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Fortification of Split in the 17th century, from Antoine de Ville to Filippo Verneda

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Abstract

The preservation of Split, as well as of successful trading that took place through the Lazaret, encouraged Venice to hastily approach the modernization of the city's fortifications at the beginning of the War of Candia. A disadvantage of fortifying the city due to its spatial position was pronounced. There were various analyses and proposals, followed by a period of about twenty years, in which several solutions and interventions were implemented for the extension, demolition and construction of various fortification elements. Each of the three elements that defended the city: the fortification around the historic core itself and two separate positions – Cape Bačvice and the heights of Gripe - went through several stages of fortification.

One of the reasons for such a variety of works was Venice's attempt to improve the state of the city's defence as quickly as possible. Nevertheless, the military engineers that Venice sent to analyse the state of Split's defence and propose improvement interventions, or supervise the work, were among the best experts of their time, from Antoine de Ville to Filippo Besseti Verneda. Most of the engaged military engineers had their own ideas about which solution would be the most appropriate one, often criticizing what their predecessors proposed or what was done according to those proposals.

This paper presents an overview of the most significant analyses or designs by the most prominent military engineers who worked on the key stages of the fortification of Split in the Baroque era, accompanied by a brief critical review of each performed part. Geometrical analyses as such can be applied as a methodological tool for the study of fortifications.

Keywords: Split, 17th century, military engineers, fortification designs.

1. Introduction

In the first half of the 17th century, various goods passed through the Split Lazaret, a centre of trade between the Republic of Venice and the Ottoman Empire. The outbreak of the War of Candia represented a potential danger for the preservation of the lucrative trade if Split fell into Ottoman hands. Thus, the security of trading would become a primary goal for modernizing medieval elements of the fortifications of Split making them suitable for artillery warfare.

So far, several papers have covered the chronology and technique of the construction of fortifications in Split (Marasović, 1993; Marasović et alii, 2002; Duplančić, 2007; Perojević, 2012, 2018, 2023), a city on the eastern Adriatic coast, in the 17th century - the Gripe and Bačvice fortresses and the defence of the city core. Fortifying each of these parts was carried out in several stages, with the application of different fortification solutions for the same part, including demolition of previously built elements that were considered deficient. This raises the question of what reasons were behind such a seemingly irrational approach. Part of the answer lies in the very unfavourable position of Split from the aspect of defence possibilities, and the rest lies certainly in the very approach of a military engineer who carried out a design.

Historical texts bring a good deal of criticism and suggestions for improvement of what had been built. This paper provides new knowledge on the analysis of individual solutions as well as the reconstruction of geometric settings of selected designs, but for those parts of the Split fortifications and stages of their construction for which geometry can be relevantly reconstructed. The attached drawing (Fig. 1) shows key parts of the city.

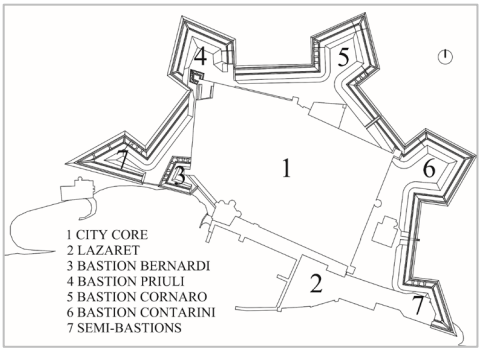

Fig. 1- Key parts of the city (author, 2024).

2. Military engineers and their engagement in fortifying Split in the 17th century

Among the military engineers who worked on fortifying Split, Antoine de Ville and Filippo Besseti Verneda were certainly the most famous ones, but it is necessary to point out a few more important authors of analyses and proposals, as well as designers, including their contribution to fortifying Split.

The attached drawing (Fig. 2) shows basic parts of the bastion system marked with Italian names as originally used in the analysed historical documents.

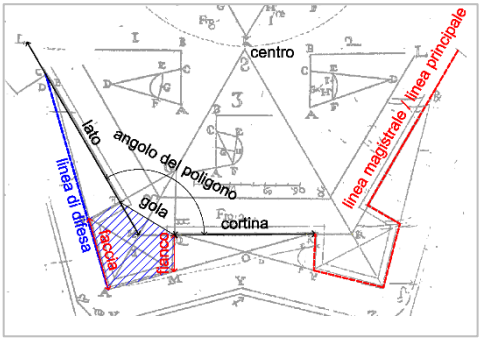

Fig. 2- Basic parts of the bastion system (author, 2024).

2.1. Antoine de Ville

Antoine de Ville was one of the most important military engineers of the French school of fortification in the 17th century. According to the literature, since 1632 (Verin, 2001) he had been in the service of Venice and had been entrusted with constant inspections of Venetian properties in Istria, Dalmatia and Slovenia, as well as with papal properties on the Po River.

He arrived in Split two years before, as evidenced by his detailed analysis of the state of Split's fortifications and a proposal for their repair, accompanied by his own design (Fig. 3). This drawing is quite significant for the issue of fortifying Split and is presented here in detail providing marking of all characteristic points.

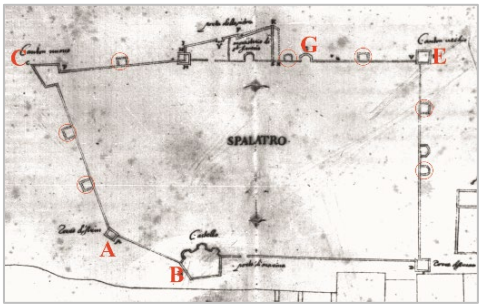

Fig. 3- Antoine de Ville drawing, 1630 (A.S.V., (2) Provv.ri da Terra e da mar, f.1152, Disegno N.1).

De Ville, as an experienced engineer and theorist of fortification, described the shortcomings of Split's defence power, and suggested several simple interventions that could have been used to improve the situation (1). Information regarding the later appearance of the city confirmed that his recommendations had been implemented to a considerable extent. His main objections referred to the masonry, which was simple, without any *terrapieno*, except for a smaller part marked as *AB* and the tower marked as *C*; furthermore, he disapproved the height of the towers because the artillery was positioned too high at the time, and they need to be lowered.

He also referred to the demolition of seven towers (marked with red circles in Fig. 3) in 1629, as they were too close and were obstructing the defence of the walls. As he still drew them in dots, these may be their remains. He also thought that the octagonal tower *(G)* needed to be demolished. In Magli's drawing from 1648, there is none left (see Fig. 5).

De Ville further suggested constructing *scarpe* on the corner towers of the eastern facade of the Diocletian's Palace, which was also done for the northern one (*E*), as can be seen in the detail of the northeastern cityscape (Fig. 4).

Fig. 4- Northeastern cityscape by Clérisseau (Adam, 1764).

De Ville suggested some other minor interventions, including construction of a fortress in the shape of a *tenaglia* on Gripe hill, which was done later. De Ville concluded that with these suggestions, Split could be brought not to perfection, but to the least possible imperfection (*Questi sono i rimedi che si possono fare per ridurre questa piazza non in qualche perfezione, ma in manco imperfezione possibile...)* and that it could even resist a shorter and weaker artillery attack. And to fortify it against any force, 5 *bastioni reali* were to be built as well as one separate body to defend the Lazaret. Thereby, Split would be extremely strong because it was located on a nerve stone, and therefore not subjected to mines.

In the end, the city was fortified this way, according to the Innocentio Conti's design only 30 years after (see below under Verneda and Conti).

2.2. Alessandro Magli

Alessandro Magli stayed in Dalmatia during the War of Candia, so his name was mentioned in 1647 in connection with Zemunik (*Zemonico*) (Vernino 1648), in 1652 with Zadvarje and with Klis near Split in 1648 (Brvsoni 1673), and he was described as a brave soldier and an excellent engineer. The latter was also the year when his engagement in the fortification of Split was mentioned for the first time (ASV, Dispacci dei Rettori di Dalmazia al Senato, relazione di Alvise Cocco Prov.or Estraordinario di Spalato e Trau). He was always titled as an *Ingegniere*.

Two stages of the Gripe fortress were built in Split according to his designs as well as the *strade coperte* system around the city (Fig. 5). Only the Gripe fortress is analysed in this paper because the *strade coperte* system has not been preserved.

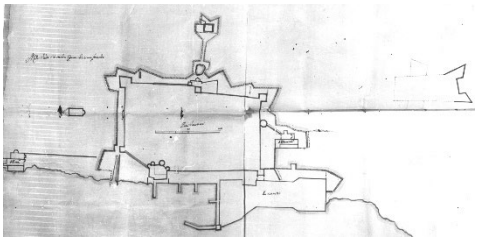

Fig. 5- Alessandro Magli drawing, 1648 (A.S.V., Dispacci dei Rettori di Dalmazia al Senato, f.53, Disegno N.1).

2.2.1. Gripe

At the beginning of 1648 a reference was made about the beginning of the construction of the foundations of the Gripe fortress (ASV, Senato Mar, reg.105 c.405, Relazione di 04.01.1648) The drawing (Fig. 5) by Alessandro Magli dates from the same year and it shows Gripe in its first of the 5 stages of fortification (Perojević, 2012, 2013, 2023), the analysis of which is provided in this paper (Fig. 6).

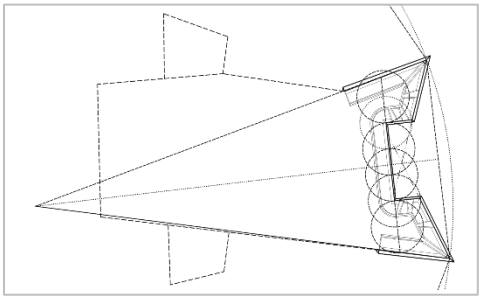

Fig. 6- Geometrical analysis of the first construction stage of the Gripe fortress (author, 2024).

The drawing shows an analysis of the geometric design settings, made based on a precise survey of the excellently preserved Gripe fortress. Typologically, this construction belonged to *tenaglia doppia*. No matter how demanding and determining the conditions of the terrain were, the designer was probably guided by design rules based on regular polygons - geometric reconstruction led to the shape of a tridecagon. The inner side (*lato*) of the polygon was divided into 7 parts and the *fianchi* amounted to $^1/_7$ of that side and were positioned vertically to the *cortina*.

A minor deviation can be seen on the north side as well as the *linea di difesa* not passing through the symmetrically placed points on the *cortina*. This was a consequence of the asymmetrically placed *facce di tenaglia*, and the cause was certainly the need to adapt to the natural cliffs.

2.3. Don Camillo Gonzaga

Don Camillo Gonzaga belonged to the Gonzaga family of Mantua. In 1645, as a well-known captain (commander) among the foreigners engaged in the War of Candia, already appointed by the Republic as *Governatore Generale dell'Armi*, was entrusted with monitoring the most important positions of Crete. He found himself in Dalmatia in 1657 and arrived in Split on 15 June, he died in 1658 in Split (Brvsoni, 1673). The following was constructed in Split according to his designs: one stage of the fortification of Gripe and one of Bačvice, and the system of fortification of the city with *mezzalune*, which distinguishes him from the others because he worked on all three parts of fortifying Split.

2.4. Onofrio del Campo

Onofrio del Campo was mentioned very rarely in the known literature, and the most valuable source of information about his activities is the text authored by Onofrio, which is a part of a private collection of Schulemberg (ASV, Archivio Proprio Schulemburg, b.34, relazione di Onofrio dal Campo). The part that refers to Split is a text with attached five drawings dated from 1661, all including a textual description. Some more meagre sources mentioned his military experience and virtue (Cantalamessa Carboni 1830, Granito 1854). In 1656 he entered the Venetian service in Dalmatia (Difnik 1986, Bertoša 2003), and in 1659 he was appointed a *Soprintendente alle Armi e Fortificazioni di Dalmazia e Albania* (ASV, Provv.ri da Terra e da Mar, f.487, relazione di Onofrio del Campo). He made his contribution to the fortification of Split by carrying out analyses of the Gonzaga and Conti designs, as well as by his own proposal to fortify the city with a bastion system and the extension of the Gripe fortress (Fig. 7) in the fourth stage of fortification, but that part was partially demolished soon after because of its conceptual shortcomings (Perojević 2012, 2013, 2023). It is interesting that his proposal to fortify the city included the already existing smaller Bernardi (see Fig. 1) bastion at the southwestern outskirts of the city, thus achieving the same effect with less cost and work than with a larger one, but geometrically completely regular system of the shape of half a heptagon, built according to Conti's design, within which the bastion Bernardi remained completely unused.

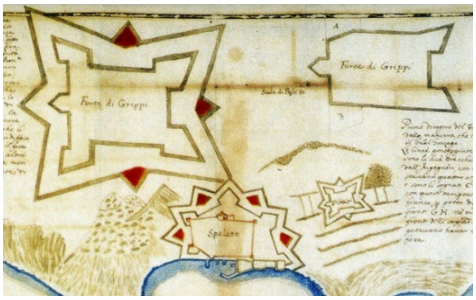

Fig. 7- A detail from Onofrio del Campo's drawing (Bertoša, 2003).

2.5. Don Innocentio Conti

Conti operated in Prague in 1648, where he carried out work to improve the state of defence against an attack (Siri, 1652). In 1659, he transferred to the service of Venice as a commander (Capeletti, 1855). Conti was the author of a design for fortifyng the very core of the city in the last stage of the development (Marasović, 1993, Perojević, 2012, 2018), which is discussed in more detail in the part regarding Verneda.

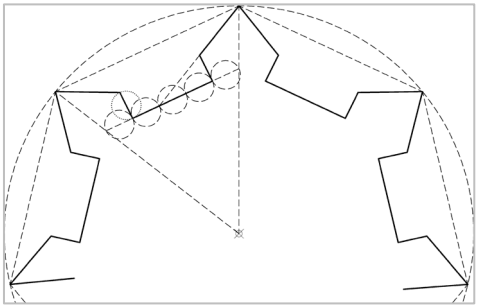

Fig. 8- Geometrical analysis of the Conti's design (author, 2024).

From the analysis of the Conti's design (Fig. 8), it is obvious that the starting point of the concept was the division of a side of the polygon - *lato* into five parts, because this way more spacious bastions were obtained, which was more favourable for the placement of artillery, as well as for the defence in general. The *Fiancho* bastion was set vertically to the *cortina* and was $^{1}/_{5}$ of the length of the *lato*. The *linea di difesa* was passing through a point on the *cortina*, whereas its

distance from the corner of the side of the bastion and the *cortina* corresponded to the length of the bastion *finacho*, which was typical for the construction of a regular hexagon according to the Italian school of fortification (Lendy 1862). Conti's design followed precisely the rules of the Italian school of fortification in respect to other analysed constructions - the Gripe and Bačvice fortresses, except that the division of the *lato* into 5 instead of 6 parts was applied, probably to obtain an optimal solution in accordance with given spatial conditions.

2.6. Filippo Besetti Verneda

Verneda, a French military engineer in the service of the Republic of Venice (Marchesi 1984) was one of the most respected military engineers of the Republic in the 17th century, he was an expert for using mines in the attack and defence of fortifications (Bašić Alerić 2015). He was in Crete in the year of its fall, 1669, (Diedo 1751), as a *Sopraintendente alle fortificazioni*. As a *Sopraintendente all'artiglieria*, Verneda was engaged in Split as a supervising engineer on the construction of the bastion system, and he was the author of detailed analyses of the Conti's design and the as-bult state.

There are four of his reports on fortifying Split are available, all accompanied by extremely precise geometric descriptions. The first one (ASV, Provv.ri da Terra e da Mar, f.491, relazione del Cavalier Verneda) dates from the end of 1663. The other two date from the beginning of 1664 - in the first of these (in ASV, Provv.ri da Terra e da Mar, f.491 n.129, relazione del Cavalier Verneda Soprintendente all' artiglieria) he referred to what was still missing to complete the fortification of Split, with a description of costs and time required, while in the second one (ASV, Dispacci dei Rettori di Dalmazia, b.54, Relazione del Cavalier Besseti Verneda sopra le fortificazioni di Spalato), he provided a detailed geometric analysis of the Conti's design and deviations occurred during construction; description of the location of Split and criticism of the state of fortifications, but also of the design itself. The last report from 1665 offered a description of what was actually constructed (ASV, Provv.ri da Terra e da Mar, f.494, relazione del Cavalier Verneda).

Based on Verneda's analysis of the Conti's design, Jerko Marasović drew a graphic reconstruction (Fig. 9) of data presented by Verneda. Two of the four drawings are presented in this paper as they best illustrate the above-mentioned analysis.

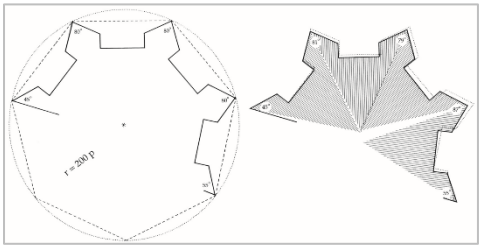

Fig. 9- Analysis of Verneda's data (Marasović, 2007).

The left drawing shows an ideal reconstruction of the Conti's design, and the right shows an interpretation of the error in the construction, both based on numerical data provided by Verneda. At the time these drawings were created, a detailed survey of the remains was lacking, therefore, Marasović had no opportunity to verify the accuracy of the reported data on the remains of the constructed parts of the bastion.

The author of the paper used data from precise geodetic surveys of the remains of the Priuli, Cornaro and Contarini bastions in her work on developmental stages of rectifications and reconstruction of the city's fortification (Perojević 2012, Perojević 2018).

When Verneda's data are transferred to the actual geodetic base, the errors in the measurements that he made come to light because it is impossible to overlap the *linea magistrale/principale*, reconstructed exactly according to Verenda's measurements, with the preserved remains of the bastion. Therefore, it was necessary to position the key points, such as the preserved corners of the bastion, in their right places and, starting from these, to assemble a polygon determined by dimensions and angles, as close as possible to those described by Verneda.

This enabled a more detailed analysis and spatial verification of the data provided by Verneda, so based on this analysis, graphical interpretations of the presented data have been made. A drawing (Fig. 10) referring to the previously mentioned shows three floor plans: the Conti's design of a radius of 201 *passo* (blue), the condition described by Verneda, aligned with the actual remains (green), and the reconstruction of the constructed *linea principale* (red) which was the base for creating a graphic reconstruction of the last stage of the development of Split's

fortifications, the bastion ring (Perojević, 2012, 2018). Thus, the deviations between the design and the as-build state are clear.

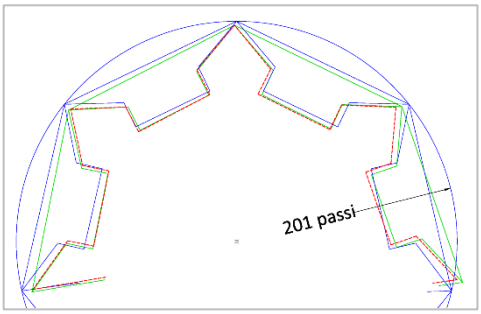

Fig. 10- Comparison of Conti's design, Verneda's description and the as-built state (author, 2024).

Verneda stated that, with the maximum possible accuracy, he had made the drawing of the city's floor plan (which, unfortunately, is unavailable or known) with the elements of fortifications and a new wall, constructed according to the Conti's design. He was detailed in his description of the design and the as-built state, including all measures and differences in measures compared to the design, for which, as he specified, there was a model. He also listed all deviations in the angles and lengths of the sides. He concluded that the described inconsistency of the constructed parts of the Cornaro and Contarini bastions from the mentioned model resulted from various errors made by the one who laid out the parts of the fortification.

In his opinion, the first error was in the positioning of the top of the Cornaro bastion using the outer radius of the polygon, which should have been 201 *passi* (349.5m), but resulted in only 197 *passi* and 2 *piedi* (343.2m), which was 20 (6.95m) *piedi* less and the said peak was facing 10 feet (3.5m) more towards the west.

A quite noticeable moment was that he talked about positioning the top of the bastion using the outer radius. An experienced theoretician de Ville considered it better when the fortifications were designed based on the internal polygon, in which case, possible errors in the outer radius of the polygon could have been avoided (de Ville 1641). This is an interesting piece of information about the way fortifications were designed/laid out. It is possible that due to the mentioned error, the eastern end of the Split Lazaret had to be partially demolished (Perojević 2002, 2003).

The second error was in the angles of the *faccia* and *fianchi* of the Cornaro bastion, from which new irregularities multiplied. Thus, Verneda concluded that the Conti's model, which he found quite accurate, had no errors, but it was made by the person who laid out the fortifications, as he furthermore noted that the design had been made in Roman *verghe*, which, when reduced to Venetian *passi*, resulted in an error.

Verneda indicated in the text that (probably the remains) of Gonzaga's *mezzalune* system were visible. He reflected positively on that system and said that, in his humble opinion, it was appropriate for the situation of that moment. Then, he took a critical look at the still partial remains of the Magli's *strade coperte* system. He drew a conclusion that all that chaos of construction and demolition swallowed up a large amount of public money, perfectly describing the work on the fortifications of Split in the 17th century, which represented constant attempts to try to find an answer to the question of how to fortify this city, and which, from distance of time, appeared inconsistent.

2.7. Lubatierée

The engineer Lubatierée (in different documents his name appeared in different forms as Loubatier, Lubatier and Lubatiera) was mentioned in 1664 in relation to Split as an author of drawings of the Bačvice (Boticelle) and Gripe fortresses (Grippi) (ASV, Provv.ri da Terra e da Mar, f.492, relazione di Gerolamo Contarini), as well as a co-signatory of one of the reports/analysis on the state of fortification of Split submitted by Verneda, in which the signature was *Lubatierée Ingegniero*.

His name appeared again in the available literature, on the list of engineers killed in the defence of Candia in 1668, with the title of *Cavaliere Lubatiera* (Brvsoni 1673).

2.7.1. Bačvice fortress

Spatial development of the Bačvice fortress was elaborated in the "Study of Spatial Development of Cape Bačvice" (Marasović et alii. 2002). In addition to drawn and written historical documents, a model illustrating the design and Santini's drawing showing its appearance in 1666 (Fig. 11) served as an outstanding source of data for the preparation of the Study on the appearance of the fortress.

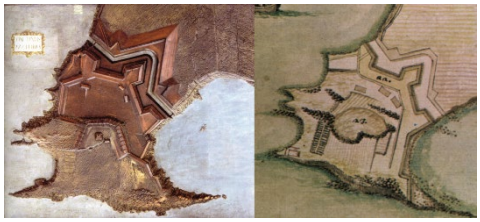

Fig. 11- Model and drawing of the Bačvice fortress (Marasović *et alii*, 2002).

The model shows the last construction stage of the Bačvice fortress according to Loubatier's design (as Contarini calls it), including its geometric analysis (Fig. 12). The model can be considered sufficiently precise, when comparing what it is representing with the real spatial parameters, so the construction analysis made sense because it was based on a credible floor plan.

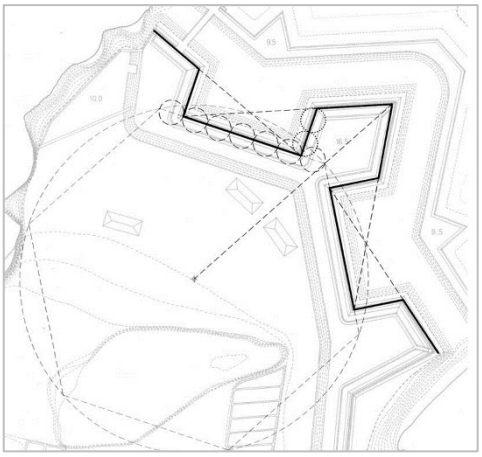

Fig. 12- Geometrical analysis of the Bačvice fortress (author, 2024).

Studying this fortress is particularly interesting because today there are no remains left, and any signs of its existence, appearance or its location are known only based on historical documents and the model of its design. This is because it was an earthen fortress, as reported by Boucaut in 1692 (Duplančić 2007). This is an exception in the fortification of Split (excluding those defensive elements for which it was characteristic, such as *strade coperte* for example). The constructed fortress belonged typologically for the most part to an *opera a corona*. A minor difference between the model and the constructed fortress lies in the depth of the ditch, which was probably impossible to dig in a live rock to the intended depth.

The analysis shows that the construction was based on a regular hexagon, with the division of the side of the polygon into 7 parts and the length - *fiancho* of $^{2}/_{7}$ of the length of the side of the polygon, so the *cortine* were quite short, and the bastion itself was narrow.

Obviously, due to the available space, on which a bastion and two half-bastions of the appropriate size had to be built, this solution had to be resorted to. Another interesting information was that the *linea di difesa* was directed towards the corner of the side of the bastion and the *cortina*, which was an element typical of the Spanish school of fortification (Lendy 1857).

3. Conclusions

This paper provides a brief overview of biographical information about the most important military engineers who worked on the fortification of Split in the 17th century and their role in the process.

For those designs, for which relevant data existed, geometric analyses of design concepts were made. All of them showed that their authors had been well educated military engineers who knew well the principles of various schools of fortification but also had knowledge on how to adapt these principles to the given local space. And at the same time, that each individual fortification was unique in its conception due to the peculiarity of the relief, but also the role of the designer himself and his own approach.

Analysis as such can be applied as a methodological tool for the study of fortifications.

Its application might help to define typologically and more precisely some fortifications, and it can enable their comparative analysis, as well as deepen the knowledge on the art of fortification.

Notes

(1) All historical and archive documents are written in Italian, so the original names are written in italic in the text, referring to a description of certain parts of the fort.

(2) Used abbreviation: A.S.V. - *Archivio di stato Veneziano* (Venetian State Archives).

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