MODEL OF TEMPORARY HOUSING
from concept to realization in the case of the Roma settlement

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Model of temporary housing
From concept to realization in the case of the Roma settlement
IMPRESSION

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Nikola Vukić
Džemal Hasanči
for masterful construction.

ABSTRACT

This publication shows the process of cooperation between the group of students (at the time) of architecture and foundation Reconstruction Women’s Fund, achieved/realized for the purpose of helping residents of the Roma settlement. The main reason for starting this cooperation was the need to help people who were endangered in floods in May 2014. The problems of socially and economically endangered groups were observed from an architectural point of view, which allowed to form an interdisciplinary approach in their solving. The cooperation and realization of projects took place from September 2014 to September 2015.

Through the publication, the beginning of the cooperation, cause, challenges and results of a several-month work, will be presented. Detailed review of research and process of work will allow the reader to understand the key principles that led us through. Those are: fast and easy installation and de-installation of house, but also the use of light and cheap materials. Publication contains a step-by-step manual for the installation of the house in order to continue the use of project.

The idea of this publication is to pass on knowledge acquired by this experience to every reader, and allow him/her to build one’s own prefabricated house for temporary living, easily and with understanding.
INTRO

After the unprecedented floods that struck Serbia and the region in May 2014, students of the Faculty of Architecture of the Belgrade University launched an initiative called New housing models for flood victims, in order to provide assistance from the profession-
al standpoint.

The initiative was conceived as a set of lectures by professors of the Belgrade University and workshops for architecture students, with the aim to explore new housing typolo-
gies, and these resulted in a series of conceptual solutions for permanent and temporary housing, planning scenarios for housing in emergency situations, possibilities to carry out projects etc. All parts of the initiative were held at the Faculty of Architecture, in the period between 12 and 15 June 2015, and subsequently, the initiative results were pub-
lished online, in order for the public to become familiarised with the initiative as soon and as fully as possible.

At the same time with the initiative, as well as with raising the collective local aware-
ness about the consequences of the mentioned weather conditions, many organisations initiated programs for helping flood victims. As one of these organisations, Reconstruction Women’s Fund started a program for helping individual households.

One of the planned programs for helping affected areas was help to a Roma settle-
ment, and repairing of existing barracks, that had also been endangered by floods.

Having learned of the mentioned student initiative, New Housing Models for Flood Vic-
tims, and having found out about its results and projects, members of the Reconstruction Women’s Fund saw the potential in establishing cooperation with students and their or-
ganisation, with the aim to provide joint assistance to those who need it.

As a part of the projects of the student initiative, members of Reconstruction Women’s Fund selected the project SOS Housing as the one with potential to be elaborated for the planned project of help for a Roma settlement. Project SOS housing is an exploration and explanation of methodologies of acting in emergency situations, depending on possible scenarios, which establish clear steps for manners in which it is possible to react in critical situations by different architectural concepts and housing typologies. These housing concepts are also defined from the socio-economic point of view, and this presented po-
tential for establishing cooperation between the student group and Reconstruction Wom-

en’s Fund, and initiating a joint project:

“Dear students, We (Reconstruction Women’s Fund), when making plans for what can be done from our side about the flood consequences, encountered situations in which consultations and cooperation with involved architects would constitute a sensible step, and maybe a new experience for you. On several locations (settlements in Mladenovac, Smederevska Palanka and Obrenovac), the situation is pretty clear, for a number of people who were affected in multiple ways, we will be able to provide (limited) help for houses they are already repairing for life, for the winter. There is also a settlement in Vrdnikovac, inhabited by Roma, which is in such a poor condition that it will take a great deal of thinking what could be useful and possi-
ble. Would you like to have a meeting with us next week, whenever you have time, and we can see what to do?
Sincerely,
RWF”
Working with the members of Reconstruction Women’s Fund included reconfiguration of the initial project and possible modifications, in accordance with the problems at hand. By the end of 2014, only a few months after the workshops, works on the first house in the Roma settlement on the outskirts of Belgrade were started (Vidikovac neighbourhood). When visiting the settlement, we observed problems and defects that were present in almost all temporary buildings – barracks, made by their own residents, in which they dwell in conditions unacceptable for life. After extended considerations and talking to occupants of the settlement, it was decided that the first house to be repaired was to be the house belonging to a single mother of four underage children, aged between 0 and 6.

The state of their house was so deficient and above all, it was necessary to improve the construction of the building, and then to replace the existing inadequate layers of materials in walls and roof, such as cardboard, carpets and all kinds of alternative covers. After a successful repair of the house, residents were able to have more pleasant and functional living quarters.

Having completed the works on the first house, on the same location, construction of a new dwelling unit was undertaken, for a young family of four. When working on both of these houses, we were guided by the idea that the house should be formed as a mobile and simple structure, predominantly with assembly-disassembly features. It was important to establish the basic construction of the house as functional for life, practical and simple for building and disassembly, in case of change of living location.

House no. 2 was finished in the shortest period possible and the family moved in, having much better conditions for life. It became their home.

Further in the text, we will explain in detail the very process and methodologies of research, construction systems and solutions for projects on which we worked over the course of several months of cooperation with the Reconstruction Women’s Fund.
This is not a story about floods

In May 2014 there were floods. Everybody knows this. Some people lost their homes, had no basic help, nothing, and the situation is still the same today. Many do not know this. Those who would have to know this, keep quiet and do nothing. The floods brought to the surface all the mud of this system – IRRESPONSIBILITY, indifference, disorganisation, greed, policy of “Some citizens are less equal than others” type. We wanted to know. To know where these people, reached by the floodwater, were. These people, who have been rejected and marginalised before, during and after the floods. No difference.

In June 2014, students of the Belgrade Faculty of Architecture of their own accord organised extracurricular workshops New Housing Models for Flood Victims. Among others, the workshop SOS Housing – Architecture in Emergency Situations. This is known to a handful of those who initiated the whole thing, a few professors, perhaps a few others. We have learned, by chance. And we immediately got in touch with them, on purpose. We were connected by ACTION of people, who realised that architecture, or any other profession could not operate alienated from the society, and that it had no purpose unless its aim is common good.

Together we have adapted one of the conceptual solutions from the workshops to the context in which we decided to work. Settlement in Vidikovac, next to a fuel station. Settlement with no electricity or running water. Settlement in constant emergency circumstances. From the initial idea of temporary housing, students jointly created, free of charge, a draft for a movable home, in accordance with habits of its residents – young women, with children, with no institutional support. This is how Sanela’s and Milica’s house came to being. One was reconstructed, the other one built from the ground up (with ‘gold’ window). Both houses can be disassembled, so that at the time when somebody decides to forcibly move them from there, or they themselves decide to go, the can take their home with them. FREE.

Our common goal was for the houses to be built of easily available materials and safe for living, not just for temporary accommodation, with relatively simple process of assembly and disassembly, cheap*. This manual is about our experience and basic steps for constructing a home in emergency circumstances.

June 2015. Milica’s house was the first one to be burned, then Sanela’s and then several others, one after the other.

Arsons.

We want to know why. All of this. Sufficient for the story to be CONTINUED...

We want to thank Aleksandar Bobić, who was the first to point out to us the mentioned student initiative and got us in touch with them, Danilo Ćurčić, who sent us to the Vidikovac settlement, to Nada Duričković and Violeta Đikanović, for leaving their heart in the field, to Džemal Hasan, for assistance in repairing Sanela’s house, to Zoran Dordić and Nikola Vukić for masterful construction of Milica’s house (with “gold” window).

Activities were supported jointly by Oak Foundation.

Reconstruction Women’s Fund

* The cost of the complete construction amounted to 2,994 euros. Cost includes materials, craftsmen and material transport. With the help of this guide, it is possible to build the house also with the joint work of people who would be found in emergency circumstances, and that have at least a basic architectural knowledge and skills, which would further reduce costs. We have found materials mainly in the warehouses, where material transport was not included in the price, although there are stocks that offer this possibility. In this case, the costs would be for that much less.
1.0 Best practice examples

Research process is one of the important stages of working on projects that require possession of certain properties, such as cost-effectiveness, energy efficiency, ease of assembly, availability. And when it is also necessary to have a solution that would be operational in emergency situations, the task becomes more difficult and demands more attention.

In the next chapter, we will present a brief analysis of the most convenient architecture examples from around the world, with different methods of construction and from very different materials.

Pallet House Project – I-Beam Design

Design of this house model is simple and flexible. In terms of configuration, each family can modify it according to their own needs. For the most basic construction, only standard hand tools are needed, nails and wooded pallets (either used or new). As additional materials, wood planks can be used, crates, nylon or any other material available to users. Building can have thermal insulation and can be comfortable for living all year long.

Pavillon ecologique – Studio 1984

This environmentally friendly house is conceived as a simple square structure, made of the simplest materials, such as wood and hay. It was constructed in three weeks period, by using recyclable materials. The basic construction of the house is on the frame made of acacia tree, with the intention to leave the smallest possible “footprint” on the location, once it is removed. High roof design enables efficient attic ventilation and prevents over-heating of the structure during summer months, while outside layer is a good insulation element. Inside the house, the space is simple and open. By adding kitchen and bathroom, the house can easily become a small home or weekend cottage in nature.
Paper Log House – Shigeru Ban Architects

Just like Serbia, which was struck by severe weather conditions, twenty years ago (1995), devastating storms hit Southwest Japan, and among others, small town of Kobe was destroyed. It was necessary to find a solution to quickly and efficiently resolve the housing problem of the residents. Paper log house is a proposal of the architect Shigeru Ban, and is a cost-effective, simple solution, easy to assemble. Foundations are made from beer crates, filled with sand, and walls are made of waterproof paper tubes, with ceiling and roof constructed from tarpaulin. After utilization, the house can be easily taken apart, transported and assembled once again, thanks to properties of materials it is made of.

Hermit house - Mark van der Net & Daniel Venneman

Hermit house represents a whole range of projects, which can be modified and adapted to the user as necessary. Materials are completely environmentally friendly – wooden construction, with a lining made of OSB panels, planks and glass. Yet, the greatest advantage of this model is easy re-fabrication, two-day transport and exceptionally simple installation. Predicted lifetime of the building is around 10 years (depending on the materials used for construction), and the price is approximately 700 Euros/m² (VAT, transport costs and installation costs are not included).

1. Hay house

Construction with bales of hay offers a lot of benefits and is more comfortable than it is perceived. Different structures and constructions can be made of hay, from a small storage unit (pantry) to a large, family house. As with prefabricated houses, skeleton of the house made of hay bales is set on the prepared foundation (footing and slab).

Materials

Having presented the analysis of the buildings already constructed, now we can identify the three systems that are applicable in our region, and that are in accordance with the financial situation of the society and with the criteria of energy efficiency.
1.1 Material exploration

The whole exploration process is based on finding cheap and available materials, which are easy to work with and match the concept of temporary housing mentioned in the beginning. From temporary housing emerges the theme of prefabricated houses, i.e., prefabricated constructions, because such systems enable efficient contraction and disassembling of buildings. When researching materials traditionally used for construction in our region, we recognised bricks and timber as the simplest solution for the construction. Having in mind the technique at our disposal, for the shell we selected panel materials, wooden composites, the properties of which enable easy shaping and construction.

Important elements of comfort are thermal insulation made of Styrofoam and styrodur and hydro insulation made of different types of foils. For the roof covering we chose roof tiles and tegola, materials widely used in our market. Having taken into consideration that this is a specific kind of housing, we also included alternative sources for collecting materials, i.e. secondary materials.

LEGEND

<table>
<thead>
<tr>
<th>Installation method</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>hammering</td>
<td>buying new materials</td>
</tr>
<tr>
<td>handsaw cutting</td>
<td>secondary raw materials</td>
</tr>
<tr>
<td>chainsaw cutting</td>
<td></td>
</tr>
<tr>
<td>gluing</td>
<td>thermal insulation</td>
</tr>
<tr>
<td>cement rendering</td>
<td>hydro insulation</td>
</tr>
<tr>
<td></td>
<td>mechanical</td>
</tr>
<tr>
<td></td>
<td>to fire</td>
</tr>
<tr>
<td>Material</td>
<td>Characteristics</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>Latte 5x1cm</td>
<td>Flammable material, low resistance to moisture without additional treatment</td>
</tr>
<tr>
<td>Pillar 10x10cm</td>
<td>Easy to process and imbed, very durable and also reusable</td>
</tr>
<tr>
<td>Euro pallets 10x80x14cm</td>
<td>Flammable (in dependence on wood type)</td>
</tr>
<tr>
<td>Brick 25x12x6.5cm</td>
<td>Material of high endurance and resilience</td>
</tr>
<tr>
<td>OSB 3 panel 24x12x1cm</td>
<td>Material of high endurance, resistant to rain and moisture, easy to install</td>
</tr>
<tr>
<td>Plywood 400x10x2.5cm</td>
<td>Flammable material, low resistance to moisture without additional treatment</td>
</tr>
<tr>
<td>Styrofoam ECO 190x10x2cm</td>
<td>Inexpensive material, easy to process and imbed.</td>
</tr>
</tbody>
</table>

**OSB 3 panel**
- It is designed for use in humid conditions, as well as wall and floor paneling, the roof structures as a basis for shingles. It consists of laminated pine resin.
- Sheet size: 1250 x 2500 mm
- Thickness: 8/10/12/15/18/25 mm
- Resistance to bending: longitudinal: 6-10 mm (22 N/mm²); 10-18 mm (20 N/mm²)
cross: 6-10 mm (22 N/mm²); 10-18 mm (20 N/mm²)
- Elasticity: longitudinal: 3500 N/mm²
cross: 1400 N/mm²
- Deformation of the humid temperature: 15%
- Combustibility class: D-S2, D1

**Styrofoam ECO**
- This material has proven to be excellent for application at the insulation of roofs, walls, slabs between the floors and floors in buildings. Excellent cost-effectiveness of the insulation material enables immediate cost savings for heating and cooling.
- Sheet size: 100 x 50 cm / 0.5 m²
- Thickness: 2 cm
- Packing: 5 m²

*Given material prices are approximate and from the time of reconstruction of the first house (November 2014)*
<table>
<thead>
<tr>
<th>characteristics</th>
<th>use</th>
<th>evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>material</td>
<td>positive</td>
<td>negative</td>
</tr>
<tr>
<td>Styrofoam</td>
<td>high insulating capacity, moisture resistant and easy to install</td>
<td>flammable, more expensive than styrofoam, which has similar characteristics</td>
</tr>
<tr>
<td>PE construction foil 0.5mm</td>
<td>easy to install, excellent waterproofing properties</td>
<td>designed primarily for protection during construction</td>
</tr>
<tr>
<td>Bituminous paper (insulation)</td>
<td>low mechanical resistance, tends to tear</td>
<td>for: waterproofing roof and floor</td>
</tr>
<tr>
<td>Roof tiles</td>
<td>material of high endurance, resistant to rain and moisture easy to install</td>
<td>requires a roof substitute, which creates an additional burden for the construction of the house</td>
</tr>
<tr>
<td>Adhesive bitumen tiles</td>
<td>does not create a large load due to its light weight, suitable for roof pitches</td>
<td>low mechanical resistance, prone to damage, which requires restoring the whole covering</td>
</tr>
<tr>
<td>Lexan</td>
<td>thermal efficient and a good conductor of light, resistant to shock, low combustible material</td>
<td>poor soundproofing, exposure to bad weather influences the aesthetics of the material</td>
</tr>
</tbody>
</table>

**SPC lean**

- Polycase SPC is the name for extruded polycarbonate plate with more walls. Polycase SPC corresponds to the outside and inside use. It is easy to transport and install. Polycase SPC panels provide excellent optical and aesthetic properties, with a wide range of transparent and translucent colors.
- Table dimensions: 2100 x 6000 mm
- Thickness: 4/6/8/10/12/25/32/35 mm
- High impact resistance
- Resistant to bad weather
- Excellent sound and thermal insulation
- Light transmission: 88 % (10mm)
- UV protection on one side
- Resistance to temperature between -40 °C and 130 °C
- High resistance to mechanical loads
- Easy to install ordinary tools

**Construction PE film**

- It is used in construction works in isolation technology, under floors and lining to prevent moisture as well as in roof construction and isolation of temporary protection of roofs. PE film is produced from quality recycled materials.
- Width: 4.15/6/8m
- Thickness: 0.05 ; 0.09 ; 0.15 ; 0.20mm
* (0.09mm : for coverage painting, to cover building materials and insulation technologies).
- Heat resistance : +70 °C
- Operating temperature : -20 °C - +40 °C

* Given material prices are approximate and from the time of reconstruction of the first house (November 2014)
2.0 Context: present situation (what we have found)

Project which realisation is the topic of this publication was made for the families from the Roma settlement in the Belgrade Vidikovac neighbourhood, next to the trunk road Ibarska magistrala. Like the majority of Roma settlements in Serbia and region, it was established on the outskirts of the city.

The Roma settlement, for which the project was set up, is one of those that has developed spontaneously and with no planning. The settlement does not have infrastructure equipment; it has no street lights or water system, no connection to electricity grid. Barrack is the basic type of the housing unit in this Roma settlement. It has only ground floor and contains one room of up to 25 m². It is constructed of non-construction materials, found in the vicinity of the settlement and nearby landfills.

The basic construction is made of timber that was previously already used, planks and latticework, while for covering roof and walls, the following materials are used: old pieces of sheet metal, doors, roof paper, nylon, cardboards, carpets etc. The floor is usually not laminated and is covered in carpets as a cheap covering for the ground. Barracks have no foundations. Roofs have rather insignificant inclines, and are mostly mono-pitched or dual-pitched, covered in nylon as the only hydro-insulation material.

This type of house is not safe for living, because the building materials are very often in bad shape. Also, it does not provide adequate living conditions, because it is cold, dark, damp and leaks when it rains. The main goal of this project and publication is the exploration of possibilities to repair existing problems on individual barracks and to improve living conditions in certain house projects.
After a long ride by bus, we got off on the stop near the Roma settlement. On one side of the street, you can see the city, and on the other – a meadow. There were several paths across the meadow, all muddy, since it was raining recently, and we got to the first line of barrack, which was barely visible from the main road. It was quite a feat to get there. When we visited for the first time, there were four barracks, surrounded by a landfills, full of garbage. It was still daytime when we arrived, but soon it began to get dark. Talking to people living there lasted for quite a while. I remember the bone chilling cold, and next to me, children running around barefoot, as if it was summer. On one side there was daily life, with its back turned to the one hidden on a seemingly empty meadow.

Maja Kopta, M.Arch

Project of helping a Roma settlement, which we carried out jointly with Reconstruction Women’s Fund, establishes a different, more humane relation to those who need help. Although small in terms of scope, for us it was a great motivation, a good starting point for changing perspective and starting to think about improving life conditions in such settlements.

Ana Đusmanović, M.Arch

I remember that the weather was bleak, cloudy, and somehow sad. It turned out that it was not only the weather, but also the situation which we found during our visit to the settlement – bleak and somehow sad. Barrack “constructed” randomly of secondary materials (and these materials scattered all over the place) almost threatened to collapse any minute, and their residents still stayed in them, carefree. At that moment, from the barrack in front of which I was standing, Sneža ran out (an adorable two and half years old girl), and greeted us by waving – carefree, wanting to play and somehow cheerful, and all still seemed bleak to me. Soon we were surrounded by dozens of dwellers of this settlement, who were curiously expecting something from us...But what? What could students of the Faculty of Architecture provide to these people, who need so much help? We did not need a lot of time, and we agreed to help in the only way we could – by our knowledge. We will try to provide at least safe roofs over their heads, and make life easier in these harsh conditions.

Tijana Savić, M.Arch

From the workshop that was our response to the floods in May 2014, to construction of the first house in the Roma settlement, our goals and ideas have changed. From the beginning, our basic goal was to help those who were endangered, but only after the first visit to the Roma settlement, it got the real dimension. The greatest impression was left by children, who were playing around us, barefoot, while we were shivering with cold. The children did not seem to mind, or their mothers, who were telling us, with smiles on their faces, about problems they encounter on a daily basis.

Jelena Stanković, M.Arch

In Roma settlements, houses are made of all kinds of stuff; cardboard, veneer sheets, wood, old doors and windows, carpets... One layer at a time is added to the construction, so that the house can be warm; over plywood, discarded carpets are added, and they become drenched with every rain and bend beams. Layers are added, nailed and tied, and then over them, tyres are placed and heavy materials, to prevent the house from “flying away”. Due to this “tucking in”, space becomes dark and unsafe, so dwellers spend more time outside their houses than in them. My wish, to participate with my colleagues in creation of a better living space, became even stronger after I got to know the situation.

Stefan Milicević, M.Arch

The basic idea, which guided us, was to provide families in the Roma settlement in Vidikojac, as quickly as possible, at least somewhat normal, quality and comfortable life. Since we met as a team at a workshop with a similar topic, we agreed about the concept fairly quickly. In the winter of 2014, construction of the first house ensued, and then in spring 2015, of the second house. Having seen the difficulties of life in a Roma settlement, spending time with the inhabitants and working on the houses, left a very strong impression on me, and my colleagues as well. I hope that this initiative will invite young architects, and individuals from related professions, to get involved in greater numbers in solving these or similar problems.

Mihailo Sladoje, M.Arch

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3.1 INTRODUCTION

Project for the first house on which we worked in the Roma settlement was initially conceived as a reconstruction of an existing house. The main goal of the project was to improve conditions for the family living in it – a single mother of four children. Reconstruction included: repair and insulation of walls, roof, windows and doors, as well as forming floors, which did not exist at all in the beginning. Guided by these goals, we started to carry out the project, but when removing layers of the wall, we found inadequate construction elements, and this increased significantly the amount of the works we planned. Due to circumstances arising from this, volume of works planned initially for the reconstruction finally equalled the amount of work needed for a construction of a new house. Due to very bad state of the house and unpredictable weather, we decided for construction works according to the principle "From the inside out", i.e. establishment of the new unit inside the existing one. We decided for this manner of work in order to work as quickly and as easily as possible and not to depend on weather conditions. According to the plan, the first thing to do was to set construction element, and then all inner layers with insulation (floor, ceiling, walls), and after this, walls of the old house would be disassembled and new outer layers put in their place, with installation of new windows and doors being the final phase.

Designing and constructing of the house no. 1 were very closely knit, because implementation called for constant adaptation to the situation. And from this experience we have drawn conclusions that had significant effect on designing the next house.
### The existing situation

<table>
<thead>
<tr>
<th>House element</th>
<th>Evaluation of elements</th>
<th>Identified problems</th>
<th>Solution proposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position</td>
<td>Materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>Planks</td>
<td>The construction of the house is made of planks buried in the ground, which after the role of pillars and beams. This design is inadequate and does not meet the basic level of structural integrity.</td>
<td>Replacement of old construction, which includes: the construction of the roof, walls, and floor.</td>
</tr>
<tr>
<td>Beam</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doors and boards</td>
<td>Mats and rags</td>
<td>The roof has no structural elements, except the ridge. It is covered with wooden planks and doors that are generally stacked, not fixed. Because of this, there is a poor isolation from external influences (wind and rain).</td>
<td>Setting the roof structure, thermal and hydro-insulation with finishing coating.</td>
</tr>
<tr>
<td>Walls</td>
<td></td>
<td>The walls are also made up of planks and doors without any substructure or isolation. They are fitted carpets in order to provide some form of protection from rain and wind. This is not the best solution, because they get wet during the rain.</td>
<td>Setting up and installing the substructure and thermal insulation in the wall. As a coating use a laminated material which is preferably resistant to water and moisture.</td>
</tr>
<tr>
<td>Floor</td>
<td></td>
<td>Lack of floor in the house. Several layers of carpets stacked on each other. Floor is often flooded during the rain. It also does not meet - even the basic standards of hygiene.</td>
<td>Setting floor structure with all layers (leveling floors, waterproofing and making &quot;both&quot;), in which construction would be settled with thermal insulation and a final layer (a kind of boards or planks).</td>
</tr>
<tr>
<td>Mats and rags</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used door</td>
<td></td>
<td>Door is poorly attached and without being able to be locked. The only window in the house was badly nailed to planks that make up the wall. The glass was broken. Windows and doors are not properly made so they enter wind and rain.</td>
<td>Setting up two windows for better brightness. Instead of glass it is desirable to use a transparent plastic material. Use old doors, fix them and ensure adequate mount. Openings around door and windows should be bordered.</td>
</tr>
<tr>
<td>Used windows</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Intervention

<table>
<thead>
<tr>
<th>Material proposal 1</th>
<th>Architecture</th>
<th>Material proposal 2</th>
<th>Architecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction:</td>
<td>w. beam 5x6cm</td>
<td>w. beam 5x6cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100 RSD/m</td>
<td>100 RSD/m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1x10x1cm</td>
<td>1x10x1cm</td>
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<tr>
<td></td>
<td>21,000 RSD/m²</td>
<td>21,000 RSD/m²</td>
<td></td>
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<tr>
<td></td>
<td>w. plank 3x2cm</td>
<td>w. plank 3x2cm</td>
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<tr>
<td></td>
<td>38 RSD/m</td>
<td>38 RSD/m</td>
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<td></td>
<td>38 RSD/m</td>
<td>38 RSD/m</td>
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<tr>
<td></td>
<td>10-50 RSD/m²</td>
<td>10-50 RSD/m²</td>
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</tbody>
</table>

Setting adequate structural system, improve the structural integrity of the building and therefore it would make it much safer for life. Also, construction with subframe enables easier mounting of all layers (floor, wall, and ceiling.).

New roof with its structure, insulation, and final coating, contributes to the comfort in the house. With this type of roof the possibility of leakage and curving roof is excluded.

By using such a wall in the house we contribute to the structural integrity of the building and thermal comfort. The wall is adequately insulated, so the wind and cold can’t pass through it.

Installing the floor with adequate insulation and construction has a positive effect in many ways, includes construction, contributes to hygiene in the house, increases the thermal comfort and prevents water from entering the building.

By mounting these doors and windows, we contribute to the thermal comfort, as wind, rain, snow and cold can not penetrate the building. Also, it is safer for the people who live in it, because the doors and windows can be locked.
3.2 Construction process (course)

The term "construction process" represents a chronological order of works during construction of the house. Due to nature of the intervention and status of the house, which was built without much planning, we believe it is appropriate to list the construction process in the form of journal from the field:

Day 1 // Clearing the house, taking out the existing layers of floor (carpets) and preparations for installing construction.
Day 2 // Clearing the house and taking off layers from walls. Disassembly of the roof and preparations for installing construction.
"We realize that in the whole house, there are only two adequate construction elements – pillars. We decide to work "from the inside out".
Day 3 // Digging holes for pillars and installing new constructions for walls and roof. From the existing house construction, only the main beam (the ridge) was kept.
Day 4 // Setting and fitting of all layers of the roof. Placing OSB panels on the outside of the roof, gluing Styrofoam to panels on the inside of the house and placing OSB panels on the inside of the roof. Covering the outer part of roof with tarpaulin and attaching it.
"It was decided that the roof should be done in the first place, because of weather conditions.
Day 5 // Placing OSB panels on the inner side of walls.
Day 6 // Gluing Styrofoam to inner OSB panels (set on the previous day) from the outer side of house, and placing outside OSB panels.
Day 7 // Ground levelling and digging of shallow canals where floor construction will be placed.
Day 8 // Setting up of hydro insulation (steam-permeable waterproof foil) and setting border beams of floor construction.
Day 9 // Forming the grid of floor construction and putting Styrofoam inside it.
Day 10 // Closing of the floor construction with OSB panels of 18 mm and folding of the previously missed hydro-insulation. Setting up the battens.
Day 11 // Fitting in windows and doors. Installing SPC lexan of 4 mm into window frames. Existing doors kept and re-installed.
Day 12 // Miscellaneous final works.
3.3 Conclusion

For our team, carrying out the project of the first house was a unique encounter with a real-life situation and problems of living in a Roma settlement, as well as with the problems of constructing a building in this environment. Lack of infrastructure equipment of the location and weather conditions additionally extended the works. In spite of all the problems that befell us, the house was finished by joint efforts of handymen, inhabitants of the settlement, project initiators and ourselves. We observed how life is not simple in this settlement. Due to lack of infrastructure equipment and upcoming winter, living conditions were additionally difficult, but completion of the works on house no. 1 helped the family a lot to spend the winter in given circumstances.

We were exceptionally glad that we provided better living conditions for one family. Having finished the first project, the plan was to continue the initiative to help Roma families by constructing houses, so that in spring we could help others who need it.
4.1 INTRODUCTION

When we finished repairs on the existing house on the same location, we began to develop the second project of a house for temporary housing, with the ideal to keep it mobile and simple. We wanted to create an assembly-disassembly house, which would be functional, practical and above all, simple for construction.

In the designing process, we paid a lot of attention to the technique of assembling parts and devising the details. We intended to make the house “from scratch”, using only the basic tools, such as: saw, hammer, nails etc.

As with the house no. 1, we decided to use the following basic elements and materials: wooden skeletal construction and OSB panels, as well as recyclable materials. Each of the construction elements was designed in detail and simple for assembling, and the process of forming the house frame was made easier by creating a manual for construction. Because of properties of the materials used and the frame structure, if needed, all damaged materials can be replaced with new ones, thus extending the endurance of the house, in conditions of emergency temporary housing.

Because of frequent moves (for different reasons), the house was designed as an assembly-disassembly structure. The basic principle of the house is that it can easily be disassembled, transported and then again put together and assembled on another location, with this feature providing a more lasting housing solution.
Model of temporary housing
From concept to realization in the case of the Roma settlement
4.2 Process (course) of construction

As it was previously mentioned, the supporting structure is made of wood, beams and pillars, on which OSB panels are attached. Between the inner and outer panels, there is a layer of thermal insulation material, in this case, Styrofoam. Thermal insulation material is inset in all surfaces of the house: from the floor, through the walls, to the roof. Assembling of such a house, with optimal investment of effort and time, can be done by 2 handymen, within 2 to 3 days.

**Setting-up the skeletal system of the house** // Pillars are placed 2 meters apart from each other. Each pillar has a metal insert at the bottom, used for fixing it to the ground. Pillars are horizontally fixed by laths, and then beams are put to place. When the supporting structure is completed, placing panels and insulation ensues.

**Roof construction** // It is advisable that the roof is assembled as soon as possible, in order to provide dry ground for putting up floors. On previously placed beams, from the upper side, appropriate OSB panels, cut according to instructions from the end of this manual, and after this, OSB panels as inside are placed. The next step is to attach thermal insulation to the bottom part of these panels, and after this OSB panels are placed as the inner cover.

**Wall construction** // Following instruction from the manual, OSB panels are set on the outer part. They are fastened by bolts to horizontal laths which are tied to the wooden skeletal construction. From the inner side, thermal insulation is placed. After that, in the final phase, inner OSB panels are installed.

**Floor construction** // On prepared, dry ground, grid of parallel and crossed planks is placed, and between them thermal insulation material is inserted. On top of this goes hydro-insulation foil. It is left hanging on all borders, for adequate protection. On top of the foil goes the inner layer of OSB panels. The sides of the foil are folded and fastened to the final wall layer.

**Doors / Windows** // Previously cut lexan is placed into openings on the house. Additional protection measures: opening for chimney and place for stove are additionally protected by tin.

*Remark: Sequence of construction does not have to be the same.*
4.3 Conclusion

After the completion of the mentioned stages, we have a building for temporary housing, which is easy to construct. It is made of materials that can be, as needed, taken off, replaced, recycled. The building is simplified in form and meets the basic criteria for functionality. It is a shelter which evokes the feeling of basic security.

This space, although small in dimensions and made of simple materials, provides protection from: wind, rain and snow, and can be called a home.
5.0 Possibilities for further elaboration

We want to point out some possibilities for further elaboration and implementation of the concepts and principles of constructing houses (mentioned in this publication) and instead of a conclusion, we would like to offer ways in which the presented housing typology can be implemented by multiplying units and creating appropriate settlement organization, via setting the principle of establishing urban pattern.

In order for the possibilities for the mentioned pattern and urban model to occur, and to prevent segregation of Roma settlements, it is important to highlight that possibility for further elaboration is not implemented on the specific example of the Roma settlement in Vidikovac. Its implementation should be observed outside a specific context, but by observing a multitude of situations in which it is possible to implement this way of establishing a settlement. These situations could be: temporary housing of people whose homes were ruined during natural disasters, temporary housing of refugees, organisation of camp settlement, accommodation for festival visitors etc.

The basic principle for establishing the mentioned settlement organisation is a simple model of neighbourhood. The way houses are grouped in this organisation is guided by ideas of socialisation, mutual interaction and hygiene. As seen in already existing, spontaneous groups, segmentation is carried out, and we have units consisting of 4 to 5 houses. By their orientation, they establish a central, joint “yard”. This principle highlights direct communication and a higher level of socialisation, so that inhabitants can help each other when it is necessary. Also, this central yard enables the parents to pay more attention to children when they play here.

When analysing the existing plans of the houses, before reconstruction and building new ones, we defined the minimal functional elements inside the house, which do not meet all basic needs for living. House is made for one family and provides: sleeping quarters, living room, space for preparing and consuming food, and planned space for keeping personal things. House organises in this way is accepted as the basic element of the further development and planning of the settlement.
One of the basic and most important functions that these houses do not have is hygiene, i.e. providing adequate space for its undisturbed practise. Each group would have an outside toilet, in order to improve living conditions inside the group of houses, and in the settlement as a whole. This is accepted as a minimum which is possible to provide, since there is no connection to the existing infrastructure network of water supply and sewerage. In ideal conditions, where access to water supply exists, it is planned for each group of houses to have one sanitary block, which would include toilet, faucet and bathroom.
House data:

area: 16m²
dimensions: 4x4m
roof type: shed roof
height: 2.72 - 2.14 m
material: wood

beginning of supporting structure:

step 1
Site preparation

step 2
Marking the position of pillars
Distance between the axes: 2m

step 3
Implementing the pillars/

3.1 coating the foundation parts with bitumen
3.2 putting the pillars into prefabricated foundations
step 4 | Supporting structure:

required material:

**beams** 10x10
5x300cm
3x250cm

**laths** 5x8
6x250cm
laths 3x5
32x410cm
6x255cm
2x87cm
8x70cm
2x99cm
2x160cm
2x215cm
2x210cm
2x155cm
2x51cm
2x290cm
2x91cm
4x43cm

Supporting structure of the object consists of beams and joists. They are attached to bearing pillars by hammering. The supporting structure elements are doubled, they are attached on the outside as well as on the inside of the house.
step 4  |  FACADE A
inside and outside supporting structure

dimensions*

L - lath; Š - lath 2; G - beam

L7  l=155cm
L9  l=410cm
L11 l=290cm
L12 l=51cm
Š9  l=250cm
G1  l=300 cm

* remark: the list of elements refers to only one side of the wall, therefore the amount of material should be doubled, for both sides of the wall.
**step 4 | FACADE B**

inside and outside supporting structure

---

**dimensions**

L - lath; Š - lath 2; G - beam

- L1: l=70cm
- L2: l=210cm
- L3: l=255cm
- L5: l=87cm
- L6: l=215cm
- L8: l=410cm
- Š9: l=250cm
- G1, G2: 300cm
- G3: 250cm

---

*Remark: the list of elements refers to only one side of the wall, therefore the amount of material should be doubled, for both sides of the wall.*
step 4 | FACADE C

inside and outside supporting structure

dimensions

L - lath | S - lath 2 | G - beam

L9  l=410cm
G2  300m

*(remark: the list of elements refers to only one side of the wall, therefore the amount of material should be doubled, for both sides of the wall)*
step 4  | FACADE D
inside and outside supporting structure

dimensions*
L - lath ; $ - lath 2 ; G - beam

L2  | l=210cm
L8  | l=410cm
L9  | l=410cm
L10 | l=43cm
G1, G2 | 300m
G3  | 250cm

* remark: the list of elements refers to only one side of the wall, therefore the amount of material should be doubled, for both sides of the wall.
step 5 | Inside wall covering: OSB | FACADE A

Inside OSB boards are screwed to the inside supporting structure. It is important to mark every OSB board (as given in the drawings) and then to put every one into its position in this order.
step 5  | FACADE B

D08 panels...

189
191.50
122.00
122.00
122.00
101
58

Ua4
Ua3
Ua2
Ua1

Elevation

Ua4
Ua3
Ua2
Ua1
step 5  | FACADE C

1.6
67.5
121
189.50

6.05

Ud3  Ud2  Ud1

Ud1  Ud2  Ud3

058 panels

elevation

l1
step 5 | FACADE D

[Diagram of a building facade with dimensions and annotations, including labels Uc1, Uc2, Uc3, Uc4, and Uc5.]
step 6 | Insulation:

Inside insulation are styrofoam boards boards 5cm thick. Styrofoam can be cut in many ways and the drawings are showing only one option, but what matters is that all areas in between supporting structure elements and OSB board are covered.
step 7  |  Outside wall covering: OSB | FACADE A

Outside OSB boards screwed to the inside supporting structure. It is important to mark every OSB board (as given in the drawings) and then to put every one into its position in this order.
step 7 | FACADE C

Sc4  | 50.00
Sc3  | 53.10  81.00
Sc2  | 59.00  122.00
Sc1  | 90.00  122.00

OSB panels

Elevation
step 7 | FACADE D
step 8 | Placing the roof

The roof is placed on the supporting structure which is made of beams and joists. OSB boards are put over and under the supporting structure, while the space between them is filled with styrofoam insulation. The final layer of the roof is waterproof foil (or PVC lorry cover).

Materials:

supporting structure:
beams 10x10cm:
7x 460
laths 5x8cm:
3x 410
inside and outside OSB
thickness 1.1cm
insulation
styrofoam – 5cm thick
vapour permeable-waterproof foil
step 8.1 | Supporting structure: beams and laths

roof supporting structure plan
S - lath; G - beam

- g4: l=460cm
- s8: l=410cm

1.
2.
step 8.2 | Inside covering : OSB

Inside OSB boards screwed to the inside supporting structure. It is important to mark every OSB board (as given in the drawings) and then to put every one into its position in this order.

OSB 0.9 cm
step 8.3 | Insulation: styrofoam

Inside insulation are styrofoam boards boards 8cm thick. It is glued to the inside OSB boards, between the beams and joists.

Styrofoam 5cm
Outside OSB boards are fixed by screwing to the inside supporting structure, which are already fixed letve. It is important to mark every OSB board (as given in the drawings) and then to put every one into its position in this order. OSB 0.9 cm
step 8.5 | Foil

Vapour permeable-waterproof foil

Amount: 50m²

The foil is placed on the outside OSB covering of the roof. Due to folding, it should be 15cm longer on each side of the roof. When folded it is hammered on the lower side of the eaves.
step 9 | Floor placing

Foil is first layer to be placed on which all the other layers are put. Floor consists of: supporting structure: joists and beams, OSB boards, and styrofoam insulation between the supporting structure and OSB.

Materials:

Vapour permeable-waterproof foil

supporting structure:

beams 10x10cm:
7x 460

laths 5x8cm:
3x 410

OSB
thickness 1.1cm

insulation
Styrofoam 0.5cm
step 9.1 | Hydro insulation: foil

Hydro insulation is a vapour permeable-waterproof foil which is placed on the clean ground, on which afterwards all other layers are put.

**Placing method:**

The foil is placed like "a tub" meaning it is folded in the way it goes 20cm up the wall, and hammered to the inside walls (OSB boards).

**Remark:** before hammering the foil it is necessary to put a small piece of cardboard between the foil and the nail/screw so it prevents the foil from tearing.
step 9.2 | Supporting structure: beams and laths

floor supporting structure plan

$S$ - laths

$S1$ $l=380\text{cm}$

$S2$ $l=410\text{cm}$

$S3$ $l=60\text{cm}$

$S4$ $l=57.5\text{cm}$

$S5$ $l=400\text{cm}$

$S6$ $l=50\text{cm}$

$S7$ $l=55\text{cm}$
step 9.3 | Insulation: styrofoam

Izolacija se sastoji od stiropora debljine 8cm i postavlja se lepljenjem na unutrašnji OSB, između greda i štafni podkonstrukcije.

styrofoam 5cm

floor detail

floor covering OSB 1.8 cm  insulation styrofoam 5cm
step 9.4 | Floor covering: OSB

OSB panels:

- P1
- P2
- T1
- T2
- T3

Elevation:

- P1
- P2
- T1
- T2

Dimensions:

- 120.00 mm
- 24.00 mm
- 74.00 mm
- 45.00 mm
step 10 | Windows and door

The house has one door and three windows: two of which are fixed, and one is for ventilation. All windows are made of polycarbonate (Lexan) which is a light, insulating material, resistant to high temperatures, and force. It is also easily cut and translucent, so the house is well illuminated by daylight. The door is made of OSB boards and insulated with styrofoam.
step 10.1 | Windows 1 i 2

Material:

OSB flashings

67

15

Lexan board

15

15.8

15.8

87.2

87.4

65

Window is made by flashing the open sides of the window hole first, and then hammering lexan board on the outside of the house. It is possible to add a frame around the lexan board.
Window 3 is the only ventilating window in the house, therefore it has hinges to allow it to be opened upwards.
Door is made of two OSB boards 0.9cm thick, which are screwed to the lath frame. Space between the laths is filled with thermal insulation (styrofoam 2cm). There is a latch on the inside of the door, as well as the padlock latch on the outside.
Two types of heating are used in house: so-called “bubnjara” which is a drum-like stove, or so-called “smederevac” stove. It is necessary to protect the space around the stove from heating. Sheet metal is used for protection, and it is placed on the floor and wall behind the stove.
The final step is digging the trench around the house. The trench goes on sides and back of the house and it protects the house from rain/water. Water goes down the drain instead of wetting the walls.
List of illustrations

11.22.2015. 16:21h

11.22.2015. 16:25h

photo 5: http://0.wp.com/naranjamipar.es/wp-content/uploads/2014/03/Cas-en-Kobe-Jap%C3%B3n.jpg?resize=449%2C310
11.22.2015. 16:23h

photo 6: http://a-deco.net/002Lanshaft/950hermit/5.-jpg
11.22.2015. 16:22h

photo 7: http://www.unistil.rs/osdplce.html#pretty-Photo/0/11.27.2015. 17:01h

photo 8: http://www.enigma.com.my/imagemap/pro_polysbig.gif
11.27.2015. 17:03h

11.27.2015. 17:05h

11.27.2015. 17:06h

Appendix

The group of students started to work together in June 2014, on the workshop SOS Housing (with mentorship of professors Aleksandru Vuja and Milan Djaric), within an initiative called New housing models for flood victims, of the Faculty of Architecture of the Belgrade University.

Today, it’s the team that continued their collaboration on other projects, with a success, due to common motivation and interest. In April 2016 they received an award at 38th of Salon of Architecture in the category of experiment and research.