ARCHITECTURAL ANALYSIS OF THREE NEOLITHIC CASTS OF THE VINČA CULTURE AND THE EASTERN-EUROPEAN ADJACENT CULTURES- THE UIVAR SITE IN THE ROMANIAN BANAT- BASED ON AN ORIGINAL RECASTING METHOD. ESTABLISHING A LOCAL TYPOLOGY

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Abstract

The Neolithic era is an essential stage in the history of humanity. The evolution of tools generates the passing from the hunter-gatherer-nomad man to the farmer – sedentary man, which has changed major aspects of the housing paradigm. In architecture, the shift from improvised, transportable shelters to the massive, stable ones is taking place. Several millennia after the sedentary life has settled in, come the first rectangular buildings in the Ierihon, Jerf el-Ahmar area, a crucial point in the history of architecture. Art and architecture histories barely cover this highly determinant period, in superficial lines, due probably to the lack of data and studies that look upon local, zonal and general typologies.

Exploring the Neolithic architecture, I have come upon a discrepancy between the recasting and representation of small artefacts: tools, pots, jewelry, ceremonial objects which are generally rendered through two faces and a distinctive section on a scale of 1:1 – 1:10 and the approximate way of the recasting the shelters through axonometric or decomposed perspectives, dimensionally imprecise, with archeological data unsystematically transmitted to a doubtfully qualified drawer. One can see this way of graphical representation useful to a simpler spatial perception, but scientific rigor commits us to a systematic approach and a thorough geometrically correct representation. I have therefore initiated the study of Neolithic architecture by elaborating a new, original method of architectural recasting of archeological structures, a study which includes two phases: 1. A brief of the factors determining the architecture, after 40 years of practice and 25 years of academic activity, in three complementary environments: geo-climatic, techno-economical and socio-cultural, going beyond the reductionist function-structure-form triad which blends together partial, social and technical elements and aesthetical concepts. The first stage is therefore the systematic gathering of information in six files: geographic, climatic, technical, economic, social, and cultural. After detailed analysis led by an inter-disciplinary team comprised of an architect, an archeologist and a structural engineer, architectural recasting is being drafted; these accurate recasts, geometrically represented by all the plans, the distinctive section, with the setting of the structural system, all faces on a scale of 1:50 and an axonometric representation for the development at a 1:100 scale. Previously published
and tested, this method applies to well-researched archeological sites to a minimum of 3 temporally close structures, in order to elaborate local typologies.

Replicating these studies on coherent areas and cultures, one can generate zonal and general typologies which will be included in the histories of architecture, especially the less researched, prehistoric one. An architectural recasting is carried out here for three structures of Neolithic Vinča and adjacent East-European cultures, the Ulvar site in the Romanian Banat. In the first stage, we fill in the six data files, with general information on this site. For each of the three structures, a textual description file is drawn up together with board sets on a 1:50 scale: a plan of the foundation digging, a plan of the first floor, a plan of the roof, distinctive sections, 4 faces and an axonometric representation of 1:100. Finally, a local typology is synthesized, which is rendered on boards with the graphical typological representation. On the Neolithic Ulvar site, the study reveals housing comprised of mono-block structures, with several rooms and an inclined roof, with a structural system made up of built-in pillars, beams leaned on natural ramifications, cast in a structure which can be assimilated by a wood bedded structure.

Keywords: architecture, archeology, Neolithic, Vinča culture, recasting

1. THE VINČA CULTURE. LATE VINČA

The northern area of the Vinča Culture--thus named after a town in Serbia where important research has been conducted and discoveries have been made--overlaps the historical Banat, on the plain situated at the confluence between Timis and Danube, as Neolithic migration often followed the course of a river.

![Fig. 1.1. Situation of the Vinča Culture in the Balkans, according to "Civilizație și cultură" (Meridiane 1991 Publishing), Maria Gimbutas, p. 15](image-url)

A separation from the Early Vinča was necessary, as changes occur now that generate new civilizations. There are also numerous migrations with a strong impact. These changes were discussed by Gh. Lazarovici in 1994, and he used the term "the Vinča C site", marking three groups of elements.
For the current region of the Romanian Banat, studies have been carried out under the coordination of Florin Draşovean in Foeni—1991-2013, Hodoni—1985-1991 and Ulivar, together with Wolfram Schier, in 1999-2009-as per the data provided by Fl. Draşovean. For Ulivar, carbon dating was carried out, which resulted in an age of 6800 years. For Foeni, the certified period is 6700 years ago.

The research carried out on compact settlements revealed that they were placed in areas not affected by floods, yet in the proximity of lakes or rivers, as well as forests—the size of which we cannot know for those times. The research is, clearly, only partial—some areas are still being researched, the analysis of well-documented cases allowing for the understanding of the evolution of the Late Neolithic and Eneolithic.

1.1. The Ulivar site

The current town is located in the region of the Timiș-Bega rivers, the Neolithic settlements being situated on alluvial sediments or other higher areas around the water. An area of over 11 ha has been researched by aerial photography, geomagnetic exploration, over 8 surveys and 3 areas, totaling 1300 square meters (Schier, Draşovean apud. "Arhitectura neoliticului și epocii cuprului din România. Neoliticul", C.M. Lazarovici, G.Lazarovici, p.480). In the central area, archeologically significant deposits are over 4 meters thick.

The lodgings seem located in rows, 4-6 meters between them. Three well-researched houses will be rebuilt, in parallel to already completed recast lodgings, in order to figure out the local typology.

2. RECASTING METHOD, D-1, BASED ON ARCHAEOLOGICAL DATA

Currently there is no standard method of recasting the constructions based on the data obtained from the archaeological research. The method proposed by the author has two stages:

1. Obtaining information
2. Determining the restructure, geometrically

The architecture is determined by three inter-relational environments:
- geography and climate
- technology and economy
- society and culture

In the first stage, six data sheets are needed: data related to geography, climate, technology, economy, society, culture and annexes with the existing information, structured. Based on these sheets, a qualified
The architect can restructure a geometrically determined construction by drawing up boards on a scale of 1:100, 1:50 - in accordance to the size of the building, as following: foundation plan, first floor plan, second floor plan, roof plan, characteristic sections - minimum 2, façades - minimum 4 and, optionally, to-scale axonometric projection.

The recast must be subjected to a structural behavior analysis carried out by a civil engineer, in order to check the stability and accuracy thereof.

3. ARCHITECTURAL RECASTS FOR THREE CONSTRUCTIONS ON THE CURRENT TERRITORY OF UIVAR COMMUNE

Three archaeological sites were chosen on the criterion of the accuracy of their description, allowing for a faithful recast. The descriptions were carried out by Professor Florin Drașovean, PhD.

![Fig. 3.1, Uivar - Archaeological Site](image)

The data sheets compressing and organizing information on geography, climate, technology, economy, society and culture are common for the three structures at hand, as they are close together spatially and have the approximately same age. We will go on to present each of the three structures with the textual description sheet and the following boards: digging-foundations, first floor, roof, characteristic section, north façade, south façade, east façade, west façade, axonometric projection. Based on these recasts, we will draw up the local typology.

3.1. Uivar datasheets

3.1.1. Geographical Information

**Location**
Currently Uivar commune, Timis county, Romania, 5200 - 5100 BCE.

**Location within the continent** - North of the Balkan Peninsula, Europe

**Relief** - Continental plain

**Bodies of water** - Bega River – allochthonous, transversal, springing from the Carpathians – 100 m³/s, Bega Mică River – allochthonous, 5-10 m³/s

**Flora** - The Bega River everglades: willow, acacia, reeds, broadleaf: beech, oak

**Local construction materials** - Broadleaf wood: beech, oak, hazelnut tree, willow, acacia, reed. Soil: clay, river stone

**Additional information:** The Bega River is a Danube affluent; the Banat Mountains protect it from the Danube Plain

3.1.2. Climate Information

**Assumed climate** - Temperate-continental, with Mediterranean influences, similar to present day.

**Seasons** - Spring - cold, wet; Summer - hot, excessive; Fall - warm, long; Winter - temperate.

**Temperatures** - annual averages: 10-12°C, maximum: +42, 5°C (Jimbolia) , minimum: - 30, 9°C (Lugoj)

**Rainfall:** 550-600 mm, Spring – normal, Summer - dry: 80 -100 mm
- Fall – normal, Winter - low: 40 mm - 20 days of snow

**Additional information:** Temperate-continental climate, with Adriatic Sea influences, the excesses of the Danube Plain being mitigated by the Banat Mountains. Dominant winds from the west - average speed 3
m/s, maximum 27 m/s.

3.1.3. Technical Information

Processed construction materials
- Beech wood, peeled oak, perhaps split in two
- Clay mixed with sand; other plant and animal-based materials
- Willow or hazel rods, linen rope, hemp
- Reed, cane, bulrush

Existing tools (plus attached sheets)
- Hammer made of polished stone with a hole for the wooden tail
- Sliver rabble, made of stone
- Wooden cleats
- Wooden stakes
- Wooden mallets
- Hacks made with animal horns

Building systems (plus attached sheets)
- Wooden frame structure with embedded pillars.
- Joints tied with rope and willow rods
- Walls - interlacing of willow rods, stuck with clay, covered in reed or cane

Available techniques and technologies
- Cutting by hitting with stone hammers
- Peeling by using rabbles on green wood
- Splitting by using wooden cleats in dry cracks
- Ties with willow rods or flax and hemp rope

Additional information
Painting in geometric patterns, earthy colors, techniques borrowed from pottery.

3.1.4. Economic Information

- Economic system (hunting, fishing, gathering, extensive/intensive agriculture, crafts, industrialism, post-industrialism)
- Extensive agriculture, animal husbandry, supplemented by gathering, hunting, fishing

Available resources
Primitive cereal, river fowl, domesticated animals, game, fish, edible roots

Workforce
- Families with several generations
- Communities of approximately 500 individuals

Additional information
Agricultural economy supplemented by hunting, gathering and fishing
Materials from the everglades of the Bega River and broadleaf forests, significant in those times

3.1.5 Social Information

Ergonomic data on population

<table>
<thead>
<tr>
<th></th>
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<th>women</th>
</tr>
</thead>
<tbody>
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<td>150 cm</td>
</tr>
<tr>
<td>average weight</td>
<td>80 kg</td>
<td>80 kg</td>
</tr>
<tr>
<td>life expectancy</td>
<td>45 years</td>
<td>50 years</td>
</tr>
<tr>
<td>infant mortality</td>
<td>high</td>
<td>high</td>
</tr>
</tbody>
</table>

Social organization
- Multiple families, three generations
- Rural communities of approximately 500 individuals
- Family system
- Three generations at the same time
- Matriarchal system, the totem being passed on to the mother

Religious system
- Home gods - animistic beliefs
The cult of fertility, of the bison

**Dietary customs**
- Indoors and outdoors cooking stoves
- Cooked food - omnivorous

**Additional information**
- Community collaboration
- Tribe's home
- Sanctuaries

### 3.1.6. Cultural Information

**Philosophical systems**
- Animist religions
- Fertility cult
- Animal sacrifices

**Artistic manifestations (plus attached sheets)**
- Painting: geometric models practiced on clay pots
- Earthy colors, 3-4 shades of umber
- Sculpture: clay idols, animal horns, bone, stone
- Architecture: structural systems in wooden frames filled with clay, with first and second floor
- Music: mostly rhythm
- Dance: ritualistic
- Decorative arts: geometric motifs
- Schematic, anthropomorphic, zoomorphic and floral motifs given a geometric interpretation

**Additional information**
Customs at the change of seasons, the fertility cult, the animal force cult - the bison.

### 3.2. Construction H4 b – 1

**TEXTUAL DESCRIPTION SHEET:**

**Title** – Construction One floor + Attic H4b – 1 (Feat 5420)

**Location** - Currently, Uivar Commune, Timis County, Ro

**Time estimate** – 5200 – 5100 BCE

**Data author** - Prof. Drașovean Florin, PhD

**Recast by** - Architect Mihai-Corneliu Popovici-Donici

**Digging plan** - the field research includes the construction plan almost entirely and can be considered a fully researched foundations plan.

**First floor plan** – based on the digging plan and the position of the poles, a first floor plan has been recreated, which shows five rooms: A – 4.8 x 1.5 m, B – 4.8 x 2.6 m, C – 4.8 x 2.2 m, D – 4.8 x 2.55 m and another room, E – 4.6 x 2.1 m, probably added after and separately covered in one escarpment, perpendicular on the existing construction.

**Second floor plan** – subsequent to the analyses carried out together with the structural engineer, we believe that it was most likely an inhabited attic, comprised of three rooms: F – 4.8 x 1.4 m above room A, G – 4.8 x 2.5 m above room B, above room C an open space for ladder access and a spatial passage to room H – 4.8 x 2.35 m.

**Roof plan** – overhead view of the structure, showcasing the longitudinal coverage with two escarpments at an angle of approximately 60 degrees, suitable for reeds, allowing a useful attic area on a central axis of approximately 2.5m and the use of lower lateral sides for storage or sleeping.

**Characteristic section** – the transversal section is very important, as it is the only one that highlights the structural system and the correct ergonomic capacities for the occupants' sizes. The structural system can be assimilated with one in wooden frames, with embedded pillars, approximately 1.4m into the ground and average diameters of 25-30 cm, but also 50 cm for main pillars. There are cases of subsequent repairs with pillars added to the structure, which shows that the structure suffered from stability issues in time. In order to join the main round beams with diameters of approximately 30 cm, we chose the most plausible option,
namely reclining them on "V" ramifications, split and tied with lianas or rope. The platform over the first floor was built using tree trunks of approximately 30 cm in diameter, split in 2, with clay added afterwards. On the longitudinal perimeter beams—ribs, on the central longitudinal cleat, approximately 2.5 m higher, round rafters were placed, at a 45 degree angle, of approximately 10 cm in diameter, 1 m apart; longitudinally, round slats were placed on top, approximately 5cm in diameter and 40 cm apart, tied with lianas or rope, and representing a structure for coverage with bundles of reed, approximately 20 cm thick and 2m long. For proper anchorage, reed mattresses overlapping in lines could be penetrated by the pointed tip of the rafter in the upper part and "stitched" with ropes or weights, similar to what certain contemporary cultures use. The end walls on the short sides were dead walls. The non-structural closing walls were built on a canvas of small pillars 20 cm apart and woven canes, as a support for the clay added to the walls, approximately 20 cm thick, which meant most likely that the main pillars were visible, since clay does not adhere well to peeled tree trunks and wood behaves better in time if it breathes and eliminates the excess humidity.

The ground flooring was made of a netting of canes, 3-6 cm in diameter, covered with clay.

The above flooring was made of split beams, placed transversally on the long axis, approximately 30 cm, covered in clay.

North façade – the construction as seen from the North, highlighting the coverage system and any small size gaps (20 x 40 cm) for light and ventilation, which could be closed off with wooden boards, canvas or animal skins, like in the case of existing ethnographic constructions.

South façade – the view from the south, includes the main access of maximum 90x180 cm, situated on this side in order to allow sunlight into the house. The access could be closed with canvas, mats or doors made of wooden boards. Also, each room could have small-size holes - 20x40cm - for light and ventilation.

East façade – showcases the shape of the roof in two escarpments at 45 degrees and the coverage of room E, probably added after. The dead wall is partially visible; any windows that might exist are also visible.

West façade – showcases the entire dead wall, with the shape of the 45 degree roof and any holes. Here we can also see the structure of the roof, coming out in the console, all around, approximately 40 cm, in order to protect the clay walls from the rain.

Axonometric projection – for a better spatial understanding of the recast, an axonometric projection at a scale of 1:100 was added, showing in detail the overall volumetric analysis of the construction.

The graphic representation of the built volume is carried out by the following set of boards:

**Graphic representation of the reconstructed volume**

Fig 3.2.1... M H4b – 1 Foundation plan

Fig. 3.2.2. M H4b – 1 First floor plan
Fig. 3.2.3.  M H4b – 1 Attic plan

Fig. 3.2.4.  M H4b – 1 Roof plan

Fig. 3.2.5.  M H4b – 1 Characteristic section

Fig. 3.2.6.  M H4b – 1 North façade
Fig. 3.2.7. M H4b – 1 South façade

Fig. 3.2.8. M H4b – 1 East façade

Fig. 3.2.9. M H4b – 1 West façade

Fig. 3.2.10. M H4b – 1 Axonometric projection
3.3. Construction H4 a-1

Textual Description Sheet:

Title – Construction P H4 a – 1 (Feat 5420)

Location - Currently, Uivar Commune, Timis County, Ro

Time estimate – 5200 – 5100 BCE

Data author - Prof. Wolfram Schier Prof. Florin Drașovean, PhD

Recast by - Architect Mihai-Corneliu Popovici-Donici

Digging plan - partially includes the layout plan, the north and west walls not being fully determined - but can be used as foundation plan.

Layout plan – starting from the digging plan and the position of the pillars, a 5-room area was reconstructed: A – 5.25 x average 1.25 m, B – average 3 x average 2 m, C – average 1.75 x average 4.25 m, D – average 3.5 x 1.75 m, E – 5.25 x average 2.25 m, the rooms not having parallel sides.

Roof plan – overhead view shows the longitudinal coverage with two escarpments at an angle of approximately 60 degrees, which is characteristic for houses covered in reed.

Characteristic section – the transversal section showcases the structural system that can be assimilated to a wooden frame system, with embedded pillars approximately 1.4m into the ground and average diameters of 25-30 cm. We believe that the jointing with the main beams of round timber, and diameters of approximately 30 cm, consists in reclining said beams on “V” ramifications, secured with lianas or rope. On the longitudinal perimeter beams, on the central longitudinal cleat, 1.8 m higher, round rafters are reclined, at a 60 degree angle, of approximately 10 cm in diameter, 1 m apart; longitudinally, round slats were placed on top, approximately 5cm in diameter and 40 cm apart, tied with lianas or rope, and representing a structure for coverage with bundles of reed, approximately 20 cm thick and 2m long. Reed mattresses overlapping in lines could be secured by the pointed tip of the rafter in the upper part and “stitched” with ropes or weights. The walls on the short sides were dead walls. Lateral closures were non-structural, on a basis of small pillars 20 cm apart and woven rods, filled with clay, approximately 20 cm thick. The main walls would remain visible, since clay does not adhere well to peeled wood.

The floors were made of woven rods of approximately 5cm, covered with clay.

North façade – showcases the coverage system and the holes. 60% thereof is estimated, due to incomplete site research.

South façade – includes the main access estimated at approximately 80x180 cm, situated on this side for sanitary reasons. Each room could have potentially had holes in the wall, of maximum 50x70 cm, for light and ventilation.

East façade – showcases the shape of the roof in two 60 degree escarpments, probably with holes for light and ventilation.

West façade – is similar to the east façade, being estimated due to the incomplete site data.

Axonometric projection – presents the spatial image of the volumetric analysis, as seen from the south-east.
Graphic representation of the reconstructed volume

Fig. 3.3.1. H4 a-1 Foundation plan A

Fig. 3.3.2. H4 a-1 Foundation plan B

Fig. 3.3.3. H4 a-1 First floor plan

Fig. 3.3.4. H4 a-1 Roof plan
Fig. 3.3.5. H4 a-1 Characteristic section

Fig. 3.3.6. H4 a-1 North façade

Fig. 3.3.7. H4 a-1 South façade

Fig. 3.3.8. H4 a-1 East façade
3.4. H3 f-1 construction

TEXTUAL DESCRIPTION SHEET:
Title – Construction P H3 f – 1 = H3 d- 1
Location - Currently, Uivar Commune, Timis County, Ro
Time estimate – 5200 – 5100 BCE
Data author - Prof. Wolfram Schier and Prof. Drașovean Florin, PhD
Recast by - Architect Mihai-Corneliu Popovici-Donici

Digging plan - includes the construction plan almost in full and can be used as foundation plan.

Layout plan – using the digging plan and the position of the beams, 4 rooms were reconstructed, from the west to the east, as following: 5.75 x 2 m, 5.75 x average 2.25 m, 5.25 x average 2.75 m, 5.25 x average 2 m. The site excavations on the southern side show that the access used to be protected by local coverage in eaves.

Roof plan – shows the longitudinal coverage with two escarpments at an angle of approximately 60 degrees, which is characteristic for houses covered in reed.

Characteristic section – the transversal section showcases the structural system that can be assimilated to a wooden frame one, with embedded pillars approximately 1.4m into the ground and average diameters of 25-30 cm. We believe that the jointing with the main beams of round timber, and diameters of approximately 30 cm, consists in reclining said beams on “V” ramifications, secured with lianas or rope. On the longitudinal perimeter beams to the central longitudinal cleat, 1.8 m higher, round rafters were reclined, at a 60 degree angle, of approximately 10 cm in diameter, 1 m apart; longitudinally, round slats were placed on top, approximately 5cm in diameter and 40 cm apart, tied with lianas or rope. The reed roof is approximately 20cm thick and 2m long. The layers of reed could be secured using the pointed tip of the rafter. The walls on the short sides were dead walls. Lateral closures were non-structural, on a basis of small pillars 20cm apart...
and woven rods, filled with clay, approximately 20 cm thick. The main walls would remain visible, since clay does not adhere well to peeled wood.

The floors were lifted approximately 30 cm from the ground, being made of woven rods of approximately 5 cm in diameter, covered with clay.

**North façade** – showcases the coverage system and the potential holes, one for each of the four rooms.

**South façade** – showcases the main access, covered by eaves. Small holes could be provided for two other rooms.

**East façade** – showcases the shape of the roof in two 60 degree escarpments, probably with two holes for light and ventilation.

**West façade** – showcases the shape of the roof and the lateral dead wall with two potential holes as windows.

**Axonometric projection** – from the south, it presents the eaves above the entrance, illustrating the overall volume.

**Graphic representation of the reconstructed volume**

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Fig. 3.4.1. H3 d- 1 Foundation plan

Fig. 3.4.2. H3 d- 1 Layout plan
Fig. 3.4.3. H3 d-1 Roof plan

Fig. 3.4.4. H3 d-1 Characteristic section

Fig. 3.4.5. H3 d-1 North façade

Fig. 3.4.6. H3 d-1 South façade
Fig. 3.4.7. H3 d-1 East façade

Fig. 3.4.8. H3 d-1 West façade

Fig. 3.4.9. H3 d-1 Axonometric projection
5. LOCAL TYPOLOGICAL CONCLUSIONS - UIVAR

By reconstructing three structures using the proposed method, we have found a series of common features:

- Wooden frames, embedded pillars approximately 1.5m into the ground - giving stability to the structure, although there are no crossbars creating stable triangles, and beams simply reclining on the natural ramifications of the pillars, tied with rope or rods.

- Ridges in two escarpments of approximately 45 degree angles, longitudinal, made up of rafters approximately 1m apart, reclining on the beams of the long sides (ribs), and the central beam of the roof (hip jack rafter). Longitudinal cleats tied to rafters 50 cm apart, supporting the plant-based cover--probably reed, placed in successive layers, tied or balanced with sand.

- Closures with non-structural walls, built out of vertical pillars, interwoven rods and clay.

- Short sides were closed by lifting walls, and obtaining dead walls.

In the case of ground-level houses with multiple rooms, there could be no ceiling, but directly the attic; thus, the vertical volume allowed for good ventilation during summer.

In the cases in which the existence of a platform with clay was documented, and thus a separate use of the attic, there is a structural advantage to the stability of the construction, the two triangles of the framing contributing to the rigidity of the structure, especially of heavy loads are stored on said platform.

The platforms were raised a few dozens of centimeters above ground.

The clay walls were probably painted in earthy colors, with geometric motifs on the inside and possibly on the outside, as suggested by recasts carried out according to fragments of burnt clay that resulted after fires destroyed the houses; this is presented in further detail in the Annexes, fig. 16.

The holes for access, light and ventilation were minimal and ergonomic, and could be covered with planks of wood, animal skins, canvas or other animal membranes--all these solutions being present in current or isolated Neolithic communities.

This gives us an image of massive parallelepiped-shaped constructions, with small holes, several internal rooms, roofs in two longitudinal escarpments of approximately 45 degrees and dead walls on short sides, the roof--covered in vegetal fiber--protruding approximately 40 cm in the console, protecting the clay walls and holes thereof.

The typology overall was surprisingly unitary, with varying sizes as well as the possibility of inhabiting the attic, which is due to the use of the same local materials, same tools and techniques that led to the creation of a structural system that was stable and easy to recreate one generation after another.

We would like to state that this system requires permanent maintenance and seasonal repairs during spring and during seasons of heavy rainfall, failure to do so leading to fast degradation.

The archeological site research shows the position of structural beams due to different colors of the soil and sometimes traces of burnt clay from the walls, floors or platforms, resulting subsequent to accidental, sanitary or conflictual fires. Board 81. Uivar construction typology H4 b-1
Fig. 5.1. Uivar construction typology H4 b-1

Fig. 5.2. Uivar construction typology H4 a-1

Fig. 5.3. Uivar construction typology H3 f-1
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