INTRODUCTION

The study of the changes that occurred within the building construction, in particular the techniques used for brickwork during the complex period that saw the end of the Western Empire and the start of Medieval era, must be interpreted in function of the significant changes that occurred within society at that time, characterised by socio-economic conditions that rendered the production and the change of building materials very difficult, or even impossible, even for prestigious architecture.

However, to attempt to rebuild the evolution of civil building materials and construction techniques supposes knowledge of the testimony that the past has left us: the data of most significance are essentially in the form of written sources and material evidence. Until now, historians and archaeologists have mainly concentrated their interest upon the centuries that form the late Middle Ages (eleventh – fifteenth centuries), for which a large abundance of written evidence and material remnants are available. Considering the Dark Ages (fifth – tenth centuries), on the other hand, noted difficulties in investigation exist, due to the scarcity of written documents, that are often only partial, and only recent developments in this field of research.

Regarding building blocks, in particular the brick, it is still difficult to define and quantify their diffusion, their mode of use and their supply on the base of the data available. While waiting for more precise data, coming from historical sources and archaeological findings precisely dated, one can only formulate hypotheses about the transformation endured by building materials and of the building techniques in brickwork between the fifth and eleventh centuries.

BUILDING TECHNIQUES DURING THE ITALIAN DARK AGES

New and reused bricks up to the tenth century

The event of the invasion of the Barbarians and the consequent dissolution of the Imperial Roman institutions brought about the inevitable slow-down and at times the cessation of architeectonic activity; but, this was not the reason why western construction techniques, that had been elaborated over the course of a long experimental tradition, stopped to constitute those in use, at least regarding the works of monumental character.
The cultural heritage of the diverse Nordic populations that invaded, starting from the sixth century, within the old confines of the empire were of insufficient knowledge and experience regarding the use of stone and brick construction techniques. All the migrating populations that did not possess legacies, able to match those of the west, did not decline the kind of tools and workforces they found in operation, indeed, they inevitably continued to keep them in action. The construction techniques of the seventh and eighth centuries were not able, therefore, to totally renew themselves and often not even differentiate themselves in an evident way, tending to be considered as simplified applications of preceding traditions (De Angelis D’Ossat 1971, pp.546-548).

At a time not well defined during the Dark Ages, while the exploitation of local experience continued, the use of large bricks of square form and of their triangular fractions (tightly linked to the Roman traditions) was gradually abandoned in favour of the diffusion of a new module (one by a half foot) that then remained in use everywhere until the modern era. Their more simple production and improved manageability ensured a long future to these new rectangular bricks. During the Dark Ages, however, the practice of reusing and recycling building materials took on an important development and continued alongside the production of new bricks. This reusing of materials was favoured by the large availability of constituent elements originating from ruined buildings: until at least the eleventh century, the reuse of building materials for the creation of new constructions constituted a fundamental component of building activities, above all for public buildings. However, it is not possible to establish what percentage the new bricks bore with respects to those reused, and it also remains uncertain the question of whether the production of bricks, that required precise technological knowledge, was allocated, or whether it was carried out by the enlisted workers, like the skilled builders of the Commacini masters – builders that had already worked on public and private constructions within the Longobard territory. These artisans, with their valuable technical knowledge and specialised workforces, moved and resettled between the locations where their work was requested, even for extremely long periods, giving life to building sites with considerable organisational and technical requirements. New materials are without doubt more interesting from the construction technique point of view, because they are able to demonstrate the survival or the recuperation of technologies linked to the production of bricks.

Even after the confirmed recommencement of the production of rectangular formed bricks, around the eleventh century, from the typological point of view, the medieval wall did not differ from the roman wall, even though they presented different cross-sectional structures and distinct building procedures were used. The very thin joints and the absence of connection elements provide evidence supporting the spread of an alternative technique compared to the Roman “a getto” technique: the central nucleus of the walls were filled with materials of heterogeneous consistence, origin and dimension (rubble, fragments of roof tile and brick, pebbles and minute shards that saturated the voids), held together by lime mortar of often mediocre quality. Following the completion and the settling of the inside of the wall, the wall faces could be built later on: the load-bearing structure was distinct from the non load-bearing structure, so the coverings could therefore be carried out at liberty and with more care with stones of various sizes and materials. On the other hand, walls of limited thickness or that were urgently required were built from hand-cut stone or in brick (Latina 1994, p 28-29). Thus, we can not but notice that the medieval building equipment, the use of heterogeneous materials and of a workforce often not sufficiently qualified, seems to imitate that of the Roman models, although being of a poorer quality.

The use of wood in the Po Valley

However, if it is true that late antique and Dark Age wall structures put into evidence the changes that resulted from a new culture in construction, linked perhaps to the differential organisation of building sites, it may also be true that these changes did not occur everywhere nor at the same time throughout northern Italy: even within a region homogeneous in socio-political terms, as the sub-Alpine region and the Po valley can be considered, the changes in construction techniques that took place were very complicated. The considerations made until now regarding works of a certain level of importance, such as public and religious buildings constructed in brickwork, can also be useful, albeit indirectly, for the study of civil buildings, since they supply a reference with which we can compare the data from written and archaeological documents about the techniques used for the construction of houses in the first centuries of the Medieval era. Until now, studies on Dark Age housing have identified some models and hypothesised some possible evolutionary routes (Brogiole; Gelliichi 1998, p 107-131); by the sixth century, a slow and contradictory transformation of the urban structure was present everywhere to some extent, and was more or less in line with traditional architecture. During the seventh century, this trend culminated in the definitive crisis of the classical model of the urban building. In northern Italy, construction activity using an array of different materials and techniques took hold; constructions were temporary in nature and were most probably built in a family context. It was in this mode that the spread of a new building method started that used almost exclusively wood; this occurred, above all, in the heart of the Po Valley. It was introduced by the Longobardi population who only knew how to build their houses with tree trunks, lattices of branches and wooden boards, in the form of poles of various diameters, was able to constitute the sole material used in a construction; the poles, connected together in either vertical or horizontal positions, rested directed upon the ground, either upon a foundation base or upon wooden boards of differing thickness and size. Supporting poles could also be used to construct a framework for the roof and for the walls; the walls could be made, for example, from clay combined with straw or with clayey soil mixed with pebbles and stone. The roofs were mostly recovered with organic materials, chiefly straw and “scandolae” (wooden boards).
Irrespective of the motivations for the new culture that was created after the fusion of the Latin and Barbaric populations, the importance of the altered environmental situation regarding the changes in materials and building techniques between the Roman period and the Dark Age must not be undervalued, and it must not be forgotten that the construction of a building in wood was of lower cost, in as much as that building materials did not need to be imported and specialised workforces did not need to be recruited, since the majority of the population was expert in carpentry. These reasons, other than those of cultural nature, determined the ever increasing mass employment of wood as the principle construction material.

Clear evidence from written sources exists for all of these uses of wood in building practices, and they also testify to the fast construction times of these structures, to their flexibility, ability to be modified and restored. In distinct and distant geographical areas, the practice of dismantling the buildings in order to be able to reutilise the rudimentary elements in new constructions has indeed been documented. In the newly founded cities within the Po Valley that lacked Roman remains from which to recuperate more substantial materials, that were often far from their natural sources for the quarrying of stones and pebbles, access to the resources provided for by large woods was, on the other hand, easy; but also in cities of more antique foundation, buildings can be found that were made entirely from wood. The more widespread technique, however, seems to be a mixed one in which the predominant, but not exclusive, use of wood is integrated with the pre-existing features in masonry, upon which the wooden structures were often founded. However, it is often difficult to recognise the construction techniques that were used: in the majority of cases, the clear indications about the quality of the walls are not evident, due to the perishable nature of the materials that were used.

BRICKS AND BRICKWORKS IN BOLOGNA

The resumption of bricks' production

Wooden structures of the Dark Ages were also found in Bologna, in Piazza Maggiore on the site of the ex-Stock Exchange, next to a Roman road whose layout was not modified until the fourteenth century; here the remains of two buildings made in wood were identified that, at least in one case, was used as a residential dwelling (Gelichi 1994, pp.587-591). In the first building, archaeological traces that form part of the eastern and southern perimeters have been identified, formed by modest trenches in the ground that guided the positioning of the supporting horizontal beams held in by pieces of brick, and by the presence of a block of selenite, perhaps used as a support for a vertical post. The building repeats, at least in the conserved parts, the progression of what would be the brick and selenite walls of the house to the rear, that dates to between the twelfth and thirteenth century. The second building, also most likely converted in housing, was identified by the alignment of three large holes that would have been for the positioning of wooden poles; this building would precede that of a thirteenth century house in brickwork that would have sat upon the same site and that in part re-traced the line of the perimeter walls. Thus, constructions in wood seem to have prevailed until at least the twelfth century, in cities of both new and antique foundation, even if by the second half of the seventh and, above all, in the eighth century, the rebirth of cities and important centres brought about a new development of construction activity, for which purchasers were mainly represented by public bodies, lay people and priests and by the ruling class citizen. With respects to the past, therefore, the specialised personnel employed in such activities started to increase and improve the quality of the architectonic accomplishments.

In Bologna, until the tenth century, no construction, worthy of such a name, is able to document the modifications undergone in building techniques, even if a number of buildings were most probably already built to meet the needs of the governing authority or of the local church. Regarding building activities during the late antiquity and the Dark Ages and how associations of authorised construction workers were organised, the silence within the documents is unquestionable. In the form of hypotheses, and probably only for the years successive to the conquest of Bologna by Liutprando in 727, one might suppose that the Commacini masters were operative within the Bolognese area; we can also presume that each completed building site became in itself a means of spreading technical knowledge, and therefore a mode in which to stimulate the local entrepreneurial capacity and activate new forces into the field of construction (Collegio costruttori edili ed imprenditori affini della Provincia di Bologna 1981, pp.22-24).

After the tenth century, the new aristocratic citizens recommenced to build in stone and brick and to resume, in a surely more accentuated form, the practice of recycling; this phenomenon remains poorly studied but presents enormous scope when one considers that nearly all the buildings in Bologna from the eleventh and twelfth centuries constructed stone and brickwork were done so using recycled materials. Constructions in wood did not disappear, not even in the urban field, but the focal use of wood as a building material was lost. The continuous and extraordinary demographic expansion that occurred during this period meant that the various problems inherent to the development and maintenance of the city were brought to the attention of the appropriate public administrations, and thus resulted in a significant increment in public activity and a noted intensification in the manufacture of building materials: in the eleventh century an intense production of brick and of lime started and this resumed the importation of stone and timber. With the progressive affirmation of local forces sufficiently expert in the building skills, the Commacini masters came out of the urban scene, and started to operate within the Bolognese hillsides, where they actively remained until the seventeenth century.
The widespread use of bricks in building constructions consequently involved the production of a vast range of components that were dimensionally compatible, in order to improve the integration of the products from the various operating kilns and to ensure indirectly their compliance with characteristics of minimal resistance. Brick dimensions were standardised, occasionally confirmed by official notifications, published in construction practice treaties. In 1245, the Province of Bologna issued statutes that definitively sanctioned the dimensions of the local bricks and fixed them upon the basis of the measurement system in force in the Bolognese territory, that was the Bolognese foot of 38 cm, divided into 12 once: thus the brick was 9 once long by 2 once wide. This system started during the municipality age and remained until the introduction of the decimal metric system.

An exemplary mould in Istrian stone was issued by the Municipality to act as reference; according to the statute, this mould was located “sub voltis palatii veteris”; that is, under the volt of the old Town Hall, the Palazzo del Podestà. From 1574 onwards, these samples were to be found at the base of the principle façade of the Town Hall (Fig. 1) and bear the official dimensions of roof tiles and bricks in linear measurement units, being: piede (foot), braccio (arm), doppio braccio (double arm) and pertica (pole); respectively equivalent to 38 cm, 64 cm, 128 cm and 380 cm, and represented by straight line grooves, of semicircular cross-section. Regarding the brick, the abacus measurements were relative to those of the mould within which clay was cast: indeed, the mould consisted of a 45 x 25 cm rectangle, within which a second rectangle that jutted outwards by 6.34 cm and measured 28.53 x 12.68 cm. The roof tile was represented in diagrammatic form, first by its curvature, and thus as a trapezoid with end measurements of 15 cm and 25 cm and a length equal to approx. 50 cm (Collegio costruttori edili ed imprenditori affini della Provincia di Bologna, 1981, pp.101-104).

Examples of residential buildings in the written sources

During the tenth century, the signs of the economic recovery became increasingly evident, as also occurred in all other European cities. The period was not only characterised by the demographic growth of city-dwelling citizens, but more so by those of the countryside. The improved conditions pulled many small farm owners to the city that were searching for an increase in the quality of life; urbanisation became increasingly consistent and above all the land-owning families from the countryside who had invested their profits in a house in the city became key protagonists, and started to dedicate themselves to artisan and commercial activities. This phenomenon brought about substantial changes in the structure of town society in Bologna, as it did in all other cities, as a new social class evolved that was able to profit from the favourable economic situation.

Between the tenth and following centuries, the flanks of the radial streets, like Strada Maggiore, via Santo Stefano and via Castiglione, started to get carved up into small rectangular plots, of approximate dimensions, 3.50 x 7 m. The shorter side faced onto the road, while the longer sides stretched away. This process of urbanization in the tenth to twelfth centuries is very well documented by the conserved map that is in the care of the ecclesiastic archives. It consents the mode in which the monks conceded the lease of their land for the construction of houses, for those that were in need or otherwise wanted to and were able to transfer to the city, to be followed step by step.

A leasehold contract exists dating to the year 918 and relates to a property of the Piacenza church located “intro civitate Bononia”; it provides many useful clues for understanding the organization of two of houses (Sas-satelli et al. 1996, p 62-63). The two houses were not neighbouring, but both had access to a public street, an obligatory condition for their habitation, and to the well from which to draw water. The first plot had a quadrangular form with boundaries measuring 30 x 31 x 32 x 25.5 feet; the second was of a more elongated form of 22 x 40 x 24 x 40 feet. The first plot covered approx. 862 square feet of land, whereas the second was of 920 square feet. Each plot gave rise to a house covered with scandolae, with walls in brickwork and a portion of open ground. The house within the first plot was situated in the corner since it had two adjoining sides that faced roads, one that faced the public street and the other that faced the street from which the well was accessed; the other house was instead confined by the two long sides and the internal side confined with other private properties.

We do not know what type of feet were used in these reported measurements: it could still have been Ancient Roman feet of 29.6 cm or it may have used the new Bolognese system of 38 cm that remained in use until the introduction of the decimal metric system that came about at the time of the unification of modern Italy. Since there are no longer any residential buildings in existence from the tenth century, it is impossible to verify directly the measurement system that would have been used; should the measurements have been made in Roman or in Bolognese feet, the ground area of first house would have been 75 or 122 m² respectively. Con-
The mean measurements of Bolognese houses documented until the eleventh century, these can be considered as medium-large dwellings; thus, if only a single family were in the position to lease these two houses, that were relatively large and situated within the city centre, the occupants could be considered as being positioned medium-high in economic terms.

A second document, dating back to 922, contains another leasehold contract; it regards a plot of land, that was also situated “Intro civitate Bononia”, measuring 16 and 14 feet on its short boundaries and 40 feet in length with access onto a public road (Fig. 2). Other than the habitation in brickwork covered by wooden boards, the plot also possessed a small courtyard. For this plot, the measurements, depending upon the units used, went from 4.70 m or 6.08 m by 11.90 or 15.20 m; it therefore refers to a small plot of land, that includes a small house built over two floors and capable of housing two families, and a small courtyard.

The house had to have been an extremely simple structure, composed of two rooms that opened onto each other, and from which it was possible to enter the courtyard. The rooms that overlooked the street were probably used for workshop activities and the room to the rear as the living space; if the dimensions, as it is presumed, were already using Bolognese feet, the width of 6 m permitted the presence of an entrance hall upon which the two rooms opening into and could permit the presence of a ladder in order to reach the floor above. The roof had two slopes, respectively orientated towards the street and the internal courtyard; the document does not explain any other features about the structure of the house, although the indications are sufficient enough to comprehend the simplicity of the building that, if measured using Bolognese feet, gave rise to an area of 60 – 70 m² for each of the two residential units.

The connection between urbanisation planning and building techniques

Towards the second half of the eleventh century, the plots started to become slightly elongated: in the older contracts, the relationship between length and width was 1 : 2; but, with the passing of the decades, it went to 1 : 3 and then to 1 : 4. At the end of thirteenth century, the convents initiated large operations for urbanised planning, including the expansion between the two Torresotti and Viali circles of city walls, where it was obligatory that the newly constructed houses possessed a portico. If the necessity to transform large areas of cultivated land near the city into residential zones corresponded with precise development plans, the type of building that was chosen also conformed to an equally precise economic consideration. The assigning to leasehold of a plot of land to be divided into areas that would be equal for all the various participating recipients, consisted of a large zone subdivided into a series of narrow plots drawn out towards the middle line of the enclosed area. The process of creating each enclosed area already ensured a series of services: large streets and an open-air drainage canal in a central position. The type of building chosen for such expansions was of a terraced form, a sort of codification of the residential needs in the tidy organization of the subdivided plots. The construction of the individual buildings was tightly linked to the dimensions of the plot, since it occupied well-defined areas, with a ratio that could reach two thirds, a half or only one third, depending upon the length of the plot; terracing meant that the boundary walls were shared, thus forming the dividing line.

Figure 2: The diagrammatic reconstruction of two houses leased out in 992 (left) and in 1107 (right); [Sassatelli et al. 1996, p. 63; drawing by Paolo Nannelli]

Originally, the load-bearing framework was formed by a series of wooden beams braced by other beams set on the diagonal; this structure was repeated on the floor above by a second series of analogous elements or by the supporting roof trusses. The wooden skeleton of the frame was completed (i.e. the longitudinal walls of the area and the dividing walls) through the construction of walls using recycled bricks, pebbles and other ob-
jects bound with lime and mud, or even wattle and daub. The construction was prevalently wooden in the remaining sections, being the front walls, the stairs and the external portico; often, the internal dividing walls were also constructed using a mixture of mixed techniques in order to economise on materials, with wattle and meshes of branches held by earth and plaster. The covering was made with brick elements, curved and flat roof tiles, that by the early Medieval time had already substituted the use of straw within the Po Valley.

On the ground floor a storeroom, the kitchen and a room destined for commercial activities are located, connected via a single ladder with a slope greater than 45° to the floor above where a room devoid of heating is located. At the rear of the house, in the courtyard, the complementary structures could be found: the well, often built on the confine between two plots, the kitchen garden, the waste hole and the latrine. The portico did not form part of the residence, but was instead a public space of the house where it was possible to work and live in contact with other people. In a contract for the lease for a house, in 1091, situated in via Santo Stefano, reveals for the first time the existence of the portico, a symbolic feature of Bolognese architecture that has always represented a common form of construction (Bocchi 1995, pp.18-21).

Hidden structures in the historical centre

Today, in the streets of the old town, it is difficult to find examples of houses with load-bearing structures made in wood, and the few examples still in existence are extremely fragmentary; one can find some porticos, some embossed structures supported by brackets and, on the inside of modified building, the remains of structures, such as pillars, made in oak that suggest that the original structure was one of a complex framework. No residence has survived to date, intact in all of its constitutes, even if until the end of the nineteenth century many recognisable elements had remained; a single century has been sufficient to eliminate the entire area of lesser buildings or to eliminate nearly all evidence within the large surviving constructions.

The demolition of via Mercato di Mezzo, between 1911 and 1920, the operation of reorganising the zone surrounding via Clavature and via Marchesana, with gobal replacements made in medieval style, together with the disastrous bombing of the plots neighbouring via Foscherari (Foscherari Road), behind the Archiginnasio, have wiped out an urban context rich in original remnants, where complete and recognisable wooden structures, mainly internal, had survived (De Angelis 1990, p. 178); even today, it is possible to observe a fragment of houses with façades of wooden coverings, situated near to “voltone dei Caccianemici”. The first interest towards Medieval constructions in wood was only verified in the second half of the nineteenth century thanks to the studies of Giovanni Gozzadini, the last descendent of a noble and extremely old Bolognese family, who dedicated himself to historical research and archaeology; in a manuscript presented to the Delegate of National History in 1877, he focused attention not only on the external visible structures and the porticoed façades, but also on the internal framework (De Angelis 1990, p 171). Gozzadini remembers the demolition operation of the Malvasia Tortorelli house, in Strada Maggiore, that was constituted of progressive dismantling and allowed the large wooden frameworks that stretched over multiple floors to be observed once the walls of simple render were knocked down (Fig. 3, left).

Figure 3: A diagram of the wooden frame of the house of Malvasia Tortorelli (left) (De Angelis 1990, p.177) and a building with a wooden framework encompassed within the brickwork in proximity of the voltone dei Caccianemici (right)

During the campaign of restorative interventions and conservational redevelopment of the terraced houses, starting in 1973 by the municipal administration of Bologna, remains of even older constructions were found within the structures of the walls; only traces were found, however, since the renovation operation of the eighteenth and nineteenth centuries restored nearly all of the originals, making modifications in both the struc-
ture and distribution (De Angelis 1990, p. 178). An exemplary house for the identification of the different phases of transformation is number 22, via Polese where next to the findings of wooden covering fragments located within the walls, documentary evidence was also found regarding its renovation (Comune di Bologna, 1980). The original division of the Polese district, in the present day zone of via Marconi and via Riva di Reno, dates back to the middle of the thirteenth century, and consisted of a collection of elongated plots, with rather narrow terraced residential units running perpendicular to the street, with a servicing drain at its centre: an organisation that repeats that found in other plots that, at the same time, were formed and organised in the territorial band external to the old city wall of the second circle.

Examining the building at 22 Via Polese, under its structural profile, it is possible to recognise the phases of aggregation and of organic growth of the internal body of the construction. Indeed, having identified sections of the internal load-bearing wooden framework within the present brickwork structure, it is possible to reconstruct both the constructive phases and the organisation of the original founding units (Fig. 4).

Knowing the average measurements of the plot façades, one could ascertain that the actual combined façade derived from the sum of three parts, two divided upon 12 Bolognese feet (equivalent to 4.56 m) and one of 20 Bolognese feet (equivalent to 3.80 m). The first building phase was based upon the use of a wooden frame, braced and packed with a filling of heterogeneous materials: difficulty in the location of good materials often resulted in the under-sizing of the structures and to the use of makeshift filling materials, such as wattle blended with mud. At least in this first constructive phase, the portico was a precarious construction that did not permit the support of an upper construction. The original cells that measured 12 and 10 feet of the façade, occupied exactly half of the plot in depth, leaving the land to the rear free; they were probably planned and organised as a succession of wooden frames where the supporting uprights rested upon blocks of selenite. The distance between the individual load-bearing frames was dependent upon the dimensions of both the materials available and of the site itself. The double-pitched roof, permitted space for a mezzanine floor to be built, reached via a ladder constant gradient that ran parallel to its length.

A model, that in its typological evolution was more strictly structural, became consolidated when the portico was included and the ladder rotated, in the characteristic conformation of the terraced porticoed house that is typical of such homogeneously crafted zones.

Around the middle of the sixteenth century, the original organization of these terraced buildings was substituted with the formation of a vast warehouse on the ground floor, separated by a room parallel to the wooden portico. In the second half of the seventeenth century, the house assumed a character of a more residential form; in 1810, the residential complex underwent an even more noticeable transformation: the wooden columns of the portico were replaced and the “padiglione” vaulted ceilings in reed matting of the first floor.

This building summarises, in a symbolic way, the evolution of the crafted/commercial terraced house that in its first form was composed of a supported wooden frame. With the economic necessity to use minimal amounts of prestigious materials, due to their high cost, the construction of the framework was given prime importance, while the filling out of the construction could be done with materials of various form and even those recycled. The progressive substitution of the walls commenced with the longitudinal outside walls of the framework that became fortified, thus substituting and supporting the original wooden uprights, with brick pillars, until the thickness was doubled without transversal tie up with supporting walls. On the ground floor, the walls had a thickness of two heads, about 30 cm, while on the second it was reduced to one head. The walls of the upper floors possessed a characteristic that can still be seen today in old farmhouses and townhouses: in corners and positions that would have acted as the supporting pillars for the roof, the thickness of the walls, otherwise 15 cm, was increased to 30 cm.

Figure 4: Features of the wooden frameworks within the brickwork of the house in via Polese (Comune di Bologna, 1980, pp.37-39)
CONCLUSIONS

The economic and social crisis that started in the third century seems to have eliminated evidence of the transitions that occurred between the refined brickwork technologies of the Romans and the medieval “methods of subsistence”: written sources and archaeological evidence only resume from the eleventh century. Analysis of the written documents, and above all the contractual documents of the eighth to the tenth centuries, reveal an extremely useful means of recreating how residential houses of the Dark Ages would have been, even if they were not able to supply sufficient information about the technological aspects. The data only broadly converge to indicate the diffuse use of timber for construction: even apparently clear and explicit expressions in their ability to define features of the structure do not establish with certainty the technological aspects used in the building. It is most probably that the lack of documentary sources relative to the Dark Age centuries and their limited technological depth will never be compensated for; thus archaeological research becomes fundamentally important as only with increasing numbers of excavations of remains that can be precisely dated can we hope to define the construction practices that characterise this time period with more certainly; practices that remain even today far from solved.

The centuries that followed the invasions of the Longobardi saw the distribution of single-family houses over two floors almost everywhere in Italy: the terraced housing patterns were adopted for the planning of towns and for the development of new streets that saw the expansion of urban districts, above all central-northern Italy. All the old towns of the Po Valley, in particular Bologna, hide evidence that if exposed could indicate the way in which wood was used as the principle building material in use during all of the Dark Age and how it would have been used in combination with brick (recycled and then newly produced brick) during the late Middle Ages. Occasional excavations of wooden frames located within the brickwork, that take place during restoration interventions, and old plans for the transformation of structures often supply evidence on how frequent the use of these two materials may have been, not only for the construction of the porticoes, but also in all the load-bearing structures of the building. In these centuries of formation, Bologna, like all the other cities, was contemporaneously built of “new” and of “old”: the transformation and the arrangement of the “old” was performed to various extents, adapting the old structures, that were born for different functions, to the new needs, while the “new” were planned and built upon basis of needs and of the current realities of the time. By the end of the thirteenth century, medieval Bolognese building had already developed a form that would be maintained even into the following centuries, when it was to be completely replaced. In the case of the typology of the crafted/commercial house in the strips of historical expansion of the urban fabric of Bologna, the spatial-distributive aspects are still linked today with the last large structural transformation that occurred in sixteenth in which, the, by then, degraded vertical load-bearing wooden structures became replaced with brickwork frames, and the transverse beams that replaced the floor and the roof that became plastered, not only because the town was launching towards an economic development that allowed the use of more expensive materials, but, above all, to prevent the fires to which wood offered easy taking. However, the original conformation of the house did not change, allowing Bologna to preserve the characteristic that the central centuries of the medieval period had bestowed upon the city.

REFERENCES