Structural organization and functional distribution of rooms
in Madrid architecture of 17th and 18th centuries:

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Several domestic architecture built in Madrid in the 17th to 19th centuries still surveys in the historical centre of Madrid, in general with a very poor conservation. In the last decades many of them have been demolished and not always due to a danger of collapse. Nowadays awareness of the cultural heritage is growing in the society and conservation (usually, in Madrid, there are only conserved the facades) is encouraged over substitution. Although this is very positive in general, a rational and deep reflection about the original way of construction and the consequent rehabilitation process itself is missed.

The essential purpose of this paper is to study the origin, evolution and functional distribution of rooms throughout these three centuries and how these changes can be reflected in their structural organization. This study follows three main lines: 1) investigation and selection of the most relevant documents of the 17th to 19th centuries; 2) arrangement and chronological classification, and 3) typological structural classification of them. The main point of the documental approach of this paper is an investigation work based upon the Historical Archives of Madrid and contains: a) graphic information including elevations of the facades, floor plans, sometimes displaying the functional distribution of rooms, and much more rarely, cross sectional views of the building, and b) written information about contracts of works, work conditions, records, architects, clerks of works, etc.

The main structure of this paper follows the next lines: 1) documental historical approach, 2) structural organization of the domestic architecture and, 3) contracts of works: functional distribution of rooms.

DOCUMENTAL ANALYSIS

The documental historical approach made to reach the aim of this paper follows two main lines: 1) Madrid by-laws, and 2) The original documents found in Madrid historical Archives, that is, a) Archivos de la Villa Secretaría, AVS, and b) Archivo histórico de Protocolos, AHP. The unity system employed in all of these documents are typically castillian feet, castillian finger, etc, and it was not substituted until the end of the 19th century, when the international unity system was generally introduced in works. We will next analyse each type of document.

Madrid by-laws

In this section we have consulted Madrid by-laws beginning a) with those written by Torija in 1661: this by-laws were not real ones as it was not compulsory to follow them, but they served as treatises or guides of construction for builders during two centuries; b) those written by Ardemans in 1719 which were a
recopilation of the previous ones and were also employed as guides of construction for people involved in works. C) the by-laws published during the 19th century (1847, 1854, 1862, 1892): the last ones attended mainly to urban aspects of building design in Madrid, that is, the definition and classification of streets according to building height, which served as a social indicator (the principal or first floor were reserved for upper social class and last floors and attics for workers or lower social class); and finally d) the New Ensanche's by-laws (1860): at the end of the 19th century a new by-law was published restricted to those new houses that could be built in the new urban areas created in Madrid, the new barrios or also called the «Ensanche». This type of document do not really advance many ideas about the practical distribution of rooms but regulates the maximum height allowable in the buildings.

**Madrid Archives**

The graphic and written original documentation of the functional distribution of rooms in Madrid houses built along these centuries is studied in this section as follows: a) documents found in the Archivos de la Villa Secretaría, AVS, and b) contracts consulted in the Archivo Histórico de Protocolos, AHP.

Archivos de la Villa Secretaría, AVS

This archives are very deep related to the graphic information as they content all the elevations of the façades (it was compulsory to be approved by the local government before carrying out the works) built in Madrid in these period of time. But in what concerns of the functional distribution of rooms, and the information contained in the cross sections, mostly for those houses built in the early years of 17th and 18th centuries, was not often presented. As the 19th century goes forward, the graphic information is more detailed showing in most of the documents analysed not only the façade or several façades when there were, but the individual plans of the different floors, that is, ground floor, first or main floor, second floor and mainly in 19th century third floor: the graphic information of the caves and the attics is only occasionally showed.

In this archives we will show the type of document containing the works licence application; the graphic information including: floor plans, in most of the contracts selected displaying the functional distribution of rooms, the elevation of the façades, some cross sections and a graphic scale in castillian feet; and a written information about the people involved in works, such as, architects, clerks of works, owners, builders, construction systems employed, prices of the materials before arriving at works and final construction prices.

Archivo Histórico de Protocolos, AHP: the contracts of work

Once the previous introductory ideas have been set out we can advance that the essential purpose of this paper is to work out an evolution of the essential ideas that lied in the contracts of works found in the last investigation work done in the Historical Archives of Madrid, AHP, after making a transcription of the original documents. To a better understanding we will follow a chronological study of them. As we mentioned in the previous section, in this contracts we will be also analysing: the type of contract document: 1) new houses construction, 2) rebuilt houses, 3) repairing contracts, 4) houses division documents, 5) title deeds, 6) expert valuation of the houses, 7) renting contracts, etc; the graphic information, that is, floor plans, in most of the contracts selected displaying the functional distribution of rooms, elevation of the façades, cross sections, the graphic scale, and the written information, such as, the explanation of the functional distribution of rooms.

**Main Structural Organization**

From a structural point of view, the main structure of the building was organized, basically, with several bays or spans placed parallel to main façades with a separation of around 15–20 feet and a main court of around 20 feet × 15 feet, placed next to the second span in where the wall sections decreased in respect to the main wall or façade. The construction consisted of a structural wood framework both vertical and horizontal, usually called «entramado» placed over a foundation and a ground floor built both totally with
masonry from the main floor or «cuarto principal» until the roof. The basic criterion to build them layed in the width of the «carrera», that is, the beam placed horizontally in the walls, and from it they dimensioned the rest of the wood structural elements, decreasing in width as the house grew higher. The spaces left between the vertical and horizontal wood elements were filled with different materials, such as bricks, rough masonry work, sun-dried brick, etc. Also the construction of the roofs was solved with a wooden structure. This historical construction systems made of wood, in what concerns of the main wooden elements dimensions employed, were perfectly regulated and controlled by the local government at least from the 17th century, and later on were slowly being substituted by masonry work as most by-laws of that time reflected.

**Vertical structure**

The maximum height allowable for each floor was controlled, as it has been reflected in the table 1, by the local government throughout the different by-laws, so the main vertical wooden elements length depended on it, that is, a) the cellar height was usually of around 9 feet height (2.60 meters) and they were totally built with masonry work, b) the ground floor was also built with masonry and had more than 14 feet height (around 4.2 meters), c) the main floor was basically built with a wooden framework or totally with masonry of more than 10 feet high (around 3.0 meters); d) the second floor, third floor, fourth floor, etc, of around 10 feet (approximately 3.0 meters), and e) the attics height started to be controlled in the 19th century and they should be of more than 9 feet height (2.60m). An example of it can be seen in figure 1.

<table>
<thead>
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<th>WOOD STRUCTURAL ELEMENTS MAINLY USED</th>
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<td>NAME</td>
<td>Length feet</td>
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<td>MADERO DE A 10 DOBLE</td>
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Table 1

The vertical structure was organized as follows: a) main walls, b) secondary walls or thin walls, c) party walls, and d) partitions.

a) The main walls were built in the main bays or spans, that is, they were located in the main façades, in the internal walls following the direction of façades and in the interior court walls. These main structural walls usually decreased in section as the façade wall grew higher being the wall initial width around 3.0 feet and this section was reduced a quarter of a foot each upper floor until the last one which had 22 feet width.

b) The thin walls, «citarras» or «tabicones» (or thick partitions) were secondary or «traviesa» walls.
that cut main walls perpendicularly. They had a width of 3/4–1 foot (21–28 cm) and were located in interior court walls, interior walls and staircases. The section of the wood elements used in the «cituras» also decreased as the house grew higher. That is, the ground floor used beams of tercias, the main floor used beams of sesma, the second floor beams of «maderos de a 6», the third floor beams of «maderos de a 8», and so on.

c) The main structural function of the party-walls was the lateral or back separation of neighbouring houses. They had a width of 3/4–1 foot (21–28 cm). Clerks of works used to build them perpendicular to main walls and to the rear of houses. As with the main walls discussed previously, the vertical section of masonry party walls also decreased with height, being reduced by around 1/4 feet in width at each floor. In this way party-walls had a typical width of 3.25 feet at the ground floor, 3.0 feet at the main floor, and so on until the roof.

**Figure 2**
Wood horizontal structure. C/ Relatores

**Horizontal structure**

Historically floors were built in wood until the end of 19th century, when they began being built with steel beams. The horizontal structure, as it can be seen in figure 2, consisted of a frame of timber beams supported in main walls covering main spans of floors; in buildings of only one bay (span), for very small distances (3.0–4.0) meters, the beams were directly supported on the masonry or timber-framed walls; when the spans were of medium length, that is, (5.0–7.0) meters, the beams were placed perpendicular to main walls and small beams following the direction of main walls; in those houses with large spans, that is, (8.0–9.0) meters, it was recommended to build the house with two bays (spans) following the timber beams the longitudinal direction. The perimetral supports were solved whether in the lateral party-walls or in the façade and back court walls. The central supports were solved with pillars or with secondary walls or «cituras». Even if the spans were in every floor the same, the section of the timber framed floors could vary depending on the height of the house: main floor, second floor, third floor, etc.

**FUNCTIONAL DISTRIBUTION OF ROOMS**

The inclusion in the houses functional distribution of rooms of several spaces destined to a concrete domestic function, such as, courts with a well, kitchens, dormers or attic windows («boardillas»), windows at street level in cellars («lumberas» or «troneras»), etc, as most contracts and records of works in the historical archives mentioned, always were a concern in the construction process but, as it was not compulsory to sign a contract of work before building a new house, there are not many documents in which this evolution can be studied. Nevertheless in those analysed showed an original information mainly for two reasons: the scant investigation work done until today in this subject, and the relevant details that can be studied if compared them altogether. The main functional distribution of rooms attending to the people that owned the houses can be classify in two groups: a) Individual houses, and b) Tenment houses or renting houses and among them, the typical and so called «corralas».

**Individual houses: general functional distribution of rooms**

This houses had an owner who lived in the so called first floor or main «room» and other floors or rooms used for «servants» or for renting them. Usually when relating to Madrid houses is very often seen to called each floor as «cuartos». Historical houses built in Madrid, principally
those placed in main streets, often had stores in the ground floor and cellars or undergrounds under them. Both were communicated by staircases or even provisional stairs. Typically the houses had four or five floors over the cellars: ground floor, main floor, second, third and attics (roofs), depending on the width of the street they faced. We will study all these aspects starting from the underground level.

Underground floor or cellar (also called «cueva»)

As we can see in the façades plans they used to build an underground floor or a cellar of around 9 feet under the street level. It was communicated with the ground floor by an staircase and sometimes even with a provisional ladder. Usually they opened small windows called «lumbleras» facing the main façades to ventilate and to light them.

Ground floor

If the house had a cellar, the ground floor was usually elevated some feet above the street level. We can find a wide information about the functional distribution of rooms at this point because it was nearly the only floor drawn. The houses usually had two entrances in the main façade: 1) a big door destined to the livery stable and linked with the stable and an interior court with a well, and 2) a house main entrance with an entrance-hall («zaguán») and linked with the main staircase. This functional distribution of rooms can be seen in the following document containing an elevation of the façade and two floor plans: the ground floor with the following distribution: 1. entrance-hall, 2. way to the stable, 3. main staircase, 4. main «sala», 5. second «sala», 6. secondary «sala», 7. «alcoba», 8. stable, 9. livery stable, 10. courtyard, and in the first or main floor with the numbers: 1.
Figure 4
House built in the Puerta del Sol (1729). 1.66.136

Figure 5
House built in C/ Carrera de S. Jerónimo y c/ del Pozo (1750). AVS. 1.84.128

The main staircase, 2. servants anteroom, 3. old servants anteroom, 4. main lady's room, 5. secondary lady's room, 6. «gabinete» or lady's private sitting room, 7. «alcoba», 8. secondary «alcoba», 9. Pastry, 10. secret staircase for servants, 13. court, and 14. corridor. The document from 1737 which is shown in figure 3, doesn't contain information about the second floor, but the main structure was similar to the first floor.

The main room was the living-room or «sala» nearly always linked to another room which had neither light nor possible ventilation called «alcoba». Depending on the depth of the ground, the house could have one court of around 20 feet by 15 feet, or several courts, usually with a well and with the kitchen near them. When there were a secondary court, it had often a secondary staircase, a kitchen and the servants rooms linked to it, as it is shown in figure 4. The construction of courts, was one of the most important «pieces» of a Madrileñian house as they served to light and ventilate the interior rooms, but its construction was not regulated until the by-laws of the last 19th century. In nearly all of the houses there were «rooms» called «alcobas» without any possibility of lighting nor ventilation, which remained linked to a main room.

First floor or main floor

Sometimes the ground floor faced totally to a commerce street and all the rooms at street level were not living rooms but secondary ones whether
«cocheras», kitchen, houses stores, or destined to shop stores, leaving in that case the upper floor, that is, the first floor, as the main one. This can be seen in the figure 5 shown below. In this case the house faced two streets, to the main one, c/ Carrera de S. Jerónimo, three rooms, the main entrance linked to the main staircase and two stores each one with an individual staircase linked to an upper floor or entresol and with a backstore facing the courtyard; and a secondary one, c/ del Pozo with the livery stable and a secondary entrance linked to secondary rooms: the cellar, a secondary staircase and some rooms around the court. The functional distribution of rooms is the following: 1. entrance hall, 2. staircase, 3. store, 4. backstore, 5. rooms around the court, 6. court, 7. livery stable, 8. way down to the cellar, 9. secret stairs, 10. stairs to the entresol. As in the previous figure there is no information about the rest of the floors: first floor or main floor, second, third and attic. In the upper floors the access to the interior rooms was solved by the corridor, a narrow way built over the courts.

Second floor, third floor, etc:

This floor had a very similar organization as the first or main floor and repeated the basical organization of the functional distribution of rooms. The main rooms faced the streets and the secondary rooms, kitchens, servants rooms, etc, were left to the back part or to interior courts.

Last floor or attic

In the last floor of the houses there were the so called «desván or buhardillas» which were not living rooms (the height was of very few feet) but, in practice, they were in the early years the servants rooms and later on, in the 19th century, when owners started renting the houses to workers, the home for several families which couldn’t afford a better lodgement. One of this kind of houses shown in the figure 6, is organized following the main ideas explain in the previous lines. The information about the functional distribution of rooms is the following: 1. entrance to the store, the «alcoba» and livery room, 2. receiving room and entrance to the staircase, 3. store, 4. living-room, 5. «alcoba», 6. kitchen, 7. servants room and storeroom, 8. court, 9. livery stable, and in the main floor with the numbers 10. receiving room, 11 rooms, 12. alcobas, 13. bedrooms, 14. kitchen, 15. store, 16. court, and 17. main staircase.

In 17th and 18th centuries the houses often had a yard or «corral» in the back part of the house with a simple adobe wall which separate those from the neighbouring but, as the town was growing, new houses were built in the backpart often with no light to streets but to interior courts.

The possibility of building attic windows or dormers existed during 17th–19th centuries and was a controversial subject in the by-laws of domestic architecture in Madrid. Due to health and hygiene considerations, it was frequently debated whether to allow or to forbid them. From a construction point of view, Ardemans (1716) and some other clerks of works always pointed out that they should be built in the same vertical line as main walls and lined with windows and balconies and never facing party-walls.

At the end of 18th century, Villanueva (1790) suggested to suppress them, «as the experience always reveals that through them the fire spreads
promptly». Nonetheless they would not be forbidden until the «Reales Órdenes» of 1834. In the «by-laws of 1892 this prohibition is kept and also the fact of allowing to use attics as living rooms, except those placed at the backs and which were over 9,0 feet in height.

Community houses or renting houses

The «corrals houses» is a typical community madrileñian house built along these three centuries and some still survey in the historic centre of Madrid. The «corrals» walls were made of open wooden framing of vertical and horizontal timber elements which supported the galleries around the interior courtyard. Its basic structural organization is a quite big central court with a staircase and several small «lodgement unities» or «cuartos» displayed around it. At street level or in the so called «cuarto baxo» the entrance was directly from the court and in the upper floors, usually only two more, the main floor or «quarto principal» and a second floor, both with the same functional distribution of rooms, had a corridor all around the central court which served to get to the different «cuartos». Each lodgement unity was very small and has usually three rooms or pieces: a main one or «sala» with balcony to the street if it faced to both sides, the street and the court, and two small ones linked to the corridor at the court: the kitchen with a small window and a room at the entrance. This general structural organization can be clearly seen in the figure 7 shown below with the following numbers, in the ground floor or «cuarto baxo»: 1. entrance, 2. staircase, 3. courtyard and well, 4. lodgement with two rooms and from number 5 to number 13 all the lodgements with three rooms and,
in the main floor, and as it is said in the plan with the same structure for the second floor, the following functional distribution of the lodgements: 1. staircase, 2) corridor, 3) dumping place, and from number 4 to number 13 all the lodging unities with 3 rooms.

In what concerns the regulation of including a special room in each house for a toilet did not exist until the end of 19th century. First the toilets were the farmyard of the houses, later on works included a comunitary toilet, called the «comun», located at the end of a community corridor, and in the last years of the 19th century the new by-laws in the new urban areas of Madrid included several regulations about it, but even in the 20th century many unity lodgement had not an individual toilet.

**THE CONTRACTS OF WORK**

In the previous section we have shown a general revision of the main functional distribution of rooms. In the following lines we analyse the main contents of the contracts of works related to this purpose following a chronological exposition of the contracts of work. This study also includes the most relevant plans of each period of time and some parts of them which have been literally transcripted.

**The contracts of work in 17th century**

The first document analysed in this paper is a contract of work of a house built in Madrid in 1626 which...
shows the elevation of the façade and the first floor with some notations on it. We can observe an original superposition of both of them. The displaying of rooms is as follows; a ground floor, also called «sala baja» which includes: the main entrance with the entrance hall linked to the staircase, the secondary entrance and the kitchen, and a living room; a first floor, also called in the elevation of the façade, «sala alta», containing the main rooms and the last floor built in a lower height used for servants. This document doesn’t contain any scale or measurement unity system, but as it can be clearly seen in the graphic information, the walls were built with different widths: the main structural wall, the façade, is about three feet width, the interior structural wall is about two feet width, and the partywalls which are represented beside the neighbouring ones are of around half the width of the façade, that is around ½ feet. This can be seen in Figure 8.

The next document analysed here is a partition contract of a house built facing two streets Valverde and Fuencarral in 1694. Even if we don’t conserve any written information, the plan we will see next is one of the most relevant documents found. This plan made in castilian feet clearly reveals the most common way of building a house in Madrid by that time: a) a house which usually faced two opposite streets, with a back length of 200 feet, that means, very long related to the length of the two façades being the main one of 49 feet long, and the secondary one 25 feet long. This aspect is very important as it «oblige» to build several interior courts, that even if they are really small, they serve to light and ventilate the interior rooms, and on the other hand they multiply the number of «alcobas» or rooms which rest dark and without any lighting possibility, and b) The distribution of rooms is starting from the main entrance as follows: the entrance hall, the livery stable linked to a back stable, the main staircase, several interior living-rooms or main rooms nearly always linked with those «alcobas» mentioned above and a central court with a water spring and in the opposite side or starting by the secondary entrance we found again the same structural organization of the house: a main room linked to a secondary one or «alcoba», a secondary staircase, another court with its well and a garden. All this information can be consulted in the graphic shown in figure 9. One of the most relevant information given in it is that includes in each room the kind of floor which must be built, that is, the wood structural elements employed: «maderos de 6’», maderos de 8’, etc, and the main wood elements direction, that is, the walls which support them.

The contracts of works in the 18th century

The next document analysed and shown in figure 10 is a renting contract document with a schematic information about the three floors functional distribution of rooms. As we can see in them, the house had three floors, here shown as first plan, second plan and third plan with the following distribution; for the first one: 1. entrance, 2. «sala» or main room, 3. 「alcoba»), 4. room, 5. kitchen, 6. stable, 7. courtyard, 8. staircase and 9. well. In the second
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The next document selected in this section is a very detailed new house building contract containing graphic and written information about the functional distribution of rooms. Related to the first one and as we show in the original document in figure 11, the distribution of rooms is as follows: 1. main staircase, 2. entrance hall, 3. main staircase, 4. livery stable, 5. «Cuarto bajo» facing the street, 6. Interior rooms, 7. corridor, 8. rooms impossible to get to in the upper floors, 9. main courtyard, 10. small courtyard, 11. rooms facing the small courtyard.

... Plan de la casa del señor D. Francisco Gedeon y Hinojosa, de la Calle de la Magdalena, se entenderá del modo siguiente. Fachada principal a dicha calle de la Magdalena se demuestra con el número 1. Zaguán nº 2.

Figure 11
Rebuilt house contract. AHP Nº 16.430 (1737)

The next document is an expert valuation of three houses. For the three of them, the main structure of the document is very similar: a) an emplacement description, b) the house and the construction systems employed description, and c) the final valuation of both, the emplacement and the house. The most relevant information shown for this paper is related to second part, the distribution of rooms and we will refer only to it. For the first valuation, the house rooms are the following ones (the plan shown in figure 12 is related to the main floor) beginning from the C/ Flor Alta: living-room, «alcoba», kitchen, servants room, dining-room linked to the courtyard, courtyard with its corridor, receiving room and main staircase, and in the opposite street, beginning from the staircase: receiving room, courtyard linked to an
anteroom and the living-room this one beside the "alcoba" and the servants room with a secondary staircase, a no lighted private room and facing the backstreet c/ de la Cueva: the dining-room, the kitchen and the childrens room. They are mentioned in the next lines the main distribution of rooms

... Como se demuestra en el mapa que queda figurado, hacen de área superficial: siete mil ciento y veinte y ocho pies y medio quadrados de sittio, con lo que le toca y pertenece de sus medianerias, á los quales dándose su justo valor, como á la fabrica de que se componen sus viviendas; y es en la fachada principal en lo bajo su zaguán, patio, cochera, y cavalleriza en los sottanos, y la escalera principal; un quarto principal de siete piezas y enzima quarto segundo y tercero, cada uno de seis piezas y un paso y desde dicha escalera principal se manda para un quarto bajo y un principal, cada uno de nueve piezas.

For the second house there is not any relevant information related to its rooms, and about the third one it says:

... Y haviendo dado a este su justo valor, como á la vivienda de una tienda Cuchilleria, con su pieza dètras y devajo un poco de cueva, y pedazo de sottano, y enzima de la tienda su desban gatiero. A la fabrica que es una tienda trasstienda, escaler para subir al quarto principal que se compone de sala y alcobamiento estrecho y todo muei maltrattado, valen según al presente se hallan, sitio y fabrica, diez mil ciento y seis Reales Vellon ... Nº 16.366 (1741).

The next document studied in this section, is as the one mentioned just above, another expert valuation of a house, this document shown in figure 13 follows the same structure as the previous one being in this case a house with a "wine cellar". In what concerns the functional distribution of rooms it contains: main entrance hall, thirteen rooms, a wine cellar and a wine press, two rooms, two courtyards and a staircase. The most relevant information is mentioned nextly, it says
CONCLUSIONS

Houses built in Madrid had in general a very large depth ground related to the extend of the main and secondary façades which obligated to built a succession of several courts to light and ventilate the interior rooms, but they still left many rooms without any possibly of lighting nor ventilation, the so called «alcobas». The regulation of including a toilet didn’t appear until the last years of 19th century building them, in general, in the corridors. Houses had several staircases, the main one was near the door entrance and a secondary one was in general built in the last part of the house and near the kitchen and the servants room. Related to the main dimensions of the structural elements, the historical approach made throughout the documents analysed verified the uniformity of the structural wood elements, both vertical and horizontal, used to build the frames along this time, so the small variation of the functional distribution of rooms did not have an effect on the structural organization of the houses construction.

NOTE

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REFERENCE LIST


Villanueva, J. 1984. *Arte de la albañilería o instrucciones para los jóvenes que se dediquen a él, en que se trata de las herramientas necesarias al albañil, formación de andamios, y toda clase de fábricas que se pueden ofrecer; con diez estampas para su mayor inteligencia*; Zengotita Vengo, Pedro. 1827. Imp. Francisco Martínez Dávila; Madrid. Editora Nacional, Madrid.

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