INTRODUCTION, BASIC DATA

Our basic conception is to create a habitat and work unit which fulfils the following criteria:

- it can resist to the extreme climate and it decreases the loss of heat with its shape and features
- it can be packed in a small place
- it is transferable and can be thrown to the target area
- it can be adaptable to an other climate
- it uses mainly natural source of energy
- it is recyclable, applies waste material - it operates with economical using of energy
- it operates with economical water using

THE FEATURES OF THE PRODUCT

aluminium framework which weighs 540kg - canvas with xenon filling weighs

 PCM heat accumulator weighs food portion for 15days

- operation radius: it can be transferred by plane and can be thrown to the target area
- operation between: 10C°/-40C°
- "U" factor of Xenon canvas: 0,17 W/m²K
- supportability: 3-6 people

THE PHYSICS

As we know ice absorbs and lets off heat meanwhile it melts and freezes. During this process the temperature doesn't change only the physical condition. We call the materials with such features phase change materials (PCM). There are also materials which are capable of storing their latent heat between 20-50C°. (In 2003 we developed a PCM of which 1kg can store 104 kJ heat energy-the same as 60 kg concrete) This material was used several times in architecture, and it is almost indispensable in computer technology. We undertook the task to find a new architectural application for this new material. So we developed the canvas structure filled with PCM. /diagramm on the right

PCM accumulator: We developed a heat accumulator for this project which has great heat capacity and heat resistance. A lot of time would be needed for its running down as we packed the beat storing material in vacuum.

Vacuum is one of the best heat isolation (we can see it in car production, space technology) so the accumulator lets off heat only when we use it.

The operation of accumulator: We place small balls in a long flexible pipe, and we roll this into a storing pot. We place the storing pots under vacuum. The storing pots can be joined depending on heat demand. (If we liked the accumulators can be joined in a row like in the electricity) We restart the accumulators in a heated (charged) condition.

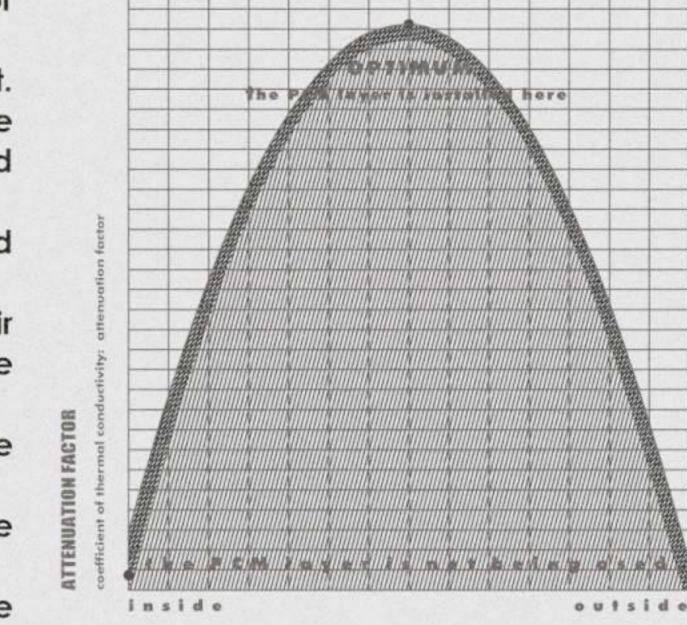
Its charging is not difficult at the starting point, on one hand the external energy resources can be easily reached against the poles; on the other hand we can charge it with sun collector or heat pump in a warmer climate.

Incoming air: We join a heat changing on the 50-55C° charged accumulator. One part of the incoming air comes in the accumulator pipe filled with PCM balls through a heat changing. We put out as much heat as we need for the keeping up of temperature.

The heat changing mixes the hot air coming out from the accumulator with other preheated air to an appropriate temperature and gets to the interior space.

Out-coming air: Out-coming air goes out through the heat changing and it gives most of its temperature to the

Xenon canvas: We chose xenon, which is the biggest heat resistant material for the filling of the canvas. We place 6 pieces of 0, 5-0,5cm canvas layers onto each other. Each layer has a cell wall creation. (Injuries don t cause big damages in the isolation)



The building physics features of the PCM canvas. As it can be seen in the diagram the canvas has mass features. It operates like a brick wall (attenuation factor, heat delay)

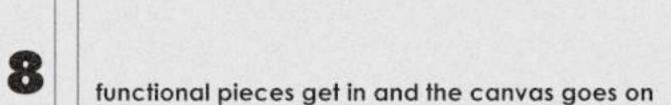
The aluminium framework of the structure has an igloo shape. The supporting has three joints, so it can be closed to a very small size. The closed shape which is similar to a shell makes possible to throw it to the ground with a parachute safely. The phases of the assembly can be seen in the middle row of graphs. The igloo shape of the open structure can resist to the wind effect, and the least specific surface belongs to this capacity (cooling down surface) that's why this building form has spread through the cool climate areas for thousand years) The heat insulation canvas goes to the standing structure. (It goes also to the flooring) We

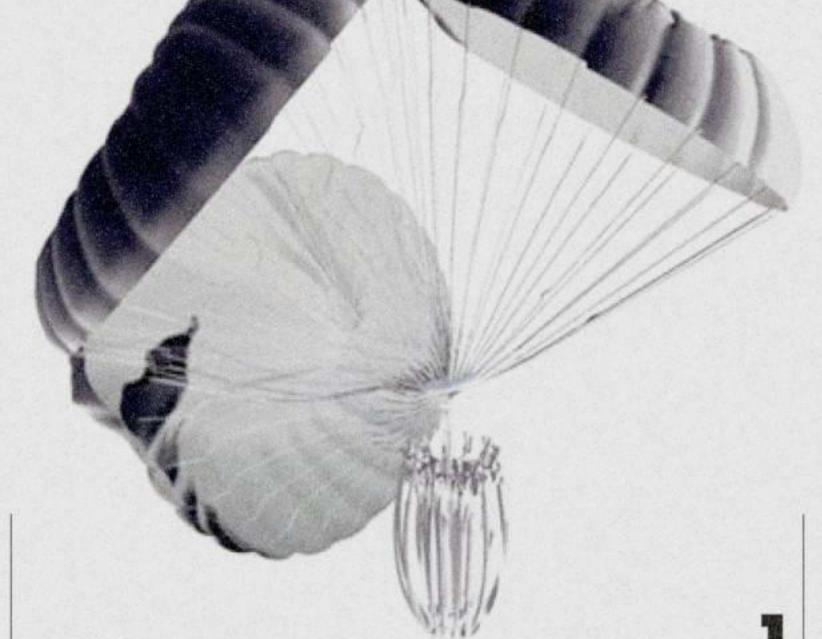
separated nine functional units within the igloo. These are simple canvas separating walls, they have only separating roles. The units are the following: 3 pieces of sleeping units, lavatory unit, energy storing unit, cooking unit, informatics unit, and common part. The ninth unit is the puffer- space of the entry, for the minimalizing of the heat loss.

Functional arrangement: We arrive at the igloo through a puffer space to the common unit. Here there is enough space for gathering, having meals, meetings etc. We can find the heat centre in the very middle of the igloo. The functional pieces the three sleeping units open from it. Next to them there is a lavatory unit (with shower, toilet, and two washbasins) the unit contains cleaning equipment which makes possible the using of grey water. Next to the lavatory there is the energystoring unit (placed between the most energy demanding units) there can be found the accumulators and the reception units of tiny wind power plant which are planted next to the building. We placed the spare heating equipment here, and the stores of secondary energy sources (heating oil, petrol) Next to it is the cooking unit and finally the informatics unit.







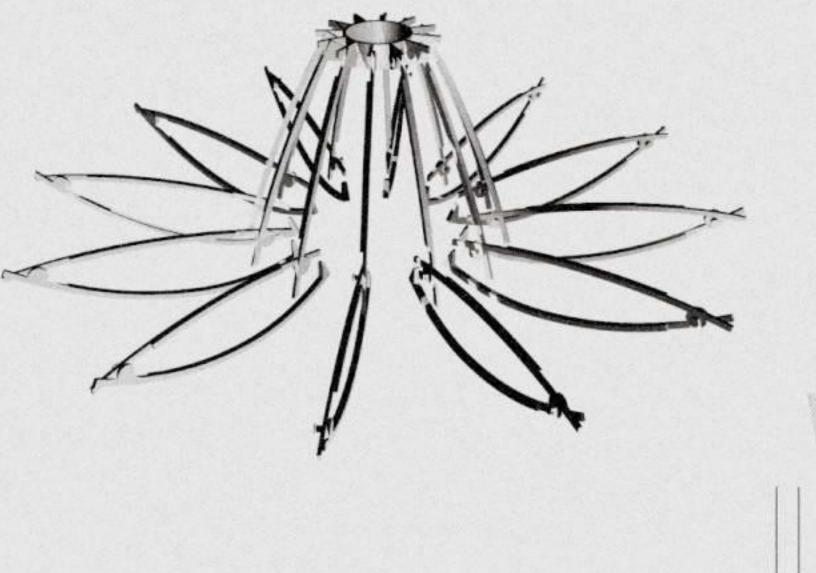


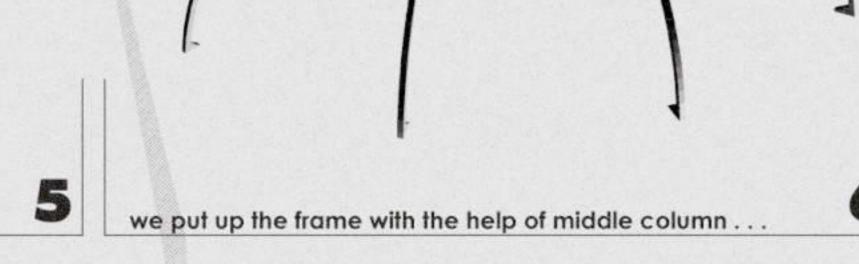
closed frame and parachute

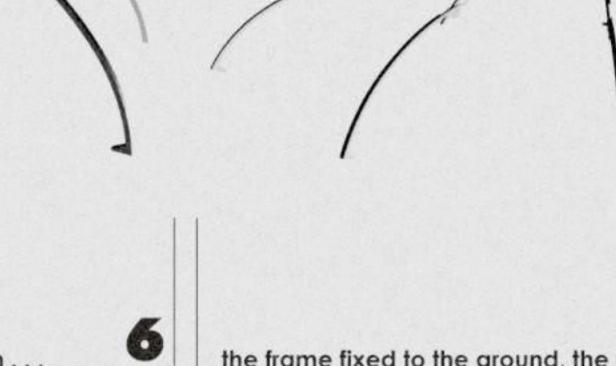


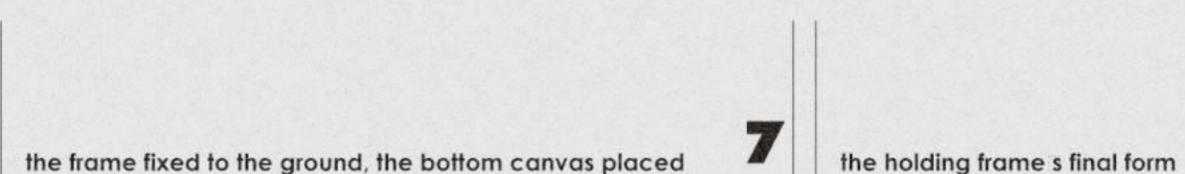












SUSTAINABILITY

THE OPERATION

The heat accumulators have important roles from this respect:

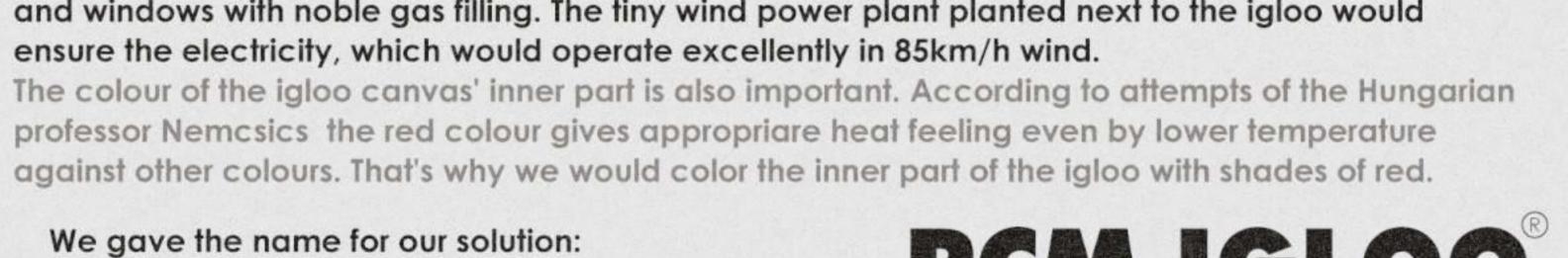
- The accumulator can be filled with renewing energy sources. It is rechargeable after its discharge. According to laboratory measures its performance is unchanged even after 10⁴ discharges.
- It has an eternal life.
 - Their mobility is due to their huge heat- storing capacity and light mass. They are adaptable for different climates. (e.g. : on a desert climate it operates contrasted, we cool it at night and fill up in the morning- meanwhile the internal temperature is permanent)!!!
 - PCM materials are the by product of oil production.

The other important element of the building is the xenon canvasfor the least energy loss.

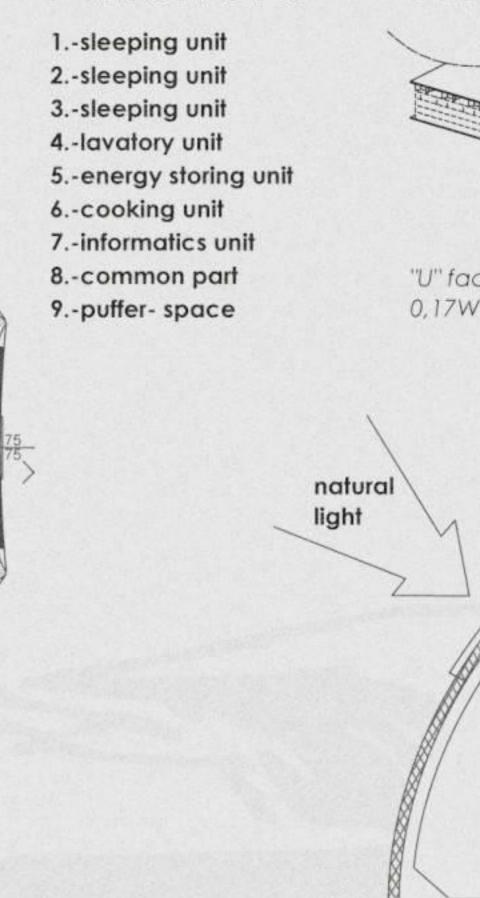
The good heat- changing equipment is important for minimalizing the energy loss. It can not only regain the internal used heat of air but the unnecessary heat of cooking and lavatory units. (Using the condensation) The lavatory and cooking units turn back the grey water for using. We created a light transparent surface on the side of the canvas as a multi-layer doors and windows with noble gas filling. The tiny wind power plant planted next to the igloo would ensure the electricity, which would operate excellently in 85km/h wind.

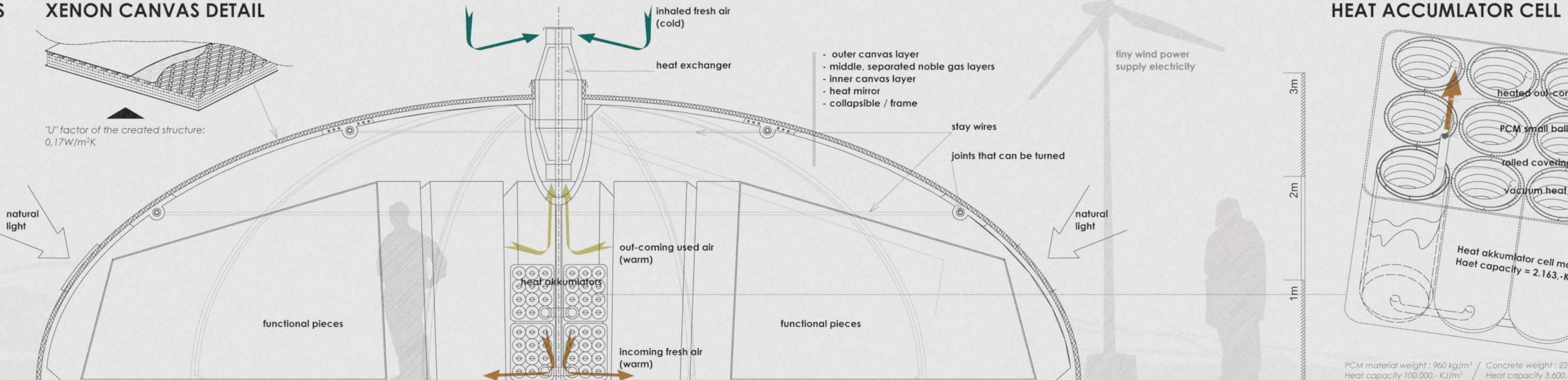
professor Nemcsics the red colour gives appropriare heat feeling even by lower temperature against other colours. That's why we would color the inner part of the igloo with shades of red.

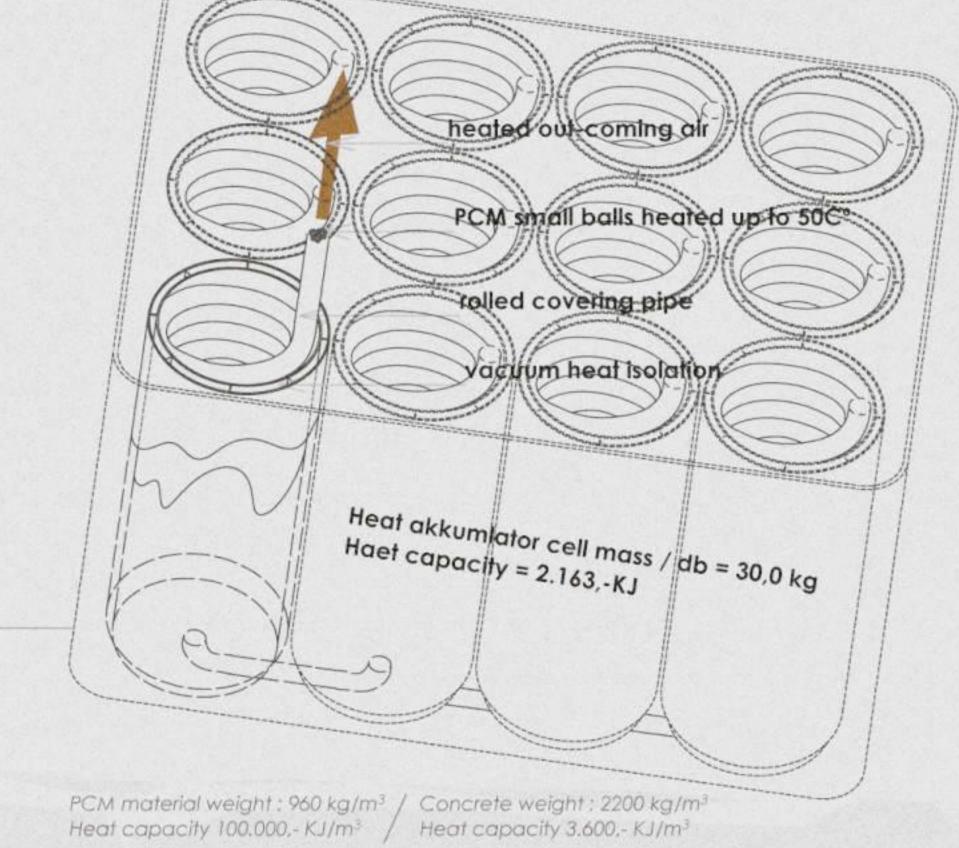
We gave the name for our solution:



heat akkumlators GROUND PLAN







PCM material mass: 180 kg Heat capacity 17.307,- KJ - in concrete weight: 10.577 kg

SEGMENT

PCM IGLOO