Examples of some late antique building techniques, applied on the horreum from mediana

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Historical circumstances in the time of late antiquity were such that the interest of the Roman world has roused and transferred towards the eastern pole of the Empire. Many very important rulers of that time were of the origin from central Balkan provinces. Consequently, this particular region, previously concerned only as a border, provincial part of the state, transformed into the place of a special interest. This was followed by the expansion of building production, which was very often of high administrative, or even imperial significance and function.

One of the centers from the mentioned provinces, which had lived the period of its highest prosperity in the time of late antiquity, was Naissus (nowadays Nin). One of its parts was the neighboring agglomeration, Mediana, famous by many highly representative villas and other buildings that were forming it. One of the particularities of this site is the presence of numerous immense buildings that certainly were of some higher importance in the region.

During many years of archaeological excavations of this site, ruins of a building that was recognized as a granary, or horreum, were discovered practically in its total plan. The remains presented the building exceptional both by its size (27 × 90 m), as well as by its function and organization. Consisted mainly of the huge storage space, with the porch in front the main entrance, auxiliary rooms and separated administrative part, the horreum was dated in the beginning of the IV century AD, like all the other buildings of this archaeological site. Two rows of eleven large stone posts for the pillars that were made of bricks have divided the main part of the building into three naves. Between them, several 2m high containers, called pitos, partly buried into the ground, were found, some of them completely preserved. In one of the later phases of the building, in the western part of the storage, three pits, carefully plastered with mortar that contained crushed brick aggregates were dug into the ground. Their use was explained as containers for oil of other liquid materials that could have been stored this way.

Although the remains of the walls and piers were scarce by its height, the plan of the building could have been defined. Found in the soil, traces of burned wooden structure, connecting metal elements and other indicators of the architecture of the former building were recorded during the excavations. This offered enough elements to review and compare different building techniques applied on this building with those of late antiquity, and enabled the creation of possible ideal-reconstruction of some particular parts of the granary, as well as of the whole building.

HISTORICAL BACKGROUND

Roman civilization whose influences have been spread over the territory of almost the whole Europe
and Mediterranean countries, has left rich cultural and building heritage in the Balkans. One of the cities that represented a significant regional urban center of that time was the ancient Naissus. Our knowledge about it is based on different historical sources, such as written documents from authentic period, epigraphic monuments and archaeological findings, representing a material proof and visualization of historical facts and assumptions. According to them, foundation of this city is connected with the foundation of the Roman province of Upper Moesia in the I century AD. Its position on the crossroad of the main routes that were bringing eastern and western parts of the Empire together, resulted with its important strategical and military significance, due to which this Roman town lived its ancient phase of life till the very end of late antiquity.

The period that is considered as the most prosperous time of Naissus was recognized as the IV century AD. Ever since the reign of Diocletian at the end of the III century, erection of the most important buildings of this town has begun, both in Naissus itself and in its neighboring parts. One of them was Mediana whose function was often explained as «the luxurious suburb with villas». Regarding the urban organization of this settlement, it is certain that its central position could be identified with a unique villa with the peristyle, Figure 1, which was often considered even as an imperial palace, or at least the place where Constantine and some of his successors used to reside during their visits to Naissus. On its east, north and south, there were traces of the existence of other luxurious representative buildings, while on its west there was a large economic complex consisted of huge workshop buildings and an immense granary. Although the organization of this settlement could be described as the one of the open type, there was a fortification in its rear, placed on the «Vlarko brdo» hill.

![Figure 1](image1.png)
Location of Naissus in Roman Empire at the end of III century AD

![Figure 2](image2.png)
Situation plan and disposition of the buildings in Mediana

**THE GRANARY BUILDING OR HORREUM**

Traces of the huge building representing a granary were discovered during the first archaeological excavations of Mediana in 1936, when its north wall was revealed, as well as the east end the inner space of the building, including remains of the stone posts for the pillars and large pots called *pitos*. During this first archaeological campaign, a western part of the building was also partly dug, in which evidences of three pits used as containers for oil or similar goods,
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Examples of some late antique building techniques were discovered. Excavations have continued many years afterwards, first in 1961, and then in the period from 1980 till 1983. Nowadays we can say with the great probability that the granary is known in its total area.

Three chronological phases of the building were discovered during archaeological excavations, although, according to the applied building material and building techniques, there was not a big interval between the building phases. Therefore, they could be probably considered as a kind of adaptation of the building during the long and continual term of use. It is believed that this building, which, the most probably, was destroyed in fire during the invasion of Huns in the mid of the V century, has never been reconstructed again.

**Organization of the building**

The granary building has an elongated trapezoidal plan. Its width was 27 m, while its longer, parallel sides, were oriented in the northwest-southeast direction. Due to the shape of its plan, the length of the longitudinal walls varied from 89.5 m (north wall) to 92 m (south wall). The main part of the building, which was built in the first building phase, is represented in the elongated storage space, 18.5 m wide. It was divided with two rows of eleven masonry pillars in three almost equal naves. Square pillars had their posts (approximately 1.5 x 1.5 m), made of cut blocks of stone, while they, themselves, were 90 cm wide and made of bricks. Between them, 2 m high *pitos*, partly buried into the ground were placed. On the south side of the granary there was a long porch, as wide as the naves of the storage, separated from the courtyard with a row of 12 square brick posts. At each of ends there were two linked square rooms. Many remains of large stone columns and bases were found in this area of the granary.

Built in the second building phase and completely separated from the main granary space, a group of six
rooms on the west side of the building, represented a part of the *horreum* that hosted the administration responsible for the collection of taxes and distribution of grain. Remains of two sacrificial altars were found in this part of the building. Apart from the described western part of the building, stone staircase in the west side of the porch, leading to the unknown position of the upper part of the building, is also considered as a part of the second building phase. The last building phase of the granary is recognized by several building activities, such as closing some openings in the western, administrative part, and digging three pits in the main storage space of the granary.

**Applied materials and building techniques**

Scarcely remains of the walls of the building had an average height of about 50 cm. The walls were built in two different widths: 90 cm for the perimetric walls, and 60 cm for the partition walls. They were built mainly with partly dressed unequal blocks of red and white stone, with a sporadic use of bricks on some typical positions. The brickwork was applied as the leveling layer at the bottom of the walls, but also in the corners, doorways and crossing of the walls. The identified sizes of applied bricks were $42.5 \times 27.5 \times 5$ cm and $40 \times 28 \times 6$ cm, or in the parts belonging to the second building phase, $43 \times 29 \times 5$ cm or 7 cm, which were formats that were typically used in this part of the Balkans in the late antiquity (Jeremić 1997; Radivojević 2000).

The principle that was used in the building process was that larger stone blocks formed faces of the walls, while the inner space, or core, was filled with the so-called mortared rubble, consisted mostly of larger round and other pebbles (Ward-Perkins 1958). The applied binder was the lime mortar, which was poured over it, while in the brickwork parts it created thick mortar joints, sometimes even thicker than bricks. This building technique, often described as *Byzantine opus mixtum* was typical for the time of late antiquity in the Eastern provinces (Eanak-Medíe 1980). Since Naissus belonged to this particular region, the use of this building technique in the case of the granary was not unexpected. However, what could be considered specific is the expressed polychromy of the walls that, according to the incised mortar joints, must have been visible in their final appearance (Mango 1976). The assumed colorfull façade of the building is in accordance with the esthetical principles of that time which often used different multicolored effects.

Walls from the younger building phases slightly differed from those from the first one. One of the differences was related to the quality of the mortar, which in later phases contained crushed brick. On the other hand, the walls were probably completely plastered. Excavations revealed that the walls from the last building phase, in fact parts of them that were filling the previous openings, did not have any foundations, but were laying directly on the soil. Posts for the pillars or the central storage room were one of the rare examples of structures from this region that were made of cut stones, in the manner of *opus quadratum*. While in this case only the upper parts of the pillars were made of bricks, pillars of the porch were built in total only with bricks.

Foundations of the walls were built in the same manner as the walls that they were carrying. They were wider than walls up to 30 cm. According to their depth, different building phases could have been distinguished since foundation from the younger building phases were not as deep as those of the first one, or, as previously described, they were even missing.

Floors of this building were preserved only in a form of traces of substructures or pieces of mortar layer which was not possible to be distinguished as a final layer or a part of floor substructure. It should be stressed that mortar layer from the main storage room contained crushed brick. Having in mind that this kind of mortar had hydraulic properties its application in the area where floor and other goods were stored has a logical connotation.

Parts of stone columns and bases, as well as other elements of architectural decoration, mostly found in the western part of the building, implicate the significance of the granary which must have been carefully decorated.

Upper parts of the building could only be a matter of hypothesis. Parts of carbonized wooden structure and metal cramps indicate the possible wooden roof structure, but they could have also belonged to the kind of the lifted floor that probably existed in the storage space. Traces of ancient roof tiles, the so called *tegulae* and *imbices*, were found in the soil.
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during the excavations, indicating the way the roof was covered.

**Reconstruction of typical structural elements of the Horreum**

Although, due to the state of preservation, our exact knowledge about the volume of the granary building is very poor, there are enough elements for different hypothesis about it. The key for any of possible assumptions is the fact that the skeleton of the building was the three-nave storage room with a porch on one of its longitudinal sides. Later extensions on the west side must have been incorporated into the original building appearance. Therefore the discussion about the reconstruction of the granary could be focused to the solution of the possible cross-sections of the original building.

Being specific by its function and size, and offering some *in situ* findings of large containers in a form of *pitos*, the manipulation of goods and reconstruction of necessary structures for this purpose deserved to be carefully thought. The input given by the disposition of structural elements was such that the central nave was bordered with parallel rows of brick pillars, laying on their wider stone posts, forming a square with a 6.5 m side. Between these pillars, three large *pitos* were placed, partly burried into the ground. Their use as containers for some goods must have required a lifted floor, that could have provided an easy access for their filling or emptying. Although indicating the roof structure in the first place, traces of wooden structures could have also be thought as remains of the former lifted floor. Since there were no traces of any separate structure that could have been used for this purpose, the idea was that some elements of the main structure must have been used for the erection of the lifted wooden floor, and the widenings of the pillars could have been used for the position of the wooden beams. These beams must have been used as a support for the system of secondary wooden beams that were posed in the opposite direction. This row of beams could have been used as the substructure of the wooden floor, made of thick planks. According to the span of different elements of the reconstructed wooden structure, the total thickness of the lifted structure must have been about 60cm. Having in mind that stone posts were about 50cm high from the ground and that 2m

heigh *pitos* were buried almost up to the half of their height, the thickness of the described structure reaches the top of the ceramic containers which could have offered an easy manipulation.

![Reconstruction of the lifted wooden floor of horreum](image)

The analysis of the geometrical characteristics of the main building part show the system of vertical structural elements, walls and pillars, that divided the storage room into three almost equal naves of approximately 6.5 m width. The porch that was along the south side of the building was 7.5 m wide, which was slightly, but not significantly, wider from the naves. These facts together with traces of wooden and metal elements that once belonged to a certain wooden structure, offer enough elements for possible reconstructions of the volume of the granary.

In the process of the reconstruction of the volume, some analogies were investigated, so the similar examples of huge late antique granaries that could be compared with the analysed one from *Mediana* were found in Trier and Veldidena, Figure 5 (Rickman 1971). The one in Trier even had similar spans and widths of walls and pillars, but also the similar applied building technique. The significant difference in comparison with the *Mediana*’s granary was the existance of pilasters along the external walls of the granary in Trier, which could be understood as indicators of the former system of cross vaults that might have been applied in this particular case. On
the other hand, the lack of such structural elements in case of the analysed *horreum* confirms that the idea of the wooden roof structure could be more probable solution for its upper zone.

Discussion about the possible volume of the granary and the disposition and form of its wooden elements is basically oriented in two directions and possibilities, Figure 6:

a) symetrical roof over the whole building, which means the storage room plus the porch, or
b) symetrical roof over the storage room, with variations in the porch that include either the possibility of extension of one of the existing roof sides, or a separate roof above it.

The roof structure itself is in all cases considered as a simple roof truss which was an invention of the Roman architecture, but at the same time, a type of structure that was extensively used in late antiquity. The massiveness of the pillars indicates the possibility that they were bonded in the upper zone with a system or arches which could have further been used as supports for the roof trusses. Possible position of the gallery, which is assumed due to the existence of the staircase in one of the corners of the porch, could be expected in the south nave of the storage room.

However, having in mind the wholeness of and simetry of the plan of the main part of the granary, represented in the storage room, we could assume that the second solution for the reconstruction of the granary’s volume is the more probable one, no matter of the possible further variations regarding the porch roof.

**CONCLUDING REMARKS**

The huge granary building from *Mediana* must have been impressive by its size, which implicates and stresses both the significance of the building itself, as well as the one of the urban settlement. This late antique building was unique in the region, and therefore it could be considered as a place of the regional interest, but it should be stressed that similar buildings existed at the same time in other regions of the Empire. Regarding the building materials, techniques and structures that were identified or reconstructed, the analyzed *horreum* was built in the usual manner of late antiquity. This means the prevalent use of the local building material, represented in rectangular bricks and local partly dressed stone, bonded with lime mortar or mortar with
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The crushed brick. The building techniques were typical for the eastern parts of the Roman Empire to which this region geographically and administratively belonged. The assumed roof structure was also in accordance to the knowledge and building skill of that time. At the end it could be concluded that the horreum from Mediana, preserved in the total of its area, together with some interesting elements related to its function, such as large pits and pits, could be considered as a good example of the late antique buildings of this region, as well as in general.

REFERENCE LIST


