International Wastewater Services Flushability Group

IWSFG Part 3C: 2017 – Disintegration Test Methods – Flask and Shaker Table

PUBLIC COMMENT VERSION

Forward

The International Wastewater Services Flushability Group (IWSFG) is a worldwide coalition of national and regional wastewater services' associations and organizations and individual wastewater services.

The work of preparing the standards is carried out by various drafting groups comprising volunteers designated by the principal and the supporting participants of the group. They participate on a voluntary basis, without remuneration of any kind.

> *The criteria for flushability and the test methods are the product of a global consensus of the coalition members and reflect the hydraulic, mechanical and environmental conditions of drain lines, various onsite treatment wastewater collection and treatment systems as well as those of the receiving waters for treatment plant effluents.*

The task of the group was to prepare standards reflecting the above purpose.

Wastewater services are organizations acting for the public good as a public service. The group expects manufacturers and distributers of their products to act in a socially responsible and environmentally sustainable manner by adhering to the established standards.

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17 # Contents

1 Introduction

Wastewater process systems are designed to receive, treat, and convey sanitary discharges1 that, after treatment, are subsequently disposed of as:

a. liquid effluents to the aquatic environments of the lakes, rivers, and oceans
b. solid residuals (biosolids) through applications to land for their inherent nutrient values
c. solids residuals incinerated or anaerobically digested for energy recovery
d. solid residuals sent to a landfill site

Typical waste streams include toilet paper, human waste, food waste, detergents and cleaning agents. In recent years, new products such as moist wipes and toilet bowl cleaning products have been introduced worldwide - many of these are identified as “flushable” products. Other products such as tampons, and condoms, facial tissue are commonly and inappropriately flushed. Moreover, the physically adverse effects of the introduction of such products on wastewater systems have not been studied systematically. For example, various flushed products may comprise materials and chemicals that can be harmful to the environment; hence, such products should not be identified as “flushable”. Accordingly, the purpose of the flushability test along with others presented in this IWSFG series aims to define the qualities and characteristics of those products that may truly be identified as “flushable”. By adhering to these test methods and providing the appropriate advice to the product users regarding the after use disposal of such products will ultimately lead to the long-term sustainability of wastewater systems, and the minimization of potential problems such as pipe blockages and equipment failures in sewer networks.

The goal of the IWSFG is not to ban the production and/or use of these products, but to encourage manufacturers to identify those products that do not meet the established IWSFG standards as being not “flushable” and to encourage users to dispose of the products after use in a more appropriate manner.

2 Purpose

The purpose of the flushability test is to assess the degree of disintegration of a product when it is subjected to the hydraulic forces typically found under the flow conditions in wastewater transport systems, i.e. forces equivalent to a Reynolds number of 20,000.

3 Scope

The scope of this PAS includes all products that a manufacturer or distributer may wish to identify as flushable, and all products, which by the location of their use and likely contamination by human

[1] In some instances, by agreement with a commercial or industrial client, a wastewater utility may agree to accept discharges containing chemicals or other contaminants not normally found in sanitary discharges. Acceptance is by specific agreement that such chemicals or contaminants can be safely treated within the treatment processes of the wastewater utility. Otherwise pretreatment by the commercial or industrial organization is required to bring the discharge into conformity with the established acceptable standards.

excreta, are likely to be flushed through a toilet into a drain line and hence into a wastewater conveyance and treatment system.

4 References

4.1 Normative References

IWSFG PAS 0:2017 *Terms and Definitions for Determination of Flushability.*

IWSFG PAS 2A:2017 *Toilet Clearance Test*

4.2 Informative Reference or Relevant Annexes

Annex 1 – Sources of Apparatus

Annex 2 – Test Report Template

Annex 3 - Procedure for Pre-rinsing Test Products for Determining Initial Dry Mass

Annex 4 - Sieving and Recovery of Product Residues

Annex 5 - Drying and Weighing of Products and Product Residues

5 Terms and Definitions

(See: IWSFG PAS 0:2017 *Terms and Definitions for Determination of Flushability)*

6 Principles

The flushability test is used to demonstrate a product's potential to disintegrate in water when subjected to the hydraulic forces normally found in gravity wastewater transport systems.

Note: The test is undertaken in potable water, as opposed to wastewater because:

1. It avoids the health and safety issues associated with wastewater.
2. It avoids the inconsistencies that would inevitably be found between two or more samples of wastewater.

7 Apparatus

The items required for the test method are:

- an orbital shaker with a 2.5 cm (1 in) orbit, and capable of rotating at 50 to 300 rpm
- a platform/tray for the orbital shaker
- two 8 L Fernbach flasks with baffles at the bottom
- clamps, screws, and other apparatus to hold the flasks in place
- a perforated plate screen with round holes, compliant with ISO 3310-2 with apertures of 6.3 mm

8 Preparation

8.1 Sample acquisition

For products that are already in the market, the testing laboratory will acquire sample products from retail outlets (e.g., grocery stores or pharmacies).

For products that are in the development stage as new or improved products, the testing laboratory may receive samples from their manufacturers or intended distributors.

The test report shall clearly indicate the applicable method of the sample acquisition or purpose.

8.2 Number of test pieces

Five specimens are required for each complete testing.[2] Specimens should be obtained from at least two distinct packages of a product. To obtain 5 specimens, the rolls of toilet paper, or a bundle of moist tissues in its original package should be divided into 5 equal sections. Then, one specimen from each section will be used for testing.

For toilet papers, the starting point, as well as the end point of a toilet paper roll, should be avoided due to the effect of glues.

To obtain moist tissue specimens, it will be convenient to cut their packaging on its side to see the whole bundle of moist tissues. Then, package will be divided into 5 equal sections, and a specimen will be removed from each part.

Caution is necessary not to damage the delicate specimens when removing them from the package. Specimens must be removed from their packaging just before the testing starts.

8.3 Sample preparation and Unit Dose

The following requirements apply to products to be tested.

8.3.1 Dry tissues:

The specimen size shall be either one (1) or two (2) sheets of toilet paper depending on the dimensions so that the total area is approximately 180-300 $cm^{2.}$. Take the specimen of dry toilet tissue from the roll's interior to avoid the possible presence of glue at the roll ends.
The dry facial tissue specimens shall be taken from the package and the unit size shall be one sheet.

[2] Note: In order to allow for the possibility that a dry mass test verification is needed, 5 additional specimens should be acquired.

The specimen should be inserted into the flask as loosely as possible. The sheet must move along with the rotational movement of the water in the flask.

8.3.2 Moist tissues:

The specimen size shall be one sheet, or if the wipe exceeds 300 cm^2, a piece measuring 13 cm X 20 cm or 260 cm^2 that is taken from the center of the product according to Sections 8.1 and 8.2. The specimen should be inserted into the flask as loosely as possible. The sheet must move along with the rotation of the water in the flask.

Moist products must be tested as soon as they are removed from the packaging to minimize the evaporation of the moisturizing chemicals from the specimen. No attempt to remove the lotion should be undertaken and the removed tissue should tested immediately, to prevent the lotion from evaporating.

8.3.3 Other products:

For other products, if the specimen is large and thereby cannot be inserted into the flask, then a representative specimen should be obtained by cutting a specimen suitably. The test specimen should have a volume from 2 to 4 cm^3 and a mass of 1 to 3 grams.

8.4 Apparatus preparation

Place 1 L of tap water into a Fernbach flask with baffles at the bottom; fasten it onto the orbital shaker, and set the rotational speed to 100 rpm. Start the shaker, and confirm that it rotates at a constant speed**.**

9 Storage and Conditioning

9.1 Storage of samples

Samples shall be stored under ambient laboratory conditions in the manufacturer's original packaging.

If the samples have been removed from the manufacturer's original packaging, the samples shall be identified and stored as follows:

1. Dry products should be returned to their original packaging, and should be double-bagged with resealable plastic bags.
2. Moist products should be returned to their original packages, e.g., hard-plastic containers or soft-plastic packages.
3. In case of hard-plastic containers, the box should be re-closed, and then should be double-bagged with resealable plastic bags to minimize any

exposure to ambient air.

4. Soft-plastic packages should be closed tightly while squeezing air out of the package, and then should be double-bagged with resealable plastic bags to minimize the potential of exposure to the ambient air.
5. Samples should be stored in secured laboratory cabinets.

9.2 Conditioning for the Test

There are no conditioning requirements. The test specimens should be removed from their packagings and used directly in the test procedure.

10 Procedure

10.1 Summary

Test specimens are placed in the flasks, which will be rotated on the shaker table at the designated speed for the designated duration, the flasks are emptied onto a 6.3 mm perforated screen and the upper surface of the screen is rinsed at the designated flow and duration, and the upper and lower surfaces of the screen are examined visually for snagged residuals. Photographs of the upper and lower screens surfaces are taken.

10.2 Test procedure

1. Place 1 L of tap water into the flask.
2. Loosely roll a specimen and insert it into the flask.
3. Make sure that the specimen lays flat in the water. This can be achieved by slightly swirling the flask manually until the sample lays flat in the water.
4. Place the flask into a flask-holder on the shaker table.
5. Initiate the movement of the shaker table at the rotational speed of 100 rpm.
6. Monitor the flask for any irregular movement of the specimen such as twisting, or rolling around itself. If this happens, stop the shaker and re-start the procedure using a new specimen.
7. Run the shaker for 120 minutes, during which time take pictures at 30 minute Intervals, or when the specimen disintegrates completely.
8. Remove the flask from the shaker table and pour the contents onto the surface of a 6.3 mm perforated sieve.
9. Take photographs of the upper and lower sieve surfaces.
10. Take up the shower head, turn on the faucet and adjust the regulator to a flow rate of 4 L per minute.
11. With the handheld showerhead spray nozzle held approximately 10-15 cm above the top surface of the sieve, gently rinse the sieve by constantly moving the spray over the entire surface for 1 minute without concentrating the spray on any specific areas. Do not force the passage of any material through the sieve.
12. Stop the rinsing after 1 minute.

13. Observe if there are any remains of the specimen on the upper and lower surfaces of the sieve.
14. Take photographs of the upper and lower sieve surfaces.
    a. If there are no residuals remaining on the sieve, the test is complete and the product has passed.
    b. If there are residuals remaining visually and quantitatively, recover all the retained materials from both sides of the sieve using forceps or by backwashing the material into a smaller sieve and then using forceps. (See Annex 4). Transfer these materials into labeled drying pans or tared weigh boats to determine their dry weight (See Annex 5).

10.3 Test Termination

Upon completion of a test, the flask and sieve shall be cleared of any residues from the test articles.

In cases where specimens contain fiber-binding chemicals that are likely to remain on the walls of the flasks or the sieve surfaces, the flasks and sieve surfaces shall be washed using solvents such as ethanol and methanol, soap and water.

10.4 Test Results

The test must be repeated with 5 specimens.

a. If 4 or more of the 5 tested specimens show no residual fragments remaining on the 6.3 mm sieve after rinsing, the product will pass.
b. Record the test results for each one of the 5 specimens. Collect any residual fragments that remained on 6.3 mm sieve during each test. Quantify the dry-mass of all residual fragments from 5 specimens by drying the fragments at 103 °C for 4 to 8 hours. For a product to pass, total dry-mass of all residual fragments (>6.3 mm solids) must be less than 5 % of the initial dry mass of 5 samples.

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(See Annexes 3, 4, and 5 for the procedure to be followed)

10.5 Calculations

The following calculations are required:

a. The number of flasks for which residual fragments remained on the 6.3 mm sieve after rinsing.

and

b. The disintegration ratio (as a percentage) should be

computed for by using the following equation is calculated using the following equation:

$$\% \text{ Disintegration} = \left[1 - \frac{\text{total dry mass of retained fraction in sieve (g)}}{\text{total initial dry mass of sample (g))}} \right] \times 100$$

(See Annexes 3, 4, and 5.)

11 Acceptance Criteria

To be acceptable:

a. The fragments from four (4) of the five (5) test specimens at the end of the 120-minutes of shaking at 100 rpm must clear completely (100%) pass through the 6.3 mm sieve after the 1 minute rinse per Annex 3, i.e., there should be no fragments on the sieve to be observed; this result must be supported with visual examination and pictures of solids on the sieve.

OR:

b. If there is material left on the 6.3 mm sieve after the 1 minute rinse as per Annex 3, the percentage of the total initial dry mass of the five (5) test specimens (as computed in step b of section 10.5) passing through the 6.3 mm sieve after 120 minutes of testing must be greater than 95%. This result must be supported with visual examination and pictures of solids on the sieve.

12 Test Report

The test report should include the following information:

1. a reference to the test procedure
2. an overview of the experimental setup and operational conditions
3. the date and location of the testing
4. the complete identification of the tested product
5. a statement as to the sample acquisition process followed and purpose of the testing
6. any departure during and/or at the end of each testing and any circumstances that may have affected the results along with an explanation
7. copies of photographs taken during the procedure

8. the test results, including:
    a. The percentage of dry-mass that passed through the 6.3 mm sieve after 1 minute of rinsing should be stated.
    b. The outcome of each test must be clearly stated in terms of disintegration. For example, complete disintegration (100 %) in xx minutes. Alternatively, YY % of the product disintegrated within the test duration (e.g., 120 minutes.
    c. A final statement indicating whether the product passed or failed the test.

13 Precision

The shaker table should be checked periodically for correct operation; if necessary, adjustments should be made to assure a rotation of 100 rpm.

There may be some variation in the quality of the products being tested, which is why 5 separate specimens shall be acquired, according to Sections 8.1 and 8.2.

Bibliography

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Eren, B. and Karadagli F. 2012. Physical Disintegration of Toilet Papers in Wastewater Systems: Experimental Analysis and Mathematical Modeling. Environmental Science and Technology, 46, 2870 – 2876.

ISO 3310-2:2013 *Test sieves -- Technical requirements and testing -- Part 2: Test sieves of perforated metal plate*

Annex 1– Sources of Apparatus

(Informative)

The following tables provide examples and basic information about suitable items, e.g., shakers, clamps, etc., that are offered by various suppliers. Other suppliers should be consulted for compatible items.

1- Orbital Shaker

The orbital shaker shall have an orbit of 2.54 cm (1 inch) and with the rotational speed range of 50 – 300 rpm at a precision of approximately 1-2 rpm is needed for this test. Below are a few examples of such shaker tables.

Distributor / Manufacturer	Part No. / Catalogue No.	Name	Additional Information
Thomas Scientific	**8290F87**	MaxQ 3000 Platform Shaker	**120 V**
Thomas Scientific	**8290F89**	MaxQ 3000 Platform Shaker	**230 V**
VWR	**89032-104**	Model 5000 Advanced Shaker	**120 V**
VWR	**89032-106**	Model 5000 Advanced Shaker	**230 V**
Lab Companion	**AAH3D1365U**	Model OS-4000 with Orbit Size of 25.4 mm (1”)	Orbital Shaker with Digital Control Panel (**120 V**)
Lab Companion	**AAH3D1315K**	Model OS-4000 with Orbit Size of 25.4 mm (1”)	Orbital Shaker with Digital Control Panel (**230 V**)
Lab Companion	**AAH3D1465U**	Model OS-7100	Orbital Shaker with Digital Control Panel (**120 V**)
Lab Companion	**AAH3D1415K**	Model OS-7100	Orbital Shaker with Digital Control Panel (**230 V**)

2- Platform/Tray for the Orbital Shaker

Suppliers may offer a standard platform along with the orbital shaker, and the cost of the platform may be included in the total price. However, some suppliers offer platforms separately. In any case, a universal platform that allows for the mounting of the flask clamps must be selected for the shaker. This type of platform will have pre-drilled holes to mount the flask clamps onto the platform. A standard platform may be of the dimensions of 18 x 24 inches (45.7 x 61 cm), while alternative sizes such as 24 x 24 inches or 24 x 36 inches are also available and suitable. The platform should be large enough to house 5 flasks to accommodate the 5 test samples. A list of the platforms offered by the shaker suppliers listed in Table 1 is provided below:

Distributor / Manufacturer	Part No. / Catalogue No.	Name	Additional Information
Thomas Scientific	**8291L10**	Universal Platform for MaxQ 3000 Platform Shakers (size: 30 x 18 inches)	Manufacturer Code: 30115BI
VWR	**97003-594**	Universal Platform for 5000-Advanced Shaker (size: 18 x 24 inches)	Not Available (N/A)
Lab Companion	**AAA31502-V1**	Universal Platform for Model OS-4000 with orbit of 25.4 mm (size: 45 x 45 cm)	(N/A)
Lab Companion	**AAA23504**	Universal Platform for Model OS-7100 (size: 75.5 x 52 cm)	(N/A)

3- Flask Clamps

Several clamps will be necessary to fix the flasks to the platform during testing. A list of clamps that fit 2.8-L Fernbach flasks, and are offered by the shaker suppliers listed in Tables 1 and 2 is provided below:

Distributor / Manufacturer	Part No. / Catalogue No.	Name	Additional Information
Thomas Scientific	**0522G90**	Stainless steel clamps for 2.8 L Fernbach Flask	Manufacturer Code: 30162
VWR	**14215-228**	Stainless steel clamps for 2.8 L Fernbach Flask	N/A
Lab Companion	**AAA23557**	Stainless steel clamps for 2.8 L Fernbach Flask	N/A

4- 2.8-L Fernbach Flask with Baffles at the Bottom

A 2.8-L Fernbach glass flask with 3 evenly spaced baffles at the bottom is needed for this testing. This flask has a bottom diameter of 15.3 cm, from which it expands outward to reach a diameter of 20.3 cm at a height approximately 4.1 cm from the bottom. The flask has a total height of 25 cm, a neck height of approximately 5.5 cm, and a neck diameter of 38 mm. The flask has three evenly spaced elliptical baffles (1.5 x 4.5 cm) cut into its bottom. The table below provides a list of the 2.8-L Fernbach flasks offered by various suppliers:

Distributor / Manufacturer	Part No. / Catalogue No.	Name	Additional Information
ThomasScientific	**1203K91**	2.8 L Fernbach Flask with 3 baffles	Manufacturer Code: Bellco 2554-02800
VWR	**71000-350**	2.8 L Fernbach Flask with Plain Neck and with 3 Baffles	Manufacturer Code: 3875-31
BellCo	**2554-02800**	2.8 L Fernbach Flask with DeLong Neck and with 3 Baffles	N/A

Below is a Picture of the Fernbach Flask for Reference.

Source: IWSFG Member.

Screws and Screwdriver*:* Screws will be necessary to fasten the flask clamps onto shaker platform. Such items may be readily available in a laboratory, or they can be purchased along with the flask clamps. Please check with your supplier to identify the type of screws that will be needed to fasten the flask clamps onto the orbital shaker.

Construction of the Shaker-Flask System: The shaker-flask system is constructed by fastening the platform onto the shaker; then, by fixing the flask clamps onto the platform, and finally, by fitting a 2.8-L Fernbach flask into the clamps. The platform should be large enoubh to accomodate up to 5 flasks.

Standard Wire Mesh Sieve of 6.3 mm Size to be Used for the Wet Seperation of Solids: It is recommended to have a few more sieves with sizes such as 12.6 mm, and 25.4 mm. The disintegration behaviour of a product can be studied in further detail by using these sieves. For instance, the amount of time that is needed for small pieces to be < 25.4 mm, or < 12.6 mm, and < 6.3 mm.

Spray-nozzle Head: Should be available for rinsing sieves. Otherwise, it should be constructed by using a 1 m long soft plastic hose, a small shower head, and clamps.

Annex 2 - Test Report Template

(informative)

Section 1 – Test Information	
Test Name and Method	Physical Disintegration by Using Shaker-Flask System
Test Date/Time	
Test Location – Laboratory Name	
Test Conducted by	
Laboratory Supervisor	
Operational Conditions and Reynold's Number	100 rpm and Reynold's Number = 20000
Notes	
Section 2 – Product Information	
Product and Packaging Information	
Product Obtained by	
Manufacturer & Distributor	
Physical Dimensions of a Single Specimen	
Other Information	
Section 3 - Test Results	
Pass or Fail	
Time Required for Complete Disintegration (e.g., < 6 mm size range)	
Percentage of Product Causing fFilure (when applicable)	
Section 4- Photographic Results	
Initial Specimen in the Flask	Picture 1
Disintegration by 30 Minutes	Picture 2
Disintegration by 60 Minute	Picture 3
Picture of 6.3 mm Sieve after 90 Minutes	Picture 4

Annex 3 - Procedure for Pre-rinsing Test Products for Determining Initial Dry Mass

(Informative)

A.3.1 Introduction

Two approaches to pre-rinsing test products to remove water soluble lotions or other additives from products before using them in the determination of their initial dry mass are described in this annex. The first method, which is recommended, involves flushing the products down a toilet and through a drain line using tap water. This approach simulates the actual rinsing process that occurs when a product is flushed on its way to a wastewater conveyance system. When a toilet and drain line is not available, an alternative method can be used that involves swirling products in a container of tap water.

A.3.2 Test Product Selection

- When conducting a test to support a flushable claim, the products used for testing must be the same as those offered in the intended market.
- Obtain a sufficient number of products (samples) to conduct the intended test.
- If there is a need to determine the average dry weight for the product, at least five more samples will be required, and when samples exhibit high variability in their weight, more may be required.
- Test specimens should be randomly obtained from different sections of one or more packages to ensure that they are broadly representative.

Note: This is particularly important for products such as wipes, which occur in a roll or stack.

A.3.3 Toilet and Drain Line Method

A.3.3.1 Equipment

- toilet and drain line as per IWSFG PAS 2A:2017, with catch basket located before the drain

- It is recommended to use a toilet with at least a 4.5 L ± 0.4 L flush volume.

A.3.3.2 Procedure

- Prior to adding any materials to the toilet bowl or initiating a flush, ensure that the toilet has stopped running and that the water in the bowl is at a normal level.
- When adding a product (e.g. hygienic wipe) place it in the center of the toilet bowl and allow sufficient time, typically 15 seconds, for it to become fully saturated with water before adding another product or flushing the toilet.
- No more than 2 wipes should be flushed at one time.
- Retrieve the products before they enter the basket or as soon as practically possible to prevent any disintegration by water flowing out of the pip.
- When necessary, use additional flushes without product to move products out of the drain line for collection.

A.3.5 Alternative Method

A.3.5.1 Equipment

- containers with a capacity of approximately 20 L (e.g. 5-gallon plastic buckets)

A.3.5.2 Procedure

- Fill the containers with tap water.
- Submerge the specimens in the water and swirl them for approximately 30 seconds, or longer if necessary, to remove any perceptible lotion or additives.
- To maintain the ratio of water to product existing in the toilet and 6 specimens should be placed together at any one time in a single container with 20 L of tap water.

Annex 4 - Sieving and Recovery of Product Residues

(Informative)

A.4.1 Introduction

This Annex describes the sieving, rinsing and recovery of the product residues from the various disintegration tests. Once the samples are transferred to a sieve in these tests, these procedures are then used to rinse small materials through the sieve and recover the residues for gravimetric analysis.

A.4.2 Equipment

- Peerless shower head Model 76114WH with hose assembly (pictured at right), or similar, attached to a faucet (tap) with a graduated flow regulator adjusted to deliver 4L per minute
- 4 L beaker (recommended)
- stopwatch or other timing device
- fine mesh hand sieve
- forceps
- drying pans

Source: IWSFG Member

A.4.3 Procedure

1. Turn the faucet on and adjust the regulator to a flow rate of 4 L per minute.

   OR:

   The flow rate can be determined by measuring the volume delivered to a suitable container with graduations after a specified time period. For example, it should take exactly 60 seconds to deliver 4 L of water to the 4 L mark on a beaker. Once the flow is adjusted, this measurement should be repeated at least three times and should vary less than 5%.
2. When transferring the contents from a disintegration test to the sieve, pour the contents of the test vessels slowly while distributing evenly them over the complete surface of the sieve.
3. With the handheld showerhead spray nozzle held approximately 10 to15cm (4 to 6") above the top surface, gently rinse the smaller materials through the sieve. Constantly move the spray over the entire surface without concentrating the spray on any specific areas. Do not force the passage of any material through the sieve.
4. After 1 minute of rinsing, quantitatively recover all the retained materials from both sides of the sieve using forceps or by first backwashing the material into a smaller sieve and then using forceps.
5. Transfer these materials into labeled drying pans or tared weigh boats to determine their dry weight (see Annex 6).

Example of a Flow Regulator and Shower Head Rinse Apparatus

Source: ISWFG Member

Annex 5 – Drying and Weighing of Products and Product Residues

(Informative)

A.5.1 Equipment

- oven capable of maintaining a constant temperature of between 40° and 103°C
- weighing dishes
- forceps
- desiccator
- analytical Balance (reads to 4 decimal places)
- specimens

A.5.2 Procedure

A.5.2.1 Loss of Mass Calculation Procedure

1. If there are residual fragments at the end of any of the 5 tests, collect them using the procedures described in Annex 5 prior to determining their dry weight..
2. Set the oven to a temperature appropriate for the chemical and physical properties of the specimen – this is typically 103 °C..
3. Place the specimens to be analyzed in an oven-safe weighing dish or on a piece of foil.
4. In the case of difficult to handle specimen residues, it may be appropriate to place the residues in a pre-weighed (tared) aluminum weigh boats.
5. Dry the specimens in the oven for several hours or overnight.
6. Transfer the specimens from the oven to a desiccator and allow them to cool.
7. Weigh the specimens and record their weight.
8. Return the specimens to the oven for approximately 30 minutes and again allow them to cool in the desiccator and determine their weigh.
9. Repeat this process as necessary until the specimens reach constant weights.
10. Record the total weight of residuals from tests 1-5;
11. Calculate the loss of mass using the Loss of Mass worksheet set out in section A.5.4

A.5.3.2 Initial Dry Mass Calculation Procedure

1. Select 10 specimens in accordance with Annex 3, section A.3.3.
2. Pre-rinse specimens with water soluble lotions or additives before using the procedures described in Annex 3 prior to determining their dry weight.
3. Set the oven to a temperature appropriate for the chemical and physical properties of the specimen – this is typically 103 °C.
4. Place the specimens to be analyzed in an oven-safe weighing dish or on a piece of foil.
5. Check that the residues of difficult to handle specimen residues need to be placed in a pre-weighed (tared) aluminum weigh boats.

6. Dry the specimens in the oven for several hours or overnight.
7. Transfer the specimens from the oven to a desiccator and allow them to cool.
8. Weigh the specimens and record their total weight.
9. Return the specimens to the oven for approximately 30 minutes and again allow them to cool in the desiccator and determine their weight.
10. Repeat this process as necessary until the specimens reach constant weights.
11. Record the total weight of the five (5) specimens.
12. Calculate the loss of mass using the Loss of Mass worksheet set out in A.5.4.

A.5.4 Example of a Loss of Mass Calculation Worksheet

Loss of Mass Calculation Worksheet				
Sample Number	**Initial Total Dry Mass of 5 Specimens Prepared in Accordance with Annex 4**	**Dry Mass of Retained Specimens from the 6.3 mm Sieve for Test 1 - 5**	**Percent Disintegration**	**95% Mass Loss PASS/FAIL**
1				