

## Crude Oil Quantity and Quality Determination

### I. General

All measurement & sampling equipment, procedures, calculations, and practices (whether performed by IIC or by terminal personnel) shall be performed in conformance with the most current International measurement, sampling and analysis standards (API Manual of Petroleum Measurement Standards (MPMS), Energy Institute Hydrocarbon Management (EI HM), ISO, NIST and ASTM). Volume and density measurements shall be adjusted from observed conditions to standard or base conditions (i.e. 60 degrees Fahrenheit or 15.0 or 20.0 degrees Celsius and a pressure of one standard atmosphere of 14.696 PSIA etc.) in accordance with the latest revision of API MPMS Chapter 11 (e.g. Table 6A, 54A etc. whichever table is applicable).

Each commercial party shall have the right to witness the measurement processes, provided adequate notification is given to interested parties.

### II. Quantity Determination for Marine, Pipeline, Truck or Rail Tank Car

A.) The quantity and quality of Crude Oil received or delivered shall be determined by a mutually appointed Independent Inspection Company (IIC). Quantity as determined by the IIC shall be final and binding on all parties and shall be the basis for preparing relevant shipping documents and invoices save fraud and/or manifest error. If, for any reason an IIC is not in attendance or if terminal operating procedures prevail, then quantity as determined by terminal personnel shall be final and binding on all parties and shall be the basis for preparing relevant shipping documents and invoices save fraud and/or manifest error.

B.) All measurements shall be determined by one of the following methods in descending order of preference;

1.) Proven custody transfer Meters

2.) Gauging of Static Tanks with the application of certified tank capacity (i.e. strapping) tables before and after cargo transfer. (See Notes 1&2 below)

3.) Marine Vessel Measurements

i. Quantity shall be based on the volumes as determined from measurements of the vessel cargo tanks with the application of certified cargo tank capacity (i.e. strapping) tables before and after the transfer and adjusted for the vessel's Vessel Experience Factor (VEF) per API MPMS 17.9- EI HM 49.

ii. Delivered ex-ship Cargoes involving Lighterage or Ship-to-Ship Transfers (STS). In the event that a cargo is lightered from Seller's vessel; "Ship to be Lightered" (STBL), the quantity of

cargo delivered/received shall be determined from the IIC's gauging of the receiving vessel's; "Service Vessel" (SV) tanks and adjusted for the SV's VEF (as valid and verifiable per API MPMS 17.9- EI HM 49).

- 4.) Truck or Rail - Certified Weigh Scales
- 5.) Truck or Rail - Tank Car gauge with the application of certified truck or rail tank car capacity (i.e. strapping) tables before and after cargo transfer.
- 6.) Agreement between commercial parties. In the event of a failure in the above measurement points, the parties shall agree to negotiate in good faith and without prejudice, a new basis for custody transfer volumes.

Note 1: Consistent with API MPMS 3.1A, measurements taken through unslotted standpipes shall not be used for custody transfer purposes. All delivering/receiving shore tanks shall be static and shall have a liquid oil surface at the official point of calibration. All receiving shore tanks shall contain sufficient volumes of oil, prior to commencement of receiving operations, to minimize measurement inaccuracy due to tank bottom movement and/or deformation. Shore tank(s) liquid levels shall not be within their calibrated tank capacity tables floating roof's critical zone(s) either prior to commencement or completion of transfer operations and/or performance of shore tanks custody transfer measurements.

Note 2(Marine Transfers): A Shore Line Fullness Verification (SLFV) shall be performed prior to custody transfer of crude oil using any of the approved SLFV Methods in API MPMS Chapter 17.6.

### III. Quality Determination & Sampling for Marine, Pipeline, Truck or Rail Tank Car

- A.) Quality analysis will be performed on representative samples obtained using one of the following methods in descending order of preference;

1.) In-line Sampler,

A representative sample of the crude oil delivered or received shall be obtained via flow-proportional in-line sampler that performs according to API MPMS 8.2 and/or corresponding ISO standard (ISO 3171).

2.) Manually Drawn Samples, or

Samples may be obtained via all-level(s) samples (running samples), upper-middle-lower level(s) samples or spot samples at agreed levels consistent with API MPMS 8.1 and/or corresponding ISO standard (ISO 3170).

- 3.) Agreement between commercial parties. In the event of a failure in the above sample points, the parties shall agree to negotiate in good faith and without prejudice, a new basis for quality determination.

IV. Lab Analyses for Sediment & Water (S&W)

\* Volumetric deductions for S&W content shall be made by one of the methods described in API MPMS Chapter 10 in the following order of preference:

Characteristic	Primary	Secondary	Tertiary
Water	Karl Fisher (ASTM D4928)	Distillation (ASTM D4006)	Centrifuge (ASTM D4007 (Lab) or API MPMS Ch. 10.4 (Field))
Sediment	Membrane filtration (ASTM D4807)	Extraction (ASTM D473)	Centrifuge (ASTM D4007 (Lab) or API MPMS Ch. 10.4 (Field))

Full deduction for all free water and S&W content shall be made according to the ASTM and API MPMS published methods and standards.