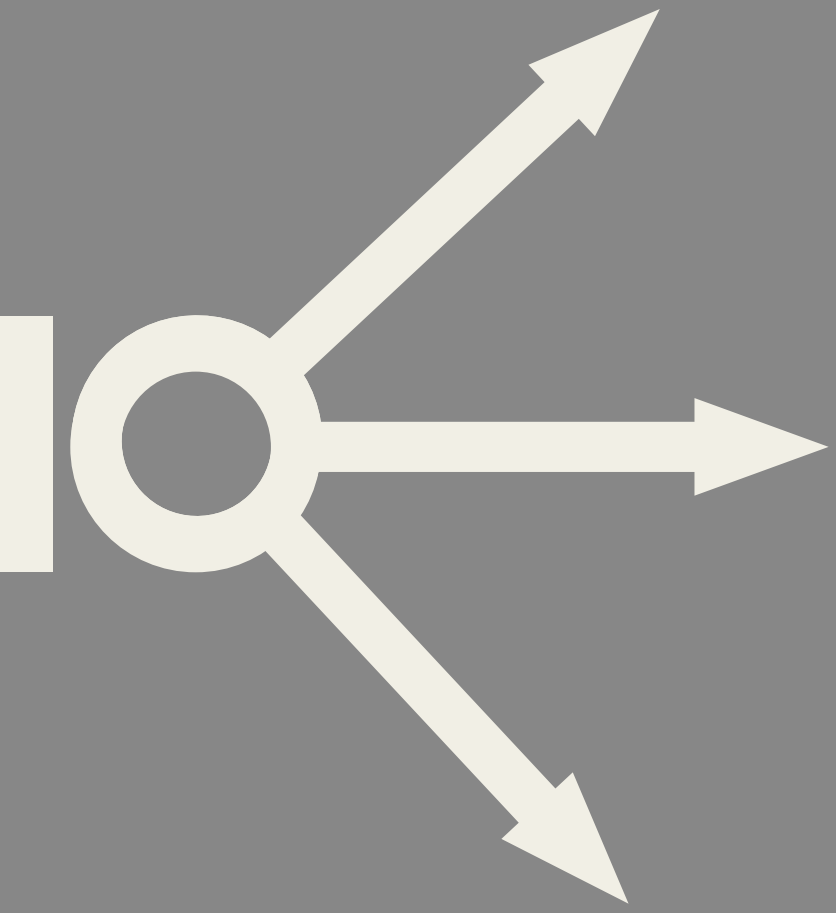
10TH INTERNATIONAL SCIENTIFIC CONFERENCE

METHODOLOGY & ARCHAEOMETRY

Zagreb, 1st – 2nd December 2022



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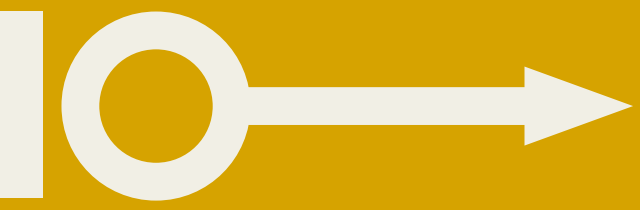

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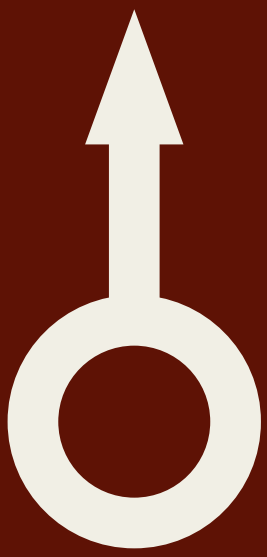

The construction history of the Ledenice castle: application of the archaeology of standing structures

Andrej Janeš, Palma Karković Takalić, Valerija Gligora

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Andrej Janeš
Croatian Conservation Institute
Division for Archaeological Heritage
Department of Archaeology
Kožarska 5, Zagreb, Croatia
ajanes@hrz.hr

Palma Karković Takalić
University of Rijeka
Faculty of Humanities and Social Sciences
Department of Art History
Sveučilišna avenija 4, Rijeka, Croatia
pkarkovic@ffri.uniri.hr

Valerija Gligora
Vadir, obrt za istraživanja i usluge
Peruanska 2, Zagreb, Croatia
vgligora9@gmail.com

The remains of the Ledenice castle are situated on the top and the south slope of a hill named Gradina, in the hinterland of Novi Vinodolski, on the southeast rim of the Vinodol valley. The castle is known from written sources at least from the mid-13th century. The castle and the settlement continued to flourish from the 13th till the 16th century, stagnating during the 17th century, to be abandoned through the 18th and 19th centuries. Since 2019, the Department of Art History of the Faculty of Arts in Rijeka, in collaboration with the Croatian Conservation Institute, has been documenting the standing structures. The aim of the project is to document the remaining structures, analyze them, and establish the construction history of this site.

During the 2021 campaign, the remains of the central castle have been surveyed and documented. Using the archeological methodology of the stratigraphy of standing structures, the remains of the castle have been analyzed. Six distinct construction phases have been identified among the standing structures. The earliest one is represented by the remains of a possible church dated to the 12th/13th centuries. That structure was supplemented by the construction of the castle that was enlarged during the next three construction phases, dated from the 13th to the end of the 15th century. The change of the owner, from the noble Frankopan family to the Habsburg Military Frontier, caused new construction changes during the 16th century. The last phase is represented by the physical remains of trenches and pill boxes of the Italian army during World War II. The aim of this paper is to present the results of the structural and field survey of the Ledenice castle and to show the possibilities of the analysis of standing structures in archaeology as one of the noninvasive field methods.

Keywords: *Ledenice castle, archaeological documentation, stratigraphic analysis of standing buildings, medieval castles, Vinodol valley*

Figure 1. Medieval castles in Vinodol valley (from Janeš 2021: 221)

Introduction

The remains of the old town Ledenice are located on the summit and the southern slope of a hill named Gradina, in the hinterland of Novi Vinodolski, on the southeast rim of the Vinodol valley. The architectural remains of the castle and the Ledenice settlement are positioned on a conical elevation situated on the south-eastern rim of the Vinodol Valley (Fig. 1). The site is named Gradina, and the remains of a medieval settlement are spread across an elevation that extends from northwest to southeast. On the very top of the hill, a fortress was built in the Middle Ages, next to which a settlement developed, known from written sources as early as the middle of the 13th century. (Laszowski 1923: 269; Kraljić 1995a: 58).[1]

Methodology

With the aim of documenting the remaining architecture of the old Ledenice, we began the project of recording and documenting the current state of the Ledenice castle. At the outset, its architectural remains were recorded (photographed) in a georeferenced system by an unmanned aerial vehicle. These photographs were used to create a 3D model from which the floor plan of the fortress, cross-sections and views of the remains of all its walls preserved in elevation were obtained. The generated models and photographs formed the basis for making precise drawings of the walls in their current, existing condition and were used for processing using the archaeological structural survey method. It is a non-invasive procedure used to define specific architectural structures of a building (walls, openings, staircases, vaults, etc.) – commonly referred to as stratigraphic units, their archaeological content (building materials, spolia, state of preservation, etc.) and their relationship with other structures (Harris 1989:109-113; 2003: 11). The method involves arranging the observed stratigraphic units into a chronological sequence according to the Harris matrix, which provides insight into construction phases and architectural changes throughout different stages (Harris 2003: 11). In order to contextualize the obtained data, it is necessary to interconnect it with data from other sources, primarily written legal docu-

[1] Stephan from Ledenice was mentioned in a charter from 1248

ments, graphic historical representations and, in areas where this is possible, with the results of archaeological research and archaeometric analyses. This approach is necessary as there are no formal and stylistic elements on the architectural remains which could usually indicate more clearly the construction period (Janeš 2022: 28). However, since this research is based exclusively on the archaeological remains preserved above the ground, it should be kept in mind that the results of the analysis are subject to change, especially if subsequent archaeological excavations take place. Such excavations would then allow for the interpretation of certain structures not only based on the formal characteristics of architecture but on the artifacts of material culture.

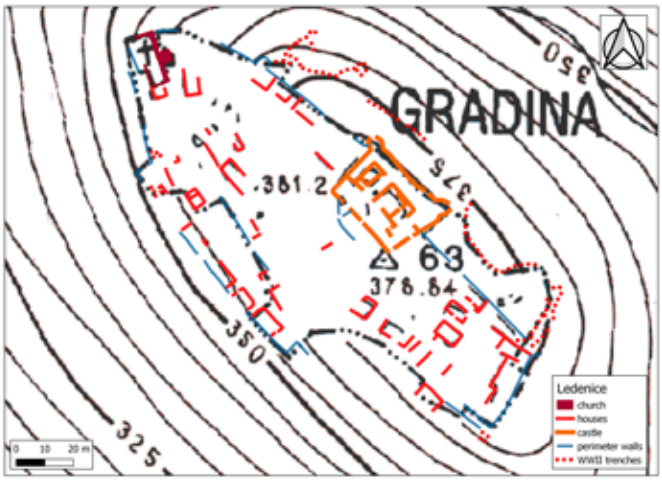

Figure 2. Layout of the Ledenice settlement. (Map by: A. Janeš).

Analysis of architectural remains of the Ledenice castle based on an archaeological structural survey and analysis of historical sources

The core of the Ledenica settlement is the castle located on the highest elevation of the Gradina hill. The north-western part of the top of the hill is made up of prominent, bare rocks that turn into a plain towards the south and southeast (Fig. 2). The architecture of the castle adapts to the rocks and the plain, which is why, we presume, the walking surface was based on at least two levels (Fig. 3). To the east of the castle lies the core of the settlement itself.

The preserved architectural remains of the castle show a significant number of additions and remodeling, indicating construction activity over an extended period. Through stratigraphic analysis, we have identified six construction phases.

Figure 3. Aerial photo of the Ledenice castle. (Photo by: Ruina Ltd).

Figure 4. Ledenice castle: construction phases. (Plans by: Valdir, edited by: A. Janeš).

First phase

Identified as the earliest phase at the castle site are two walls that enclose a rectangular area measuring around 8.5 x 6.5 meters, oriented in the northeast-southwest direction (SU 1001, SU 1005) (Fig. 4: Construction phase (CP) 1). Remains of a vaulted construction in the form of a calotte can be observed on the northern wall. Only the aforementioned south-eastern and northern walls, along with a fragment of a vaulted construction that may have been a part of a smaller semi-circular apse, are currently visible at the site. Judging by the simple floor plan, construction technique, and the presence of an apse, the most likely scenario suggests its identification with a smaller structure that predates the construction of the castle. In the Vinodol area, there are multiple instances of isolated ecclesiastical structures situated on elevations. For instance, the early medieval church located on the site of the present-day chapel of Sts. Cosmas and Damian, at the Sopalj site between Dramalj and Tribalj. There are also those positioned on elevations, near settlements, such as the Romanesque church of St. George atop the highest peak of Kotor hill, overlooking the settlement of Kotor. This construction phase can be tentatively attributed to either the 12th century or the first half of the 13th century. Even though there are no surviving written records for this period, the stratigraphy of the walls suggests that the structure is older than the castle.

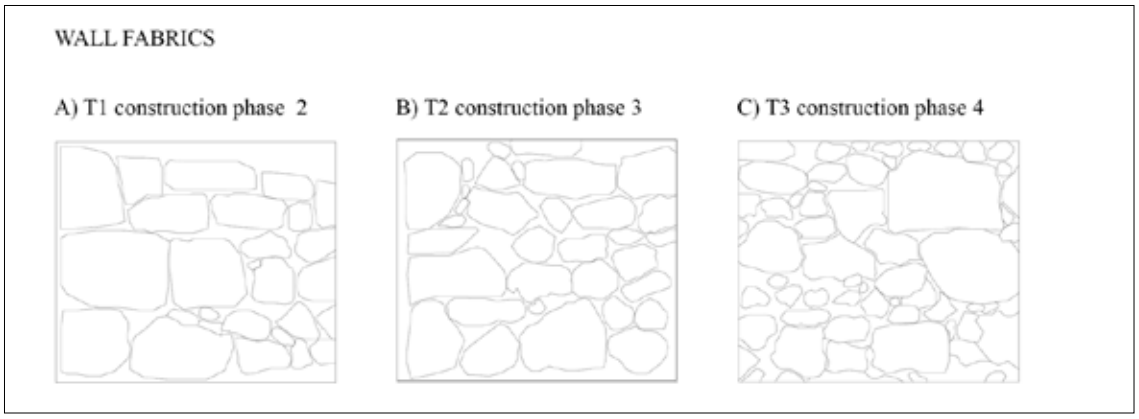

Figure 5. Typology of masonry fabrics of Ledenice castle. (Made by: A. Janeš).

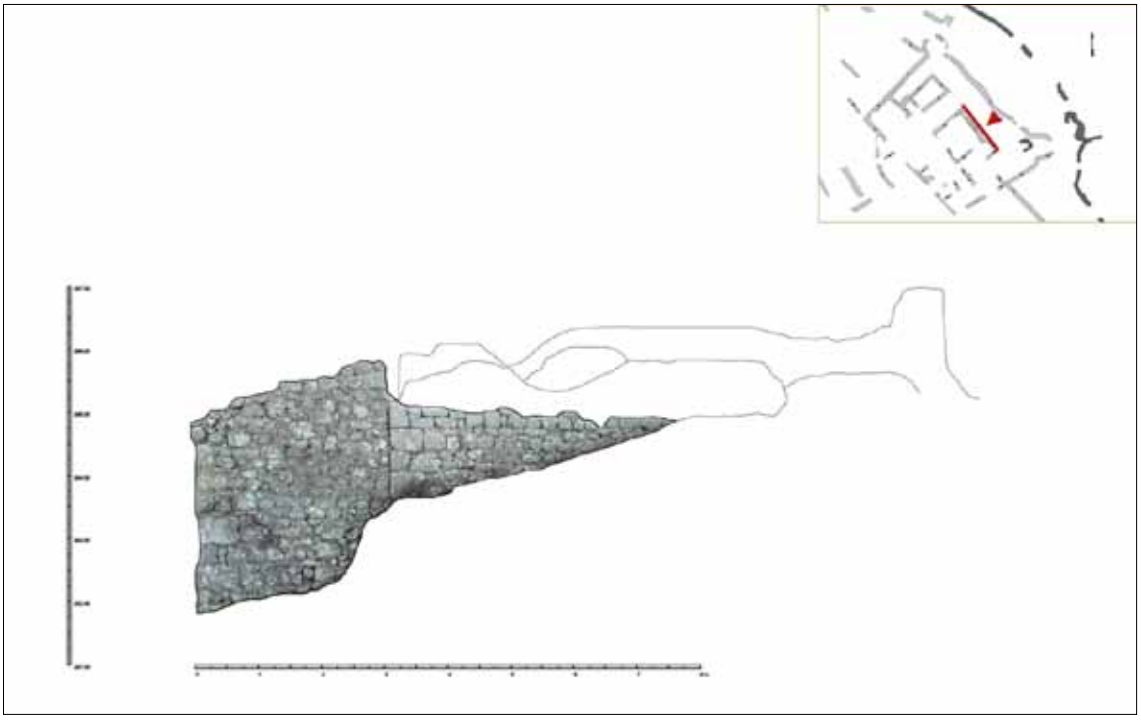

Figure 6. Masonry fabric of walls SU 1002 (CP2) and SU 1003 (CP3). (Plan by: Valdir).

Second phase: first half/mid-13th cent. to the 1320s; construction of the initial defensive tower castle

The following construction phase of the Ledenice castle includes at least three walls that, along with the walls of the „apse-like" structure, enclose a square-shaped area measuring approximately 8.5 x 8.5 meters (SU 1002, SU 1006, SU 1007) (Fig. 4: CP 2). The walls of this phase differ from those of the previous phase as they are thicker, made of regular cut stones and are arranged in orderly rows with prominent cut cornerstones alternating between the short and long sides (Fig. 5A: T1; Fig. 6). We find analogies in construction techniques in the walls of the first phase of the Gradec castle and Fortičina (Omišalj) on the island of Krk, which date to the early 13th century (Starac and Višnjić 2018a: 92-96; 2018b: 102-104).[2]

According to R. Matejčić, the initial set of medieval fortifications in the Vinodol municipalities were built in the first half of the 13th century, during or shortly after the Mongol invasion (Matejčić 1988: 255-256).[3]

[2] In the Primorje region this type of construction is connected to the fact that the masons were familiar with Roman building techniques (Horvat 2010: 46).
[3] For other Vinodol examples see: Horvat 2010: 48.

As examples, she mentions the castles in Trsat, Grobnik, and Bribir, which preserve the remains of a prismatic tower, known as a "turanj", characteristic of the Romanesque defensive architecture of the Kvarner region.

The mentioned remains of the walls from the second 2nd phase could therefore, due to their square plan and construction technique, be parts of such a tower. In the first phase of Petrapilosa in Istria, which predates the 13th century, the castle consisted of a single rectangular defensive tower, constructed using a technique similar to that of the Ledenice castle. The courtyard, enclosed by ramparts on three sides due to steep cliffs, contained several smaller buildings.

Besides the castle, there are other significant construction activities in Ledenice which can be dated back to the 13th century, for example, the construction of the parish church of St. Stephen the Protomartyr and the cemetery church of St. George, both of which exhibit formal architectural traits typical of the 13th century (Matejčić 1988: 250-251; Starac 2000: 60-63).

Third phase: 1320s – mid-15th century; restoration and expansion of the original castle, which likely suffered partial damage in the earthquake of 1321

Based on the archaeological structural survey, we have determined that the architectural remains of the next phase – the 3rd phase of the Ledenice castle, consists of a series of walls that connect to the square tower in the north, northwest, and south directions (Fig. 4: CP 3). In addition to the spatial expansion, there is also an observable shift in the construction technique – smaller stones with rougher finishes are used, but they are also arranged in orderly rows with chiselled corners alternating on the shorter and longer sides (Fig. 5B: T2). Through these interventions, the original defensive tower is expanded, and adjacent to it, an elongated rectangular space is built on its northwest side, with at least one floor and wall openings (SU 1003, SU 1004, SU 1008-1010, SU 1012, SU 1013, SU 1015-1017, SU 1021, SU 1023-1025). Thanks to the photographs of the western facade of the structure and the results of their processing, we have determined that a square corner space, with at least one floor and multiple wall openings, was constructed on the western side of the castle. The opening on the ground floor still offers a view on the entire settlement, the coast, and the Vinodol hinterland from Senj to Kraljevica. Based on its shape and position relative to the other structures, we presume that this is another defensive tower (Fig. 7).

From the tower in the direction of northwest to southeast, a wall has been preserved, which, based on its position and its comparison with cartographic representations, can be defined as the perimeter wall of the castle, which encloses a rectangular courtyard in its central part. That is the wall of the entrance to the castle, as seen marked on the above mentioned historical maps. Despite an *in situ* inspection, its remains could not be observed today. On the 1844 map, on the outer left side of the entrance, there was a structure resembling a barbican whose function was protecting the entrance to the castle. It is highly likely that the barbican was used as a foundation of a bunker during the Second World War, the remains of which are still visible today. There is a significant difference in the levels between the courtyard's walking surface and the foundation of the perimeter wall, which is why we presume that there was a ramp or a similar structure leading to the entrance of the castle.

Within the courtyard area, a well is marked on the maps, where it remains to this day. Its circular opening is surrounded by finely crafted chiselled stones. The placement of these stones also indicates the difference in the elevation of the courtyard's walking area, which is higher than that of the exterior level, yet lower than the foundation of the initial defensive tower and the northern part of the fortress – which is also indicated in Stier's map. The representation includes a marked pathway that starts from the entrance of the fortress and goes through the courtyard, where it traverses in a „roundabout manner" leading to the original defensive tower on its eastern side. Nevertheless, we presume that the tower was directly connected to the courtyard, possibly via a staircase or a comparable structure. A clear line of the lintel of the opening, which can still be observed today, is oriented southwards towards the courtyard.

The castle's south-eastern tracts of its perimeter wall are also preserved from the 3rd phase. In one place, from the inside, there is a sequence of five irregular holes all at the same height, and below them, another sequence of small holes forming a rectangular shape, possibly indicating the remains of openings for wooden consoles – supporting elements of the floor structure. Just above, there are traces of a window that extended almost to the floor, most likely serving as a source of light.[4] Based on its position and construction technique, we assume that here, as well as on the opposite side, there was an

[4] The window was walled-up in the 5th phase and is preserved till today.

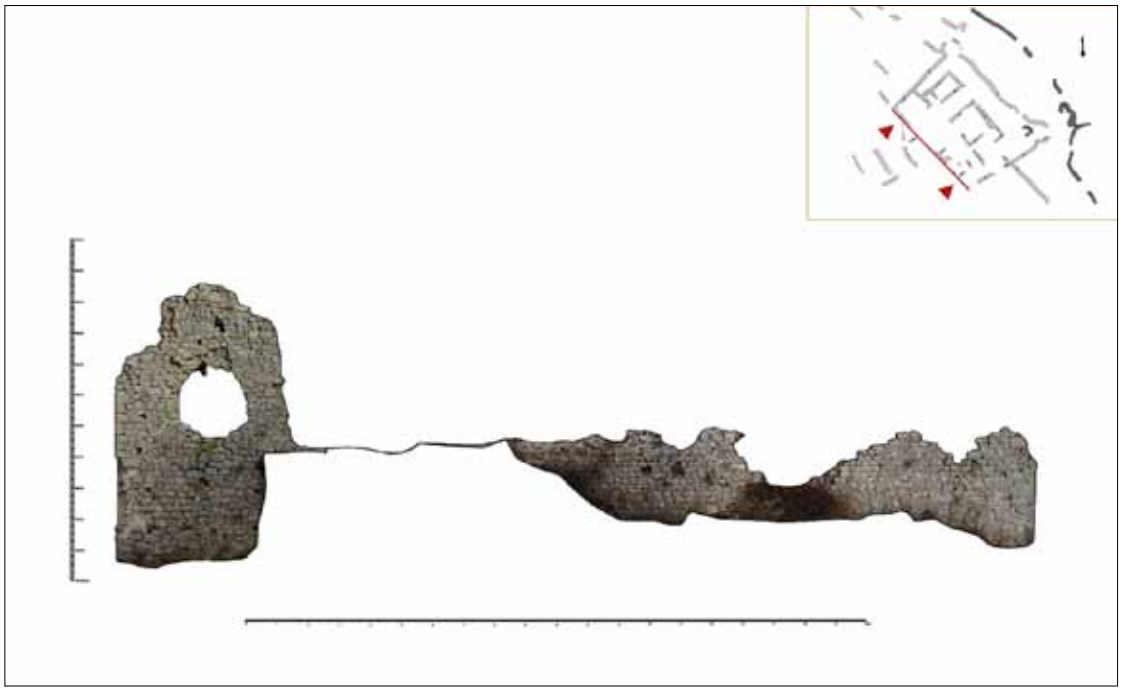

Figure 7. Walls SU 1016 and 1017. (Plan by: Valdir).

elongated rectangular space with at least one floor. In the continuation of the wall, above the ground, there are preserved remains of two more walls which form a right angle. A single arrow slit is preserved in the wall that stretches from northwest to southeast, which means that the wall served as the northern perimeter wall of the fortress during the 3rd phase.

It is, therefore, a castle of an irregular quadrilateral plan, with a courtyard on its west side, two square towers, and several accompanying structures that, given the presence of windows, could have served for residential purposes. There is no structure here that could be identified as a "typical" palas – a self-contained, multi-floor structure of residential and representative character, akin to those in Gradec, Grobnik, or Trsat. However, it is more likely that multiple areas of the fortress, especially those situated on the first floor, could have taken that function.

When and under what circumstances could the construction interventions of the 3rd phase have taken place? According to Matejčić, a section of the initial Vinodol fortifications (built in the first half of the 13th century) must have suffered damage in the 1321 earthquake (Matejčić 1988: 256-257). A part of these existing structures, such as Ledenice, was most likely restored through the mediation of the Krk counts, while some, like Badanj, were abandoned. It is our opinion that the refurbishment and the extension of the Ledenice castle during that period can be linked to the presence of the Krk count's representatives – Friks, the Ledenice viscount, as attested by two documents from 1354. and 1359 (Laszowski 1923: 270).[5] Evidence supporting the assumption of the existence of a single, larger architectural complex can be found in the interpretation of the term used to refer to Ledenice in the marriage contract between its subsequent owners, Count Ivan V and Ana Gorička from 1364, in which Ivan pledges to her the *Schloss Ledenice* and *Dorff Grižane* (Janeš 2021: 226).

The construction of the 3rd phase of the Ledenice castle should be, therefore, attributed to the period following the earthquake of 1321.

The assumption is that the restoration-expansion of the castle was funded by the Krk counts, and the presence of their representative – a viscount, has been confirmed in Ledenice (Laszowski 1923: 270). The castle was expanded with another defensive tower, a residential area, and a courtyard, elements typical of the fortification architecture of the High Middle Ages.

[5] *Frixonus vicecomes Ledinicçe*; Laszowski, 1923, 270.

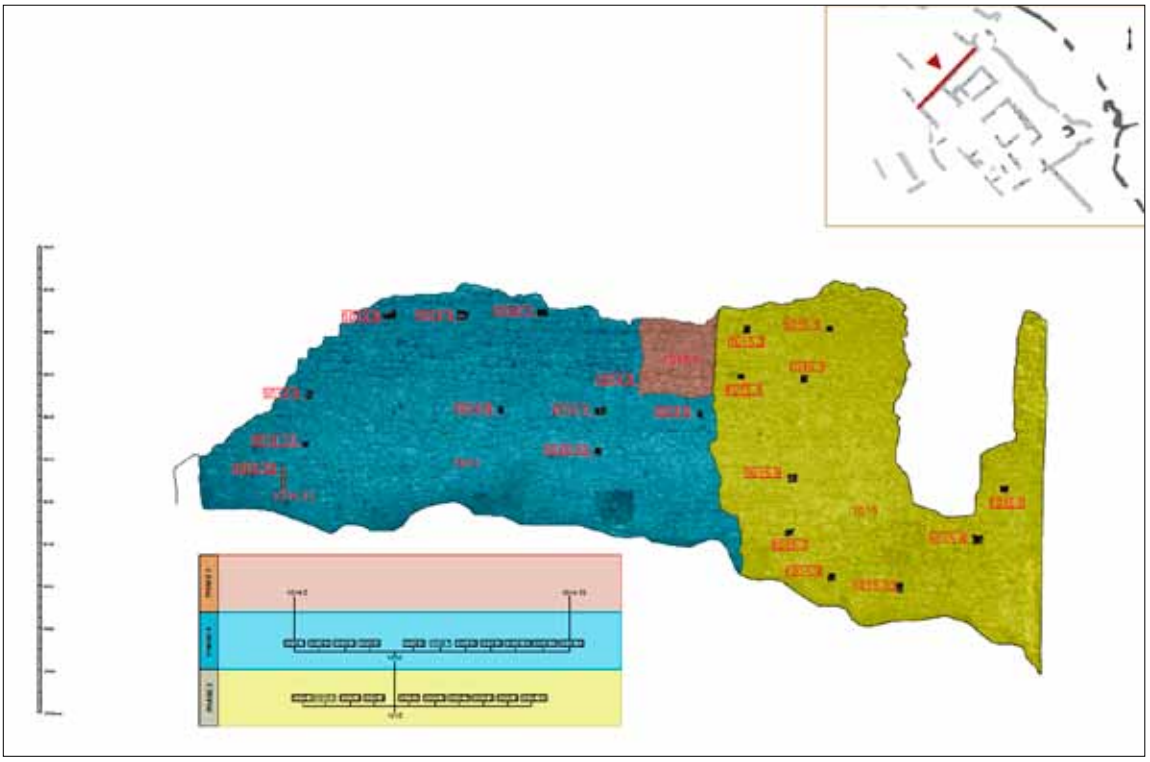

Figure 8. Stratigraphy of the western façade of walls SU 1014 and 1015. (Plan by: Valdir, edited by: A. Janeš).

Fourth phase

The fourth phase encompasses the extension of walls on the north, northeast and east side in relation to the 3rd phase of the castle (Fig. 4: CP 4). It is a narrow, elongated space that now connects the western defensive tower and the central part of the castle, as well as the northern and north-eastern perimeter ramparts with two corner semi-circular towers (SU 1014, SU 1026-1029; Fig. 5: T3). The configuration is to a large extent adapted to the topography of that particular area of the hill. They were built using roughly shaped stones arranged in relatively regular lines. Today, in the narrow space there are remains of a stub of a vaulted construction with a pointed cross-section, above which there are slots for the wooden beams of the floor structure. Below the stub of the north-eastern wall's vault, there are remains of openings. There was a passage between the vaulted room, the guard tower, and the central part of the castle, as suggested by the remains of former openings. On the "new" perimeter walls, there are three preserved elongated rectangular loopholes in shallow rectangular niches.

We observe that even in this phase, a separate palas building was not constructed, but that the rooms located on the first floor of the northern, north-eastern, and south-eastern parts, with the presence of windows, could had still have been used as living quarters.

In relation to the dating of this phase, the introduction of the structural element of the pointed arch indicates the period of the 15th century, along with the presence of simple rectangular loopholes.[6] In a similar fashion, the fortification of the Grobnik castle included the construction of two additional perimeter walls and semi-circular towers during the period between the 15th and 17th centuries (Miculinić 1988: 158-159).

This phase of the Ledenice castle is associated with Dujam IV of Slunj (1416-1487), who resided in Ledenice, which could explain the expansion of the residential part of the castle in the north-west (Laszowski 1923: 270; Kraljić 1995b: 28-29).

It is also a period of an increasing Ottoman threat and the formation of the 1463 Banates of Jajce and Srebrenik, as well as the establishment of the Captaincy of Senj in 1469 (Moačanin & Holjevac 2007: 12), which could explain the need for additional fortifications, the construction of the two semicircular towers and ramparts.

During the first half of the 16th century, the Ottomans penetrated the regions of Lika and Primorje (Kruhek 1995: 89). At that time in Ledenice, there were already four

[6] For 15th century types of loopholes. Horvat 2014: 382.

recorded members of the imperial-frontier army. Later, that number rose to 10. Laszowski believes that even then, Ledenice castle, where the frontier garrison was situated, was already expropriated from the Frankopan family as a castle and territory of the Captaincy of Senj (Laszowski 1923: 273). The following period was once again marked by sieges of Ledenice, first by the Ottoman troops (1577), and subsequently by the Venetian siege (1600). From the correspondence of Ledenice captains with King Ferdinand and the Military Frontier administration, it is known that there are 10 soldiers residing in the town at the moment, that the settlement infrastructure is in poor condition, and that financial assistance is necessary for its defence (Laszowski 1923: 273-274, 278-280). The provided information can be connected to the 5th phase of the Ledenice castle. There are no recorded additions or renovations, only the walling up of its big openings – we assume for better safeguarding (Fig. 8). The focus, we presume, after the two sieges in the late 16th and the early 17th century, had to be on the defence of the town in its entirety, leading to the construction of ramparts encircling the entire settlement. As a *terminus ante quem* of the ramparts construction, we can take the Ledenice plan from M. Stier's 1664 manuscript which depicts the entire town surrounded by ramparts (Karković Takalić and Janeš 2022).

The final construction phase of the castle consists of defensive objects and structures built by the Italian army during the World War II: a bunker created at the site of the medieval barbican, right next to the entrance to the fortress; another square bunker located at the southern corner of the ramparts, etc.

Concluding remarks

By conducting research on the preserved architecture of the Ledenice castle, we have identified, based on the analysis of formal structural characteristics (construction techniques, architectural elements) and their relations (stratigraphy), that there were six construction phases, connected to historical events of the broader Vinodol area: the transfer of the Vinodol property into the possession of the Krk counts, the Vinodol earthquake, the transfer of the Vinodol property under the administration of the Slunj branch of the Frankopan family, its subsequent administration by the Captaincy of Senj, sieges of Ledenice by the Ottoman and Venetian forces, and the presence of historical figures such as Viscount Friksa and Dujam IV of Slunj, whose presence in Ledenice is documented in written sources. The implementation of the archaeology of architecture has made it possible to dissect specific stratigraphic and constructional phases, which are chronologically defined based on written sources. This non-invasive method, if circumstances permit, should be supplemented with archaeological excavations and movable archaeological materials, which would either determine, complement, or rectify prior findings.

Translation: Marija Marić

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