

Standard Operating Procedure – Emergency Lime treatment using emergency drying beds

This procedure describes an emergency method for treating faecal sludge with lime. This method should only be used in cases where the faecal sludge is collected in containers due to high ground-water levels, without access to a conventional faecal sludge treatment site.

Faecal sludge should **never** be handled without the following Personal Protective Equipment (PPEs):

- Boots
- Gloves
- Jumpsuit
- Disposable mask

Ensure sufficient PPEs for all workers. Consider that PPEs need to be washed and dried after a day of work. The availability of PPEs need to allow for this.



When handling, transporting and treating faecal sludge, it is essential to have **access to water** for mixing of lime, handwashing and for cleaning of equipment.



How to work hygienically

- Always disinfect spillage of sludge with chlorine spray (2%)
- Always use all PPEs when transporting and handling sludge and polluted equipment.
- Never eat, drink or smoke when wearing PPEs.
- Always clean all PPEs using soap. Clean the pH meter daily in water.
- Always wash hands and face with soap after work (preferably take a shower)

Procedure

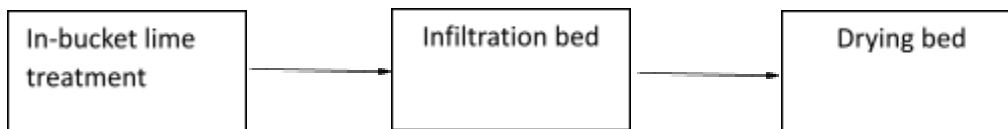
For this emergency lime treatment method, it is essential to have access to an empty field which is:

- a higher-laying area where the groundwater is not at the surface
- Where it is possible to dig a large infiltration bed
- Which is minimally 50 m from a water source (preferably further away)
- Where it is accepted to conduct emergency faecal sludge treatment by the authorities

Preparation of emergency treatment site

Ensure that the emergency treatment site is closed off, ideally with a fence, but in cases of emergency this can also be done with caution tape. ++===

An emergency lime treatment plant is developed, consisting out of the following treatment steps:



Pictures of examples of these treatment steps can be found in the attachment.

1. In-bucket lime treatment

As this treatment is conducted in the same buckets as are used in the bucket latrines, which are transported to the emergency treatment site.

2. Infiltration bed

Infiltration beds are excavated pits of (for example) 3 meter by 2 meter with a depth of 70 cm. The beds are filled with gravel (15 cm), an empty sandbag sheet, sand (10 cm) and on top an empty sand bag sheet. Depending on the climate and the infiltration capacity of the soil, the treatment capacity needs to be assessed empirically. One infiltration bed can be taken in operation, while others are still being constructed.

On top of the infiltration bed, a cake layer will form. To enable cake formation, the infiltration bed needs to not be fed for a number of days. How long, depends on the local conditions (temperature, infiltration rate). If daily desludging is required, it is advisable to install several infiltration beds alongside each other.

3. Drying beds

Drying beds are cleared areas, where the dried sludge collected from the infiltration bed can be left to dry further.

Resources and material required

For the emergency treatment site

- Material to close off the emergency treatment site (fencing material or rope)
- Shovels to dig the infiltration bed.
- Machete to clear the land

- Sand (0,6 m³ per infiltration bed)
- Gravel (0,9 m³ per infiltration bed, this can also be broken bricks, or stones)
- Sand bags made into sheeting (15 m² per infiltration bed, can also be another type of permeable sheeting, like geotextile)

For the treatment procedure

- Sludge transport and disposal team
 - Team of minimally 2 workers and 1 supervisor
 - Trained on the health risk of handling faecal sludge and on the use of PPEs
 - Trained on the treatment procedure
- PPEs for everyone who is collecting, transporting or handling the faecal sludge
- Soap for cleaning after work
- Collection buckets which are used as bucket latrines. These barrels need to have a closeable lid.
- Lime (CaOH₂, calcium hydroxide)
 - 20 kg CaOH₂/m³ sludge
 - **NOT** CaCO₃, calcium carbonate!!!
- 1 L bucket for mixing the lime with water
- Mixing equipment (long spoons or sticks)
- pH meter (picture in attachment)
- Glass with water to test the lime
- Shovels/hoes to dig pits
- Chlorine (2%) (HTH) for disinfection, preferably in sprayer or spraying backpack
- Material for a temporal safe cover of the pit
 - Wood/bamboo (or any other available material that can be used to safely cover the pit overnight)
 - Tarpaulin
 - Sand bags
 - Caution tape

Actions

Lime treatment

1. Test the lime. Add a few spoons to a glass of water and measure if the pH is increasing to pH > 11.
2. Bring the sludge to the suitable location.
3. Guess the volume of the sludge.
4. Dig a pit at least 1.5 times the volume of the sludge being treated. Store the excavated soil on-site, it will be used later.
5. Prepare the lime (a lime solution is made prior to adding the lime to sludge, to enhance the mixing)
 - a. The required lime dosage is 20 kg lime/m³ of faecal sludge. For example, for a bucket of 100 liter, 2 kg of lime is added.
 - b. To prepare the lime slurry: add 1 kg of lime to 1 L of water and mix. The lime slurry can be prepared on site or can already be prepared previously.

- c. Add the lime slurry to the bucket. Repeat until the desired amount of lime is added to the bucket.
- d. Stir for 5 minutes.
- e. Measure pH. If the pH is not above 11, add more lime slurry.
- f. Close the lid, note the time, note the pH.
- g. After 1 hour, mix the faecal sludge, measure pH. If the pH is not above 11, add more lime slurry. Close the lid, note the time, note the pH.
- h. After 2 hours, mix the faecal sludge, measure pH. If the pH is not above 11, add more lime slurry. Close the lid, note the time, note the pH.

Infiltration bed

6. After minimally 2 hours with a pH above 11, empty the buckets in the pit.
7. Leave the sludge in the infiltration bed to dry.
8. Only remove the formed cake layer when the infiltration bed needs to be used again for fresh sludge, because a longer drying times leads to a smaller volume, drier sludge and increased pathogen inactivation.

Drying beds

9. Place the formed cake layer on top of infiltration bed for further drying.

Final disposal

10. After a while, a large volume of dried sludge will be formed. This can either be buried or burned.

Attachment A. Pictures of examples of bucket lime treatment, an infiltration bed and a drying bed.



Bucket lime treatment



Lime treatment (pH measurement)



Infiltration bed (with basket to filter out plastic waste)
rain)



Infiltration bed (with roof protection against

Attachment B. Examples of required material



Simple pH meter



Chlorine spray backpack

