# MANUAL

Water and sanitation disaster response

# **KITS 5 & 10**



providing

Water Treatment, Supply, Distribution and Trucking and Basic Sanitation for 5,000 or 10,000 Beneficiaries



# WatSan Disaster Response Kit

# <u>Kit 5 &10</u>

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# WatSan Disaster Response Kit 5 & 10

### Kit 5 &10 Overview

## <u>Water</u>

- Kit 5 is designed to supply up to 75,000 litres of water per day sufficient for 5,000 beneficiaries when run continuously. Kit 10 is designed to supply up to 150,000 litres of water per day sufficient for 10,000 beneficiaries when run continuously.
- The treatment of the water is carried out using a 4m<sup>3</sup> per hour sand and charcoal filter system, which utilises coagulant chemicals and chlorine dosing.
- Water is delivered to  $3 \times 10^{3}$  storage tanks and distributed via  $4 \times$  tapstands.
- Alternatively 2 of the tanks can be erected at separate locations each with tapstands and water can be supplied to them using a 5m<sup>3</sup> transport bladder with pump mounted on a local truck.
- The kit includes jerrycans and buckets for families to transport the water.

### **Sanitation**

- The kit also provides basic sanitation needs. Kit 5 contains initial sanitation equipment sufficient to build 35 latrines with consumables for up to 20 days and vector control. Kit 10 contains initial sanitation equipment is also supplied sufficient to build 70 latrines with consumables for up to 20 days and vector control.
- One bar of soap and one low flow water dispenser for hand washing is supplied for each family.

### **Hygiene Promotion**

• Materials for a variety of hygiene promotion activities are also included.



# Alternative Tank Set-Up



The EM WAT System

# 4m<sup>3</sup> Water Treatment Unit

# **Skid Mounted**

(Scan-Water and LMS Manufacture)



Kit 5 &10 page no. 5

#### A. Description and operation

#### **General features**

These water treatment units are appropriate for emergency situations and do not require any specific skills on the part of the users. The principle used is coagulation – flocculation with filtration on thin sand, adsorption on activated carbon and disinfection with solid calcium hypochlorite (chlorine).

The units are completely self-contained. Power is supplied by a diesel engine.

The distinctive feature of these units is the injection of reagents (coagulants and flocculants) without the use of a flocculant preparation plant, a dosing pump and a stirrer. The kit contains coagulant and flocculant tablets which dissolve slowly in proportion to the flow rate. To obtain the necessary quantity of reagents, the number of tablets is increased or decreased in coagulation or flocculation unit. A static mixer is utilized to improve and speed up the reaction.

#### Principle scheme





#### В. Unit composition

- Skids entirely galvanized under heat appropriate to field use
- Perforated pipe with filtering sock (Rep.2) •
- 1 x Foot valve with EPDM diaphragm (Rep 1) •
- Self-priming pump (open impeller) with diesel engine 4.8 HP 3600 RPM (Rep 3)
- 2 x polypropylene coagulation/flocculation kit (Rep.4 & 6)
- 2 x PVC static mixer with rings (Rep.5 & 7)
- Complete hose equipment for the connecting of the different elements including :
- 2 x 6m hose<sup>3)</sup> with Storz fitting, one equipped with an outlet for the connection of the strainer (Rep.12 & 0 14)
- 1 x 3m hose<sup>3)</sup> equipped with a yellow Storz fitting and a valve (Rep.16) 0
- 1 x 3m hose<sup>3)</sup> equipped with black Storz fitting (Rep. 19) 0
- 1 x 1.3m hose<sup>3)</sup> equipped with Storz fitting (Rep. 20) 0
- 1 x 3m hose<sup>3)</sup> equipped with Storz fitting with a blue one (Rep. 21) 1 x 3m hose<sup>3)</sup> equipped with Storz fitting with a red one (Rep. 22) 2 x 3m hose<sup>3)</sup> equipped with Storz fitting (Rep.13 & 17) 0
- 0
- 0
- 4 x 25m PVC flat hose equipped with Storz fitting (Rep.15) 0
- 1 x filter (Rep.8) in alimentary HDPE resisting to abrasion including fine sand with 5% activated silica for • the filter layer, 2 support layers with a different granular size and equipped with a multiport valve (Rep. 9).
- 1 x filter (Rep.10) in alimentary HDPE resisting to abrasion including granular activated carbon (with high capacity of adsorption and with a lot of transport pores) and equipped with a multiport valve (Rep. 11)
- Proportional dosing devices of chlorine (Rep. 18) in line with anticorrosive material with Easylock cap and dosing valve.
- 1 x maintenance kit for the operation and maintenance
- 1 x tool box
- Analysis kit for chlorine, pH control, with reagents
- <sup>3)</sup> PVC transparent hose resisting to abrasion and ozone, alimentary quality approved by IANESCO

### C. Operation

#### C.1 Skid set-up

It is better to choose a flat field for the unit before its using. The choice of the location should allow easy access to the storage and supply equipment. Draining of waste water should be done in such a way that the area does not get muddy. Drainage must always be downstream of the water supply point.

#### <u>C.2</u> Connecting of the different elements Prefiltration – Pumping zone

Put the perforated pipe and sock in the river and fix them in position using a wooden pole driven into the river bed.

The water level must be at least at  $^{3}\!$  of the black perforated pipe's height.

# BE CAREFUL NOT TO MAKE A HOLE IN THE FILTRATING SOCK.

![](_page_7_Figure_7.jpeg)

#### Pumping

Take the 6m hose equipped with the strainer and fit the float to approximately 5 cm above the perforated pipe bottom.

Then, fill the hose with raw water (with a watering can or a bucket) and connect it to the pump inlet.

To tighten the Storz fitting use 2 C-wrenches in order to avoid spinning around the fixed connectors.

Fill the pump body with raw water to the maximum via the outlet port.

#### **NEVER RUN THE PUMP DRY**

![](_page_8_Figure_0.jpeg)

**Coagulation – Flocculation** 

Use a 3m transparent hose to connect the pump outlet to the coagulation kit inlet and then connect the static mixer.

Use the 6m transparent hose to connect the static mixer outlet to the flocculation kit inlet and then connect the second static mixer.

The static mixers are equipped with a collar interlinked with a fixed support. Put this support perpendicular to the mixer so the mixer is horizontal.

# The coagulation and flocculation kits and connected static mixers are the same and are therefore interchangeable.

![](_page_8_Figure_6.jpeg)

#### **Flocculation time**

From the flocculation kit outlet and its static mixer to the treatment unit inlet use the 4 x 25m hoses. This length of hose gives the required flocculation time.

![](_page_9_Figure_2.jpeg)

Use the 3m hose equipped with a valve and a Storz yellow anodized fitting to connect the 4 x 25m hoses outlet to the inlet station (yellow fitting).

Connect the 3m hose equipped on one side with a Storz blue fitting to the station blue anodized fitting (treated water outlet).

![](_page_9_Figure_5.jpeg)

#### C.3 Coagulant and flocculant choice

Many raw waters contain colloidal matter (particularly clays) in suspension. This aspect is usually highlighted after natural catastrophes such as floods or earthquakes as the particles settled at the bottom of the rivers and lakes move and dilute in water. Colloids will not settle readily by natural sedimentation alone as their specific gravity is

similar to water. Therefore, the colloidal particles must be forced to combine to form heavier particles before they can settle as sludge. These processes are called coagulation and flocculation.

To speed up the agglomeration and to get bigger micro-flocs sizes, the unit utilizes a flocculant which has the feature to group these micro-flocs together to obtain flocs which will be filterable.

#### Coagulant

The kit is supplied with two kinds of coagulants in slow dissolving tablet form:

- Alufloc<sup>®</sup> : coagulant made with aluminium salts (sulphates) (Al<sup>3+</sup>)
- Ferufloc<sup>®</sup>: coagulant made with iron salts (sulphates) (Fe<sup>3+</sup>)

In most cases, the Alufloc coagulant will be used. This chemical has the advantage of not affecting the color of the water, while the Ferufloc is inclined to give a slight yellow color to the water. On the other hand, pH is an important parameter for the colloid elimination. The iron sulphate (Ferufloc) is capable of operating over a larger pH range and can be more effective in treating some water.

If the iron content of the raw water is close to the WHO limit (see Watsan Mission Assistant), aluminium sulphate (Alufloc) is preferable. Conversely, Ferufloc is preferable for use in water with high aluminium content. Tests for these metals are not included in the kit.

#### Flocculant

The kit is supplied with two kinds of flocculants in slow dissolving tablet form:

- Aniofloc<sup>®</sup>: flocculant made with anionic polymer
- Catiofloc<sup>®</sup>: flocculant made with cationic polymer

These two kinds of flocculants are long chain macromolecule with electric charge.

The choice of which polymer to use is made by means of a jar test. To carry out a jar test in the field, use plastic or glass bottles, buckets, or the turbidity tube supplied with the unit.

![](_page_10_Figure_14.jpeg)

(1) Fill tube with raw water and (2) add a small bit of Alufloc coagulant by slightly scratching the tablet side with a knife or fingernail. (3) Cover the top of the tube with a rag or hand and shake strongly for about 30 seconds.

(4) Add a few scraps of Aniofloc flocculant (in the same manner as for the coagulant, but be careful as the flocculant tablets are crumbly) and (5) shake with less energy than before for about 30 seconds. (6) Keep the tube motionless during the formation of flocs.

(7) Repeat these steps by making different combinations (Ferufloc + Catiofloc; Alufloc + Catiofloc; Alufloc + Ferufloc + Aniofloc; Alufloc + Ferufloc + Catiofloc ...). Choose the chemical combination which results in the larger and higher quantity of flocs.

# After each test, clean the tube inside with a brush as there might be sediment from the previous test that may alter the results of the following tests.

In some cases, the use of either flocculant produces satisfactory results. In this case the combination of Alufloc + Aniofloc in the coagulation kit and Ferufloc + Catiofloc in the flocculation kit is recommended. However, in most applications, the use of one coagulant with one flocculant will be sufficient. In some cases, such as when water is only saturated with clay, only one flocculant without the use of a coagulant is required. While the addition of a coagulant will further decrease the turbidity, the increased production cost must be taken into account.

Usually, Aniofloc flocculant is used for water with high clay content, pond sludge, and lakes and rivers. Whereas Catiofloc flocculant is used for waters containing organic material (decomposed plants, algae, etc). This is only guidance, the results of a jar test will give the best combination to use.

#### C.4 Installation

#### Motor-pump

Motor-pump engine is supplied empty of oil and fuel. Before use, top up oil with the 5 litre can and the funnel supplied. The filling cap (orange colored) is at the top of the engine and oil dipstick (oil capacity: 1.2 L) on the right side (pump side).

Top up the fuel (diesel oil for the standard model, double check this). Put the accelerator lever in the middle position and pull up rapidly on the starter line to start the engine.

![](_page_11_Figure_10.jpeg)

# The pump is self-priming but needs pre-filling if totally empty (suction hose without water). Fill the pump and suction hose with water before starting.

#### **Coagulant – Flocculant**

After choosing the appropriate coagulant and flocculant, put 10 coagulant tablets in the coagulation kit basket and 5 flocculant tablets in the flocculation kit basket as follows:

- Loosen the coagulation kit nut and take out the cap and the gasket. Pull up a part of the basket and place the coagulant tablets inside. Fill in the kit with raw water up to the inlet port, replace the gasket in its groove (ensure there are no impurities on the gasket and in the groove), replace the cap and tighten the nut.
- Repeat the process for the flocculant and then wait 10 minutes (the required time for the forming of a gelatinous mass which makes the flocculant injectable) before operating the water treatment unit.

![](_page_12_Figure_2.jpeg)

Ginormation

Open the cover of the chlorinator by pushing on the releasing button of the Easylock device and unscrewing the cap. Insert 3 x 300g slow dissolving calcium hypochlorite tablets (never use fast dissolving tablets in these devices). The tablets are individually wrapped for protection. Put the injection valves on position 2. Screw back the cover **without** forcing up to the « click ».

**NOTE:** An alternative system using non-hazardous NaDCC chlorine is available using in line dosing.

![](_page_12_Figure_6.jpeg)

#### Starting

Connect the draining outlet (red connector) of the sand filter valve. Use the 3m hose equipped at one end with a Storz red fitting. Put this valve on rinse position (see below) and check if the valve on the 3m hose equipped with a yellow connector (station inlet) is opened. Start the motor-pump after ensuring the following steps were carried out:

- Coagulant and flocculant tablets placed in their respective kit
- Chlorine tablets in place and valves in position
- Motor-pump ready for starting

![](_page_13_Figure_5.jpeg)

![](_page_13_Figure_6.jpeg)

When the valve is in rinse position, the filter inlet is the yellow fitting, which allows water to pass through the filtering mass, as in filtration. However, the filter outlet is the red fitting. This ensures good coagulation / flocculation / filtration has been achieved before sending water to the carbon filter and possibly clogging it. Allow the unit to run 5-10 minutes and fill up the 10 litre bucket. Check the water turbidity using the turbidity tube.

# Never operate a multiport valve under pressure. First stop or run the engine at the minimum speed or close the stop valve (on the hose equipped with the yellow fitting).

If the cross clearly appears at the bottom of the turbidity tube, the turbidity is in accordance with WHO standards and water production can begin.

- o 10 NTU: slow slightly the engine speed.
- 10 NTU < Value < 40 NTU: increase the coagulant injection and, if necessary, flocculant by changing the engine speed or adjusting the stop valve.
- > 40 NTU: check if the correct coagulant and/or flocculant is being used.

#### How to increase the coagulant and flocculant injection

During operation, the water quality may change and the quantity of tablets in the coagulation and flocculation units may not be sufficient. To remedy this problem:

- Put more coagulant and flocculant tablets.
- Increase the height of the tablets inside the basket. As the water flows between the coagulation (or flocculation) kit inlet and outlet port, moving the tablets between these two ports, will inject more reagents than leaving them at the bottom of the basket. For this, add non polluting solid elements with a size of about 3 to 5 cm (stones for example).

![](_page_14_Figure_7.jpeg)

#### Filtration

Put the multiport valves on the sand filter and carbon filter on the filtration position, taking care to ensure the valves are not under pressure (stop valve closed or pump closed). Connect the outlet (blue fitting) to the storage device. Start the engine (or open the valve) and check the pressure on the multiport valve gauge (equipped with the yellow fitting) of the sand filter. The value should be around 0,3 - 0,5 bars at the sand filter and 0,2 - 0,3 bars at the carbon filter inlet.

![](_page_15_Figure_2.jpeg)

A few minutes after running the system take a sample (fill the 10 litre bucket) via the PVC valve at the chlorinator's outlet. Check the turbidity and carry out chlorine/pH.test

![](_page_15_Figure_4.jpeg)

If water quality is within limits, continue operation for 30 minutes and then conduct another turbidity analysis and a chlorine test at the storage device outlet. The turbidity must be less than 5 and the chlorine level around 0,5 mg/l after 30 minutes wait.

If the chlorine residual is less or greater than 0,5 mg/l, adjust the valve on the chlorinator to get the required rate. Be sure to have 0.5mg/l free chlorine in treated water for residual protection from bacteria and viruses.

pH must be between 6,5 and 8,5 (optimal pH 7). If pH is over 8.5, try to increase the coagulant dose by adjusting the aluminium and iron content or the chlorine dose (in both cases, the injection is followed by the release of acidity) and inversely for a pH value below 6.5. If pH is much less than 6,5, it is best to choose another water source to treat (if possible).

#### **Backwash and rinsing**

After a period of operation (the length of which will depend on the quality of the water leaving the coagulation and flocculation units), the sand filter will begin to be blocked by whole flocs (forming of a cake at the surface) and will gradually clog. This will increase the back pressure at the filter inlet, indicated by the filter pressure manometer. When the pressure reaches 2 bars, stop the water production and begin the "backwash" process to remove the particles trapped in the sand.

Complete the backwash process as follows:

• Stop the engine and put the sand filter valve on backwash position.

![](_page_16_Picture_4.jpeg)

- Connect the pump inlet to the storage tank via the 6m hose and connect the hose outlet equipped with the stop valve to the multiport valve yellow fitting.
- Connect the waste outlet of the multiport valve (red color) to the hose equipped with a red fitting. The flow inside the filter is now reversed. The waste water will go out of this hose.

![](_page_16_Figure_7.jpeg)

• Start the engine, slowly increasing the speed over time. Adjust the engine speed so that no sand appears in the waste outlet but only flocculated particles.

![](_page_17_Figure_0.jpeg)

• When the waste water is clear, stop the engine and put the multiport valve (ensuring first it is not under pressure) on the rinsing position.

![](_page_17_Figure_2.jpeg)

- Start up the engine again (or open the valve) and let it run for about 30 seconds to allow the filter mass to settle in its proper place (check before the end of this stage that the turbidity is less than 5).
- Return the multiport valve to the filtration position and re-start water production.

In some cases, using treated water to backwash the sand filter is not possible (too little water in the storage tank). A backwash can be carried out with raw water as follows:

- Stop the pump and remove the baskets from the coagulation/flocculation kits.
- Carry out the backwash procedure detailed above.
- For rinsing, return the baskets to their respective kits and rinse the filter until the water is free of particles visible to the naked eye.
- Return the multiport valve to the filtration position and restart water production.

Following a bad coagulation and/or a bad flocculation, the carbon filter may retain flocs and clog (indicated by a pressure reading of more than 1,5 bars on the multiport valve pressure gauge of this filter). The carbon filter can be backwashed, but **only if absolutely necessary and at very low flow rate**. The procedure is:

- Vent the unit in filtration (coagulation, flocculation, sand filtration).
- Put the carbon filter multiport valve (first ensuring the valve is not under pressure) in the backwash position and adjust the engine speed so that carbon particles are not viewed in the waste water. Continue until the waste water is clear.
- Return the water to production (multiport valve in the filtration position).

#### **Periodic control**

At least twice per day it is necessary to carry out basic tests at the storage tank outlet using the pool tester for chlorine and pH and the turbidity tube. See sections on the turbidity tube and pool tester.

Note the values obtained after each test, the number and life of coagulant and flocculant tablets, and life of calcium hypochlorite tablets.

#### D. Maintenance

The units do not require any specific maintenance. The only wearing and moving parts are in the motor pump.

- For the engine, follow the instructions described in the manufacturer manual.
- For the pump, this model does not have bearing (it uses of the engine bearing), the only wearing part is the mechanical seal.
- After several hours of operation, sediment may appear on the static mixer rings and they will require cleaning.
- Drain the filters after use and after back-washing with treated water by opening each filter draining gasket and putting the multiport valve to a halfway position (air inlet).

### **Checking Turbidity**

To test the turbidity of water, fill the turbidity tube with water. Look straight down the tube. If the cross at the bottom is difficult to see or not visible at all, pour water from the tube gradually until it becomes visible, then note the value according to the tube graduations.

### TURBIDITY OF DISTRIBUTED WATER SHOULD BE LESS THAN 5 NTU

![](_page_19_Figure_3.jpeg)

#### 1. Measurement of Chlorine and pH

Chlorine and pH can be easily tested using the so-called "**Pool Tester**" box as follows:

- 1) Remove the lid and rinse the compartment with the water to be tested three (3) times.
- 2) Fill both compartments with the water to be tested.
- 3) Place a 'DPD1' tablet in the Chlorine compartment.
- 4) Place a 'Phenol Red' tablet in the pH compartment.
- 5) Replace the lid and gently shake the tester until both tablets are dissolved.
- 6) In the light, compare the colour of the water in the pH and Chlorine compartments to the colour scale next to the compartments.
- 7) Record the result for pH and Chlorine.

Note: In case of use of NaDCC, add 1 tablet of DPD 3 after adding 1 tablet of DPD 1.

![](_page_20_Figure_11.jpeg)

Chorine and pH pool tester kit.

#### 2. Requirements

Test the water 30 minutes after chlorination. The water is safe if the residual chlorine level is 0.2 - 0.5 mg./litre and pH is below 8. Water should also be tested at the household level after 24 hours to see if any residual remains and whether the dose should be adjusted or if containers need to be cleaned.

The local technical staff should carry out water testing regularly to ensure that the water stays within safe parameters.

**Note:** Testing is pointless unless action is taken. Chlorine residuals outside the range of 0.2 - 0.5 mg/L should be dealt with by increasing or reducing the recommended dose or addressing other causes such as the cleanliness of storage containers.

#### **Del Agua Kit**

#### Measurement of Faecal Coliforms

The Del Agua kit allows for thermo-tolerant faecal coliform testing at the field level. The kit contains an instruction manual and CD ROM on its use.

#### NOTE:

The following items are not included in the Del Agua kit:

Methanol

Electricity

A clean space to do the test

Refrigeration

The kit requires methanol for sterilizing equipment. Methanol is not included in the kit and cannot be transported by air. Methanol releases formaldehyde when burned and the formaldehyde gas sterilizes the equipment. Other alcohols cannot be used in place of methanol.

The kit requires continuous electricity for the incubator. It is possible to run the incubator off of a vehicle engine.

Refrigeration is usually required for the methyl lauryl sulphate broth.

The WHO standard for faecal coliform is zero (0) coliforms.

If a water sample has a chlorine residual greater than zero (0) and a turbidity less than 5 NTU, it is not usually necessary to test for faecal coliforms.

![](_page_21_Figure_14.jpeg)

Generally speaking, frequency of testing will depend on how often the source changes, how often batches are done, and based on experience at the truck, bladder, and jerry can level. It is a feedback loop, the more often problems are found (e.g. high turbidity at bladder level) the more often a test is needed.

## Lightweight Pump

This comprises:-

Lightweight 2" pumps with pipework for mounting on the trucks carrying the 5,000 litre bladder tanks, to enable rapid unloading. Use the tool kit supplied for the heavy-duty pump.

![](_page_22_Figure_3.jpeg)

## The Lightweight Pump Details

2" General Purpose Lightweight Portable Self-Priming Pump, Plastic, Cast Iron or Aluminium

with

Lombardini 15LD225 Diesel Engine

Max. flow: 40m<sup>3</sup>/hour 

Max. head: 30m 

Solids Handling 12mm

**Pump** Centrifugal self-priming pump with an aluminium, cast iron or reinforced plastic casing and cast iron wearing parts for both lightness and durability. Integral non-return valve, semi open clog resistant impeller, carbide/carbon mechanical seal and screwed BSP male suction and discharge connections.

**Engine** Lombardini 15LD225 single cylinder 4 stroke air cooled diesel engine developing 3.1 kW at a nominal 3600 rpm complete with recoil start, 3 litre (3 hrs. running) fuel tank, throttle control, replaceable element air, fuel and oil filters and exhaust silencer.

**Mounting** Pump and engine are close coupled together and mounted in a tubular steel roll over frame with anti-vibration mounts.

![](_page_23_Figure_8.jpeg)

**NOTE:** (1) Alternative engines may be used to match other pumps in use in the system.

(2) Aluminium pumps are not recommended for drinking water.

#### Commissioning, Operation, Safety and Maintenance Information

#### Commissioning

After completing the installation, including fixing the pump securely to the truck and supporting the suction and delivery hoses, ensure that the suction hose is well submersed in water. Fill the hose with water and prime the pump by filling with water through the priming hole in the pump outlet. Close the discharge valve. Follow manufacturer's instructions, shown in the engine manual (enclosed with the kit) for commissioning the engine before attempting to start.

If the pump does not operate within five minutes from first starting the engine, re-check that all pipe joints on the suction side are air-tight as any air in the hose will prevent satisfactory pump operation.

When the pump is operating adjust the yield to suit both demand and the supply available at the source. Minor adjustments may be achieved by changing the engine speed, however, if this gives insufficient reduction, use a throttle valve on the delivery side of the pump to introduce an artificial increase in head. After making such adjustments lock the speed control and remove the hand wheel of the valve to make sure that they cannot be tampered with.

Shading is particularly important in hot climates as high temperatures reduce engine efficiency. Ensure that both initial and regular maintenance of the pump and engine is carried out according to manufacturer's instructions by a competent mechanic. Regular replacement of oil, fuel and air filter elements is essential, as is changing of engine oil. Check the level of engine oil every day, or more frequently if running for prolonged periods. Keep the engine speed to the minimum required and ensure that fuel used is clean and that it is filtered by use of the funnel provided when filling the tank.

#### **Operational Problems**

The most common problems occur on the suction side of the pump. The most likely causes are lack of pump prime or blockages. Lack of prime is due to air getting into the suction house, which may be caused either by leaking joints or by lack of water at the source. All pipe joints should be regularly checked but beware of over-tightening plastic fittings. If the source is being pumped dry, adjust either the pump yield or the daily pumping periods. Check regularly that the foot-valve is operating satisfactorily and is not being blocked open by sand and gravel. Allowing air to be sucked in while running the pump can cause cavitation damage.

Blockages may occur at the suction strainer due to sand and silt when pumping from the bottom of a well or river. Either build better screening protection around the strainer or suspend it above the bottom. When pumping from a river the strainer may become blocked by vegetation. This can be avoided by use of a screen combined with regular cleaning. Beware of completely emptying tankers and running pumps dry. This can cause serious damage to the impellers.

#### NEVER RUN THE PUMP DRY

Ensure that the engine fuel tank is kept regularly topped up with clean fuel. If a diesel engine runs out of fuel it will be necessary to bleed the fuel system to rid it of air.

# **Routine Maintenance Schedule**

Pumps and engines

First 25 hours	Check and adjust, if necessary, tappet clearances, Tighten nuts, bolts and unions, especially the fuel system. Change oil.
Daily	Check supply of fuel oil, watch for dirty exhaust – this can signify overload or faulty injectors. With the engine stopped, check level and condition of lubricating oil. Clean the air filter under very dusty conditions. Check clack valve on pump body, flush and fill with clean water. Check and clean suction hose filter/foot valve if fitted. <b>N.B.</b> If there is any chance of frost, water should be drained immediately after use.
Weekly	Check for mechanical seal leaks, hoses for damage, excessive noise or vibration, all bolts for tightness.
125 hours	Clean or change the air cleaner element under moderately dusty conditions. Check for fuel and lubrication oil leaks, tightening nuts and fittings as necessary.
250 hours	Drain lubricating oil. Flush out system, renew filter element and refill with correct type and grade of oil. Clean the fuel injector nozzles if the exhaust is dirty. Renew fuel filter element if the fuel used is not perfectly clean.
500 hours	Renew the fuel filter element.
1,000 hours	Decarbonise if the engine shows loss of compression or blow-by past the piston, (do not disturb otherwise). Adjust the valve clearances while the engine is cold. Clean the cylinder and cylinder head fins under dusty conditions.
2,000 hours	Decarbonise the engine.
5,000 hours	Major engine overhaul if necessary.
12 months	Dismantle pump and examine for wear.

#### 5 m<sup>3</sup> Trucking Bladder Tank

The kit comprises a bladder with groundsheet and harness with pipework and fittings to enable installation to most vehicles.

**Vehicle Selection** 

- (1) The vehicle **<u>must</u>** have a carrying capacity of 10 tonne.
- (2) The body must be at least 0.5m wider and longer than the empty bladder tank.
- (3) As trucking water can cause load surging special attention should be made to the vehicle's stability.

#### Fitting the Bladder

- (1) Check the vehicle body remove any nails, sharp edges, etc., that could damage the bladder.
- (2) Lay out the groundsheet on the vehicle bed, positioning it as near as possible in the centre of the vehicle. Then tie down using the corner eyelets.
- (3) Unroll the bladder on to the groundsheet with fittings positioned as shown.

![](_page_26_Figure_10.jpeg)

Locate suitable positions for the straps and fit as shown.

![](_page_26_Figure_12.jpeg)

Fill the bladder until the pressure relief valve opens (do not over fill). Then after turning off all valves tighten all straps as tight as possible.

#### <u>Note</u>

- (1) Bladder should only be transported totally full or totally empty.
- (2) Bladder should only be filled or emptied under full supervision.

#### **Bladder/Pillow Tanks Instruction Sheet**

#### Handling instructions

#### (1) Site Inspection

Ensure that the ground or vehicle bed is level and free from sharp objects.

#### (2) Tank unfolding

Remove groundsheet (if purchased) from carton and lay on surface where the tank is to be located.

Carefully remove the tank and roll out so that the main fill/empty port is positioned at the correct side for filling/ emptying. Ensure that the tank is free to fill without restriction. Couple up the hose assembly to the fill point or locate hose in vent, top centre of tank.

#### Pre-fill checks

- (a) Check all surfaces for damage
- (b) Check connector is closed if not to be used for filling.
- (c) Check that the tank is located in the correct position for filling/discharging.
- (d) Check that all loose items are repacked and stowed adjacent to tank (repair kit, etc.)

#### (3) *Filling*

If a valve is being used, ensure it is in the open position. Open vent cap to ensure safe filling.

#### Warning

Pump water into the tank at a reasonable pressure, checking that no items become entangled during the pumping process, putting localised stress on the tank.

Support hose if necessary. Continue pumping until nominal volume has been metered in or until the surface of the tank becomes hard. Stop pumping, close valve and remove hose. Close the vent cap.

Tighten down restraints where appropriate making sure they are taut but without putting additional pressure on the tank. Conduct an inspection of the tank for leaks.

#### (4) *Emptying*

Reconnect the hose, open ball valve and commence pumping.

#### (5) *Folding*

Ensure that the tank is empty and that all fittings are secure.

Carefully roll the ends of the tank into the centre ensuring that all debris is removed from the tank surface during the folding operation.

Place the tank in the case. Clean groundsheet. Roll up and place in case.

#### (6) Tank cleaning

(a) <u>Cleaning methods</u>

The following notes should be observed concerning cleaning the tanks:-

Hot water and hot air can be used where appropriate. Neither should exceed  $70^{\circ}$ C.

Normally, a solution of NaDCC chlorine in water at 10 parts per million (or 10 mg/L) mild cleaning agent (Milton) can be used to clean the tanks. Allow the solution to stand for at least 2 hours to kill any bacteria.

For stubborn stains or biological contamination, an alkaline cleaning fluid can be used to a maximum of pH 11.

Cleaning by abrasion rather than wiping should be avoided.

#### (b) <u>Tanks</u>

Attention should be given to tanks as soon as they are received in the stores.

Inspect the tank for obvious damage and note for future attention.

i) Punctures

ii)Major abrasions/damage

iii) Insecure and damaged fittings

Either hang up the tank or place the tank on a convenient table or trolley

Follow any other procedures laid down for sterilising the tanks.

Wash the tank out with soap solution and then clean water.

Use air flow to dry out the tank thoroughly.

Inspect the tank for problems and carry out necessary repair work prior to placing it into storage. To store the tank, fold up tightly and pack into a clean dry case.

#### (7) General Repairs

Repairs can be carried out in the field according to the information included, with the repair kit.

### (8) Do's and Don't's

Do

Move the tank in its case Protect surface of the tank from sharp objects Empty before packing Dry tank after use

Don't Walk over tank when empty or full Over fill Drag, even on the groundsheet Drop the hose assembly or any sharp object on to the tank If the tank has to be moved in an emergency, empty the contents, roll up the ends until there is sufficient fabric to grip and lift and carry the tank to its new location.

![](_page_29_Figure_1.jpeg)

10,500 litres usable The packed consists of one 2.5m  $\oslash$  x 2.3m high corrugated steel tank with EPDM synthetic rubber liner and PVC cover.

Flexible plastic pipe connects the tank via a valve to a steel frame on which 6 taps are mounted.

If the site permits the collection point to be installed so that the taps are level with or lower than the tank outlet then the full 10,500 litres storage can be utilised. If the site is flat then only 6,200 litres are usable.

#### NOTE:

**§** 10,500 litres provide 1 day's supply for 525 people at 20 litres/person/day.

**§** 6,200 litres provide 1 day's supply for 310 people at 20 litres/person/day.

![](_page_29_Figure_9.jpeg)

1. Select site firm enough to support full tank. Ensure site is level since the smaller diameter of this tank makes it slightly less stable than larger tanks.

![](_page_29_Figure_11.jpeg)

2. A site well clear of trees is desirable to avoid problems of roots, falling branches, leaves and canopy drip (which often brings with it living organisms).

![](_page_30_Figure_0.jpeg)

3. Using a stick and string, make out a circle of 1.5m radius and clear inside of all vegetation, roots, boulders and stones. Level if necessary but ensure areas of fill are well compacted.

![](_page_30_Figure_2.jpeg)

4. Using same centre, mark out a circle of 1.25m radius and dig out a narrow trench on this line about 50mm deep into which the bottom ring can be set. (Prevents liner squeezing out underneath). If the ground is soft and clayey, dig out a 200mm deep trench and backfill 150mm with stones and gravel to support steel sheets.

If available spread a sand layer up to 50mm deep to cushion liner and prevent damage. Otherwise ensure ground is smooth and free from all sharp projections.

![](_page_30_Picture_5.jpeg)

5. Place liner on ground in centre of circle. Ensure no oil or petroleum in contact with liner (causes damage as well as contamination).

Place sheets around circle with outlet hole in chosen position.

Second sheet with hole to be used in top ring.

![](_page_30_Figure_9.jpeg)

6. Working in pairs, one person inside and one outside the ring, stand first sheet in shallow trench and bolt next one to it *keeping all bolt heads on the inside.* To align the sheets, first use the podger (spike) and insert bolts at top and bottom of sheets. Then insert remaining bolts. Do not fully tighten any bolts at this stage.

![](_page_31_Figure_0.jpeg)

7. Complete first ring of sheets then erect second ring either bolting inside the first ring, with laps staggered, or adjacent sheets may be woven in and out of lower ring (see illustration). When second ring is complete tighten bolts in bottom ring only. Erect third ring in a similar way. Choose position of sheet with 3" hole to be suitable for overflow outlet and bolt on so that holes are near *top* edge. Tighten all remaining bolts only when all three rings completed. While tightening, check that sheets fit snugly and that any dents or sharp edges that could damage liner are flattened or filed smooth.

![](_page_31_Figure_2.jpeg)

8. On inside of tank cover joints between sheets with strips of self adhesive tape (to protect liner). Fit smaller size of split PVC capping round top of sheets. (Bend capping back to open up split, then roll on and press down evenly round rim). Trim off any excess at join.

![](_page_31_Figure_4.jpeg)

9. Make Stage 1 of each tank to pipework connection as follows:-

Tank the flange with the threaded 3"  $\varnothing$  pipe welded to it and having cleaned their threads screw 4 studs into the threaded holes so that they project 50mm on the same side as the pipe. Use 2 nuts and a spanner if necessary. From inside the tank pass the assembly through the holes in the tank wall. Tighten nuts and washers on the outside flattening the corrugations slightly. Pass first rubber gasket over studs projecting inside the tank.

Fit a similar flange to the hole in the top ring for the overflow pipework.

![](_page_31_Figure_8.jpeg)

10. Backfill shallow trench in which steel rings are sitting, adding soil or sand to make a fillet on the inside to support liner.

Use two workers (with bare feet or rubber-soled shoes free of any oily contamination) to unfold the liner inside the tank. Hands must also be clean. Carefully pull and smooth out the base area to fit as accurately as possible. The workers inside can gently kick the liner into the base of the wall. The seam in the liner between the circular base and the vertical walls should lie against the fillet of soil. At this stage ensure that the vertical seams in the liner do not coincide with either of the outlet holes. If they do rotate liner base slightly.

![](_page_32_Figure_0.jpeg)

11. Attach topes to the eyelets round the edge of the liner and pass the ropes over the rim of th tank. Directing operations from a ladder, on the outside, position and number the rope controllers.

Start lifting the liner from the inside with the slack being taken up by the controllers on the outside preventing it dropping back. Do not attempt to pull the liner up by heaving on the ropes from the outside.

Make adjustments to minimise wrinkles and to end up with an equal margin hanging down all round outside.

12. Secure liner with the larger size of split PVC capping and then snap on the spring clips over the capping at regular intervals of about 0.5m. If the length of capping has to be trimmed, peel back enough to enable the cutting to be done well away from the liner. Position a clip close to *each side* of joint. Finally release the control ropes.

13. Make Stage 2 of each tank to pipework connection as follows:

(a) With the liner correctly positioned and not under any tension cut 4 small circular holes in the liner by pressing it against the end of the studs and cutting round them with a sharp knife. Slide the liner over the studs and against the first gasket.

(b) Now pass the second gasket and plain flange over the studs and wind PTFE tape on to the studs (to prevent leakage) before tightening on the inside nuts. Finally cut liner round inside of plain flange leaving 3"  $\varnothing$  outlet hole. Drawing shows bottom outlet, repeat for overflow outlet.

14. Complete the inlet overflow pipework as follows:

Push hose connector well into hose, fit clip towards end of hose and tighten bolt. Then screw hose connector (with rubber washer in place) on to outer tank flange. Use PTFE tape on all screw joints. Dig a channel to carry any overflows safely away from tank.

![](_page_33_Figure_0.jpeg)

15

15. Assemble the metal roof frame on the ground and lift it into position with hook ends locating over the tank perimeter capping. Take care to ensure no damage is caused to the tank liner while fitting frame.

16. Screw retaining eyes over bolts joining upper and middle ring of tank sheets. Space equally round tank, 2 per sheet.

17. Lift the cover over the metal frame and disc upstand and secure in position with rope through eyelets and around retaining hooks.

![](_page_33_Figure_4.jpeg)

18. Finally either tie 6 guy ropes to eyes spaced round tank and peg down or bank earth against outside of tank to  $\frac{1}{3}$  of tank height. This is to ensure stability of tank in windy conditions when nearly empty.

# Tapstand

![](_page_34_Figure_1.jpeg)

Water distribution points are very prone to becoming muddy from water spillage, which could constitute a health problem and be inconvenient for users. Particular care needs to be taken to ensure that this problem does not arise. The first step is to ensure that the frame is well sited, preferably on higher ground and on a slope, to encourage good drainage.

19. Place the distribution stand upside down on the ground; screw the four legs into the sockets and tighten with a wrench so that the base plate is pointing away from the frame. Screw the 1" GS down-pipe into the centre of the distribution stand from the underside. Turn the distribution stand the right way up. Screw the six  $^{3}/_{4}$ " extension pieces into the frame.

The other end of the 1" down-pipe is already attached to the 1" galvanised 90° elbow. The 1"  $\varnothing$  BSP (M) x 32mm  $\varnothing$  UPVC compression coupling can be screwed into this elbow, after which it can be fitted to the flexible plastic pipe.

20.Remove the thread protection and screw the six water-saving valves on to the projecting pipes, using PTFE tape to make a watertight joint; make sure that the valves sit vertically, once tightened up. If fewer valves are required, screw a plug on to the end of the pipe.

![](_page_34_Figure_6.jpeg)

21. Connect the distribution stand to the tank using the 32mm PE pipe. The coils of pipe should be unrolled rather than pulled out. Connect the pipe using the compression threaded couplings. Clean all threaded fittings and make joints using PTFE tape. If pipes need to be extended, compression couplings may be used. Bury the pipeline in a shallow trench.

22. Connect the pipe to the tank as shown.

![](_page_34_Figure_9.jpeg)

#### Commissioning

As soon as possible after completion the tanks should be filled to stabilise them against wind damage and to check for leaks. Note that it is important to keep tanks permanently held down with guy ropes to ensure stability in windy conditions. Alternatively, or even additionally, soil should be banked up against the outside of the tank to one-third the height of the tank to give support and stability.

The roof is important not only to prevent dust and rain entering the tank, but also to protect the liner from the sun and to prevent wind lifting the liner from a completely empty tank.

#### **Operational problems**

Mechanical damage to the liner is the most likely problem. This will require the tank to be drained to allow a patch (from the repair kit provided) to be applied to perfectly dry rubber. A leak in the base, therefore, necessitates baling to remove the last 50mm of water.

Erosion of the soil into which the rings are set can undermine the liner and threaten stability. Unexpected overflows and rain run off from the PVC cover must be guarded against. If a tank must be drained lay discharge pipework well clear of it.

Never let petroleum products contaminate the liner since they will dissolve it.

To minimise risk of damage, storage tank installations should be fenced to prevent access to unauthorised persons and a drainage channel should be dug outside the fence to divert any surface run-off from heavy rain away from the tank.

# **Basic Sanitation**

![](_page_36_Picture_1.jpeg)

## Capacity

This kit has a basic capacity to provide initial sanitation services according to SPHERE standards.

# • Sanitation Equipment

Kit 5	Kit 10	
30	60	Squatting plates, 80 x 120 cms.
1	1	Latrine Sanplat mould box, complete kit
3	6	Plastic sheeting, 4m x 50m to UNICEF spec.
5	10	Rapid latrine
2	4	Backpack sprayer, manual, 15 litres, Birchmeier with fan nozzle and spares
100	200	Insecticide Deltametrine in 33g. sachets
2,000	4,000	Soap, 100g approx.
6	12	Protective clothing set
1	2	Hygiene promotion box A
	1	Hygiene promotion box B

#### A. General Introduction

The cycle that leads to many diseases, especially to faecal-oral disease transmission, begins with poor sanitation. Failure to dispose of human excreta safely can result in the contamination of the environment and create new victims through a variety of routes. While contaminated water supplies are one route, poor personal hygiene and household practices can spread diseases, too. Even when acceptable sanitation facilities are installed, poor hygiene behaviour is still a great risk.

Lack of attention to other aspects of environmental health can also detract from the intended benefits. Poor solid waste management encourages rats, flies, cockroaches, and other vectors of disease. Uncontrolled disposal of solid waste creates fertile breeding grounds for rodents and insects which can lead to epidemics.

Inadequate drainage of surface water and dirty water can lead to local flooding and spread of waste, e.g. from foul sewers, latrines or waste disposal areas.

The most important aspects on preventing disease through sanitation facilities are:

- Safe excreta disposal (latrine construction)
- Solid waste collection / disposal
- Burial of corpses and destruction of animal carcasses
- Vector control and protection
- Incineration of medical waste
- Drainage / wastewater removal (camp design)
- Hygiene promotion and education

#### B. Excreta Disposal and Latrine Building

#### **B.1** Introduction

The primary objective of sanitation programmes in disasters is to provide dignity for people and to reduce the risks associated with faecal-oral diseases. Sanitation programmes commonly include public health promotion, excreta disposal, vector control, solid waste disposal and drainage.

Sanitation is more than a latrine. Construction on its own will not solve all sanitation issues. Ensure that disaster affected people have the necessary information, knowledge and understanding to prevent disease from poor sanitation.

#### **B.2 Background**

Human faeces contain large numbers of bacteria, some of which may cause diarrhoea. When people become infected with diseases such as cholera, typhoid and hepatitis, their excreta will contain large amounts of the germs which cause the disease.

When people defecate in the open, flies will feed on the excreta and can carry small amounts of the excreta away on their bodies and feet. When they touch food, the excreta and the germs in the excreta are passed onto the food, which may later be eaten by another person. Some germs can grow on food and in a few hours their numbers can increase very quickly. Where there are germs there is always a risk of disease.

During the rainy season, excreta may be washed away by rain-water and can run into wells and streams. The germs in the excreta will then be carried into the water which may be used for drinking.

In many cultures it is believed that children's faeces are harmless and do not cause disease. This is not true. A child's faeces contain as many germs as an adult's, and it is very important to collect and dispose of children's faeces quickly and safely.

Disposing of excreta safely, isolating excreta from flies and other insects, and preventing faecal contamination of water supplies will greatly reduce the spread of diseases. The disposal of excreta alone is, however, not enough to control the spread of cholera and other diarrhoea diseases. Personal hygiene is very important particularly washing hands after defecation and before eating and cooking.

Excreta disposal should follow a timeline. Temporary measures should be taken initially and then improved as soon as possible.

![](_page_38_Figure_1.jpeg)

#### **B.3 Latrine Materials**

This kit contains plastic squatting plates and rolls of plastic sheeting (4 m x 60 m) for the construction of latrines. Additional materials such as bricks for pit reinforcement (if necessary), timber and nails for superstructures, and tools for construction will have to be procured locally.

#### **B.4 Defecation fields and shallow trench latrines**

#### **Defecation Fields**

In many cases, the only immediate solution to excreta containment is to designate defecation fields. These fields localise contamination and make it easier to manage the safe disposal of excreta. Defecation fields have a limited life-span and can only be used once in a short term, so prepare new fields well in advance of existing fields filling up. Defecation fields become difficult to supervise over time, they take up a lot of space and they are not easy to keep in a hygienically acceptable state. Defecation fields are only a short-term measure until alternative solutions are developed.

![](_page_38_Figure_7.jpeg)

Key points are:-

- Defecation fields should be made as large as possible to manage safely. Aim for 0.25 m<sup>2</sup> per person per day.
   400 families will need about half a hectare for a week.
- Space fields according to distribution of people in the camp, easy access without too far to walk.

- Try to provide some form of privacy, such as a fence surrounding the field.
- Locate on land sloping away from shelters, water sources, etc.
- The soil should be easy to dig to cover faeces.
- Defecation fields need supervision, appoint sanitary assistants to do the job.
- Ensure polluted surface run-off is disposed of safely and does not contaminate water sources downstream.
- Designate male and female defecation fields.
- Provide water and soap for handwashing at the exits.
- **DEFECATION FIELDS ARE A SHORT TERM MEASURE.** Shut down the defecation fields by providing latrines as soon as possible.
- Ensure the field is covered with dirt (and lime if possible) and care is taken when using the area for a period of several months.

See Engineering in Emergencies for more guidance and information on defecation fields.

# WHEREVER POSSIBLE AVOID DEFECATION FIELDS AND INSTALL SHALLOW TRENCH LATRINES AS FIRST OPTION

#### Shallow Trench Latrine

A shallow trench latrine is made by surrounding an area in plastic sheeting or fabric and digging a few shallow trenches. Shallow trench latrines can be quickly prepared to provide a short-term excreta disposal solution. There are two basic types: shallow and deep trench latrines. A shallow trench latrine may last 2 - 4 weeks while a deep trench latrine may last for 1 - 2 months.

Provide sufficient number of latrines to cope with peak use in the morning and evening. Design for a maximum of 50 people per meter length of trench per day (better 25).

Communal trench latrines must be supervised and maintained if they are to remain in sanitary conditions. Latrine supervisors must regularly clean the foot boards and surrounding area, and periodically cover the trench content with 5-10 cm soil.

Provide anal cleansing material, soil for covering excreta, and water and soap for handwashing.

Key points are:-

- Space trench latrines according to distribution of people in the camp, easy access without too far to walk.
- Try to provide some form of privacy on each row, such as a plastic sheet curtain.
- Locate on land sloping away from shelters, water sources, etc.
- The soil should be easy to dig to cover faeces.
- Trench latrines need supervision, appoint sanitary assistants to do the job.
- Ensure polluted surface run-off is disposed of safely and does not contaminate water sources downstream.
- Designate male and female latrines.
- Provide water and soap for handwashing at the exits.
- SHALLOW TRENCH LATRINES ARE A SHORT TERM MEASURE. Shut down by providing deep trench or family latrines as soon as possible.
- Ensure the used area is covered with dirt (and lime if possible) and care is taken when using the area for a period of several months.

![](_page_40_Figure_0.jpeg)

#### **Trench latrine:**

1 Fence (Plastic sheeting)

2 Water container/tap/soap

3 Stones for drainage

4 Zigzag entrance 5 Planks 6 Trenches

7 Soil for burying excreta

#### **B.5** Latrines

Building a latrine is no guarantee that it will be used at all, used properly, or well maintained. Latrines must always be accompanied by hygiene promotion programmes.

Remember that the needs of women, children, disabled, and sick people are different than those of men. Special latrine designs may be required.

#### Communal Latrines and Washrooms

Plastic sheeting is commonly used to cover the superstructures of latrines or washrooms. Where blocks of latrines are built together, less material is used but the risk of them falling into disrepair increases due to lack of ownership. Communal latrines must have assigned cleaning staff.

#### Simple pit latrine

This is the most basic form of improved sanitation available, and is often only supplied on a household basis. It consists of a square, rectangular or circular pit dug into the ground, which is covered by a hygienic cover, slab or floor. This slab has a hole through which excreta fall into the pit. Depending on user preference, a seat or squat

hole with footrests can be installed, and a lid should be supplied to cover the hole. The latrine is covered with a shelter and should be situated well away from water sources and some distance from the home.

As well as isolating the excreta, the simple pit latrine has the advantage of being easy and cheap to construct. Depending on the material used for their construction, the slab and shelter can be re-used. Simple pit latrines can, however, produce unpleasant smells and allow flies to breed easily.

#### Ventilated improved pit (VIP) latrine

This is an improved type of pit latrine which aim to remove smells and flies from the latrine using a vent pipe. As with the simple pit latrine, a pit is dug into which the excreta fall. A cover slab with squat hole and a hole for a vent pipe is cast. A shelter is built, which must be kept semi-dark, and the vent pipe is raised to at least 0.5 metres above the top of the shelter. It is important that the latrine is well away from high buildings or trees.

These latrines share certain advantages: there are few problems with smell or flies; the slab, vent pipe and shelter are re-usable; and the excreta are isolated. Their disadvantages include the necessity of keeping the inside of the shelter semi-dark, which may discourage use of the latrine, and the maintenance required to ensure that the vent pipe remains in good working order. Another common problem with the VIP latrine is the difficulty of obtaining a durable fly screen for the vent pipe.

SPHERE key indicators for latrines

- 50 people per latrine in the period immediately after an emergency involving displaced persons.
- Maximum 20 people per latrine as soon as possible.
- Use of toilets is arranged by households and/or segregated by sex.
- Separate toilets for women and men are available in public places (markets, distribution centres, health centres, etc.)
- Shared or public toilets are cleaned and maintained in such a way that they are used by all intended users.
- Toilets are no more than 50 metres from dwellings.
- Toilets are used in the most hygienic way and children's faeces are disposed of immediately and hygienically.

Please see SPHERE guidelines for more detailed information.

#### **B.6 Selection of design and location of latrines**

Proper attention to locating and designing latrines can make it easier for people to use them. Consult with as wide an array of beneficiaries as possible, including the disabled, to help to understand where and how it is best to build.

#### DO NOT JUST TALK TO MEN.

In particular, women, small children, and girls are often reluctant to use latrines if they do not feel safe or if a latrine's design is not culturally or socially acceptable. This is especially true where latrines are located at the edge of settlements or in dark places, they are not segregated by sex, or do not guarantee enough privacy. Safety is a crucial issue in emergency but also social and cultural considerations should be taken into account. In all cases, the siting of latrines and appropriate design must be carefully planned before construction begins.

#### **B.7 Cleaning and Maintenance**

The cleaning and maintenance of latrines, especially communal latrines, is often the single biggest problem affecting sanitation in an emergency.

#### IF LATRINES ARE NOT CLEAN, PEOPLE WILL NOT USE THEM.

Latrines should be cleaned at least daily to prevent diseases transmission through contact with faeces and flies and to prevent unsanitary conditions and odour. It only takes one person to make a latrine dirty. In those situations where communal latrines are chosen special arrangements must be made to keep them clean. Members of the affected community can usually be effectively employed through paid work or other incentives to undertake these activities with proper supervision, equipment and training. Cleaning materials (brush, mop, detergent, bleach, bucket, etc), equipment (apron, gloves, rubber boots, etc) can often be locally purchased.

#### **B.8 Anal cleansing material**

Arrangements must be made to assure the availability of appropriate anal cleansing materials at or near all latrines. Water, paper, maize cobs, etc. might be used for cleaning the anus. You won't know unless you ask. Also consider

that the accumulation of non-degradable and cleansing material such as stones can markedly affect the life of a latrine.

# DO NOT ASSUME THAT THE POPULATION WILL HAVE THEIR OWN SUPPLY OF ANAL CLEANSING MATERIALS.

#### **B.9 Sample Plastic Sheet Latrine Designs**

![](_page_42_Figure_3.jpeg)

![](_page_42_Picture_4.jpeg)

Consult Sphere 2004; Excreta disposal in Emergencies 2007 and Engineering in Emergencies 2002 for further information on sanitation standards and construction.

#### C. Sanitation in Public Places

Where a large number of people are using one area, such as a bus station or school, especially when they are eating food from the same source, there is a greater risk of the spread of diseases such as cholera, hepatitis A, typhoid and other diarrhoeal diseases.

These places vary in the number of people using them, the amount of time that people spend there and the type of activity that occurs in the area, but all public places need to have adequate sanitation and hygiene facilities. Special attention should be paid to the adequacy of facilities, their availability to the public, their accessibility to the disabled and young children, and the system in place to clean them.

There are several basic rules for sanitation in public places :

- There should be sufficient toilet facilities for the maximum number of people using the area during the day.
- This normally means one toilet compartment for every 20 users. The toilet facilities should be arranged in separate blocks for men and women. The men's toilet block should have urinals and toilet compartments; the women's block, toilet compartments only. The total number of compartments in the women's block should be three times the total number of urinals plus compartments in the men's block (3:1 ratio).
- Toilet facilities should not be connected directly to kitchens. This is in order to reduce the number of flies entering the kitchen and to reduce odours reaching the kitchen. It is important that people using the toilet facilities cannot pass directly through the kitchen.
- There must be a hand washing basin with clean water and soap close to the toilet facilities. There should be separate, similar facilities near to kitchens or where food is handled.
- There must be a clean and reliable water supply for hand washing, personal hygiene and, if necessary, flushing of toilet facilities. The water supply should meet quality standards and be regularly tested to ensure that any contamination is discovered quickly and that appropriate remedial action is taken.
- Refuse must be disposed of properly and not allowed to build up, as it will attract flies and vermin.

Responsibilities for cleaning sanitation facilities should be very clearly defined. Dirty facilities make it more likely that people will continue to use the facilities badly or not at all. Clean facilities set a good example to users.

It is important to make sure that information about health is available in public places. Such information should be displayed in an eye-catching, simple and accurate way. Where appropriate, large posters with bright colours and well-chosen messages, put up in obvious places, are effective. See the section on Hygiene Promotion for more detail.

#### D. Drainage

No sanitation system can be considered safe if the area it serves is poorly drained.

Any sanitation system (sewer, septic tank, latrine or other) can become a source of faecal contamination when flooded, as the flood waters will mix with the excreta and spread the contamination wherever the water flows. This can be prevented by protecting sanitation facilities with drainage trenches and ensuring they are not located uphill from water supplies.

"Gray water" consists of domestic water exclusive of toilet waste, but this does not mean that it is safe. Water used for cleaning clothes and nappies can be heavily contaminated with the same disease-causing organism that sanitation is intended to control.

"Runoff" consists of the portion of rainfall that runs off the surface during or after a storm. Sewers are often designed to drain all three liquid wastes (toilet waters, sullage, and runoff), but in emergency situations they often do not work, are destroyed, or even do not exist where e.g. refugee camps are meant to be set up.

Regardless of the technical option chosen for sanitation, both runoff and gray water need to be disposed of safely if the sanitation system is to be considered complete.

#### E. Solid Waste Disposal

The disposal of refuse can have a significant effect on the health of communities. Where refuse is not disposed of properly, it can lead to pollution of surface water, as rain washes refuse into rivers and streams. There may also be a significant risk of groundwater contamination. Refuse disposed of in storm drains may cause blockages and encourage fly and mosquito breeding. It is therefore very important that household waste is disposed of properly.

It is also important that industrial waste is disposed of safely, as it is sometimes toxic and highly dangerous to human health.

The type and quantity of refuse produced by a community are extremely variable. The main factors affecting the composition of refuse are:

- geographical region
- sociocultural, cultural and material levels
- seasonal variations
- packaging of food ration
- refuse-generating activities

Refuse containers should gather the refuse to facilitate the collection and avoid dispersion by wind and animals. Often metal drums are used. The bottoms could be pierced so that they do not retain liquids from decomposition, and should be provided with covers and handles for easy lifting.

Solid waste in the developing world tends to be dense and heavy. Hauling capacity is more critical than compaction technology.

The collection of the refuse should be well organised; teams, timetables and circuits, with a vehicle or hand carts, established.

Disposal techniques are

- burying
- incineration
- composting

#### F. Vector Control

Emergencies often create environments favourable to the proliferation of disease-carrying insects and rodents. In addition to creating a health risk, these pests can also spoil or destroy large quantities of food.

Vector problems develop in densely crowded conditions, and when general environmental sanitation (disposal of excreta, rubbish and waste water) is inadequate. Local expertise should be sought to supplement surveys to establish the incidence of lice, fleas and ticks; and to determine the extent and location of rodent infestations.

Any problems due to vectors should be reviewed with representatives of the affected population to discuss the underlying causes and assess possible eradication measures. Education campaigns should be considered, covering the significant methods of vector control, including the elimination of possible breeding grounds; and ensuring that food and latrines are covered against flies. A range of interventions is available to deal with vectors, depending on the severity of infestation. Specific insecticides may be appropriate for mosquitoes, flies, lice, fleas, ticks, and bed bugs. In areas where plague or other arthropod-borne diseases are endemic, action must be taken to control the vectors carried by rats before any large-scale control of rodents is attempted. If this is not done, an epidemic or plague may be precipitated by fleas transferring disease from dead rats to humans.

#### Vectors which may pose significant health risks

Vector	Health risks	Favourable environment
Mosquitoes	Malaria; filariasis; encephalitis; yellow	Stagnant water, especially in the
	fever; dengue	periphery of inundated areas; pools and
		slow-moving water. Stored water in or
		around dwellings; accumulations of
		rainwater in old tins and other containers
Flies	Eye infections (particularly among infants	Exposed food; excreta; dead animals
	and children); diarrhoeal diseases	
Mites	Scabies, Scrub typhus	Overcrowding and poor personal hygiene
Lice	Epidemic typhus, relapsing fever	Overcrowding and poor personal hygiene
Fleas	Plague (from infected rats), endemic	Overcrowding and poor solid waste
	typhus	disposal
Ticks	Relapsing fever, spotted fever	Livestock and vegetation
Rats	Rat bite fever, leptospirosis,	Inadequately protected food; exposed
	salmonellosis	garbage; covered spaces.

#### Mosquitoes

Malaria is the single most important vector-borne disease world-wide in terms of the morbidity and mortality it causes. There are four types of malaria: ovale, malariae, vivax, and falciparum. Each is transmitted by the various species of *Anopheles* mosquito. Control programmes are highly specific to the species of mosquito involved in transmission. Residual spraying of insecticide on the inner walls of dwellings is the method of choice for malaria control where the vectors are known to rest indoors.

![](_page_45_Picture_8.jpeg)

# ANOPHELES MOSQUITO: THE MOST DANGEROUS ANIMAL IN THE WORLD

Anopheles mosquitoes breed in still, stagnant but unpolluted water below 3000 metres altitude. Most of them feed on human beings at night, and fly up to 2km from their breeding site. Reduction of breeding sites through

environmental modification and manipulation is always recommended. However, shortening the life span of adult mosquitoes through indoor residual spraying or the use of impregnated nets will have the most impact on the malaria disease burden. While it is possible to control this vector in various ways, the mosquitoes often adapt. Insecticide resistance is widespread The use of personal control measures such as nets during sleeping periods can lead to the mosquitoes biting earlier.

# IT IS ESSENTIAL THAT ALL VECTOR CONTROL PROGRAMS ARE MONITORED AND MODIFIED TO ADDRESS CHANGES IN THE ENVIRONMENT AND VECTOR BEHAVIOUR.

The arboviral infections which cause major diseases include dengue and dengue haemorrhagic fever, yellow fever, and Japanese encephalitis. Arboviral diseases occur in non-human hosts, such as monkeys and pigs, and infect humans accidentally. Most are transmitted from their animal host by a range of mosquitoes or ticks. The mosquito *Aedes aegypti is* the most common urban vector of arboviral and filarial disease, and is found worldwide. It breeds in fabricated containers, such as water storage jars, pots, tin cans and tyres that contain water, and natural pools in leaf axils or tree holes. The eggs survive desiccation. It is nearly always associated with human habitats, and lives off human beings. It has a short flight range (30 metres), and most species bite during daytime (meaning bed nets are not effective) and rest outdoors. Control of these mosquitoes entails removing standing water, covering water storage containers, and changing stored water on a weekly basis. Widespread popular mobilisation is needed if a control campaign is to be successful.

#### Methods of mosquito control are:

- § Personal protection, protecting human beings from infection by using bed-nets or repellents
- § Making houses and shelter insect proof (screens, insecticide plastic sheeting)
- § Insecticide residual spraying
- § Environmental modification and manipulation to prevent breeding (drainage)

# VECTOR CONTROL PROGRAMS, PARTICULARLY INDOOR RESIDUAL SPRAYING CAMPAIGNS, MUST BE COORDINATED WITH GOVERNMENT AUTHORITIES.

#### Backpack Sprayers

This kit contains two 15 litre Birchmeier backpack sprayers with fan nozzle and spares. Read the included instruction manual prior to use.

#### Insecticide spraying of walls

Mosquitoes, even species that usually rest outdoors may enter houses to feed and may then spend some time resting indoors before and after feeding. When mosquitoes and other insects rest in houses it is possible to kill them by spraying the walls with a residual (long-lasting) insecticide. Mosquitoes resting on sprayed walls come into contact with insecticide through their feet and are killed. Wall-spraying may not prevent biting. Hungry mosquitoes entering a house may bite first and then be killed when resting on a treated wall. As most anopheline vectors of malaria enter houses to bite and rest, house-spraying is an important malaria control method

#### **Spraying requirements**

Before spraying is undertaken, detailed studies should be conducted to obtain data on the localities where disease transmission occurs, the season of transmission, the vector, its resting and biting behaviour, and its susceptibility to insecticides.

Proper insecticide spraying also requires trained personnel; these may be professionals employed by a government programme or community members employed by a local health organization to carry out spraying duties seasonally. Spraying equipment needs maintenance, and spare parts must be kept in stock.

Consult with local health authorities before attempting spraying activities. The WHO publication "Vector Control: Methods for Use by Individuals and Communities" has detailed guidance on conducting indoor residual spraying. (<u>http://www.who.int/water\_sanitation\_health/resources/vectorcontrol/en/</u>)

Environmental modification and manipulation can include:

• Removal of mosquito breeding sites by unblocking gutters, emptying all water containers on a weekly basis and scrubbing them out before refilling, ensuring that all waste water drains into soakaways and that soakaways, grease traps, and latrine pits are tightly closed.

- Preventing the excessive production of waste water by regularly monitoring and repairing faulty pipes to reduce the number of stagnant pools. Water saving taps can also reduce waste water if properly maintained and accompanied by soakaway pits.
- Reusing waste water by redirecting it into vegetable gardens. The amount of water required for washing is much greater than that required for drinking, and may result in stagnant pools being created or water being wasted in underground soak-away pits. Plants which are water-hungry, such as eucalyptus, papaya, and banana, can be planted in the area of run-off or by marshy ground in order to absorb the surface water.
- Screening or covering open water supply tanks to prevent mosquitoes getting in, with rust-resistant material like nylon, stainless steel or aluminium mesh.
- Draining or filling in puddles where fresh water collects. A vector sampling program can identify which source of water is most responsible for the production of mosquitoes and make control activities more efficient.
- Fill breeding sites with fish, such as Gambusia, which eat larvae.
- Apply insecticides to water that are safe for humans and animals. Slow release briquettes of these insecticides are available. Only three insecticides are approved by the WHO for use in drinking water. These are Temephos (an organophosphate insecticide of very low mammalian toxicity), Methoprene (a hormone which interferes with larval growth), and Bacillus thurinigensis (a bacterial insecticide). *No other insecticides should be used in drinking water*.

#### Mosquito Nets

#### This kit does not contain mosquito nets.

Insecticide treated nets act as a physical barrier between mosquitoes and humans and kill mosquitoes that land on the net. Nets must be long lasting insecticide treated nets (LLINs). LLINs last at least 3 years of recommended use under field conditions. Nets must be approved by the Ministry of Health.

#### THE COLOR AND SIZE OF NETS ARE IMPORTANT – TALK TO PEOPLE

#### UNTREATED NETS OR NETS WITH TREATMENT SACHETS ARE NOT ACCEPTABLE

#### DISTRIBUTING INAPPROPRIATE NETS IS NO DIFFERENT FROM USING EXPIRED MEDICINE

The target population for LLIN distribution is children under 5 years of age and pregnant women. However, distributing only one net may not result in this target population sleeping under the net. Enough nets, usually 2 per household, should be distributed in order to result in 100% of the population sleeping under nets.

#### General Considerations for planning and delivery of nets

- Always involve the national society from the beginning of the process.
- Assess local coverage rate and availability of LLINs to avoid duplication and parallel efforts.
- If nets already in area, it may be that the wealthier population has them (ability to buy them). Check to see if the most vulnerable have nets.
- Use national plans as basis for RC involvement and planning for community based interventions.
- Register all beneficiaries to avoid overlapping with other planned distributions and to facilitate for reporting on LLIN coverage rates.
- Calculate one to two LLIN per household unless extraordinary circumstances. It is assumed that the mother sleeps together with the newborn.
- If feasible, integrate the distribution with other health interventions like vaccination campaigns, routine maternity and vaccination activities etc.
- Federation distribution of LLINs is always free of charge.
- LLINs deliveries should be followed up with house-to-house visits to ensure proper hanging and usage. This activity can be integrated in ongoing community health programmes which include health prevention/ education activities. Merely distributing nets without training people in their use is insufficient.

#### **Relief Specific Considerations**

- All RC/RC distributions must be carefully co-ordinated and planned together with the health co-ordinator or the health delegate and the national society.
- Co-ordinate mapping of needs, identification and registration of target population and distribution with other partners like MoH/WHO/UNICEF and other operating NGOs.

#### Flies

Fly-borne diseases are mainly diarrhoea (shigella, salmonella, and cholera), and eye diseases (trachoma and conjunctivitis). Flies occur wherever there is breeding material and the environmental temperature and humidity suitable for development. Fly numbers increase in warm weather. Flies transmit diseases by treading and vomiting pathogens onto food, or into eye or wound excretions. Since flies are never the sole transmission route for any of the diseases that they transmit, it may be impossible to assess how important fly transmission is. However, since diarrhoea diseases are often the major cause of death in small children, flies must be considered as a very serious health hazard.

Flies breed in organic matter: rubbish, animal and human faeces, corpses, and rotten plant material. Over 42,000 bluebottle larvae can be bred in 1 kg of human faeces. One female adult housefly can lay 1200 eggs each day, and eight days later these hatch as flies. Wherever possible, control programmes should be based on providing suitable, effective sanitation, and rubbish disposal, and improved public and personal hygiene. Flies are able to develop resistance to insecticides extremely rapidly. Insecticides should be used only if absolutely necessary, and then only for a short period. Residual spraying is not recommended since it is likely to enhance the development of resistance.

#### Methods of fly control are as follows:

- Incinerate rubbish, hospital dressings, and dried manure. In some situations animal manure may be used as a fuel source. If the dung is spread thinly and dried then fly numbers should not be excessive.
- Destroy potential breeding sites for flies by burying rubbish and faeces to a minimum of 25 cm depth of compacted soil.
- Localise the organic matter in such a way that flies breeding in it are unable to escape, for instance by sealing latrine squatting slabs and fitting vents with mesh.
- Treat with an insecticide, though only if absolutely necessary, and then only for a short time.
- Ensure effective participation by women and men in control schemes. It may be necessary to offer training in organisational skills, as well as health and hygiene promotion, in order for a fly campaign to be set up in a community.

Problems should be reviewed with representatives of the affected population to discuss the underlying causes and assess possible eradication measures. Education campaigns should be considered, covering the significant methods of vector control, including the elimination of possible breeding grounds; and ensuring that food is covered against flies.

#### SAFETY INSTRUCTIONS FOR USE OF INSECTICIDES

This kit contains sachets (33 grams each) of Deltamethrin, a synthetic pyrethroids. These chemicals are slower to be broken down by light, moisture, air than natural pyrethrins. They have a low toxicity to mammals, but are very toxic to fish. Residual effects lasting from 3 months up to a year. Deltamethrin is biodegradable, is of low toxicity, is very effective for mosquito control, and is universally used.

Insecticides are harmful not only to insects, but also to humans. They must therefore be handled with care. The following recommendations must be respected before beginning a spraying campaign.

The following precautions must be followed by people using chemical insecticides:

- spray personnel must be properly instructed and fully trained in pesticide use and warned of the dangers of pesticide poisoning;
- their faces must be protected and they must wear rubber gloves;
- they must receive detergent and soap each week, for washing their work clothes and themselves;
- their work clothes must cover the entire body, must be removed immediately after work, and must be washed frequently. Ordinary cotton clothes are preferable;
- workers must not spray for more than 4 or 5 hours a day;
- spraying must be supervised;

- insecticides must be handled using ladles or spoons, and mixed using sticks in basins having handles, in order to avoid any hand contact with the products;
- workers must take a shower with soap after each day's work, or each time they accidentally have any contact with the insecticide;
- equipment must be kept in good condition;
- spray personnel must use the minimum pressure necessary to deliver a good spray;
- a stock of injectable atropine must be kept on hand in case of organophosphate poisoning.

Emulsifiable concentrates are more hazardous to handle than wettable powders because absorption through the skin is faster and more massive.

If pesticides are applied properly, there is very little risk to the occupants of dwellings. Food must be removed or carefully covered before a dwelling is treated.

The following protective clothing must be made available to each sprayer:

- 2 light, comfortable long-sleeved cotton overalls
- 1 pair of rubber boots
- 2 broad-brimmed hats
- 1 pair of plastic safety glasses
- 2 felt masks and 1 respiratory half-mask with filter cartridge (to be used during space spraying)
- 2 pair of rubber gloves

The insecticide mixer must have a plastic apron, rubber gloves, and rubber boots.

#### Key Indicators from SHERE Minimum Standards in Sanitation

- Maximum 50 people per toilet in initial phase of emergency with maximum 20 people per toilet as soon as possible.
- Toilets no more than 50 metres from dwellings, or no more than 1 minute walk
- Separate toilets for women and men are available in public places at a ratio of 3:1
- Latrines and septic tank soakaways are 30 metres from any groundwater source and the bottom of the latrine pit is 1.5 metres above the water table
- No dwelling is more than 15 metres from a refuse container
- One 100 litre refuse container is available per 10 families, where domestic refuse is not buried on site
- Storm water is drained in such a way that shelters, paths and watsan facilities are not flooded or eroded by water.
- Drainage at water points and washing and bathing facilities is well planned, built and maintained so that there is no standing water
- Each household has 2 water collecting vessels of at least 10-20 litres, plus water storage vessel of 20 litres
- 250 gr. of soap available per person per month
- 1 washing basin per 100 people

### Rapid Latrine

- The rapid latrines are provided to enable full pit latrines with superstructures to be installed quickly on site.
- A unit can also be used as templates for setting up local latrine structure production using locally available materials.
- Different designs with different materials are utilized. Refer to the instruction manual included with the latrine.

![](_page_51_Picture_4.jpeg)

Rapid latrine example.

Most designs use Monarflex 1200 x 800 slab as base

#### To Erect Latrine

- 1. Lay squatting plate base on ground.
- 2. Assemble superstructure.
- 3. Place latrine in required position.
- 4. Install ground anchors
- 5. If constructed of wood, spray assembly with anti-termite spray within one week of installation using backpack sprayer or brush.

All efforts to make water clean are pointless if the water is improperly stored or handled.

#### Narrow necked containers prevent contamination but are difficult to clean

But there's a problem:

#### Wide necked containers are easily contaminated but easily cleaned

In emergencies, people will use containers they already own or containers that they are provided with during the intervention. Or both. Work with what you have.

For narrow necked containers, encourage people to clean them regularly with a soap solution, chemical disinfectant (if available), or pebbles.

For wide necked containers, encourage people to keep them covered and design a system for removing water that avoids hands coming into contact with the water. This could be a long handled ladle that allows them to collect the water without touching it or a spigot at the bottom of the container. They should also be encouraged to regularly clean their container.

Even after the quality of the source has been improved, a campaign to improve the storage and handling of water will benefit the health of a population.

Encourage people to ALWAYS wash their hands prior to handling drinking water. Distributions of household water treatment chemicals present a perfect opportunity to distribute soap and give hygiene messages.

#### 1. Introduction

Hand washing is one of the most important factors in reducing diarrhoeal disease. The majority of the 'critical times' for hand washing occur at the home. In an emergency, families may not have suitable containers for allowing regular hand washing.

Excreta disposal facilities should be accompanied by handwashing stations. Providing latrines with handwashing stations and ensuring the stations contain water is major logistical commitment. A number of technical solutions have been used in the past to make handwashing easier and more accessible. These solutions include various containers with taps or holes plugged with nails and small plastic devices that release water in small amounts when opened. *Consult Excreta disposal in Emergencies 2007 for further information on handwashing facilities without piped water.* 

#### 2. Dispenser

This kit contains one low flow water dispenser for handwashing per family. In theory, promoting hand washing dispensers at the household level will foster a sense of ownership and increased use. In such a situation, a hand washing container at household level would be filled up by those who actually used it, rather than left empty as is so often seen at communal facilities.

- The low flow rate of 2 litres in 16 minutes allows for adequate cleansing, while making it suitable for use in water-scarce situations.
- The dispenser fits soft drink bottles, allowing longer-term use in case of damage to the container.
- The container is made from durable U/V-resistant polyethylene.

**Note:** This dispenser is most likely to break at the seams, especially around the nozzle. Encourage users to handle the bag with care.

**Note:** The dispenser is easily used as a drinking water container. One solution to discourage drinking the water in the container is for people to fill it with soapy water.

![](_page_53_Picture_11.jpeg)

![](_page_53_Picture_12.jpeg)

#### Hygiene Promotion

Merely distributing chemicals to people will not protect people from getting diarrhoeal diseases. Because diarrhoeal diseases are of faecal origin, the key primary barriers to the transmission of those pathogens are safe stool disposal and adequate handwashing.

In the emergency context, getting people to carry out household water treatment and safe storage and promoting the use of latrines and handwashing is a form of behaviour change. Hygiene promotion in an emergency is focussed on behaviour change and how emergency teams in the field promote adherence to safe hygiene practices among affected population.

Contrary to popular belief, changes in practices or behaviour do not always take a long time to occur and even short-term changes can be important where the health risks are high. If people feel themselves to be at risk then they are also more likely to change their behaviour quickly.

Therefore, if that willingness to change is enabled it can happen very quickly. For example, if water containers are provided to make it easier for the families to properly store water at home. The emphasis must be on enabling and mobilising women, men, and children to take action to reduce health risks (by adhering to safe hygiene practices) rather than simply raising awareness about the causes of ill health.

In an emergency, an important driving force for change may be the perception of health benefit. But this is not always necessarily the case. It is important to identify cultural / traditional norms in the community that might be additional motivations for behavioural change. For example, a woman may adopt a certain water treatment method at home after noticing her neighbour using it.

The provision of hygiene items can also act as an incentive for people to become involved in hygiene promotion activities. Distributions of household water treatment chemicals present a perfect opportunity to distribute soap and other watsan-related NFI and to disseminate key hygiene messages related to safe water handling and storage. An important opportunity to enable better health and hygiene may be lost if people are not given sufficient information about the health benefits of the items distributed.

Numerous tools are available that can be utilized to promote the adherence to safe hygiene behaviour in an emergency. Emergency contexts are very varied and the specific approach to Hygiene Promotion will depend on the existing situation and what is feasible in terms of population customs, culture, and resources.

In general, the early stages of the emergency will be characterised by the need to provide information (mass media approach) to the affected population but as soon as possible a more interactive approach should be used.

![](_page_54_Figure_9.jpeg)

#### AT ALL TIMES THE EMPHASIS SHOULD BE ON MOBILISING PEOPLE TO TAKE ACTION

Hygiene promotion is not simply a matter of providing information. It is more a dialogue with communities about hygiene and related health problems, to encourage improved hygiene practices.

## Comparative chart of methods and tools for hygiene promotion in Emergency

Metho		Methods	Description	Tools	
			Mass media	These methods use the same marketing principles that are used to	Popular media: drama, songs, puppets, and story-
			campaigns	sell products to consumers but instead of selling product these	telling.
				methods seek to "sell" ideas, attitudes and behaviours.	Mass Media (Radio and TV): news, spot
				The set of tools are designed to focus on the consumer preferences -	announcements, slogans and jingles, phone-in
				on learning what people want and need rather than trying to	programme, interviews, talks and documentaries,
				persuade them to buy what we happen to be producing.	drama, music, quizzes and panel games, magazine
					programme, etc.
					Messages delivered through loudspeakers.
					Messages delivered through posters, leaflets, notice
				<b>—</b>	boards, stickers, t-shirts, etc.
			Peer education	These methods are designed based on the theory that learning	Individual channels: Home visiting, targeting individuals
				processes that occur within a social context take place through	in markets, churches, schools, community meeting
				observation, imitation and modelling so selected individuals will	points, etc.
				adapt to the role of group facilitator and will behave as is expected	Group channels: Discussion groups, structured
				from a person in this position.	meetings, demonstrations, etc.
				The set of tools are designed to influence on individuals choices	
			Interactiva	These methods are designed to build self esteem as the community.	Three pile conting
			methodo boood	helieves in their shility to take action and make improvement in their	Posket short voting
		/		believes in their ability to take action and make improvement in their	Community mon
		/	on community	The set of teals are designed to ansure community involvement	Linearialized postero
			action	during the planning phase so they can make their own decisions and	Question box
			action		Etc
	_ ▼				

#### **Description**

This kit contains essential material and equipment for implementing hygiene promotion activities in an emergency. They have been designed to facilitate the implementation of various hygiene promotion activities at household and community level.

This table contains the list of equipment included in the kit for hygiene promotion and potential use of the items.

Pocket chart, set of laminated cards, and tokens for interactive activities.	<ul> <li>This set of materials can be used to conduct different activities:</li> <li>1. Pocket chart (voting exercise)</li> <li>2. Three pile sorting</li> <li>3. Chain of contamination</li> <li>4. Take 2 children</li> <li>The set of cards include instructions to conduct any of the 4 activated listed</li> </ul>
	above.
Set of posters	This set can be used to disseminate key message sin public places, undertake house-to-house visit and 'on-site' training during distribution of hygiene items.
Puppet kit	This kit might be useful for the preparation of hand-made puppets.
Training kit	This kit can be used in all type of training conducted during the implementation of hygiene promotion activities.
Banner kit	The banners can be used for hygiene promotion campaigns.
Megaphone	The megaphone can be used for hygiene promotion campaigns.
T shirts	The T-shirts will help to identify 'hygiene promotion' volunteers during the emergency operation.
Waterproof polycotton sheets	Useful for drawing games e.g. giant snakes, ladders, arrows, etc. or to locally produce a pocket chart.
Various books, manuals and CD Roms.	Visual images included in the CD's or books can be photocopied, coloured, and laminated for use in the communities. Useful to make posters, fact sheets, leaflets or wallcharts, and may be adapted for local use. The IEC materials can be adapted to produce fact sheets, leaflets and posters. Some of the books provide details of the methodologies used as well as pictures which can be adopted and used. Examples of job descriptions and training schedules are also included.

Hygiene Promotion component should be considered as an essential part of any emergency operation and must be carried out alongside water treatment and provision of sanitation facilities.

#### A. Hygiene Promotion campaigns

In carrying out a hygiene promotion campaign, you will need to carry out the following activities:

- A. Evaluate current hygiene practices.
- B. Identify specific target group
- C. Develop hygiene messages.
- D. Select communication methods.

**1.- Evaluate current hygiene practices:** Mass media campaigns can be used effectively in an emergency. They should be short and sharp and focus on the key issues. They can easily set up as long as the first rapid assessment field trip is undertaken and key hygiene behaviour risks identified. The five areas that need to be assessed since the beginning of the emergency are likely to be:

- 1. Excreta disposal
- 2. Use and maintenance of toilets
- 3. Lack of hand washing with soap or alternative
- 4. Unhygienic collection and storage of water
- 5. Unhygienic preparation and storage of food

Prioritize these by choosing those which pose the greatest health risk. Try not to deliver more than 4 or 5 messages at a time. Be as interactive as is feasibly possible. You should look at the resources available to your

target population taking into account local behaviours, knowledge and cultural norms. The needs of vulnerable groups should be given particular attention.

**2.- Identify specific target group**: In the initial stages of the emergency we often conduct massive campaigns with no specific target groups. It is recommended instead that we identify specific audience so we direct the messages at groups responsible for carrying out the activity that is referred to. For example, when children are those in charge of collecting water, they need to be the ones targeted by the messages related to collection and transport behaviour.

#### 3.- Develop hygiene messages

- I. Messages should focus on a few key practices: the less the better! Overloading people with information may have the opposite effect.
- II. Present messages in a positive light and make use of humour wherever possible.
- III. Hygiene promotion messages should use simple words in the local language.

If possible pre-test the messages with a group of similar age, educational level and culture to those the message is trying to reach.

**4.-** Select communication methods: The choice of communication method depends on the nature of the audience and the resources available. In an emergency, mass media is the most commonly used method for the rapid spread of messages to the widest audience at the lowest cost.

People spend a great deal of the time at distributions waiting. This is a perfect opportunity for delivering messages that can be delivered quickly to a large number of people. Use distribution points to conduct different activities using **popular media** like drama, songs, puppets, and story-telling, etc (they combine entertainment with practical advice) or **mass media** delivering through loudspeakers, posters, leaflets, banners, notice boards, stickers, t-shirts, etc.

Some tips on how to produce printed IEC materials (posters, banners, leaflets, etc):

- Try to make figures and objects stand out clearly from the background.
- It is probably best not to make posters that involve sharply receding perspective.
- If you use a number of frames to represent a sequence of events, it is best not to assume that people will always read the pictures in the same sequence.
- Stylised drawing can be difficult for people to understand. Non-literate people tend to read pictures in a very literal way and may find any sort of stylisation confusing.
- Shaded line drawings seem to be well understood, although the way you do the shading should be given some thought. Lines used in hatching, or dots used for shading, may be misinterpreted.
- People and objects shown in your design will be most easily recognised if they are drawn in the same relative proportions as they appear in everyday experience.
- It may be best to avoid using visual symbols crosses, arrows, ticks, skull and crossbones, etc. in your design, unless you are sure that other people attach the same meaning to symbols as you do.
- Remember that showing only a part of a person's body in your poster may lead to misunderstanding. Extreme visual amputation is best avoided.
- Trying to show what is normally invisible or unseen can also cause problems. For example, a poster that shows the inside of a person's body, or a house with its roof taken away, seen from above, may not be understood in the way you intend.
- Pictorial conventions used in the cartoon style such as thought bubbles may not be familiar to people from poor communities.
- Maps, diagrams and graphs rely on a range of conventions which may not be known by the viewer.
- Try to use only figures and objects that are familiar and relevant to the people who will see your visual aid. Local styles of dress, houses, hair-arrangement and so on, will help people understand your poster better.

#### Some tips about how to make hand-made puppets.

Puppets can be used to give theatre performances or with small groups to encourage discussion. They are especially helpful for communicating with small children as they often talk directly to puppet although they might be too shy to talk.

Simple puppets can be made from mounting cardboard cut-out figures on sticks or painting features on to wooden spoons, cardboard tubes or paper bags. Glove puppets from felt fabric are easy to make and effective to perform with as they are able to pick things up.

#### Do's and don'ts for street puppet shows:

#### Do's

- Short simple plots with very loud and slow speech.
- Use traditional characters (traditional healer, beggar, villager, etc) and speaking animal characters (fly, worms, etc).
- One character should speak at one time the puppet should move or nod when speaking.
- Use music and dance.

#### Don'ts

- Long monologues by single puppet.
- Messages conveyed through words rather than actions.
- Puppets asking questions to the audience during the show.

#### B. Peer education

Messages delivered though mass media can be reinforced by **face-to-face** activities. These activities, like house to house visits might be conducted in parallel with the NFI distribution activities. The visits offer an opportunity for the hygiene promoters to assess the domestic environment and tailor hygiene messages to the specific needs of the family.

Some tips to consider when conducting home visits are the following:

- Visits need to be handled with sensitivity. Even in an emergency situation, certain 'etiquette' needs to be respected.
- On average 1 volunteer can visit 5-6 households in a one working day (4 hours).
- Visuals aids in the form of flipcharts, posters, or picture cards are very useful to promote discussion.
- Timing of the visits needs to be carefully planned and villagers need to be informed previously if possible. In an emergency people will be busy securing the basic essentials for survival.

#### C. Interactive methods

'Participatory hygiene and sanitation for transformation' (PHAST) is an approach that makes use of a set of participatory methods and tools used with community groups to motivate their engagement in improved hygiene and sanitation. Trained facilitators take community groups through a sequence of steps by regularly meeting with them over a period of several months.

Faster PHAST was developed by the Federation and others to apply these tools over a shorter period of time in emergency contexts, by reducing the number of steps involved.

# FASTER PHAST IS NOT THE PHAST PROCESS AT HIGHER SPEED. IT IS USING THE PARTICIPATORY TOOLS OF THE PHAST PROCESS IN AN EMERGENCY.

Despite this, it may not be feasible to meet regularly with the same groups in the acute stage of an emergency. However, the participatory principles and tools that PHAST recommends can still be employed during an emergency.

# Brief guidelines about how to adapt PHAST to specific emergency scenarios (including disease outbreaks like cholera)

A rapid appraisal should be undertaken as outlined above. It is recommended that for an outbreak the PHAST process can been shortened as follows:

Step	Activity	Tool(s)	Purpose	Timeframe
2	Community	Community	In-depth analysis of	Day 1: 1-1 ½ hours
	mapping	mapping	the disease outbreak&	session
	Good & bad	3-pile sorting	its cause	Day 1: 1-2 hours
	hygiene behaviour			sessions / group.
	How disease	Transmission		Day 1: 1-1 ½ hours
	spreads	routes		session
3	Blocking the	Blocking the routes	To analyze for	<b>Day 2:</b> 30 min – 1
	spread of disease		possible solutions to	hour
	Selecting the	Barriers matrix	identified causes of	<b>Day 2:</b> 30 min – 1
	barriers		problems	hour
4	Choosing	3-pile sorting	To identify key	<b>Day 3</b> : 1 hour
	improved hygiene		messages for	
	behaviour		improved behaviour	
			hygiene	
6	Preparing to check	Monitoring chart	To monitor according	Day 4: 2 hours
	our progress		to agreed standards	

#### Activities removed from the standard PHAST process:

- Community stories
- Health Problems in our community
- Investigating community practices
- Tasks for men and women
- Choosing improved water and sanitation activities
- Taking time for questions
- Planning for change
- Planning who does what
- Identifying what may go wrong
- Checking our progress

After the emergency phase of the disease outbreak, the community can be taken through the PHAST process as in a developmental/post relief phase.

#### Tips:

Specific sessions might be designed for cholera transmission routes and prevention measures. General references about cholera are included in the Software WatSan Mission Assistant CD: Hygiene Promotion < Diarrhoea – Cholera:

- Managing cholera outbreak (WHO)
- Cholera outbreak Assessing the response (WHO)
- Diarrhoeal diseases preparedness and response Training manual for participants and guidance for facilitators (WHO)
- IFRC Cholera Kit contents

## **Consolidated Parts List**

# WatSan Disaster Response Kit 5 for 5,000 Beneficiaries

## Red Cross Code KWATNEACK05

Code	Description	Qty
WWTUTREA04	WATER PURIFICATION UNIT, 4m3/h at 100 NTU, transportable	1
KWATRAMP06AP	KIT, 1 TAPSTAND + PIPEWORK, water and sanit. ERU	4
KWATTANKR10	KIT, WATER TANK, 10 m3, rigid, corrugated	
WPUCESRW001	PUMP, END-SUCTION, diesel, Self-Priming Lightweight, 2"/3.3kW	2
KWATTOOLPU01	KIT, TOOL + ENG.OIL, for pumping set up, wat. and sanit. ERU	1
KWATTANKRTO1	KIT, TOOL, for rigid corrugated water tanks	1
WMEAPHMT0409	PH TESTER, colorimetric, from 4.5 to 9	1
KWATFITT05	KIT, CONNECTORS, for WatSan disaster response kits	1
WMEACNDU01	CONDUCTIVITY METER, wide range 0-20 mS/cm	1
WMEAPHPA0014	SET OF pH STRIPS, 100 strips, 0 to 14	4
WASDCHLAG25	CHLORINE, NaDCC granulates, >50% active chlorine, 25kg	1
WCHPALUSG50	ALUMINIUM SULFATE, granulates, 50kg bag	2
WMEAPOOL10	POOL TESTER + accessories	2
WNEPPESR63	PIPE, MDPE polyethylene, d.ext: 63mm, NP10, coil, per meter	1
KWATWLAB02	KIT, WATER LAB TEST, bacteriologic, + accessories, Delagua	1
HCONJCANPF10	JERRYCAN, foldable, 10L, food grade plastic, zipper closing	
HCONBUCKP14L	BUCKET, plastic, 14L with clip cover and 50mm outlet	1000
WSANLATRSE01	LATRINE, rapid infrastructure, for 1 pit latrine, complete	1000
KWATTANKP05T	KIT, WATERTANK, flexible pillow, 5m3, transport/storage	
WSANSQPL003	SQUATTING PLATES, polypropylene, + drop-hole cover, 1.2x0.8m	30
WSANSQPL002	MOLD, for making latrine slabs, SanPlat type	1
HSHETARPW460	TARPAULINS, woven plastic sheeting 4 x 60m white/white, roll	3
WSANLATRSE01	LATRINE, rapid infrastructure, for 1 pit latrine, complete	5
WSANSPRA15	SPRAYER, manual, back pack, 15l	2
Alternative to above item:	WSANSPRA10H SPRAYER, manual, hand held, 10L	
KSANSPROSP01	SET, PROTECTIVE CLOTHES, for 1 person spraying chemicals	6
WCHPDELT2WP3	DELTAMETHRIN, 'K-OTHRINE', 2.5%, wettable powder, 33g sach.	100
HHYGSOAP100G	SOAP, body soap, 100g, piece	2000
WMEAPOOL10A	(pool test) TABLET DPD1 for dosing free chlorine	500
WMEAPOOL10B	(pool test) TABLET DPD3 for dosing total chlorine	500
WMEAPOOL10C	(pool test) TABLET RED PHENOL for PH control	
WASDVASD0010	WATER PURIFICATION AGENT, for 10L of water	3000
KSANHYGP01A	HYGIENE PROMOTION BOX A, promotion items	1

Detailed Specifications of all items at: http://procurement.ifrc.org/catalogue

## WatSan Disaster Response Kit 10 for 10,000 Beneficiaries

## Red Cross Code KWATNEACK10

Code	Description	Qty
WWTUTREA04	WATER PURIFICATION UNIT, 4m3/h at 100 NTU, transportable	2
KWATRAMP06AP	KIT, 1 TAPSTAND + PIPEWORK, water and sanit. ERU	
KWATTANKR10	KIT, WATER TANK, 10 m3, rigid, corrugated	6
WPUCESRW001	PUMP, END-SUCTION, diesel, Self-Priming Lightweight, 2"/3.3kW	4
KWATTOOLPU01	KIT, TOOL + ENG.OIL, for pumping set up, wat. and sanit. ERU	1
KWATTANKRTO1	KIT, TOOL, for rigid corrugated water tanks	1
WMEAPHMT0409	PH TESTER, colorimetric, from 4.5 to 9	2
KWATFITT05	KIT, CONNECTORS, for WatSan disaster response kits	2
WMEACNDU01	CONDUCTIVITY METER, wide range 0-20 mS/cm	2
WMEAPHPA0014	SET OF pH STRIPS, 100 strips, 0 to 14	4
WASDCHLAG25	CHLORINE, NaDCC granulates, >50% active chlorine, 25kg	2
WCHPALUSG50	ALUMINIUM SULFATE, granulates, 50kg bag	4
WMEAPOOL10	POOL TESTER + accessories	4
WNEPPESR63	PIPE, MDPE polyethylene, d.ext: 63mm, NP10, coil, per meter	2
KWATWLAB02	KIT, WATER LAB TEST, bacteriologic, + accessories, Delagua	1
HCONJCANPF10	JERRYCAN, foldable,10L, food grade plastic, zipper closing	2000
HCONBUCKP14L	BUCKET, plastic, 14L with clip cover and 50mm outlet	2000
HCONJCANPWD	WATER DISPENSING BAG, hanging with low flow tap	2000
KWATTANKP05T	KIT, WATERTANK, flexible pillow, 5m3, transport/storage	2
WSANSQPL003	SQUATTING PLATES, polypropylene, + drop-hole cover, 1.2x0.8m	60
WSANSQPL002	MOLD, for making latrine slabs, SanPlat type	1
HSHETARPW460	TARPAULINS, woven plastic sheeting 4 x 60m white/white, roll	6
WSANLATRSE01	LATRINE, rapid infrastructure, for 1 pit latrine, complete	10
WSANSPRA15	SPRAYER, manual, back pack, 15l	4
Alternative to above item:	WSANSPRA10H SPRAYER, manual, hand held, 10L	
KSANSPROSP01	SET, PROTECTIVE CLOTHES, for 1 person spraying chemicals	12
WCHPDELT2WP3	DELTAMETHRIN, 'K-OTHRINE', 2.5%, wettable powder, 33g sach.	200
HHYGSOAP100G	SOAP, body soap, 100g, piece	4000
WMEAPOOL10A	(pool test) TABLET DPD1 for dosing free chlorine	1000
WMEAPOOL10B	(pool test) TABLET DPD3 for dosing total chlorine	1000
WMEAPOOL10C	(pool test) TABLET RED PHENOL for PH control	1000
WASDVASD0010	WATER PURIFICATION AGENT, for 10L of water	3000
KSANHYGP01A	HYGIENE PROMOTION BOX A, promotion items	2
KSANHYGP01B	HYGIENE PROMOTION BOX B, electronic items	1

#### Detailed Specifications of all items at: http://procurement.ifrc.org/catalogue