REINTERPRETATION OF THE TRADITIONAL RUSSIAN OVEN IN CONTEXT OF SOLAR CHIMNEY

D. Dopudja, S. Dzurishich

Peoples' Friendship University of Russia
Miklukho-Maklaya str., 6, Moscow, Russia, 117198

This article has a goal of demonstrating the way unity between sustainable design and traditional elements can be made, forming a synergic whole — by merging both forms and functions of solar chimney and a traditional Russian oven.

Key words: sustainable design, green house, solar chimney, Russian oven, passive architecture

It is completely natural for people to strive for comfort and financial independence. In that manner, he tends to cozy up his surroundings, which are — mainly buildings, considering that an average person, according to researches of a number of European scientists, spends about 85% of his life indoors [3. P. 48]. In this pursue, his wishes often surpass his needs by far, resulting by huge energy waste on wrong goals.

The ecological crisis today is very serious and till date much of the debate still focuses on the symptoms rather than the causes. As a result, there is an urgent need to emphasize and workout the best possible approach towards environmental protection thereby minimizing further degradation.

Sustainable architecture has a goal of minimizing built environments' energy usage, by developing and implementing systems that will ensure flawless function of all relevant systems. It is a philosophy of designing buildings to comply with the principles of social, economic and ecological sustainability.

Sustainable design is the thoughtful integration of architecture with electrical, mechanical, and structural engineering. In addition to concern for the tradition; aesthetics of massing, proportion, scale, texture. Shadow and light, the facility design team needs to be concerned with long-term costs: environmental, economic and human. All in all, sustainable design is more of a philosophy of a building than perspective building style.

Unique problem with sustainable design lies in a fact that its robustness often makes him unattractive for wider scope of possible users. In general, during architectural design, professionals have a choice: to stick with traditional values, which usually do not possess any practical role, or to go with the new stuff, which, on the other hand, often imply complete brake up with any traditional elements.

This article has a goal of demonstrating the way synergy between sustainable design and traditional elements can be made, forming a synergic whole — by merging both forms and functions of solar chimney and traditional Russian oven.

By **solar chimney**, we refer to a plain chimney system, upgraded in that manner that it serves not only as a smoke disposition tool, but also as a passive ventilation system. Essentially, solar chimneys are hollow containers that connect the inside part of the building to the outside part of the building. Systems way of function is plain simple: relying on pressure differences between hot and cold air (based upon the fact that heat itself (or

its absence) depends of the molecule velocity). In practice, that is achieved by ensuring enough heat on chimney top (often, simply by painting it black), which conditions the inside air to go higher; that creates a vacuum-like state inside the system, that constantly has to be filled with new air — which ensures it's constant flow. More sophisticated solar chimney systems also tend to ensure themselves constant cold air supply, mainly by underground tunnel, where hot air from the outside passes away its heat to the soil [Fig. 1].

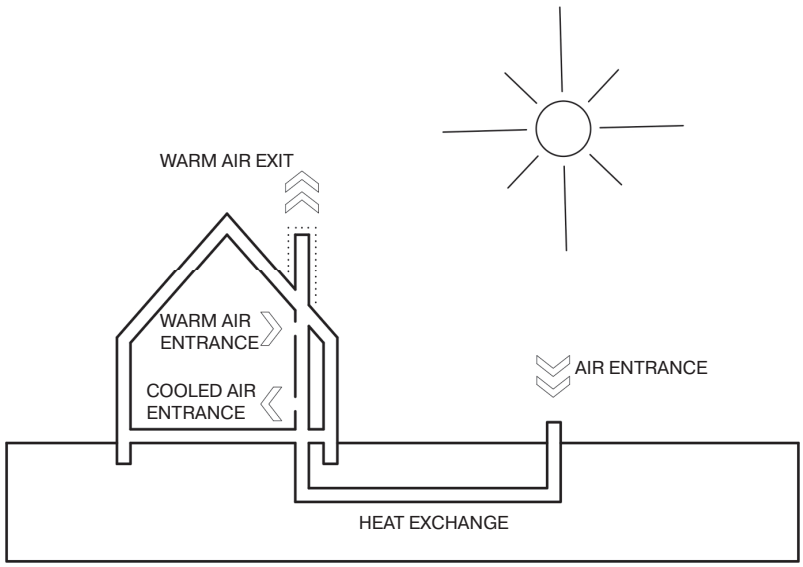

Fig. 1 Schematic diagram of solar chimney system

Russian oven, on the other hand, represents a unique type of traditional masonry stove, used both for cooking and domestic heating in Eastern Slav (Russian, Belarusian and Ukrainian) households. It used to be a large, brick stove that took up about nearly one-quarter of the living space of a peasant home. The immense structures weighed between one and two tons and served multiple purposes. Made from earth-crafted, heat-preserving materials (nowadays mostly brick), it need to possess additional or even separate fundament, in order to prevent whole house from slanting. Its special design, consisting of complex labyrinth of passages, ensures heat retain over long periods of time.

It is often located in the center of Russian izba, which, together with its dimensions (2.0 × 1.3—3.5 × 2.2 m), ensures its central role in family's daily life. Expansive in size but efficient when it comes to energy, the ovens only needed to be lit once or twice a day to keep dwellers warm. Having in mind its complexity, we can say that a Russian oven alone represents a kitchen itself, together with some additional functions, like sleeping [Fig. 2].

Unfortunately, in warm periods of the year, Russian oven also represents an over-heating problem in summer months: mostly due to its cooking function and lack of ventilation of izba itself. This problem especially "heated up" in past few decades, as the climate change takes place.

Having in mind mentioned systems attributes (and especially their flaws), it is clear that by plain upgrade of the Russian stoves function — by merging those two systems —

one could ensure complete heating/ventilation sustainability, slightly reducing household's energy needs. Mentioned upgrade, as described earlier, would consist of:

— Cold air deliverance system (containing cold-air deliverance pipes that end at the lower parts of the stove);

— Place of hot air exit, located near the ceiling (as hot air tends to go upwards).

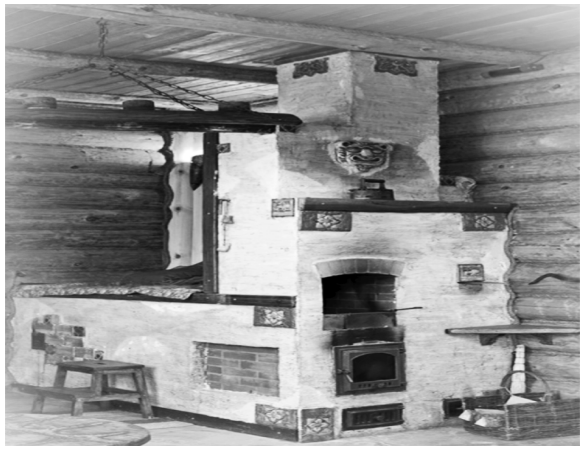

Fig. 2. Traditional Russian oven

Both with cold air entrance and hot air exit need to have highly attaching sealable doors, purposed to cut the airflow in case of need. Additionally, a longer chimney neck may show itself needed, in order to ensure air heating by greater sun absorbable surface [Fig. 3].

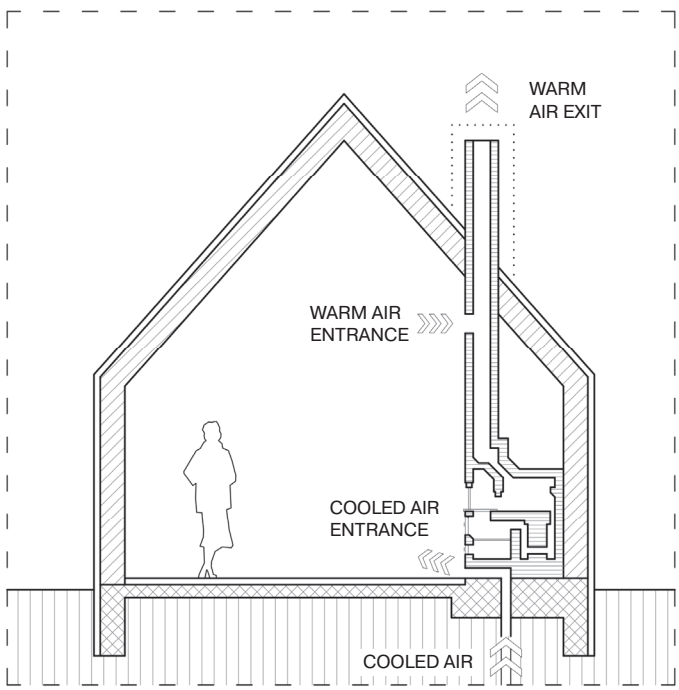

Fig. 3. New, merged system detailed scheme

Although it is possible to deliver cold air inside the space trough one of stoves niches — which would preclude any impact on current Russian stove's aesthetic expression — it is, however, highly recommendable to avoid that approach, due to possibility of material fatigue over long period of using. In order to avoid that course of action, it is essential that, during the process of design (and later construction) put all efforts to isolate hot and cold sections of the stove. Only in that case, the new system will be able to guarantee it's consistency and flawless work.

Of possible questions that may come up, questioning practical use of suggested system, central may be formulated in the following manner: even though oven has and keeps its central place in Russian traditional homes, how can we ensure ventilation of the other premises too, especially having in mind systems robust dimensions?

First of all, sustainable architecture, consists of both active and passive systems, latter focusing their efforts on minimizing energy consumption by preventing it's loss (energy conversion efficiency). In that manner, to insure flawless function of the represented system, it is crucial for it to be followed by adequate passive elements — especially thermal isolation.

Moreover, rising "growing" [1; 2] or "organical" [7] approach to architectural dwelling design, which is in fact, a factor stimulating reinterpretation of the traditional elements, implies that a kitchen, or oven itself should represent both functional and spatial center of the house. Moreover, growing home concept, in order to satisfy fast-changing lifestyle needs mostly relies on ephemeral, open house space, with soft space partitions, or their complete absence.

Following described approach, it is clear that in that manner, Russian oven, improved as suggested, will have, by all means, enough capacity to secure both heating and ventilation needs for sustainable housing, at the same time representing familiar traditional element.

REFERENCES

[1] *Виденович А.Ч.* Ревитализација центара у селима брдско-планинских подручја Источне Србије.: дисс. ... д-ра архитектуры. Београду, Б., 2016.
[2] *Novikov V.A.* Architectures organizations of country. M.: Russian academy of architecture and building sciences, «Architecture-C», 2005.
[3] *Baue M., Mösle P., Schwarz M.* Green Building. Guidebook for Sustainable Architecture, Springer. Verlag, Berlin, Heildelberg, 2009.
[4] *Loftness V., Haase D.* Sustainable Built Environments, Springer Science + Business Media, New York, 2013.
[5] *Pertic J.* Sustainability of the City and its Ecological Footprint, article, Scopus, Belgrade, 2003.
[6] *Szokolay S.V.* Introduction to Architectural Science: The Basis of Sustainable Design — Architectural Press, Elsevier Science, Linacre House, Jordan Hill, Oxford, 2004.
[7] *Zevi B.* Towards an Organic Architecture. London: Faber & Faber, 1982.

РЕИНТЕРПРЕТАЦИЯ ТРАДИЦИОННОЙ РУССКОЙ ПЕЧИ В КОНТЕКСТЕ СОЛНЕЧНОГО ДЫМОХОДА

Д. Допуджа, С. Джуришич

Российский университет дружбы народов
ул. Миклухо-Маклая, 6, Москва, Россия, 117198

Целью данной статьи является демонстрация приема обеспечения синергического единства между самообеспечивающим дизайном и традиционными элементами через соединение солнечного дымохода и традиционной русской печи.

Ключевые слова: самообеспечивающий дизайн, зеленый дом, солнечный дымоход, русская печь, пассивная архитектура

ЛИТЕРАТУРА

[1] *Виденович А.Ч.* Ревитализација центара у селима брдско-планинских подручја Источне Србије.: Диссертация на соискание ученой степени доктора архитектуры, Архитектонски факултет Универзитета у Београду, Б., 2016.
[2] *Новиков В.А.* Архитектурная организация сельской среды. М.: Российская академия архитектуры и строительных наук, «Архитектура-С», 2005.
[3] *Baue M., Mösle P., Schwarz M.* Green Building — Guidebook for Sustainable Architecture, Springer — Verlag, Berlin, Heildelberg, 2009.
[4] *Loftness V., Haase D.* Sustainable Built Environments, Springer Science + Business Media, New York, 2013.
[5] *Pertic J.* Sustainability of the City and its Ecological Footprint, article, Scopus, Belgrade, 2003.
[6] *Szokolay S.V.* Introduction to Architectural Science: The Basis of Sustainable Design — Architectural Press, Elsevier Science, Linacre House, Jordan Hill, Oxford, 2004.
[7] *Zevi B.* Towards an Organic Architecture. London: Faber & Faber, 1982.