



LPG Group

### CHECKLIST FOR SAFETY AUDIT OF LPG INSTALLATIONS

The Nigeria Liquefied Petroleum Gas Association (NLPGA) and the Lagos Chamber of Commerce and Industry (LCCI) LPG Group, with encouragement from the Standards Organisation of Nigeria (SON) has developed this Checklist for Safety Audit of LPG Installations. It was developed under the auspices of the industry Joint Working Committee (JWC) as part of measures to promote self-regulation among industry practitioners and in support of the Federal Government's regulatory regime through its Ministries, Agencies and Departments (MDA).

The objectives include:

- to promote a steady growth in the LPG industry under an atmosphere of utmost safety of Stakeholders, Consumers of LPG and the Nigerian populace in general;
- to encourage increased patronage and use of LPG by all and sundry in Nigeria; and
- to support the Federal Government's Economic Recovery Growth Plan (ERGP)

This checklist is applicable to both new installations and existing ones. It shall be updated and reviewed at the instance of the JWC on Liquefied Petroleum Gas (LPG) whenever the need arises in order to tie-in with technological advances in the Liquefied Petroleum Gas industry.

<i>Name of Facility:</i>		
Name of Health & Safety specialist on the facility:		
<i>Address of Facility:</i>		
<i>Number of Employees:</i>	<i>Date and Time of Audit:</i>	
<i>Email:</i>	<i>Telephone:</i>	<i>Fax:</i>
<i>Name(s) of Facility Representatives:</i>	<i>Designation</i>	<i>Signature &amp; Date</i>
<i>Name(s) of Auditors / Inspectors</i>	<i>Designation/Organization</i>	<i>Signature &amp; Date</i>

**Note: Conditions, monitored discrepancies and problems must be Noted in the "Comments" column. Facility representative shall be present during the audit of facility.**

DOCUMENT KEY: Y = Yes

N = No

NA = Not Applicable

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### Glossary of Terms

TERM	DEFINITION
PTW	Permit to Work
LOTO	Lock Out Tag Out
LPG	Liquefied Petroleum Gas
EFV	Excess Flow Valve
ESV	Emergency Shutdown Valve
PRV	A pressure relief valve is a spring-loaded device fitted on equipment to relieve the pressure built up within the equipment due to the additional of mechanical or thermal energy.
TRV	A thermal relief valve is a spring-loaded device fitted on isolatable sections of line or equipment to relieve the expansion stresses and strains of blocked in fluids (such as LPG) to prevent pipeline or equipment failure.
NFPA 58	National Fire Protection Agency standard No 58
PPE	Personal Protective Equipment
MUSTER POINT	A place on the facility that has been identified to be safe for assembly of people in case of emergency
ATEX	Describes an equipment and work space that is allowed in an environment with an explosive atmosphere.
GLDs	Gas Leak Detectors
DCP	Dry Chemical Powder

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A. VISUAL INSPECTION OF FACILITY					
	ITEM CHECKED		Y/N/NA	COMMENTS	
1.	Comment on the general cleanliness and housekeeping of the facility?				
	Trips & Falls	Is the facility generally free of debris that can cause trip or fall?			
		Is the facility area clear of obstacles that can inhibit movement?			
		Are there trip hazards to employees or customers?			
	Flammable Materials	Are there flammable items left around the facility?			
		Is the area free of grass, wood, other combustible material?			
		Is the loading platform or any other structure made of combustible materials?			
		Are there other hydrocarbons stored in the gas area?			
	2.	What form of Personal Protection Equipment (PPE) is provided for staff / facility visitors?			
		• Hard hats?			
• Are the hard hats within expiry dates (if applicable)?					
• Safety glasses, nose masks available and in good condition?					
• Flame retardant coveralls?					
• Earplugs (if noisy environment)?					
• Hand gloves available and not damaged?					
3.	Are the storage tanks installed within the mandatorily specified safety distances (refer <b>NFPA 58 Chapter 6</b> ) from regularly occupied buildings or from the separating line of adjoining properties?				
	4. Are safe distances observed to nearest ignition sources on all sides?				

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5.	Are there general / standard warning signs: “No Smoking,” “No Entry,” “PPE Required,” “No Cell Phones?” etc.		
6.	Is there a clearly demarcated and marked Mustering Point?		
7.	Is there well place and well labelled “Emergency Exit” signs within the premises?		
	<ul style="list-style-type: none"> <li>• Internally (offices, control room etc.)?</li> <li>• Externally (plant / facility area)?</li> </ul>		
8.	Daily updated register of Staff & People within the premises (mandatory)?		
	If yes, are regular fire and emergency drills conducted to test the system?		
9.	Is the cylinder filling area properly ventilated and on all sides?		
10.	Confirm that there are no drain, gutter or canal around the cylinder filling area and/or the LPG storage area?		

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## B. EMERGENCY RESPONSE

	ITEM CHECKED	Y/N/NA	COMMENTS
1.	Are warning signs/emergency notices painted or fixed in appropriate locations as required by the Fire Service and DPR?		
2.	Are weeds, grass and any combustible material kept clear from all area as specified by regulations?		
3.	Gas alarm unit, warning system fitted? If so, is it clearly audible across the facility?		
4.	Fire alarm unit, warning system fitted? If so, is it clearly audible across the facility?		
5.	Are fire extinguishers available and the right type e.g. DCP?		
6.	Are fire extinguishers adequately placed i.e. within 15m radius of the risk?		
7.	Are fire extinguishers positioned in accessible places, not hidden?		
8.	Are fire extinguishers serviced every six months and with a service tag on it?		
9.	Are staff trained in the use of portable fire extinguishers?		
10.	Is there an Emergency Response Plan (mandatory)? If so:		
	• Are they updated?		
	• Do scenarios correspond to facilities?		
	• Are there drills conducted for emergency response?		
	• When was the last drill undertaken?		
	• Are workers trained on the Emergency Response Plan?		
11.	Does the facility have an adequate primary supply of firewater?		
12.	Does the facility have an adequate alternative source of firewater (refer NFPA 15)? If so:		
	• Are reservoirs kept full?		
	• Capacity and number of firewater reservoirs?		
13.	Is a Firefighting Information Board displayed?		

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14.	Is there a diesel operated firewater pump for firefighting in the facility? Number? Capacity?		
15.	Are firefighting pumps tested monthly (fortnightly)?		
16.	Do fire hydrants have adequate spray coverage?		
17.	Is fire hydrants labeled / colour-coded?		
18.	Are fire water system flow rates and pressures adequate (refer NFPA 58)? (pressure should be maintained continuously)		
19.	Does the facility have a backup firewater system?		
21.	Is each valve cycled at least once a month?		
22.	Are first aid fire hoses installed in appropriate locations? <ul style="list-style-type: none"><li>• Within 6 m - 15 m of the hazard.</li><li>• Recommended for installation in process units, near pumps, manifold, other critical equipment; loading racks, and process buildings.</li></ul>		
23.	Are fire hoses maintained properly? <ul style="list-style-type: none"><li>• All parts are present &amp; Not corroded</li><li>• No hose leaks or rot</li><li>• Proper size hose connectors</li><li>• Block valve operable</li><li>• Hose reel drum rotates</li><li>• No freeze damage</li></ul>		
24.	Are fire hose locations well marked?		
25.	Is there unobstructed access to first aid fire hoses?		
26.	Does the facility have a procedure to functionally test fire hoses annually? Are inspection records available?		
27.	Are fixed spray systems installed?		
28.	Are there records on testing spray systems?		
29.	Type of gas detector, operational suitability		
30.	Do gas detectors have reserve power supply?		
31.	Are the gas detectors regularly inspected and tested?		

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32.	Is there sufficient access for emergency vehicles? <ul style="list-style-type: none"> <li>Road width adequate?</li> <li>Turn radius adequate?</li> <li>Multiple approach paths?</li> </ul>		
33.	Are light levels adequate? <ul style="list-style-type: none"> <li>in process buildings, at loading racks, in hallways, stairwells, and lobbies</li> <li>in exterior facility &amp; off-plot process areas</li> </ul>		
34.	Are night operations conducted?  If so, is the lightning of the facility adequate to ensure safe operation?		
35.	Do night operators have intrinsically safe flashlights available? Are lights inside electrically classified / hazardous areas ATEX rated or explosion proof?		
36.	Does the facility have an Emergency Shutdown (ESD) System? If Not, is there a manual shutdown procedure? When was this procedure last audited?		
37.	Is there a procedure to test the emergency shutdown system & alarm system periodically (minimum monthly)? Are operators trained in the testing procedures?		
38.	Is there a procedure to test process alarms monthly (mandatory minimum)? When was this procedure last audited?		

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### C. STORAGE TANKS

	ITEM CHECKED	Y/N/NA	COMMENTS	
1.	Number of Tanks for storing LPG?			
	Tank 1:	Tank volume (liters)?		
		Tank design pressure (Bar?)		
		Date of tank certification (mandatory)?		
		Date of last pressure test (mandatory)?		
		Is a PRV fitted?		
		Date of last PRV certification?		
		Does the tank have an internal EFV fitted (for orifices larger 1.5" -mandatory)?		
		Does the tank have an external emergency shutoff valve (ESV)?		
		Is the tank fitted with an overfill protection?		
	Tank 2:	Tank volume (liters)?		
		Tank design pressure (Bar?)		
		Date of tank certification (mandatory)?		
		Date of last pressure test (mandatory)?		
		Is a PRV fitted?		
		Date of last PRV certification?		
		Does the tank have an internal EFV fitted (for orifices larger 1.5" -mandatory)?		
		Does the tank have an external emergency shutoff valve (ESV)?		
		Is the tank fitted with an overfill protection?		
	Tank 3:	Tank volume (liters)?		
		Tank design pressure (Bar?)		
		Date of tank certification (mandatory)?		
		Date of last pressure test (mandatory)?		
		Is a PRV fitted?		
		Date of last PRV certification?		
		Does the tank have an internal EFV fitted (for orifices larger 1.5" -mandatory)?		

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		Does the tank have an external emergency shutoff valve (ESV)?		
		Is the tank fitted with an overfill protection?		
	Tank 4:	Tank volume (litres)?		
		Tank design pressure (Bar?)		
		Date of tank certification (mandatory)?		
		Date of last pressure test (mandatory)?		
		Is a PRV fitted?		
		Date of last PRV certification?		
		Does the tank have an internal EFV fitted (for orifices larger 1.5" - mandatory)?		
		Does the tank have an external emergency shutoff valve (ESV)?		
		Is the tank fitted with an overfill protection?		
2.		Are tank integrity plates fitted?		
3.	Are tanks pressure tested biennially?			
4.	Are tanks thickness checked for internal corrosion every five years?			
5.	Are tanks treated for external corrosion?			
6.	Do PRVs on the tank have a rain cap?			

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## D. MECHANICAL

	ITEM CHECKED	Y/N/NA	COMMENTS
1.	Rotating Equipment - Pumps		
	LPG Pump 1:	Type (reciprocating, centrifugal, diaphragm etc.)?	
		Are pumps designed for LPG i.e. ATEX electrical motors?	
		Operating Pressure	
		Output, m <sup>3</sup> /hr	
		Are rotating equipment guards fitted?	
		Are there obvious anomalies e.g. <ul style="list-style-type: none"> <li>• lack of hold down bolts</li> <li>• check for misalignment</li> <li>• excessive vibration, noise etc.</li> </ul>	
	LPG Pump 2:	Type (reciprocating, centrifugal, diaphragm etc.) ?	
		Are pumps designed for LPG i.e. ATEX electrical motors?	
		Operating Pressure	
		Output, m <sup>3</sup> /hr	
		Are rotating equipment guards fitted?	
		Are there obvious anomalies e.g. <ul style="list-style-type: none"> <li>• lack of hold down bolts</li> <li>• check for misalignment excessive vibration, noise etc.</li> </ul>	
	LPG Pump 3:	Type (reciprocating, centrifugal, diaphragm etc.) ?	
		Are pumps designed for LPG i.e. ATEX electrical motors?	
		Operating Pressure	
		Output, m <sup>3</sup> /hr	
		Are rotating equipment guards fitted?	
		Are there obvious anomalies e.g. <ul style="list-style-type: none"> <li>• lack of hold down bolts</li> <li>• check for misalignment excessive vibration, noise etc.</li> </ul>	

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2.	Rotating Equipment - Compressors			
	LPG Compressor 1:	Type (reciprocating, centrifugal, diaphragm etc.) ?		
		Operating Pressure		
		Output, m <sup>3</sup> /hr		
		Are rotating equipment guards fitted?		
	Are there obvious anomalies e.g.			
		<ul style="list-style-type: none"> <li>• lack of hold down bolts</li> <li>• check for misalignment excessive vibration, noise etc.</li> </ul>		
	LPG Compressor 2:	Type (reciprocating, centrifugal, diaphragm etc.)?		
		Operating Pressure		
		Output, m <sup>3</sup> /hr		
		Are rotating equipment guards fitted?		
		Are there obvious anomalies e.g.	<ul style="list-style-type: none"> <li>• lack of hold down bolts</li> <li>• check for misalignment excessive vibration, noise etc.</li> </ul>	
	LPG Compressor 3:	Type (reciprocating, centrifugal, diaphragm etc.) ?		
		Operating Pressure		
		Output, m <sup>3</sup> /hr		
		Are rotating equipment guards fitted?		
		Are there obvious anomalies e.g.	<ul style="list-style-type: none"> <li>• lack of hold down bolts</li> <li>• check for misalignment excessive vibration, noise etc.</li> </ul>	
	3.	Does the equipment have appropriate labeling?		
	4.	Is there a preventive maintenance plan/ schedule for equipment?		
5.	Is the maintenance plan/ schedule being followed with record of maintenance kept e.g. logbooks			
	Mechanical Piping			
6.	Do LPG sample points have double isolation valves?			
7.	Do pipes have appropriate labeling or color code?			
8.	Are pipes protected from corrosion e.g. wrappings, cathodic protection, painting, etc.?			
9.	Is flow direction marked clearly?			

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10.	Are there any signs of piping leakage?		
11.	Are pipes and hoses effectively clamped (physical support)?		
12.	Are hoses checked for continuity and pressure tested? Evidence required.		
13.	Are seals (gaskets) made with the right material i.e. (Not susceptible to LPG attack e.g. rubber)		
14.	Are blind flanges in place for open ended piping?		
15.	Are isolation valves installed in all LPG pipelines where necessary e.g. strainers, hoses, pumps etc.?		
16.	Are installed valves and fittings of the right rating (e.g. 150lb butane rated; 300lb propane)?		
17.	Are all flange joints bridged for continuity?		

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### E. INSTRUMENT / MEASURING DEVICES

	ITEM CHECKED	Y/N/NA	COMMENTS
1.	Functional temperature gauges?		
2.	Functional pressure gauges?		
3.	Functional level gauges?		
4.	Are there GLDs installed around the LPG storage, transfer and filling areas?		
5.	Are GLDs checked regularly to reduce risk of failure? Check for instrument and electrical plans/schedule.		
6.	Are there emergency shutdowns (ESDs)?		
7.	Are there TRVs on isolatable sections of line and equipment?		
8.	Are there flame detectors installed?		

### F. ELECTRICAL WORKS/CONNECTION PROCEDURES

	ITEM CHECKED	Y/N/NA	COMMENTS
1.	Are all electrical equipment in the designated hazardous area in compliance with the zone within which they are installed?		
2.	Are all the LPG piping and equipment electrically continuous and earthed (except where breaking in continuity is necessary for cathodic protection requirements)?		
3.	Are electrical units in the gas area ATEX rated (lights, motors, cabling, glands, etc.)?		
4.	Are cables properly terminated and continuous i.e. not joined?		
5.	Is the truck (loading and unloading) earthing system interlocked with an ESD to auto stop truck discharge?		
6.	Is there a lightning arrestor installed on the facility (highest point)?		
7.	Are electrical jobs done by ATEX qualified personnel? Confirm ATEX qualification of personnel.		

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G. TRUCK OFFLOADING BAY			
	ITEM CHECKED	Y/N/NA	COMMENTS
1.	Is there a sprinkler system connected to the truck offloading bay?		
2.	Is there provision for earthing of truck before discharge?		
3.	Are quick release couplings connected?		
4.	Are there chocks for wedging truck tYres?		
5.	Is there any emergency shut down (ESD) button on the truck offloading bay?		
6.	Is there any fire extinguisher on the loading bay?		
7.	Is the driveway obstruction free e.g. clear of hoses/ pipes etc.?		

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## H. TRUCK INSPECTION CHECKS

	ITEM CHECKED	Y/N/NA	COMMENTS
1.	<b>TRUCK HEAD / TRACTOR</b>		
	Master battery switch on the outside of cab?		
	Audible reversible alarm?		
	Diesel lines well fitted and without cracks?		
	Exhaust system well fitted and without leaks?		
	Hydraulic system without leaks?		
	In-cab Dry Chemical Powder (DCP) fire extinguisher?		
	Rear/side under run protection?		
	Interlocks on breaks during loading?		
2.	<b>LPG TANK</b>		
	Tank integrity plate fitted?		
	Tank fitted with pressure relief valve?		
	Quick shut-off buttons for both inlet and outlet valves?		
	Blind flanges for fill and vapour lines?		
	Inspection certificate issued by Regulator?		
	Pressure Testing Certificate?		
	Compatible grounding plug or earthen stud?		
	Valves open/close properly?		
	Functional level gauge?		
	Interlocks on semi-trailer breaks during loading?		
	Fill pipe coupling is compatible with loading arm coupling?		
	Functional pressure gauge?		
	Functional level gauge?		
	Functional Temperature gauge?		
	All electrical safe and well fitted?		
	Compatible grounding plug or earthing stud?		
	Integral continuity wire?		
	Pump well fitted and safe (if installed)?		

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3.	<b>ROAD SAFETY REQUIREMENTS</b>		
	License to drive LPG truck?		
	Trained in safe handling of LPG?		
	Personal Protective Equipment (PPE) - safety boot, fire retardant coverall, hand gloves, safety cap, rain boot, rain coat etc.?		
	License plate clear and well fitted?		
	Single pane laminated windshield (no cracks and free of stickers)?		
	Rearview mirrors?		
	Side mirrors?		
	Clearance and warning lights?		
	Stop, tail and turn lights?		
	Tyres in good condition and not expired?		
	All nuts on each wheel in place?		
	Wheel fixing to chassis (cracks)?		
	Suspension in good condition?		
	Wiper in good condition?		
	Wiper washer working?		
	Road block devices available?		
	Side and rear reflective tapes?		

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## I. PLANT / FACILITY OPERATING PROCEDURES

	ITEM CHECKED	Y/N/NA	COMMENTS
1.	Is there a permit to work (PTW) system in place?		
	Is there a Lock Out Tag Out procedure in place?		
	PTW for Hot Works (mandatory)?		
	PTW for Cold Works (mandatory)?		
	Any other PTW system e.g. heavy lift procedures; excavation (if applicable)?		
2.	What other Standard Operating Procedures are in place? <i>If "Yes" to any of the below, auditor is to comment on the adequacy of procedures in comparison with best practice</i>		
	Cylinder Inspection Procedure?		
	Is there a Lock Out Tag Out procedure in place?		
	Cylinder Storage & Transportation Procedure?		
	Cylinder Filling procedures?		
	Emergency Response Plan?		
	Plant / Equipment Operating Procedures?		
	Plant / Equipment Maintenance Log Book (mandatory)?		
	Truck Acceptance / Inspection Procedure?		
	Confined Space Entry Procedure (if applicable)?		
	Accident and Incident Investigation Procedure?		

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J. RISK AND LIABILITY			
	ITEM CHECKED	Y/N/NA	COMMENTS
1.	Is the Plant insured against third-party damages from fixed installations?		
2.	Is the company insured from third party liabilities due to transportation incidents via trucks/ mobile plants?		
3.	Is there provision for group life assurance for all staff?		

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## GENERAL OBSERVATIONS OR SPECIAL COMMENT

## RECOMMENDATIONS

## CONCLUSION

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