



Dubai Municipality
Health and Safety Department

Technical Guidelines for
Liquefied Petroleum Gas Cylinders

DM-HSD-GU53-LPGC2

 GOVERNMENT OF DUBAI	Organization Unit: Health & Safety Department		الوحدة التنظيمية:	 بلدية دبي DUBAI MUNICIPALITY
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1. INTRODUCTION

Liquefied Petroleum Gas (LPG) has greatly benefited mankind and our society since it is a clean, reliable and abundant fuel which has many applications in various fields from agriculture, power generation, transportation, etc. Yet, the most common use of LPG is for cooking and heating in residential dwellings and commercial establishments.

Despite its many beneficial uses, LPG's inherent nature is that it is highly flammable and can form explosive mixtures with air. Thus, appropriate guidelines and health and safety practices must be strictly put into place at different stages of its distribution chain to minimize its associated risks.

2. PURPOSE

Throughout the years, the Emirate of Dubai is experiencing exponential growth and with that, the demand of LPG-filled cylinders in the retail and distribution for domestic and industrial sectors is increasing. Dubai Municipality, being the foremost civic body in the Emirate of Dubai to safeguard the general public and people at work, developed this document to provide technical guidance on the safe handling and storage of LPG cylinders in harmony with pertinent UAE rules and regulations.

Manufacturers, distributors, retailers and persons involved in storage and transportation of LPG cylinders are required to strictly comply with all UAE Federal and Local requirements and regulations (e.g. Code of Practice for the Management of Dangerous Goods in the Emirate of Dubai, etc.) to ensure safety of public and persons working or are involved in LPG industry.

3. SCOPE


This technical guideline, shall apply to all establishments or entities involved in the storage, use and supply of liquefied petroleum gas (LPG) cylinders in the emirate of Dubai.

This document provides guidelines and information on the proper storage, handling, separation, stacking, etc. of LPG cylinders.

In addition, establishments or entities involved in the storage and supply of liquefied petroleum gas (LPG) shall also refer to other applicable requirements and standards such as:

- Emirates Authority for Standardization and Metrology (ESMA) – standards for the design, fabrication, testing, filling, marking, checking and cancellation of LPG Cylinders;
- Department of Economic Development (DED) – distribution and retail of LPG cylinders in Dubai;
- Dubai Civil Defence (DCD) – bulk storage, manifold/piping systems, residential use, etc;

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- Roads and Transport Authority (RTA) – transport of LPG cylinders on road;
- Dubai Municipality (Environment Department) – environment protection and permit requirements;
- Dubai Municipality (Building Department) – approval of building/warehouse facility; and
- Any other concerned government authorities requirements/guidance applicable in this regard.

4. DEFINITIONS

Unless the context otherwise requires, the following terms shall be deemed to mean the definitions hereby assigned to them.

Accident

Any incident which occurred and has given rise to ill health, injury, or fatality.

Cylinder

Pressurized container usually made of steel used to store LPG.

Emergency Preparedness and Response Plan

Document developed by the establishment to ensure the safety of people present on site and to minimize the effects of identified emergency events that could endanger an establishment's ability to function.

LPG

Liquefied Petroleum Gas.

Safety Cap

Device attached to the cylinder to provide protection to the valve

Shroud

Device permanently attached to the cylinder usually thru welding with the primary function of protecting the valve.



Stack

Group of LPG cylinders which are properly piled and arranged.

Valve

Part of cylinder used for gas filling, service and level indication.

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5. GUIDELINES

Companies engaged in the storage, use and supply of LPG cylinders in the Emirate of Dubai are required to satisfy the safety requirements of Dubai Municipality as prescribed in this Technical Guideline.

A. Hazard Identification and Risk Assessment

The employer shall carry out hazard identification and risk assessment to identify the applicable hazards associated with Liquefied Petroleum Gas (LPG) cylinder filling, handling, storage and transportation operations.

Common potential hazards associated with LPG are (list is not exhaustive):

- Fire and explosion;
- Intentional inhalation of LPG vapor;
- Cold burns if LPG comes in contact with skin;
- Accumulation of LPG in low lying areas or confined spaces due to leak;
- Uncontrolled release of LPG;
- Transportation incidents;
- Lifting injuries;
- Cylinder valve damage, etc.

Having completed a risk assessment and having taken account of existing controls, the establishment should be able to determine whether existing controls are adequate or need improvement, or if new controls are required.



In cases wherein new or improved controls are necessary, selection should be based on the principle of the hierarchy of hazard controls which consist of elimination or minimization through engineering, administrative and personal protective equipment controls.

Hazard identification should be conducted by a person(s) with competence in relevant hazard identification methodologies and techniques and appropriate knowledge of the work activity.

B. Safe Systems of Work

Employers are required to implement safe systems of work which includes information, training, instruction and supervision. Safe systems of work must be properly communicated to all stakeholders detailing potential hazards, duties and responsibilities, procedures and guidelines. Ensure that workers are

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properly supervised to follow safe work procedures and guidelines and to ensure proper and diligent use of protective and lifting equipment.

Safety management systems shall be properly reviewed and revised to assess effectiveness and suitability of existing control measures.

C. General LPG Cylinder Requirements

Ensure that all LPG cylinders distributed in the Emirate of Dubai are properly designed, fabricated, tested, filled, marked/labeled, color coded and checked in accordance with Emirates Authority for Standardization and Metrology (ESMA), UAE Federal law, and other applicable UAE government regulations.

Companies engaged in filling, the pre-filling inspecting party and the rehabilitation party for gas cylinders and valves must have clear, announced and written instructions for the process of withdrawal or cancellation of LPG cylinders in the market in accordance with ESMA and other applicable UAE government regulations.

These instructions must include the rules that are taken into consideration while replacing valves of cylinders that are in service, as well as the permission of reusing valves off cancelled cylinders.

D. General Storage Provisions



Storage of LPG cylinders are only allowed to establishments/facilities having valid approval/permit from concerned Dubai government authorities (e.g. DM Environment Department, Dubai Civil Defence). Commercial establishments such as supermarkets and groceries; and residential areas are not allowed to store LPG filled cylinders.

All LPG cylinders shall be stored in a well-ventilated covered area wherein no LPG cylinder shall be stored or kept under direct sunlight.

Storage perimeter shall be enclosed by a boundary masonry wall at least 2 meter in height provided with adequate means of emergency exit in accordance with Dubai Civil Defense requirements.

LPG cylinders shall not be stored along with toxic, corrosive, oxidizing materials and other incompatible gas cylinders. Storage of other chemicals or materials are not allowed unless permitted by concerned government authorities.

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LPG storage areas shall be properly secured at all times wherein unauthorized entry of persons is prohibited.

LPG stacks consisting of 100 cylinders or more each shall be provided with 2-hour fire rated masonry wall at least 1.8 meter in height in between stacks while taking into consideration to provide adequate ventilation.

Provide adequate clear egress of at least 1.5 meters between cylinder stacks. Egress shall be wide enough considering easy handling of cylinders, movement of lifting equipment, etc.

Refillable or empty LPG cylinders shall be regarded as to be full, observing appropriate safety precautions as to its storage and handling.

Storage of LPG shall be stored in a systematic manner wherein full and empty cylinders shall be stored separately in designated areas with displayed notices for easy identification.

Ensure that stored LPG cylinders are fitted with safety cap or plug and care shall be taken that valves are tightly shut.

LPG shall be stored in appropriate conditions that will not cause the cylinders to develop corrosion, degrade, etc. and in location so as to minimize exposure to excessive temperature, tampering or physical damage.


LPG storage surface should always be level and concreted or paved meeting designed load-bearing requirements. Provide adequate drainage for surface water.

LPG cylinders shall not be stored near unprotected elevated edges. Provide suitable safety railings or enclosures to avoid accidental falling of cylinders.

LPG cylinders shall not be stored or kept in the following areas:

- Inside distribution offices;
- Underneath building or facility foundation;
- In compartments housing electrical switchgears, generators or transformers;
- Lift shafts and cavity walls;
- Below ground of the building such as basement, etc.;

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- Adjacent to pipes and vessels containing oxidizing, corrosive, flammable and other dangerous goods;
- At doors or in areas that it may be exposed to impact;
- In places or areas used for evacuation and firefighting provisions such as fire pumps, water tank rooms, corridors, staircases, etc.;
- Other places wherein it is not allowed by concerned government authorities.

E. Sources and Control of Ignition

Hot work activity, naked flame, pilot lights or other fixed source of ignition is prohibited in premises wherein LPG cylinders are stored.

Smoking, burning and cooking activity is prohibited inside LPG storage facility.

Vehicles and other equipment not associated with handling and transfer of operations is not allowed inside LPG storage premises. Strict control shall be exercised at all times.

Engines of vehicles and other electrical/communication equipment (e.g. mobile phones, radio's, etc.) should be turned off during loading and unloading of LPG cylinders.

Storage area should be kept free of any combustible materials such as plastic sheets, cardboard, paper, dry leaves, weeds, grass, etc. at all times.

As practicable as possible, electrical equipment shall not be installed within the LPG storage area. All electrical equipment or apparatus shall be spark proof and/or have protection against weather (if applicable) and shall comply with all relevant standards (e.g. BS EN 60079, BS EN 60529, etc.) and guidelines/regulations from government authorities such as DCD, DEWA, etc.

All electrical work shall be conducted only by competent and trained personnel in the presence of a competent supervisor on site. Written safe work procedures and permit to work system shall be properly implemented if conducting electrical work in hazardous areas.

F. Separation Distances

Minimum separation distance of stored LPG cylinders from nearby boundary, building or fixed ignition source shall be in accordance with the tables below (Table 1 and Table 2) taking into consideration the total amount of cylinders stored and the largest size of cylinder stack.

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The minimum separation distance to be adopted should be the larger distance value between the two reference tables.

Example Scenarios:

- Total LPG stored 20,000 kg without fire wall = 7 meters (from Table 1)
Two (2) stacks of 10,000 kg each without fire wall = 10 meters (from Table 2)
Adopted separation distance value shall be 10 meters
- Total LPG stored 12,000 kg from fire wall = 2 meters (from Table 1)
Twelve (12) stacks of 1,000 kg each from fire wall = 1 meter (from Table 2)
Adopted separation distance value shall be 2 meters
- Total LPG stored 8,000 kg without fire wall = 6 meters (from Table 1)
Two stacks composed of 1,000 and 7,000 kg without fire wall = 8 meters (from Table 2)
Adopted separation distance value shall be 8 meters

Table 1: Minimum Separation Distances for Total LPG Storage

Total Quantity of LPG Storage (in kilograms) (Column 1)	Minimum separation distance to boundary, building or fixed ignition source	
	From nearest LPG cylinder (Without 2-hour fire rated masonry wall) (Column 2)	From 2-hour fire rated masonry wall (Column 3) <i>*See note c</i>
From 15 to 270	1 meter <i>*See note d</i>	Nil
Above 270 to 1,000	3 meters	1 meter
Above 1,000 to 4,000	4 meters	1 meter
Above 4,000 to 6,000	5 meters	1.5 meter
Above 6,000 to 12,000	6 meters	2 meters
Above 12,000 to 20,000	7 meters	2.5 meters
Above 20,000 to 30,000	8 meters	3 meters
Above 30,000 to 50,000	9 meters	3.5 meters
Above 50,000 to 60,000	10 meters	4 meters
Above 60,000 to 100,000	11 meters	4.5 meters
Above 100,000 to 150,000	12 meters	5 meters
Above 150,000 to 250,000	15 meters	6 meters
Above 250,000	20 meters	7 meters


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Table 2: Minimum Separation Distances for Size of Largest Cylinder Stack

Size of Largest Cylinder Stack (in kilograms) (Column 1)	Minimum separation distance to boundary, building or fixed ignition source	
	From nearest LPG cylinder (Without 2-hour fire rated masonry wall) (Column 2)	From 2-hour fire rated masonry wall (Column 3) <i>*See note c</i>
Up to 270	1 meter <i>*See note d</i>	Nil
Up to 1,000	3 meters	1 meter
Up to 3,000	5 meters	1.5 meter
Up to 5,000	7 meters	2.5 meter
Up to 7,000	8 meters	3 meters
Up to 9,000	9 meters	3.5 meters
Up to 10,000	10 meters	4 meters
Up to 20,000	12 meters	5 meters
Up to 30,000	15 meters	6 meters

Notes:

- The distances stated in the table above refer to the horizontal distance between the nearest point of the storage area and the reference point.
- The distances indicated in Column 2 are distances in open ground. If 2-hour fire rated masonry wall is provided, distances shall be reduced to the stated values in Column 3.
- Minimum separation distance of 1.5 meters shall be provided between the nearest cylinder to the 2-hour fire rated masonry wall.
- Presence of any cellars, pits, or openings into buildings (windows, doors, balanced-flue outlets, air vents, gully, drain, etc.) **shall not be seen within 3 meters** from the nearest cylinder. If such openings are present and unavoidable, minimum separation distance of 3 meters is recommended.

G. LPG Cylinders Stacking


All LPG cylinders shall be properly stacked vertically using industry best practice methods such as:

- Free standing cylinders shall be stacked with the bottom of the upper cylinder firmly sitting on the shroud of the lower cylinder
- Cylinders' stored in standard pallets shall stack cylinders with the bottom of the upper pallet properly sitting on the shrouds of the cylinders located in the lower pallet.

Maximum stacking height of LPG cylinders shall be in accordance with the following:

- Any un-palletized cylinder stack shall not exceed 2.5 meters.

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- Vertical stacking height shall be in accordance with the manufacturers' or suppliers' documented recommendation.

LPG cylinders containing more than 13 kg in capacity shall be stored vertically and no stacking.

H. Safe Handling Requirements

All cylinders shall be kept in readily accessible areas to facilitate easy movement or removal.

Cylinders shall be stored in vertical position with the valves uppermost, arranged uniformly and shall be placed in a manner that it will be not knocked over.

Handling of cylinders shall be conducted in the presence of competent supervision to ensure safe handling of LPG.

Care shall be observed in handling and ensuring that cylinders shall not be exposed to rough treatment such as dropping, rolling, dragging and not allowed to come in violent contact with other cylinders or any sharp or hard objects.

As practicable as possible, manual handling of cylinders shall be minimized and lifting equipment such as appropriate trolleys, forklifts, etc. shall be used.

Forklifts used for lifting LPG cylinders shall be equipped with spark suppressing features (flameproof).

Cylinder valves' safety cap, cover or plug shall be kept in place while the cylinder is being stored or handled.

Lifting cylinders thru valves, shrouds or caps is not allowed unless these parts have been designed and manufactured for this purpose.


Cylinders shall not be used for any purpose other than its intended use.

I. Fire Fighting Requirements

LPG cylinder storage area firefighting requirements shall be in provided and maintained in accordance with applicable UAE government regulations from Dubai Civil Defense (DCD), Dubai Municipality, etc.

The minimum fire extinguisher requirements to be adopted for LPG storage areas shall be the larger value between the below reference criteria

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- By storage area: Minimum of two (2) 9 kg. capacity approved portable B, C rating dry chemical fire extinguisher plus (1) unit per additional 100 square meters of floor area for storage.
- By quantity of LPG stored: Minimum of two (2) 9 kg. capacity approved portable B, C rating dry chemical fire extinguisher plus one (1) unit per additional 10,000 kg. or part thereof equal or in excess of 5,000 kg (e.g. 25,000 = 4)

Example Scenario: LPG cylinder storage facility of 300 m² in floor area with a total quantity of 35,000 kg.

- By storage area: 300 m² = 4 units
- By quantity of LPG stored: 35,000 = 5 units

Minimum fire extinguisher requirement = 5 units kg. Capacity approved portable B:C rating dry chemical fire extinguisher

Fire extinguishers shall be placed in safe positions which are easily seen and accessible such as near exits, around the storage perimeter, along egress path in between stacks and situated no more than 15 meters from the LPG cylinders storage location.

Ensure that all life and safety systems (fire hose, fire alarms, extinguishers, detectors, manual call points, etc.) are available, accessible, unobstructed and in good working condition at all times.

Fire extinguishers shall be properly secured, mounted, and not kept in a freestanding position.

Extinguishers shall be periodically checked (with sticker) at regular intervals by DCD approved company and maintained fully charged.

All extinguishers shall be installed in such that the operating instructions are clearly readable and mounted facing the user.



Adequate water supply provision and associated firefighting equipment shall meet the requirements of DCD.

J. Warning Sign/Notice

Permanent safety/warning signage shall be properly and adequately fixed and displayed outside the entrance gate and in conspicuous areas inside the LPG storage facility.

Safety/warning signage shall be easily understandable and preferably written in Arabic and English Language.

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Safety/warning signage fixed at the entrance gate shall have a minimum dimension of 800x600 mm bearing red colored lettering of minimum height of 50 mm on white background. Text written on the left portion of the safety/warning signage shall include:

“LPG / HIGHLY FLAMMABLE / NO SMOKING / NO NAKED LIGHTS”

On the right portion of the safety/warning signage, top portion shall bear the hazard symbol (hazmat) of LPG and under it are three equal boxes with the following information:

- The Emergency Action (Hazchem Code)
- Licensed quantity by DCD (in liters)
- Name and contact numbers of supplier company and concerned government authorities whom specialized advice can be obtained at all times (*see Annex A*)

Other safety/warning signage that shall be posted conspicuously inside the storage establishment shall include:

- No smoking, no mobile phones/electronic devices and other sources of ignition are prohibited.
- What to do in case of fire/emergencies
- Signage for fire extinguishers, hose reels, evacuation/assembly point, etc.



K. Training

Employers are required to provide suitable and sufficient training for employees especially those engaged in LPG cylinder handling operation and even visitors. Records of any training including induction and tool box talks shall be properly kept for at least five (5) years and be made readily available to Dubai Municipality OHS inspectors and other regulatory agencies for review and demonstrate compliance with pertinent UAE and Dubai Municipality regulations.

Scope of training may include risks of handling LPG cylinders, safe handling and storage, proper use of lifting equipment, precautions to be observed while working with LPG, location of firefighting provisions, use of PPE's, etc.

Employer shall provide approved third party training for safe driving and operation of forklift and lifting equipment for LPG and fire warden.

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L. Personal Protective Equipment

The employer shall ensure to provide suitable personal protective equipment which in accordance with Emirates Authority for Standardization and Metrology (ESMA) and/or conforms to international standards such as BS, EN, ISO, ANSI, ASTM, etc. Employer shall refer to applicable Technical Guidelines at Health and Public Safety section of Dubai Municipality website (www.dm.gov.ae).

Employers must note that use of personal protective equipment does not provide unlimited protection against hazards and are not substitutes for sound risk control measures but should be used in conjunction with engineering controls and sound safety practices.

Workers shall be provided by employers with adequate training and instruction in the proper use, testing and fitting of personal protective equipment.

All PPE's including emergency response equipment shall be properly stored, checked, maintained and tested at regular intervals.

M. Workers Responsibility


All workers shall ensure to fulfill their duties and responsibilities for their personal, workplace and general public health and safety during the conduct of activities related to LPG storage and handling. The following are:

- Abide with all health, safety and protection procedures including all applicable safety rules and regulations of the establishment at all times while at work;
- Personal protective equipment as required shall be properly and diligently used;
- Ensure cooperation with the employer with regards to health, safety and protection programs.
- Refrain from wilful unsafe actions or disregard of health and safety rules of the establishment which could create unsafe conditions and situations;
- Willing to accept information, training, instruction and supervision from the establishment;
- Report to the establishment any unsafe acts, hazards, situations and conditions that may arise or is present in the workplace.

N. Emergency Preparedness and Response

The employer shall ensure that Emergency Preparedness and Response Plan (EPRP) shall be properly developed, maintained and implemented in cases of emergency situations. The EPRP shall cover all

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reasonably foreseeable emergencies such as gas leak, fire and explosion, etc. and shall be commensurate with the nature and magnitude of the risks.

Arrangements for developing EPRP shall involve the following steps:

- Identification of potential incidents and evaluation of its related risks;
- Development of necessary emergency plans and procedures to address identified incidents and risks;
- Acquisition of appropriate emergency response equipment;
- Conducting training to the staff to properly implement response plans and procedures including proper use of emergency equipment;
- Conduct emergency response drills periodically to evaluate EPRP;
- Review and update plan as necessary.

Emergency Preparedness and Response Plan shall include reporting procedure of emergency incidents to Dubai Municipality and other competent government authorities.

Names of emergency persons and other contact information stated in the EPRP shall be reviewed and updated at least once a year.

Emergency equipment shall be properly maintained and inspected at least annually and be readily available as needed.


O. Reporting Requirements

The establishment shall immediately call the following Dubai Government Emergency Contact Numbers in cases of fire, gas leak or other emergencies:

Police	999
Civil Defense	997
Ambulance	999/998
Dubai Municipality	800900

Emergency incidents which resulted to workers' injury or fatality shall be reported within 24 hours to Health and Safety Department of Dubai Municipality. Failure to submit incident/accident report to Dubai Municipality within the above given timeframe shall subject the company to appropriate legal actions.

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6. REFERENCES

World LPG Association: Guidelines for Good Industry Practices LPG Cylinder Filling.

World LPG Association: Guidelines for Good Safety Practices in the LP Gas Industry.

United Kingdom: Code of Practice No. 7 – Storage of Full and Empty Cylinders and Cartridges (2004).

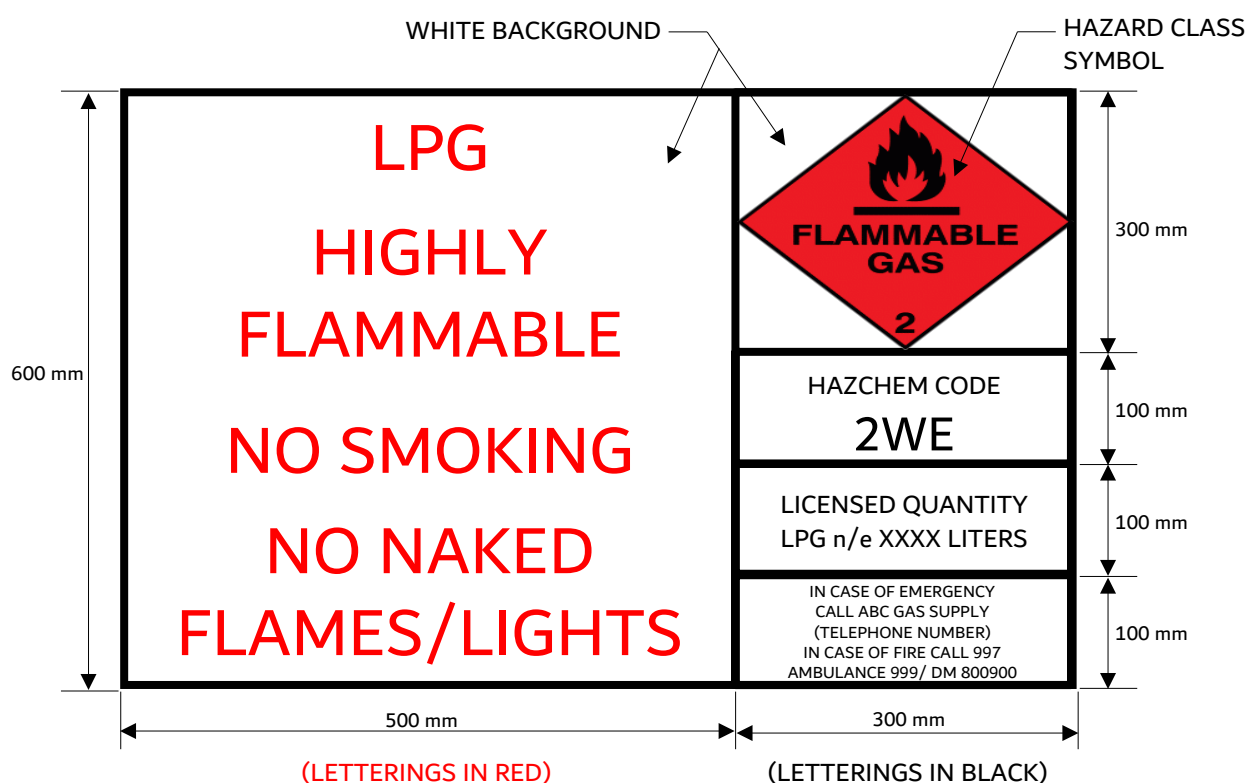
United Arab Emirates: General Headquarters of Civil Defense – UAE Fire and Life Safety Code of Practice (2011)



United States: The National Fire Protection Association (NFPA 1) Fire Code

United States: The National Fire Protection Association (NFPA 58) Liquefied Petroleum Gas Code

ANNEX A: SAFETY/WARNING SIGNAGE

Permanent safety/warning signage shall be properly and adequately fixed and displayed outside the entrance gate of LPG Storage Facility. Note: Dimensions provided are minimum.



 GOVERNMENT OF DUBAI	Organization Unit: Health & Safety Department		الوحدة التنظيمية:	 بلدية دبي DUBAI MUNICIPALITY
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For any further information, please contact:

Health and Safety Department

Dubai Municipality

Tel: 800900

Safety@dm.gov.ae

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