

SAUDI ARABIAN OIL COMPANY (Saudi Aramco)

GENERAL INSTRUCTION MANUAL

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405.008

ISSUING ORG. PROCESS & CONTROL SYSTEMS DEPARTMENT

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SUBJECT SHIP/ShORE LOADING & DISCHARGE QUANTITY
COMPARISON FOR RELEASING SHIPS FOR SAILING

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1.0 PURPOSE AND SCOPE:

This Instruction outlines the procedure for comparing the quantity of crude oils, LPG, natural gasoline, refined products and bunker fuels transferred from shore measurement facilities with the quantity received aboard ship; or the quantity of crude oils, hydrocarbon, and refined products discharged from ship with the quantity received at shore measurement facilities. This Instruction also defines Shipping Accounting release tolerances for sailing ships.

2.0 DEFINITIONS AND ACRONYMS:

AM BAPCO	Arab Medium Crude for Bahrain Petroleum Company
ANC	Average Normal Check
ANCD	Average Normal Check (Discharge) is used to compare the Ship and Shore Gross Standard Volume (GSV).
ANCL	Average Normal Check (Loading) is used to compare the Ship and Shore Gross Standard Volume (GSV).
API	American Petroleum Institute
API Gravity	A term used by the petroleum industry to express the relative density of petroleum liquids.
COSMD	Crude Oil Sales & Marketing Department
Crude Oil	A mixture of hydrocarbons that existed in liquid phase in underground reservoirs and remains liquid at atmospheric pressure after passing through surface separating facilities.
Contamination	Crude oil contamination (from other crude oil grades) originating from shore loading and exceeding 3% of total ship cargo.

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DWT	Dead Weight Ton
EDP	Early Departure Procedure
EOM	Export Operations and Management
GOV	Gross Observed Volume is the total volume of all petroleum liquids and sediment and water, excluding free water at observed temperature and pressure.
GSV	Gross Standard Volume is the total volume of all petroleum liquids and sediment and water, excluding free water, corrected by the applicable volume correction factor for the observed temperature and API gravity, relative density or density to a standard temperature such as 60°F or 15°C.
Innage	Innage is a process to determine the depth of liquid in a tank measured from the surface of the liquid to the tank bottom of to a fixed datum plate.
JOP	Juaymah Offshore Platform
LPG	Liquefied Petroleum Gas (Propane/Butane)
LC&CCU	Loss Control & Contract Compliance Unit
Liftings	Cargo Loadings
Loss Control Authority	Metering Engineer/Engineering Division or assigned Saudi Aramco position in Yanbu, Rabigh, Jeddah or Terminal Petroleum Loss Control Unit in Ras Tanura
MINPET	Saudi Arabian Ministry of Petroleum & Mineral Resources
MOV	Motor Operated Valves
MPMS	Manual of Petroleum Measurement Standards
NEDP	No Early Departure Procedure
NSV	Net Standard Volume is the total volume of all petroleum liquids, excluding sediment and water, corrected by the appropriate volume correction factor for the observed temperature and API gravity, relative density, or density to a standard temperature such as 60°F or 15°C.
OSPAS	Oil Supply Planning and Scheduling
OBQ	Onboard Quantity is the material present in ship's cargo tanks, void spaces, and pipeline immediately before the ship is loaded. On-Board Quantity may include any combination of water, oil, slops, oil residue, oil/water emulsions, and sediment.
ROB	Remaining Onboard Quantity is the measurable material remaining onboard a ship after discharging including sludge, sediment, oil, water, and oily residue on the bottom of cargo compartments.
RLPG	Royalty Liquefied Petroleum Gas
Shrinkage Factor	Volumetric discrepancy resulting from mixing hydrocarbons of different properties, where the resulting volume is less than the total volume of the sum of the components.
Strapping Table	Calibration chart containing tank volume for use in volume computation.
TCV	Total Calculated Volume is the total volume of all petroleum liquids and sediment and water, corrected by the appropriate volume correction factor for the observed temperature and API gravity, relative density, or density to a standard temperature such as 60 °F or 15 °C and also corrected by the

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Ullage applicable pressure correction factor and meter factor, plus all free water measured at the observed temperature and pressure.
 Measurements from the surface of the liquid being the lower point to the gauge hatch being the upper point

VEF Vessel Experience Factor is a compilation of the history of the total calculated volume (TCV) vessel measurements, adjusted for onboard Quantity (OBQ) or remaining onboard (ROB), to the TCV shore measurements. SDC Ship Discharge Comparison.

SLC Ship Loading Comparison

3.0 RESPONSIBILITY:

3.1 Shipping Accounting shall:

- 3.1.1 Request ship and shore Onboard Quantities (OBQ) from the Ship's Master prior to loading at Saudi Aramco Terminals. These figures are secured at berth through the Loading Facility Supervising Operator or the Saudi Aramco Harbor Pilot.
- 3.1.2 Obtain ship (ullage sheet) and shore measurements (tank/meter delivery tickets).
- 3.1.3 Run ship/shore comparison via SAP Transaction ZE0007 and certify its accuracy of as identified in Appendix B.
- 3.1.4 Inform the Operation Shift Superintendent/Coordinator, OSPAS Terminal Planner, and Loading Facility Supervisor in the following cases:
 - 3.1.4.1 When the ship is released within allowable ship/shore releasing tolerance.
 - 3.1.4.2 When the ship is not released, so a thorough investigation can be initiated and coordinated (through the Operation Shift Superintendent/Coordinator) as outlined in Appendix A of this Instruction.

3.2 The Operation Shift Superintendent/Coordinator shall:

- 3.2.1 Ensure hourly ship/shore comparisons between quantities shipped and quantities received are performed by operations during loading.
- 3.2.2 Ensure ship and shore figures are sent to Shipping Accounting as soon as they are complete.
- 3.2.3 Release ships to sail with an unresolved ship/shore difference, after the initial investigation is complete, as outlined in Appendix A of this Instruction.

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3.2.4 In the event a ship/shore difference exceeds the allowable releasing tolerance, the Operation Shift Superintendent/Coordinator shall:

3.2.4.1 Notify the MINPET representative (Government Gauger) on royalty transfer shipments.

3.2.4.2 Direct an investigation of the difference by:

3.2.4.2.1 Requesting the Saudi Aramco Petroleum Inspector to verify the ship measurement and calculation.

3.2.4.2.2 Requesting the Loading Facility Supervising Operator to verify the shore measurement and calculation.

3.2.4.2.3 Forwarding a copy of the ship/shore investigation checklist to the Loss Control Authority and Shipping Accounting.

3.3 The Saudi Aramco Petroleum Inspector shall:

3.3.1 In the case of a ship/shore difference exceeding the allowable tolerance, check the ship measurement and calculation when requested by the Operations Shift Superintendent/Coordinator. This check will include the actions identified in Appendix A.

3.3.2 Investigate ship/shore differences reported on a ship at its first berth location for total quantity loaded at that berth, the ship, and shore prior to commencement of loading at the second berth.

NOTE: Saudi Aramco Petroleum Inspector responsibilities at Terminal Department-Juaymah are performed by Saudi Aramco Harbor Pilot, who will have received full training/instruction in respect to the performance of these responsibilities.

3.4 The Loading Facility Supervising Operator shall:

3.4.1 Run hourly ship/shore comparisons between quantities shipped to quantities received onboard ship.

3.4.2 Send final shore measurement as soon as possible to Shipping Accounting.

3.4.3 In the case of a ship/shore difference, exceeding the allowable tolerances identified in Section 5, check the shore measurement including the actions identified in Appendix A.

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3.5 Saudi Aramco Harbor Pilot shall:

3.5.1 Advise the ship's master that the ship ullage report is required before sailing is permitted.

3.5.2 Inform the Operation Shift Superintendent/Coordinator if the ship's figures are given during berthing or unberthing.

3.5.3 Advise the ship's master that the ship is free to sail upon release.

3.5.4 Bring the ship's ullage report onshore to Shipping Accounting.

3.6 The Loss Control Authority shall:

3.6.1 Coordinate the after sailing investigations. Investigation findings must be recorded in SAP Transaction #ZE0007, "Ship/Shore Comparison."

3.6.2 Inform MINPET representative (Government Gauger) when the shore figures for royalty transfer shipments are adjusted and get his signature on the revised documents.

3.6.3 Inform COSMD in case of reportable contamination (see Section 6) for all grades of crude (excluding AM BAPCO).

3.6.4 Inform OSPAS in case of reportable contamination (see Section 6) for AM BAPCO only.

3.6.5 Inform Shipping Accounting and the Operation Shift Superintendent/Coordinator of the time and basis for releasing the official shore figures.

3.6.6 Release official shore figures for ships with unresolved ship/shore differences exceeding the allowable tolerance (including ships released to sail) if the investigation (see Appendix A) did not resolve the ship/shore difference. If ships are scheduled to reach the final destination before the investigation is complete, Saudi Aramco figures shall be noted as follows: "SHORE FIGURES ARE UNDER INVESTIGATION AND SUBJECT TO CHANGE."

3.6.7 At the conclusion of the investigation, issue a final report including findings, actions taken and recommendations for released ships reporting both resolved and unresolved ship/shore differences exceeding the allowable tolerance.

3.6.8 Provide LC&CCU upon request a copy of the ship/shore difference investigation report issued by the Loss Control Authority for documentation against any future claims of the Buyer.

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3.7 Crude Oil Sales and Marketing Department (COSMD)

3.7.1 Loss Control and Contract Compliance (LC&CCU) Group Leader shall:

Assign an independent inspector when requested by the Operating Department to confirm ship figure at the discharge port. This is usually required when ships figures are applied as the basis for calculation of official shore delivery (see Section 10.2).

NOTE: It is recommended that the final shore outturn figure at the discharge port(s) be confirmed by an inspector not working for Saudi Aramco, as this implies acceptance of the adequacy and accuracy of that outturn figure by Saudi Aramco and may limit our ability to defend any subsequent claims against the ship based BL by the Buyer.

3.7.2 Export Operations and Management (EOM) Representative shall:

Coordinate with relevant affiliate organizations, to obtain approval from the Customer for loading in cases of contamination on all grades of crude oil (except AM BAPCO).

3.8 Oil Supply Planning and Scheduling Department (OSPAS) shall:

Coordinate with Bahrain Petroleum Company, to obtain approval from the Customer for loading in cases of contamination on AM BAPCO only.

4.0 CALCULATION OF SHIP/SHORE QUANTITIES

4.1 Average Normal Check (ANC) is the average of the last twenty (20) consecutive ships to shore quantity comparisons (expressed as a percentage) from Saudi Aramco Terminals. Equation 1 below expresses this relationship. The ANC shall be calculated according to Appendix B – ANC Calculation Procedure. All quantities are corrected to Gross Standard Volume (GSV) before calculation.

$$\text{ANC} = \frac{\text{Sum of (Ship Volume reported for 20 consecutive volumes)}}{\text{Sum of (Shore Volume reported for 20 consecutive volumes)}} \times 100$$

(Equation 1)

The ANC is calculated separately for ship loadings and discharges.

The Average Normal Check - Discharge (ANCD), is based on Ship Discharge Comparisons (SDC) defined in Section 4.2.

The Average Normal Check - Loading (ANCL), is based on Ship Loading Comparisons (SLC) defined in Section 4.3.

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- 4.2 Ship Discharge Comparison (SDC) is the GSV from the ship measurement on arrival less the quantity of ROB, divided by the GSV from shore measurement at discharge. This relationship is expressed by Equation 2 below:

$$\text{SDC} = \frac{\text{GSV on arrival} - \text{ROB}}{\text{GSV received on shore at discharge}} \times 100 \quad (\text{Equation 2})$$

- 4.3 Ship Loading Comparison (SLC) is the GSV from the ship measurement on sailing less the OBQ, divided by the GSV from shore measurement at loading. This relationship is expressed by Equation 3 below:

$$\text{SLC} = \frac{\text{GSV on sailing} - \text{OBQ}}{\text{GSV received from shore at loading}} \times 100 \quad (\text{Equation 3})$$

The procedure for calculation of ANCD and ANCL as performed by SAP Transaction ZE0007 is included in Appendix B.

5.0 TOLERANCES FOR SHIP/ShORE QUANTITY COMPARISONS AND RELEASING SHIPS:

- 5.1 The Shipping Unit of Operations Accounting Department shall release ships for sailing in accordance with a specified allowable releasing tolerance.

5.1.1 The allowable releasing tolerance is the percentage difference between the current comparison and the previous ANC for either Loading (ANCL) or Discharge (ANCD). The allowable releasing tolerances are shown in Tables 1 and 2 below. If the difference lies outside the allowable releasing tolerance, a ship/shore difference will be declared.

5.1.2 Ship/shore differences of less than 250 BBLs are to be considered within the allowable releasing tolerance, irrespective of the percentage difference.

Table 1 – Ship Release Criteria for Crude Oil, LPG, Natural Gasoline, or Refined Products

When a ship loads Crude Oil, LPG, Natural Gasoline or Refined Products:	<u>Tolerance Limits</u>
Less than 10,000 BBLs	= ± 2.000% of A.N.C.
Between 10,000 and 14,999 BBLs	= ± 1.500% of A.N.C.
Between 15,000 and 24,999 BBLs	= ± 1.000% of A.N.C.
25,000 BBLs or more	= ± 0.300% of A.N.C.

NOTE: For Propane (A-140) and Butane (A-160) cargoes, apply the shrinkage factor before performing the ship/shore comparisons.

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NOTE: Refined products ships and ships engaged in Saudi Arabian coast wide trade with maximum release tolerance allowance of $\pm 2.0\%$ and whose ship/shore comparison falls between $\pm 0.4\%$ and $\pm 2.0\%$ will be reullaged once by Saudi Aramco/ or an independent inspection Company to confirm the ship's figure, even though such reullage measurement is not considered an official ship/shore difference.

Table 2 – Ship Release Criteria for Bunker Fuel

When a ship loads Bunker Fuel Oil:	<u>Tolerance Limits</u>
Less than 25,000 BBLS	$= \pm 2.000\%$ of A.N.C.
Greater or equal to 25,000 BBLS	$= \pm 1.000\%$ of A.N.C.

- 5.2 If a ship/shore difference is declared for the current comparison (i.e., the difference between current comparison and previous ANC is not within the allowable tolerance established in Tables 1 or 2), use-Table 3 for an expanded release tolerance limit used to select historical comparison records.

Table 3 – Difference tolerances based on Ship Dead Weight Ton

When a ship loads Crude Oil, LPG, Natural Gasoline or Refined Products:	<u>Tolerance Limits</u>
Ships Greater than 25, 000 DWT	$= \pm 0.300\%$ of A.N.C.
Ships Less than 25, 000 DWT	$= \pm 1.000\%$ of A.N.C.

- 5.3 For newly built ships, ships with no ANC and ships from dry dock with major structural changes that gave mandated restrapping of the ship tanks use the release tolerance limits in Table 4 below.

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Table 4– Newly Built or Ships Returning from Dry Dock

For newly built ships, ships with no ANC and ships from dry dock with major structural changes	<u>Tolerance Limits</u>
<u>1st Voyage</u> Previous ANC = 100.00 Current ANC= 100.00	= \pm 0.700% of shore figure.
<u>2nd Voyage</u> Previous ANC=100.00 Current ANC= 100.00 Note: This is a default value set for the second voyage.	= \pm 0.700% of shore figure.
<u>3rd Voyage and Subsequent voyages:</u> Previous ANC = Current ANC for previous voyage. Tolerance to be used for current comparison as determined previously. Calculate current ANC as explained in Appendix B	= \pm 0.300% of 1 st and 2 nd Voyage shore figure average.

- 5.4 Ship liftings more than three (3) years old shall not be used for ANC calculations. However, liftings may be reviewed when conducting a reported ship/shore difference investigation.
- 5.5 Ships with allowable releasing tolerances of $\pm 0.700\%$ and whose ship/shore comparison falls between $\pm 0.300\%$ and $\pm 0.700\%$ for any petroleum product will be re-checked by the Saudi Aramco Petroleum Inspector to confirm the ship's measurements.
- 5.6 Ships arriving at Saudi Aramco ports with an OBQ ship/shore difference and having released Saudi Aramco cargo, and a ship/shore difference on-total quantities (OBQ + Saudi Aramco cargo), shall have the ship's OBQ deleted and the ship difference considered resolved.
- 5.7 Ships arriving at Saudi Aramco ports with no ship/shore difference OBQ or on-total quantities (OBQ + Saudi Aramco cargo), but having a ship/shore difference on Saudi Aramco cargo, shall consider the ship difference resolved.
- 5.8 Ships arriving at Saudi Aramco ports with no ship/shore difference OBQ, but having a ship/shore difference on Saudi Aramco cargo and on-total quantities (OBQ + Saudi Aramco cargo), then a ship/shore difference is declared, and a through investigation shall be carried out.
- 5.9 There are certain ships that are either over or under calibrated (inaccurate ship's capacity tables) and will always check more than the allowable releasing tolerance. These ships shall be always

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given $\pm 0.700\%$, but its measurements shall be checked and confirmed by Saudi Aramco Petroleum Inspector.

5.10 Appendix A details the procedure for ship/shore difference investigations and authorities for release.

5.11 Appendix C details the additional requirements associated for ship/shore difference investigations and authorities for release of bunker fuel quantity releasing.

6.0 CRUDE OIL CONTAMINATION:

6.1 In cases of contamination, the Loss Control Authority will calculate the percentage of contamination per Equation 4 below.

$$\text{Contamination Percentage} = \frac{\text{Contaminated Quantity} \times 100}{\text{Total Onboard Quantity}}$$

(Equation 4)

6.2 If contamination is less than 3%, cargo loading shall be resumed.

6.3 If contamination is more than 3%, cargo loading shall not be resumed. Export Operations Management of the Sales and Marketing Logistics Department shall coordinate with affiliate organizations to obtain acceptance and approval from customer to permit loading to continue for all grades of crude oil except AM BAPCO, which will be handled by OSPAS.

7.0 DOUBLE BERTHING SHIPS:

When a ship/shore difference is reported at a ship's first berth location at Saudi Aramco (on total quantity loaded at that berth), the ship measurements must be checked by the Saudi Aramco harbor pilot onboard the ship and the shore measurement must be checked by the Loading Department Facility Supervising Operator prior to commencement of loading at the second berth at Saudi Aramco.

8.0 SHIP LOADINGS HANDLED BY INDEPENDENT PETROLEUM INSPECTORS:

The release of ships handled by independent inspectors shall follow the same procedures as that of the other ships.

9.0 SPLIT CARGO AND PART CARGO LOADINGS:

9.1 Each individual product comprising a split load or part cargo will normally be gauged, ullaged and the ship/shore comparison recorded. Sailing release for such loadings will be based on ship/shore comparison on TOTAL cargo.

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- 9.2 Some ships may have loaded part cargo at another port before calling at Saudi Aramco Terminals. Shipping Unit will request part cargo ship and shore figures corrected to GSV from ship's Master when ship is secured at berth through the Loading Facility Supervising Operator.
- 9.3 For ships that cannot provide a part cargo shore figure, the part cargo shore figure will be assumed to be the same as the part cargo ship figure for total cargo comparison purposes.
- 9.4 For ships with a ship/shore difference that have part cargo onboard, which was loaded at another port, the ship's tanks containing part cargo shall always be reullaged along with ship's tanks containing Saudi Aramco cargo.

10.0 RECORDS AND REPORTS:

- 10.1 Royalty/custody shore tank or metering figures are used for official shipping records. Ship figures are used as a check against the shore figures (except for LPG shipments at RT Terminal, where ships figures are used for official records).
- 10.2 When unusual conditions exist, such as valve and line leaks, or meter failures, ship figures may be used as the basis for calculation of official shore delivery. When used, this practice must have the approval of MINPET representative, the Superintendent of the Operating Facility and the Supervisor of the Loss Control Authority.
- 10.3 The following written records and reports shall be prepared:
- 10.3.1 Parties identified in Appendix A will prepare checklists of all ship/shore difference investigations. Checklist copies will be retained in the ship's file. Copies of ALL ship/shore difference investigations shall be forwarded to the Supervisor, Loss Control Authority.
- 10.3.2 A copy of all meter reports or shore tank gauging tickets, for every unresolved ship/shore difference, shall be transmitted to the Loss Control Authority.
- 10.3.3 The Loss Control Authority shall issue a final investigation report including findings, actions taken and recommendations for previously released ships to sail with both unresolved and resolved ship/shore differences. This report will be issued to LC&CCU, as documentation against any future claims of the Buyer.

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APPENDIX A – SHIP/Shore Difference Investigation

In the event a ship/shore comparison exceeds the allowable releasing tolerance, the possible causes shall be investigated.

A ship's quantity can differ from shore quantity for many reasons including:

- a. The inherent inaccuracies associated with measuring cargo found Onboard prior to loading (OBQ) or remaining Onboard after discharge (ROB), including undetected clingage.
- b. Inaccuracies in the ship's engineering and/or architectural quantity calculations and measurement tables, including wedge calculations, trim and list calculations.
- c. Modifications, renewal, or additions to ship tanks that may not be accounted for.
- d. Measurement errors.
- e. Volumetric shrinkage.
- f. Partly full or empty ship or shore lines.
- g. Evaporative losses.
- h. Permanent or temporary tank deformation.
- i. Weather conditions affecting measurement.

The below listed individuals, their representatives (or functional equivalents) shall perform the following actions as part of the ship/shore difference investigation. Terminal facility variations from this investigation practice will be documented in local area procedures.

SHIPPING ACCOUNTING REPRESENTATIVE:

- a. Ensure the applied ship's Average Normal Check (ANC) is correct.
- b. Ensure voyage number is correct.
- c. Ensure allowable releasing tolerance given is correct.
- d. Ensure ship and shore figures are obtained and entered into the SAP system correctly.
- e. Ensure correct API gravities are used (apply Shore API for ship loading and Ship or BL API for ship discharge).
- f. Ensure OBQ prior to load at Saudi Aramco Terminals is used in the ship/shore comparison.

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SAUDI ARAMCO PETROLEUM INSPECTOR:

The Saudi Aramco Petroleum Inspector shall investigate the following possible causes of a shore difference in accordance with the following:

NOTE: Saudi Aramco Petroleum Inspector responsibilities at Terminal Department are performed by Loading Facility supervising operator who will have received full training/instruction in respect to the performance of these responsibilities.

- A change in gauge of shore tanks for the same loading and filling system. The tanks used during closing shall be rechecked. If possible, this shall be performed by a different Gauger to prevent repetitive errors.
- Check any change in gauge of slop tanks on the system, or slack lines on shore.
- Investigate possible inaccuracy of measurement equipment, including gauging tapes and thermometer calibration.
- Check the previous loading from the same shore tank(s) for:
 - Any excessive temperature changes between the tank's opening and closing readings.
 - Correct starting/stopping times,
 - Correct meter numbers are used.
 - All loading metering tickets used for the shipment were sent to and received by Shipping Accounting. This including leg flushes, backfill tickets, and the line flush quantity.
- Check the shore tank to ensure roof if the is floating. Check for oil on roof, rainwater on roof or on bottom of tank or any water movement.
- Check any line work that could cause a slack line.
- Check any suspected separation MOVs/valves for leaking or bypassing.
- Comparison of the meter tickets with the meter totalizers. Check the meter calculation and review system alarms to make sure that there is no meter failure or malfunction.

The Saudi Aramco Petroleum Inspector shall investigate the following possible causes of a ship difference in accordance with the following:

NOTE: Saudi Aramco Petroleum Inspector responsibilities at Terminal Department-Juaymah are performed by Saudi Aramco Harbor Pilot who will have received full training/instruction in respect to the performance of these responsibilities.

- Ensure the VEF is not applied to ship's figures when making ship/shore comparison.

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- b. Ensure the ship figures are received in terms of GOV.
- c. Check the ullage of all ship's tanks (level, temperature, and water determination) including slop, bunker, and water tanks.
- d. Check the ship's calibration charts for error. Compute ship's cargo using all the units of measurements shown on ship's calibration charts. Check for error in transposition of original ship's tank strapping to ship's officers own book with interpolations.
- e. Any reclaimed ROB that the ship is commingling with the loaded cargo, must be deducted from the ship's figures. If the tanks are free of ROB, a dryness certificate is issued.
- f. Before and after loading, for leakage of product into other tanks (single and double bottom), slop, ballast, pump rooms, or cofferdams aboard the ship in question or aboard other ships.
- g. Leakage of cargo into the sea.
- h. Pipelines are emptied into the cargo tanks or otherwise accounted for in the ship's volumes.
- i. Water in ship's tanks; this is determined by taking water cuts on ALL ship's tanks regardless, of whether ship is over or under shore figures.
- j. The effect of ship's trim/heal and installation or removal of lines, bulkheads, or other equipment from tanks upon calibration charts. Check report of condition of ship's tanks prior to loading and disposition of residue, if any.

For further details, refer to the API MPMS Chapter 17, "Marine Measurement" Section 2, Measurement of Cargoes Onboard Tank Ships.

SAUDI ARAMCO HARBOR PILOT:

The Saudi Aramco harbor pilot shall check the following areas in case of a ship/shore difference:

- a. Ensure the "Vessel Experience Factor" (VEF) has not been applied to the ship's figure.
- b. Ensure the ship's figure is submitted in terms of GSV barrels at observed temperatures.
- c. Ensure that ship's tanks quantities are added correctly
- d. Ensure ship's loading systems quantity, if not already incorporated in the ships calibration tables, is added to ship's received quantity figure.
- e. Ensure trim/heal corrections are applied.

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- f. When a recheck is required, (due to a ship/shore difference) a new ship Ullage form must be completed and the new calculations signed by the vessel's Master. The original ship Ullage form should not be altered or amended.
- g. If a large difference in free water, temperature or oil ullage is recorded between the original ship's figure and the rechecked ship's figures, the reason for this must be investigated and an explanation included on the rechecked ships Ullage form.
- h. Ensure OBQ prior to load at Saudi Aramco terminals are submitted to Shipping Accounting at the arrival.
- i. Ensure ship and shore figures of OBQ are submitted in barrels at 60 °F, using the same table for volume correction factors, and the actual VCF table used is noted on the submitted report.

LOADING FACILITY SUPERVISING OPERATOR:

The Loading Facility Supervising Operator shall check the following areas in case of a ship/shore difference:

- a. Check tank gauges and temperatures of all shore tanks that were used for that shipment.
- b. Check all thermometers used in gauging shore tanks against new and certified ones.
- c. Check for any excessive temperature changes between tanks opening and closing. Excessive temperature changes must be investigated.
- d. Check on previous loadings from the same shore tanks.
- e. Check shore tank to be sure roof is floating.
- f. Check for oil, rainwater on roof or bottom of tanks or any water movement.
- g. Check for previous maintenance performed on the system used for that shipment, which could be the cause to the discrepancy.
- h. Checking any suspended separation, MOV's/valves for leaks/by-passing.
- i. Check starting and stopping times and dates recorded on loading master tickets.
- j. Check if all loading metering tickets include leg flushes and backfill tickets used for that shipment were sent to and received by Shipping Accounting.
- k. Check loading meter tickets; make sure they are the correct meter numbers used.
- l. Ensure all relevant original shipping documents are submitted to the Shipping Accounting Unit.

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APPENDIX B – ANC CALCULATION PROCEDURE

ANCL CALCULATION

- a. List the voyage data for as many as available, up to a maximum of twenty voyages.
- b. Calculate individual SLCs for each voyage, rounding to four decimal places.
- c. Disqualify ship shore gross error difference in excess of 2%, in other words all voyages with ratios outside the range of 0.98000 and 1.02000.
- d. Of the remaining voyages, calculate the Average Ship/Shore Ratio from the total quantities.
- e. Check whether SLCs qualify—Y/N (SLCs outside $\pm 0.300\%$ from Average Ship/Shore Ratio determined in step (d) do not qualify).
- f. Use only remaining qualifying voyages to calculate ANCL if at least two qualifying voyages remain. If less than two qualifying voyages remain, ANCL will default to 0.700%.
- g. Calculate total ship and shore quantity.
- h. Divide total ship quantity by total shore quantity.
- i. Calculate to four decimal places and round to three decimal places.

ANCD CALCULATION

- a. List the ship voyage data for as many as available, up to a maximum of twenty voyages.
- b. Calculate individual SDCs for each voyage, rounding to four decimal places.
- c. Disqualify ship shore gross error difference in excess of 2%, in other words all voyages with ratios outside the range of 0.98000 and 1.02000.
- d. For the remaining voyages; calculate the average ship/shore Ratio from the total quantities
- e. Check whether SDCs qualify - Y/N (SDCs outside $\pm 0.300\%$ from average ship/shore ratio determined in step (d) above do not qualify).
- f. Use only remaining qualifying voyages to calculate ANCD if at least two qualifying voyages remain. If less than two qualifying voyages remain, ANCD will default to 0.700%.
- g. Calculate total ship and shore quantity.
- h. Divide total ship quantity by total shore quantity.
- i. Calculate to four decimal places and round to three decimal places.

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**APPENDIX C –PROCEDURE FOR
 BUNKER FUEL QUANTITY RELEASING**

- a. After receipt of a bunker ship/shore difference, the next bunker delivery metered volume will be compared with the ullaged volume received by the next ship.
- b. The Saudi Aramco petroleum inspector will check the opening and closing Ullages for the next ship.
- c. The Supervising Operator will make a written report to the Operations Foreman who will inform the Supervisor, of the loading port's Terminal Operations Loss Control Authority.
- d. For ship/shore comparison purposes, the metered quantity shall be the official quantity for the next delivery.
- e. If the comparison exceeds the tolerances stated in Table 2, the following actions will be performed:
 - i. The meter will be taken out-of-service and Petroleum Loss Control notified.
 - ii. Once a meter is taken out-of-service, it shall not be used for official purposes until it has been recalibrated.
 - iii. If a discrepancy is found in the meter, the loading meter will be recalibrated and the official shore volume will be adjusted accordingly to the results of the recalibration.
 - iv. After receipt of a ship/shore difference, the bunker meter will be compared to a check volume, generated by a master meter or prover on the next loading. The reported volume must be converted to GSV (by giving the gross barrels, temperature, and API gravity to Shipping Accounting and requesting the corrected volume).
 - v. If the resulting difference is less than $\pm 0.500\%$, the loading meter shall be used to determine the official shore volume.
 - vi. If the difference is more than $\pm 0.500\%$, the check volume (corrected to gross standard volume) will be used for the official shore volume.
- f. If no discrepancy is found in the meter, the metered volume will be the official shore volume for the delivery for which the protest was received and the subsequent comparison made.

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RECOMMENDED BY:

Manager, Process & Control Systems Department

CONCUR:

Vice President, Marketing and Supply Planning

Vice President, Distribution and Terminal Operation

Associate General Counsel, Law

Controller, Finance

APPROVED:

Executive Director, Engineering Services

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