



CLASSIQUES  
GARNIER

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Under the protection of the church and the king. Prebends, privileges and contracts of medieval builders in Medieval Spain (11th–12th centuries)

The main goal of this paper is to review some aspects concerning the administrative and economical dimensions of building from a new perspective. One of the most important aspects of the study of Romanesque cathedrals in the Iberian Peninsula is the richness and diversity of the documentary sources concerning wages and working conditions. Contracts, deeds, and economic contributions provide us with accurate data that allow for a better comprehension of building in terms of its professional and social dimensions.

The privileges and prebends granted to architects such as Master Mateo (Santiago de Compostela), Ramón Lambard (La Seu d'Urgell), or Pere de Coma (Seu Vella de Lleida) lead us to believe that the church protected medieval builders, particularly the work of architects. Maestro Mateo is one of the most remarkable examples in this regard. In 1168, he was granted a lifetime pension of 100 maravedís a year by Fernando II of León and Galicia. This is the first explicit reference to Master Mateo, “who possesses the primacy and mastery of the works of Santiago Cathedral”.

The various construction trades likely formed part of a control system linked to the ecclesiastical sphere, from which medieval builders did not emancipate themselves until the 13<sup>th</sup> century because of the consolidation of trade corporations. The church and the monarchy protected medieval builders and granted them with benefits that usually belonged to members of the *ordo clericalis*. Hence, architects, sculptors, and masons received special privileges such as exemptions from paying taxes. These conditions provided them with a status equal to that of the canons.

As far as wages are concerned, the documents available suggest that the work was remunerated in three primary ways: payment for each working day; monthly payments; and payment for the work done. However, in the case of the Iberian Peninsula, in addition to these three methods of remuneration, two other exceptional ways of paying medieval

builders for their work are documented: the provision of an annuity and the granting of benefits and prebends. Both of these payment methods are analysed in this paper.

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Iron and lead in mediaeval monumental construction, from written sources to material analysis. An overview of twenty years of research and perspectives

This paper provides an overview of the archaeological, historical, and analytical studies linked to the use of metal in construction since the beginning of the 2000s. The development of archaeometric studies led to major evolutions, especially in iron analysis, which now allows us not only to determine the metallographic nature and mechanical behaviour of iron armatures in monuments but also to identify the technological processes used to produce iron and identify their provenance. Ancient steels can also be dated using radiocarbon dating. Studies on construction lead are much less developed, yet trace element analysis provides us with clues as to the implementation phases. Using archaeometric data gathered on more than 500 iron samples from around 25 mediaeval buildings (including 20 churches) and 200 lead samples from Bourges, Chartres, and Metz cathedrals, along with archaeological surveys and the study of historical sources, we can undertake an interdisciplinary reflection on the use of these metals and their implication for mediaeval society.

Firstly, this paper briefly examines how iron and lead were used in mediaeval construction, from iron tie-rods and chains in masonry to iron frameworks for windows, lead roofing and lead sealings for iron

armatures and for stone, and lead use in stained glass. It focuses on the huge quantities of metal used by builders in major buildings: from dozens of tons for iron to several hundreds of tons for lead. The paper then examines the results of this interdisciplinary approach in relation to the quality, provenance, and chronology of both metals.

Regarding iron quality, the material analysed is usually quite heterogeneous and does not seem to differ from the regular iron produced by local productions. This heterogeneous material is named “iron” in mediaeval markets and accounting books. Its mechanical behaviour is much worse than that of contemporaneous unalloyed steels. However, it seems to have been sufficient for most uses. Apart from tools, the deliberate use of “steel” is much scarcer: only one example has been found so far, in the Palais des Papes d’Avignon. Even if most iron seems to have been acquired from local or regional production according to historical sources, the analytical study of iron supplies sometimes reveals different provenances and highlights the complexity of medieval iron markets. The share of recycled iron could also be estimated to be at least 10 percent to 30 percent of the whole stock.

To date, far fewer studies have demonstrated a real interest in construction lead, although the same issues are also involved. According to historical sources, lead sometimes seems to have a more international origin. Different qualities are also assessed, and though lead recycling is omnipresent in building yards, its true importance has not yet been estimated. A relevant dataset does not yet exist that makes use of elementary and isotopic analyses to obtain a more precise idea of lead qualities, supply, and recycling. A great deal remains to be considered in relation to this metal.

Finally, this paper opens up several different avenues for developing cross-cutting material studies, particularly in relation to the questions of “designation of origin”, material recycling, and the phasing of structures, in which ancient metal studies could be of great interest.

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The repair and maintenance of buildings in a 15th-century rural seigneurie. The example of the castellany of Talmont (Vendée region)

Various sources give us access to the Talmondais construction sector in the Middle Ages. While the documents provide us with the names and professions of craftsmen since the 11<sup>th</sup> century, the management documents from the 15<sup>th</sup> century allow us to refine the analysis thanks to their reference to contracts and purchases of materials. The clients of the construction projects at Talmont Castle were the lords themselves. To our knowledge, no actual construction orders have been preserved. However, the correspondence between the lords and officers and the seigneurial receipts provide information on the chain of command. As the real owner, it was the lord who would order the repairs to be made to the buildings. Seigneurial officers, for their part, seem to have been responsible for paying for and overseeing the works rather than playing the role of prime contractors. If we look at the accounting of construction sites, the payment of skilled labour was the first item of expenditure. Purchases of materials often involved inexpensive local materials. The financial management of construction sites thus provides us with valuable information on the financial conditions of construction companies. The mention of buildings that are not settled in the seigneurie's accounts leads us to believe that the buildings would be indexed to specific revenues and project management. Wood craftsmen seem to have been most numerous, but stone and iron craftsmen were also present, alongside less skilled workers, who were employed as assistants to the craftsmen or for the transport of materials. A family logic is at work here, with the introduction of the son into the trade by his father, and the allocation of work sites to the same craftsmen for years, even to families over decades, perhaps marking a "family tradition" and recognised competence for work on seigneurial buildings. Stone and wood, the primary materials extracted, seem to have been sourced only from the nearby soil: wood was taken from the Orbestier forest and stone from two main extraction sites, namely the coastal rocky ridge and the Jard quarries. Given the

relatively distant origin of slate, the site can be placed in the context of the exchange networks for this material at the end of the Middle Ages. Materials from the arts of fire are more difficult to locate, especially iron, the origin of which is almost never indicated; one can only suspect that it was produced locally. Imports were reported at the beginning of the 16<sup>th</sup> century. Architectural terracotta, on the other hand, makes it possible to understand local production, which was transported to the castle by boat and cart.

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### The manufacturing of porcelain stoneware tiles in France in technical literature (1840–1920)

Following the introduction of reinforced concrete skeletons in residential and commercial architecture in the early years of the 20<sup>th</sup> century in Paris, new construction solutions were required for filling and cladding these filigree structures. One of the first solutions was to infill the concrete skeletons with non-bearing, often double-layered brick dressings, and apply a cladding of porcelain stoneware tiles. Recently developed by the ceramics industry, this product was intended to provide a protective shell. The profusion of treatises, manuals, and aide-memoires relating to industrial ceramics and reinforced concrete between the 1890s and 1910s illustrates the almost incidental encounter of the two materials.

The review of contemporary technical literature reveals the material conditions that determined the use of stoneware for cladding these buildings. The manufacturing sequence of stoneware tiles shows many similarities with that of other ceramic products, namely in relation to: the extraction and transport of clays; the preparation of ceramic bodies; forming; drying; and firing. However, the details of the processes differ radically due to their differences in composition and the material properties intended. The aim of this article is to illustrate the extent of the industrial equipment used during the production of the material and the number of manipulations that were involved. The article emphasises the gradual development of more efficient, powerful machines for each production stage: paste preparation (crushers, pulverisers); forming (hydraulic presses); and firing (reverse flame furnaces).

The marks observed on the surface of buildings featuring stoneware tiles are the result of manufacturing processes, laying techniques, or subsequent damage. Like any other building material, ceramic products such as bricks or stoneware tiles provide a record of the stages of their manufacturing processes. The observations made on the surface of a stoneware tile are especially intriguing because the findings, although altered or transformed, persist beyond the firing stage, which can last up to a week and reach temperatures exceeding 1000°C. The development of knowledge of construction based on the study of contemporary technical literature is also intended to allow the researcher and reader to better identify and interpret these marks.

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## Fabricating buildings in Italy in the 1930s. Prefabricated systems for temporary use

The steel and wood prefabricated construction systems for temporary buildings developed in Italy in the 1930s by companies such as Curtisa, Palini, Legnami Pasotti, L'Invulnerabile and Officine Lenzi are useful for analysing – beyond the most famous constructions – the trend of minor experimentation that anticipated the post-war debate on building industrialisation in Italy.

These were proto-industrialised solutions, suitable for temporary uses, either destined for the Italian colonial market in East Africa (hospitals, military barracks, offices, and residences) or reserved for holiday homes in Italy.

The systems were characterised by solutions that offered a high degree of adaptability and technological flexibility, economy and speed of production, as well as ease and reversibility of assembly methods. For these reasons, companies preferred modular and modifiable structural grids with reversible connection systems that allowed for the disassembly and recovery of parts. The walls of the systems were formed of sandwich panels using materials patented in Italy, such as Cel-Bes for thermal and acoustic insulation and fibre cement plasters or steel sheets for covering.

The most significant solution in terms of spatial adaptability and technological flexibility was developed by the company Curtisa. The structure of this system consisted of lattice beams and perimetral iron box-section pillars. To ensure maximum flexibility of the interior spaces, the roof was devised using a system of metal trusses placed on the perimetral columns.

After the Second World War, the fate of the leading companies of the 1930s proved complex. In order to be able to operate on the building projects' with the greatest construction value and media impact of the 1950s, Curtisa chose to specialise in the production of prefabricated facade systems. The company L'Invulnerabile continued to work on light construction systems, and in 1945 it deposited a patent for a construction



system derived from the solution of the 1930s. Società Legnami Pasotti maintained a leading position until at least the early 1960s.

The legacy of the pioneering phase of the 1930s was fragmented; however, in the 1950s, a new season of experimentation began. The experimentation was supported by clients from the modern manufacturing industry that required modern production and sales spaces, and concerned the use of light facades systems and prefabricated interior walls. In these spaces (offices and factories), reinforced concrete structures were combined with prefabricated facades and interior walls.

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The modernisation of raw earth in the 1960s Morocco. Neo-traditional or neo-colonial architecture?

In the 1960s, there were considerable developments in earthen architecture in Morocco: in the space of just a few years, the state built thousands of social housing units using this material.

Between 1962 and 1965, 2750 economic units made of compressed earth bricks were built by a French engineer, Alain Masson, in the Daoudiate district of Marrakech. Inspired by the local construction culture, he modernised the material, tools, and construction process in order to reintroduce this material in a country in which it was already present in the vernacular tradition. Was this the approach of a former coloniser bringing a technology derived from their own traditions to the population, or was the aim to “re-traditionalise” local architecture?

Our objective is to understand the extent to which the socio-economic and cultural context was taken into account in the technical choices of the design. As such, we will try to answer a question that remains topical to this day: can rammed earth be a solution for mass housing?

To this end, this article analyses the context and progress of the Daoudiate project in order to learn from this experimentation, which could prove very useful in the current context of environmental crisis.

In this project, the housing design employed was based on the functionalist framework inherited from the colonial period and the modern movement: the dwellings make up identical minimal cells assembled two by two to form orthogonal streets. Despite the introversion of the dwelling and the presence of the patio, this design corresponds more to western standards than to local ones. On the other hand, the choice of raw earth for construction met economic and social needs: to build at a lower cost and employ unskilled labour. However, in Daoudiate, earth bricks were associated with streamlined construction methods, in which cement, mechanical presses, and prefabrication played an important role. Thus, the use of a poor material with modern technical processes appealed to Alain Masson's hierarchy and the project was revived, from a first tranche of 700 dwellings to 2750 altogether. This use of raw earth was a genuine strategy put in place by this European engineer to make people accept a traditional material in a post-colonial context, at a time when Moroccan architecture was looking to modernise.

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The statute of lumber-sellers of Toulouse (1422). Edition and translation

This article concerns the edition and translation of a professional statute, regulating the craft of “fustiers”, *i.e.* lumber-sellers, in Toulouse in 1422. Surprisingly, this document does not come from official archives, but from a private register. In this regard, it offers an interesting insight into the writing process. When reading this text, it is important to consider it in relation to an earlier version, written in 1273; such a comparison demonstrates the changes in the professional fields in Toulouse at the time. There is no doubt that this statute is linked with the rise of municipal power. Whereas the 1273 statute was issued by the royal authorities, the 1422 one was written by the “capitouls”, *i.e.* the city council. At the time, because the city council was facing a crisis caused by currency instability and military unrest, it sought to ensure vital supplies, such as of food. The supply of timber seem to have become more difficult at the time, and a fear of shortages of this material is explicitly mentioned in the text. As a result, the city council tried to regulate and encourage the trade of wood, lumber, and firewood. This date also marks a step in the development of craft organisation. The statute shows how one single guild united all the craftsmen of the town, all gathered in one religious brotherhood. It is likely that several “fustier” organisations had existed previously and merged in 1422. The most interesting aspect of this text, however, is the outlook it offers on the wood market. Each device is described by specifying its timber species, length, and, less commonly, width (the name of the device appears to be an indication of the width). The market itself was then regulated by a set of rules, for instance concerning wood measuring, stock visits, and trademark registers, with the aim being to reduce speculation and encourage trade. Labour conditions were less regulated at the time. The supplies seem to have come from quite far from the city: fir was an important species in the Toulouse lumber market and could only be found in mountainous areas, a hundred kilometres away. The text also describes the transportation system: wood was brought to Toulouse

using log rafting. Rafting was already used for lumber transportation, but the text also describes its use for firewood. Firewood regulation was enforced by the “fustiers”, which was relatively new at the time and highlights a significant development in the firewood trade.

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