

ICS 75.080

CCS E 30



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 19780-2005

**Capacity calibration of spherical metal tanks - Total station
external measuring method**

球形金属罐的容积标定 全站仪外测法

Issued on: May 25, 2005

Implemented on: November 1, 2005

**Issued by: General Administration of Quality Supervision, Inspection and
Quarantine;
Standardization Administration of the PRC**

Table of Contents

1 Scope
2 Normative references
3 Terms and definitions
4 Principle of the method
5 Instruments and equipment
6 Preparation before measurement
7 Measurement procedure
8 Calculation of the capacity table
9 Uncertainty of the result
10 Calibration certificate
About this edition
Classification and status
How a Chinese national standard is set out
About this English translation

1 Scope

This standard specifies the principle, the instruments, the measurement procedure, the calculation of the capacity table and the uncertainty for calibrating the capacity of spherical metal tanks by external measurement with a total station.

The table is the legal measure

A spherical tank holds liquefied gas under pressure, and the quantity in it is found by measuring the level and reading a capacity table.

Every custody transfer into and out of the vessel over its whole life rests on that table.

And a sphere cannot be calibrated the easy ways

It cannot be filled with measured water: a pressure sphere is not designed to carry the weight of a full water charge, and the vessel is in service anyway.

It cannot be strapped like a vertical cylinder either, because a sphere has no constant circumference.

So the shell is surveyed from outside

A total station at defined stations measures a large number of points on the surface, and the true shape is reconstructed from them and integrated to give volume against level.

True shape, not sphere - fabrication from formed plates and settlement of the supports both distort it, and that distortion is precisely what the calibration has to capture.

What has to be fixed

The number and distribution of measured points, the station geometry, the instrument accuracy, and the corrections for plate thickness, temperature and internal fittings that displace liquid.

Then the calculation and the uncertainty of the resulting table, without which the figure has no metrological standing.

About this edition

GB/T 19780-2005 is the current edition. It was issued on 25 May 2005 and has been in force since 1 November 2005.

The interval between issue and effect is the transition period. It exists so that producers, laboratories and buyers can requalify products, revise procedures and use up documentation before the new text becomes the one that applies. The date on this page is the official one from the record of the Standardization Administration.

Classification and status

GB/T 19780-2005 is classified under ICS 75.080. ICS is the International Classification for Standards, the same scheme used by ISO and by the national bodies of most countries, which is what allows a Chinese standard to be placed beside its foreign counterparts on subject rather than on number.

Its Chinese Standard Classification code is CCS E 30. CCS is the domestic scheme, a letter for the sector and two digits for the subject within it, and it is the code by which the standard is filed and searched in China.

The GB/T prefix marks a recommended national standard. It is not, in itself, law: it becomes binding when a contract names it, when a regulation or a mandatory standard refers to it, or when a producer declares conformity with it. In practice that covers most of the cases in which it will be read - a purchase specification, an inspection agreement or a certification scheme.

How a Chinese national standard is set out

Chinese national standards are drafted to the rules of GB/T 1.1, which fixes the order in which a standard is set out. The document opens with a foreword recording the issuing bodies, the relationship to any previous edition and the technical committee responsible for it. Clause 1 is the scope. Clause 2 lists the normative references - the other standards that have to be applied together with this one, and without which its requirements cannot be met. Clause 3 gives the terms and definitions. The technical clauses follow: the requirements themselves, the test or measurement methods by which conformity is established, the inspection rules that say how a lot is sampled and judged, and, for a product standard, the provisions on marking, packaging, transport and storage. Annexes, normative or informative, come last.

GB/T 19780-2005 runs to 15 pages in the English translation. What is delivered is the complete document in that order: every clause, every table, every figure and every annex of the Chinese original, with the same numbering, so that a reference to a clause number in a contract or a test report points to the same place in both languages.

About this English translation

The English edition of GB/T 19780-2005 is a full translation of the official Chinese text, not a summary, an abstract or a machine rendering left unchecked. Clause and subclause numbers, table and figure numbers and annex letters are those of the original, because they are what a specification, a purchase order or a test report cites.

Technical terms are translated against the vocabulary standards of the same field, so that a term used in GB/T 19780-2005 reads the same way as in the other Chinese standards it is used beside. Where a term has an established English form in an ISO or IEC document on the same subject, that form is used; where China's term has no foreign counterpart, it is translated literally and the Chinese is kept alongside it rather than replaced by an approximation.

Quantities, units and symbols are carried over unchanged. Chinese standards use SI, so a value in the translation is the value in the original document, not a conversion, and a limit read from the English text is the limit that will be applied by a Chinese inspection body reading the Chinese one.

This page is compiled from the official publication record: the standard number and both titles, the issuing bodies, the dates of issue and effect, the ICS and CCS classification. The requirements, limits, tables and test conditions are in the document itself.