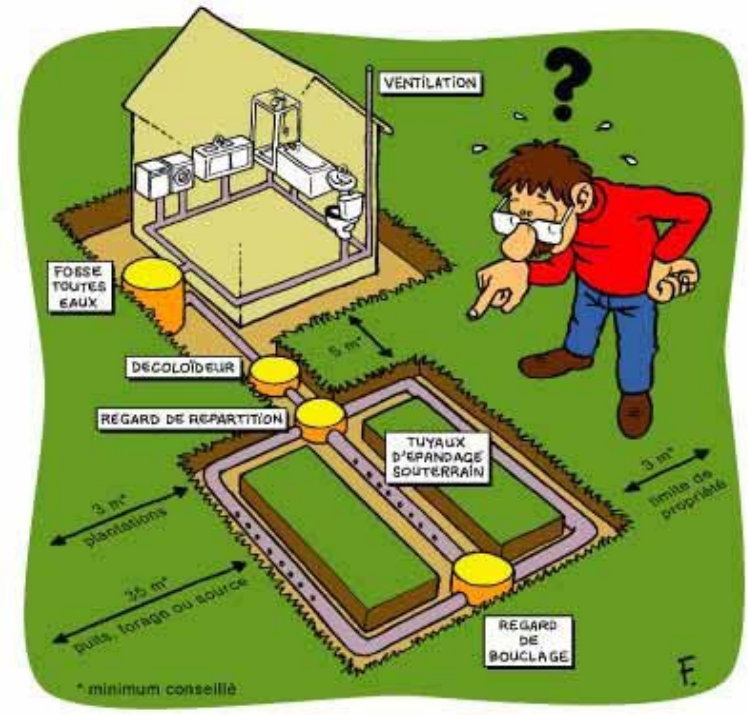
IMPLEMENTATION OF

ON-SITE SANITATION SERVICE

A.N.C.

PRACTICAL GUIDE



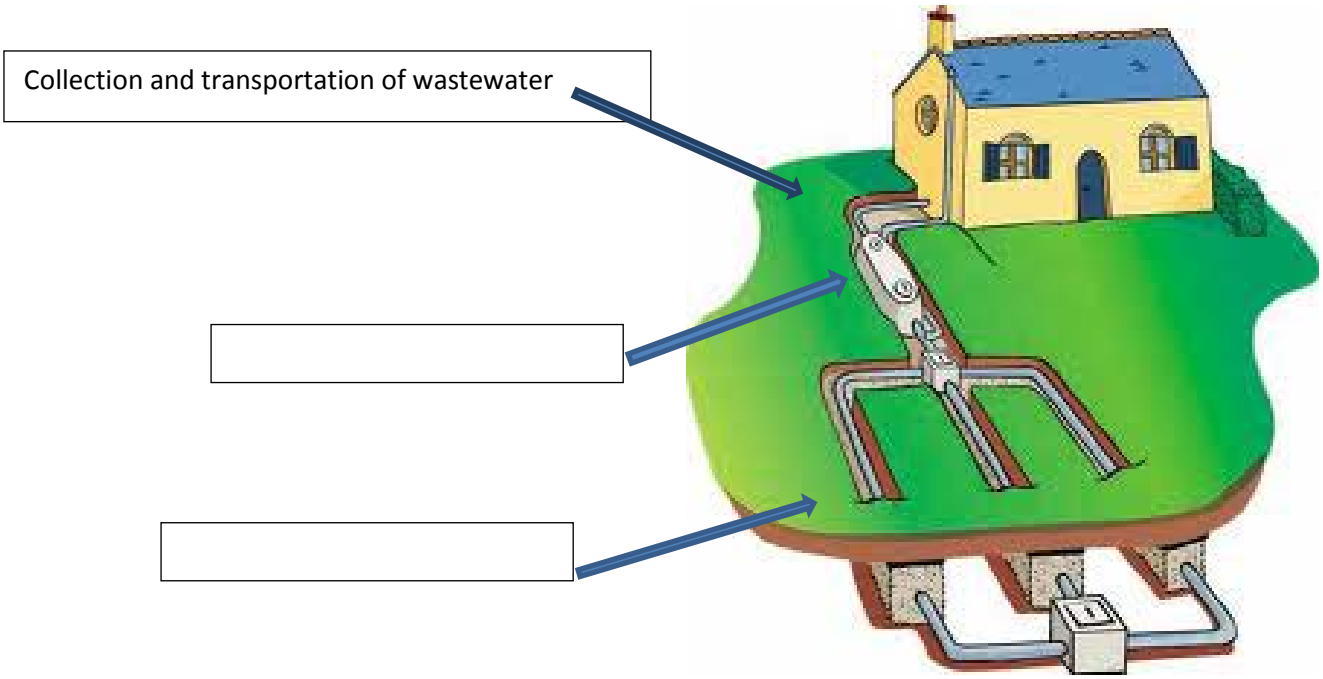
On-site Sanitation.

Sanitation aims to ensure the evacuation and treatment of wastewater in minimizing the risks to health and to the environment. The collection of waste and their disposal helps to maintain a healthy environment. In effect, the treatment of wastewater from the house must prevent several types of risks: health (virus infections, bacteria and parasites following contact with polluted waters) and environmental (contamination of the soil and groundwater but also of eutrophication of rivers and other bodies of water, limiting the volume of sludge).

Buildings and homes cannot be connected to the existing collective sanitation network (all sewage disposal) must have an on-site sanitation (ANC) or an individual or autonomous sanitation, ensuring the collection, pre-treatment, purification and infiltration or the discharge of domestic water.

An on-site sanitation system must be comprised of a complete device:

- 1st step : Collecting and transporting is carried out by a device for collecting water coming from the habitation following a pipeline ensuring the transport.
- 2nd step : The pre-treatment is carried out in general by the all-water tank which receives all the water from the habitation (blackwater, household water) ; it allows waste water to dispose of part of its pollution load but constitutes in nothing to itself, a waste water treatment process. It ensures the decantation of organic matter (sludge) and flotation of fat. This step is a mandatory requirement and must be followed by a treatment system ensuring water purification.
- 3rd step : The aerobic treatment of pre-treated domestic waste water ; pre- treated during the second step, is conducted in the surface soil in place or restored. It is at this stage that the water will get rid of all of its polluted load. The choice of treatment implemented is essential because it will determine the degree of water pollution. Knowledge of the ground where the system will be established is necessary to guide the selection of the sector.
- 4th step : The discharge of treated domestic waste ; is preferably carried out by infiltration into the basement, through a drip system and by default release to a shallow water environment.



The Treatment Systems

All-Water Tank

An all-water tank is a device indended for the collection of, partial liquefaction, polluting substances contained in the wastewater, the retention of solid and the floating waste.

It receives all the domestic wastewater (black water and household water) ; it replaced the septic tank and grease tanks since 1982.

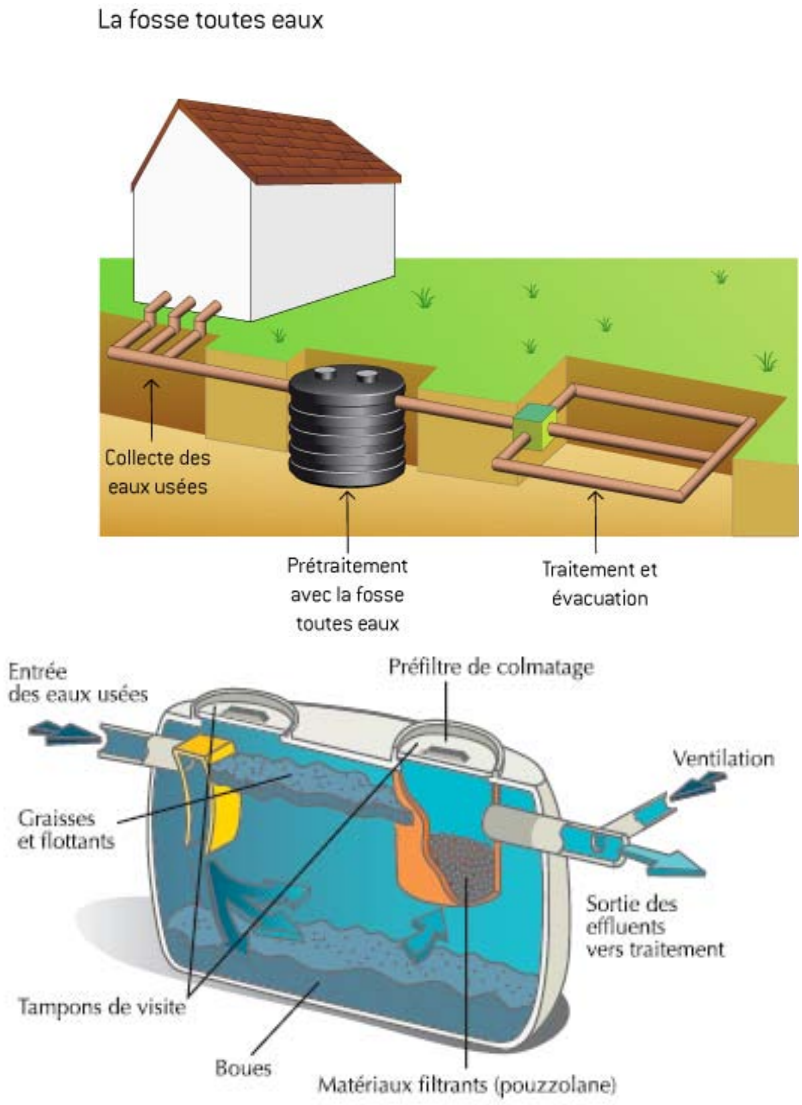
The dimension of this pit is as follows:

Number of main parts	Minimum volume of the pit
Up to 5	3 m3
Additional part	+1 m3

The number of main rooms = number of bedrooms +2.

Number of occupants	Minimum volume of the pit
5	3 m 3
Additional person	+0.5 m3

Generally speaking, the pit should be placed as close to the house as possible, that means, less than 10 m.



Maintenance :

- Except in special cases, draining of the sludge and floating materials is expected **every four (4) years.**
- A small amount of sludge is left in place and the water level must be restored.

- The pits are generally equipped with a pre-filter (tank with pouzzolane on the exit side of the pit). This prefilter, reduces the risks of clogging the downstream devices. En cas de constat d'entretien de boues, la vidange devra être anticipée.

The Pre-filter.

It can be integrated into the all-water tank or be placed after the upstream treatment. It «protects» the treatment system.

The Grease Trap.

Generally speaking, the grease trap is not useful, except in special need. When installed, it must be less than 2 m from the habitation, upstream of the septic tank.

Aerobic devices.

These devices are currently considered as a pre-treatment. They also receive all the domestic wastewater.

Biological treatment device with activated sludge.

After passing through the aeration tank and the clarifier, domestic pre-treated wastewater must then be directed to the treatment device.

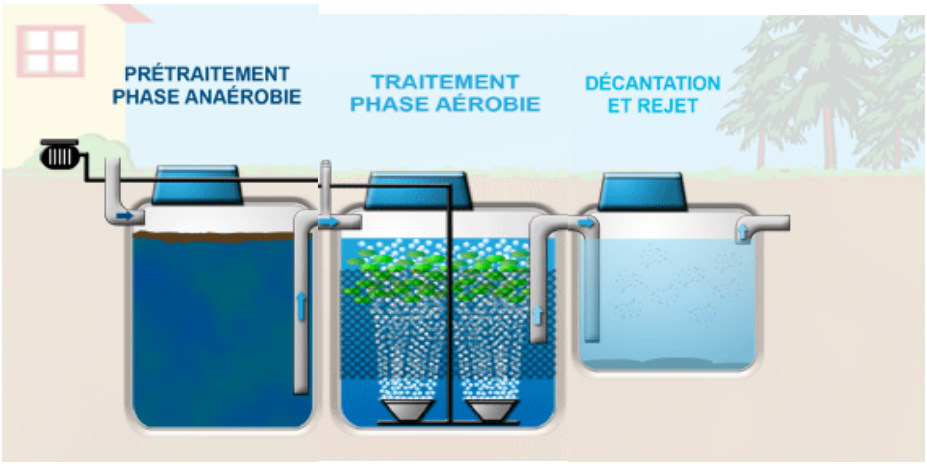
The sludge is retained by the clarifier, or directed to the retention and accumulation system (minimum volume 1 m3).

Sizing : The following table gives the size of the treatment device with activated sludge, depending on the number of main rooms.

Number of main parts	Useful volume in m3
Up to 6	2.5
➢ 6	Special study

Biological treatment device with fixed culture.

This device includes an anaerobic pre-treatment compartment followed by an aerobic compartment. The anaerobic phase may be provided by a septic tank.



Sizing : The following table gives the size of the treatment device with activated sludge in function to the number of main rooms.

Number of main rooms	Useful volume in m3
Up to 6	5
➢ 6	Special study

The treatment.

The treatment system is positioned after the pre-treatment device.

The designing of an appropriate system depends on several factors: permeability, slope, soil's thickness, available surface.

The soil type 1 corresponds to a sufficiently permeable soil allowing both the treatment and the infiltration of treated water.

The soil type 2 corresponds to an overly permeable soil that does not allow water purification, but ensures great infiltration, after treatment.

The soil type 3 is impermeable soil and does not allow the treatment nor the evacuation of water from the pit

Soil classification	Sector
Type 1	Spreading in the soil in place: ✓ Trench spreading at shallow depth ✓ Trench spreading in sloping ground ✓ Spreading bed.
Type 2	Spreading in reconstituted soil (washed silica sand) undrained: ✓ Sand filter ✓ Tertre infiltration in slope or above ground in case of waterlogging or water at a shallow depth (<1 m).
Type 3	Spreading in reconstituted soil (washed silica sand) undrained ✓ Horizontal drained sand filter (low slope) or vertical ✓ Tertre infiltration drained in case of the presence of waterlogging or water at a shallow depth .

Discharges of wastewater or even treated are prohibited in a sump pit, soak pit, decommissioned wells, natural or deep artificial cavity.

The treatment devices.

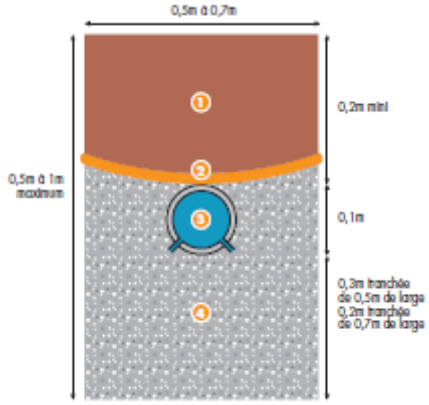
↳ The spreading trenches.

This is the priority sector in an on-site sanitation when the soil has sufficient permeability.

The spreading trenches receive the pre-treated domestic wastewater. The existing soil is used as a purifying system and a dispersing use.

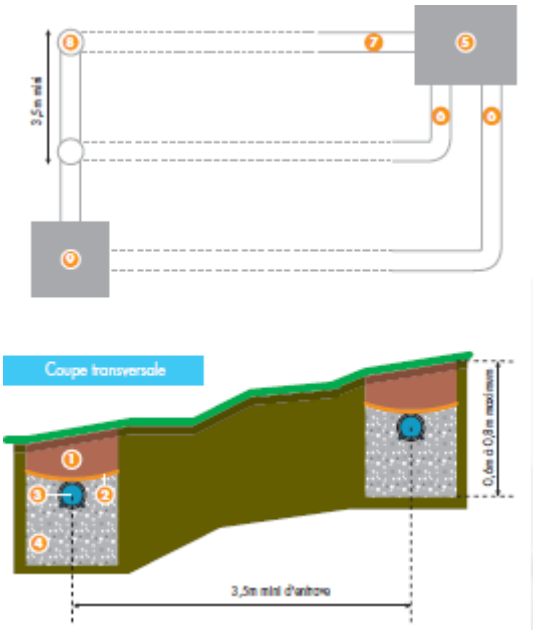
Value of K (mm/h)	6 à 15	➢ 15 à 30	➢ 30 à 50	➢ 50
	Very low permeability	Poor permeability	Medium permeability	High permeability
For 5 main rooms (m.r.) total length of spreading trenches in linear meter	Special study	80 ml	50 ml	45 ml
Up to 5 main rooms	Special study	16 ml/add m. room	10 ml/add m. room	6 ml/add m. room

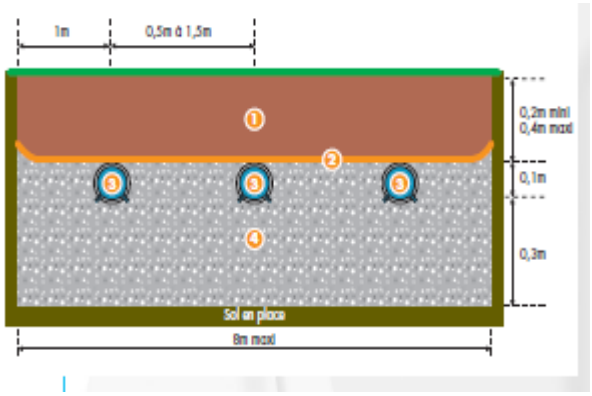
CROSS-SECTION



1) Top soil
2) Geotextile
3) Spreading pipe of 100mm hole facing down, slope de 0.5 à 1%
4) Gravel 20/40 mm
5) Looking loop
6) Full pipe
7) Full pipe on 1 meter
8) Looking loop T
9) Looking Loop

SLOPING GROUND





SPREADING BED

For a land with a slope between 5 and 10% the design sector must be adapted (diagram above). The cleaning T are necessary regarding the differencies of the spreading levels.

Up to a 10% slope, the realization of spreading trenches is not permitted. The realization of trenches is possible in the case where terraces are appointed (XP DTU 64.1 P1-1 March 2007).

➥ The spreading bed

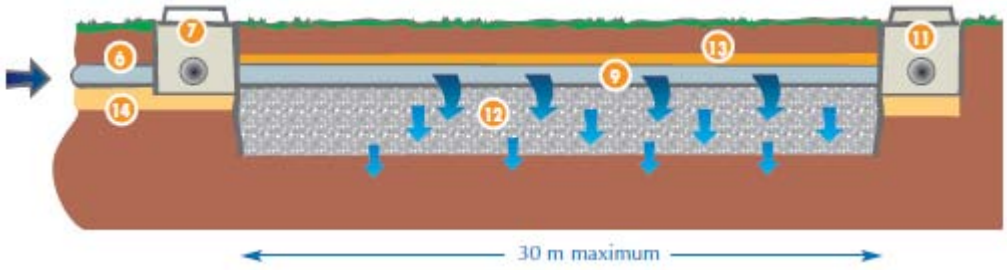
It is carried out in the case of dominant sandy soil, when the realization of trench spreading is difficult. Below 50 mm/h, the spreading bed must be justified by a special study.

The spreading is made in a single excavation.

The spreading bed should not be implanted in a ditch which collects rain water or near a ruptured slope.

Value of K (mm/h)	**6 à 15**	**➢ 15 à 30**	**➢ 30 à 50**	**➢ 50**
	Very low permeability	Poor permeability	Medium permeability	High permeability soil
For 5 main rooms	Special study	Special study	Special study	Spreading bed 60 *sqm*
Up to 5 main rooms	Special study	Special study	Special study	Spreading bed 20 sqm/add m. room

LONGITUDINAL SECTION



In a cracked soil, the spreading is excuded.

For K less than 6 mm/h or in a swellable clay ground : the spreading is excluded.

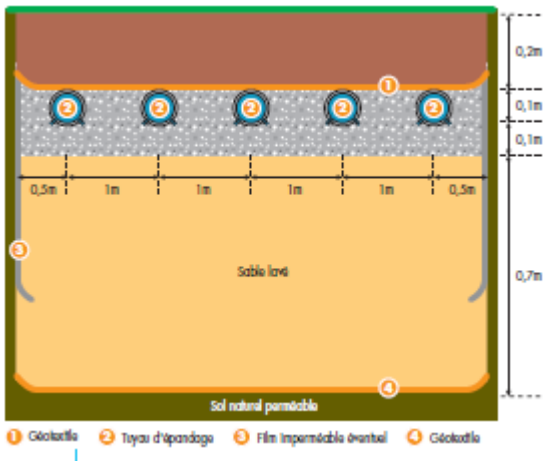
The vertical sand filter undrained.

When the soil in place cannot play the role of purifier (for shallow soil and fractured rock, for example) or when one lack the space to make spreading trenches, a vertical sand filter may be recommended.

The sand is used as a means of dispersing and purifying of the effluents.

Number of main rooms	Dimensions in meters	Surface in *sqm*
4 (2 bedrooms)	5*4	20 *sqm*
5 (3 bedrooms)	5*5	25 *sqm*
6 (4 bedrooms)	5*6	30 *sqm*
7(5 bedrooms)	5*7	35 *sqm*
+ 1 room		+5 *sqm*

CROSS SECTION.



1) Geotextile
2) Spreading pipe
3) Impermeable film
4) Geotextile

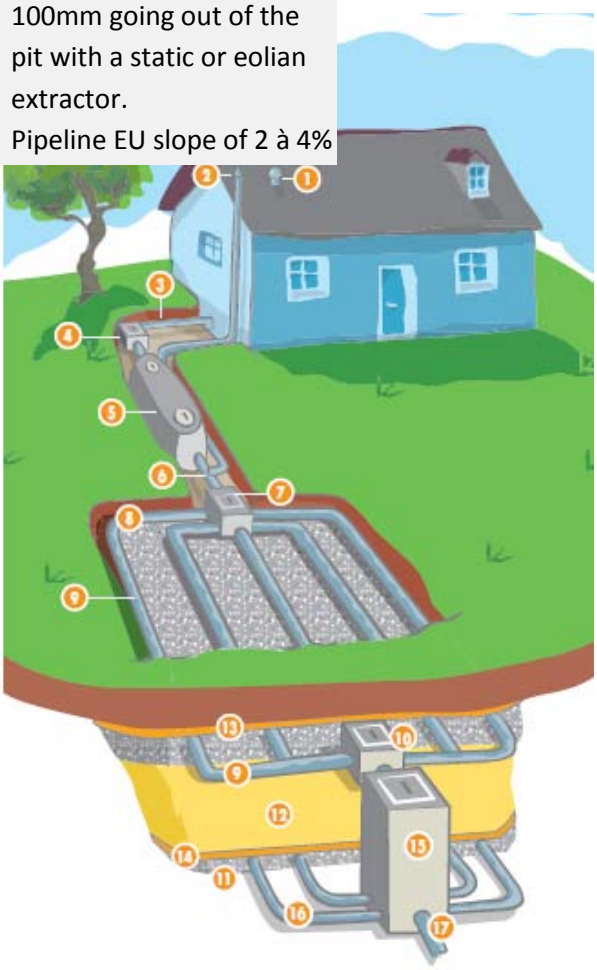
The depth of the filter should be limited to 1.60m in order to keep good oxygenation.
The minimum size is 20 sqm (5 m wide of the distribution and 4 m long)
5 sqm is added per additional main room.

Vertical sand filter drained.

When the soil in place is unfit to spread naturally and is impermeable, a «vertical drained sand» filter can be recommended. This sector must be exceptional.
The rejection must be authorized by the sanitation department and compatible with the uses (shallow water enviroment- public domain).
The washed sand is used as a purifying system. The proper functioning of the filter can be verified by a sample test on the discharge. The standard is 45 mg/l of DBO (biochemical oxygen demand in 5 days) and SS (suspended solids).

Number of main rooms	Dimensions in meters	Surface in sqm
4 (2 bedrooms)	5*4	20 sqm
5 (3 bedrooms)	5*5	25 sqm
6 (4 bedrooms)	5*6	30 sqm
7(5 bedrooms)	5*7	35 sqm
+ 1 room		+5 sqm

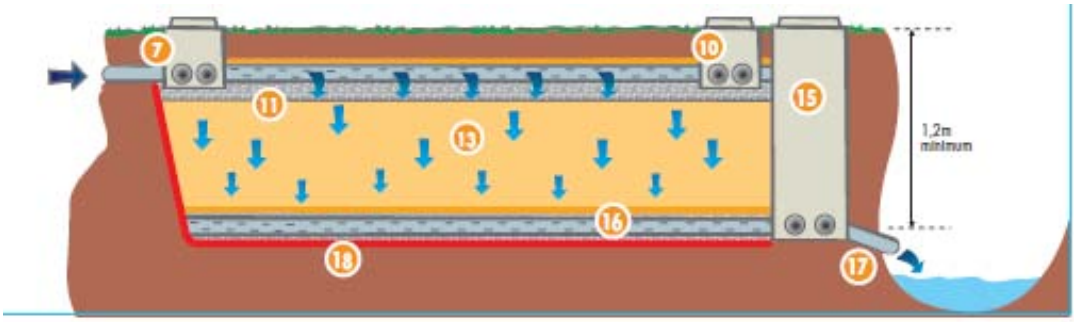
1) Ventilation column drop
2) High ventilation pipe ⌀ 100mm going out of the pit with a static or eolian extractor.
3) Pipeline EU slope of 2 à 4%



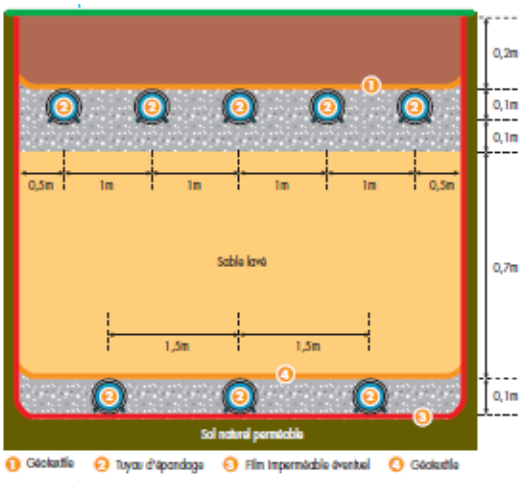
⌀

18) Ventilation column drop
19) High ventilation pipe ⌀ 100mm going out of the pit with a static or eolian extractor.
20) Pipeline EU slope of 2 à 4%
21) Direction change manhole
22) All-water tank
23) Drainage pipeline of pre-treated water, slope 1%.
24) 5 ways distribution manhole
25) Full pipe ⌀ 100mm of distribution
26) Spreading pipe ⌀ 100mm
27) Looking Loop
28) Gravel 20/40mm
29) Wash sand in accordance with DTU 64.1.
30) Mesh geotextile ≤ 125 micron, pulling resistance ≥12 kN/m.
31) Mesh geotextile > 140 micron or grid plastic mesh of 1 mm, pulling resistance ≥ 6 kN/m.
32) Collecting Manhole
33) Collection drain (3 mini.)
34) Drainpipe towards the outlet

LONGITUDINAL SECTION



CROSS SECTION



The depth of the filter should be limited to 1m70 to maintain a good oxygenation.
The minimum size is 20 sqm (5 m wide of the distribution and 4 m long).
5 sqm is added per additonal main room.
All the pipes should be placed with a 0.5 to 1% slope. Towards the looking loop or the collecting manhole.
The excavation bottom should be adjusted accordingly.

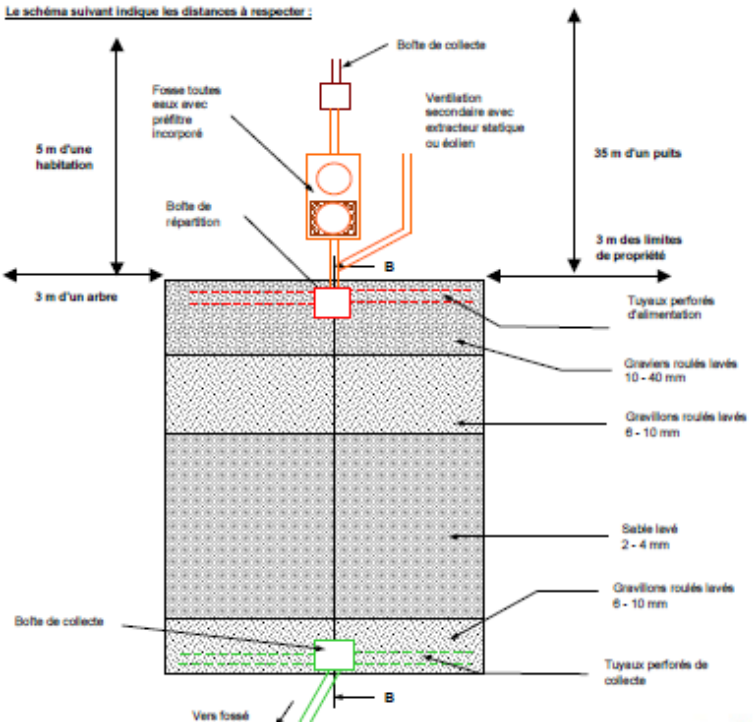
Horizontal Filter Bed Drained

This device should be implemented only in exceptional cases**: soil unsuitable for spreading** and impossible to install a filter drained to a vertical flow.

Number of main rooms	Width of the front distribution (m)
4 (2 bedrooms)	6
5 (3 bedrooms)	8
For each addl.	+1

Conditions of implementation:

The distribution of effluents over the entire width of the trench is ensured by a pipe coated with gravel of which the water is located at least, 0.35 m on the bottom of the excavation. The device successively includes in the flow direction of a minimum height os 0.30 m and a total length of 5.50 m.



a) A band of de 0.80m of gravel rolled washed (10 to 40 mm).

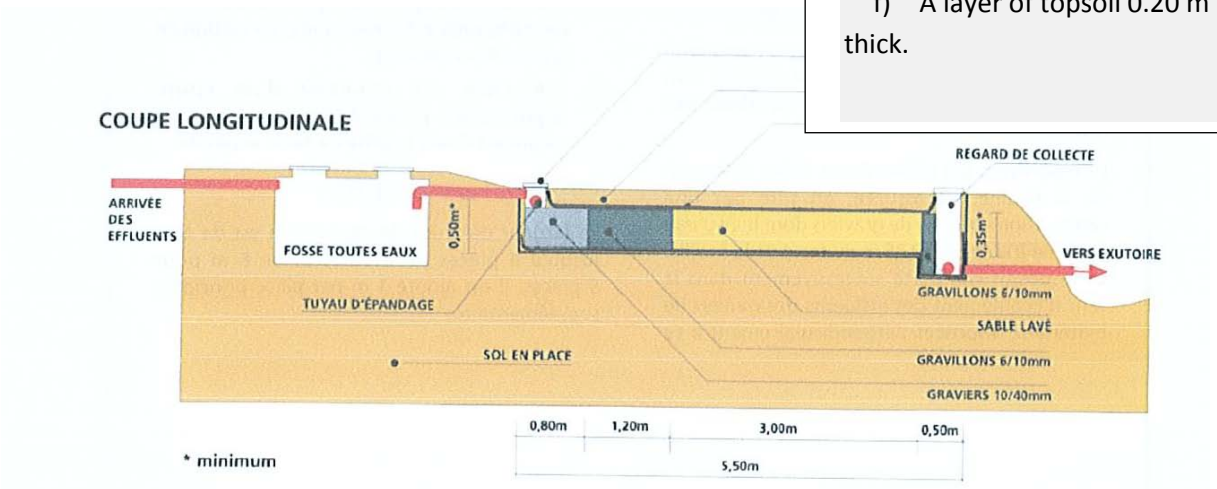
b) A band of 1.20m fine gravel rolled washed (6 to 10mm).

c) A band of 3 m washed sand (2 to 4 mm)

d) A band of 0.5 m of gravel washed rolled (6 to 10 mm).

e) Everything is covered with a geotextile fabric permeable to air and water.

f) A layer of topsoil 0.20 m thick.

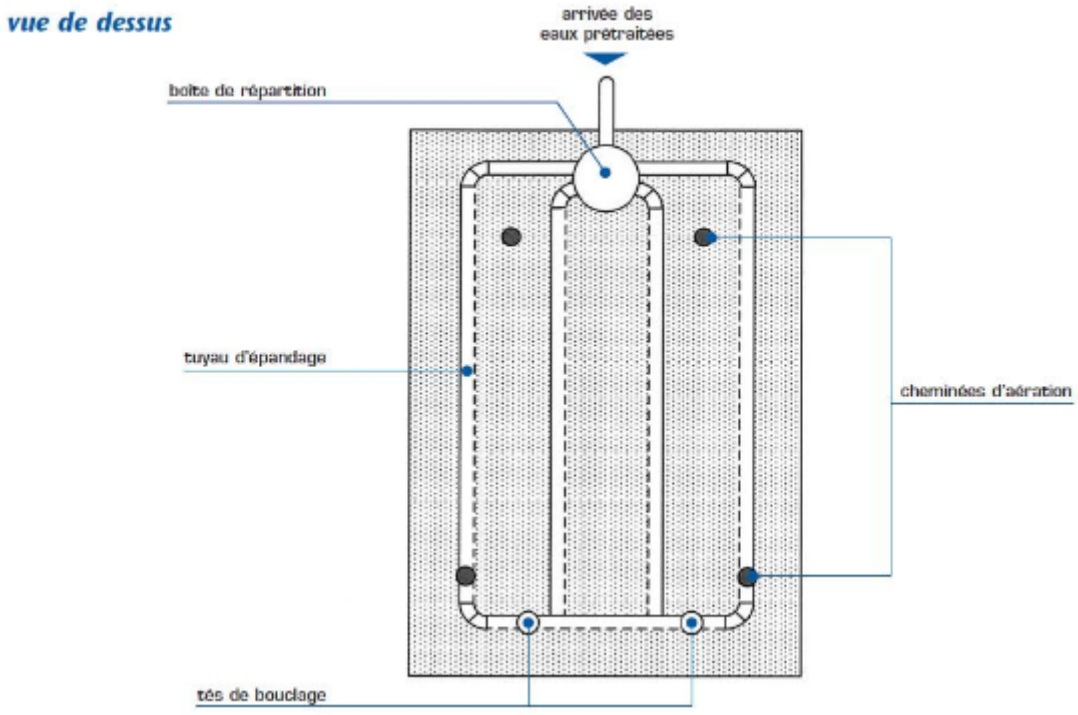


Vertical Flow Filter Bed Drained - Solid Zeolite

This device is used for a type of clayey soil that does not allow suitable infiltration and purification of the wastewater. These waters are purified through a solid zeolite then collected to reach an outlet (stream, ditch…). This compact device can also solve sizing problems. However, It cannot be implemented where sensitive users (shellfish, swimming,…) exsist near the discharge area.

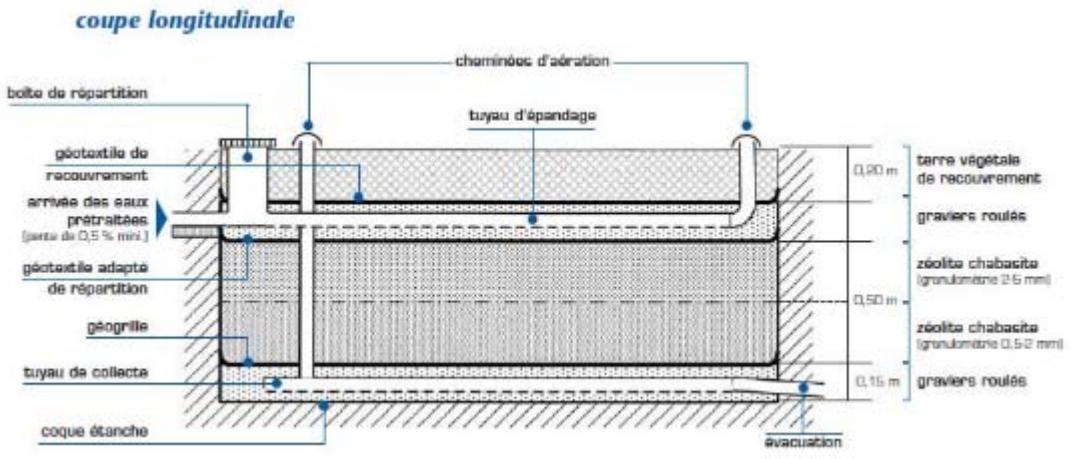
This device can be used for homes of 5 main rooms, at the most. It should be placed downstream of a pre-treatment consisting of an all-water tank with a minimum volume of 5 m3. The minimum surface of the filter should be 5 m3.

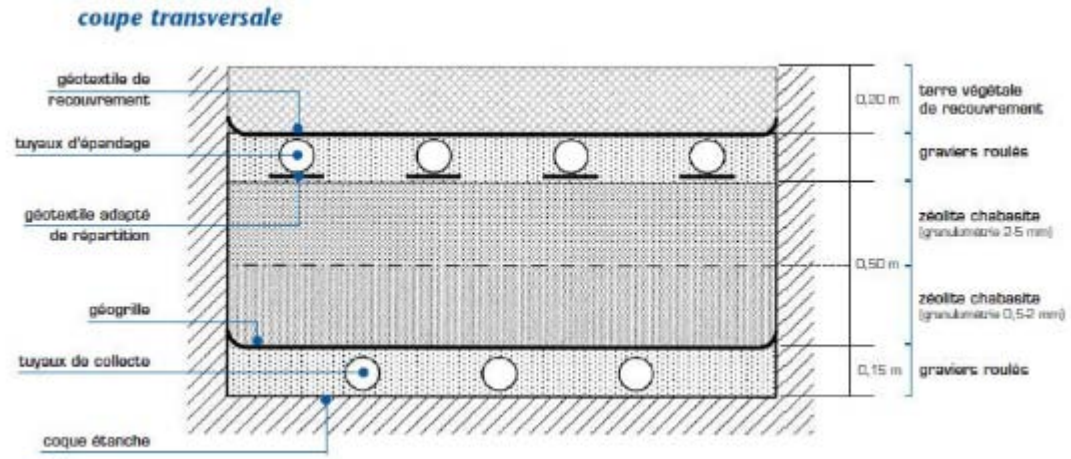
Number of main rooms	Minimum surface
5 (3 bedrooms)	5



Note:

- It is imperative to have the autorization of the owner of the outlet.
- To ensure the continued discharge of treated wastewater, the discharge pipe of the filter must be at least 0.10m above the highest water outlet





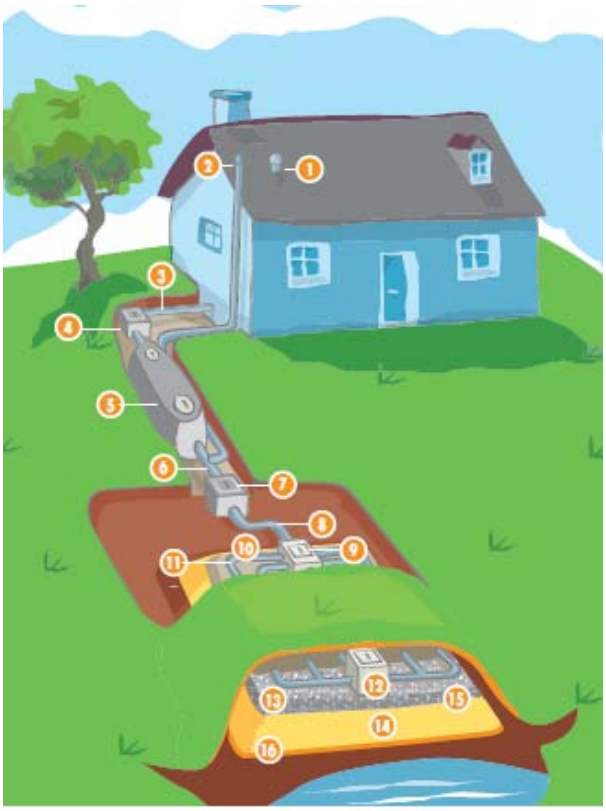
Precautions for implementation:

Particular attention should be given to:

- The type of zeolite (natural zeolite of a chabazite type)
- The thickness of the zeolite (0.50m after compaction)
- The 2 layers of different particle size of the zeolite (particle size 0.5-2 mm at the bottom et 2 5mm above)
- A good distribution of effluents into the distribution box
- Proper water drainage to the outlet
- Good ventilation
- The thickness recovery on the non clay topsoil (0.20m max)
- A spreading system for distributing effluent over the entire surface of the solid zeolite
- A spreading system located at the bottom, for collecting the effluents after treatment.

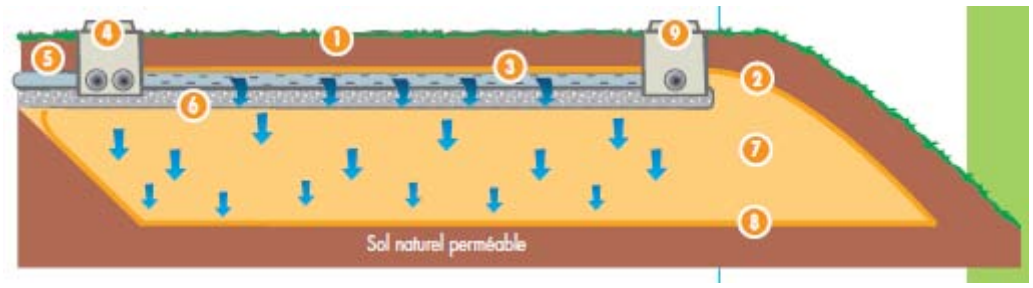
Infiltration mounds.

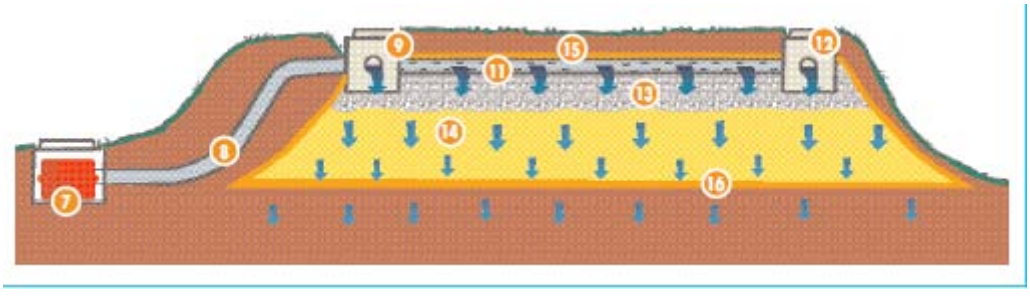
This sector is recommended when the soil is unsuitable up to the surface in the natural spreading (no possibility of elevated trenches) but is permeable in the presence of a near water table, and finally, when the absence of an outlet or the sensitivity of the environment does not permit a drained sand filter. The sand is used as a means of dispensing and a purifier of effuents.



1) Ventilation column drop
2) High ventilation pipe ∅ 100mm going out of the pit with a static or eolian extractor.
3) Pipeline EU slope of 2 à 4%
4) Direction change manhole recommended
5) All water tank
6) Canalisation d'écoulement d'eaux prétraitées, pente 1%.
7) 5 ways distribution manhole
8) Discharge pipe
9) 5 ways distribution manhole
10) Full pipe o 100 mm
11) Spreading pipe ∅ 100 mm
12) Looking Loop
13) Mesh geotextile ≤ 125 micron pulling resistance ≥ 12 kN/m.
14) Mesh geotextile >140 micron grid plastic mesh de 1 mm, pulling resistance ≥6 kN/m.

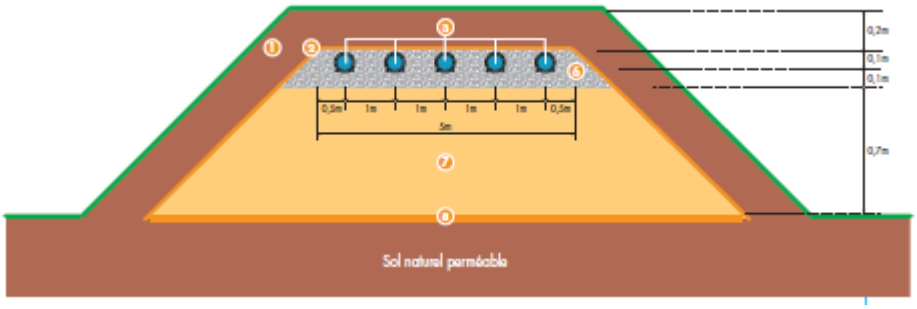
LONGITUDINAL SECTION





Number of main rooms	Minimim surface area at the top of the mound	Minimum surface at the base of the mound	
		Predominantly silty soil	Predominantly sandy soil
5 (3 bedrooms)	25 sqm	90 sqm	60 sqm
6 (4 bedrooms)	30 sqm	120 sqm	80 sqm
+ 1 bedroom	+ 5 sqm	+30 sqm	+20 sqm

- The surface of the mound must remain completely free and must be grassed.
- Except in special cases, the mound must be 3 meters of the property boundaries and 5 m of the habitation. It is also necessary to keep a distance of 3 m from any shrubby vegetation.
- The mound should be more than 235 meters of an ancient well used for the consumption of drinking water. However, all wells less than 35 m cannot be used for human consumption and, following the study recommendations, must be either reserved for other uses or backfilled.
- The minimum surface area at the base of the mound depends on the permeability of the soil (see sizing). This corresponds to the angle of repose of 30° maximum (see section below)



Installation with other treatment devices.

Domestic wastewater can be treated by facilities consisting of devices approved by the departments in charge of Health and Ecology, at the end a procedure for evaluating the effectiveness and risks the installations may cause directly or indirectly to health and the environment.

The list of treatment devices approved and the relevant datasheets are published in the Official Journal of the French Republic by joint opinion of the Minister of the Environment and the Minister in charge of Health, ensuring better information to the consumers and economic operators.

The infiltration wells.

The infiltration wells are devices put in place only on derogation when any of the evacuation by ground is impossible. They carry out the transit of treated effluents through the impermeable surface layer in order to reach the underlying permeable layer.

THE BASIC RULES:

The system must be located outside of the traffic zone, vehicle parkings, heavyloaders, crops and plantations.

The equipments must be accessible for maintenance.

No air-impermeable covering should cover it except grass seeding.

The all-water tank at less than 10 meters from the habitation.

The spreading zone must be located more than:

- 5 meters from the habitation
- 3 meters from property boundaries
- 3 meters from tree planting
- 35 meters from wells or water catchment for human consumption.