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LESSON SERIES
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LOW FLUSH LATRINES FOR PUBLIC SCHOOLS
Lessons From Two School Pilots

WATER RESEARCH COMMISSION

1 Introduction

Pour flush and low flush sanitation systems bridge the gap between on-site dry sanitation and full waterborne sanitation sustainably. Using a small amount of tap water or grey water (1-2.5l) to flush, a pour system can terminate in a simple soak away. This overcomes the problems involved with laying sewers to widely spaced rural homes or tightly spaced informal settlements, represents an large saving of water over regular waterborne sewage – a loss which is compounded if hardware begins to leak -- and provides a number of the benefits of a flush toilet.

While pour flush technology is used widely in Asia, it had not been tested in South Africa, and trials with low flush systems had mixed success.

The Water Research Commission has developed two new innovations in this regard:

- The pour flush pedestal which uses a minimum 1L to flush
- The low flush pedestal, based on the pour flush design which uses a 1.5L flush

The pour flush system was tested successfully in the field at 20 private homes and at a crèche.

However, in order to succeed in an institutional setting such as a school or public ablution facility, the technology would need to include a cistern so that users would not be required to fill buckets in order to flush.

This prototype, called the low flush system, was developed, and tested by the WRC.

Prototype pan and gooseneck outlet

Standard Envirosan pedestal (left) with low flush pan and rim flush ring inserted (right)

A low flush system addresses a number of needs as it achieves the following:

- it provides an onsite flush system which can be installed in many contexts, including rural or crowded communities where laying sewers is not a realistic option
- it introduces a sanitation option which is more progressive than standard waterborne sanitation in terms of stewardship of water resources
- it provides a competitively priced alternative to the VIP, allowing municipalities to move away from a "one size fits all" approach to sanitation delivery which can undermine agency and ownership
- it provides greater safety to young children than does a pit latrine
- it provides the convenience and safety of an indoor toilet if this is desired by the household
- it provides a greater sense of cleanliness than does a pit latrine by removing the sight and smell of faecal material away from the user.

The pour flush system was piloted in two schools and two homes. The systems were monitored over a period of three months. For the schools, the monitoring involved:

- Checking in with principal or Heads of Department on the functioning of the toilets.
- Installing water meters and logging meter readings
- Documenting the condition and functioning of the toilets and toilet blocks and any problems that arose.

2 Pilots and application

In consultation with eThekwini Water and Sanitation (EWS), two schools were selected to participate in the trial. Sizimesele Primary School is located in rural Molweni in the Waterfall/Hillcrest area and Thandaza High School is located between Hammarsdale and Mpumalanga. It was proposed that three toilets be placed in each school: one in the boys' block and one in the girls' block.

After implementation of the pilots, the monitoring involved:

- Checking in with principal or Head Of Department on the functioning of the toilets.
- Installing water meters and logging meter readings
- Documenting the condition and functioning of the toilets and toilet blocks and any problems that arose

User education including user posters was also undertaken at both schools.

2.1 Sizimesele Primary School, Molweni

Sizimesele Primary School was built in 1978. Enrollment in July 2013 was at 239, with 125 boys and 114 girls. The school was originally built with VIP pit latrines. By 2012, these had become smelly and unhealthy. Because the toilets were not locked their use and condition could not be monitored outside of school hours, and they were sometimes used by people from the surrounding area.

In 2012 when construction of the new pilot toilets was to begin, the pit latrines were demolished and portable chemical toilets provided.

Sizimisele Primary School located in rural Molweni, KwaZulu-Natal, South Africa

Sizimesele Primary School

Newly built toilet blocks at Sizimesele Primary School

Figure 4.2 Stalls (left) and a pour flush unit (right) in the girls' toilet block at Sizimesele Primary School

As part of the pilot at Sizimesele Primary School, a girls' toilet block was constructed with 6 toilets and 4 sinks. This provided 1 toilet per 19 girls and 1 sink per 28 girls. Two of the systems installed were low flush toilets. The boys' block contained 2 toilets, one of which was a low flush, 2 urinals and 2 sinks, providing 1 toilet per 31 boys and 1 sink per 62 boys. Staff toilets were also built but did not include any low flush toilets. Water meters were installed on all 8 toilets.

During the monitoring phase of the project, the toilet blocks were found to be clean and tidy, and the low flush units were working well. However, some of the water meters were not working for unknown reasons. In addition, 3 of the standard toilets were leaking. The leaks were reported to eThekwini Water Services and were fixed.

2.2 Thandaza High School, Hammarsdale

Thandaza High School in the rural Hammarsdale area

New Toilet blocks at Thandaza High School

About 886 learners are enrolled at the school which is served by a staff of 37. The school was provided with VIP toilets in 1998, and these were later replaced by a small number of flush toilets. In April 2013, the 3 girls' toilets were serving 522 girls (a user ratio of 1:174), and the boys' toilets (2 pedestals plus a wall urinal) were serving 364 boys (a facility:user ratio of 1:73)

The main issues with the old toilets were that the number of toilets was inadequate, causing overcrowding and forcing learners to queue at break time. This resulted in blockages and a very unpleasant smell due to the volume of material handled. There were also problems with vandalism, with metal water taps and other steel fittings being stolen.

The pilot at this school involved construction of a toilet block with two buildings separated by a Jojo tank. The toilets drained to a 4m wide x 5.4m long x 2.8m deep septic tank and 2 50m2 soak aways. Water meters were on the 3 boys' toilets and the first 4 of the 11 girls' toilets.

Figure 4.4 Stalls in the girls' toilets (left) and sinks in the women's staff toilet (right)

2.3 Private homes

In addition to the school installations, two homes in the Azalea area of Msunduzi Municipality were converted to low flush systems. These homes had been part of the pour flush trials, and their systems had by this stage performed well for 30 and 26 months respectively. The monitoring phase of the toilet use in the households revealed no problems with the low flush toilets over the four months of use.

Pour flush toilets selected for conversion to low flush systems

Heath hygiene and toilet use education at Thandaza High School (left) and Sizimesele Primary School (right)

Educational poster which was posted in Zulu in each stall in the boys' and girls' toilet blocks at both schools.

3 Findings

This project resulted in a fibreglass low flush system which performs well with either toilet paper or newspaper used as an anal cleansing material with a 2.5 litre flush. User acceptance of the system was good, with staff and learners at the two pilot schools making no distinction between low flush and standard toilets installed in the same blocks.

Pit latrines typically need to be emptied manually, both because of the dryness of the sludge and because of the presence of large amounts of rubbish. With the low flush system, the addition of a small amount of flush water results in a slightly wetter, more uniform material while a design that flushes material away rather than allowing it to drop through a pedestal to a pit discourages the disposal of rubbish into the pit. This results in a sludge which can which can be removed by a standard vacuum tanker or removed to a small treatment plant or communal digestor via a small bore sewer, reducing the risks to workers' health or to the environment that exist with manual pit emptying. Alternatively,

twin pits can be constructed and while the second pit is in use sludge in the first pit can be left to degrade and dewater, reducing in volume.

The prototypes produced in this study demonstrate that a low flush system can perform well where either toilet paper or newspaper are used for anal cleansing, although further modification is needed in order to maintain this level of performance with an injection-moulded model of the prototype.

Low flush technology has proven successful in this project in both institutional and domestic contexts on a small scale, providing a 40 to 70% savings of water over standard toilets which typically require between 4.5 litres and 9 litres to flush. It provides a sanitation model in which scarce water resources are used responsibly and sustainably, pointing a way forward not only for those who find dry sanitation unacceptable but also for standard sanitation design which in its current form is unsustainable as it relies on freely available water.

In conclusion, this technology may provide a viable option to municipalities under pressure to provide waterborne sanitation where laying sewers is not feasible or affordable. In addition, it could provide an option for householders desiring a flush toilet to upgrade their VIP systems to a low flush toilet on their own initiative. The low flush system can be installed indoors, reducing the costs of building a separate structure, or it can be installed in an existing VIP structure with the addition of a soak pit built beside the structure. It is essential that wherever low flush systems are installed, pedestals and other parts are made available to local hardware shops and plumbers to ensure that systems can be repaired over time. As many households in South Africa are unable to afford toilet paper, the ability of the low flush system to accommodate newspaper makes this a technology which municipalities could specify even for poor communities and which poor families could opt for with a one-time expense of upgrading their system but without incurring the long-term expense for toilet paper which they may not be able to sustain.

Low flush technology shows the potential for overcoming one of the thorniest problems facing municipalities: the difficulty of removing sludge from pits. While VIP sludge is often too dry and contains too much rubbish to be removed with a vacuum tanker, the low flush system is far more conducive to vacuum removal because sludge contains less rubbish and has a higher moisture content.

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