

THE DOOR FILTER ISOLATION DEVICE

Authors

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The door filter isolation device

Technical details and cost estimates

In the following pages we will get into more detail about the following topics:

- I. Initial analysis of the issue and medical advice
- II. The project objectives and how our solution responds to them
- III. Technical solutions, costs and final package

I. Initial analysis of the issue and medical advice

Intro Despite the numerous opinions of highly specialized people from the healthcare and administration offices, it is clear there is no consensus about how communities will recover after the lock-down. The optimum healthcare strategies have dire economic implications, financial systems and national budgets strain under the load of social expenses as it gets more obvious that a “cure for all” will not be at hand anytime soon.

In this context, we are worried about the near future, as more people will have to return to their jobs, contact with other will increase and the possibility of having to live with an infected member of the family also increases.

Built space and the pandemic This crisis has brought up many questions about the relationship between people and the spaces we dwell in, from an individual, to community and city scales. Streets became perfect scenes for empty dystopian photographs of the kind cherished by architecture magazines, showing the “undisturbed perfection” of architecture. Is this what we, as architecture professionals and creators of space and form consider valuable? We shift our view towards the relationship between the use of our “instruments” and their form and aesthetics, as they should be enhancing each other, not conflicting.

It is hard not to notice that, for some, the home changed from a refuge to a confinement. We can expect the feelings of fear and unease become more intense with the presence of a sick person. The obvious challenge arises of **reducing stress** both on the healthy and on the sick occupants.

Medical advice Resident Doctor Ana Maria Stoița from the Regional Hospital in Timiș County, was our consultant for the issues regarding the limiting of the spread of the virus. Together we reached a better understanding of the disinfecting procedures and the needs of persons in isolation. The main challenges in this respect was the **communication** with the patient: how to keep a connection in order to provide necessary treatment, food and other supplies without risking infection.

II. The project objectives and how our solution responds to them

Following our research and analysis we came up with a set of objective we consider every solution should follow.

1. quality living conditions for the isolated person:

- adequate space to live in for 14-30 days,
- enough room to move around,
- access to natural light and ventilation,
- access to media and entertainment

2. ensure a safe communication/exchange medium

- transferring fresh food, clothes, medicine without putting the others at risk
- easy cleaning and disinfection of objects transfered from the sick person to the outside

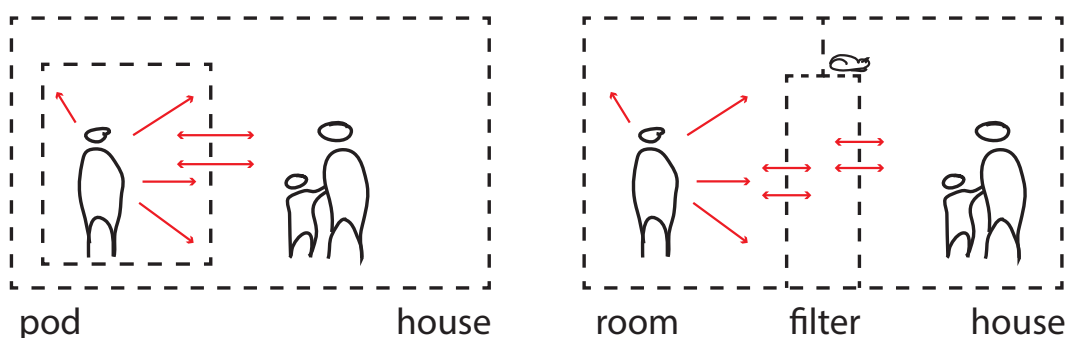
3. improve psychological comfort

- keeping contact with the other members of the family visually/by talking directly to eachother
- the possibility of entering in case of emergency

4. versatile and easy to use

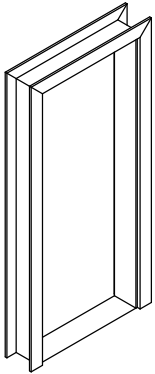
- must fit in all types of housing environments
- easy to install, light weight
- easy to clean and disinfect
- made from standardized parts
- reusable

Project description The main idea of the door filter is to be able to “seal off” an entire area of the house or apartment from the rest. This has numerous advantages, starting from the fact that we can offer adequate space for the sick person this way. Moreover, many dwellings have more than one bathroom so including them in the quarantined area will make it easy to provide basic necessities for the patient completely safe from the other inhabitants. Having a pod inside an apartment could lead to great restrictions on available space especially for the sick person and designing pods according to the available space would prove time consuming and financially unproductive.

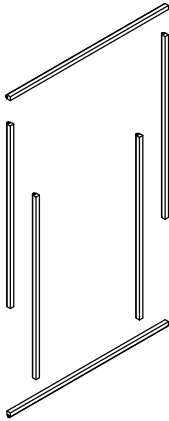


Doors or wall openings are mostly standardized elements, far easier to reference than space with all its particularities and personal arrangements made inside. **Our solution is based on a modular aluminum structure that is fixed on both sides of any door, creating a buffer space between the two parts of the house.**

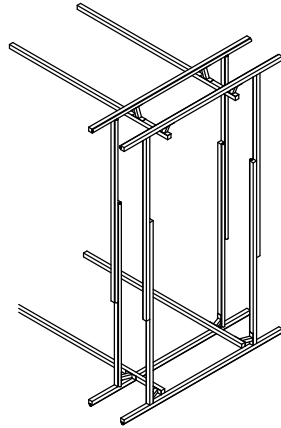
This space will contain disinfecting materials, UVC lights, and shelves so the objects can be placed from one side, disinfected and then removed from the other side. Passing through is also possible, with medical coats and gloves being stored inside to be disinfected by the UV light.



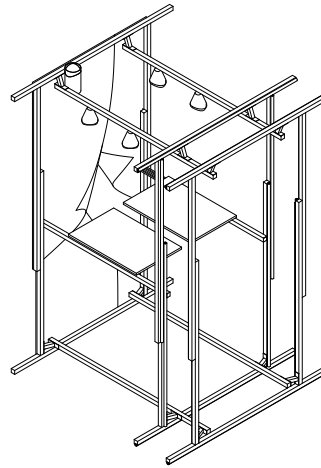
typical door frame, door leaf removed from hinges



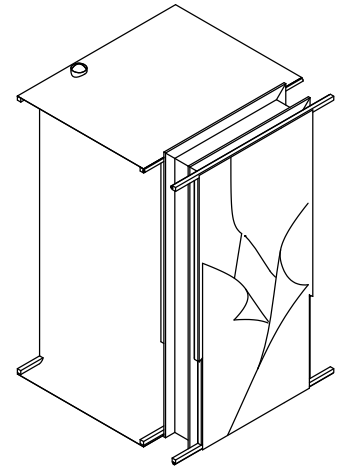
aluminum profiles can be fitted to many door sizes



a pair of aluminum profile frames on each side of the wall clamp tight with gaskets



supporting structure and hardware used for disinfecting mounted on the adaptable structure inside



the whole structure is covered in PVC coated Polyester material. Access held closed by magnetic strips.

1. living conditions advantages:

- using a whole room/are of the house offers more space than a capsule
- the windows allow for natural ventilation and light ensuring an adequate environment and contact with the outside. This factor should have great positive impact of the patient's mental state
- the room will provide enough space for the person to do minimal physical activities such as yoga
- the patient is in a familiar place surrounded by personal objects, books, electronic devices
- an optional bathroom module can be added to the filter module for situations where two bathrooms are not available. This is designed from the same structure as the frame and would be equipped with a water storage tank, portable toilet, shower and sink.

Possible drawbacks:

- all the objects in the quarantined area will be exposed to the virus which means that part of the house will not be usable for a longer period of time, until we are certain the survival period of the virus on any surface has passed.
- occupants of the dwelling must pay particular attention when ventilating the house. If windows are opened in the quarantined area and the rest of the house, a strong draft could push contaminated air from the patient's room to the rest of the house. The proposed system is not 100% airtight due to the adaptability requirements. This issue is easy to counter by ventilating rooms at different times.

2. safe communication and transfer of objects advantages

- the windfang system we propose offers enough space to disinfect objects sent and received from one part of the house to another (eating utensils, cleaning objects, personal items, bags with trash, etc) It includes:
- UVC lamps operated from the outside
- antibacterial gel dispenser
- disinfected mats on the floor
- space for medical coats to be stored in order to be disinfected by the UV
- ventilation system to create a negative pressure inside the filter
- light fixtures
- heating and humidity control in order to provide a warmer more humid environment, the least favorable conditions for the virus to survive.
- all the climate control hardware is easily available on the market and can be individually set to maintain certain parameters or controlled with simple DIY electronics like Arduino.

Possible drawbacks:

- access in the filter makes it less airtight
- all the equipment mentioned above will increase the price of the system and it's installation complexity



automatic hand sanitizer dispenser⁽¹⁾



small heating radiator⁽²⁾



air extractor⁽³⁾



humidifier⁽⁴⁾



UVC germicidal lamp⁽⁵⁾

3. improve psychological comfort

- we feel that one of the most disturbing situations is for the family and the COVID infected person to lose communication with each other. This happens often when the sick is admitted into the hospital and there is no option to see each other, visit and offer emotional support. Many times victims have died without their family being able to see them again due to the strict burial procedures in place. Having the option to see, talk and provide assistance to the sick person would have a great positive impact on their psyche.
- moreover, having someone there for us which can safely intervene in case of emergency should be very comforting
- another very important aspect is that our device would give the isolated person some peace of mind knowing that the chances of infecting the loved ones are reduced, and so reducing feelings of guilt and blame
- last but not least, we consider a great advantage to be able to pass through the sickness period in a familiar space, in a room surrounded by things which are familiar. It would give an impression of normality and help shift the focus away from the disease.

4. versatility and usage

- the door filter can cover almost any door because of the modular design. Most door frames have the same components, varying in size and finish. Our solution clamps the door from both sides using standard rubber seals to achieve an airtight fit over any surface.
- the structure for the frames is standard 30x30mm extruded aluminum profiles widely available for many industrial applications.
- connectors and fasteners are easy to install and allow for a great deal of flexibility in arranging the parts and hardware necessary on the inside.
- aluminum is lightweight and durable can be cleaned easily with soap and water get for disinfecting purpose.
- the PVC/Polyester foil is widely used for outdoor applications. It is chosen for it's water repellent proprieties, UV resistance, light weight and variation in colors available. It can be washed with soap, disinfected and reused.

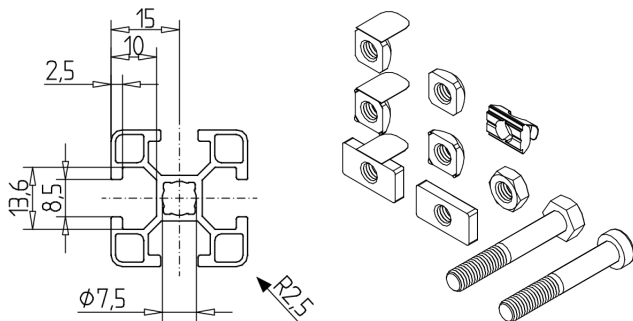
Possible drawbacks:

- the only non-standard parts are the steel spacing fixtures which allow the frame to be attached over the closing edges of the door. This pieces are very simple though and should be cheap and easy to manufacture in any metal shop.

III. Technical solutions, costs and the final package

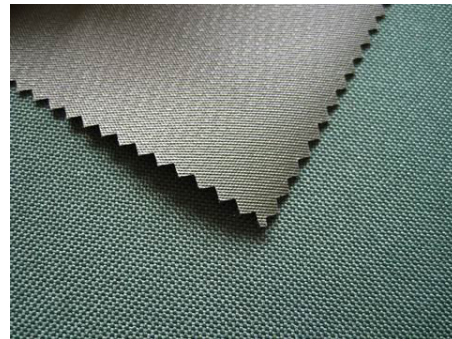
Structure

30x30mm extruded aluminum profile and standard fasteners ⁽⁶⁾



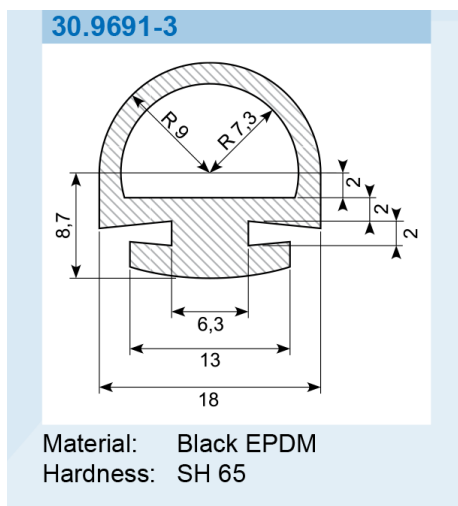
Closure

PVC coated polyester foil approx. 600g/m², 0.6-1mm thick ⁽⁷⁾



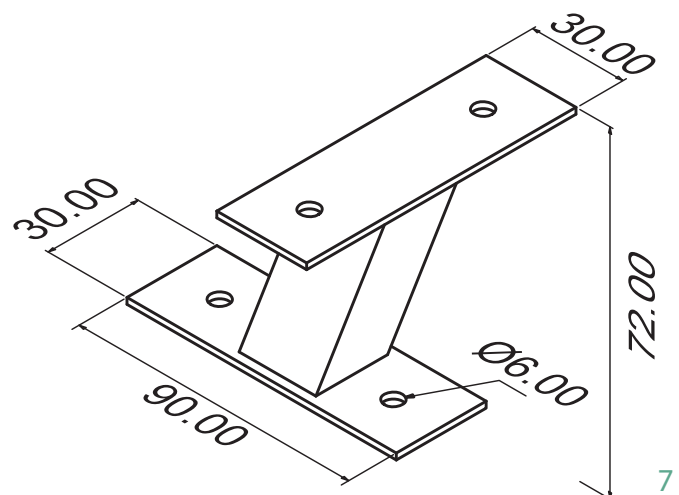
Sealing rubber

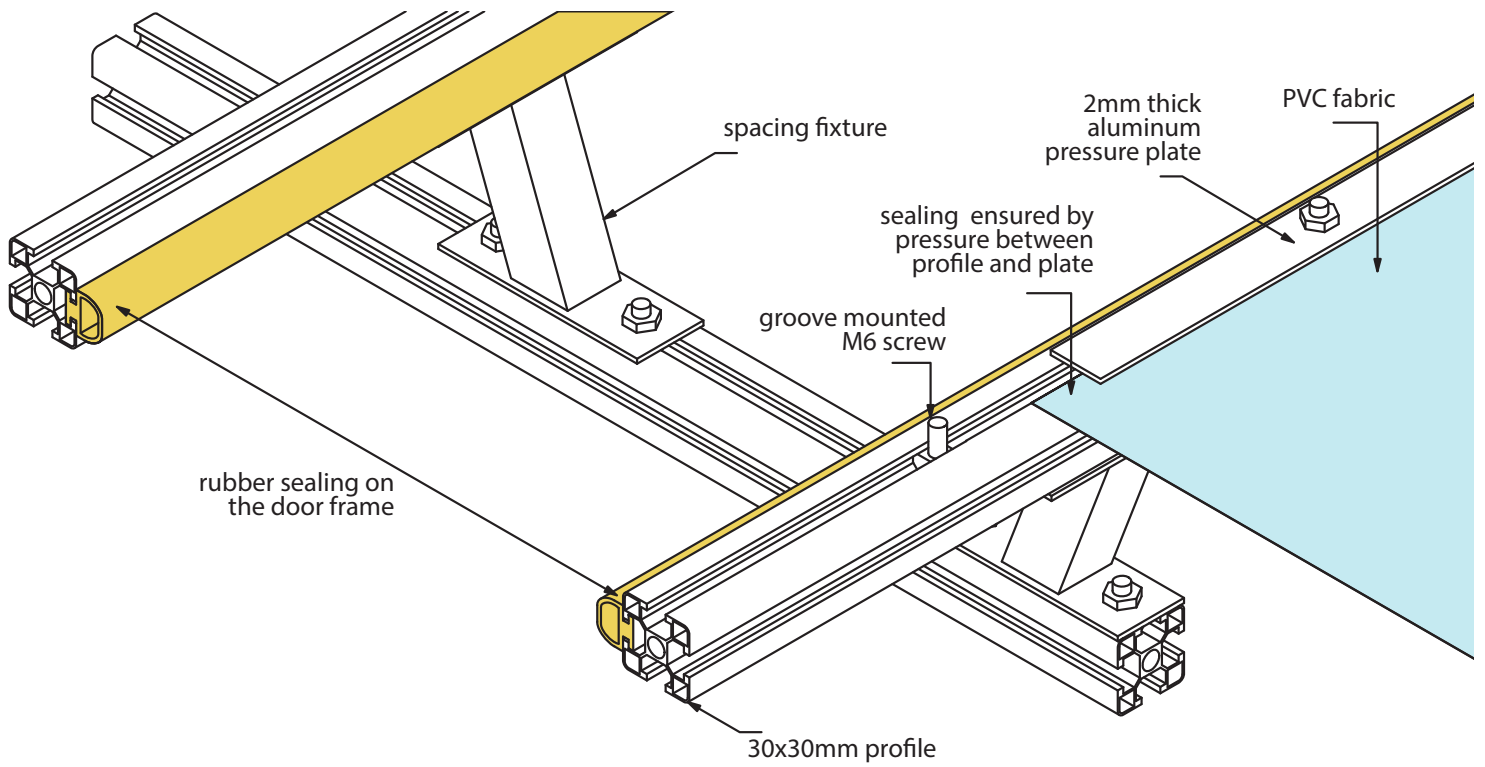
Standard rubber used in industrial/car manufacturing ⁽⁸⁾



Custom spacing fixture

2mm thick steel plate and square tube, cut and welded

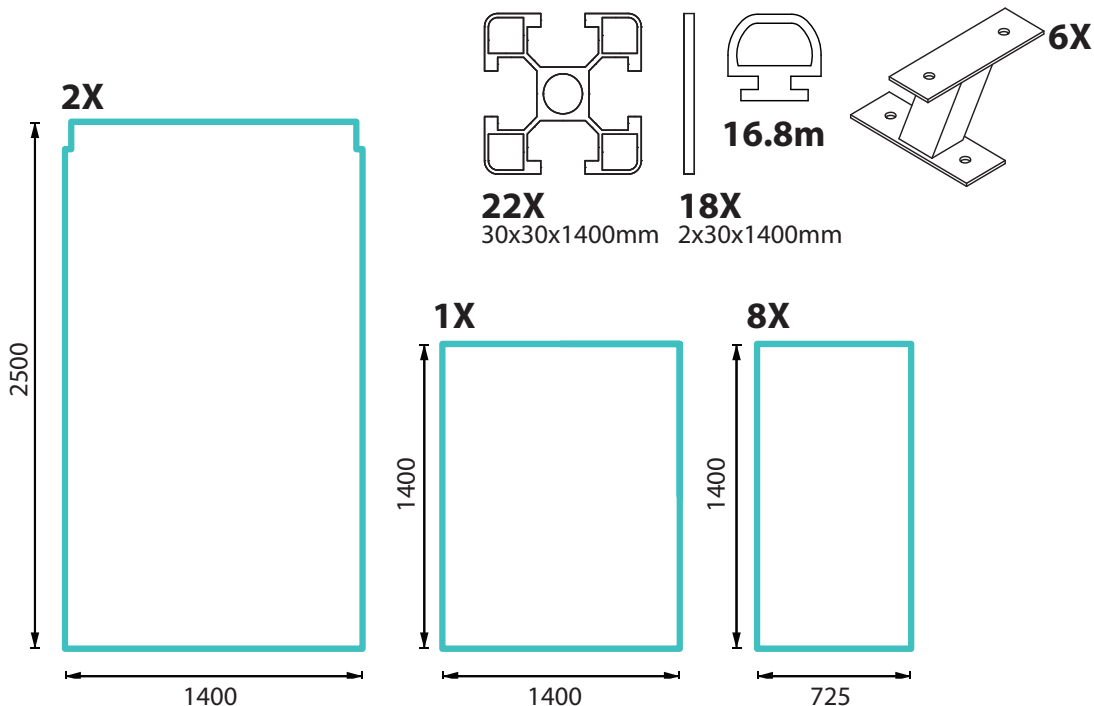




Structural detail

- the image above shows the simple mechanism for fixing to the door and sealing the foil on the frame.
- the spacing fixtures slide on the bottom rail in order to compensate for different wall thickness. Tightening the nuts on the rail secures the frames on both sides of the wall in place.
- after the frame is completely erected the PVC fabric can be fitted to the rails by pressing the top plate over the profile, ensuring a good seal.
- the groove mounted screws and other fasteners are standard allowing for plenty of mounting options

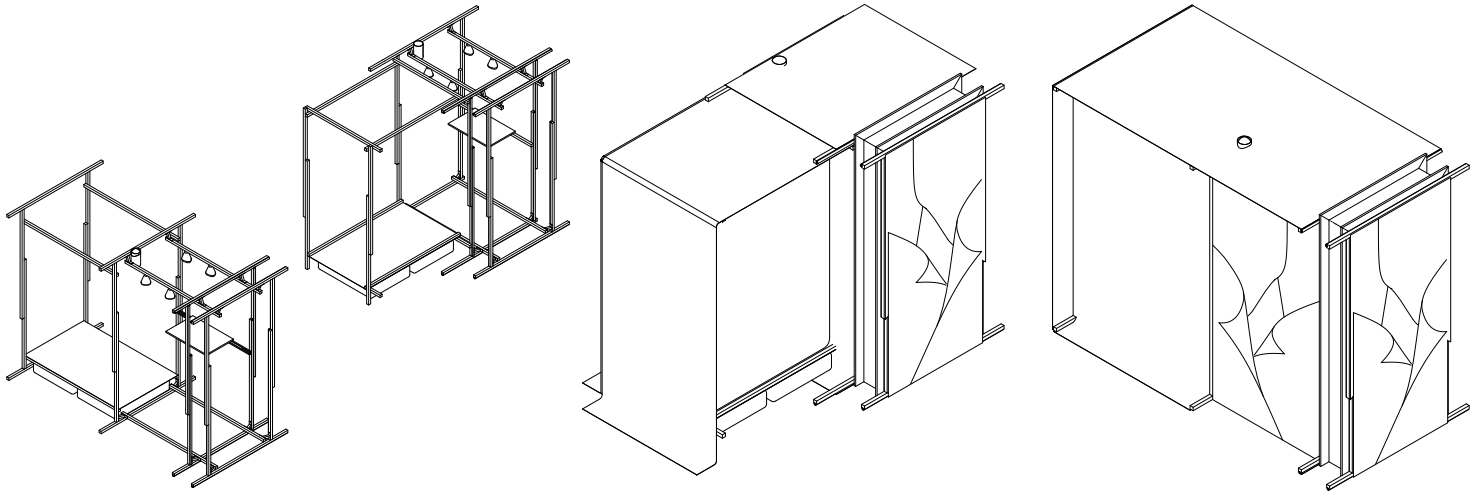
Installation KIT



Item	Size	Pcs.	Total	Price €
aluminum profile	30x30x1400mm	22+2	33.6m	250
aluminum pressure plate	2x30x1400mm	18	25.2m	94
rubber sealing	18mm width with groove profile,	12	16.8m	70
PVC coated polyester fabric	access sheets 725x1400mm	8	Roll of 1400mm width required length 9.7m	90
	top sheet 1400x1400	1		
	sides 1400x2500	2		
spacing fixture		6		40
UVC light		1		31
humidifier		1		25
air extractor		1		60
small heating radiator		1		20
sanitizer dispenser		1		20
fasteners		30		200
electrical	cables, switches, connectors, lights			60
perforated steel shelves	600x400mm	2		10
magnetic strip	30x140	12	16.8m	25
TOTAL				995 €

Bathroom module

- using mostly the same materials, a separated module can be attached to the existing filter structure in order to contain a toilet, shower and sink.
- the module can be positioned on any side of the filter in direct contact with it. It is important to allow for maximum flexibility with regard to different room layouts.
- persons outside can remove used water, provide clean water if necessary.



- proposed solutions are frequently used in camping to provide a safe, easy to clean and disinfect environment
- this module has a double layer of foil; the one on the inside acting as waterproof seal draining all the water towards a portable waste tank.
- there are many solutions on the market for waste water sanitizing and disinfecting in order to ensure no bad smells are present in the room and the WC waste can be safely disposed in the house toilet by the other members of the family



compatible portable sink ⁽⁹⁾



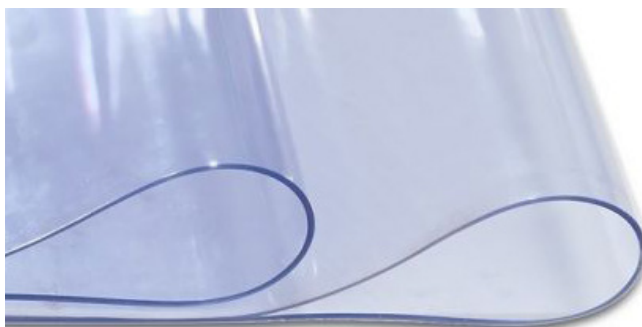
airtight portable toilet ⁽¹⁰⁾



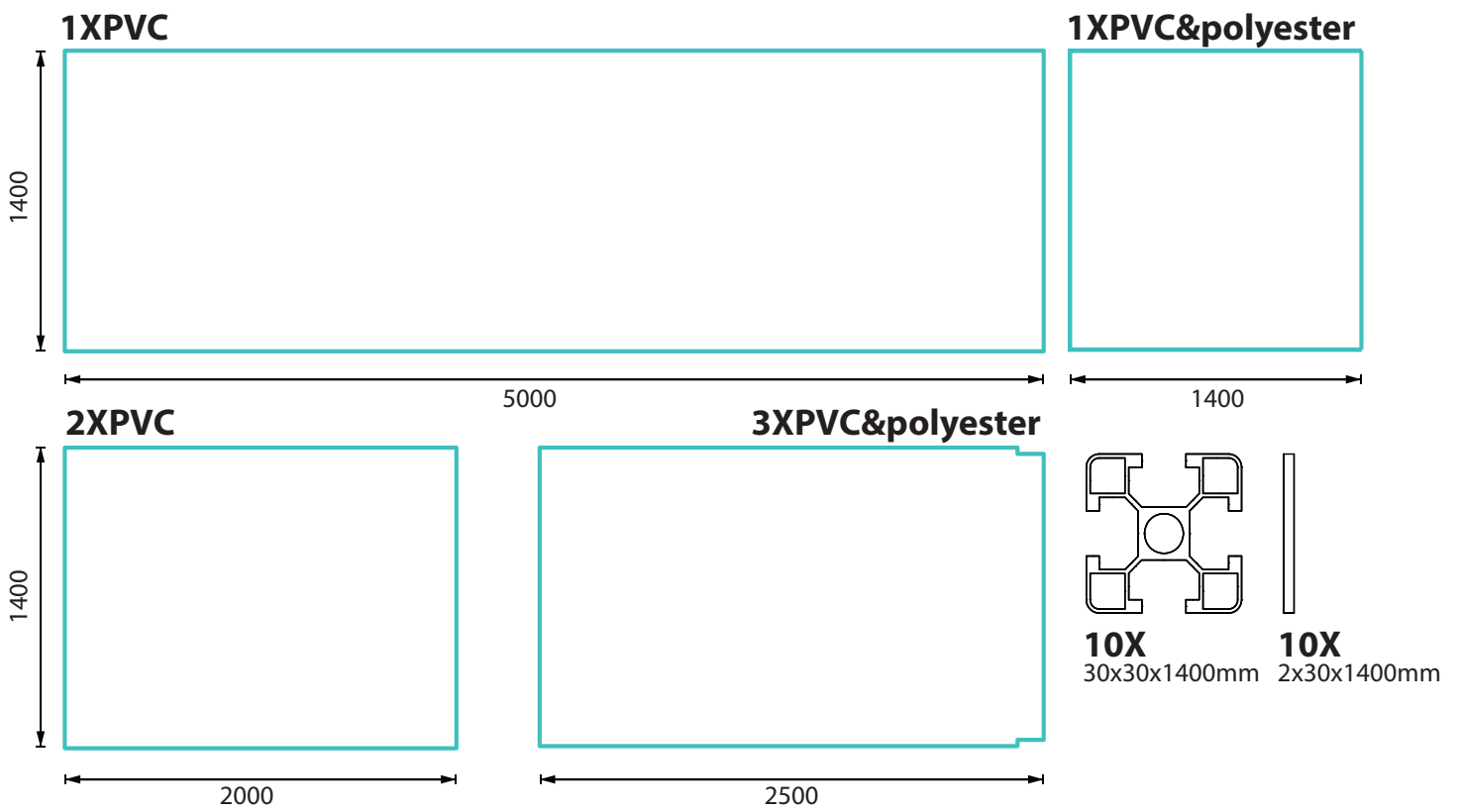
waste tank (shower+sink) ⁽¹¹⁾



toilet tablets ⁽¹²⁾



clear PVC foil ⁽¹³⁾



Item	Size	Pcs.	Total	Price €
aluminum profile	30x30x1400mm	10	14m	105
aluminum pressure plate	2x30x1400mm	10	18m	52
PVC coated polyester fabric	access sheets 725x1400mm	8	Roll of 1400mm width required length 14.7m	90 140
	top sheet 1400x1400	1		
	sides 1400x2500	3		
Clear PVC	1400x5000	1	9m	95
	1400x2000	2		
Perforated steel floor	1400x880	1	1.3m ²	5
UVC light		1		31
waste tank		1		150
portable toilet		1		150
portable sink		1		100
electrical	cables, switches, connectors, lights			60
plumbing and fixtures				20
magnetic strip	30x140	12	16.8m	25
fasteners		14		88
TOTAL				1111€

Image sources:

1. <https://tatrixmedical.com/product/wall-mounted-dispenser-ce-certificates/>
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13. <https://tuplex.ro/produse/constructii/foлие-pvc-crystal-clear>

