CLARIWASH SELF-WASHING FILTRATION SYSTEM

GUIDANCE NOTES

(PROVIDING PURIFIED WATER TO A COMMUNITY)

WaterReach Can Help

Waterreach Ltd can provide seek to provide guidance to field staff and others. The WaterReach website is:

www.waterreach.co.uk

Email Nigel Heeler on:

nigel.heeler@waterreach.co.uk with any queries.

Description of ClariWash System

The ClariWash self-washing filtration system is designed to operate without the need for operational input to achieve backwash cleaning of both clarifier and filter. It has no requirement for power supply or control system & has no moving parts making it ideal for off-grid locations and where expensive technologies would otherwise breakdown and be difficult to repair/ maintain. It is a community system with filter(s) located at a single treatment location as distinct from household systems (point of use) where a purification device is needed in every household. It is suitable for supplying communities comprising a few hundred people to several thousand.

It is necessary to pipe raw water from a reliable water source to the ClariWash filter and then pipe treated water from the ClariWash filter to the community for consumption.

The ClariWash system purifies water by removal of suspended solids, turbidity and microbiological pathogens. This is achieved by aeration, clarification, filtration and chlorination. The chlorination is located after filtration prior to the supply tank. The aim is to provide an improved water quality which is significantly better than that of existing unimproved sources. It is not designed to remove salinity or industrial contaminants although these may be assessed on a case by case basis.

Operation of the system

Ideally a constant 24/7 steady flow into the ClariWash system is best. If solar pumps are used to supply the filter it may be that a lower overall flow will be possible as pumping only occurs during the sunshine hours unless a feed tank is used.

The ClariWash system will continuously purify the incoming supply which will pass downstream to the consumers. Over time the filter will slowly become clogged with contaminants and when maximum clogging is reached, self-washing will occur to maintain operation of the system. This will occur hydraulically without valve operation or operator intervention. The wash cycle cleans both clarifier and filter. During this cycle, dirty wash water will discharge from the U tube device. There needs to be a location where the washwater flow can be piped and disposed, possibly to a soakaway or lagoon. It must not be used for consumption as it will be contaminated. The wash water discharge lasts for a period of only about 5 minutes per wash, but for the large filter the rate can be quite significant.

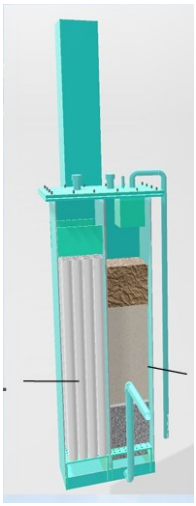
The frequency of washing depends on the raw water turbidity, the higher the more frequent. If frequent high turbidity occurs in the raw water, this may cause excessive washing. Measures will be needed to deal with this which may include upstream pre-treatment.

The ClariWash should not be left off-line for long periods as the granular media may stagnate/biofoul.

A supply tank is likely to be required downstream of the ClariWash to allow for demand fluctuations.

ClariWash Sizes

Currently two Clariwash sizes “small” and “large” are available in the form of design drawings to allow manufacture of the units in fiberglass and to then guide assembly on site. The manufacture needs to be carried out by a competent fiberglass fabrication company - in country where possible to provide local employment.



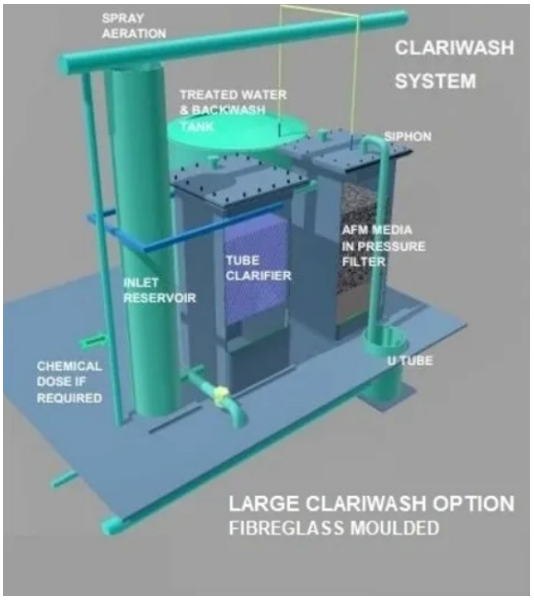
SMALL MODULAR CLARIWASH

The capacity of the small modular system is sufficient to supply 350-400 people per day with 25 litres per person if run steadily 24/7. To supply larger communities a number of filters can be clustered.

The capacity of the large modular system is sufficient to supply over 3,000 people per day with 25 litres per person if run steadily 24/7. Again, to supply larger communities, several filters can be clustered.

Drawings

A set of drawings for the ClariWash fabrication and installation (small and large) is attached.



LARGE MODULAR CLARIWASH

Overall Scheme Design

<u>Raw Water Source</u>

Choose the least contaminated and most reliable source which is as close as possible to the community to minimize the pipeline length. Ideally the source will be elevated to allow gravity feed to the ClariWash unit. If this is not possible then pumping (solar, diesel, ram pump) at the source will be required.
Choose a means of abstracting water that is reliable against intake of weed and debris. A back-up intake suction hose with strainer may be needed in case of loss of the intake.

<u>Locate ClariWash filters</u>

The elevation of the ClariWash filters should be high enough to allow gravitation to the community. The topography of (how hilly is) the community area will affect how water is distributed. A centralized water collection point may be more appropriate for flat topography. A distribution pipe network (usually in plastic PVC or PE) with tap stands may be possible where there is sufficient land fall. Bearing in mind the local features and best upstream and downstream layouts, a suitably located flat area should be chosen for the filters.

It will be necessary to provide a flat concrete base to mount the ClariWash filter(s) as shown on the drawings. It should be in a secure area free from the risk of flooding or damage and ideally security fenced.

Layout of Distribution System

For locations where only a centralized means of treated water collection is needed, the supply tank could feed a grid of tapstands local to the tank. The tapstands should be mounted on a concrete apron to prevent splilages causing mud hazards at the collection points. The supply tank needs to be mounted a bit above the tapstands to allow flow to occur when the tank is at low water level.

For a centralized water collection system, water could also be distributed out to a wider area using for example “hippo” rollers or transportation by vehicle. A foldable bladder reservoir mounted on a flat bed truck which is filled via a bunkering hose from the supply tank may be another way to distribute water to a much wider extent.

Where a piped distribution system is required, there should be sufficient gradient to allow flow to the extremities of the system. Tapstands should be located at convenient points in relation to homesteads.

Where high pressure can occur in the pipeline due to steep gradients, care should be taken to select the appropriate pipe pressure rating and pressure reducing valves may be required to limit pressures at tapstands.

Fabrication of ClariWash Units

The fiberglass units are detailed on the drawings which are labelled **FIBREGLASS FABRICATION DRAWING**. These drawings need to be sent to a competent fiberglass manufacturer who is capable of fabricating the units working from drawings. This will need to include the incorporation of built-in pipe stubs etc. as shown on the drawings. Ideally the fiberglass units will be manufactured in the country where the project is taking place to provide local employment; or if not possible then in the region.

The other drawings detail the site assembly requirements including additional items such as pipework, valves, plastic tank and the AFM activated filter media by Dryden Aqua. The media grades and quantities are shown on the drawing. AFM is available at various country locations — contact WaterReach for more details.

Assembly and Commissioning

It will be necessary to have an installation team with reasonable practical skills, such as engineers, pipe fitters, plumbers etc.

After transportation from the manufacturer to the site, the ClariWash fiberglass units should be assembled and connected together with pipework as shown on the drawings. The plastic backwash tank (procured locally) also needs to be incorporated as shown.

Before bolting down the cover on the clarifier and filter, the tubes (small ClariWash) or inclined plates (large Clariwash) should be installed in the clarifier and the AFM media in layers for each different grade should be installed inside the filter as shown on the drawing. This may include a top layer of granular activated carbon.

After the contents of the clarifier and filter have been installed, the covers can be bolted using silicone sealant between the flanges to produce a seal. Plumbing connections to the top of the filter including the siphon pipework and the air pipe can now be made.

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Once assembly is complete, open the raw water inlet valve to slowly fill the system with water checking for leaks. The filter outlet valve should be closed initially to cause water to fill the inlet pipe causing maximum pressure to occur – any leaks should be sealed.

IMPORTANT—at this point prime the U tube by pouring water into it until it overflows. This will only need to be done once as thereafter the U tube will remain primed during filter operation.

Once the system is leak tight, the filter outlet valve should be slowly re-opened and left open. The inlet valve should be slowly re-opened to allow the design flow to enter the system from the raw water source as measured on the inlet flow meter. As the filter runs, over time, turbidity from the raw water will build up in the system eventually causing the system to self-wash.

The period between washes may be short at first but increase over time (several days) for a given turbidity level in the raw water as the media is cleaned of fines. The system should be ideally run to waste initially until water quality tests are carried out. After satisfactory test results the system can be run to serve the community. Some adjustments to the inlet flow rate and replacement of chlorine supply may be needed but no operational attendance is required for the self-wash activation.

DISCLAIMER

The use of information provided in this document and associated drawings shall be entirely at the users risk who shall be responsible for the water quality delivered to consumers.

Treated water produced using equipment defined on the drawings shall be subject to a regular sampling and testing regime which shall demonstrate it satisfies national standards for drinking water quality before it is used for potable consumption.

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