

Construction Methods and Models of Cistercian Abbeys in North-Western Italy between XII and XIII Century

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ABSTRACT: Several studies on the Cistercian architecture in Europe have reported on the construction methods and models in the monastic construction sites. Recent European historiography has contributed to the meeting between the local constructive traditions and the over regional models spread by Cistercians into Italy. A great debate arose about the true paternity of the architectural model and the role of St. Bernard in its formulation and diffusion inside the Cistercian world. The well-preserved models of Casanova, Rivalta Scrivia give the opportunity to understand into details the rules of the planning layout ad quadratum and architectural modules. The use of repeated modules can be found also in part of the elevation in the churches which have been analysed.

In some areas, however, the employment of different skilled workers, who were used to local constructive traditions, led to building sites in which some phases signed a clear chronological and technological gap from the beginning. The skilled workers employed in Casanova, Rivalta Scrivia and Staffarda's construction sites brought their own experience and knowledge and could hardly comply with the strict rules of the monastic order. The North-Western Italy cases, objective of this study, line up with the constructive iter which have been hypothesized for the major factories of St. Bernard's monks in the Lombard area: after a first phase conceived in accordance with strict schemes, building sites continue with more freedom, following the local constructive tradition.

INTRODUCTION

Studies on the so-called bernardine plan (plan bernardin, bernhardinischer Grundtypus), a rigid layout without bending elements (transept with squared chapels on the eastern and western sides, and a rectangular projecting church), and the diffusion of this planning choice in the multiform world of the Cistercian architecture made remarkable progress in recent years, thanks to fine job of collecting and classifying examples of this in different European countries (Romanini, 1975, 1990, 1992; Ratio fecit diversum 1994). Today we know that the greatest fortune of the bernardine plan was reached in France (Pressouyre 1994), England (Kinder, 2002) and in some Italian regions, while it was less diffused eastern of Rhine and undoubtedly reduced in Spain (Chauvin 1992, Rudolph 1990; Bernhard von Clairvaux 1994).

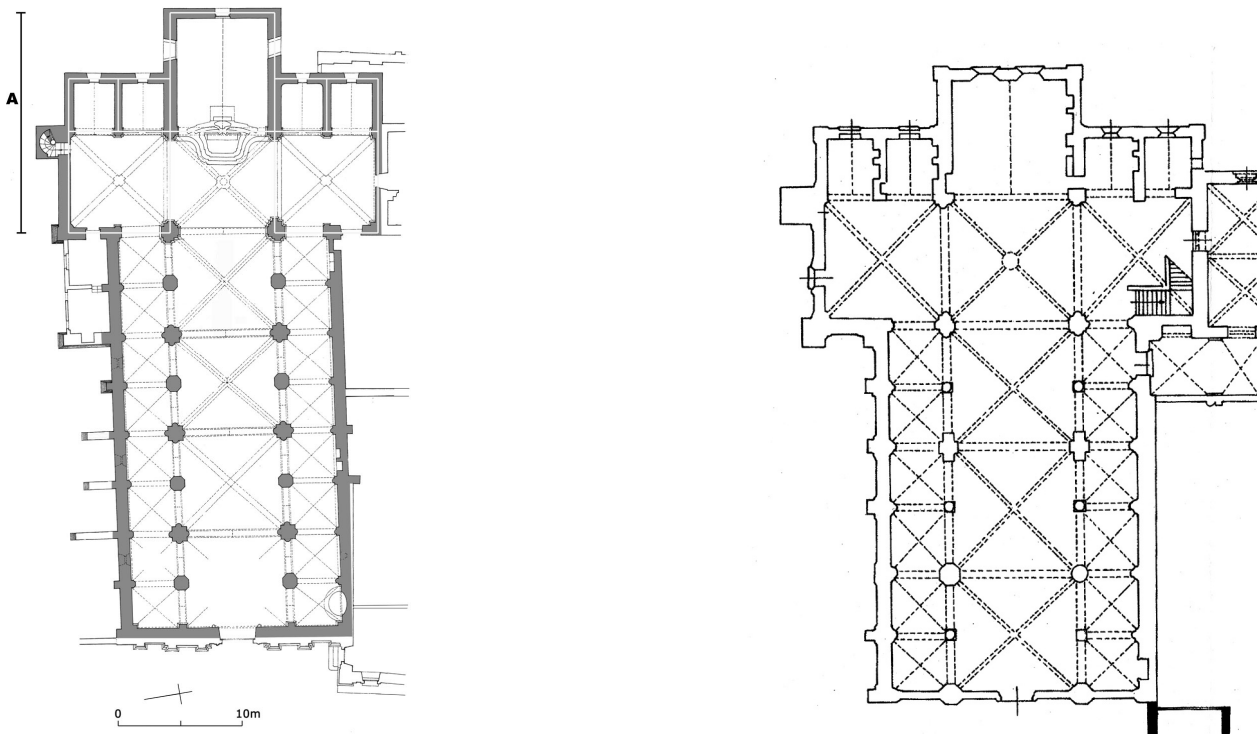
A great debate arose about the true paternity of the architectural model and the role of St. Bernard in its formulation and diffusion inside the Cistercian world (San Bernardo e l'Italia 1993; Lillich 1993). The need for a monographic probing of single case-studies, in an attempt to verify and detail the chronology and stratification of the churches inside the local architectural ambit, become clear.

CASANOVA AND RIVALTA SCRIVIA: A COMPARISON BETWEEN TWO ABBEYS. MODULES AND MODELS.

The model of Cistercian architecture realized in the Casanova Abbey, near Turin, was long ago recognized by the studies (Olivero 1939; Fraccaro de Longhi 1958). Research was necessarily limited to the structure of St. Mary's Church, there, since the baroque reconstruction replaced the Medieval monastery (Casanova 1990). Following a re-reading of archive documents, construction analysis and precise measurement of the structures, it has been possible to formulate more circumstantial hypotheses about the construction phases and techniques used in the Cistercian building site.

The church was built beginning from the eastern block, following the rigid layout called today "bernardine plan". The project prefigured an orthogonal plan, without bending elements, with a rectangular apse and a protruding transept, with open chapels in the arms. Among the variants detected in this planning model, Casanova followed the four-chapel type, as in Fontenay, two for each arm (Viti 1995), a solution which had

the advantage of a more precise alignment between the perimeter walls of the longitudinal aisle and the partition wall of the chapels.



Figures 1-2: Plan of Casanova and Rivalta Scrivia

The Casanova model offers the possibility of comprehending in detail the rules of the plan layout *ad quadratum* and the modules that were adopted. The measurements were taken directly on the building, in the respect of the slightest dimensional unevenness. As usually happened in the building sites following the *bernardine model*, the base module was calculated as the distance between the apse back wall and the connection of the nave with the transept. This measurement, which we call A, should be equal to the distance between the transept's back wall and the opposite choir's wall. Its fractions established the other dimensions: each transept's arm was long $A/2$, the same for the choir depth, while the chapels were $A/4$ wide. At Casanova these modules were respected, with dimensional deviations comprised between 1 and 3 decimetres. In the church structure, A lengths 1687 cm in the southern transept arm and 1696 cm in the northern arm, thus with a 10 cm deviation, easily understandable considering the empiric sketch methods. This was built on the basis of a planning model (*schemata*) provided by the mother-abbey which had supported the foundation of the abbey (Tosco, 2003a). The *schemata* consisted in a graphic work-out, presumably a plan on parchment paper (Ascani 1977).

The use of architectural drawings in the Cistercian communities is deducible from the regularity of the structural layouts themselves (Borgherini 2001); presumably, however, they were not detailed drawings, but linear planning schemes, where wall perimeters and the position of the supports were indicated (Recht 2001). An example of these graphic work-outs is preserved in the *Taccuino* by Villard de Honnecourt (Hiscock, 2004).

This type of work-out did not consider the wall thickness, but it offered a reset planning layout. Interestingly, the measurements taken in Casanova confirm the hypothesis of a linear drawing: the dimensional modules correspond to the centre line. The foundation trench was dug in correspondence of the stretched thread, which fixed the drawing line. This explains some apparent irregularities that verified with the subsequent masonry sizing. When the layout was completed, the wall thicknesses were realized with sensible variations, depending on the weight-bearing functions: the longitudinal chevet walls, that had to support a remarkable thrust from the pointed barrel vault, were thicker, while the partitions between the chapels were thinner, since the two minor barrel vaults sustained each other. This is also the reason why the inner layout of the chapels is not perfectly squared, but slightly rectangular.

As stated above, the base module, the so-called A-segment, was equivalent to 1690 cm. It is interesting now to wonder if the planning model provided by the mother-abbey was just a scheme based on the modular proportions or, instead, if it also gave absolute pre-fixed measurements. Reference to these measurements could possibly have been found in the graphic work-out or, more probably, in the predetermined calibration of the measuring perch (*hasta mensoria*).

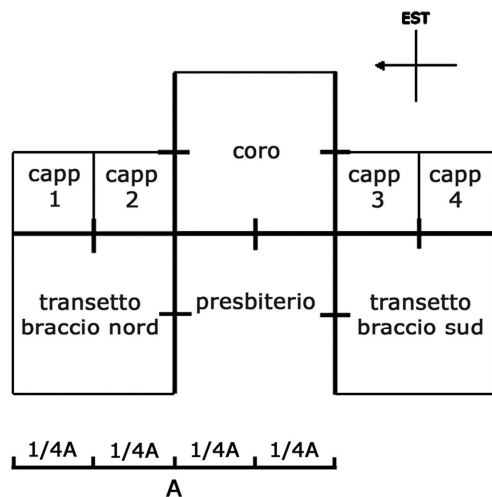


Figure 3 (left): Plan of choir, transept with the modul A (Beltramo; Tosco 2006, p. 65)

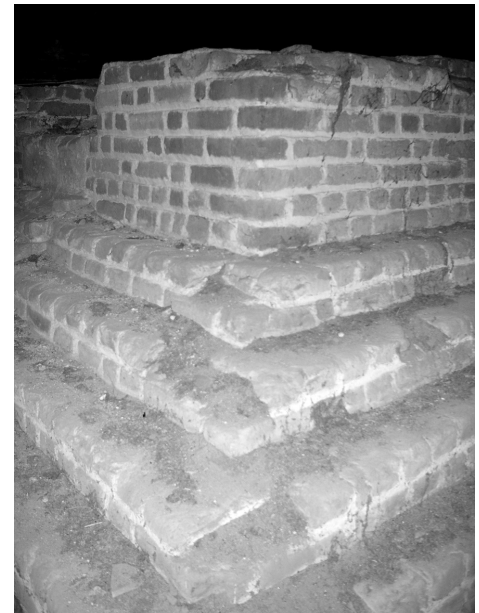


Figure 4 (right): the Casanova's crossing tower

In the more ancient French Cistercian churches, dating back to the XII century and still preserved, following the four-chapel scheme (Fontenay, Noirlac, Acey), A-measurement usually varies between 20 and 22 m, with slightly greater values than in our case. Measurements of abbeys founded outside the original Burgundian nucleus, such as the Swiss churches of Bonmont (Eggenberger; Sarott 1988) and Hauterive (Waeber 1990), appear to be more similar to Casanova's: in these cases, the A-module is equal to 1690-1710 cm. Such a precise correspondence cannot be casual and probably this new base measurement spread among the new Cistercian foundations, following channels that cannot now be reconstructed into details.

A similar approach was followed for the study of the St. Mary's Church in Rivalta Scrivia near Tortona (Lugano 1916; Orlando 1994; Beltramo 2001). The Cistercian abbey rose upon a former monastery entitled to St. John; in 1180, the religious community was put under the protection of the Citeaux order, as a dependence of the mother-house in Lucedio, in the bishop of Vercelli (Trucco 1910).

The structural system of the church in Rivalta Scrivia, similarly to Casanova's, belongs to the bernardine type, with rectangular-shaped central chevet and transept chapels. Rivalta Scrivia shows also a clear separation, in the different phases which led to the construction of the church, between the planning and the realization of the aisles in comparison with the transept and the apse.

The extraordinary correspondence which exists between the dimensional characteristics of Casanova and Rivalta Scrivia is not casual. Behind the planning of the two churches there is a common geometrical, as well as dimensional, drawing, confirming the hypothesis of a diffusion of the model carried on by the monks themselves. As a matter of fact, on the basis of the surveys, it has been possible to verify that A-measures in Casanova and Rivalta coincide with irrelevant deviations. The distance between the back wall of the northern transept and the choir measures 1690 cm in Rivalta Scrivia and 1696 in Casanova, while the distance between the southern back wall and the choir is slightly bigger in Rivalta (1740 cm compared to 1687 cm in Casanova), due to a thickening of the weight-bearing masonry between the church and the sacristy, in the point of connection of the two bodies of the building, which is more fragile and subjected to structural disarrangements. In Rivalta it is not possible to measurement the original gross length of the church, since last span was demolished, but hypothesizing to sum the mean span dimensions, the longitudinal body would be equal to 2A and the whole church to 3A, just as in Casanova.

CONSTRUCTIVE CHARACTERS AND TECHNICAL SOLUTIONS

The longitudinal body of the church with the aisles and the nave was realized in Casanova in a subsequent phase in respect to the construction of the eastern block, phase that marked a chronological as well as technological gap. Skilled-workers constructing this part of the abbey utilized different methods for the building site. At a planning level, surveys showed a clear misalignment towards the South, in exact correspondence to the connection with the transept. It is interesting to observe how the nave builders adapted to the modular Cistercian layout the alternate support system characteristic of the Lombard Romanesque. This witnesses the skill of the workers to interact with the different local situations, taking advantage of the pre-existing knowledge and techniques, as had happened in other Northern Italy construction sites. In Casanova, the subdivision of the spans was traced on the basis of the A-module, repeated twice in length, with four major spans on the nave and eight minor spans on the aisles. The supports of the nave followed the traditional subdivision in "strong" and "weak", alternatively bundled or octagonal brickwork piers. As for the construction of the nave, skilled-

workers had therefore adopted a mature system of arrangement of the supplies on the building site, which was characteristic of the development of the brickwork art in the Lombard area. A light sandstone was used for some structural knots only, such as capitals and vault bosses. The original capital decorations are still visible somewhere, with simple linear mouldings and stylized vegetal elements, characteristics of the first Cistercian age (von Hülsen 1992). The external suspended arches' frames were also decorated with a white lime plasterwork limited to the spaces among the archivolts, following a characteristic solution of the Lombard Cistercian churches, present also in Staffarda and at the basis of the bell tower in Lucedio (Tosco 2003b). In this phase, builders followed faithfully the strict Cistercian prescriptions, which forbid pointless decorations and precious ornaments in the monasteries (Canivez 1933).

In Rivalta Scrivia, the two-colour decoration is a key-element: ribs, scarcements and salients are painted in red and white with different rhomboidal, rectangular, herringbone-shaped geometries, together with a relevant use of fine stone decorations alternated to brickwork in capitals and pillars.



Figures 5-6: nave and aisle of Casanova and Rivalta Scrivia

The church coverings were realized following different techniques, but all the major longitudinal and transversal arches are pointed. In Casanova and Rivalta Scrivia, a systemic use of the lancet arch is found, that constitutes an important innovation in the panorama of the subalpine architecture, together with the introduction of the groin vault, with rectangular ribs in the lateral transept arms, and a double torus (Casanova) or simple (Rivalta Scrivia) in the crossing. Vaults laid down on these arches, however, follow different models. Pointed barrel vaults can be found in the apse and the lateral chapels of both abbeys, following a typical Cistercian tradition of Burgundian origin. These vaults did not bear the overload of the roof rafters. Pitched sings were reconstructed several times, substituting the carpentry, but traces of the original sloping are still visible in the attic, in correspondence with the crossing, at an inferior height than today, but sufficient to host the trusses. Garrets were therefore easily accessible by the workers for the maintenance, as demonstrated by the study of the service paths still preserved in both churches. Access to the highest parts of the building was guaranteed by a spiral staircase in the northern transept arm. The tower-shaped stairwell, with striped bricks and drawn joints, is a characteristic structure of the Cistercian factories, which is still visible, for example, in the transept of Chiaravalle Milanese. The path, which rose from the transept, crossed the garret of the chapels and proceeded into the apse with a second flight of stairs obtained behind the perimeter wall, is still accessible today both in Casanova and Rivalta Scrivia. The static autonomy of the two systems (roof and vaults), characteristic of the first Northern Europe Gothic, constitutes an important element which allows to make circumstantiated hypothesis about the relative chronology of the building phases. In all probability, builders realized first the roof covering and then the underlying vaults, in order to make immediately accessible the presbytery, the transept and the chapels, where the altars were located to the monks.

The vaults on the transept arms and the crossing were probably realized in a second time, while the Casanova construction site proceeded westwards. A crossing tower were superimposed on the crossing itself, as demonstrated by the rests of the stepped bolster kept in the garret. A similar tower was realized in Rivalta Scrivia, while it remained in the project phase as regards Staffarda. A tower is present on Casanova's crossing in table I, 59 of *Theatrum Sabaudiae*, preceding the great restoration work supported by Innocenzo Migliavacca, lay abbot during the years 1674-1693 (*Theatrum Sabaudiae* 2002). The crossing tower was a characteristic of some Cistercian churches in Northern Italy (just think at the great development reached by the tower of Chiaravalle Milanese during the XIV century) and constituted a compromise with the strict order rules which formally prohibited to build *turres lapideae ad campanas* in the monasteries (Lucet 1964).

Solutions adopted for the longitudinal body are completely different and are result of further assonances between the two building sites. The quadripartite ribbed vaults of the naves of both churches are characterized by the use of ribs with different sections depending on the spans, rectangular and torus section at Casanova, torus only at Rivalta. The alternate support system of Lombard origin is present at Rivalta as well as Casanova, with strong bundled piers in both cases, while the weak ones are octagonal in Casanova and circular in Rivalta Scrivia. Subsequent construction site phases lead to a differentiation in the strong pillar section in Rivalta;

the third pair of supports is indeed constituted by a circular and an octagonal pier, similarly to Casanova. Same pillars can be found in Morimondo also, where the sixth pair of supports in the longitudinal body is octagonal.

The naves in Casanova have buttresses according to a typical Lombard layout: the longitudinal perimeter walls are spelled on the external side by blind arches on fluted pilasters protruding of 45 cm, with a function of counterthrust.

In correspondence to the fluted pilasters, transversal arches, protruding as inclined extrados from the roof pitches, assured the structural connection with the nave vaults, as it is still today on the northern side. This buttresses system, however, revealed to be insufficient and the fluted pilasters were reinforced through slanting spurs, which clearly belong to a subsequent phase.



Figures 7-8: crossing and transept of Casanova and Rivalta Scrivia

The excess weight was due to the fact that the nave arches were loaded with the roof, directly leaning against the extradoses. This problem was definitively solved in Casanova through an elevation of the clerestory and the creation of a new system of trusses. In Rivalta Scrivia, the external buttresses system is different: the solution here was based on ribs outlined with offsets leaning against jack arches and not joined by discharging arches, marking a fifty years difference between the progression of the two building sites. The Rivalta solution is very similar to the counterthrust system adopted in Morimondo and Chiaravalle della Colomba: in both cases buttresses protrude from the roof pitch.

It is therefore clear that the builders of the longitudinal body and transept in the two churches utilized a technique different from those who had worked in the apse and chapels, which were characterized by vaults able to reduce the slanting thrusts and support the roof pitches (Peroni 1969). The latter solution was typical of the Lombard construction sites around the half of the XII century and, together with the alternate covering system, denounces clearly the skilled-workers' origin (Segagni Malacart 1993). The big misalignment of the longitudinal body in Casanova confirms, at a planning level, the presence of a clear discontinuance in correspondence of the connection between the transept and the naves.

The northern and eastern prospects of the Casanova Abbey, in which the Cistercian phase is still readable, are characterized by a suspended arches frieze, crowned by a sawtooth profile. The arches are round, with the exception of the first ones near the transept and the façade, which were adapted to the remaining space, by changing their bending. The internal of the arch presents clear traces of a presumably original white colour.

The same arch frieze runs along the whole northern, eastern and southern perimeter of the Rivalta Scrivia Abbey, with similar geometrical and dimensional characteristics. A slight difference due to the skilled-workers is in the solution adopted for the northern prospect of the transept, where the arch frieze is parallel to the roof moulding: in Casanova, the connection between the profiles of the two sides is made by two side-by-side arches, while in Rivalta Scrivia a better solution was found with the connection made by a single arch.

The chronological phases of the construction of the Casanova church can be summarize as follows:

- 1142 - 1152: construction of the eastern block until the transept and probable drawing of the whole perimeter (that will be re-elaborated later, during the work prosecution, see phase 5)
- 1150 – 1160: roof covering of the whole eastern block
- 1150 – 1160: completion of the pointed barrel vaults on the apse and chapels
- from 1170: construction of the ribbed vaults on the transept and crossing
- from 1170: construction of the longitudinal body, with relative coverings and roof.

The church of Casanova lines up with the constructive *iter* as it was hypothesized for the white monks' major factories in the Lombard area: after the first phase of construction of the eastern block according to the strict bernardine model, building sites proceeded with more freedom, in line with the local constructive tradition. The chronology of the construction site of Rivalta Scrivia Abbey can be brought back to two working lots, subdivided in different constructive moments:

First phase:

- Eighties of the XII century: construction of the apse and the chapels, the choir and a part of the transept
- Nineties of the XII century: beginning of the construction of the monastery
- First decade of the XIII century: chapter house, parlour and monks' staircase, warming room and eastern cloister corridor, roof covering of the apse
- Within the Twenties of the XIII century: pointed barrel covering of the choir

Second phase:

- From the Twenties to the Fifties of the XIII century: end of the transept, with quadripartite ribbed vaults, construction of the supports westwards, covering with crossing vaults of the longitudinal body.

CONCLUSIONS

The two cases of Casanova and Rivalta Scrivia present several analogies due to the same planning and working choices. A first phase of study and project on the geometry and dimensions of the building is followed by a more local building site direction, that utilizes the Lombard constructive traditions on a pre-defined layout which must be respected at least for its characteristics of modularity. Nevertheless, the similarity between the two abbeys does not prevent from signalling some differences, that confer peculiarities to the buildings. The most evident of them is, beyond any doubt, the major development in highness of the Rivalta structures, stressed by the presence on the nave of the interrupted salients, a typical Cistercian solution, and the use of slender strong pillars, thinner than in Casanova. The latter assumes, therefore, a more "Lombard" aspect, with solutions close to the Northern Italian tradition, as regards some elements (Segagni Malacart 1993), in comparison with the more Burgundian and French architectonic language of Rivalta Scrivia.

Studies on the meeting between the local constructive traditions and the over-regional model spread across Italy by Cistercians went in different directions, at the opposite ends of the peninsula: while in Staffarda references to the Pavian Romanesque prevailed (Tosco 2003b), Angela Maria Romanini (1997) proposed the Early Christian basilicas as a model for the Tre Fontane Abbey in Latium; as regards Santo Spirito's Abbey in Palermo, compromises between the monastic severity and *tarsia*, ashlar and weaved-arch decorations which established in Sicily under the age of William II have been investigated (Torregrossa 2000). The Cistercian universe reveals itself once more as a receptive phenomenon, able to synthesize the local figurative tendencies and harmonize them with the Burgundian models. It is necessary by now to consider the idea of the monastic construction sites as a space of meeting and architectonic cross-contamination.



Figures 9-10: the external buttresses system of Casanova and Rivalta Scrivia

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