Reconstruction of a settlement of the 5th-4th BC

Final Version of 30/06/2022

Deliverable Number D.4.1.2.

Project Acronym	VALUE
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Specific objective	3.1
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Work Package Title	Development of the districts (including Pilot Actions)
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Partner in Charge	LP Municipality of Comacchio
Partners involved	PP3 Emilia-Romagna Region
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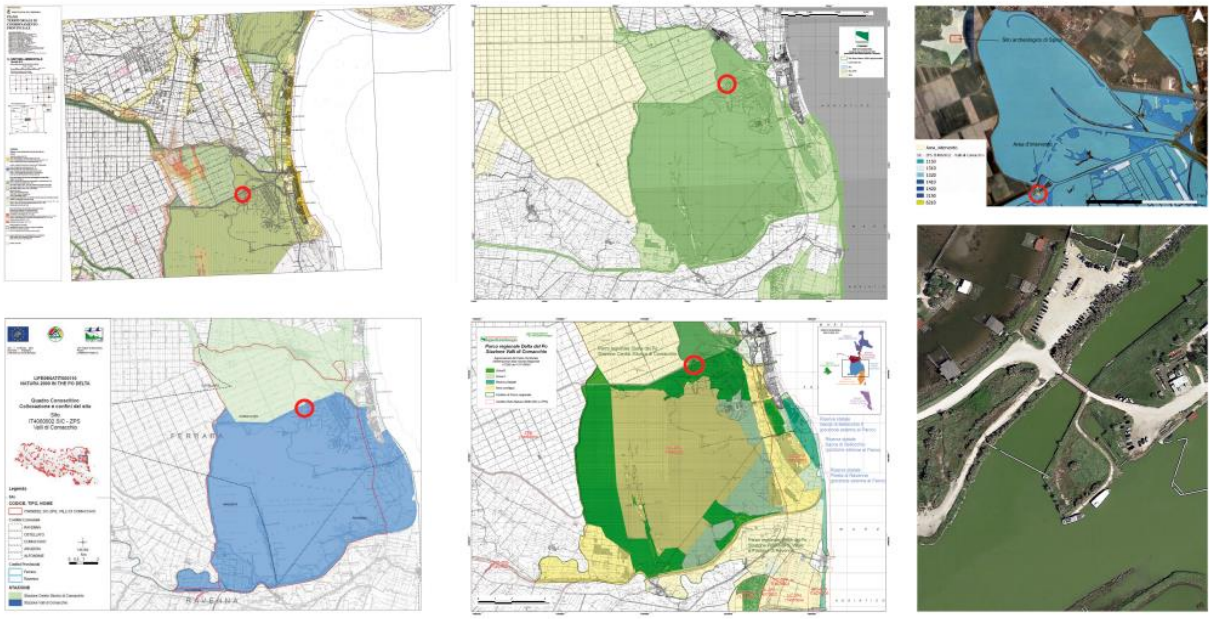
The project

To make known to the general public what once must have been the disappeared Etruscan city of Spina, the Municipality of Comacchio, in concert with the University of Bologna Alma Mater Studiorum and with the Ministry for Heritage and Cultural Activities and for Tourism, has thus conceived the construction of an Open-air Archaeological Park near Stazione Foce in Comacchio.

The goal was to recreate, through the practices of experimental archaeology, a series of full-scale installations that would allow visitors to enjoy an immersive experience inside the ancient city, a real "museum" at the open in which to walk through the ancient structures of the town, to appreciate the construction techniques, the technical expedients and the living conditions of a lagoon city of about 2500 years ago.

Landscape – territorial framework



The territorial context of reference is located within the Municipality of Comacchio, in particular in the Comacchio Valleys within the Natura2000 site IT4060002 SCI-SPA "Valli di Comacchio" which has a total

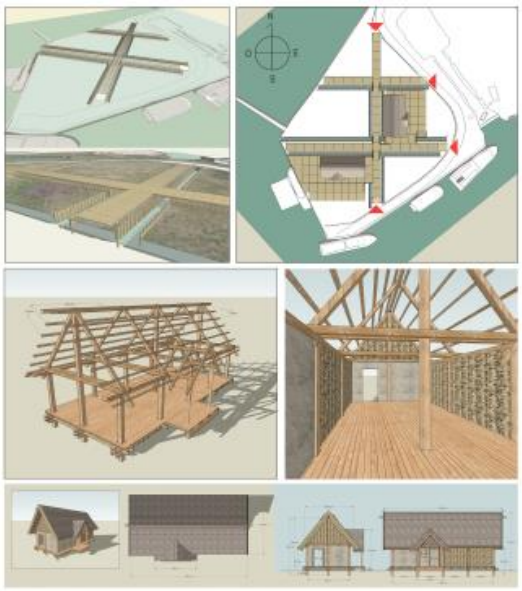
area of 16,781 ha, of which 14,378 falling in the Province of Ferrara (in the municipalities of Argenta, Comacchio and Ostellato) and 2,403 in the Province of Ravenna (in the municipalities of Ravenna and Alfonsine).

The site is entirely included in the perimeter of the Po Delta Regional Park pursuant to the R.L. 27/1988 and related stations in the historic centre of Comacchio and Valli di Comacchio. Within the Natura2000 site there are various economic activities, some of which have developed precisely according to the naturalistic and hydraulic connotation of the site. Of these, the main ones are agriculture, valley farming, shellfish farming, recreational fishing, tourism and hunting.

According to the provincial map of the surface geology of the PTCP of Ferrara, the intervention area is affected by deposits of a mainly fine, highly compressible nature. According to the cartography of the Extract Plan for the Hydrogeological Asset (PAI) regarding Geolithology, the intervention area is located within the lithotype “River and lake floods flanking the main waterways – gravels, sands and silts (AFL)” and, again according to the PAI cartography, as regards the hydraulic and hydrogeological risk, the entire municipality of Comacchio falls into a total risk class R1 – Moderate.

The intervention area falls into “Bumps or dunes of historical, documentary and landscape significance”, “Naturalistic protection areas”. According to the Territorial Plan of the Delta del Po Regional Park (Valli di Comacchio Station Plan) the intervention area falls within zone B, sub-area SMT (Valli di Comacchio Station), in the Ramsar wetland “Residual valleys of the Comacchio district”.

The Open-Air Park project



Urban design

The first fundamental aspect of the project specifications was the organization of the visit routes within the chosen area, in relation to the arrangement of its possible accesses. These had to insist on the pedestrian road that connects the parking area of Stazione Foce to the North with the landing pier that delimits the east-south-east perimeter of the small peninsula.

The organization of the accesses and visits to the area had to have a philological coherence with what had been ascertained on the urban topography of the ancient

Spina. A recognized factor of extreme importance was the general structure of the urban system according to an orthogonal axis scheme, whether they were roads or canals. IN addition to the cases of other contemporary centres that adopt this solution (see in particular, Kainua-Marzabotto), orthogonality is linked to a model of "new city" which, according to recent studies, has its foundations in a sacred conception of urban space that places the city in analogy with its geometric figure of the movement of the sun in its solstice extremes[1]. The orthogonal axes were therefore oriented according to cardinal signs and this solution was placed as the qualifying principle of the entire project, as it evokes the "urban" dimension of the plant and, at the same time, of its sacred inspiration.

The canals

The existence of a dense network of canals in the ancient Spina, due to current regulations that prohibit deep excavations, has been evoked "negatively" due to a general increase in the travel planes and the insule delimited them. This effect was accentuated by the laying of a dense network of poles to reinforce the banks of the canals themselves, as revealed by the archaeological data. On the sides of a large plateia (walkway in the North-South direction) secondary channels are arranged parallel and orthogonally, whose double function is to drain the soil and at the same time accommodate the discharge of the waters descending from the roofing of the houses.

The streets and blocks

The internal road axes were thus designed on wooden walkways elevated above the ground and the excavations of the internal areas were designed to respond to the choices of their use with respect to housing reconstructions or future secondary installations, such as small production plants that can be used for educational purposes, furnaces or tanks for the processing of salt.

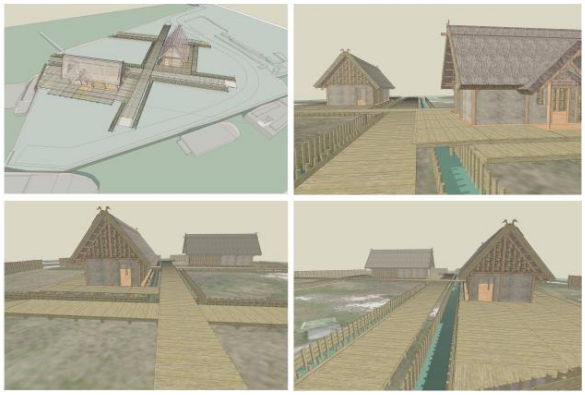
This refers to the vocation of the various insulae in terms of greater or lesser accessibility with respect to the external pedestrian paths, greater or lesser accessibility compared to the tourist pier, or their contiguity with a free seashore (possible construction of an ancient pier).

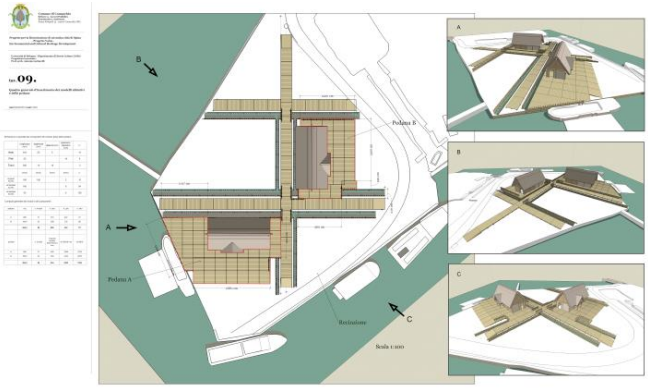
The housing models

From a structural point of view, the most likely construction hypothesis for the houses in Spina was that of a wooden frame set on vertical poles linked by a double horizontal entablature on which to clamp the roof beams. From the static point of view, this solution results in rigid box-like structures particularly resistant to tangential loads and with general transmission of the load to the base of the poles. In the presence of plastic soils whit low compressive strength, the peak load of the piles was more distributed,

[1] Gottarelli A., "*Contemplatio, Templum solare e culti di fondazione. 1998-2013. Sulla regola aritmogeometrica del rito di fondazione della città etrusca-italica tra VI e IV secolo a.C.*", collana "*Archeologia del Rito*", vol. 1, Edizioni Te.m.p.l.a., 2013.

clamping the piles at their base with a transversal system of beams. This is in order to avoid possible sinking phenomena when it is stressed by earthquakes or strong gusts of wind.

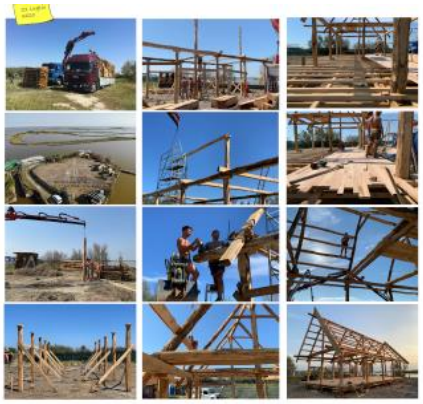


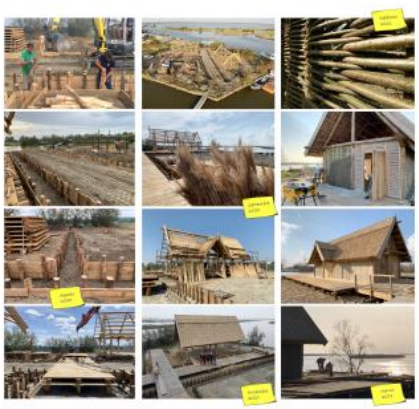


From the project to the construction site

In the Services Conference of March 2019, the final project was approved by the Regional Delta Po Park and by the Superintendence for Architectural and Environmental Heritage, starting the executive phase of the project, which ended in September 2019.

The tender procedure was completed with the assignment of the work in early March 2020, in full lockdown period. In July the intervention resumed leading to the completion of the structural works; in November 2020 the reed roofs were completed, thus preparing the protection of the housing models for the winter months. The works resumed again in February 2021, with interventions to complete the walkways, infill the spacing of the frames of the houses with lattice walls and conclude the infrastructure in March 2021.





Spina and the Etruria of the Po Valley

The birth myth

Greek and Roman authors ascribe the foundation of Spina either to the pre-Greek population of the Pelasgians, colonizers of the Po Valley and ancestors of the Etruscans, or to Diomedes, the Achaean warrior who fought at Troy and brought Greek civilization to the Adriatic area. But all of them agree on the location of the city in the dela of the Po River, the ancient Eridanum, near a channel called Spinete or Spino.

The Etruscans

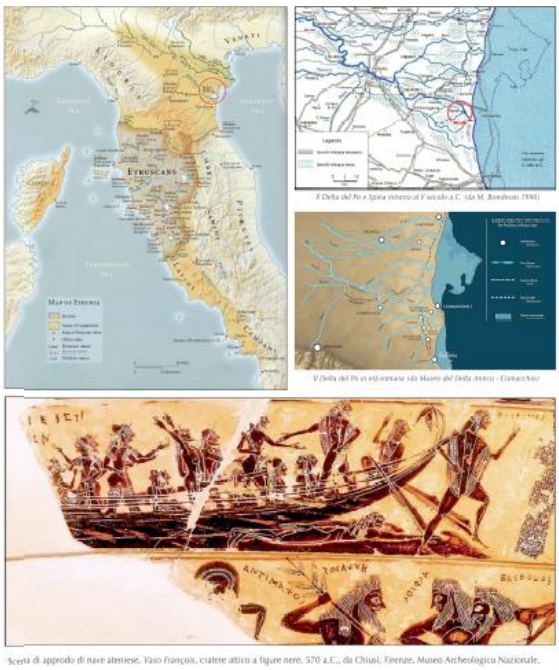
The Po Valley, where the Etruscans expanded since the 9th century, during the 5th century experienced enormous development, becoming a frontrunner which dealt on equal terms with a great power like Pericles' Athens. The ancient authors had already visualized an Etruscan colony on the plain, a twelve-city organization modeled on Etruria itself. Archaeological excavations have confirmed a widespread occupation of the territory, well organized from a political, commercial and military point of view, with a good road network, settlements, land reclamation and developed agriculture techniques. Each city had an autonomous government but acknowledged Felsina-Bologna as the capital of Padan Etruria.

The History

Spina, a key trade centre at the mouth of the Po River, played a leading role in the political and economic sphere of the Adriatic area. Founded in 540 B.C. by the Etruscans, it was an open gate into the Mediterranean for the whole Etruscan area of the Po Valley and distinguished itself by a deeply Hellenized lifestyle as demonstrated by magnificent artefacts found in the tombs.

The environment

The Po Delta, where Spina was founded, is a very special and fragile water and dry land environment. Reconstructing the former landscape has been particularly challenging due to: alluvial sediments from the Po River and some of its Apennines tributaries; progressive shoreline encroachment; swamp envelopment of large areas; cutting of artificial navigable canals; reclamations works. Understanding of this vast territory has been enhanced by aerial photography, together with archaeological and geomorphological surveys, knowledge once solely based on the writings of ancient historians.



Scena di approdo di nave ateniese. Vaso François, cratere attico a figure nere, 570 a.C., da Chiusi. Firenze, Museo Archeologico Nazionale.

The discovery of Spina

The quest for ancient Spina in the swamps of the Po Delta was a real archaeological thriller that fascinated scholars since Medieval times. No trace remained of the renowned and thriving sea emporium mentioned by Greek and Roman authors.

The extraordinary adventure only began in 1922 after the fortuitous and unexpected finding of splendid Greek pottery and bronzes during reclamation works in the northern Comacchio valleys. The subsequent systematic archaeological excavations brought to light thousands of tombs with magnificent artefacts which allowed the reconstruction of the past of the famous city buried under the mud.

Spina: city and necropolis

The inhabited area

Spina was a lagoon town in the delta of the Po River, built at the confluence of an ancient channel, the Spinete, with a minor tributary. The mounds of the necropolis gave it protection on the shore side. It appeared as a scattered built-up area, similar to the other coastal towns of the upper Adriatic Sea, with a gat and built according to the orthogonal grid plan which met the foundation rules of the Etruscans.

The Necropolis

More than 4.000 graves – both inhumation and cremation tombs – have been excavated since 1922 in Spina necropolis. The graves, distributed in contiguous valleys named Valle Trebba and Valle Pega, were located on sandy deposits parallel to the ancient Etruscan coastline. The choice of these outcrops was determined by the scarcity of dry land and the certainty of finding there, and only there, the morphologic soil stability indispensable to the cities of the dead.

The finds from the tomb

The objects and rich artefacts buried beside the dead not only offer precious indications about the society of Spina, its economic life and its trade with Greece and Italic peoples, but also reveal how deeply the ritual sphere was influenced by Hellenic customs. Very few examples of the richly equipped tombs are to be found in the whole Northern Italy.

Economy and society

The economic and social configuration of Spina, where numerous foreign communities lived and traded – Greeks in the first place, but also Veneti and probably other immigrants – suggests a structured political and institutional organization, while the relations between Spina and the other Etruscan towns of the Po Valley – Bologna in particular, the Felsina which according to Plinius had been *Princeps Etruriae*, the most important and representative city of Etruria – are still a subject of discussion among scholars.

Natural resources and economic activities

In Spina's time, as it is today, the delta lagoon was a unique environment born from the sea and the river, endowed by nature with a great variety of plants and animals according to the different habitats. Man succeeded in drawing sustenance from this damp, cold rain-prone region through trade (the major source of wealth), agriculture, breeding, fisheries, handicraft and building.

Trade

The strategic position of Spina can only be understood if one has clear in mind the fundamental importance of waterways in antiquity. Being a place of arrival of the Adriatic Sea lands from the Aegean Sea and a point of departure for the Po Plain and Central Europe through rivers and mountain passes, Spina was a well-organized trade centre. For the sake of commerce Etruscans, Greeks, Veneti and Celts met and lived together in a hard and unhealthy environment, fostering not only interchange of products, but also of cultures and traditions.

Scavo di tombe in Valle Trebba negli anni '20

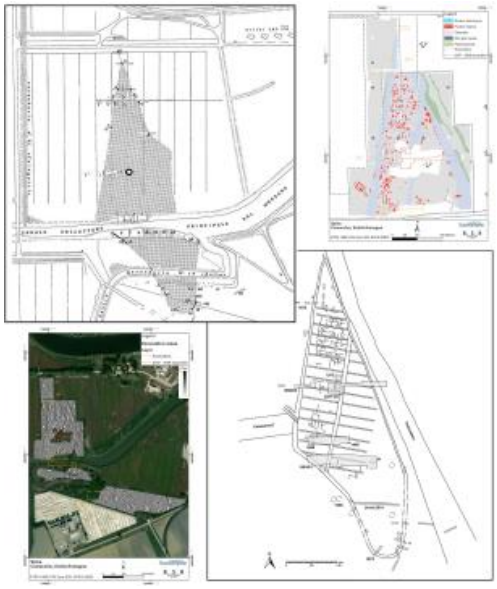
Il corredo della tomba 128 di Valle Trebba

le aree di interesse di Spina e della sua necropoli di Valle Trebba e Valle Pega

Ricostruzione del paesaggio di Spina etrusca

The archaeological investigations on Spina

Research history



The discovery of Spina is linked to the identification of the necropolis of Valle Trebba (1920s) and Valle Pega (1950s), which took place during the reclamation works of the Comacchio Valleys. Following these findings, Nereo Alfieri set out to find the corresponding settlement, which, after several multidisciplinary investigations (aerial photography and surveys), was identified to the west of the necropolis, separated rom it by the Padovetere course. The port area of the city was instead located a few kilometers from the town, in the Pega Valley.

Official excavations began in 1965, under the guidance of the Superintendency of Bologna and the Archaeological Museum of Ferrara, directed first by Stella Patitucci and Giovanni Uggeri, and then by Fede Berti. The inadequate graphic and photographic documentation of these excavations has not made it possible to verify, albeit broadly, the sequence of operations and the correctness of the interpretations.

Since the 1980s, systematic excavations in Spina remained suspended until the beginning of the new millennium, when following an archaeological surveillance in the pipeline laying sites (in 2004) traces of settled areas emerged on the eastern edge of Valle Trebba, with characteristics of areas of productive activity strongly compromised by agricultural work.

Topographic surveys and city structure

In 2007 excavations resumed regularly, with two projects, one by the Regional Directorate and the Superintendence for Archaeological and Landscape Heritage of Emilia-Romagna, under the direction of Luigi Malnati in collaboration with the University of Milan, and the other by the University of Zurich, under the direction of Christoph Reusser.

The results of the geomagnetic surveys at Spina, carried out in 2008 by th University of Southampton, now provide a clear picture of the city boundaries and its strictly orthogonal system with an EO/NS orientation.

To date, it seems that the so-called “inhabited area” extended over a rhomboidal surface of about 6 hectares, oriented in a north-south direction and armed with powerful hydraulic defense works, consisting of vertical pilings reinforced horizontally. The excavations have helped to define the subdivision of the 8x17m insulae, but still leaving many ambiguities about the ancient houses.

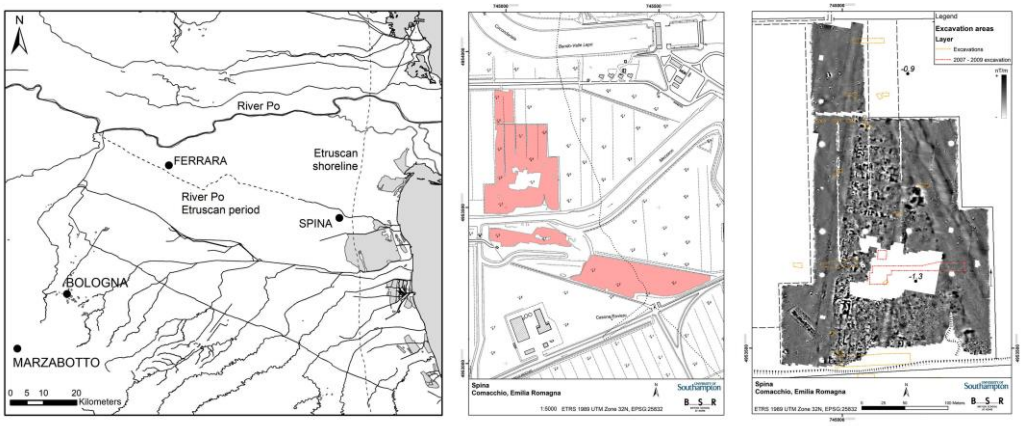
Building techniques

According to the chronological phases, in fact, it seems that the wooden building techniques used in ancient times in Spina were many, especially in the construction of the roofs (mainly straminei and sometimes with bricks), and that the peripheral areas with production plants and streets are better identified, paved with pebbles and ceramic fragments, perhaps also used as slide structures for boats. Between 2007 and 2009 one of the areas investigated returned a complex of three rooms, considered “for residential use”, made of perishable materials of which mainly negative footprints remained.

The construction materials

The houses were built with oak (well attested for the partitions) and elm. The same wood species were also used for the pilings, together with the alder, while hornbeam and hazel were used to create partitions and warping of the roofs. Other woods such as willow, poplar, maple, ash, silver fir and stone pine, and elements linked to humid environments such as marsh reeds, gramignone, yellow pigamus and brasca are also attested.

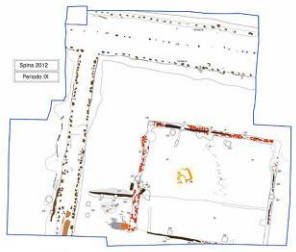
In 2008 the British School at Rome (BSR) and Archaeological Prospection Services of Southampton (APSS) conducted a geophysical survey at the Etruscan site of Spina on the behalf of the University of Southampton, the University of Zurich and the Superintendence for the Metropolitan City of Bologna and the Provinces of Modena, Reggio Emilia and Ferrara. The survey was conducted during a period of excavations in a central area of the site and aimed to place the excavation results in a wider context. The geophysical survey was conducted in view of a new research programme undertaken by the University of Bologna.



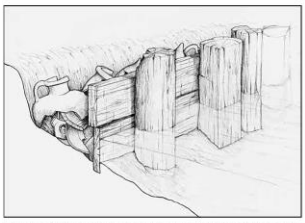
Objectivity and interpretation

The intervention does not intend to represent a philological reconstruction of the ancient town nor a reconstruction of the hypothesis formulated at the current state of archaeological research, but rather a synthetic re-enactment of its general characteristics based on experimental archaeological techniques which, while representing archaeological findings, allow the planivolumetric representation to the truth on the criteria of technological, static and normative compatibility.

Spina: foto d'archivio che mostrano la presenza di intrecci ortogonali di tronchi, pali ed altri elementi vegetali nelle sottofondazioni.



Spina: Pianta dei canali N e W e delle strutture riferibili all'edificio di II fase (periodo IX; aggiornata alla campagna di scavo 2014) da Cappuccini-Mohr 2017.



Spina: Ricostruzione del sistema di protezione e compattazione della sponda di un canale, realizzato con pali verticali e assi a contrasto: da Cappuccini-Mohr 2017. A destra pali sui bordi dei canali da Reusser 2017.

The construction materials

The choice of the type of wood essence on which to set up the reconstruction was a substantial aspect of the design choices, having repercussions that are not limited to the philological coherence of what was found in ancient times (oak wood), but which radically affect the needs realization. The result was the forced choice of the least cost essence that would guarantee compliance with those parameters of resistance, hardness, workability, durability and less need for maintenance over time when required, and this essence turned out to be chestnut wood.

Chestnut complies in hardness, resistance and workability with the required structural needs and is one of the most durable tannin essences with less maintenance required in humid and brackish environments.

Canalisation, reclamation and drainage works

Regardless of the different life stages of Etruscan Spina (from Spina I, 525-500 BC, to Spina VI, 400-375 BC), the first need to be faced for the construction of the housing units was to stabilize and drain the sandy soil of the dunes and to create insulation from humidity. In addition to an articulated reclamation system through the superposition of layers of reeds, bark, twigs (including hazelnut and willow branches), vegetable fibers, wood of various sizes together with tied bundles, sometimes with a greater

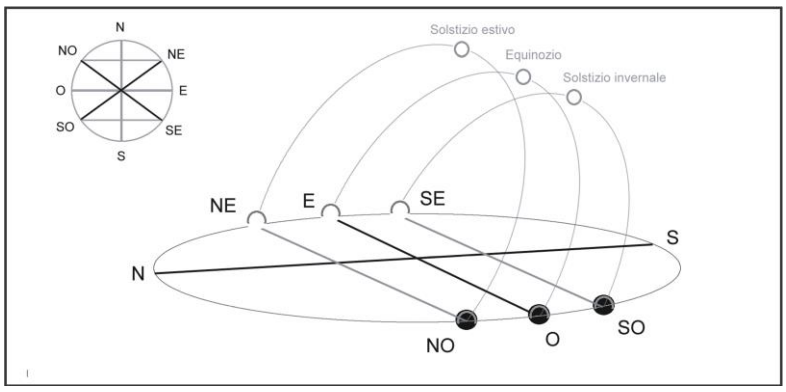
concentration of wooden poles and trunks[2], the organization of the urban space was divided into a complex system of orthogonal canals.

The main axis coincided with a large north-south canal between 8 and 10 meters wide and almost 300 meters long. A network of minor canals, perpendicular to it, lined the blocks and houses. All were reinforced along the banks by dense rows, even double ones, of vertical poles with transverse axes to contain the soil[3].

The presence of a complex articulation of canals ensured the correct regulation of the waters as well as the interchange of functions and activities linked to the land-water interface. On the sides of a large north-south axis, numerous secondary east-west canals were arranged orthogonally, between 2 and 4 meters wide, real navigation lanes for small coastal boats. Other minor channels, like those reconstructed here, were functional for the discharge of rainwater coming from the roofing of the houses.

Rituals of urban design

The town was organized, since its foundation, according to urban planning criteria of orthogonality of the road axes and the canals that skirted them and today we know that the birth of this organization of the living space took place in accordance with the precise ritual rules of the Etruscan discipline.



[2] Patitucci S. – Uggeri, G., "*Spina. Topografia, urbanistica, edilizia: un Aggiornamento"*, in Atti dell'Accademia delle Scienze di Ferrara, vol. 94, A.A. 2016-2017
Reusser C., "*Die Grabungen der Universitat Zurich. Ein Vorbericht zur fruhellenistischen Phase und zur Salzsiederei in Spina*", in Spina 2017
Zamboni L., "*Case di legno e d'argilla. Urbanistica, tecniche edilizie e vita quotidiana a Spina tra VI e IV sec. a.C.*", in Spina 2017.

[3] Cappuccini L. – Mohr M., "*Strutture a Spina nel IV sec. a.C.*", in Spina 2017.

A confirmation of the fact that in Spina the operations of dividing the spaces took place according to a preordained urban plan was the discovery of a boundary stone containing a cross sign on the top and on one side the Etruscan inscription *mi tular*, which can be translated into "*I am the border"*. The cippus had to be driven vertically below a road intersection, as found in other contemporary centers of the Etruria of the Po Valley and in particular in the city of Kainua (Marzabotto) on the Bolognese Apennines.

The organization of the urban space of Spina was therefore a central aspect of the design hypothesis of this reconstruction and is emphasized here by the orthogonality of the large, raised platforms and the canals that flank them. Recent studies conducted in the Etruscan city of Kainua have also made it possible to specify the ritual model that led to delineate this innovation of the forma Urbis. It is precisely from the first observations made in Kainua that a research began that will lead to the hypothesis, between 2000 and 2005, that its orthogonal axis system and the relative foundation rite were derived from the tracing of the axes of the solar templum of the place, a figure that can be described by connecting the extreme points of rising and setting of the Sun over the course of the year with respect to the observer's horizon.

Its geometry changes as the latitude varies and is specific to a particular place, increasing the angle between the solstitial diagonals as you move north. The azimuths in centesimal degrees of the diagonal axes are indicated in the figures below (azimuth = angle on the horizontal plane measured clockwise starting from the geographic North). The ASE point indicates the rising of the Sun at the summer solstice (20/21 June), the day with the most hours of light, and the ISE point indicates its sunset; ASI indicates the rising at the winter solstice (21/22 December), the day with the fewest hours of light that marks the end of the solar year and its new beginning, with TSI indicating the sunset point. At the two equinoxes (20/21 March – 22/23 September), days in which the day and night hours are equal, the sun rises exactly in the East (E) and sets exactly in the West (W).

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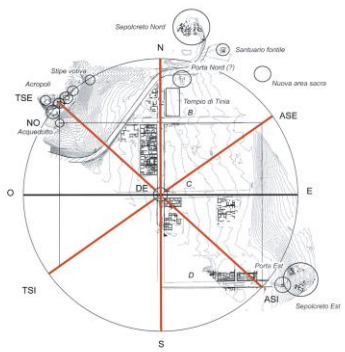

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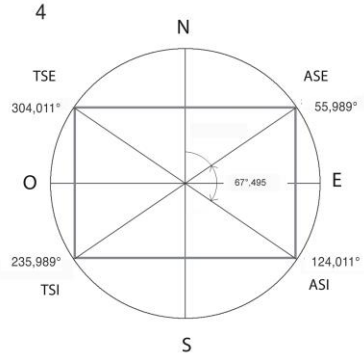
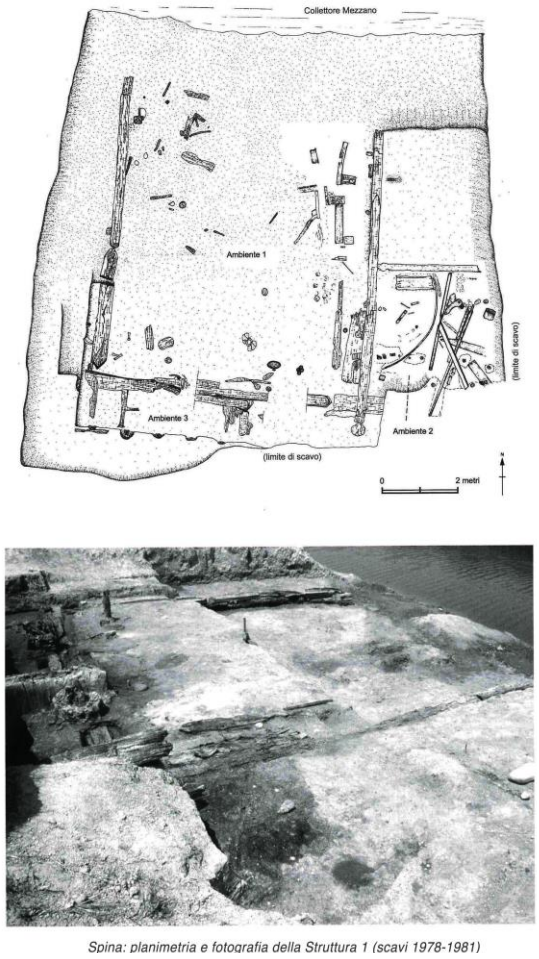


Housing models

Structural foundation elements

One of the buildings in Spina most documented by archaeological excavations, the so-called "Structure 1" (phase I, last quarter of the sixth century BC), had foundations consisting of wooden beams placed horizontally along the main axes of the perimeter of the houses. The terminations of both beams of Structure 1 appear slightly protruding and shaped with a rounded tip towards the outside, a technical expedient perhaps attributable to the methods of interlocking the foundation frame. The excavation photos clearly show how the beams were clamped together on the corners, carved and interlocked alternately[4].



Spina: planimetria e fotografia della Struttura 1 (scavi 1978-1981)

The function of these beams must certainly have been that of supporting the foundation of the building, but the absence of their evidence in the rest of the elevation does not clarify their vertical development. It has been observed how the construction technique can recall the Alpine tradition of the Blockbau, which provides for the elevation of the building by horizontal overlapping of logs or crossed beams without the use of additional fastening systems[5].

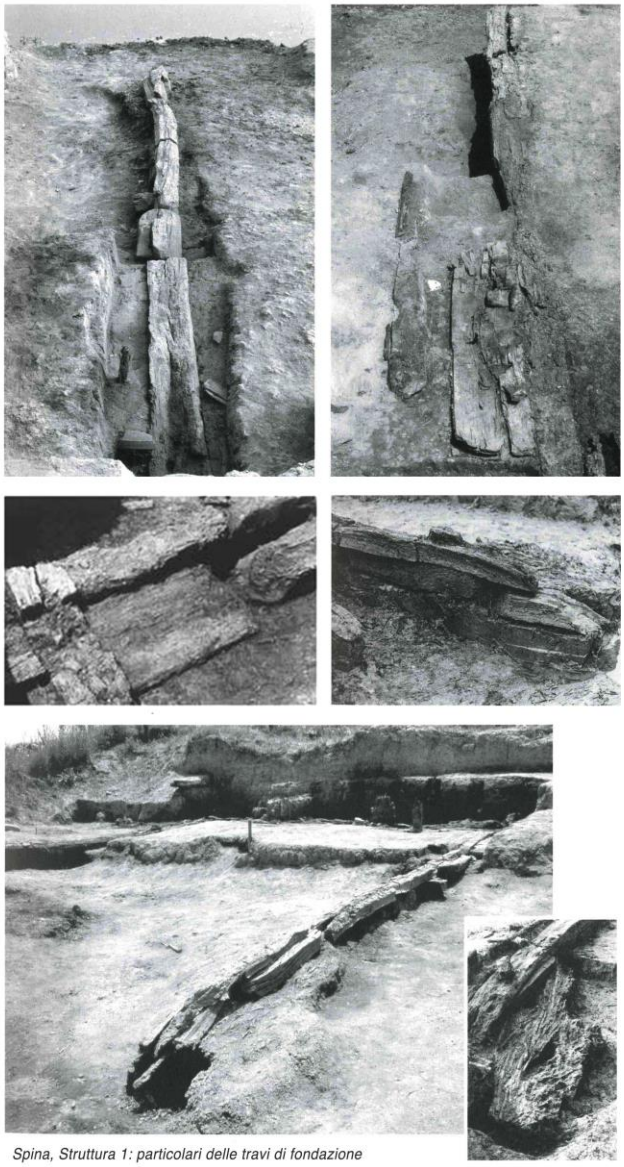
However, the lack of traces of vertical development of the Blockbau or frame walls, together with the presence of numerous remains of canopy referable to light non-load-bearing walls, do not allow us to relate this foundation frame with certainty to the vertical development of the structure. It would seem more reasonable to think of a reinforcement system designed to increase the rigidity of a load-bearing frame set on vertical poles.

From the static point of view, this solution results in a rigid box-like structure particularly resistant to tangential loads and with general transmission of the load to the base of the poles themselves. In the presence of plastic soils with low compressive strength, the peak load of the piles thus more distributed

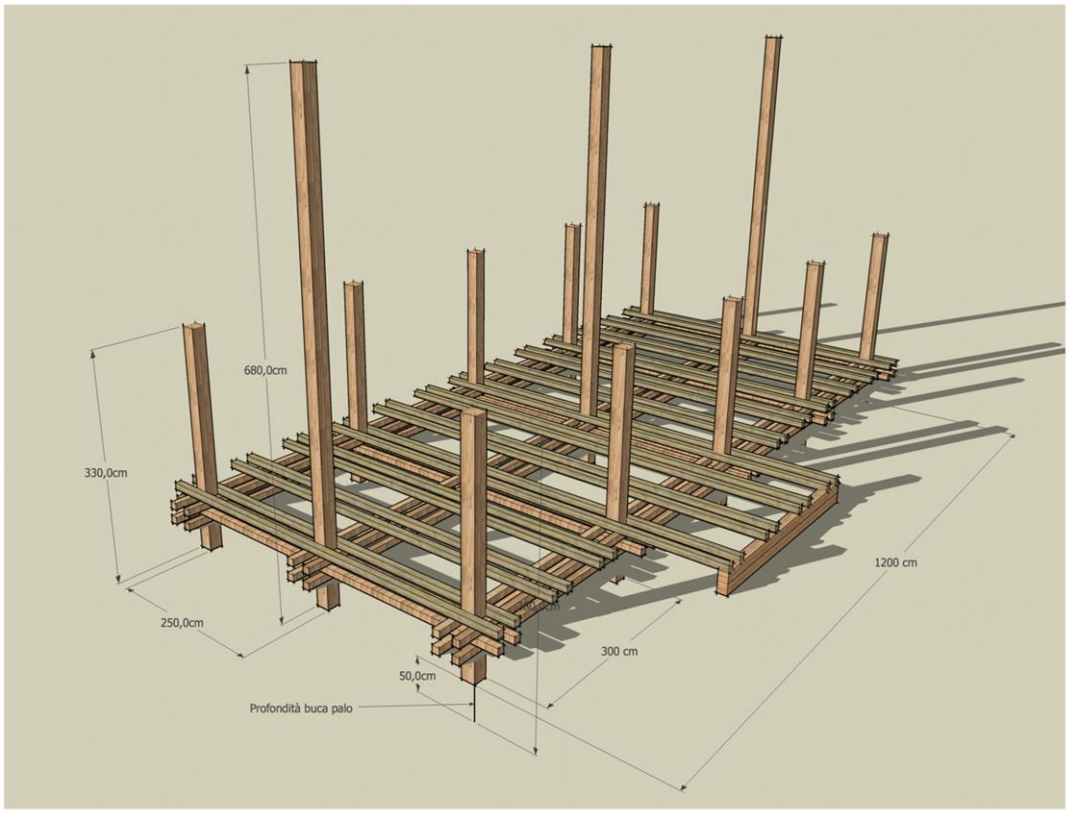
[4] Zamboni L., "*Spina città liquida. Gli scavi 1977-1981 nell'abitato e i materiali tardo-arcaici e classici*", Rahden, 2016.

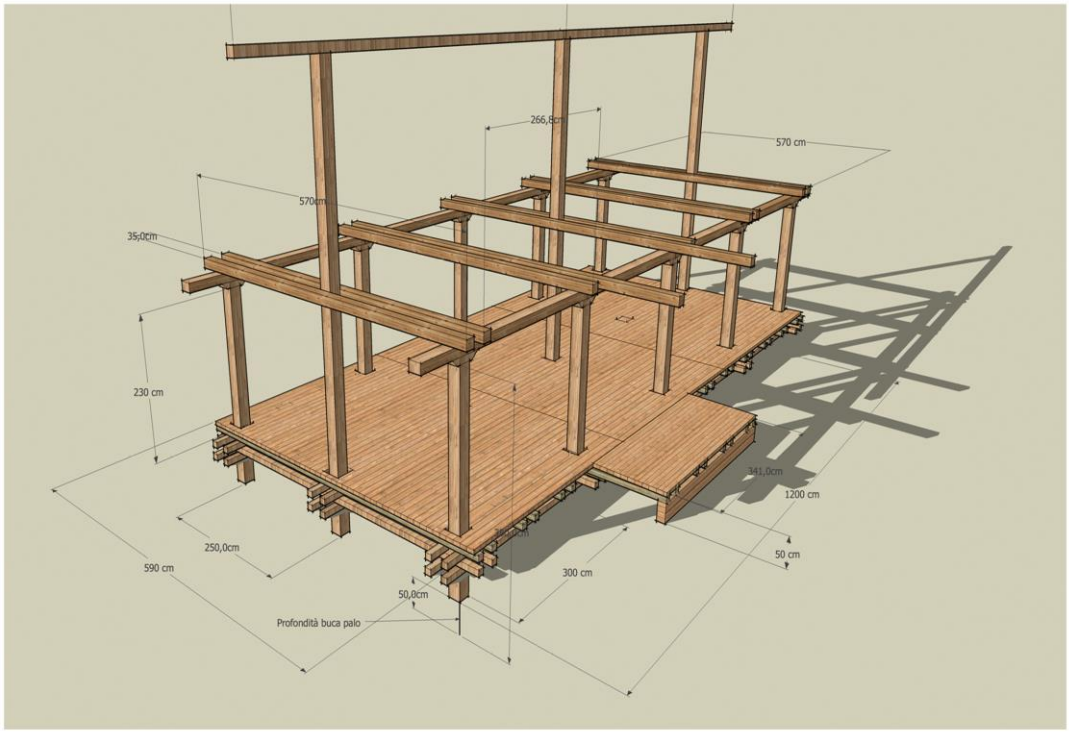
[5] Zamboni L., "*Case di legno e d'argilla. Urbanistica, tecniche edilizie e vita quotidiana a Spina tra VI e IV sec. a.C.*", Spina 2017.

and this in order to avoid ground subsidence phenomena when the frame was stressed by seismic events or strong gusts of wind.



Spina, Struttura 1: particolari delle travi di fondazione


680,0cm
330,0cm
250,0cm
50,0cm
Profondità buca palo
300 cm
1200 cm


266,8cm
570 cm
570cm
35,0cm
230 cm
341,0cm
1200 cm
250,0cm
590 cm
300 cm
50 cm
50,0cm
Profondità buca palo

The frame of the house

The surface

As for Structure 1 in Spina, its floor plan is not fully documented. However, its orientation (NNE-SSW), the rectangular plan and the extension of the surface for at lease 10.5m in an East-West direction and almost 9m in a North-South direction, with a perimeter consisting of powerful horizontal beams on which the elevations were set. The need for modern reconstruction, in parallel with the multiplicity and diversity of Spina's housing phases, means that design solution adopted cannot stick to a specific spinete phase, but constitutes a sort of adaptation that "crosses" the phases taking into account the needs of current use of the facilities. The planimetric dimensions were thus established taking into account both the excavation data and the limitations imposed by the surfaces on which to intervene.

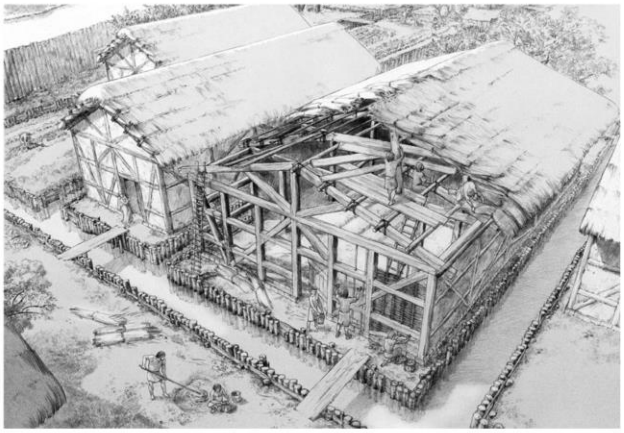
Roof pitch

The very scarce presence of roof tiles in all the settlements phases of Etruscan Spina leads us to believe that the construction of a roof marsh reeds, easily found in the lagoon area, is certain. This solution has repercussions on the structural aspect of the wooden frame, resulting in the need to give the pitches a slope greater than 40 degrees, in order to ensure the correct disposal of rainwater and snow.

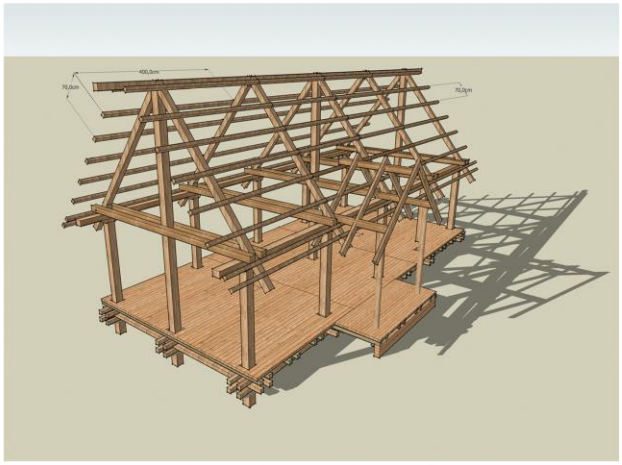
The steep slope then implies the preparation of a frame within which the roof beams are not simply supported on the horizontal entablature but stably constrained with a hinge, so that they act as a chain. The structure thus acquires a particular stability to tangential loads, those mostly derived from the "sail" effect that the large surfaces of the water table offer to the pressure of string winds.

One of the solutions hypothesized in the literature, that of "frame" load-bearing walls, does not seem to take into account the strong real slope that the pitches of the roof should have had depending on the type of roof. Load-bearing wooden walls are not documented for the period considered, being instead widespread in later times, when in urban areas it is necessary to reach elevations higher than those offered by medium-maximum size of the stem of the tree species (7-9 maximum meters of the central pole), this introducing the use of the "truss" solution for the supporting entablature of the roof.

Ricostruzione ipotetica del sistema di travature dell'edificio di II fase (periodo IX) da Cappuccini-Mohr 2017.



Ricostruzione ipotetica dei modelli abitativi di Spina di V sec. a.C. (da Zamboni 2017)



Floors and roofing

Life plans

As regards the flooring inside the houses, it is not clear from the archaeological evidence whether it was rammed earth or rather wooden planking (not preserved). The latter seems to be the most likely solution as it allowed the living areas to be kept dry an insulated from humidity. A raised floor and wooden planking is also documented in the 5th century BC in Adria and in the IV-III century in Monte Bibele. Today as then, this solution also implies a better preservation of the flooring, an optimal usability of the structures and easier maintenance of the same. The mezzanine floor is also technically induced by the presence of clamping beams of the support poles of the deck and by the consequent raising of the walking surface.

The reed cover

In Spina, the roof of the first phase houses was certainly a covering in strips of marsh reeds, perhaps mixed with straw, according to a local tradition that survived in the Venetian huts. This type of solution was able to guarantee a long life to the roof, excellent thermal insulation and at the same time a high degree of waterproofing of the load-bearing elements of the house.

Adria: tavolato basale di un'abitazione del V sec. a.C.

The bundles of reeds were arranged in layers until reaching a thickness if 35-40cm and tied to the roof currents with woven hemp ropes, that are documented in Spina by palaeobotanical investigations.

The ridge could be completed by intertwined transversal bundles, and it has been hypothesized that it could also be reinforced by a row of clay tiles, which in Spina are however rare until the full fifth century B.C. and increasingly only with the Hellenistic phase. Taking into account the presence in Spina of a lively ceramic manufacturing industry, the scarcity of bricks makes certain the general adoption of this solution, the simplest and cheapest given the wide availability of reed in the lagoon area.

Given that most of the approximately 30 fragments of tiles found come from the filling of the canal, and that the finds of tiles are also rather small (about 40 frr. in all the published material), it seems likely that the solution of roofs in perishable material has long been the favorite.

Undocumented but likely with respect to the structural solution adopted is the preparation of large side roofs at the accesses to the houses arranged under the roof line, which guaranteed the protection of the interior from meteoric infiltrations.






Walls and infill

The half-timbered wall

For the reconstruction of the elevations there are some archaeological clues: large quantities of raw clay pressed with imprints of branches and reeds (entangled) and some parallelepiped blocks of raw clay, probably dried in the sun. It has been hypothesized the existence in ancient times of wall frames buffered with lattice techniques, fixed on orders of horizontal interlocking foundation beams. The blocks, identifiable as bricks, are numerically small and perhaps can be traced back to specific parts of the buildings (presumably the lower parts of the wall, next to them).

Spina, frammenti di lastre di intonaco e frammento di mattone (in basso). A destra, edificio di II fase (periodo IX): fossa di fondazione di una parete colma di lastre.

In Spina the introduction of a new type of cladding is also attested, already in a rather ancient phase; a sort of system of clay plates, finished and painted on one side, returned in abundance in the collapses of the structures starting from the second fourth of the fifth century BC. Over 2500 fragments of plaster of various shapes and sizes, of orange, purple and very light-yellow color, have – on one of the two well smoothed and finished sides – a rather thick englobe that takes on different colors with a predominance of red. With regard to the use of these slabs, not well clarified by the excavation data, it was assumed that they were wedging of ducts for housing horizontal beams, for the purposes of protection and insulation of the wooden elements of the foundation and elevation.

Similarly clay slabs were found in S. Basilio and Adria and interpreted as wall plaster. However, it cannot be ruled out that plaster and trellis were intended for different walls of the same environment (internal and external), or to buildings with different functions (e.g. plaster for the residential ones, trellis for the service ones).

The “lattice” infill solution of the interaxis of the upright poles, certainly documented here by the bodies of plaster smoothed on one side and with traces of hooked on the other, does not imply any other structural support element that justifies a load-bearing frame, requiring only the insertion of small alternating poles within which to move the weave.

The reconstruction of this technique carried out at the Museum of Monterenzio and at the Area of Archaeological Naturalistic Interest of Monte Bibele have demonstrated the effectiveness of this solution both for the construction of internal partitions and for the construction of external walls between the centre distances of the wooden frame, resulting in highly resistant and durable plastering.

Facades, entrances and doors

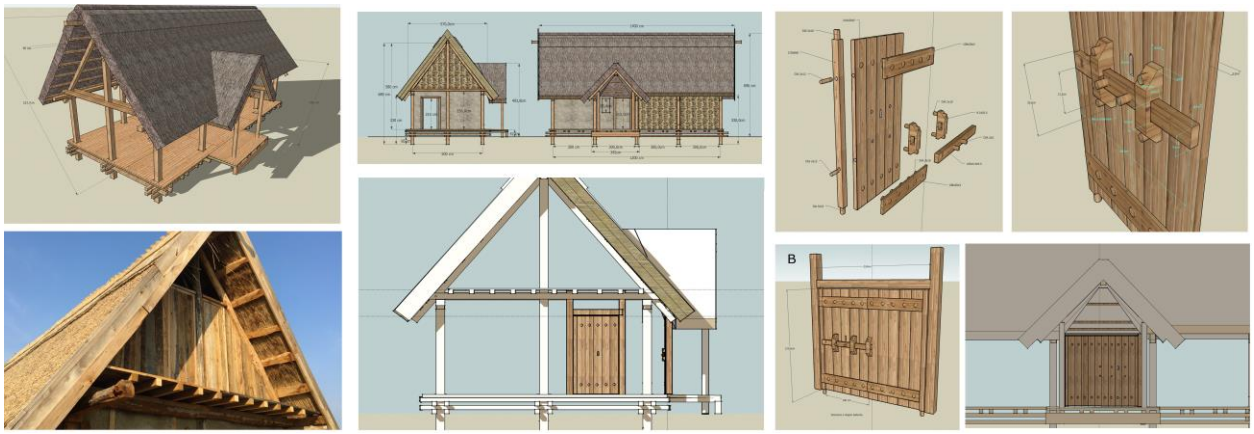
The facades

The steep slope of the pitches of the roof, necessary to guarantee the impermeability of the roof in marsh reeds, and the consequent considerable height of the wooden deck, make it plausible to prepare a second floor inside the house, level of the crosspieces that make up the base of the eardrum. This solution, combined with the string overhang with respect to the façade of the pitch current and joists of the floor, results in the possibility of creating a small external balcony on the façade with a small access door at the level of the upper floor.

The access

The ambient pitches of the roof, which descend on the sides beyond the perimeter line of the poled to protect the walls, ensure that even on the ground floor the most natural opening of the accesses to the house is on the two facades, as these are not affected by the pitch lines and from the draining of rainwater.

The presence of lateral entrances, documented in some houses of the contemporary Etruscan village of Monte Bibele, on the Bolognese Apennines (Monterenzio, Bologna), involves the construction of a large roof that breaks the eaves line of the aquifer, and which is placed to protect the entrance. Its large dimensions, which derive from the need to keep the sloped of the roof constant with respect to those of the main roof, prepare the width to accommodate the main entrance of the house, with a double door.



The doors

Also from the contemporary Etruscan village of Monte Bibele (late 5th-4th century BC), the existence of iron keys or locks in this type of dwelling was ascertained. In the reconstruction of the doors, a similar possible closure solution with gear latches was thus hypothesized, in wood functioning both for single-leaf doors and for double-leaf side openings.

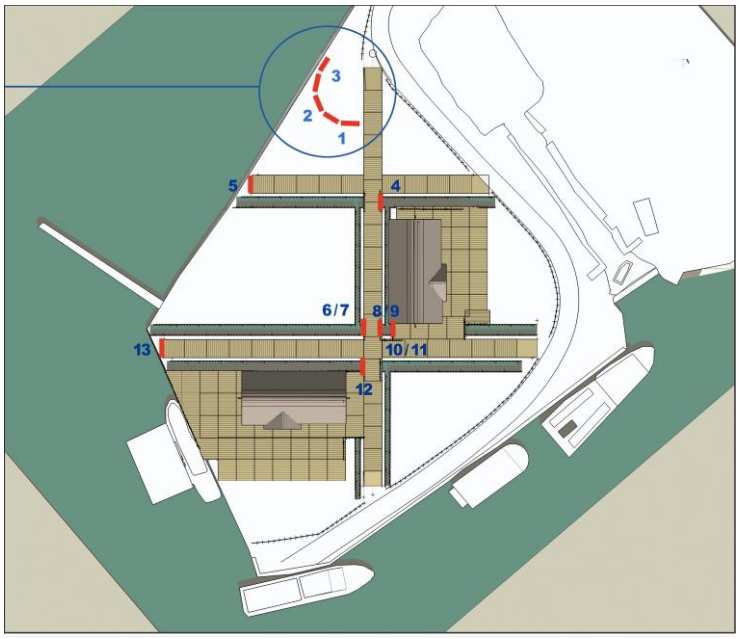
Themes of the visit itinerary

The VALUE Project

1 The Open-air Archaeological Park of Spina

2 The Open-air Park project

3 General framework for the insertion of housing models and platforms. From the project to the construction site.



The Etruscan city of Spina

4 Spina and the Padana Etruria

Spina archaeology

5 Research history

Objectivity and interpretation

6 Construction materials; works of canalization, reclamation and drainage

7 Rituals of urban design

8 Housing models; Elements structural foundation

9 The frame of the house; the surface; the supporting structure; the slope of the pitches

10 Floors and roofing; life plans; the reed cover

11 Walls and curtain walls; the trellis

12 Facades, entrances and doors

13 Spina: from the Tyrrhenian shores to the Adriatic. The geographical horizon in front of you