

# Particle Size Distribution Analysis for Ceramic Pot Water filter production

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## **Abstract:**

**To develop a standard Particle Distribution Analysis testing protocol for use in Ceramic Pot Water Filter factories.**

## **Introduction:**

Ceramic Pot Water filters are generally manufactured from sources of raw clay that vary in their consistency, some factories have begun using particle distribution analysis to qualify clay batches, as well as for blending multiple clay sources in order to maintain a more homogeneous clay body.

In order to promote common testing methods between factories, we have begun herein to develop testing protocols that utilize widely available apparatus and materials. It is desirable to develop an effective test that is easily accessible to individuals with limited laboratory experience. This test must be able to be performed in extremely rudimentary conditions with limited resources while presenting reliably accurate results.

We hope that by establishing stabilized testing standards specific to filter production the test data will be useful in comparing clay bodies between all participating filter factories. We find that difficulties in ensuring that identical lab equipment is used (cylinder dimensions) may make it difficult to accurately compare results across different factories.

Several standards already exist for soil classification; particles can be classified into categories of Clay, Silt or Sand. These categories are demarcated recognizing that suspended particle size is in direct relationship to settling time. For our purposes, we established a baseline for classification by comparing other standards and examining the results of our tests.

<b><u>Particle Size Classification Standards</u></b>			
	<b><u>USDA</u></b>	<b><u>ISSS</u></b>	<b><u>PWB</u></b>
<b>Sand</b>	< 2 min	< 12 min	< 2 min
<b>Silt</b>	< 24 hrs	< 24 hrs	< 24 hrs
<b>Clay</b>	Over 24 hrs	Over 24 hrs	Over 24 hrs

Although it is useful for general comparisons to define the samples by the three categories (Sand, Silt, Clay), for the purposes of detailed clay sample comparison, it is better to collect data from various particle sizes, thus developing a curve of particle size distribution. For this reason we tested samples at 13 different time intervals: 30 seconds, 1 minute, 2 minutes, 5 minutes, 10 minutes, 15 minutes, 30 minutes, 1 hour, 2 hours, 4 hours, 6 hours, 8 hours, and 24 hours.

Having this expanded range of sample data allows us to compare samples in greater detail. These times were also chosen in order to complete the test within an 8 hour work day.

\*Note 1: Samples in Appendix 2 (Raw Data) which fall outside the standard testing procedure (Those prepared 24 or 48 hours before testing) were excluded from the final averages as there was significant variation in their results.

It would have been interesting to use the results gathered to compare particle distribution results to burnout mixture ratios used in the participating factories. This proprietary information did not receive specific approval prior to publication.

## Potters Without Borders

# STANDARD TEST METHOD for PARTICLE SIZE DISTRIBUTION ANALYSIS

VERSION NUMBER 1.1

Version Date: 2012/09/20

## SCOPE

Particle size distribution analysis for the purpose of monitoring raw clay bodies used in the production of Ceramic Water Filters (CWFs).

## PRINCIPLE

Clay consists of an assembly of particles of various shapes and sizes. The object of a particle size analysis is to group these particles into separate ranges of sizes.

The method employs sedimentation of a soil/water/dispersant suspension to separate the particles. The sedimentation technique is based on an application of Stokes' law to a soil/water suspension and periodic measurement of the density of the suspension.

## SPECIAL APPARATUS

- Soil hydrometer (**ASTM 152H hydrometer**). (\*See Note 2)
- Identical graduated cylinders with internal depths of  $340 \pm 20$  mm and capacity of 1 L. (\*See Note 3)
- Interval timer
- Immersion Thermometer
- Gram Scale accurate to 0.1 grams

## REAGENTS

### 25% sodium hexametaphosphate (Calgon)

Crush 250 g of sodium hexametaphosphate into a clean, dry, receptacle. Place 900 mL of distilled water into a pan and gently heat, do not boil. Add sodium hexametaphosphate slowly while stirring, make sure it is fully dissolved. Remove solution from heat, pour into a graduated cylinder. Top up with distilled water to complete 1 Litre.

## SAMPLE PREPARATION

Care must be taken that samples collected from clay batches reflect the entire batch as much as possible. Take your samples from a variety of areas within the batch.

Raw clay is dried and milled (crushed, hammermilled, or disc milled) passing through normal factory procedure for preparation in use in CWF production. The samples must be very dry and consistent with normal factory use.

## **DISPERSION AND SOAKING**

### Preparation of "Blank Solution":

Place 980 ml of distilled water in a graduated cylinder and label it "Blank Solution"

Add 20 ml of 25% Sodium Hexametaphosphate solution.

Take hydrometer and temperature readings (to the nearest 0.5 °C) from the blank solution throughout the duration of the "Clay Suspension" test. Read the hydrometer at the top of the meniscus.

Use these readings to calibrate the results of the other tests.

### Preparation of "Clay Suspension":

Place 50 g of air-dry clay into a clean, dry, sealed container.

Add 200 ml of distilled water and 20 mL of 25% sodium hexametaphosphate solution.

Shake well then let soak for 1 hour, occasionally agitating to disperse particles.

### Testing procedure:

1. Place prepared clay suspension in clean graduated cylinder and top up distilled water to the 1 litre mark.
2. Stir with a plunger for 20–30 seconds ensuring that all material at the bottom is brought into suspension. At the end of stirring, remove the plunger and immediately start the interval timer.
3. Immerse the hydrometer to a depth slightly below its floating position and allow it to float freely.
4. Take hydrometer and temperature readings according to "Schedule 1" below.
5. Repeat the 30 second reading 3 times and record the average.
6. Place the hydrometer into the "Clay Suspension" in advance of scheduled readings allowing time for it to settle before taking your readings.
7. Read at the top of the meniscus and record readings to the nearest 0.5 g/L.
8. After each reading from the "Clay Suspension" remove the hydrometer slowly, rinse clean and place in the "Blank Solution". The water temperature in the blank cylinder must be the same as that of the clay suspension.
9. At about the same time as each clay suspension hydrometer reading, take a hydrometer and temperature reading (to the nearest 0.5 °C) of the "Blank Solution". Read the hydrometer at the top of the meniscus. The hydrometer should be left in the blank solution between readings.

## Calculations:

Temperature corrected readings are achieved by subtracting readings from the blank cylinder from the clay suspension cylinder readings.

Example:

INDONESIA CLAY		30"
Hydrometer reading in clay suspension g/l		30.0
Temperature °C		19.3
Hydrometer reading in blank solution g/l		4.0
Corrected reading g/l		26.0
Percentage remaining in suspension		52%

Clay suspension reading - Blank solution reading = Corrected reading

$$30-4=26$$

<u>Schedule 1</u>		
	0:00:00	
30 seconds	0:00:30	sand
1 minute	0:01:00	sand
2 minutes	0:02:00	sand
5 minutes	0:05:00	silt
10 minutes	0:10:00	silt
30 minutes	0:30:00	silt
1 hour	1:00:00	silt
2 hours	2:00:00	silt
4 hours	4:00:00	silt
6 hours	6:00:00	silt
8 hours	8:00:00	silt
24 hours	24:00:00	silt
Remaining		clay

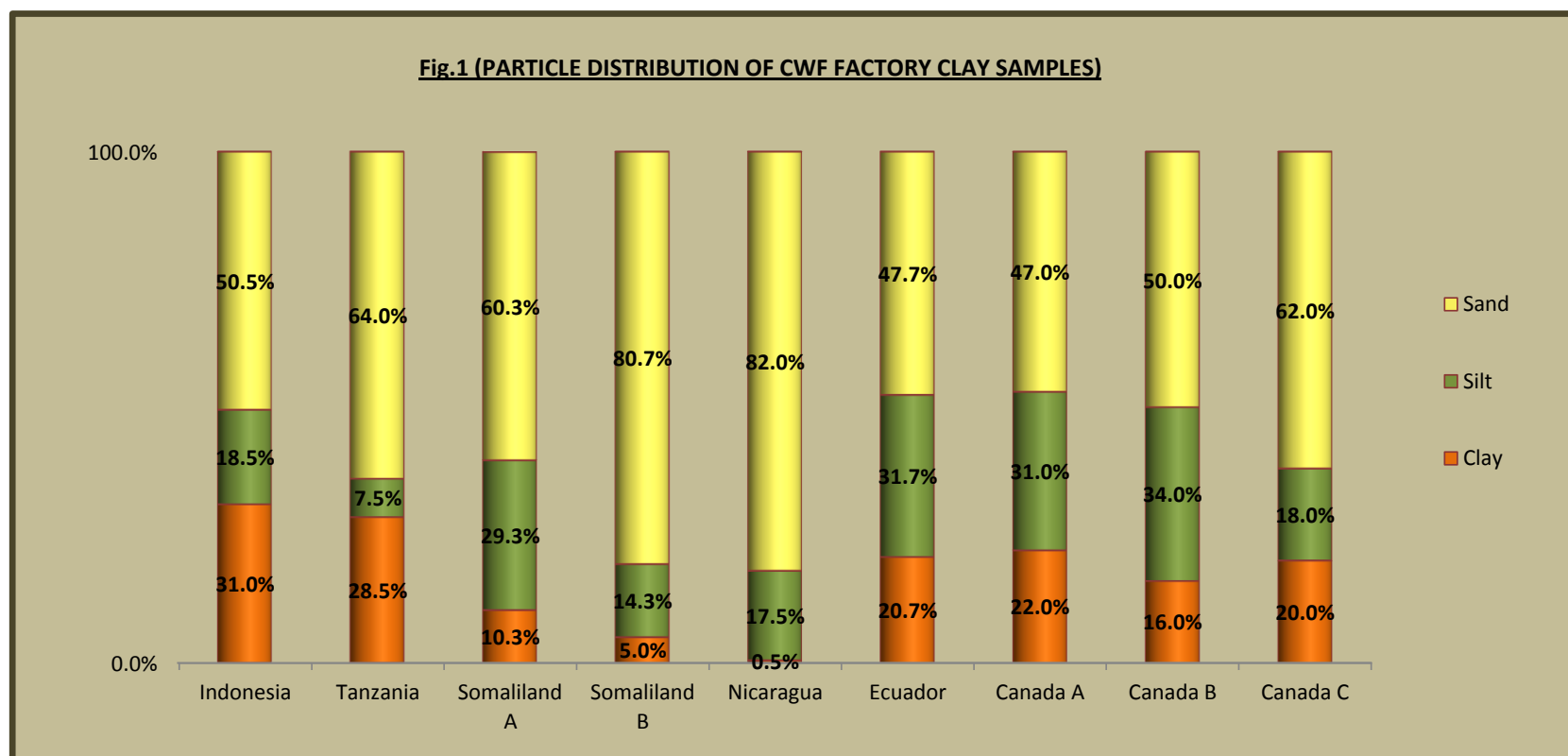
*\*Note 2: A 151H is graduated to read in specific gravity whereas, the 152H reads in grams per liter of suspension, both at 68° F (20° C).*

**ASTM Hydrometer 151H, range 0.995 to 1.038 S.G. by .001 divisions**

**ASTM Hydrometer 152H, range -5 to +60g/liter S.G. by 1g/ l divisions**

*\*Note 3: Cylinders must be completely transparent so that the hydrometer can be read accurately. Cylinders are of identical size because variations in cylinder dimensions affect results.*

	Indonesia	Tanzania	Somaliland A	Somaliland B	Nicaragua	Ecuador	Canada A	Canada B	Canada C
Sand	50.5%	64.0%	60.3%	80.7%	82.0%	47.7%	47.0%	50.0%	62.0%
Silt	18.5%	7.5%	29.3%	14.3%	17.5%	31.7%	31.0%	34.0%	18.0%
Clay	31.0%	28.5%	10.3%	5.0%	0.5%	20.7%	22.0%	16.0%	20.0%



**Indonesia:** Sample collected from PATH study, from a currently producing facility.

**Tanzania:** Sample collected from PATH study, from a currently producing facility.

**Somaliland A and B:** Sample collected from site from a currently producing facility. These two samples are blended to regulate variable sources.

**Nicaragua:** Sample collected from PATH study, from a currently producing facility. Although it is known that this sample contains relatively less clay than others, the extreme lack of clay causes us to suspect an error in sample collection.

**Ecuador:** Sample collected from site from a currently producing facility.

**Canada A:** A blend of industrial clay bodies procured in Canada to formulate filters in the PWB research facility.

**Canada B:** Raw clay collected from Bridgetown, Nova Scotia

**Canada C:** Raw clay collected from Truro, Nova Scotia

**RAW DATA - PARTICLE SIZE DISTRIBUTION ANALYSIS TESTS (See note: 1)**

INDONESIA CLAY		10"	30"	1'	2'	5'	10'	15'	30'	1h	2h	4h	6h	8h	24h	Observations	Classification	g	%
31/07/12	Hydrometer reading in clay suspension g/l	30.5	30.0	29.0	29.0	27.5	26.0	25.5	25.0	23.5	22.0	21.0	20.0	19.5	19.0	Clay prepared 1h before test	Sand Silt Clay	25.0	50
	Temperature °C	19.3	19.3	19.3	19.3	19.3	19.3	19.5	19.7	20.1	22.4	23.7	25.0	25.7	18.9			10.0	20
	Hydrometer reading in blank solution g/l	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5	3.0	4.0			15.0	30
	Corrected reading g/l	26.5	26.0	25.0	25.0	23.5	22.0	21.5	21.0	19.5	18.0	17.0	16.5	16.5	15.0			50.0	100
	Percentage remaining in suspension	53%	52%	50%	50%	47%	44%	43%	42%	39%	36%	34%	33%	33%	30%				
29/08/12	Hydrometer reading in clay suspension g/l	31.0	30.0	30.0	29.0	28.0	27.0	26.0	25.0	24.0	23.5	22.0	21.5	21.0	21.0	Clay prepared 1h before test	Sand Silt Clay	25.5	51
	Temperature °C	17.0	17.0	17.0	17.0	17.0	17.0	17.3	17.5	18.0	18.4	19.7	20.0	20.3	15.4			8.5	17
	Hydrometer reading in blank solution g/l	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.0	4.0	4.0	4.0	4.0	5.0			16.0	32
	Corrected reading g/l	26.5	25.5	25.5	24.5	23.5	22.5	21.5	20.5	20.0	19.5	18.0	17.5	17.0	16.0			50.0	100
	Percentage remaining in suspension	53%	51%	51%	49%	47%	45%	43%	41%	40%	39%	36%	35%	34%	32%				
TANZANIA CLAY		10"	30"	1'	2'	5'	10'	15'	30'	1h	2h	4h	6h	8h	24h	Observations	Classification	g	%
13/08/12	Hydrometer reading in clay suspension g/l	24.0	23.0	22.5	22.0	21.0	20.0	20.0	19.5	19.0	19.0	18.5	18.0	17.5	18.5	Clay prepared 1h before test	Sand Silt Clay	32.0	64
	Temperature °C	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.7	22.8	23.0	23.7	24.8	26.1	20.0			3.5	7
	Hydrometer reading in blank solution g/l	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5	3.0	4.0			14.5	29
	Corrected reading g/l	20.0	19.0	18.5	18.0	17.0	16.0	16.0	15.5	15.0	15.0	14.5	14.5	14.5	14.5			50.0	100
	Percentage remaining in suspension	40%	38%	37%	36%	34%	32%	32%	31%	30%	30%	29%	29%	29%	29%				
30/08/12	Hydrometer reading in clay suspension g/l	26.0	24.5	23.5	23.0	22.0	21.0	20.5	20.5	20.0	19.5	19.0	18.0	18.0	19.0	Clay prepared 1h before test	Sand Silt Clay	32.0	64
	Temperature °C	16.9	16.9	16.9	16.9	16.9	16.9	17.1	17.3	17.6	18.7	20.4	22.4	22.6	16.9			4.0	8
	Hydrometer reading in blank solution g/l	5.0	5.0	5.0	5.0	5.0	5.0	4.5	4.5	4.5	4.0	4.0	4.0	4.0	5.0			14.0	28
	Corrected reading g/l	21.0	19.5	18.5	18.0	17.0	16.0	16.0	16.0	15.5	15.5	15.0	14.0	14.0	14.0			50.0	100
	Percentage remaining in suspension	42%	39%	37%	36%	34%	32%	32%	32%	31%	31%	30%	28%	28%	28%				
SOMALILAND A CLAY		10"	30"	1'	2'	5'	10'	15'	30'	1h	2h	4h	6h	8h	24h	Observations	Classification	g	%
17/07/12	Hydrometer reading in clay suspension g/l	30.0	26.0	25.0	23.0	22.0	20.0	19.0	18.0	17.0	16.0	14.0	13.0	12.0	12.0	Clay prepared 1h before test	Sand Silt Clay	31.0	62
	Temperature °C	19.9	19.9	20.0	20.0	20.0	20.0	20.2	20.4	20.9	21.7	23.1	23.3	23.5	20.8			11.0	22
	Hydrometer reading in blank solution g/l	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			8.0	16
	Corrected reading g/l	26.0	22.0	21.0	19.0	18.0	16.0	15.0	14.0	13.0	12.0	10.0	9.0	8.0	8.0			50.0	100
	Percentage remaining in suspension	52%	44%	42%	38%	36%	32%	30%	28%	26%	24%	20%	18%	16%	16%				
18/07/12	Hydrometer reading in clay suspension g/l	28.0	26.0	24.0	23.5	22.0	21.0	19.5	18.0	17.0	15.0	11.5	10.5	6.0	6.0	Clay prepared 48h before test	Sand Silt Clay	30.5	61
	Temperature °C	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.7	21.6	24.0	24.4	27.7	19.1			17.5	35
	Hydrometer reading in blank solution g/l	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5	3.5	3.0	4.0			2.0	4
	Corrected reading g/l	24.0	22.0	20.0	19.5	18.0	17.0	15.5	14.0	13.0	11.0	8.0	7.0	3.0	2.0			50.0	100
	Percentage remaining in suspension	48%	44%	40%	39%	36%	34%	31%	28%	26%	22%	16%	14%	6%	4%				
19/07/12	Hydrometer reading in clay suspension g/l	28.0	26.0	25.0	23.5	21.5	20.5	20.0	18.0	17.0	15.0	14.0	13.0	12.0	10.0	Clay prepared 1h before test	Sand Silt Clay	30.5	61
	Temperature °C	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.7	20.8	21.2	21.9	22.6	23.3	16.2			14.5	29
	Hydrometer reading in blank solution g/l	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0			5.0	10
	Corrected reading g/l	24.0	22.0	21.0	19.5	17.5	16.5	16.0	14.0	13.0	11.0	10.0	9.0	8.0	5.0			50.0	100
	Percentage remaining in suspension	48%	44%	42%	39%	35%	33%	32%	28%	26%	22%	20%	18%	16%	10%				
/08/12	Hydrometer reading in clay suspension g/l	29.0	27.0	27.0	25.0	24.0	23.0	22.0	21.0	19.0	17.5	15.0	13.0	11.0	7.0	Clay prepared 1h before test	Sand Silt	29.0	58
	Temperature °C	23.4	23.4	23.4	23.4	23.4	23.6	23.7	23.9	24.5	25.0	25.4	24.5	22.7	17.1			18.5	37
	Hydrometer reading in blank solution g/l	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5	3.5	3.5	3.5	4.0	4.5				



08/	Corrected reading g/l	25.0	23.0	23.0	21.0	20.0	19.0	18.0	17.0	15.5	14.0	11.5	9.5	7.0	2.5	before test	Clay	2.5	5
	Percentage remaining in suspension	50%	46%	46%	42%	40%	38%	36%	34%	31%	28%	23%	19%	14%	5%			50.0	100
	<b>SOMALILAND B CLAY</b>	10"	30"	1'	2'	5'	10'	15'	30'	1h	2h	4h	6h	8h	24h	Observations	Classification	g	%
15/07/12	Hydrometer reading in clay suspension g/l	20.0	16.0	14.0	13.5	12.0	11.0	10.5	10.0	9.0	8.0	7.0	6.5	6.0	6.0	Clay prepared 1h before test	Sand Silt Clay	40.5	81
	Temperature °C	19.9	19.9	20.0	20.0	20.1	20.2	20.4	20.6	21.6	23.3	27.1	27.4	27.5	20.2			7.5	15
	Hydrometer reading in blank solution g/l	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0	4.0			2.0	4
	Corrected reading g/l	16.0	12.0	10.0	9.5	8.0	7.0	6.5	6.0	5.0	4.0	4.0	3.5	3.0	2.0			50.0	100
	Percentage remaining in suspension	32%	24%	20%	19%	16%	14%	13%	12%	10%	8%	8%	7%	6%	4%				
24/07/12	Hydrometer reading in clay suspension g/l	19.0	16.0	15.0	14.0	13.0	12.0	11.0	10.5	11.0	10.0	8.0	8.0	8.0	8.0	Clay prepared 1h before test	Sand Silt Clay	40.0	80
	Temperature °C	20.6	20.6	20.9	20.9	20.9	21.0	21.0	21.0	21.4	21.9	22.2	22.6	21.7	17.4			6.5	13
	Hydrometer reading in blank solution g/l	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.5			3.5	7
	Corrected reading g/l	15.0	12.0	11.0	10.0	9.0	8.0	7.0	6.5	7.0	6.0	4.0	4.0	4.0	3.5			50.0	100
	Percentage remaining in suspension	30%	24%	22%	20%	18%	16%	14%	13%	14%	12%	8%	8%	8%	7%				
28/07/12	Hydrometer reading in clay suspension g/l	17.5	15.0	14.0	13.0	11.5	11.0	10.5	10.0	8.0	7.5	7.0	7.0	7.0	7.0	Clay prepared 1h before test	Sand Silt Clay	40.5	81
	Temperature °C	25.0	25.0	25.0	25.0	25.0	25.2	25.5	25.7	26.0	26.5	25.8	24.5	20.5	16.7			7.5	15
	Hydrometer reading in blank solution g/l	3.5	3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.5	4.0	5.0			2.0	4
	Corrected reading g/l	14.0	11.5	10.5	9.5	8.0	7.5	7.5	7.0	5.0	4.5	4.0	3.5	3.0	2.0			50.0	100
	Percentage remaining in suspension	28%	23%	21%	19%	16%	15%	15%	14%	10%	9%	8%	7%	6%	4%				
	<b>NICARAGUA CLAY</b>	10"	30"	1'	2'	5'	10'	15'	30'	1h	2h	4h	6h	8h	24h	Observations	Classification	g	%
09/08/12	Hydrometer reading in clay suspension g/l	20.0	17.0	15.0	14.0	11.0	9.5	9.0	8.0	7.0	5.5	5.0	4.0	4.0	4.5	Clay prepared 1h before test	Sand Silt Clay	40.0	80
	Temperature °C	20.7	20.7	20.7	20.7	20.7	21.2	21.2	21.2	22.5	23.8	25.1	26.0	24.6	19.0			9.5	19
	Hydrometer reading in blank solution g/l	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5	3.0	3.5	4.0			0.5	1
	Corrected reading g/l	16.0	13.0	11.0	10.0	7.0	5.5	5.0	4.0	3.0	1.5	1.5	1.0	0.5	0.5			50.0	100
	Percentage remaining in suspension	32%	26%	22%	20%	14%	11%	10%	8%	6%	3%	3%	2%	1%	1%				
11/08/12	Hydrometer reading in clay suspension g/l	17.0	16.0	14.0	12.0	10.0	9.0	8.0	7.0	6.0	5.0	4.8	4.5	4.0	4.0	Clay prepared 1h before test	Sand Silt Clay	42.0	84
	Temperature °C	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.3	21.6	22.0	23.1	23.6	23.7	20.4			8.0	16
	Hydrometer reading in blank solution g/l	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			0.0	0
	Corrected reading g/l	13.0	12.0	10.0	8.0	6.0	5.0	4.0	3.0	2.0	1.0	0.8	0.5	0.0	0.0			50.0	100
	Percentage remaining in suspension	26%	24%	20%	16%	12%	10%	8%	6%	4%	2%	2%	1%	0%	0%				
	<b>ECUADOR CLAY</b>	10"	30"	1'	2'	5'	10'	15'	30'	1h	2h	4h	6h	8h	24h	Observations	Classification	g	%
13/07/12	Hydrometer reading in clay suspension g/l	33.0	32.0	31.0	30.5	30.0	27.0	27.0	25.0	23.5	21.5	20.5	19.0	18.0	17.0	Clay prepared >24h before test	Sand Silt Clay	23.5	47
	Temperature °C	18.0	18.0	18.0	18.0	18.1	18.2	18.2	18.5	19.0	21.1	23.7	24.8	26.4	19.6			13.5	27
	Hydrometer reading in blank solution g/l	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5	3.0	4.0			13.0	26
	Corrected reading g/l	29.0	28.0	27.0	26.5	26.0	23.0	23.0	21.0	19.5	17.5	16.5	15.5	15.0	13.0			50.0	100
	Percentage remaining in suspension	58%	56%	54%	53%	52%	46%	46%	42%	39%	35%	33%	31%	30%	26%				
16/07/12	Hydrometer reading in clay suspension g/l	32.0	30.0	30.0	30.0	27.5	26.0	25.0	23.0	21.0	19.0	17.0	16.0	15.0	14.0	Clay prepared 1h before test	Sand Silt Clay	24.0	48
	Temperature °C	20.1	20.1	20.1	20.1	20.2	20.3	20.3	20.4	20.5	20.8	21.5	22.2	22.6	19.8			16.0	32
	Hydrometer reading in blank solution g/l	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			10.0	20
	Corrected reading g/l	28.0	26.0	26.0	26.0	23.5	22.0	21.0	19.0	17.0	15.0	13.0	12.0	11.0	10.0			50.0	100
	Percentage remaining in suspension	56%	52%	52%	52%	47%	44%	42%	38%	34%	30%	26%	24%	22%	20%				
23/07/12	Hydrometer reading in clay suspension g/l	32.0	31.0	31.0	30.0	29.0	27.0	26.0	24.0	22.0	20.0	18.0	17.0	15.5	15.0	Clay prepared 1h before test	Sand Silt Clay	24.0	48
	Temperature °C	20.6	20.6	20.6	20.6	21.0	21.1	21.3	21.5	21.8	23.1	25.7	26.0	26.5	19.4			15.0	30
	Hydrometer reading in blank solution g/l	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0	4.0			11.0	22
	Corrected reading g/l	28.0	27.0	27.0	26.0	25.0	23.0	22.0	20.0	18.0	16.0	15.0	14.0	12.5	11.0				

30/07/12	Percentage remaining in suspension	56%	54%	54%	52%	50%	46%	44%	40%	36%	32%	30%	28%	25%	22%	Clay prepared 1h before test	Sand Silt Clay	50.0	100
	Hydrometer reading in clay suspension g/l	33.0	32.5	32.0	31.0	29.0	28.0	27.0	23.0	21.0	19.0	17.0	16.0	15.0	14.0			23.5	47
	Temperature °C	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	18.0	19.0	22.1	24.2	24.7	18.0			16.5	33
	Hydrometer reading in blank solution g/l	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.0	4.0	4.0	3.5	3.5	4.0			10.0	20
	Corrected reading g/l	28.5	28.0	27.5	26.5	24.5	23.5	22.5	18.5	17.0	15.0	13.0	12.5	11.5	10.0			50.0	100
Percentage remaining in suspension	57%	56%	55%	53%	49%	47%	45%	37%	34%	30%	26%	25%	23%	20%			50.0	100	
CANADA A CLAY		10"	30"	1'	2'	5'	10'	15'	30'	1h	2h	4h	6h	8h	24h	Observations	Classification	g	%
11/07/12	Hydrometer reading in clay suspension g/l	34.0	33.5	33.0	32.0	31.0	30.0	29.0	28.0	26.0	23.0	20.0	18.5	18.0	17.0	Clay prepared >24h before test	Sand Silt Clay	22.5	45
	Temperature °C	17.0	17.0	17.0	17.0	17.0	17.0	17.3	17.5	18.0	19.5	23.0	25.8	27.0	17.5			14.0	28
	Hydrometer reading in blank solution g/l	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.0	4.0	4.0	3.0	3.0	4.5			13.5	27
	Corrected reading g/l	29.5	29.0	28.5	27.5	26.5	25.5	24.5	23.5	22.0	19.0	16.0	15.5	15.0	13.5				
	Percentage remaining in suspension	59%	58%	57%	55%	53%	51%	49%	47%	44%	38%	32%	31%	30%	27%			50.0	100
01/08/12	Hydrometer reading in clay suspension g/l	33.0	32.0	31.5	31.0	30.0	29.0	28.0	27.0	25.0	23.0	20.5	18.0	17.0	16.0	Clay prepared 1h before test	Sand Silt Clay	23.0	46
	Temperature °C	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	20.1	20.3	20.9	22.1	22.4	17.8			15.5	31
	Hydrometer reading in blank solution g/l	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.5			11.5	23
	Corrected reading g/l	29.0	28.0	27.5	27.0	26.0	25.0	24.0	23.0	21.0	19.0	16.5	14.0	13.0	11.5				
	Percentage remaining in suspension	58%	56%	55%	54%	52%	50%	48%	46%	42%	38%	33%	28%	26%	23%			50.0	100
06/08/12	Hydrometer reading in clay suspension g/l	32.0	31.0	30.5	30.0	29.0	28.5	28.0	26.0	23.5	21.0	19.0	17.0	16.0	15.0	Clay prepared 1h before test	Sand Silt Clay	24.0	48
	Temperature °C	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	24.0	24.6	25.9	26.6	25.1	17.8			15.5	31
	Hydrometer reading in blank solution g/l	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5	3.5	3.0	3.0	3.5	4.5			10.5	21
	Corrected reading g/l	28.0	27.0	26.5	26.0	25.0	24.5	24.0	22.0	20.0	17.5	16.0	14.0	12.5	10.5				
	Percentage remaining in suspension	56%	54%	53%	52%	50%	49%	48%	44%	40%	35%	32%	28%	25%	21%			50.0	100
CANADA B CLAY		10"	30"	1'	2'	5'	10'	15'	30'	1h	2h	4h	6h	8h	24h	Observations	Classification	g	%
14/08/12	Hydrometer reading in clay suspension g/l	31.0	31.0	30.0	29.0	26.0	24.0	23.0	21.0	19.5	17.0	15.0	14.0	13.0	12.0	Clay prepared 1h before test. Need to be mashed.	Sand Silt Clay	25.0	50
	Temperature °C	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.3	20.6	24.9	26.8	25.9	20.9			17.0	34
	Hydrometer reading in blank solution g/l	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5	3.0	3.0	4.0			8.0	16
	Corrected reading g/l	27.0	27.0	26.0	25.0	22.0	20.0	19.0	17.0	15.5	13.0	11.5	11.0	10.0	8.0				
	Percentage remaining in suspension	54%	54%	52%	50%	44%	40%	38%	34%	31%	26%	23%	22%	20%	16%			50.0	100
CANADA C CLAY		10"	30"	1'	2'	5'	10'	15'	30'	1h	2h	4h	6h	8h	24h	Observations	Classification	g	%
17/08/12	Hydrometer reading in clay suspension g/l	27.0	25.0	24.0	23.0	21.0	20.0	19.5	19.0	17.0	16.0	15.0	14.5	14.0	14.0	Clay prepared 1h before test	Sand Silt Clay	31.0	62
	Temperature °C	20.2	20.2	20.2	20.2	20.2	20.2	20.5	20.8	21.4	22.3	22.8	22.8	22.9	18.0			9.0	18
	Hydrometer reading in blank solution g/l	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			10.0	20
	Corrected reading g/l	23.0	21.0	20.0	19.0	17.0	16.0	15.5	15.0	13.0	12.0	11.0	10.5	10.0	10.0				
	Percentage remaining in suspension	46%	42%	40%	38%	34%	32%	31%	30%	26%	24%	22%	21%	20%	20%			50.0	100