

Contemporary vision of the Traditional building systems of the rural Mediterranean Residence

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Abstract:

The importance of the research is showing the technical and economic value of Traditional building systems of the Arab rural Mediterranean Residence as an architecture that places the economic factor as a basic axis for construction, where the materials produced the techniques, and the burden of adapting the material and developing the technology to compensate for the material weakness through Added Value.

The **problem of the research** lies in answering the question: Is it possible to take advantage of the traditional building systems for the Arab rural Mediterranean Residence to obtain economic architectural designs characterized by the elements of contemporary housing? And are there reasons that explain this simplicity in implementation?

The research **aims to** revive the traditional building systems of the Arab rural residence, and creating an architectural design that meets building standards that are inspired by that heritage. The **research Hypotheses** is the possibility of exploiting earth resources to build economic architectural structures that bring together human, social and environmental) factors through a contemporary vision. **The research limitations are:** the envelope and the construction.

The research presented the building systems and local inherited technology in the different environments in the area under study, through **an analytical approach**, of Vertical and Horizontal Structures. It was limited to studying the housing between the eighteenth century and the first thirties of the twentieth century, then the building systems were applied to an architectural design in an Egyptian environment through **an applied approach**.

Then **the results were presented and discussed** where it was possible to take advantage of the traditional building systems in North Sinai to make an architectural design for chalets of a tourist village, characterized by the elements of modern housing. The research believes that the contractor investor who has the ability to implement a complete society based on local earth raw materials and technologies will be a Pioneer and an example to be followed in the future architecture field in Egypt and all developing Arab countries.

Keywords:

Traditional building Systems-Arab rural Mediterranean Residence - Local Building Materials (Earth Materials).

1. Introduction

The structures of Arab rural housing in the Mediterranean Residence are varied, those housing that expressed a regional identity but are seen today as limited or strange, but they are originally a rich model for various architectural expressions and terms, it is a family residence and a center for multiple other vital activities, linked with the traditions of the conservative and intimate area

of the population, they are permanent residence dwellings that have been and continue to house hundreds of thousands of families to this day.

Earth Materials is not receiving real attention on this planet, despite being a valuable raw material and an invaluable divine gift. Here we are about to build using local raw materials and manufacturing next to the site, and the idea of a living space that cannot be separated from economic considerations, they are buildings that did not benefit from modern heavy materials, they are inherited building systems that were formulated by simple implementation methods to achieve economic solutions that can be adapted to the environment and local requirements.

2. Overview And Background

2.1. Planning and design of Arab rural housing: The biggest influencing factor in Arab rural Mediterranean Residence design is (the family), so it is considered a family building. There are three Architectural Shapes (Typologies): Basic House - Compact/Complex House - Multiple Structure House. Three solutions to the housing relationship with the surrounding nature (Domesticating External Area): Houses with Patio - Houses with Courtyard - Houses with Garden.

2.2. Inherited local technology (Local & Ancestral): The raw materials are the ones that produced simple techniques, which are based on skill, local materials have the ability to adapt to the surrounded environment, so the builder has to adapt the material and developing the technology.

2.3. Vertical Structures (The Walls): There are two types of walls, Rough Stone Wall and Mud Wall. The ground floor is built on a stone foundation to protect the building from water.

2.3.1. Stone Walls Systems: Most of the common walls in the Mediterranean area are constructed of rough stone, built in thick course laid with mortar. Types of stones: limestone, sandstone, salt stone, Ashlar stone, hewn stone and volcanic stone. The stone shapes: random shapes, round edges smooth shapes and right angle shapes with polygons. There are two types of buildings technique: smaller modules, and largest modules.



Fig.1&2 traditional rural house with a large courtyard for a large family. Ramallah (Palestine) quarry stone dressed.



Fig.3 Aures (Algeria) An unfamiliar construction, wood is used with stone to improve the performance of the wall structure - these fixing systems provide the opportunity to use irregular stones linking the two surfaces to increase stability, bonding and to resist earthquakes without disturbing the building balance.



Fig.4 Irbid (Jordan) - Ashlar stone masonry construction is cut with saw or chisel which is of 4, 5 or 6 faces - The construction is made of limestone and basalt layers, the surface is engraved.

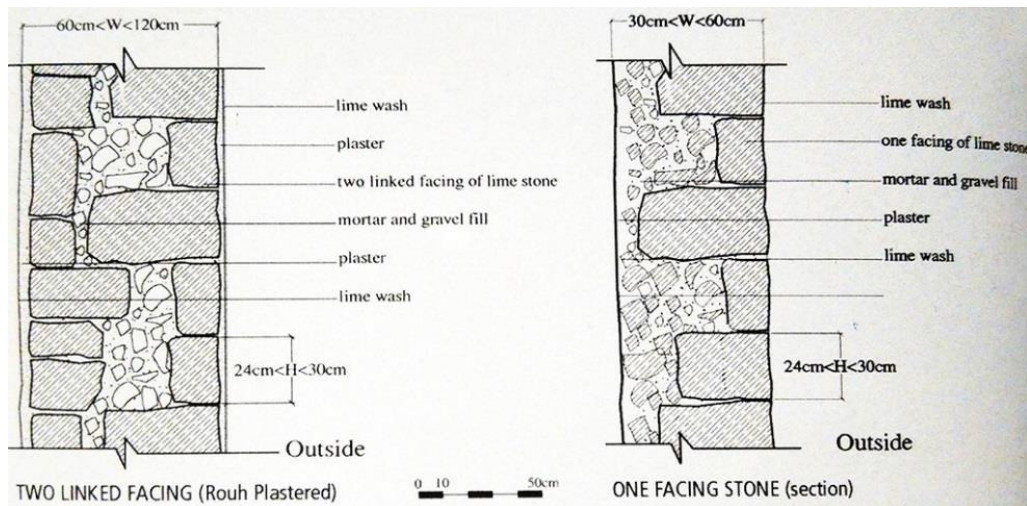


Fig.5 stone wall installed by mortar, two models: double facing & single thickness wall.
Single thickness wall: The thickness of the wall is 20 :30 cm, it has a single row of stones that make up the outer and inner sides of the wall.
Double facing wall: The thickness of the wall is varies between 30 : 55 and 50 : 55 cm, between the two sides is filled with a mixture of gravel and mortar that ensures the consistency of the mortar.

2.3.2. Mud Wall Systems: Mud is easy to use compared to stone structures, it is available, inexpensive and high thermal insulation, but when it reaches water it becomes brittle, weak and dangerous, due to its porous surface, it has added raw materials to strengthen it, such as: (sand - stone - lime - ashes – gravel). there are two types of mud walls, mud brick (Terracotta brick), Usually cut to size 20*10*3 cm, 40*20*20, 15*115*6 cm, 45*45*11 cm, and Compacted mud Walls System, which made of pressed mud, molded in wood blocks 1: 3 m, height of 50 cm, 80 cm thick, which compensates for their weak resistance and low hardness.

2.3.3. Rendering & Washes: Coating has two basic functions: protection and waterproofing against water rendering, and the aesthetic value due to the irregular shape of the units (whether brick or stone). Rendering has different thickness of coating layers. There are three types of rendering: rustic rendering it is from one-layer without leveling, smoothed rendering of two layers with leveling, and Stucco, the most complex. The Washes is a thin layer of lime.

2.4. Horizontal Structures (Flooring/Ceiling): there are three types of ceiling/flooring system: Thin Floor; it is built from (joist & boards), Thick Floor is built from (crossing & linking & filling & finishing), and Superimposed Floor is built from jointed wooden boards of (framework & secondary framework & poured mortar & poured mortar support like blanket of linked reeds).



Fig.6 Ghardaia Village (Algeria) - The accuracy of the solid lime stone slabs closure, with extended beams of palm trunks.



Fig.7 Haut (Morocco) The masonry took advantage of the natural tree shape with a trunk to support the trunks above.



Fig.8&9 Hauf-Rif (Morocco) regular and irregular Implementation of mud brick installed, mortar and brick are from the same material.



2.5. The Applied model: Application of using local Egyptian earth materials and rural traditional building systems to build tourist village chalets in North Sinai region

(Table 1 - by researcher)

The Proposed Building System which is environmentally and economically in North Sinai		item
<p>Building Typology: The Compact/Complex House was used in chalet planning, of ground and first floors, it has multiple spaces, based on the concept of unity and superposition of its being.</p>		Chalets Planning
<p>Building System: The largest modules building system was used on the basis of a rocky base of solid course, buried at a depth of 60 cm and a double thickness of wall 80 cm. walls thickness is 40cm to avoid heat variation for summer and winter, the walls are built in horizontal courses, with wedges of small stones pounding in large stones in order to reduce construction loads.</p> <p>Construction material: limestone walls which are available in the Sinai Mountains, masonry laid in earth lime mortar. The stones are cut with 15 cm thick, the two sides of the wall are connected to each other by filler of limestone mortar containing small elements of lime and gravel, leaving stone tails inside to ensure bonding strength.</p>		Vertical Structures Walls Systems
<p>Colors were used in the facade paint (by adding dyes), rendering is used in order to protect from moisture and to add aesthetic value, it is a thick type of protection Rendering (waterproof) because limestone is porous Smooth rendering method was used: it is applied in two layers, by manually covering surface with a shovel, then smoothing again with it, with a thin washes of lime layer that protects from dust and organic material, by washing the structure with water and a brush of animal hair.</p>		Rendering & Washes

- **Ground Floor:**

A thick floor system construction was used, which is of three complex layers:

- **The main wooden Framework** is the supportive structure of palm trunks, which is abundant in the Sinai environment, it is exposed (from the side of the roof), the trunks are about 80 cm apart, the structure is made up of crossing and linking that are perpendicular to each other, with an outer frame that defines the roof area, palm trees were used to make architectural lintels.
- **Filing:** It forms the roof surface (formwork and mortal mass) made of lime mortar with use of plant materials as secondary support beams with filing like blanket of linked reeds and bunches, palm trees leaves were used in open outer spaces.

The height of the first floor is 320 cm.

- **First Floor**

The dome was used in some of the first floor interior spacing, in order to reflect the sun radiation and heat. It is a compact limestone of size 30 * 15 * 8 cm, laid in lime mortar, and the rest of the internal spaces on the first floor have been used the same ceiling system of the ground floor. Ground floor for its construction (the first floor ceiling height is 3 m and the dome height is 1.5 m).

- **Finish coating:** was done from washing the surface to insulation, leaving the ceiling on its original color.

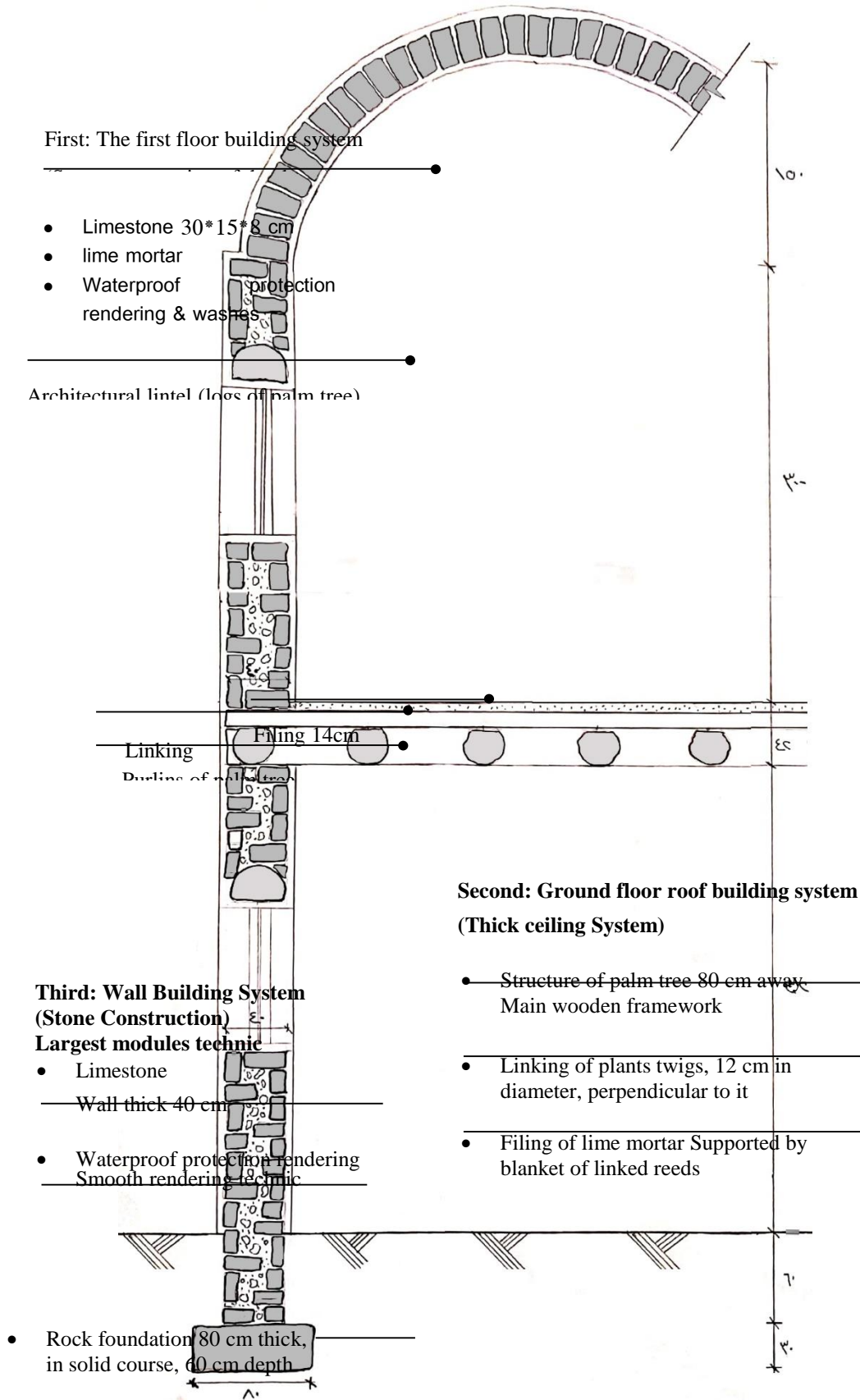


Fig.10 Section in tourist village chalet, in North Sinai, explaining the use of raw surrounding environment materials and traditional building systems, inspired by the Arab rural Mediterranean building system.

3. Problem Statment

- **The problem of the research** lies in answering the question: Is it possible to take advantage of the traditional building systems as well as the local materials for the Arab rural Mediterranean Residence to obtain economic architectural structures designs characterized by the elements of modern contemporary housing?
- Are there reasons that explain this enthusiasm and satisfactory simplicity in implementation?
- Lack of the traditional building systems studies.

4. AIMS AND OBJECTIVES

- Revive the traditional building systems of the Arab rural Mediterranean Residence that closely related to the surrounding environment in raw materials and technology.
- Create an architectural design that inspired by that heritage of Arab rural Mediterranean Residence.

5. Hypothesis And Methodologies

- Analytical Method: of the Arab rural Mediterranean Residence.
- Applied Method: make a contemporary architectural designs that are inspired by the traditional heritage of Arab rural Mediterranean Residence.

6. Conclusions

1. It was possible to take advantage of the traditional building systems and local earth resources in the Arab rural Mediterranean Residence, to make an economical architectural design characterized by the elements of modern housing, and that have been applied on the chalets of a tourist village in North Sinai region.
2. The Arab rural Mediterranean Residence is a great achievement, as it is a pure building adapted to the environment and not harmful, despite being rough and rustic, the builder chooses the site according to its ability to extract its raw materials and according to the balance between the material and its operation, even if the structure is not suitable for the earth properties, the builder adds reinforcement materials to support the structure.
3. The research believes that the contractor investor who has the ability to implement a complete society based on local earth materials and simple technologies will be a pioneer and an example to be followed in future building field in Egypt and all developing Arab countries.
4. Buildings which are using local methods and materials are not limited to specific cultures and places, but it is a real demand for all the world for environmentally, friendly economical, adaptive future architecture.

7. Recomendations

1. We have to make traditional economic building systems and friendly environmental architecture that can be implemented on a large scale instead of economically costly concrete architecture, especially in new societies outside Cairo.
2. Attention to the importance of relying on the natural materials present in the various Egyptian environments in future construction and building projects, especially the tourist establishment, as an important tourist attraction that expresses an identity.

3. Urging young people to build their homes in villages and new societies in the desert back, using traditional economic building systems, local natural materials, natural energies, and simple technologies, as they are suitable for young people in light of the difficult economic conditions in our country.
4. Finding a link between heritage and progress, by returning to our original heritage, we learn from it and then formulate it in a manner that carries the elements of the modern era, to present an authentic architecture based on civilization mixed with scientific progress.

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