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Addendum 2

Introduction, 5th paragraph: The paragraph shall be changed to the following:

Annex A (informative) concerning use of the API Monogram by Licensees is now purposely blank; refer to Annex A of API Specification Q1. Annex B provides the test precision, Annex C (informative) details examples of calculations, and Annex D discusses the API Reference Material Program.

Section 1 (Scope): The last sentence shall be replaced with the following:

Annex A (informative) on the API Monogram Program is now purposely blank; refer to Annex A of API Specification Q1..

Section 5.2.11: The section shall be replaced with the following:

The user shall perform in-house verification of the reference material program samples of test calibration barite and/or (where applicable) reference (calibration) bentonite for properties listed on the reference material's certificates of analysis or lot label, as required by this standard.

These results shall be within the "reproducibility limit (interlab)" listed in Table B.1 and Table B.3 for the value listed on the certificate of analysis or lot label. An example calculation is provided in Annex B for test calibration barite and reference (calibration) bentonite.

Section 6: The section shall be replaced with the following:

6 Packaging and Marking—Bagged and Bulk Material

6.1 Description

The manufacturer shall develop and maintain a procedure for packaging and marking of drilling fluid products that conform to this specification.

Packaging should preserve products used in drilling fluids, completion fluids, and oil well cements, including dry, powdered, or granular products not covered under this standard. Marking shall identify the product in each package or bulk container.

Packaging of palletized goods should safeguard the safe handling, transport, storage, and identification and minimizes damage and spillage.

NOTE Drilling fluid products may be supplied in unpackaged pneumatically conveyed bulk, bulk bags, multi-wallpaper sacks, or cardboard boxes.

6.2 Apparatus—Pallets

The preferred pallet design and construction shall conform to ISO 6780.

Unless otherwise agreed between the manufacturer and purchaser, the sizes for wooden chemical industry pallets (CP) shall be one of the following:

- a) 120 cm × 100 cm (47 in. × 39 in.) CP6;
- b) 114 cm × 114 cm (45 in. × 45 in.) CP8/CP9/CP3;
- c) 122 cm × 122 cm (48 in. × 48 in.);
- d) 112 cm × 130 cm (44 in. × 52 in.);
- e) 110 cm × 130 cm (42 in. × 52 in.), equivalent to CP4/CP7;
- f) 102 mm × 122 mm (40 in. × 48 in.).

NOTE CP number is the size of a chemical industry pallet as defined in ISO 6780.

When practicable, packed material shall be inside the dimensions of the pallet. The maximum outside dimensions of the total package shall be in accordance with the applicable pallet size plus a maximum overhang of 30 mm (1.2 in.). The overall height shall not exceed 2.0 m (80 in.).

The maximum net mass shall not exceed 2000 kg (4400 lb) unless agreed upon by the manufacturer and the customer.

6.3 Apparatus— Super Sacks and Bulk Bags

Super sacks and bulk bags [flexible intermediate bulk container (FIBC) commonly named “big bag”] shall be resistant to moisture and damage in order to provide safe handling, transport, and storage of the product.

Super sacks and bulk bags should be selected with consideration for humidity-barrier capabilities relative to the needs of the specific product.

NOTE Drilling fluid product sacks are typically constructed with multiple layers of paper and plastic (usually polyethylene or polypropylene) between paper layers.

6.4 Marking—Palletized Material

Unless otherwise specified by contract, marking of product on pallets shall include the following:

- a) manufacturer or customer trade name, or for barite as per API grade (Barite 4.x g/mL);
- b) gross/net mass, in kilograms (pounds);
- c) other information as specified by the manufacturer or in the contract, such as generic product’s name, gross allowable mass, lot/batch number, date of manufacture, regulatory, transportation, and health, environmental and safety information.

6.5 Marking—Super Sacks and Bulk Bags

Marking for super sacks and bulk bags shall include the following:

- a) manufacturer or customer trade name, or for barite as per API grade (Barite 4.x g/mL);
- b) net mass, in kilograms (pounds);

c) lot/batch number traceable to the manufacturer's facility and country of origin.

6.6 Marking—Bulk Products

Marking requirements for bulk products shall be marked on or attached to the bill of lading/delivery ticket and shall include the following:

- a) manufacturer's product name, or for barite as per API grade (Barite 4.x g/mL);
- b) net mass, in kilograms (pounds);
- c) lot/batch number traceable to the manufacturer's country of origin.

6.7 Pallet Covers

When required by customer orders or environmental conditions, each unit of palletized material shall include a cover to further protect the material from external conditions that can result in damage to the product.

Examples of materials commonly used in pallet covers include:

- a) polyethylene (PE) shrink or wrapped film;
- b) PE bonnet type;
- c) polypropylene (PP) bonnet type.

Plastic used in a pallet cover shall be UV stabilized.

NOTE Cardboard, carton, or wood covers may be used in place of the above. If needed, a bottom layer of cardboard, PE sheet, or plywood may be connected to the cover to unitize the overall package.

6.8 Super Sack and Bulk Bag Mass

Each super sack or bulk bag shall contain a specified net mass $\pm 5\%$. The average mass of 5 % of all super sacks and bulk bags in a shipment, taken at random, shall not be less than the specified mass.

6.9 Storage

The manufacturer shall provide to the customer specific product storage requirements that can prevent damage to the product.

6.10 Recycling

When practicable, recycling of the remaining product shall conform to manufacturer or customer instructions.

Super sacks and bulk bags shall be selected to allow for recycling of the packaging material.

NOTE When handling chemicals, reduction in the volume of packaging materials is possible by using dedicated reusable, refillable containers such as intermediate bulk container (IBC) totes for liquids, bulk bags, and hoppers, or pneumatic transfer silos and associated equipment.

Section 7.1.1: The first two sentences shall be replaced with the following:

7.1.1 Drilling-grade barite is produced from commercial barium sulfate containing ores. Specifications are provided in Table 2 for two density grades of barite: Barite 4.1 g/mL and Barite 4.2 g/mL. The manufacturer shall retain certificates of analysis or similar documentation on these commercial barium sulfate ores.

Section 7.1.2: The NOTE shall be change to the following:

NOTE API specifications for barite are for two density grades: Barite 4.1 g/mL and Barite 4.2 g/mL. Other than density, Barite 4.1 g/mL and Barite 4.2 g/mL have identical test specifications. Barite 4.1 g/mL grade may not be appropriate for higher mud weights and a performance evaluation with Barite 4.2 g/mL should be made to determine suitability.

Table 2: The table shall be replaced with the following:

Table 2—Barite Physical and Chemical Requirements

Requirement	Standard	
	Barite 4.1 g/mL	Barite 4.2 g/mL
Density	4.10 g/mL minimum	4.20 g/mL minimum
Water-soluble alkaline earth metals, as calcium	250 mg/kg, maximum	
Residue greater than 75 µm	maximum mass fraction 3.0 %	
Particles less than 6 µm in equivalent spherical diameter	maximum mass fraction 30 %	

Annex A: The entire annex after the title shall be replaced with the following:

The information in this annex has been intentionally removed.

See API Specification Q1, Annex A or the API website for information pertaining to the API Monogram Program and use of the API Monogram on applicable products.

Section B.1.2: The two paragraphs in the section shall be changed to the following:

The precision data in Tables B.1 through B.10 reflect the fact that the standard test methods are subject to normal test variability. This variability can lead to conflicts between a manufacturer and a user based on their respective test results on the same sample of material.

The precision data indicate the maximum expected difference between two test results on the same sample, both within and between laboratories, at the 95 % confidence level (see B.5 and Tables B.11 and B.12).

Section B.2: The first paragraph shall be replaced with the following:

The limits in Tables B.1, B.3, B.4, B.5, B.9, and B.10 were determined from interlaboratory studies conducted from 1988 to 1991. The data analysis is given in API Reports 88-30, 89-30, 90-30, and 92-30. The studies were designed and conducted by an independent consulting laboratory under contract to API. The project was overseen by a Technical Advisory Committee of API Committee C3/SC13. The limits in Tables B.2, B.6, and B.7 were determined from interlaboratory studies conducted in 1992 (API Report 92-30).

Table B.6: The table shall and its associated paragraph shall be deleted.

Tables B.1 through B.11 shall be replaced by the following Tables B.1 to B.10 and their associated paragraphs:

The values in Table B.1 were determined from a study conducted in 1988 and 1989 [API Reports 89-30 (1990) and 90-30 (1992)]. Each of the 12 laboratories repeatedly tested the same three samples once each day for three days. Each test result is the result of a single determination.

Table B.1—Test Precision for Barite

Test	Repeatability Limit (intralab)	Reproducibility Limit (interlab)
Density	0.022 g/mL	0.030 g/mL
Water-soluble alkaline earth metals, as calcium	9.2 mg/kg	23.0 mg/kg
Residue greater than 75 μm	0.22 %	0.50 %
Particles less than 6 μm in equivalent spherical diameter	1.7 %	2.5 %

The values in Table B.2 were determined from a study conducted in 1992 [API Report 92-30 (1993)]. Each of the seven laboratories repeatedly tested the same two samples once each day for three days. Each test result is the result of a single determination.

Table B.2—Test Precision for Hematite

Test	Repeatability Limit (intralab)	Reproducibility Limit (interlab)
Density	0.026 g/mL	0.050 g/mL
* Water-soluble alkaline earth metals, as calcium	9.2 mg/kg	23.0 mg/kg
Residue greater than 75 μm	0.16 %	0.36 %
Residue greater than 45 μm	0.6 %	3.2 %
Particles of diameter less than 6 μm	0.9 %	3.4 %
* Values for barite used		

The values in Table B.3 were determined from a study conducted in 1989 [API Reports 89-30 (1990) and 90-30 (1992)]. Each of the eight laboratories repeatedly tested the same two samples once each day for three days. Each test result is the result of a single determination.

Table B.3—Test Precision for Bentonite

Test	Repeatability Limit (intralab)	Reproducibility Limit (interlab)
Suspension properties		
Viscometer dial reading at 600 r/min	2.9	6.3
Yield point-plastic viscosity ratio	0.16	0.25
Filtrate volume	0.8 mL	1.3 mL
Residue greater than 75 μm	0.7 %	1.3 %

The values in Table B.4 were determined from a study conducted in 1989 [API Reports 89-30 (1990) and 90-30 (1992)]. Each of the eight laboratories repeatedly tested the same two samples once each day for three days. Each test result is the result of a single determination.

Table B.4—Test Precision for Non-treated Bentonite

Test	Repeatability Limit (intralab)	Reproducibility Limit (interlab)
Suspension properties		
Yield point-plastic viscosity ratio	0.15	0.25
Dispersed plastic viscosity	2.1 cP	3.1 cP
Dispersed filtrate volume	0.9 mL	1.5 mL

The values in Table B.5 were determined from a study conducted in 1991 [API Report 90-30 (1992)]. Each of the seven laboratories repeatedly tested the same two samples once each day for three days. Each test result is the result of a single determination.

Table B.5—Test Precision for OCMA-grade Bentonite

Test	Repeatability Limit (intralab)	Reproducibility Limit (interlab)
Suspension properties		
Viscometer dial reading at 600 r/min	4.9	9.3
Yield point-plastic viscosity ratio	1.15	1.16
Filtrate volume	0.8 mL	1.6 mL
Residue greater than 75 μ m	0.5 %	1.1 %

The values in Table B.6 were determined from a study conducted in 1992 [API Report 92-30 (1993)]. Each of the five laboratories repeatedly tested the same two samples once each day for three days for all properties except moisture content. Only four laboratories participated in the moisture test. Each test result is the result of a single determination.

Table B.6—Test Precision for Attapulgate

Test	Repeatability Limit (intralab)	Reproducibility Limit (interlab)
Suspension properties		
Viscometer dial reading at 600 r/min	3.2	6.8
Residue greater than 75 μ m	0.6 %	1.0 %
Moisture mass fraction	1.5 %	2.1 %

The values in Table B.7 were determined from a study conducted in 1992 [API Report 92-30 (1993)]. Each of the four laboratories repeatedly tested the same two samples once each day for three days. Each test result is the result of a single determination.

Table B.7—Test Precision for Sepiolite

Test	Repeatability Limit (intralab)	Reproducibility Limit (interlab)
Suspension properties		
Viscometer dial reading at 600 r/min	4.5	5.6
Residue greater than 75 μm	0.3 %	0.8 %
Moisture mass fraction	1.6 %	1.6 %

The values in Table B.8 were determined from a study conducted in 1991 [API Report 90-30 (1992)]. For the viscometer dial reading at 600 r/min test, each of the eight laboratories repeatedly tested the same two samples once each day for three days. Each viscometer 600 r/min test result was the result of a single determination. For the filtrate volume test, each of the six laboratories repeatedly tested the same two samples once each day for three days. Each filtrate volume test result is an average of two determinations.

Table B.8—Test Precision for CMC-LVT

Test	Repeatability Limit (intralab)	Reproducibility Limit (interlab)
Suspension properties		
Viscometer dial reading at 600 r/min	2.6	5.1
Filtrate volume	0.9 mL	1.6 mL

The values in Table B.9 were determined from a study conducted in 1991 [API Report 90-30 (1992)]. For the viscosity reading at 600 r/min tests, each of the nine laboratories repeatedly tested the same two samples once each day for three days. Each viscometer result was the result of a single test. For the filtrate volume test, each of the seven laboratories repeatedly tested the same two samples once each day for three days. Each filtrate test result is an average of two determinations.

Table B.9—Test Precision for CMC-HVT

Test	Repeatability Limit (intralab)	Reproducibility Limit (interlab)
Suspension properties		
Viscometer dial reading at 600 r/min		
— in distilled water	2.4	4.8
— in 40 g/L salt water	2.1	5.8
— in saturated salt water	3.0	5.6
Filtrate volume	0.6 mL	1.9 mL

The values in Table B.10 were determined from a study conducted in 1991 [API Report 90-30 (1992)]. For the 40 g/L saltwater viscometer dial reading at 600 r/min test, each of the eight laboratories repeatedly tested the same two samples once each day for three days. For the saturated saltwater tests, each of the seven laboratories repeatedly tested the same two samples once each day for three days. For the 40 g/L saltwater filtrate volume test, each of the seven laboratories repeatedly tested the same two samples once each day for three days. For the saturated saltwater tests, each test result is an average of two determinations.

Table B.10—Test Precision for Starch

Test	Repeatability Limit (intralab)	Reproducibility Limit (interlab)
Suspension properties		
Viscometer dial reading at 600 r/min		
— in 40 g/L salt water	2.0	7.1
— in saturated salt water	1.5	4.9
Filtrate volume		
— in 40 g/L salt water	0.7 mL	2.3 mL
— in saturated salt water	0.6 mL	1.5 mL

Section B.5: The following section and tables shall be added:

B.5 Example Calibration Allowable Results

As stated in 5.2.11 and 5.3.11, calibration requires that in-house verification testing results be done using the reference material program samples of test calibration barite and/or reference (calibration) bentonite. These results must be within the “reproducibility limit (interlab)” listed in Table B.1 (barite) and Table B.4 (non-treated bentonite) for the value listed on the certificate of analysis or lot label of the reference material. Tables B.11 and B.12 show examples of the in-house verification allowable test results.

NOTE Some older reference material labels show the range of results from the round-robin qualification testing. These round-robin values are not used for in-house verification testing compliance. The Table B.1 or Table B.4 “reproducibility limit (interlab)” values are used to determine the range of acceptable results.

Table B.11—Calibration Barite Example In-House Verification Allowable Results

Test Calibration Barite	Lot: 005 COA/Label Value	Table B.1 Reproducibility Limit (interlab)	Acceptable Range for In-house Calibration Test Results
Density, g/mL	4.22	± 0.030	4.19 to 4.25
Water-soluble alkaline earth metals, as calcium, mg/kg	81.6	± 23.0	58.6 to 104.6
Residue greater than 75 µm, wt %	0.85	± 0.50	0.35 to 1.35
Particles less than 6 µm in equiv. spherical diameter, wt %	18.9	± 2.5	16.4 to 21.4

Table B.12—Reference (Calibration) Bentonite Example In-house Verification Allowable Results

Reference (Calibration) Bentonite	Lot: 6-2013 COA/Label Value	Table B.3 Reproducibility Limit (interlab)	Acceptable Range for In-house Calibration Test Results
Yield point-plastic viscosity ratio	0.84	± 0.25	0.59 to 1.09
Dispersed plastic viscosity, cP	15.37	± 3.1	12.3 to 18.5
Dispersed filtrate volume, mL	10.4	± 1.5	8.9 to 11.9

Section D.3.1: The section shall be changed to the following:

The following are the requirements for calibration materials necessary to comply with this standard.

The standard reference materials are untreated, mined, natural-occurring minerals not subject to shelf-life limits as long as the sample remains in original packaging that has not deteriorated functionally or has been subjected to storage conditions that result in prolonged exposure to direct sunlight, extreme temperature variations, or excessive moisture conditions by improper container closure.

Section D.5: The following section shall be added:

D.5 Reference Material Label

The reference material program has had several custodians in the past, and some lots of reference materials have differently formatted labels.

D.5.1 Label Format

At a minimum, reference materials will have labels that contain the following information.

- a) reference material name;
- b) reference material lot number;
- c) packaging date;
- d) net weight;
- e) reference material certificate of analysis (label) values:
 - 1) for test calibration barite and reference (calibration) bentonite, round-robin average properties values;
 - 2) for standard evaluation base clay (SEBC), typical physical properties.

D.5.2 Replacement Label

If a label has deteriorated or come off the container, a replacement label should be used that transfers the following information from the original label to the new label:

- 1) reference material name;
- 2) reference material lot number;

- 3) packaging date (if listed); and
- 4) reference material certificate of analysis (label) values for test calibration barite and reference (calibration) bentonite or typical physical properties for SEBC.

If all of this information is not available and listed on the replacement label, the reference material sample shall not be used for in-house verification testing.

NOTE Some older reference material labels show the range of results from the round-robin qualification testing. These round-robin values are not used for in-house verification testing compliance. The Table B.1 or Table B.4 "reproducibility limit (interlab)" values are used to determine the range of acceptable results.

Bibliography: The following references shall be added:

- [14] API Specification Q1, *Specification for Quality Management System Requirements for Manufacturing Organizations for the Petroleum and Natural Gas Industry*, 9th Edition, amendments and changes through Errata 3 (October 2019)
- [15] API Report 92-30, *Specification Parameters Determination Drilling Fluids Materials*, 1993
- [16] ISO 21898, *Packaging—Flexible intermediate bulk containers (FIBCs) for non-dangerous goods*