School WASH Hardware Standards

School Rainwater Harvesting, Latrine Blocks, and Handwashing Points

Lifewater®

Our Mission

We are Christians committed to ending the global water and sanitation crisis, one village at a time.

Our Vision

Safe water for every child. A healthy home for each family. The love of Christ for all.

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Table of Contents

Usage Guidelines

Purpose of the Standards:
This list of hardware standards is designed to enable quality design and construction of water, sanitation, and handwashing hardware in schools. The standards include an overview of the topic before diving into the various aspects that need to be considered prior to design of water, sanitation, or hygiene facilities.

Target Audience:
Any organization or body that is planning to design WASH-related hardware for schools in a low resource setting.

Instructions for Use:
Prior to hardware design, review the entirety of the standard and adapt as needed for the specific context in which you are constructing. Reference the section again prior to construction.

1. School Rainwater Harvesting

1.1. Background

School rainwater harvesting systems use roof structures, gutters, and tanks to collect rainwater and store it for use, and then dispense the water through tap stands. Lifewater uses these rainwater harvesting systems both for drinking water and also for handwashing at schools.

Roof rainwater harvesting systems are generally more expensive to construct and operate than groundwater or surface water sources, in terms of their annualized cost per volume of water supplied. However, in some cases groundwater or surface water resources are unavailable or very expensive to develop and protect—especially if multiple sources are required to supply enough water for a school. Also, when wells with manual pumps are used by schools or health facilities for drinking water, it is sometimes impractical to use these for other purposes like handwashing due to their distances from school latrines and the extended queuing time required with only a single outlet at a hand pump. Lifewater programs may choose to implement rainwater harvesting systems in schools and health facilities if the annual distribution and depth of rainfall is sufficient and if another option (such as a well or protected spring) is infeasible.

Rainwater harvesting systems should be implemented with caution because the upfront capital expenditures and the operation and maintenance (O&M) expenditures required for such systems pose many challenges to school and health facility management structures:

1. Depending on the timing and depth of annual rainfall, **rainwater harvesting systems may require large capital expenditures to construct one or more large water storage tanks** to ensure sufficient and uninterrupted supply when needed. It is very important to obtain accurate regional rainfall data to evaluate the rainwater harvesting potential from a given roof surface and calculate the required storage volume to bridge dry periods.

2. **A rainwater harvesting system must be kept clean.** Dust, debris, insects, rodents, animal droppings, and other contaminants can enter a rainwater supply through many parts of the system: the rooftop, gutters, and water storage tank. To limit this risk, the roof surface, gutters, and tank must be cleaned regularly. Also, some national governments may require treatment of rainwater collected from rooftops to ensure that the water is safe to drink.

3. **Gutters, pipes, downspouts, etc. may be damaged over time and must be repaired to continue harvesting rainwater effectively.**

4. **Maintenance personnel are required to provide year-round attention and care of the system**; otherwise the system will fall into disrepair and will no longer be used, resulting in a lost investment.

The following sections summarize the basic requirements for designing and constructing a rainwater harvesting system.

1.2. Use of Rainfall Data for System Design

1.2.1 All systems must be planned using available rainfall data and appropriate calculations to demonstrate the technical and financial feasibility of rainwater harvesting at the site.

1.2.2 If available, program offices should obtain area-specific average annual and average monthly rainfall depths, maximum rainfall intensity estimates, and the maximum number of dry days between rain events. These data must be reviewed by the DPO and WASH Engineer.

1.2.3 The monthly rainfall collection potential for a school or health facility must be estimated using the mean monthly rainfall depth, the size of the catchment area(s), and the assumed efficiency of the rainwater harvesting system.

1.2.4 Unlike at health facilities, water usage at schools often varies dramatically throughout the year due to school holidays and breaks. The water usage requirements for schools must be estimated based on the number of days that schools are in session. The minimum volume of storage should be determined using the guidelines in Table 1.

Table 1: Estimating Required Supply

Rainwater Use Option	Recommended Minimum Supply
As the only water source at a school	At least 2 liters per student for each day school is in session
As a supplementary water source for some drinking and hygiene needs	At least 1 liter per student for each day school is in session
As a supplementary water source for only handwashing at latrine block	At least 1 liter per student for each day school is in session.

1.3. Site Evaluation

1.3.1. Potential rainwater catchment surfaces must be inspected to confirm that the surface material is smooth and made of non-toxic materials.

1.3.2. Roofing made of organic materials (such as thatch) must not be used as a catchment surface for rainwater harvesting systems intended to collect water for drinking.

1.4. Gutters, Downspouts, Screens, First Flush, and Piping

1.4.1. Gutters, downspouts, and conveyance piping must be sized and designed to convey flow resulting from anticipated local rainfall intensities. These will be estimated after reviewing local data.

1.4.2. Gutter materials should be corrosion resistant and resistant to UV-destabilization. Extruded PVC, polyethylene/polypropylene, aluminium alloy-coated steel, galvanized iron, and aluminium are all materials suitable for use as gutters and/or downpipes where water for human consumption is being collected.

1.4.3. Gutter runs1 should typically be 12 meters long or shorter. Additional downspouts should be installed when necessary to create multiple gutter runs along long roof surfaces.

1.4.4. The slope of the gutter should be designed based upon the gutter cross-section and material used, ensuring that the design flow is adequately conveyed to the downspout and minimizing water losses due to overshooting the end of the gutter.

1.4.5. Debris screens must be provided to prevent leaves and debris from entering the rainwater storage tank.

1.4.6. First flush diverters (similar to Figure 1) must be installed in all rainwater harvesting systems used to collect drinking water, to prevent accumulated dirt and contaminants from entering the storage tanks. A first flush diverter must be installed at each downspout and have sufficient volume to capture the first 40 liters of water per 100 square meters of contributing roof surface.

1.4.7. First flush devices must have both a removable cleanout to permit seasonal cleaning and a passive drain mechanism (such as a weephole) to drain dirty water between rain events without manual intervention.

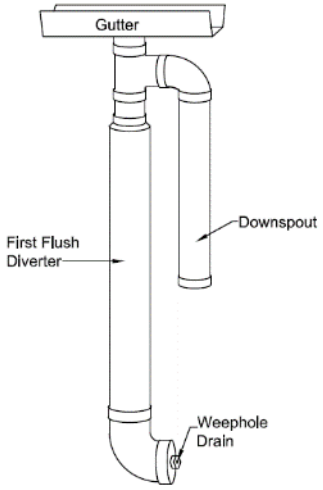


Figure 1

1.5. Rainwater Storage Tanks

1.5.1. Rainwater storage tanks must be constructed of strong, non- corrosive materials such as:

- galvanized steel,
- aluminum,
- roto-molded polyethylene plastic resin,
- ferro-cement,
- or reinforced concrete.

1.5.2. Tanks must be sealed and any openings screened to prevent contamination and the entrance of disease-carrying vectors.

1.5.3. Tanks must include the following features:

- Ventilation
- Overflow pipe
- 600 mm x 600 mm square or 600 mm diameter (minimum size) locking access hatch
- Cleanout drain
- Outlet and inlet pipes

1.5.4. Adequate drainage must be provided to convey water away from the tank foundation area when it is drained and cleaned.

[1] *A **gutter run** is a continuous length of gutter that slopes from a high point to a low point with a downspout installed at the low point.

1.5.5. Tanks must be dark colored, painted, or coated to prevent light penetration. Reinforced concrete tanks need not be painted because light cannot penetrate through the walls.
1.5.6. Tank foundations must be designed and constructed to prevent movement and evenly distribute and support the load of the tank when full.
1.5.7. Many tanks expand or contract in different conditions (e.g., when a tank is empty or when a tank is full). The design of the tank and foundation must accommodate such deformations.
1.5.8. The tank foundation must be protected from erosion due to surface water runoff or tank overflow.
1.5.9. Tanks must be constructed above ground. Underground tanks are not acceptable due to increased contamination risks.

1.6. Water Collection Point

1.6.1. One or more water collection taps must be installed on a tap stand located at least 1 meter from the rainwater storage tank.
1.6.2. Tap stands must discharge onto a concrete apron to prevent erosion.
1.6.3. Water collection taps must be high enough above the concrete apron to fit 20 liter jerry cans and water buckets underneath them, which is 480 to 500 mm from the ground.
1.6.4. There must be adequate drainage away from the water collection point to prevent ponding, or a soak pit must be constructed.

1.7. Contributing Sources

[1] Center for Rainwater Harvesting, 2006. ***Roof and Gutters: Calculating Area.*** [Online] Available from: http://www.thecenterforrainwaterharvesting.org/2_roof_gutters4.htm#designing_gutters

[2] Harvest, H2o, 2018. ***First Flush Devices – A Review.*** [Online] Available from: http://www.harvesth2o.com/first_flush.shtml#.WiGITkqWZm9

[3] Kniffen, B., B. Clayton, D. Kingman, F. Jaber, 2012. ***Rainwater Harvesting: System Planning.*** College Station, Texas: Texas A&M AgriLife Extension.

[4] LWI, 2015. ***Quality Standards for Programs, Revision 2.5*****.** Stafford, Texas: Living Water International.

2. School Latrine Blocks and Handwashing Points

2.1. Background

Latrine blocks and handwashing points at schools are a critical element in WASH in Schools programming. The provision of adequate sanitation facilities has a direct impact on the willingness of girls and disabled students to attend school and on the performance level of all students at school. School sanitation and handwashing practice also serves as a means for hygiene messages to be transmitted back to the whole community as students serve as an influence their homes.

It is important that the number of facilities available per student are adequate so that all students are able to use them during their breaks. Also, the quality of construction of a latrine affects the longevity of the structure and is important for student safety. Good layout and design to serve the needs of children, girls, and those who are disabled are a key factor in the development of the Lifewater standards included here.

2.2. General

2.0.1 Schools must have appropriate and separate latrines for boys and girls and should have latrines for teachers.

2.0.2 All latrines must either be drainable ventilated improved pit latrines (drainable VIPLs) or pour-flush latrines. Standards for these two types may be found in Sections 10.10 and 10.11, respectively.

2.3. Targeted Student Ratios for Stances and Configurations for Latrine Blocks

The following section outlines the minimum requirements for student ratios for latrine blocks and must be used to design a configuration for a toilet block. Pre-approved configurations showing types and numbers of stances for boys' and girls' latrine blocks are also shown in Appendix A for Ethiopia and Uganda country programs.

2.0.3 There must be no more than 50 students per latrine stance (containing a drop hole or toilet).

2.0.4 The inclusive stance (Section 10.7) should not be counted in the student ratios.

2.0.5 There must be at least 3 stances in each latrine block, including the one latrine pedestal/seat for children with disabilities.

2.0.6 For boys, one meter of urinal channel will, under some conditions, be considered equivalent to one latrine stance. One meter of urinal channel will replace one of the first 3 standard stances in a boys latrine block. Additional one-meter sections of urinal channel will replace half of any additional stances required beyond the first four standard stances in a given latrine block.

2.0.7 Each girls' latrine block must contain one washing/changing room for menstrual hygiene needs. This room may be counted as a standard latrine stance if it meets the standards in 10.8.1.

2.4. Latrine Blocks for Teachers

2.4.1. Lifewater will mobilize the government and/or community to provide adequate teacher latrine facilities. Lifewater may offer technical support but does not finance the construction of teacher latrines.

2.5. Location of Latrine Blocks and Gender Separation

2.5.1 All latrine blocks must be located between 10 to 30 meters from classrooms, within the school compound, and must be visible from the classrooms.

2.5.2 Latrines must be located at least 30 meters from any drinking water well or other protected groundwater source.

2.5.3 Latrines must be located high enough so that floods do not cause the latrine pits to overflow.

2.5.4 Latrines must be planned for student convenience and not for teacher convenience.

2.5.5 There must be no barriers between classrooms and latrines that would make it more difficult for students to access the latrines (e.g. fences or walls).

2.5.6 The boys and girls latrine stances must not be in the same latrine block. There are two exceptions to this:

- In Cambodian schools, boys' and girls' stances must be in the same latrine block based on government requirements.
- Any small school that requires 4 or fewer standard stances per gender. In this circumstance, all stances can be contained in the same block. Entrances for boys and girls must be completely separated by a wall or fence and entrances must be located on opposite corners of the latrine block.

2.5.7 There must be at least 20 meters between boys and girls latrine blocks (except in the excluded cases listed above). Ideally, latrine blocks should be located in different parts of the school compound; if this is not possible, latrine blocks should be oriented so that the entrance(s) to the girls latrine block faces a different direction than the entrance(s) to the boys latrine block. The entrance(s) to the girls latrine block should face school buildings and be visible to teachers.

2.5.8 Lifewater staff must consult with pupils, teachers, and parents about latrine block location preferences prior to construction.

2.6. Standard Latrine Stance Features

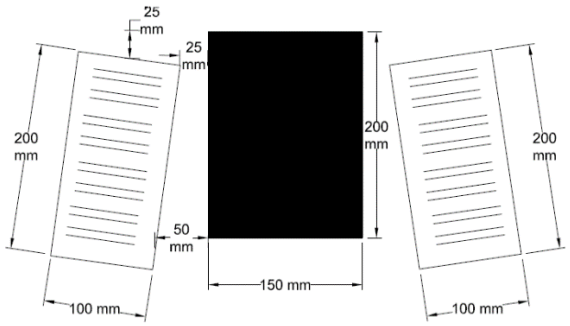
2.6.1 Each standard latrine stance must be at least 1000 millimeters (mm) wide and 1200 mm long (from front to back).

2.6.2 For latrine blocks with a drainable VIPL design, each standard latrine stance must have one drop hole measuring 150 mm wide x 200 mm long. The hole should be centered in the width of the stance. The back edge of the hole should be located 350 mm from the back wall of the stance.

2.6.3 For latrine blocks with a shallow, alternating pit design, two drop holes (each 150 mm wide x 200 mm long) must be constructed inside each latrine stance, spaced evenly in the width of the latrine stance.

2.6.4 Standard latrine stances must have high-quality foot pads with dimensions of 100 mm wide by 200 mm long as shown in Figure 1. If a pour-flush pan is used, it must be mortared over the drop hole.

Figure 1. Child-size drop-hole with footpads



2.6.5 Standard latrine stances must have doorways at least 700 mm wide.

2.6.6 Urinal floor channels must be 500 mm wide and must slope to a drain. The length of channel in a given block will be determined based upon the minimum requirements shown in Section 8.3.5.

2.6.7 All latrine stances and changing rooms must have walls, a roof, and doors. Urinals may be located in a single area with a minimum of 1200 mm high (half-height) exterior walls. A roof is optional, as are partitions within the urinal area depending on cultural standards.

2.6.8 Where the terrain is steep, uneven, or with dense vegetation in the school compound, an access path must be established between the classrooms and the latrines. The path must be at least 1200 mm wide. Regardless of the terrain, the walking area between the classroom and latrine must be firm, relatively smooth, and well drained so that it remains hard and dry throughout the year.

2.7. Accessibility for Children with Disabilities

2.7.1 One stance in each latrine block must be accessible to children with disabilities. This stance must be at least 1500 mm wide and 1200 mm long (from front to back). The drop hole must be 200 mm long and 150 mm wide.

2.7.2 The seat/pedestal in the stance for children with disabilities must be 350 mm high x 200 mm long (from front to back) x 250 mm wide. It must be fixed in place.

2.7.3 The doorway stance of the inclusive stance must be at least 800 mm wide.

2.7.4 At least one handrail, but preferably two, must be installed in the stance for children with disabilities. The handrail should be located within arm's reach of the seat/pedestal at a height of 600 mm.

2.7.5 If the latrine floor is raised above ground level or the ground is sloped, an access ramp must be constructed to the stance for children with disabilities. The ramp's slope must not exceed 6.6% (1 unit vertical to 15 units horizontal). If the ramp is more than 5 meters long, a level platform where the user can rest must be constructed at 3-meter intervals.

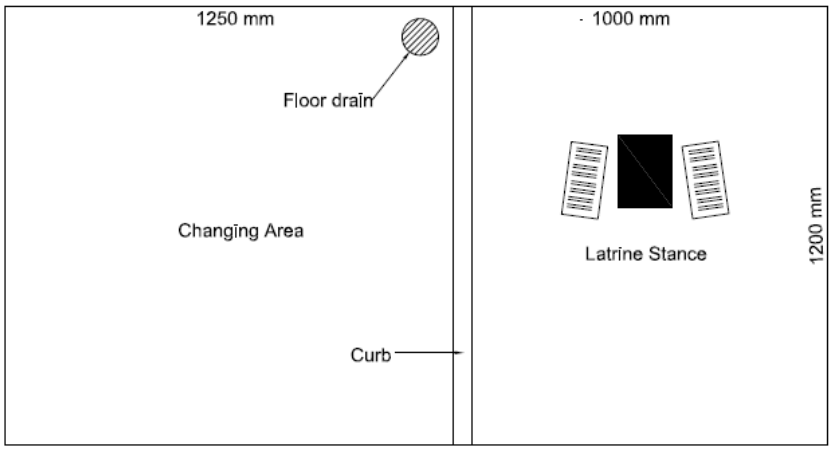
2.7.6 The access ramp must not have any vertical steps and must have a level landing at the entrance to the door so that users can safely open the door.

2.7.7 The access ramp must have a handrail on each side with a consistent height between 900 mm and 1000 mm.

2.8. Provision for Menstrual Hygiene Management

2.8.1. The girls changing room must at minimum measure 1350 mm wide x 1200 mm long. If there is a drop hole or toilet in the changing room, the room must have minimum dimensions of 2250 mm wide x 1200 mm long with a curb installed between the drop hole and the wash area to promote hygienic conditions. A cover must be provided for the latrine drop hole in the changing room. Each of these provisions are for the purpose of preventing contamination of the changing and washing area by feces.

Figure 1: Example of changing room with drop hole. The changing room is on the left, separated from the drop hole by a curb with a height of 30 to 50 mm.



2.8.2. The changing room must have a screened opening above the door to provide light and ventilation.

2.8.3. The changing room must have a floor drain and the floor must slope to the drain.

2.8.4. There must be a covered waste container for disposal of menstrual hygiene materials inside the changing room.

2.8.5. There must be piped water or a storage tank with a tap provided inside the changing room.

2.8.6. There must be a wall hook in the changing room so that girls have a clean place to hang clothing.

2.9. Use of Environmental Data to Select Pit Design

2.9.1 Before selecting a latrine pit design, the soil and groundwater conditions must first be assessed to inform the design.

2.9.2 The type of material to be excavated must be assessed through examination of other local excavations, down to the expected depth of the latrine pits. Materials include soil (sand, silt, and/or clay), gravel, boulders, and consolidated rock.

2.9.3 It must be determined whether the walls of the pit are likely to become unstable during excavation.

2.9.4 The minimum annual depth of the water table below the ground surface must be estimated using observations from ponds and/or hand-dug wells.

2.9.5 The bottom of a latrine pit which is planned to have a sealed lining may be constructed below the water table if it is technically feasible to dewater the pit and if the water is not in the drinking water aquifer. Otherwise the bottom of an unsealed

pit or a pit which extends into the drinking water aquifer must remain at least 2 meters above the highest water table level.

2.9.6 Alternative designs for pit latrines (other than those presented in these standards) must be considered in the following cases:

- If the groundwater at its highest annual level is less than 6 meters below ground,
- If a rock layer or boulders prevent hand excavation of a deep pit,
- If the soil is too unstable, making hand excavation of a deep pit dangerous and more expensive.

2.10. Drainable Ventilated Improved Pit Latrine (VIPL) Features and Construction

2.10.1 Two design configurations are approved for drainable, ventilated improved pit latrines:

- Singly loaded corridor design in which stances have doors that open all in the same direction.
- Back-to-back design with doors opening in opposite directions.

The ventilation requirements for the two configurations have many similarities, but they also have a few differences described below.

2.10.2 For both designs, there must be a screened air vent above the door lintel of each latrine stance that spans the width of the door and is 400 mm tall.

2.10.3 For the singly loaded design, each latrine stance must have a PVC ventilation pipe of 110 mm diameter. The pipe must be installed in the back portion of the pit behind the drop hole. The vent pipe must extend at least 500 mm above the highest point of the latrine block roof and protrude below the slab by about 50 to 100 mm so that warm air leaves the pit effectively. The top of the ventilation pipe must be covered with fly screen and the exterior portion of the vent pipe must be painted black.

2.10.4 For the back-to-back design, each pair of back-to-back stances must have a PVC ventilation pipe of 110 mm diameter. The pipe must be installed in the back portion of one of the two stances (near the middle of the pit). The vent pipe must extend at least 500 mm above the highest point of the latrine block roof and protrude below the slab by 50 to 100 mm so that warm air leaves the pit effectively. The top of the ventilation pipe must be covered with fly screen and the exterior portion of the vent pipe must be painted black.

2.10.5 For the singly loaded design, the walls must extend to the roof and there must not be other ventilation other than the screen above the door and the ventilation pipe.

2.10.6 For the back-to-back design, the walls must only extend vertically to the height where they intersect the lower side of the roof. Air must be allowed to pass over the tops of the stances.

2.10.7 For both designs, all stances must have a direct drop hole into the pit with no

water required for flushing.

2.10.8 Each block must include at least one removable, reinforced concrete access slab with handles for pit emptying.

2.10.9 All drainable VIPL pits must be fully lined and fully sealed with any masonry joints mortared to make a continuous, impermeable barrier.

2.10.10 The pit lining may utilize stone masonry, hollow concrete block, or burnt brick, depending on local material and skills availability.

2.10.11 The bottom course of the lining must be placed on a foundation meeting the following specifications:

- First, a layer of 100 mm of hardcore (gravel base material) bedding must be installed and compacted. The base material must be comprised of 10 to 30% sand with no clay, silt, or organic materials. All base course aggregate must be 20 mm or smaller in diameter.
- A 100-mm-thick reinforced concrete foundation slab must be installed on top of the compacted hardcore/base material.

2.10.12 The slab at the bottom of the pit must slope at least 2% across its length to the area beneath the access port to facilitate movement of the liquid sludge when emptying the pit.

2.10.13 If rock layers, unstable soils, or a high groundwater table prevent the use of a standard deep pit, a shallow, alternating pit design with two drop holes per stance or an elevated pit may be used. Consult with HQ for design guidance prior to construction.

2.10.14 The top of the lining wall must include a reinforced concrete grade beam to provide a strong, level surface on which to cast the latrine block floor slab.

2.10.15 The lining must extend at least 150 mm above the surrounding natural ground level to prevent surface water from entering the pit.

2.10.16 The gap between the pit sides and the constructed lining must be backfilled with earth and compacted, layer by layer, to avoid voids which could later collapse.

2.11. Pour-flush Latrine Features and Pit Construction

2.11.1 A pour-flush latrine pan with a watertight seal must be installed in the slab of each latrine stance over the drop hole.

2.11.2 All latrine stances must be provided with water storage containers and 1-liter dippers (or mugs) for pour flushing and anal cleansing. A tap in each stance may be used if piped water supply is available. The tap must be placed next to the squatting pan at a height of 500 mm.

2.11.3 One single 110-mm-diameter PVC ventilation pipe must be installed from the pit and extended above the height of the latrine block roof to release gas build up. The vent pipe opening must be covered with a fly screen and the pipe must either be UV-stable PVC or must be painted to prevent degradation.

2.11.4 A minimum 75-mm-diameter PVC sewage pipe must be installed to convey the combined flushed waste from all pour-flush toilets to a seepage pit located outside the latrine block. The sewage pipe must have a slope of at least 2%.

2.11.5 The seepage pit must be constructed at least 1.5 meters outside the foundation of the latrine block. The pit must be sized based on the expected combined flow from all the latrine stances and the assessed percolation rate of the surrounding ground material.

2.11.6 Where latrine pit pumping services are unavailable and manual desludging is required, two pits must be constructed. The two-pit design allows for alternating use of the pits, providing time for bacteria to die off in a full pit before the sludge is removed manually and the pit is returned to service.

2.11.7 The pit lining may utilize stone masonry, hollow concrete block, or burnt brick, depending on local material and skills availability.

2.11.8 The bottom course of the lining must be placed on 100 mm of compacted hardcore bedding.

2.11.9 The below-ground portion of the pit lining must be permeable (except at the top). This is accomplished by leaving vertical joints un-mortared for two courses and then fully mortaring every third course of brick or blockwork, allowing liquid to infiltrate into the surrounding ground material.

2.11.10 The top 500 mm of the lining must be fully sealed with all joints mortared to make a continuous barrier around the top of the pit. This sealed section must include a reinforced concrete grade beam to provide a strong, level surface on which to cast the pit cover slab. The pit lining and grade beam only need to support the cover slab(s) of the pit, and not the latrine superstructure.

2.11.11 The lining must extend a minimum of 150 mm above the surrounding natural ground level to prevent surface water from entering the pit.

2.11.12 The gap between the pit sides and the constructed lining must be backfilled. Where the lining is permeable, the space must be filled with coarse, granular material such as sand or gravel. Closer to the ground surface, where the lining is sealed, the gap must be filled with earth and compacted, layer by layer, to avoid voids which could later collapse.

2.11.13 The pit cover must be constructed of one or more removable slabs that can be lifted manually for desludging. Lifting rings must be cast into the slab(s).

2.12. Handwashing Points

2.12.1 Each latrine facility must have at least 1 handwashing tap for every 2 stances (or stances replaced by urinal channel), as summarized in the following table:

Number of stances (all types)	Number of handwashing taps required
2	1
3	2
4	2
5	3
6	3
7	4
8	4
10	5
12	6

2.12.2 More than one handwashing tap may be included at a single handwashing point (sink or tank) to allow flexibility for different latrine block layouts.

2.12.3 Handwashing taps must be located less than 10 meters from the latrine stances they serve.

2.12.4 Handwashing taps must be installed at a suitable height for the children served. Handwashing taps serving typical stances must be installed at a height of 750 mm above the ground level while taps nearest to the inclusive stance must be installed at a height of 650 mm and must include a seat pedestal.

2.12.5 Water sufficient for the day's handwashing needs (approximately 1 liter per student per school day) must be stored in a water storage tank or container and plumbed to the handwashing taps.

2.12.6 Handwashing taps must be well drained with a sink or drainage channel to prevent standing water. Water must drain into a soak pit.

2.12.7 A sturdy place to store soap must be provided at every handwashing tap.

2.12.8 When practical, a mirror that enables the students to see the upper part of their body/face will be provided at every handwashing point to promote handwashing.

2.12.9 There must be a permanent (concrete) walkway from the latrine to the handwashing stations, and the walkway should extend to be where students will stand while washing hands. This should 1200 mm wide. There should be arrows or feet painted on this walk way to encourage children to go to the handwashing station after they use the latrine.

2.13. Excavation Safety

2.13.1. Great care must be taken to protect workers from hazards due to pit collapse.

2.13.2 Workers excavating a latrine pit must wear hard hats and sturdy boots to protect them from falling objects and safety glasses if they are breaking rock.

2.13.3 The excavation site must be fenced off and children kept away.

2.13.4 During the excavation process, there must always be at least one person at the surface with a rope for quick escape, available to help in case of an accident.

2.13.5 A guard must be posted at the pit anytime children are present and while work is not currently underway. A visual barrier should be placed around the circumference of any excavation to alert passers-by of the potential hazard.

2.13.6 When a pit is excavated in unconsolidated material that is prone to collapse, temporary supports (also known as shoring or shuttering) must be used until the lining is constructed to prevent pit collapse. Unstable materials generally include silt, silt loam, sand, gravel, fissured soils, and any soil with water seeping through it.

2.14. Contributing Resources

[1] Reed, B. and R. Shaw, 2008. ***Sanitation for Primary Schools in Africa***. Leicestershire, UK: WEDC Loughborough University

[2] Government of Uganda, 2001. ***Guidelines for School Sanitation Promotion.***

[3] Government of Ethiopia, 2012. ***Design and Construction Manual for Water Supply and Sanitary Facilities in Primary Schools.***

Appendix A: Ethiopia and Uganda Pre-approved Latrine Block Configurations

ETHIOPIA

Boys Latrine Configurations

			Type of Stance and Number of Each Type to Match Back-to-Back Block				
	No. students if all day	*No. students if 2 half-day shifts*	*Standard stance**	*Urinal (# of 1-m channel lengths)*	*Disability stance*	*Total # pit stances (all types)*[+]	*Design configuration*
Number of boys	151-200	301-400[1]	3	1	1	4	Single Corridor
	201-400	401-800	5	3	1	6	Back-to-back stances
	401-500	801-1000	7	3	1	8	

* Note that to accommodate a disability stance once of the standard stance rooms will have the larger dimensions as disability stance room

[+] Total does not include urinal sections since these are not required to have a pit underneath them

[1]Note: Under most circumstances it is recommended serve a population this small in a combined latrine block (see the third table).

Girls' Latrine Configurations

			Type of Stance and Number of Each Type to Match Back-to-Back Block				
	No. students if all day	*No. students if 2 half-day shifts*	*Standard stance*	*Disability stance*	*Changing room w/standard stance Included*	*Total # pit stances (All*	*Design configuration*
Number of girls	*101-150*	*201-300**	2	1	1	4	Single corridor
	151-250	*301-500*	4	1	1	6	Back-to-back Stances
	251-350	*501-700*	6	1	1	8	
	351-450	*701-900*	8	1	1	10	

*Note: Under most circumstances it is recommended to serve a population this small in a combined latrine block (see the third table).

Combined Latrine Configuration for Small Schools under 700 students

			Type of Stance and Number of Each Type to Match Back-to-Back Block				
		No. students if 2 half-day shifts	*Standard stance*	*Disability stance*	*Special Facility*	*Total # pit stances (All*	*Design configuration*
Number of students	*Under 500 students (w/ max. 200 girls)*	*1-200 Girls*	1	1	1 changing room w/standard stance included	3	6 stance back-to-back latrine block w/end urinal
		1-300 Boys	2	1	1-m urinal stance	3	
	Under 700 students total (w/ max. 300 girls)	*201-300 Girls**	2	1	1 changing room w/standard stance included	4	8 stance back-to-back latrine block w/end urinal
		*301-400 Boys**	3	1	1-m urinal stance	4	

*See the corresponding note in the first and second tables

UGANDA

Boys' latrine configurations		Type of stance and minimum # each type (based on 40 per stance)		
		Standard stance	***Urinal (# of 1-m channel lengths)***	***Disability stance***
Number of boys (based on all-day attendance)	1-80	2	0	1
	81-120	2	1	1
	121-160	3	1	1
	161-200	4	1	1
	201-240	4	2	1
	241-280	5	2	1
	281-320	5	3	1
	321-360	6	3	1
	361-400	6	4	1
	401-440	7	4	1
	441-480	7	5	1
	481-520	8	5	1
	521-560	8	6	1

Girls' latrine configurations		Type of stance and minimum # each type (based on 40 students per standard stance)		
		Standard stance	***Disability stance***	***Changing room w/no stance***
Number of girls (based on all-day attendance)	*1-80*	2	1	1
	81-120	3	1	1
	121-160	4	1	1
	161-200	5	1	1
	201-240	6	1	1
	241-280	7	1	1
	281-320	8	1	1