

THE DISCOVERY OF THE PROPORTIONS ESTABLISHED BY VITRUVIUS AND ALBERTI IN THE “MAESTRAZGO DE MONTESA”, LANDS THANKS TO GRAPHICAL ARCHITECTURAL SURVEYS

El descubrimiento de las proporciones establecidas por vitrubio y alberti en las tierras del Maestrazgo de Montesa, gracias a los levantamientos gráficos arquitectónicos

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ABSTRACT

The Order of Montesa was a military religious order founded in the fourteenth century. In the north of the province of Castellón a wide area was called “el Maestrazgo de Montesa”. In these lands is situated one of the most important Renaissance churches of the Valencian region: the Vistabella parish church, built in the early seventeenth century.

A thorough graphical architectural survey, which includes not only traditional methods of analysis, but also modern 3D scanner technologies, has allowed us to identify the canon governing the building, and from this to determine the proportions of this building. This canon or standard unit of measurement, which is based on the Valencian span, connects the different parts of the building with each other and these with the whole. This principle was already embodied by Vitruvius in ancient Rome and by Alberti in the Italian Quattrocento. This shows that in this building there are not only Renaissance forms and ornaments, but also spatial structures, resulting from the maturity, knowledge and assimilation of the language of classicism of the architect.

Keywords:

Renaissance, Montesa, proportion, Valencian span.

1. INTRODUCTION

The Order of Montesa was a military religious order in the Kingdom of Valencia founded by King James II of Aragon in 1319, with possessions confiscated to the order of the Temple, as well as almost all the properties that has the Order of the Hospital in this Kingdom (1).

In the XIV century, a large territory in the north of the Kingdom of Valencia, current province of Castellon, took the name of “Maestrazgo de Montesa”, because this territory was under the government, economic power and jurisdiction of the Grand Master, Lord or first charge of the military religious order (2).

Within this territory was Vistabella del Maestrazgo, where at the beginning of the XVII century, still under the jurisdiction of the order, there was erected a new parish church: the church of “Nuestra Señora de la Asunción”.

Breaking away with the strong inertia of the Valencian gothic, the temple was built following the Renaissance style imported from Italy.

Its architect was Joan Tell, of French origin descent, who in those years would be the designer of the lines other Renaissance buildings in the province of Castellón, as the hermitage of San Vicente (Catí), the Benlloch church or La Jana parish church (3).

The temple was declared a Property of Cultural Interest, as monument, on September 28th of 2007 (4). Today, this monument is considered one of the best temples of this particular architectural Valencian period, developed between finals of the XVI century and middle of the XVII, in which ornamental and constructive Renaissance solutions combined with Gothic solutions, such as covering solutions with late Gothic ribbed vaults (5).

Outwardly, it appears as a exempt building, with a rectangular ground plan, with another smaller rectangular body attached at the apse of the church. Highlights in its main façade, faces to the south, the two portals and the bell tower. Special mention deserves the major façade placed in an impressive front altarpiece, sheltered by a pointed arch. It is built from ashlar stone and masonry, the main body is covered with a gabled roof tile, the apse

it is cover with a five sides roof, and cover with a single pending the header, that is lower than the previous constructions.

In his interior it is form by a single nave with four aisles, and chapels between buttresses, presbytery which is octagonal and ambulatory, with chapel and sacristy in the head-board. Both, the nave and the presbytery, are cover with ribbed stellar vaults and the lateral chapels with groin vault simply.

The objective of the research has been trying to find a module or canon that could govern the building and which will reveal the assimilation and knowledge of the architect author of the work of the spatial structures and constructive Renaissance inherited from antiquity.

2. VITRUVIUS AND ALBERTI

The Renaissance architecture arises in Italy principally for three motives: one for the appearance in Florence of the Humanism, cultural movement of the 16th century (6); other one that was there, in Italy, where they were finding the ruins of a great quantity of Roman buildings that were allowing to study and to copy the art of the classic antiquity (antique), and the third, for the rediscovery that, in 1416, did Poggio Bracciolini of Vitruvius book *De Architectura*, written in the former Rome (7). This Vitruvius text acquired a lot of importance from the Renaissance.

Vitruvius distinguished the theoretical part of the architecture, which he called *ratiocinatio*, of the constructive part, which he called *fábrica*. In addition he established the qualities of the architecture: *firmitas* (firm), *utilitas* (useful), *venustas* (beautiful).

The *ratiocinatio*, for Vitruvius, consists of *ordinatio* (order and proportionate composition), *euritmia* (elegance and harmony), *symmetria* (symmetry), *dispositio* (project), *decor* (suitable aspect) and *distributio* (economy, suitable assignment of the resources).

Vitruvius refers to the module in the three first ones the *ordinatio*, the *euritmia* and the *symmetria*, together with the *compositio*.

This way *ordinatio* means suitable size, modulation, proportion and correct distribution of the diverse parts of a building. It is the ordination of the parts with regard to a module, which arises as division of the principal part of the temple, the front.

The *Compositio*, for Vitruvius, is the application of the system of proportion (the one of the musical harmonies) to the architectural pieces, taking the module as a unit of reference. According to Vitruvius: "No any temple can present a reason in the compositions without the symmetry and the proportion, in the same way as there is an exact reason in the members of a well formed man"

The *Euritmia* is the "beautiful and pleasing aspect that ensues from the suitable disposition of all the parts of the work, as consequence of the correspondence between the height and the width and from these with the length". "In nothing there must put the major elegant the architect as in doing that the buildings has the measures just and provided between the set and the parts that compose it. Therefore, when the rule of the symmetry has been decided, and there have diminished by means of the calculation the relations of this measure common (module), then there is come the moment to attend with the intelligence to the local nature, to the use and to the external aspect of the future building".

The *symmetria* is used by Vitruvius simultaneously with the proportion and the reason sometimes. *Symmetria* refers to the suitable size, size of the parts in comparison with everything and with a module.

The author also affirms that the Roman measures are extracted of the human ideal body and that the architecture must be done with the same proportions that the body of a well formed man; definitively, that the systems of weight and measures and the arithmetic itself, as well as the proportion, they are born in reference to the human body (8).

In the Italian *quattrocento* the new Renaissance proposals need theory to justify and explain; this theory began with the treaties of Leonardo Battista Alberti (1404-1472) (9), scholar, humanist, architect, writer and archetype of the Renaissance man, that by merging theory and practice attempt to dominate all the areas of knowledge. He was ordained to the priesthood and served as apostolic abbreviator in Rome from 1432 to 1464. During this period, he had occasion to study in depth the classic ruins, and sculpture and architecture. During this period he wrote three books dedicated to the different arts: *De la pintura*, *De statua* and *De Re Aedificatoria*. In the text dedicated to the architecture, divided in ten books in similarity to *De Architectura* (book of Vitruvio), he insisted on the importance of the knowledge of the architectural orders and highlighted the *concinnitas* (harmony, beauty, composition) based on the proportions that had to unify everything from modular units. For Alberti the measure of the man must generate ~~the~~ the measure of the buildings. In his work also the paper of the architect stands out as designer of the building, who in addition must possess wide knowledge, especially of mathematics and of geometry (10). But the idea of the classicism proposed by Alberti is not only to copy the Antiquity, but also that this one is the source in the one that feeds to develop own expositions and to overcome (11).

All these theories formed by Vitruvius and Alberti on the relationships between the parties, and these with the whole, it did of the human body the canon or ideal measure of the architecture.

3. THE VALENCIAN SPAN

Already from the antiquity the measures were based on the human proportions. This way, in the medieval age, the system of measuring in Spain was changing from a geographical zone to other one. The diverse systems of measures used had his origins in the Roman metrological system, of character anthropometric, with multiple and submultiple of the foot according to the sexagesimal system (inherited from the oriental culture of Syria). After the disintegration of the Roman Empire this unit was lost and there appear the regional or local variants (12).

After the reconquest of the Kingdom of Valencia to the Muslims, the King Jaime I, in the 13th century, granted the jurisdictions, that is to say, the Valencian laws to his settlers. In them he restored a system of measures and weights that had to be equal in the city of Valencia as in all the villas, castles and other places of the kingdom.

This Valencian foral measures system introduced as a measure of length the *alna* or the *vara* (measuring-rod). How submultiple of these units was the span, so a measuring-rod had to have 4 spans. As multiples of this unit of measure, we had the *braza* (breaststroke) and the *cuerda* (rope). The breaststroke is equivalent to 9 spans and the rope to 45 measuring-rod or 20 breaststrokes (13). In addition, the measuring-rod had 3 feet (14).

This statutory system would govern the Kingdom of Valencia for more than six centuries, until the promulgation of the Royal Order of Queen Isabel II, for which the metric system was implemented.

Since then it was sought the equivalence of the old with the new measures, being determined that the Valencian span had 23 centimeters and the Valencian measuring-rod had 91 centimetres, therefore the breaststroke average 207 cm and the rope 4140 centimetres, that is 41.40 meters.

In addition, the jurisdictions established the office of *Mustaçaff*, *Almudacaff* or *Almotacen* of the city of Valencia (15), which should ensure compliance with the weights and measures, the quality of the products, the cleaning of the city and also to punish the failures and commercial scams. The Almotacen was a charge that is held for a year, was chosen by the patricians and courts of the city of Valencia on the day of San Miguel, in September, and swore the charge on the Gospels. This trade was extended to all villas, castles and places of the Kingdom (16).

In the city of Valencia, the headquarters of this office was located from 1372 until the 16th century after the Church of Santa Catalina. The original Jaime I rod of iron and the stone *barcilla* were guarded in this place. The symbol of the *Mustaçaff* was a walking stick or cane 6 spans length called *junc* of the *Mustaçaff*. His first mission after the oath was to receive from his

predecessor the patterns of weight and measures to use to check and tweak them, following a fully regulated procedure (17).

4. SURVEYING GRAPHICS ARCHITECTURE

The need of realizing a complete planimetric and photographic raising of the buildings, inside the previous studies, since they were contemplated in the "*Carta del Restauro italiana de 1972*", added to the indications of the "*Carta del Rilievo*" about the architectural raising, and in addition the important indications of the teacher Antonio Almagro (18) about this topic, make clear the importance that the architectural raisings acquire for the knowledge of the constructed Heritage.

For it, in the present investigation, the methodology used has been the capture of information of the buildings in situ and its later graphical representation, so it has realized an exhaustive graphic surveying.

For it fieldworks have been realized by the aim to catch the dimensional, metric, geometric and graphical characteristics of the constructions.

For the acquisition of the information there have been used from instruments and topographic devices up to traditional systems consistent, between others, of the accomplishment of sketch, tactile recognitions of moldings, checking dimension by means of such manual elements as measuring tape, archaeologist's comb, compass, range finder laser, levels or plummets

With regard to the survey instruments and apparatus has been used as an element of support, a robotic total station with image of reading without prism, the Topcon brand, model IS-203, which has a range of up to 2000 meters, with a linear accuracy $\pm 2\text{mm}$ and an angle of 3" with two digital cameras internal, a panoramic and another with zoom increases of 30 and with a apparent resolution equivalent to 4.8 mega pixels. In addition, it has been used a terrestrial laser scanner based 3D pulse (time of flight), laser invisible class of one long-range, type Topcon GLS 1500 and accuracy of 4 mm, in a range of scanning up to 150 m and angle of 6", associated with an integrated digital camera of 2.0 Mega pixels.

The capture of information there has completed with a digital camera Nikon model D-80 of 10,2 Gentle pixels, with an lens understood between them 18-135mm and with a focal opening of f/3.5-5.6.

Subsequently, the collected information has been processed and digitized in cabinet. We have used the Scanmaster and Imagemaster programs in the processing of the data captured by the station of image and the 3D scanner, the program Autocad 2012 for the implementation of plans and the programs Ptlens and Asrix 2.0 for rectification of photographs.

The purpose of the uprising was to obtain the largest possible number of graphic documents, such as drawings (elevations, and sections on plants in dihedral system), pictures or 3D models, which represent objectively the building. Through this convenient graphical representation has been possible to analyze the dimensional characteristics in the context of the period in which it was built the church, find the geometric models and traces that led to its construction.

It was an attempt to contribute to the value placed on an architectural heritage that, while immersed in a rural society, enjoys great artistic value, historical, cultural and social. The building chosen, such as cultural heritage of our environment, has allowed "...of a set of historical documents and artistic translated into stone, no less precious than those that are preserved in museums and in the archives, to allow anatomical studies that may have as a result new and unforeseen determinations in the history of art and construction (19)"

5. THE CANON OF THE BUILDING

After an exhaustive surveying architectural graphical, the pretension has been to search if there was a canon or module that could govern the building.

The first step of the investigation was to verify that the master Joan Tell was using the Valencian span as unit of measure. The proximity of Vistabella to Aragon to suspect that is not the case, and that the architect would use the Aragonese span, of 19.4 centimeters, smaller than the Valencian one.

For this we drew and annotated the hermitage of San Vicente Ferrer (Cati) (20), drawn by the same architect than the Vistabella parish church. From this hermitage we had the notarial protocol, dated on October 29, 1610, where was indicated that the building had to have a dimensions of 60 x 30 spans and a chapel squared in its head-board of 20 spans. These first steps confirmed the utilization of the Valencian span for the master Tell.

The second step was to analyze the various facades of the building.

Due to the importance that acquire the two acces portals to the temple, located in the main facade, we started the analysis by them.

After the study there was able to show that the cover fit into two small square of 18 valencian spans side and these ones could breake down into other smaller ones of 6 spans.

In the same way, the front altarpiece was also articulated in two squares superposed of 36 spans of side that could be divided in others of 12 spans, which in turn were decomposing in squares of 6 spans. In addition this facade was four times the small facade.

Both the eastern facade, as the west, both sides of the building, they formed in squares of 108 spans that could be broken down into other 36, equal to the facade of the altarpiece. In the same way that the facade the decomposition just in square 6 spans.

It proved more cumbersome for the modulation of the main and back facades of the building, because the body of the chapels added in the head of the church, the partition significantly difficult. We chose to include the totality of this body; and as a result the facades fit into a rectangle formed by two squares of 114 spans of side. These squares in turn could be divided into 9 of 38 other spans or squares of 6 spans.

In the third step the interior of the building was studied. For it was begun by the plant, which it she revealed that the interior length of the temple was measuring a Valencian rope, that is to say 41.4 meters, and the width could be fitted into 1/2 rope, that is to say, 20.7 meters. Also the square chapels of the head-board measured up, where they were fitting perfectly squares of 30 spans of side, which equally were divisible in others smaller of 6. Likewise the plant of the temple was divisible in 18 squares of 30 spans.

For the longitudinal section there were valued the round arches that lead to the lateral chapels and the height up to the supporting arches of the church, wherefrom there were obtained three squares superposed of 24 spans of side, multiple of the module already almost confirmed of 6 spans. That is to say, the principal ship had 72 spans of height, like the front altarpiece

In the examination of the cross section the width of the nave was assessed from inside of pillars and the height of the side chapels. The cross section is part of a rectangle formed by six squares of 24 spans, equal to the previously explained of the arches of the side chapels and the side chapels in one of 18 spans wide by 42 high spans.

6. CONCLUSIONS

The module that governs the building is a square of 6 Valencian spans, that is 1.38 meters on each side and that the building module and provided from this unit of anthropometric measure, using the measure of the *junc* of the *Mustaçaff*, which curiously did not correspond to the Valencian measuring-rod of 4 spans, but the one and a half, that is 6 spans.

This module multiplies to give squared patterns of 24, of 30, of 36 and of 38 spans of side, which in turn multiply for four to give squares of 48 spans or for three to give pictures of 90, 108 and 114 spans, where the different parts of the building register, except the rectangular chapel of the head-board of the church that corresponds to a rectangle of 30 x 12 spans. With regard to this point

it is necessary to remember that the square forms were a habitual digest of the Renaissance architecture (21).

In addition, the length within the walls of the plant of the principal body of the building corresponds to the multiple one of the Valencia span, the rope, of 45 measuring-rod of length.

Likewise one could have deduced that the small facade is a 1/4 of the front altarpiece and that the height of the principal nave corresponds approximately with the height of the principal facade of the temple.

The proportions calculated of height with regard to width are: in the facades 2/1 (double); in the principal nave 3/2; lateral fronts 1/1; main and posterior face 1/2 (double).

On the other hand the constant utilization of the symmetry is undeniable in the whole construction.

All this reveals that the architect author when it he projected the building, bore in mind the use of the symmetry, the proportion, the modulation, the correct distribution and the size of the parts in comparison with everything and with his module. It approaches the theories formed by Vitruvius and Alberti, which does that it does not look like a chance fact, but rather a deep knowledge and assimilation of the spatial Renaissance structures of the master Joan Tell.

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