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Earthen houses in Bulgaria- past, presence and future

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The old or Renaissance houses built during the 18 century in Bulgaria still exist, weather-proof and durable during the years. Typical town houses are shown on figures 1-2.



Fig. 1 Town Renaissance house in Plovdiv

Fig. 2 Town Renaissance house in Koprivshtitsa



Presently about 30 % of the buildings in the villages in Bulgaria has been constructed by a wooden construction **Frame-built houses** (wattle-and-daub lattice infill smeared on both sides with a clay and straw)



Fig. 3 Village Renaissance house in Arbanassi



Fig. 4 Village Renaissance house in Bozhentsi

Interiors of traditional village Renaissance houses in Bulgaria used for villas



Fig. 5 Interior of Village renaissance houses

Newly built earthen houses in Bulgaria. Everything is handmade, of natural materials- stone, straw, clay, sand and wood



Fig. 6 Two floor six sided houses in Hrabrino



Construction Technology of new built eco houses – basement and wooden construction



*Fig. 7 The base is made of stone, without concrete,
but with a wooden construction*

The wooden construction basically is the best proven earthquake resistant material. The reason for this is that wood has no resonance frequency, which will coincide with the earthquake frequency, that means the construction represents a wooden framework. The columns between the floors are confirmed by a diagonal struts, which makes the construction enduring in all directions.

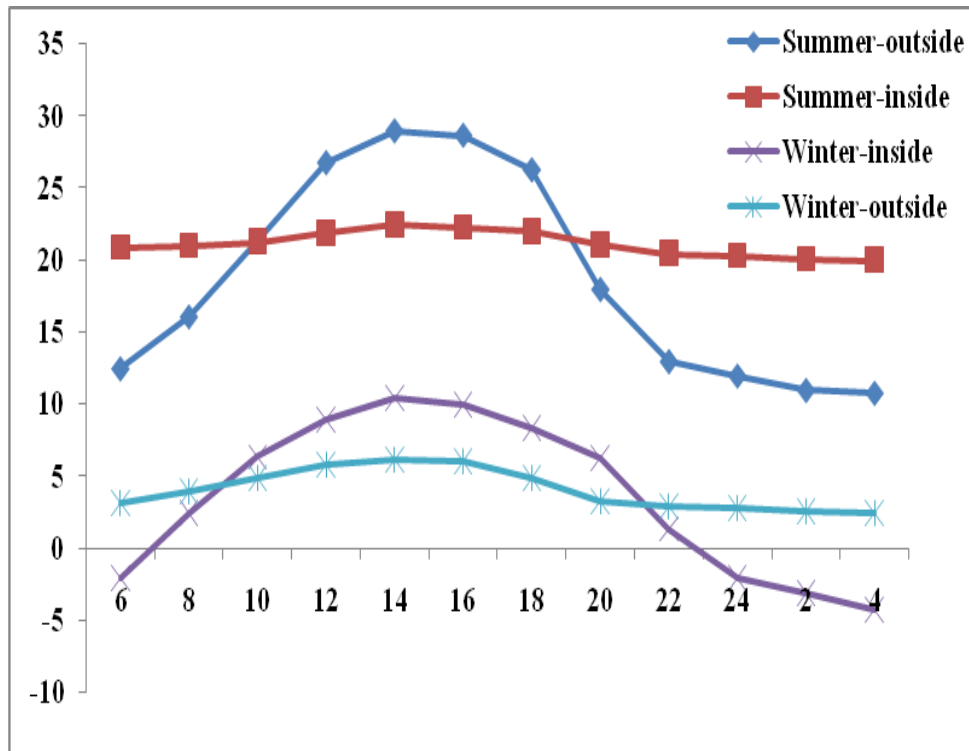
Construction Technology of newly built eco houses – adobe walls

- The mixture for adobe could be with different density and content, but normally in the proportion of: 20% clay, 60% sand and 20% straw.
- The clay represents organic glue: It is flexible and suitable for all forms like plasticine. The sand is the building material, the straw plays the role of a connection and insulation;
- The mixture is best mixed by a mechanic mixer- normal productivity: 15 m³ for about 4 hours.
- Mixed materials (sand, clay and straw) are poured in 50 cm high forms staying for one day under the sun;
- On the next day the bricks are extracted and the holes are filled manually;

Construction Technology of newly built eco houses – adobe walls



A research of the fluctuations of the outside and inside temperature in summer and winter in eco houses in Hrabrino



Winter:

Outside temperature fluctuation:

12,5°

Inside temperature fluctuation:

3,7°C

Summer:

Outside temperature fluctuation:


18,2°

Inside temperature fluctuation:

2,0°C

Fig. 8 Dynamic of the inside temperature towards the outside temperature for the summer and winter period

CONCLUSIONS:

- The temperature and humidity in the earthen houses are relatively constant- these are passive houses;
 - The construction of these houses is ecological, with low carbon emissions (more than 20 times less than the modern construction);
 - The adobe materials are highly recyclable and reusable;
 - The clay isolates the wooden framework from humidity and protects it from mould and fungi;
 - The clay has fire protection features and protects the wooden framework.
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Thank you

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