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International Wastewater Services Flushability Group

IWSFG PAS 4: 2017 – Settlement Test Method

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PUBLIC COMMENT VERSION

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

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, onsite various treatment and wastewater collection and treatment systems as well as 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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DRAFT

61 1 Introduction

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

- 64 a. liquid effluents to the aquatic environments of lakes, rivers, and oceans
- 65 b. solid residuals (biosolids) for application to land for their inherent nutrient value,
- 66 c. solid residuals incinerated or digested for energy recovery
- 67 d. solid residuals sent to landfill sites

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

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

85

86 2 Purpose

87 The purpose of this test is to assess the settling performance of a product when it is subjected to the
88 hydraulic conditions typically found in the treatment plants of wastewater systems.

89 3 Scope

90 The scope of this PAS includes all products that a manufacturer or distributor may wish to identify as
91 being 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.

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

94 4 References

95 4.1 Normative

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

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

98 IWSFG PAS 2B:2017 *Drain Line Flow Test*

99 4.2 Informative References or relevant Annexes

100 Annex 1 – Sources of Apparatus

101 5 Terms and definitions

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

103 In addition to IWSFG PAS 0:2017 Terms and Definitions for Determination of Flushability, the following
104 eight terms are used specifically and only in this PAS.

105 5.1 Fill Mark

106 the upper graduation level marked on the clear settling pipe indicating the
107 commencement of settling range within the pipe

108 5.2 Settling

109 losing buoyancy and passing below the Stop Mark

110 5.3 Settling range

111 the distance in the settling pipe over which the settlement of the product is timed, i.e.,
112 the distance between the fill mark and the stop mark

113 5.4 Stop Mark

114 the lower graduation level marked on the clear settling pipe 1200 mm below the Fill
115 Mark

116 5.5 Unit Size – dry tissues

117 for dry tissues that are not toilet paper, the unit size is 2 tissues as removed from the
118 packaging

119 5.6 Unit Size – toilet paper

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

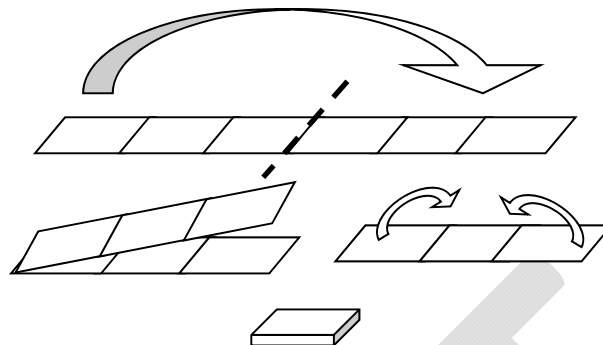


Figure 1: Folding of Toilet Tissue into a “Unit Size” [2]

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125

126

127 **5.7 Unit Size – moist tissues**

128 one tissue or the maximum number of the product that may be flushed according to the
129 manufacturer’s instructions or recommendations shown on the packaging.

130 **5.8 Unit Size – other products**

131 one product or the maximum number of the product that may be flushed according to
132 the instructions or recommendations contained on the packaging.

133 **6 Principles**

134 The flushability test is used to demonstrate a product’s potential to settle in water
135 when subjected to the hydraulic conditions normally found in wastewater treatment
136 plants.

137

138 The test is to place a wetted test product into the top of a 1500 mm column of tap water to
139 allow the settling behaviour of the product to be observed over a given period.

140 **Note: 1.** The wetted test product’s desirably is the amount of product collected from the
141 combined toilet clearance and drain line flow clearance test (IWSFG PAS 2B: 2017).

142 **2.** The test is undertaken in potable water, as opposed to wastewater because:

143 a. It avoids health and safety issues associated with wastewater.

144 b. It avoids the inconsistencies that would inevitably be found between

145 two or more samples of wastewater.

146

147

148 7 Apparatus

149 The apparatus comprises a:

- 150
- 151 • clear plastic pipe that is:
 - 152 ○ at least 1500 mm in height and in 180 to 220 mm inside diameter
 - 153 ○ open at the top and closed at the bottom
 - 154 ○ supported structurally to keep the pipe upright and stable
 - 155 ○ marked with two graduation lines 1200 mm apart indicating
 - 156 ■ the start level of the test (Fill Mark)
 - 157 ■ the termination level of the test (Stop Mark)
- 158 **Note:** Other graduation lines are optional
- 159 ○ provided with drain valves at the bottom of the pipe and 200 mm below the fill
 - 160 mark
 - 161 • a stop watch or other suitable timing device
 - 162 • a 1 liter container
 - 163 • a thermometer
 - 164 • a 1 mm sieve with a handle
 - 165 • a removable collection basket (e.g. comprising a 6.3 mm wire mesh) to be
 - 166 placed at the bottom of the column for recovering settled products at the
 - 167 conclusion of the test.²

168 Optional equipment includes:

- 169
- 170 • flexible hoses (recommended)
 - 171 • plastic bucket or other suitable container of sufficient capacity to hold 20 L
 - 172 of water

173 8 Preparation

174 8.1 Sample Acquisition

175

176 8.1.1 Preferred acquisition method

177 The preferred sample acquisition is to collect the residues of specimens
178 successfully tested and recovered from the combined Toilet Clearance the Drain
179 Line Flow Test (IWSFG PAS 2B).

² The removable basket should be attached by fine cords, and maintained under tension on opposite sides of the pipe so as not to interfere with the settling process. The removable basket is used to remove settled fragments at the conclusion of the test and to facilitate the clearing of the test column.

180 **Note:** Test samples should be placed in sealed plastic container following their
181 collection until used for this test.

182 8.1.2 Alternative Acquisition Method

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

185 For products under development as new or improved products, the testing laboratory
186 may receive samples from their manufacturers or intended distributors.

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

189

190 8.2 Number of test pieces

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

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

197 To obtain moist specimens, it will be convenient to turn their packaging on their sides to
198 see the whole bundle of wipes. Then, package will be divided into 5 equal sections, and
199 a specimen will be removed from each section.

200 Caution is necessary not to damage delicate specimens when removing them from the
201 package. Specimens must be removed immediately before testing starts.

202

203 8.3 Sample Preparation – Alternative Acquisition Method

204 The following requirements apply to products to be tested when acquired through the
205 alternative acquisition method.

206

207 8.3.1 Dry Tissues:

208 The specimen shall comprise one unit of toilet paper or one unit of facial tissues.

209

210 8.3.2 Moist Tissues

211 The specimen shall comprise one moist tissue taken directly from the packaging,
212 unless the manufacturer's instructions recommend a maximum, in which case

213 the maximum loading per flush suggested by the manufacturer shall be used and
214 its size recorded in the test report.

215 Moist tissues shall be tested as removed from the package. No attempt to
216 remove the lotion should be made and the removed moist tissue should not be
217 left for any time, to reduce the evaporation of the moisture.

218

219 8.3.3 Other products

220 For other products, a unit shall consist of one article taken directly from the
221 package.

222

223 8.4 Apparatus

224 The following preparation steps shall apply:

- 225 1. Close all column valves and ensure that the column is located near or connected
226 by flexible hoses to a suitable drain or collection vessel.
- 227 2. Place the collection basket in the bottom of the column and ensure that both
228 strings on the basket are tensioned.
- 229 3. Record the temperature of the water and the room.
- 230 4. Fill the column with tap water until it reaches the fill mark and wait for 6 hours
231 to allow the dissolved oxygen to come out of suspension and the column of
232 water to stabilize.

233

234 9 Storage and Conditioning

235

236 9.1 Storage of Samples

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

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

- 241 1. Dry products should be returned to their original packaging, and should be
242 double-bagged with resealable plastic bags.
- 243 2. Moist products should be returned to their packages, e.g., hard-plastic
244 containers or soft-plastic packages.
- 245 3. In the case of hard-plastic containers, the box should be closed, and then should
246 be double-bagged with plastic resealable plastic bags to minimize any exposure
247 to the ambient air.

248

- 249
- 250 4. Soft-plastic packages should be closed tightly after squeezing the air out of the
- 251 package, and then should be double-bagged with resealable plastic bags to
- 252 minimize potential for exposure to the ambient air.
- 253 5. The samples shall be stored in secured laboratory cabinets.
- 254

255 9.2 Conditioning for the test

256 There are no conditioning requirements if the items used in the test are those collected

257 from the flow from the combined Toilet Clearance the Drain Line Flow Test (IWSFG PAS

258 2B).

259 **Note 1:** If there is a time lapse of more than 30 minutes between retrieval of the

260 specimen from the Toilet Clearance Test and Drain Line Clearance Test, the specimen

261 should be stored in accordance with section 8.1.

262 **2:** If the specimens tested are acquired through the alternative acquisition

263 method (section 8.1.2), then the specimens should be immersed for 30 seconds in

264 water, and if moistened should additionally be gently agitated to remove coatings.

265 10 Procedure

266 10.1 Summary

267 The test consists of 10 settlement sequences with the test product. After each test,

268 observations are made regarding whether the specimen has settled.

269

270 10.2 Test procedure

- 271
- 272
- 273 1. Empty the container with the specimen into the top and center of the water
- 274 column.
- 275 2. Start the timing process when the specimen sinks to the Fill Mark.
- 276 3. Stop the timing process when the specimen sinks to the Stop Mark.
- 277 4. Record the travel time to the Stop Mark (in the event of a disintegrated
- 278 specimen, record the time for the slowest specimen piece to reach the Stop
- 279 Mark.
- 280 5. Wait 24 hours to determine if any settled material refloats.
- 281 6. Record whether there is any floating material.
- 282 7. Record the height above the Stop Mark where refloating material is observed,
- 283 8. Record the results.
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10.3 Test Termination

Upon the completion of a round of testing, the pipe is drained and cleared of any residues from the test specimens.

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

10.4 Calculations

The following calculations are required:

1. the average time taken for the specimens to settle through the 1200 mm between the Fill Mark and Stop Mark
2. the average settling velocity of the specimens in mm/sec (i.e., travel distance (mm) divided by the travel time (sec))
3. the percentage of the ten tests in which conditions 10a. and 10b. are met
4. the average height gained by any refloating specimens above the Stop Mark, in mm

11 Acceptance Criteria

To be acceptable:

- a. In at least 90% of the tests, the specimens must settle at an average velocity of at least 1 mm/second over the 1200 mm measuring distance, i.e., to have settled through the 1200 mm test range within 20 minutes.

and
- b. In tests that are regarded as successful (see 1 above), the specimen or disintegrated parts of the specimens tested must not become sufficiently buoyant to rise more than 300 mm from the Stop Mark of the column within 24 hours. If this occurs, that particular test should be regarded as being a 'failed' test.

and
- c. At least 90% of all of the specimens should meet both criteria (a) and (b) above.

325 12 Test report

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The test report shall include the following information:

1. reference to the test procedure
2. date and place of testing
3. an overview of the test procedure including the settlement pipe configuration
4. complete identification of the tested product
5. a statement as to the acquisition process followed and purpose of testing
6. approximate dimensions and mass of the specimen either as originally acquired and tested or after passing through the combined Toilet and Drain Line Clearance Test (IWSFG PAS 2B) (If appropriate, include a photograph)
7. any departure from the established procedure and any circumstances that may have affected the results
8. copies of photographs taken during the procedure
9. the test results including:
 1. the number of tests during which some articles failed to settle and the proportions of the articles that did not settle
 2. for each individual test:
 1. the settling time
 2. the calculated settling velocity. (If the article has disintegrated or partially disintegrated, the settling velocity should be based on the longest time for a particle of the product to settle – occasional individual fibres excepted);
 3. the number and percentage of the tests where the refloating of some of the product was recorded after 24 hours;
 4. the number (proportion of tests) in which both the required settlement rate was achieved and refloating either did not occur or was within the stated limits;
 4. a statement indicating whether the product passed or failed the test.

355

356 13 Precision

357

358 There may be some variation in the quality of the products being tested, which is why 10 separate
359 specimens shall be acquired, according to Section 8.1.

360 There may be some variation in the quality of the products being tested, which is why 10 separate
361 specimens shall be used in the combined toilet drain line flow clearances tests (IWSFG PAS 2B), which
362 establish the preferred prerequisites to this test.

363 Failure to settle may result from non-stabilized water columns, which is why the water column should
364 be allowed to stabilize after filling.

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368

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Annex A – Sources of Apparatus (Informative)

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381

All apparatus required for this test are readily available in hardware and plumbing outlets, and lumber yards.

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383

The mounting platform for the clear plastic pipe (and drain lines if attached) can be constructed using readily available lumber.

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