Structural Analysis of Historical Constructions, New Delhi 2006
P.B. Lourenço, P. Roca, C. Modena, S. Agrawal (Eds.)

An Analysis of Porched Courtyards in Mosques of the Classical Ottoman Period

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ABSTRACT: The courtyard and porch motifs in Islamic architecture and in the mosques that are the basic building type of this architecture were used very widely. The porch, a half open space, becomes a porched courtyards or portico courtyards that were placed in the vicinity of either a square or rectangular planned courtyard as a unit element. In Ottoman architecture in the 16th century, known as the "classical period," the mosques with porched courtyards are the Yavuz Selim, Şehzade, Süleymaniye, Atik Valide, Nişancı Mehmet Paşa and Edirne Selimiye.

In this study the porched courtyards of the mosques identified above will be examined from the point of view of the structural and modular system, the measurements of the architectural elements and a numerical analysis made and the materials identified. In the end an evaluation related to the classical period of Ottoman architecture will be made relying on specific measurements.

1 HISTORICAL DEVELOPMENT IN ANATOLIA OF THE MOSQUES WITH PORCHED COURTYARDS

In Islamic architecture the courtyard is a widely used motif. The mosques that are the basic type are buildings made up of an inner courtyard that occurs in front of the space that's generally with an enclosed space for worship. From the middle of the 12th century the Turks who came to Anatolia used interior courtyards in the schools (medrese) and caravansarays that they built, but in the mosques they didn't use this motif. The first Turkish mosque with a courtyard known in Anatolia is the Sivas Ulu Camii (1197) (Kuban 1970).

Another architectural element frequently used in Islamic architecture is the porch. Its top could be covered with a vault or a dome, the front face is an arch and the porch that is a half-open space as a unit element became porticoed courtyards located in the neighborhood of a courtyard. At the end of the 14th century the Seljuk Isa Bey Camii (1374) that was built in western Anatolia and the Manisa Ulu Camii (1376) are the protypes of the monumental mosques with interior courtyards that developed in the Ottoman period (Kuban 1970).

The first porched courtyard mosque built in the Ottoman period is the Edirne Üç Şerefeli Mosque (1437-1447). This mosque influenced the plan design of all the sultan mosques that were to be made after it with its porched courtyard and minarets located at the corner of the courtyard and became the leader of the classic Ottoman style. It is said that ever since the Üç Şerefeli Mosque permission was only given for porched courtyards to be used in sultan mosques (Yerasimos 2000). Examples too confirm this. The later porched courtyard was tried on the İstanbul Fatih (1462-1470), Edirne Beyazit (1484-1488) and İstanbul Beyazit (1501-1506) mosques and was developed in the classical period sultan mosques in the 16th century.

In the 16th century the works built by Architect Sinan under the patronage of the Ottoman sultan Kanuni Sultan Süleyman and his family created the classical period of Ottoman architecture. In this period that was named the "Sinan School," Mimar Sinan united the

accumulation of the past of Ottoman architecture with his own knowledge and experience and brought it to classical form. Sinan who was the chief architect of the Ottoman Empire for a long period like half a century was the designer and responsible for 477 buildings and their repair (Kuban 1998). After Sinan the tradition of the porched courtyard sultan mosques tradition continued with the Sultanahmet Mosque (1610-1647), Yeni Mosque (1664), Üsküdar Yeni Valide Mosque (1708), Nur-u Osmaniye Mosque (1748-1755), Laleli Mosque (1759-1763) ended with Yeni Fatih Mosque (1767-1771).

2 PORCHED COURTYARD MOSQUES IN THE CLASSIC OTTOMAN PERIOD

In the classic period mosques the porched courtyards are to be found in only six buildings; in İstanbul Yavuz Selim (1521-1544), Şehzade (1543-1548), Süleymaniye (1550-1557), Atik Valide (1570-1579, 1583) and Nişancı Mehmet Paşa (1584-1588) and in Edirne at the Selimiye Mosque (1569-1575), see Figs. 1-6.

Figure 1 : Şehzade Mosque

Figure 2 : Yavuz Selim Mosque

Figure 3 : Süleymaniye Mosque

Figure 4 : Nişancı Mehmet Paşa Mosque

Figure 5 : Atik Valide Mosque

Figure 6 : Selimiye Mosque

The Ottoman grand viziers in order to remove the prohibition on porched courtyards as a special characteristic of sultan mosques only, while making the schools (medrese) that touched on the mosque space uniting the mosque courtyard with that of the school courtyard (Yerasimos 2000). However in the situation in which a school was not added to the Nişancı Mehmet Paşa Mosque that was not a sultan mosque (Yerasimos 2000), it is not understood how permission was given to apply a porched courtyard.

2.1 General Characteristics of Porched Courtyards

Generally in mosque architecture the architectural characteristics of the worship space that was the main space won importance, the courtyards and the porches that completed this space remained on the second plan. The porched courtyard, because it was made after the main space did not influence the design relations of the main space and its dimensions. Together with this there is an important fundamental that won the mosque character and direction (Kuban 1988). The porched courtyard always in the north of the mosque space, occurred in front of the rear congregation area made up of porch modules. Saying it in another way the four sides of the courtyards that were planned rectangularly or squarely were framed as modules with the square plan and half open space with domes. Some of the porched courtyards have two minarets and some have four. The entrance to the courtyard is provided with portals that opened on the north, east and west sides. The side doors in the east and west occur on the modules immediately beside the portico module of the rear congregational area. As for the main entrance gate it is right in the middle of the north courtyard wall on the same axis with the mosque mihrab (niche showing the direction of Mecca) and the mosque main entrance gate. The floor level of the porch models while was always kept higher than the level of the floor of the courtyard floor creates boundaries between the porches and the interior courtyard.

The fountain occurs in the middle of this area and the inner courtyard that is open above the porch modules borders it. So the porched courtyard is also called the fountain courtyard. Generally the inner courtyard is covered in marble (Yavuz Selim, Şehzade, Selimiye, Süleymaniye mosques) or limestone and it stretches as far as in front of the courtyard doors and the mosque entrance. For the coverings in front of the door red porphyry circles were put down. As the courtyard flooring has been made inclined toward the fountain, rain water that was deposited in the cisterns under the courtyard was ensured. The size of the inner courtyard - excluding the areas in front of the entrance gates- changes between 346 m^2 and 1373 m^2.

In the porched courtyards, the modules control a façade arrangement. The courtyard facades on the inside and outside are bordered with an eave moulding and on this moulding rises eight-sided drum domes and a lead-covered roof. On the exterior facades single or double window arrangements in the lower and upper rows are repeated as modules. The courtyard's main entrance gates were larger than the side doors and more decorated. In the inner facades of the porch modules that overlook the courtyard, with the marble, granite or porphyry columns and pointed archs give the half transparent impression. On what is above the arches and between them, as far as the eave moulding cut stone (Selimiye, Atik Valide, Nişancı mosques) or marble (Şehzade, Yavuz Selim, Süleymaniye mosques) has been used.

3 THE ARCHITECTURAL ELEMENTS THAT CREATE THE PORCHED COURTYARDS

3.1 Domes and vaults

Every single porch module that encircles the fountain courtyard is seen as square planned most of the time they aren't square planned. Sometimes between the two sides of the same poch a difference of as much as 50 cm exists. This difference is reflected in the domes that cover the porches. Generally on the porches that are covered with domes sometimes a vault covering is seen. In the construction of the domes and vaults brick materials were used. On the wooden mould the bricks are lined up as radiating from the center, on the top the domes that were raised as far as the keystone were placed and they were covered with lead. Generally the porch domes that sit on octagonal drums were made without drums in the Nişancı Mehmet Paşa and Atik

Valide Mosques. As transitional elements on the domes there are pendentives that threw the dome's load on to the corners. In some mosques the dome that covers the mosque's main entrance door is decorated with pendentive stalactites (Selimiye, Süleymaniye and Şehzade mosques).

Along side the domes on the porched courtyards or even if a vault form is used it is a mirror vault. For this type of vault the rear congregation area was in door module (Atik Valide, Nişancı Mehmet Paşa, Yavuz Selim mosques), in modules that occur on two sides of the rear congregation door module (Selimiye Mosque), in the courtyard's main entrance door module (Yavuz Selim Mosque) and in the corner where the courtyard porch meets the mosque (Atik Valide Mosque). In order to indicate the main entrances and stress them, the domes and vaults on the modules on the mihrap axis were made higher than some of the porch modules.

3.2 Arches

In every module that the porched courtyard created, at a certain height the portico arches are found that secured the carrying of the dome, and tied each of the four sides together. Generally these arches that are in pointed arch form, sit with the courtyard wall at the back, the columns in front, and the column and wall at the sides, see Fig. 1. It is seen that sometimes the side arches were supported by the pilasters that were created in the porch walls (Şehzade and Atik Valide mosques). The iron tie rod that attached each one of the columns and the walls was used in order to block the arches from being crushed under the weight of the dome and in the case of an earthquake would meet the side loads.

The arch thickness at Yavuz Selim Mosque was 95 cm and at Süleymaniye, Şehzade and Selimiye mosques was 80-85 cm and changed to 50-54 cm at Nişancı and Atik Valide mosques. Also, the arch openings in the porched courtyard mosques was 316-690 cm while the height of the arch changed from 850 to 1000 cm. Between the arch opening that continued side by side in the same courtyard in spite of the appearance of being equal there exist differences that change between 15 and 67 cm (Süleymaniye Mosque). However the heights of these arches that had different openings were kept the same, aside from the door module that was on the mihrap axis. Aside from all these generalities, at the rear congregational area at the Selimiye Mosque - because the structural plan inside the mosque reflected the rear congregation area- on the axis of the mihrap a broad arch opening was used, on the two sides a narrow one and later again the broad arch opening. However there is a difference between the heights of the broad archs and the heights of the narrow arches.

The porched arches found in the same courtyard even if there are differences in the openings and the heights the column heads were on the same level, see Fig. 2. However, in situations in which the heights of the rear congregation area porches and the courtyard porticoes were different or the main entrance porch was raised (Süleymaniye and Selimiye mosques) it had to unite the arches. In such situations, the courtyard arch that was lower, seated on the half column head jutting out at half the height of the column body, see Fig. 3.

On the courtyard side of the bearing arches sometimes only limestone was used (Nişancı Mehmet, Atik Valide mosques), sometimes limestone and red limestone (Selimiye Mosque), sometimes marble and pudding stone (Şehzade, Süleymaniye and Yavuz Selim mosques were taken in turns.

3.3 Walls

The walls that bounded the porched courtyards from outside, carry the domes or the vaults together with columns and arches at the same time. The porched courtyard sidewalls were made as continuations of the mosque's sidewalls. Generally in the walls that were made from cut stone using the technique in which the stones were tied to each other with clamps so that a coin couldn't pass through (akça geçmez). Only in the Nişancı Mehmet Paşa Mosque one sees that the wall fabric is alternating stone and brick. In the Istanbul mosques the limestone known as Bakırköy stone whereas in the Edirne Selimiye Mosque a local stone known as almond limestone was used (Yorulmaz and Ahunbay 1986). Wall thickness changed according to the

mosques. The outer wall of the porched courtyard at Yavuz Selim was 155 cm, at Şehzade the sidewalls were 163 cm and on the north wall 181 cm, at Süleymaniye it was 239cm, at Selimiye 177 cm, at Atik Valide 109 cm; at Nişancı Mehmet Paşa the side walls were 77-95 cm and on the north wall 101 cm. The walls of the courtyards of the Şehzade Mosque and the east wall of the courtyard of Atik Valide Mosque on the inner faces have been thickened with pilasters located on the module axes. The fullness-emptiness on the walls (the total fullness length on the wall-the total emptiness length) proportion at Süleymaniye, Selimiye, Atik Valide and Yavuz Selim Mosques is 30-36%, at Nişancı Mehmet Paşa Mosque it is 45.5% and at Şehzade Mosque it is 54%.

3.4 Columns, column capitals, drums

The columns that are of the main bearers of the porch modules were made of materials like white marble, gray-white granite, pink-white granite, red porphyry, green porphyry and pink pudding stone and a color harmony was created in the courtyards. Because granite columns are more solid than marble, they were especially used on the courtyard corners and the rear congregation porches; and as for the main entrance porch for the courtyard and mosque porphyry (somaki) columns were preferred. It is understood that large dimensioned columns were brought from ancient ruins and used (Yorulmaz and Ahunbay 1986). Generally the columns used as a single piece in special cases they were used in pieces. In the Süleymaniye and Selimiye mosques in order for two arches of different heights to be able to sit on the same column after the column body had been cut at by the capital, they were continued and ended with a second capital. The change from the ancient works shows that some were used as pieces in the columns brought and the places where they united were hidden with bronze rings. The column intervals and diameters together with seeming to be visually equal are not modular. However the capital intervals in the door modules always were kept wider according to the other column intervals. The column diameters in the courtyard porchs change between 35 and 65-70 cm, and in the late congregation place 67-90 cm. Bigger diameter columns were preferred in the late congregation place portico corners. It has been ascertained that the proportion of the column heights in the courtyard porches to the column diameters is 6.5 (the body heights are 13 levels of the half diameters). On the outside of the column, it is seen that in the northeast and northwest corners of Selimiye Mosque two marble feet (62x62 cm) and in the southeast corner of Atik Valide Mosque one marble foot were used (38x38 cm). The columns and feet, the lower drum and the upper head are tied with iron mortises (Eriç 1988).

All of the column capitals were made from a single piece of white marble. Generally together with stalactite capitals being preferred, in the courtyard porchs of the Atik Valide and Nişancı Mehmet Paşa mosques diamond-shaped capitals were used, see Fig.. 4. The column capitals in the main entrance door of the courtyard at Selimiye Mosque were made in a different form and as pieces. The stalactite capitals were not made from definitive types. The stalactite capitals found in the same courtyard even if they were made by different craftsmen, it seems that they were experimenting with different forms. The heights of the capitals can change depending on the heights of the column used. Because the arches seated on the same column differed from one another in height, the problem that appeared was solved with half column capitals resting on the column bodies.

In the sultan mosques the columns generally sat on marble drums. However at the Nişancı Mehmet Paşa and Atik Valide mosques the porch columns and at the side courtyard portico at Selimiye Mosque the columns there are without column drums. The height of the drum changed between 15-50 cm.

3.5 Windows

In the east, west and north modules of the porched courtyards, two types of windows were used on the lower and upper windows that were tied to the porch's height. In the Nişancı Mehmet Paşa and Atik Valide mosques because the porch's height was low, in every single module only the lower window exists, see Fig. 5. In every porch module of the Şehzade and Süleymaniye

mosques and on the east and west sides of the Selimiye Mosque two windows are placed side by side in the lower and upper rows, see Fig. 6. The proportion is nearly ½ between the widths and heights of the lower row of windows that are generally rectangular. In these windows, on the outside there was a piece of iron bars, on the inside is a wooden cover. In the lower row of windows on the inside and outside has been surrounded the marble jambs. Sometimes in place of marble, the stone (Nişancı Mehmet Paşa Mosque) or pudding stone (Şehzade Mosque inner frame) was used. Found above the lower row of windows the lightening arches are generally pointed arches and the arch in the Nişancı Mehmet Paşa Mosque is a surbased one. The Tudor arched upper row of windows were narrower than the lower row of windows were closed with gypsum plaster slag. In the window arches stone (Atik Valide Mosque), pudding stone and stone (Şehzade Mosque), porphyry and stone (Süleymaniye and Selimiye mosques) and brick material (Nişancı Mehmet Paşa Mosque) were used.

3.6 Doors

The entrance to the porched courtyards in the sultan mosques was generally solved from three sides. The door that was located in the center of the north porchs, the "courtyard main entrance gate" that was on the axis of the mihrap and indicated the mosque entrance, as for the doors in the east and west porches, they were called the "gates on the side of the courtyard." In the Atik Valide Mosque courtyard there are four, in the Nişancı Mehmet Pasa Mosque courtyard there exists two courtyard doors.

Generally the porched courtyard doors were designed as a fundamental architectural feature that enriched both the symbolism and the visual façade of mosque. They have got the portal quality but the main entrance door has been made wider and more magnificent others. All the courtyard doors were created from an empty surbased arch that was located inside pointed arch niche sometimes but generally a stalactite niche. The courtyard main entrance doors at Süleymaniye, Selimiye, Şehzade and Yavuz Sultan Selim mosques are of monumental character. In the Atik Valide Mosque courtyard gates the pointed arch niche was not used, the surbased arched door emptiness was completed with the cut stone upright frame that was slightly jutting out from the wall. The courtyard main entrance door widths change between 182-264 cm.

4 CONCLUSIONS

Evaluations of the building elements and the materials used are as indicated below. The measurements have been evaluated in centimeters. In the Ottoman period studies on the "arşın" used as the unit of length will be taken up in another study.

Courtyard and Porchs: The courtyard areas (including wall thickness) change between 1427 m^2 and 3682 m^2. The inner courtyard areas are between 484 m^2 and 1373 m^2. The courtyard's proportion on the inner courtyard area is between 18% and 26%. As a result of the measurements made, there is no porch module in common use in all the sultan mosques. However it has been shown that every porch module seems like a square plan but most are not, see Table 1.

Table 1 : The areas of porched courtyard

	courtyard areas m^2	inner courtyard areas m^2	Courtyard / inner courtyard %
Yavuz Sultan Selim Mosque	1427	629	44
Sehzade Mosque	1866	484	26
Süleymaniye Mosque	3682	1373	37
Selimiye Mosque	2646	937	35
Atik Valide Mosque	3671	1258	34
Nisancı Mehmet Pasa Mosque	3227	605	18

Domes: It was covered with octagonal drums and the transition to the dome was provided by pendentives. The domes and the vaults over the entrance porches on an axis with the mihrap was always made higher than the other porch module. The dome diameters change between 360-810 cm; as for the dome heights in the porches they change from 600 to 1370 cm, in the entrance porches on the mihrap is 866-1999 cm, the rear congregational area porches change between 864-1781 cm. Between the dome diameters and the height there is no proven clear proportion, see Table 2.

Table 2 : The domes of porched courtyard

	diameter cm	porches height cm	courtyard gate height cm	rear congregational area porches height cm
Yavuz Sultan Selim Mosque	450-500	1140	1262	1143
Sehzade Mosque	680-720	1370	1495	1370
Süleymaniye Mosque	550-600	1351	1586	1600
Selimiye Mosque	670-810	1311	1405	1781
Atik Valide Mosque	360-400	637	-	937
Nisancı Mehmet Pasa Mosque	300-380	600	-	864

Arches: All have pointed arches. The arch openings change between 316 and 690 cm, the arch heights between 850 and 1000 cm. The arches found in the same courtyard even if they have different opening -aside from the door modules on the mihrap axis- generally were made at the same height. The arch thickness would change between 50 and 95 cm and the arch was used at 80-85 cm in thickness at most, see Table 3.

Table 3 : The arches of porched courtyard

	arch openings (a) cm	arch heights (b) cm	iron tie rod heights (c) cm	a/b -	a/c -	c/b -
Yavuz Sultan Selim Mosque	476	885	633	0.54	0.75	0.72
Sehzade Mosque	690	992	557	0.69	1.24	0.56
Süleymaniye Mosque	593	927	570	0.64	1.04	0.61
Selimiye Mosque	674	856	458	0.79	1.47	0.54
Atik Valide Mosque	359	415	242	0.87	1.50	0.58
Nisancı Mehmet Pasa Mosque	316	408	260	0.77	1.22	0.64

Walls: The courtyard walls that border the courtyard porches on three sides are one with the main building. On the walls that rise inconspicuously as high as the eave moulding, the “akça geçmez” technique was used to tie the cut stones together to each other with iron clamps. In the mosques in Istanbul limestone known as Bakırköy stone was used but in the Edirne Selimiye Mosque a local stone known as almond limestone was used. The thickness of the porched court-yard wall changes from 77 to 239 cm. On the horizontal section the full-empty (the total fullness length on the walls-the total empty length) proportion does not exceed 54%.

Columns: Except for special circumstances generally the single piece columns and the stalactite column heads were preferred. The column intervals and diameters together with their visually being perceived equal, are not equal. The column diameters change in the courtyard porchs between 35 and 65-70 cm, and the rear congregational area changes from 67-90 cm. The column heights in the courtyard porches have been ascertained as being in a 6.5 proportion between them and the column diameters, see Table 4.

Table 4 : The columns of porched courtyard

	Diameter Cm	height cm	height / diameter
Yavuz Sultan Selim Mosque	71	458	6.5
Sehzade Mosque	66	425	6.4
Süleymaniye Mosque	66	426	6.5
Selimiye Mosque	52	342	6.5
Atik Valide Mosque	35	195-212	5.6-6
Nisancı Mehmet Pasa Mosque	35	196	5.6

Windows: The porch windows according to the height of the window upon there being a lower and a higher window were made in two types. The lower row of windows that are rectangular in breadth changes from 90-140 cm and its height changes between 167-274 cm. The proportion between the width and the height is nearly ½. The Tudor arch upper windows are narrower and lower than the lower row of windows, see Table 5.

Table 5 : The windows of porched courtyard

	wall width (a) cm	window breadth (b) cm	window height (c) cm	b/a -	b/c -
Yavuz Sultan Selim Mosque	155	142	257	0.92	0.55
Sehzade Mosque	163.5	140	270	0.86	0.52
Süleymaniye Mosque	239.5	149	274	0.62	0.54
Selimiye Mosque	177	134	237	0.75	0.56
Atik Valide Mosque	109	110	182	1.01	0.60
Nisancı Mehmet Pasa Mosque	77	90	167	1.17	0.54

Doors: All the courtyard doors are generally pointed arched and sometimes from a low arch door empty space has been located in a stalactite niche. Generally the courtyard main entrance door that is characteristic generally is wider and more magnificent than the side doors. The door width changes between 182 and 264 cm; its height changes from 294 to 421 cm.

Materials: On the walls the cut stone: on columns marble, granite, porphyry; on the domes and vaults brick; and on the arches cut stone, marble and pudding stone; on the floors of the courtyard and portch limestone, marble, hexagonal brick; on the domes and roofs lead material was used.

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