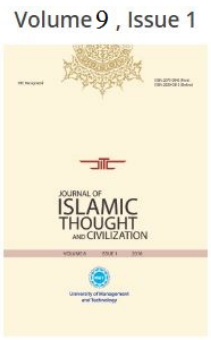

Journal of Islamic Thought and Civilization (JITC)

Volume 9, Issue 1, Spring 2019
pISSN: 2075-0943, eISSN: 2520-0313
Journal DOI: https://doi.org/10.32350/jitc
Issue DOI: https://doi.org/10.32350/jitc.91
Homepage: https://www.umt.edu.pk/jitc/home.aspx

Journal QR Code:

Article: **Developing Standards for Mosque Design in Lahore, Pakistan**

Author(s): Muhamamd Ilyas Malik
Beenish Mujahid
Farah Jamil

Online Published: Spring 2019

Article DOI: https://doi.org/10.32350/jitc.91.10

QR Code:

M Ilyas Malik

To cite this article: Malik, Muahmmad Ilyas, Beenish Mujahid, and Farah Jamil. "Developing standards for mosque design in Lahore, Pakistan." *Journal of Islamic Thought and Civilization* 9, no. 1 (2019): 147–164. Crossref

A publication of the
Department of Islamic Thought and Civilization, School of Social Science and Humanities, University of Management and Technology, Lahore, Pakistan.

Developing Standards for Mosque Design in Lahore, Pakistan

Muhamamd Ilyas Malik
Department of Architecture,
School of Architecture and Planning
University of Management and Technology, Lahore

Beenish Mujahid*
Department of Architecture,
School of Architecture and Planning
University of Management and Technology, Lahore

Farah Jamil
Department of Architecture,
School of Architecture and Planning
University of Management and Technology, Lahore

Abstract

Mosque has always been the most prestigious and important building for the Muslims. However, no standards or guidelines are available in Pakistan for the design and details of Mosque, therefore, mosques are being designed and built as per the existing examples or personal wisdom of the architects, financers, decision makers, and individuals or groups responsible for its execution. It has been generally observed that there are many flaws found everywhere in terms of plot orientation, placement of different functions of mosque, planning layout, interior spaces, opening of doors/windows, design of ablution area, adequate no. of toilets and shoe storage racks etc. The major problem that worshipers face, are related to insufficient width of row *(saff)* and clearance from walls to perform physical actions of prayer and to carryout ablution in comfortable manner. The aim of this research is to set-out the planning and design guidelines and to develop standards for a religiously and socially acceptable, efficient and comfortable design for all features of a mosque. The methodology includes study of religious literature and survey of existing mosques selected in different localities of Lahore to obtain standards being practiced and comments of end users. Methodology also included physical demonstration to experiment the actual space needed during performance of prayer by worshippers. The paper suggests solutions to some of the issues related to this topic. The developed guidelines/standards would be a source of information for students, practicing architects and academicians. Mosques constructed on the basis of these standards will provide better utilization of space and more comfortable environment to the end users.

Keywords: Mosque, Prayer Hall, Ablution Area, *Saff*, Guidelines

Introduction

Mosque is considered to be one of the most important buildings of the Muslim world. The word mosque, which is the English version of the Arabic word '*masjid*,'

*Correspondence concerning this article should be addressed to Beenish Mujahid, Assistant Professor, Department of Architecture, School of Architecture and Planning, University of Management and Technology, Lahore, at beenish.mujahid@umt.edu.pk

refers to a place of prostration. Phenomenally and traditionally, any place or building, which is used for *Salat*,[1] can be defined as a mosque; it plays a significant role in spiritual and practical life of a Muslim at personal and communal level. Historically, it was the first public building to perform religious as well as social, administrative and teaching functions.[2] However, in present times mosque is generally meant for offering Prayers and studying Qur'ān. With the development in science and technology, some variations have also undergone in mosque architecture. The contemporary mosque architecture is not based upon any standards in terms of planning as well as interior design. The book, *Time aver Standards for Building Types*," which is known as Bible for architects, provides guidelines and standards for designing of almost every kind of building including churches and temples but the mosque.[3] Reference books available for mosque design include *Architectural Graphic Standards*, *Neufert Architects' Data and Metric Handbook*. These books provide very basic information about the mosque design. Due to lack of any standards and guidelines, mosques are being designed and built as per personal wisdom of the architects, financers, decision makers, and individuals or groups responsible for its execution. It has been generally observed that there are many flaws everywhere in terms of plot orientation, placement of different functions of mosque, planning layout, interior spaces, opening of doors/windows, width of rows, design of ablution space, toilet areas and shoe storage etc. Architectural elements of a typical mosque include *mehrāb,* prayer hall, court yard, verandah and minaret. The basic objective of this research paper was to analyze the problems faced by worshippers and to set out the architectural standards and guidelines for effective design of mosque in terms of spatial and functional provision so as to provide maximum comfort and convenience to its users.

2. Problem Statement

The major problem that worshipers face is related to the following:

1. Layout and shape of prayer hall resulting in wastage or underutilization of land area.
2. Improper width of row *(saf)* to perform physical actions comfortably during prayer. The common problem is that worshipers hit each other while one is going to prostrate (*Sajdah*) position and the person in the row ahead is rising from prostrate (*sajdah*) or sitting position (*Tashhud*) to standing position.
3. Arrangement of persons in straight line in the row.
4. Improper clear space from wall in front and the rear row of the praying hall walls. Due to insufficient space between the last row and the back wall, the person cannot perform *raku* (bowing) properly. Also anyone desiring to pass behind him cannot do so unless one goes in the prostrate position.
5. Insufficient number, and location of exits from the prayer hall
6. Opening of doors in the wrong direction (inward)
7. Inadequate number of toilets

[1]**Salat** or **namāz** (Persian: نماز), one of the five pillars of Islam

[2]Muhammad Yusuf Awan et al., "History of Mosque Architecture in Lahore," *Journal of Islamic Thought and Civilization* 4, no 2 (2014): 22.

[3]Joseph De Chiara and John Callenider, *Time Saver Standard for Building Types* (McGraw-Hill, 2001).

8. Inadequate number and design of ablution units.
9. Wrong placement and insufficient area for shoe racks.

3. Objectives

The aim of this research is to set- out the planning and design guidelines to develop standards for a religiously and socially acceptable, efficient and comfortable design for various features and functions of a Mosque. The developed guidelines/standards would be a source of information for students, practicing architects and academicians. Mosques constructed on the basis of these guidelines/standards will provide better utilization of space and more comfortable environment for the end users.

4. Methodology

The methodology adopted for the current research was based on the critical study of existing mosques, formal interviews from worshippers and Anthropometric space analysis. To deduce how people, use and feel about mosque spaces, one representative mosque was selected as case study from different residential areas under developmental authorities like LDA, DHA and other Cooperative Housing Societies in Lahore. The details of studied mosques are shown in Table 1. Field survey included measurements of built structures and other spatial features of the mosque. User's feedback was also obtained through interviews in the form of written questionnaire. Findings and other support information as presented in the form of charts and tables etc. was analyzed which helped in formulation of design criteria and standards for mosque design.

Practical/physical demonstration was also carried out to support the objectives of research. Following mosques were selected for the intending study.

Table 2. Detail of Mosques Surveyed
Source: Author

	Mosque Name	**Location**	**Mosque Praying Capacity**
1	Bahria town Grand Mosque	Bahria Town, Sector C, Lahore.	95,000 Persons
2	Jamia Mosque	Defence Housing Authority (D.H.A)	1000
3	Wapda town	Areas under control of Lahore Development Authority(LDA)	500
4	Nespak housing society		300
5	PCSIR		200
6	Johar Town UMT Mosque		1200
7	Data Darbar Mosque	TMA	50,000

5. Literature Review

Literature survey was conducted through books, research papers and from different sources like internet and libraries. It was inferred from the data that there is no such comprehensive compilation of design standards and criteria for mosque designing with reference to the theory and practice. Mosque is basically a house of prayer and its major function is to facilitate the activity of *salat* with *jamāt* (in congregation). Many other activities related to Muslim community were also performed in mosque.

Thus a mosque was a complex building which comprised other structures like *madrasa. Imam*'s residence, storage rooms and etc. Mosques were not designed or built according to the divine patterns of Qur'ān and *Hadīth* as it does not provide any such clear rules of mosque designing. Books such as in *Architectural Graphic Standards, Neufert Architects Data, Metric Handbook* by David Little Field and *Design Criteria for Mosque and Islamic Centers* by Akel Kahera, Abdul Malik and Craig Anz which ptovide some useful information on the subject.

The mosque can be characterized as a simple, austere and strictly functional one. Influences from other religions and architectural styles led the mosque architecture towards monumental structures. Mosques of early Islamic period were built under the patronage of rulers and distinguished rich Muslims. Gradually the common people started to build mosques in their own creativity which reflects the desire and demand of the community.

In most of the cases, they do not follow any systematic design criteria or standard in terms of theology and practice. The Prophet (*SAW*) established the first mosque in Medina in a simplest possible manner as shown in Figure 1. This first mosque underwent some obvious changes. A mosque usually comprised of *Iwān,*[4] *Riwak,*[5] *Sahn,*[6] *Haud,*[7] *Mihrab*[8] and *Mimber.*[9]

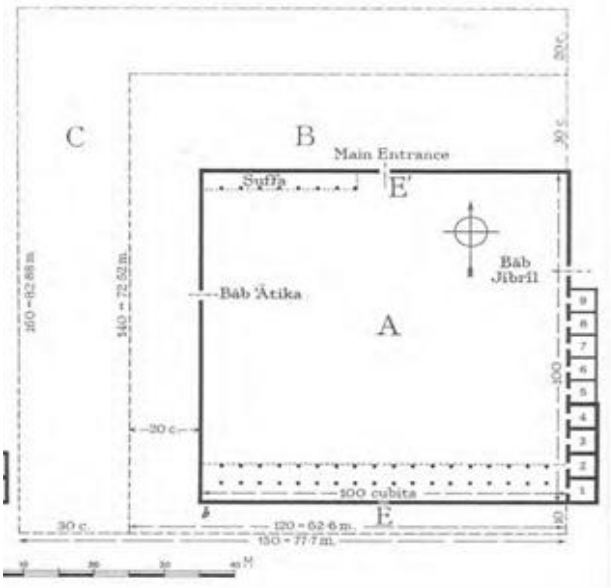

Figure 1. Prophet's (*SAW*) First Mosque in Medina Munawwara
Source: http://thecityasaproject.org/2012/06/medina/

[4]Prayer hall
[5]Cloister
[6]Courtyard
[7]Tank
[8]Prayer niche
[9]Pulpit

5.1. Site Requirement for the Mosque Layout

The pivotal feature of the site plan is the orientation of the prayer hall towards Makkah; the rest of the building parts are free to comply with this liturgical requirement. A detailed site study is essential, because it provides a visual assessment of features significant views, landscape character, and other features including traffic, pedestrian movement and parking. The site study provides the opportunity to accomplish the logical and comfortable placement of different components of mosque keeping in view the needs of end users.

5.2. Design of Facility Spaces

Space standards are derived from a balanced consideration of human need. As a measuring component, human body dimension in terms of anthropometrics, data is required to form a basis for the study that helps to derive space standards.

5.3. Prayer Hall

Prayer hall because of its main function for ritual prayer, is the main space in the mosque. It is simply a covered/open space, empty of furniture, used for the performance of prayers. However, in designing this space, several issues need to be considered. Some of these issues reflect religious rulings for prayer performance. People perform the prayer facing the direction of *Qibla* (Kaaba). For prostration position as shown in figure the required space is 120 cm in depth. Therefore, the clear depth of the hall is measured in multiples of 120 cm generally.

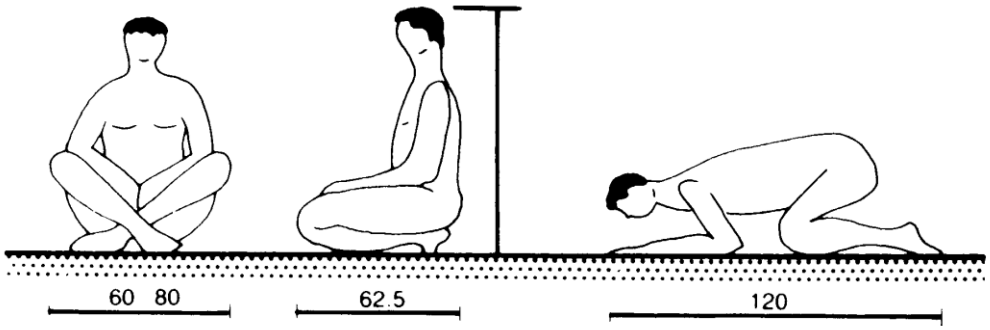

Figure 2: Anthropometric standards during a prayer
Source: (Metric handbook)

The required rectangular area of floor with average dimensions of 60 cm wide by 120 cm deep results in an area of 0.72 m^2 per user (Ahmed Mukhtar). Whereas in some reference works it is suggested that it should be 0.75 m^2. According to *Neuferts Data*, an area of 0.85m^2 per user is appropriate.[10] A larger area is more appropriate in a hall used for the Friday ceremonial prayer because users sit down when the speech is being given. The average width of a sitting person is 80 cm (as opposed to 60 cm for a

[10]Bousmaha Baiche and Nicholas Waliman, 3rd ed, *Architectural Standard* - Ernst and Peter *Neufert - Architects' Data*

standing one) as shown in figure 2. Anthropometric standards during a Prayer are given in Table 1. The space required for prayer vary from one user to another. [11]

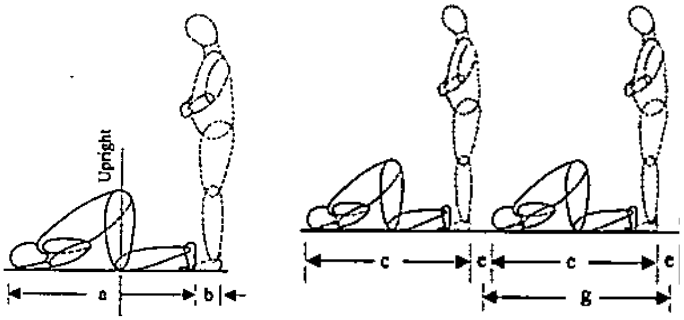

Figure 3: Anthropometric standards during a prayer
Source: Najal Imam "Mosque Architecture"

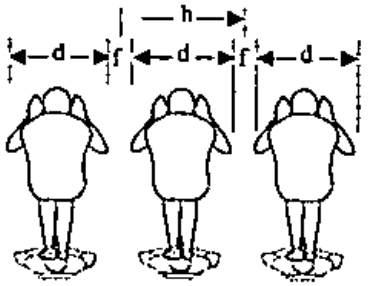

Figure 4 Anthropometric standards during a prayer
Source: Najmal Imam "Mosque Architecture"

Table 1. Anthropometric standards during a prayer

	Dimensions (m)				Clearance (m)		Dimensions (m)	
	a	b	c	D	e	f	g	H
Minimum	1.13	0.15	1.28	0.60	0.23	0.02	1.51	0.62
Good	1.17	0.16	1.33	0.63	0.24	0.02	1.57	0.64
Excellent	1.20	0.16	1.35	0.64	0.25	0.02	1.60	0.66

5.4. *Mihrāb*

The *Mihrāb* is the place in the center of the wall towards *Qibla* where the leader of the group prayer (*Imām*) commonly stands. Reference suggests that *mihrāb* or prayer niche should be situated in front wall facing *qibla* direction. Required area for it should be $6m^2$ (Abu Dhabi standards). There is no religious requirement for any particular design of the *Mihrāb.*

[11]Sheikh Muhammad Najmal Imam, "Mosque Architecture: Formulation of Design Criteria and Standards in the Context of Bangladesh," (Dhaka: Master's Thesis, Bangladesh University of Management and Technology, 2000), http://lib.buet.ac.bd:8080/xmlui/bitstream/handle/123456789/1338/Full%20%20Thesis%20.pdf?sequence=1&isAllowed=y

5.5. *Mimber*

Mimber is a stepped seating stand placed in *Mihrāb*. Imam sits on member during Friday gathering to deliver speech and *Khutba*[12] before the Friday prayer.

5.6. Shoe Removing and Shoe Rack Space

This is usually the most ignored space in the prayer facility. Here, users take off their shoes, and enter the prayer space. The space may also serve as the lobby of the prayer facility. According to Abu Dhabi mosque regulations, shoe racks area should provide sufficient space to allow the simultaneous activity of taking off and putting on shoes as well as for moving persons.

5.7. Bathrooms

The design requirements of bathrooms that serve mosque should not be located behind the *Qibla* wall or above the prayer hall. In general, bathrooms in Islamic countries require the following design considerations, Individual cubicle walls and doors should provide good visual and preferably acoustic privacy. The water closet should preferably be perpendicular to *Qibla* direction. Hygienic water sprays (Muslim showers) should preferably be provided at the right side of each water closet.

5.8. Ablution Space

To attain *taharat* ablution (*wudhu*) is an obligatory ritual for performing *salat.* One should not enter into a mosque for a prayer without *taharah.* So, a mosque should be equipped with facilities to perform this significant and pre-requisite. The references suggest one ablution unit per 10 worshippers. The ablution function involves cleaning parts of body with fresh water in certain order so the relationship between the clean zone and ablution area is important for designers. In the Schematic plans, the facilities for *wudhu* and bath are placed at the entry for an easy and immediate access. It is a *sunnah* to face the *Qibla* and sit on a higher place, so that the water used in *Wudhu* docs not wet the person splashing or any other way. The ablution should be separated from toilet.

6. Results and Analysis

6.1 Site Area

The first step in the site planning process is to define project goals and objectives of the project, which will result in a master plan for the mosque. Both client and architect should review the plan to determine project guidelines to meet the needs, goals and objectives, which become crucial to the program requirements. The area of the site includes the building footprint; vehicular parking; and service zones; pedestrian circulation; landscape design and open space for social activities. The master plan has to be established at *qiblah* axis by all means. Majority of mosques praying hall are placed at an angle varying from 30 to 60 degrees to site lines that is because of wrong orientation if plot reserved for mosque. This practice has caused reduction in the capacity of the prayer hall and resulted in wastage of site area as shown in figure below. There is a need to consider this factor at the time of planning of community facilities in housing societies.

[12]Religious Sermon

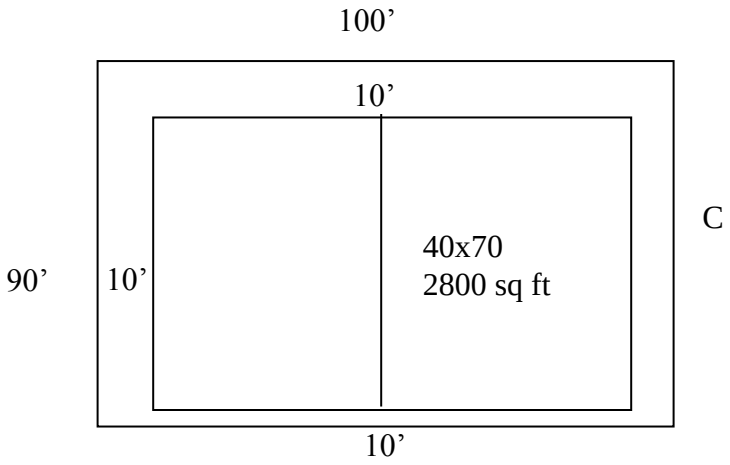

Figure 5. Usable area in assumed plot size in *Qibla* direction
Source: Author

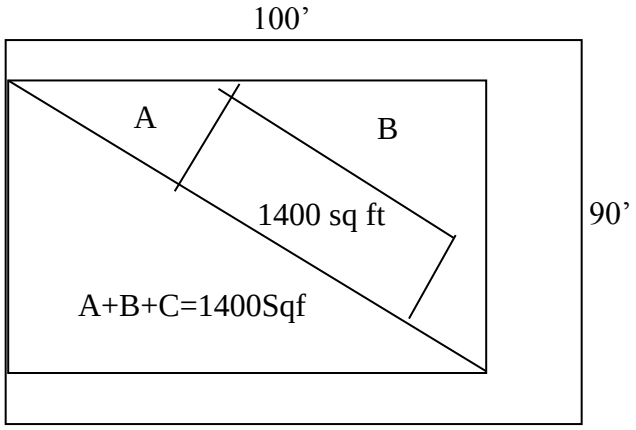

Figure 6. Usable area in assumed plot size in angular orientation to *Qibla*
Source: Author

To understand the problem, we can take the example of a two *kanal* plot of dimensions 90’x100’. We can leave 10’ clear space on all sides as per building byelaws so we are left with an area of 70’x 80’ i.e. 5600 sq.ft. Now if the plot is oriented in the direction of *Qibla* then we can cover half of this area as prayer hall, which will be 2800 sqft as shown in figure 5.but if the same plot is oriented at an angle to the *Qibla* direction then if we divide the same space into half, the covered space available for prayer hall is only 1400 sqft as shown in figure 6, that is exactly the 50% of the available spacing in first case. The rest 50% of space is wasted/ underutilized because of its triangular shape.

6.2 Prayer Hall

Prayer hall is the main area in the Mosque. Most of the mosques have hall in rectangular shape, preferably having the long side of the rectangle facing the direction of Mecca (*Qibla*). A few have square, circular and some even shape as discussed in

Table 4. To determine that width of the row is comfortable or not for worshippers, field survey was done in which interviews were conducted with the users. Their response was recorded in Table 5. The results show that majority of the worshipers are not satisfied with the width of the row, as they generally experience of hitting their head with the back of persons in the row ahead of them. It simply shows that the standard width of 4' (120cm) in practice for the row is not sufficient and it should be increased or a gap should be made in between the rows. Because the front prayer lines must be filled first, and because people should not pass in front of those who are praying, it is better that more than one entrances to the prayer hall are located at the back wall of the prayer hall (opposite *Qibla* direction). Side entries are acceptable, but are better located away from the *Qibla* wall. No entrances should be on the *Qibla* wall.

Table 3. Details of Mosque Surveyed

Mosque Name	Mosque Hall Capacity (Persons)	Hall Shape	Clear Space Provided b/w Front Row and Wall	Clear Space Provided between Last Row and Wall	Width of Row	No. of exits to he Hall	Opening Direction of Doors
Data Darbar Mosque,	10,000	Rectangular	6'-0"	1'-0"	4 ft	3	Outward
Wapda town Jamia Mosque	300	Rectangular	1' -0"	1' -0"	4 ft	3	inward
Nespak Housing Society College Road,	200	Rectangular	No Space	4"	4 ft	2	Inward
DHA Phase-I Mosque	1000	Rectangular	No. Space	2'-6"	4 ft	5	Inward & Outward
DHA Phase-IV Mosque	1500	Square	No. Space	1'-6"	4 ft	3	Sliding
PCSIR Mosque Phase 1	500-600	Rectangular	No. Space	1'-6"	4 ft	3	Inward
Umt mosque Johar town	1200	rectangular	2ft	3ft	4ft	3	Inward
Bahria Grand mosque	25000	circular	2ft	3ft	4ft	2	Inward

Data collected and shown in table 3 that all mosques have rectangular shape except one. Which indicates the significance of rectangular shape for mosques prayer halls. It also shows that standard width of 4' for row (*saff*) is being used. About 50% mosques have proper clear space at front and rear row. Violating the safety rules more than 60% mosques have exit doors opening inwards. The number of entry/exits are also insufficient in most of the mosques.

6.3 Results of interviews with worshippers

Table 4: Width of Row
Source: Author

Do you think width of row is comfortable or not		
	Satisfied	Not Satisfied
Data Darbar Mosque, Lahore.	90	10
JamiaMosque Block F Wapda Town Lahore.	50	50
Nespak Housing Society C- 1, Block College Road, Lahore.	20	80
DHA Phase-I Mosque	50	50
DHA Phase-IV Mosque	90	10
PCSIR-PHASE I	90	10
Umt mosque johar town lahore	10	90
Bahria Grand Mosque	60	40
Total	460 (57%)	340 (43%)

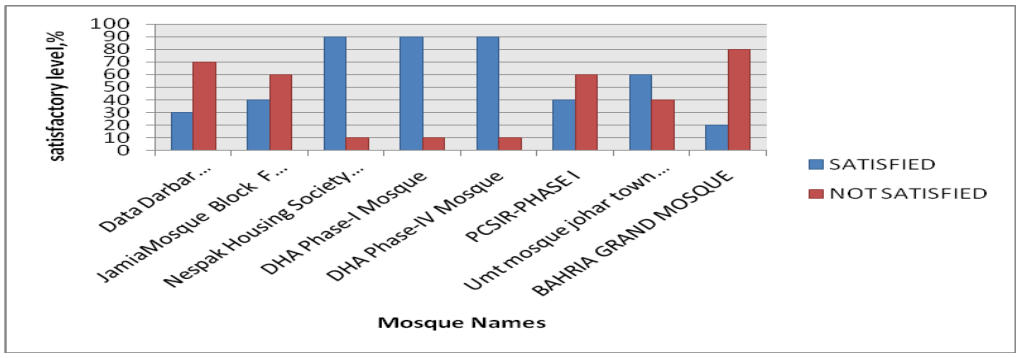

Figure 7. Width of row graphical representation
Source: Author

Results from table number 4 shows that 43% people are not satisfied with width of row in mosques. Such number of users cannot be ignored.

6.4. Physical Demonstration

Keeping in view dissatisfaction of worshippers regarding width of Row (*Saff*), physical Demonstration of different positions /postures during the Prayer was carried out to find out the adequate width of the row. For this purpose, an average size person was required so that there are no biased results. The average height in Pakistan as per statistics varies from 5'-4" to 6'-2" for males. Accordingly, two persons of height 5'-10" and 5'-7" were engaged to perform different postures of prayer on 4' width of *saff* (Praying Mat). Vertical wooden planks were placed behind them at varied distances to see their leaning positions till they touch planks as shown in figure 9and 11. It was found that min 8" is the required space that one needs to lean back from the line of their feet while in *raku* position as shown in figure 8. And the stage of rising up to the standing position from the sitting position "*tashhud"* it was found that min 6" to 8"

clear space is needed behind them from their feet line to rise up comfortably without hitting head of person behind who is going to prostrate position. The prostrate position shown in figure 12 and 13 shows that the taller person's head touches the planks placed in front at 4' distance from his feet line i.e., some clearance is required even at the front side.

Figure 8. Posture 1 Standing Position
Source: Author

Figure 9. Posture 2 Going to *Raku*
Source: Author

Figure 10. Posture 4 Sitting Position
Source: Author

Figure 11. Rising from Sitting Position (Tashhud)
Source: Author

Figure 12. Postrate Position clearance required in front wall **Source:** Author

Figure 13. Position 5 prostate Action
Source: Author

Table 5: Number of toilets and ablution units
Source: Author

Mosque Name	Mosque Hall Capacity (Persons)	Number of Toilet Units			Ablution Space
		No. of Toilets with Euro. WC	No. of Toilets with Ind. WC	Total Toilets	Total no. of Ablution Units
Data Darbar Mosque, Lahore.	10,000	4	16	20	70
Jamia Mosque Block F Wapda Town Lahore.	300	2	2	4	20
Nespak Housing Society C- 1, Block College Road, Lahore.	200	4	4	8	24
DHA Phase-I Mosque	1000	4	8	12	30
PCSIR Mosque Phase 1	500-600	1	5	6	3
Umt mosque johar town lahore	1200	8	8	16	25
Bahria Grand mosque	25000	30	20	50	150

Table 6. Placement and number of Shoe racks Appropriate or Not
Source: Author

Mosque Name	**Mosque Capacity (Persons)**	**Shoe Racks**	
		Placement of Shoe Racks	No of shoe Boxes in Racks
Data Darbar Mosque, Lahore.	10,000	In-Front of the Entrance	Shoe Boxes(open
JamiaMosque Block F Wapda Town Lahore.	300	At Entrance lobby	80 (1:4)
Nespak Housing Society C- 1, Block College Road, Lahore.	200	In open near entranc	30 (1:7)
DHA Phase-I Mosque	1000	Near Entrance	50 (1:20)
PCSIR Mosque Phase 1	500-600	No designated space	2
Umt mosque johar town lahore	1200	At Entrance lobby	20 (1:60)
Bahria Grand mosque	25000	Inside and outside main prayer hall	60 (1:416)

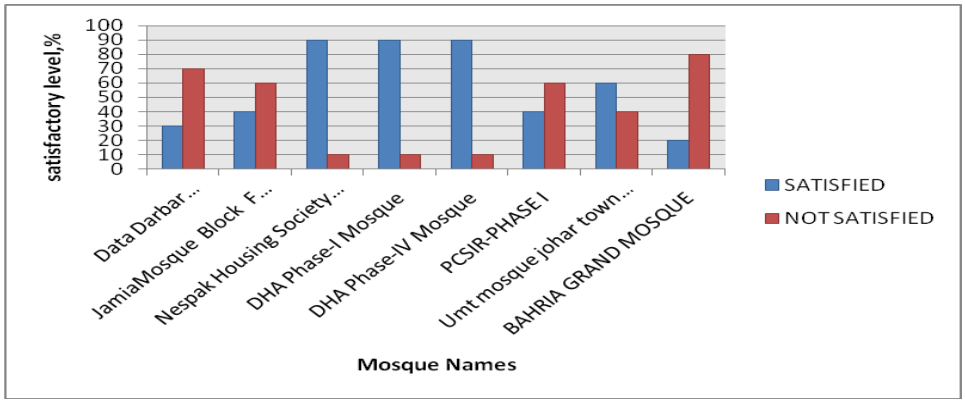

Figure 14: Placement and number of Shoe racks Appropriate or Not
Source: Author

Table 7: Satisfied with the toilet facility
Source: Author

Are you satisfied with the toilet facility		
	Satisfied	Not Satisfied
Data Darbar Mosque, Lahore.	30	70
Jamia Mosque Block F Wapda Town Lahore.	40	60
Nespak Housing Society C- 1, Block College Road, Lahore.	90	10
DHA Phase-I Mosque	90	10
DHA Phase-IV Mosque	90	10
PCSIR-PHASE I	40	60
Umt mosque johar town Lahore	60	40
Bahria Grand Mosque	20	80
	460 (57%)	340 (43%)

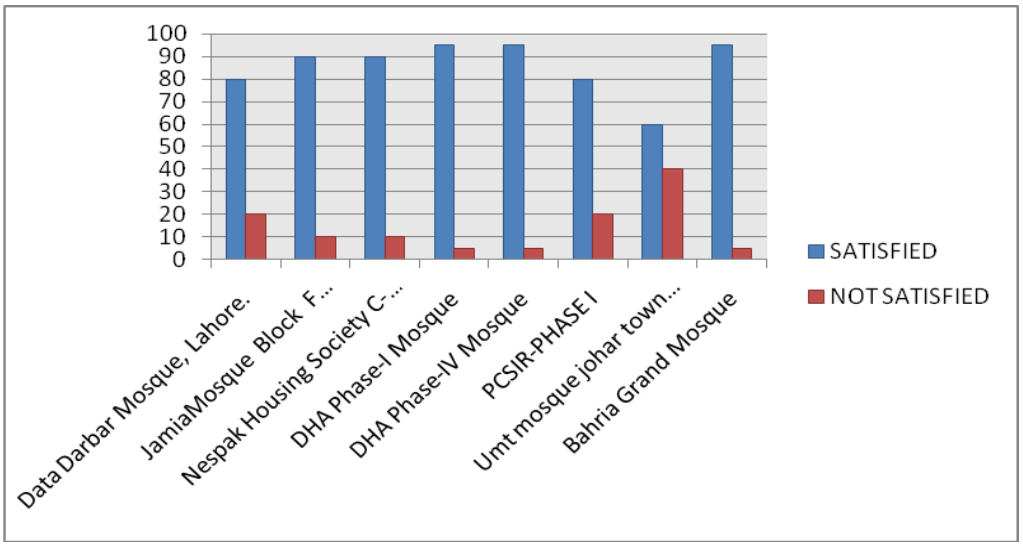

Figure 15. Satisfied with the toilet facility
Source: Author

Table 8. Satisfaction on placement of Shoe racks Appropriate or Not
Source: Author

Placement of shoe rack appropriate or not		
	satisfied	Not satisfied
Data Darbar Mosque, Lahore.	95	5
JamiaMosque Block F Wapda Town Lahore.	90	10
Nespak Housing Society C- 1, Block College Road, Lahore.	40	60
DHA Phase-I Mosque	95	5
DHA Phase-IV Mosque	5	95
PCSIR-PHASE I	95	5
Umt mosque johar town lahore	60	40
Bahria Grand Mosque	60	40
	540(67.5%)	260(32.5%)

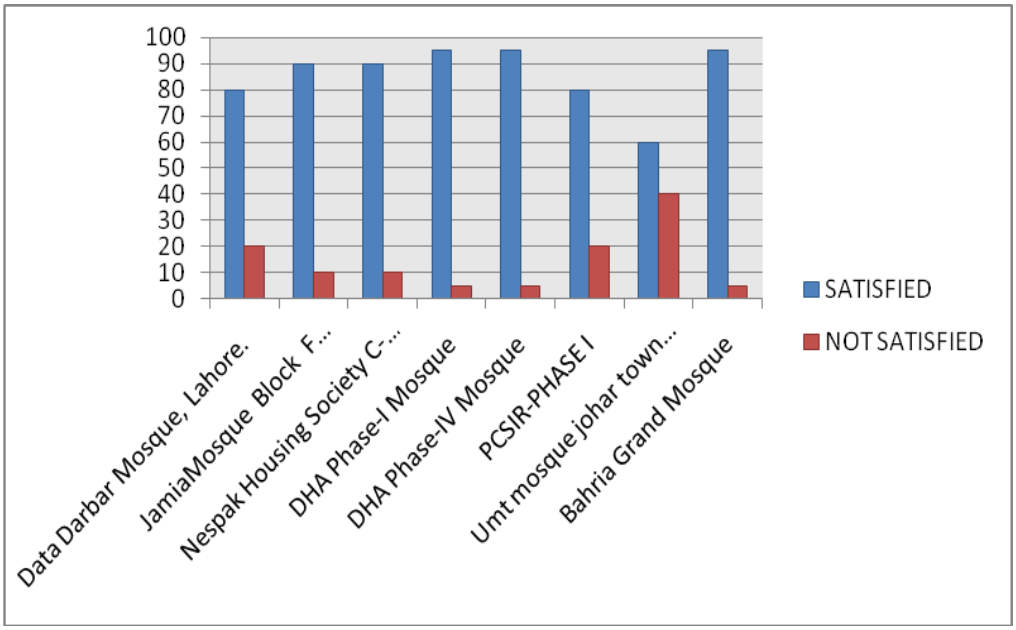

Figure 16. Satisfaction on placement of Shoe racks Appropriate or Not
Source: Author

Table 9. Satisfied with the ablution facility
Source: Author

Are you satisfied with the ablution facility		
	Satisfied	Not Satisfied
Data Darbar Mosque, Lahore.	80	20
JamiaMosque Block F Wapda Town Lahore.	90	10
Nespak Housing Society C- 1, Block College Road, Lahore.	90	10
DHA Phase-I Mosque	95	5
DHA Phase-IV Mosque	95	5
PCSIR-PHASE I	80	20
Umt mosque johar town lahore	60	40
Bahria Grand Mosque	95	5
	685(85.6%)	115 (14.3%)

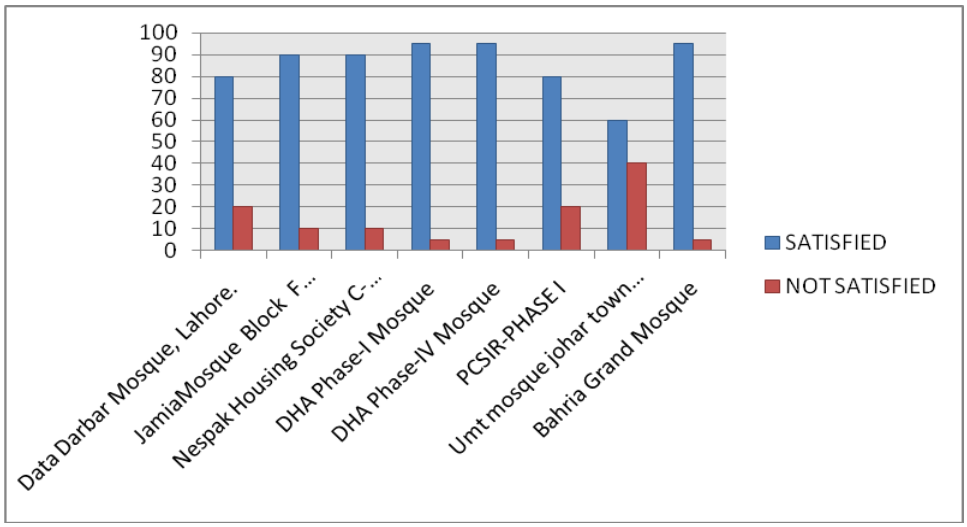

Figure 17. Satisfied with the ablution facility
Source: Author

7. Result and Analysis

In layout planning of mosques within the plot, we have found that five out of eight mosques are at some angle in the given site. Figure 5 and 6 shows that in such case the usable space is reduced by 50 % or in other words 50% of site is wasted or underutilized. The shape of praying hall was either rectangular or square except one which is circular. Historical references show that prayer halls were rectangular or square in shape. However, some architects have designed mosques in circular form, in which the first rows are smaller in length than the middle one. In other words, there

will be less people in the front rows and that is in contradiction to a hadith which quotes that there are more blessings of Allah in the front rows.

As shown in table 4, 43% worshippers have shown dissatisfaction over width of row (*Saf*) which is kept 4' wide in all mosques.

The arrangement of straight line is instructed by *Imām* always at start of the prayer. It will be very easy to obtain if design of the *saf* is made such that it has a strip of 10" (average foot length) in different color pattern at lower edge of the *saf* and worshippers are asked to keep their feet within the strip as shown in figure 18.

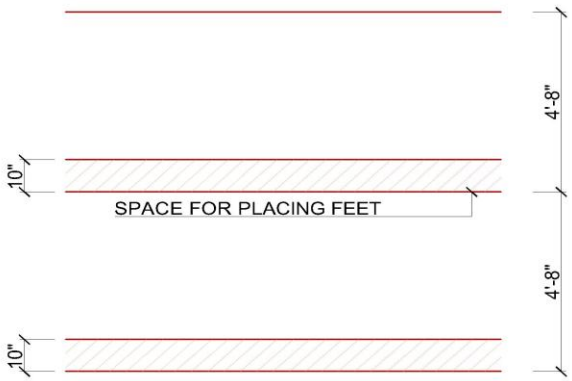

Figure 18: Proposed design of *saff* (Row)

About 50% mosques have no clear space in the front row and wall. Similarly, 50% mosques have either no clearance or inadequate clearance between the back row and the back wall as shown in Table 3, shows that surely creates problem for the worshippers at the time of exit who finish their prayer early. Clear space in front wall in the front row is needed to give comfortable clearance to people with longer height. This space is also useful for placing the stands for recitation of Holy Qur'ān.

Clear space at rear is utmost necessary as shown in figure 19. It should be about 2'-8" so that people can pass easily behind the person who is praying in *Rakū* position.

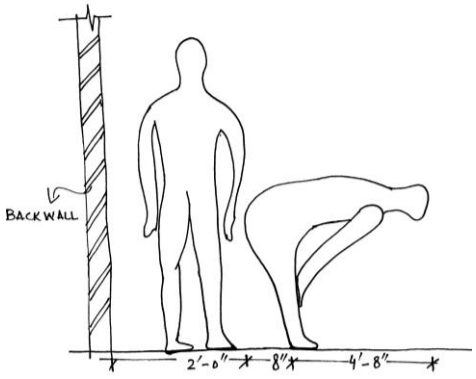

Figure 19. Requirement for last Row (*Saff*) space

There should be more than one exit in any hall having public of gathering to provide comfortably in regular times as well as in emergency. These exits should be well distributed in the back wall. As per table 4, some of the mosques have only two exists which is insufficient. Out of eight mosques seven have their doors openings inward as shown in table 3which is against the rules of exits at a public gathering space. As per emergency exit rules and for safe evacuation of people after prayer, the doors must always open outwards.

As per table 7, the number of toilets is insufficient and 43% worshippers have shown dissatisfaction. This issue needs to be considered in detail to develop adequate no of toilets as per capacity of mosque.

Many worshipers have shown their dissatisfaction about the ablution facility in mosque as shown in Table 9. It could be because of the inadequate no. of ablution units or the inadequate design of the ablution units. This varies as per locality and location of the mosque and the educational/cultural level of the users. However, detailed study is needed on experimental basis to develop a most comfortable design of the ablution unit. A Lot of people have shown dissatisfaction over the location and number of shoe racks in the mosques as shown in table 8. Little attention is given to this facility. Mostly; a junk of shoes is left at the entrance or the starting line of clean area. The practice is very uncomfortable at the exit time. This requires good consideration in design by the architects as well.

8. Conclusions

The following recommendations are made on the basis of results and analysis. These can be made part of building byelaws by development authorities as a special section under the head "Standards for Mosque Design."

1. The urban planners should give due consideration while planning layout of housing societies that the plot designated for the mosque is oriented in the direction of *Qibla*. Care should also be taken that the entrance of mosque falls on the access road side. This will give maximum utilization of plot as well as good view of the front elevation from road side.
2. As learned through literature review and practical demonstration, the Row (*Saff*) width of 4' is insufficient should be increased to minimum 4'-6" and preferable is 4'8" or a space of 6" to 8" should be kept between each row (*Saff*) if the width has to be kept 4'-0." Personal experience of offering prayer in Arab countries shows that there the regular width of *Saff* (Row) is 4'-6" and not 4' as practiced in Pakistan.
3. The design of *Saff* (Row) should have a clear strip of 10" width at feet side whether it is made up of carpet, plastic or any other material. It will be convenient for worshippers to line up straight.
4. A clear space of min 8" at the front row and 2'-8" at the rear row should be kept from the wall.
5. Minimum three exits should be provided in rear wall of the prayer hall for small mosques and five for bigger mosques.
6. All doors meant for exit should open outwards without any hindrance.

7. Adequate number of toilet and ablution units should be provided keeping in view the capacity and location of the mosque.
8. Sufficient number of shoe racks should be provided under a covered space keeping in view the capacity of the mosque.

Bibliography

Ahmed, Imtiaz. *Remainders for People of Understanding with Essential Details of Prophet's Mosque Madina Mukarrama*. 2001.

Awan, Dr. Muhammad Yusuf., et al., "History of Mosque Architecture in Lahore." *Journal of Islamic Thought and Civilization* 4, no 2 (2014): 21-36.

Chiara, Joseph De., and John Callenider. *Time Saver Standard for Building Types*. McGraw-Hill, 2001.

Farahati, Abbas Ali. "The Mosque as the First Political-Ideological base in the Islamic Society." *Journal of Politics and Law* 4 (2011): 146-152. Accessed October 5, 2015., http://ccsenet.org/journal/index.php/jpl/article/viewFile/7604/6881

Kahera, Akel. Latif Abdul Malik, and Craig Anz, *Design Criteria for Mosques and Islamic Centers: Art, Architecture, and Worship*. USA, Architectural Press, 2009.

Littlefield, David. *Metric Handbook: Planning and Design Data*. 3rd Ed., Routledge, 2005.

Mukhtar, Dr. Ahmed. *Design Guidelines for Ablution Spaces in Mosques and Islamic Praying Facilities.* UAE: American University of Sharjah, 2005.

Nabvi Khan, Ahmed. *Development of Mosque Architecture in Pakistan*. Lok Virsa Publishing House, 1991.

Omer, Spahic. "Some Lessons from Prophet Muhammad (*SAW*) in Architecture: The Prophet's Mosque in Madinah." *Intellectual Discourse* 18 (2010), Accessed September 15, 2015, http://irep.iium.edu.my/12874/1/126.pdf.

Saqib, M. Abdul Karim. "A Guide to Prayer in Islam." 16-17, accessed Nov. 12, 2015, http://d1.islamhouse.com/data/en/ih_books/single/en_a_guide_to_prayer_in_Islam.pdf

Urey, Ozgur. "Transformation of Minarets in Contemporary Mosque Architecture in Turkey." *International Journal of Science Culture and Sport* 4, no 1 (2013).