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List of additional documents

A. SDMO Generator Operation Manual

1.0 INTRODUCTION

This document serves as a guide to operating and maintaining all system components in the Bbanda Distribution Systems (BDS). The overview of the system is shown in Figure 1.

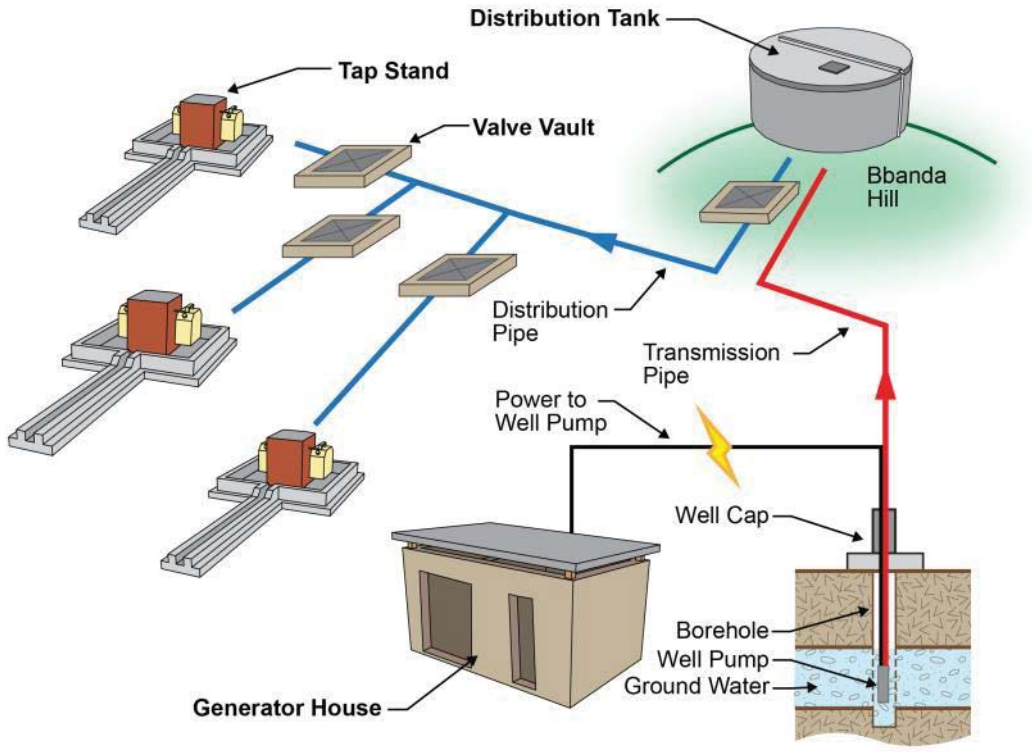


Figure 1 - Simplified Drawing of the Bbanda Distribution System

The system operates as follows:

- A diesel generator in the generator house powers a pump in the borehole.
- The pump moves water up the transmission main to the tank.
- Water flows by gravity through distribution line to the tap stands.
- Residents fill jerry cans at the tap stands.

These are the components covered by the Operations and Maintenance Manual.

2.0 ADMINISTRATIVE INFORMATION

2.1 System Personnel

Water System Manager

The Water System Manager is the Water Board member responsible for day to day oversight of system operation. The Water System Manager shall:

- Oversee the work of the Maintenance Director.
- Approve the training of any new personnel to operate the system.
- Conduct periodic inspections of BDS facilities to assure operations and maintenance are in accordance with the requirements of this manual.
- Fulfill all of the Maintenance Director's tasks if the Maintenance Director is unavailable.

Maintenance Director

The Maintenance Director shall:

- Conduct daily operation and oversight of the system, which includes to:
    - fill the water storage tank (Section 3.1 and 3.2)
    - open main system valves
    - check all valve vaults and structures are kept locked while not in operation
    - check all components are functioning
    - inspect for leaks
- Complete each inspection or troubleshooting activity required by this manual on the appropriate schedule as well as complete and sign the Maintenance Log Book to document results. These activities are to:
    - Inspect the tank and tank site (Section 4.2)
    - Clean the water storage tank (Section 4.2.2)
    - Inspect the generator house area (Section 4.3)
    - Manage diesel spills (Section 4.3.2)
    - Inspect tap stands and valve vault areas (Section 4.4 and 4.5)
    - Contact Davis & Shirtliff for problems with the pump or generator (Section 4.6)
    - Perform routine maintenance on the generator (Section 4.7)
    - Drain the system (Section 4.8)
- Complete repairs for small maintenance issues and contact professionals to repair large problems.
- Collect water fees from Tap Stand Monitors at least twice per week (or as directed by the Water Board) as well as record the amount of funds in the Tap Stand Log

- Turn over collected funds to the Treasurer, or deposit collected funds into the Water Board bank account and provide the Treasurer documentation of the transaction.

Tap Stand Monitor

The Tap Stand Monitors shall:

- Unlock and lock their tap stand at the beginning and end of each day
  - If they are unavailable, the tap stand monitors must find a trained replacement.
- Collect water fees at the rate set by the Water Board.
- Provide the agreed upon amount of water fees to the Maintenance Director at least twice per week, or as directed by the Water Board.
- Maintain the tap stand area neat and clean at all times.
- Promptly report any problems with the tap stand operation to the Maintenance Director.

2.2 Keys

The Maintenance Director, Water System Manager, and Water Board Chairman shall have a set of spare keys for all parts of the system and be fully trained to operate and maintain the system in the absence of the Maintenance Director.

3.0 OPERATIONS

Only qualified and trained personnel should conduct the operations described in this manual. The Water System Manager must approve the training of any personnel prior to their performing any tasks.

3.1 Filling the Tank (Tank Site)

Responsibility: Maintenance Directo

3.1.1 Determine Pumping Time

Responsibility: Maintenance Director

Count the number of points from the top of tank level indicator down to the pointer flag (See Figure 2). This number represents the amount of water required to fill the tank. A chart in the generator house relates the number of points to the pumping time in hours.

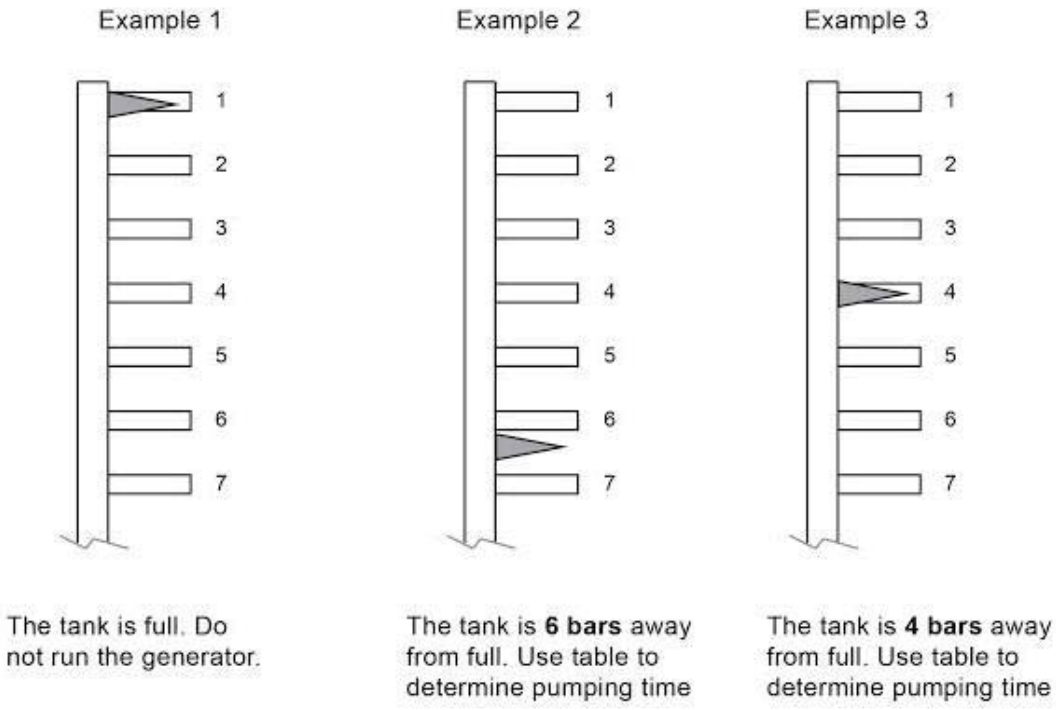
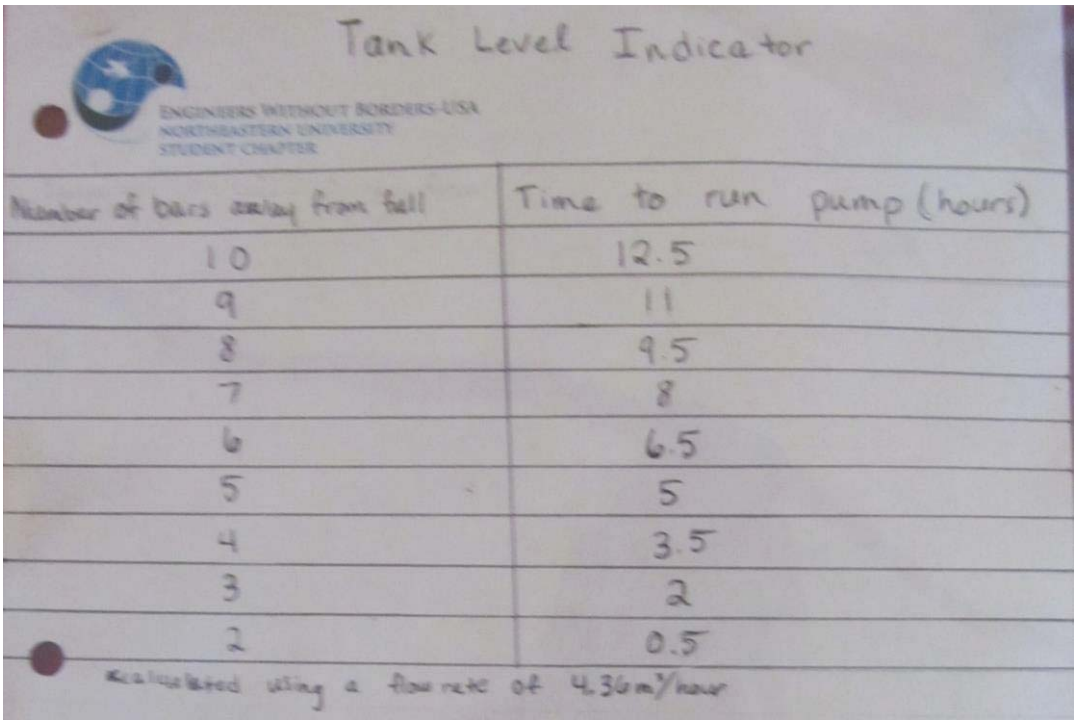


Figure 2 (a) - Examples for Reading the Tank Level Indicator



Tank Level Indicator

ENGINEERS WITHOUT BORDERS-USA
NORTHEASTERN UNIVERSITY
STUDENT CHAPTER

Number of bars away from full	Time to run pump (hours)
10	12.5
9	11
8	9.5
7	8
6	6.5
5	5
4	3.5
3	2
2	0.5

Calculated using a flow rate of 4.36 m³/hour

Figure 2 (b) – Tank Level Indicator Pump Timing Chart

3.1.2 Open Valves at the Tank

Responsibility: Maintenance Director

At the beginning of each day, open the valve on the distribution main where it leaves the tank (See Figure 3) as follows:

1. Unlock the valve vault for the distribution line.
2. Open the distribution main valve by slowly turning the handle a quarter turn as shown in Figure 3. When open, the valve handle is in line with the pipe.
3. Verify the valve on the transmission main is half open as shown in Fig 3. When half open, the valve handle is at 45 degrees relative to the pipe. This valve should never be closed.
4. Lock the valve vault.

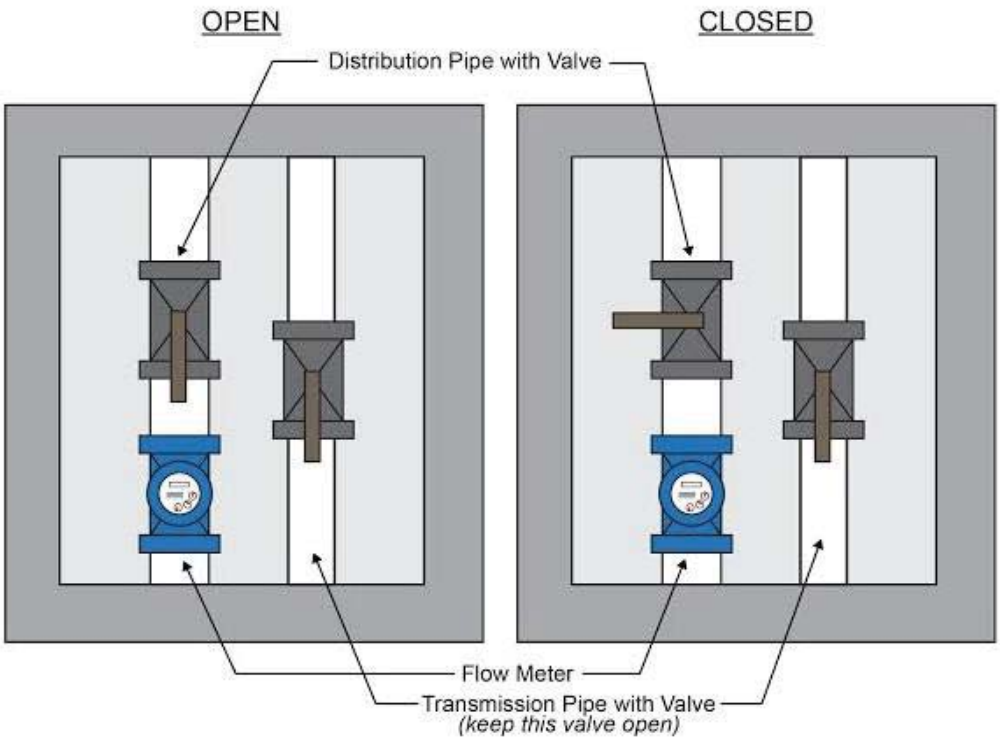


Figure 3 - Distribution Main Valve at Tank

If any valve is difficult to open or close by hand, the valve wrench can be used as shown in Figure 4:

1. Slide the valve wrench's short handle (1) over the valve handle.
2. Using the upper handles (2) turn the valve wrench a quarter turn counter-clockwise to open or clockwise to close the valve.

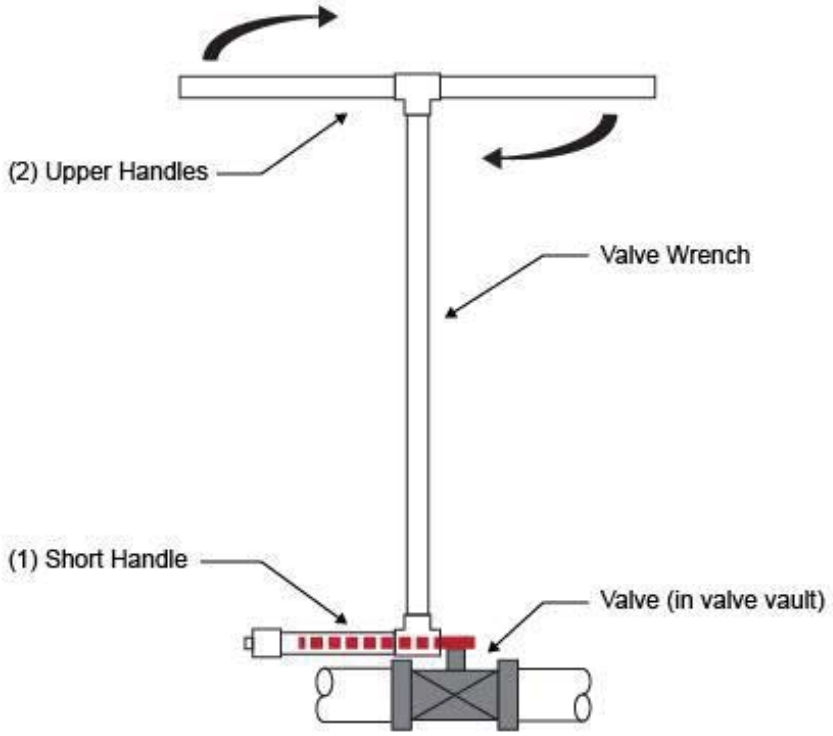


Figure 4 - Valve Wrench to assist opening and closing large valves

3.2 Filling the Tank (Generator House Site)

Responsibility: Maintenance Director

3.2.1 Transmission Main Drain Valve (in Generator House)

A pipe branches off of the transmission main and passes through the generator house backwall into the surrounding fields. The valve on this pipe is used to drain the transmission main (see Section 4.8 for the correct operation). During regular operations the valve should be CLOSED.

3.2.2 Fuel Safety

Follow the safety measures below at all times:

- Read and follow all safety precautions in the Generator User Manual (attached) prior to fueling the generator.
- All diesel for the generator is kept in **the locked room separated** from the generator.
- Lock both doors to the generator house when not in use to protect the diesel and the generator. The Maintenance Director, Water System Manager, and Water Board Chairman will have the keys and be responsible for the contents of the structure.
- Be careful not to overfill the generator fuel tank. If any spillage does occur, wipe up small amounts with a rag and put the rag outside the building. For any sizable spills, see Section 4.3.2.
- Never leave fuel soaked rags in a pile or inside the generator house.

3.2.3 Fuel in Generator

Fill the generator fuel tank with diesel from the storage room. Observe the following safety precautions during this process:

- Do not open the fuel tank while the generator is operating.
- Return all full and empty fuel cans to the store room before starting the generator.
- Clean up any spilled diesel prior to starting the generator (See Section 4.3.2 Diesel Spills).
- Discard and replace a damaged or gouged jerry can immediately to avoid the risk of a leak.
- Only use diesel from Mityana. Do not use diesel from Bbanda or Kanoni.
- Do not let the generator run out of fuel to prevent an air lock in the fuel line.

3.2.4 Generator and Pump Operations

Running Time

The Maintenance Director shall keep track of the generator and pump operation time. He/she shall determine operation time based on the measurement of the tank level indicator at the tank site and the conversion table in the generator house and set a timer on their phone or other timing device before starting the generator. The Maintenance Director must turn off the pump and generator immediately after the elapsed time.

Starting the Generator

1. Open the fuel tap, (14) in Figure 5 (a).
2. Turn the starter key in Figure 5 (b) clockwise to position C and hold it there until the motor starts.
3. Release the key.
4. Do not hold the key in position C for more than 10 seconds. If the generator does not start, release the key, wait 15 seconds, and try again.
5. Let the generator run for three minutes before starting the pump.

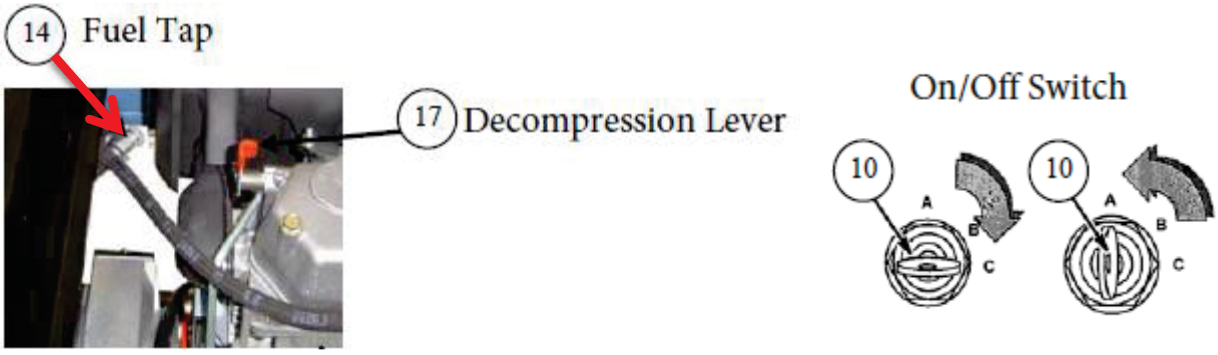


Figure 5 (a) Location of the Fuel Tap (b) Engine Switch

Starting the Pump

1. Turn the circular dial on the control box clockwise.
2. Press the green button on the control box.

Turning off the Pump

1. Press the red button on the control box.
2. Turn the circular dial on the control box counter-clockwise.

Figure 5 – Control Box

Turning off the Generator

1. Wait two minutes after turning off the pump.
2. Turn the key in the engine switch to the off position and ensure the generator turned off.
3. Close the fuel tap.
4. Lock the door to the generator house when leaving.
5. Go to the tank site to ensure the tank is adequately filled.

3.2.5 Tank Under Filled

If the tank has not filled enough to provide water for the day, record the tank level indicator reading and repeat the process of filling the tank.

If this situation occurs regularly, correct the pump timing chart in the generator house.

3.2.6 Tank Overflowed

If the tank overflows, immediately shut off the pump and generator in accordance with the above procedures. If any water overflow runs towards the Umea school latrines or Umea school buildings, construct a berm to direct water down the center of the hill.

If this situation occurs regularly, correct the pump timing chart in the generator.

3.3 Tap Stand Operation

Responsibility: Tap Stand Monitor

The Tap Stand Monitors shall complete the following activities. The Maintenance Director shall periodically check or help them with their work. A typical tap stand is shown in Figure 7.

3.3.1 Opening Tap Stand

To open a tap stand for business, the Tap Stand Monitor shall:

1. Inspect the tap stand and surrounding area to ensure the taps operate properly, there is no damage to the structure, and the area is neat.
2. Unlock and open the access panel with the key supplied by the Water Board.
3. Turn the valve handle a quarter turn to the ON position so it is in line with the pipe.
4. Turn on the taps to test the water; if the flow is too high, partially close the valve. If the flow changes over the course of the day, adjust the valve appropriately.
5. Close and lock access panel.
6. Allow residents to fill their jerry cans after collecting the water fee.

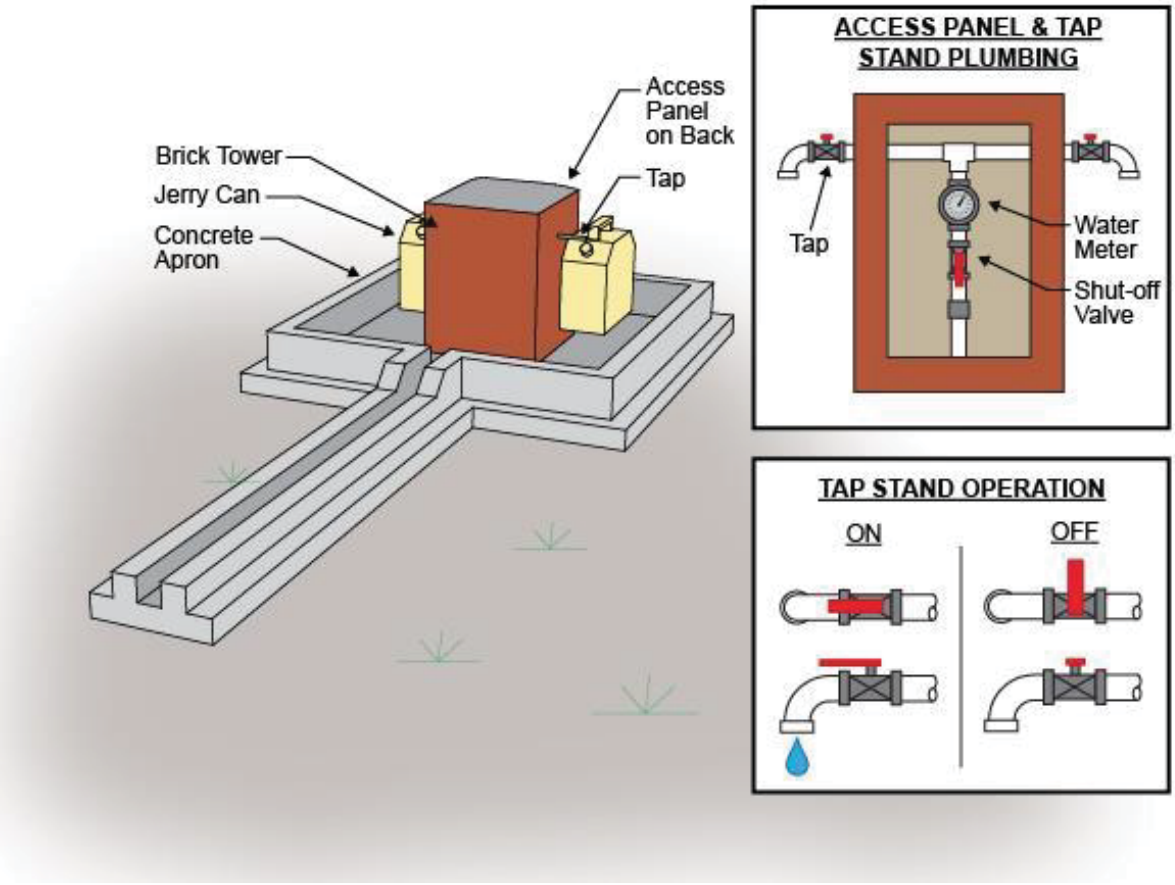


Figure 7 - Typical Tap Stand

3.3.2 Closing Tap Stand

Tap Stand Monitors shall shut off and lock tap stands at the end of each day, or whenever they are not present:

1. Turn off all taps.
2. Unlock and open the access panel with the key supplied by the Water Board
3. Turn the valve handle a quarter turn to the OFF position so it is perpendicular to the pipe.
4. Close and lock the access panel.

3.4 Flow Meters

Responsibility: Maintenance Director and Tap Stand Monitors

At each tap stand, the transmission main (generator house), and distribution main (tank site), there is a flow meter to measure the amount of water passing through. At the end of each day, the Maintenance Director shall record the flow meter readings at the tank and in the generator house. When collecting water fees, the Maintenance Director shall record the flow meter reading at each tap stand, and the Tap Stand Monitors shall confirm that the reading is correct. The Maintenance

Director shall collect water fees from the Tap Stand Monitor based on these reading. The following figures demonstrate how to read flow meters.

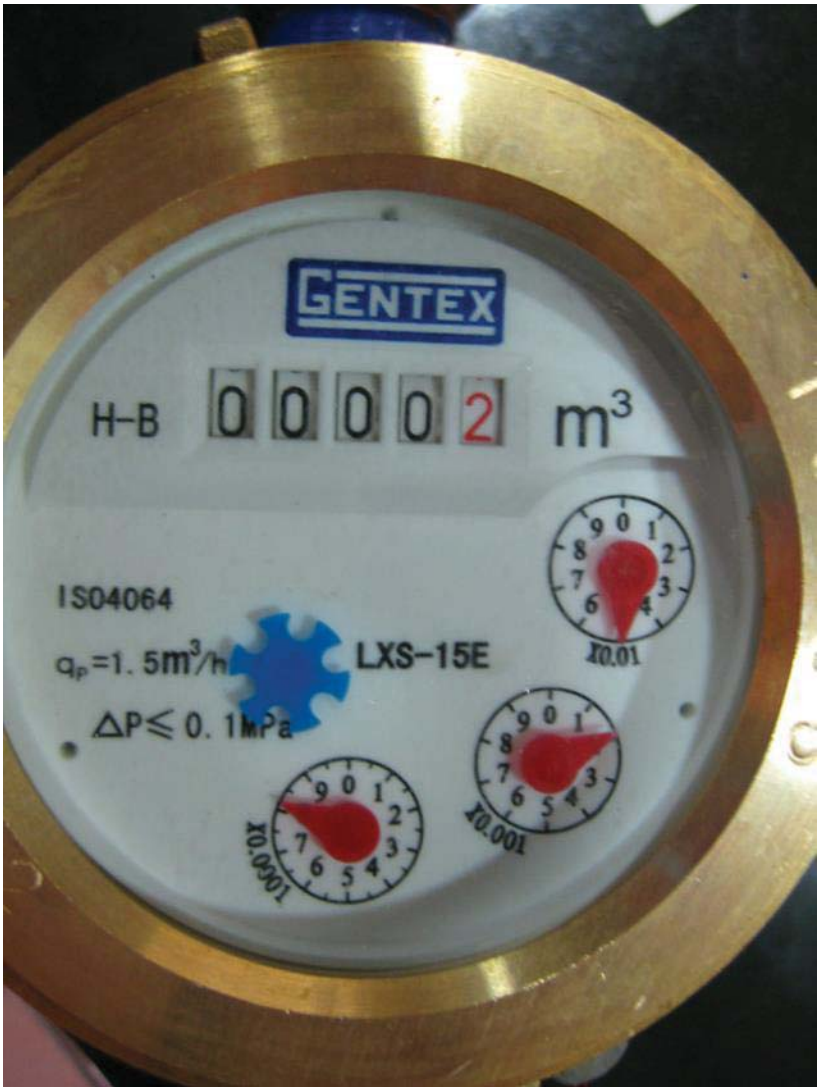


Figure 8 – Flow Meters Located in the Tap Stands

The flow meter measures the volume of water in cubic meters (m^3). The four black numbers to the left of the 'm^3' sign represent the number of cubic meters that have passed through the flow meter. The red number indicates $1/10^{th}$ of a cubic meter. The circular gauges below the 'm^3' sign represent $1/100^{th}$, $1/1{,}000^{th}$, and $1/10{,}000^{th}$ of a cubic meter corresponding to the uppermost gauge, middle gauge, and lowermost gauge.

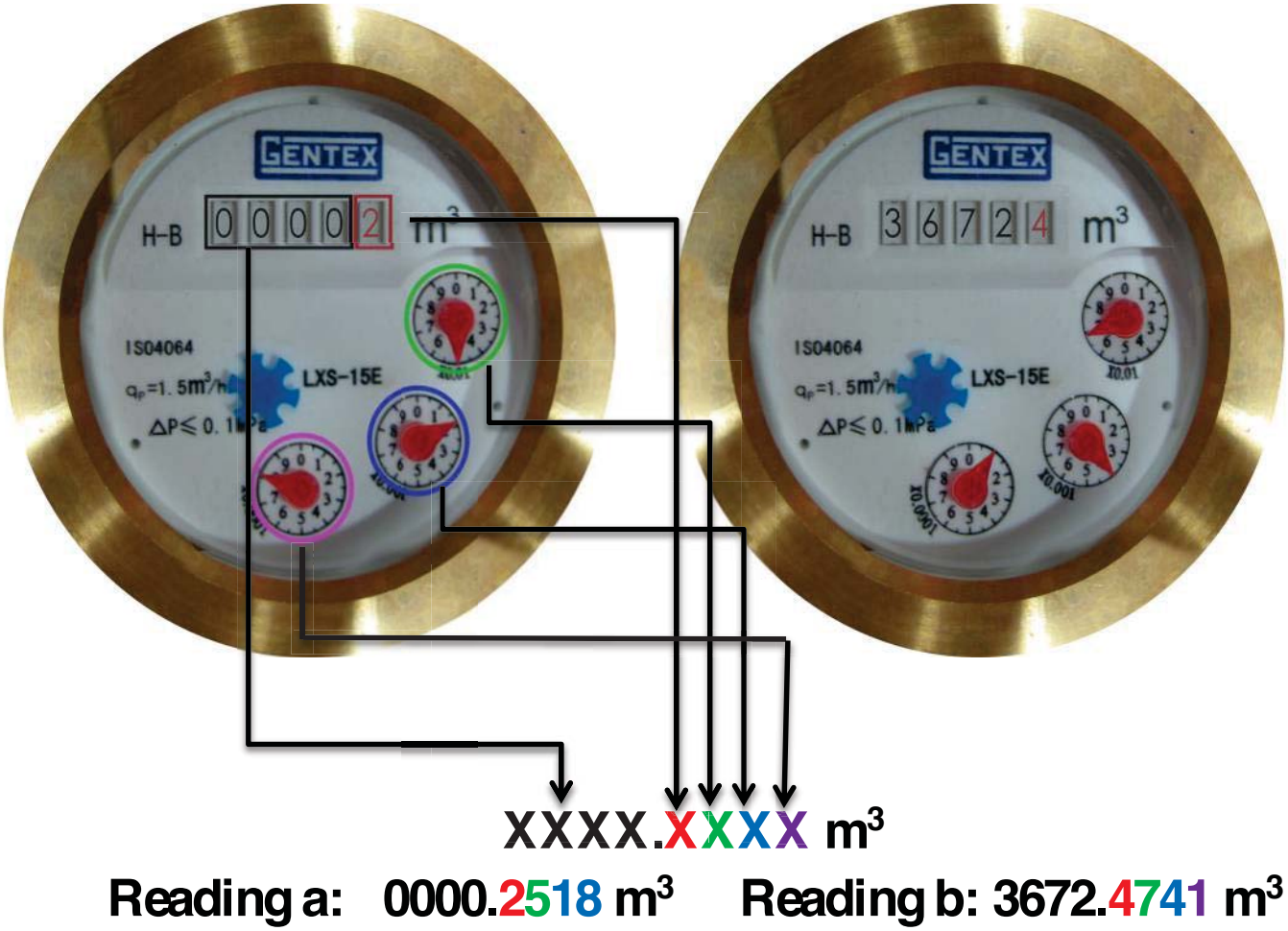


Figure 9 – Examples of Flow Meter Readings

If a dial on the flow meter is near a digit, the operator must look at the next dial down as well. If the next lower dial is just above "0", record the number that the needle is pointing at. If the next lower dial is just below "0", record a number one less than what the needle is pointing at. For example: in the meter on the left in Figure 9, the needle in the green circle reads "5", and the needle in the blue circle reads about "2". Therefore record the 1/100th place as "5". To record the dial reading at the blue circle, note that the pink circle is at "8", therefore reduce the reading by 1 and record the 1/1,000th place as "1" for this dial. This leads to the overall measurement of 0000.2518 m^3.

4.0 MAINTENANCE

4.1 Inspection Schedule

The Maintenance Director is responsible for inspection of system components according to the schedule presented in Table 1. When repairs are required, the Maintenance Director conducts the repair or arranges for the appropriate professional to conduct the repair. All maintenance inspections and repairs must be recorded and signed off in the Maintenance Log Book.

Table 1 – Inspection Schedule for Bbanda Distribution System

Component	Frequency of Inspection/Action
Tank/Tank Site - general	Weekly
Tank – cleaning	Every Three Months
Generator House	Weekly
Tap Stands	Daily
Valve Vaults	Every three months
Pump	If not operating properly
Generator	Per manufacturer's recommendations
Flush Transmission + Distribution Main	Contamination entering the tank or pipes. After any repaired leaks.

4.2 Tank/Tank Site

Responsibility: Maintenance Director

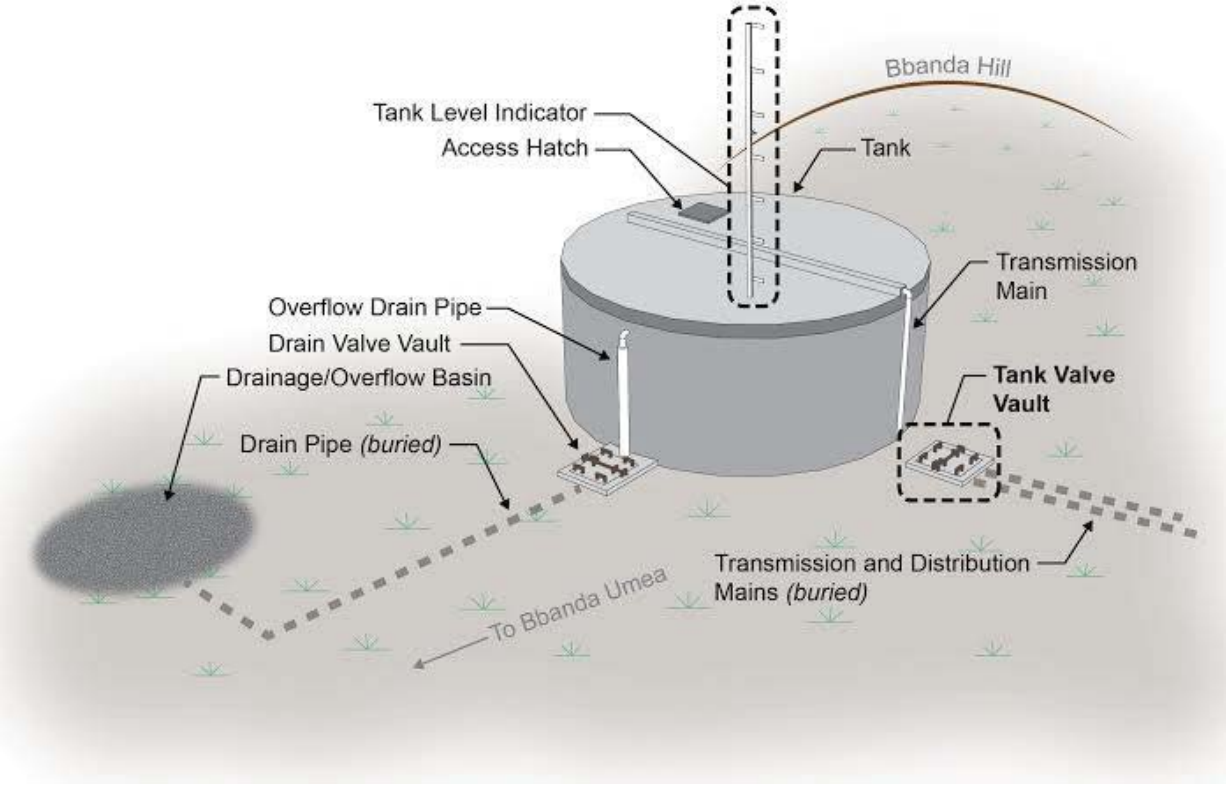


Figure 10 – Schematic of Tank Site

4.2.1 Inspection and Action

The Maintenance Director shall inspect the tank and tank site weekly. Some possible defects and required actions are listed in Table 2. The Maintenance Director shall record the inspection, findings, and actions taken in the Maintenance Log Bog and report these to the Water System Manager.

Table 2 – Tank/Tank Site Inspection Elements

Element	Defects	Required action
Tank Leaks	Leaks	Any leak is a cause for concern. Report to Water Board. If large leak, do not refill the tank until resolved.
	Cracks, loose bricks or spalled masonry without leakage	Contact a mason to repair
Drainage pit / Overflow basin	Overgrown	Clear weeds within 5 m of drainage pit
	Clogged	Remove hard core, clean and restore. Complete at least once every two years.
Tank area	Overgrown	Clear weeds within 5 m of tank
Tank exterior	Spalling concrete, exposed reinforcement, cracked or loose brick	Contact a mason to repair
Tank interior	Eroding mortar lining, exposed brick	Arrange for mason to restore lining
Security	Damaged or missing locks, gates or lids not operating properly	Repair or replace immediately

4.2.2 Cleaning the Tank

Draining the Tank

Determine the pump is off and remove the generator key to prevent it from being turned on while cleaning the tank. Lock the generator house and fence.

Normal tank operation: If water quality is good, drain the tank through normal usage at tap stands.

Contaminated water supply: If there is concern that water in the tank was contaminated, drain the tank and distribution line in accordance with the following procedure:

1. Open the valve on the distribution line at the tank (you must drain the tank to drain the distribution line)
2. Open the valve at the Buzibazi Road Crossing that points into the ditch.
3. Let all water drain.
4. Close both valves.

Once the tank is drained below the distribution line outlet:

- Close the distribution line valve

- Open the sedimentation outlet (in the valve vault near the overflow pipe) to allow remaining water to drain into drainage pit.
- Leave the sedimentation outlet valve open to allow some air flow during the cleaning operation.

Precautions Before and During Tank Entry

A tank is a confined space and can accumulate dangerous fumes. Safety precautions are required before and during tank entry:

1. Verify the vent is clear.
2. Whenever someone enters the tank, two additional people must remain outside the tank and be in constant contact with the person inside the tank.
3. Anyone inside the tank must leave immediately if experiencing dizziness, lightheadedness, disorientation, or any uncomfortable feelings.
4. Concentrated bleach vapors can be harmful. Follow the procedure described below while cleaning the tank.

Interior Cleaning Procedures

Equipment list:

- rubber boots
- rubber gloves
- unscented household bleach
- push broom
- bucket
- dish Soap
- long handle stiff bristle brush
- jerry can filled with water
    - note: this jerry can is for tank cleaning only, do not use it for diesel storage

Clean the tank as follows. Note that clothing and cleaning requirements are set to protect people entering the tank and to prevent contamination of water.

1. **All cleaners entering the tank shall wear rubber boots and gloves.**
2. All cleaners shall **wash their hands and boots before entering the tank**. Add a small amount of dish soap to the bucket and fill with water, mix well, and use to wash hands and boots.
3. After draining the tank in accordance with the steps provided, remove all silt and sediment from the bottom of the tank. Allow water to drain out the sedimentation outlet and remove all solids – silt or debris – through the hatch and dispose of them at a location designated by the Water Board. If silt cannot be removed with a bucket, use a broom to sweep it through the sedimentation outlet.
4. Fill a 20 liter bucket with water and add 500 ml of household bleach. It can become dangerous if more than this is added. **Do not substitute commercial bleach or bleach powder.**
5. Use the long handle stiff bristle brush to scrub all internal surfaces with the bleach mixture from Step 4. Take special care to clean corners and hard-to-reach areas.
6. Avoid inhaling bleach fumes. Leave the tank immediately if feeling dizzy or nauseous.
7. Exit the tank, close the sedimentation outlet valve, and run the pump for approximately 15 minutes.
8. Use the water at the bottom of the tank to rinse walls of the tank.
9. Drain the bleach solution to the drainage pit by opening the sedimentation outlet valve.
10. Fill the tank and resume system operations.

If there was concern with contaminated water prior to cleaning, contact the District Water Engineers for assistance in verifying that the system is now clean.

4.3 Generator House

4.3.1 Inspection and Action

The Maintenance Director shall inspect the generator house weekly. Some possible defects and required actions are listed in Table 3. The Maintenance Director shall record the inspection, findings, and actions taken in the Maintenance Log Bog and report these to the Water System Manager.

Table 3 – Generator House Inspection Elements

Element	Defects	Action Taken in an Extreme Case
Masonry	Cracked or loose bricks	Contact a mason to repair
Roof	Damaged wooden supports from termites or weather	Replace the damaged supports.
Building ventilation	Blocked	Clear any debris (soil, plants, sticks) from the gaps in the ventilated brick masonry.
Building foundation	Cracked or settling foundation	Report to the Water Board
Diesel storage	Spilled fuel	See guidance below
Security	Damaged or missing locks, doors or gates not operating properly	Repair or replace immediately
Plumbing	Leaks in the above ground fittings	Shut off pump, drain transmission main, repair or replace pipe and or fittings as needed.
Generator house area	Overgrown	Keep the area around the generator house and 2 m outside of the fence area clear of all weeds.

4.3.2 Diesel Spills

In the event of a diesel spill:

1. If it is safe to do so, shut off the generator.
2. Keep generator house doors open.
3. Stop the source of spill. If the generator is leaking, consult Davis & Shirtliff for assistance. Do not restart the generator.
4. If a diesel jerry can is leaking, pour any remaining fuel into another jerry can.
5. **Follow all Ugandan laws concerning disposal or treatment of contaminated materials.**
6. Pour sand over the spill. Wait several minutes for the sand to soak the diesel. Remove sand into a container and repeat until it is no longer absorbing diesel.
7. Scrub the spilled area with water and strong soap.
8. Rinse area with water.
9. Dispose of the diesel and sand in a designated area within the tank site fence. This designated area must be at least 50 feet away from the tank and the sand must be laid on a plastic sheet or tarp.
10. Once per week for four months, mix the pile of diesel and sand with a shovel. At this point, the sand is no longer contaminated and can be moved to another location.
11. Consult a hazardous waste disposal company if the diesel spill exceeds two jerry cans. At the time of writing this manual, the following companies in Kampala perform waste disposal:

Array Services Ltd.
P.O. Box 16125 Kampala
0701840969

Epsilon (U) Ltd.
Plot 1413, Mboga Rd
P.O. Box 12647, Kampala
0414252076

Green Label Services Ltd.
P.O. Box 40303 Kampala
0414532235

4.4 Tap Stands

4.4.1 Inspection and Action

The Maintenance Director shall inspect the tap stands daily. Some possible defects and required actions are listed in Table 4. The Maintenance Director shall record the inspection, findings, and actions taken in the Maintenance Log Bog and report these to the Water System Manager.

Table 4 – Tap Stand Inspection Elements

Element	Defect	Action Required
Tap stand structure	Cracked or loose bricks	Contact a mason to repair
Tap stand piping	Leaking pipe or corroded G.I. fittings inside the structure	Replace pipe or G.I. fittings
Spigots	Broken	Replace spigot
Tap stand area	Overgrown, muddy, or dirty	Instruct Tap Stand Monitor to keep area clean. Correct overflow drainage if necessary
Security	Damaged or missing locks	Replace immediately

4.5 Valve Vaults

4.5.1 Inspection and Action

The Maintenance Director shall inspect the valve vaults every three months. Some possible defects and required actions are listed in Table 5. The Maintenance Director shall record the inspection, findings, and actions taken in the Maintenance Log Bog and report these to the Water System Manager.

Table 5 – Valve Vault Inspection Elements

Element	Inspection Required	Action Taken in an Extreme Case
Vault structure	Cracked or loose bricks, damaged lid	Contact a mason to repair, arrange for lid repair as appropriate.
Valve and piping	Leaks or valve will not turn	Repair or replace as necessary
Security	Damaged or missing locks	Replace immediately.

Figure 11 and the list below provide the locations of all valve vaults

1. South of Lubira Road Crossing by Bbanda RC
    a. 2.5" Ball Valve
    b. Shuts off the flow of water to Tap Stand 1
2. Valve off the Tee at Lubira Road
    a. 1.5" Ball Valve
    b. Near the borehole. Will be used to construct and isolate branch in system expansion
3. 2 Valves at Buzibazi Road Crossing (North of Bbanda Parents)
    a. 2.5" Ball Valve (2)
    b. One valve for isolating system expansion. One valve acts as the distribution line drain
4. Tap Stand 2 at Town Center
    a. 4" Ball Valve
    b. Shuts off the flow of water to Tap Stand 2
5. Tap Stand 3 at Pentecostal Road
    a. 2.5" Ball Valve
    b. Shuts off the flow of water to Tap Stand 3
6. Tap Stand 0 at Umea School
    a. 0.75" Ball Valve
    b. Shuts off the flow of water to Tap Stand 0
7. Tap Stand 4 to Anglican, in Umea School Yard
    a. 1.5" Ball Valve
    b. Shuts off the flow of water to Tap Stand 4
8. Tee near Tap Stand 1
    a. 1.5" Ball Valve (2)
    b. One valve to shut off flow to Tap Stand 1. One valve to shut off flow to future system expansion
9. Tank Distribution/Transmission Main
    a. 4" (distribution) and 2.5" (transmission) Ball Valve
    b. Shuts off water flowing from the tank and into the transmission main
10. Sedimentation Outlet
    a. 2" Ball Valve
    b. Allows drainage of the tank into the soak pit next to the tank

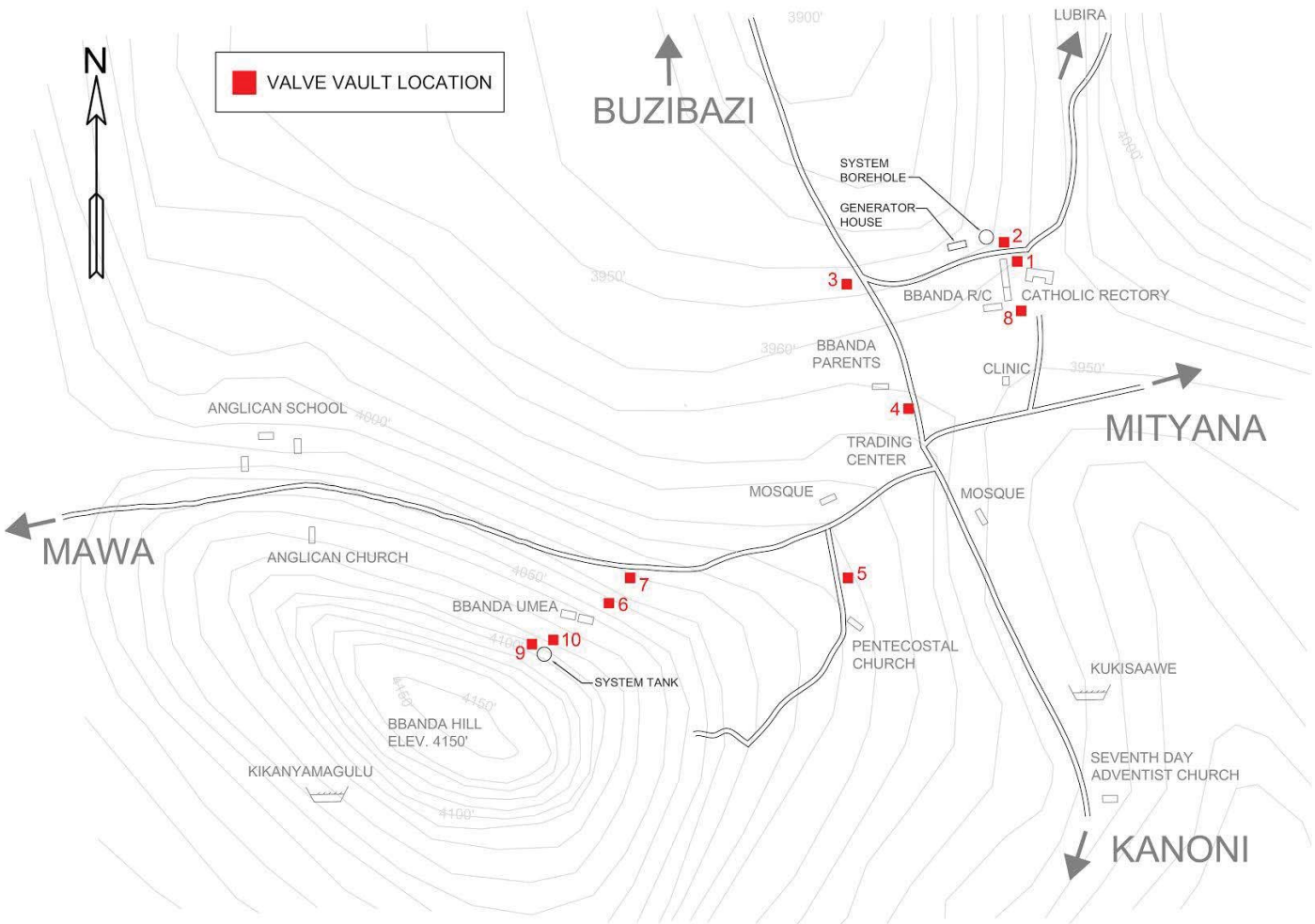


Figure 11 – Valve Vault Locations

4.6 Pump

The pump is maintenance-free. If the pump stops working, report the failure to the Water Board and contact Davis and Shirtliff to inspect and repair. Refer to Table XX on page XX for Davis and Shirtliff contact information.

4.7 Generator

The Maintenance Director shall perform routine maintenance to the generator according to the schedule in Table 6. More information about generator operations and maintenance can be found in the attached manual. If the generator stops working, report the failure to the Water Board and contact Davis and Shirtliff to inspect and repair. Refer to Table XX on page XX for Davis and Shirtliff contact information.

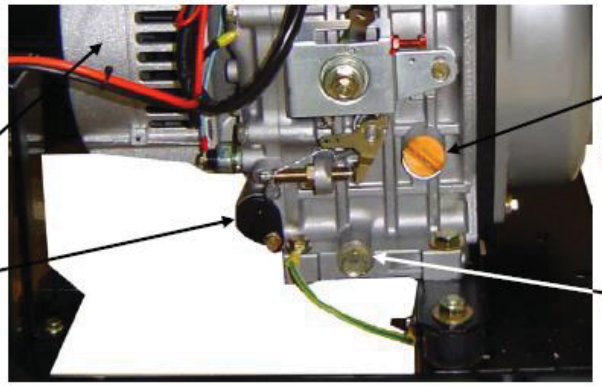
Table 6 – Generator Maintenance Schedule

Part / Carry out these maintenance procedures at whichever of the two intervals is reached first		Each time it is used	After the first 50 hours of use	Every 3 months or 200 hours	Every 6 months or 400 hours	Every 12 months or 1000 hours
Engine oil	Check the level	•				
	Change		•	•		
Oil filter	Clean		•		•	
Air filter	Check	•		•		
	Replace				•	
Fuel filter	Replace				•	
Cleaning the generating set				•		
Valve clearance	Check				• (1)	
Injection system	Check					• (1)
Battery	Check	Every month				

(1) These operations should be conducted by Davis & Shirtliff or another qualified diesel mechanic

General Photographs:

A



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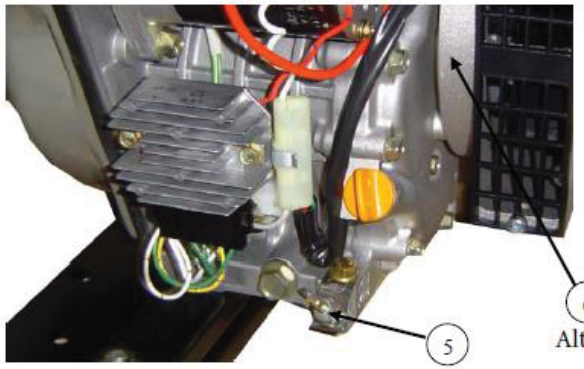
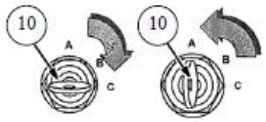


A

On/Off Switch



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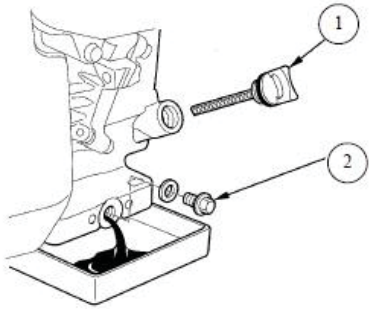

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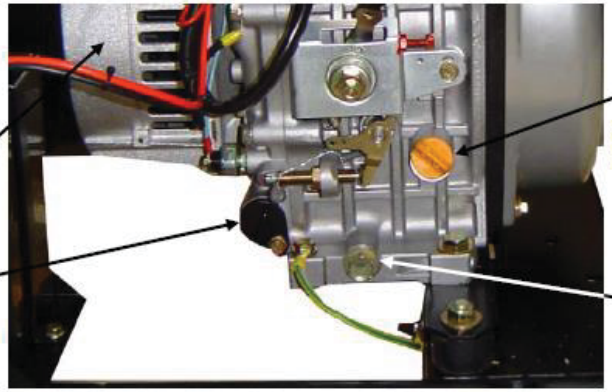

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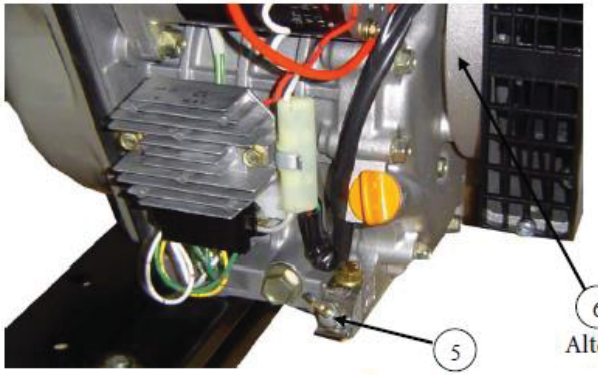
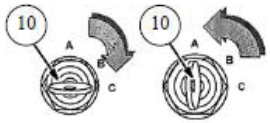


A

On/Off Switch



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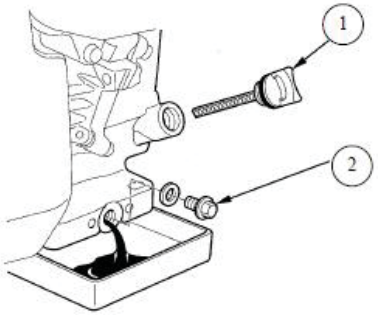
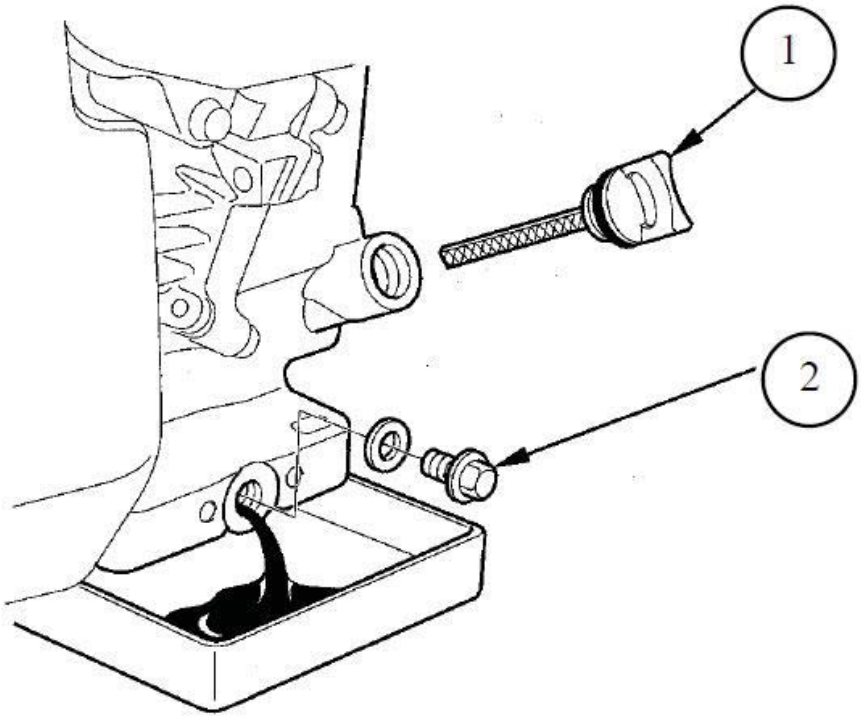


Engine Oil



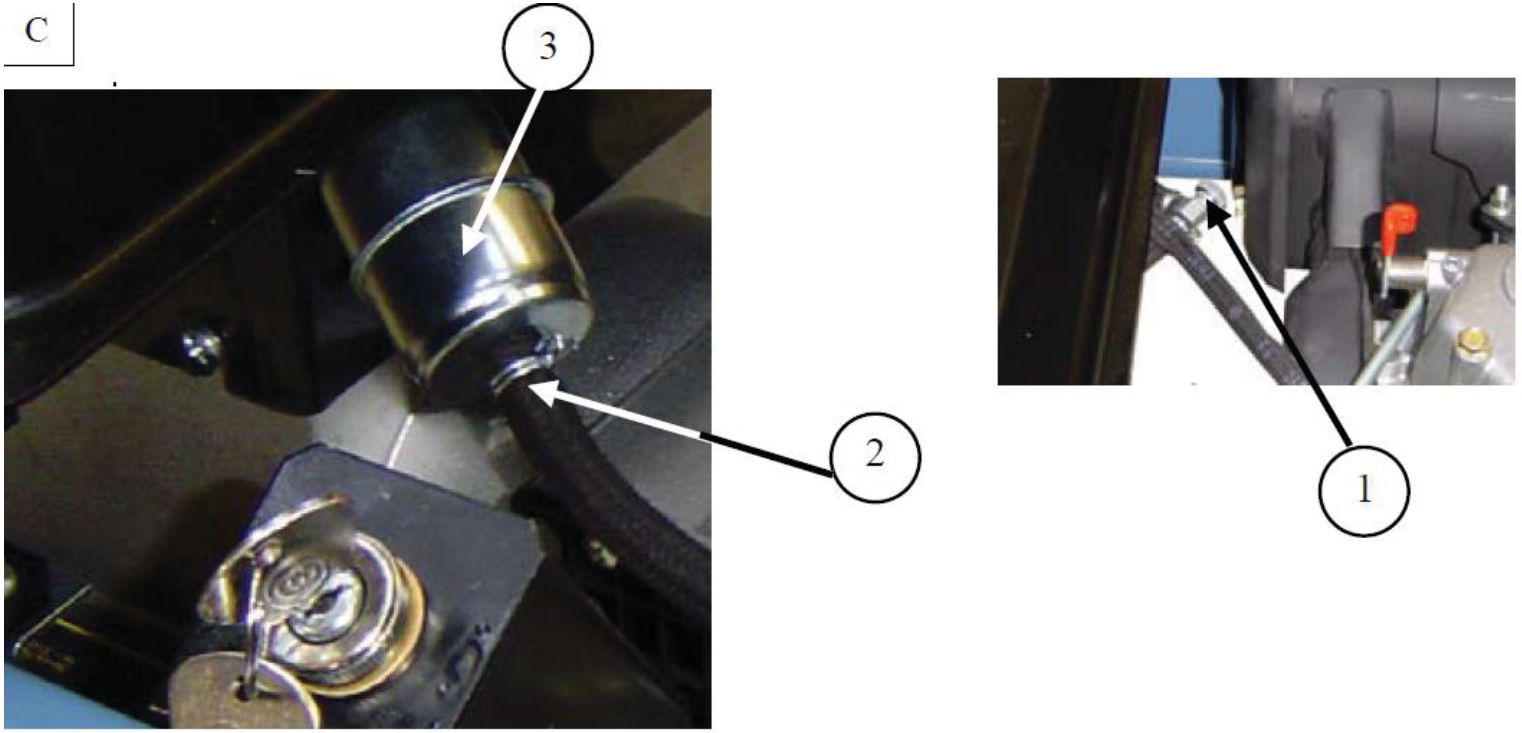
7.4. Renewing the motor oil (diagram B)

Change the oil when the engine is still warm, to ensure that drainage is rapid and complete.

1. Remove the filling plug-gauge (1) and the drain plug (2) and drain the oil into a suitable container.
2. On completion, screw up again and tighten the drain plug (2).
3. Fill the engine oil sump with the recommended oil, then check the level.
4. Put in place and tighten the filling plug-gauge (1).
5. Check that there is no oil leak after filling.
6. Wipe off any trace of oil with a clean cloth.

Replacing the Fuel Filter

C



7.5. Replacing the fuel filter (diagram C)

⚠ Danger	Fuel is a highly-flammable substance which may combust in certain conditions. Do not smoke or bring naked flames or sparks near to it. After refitting the filter, check that there are no leaks and that the area is dry before starting the generating set.

Note : Protect the alternator air inlets from splashes of fuel using plastic adhesive tape. Do not forget to remove it when the operation is finished.

❶ Close the fuel tap (1).

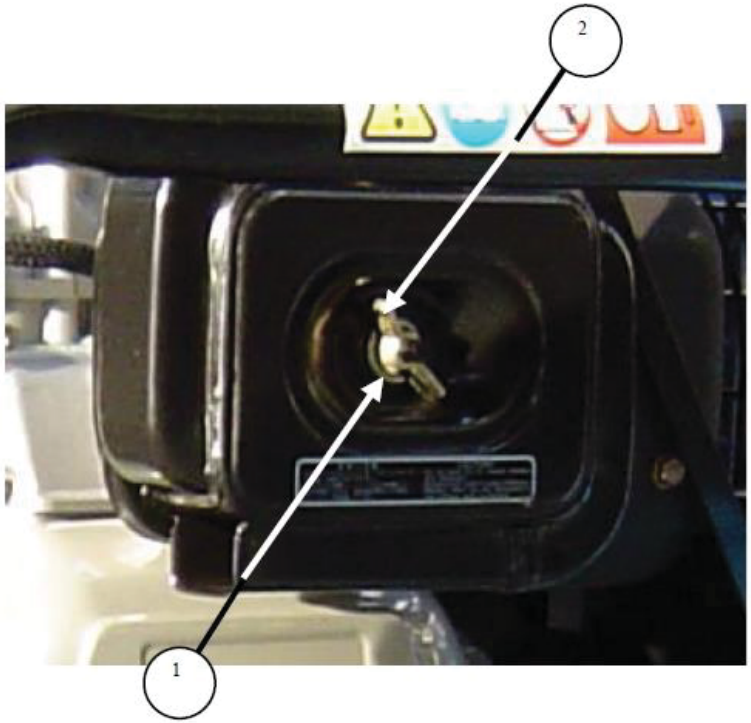
❷ Observe the direction of fitting for the filter.

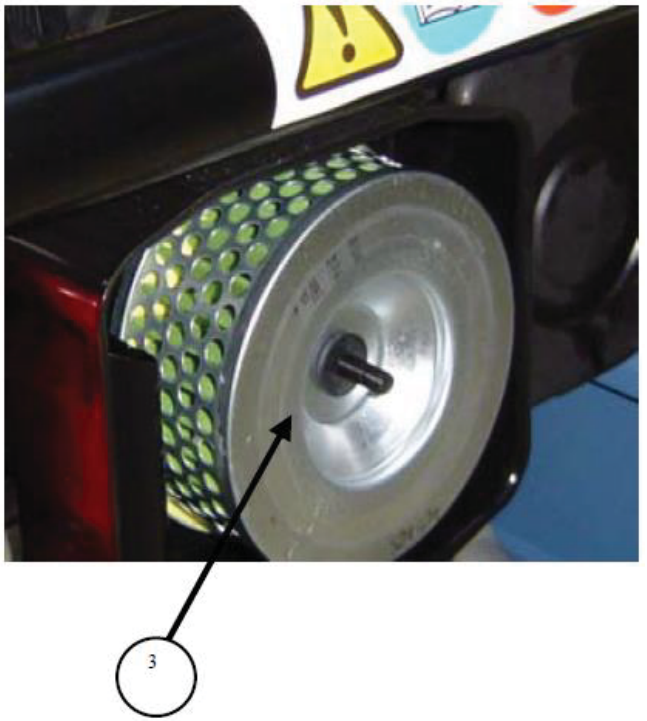
❸ Unclip both mounting clips (2) from fuel filter (3) on the piping and remove the filter. Recover the fuel in a suitable container.

❹ Refit a new filter to the piping and ensure it is properly secured by the clips (check that the direction of fitting is correct).

❺ Open fuel tap (1) and check there are no leaks.

D

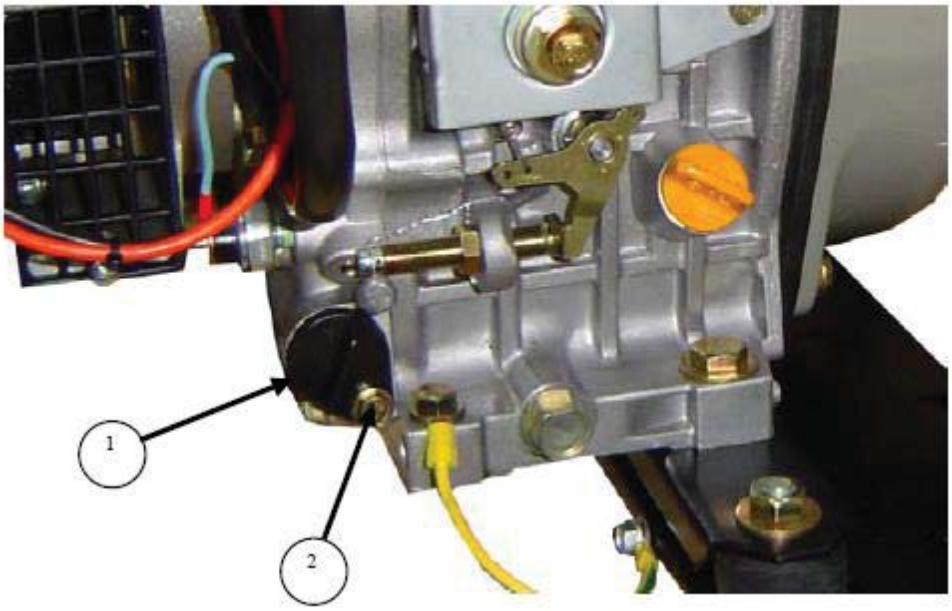




7.1. Replacing the air filter (diagram D)

1. Unscrew, then remove wing nut (1) from the air filter threaded rod and retain the washer.
2. Remove cover (2) from the filter.
3. Extract filter element (3) then replace it with a new element.
4. Refit the cover after cleaning it.
5. Refit the washer onto air filter threaded rod and fully tighten the wing nut.

Cleaning the Oil Filter



7.3. Cleaning the oil filter (diagram E)

1. Changing the motor oil.
2. Extract filter (1) after loosening the 10 mm mounting bolt (2).
3. Clean the filter with diesel or petrol.
4. Dry the filter then refit in the reverse order to removal.
5. Tighten the filter mounting bolt.
6. Fill the motor with the required quantity of oil.
7. Switch on the generating set.
8. Check there are no leaks and top up the oil if necessary.

	Name	Postion	Email	Phone Number (Mobile)
Water Board				
Priests at Catholic Rectory				
Davis & Shirtliff				
Contractors				
Gentex				
To call from the US to Uganda, replace the first 0 and dial 011 256.				*landline (not mobile number)
For example, to call Godfrey from the US, dial 011 256 777 504 751				

4.8 Draining the Transmission Main

Occasionally the entire BDS will need to be drained of water. This will occur if there is any known contamination, blockages/leaks in the pipe or certain maintenance on the system. If there is concern about contamination in the system, contact the Mityana District Water Engineers for assistance in decontamination. EWB-USA NEU is available for further assistance if required.

Bbanda Water Distribution System

Maintenance Log Book
Date Range: _____

Prepared by

Contact Information: [redacted]

With support from:

Village in Focus

Maintenance Schedule

The Maintenance Director is responsible for the inspection of system components according to the schedule presented in Table 1. When repairs are required, the Maintenance Director conducts the repair or arranges for the appropriate professional to conduct the repair. All maintenance inspections and repairs must be recorded in following Maintenance Log Book.

Table 1 – Inspection Schedule for Bbanda Distribution System

Component	Frequency of Inspection/Action
Tank/Tank Site - general	Weekly
Tank – cleaning	Every Three Months
Generator House	Weekly
Tap Stands	Daily
Valve Vaults	Every three months
Pump	If not operating properly
Generator	Per Manufacturer's recommendations
Flush Transmission + Distribution Main	Contamination entering the tank or pipes. After any repaired leaks.

Ennaku Zomwezi (Date)	Ebikozeseddwa (Element)	Okulambula Okwetaagisa (Inspection Required)	Ekyetaagisa Okukola (Action Required)	Okutereeza Lwekwamalirizibwa (Date Maintenance Completed)	Omukono (Signature)
	Tank				
	Ennyumba ya Generator				
	Tap Stands				
	Obuyingiro				
	Tank				
	Ennyumba ya Generator				
	Tap Stands				
	Obuyingiro				
	Tank				
	Ennyumba ya Generator				
	Tap Stands				
	Obuyingiro				
	Tank				
	Ennyumba ya Generator				
	Tap Stands				
	Obuyingiro				
	Tank				
	Ennyumba ya Generator				
	Tap Stands				
	Obuyingiro				
	Tank				
	Ennyumba ya Generator				
	Tap Stands				
	Obuyingiro				
	Tank				
	Ennyumba ya Generator				
	Tap Stands				
	Obuyingiro				

Bbanda Water Distribution System

Cash Management Plan

Prepared by

ENGINEERS WITHOUT BORDERS USA
NORTHEASTERN UNIVERSITY CHAPTER

Contact Information: [redacted]

With support from:

Village in Focus

1.0 Definition of Roles

This section details responsibilities of Water Board personnel for handling funds collected at tap stands.

1.1 Tap Stand Monitor

- Collect water fees at the rate set by the Water Board
- Turn over 80 percent of collected water fees, or funds, to the Maintenance Director

Funds to Maintenance Director = Change in Flow Meter Reading * Rate Set by Water Board * 0.8

1.2 Maintenance Director

- Collect funds from each Tap Stand Monitor at least twice per week, or as directed by the Water Board.
    - Record the amount of funds on the standardized account sheet
- Turn over funds to the Treasurer

1.3 Treasurer

- Collect water fees from the Maintenance Director at least twice per week, or as directed by the Water Board
    - Record the amount of funds on the standardized account sheet
- Dispense funds for all approved system costs such as staff wages, outsourced repairs, and fueling costs
- Obtain prior approval from the Water Board Chairman for expenditures greater than _____ UGX (amount to be set by Water Board)
- Keep records of deposits and withdrawals from the Water Board's bank account
- Maintain records of all monetary transactions
    - Save receipts for all transactions

2.0 Collection of Water Fees

The Tap Stand Monitor shall collect a fee for all water dispensed at the tap stand. The current water fee is 100 UGX per 20 liter jerry can, but may be modified by the Water Board. The tap stand monitor shall turn over 80 percent of the collected water fees, or funds, to the Maintenance Director, but this percentage may be modified by the Water Board. The Maintenance Director shall then turn over 100 percent of these funds to the Treasurer to deposit into the Water Board bank account, as soon as possible.

2.1 Records

Prepared forms will be used to record the flow meter reading at the end of each day. The forms shall be completed as follows:

Funds to be turned over are calculated as:

Bbanda Distribution System
Tap Stand # ___

A Ennaku zomewzi & Obbude	B Mika Yamazzi Esoma (m^3)	C Mika Yamazzi Esoma (L)	D Enkyukakyuka mu Meter	E Ssente za Wotta Bodi	F Zikunganyiziddwa	G Ziggyiddwa
4/30/15	0.075	75				
5/1/15	0.100	100	25	100		

- **C** $Mika\ Yamazzi\ Esoma(L) = Mika\ Yamazzi\ Esoma\ (m^3) * 1000$
  - C = B * 1000
  - 100 L = 0.100 * 1000

- **D** $Enkyukakyuka\ mu\ Meter = Meter\ Ngabwesoma\ Kati - (yawulako) Meter\ NagabChange\ in\ Liters$
  $= 100 - 75 = 25\ L$
  - D = C (5/1/2015) – C (4/30/2015)
  - 25 = 100 – 75

- **E** $Ssente\ za\ Wotta\ Bodi\ (UGX)$
  $= \frac{Enkyukakyuka\ mu\ Meter}{20} \times 100 * 0.8$
  $= Enkyukakyuka\ mu\ Meter \times 0.04$
  - E = D * 0.04
  - 100 UGX = 25 * 0.04

2.2 Banking Deposits

Once funds are collected, they will be deposited into a bank account created and monitored by the Treasurer. When a deposit is made into the bank account, the Treasurer should receive

a deposit slip from the bank for documentation. This slip should be given to the Treasurer so he/she can record the transaction on the expense sheet.

3.0 Cash Payments

3.1 Staff Wages

Staff wages will be paid on a schedule determined by the Water Board. These staff wages are considered an expense and must be recorded on the Expense Form by the Treasurer. Staff wages of Bbanda Distribution System (BDS) personnel include:

- Tap Stand Monitor – Funds remaining after turning over 80 percent of collected water fees to the Maintenance Director
- Security –
- Maintenance Director –

3.2 Outsourced Repairs

When the BDS is in need of routine or unplanned maintenance, the Maintenance Director is responsible to arrange for materials and repairs. For repairs that are under _____ the approval of the Chair or the Treasurer of the Water Board is needed. Any expense over _____ needs to be approved by the Chair and two other Water Board Members.

The Treasurer shall dispense the necessary funds for maintenance or repair to the Maintenance Director. The Maintenance Director shall then provide a receipt to the Treasurer to be recorded on the Expense Form.

3.3 Fueling Costs

There will be extra jerry cans filled with diesel inside the generator house, stored behind the fire wall. The Maintenance Director is responsible to ensure the generator is powered whenever needed. This means periodically checking generator fuel tank and jerry can levels to determine if more diesel is needed.

The Treasurer shall dispense the necessary funds for diesel to the Maintenance Director. The Maintenance Director shall then provide a receipt to the Treasurer to be recorded on the Expense Form.

4.0 Reporting Process

4.1 Forms

- **Tap Stand Collection Form** – This form is provided to assist the Maintenance Director to collect water fees from Tap Stand Monitors on a daily basis. The flow meter reading

will be recorded daily; the difference of the flow meter reading from the current day and previous day will be used to determine money owed.

- **Water Storage Tank & Borehole Form** – This form is provided to assist the Maintenance Director to record the flow meter readings at the Tank and at the source borehole. These levels should be checked daily.
- **Expense Form** – This form is provided to assist the Treasurer to track funds for the BDS. All debits and credits should be recorded in the form and the balance of the account should be adjusted accordingly.

4.2 Money Tracking

The Treasurer is responsible to track all funds that are dispensed and collected. The Expense Form is provided to record all transactions made by the Water Board.

The Treasurer shall present the finances to the Water Board at each meeting to provide a review of funds. For the first year of the BDS, the Expense Form should be sent to EWB-USA NEU to provide an additional review of Water Board funds.