
**Petroleum and natural gas industries —
Drilling fluids — Laboratory testing**

*Industries du pétrole et du gaz naturel — Fluides de forage — Essais
en laboratoire*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 10416:2008](https://standards.iteh.ai/catalog/standards/sist/864f4d7d-5ab0-49dc-be1e-801152e7ab1a/iso-10416-2008)

<https://standards.iteh.ai/catalog/standards/sist/864f4d7d-5ab0-49dc-be1e-801152e7ab1a/iso-10416-2008>



Reference number
ISO 10416:2008(E)

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 10416:2008

<https://standards.iteh.ai/catalog/standards/sist/864f4d7d-5ab0-49dc-be1e-801152e7ab1a/iso-10416-2008>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2008

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword.....	vii
Introduction	viii
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Symbols and abbreviations	3
5 Barite	6
5.1 Principle	6
5.2 Reagents and apparatus	6
5.3 Sampling	7
5.4 Calculation of moisture content	7
5.5 Sieve analysis	7
5.6 Sedimentation analysis	8
6 Barite performance	12
6.1 Principle	12
6.2 Reagents and apparatus	12
6.3 Base drilling fluid preparation	13
6.4 Rheology test	13
6.5 Calculation	14
7 Abrasiveness of weighting materials	14
7.1 Principle	14
7.2 Reagents and apparatus	15
7.3 Determination of abrasion	15
8 Mercury in drilling fluid barite	17
8.1 Principle	17
8.2 Reagents and apparatus	17
8.3 Preparation of standards	19
8.4 Sample digestion	19
8.5 Check for recovery of Hg during digestion	20
8.6 Analysis of standards and samples	20
8.7 Calculation	20
9 Cadmium and lead in drilling fluid barite	21
9.1 Principle	21
9.2 Reagents and apparatus	21
9.3 Preparation of combined cadmium and lead standards	22
9.4 Sample digestion	22
9.5 Analysis of standards and samples	22
9.6 Calculation	23
10 Arsenic in drilling fluid barite	23
10.1 Principle	23
10.2 Reagents and apparatus	24
10.3 Preparation of standards	25
10.4 Sample digestion	25
10.5 Analysis of standards and samples	26
10.6 Calculation	26
11 Bridging materials for regaining circulation	26

11.1	Principle	26
11.2	Apparatus.....	27
11.3	Preparation of test drilling fluid.....	27
11.4	Static slot test.....	27
11.5	Dynamic slot test	28
11.6	Static marble bed test.....	28
11.7	Dynamic marble bed test.....	28
11.8	Static ball bearings (BB shot) bed test	29
11.9	Dynamic ball bearings (BB shot) bed test.....	29
12	Filtration-control agents.....	29
12.1	Principle	29
12.2	Reagents and apparatus	29
12.3	General instructions for preparation of base drilling fluids	31
12.4	Salt-saturated drilling fluid.....	31
12.5	High-hardness, salt-saturated drilling fluid.....	32
12.6	10 % potassium chloride (KCl) drilling fluid.....	32
12.7	Pre-hydrated bentonite slurry.....	33
12.8	Modified seawater drilling fluid	33
12.9	Low-salinity drilling fluid.....	33
12.10	Lime-treated drilling fluid	34
12.11	Low solids, non-dispersed drilling fluid	34
12.12	Freshwater lignosulfonate drilling fluid.....	35
12.13	Initial performance test.....	35
12.14	Performance after heat ageing	36
13	Methylene blue test for drilled solids and commercial bentonite.....	36
13.1	Methylene blue capacity of drill solids	36
13.2	Methylene blue capacity of commercial bentonite.....	39
13.3	Solids content.....	40
14	Deflocculation test for thinner evaluation.....	41
14.1	Principle	41
14.2	Reagents and apparatus	42
14.3	Procedure for moisture content	43
14.4	Calculation of moisture content	43
14.5	Preparation of drilling fluid base	43
14.6	Calculation	44
14.7	Determination of rheological properties.....	44
14.8	Calculation of thinner efficiency.....	46
15	Testing base oils used in drilling fluids.....	46
15.1	General.....	46
15.2	Reagents and apparatus	46
15.3	Density, relative density (specific gravity), or API gravity-hydrometer method (see ISO 3675)	46
15.4	Density and relative density of liquids using a digital density meter (see ASTM D 4052)	47
15.5	Kinematic viscosity of transparent and opaque oils — Calibrated capillary tube method (see ISO 3104).....	47
15.6	Distillation (see ISO 3405)	47
15.7	Aniline point and mixed aniline point (see ISO 2977:1997).....	48
15.8	Pour point (see ISO 3016).....	48
15.9	Flash point by Pensky-Martens closed tester (see ISO 2719)	49
15.10	Aromatics content (see IP 391 or ASTM D 5186).....	49
16	Potassium ion content — Ion-selective electrode method.....	50
16.1	Principle	50
16.2	Reagents and apparatus	50
16.3	Preparation of electrodes.....	51
16.4	Operational check of electrode system	51
16.5	Measurements using a meter with direct concentration readout capability	52

16.6	Measurements with instruments that provide either a digital or an analogue readout in millivolts	52
17	Calcium ion content — Ion-selective electrode method	53
17.1	Principle	53
17.2	Reagents and apparatus	53
17.3	Preparation of electrodes	54
17.4	Operational check of electrode system	55
17.5	Measurements using a meter with direct concentration readout capability	55
17.6	Measurements with instruments that provide either a digital or an analogue readout in millivolts	55
18	Sodium ion content — Ion-selective electrode method	56
18.1	Principle	56
18.2	Reagents and apparatus	57
18.3	Preparation and operational check of the electrode system	57
18.4	Measurements using a meter with a direct concentration-readout capability	58
18.5	Measurements using a meter with readout in millivolts	58
19	Density of solids — Stereopycnometer method	59
19.1	Principle	59
19.2	Apparatus	59
19.3	Procedure — Stereopycnometer method	59
19.4	Calculation — Stereopycnometer method	60
20	Density of solids — Air comparison pycnometer method	61
20.1	Principle	61
20.2	Apparatus	61
20.3	Procedure — Air comparison pycnometer method	61
20.4	Calculation — Air comparison pycnometer method	61
21	Ageing of water-based drilling fluids	62
21.1	Principle	62
21.2	Practices common to preparation, handling and testing over all temperature ranges	62
21.3	Drilling fluid sample preparation and ageing at ambient temperature	63
21.4	Drilling fluid ageing at moderate temperatures [ambient to 65 °C (150 °F)]	64
21.5	Drilling fluid ageing at substantially elevated temperatures [over 65 °C (150 °F)]	66
21.6	Inertness and chemical compatibility in high-temperature ageing cells	68
21.7	Obtaining supplies and services for the ageing of drilling fluid samples	69
22	Ageing of oil-based drilling fluids	69
22.1	Principle	69
22.2	Apparatus	70
22.3	Practices common to preparation, handling and testing over all temperature ranges	71
22.4	Drilling fluid ageing at ambient temperatures	72
22.5	Drilling fluid ageing at moderate temperatures [ambient to 65 °C (150 °F)]	73
22.6	Drilling fluid ageing at substantially elevated temperatures [over 65 °C (150 °F)]	74
22.7	Inertness and chemical compatibility in high-temperature ageing cells	75
22.8	Obtaining supplies and services for the ageing of drilling fluid samples	76
23	Shale-particle disintegration test by hot rolling	76
23.1	Principle	76
23.2	Reagents and apparatus	77
23.3	Procedure	77
23.4	Calculation	78
24	Drilling fluid materials — High-viscosity polyanionic cellulose (PAC-HV) (regular)	79
24.1	Principle	79
24.2	Determination of moisture content	79
24.3	Procedures with test fluid containing PAC-HV	80
25	Drilling fluid materials — Low-viscosity polyanionic cellulose (PAC-LV)	82
25.1	Principle	82
25.2	Determination of moisture content	83

25.3	Procedures with test fluid containing PAC-LV	83
26	Preparation and evaluation of invert-emulsion drilling fluids	86
26.1	Principle	86
26.2	Reagents and apparatus	86
26.3	Mixing of the initial drilling fluid	87
26.4	Testing the properties of the initial drilling fluid	88
26.5	Preparation of the sample contaminated by seawater	88
26.6	Preparation of the sample contaminated by base evaluation clay	89
26.7	Preparation of the sample contaminated by mixed-salt brine	89
26.8	Procedure for hot-rolling	89
26.9	Procedure for static ageing	89
26.10	Procedure for testing after heat ageing	90
27	High-temperature/high-pressure filtration testing of drilling fluids using the permeability plugging apparatus and cells with set-screw-secured end caps	90
27.1	Principle	90
27.2	Safety considerations	90
27.3	Apparatus — Permeability-plugging apparatus (PPA) with set-screw-secured end caps	92
27.4	Procedure for high-temperature/high-pressure (HTHP) filtration	94
27.5	Test conclusion and disassembly	97
27.6	Data reporting	99
28	High-temperature/high-pressure filtration testing of drilling fluids using the permeability-plugging apparatus and cells with threaded end caps	100
28.1	Principle	100
28.2	Safety considerations	100
28.3	Apparatus — Permeability-plugging apparatus (PPA) with threaded end caps	102
28.4	Procedure for high-temperature/high-pressure (HTHP) filtration	104
28.5	Test conclusion and disassembly	106
28.6	Data reporting	108
Bibliography	ISO 10416:2008 https://standards.iteh.ai/catalog/standards/sist/864f4d7d-5ab0-49dc-be1e-801152e7ab1a/iso-10416-2008	109

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 10416 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 3, *Drilling and completion fluids, and well cements*.

This second edition cancels and replaces the first edition (ISO 10416:2002), which has been technically revised.

ISO 10416:2008
<https://standards.iteh.ai/catalog/standards/sist/864f4d7d-5ab0-49dc-be1e-801152e7ab1a/iso-10416-2008>

Introduction

This International Standard, which establishes testing methodologies for drilling fluid materials, is based on API RP 13I, seventh edition/ISO 10416:2002 [2]. This International Standard was developed in response to a demand for more exacting testing methodologies. The tests contained herein were developed over several years by a group of industry experts and were identified as being those which can yield reproducible and accurate results. The tests are anticipated to be performed in a laboratory setting, but can be applicable in a field situation with more rigorous apparatus and conditions than normally found in a drilling fluid field-test kit.

These tests are designed to assist in the evaluation of certain parameters for drilling fluids, with these properties not necessarily used for the maintenance of a drilling fluid in field use. The tests provide either more precision or different properties than those given in the field-testing standards ISO 10414-1 and ISO 10414-2.

It is necessary that users of this International Standard be aware that further or differing requirements can be needed for individual applications. This International Standard is not intended to inhibit a vendor from offering, or the purchaser from accepting, alternative equipment or engineering solutions for the individual application. This may be particularly appropriate where there is innovative or developing technology. Where an alternative is offered, the vendor should identify any variations from this International Standard and provide details.

As with any laboratory procedure requiring the use of potentially hazardous chemicals, the user is expected to have received proper knowledge and training in the use and disposal of these chemicals. The user is responsible for compliance with all applicable local, regional, and national regulations for worker and local health, safety and environmental liability.

This International Standard contains footnotes giving examples of apparatus, reagents and sometimes the supplier(s) of those materials that are available commercially. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the products named. Equivalent products may be used if they can be shown to lead to the same results.

Petroleum and natural gas industries — Drilling fluids — Laboratory testing

1 Scope

This International Standard provides procedures for the laboratory testing of both drilling fluid materials and drilling fluid physical, chemical and performance properties. It is applicable to both water-based and oil-based drilling fluids, as well as the base or “make-up” fluid.

It is not applicable as a detailed manual on drilling fluid control procedures. Recommendations regarding agitation and testing temperature are presented because the agitation history and temperature have a profound effect on drilling fluid properties.

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.

ISO 91-1:1992, *Petroleum measurement tables — Part 1: Tables based on reference temperatures of 15 °C and 60 °F*

ISO 2719, *Determination of flash point — Pensky-Martens closed cup method*
<https://standards.iteh.ai/catalog/standards/sist/80-44d7/d-5ab0-49dc-b61e-801152e7ab1a/iso-10416-2008>

ISO 2977:1997, *Petroleum products and hydrocarbon solvents — Determination of aniline point and mixed aniline point*

ISO 3007, *Petroleum products and crude petroleum — Determination of vapour pressure — Reid method*

ISO 3016, *Petroleum products — Determination of pour point*

ISO 3104, *Petroleum products — Transparent and opaque liquids — Determination of kinematic viscosity and calculation of dynamic viscosity*

ISO 3405:2000, *Petroleum products — Determination of distillation characteristics at atmospheric pressure*

ISO 3675, *Crude petroleum and liquid petroleum products — Laboratory determination of density — Hydrometer method*

ISO 3696:1987, *Water for analytical laboratory use — Specification and test methods*

ISO 3839, *Petroleum products — Determination of bromine number of distillates and aliphatic olefins — Electrometric method*

ISO 10414-1:2008, *Petroleum and natural gas industries — Field testing of drilling fluids — Part 1: Water-based fluids*

ISO 10414-2:—¹⁾, *Petroleum and natural gas industries — Field testing of drilling fluids — Part 2: Oil-based fluids*

1) To be published. (Revision of ISO 10414-2:2002)

ISO 13500:—²⁾, *Petroleum and natural gas industries — Drilling fluid materials — Specifications and tests*

ASTM D 1141, *Standard Practice for the Preparation of Substitute Ocean Water*

ASTM D 4052, *Standard Test Method for Density and Relative Density of Liquids by Digital Density Meter*

ASTM D 5186, *Standard Test Method for Determination of Aromatic Content and Polynuclear Aromatic Content of Diesel Fuels and Aviation Turbine Fuels by Supercritical Fluid Chromatography*

ASTM E 100, *Standard Specification for ASTM Hydrometers*

IP 391, *Petroleum products — Determination of aromatic hydrocarbon types in middle distillates — High performance liquid chromatography method with refractive index detection*

3 Terms and definitions

3.1

ACS reagent grade

chemical which meets purity standards as specified by the American Chemical Society (ACS)

3.2

base oil

solids- and water-free hydrocarbon oil, commonly used in the drilling fluid industry for preparation and/or dilution of an oil-based drilling or completion fluid

NOTE 1 Commonly used base oils are often termed “mineral oils”, “solvent oils” or “absorber oils” and also include the “diesel oils”.

NOTE 2 See Clause 15.

3.3

darcy

k

permeability of a porous medium, where one darcy is the flow of a single-phase fluid of 1 cP viscosity that completely fills the voids of the porous medium, flowing through the medium under conditions of viscous flow at a rate of $1 \text{ cm}^3 \cdot \text{s}^{-1} \cdot \text{cm}^{-2}$ cross-sectional area, and under a pressure or equivalent hydraulic gradient of $1 \text{ atm} \cdot \text{cm}^{-1}$

NOTE 1 cP = 1 mPa.s.

3.4

flash side

side containing residue (“flash”) from stamping and with concave indentations

3.5

quarter, verb

mix and divide into four specimens to assure homogeneity of specimens

3.6

spurt loss

volume of fluid that passes through the filtration medium before a filter cake is formed

3.7

tube sampling

sampling method comprising withdrawal of powdered sample from bag or bulk via a cylindrical device pushed into the sample, locked shut and withdrawn

2) To be published. (Revision of ISO 13500:2006)

4 Symbols and abbreviations

AA	atomic absorption spectroscopy
ACS	American Chemical Society
API	American Petroleum Institute
ASTM	American Society for Testing and Materials
BB	ball bearings
C	concentration
$C_{B,A}$	concentration of bentonite, in kilograms per cubic metre;
$C_{B,B}$	concentration of bentonite, in pounds per barrel;
$C_{DS,A}$	is the concentration of drilled solids, in kilograms per cubic metre
$C_{DS,B}$	is the concentration of drilled solids, in pounds per barrel
$C_{LG,A}$	concentration of low gravity solids, in kilograms per cubic metre;
$C_{LG,B}$	concentration of low gravity solids, in pounds per barrel;
$C_{MBT-AVE}$	average methylene blue capacity for all low-gravity solids, in milliequivalents per hundred grams (meq/100 g)
C_{MBT-B}	methylene blue capacity of commercial bentonite, in milliequivalents per hundred grams (meq/100 g)
C_{MBT-DS}	methylene blue capacity of drill solids, in milliequivalents per hundred grams (meq/100 g)
CAS	Chemical Abstracts Service, a division of ACS
d	inner diameter
D	outer diameter
DCP	direct current plasma
DS	drill solids
$E_{BE,A}$	bentonite equivalent, expressed in kilograms per cubic metre
$E_{BE,B}$	bentonite equivalent, expressed in pounds per barrel;
e	thinner efficiency, in percent
EDTA	ethylenediaminetetraacetic acid
F_{PI}	the performance index (mathematical symbol)
H_c	corrected hydrometer reading (the hydrometer reading minus composite correction)
HTHP	high-temperature, high-pressure
ICP	inductively coupled plasma

IP	standards issued by Energy Institute (formerly, Institute of Petroleum)
ISA	ionic strength adjuster
ISE	ion-selective electrode
LGS	low-gravity solids
MBT	methylene blue test
a	abrasion, in milligrams per minute
$G_{10\text{ s}}$	10 s gel reading
$G_{10\text{ min}}$	10 min gel reading
l	effective depth of hydrometer, in centimetres (see Table 2)
m_{As}	mass of arsenic in the digested sample, in micrograms
m_{b}	initial blade mass, in milligrams
m_{B}	mass of a commercial bentonite sample, in grams
m_{h}	mass of water required for solids adjustment, in grams
m_{l}	specified mass of suspension, in grams
m_{d}	mass of a dry sample, in grams
m_{DS}	mass of drill solids sample, in grams
m_{f}	final blade mass, in milligrams
m_{Hg}	mass of mercury in the digested sample, in micrograms
m_{O}	mass of original sample, in grams
m_{r}	mass of residue, in grams
m_{s}	mass of sample, in grams
PAC-HV	high-viscosity polyanionic cellulose
PAC-LV	low-viscosity polyanionic cellulose
PI	performance index
P_{df}	phenolphthalein alkalinity of the drilling fluid
PPA	permeability plugging apparatus
PPT	permeability plugging test
p_{r}	performance of reference thinner, for example yield point or gel strength as determined in accordance with ISO 10414-1
p_{s}	performance of test sample, for example yield point or gel strength as determined in accordance with ISO 10414-1

PTFE	polytetrafluoroethylene
t_1	time at initial reading, in minutes
t_2	time at final reading, in minutes
w_{As}	mass fraction of arsenic in the sample, in micrograms per gram
w_{Cd}	mass fraction of cadmium in the sample, in micrograms per gram
w_{d}	mass fraction of sample in suspension, in percent
w_{h}	moisture content, as percent mass fraction
w_{s}	mass fraction of solids, in percent
w_{Hg}	mass fraction of mercury in the sample, in micrograms per gram
w_{f}	part of material finer than the sieve, in percent (mass fraction)
w_{Pb}	mass fraction of lead in the sample, in micrograms per gram
w_{r}	mass recovery (mass residue), expressed as a mass fraction in percent
t	time, in minutes
V	volume of methylene blue solution used in titration, in millilitres
V_{c}	volume of filtrate collected between 7,5 min and 30 min, in millilitres
V_{f}	corrected volume of filtrate, in millilitres
V_{o}	volume of solution, in millilitres
V_{s}	volume of sample, in millilitres
V_{PPT}	PPT volume, in millilitres
V_1	spurt loss, in millilitres
$V_{7,5}$	filtrate volume after 7,5 min, in millilitres
V_{30}	filtrate volume after 30 min, in millilitres
v_{f}	static filtration rate (velocity of flow), in millilitres per minute
Y_{p}	yield point, in pascals
ρ	density, in grams per millilitre
ρ_{Cd}	density of cadmium in the digested sample, in micrograms per millilitre
ρ_{Pb}	density of lead in the digested sample, in micrograms per millilitre
η	viscosity of water at test temperature, in centipoise (cP) (see Table 1)
η_{A}	apparent viscosity
η_{P}	plastic viscosity, in centipoise
η_{600}	viscosity reading at 600 r/min, in millipascal seconds

5 Barite

5.1 Principle

Fines are the particles of 2 µm to 10 µm equivalent spherical diameter and are considered detrimental to drilling fluids at high concentrations. Both sieve analysis and sedimentation methods for determining fines concentration are described in 5.2 to 5.6.

5.2 Reagents and apparatus

5.2.1 Dispersant solution.

Prepare a solution of 40 g sodium hexametaphosphate and approximately 3,6 g sodium carbonate diluted to 1 l with deionized or distilled water. Sodium carbonate is used to adjust the pH of the solution to 9,0 or slightly less. After the initial pH adjustment, check the pH each day the solution is used. When the pH falls below 8,0, discard the solution.

5.2.2 Oven, capable of maintaining a temperature of 105 °C ± 3 °C (220 °F ± 5 °F).

5.2.3 Mixer, capable of operation at 11 500 r/min ± 300 r/min under load, with single corrugated impeller approximately 25,4 mm (1 in) in diameter³⁾.

5.2.4 Container, for mixing, 180 mm (7-1/8 in) deep, $d = 97$ mm (3-3/4 in) at top and 70 mm (2-3/4 in) at bottom⁴⁾.

5.2.5 Sieves, of mesh sizes 75 µm, 45 µm and 30 µm, having a diameter of 76 mm (3,0 in) and a depth of 64 mm (2,5 in) from the top of the frame to the wire cloth.

5.2.6 Stopwatch, with direct-reading counter and an accuracy of 0 min to 25 min over the test interval.

5.2.7 Stopper, rubber, size 13 [diameters 68 mm (2-2/3 in) top and 58 mm (2-1/4 in) bottom].

5.2.8 Wash bottles, one containing 125 ml dispersant solution diluted to 1 l with deionized water, and one with deionized water.

5.2.9 Balance, accuracy ± 0,01 g.

5.2.10 Thermometer, with a scale reading 16 °C to 32 °C (60 °F to 90 °F), accurate to 0,5 °C (1 °F).

5.2.11 Beaker, 250 ml.

5.2.12 Water bath or constant-temperature room, capable of maintaining a convenient constant temperature at or near 20 °C (68 °F).

5.2.13 Cylinder, glass sedimentation, 457 mm (18,0 in) high and 63,5 mm (2,5 in) in diameter, and marked for a volume of 1 l (see ASTM D 422).

5.2.14 Hydrometer, ASTM No. 151H, conforming to ASTM E 100, graduated to read the specific gravity of the suspension.

3) Multimixer Model 9B with B29 impeller is an example of a suitable product available commercially. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of this product.

4) Hamilton Beach Mixer Cup No. M110-D is an example of a suitable product available commercially. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of this product.

5.2.15 Dishes, evaporating.

5.2.16 Spatulas, laboratory, of assorted sizes.

5.2.17 Desiccator, with calcium sulfate (CAS number 7778-18-9) desiccant, or equivalent.

5.2.18 Spray nozzle⁵⁾.

5.3 Sampling

Obtain four samples of approximately 10 g and one sample of approximately 80 g of the barite by tube sampling and quartering.

5.4 Calculation of moisture content

5.4.1 Weigh $10\text{ g} \pm 0,01\text{ g}$ of the barite obtained in 5.3.

5.4.2 Dry to constant mass at a temperature of $105\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ ($220\text{ }^{\circ}\text{F} \pm 5\text{ }^{\circ}\text{F}$).

5.4.3 Cool the sample in a desiccator and weigh.

5.4.4 Calculate w_h , the moisture content, expressed as a percent (mass fraction), from Equation (1):

$$w_h = 100 \frac{m_o - m_d}{m_o} \quad (1)$$

iTeh STANDARD PREVIEW
(standards.iteh.ai)

where

m_o is the mass of original sample, expressed in grams;

m_d is the mass of dry sample, expressed in grams.

5.5 Sieve analysis

5.5.1 Weigh $10\text{ g} \pm 0,01\text{ g}$ of the barite obtained in 5.3, and place it in a mixing container. Add 44 ml of dispersant solution. Hand-stir the sample and dilute to approximately 350 ml with deionized water. Stir 5 min on the mixer.

5.5.2 Wash the sample with the diluted dispersant solution onto a 75 μm mesh sieve. Continue to wash with approximately 400 ml of the dilute dispersant solution using a wash bottle. Then wash the material on the screen using tap water from a spray nozzle at 70 kPa (10 psi) for 2 min. While washing, allow the elbow bend of the nozzle to rest on the rim of the sieve and move the spray of water repeatedly over the surface of the screen. After tap-water washing, wash the sample at least twice with deionized water; then transfer the residue from the screen to a tared evaporating dish, using deionized water to remove the residue from the screen.

5.5.3 Dry the residue in the oven to constant mass, cool in a desiccator. Weigh to $\pm 0,01\text{ g}$.

5.5.4 Repeat 5.5.1, 5.5.2, and 5.5.3 using 45 μm and 30 μm mesh sieves with separate barite samples.

5) Spraying Systems Company No. TG 6.5 tip with 1/4 TT body is the trade name of a suitable product supplied by Spraying Systems. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.