CYLINDER RECIRCULATION MODEL (CRM)

GUIDELINES FOR CYLINDER EXCHANGE POINTS

May 2023

Contents

1.0 Handling and storage of LPG cylinders

1.1 Handling of LPG Cylinders

a. Cylinders shall be handled with care and shall not be subjected to shock. Care shall be taken to avoid any damage to the cylinder and the valve.

b. Cylinders shall not be dropped (for example, from lorry tailboards), dragged or rolled on their sides or allowed to skid. Cylinders that are too large to be carried shall be tilted and rolled on the rims of their foot rings. Cylinders that cannot be manually handled by hand shall be moved by a trolley.

c. Filled cylinders shall always be handled, transported, used and stored in a secured, upright position except for cylinders that are designed to be handled, transported, used and stored in the horizontal position.

d. All cylinders that are empty (or appear to be empty) shall be handled with the same care as a filled cylinder.

1.2 Storage of LPG cylinders

1.2.1 Storage area

The storage area shall:

a. be approved and be as shown in Figure 2 Appendix (A);

b. not be located inside a building, but in an open, well-ventilated area, and shall be used exclusively for the storage of LPG cylinders;

c. be so located as to eliminate, as far as possible, exposure of the cylinder to any heat source/ambient condition above 45°C, corrosive substances or vapours, other highly flammable substances, physical damage and tampering by unauthorized persons;

d. be kept clean and free from any combustible material, such as paper, used tyres, etc. An area of at least 3 m in all directions round the perimeter of the storage area shall be kept clear of grass, weeds and other combustible materials, including any electrical source of ignition that does not comply with the requirements of zone 2 equipment;

e. be provided with fire-fighting protection as given in Table 1;

f. be free from potentially dangerous activities, such as the use of open flames, welding and cutting operations, the use of electric grinding tools, and smoking, shall be prohibited in the storage area;

g. be provided with symbolic safety signs (no smoking, switch-off mobile phone, switch-off engine, thoroughfare of pedestrians prohibited and no naked flame) and shall be prominently displayed;

h. Access to all storage areas by unauthorized persons shall be prohibited;

i. Strict control shall be exercised on the access of vehicles and mechanical handling equipment into the storage area;

j. Cylinder transportation trucks shall have their engines and auxiliary electrical equipment (radio) turned off when cylinders are being unloaded;

Table 1 — Summary of fire protection details

Installation capacity Kg	**Fire precautions**
0 – 500	2 × 9 kg dry powder extinguishers
501 – 2250	2 × 9 kg dry powder extinguishers 1 x 5 kg CO_2 extinguisher
2 251 – 9 000	fixed water spray to meet requirements for the standards 2 × 9 kg dry powder extinguishers 1 x 5 kg CO_2 extinguisher.

NB: Water requirement must be able to fight fire for 1hr

1.2.2 Electrical Equipment

All electrical equipment and wiring in the storage area shall be suitable for zone 2 hazardous location.

1.2.3 Conditions for storage of Cylinders

1.2.3.1 General

a. Cylinders that do not exceed 14.5 kg may be stacked vertically (but should not exceed 1.5m), provided the cylinder design caters for such stacking.

b. Cylinders may be stored on acceptable, robust shelves constructed of a noncombustible material.

c. Cylinders shall always be stored above ground level and at least 3 m away from openings to, for example, basements, drains, hollows or depressions, manholes and culverts where vapour might collect.

d. Cylinders shall be stored in a well-ventilated area.

e. The outlet valve of every cylinder shall be kept closed while the cylinder is in store or on display. Plastic caps or plugs must be fitted to cylinders.

f. Cylinders shall be so stored that they are accessible for inspection at all times and that every cylinder is readily removable.

1.2.3.2 Conditions for storage capacity of less than 250 kg

Where cylinders of total capacity less than 250kg are stored at a facility, they shall be encaged. Such storage cage shall:

a. accommodate a maximum of 250 kg of gas at any time;

b. be constructed of metallic material, and the material and design shall not restrict the flow of cooling water onto the cylinder for fire-fighting purposes (see Figure 1);

c. not accommodate more than two rows of cylinder per level from the access point of the cage;

d. be designed in such a manner that where it has a roof or shelving, it shall not allow for the storage of any other items, and such roof or shelving shall not interfere with the access to the cylinder valves;

e. have a minimum height of 2.5 m.

f. be fixed and positioned in accordance with the safety distances as given in Table 2;

g. be located at least 1.5 m away from any electrical equipment.; and

h. be located in such a way that no vehicle shall get closer than 1 m from the cage (see table 2 column 3); where vehicles can get closer than the required distance, then fixed bollards or any other acceptable barriers, shall be fitted at the perimeter of the safety distance.

Figure 1: Cage for storing LPG Cylinder

1.2.3.3 Conditions for storage capacity of more than 250 kg

a. Cylinders that are filled shall be separated from Cylinders that are empty, and both shall be stored in clearly demarcated areas, depicted by symbolic safety signs, which shall be a minimum of 190 mm × 190 mm.

b. Gangways shall be provided and shall be wide enough to allow easy access to, and handling of, individual cylinders. Cylinders shall not be stored in more than two rows between gangways.

c. The storage area may have a roof made of a non-combustible material and that it is at least 2.5 m above floor level.

d. The floor of the storage area shall be of concrete or other non-combustible and impervious material, and there shall be no spaces underneath it where leaking gas can collect and thus create a fire hazard.

e. If unauthorized persons can gain access to the storage area, the storage area should be enclosed by a wire mesh fence of height at least 1.8 m and that has an outward-opening gate that shall be kept locked when not in use.

f. The fence supports should be of steel or reinforced concrete. If the floor area exceeds 10 m^2, an additional escape gate, fitted with a sliding bolt or other similar locking device that can be opened from the inside without using a key, shall be provided. The second gate shall be fitted as far as possible from the first.

g. Where storage of cylinders exceeds a total quantity of 3,000 kg, additional gates shall be fitted. Travel distance to the nearest exit gate shall not be more than 10 m.

h. The storage area shall be in compliance with the requirements of column 2 of Table 2 (with a minimum distance of 3 m) for any electrical equipment.

2.0 Safety distance requirements

a. Vapour barriers or firewalls, as appropriate, can be used to reduce the distances given in table 2. However, the presence of vapour barriers and firewalls can create significant hazards, for example, pocketing of escaping gas, interference with the application of cooling water by the Ghana National Fire Service (GNFS), redirection of flames against storage vessels, and impeding the ingress of personnel in an emergency.

b. Special care shall be taken to ensure that where two walls are joined to form an enclosing corner, the angle shall not be less than 90°.

c. Safety distances shall be measured horizontally from the perimeter of the storage area where vapour barriers are used. The distance shall be measured in a horizontal line around such barriers. Safety distances shall be measured horizontally and radially from the perimeter of the storage area where firewalls are used.

d. The minimum safety distances from buildings, boundaries of premises, thoroughfares, sidewalks and the line of adjoining properties, etc. shall be in accordance with the requirements of Table 2.

e. The safety distances given in Table 2 shall be applicable to open storage areas only.

f. LPG cylinder storage area shall be located at a minimum distance of 10m from the center of transmission lines above 600 V. **Table 2 — Minimum safety distances**

1	2	3
Total quantity of LPG stored Kg	**Minimum distance** m	

	From buildings and boundary of the premises	From thoroughfares ,sidewalks and line of adjoining property of ,, etc.
< 250	1.0	1.0
250 – 500	1.5	3.0
501 – 1 000	3.0	5.0
1 001 – 3 000	5.0	5.0
3 001 – 5 000	7.5	7.5
5 001 – 20 000	10.0	10.0
> 20 001	15.0	15.0

3.0 Action in an Emergency

3.1 Gas leakage without fire

a. Unless remedial action, such as closing of valve, can be effected on the spot, a leaking cylinder shall be identified and handled as described below:

- Open the cylinder valve and allow the gas to escape slowly and to disperse into the air without causing a hazardous concentration of gas. Keep the cylinder in a vertical position. Avoid inhaling the gas. When the cylinder is empty, close the valve securely

3.2 Gas leakage with fire

a. In the event of a fire, it is the responsibility of the first respondent or owner or person in charge to ensure that Ghana National Fire Service is immediately informed by calling 192, before attempting to extinguish any flames.

b. Unless there is a danger that flames might impinge on other cylinders, no attempt shall be made to extinguish a fire before the source of the leakage has been determined and it is known that the leakage can be stopped after the fire

has been extinguished. For example, a fire occurring at the outlet of a cylinder valve can be extinguished by means of a portable extinguisher, provided that the valve is then closed immediately or the cylinder is promptly removed from filling point or a place where gas leakage will not result in a subsequent explosion.

c. Where it is not possible to extinguish the fire and either stop the leakage or to remove the leaking cylinder promptly, water spray shall be used to keep cool all the cylinders in the vicinity of the burning fire.

3.3 Cylinders exposed to fire

a. If a cylinder that does not incorporate a safety-relief device is exposed to severe heat radiation, acceptable volumes of water shall be sprayed onto the cylinder to cool the liquid and will, in all probability, prevent hydraulic rupturing that could result from over-pressurization.

b. An assessment shall be made of the risks of possible rupture since such rupture occurs with explosive force and can endanger life and property over a considerable area. The impingement of flames on cylinders shall be regarded as an extremely dangerous condition that necessitates immediate evacuation of the area.

c. Cylinders not involved in or affected by the fire shall be removed to a safe area or, alternatively, if this is not possible, such cylinders shall be kept cool by spraying them gently with acceptable quantities of water. If cylinders equipped with relief devices are exposed to a severe fire, care shall be taken to avoid jets of gas that escape via these devices (for example, by standing well clear of the cylinders), since such jets might extend as far as 10 m.

Appendix A: Illustration of free standing cage

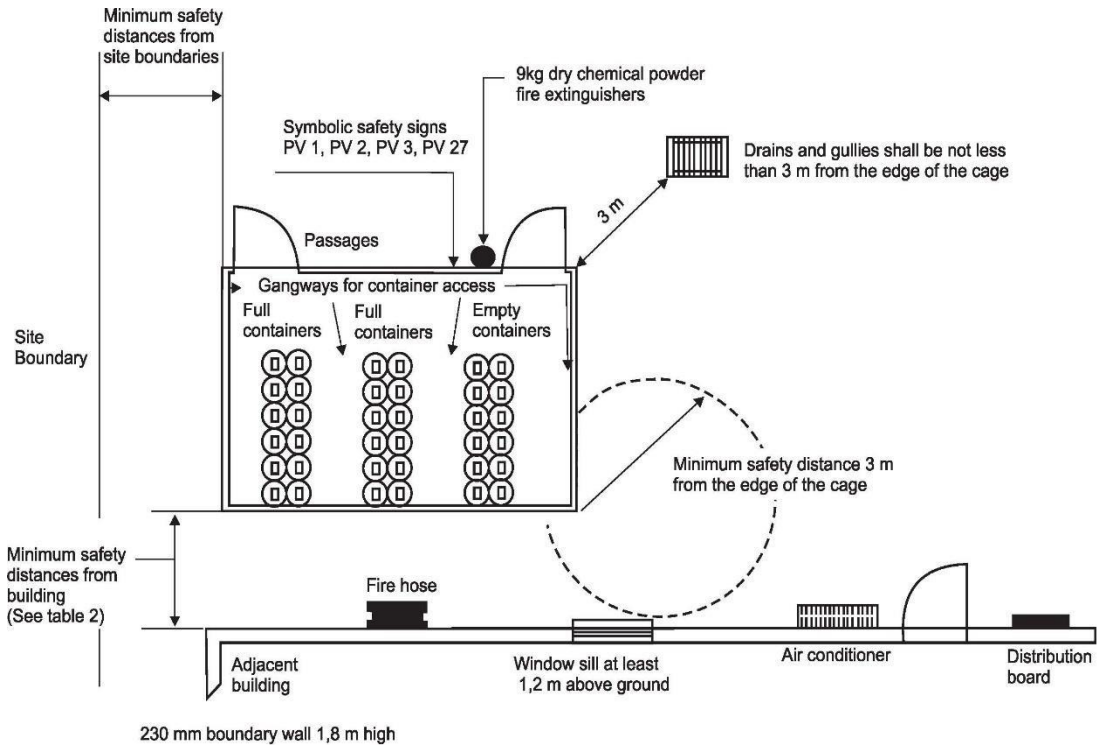

Figure 2 — Free Standing Cage for LPG Cylinders

NB:

PV1 – No Smoking

PV2 – Fire and Open Flame Prohibited

PV3 – Thoroughfare for Pedestrians Prohibited

PV27 – **No Mobile Phone**