

## ANNEX II: Experiences for evaluating the performance of pilot-scale: water consumption, vacuum required and dilution of the urine

### 1. – Water consumption and dilution of urine.

#### 1.1. Target

- Analyzed of hydrodynamics performance of the wc.
- Characterize water consumption depend on the variation of control mechanism.
- Calculate the dilution of urine thanks to characterize the quantity of water which gets out from the two compartments of the bowl: urine and feces.

#### 1.2. Procedure.

Measure the quantity of water at the outlet of the pumps for each jet carrier size and note the value of the flow meter. Pressure difference fix.

Pay attention to not press the button more than 1 second for getting the water discharged of the corresponding jet carrier period.

Make the measure by weigh:

- Precision of balance for urine  $\pm 0.01$  g
- Precision of balance for feces  $\pm 0.1$  g
- Precision of flowmeter  $\pm 0.05$  L

#### 1.3. Expression of results.

*Table 1 Expression of results of 1- Water consumption and dilution of urine.*

Size	Run no	Value of the flowmeter before flush (m3)	Value of the flowmeter after flush (m3)	Urine outlet (g)	Feces outlet (g)	Comments
0.20	1					
	2					
	3					
0.30	1					
	2					
	3					
0.40	1					
	2					
	3					

## 2. – Influence of pressing time of faces button.

### 2.1.Target.

Measurer if the difference of quantity of water discharged in the bowl depends on pressing time.

### 2.2.Procedure.

Push the button during different times and note the value of the flow meter. Pressure difference fix. Size of jet carrier predefined 0.40, variation of the alternative jet carrier size.

### 2.3.Expression of results.

Table 2 Expression of results of 2. – Pressing time of faces button.

Size	Run no	Value of the flowmeter before flush (m3)	Value of the flowmeter after flush (m3)	Comments
0.20	1			
	2			
	3			
0.30	1			
	2			
	3			
0.40	1			
	2			
	3			
Pressing time of the bouton (s)				

## 3. – Influence of driving pump of urine with delay.

### 3.1.Target.

Evaluate of toilet paper removal by operating the pump of urine with different delays.

### 3.2.Procedure.

Develop 3.1. *Toilet paper test* ANNEX I but drive the pump of urine with different delay: at the same time that feces pump; one second after and two seconds after. Pressure difference and jet carrier fix.

### 3.3. Expression of results.

Table 3 Expression of results test 3

Run no.	Quadrant where paper was dropped (x=one ball of paper)		Replicate					
			t= 0s		t=1s		t=2s	
	A/B	C	A/B	C	A/B	C	A/B	C
1	xxxx							
2	xx	xx						
3	xx	xx						
4	xx	xx						

## 4. – Total removal of the paper: influence of water discharge.

### 4.1. Target.

Characterization of water discharge which gets the total elimination of the toilet paper in both compartments.

### 4.2. Procedure.

Develop 3.1. *Toilet paper test* ANNEX I for each variation of water discharge by changing the jet carrier of control mechanism and note the value of flowmeter for quantifying the discharge of water. Pressure difference fix.

Water discharged expected in accordance with the results of test 2. - *Pressing time of faces button.*

Pay attention to not press the button more than 1 second for getting the water discharged of the corresponding jet carrier period.

### 4.3. Expression of results.

Table 4 Expression of results of 3. – Total removal of the paper: influence of water discharge.

Size	Quadrant where paper was dropped		Run no	Water discharge expected (ml)	Value of the flowmeter before flush (m3)	Value of the flowmeter after flush (m3)	Toilet paper remains after flush	
	A/B	C					A/B	C
0.20	xxxx		1	1000				
	xx	xx	2	1000				
	x	xxx	3	1000				
0.30	xxxx		1	950				
	xx	xx	2	950				
	x	xxx	3	950				
0.40	xxxx		1	800				
	xx	xx	2	800				
	x	xxx	3	800				

(0)= fail; (1)=success (x)= ball of paper

## 5. – Total removal of the paper: influence of feces pump.

### 5.1. Target.

Delimit pressure difference minimum in feces pump that makes the maximum elimination of the paper in feces compartment and separate area using pressure difference minimum (-0.50 barg).

Change the different jet carriers of control mechanism, for dismissing the likely influence of water discharge.

### 5.2. Procedure.

Develop 3.1. *Toilet paper test* ANNEX I for each variation of pressure difference. Jet carrier fix for each cycle of test.

Pay attention to not press the button more than 1 second for getting the water discharged of the corresponding jet carrier period.

### 5.3. Expression of results.

Table 5 Expression of results of 4. – Total removal of the paper: influence of water discharge.

$\Delta P$	Quadrant where paper was dropped		Run no	Water discharge expected (ml)	Value of the flowmeter before flush (m3)	Value of the flowmeter after flush (m3)	Toilet paper remains after flush	
	A/B	C					A/B	C
-0.20	xxxx		1					
	xx	xx	2					
	x	xxx	3					
-0.40	xxxx		1					
	xx	xx	2					
	x	xxx	3					
-0.60	xxxx		1					
	xx	xx	2					
	x	xxx	3					
-0.80	xxxx		1					
	xx	xx	2					
	x	xxx	3					
Jet carrier size								

(0)= fail; (1)= success (x)= ball of paper

## 6. – Total removal of the paper: influence of urine pump.

### 6.1. Target.

Delimit pressure difference minimum in urine pump that makes the maximum elimination of the paper in the entire bowl with a pressure difference optimum obtained in test 4 *Total removal of the paper: influence of feces pump.*

Change the different jet carriers of control mechanism, for dismissing the likely influence of water discharge.

### 6.2. Procedure.

Develop 3.1. *Toilet paper test* ANNEX I for each variation of pressure difference. Jet carrier fix for each cycle of test.

Pay attention to not press the button more than 1 second for getting the water discharged of the corresponding jet carrier period.

### 6.3. Expression of results.

*Table 6 Expression of results of 5.– Total removal of the paper: influence of urine pump.*

$\Delta P$	Quadrant where paper was dropped		Run no	Water discharge expected (ml)	Value of the flowmeter before flush (m3)	Value of the flowmeter after flush (m3)	Toilet paper remains after flush	
	A/B	C					A/B	C
-0.20	xxxx		1					
	xx	xx	2					
	x	xxx	3					
-0.40	xxxx		1					
	xx	xx	2					
	x	xxx	3					
-0.60	xxxx		1					
	xx	xx	2					
	x	xxx	3					
-0.80	xxxx		1					
	xx	xx	2					
	x	xxx	3					
Jet carrier size								

(0)= fail; (1) = success (x) = ball of paper

## 7. – Real performance. Dilution of urine and feces.

### 7.1. Target

- Analyzed of hydrodynamics performance of the wc.
- Calculate the dilution of urine thanks to characterize the quantity of water which gets out from the two compartments of the bowl: urine and feces.
- Evaluate the cleaning of the bowl with pumps for simulating urine and feces.

### 7.2. Procedure.

Switch on pumps of feces for 20 seconds (100 g of feces) and urine for 15 seconds (200 ml urine).

Measure the quantity of water at the outlet of the pumps and note the value of the flow meter. Pressure difference fix.

Pay attention to not press the button more than 1 second for getting the water discharged of the corresponding jet carrier period.

Make the measure by weigh:

- Precision of balance for urine  $\pm 0.01$  g
- Precision of balance for feces  $\pm 0.1$  g
- Precision of flowmeter  $\pm 0.05$  L
- Flow of urine pump: 13 ml/s
- Flow of feces pump: 5.8 ml/s

7.3. Expression of results.

Test 3.1. Toilet paper test (Annex I)