Cabinet Resolution No. (15) of 2026
Regarding the UAE Safety Requirements Regulation in Industrial Gas Facilities

The Cabinet:

- Having reviewed the Constitution;
- Federal Law No. (1) of 1972 Regarding the Competences of the Ministries and the Powers of Ministers, as amended;
- Federal Law No. (14) of 2016 Regarding Administrative Violations and Penalties in the Federal Government;
- Federal Decree by Law No. (17) of 2019 Regarding Weapons, Ammunition, Explosives, Military Materiel, and Hazardous Substances;
- Federal Decree by Law No. (20) of 2020 Regarding Standardization and Metrology;
- Cabinet Resolution No. (35) of 2015 Regarding the UAE Regulation of Control on Conformity Assessment Bodies;
- Cabinet Resolution No. (3) of 2016 Regarding the UAE Regulation for the Control of Equipment, Tools, and Materials for Personal Protection and Occupational Safety and Health;
- Cabinet Resolution No. (23) of 2016 Regarding the UAE Regulation for the Control of Electrical Equipment Intended for Use in Potentially Explosive Atmospheres; and
- Upon the proposal of the Minister of Industry and Advanced Technology, and the approval of the Cabinet;

Hereby resolves as follows:

Article (1)
Definitions

For the purposes of implementing the provisions of this Resolution, the following terms and expressions shall have the meanings assigned to each of them, unless the context requires otherwise:

State	:	The United Arab Emirates.
Ministry	:	The Ministry of Industry and Advanced Technology.
Minister	:	The Minister of Industry and Advanced Technology.
Competent Authority	:	The federal or local government entities in the State within whose competence the implementation of any provision of this Resolution falls.
Industrial Gases	:	Gases of various types and categories produced or filled for industrial or commercial uses, including principal gases such as nitrogen, oxygen, carbon dioxide, argon, hydrogen, helium, acetylene, and other gases or mixtures thereof.
Authorized Entity	:	Any federal or local government entity, or any private entity formally authorized by the Competent Authority to undertake any of its duties and powers prescribed under this Resolution.
Facility	:	Any industrial or commercial establishment or company engaged in production, filling, transportation, storage, import, or export activities of compressed, liquefied, or Cryogenic Industrial Gases, including activities involving the manufacture, maintenance, and requalification of cylinders, tubes, tanks, and equipment used in the production and Filling of Industrial Gases.
Product	:	Ready-for-use packaged Industrial Gases of all types and in all containers, including empty cylinders, tubes, tanks, as well as the equipment, and installations used in Industrial Gas production, filling, and storage activities, such as valves and Measuring Instruments and devices.
Supplier	:	The manufacturer, filler, processor, storage provider, importer, agent, principal or sub-distributor, or carrier of Products whose activity affects the characteristics and safety of Industrial Gases, as well as any commercial or legal representative responsible for importing Products subject to the provisions of this Resolution.

Conformity Assessment	:	Any activity used, directly or indirectly, to verify that a good, Product, material, or service satisfies the relevant technical requirements.
Accreditation	:	A procedure whereby the Ministry formally grants recognition to a Conformity Assessment Body and declares that it is qualified and competent to perform specified tasks.
Conformity Assessment Body	:	A body registered, accredited, or approved by the Ministry to carry out Conformity Assessment procedures, including testing and Calibration laboratories, inspection bodies, proficiency-testing providers, and certification bodies for systems, persons, or Products. Medical Laboratories, research and development Laboratories, and Laboratories used for personal, training, or educational purposes shall be excluded.
Certificate of Conformity	:	A certificate issued by the Ministry or by a Conformity Assessment Body accepted by the Ministry, confirming that the Product, or any batch thereof, complies with the relevant Standard Specifications.
Standard Specification	:	A document specifying the characteristics, descriptions, quality level, dimensions, measurements, safety and security requirements, terms, symbols, testing methods, sampling procedures, packaging requirements, labels, and Marks relating to any good, Product, material, service, or anything subject to measurement.
Approved Standard Specification	:	A Standard Specification adopted by the Ministry and designated as a Standard Specification of the United Arab Emirates, denoted by the symbol (UAE.S).
Technical Regulation	:	A Cabinet Resolution prescribing technical requirements, whether directly or by reference to, or incorporation of, the contents of a Standard Specification, technical specification, or code of practice, having mandatory application.

Laboratory	:	An entity engaged in the performance of testing or Calibration activities.
Inspection and Requalification Centers	:	Registered or accredited entities possessing the capabilities and qualified competences required to conduct periodic inspections, maintenance, and requalification of cylinders and tanks used in Industrial Gas Facilities, for the purpose of verifying their safety and continued fitness for service, stamping them and affixing a mark confirming their validity and indicating the date of the next periodic inspection, or withdrawing and removing them from service where they are found unfit for use.
Measuring Instruments	:	Machines, instruments, and devices intended for measurement purposes, including direct measures such as scales, capacity measures, length-measuring devices, standard units, and the like, as well as indirect measures such as temperature and pressure gauges, water meters, electricity meters, and the like.
Mark	:	Any drawing, sign, symbol, stamp, engraving, or image denoting the Ministry or any matter issued thereby concerning standards, metrology, quality, and conformity, or denoting any international body concerned with standards, metrology, quality, and conformity.
Calibration	:	The operations undertaken to determine and adjust the accuracy of Measuring Instruments and devices.
Occupational Health and Safety	:	The set of procedures, rules, and systems applied within a legislative framework and according to specified technical standards, aimed at protecting workers from work-related hazards, accidents, and diseases resulting therefrom, reducing workplace injuries, and safeguarding property.

Supply Chain	:	All stages through which a Product passes, commencing from primary production and ending with its delivery to the consumer, including the stages of importation, production, filling, storage, and transportation of the Product, as well as any other related operation.
Filling of Industrial Gas	:	The operations carried out by a Facility to fill Industrial Gases produced thereby or stored on its premises into cylinders or containers to facilitate safe transportation, storage, and use by the concerned authority, in accordance with the instructions specifying their uses and satisfying quality and safety requirements.
Cryogenic Gases	:	Gases maintained, transported, and stored in a liquefied state at extremely low temperatures, requiring specific procedures for storage, transportation, and handling to ensure compliance with safety standards, such as nitrogen, argon, helium, and hydrogen gases.
Inert Gases	:	Non-flammable and non-toxic gases used in gaseous form or as cryogenic liquids at temperatures below minus one hundred (-100) degrees Celsius, for various purposes such as refrigeration or as rocket fuel, including nitrogen and neon gases.
Toxic Gases	:	Gases that cause death or serious harm to human health when inhaled, such as fluorine, chlorine, and hydrogen cyanide gases.
Flammable Gases	:	Gases that ignite upon contact with an ignition source, such as acetylene and hydrogen.
Emirates Conformity Assessment Scheme (ECAS)	:	The scheme issued by the Ministry, which is concerned with verifying a Product's compliance with requirements specified in the Approved Standard Specifications, whether directly or indirectly, through specified procedures undertaken by the Ministry, such as inspection, testing, or Calibration, for the purpose of issuing Certificates of Conformity.

Color Coding of Industrial Gas Cylinders and Containers	:	The system used to distinguish gases filled in cylinders or containers by assigning a specific color to each cylinder or container according to the type of Industrial Gas and its degree of hazard, thereby facilitating the identification of the filled gas, enabling prompt handling and risk avoidance during incidents or for the purpose of gas identification, and contributing to the reduction of filling errors at source, and the prevention of delivery of incorrect Products to consumers.

Article (2)

Scope of Application

1. The provisions of this Resolution shall apply to Industrial Gas Facilities in the State, including those operating within Free Zones, as follows:
   a. Industrial Gas Facilities including industrial or commercial institutions and companies engaged in the production, filling, importation, exportation, transportation, or storage of Industrial Gases.
   b. Facilities engaged in the production or importation of cylinders, tubes, tanks, and tankers used for the Filling of Industrial Gases.
   c. Empty and filled Industrial Gas cylinders, tubes, tanks, and tankers of all types.
   d. Equipment and apparatus specified in the reference Standard Specifications set out in Annex No. (1-A) attached to this Resolution.
   e. Centers for the inspection, testing, and requalification of Industrial Gas cylinders and tanks.
   f. Land transport means and logistics operations associated with the transportation, storage, and handling of cylinders and containers containing compressed gases and Cryogenic Industrial Gases.
2. The provisions of this Resolution shall not apply to petroleum gas and natural gas facilities and its Products, transmission pipelines, tankers, containers, and cylinders filled with petroleum gas or natural gas Products in all compressed or cryogenic liquefied forms, or means of transport operating on such gases.

Article (3)

Safety and Risk Management in Industrial Gas Facilities

Industrial Gas Facilities shall comply with the following:

1. Establish and implement prevention and safety policies and measures in the course of their operations and the conduct of their activities, in accordance with the requirements prescribed by the Standard Specifications relating to Occupational Health and Safety Management Systems, Risk Management, and the instructions set out in the Annexes attached to this Resolution.
2. Apply the Standard Specifications relating to Environmental Management Systems (UAE.S ISO 14001), Occupational Health and Safety Management (UAE.S ISO 14001), and Risk Management (UAE.S ISO 31000 UAE.S), and obtain Certificates of Conformity for such systems issued by Conformity Assessment Bodies accredited in accordance with the National Accreditation System promulgated pursuant to Cabinet Resolution No. (22) of 2004.
3. Prepare and maintain a Risk Register for the purpose of identifying hazards, assessing risks, establishing and monitoring of control measures relating to the relevant operations and activities, and reviewing the same on a periodic basis.
4. Establish the controls and measures necessary to ensure the proper and safe handling of outputs and waste resulting from industrial operations in Industrial Gas Facilities, in accordance with the legislation and procedures applicable in the State.
5. Install safety signs, symbols, instructions, labels, and warning notices for hazards and hazardous locations throughout the various installations of the Facility, provided that they are written in both Arabic and English, in addition to any other languages appropriate for the Facility's workers. Such signs shall comply with the international symbols and Marks prescribed under the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) for the identification of hazardous chemical substances.
6. Ensure that all public and personal safety and protective equipment and supplies used in all operations and installations of the facilities comply with the UAE Regulation for the Control of Equipment and Tools for Personal Protection and Occupational Safety and Health; promulgated pursuant to Cabinet Resolution No. (3) of 2016.

7. Comply with the UAE Regulation for the Control of Electrical Equipment Intended for Use in Potentially Explosive Atmospheres promulgated pursuant to Cabinet Resolution No. (23) of 2016, in Facilities handling hazardous explosive gases.
8. Establish a comprehensive training system on safety systems and instructions, as well as emergency plans, including the preparation and implementation of training program for all workers, with particular emphasis on operations and warehouse departments and divisions. Such program shall cover storage, handling, segregation, and classification procedures based on chemical compatibility, methods for the identification and differentiation of cylinders, understanding of safety regulations, and ensuring that all workers are fully acquainted with the safety systems and procedures approved by the Facility.
9. Comply with the National List of Hazardous Substances approved by the State during the production, filling, importation, transportation, and handling of Industrial Gases listed therein.
10. Maintain a general fire-fighting system that satisfies safety requirements proportionate to the nature of the Industrial Gases and the Facility's operational activities, and that is consistent with the UAE Fire and Life Safety Code., provided that smoke and Industrial Gas leakage detection and alarm systems are connected to the Facility's control room.
11. Apply the rules and requirements set out in Annex No. (2) attached to this Resolution.

Article (4)

General Safety Requirements and Rules for Industrial Gas Facilities

Industrial Gas Facilities shall comply with the following requirements:

1. The Facility shall be duly licensed and registered in the State in accordance with the applicable legislation. No Facility may conduct its activities unless it has obtained the licenses prescribed by the Competent Authorities for the conduct of such activity.
2. The Facility's premises shall be planned and designed, and the location thereof shall be selected in accordance with the safety requirements, controls, and general safety rules approved by the concerned authorities, and such requirements, controls, and rules shall be incorporated into the design and construction contracts.

3. Preventive measures shall be adopted to ensure the health and safety of all persons and workers participating in operational activities and present at the Facility's sites, in order to minimize occupational risks arising from exposure to toxic substances, risks of fire, explosions, asphyxiation, electrical shock, noise, and physical injuries, while taking into account the long-term health effects resulting from continuous or cumulative exposure to such substances.
4. Approved occupational health program shall be established and implemented, including pre-employment and periodic medical examinations of workers to verify their medical fitness for work and to facilitate the early detection of occupational diseases or cases of exposure to Industrial Gases, in addition to providing mental health care program for workers.
5. Technical instructions and guidance relating to the Calibration, maintenance, and operation of equipment and devices within Facilities, such as (gas cylinders, valves, and pressure regulators), shall be displayed, published, and clearly visible so as to achieve their intended purpose.
6. Facilities engaged in the production, filling, and storage of Industrial Gases shall install automated monitoring systems and devices for detection and alarm and adopt the necessary measures to monitor and respond to any emissions or leakages resulting from operational activities or occurring in storage facilities which may pose potential risks to the surrounding external environment, including residential communities and neighboring Facilities and installations.
7. Facilities engaged in the production, filling, and storage of Industrial Gases shall comply with the general safety requirements and instructions specified in Annex No. (3) attached to this Resolution.
8. Industrial Gas Facilities shall, each in accordance with its specialization and Products, comply with all requirements, instructions, and measures set out in Annexes Nos. (4), (5), (6), (7), (8), (9), (10), and (15) attached to this Resolution.

Article (5)

Safety Requirements for Compressed Gas, Medical Gas, and Industrial Liquefied Gas Production and Filling Facilities

1. Medical gas and Medical Air Facilities shall obtain a permit to carry on the activity from the Emirates Drug Establishment and shall hold a Good Manufacturing Practice (GMP) Certificate in accordance with the requirements of the World Health Organization, issued by an accredited Conformity Assessment Body.
2. Cylinders used for filling shall be designed and manufactured in accordance with the Standard Specifications and Reference Technical Documents set out in Annexes (1-A) and (1-B) attached to this Resolution. Such cylinders shall be suitable for the gases filled therein and their corresponding color-coding, in a manner consistent with the label and gas contents. The cylinders shall be clean and free from any deposits, contaminants, or residues of other gases, and compliance with these requirements shall be verified prior to carrying out the filling operation.
3. Cylinders used for filling medical gases shall be manufactured and designed in accordance with the requirements of International Standard ISO 9809. They shall be clean and free from any contaminants or residues, and contamination-control systems shall be implemented within the Facility during filling operations to prevent the transfer of contaminants. The color coding and labelling shall conform to the guidelines of the World Health Organization to ensure rapid identification of the gas type, and labels indicating the gas composition and uses shall be affixed.
4. Comply with the Standard Specifications relating to approved Quality Management Systems (ISO 9001) or (UAE.S ISO 13485) for medical devices, as well as digital traceability and monitoring systems covering the gas life cycle throughout the Supply Chain, so as to ensure immediate traceability of any batch in the event of any issue. Artificial intelligence-based systems shall be employed to detect any deviations in Product quality.
5. The Good Manufacturing Practice (GMP) principles issued by the World Health Organization shall be applied throughout all stages of medical gas production, including

the Facility design, production equipment, and hygiene standards. The manufacturer shall implement stringent quality-control programs, including the following:

a. Conducting periodic testing of medical gases to verify their purity and conformity with the Approved Standard Specifications (UAE.S GSO 698), (UAE.S GSO 363), and (GSO 747).
b. Documenting all production and analysis stages.
c. Verifying the conformity of production processes with international standards, such as the ISO 8573 series of Standard Specifications relating to compressed air contaminants.

6. Comply with all requirements and measures relating to the prevention of hazards and causes of accidents or contamination, particularly in medical gas and Food-Grade Gas production, filling, and storage Facilities, as set out in Annexes (7) and (8) attached to this Resolution.
7. Food-Grade Gas production and filling Facilities shall comply with all requirements and instructions relating to quality-management, monitoring and control systems, finished-Product management, and Product traceability systems. Such facilities shall obtain certificates confirming its implementation of a Food Safety Management System, issued by a Conformity Assessment Body accredited in accordance with the National Accreditation System promulgated pursuant to Cabinet Resolution No. (22) of 2004.
8. Hydrogen gas filling facilities shall apply technical instructions relating to filling stations to ensure safe operation and the maintenance of safety. Such instructions shall include Hydrogen Fuel Quality Requirements and conformity with Standard Specification S.UAE ISO 14687, which specifies safety protocols, equipment requirements, maintenance procedures, and other requirements.
9. Hydrogen Vehicle Refueling Stations shall comply with the requirements of Standard Specification ISO S.UAE 19880-1, which sets out the minimum requirements for design, installation, operation, inspection, and maintenance to achieve the safety, performance, and safe operation standards for such stations during the refueling of light-duty and heavy-duty road vehicles with hydrogen fuel.

10. Specialty Gas Filling Facilities shall comply with the technical instructions and guidelines approved for this category of Industrial Gases, in order to ensure the quality and composition of the gas or gas mixtures during filling operations. They shall also provide the infrastructure, equipment, and apparatus necessary for the filling, inspection, and testing of Specialty Gases of all types.

Article (6)

Requirements for the Transportation, Distribution, and Storage of Industrial Gases

Facilities responsible for the transportation, distribution, and storage of Industrial Gases of all types and in all forms of packaging shall comply with the following requirements:

1. Observe safety procedures and instructions during the loading, transportation, distribution, and handling of filled gas cylinders, whether carried out by the Facility's workers or by contractors engaged for their transportation. Contractors shall provide vehicles designated for the transportation of cylinders and shall carry out the related operations in accordance with the instructions specified in Standard Specification No. (UAE.S 5060) and the Reference Technical Documents set out in Annex (1-B) attached to this Resolution.
2. Truck drivers, operators of mechanical equipment, and workers engaged in the handling, transportation and loading shall undergo appropriate training and retain certificates and documents evidencing their competence to handle, transport, or unload Industrial Gas products, in accordance with the nature and types of hazards associated with each type of transported gas and its method of packaging, whether in cylinders, compressed tubes, or tanks and containers for liquefied Cryogenic Gases. Compliance shall be maintained with the safety requirements specified in Standard Specification No. (UAE.S 5060), in a manner that prevents any incidents of explosion, leakage, or spillage during transportation, filling, unloading, and storage operations.
3. Apply the Standard Specifications and Technical Documents relating to the safety of cylinders, tanks, and handling operations set out in Annexes Nos. (1-A) and (1-B) attached

to this Resolution, while complying with the requirements specified in Annexes Nos. (12) and (13) attached hereto.

4. During the transportation, handling, and delivery of helium tanks (Dewars) to hospitals, compliance shall be maintained with the instructions and guidelines approved by the Facility and the hospital throughout all stages of transportation and delivery. Strict compliance shall also be maintained with the safety and health requirements and instructions referred to in Annex (16) attached to this Resolution, so as to ensure the safety of workers, equipment, machinery, means of transport, and facilities during the performance of such operations, while maintaining compliance with storage requirements to safeguard public safety, operations, and the environment.
5. Conduct a comprehensive inspection of helium tanks prior to transportation and delivery to verify their integrity and ensure that it is free from any damage or leakage, and to confirm the safety of the valve and the suitability of the tank for transportation and use. The inspection results shall be documented, and the tank shall be safely secured within the vehicle during transportation and delivery to prevent accidents or potential hazards.
6. The design, manufacturing, and inspection requirements applicable to large vacuum-insulated vehicle tanks intended for the transportation of Cryogenic Gases with a capacity exceeding four hundred and fifty (450) liters, whether permanently mounted tanks or demountable transportable tanks, shall conform to Standard Specification No. (UAE ISO 20421-1) referred to in Annex No. (1-A) attached to this Resolution.
7. Comply with all requirements specified in Standard Specification No. (UAE.S GSO 2654) concerning the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) in their operational activities.
8. Comply with the safety conditions and requirements governing the road transportation of dangerous goods in accordance with Standard Specification No. (UAE.S 5060), and adhere to the safety instructions relating to the loading, transportation, and handling of cylinders and tanks used for the transportation of Industrial Gases, whether compressed, bulk, or cryogenic. Means of transport used for the transportation of Industrial Gases shall carry the documents and certificates issued by the Competent Authority or the Authorized Entity evidencing their suitability and fitness for the transportation purposes and

designated load, in accordance with the international agreements governing the transportation of dangerous goods.

9. Comply with the safety requirements and procedures governing lifting equipment used in Industrial Gas Facilities as set out in Annex (19) attached to this Resolution.
10. Apply the Standard Specifications and Technical Documents relating to the safety of cylinders and tanks in gas-cylinder storage installations and locations set out in Annexes (1-A) and (1-B), together with the instructions specified in Annexes (13), (14), and (15) attached to this Resolution.

Article (7)

Inspection of Industrial Gas Cylinders and Cryogenic Gas Tanks

1. Comply with the quality, performance, and safety requirements specified in Annexes (1-A) and (1-B) attached to this Resolution when designing and selecting materials, and throughout the manufacture of cylinders or jumbo tubes used for filling Industrial Gases, or during the manufacture of Cryogenic Gas tanks.
2. Conformity Assessment Bodies shall undertake the inspection, examination, and testing procedures associated with the operations referred to in Clause (1) of this Article, in accordance with the acceptance criteria applicable to the design and manufacture of cylinders, jumbo tubes, and Cryogenic Gas tanks specified in the relevant Standard Specifications set out in Annexes (1-A) and (1-B) attached to this Resolution and in Technical Document No. (EIGA 08/046) relating to tanks.
3. All new cylinders shall, prior to being placed into service, obtain a Certificate of Conformity from the Ministry confirming their safety and conformity with the Standard Specifications specified in Annex (1-A) attached to this Resolution, and shall bear the approved Mark of the manufacturer. Under no circumstances may any Facility place a new cylinder into service unless it has obtained such Certificate of Conformity.
4. Each cylinder shall bear markings and Marks relating to the manufacturer, maximum filling pressure, year of manufacture, service life (cylinder lifespan), and the serial number, in accordance with the Standard Specifications and Reference Technical Documents specified in Annexes (1-A) and (1-B) attached to this Resolution, thereby enabling

inspection and traceability. Such Marks shall not be capable of forgery or removal, and no cylinder may be used if it does not bear such stamps and Marks, or if it bears stamps or Marks that are inconsistent with the Product label or the gas contents.

5. Where it is established that a cylinder does not bear any stamps or Marks, or bears stamps or Marks that are inconsistent with the label or the gas contents in accordance with Clause (4) of this Article, it shall be deemed non-compliant and shall be immediately withdrawn from operational service and referred to a Cylinder and Tank Inspection and Requalification Centre accredited in accordance with the National Accreditation System promulgated pursuant to Cabinet Resolution No. (22) of 2004, for a decision to be taken thereon and for the affixing of the required stamps and the issuance of the required certificates.
6. Periodic inspection and examination procedures shall be conducted for cylinders, jumbo tubes in service, Cryogenic Gas tanks, and vacuum-insulated cryogenic pressure vessels, including static-electricity testing, in accordance with a specified program. Records and documentation relating to the results of such inspections and the corrective measures implemented shall be maintained. Such equipment shall be subject to periodic inspection and examination by inspection bodies and Conformity Assessment Bodies accredited in accordance with the National Accreditation System promulgated pursuant to Cabinet Resolution No. (22) of 2004 or by Conformity Assessment Bodies accepted by the Ministry. Any cylinder, tank, or cryogenic pressure vessel that successfully passes the required tests shall bear the stamp of the inspection body, clearly indicating the date of testing and the date of the next periodic test, in accordance with the requirements of the Standard Specifications relating to periodic cylinder inspection set out in Annex (1-A) attached to this Resolution and the instructions of the supervisory authorities and manufacturers.
7. Cylinders that have remained in service beyond the prescribed periodic testing interval shall undergo testing and verification of their continued fitness prior to the next filling operation.
8. No Facility may place any cylinders or cryogenic gas tanks into service, or continue operating them, unless they have successfully passed the periodic inspection procedures

in accordance with Clauses (5) and (6) of this Article. Both the Facility and the accredited Conformity Assessment Body shall be responsible before the Competent Authority for the implementation of the requirements and procedures specified in this Article.

9. Facilities shall establish a cylinder register in which all inspections and tests conducted on each cylinder are recorded and shall retain such records for submission to the Competent Authority upon request.
10. Cylinder and Tank Inspection and Requalification Bodies and Centers shall comply with the requirements and procedures set out in Annexes (17) and (18) attached to this Resolution.

Article (8)

Safe Disposal of Expired Gases

1. Facilities and owners of gas cylinders and containers shall ensure the safe disposal of expired Industrial Gases in a manner that prevents any risks, and each shall bear responsibility in the event of a breach of the requirements of this obligation.
2. Gas cylinders and containers, and the disposal of the gases contained therein, whether their contents are known or unknown, shall be handled only by qualified workers or by the authorities concerned with environmental matters, as the case may be.
3. Facilities shall prepare and implement guidelines and instructions for the safe disposal of Industrial Gases contained in cylinders and containers, whether prior to their refilling or prior to their destruction thereof, in accordance with the instructions of the authority concerned with waste management in each Emirate.
4. Safe disposal operations relating to the Industrial Gases referred to in Clause (3) of this Article shall be carried out by workers possessing the requisite expertise and competence, after conducting a comprehensive risk assessment.

Article (9)

Procedures and Controls Governing the Safe Disposal of Expired Cylinders

Industrial Gas Filling Facilities shall comply with the following:

1. Establish procedures for the management of cylinders approaching the end of their service life, taking into consideration the type and construction of the cylinder, the intended use of the gas, the manufacturer's instructions, and the inspection results determining its continued suitability. A cylinder shall be withdrawn from service upon confirmation that continued use poses a risk, and the necessary measures shall be taken to classify it as waste unsuitable for further use, with the disposal process documented in the cylinder records.
2. Safely dispose of damaged acetylene cylinders in accordance with EIGA Doc 05 concerning the Guidelines for the Management of Acetylene Cylinder, so as to ensure the safe handling of this category of cylinders.
3. Comply with the instructions prescribed in EIGA Doc 166/23 concerning the Guidelines on Management of Waste Gas Cylinders issued by the European Industrial Gases Association (EIGA).

Article (10)

Color Coding of Gas Cylinders

1. Industrial Gas Filling Facilities shall implement a color-coding system for Industrial Gas cylinders by assigning designated colors to the various categories of Industrial Gases, thereby ensuring identification of the gas type and the associated level of hazard and achieving the highest standards of safety in the handling of cylinders, in accordance with MEGA TD 08//E concerning Color Coding.
2. Industrial Gas Filling Facilities shall apply the standard color-coding system for cylinders and tanks containing Industrial Gases in a manner that serves health and safety objectives and reduces the risks of mishandling or confusion during storage, transportation, and use operations, particularly in the event of accidents.
3. Labels and Color Coding affixed to cylinders shall be subject to inspection procedures conducted by Conformity Assessment Bodies accredited in accordance with the National Accreditation System promulgated pursuant to Cabinet Resolution No. (22) of 2004, for the purpose of verifying their accuracy and consistency with the gas contents of the cylinder.

4. Industrial Gas Filling Facilities shall provide a guidance manual to workers and users setting out the approved color-coding indications applicable to cylinder contents, display the necessary instructional signage in areas where cylinders are handled, and ensure that all workers are fully aware of the significance of such colors.

Article (11)

Marks and Labels for Industrial Gas Cylinders

Industrial Gas Filling Facilities shall comply with the following:

1. Apply the requirements and instructions set out in MEGA TD 04/14 concerning Cylinder Product Labels, and implement the instructions relating to the labelling and color coding of Industrial Gas tanks and cylinders with descriptive information concerning the filled gas, in a manner that ensures the identification of Industrial Gases and their safe handling during transportation and circulation.
2. Affix Marks to cylinders in accordance with the instructions prescribed in Technical Document EIGA Doc 169/22 concerning Classification and Labelling, referred to in Annexes Nos. (1-A) and (1-B) attached to this Resolution.
3. The Label affixed or marked on a gas cylinder, together with the color coding, shall be subject to Conformity Assessment procedures to verify that the gas content of the cylinder corresponds to the Label and the cylinder color coding, by Conformity Assessment Bodies accredited in accordance with the National Accreditation System promulgated pursuant to Cabinet Resolution No. (22) of 2004.

Article (12)

Cylinder Valve

1. Industrial Gas Filling Facilities shall select the appropriate valve for each cylinder according to the type of Industrial Gas and the applicable operating pressure, provided that the valve conforms to the Standard Specifications prescribed by the manufacturer and the safe-operation regulations.
2. Persons handling and using gas cylinders shall handle cylinder valves with due care in accordance with the manufacturer's instructions and guidance to ensure safe operation,

and shall take the necessary measures to ensure proper handling of cylinder valves, including during maintenance operations performed thereon.

3. Industrial Gas Filling Facilities shall ensure that the valves of transportable gas cylinders conform to the requirements of Standard Specification No. (UAE.S GSO ISO 10297) referred to in Annex No. (1-A) attached to this Resolution under normal service conditions.
4. Industrial Gas Facilities and operators shall comply with the valve installation and operation instructions prescribed in Clause (14) of Annex No. (17) attached to this Resolution.

Article (13)

Connections for Cryogenic Gas Tanks

1. Connections used in Industrial Gas filling locations shall be selected with precision to ensure the safe filling and discharge of Industrial Gas to and from transportable and stationary tanks, as well as cryogenic storage vessels for liquified air gases.
2. Pipe or hose connections designated for cryogenic gases shall be selected in accordance with the applicable technical requirements, so as to ensure the safe transfer of gases without exposing the tanks to damage, leakage risks, or accidents.
3. Industrial Gas Facilities shall comply with the requirements of the Guide for Connections for Transportable and Static Storage Tanks for Cryogenic Gases (MEGA TD 02), referred to in Annex No. (1-B) attached to this Resolution.

Article (14)

Equipment and Accessories

Production and Filling Facilities for Industrial Gases, as well as Facilities engaged in the manufacture and supply of equipment and installations used in cylinder and tank production and filling operations, shall verify the following:

1. That all equipment used in the production or Filling of Industrial Gases, including cylinders, tanks, tankers, aluminum tanks, cryogenic pumps, valves, regulators, flow meters, connections, and other equipment and installations, is designed and

manufactured and provided with the necessary safety devices, safety requirements, and user-protection measures, and that such equipment poses no risk when operated under its specified operating conditions.

2. That the characteristics and performance of equipment and installations are not adversely affected during filling, transportation, and storage operations, and that they are used in accordance with the manufacturer's instructions, thereby ensuring that their design satisfies safe-use requirements and fulfils safety requirements when handling various materials and gases under normal operating conditions.
3. That the risks of fire, explosion, or leakage are minimized throughout all production, operation, filling, transportation, and storage processes, particularly with respect to installations and equipment intended for use with flammable substances.
4. That equipment incorporating Measuring Instruments with measurement limits demonstrates the required degree of accuracy and stability within the prescribed limits as specified by the manufacturer, including equipment used in gaseous-fuel filling stations, and that the flow rate remains accurate and capable of being monitored so as to ensure customer safety.
5. That all valves, measuring devices and instruments, pressure-relief valves, safety valves, connections, and hoses conform to the specifications prescribed in Annexes Nos. (1-A) and (1-B) attached to this Resolution and have obtained Certificates of Conformity from Conformity Assessment Bodies accredited in accordance with the National Accreditation System promulgated pursuant to Cabinet Resolution No. (22) of 2004.
6. That all equipment, devices, and Measuring Instruments used in Industrial Gas production, filling, and discharge operations are subject to periodic Calibration and hold valid periodic Calibration certificates issued by accredited Calibration Bodies in accordance with the National Accreditation System promulgated pursuant to Cabinet Resolution No. (22) of 2004.
7. That equipment and installations are designed and manufactured in a manner that minimizes potential risks, including accidental electric shocks, mechanical hazards, vibrations, and hazards arising from noise.

8. That every component or part of the equipment used is accompanied by all safety information, operation and maintenance manuals, labels, Marks, and instructions for use, and is provided in a manner that enables user training, while clearly indicating the manufacturer's particulars.

Article (15)

Cryogenic Gas Pumps

1. Centrifugal pumps used for cryogenic gases shall satisfy the minimum design, manufacturing, and testing requirements prescribed in Standard Specification No. (UAE.S GSO ISO 24490) set out in Annex No. (1-A) attached to this Resolution. These requirements may also be applied to other types of cryogenic pumps, such as reciprocating pumps.
2. Cryogenic reciprocating pumps, and liquid oxygen, liquid argon, and liquid nitrogen installations, shall satisfy the requirements prescribed in Technical Document No. (EIGA Doc 159) set out in Annex No. (1-B) attached to this Resolution.

Article (16)

Industrial Gas Flow Meters

Industrial Gas flow meters shall conform to the requirements prescribed in Standard Specification No. UAE.S GSO ISO 15002 set out in Annex No. (1-A) attached to this Resolution when used with the following gases: Oxygen, Nitrous Oxide, Medical Air, Carbon Dioxide, Oxygen/Nitrous Oxide mixtures, or any specified mixture of such gases.

Article (17)

Gas Pressure Regulators

Gas pressure regulators shall conform to the Approved Standard Specifications appropriate to the type of gas used and the operating conditions, in accordance with the requirements of the International Association of Oil and Gas Producers (IOGP), including requirements relating to design, dimensions, materials, inspection, testing, and markings. Such specifications shall

apply to pressure regulators used in production facilities and in transportation, distribution, and storage systems.

Article (18)

Industrial Gas Laboratories

1. Industrial Gas Production or Filling Facilities shall provide a specialized Laboratory equipped with measuring and Calibration instruments, as well as inspection and testing equipment appropriate to the type of Industrial Gases and technologies employed, in order to ensure the quality of filled gases and the safety of containers and production operations within the Facility. The Laboratory shall satisfy the following requirements:
   a. The Laboratory shall possess the competence necessary to perform analyses and tests on Industrial Gas samples, determine their purity levels and the extent of their conformity with the required specifications, and conduct quality, safety, Calibration, and other tests prescribed for the Laboratory.
   b. The design and construction of the Laboratory shall be suitable for the nature and type of tests and examinations required, while complying with the safety instructions and guidelines applicable to hazardous chemical substances prescribed in the Approved Standard Specification No. UAE.S GSO 2654, as well as the guidance relating to the inspection and testing equipment used.
   c. Laboratory workers shall be qualified technicians holding the necessary certifications to conduct the required tests, and shall comply with measurement and result accuracy requirements and with safety instructions and guidelines through the use of suitable protective and safety equipment prescribed by the Standard Specifications governing the applicable test methods.
2. Laboratories of Industrial Gas Production and Filling Facilities may issue certificates relating to the testing of filled gases for use by customers, provided that:
   a. The Laboratory is accredited in accordance with the National Accreditation System promulgated pursuant to Cabinet Resolution No. (22) of 2004 and complies with the requirements of International Standard ISO/IEC 17025.

b. Measuring, Calibration, and testing instruments shall be calibrated on an ongoing basis within the required measurement accuracy limits, including periodic Calibration, through Calibration Laboratories accredited in accordance with International Standard ISO/IEC 17025.

Article (19)

Industrial Gas Cylinder Inspection, Testing, and Requalification Centers

Industrial Gas Cylinder Inspection, Testing, and Requalification Centers shall comply with the following:

1. Fulfil all safety and health requirements necessary for dealing with filled and empty Industrial Gas cylinders of all types, in accordance with the Standard Specifications and reference technical documents prescribed in Annexes Nos. (1-A) and (1-B) attached to this Resolution.
2. Ensure that workers in such Centers are qualified and hold the certifications necessary to perform the required tests, and that they comply with safety instructions and guidance and use the appropriate personal protective equipment prescribed by the Approved Standard Specifications.
3. Take all safety measures and procedures relating to the handling of Industrial Gas cylinders upon receipt.
4. Comply with the requirements of International Standard ISO/IEC 17065 concerning Conformity Assessment — Requirements for Bodies Certifying Products, Processes and Services, and be accredited under the National Accreditation System pursuant to Cabinet Resolution No. (22) of 2004.
5. Comply, in their operations and activities, with the Standard Specifications relating to Quality Management Systems (UAE.S ISO 9001) and Environmental Management Systems (UAE.S ISO 14001).
6. Establish procedures and programs relating to maintenance, inspection, testing, and requalification activities for cylinders and tanks.
7. Comply with the instructions and procedures prescribed in Annex No. (17) attached to this Resolution.

Article (20)

Obligations of Suppliers and Facilities

Suppliers and Facilities shall, each according to the nature of its activity, comply with the following requirements:

1. Ensure that all empty and filled Industrial Gas cylinders, tubes, tanks, and tankers of all types, as well as equipment and installations used in Industrial Gas Facilities, satisfy the requirements prescribed in the Standard Specifications and reference technical documents set out in Annexes Nos. (1-A) and (1-B) attached to this Resolution, together with any other Standard Specifications referred to in this Resolution.
2. Implement Environmental Management Systems (UAE.S ISO 14001), Occupational Health and Safety Management Systems, and Risk Management Systems (UAE.S ISO 31000), and obtain Certificates of Conformity for such systems from Conformity Assessment Bodies accredited in accordance with the National Accreditation System promulgated pursuant to Cabinet Resolution No. (22) of 2004. A Facility holding such certificates shall be deemed compliant with this requirement.
3. Implement digital systems for the tracking and monitoring of filled gas Products throughout the Supply Chain, while ensuring immediate traceability of any batch whenever an issue arises concerning the quality or safety of gas products, including medical gases and food-grade gases, and employ artificial intelligence systems to monitor any deviations in quality.
4. Obtain Certificates of Conformity for new personal protective equipment and devices before being placed into service, in accordance with the Approved Standard Specifications.
5. Ensure that all new cylinders and tanks of every type used in the filling and storage of Industrial Gases obtain Certificates of Conformity from the Ministry before being placed into service, in accordance with Form (H) under the Emirates Conformity Assessment Scheme (ECAS).
6. Comply with the requirements of Standard Specification No. (UAE.S 5060) relating to the transportation of all types of Industrial Gases, whether compressed, cryogenic, or bulk.

7. Ensure that all Industrial Gas cylinders and tanks bear the Marks and Labels prescribed in Article (11) of this Resolution and carry the Color Coding applicable to the filled gas in accordance with Article (10) of this Resolution.
8. Cooperate with Ministry personnel and the Competent Authorities during monitoring and inspection activities and provide, upon request, all documents, technical documentations, certificates, reports, and data demonstrating the conformity of their Industrial Gas-filled cylinders and tanks with the requirements of this Article.
9. Retain test reports relating to medical gases and food-grade gases demonstrating their safety for a period of not less than ten (10) years from the date of the latest production batch, provided that such reports are updated whenever necessary.
10. Verify the conformity of the Products referred to in Clause (1) of this Article by obtaining the Certificate of Conformity referred to in Article (21) of this Resolution.
11. Register the Industrial Gases included in the National List of Controlled Hazardous Materials with the concerned authorities in the State.

Article (21)

Requirements for Obtaining a Certificate of Conformity

1. The Ministry shall establish the procedures necessary for the Conformity Assessment of the Products referred to in Clause (1) of Article (20) of this Resolution.
2. The applicant shall submit all required documents and select a Conformity Assessment Body (third party) after approving the terms of the relevant agreement.
3. The Conformity Assessment Body shall undertake the necessary verification and assessment to determine the conformity of the Product referred to in Clause (1) of Article (20) of this Resolution with the Standard Specifications and reference technical documents prescribed in Annexes Nos. (1-A) and (1-B) attached to this Resolution and any other Standard Specifications referred to in the provisions hereof.
4. Equipment and accessory Products used in Industrial Gas Facilities shall meet the requirements specified in Clause (1) of Article (20) of this Resolution. Where the Facility applies to the Ministry for a Certificate of Conformity for such Products, such certificate

shall be granted in accordance with Form (B) approved under the Emirates Conformity Assessment Scheme (ECAS).

5. An applicant who satisfies the provisions of Clause (4) of this Article shall be entitled to use the Emirates Conformity Mark (ECAS) on Products for which a Certificate of Conformity has been issued pursuant to the provisions of this Resolution.
6. During the validity period of a Certificate of Conformity granted to Industrial Gas Facilities and Suppliers, the Ministry may conduct assessments to verify the continued conformity of certified Products with the Approved Standard Specifications in accordance with its applicable procedures.
7. The Products referred to in Clause (1) of Article (20) of this Resolution that bear the Emirates Quality Mark or any other conformity mark approved by the Ministry shall be deemed compliant with the requirements prescribed in this Resolution.

Article (22)

Responsibilities of the Ministry

1. The Ministry shall register Industrial Gas Facilities in accordance with the requirements of this Resolution and shall obtain an undertaking from the owner of the Facility or the Supplier to comply with the requirements hereof in accordance with the activity licensed to be carried out.
2. The Ministry shall grant Certificates of Conformity for cylinders, tanks, tankers, and new equipment and installations (prior to being placed into service) used in Industrial Gas Production and Filling Facilities that satisfy the requirements prescribed in Clause (1) of Article (20) of this Resolution.
3. The Ministry may designate an external Conformity Assessment Body for the Facility in accordance with Cabinet Resolution No. (35) of 2015 referred to herein.
4. The Ministry shall approve Industrial Gas Cylinder and Tank Inspection and Requalification Centers and any Conformity Assessment Bodies providing services to Industrial Gas Facilities.

Article (23)

Responsibilities of the Competent Authority

Within the scope of its competence and powers, the Competent Authority shall undertake the following:

1. Verify that the cylinders, tanks, and equipment referred to in Clause (1) of Article (20) of this Resolution have obtained a Certificate of Conformity.
2. The Competent Authority or the Authorized Entity may conduct random sampling of filled Industrial Gases or of empty cylinders and equipment in order to verify their conformity with the requirements prescribed in this Resolution.
3. Where non-conformity is detected in samples of filled Industrial Gases or empty cylinders and equipment, the Competent Authority may withdraw the non-conforming Products and take necessary legal actions against the responsible parties.
4. Verify the Facilities' compliance with the safety requirements and conditions prescribed in this Resolution in their various practices and operational activities, and verify compliance with the requirements and conditions relating to filled and empty gas cylinders and tanks and other equipment and installations intended for use in their operations or by customers in accordance with the provisions of this Resolution.
5. Verify the availability of safety equipment, alarm systems, and warning Marks in Facilities, as referred to in this Resolution, throughout their operations and activities.
6. Verify the Facilities' compliance with the requirements governing the transportation of dangerous goods when transporting Industrial Gases and ensure the availability of tracking technologies for the means of transport used.

Article (24)

Monitoring and Inspection

1. The Ministry shall, in coordination with the Competent Authority, as the case may be, supervise the implementation of all requirements prescribed in this Resolution.
2. All types of cylinders and Cryogenic Gas transport containers used in the Filling of Industrial Gases shall be subject to monitoring and inspection procedures by the Competent Authorities to verify compliance with the provisions of this Resolution.

3. The Industrial Gas Facility shall maintain all documents and records relating to Industrial Gas cylinders or containers from the date they are placed into service until the date of the latest test to which they were subjected, and shall provide such documents and records during monitoring and inspection activities conducted by the Ministry or the Competent Authorities.
4. During monitoring and inspection activities, verification shall be undertaken of the Marks, manufacturer's stamp, serial number, dates, symbols, and other Marks affixed or stamped on the shoulder of cylinders, including Marks relating to periodic cylinder inspection and Color Coding, together with any other markings or labels prescribed by this Resolution.
5. Customs Authorities in the State shall undertake monitoring and inspection of imported consignments of gases packaged in cylinders or cryogenic gas tanks to verify that they have obtained a Certificate of Conformity, in coordination with the Ministry or the Competent Authority.

Article (25)

General Provisions

1. All requirements, instructions, and procedures prescribed in the Annexes attached to this Resolution shall be mandatory for all Industrial Gas Facilities.
2. The Minister may, after coordination with the Competent Authority, add, amend, or delete any Standard Specifications or requirements prescribed in the Annexes attached to this Resolution for the purposes of implementing this Resolution and in accordance with the legislation in force in this regard.
3. The Facility shall provide all information and data requested by the Competent Authorities for the purpose of identifying the source, type, and particulars of the Products referred to in Clause (1) of Article (20) of this Resolution, together with any other requirements relating to the implementation of the provisions of this Resolution, without delay.
4. The Facility shall provide assistance to the Competent Authority in transportation and handling activities to facilitate access to the required samples of the Products referred to in Clause (1) of Article (20) of this Resolution for inspection or testing, whether on-site, or at inspection and Conformity Assessment Bodies accredited in accordance with the

National Accreditation System promulgated pursuant to Cabinet Resolution No. (22) of 2004.

5. Nothing in this Resolution shall preclude the Ministry, the Competent Authorities, or the Authorized Entities from conducting inspections, taking samples, and carrying out tests to verify the conformity of the equipment, installations, and instruments referred to herein with the mandatory requirements prescribed under other legislation.
6. In furtherance of the public interest, the Ministry may take such measures as it deems appropriate in respect of cases that cannot be addressed under the provisions of this Resolution or where any dispute arises concerning its interpretation or application. In doing so, the Ministry may rely upon prevailing international practices in this field.
7. The Ministry and the Competent Authority shall each verify the compliance of the Facility and the Conformity Assessment Body accredited in accordance with the National Accreditation System promulgated pursuant to Cabinet Resolution No. (22) of 2004 with the tasks assigned thereto, in order to ensure the quality and safety of filled Industrial Gases, cylinders, tanks, equipment, and instruments used in the production, filling, storage, transportation, and handling of Industrial Gases.
8. The Standard Specifications and reference technical documents prescribed in Annexes Nos. (1-A) and (1-B) attached to this Resolution, together with any other Standard Specifications referred to herein and any updates thereto, whether or not included in Annexes Nos. (1-A) and (1-B), shall constitute mandatory technical requirements for the implementation of the provisions of this Resolution.

Article (26)

Violations

Where a violation of the provisions of this Resolution is identified, the Ministry or the Competent Authority, as the case may be, shall take the necessary measures to remove such violation and its consequences. For that purpose, either may:

1. Confiscate, destroy, or seize any gas cylinder that does not bear the Marks, symbols, stamps, Color Coding identifying its Industrial Gas contents, and the Label relating to the

cylinder contents, in accordance with the provisions of Articles (10), (11), and (24) of this Resolution and the legislation in force in the State.

2. Impose the sanctions prescribed under the legislation in force in the State in proportion to the scale or gravity of the violation.

Article (27)

Grievance Against Administrative Sanctions

1. The Ministry or the Competent Authority, or any person authorized by either of them, as the case may be, shall notify the violator of the decision imposing the administrative sanction within fourteen (14) Working Days from the date of notification thereof, through the approved means adopted by it. The notification shall include details of the violation committed, the period required to remedy the violation and regularize the status, and any other particulars it may prescribe.
2. Any person against whom an administrative sanction decision has been issued may file a grievance with the Ministry or the Competent Authority, as the case may be, in accordance with the procedures followed by each, within fourteen (14) Working Days from the date of notification of the decision against which the grievance is filed, provided that the grievance is reasoned and accompanied by all supporting documents.
3. The grievance shall be determined within twenty-five (25) Working Days from the date of submission thereof. The lapse of such period without a decision being issued shall be deemed a rejection of the grievance.
4. The decision issued in respect of the grievance shall be final.

Article (28)

Regularization of Status

1. Facilities shall regularize their status in accordance with the provisions of this Resolution within three hundred and sixty-five (365) days from the date of its entry into force.
2. The Cabinet may, upon the proposal of the Minister, extend the period for regularization of status for a further period not exceeding three hundred and sixty-five (365) days from the date of entry into force of the provisions of this Resolution.

Article (29)

Repeals

Any provision that contradicts or conflicts with the provisions of this Resolution is hereby repealed.

Article (30)

Publication and Entry into Force

This Resolution shall be published in the Official Gazette and shall enter into force on the day following the date of its publication.

Mohammed bin Rashid Al Maktoum

Prime Minister

Issued by us:

On: 29 Ramadan 1447 A.H.

Corresponding to: 18 March 2026 A.D.

Annex No. (1-A)

List of Reference Standard Specifications

No.	Standard Reference	Title of the Standard Specification
1.	UAE.S ISO 9001	Quality Management Systems — Requirements.
2.	UAE.S ISO 14001	Environmental Management Systems — Requirements with Guidance for Use.
3.	UAE.S ISO 45001	Occupational Health and Safety Management Systems — Requirements with Guidance for Use.
4.	UAE.S 45003	Occupational Health and Safety Management Systems — Psychological Health and Safety at Work — Guidelines for Managing Psychosocial Risks.
5.	UAE.S GSO ISO 31000	Risk Management — Guidelines.
6.	UAE.S 5060	Carriage of Dangerous Goods by Road.
7.	UAE.S GSO 2654	The Global Harmonized System (GHS) in Gulf Cooperation Council (GCC) countries.
8.	UAE.S GSO ISO 3807	Gas Cylinders — Acetylene Cylinders — Basic Requirements and Type Testing.
9.	UAE.S GSO ISO 6406	Gas Cylinders — Seamless Steel Gas Cylinders — Periodic Inspection and Testing.
10.	UAE.S GSO ISO 8573-1	Compressed Air — Part 1: Contaminants and Purity Classes.
11.	UAE.S GSO ISO 8573-2	Compressed Air — Part 2: Test Methods for Oil Aerosol Content.
12.	UAE.S GSO ISO 9809-1	Gas Cylinders — Refillable Seamless Steel Gas Cylinders — Design, Construction and Testing — Part 1: Quenched and Tempered Steel Cylinders with Tensile Strength Less than 1100 MPa.
13.	UAE.S GSO ISO 10297	Transportable Gas Cylinders — Cylinder Valves — Specification and Type Testing.

14.	UAE.S GSO ISO 10460	Gas Cylinders — Welded Aluminium Alloy, carbon and stainless Steel Gas Cylinders.
15.	UAE.S GSO ISO 10961	Gas Cylinders — Cylinder Bundles — Design, Manufacture, Testing and Inspection.
16.	UAE.S GSO ISO 11114-1	Gas Cylinders — Compatibility of Cylinder and Valve Materials with Gas Contents — Part 1: Metallic Materials.
17.	UAE.S GSO ISO 11114-2	Gas Cylinders — Compatibility of Cylinder and Valve Materials with Gas Contents — Part 2: Non-Metallic Materials.
18.	UAE.S GSO ISO 11114-3	Gas Cylinders — Compatibility of Cylinder and Valve Materials with Gas Contents — Part 3: Autogenous Ignition Test for Non-Metallic Materials in Oxygen Atmosphere.
19.	UAE.S GSO ISO 11114-4	Transportable Gas Cylinders — Compatibility of Cylinder and Valve Materials with Gas Contents — Part 4: Test Methods for Selecting Metallic Materials.
20.	ISO 11114-5	Gas Cylinders — Compatibility of Cylinder and Valve Materials with Gas Contents — Part 5: Test Methods for Evaluating Plastic Liners.
21.	UAE.S GSO ISO 11114-6	Gas Cylinders — Compatibility of Cylinder and Valve Materials with Gas Contents — Part 6: Oxygen Pressure Surge Testing.
22.	UAE.S GSO ISO 11119-1	Gas Cylinders —Refillable composite gas cylinders and tubes — Design, construction and testing — Part 1: Hoop-Wrapped Fibre Reinforced Composite Gas Cylinders and Tubes up to 450 L.

23.	UAE.S GSO ISO 11119-2	Gas Cylinders — Refillable composite gas cylinders and tube Design, Construction and Testing — Part 2: Fully Wrapped Fibre Reinforced Composite Gas Cylinders and Tubes up to 450 L with Load-Sharing Metal Liners.
24.	UAE.S GSO ISO 11119-3	Gas Cylinders — Design, Construction and Testing of Refillable Composite Gas Cylinders and Tubes — Part 3: Fully Wrapped Fibre Reinforced Composite Gas Cylinders and Tubes up to 450 L with Non-Load-Sharing Metallic or Non-Metallic Liners or Without Liners.
25.	UAE.S GSO ISO 11119-4	Gas Cylinders — Refillable Composite Gas Cylinders — Design, Construction and Testing — Part 4: Fully Wrapped Fibre Reinforced Composite Gas Cylinders up to 150 l with load-sharing welded metallic liners.
26.	UAE.S GSO ISO 11621	Gas Cylinders — Procedures for Change of Gas Service.
27.	UAE.S GSO ISO 11623	Gas Cylinders — Composite Construction — Periodic Inspection and Testing.
28.	UAE.S GSO ISO 11625	Gas Cylinders — Safe Handling.
29.	UAE.S GSO ISO 11755	Gas Cylinders — Cylinder bundles for Compressed and Liquefied Gases (Excluding Acetylene) — Inspection at Time of Filling.
30.	UAE.S GSO ISO 13485	Medical Devices — Quality Management Systems — Requirements for regulatory purposes.
31.	UAE.S GSO ISO 14114	Gas Welding Equipment — Acetylene Manifold Systems for Welding, Cutting and Allied Processes — General Requirements.

32.	ISO 14644-1 (ISO Class 8)	Cleanrooms and Associated Controlled Environments — Part 1: Classification of Air Cleanliness by Particle Concentration.
33.	ISO 14644-4	Cleanrooms and Associated Controlled Environments — Part 4: Design, Construction and Start-Up.
34.	ISO 14698 (All Parts)	Cleanrooms and Associated Controlled Environments — Biocontamination Control.
35.	UAE.S GSO ISO 15002	Flow Metering Devices for Connection to Terminal Units of Medical Gas Pipeline Systems.
36.	UAE.S GSO ISO 15615	Gas Welding Equipment — Acetylene Manifold Systems for Welding, Cutting and Allied Processes — Safety Requirements in High-Pressure Devices.
37.	UAE.S ISO/TR 15916	Basic Considerations for the Safety of Hydrogen Systems.
38.	UAE.S ISO 18119	Gas Cylinders — Seamless Steel and Seamless Aluminium-Alloy Gas Cylinders and Tubes — Periodic Inspection and Testing.
39.	UAE.S ISO 19880-1	Gaseous Hydrogen — Fueling Stations — Part 1: General Requirements.
40.	UAE.S ISO 20421-1	Cryogenic Vessels — Large Transportable Vacuum-Insulated Vessels — Part 1: Design, Fabrication, Inspection and Testing.
41.	UAE.S ISO 20421-2	Cryogenic Vessels — Large Transportable Vacuum-Insulated Vessels — Part 2: Operational Requirements.
42.	UAE.S ISO 20475	Gas Cylinders — Cylinder Bundles — Periodic Inspection and Testing.
43.	UAE.S GSO ISO 21009-1	Cryogenic Vessels — Static Vacuum-Insulated Vessels — Part 1: Design, Fabrication, Inspection and Tests.

44.	UAE.S GSO ISO 21009-2	Cryogenic Vessels — Static Vacuum-Insulated Vessels — Part 2: Operational Requirements.
45.	UAE.S GSO ISO 21010	Cryogenic Vessels — Gas/Material Compatibility.
46.	UAE.S GSO ISO 21011	Cryogenic Vessels — Valves for Cryogenic Service.
47.	UAE.S GSO ISO 21012	Cryogenic Vessels — Hoses.
48.	UAE.S GSO ISO 21013-1	Cryogenic Vessels — Pressure Relief Accessories for Cryogenic Service — Part 1: Reclosable Pressure-Relief Valves.
49.	UAE.S GSO ISO 21013-2	Cryogenic Vessels — Pressure Relief Accessories for Cryogenic Service — Part 2: Non-Reclosable Pressure-Relief Devices.
50.	UAE.S GSO ISO 21013-3	Cryogenic Vessels — Pressure Relief Accessories for Cryogenic Service — Part 3: Sizing and Capacity Determination.
51.	UAE.S GSO ISO 21013-4	Cryogenic Vessels — Pilot-Operated Pressure Relief Devices — Part 4: Pressure Relief Accessories for Cryogenic Service.
52.	UAE.S GSO ISO 21014	Cryogenic Vessels — Cryogenic Insulation Performance.
53.	UAE.S GSO ISO 21028-1	Cryogenic Vessels — Toughness Requirements for Materials at Cryogenic Temperature — Part 1: Temperatures Below -80°C.
54.	UAE.S GSO ISO 21028-2	Cryogenic Vessels — Toughness Requirements for Materials at Cryogenic Temperature — Part 2: Temperatures Between -80°C and -20°C.
55.	UAE.S GSO ISO 21029-1	Cryogenic Vessels — Transportable Vacuum-Insulated Vessels of not more than 1,000 Liters Volume — Part 1: Design, Fabrication, Inspection, and tests.

56.	UAE.S GSO ISO 21029-2	Cryogenic Vessels — Transportable Vacuum-Insulated Vessels of not more than 1,000 Liters Volume — Part 2: Operational Requirements.
57.	UAE.S GSO ISO 22000	Food Safety Management Systems — Requirements for Any Organization in the Food Chain.
58.	UAE.S GSO ISO 23208	Cryogenic Vessels — Cleanliness for Cryogenic Service.
59.	UAE.S GSO ISO 24431	Gas Cylinders — Seamless, Welded, and Composite Cylinders for Compressed and Liquefied Gases (Excluding Acetylene) — Inspection at Time of Filling.
60.	UAE.S GSO ISO 24490	Cryogenic Vessels — Pumps for Cryogenic Service.
61.	UAE.S GSO ISO 9809-1	Gas Cylinders — Refillable Seamless Steel Gas Cylinders — Design, Construction and Testing - Part 1: Quenched and Tempered Steel Cylinders with Tensile Strength Less than 1,100 MPa.
62.	UAE.S GSO ISO 9809-2	Gas Cylinders — Refillable Seamless Steel Cylinders and Tubes - Design, Construction and Testing — Part 2: Quenched and Tempered Steel Cylinders with Tensile Strength Greater than or Equal to 1,100 MPa.
63.	UAE.S GSO ISO 9809-3	Gas Cylinders — Refillable Seamless Steel Cylinders - Design, Construction and Testing — Part 3: Normalized Steel Cylinders.
64.	UAE.S GSO ISO 11120	Gas Cylinders — Refillable Seamless Steel Tubes of Water Capacity from 150 Liters to 3,000 Liters - Design, Construction and Testing.
65.	UAE.S GSO ISO 148-1	Metallic Materials — Charpy Pendulum Impact Test — Part 1: Test Method.
66.	UAE.S GSO ISO 6506-1	Metallic Materials — Brinell Hardness Test — Part 1: Test Method.

67.	UAE.S GSO ISO 6508-1	Metallic Materials — Rockwell Hardness Test — Part 1: Test Method.
68.	UAE.S GSO ISO 6892-1	Metallic Materials — Tensile Testing — Part 1: Method of Test at Room Temperature.
69.	UAE.S GSO ISO 9712	Non-Destructive Testing — Qualification and Certification of NDT Personnel.
70.	UAE.S GSO ISO 10286	Gas Cylinders — Vocabulary.
71.	UAE.S GSO ISO 13341	Gas Cylinders — Fitting of Valves to Gas Cylinders.
72.	UAE.S GSO ISO 13769	Gas Cylinders — Stamp Marking.
73.	UAE.S GSO ISO 11363-1	Gas Cylinders — 17E and 25E Taper Threads for Connection of Valves to Gas Cylinders — Part 1: Specifications.
74.	UAE.S GSO ISO 11363-2	Gas Cylinders —17E and 25E Taper Threads for Connection of Valves to Gas Cylinders — Part 2: Inspection Gauges.
75.	UAE.S GSO ISO 11117	Gas Cylinders — Valve Protection Caps and Valve Guards — Design, Construction and Tests.
76.	UAE.S GSO ISO 25760	Gas Cylinders — Operational Procedures for the Safe Removal of Valves from Gas Cylinders.
77.	UAE.S GSO ISO 10893-1	Non-Destructive Testing of Steel Tubes — Part 1: Automated Electromagnetic Testing of Seamless and Welded (Except Submerged Arc-Welded) Steel Tubes for the Verification of Hydraulic Leak tightness.
78.	UAE.S GSO ISO 10893-2	Non-Destructive Testing of Steel Tubes — Part 2: Automated Eddy Current Testing of Seamless and Welded (Except Submerged Arc-Welded) Steel Tubes for the Detection of Imperfections.

79.	UAE.S GSO ISO 10893-3	Non-Destructive Testing of Steel Tubes — Part 3: Automated Full Peripheral Flux Leakage Testing of Seamless and Welded (Except Submerged Arc-Welded) Ferromagnetic Steel Tubes for Detection of Longitudinal and/or Transverse Imperfections.
80.	ISO 10893-4	Non-Destructive Testing of Steel Tubes — Part 4: Liquid Penetrant Inspection of Seamless and Welded Steel Tubes for Detection of Surface Imperfections.
81.	UAE.S GSO ISO 10893-5	Non-Destructive Testing of Steel Tubes — Part 5: Magnetic Particle Inspection of Seamless and Welded Ferromagnetic Steel Tubes for the Detection of Surface Imperfections.
82.	UAE.S GSO ISO 10893-7	Non-Destructive Testing of Steel Tubes — Part 7: Digital Radiographic Testing of the Weld Seam of Welded Steel Tubes for the Detection of Imperfections.
83.	UAE.S GSO ISO 10893-8	Non-Destructive Testing of Steel Tubes — Part 8: Automated Ultrasonic Testing of Seamless and Welded Steel Tubes for the Detection of Laminar Imperfections.
84.	UAE.S GSO ISO 10893-10	Non-Destructive Testing of Steel Tubes — Part 10: Automated Full Peripheral Ultrasonic Testing of Seamless and Welded (Except Submerged Arc-Welded) Steel Tubes for the Detection of Longitudinal and/or Transverse Imperfections.
85.	UAE.S GSO ISO 10893-11	Non-Destructive Testing of Steel Tubes — Part 11: Automated Ultrasonic Testing of the Weld Seam of Welded Steel Tubes for the Detection of Longitudinal and/or Transverse Imperfections.

86.	UAE.S GSO ISO 10893-12	Non-Destructive Testing of Steel Tubes — Part 12: Automated Full Peripheral Ultrasonic Thickness Testing of Seamless and Welded (Except Submerged Arc-Welded) Steel Tubes.
87.	UAE.S GSO ISO 7866	Gas Cylinders — Refillable Seamless Aluminium Alloy Gas Cylinders — Design, Construction and Testing.
88.	UAE.S GSO ISO 11118	Gas Cylinders — Non-Refillable Metallic Gas Cylinders — Specification and Test Methods.
89.	UAE.S GSO ISO 11372	Gas Cylinders — Acetylene Cylinders — Filling Conditions and Filling Inspection.
90.	UAE.S GSO ISO 10462	Gas Cylinders — Acetylene Cylinders — Periodic Inspection and Maintenance.
91.	UAE.S GSO ISO 13088	Gas Cylinders — Acetylene Cylinder Bundles — Filling Conditions and Filling Inspection.
92.	UAE.S GSO ISO 3807	Gas Cylinders — Acetylene Cylinders — Basic Requirements and Type Testing.
93.	UAE GSO ISO 10298	Determination of Toxicity of a Gas or Gas Mixture.
94.	UAE GSO ISO 10286	Gas Cylinders — Vocabulary.
95.	UAE.S GSO ISO/IEC 17025	General Requirements for the Competence of Testing and Calibration Laboratories.
96.	UAE.S GSO IEC 60079 Series	Explosive Atmospheres — Fundamental Electrical Safety Systems.
97.	UAE.S GSO EN 1127-1	Explosive Atmospheres — Explosion Prevention and Protection.
98.	EN 1802 and EN 1803	Periodic Inspection of Aluminium Cylinders and Welded Steel Cylinders.

Annex No. (1-B)

List of Reference Technical Documents

No.	Technical Document Reference	Title of the Technical Document
1.	WHO	GMP Guidelines
2.	*MEGA TD 01	Requirements of Road Transportation of Class 2 Goods
3.	MEGA TD 02	Connections for Transportable and Static Storage Tanks for Cryogenic Gases
4.	MEGA TD 04	Cylinder Product Labels
5.	MEGA TD 06	Recommendation on Personal Protective Equipment for Use in Industrial Gases Applications
6.	MEGA TD 08	Color Codes Industrial
7.	MEGA TD 09	Medical Gas Cylinders Color Coding
8.	MEGA TD 10	Cylinder Handling and Transportation
9.	MEGA TD 12	Cylinder Valve Guidelines
10.	MEGA TD 28	Liquid Container Product Labels – Refrigerated Liquids
11.	MEGA TD 30	Disposal of Gases
12.	**EIGA Doc 79	Cylinder Retest Stations
13.	EIGA Doc 159	Reciprocating Cryogenic Pumps and Pump Installations for Oxygen, Argon, and Nitrogen
14.	EIGA Doc 166	Guidelines on Management of Waste Gas Cylinders
15.	EIGA Doc 169	Classification and Labelling Guide
16.	EIGA Doc 177	Medical Gas Cylinders Color Coding
17.	EIGA Doc 180	Pressure Regulator
18.	EIGA Doc 190	Plant Integrity Management
19.	EIGA Doc 236	Best Operational Practices for Filling Plants
20.	EIGA Doc 240	Commodity Specification Acetylene

21.	EIGA Doc 241	Purification, Compression and Drying of Acetylene
22.	EIGA SI 42	Acetylene Cylinder Base Corrosion
23.	EIGA SI TS 04	Transport of Gases – Contractor Management
24.	EIGA SL 08	Safe Transport of Gases
25.	EIGA SL 10	Safe Handling of Cylinders
26.	EIGA TB 02	Microbiological Quality of Medical, Pharmaceutical and Food Grade Gases
27.	EIGA TB 04	Lifetime of Pre-1930 Steel Cylinders
28.	EIGA TB 13	Safe Design, Use and Inspection of Cylinder Pallets
29.	EIGA TB 15	Energy Efficiency Compliance with Legal Requirements and Best Practices
30.	EIGA TB 16	"–40°C" Mark on Cylinder Valves
31.	EIGA TB 21	Recommendations for Cooling and Heating of Gas Cylinders
32.	EIGA TB 22	Cylinders and Valves – Pressure Definitions
33.	EIGA TB 24	Marking of Tank Containers with the Reference Holding Time
34.	EIGA TB 25	Transportation of Gases in Curtain-Sided Vehicles
35.	EIGA TB 27	Pressure Equipment Directive – Periodic Inspection and Reassessment
36.	EIGA TB 29	Recommendations for Pressure Safety Valves
37.	EIGA TB 30	Classification of Medical Device Gases
38.	EIGA TB 33	Elemental Impurity Product Risk Assessment Summary
39.	EIGA TB 34	Acetylene Plant Operating Pressures and Temperatures
40.	EIGA TB 41	Continued Use and Retesting of Bundles of Cylinders not Constructed to EN or EN/ISO Standards

41.	EIGA TB 45	General Safety and Performance Requirements of Medical Device Regulation Applied to Carbon Dioxide
42.	EIGA TB 46	General Safety and Performance Requirements of Medical Device Regulation Applied to Liquid Nitrogen
43.	EIGA TB 50	Pressure Reducing Valves
44.	EIGA IGCC Doc 102	Safety Audit Guidelines
45.	NFPA 55 -	**Compressed Gases and Cryogenic Fluids Code** Focuses on gas storage and handling, not specifically a lab safety standard but relevant to associated storage
46.	OSHA 29 CFR 1910 (U.S.)	**Occupational Safety and Health** Includes emergency showers, eyewashes, and PPE mainly for chemical labs handling hazardous materials alongside gases.
47.	ASHRAE Standards – Ventilation and Indoor Air Quality	Used to define ventilation and air quality requirements inside laboratories
48.	Emergency Equipment (Showers and Eyewashes)	From OSHA 1910.151(c) and EN 15846
49.	Ventilation and Air Quality	ASHRAE 62.1 and EN 14175 for proper ventilation
50.	Physical Safety Measures and Zoning	Guided by OSHA 1910.120 and ATEX directives for marking hazardous areas.
51.	Training and Emergency Procedures	Derived from OSHA 29 CFR 1910 Subpart H and Equivalent EN Safety Training Standards
*MEGA: Middle East Gases Association (جمعيةالشرق ألوسط للغازات).		
**EIGA: European Industrial Gases Association (الجمعيةألوروبيةللغازاتالصناعية).		

Annex No. (2)

Safety and Health Management Requirements in Industrial Gas Facilities

1. Safety and Health Committee:

1.1 A committee to be known as the Safety and Health Committee shall be established within the Facility.

1.2 The Safety and Health Committee shall convene its meetings on a regular basis.

1.3 The matters identified by the Safety and Health Committee shall be followed up until final results and recommendations are reached.

1.4 The Safety and Health Committee shall include members representing all categories of the Facility's employees.

1.5 Members of the Safety and Health Committee shall receive appropriate training as determined by the concerned department within the Facility, for the purpose of qualification, skills development, and raising awareness of the various risks associated with the Facility's operations, with a view to mitigating such risks and achieving the policies and objectives of the Facility's health and safety management systems.

1.6 Members of the Safety and Health Committee shall prepare regular training courses for employees, organize meetings dedicated to safety and health matters, and conduct auditing and assessment processes and procedures, including a Facility evacuation plan (BSV), first-aid training, and firefighting training.

1.7 The Safety and Health Committee shall establish an Occupational Health, Safety and Environment Management Policy and shall conduct risk assessments for the Facility and its associated installations in coordination with the Facility's management and its strategic partners.

2. Requirements for Safety Systems and Installations:

2.1 The general firefighting system shall satisfy the requirements of the Federal Fire Prevention and Safety Procedures System applicable to Facilities, issued by the

Federal Authority for Ambulance and Civil Defense in the State, including smoke detection devices, alarm systems, fire extinguishers, and automatic sprinkler systems, and shall be consistent with the UAE Fire and Life Safety Code.

2.2 Firefighting systems shall be monitored and inspected periodically.

2.3 General lighting at the Facility site shall satisfy the standards and operational requirements of the Facility as specified in the plans and designs approved by the Competent Authorities.

2.4 Protective clothing and equipment provided to workers shall comply with the standards prescribed for the activities performed thereby.

2.5 Personal protective equipment shall be worn and used properly.

2.6 Personal protective equipment shall be inspected periodically and regularly to verify its safety and fitness for use, including cryogenic gloves, rubber gloves, safety footwear, helmets, and protective eyewear.

2.7 Emergency showers and emergency eyewash equipment shall be available at pre-designated locations within the Facility.

2.8 Emergency showers and eyewash equipment shall be inspected and examined regularly, and their readiness shall be verified periodically.

2.9 Compliance shall be maintained with the requirements and instructions of the Civil Defense authorities in the State and the concerned authorities responsible for occupational safety and public safety requirements.

3. Safety Signage Instructions:

3.1 Updated work instructions shall be disseminated, including Safety and Health Committee reports and guidance notes.

3.2 Safety procedures, instructions, and guidance applicable to the Facility and its affiliated workplaces shall be displayed in prominent locations that are readily visible and accessible.

3.3 Safety instructions shall be legible and clear.

3.4 Roads, access routes, evacuation routes, and emergency exits throughout the Facility shall remain free from any obstructions or waste materials.

3.5 Roads and passageways shall be clearly marked with directional signs and arrows indicating locations and routes within the Facility.

3.6 Forklift operating areas and truck operating areas shall be identified by clear floor markings, and signs shall be displayed indicating pedestrian walkways.

3.7 Restricted areas shall be clearly identified through the placement of appropriate signs and notices, including no-smoking signs, no-open-flame signs, traffic speed limit signs, access speed limit signs, restricted-access signs, forklift operating areas, signs identifying truck operating areas, and signs identifying no-parking zones.

3.8 Clear signs and notices shall be placed at storage areas for filled Industrial Gas Products and chemical substances used in various production and operational processes, together with warnings appropriate to the nature of the stored materials.

3.9 Filled Industrial Gas Products and chemical substances used in production processes shall be stored according to the type of hazards arising therefrom in the event of incidents or to which they may be exposed, in accordance with the standards and regulations of the Competent Authorities.

3.10 The prescribed safety distances in storage areas shall be observed in accordance with the nature of the chemical substances and gases, as specified in the safety regulations and instructions applicable at the Facility, and in accordance with the Standard Specifications and technical documents set out in Annexes No. (1-A) and (1-B) attached to this Resolution.

3.11 Filling centers and work areas shall be equipped with recording cameras having a memory retention period of not less than fifteen (15) days.

4. Risk Prevention and Incident Reporting:

4.1 Incidents and near-misses shall be investigated.

4.2 Incidents and near-misses shall be fully documented.

4.3 A Root Cause Analysis (RCA) shall be conducted for incidents, and recommendations relating to incidents and near-miss events shall be formally implemented.

4.4 The Facility shall conduct risk assessments and take measures to reduce their occurrence and mitigate their impact.

Annex No. (3)

General Safety Requirements and Instructions for Industrial Gas Facilities

1. Cylinders shall be placed and stored in a safe, well-ventilated location protected from weather conditions, corrosion, and heat.
2. Cylinders shall be stored safely in the upright position and shall not be left free-standing.
3. Fuel gases shall be separated from oxygen by a fire-resistant wall that prevents the spread or propagation of fire.
4. Different Industrial Gas cylinders, including empty cylinders, shall be segregated from one another.
5. Empty cylinders shall be clearly identified before being returned to storage.
6. Protective caps shall remain permanently fitted to cylinders classified as toxic or corrosive gases while in storage and whenever such cylinders are not in use.
7. The storage of cylinders in a Laboratory shall be prohibited except in cases of absolute necessity.
8. The storage of cylinders inside buildings shall be prohibited.
9. All cylinders shall be securely restrained while in use.
10. All cylinder valves, in addition to regulators, shall be closed when the cylinders are not in immediate use.
11. All connections to equipment shall be made through shut-off valves or safety valves and not through direct connections.
12. All tank and cylinder connections shall be fitted with safe valves and fittings.
13. Where flow systems are used, the system shall be free from glass pipes or vessels, and rubber connections.
14. All cylinders in use shall be fitted with pressure regulators.
15. Regulators shall be removed before cylinders are moved from one work area to another or transported within the Laboratory premises.
16. The cylinder outlet shall be clean and free from dirt before the regulator is connected.
17. The use of grease or joint compounds as lubricants for valves and fittings shall be prohibited.

18. The pressure regulator adjustment valve shall be fully closed before the regulator is installed.
19. A non-return valve shall be installed on fuel gas systems or oxygen systems.
20. Non-return valves shall be installed to prevent backflow.
21. Automatic shut-off/isolation valves shall be installed to prevent the occurrence of low pressure within cylinders.
22. The following precautions shall be taken to prevent backflow:
    a. The gas supply cylinder of the manifolded system shall remain closed whenever it is not in use.
    b. An empty cylinder shall not be left connected to the operating process.
    c. A cylinder shall not be used as a receiver for waste gas, liquids, or other substances.
23. Cylinders shall be securely fastened during transportation.
24. Cylinders shall be moved only by means of a wheeled trolley.
25. Where cylinders are used at different locations, a trolley shall be provided for the purpose of moving and transporting them.
26. Appropriate eye protection equipment shall be worn at all times when handling Industrial Gases.
27. The Supplier or Facility shall be contacted whenever any problem arises with cylinder valves, levers, or regulators.
28. All hoses and connections used within the Facility, including those used in the filling and discharge of Industrial Gas containers, shall be inspected regularly in accordance with the Standard Specifications or technical documents specified in Annexes No. (1-A) and (1-B) attached to this Resolution.
29. Pressure regulators used shall be designed and suitable for the specified gas and pressure.
30. Cylinders used in Laboratories shall be kept away from heat sources.
31. Toxic or corrosive gas cylinders shall be stored in well-ventilated outdoor areas or within enclosed cabinets specifically designated for such gases, provided that such cabinets are adequately ventilated.
32. Cylinders shall be handled safely during use and during transportation to and from storage areas.

33. Acetylene cylinders shall remain in the upright position, and all cylinders shall be maintained in the vertical position while in use.
34. All hoses shall be maintained in good condition at all times and shall be securely fastened.
35. The flow of Industrial Gas shall be shut off at the cylinder valve (shut-off valve), and not merely at the regulator, whenever the cylinder is not in use.
36. The correct regulator shall be used for each cylinder.
37. All gauges shall return to zero upon pressure release.
38. A detection and alarm system for Industrial Gases shall be provided where Toxic Gases or Flammable Gases are used.
39. Industrial Gas detectors shall be compatible with the chemicals used in the surrounding area so as not to generate false positive alarms.
40. The Industrial Gas detection system shall be linked to an automatic shut-off device for the gas source in the event of a leak.
41. Compressed gases shall be located outdoors and connected directly to points of use.
42. Piped Industrial Gas systems shall be designed to shut down automatically in the event of excessive flow and to switch to a reserve cylinder when the primary cylinder reaches a low-content condition, while transmitting a signal to the central monitoring station.
43. Flammable Gases shall be segregated from oxygen or oxidizing agents during storage and during pipeline transportation.
44. Industrial Gas cylinders shall be placed within dedicated cabinets that are well ventilated and fire-resistant whenever such cylinders are located inside a building.
45. Permanent passive (exhaust) ventilation shall be provided in all enclosed or semi-enclosed areas where asphyxiant, Toxic Gases, corrosive gases, or Flammable Gases are used.
46. Cylinders or pipelines containing Flammable Gases located inside buildings shall be installed within well-ventilated service ducts that do not contain oxidizing agents, cables, or electrical equipment.
47. The use of compressed air for cleaning equipment or surfaces shall be prohibited.
48. Quick-connect fittings on compressed-air lines shall be provided with appropriate warning signs and Marks.

49. Warning signs and Marks shall be displayed in all areas where compressed gas cylinders are used or stored.

Annex No. (4)

Requirements for Liquefied Gas and Compressed Gas (L. and G.) Production Facilities

1. General Safety Policy:

1.1 Safety references for all types and categories of gases, such as acetylene, ammonia, freon, argon, chlorine, hydrogen, nitrogen, oxygen, and all other miscellaneous gases, shall be made available at the Facility site.

1.2 No modifications to the Facility's control circuits or operational processes shall be permitted except through a specified and approved procedure.

1.3 An operational training matrix shall be provided for all operators, and all operators shall be trained in accordance with such matrix.

1.4 All electrical technicians shall be certified to perform work relating to high-voltage, medium-voltage, and low-voltage equipment.

1.5 Work permit procedures and work permit endorsements shall be complied with prior to the shutdown or recommissioning of Facility equipment.

1.6 Operating procedures for all Facility associated installations and equipment of the Facility shall be issued and reviewed periodically.

1.7 Cleaning specifications and acceptance criteria shall be clearly established for all Industrial Gas Production Facility services.

1.8 Pressure and level gauges for oxygen service shall be clearly specified.

1.9 The operating procedure shall be followed to determine the cause of any leakage from the cold box connected to the Facility's Industrial Gas cooling system.

1.10 Emergency procedures relating to major liquid leaks from tanks or containers shall be documented and displayed in their designated locations.

1.11 Pressure systems, condenser separators, and carbon-steel piping within the plant shall be adequately inspected to verify the absence of corrosion or similar deterioration, and appropriate inspection records shall be maintained.

1.12 Rules and procedures shall be established for the inspection and testing of pressure-relief valves, and inspection and testing records shall be retained.

1.13 Critical operating criteria and procedures shall be established and implemented for all operations and equipment.

1.14 Implemented procedures and records relating to the inspection of plant pipelines, including monitoring, repairs, reporting, and cathodic protection, shall be maintained in their designated locations.

1.15 Oxygen-monitoring devices shall be installed in confined spaces, and personal portable devices shall be used to monitor ambient gas concentrations as an additional measure to enhance safety standards or in the event of a sudden failure of the primary gas-monitoring devices.

1.16 A showers shall be installed near hazardous chemical areas in all Facilities containing hazardous areas.

1.17 Warning signs shall be displayed in the vicinity of hot areas (high-temperature areas).

2. Main Air Compressor and Surrounding Area Policy:

2.1 Suitable guards shall be installed and secured over machine and motor couplings within the Facility.

2.2 A sign bearing the words "Danger – Do Not Stand in Front of the Compressor During Start-Up" shall be affixed to the start capacitor enclosure.

2.3 Adequate lighting shall be provided around the compressor, together with an emergency stop button, which shall be tested at regular intervals.

2.4 A preventive maintenance program shall be implemented for the regular inspection of pressure gauges, instrument installations, filters, valves, alarm devices, electrical systems, vibration-monitoring devices, and other associated equipment.

2.5 A daily log sheet shall be maintained for recording the plant's critical indicators together with all abnormal events, and reference points shall be indicated on the log sheets.

2.6 The piping connecting the main compressor to the coolers shall be inspected at regular intervals to verify the absence of oil leakage or any other abnormalities.

2.7 Alarm functions throughout the operational process stages shall be maintained in proper working condition and shall be inspected regularly.

3. Air Cooling Equipment Policy:

3.1 Halogen gas detection equipment shall be installed in its designated location to detect any potential leakage of gas vapors.

3.2 The work permit form shall contain a clear indication of the hazard of phosgene/ammonia gas formation when carrying out heating operations or where equipment is subjected to elevated temperatures, or when work is performed in the vicinity thereof.

3.3 An operating instruction bulletin shall be displayed adjacent to the air-cooling equipment.

3.4 Specific procedures shall be available for determining the methods of isolation, recommissioning, or restarting production-system units.

3.5 Personnel shall receive adequate training, and a risk assessment shall be conducted concerning the hazards associated with this type of equipment.

3.6 Emergency water showers and eye-wash equipment shall be provided.

3.7 Warning signs and notices shall be displayed adjacent to ammonia and freon cooling equipment.

4. Cold Box and Surrounding Area Policy:

4.1 Gas samples shall be taken from abnormal ice formations within the Cold Box and in the surrounding areas and shall be analyzed immediately to identify potential safety hazards and prevent accidents.

4.2 Safety-valve exhausts shall be vented to a safe location free from obstructions to prevent hazards arising from leakage into the surrounding environment.

4.3 Regular temperature inspections shall be conducted on the Cold Box to ensure temperature stability and prevent any potential safety hazards.

4.4 Liquid drain lines shall be sloped towards the outlet end to the disposal area to ensure proper drainage and prevent potential hazards resulting from liquid accumulation.

4.5 Following drainage operations, operating procedures shall be followed, and preferably documented, to ensure that all drain lines and associated equipment are clean and free from moisture, thereby preventing any potential safety hazards.

4.6 Warning signs stating "Asphyxiation Hazard," "Extreme Cold Hazard," and "Toxic Material Hazard" shall be installed along passageways and platforms within the argon, nitrogen, and oxygen opening areas to prevent potential safety hazards.

4.7 Insulation material shall be correctly installed on cold pipes free from moisture in order to prevent any potential safety hazards.

4.8 Pipelines shall be inspected regularly for corrosion in order to prevent any potential safety hazards.

4.9 Any friction affecting refrigeration-compressor valve stems, and any resulting increase in temperature beyond the specified limit during normal operation, shall be monitored and addressed immediately in order to prevent any potential safety hazards.

4.10 The designs of ladders, cages, safety gates, guardrails, and platforms shall comply with the dimensions and standards prescribed for such structures, or with the designs and drawings of the designing company, so as to ensure the safety of workers and prevent any potential safety hazards.

4.11 Means shall be provided to monitor hydrogen levels in the upper section of the Cold Box in the event of leakage, and a dedicated alarm device shall be installed for this purpose, in order to prevent any potential safety hazards.

4.12 Ice or frost accumulation on pressure-relief valves shall be removed using a damp cloth, and workers shall wear appropriate Personal Protective Equipment (PPE) when carrying out frost-removal operations.

5. Air Separation Unit (ASU):

5.1 Air Separation Unit operating instructions shall include start-up procedures, normal operating procedures, shutdown procedures, emergency shutdown procedures, and emergency liquid-disposal procedures, in order to ensure workers' safety and prevent any potential safety hazards.

5.2 Records and flow diagrams shall be maintained for all equipment and services associated with the station, such as ventilation equipment, gas seals, cooling-water systems, and other utilities, in order to ensure workers' safety and prevent any potential safety hazards.

5.3 A daily log shall be maintained containing pressure data, temperature readings, liquid levels, flow conditions, and energy-consumption figures, in order to ensure workers' safety and to minimize any potential safety hazards.

5.4 Facility Management shall verify the information recorded in the log sheet on a regular basis in order to ensure workers' safety and prevent any potential safety hazards.

5.5 All liquid-level indicators, warnings, and alarms associated with columns or condensers during operational processes shall be inspected and maintained at specified intervals in order to ensure workers' safety and prevent any potential safety hazards.

5.6 Warning and alarm devices and equipment shall be tested regularly throughout all operational stages in order to ensure workers' safety and prevent any potential safety hazards.

5.7 Buildings and ancillary structures within Air Separation Units shall be equipped with an appropriate ventilation system, including the use of fans or blowers where necessary, and appropriate arrangements shall be made for the ventilation of buildings and passageways due to the hazards associated with the accumulation of leaked gas concentrations in such locations. Adequate emergency exits shall be provided and clearly marked.

5.8 The Air Separation Unit shall be monitored by means of an air-concentration analyzer equipped with an alarm device that activates whenever oxygen

concentration falls below the permissible limit, together with a warning sign prohibiting entry into the Air Separation Unit area.

6. Control Room:

6.1 Analyzers shall be vented through a common vent outlet and connected to piping extending outside the building.

6.2 Hydrogen gas shall be discharged or vented through a separate ventilation system dedicated to that purpose.

6.3 All chemicals used in testing activities shall be clearly identified.

6.4 Oxygen gas levels within the Control Room shall be monitored where valve actuators are supplied by a nitrogen system.

6.5 The oxygen-monitoring device shall be connected to an audible alarm that is activated whenever oxygen concentration exceeds the prescribed limit.

6.6 All uses and locations of cylinders shall comply with the requirements specified by the cylinder manufacturer and the national cylinder regulations.

6.7 Fire extinguishers appropriate to the nature of the site shall be provided, and shall remain available at all times and readily accessible.

7. Prevention of Elevated Hydrocarbon Concentrations:

7.1 The Facility shall implement a continuous monitoring system for hydrocarbons present in the area surrounding the reboiler basin or condenser.

7.2 Where hydrocarbon levels exceed the maximum permissible limit, the management of the Air Separation Unit shall be notified immediately.

7.3 Corrective-action procedures shall be established and followed whenever a significant increase in hydrocarbon levels is detected.

7.4 Acetylene levels within Liquid Oxygen (LOX) reboilers shall be tested regularly.

7.5 The minimum liquid level within the oxygen-condenser basin shall be maintained at all times to ensure a safe operating level.

7.6 The Liquid Oxygen (LOX) basin and the oxygen-enriched lower column shall be maintained free from hydrocarbon accumulation in a manner that ensures hydrocarbon concentrations do not exceed safe levels.

7.7 The condition of the adsorber material shall be inspected at specified intervals and replaced whenever necessary. Spent and replaced adsorbent material shall be disposed of in accordance with the procedures and legislation prescribed by the Competent Authorities for the disposal of hazardous waste, due to the possibility of such material containing toxic or hazardous substances.

8. Oxygen Pumps:

8.1 Periodic inspection and maintenance shall be carried out for contained gas control equipment, including pressure regulators, valves, and other equipment.

8.2 A preventive maintenance system shall be implemented, including the inspection and Calibration of vibration-monitoring devices, mechanical pump components, alarm functions, safety devices, and electrical systems.

8.3 Special maintenance procedures shall be implemented for the repair of pumps in accordance with oxygen gas purity and quality specifications.

8.4 Pump suction filters shall be inspected and cleaned periodically and regularly.

8.5 Materials compatible with centrifugal pumps shall be used and shall be free from substances incompatible with Liquid Oxygen (LOX).

8.6 Protective equipment designed to prevent centrifugal-pump cavitation shall be maintained in a continuously serviceable condition, including pressure switches and low-current operation.

8.7 Vent openings shall remain free from any obstruction where pumps are installed in confined areas.

8.8 The area surrounding the pumps shall be maintained and kept free from combustible materials such as oils, greases, tar, and similar substances.

9. Expansion Turbines:

9.1 A policy for monitoring and recording all applicable readings shall be adhered to, including pressure readings, temperature readings, and power readings.

9.2 Pressure and temperature conditions at turbine exhausts shall be controlled to avoid any possibility of liquid formation within the turbines.

9.3 All indicators shall be appropriately marked with the limits, including pressure, temperature, power, rotational speed (rpm), and others.

9.4 Alarm functions associated with the braking system shall be tested at regular intervals during operation.

9.5 Alarm functions relating to oil temperature, oil pressure, and oil tank level shall be tested periodically during operation.

9.6 Regular tests shall be conducted on the alarm functions relating to oil temperature, oil pressure, and oil-tank level during operation. The inspection frequency shall be specified in the maintenance plan, and any deviation shall be reported to the maintenance supervisor.

9.7 Cleanliness standards shall be strictly observed during turbine maintenance activities, and the workers shall implement the applicable procedures to ensure that no contamination occurs during maintenance operations.

10. Expansion Engines:

10.1 Lubricating oil shall be properly inspected, including the oil separator, oil filter, adsorber material, and engine lubrication equipment. The inspection frequency shall be specified in the maintenance plan, and any deviation shall be reported to the maintenance supervisor.

10.2 Temperature and pressure conditions at the expansion engine exhaust shall be controlled to avoid any possibility of liquid formation within the expansion engine.

10.3 Control points shall be identified in the maintenance plan, and any deviation shall be reported to the maintenance supervisor.

11. Oxygen Compressors:

11.1 All required readings shall be taken without entering the restricted area during normal compressor operation. Where obtaining such readings requires entry into a restricted area, the necessary safety precautions shall be implemented.

11.2 Entrances to and exits from restricted areas shall be provided with warning signs and means of alerting workers to potential hazards.

11.3 Prescribed operating procedures shall be readily understandable and made available in advance to all authorized workers. Workers shall be trained to comply with such procedures to ensure safety.

11.4 Emergency stop switches, whether located near to or remote from the equipment, shall be available at all times to ensure that the machine can be stopped immediately in an emergency.

11.5 All vent, drain, and relief valves shall be piped to safe external locations to ensure that any discharge operations do not cause harm to persons or the environment.

11.6 The location of the oil-vapor vent opening shall be maintained at a safe distance from all other oxygen openings in order to prevent any potential source of ignition in the vicinity of an oxygen area.

11.7 A sign bearing the wording "Danger – Do Not Stand in Front of the Starter Enclosure During Motor Start-Up" shall be affixed to the start capacitor enclosure in order to warn and alert individuals to potential hazards.

11.8 The piston rod shall be inspected regularly for any indication of oil contamination using ultraviolet light. The inspection frequency shall be specified in the maintenance plan, and any deviation shall be reported to the maintenance supervisor.

11.9 Operating procedures (normal and emergency) shall be posted and made readily available to workers to ensure ease of access and implementation.

11.10 Alarm limit values during operation shall be established and clearly displayed on all valves, pressure gauges, and temperature indicators in order to alert workers to any deviations.

11.11 Materials compatible with oxygen gas shall be used when carrying out inspection and maintenance procedures for oxygen equipment and machinery, including

compressor isolation, purging, and inspection operations. Compliance with purity and quality standards for filled oxygen, the requirements relating to ultraviolet inspection equipment, and the procurement of oxygen-equipment spare parts in accordance with the Approved Standard Specifications shall be ensured. Lint-free white gloves conforming to the manufacturer's standards shall be worn when handling clean oxygen equipment, when inspecting pre-filter areas and non-return valves, and when carrying out compressor inspection activities.

11.12 Non-return valves shall be installed on oxygen-compressor discharge lines to prevent any backflow of oxygen into the compressor.

11.13 Manually operated oxygen valves shall be fitted with dedicated protective shields to protect individuals in the event of ignition during operation or while handling the valve.

11.14 Safety signs, safety Marks, and firefighting equipment shall be installed in accordance with the site's emergency plan to ensure that individuals are able to respond effectively to emergency situations.

11.15 All individuals shall be provided with protective clothing and equipment appropriate to the activities assigned thereto in order to ensure their safety.

11.16 A planned preventive-maintenance program shall be established for the periodic inspection and Calibration of pressure gauges, temperature indicators, vibration-monitoring equipment, major machine components, and all other monitoring and alarm devices.

12. Cooling Towers and Pumps:

12.1 All pump suction filters shall be removed using lifting handles in order to ensure the safety of individuals.

12.2 Adequate protective barriers shall be installed around cooling-tower basins to prevent individuals from the risk of falling into them.

12.3 Cooling-tower surfaces shall be fitted with fixing plates and slip-resistant surfaces in order to prevent hazards and to protect individuals from slipping, falling, or tripping accidents.

12.4 Guardrails and ladders shall be smooth and free from splinters on wooden handrails and free from sharp edges on metal handrails in order to ensure the safety of individuals.

12.5 A safe system of work shall be established for the normal operation, inspection, and maintenance of gearbox areas and V-belt drive motors within cooling towers.

12.6 Emergency exits at the upper level shall remain accessible and free from obstructions to ensure safe evacuation in emergency situations.

12.7 Emergency stop switches shall be installed at the top of the tower to ensure that individuals can access them easily.

12.8 Protective devices shall be installed for fans and gearboxes to prevent injury to individuals or damage to equipment by providing protection against excessive vibration and elevated temperatures.

13. Cooling Water Treatment:

13.1 Procedures governing the discharge operation shall be established and published to provide guidance for the safe and effective discharge of chemicals used in water treatment.

13.2 Personal Protective Equipment (PPE) shall be available to individuals handling water-treatment chemicals.

13.3 Warning signs and notices shall be properly displayed to alert workers to hazardous areas.

13.4 Storage openings of chemical tanks shall be located close to ground level, and chemicals shall be discharged or poured in a safe area and in the proper manner to prevent contamination and injury to individuals. Emergency showers and eyewash stations shall be installed within appropriate safety areas to provide immediate assistance in emergency situations.

13.5 Chemical dosing pumps shall be fitted with glass guards to prevent chemical splashes and to ensure the safety of individuals.

13.6 Chemical cylinders and containers shall be stored in safe areas to prevent hazards and ensure the safety of individuals.

13.7 Workers shall be aware of the hazardous nature of all chemicals used in water treatment and shall be trained in the handling of such chemicals and in the safety procedures governing their safe disposal.

13.8 Appropriate installations and equipment shall be provided for responding to emergency situations associated with the use of chemical water-treatment substances.

14. Emergency Equipment:

14.1 Breathing gas cylinders shall be filled with gas and maintained ready for immediate use in emergency situations.

14.2 All components of breathing apparatus shall be maintained in good condition so as to ensure the safety of individuals.

14.3 The Facility shall establish procedures and records for the inspection and monitoring of emergency equipment to ensure that the necessary maintenance is carried out in a timely manner.

14.4 Emergency equipment shall be tested regularly to ensure the safety of individuals.

14.5 Breathing-gas cylinders in service shall be fit for use and within the approved validity period for periodic testing in order to ensure their safe operation.

14.6 Operators shall be trained in the use of breathing equipment to ensure its proper handling and operation.

14.7 All equipment shall be inspected and recorded on a regular basis, including, by way of example, stretchers, firefighting suits, fire blankets, eyewash stations, showers, lighting systems, and portable inspection and analysis devices, so as to ensure safe operation and maintenance.

14.8 All first-aid kits within the Facility shall be inspected regularly to verify that they are supplied with the necessary materials, and the periodic inspection system shall be documented. The person responsible for conducting the inspection shall sign the inventory list, and any missing first-aid item shall be replaced immediately.

14.9 Emergency shutdown procedures for all Facility components shall be available and kept continuously updated. All procedures shall be clearly documented and

readily accessible to all relevant workers, and shall be subject to regular review and updates to ensure that such procedures remain effective.

15. Argon Purification Station:

15.1 Oxygen-level monitoring devices, alarm devices, and warning-sign shall be installed in enclosed spaces in order to warn individuals against entering the air separation area. The automatic protection device for high oxygen content in the feed stream to the deoxygenation unit (de-oxo unit) shall be inspected regularly to ensure its proper operation. The inspection system shall be documented, and any defective device shall be repaired or replaced immediately.

15.2 Regular inspections shall be conducted on the high-temperature protection device installed in the deoxygenation unit (de-oxo unit) to ensure its proper operation. The inspection system shall be documented, and any defective device shall be repaired or replaced immediately.

15.3 The hydrogen and hydrocarbon analyzers associated with the Cold Box shall be inspected at regular intervals for monitoring leakage of Flammable Gases. The inspection system shall be documented, and any defective analyzer shall be repaired or replaced immediately.

15.4 Venting operations shall be carried out safely during the discharge of sampling points, such that gases are discharged to a safe area outside the building. The ventilation system shall be designed in a manner that prevents any leakage of hazardous gases or liquids into the environment.

15.5 Forced-ventilation systems in testing rooms shall be inspected at regular intervals to ensure that they are operating properly. The inspection system shall be documented, and any defective ventilation system shall be repaired or replaced immediately.

15.6 The hydrogen-gas monitoring and recording device shall undergo periodic Calibration at specified intervals. The monitoring and recording system associated with such device shall be documented, and any defective monitoring device shall be repaired or replaced immediately.

15.7 All equipment grounding readings shall be verified at specified intervals. The verification system shall be documented, and any defect in the grounding of equipment shall be repaired or rectified immediately.

15.8 Steam condensate traps installed on condenser separators shall be inspected regularly to ensure that no hydrogen is being released therefrom. Such traps shall be inspected periodically; and the inspection system shall be documented, records shall be retained, and any defective trap shall be repaired or replaced immediately.

15.9 All manually operated valves shall be located in readily accessible positions. The valve-access system shall be designed in a manner that minimizes any difficulty in reaching such valves during emergency situations.

15.10 Low-flow shutdown devices installed on all process heaters shall be inspected and maintained at regular intervals. The inspection and maintenance system shall be documented, and any defective device shall be repaired or replaced immediately.

16. Hydrogen System:

16.1 Safety distances shall be clearly specified and incorporated into the Facility's regulations. The safety-distance system shall be documented, and any violation of the prescribed safety distances shall be rectified immediately.

16.2 The hydrogen storage area shall be clearly identified, and warning signs and notices shall be displayed indicating that it is a hazardous area in which smoking and the use of open flames are prohibited. It shall be emphasized that such activities are strictly prohibited within the storage area.

16.3 Adequate protective barriers shall be installed around piping and filling connections in the vicinity of vehicle traffic areas in order to prevent damage and ensure safety. Such barriers shall be inspected and maintained regularly to verify their effectiveness.

16.4 Vent lines and safety-device outlets shall be free from obstructions and shall be piped to a safe height in order to prevent potential hazards. Regular inspection and maintenance shall be carried out to ensure that vent lines remain in good condition and function properly.

16.5 The ventilation system installed within the hydrogen pressure-reduction cabinet shall be adequate to ensure safe operation. Regular inspections and maintenance shall be conducted to verify that the ventilation system is functioning properly.

16.6 Only approved equipment and apparatus may be used within the designated hydrogen-system operating area in order to prevent potential hazards. All equipment and apparatus shall be inspected and approved prior to use in accordance with the legislation and systems in force in the State.

16.7 Hydrogen trailers shall be properly grounded prior to connection in order to prevent potential hazards. Connections shall be carried out only by qualified personnel.

16.8 The surrounding area and the hydrogen Facility shall be maintained free from dry grass, weeds, and combustible materials in order to prevent potential fire hazards. Regular maintenance and inspection activities shall be carried out.

16.9 All workers shall be instructed and trained regarding the properties of hydrogen gas, handling methods, and safety procedures.

16.10 All workers shall receive training on how to respond to hydrogen fires.

16.11 Gas-transfer hoses shall be replaced at regular intervals in order to prevent potential leakage hazards. A hose replacement schedule shall be established and strictly implemented.

16.12 Filters shall be cleaned at regular intervals to ensure the safe operation of the hydrogen system. A cleaning schedule shall be established and adhered to.

17. Product Vaporizers and Disposal Systems for Liquid Nitrogen, Oxygen, and Argon:

17.1 Functional tests shall be conducted regularly on all alarm devices associated with operating stages to verify that they are functioning properly.

17.2 In the event of rupture of a cooling coil, warm water or steam shall be discharged from the vaporizer to a safe location in order to prevent potential hazards. Regular inspection and maintenance activities shall be carried out to ensure compliance with the instructions and procedures.

17.3 An updated operating bulletin shall be available at all times to ensure the safe operation of the Product and the operation of gas-disposal vaporizers.

17.4 All hot-water and steam lines shall be insulated in order to protect the individuals and prevent potential hazards. Regular inspection and maintenance activities shall be carried out to ensure compliance with the instructions and procedures.

Annex No. (5)

Safety Requirements for Acetylene Production and Filling Facilities

1. Strict safety regulations and instructions shall be implemented in acetylene production and filling Facilities, in view of the hazardous nature of acetylene gas, its high flammability, and its susceptibility to explosion. Particular emphasis shall be placed on the following safety and security procedures:
   a. Storage of Calcium Carbide, the material used in the production and generation of acetylene.
   b. Procedures for operating and handling the acetylene generator.
   c. Drying and purification operations for acetylene gas prior to filling.
   d. Operation of the acetylene compressor.
   e. Systems and equipment used for filling acetone into acetylene cylinders and the various associated processes.
2. Internationally approved separation distances for acetylene production and filling Facilities shall be observed as follows:
   a. A separation distance of 200 meters shall be maintained between the Facility and the nearest public building (schools, restaurants, and similar premises).
   b. A separation distance of 15 meters shall be maintained from the boundary of the adjacent site or from public roads.
   c. A separation distance of 6 meters shall be maintained between the filling station and storage vessels and cylinders containing flammable, toxic, and oxidizing agents.
   d. The Calcium Carbide storage area shall be located at a distance of not less than 3 meters from the site boundary.
3. Operators, drivers, and technical crew members shall possess the qualifications, training, experience, and skills necessary to perform their assigned duties safely.
4. The Facility shall establish procedures governing the operation of the Calcium Carbide treatment unit, equipment maintenance, and emergency procedures and plans.
5. A layout plan of the acetylene Facility shall be displayed at an appropriate location within the area in which the Facility is situated.

6. Safety signs and hazard warnings, such as “No Smoking” and “No Unauthorized Entry”, shall be provided and prominently displayed so as to be clearly visible.
7. Safety signs identifying hazardous locations shall be prominently displayed throughout the Facility.
8. Personal protective equipment (PPE) shall be used in accordance with the Facility’s instructions and PPE policy’s program, in a manner commensurate with the nature of the hazards.
9. The use of mobile phones within the acetylene Facility shall be prohibited.
10. Spark-resistant tools and equipment shall be used within the acetylene Facility to ensure safe operation and maintenance.
11. All structures, equipment, machinery, and metallic components within the Facility shall be properly grounded.
12. Machinery, equipment, and rotating shafts shall be properly guarded.
13. Floors shall be inspected to ensure their integrity and continuity and to verify the absence of pits or obstructions in work and operating areas.
14. The main emergency shut-off switch for the plant shall be installed at a strategic position that is readily accessible, and operators shall be familiar with its location.
15. Lime sludge generated from the reaction of Calcium Carbide within the Facility shall be disposed of in accordance with applicable international practices, instructions, regulations issued by the competent authority, and environmental compliance requirements.
16. Electrical installations, circuit breakers, and lighting systems shall comply with the UAE Regulation for the control of electrical equipment intended for use in potentially explosive atmospheres issued pursuant to Cabinet Resolution No. (23) of 2016.
17. Approved Standard Specifications, the standards and instructions of the cylinder manufacturer, and any legislation in force in the State shall be applied when inspecting and requalifying acetylene cylinders.
18. Records of cylinder requalification shall be maintained on site.
19. Rejected cylinders and cylinders designated for destruction shall be isolated and disposed of in accordance with the legislation in force in the State.

20. A maintenance program shall be established and its implementation at the site shall be monitored.
21. Technicians and maintenance personnel shall be aware of the material composition of the Facility, provided that the copper content of such materials does not exceed 70%.
22. Nitrogen purging programmes and procedures shall be established and followed before and after any maintenance activities within the acetylene Facility.
23. Clear and effective emergency procedures shall be implemented for the following equipment and situations: the heat generator, the hot calcium carbide cylinder, blockage of the generator feed inlet, blockage of the sludge-discharge outlet, fire inside the filling cylinder, the presence of a gas-leaking cylinder, and cylinder rupture or cracking.
24. Calcium carbide drums shall be inspected upon receipt to verify the condition of the packaging and seals.
25. Storage quantities shall be commensurate with the specified and permitted quantity limits.
26. The calcium carbide storage room shall be well ventilated, and its storage and handling shall be carried out in accordance with approved procedures, while taking all necessary measures to prevent water leakage or ingress into calcium carbide storage areas during storage and handling operations.
27. All other materials shall be segregated from the calcium carbide store.
28. Safety labels and warning notices shall be provided, including warnings such as “Do not use water to extinguish calcium carbide fires.”
29. Non-sparking tools shall be used when opening calcium carbide drum covers, and emergency exits shall at all times be kept free from obstructions.
30. Regular inspections shall be conducted on storage tanks to verify their condition.
31. Unsealed containers shall be stored outside the calcium carbide storage area.
32. Empty calcium carbide drums shall be disposed of in accordance with the legislation in force in the State, provided that they are free from dust and calcium carbide residues.
33. The acetylene generator shall be equipped with all safety accessories recommended by the manufacturer.
34. Safety accessories and equipment shall be tested and calibrated periodically.

35. Periodic inspection and Calibration shall be carried out for instrument systems, including pressure-measuring devices, temperature indicators, and water-level indicators.
36. The Facility shall be equipped with alarm devices necessary for critical conditions and hazards.
37. A nitrogen-purging system shall be available for the acetylene generator hopper and shall also be used when charging carbide into the acetylene generator.
38. A monitoring system for nitrogen cylinders shall be provided.
39. Alarm devices and automatic shutdown systems shall be provided in the event of high-water level within the generator or an increase in its temperature.
40. The water supply to the acetylene generator shall be monitored and automatically controlled whenever the water level rises above or falls below the prescribed limits.
41. Sludge-discharge valves shall be monitored and maintained continuously to ensure safe and uninterrupted operation.
42. The sludge-discharge channel shall be monitored and maintained periodically to ensure that it remains operational and free from blockages.
43. Hydraulic reverse-discharge systems shall be monitored to ensure that the appropriate level is maintained, and the valves shall be maintained periodically.
44. The water level within the acetylene generator shall be monitored periodically.
45. Acetylene generator surfaces shall be kept clean and free from calcium carbide dust or residues.
46. Internal cleaning and necessary maintenance of the acetylene generator shall be carried out and recorded periodically.
47. The Facility shall maintain clear and specific instructions for dealing with the following situations: the hopper, blockage of the screw feeder, elevated temperature of the acetylene generator, lime sludge accumulation, and blockage of water outlets.
48. Guide pulleys, ropes, chains, and the gas-holder counterweight system shall be inspected periodically to verify freedom of movement.
49. Lime-sludge storage ponds shall be secured with protective barriers.
50. Lime-sludge levels shall be monitored and disposed of periodically in accordance with the legislation in force in the State.

51. The internal components of the low-pressure dryer shall be inspected periodically.
52. A dedicated record shall be maintained for calcium chloride replenishment operations.
53. Low-pressure dryer discharge lines shall be inspected regularly for any blockage or spillage of calcium chloride.
54. The acetylene purification unit shall be equipped with ventilation and purging facilities.
55. The purifier drain valves shall be operated at regular intervals.
56. A means of measuring the purity of acetylene gas discharged from the purifier shall be provided.
57. The gas purifier medium shall be regenerated periodically in order to maintain gas purity, in accordance with the manufacturer's recommendations.
58. The temperature shall be monitored during the purifier regeneration process.
59. The purifier medium shall be replaced at intervals determined by the manufacturer, and the Facility shall maintain records documenting all purifier medium replacement operations.
60. Internal corrosion levels of the purifier shall be monitored.
61. The spent purifier medium shall be disposed of in accordance with the legislation in force in the State.
62. Water levels in both the condenser and the cleaning unit shall be monitored during operation, and the necessary maintenance shall be carried out.
63. Liquids in the condenser shall be drained periodically during operation.
64. The acetylene compressor shall be equipped with low-pressure suction cut-out devices and high-pressure discharge cut-out devices.
65. The low-pressure and high-pressure stages of the acetylene compressor shall be tested and calibrated periodically.
66. The head of the acetylene compressor shall be immersed in water.
67. Cylinders to be filled with acetylene shall be immersed in water.
68. The Facility shall maintain a system for the circulation and reuse of cooling water.
69. Water and gas temperatures shall be monitored and recorded periodically.
70. Water drainage and high-pressure oil drainage shall be carried out periodically.

71. Oil and oil pressure shall be monitored throughout the pressure build-up stages, and measurements relating to such stages shall be recorded.
72. Periodic maintenance of the compressor shall be carried out, and its tanks shall be cleaned in accordance with the manufacturer's recommendations.
73. Suction safety valves, delivery valves, and interstage valves shall be inspected and calibrated periodically.
74. The acetylene filling/loading manifold shall be fitted with non-return valves and flashback arrestors, and such flashback arrestors and non-return valves shall be inspected periodically.
75. Flashback arrestors installed in the manifold shall be inspected for any pressure drop.
76. Flashback arrestors in the manifold shall be cleaned or replaced periodically.
77. Filling manifold lines shall be purged and cleaned periodically in accordance with the approved procedure.
78. Filling hoses and pigtail connections shall be inspected periodically and replaced where necessary.
79. Cylinders fitted with bottom support rings shall be inspected for corrosion and bottom leakage.
80. Adequate means shall be provided for inspecting the bottom of cylinders during filling operations.
81. Regular leak-testing procedures shall be implemented during filling operations.
82. Valve outlets and fusible plugs shall be inspected after filling.
83. A water spray/sprinkler system shall be provided for cooling acetylene cylinders during filling operations.
84. A clear procedure for inspecting cylinders prior to filling shall be established.
85. All rejected cylinders shall be recorded in a register maintained for that purpose.
86. Acetylene cylinders shall be weighed after filling, and the results shall be recorded.
87. Weighing devices shall be inspected and calibrated periodically.
88. A safe procedure shall be established for the loading and unloading of acetone drums where they are stored at elevated levels.
89. The fixed acetone system and associated equipment shall be properly grounded.

90. Acetone charging pipelines, hoses, and pumps shall be inspected periodically for leaks.
91. The residual gas content and solvent quantity shall be calculated before refilling a cylinder with acetone solvent.
92. Operators shall be aware of the consequences of overfilling and solvent deficiency in acetylene cylinders.
93. The quantity of acetone charged shall be clearly recorded in the individual cylinder register.
94. The acetone storage and charging area shall be located away from the acetylene filling area.
95. Acetone solvent drums shall be stored in a separate room in accordance with international practices and the instructions of the Competent Authorities governing the storage of flammable chemicals.
96. Nitrogen purging shall be carried out prior to any maintenance of acetone equipment.
97. The same requirements shall apply where Dimethylformamide (DMF) is used as a solvent instead of acetone.
98. The safety requirements applicable to Dimethylformamide (DMF) shall be complied with.

Annex No. (6)

General Requirements for Industrial Gas Filling Facilities

1. Industrial Gas Filling Facilities shall adopt a clear and defined Occupational Health and Safety Policy, which shall be published and made known to all workers.
2. The allocation of responsibilities shall be updated in accordance with the Occupational Health and Safety Management System implemented by the Facility.
3. Upon the installation of new stations or equipment, instructions shall be issued to all concerned workers to ensure compliance with their implementation.
4. Assistant operators shall be properly trained and possess adequate knowledge.
5. All water drains shall be cleaned periodically and at regular intervals.
6. Emergency lighting shall be inspected at regular intervals.
7. Emergency response training shall be conducted for individuals, and attendance and qualification records shall be maintained and documented.
8. Workers exposed to toxic substances or substances presenting a similar degree of hazard shall possess sufficient knowledge and awareness regarding such substances, their hazards, preventive measures, and disposal procedures.
9. An official register shall be maintained for all hazardous substances kept or stored at the site or in the Facility's storage areas.
10. Personal protective clothing and equipment shall be inspected and verified regularly to ensure their condition and suitability for use, and they shall be available in designated locations and readily accessible to users.
11. Signs and notice boards shall be installed along the passageways throughout the Facility and such passageways shall be kept free from any obstruction.
12. Areas designated for forklift operations and pedestrian walkways shall be clearly identified by signs, and the relevant symbols and signs shall be affixed to walkway surfaces where necessary.
13. Restricted areas shall be clearly identified by appropriate warning signs and labels placed in visible locations.

14. The Facility shall adopt a fire emergency plan that includes the identification of emergency exits.
15. Periodic training exercises on the emergency plan shall be conducted for workers at specified intervals.
16. A Facility layout plan shall be approved, indicating the locations of air gas and other gas storage tanks, toxic substances, and other hazardous materials at the site. The plan shall also indicate storage or fuel-supply locations for diesel, gasoline, oils, lubricating greases, paints, and other flammable materials.
17. Emergency contact numbers, including those of the physician, hospital, police, civil defense, and other emergency services, shall be displayed in conspicuous locations within the Facility.
18. The type, number, and locations of leak, fire, and other alarm devices shall be identified, together with the locations of fire hydrants. Their locations shall be consistent with the site layout plan and the locations of hazardous materials present or potentially present, and such devices and hydrants shall be clearly marked and readily visible.
19. Firefighting equipment, including fire alarm systems, shall be inspected regularly.
20. An adequate supply of water for firefighting purposes shall be available at all times.
21. Exit doors and emergency exits shall be inspected regularly to verify their proper operation and to ensure safe evacuation in the event of fire.
22. Emergency exit routes shall be clearly identified and kept free from any obstruction.
23. Alarm activation drills shall be conducted at regular intervals, together with occasional simulation exercises for anticipated incidents.
24. Fire alarm systems and other alarm systems within the Facility shall be tested regularly.
25. Maintenance workers shall undergo qualification and training and shall be granted certificates issued by Conformity Assessment Bodies accredited in accordance with the National Accreditation System promulgated by Cabinet Resolution No. (22) of 2004, enabling them to perform the duties assigned thereto.
26. Electrical tools and equipment used within the Facility shall be approved and shall hold Certificates of Conformity to the applicable Standard Specifications governing electrical equipment intended for use in hazardous areas susceptible to explosion or ignition. Such

tools and equipment shall be installed and maintained by specialized and approved companies and shall be inspected and verified for safety at specified and regular intervals, or whenever necessary.

27. Work Permit Forms shall be issued, where necessary, for locations and situations requiring such permits.
28. Fences, walls, and gates within the Facility shall be maintained in good condition.
29. Layout drawings of installations, equipment, and the electrical network of the Facility shall be maintained and kept continuously available.
30. A preventive inspection and maintenance system shall be established for all electrical equipment and apparatus within the Facility.
31. Verification shall be carried out to ensure that electrical installations and fittings have been installed by Competent Authorities.

Annex No. (7)

Requirements for Medical Gas and Medical Air Production and Filling Facilities

1. Building Design and Site Layout:

1.1 The filling station and site shall be designed in a manner that enables the handling of any hazardous situations or emergency fires.

1.2 The filling station shall be designed to ensure the containment of Flammable Gases and Products.

1.3 Safety labels and signs shall be displayed in conspicuous and prominent locations throughout the Facility.

1.4 The design of the Facility building shall allow safe access and unrestricted movement of forklifts.

1.5 The building design and site layout shall permit safe access and movement within the Facility.

1.6 Site areas in which forklifts operate shall be maintained in a safe condition.

1.7 Lighting within work areas of the building shall be adequate.

1.8 The Facility shall provide conditions suitable for the production and filling of medical gases, while complying with design, construction, maintenance, and sanitation practices that conform to the requirements of Good Manufacturing Practices (GMP).

1.9 Medical gas shall be manufactured within a fully enclosed system to prevent any accidental contamination.

1.10 The filling building shall be designed in a manner that ensures the reduction of noise levels, in accordance with the limits approved by Technical Regulations and rules or Good Manufacturing Practice (GMP) indicators relating to acceptable noise levels.

1.11 Passageways and operating platforms within the Facility shall be designed to enable the safe performance of operations and activities.

2. Quality Management System:

2.1 Compliance of the medical gas Product with the Approved Standard Specifications shall be ensured through a documented program covering detailed specifications, approved testing methods, and acceptance criteria for all components, filling materials, and filled medical gas Products.

2.2 Compliance with approved quality management systems, such as ISO 9001 or ISO 13485 for medical devices, shall be maintained, including compliance with the following requirements:

a. Implementing digital traceability and monitoring systems covering the entire gas life cycle, from production through delivery to the consumer, to ensure immediate traceability of any batch in the event of a problem.

b. Implementing artificial intelligence–based systems to detect any deviations in the quality of the filled medical gas product.

2.3 The following procedures shall be observed to ensure the safety of filled medical gas and to prevent contamination:

a. An ISO Class 8 cleanroom environment, or a higher classification where necessary, shall be used for production operations.

b. Approved emergency response plans shall be developed to address leaks or chemical contamination, including the regular training of workers.

c. Sterile filling tools and equipment shall be provided, and cylinders shall be sterilized regularly using techniques such as steam sterilization or ozone sterilization.

2.4 The Facility shall establish a quality system incorporating the principles of Good Practice (GxP), which shall apply throughout all stages of the medical gas life cycle, including receipt of materials, manufacturing, filling, testing, release, distribution, and container recovery following the use of the medical gas.

2.5 Labels and data appearing on medical gas cylinders shall contain, at a minimum, the information recommended in the applicable pharmacopeias.

2.6 A Good Laboratory Practice (GLP) program shall be established, approved, and implemented with the objective of providing testing facilities within the Facility

that ensure testing accuracy, verification of approved testing methods and the validity of their results, and documentation of testing procedures and results.

2.7 The Facility shall provide approved periodic training programmes for workers, including:

a. Principles of Good Manufacturing Practices (GMP).
b. Standards of the World Health Organization (WHO) relating to medical gases.
c. Sterilization methods and quality control procedures.

2.8 The Facility shall implement comprehensive documentation procedures in accordance with Good Manufacturing Practice guidelines, including in particular:

a. Detailed operational records for each batch of the produced gas.
b. Documentation of internal and external audit activities.
c. Incident reports, their causes, and the corrective actions taken in relation thereto.

2.9 Establishing a risk assessment program covering all stages of the Supply Chain.

2.10 A Corrective and Preventive Action (CAPA) procedure shall be established and documented to address any non-conformity or deviation from quality requirements. Such procedure shall include problem identification, root cause investigation, timely implementation of corrective actions, and follow-up activities to confirm implementation.

2.11 Internal data and customer satisfaction data shall be used to assess the effectiveness of corrective-action programmes and to identify opportunities for continual improvement within the quality system.

2.12 Medical gas Facilities shall adopt documented and implemented management systems that ensure compliance with all applicable regulatory requirements, particularly those relating to the safety and quality of medical gases. Such facilities shall maintain certificates and conformity marks for quality and safety systems issued by accredited Conformity Assessment Bodies.

2.13 Each batch of medical gas shall be tested against the approved specifications or pharmacopeia, and a record of analysis shall be maintained.

2.14 Workers involved in the manufacture, monitoring, approval, or release of batches of medical gases, as well as in their storage and distribution, shall possess appropriate academic qualifications, such as a diploma or degree in health-related fields, engineering, or pharmaceutical sciences, together with the practical experience and training appropriate to the duties assigned thereto.

3. Safe Work Systems at the Site:

3.1 Safety instructions and requirements at filling sites shall be complied with to ensure the protection of workers, customers, and the surrounding community from any medical gases, while adhering to all applicable safety regulations and guidelines.

3.2 The use of shared pipeline networks for medical gases and other industrial gases shall be prohibited.

3.3 A Permit-to-Work (PTW) system shall be implemented at the Facility whenever circumstances so require.

3.4 Clear administrative procedures shall be established for both preventive maintenance (PM) and unplanned maintenance activities, and the maintenance program shall cover all major equipment within the Facility.

3.5 An effective Calibration system shall be implemented for Measuring Instruments and devices used in equipment and operational and production processes, including alarm devices, vent and pressure-relief valves, and torque-Measuring Instruments.

3.6 The site shall maintain a written and up-to-date emergency plan.

3.7 Emergency drills shall be conducted at specified intervals.

3.8 Training records shall be maintained and reviewed regularly to ensure compliance with training requirements and to address identified training needs.

3.9 Emergency alarm functions and the public-address system shall be tested at appropriate intervals.

3.10 The Facility shall provide first-aid equipment and medical treatment facilities, and shall identify the requirements or conduct a needs assessment.

3.11 All workers at the site shall undergo specified induction training and assessment.

3.12 A clear procedure shall be established for recording and selecting appropriate personal protective equipment (PPE) for workers.

3.13 A manual governing the entry and exit of workers, visitors, and contractors shall be established. Vehicle entry and exit shall also be controlled to ensure compliance with safety requirements.

4. Filling of Medical Air Cylinders:

4.1 A manual governing medical cylinder filling infrastructures shall be established and shall comply with the health standards of the World Health Organization (WHO).

4.2 The air intake to the medical air compressor area shall be located away from potential sources of contaminants and impurities in order to minimize the risk of contamination of the medical gas.

4.3 Medical gas filling plant shall be designed in a manner that prevents any possibility of contamination of the medical gas Product.

4.4 An identification procedure shall be implemented during filling operations to ensure that the specified medical gas is filled only into the correct medical cylinder.

4.5 Evidence and indicators shall be available demonstrating the implementation of controls governing the safe storage of controlled and authorized materials, including medical labels, collars, markings, patient information leaflets, and other related materials.

4.6 Any medical cylinder that fails the pre-fill inspection shall be subject to corrective procedures.

4.7 Approved operating procedures shall be established at storage and distribution locations to ensure that only medical gas cylinders authorized for distribution are present at such locations, and that an illustrative demonstration is provided.

5. Forklift Trucks:

5.1 Necessary inspections of forklift trucks shall be conducted prior to operation.

5.2 A maintenance manual for forklift trucks shall be established.

5.3 Documentary evidence shall be available demonstrating that forklift trucks are operated safely.

5.4 Forklift trucks shall be refueled in accordance with Occupational Health and Safety requirements and at locations remote from gas production, filling, and storage areas.

5.5 Operators shall safely use cylinder clamps, booms, hoists, and other lifting attachments.

5.6 Evidence shall be available demonstrating the identification of flammable areas within the site, and only forklift trucks of suitable size and characteristics authorized for use within such areas shall be permitted.

6. Handling and Storage:

6.1 A site-specific traffic management plan shall be established and implemented effectively.

6.2 An effective system shall be established to prevent cylinder transport vehicles from moving or deviating during loading operations carried out using forklift trucks.

6.3 A system shall be established to ensure compliance with safety and security requirements during the loading and unloading of cylinders, whether in vehicles equipped with pallets or in vehicles not equipped with pallets.

6.4 It shall be demonstrated that cylinder loads carried on distribution vehicles are within the safe limits permitted in the State.

6.5 A specific and appropriate procedure shall be adopted for handling filled cylinders that are present and have not been properly classified.

6.6 Cylinders shall be stored and stacked properly and in their designated locations.

6.7 All cylinders shall be stored and stacked safely and in an orderly manner on pallets suitable for their dimensions and sizes.

6.8 All free-standing cylinders (equipped with support bases) shall be stored properly and in accordance with approved safety rules.

6.9 The condition of the cylinder bundles shall be continuously inspected and monitored.

6.10 Applicable systems and safety rules shall be observed when handling cylinder storage areas in order to ensure safe operation.

6.11 Where rolling a cylinder is required during transport, the operation shall be performed with the utmost care and in a safe manner that ensures the cylinder's integrity throughout the rolling process.

7. Facility Requirements:

7.1 The Facility shall be maintained clean and free from rodent-, pest-, and insect-attracting materials, as well as from breeding sites thereof.

7.2 The medical gas container shall provide adequate protection for its gas contents against any potential contamination.

7.3 The Facility shall document its procedures and evidence demonstrating the effective implementation of rodent, pest, and insect control programs, including the identification of breeding sites and the corrective actions taken.

7.4 An effective security program shall be established to prevent unauthorized access to the Facility.

7.5 Shipping containers shall be inspected before use to ensure that they are clean and free from contaminants.

7.6 Chemical treatment activities shall be prohibited within medical gas filling areas in order to prevent contamination of medical gas.

7.7 All consignments shall be secured with tamper-evident seals clearly indicating any interference, tampering, or unauthorized access. The seals affixed to medical gas containers shall be preserved and carefully inspected prior to shipment, and any containers bearing broken or missing seals shall be reported and investigated immediately.

7.8 All medical gas cylinders shall be stored in a manner that prevents contamination and preserves gas quality and cylinder integrity. Storage areas shall be clean, dry, free from pests, and separated from any chemicals or substances that may cause

contamination. Medical gas cylinders shall also be stored at an appropriate temperature.

7.9 Tags and labels affixed to medical gas cylinders shall be maintained in an orderly and appropriate manner to ensure efficient and systematic stock rotation and to prevent any mix-up or cross-contamination.

Annex No. (8)

Requirements for Food-Grade Gas Filling Facilities

1. Building Design and Site Layout:

1.1 The Facility shall provide suitable conditions for the manufacture of food ingredients or the filling of materials using food-grade gases, while adhering to design, construction, maintenance, and sanitation practices that comply with food production requirements and are consistent with the requirements set out in Clause (1) of Annex No. (7) attached to this Resolution.

2. Quality Management System:

2.1 An approved Food Quality and Safety Management System shall be established and regularly maintained to ensure that all activities relating to food ingredients and the manufacture of food-packaging are carried out in accordance with the quality requirements applicable to packaged food-grade gases. The Quality System shall cover all aspects of production and filling operations, including supplied materials, processing operations, storage, and distribution.

2.2 The Facility shall comply with a Global Food Safety Initiative (GFSI) scheme, such as BRCGS, FSSC 22000, or SQF, and shall maintain conformity and compliance therewith throughout all its operations.

2.3 The Facility shall document its procedures to ensure compliance with all requirements applicable to the implemented Quality and Food Safety Management System and shall retain the certificates and conformity marks relating to the approved Quality and Food Safety Systems.

3. Quality Programs:

3.1 Conformity of the food-grade gas Product with approved specifications shall be ensured through a documented program that includes detailed specifications, approved testing methods, and acceptance criteria for all components, packaging and packing materials, and finished food products.

3.2 A Good Manufacturing Practices (GMP) Program shall be established, approved, and implemented, and all workers involved in the manufacturing process shall adhere to health practices and maintain cleanliness.

3.3 A Good Laboratory Practices (GLP) Program shall be established, approved, and implemented to ensure the accuracy of tests, verification of approved testing methods and the validity of their results, and the documentation of procedures and results.

3.4 A Pest Control Program shall be established and implemented to prevent contamination by pests.

3.5 A Corrective and Preventive Action (CAPA) Process shall be established to address any non-conformity or deviation from quality and safety requirements. Such process shall include problem identification, root cause investigation, implementation of corrective actions in a timely manner, follow-up activities to confirm implementation, and documentation of all actions taken in respect of such cases.

3.6 Internal data and customer satisfaction data shall be used to evaluate the effectiveness of the corrective action program and to identify opportunities for continual improvement of the quality system.

4. Suppliers' Food Safety Certification:

4.1 A Supplier Evaluation Program shall be implemented to approve the performance of Suppliers and the materials and services provided in relation to food and to monitor them throughout the contractual period. The evaluation program shall include criteria such as compliance with the regulations applicable within the Facility, Food Safety standards, food-grade Industrial Gas quality requirements, and delivery performance.

4.2 An inspection program shall be established for Facility's supplies to ensure that all contracted and supplied materials and services satisfy the required quality, safety, and performance requirements. Such program shall include criteria such as the

specification and quality characteristics for food-grade gases, inspection procedures, and sampling plans.

4.3 A subcontractor management process shall be established to review third-party operations, ensure quality, verify the implementation of all safety requirements and procedures applicable within the Facility, and monitor operational performance. Such process shall include procedures for identifying and evaluating potential subcontractors, establishing the applicable requirements therefor, and regularly monitoring their performance.

4.4 A Supplier Licensing Agreement shall be concluded with all Suppliers to ensure compliance with the regulatory requirements applicable within the Facility and with food safety standards. Such agreement shall include criteria relating to food-grade gas quality, delivery performance, and notification of any changes affecting such gases or the related process.

5. Filling of Food-Grade Gases:

5.1 Operators shall be familiar with the additional precautions and standards that must be observed when filling and handling food-grade gases.

5.2 A system and procedures shall be established at the site to permit the traceability of food-grade gases cylinders for control, recall, or withdrawal purposes.

5.3 Filling hoses and connections shall be maintained in a clean condition and free from any potential contamination.

6. Production Process Monitoring and Control:

6.1 All Critical Process Control Points shall be identified.

6.2 Periodic monitoring shall be established during the conversion of raw materials into food-grade gases.

6.3 Acceptance and rejection criteria, as well as responsibilities, shall be defined for each control point.

7. Management of Food-Grade Gas Cylinders:

7.1 All Food-Grade Gas containers shall be stored in a manner that ensures gas quality and cylinder safety. Management of filled-gas inventory shall include inventory monitoring, stock rotation, documentation, and accurate record-keeping.

7.2 A Certificate of Analysis (COA) shall be issued for food-grade gases ready for delivery and use in respect of each delivery. The certificate shall be documented and shall include information such as the Product name, batch number, manufacturing date, expiry date, and test results for key quality indicators.

7.3 Storage installations shall be designed and maintained to provide suitable storage conditions, including protection from dust, condensation, sanitation, waste, temperature fluctuations, and other sources of contamination.

7.4 An appropriate procedure shall be implemented for segregating non-conforming food-grade gas cylinders and for preventing their commingling with conforming cylinders.

8. Food Safety Management and Traceability:

8.1 A Food Safety Management Program based on Hazard Analysis and Critical Control Points (HACCP) shall be implemented to identify and control food safety hazards.

8.2 A production process flow diagram for food-grade gas shall be developed, and a hazard analysis shall be conducted to identify potential hazards within the production process.

8.3 Critical Control Points shall be identified and monitored in order to control identified hazards.

8.4 A full traceability system shall be established for all food-grade gas cylinders, providing both forward and backward traceability.

8.5 Records of mock recall exercises shall be retained to test the effectiveness of the recall system.

8.6 Traceability records shall be linked to quality and process data to ensure traceability of food-grade gases.

9. Facility Requirements:

9.1 The Facility shall be maintained clean and free from materials that attract rodents, pests, and insects, as well as from their breeding sites.

9.2 The container shall provide adequate protection for the gas packaged therein against any potential contamination.

9.3 Evidence demonstrating the effectiveness of pest and insect control systems and programs within the production and storage areas of the Facility shall be documented and maintained.

9.4 An effective security program shall be established to prevent unauthorized access to the Facility.

9.5 Chemicals shall be handled properly and segregated from production areas.

9.6 Shipping containers shall be inspected before use and verified to be clean and free from contaminants.

9.7 Chemical treatment activities shall be prohibited within food-grade gas filling areas and locations in order to prevent contamination of the gas.

9.8 All shipments shall be secured with seals clearly indicating any tampering, interference, or unauthorized access. Such seals affixed to gas containers shall be preserved and carefully inspected before shipment, and any gas containers bearing broken or missing seals shall be reported and investigated immediately.

9.9 All food-grade gas cylinders shall be stored in a manner that prevents contamination and preserves gas quality and cylinder safety. The storage area shall be clean, dry, free from pests, and separated from any chemicals or substances that may cause contamination. Food-grade gas cylinders shall also be stored at an appropriate temperature.

9.10 Tags and labels on food-grade gas cylinders shall be maintained in an organized and appropriate manner to ensure efficient and orderly stock rotation and to prevent any mix-up or cross-contamination.

Annex No. (9)

Requirements for Hydrogen Fuel Filling Facilities

1. General Requirements:

1.1 The Facility shall train workers, including drivers and mechanical equipment operators, on the properties of hydrogen, its hazards, flammability, explosion limits, low ignition-energy requirements, and the effect of heating on its expansion.

1.2 Strict procedures and instructions shall be issued for the cleaning and purging of all major station equipment.

1.3 Verification shall be conducted to ensure that the distributed nitrogen purging system is in good working condition.

1.4 The plant shall be monitored regularly for any hydrogen leakage, and immediate measures shall be taken to locate the source of the leak. Workers shall be trained on the procedures to be followed upon the discovery of a hydrogen leak.

1.5 All sources of ignition within the Facility shall be eliminated.

1.6 Suitable means of escape shall be provided, all doors shall open outwards, and escape routes shall be properly planned, designed, and kept free from obstructions.

1.7 Workers shall be provided with the necessary and appropriate safety clothing and protective equipment, including antistatic clothing, electrically conductive footwear, and protective garments, and shall be required to use the clothing and equipment designated for this type of activity within work areas and facilities.

1.8 Workers shall be aware of the need to use only approved and authorized tools and equipment when working in hydrogen production, filling, and storage installations. Hydrogen systems shall be properly inerted and purged with nitrogen prior to entry into such sites.

1.9 Suitable tools and equipment shall be provided for hazardous areas and areas susceptible to ignition or explosion, and such tools and equipment shall be of a non-sparking type.

1.10 It shall be verified that the installation, commissioning, and testing of electrical systems following implementation have been carried out in accordance with the regulations, standards, and approved safety requirements applicable to electrical equipment used in potentially explosive atmospheres, through the application of Cabinet Resolution No. (23) of 2016 Regarding the UAE Regulation for the Control of Electrical Equipment Intended for Use in Potentially Explosive Atmospheres. Where essential lighting fittings are installed, they shall be inspected at the intervals prescribed by the Competent Authority to ensure their continued suitability and safety.

1.11 All electrical systems and equipment shall be bonded and grounded to provide protection against the hazards arising from stray electrical currents and static electricity in accordance with the approved Technical Regulations and systems, and shall be periodically inspected at specified intervals.

1.12 Workers shall be trained and made aware of the hazards associated with the use of portable electrical and electronic equipment, including mobile phones, in hazardous areas.

1.13 Workers on site shall verify that signs and markings identifying hazardous areas are present and clearly visible before entering the site.

1.14 Warning labels and signs shall be displayed at appropriate locations. Hazard warnings shall be written in the approved languages to alert personnel to the presence of risks such as hydrogen gas, Flammable Gases, or areas in which smoking or the use of naked flames is prohibited.

1.15 All activities other than normal operations shall be covered by a Safe Work Permit system.

1.16 It shall be ensured that natural or forced vent openings are free from obstruction and are functioning properly.

1.17 Hydrogen monitoring devices shall provide both audible and visual alarms in open-air conditions in the event of hydrogen enrichment within a building, and such devices shall be tested and calibrated at specified intervals.

1.18 Adequate lighting shall be provided within the hydrogen production area, together with suitable emergency lighting, and such lighting shall be inspected at regular intervals.

1.19 The plant and the functions of machinery shall be inspected and monitored, and the designated supervisor shall periodically review such information.

1.20 All vents, drains, and safety-valve discharge lines shall be kept free from blockages and shall be directed to a safe location away from workers and combustible materials.

1.21 Pressure gauges and indicators shall be inspected, and their readiness and Calibration shall be verified regularly.

1.22 All analytical and testing equipment shall be tested and calibrated at regular intervals.

1.23 All safety valves shall be inspected and reset at specified intervals.

1.24 All critical safety circuits shall be inspected at regular intervals.

1.25 All hazardous chemicals, such as desiccants, purifiers, and the DeOXO chemical catalyst, shall be disposed of in accordance with procedures approved by the Facility, and all approved regulations and controls shall be complied with.

2. Hydrogen Compressors:

2.1 Operating instructions for the hydrogen compressor shall be available, up-to-date, and readily accessible.

2.2 The process flow diagram shall be available and kept up to date.

2.3 The compressor's main shut-off valves shall be maintained regularly.

2.4 Regular inspections shall be carried out to ensure that hydrogen cannot leak into the nitrogen purging system.

2.5 High- and low-pressure alarms, together with compressor process operating settings, shall be tested at specified intervals.

2.6 The sampling point for the oxygen analyzer shall be provided with an appropriate response time to detect hazardous mixtures before the gas reaches the compressor.

2.7 Regular tests shall be conducted to ensure that the process alarm functions correctly at the pre-set oxygen concentration levels.

2.8 Temperature limits for each stage shall be clearly defined.

2.9 Temperature indicators and recorders shall be inspected regularly.

2.10 Process alarms operating at elevated temperatures during compressor discharge stages shall be tested regularly.

2.11 Pressure limits for each stage shall be clearly defined.

2.12 Remote emergency compressor shutdown controls shall be inspected at regular intervals.

2.13 Emergency stop controls shall be located outside the hazardous area and in a clearly visible location, identified by appropriate signs, labels, or Color Coding.

2.14 Automatic drain valves of condensate collection vessels shall be inspected at regular intervals.

2.15 Process alarms associated with high and low condensate level gauges shall be verified at regular intervals.

2.16 Water-drain lines shall be maintained free from obstruction.

2.17 All compressor safety valves shall be inspected and reset at regular intervals.

2.18 Water temperature, water pressure, and oil pressure of individual compressors shall be inspected, and motor overload conditions and the associated process alarm functions shall be examined regularly.

2.19 Temperatures upstream of the compressor inlet and downstream of coolers shall be inspected at regular intervals.

2.20 Safety devices installed on the water side of all coolers shall be inspected at regular intervals.

2.21 Openings leading from safety devices to the safe area shall be inspected regularly to ensure that they remain free from obstruction.

2.22 The safety valve of the compressor crankcase shall be inspected and maintained at specified intervals.

2.23 Alarm functions and trip devices installed in the crankcase purge-gas system shall be inspected regularly under low-pressure/low-flow conditions.

2.24 The sampling valve installed in the compressor crankcase purge gas system shall be inspected and maintained as necessary.

2.25 Gas samples shall be taken from compressor crankcase purge vents before maintenance activities are permitted to commence.

2.26 Compressor start-up procedures shall be available following installation or maintenance works.

2.27 Start-up procedures shall include nitrogen purging operations.

2.28 Start-up procedures shall include analysis of nitrogen purging operations, including inter-stage bypass lines and similar arrangements, in order to ensure that the internal parts of the compressor are fully charged with Inert Gas prior to start-up.

2.29 Compressor restart and shutdown procedures shall be available.

2.30 All suction cylinders and inter-stage separators shall be internally verified, cleaned, and inspected at specified intervals.

2.31 Regular inspections shall be carried out to determine the rate of corrosion by measuring wall thickness at fixed points within piping systems and condensate vessels.

3. Hydrogen Filling Manifolds:

3.1 The emergency automatic valve located upstream of the main supply-system valve shall be inspected and maintained at specified intervals.

3.2 Remote emergency shutdown controls installed on each filling line shall be tested regularly.

3.3 The holder vent/purge valves shall be purged independently during plant start-up.

3.4 Each shut-off valve and charged manifold connection shall be opened slowly.

3.5 Manifolds (distribution headers) shall be securely anchored to the ground.

3.6 Cylinders, bundles, and trailers shall be grounded during filling operations.

3.7 Cylinder connections shall be leak-tested during filling at the point of connection to the filling line.

3.8 Valve stems, cylinder plugs, bundle valves, and trailer valves shall be regularly leak-tested to ensure safety, proper operation, and the prevention of leakage.

3.9 Cylinder, bundle, and trailer valves shall be inspected after filling to ensure the absence of leakage.

3.10 Regular leak tests shall be carried out on mechanical joints within the filling system, as well as on cylinders and trailers, to ensure leak-tightness.

3.11 Filling connections shall be maintained in good condition, including threads and fastening bolts, which shall be complete and free from damage.

3.12 Filling adapters shall be used, and their use shall be controlled. Access thereto shall be restricted to authorized workers only. Filling adapters shall be inspected regularly to ensure their integrity, including examination of threads and verification that they are free from damage.

3.13 Tools and analytical systems used for hydrogen service shall be inspected and maintained at specified intervals.

4. Maintenance:

4.1 Maintenance procedures for hydrogen systems shall be provided.

4.2 Operators shall be instructed that personnel assigned to depressurize, purge, or perform work on hydrogen systems must first obtain a Safe Work Permit.

4.3 The Safe Work Permit shall require a final analytical sample to be taken before any equipment is reconnected directly to the system.

4.4 All portable hydrogen monitoring equipment shall be tested and calibrated as prescribed and at regular intervals.

4.5 Maintenance workers assigned to work on hydrogen systems shall receive adequate training and shall possess adequate knowledge of the safety precautions applicable to this type of stations.

4.6 Workers shall be instructed to use only approved and authorized tools and equipment intended for use within hydrogen safety and security areas.

5. Emergency Procedures in Hydrogen Facilities:

5.1 It shall be ensured that emergency plant shutdown procedures are available, including electrical isolation, equipment isolation, and nitrogen purging procedures.

5.2 Workers shall be aware of, and capable of implementing, the safety procedures required in the event of a fire, including activation of the emergency shutdown switch, raising the alarm level, summoning emergency and firefighting services, closing valves to isolate hydrogen supply sources, and evacuating all persons from the hazardous area except those specialists whose presence is necessary to manage the emergency. Any approach to a fire shall be made from upwind direction.

5.3 Workers shall be aware that hydrogen flames are extremely difficult to see in daylight.

5.4 Operators shall wear gloves when handling valves, control systems, and other equipment as part of their duties.

5.5 Operators and technical supervisors shall ensure that non-sparking portable lighting devices (hand lamps) are readily available for use during emergencies.

5.6 Remotely controlled emergency inert-gas supplies shall be tested at regular intervals to ensure proper operation.

6. Handling and Storage of Hydrogen Cylinders:

6.1 It shall be ensured that a site traffic management plan is in place and effectively implemented.

6.2 A system shall be provided to prevent vehicles from shifting position or moving during loading operations carried out by forklifts.

6.3 A safe work plan and safe system of work shall be established for the loading and unloading of hydrogen gas cylinder pallets onto and from vehicles.

6.4 Where loading platforms for hydrogen cylinders are unavailable, workers shall follow a safe system of work for loading hydrogen cylinders onto vehicles and unloading them therefrom.

6.5 Workers shall ensure that cylinder loads on vehicles are properly secured and shall verify such securement.

6.6 Workers shall follow an appropriate procedure for handling filled cylinders bearing incorrect Labels.

6.7 Hydrogen cylinders shall be properly stored in designated locations.

6.8 All cylinders shall be properly stored on pallets and within cages.

6.9 All free-standing cylinders (cylinders provided with a base ring) shall be properly stored.

6.10 The condition of pallets shall be continuously monitored.

6.11 Drum Tanks shall be handled safely.

6.12 Workers shall handle cylinders safely and with due care whenever it becomes necessary to roll a cylinder.

Annex No. (10)

Handling and Distribution of Liquid Hydrogen

1. Safety and Operational Requirements for Hydrogen Stations:

1.1 Workers and operators shall strictly comply with instructions and checklists to ensure safety and efficiency during the handling and distribution of liquid hydrogen cylinders (LH_2). Such checklists shall cover a range of topics relating to the handling and transportation of liquid hydrogen (LH_2), including equipment requirements, safety protocols, maintenance, and the implementation of procedures.

1.2 Compliance shall be maintained with the requirements of the standard specification for hydrogen fueling stations (UAE.S ISO 19880-1), which sets out the minimum design, installation, operation, inspection, and maintenance requirements for the purpose of establishing safety and performance requirements for hydrogen fueling stations serving light-duty and heavy-duty hydrogen-powered road vehicles, in accordance with the prescribed instructions.

1.3 Signboards and directional signs indicating the locations of hydrogen fueling stations along roads shall be distinctive and clearly visible. The station shall be equipped with all necessary safety and health means and shall be provided with signs and labels containing hazard warnings and instructions for safe operation and use in accordance with Occupational Health and Safety requirements.

1.4 Operators at hydrogen fueling stations shall possess adequate knowledge of hydrogen gas hazards, hydrogen fuel dispensers, fueling nozzle standards for pressures of (350) bar and (700) bar, and the management of filling and flow rates, particularly in hot climates.

1.5 Drivers of vehicles and trucks used for the transportation of hydrogen gas cylinders shall be fully familiar with safety procedures and instructions governing the transportation and unloading of hydrogen cylinder consignments, as shall workers at the fueling station.

1.6 Workers shall receive instructions regarding the various hazards and environmental conditions associated with operational activities throughout the different stages of hydrogen gas production, filling, storage, and transportation.

1.7 All recommendations and guidelines relating to the safe design and operation of hydrogen production facilities shall be implemented in accordance with the production method employed.

1.8 Compliance shall be maintained with the guidelines contained in International Standard ISO/TR 15916 concerning basic safety considerations for hydrogen systems.

2. Liquid Hydrogen Transport Vehicles:

2.1 Liquid hydrogen transport vehicles shall be equipped with tracking devices approved in the State.

2.2 Liquid hydrogen transport vehicles shall be equipped with a tachograph device for recording all information relating to the vehicle journey, and the tachograph discs shall be inspected regularly.

2.3 During the mandatory retention period, the operational diagrams and records of the Facility, inspection results, maintenance activities, and records relating to the transportation and distribution of gas cylinders or tanks shall be maintained.

2.4 Drivers shall be informed of all violations recorded on the tachograph charts.

2.5 Verification shall be made as to whether any modifications have been made to the vehicles, and it shall be ensured that such modifications are authorized in accordance with the approved requirements.

2.6 Verification shall be conducted to ensure the availability and validity of the following items in the vehicle: transport permit, gas data record, Safety Data Sheet (SDS), emergency equipment, ADR placards, shipping and loading documents, operating instructions, and other relevant items.

2.7 The following information shall be clearly displayed on the liquid hydrogen (LH_2) transport vehicle:

a. Product name and United Nations Number (UN No. 1966).

b. Liquid hydrogen (LH_2) safety signs, including: Flammable Gas – No Smoking – No Open Flames.
c. Name of the Facility and telephone number.

3. Subcontractors for the Transportation of Liquid Hydrogen (LH_2) Tankers:

3.1 Prior to contracting with or appointing liquid hydrogen (LH_2) transport contractors, it shall be verified that they have undergone all appropriate training courses appropriate to this category of material, have been provided with copies of the relevant safety rules, and have been provided by the relevant department with a questionnaire for auditing safety in liquid hydrogen (LH_2) systems.

3.2 The safety rules applicable to the loading and unloading of contractor transport company vehicles shall be applied to the same extent as those applicable to the Facility's vehicles.

4. Training of Liquid Hydrogen (LH_2) Distribution Drivers:

4.1 All drivers shall receive the necessary training on safety requirements and procedures.

4.2 Drivers shall attend courses and seminars addressing the following subjects:

a. Properties and hazards of cryogenic liquid hydrogen.
b. National regulations governing the handling of liquid hydrogen (LH_2).
c. UAE.S 5060 concerning the requirements for the carriage of dangerous goods by road.
d. Design and safety of liquid tankers, and liquid hydrogen (LH_2) transfer pump technology and operation.
e. The effect of liquid movement on tanker stability.
f. Procedures in the event of accidents and emergencies.
g. Firefighting.
h. Vapor cloud hazards and precautions.
i. Transfer of liquid to low-pressure storage tanks.
j. Safe tanker positioning.

4.3 Refresher training shall be provided to drivers at regular intervals.

4.4 Drivers shall be instructed to report defects and malfunctions in the truck, pump, or tanker equipment, as well as any defects in customer facilities and any accidents involving tankers or workers.

4.5 Drivers shall not conceal any evidence relating to defects, accidents, or incidents occurring at customer Facilities.

4.6 Drivers shall be instructed to perform daily inspections of their vehicles in accordance with the approved checklist, including inspection of lights, tyres, brakes, and other components, verification that the anti-drive-away device is in place, compliance with work orders, strict adherence to traffic regulations, avoidance of overloading the tanker beyond permissible limits, and the use of suitable protective clothing and equipment such as gloves, goggles, and safety footwear.

4.7 Contracted drivers shall receive the same training prescribed for the Facility's drivers.

5. Emergency Measures:

5.1 Drivers shall receive instruction regarding the hazards associated with:

a. The minimum ignition temperature of hydrogen.

b. The flammability range of hydrogen.

c. Hazards arising from hydrogen-air or hydrogen-oxygen mixtures.

d. The biological effects and characteristics of liquid hydrogen (LH_2).

5.2 Drivers shall be instructed regarding the actions to be taken in the following situations:

a. Road traffic accidents.

b. Liquid hydrogen spills.

c. Tanker or pump fires.

d. Tyre fires.

5.3 Drivers shall be familiar with the vehicle's equipment and fittings and with the actions to be taken in the event of cryogenic burns.

6. Equipment and Fittings of Liquid Hydrogen Transport Vehicles:

6.1 The engine compartment of the hydrogen transport vehicle shall (wherever practicable) be equipped with an automatic fire suppression system to enhance safety, and its readiness shall be continuously verified.

6.2 Regular inspections shall be conducted to verify that the following items are present on board the vehicle and are in good working order: wheel chocks, emergency warning lights, portable drip tray, fire extinguishers of the appropriate type and size, safety signs such as "No Open Flames", "No Smoking", and "Do Not Move the Vehicle", roadside warning triangles, and a first-aid kit.

6.3 Regular inspections shall be carried out to verify the operational readiness of anti-skid devices.

6.4 Dangerous goods regulatory placards shall be affixed to the vehicle in accordance with the requirements of UAE Standard UAE.S 5060 concerning the carriage of dangerous goods by road.

6.5 Emergency telephone numbers shall be clearly displayed on the tanker vehicle and regularly updated.

6.6 Flexible hoses and connections of the tanker shall be inspected at regular intervals.

6.7 Fire extinguishers shall be inspected regularly; maintenance tags shall be affixed thereto, and inspection and maintenance records shall be retained.

7. Delivery of Liquid Hydrogen to Customers:

7.1 Clear and specific procedures shall be established for the transportation of cryogenic liquid hydrogen.

7.2 Drivers shall receive instruction regarding the rules governing tanker positioning during delivery operations.

7.3 Drivers shall be instructed to report any deviation from such rules by any customer.

7.4 Drivers shall be instructed to report any modifications or maintenance work carried out on the vehicle by a customer where the driver considers such work

unsuitable or non-compliant with the vehicle's safe operating requirements and instructions, including associated measuring and alarm devices, by immediately notifying the competent officials within the gas Facility.

7.5 Drivers shall notify the customer upon arrival at the delivery location.

7.6 Tanker safety distances shall be observed in a manner ensuring:

a. Protection of persons in the event of accidental incidents.
b. Protection of surrounding equipment in the event of accidental incidents.
c. Accessibility of emergency services where necessary.

7.7 The liquid hydrogen transfer area shall be clearly demarcated, and signs shall be displayed indicating that parking within the area is prohibited.

8. Maintenance of Liquid Hydrogen Tankers:

8.1 Driver-operators shall be instructed to:

a. Verify the type of gas before delivery to avoid any error or confusion.
b. Ensure that connection fittings correspond to the gas identification indicated on the tanker and the tank to be filled.
c. Avoid connecting flexible hoses end-to-end.
d. Exercise particular care in controlling tank pressure during delivery operations.
e. Remain near the tanker throughout filling and delivery operations.
f. Shut down any transfer pump showing signs of malfunction.

8.2 All hydrogen vents, including pressure safety valve (PSV) pipes and purging operations, shall be connected to a vent stack.

8.3 Vent stacks shall be arranged to discharge into a safe outdoor location.

8.4 All piping, fittings, gaskets, thread sealants, valves, and pressure regulators shall be suitable for liquid hydrogen (LH_2) service.

8.5 The gas check valve shall be installed away from the vehicle battery boundary in order to prevent reverse flow into the hydrogen system.

8.6 Maintenance of liquid hydrogen (LH_2) transport vehicles shall be carried out as follows:

a. A planned preventive maintenance system shall be established covering the following: liquid hydrogen (LH_2) transfer pump, engine, chassis and vehicle body, transmission, gearbox, brakes, steering mechanism, electrical equipment and lighting, tyres, tyre pressure, wheels, and fire extinguishers.
b. Updated inspection programmes shall be provided.
c. It shall be ensured that no major servicing requirement for any vehicle is overlooked.
d. Detailed inspections shall be conducted on a number of vehicles to verify compliance with maintenance standards.
e. Inspection results shall be verified against maintenance records to ensure their accuracy.
f. Entities engaged in gas transportation shall establish a safe transport plan, including assessment of potential risks along the transport route, avoidance of unnecessary transport operations near residential areas or critical facilities, verification of the suitability of the infrastructure along the selected route, provision of rapid access to emergency services, and identification of safe alternative routes.

9. Customer Handling of Liquid Hydrogen Deliveries:

9.1 Approved tools specifically designed for handling liquid hydrogen shall be used, including leak-tight valves and high-pressure hoses.

9.2 Workers and users shall be trained in the safe handling of liquid hydrogen cylinders, including emergency procedures.

9.3 In the event of a leak, the area shall be evacuated immediately, and the leak shall be handled by specialized experts.

9.4 Warning Marks shall be placed on cylinders and in surrounding areas to alert users to the hazards of liquid hydrogen.

9.5 The correct orientation of cylinders shall be identified, particularly cylinders containing openings in their upper sections.

9.6 Approved Technical Regulations shall be followed for the disposal of empty or damaged cylinders, including recycling or disposal at designated facilities.

9.7 The temperature inside liquid hydrogen cylinders shall be continuously monitored to ensure that it does not exceed the maximum permissible limit.

9.8 Liquid hydrogen cylinders shall be stored away from heat sources such as furnaces and areas containing fire or open flames. Exposure of cylinders to heat may increase internal pressure, thereby increasing the risk of explosion.

9.9 Liquid hydrogen cylinders shall not be placed near flammable substances such as gasoline, alcohol, or other chemicals that may react with hydrogen.

9.10 Cylinders shall be stored in well-ventilated areas to prevent the accumulation of Flammable Gases in the event of leakage.

9.11 Where multiple liquid hydrogen cylinders are stored, adequate spacing shall be maintained between the cylinders and any potential heat source in order to reduce hazards.

Annex No. (11)

Transportation and Distribution of Filled Gas Cylinders

1. Vehicles used for the transportation and distribution of industrial gas cylinders shall be equipped with a vehicle tracking system approved in the State and with a tachograph device for monitoring compliance with prescribed speed limits.
2. Global Positioning System (GPS) devices shall be inspected on a regular basis.
3. Records relating to violations shall be retained throughout the mandatory retention period prescribed for such records.
4. Drivers shall be notified of any violations recorded against them.
5. Any modifications made to vehicles used for the transportation and distribution of gas cylinders shall be approved by the licensing authority.
6. Inspections shall be conducted to verify the presence of the following items on board the vehicles: the transport permit, gas data record, emergency cards, signs, placards and labels relating to dangerous goods transported by road in accordance with the applicable UAE Standard Specifications for the carriage of dangerous goods by road, loading and delivery documents, operating instructions, and any other requirements prescribed by the legislation in force in the State.
7. The name of the Facility and its telephone number shall be clearly displayed on the vehicle.
8. All drivers shall receive the necessary training on the safety requirements and procedures applicable to the industrial gas cylinders being transported.
9. Drivers shall attend training sessions covering the following subjects: the properties of the gases with which they deal, the relevant national regulations, emergency procedures in the event of accidents, and firefighting operations.
10. Refresher training shall be provided to drivers at regular intervals.
11. Drivers shall be instructed to report any defect in the vehicle, engine, or equipment (including brakes, lighting systems, and the like), as well as any accidents or damage affecting the vehicle, the cylinder load, or individuals.
12. Documentary evidence relating to drivers' reports shall be retained.

13. Drivers shall be provided with clear instructions to undertake the following:
    a. Carry out a daily inspection of their vehicle in accordance with the inspection checklist, including lighting systems, tyres, valves, and brakes.
    b. Strictly comply with road traffic rules and regulations.
    c. Refrain from exceeding the permissible load capacity of the vehicle, and clear and strict emphasis shall be placed upon this requirement.
    d. Ensure that the load is properly secured by using chocks, restraints and lashing means, (straps and similar means).
    e. Avoid rough handling of cylinders, particularly during loading and unloading operations, and inspect all cylinders and valves for defects or indications of improper use, with all defective cylinders being appropriately marked.
    f. Drivers and all workers participating in loading and unloading operations shall use personal protective equipment (PPE) such as gloves, safety footwear, and respiratory protection devices.
14. Regular inspections shall be conducted on the mechanical components, chassis, hydraulic system, electrical equipment, pneumatic systems, wire ropes, chains, and other equipment fitted to transport vehicles.
15. The crane shall bear Marks containing operating instructions.
16. Drivers shall be familiar with the weights of the various loads handled, including pallets, bundles, cylinders, tanks, and other items.
17. Instructions relating to the use of vehicle tail lifts and crane extension booms shall be followed with utmost precision.
18. Warning signs affixed to the crane shall indicate that travelling with suspended loads is prohibited.
19. Crane operators shall be instructed not to operate cranes at locations situated beneath electrical power lines.
20. Drivers shall be instructed to report defects affecting the tail lift or other cranes, and any such defects shall be rectified immediately.

21. Regular inspections shall be conducted on load-securing components, including cable tensioners, hoists, pins, cables, straps, brackets, and similar items, and drivers shall report any defects therein.
22. All equipment required for the safe securing and transportation of loads shall be available and shall be inspected at regular intervals.
23. Cylinders shall be secured and transported in an upright position and shall be fitted with the requisite protective devices, including valve caps and cylinder bases.
24. Preventive maintenance programmes shall be established for transport vehicles, and standard vehicle maintenance criteria shall be applied so as to ensure a satisfactory level of efficiency and safety.
25. Distribution vehicles shall not miss any major service required to be performed.
26. Entities engaged in gas transportation shall establish a safe transportation plan for industrial gases, including the assessment of potential risks along transport routes, the avoidance of unnecessary transport operations in the vicinity of residential areas and critical facilities, the verification of the suitability of the infrastructure along the selected route, the provision of rapid access to emergency services, and the identification of safe alternative routes.

Annex No. (12)

Transport and Distribution of Bulk Gaseous Products

1. Vehicles used for the transportation of bulk gaseous Products shall be equipped with tachograph devices or any other speed-monitoring system for such vehicles while travelling on roads.
2. Tachograph charts shall be inspected on a regular basis.
3. Graphs and records shall be retained throughout the mandatory retention period.
4. Drivers shall be alerted to avoid committing violations recorded on the vehicle route records.
5. It shall be verified that any modifications made to vehicles are authorized and approved by the licensing authority.
6. Inspections shall be conducted to verify the presence of the following items on board the vehicles: the transport permit, gas data record, emergency cards, signs and placards, loading documents, and operating instructions in accordance with the requirements for the carriage of dangerous goods by road as approved in the State.
7. The name of the gaseous product, together with the name of the Supplier or Facility and the telephone number, shall be clearly displayed on the vehicle.
8. Where the services of an external transport company are utilized, it shall be verified that such company complies with all instructions and requirements relating to the transportation of hazardous materials. Responsibility for such verification shall rest with the Facility prior to contracting with the transport service provider for the carriage of its Industrial Gas Products, including providing the transport company with all appropriate training requirements for the driver and vehicle crew, copies of the relevant safety rules, and a copy of the vehicle safety audit report approved by the competent department within the Facility.
9. The same rules applicable to the Facility's vehicles shall be applied when using the services of external transport companies for loading or unloading operations.
10. All drivers shall receive safety training.
11. Drivers shall attend sessions covering the following subjects: the properties of gases and cryogenic liquids; the relevant national regulations governing the carriage of hazardous

materials; the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR); the design and safety of liquefied gas tankers; pump technology and operation; the effect of liquid movement on tanker stability; emergency procedures in the event of accidents; firefighting; vapor draw-off hazards and the precautions to be taken; transfer of liquids to low-pressure storage tanks; and the safe positioning of tankers.

12. Refresher training shall be provided to drivers and their assistants at regular intervals.
13. Drivers and their assistants shall be instructed to report defects in vehicles, pumps, and tanker equipment, deficiencies at customer facilities, and accidents in general, including tanker-related accidents and workers' incidents.
14. Drivers shall be provided with clear instructions to undertake the following:
    a. Carry out a daily inspection and audit of their vehicle in accordance with the inspection checklist, including light, tyres, brakes, and similar items.
    b. Verify that the anti-towaway device is functioning properly.
    c. Strictly comply with road traffic rules and regulations.
    d. Refrain from overloading the vehicle beyond the permissible limit.
    e. Emphasize the necessity of using personal protective equipment (PPE).
15. Contracted drivers shall undergo the same training programs prescribed for the Facility's drivers.
16. It shall be ensured that drivers receive instruction regarding the hazards associated with oxygen-enriched atmospheres and oxygen-deficient conditions.
17. Drivers shall be instructed and guided on the procedures to be followed in the event of a road traffic accident, liquid spillage, tanker or pump fire, or tyre fire.
18. Drivers shall be familiar with the actions required in the event of Cryogenic Gas burns.
19. Periodic inspections shall be conducted to verify the presence of the following items on board the vehicle:
    a. Wheel chocks.
    b. Emergency warning lights.
    c. Portable drip tray, where required.
    d. Fire extinguishers of the appropriate type and size.

e. Safety signs such as "No Smoking" and "Do Not Move the Vehicle", together with road warning triangles.
f. First aid equipment.

20. The operation of anti-towaway devices shall be inspected regularly.
21. Hazardous materials placards and labels shall be affixed to the vehicle in accordance with UAE Standard Specification UAE.S 5060 concerning the carriage of dangerous goods by road.
22. The transport company shall have instructions and procedures in place for the changeover of a tanker from the carriage of one gas to another gas, and such instructions and procedures shall be fully implemented.
23. Emergency telephone numbers shall be clearly displayed on the vehicle and shall be updated regularly.
24. Flexible hoses and the associated connections installed on the vehicle shall be inspected at regular intervals.
25. Fire extinguishers shall be inspected periodically, and the relevant identification Marks and seals shall be affixed thereto.
26. A specific procedure shall be established for the transport of cryogenic liquefied gases.
27. Drivers shall be instructed regarding the rules governing vehicle positioning during delivery operations.
28. Drivers shall be instructed to report any deviation observed at customer facilities from the rules governing the transport and distribution of bulk gaseous Products.
29. Drivers shall be instructed to report any customer unloading and transfer installations of consignments where such installations have been modified, are unfit for use, lack operating instructions, or bear illegible instructions.
30. Drivers shall notify the customer immediately upon arrival at the delivery site and shall comply with the safety rules and other regulatory requirements in force at the customer's site.
31. Drivers or operators shall be instructed,, prior to delivery of the consignment, to verify that no confusion exists regarding the type of gas to be delivered; ensure that the unloading connections correspond to the name and type of gas indicated on the vehicle and the tank

into which the consignment is to be discharged; avoid connecting flexible hoses end-to-end; closely monitor tank pressure during delivery operations by the worker; remain in the vicinity of the tanker during filling and delivery operations; shut down any oxygen pump exhibiting signs of malfunction; and immediately report any defect in an oxygen pump during transportation, where oxygen is being transported.

32. A planned preventive maintenance system shall be established for the vehicle and shall include the engine, chassis, vehicle body, transmission, gearbox, brakes, steering system, electrical equipment and lighting, as well as tyre condition and pressure.
33. Inspection programs shall be updated on a regular basis.
34. All vehicles shall undergo major servicing and periodic maintenance at regular intervals in accordance with the recommendations and instructions of both the vehicle manufacturer and the Industrial Gas Facility, so as to ensure safe and reliable operation. Any overdue major service shall be carried out immediately, and the vehicle shall not be used until it has been repaired and rendered safe for operation.
35. Detailed inspections shall be conducted on all vehicles to verify that their maintenance standards are acceptable and satisfactory.
36. Entities engaged in gas transportation shall establish a safe gas transportation plan, including the assessment of potential risks along transport routes, the avoidance of unnecessary transport operations in the vicinity of residential areas and vital installations, the verification of the suitability of the infrastructure along the selected route, the provision of rapid access to emergency services, and the identification of safe alternative routes.

Annex No. (13)

Storage Sites for Filled Gas Cylinders

1. General Requirements:

1.1 Facilities shall comply with the recommendations of the Gulf Cooperation Council concerning preventive requirements for hazardous materials, or with the applicable international practices relating to the storage of hazardous materials and the standards governing storage locations.

1.2 The Facility responsible for the gas cylinder storage site shall conduct periodic reviews and regular updates of occupancy permits, building and fire code requirements, hazardous materials codes, and insurance requirements relevant to filled gas cylinders.

1.3 Adequate ventilation shall be provided to prevent vapor accumulation, whether at the filled-cylinder stacking area or at the separate storage platform.

1.4 The site emergency plan shall include responses to potential incidents involving toxic gaseous materials and Flammable Gases.

1.5 Emergency evacuation routes, exits, and assembly points shall be clearly identified and **by** appropriate signage and shall be kept free from obstructions and from areas that may be affected by gas leakage or release.

1.6 The emergency notification plan shall include neighboring areas whose occupants may be exposed to danger.

1.7 A wind-direction indicator shall be provided at the site.

1.8 Facility workers shall receive periodic training concerning the properties, hazards, handling operations, and emergency procedures relating to specific gas Products.

1.9 All locations within the Facility that handle chemicals of concern and highly hazardous substances in the event of atmospheric release shall undergo a risk assessment to ensure the security and safety of the site.

2. Storage Area:

2.1 The Facility shall provide a separation distance of not less than six (6) meters, or provide a fire-resistant separation barrier, between gaseous materials of different categories, storage areas, vehicle parking areas, and groups of incompatible materials.

2.2 All stored filled cylinders shall be fitted with valve caps or valve protection guards.

2.3 The storage area shall be provided with suitable ventilation and continuous monitoring of air composition within indoor storage areas.

2.4 The Facility shall properly classify each of its hazardous areas in accordance with the Facility's classification guidelines.

2.5 The Facility shall maintain storage areas for oxidizing gas cylinders free from ordinary combustible waste, oils, and grease.

2.6 The Facility shall provide a storage system for filled gas cylinders, whether through stacked storage or on pallets, together with additional protective measures including earthquake-resistance measures, fire protection, weather protection, ease of access during emergencies, and safe storage systems for materials transported on, or placed upon, pallets or shelving units.

2.7 The Facility shall provide fire extinguishers at the entrances to storage areas designated for flammable materials.

2.8 The Facility shall install clear warning signs and notices prohibiting smoking throughout all storage areas.

2.9 The Facility shall provide cylinder fall-prevention devices.

2.10 The Facility shall provide a separate secondary storage area, isolated from the gaseous-Products warehouse, suitable for storing drums containing flammable materials or corrosive liquids.

2.11 The Facility shall properly segregate gas cylinders and stored chemicals according to the following categories: full cylinders, empty cylinders, medical gases, liquefied gases, Flammable Gases, oxidizing gases, inert gases, Toxic Gases, corrosive substances, and cylinders with technical defects.

2.12 Signs and placards shall be used, wherever practicable, to identify and classify storage areas according to the classification of gaseous Products (flammable,

oxidizing, toxic, and others), in accordance with the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

Annex No. (14)

Safety Requirements for the Storage of Cryogenic Gases

1. Signs and Identification Marks:

1.1 A sign displaying the name of the Facility and the nature of its activity shall be installed in a prominent location and shall remain clearly visible and legible.

1.2 Labels and information boards showing the Facility layout, site locations, process-flow diagrams, and Cryogenic Gas storage locations shall be provided.

1.3 All valve identification data within the Facility's installations shall be maintained in good condition to ensure that they remain clear and legible.

1.4 A sufficient number of labels and Marks shall be displayed to identify gas Products or hazardous materials, together with safety signs and warning notices such as "No Smoking", "Wear Personal Eye Protection", and similar instructions.

1.5 Warning signs shall be installed indicating that a work permit must be obtained before accessing ducts, outlets, openings, or locations containing valves.

2. Emergencies:

2.1 It shall be verified that the remotely operated emergency shut-off valve installed at the tank's main liquid outlet is functioning properly.

2.2 It shall be verified that the emergency shut-off valve remains operable and functions in the event of a power failure or equipment malfunction.

2.3 All sections in which Cryogenic Gas or liquid Product may become trapped shall be fitted with safety relief valves.

2.4 The Facility shall ensure that the remote emergency stop device associated with the supply pump remains continuously operational and in good condition.

2.5 It shall be ensured that supply pumps automatically cease operation upon failure of the air-supply system.

2.6 An emergency safety shower shall be provided near the storage tank for oxidizing liquid Products (LOX) and shall be maintained in good condition and readily available for use when required.

3. Preventive Inspections and Testing:

3.1 Emergency push button electrical switches shall be inspected regularly and maintained in a constant state of readiness.

3.2 Pressure-control devices installed throughout the tank system shall be inspected and verified for serviceability at regular intervals.

3.3 The Facility shall provide alarm and warning systems for all stages of operation in cases of minimum pressure, maximum pressure, and excessive liquid-level conditions, and their operational readiness shall be verified regularly.

3.4 Inspections shall be conducted to ensure that all safety devices installed on the tank are capable of relieving vapors generated by tanker flash-off, even under the most severe anticipated operating conditions.

3.5 Safety relief valves shall be inspected and maintained at specified intervals.

3.6 The automatic tank vent valve shall be inspected and maintained regularly.

3.7 Control of gas flow within the tank annular space shall be maintained at the prescribed rate.

3.8 Regular analysis shall be conducted of the constituents present within the annular space surrounding the outer shell of the tank, together with analysis of the constituents present at the valve location.

3.9 The liquid-level indicator installed on the tank shall be inspected and calibrated at regular intervals.

3.10 Tank liquid-level limit switches shall be inspected at regular intervals.

3.11 The automatic tank pressure boosting control system shall be inspected and maintained regularly.

3.12 The tank anti-vacuum system shall be inspected and maintained regularly.

3.13 The air-control system shall be regulated and maintained regularly.

3.14 The liquid-level controller or recorder installed on the tank shall be calibrated and inspected at specified intervals.

4. Safety Relief and Vent Valves:

4.1 Exhaust lines connected to safety relief valves and vent valves shall be kept free from any obstruction, including foreign materials, ice accumulation, or similar impediments.

4.2 Necessary preventive measures shall be taken to ensure that safety relief valves and vent valves remain operational and to prevent the falling of ice masses from tank vent outlets.

4.3 Ready access shall be ensured to any manually operated vent valve installed on the tank.

4.4 It shall be verified that the dew point of instrument air in fixed connection lines serving critical equipment is sufficiently low to prevent blockage.

4.5 Operators shall be trained in the management and dispersion of large vapor clouds.

4.6 Diverter valves installed above safety relief valves shall be maintained in the center position to ensure that both relief valves remain operational.

4.7 Prior to the inspection of safety relief valves, a relief test shall first be conducted.

5. Inspection and Transfer Procedures:

5.1 Approved procedures shall be established for the inspection and comprehensive repair of tank safety devices.

5.2 Procedures relating to the transfer of liquid Products into low-pressure bulk-storage tanks shall be established and made available.

Annex No. (15)

Safety Requirements for Cryogenic Gas Storage Tanks at Production Sites

1. Tanks:

1.1 Operators shall comply with the requirements and instructions prescribed for the storage of Cryogenic Gases in designated storage tanks, so as to ensure the safety of the Facility, individuals, and the surrounding environment.

1.2 Compliance shall be maintained with Standard No. UAE.S ISO 21009-1 and International Standard No. ISO 20421-1, referred to in Annex No. (1-A) attached to this Resolution, when determining the design, manufacturing, examination, and inspection requirements for fixed tanks and vacuum-insulated transportable tanks intended for the conveyance of Cryogenic Gases having a capacity exceeding four hundred and fifty (450) Liters, as well as tanks not permanently connected to a transport vehicle (demountable tanks and portable tanks).

1.3 Compliance shall be maintained with the requirements of Technical Document No. MEGA TD 28/18/E, referred to in Annex No. (1-B) attached to this Resolution, concerning "Liquid Container Product Labels – Refrigerated Liquids."

1.4 The prescribed instructions for marking of cryogenic liquid gas Product tanks with hazard warning Marks shall be observed, and Labels containing the descriptive information relating to such Products shall be affixed.

1.5 Accurate identification of gas Products contained within tanks shall be ensured, together with the safe handling and transportation of portable tanks and tankers containing various types of Cryogenic Gases.

1.6 The instructions and guidance applicable to Cryogenic Gases shall be observed in order to maintain such gases at their prescribed low temperatures during storage, transportation, and handling operations.

1.7 Compliance shall be maintained with the instructions and measures relating to the security and safety of customers and persons present at the site, and to the mitigation of risks associated with the processing, storage, and handling of Cryogenic Gases.

1.8 Compliance shall be maintained with the instructions and guidance governing the handling, use, and maintenance of Cryogenic Gas tanks at users' sites, in order to ensure the safe transportation, storage, installation, and operation of such tanks, and to ensure adherence to all safety requirements and standards in accordance with the requirements of Standard No. ISO 20421-2 relating to operational requirements, and Standard No. ISO 21009-2 relating to operational requirements for cryogenic vessels.

1.9 The manufacturer's data plate for Cryogenic Gas tanks shall be legible and securely affixed to the tank.

1.10 A label showing the process flow diagram of the Facility or site shall be prominently displayed in a conspicuous location.

1.11 It shall be ensured that the remotely operated emergency shut-off valve is installed at the tank's main liquid outlet and is functioning properly.

1.12 It shall be ensured that the emergency shut-off valve remains operable in the event of a power outage or equipment failure.

1.13 Emergency push buttons shall be inspected, maintained, and preserved on a regular basis.

1.14 Pressure-control devices installed on the tank annular space shall be inspected regularly.

1.15 Necessary inspections shall be conducted to verify that all safety devices and vapor- or odor-detection systems installed on the tank are operating efficiently and are capable of detecting vapors released from the tank under the most severe anticipated operating conditions.

1.16 Procedures governing the transfer of cryogenic liquid gases into low-pressure bulk storage tanks shall be published and made available.

1.17 Safety relief valves installed at the site shall be inspected and maintained at specified intervals.

1.18 Inspection of safety relief valves shall be preceded by a tank relief test.

1.19 Diverter valves located above safety relief valves shall be maintained in the center position to ensure that both relief valves remain operational.

1.20 The automatic tank vent valve shall be inspected and maintained regularly.

1.21 Exhaust lines connected to safety relief valves and vent valves shall be kept free from obstructions, including foreign matter, ice accumulation, and similar impediments.

1.22 Special procedures for the inspection and maintenance of tank safety devices shall be established, implemented, and applied regularly.

1.23 It shall be ensured that all necessary measures are taken to prevent ice masses from falling from tank vent outlets and to maintain such outlets in serviceable condition.

1.24 The gas-flow opening within the tank annular space shall be maintained at the prescribed rate.

1.25 Regular analyses shall be conducted of the components present within the annular space, in addition to those present at the gas shut-off valve location.

1.26 Ready access shall be provided to manually operated tank vent valves.

1.27 All monitoring alarms and warning devices relating to minimum pressure, maximum pressure, high level, and similar conditions shall be provided and maintained on a regular basis.

1.28 The liquid-level indicator shall be inspected and calibrated at regular intervals.

1.29 Liquid-level switches shall be inspected at regular intervals.

1.30 All vent-valve and safety-valve identification signs and plates shall be maintained in good condition and remain legible.

1.31 All units containing liquefied or Cryogenic Gases shall be equipped with thermal relief valves at locations where cold gas or liquid Product may become trapped.

1.32 The automatic tank pressure control system shall be inspected and maintained regularly.

1.33 The tank vacuum prevention system shall be inspected and maintained regularly.

1.34 The air-control device shall be inspected and maintained regularly.

1.35 It shall be ensured that the dew point of air in fixed lead lines is sufficiently low to prevent any adverse effect on equipment performance and to avoid blockages.

1.36 Transfer pumps shall automatically cease operation in the event of failure of the air-supply system.

1.37 The Facility shall ensure that the remote emergency stop switch for the transfer pump remains continuously operational and in good condition.

1.38 A sufficient number of gas identification signs, labels, safety notices, and warning signs shall be provided, including notices such as “No Smoking”, “Wear Safety Goggles”, and similar instructions and warnings.

1.39 An emergency shower shall be provided adjacent to cryogenic storage tanks and maintained in proper working order.

1.40 Workers shall be trained in methods for dispersing large vapor clouds and in the procedures for dealing with them.

1.41 Notices and warnings concerning compliance with permit-to-work procedures shall be posted at entry points to confined spaces, pipelines, inspection chambers, vent openings, and similar access points.

1.42 The tank liquid-level controller or recorder shall be calibrated and verified at specified intervals and on a regular basis.

2. Cryogenic Filling Points:

2.1 The gas pressure gauge on the tank located at the filling point shall be monitored, inspected, and maintained regularly.

2.2 Pressure gauges installed at the suction and discharge points of transfer pumps shall be inspected, maintained, and preserved regularly.

2.3 Pressure gauges shall bear a clear indication of the maximum permissible pressure.

2.4 Pump safety valves shall be inspected and repaired at regular intervals.

2.5 The remote emergency shutdown device for the transfer pump shall be tested regularly.

2.6 Procedures governing the filling of tankers used for the transportation of Cryogenic Gases by road or rail shall be published.

2.7 A schematic diagram showing the cryogenic liquid gas installation up to the filling point shall be displayed for guidance and awareness purposes.

2.8 Product filling-point valve identification markings shall remain legible.

2.9 Safety distances shall be clearly defined and strictly observed, and compliance therewith shall be continuously monitored.

2.10 Filling hoses shall be inspected and maintained at regular intervals.

2.11 It shall be ensured that filling-hose supports are functioning properly.

2.12 Filling hoses shall be kept free from dirt and foreign materials.

2.13 Necessary precautions shall be taken to prevent filling hoses from becoming entangled.

2.14 Tanker loading areas at Cryogenic Liquid Oxygen (LOX) filling points shall be constructed of concrete and shall remain free from oils, grease, and organic compounds.

2.15 Warning Marks and notices prohibiting the use of towing equipment shall be displayed in order to prevent the towing or pulling of tankers.

2.16 Each filling point shall be clearly identified.

2.17 Transfer pumps shall be maintained in a protected condition and kept serviceable through the conduct of necessary inspections and, where required, replacement of the low-current pressure switch.

2.18 Filling procedures shall clearly define the operational responsibilities of individuals and tanker drivers.

2.19 Signs indicating the required personal protective equipment shall be displayed at every filling point, including, for example, safety goggles, safety footwear, and cryogenic protection gloves.

2.20 Distinct connections shall be used for each type of gas being filled.

2.21 Procedures shall be established for reporting and addressing cryogenic-gas leaks at filling points.

Annex No. (16)

Safety Requirements for Cryogenic Gas Tanks at Customer Sites

1. General Requirements:

1.1 It shall be ensured that the location of Cryogenic Gas tanks and the surrounding area are adequately ventilated.

1.2 It shall be ensured that all Product vent lines are correctly directed to a safe location.

1.3 Tanker unloading areas shall permit rapid evacuation from the area and shall not obstruct emergency exits or routes leading to designated safe areas.

1.4 The operational area shall be fenced, properly maintained, and provided with two means of escape.

1.5 Suitable firefighting equipment shall be available at the site.

1.6 The operational area shall be maintained in a clean condition and kept free from obstructions, combustible materials, oils, grease, and waste.

1.7 Adequate lighting shall be provided for night-time delivery operations.

1.8 A water supply source shall be provided and available from the main water intake or supply source.

1.9 All passageways and access routes shall be kept free from hazards or obstructions that may result in tripping or collision.

1.10 Sharp edges and support brackets along access routes shall be removed or covered in order to prevent hazards and accidents.

2. Signage, Labels, and Warning Instructions Requirements:

2.1 Appropriate identification and warning labels shall be affixed to the tank.

2.2 Emergency telephone numbers shall be displayed in prominent locations and shall be clearly visible and regularly updated.

2.3 All safety signs and warning notices shall be written in both Arabic and English, at a minimum.

3. Tanks and Associated Equipment:

3.1 Tank foundations shall be inspected regularly for signs of damage or deterioration to the tank body, including cracks and bulging, and any such defects shall be repaired immediately.

3.2 The coating applied to tanks and their appurtenances shall be maintained in good condition.

3.3 All safety relief valves shall be properly marked, indicating the date of the last inspection, the set pressure, the set pressure, the serial number, and the valve type.

3.4 It shall be ensured that the tank pressure gauge is marked with a green indication denoting the normal safe operating-pressure range and a red indication denoting pressure exceeding the Maximum Allowable Working Pressure (MAWP).

3.5 It shall be verified that the tank is properly secured by inspecting all anchor bolts and fastening nuts at each tank anchorage point.

3.6 The valve handwheel shall be verified to be in good condition.

3.7 The contents-level gauge glass shall be verified to be in good condition.

3.8 Pressure gauges shall be verified to be in good condition.

3.9 It shall be ensured that the tank is equipped with a dual pressure-relief system.

3.10 It shall be verified that the bursting discs are in good condition.

3.11 It shall be ensured that valid certificates of conformity for safety relief valves have been issued by an accredited Conformity Assessment Body.

3.12 It shall be verified that no obstruction exists in front of the vent device installed on the vacuum-jacketed tank.

3.13 It shall be ensured that the filling connection is either unobstructed or fitted with a cap incorporating a vent opening and chain.

3.14 The Product identification data label shall be affixed or attached to the tank.

3.15 The tank shall be identified by a nameplate permanently affixed to its shell containing the essential identification data in accordance with the Piping and Instrumentation Diagram (P and ID).

3.16 It shall be ensured that all valves bear permanent tag numbers attached to the valve body.

3.17 The date of the most recent painting operation shall be marked on the tank leg or tank shell.

3.18 It shall be verified that the tank installation location conforms to the approved site layout drawing.

4. Electrical Safety Requirements at the Tank Site:

1. It shall be ensured that all electrical installations at the site are fully and properly grounded.
2. The electrical power supply outlet shall be clearly identified and provided with suitable protective devices.
3. Power lines shall be located no less than twelve (12) feet (approximately four (4) meters) from Cryogenic Gas tanks, in accordance with the site layout plan.

Annex No. (17)

Cylinder Inspection and Requalification Centers

1. Training and Qualification:

1.1 All cylinder testing centers shall establish procedures governing maintenance, inspection, and testing operations.

1.2 Technicians and operators shall receive adequate training and possess the appropriate experience and technical skills to supervise comprehensive cylinder maintenance and inspection activities, including, without limitation, cylinder inspection, maintenance, and periodic examination.

1.3 Operators shall undergo refresher training at least once every three (3) years. Such training shall likewise be required whenever any amendment is introduced to the Standard Operating Procedures (SOPs) or to the equipment.

1.4 All training activities shall be documented.

2. Organization of Inspection Centre Areas:

2.1 Cylinder reinspection centers shall designate a specific area for the receipt and sorting of cylinders intended for reinspection. Upon receipt, cylinders (which normally contain residual pressure) shall be sorted and grouped according to the hazard class of the gas or other hazardous substances. The cylinders shall then be safely vented (i.e., the gas contained therein shall be safely released).

2.2 Cylinders that have been vented (and purged, where necessary) shall be clearly identified or transferred to a designated area reserved for cylinders requiring venting and disposal of the gases contained therein.

2.3 Cylinders shall be sorted according to reinspection pressure requirements and the hazard class of the gas or other hazardous materials, and shall thereafter be transferred to the reinspection area for processing. All cylinders shall be examined for residual pressure and verified to be free from valve blockage prior to commencement of valve removal operations.

2.4 Cylinders classified as unsuitable for further processing shall be identified and placed in a dedicated quarantine area, and the inspection-site supervisor shall be consulted for the necessary instructions.

3. Cylinder Identification:

3.1 The type of each cylinder undergoing reinspection shall be identified through the Marks and stamps affixed to the cylinder shoulder. Operators shall record, at a minimum, the following information:

a. Name of the owner.
b. Manufacturer.
c. Cylinder manufacturing specifications or design specification.
d. Name of the official inspector (optional).
e. Alloy type, where the cylinder is manufactured from aluminium alloys (where specified).
f. Cylinder service pressure or reinspection pressure.
g. Date of manufacture.
h. Serial number.
i. Tare weight.

3.2 Certain cylinder reinspection systems are automated or programmed to perform reinspection procedures and record data automatically at the time of retesting. In such cases, the required information shall be documented electronically or manually and shall be available to inspectors whenever required.

3.3 Rejected cylinders that fail inspection shall be designated for further processing and set aside either for further processing or, where appropriate, for scrapping.

4. Removal of the Cap or Guard:

4.1 Valve protection caps shall be removed from cylinders without the use of excessive force. Lubricants or any other substances shall not be used to loosen corroded cap threads. Valve protection caps shall be fitted with vent openings.

4.2 Prior to removing the cap, the operator shall verify that the vent openings are unobstructed. Where blockage exists, the vent opening shall be cleaned using an appropriate tool, which shall be used in a manner that prevents inadvertent valve opening. Protective goggles and safety gloves shall be worn.

4.3 Where the cylinder cap cannot be removed by normal means, the operator may use a non-sparking hammer to strike the cap with moderate force to release it. No tool or device shall be improperly used in a manner that could result in valve opening or damage, such as inserting a lever through a cap vent opening. For the purpose of removing a valve protection cap, a dedicated tool specifically designed for removing compressed-gas cylinder caps, such as a suitable type of wrench, shall be used and may be struck with a hammer if necessary to loosen and remove the cap, after ensuring that no sparks are generated particularly when handling flammable or oxidizing gas cylinders.

4.4 Cylinders whose valve protection caps cannot be loosened or removed using the conventional methods specified in this Section shall be set aside for special handling.

4.5 Operators shall consult a competent person whenever necessary for cap removal or for advice regarding the appropriate removal method, while observing the necessary precautions required against the possible release of toxic, oxidizing, or Flammable Gases during cap-removal operations.

5. Depressurization:

5.1 Cylinder pressure shall be released prior to carrying out any of the following operations: internal cylinder inspection, hydrostatic retesting, valve maintenance (including replacement of pressure-relief devices), or valve removal.

5.2 Cylinders fitted with operable valves shall be depressurized in a safe and environmentally compatible manner. The process shall ensure adequate ventilation, proper handling of toxic and flammable products, safe discharge of any residual hazardous gases, and sufficient purging of the area using an Inert Gas.

5.3 Cylinder maintenance and reinspection installations shall ensure that the cylinder filling Facility is capable of carrying out venting or purging operations before the cylinder is released for maintenance, in order to prevent exposure to toxic or Flammable Gases.

5.4 Maintenance, testing, and requalification installations shall notify cylinder-filling plants to affix Marks on incoming cylinders to identify cylinders that were previously used for flammable or Toxic Gases and that have been properly emptied and purged.

5.5 Operators shall possess the knowledge and capability necessary to use specialized equipment required for handling cylinders requiring venting (residual pressure) and fitted with Residual Pressure Valves (RPVs).

5.6 Cylinders fitted with blocked or inoperable valves shall be handled exclusively by specially trained individuals and processed separately from areas where normal valves are handled. Operators shall be trained in the application of written procedures approved by a technical expert and shall use personal protective equipment designated for this type of cylinder depressurization activity.

5.7 All aluminium cylinders fitted with inoperable valves, shall undergo hydrostatic testing, regardless of whether evidence of fire exposure exists, before valve replacement and return to service, since valve inoperability may indicate exposure of the cylinder to elevated temperatures.

5.8 Depressurization of cylinders fitted with blocked or inoperable valves shall be carried out using a depressurization machine by slowly loosening and removing the cylinder valve while the cylinder remains pressurized. This method shall not be used for cylinders containing flammable, toxic, or unidentified gases. Specific conditions shall be satisfied before using pressure-reduction equipment to depressurize cylinders containing inert or oxidizing gases and to reduce their volume. No person other than the operator shall be present within the cylinder depressurization area during such operations.

5.9 The operator shall run the pressure-reduction machine at the lowest practicable rotational speed and shall remain at a safe distance. The required distance shall

vary according to the available protective measures, whether the operator is positioned behind a protective wall or protected by other means against sudden pressure release or valve ejection.

6. External Cleaning – Shot Blasting:

6.1 Shot-blasting machine used for external cylinder cleaning shall be capable of distributing the blasting stream uniformly over the cylinder surface. The blasting media (shots or pellets) used shall be compatible with the cylinder material, whether steel or aluminium alloy.

6.2 Composite cylinders shall not be subjected to shot blasting.

6.3 Cylinders from which valves have been removed shall be plugged before blasting operation to prevent any shot from entering the cylinder.

6.4 A special valve protection cap without vent openings shall be used during blasting operations for cylinders fitted with valves in order to prevent any shot from entering through vent openings and damaging the valve.

6.5 Automatic blasting machines shall be equipped with an emergency automatic shut-off safety device to stop the blasting process in the event of system malfunction, such as cessation of cylinder rotation. The emergency shut-off system shall be linked to an audible alarm or visual indicator to prevent excessive blasting of the cylinder.

7. External Cleaning – Brushing:

7.1 Cylinders shall be gas-free prior to brush cleaning of the external surface to remove rust, paint, or other surface materials. An exception applies to cylinders fitted with Residual Pressure Valves (RPVs), in which case all necessary safety precautions shall be taken in view of the residual pressure present within the cylinder.

7.2 Brushes used for external cylinder cleaning shall be manufactured from materials compatible with the cylinder material, whether steel or aluminium alloy. The brush material shall be softer than the cylinder material in order to avoid damage to the cylinder surface.

7.3 Brush-cleaning systems shall not be used for composite cylinders.

7.4 Cylinders not fitted with valves shall be plugged before brushing to prevent debris or foreign matter from entering the cylinder.

7.5 A special valve protection cap without vent openings shall be used during automatic brushing of cylinders fitted with valves, in order to prevent cleaning debris from entering through the valve opening.

7.6 Where an automatic cylinder-brushing machine is used, it shall be equipped with a safety device providing automatic shutdown in emergency situations to stop the cleaning operation in the event of any system malfunction, such as cessation of cylinder rotation, thereby preventing excessive brushing. Alternatively, the machine shall be equipped with an audible alarm or visual indicator. Where the machine is not equipped with an automatic shutdown system, a procedure shall be implemented to ensure continuous operator monitoring to prevent excessive brushing of the cylinder.

7.7 All cylinders shall be cleaned and inspected regularly to ensure their continued safe use.

8. External Inspection:

8.1 All cylinders shall undergo external and internal inspections using hydrostatic pressure testing or any other approved testing method whenever the valve is removed for cylinder reinspection purposes or upon replacement of the cylinder valve.

8.2 The external cylinder surface shall be inspected for scratches, bulges, arc burns, neck cracks, corrosion, or damage resulting from exposure to elevated temperatures or fire. In the case of composite cylinders, the external surface shall be inspected in accordance with the Standard Specifications specified in Annex No. (1-A) attached to this Resolution. The permissible service life of such cylinders shall be determined in accordance with the approved Technical Regulations governing their use.

8.3 Aluminium-alloy cylinders shall be fitted with a high-temperature indicator (heat-sensitive device), whether in the form of a plastic neck ring or heat-sensitive paint (e.g. used as stenciling). Aluminium cylinders shall be inspected prior to filling to verify that they have not been exposed to elevated temperatures. If such exposure is suspected, a hydrostatic test shall be conducted before the cylinder is returned to service.

8.4 The external cylinder surface shall be inspected for evidence of illegally stamped or altered Marks, or for any unauthorized modifications or repairs.

8.5 Any cylinder suspected of having been illegally altered through forged Marks or unsafe modifications shall be withdrawn from service.

9. Internal Inspection and Cleaning of Cylinders:

9.1 Before installation of the cylinder valve, the cylinder shall be internally inspected to ensure that it is free from internal defects, contamination, water, and corrosion. The inspection shall be conducted after removal of the cylinder valve during periodic inspection or maintenance.

9.2 Operators shall inspect the internal valve threads of the cylinder neck whenever the valve is removed to verify their integrity and the absence of defects or corrosion.

9.3 Internal inspection shall be required for all cylinders from which the valve has been removed. However, where cylinder reinspection is performed using ultrasonic testing, valve removal is not normally required. Accordingly, internal inspection shall not be required when requalification is carried out by ultrasonic testing. Operators shall comply with the Technical Regulations of the country of use governing the authorization to perform testing by ultrasonic methods.

9.4 Before conducting an internal visual inspection at the cylinder maintenance site, it shall be ensured that the cylinder is free from any hazardous concentrations of flammable or Toxic Gases and is clearly marked to indicate that it is free from such gases, in order to eliminate the risk of exposure e during the inspection process.

9.5 The internal surface of the cylinder shall be inspected using a fibre-optic light. Where an incandescent light source is used, it shall be protected against breakage. Procedures shall be established requiring operators to ensure that the cylinder has been purged to remove any flammable, toxic or oxidizing gases before inspection. If the incandescent light source breaks inside the cylinder, measures shall be taken to ensure the removal of all broken parts, particularly wire filaments.

9.6 Any cylinder containing foreign matter, oily residues, liquids, signs of internal corrosion, or accumulated oxide deposits shall be withdrawn for cleaning.

9.7 The cylinder shall be dismantled if there is evidence of compacted internal residue or sludge in the bottom section.

9.8 Foreign matter and other deposits accumulated inside the cylinder shall be removed or reduced, excluding superficial rust or oxidation, using appropriate methods such as brushing, blasting (using media specifically intended for steel cylinders, and alumina or silica media for aluminium cylinders), high-pressure water, steam, or chemical cleaning.

9.9 Operators shall ensure that all traces of cleaning agents used for cylinder cleaning are removed. The substances or compounds used for final cleaning or rinsing process (such as final water rinse) shall be compatible with the intended gas service. Cleaning agents and materials shall be disposed of in accordance with the legislation in force in the State. In the case of aluminium-alloy cylinders, operators shall ensure that the chemical cleaning product is specifically designated as "suitable for aluminium alloys."

9.10 Where any internal cleaning method capable of generating sparks is used, such as wire brushing or internal blasting with pellets or shots, cylinders that previously contained oxidizing or Flammable Gases shall first be purged with an Inert Gas. Upon completion of the internal cleaning process, all loose debris, scale, and dirt shall be removed from the interior of the cylinder.

9.11 Where the cylinder is sprayed and rinsed with pressurized water for the purpose of removing loose debris or cleaning, the interior of the cylinder shall be

completely dried following completion of the treatment and before valve installation.

9.12 Steam cleaning may be carried out. In such cases, temperatures and exposure times shall be monitored to ensure that the cylinders are not damaged. Particularly aluminium-alloy cylinders and composite cylinders, in which temperatures during cleaning shall remain below the maximum temperature limits permitted for exposure of such types of cylinders.

10. Cylinder Testing:

10.1 Hydrostatic testing shall be regarded as an approved method for the retesting of cylinders, where permitted by the regulations issued by the Competent Authorities. Such methods include the volumetric expansion test and the proof pressure test.

10.2 Hydrostatic inspection systems using the water-jacket method shall incorporate a means of preventing or securing the water-jacket head assembly against accidental ejection from the water jacket.

10.3 Potable water, or water of a quality, shall be used to maintain the internal cleanliness of the cylinder under hydrostatic testing and to prevent contamination of cylinders intended for medical or food-industry applications. Water used for hydrostatic testing purposes (whether treated or untreated) shall not contain any degree of acidity, high concentrations of chlorides or chlorine, iron particles, or other particulate matter.

10.4 Test equipment and connected cylinders shall be designed and installed in a manner that prevents air entrapment within the system during water pressurization.

10.5 The test pressure specified for conducting hydrostatic testing shall be adopted on the basis of the operating pressure specified at the filling station, or the test pressure stamped on the cylinder being tested.

10.6 Operators shall be protected against cylinder failure (including leakage or rupture), as well as against any failure of hydraulic piping during hydrostatic testing.

10.7 Ultrasonic testing (UT), as a non-destructive testing (NDT) method, may be used for the retesting of cylinders requiring periodic retesting, provided that the approved procedures are implemented, operators are appropriately trained, the Facility is equipped with a suitable ultrasonic testing system. Such testing shall only be conducted after obtaining authorization from the Competent Authority and in accordance with the approved Technical Regulations or Standard Specifications. Ultrasonic testing shall not be used for the retesting of cylinders suspected of having been exposed to elevated temperatures. Operators shall be provided with adequate protection during cylinder rotation throughout the retesting process.

10.8 Acoustic emission testing (AE), as a non-destructive testing method, may be used for the retesting of cylinders requiring periodic retesting, provided that the approved procedures are implemented, operators are appropriately trained, the Facility is equipped with a suitable acoustic emission testing system, authorization for acoustic emission testing has been obtained from the Competent Authority, in accordance with the approved Technical Regulations or Standard Specifications. Acoustic emission testing shall not be used for the retesting of cylinders suspected of having been exposed to elevated temperatures.

10.9 Cylinders that fail the hydrostatic test or the acoustic emission test shall be permanently withdrawn and removed from service.

10.10 Where a cylinder that has undergone blasting fails the hydrostatic test, or where ultrasonic testing reveals a significant defect, all other cylinders of the same manufacturing specification and from the same manufacturer shall be inspected to verify their integrity and continued suitability for gas service.

11. Drying:

11.1 Following hydrostatic testing and drainage of water from the cylinder, the cylinder shall be dried internally without delay using an appropriate method.

11.2 After drying, the cylinder shall be internally inspected to verify the absence of water, after which the cylinder valve shall be reinstalled and maintained in the closed position.

11.3 Where the valve is not installed immediately following the drying process, or where a discharge valve or temporary fitting has been installed, the cylinder shall be sealed to prevent the ingress of atmospheric moisture.

11.4 Companies engaged in such activities shall identify the type of aluminium alloy used in their aluminium-alloy cylinder groups.

11.5 Composite cylinders fitted with 6061AA aluminium-alloy liners shall be dried immediately upon exposure to water.

11.6 Aluminium-alloy cylinders shall not be exposed to excessive temperatures during the drying process.

11.7 Cylinders manufactured from aluminium alloys 6061, 6351, 6082, 7060 and 7032 shall not be exposed to temperatures exceeding 150°C. In addition, they shall not be exposed to temperatures between 110°C and 150°C for more than 30 minutes.

11.8 Cylinders manufactured from aluminium alloy 5283 (5AG) shall not be exposed to temperatures exceeding 80°C for a period exceeding 30 minutes. In addition, they shall not be exposed to temperatures between 70°C and 80°C for more than 30 minutes.

12. Official Stamps and Test Records:

Upon completion of all cylinder retesting requirements, the cylinder shall be stamped with the official stamp indicating that it has satisfied all applicable requirements. Cylinder retest Marks, and the documentation of cylinder testing activities shall comply with the approved systems and Technical Regulations in the State.

13. Changes in Gas Service:

13.1 The cylinder selected for a change in service shall be suitable and compatible with the new gas.

13.2 The cylinder working pressure shall be suitable for the new gas.

13.3 The selected valve shall be suitable, shall have an appropriate pressure rating, and shall be compatible with the new gas.

13.4 The cylinder shall be cleaned, where necessary, based on the type of both the gas previously filled therein and the new gas.

13.5 The cylinder shall be painted with the color code appropriate for the new gas.

14. Valve Installation:

14.1 Before installing the cylinder valve, it shall be verified that the valve thread characteristics, including thread deformation, nominal dimensions and thread profile, are compatible with the thread characteristics of the cylinder neck. Where there is any doubt, the valve threads and cylinder-neck threads shall be verified using a thread gauge.

14.2 The operator shall internally inspect the cylinder to verify that no water has accumulated therein and shall ensure that the threads on both the valve and the cylinder neck are clean and undamaged. Any sealants and lubricants used shall be effective and compatible with the valve material, cylinder material, and intended gas service.

14.3 When cleaning the cylinder-neck threads, operators shall take the necessary precautions to prevent cleaning residues from falling into the cylinder or shall arrange for the removal of such debris using a suitable vacuum cleaner.

14.4 Operators shall use only the minimum amount of lubricant and sealing compound necessary and shall apply the sealing compound to the valve stem rather than to the cylinder-neck threads.

14.5 Where thread-sealing tape is used (for any gas service), only oxygen-compatible PTFE tape shall be used. The sealing tape shall be stored in a location free from excessive moisture, dust, and dirt and in a manner that preserves its cleanliness and performance.

14.6 Lubricants or sealing tape shall not be used on valves with parallel threads. Where required, a new O-ring of the appropriate size shall be installed for parallel-threaded valves.

14.7 The tightening torque for valve installation shall be in accordance with the regulations in force in the State and the recommendations of the cylinder manufacturer.

14.8 After confirming that the valve is clean and that its threads are compatible with those of the cylinder neck, the valve shall be hand-tightened into the cylinder neck as far as practicable, followed by mechanical tightening using only a valve-installation machine or a manual torque wrench.

14.9 Where a machine is used to open or close the valve, the applied torque shall be verified periodically using a torque wrench or any other Calibration method. Adjustments shall be made to the valve machine where necessary.

14.10 Where the cylinder is opened manually, a calibrated torque wrench shall be used. Cylinders shall be secured in a manner that does not damage the cylinder body, and torque wrenches shall be calibrated at least once annually.

14.11 Operators shall ensure that the valve is installed in the cylinder to the appropriate depth, such that the upper valve threads are not positioned below the upper threads of the cylinder neck, and that no fewer than six (6) threads are engaged within the cylinder neck.

14.12 Aluminium-alloy cylinders manufactured from 6082 or 6351 alloys are susceptible to crack development in the neck area. Accordingly, where cylinder valves are manufactured from these alloys, the applied torque shall be maintained as close as practicable to the minimum torque recommended by the cylinder manufacturer and in accordance with any Technical Regulations approved in the State.

15. Marking:

15.1 The tare weight of the cylinder shall be calculated as the mass of the cylinder shell (empty weight) plus the mass of the valve and all permanently attached accessories (such as the valve guard). The tare-weight value shall be permanently marked on the cylinder wall, shoulder, or upper body.

15.2 Cylinders used for, or intended for use with, liquefied gases shall be weighed to determine the tare weight. An acceptable method of determining the tare weight of a cylinder is the installation of a loosely fitted metal ring or disc around the valve base before valve installation. A cylinder shall not be marked with a tare weight until it has successfully passed the internal inspection and has been confirmed to be free from corrosion. During periodic retesting, and after successfully passing the internal inspection, any cylinder bearing a tare-weight Mark shall be weighed to verify the accuracy of the stamped tare weight. Weighing shall be carried out using a recently calibrated and approved scale.

15.3 Retested cylinders shall be marked with Marks complying with the Technical Regulations or Standard Specifications approved in the State where the cylinder is retested, taking into account the following:

a. Cylinders that fail or do not pass the retest shall be clearly marked with the words "UNSERVICEABLE" and the symbol "X" placed adjacent thereto and shall be segregated from cylinders fit for service.
b. Size of the marking.
c. Location of the marking.

15.4 Any change in cylinder ownership, tare weight, or any other data element requiring amendment of stamped Marks shall be indicated by stamping a dash ("-") over the original (previous) Mark in such a manner that the original Mark remains legible. A dash ("-") shall not be stamped on periodic retest dates preceding the most recent retest date.

16. Cylinder Painting:

16.1 Cylinders shall be painted at periodic intervals to prevent external corrosion. Where necessary, cylinders shall be blasted or brush-cleaned before painting to remove loose or flaking paint and surface rust.

16.2 Cylinder painting shall be carried out in a manner that protects operators and the environment and in accordance with the safety requirements approved by the Facility. This includes the use of approved paint systems, personal protective

equipment (PPE), adequately ventilated paint booths, or workstations equipped with the required protective measures.

16.3 Cylinders shall be painted in accordance with the approved color-coding requirements.

16.4 The painting or drying operations of cylinders shall not expose aluminium alloy cylinders to excessive heat.

17. Valve Cap or Valve Guards:

17.1 Protection shall be provided for the cylinder valve in accordance with the requirements of this Resolution.

17.2 Where valve-protection caps are used, the caps shall be provided with two vent openings. Each vent opening shall have a diameter of not less than 10 mm, and the openings shall be positioned directly opposite each other.

17.3 Where a valve guard is used, it shall be installed with the opening aligned with the valve outlet connection.

18. Withdrawal of Cylinders from Service:

18.1 The current level of cylinder corrosion shall be evaluated in accordance with the rejection standards specified in the applicable manufacturing specification, and the extent of corrosion deterioration shall not exceed the percentage permitted under the cylinder manufacturing specification.

18.2 Any cylinder determined to be unfit for service shall be withdrawn from service and rendered incapable of repair or requalification, including by cutting the cylinder shoulder to prevent any unlawful repair thereof. The cylinder shall thereafter be permanently removed from service. Where a customer-owned cylinder is removed, or where the customer themself remove it, the Competent Authority shall verify that the cylinder has been withdrawn from service and is not returned to use or operation.

18.3 Prior to the permanent withdrawal of a cylinder from service, it shall be verified that the cylinder is empty and free from hazardous concentrations of oxidizing, Flammable, or Toxic Gases.

18.4 The Facility responsible for withdrawing a cylinder and removing it from service shall maintain records identifying the condemned cylinder. Where available, such records shall include the following information:

a. Owner's name.
b. Cylinder manufacturer.
c. Date of condemnation.
d. Manufacturing specifications (including aluminium-alloy designation).
e. Cylinder capacity.
f. Date of manufacture.
g. Service pressure or test pressure.
h. Most recent gas, or gas-service type (e.g. “Inert Gas”).
i. Cylinder serial number.
j. Reason(s) and justification for condemning the cylinder and its withdrawal from service.

Annex No. (18)

Requirements for Openings on the Surface of Gas Cylinders and Tanks

1. Every opening in a cylindrical container, except openings designated for pressure-relief devices, shall be fitted with a boss, fitting, or reinforcement pad welded to the cylinder.
2. Openings shall only be permitted in the heads or end closures which are non-cylindrical surfaces, provided that they are circular and do not exceed three (3) inches in diameter or one-third of the cylinder diameter, whichever is less. Such openings shall be fitted with a mounting, neck, or pad integrated with the body or securely attached thereto by fusion welding, brazing, mechanical fastening, or threading.
3. Clear instructions shall be provided regarding the handling of the cylinder, including specific orientation instructions where the cylinder is intended to be used in a non-vertical position and incorporates openings in its upper section.
4. All openings and the reinforcements associated therewith shall be located within an imaginary circle centered on the cylinder axis, provided that the diameter of such circle does not exceed eighty per cent (80%) of the external diameter of the cylinder, and that the plane of the circle is parallel to the circumferential weld and perpendicular to the longitudinal axis of the cylinder.
5. The materials used for openings and weldable attachments shall be of weldable quality and compatible with the cylinder material.
6. All shut-off valves shall be designed and positioned in a manner that prevents unintentional opening.
7. Filling and discharge openings located below the liquid level in portable tanks intended for the transport of flammable and/or toxic liquefied compressed gases shall be fitted with an internal shut-off valve equipped with a self-closing safety device that automatically and completely closes during filling or discharge operations in the event of fire. Such device shall fully close within thirty (30) seconds from activation, except for portable tanks having a capacity not exceeding one thousand (1,000) Liters (264.2 gallons). provided that the device is capable of remote operation.

8. All portable tanks shall be provided with inspection openings or other openings of adequate size to permit internal inspection and provide sufficient access for maintenance and repair of internal components.
9. Each manway or filling opening shall be structurally capable of withstanding the internal liquid pressure without leakage or permanent deformation affecting its structural integrity, provided that such pressure is not less than thirty-six (36) PSIG or the tank test pressure, whichever is greater. The manufacturer of the manway assembly shall verify compliance with this requirement through hydrostatic testing of not less than one per cent (1%) of all manway-type closures produced every three (3) months, or one closed manway, whichever is greater, in accordance with the following:
    a. The manway assembly or filling opening shall be tested with vent devices blocked in order to verify the absence of leakage or deformation affecting the assembly's gas-retention capability. Any such defect shall constitute failure of the test.
    b. Where a manway or filling-opening test fails, five (5) additional covers from the same batch shall be retested. If any one of such covers fails, all covers from the batch from which the tested covers were selected shall either be tested on a one hundred per cent (100%) basis or removed from service.
    c. Every filling cover or manway shall be equipped with a safety device preventing the cover from being fully opened while internal pressure exists.
    d. Every filling cover or manway shall be secured by connections preventing the covers from opening as a result of vibration during normal transportation or due to impact resulting from a road or curb rollover accident, provided that the filling cover is not subjected to impact with a major obstruction.

Annex No. (19)

Safety Requirements and Procedures for Lifting Equipment Used in Industrial Gas Facilities

1. Definitions:

1.1 Lifting Equipment:

Fixed or mobile lifting appliances and all tools and accessories used in lifting or transporting loads.

1.2 Operator:

A qualified and trained person to operate lifting equipment safely in accordance with the approved standards.

2. General Safety Requirements for All Lifting Equipment:

The general safety procedures and rules for lifting equipment used in the lifting and transportation of industrial gas cylinders and tanks shall be implemented in accordance with the requirements of international standards, while complying with the following:

2.1 Inspection, Examination and Maintenance of Lifting Equipment:

a. Prior to the operation of any lifting equipment within Industrial Gas Facilities, an inspection certificate issued by a Conformity Assessment Body accredited pursuant to the National Accreditation System promulgated by Cabinet Resolution No. (22) of 2004 shall be obtained following installation and before commissioning.

b. Periodic examinations and inspections shall be carried out by Conformity Assessment Bodies accredited pursuant to the National Accreditation System promulgated by Cabinet Resolution No. (22) of 2004 to ensure the safety of the equipment and its accessories throughout all stages of use, transport, maintenance, modification, or changes in the operating environment.

c. Maintenance inspections shall be conducted before and after each use and shall be documented in the technical records.

d. It shall be ensured that all components of lifting equipment, including chains, hoists, hooks, and accessories, are in good operating condition, free from defects that may affect safety or performance, and have undergone technical inspection by a Conformity Assessment Body accredited pursuant to the National Accreditation System promulgated by Cabinet Resolution No. (22) of 2004.

2.2 Competency Requirements for Inspection Bodies:

a. All inspection bodies shall be accredited by the National Accreditation Authority in accordance with ISO/IEC 17020.

b. The National Accreditation Authority shall determine the technical and professional competency requirements necessary for the Accreditation of inspection bodies.

2.3 Operator Competency and Training:

a. All lifting equipment operators shall receive specialized professional training from a recognized body, preferably accredited by LEEA or equivalent.

b. Operators shall possess full knowledge of emergency procedures and operational hazards.

2.4 Load Capacity and Stability:

a. The rated load capacity of lifting equipment shall not be exceeded.

b. Loads shall be properly balanced to prevent overturning.

c. Appropriate lifting accessories shall be used to secure loads.

2.5 Environmental Safety Precautions:

a. Lifting equipment shall only be used on stable, level, and non-slip surfaces.

b. The use of lifting equipment in severe weather conditions that may affect safety shall be prohibited.

c. A safe distance shall be maintained from obstacles and individuals during operation.

2.6 Emergency Requirements:

a. The Facility shall clearly designate lifting zones and display information relating to load weight and dimensions.

b. Powered lifting equipment shall be fitted with emergency-stop devices.
c. Visual or audible communication means shall be provided between crane operators and ground workers to ensure proper coordination.

3. Specific Safety Requirements for Lifting Equipment:

3.1 Overhead Crane:

a. Load testing of lifting equipment shall be carried out periodically in accordance with the technical standards issued by the Crane Manufacturers Association of America (CMAA) and American Society of Mechanical Engineers (ASME B30), or their equivalent approved international standards.
b. Overhead travel paths shall be kept free from obstructions.
c. Remote control devices or suspended operating systems shall be used for safe operation.

3.2 Manual/Electric Pallet Jack:

a. Hydraulic fluid levels shall be inspected regularly.
b. Feet and hands shall be kept clear of moving parts.
c. Overloading or uneven stacking shall be avoided to prevent overturning.

3.3 Hydraulic Lifting Table:

a. Locking systems shall be used to prevent accidental lowering.
b. The table surface shall be maintained clean and stable.
c. Loads shall be properly secured prior to lifting.

3.4 Cylinder Trolley:

a. Gas cylinders shall be secured using appropriate straps or chains in accordance with the requirements of BCGA CP4 or any equivalent approved technical standard.
b. Cylinders shall be tilted and rolled correctly to prevent falling.
c. Cylinders shall never be transported with the valve in the open position.

3.5 Mobile Crane:

a. Approved international standards applicable to mobile cranes shall be observed.

b. Outriggers shall be fully deployed, and the crane shall be stabilized before commencing lifting operations.
c. Loads shall not be lifted over individuals, and the suitability of the ground shall be verified.

3.6 Tail Lift:

a. Hydraulic system pressure and functionality shall be verified before use.
b. The platform shall be fully lowered before loading or unloading.
c. Workers' hands and feet shall be kept away from moving parts.

3.7 Truck-Mounted Crane (Hiab):

a. Hydraulic booms and lifting mechanisms shall be inspected prior to operation.
b. Vehicle stabilizing legs shall be used to prevent overturning.
c. Load-handling procedures shall be followed in accordance with the approved international standards governing load handling.

4. Technical Requirements for Older Cranes Used in Industrial Gas Facilities:

4.1 Structural Assessment:

a. A comprehensive structural integrity inspection shall be conducted, including beams, cranes, and chains.
b. Non-Destructive Testing (NDT) shall be carried out to identify hidden cracks or stress-related defects.

4.2 Load Testing:

a. Periodic load testing shall be conducted in accordance with the approved international standard.
b. Continued conformity of the crane with its original load-capacity rating shall be verified.

4.3 Electrical-System Inspection:

a. Wiring, control panels, and motor functions shall be inspected for wear or potential failure hazards.
b. Legacy control systems shall be upgraded to comply with current safety standards.

4.4 Replacement of Mechanical Components:

a. Worn gears, bearings, and brakes shall be replaced to ensure operational efficiency and reliability.

b. Moving parts shall be lubricated regularly to minimize wear and deterioration.

4.5 Safety Enhancements:

a. Modern safety features, including emergency-stop buttons and load limiters, shall be installed.

b. Additional training shall be provided to operators, commensurate with the operational characteristics and technical requirements of older crane.

5. Images and Illustrations of Lifting Equipment Used in Industrial Gas Facilities:

Overhead Crane

Manual Pallet Jack

Hydraulic Lifting Table

Cylinder Trolley

Mobile Crane

Tail Lift

6. International Regulations and Reference Standard Specifications for the Safety of Lifting Equipment Used in Industrial Gas Facilities:

6.1 OSHA – Occupational Safety and Health Administration.

6.2 LOLER – Lifting Operations and Lifting Equipment Regulations.

6.3 ASME B30 Series of Safety Standards published by the American Society of Mechanical Engineers (ASME). Each part of the B30 Series focuses on a specific type of lifting or material handling equipment.

6.4 ANSI/ASME P30.1 – Planning for Load Handling Activities.

6.5 CMAA – Crane Manufacturers Association of America, INC.

6.6 ISO 23814 – Cranes –– Competency Requirements for Crane Inspectors.

6.7 EN 13155 – Non-Fixed Load-Lifting Attachments Safety.

6.8 FEM – European Materials Handling Federation Guidelines.

6.9 ISO 9927-1 – Crane Inspection and Maintenance.

6.10 BS 7121 Series – Safe Use of Cranes.