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C O D P R A C T I C Î N C O N S T R U C Ţ I I

C.01.08

CLĂDIRI ŞI FUNCŢIONALITATEA LOR

**CP C.01.08:2016**

**Construcţii civile**

**Construcţia toaletelor uscate cu colectarea separată  
a excrețiilor**

EDIŢIE OFICIALĂ

MINISTERUL DEZVOLTĂRII REGIONALE ŞI CONSTRUCŢIILOR

CHIŞINĂU 2016

## **Code of Practice in Construction**

# **CP C.01.08:2016**

## **Construction of Urine Diverting Dry Toilets**

### **Preamble**

- 1 DEVELOPED by Asociația obștească Femeile în Dezvoltarea Durabilă a Moldovei (WiSDOM Association).
- 2 ACCEPTED by the Technical Committee for the Technical Norms and Standardization in Constructions CT-C 05, protocol nr. 04 from 20.06.2016.
- 3 APPROVED AND ISSUED through the order of the Ministry of Regional Development and Construction nr. 91 from 13.07.2016 (Monitorul Oficial al Republicii Moldova, 2016, nr. 217-229, art. 1210), enforce from 22.07.2016.
- 4 DEVELOPED FOR THE FIRST TIME.

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## 1 Field of application

- 1.1 This norm is applied to planning, construction and use/maintenance of private and collective urine diverting dry toilets (UDDT).
- 1.2 This norm refers only to individual or collective UDDTs. It cannot be applied to public toilets.

## 2 References

- 2.1 NCM A.08.02:2014 Securitatea și sănătatea muncii în construcții.
- 2.2 NCM C.01.03:2000 Proiectarea construcțiilor pentru școli de învățământ general.
- 2.3 NCM C.01.04:2005 Clădiri administrative. Norme de proiectare.
- 2.4 NCM C.01.06:2014 Cerințe generale de securitate pentru obiectele de construcție la folosirea și accesibilitatea lor pentru persoanele cu dizabilități.
- 2.5 NCM C.02.02:2004 Clădiri de producție.
- 2.6 NCM C.02.03:2004 Clădiri de depozitare.
- 2.7 NCM C.04.02:2005 Iluminatul natural și artificial.
- 2.8 NCM C.04.03:2005 Învelitori. Norme de proiectare.
- 2.9 NCM E.03.02:2014 Protecția împotriva incendiilor a clădirilor și instalațiilor.
- 2.10 NCM E.04.01:2006 Protecția termică a clădirilor.
- 2.11 NCM F.03.02:2005-A2:2015 Proiectarea clădirilor cu pereți din zidărie.
- 2.12 NCM F.05.01:2007 Proiectarea construcțiilor din lemn.
- 2.13 СНиП 3.04.01-87 Изоляционные и отделочные покрытия.
- 2.14 СНиП 2.08.01-89 Жилые здания.
- 2.15 СНиП 2.09.04-87 Административные и бытовые здания.
- 2.16 CP C.01.02:2014 Proiectarea clădirilor și construcțiilor cu considerarea accesibilității pentru persoane cu dizabilități. Prevederi generale
- 2.17 CP E.04.02:2013 Reguli tehnice de execuție a sistemelor de termoizolație exterioară și interioară a clădirilor
- 2.18 CP E.04.03:2005 Protecția anticorosivă a construcțiilor și instalațiilor
- 2.19 CP G.03.01:2006 Proiectarea și montarea conductelor sistemelor interioare de alimentare cu apă rece și fierbinte cu utilizarea țevilor de oțel cu acoperire de polimeri
- 2.20 CP G.03.02:2006 Proiectarea și montarea conductelor sistemelor de alimentare cu apă și canalizare din materiale de polimeri
- 2.21 CP G.03.03:2011 Proiectarea și montarea conductelor subterane de alimentare cu apă din țevi de masă plastică cu fibre de sticlă
- 2.22 CP G.03.04:2011 Proiectarea, montarea și exploatarea sistemelor de canalizare interioară din țevi din polipropilenă
- 2.23 CP G.03.05:2011 Proiectarea și montarea sistemelor interioare de alimentare cu apă și încălzire a clădirilor din țevi de cupru
- 2.24 CP G.03.06:2011 Proiectarea și montarea conductelor subterane de canalizare din țevi plastice armate cu fibre de sticlă
- 2.25 SM SR EN 80:2013 Pisoare de perete. Cote de racordare.
- 2.26 SM SR EN 12541:2013 Robinetărie sanitară. Robinete de spălare cu apă și robinete pentru pisoare cu închidere hidraulică automată la PN 10.

- 2.27 SM SR EN 13407:2010 Pisoare de perete. Cerințe de funcționare și metode de încercare.
- 2.28 SM SR EN 14296:2010 Instalații sanitare. Lavoare colective.
- 2.29 SM SR EN 14688:2010 Obiecte sanitare. Lavoare. Cerințe de funcționare și metode de încercare.

### 3 Terms and definitions (please use an alphabetic sequence)

- 3.1 **Greywater** – the wastewater generated from bath, laundry and kitchen. Greywater does not contain toilet wastewater.
- 3.2 **Toilet cabin** – small fixed or mobile room specially designed for individual use for urination and defecation.
- 3.3 **Compost** – organic soil supplement produced through biological decomposing of organic waste. Other definition: organic matter that has been decomposed and recycled as a fertilizer and soil amendment.
- 3.4 **Adjacent constructions, attachments** – temporary or permanent buildings, usually constructed near the main building, designed to complement the function of the main building, together constituting a distinct functional unit.
- 3.5 **Human waste** – a special type of waste, which is product of human excretion, such as urine and faeces.
- 3.6 **Ecosan** – see Ecological sanitation.
- 3.7 **Liquid fraction** – the separately collected liquid part of human excreta, the urine.
- 3.8 **Solid fraction** – the separately collected solid part of human excreta, the faecal matter.
- 3.9 **Urinal** – a funnel like a sanitary plumbing fixture, designed for urination only, predominantly by males.
- 3.10 **Sanitation** – set of measures for protection of human health and the environment through provision hygiene and effective management of human waste.
- 3.11 **Ecological sanitation** – an approach in management of human excreta, in which nutrients and organic matter from separately collected fractions are safely recycled and reused in agriculture, .
- 3.12 **Toilet** – a bathroom installation with sanitary fixtures used for satisfying physiological needs and personal hygiene. Closet.
- 3.13 **Collective toilet** – a toilet that is used by a constant group of users, e.g. staff of an institution, organisation or company. Schools are excluded?
- 3.14 **Individual toilet** – a private toilet that is used by households.
- 3.15 **Urine Diverting Dry Toilet (abr. UDDT)** – an Ecosan type of toilet which functions without flushing of water. Dry toilet. A urine diverting dry toilet is a type of toilet with two outlets and two collection systems; one for urine and one for the faeces, in order to keep these excreta fractions separate and which is functioning without water flushing.
- 3.16 **Toilet seat** – a ceramic, plastic, wooden, concrete or made of other rigid material bowl shaped sanitary unit designed for collection of human excreta in a toilet. There are two main types of toilet seats: sitting type and squatting type.
- 3.17 **UDDT toilet seat** – a urine diverting sitting or squatting toilet device
- 3.18

## 4 General principles

- 4.1 The present norm refers to design, construction and operation of UDDTs. This type of toilets operate on the principle of Ecosan [2], [3], [4], which refers to sustainable management of human waste by separate collection of liquid and solid fractions for reuse after proper treatment in agriculture, landscaping and forestry.
- 4.2 The design and construction of UDDT must be in accordance with the principles of ecological sanitation [2], [3], [4], proper management of human waste, according to WHO guidelines [5], to provide the necessary conditions of hygiene.
- 4.3 UDDT should be used and maintained only by trained or informed users, fully aware of the human excreta separation and the Ecosan concept.
- 4.4 UDDT toilet rooms should correspond to the general construction, sanitation and other relevant existing regulations and norms.
- 4.5 Conditions for fire safety should be based on the provisions and classifications adopted in NCM E.03.02.
- 4.6 The UDDT consists of the following main elements:
  - toilet superstructure: the toilet cabin itself;
  - toilet substructure: the basement, which is located under the toilet room and consists of one or two rooms for collection and storage of solid fraction (Figure 1);

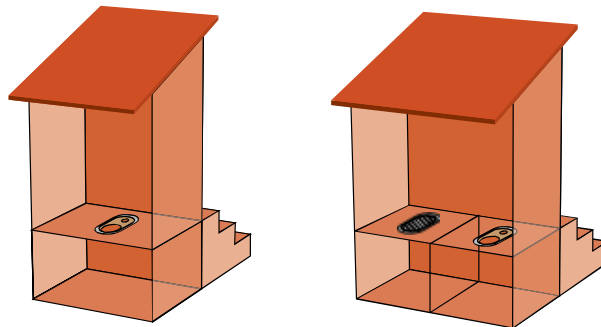


Figure 1 UDDT with one and a UDDT with two collection chambers (one vault and two vault).

- toilet seat or squat, which allows separate collection of liquid and solid fractions of excreta (Figure 2);

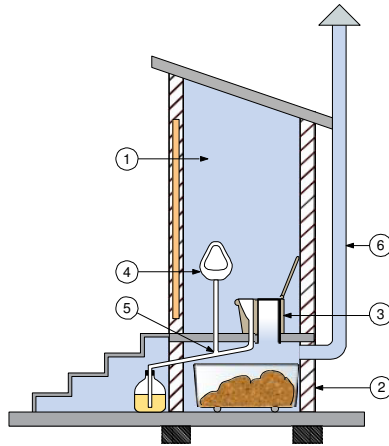


Figure 2 The general schematic of a UDDT.

The key elements: 1) UDDT superstructure; 2) UDDT substructure; 3) toilet seat; 4) urinal; 5) urine collection piping; 6) ventilation system.

- urinal (according to SM SR EN 80 and SM SR EN 13407), which is waterless or not connected to the water supply system; a strong requirement in men's compartment of collective UDDTs and optional in private UDDTs;
- piping system for collecting and discharge of urine (according to CP G.03.02, CP G.03.04 and CP G.03.06);
- ventilation system for replacing odour and moisture from collecting chamber;
- lavatory (according to SM SR EN 12541, SM SR EN 14296 and SM SR EN 14688), connected to the greywater collection system (Figure 3);
- one or two urine reservoirs;
- if the greywater collection system is not connected to centralised sewerage, UDDT should have its own greywater treatment and discharge units.

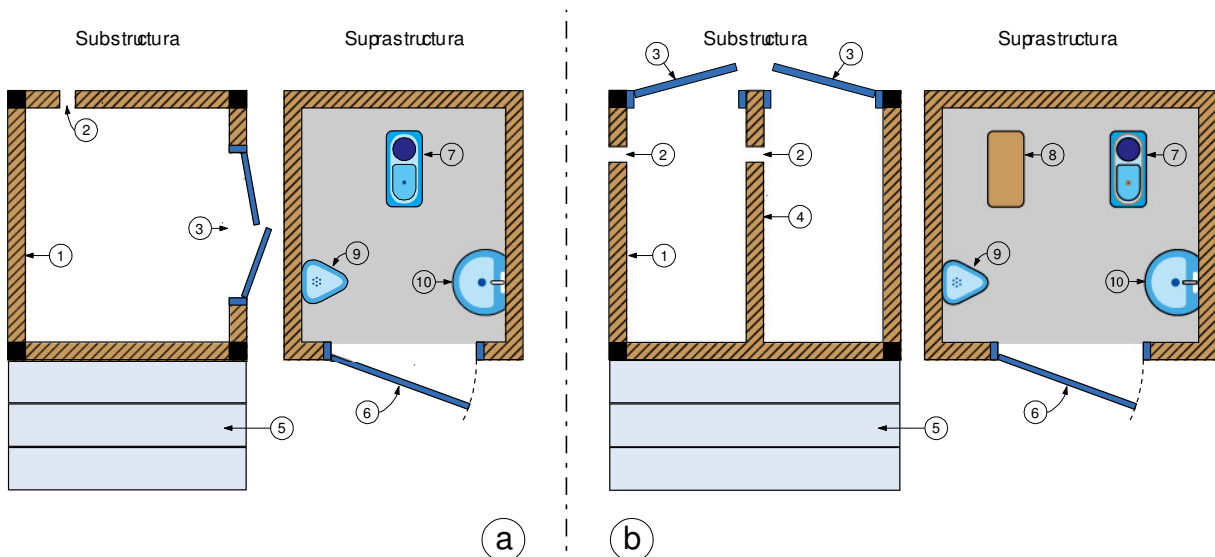


Figure 3 General top view of a UDDT: a) single vault UDDT; and b) double vault UDDT.

Legend: 1 – substructure wall; 2 – ventilation extraction hood; 3 – collection chamber door; 4 – partition wall; 5 – stairs to the toilet cabin; 6 – main entrance door; 7 – toilet seat/squat (UDDT type, removable); 8 – second place for installing the toilet seat or squat; 9 – urinal; 10 – handwashing facility.

## 5 Location for the UDDT

5.1 There are four main options for placing UDDT (Figure 4):

- 1) separate building, located near the main building;
- 2) adjacent building attached to the building, with entrance from the outside;
- 3) adjacent building attached to the building, with entrance from inside the house;
- 4) UDDT located inside the building.

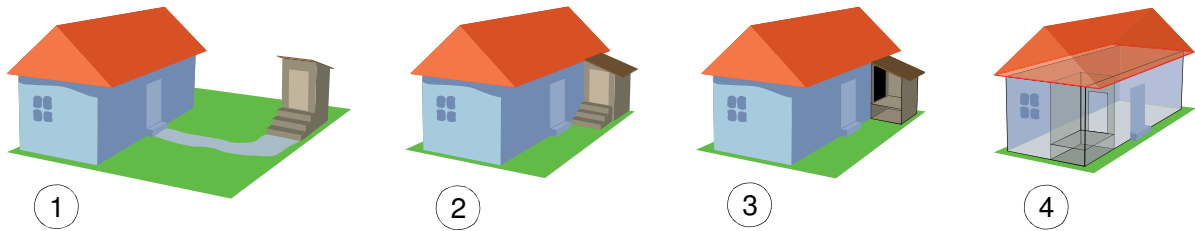


Figure 4 Examples for placing of a UDDT in relation to an existent building.

5.2 For collective UDDTs the same options can be used, however in order to assure a better use and management of the toilet the 2 and 3 options are recommended (Figure 5).

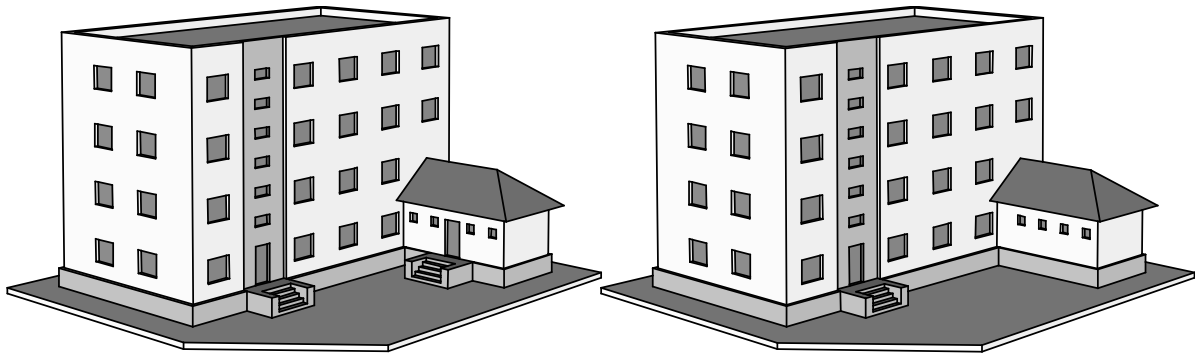
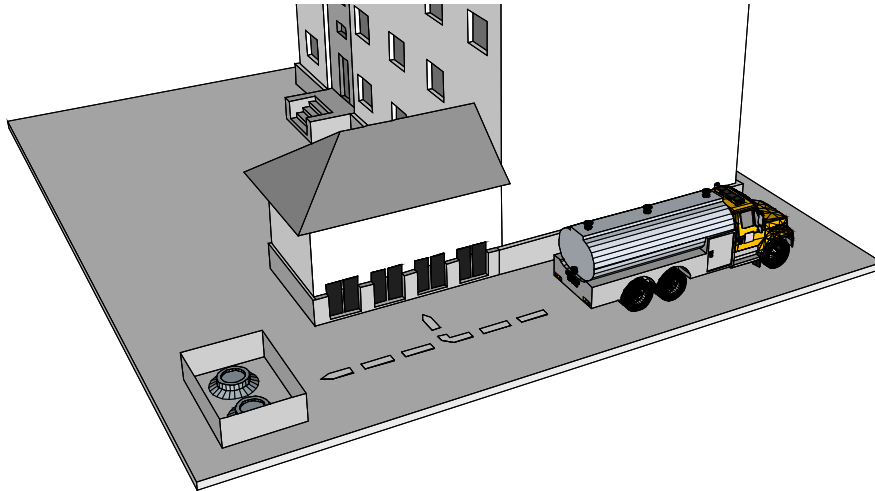


Figure 5 placement of collective UDDT relative to the main building; 2 and 3, attached to the main building, are the recommended options.

- 5.3 For the adjacent constructions legal construction authorizing procedures should be applied [1], as well as the relevant norms on construction of buildings, including thermal insulation (CP E.04.02-2013, NCM E.04.01), the access to key elements of the building, connection to water and sewerage networks (CP G.03.01, CP G.03.02, CP G.03.03, CP G.03.04,) and connection to electricity.
- 5.4 For all types of location, including that when UDDT is placed inside other building (Figure 4(4)), access to collection chamber directly from outside should be provided.
- 5.5 In collective toilets, where considerable amounts of excreta are collected, the unhindered access for special transportation units to the chamber openings and urine tanks should be assured (Figure 6).





*Figure 6 Access ways for the special transportation units to the collection chambers and urine tanks in collective UDDTs.*

## 6 Substructure with two collection chambers

- 6.1 The substructure is generally intended for the collection, temporary storage, on site dehydration and hygienisation of solid fraction of human excreta. Also inside the chambers pipelines can be placed for liquid fraction collection and disposal of greywater.
- 6.2 The basement consists of two equal rooms separated by a partition wall. On the ceiling of each chamber there should be an opening for mounting the removable toilet seat or squat. Both chambers are connected to a ventilation system (according to Chapter 13).
- 6.3 In collective toilets all the cabins will have under-structures with the same set of constructive elements, as stated in 6.2.
- 6.4 The operation principle is based on alternating the collection of solid fraction from each chamber consecutively. While one chamber is used for collecting, the other chamber, which is already full from the previous cycle, is stored under favourable conditions to achieve slow composting.
- 6.5 The alternating cycle length depends on the storage capacity of the collection chambers and should not be shorter than 2 years.
- 6.6 The size of the collection chamber depends on the maximal volume of faeces, which could be collected after a 2 year period depending on the usage by a certain number of users. The height is the most variable dimension, but it should not be less than 0.6 m in individual toilets and less than 1 m in collective toilets. The perimeter of the collection chamber is equal to that of the superstructure cabin.
- 6.7 The walls of the chambers should be constructed strong enough in order to support all the superstructure above. They should be resistant to external weather conditions (according to NCM F.03.02, СНиП 3.04.01).
- 6.8 All the interior surfaces should be covered with appropriate wall coating (according to SNiP 3.04.01-87).
- 6.9 At the end of each cycle the collection chambers need to be emptied. Each chamber will have a door with an opening large enough to ensure unhindered access for manual evacuation of the composted mixture. In the inner side of the door opening a raised 0.1 m threshold should be constructed, in order to avoid seeping in of rainwater.

- 6.10 The doors will be built from impermeable and resistant materials. In order to make the doors airtight and inaccessible to insects, they should be provided with gaskets. All corrosion vulnerable elements should be treated with anticorrosive materials (according to CP E.04.03).
- 6.11 In order to avoid unauthorised access all substructure doors should be locked with separate locks.

## **7 Substructure with single collection chamber**

- 7.1 The substructure is generally intended for the collection, temporary storage, on site dehydration and hygienisation of solid fraction of human excreta. Also inside the chambers pipelines can be placed for liquid fraction collection and disposal of greywater.
- 7.2 The substructure consists of a single chamber. On the ceiling there is a opening for mounting non-removable toilet seat/squat. The chamber is connected to the ventilation system through an extraction hood, which is installed either on the wall or on the ceiling.
- 7.3 In collective toilets all the cabins will have substructures with the same set of constructive elements, as stated in 7.2.
- 7.4 In the collection chamber the solid fraction is collected in replaceable containers. The operating principle is based on alternating containers after filling them. Full containers are kept some time in the collection chamber. The frequency of emptying of full containers may vary depending on how quick they are filling up.
- 7.5 Usually the space inside the collecting chamber is insufficient for storing and preserving for a period of at least two years of all of the faeces (as recommended by OMS, [5]). In this case some of the containers are emptied prematurely and composting of the solids continues in specialised units outside the toilet.
- 7.6 Usually area and shape of the substructure correspond to that of the superstructure. The height will be at least 0.5-1.2 m, depending on the size and shape of the containers.
- 7.7 The volume of the containers for the solid fraction should be no more than 60 L, with the height of at least 0.40 m, the width of at least 0.45 m and the opening area no less than 0.4 m<sup>2</sup>.
- 7.8 The containers should be strong and impermeable, preferably made of non-corrosive materials, e.g. from plastic or stainless steel.
- 7.9 To assure easy handling of heavy (>40 L) containers they should be provided with wheels.
- 7.10 When the entire substructure space will be full, the oldest container should be removed and replaced with a new one. The opening of the door should be wide enough in order to ensure easy removal and for the transport of the containers.
- 7.11 The collection chamber door/doors should open to the outside. They should be built from impermeable and resistant materials. In order to make the doors airtight and inaccessible to insects they should be provided with gaskets. All corrosion vulnerable elements should be treated with anticorrosive materials (according to CP E.04.03).
- 7.12 In collective UDDTs each chamber should be provided with its own opening and door.
- 7.13 In order to avoid unauthorised access all substructure doors should be locked with separate locks.

## **8 Requirements for the superstructure**

- 8.1 The superstructure consists of the toilet cabin and, where appropriate, a room for hand washing or other adjacent rooms.

- 8.2 The toilet cabin must be at least 1.6 m by 1.1 m with door opening to the outside. The toilet cabin must be equipped with hand washing facilities, which will be located in the cabin or in the lavatory.
- 8.3 In the toilet cabin a seat or squat is installed (removable or fixed, depending on the UDDT type, single or two collection chambers) a hand wash basin. As recommended option or in case of collective toilets a requirement, in the cabin a urinal should be installed (according to SM SR EN 13407, SR EN 80).
- 8.4 The floor and the walls of the UDDT cabin should be covered with washable and non-slippery materials, such as ceramic tiles or plastic covers.
- 8.5 Each cabin should be illuminated electrically and, if possible, naturally by installing a small window (NCM C.04.02).
- 8.6 The ventilation of the cabin is done through the opening on the toilet seat, as it is described in the chapter 13, Figure 14. For emergency ventilation each cabin should be provided with an opening or a small window, which could be opened on necessity.

## 9 Special requirements for persons with disabilities

- 9.1 The building of collective UDDT should provide access to persons with physical disabilities (CP C.01.02, NCM C.01.06).
- 9.2 The entrance into the toilet building should be either on the same level of the main building or, in other cases a slope without steps should be provided.
- 9.3 At least one of the cabins will be designed and appropriately equipped for use by persons with physical disabilities. The cabin will be equipped with vertical and horizontal solid mounted handles. The dimensions are shown in the picture Annex A.

## 10 Design and placement of the UDDT seat/squat

- 10.1 The UDDT type toilet seat/squat is installed in place of the opening on the floor just above the container where the faeces will be collected (Figure 7).
- 10.2 The UDDT type toilet seat/squat is a special one, which interface is separated into two functional parts. Both openings correspond to physiological position of the human organs of excretion. The opening for solid fraction is an open channel through which faeces fall into the collection recipient. The urine is collected in a funnel-like part, which is connected to a pipe.

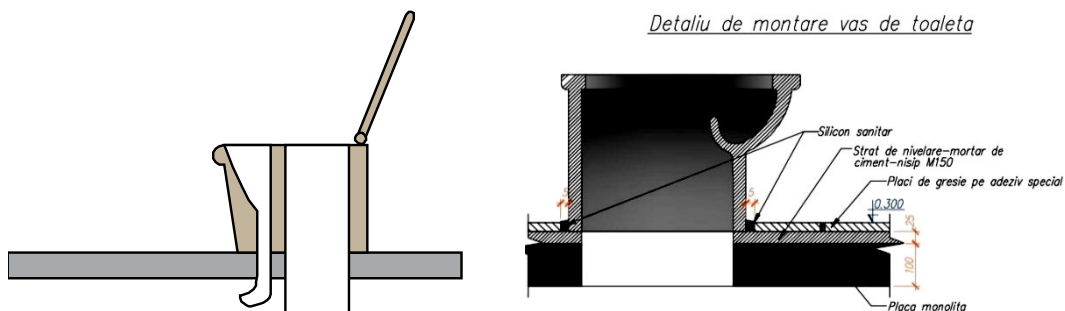


Figure 7 The schematic and the installing of a urine diverting toilet seat.

- 10.3 The height of the upper edge of the toilet seat to the floor must be between 40 and 48 cm.

- 10.4 The UDDT squat should be equipped with foot-shaped markings to show the user the correct position during use, in accordance with the shape and location of the squat functional openings (Figure 8, Figure 9).

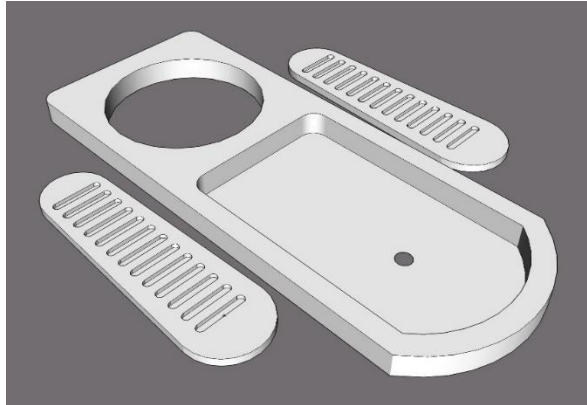


Figure 8 The approximate shape of the position of the feet of an UDDT dry squat.

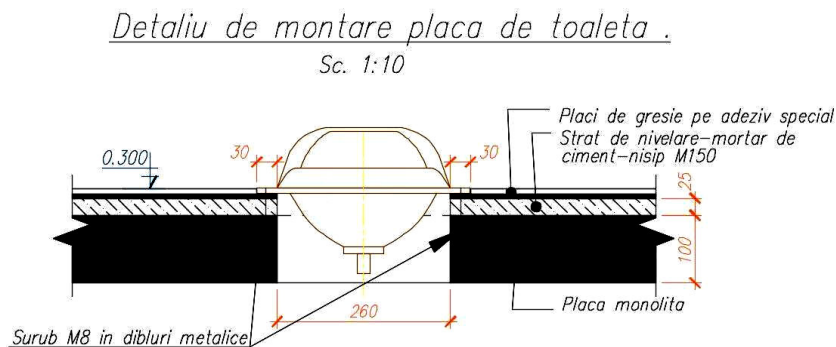


Figure 9 Schematic for installing of an UDDT squat into the floor

## 11 Piping system

- 11.1 The urine is collected from the funnel of the toilet seat/squat and, where appropriate, from the urinal. Through pipes or hoses the urine is directed to the recipient. To achieve a reasonable amount of urine collection tank the use of water should be avoided.
- 11.2 As pipes both, rigid tubes and flexible hoses or tubes can be used (CP G.03.02, CP G.03.03, CP G.03.04, CP G.03.05, CP G.03.06). It is recommended using pipes with smooth inner surface to avoid clogging.
- 11.3 The interior diameter of the pipes should be at least 20 mm for individual toilets and 50 mm for collective toilets.
- 11.4 When installing the pipes the appropriate angle of slope should be set up, which shall be at least 3.5 ° from the horizontal.
- 11.5 To stop odour circulation it is indicated to plunge the end of the pipe to the bottom of the urine recipient (Figure 10), as well as special valves (membrane-based or with floating ball) to be installed close to the toilet sit/squat funnel and, where appropriate, to the urinal ((Figure 11 Figure 12, Annex B).

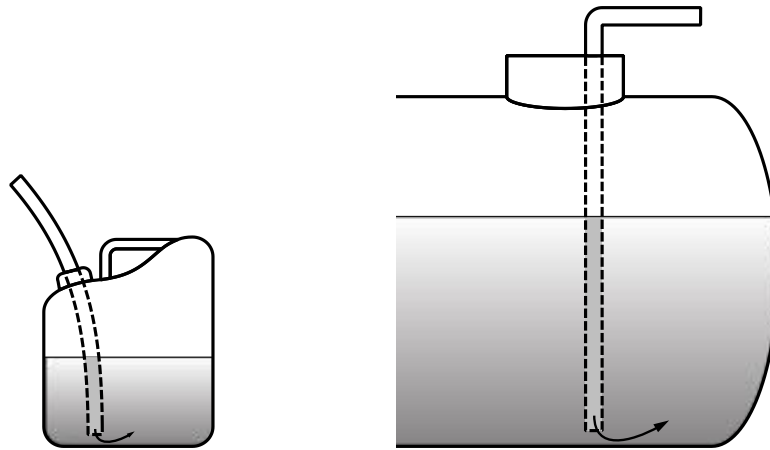


Figure 10 Smell stop through plunging of the end of the pipe nearby the bottom of the reservoir.

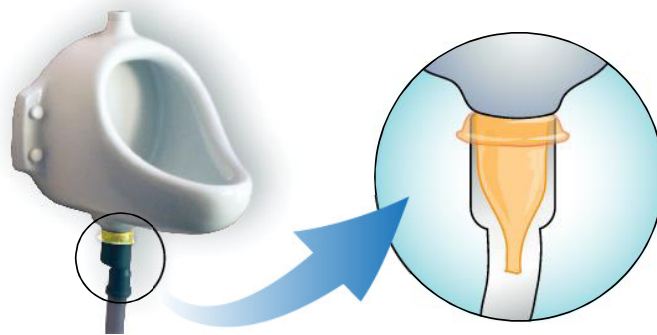


Figure 11 Examples of installed smell stops: the floating ball and the membrane valves (ex. end-cutted condom).

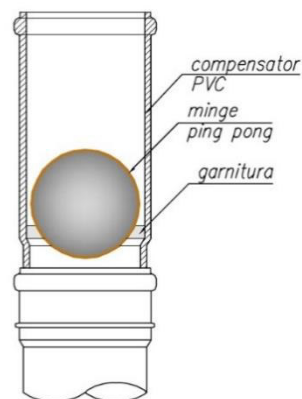
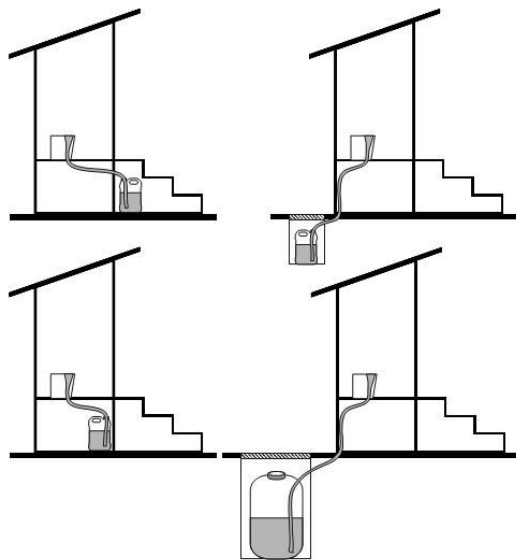


Figure 12 Floating ball valve. Should be installed on the connection of the 50 mm pipe (for canalisation) at the connection to the urinal or the urinal funnel of the toilet seat.

## 12 Reservoirs for liquid fraction

12.1 The option for the placement of the urine reservoir or tank will be chosen according to the specific construction and shape of the toilet, ensuring at the same time the necessary slope for the urine to easily flow by gravity into the reservoir (Figure 13). In order to avoid

- the freezing of urine during the wintertime the reservoirs and the pipes should be protected accordingly by ensuring the necessary insulation.
- 12.2 Urine is a volatile and corrosive liquid, therefore should be collected in impervious and resistant reservoir that can be closed. This reservoir should be made of impermeable and non-corrosive materials. If it is placed underground it should be also resistant to pressure from the soil layer, thus avoiding leakage and pollution to the environment.
  - 12.3 The underground recipients will be buried at such depth, which ensures a ground layer of at least 0.8 m above the floor of the reservoirs.
  - 12.4 In collective UDDTs two identical recipients will be installed, which will be used consecutively, according to 14.6.
  - 12.5 Switching off the active (in use) recipients is done using valves, which are mounted on the two pipelines feeding reservoirs. These valves are usually installed in the substructure, under the male's compartment. The flow of urine to a tank is achieved by closing the valve of the other tank.



*Figure 13 Different options for placement of urine reservoir.*

- 12.6 The reservoirs will be provided with appropriate openings, which allow easy access for emptying. The lid or cover of the opening should be closed and locked. The opening of the reservoir will be surrounded by a gravel pitching bed of 0.5 m wide and 100 mm thick.
- 12.7 Depending on the reservoir or tank material its interior and exterior waterproofing will be implemented.
- 12.8 The end of the pipe entering into the reservoir should be plunged to the bottom of the recipient (Figure 10).
- 12.9 For emptying large volume urine tanks the access for trucks should be ensured and appropriate mechanisms for connecting pumping hoses should be provided (Figure 6).
- 12.10 In order to avoid unauthorised access to the tanks they should be surrounded by fences with a gate.
- 12.11 The design volume of each recipient results from the frequency of emptying, related to the number of users and the desired on site storage.
- 12.12 When calculating the minimum required volume of the urine recipient for the individual UDDT the following formula (1) will be used:

$$V(L) \geq n \times t \times 6 \quad (1)$$

Recipient volume calculation formula for individual UDDTs ( $\leq 5$  users), where:  $V$  – the minimal recommended volume (L);  $n$  – number of permanent users;  $t$  – storage time (months).

12.13 When calculating the minimum required volume of one of the two tanks of collective UDDT the formula (2) will be used, given that a person in a collective toilet produce approximately  $0.002 \text{ m}^3$  of urine per month. Alternatively they could be guided by Table 1, where volume is indicated in relation to the number of users and the reasonable storage period of 6 months for ordinary collective toilets and 9 months for collective toilets in schools.

$$V(\text{m}^3) \geq n \times t \times 0,002 \quad (2)$$

Recipient volume calculation formula for collective UDDTs ( $\geq 5$  users), where:  $V$  – the minimal recommended volume ( $\text{m}^3$ );  $n$  – number of permanent users (min 5);  $t$  – storage time (min 6 months).

12.14 A special category are collective UDDTs in some institutions where users visit the toilets more often, for example in boarding schools. In this case the formula (3) should be applied, based on doubling the volume of collected urine.

$$V(\text{m}^3) \geq n \times t \times 0,004 \quad (3)$$

Recipient volume calculation formula for collective UDDTs in boarding schools ( $\geq 5$  users), where:  $V$  – the minimal recommended volume ( $\text{m}^3$ );  $n$  – number of permanent users (min 5);  $t$  – storage time (min 6 months).

Table 1 The minimal recommended volume for one of the two urine tanks in collective UDDTs (formula (2))

t	6 months	9 months*	6 months*
n	V ( $\text{m}^3$ )		
5	0,06	0,09	0,12
10	0,12	0,18	0,24
20	0,24	0,36	0,48
50	0,60	0,90	1,20
100	1,20	1,80	2,40
150	1,80	2,70	3,60
200	2,40	3,60	4,80
250	3,00	4,50	6,00
300	3,60	5,40	7,20

(\* - study time for scholar UDDTs);  $n$  – number of permanent users.  $t$  – storage time

## 13 Construction of ventilation system

13.1 In a UDDT facility the ventilation system has two main functions:

- i) replacing the air in the toilet cabin to ensure the required indoor air quality;

- ii) drying the faecal content by continuously extracting the wet air from the substructure of the toilet.

13.2 Ventilation can be passive, active or hybrid.

13.3 In order to achieve proper circulation the air is removed (sucked) from the chamber and not from the toilet cabin (Figure 14). For emergency ventilation or other special situations an extraction hood or a small window should be installed in each cabin which could be opened or closed on demand.

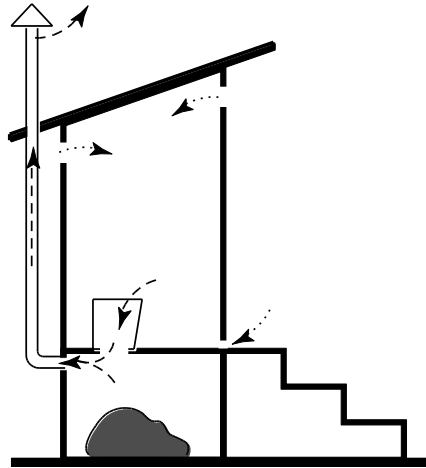


Figure 14 The correct schematic of the air circulation in passive ventilation system of UDDT.

13.4 There are two ways of installing the extraction hood:

- The hood is installed on one of the walls of the collecting chamber in close proximity to the cabin floor (Figure 15 a). In this case, the drawn out of the collection chamber pipe must be diverted as quickly as possible to the vertical direction.
- Through a hole on the floor. The air duct passes through the toilet cabin and through the ceiling (Figure 15 b).

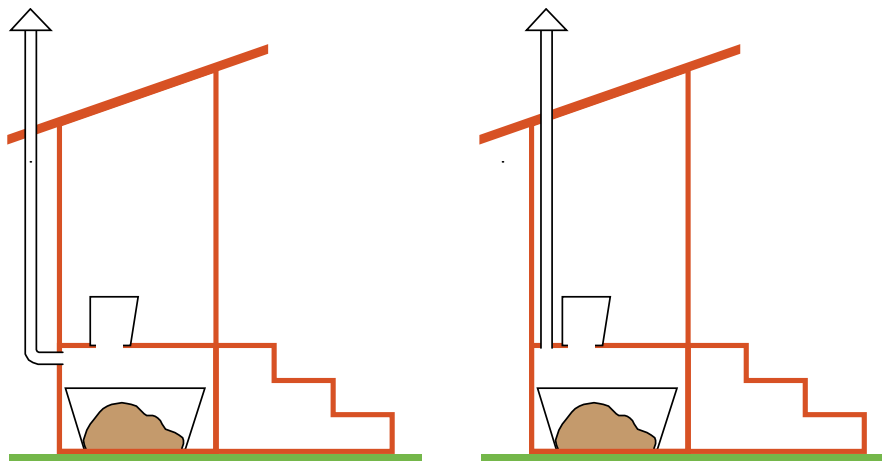


Figure 15 Two approaches in installing the ventilation extraction hood. Which one is a and b?

13.5 Rooftop vent pipe end must be at least 0.5 m above the roof or other object that obstruct the airflow. It is recommended to install a rotary turbine extractor.

13.6 Models with two collection chamber or UDDTs with more than two cabins (for the public toilets), should have a ventilation system for all chambers. For example, the chambers



can be provided with special holes in the partition walls of the collection chambers and installation of common exhausts to several chambers.

13.7 To ensure that both functions of the ventilation system (13.1) work, the extraction air flow rate should be greater than for conventional ventilation systems.

## 14 UDDT operation and maintenance

14.1 Operation and maintenance of individual and collective UDDTs include several activities, among which:

- collection, storage and disposal of solid fraction mixture;
- collection, storage and disposal of liquid fraction;
- diverting and use of greywater from toilet lavatory;
- cleaning of UDDT;
- ensuring the work and use safety.

14.2 Depending on the substructure type of the UDDT, collection of solid fraction is performed as follows:

- a) **One vault UDDT:** Under the toilet seat, in the collection chamber, the faeces are collected in a mobile container. When it is full it needs to be replaced by an empty container. The full container will be covered with dry organic materials, stored in the collection chamber (where the collection chamber has enough storage capacity) for decomposing for a period of 2 years. After two years the organic matter can be used in agriculture or scattered field [5], [6].
- b) **Double vault UDDT:** The compartments for the collection of faeces are used alternately. The toilet seat is installed above the first chamber, where the faeces will be collected until it is full. As soon as it was filled, the toilet seat is dismantled and installed above the second chamber, which is previously emptied from the content of the previous cycle. The hole, on which the toilet seat was previously mounted, should be firmly covered with a lid stopper. During the composting of faeces in the first chamber, the second chamber is filling with fresh faeces. After composting for at least two years, the chamber is emptied and the cycle continues.

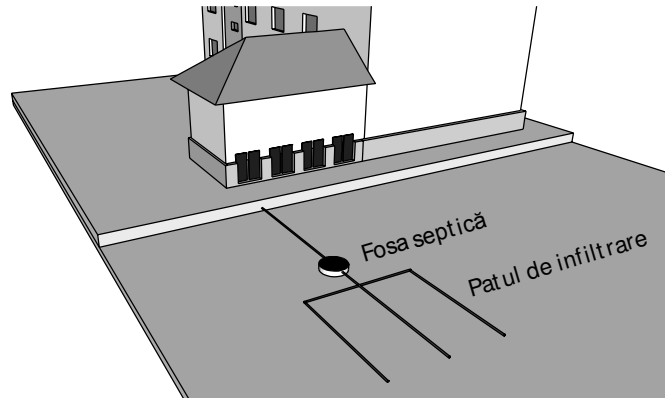
14.3 After extraction the solid fraction, which previously was sanitised either by long term storage as specified in [5] and [6] or by other means (composting with other organic materials), can be used according in one of the following ways:

- c) The sanitised product can be used as compost for fertilizing and soil conditioning ([5], [6]). Compost obtained from collective UDDT is recommended to be used for agriculture, decorative flower beds or in horticultural activities;
- d) b) If it is not desired or not possible to use the compost in agriculture, horticulture or for decorative plants, it is recommended burying it in less accessible areas and cover it with a layer of soil.

14.4 Solid fraction which is under-sanitized or its state of sanitisation is uncertain, should be buried under a soil layer, which should be at least 0.5 m thick. In cases where the burying will be done outside the toilet owner's property, a special permit from the local authority or the next owner should be requested, according to the requirements.

14.5 Liquid fraction, if collected separately, avoid mixing or contamination with solid fraction (10.2 [2]??), it is a practical pathogen free and very rich in nutrients ([6], [7])

- 14.6 However, if UDDT is collective, for the avoidance of doubt, the urine should be sanitized by keeping for at least 6 months after completion of collection.
- 14.7 In collective UDDTs there should be two separate urine tanks, which are filled alternately (12.4), allowing storage for at least 6 months in each recipient .
- 14.8 For evacuation of large volumes of liquid fraction special mechanised units will be used, e.g. cistern trucks, for which appropriate ways of access will be guaranteed, as stated in 5.5 and Figure 6.
- 14.9 The large volumes of extracted urine shall be used either as fertiliser [7] or shall be transported to a municipal waste water treatment plant (WWTP). In either case a prior agreement with the fertiliser buyer or with the WWTP administration is a requirement.
- 14.10 Greywater collected from the handwashing facility of UDDT can be either discharged to the centralised sewerage, if such exists, or discharged to an infiltration bed, as seen in Figure 16 and Figure 17. In bigger collective UDDTs, where the volume of greywater is higher, before using the infiltration bed it is recommended to install pre-treatment units, e.g. septic tanks (Figure 18).



*Figure 16 Greywater diversion system with infiltration bed and septic tank.*

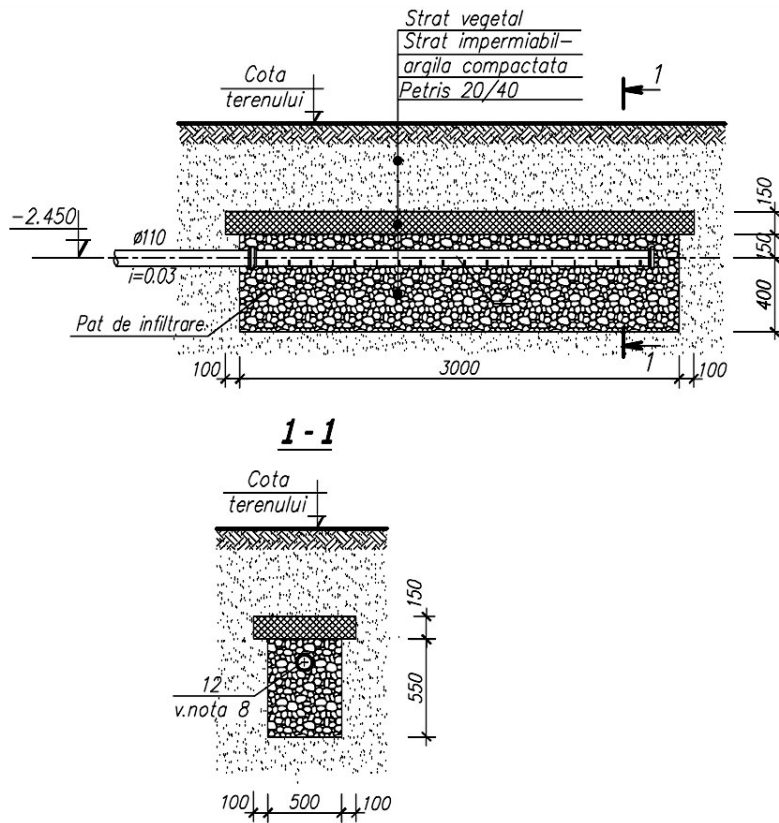


Figure 17 Schematic of an infiltration bed for greywater.

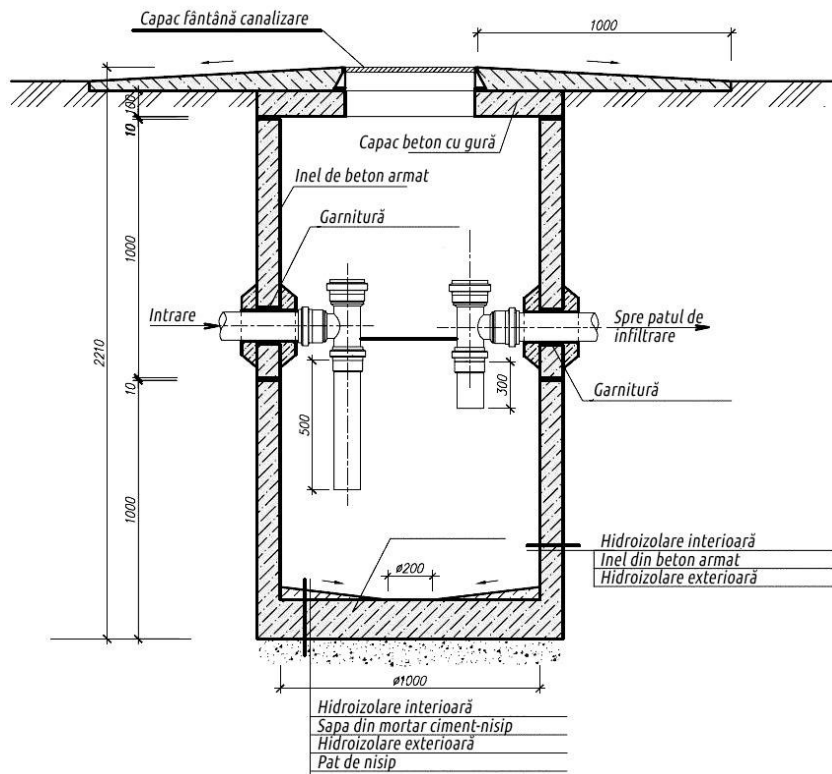
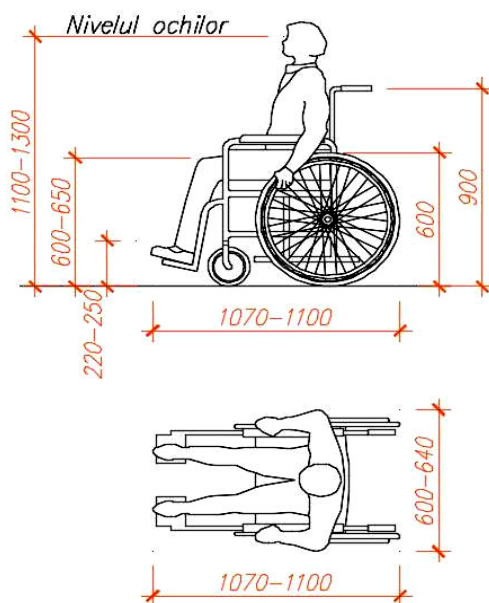
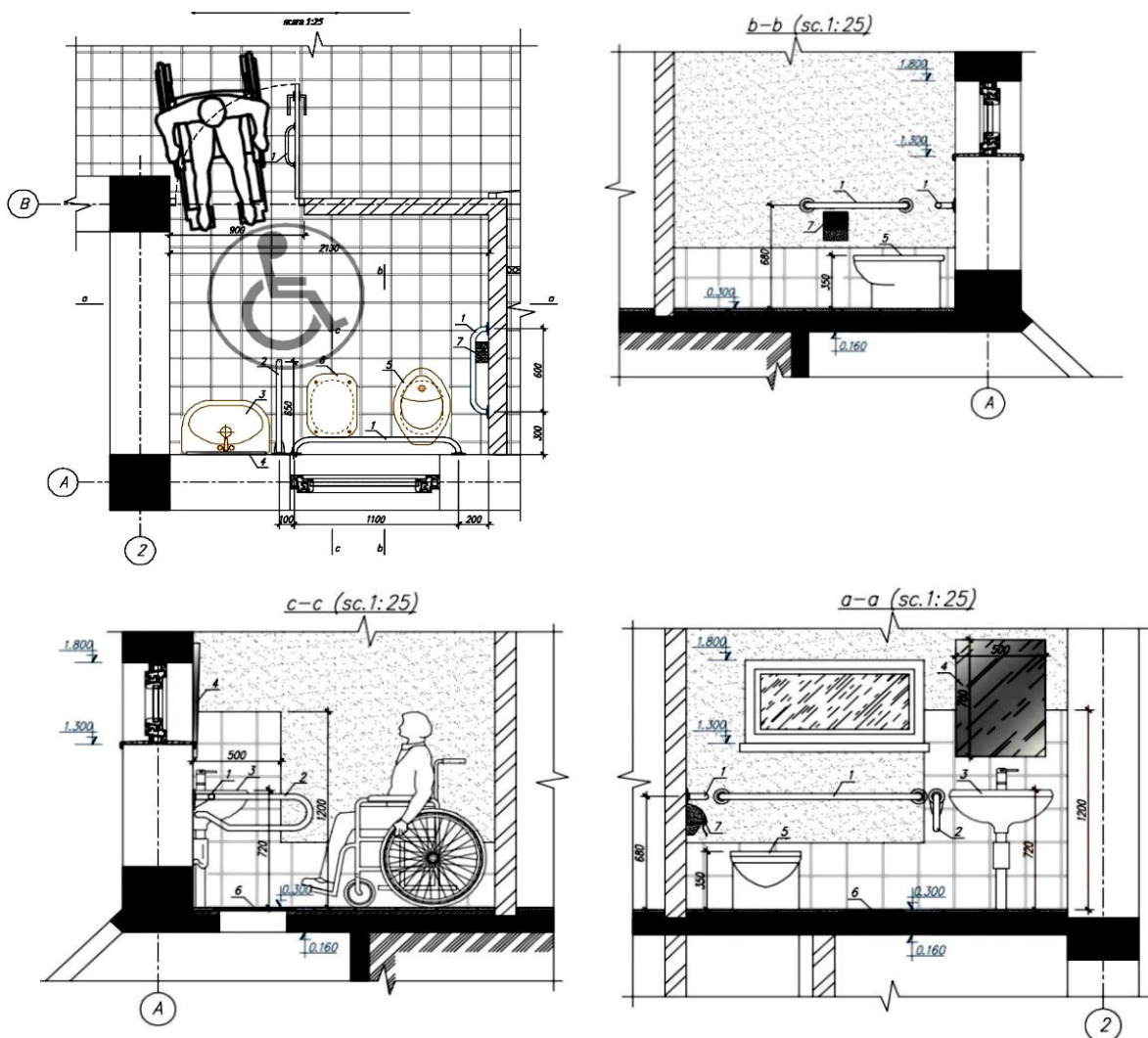


Figure 18 Septic tank for pre-treatment of greywater.

- 14.11 General inspection of the integrity and functioning of the toilet and its ancillary facilities is carried out at least once a year. Integrity of pipes, valves and the ventilation system should be carried out at least 4 times per year.
- 14.12 Cleaning activities involve removing dirt from all surfaces inside the toilet cabins and ancillary rooms, cleaning of the toilet seats, urinals and washbasins. When cleaning the toilet seats and urinals spilling any liquids into them should be avoided.
- 14.13 Given that human excreta are potentially dangerous in terms of health, the operation of UDDT should meet the relevant occupational safety procedure. Special attention will be given to protection from inhaling airborne pathogens, especially during evacuation of the solid fraction from collection chambers. Using rubber gloves and protective breathing masks is a requirement.

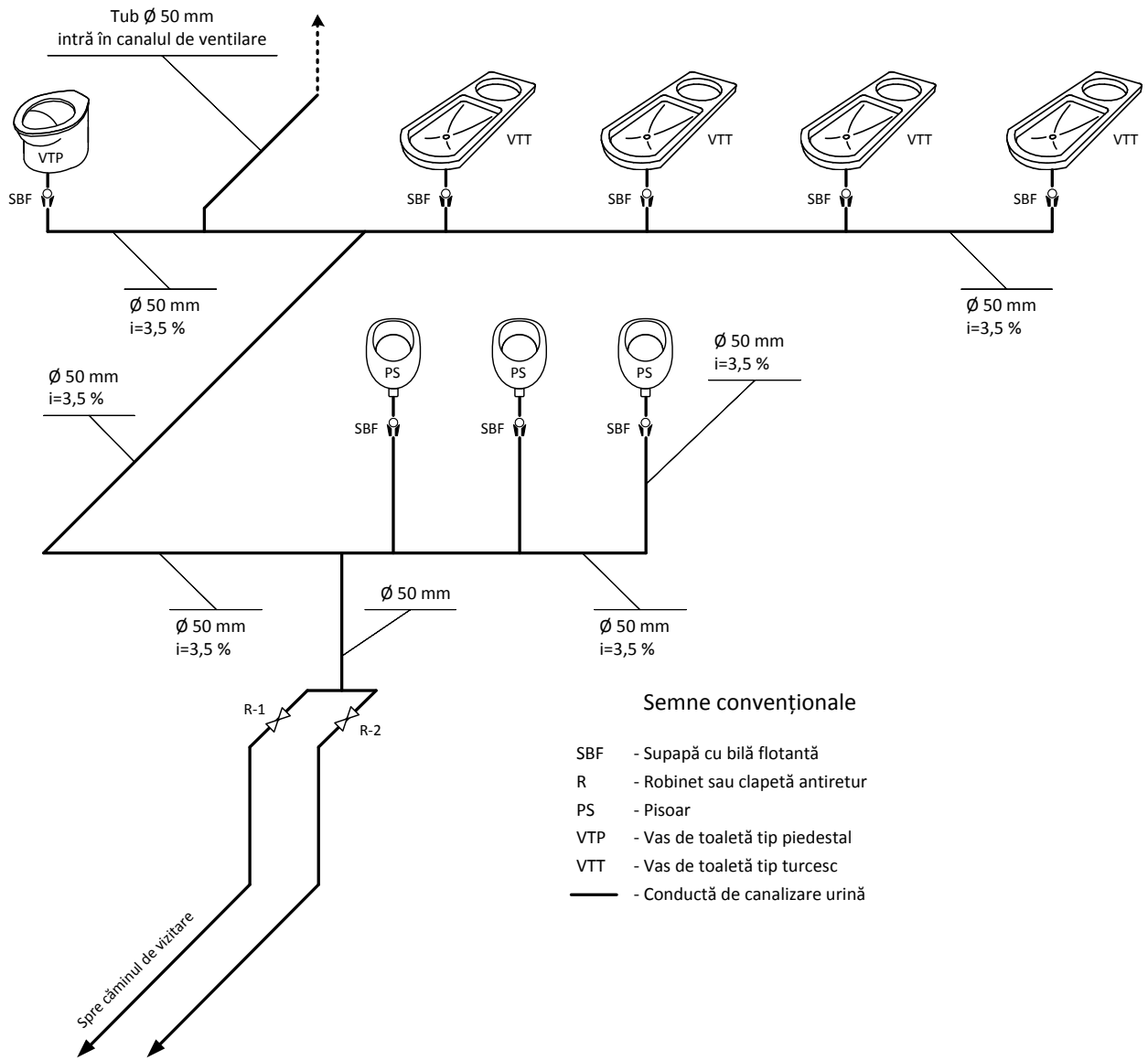
## Annex A (recommendation)

Placement and dimensions of the elements in the toilet cabin for persons with physical disabilities



**Annex B**  
(recommendation)

The schematic of the urine collection system in collective UDDTs



## 15 Bibliography

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