



The **maggie** shelter

A solution when and where fixed structures are not permitted, practical or desired. The maggie is a sturdy, highly-insulated, sustainable shelter that is adaptable to all climates.

A temporary shelter with the benefits of a building.

maggie
SHELTER

LET'S BUILD OPPORTUNITIES

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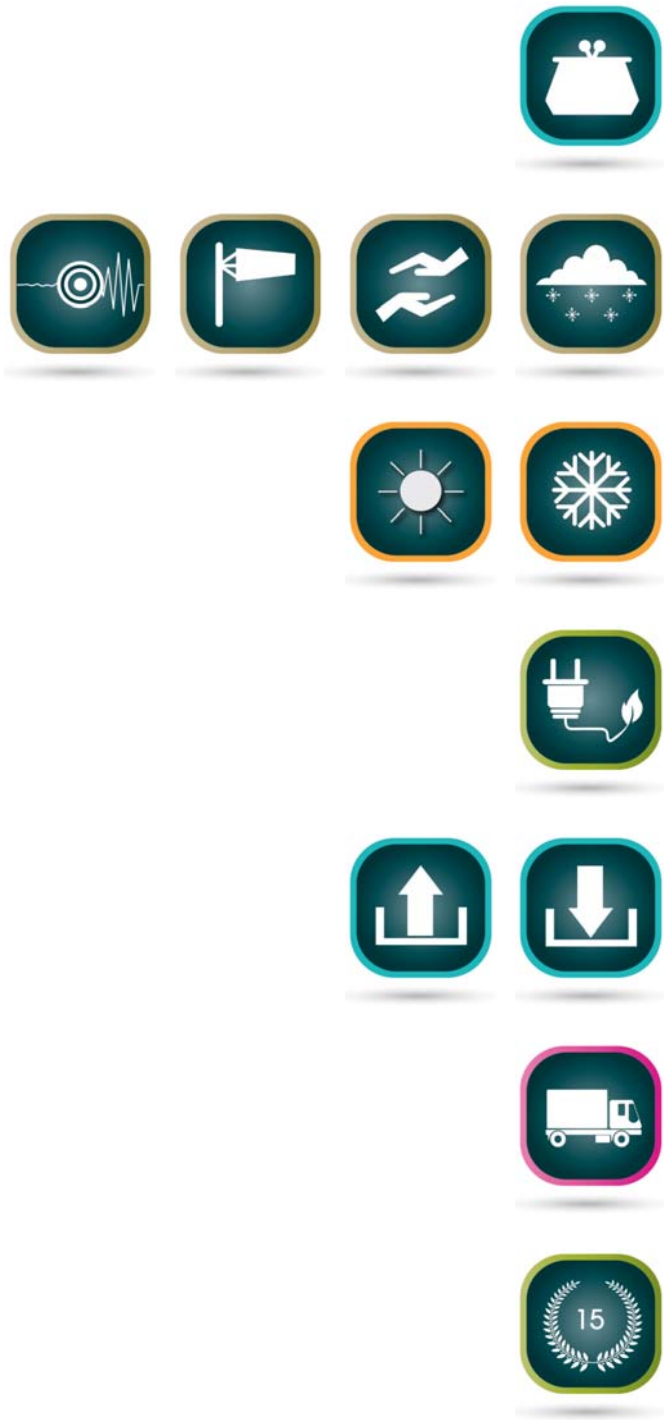
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1. MAGGIE'S TOP FEATURES



LOW COST

HIGH PERFORMANCE

ADAPTABLE TO ALL CLIMATES

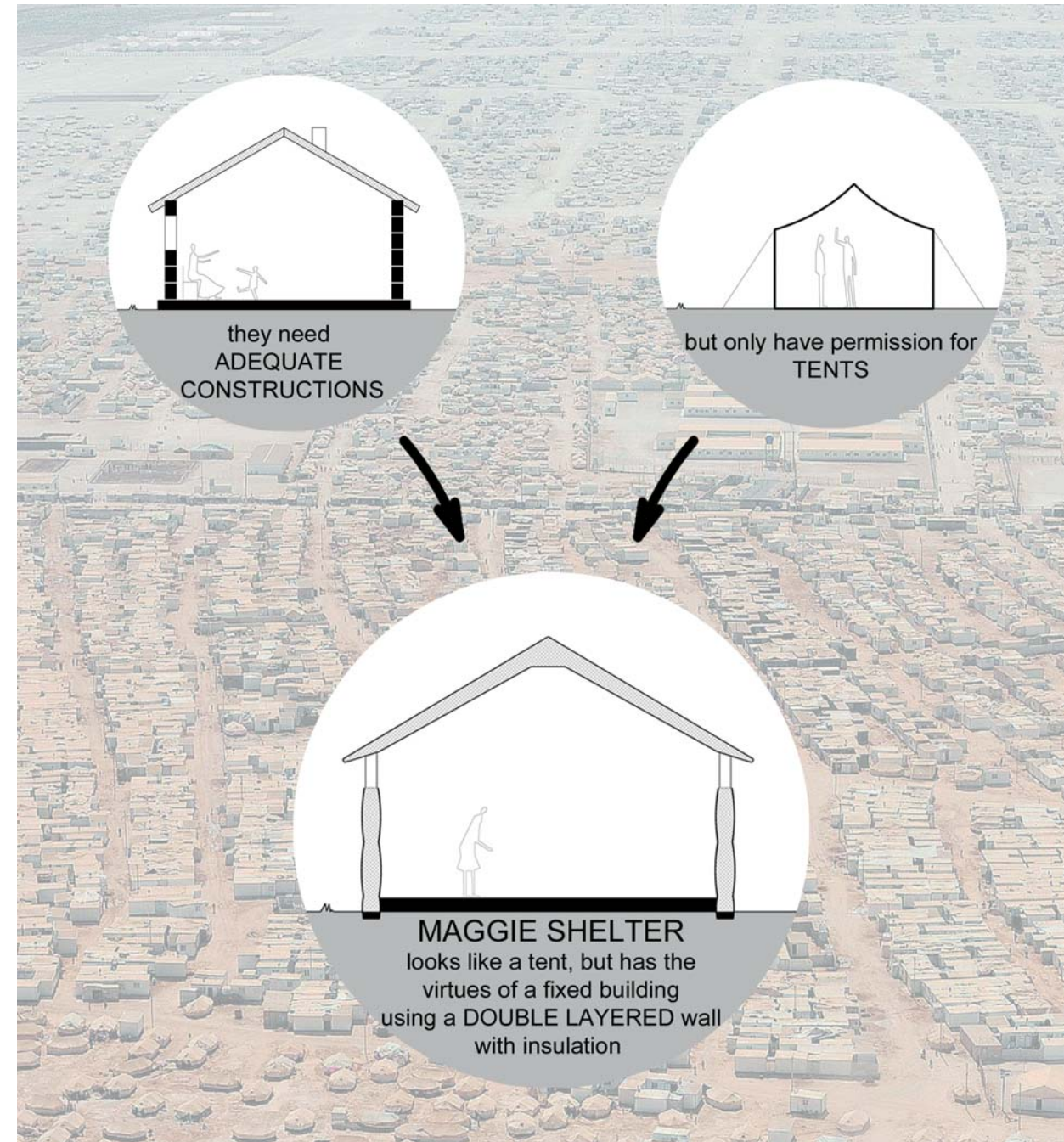
LOW ENERGY

EASY AND FAST TO ASSEMBLE/DISASSEMBLE

LIGHT-WEIGHT AND COMPACT TRANSPORT

HIGH DURABILITY

2. CONCEPT - THE YURT REINVENTED



In a lot of situations fixed structures are not permitted, practical or desired. So we set out to create a temporary, low-cost shelter that has the qualities and advantages of a sturdy, insulated construction: a tent that acts like a building. The double-layered skin can easily be filled with local materials like sand, organic and regular insulation or even plastic waste. Local economies can cooperate with labour and materials to create this modern Yurt.

3. MULTI PURPOSE - WHAT CAN MAGGIE DO FOR YOU?



Medical Wards

Access to decent health care is a **basic right** and top priority. This means there is a need for sustainable constructions in which people can be taken care of in safe and **humane conditions**. Temperatures cannot exceed healthy minima or maxima and the structures should resist heavy weather conditions and offer a **safe haven** in conflict areas.

Using insulation and sand, the inside temperature, safety and stability can be controlled. Using high-quality textile, the **maggie** is protected against dust, insects and can be easily disinfected.

The **maggie** can be upgraded with shelves, beds and curtains using standard profiles to which elements can be attached. A fixed floor and techniques can be added for more desired comfort.

Schools

Children should always have access to **modern education**. They are the active population of tomorrow. Long-lasting conflicts or poverty can easily jeopardize the future of an entire generation by cutting off communication and education.

This means there is a need for sustainable constructions in which people can go to school in safe and **humane conditions**. Temperatures cannot exceed healthy minima or maxima and the structures should resist heavy weather conditions and offer a **safe haven** in conflict areas.

maggie has many features that allow it to function as a genuine classroom. The incoming light can be direct or indirect, depending on the positioning of the windows. Acoustic insulation, added functionalities and flexibility can improve schools in a camp.



Vocational training centres

Rebuilding an economy after disaster or conflict means investing in vocational training. People need to learn how to **rebuild** their homes and infrastructure(s). Therefore, vocational training centres can be a highly **strategic** way to act with determination and efficiency at a time when this is most needed.

This means you need flexible and high-quality shelters that can be erected in a short period of time before the real rebuilding starts. Don't lose time but invest first in the study phase and preparations in order to achieve both sustainable and **efficient** solutions.

The **maggie** can be easily implemented as a vocational training and community centre. The quality of the building improves the **quality of development**.

Temperature controlled storage

Tons and tons of food are thrown away in hot countries because there is no infrastructure to maintain the **quality of the food**. The same problem occurs with complex medications (like **vaccines**) that are often needed in hot countries but which quickly lose their efficacy when stored in high temperatures. Hence there is a need for temperature-controlled warehouses in which medications and food can be stored for longer time periods without risk of rotting or deterioration. Goods and foodstuffs can be stored safely, protected against dust, rodents, heat and cold.

Controlling temperature means using good insulating materials and sometimes additional techniques. Yet many times there are no structures available and farmers, for example, don't have the **legal certainty** that they may build a fixed structure on a specific spot due to legalities and land ownership concerns.

Therefore a temporary construction like the **maggie** that can act like a building is a perfect solution. Additions like shelves and lighting can be easily affixed to the **maggie**.



Operational & coordination centres

Conflict areas, big construction sites, rebuilding sites after disaster,... They all need **safe havens** or good visible central buildings to coordinate missions, teams and people so that communities can gather to **engage**.


Again there is a need for safe, stable, sustainable but temporary constructions like **maggie** to work efficiently and let people organise their lives.

Using different layers in the walls, combining safety and thermal comfort, the **maggie** can be operated as a highly safe and comfortable shelter.



4.2 30 holistic criteria

COMFORT



Heat
T(i) < 30°



Cold
T(i) > 15°



Rain
100% waterproof




Acoustics
50 dB noise reduction



Daylight
300 lux

SAFETY



Snowload
40 Kg/m²



Fire retardant
M2 cladding
- flame retardant
- self-extinguishing



Protection
bulletproof
anti theft & vandalism




Strong winds
adaptable
90-165 km/h



Natural forces
pilotis structure
earthquake proof

HYGIENE



Clean
- washable
- chlorine resistant
- PH-neutral



Fresh air
CO₂ < 600 ppm
ventilation
20m³/pp



Anti insects
mosquito net
perfo < 1,5x1,5 mm



Anti rodents
- fixed floor
- underground barrier




Anti dust
- sluice system
- airtightness

DURABILITY




Community involvement
- teamwork
- ownership/
respect




Energy Friendly
K35 -> K15
E60 -> E30



Eco friendly
- recycable
- waste processing




Life span
- structure >15Y
- textile (cladding):
> 650 g/m²
UV-resistant



Local reparability
easy to repair
on site


ADAPTABILITY



Different climates
- adaptable
- upgradable
- evolution in time




Multi-purpose
- health & education
- community & safety
- storage



Modular combinations
- flexible dimensions
- compatibility
- safety-clustering



Local upgradability
- local materials
- local economies
- local labour



Compact transport
air, sea, rail, road:
- strapped in bundles
- easy handling
- standard pallets

USER CENTERED



Low cost
importance of cost of ownership versus initial cost



Services
- site surveys
- energy survey
- interior design
- custom made solutions



Fast & easy to assemble
- construction = 1 day/6 p
- filling Maggie = 1 day/6 p
- 1 tool/1 bold-type



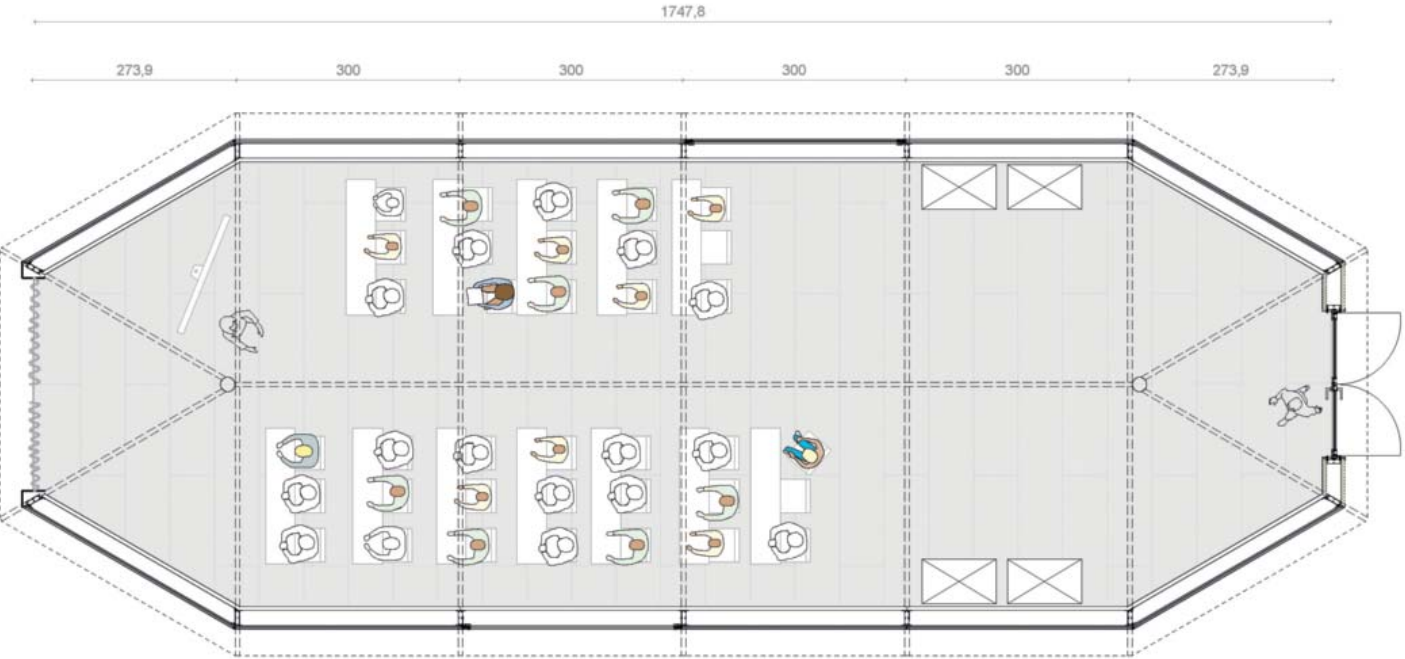
Fast & easy to disassemble
- 1 day/6 p
- 1 tool/1 bold-type



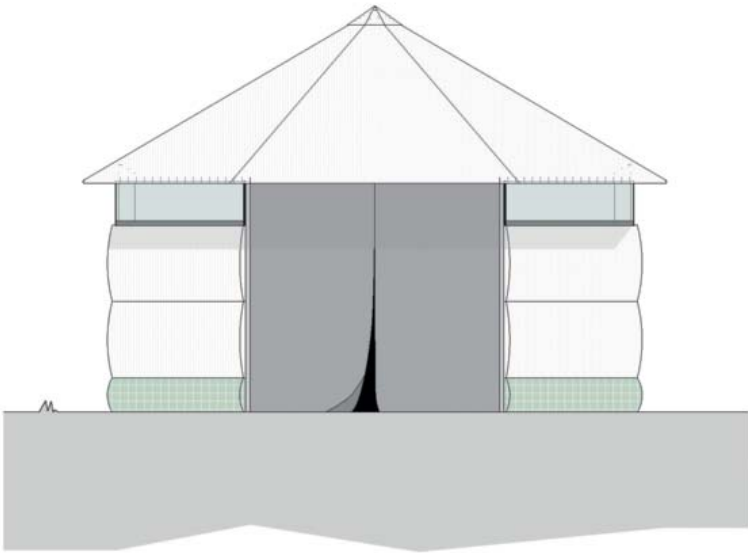
Light weight
- 1 piece < 25kg
- transport weight < 2 ton

5. TECHNICAL DRAWINGS AND INFORMATION

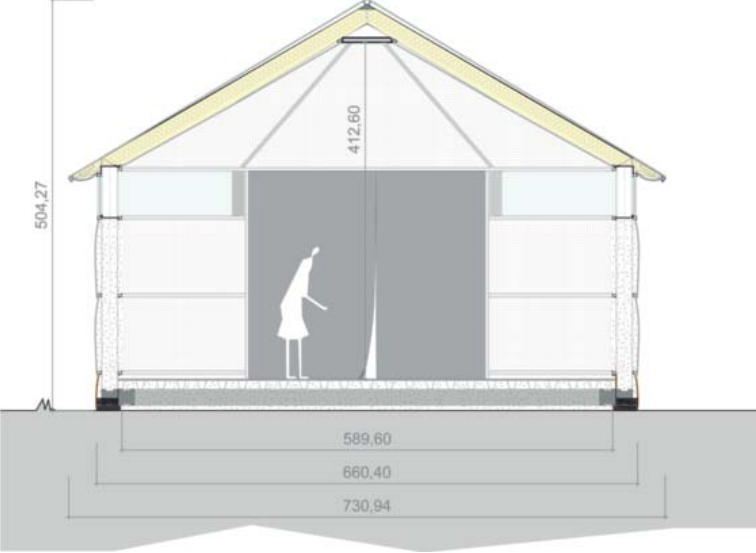
5.1 Plan, sections and elevations



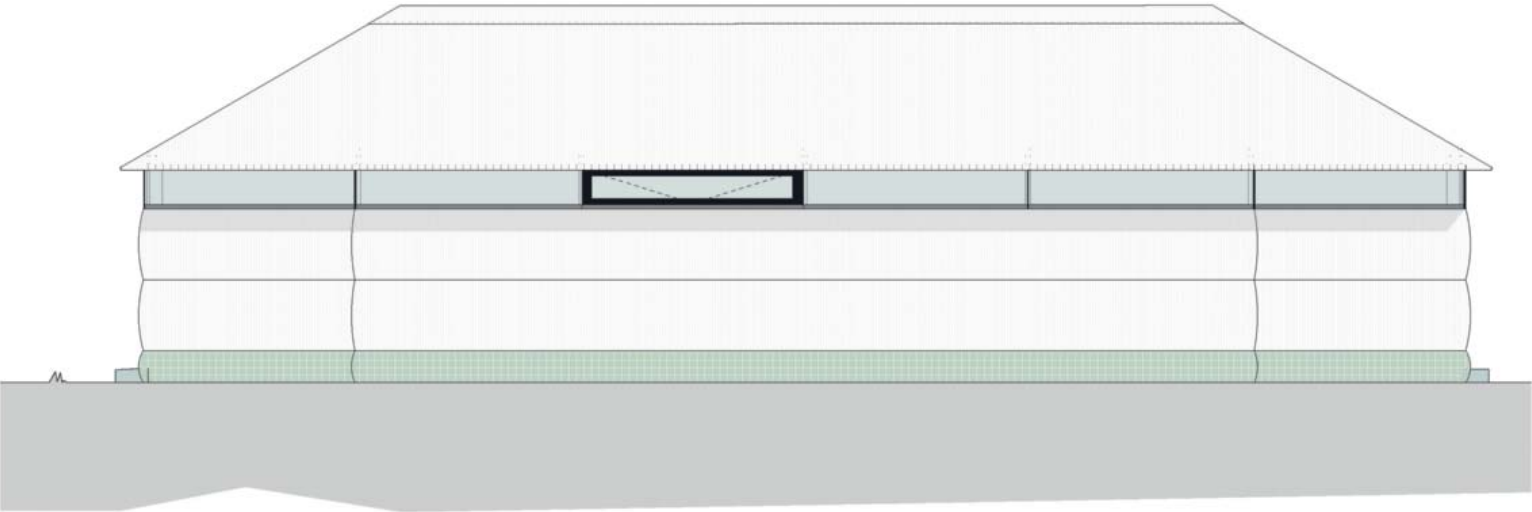
PLAN



FRONT ELEVATION



CROSS SECTION

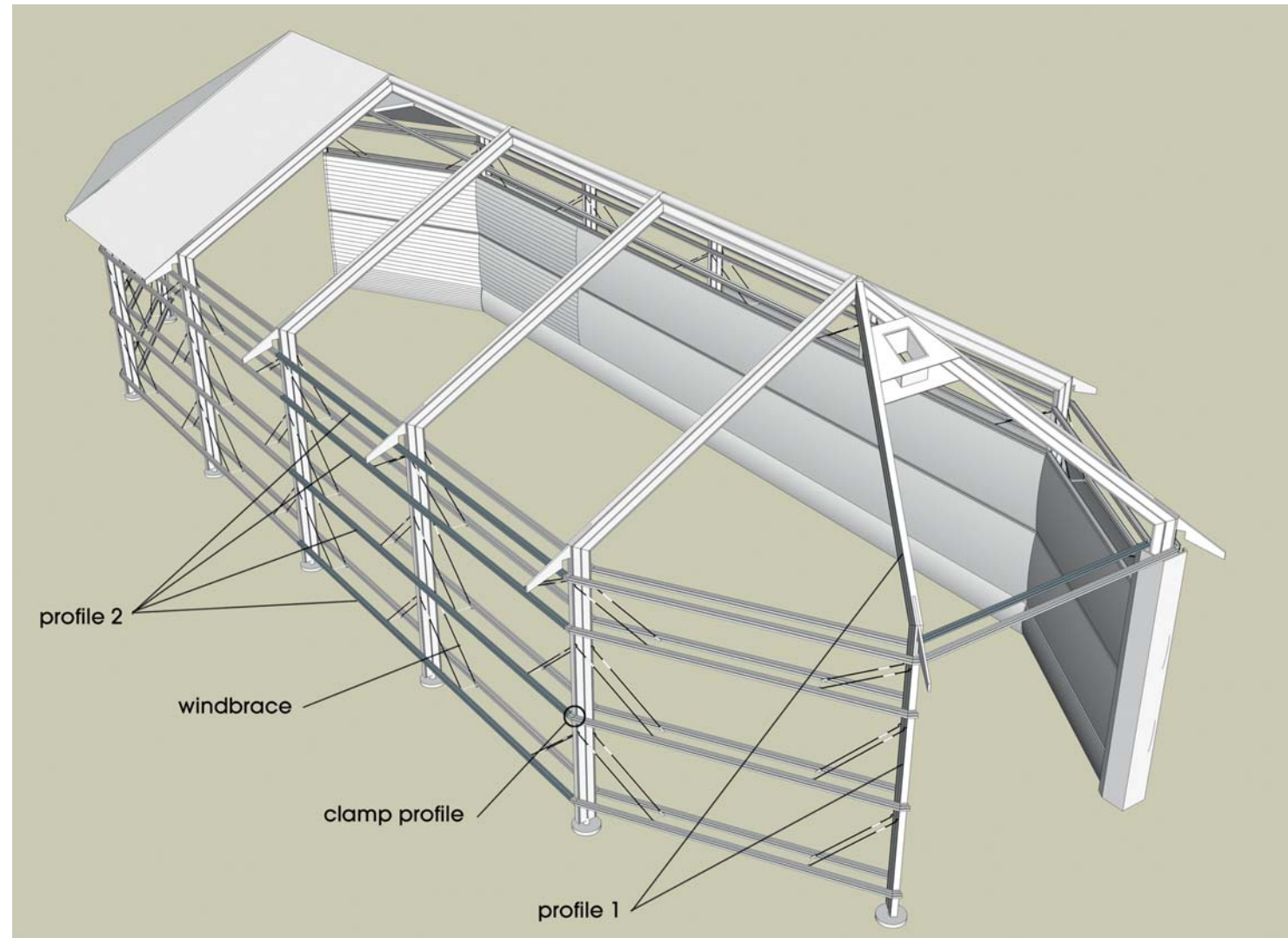


ELEVATION



LONGITUDINAL SECTION

5.2 Extruded profiles in aluminium



The structure of the **maggie** is constructed with custom-made, high-performance aluminium extruded profiles. This makes the transport weight as low as possible without compromising the overall strength.

Each profile has its own specific features. By designing the right cavities, bolts can easily be attached and textile can glide through the circular shaped edges (keder system).

For increased thermal performance, the keder profile is separated from the carrying beam by an insulating joint. This avoids condensation (and later fungus) around the profiles when the **maggie** is highly insulated.

Additional small profiles help to mount everything together and make the specific "twist shape" that typifies the **maggie**.

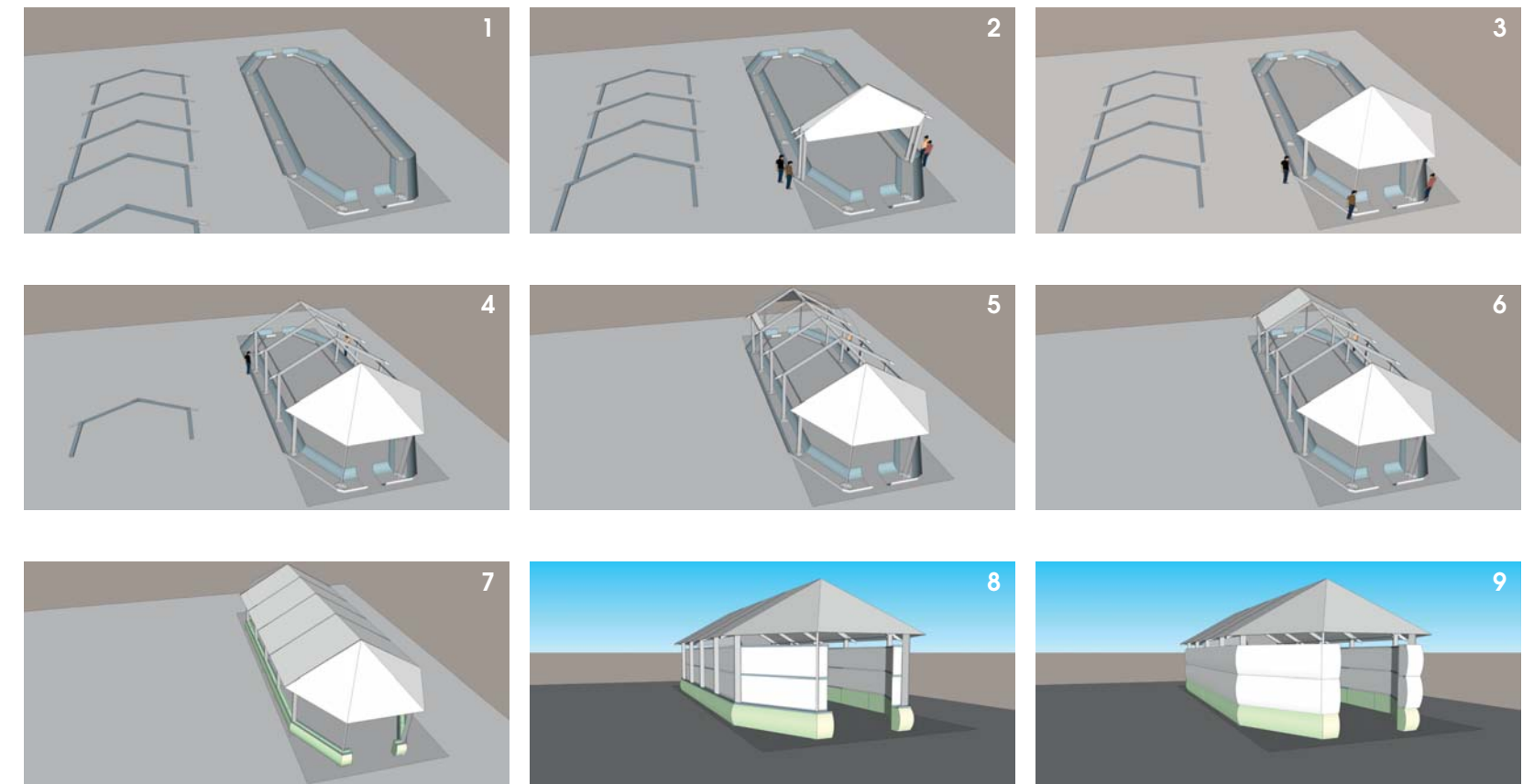
5.3 Smart design

5.3.1 Building manual - fast & easy to assemble/dissassemble

Responding to a crisis, disaster or conflict requires fast and easy solutions. Harsh climates demand a quick means of sheltering against nature. Reducing cost means that everybody should be able to assemble the construction without the help of expensive professionals.

The **maggie** is a building package that can be set up as a building-kit with 6 adults in 1 day. The next day the community can help to fill up the **maggie** with local insulating materials such as sand, organics and even waste.

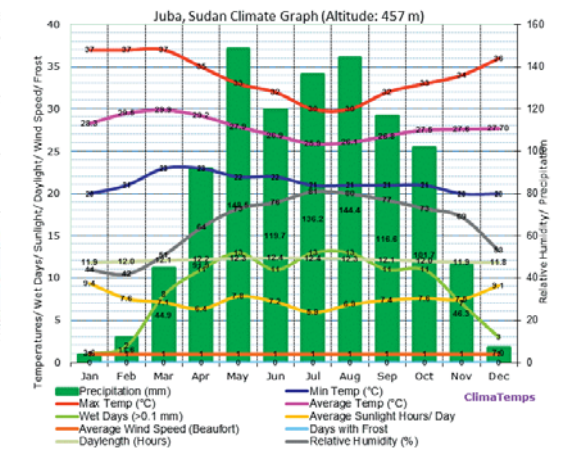
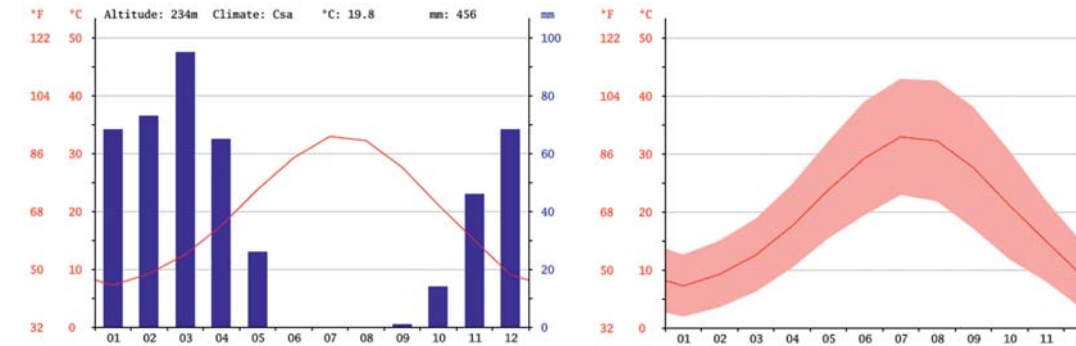
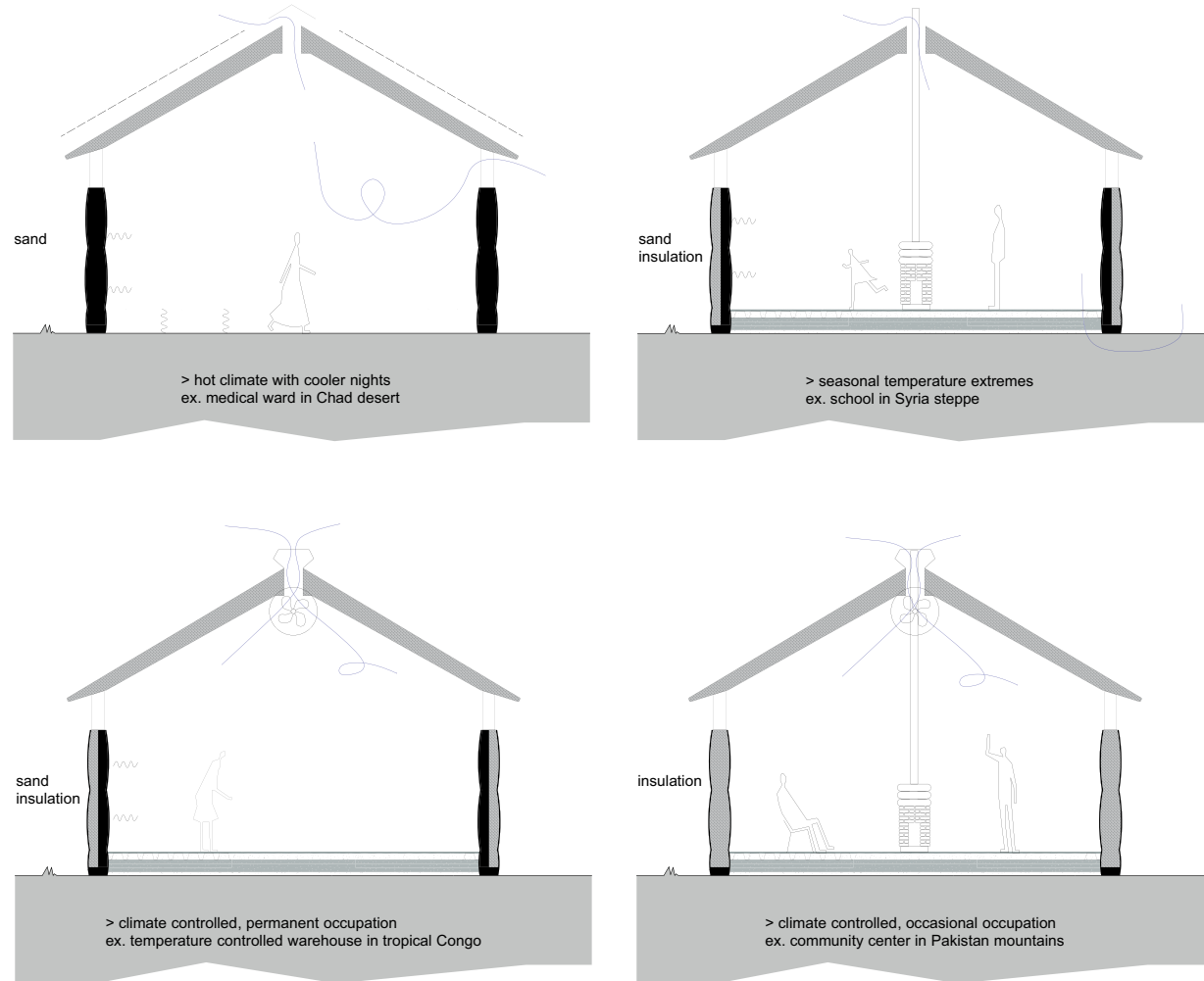
All the parts can be mounted from the ground up. There is no need to work from an elevated height. No cranes or heavy tools are needed.



5.3 Smart design (continued)

5.3.2 Climate control

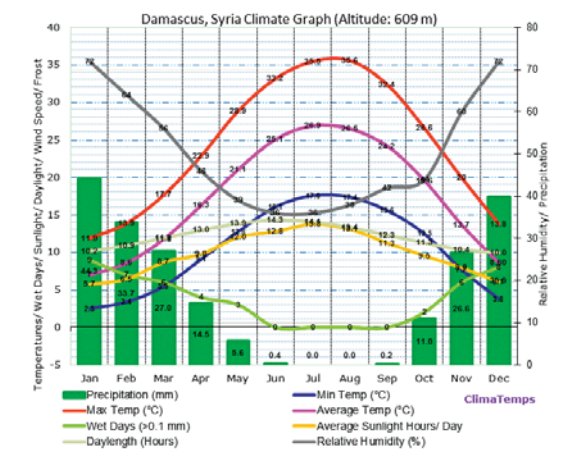
The **maggie** is developed to resist harsh climates and seasonal fluctuations because she can be filled with insulation and sand and has a high-performance skin that reflects UV and protects against rain and snow. Each climate has its own specific dynamics which should be taken into account when choosing the right amount and type of insulation.



The most efficient way to save energy or to control inside temperature is by using mass-inertia (sand - high thermal capacity) and light insulation (keeping the energy inside or outside depending on the situation.). The combination of sand and insulation gives the best results. It has proven its efficiency through ages of building techniques starting with the yurt thousands of years ago until today's buildings with concrete, stone and insulation. The **maggie** can do exactly the same by making an insulated wall with loose material (sand) and an insulation board. After the **maggie** is disassembled, the sand can be returned to nature and the insulation can be reused.

Sand stabilises temperature fluctuations between day and night (desert climate!) and the insulation keeps the optimal temperature inside once it achieved. To verify this information, the energy efficiency of the **maggie** was calculated via a specialized application, created in cooperation with the University of Leuven. The user can implement this data to get a highly sustainable solution and recuperate a lot of money over time that is normally spent on heating or cooling. This makes the **maggie** unique among temporary constructions.

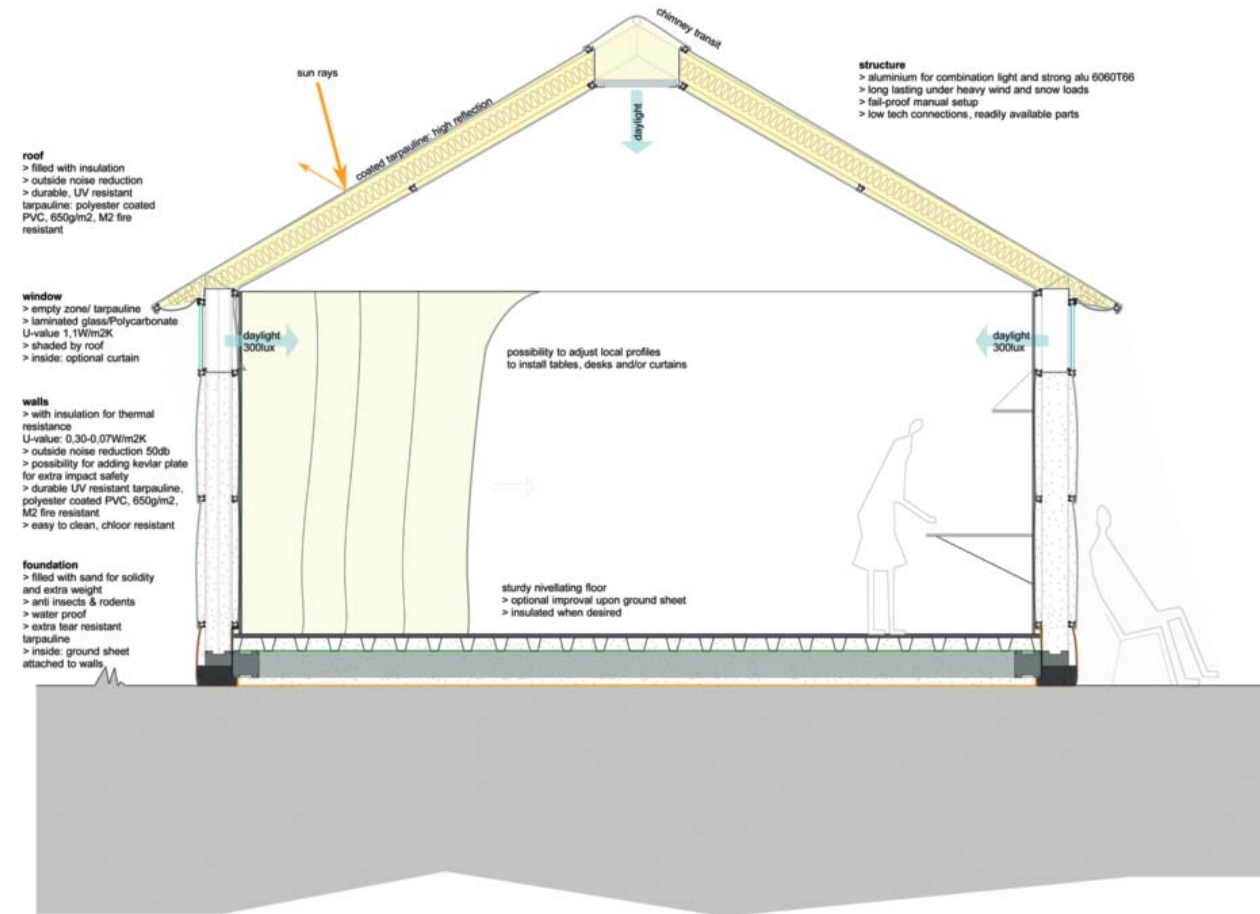
The user determines their purpose, location and preferred minimum and maximum temperature and the specialized application does the rest.



PURPOSE	occupation day (6:00-18:00)	occupation night (18:00-6:00)	internal heat gains from persons (when in use)	internal heat gains from appliances lighting (when in use)	acceptable min. temperature (°C)	acceptable max. temperature (°C)	ventilation per person (m³/hp)	minimal window height (cm)	LOCATION	ROOF INSULATION			WALL INSULATION			FLOOR INSULATION			WALL MASS	FLOOR MASS	VENTILATION KITS	WITHOUT CLIMATISATION		WITH CLIMATISATION		heating demand (kWh/year)	heating cost with gas heater (euro/year)	cooling demand (kWh/year)	HEATING DEVICE	Power (W)	COOLING DEVICE	ENERGY SUPPLY	Power (W)	U _{in} (W/m²K)	K-level	
										thickness (cm)	thermal conductivity A (W/m.K)	thermal capacity c (J/kg.K)	density ρ (kg/m³)	thickness (cm)	thermal conductivity A (W/m.K)	thermal capacity c (J/kg.K)	density ρ (kg/m³)	thickness (cm)				thermal conductivity A (W/m.K)	thermal capacity c (J/kg.K)	density ρ (kg/m³)	CLIMATISATION											CLIMATISATION
11	Fedasil	10h	4h	15 p.	0 W	300 W	18°C	n.v.t.	20 m³/hp	40 cm	Ukkel	mineral wool	25 cm	0.04 W/m.K	1000 J/kg.K	40 kg/m³	argex	30 cm	0.11 W/m.K	1000 J/kg.K	340 kg/m³	argex	30 cm	0.11 W/m.K	1000 J/kg.K	340 kg/m³	/	/	balanced	5000 kWh/year	406 euro/year	0 kWh/year	18180,00 W	/	0.35 W/m².K	34
12	Fedasil	10h	4h	15 p.	0 W	300 W	18°C	n.v.t.	20 m³/hp	40 cm	Ukkel	mineral wool	25 cm	0.04 W/m.K	1000 J/kg.K	40 kg/m³	argex	30 cm	0.11 W/m.K	1000 J/kg.K	340 kg/m³	argex	30 cm	0.11 W/m.K	1000 J/kg.K	340 kg/m³	/	/	natural	7700 kWh/year	626 euro/year	0 kWh/year	17530,00 W	/	0.35 W/m².K	34
1b	Fedasil	10h	4h	15 p.	0 W	300 W	18°C	n.v.t.	20 m³/hp	40 cm	Ukkel	/	/	/	/	/	argex	30 cm	0.11 W/m.K	1000 J/kg.K	340 kg/m³	/	/	natural	35828 kWh/year	2911 euro/year	0 kWh/year	41170,00 W	/	/	/	/	/	/		

5.3 Smart design (continued)

5.3.3 Materials

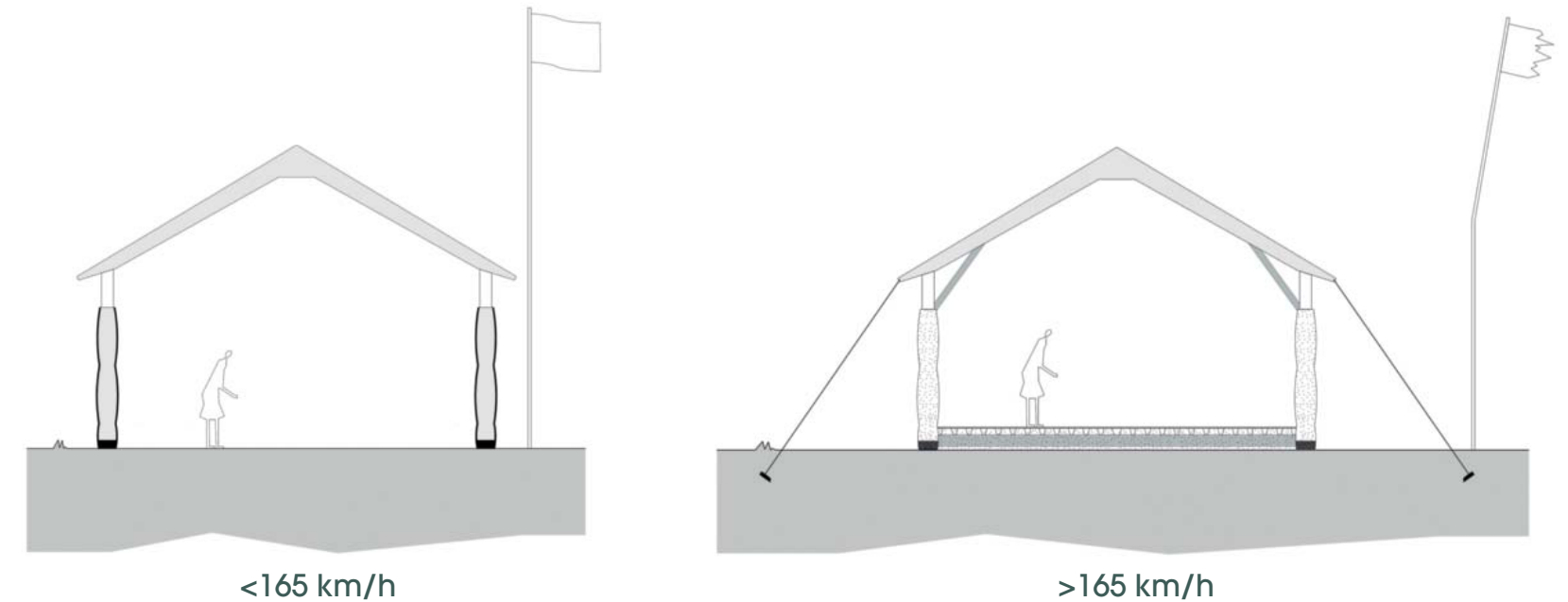


1. structure: aluminium 6060, T66. Possible to finish with an extra (coloured) coating. The aluminium is totally protected by surrounding cladding so it's protected against outdoor influences.

2. cladding: tough PVC impregnated polyester fabric of 650 g/m². The sheets are sectioned in accordance with the modular measure of 3 m. Joints are waterproof and able to withstand vibrations caused by high winds. The fabric is coated to reach a M2 fire resistance. This means self-extinguishing and flame retardant. Virtually any colour is available on request, but our standard stock colours are white and Nato green. Logos can be printed on the canvas. Standard the windows are made of transparent fabric. For higher performance a sandwich panel is custom made by putting extra insulating layers of bubble wrap (to create air chambers) between two transparent fabrics. The cladding can easily be glided into the same profile system around the **maggie**. Opening windows can be pre defined by the user.

3. foundations: The preparation of a site is usually the user's responsibility. This could include site clearance and construction of the foundations. However, we can offer assistance in searching for the right solution on a 'turn-key' basis.

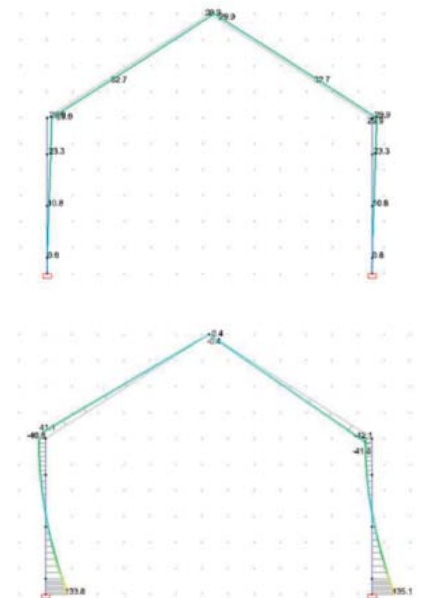
5.3.4 Upgradable structure



Each location has its specific wind characteristics. This means it's not necessary to make each **maggie** equally strong. Otherwise a **maggie** in a windstill area would be totally over-dimensioned and users would pay too much for the structure.

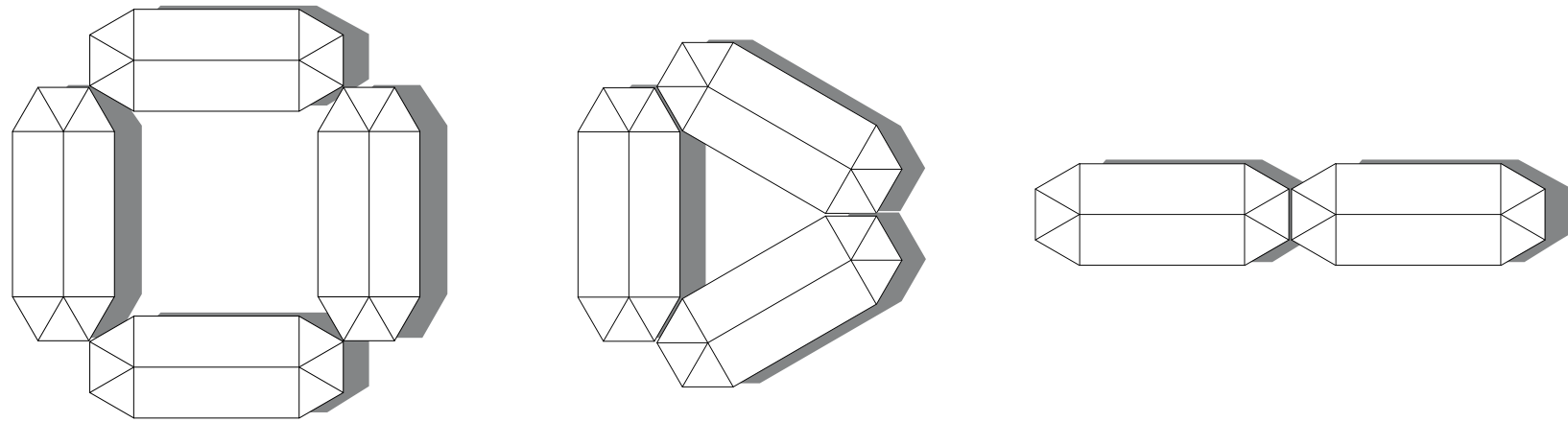
Therefore the basic **maggie** can be easily upgraded with small add-ons to become stronger and stronger depending the location. This is easy engineering based on click-on details on the basic profiles.

The strongest "heavy duty" **maggie** is the one in which the walls are totally filled up with sand and the foundation is made by digging in the first 30 centimeters of the wall in the ground. It results in a **maggie** of 40 tons and a most efficient ground anchor. Finally extra storm cables can be clipped on the corners and anchored in the ground with spikes. Wind speeds can exceed 165 km/h.



5.3 Smart design (continued)

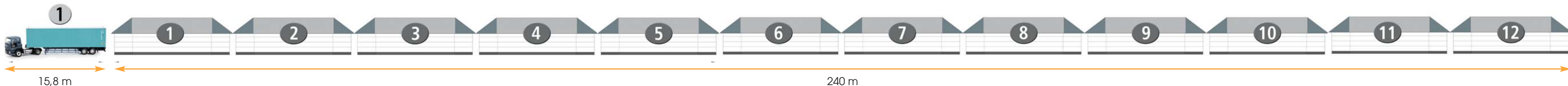
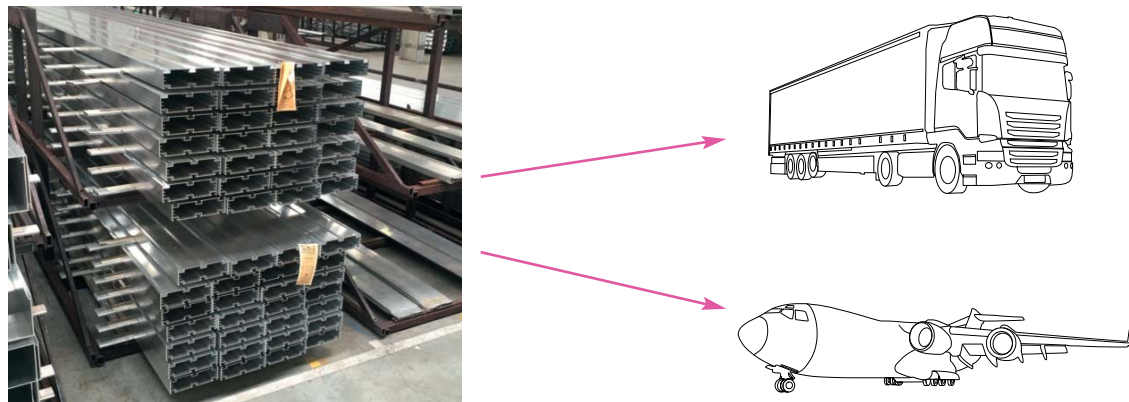
5.3.5 Modular combinations



Combining maggies in a smart cluster creates safe and windstill areas where children can play safely and can be easily supervised. Clusters are also stronger against wind because they work together and break the storm.

5.3.6 Compact transport

All elements are strapped and affixed to pallets for easy handling and compact transport. They can be packed in ISO containers for shipping by sea, air, rail or road. 1 standard container can load up to 12 maggies of 100 m² for a total of 1200 m² in 40 ft container.



5.3.7 Insulation materials



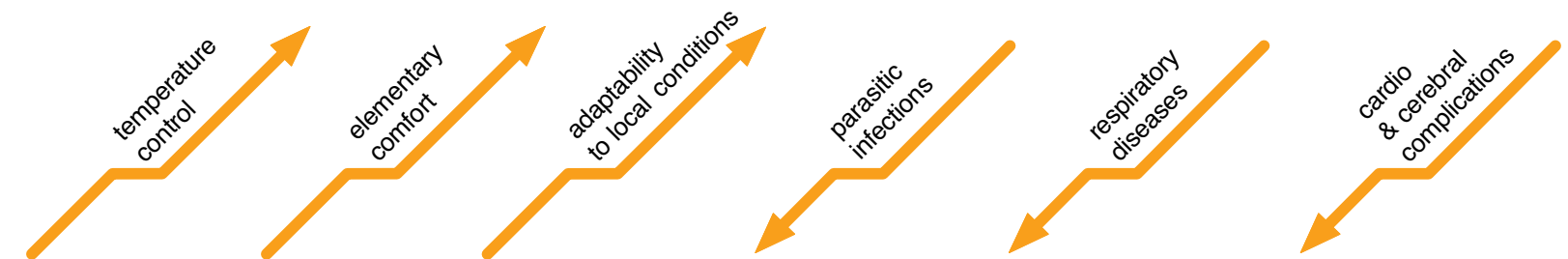
The **maggie** ingeniously allows the use of local, freely available materials to be used as insulation. This can be sand (thermal capacity and stability), organic materials, recycled plastic waste or existing insulation products.

We also ship vacuum packed insulation to reduce the shipping volume.

Local economies can be triggered to produce small scaled pellets (capsules) from waste to fill up the walls.

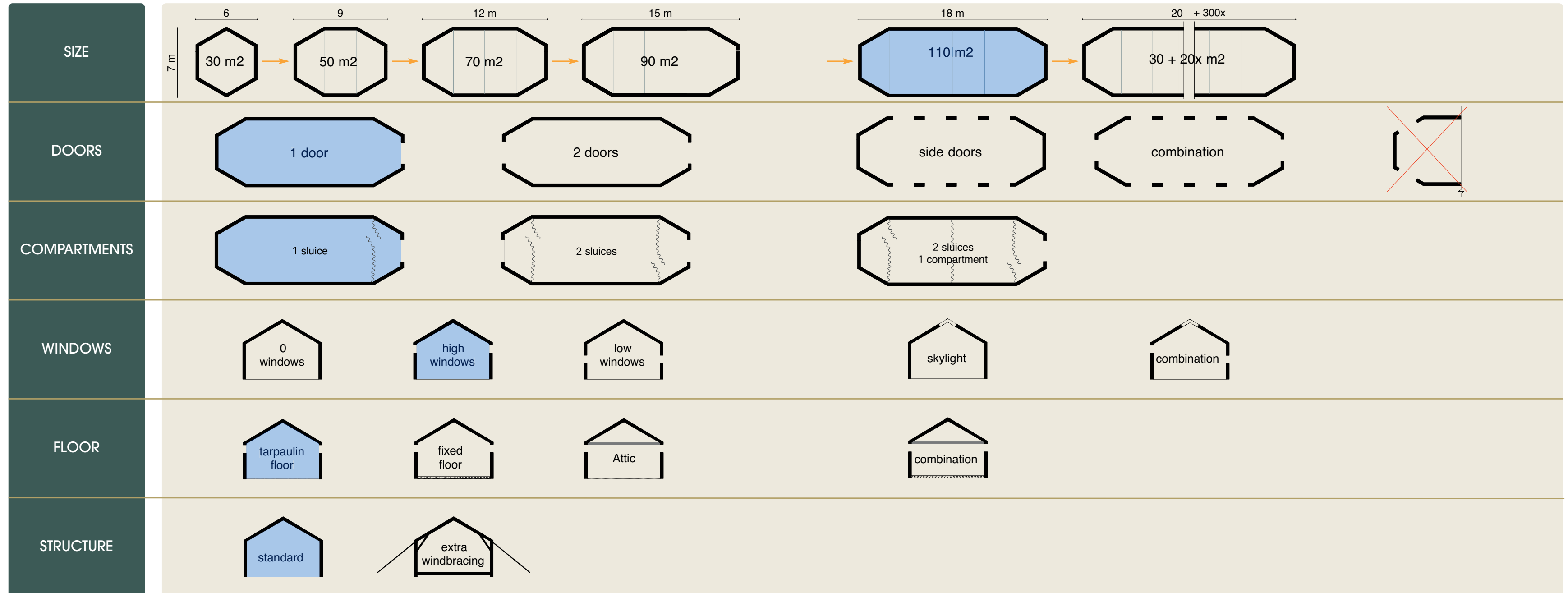
5.3.8 Improving health quality

In refugee camps many people live together within a small area. These places are a source of diseases. Many people die due to lack of hygiene. Providing hygienic and insulated shelters is a way to reduce contamination and the risk of illness.



6. CUSTOMIZE YOUR MAGGIE (* standard Maggie features shown in blue below)

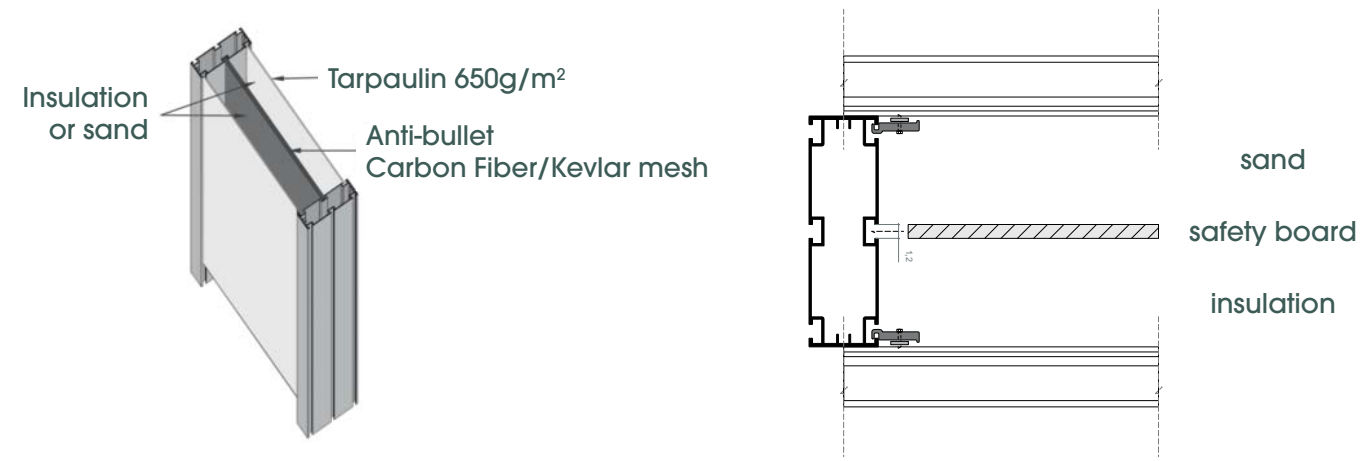
6.1 Basic settings



6.2 Advanced options

6.2.1 Enhanced safety

A **maggie** filled with sand gives a lot of protection. Users searching for even more protection can glide a reinforced board (Kevlar, steel, wood,...) in the middle of the wall as a hidden protection. The board can simultaneously serve as both a separation between the insulation and sand filling and as a real, double-layered wall. It can easily be mounted with a clip in the standard cavity in our profile.

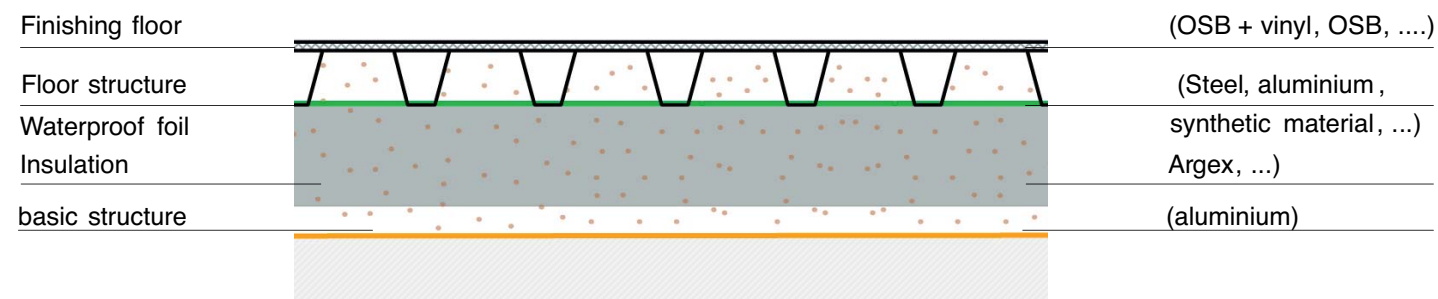


6.2.2 Floor

In difficult and remote locations the floor is often the weak spot in a shelter because the standard fabric floor doesn't do the job. Rodents, moisture, mud, unstable ground surface, frozen soil,... all cause unhygienic and inhumane situations.

The **maggie** can be upgraded with a fixed floor that uses the same aluminium profiles as in the rest of the structure. First an aluminium beam layer, then a load-spreading steeldeck plate (or aluminium) and then a hardboard finish. The hardboard can be topped with linoleum for extra hygiene and resistance.

Between the beams the floor can also be insulated with local materials or shipped insulation.

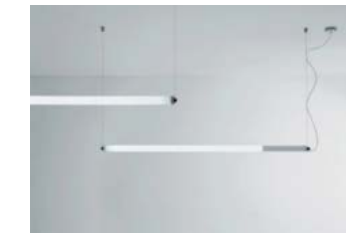


6.2.3 Techniques

Zero footprint or low energy solutions are no longer a utopian vision. People understand that long term solutions often show that the cost of ownership (the real cost of a solution over time instead of only the initial investment) is much lower if you invest in energy efficient constructions and renewable or low energy techniques. Huge amounts of logistics budgets are wasted on fossil fuels and tons of CO2 is pushed into the atmosphere. This is also true for low-cost solutions.

Medical wards will always need temperature controlling as does food storage. You cannot medically treat people in a tent of 45°C without risking that they dehydrate and suffer. You cannot store food without temperature controls.

Secondly, remote operations need autonomous solutions. Therefore batteries and solar panels can be a solution to implement in a shelter to make it self sufficient. The **maggie** offers the possibility to add solar panels to provide energy. This way the **maggie** can operate independent of other energy sources. Space is foreseen in the ridge of the roof for cables and technical tubes. Extra lighting can be easily attached on the profiles in the roof. Depending on the positioning of the windows, the **maggie** allows natural light to enter directly or indirectly and there is an option to add a skylight.



6.2.4 Cooling and heating



Split units and heating and cooling devices on electricity are very efficient today. The **maggie** program works together with Daikin light-weight and low-cost yet highly-efficient units that can be easily implemented in the **maggie** to attain a controlled temperature. This will result in new solutions in the future.

6.2.5 Ventilation unit



In extreme climates or for very low energy energy, the **maggie's** ventilation becomes important. Each person needs 20m³ of fresh air per hour so by pulling fresh air from the outside a lot of energy is wasted. Aeropulmo (Belgium) has invented a low weight and highly-efficient ventilator that recuperates 95% of the energy out of the air that is pushed outside and inserts it again in the fresh air that is blown inside. In this way the energy efficiency of the shelter rises significantly and money can once again be saved over time. This unit can easily be hung on the ceiling of the **maggie** as shown in our case study for the refugees in Steenokkerzeel, Belgium.

6.3 Equipment and furnishing

The **maggie** team loves to design. We can offer users a custom-made plan with all kinds of features that makes the usage much more efficient and logical.. Thanks to the specially-designed cavities in the aluminium profiles, all kinds of shelves, curtains, lesson boards, clothing bags and other equipment can be clipped on the walls and ceiling –something that is not very feasible in a normal tent.

The **maggie** team is specialised in working out specific solutions for users, so don't hesitate to challenge us to think about new features.



Curtains of quality fire retardant tarpaulin that can be cleaned with disinfectants.



Aluminium racks & cupboards designed with quality and washable tarpaulin. They can be fitted easily at different heights for monitors, medical equipment or personal belongings.



Light-weight but sturdy furniture such as chairs, desks and workstations.



Light but strong patient-beds that have the features of common hospital beds. Special attention has gone to the compartments under the bed to allow storage for personal belongings.



6.4 Monitor your Maggie – how sustainable is she?

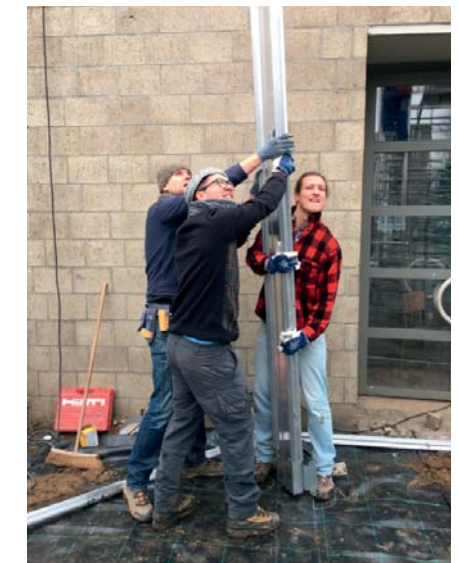
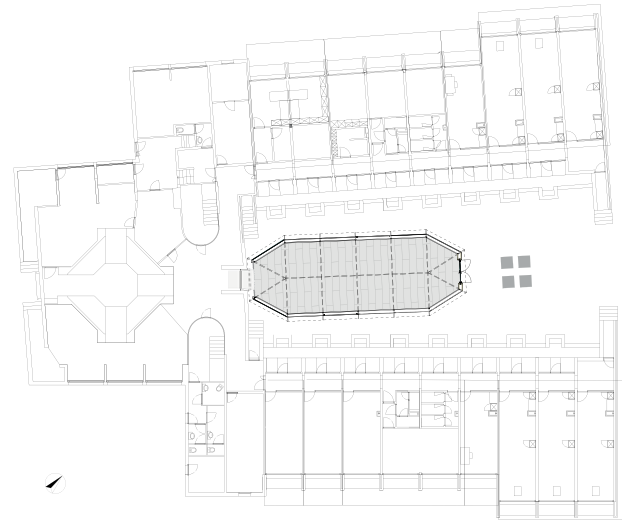
At the end of the day the facts count.
Is the Maggie really efficient?
How much energy do we save as users and how much do we ultimately gain?

These questions can be easily answered by making smart measurements in a **maggie**. Getting data out of a building is very relevant these days. There is always a difference between the theoretical intentions and studies and the real result.

Therefore the **maggie** has partnered with a company (Bynubian) that monitors buildings and data from buildings. We are investigating how to implement this building intelligence in a **maggie** to monitor the efficiency and to learn from the daily usage to improve the **maggie** each time and provide users with feedback.

7. CASE STUDY – REFUGEE CENTER – FEDASIL BELGIUM

- program: education and community centre
- location: Steenokkerzeel, Belgium
- date: 3th of March 2016
- users: FEDASIL
- structure: aluminium
- surface: bruto 105 m², netto 95 m²





8. THE BROADER VISION: THE MAGGIE PROGRAM

The **maggie program** is the name of the broader platform within which the Maggie shelter plays an important role. The **maggie program** represents a comprehensive approach towards providing access to health, education and perspective for displaced people worldwide. The **maggie program** functions as a social platform that seeks and identifies urgent needs and improvements for displaced people across the planet. Once a need is defined, expertise is offered by companies like DMOA architects and engineers, Vermako (aluminium structure), Vervaeke (cladding) and institutions like IWT, KUL, CENTEXBEL,... This public private partnership is the key to fast and adequate innovation that can make a difference.

A recent partnership with Close the Gap vzw has opened new doors to implement solutions where they are most needed.

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(director)

SPECIFIC NOTE ABOUT THE MAGGIE AS A SOLUTION FOR REFUGEES

HEALTH ISSUES DUE TO EXPOSURE TO A HARSH CLIMATE

Forced displaced people have a disproportionately high rate of mortality, diseases and mental illness. Of the nearly 60 million displaced people, almost half are in a state of extreme vulnerability. A number of the causes for diseases amongst refugees are preventable when providing comfort for those at risk. The **maggie** shelter addresses the shortcomings of tents and is a solution against the elements of a harsh climate.

SAFETY ISSUES AMONGST REFUGEES

The refugee population is a mosaic of individuals, each with a personal history. They reconstitute their complex societies in the refugee camps and take with them the ethnic, cultural and religious rituals and convictions of their home country. The scarce resources and challenges for survival further exacerbate the divisional tension amongst refugees. Creating safe refuges within a camp for those at risk is a demanding task given the fact that countries hosting the refugees only allow for temporary settlements. Tents provide little protection against intruders.

THE NEED FOR EDUCATION AND SKILLS FOR REFUGEES

In the midst of conflict or sustained poverty, education for the victims and displaced people is often seen as secondary to the struggle for food, aid and shelter. Providing education (children), vocational skills (adults) and capacity building helps refugees to get back on their feet and develop competences that allow them to return and build a better future.

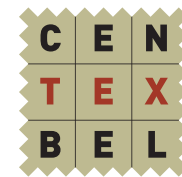
“Education is often the only hope and ticket for change children have.”

Bart Peeters



LET'S BUILD OPPORTUNITIES

9. INNOVATION PARTNERS



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