Manual of Petroleum Measurement Standards Chapter 2.2G

Calibration of Upright Cylindrical Tanks Using the Total Station Reference Line Method

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Foreword

Chapter 2.2G of the *Manual of Petroleum Measurement Standards* should be used in conjunction with API *MPMS* Chapter 2.2A, *Measurement and Calibration of Upright Cylindrical Tanks by the Manual Tank Strapping Method*. Units of measure in this publication are in International System (SI) and U.S. customary (USC) units consistent with North American industry practices.

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Introduction

The Total Station Reference Line Method (TSRLM) is an alternative to the Manual Tank Strapping Method (MTSM) for determining tank diameter. The primary difference between TSRLM and MTSM is the procedure for determining tank diameter at shell courses other than the bottom course. TSRLM requires measuring a reference circumference on the bottom course by manual strapping with a tape that is traceable to the National Institute of Standards and Technology (NIST) or other national metrology institute. The other required special measurements, procedures, methods, and analytical tools for the development of a tank capacity table are identical to those stated in API *MPMS* Chapter 2.2A.

In addition, TSRLM requires the measurement of deviations in tank diameter at other predetermined horizontal and vertical stations by using a total station electro-optical device.

This method eliminates the use of a magnetic trolley that is required in the external Optical Reference Line Method (ORLM, reference API *MPMS* Chapter 2.2B) for the calibration of upright cylindrical tanks; thus, it provides significant safety enhancements by being able to do all the offset measurement work from ground level.

Calibration of Upright Cylindrical Tanks Using the Total Station Reference Line Method

1 Scope

This standard describes measurement and calculation procedures for determining the diameters of upright cylindrical tanks by taking vertical offset measurements externally using Electro-optical Distance Ranging (EODR) equipment rather than conventional ORLM plummet/trolley equipment. This standard is an alternate standard to API *MPMS* Ch. 2.2B. This standard is used in conjunction with API *MPMS* Ch. 2.2A. Calibration of insulated tanks is covered by API *MPMS* Ch. 2.2D. Abnormally deformed tanks that are dented or have other visible signs of damage are not covered by this standard.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API *Manual of Petroleum Measurement Standards (MPMS)*, Chapter 2.2A, *Measurement and Calibration of Upright Cylindrical Tanks by the Manual Tank Strapping Method*

3 Terms and Definitions

For the purposes of this document, the following terms and definitions apply. Terms of more general use may be found in the API *MPMS* Chapter 1 Online Terms and Definitions Database.

3.1
horizontal station
Preestablished location in the horizontal plane at ground level along the tank circumference.

3.2
slope distance
Distance measured from an EODR instrument to a vertical station on the tank.

3.3
vertical station
Preestablished location in the vertical plane along the tank shell, corresponding to a given horizontal station.

4 Application of the Total Station Reference Line Method

This method is for the external calibration of upright cylindrical tanks. For tanks that are insulated, the insulation shall be removed for application of this method, or the calibration may be undertaken internally per API *MPMS* Ch. 2.2D.

5 Electro-optical Device General Requirements

The total station instrument should preferably have a locking device, the objective being to keep the horizontal angle constant while vertical station measurements are taken at any given horizontal station.

The electro-optical device shall be capable of reading distances to within 2 mm and angles to within 5 sec or better.

For the proper operation of the electro-optical device being used, follow manufacturer's instructions.