

1 **International Wastewater Services Flushability Group**
2 **IWSFG PAS 2B: 2017 – Toilet and Drain Line Clearance Test Methods – Drain Line Settling Test**

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10 permission from the IWSFG.

11 Once finalized, the IWSFG will permit the downloading and use of the documents without charge for
12 the purpose of determining whether a product is likely to be considered flushable and to be so
13 identified.

14 **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 systems, and wastewater collection and treatment systems as well as the nature 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 the manufacturers and distributors of their products to act in a socially responsible and environmentally sustainable manner by adhering to the established standards.

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

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53 1 Introduction

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

- 56 a. liquid effluents to the aquatic environments of lakes, rivers, and oceans
- 57 b. solid residuals (biosolids) for application to land for their inherent nutrient values
- 58 c. solid residuals incinerated for energy recovery
- 59 d. solid residuals sent to landfill

60 Typical waste streams include toilet paper, human waste, food waste, detergents and cleaning agents. In
61 recent years, new products such as moist wipes and toilet bowl cleaning products have been introduced
62 worldwide - many of these are identified as “flushable” products. Other products such as tampons,
63 condoms, and facial tissues are commonly but inappropriately flushed. The physically adverse effects of
64 such products on wastewater systems (clogging and plugging) have already been identified but
65 numerous other environmental effects have not been studied systematically. For example, various
66 flushed products may comprise materials and chemicals that can be harmful to the environment; hence,
67 such products should not be identified as “flushable”. Accordingly, the purpose of the flushability test,
68 along with others presented in this IWSFG series, is to define the qualities and characteristics of those
69 products that may be considered as “flushable”. By adhering to these test methods and providing the
70 appropriate advice to the product users regarding their after use disposal will ultimately lead to the
71 long-term sustainability of wastewater systems and the minimization of potential problems such as pipe
72 blockages and equipment failures in sewer networks.

73 The goal of the IWSFG is not to ban the production and/or use of these products, but to encourage
74 manufacturers to identify those products that do not meet the IWSFG’s standards as not being
75 “flushable” and to encourage users to dispose of such products after use in an appropriate manner.

76 2 Purpose

77 The purpose of this test is to assess the performance, i.e. drain lane clearance, of a product when it is
78 subjected to the hydraulic forces typically found under the intermittent flow conditions found in
79 wastewater transport systems.

80 The test will demonstrate the potential of an article to pass through and clear a typical drain line in and
81 immediately surrounding a building with a standard number of toilet or WC flushes and to ensure that
82 there is no evidence of the flushed material backing up. [1]

83 **Note:** This test is proposed for application in the United Kingdom.

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.

84 **3** Scope

85 The scope of this PAS includes all products that a manufacturer or distributor of a particular product
86 may wish to identify as being flushable and all products, which by the location of their use and likely
87 contamination by human excreta, are likely to be flushed through a toilet or WC into a drain line and
88 into a wastewater conveyance and treatment system.

89 **4** References

90 4.1 Normative References

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

92 IWSFG PAS 2A: 2017 *Toilet Clearance Test*

93 4.2 Informative References or relevant Annexes

94 Annex 1 – Sources of Apparatus

95 Annex 2 – Photographs of Test Apparatus

96 **5** Terms and Definitions

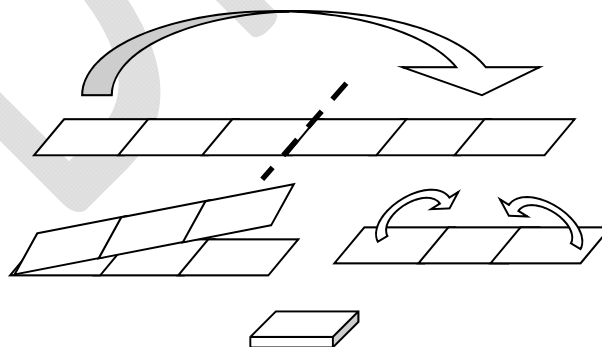
97 With the exception of the definitions of unit size, see: IWSFG PAS 0:2017 *Terms and Definitions for*
98 *Determination of Flushability*

99 5.1 Unit size – dry tissues

100 For dry tissues that are not toilet paper, the unit size is 2 tissues as removed from the
101 packaging.

102 5.2 Unit Size – toilet paper

103 A number of multiple joined sheets (typically 6) folded into a square as shown in the
104 Figure 1 below. The target mass for a unit is 3 g. Hence, the number of sheets in a unit
105 should be that number that provides as close to 3 g of total material as is practical.



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Figure 1 - Folding of Toilet Tissue into a "Unit Size" [2]

109

110 5.3 Unit Size – Moist Tissues

111 one tissue or the maximum number of the product that may be flushed according to the
112 manufacturer's instructions or recommendations as indicated on the packaging

113 5.4 Unit Size – Other Products

114 one product or the maximum number of the product that may be flushed according to
115 the manufacturer's instructions or recommendations as indicated on the packaging.

116 6 Principles

117 The flushability test is used to demonstrate a product's potential to successfully exit a drain
118 line without subsequent snags when subjected to the hydraulic forces normally found in a
119 gravity fed intermittent flow situation.

120 This test provides evidence that the product being tested will clear a drain line within a set number of
121 toilet flushes.

122 It is recommended that the toilet bowl clearance test and drain line clearance test be evaluated
123 simultaneously, using identical product/product loading.

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

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

128

129 7 Apparatus

130 The drain line and toilet apparatus comprises:

- 131 a. a 4.5 L ± 0.4 L siphonic toilet as used in the IWSFG PAS 2A: 2017 Toilet Clearance Test
- 132 b. a 3 m long ABS 76 mm (3 in) vented sewer pipe connection to the drain line with two 90°
133 horizontal bends
- 134 c. a 20 m long PVC drain line 10 cm (4 in) constructed of joined pipe sections of approximately 2.5
135 m, firmly mounted on a series of trestles such that there is a continuous slope of 2%
- 136 d. one 90° horizontal corner 10 m from the head end shall be contained the drain line

137 (See: Photo A.1 – Toilet and Drain Line Set Up)

138

139 Optional equipment:

- 140 1. Suitable containers (e.g. plastic bucket) to:
- 141 a. transfer the test material from the toilet used for the Toilet Clearance Test to the drain

- 142 line, or
143 b. to capture the liquid exiting the drain line during the test.
144

145 8 Preparation

146 147 8.1 Sample acquisition

148 For products already in the market place, the testing laboratory technicians shall select
149 and acquire sample products from retail outlets (e.g., grocery stores or pharmacies).

150 For products under development as either new or improved products, the testing
151 laboratory may receive samples from the manufacturers or the intended distributors of
152 such a product.

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

155 156 8.2 Number of Test Pieces

157 Ten specimens are required for each complete testing. Specimens should be obtained
158 from at least two distinctly separate packages of a product. To obtain 10 specimens, a
159 roll of toilet paper, or a bundle of wipes in its original package should be divided into 5
160 equal sections. Then, one specimen from each section will be used for testing.

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

163 To obtain moist tissue specimens, it will be convenient to turn their packaging on its side
164 so that the whole bundle of moist tissues is evident. Then, the package will be divided
165 into 5 equal sections, and a specimen will be removed from each section.

166 It is necessary to practice caution so as to not damage delicate specimens when removing
167 them from their packaging. Specimens must also be removed just before the start of
168 testing.

169 170 8.3 Sample preparation

171 The following specifications apply to all of the products to be tested.

172 173 8.3.1 Dry tissues:

174 The sample shall comprise one unit of toilet paper or one unit of dry tissues.

175

176

8.3.2 Moist tissues

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The sample shall comprise one unit of moist tissues taken directly from the packaging, unless the manufacturer's instructions recommend a maximum, in which case the maximum loading per flush suggested by the manufacturer should be used and recorded in the test report.

181

182

183

Moist tissues shall be tested as removed from the package. No attempt to remove the lotion should be made and the freshly-removed moist tissue should be tested immediately, to reduce the likelihood of moisture evaporation.

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8.3.3 Other products

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For other products, one specimen will be taken directly from the package.

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188

8.4 Apparatus

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The following configuration shall apply:

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1. The maximum vertical distance from the toilet outlet to the horizontal drain line beneath it should not exceed 40 cm (16 in).
2. The line should be vented near the toilet to prevent the development of a vacuum in the line.
3. Each section of the drain line should be held in place using adjustable supports or by laying the pipe on a bed of sharp sand.
4. The support system must be set and maintained to prevent sagging at the joints.
5. To ensure accurate positioning of the drain line, it is recommended that the slope of each individual pipe is measured.
6. Along the drain line's length, distances are marked at regular intervals (0.5 meters) to allow for the quick measurement and the recording of the location of the specimens relative to the toilet after each flush.
7. A screen or other device should be used at the terminal end of the drain line to recover the flushed specimens during testing.

204

Note: Photographs of a representative test system can be found in Annex 2.

205

206

207

Upon set-up and prior to conducting a test, the drain line and snags should be checked to ensure that all are clear of residual specimen materials from previous tests (See: Photo A.4).

208

Prior to conducting the test:

209 Three flush actions should be performed without a specimen and each flush should be collected
210 for measurement to establish a baseline flush for the drain line and to ensure the correct
211 operation of the toilet or WC. The average of the three flush actions should be $4.5 \text{ L} \pm 0.4 \text{ L}$.
212 Prior to initiating a test flush, it is necessary to ensure that the drain line has no flow.
213 From time to time, confirm that the average slope in the drain line remains at 2%.

214

215 9 Storage and Conditioning

216

217 9.1 Storage of samples

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

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

- 222 1. Dry products should be returned to their original packaging, and should be
223 double-bagged with resealable plastic bags.
- 224 2. Moist products should be kept in their original packaging, e.g., hard-plastic
225 containers or soft-plastic packages.
- 226 3. In case of hard-plastic boxes, the box should re-closed, and then it should be
227 double-bagged with plastic resealable plastic bags to minimize any exposure to
228 the ambient air.
- 229 4. Soft-plastic packages should be closed tightly after squeezing the air out of the
230 package, and then they should be double-bagged with resealable plastic bags to
231 minimize the potential exposure to ambient air.
- 232 5. Samples should then be stored in secured laboratory cabinets.

233

234

235 9.2 Conditioning for the Test

236 Specimens shall be conditioned by first passing the products through the
237 IWSFG PAS 2A – *Toilet Clearance Test Method*.

238

239 10 Procedure

240

241 10.1 Summary

242 The test consists of ten toilet flush sequences using the test product, and the loading
243 levels provided by the manufacturer’s instructions or the product’s anticipated usage.
244 After each flush, observations are made regarding whether the specimen has cleared
245 the toilet bowl and trap.

246 Following each flush, the location of the specimen in the drain line is recorded.

247

248 10.2 Test procedure

249 The following steps should be undertaken:

- 250 1. Prior to adding any articles to the toilet and/or initiating a flush ensure that
251 there is no flow in the drain line.

252 **Note:** This does not mean that the drain line should be dry.

- 253 2. With the drain line connected to the toilet used in the IWSFG PAS 2A Toilet
254 Clearance Test, simply flush the toilet in conformity with that test.

- 255 3. After the initial flush action, inspect the drain line to determine where the
256 test article is located in the drain line, as measured from the upper end of
257 the drain line. Record the location of the product.

- 258 4. Repeat the flush action after 3 minutes and inspect the drain line to
259 determine and record where the test article is located in the drain line, as
260 measured from the upper end of the drain line.

- 261 5. Repeat steps 2 to 4, a maximum of 5 times to determine and record the
262 location of the test article in the drain line.

- 263 6. A total of 10 flushing sequences of test product is required to complete the
264 test.

- 265 7. If any flush sequence requires more than 5 flushes for a test article to clear
266 the drain line, abort the test sequence, record the event in the test data
267 sheet, empty the drain line, and commence the next flush sequence.

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- 269 8. Record the outcome (observations) according to Table 1.

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Table 1: Procedures to Follow after Each Flush Based on Observations of Toilet and Drain Line

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Observation	Procedures to Follow
Record the distance from the drain line entrance following the 1 st flush.	<ol style="list-style-type: none"> 1. Allow 3 minutes for the water and the flushed articles to equilibrate within the drain line. 2. If the specimen has exited the drain line, commence with the next test with the specimen loaded in the toilet bowl. However, if the product has not cleared the drain line, make the second flush an 'empty' flush.
Record the distance from the drain line entrance following the 2 nd flush.	<ol style="list-style-type: none"> 1. Allow 3 minutes for the water and the flushed articles to equilibrate within the drain line. 2. If the specimen has exited the drain line, commence with the next test with the specimen loaded in the toilet bowl. However, if the specimen has not cleared the drain line, make the third flush an 'empty' flush.
Record the distance from the drain line entrance following the 3 rd flush.	<ol style="list-style-type: none"> 1. Allow 3 minutes for the water and the flushed articles to equilibrate within the drain line. 2. If the specimen has exited the drain line, commence with the next test with a specimen loaded in the toilet bowl. However, if the specimen has not cleared the drain line, make the fourth flush an 'empty' flush.
Record the distance from the drain line entrance following the 4 th flush.	<ol style="list-style-type: none"> 1. Allow 3 minutes for the water and the flushed articles to equilibrate within the drain line. 2. If the specimen has exited the drain line, commence the next test with a specimen loaded in the toilet bowl. However, if the specimen has not cleared the drain line, make the fifth toilet flush an 'empty' flush.
Record the distance from the drain line entrance following the 5 th flush.	<ol style="list-style-type: none"> 1. Allow 3 minutes for the water and the flushed articles to equilibrate within the drain line. 2. If the specimen has cleared the drain line, complete the test. Alternatively, if the specimen has not cleared the drain line, note the position of the specimen and given that specimen did not clear the drain line in the ten requisite flushes, conclude the test.

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275 10.3 Test Termination

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Upon the completion of a round of testing, the drain line shall be drained and cleared of any residue from the test specimens.

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In cases where the 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, or soap and water.

284 10.4 Calculations

285

The test is intended to assess if the specimen:

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- a. remained stationary for 3 or more flushes, in which case the specimen is regarded as being “Stranded”
- b. failed to clear the drain line in 5 flushes

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The following calculation is required:

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293
294

- a. when the number of tests where the specimen remained stationary in the drain line after 3 subsequent “no product” flushes
- b. the percentage of all flush sequences where the specimens cleared the drain line with no more than 5 flushes

295

296 11 Acceptance Criteria

297 To be acceptable:

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299
300

- a. no specimen remains stationary after 3 flushes
- b. all of the flush sequences result in all of the specimens clearing the drain line in no more than 5 flushes

301 12 Test Report

302 The test report should include the following information:

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- a. a reference to this test procedure
- b. an overview of the test procedure including the drain line configuration
- c. the date and location of testing
- d. a complete identification of the tested product
- e. a statement as to the acquisition process followed and the purpose of testing
- f. the dimensions and weights of the specimens
- g. the number of specimens used per flush

- 310 h. any departure from the set procedure and any circumstances that may have affected the results
311 along with an explanation for such circumstances
312 i. confirmation of the average number of flush actions performed in the test sequence
313 j. copies of photographs taken during the procedure
314 k. the test results, including:
315 1. the details of each test, in terms of distance travelled after each flush and the number of
316 flushes required for the product to exit the drain line
317 2. the average number of flushes needed for the specimens to exit the drain line
318 3. the percentage of the 10 tests in which the specimens did not exit the drain line
319 4. a statement indicating whether the product passed or failed the test
320
321

322 13 Precision (On-going Maintenance of the Toilet and Drain Line)

323 Periodically, the toilets used should be checked for correct operation (flapper/check valve, fill line) and
324 the delivery of the correct flush volume. When required, they should be adjusted to meet the
325 manufacturer's specifications.

326 Periodically, drain lines used should be checked for correct alignment, and, if necessary, adjustments
327 should be made to insure a continuous average gradient of 1°.

328 There may be some variation in the quality of the products being tested, which is why 10 separate
329 specimens shall be acquired and tested, according to Section 6.1.

330

331

332 **Bibliography**

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- 335 2. *Guidelines for Assessing the Flushability of Disposable Nonwoven Products. A Process for Assessing*
336 *the Compatibility of Disposable Nonwoven Products with Plumbing and Wastewater Infrastructure*.
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339 Coalition (PERC), November 2012.
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Annex 1 – Sources of Apparatus

343

(Informative)

344

All of the apparatus required for this test are readily available in hardware and plumbing outlets.

345

It is recommended that all the drain lines used should be certified as conforming to the applicable national standards.

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The mounting platform for the drain lines can be constructed using readily available lumber.

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Annex 2 – Photographs of Test Apparatus (Informative)



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354 Source: Courtesy UK WRc



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356 Source: Courtesy UK WRc