

Impact	Option 1 : Tinadhoo	Option 2: Faresmadhoodah	Option 3:Vaadhoo	Comments
Ability to finance	High	High	High	
1,9	1,9	1,9	1,9	
Return on Investment	Low	Low	Low	
2,2	2,2	2,2	2,2	
Sensitivity of costs	Medium	Medium	Medium	
1,2	1,2	1,2	1,2	
Total score	82,40	92,70	94,30	

It came out that Gdh. Vaadhoo is the most suitable option as location of the Transfer station

5.6.2. Layout design

Key figures

TS Gdh Vaadhoo	
Capacity	5.500 t/year
Site surface (m²)	2.000 m²
Access area, Circulation and transfer area (asphalted)	Approx. 1.500 m²
Parking/container storage and foreseen area for sorted waste	Approx. 200 m²
Green area/landscaping	To be determined
Buildings : full equipped container	1 control building 1 social building
Infrastructure	Perimeter fence and gate Surface water drainage concrete ditch : Firefighting reservoir and pump Potable water tank (01) and pump Septic tank (01) Lightning poles
Operation	6 days/week Minimum 8 hrs./day (opening time depending on local collection concept) Personnel : min. 3 persons + administration
Equipment	1 Hook lift truck

	set of containers (8) 1 multipurpose loader 1 waste handler small equipment (security and office)
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The transfer station is consisting of an asphalted entrance and waiting area in front of the entrance gate. After the entrance gate there is an office container and a social facilities container (shower, lockers, and toilet) on concrete strip foundation. The incoming truck and containers (from Vessels) will be conducted through an asphalted traffic road over a ramp to an unloading asphalted platform. The incoming waste collection trucks will unload the waste in 2 open waste containers of a capacity of 25 m³ and disposed on the down part of the area. The unloading surface and the waste transfer container surface are protected against heavy rainfall by a metallic shed construction. The site is protected by a surrounding mesh wire fence and entrance gate. The capacity has been planned with the actual waste forecast and the transport path.

Incoming	2 Vessels 1 small truck
Outgoing Vessels (long distance transport)	1
operation time	Uploading time at TS : 1-2 hr One way: 45 min Waiting and unloading time at dumpsite: 1 hr. Unloading/operation at TS : 30 min. operation time: approx. 4 hrs 50

Transfer area has been dimensioned for:

Upper side (Incoming trucks)	Small dumping truck max 8 m 2 axial Turning radius: 5 m Buffer of 1 m Uploading height 3,5 m
Down side (Outgoing truck)	1 Hook lift truck single 3 axial Turning radius : 9,0 m Buffer of 2 m Loading height according hook lifting device with 25 m ³ container

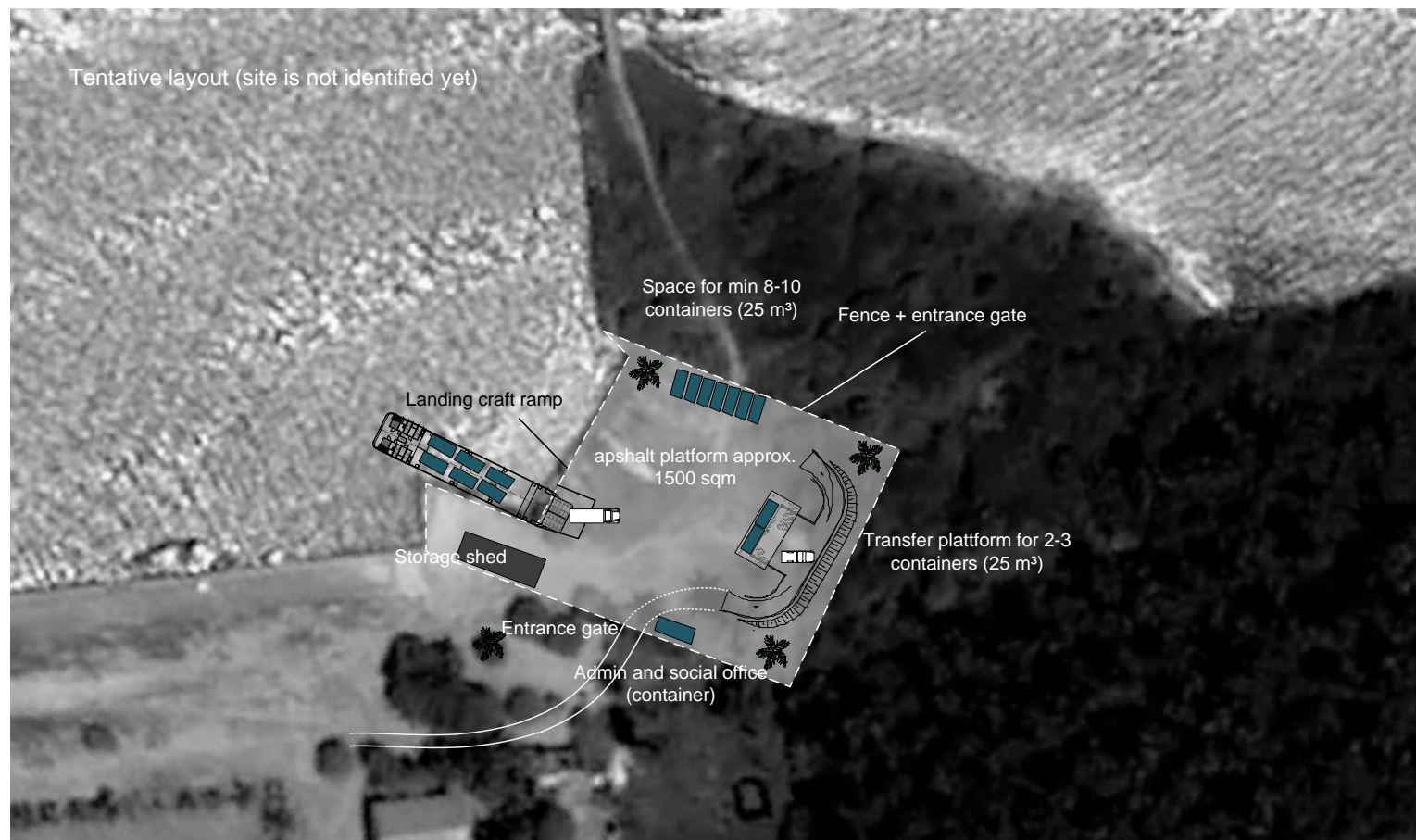


Figure 23: Schematic view of the transfer station in Vaadhoo

Entrance/control building

The transfer stations should be as simple and economic as possible without compromising an effective operation. Therefore the numbers of buildings for the site have been reduced to a minimum. Therefore fully equipped container solutions have been chosen for the office as well as for social facilities.

Office container	Surface (l x w x h) : 6,1 x 2,5 x 2,6 8 [m] 1 main office room 1 storage room
Concrete foundation	3 strip foundation 30 x 80 x 250 [cm] structural calculation C 20/25 concrete C 5/10 lean concrete Structural calculation according Maldivian construction norms (alternatively British standard)
Installation	Fully isolated outside steel door (875 x 2000 mm) windows PVC frame double glazed glass and shutter Linoleum floor, Wall insulation Cooling by Air conditioner Electrical installation: Roof lightning (energy saving lamps) min. 5 plug sockets phone line
Equipment	Office furniture for 1 person (table, chair) including some storage lockers 1 computer with printer 1 phone/Fax 1 fire extinguisher and fire alarm 1 first aid kit

Social facilities

Social facilities container	Surface (l x w x h) : 6,1 x 2,5 x 2,6 8 [m] Toilet facilities (1-2) Shower facilities (1) Dressing/locker room rest room (optional)
Concrete foundation	3 strip foundation 30 x 80 x 250 [cm] structural calculation

	<p>C 20/25 concrete</p> <p>C 5/10 lean concrete</p> <p>Structural calculation according Maldivian construction norms (alternatively British standard)</p>
Installation	<p>Fully isolated</p> <p>outside steel door (875 x 2000 mm)</p> <p>windows PVC frame double glazed glass and shutter</p> <p>3 plug sockets</p> <p>1-2 shower cabins</p> <p>2 toilets and hand wash basins</p>

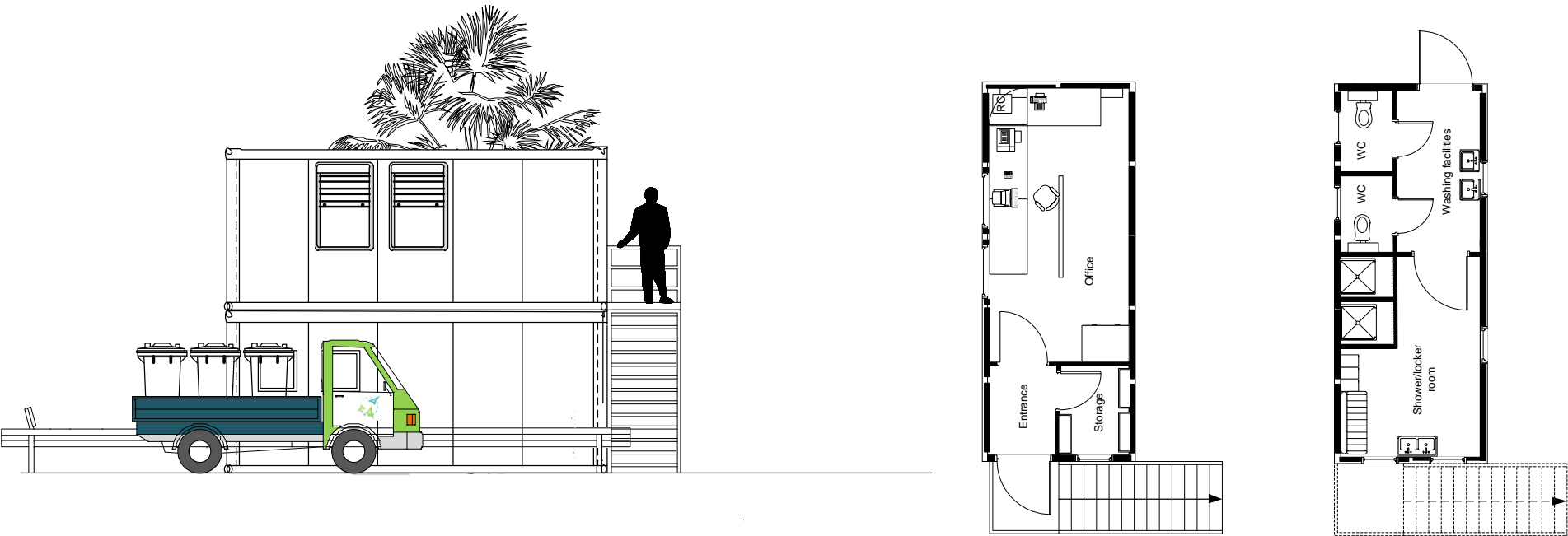


Figure 24 : Administration and Social containers



Figure 25 : Administration and social containers (cross section)

Surface water collection

The surface water should be collected by surface water ditch surrounding the site. The evacuation will be made by gravitation to the sea or the nearest collector outside of the site and situated along the main roads.

3 types of surface water ditches could be foreseen

- Main surface water ditch around the TS station as open compacted earth water ditch
- full pipe DN 400 for roads crossing
- Open concrete hatch at the asphalted traffic area.

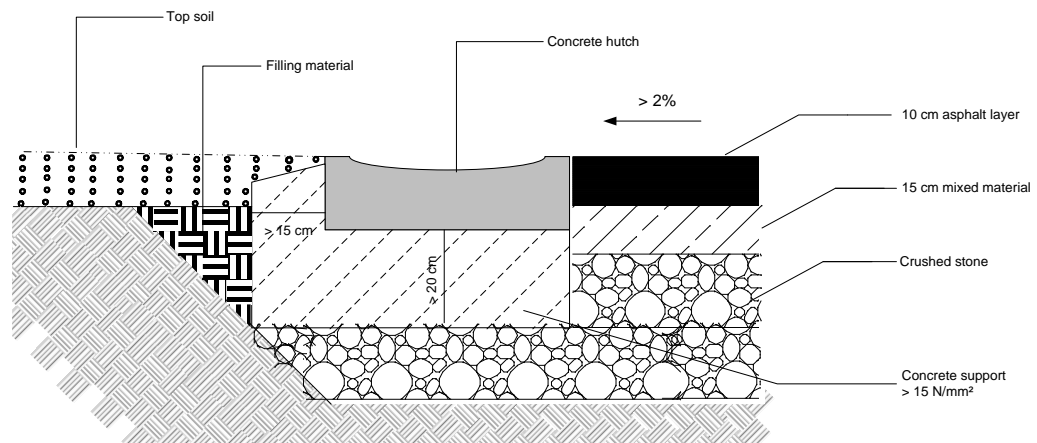


Figure 26: Scheme of the surface water ditch for traffic area

Waste water and leachate management

The incoming daily household waste present of course a risk of leachate development but which can be easily controlled and avoided with constructive and management measures:

Constructive measures	Shed construction on the unloading zone
Management measures	Daily operation/waste transfer Sufficient containers for peak period and week end Canvas/cover for waste container Permanent clean-up of unloading zone

Wastewater from office and social building will be collected in a septic tank. The septic tank could be built as a 3 chamber septic tank.

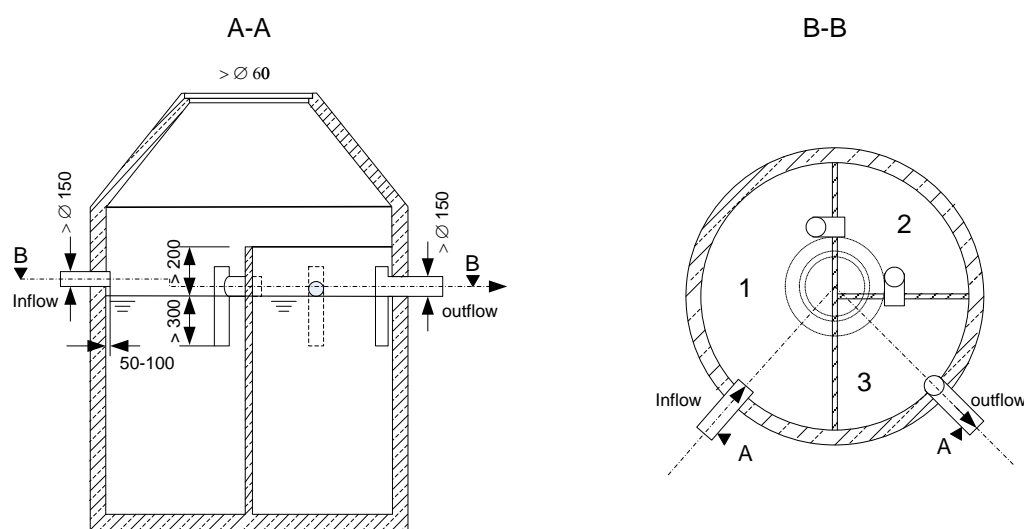


Figure 27: Scheme of a 3 chamber septic tank

Waste water for 4 Eq/hab.	3 Chamber septic tank: 4 m ³ Emptying frequency: every 3/years maximum
Construction works:	
Excavation works	4,5 m ³
Filling works	0,5 m ³

Internal traffic road

Internal traffic roads should be in asphalt. There are no sideway foreseen. Endings and transition will go directly into unpaved areas. Asphalt surfaces have a 2,5 % slope for rainwater evacuation. Front/entrance rainwater evacuation should be warranted by ditches (see rainwater drainage).

Asphalt surfaces dimensioned according Maldivian legislation for truck support and low frequency.

slopes	2,5 %
Structure/cross section from bottom up (example)	<ul style="list-style-type: none"> • 10 cm ballast layer • 10 cm stabilisation layer (0-35 mm) • 7 cm binder course • 3 cm asphalt layer <p>Total : 30 cm</p>

Unload platform and access ramp

The access ramp and the unload platform should be also in asphalt. There are no sideway foreseen. Asphalt surfaces of the unload platform should have a minimum slope 2,5 % for rainwater evacuation. Rainwater evacuation of access ramp is warranted by ramp slope (> 5 %). The access ramp and some parts of the unload platform should be limited by guardrails

Asphalt surfaces dimensioned according Maldivian legislation for truck support and low frequency.

slopes	2,5 %
Structure/cross section from bottom up	<ul style="list-style-type: none"> • 10 cm ballast layer • 10 cm stabilisation layer (0-35 mm) • 7 cm binder course • 3 cm asphalt layer <p>Total : 30 cm</p>

Unpaved area and parking lots

In order to minimise the use of asphalt and for better percolation of rainwater, all other areas of the site (additional container storage, etc.) and parking lots should be unpaved. The areas will be on natural ground (compacted sand). If needed it could be reinforced with coral rubble

Fence and gates

Site security is an important consideration. In order to ensure good security conditions, the site will completely fenced by a mesh wire fence (height 2,0 m). The access to the transfer station from the roadside is only for the waste collectors of Gdh Vaadhoo itself and private entities which wants to deliver their waste personally, and is consisted of a simple (non-electronically) mesh wire gate (4,00 m large/height 2,00 m) bottom frontal rolling frame.

Description
Fence with metallic plasticized fence mesh wire Height : 2,0 m Reinforced concrete foundation C 12/15 (0,2 x 0,2) m every 2,5 m with precast concrete kerb, fixing pole Ø 73 mm (hole round pipe) and Ø 60 mm fixing pipe manual one wing gate : (1 x 4,0 m), Height 2 m

Unloading/transfer area

The unloading areas of the Transfer station should be designed in order to optimize as much as possible the need of space and the filling works preferably with two one-way access ramps. The unloading platform should be designed with a turning radius for a small 2 axe waste collection truck. The height of the

platform should be chosen as a function of the waste container height and additional buffer (in case of use of slightly bigger containers). The unloading area on the truck side and on the container side is protected against rain by a metallic shed structure which should be dimensioned with a sufficient height to allow the opening of a the waste lifting and unloading system of a small 2 axe waste collection truck/dump truck. The shed has a slope of 5% in order to allow an adequate rainwater run-off and a gutter for rain water collection and evacuation to the surface water drainage system.

The container area which will catch the waste should be dimensioned to allow all shunting of the long distance trucks (3 axe trucks).

Additional areas should be foreseen for:

- future sorted fraction 3 bunker and storage construction (for P&C, Plastics and metals, for example)
- for replace containers
- for social facilities

Retaining wall

In order to avoid landslides and for the structure of the unloading platform and the access ramp the complete structure lays on retaining wall system. The retaining walls should be dimensioned according structural calculation

Water supply

If there is no public water supply network in the vicinity of the TS site, a water supply system is to be foreseen for the employees. The small number of employees (3 persons) requires only a tank solution.

Number of employees	3
Water demand (drinking water, toilet and shower purposes)	100 l/cap/day
Q_{drinking}	500 l/day
Peak factor	1,5
Q_{peak}	750 l/day
Water reservoir (for example	4.000-5.000 l PE (Polyethylene) as surface tank with feeding pump weekly recharging

Lightning

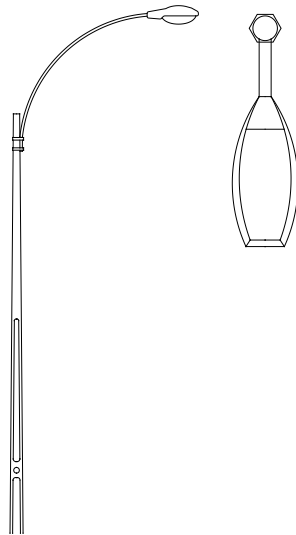
The site should be illuminated adequately. For the external illumination lightning pole should be foreseen.

Outside requirement: 20 lux. Galvanized steel polygonal street lighting pole.

- Height: 7 m
- Steel Polygonal Pole.
- Flange and anchor bolts included.
- Arm brackets. 1-side illumination. Steel arm for mounting lighting fixtures.
- Hot Dip Galvanized.

- Anchor Bolt. Steel J type bolts for anchorage.
- lighting fixtures:

Input: 230V AC 50Hz
Mounting: Surface Mount
Insulation type: Class I, Must earth
IP rating: IP65
Lamp Type: Max 112 x 1 W
Control Gear: 112 W , w/ 350 mA constant Output
Adjustable direction: Fixed
Wiring: W/ Terminal Block
Main Material: Aluminium
Including cable, earthings



Lightning pole:

Radiation angle : 120°

Numbers of lightning poles: to be determined min.:

2 on the upper side of unloading area

1 down side of unloading area

1 next to firefighting reservoir

1 next to buildings (control/social)

Outside electrical work

Electrical supply should be provided by connecting the site with the electrical grid of the Island.

Inside electrical works should include the power supply cable from low voltage distribution network to Main Distribution Panel board, also the others low voltage cables supplying, external lighting panel, including delivery and laying of the cables in plastic conduits including earthing system.

Fire fighting

For fire protection of the transfer station, a firefighting system is to be foreseen. The system could be consisting of a firefighting reservoir (concrete reservoir) and a suction pump (including firefighting accessories, hose etc.) The reservoir should be located next to the transfer area in the proximity of the waste container (fire source). For the entrance area and the buildings some manual extinguishers have to be foreseen.

Water demand for fire fighting	48 m ³ /h
fire duration	2 h/day
Q _{firefighting}	96 m ³ /day
Water demand for irrigation	10 l/day/m ²
Q _{irrigation}	500 l/day
firefighting water reservoir	150 m ³ Concrete tank with feeding pump
Pump	mobile pump /Diesel aggregate Q = 48 m ³ /h P = 5 Bar

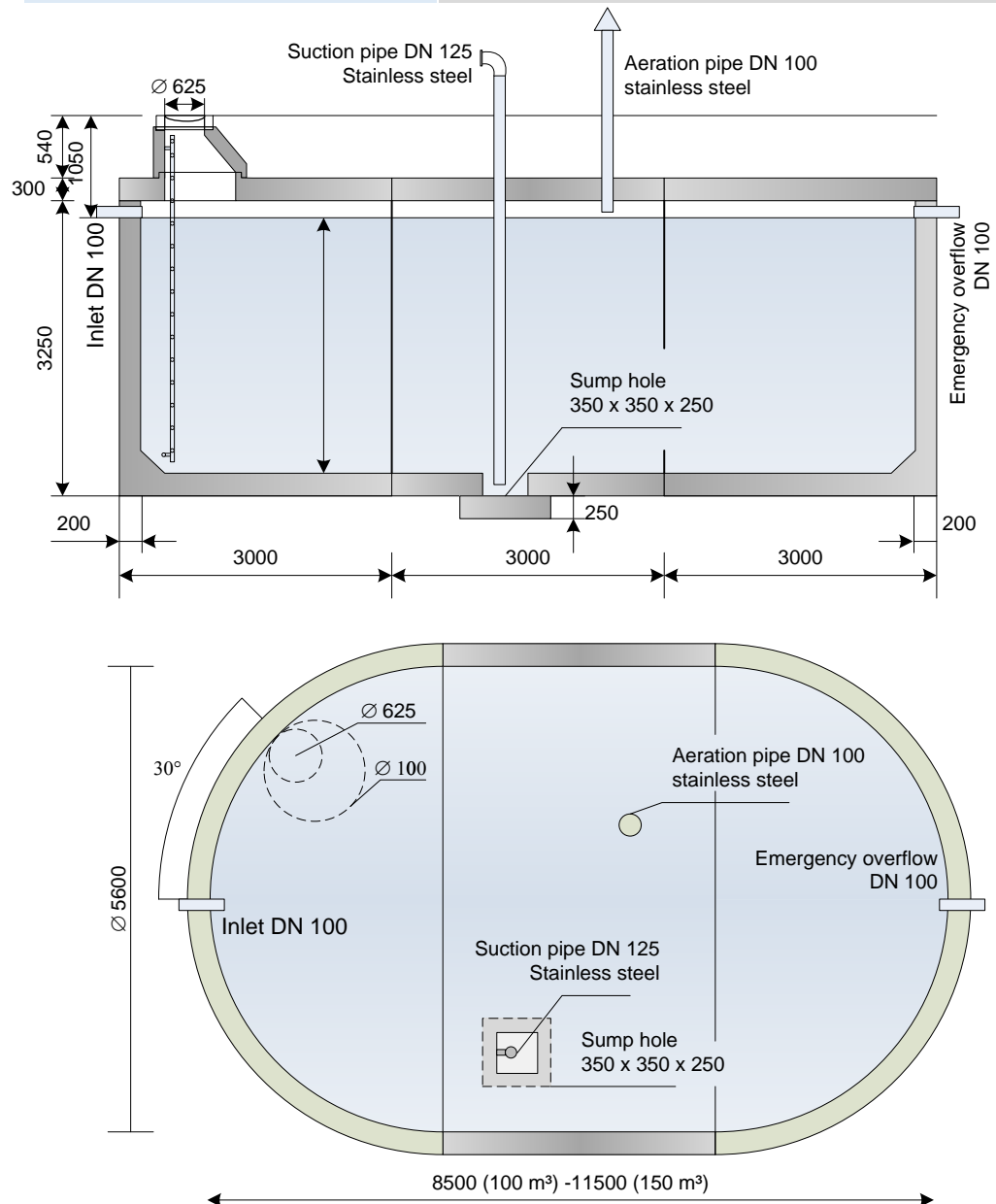


Figure 28: Scheme of a firefighting tank

Landscaping

Landscaping plan should be part of the detailed design. The TS is close to some habitations. Some protective measures with local plants and trees should be foreseen in order to be in harmony with the surrounding landscaping.

Signing

The TS should have all signing measures in order optimize all incoming and out coming flows. Customized signing boards for the infrastructure and the communication path should be included.

Equipment

Truck			
			
			
Axe	6 x 4 (3 axes)		
Dimension Chassis	Width 2,30 m		
Min emission standard	EURO III min.		
Additional	with Hook lift device		
Hook lift device capacity	min 17 t		
Example type chassis	Hyundai 260 or similar		
Containers	Width [m]	Length [m]	Height [m]
			
25 m ³	2,3	5,0	2,00
Waste handler			

