

## New Models Of Collective Housing Through The Application Of Steel And Steel Products

Damjan Balkoski<sup>1</sup>, Vangjel Dunovski<sup>2</sup>

<sup>1</sup>(M. Arch., Faculty of Architecture, MIT University – Skopje, R. Macedonia)

<sup>2</sup>(PhD., Faculty of Architecture, MIT University – Skopje, R. Macedonia)

Corresponding Author: Damjan Balkoski

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**ABSTRACT:** The model of modular mounting apartment building is a new model of housing based on mobile residential units - shipping containers designed in a modular system. The model also enables the transformation of the purpose of the building from housing into a multimedia public space for exhibitions, presentations and other events. The building is designed to be constructed of a complete steel structure with modular dimensions of mounting type.

**KEYWORDS** – construction, container, housing, steel.

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### I. INTRODUCTION

Living in homes of transformed steel containers has several advantages: economy - cheap construction, easy transformation from container into home, quick fix and home construction, durability of construction and mobility of the home. The need for economical and functional housing facilities built in the short term is an important task in the area of architecture and construction, and at the same time is the goal of providing quality housing. This paper will offer a new type of assembly building that is rapidly built, economical and environmentally non-polluting, so it can exist even in protected environments with different uses. The whole building is designed modularly and is fully assembled and can be completely disassembled depending on the purpose and the need of the space and users. The structure is composed of steel profiles with steel pillars, beams and floor joist.

### II. USE OF THE STEEL IN ARCHITECTURE AND CONSTRUCTION

Steel as a material finds wide application in the industry. Also, in the segment of the construction industry, it is represented in a wide range of materials, from basic to prefabricated materials. With its features, it makes the construction easy and fast, using modern construction methods. However, it should always be noted that the drawbacks that arise from the material itself should always be considered and designed to act as if they were solvable in the design itself.

Always, with the use of steel, the glass comes as a blend, and thus the openness of the very object in the space. The use of steel is associated with industrial, administrative buildings with an assembly type of construction. In this paper a solution is also proposed for the use of steel in residential housing for various purposes.

Characteristic elements in the construction of a steel structure are the connections between the steel elements. In this section, we distinguish many types of links:

- Joints of pillars: connection with wedges, solid bonds and prefabricated knots.
- Joints of beams: prefabricated and solid bonds
- Connections of steel with concrete<sup>1</sup>

- **Continuous column**

- **Connection with wedges** - this connection is screwed, and the plate is welded to the column

- **Solid connections** - the connection is screwed, the end plate is welded to the beam

- **Continuous beam**

- **Prefabricated connections** - they are screwed, and the end plates are welded to the pillar and beam

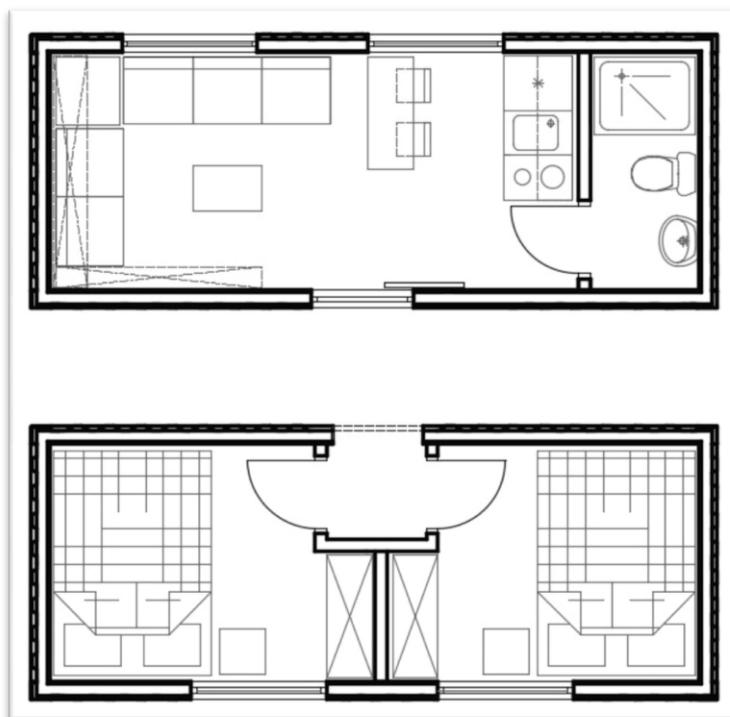
- **Solid connections** - they are screwed, and the hardeners are welded to the beam under the belts of the pillar.

- **Connection of steel with concrete**

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<sup>1</sup> A. Deplazes, “Constructing architecture, materials, processes, structures” (Basel, Switzerland, Birkhauser GmbH, 2008).





**Сл. 4 - interior arrangement of containers K1 и K2**

The container remains with the same dimensions and the same structural system - carries steel profiles. The entire outer space is insulated with a stone wool of 8 cm. and gypsum cardboard plates, and in the sanitary knot with ceramic tiles.

New openings designed for windows and outside doors are projected - which will be the type of outer slide, for the purpose of occupying as little space and waterproofness as possible. A sanitary node has been designed which has a separate installation system for connection to the water and sewage network. A mini kitchen with a dishwasher dining table is provided. Also, the seating set is designed at right angles. The free surfaces are designed to be elements that will serve the purpose of providing living conditions.

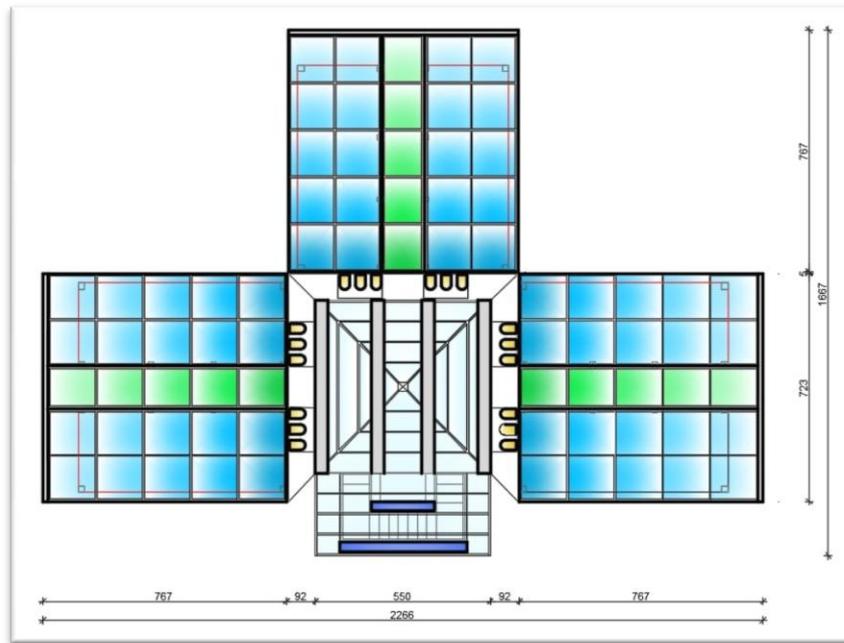
The second type of container remains with the same dimensions and the same structural system - carries steel profiles. The entire outer space is insulated with a stone wool of 8 cm. and gypsum cardboard plates, and in the sanitary knot with ceramic tiles. From the front door, the type of outer slide, for the purpose of occupying as little space and waterproofness, enters into a small enclosure where on the left and right side are the rooms for living. This second variant K2 can be modularly adapted to the initial basic variant of the container unit K1.

The newly designed model TC1 (tourist container 1) is projected with modular dimensions and an independent steel structure on which the containers will be placed. The steel structure is composed of pillars and beams. The pillars are laid on reinforced concrete foundations where aseismic construction system is used - ALSC system<sup>2</sup>. Pillars and beams form a platform type where the containers will be placed (Fig. 5). The ground floor is open, in the part where the containers are on the first floor, and it is closed only in the main space from where it enters the stairs space.

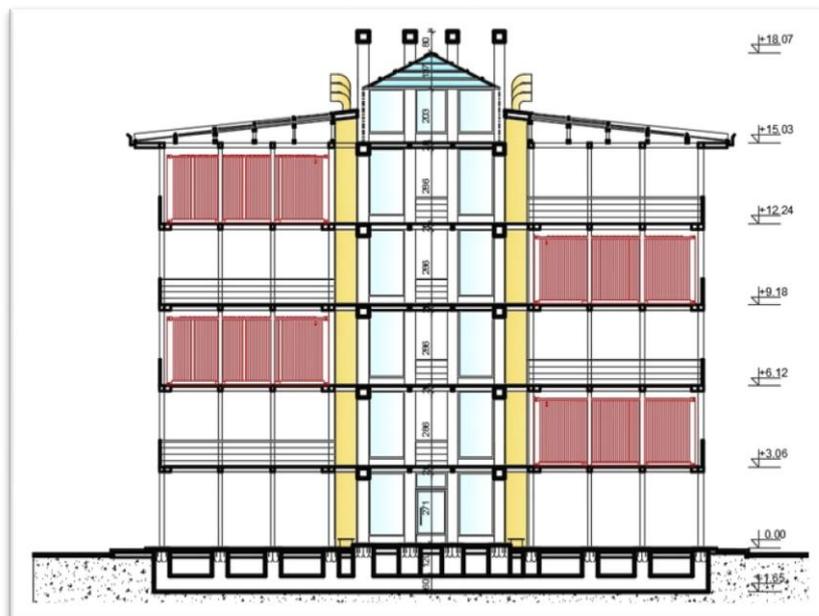
<sup>2</sup> Prof. PhD. Mirce Kokalevski, PhD. Ljubomir Taskov, Antim Antimovski - ALSC System, <http://www.alsc-system.ws/>



On the third floor, the roof is intended to be lean - to roof, composed of five parts that are assembled one below the other, made of prefabricated solar collector elements, which if released, solar energy will be used as electricity for the whole building (fig. 7). Waste water and rainwater will be collected in separate underground tanks with a treatment plant, which will then be used to irrigate the green areas around the building.



**Fig. 7 – Roof plan**



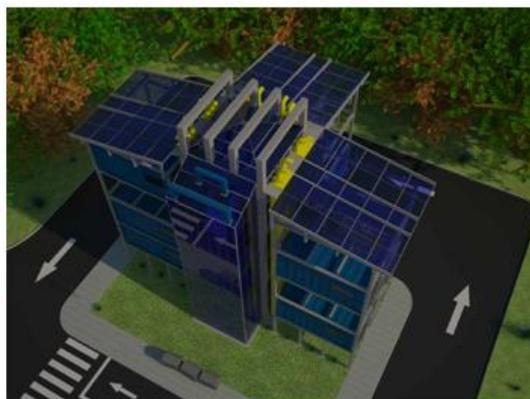
**Fig. 8 – Section**

Waste will be selected through special bins for selected waste, and part of the greenery and leaves will be composted in special tanks that will serve for fertilizing and nourishing grass and trees. The whole model is designed to be self-efficient.

In the period when there are no tourist mobile units, the construction that is designed to be a standalone system will be used as a multimedia space for holding exhibitions, summer scenes, concerts, lectures and other public events.



**fig. 9 – 3D picture of the building**



**Fig. 10 – 3D picture of the building with the roof**

#### **IV. CONCLUSION**

This paper shows a type of object that can be used for multiple purposes. Primarily the purpose is for temporary housing in conditions when buildings for short deadlines should be built. The advantage is that housing units can be independently installed in the building and be independent of each other, with a certain deadline, and then to pull out and transfer to another location, and the existing construction to function for the rest of the housing elements. The ground floor is free from hard construction.

In the absence of units - housing elements, the existing building would be without purpose for housing, but it would be transformed for other purposes, for public manifestations. The facility, together with all installations, does not pollute the natural environment, a water treatment plant is used, and rain water which is used as technical, is used in the building for irrigation of the green areas. More such facilities can be projected as part of an urban settlement and represent a tourist complex.

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