



PETROLEUM PRODUCTS LOADING, TRANSPORTATION, UNLOADING AND LOSS CONTROL MANUAL

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1.0 Introduction

The petroleum industry has been playing a pivotal role in Ghana's sustainable development since independence. Even though the industry has been plagued with problems attributed to both human and non-human factors over the years, such problems have become more prominent in recent times, particularly after the introduction of the Deregulation Policy.

The accuracy of measurement of the quantity of petroleum products delivered or received at Depots, Retail Outlets or Bulk Customer Sites have been a subject of controversy between service providers in the Petroleum Downstream Industry and on some occasions threatened the industrial harmony prevailing in the Petroleum Downstream Industry.

In 2004 and under the auspices of the Energy Commission, the National Oil Loss Control Committee (NOLCC) was reactivated to identify the major sources of oil losses at all the stages of operations in the petroleum industry namely: the loading gantry (supply source), during transportation/distribution, and during sales at the stations/outlets. The work of the Committee culminated in the Issue of the Oil Loss Control Manual in 2004.

The National Petroleum Authority (NPA) reconstituted the National Oil Loss Control Committee to review the Oil Loss Control Manual to reflect current trends and development in the Petroleum Downstream Industry.

2.0 Purpose

The purpose of this manual is to provide minimum requirements of standard procedures and methods to be used to determine the quantity of petroleum product in storage tanks, river barges, Bulk Road Vehicles (BRVs) etc. used in the distribution of petroleum products relating to the purchase, sale, and custody transfer or inventory control in the Petroleum Downstream Industry. It is to ensure that accurate measurements form the basis of transactions for the calculation of taxes, margins, fees, transit losses, amongst others.

3.0 Distribution Losses (White Products)

There are two basic types of losses. These are physical and apparent losses

3.1 Physical losses

Physical losses generally arise from;

3.1.1 Leakages

3.1.2 Spillage

3.1.3 Evaporation

3.1.4 Left on board

3.1.5 Meter Under/Over Delivery

3.1.6 Pilferage

3.1.1 **Leakages** could occur when the valve/hatch/manhole systems and/or the underground tanks/bulk of BRVs are not in a good condition. This could be reduced through proper inspection and preventive maintenance.

3.1.2 **Spillages** could occur when there is overfill of any storage system as a result of a breach of product handling procedures. For example, when manhole covers of a BRV is not in a good condition due to wear and tear of the seals and gaskets. Spillages could also occur due to BRV or delivery system valve failure or inadequate or lack of proper product handling training.

3.1.3 **Evaporation** occurs quite often for volatile products especially premium and premix. When evaporation occurs, products escape to the atmosphere only when the manhole cover is opened or when the rubber seals of the manhole cover are worn out. Evaporation can also occur through tank vents and breather valves. Evaporation could be reduced through proper planned and preventive maintenance and or replacement of the seals of the manhole cover and fittings and covers of underground tanks.

3.1.4 **Left on Board:** This refers to petroleum products that are left in the BRV compartments or Barges after discharging. It is the responsibility of the dealer or depot operators to ensure that BRV or Barge compartments are sufficiently emptied. Inspection of BRVs and Barges and their valve systems must be diligently carried out.

3.1.5 Meter Under / Over Delivery: Normal wear and tear tend to cause a meter to malfunction resulting in over or under-delivery. Calibration of meters at the depots and other installations must be done at least every six months or as recommended by the manufacturer. Calibration intervals will be determined in consultation with Ghana Standards Authority (GSA) taking the following factors into account:

- i) Manufacturer's recommendation
- ii) Record of history of maintenance
- iii) Extent and severity of use
- iv) Environmental conditions

3.1.6 Pilferage is the unauthorized physical removal of petroleum product at the delivery point or after it has been dispatched from the depot. Product security will be improved by employing the NPA BRV tracking system or any other NPA approved system.

3.2 Apparent Losses

It is a loss due to inaccurate measurements of product volumes, and also due to changes in densities because of temperature variation. This loss could be controlled by ensuring very accurate and systematic measurement procedures. An apparent loss is not a real loss.

3.3 Accuracy of measurements

Accuracy of measurements ensures that within economic confines, measurements are within a specified range of tolerance (Ghana Standard Authority tolerance +/- 0.2% for flow meters). All measuring instruments must be certified by the Ghana Standards Authority.

3.4 Importance of accurate measurements

Inaccurate volume measurements, while not an actual physical loss, result in either a gain or loss within the accountability system. In Ghana, the two most common methods of measuring the volume of petroleum product in a BRV are

by metering and by ullage level measurement through the employment of a certified T-bar and/or other certified measuring equipment at both loading and unloading points.

3.5 Factors affecting accuracy of measurement

The performance of measuring equipment such as measuring units at the loading gantry may change with time, under the influence of the environment to which it is exposed, wear and tear, overload or because of improper use. The accuracy of volume measurement obtained using meters is a function of the accuracy of;

- 3.5.6.1 Calibration standard (prover) used;
- 3.5.6.2 Calibration (proving) procedure used;
- 3.5.6.3 Meter repeatability;
- 3.5.6.4 Calibration factor adjustment (linearization) for variations in operating conditions e.g. (flow rate, viscosity and /or temperature)
- 3.5.6.5 Temperature and pressure compensation
- 3.5.6.6 Air elimination

The accuracy of the measurement given by the meters must be checked at least once every six months. If the flow meters are inaccurate, then ullage levels of petroleum products in BRVs would be affected. Strict adherence to verification/certification procedures is necessary to minimize losses from flow meter inaccuracies.

For BRVs, the employment of T-bars for ullage level measurement should be critically examined for accurate results. The T-bar (certified by Ghana Standard Authority) should be used for measuring ullage level at a level ground. Sealers should always record accurate measurement of ullage levels on waybills.

If the measurement accuracy of the T-bar is not up to expected standards, there will always be physical loss / gain of petroleum product to the customer.

3.6 Temperature variation

Temperature variation is a major contributor to change in levels of BRVs/ underground tanks. The magnitude of level (the loss) due to temperature variation depends on the magnitude of the temperature change, capacity configuration of compartment and product type.

3.7 Temperature compensation

To minimize the effect of temperature on the losses experienced in transit and at customers end, all Loading Depots are to comply with temperature compensation at **20 degrees Celsius** for all Products. Depots are therefore to ensure they install temperature compensated meters to meet the 20 degree Celsius product compensation at the loading gantries.

Depots without temperature compensation meters shall convert loaded nominal volumes to volumes at 20 degree Celsius and this shall form the basis of invoicing and issuing of way bills and delivery notes.

Temperature correction charts with 20 degrees Celsius as reference temperature are attached to this document

4.0 Potential Sources of Losses

4.1 Losses at the Depots

- (i) Noncompliance with approved biannual verification of weigh bridges
- (ii) Improper positioning of Bulk Road Vehicles on weigh bridges during weighing
- (iii) Leaking hoses and flanges

4.2 In-Transit Losses

- (i) Leaking valves and hoses
- (ii) Pilfering

4.3 Losses at the Unloading point

- (i) Leaking valves and hoses
- (ii) Malfunctioning Rotor gauges
- (iii) Retention of product in Bulk Road Vehicle (Left on Board)
- (iv) Apparent Loss (due to phase change during offloading)
- (v) Pilfering

4.4 Losses at the Point of Sale

- (i) Tampering with dispensers and weighing scales
- (ii) Non adherence to procedures for weighing cylinders (**see Appendix VII**)

5.0 NPA BRV Tracking Scheme

The National Petroleum Authority has established a BRV Tracking Scheme which enables the Authority to monitor the activities of BRVs used in the distribution chain.

Access to NPA BRV Volume Monitoring, Electronic Sealing and Vehicle Tracking System shall be granted to interested and relevant Petroleum Service Providers in line with Legislations covering the Scheme.

The NPA shall ensure the integrity of the Tracking Scheme at all times.

6.0 Process assurance of Calibration Companies

NPA shall validate the operations of the approved calibration companies against standard industry practices every six months.

7.0 Allowable Transit loss for Transportation

The following allowable losses shall apply;

- i. Diesel - 0.1%
- ii. Petrol - 0.20%
- iii. Kerosene - 0.15%

8.0 Parking Garage for BRVs

All BRVs assigned to load petroleum products from any depot shall prior to loading be parked at NPA approved BRV parking facilities. Parking of BRVs in the vicinity of refineries, depots or on roads leading to a refinery or depot is strictly prohibited. BRVs found to be in violation of this rule will be suspended from loading.

9.0 Loading Bulk Road Vehicles at Bulk Supply Points (BSP):

Procedures for loading petroleum products at depots and refineries

- 9.1 BRV shall go through safety inspections at the depots/refineries parking lot. The safety inspections shall be carried out by the operator of the designated depot/refinery using a standard checklist (Appendix I).
- 9.2 All BRVs shall meet the minimum safety requirements and shall have a valid NPA sticker before being allowed to enter the depot/refinery to load.
- 9.3 The Bulk Vehicle Operator (BVO) shall submit all documents including the checklist and valid calibration certificate to the OMC representative to generate an order via the NPA Enterprise Relational Database Management System (ERDMS).
- 9.4 The Depot Operator shall queue BRVs to load after approvals via the ERDMS by the Bulk Distribution Company (BDC), GRA and the Depot.
- 9.5 The BVO shall comply with all the safety loading instructions displayed at the gantry (Appendix II) and also observe the following:
 - 9.5.1 Position the BRV so that it can be evacuated rapidly in the event of an emergency alert
 - 9.5.2 Apply the parking brake
 - 9.5.3 Turn the engine off
 - 9.5.4 Close the cabin windows and doors and shut off all electric devices (radio, fan etc.)

- 9.5.5 Activate the battery cut-off switch (opening of the electric circuit)
- 9.5.6 Make sure that the discharging valves are closed.
- 9.5.7 The loader shall:
 - i. Connect the earthing clamp to the vehicle earth terminal connector which should be clean and bare
 - ii. Check that the valves are closed, the safety foot-valves are closed
 - iii. Check that each compartment is clean and empty.
- 9.5.8 The loader shall carry out the loading operations as detailed in Appendix III.
- 9.5.9 The BVO shall witness flow meter readings before and after loading.
- 9.5.10 Loaded Volume for each compartment should be temperature compensated to 20 degree Celsius.
- 9.5.11 The BVO shall ensure adherence to the procedures as indicated in appendix IV at the end of the loading operation.

10.0 Post loading inspection, tests and verifications at level bay

- 10.1 The BVO after loading shall park the BRV at the level bay area in the depot/refinery for at least ten (10) minutes for the product to settle.
- 10.2 The sealer in the presence of the BVO shall conduct a water test for each compartment to ensure that the product is water-free with the use of water finding paste on a dipstick.
- 10.3 If water is detected, sealers shall report to the OMC Representative immediately to quarantine the BRV within the depot/refinery and take appropriate actions in consultation with the depot/refinery management and Ghana Revenue Authority (GRA) officials.
- 10.4 If water is not detected, the sealer, in the presence of the Ghana Revenue Authority (GRA) official assigned to the loading gantry and the rack foreman shall conduct the ullage measurement of each compartment by using the T-Bar.

- 10.5 At the loading depot, the loading temperature must be measured and recorded. The recorded temperature must be endorsed by both the depot and OMC representatives.
- 10.6 The Sealer shall record the T-Bar readings on the Product Delivery Note.
- 10.7 The OMC representative at the depot shall ensure that the loaded product is duly marked where applicable, before the BRV is dispatched.
- 10.8 The OMC representative at the depot shall ensure that the loaded BRV is sealed and the seal numbers recorded on the waybill before the BRV is dispatched.
- 10.9 The BRV shall be dispatched with waybills/ Product Delivery Note (PDN) with printed loading system generated temperatures or temperature recordings duly endorsed by OMC and the loading depot representatives.
- 10.10 Certified copies of all NPA registered BRV Calibration Certificates with Temperature compensated volume charts shall also be available to all service providers that require them.

11.0 Unloading Bulk Road Vehicle – White Product receiving procedures at Retail Outlets and Bulk Customer sites

Unloading of petroleum products shall only be carried out between **6am and 6pm**

On the arrival of Bulk Road Vehicles (BRV) at discharge points the following procedures shall be followed:

11.1 Parking

- 11.1.1 On arrival at a discharge point, the BRV shall park on a level surface (Zero % slope) to ensure that the true product level in each compartment is obtained.
- 11.1.2 The product must be allowed to settle for at least 15 minutes
- 11.1.3 In the event that the parking ground is uneven, the sponsoring OMC should take necessary steps to achieve levelness.

- 11.2 The Station Manager/OMC representative must check that the BVO has a Product Delivery Note (PDN), which corresponds with the order placed, in respect of both product quality and quantity.
- 11.3 The Station Manager /OMC representative must inspect and check that seals on the vehicle manhole cover and discharge valves bear the same serial numbers as those on the waybill and are not broken; this must be done together with the BVO.

Where BRVs are electronically sealed, the Station Manager shall seek clearance from the NPA Monitoring Centre before seals are opened.

Where seals are opened or broken prior to arrival at the delivery point, unloading of product shall be suspended and the OMC and NPA informed.

- 11.4 The station manager/OMC representative must measure the coupling height (vertical distance from the bottom of the bulk - this should be a welded mark on the bulk, to the level ground). This should be done for both FORE and AFT and the readings compared with figures stipulated on the calibration certificate.
- 11.5 Open the manhole covers and measure the overall height of each compartment (vertical distance from bottom of the tank to the manhole) and compare with figures on the calibration certificate.
- 11.6 Measure the hatch height of each compartment and compare with figures provided on the calibration certificate .
- 11.7 Measure the underground dip before product is discharged.
- 11.8 Take the product temperatures and density, and record it in the appropriate columns of the accompanying delivery notes using GSA-certified sampling thermometers and density-meters / hydrometers.
- 11.9 Take ullage measurements using the Ghana Standard Authority certified T-bar and record same on delivery notes. (Apply a little ullage paste to the calibrated surface of the T-bar. Introduce the T-bar gently into the compartment so that the horizontal arm of the T-bar rests on the lips of the hatch/manhole. After two seconds, withdraw the T-bar and read the measurement marked by the product level on the T-bar.)

- 11.10 Check that the quantity of product in each compartment of the BRV agrees with the PDN and the figures at the minimum compartment levels at discharge point column of the certificate of calibration. This should be done using the T-bar.
- 11.11 Before discharging the consignment, draw a small quantity from the outlet valve into a suitable container and examine the color to check that they are normal. The presence of water shall be checked, and should water be found in the product, it must be drained and treated as a shortage against the transporter. If a product is suspected to have been contaminated, a report should be made immediately to the nearest OMC sales office, and off-loading should be suspended.
- 11.12 In the event of a perceived loss, use the product already in stock or in a different compartment of the BRV, in the Top-up method, to determine the total loss, and then record such losses on all delivery notes.

Note that:

- a) For safety reasons, only bonded aluminum containers are permitted for use in the top-up.
 - b) Extrapolating with Calibrating Agency's figures to determine losses is not permitted.
 - c) Using weigh bridges to measure product weight and converting into volume by applying arbitrary specific gravity values also breaches industry regulations and is not permitted.
- 11.13 The Station Manager shall check that there is sufficient ullage in the underground tank to receive the product ordered.
 - 11.14 The Station Manager shall check that the earth wire is connected and a fire extinguisher is in place as per discharge procedure.
 - 11.15 The Station Manager shall check that the hose connections made to the correct compartment outlet valve are tight and are connected to the correct storage tank. (Observe tank color codes e.g. gasoline-red; gasoil-black and kerosene-blue)

- 11.16 It is the responsibility of the BVO to open the appropriate valve for the discharge of the product. Should any leakage occur during the discharge, the BVO should stop immediately and rectify the cause of the leakage before continuing the discharge process.
- 11.17 Station manager should ensure that the BVO stands by his vehicle throughout the unloading operation and that the vehicle is facing an exit from the station/yard.
- 11.18 Check that the vent pipes from the underground tank are working correctly [a slight haze will be seen issuing from it during unloading if pipes are not blocked. Otherwise no haze will be observed if vent pipes are blocked]. Report such blocks to the OMC.
- 11.19 Proceed thereafter to discharge product.
- 11.20 To ensure that the entire product has been delivered, both Station Manager and BVO must inspect the compartment(s) after discharge and the discharging hose drained into an aluminum container after vehicle has done a turn around.
- 11.21 Measure the underground dip after product is discharged, determine if there has been any underground short delivery and then record such losses overleaf on all delivery notes. Only the BRV arrival figures (product levels measured at customer site) shall be used for custody transfer.
- 11.22 Both Station Manager and BVO shall then append their signatures against the recorded losses on the delivery notes.
- 11.23 All copies of the delivery note, except the Station Manager's copy, shall be given back to the BVO after the signatures to be returned to the loading (liaison) office for onward submission to the head office of the sponsoring OMC for processing.
- 11.24 In a situation of no agreement between the Station Manager and the BVO in the process of going through the discharge procedure, both parties may call the Customer Service Centers of the sponsoring OMC for advice/adjudication.
- 11.25 On receipt of the delivery notes by the OMC, the full value of the physical loss established after applying the Temperature variation factor will be credited to

the account of the station manager and that of the transporter debited when delivery confirmation is done. [It must be noted that the full value of the physical loss will be credited to the accounts of station manager, provided that the steps enumerated in the discharge procedures had been adhered to].

- 11.26 It is to be noted that under no circumstance should a Station Manager unilaterally deduct any perceived loss at source or attempt to confiscate the BVO's calibration certificate or any other documentation or demand payment for the perceived loss from the BVO, for obvious reasons of verifiability and mutuality.
- 11.27 In case of part load, supplied compartments which are supposed to have been discharged previously should be inspected to ensure that they are truly empty.
- 11.28 In the event of fire, or if for any reason, it is necessary for the BRV to leave the station yard before unloading has been completed, the BVO must ensure that the BRV valves are closed and hoses disconnected before the BVO moves the vehicle.

12.0 Unloading Bulk Road Vehicle – White Product receiving procedures at depots – Top Up method

- 12.1 On arrival at a discharge point, the BRV should be parked at an area designated for product measurement, which is required to be well leveled, to ensure a true product level in each compartment of the BRV is obtained. The products must be allowed to settle for about 15 minutes.
- 12.2 The Depot Manager and Customs Representative must check that the BVO has all delivery documents [Product Delivery Note (PDN), calibration certificate, check note, waybill, etc.] which correspond with the delivery in respect of both product quality and quantity.
- 12.3 The Depot Manager or his representative must inspect and check that seals on the vehicle manhole cover and discharge valves bear the same serial numbers as those on the waybill and are not broken; this must be done together with the BVO.

Where BRVs are electronically sealed, the Station Manager shall seek clearance from the NPA Monitoring Centre before seals are opened.



Where seals are opened or broken prior to arrival at the depot, unloading of product shall be suspended and NPA informed.

- 12.4 The Depot Manager or his representative must measure the coupling height (Example: FORE, AFT, hatch height, overall height) and the readings compared with figures stipulated on the calibration certificate.
- 12.5 If the variance in coupling height between the FORE and AFT readings is more than 1 cm, then the BVO, the Depot Operator and the GRA representative shall work to adjust the levels to achieve a height variance less or equal to 1cm before ullaging.
- 12.6 The depot operator in the presence of the BVO shall conduct a water test to ensure that the product is water-free with the use of water finding paste on a dip stick.
- 12.7 The depot operator shall take the product temperature and density, and record them in the appropriate columns of the accompanying delivery notes, using GSA-certified sampling thermometers and density-meters. Cross reference with the Density chart to ascertain quality of product.
- 12.8 Take ullage measurements using the GSA certified T-bar and record same on delivery note(s).
- 12.9 Compare readings with those on the delivery note(s) with the calibration certificate.
- 12.10 If there is a deviation between the unloading point and loading point levels, then the following procedure shall be followed to ascertain the deviation of quantity of product:
 - 12.10.1 Product from a designated compartment shall be used to fill the other compartments up to the loading levels.
 - 12.10.2 After filling the other compartments up to the loading levels, a calibrated container shall be used to measure product from any of the other compartments to fill the designated compartment. The amount of product used to fill the designated compartment becomes the total product loss. Record this loss on the delivery note.

- 12.10.3 The Measuring Platform Supervisor or Depot Operator shall approve for product receipt by giving the Discharging Note to the BVO.
- 12.11 The BVO shall present the Discharging Note to the Discharging Bay Supervisor before unloading the product.
- 12.12 To ensure that there is sufficient space to receive the product, the depot operator shall take the dip of the receiving tank and check the automatic level gauge indicator on the tank to confirm the product level.
- 12.13 The depot operator should ensure that the drain valve of the tank is closed and identify and close all receiving lines of the other tanks before commencement of the discharging process. The depot operator representative must stand near the emergency stop switch while discharge is in progress.
- 12.14 The depot operator should connect the earthing / grounding device to the cable attached to the bulk of the BRV before discharge.
- 12.15 The depot operator should couple the product hoses and open the BRV foot valves and the discharging valve on the BRV to fill the hose and check for leakage on the hose and coupling joints.
- 12.16 The depot operator should start the discharging pump and the BVO must be present at the vehicle while discharging is in progress.
- 12.17 After discharging, the depot operator shall ensure that all compartments and hoses are empty and drain any content into an aluminum bucket for onward transfer into a storage tank.
- 12.18 The depot operator should give a Drained Note to the BVO for onward submission to the Depot Manager and Customs before the discharging documents are processed.
- 12.19 The depot operator shall indicate the product loss on the relevant documents accompanying each BRV and process them with customs and the BVO. All the stakeholders shall be given copies of the processed documents before the BVO is allowed to leave the depot with the BRV.



13.0 Unloading Bulk Road Vehicle - Procedures for discharging petroleum products using flow meters

- 13.1 Receiving flowmeters shall be proved using GSA certified prover tanks weekly and the process witnessed by representatives of the depot, Tanker Drivers Union, GRA-Customs and NPA.
- 13.2 Discharging of product shall be carried out between the hours of **6am** and **6pm**
- 13.3 The products must be allowed to settle for about 15 minutes.
- 13.4 The Depot Manager and Customs Representative must check that the BVO has all delivery documents [Product Delivery Note (PDN), calibration certificate, check note, waybill, etc.] which correspond to the delivery in respect of both product quality and quantity.
- 13.5 The depot operator in the presence of the BVO shall conduct a water test in each compartment to ensure that the product is water-free with the use of water finding paste on a dip stick.
- 13.6 The depot operator shall take the product temperature and density, and record them in the appropriate columns of the accompanying delivery note(s) using GSA-certified sampling thermometers and density-meters/hydrometers. Cross reference on Density chart to ascertain quality of product.
- 13.7 The Measuring Platform Supervisor or Depot Operator should approve for product receipt by giving Discharging Note to the BVO.
- 13.8 The BVO shall present the Discharging Note to the Discharging Bay Supervisor before unloading the product.
- 13.9 To ensure that there is sufficient space to receive the product, the depot operator shall take the dip of the receiving tank and check the automatic level gauge indicator on the tank to confirm the product level.
- 13.10 The depot operator should ensure that the drain valve of the tank is closed and identify and close all receiving lines of vertical tank before commencement of discharge. The depot operator representative must stand near the emergency stop switch while discharging is in progress.

- 13.11 The depot operator should connect the earthing/grounding device to the cable attached to the bulk of the BRV.
- 13.12 The depot operator should use the product hoses and open the BRV foot valves and the discharging valve on the BRV to fill the hose and check for leakage on the hose and coupling joints.
- 13.13 The depot operator should start the discharging pump and the BVO must be present at the vehicle while discharging is in progress.
- 13.14 After discharging, the depot operator should ensure that all compartments and hoses are as empty as possible and drain content into aluminum bucket for onward transfer into a storage tank
- 13.15 The depot operator should take the final flow meter reading with the BVO and record it on the Discharging Note.
- 13.16 The depot operator should give a Drained Note to the BVO for onward submission to the Depot Manager and Customs, before the discharging documents are processed.
- 13.17 The depot operator shall determine the product loss by using the equation:
Product loss or gain
= Final meter reading - initial meter reading
- loaded quantity of BRV + Quantity of product drained
- 13.18 The depot operator shall indicate the product loss after applying temperature compensation on the relevant documents accompanying each BRV and process them with GRA -Customs and the BVO. All the stakeholders shall be given copies of the processed documents before the BVO is allowed to leave the depot with the BRV.

14.0 Calibration Procedures

14.1 BRV calibration

All Bulk Road Vehicles (BRVs) shall be calibrated by an appropriate agency licensed by the National Petroleum Authority and registered with the Ghana Standards Authority.

Before calibration, the calibrating agency shall ensure that the BRV to be recalibrated is in good physical condition. A BRV that is to be calibrated is to be positioned at a level ground and specified quantities of water metered into the compartments accordingly.

BRV calibration process may be witnessed by an OMC representative, transporter, depot operators and/or drivers' union.

The following procedures shall be carried out when the BRV is called to the platform for the checks: -

- a. Particulars of vehicles including BVO's license, number plate, and engine and chassis number are recorded on calibrating agency's form.
- b. The BRV shall be examined for road worthiness and safety to haul petroleum products.
- c. Measurement of overall heights of bulk compartments, hatch and coupling heights shall be taken.
- d. Pre-determined volumes shall be introduced into the bulk compartments of the BRV step by step through a Master- Meter until the nominal capacity of compartment is attained.
- e. Final checking of ullage levels and coupling heights shall be taken with relevant witnesses.
- f. All readings should be documented on the field form and endorsed by relevant witnesses
- g. The calibrated BRV should be moved from the platform to the discharging bay to discharge the water back to the water storage reservoir.
- h. The Field form should be received by the supervising calibration inspector for security and submitted for computerized processing.
- i. Printed certificates should be given to supervising calibration inspector for verification against the field report, and handed over to the Technical Manager for signature.

- j. The signed certificate should be received by the Calibration Company for lamination and subsequent issue to the BVO or Transporter.
- k. Copies of the final calibration certificate shall be sent to NPA

14.2 Responsibilities of the Bulk Vehicle Operator (BVO)

14.21 BVOs must;

- a. Witness the calibration and ensure that the correct ullage levels at the loading and discharge points are recorded on calibration certificates.
- b. Ensure that after calibration, the levels are the same at any point in time after loading at the gantry (Refinery/ Depots).
- c. Must make a report to the OMC, Depot representatives for advice if the BVO notices any differences in level at any point in time, immediately after loading and taking ullage levels, if all parties agree that the product must be delivered, then all the parties should endorse on the reverse of all copies of the product delivery note (PDN) and first signed by all representatives before the BVO appends his signature.
- d. Must ensure that all compartment manholes and outlet valves are well sealed before taking off.
- e. Must ensure that, vehicles are parked at the designated “level” ground at the station/ depot for ullage measurement purposes.

14.22 If after breaking the seals at the discharge point, it is found that the levels do not correspond “to minimum levels at discharge point” on the calibration certificate, the customer should pump the same product from his underground tank using his dispensing pump into the compartment affected until the product level reaches the level “at discharged point column”. The number of litres recorded should be stated on all copies of the PDN and treated as shortage. The BVO should then be requested to sign the endorsed shortage on the PDN.

14.23 After checking the correctness of quantity and quality, the BVO of the BRV will connect the discharging hose to the appropriate tank as instructed by the customer.

- 14.24 It is the responsibility of the BVO to open the correct valve for the discharge of the product. Should any leakage occur during discharge, the BVO should stop immediately and rectify the cause of the leakage before continuing
- 14.25 After discharge, both BVO and customer should make sure that compartments and delivery hoses are completely empty.
- 14.26 The BVO must always stand by his vehicle throughout the off-loading operations and must ensure that the vehicle is always facing an exit from the station/ yard.
- 14.27 Under no circumstances should a BVO give his T-bar to another vehicle for level measurements.

15.0 Procedure for calibration of horizontal fuel storage tanks by liquid transfer using prover tank or flowmeter

This procedure is in conformity with API Standard 2555; ANSI/ASTMD 1406/65.

Prior to the calibration, client undertakes the following.

- a. Check the seals of the various compartments of the BRV
- b. Take samples from the various compartments of the BRV
- c. The tank under calibration must be emptied and cleaned

15.1 Calibration using a 100 litre or 200 litre prover tank

- a. Take ullage and temperature measurement of the BRV that contains the product to be used for the calibration.
- b. The prover tank to be used must be a standard one calibrated and certified by Ghana Standard Authority. This should be checked by inspecting the seals, sticker and certificate of Ghana Standards Authority on the prover tank. Copies of prover tank certificate should be made available. Copies of this document should be uploaded onto the NPA website to be accessed by all stakeholders.
- c. All safety precautions must be observed (transfer pump type, earthing, etc.)
- d. The prover tank must be at a level position

- e. Before use run a specified quantity of product through a master meter into the prover tank.
- f. A reference point is marked on the site tank dipping pipe and reference height marked on the dip stick to facilitate accurate dipping
- g. Product is taken from the BRV into the prover tank via a pump and hose. This is allowed to settle at the graduated mark which is then drained into the tank(s) under calibration. [(By gravity into underground tanks and with a pump into above ground tank(s)]
- h. The product in the tank is allowed to settle adequately. (At least 10 minutes)
- i. A dip is taken of the product in the tank and the level marked and recorded. This exercise is repeated until the tank capacity is obtained.
- j. The dip stick is graduated and the levels boldly engraved on it.
- k. The levels and corresponding volumes on the dip stick is transferred to a Field Record Sheet and a copy sent to the client
- l. A calibration certificate is also issued to the client and the dealer at site
- m. The Calibration Company should within one week send a final copy of the calibration certificate to NPA.

15.2 Calibration using flowmeter

- a. The flowmeter to be used for the calibration must have been calibrated and certified by Ghana Standard Authority. This should be checked by inspecting the Ghana Standards Authority seal or sticker on the flowmeter and the certificate.
- b. All safety precautions must be observed
- c. Before use, run a specified quantity of product through a master meter into the prover tank.
- d. A reference point is marked on the dipping pipe and a reference height marked on the dipstick
- e. Product from the BRV is allowed to flow through the meter either by gravity

(gravity flow meter) or with the aid of a pump, depending on the flow rate of the meter. Initially, volumes of 100 litres is allowed in at a time for the first 2000 litres, and then volumes of 200 litres till the last 2000 litres which is again calibrated at 100 litres at a time. After each volume, the product is allowed to settle adequately before dips are taken. (At least 10 minutes)

- f. A dip is taken of the product in the tank and the level marked and recorded. This exercise is repeated until the capacity of the tank is obtained.
- g. The dipsticks are graduated and the levels boldly engraved on them
- h. The levels and corresponding volumes on the dipstick are copied to a Field Record Sheet and a copy sent to the client.

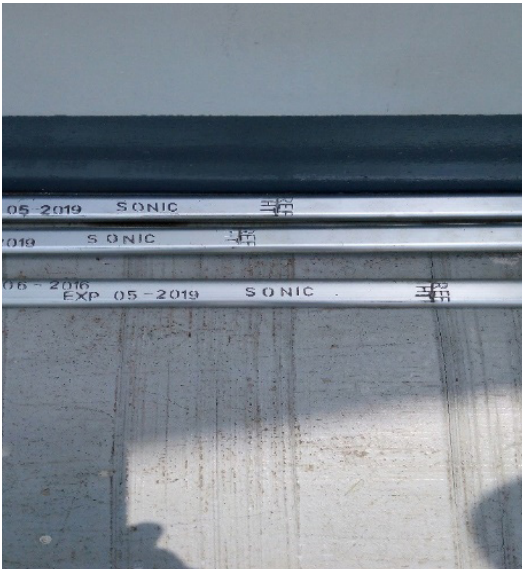
16.0 Things to look out for on a calibrated underground tank's dipstick at fuel stations as illustrated below



Name of calibration agency



Reference height



1. Mark at the tip of dipstick to check wear and tampering.
2. Reference height mark on dipstick should flash with tip of dip pipe (which has also been marked) when taking a dip.
3. Date of calibration and expiry date embossed on dipstick. (All calibration data must be uploaded on the NPA electronic platform within a week).
4. Identity mark on dipstick to ensure right dipstick is used to dip the right tank.

17.0 Receipt of Petroleum Products from Vessels by Pipelines from the harbour

The following procedures shall be followed during receipt of petroleum products from vessels delivering to terminal shore tanks using underwater and surface pipelines.

17.1 On arrival at the port, the captain of the vessel shall advise the Agent, the receiving Bulk Distribution Company (BDC) and the Nominated Inspectors. [Only inspectors duly registered by NPA and granted access to NPA's Enterprise Relational Database Management System (ERDMS) shall be used].

17.2 The Agent shall gather all information in relation to the nominated berth and berthing times.

- 17.3 Prior to the arrival of the vessel, the Nominated Inspectors will have drawn their plan of operations in relation to both ship and shore operations, nominated receiving Terminal, including cargo receiving tanks and pipelines to be used for the operation.

Sampling of Cargo

- 17.4 Sampling of product shall comply with NPA's Crude Oil and Petroleum Product Supply and Quality Control Regulations.
- 17.5 The Inspector taking samples should be conversant with taking good average samples from the vessel in order to evaluate the quality accurately.

Vessel operations on berthing

- 17.6 Once berthed and the Inspector boards the vessel, a full cargo survey should be conducted on the nominated cargo tanks for discharge (Should there be cargo onboard not nominated to be discharged, this should also be surveyed accurately in order to ensure none is discharged or none of the nominated cargo loaded into it)
- 17.7 The cargo survey should be conducted to ASTM, API, MPMS guidelines. Ullages, Temperatures at 3 levels and water sounding taken. The vessel should be inspected for any empty tanks or void spaces where cargo could be hidden.
- 17.8 A record of the ships ballast tanks and quantities, and Bunker survey conducted shall be made.
- 17.9 The inspector should also conduct a Vessel Experience Calculation taking note of MPMS Chapter 17, section 9, in particular 6.7.1 & 8. Calculations will be in-line with ASTM guidelines and calculated to standard Volumes and Metric Tons based on the Ships Composite Analysis. Quantities shall be calculated to standard 20 Degrees Celsius and recalculated for comparison at 15 Degrees Celsius.
- 17.10 Prior to discharge, the discharging sequence to be adopted by the vessel should be agreed.

Shore Operations

- 17.11 Prior to, and during berthing of the vessel, the Inspector designated to cover shore operations should be well acquainted with the terminal. Identify the shore tanks nominated to receive the cargo and ensure sufficient space is available to receive the whole of the nominated quantity.
- 17.12 The receiving sequence should be thoroughly understood which also includes the line system and its apparent condition (i.e. Empty, Partially Empty, Full and the product it contains in particular if water has been introduced during a prior use in order to clear the line from the vessel for safety and/or pollution reasons).
- 17.13 Gauging of the receiving shore tanks should be done in conjunction with a terminal representative, BDC representative and Ghana Revenue Authority (GRA) Customs official.
- 17.14 The gauging should be conducted using certified and intrinsically safe equipment supplied either by the Terminal or the Independent inspector as agreed.
- 17.15 The unique and general identification of equipment used shall be recorded.
- 17.16 The gauging data to be recorded shall include the Tank Number, Reference height of the Datum Point Time of the operation, Water sounding and Multi-Level temperatures measurements.
- 17.17 The collected data shall be used to calculate the quantities in the tank. Quantities determined shall be standardized to 20 Degree Celsius. (Duplicate Calculations standardized to 15 degree Celsius shall be made)
- 17.18 Shore tank valves for exporting as well as water drain valves or any outlet that can be used to remove product from the tank shall be closed and sealed.

Commencement of discharge operations

Prior to commencing the discharge, both the ship and shore line system should be evaluated and be lined up correctly as per the discharge and receiving plan. Shore lines that are not being used for the discharge should be locked off and sealed accordingly so that product cannot be diverted to other areas not included in the discharge sequence.

- 17.19 A Shore line displacement will be carried out at the start of the discharge. The line displacement shall be pushed into a single nominated shore tank which should be accurately gauged prior to and on completion of the line displacement.
- 17.20 At the vessel side, the displacement should be carried out from the vessel using the minimum of cargo tanks preferably one. The quantity should not be less than one and a half times (and preferable two times) the pipeline volume in order to obtain the best resolution. The discharging rate of the line quantity should also be done at the maximum pumping rate the vessel can achieve based on safety and performance of the Vessel Equipment.
- 17.21 on completion, both the vessel and shore tanks used should be gauged and the quantities agreed. Should the quantities not be consistent with expected volume, then a further line displacement should take place to confirm this. (These quantities are to be recorded and compared in gross volume only.)
- 17.22 Any major differences on the second line displacement may indicate line leakages or passing valves which should be investigated. Once the line system fullness has been evaluated, the discharge should commence as normal following the approved Discharge Plan.

Completion of Discharge.

- 17.23 On completion of the discharge, the captain of the vessel shall ensure that the ships lines to the shore connection are empty of product. (By blowing the lines or pump water into the line system) to alleviate the risk of polluting the waters.
- 17.24 In all cases once the vessel has completed the discharge and before resuming either water flush or blowing of the lines, the shore tank receiving the product should be gauged and recorded. Then once flushing or blowing is completed, the shore tank gauged again and recorded to evaluate the quantity displaced into the line in order to evaluate the fullness of actual product in the line.

Ship Side on Completion of Discharge and Line Flush or Blowing.

- 17.25 It will be the responsibility of the Nominated Inspector to ensure that all product has been discharged from the Vessel and accounted for.

- 17.26 The Inspector shall upload the quantities received into the Shore facility on the NPA's ERDMS, along with general data that the inspector is expected to document, that is, Ballast, Bunkers void spaces etc.

Shore Tanks after Discharge

- 17.27 Once the operation is completed, individual shore tanks should be left to settle before gauging. This can be from a few hours to a few days depending on the agreement reached between the parties, but should not be less than Four Hours.
- 17.28 Gauging shall be carried out using the same Certified Equipment as used in the opening gauging in order to obtain consistency.
- 17.29 The tanks shall be gauged for free water using a suitable water finding paste, sounding or ullage taken at the Tanks Datum point. Total heights should also be measured and recorded. Multi-level Temperatures taken, samples taken for analysis.
- 17.30 A line balance calculation should be included in the final figures. For reference, the line volume temperature adjustment to be used in calculations will equate to that of the vessels average cargo temperature or by agreement, the ambient air temperature should the pipeline be static for a lengthy period.
- 17.31 Water increases should also be taken into consideration. If a shore tank appears to have lost water during the discharge then the opening quantity should be used unless (WHICH SHOULD NEVER HAPPEN) water has been drained during the receiving of the cargo.
- 17.32 Calculation of the received quantities are to be calculated using ASTM Table 54B for quantities based at 15 degrees Celsius, Density at 15 degree Celsius VAC, and at 20 degrees Celsius based on Table 60B, the related density in 20 degrees Celsius VAC. The two calculations are for reference and cross checking only, the volumes calculated at 20 degrees Celsius will be the one used and input into the NPA ERDMS.

18.0 Inter-depot Transfer of Petroleum Products by Barges: Standard Operating Procedure for Barge Operations

18.1 Loading Procedures

The following steps shall be observed during loading of petroleum product into Barges:

1. The Terminal operator shall hold a pre-loading meeting with all parties and record all attendees for reference. At the pre-loading meeting the issues below shall be considered, among other things:
 - a. Emergency Response procedures;
 - b. Establishment of Barge / Shore Communications Procedures;
 - c. Transfer Shutdown procedures;
 - d. Spill Containment procedures;
 - e. Identification of Shore Tanks to be used and quantity of product available in each Shore Tank for transfer into Barge including the sequence of delivery from the tanks should be established' and
 - f. Loading plan for the Barge indicating which tanks are to be loaded, the sequence and quantity should be provided and established. It should be emphasized that the loading should always be conducted in such a manner as to maintain Safe Stress, Trim and Draft requirements. Part filled tanks should be kept to a minimum.
2. Shore Tanks nominated for the loading should be gauged by an independent inspector appointed by both parties with all parties in attendance. Records of time, date, agreed measurements or product levels and temperature as well as sampling (if required) shall be kept.
3. Quantities shall then be calculated using the required tables and figures agreed upon by all parties.
4. The Barge should be inspected together with an Independent Inspector appointed by all parties to ensure all cargo tanks are empty and ready to receive cargo.

5. Scuppers should be seen plugged and oil booms placed around the Barge to contain any spillages. Operators should be seen wearing the required Personal Safety Equipment (PSE).
6. The flexible hose should be connected from the Shore Header to the Barge main deck line. Vessel lines should be correctly lined-up and valves ready for loading.
7. Communications should be established between the Barge and Shore prior to commencement of loading using the appropriate gadgets.
8. Once confirmation of readiness to load by all parties are agreed, ensure all shore valves required for the operation are correctly lined up and all or any required blanks fitted.
9. The Shore Tank valves shall be opened as per the agreed plan to commence loading.
10. During loading, constant monitoring of the vessels tanks should be performed until the completion of the loading.
11. Near to completion of loading the flow shall be controlled by the Barge operators using the jetty header valve or Barge tank valves. This is effective unless the shore tanks are in a low condition and loading is suspended from shore.
12. Barge operators should always be aware of the line quantity, which on completion should be drained into the Barge. Consequently enough space should remain in the Barge to accept this quantity.
13. Close shore tank outlet valves after completion of loading.
14. Open vent valves to vent loading pipelines.
15. Ensure that all product in the shore lines are drained into the Barge, leaving a minimum amount of product in the lines.
16. Decouple all loading hoses whilst ensuring no spillage occurs.
17. Carry out joint gauging of cargo compartments on the loaded Barge. Record the Gauge and Temperatures, and calculate agreed loading quantities.

18. Seal all loaded compartments with approved security seals and record seal numbers
19. Carry out joint final gauging of shore tanks together with the Independent Inspector appointed by parties; record Gauge and Temperature and calculate quantities.
20. Barge and Shore tank figures should be compared for any significant differences and should these be outside the normal range ($\pm 0.1\%$ for AGO and $\pm 0.2\%$ for PMS), then a re-check should be conducted at most three (3) consecutive times as all parties agree to the differences.
21. Quality and Quantity Certificates should be prepared covering total product released from Shore Tanks.
22. The Quality and Quantity Certificates shall be signed by all parties, including the nominated Independent Inspector.

18.2 Discharging Procedures

The following steps shall be observed during discharging of petroleum product from Barges:

1. The Terminal operator shall hold pre-berth meeting with all parties and record all attendees for reference. At the pre-berth meeting the issues below shall be considered, among other things:
 - a. Emergency Response Procedures;
 - b. Establishment of Barge / Shore Communications Procedures;
 - c. Transfer Shutdown Procedures;
 - d. Spill Containment Procedures; and
 - e. Identification of Shore Tanks nominated to receive the product and confirmation of sufficient ullage space to receive the whole of the cargo to be discharged.

2. Conduct joint initial shore tank gauging together with an Independent Inspector appointed by parties; record Gauge and Temperatures. Shore Tank quantities should be agreed by all parties before discharge.
3. Seals should be placed on the closed Export Valves of the nominated Tanks, and take initial product sample if required.
4. Seals and seal numbers of the Tanker Barge tanks should be confirmed by all parties, including the Independent Inspector before commencing gauging and recording of temperatures.
5. Quantities shall then be calculated and compared to the quantity recorded after loading and before sailing from the loading port. Any significant differences should be investigated by the Independent Inspector prior to discharge.
6. Oil Booms should be in place and spill contingency prepared to contain any spillages.
7. Connect the flexible discharge hose to the Barge.
8. Conduct pre-discharge safety checks on discharging Barge with the relevant checklist, and ensure all personnel involved in the discharging process are in approved Personal Protective Equipment (PPE).
9. Ensure Barge / Shore communications procedures are checked and operational.
10. Ensure all Shore line valves necessary for the discharge are properly lined up and all by-passes are blanked.
11. Barge discharge valves shall only be opened last to commence discharge once the shore operational personnel have accepted they are ready to receive the cargo.
12. Commence discharge and inform the Terminal Manger and record the time.
13. A line displacement of approximately 2 times the capacity of the pipeline shall be conducted and both Barge and Shore tank (Gross) quantities calculated to ensure the fullness of the line. Any discrepancy should be investigated and quantities re-checked. Loss differences can be assumed to be that the line was not totally full prior to the discharge and may be added to the outturn for reconciliation purposes. Discharge can then resume once figures are agreed by all parties.



14. Conduct periodic inspection of both Shore line system and Barge together with an Independent Inspector.
15. Ensure the discharging of the product conforms to the organization's safety policy.
16. Barge operator shall inform the terminal when the discharge is complete.
17. Close all pertinent valves relating to receiving Shore tanks.
18. The Barge tanks shall be inspected by all parties, including an Independent Inspector to ensure no product remains and the tanks are well drained.
19. Once confirmation is received from shore that the system is shut down, decouple the discharge hoses of the Barge ensuring any product remaining in the hose does not enter the waterway (Spill Trays or other means of capturing the residue shall be in place).
20. Jointly Gauge the Shore tanks after allowing the product to settle for not less than three (3) hours.
21. Conduct joint final Shore tank gauging together with an Independent Inspector; record dips and temperature and agreed figures of the received quantities.
22. In the event Barge / Shore figures differ outside an acceptable limit against the Bill of Laden from the loading port, then further investigation and re-gauging shall be conducted. Similarly, when there are no differences found, a Notice of Apparent Discrepancy indicating the differing quantities shall be issued by the Barge to the Terminal Manager, and the Terminal Manager to the Barge before sailing.
23. Take final product sample and conduct quality analysis if required.
24. Out-turn document shall be prepared by the Independent Inspector and signed by all parties.

18.3 Allowable Transit Loss for Barge Operations

The following allowable losses shall apply;

- iv. Diesel - 0.1%

- v. Petrol - 0.20%
- vi. Kerosene - 0.15%

19.0 Loading and Offloading of Liquefied Petroleum Gas (LPG) from depots to Refilling plants and Bulk Customer sites

19.1 General

- 1) All new or newly re-qualified Liquefied Petroleum Gas Bulk Road Vehicles (BRVs) must be purged free of air before the first loading is permitted. The re-qualification must be done by a company approved by the National Petroleum Authority (NPA) or an authorized State Agency.
- 2) Liquefied Petroleum Gas Bulk Road Vehicles which have been subjected to accident damage in such a way that may affect their safety must not be returned to service until they have satisfactorily passed the necessary inspections by an Inspection Company approved by the National Petroleum Authority.
- 3) Each individual prime mover (tractor/BRV head), trailer or rigid chassis vehicle must be weighed prior to its first introduction into operation to prevent overfilling and ensure compliance with maximum gross/laden weight (embossed on the bulk) and axle weights. It should be weighed in its nominally empty, vapour charged condition with a full fuel tank, oil, and water and discharge equipment including hoses together. The kerb weight and axle weights of the Bulk Road Vehicle should be recorded.

19.2 Loading and Offloading Operations

19.2.1 Safety Precautions

The following safety precautionary measures apply to both loading and offloading operations and must be in place before any product transfer operations commence.

- 1) Drivers and other operatives involved in LP Gas bulk transfer operations must wear appropriate personal protective equipment (PPE) during the transfer operation. This may include the following:
 - a. Goggles or full face visors

- b. Gauntlet design hand gloves
 - c. Protective Footwear
 - d. Safety helmet in areas prescribed by risk assessment
 - e. Long sleeved clothing made of 100% cotton
 - f. High visibility jackets/vests if there is risk of not being seen by drivers of other moving vehicles
- 2) Smoking and other naked flames must not be allowed throughout the loading/unloading operation. All other electrical equipment not rated for the hazardous zone should be switched off.
 - 3) Transfer hoses must be pressure tested every six months and must be visually examined for kinks, wear or any damage. Couplings and seals should be similarly examined to ensure compatibility and for the presence of any dirt etc. before connection.
 - 4) All required fittings on a vessel (receiving tank) as per Appendix VI must be present and functional.
 - 5) The grade of LP Gas to be loaded or offloaded should be correctly identified and the receiving tank/Bulk Road Vehicle must be suitable and have sufficient ullage for the intended load.
 - 6) The quantity required to be loaded must not exceed the maximum safe fill capacity of 85 per cent of the BRV capacity and the statutory limitations on maximum gross/laden weight of vehicles and individual axle weight allowed on public roads (see Appendix V).
 - 7) On no account should any overloading be allowed. If the Bulk Road Vehicle/receiving tank is inadvertently overloaded, technical and supervisory assistance must be obtained by the operatives involved to resolve the situation.
 - 8) The Bulk Road Vehicle shall not be standing on public roads during the transfer operation. If there is no other alternative, a risk assessment must be carried out. In space restricted areas, the Bulk Road Vehicle must be able to be easily driven out without reversing.

- 9) The Bulk Road Vehicle must be correctly positioned, e.g. beneath water sprays, adjacent to loading/unloading connections, facing in the direction that will permit easiest exit in the event of an incident.
- 10) Transfer operations shall only be undertaken during the day time hours of 6am to 6pm.
- 11) Transfer operations should not be undertaken when there is any kind of storm, and if it is in progress, it must be stopped.

19.2.2 Loading Procedures

The following steps shall be observed during loading of Liquefied Petroleum Gas into Bulk Road Vehicles:

- 1) The depot safety officer/ operator shall inspect the Bulk Road Vehicle to ensure it is in an acceptable condition for “safe loading” and keep a record of each Bulk Road Vehicle following an initial examination of major safety aspects. Periodic spot-checks are recommended for subsequent entries.
- 2) Position the Bulk Road Vehicle on the weigh bridge to determine the kerb (empty) weight. It is recommended that the same weigh bridge is used for BRVs before loading and after loading
- 3) Position the Bulk Road Vehicle at the designated loading bay and engage the brake interlock. Make sure the Bulk Road Vehicle is immobilized for the duration of the loading operation. Wheel chocks must be used in addition to the interlock system provided on the Bulk Road Vehicle.
- 4) The depot operator shall connect the earthing cable of the Bulk Road Vehicle to the gantry structure and ensure the vehicle tank is properly bonded.
- 5) Connect the transfer hoses/loading arms. Ensure the couplings are properly connected without use of undue force before loading and check for any sign of leakage before and during loading.
- 6) Gradually open the valves. When filling, monitor the level in the receiving Bulk throughout the loading operation with whatever devices are provided, to ensure that the filling requirements of section 20.2.1 (6) are met. Periodic level checks and observation of the Bulk Road Vehicle tank pressure during loading will help

in identifying if the vapour return line (excess flow valve) has inadvertently closed. Should this occur, the operation should be stopped and the condition rectified.

- 7) Reduce the filling rate as the maximum safe level fill in the receiving bulk is approached to avoid overfilling.
- 8) Stop the loading immediately when the maximum safe level of 85% in the receiving bulk is reached.
- 9) Conduct a final check after disconnecting the loading lines and earthing connection to ensure all Bulk Road Vehicle outlets are properly closed and secured and that the vehicle is in a fit and safe condition to be driven away. Anti-drive-away interlocks/installation barriers should not be disengaged until it is verified that the vehicle can be safely moved.
- 10) A safely loaded Bulk Road Vehicle must weigh out using the same weighing bridge to determine the quantity loaded before exiting the facility.
- 11) If a Bulk is accidentally overfilled, the excess LP Gas should be removed in a safe manner as soon as possible and before leaving the facility.
- 12) The recommended procedure is to discharge the excess product into a standby bulk (minimum capacity of 10 tonnes) provided by the facility.
- 13) Bulk Road Vehicles that have shed off excess load after overfilling should be weighed to ensure that they are not overloaded based on maximum gross weight.
- 14) The OMC/LPGMC representative at the depot shall ensure that the loaded Bulk Road Vehicle is sealed with the company's approved seals and the seal numbers recorded on the waybill before the Bulk Road Vehicle is dispatched.
- 15) A waybill shall be issued to the driver with copies to relevant parties.

19.2.3 Off-loading Procedures

The offloading of Liquefied Petroleum Gas from a Bulk Road Vehicle into stationary storage tanks inside the Refilling plants/Bulk Consumer sites should follow the following procedures:

- 1) On arrival at the discharge point, the driver must report to the officer in charge

of the Refilling Plant/Bulk Customer site and present the delivery documents on the product specifying the quantity loaded, density of the product and loading temperature.

- 2) Position the Bulk Road Vehicle within easy reach of the transfer connection so that the hoses are not under tension and at least one turn remains on the hose reel. The position of the Bulk Road Vehicle should permit the driver (or the person in control of the off-loading operation) to have a clear line of sight of both the Bulk Road Vehicle and the receiving tank.
- 3) The engine of the BRV must be allowed to cool for at least 2 hours before off-loading operations commence.
- 4) The Terminal Manager shall carry out a pre-delivery check of the receiving tank if delivering to a customer site to ensure the facility is in order. This should include a visual check of the surroundings for any unusual or dangerous situations. A sample Pre-delivery Inspection Checklist is given in Appendix VI.
- 5) Take out and position the fire extinguishers in such a way that they are easily accessible in case of an emergency.
- 6) Connect the earthing cable of the Bulk Road Vehicle to the receiving facility's earthing point. Ensure the Bulk Road Vehicle is properly bonded.
- 7) Connect the Bulk Road Vehicle hoses (liquid and vapour lines) to the receiving tank fill connection. Connections should be properly made without use of undue force before offloading and checks made for any sign of leakage before and during offloading. Any leakage shall be rectified before proceeding.
- 8) Hoses should not be located across a public footpath or pavement for offloading unless there is no alternative and where consideration of likely public activity during the time of offloading indicates it will not constitute a significant hazard. In such cases, before and during offloading, warning notices shall be prominently displayed at the front and rear of the vehicle and should state: "LP Gas delivery in progress. No Smoking or Naked Flames"
- 9) Monitor the liquid level of the receiving tank during the offloading operation

with whatever devices are provided to ensure that overfilling does not occur. Rotor gauges of receiving tanks must be functional at all times.

- 10) The pumping rate should be reduced as and when the maximum permissible level in the receiving tank is approached, particularly when filling small tanks.
- 11) The delivery shall be stopped immediately when the maximum fill level of 85 per cent in the receiving tank is reached.
- 12) Under no circumstance shall a tank be filled beyond the 85 per cent maximum level of the receiving tank.
- 13) If a tank is overfilled, any excess LP Gas shall be removed as soon as possible in a safe manner. The recommended procedure is to discharge the excess product into a standby overflow receptor (minimum capacity of 2 tons) provided by the facility.
- 14) At the completion of offloading, the following steps should be taken:
 - a. Close all isolating valves on the Bulk Road Vehicle.
 - b. Close all pertinent isolating valves on the liquid fill and vapour return lines on the receiving tank.
 - c. Disconnect and stow or reel in the delivery hoses. Any protective caps should be re-connected.
 - d. Disconnect the earthing cable after the hoses have been removed.
 - e. Stow the fire extinguishers and warning notices back into the Bulk Road Vehicle.
 - f. Disengage the brake interlocks after confirming that the Bulk Road Vehicle is safe to move away.

20.0 Other Requirements

- 1) Only weigh bridge verified by the Ghana Standards Authority (GSA) with valid certifications shall be used by Terminal operators to weigh Liquefied Petroleum Gas Bulk Road Vehicles.
- 2) The maximum permissible error in the measurement of weight shall be within

GSA maximum permissible error.

- 3) Ghana Standards Authority and Terminal operators must ensure weigh bridge verification is done every six months.
- 4) Ghana Standards Authority should readily attend to emergency issues relating to weigh bridge. Terminal operators should also ensure their technical service providers are readily on standby to assist the GSA.
- 5) Terminal operators should ensure the driver properly positions the Bulk Road Vehicle on the weigh bridge to obtain accurate weight of the Bulk Road Vehicle before and after loading.
- 6) Terminal operators must ensure unexpired fire extinguishers and emergency equipment are located in a place known or seen by all.
- 7) Loading of Liquefied Petroleum Gas at bulk supply points shall be done via only temperature-compensated or mass flow meters.
- 8) All Rotor gauges of Liquefied Petroleum Gas Bulk Road Vehicles should be serviced and certified every year by a company approved by the National Petroleum Authority or an authorized State Agency.
- 9) Terminal operators are advised to make provision for breakaway valves as additional safety measures during loading.
- 10) Distribution of Liquefied Petroleum Gas to Refilling plants and Bulk Customer sites should be done with Bulk Road Vehicles installed with tracking devices approved by the National Petroleum Authority.
- 11) Offloading of Liquefied Petroleum Gas should be done by the use of standby electric pumps (with anti-spark and fire proof features).
- 12) All Bulk Road Vehicles must have bonding cables.
- 13) Operators of Refilling plants must keep a Station Discharge Log Book
- 14) Operators of Refilling plants using dispensers should clearly display price per litre of product sold in weight with corresponding volume.
- 15) No cylinder must be filled above its specified maximum capacity.



- 16) Vapour lines for Refilling plants and Bulk Customer sites **ARE mandatory**.
- 18) Drivers must be trained and certified by institutions recognized by the National Petroleum Authority before they can operate Bulk Road Vehicles.

21.0 Glossary of Terms

- a. BRV TRANSIT LOSS: Loss incurred by a BRV between boarding point and final destination (discharge point)
- b. BULK ROAD VEHICLE (BRV): a truck for hauling Petroleum product
- c. BULK VEHICLE OPERATOR (BVO): A driver of a BRV
- d. FLOW-METER: A volume measuring device consisting of primary flow device which produces a signal proportional to the rate of quantity of flow and a secondary device or devices to convert the signal into observable form in an analogue or digital display.
- e. FLOW-METER/PROVER TANK PROVING: A means to determine accurate meter performance by metering a quantity of a petroleum product to a prover tank (calibrated tank) and comparing the observed quantity through the meter with the actual quantity as indicated in the calibrated tank.
- f. FLOW- METER/MASTER METER PROVING: means to determine accurate meter performance by metering a quantity of a petroleum product through a master meter and comparing the observed quantity through the meter with the actual quantity as indicated on the master meter
- g. GROSS WEIGHT: The Kerb Weight of a vehicle plus passengers and cargo.
- h. HATCH is the opening in the manhole cover of a tank.
- i. HATCH COVER: Movable covering over a manhole of a tank.
- h. HOSE: A flexible pipe through which petroleum products are discharged from BRVs.
- i. KERB WEIGHT: The total weight of a vehicle with standard equipment, all necessary operating consumables such as motor oil, transmission oil, air conditioning refrigerant, and a full fuel, tank while not loaded with either passenger or cargo.
- j. LEVEL GROUND: It is an area at the depot or customer site designated for BRV measurement. This area should be engineered to ensure it is as flat as reasonably possible

- k. **LOSS TOLERANCE:** The maximum allowable BRV transit loss.
- l. **MANHOLE:** an Opening on a storage tank that allows access for loading and maintenance.
- m. **MANHOLE COVER:** this is the cover over the manhole in the tank secured with bolts
- n. **METER REPEATABILITY:** The closeness of the agreement between the results of successive measurements of the same quantity carried out by the same method, the same person, with the same measuring instrument at the same location over a short period of time.
- o. **PRODUCT DELIVERY NOTE (PDN):** An invoice stating the quantities and ullage levels of petroleum products to all compartments of a BRV after loading, to be presented at discharge point(s).
- p. **SEALER:** An OMC representative who seals manhole covers and discharging valves of BRVs after loading of petroleum products.
- q. **T-BAR:** A measuring ruler usually constructed by welding a horizontal bar perpendicular to the ruler to obtain a 'T'-shape.
- r. **TEMPERATURE COMPENSATION:** The application of the liquid co-efficient of expansion and the measured liquid temperature to convert the observed volume to the equivalent volume at standard temperature.
- s. **TEMPERATURE VARIATION:** Difference between temperature of petroleum products at the loading point and the discharge point.
- t. **ULLAGE:** Unfilled Air Space above the surface of petroleum products contained in a tank.
- u. **ULLAGE LEVEL:** The distance between the top of a manhole and surface of petroleum product contained in a BRV compartment.
- v. **ULLAGE PASTE:** A paste for smearing on the calibrated surface of a T-bar which becomes colored when it gets in touch with petroleum products for clear reading of ullage levels after T-bar drippings into compartments of BRVs containing petroleum products.

APPENDIX I: CHECKLIST FOR INSPECTING BRVs

ITEM	DESCRIPTION
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- | | |
|----|---|
| 1 | Current and valid BRV header Insurance certificate displayed |
| 2 | Current and valid BRV header NPA licensee displayed |
| 3 | Current and valid BRV trailer Insurance certificate displayed |
| 4 | Current and valid BRV trailer NPA license displayed |
| 5 | Tank calibration certificate current and valid. |
| 6 | Valid RSL sticker |
| 7 | Driver has a current and valid driving license for the class of vehicle operated. License number: |
| 8 | Driver has required Personal Protective Equipment and in good condition i.e. Helmet, Safety shoes and Gloves. |
| 9 | Is BRV diesel powered? |
| 10 | Spark Arrestor fastened onto exhaust pipe |
| 11 | Copper or brass earthing studs brazed on both sides of the tank (not on the chassis or anywhere else) |
| 12 | 2 No. 9 kg dry powder fire extinguishers - serviced within 6 months, secured but easy to remove. |
| 13 | Battery cover and terminal cables are undamaged and properly secured. |
| 14 | Electricals: No un-insulated or dangling cabling and wires on / under the BRV and in the cabin. No Broken lights. |
| 15 | The BRV can self-start |
| 16 | Battery Isolation master switch working and can disable the BRV electrics. |
| 17 | Seat belt in good condition and retractable |
| 18 | Hand brake is effective |
| 19 | Foot Brakes are effective |
| 20 | BRV has an audible reversing alarm |

ITEM	DESCRIPTION
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- | | |
|----|---|
| 21 | Driving mirrors in good condition |
| 22 | All lights and indicators in good working condition |
| 23 | Wind screen wipers and horn in good working condition |
| 24 | Tyres with good tread (at least 2mm) and all studs in place |
| 25 | No dents or major deformations to the tank body that would affect accuracy of measurement or cause leaking. |
| 26 | No visible leaks/drips of oils; engine, gear box or transmission oils and fuel stains |
| 27 | Tank outlet valves close properly and are not leaking. |
| 28 | Compartment maximum capacities indicated at the top of the tank (on both sides) |
| 29 | BRV equipped with access ladder to the top of the tank. No wobbling or missing rungs. |
| 30 | All compartments empty |
| 31 | No empty containers or jerry cans on BRV |
| | Driver should know: |
| | · No use of phones within bonded area. Leave phones at the gate |
| 32 | · The use of seat belt |
| | · No smoking |
| | · 'Drive to site' regulations |
| 33 | Loose Lamps wires on Trailer body |

APPENDIX II: LOADING INSTRUCTIONS AT THE DEPOT/REFINERY

- a) Smoking is prohibited
- b) Make sure the fire extinguishers and emergency equipment are located in a place known by all.
- c) Wear the appropriate Personal Protective Equipment:
 - Anti-static and non-inflammable clothing (never wear synthetic material)
 - Safety shoes and gloves
 - Helmet must be worn and safety glasses are recommended as protection against any splashing
- d) Switch mobile telephones off



APPENDIX III: STANDARD LOADING OPERATIONS (LOADER)

- a) Put the handrail or safety platform in place.
- b) Open one compartment at a time.
- c) Check to see if the Gantry meter has a temperature compensation to 20 degree.
- d) Open the loading arm valve to the “reduced flow” to start loading then go onto full flow.
- e) When the filling operation is completed, lift the loading arm tube and let it drip into the compartment. Close the manhole before opening the manhole of the next compartment.
- f) If the vehicle has to be moved in order to change compartments, make sure that the manholes have been closed, that the loading arm is in the neutral position that the handrail has been lifted up and earthing cable removed before moving the vehicle.

APPENDIX IV: STANDARD LOADING OPERATIONS (BVO)

At the end of the loading operation, the BVO shall:

- a) Make sure that all the manholes have been closed and locked.
- b) Fold back the loading arm and then the platform.
- c) Check that the unloading valves are not leaking and put the caps back.
- d) Close the safety foot-valves.
- e) Unplug the grounding terminal (connector).
- f) Leave the loading station following the road signs.
- g) Drive to the checking station (level bay) for dipping and seal installation.

APPENDIX V: ALLOWABLE AXLE WEIGHT ON PUBLIC ROADS

Number of Axles per Truck	Permissible Weight (in tonnes)
2	21
3	30.5
4	44
5A	50.5
5B	53.5
6	60
7A	68
7B	70

APPENDIX VI: BULK CUSTOMER PRE-DELIVERY CHECKLIST

The following is a standard minimum requirement example of a pre-delivery checklist that must be completed by the Terminal Manager before making a delivery to a bulk customer

LPG Customer Site Pre-Delivery Inspection Report

Customer Name:

Account Number:

Location:

Vessel Serial Number (if more than one tank on site):

Geo Code location of delivery (if possible):

Please place a cross (X) in the appropriate box where faults or hazards are present

- | | | | |
|-------------------------------------|--------------------------|----------------------------|--------------------------|
| 1. Emergency phone number displayed | <input type="checkbox"/> | 11. Tank condition | <input type="checkbox"/> |
| 2. No Smoking sign displayed | <input type="checkbox"/> | 12. Piers & foundations | |
| | | Fixed liquid level gauge | <input type="checkbox"/> |
| 3. Safe access to site | <input type="checkbox"/> | 14. Pressure relief valve | <input type="checkbox"/> |
| 4. Safe condition at site | <input type="checkbox"/> | 15. Liquid fill coupling | <input type="checkbox"/> |
| 5. Bonding point | <input type="checkbox"/> | 16. Vapour return coupling | <input type="checkbox"/> |
| 6. Gas leaks | <input type="checkbox"/> | 17. Coupling accessible | <input type="checkbox"/> |
| 7. Ignition sources | <input type="checkbox"/> | 18. Coupling caps fitted | <input type="checkbox"/> |
| 8. Flammable material | <input type="checkbox"/> | 19. Fire extinguishers | <input type="checkbox"/> |
| 9. Overhanging trees, etc. | <input type="checkbox"/> | | |

Delivery must not commence until:

All ignition source are removed/extinguished

Customer/Driver has checked that the storage will contain delivery

Further Comments:

Driver's Name

Date:

To be filled by OMC/LPGMC

Action Required:	Action Party	Date Done

APPENDIX VII: PROCEDURES FOR WEIGHING LPG CYLINDERS AT POINT OF SALE

1. Place the Nozzle of the liquid dispenser on the cylinder and take your hands off the Nozzle.
2. Take initial weight (W1) of the cylinder with the Nozzle
3. Add the quantity of the Liquefied Petroleum Gas required (to be purchased by consumer) to the initial weight recorded. This is to give an indication of the final weight of the cylinder with the Nozzle after filling.
4. Fill the cylinder up to the indicative final weight.
5. Take the final reading of the weighing scale (W2) with cylinder with the Nozzle on and your hands off.
6. Ensure that final weight of the filled cylinder with the Nozzle (i.e. W2) equals the calculated weight **in step 3**.

Appendix VIII: Committee Members and Contributors

S/N	Name	Institution
1	Samuel Asare-Bediako	National Petroleum Authority
2	Esther Anku	National Petroleum Authority
3	Theophilus Mohenu	National Petroleum Authority
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9	Isaac Kofi Ampofo	Ministry of Energy
10	George Omane Twumasi	Ghana Standards Authority
11	Richard Dollah	Ghana Standards Authority
12	Stephen Adu	Ghana Standards Authority
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14	Gilbert Tomani	Chamber of Bulk Oil Distribution (Cirrus Oil)
15	Andrew Baafi Owusu	Chamber of Bulk Oil Distribution (Fuel Trade)
16	Emmanuel Kotei	Chamber of Bulk Oil Distribution
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18	Joseph B. Kankam	Association of Oil Marketing Companies (Vivo Energy)
19	Ebenezer Charway-Mireku	Association of Oil Marketing Companies (Coeghan Ltd)
20	Nicholas Yaw Samari	Bulk Oil Storage & Transportation Company Ltd
21	George Ekow Sey	Bulk Oil Storage & Transportation Company Ltd
22	Solomon Nwiah Ackah	Tema Oil Refinery
23	Naa Afi Mante	Volta Lake Transportation Company Ltd
24	George Nyaunu	Ghana National Petroleum Tanker Drivers Union
25	Sunday Alabi	Ghana National Petroleum Tanker Drivers Union
26	Enoch Raymond Gyimah	Sonic Control and Engineering Services Ltd
27	E.M. Commorendore Mensah	Petroleum Retailers Association
28	Nana Owusu Ansah	Petroleum Retailers Association
29	J.K. Ahiadome	Tanker Owners Union
30	Samuel Adom Mensah	Tanker Owners Union
31	Ignatius K. Doe	Tanker Owners Union
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