
WATER INDUSTRY SPECIFICATION

**Fine to Flush:
WIS 4-02-06**
November 2019: Issue 1.2
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UK Water Industry

Fine to Flush: SPECIFICATION FOR A TESTING METHODOLOGY TO DETERMINE WHETHER A PRODUCT IS SUITABLE FOR DISPOSAL THROUGH A DRAIN OR SEWER SYSTEM

FOREWORD

Sewers serving premises are designed to receive the "contents of lavatories", "water which has been used for cooking or washing" and surface water¹.

The most common problem with sewer systems is blockage of pipelines or pumps. This can lead to loss of service, sewer flooding or pollution of the environment. Resolving these blockages is also a major cost to sewer system operators.

One of the major causes of blockages is the disposal/flushing to sewer of inappropriate and unsuitable items.

There are many products that are approximately the size of toilet tissue and appear to flush from the WC bowl; however they have the potential to cause significant problems once in the wastewater system.

Section 111 of the Water Industry Act, 1991, prohibits the disposal of harmful substances into public sewers or drains communicating to a public sewer. These include anything that would damage the fabric of the sewer system, interfere with the free flow of the sewer, or prejudicially affect the treatment works. Also, any substance that is dangerous, would cause a nuisance or would be injurious or likely to cause injury to health.

Reference to a European Standard, British Standard or Water Industry Specification applies equally to any equivalent specification.

It has been assumed in the drafting of this specification that the execution of its provisions is entrusted to

appropriately qualified and experienced people, for whose guidance it has been prepared.

Information contained in this specification is given in good faith. Neither Water UK nor the members of its Standards Board can accept any responsibility for actions taken as a result.

This specification will be reviewed at least annually, and sooner if appropriate, to ensure that it remains appropriate as the product market develops.

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¹ Water Industry Act 1991: Section 117.

1. SCOPE

This WIS specifies the test methods and requirements to determine whether a product is suitable for disposal through a WC into a drain or sewer system. The WIS has been developed for wet wipes or moist toilet tissue that, when used, are likely to become contaminated with faecal or other body waste that could contain water-borne diseases.

2. DEFINITIONS

For the purposes of this specification, the following definitions apply:

- 2.1 CSO – Combined Sewer Overflow.
- 2.2 Disposable product – any product designed and manufactured to be disposed of to the sewer system
- 2.3 Drainline – Small diameter pipe leading from a domestic property and connecting to the public sewer system.
- 2.4 Snag – Engagement of a product on a protrusion into the pipe and / or on a rough pipe joint.
- 2.5 ‘Stranded’ – temporary settlement of material on the pipe invert
- 2.6 WaSC – Water and Sewerage Company.
- 2.7 Water UK – Industry association that represents UK statutory water supply and wastewater companies at national and European level.
- 2.8 WC – Water Closet. (Toilet cistern)
- 2.9 WwTW’s – Wastewater Treatment Works.

3. REQUIREMENTS

3.1 General

A product is assessed against nine different requirements. Two are general requirements and require a manufacturer’s declaration that these are satisfied (Intended Use and Safety in the Environment).

The remaining seven requirements relate to physical tests carried out on the product. This is to ensure that the product does not adversely affect the physical or performance requirements of either a sewer system or treatment system. The seven tests are:

- a) WC bowl clearance;
- b) Drainline clearance;
- c) Disintegration in the drainline;
- d) Snagging in the drainline;

- e) Continued disintegration in the sewer;
- f) Settlement in treatment processes; and
- g) Determination of synthetic and non-synthetic organic components.

Three of these tests (*Disintegration in the drainline*, *Snagging in the drainline* and *Disintegration in the sewer system*) are interrelated, and the results are considered together in determining whether a product passes.

Personal care products are covered by EC/1223/2009 (as amended). Household cleaning products are covered by REACH, EC 1907/2009 (as amended) CLP, EC 1272/2008 (as amended) and the Detergent Regulations EC 648/2004 (as amended).

3.2 Intended use

The intended use of the product as shown on the labeling or manufacturer’s literature shall be such that when used, the product is likely to become contaminated with faecal or other body waste that could contain water-borne diseases.

3.3 Safety in the environment

Legislation can restrict the disposal of certain substances to the environment, including discharges to the sewer system. The manufacturer shall demonstrate that the product complies with such legislation, when disposed through the sewer system.

3.4 WC bowl clearance

The purpose of the test is to confirm that the sample shall pass through the WC water trap (U-bend), and not cause the WC to surcharge up to its rim or overflow.

When tested in accordance with the method specified in Appendix A, on 40 occasions, the product shall pass if:

- 1) Greater than 95% of the products tested clear the bowl in no more than 2 flushes; and
- 2) Any surcharging of the bowl is below the rim on 100% of the tests.

3.5 Drainline clearance

The purpose of the test is to assess the risk of the product settling out or snagging as it passes through the drainline.

When tested in accordance with the method specified in Appendix B, in at least 95% of the 40 tests, the product shall:

- 1) Travel a distance of at least 20 m along the drainline within 5 consecutive flushes; and
- 2) Not remain stationary for more than 3 consecutive flushes.

3.6 Disintegration in the drainline

The purpose of the test is to confirm that the product disintegrates sufficiently, to an extent that minimises the

risk of a blockage occurring, should the product settle out or snag as it passes through the drainline, or clog a pump.

When tested in accordance with the method specified in Appendix C, on 5 occasions, the product passes this test if it disintegrates sufficiently so that:

1) At least 50% of the product mass (average of 5 replicates) shall pass through the 12.5 mm perforated plate sieve.

If the product does not pass the test, but at least 40% of the product mass for each of the 5 replicates passes through the 12.5mm perforated plate sieve, then the *Snagging in the drainline* test will be carried out.

Successfully passing the *Snagging in the drainline* test, pursuant to the preceding paragraph, will be considered sufficient to assess that the product has passed the *Disintegration in the drainline* test.

3.7 Snagging in the drainline

If a product does not pass the *Disintegration in the drainline* test and/or the *Disintegration in the sewer system* test then, depending on the results of both tests, the *Snagging in the drainline* test may be required (see Appendix C, D and E for details).

The purpose of the test is to confirm that the product, if it becomes temporarily engaged ('snagged') on an otherwise not significant imperfection in the drain or sewer, will break up or tear from the imperfection sufficiently quickly to minimize the risk of a blockage developing.

When tested in accordance with the method specified in Appendix D, the product passes this test if it:

1) Disintegrates sufficiently before it reaches the snag point so that it does not snag; or

2) For greater than 90% of the number of samples that become snagged on a snag point, break up or tear off the snag point in no more than 7 toilet flushes.

The snagging test is NOT required if the product passes both the *Disintegration in the drainline* and the *Disintegration in the sewer* tests. If the *Snagging in the drainline* test is carried out, then the result of the *Disintegration in the drainline* and/or *Disintegration in the sewer system* tests are considered together with the result of the *Snagging in the drainline* test in determining whether a product passes.

3.8 Disintegration in the sewer system

The purpose of the test is to confirm that the product continues to disintegrate in the sewer, beyond the break-up level required in the Drainline Disintegration Test and does not blind screens at a Combined Sewer Overflow (CSO) or blind wastewater treatment works inlet screens.

When tested in accordance with the method specified in Appendix E, on 5 occasions, the product passes this test if:

1) Greater than 80% of the product mass (average of 5 individual samples) passes through the 5.6 mm perforated plate sieve: and

2) For the product mass that does not pass through the 5.6 mm sieve, a good and relatively uniform break up pattern (where no individual piece is greater than 40mm in the largest dimension) is apparent.

Alternatively:

3) Where photographic evidence of break up to 25 mm or less has been obtained and clumping of the sample is noted at the sieving stage, the pass rate will be reduced to 60% of the product mass passing through the 5.6 mm perforated plate sieve for each of the 5 replicates.

If the product does not pass criteria 1) and 2), and the alternative criterion 3) does not apply, then the *Snagging in the drainline* test will be carried out.

Successfully passing the *Snagging in the drainline* test, pursuant to the preceding paragraph, will be considered sufficient to assess that the product has passed the *Disintegration in the sewer system* test.

3.9 Settlement

The purpose of the test is to confirm that the disintegration by-products of the sample under test settle out in the sewage treatment process primary settlement stage and are not passed on to the secondary treatment, to disrupt the overall sewage treatment process or impair the final effluent quality. When tested in accordance with the method specified in Appendix F, 100% of the product shall:

1) Settle at a velocity that must exceed 1 mm/second; and

2) Following settlement, not become sufficiently buoyant to rise more than 300mm from the bottom of the column within 24 hours.

3.10 Determination of synthetic and non-synthetic organic components

The purpose of the test is to confirm that the product material does not contain synthetic organic material (e.g. petro chemical derived plastic fibres). The test will dissolve natural organic material in a test sample and leave synthetic organic material (e.g. petro chemical derived plastics) as a test residue. When tested on 5 occasions in accordance with the method specified in Appendix G, the product shall:

1) Pass through the 0.5 mm sieve without leaving visible fibres or other residue(s).

4. REFERENCES

This specification makes reference to the latest edition of the following publications (except where otherwise indicated) including all addenda and revisions.

UK Building Regulations

Building Regulations Approved Document H: Drainage and waste disposal (2015 edition)

European Standards

EN 752: Drain and sewer systems outside buildings.

French Standard

NF U44-164: Organic Soil Improvers and Growing Media - Analytical Method for Inert Components - Bleach Washing Method

Appendix A - WC BOWL CLEARANCE TEST

The purpose of the test is to confirm that the sample shall pass through the WC water trap (U-bend), and not cause the WC to surcharge up to its rim or overflow.

A.1 Apparatus

A 4.5 litre flush wash down WC² connected to a water supply and discharge pipe.

Details of the test apparatus and layout for the WC Bowl Clearance Test³ are shown in Appendix B: Figure B1.

A.2 Safe practices

The procedure shall be carried out using tap water.

Each testing laboratory is responsible for developing and implementing its own safe practices for this test, including the use of appropriate personal protection equipment.

A.3 Sample Size and Preparation

The number of products flushed for each test shall be the maximum indicated/advised on its packaging. If there is no indication on the packaging, one product shall be flushed.

If testing toilet paper, four sheets should be flushed.

The product shall be tested immediately after removal from its packaging (e.g. for wet wipes, while they are still moist).

The sample(s) should be scrunched up before being deposited in the WC bowl, to represent typical product use.

A.4 Number of Tests

A minimum number of 40 tests shall be undertaken.

A.5 Test Procedure

- 1) Confirm that the flush volume is 4.5 litres (+/- 0.2 litres).
- 2) Flush the WC, to clear the bowl of any debris.
- 3) Place the sample(s) in the WC bowl, flush once and record whether:
 - i) the whole of the sample(s) has cleared the WC bowl and entered the drain downstream of the water trap (U-bend); and
 - ii) the water level in the toilet reached the rim at any time.

² A 4.5 litre flush volume toilet has been selected because it:

- Is considered representative of the most commonly used units now being installed in the UK.

³ The WC Bowl Clearance Test may be carried out in conjunction with the Drainline Clearance Test, in which case it shall be connected to a drainline as specified in Appendix B.

- 4) If the product does not clear the bowl and the U-bend, i.e. the product is not visible in the drainline, wait for the WC cistern to fill and repeat step 3.
- 5) When the whole of the sample has entered the drain, the total number of flushes used shall be recorded.

A. 6 Test Report

The test report shall include:

- a) The name of the test house and the date(s) of the testing;
- b) The name of the product tested;
- c) A reference to the test procedure or a copy of it;
- d) The type of toilet used and volume of flush;
- e) The number of items flushed in each test sample (see A4);
- f) For each test:
 - i) The number of flushes required to clear the WC bowl;
 - ii) Whether or not the rise in water level in the WC bowl reached the rim;
 - iii) Whether the sample cleared the WC bowl within the specified number of flushes (pass/fail); and
 - iv) Any other relevant observations (if applicable);
- g) The overall result, in terms of the pass/fail criteria.

A. 6 Pass / Fail Criteria

When tested in accordance with the method specified above, on 40 occasions, the product shall pass if:

- 1) Greater than 95% of the products tested clear the bowl in no more than 2 flushes; and
- 2) Any surcharging of the bowl is below the rim on 100% of the tests.

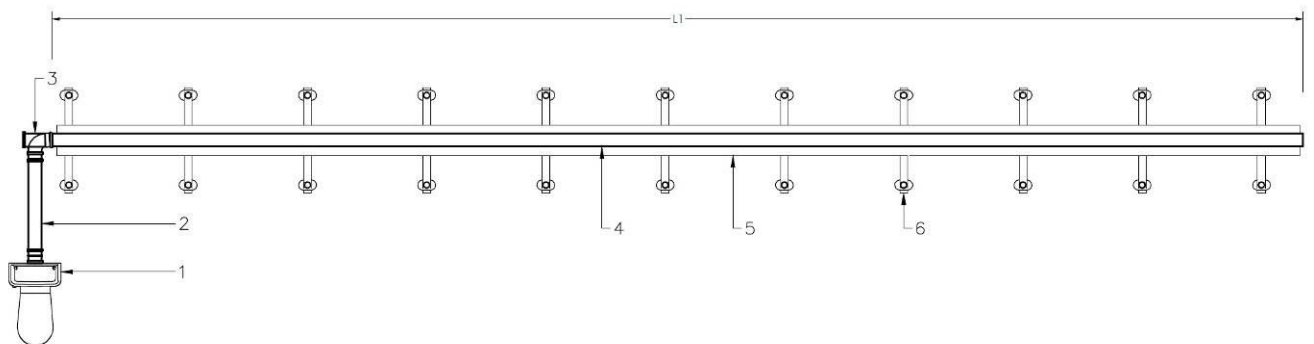
Appendix B - DRAINLINE CLEARANCE TEST

The purpose of the test is to ensure that the product passes through the household drainline⁴. The Drainline Clearance Test may be carried out in conjunction with the WC Bowl Clearance Test (see Appendix A).

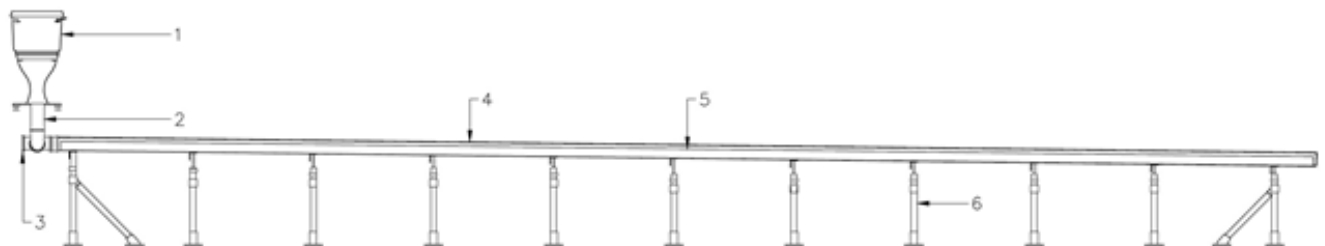
B.1 Apparatus

A 4.5 litre flush wash down WC connected to a water supply and discharging to the drainline of the test rig, using a connection with short radius bends, as detailed in Figure B1.

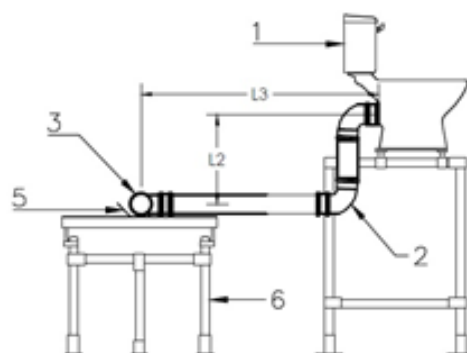
Figure B 1 Test apparatus for toilet and drainline clearance test



Plan of typical WC and drainline rig



Longitudinal section of typical WC and drainline rig



Section of toilet branch

⁴ The household drainline is the foul sewer leading from a property. It is commonly 100 mm in diameter, takes one or a limited number of properties and is characterised by small intermittent flows of which the WC flush is normally the most significant.

1. Specified WC
2. Start of drain test length
3. End cap
4. Drain length
5. Support channel for drain length
6. Channel supports

A drainline test rig, as detailed in Figure B1, with the following characteristics:

- Pipeline: Clear plastic pipes of 100 mm nominal internal diameter and 1 m individual lengths, connected with sleeve joints;
- Gradient: 1:80; and
- Minimum length from the point of the WC discharge into the drainline, to the end of the drainline: 20 m.

B.2 Safe practices

The procedure shall be carried out using tap water.

Each testing laboratory is responsible for developing and implementing its own safe practices for this test, including the use of appropriate personal protection equipment.

B.3 Sample Size and Preparation

The number of products flushed for each test shall be the maximum indicated/advised on its packaging. If there is no indication on the packaging, one product shall be flushed.

The product shall be tested immediately after removal from its packaging (e.g. for wet wipes, while they are still moist).

B.4 Number of Tests

A minimum number of 40 tests shall be undertaken.

B.5 Test Procedure

- 1) Confirm the WC flush volume is 4.5 litres.
- 2) Flush the toilet to clear the WC and the drainline of debris.
- 3) For the initial flush, place the sample(s) in the WC bowl (see B.3 for number of samples), flush once and if the sample(s):
 - i) Enter(s) the drainline, record the distance travelled by the sample(s) along the drainline from the WC connection.or
 - ii) does not pass through the bowl, i.e. the product is not visible in the drainline, wait for the WC cistern to fill and repeat the flush.
- 4) When the sample has entered the drainline, record the distance travelled by the sample along the drainline from the WC connection.

- 5) Following the WC flush wait for 5 minutes to allow the water to drain down from behind the product. (It will be necessary to observe the flow downstream of the sample until it becomes insignificant or nil).
- 6) In the second and subsequent flushes, at 5 minute intervals, flush with water only (4.5 litre flush) until:
 - i) the sample passes through the 20 m drainline; or
 - ii) the sample remains stationary for 3 consecutive flushes, i.e. has “stranded”.

If, after five flushes, the sample has not travelled a distance of 20 m from the WC connection into the drainline, conclude the test.

B.6 Test Report

The test report shall include:

- a) The name of the test house and the date(s) of the testing;
- b) The name of the product tested;
- c) A reference to the test procedure or a copy of it;
- d) The type of toilet used and volume of flush;
- e) The number of items flushed in each test sample (see B4);
- f) For each test, the location of the sample after each flush, either:
 - In the WC bowl, or
 - In the WC trap, or
 - The distance travelled along the drainline from the WC connection into the drainline.
- g) Any other relevant observations (if applicable);
- h) Individual test results (pass/fail); and
- i) The overall result, in terms of the pass/fail criteria.

B. 7 Pass / Fail Criteria

When tested in accordance with the method specified above, in at least 95% of the 40 tests, the product shall:

- 1) Travel a distance of at least 20 m along the drainline, within 5 consecutive flushes; and
- 2) Not remain stationary for more than 3 consecutive flushes.

Appendix C– DISINTEGRATION IN THE DRAINLINE

The purpose of the test is to confirm that the product disintegrates sufficiently, to negate the risk of the product settling out or snagging as it passes through the drainline or clogging a pump.

It is inevitable that a small percentage of product samples will settle, or snag on grit in the drain or on the drain's imperfections. Where this is the case the product sample must be able to start disintegrating. This will avoid a snagged product remaining in an intact condition for a considerable time and in doing so collecting other sewer solids and potentially developing into a blockage.

The results from this test (and the *Disintegration in the sewer system* test) determine whether or not the *Snagging in the drainline* test is conducted (see C.7 and E.7). If the product fails the *Disintegration in the drainline* test, but within the margin defined in C.7, then the *Snagging in the drainline* test will be carried out. If the product then passes the *Snagging in the drainline* test, the overall result for the *Disintegration in the drainline* and the *Snagging in the drainline* tests will be a pass.

If the product passes both the *Disintegration in the drainline* test, and the *Disintegration in the sewer system* test, then the *Snagging in the drainline* test is not required.

C.1 Apparatus

An orbital shake table with a horizontal orbital diameter of 25mm and rotating speed control of up to 150 rpm and relevant clamps to accommodate the conical flasks. See Photograph C1.



Photograph C 1 Orbital shake table

Baffled shake flasks, of 2 litre nominal capacity, for which dimensions and are provided in Figure C1 and Photograph C2.

The supplier details/product codes Merck (Sigma Aldridge) F0527, Fisher Scientific 4110-2000. Other suppliers are available.

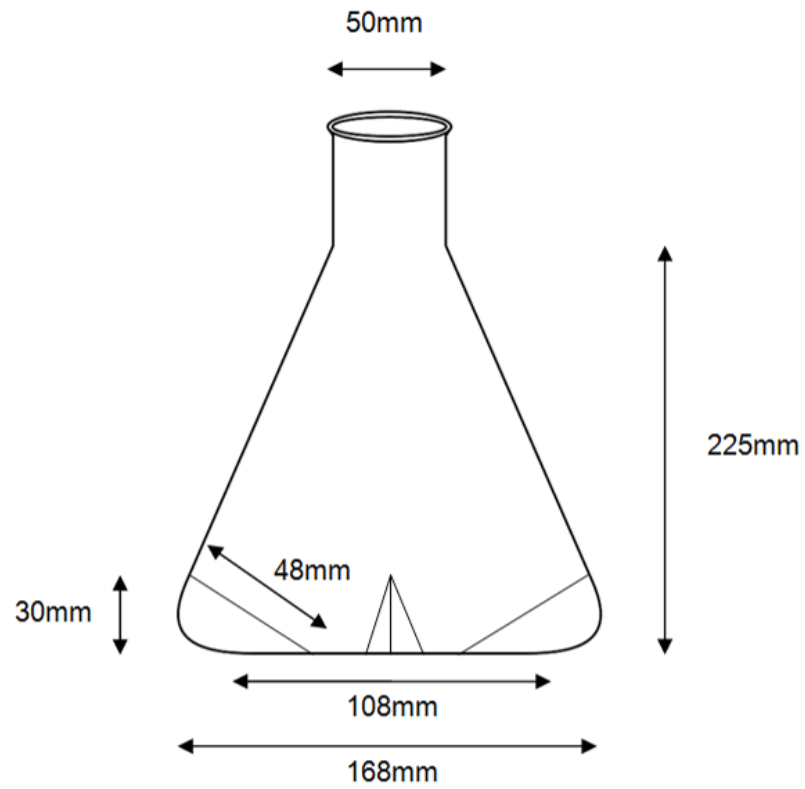


Figure C 1 Baffled shake flask dimensions



Photograph C 2 Baffled flask

A **12.5 mm perforated plate sieve** (round holes) complying with ISO 3310-2, as illustrated in Photograph C3.



Photograph C 3 12.5mm perforated plate sieve

A dark coloured **shallow tray**.

A **drying oven** (to 105°C).

Crucibles

A **desiccator**

An **analytical balance**

C.2 Safe practices

The procedure shall be carried out using tap water.

Each laboratory is responsible for developing and implementing its own safe practices for this test, including the use of appropriate personal protection equipment.

C.3 Sample Size and Preparation

The sample size consists of a single full sized product.

In the case of an unusually large wipe it will be necessary to cut it down so that the sample measures no greater than 350 cm² (35,200 mm²). This procedure is only required if the wipe measures more than 220 mm x 160 mm or greater than 350cm².

The product shall be tested immediately after removal from its packaging (e.g. for wet wipes, while they are still moist).

Sufficient samples should be available to carry out 5 individual tests and to provide 3 control samples

C.4 Test Procedure

Preparation of control samples

Control samples are required to accurately obtain the weight of a dry sample of the product.

This information is subsequently used to compare the amount of disintegrated product caught on the sieve, to determine the proportion of product break up.

The recommended procedure is:

- 1) Place at least three test samples in a heat resistant tray and dry them in an oven at 105°C for 12 hours.
- 2) Remove control samples from the oven and place in a desiccator until cooled to room temperature¹
- 3) Weigh the samples using an analytical balance to 100th g accuracy.
- 4) Determine the average dry weight of the 3 control samples.
- 5) Discard the dried samples.

Disintegration test

- 6) Pour 1 litre of tap water into a baffled shake flask.
- 7) Secure the flask on the orbital shaker using the clamps.
- 8) Add a single sample to the flask, using a product immediately after being removed from its packaging. 'Scrunch' the sample to imitate product use.
- 9) Repeat stages 6 to 9, until five flasks with samples are secured on the orbital shaker.
- 10) Set the orbital shaker to rotate for at 100 rpm.
- 11) After 45 minutes bring the shaker table to a halt. Then reverse the direction of the shaker table and restart.
- 12) Similarly, after every additional 45 minutes reverse the direction of the rotation of the shaker table and restart.
- 13) After 3 hours, stop the orbital shaker.

Assessment of proportion of disintegrated product

For each of the 5 individual shake flask samples:

- 14) Carefully pour the contents of the shake flask into a shallow tray. With the water typically 15 - 20 mm deep, carefully separate and disentangle the broken-up wipe, taking care not to further break up the wipe during the disentangling process. A small stirrer or tweezers may be used, provided that they do not break up or tear the wipe remains.

A dark coloured tray is recommended – the dark background helps to highlight the break up pattern / size of broken up particles.

Photograph the broken-up wipe. Including a ruler or object of known size in the photograph can assist in giving an indication of the size of broken up particles.

- 15) Carefully pour the contents of the tray onto the 12.5 mm sieve. The sieve should be submerged in a bath of water, for example a large sink, with the sides of the sieve being at least 10 mm out of the water. Care should be taken not to flood the sieve and allow the poured in contents of the tray to spill out over the sieve sides.
- 16) Spread the contents out across the sieve, again taking care not to break or tear the disintegrated particles. Provided that any tangled parts of the wipe were disentangled in stage 14, the need to disentangle again should be minimal.



Photograph C4 The contents after being poured into the submerged sieve

- 17) Position the sieve so that the bottom of the sieve is submerged to a depth of approximately 20mm With the sieve sides remaining above the water level and the sample below water level carefully agitate the sieve backwards and forwards three times.
- 18) Lift the sieve out of the bath of water.
- 19) Rotate the sieve through 45 degrees and re-submerge the sample in the bath of water.
- 20) Repeat stages (17) to (19), rotating the sieve by a further 45 degrees in the same direction after each test cycle.
- 21) Continue the process for one minute, by which time c.30 cycles of stages (17) to (19) should have been undertaken
- 22) Observe the size and uniformity of disintegration of the sample retained on the sieve. Measure the largest fragments and take a photograph to report the results.
- 23) Collect the material retained on the upper surface and underside of the sieve and place in a crucible and dry in an oven at 105° for 12 hours.
- 24) After 12 hours remove the sample from the oven and place in a desiccator⁵ until cooled to room temperature.
- 25) Weigh the sample using an analytical balance to 100th g accuracy.
- 26) Determine the average dry weight of the 5 individual samples.
- 27) Determine the proportion of product mass passed through the sieve, as follows:

$$\% \text{Mass of product passed through} = \left(1 - \frac{\text{dry mass retained on 12.5mm sieve}}{\text{dry mass of control sample}} \right) \times 100$$

C.5 Number of Tests

Five replicates of the test sample shall be tested.

⁵ During cooling from 105° to room temperature, the rate of absorption of atmospheric moisture will vary depending on the product. To mitigate this effect cooling of the sample should be undertaken in a desiccator.

C.6 Test Report

The test record shall comprise of:

- a) Name of the testing laboratory undertaking the tests and the date(s) of the testing;
- b) The name of the product tested;
- c) A reference to the test procedure or a copy of it;
- d) Overview of the test procedure;
- e) Detailed description of the test apparatus;
- f) Details of the test samples used, to include type, size and lotion applied;
- g) For each of the 5 individual samples:
 - A record of fragment size at the end of agitation on the shake table;
 - Confirmatory photos of the sample at the end of agitation on the shake table;
 - Confirmatory photos of the sample uniformity of breakup on the sieve at the end of the 1 minute rinsing period; and
 - A record of the weight of the sample retained on the sieve after drying at 105° for 12 hours;
- h) For the test sample:
 - The average weight of the 5 individual samples retained on the sieve;
 - A record of the calculated percentage mass loss for the sample;
 - A record of any individual samples where individual fragments remain greater than 25 mm in the larger dimension.
- i) The overall conclusion in terms of pass/fail.

C. 7 Pass / Fail Criteria

When tested in accordance with the method specified above, on 5 occasions, the product passes this test if it disintegrates sufficiently so that:

- 1) At least 50% of the product mass (average of 5 replicates) passes through the 12.5 mm perforated plate sieve.

If the product does not pass the test, but at least 40% of the product mass for each of the 5 replicates passes through the 12.5mm perforated plate sieve, then the *Snagging in the drainline* test will be carried out.

Successfully passing the *Snagging in the drainline* test, pursuant to the preceding paragraph, will be considered sufficient to assess that the product has passed the *Disintegration in the drainline* test.

Appendix D – SNAGGING IN THE DRAINLINE TEST

If a product does not pass the *Disintegration in the drainline* test and/or the *Disintegration in the sewer system* test then, depending on the results of both tests (see sections C.7 and E.7), the *Snagging in the drainline* test may be required.

The purpose of the test is to confirm that the product, if it becomes temporarily engaged ('snagged') on an otherwise not significant imperfection in the drain or sewer, will break up or tear from the imperfection sufficiently quickly to minimize the risk of a blockage developing.

The snagging test is NOT required if the product passes both the *Disintegration in the drainline* and the *Disintegration in the sewer* tests.

D.1 Apparatus

A 4.5 litre flush wash down WC connected to a water supply and discharging to the drainline of the test rig, using a connection with short radius bends, as detailed in Appendix B: Figure B1.

A drainline test rig, as detailed in Appendix B: Figure B1, with the following characteristics:

- Pipeline: Clear plastic pipes of 100 mm nominal internal diameter and 1 m individual lengths, connected with sleeve joints;
- Gradient: 1:80; and
- Minimum length from the point of the WC discharge into the drainline, to the end of the drainline: 20 m.

as detailed in Appendix B and Figure B1.

Snag points deliberately set into the invert of the drainline test rig. (See Photograph D1).

Three snag points, which consist of screws fixed into the pipe from the outside are:

- i) Located at a distance of 12 m from the WC flush input to the drainline;
- ii) Protrude into the pipe 3 mm (in height);
- iii) Close to the invert of the pipe, adjacent to each other in the 4:30, 6 o'clock and 7:30 positions (as illustrated in Photograph D1).

The screws are a standard 10mm pan head self tapping screws, 4mm external thread and 3mm internal thread diameter.



Photograph D 1 Snag points set in half radius 100 mm diameter pipe

A simulated faecal solid, fabricated as specified in Australian Test Standard ATS 5200.499:2008 and subsequently adopted for BS EN 997:2003 as the test specimen for WC bowl clearance testing. (See photograph D2).

The dimensions of the test solid are:

- Diameter (mm): 25
- Length (mm); 200
- Mass (g): 40.9
- Volume (mL): 41
- Specific gravity: 1.0



Photograph D 2 Examples of the simulated faecal solid

D.2 Safe practices

The procedure shall be carried out using tap water.

Each testing laboratory is responsible for developing and implementing its own safe practices for this test, including the use of appropriate personal protection equipment.

D.3 Sample Size and Preparation

For each test the sample consists of a single full sized product. The product shall be tested immediately after removal from its packaging (e.g. for wet wipes, while they are still moist), 'scrunched' to imitate product use and dropped into the WC bowl.

Sufficient samples should be available to carry out 10 tests.

D.4 Number of Tests

A minimum of 10 tests shall be carried out.

D.5 Test Procedure

This test involves two stages, as follows:

- Firstly, to engage the product on a snag point;
- Secondly, to assess the snagged samples ability to disengage from the snag by flushing of the WC (maximum 7 flushes).

Test procedure - engaging ('snagging') sample on snag points

- 1) Calibrate the WC flush volume to 4.5 litres (+/- 0.2 litres).
- 2) Flush the WC to clear the WC and the drainline of any debris.
- 3) Place the sample(s) in the WC bowl and flush.
- 4) If the sample does not enter the drainline, flush the WC with water only until the sample enters the drainline.
- 5) Once the sample is in the drainline, continue flushing until the sample reaches the snag point at 10m distance.
- 6) If the sample does not snag, repeat steps 3 and 4.

If after three successive flushing attempts the test product does not engage on the snag points, manually snag the product by placing a test product intact on the snag points.

Apply light pressure with a finger, taking care not to press too hard so that the product tears on placement, otherwise that test will be invalidated. Once the test product has been placed on the snag, very carefully pull the test product in the downstream direction to ensure that it has engaged. Again, take care not to pull too hard and tear the product, otherwise that test will be invalidated. Following engagement, fully wet the sample.

Alternatively, if, after flushing, the product disintegrates before reaching the snagging point, to an extent that snagging is not possible, the product has passed that particular test. This is because snagging would never arise.

- 7) Once the samples has snagged, see Photograph D3, either by flushing as in steps 3 and 4 or by placing upstream of the snag point as in the option given in stage 6, the Snagging In The Drainline Test can be undertaken.



Photograph D 3 Sample snagged on two snag points

Test procedure - sample disengagement

The disengagement of the sample from the snag points shall be attempted using the following sequence of WC flushes representing male urination, female urination and bowel movement discharges respectively:

- a) water only;
- b) water and 4 sheets of toilet paper;
- c) water, 8 sheets of toilet paper and single solid,

A time interval of 15 minutes shall be allowed between successive test flushes, to allow for 'drain down' of the reservoir of water upstream of the snagged sample.

Test procedure - flush sequence

- 1) Flush the WC (Flush 1) with water only.
 - Observe the behaviour of the snagged sample and note if there has been any change in the position of the sample on the snag point.
 - If the sample breaks up or tears and the sample disengages from the snag points note the number of flushes the wipe has been subject to since snagging and the individual test is completed.
 - If the snagged sample does not break up or tear and be released from the snag point, continue the test as directed in step 2 below.
- 2) Flush the WC (Flush 2) with four sheets of toilet paper.
 - Observe the behaviour of the snagged sample and note if there has been any change in the position of the sample on the snag point or the addition of material to the snagged sample.
 - If the sample breaks up or tears and the sample disengages from the snag points note the number of flushes the wipe has been subject to since snagging and the individual test is completed.
 - If the snagged sample does not break up or tear and be released from the snag point, continue the test as directed in step 3 below.
- 3) Flush the WC (Flush3), with eight sheets of toilet tissue and a BS EN 997:2012 specified solid.
 - Observe the behaviour of the snagged sample and note if there has been any change in the position of the sample on the snag point or the addition of material to the snagged sample.
 - If the sample breaks up or tears and the sample disengages from the snag points note the number of flushes the wipe has been subject to since snagging and the individual test is completed.
 - If the snagged sample does not break up or tear and be released from the snag point, continue the test as directed in step 4 below.
- 4) If the sample remains snagged repeat the WC flush sequence in the order listed below (Flush 4 to 7). After each flush note if there has been any change in the position of the sample on the snag point or the addition of material to the snagged sample. If the snagged sample breaks up or tears sufficiently for the sample to be released, that individual test is completed.
 - (Flush 4) - Flush the WC with water only,
 - (Flush 5) - Flush the WC with four sheets of toilet paper,
 - (Flush 6) - Flush the WC with eight sheets of toilet tissue and a BS EN 997:2012 specified solid.

- (Flush 7) - Flush the WC with water only,

If the sample remains snagged after 7 flushes⁶ the individual test is complete. Manually remove the snag, flush the drainline clear of any residual debris.

Repeat the test procedure until 10 individual tests have been completed.

Photographs D4 and D5 demonstrate typical pass and fail conditions respectively.



Photograph D 4 Small traces of sample remaining (representing a pass).



Photograph D 5 Accumulation of material on snagged sample (representing a fail)

⁶ Number of flushes for a single person household per day. Compendium of micro-component statistics. WRc Report Ref: P9193.03: 2012.

D.6 Test Report

The test report shall comprise of:

- a) The name of the test house and the date(s) of the testing;
- b) The name of the product tested;
- c) A reference to the test procedure or a copy of it;
- d) The type of toilet used and volume of flush;
- e) Details of the snag points, including a photograph;
- f) For each test, details of:
 - The method of snagging – via a flush or manually introducing immediately upstream;
 - The WC flushes undertaken, to include the flush loading and the effect on the snagged sample;
 - The number of flushes to effect the disengagement of the sample and the mode of release of the snagged sample (if applicable);
 - Any other relevant observations (if applicable);
- h) Individual test results (pass/fail); and
- i) The overall result, in terms of the pass/fail criteria.

D. 7 Pass / Fail Criteria

When tested in accordance with the method specified above, the product shall:

- 1) Disintegrate sufficiently before it reaches the snag point so that it does not snag; or
- 2) For greater than 90% of the number of samples that become snagged on a snag point, break up or tear off from the snag point must occur in no more than 7 toilet flushes.

If the *Snagging in the drainline* test has been required, and the product passes the *Snagging in the drainline* test, the overall result for the two disintegration tests (*Disintegration in the drainline* and *Disintegration in the sewer system*) and the *Snagging in the drainline* test will be a pass.

Appendix E– DISINTEGRATION IN THE SEWER SYSTEM TEST

The purpose of the test is to confirm that the product continues to disintegrate in the sewer, beyond the break-up level required in the Drainline Disintegration Test. This is to ensure that the product or partially disintegrated parts of the product do not blind screens at a Combined Sewer Overflow (CSO) or blind wastewater treatment works inlet screens.

The results from this test (and the *Disintegration in the drainline* test) determine whether or not the *Snagging in the drainline* test is conducted (see C.7 and E.7). If the product fails the *Disintegration in the sewer system* test, but within the margin defined in E.7, then the *Snagging in the drainline* test will be carried out. If the product then passes the *Snagging in the drainline* test, the overall result for the *Disintegration in the sewer system* and the *Snagging in the drainline* tests will be a pass.

If the product passes both the *Disintegration in the drainline* test, and the *Disintegration in the sewer system* test, then the *Snagging in the drainline* test is not required.

E.1 Apparatus

Apparatus is as per Appendix C: C.1 with the exception of the perforated plate sieve. The Sewer Disintegration Test requires a **5.6mm perforated plate sieve** (round holes) complying with ISO 3310-2: 2013, as illustrated in Photograph E1.



Photograph E 1 5.6mm perforated plate sieve

E.2 Safe practices

The procedure shall be carried out using tap water.

Each testing laboratory is responsible for developing and implementing its own safe practices for this test, including the use of appropriate personal protection equipment.

E.3 Sample Size and Preparation

Sample size and preparation are as per Appendix C: C.3.

E.4 Number of Tests

Five individual product samples shall be tested.

E.5 Test Procedure

Preparation of control samples

Preparation of control samples is as per Appendix C: C.4.

Disintegration test

Disintegration test is as per Appendix C: C.4, with the exception of:

- 1) Set the orbital shaker to rotate for 6 hours⁷ at 120 rpm.
- 2) After 45 minutes bring the shaker table to a halt. Then reverse the direction of rotation of the shaker table and restart.
- 3) Repeat step (11) every 45 minutes until the end of the 6 hour period.
- 4) After 6 hours, stop the orbital shaker.

Assessment of proportion of disintegrated product

Carry out *The assessment of proportion of disintegrated product* as per Appendix C: C.4, with the exception of:

- 5) Carefully pour the contents of the tray onto the 5.6 mm sieve. The sieve should be submerged in a bath of water, for example a large sink, with the sides of the sieve being at least 10 mm out of the water. Care should be taken not to flood the sieve and allow the poured in contents of the tray to spill out over the sieve sides.

Photographic evidence of break up

Where a product displays good disintegration characteristics, to an extent where the break up is clearly sufficient for the product to pass the test, photographs of the extent of break up should be recorded at the end of the shake flask agitation stage. One method of achieving this may be to pour the shake flask contents carefully into a rectangular glass dish placed on top of a sheet of graph paper (marked with 25 mm squares). This is to both assess the extent of disintegration and size of broken up product.

Determine the proportion of product mass passing through the sieve as described above. If clumping of the disintegrated product on the sieve is observed and this cannot be resolved using the procedure above, a reduced pass rate (see E.7) is acceptable, **provided that** photographic evidence of a uniform break up when placed on the shallow tray / flat bottomed dish (see step 14 Appendix C: C.4) is reported.

E.6 Test Report

The test record shall comprise of:

- a) Name of the testing laboratory undertaking the tests and the date(s) of the testing.
- b) The name of the product tested;
- c) A reference to the test procedure or a copy of it.
- d) Overview of the test procedure.
- e) Detailed description of the test apparatus
- f) Details of the test samples used, to include type, size and lotion applied.

⁷ Whilst it is accepted that the transport time for a product to progress from a WC flush to treatment works inlet will vary considerably, a time of six hours has been chosen for the test as representative the average time of transit from a property to a wastewater treatment facility.

- g) For each of the 5 samples:
- A record of fragment size at the end of agitation on the shake table (to assess appropriate fragment size procedure);
 - Confirmatory photos of the sample at the end of agitation on the shake table;
- h) A photograph showing the break up pattern achieved for the product retained on the 5.6 mm sieve.
- i) For each of the 5 samples tested:
- The proportion of weight loss after 6 hours of disintegration.
 - Any other relevant observations (if applicable).
- j) Individual test results in terms of pass/fail.
- k) For the series of 5 tests:
- The average proportion of weight loss after 6 hours of disintegration.
 - The overall conclusion in terms of pass/fail.

E. 7 Pass / Fail Criteria

When tested in accordance with the method specified in Appendix E, on 5 occasions, the product passes this test if:

- 1) Greater than 80% of the product mass (average of 5 individual samples) passes through the 5.6 mm perforated plate sieve: and
- 2) For the product mass that does not pass through the 5.6 mm sieve, a good and relatively uniform break up pattern (where no individual piece is greater than 40mm in the largest dimension) is apparent.

Alternatively:

- 3) Where photographic evidence of break up to 25 mm or less has been obtained (see Section E5 – Assessment of proportion of disintegrated product) and clumping of the sample is noted at the sieving stage, the pass rate will be reduced to 60% of the product mass passing through the 5.6 mm perforated plate sieve for each of the 5 replicates.

If the product does not pass criteria 1) and 2), and the alternative criterion 3) does not apply, then the Snagging in the drainline test will be carried out.

Successfully passing the *Snagging in the drainline* test, pursuant to the preceding paragraph, will be considered sufficient to assess that the product has passed the *Disintegration in the sewer system* test.

Appendix F – SETTLING TEST

The purpose of the test is to confirm that the disintegration by-products of the sample under test settle out in the sewage treatment process primary settlement stage and are not passed on to the secondary treatment, to disrupt the overall sewage treatment process or impair the final effluent quality.

The need to settle wastewater solids is important for both large and small wastewater treatment works and for domestic treatment facilities such as septic tanks or packaged sewage treatment facilities. The settlement would also remove any larger semi-intact fragments of product where the treatment process does not have an inlet screening process.

F.1 Apparatus

Settling column, a 2.0 m length of transparent plastic pipe of 200mm nominal internal diameter, mounted vertically on a test stand. The column should be equipped with a pipe cap (to seal the base of the pipe) fitted with a drain valve and another drain valve fitted half way up the column. The column should be marked as follows:

- an upper timing line which is 1.60 m above the column base;
- a lower timing line, which is 1.20 m below the upper timing line; and
- a floatation line, which is 300mm above the column base.

The settling column dimensions and arrangement are illustrated in the Figure F1.

Stop watch or other suitable timing device which displays seconds.

F.2 Safe practices

The procedure shall be carried out using tap water.

Each testing laboratory is responsible for developing and implementing its own safe practices for this test, including the use of appropriate personal protection equipment.

F.3 Sample Size and Preparation

Each sample consists of a single sample of the product in 1 litre of tap water which has been subjected to the 6 hour agitation stage of the Sewer Disintegration Test (see Appendix E). The sample is retained in the one litre of water prior to pouring into the settlement column.

F.4 Number of Tests

A minimum of three series of tests are required.

In each series of tests a 1 litre sample is poured into the column and the settling rate is observed. This is repeated 10 times. After the 10 tests the apparatus is then left undisturbed for 24 hours and the products susceptibility to refloat is observed.

The above series of tests are repeated three times.

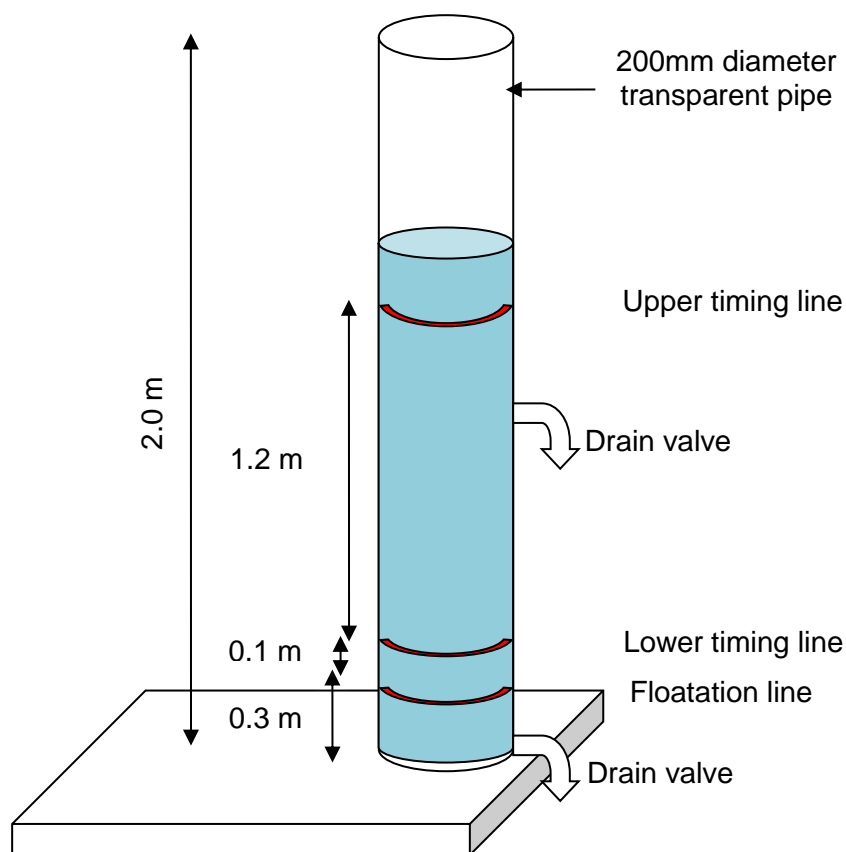


Figure F 1 Settling column arrangement

F.5 Test Procedure

- 1) Close all column valves and ensure that the column is located near and/or connected by flexible hoses to a suitable drain or collection vessel.
- 2) Fill the column with tap water to a minimum of 100mm above the upper timing line, which must be 1200 mm above the lower timing line.
- 3) Fill the column in such a way to minimize aeration of the water and to maximize the release of entrained air in the supply water lines.
- 4) After filling, allow sufficient time for bubbles⁸ in the water or on the column wall to dissipate.
- 5) Pour a single 1 litre sample into the top of the column. Take care to pour the contents into the centre of the column to avoid the article contacting the inner wall of column.
- 6) Start the timing of the settlement when the first fragment or fibres reach the upper timing line.
- 7) Stop the timing of the settlement when the last fragment or fibres pass the bottom timing line.
- 8) The travel time between the timing lines is recorded.

⁸ When the tap water is much colder than the laboratory temperature, bubbles can form over the 24 hour test period as the water warms. In this situation, it is highly recommended that the temperature of water in the column and air temperature in the laboratory be allowed to come into equilibrium over 24 hours before starting a test.

9) Repeat this process (5) to (8) until all ten samples have been tested.

In the event that a test material does not settle when poured into the column, the following procedures shall be followed:

- If the sample is still floating on the surface after 5 minutes, add a litre of water to the column and remove one litre of water using the drain valve fitted half way down the column;
- If, after another 5 minutes, the sample is still floating, another litre of water is added and a litre is removed from the column using the drain valve fitted half way down the column;
- If the sample continues to float, the sample is removed from the column and discarded. In this situation the test is concluded at this point. The product has failed the Settlement Test and is therefore to be regarded as “not flushable”.

In the event that any sample does not reach the lower timing line after 20 minutes:

- The sample has failed to reach the required settling velocity and the test has failed as all samples are required to meet the settling velocity (see Section 3.8).

10) After adding the ten test samples, leave the column and its contents undisturbed for a period of 24 hours.

11) At the end of the 24-hour period, inspect the column and record if any of the samples have risen above the floatation line, located 300 mm above the bottom of the column.

In the event that articles refloat within 24 hours:

- Carefully tap the column to release any air trapped within the settled sample and leave for 1 hour. If after 1 hour the refloat material has not re-settled to the base of the column or below the 300 mm marker line the sample has failed this stage of the test.

F.6 Test Report

The test report shall comprise of:

- a) The name of the test house and the date(s) of the testing;
- b) The name of the product tested;
- c) A reference to the test procedure or a copy of it;
- d) Overview of the test procedure;
- e) Detailed description of the test column;
- f) Details of the test samples used, to include type of sample and extent of disintegration at start of test;
- g) Confirmatory photos of product behavior (optional);
- h) For each individual test:
 - A table listing the settling velocity of the 10 individual samples and the average settling velocity.
 - Any other relevant observations (if applicable).
- i) For each of the three series of tests:

- A list of samples that remained settled and those that refloated within 24 hours.
- Any other relevant observations (if applicable).

j) The overall conclusion in terms of sample pass/fail.

F. 7 Pass / Fail Criteria

When tested in accordance with the method specified above, 100% of the product shall:

- 1) Settle at a velocity that must exceed 1 mm/second; and
- 2) Following settlement, not become sufficiently buoyant to rise more than 300mm from the bottom of the column within 24 hours.

APPENDIX G – DETERMINATION OF SYNTHETIC AND NON- SYNTHETIC ORGANIC COMPONENTS

The purpose of the MONS test⁹ (Matière organique non synthétique – non-synthetic organic matter) is to confirm that the product material does not contain synthetic organic material (e.g. petro chemical derived plastic fibres).

The test will dissolve natural organic material in a test sample and leave synthetic organic material (e.g. petro chemical derived plastics) as a test residue.

G.1 Apparatus and Reagents

A 2 litre beaker

0.5 mm stainless steel sieve

A 14/15% solution of bleach (NaClO)

Tap water

G.2 Safe practices

The method uses a 15 % active bleach solution (NaClO) which is corrosive.

The dissolution method may lead to the evolution of low levels of chlorine gas and the test must be undertaken in a fume cupboard.

Each testing laboratory is responsible for developing and implementing its own safe practices for this test, including the use of appropriate personal protection equipment.

G.3 Sample Size and Preparation

Each test consists of a single sheet of the product.

G.4 Number of Tests

⁹ Laboratory based biological biodegradability tests for the most part require bespoke equipment and need to be carried out over periods of days and weeks under optimum test conditions to gain a measure of how rapidly organic biomass can be broken down by aerobic and anaerobic organisms.

Surrogate chemical dissolution tests have the potential advantage over biological tests in that they are simple to undertake and tend to generate data over a couple of days. They do not provide information on environmental timescales for degradation, but importantly in the context of disposable products to sewer they can provide information on the amount of natural biomass material versus synthetic organics (e.g. plastics and other synthesised polymers) in a wipe.

The test procedure detailed in this WIS is a modified version of the French standard NF U44-164 and can be used to determine the fraction of readily degradable non-synthetic or 'natural' organic matter in a sample. The test has been widely applied on samples of mixed residual municipal waste and fractions thereof to provide a measure of the content of organic material in a sample that would, with the right conditions, be environmentally degradable.

Five replicates of the test sample shall be tested.

G.5 Test Procedure

- 1) Place a single sheet of the product in a 2l beaker. In a fume cupboard cover the sample with 1000 ml of the 14/15% bleach solution. Mix the sample well with the bleach: all the sample has to be soaked. NOTE: when the sample comes into contact with bleach exothermic reactions may occur and chlorine fumes may be produced.
- 2) Leave the sample to react for 48 hours. Stir the sample at the beginning and end of the test period.
- 3) Empty the contents of the beaker onto a 0.5 mm sieve.
- 4) Rinse the sample by carefully pouring 2 litres of tap water from a 2 litre beaker over the sieve.

G.6 Test Report

The test report shall comprise of:

- a) The name of the test house and the date(s) of the testing;
- b) The name of the product tested and product description;
- c) A reference to the test procedure or a copy of it;
- d) Overview of the test procedure.
- e) Confirmatory photos of product behavior.
- f) The overall conclusion in terms of sample pass/fail.
- g) Any other relevant observations (if applicable);

G. 7 Pass / Fail Criteria

When tested on 5 occasions in accordance with the method specified above, the product shall:

- 1) Pass through the 0.5 mm sieve without leaving fibres or other visible residue(s)