Latrine dimensions in Nairobi, Kenya

Observations from 227 pit latrines in 12 different villages from informal settlements in 2014

Rahel Künzle and Mark O'Keefe
Eawag, Swiss Federal Institute of Aquatic Science and Technology, 8600 Dübendorf, Switzerland

Description

The data presented here were gathered during the field test of the Blue Diversion Toilet (BDT) in collaboration with Sanergy in Nairobi. The concept of Blue diversion foresees a retrofitting of the toilet into existing or abandoned latrine superstructures. With this approach money for construction can be saved and space reused, which is not in use anymore. The dimensions of the existing toilets are therefore highly important for implementation.

Figure 1: Photomontage @ EOOS- The Blue Diversion Toilet retrofitted into an existing pit latrine

The data and method are published as part of the global access strategy of the Blue Diversion project. The latrine measurements are valuable information for practitioners with an interest in building latrines and the method and the related excel tool can be helpful for other projects on innovative sanitation solutions, which may be fitted into existing latrine superstructures.

Methods

227 latrines in 12 different villages in informal settlements of Nairobi were observed between April and May 2014. The sample was based on a random route approach where every third household was surveyed. The outside measurements (width, depth, front and back height, door width and door height) were taken with tape measures and the wall materials, the floor materials and the door conditions were noted down for each superstructure. For practical reasons (e.g. access to the toilet) the wall thickness was only measured for some of the structures (10 samples from the stone, concrete and iron sheet facilities). The mean of the wall thickness measurements was used to calculate the interior depth and width (d and c in the graph below). The thickness of the walls built with mud or brick had to be estimated but fortunately they only represent 13% of the latrines in the survey.

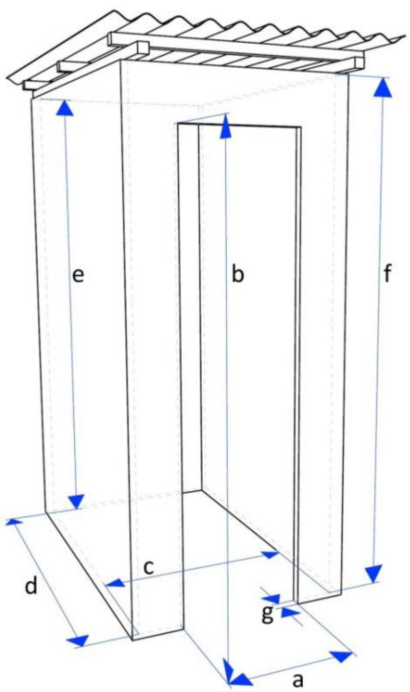

Figure 2: The dimensions which were recorded and calculated from the measurements are labeled in the scheme of a typical superstructure

Different percentiles were calculated with the function percentile in excel. The goal was to figure out in how many toilets the BDT (or any other object) would fit. All calculations can be found in the corresponding excel file.

Results and Discussion

The most common construction material for latrine walls is iron sheets (63%), followed by concrete (13%), stones (11%), mud (9%) and brick (3%). 92% of the latrine doors were working well and only 8% didn't fulfill their purpose.

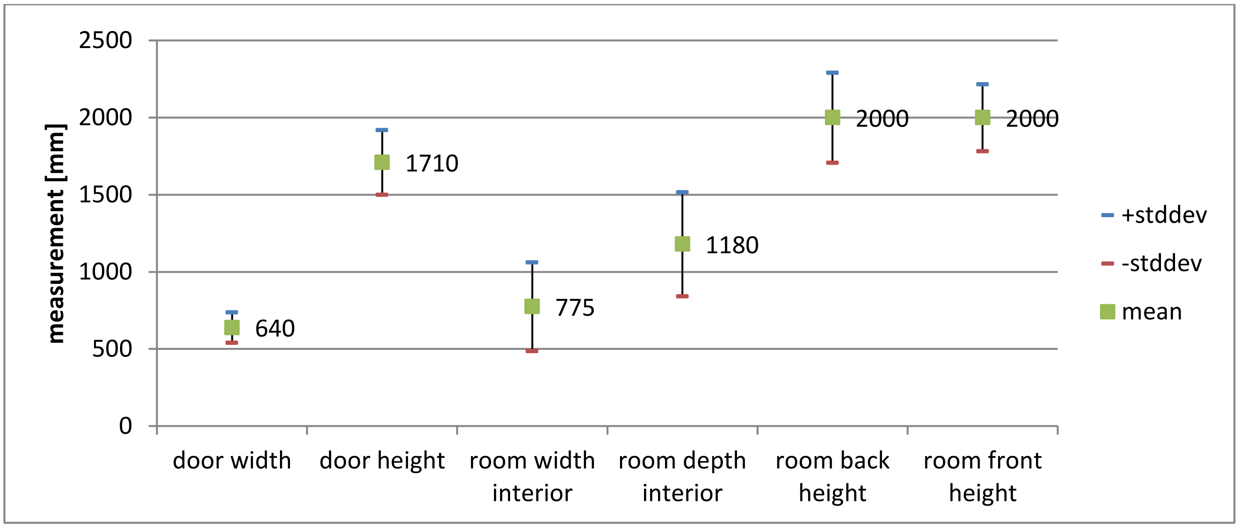

Figure 3: Mean (=50% percentile) and standard deviation of all measurements taken

From Figure 3 one can see that the door width doesn't vary a lot with a standard deviation of 98mm whereas the other measurements have standard deviations of more than 210mm.

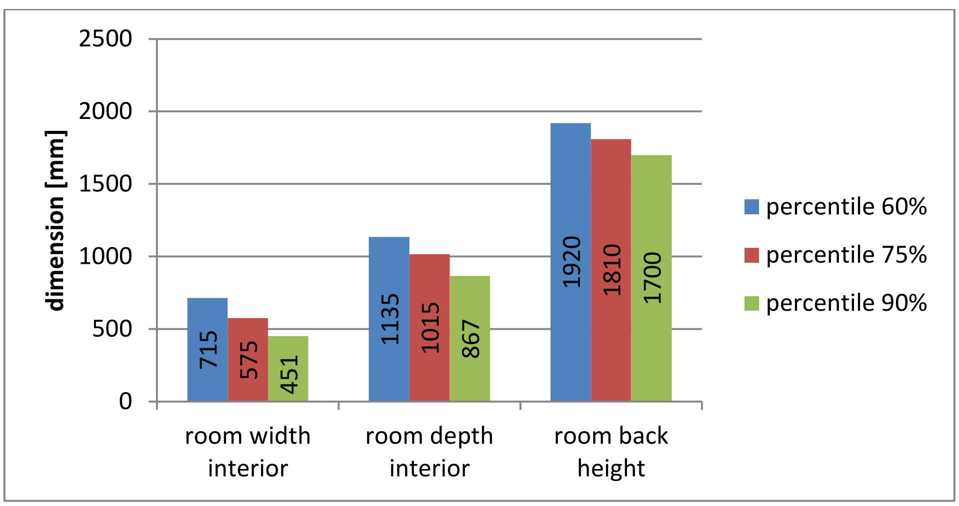

Figure 4: Different percentiles of width, depth and back height

The percentiles (see Figure 4) only give a hint if an object could fit in one dimension of the toilets. But to know whether it really fits in a superstructure, one has to compare the dimensions of the object with each toilet. From an earlier survey in Kampala (69 measurements in 7 villages from informal settlements; data shown in a separate excel file), we observed that the first working model (800 x 1255 x 2556 mm) would fit into 28 % of the existing superstructures if height is not a taken into account and it none of the

69 superstructures if height is included. This was a main reason for developing the more compact working model 2 (734 x 910 x 1890mm), which would fit into 88 % of the Kampala superstructures (if only width and depth are taken into account) and in 36 % (if height is also considered).

The present survey in Nairobi shows that the superstructures in Kampala are substantially wider. The first Blue Diversion toilet working model would only fit into 22% of the latrines in Nairobi if one looks at width and depth and in none of them if height is included as well. The second working model, however, would fit into 50% of the toilets looking at width and depth and into 36% including the height. Although this is less than in the Kampala context, it is still a large achievement compared to the first working model. From the two examples, we see that conclusions may differ substantially between different cities. Considering the dimensions of the superstructures observed in Nairobi, reducing the width of the Blue Diversion toilet is the most promising option. If the width can be reduced by 25%, the Blue Diversion toilet would fit in 50% of the observed latrines (70 % if only width and depth are considered).

It will be extremely difficult to reduce the size of the Blue Diversion Toilet enough to make it fit in all latrines and adaptions of the superstructures will thus have to be considered. In such cases the construction material becomes important. Generally, superstructures made out of iron sheets are easier to adapt than the ones built with brick or cement. Whether adaptions are possible or not depends the available space around the toilet and on the willingness to pay for the upgrade by the landlord. These adaptations would have to be assessed on a case by case basis.

Acknowledgements

This investigation was financed by Eawag and the Bill & Melinda Gates Foundation. Thanks are given to Tove Larsen (Eawag) for initiating the Bill & Melinda Gates Foundation project, and Tove Larsen and Ulrike Messmer (Eawag) for overseeing and coordinating it. Further, we thank Robert Tobias (Eawag) for initiating and managing the Eawag project. We thank our colleagues at Sanergy (Nairobi) and Makerere University (Kampala), particularly the data collection teams, for their valuable help in the field study. Finally, the Blue Diversion team is appreciated for the constructive comments on this manuscript.