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TANK CALIBRATION AND SETTLEMENT SURVEY

METHODOLOGY

After meticulously scrutinising and testing all calibration methods available locally and internationally, SCMS Africa selected the E.O.D.R. (Electro Optical Distance Ranging) method to ensure we are at the forefront of providing accurate and advanced state of the art calibration and measurement services to the market in the petrochemical, structural and mechanical industry.
This methodology would has the following benefits:

BENEFIT 1

EQUIPMENT

- Due to its ability, the **E.O.D.R.** code enables us to utilize equipment which accurately measure safety heights, maximum tank volume efficiency and evaporation heights of floating roof tanks
- Report turnaround time is minimised due to data accumulation and processing integration
- As per code requirements, insulated tanks with 'lagging' can be accurately calibrated with the required corrections
- Our mechanical engineering and quality assurance team is available to provide quality assurance to validate all calibrations

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SERVICE SCOPE

BENEFIT 2

UNPARALLELED ACCURACY

- An approximate result of **0.02%** is attainable over open volume capacity.
  This provides clients with a remarkable money saving solution
- All corrections are accounted for within the open volume as per ISO 7507 -1, -4 &-5
- All measuring equipment are calibrated as per code requirement
- Dipping indicators are mounted directly adjacent to a groove, on all dip hatches to ensure correct and repetitive dipping of tank volumes

BENEFIT 3

SAFETY COMPLIANCE

- With an intrinsically safe Leica total station, the technician is continuously ground based measuring the shell free of hazards
- All technicians are fully trained in safety with regards to first aid and fire fighting
- Safety height levels can be accurately measured from ground level

We endorse and apply the following South African Codes:

- Local by-laws
- Best Practices
- Safe Work Practice for Contractors (Major Oil companies)
- Occupational Health and Safety Act
- Environment Management Act
- National Road Traffic Act
- Company Standards

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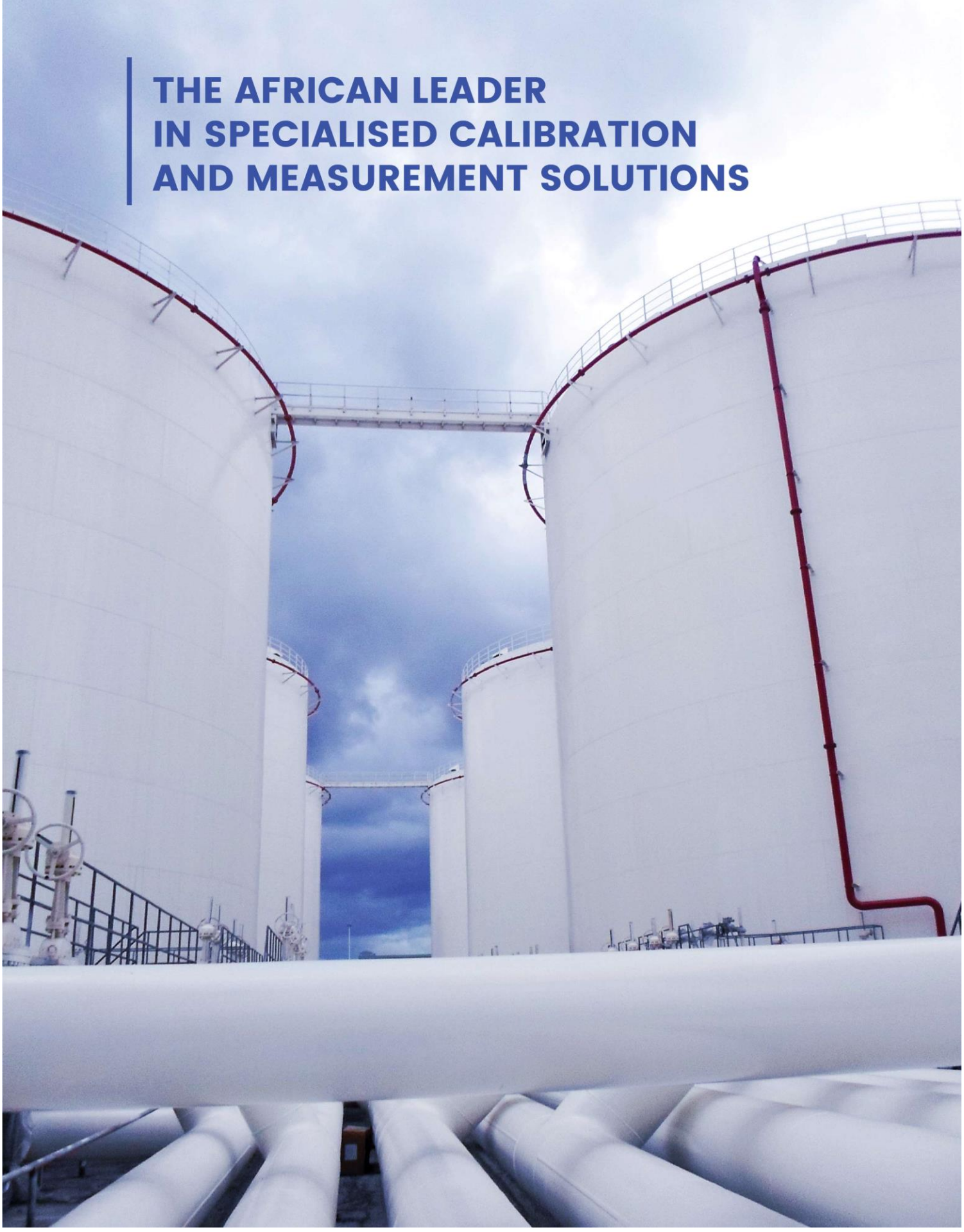
THE AFRICAN LEADER IN SPECIALISED CALIBRATION AND MEASUREMENT SOLUTIONS



OVERVIEW

The **E.O.D.R.** calibration scope can be applied to tanks in and out-of-service operational conditions, therefore an inefficiently operating tank can be calibrated as accurately with all the necessary corrections in terms of the hydrostatic head, deadwood displacement, thermal expansion etc. For IFR / IFB storage tanks, critical zone volume displacement calculations are calculated accordingly for additional accuracy within the open volume of vertical storage tanks.

In addition innage, ullage & ATG tables/reports are readily generated at the push of a button.

CODE COMPLIANCE

VERTICAL STORAGE TANKS (IN AND OUT-OF-SERVICE):

- ISO 7507-1 (Strapping method)
- ISO 7507-4 (Internal E.O.D.R. method)
- ISO 7507-5 (External E.O.D.R. method)

± 0.02 % ACCURACY!

- API 653 Shell Roundness (O-O-R) | Shell Verticality (O-O-V) | Shell Differential (O-O-P) Floor Settlement | Edge Settlement
- API 650 Shell Roundness (O-O-R) | Shell Verticality (O-O-V) | Shell Differential (O-O-P)
- API 620 Shell Roundness (O-O-R) | Shell Verticality (O-O-V)
- EEMUA 159 *Refer to API653
- EN14015 Shell Roundness (O-O-R) | Shell Verticality (O-O-V) | Shell Differential (O-O-P)
- DEP (SAPREF) Shell Roundness (O-O-R) | Shell Verticality (O-O-V) | Shell Differential (O-O-P)

HORIZONTAL STORAGE TANKS (IN AND OUT-OF-SERVICE):

- ISO 12917-1 (Manual method)
- ISO 12917-2 (Internal E.O.D.R. method)

SPHERICAL STORAGE TANKS (OUT-OF-SERVICE):

- API 2552 (Manual method – Applied internal E.O.D.R.)

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OVERVIEW

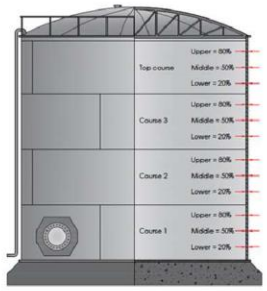
During our on-going pursuit to provide the best calibration services we followed the natural progression into developing comprehensive tank measurement solutions.

These tank measuring services thus enable us to survey and analyse vertical storage tanks for structural anomalies which impair and subsequently compromise the efficiency and integrity of a vertical storage tank.

CODE COMPLIANCE: CRITERIA

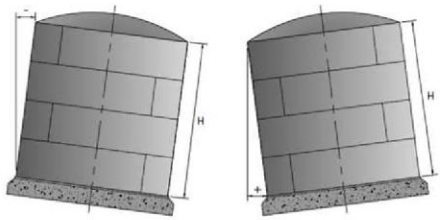
VERTICAL STORAGE TANKS

CODE	CODE REFERENCE	SCOPE
API 653	10.5.3 & Table 10.2	*Out-Of-Round (O-O-R)
	10.5.2.1.	*Out-Of-Verticality (O-O-V)
	B.3.2.1.	*Out-Of-Plane (O-O-P)
	Figure B.8, B.9 & B.10	*Floor Settlement
	B.2.3.1, B.3.4.5, Fig. B.11 & B.12	*Edge Settlement
API 650	7.5.3	Out-Of-Round (O-O-R)
	7.5.2	Out-Of-Verticality (O-O-V)
	7.3.6	Out-Of-Plane (O-O-P)
API 620	6.5.3	Out-Of-Round (O-O-R)
	6.5.2	Out-Of-Verticality (O-O-V)
EEMUA 159	*Refer to API 653	*Refer to API 653
EN14015	16.7.1	Out-Of-Round (O-O-R)
	16.7.3	Out-Of-Verticality (O-O-V)
	16.2.2	Out-Of-Plane (O-O-P)
DEP (SAPREF)	3.1.3	Out-Of-Round (O-O-R)
	3.1.1	Out-Of-Verticality (O-O-V)
	4.2	Out-Of-Plane (O-O-P)



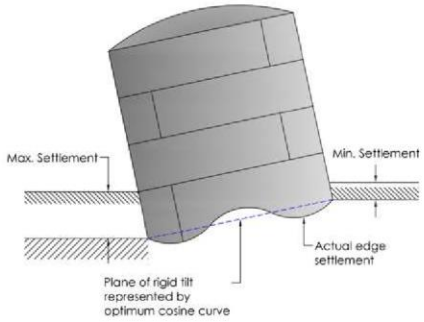
SHELL ROUNDNESS (O-O-R)

Refers to the cylinder deflecting or deviating from the mean radius essentially due to stresses on the cylinder, subsequently compounding the stresses throughout the cylinder resulting in peaking and banding and therefore weld failure.



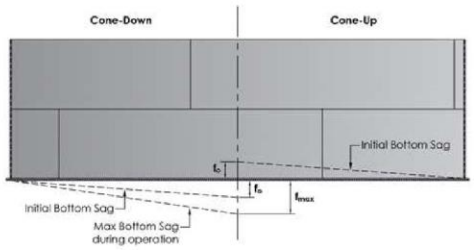
SHELL VERTICALITY (O-O-V)

Refers to the cylinder top leaning over the adjacent bottom critical weld/floor. Occurrence can be due to multiple factors resulting in critical weld/tank & IFR failure.



SHELL DIFFERENTIAL (O-O-P)

Refers to the critical weld deviating in vertical height when compared to adjacent locations around the periphery. Occurrence can be due to soil, foundation & edge settlement resulting in critical weld, tank & IFR/IFB failure.



FLOOR SAGGING

This settlement refers to a holistic sagging of the floor, be it downward or upward trajectory, from the originally constructed gravitational slope, most commonly due to stressed effected on the floor during operation. When sagging occurs in the “incorrectly” intended location incorrect product flow & sludge build up etc. settles and leads to corrosion of these locations.

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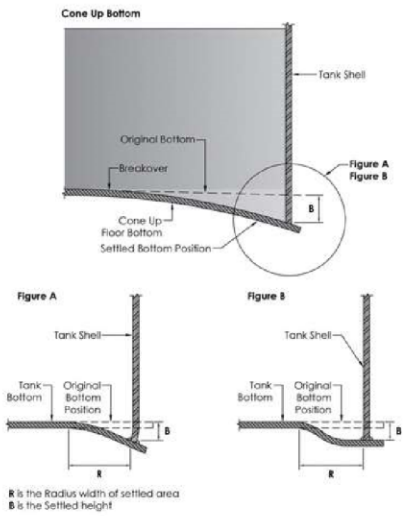
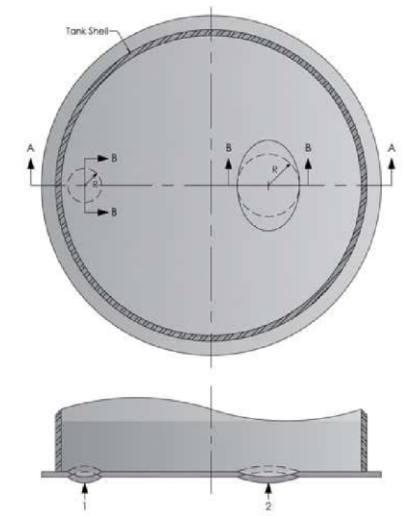


EDGE SETTLEMENT

This settlement refers to the critical weld settling over the foundation shoulder due to downward force applied by the cylinder and or crumbling foundation. Complete tank failure can occur due to excessive weld stress and corrosion due to exposed floor & water accumulation.



FLOOR SETTLEMENT

This settlement refers to the localized & remote bulges and depressions which develop in the floor due to expansion and contracting of the tank as well as operational procedures in service conditions. Floor welds may start to “tear” or “crack” under the applied stresses and corrosion or metal failure may occur under the floor.

Future instalments include floor sagging, banding & peaking, evaporation loss calculations, tank design, 3D tank scanning and reverse structural engineering to name a few...

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