
non-tectonic system
Grèmound®

✓ Historical background of the non-tectonic technology

- After the first successful experimental constructions (1970s-80s) several companies engaged in creating residential houses with non-tectonic technology in the 90s, among them a housing settlement was erected for Transsylvanian refugees. These houses, due to their cheap price and fast completion time have proved the competitiveness of this technology.

- Non-tectonic systems belong to the so called open building systems of the construction industry, meaning that the final product (the building) is not determined but flexible: the pre-fabricated elements can be assembled according to one's own design. The first such experimental building (Budafok Maisonette 1972-73) was erected by using exclusively unskilled labour and our experience was very positive.

ousing settlement for Transsylvanian refugees '92






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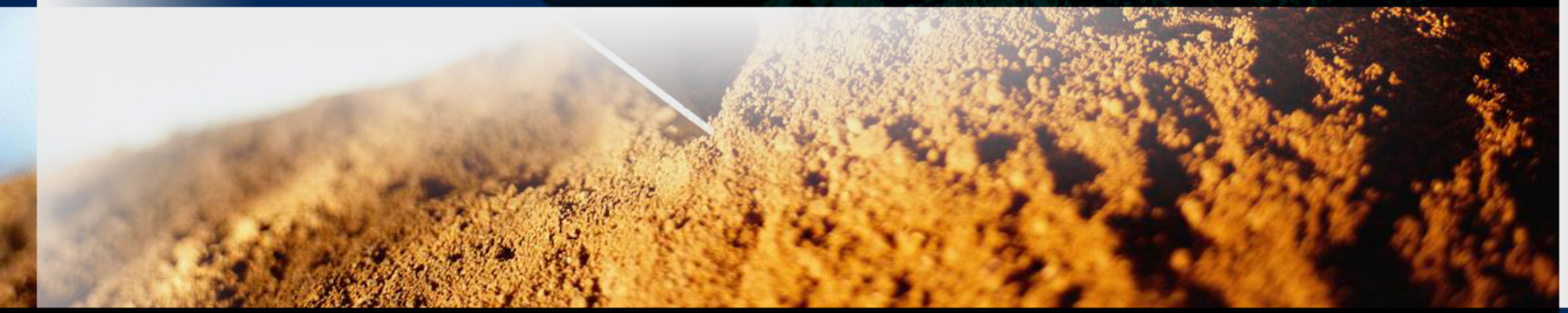
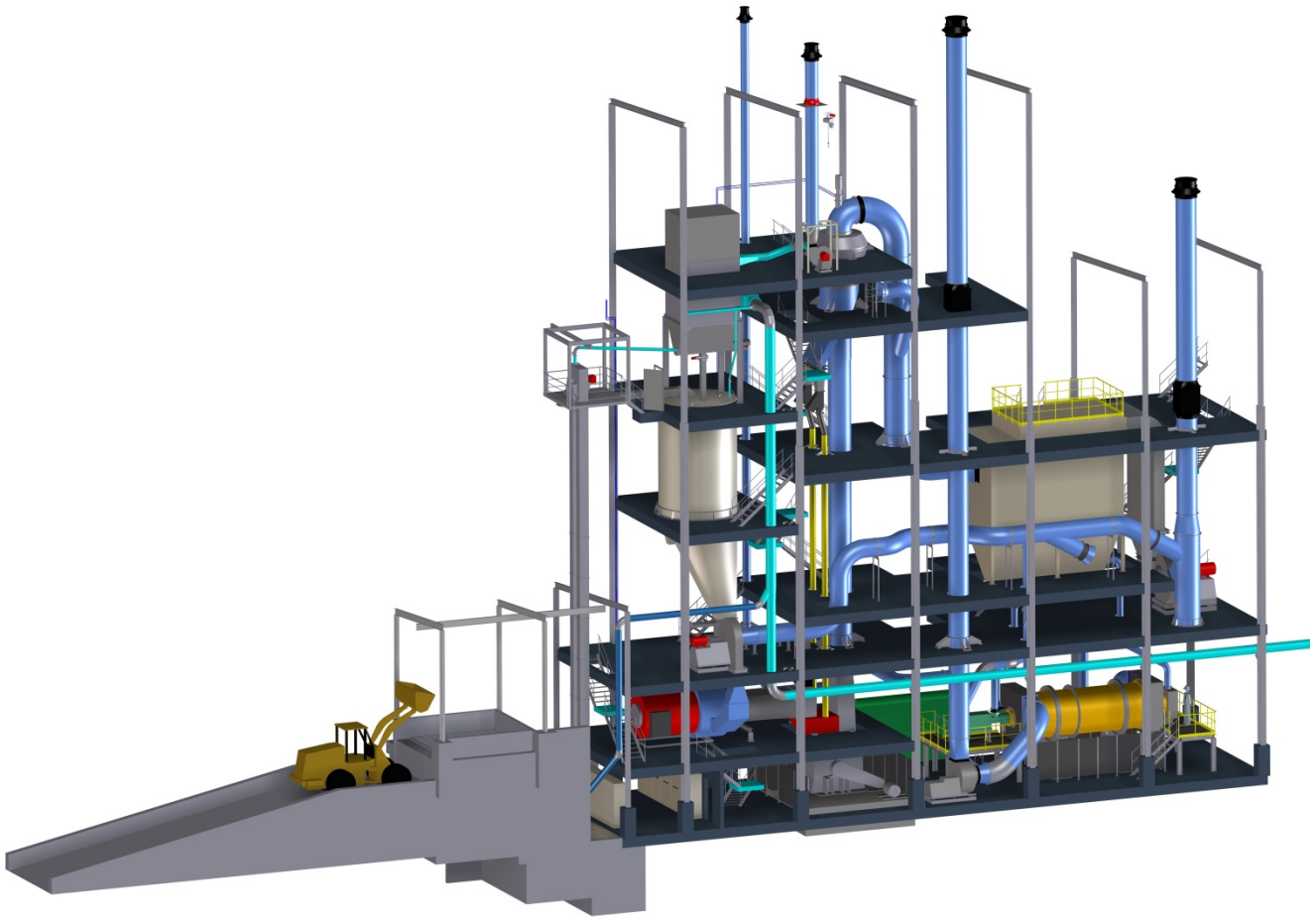
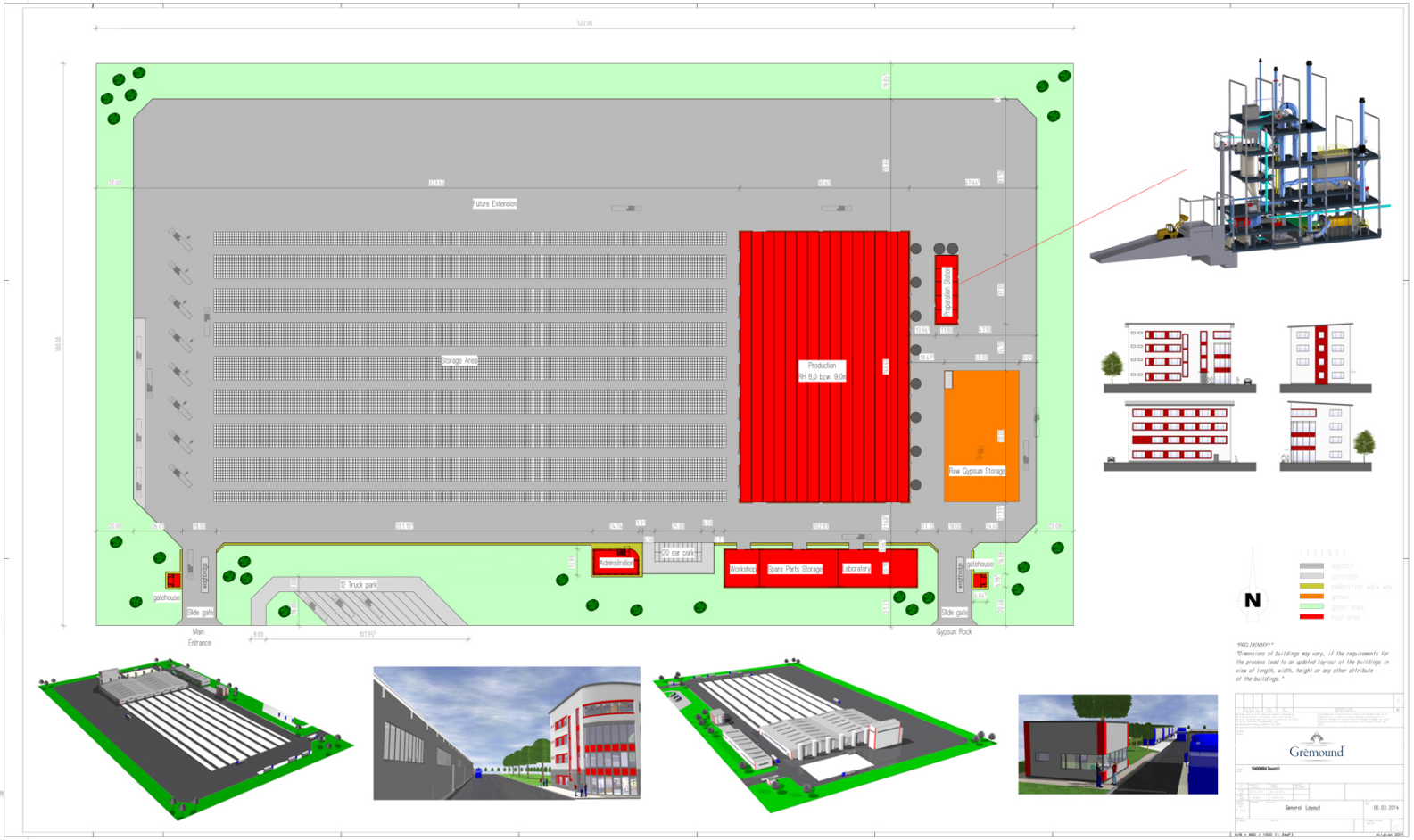
The first industrialized production technology in the world, based on non-tectonic construction technology..



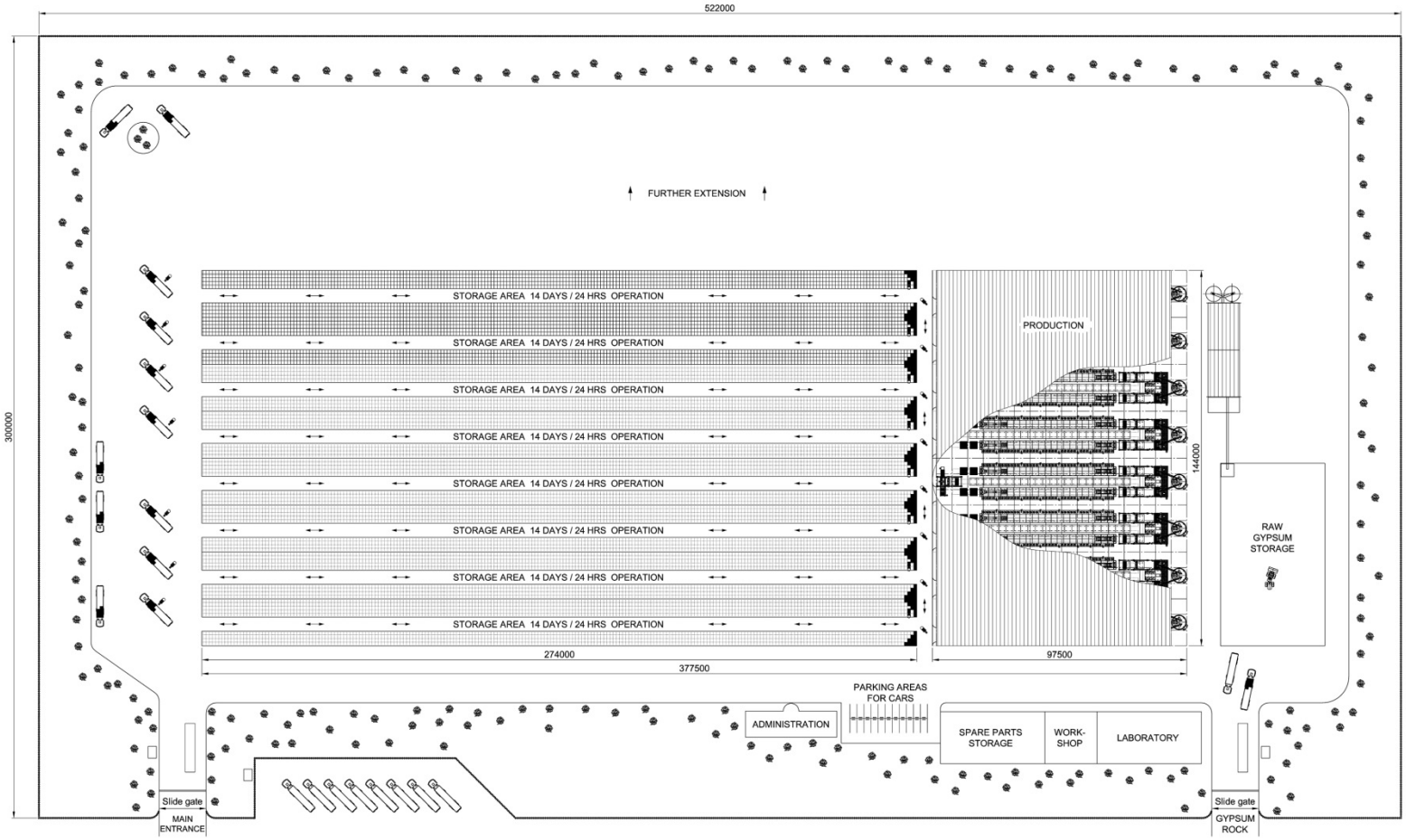
Grèmound calcining plant



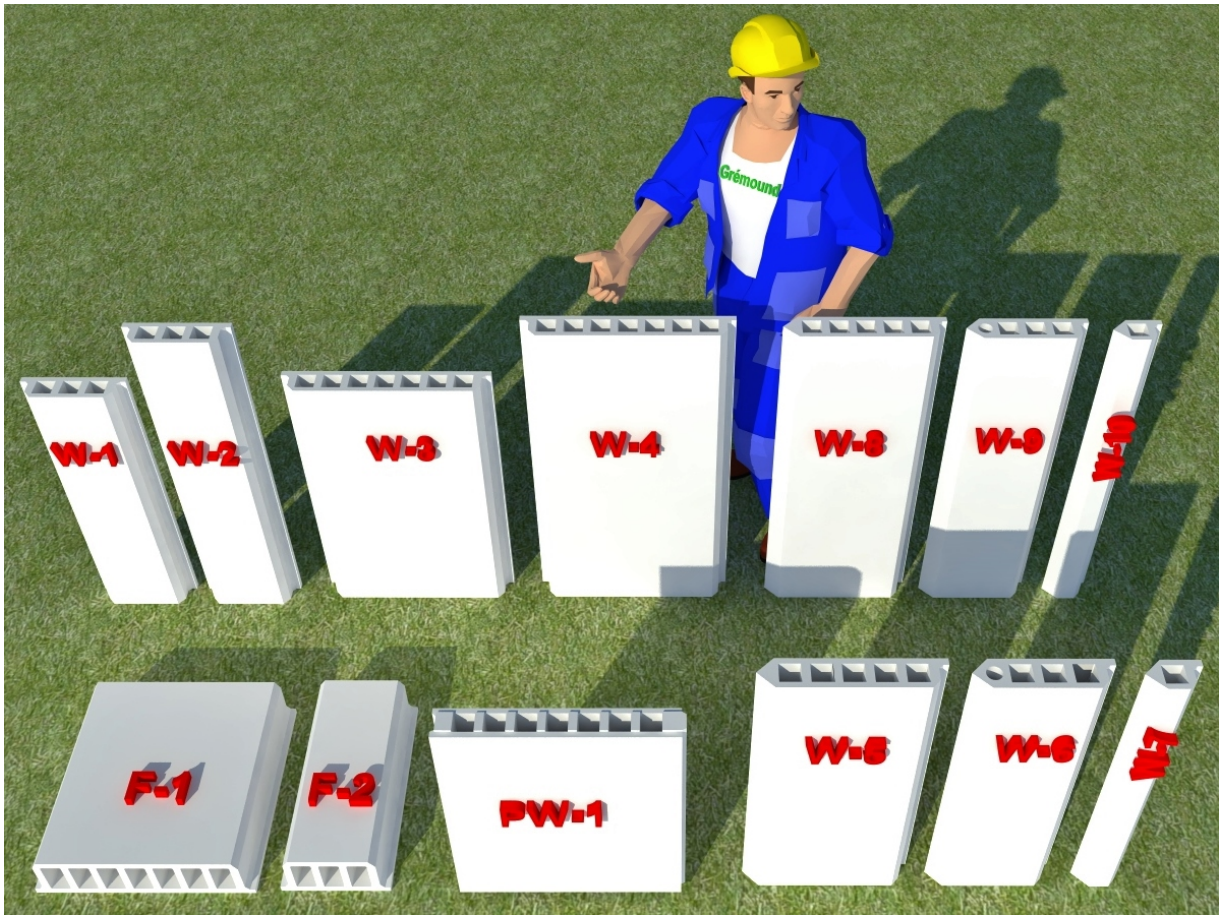
Grèmound factory plan



Grèmound production line



Grèmound elements



Grèmound non-tectonic system

✓ Purpose of the project

- The purpose of the project is to reconstitute an existing Hungarian technology, to apply it as a complete system for solving the acute social problems of unemployment and housing shortage at the same time.

✓ Large scale employment

- The human resources demand of this technology (both in the production and on the site) is based 99 percent on locally recruited unskilled labour.

✓ Using local raw materials

- The applied raw material is 90-96 percent locally available, the ratio of imported materials is kept on the minimum.

The technology's main characteristic

✓ Excellent structural properties

- Earthquake-resistant up to Grade 8 in Richter scale
- Storm-resistant up to 250 km/h wind speed

✓ Fast production and assembly

- Net 122 working hours / house

✓ Economic, cost-efficient

- The most contemporary technology, optimized especially for low-cost housing

✓ Qualified structures

- Qualified components and materials

The technology's main characteristics

✓ Vapour permeability

Basic characteristic	Performance	Evaluation method
vapour diffusion resistance coefficient of reinforced concrete, μ	by dry method: 130 by wet method: 80	MSZ EN 12524:2000 data taken from the table
vapour diffusion resistance coefficient of gypsum, μ	by dry method: 130 by wet method: 80	MSZ EN 12524:2000 data taken from the table

✓ Hazardous materials

- The manufacturer shall make a declaration regarding the hazardous materials used in the products if such hazardous materials are to be considered hazardous according to the "General Checklist" of ER 3 and are listed in the "Indicative List of Hazardous Substances".
- It is declared that there will be no need for the use of any hazardous material.

forrás: ÉMI szakértői vélemény

The technology's main characteristics

✓ Safe use and accessibility

Basic characteristic	Performance	Evaluation method
Shock resistance	NPD	Expert evaluation, taking ETAG 009 6.4.1. into account
Resistance to concrete pressure	Appropriate	Expert evaluation, taking the National Technical Approval (ÉME) No. 158/1987 into account
Safety against personal njury	Appropriate	Expert evaluation, taking ETAG 009 6.4.3. into account

✓ Energy saving and heat control

Basic characteristic	Performance	Evaluation method
Average heat transmission coefficient › of the **wall structure,** Uwall (without heat insulation and calculating with 60 cm rib spacing and 0.34 W/mK thermal conductivity for gypsum)	1.6 W/m2K	Verification according to the standard MSZ EN ISO 6946:2008

forrás: ÉME szakértői vélemény

The technology's main characteristics

✓ Energy saving and heat control

Basic characteristic	**Performance**	**Evaluation method**
Average heat transmission coefficient of **floor structure,** Ufloor (without heat insulation and calculating with 60 cm rib spacing and 0.34 W/mK thermal conductivity for gypsum)	2,4 W/m2K	Verification according to the the standard MSZ EN ISO 6946:2008
Thermal conductivity of **reinforced concrete**	2,3 W/mK	MSZ EN 12524:2000 data taken from table
Thermal conductivity of **gypsum**		
- for a density of 600 kg/m3	0,18 W/mK	MSZ EN 12524:2000
- for a density of 900 kg/m3	0,30 W/mK	interpolation of data
- for a density of 1000 kg/m3	0,34 W/mK	taken from table

source: ÉMI test results

The technology's main characteristics

✓ Sustainable use of natural resources

Basic characteristic	**Performance**	**Evaluation method**
Durability against physical effects (if appropriate protection against rainwater and sanitary water is provided)	appropriate	in consideration of ETAG 009 6.7.1.1
Durability against chemical effects	appropriate	ETAG 009 6.7.1.2
Durability against biological effects	appropriate	ETAG 009 6.7.1.3
Resistance to damages occurring during normal use (in case of internal and external surface finishing	NPD	ETAG 009 6.7.2.1 ETAG 009 6.7.2.2 ETAG 009 6.7.2.3

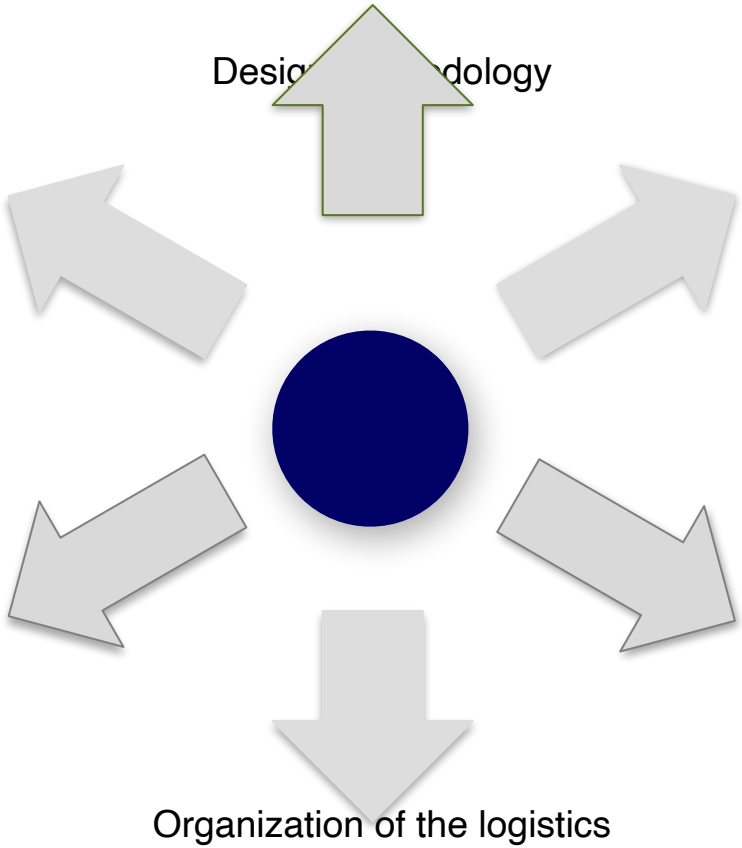
forrás: ÉMI szakértői vélemény

Application of the technology

✓ Necessary steps to start the project

- Founding a construction company that will manage and organize the work process.
- Setting up a vocational centre, training the future tutors who will later train the unskilled labour and teaching the local architects for designing methods.
- The necessary training handbook, teaching methodology and labour safety rules as well as the corresponding test material are provided by us.
- Drawing the designs of the family residential houses and settlements. In case of need we can provide our own architects for that purposes.
- Mass production of the elements auxiliary structures and supplementary material, that are needed for the construction.

What we are providing:



Planning methodology

✓ This technology

- is not just a copy of solutions that were successfully used in other parts of the world. Our solution was developed especially for socially sensitive locations, taking into consideration the real needs of the local population.
- Because of our new concept, i.e. focusing on local circumstances and demands, our technology is able to meet the demands of maximum cost and time reduction while not losing from sight the need for utmost efficiency.
- In order to reach this goal, we calculated with every possible locally available economic resources (raw materials, energy, labour).

Training, vocation

✓ Special technological training

- It does not require special or previously acquired knowledge.
- The socially sensitive Grèmound non-tectonic system can be really successful through the active participation of the local population. This is done through controlled vocation, followed by exams in both theory and practice. Work safety is part of the curriculum.
- Construction work creates a wide range of tasks for the workers. People with different capabilities or educational background can find suitable jobs and each of them can become indispensable in his own field.

Production technology

- The machinery of the future production plant are to be produced partly in Hungary and partly by a German manufacturing company.
- In order to build sufficient manufacturing capacity, it is indispensable to know how many housing units are to be constructed per annum.
- Of course this capacity can later be doubled or multiplied, according to actual further needs.

Organization of the logistics

- Logistics are an essential part of an efficient production: raw material arriving in correct time, as well as putting the final products into warehouses and later dispatching them to the construction site need thorough organization.
- Because of the mass volume, all elements should arrive to their destination according to the preliminary plans.
- Stockpiling
- Warehousing
- Forwarding
- Lodging and moving inside the construction site

✓ Specially developed concrete technology

- New technologies, developed in a certain country, usually spread by applying them elsewhere. We however concentrate on local materials, processed by local labour, meeting to local housing needs. This approach is completely new and different from any previous one.
- Houses, built by our method, will show their best qualities in the particular climatic conditions. We pay attention to implement all local regulations and to calculate with the local weather conditions. As such, our houses will become comfortable while costs are kept low.

✓ New construction method

- The construction method that we developed is served by a technical background, made mainly in Hungary.
- Having acquired the technology it can be used with extreme efficiency.