

Prototype Testing:

Engineering Metric Being Tested: Percent of Urine in Feces Bucket

Purpose:

The purpose of this protocol is to understand the amount of urine that is being collected in the feces bucket, for better understanding of the effectiveness of the toilet prototype.

Since urine disposal was changed to the users disposing of their urine instead of our team members, and our toilet prototype could not fit the feces bucket with the current diverter prototype, we could not run this test. An alternative where qualitative data on spillage occurring was run instead.

Goals:

The ideal goal is to have no spillage of urine on the floor. The marginal goal is to have minimal spillage of urine fall on the floor.

Conclusions:

With our current diverter prototype, spillage does occur. Female users seem to spill more urine than male users. Further testing must be done to see if the feces bucket would collect the urine spilled. Additionally, improvements to the diverter should focus on improving alignment with urine jug and clearance for female users.

Materials:

- Completed toilet prototype
- Clorox wipes
- Gloves
- Paper towels
- Ruler

Procedure:

1. Put gloves on
2. Place paper towels at base of toilet prototype.
3. Follow Human Subjects Testing protocol for collecting urine from human subject.
4. When user is done using the toilet, scan the base of the toilet prototype for any urine spillage.
5. If there is no spillage, follow Human Subjects Testing protocol for cleaning of prototype, and take note of no spillage and gender of participant.
6. If there is minimal spillage, record the description and size of the spillage. Use a ruler to measure the spillage site. Record information. Then remove wet paper towels and replace with new paper towels.
7. If there is a lot of spillage, remove paper towels and clean the area before applying new paper towels. Record information of size of spillage, and gender of user.

Results:

For the following table, the shades of red signify the level of spillage.

White= No spillage

Light Red= light spillage

Medium red= some spillage

Dark red= almost complete/complete spillage

Trial #	Size of Spillage	Area	Comments	Gender
1	3 droplets	Urine Jug		Male
2	~12cm x 6cm splatter	Urine Jug		
3	Entire floor	Bottom of toilet	May be due to the jug being misaligned with the urine diverter	Female
4	no spillage			Female
5	Half of the floor	Bottom of toilet	May be due to the jug being misaligned with the urine diverter, or user changing the alignment of the diverter and jug. User said they did dispose of their urine in the regular toilet though	
6	~7cm x 20cm	poop bucket area	Urine seemed to have spilled over into poop bucket area while user was sitting on the toilet. If bucket was there, spillage would probably not have happened	
7	~18cm X 18cm	Bottom of toilet	May be due to the jug being misaligned with the urine diverter, or user changing the alignment of the diverter and jug.	Male
8	no spillage			Male
9	3 droplets	urine jug area	Probably due to removal of jug	Male
10	most of the inside of the floor	Bottom of toilet	Urine seemed to have spilled over into poop bucket area while user was sitting on the toilet. If bucket was there, spillage would probably not have happened	Female
11	Missing data for one trial...			
12	Some spillage	Urine Jug	Seems to be due to urine diverter not diverting well enough	Female

13	No spillage			Male
14	Complete spillage	Bottom of toilet	Seems to be due to urine diverter not diverting well enough	Female
15	one droplet	back of toilet area, on top of bathroom drain	may be due to transport of waste from outside of toilet to other toilet. May not be urine, etc.	Male
16	no spillage			Male
17	17cm x 20 cm puddle; additional droplets scattered at the back end of the toilet	underneath/behind urine jug	Urine splashed back on the back end of the diverter to the back of the toilet base floor in droplets around the ground, and a puddle formed underneath the urine jug. Most of the urine did successfully drain through the diverter though.	Female
18	9cm x 11cm puddle	underneath/behind urine jug	possibly due to splashback from back end of diverter	Female
19	no spillage			Male
20	No spillage			Female
21	Some spillage; 26cm x 22cm	underneath urine jug		Female
22	no spillage			Male
23	some spillage; 2 cm x 2cm	front, towards the window		Male
24	5cm x 5cm	middle		Female
25	no spillage			Male

* yellow highlighted tests are results from team members.

Analysis:

Overall, it seems spillage was common during most trials. Male users seemed to have a lower amount of spillage, while female users had much more spillage occurring. Tests 5-7 had very similar results that may have been due to lack of discussion with users about not altering the state of the toilet before use (the urine diverter was prone to being misaligned with the urine jug if not set up properly). After users were made aware of this fact, the results began to improve.

There were three occurrences with almost complete/complete spillage, and all three occurred with female users. Many of the other moderate amount of spillage happened with female users as well. The spillage would tend to occur around the urine jug and around the back end of the toilet. For male users, if any spillage occurred it seemed to be usually due to removal of urine jug, as the spillage would be found mostly in front of the jug area or right underneath it.