



# Flushability Standards

Jeff Lundeen, PhD



# Flushability Standards



- Guidelines for Assessing the Flushability of Disposable Nonwoven Products, Third Edition, INDA, 2013  
<http://www.inda.org>
- IWSFG Flushability Standard (proposed), International Water Services Flushability Group, 2017  
<http://iwsfg.org/iwsfg-flushability-guidelines/>
- Disintegration of Toilet Paper, ISO 12625-17 (proposed), International Standards Organization, 2017  
<https://www.iso.org>

# INDA Flushable Product Definition



For a product to be deemed flushable there must be evidence indicating that it:

- Clears toilets and properly maintained drainage pipe systems when the suppliers recommended usage instructions are correctly followed;
- Passes through wastewater conveyance systems and is compatible with wastewater treatment, reuse and disposal systems without causing system blockage, clogging or other operational problems; and
- Is unrecognizable in effluent leaving onsite and municipal wastewater treatment systems and in digested sludge from wastewater treatment plants that are applied to soil.

# IWSFG Flushable Product Definition



To be flushable a product must:

- Break into small pieces quickly
- Not be buoyant
- Not contain plastic or regenerated cellulose but only contain materials which will readily degrade in a range of natural environments

# Testing Protocol



Test	INDA	IWSFG
Environment & Health		PAS 1
Toilet & Drainline Clearance	FG 501	PAS 2A and PAS 2B
Disintegration	FG 502	PAS 3A or PAS 3B or PAS 3C
Household Pump	FG 503	
Settling	FG 504	PAS 4
Aerobic Disintegration	FG 505	PAS 5A
Anaerobic Disintegration	FG 506	PAS 5B
Municipal Sewage Pump	FG 507	

# Environmental Health and Safety Requirements PAS 1



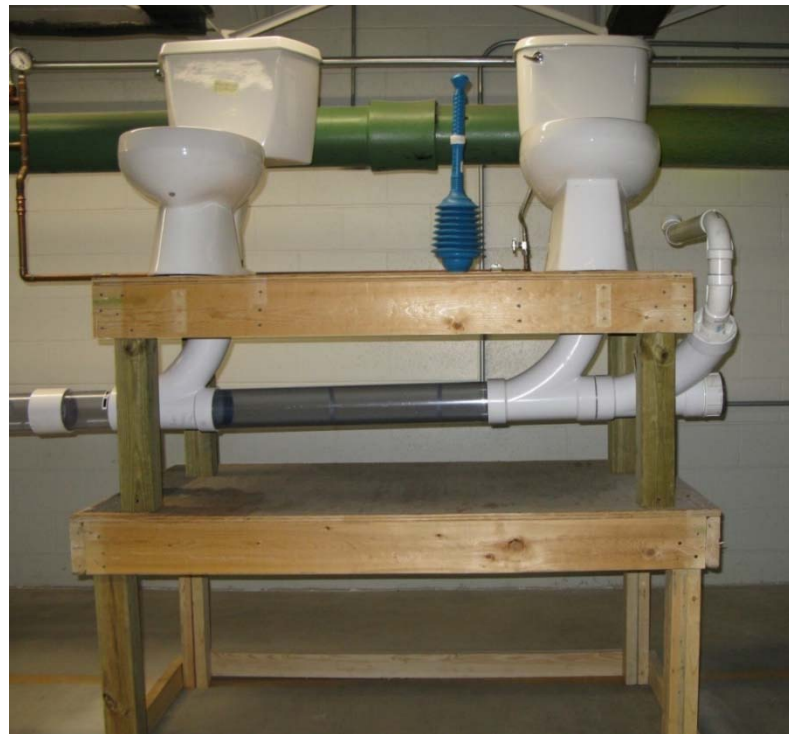
To ensure the product is safe for the consumer and has no adverse environmental impacts.

Specification	IWSFG
Acceptance Criteria	No banned substances No synthetic fibs of any kind (including regenerated cellulose) No geological materials (clay, calcium carbonate, etc.)

# Toilet and Drainline Test FG 501, PAS 2A, PAS 2B



To determine the likelihood that a product will successfully clear toilet and building drainlines.



# Toilet and Drainline Test



Specification	INDA	IWSFG
Toilet	Kohler Cimarron 6 L	Any 4.5 L
Drainline	Clear PVC, 10 cm i.d., 2% slope, 20 m length	Same
Toilet paper dose	Sheets equivalent to 3 g	Same
Flush 1	1 dose toilet paper, 2 wipes	1 dose toilet Paper
Flush 2	Nothing	Nothing
Flush 3	1 dose toilet paper, 2 wipes	Nothing
Flush 4	Nothing	Nothing
Flush 5	3 pieces synthetic feces, 2 doses toilet paper, 2 wipes	Nothing
Acceptance Criteria	< 5% of flushes cause clogs Center of mass of flushed material does not consistently decrease	No specimen is stationary after 3 flushes All specimens clear after 5 flushed



# Slosh Box Disintegration Test FG 502, PAS 3B



To assess the potential for a product to disintegrate when subjected to mechanical agitation in water.



# Slosh Box Disintegration Test

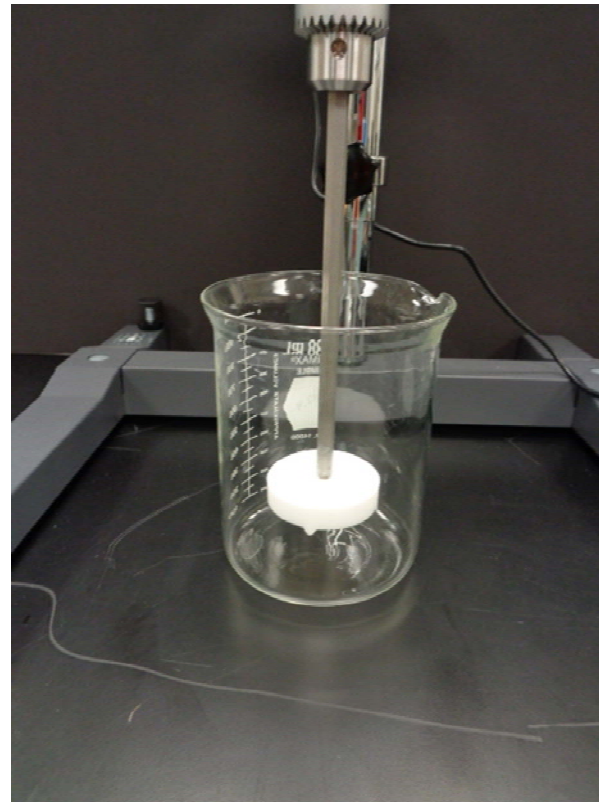


Specification	INDA	IWSFG
Box	18"L x 12"W x 12"H	18"L x 12"W x 12"H
Speed	26 rpm	13 rpm
Water	2 L	4 L
Time	3 hr	2 hr
Sieve	12.5 mm holes	6.3 mm holes
Sample	1 wipe pre-rinsed	180 - 300 cm <sup>2</sup> flushed through toilet
Acceptance Criteria	< 75% of material retained on sieve	< 5% of material retained on sieve

# Accelerated Bench Top Disintegration Test PAS 3A



To assess the potential for a product to disintegrate when subjected to mechanical agitation in water



# Accelerated Bench Top Disintegration Test



Specification	IWSFG
Beaker	98 mm i.d., 150 mm height
Propeller	PTFE 60 mm dia. With 4 ridges
Speed	800 rpm
Water	600 mL
Time	2 min
Sieve	6.3 mm holes
Sample	180 - 300 cm <sup>2</sup>
Acceptance Criteria	< 5% of material retained on sieve

# Flask and Shaker Table Test PAS 3C



To assess the potential for a product to disintegrate when subjected to mechanical agitation in water.



# Flask and Shaker Table Test



Specification	IWSFG
Flask	Fernbach 2.8 L with bottom baffles
Shaker Table	Orbital, 2.5 cm orbit
Speed	100 rpm
Water	1 L
Time	120 min
Sieve	6.3 mm holes
Sample	180 - 300 cm <sup>2</sup>
Acceptance Criteria	< 5% of material retained on sieve

# Household Pump Test FG 503



To assess the compatibility of a product with household sewage ejector pump systems to ensure that the product does not clog, accumulate within or otherwise interfere with normal system operation under high usage conditions.



# Household Pump Test



Specification	INDA
Toilet	6 L
Pump	Submersible ejector pump 0.25 – 0.75 hp
Time	8 day
Flushing sequence	Total of 12 flushes over 55 minutes - 12 wipes/day
Acceptance Criteria	No system failure Average number of wipes remaining on days 2 -6 is < 24



# Settling Test FG 504, PAS 4



To assess whether a product settles in sumps, septic tanks, onsite aerobic systems and settling chambers that are associated with pump stations and municipal wastewater treatment plants.



# Settling Test



Specification	INDA	IWSFG
Column	20 cm i.d., 150 cm height	Same
Sample	4" x 4" wipe flushed through toilet	3 g
Acceptance Criteria	Settling rate > 0.1 cm/sec ≤ 5% of samples refloating after 24 hr	90 % of samples: Settling rate > 0.1 cm/sec Sample rises < 30 cm after 24 hr

# Aerobic Biodisintegration/ Biodegradation FG 505, PAS 5A



To assess the potential for a product to biologically degrade under aerobic conditions typically found in sewers as well as onsite and municipal wastewater treatment systems.



# Aerobic Biodisintegration



Specification	INDA	IWSFG
Liquid	Activated sewage	Activated sewage
Sample	1 wipe	1 sheet
Time	14 day	21 day
Sieve	1 mm	600 micron
Acceptance Criteria	> 95% pass through sieve	> 95% pass through sieve

# Anaerobic Biodisintegration/ Biodegradation FG 506, PAS 5B



To assess the potential for a product to biologically degrade under anaerobic conditions typically found in sewers as well as onsite and municipal wastewater treatment systems.



# Anaerobic Biodisintegration



Specification	INDA	IWSFG
Liquid	Anaerobic digester sewage	Anaerobic digester sewage
Sample	1 wipe	1 sheet
Time	28 day	21 day
Sieve	1 mm	600 micron
Acceptance Criteria	< 5 % retained on sieve	< 5 % retained on sieve



# Municipal Pump Test FG 507



To assess the compatibility of products with small municipal sewage pump systems.



# Municipal Pump Test



Specification	INDA
Pump	ITT Flygt Model C-3085.183
Addition rate	1 wipe/10 s for 10 min
Acceptance Criteria	< 15 % power increase over baseline