IWSFG Template for reviewer comments and IWSFG secretariat observation

Document reviewed: **PAS 3**

Due date:3/2/2018

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Initial	Starting Line Number (e.g. 17)	Ending Line Number (e.g. 23)	Clause/ Subclause (e.g. 3.1)	Type of comment[1]	Comments	Proposed change	Observation of the secretariat
KC1	11	13	Copyright Notice	Ed	Copyright notice is relevant to the current document, stating purpose for future documents seems superfluous.		
KC2				Ge	The document title and organization title suggests that this PAS will apply in all countries worldwide	Please provide list of all countries for which this specification document is valid noting any exclusions.	
KC3	16	17	Foreword	Ed	Does country representation from USA, Australia, Japan, Canada, New Zealand and Spain (?) truly represent a worldwide coalition?	Replace “worldwide ‘ with “international”	
KC4	18	19	Foreword	Ed/Ge	“ without remuneration of any kind” Does this also cover frequent flier miles accrued for international flights to attend IWSFG meetings?		

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KC5	21	23	Foreword	Ed/Ge	Per earlier comment – not truly a global consensus PAS 3 does not reflect hydraulic, mechanical or environmental condition. See PAS 3 comments The lack of a household pump test , municipal pump test, or Aerobic Biodisintegration Test are significant gaps in the protocol offered if it is to be considered an holistic assessment of Flushability. These should be called out as exceptions. “as well as the nature of the receiving waters for treatment plant effluents.” Statement is not clear and there is no discussion on the nature of receiving waters throughout PAS1,PAS2,PAS3	Suggest amending to reflect limitations in PAS The criteria for flushability and the appropriate test methods are the product of a ~~global~~ consensus ~~of~~ among IWSFG coalition members, which are thought to approximate some of ~~and reflect~~ the hydraulic, mechanical and environmental conditions found in drain lines, ~~various~~ anaerobic onsite treatment, wastewater collection and anaerobic treatment systems. ~~as well as the nature of the receiving waters for treatment plant effluents.~~ Consideration of Aerobic Treatment, Household Pump or Municipal Pump compatibility are not included.	

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KC6	105	105	1 Introduction	Ed	Define compatible	Provide data/evidence for what constitutes sufficient disintegration to not cause operational issues in conveyance and treatment	
KC7	108	112	2 Purpose	Te	This test produces forces in a reciprocating system which pulses with large variation between max and min. The tumbling hydraulic forces caused by rapid acceleration and deceleration are unlikely to be an exact analogue for a flowing pipe. Unless specific studies or analysis exists which confirms that the forces in PAS 3 are equivalent to the forces in an 8" pipe (forces will depend on flow, depth of water in pipe, pipe construction and slope – not referenced in definition) then the scope statement needs to be simplified	Suggest changing to *"The purpose of this test is to assess the disintegration performance of a material when it is subjected to hydraulic forces.* ~~*typically found in continuous flow conditions in small diameter (8 inch/200 mm) wastewater transport systems, immediately after a product is flushed: i.e. forces equivalent to a Reynolds number of 20,000. "*~~	
KC8	108	112	2 Purpose	Te	The Reynolds Number for this method is stated once again to be 20,000 yet the speed of the oscillation (between PAS3B and PAS3) has been increased by 23% - they cannot both provide a Reynolds Number of 20000. Reynolds number has a linear relationship with velocity, so changing RPM and speed of the water flow in the box, will change the "effective Reynolds number" for the method There is no justification for the RPM change provided in the replies to version 1 public comments.	Please provide evidence that the forces in a reciprocating slosh box are the same to 20,000 seen in a linear flowing system. Expertise for CFD modelling in a slosh box were identified by NACWA at Saint Louis University, Parks College of Engineering, Aviation, and Technology, CIVIL ENGINEERING Department	

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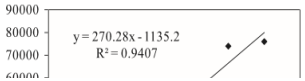
					Reducing the time end point to 30 minutes and increasing the sieve size do not change the Reynolds number.		
KC9	KC7		2 Purpose	Te	The Reynolds Number for this method is stated once again to be 20,000 yet the speed of the oscillation (between PAS3B and PAS3) has been increased by 23% - they cannot both provide Reynolds Number of 20000. Testing in KC labs with 3 different US toilet papers (1,2, and 3 plies) it is clear that: · 16 rpm is generating significantly more disintegration (at the same Reynolds Number?) but this may still not be sufficient for assessment of Dry Toilet Papers against a criteria of 95% · Not all samples pass the PAS3 criteria at 30minutes % Passing 25mm Sieve - at different time endpoints and 13rpm/16rpm 30 min: 13 rpm / 16 rpm; 60 min: 13 rpm / 16 rpm; 90 min: 13 rpm / 16 rpm 1 ply US TP: 52% / 88% / 84% / 94% / 83% / 96% 2 ply US TP: 98% / 98% / 100% / 100% / 100% / 100% 3 ply US TP: 8% / 22% / 12% / 45% / 32% / 44% Source: KC Labs. Report 18-006	Please provide evidence that the forces in a reciprocating PAS3 slosh box are the same to N_R~20000 seen in a linear flowing system and suitable for assessment of International Toilet Papers.	
KC10	KC8		2 Purpose	Te	Karadaghli et al (Water Environment Research, Vol 84,5 ; May 2012; pp. 424-433(10)) reported that a Shaker Flask run at 74rpm using Bellco Baffled Flasks containing 1L of water on a 1" shaker orbit generated N_R~20,000. 	Please provide evidence that the forces in a reciprocating PAS3 slosh box are the same to N_R~20000 seen in a linear flowing system and suitable for assessment of International Toilet Papers. Consider	

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					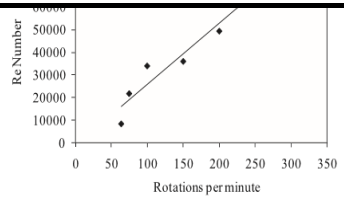 **Figure 4—Estimated Reynold's number values (dimensionless) for the shake flask containing 1 L water at rotational speeds ranging from 64 to 300 rpm (minute^{-1}).** **Water Environment Research,** Volume 84, Number 5		

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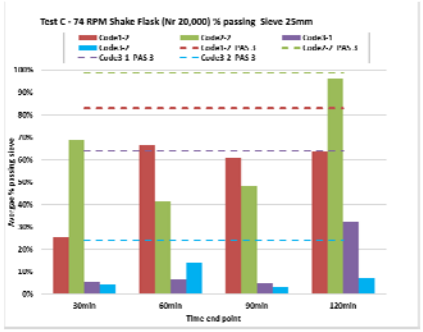
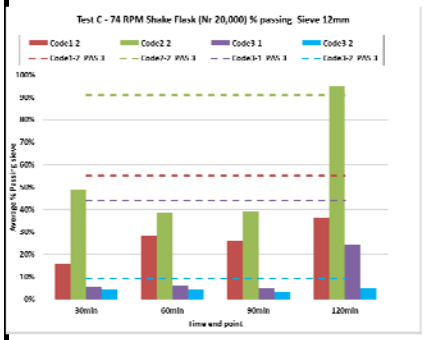
					Dry toilet paper codes tested in the shake flask set up reported by Karadağlı do not line up well with PAS 3 results (also at N_R~20,000) unless the flask is run for 2hours   Disintegration rate of the dry toilet paper samples is less than anticipated.		

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					The low level of disintegration even at 2 hours suggest that neither PAS 3 or the Shake Flask are fulfilling the role of N_R 20,000 intended Source: KC Labs. Report 18-006		
KC11					Interestingly, at the ISO TC224 WG 10 Technical Session held on May 5, 2015. Dr Karaghli (nonvoting associated of IWSFG) presented his continued research of disintegration using a shake flask. Summary slide 45 shown below He suggests that waste water flow in small to mid-size corresponds to a Reynolds Number of 49200 which would in turn correspond to a rotational speed of 187 rpm (Note that INDA guidelines edition 1 used this method at 150rpm and 3hours) No testing has been completed at 187rpm, but it is reasonable to expect more complete disintegration of the 8 toilet paper samples under these more turbulent conditions. Dr. Karadağlı's estimate of Reynolds number may prove to be a better testing point than the current 20,000.		

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					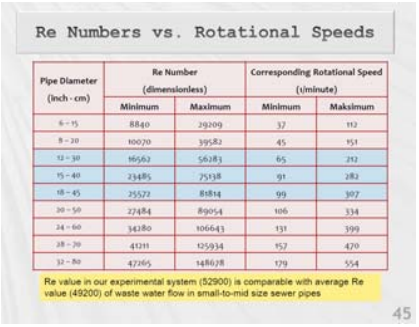		
KC12	113	117	3 Scope	Ge	ISO TC6 SC2 WG27 is only developing a test method to measure disintegration of paper using agitation within a small flask and stirrer. There will be no pass/fail criteria associated with this standard.	Scope statement needs to be amended to reflect output of TC6 SC2 WG27	
KC13	135		6 Principles	Te	If the test is to demonstrate potential to disintegrate a pass / fail Criteria of 95% is unnecessarily aggressive, given the variability associated with using 25mm sieve. Refer to picture of Brand X wipe after 30minutes (A.8.2) – the accompanying data indicates ~ 85% passing 25mm which would be a fail, implying that this sample would not have potential to disintegrate?		
KC14	142		7.1	Te	Check with manufacturer references, the depth of slosh boxes from Lenzing is 6.5"(16.5cm)	Check, update and consider note to allow a range of depths for slosh box from 6.5 – 12.0	

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KC15	153			Te	11 degrees (+/- 0.5 degrees)	Please share data that confirms variance in % pass through across the angle range specified for set up.	
KC16	154			Te	Angle is measured against horizontal	Change vertical to horizontal	
KC17	154	155		Te	Not necessary to measure angle and displacement. Stick with angle as shown in appendix	Delete “With a vertical travel of 10 cm from top of stroke to bottom of stroke as measured from the bottom edge of the test tank’s base platform.”	
KC18	165		10.4	Te	Testing 1,2,3 ply toilet papers using PAS3 by KC with both 25mm and 12.5 mm sieves indicates that % passing 25mm sieve is dependent on showering without any attempt to “force the passage” This level of variation is unacceptably high given a pass/fail criteria of 95%. The opportunity for false positives exists	Change 25mm sieve to 12.5mm sieve and reassess pass / fail due to lower pass through amounts on the smaller sieve hole size.	

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					Condition: Shower Average of % pass / Column L Row Labels: 25mm / 12mm only Code1-1: 100% / 100% Code1-2: 83% / 49% Code2-2: 99% / 91% Code3-2: 24% / 7% Condition: No Show Average of % pass / Column L Row Labels: 25mm / 12mm only Code1-1: 100% / 100% Code1-2: 61% / 49% Code2-2: 92% / 89% Code3-2: 12% / 7% % increase due to shower 25mm / 12mm only Code1-1: 0% / 0% Code1-2: 36% / -1% Code2-2: 8% / 2% Code3-2: 94% / -4% The % passing 12.5mm sieve is only minimally affected by showering and is the correct choice of sieve for Toilet Papers Source KC labs Report 18-006		
KC19	165		10.4	Te	Round robin testing of PAS3 between KC and	Change 25mm sieve to 12.5mm sieve	

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					PG labs using 8 international toilet papers reveals false positive errors in both labs (Type 1) for the 25mm sieve **Rinsing** - generating type 1 errors • Causes 3 codes to move from fail to pass - PG • Causes 1 code to move from fail to pass - KC **ISWFG : PAS3 Round Robin Testing at KC and PG Labs** **Data by lab** KC : 2L and 4L Pour PG : 1L and 4L Pour KC: No Rinse Mean 99.9% Std Dev 0.2%; Rinse Mean 100.0% Std Dev 0.0%; PG: No Rinse Mean 99.5% Std Dev 0.2%; Rinse Mean 100.0% Std Dev 0.0% Code 1-2: KC No Rinse Mean 60.8% Std Dev 12.8%; Rinse Mean 82.9% Std Dev 3.8%; PG No Rinse Mean 81.7% Std Dev 8.4%; Rinse Mean 97.9% Std Dev 1.5% Code 2-1: KC No Rinse Mean 89.4% Std Dev 6.0%; Rinse Mean 92.8% Std Dev 4.0%; PG No Rinse Mean 88.5% Std Dev 4.8%; Rinse Mean 99.1% Std Dev 1.3% Code 2-2: KC No Rinse Mean 91.5% Std Dev 3.7%; Rinse Mean 98.9% Std Dev 1.4%; PG No Rinse Mean 89.5% Std Dev 3.2%; Rinse Mean 98.6% Std Dev 1.7% Code 3-1: KC No Rinse Mean 72.2% Std Dev 14.1%; Rinse Mean 64.5% Std Dev 6.6%; PG No Rinse Mean 72.3% Std Dev 14.4%; Rinse Mean 87.3% Std Dev 7.6% Code 3-2: KC No Rinse Mean 12.3% Std Dev 10.5%; Rinse Mean 23.9% Std Dev 11.8%; PG No Rinse Mean 15.6% Std Dev 14.9%; Rinse Mean 32.4% Std Dev 13.5% Code 4-1: KC No Rinse Mean 97.7% Std Dev 1.3%; Rinse Mean 100.0% Std Dev 0.1%; PG No Rinse Mean 95.0% Std Dev 3.3%; Rinse Mean 100.0% Std Dev 0.0% Code 4-2: KC No Rinse Mean 81.1% Std Dev 5.3%; Rinse Mean 76.4% Std Dev 3.9%; PG No Rinse Mean 80.6% Std Dev 6.5%; Rinse Mean 81.1% Std Dev 3.3% Note : Conditional formatting of both tables set per >95% criteria		
KC20	165		10.4	Te	Round robin testing of PAS3 with international dry toilet papers reveals that PAS3 is not repeatable between 2 labs PAS3 - Interlab variability (KC and PG) One way analysis of means – between labs • Codes statistically the same : Code 1-1,2-2,3-2,4-1 • Codes statistically different : Code 1-2,2-1,3-1,4-2 	Test method PAS3 needs further work to ensure that the method is repeatable between experienced labs.	

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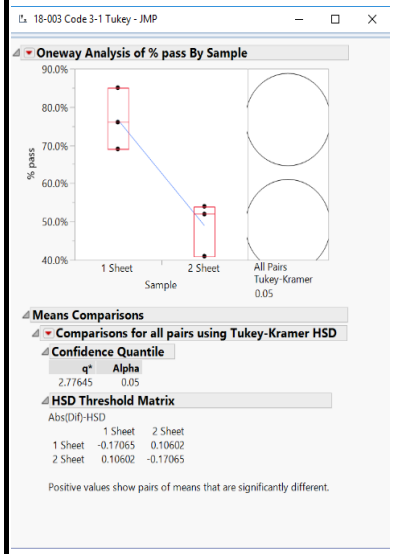
KC21	176	185	8.2 Number of pieces	Te	To allow for equal sampling between two packs it would make more sense to sample 6, this would also improve the calculation of average.	Change 5 specimens to 6 specimens	
KC22	189			Te	For 3ply dry toilet paper (code 3-1) it can be demonstrated that the % pass is a function of the starting mass (or sheet count). For code 3-1 statistically different results are obtained with 1 and 2 sheets. The results should not be a function of mass loading. See analysis of means below  Source : KC lab 18-003	Further work is required with method PAS3 to ensure sample size does not affect outcome. Furthermore the sample size/quantity used in the slosh box should reflect the material usage. For dry toilet paper this should be an implement of 6 sheets.	

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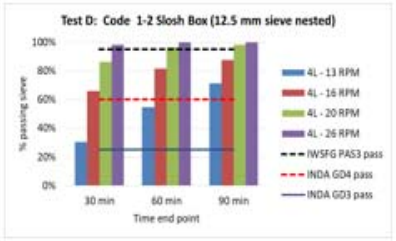
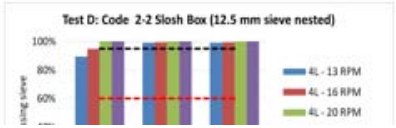
KC23	215		9.1	Ge	Any reason for cabinet to be secured?		
KC24	219	230	10.1 Summary	Ed	Not clear, needs to be re written. I think I know what it means	Make clear	
KC25	223	225	10.1 Summary	Te	Testing dry toilet papers at 4l, 16rpm, 30 minutes in the Slosh Box does not appear to generate lower levels of disintegration than anticipated. A slosh box ladder using 4l at 13,16,20,26 rpm with time end points of 30,60,90 minutes and a 12.5mm sieve indicates that higher rpm and longer time end points are needed to generate more complete disintegration noted in sewers.  		

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					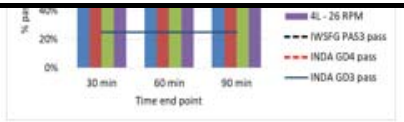 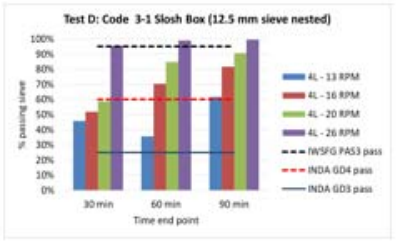 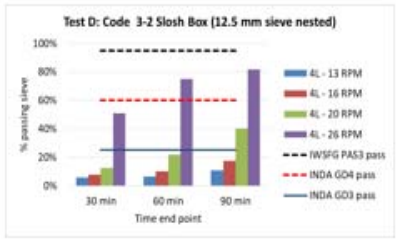 Source KC Lab Report 18-006		

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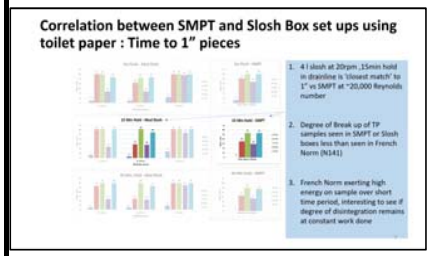
					The output of the Slosh Box ladder is directionally supports the results reported to ISO TC224 WG10 N287 when a linear flowing system (10" pipe) was set to run half full at 1.2ft/sec to approximate to Nr ~20,000 and then correlated to various Slosh boxes – using Dry Toilet Paper samples 		
KC26	236			Te/Ge	Is the flush volume important/ The flush volume spec shown doesn't exist for toilets in USA.	Suggest dropping any reference to flush volume or provide a range which could encompass International flush volumes i.e. 4.5 - 6.0L	
KC27	270			Te	If distance is important then provide a range for the shower distance	E.g. 10-15cm	
KC28	259		10.3 Set up	Te	If angle is critical, is it safe to wait 30 days? Would it make sense to check before every run?		
KC29	288		10.4	Te	"Do not force the passage of any material through the sieve. " See earlier comments which confirm that 12.5 mm sieve is more secure than 25mm sieve for avoiding "forcing the passage of material"	Change to 12.5mm sieve to reduce variability cause by rinse/showering	

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KC30	312	315	11 Acceptance Criteria	Ed	Unclear if this requires the average of 5 replicates to be >95% pass through	Make clearer	
KC31	358		A1.1 Sources	Ed	Slosh Box manufacturing reference from FG502 omitted		
KC32	401	405	Annex 3 – Slosh Box Angle Calibration Procedure	Ed/Te		This is a measuring procedure, not a calibration procedure. Please provide guidance on how to adjust angle for the 2 different box models A1.1	
KC33	419		A4.1	Ed		Delete “actual”	
KC34	421			Ed/Ge	Unable to locate the “swirling products in a container of tap water” method		
KC35	435			Te	4.5L flush toilet isn’t standard in US	Suggest a range 4.5-6.0L if flush volume is not critical for rinsing lotion	
KC36	A8.1			Te/Ed	84.90% is a fail not a PASS	Change Test Result to FAIL	
KC37	A8.2			Te/Ge	Brand X Wipe after 30 minutes looks well broken up but fails criteria (84.90%)	Please explain why this Brand X wipe would not be compatible with Wastewater infrastructure?	