Architectural Analysis of British Colonial Railway Residential Buildings in Lahore

Submitted by

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Acknowledgement

Sitting in my small study at home surrounded by books, a computer, some gadgets, numerous files, maps and a magnifying lens to view old drawings and writings, was simply a unique experience. These things sufficed as my company, as I satisfactorily engaged in long spells of work. I would wake up early each day, grab my spectacles and get down to the task at hand.

My family’s immense support was with me at all times. My late father always pumped me up with his support in numerous ways and the strength he provided me will remain with me forever. I will never be able to fully thank my mother for her prayers without which I would not have made it this far. My wife’s assistance played a significant role during the whole process of this thesis. My daughter’s freshly-brewed tea at regular intervals and precisely at those moments when my energy and spirits seemed to be flagging, always worked like an elixir.

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Abstract

As the provincial metropolis of the strategically located North-Western region of India, Lahore received special attention during the British rule (1849-1947). It became a hub of the huge railway network for a vast and growing economy spread over a large area. The city’s eastern part accommodated railway facilities of all types and residential colonies primarily for the European staff of all levels. Soon the railways became the largest employer in the city and helped to rapidly transform its economy from one based largely on agriculture to an industrial one. For accommodating this varied staff, comprising of a multitude of ethnic and socio-economic backgrounds, as close as possible to the railway facilities a large number of railway housing colonies were built in the east and southeast side of Lahore. With the passage of time the railway housing became the largest public sector housing in northern India. Railway housing from the English period (1862-1947) has been neglected by scholars in spite of its historical status and contribution to the social and urban fabric of Lahore. While researching this topic a number of questions were raised and thoroughly dealt with. These could be, generally, listed under three heads: Urban; Neighborhood; and the Residential.

As per the contemporary urban historians, multi-level and ever-changing complexities of city life require that a city’s residential architecture can only be understood properly in its neighborhood and city-wide context. The railway housing was scattered, as the housing for the senior officers was located at a distance from that for the low-income staff and this obviously changed their contextual placement in an urban setting.

The study of residential buildings in their immediate context was the second level of this study. Any study of individual residential buildings remains incomplete without the study of the complete built culture including the building bylaws, land-use and other socio-cultural infrastructure for the different users. To ascertain all this investigation addressed the following questions: What is the reason for their location in a particular residential settlement, who are its users, what is the conceptual underpinning behind their layout, type of its infrastructure with respect to its users. The objective of the above-mentioned studies was to situate the architectural analysis within a multi-scale social framework of residential colonies and metropolitan Lahore.

Finally, this study in detail analyzes individual residential buildings. This requires a different approach than those adopted for the above two categories so a different set of questions was raised and answered: These concerned, firstly, the different categories of plots and their layouts, reasons for differences in planning of interior spaces and changes in them over time. The second type of questions concerned the technological aspects such as the different construction techniques adopted and improvements in them over time. The third aspect concerned the environmental concerns such as those dealing with the techniques adopted in attempting to cope with the harsh weather conditions. The fourth and final question concerned the adoption of different architectural styles/forms and reasons for their adoption. This dissertation, takes into account all the direct and indirect sources, archival records as well as field studies to answer the above-mentioned questions.
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Chapter-1

Introduction

The city of Lahore holds a unique status in terms of the variety of architectural heritage from various periods of history. This heritage consists of monumental royal buildings, mosques and tombs, and a rich heritage of residential architecture. The houses were densely packed in residential neighborhoods. The most common feature of these houses was the courtyard and roof openings in the form of ‘mungs’ in case of very small houses. This planning feature remained consistent in the walled city and the city’s suburban settlements. British were the last foreign invaders of Lahore who ruled the city from 1849 to 1947. The city expanded immensely during this period and at the close of the British administration the walled city, civil station, cantonment and the railway establishments of all types were the four largest urban constituents of Lahore. The railway settlements of Lahore comprised of a variety of building types for various uses and became an important part of the British architectural legacy in Lahore. Among the huge stock of railway buildings, the residential ones occupied large areas. They were also divided into residences for the European, the Indian and the Anglo-Indian staff. New concepts in housing plan forms were introduced in addition to various other challenges.

In planning the residential buildings for its staff, the railway administration faced many challenges, particularly for the European staff. These challenges were related to safety/security, the local climatic conditions, environmental issues, and socio-cultural needs. After the uprising of 1857, the safety of Europeans emerged as a primary requirement and, therefore, safe siting of their housing became extremely important.

The second issue was related to climatic and environmental conditions. This was not conducive to the Europeans as they suffered from high mortality rates all over the plains, marshy and forested regions of India. The major challenge was to create conducive environment to support the Europeans’ buildings by optimizing the indoor climatic conditions. Various techniques and strategies were needed to be worked out in order to minimize the problems.
The third issue concerned the social life of the employees. The major task was to provide such indoor and outdoor enjoyment facilities in which employees could feel homely. To arrange the required facilities for the staff was another important challenge.

The fourth issue was related to design of Indian and Anglo-Indian residences in the railway housing settlements. Whether they were to be provided the same accommodations or were they to be treated differently from one another. In the latter case determining the area requirement for each and, correspondingly, the kind of functional spaces to be provided, respectively, to each group, was a thought provoking matter.

The fifth issue was to differentiate the housing of European officers from subordinates. The important question was whether the European officers and staff were to be accommodated in the same locality or would locating them in separate colonies be preferable. This subject got particular attention and continued to evolve throughout the period of the British railways.

To analyze railway residential architecture, different approaches were studied. These case-studies were chosen from different parts of the world in order to draw conclusions to outline the scope of the study. These approaches are narrated in the following paragraphs.

1.1 Different Approaches for Studying Residential Architecture

There is not any in-depth study of public sector housing especially with respect to railway residential architecture in India, Pakistan and Bangladesh. Therefore a variety of analytical studies of houses was required from developed and undeveloped countries to frame a course of action for the study of railway residential buildings in Lahore.

The typological studies analyzed residential building designs from different dimensions. Hsu and Shih [1] have analyzed typological housing design based upon the modular system. The case-study chosen was Quartier Fruges Pessac by Le Corbusier. In this research the author has discussed the method of form-production in Le Corbusier’s housing design from typological point of view to explore his composite principles of rational housing. In particular, the paper explored how Le Corbusier produced a spatial variety and unity by applying composite principles to housing design and production. The cellular concept of
housing creating a new typology had first been applied in the Quartier Fruges in Pessac. Various approaches have been followed to understand the development of housing in the light of Corbusier’s design philosophy. The first approach was to review the effectiveness of Le Corbusier’s ‘machine’ analogy through the lens of “past occupancy evaluation”. The second approach pointed out Le Corbusier “deliberate” housing design for the said housing project and later modified and remodeled by the occupants. The modular planning of smaller unit “cellules” and their multiplication for the production of multiple units and larger units, were closely examined. The housing designed echoed assembly-line prototypes.

Mushtaha and Arar [2] have taken a different approach and focused upon “House typology from Adjacency Diagram Theory.” The authors claim that no attempts, so far, have so been made to analyze the indoor spaces from the direction of geographic direction. As an experiment, an instance of a corridor plan was investigated. Accordingly, the outcome of the analysis has shown that the number of pattern using space orientation theory is greater than those patterns of the Adjacency Diagram Theory. The Adjacency Diagram shows that the circulation and space distribution in the plan. The author concludes that space orientation theory in a holistic approach for typology and more accurate and comprehensive than the theory of the Adjacency Diagram.

Ashraf Salama [3] has used cultural historic-spatial theory in analysis of historic houses in Cairo. In his paper entitled “A typological perspectives: The impact of cultural paradigmatic shift on the evolution of courtyard houses in Cairo.” Salama analyzed different functional spaces using six different approaches such as: (1) the aesthetic formal interpretation, (2) the typological approach, (3) evolutionary theory, (4) physical explanations such as building technology and climatic aspect, (5) Social explanation such as defense theory and household structure, and finally, socio-cultural factors and religious practices. The paper examined the evolution of Cairene courtyard houses by considering the formal changes in their key spaces and by relating the evolutionary process to cultural change that Egypt and its capital have witnessed. The analysis was envisioned within terms of culture and cultural change. The major cultural spaces analyzed in this respect were the courtyard, Dihliz (entrance), qa’a (reception hall), takhtabush (A covered outdoor sitting area near the entrance), and Maka’ad (A square- or rectangular-shaped covered loggia). In this
analysis eighteen houses were selected from the Mamluk period up till 1990. Salama believes that integrating pattern language and behavioral setting concept into the study of house typology, forming a more comprehensive methodology can provide insight into deeper understanding and interaction of interactive relationship between the evolutionary process and the house environment.

The most seminal work in the typological study of residential architecture is done by Prof. Attilio Petruccioli [4]. In his two books, “After Amnesia: Learning from the Islamic Mediterranean urban Fabric”, and “Typological Process and Design Theory”, Petruccioli has analysed different typologies of residential building with reference to historical developments, spatial patterns and architectural form. A number and variety of houses has been selected in different countries and lessons drawn from a comparison between various types of spaces within the houses, and the form and composition of the houses.

There are a number of studies dealing with cultural segregation in housing in European towns but very little literature exists on the colonial settlements in India. Jonston Ron et al. [5] admitted in their paper entitled “The Geography of Ethnic Residential Segregation: A Comparative Study of Five countries”, specifically mentioned that few studies have undertaken rigorous comparative analyses of levels of ethnic residential segregation across two or more countries. Using data for the latest available censuses (2000–2001) and a bespoke methodology for such comparative work, the research analyzed levels of segregation across the urban systems of five major immigrant-receiving, English-speaking countries: Australia, Canada, New Zealand, UK and the US. The findings show common factors influencing segregation levels in all five countries: notably the size of the group being considered as a percentage of the urban total, but also urban size and urban ethnic diversity, plus country-specific variations that cannot be attributed to these generic factors. In general, there is less segregation in Australia and New Zealand than in the other three countries.

In India, cultural and ethnic problems were quite complex in the presence of several ethnic and religious groups. There was strong uprising against the British in 1857 that led to the development of independent housing settlements for the Europeans using a different planning concept as compared to the traditional ones. In Lahore, for example, European-
dominated settlements furthered class and ethnic segregation and this is apparent in the form of separate housing quarters for the Europeans and the local Indians. New building types to meet socio-cultural and sports-related infrastructure were introduced. Civil Lines was planned for the European where elite local ruling class was also accommodated but local population lived in their own densely populated settlements. These aspects were very strong in Lahore compared with other cities as the railways contributed further to this problem. A variety of houses was required to accommodate employees of different status and ethnic backgrounds.

Considering the above mentioned factors, the following study has been designed to look into railway residential at the Macro and the Micro levels. At the Macro level, the relationship between the city and the residences has been investigated. In addition, the settlement planning was also an important subject with reference to size and layout of the plots and socio-cultural and technical infrastructure associated with it. Finally, at the Micro level, a detailed study of individual residences was analyzed.

On one hand individual spaces within a residential building, their location, size, orientation, suitability and function, relationships between different spaces (adjacency approach) and heights were investigated. And on the other hand, square-foot areas provided for different functions, heights and wall areas were compared between each category developed during different time-periods in the colonial era. The main focus was upon discovering the principles of design and construction, and to discover Why, How and What kind of improvements in the designs were made with time. To investigate the subject, the research methodology has been carefully designed and literature also has been thoroughly reviewed in this chapter.

1.2 Research Methodology

In order to study the railway residential architecture at a deeper level, a proper research methodology was devised based upon primary sources and supporting modern interpretations, researching archival record in the form of drawings, official documents and reports, and finally, the information gained from these sources was verified at the respective sites. Since there is not any direct source of information on railway residential architecture in
Lahore, therefore, only those information which were relevant to railway residential building were considered and utilized in this research.

The research methodology is described in the following paragraphs:

In terms of textual sources, various archives and libraries in Pakistan and India were consulted. In Lahore, the Punjab Provincial Archives of Pakistan(PPAP), old Record Room Archives of Municipal Corporation, Library of National Museum, Punjab Public Library, Dyal Sing Library, Library of Irrigation Secretariat, and Library of Railway Headquarters, were consulted. In India, some time was spent in the National Archives of Railways, a part of the Rail Museum, Delhi, which holds an extensive material in the form of books, magazines, official railway reports, maps and photographs. In addition, various opinions/observations recorded in travelogues pertaining to Lahore were also studied. All these sources have been discussed in the literature review.

1.2.1 Architectural and Structural Drawings

Along with the text sources, efforts were made to search out other sources to develop a deeper understanding of the subject. In this regard a lot of time was spent to try and find out the original drawings. It was revealed from the Design Office of the Railway Headquarters at Lahore that like other extensive documentation and record of the British Indian Empire, the railway administration of Lahore also prepared drawings of housing settlements and residential buildings. This conclusion was drawn from the old catalogs of drawings which existed during the period of the British administration. The indexation of drawings, leads one to conclude that thousands of drawings were prepared. This information encouraged an exploration of the further availability of drawings at various design offices of the railway in Lahore, such as the Design Office of the Railway Headquarters, Office of the Divisional Superintendent, and Office of the Divisional Superintendent Railway Workshops. A lot of time was spent in these offices for locating the original drawings. However, with determined efforts a large number of drawings were recovered from the old cabinets and old jute sacks. Most of the drawings were in the worst condition and the goal now was to bring them to a legible and comprehensible level. Therefore, with the help of CAD and other graphics software these were slowly repaired and brought to a stage where some detailed info could be
gleaned from them. In fact, these original drawings formed the real foundation and source of information for this thesis and departure point at different inert stages during the research process.

The drawings were arranged in a chronological order and divided into various categories such as layout plans of housing settlements, site plans, and architectural plans comprising of elevations, sectional details and structural aspects. The overall view of these drawings prompted the conclusion that they were made for different-sized houses. In addition, titles of some of these drawings noted that these were made, particularly, for the residences of Europeans and Indians. The sectional details and specifications on materials and structures also appeared to varying many cases. Furthermore, except for a few drawings of twentieth century no evidence was found that the buildings shown in these drawings were designed by the architects. In fact the establishment of the Architecture Wing in the Public Works Department only started functioning during the first decade of the twentieth century. At that time Consulting Architects were appointed in the Government of Punjab, and as a result, they became responsible for designing the government residential buildings. Actual input by the architects in the design process, though appears to be limited. Consequently, the railway residential buildings and other structures like the Lahore Railway Station were, designed by the Engineers.

1.2.2 Field Studies

However, to confirm the validity of the drawings, extensive field surveys were conducted, because with the passage of time, as expected, a lot of interventions had taken place in the original scheme and much difficulty was faced in the verification process. During the field surveys, the main focus remained on the original layouts, spaces, plan configurations, uses, specifications, materials and the structural systems employed. It was observed that plans were faithfully executed as depicted on the drawings and specifications were followed observed on site.

After verification of drawings at the sites, it was noted that there were many areas in the drawings which required interpretation. The most important point to be understood is that the system of building types, their construction, etc., was a dynamic one and not static. It
continuously incorporated changes made elsewhere in India and England, and continued to react and evolve per socio-economic, design, climatic, and other requirements, locally. For example, it emerged that to track the evolution of various types of house plans and the reasons for such changes resorting to the comparative analysis was necessary. For example, to determine what kind of spaces emerged as ‘permanent’ spaces and what type of spaces were discarded from use, as time passed, could only be determined through a comparative method. Similarly, the structural systems experienced many changes and improvements as it evolved.

1.3 Literature Review

Beginning with the introduction of railways in 1853, an extensive literature has been published on the history of the British Indian Railways, its administrative setup, railway engineering and its associated infrastructure, such as railroad construction. The British architects and historians gave much more attention to the description of monumental public buildings including some of the railway stations. These writings by the British planners dealt with the planning of new housing settlements based upon the principles of modern town planning. At the same time a vast amount of literature dealt with the history, geography and culture of the Indian subcontinent. The scholarly work on the British Colonial Railway Architecture, generally, but housing in particular, did not receive adequate attention. Wayne Mullen has identified one reason for not dealing with the description of subjects like the built during the British rule in India. He opined that the histories of the British political, administrative and military presence in India, as subjects of research and scholarship, attracted far more attention than the history of what they built in India[6]. The design concepts of housing schemes and different types of residential building for variety of users were not dilated upon. The British professionals produced handbooks and manuals of building construction for the convenience of their engineers and the subordinate staff. This section, therefore, discusses in detail the variety of literature produced which directly or indirectly helps in understanding the rich heritage of the railway residential buildings and the built environment which they produced. The publications include primary and secondary sources, including the reports, theses, travelogues and research papers, from which inferences have been drawn to prepare the scope of this study.
1.3.1 Primary Sources (Books)

Among the books written on the history of Lahore, the best-known and the most-frequently referred publication is Latif’s “Lahore, Architectural Remains and Antiquities”, written in 1892. Syed Muhammad Latif served as an extra-judicial Assistant Commissioner at Gurdaspur and had a keen eye for the environment that surrounded him. When Latif penned his book on Lahore, development around the railway station was at its climax. These included the railway workshops, residential colonies and the office buildings. The Railway Station, because of its scale and form, quickly became an important representative landmark of the city. Latif has given a comprehensive eye-witness account of the various areas of the railway workshops where different tasks were being carried out. While discussing the railway workshops, he mentioned that:

“Lahore being head-quarter of North Western Railway system, there are extensive workshops which, together with the station, covers about 126 acres of ground. Upwards of 4000 workmen are employed daily. These include a number of European foremen, Eurasian and Parsi mechanics, but the bulk of workmen are the native of Punjab.” [7]

The description of staff working in the workshops is quite clear. The workshop described by Latif was located near the Walled City and not on its present site at Mughalpura. It employed a variety of specialist staff for the maintenance of engines and production of machines. The railway workshops played a vital role in providing huge employment to people of different backgrounds. There must have been some housing for these European and Eurasian technicians. Latif has briefly described the housing provided for such workers:

“In the vicinity of the station, north and south of the line quarters have been built for the Railway community; and in them foremen, drivers, guards and mechanics are comfortably lodged with their families. There are a good swimming bath, a Railway Institute, Library, Billiard room, Recreation Ground, Theater and Cooperative Stores…..The Railway quarters are supplied with canal water for purposes of irrigation, and water from the Municipal Water-works is laid on for the use of Railway people…..”[8].
This is the earliest description with reference to railway residential buildings and housing settlements. The description is silent about the nature, for ethnic/racial composition of this Railway community. Additionally, nothing is clear about the form and typologies of residential structures built for the different cadres of technicians and workers. The precise function of the Railway Institute, alluded to by Latif, is unclear in order to understand the physical and social environment of the residential neighborhood. On the other hand it is obvious that such community was well equipped with different types of sports, recreation and reading facilities. In addition, safe water-supply was ensured, whereas the canal water was used to irrigate the lawns. In short from Latif’s quote one does not get a clear idea of the architecture of the residential buildings.

Lahore remained an important subject for academic research throughout the British Colonial Period. A number of Indian and English authors also wrote about its heritage and colonial buildings. Kunaya Lal, who served as an Executive Engineer during the second half of the nineteenth century and supervised the construction of a number of public buildings, especially on the Mall, wrote a book in Urdu about the history of Lahore, in 1884. This book entitled, “Tarikh-e-Lahore”, describes at length the important architectural elements of the Lahore Railway Station as well as different areas of the railway storage barracks and the associated workshop. Similarly, Col. Newel also wrote a small booklet in 1921, entitled, “Lahore”. The book described important monuments of the Mughal and the English periods. Another important book, dealing mainly with the colonial period, was written by H.R. Goulding, who served as the Financial Commissioner in the Punjab Government. The book, “Lahore: Reminiscent of a Resident” described the important buildings and cultural institutions of Lahore. The information given in the book was derived from Gazette notifications and correspondence files of the different departments.

Although there is a wealth of information provided in the above-mentioned books on Mughal and Colonial buildings, but they are silent about residential architecture and the built environment in general, and housing in particular. The railway residential building settlements were no even mentioned. Latif’s was the only book which did dilate, though briefly, upon the subject.
Not to mention railway architecture, books about aesthetics of colonial architecture in general and residential architecture in particular, were not popular topic for writers during the nineteenth century. One of the earliest books that appeared on architecture was the “History of Modern style of Architecture”, written by James Ferguson in 1873. Ferguson also gave a short thrift to colonial residential buildings in his book, although he did briefly discuss the bungalows of European colonists in Calcutta. His description gives an idea about the house design, architectural style, materials and various functional spaces of those bungalows. Apart from discussing public buildings, he did point out that in the seventeenth century the Dutch and the English tombs were much influenced in form and other aspects from Mahommedan Princes of the day. He mentioned that:

“Europeans were then a small and dependent community, and were content to copy the manners and arts of the natives who were then superior in rank and in power. The process has been since then entirely reversed; we are now in the position of the rulers of India in those days, and the natives have unfortunately taken to copying us and our arts, as we adopted their habits and copied their arts when we first settled in their country”[9]

Amongst Ferguson’s other books was the one that he wrote in 1849, titled, “True Principles of Beauty in Art, more specifically with reference to Architecture”. This book gives an overview about how the Europeans and the Indians conceived their buildings beautiful. This book is a useful source for identifying the European architectural elements on residential and other buildings in India [10].

The debate on the appropriate architectural style of British architecture in India really started with the arrival of John Lockwood Kipling. He argued that architecture must emerge from the vernacular traditions and must not be borrowed. He was opposed by those who argued that the British architecture should be imposed with confidence with total disregard of the local cultural and building history. In the light of this debate, the philosophy of British colonial residential architecture requires to be analyzed in greater depth.
1.3.2 Government Reports

An important source for the study of the Colonial period’s heritage is the annual administrative report of the Government. The Public Works Department regularly published such reports under various titles, such as, “General Report on the Administration of the Punjab territories”, “Annual Progress report of Public Works Department in Punjab”, “Administration of the Punjab and its Dependencies”, “Report by the Railway Board on Indian Railways”, “The Railways of India”, and “The Punjab Railways”. These reports provide a wealth of information on development activities, their up-to-date progress accompanied by photographs of important projects. The housing and residential buildings were not discussed directly but instead provided general information on various matters. Among these, the report titled, “The Punjab Railways”, published in 1857, consists of a number of letters of the Chairman, Directors, and the Agent of the “Scinde Railway Company”, on the subject of establishing a railway link between Multan, Amritsar, Lahore, and Multan. The official correspondence of William Brunton, Superintending Engineer of Punjab Survey with the “Scinde Railway Company”, is also part of this report. Brunton designed the Lahore Railway Station and also planned the railway line between Amritsar, Lahore and Multan. This first-hand information was useful in the search to find the reasons behind present site selection for railway and the objective intended with unique design of railway station.

According to these annual reports the railway system for Lahore was planned in 1857, a difficult time for the British in India. Sir John Strachey, [11] a reputed writer and the acting Governor General of India, wrote about India in 1888, and sketched a complete picture of India after the 1857 Uprising against the British. John explained in his book that the Uprising of 1857 shook the British Indian Empire seriously and as a result various changes in administration and government policies took place.

In 1858 the East India Company was abolished and the administration of India was placed under the direct authority of the British Crown. To avoid and any future challenges, the whole military organization was modified. The ratio between the Europeans and Indians army was changed from 1:5 to 1:2. The communication system was rapidly expanded with a large new network of railways and roads. At the time of the Uprising, India had about 400
miles of railway track, whereas by 1888 it had expanded to 8312 miles. In 1857, when a regiment took three or four months from the seaboar to reach Lahore, it could only take a week from Calcutta to Lahore in 1888.

John Strachey also referred the inquiry of the Royal Commission constituted in 1859 to inquire into sanitary conditions of army in India. The Commission discovered that the death-rate among the British troops in India for the forty years ending with 1856 had been 69 per thousand. This was six times the rate among Englishmen of the same age-group at home. Strachey highlighted that after the Uprising, health of the European troops improved with the improvements in sanitary the conditions of their Barracks. As a result of their death-rate declined in 1879 to 19 per thousand. Another measure to ensure the health of European in India was that 20 percent of the Europeans in the British army in India were posted at hill stations, in a climate similar to that of their homeland, England. [12]

The Administrative Reports of the Public Works Department Government of the Punjab published during the 1930s provided the photographs and details of steel bridges constructed over the Haro River in the Attock District. Considering all these important projects discussed in the reports, the housing and their construction did not receive much coverage. Since the earliest for of railway barracks were similar to army barracks, therefore Strachey comments become much more important on the sanitary measures. What the railway has done to improve the sanitary condition of its housing and residential buildings needed to explore. This important subject has not been studied at all in any scholarship.

1.3.3 Travelogues

During the British period a number of travelers visited Lahore and admired its landscape and beauty. Housing built by the railway, however, was seldom their topic of interest. Among these travelers, Lord Edwin Weeks and David Ross are quite significant. Weeks was an American artist who came to Lahore via Karachi and admired the beauty and gardens of Lahore. Weeks made water-color sketches of the Wazir Khan Mosque and bazaars of the Walled City. David Ross travelled from Karachi to Peshawar. He described the history and architecture of all important towns which he passed during his trip.
Whereas Weeks described the landscape of the entire built-up areas of the city and its important buildings, he also wrote about the new Lahore being developed at that time in the following words:

"While the English community of Lahore, as elsewhere in India, has elected to live away from the native city, and while the original nucleus of this settlement was planted, for sanitary and other reasons, far from the city walls, it has gradually filled up the intervening space, so that the usual neutral ground, or no man's land, has ceased to exist. In the crowded suburb of Anarkali which we must traverse in order to reach the post-office, the bazaars extend out from the city gate to elite European civil lines." [13].

Weeks never referred directly to the housing settlement of the railway but he pointed out that the European quarters were being developed to the east and south-east side of the city. It was pointed out that these settlements were planned and planted for sanitary reasons.

David Ross, an English traveler, visited India in the late 1870s. He narrated his observations in a book titled, “The Land of Five Rivers and Sindh”, which he wrote in 1882. The book provided a brief political history of all important towns and cities located along the Railway line. In addition, the book also provided information on the architectural developments recent past, which had taken place in those cities. His description of Lahore was quite comprehensive and provided information on cities built so far. Ross also described the Lahore Railway Station and its attached workshops. Ross also briefly described the railway settlement and more or less supported the information furnished by S.M. Latif, in the following words:

The railway workshops are very extensive, covering 126 acres. Over 2,000 men are employed. The railway company has provided substantial houses for their employees with a good swimming bath, library, billiard room, theater and recreation grounds. The church attached was formerly a Musalman tomb, and seats about eighty persons [14].
This meager description of the housing settlement is did not provide detailed information. It is obvious that the housing settlements did have public facilities. The term “substantial” indicates that it must have been built on modern principles providing amenities which had not existed earlier. Ross’s description did not provide comprehensive information on either housing or residential buildings, which required further investigation.

1.3.4 Secondary Sources

Soon after the partition of India, railway administrations of both India and Pakistan felt the need for compiling the achievements of the respective railways as they were, formerly, part of the same system. The first centennial of the railway’s appearance in S Asia was the prompting factor. Among these publications a few are worth mentioning. The first book in this respect was written by J.N. Shani. It was titled “Indian Railways: One Hundred Years 1853-1953”, and published from Delhi in 1953 by the Indian Railway Board. Similarly, the book entitled, “Hundred Years of Pakistan Railways”, written by M.B.K. Malik, was published by the Pakistan Railway Board in 1962. The material provided in these books was derived from the primary sources and discussed subjects like origins of railways, railway stations, bridges, tracks and their construction. Railway housing was overlooked in these books. A chapter on architecture was devoted in the book published in India, and discussed important railway station buildings only. The book did not even discuss the housing developed around Victoria Terminus or the Jamalpur Railway Workshops. A chapter on Employees and Welfare Services in the book “Hundred Years of Pakistan Railway”, devoted a just briefly mentions railway housing in the following forwards:

“In 1926, the Government of India enunciated the momentous policy that quarters should provided by railways where conditions were such that private enterprise did not meet adequately housing demands, and where it was necessary for special reasons to provide quarters for the certain classes of the staff near place of the work……..The railways constructed large colonies for officers and other staff at the central divisional and district headquarters, which stand out as a tribute to the solicitude shown by the railway administration in looking after the staff and their families. The Mayo Garden
and Canal Bank colonies at Lahore, the Mughalpura colonies…… evoke admiration and envy of the visitors” [15]

The above-mentioned description points out the importance of railway staff housing in the eyes of the railway authorities. The housing settlements and their physical environments were exemplary and were admired even after independence. It were not only the residential buildings alone which lend a character to the built environment, but other issues and topics, like the philosophy of site planning and infrastructure facilities, etc., have to be considered as well, to get a fuller view of the total picture. Such concepts which make these settlements the “envy of visitors”, need an in depth study.

Another book titled, “Couplings to the Khyber: The Story of North Western Railway”, was written by Berridge, in 1969. He had served in the North Western Railway for twenty years (1926-46), and also edited the monthly staff magazine. The pen and the camera were united in an excellent effort to record the history of the North-Western Railway. This book gives detailed information on opening and construction of various railway lines in the plains and the hilly areas of the Punjab. It also discusses wonderful steel bridges with large spans. It also provides information on the steam-boat service which was begun on the Indus River in 1843 and ended in 1878 with the name Indus Flotilla. The Indus Flotilla also linked Multan with Karachi till the establishment of the railway line between the both cities [16].

A recent book titled, “Railways of the Raj”, written by Michael Satow and Ray Desmound in 1980, focused on the historical development of the railway system in India. The book discussed the people and their philosophies dealing with different problems including architecture. A short critical commentary about the Lahore Railway Station is also available in this book. The importance of the security of passengers became the basis of design so that it acted as a fortress-like structure [17]. The book is silent on housing settlements and residential buildings.

‘ ’Recollection of Railway Man’’ by A. Kalam, written in 1995, described the author’s thought about the housing colony of Mughalpura where he resided during his active service. Such useful books shed light on the feelings of the residents but they do not explicitly describe the architectural qualities [18].
1.3.5 Administrative Reports

During the Colonial rule the architectural design as well as construction of buildings was carried out by the Public Works Department (P.W.D), Punjab. At the end of the financial year, a comprehensive report was prepared by the department which included the report by the consulting architect with respect to the projects in hand, progress of work, as well as a list of the completed projects. These reports are one of the important sources of information which shed light on the status of each project at a given point in time. The P.W.D worked for nearly all the other provincial departments in planning and execution of the civil works during the colonial rule. Prior to the PWD, the civil works were under the control of the Military Board. Initially, the volume of work was limited, so the Annual Administration Reports for all the departments such as the Military, Roads, Railway, Irrigation, Education, Revenue and Health, were prepared jointly. With the expansion and increase in the volume of work, each department started publishing its own annual administration reports independently.

The order for the preparation of the Annual Administration Reports was issued to all Presidencies and Provincial Administrations under the Government of India, on 18 May 1855.

An overview of the annual administration reports of the Public Works Department reveals that planning, designing and construction of buildings progressed under a well-planned system. The Public Works Department (P.W.D.) as a separate branch of the Government of India was also established in February 1855 [19]. The reports of the P.W.D. and others departments were generally published from Lahore, Culcutta, Bombay, Simla and London. The wide circulation of these reports to every part of Indian the Empire is evidence that sharing of experiences was an important dimension of these reports. The PWD reports are unmatched in the information they provide. The introductory note of the Consulting Architect usually gives the overview of the activities performed during the year, design philosophy, and difficulties and achievements made during the respective financial year.

In 1901, for the first time on a department-wide basis, RIBA qualified architects were engaged as salaried officers of the PWD to serve as the ‘Consulting Architect to
Government’ in each of the provincial and presidency administration. As a result of this decision, the post of the Consulting Architect to the Government of India was created at Delhi with the appointment of John Begg, who was also responsible for designing projects in the Punjab.

The post of a consulting architect in the province of Punjab was created in 1914 with the appointment of Basil Martin Sullivan. John Begg designed a number of projects in Lahore and other parts of Punjab and wrote detailed administration reports till the appointment of B.M. Sullivan. In addition to the written description of the progress of the important projects, the reports hold images of the completed projects which helped to formulate the concepts of architectural composition, materials and construction techniques. In his annual Report on Architectural Works in India for the year 1914-15, John Begg included the sketches of the Railway Station Lahore but further elaborate that work not yet under construction. Similarly, Sullivan also mentioned the preparation of the proposal for the extension of the Railway Station yard at Sheikhupura. The Annual reports prepared during 1930 to 1937 gave the photographs of several railway bridge constructed in the Attock District. These reports don’t reveal the architect’s names.

The railway was also preparing its own reports but their major focus was upon the tracks, engines, workshops, bridges, and income and expenditure statements. However, some information is available about residential buildings, schools and other facilities. The black and white images of important buildings and colored maps of the provinces was a regular feature of these reports. The images of work-in-progress provided information on building materials and methods of construction. These reports have been found useful in understanding the chronological development of different types of buildings, developments in construction techniques and concepts of architecture built during the British rule in India. It is strange that residential buildings built in different cities did not receive any coverage.

1.3.6 Technical Manuals and Professional Papers

Thomson College of Civil Engineering at Roorkee, the oldest engineering college (1847) in India, was built after the initiation of an irrigation mega project called the ‘Ganges Canals’. The college remained an important institution during the colonial period and
strengthened the Public Works Department by providing engineers and subordinates throughout India. Among the several publications published by the college, the “Roorkee Treatise” dealt with a variety of engineering subjects including the Building Materials, construction, roofing system, Carpentry, water supply and Estimation. The “Roorkee Treatise” grew out of the various College Manuals and has been constantly revised and re-written. The special dimension of these Treatises was their development in accordance with the actual requirements in the field, considerations of suitability to the climate and methods used in India. This source developed a general understanding of local building materials, method of construction and many other aspects related to the building profession. [20].

Besides the Roorkee Treatise, the series of “Professional Papers on Indian Engineering”, was also initiated by the College’s principal, Major J.G. Medley, in 1864. These papers have been generally overlooked by the architects in various studies on buildings although these hold original information on various aspects such as architecture, materials, construction technology, structure, and site layouts, etc. Almost all important buildings of Lahore constructed in the nineteenth century were discussed in these papers either by the designer or originators. Besides buildings, the Roads, Railways, Bridges, Irrigation, and Hydro-Power were also the dominated the subjects in these papers. A series of articles was also published in these papers about lime-mortar, manufacturing of bricks and tiles, roofing systems, ventilation, and some related topics.

Besides serving as the editor of the Professional Papers on Indian Engineering, Medley also wrote many articles and delivered lectures in India and England. His article on the subject “Architecture, Anglo Indian”, published in 1864, provide a good understanding of the Anglo Indian Architecture. Similarly, articles on “Peculiarities of Indian Engineering”, published in 1866, give a detailed commentary on a variety of differing topics such as the climatic problems in the plains in India, English and Indian Bricks, building roofs, verandahs and many others aspects. He also wrote an article on ventilation about the Barrack, which gave various suggestions for effective ventilation in plain areas.

A number of papers on specialized issues were prepared by the British engineers in India to meet various challenges related to building materials, techniques, construction
methods and the roofing systems. Many experiments were carried out for establishing standard plans and standard spaces to meet the challenge of the Indian plains’ climatic condition and satisfy living and social requirements of the Europeans. The major challenge in creating large spaces in residential buildings was the design of appropriate roofing system, which was ultimately resolved with the implementation of the Jack Arch roofing system. This system was imported from Europe where it was being used in the industrial buildings.

In 1909 Goument, Chief Engineer, Public Works Department, Building and Road Branch, United Provinces, wrote a comprehensive paper on the use of wire-lime concrete in roofs and discussed experimental results and different options. Similarly, a paper was written by W.S. Dorman, Executive Engineer, King Edward Memorial Division, Lahore, on the ‘Jack Arch’ in August 1913, which gave complete details on the construction of Jack Arches in different areas in India[21].

The aspects of building construction and solutions for environmental problems in various writing of articles, has been discussed especially by the engineers. These solutions were applicable in many areas and also applied to the residential buildings. These articles were published both in India and Great Britain. At the same time a number of pattern books giving typical house plans were also published in England. These books became useful model for the preparation of the typical plan of the Bungalows for Europeans in India. “The Architect” from London occasionally published articles on public buildings in India. This journal published a full length article in 1869, titled, “The Handy Book of House Building”. Although the article was unrelated to India, it nevertheless was useful for understanding the European requirements of houses and its comparisons with the standards of the British colonial residence in India [22].

Like this, “Handy Book of House Building”, the European traditions of publishing architectural pattern Books and manuals was rooted in the 18th century. There were two types of pattern books: one by the well-known architects about their finished projects, and the other from building craftsmen or architects containing untried design patterns sometimes copied from other books. In European countries such books were intended for rural areas where architects were not available. There was a flood of these books in Europe when railway was
first introduced in Lahore. A long list of these books was independently printed by Long in his book, “Victorian Houses and their details” [23].

Another journal, “The Builder”, was started in 1842 presently known as “Building”, had published many articles on the subject of architecture focusing European countries. The articles published on European housing in Europe help in understanding the European housing requirements in India. The article published in 1850 on “Syphon Ventilation System”, in houses, and the “Construction of Houses for the Prevention of Fire”, has become very useful in understanding the extensive provision of Syphon Ventilators and Fireplaces in railway bungalows and quarters. Similarly, “Bombay Builder” was another journal which published number of articles on architecture in India.

Following the European tradition, the Indian engineer trained from England, working in the Public Works Department of India, also started writing the pattern books. One of the popular book in Lahore during last decade of nineteenth century was “Hand book of Civil Engineering” by Ganga Ram in 1889. In addition to a variety of house-plans, their elevations, sections and the perspective views, the book provided solutions to various problems related to civil engineering. The house designs given in the book show the completed as well as proposed projects. John Lockwood Kipling (b 1837), who served as principal of the Mayo School of Art and Design, now the ‘NCA’, in Lahore between 1875-1893, passed remarks on Indian master masons as “--------the ancient prejudice against manual labour still exists, as a rule, our native subordinate of public works department have only knowledge of the ‘bookish theories’. There are hundreds of them indeed earning relatively large salaries, who are mere copyist and tracers. The best mistri of the old school is often skilful in several crafts and wonderful facility in designing ornaments” [24]. Similarly, another article written by Tempel in 1885, quoted his site visits and interaction with the master mason. He stated that:

“-------- “Then where are the plans?” “The master mason knew”. Whereupon this worthy smoothed the ground near and drew his design upon it with his finger. This was intelligible enough as far as it went, but how, without permanent drawings, did he fit the stones and make the mouldings accurately? That, he explained was his trade, which he knew as matter of
course. To a question as to where he got his design, he replied that there was no difficulty, he had seen many Sivalas, as doubtless had also the Sahib, his interlocutor and this would be like those he had seen.” [25].

The role of the Indian craftsman and the Master masons remained limited in colonial Railway buildings to construction of a variety of arches in the verandah and segmental arches in roofs for the Jack Arch construction. Like arches, many other architectural elements and details were made standardized for repetition at various sites. Scriver’s study, titled, “Rationalization, Standardization, and Control in Design: A Cognitive Historical Study of Architectural Design and Planning in the Public Works Department of British India, 1885-1901”, has thoroughly examined the whole process. This study helps in concluding the planning and Architectural style of colonial railways buildings in Lahore as architecture built in an ordered environment.

1.3.7 Modern Sources: Books and Theses

Considering the study on pure European residential buildings in the nineteenth century, T. Roger Smith’s work, comprehensively explained the residential buildings which remained under the use of the Europeans. Smith’s major focus was the evolution of the Bungalow. His study covered almost every aspect of Bungalow including the social-cultural, climatic, aesthetic and the structural. Smith’s work is important because of his Indian experiences. However, in the twentieth century, King Anthony, wrote a book on the subject “The Bungalow” in 1984 where he had made Smith’s studies, the basis of his book. King also wrote another book titled “Colonial Urban Development”, which focused mainly on India. Both books are excellent in terms of their contents but the colonial architecture of Lahore was not covered adequately. However, these books solved many problems in this thesis when railway colonial residential buildings were viewed in the larger context with other residential colonial buildings in India.

During the same time when King was writing on colonial urban development, a PhD thesis titled, “The Punjab Province and the Lahore District, 1849-1872: A Case study of British Colonial Rule and Social Changes in India” was presented by Kerr. The thesis focused particularly on the European railway community in Lahore, where European railway
employees were given significant space for discussion with reference to their social needs and social interaction with other places of European community in Lahore. The thesis also shed light on the Eurasian employees of the railways. Kerr had also written some articles on the railway discussing its role in the urban growth of Lahore. Another study on Lahore with the title, “Making Lahore Modern”, was carried out by Glover in 1999, which in addition to other things explained various dimensions of the traditional Indian houses and European bungalows.

Another famous writer, Thomas Metcalf, while commenting on the post-1857 period explained that an effective imperial rule required not only troops and expressive symbols but also ‘knowledge’, as an important area for success in various areas. He stated that after 1857, and particularly during the late nineteenth century, it took the shape of institutions such as the census, detailed gazetteer of each province, and Archaeological and ethnological surveys. With this process, the India architectural heritage was for the first time known to the west. Metcalf mentions that the post-1857 period saw the British taking up huge public works to gain the Indians’ confidence and to perpetuate their own rule in India.[26]. While on one side the British became cautious towards the Indians, while on other side to regain the Indians’ confidence, a large number of development projects in almost every city of India were initiated. The already functioning Central Public Works Department, started working more rigorously on the larger public projects.

In addition to these books dealing with historical context of railway and prominent buildings, the two PhD theses, one on the “Development of Indian Railways”, by Nalinaksha Sanyal, and presented to the University of London in 1930, and the other one completed under the auspices of the Delhi University in 1952 by Amba Prasad, are very useful sources for developing understanding of the introduction of the railroad in India, its working, administration and management.

1.3.8. Conclusions

Although a vast amount of books and documents dealt with different aspect of Colonial administration, their working procedures, native resources and cultural traditions, building arts and crafts, rules and regulations for improvement of urban environments but
very limited literature exists on different aspects of urban environment and residential architecture. In terms of architecture, monumental buildings and large structures received priority and, were, therefore, given adequate coverage. The various dimensions of residential architecture such as culture, environment, construction and functions, did not receive adequate coverage. One can only partially understand colonial residential architecture through building byelaws which were enacted by the municipalities from time to time. The residential architecture, therefore, cannot be understood without studying the entire context at different levels from the city and the neighborhood down to the residential level.

1.4 Dissertation Organization

The thesis is comprised of seven chapters. Chapter 1 is the Introduction: i.e., sources, methods, and its organization.

Chapter 2 is titled “Spatial Growth of Railway in Relation to the City of Lahore”. The main objective of this chapter is to find out the relationship of the city with railway settlements and, subsequently, with individual buildings. The major basis for this objective is that, according to urban historians, residential architecture cannot be fully understood without the study of its immediate neighborhood and urban context. The socio-cultural, ethnic based issues and many local contextual problems are important in such housing settlements whose residents are heterogeneous. The railway was one of those cases where besides a large section of Europeans, the Indians and the Anglo Indians were provided residences which were located in any housing settlement. To find out the impact of local contextual issues on railway housing settlement and subsequently on its residential buildings, the subject was explored at the urban level with the help of maps of Lahore, official railway reports and other documents. A comparative study of old and post-colonial maps of Lahore was performed with reference to various aspects. The comparison of Lahore’s maps, with and without the railway, raised many questions the selection of its particular site and how the housing settlements grew in certain directions and in relation with other important parts of the city. The comparison of late colonial and early post-colonial maps of Lahore was made in this chapter to find out the differences between the city’s different phases, especially, as if it existed in the absence of the railway settlement. Similarly, with the help of maps relating to
the development of railway infrastructure during the British period (1862-1947), the relationship of railway housing with its other spatial growth was studied.

Chapter-3, titled, “Railway Residential buildings and housing settlements”, investigates the residential buildings at the neighborhood level. The main objective behind this chapter was to investigate the extent to which the planning of the railway housing settlements and layout scheme is supportive for individual buildings and their users in terms of climate, sanitation, public health, environmental, security and socio infra structure issues. This chapter further investigates that how the people of various ethnic backgrounds are placed in one settlements and how class differences were maintained between officers and the subordinates through use of different housing strategies.

Chapters -4, 5 and 6, are strongly interlinked with each other and deal with the study of individual buildings. These chapters form the core of this thesis. ConsiderChapter4, which is titled, “Housing Typologies: Form and Meanings”. It focuses on, identifying various housing typologies, their functional spaces and their bases. After identification, the chapter further explores the evolving plan-forms, plan-configurations and types of functional spaces in various typologies through a comparative analysis involving time gauge. This comparison is made in tabular form with graphical representation of various spaces. The purpose of the analysis is to define changing trends in the plan-form and architectural planning of spaces. The results of analysis also determine the most common planning features in each category of typology.

Chapter-5 is titled, “Interpretation of Architectural Spaces and Planning Features”. This chapter interprets the architectural spaces and planning features with the help of architectural analysis and textual sources. In case of architectural analysis, in each category of housing typology the share of each space (floor area) towards overall magnitude (total covered area) of the building is calculated and tabulated for the comparative study. Similarly, on the volumetric side, data for internal height of various spaces in each category of typology was collected, tabulated and compared. The results of both the analyses highlighted some spaces and planning features which are interpreted with the help of textual support from various writers in of colonial residential buildings in India.
Chapter 6 is titled, “Materials and Construction Technology”. This chapter discusses various materials and roofing, and wall and foundation systems.

In the last, Chapter 7, main conclusions of the thesis are drawn, recommendations are formulated and future studies are recommended.

References and Notes


8. Ibid., p. 289.


11. According to Banglapedia, Strachey, (Sir) John (1823-1907), was a distinguished member of the Indian Civil Service, acting Viceroy and Governor General of India and a reputed writer. John Strachey first came to India in 1842 and served with distinction. He held many high positions such as the Judicial Commissioner in the Central Provinces (1862), Chief Commissioner of Oudh (1866-1867), Member of the Governor General’s Supreme Council (1868-1872), acting Viceroy and Governor-General (1872), Lieutenant-Governor of North-Western Provinces (1874-1876), and Finance Member of the Supreme Council (1876-1880). John Strachey left India in 1880 and became a member of the Council of India in 1885, a post he held till 1895. John Strachey was awarded GCSI in 1878. A prolific writer, his book on “The Finance and the Public Works of India 1869-1881”, was published in 1882, two years after he left India. His two other books entitled, “Hastings and the Rohilla War”, and “India, Its Administration and Progress” were published in 1892 and 1903, respectively.


Chapter-2

Spatial Growth of Railway Settlements in Relation to the City of Lahore

2.1 Introduction

At the time of planning proposal for railway in Lahore during the year 1857, the British administration had to factor in many important pros and cons of any site before it could be finalized. The most important considerations were the following:

1. Relationship of the railway with the existing large settlements of the city. Walled City, Cantonment and the Civil Station, were the three largest ones at that time and it was felt that, one way or another—and for various reasons—their residents should have access to it. Ability of the administration to guarantee its safety from natural catastrophes and man-made disturbances and upheavals.

2. How best to locate the railway facilities in Lahore such that the railway formed as direct a connection between Delhi and the Frontier (KP at present) through Lahore, as was possible at the time. Russian threat in C Asia, Iran and Afghanistan, could only be countered by converting Lahore into a big military personnel and supply back-up base for Rawalpindi and areas to the south. It was thus imperative, to create smaller cantonments in-between Lahore and Peshawar, in one direction, and between Lahore and Sindh & Balochistan to the South and SW. Karachi was developed for the same reasons.

3. Punjab was seen as the alternate to the US southern states’ cotton, so it was important to create the province’s main railway hub at Lahore.

4. With increasing trade and military commitments worldwide, the British were eyeing heavy military recruitment from this province, especially from the Sikh community, which had proved its loyalty to them during the troubles they had
faced beginning in May 1857. This was important as the recruits from the UP had become objects of suspicion. It had thus become extremely important to convert Lahore at the earliest, from a non-railway city to the center of a far-flung and ambitious railway network, for strategic (military), administrative and economic reasons.

Lacking local expertise in railway construction, European professionals had to be relied upon. However, the 1857 upheaval guaranteed that extra security had to be earmarked for them, as without the use of the Indian labor the project simply would not work. Similarly, security would also be required for the railway facilities.

This chapter explores how the above-mentioned challenges, affected, directly or indirectly, in the development of railway residential settlements and, subsequently, its residential buildings, in Lahore.

2.2 Introduction of Railway in Lahore and Site Selection

An article on the need for railway between Lahore and Amritsar appeared in “Lahore Chronicle” during June 1852 where it was advocated that introduction of railway between these two cities will be more advantageous in terms of commercial activities and, resultantly, a profitable scheme for the government [1]. However, the subject of introduction of railway in Lahore first appeared on official record during the year 1855 when a letter was written by the secretary of the Governor of Bombay to Mr. Bartle, the Commissioner in “Scinde” (Sindh), wherein it was suggested that the “Scinde” Railway Company should make surveys for the extension of the railway line between “Mooltan” (Multan), Lahore and “Umritsir” (Amritsar) [2]. After couple of months the Commissioner in Scinde invited the views of Sir John Lawrence, then Chief Commissioner of the “Punjaub” on the proposal [3].

The secretary to the Chief Commissioner of the “Punjaub” (Punjab) replied and agreed on the proposal and also attached the extract of letter written to Government of India [4]. The extract of letter from the Resident Engineer to the Agent of the Scinde Railway Company, [5] and the letter from the Agent to the Chairman and Directors of the “Scinde” Railway Company, [6] explain that initially the project was conceived to connect Karachi
with Multan, Lahore and Amritsar, through railway lines between these cities. However, the recommendations of the Railway Agent and the Consulting Engineer differed from the proposal for providing a railway link between Multan and Karachi. They were of the view that the terrain between Multan and Karachi was a difficult one for the railway, and this could delay the project which was important from a defense and commercial point of view.

The final shape of the project approved was like this: To avoid the difficult terrain, steam (water) transit between Hyderabad and Multan through the Indus River to speed up creation of a connection between these cities. The stretch between Multan and Hyderabad would be linked by steam (water) power. The “Scinde Railway Company” was awarded both these projects. Finally, an already-sanctioned railway project would link Hyderabad with Karachi. The terms and conditions of the project were laid down as per the “Guaranteed System”, already in practice in India. However, the approval of conducting the survey was granted on 3rd July, 1856 by the Honorable Court of the East India Company [7].

The railway in India was supervised similarly, to the one that prevailed in England at that time. The Government of India exercised its control on the railways through an Official Director who was to attend the meetings the boards of all the railway companies in India. Per the deed of the contract, the director was empowered to veto all the proceedings of the Directors. The ‘Consulting Engineer’ was another official who, although not a state servant, was frequently consulted by the office of the Secretary of State on technical matters as required.

The present location was selected following visits to many prospective sites. William Brunton, Superintending Engineer, Punjab Survey, later the Chief Engineer of the Punjab Railway, prepared the plans, sections and estimates for the railway connecting the towns of Amritsar, Lahore and Multan, measuring about 250 miles. Brunton forwarded the case to Sir James C. Melvill, K.C.B., Chairman, “Scinde” Railway Company, and it’s Directors on 15th July, 1857 [8]. The outbreak of the 1857 War in May 1857 delayed the project [9]. Work commenced on the 8th February 1859 at Lahore, following a formal opening by Sir John Lawrence, Lieutenant Governor of the Punjab. Its estimated completion
time was four years [10]. William Brunton’s report, sent to the Chairman and the Directors of the “Scinde” Railway Company, stated about site selection, that:

“I have consulted the wants of the Meean Meer Cantonment and have allotted a station at each end of their lines. The stations at Lahore, Umritsir and Mooltan, I have placed more especially with a view to native passenger traffic, which will be the main source of revenue from passengers: they are also in suitable positions for the delivery and reception of goods. It is possible (I may say certain) that near each station between Lahore and Mooltan, natives will form in time large villages. I should recommend you to make such arrangements with the Honorable East India Company as shall give you the control over the erection of any buildings within, say one mile, from each station; that villages may be constructed with regularity, and proper sanitary measures taken, as you may be advised by your engineer for the time being.” [11].

Putting aside all other issues, Brunton’s statement clearly indicates that he was aware of the impact of railway on spatial growth between Lahore and Multan. If this was the perception, then definitely, the railway’s impact within Lahore would certainly have agitated the minds of the colonial administration of Lahore. Although this was not specifically mentioned in Brunton’s report, however, his consultation with the Lahore administration on provision of the Mian Mir cantonment and location of the Lahore Railway Station are quite explanatory.

Locating the Railway Station near the Walled City as a prospectively fruitful source of revenue was understandable, but comments of the colonial administration of the Punjab province and the city of Lahore, add something more. In fact the station building was planned at the time of revolt of 1857 when the British control of India was under a serious threat of uprising by the Indians at large. R.H. Davies, Secretary to the Government of Punjab, in his report on the administration of the Punjab Territories for the year 1860-61, stated that:
“The passenger station is being constructed for a defensible post, as well as for its own proper purpose in connection with the railway. It has round bastions, loop-hooked and the roof, protected by a loop-holed parapet, commands the whole station ground. By massive sliding door across the line at both entrances, the station can entirely closed. It is intended to form the railway employees into a distinct company, about 60 strong. To be attached to the present corps of Lahore Rifle Volunteer (1st Punjab).” [12].

Similarly in many other documents one of the purposes of the Lahore Railway Station to act as a garrison in an emergency, is clearly defined. In 1863, the Principal Thomson College, Roorkee, passed these remarks about the railway station:

“The Lahore Railway Terminus is about 400 yards distant from the Delhi Gate of the city, on the site of the old Sikh Cantonment of Nolukha, among the ruins of the ancient city. In designing the Passenger Station, it was thought advisable to give it a defensive character, as far as possible, and to arrange the defences so as to require but a small garrison hence the Fort-like appearance of the present structure” [13].

In 1868, the official report on “Railways of the India”, explained the station building more clearly:

“At Lahore it was considered desirable to make the passenger station easily defensible, and in external appearance it resembles a fort. The interior is however, commodious, containing both arrival and departure platforms, with the usual offices. The rail exit can, if necessary, be closed with heavy sliding doors; and the station itself is so planned with reference to other buildings in the terminus, as to have a command of fire over them to some extent, so that if an emergency should arise it might be occupied as citadel. It is situated about 400 yards from the Delhi Gate of Lahore, and is built entirely of the best brickwork. The line from Multan to Lahore was opened for traffic in April, 1865.” [14]
One of the high officials of railway, Lieutenant-Colonel Boughey, R.E., Manager of the North-Western Railway System, reported on the railway station:

“It has connection with all the railways and all the principal places of India. It is therefore a busy centre and the building itself (a castellated structure) is a fine piece of modern brick – work which cost nearly five lakhs of rupees. It has been so constructed as to serve as a defensive work in case of need.” [15]

Michael Satow and Ray Desmond comment on the site of railway station as:-

“--------- . When the site of the station was debated in 1854 it was first agreed to locate it within the cantonment near the barracks. But the case put forward by Brunton for a passenger station, which shall be perfectly defensive in every respect’ prevailed ----------.” [16]

The above remarks and official record of the Punjab Government are evidence which speak on the purpose of railway station other than revenue generation and facilitating the people for movement. The reporting of government at the time of construction of railway station that station building is being constructed as “defensible post” gives rise to an important question that why the defensible post was required at this particular location. There were two reasons: As a revenue-generating system. Also, besides keeping a watch on the Old City, it could be defended when required. Michael Satow has furnished similar reasons in his book “Railways of the Raj”:

“The siting of railway stations was to larger extent decided by the distribution of the population, the centre of the industry and the nature of the terrain. After mutiny of 1857, however, a new factor taken into consideration was their strategic and defensible position.” [17]

Besides the reasons already mentioned, availability of land was another factor for its present location. In a map of Lahore, prepared by the office of the chief engineer in 1846 for the “Sutledge” (Sutlej) army, gave a detailed picture of Lahore and its environs. The map shows
a large number of gardens and a few villages outside the Old City’s walls, mostly towards the southern and the eastern sides. On the northern and the western sides, the city was surrounded by River Ravi, and a large area between city and river was covered either with plenty of sand or the side channels of the river. These tracks were famous as sources of flood in the northern areas of the city.

Similarly in 1844, Lieut. William Barr during his march from Delhi to Lahore had also passed similar remarks on the surroundings of Lahore’s Walled City:

“------ a branch of the river Ravee (the ancient Hydraotes—its Greek name) runs close to it on the west side, but as in the rainy season the main stream unites with this, Lahore may be truly said to be built on the left bank of the river [18].”

However, the absence of villages and gardens between the city and the river towards the northern and the western sides is understandable as this area was subject to flooding. These existing features of Lahore and its environs became guidelines for the British administration for establishment of the cantonment and the civil station on safer sides. ‘Anarkullee cantonment’ was developed on the southern side of the city near the ‘Loharee’ and the ‘Shah Alam’ Gates on the old site of the Sikh cantonment. Similarly, the foundation of the civil station was laid on the southern side of the city near ‘Anarkullee’. In 1851-52, the ‘Anarkullee cantonment’ was abolished on health grounds as during the same year the British soldiers of two regiments experienced heavy mortality rates. This forced the shifting of the cantonment to “Meean Meer” at a distance of 4-5 miles from ‘Anarkullee’. Despite the unhealthy conditions in Anarkali, however, it remained the principal European area for the civil station. By function the Civil Station was a residential enclave comprised of residences of the British civilian population concerned with the administration of the Lahore. It was a low- density area and less formal as compared to cantonment. In addition to residential area the civil lines was consisted of administrative offices of the law courts, public parks, clubs, gymkhana, churches, and many other buildings [19].
Figure 2.1: Map of Lahore, 1846. Reflecting Northern side as vacant area with few Gardens

Source: National Library of Canberra, Australia

However, the Mian Mir cantonment, a more formal area, expanded vastly towards the south-east adding a number of barracks, bungalows and other buildings. In this way the expansion of Lahore city towards southern and eastern sides was mainly due to the cantonment and the civil station. Under these circumstances the only viable and available area for establishment of the railway network was on the eastern side of the city. Therefore, present location of Railway station was finalized enough land was available for the railway network and its future expansion.
Another advantage of present site of railway station was its location near River Ravi, which provided an alternate route of transportation via steamer boats of the Indus Flotilla. The strategic location of railway station was an additional advantage at this site. Although at present site of railway station the great difficulty was experienced and comparatively much cost was spent on its deep foundations in result of loose soil but various advantages of site were so convincing that local administration and Railway Company both were completely satisfied on the location of station building. After construction of the railway station the railway network expanded along the lines towards the east. In this way the railway finally appeared as the fourth settlement, but also a divider of the city.

2.3 Lahore with Railway

From the very beginning it was perceived that establishment of railway network in Lahore will provide the foundation for a future expansion of Lahore. In 1863, just one year after the establishment of Railway the ‘Times of India’ described Lahore as:

“To those unacquainted with the locality, it may perhaps be better were I to mention, that Lahore, commonly so called, consists of our distinct and distantly situated and by no means imposing stations. Ancient Lahore (the city) is enclosed by walls, and is entirely inhabited by natives of all kinds. Anakullie, the seat of local Government, is a pleasant little village situated a short distance from the city, and occupied almost entirely by employees of Government. Meean Mir, the military cantonment, is six miles south of Anarkullie; while Noulukha, the railway terminus and future town, around which commerce ultimately is sure to cling, is nearly three miles from either of the other places referred to. These four stations embrace probably an area of some 15 miles in circumference, and, as may well be supposed, their scattered and isolated condition is productive of considerable inconvenience to the ordinary public business of the place, and must prove fatal to its prosperity in a commercial point of view.” [20].

However, with the construction of the Lahore Railway Station and Lahore-Amritsar lines, Lahore was divided into two parts: northern and southern. According to Kerr, “railway
was both a magnet and divider.” [21] However, the latter role was visible immediately. The northern side, which was a place of gardens, became less attractive for development. No significant development took place on that side till the construction of an overhead steel bridge above the railway lines on Shalimar Road, circa 1880. This bridge connected the Grand Trunk Road with the Mayo Road and opened an opportunity for development of northern Lahore. Similarly, when railway lines were extended towards the western side of the railway station connecting Lahore with Rawalpindi, the underpasses were constructed to connect the two parts of the city. Railway itself made a large construction to this side which includes godowns, railway market, co-operative stores, railway stores, railway hospital for its staff and the subordinates’ housing.

The basis for development of Lahore’s south side already existed in the form of the three previously existing population clusters. Soon an extensive road network linking all these three with the railway station and development of the railway establishments, offices, and bungalows for its staff, began to give Lahore a modern meaning. [22].

In this regard one of the existing carts track (bullock track) was converted into Mayo Road (presently Allama Iqbal Road) as a feeder road which linked the railway station with the cantonment. Civil station was brought close to the railway station through establishment of the Railway Road, as it provided a direct access to the British community. Empress Road connected the Lieutenant Governor’s House to the Railway Station. Mcleod Road appeared as a link for the General Post Office (GPO) and the Mall with the railway station. Similarly, Naulakha Road linked the Walled City with the railway station through the Landa Bazar. These roads were linked with each other through many intermediate roads and all this network converted a large undeveloped area into a developed one, Fig.2.2.
Figure 2.2: Road infrastructure appeared in Lahore after establishment of the Railway

Note: (white color). Railway Station (red circle), Cantonment (blue circle)

Drawing by the Author. The background is map of Lahore, 1954.
2.4 Expansion of Railway Network and Housing for the Railway Staff

Besides playing an important role in Lahore’s expansion, the Lahore railway station became a focal point for expansion of railway’s various establishments and housing schemes to the east side of Lahore. A linear expansion of railway infrastructure took place along the northern and southern sides of the lines. The work-areas like the workshops, power houses, foundry, godowns, engine-sheds, and the washing lines were constructed to the east of the station on both sides of the railway lines. All the administrative buildings including the station building, railway central offices, cash office, and armory were housed on the southern side of these lines. The residential colonies were planned on both sides of the lines between the work areas and major links of the town. This area was designed for ease of access, both from the city and the station. The playgrounds and clubs/ institutes were located to the south side of lines. Both sides of the lines were connected to each other by providing overhead steel bridges. The cycle track to facilitate the movement of the subordinate staff was a special feature of these bridges. However, the special feature of this whole arrangement was a strong relationship between the living, recreation and the work areas of the railway employees.

The expansion of railway continued apace and culminated, firstly, in the creation of the Headquarters of the North Western Railways in 1884, following amalgamation of the Punjab, -Scinde(currently ‘Sindh’), and the Delhi Railways. Subsequently, in the early years of the twentieth-century, the largest network of railway workshops was constructed in Lahore. Being an important railway junction connecting Peshawar, Amritsar, Delhi, Multan, Karachi and Calcutta, Lahore was declared as the Headquarter of North-Western Railways (NWR) in January 1886, following an amalgam of the Sind, Punjab and Delhi Railway (SPDR) [23]. Under new circumstances the railway network started expanding and finally the area occupied by railway in Lahore was more than the area of the Walled City. A large variety of buildings including the Railway Stations, workshops, Power Houses, offices, Barracks, Quarters, Bungalows, schools, churches, clubs, Hospitals, Workshops, markets, stores, cooperative stores, and vegetable gardens were added from time to time and resultanty the railway became the fourth important component of modern Lahore.
Figure 2.3: Railway appeared as fourth important settlement of Lahore. 
Drawing by the author. The background is map of Lahore 1954.


2.5 Conclusion

The site selection for railway in Lahore was dictated by various factors including its strategic location, safety and security, availability of land, and protection from floods. Location of the Lahore railway station became the focal point for a vast network of new roads linking other settlements of the city. The main roads were connected with each other through secondary roads and the first time, the urban landscape of Lahore expanded on a large scale.

Following the Railway Station as a focal point, the Railway facilities experienced tremendous expansion towards the eastern side in a linear fashion where workplaces and residential areas went parallel to each other on both sides of the railway lines. This development in the urban landscape of Lahore, added railway’s housing and work areas as the fourth major addition to the city after the cantonment, civil station and the walled city.

At the end of the colonial rule in 1947, these railway settlements in the city were occupying strips of large areas between the Mayo Road and the Grand Trunk Road (G.T. Road), starting from the railway station and ending at the Bari Doab Canal.

Reference and Notes


2. Extract from letter written by the Secretary of the Governor of Bombay to Commissioner in “Scinde”, of 2 July 1855.

3. Extract from the letter written by the Commissioner in “Scinde” to Chief Commissioner of the “Punjaub” for his views on the proposal, of 21 September 1855.

4. Extract from letter of the Chief Commissioner of the “Punjaub” to Commissioner in “Scinde”, of 23 October 1855.

5. Extract from the letter of the Resident Engineer to the Agent of the “Scinde” Railway Company, 16 January 1856.

6. Extract from the letter of the Agent to the Chairman and Directors of the “Scinde” Railway Company, of 26 January 1856.

8. ibid pp.12-13


17. Ibid, p.32.


20. Lahore was described by the newspaper, Times of India, in 1863, quoted by Kerr, J.I. The Punjab Province and the Lahore District, 1849-1872: A Case study of British Colonial Rule and Social Change in India, University of Minnesota, pp.149-50, 1975.


23. History of Indian Railways constructed and in progress, p. 146, Govt. of India Press, Simla, 1927.
Chapter-3

Railway Residential Buildings in the Context of Housing Settlements

3.1 Introduction

The symbiotic relationship between neighborhood settlement planning and residential architecture is so strong that it is well-nigh impossible to think of them as separate from one another. This chapter attempts to explore that relationship at a deeper level.

The Punjab Railway (1862-1884) and subsequently the North-Western Railway (NWR) systems (1884-1947) in Lahore comprised of people from varied backgrounds. Three groups, however, dominated in railway employment: the Europeans, Eurasians, and the Indians. All these groups varied considerably both from each other and amongst themselves as well. The biggest divide, at all levels, sometimes natural but often due to forced British colonial policies, was between the first and the third groups. How this divide had influenced the planning of housing settlements and housing of each group is one of the important parts of this chapter.

While the Indians and Eurasians were, generally, better able to bear the harsh weather of Lahore and its environs, than the European community, as the latter suffered a high mortality rate because of its inability to adjust to hot climatic conditions and other, local, environmental problems. These problems required that extraordinary attention be paid to come up with innovative and creative solutions for overall planning of railway settlement, housing and individual buildings. How the planners of railway settlement and housing (railway engineers of British colonial period in Lahore), coped with these problems and created a supportive environment for individual buildings particularly of European employees in railway is thoroughly explored in this chapter.
3.2 Background for the Planning Housing Settlements

As early as in 1862, when railway was being established, the prevailing practice in the government departments for providing residential accommodation to their employees was mostly to hire houses from Indian landlords on nominal rent instead of constructing housing at own [1]. This scheme was successful and practical because of nominal rent than the considerable capital investment for construction of houses. Despite this economical solution for providing housing to employees the railway came with a different idea and started constructing houses for staff in comparison to this the railway worked with a different idea.

At the same time the railways preferred to construct its own residences to accommodate a large subordinates undertaking company’s work in Lahore also the residences for officers were hired near railway settlement on other locations in the city. The study revealed that idea of railway to construct residences for its subordinate’s staff was initially costly but had more benefits in the long run. The layout and designing of housing settlements, especially for the European staff, was a complicated task and it was felt that the local staff was not up handling it satisfactorily. [2]. This compelled the company to employ Europeans on a large scale. The health problems, alluded to above, placed the Company in a tough situation: On one hand it could not employ too many Europeans in the junior posts even it had wanted to because the extreme weather had already caused too many fatalities amongst them. On the other, it felt that Indians were not up to the task at hand. In spite of all these difficulties a large number of European mechanics, guards, drivers and other officials kept on coming to Lahore since 1862.

As the railway work progressed in Lahore it was realized that the original hope that with the passage of time the Europeans will get acclimatized to the weather here, especially the extremely high temperatures in the summers, and the humid monsoons, proved wrong. The Europeans casualty rate due to malaria and cholera proved unsustainable as the following statistics prove: [3]. During the thirty years from 1808 to 1837, the mortality rate of British soldiers in India was 102.70 per thousand, while the same for the European troops at the Garrison of Fort William, Calcutta, between 1822-38, was 73.26 per thousand [4]. The average annual rate of hospital admissions on account of fevers, dysentery and hepatitis
during thirteen years (from ---to--) at Behrampore was 2196 per 1000; in Secunderabad, during the period 1804-35, the fatalities averaged 106 per 1000 per annum and a large number of 2620 men and officers, women and children died [5].

During the period 1857-59, the European employees of the Indian Railways died at the rate of 38 per thousand, excluding the deaths caused by the 1857 [6]. Various reasons put forward by the medical specialists attached with the British army in India, all pointed towards incompatibility of the Europeans with the Indian climate and environment [7].

Lahore also remained an unhealthy place for Europeans for a long time. In 1851-52, the British soldiers died on account of cholera at the rate of 132 and 218 per thousand, respectively, in two regiments stationed at the Anarkali Cantonment close to the walled city [8]. Comparatively, the incidence of malaria and other diseases inside the walled city was, relatively, low. The European medical specialists in India interpreted it with reference to walled city of Delhi as:-

“within the walls, and especially most dense and crowded quarters of the city, there were comparatively few indications of pure malarial disease. This accords with what has often been remarked in other countries, viz., that the high walls, and narrow crowded smoky streets of large cities, are frequently safeguarded against marsh miasma, although other causes of disease may abound in such situations.”[9]

The high death-rate amongst the Europeans caused Anarkali to be labeled as an ‘unhealthy place’, a term frequently used by the British for a ‘native city’ and its environment, and, consequently, [10] the cantonment was shifted to the suburb of Mian Mir. The shifting of the cantonment was a turning point in the urban history and the landscape of the city of Lahore. However, for sometime the cantonment at Mian Mir cantonment was no healthier than at the Anarkali cantonment. About sixty-one percent of the soldiers and their families died due to cholera in less than one month at Mian Mir [11]. A nearly similar situation existed in many cities of India.

Due to Florence Nightingale’s exhortations to the British politicians and the general public, accompanied by her writings based on her experiences during the Crimean War of
1853-56, the British Parliament realized the gravity of the situation and appointed a Royal Commission in 1859, to determine the causes of the high mortality rate for the British soldiers in India [12]. The Commission compared living conditions of the urban areas in India with metropolitan society of England and expressed a grave concern about the life span of European soldiers in India. It was pointed out that at the age of twenty (20), the expectation of life for European troops in the metropolitan society of Britain was 59.5 years, while in the colonial environment of India it was 37.7 [13]. The commission was of the view that incompatibility of Europeans with local Indian climate, and bad sanitation and improper public health practices and were the major causes for the high mortality rate. The commission particularly stressed for improvements in sanitary conditions and the overall environment.

Although the commission submitted report after spending a long time but its findings remained very useful in terms of improvements on environmental conditions in various places of India. This report compelled the British administration which started working on various plans for dealing with the problem areas. Cantonments were relocated in several cities and focus was on their healthier site location rather than simply on their strategic value. It was decided that as a principal the cantonment must be located at a distance of least 2-3 miles from native city as Indian cities were considered a potential source for various diseases. It was thought that this distance would provide safety and prevent attacks of airborne diseases. Mitchell interpreted it as “Indian environment and climate is a main source of diseases from which Europeans had to be protected” [14]. However, new sites selected for cantonments defined a social distance between Europeans and Indians on health grounds.

Finding ways of dealing with the Indian environment and climate had become subjects of top priority for the new administrators. This resulted in a huge task of new settlement planning based upon new discoveries and methods, expected to better withstand the effects of such weather/environment-effects was undertaken. These settlements included wide, metal roads and streets, water-works, sewerage system, and other environmental controlling measures. Sanitary Commissions were formed and activated during the year 1864 in the three Presidencies of Bombay, Calcutta and Madras [15]. It was thought of as more practical to plan new suburban communities instead of remodeling the old walled cities. The expansion
of cities, and establishment of new towns and housing stock, was undertaken from the mid-nineteenth century onwards, with strong emphasis on creating a cleaner and healthier environment and a much improved sanitation. The recommendations of the Public Health experts were seriously considered and implemented while planning for new housing settlements. “Better ventilated houses, pure water, good drains, better waste and sewage disposal, open spaces, and ventilating effect of new roads”, were now the main criteria for new housing layouts. Resultantly, in addition to improvements in the soldiers’ barracks bungalows for officers, principles of metropolitan sanitary theory in site selection and planning of new settlements were followed [16].

Another major step to provide a home-like climate and environment to Europeans in India was the establishment of a summer capital for British Indian Empire at Simla; it functioned from 1865-1939 in that capacity. The Viceroy and the whole British administration, including the military, civil, and the judicial branches functioned at Simla from May-October. Besides the administrative staff, bankers, butchers, lawyers, merchants, foreign consuls, bakers, candlestick makers, hotel and boarding-house keepers, servants, coachmen and their horses, all formed part of this huge twice-a-year migration-moving to Simla in May and retracing their footsteps to their original locations in October. Apparently, all this seems difficult but it was managed for fifty years in an excellent manner despite various difficulties in terms of transportation. William Eleroy has sketched out the migration of Viceroy and his staff from Calcutta to Simla and states that:

“The viceroy has its own outfit and when the word is given the transfer takes place without the slightest difficulty of confusion. A public functionary leaves his papers at his desk, puts on his hat and walks out of his office at Calcutta, three days later he walks into his office at Simla, hangs his hat on peg behind the door and sits down at his desk with the same papers lying in the same position before him, and business goes down on with the interruption of only three or four days at most” [17].

Similarly, the hill-stations of Murree and Dalhousie, were the summer headquarters for the Punjab Government during the British period. These annual to-and-fro migrations to
escape the plains’ summer and monsoon seasons played a significant role in reducing the mortality rate of the European community in India. For example, Simla in 1883 registered a death rate of 18 per 1000 for the Europeans [18].

The summer capital of British Indian Empire resulted two types of houses in plain areas which were termed as winter and permanent house for the officers of high and lower status respectively. The railway colony named the ‘Mayo Garden’ was planned on such basis in 1920. Similarly the GOR (Gazetted Officers’ Residences Estate) in Lahore for officers of the civil administration was planned with bungalows for use permanently and as winter housing. Besides the provision of summer housing in the hills, the establishment of low-density housing in the plains was another way to make the environment more friendly and sustainable.

From its earliest inception, the railway housing in Lahore incorporated the idea of low-density housing. The Barracks and bungalows for Europeans were planned in large compounds which varied between a half and eight acres (0.5-8). In no case the percentage of covered area exceeded twenty (20) percent. As a result of the Garden City concepts, which came into existence at the end of the nineteenth century in Europe was long before implemented in railway housing in Lahore [19]. These concepts were verified by Linton as late as 1929, the Chief Engineer of the Lucknow Improvement Trust, through a comparative study carried out in the towns of India and England with reference to the infant mortality rate. The study concluded that housing built under the Garden City’s ideals showed more encouraging results in reducing mortality rate as compared to those where sanitation conditions were good but housing layout was congested [20]. However in the twentieth-century, there was no comparative study of the railway officers’ housing with any single government private housing scheme of Lahore with respect to compound and covered area. In the private sector, the newly-planned Model Town was one leading example which was laid out on the ‘Garden City’ concepts.

3.3 Railway Housing Settlements

The housing for railway employees in Lahore revealed the establishment of three major housing settlements in Lahore--two for subordinates and one for officers. The first was
started in 1862 in the vicinity of railway station and expanded eastward during the nineteenth century over a large area between the Mayo, the Grand Trunk and the Shalimar Roads (Fig. 3.1).

Figure 3.1 Developments of Railway Network and Housing Settlements during 1862-1947. Source: Drawing by Author on the map of Lahore 1954 (Obtained from Survey of Pakistan).
Figure 3.2: Subordinate Housing Settlement near the Railway Station (1862-1900): surrounded by Mayo, Grand Trunk and the Shalimar Roads. City Rajhbah (water channel from Bari Doab Canal) is passing through the centre of the settlement providing water for irrigation of large lawns for the subordinates’ bungalows.

Source: Railway Archives at Railway Headquarters Lahore

The Mayo Road, presently the Allama Iqbal Road, was located on the southern side of the railway lines connecting the railway station with the Mian Mir cantonment and the Grand Trunk Road, an ancient trade route located to the north of the lines. Both these main roads were connected by the Shalamar Road. The expansion of railway network took place to the east, and concomitantly, the railway housing also expanded in a similar direction. The railway club/institute, hospital, grounds and pavilion were planned on the south side of the lines while the workshops, stores, foundry, power houses, godowns, signal shops, market, co-
operatives stores, etc., were all were on the northern side of the railway lines. The “Lahore Passenger Station” was located on the southern side of the lines and once it was a hub of various railway offices but finally these were shifted to the Central Offices building, presently known as the Pakistan Railway Headquarter, a short distance away on the Empress Road.

In 1869, offices located adjacent to the station building included the offices of the Punjab Railway Agent, Chief Engineer, Consulting Engineer, Drawing Office of Chief Engineer, Auditor’s office, Chief Accountant, Traffic Manager, Chief Engineer Store, Paymaster’s Office and offices for the subordinate staff of those officers, including the baboos’ and the clerks. [21] Railway officers were, at that time, provided with rental buildings in the city in the Donald Town area, till the provision of their own housing by the railway department in the early twentieth century. The residential and work areas initially developed on the northern side were linked with the railway station through overhead steel bridges spanning the railway lines at various points.

It is evident from Fig. 3.1 that railway residential settlement was located parallel or adjacent to the railway network. The former expanded in tandem with the latter. The problem of travel and transportation along with easy availability of free space in those days necessitated this type of a general approach to layout of housing colonies. The interrelationship continued throughout the British period as shown in. However, the growth of housing parallel to the railway facilities created a strong bond between the two was result of a conscious and well thought out policy of the railway administration.

The housing settlement (Fig.3.1) near railway station was generally known as the station colony and it provided accommodations to European, Indian and the Anglo-Indian subordinates such as Guards, Drivers, Foreman, Mechanics, Artisans and other employees of equivalent status. A large number of Barracks, Bungalows and Quarters were constructed on both sides of the lines for subordinates besides a small number of bungalows for officers also. The Quarters of Indians subordinates were separately located in the form of dense housing settlement as compared to the housing for the Europeans. A closer look on the official documents, files and drawings of station colony housed in railway headquarter
Lahore tells that although the housing was constructed during different times and phases but it almost possessed similar character in terms of layouts, road/street pattern, climate and environmental considerations till the end of 19th century.

During the first decade of the 20th century, the railway administration decided to shift the railway workshops from the Naulakaha area to a new site at Mughalpura, about two miles to the east. At the new site the Carriage, the Wagon and the Locomotive shops began operations in 1910. The decision was taken because of the increasing demand of work-load at the previously located workshops. One of the main reasons for overloading of workshops at Naulakha was cost-effectiveness and satisfactory workmanship with the combined efforts of European engineers and native artisans. The report on the administration of Punjab territories for the year 1862-63, while detailing the work production in the railway workshops of Lahore, stated that

“-------- with the exception of the Locomotives and tenders, and the first carriage, and few of the second class, sent from England, as a patterns the whole of the carriages, less iron work and fittings, are erected or made by the native workman in the Lahore workshops. Credit is due to the Locomotive superintendent, Mr. Bocquet, and to the carriage superintendent, Mr. May, with their European foreman, for the results obtained [22].”

To get more effective force of natives to be utilized in technical work at workshops, the railway administration established “The Railway Technical School”, near the railway station in 1889, where industrial and technical education was imparted to the sons of artisan-class of natives [23]. Similarly, the Moghalpura railway workshops played a fundamental role in the founding of the University of Engineering and Technology, Lahore. The university started in 1921 as the Moghalpura Technical College and as the Moghalpura Technical School, at a walking distance from the workshops with the understanding that all practical training will be provided to the students in the railway workshops. The college was intended to provide five-year courses in Electrical and Mechanical Engineering, whereas its school section was planned for the courses of same duration for subordinates in the
mechanical and the electrical fields. The engineers and mechanics produced by the college and the school were mostly absorbed in the railway’s offices [24].

Besides the role of workshops towards the technical education in Punjab, these were the single largest employer of labour in Lahore. According to Kerr in 1870, the labour strength in the workshop was 1000. According to Latif in the year 1892, the railway workshops together with railway station were covering the ground area of about 126 acre and 4000 workmen were employed on a daily basis. According to the Gazetteer of Lahore District 1916, the railway workshops at ‘Moghalpura’ were providing employment to 10,000 workmen per day [25]. This regular increase in the workmen’s strength continued in the future and Lahore started to be known as an ‘industrial town’. However, this large employment and variety of work at workshops with modern tools and techniques created impact towards various directions in Lahore as well as in the crafts of the Punjab province.

A large migration of workers, artisans and others took place towards Lahore from various places and these people mostly resided in the villages around workshops such as Baghbanpura, Bhogiwal, Shahu-ki-Garhi, Singhpura, etc. Similarly, a major segment of the work force was coming daily from the walled city and a special train service operated between the city and the railway workshops [26]. The numbers of the railway resident staff and workers also increased significantly. The demand for additional housing kept on increasing with the passage of time. The housing for mechanics, electricians, foreman, drivers, guards and artisans, was planned in the vicinity of workshops. The housing settlement was known as the workshop colony [Fig. 3.3].
Figure 3.3: Housing Settlement near Workshops at Mughalpura: Indian Quarters (270 numbers) are shown in a circle. The rest of the residences (Bungalows) belong to European subordinates. Note Work Area, Markets and Vegetable Garden are at shorter distances from residential area. A water channel (blue in color) originating from Bari Doab Canal and passing through railway was planned to irrigate the large lawns of European bungalows. Source: Drawing by Author on the map obtained from Railway Archives at Railway Headquarters Lahore
The settlement comprised of Bungalows and Quarters for the Europeans and single-storey Quarters for Indians and Anglo Indians. According to Gazetteer of Lahore District 1916, three hundred Europeans were lodged in the workshop colony. This housing generally followed the same principles as observed in the station colonies except for a few modifications. The bungalow and plot size remained almost the same but subdivisions were made to accommodate the increasing strength of the staff. In this regard all necessary additions and alterations were made in the bungalow plans. In this way the housing density increased but the overall scheme remained the same. Like the station colony, the housing for the Indian subordinates was located separately without any major change. The workshop colony had an institute, a chapel and a market. It was, in fact, extension of the previous ideas implemented in the station colony but provision of dairy, cattle farm, beef stall and vegetable garden was first time introduced with the housing to achieve greater sustainability.

Following up on provision of housing for the subordinate classes, the railway administration decided to establish housing for its officers as this group was residing in rental buildings in the city. In this regard the first step was taken in 1908, when some bungalows were constructed on the bank of the Bari Doab Canal, in close proximity to the Mian Mir cantonment. This housing was named as the Canal Bank colony. In the second phase a site covering a larger area and allocated for senior railway officials, was selected in 1920 between the Mayo (presently Allama Iqbal Road) and the Davis Roads near the Bari Doab Canal. The plan in Fig. 3.4 shows the Housing Settlements of the Mayo Garden. This settlement was named as “Mayo Garden” to commemorate Mayo Richard Southwell Bourke, who served as the Viceroy of India from 1869-72; he was assassinated in 1872 [27].

The basic concepts of physical planning in the officers’ housing remained the same as had been developed earlier in the Europeans subordinates’ housing near the Railway Station and Mughalpura Workshops. However, the socio-economic status of the officers played a fundamental role in deciding the site, size of residential plots, and the architecture of residential buildings. The bungalows were planned in large compounds with no spatial economy. The status of occupant of a house in Mayo Garden could be readable from the size of a compound, number of its servant quarters, and the number of main rooms in the building. In addition to the residence of the North Western Railway Agent, all high officials
of the North Western Railway were housed at Mayo Garden. These senior officials also had summer residences at Simla. For such officers the bungalows at Mayo Garden were called winter houses whereas permanent houses were built for those who were supposed to live round the year in Lahore. The basic difference between summer and winter houses was the bungalows’ orientation, a concept understood with greater depth in the 20th century and implemented in Mayo Garden. Mostly the drawings of bungalows bear the directions for the rotating plan at site.

Fig.3.4: Plan of Railway Officers’ Housing later on called the Mayo Garden, circa 1921. The site level, the plantation scheme including names and space between two plants, city Rajbah (water channel) from the Bari Doab, the Lime Kiln and a Garden in the center, are all visible in this the map.

Source: Railway Archives at Railway Headquarters Lahore

3.4 Concepts of Physical Planning

The physical planning in housing followed rectilinear grid pattern. The roads followed the east-west axis and houses were planned on the north-south axis. A housing settlement usually comprised of a main road directly or indirectly connected with the cantonment as well as the railway station. The houses on the secondary streets were connected with the main road through a number of cross-streets. Within the housing settlement, whether for officers or subordinates, the streets were at three levels:
One facing the front of the houses, which was wider than any other street in the colony. The main or the primary streets were mostly parallel to each other with varying numbers.

At the second level, the main streets were connected with each other through the secondary streets and their width was less than that of the primary streets.

At the third level, the streets were provided on the rear side of the houses for various services and this street was known as the “Sanitary road” in various documents and drawings. On both sides of sanitary roads the Servant Quarters were arrayed and the roads were exclusively built for the movement of the night-soil conservancy carts, and servants. The night-soil conservancy carts were purpose-designed and built, with built-in cover to keep the environment clean and friendly. In 20th century when water-borne sewerage system became common in the railway colonies, the sewer system was laid along these roads [Fig.3.5].

Figure 3.5: Night Soil Conservancy Carts

The wide roads contributed towards better performance of house in terms of light and ventilation conditions. The plan of the subordinates’ and the officers’ housing indicates that roads and streets were planned on the pattern of the Indian cantonment where safety and security were linked with straight roads. In fact after 1857, the European community in India was much concerned about their safety and security. In railway colonies, a direct access to the cantonment and the railway station was ensured, as both places were secured for the Europeans in case of an emergency.
Like other railway settlements in India the roads in the railway housing settlements in Lahore were also known by various names of the retired European railway officers and others of importance.[28] This system was particularly adopted in the earlier housing settlements of subordinates with the intention of creating a strong bond between the British workers and their employer, the railways. The roads of the railway housing settlements in Lahore are still witness to this system of names: Victoria, Gordon, Stanton, Pemberton, Duffern, List, Wallace, Pringle, Hope, Finney, Nicholson, Dunlop, Burns, Jacob, Halway, Bracken Bury, and Andrews, were different names which are still in practice in all documents and sites of the station colony. In the 20th century, the names of roads in Workshops and Mayo Garden came with a different approach. At this stage instead creating emotional attachment with the residential area, the environment and other practical aspects were attached with the names of roads. For example, the roads in Workshops colony were named with reference to orientation and place such as North, South, Moghalpura, Market, and the Sanitary Road.[29]

The design of European housing in India always focused upon environmental and public health issues. As insanitary conditions in Indian towns were basic cause for various diseases, therefore, this area received much importance in physical planning. A close comparison of railway housing with locals’ houses in the walled city revealed that there was a complete contrast on every aspect of environmental and public health between both ends. The street pattern, building height, night soil conservancy system and overall sanitary conditions, were all planned and managed differently. The Gazetteers of Lahore District 1893-94, presents a detailed picture of the walled city for its unhealthy conditions. It states that:-

“The streets of Lahore city are for the most part narrow and winding, the houses though lofty and to all appearance well built from the outside yet inside are much cramped for space and ill-ventilated. They generally consist of three or four storeys high, built of burnt bricks laid in mortar. Very few have even a courtyard in front.” “-------- and the open roof above are used as a sleeping shed; the latrine is the only convenience of the sort available to all residents of the house, male or female; an open drain (parnalah) leads down
the front wall of the house into the alley below, where it is carried off by an open saucer gutter into the main drain in the adjoining street. The filthy indecency and the unwholesomeness of the whole arrangement may be left to the imagination. Night soil and other filths are carried off only once in 24 hours and before being finally taken to the conservancy carts are stored in one place in the alley exposed to public view. “From early morning till 10 or 11 A.M. the conservancy carts are waiting about to be filled up and driven off through the gates. Thus the ordinary citizens’ residence in Lahore as in all other large native towns, is beset with the most unwholesome conditions both inside and outside; any educated member of the native community who can afford it, builds himself a house outside these unhealthy surroundings and pays some attention to ventilation and other sanitary requirements, but so far progress in this respect has been very slight” [30].

These sanitary conditions in walled city were really axiomatic. The Gazetteer of Lahore District where had presented a detailed picture of insanitary conditions prevailed in walled city there weak areas were also underlined and a deeper look on report further provides suggestions for future housing in Lahore where a healthy environment can be created giving emphasis on critical areas. The deficient areas pointed out in the report were related to street pattern, open space, sewer system, disposal of night soil conservancy system, etc. The closing lines of this report linked the main reason for shifting from walled city to insanitary conditions. At its end, the report linked socio-economic status and education with healthy environment and this important aspect was pointed out in various sanitary conferences during the British rule in India. One of the conferences in this regard was held in Bombay where education was strongly emphasized. The members of the conference were suggested to place education in the forefront of their sanitary training and information programs [31].

Although the social interaction between the European and Natives were limited to the upper class but British made several efforts in different directions for creating healthy living environment in Lahore. The more effective tool in this regard appeared as physical display and object learning. This process took a long time but brought effective results to the
Indians. The Awareness among the Indians on Public Health issues can be imagined from the following case and many others of similar nature archived in the offices of the Lahore Cantonment Board:-

Mr. Charn Singh, a retired Inspector of the Police Department submitted an application to the President Cantonment Board Lahore vide Cantonment No.9221, dated 11-01-1939, which urged action against unlawful construction near his residence. He stated that:

“Lala Bhagwan Dass is building residential quarter in compound No 1431/3-4 on the Calcutta Street of the Sadder Bazzar. To separate two blocks a lane of 9'-9" only is being left which I understand is 3” shorter than the sanctioned plan. It is apparently clear that the said plan has also been approved by the Saddar Bazzar Committee under the influence of Lala Bhagwan Das over the members. It is quite surprising that under what plea the lane of 10’ wide has been approved when the Improvement Trust does not allow any lane less than 20 feet wide. This patronage has been afforded to Lala Bhagwan Das, because he is a rich man and no regard has been paid to health of those who will have to reside in those quarters. On the completion of these quarters the free pass of light, sunshine and air will be totally blocked. It is therefore surprising that why the Bazzar Committee has sanctioned that plan at all. The main street left by Lala Bhagwan Das in his quarter is also shorter than the sanctioned plan. It mean that law and order of the cantonment are not applicable to Lala Bhagwan Das.

I shall deem it a favor if you will please take trouble of paying visit to the situation. Hopping that you will pay very kindly afford a sympathetic consideration over my request.

I beg to remain
Sir”[32].

There are several applications archived the record room of the Lahore Cantonment Board where such complaints were filed during the last decade of the British administration in Lahore. This complaint just for a violation of three inches, alerts not only for the concern
of Charn Sing about public health issues in housing but reflects the level of awareness among the public which was achieved by colonial administration through display concepts.

The width of a street was always higher than the height of the residence and this was a common principle in the Railway colonies for Europeans. The wider road was found more advantageous in terms of ventilating effects for buildings and reducing housing congestion and finally the improvements towards health and sanitation conditions of occupants in any town [33].

However, the provision of large open spaces around the single storey bungalows and further the streets on front and rear sides of the same had left no room for ill ventilation and week light conditions for colonial dwellings. Furthermore, the streets were oriented with the intention to receive minimum solar radiations as street width due to its surface area and orientation effects on heat gain in nearby buildings and overall rise in temperature of particular locality. Another important consideration to minimize the heat gain through the surface area of the streets was provision of well-planned greenery in each railway colony. In this way the streets of railway colonies despite being wider in width than the walled city’s streets, had little influence on heat gain through their larger surface area.

Tree plantation along roads and landscaping in the Bungalows compounds were areas which were not only concerned with the limited environment of the particular bungalow but its impact towards community health was significant. From the very beginning the British administration paid much attention on plantation of trees in Lahore and other plain areas of the Punjab province. As early as in 1852, the government issued a circular No 15 of 1852, in which plantation and forest conservancy was encouraged. In addition, both the Public Works Department (PWD) and the Railways Department were encouraged to plant greenery along the roads and around the government buildings. During 1879-80, the Arboriculture Report was prepared separately and the Lieutenant Governor of Punjab himself reviewed it [34]. The awareness in public was created through various manuals, pocket-books, and notes. A Catalogue of the Plants of the Punjab and Sindh, was also published in 1869 [35].

A manual prepared by W.R. Mustoe, the Superintendent, and Government Agri-Horticulture Gardens Lahore discusses the types of trees planted in the Railway colonies
[36]. According to this manual and as per Plans of various housing settlements, different kinds of trees were planted which included Terminalia Arjuna, Pipal, Eucllyptus Rudis, Biscophia Javanico, Albizzia Phoncera, \textit{kiker} and Caltis Australis [37]. The most important aspect of these trees was their sustainability in the climatic conditions of Lahore. These trees were used as shading device for streets and resultanty heat gain was much lower as compared to surface area of the roads. In this way the wide streets of railway colonies were protected from direct solar radiations during summer and their ventilating effect was further enhanced. In addition to these benefits the plants absorbed radiation due to the photosynthesis process, causing pressure differences and thus regulating the air-speed and direction of air-flow [38]. A visible temperature difference is observed in the Mayo Gardens during hot days of summer as compared to other areas of Lahore. The impact of tree plantation was not only limited to the micro-environment of the Mayo Garden but outside its main road is still carrying the name as ‘tandisarak’ cool road.

Figure 3.6: Plantation along roads in the Mayo Garden
These plants and large grassy lawns of Mayo Gardens were irrigated through City Rajbaha (a water channel) originating from the Bari Doab Canal. Similarly, lawns of bungalows in the station and the workshop colonies were irrigated from the ‘City Rajbah’, coming from the same canal and ending at the Circular Gardens near the walled city. The early Barrack, Bungalows and the Institute at the station colony were built adjacent to the ‘City Rajbah’, so that the water requirements of these buildings could be fulfilled. The provision of one well with each bungalow was an additional source for irrigation of lawns. The provision of water for drinking purposes from the wells continued in the railway colony and Lahore as well till 1880, when a large Municipal water-works was constructed upon the highest part of walled city, with an average head of forty 40 feet to the entire system of about 25 miles pipe. With the provision of water from municipal water works the system of installing water-hydrants was introduced at various sites in the city for use in case of fire [39]. The railway administration separately constructed its own steel water tank of various heads in the housing and the work areas. In some housing areas the high service tanks were also found connected with hydrants in bungalows. The location of hydrants in bungalows was between the main building and the servant quarters as fire incidents usually happened in the servant quarters, as shown in Fig. 3.7.
Figure 3.7: Hydrants between Bungalows and Servant Quarters at Victoria and other roads in Station colony. The light blue circles indicate Hydrants whereas serial numbers are for Bungalows and Barracks. The out-houses and servant quarters are located on the rear side of the bungalows.

Source: Railway Archives at Railway Headquarters Lahore
3.4.1 Class and Racial Segregation

The British railway employees in Lahore were mainly European, Indians and Anglo-Indians. Generally, it was broken down into the Officer and the Subordinate classes. Distance between the housing for various groups indicated the mandated ‘unwritten’ social distance between the classes/ethnic groups. The Europeans were only placed in senior positions, while the records reveal that Indians and Anglo-Indians were restricted to subordinate positions only. The Europeans being expert in the subject and belonging to the ruling group were always treated as superior compared to other employees. They were dealt with differently in all matters like location, size and type of their residence as compared to the Indians and the Anglo-Indians despite having the same ranks and responsibilities in many cases.

In locating the houses for groups, similar disparities prevailed. A large open space was provided between the European and the Indians Quarters, which was termed as buffer space on drawings, and this space defined the racial segregation. The Indian quarters were
densely populated and located in a small area. According to statistical data relating to the subordinates’ housing at the station and workshops colonies, a few bungalows of Europeans subordinates were equal to 500 residences of Indian and Anglo-Indian quarters, reference to Figs. 3.2 and 3.3. Besides these facts which have no doubt relate to racial segregation the European dealing with Anglo Indians was self-explanatory in many aspects. The loyalty of this class to the Europeans was established during the uprising of 1857 and large opportunities for employment of these people were created in the railway and the telegraph departments. Being related to both the Indians and the Europeans they escaped losses during the 1857 uprising. Any commentary on the British railways in India would be incomplete without knowing in depth about the Anglo Indians which discloses that how racial and class segregation prevailed in housing of railway employees. In Lahore, the Anglo-Indians remained in the railways for a long time after 1947 and were an important part of the railway workshops at Mughalpur.

The terms “Anglo Indians”, “Eurasians”, and “Domiciled Europeans”, have been used in various studies for the people who claimed themselves as part of the European community in India. According to Mc Menamin, Domiciled Europeans were those born in India of parents who were either British or of European descent, and had settled permanently in India. They considered themselves part of the British community, who were originally known as Anglo-Indian as opposed to the racially mixed European and Indian community who were called Eurasians “half castes”, In 1911 the term was used for those who were either racially unmixed or of a mixed heritage. In the Government of India Act 1935, under article 366 (2):

“An ‘Anglo Indian’ means a person whose father or any of whose other male progenitors in the male line is or was of European descent but who is domiciled within the territory of India and is or was born within such territory of parents habitually resident therein and not established there for temporary purpose only.”

This definition included all those in the Anglo-Indians class whose paternal descent was European irrespective of the racial group of their maternity, but who
were permanently settled in India. The British who came from England on various jobs in India were excluded from this definition [40]. These ‘Anglo-Indians’ never resided in England nor even the majority amongst them visited the UK. One of the interviewees of Nixon stated that few members of his family went to England but came back to India because they were considered ‘too swarthy’ [41].

The Anglo-Indians lived in Lahore for a long time even after the partition of India in 1947. A recently published article about the Anglo Indians of Lahore reveals that the author himself witnessed Anglo Indians in the Railways when he was residing at Garhi Shahu near the railway colonies and the Railway workshops during the year 1970. The author of this article also interviewed many Anglo Indians who retired from North Western Railway Service. He recorded one of his visits to Garhi Shahu Bazaar as:

“What struck me most was the buzzing life in Garhi Shahu: I would see it the moment I stepped out of my house in the bazaar. Sunday was a special day with a steady stream of shoppers thronging the general stores, retail merchants, vegetable and fruit vendors. The butchers were always busy. And it was here that I became fascinated with the light-complexioned ladies sporting curly short hair and flowery frocks and skirts. Often I saw them riding bicycles, approaching from the carriage factory area. These were Anglo-Indians. They had been living around here for generations. They were Lahoris with a difference. Their soft peddling in the bazaar, dismounting from bicycles and jostling close to the sabziwala was too familiar a sight. They were Lahore-born but were known in the city as 'Anglos'. The Anglos, as I witnessed in those days, had been living around the Railway Carriage factory area. Their women moved around on cycles with ease and comfort; they would pull the brake, dismount and haggle with the vendors. Colourful flowery clothes with a swinging cross around their necks - this was the familiar look. At times some of them were in sleeveless tops and tight trousers. It was no one's business to raise an eyebrow” [42].

According to Tariq,
“An Anglo inspector would fetch a salary of Rs 600-700 but would not go beyond the position of an inspector and retire as such. This was a deliberate policy, as the British were keen to have an incentivized, motivated professional and at the same time would not like to lose a very good subordinate and hence retire him at a low position. This was how the system worked. A minor fault in the railway engine would cause sleepless moments to an Anglo engine driver; imbued with a deep sense of responsibility, he would rush with his engine to the shed where a keenly waiting Anglo foreman would bring out his tools and spend hours putting the engine back on track with beaming smiles on his face. The Anglo driver would polish his engine with graphite and sit on the driving wheel as if it was his personal belonging, which in many ways it was. The Anglos could be found in almost all departments of North Western Railways. They were Ticket Collectors, Special Examiners, Guards, Transport Inspectors, and Track Assistants. They lived a comfortable life in posh houses and expanded bungalows.”

The Railway and Telegraph departments were major employers of Anglo Indians and domiciled Europeans. The Europeans always considered these employees trustworthy and loyal as compared to natives but their darker complexion was a major barrier between the two groups. A behind the scene tension always prevailed at both ends. At one end the loyal and efficient employees of railway were at their best in contributing in railway and subsequently the British Empire then on other side the British were not ready to bring them at-par their status despite the blood relation with them. So much so in case of Eurasians the image during 1880-1910 was as:

“----- Several forces in British thought. There is an element of sexual guilt which was bound to find expression in a disavowal of this group. The British were responsible for the creation of the Eurasians to appear more like the English only accentuated this fact. Also, in an age such as this one when the British were basing their superiority purely on racial lines, the Eurasians were a threat to their unique position” [43].
Kerr has also traced some facts from the autobiography of Sir Walter R. Lawrence, who came to Lahore in 1879 as a very young Indian commission Service man (I.C.S.). His stay at the Victoria Hotel near the railway station and interaction with some Eurasians uncovered many sides of the relationship between the Europeans and the Eurasians. The young man Lawrence states that:

“As I drew near Lahore I asked the guard of the train where I should stay. He advised me to go to the Victoria Hotel. It was on a hill, near the station. The name and the situation appealed to me, and I arrived there at dark. After a shivering night, I came down to breakfast and found about five guests eating a bony fish, which is caught in the river Ravi. They were all dark of visage, all Eurasians, as the descendants of European fathers and Indian mothers were called in my time. They were all in the railway service. One of them kindly addressed me: ‘Are you come here to work on the railway?’ I replied quite truthfully, that I did not exactly know what work I should get. ‘Well’, he said, ‘you’ll find it difficult to get any work. It’s India for the Indians these days.’ His companions bore him out and told me of the evil times on which we had fallen, and I felt greatly depressed. The hotel was dirty and slovenly, the table-cloth was stained and smeared, and the men spoke strange English in strange accents. Life was expensive, life was hard, and malaria took for the suffering out of a man. We sat for quite an hour, and I think they saw how depressed I was. But happily there walked into the room a glorious figure in scarlet and gold, and he handed me a letter. It was from Lepel Griffin, the secretary of the Punjab Government, asking me to come at once to his house with my baggage. No more depression, but weeks of charming and delightful hospitality in the house of the best known Civilian of his time, able, brilliant, and scornful”[44]. Lawrence’s autobiography has many points worth noting. For example, the name of hotel and its environment both were at extreme ends like Lawrence and the persons to whom he had met at breakfast. In both cases, between Lawrence and Eurasians, the common thing was English blood but difference was complexion and the place of residence. At one end the sentiments and emotions associated with India as
mother country were strengthening the confidence and expressed as “India for Indians”, whereas on other end depression prevailed, which was expression as a commentary on the environment of the hotel and speaking of English by the Eurasians. However, the crux of this autobiography clearly represents the difference between the British and the Eurasians in terms of lifestyle, language, complexion, and the environment. It also highlights the effects of geographical, spatial and socio-cultural background on various aspects of human personalities. This difference had made railways a heterogeneous arena of service in terms of classes of employees but each tied inexorably to his group.

Although most of the Anglo Indians left India during the early post-colonial period and settled in various countries such as UK, USA, Australia and Canada, but during the whole employment period in India the home for Anglo Indians was wherever they worked”. Nixon mentioned that a boy asked his father, “Where home was?” “Oh, wherever the old man was: Bombay, Itarsi, Poona, Nagpur, Bhusawal, Damoh, Jhansi, Jubilpore, Bhabal, - there may be more and then I went to boarding school for 9 months of the year. Nixon interviewed many Anglo Indians and in one case he referred to an interview of Lois Harding who commented that:

“railway people were considered lowest of the low on social scale which I surprised about because I thought we did a really good job”. In addition she thought it unfair that those who came from England who may have had a lower level of literacy and education were entitled to better positions and pay because they were English they were given the higher job”[45].

3.4.2 Socio - Cultural Infrastructure

The railway colonies were self-contained in terms of their socio-cultural infrastructure. The club, institutes, playgrounds, pavilions, churches, markets, and co-operative stores were the places of social intercourse. This extensive network of social activities was created on several grounds. The location of railway colonies and the socio-
economic status of the employees was a barrier for social interaction of the European employees of the railway with other Europeans in Lahore residing at some distance from the railway colonies. In 1863, just one year after the establishment of the NW Railway in Lahore, the Times of India described the various important areas of Lahore and presents a complete picture of “Noulukha”, a place where the first railway colony was established. The Times of India stated that:-

“To those unacquainted with the locality, it may perhaps be better were I to mention, that Lahore, commonly so called, consists of our distinct and distantly situated and by no means imposing stations. Ancient Lahore (the city) is enclosed by walls, and is entirely inhabited by natives of all kinds. Anakullie, the seat of local Government, is a pleasant little village situated a short distance from the city, and occupied almost entirely by employees of Government. MeeanMir, the military cantonment, is six miles south of Anarkullie; while Noulukha, the railway terminus and future town, around which commerce ultimately is sure to cling, is nearly three miles from either of the other places referred to. These four stations embrace probably an area of some 15 miles in circumference, and, as may well be supposed, their scattered and isolated condition is productive of considerable inconvenience to the ordinary public business of the place, and must prove fatal to its prosperity in a commercial point of view”[46].

According to the above description of Lahore, the relationship of railway housing settlements with the other places where the Europeans resided in Lahore, such as the Mian Mir cantonment and Anarkali, was very weak in terms of social interaction. Being at a greater distance between the railway housing and other places, a casual movement between both ends was not possible. Furthermore, the socio-economic status of the European railway employees was further bar to crossing the ‘line’. This situation had isolated European employees of the railways from other Europeans in the city. Although it was a policy matter to provide clubs/institutes in railway colonies but Lahore site was more demanding for immediate attention for creating a place of entertainment and social intercourse where Europeans employees of railway could pass some free hours from their hard working and
dedicated life in building the most important component for their Indian empire. Another important reason for provision of these social centers in railway colonies was the lesson learnt from the prevailing situation of army soldiers in the Mian Mir cantonment. Kerr drew the picture of soldiers stationed at Anarkali and then Mian Mir as:

“----- They were poorly housed, badly fed, often bored. Their non – occupational contacts with Indians usually resulted from their attempt to find a few moments of pleasure to enliven their dreary existence. Drinks and sex were the main items of enjoyment. Alcohol resulted in some abusive behavior by soldiers towards Indians and ion Indians retaliations. The problem of soldiers, particularly drunken ones, wandering from the cantonments into neighboring villages came to official notice in Lahore as early as 1851 and special guidelines for handling such men had to be issued to the police [47].”

The situation did not stop at the drunk British soldiers wandering into villages near the cantonment and soon they were exposed to venereal diseases in large numbers. Under this situation, it was decided that:

“No women known to be a public prostitute shall reside or practice her trade within the limit of the cantonment unless she shall first have her name registered” [48].

Furthermore, lock hospital were also opened at Mian Mir in 1859 and at Anarkali in 1879, for regular medical checkups of prostitutes. The government legislation and the moral conditions of soldiers were highly criticized by the missionaries, the Indians and men of eminence in the British community. Sir John Lawrence and other British officials expressed a concern for improving the moral conditions of English soldiers who set a bad example and, therefore, discouraged Indians from converting to Christianity [49].

According to Kerr, Rudyard Kipling expressed his feeling as:

“I came to realize the bare horrors of the private’s life, and the unnecessary torments so endured on account of the Christian doctrine which lays down that ‘the wages of sin is death’. It was counted impious that bazaar
prostitutes should be inspected; or that the men should be taught elementary precautions in their dealing with them. This official virtue cost our Army in India thousand expensive white men a year always laid up from venereal disease. Visit to Lock hospitals made me desire, as earnestly as I do today, that I might have six hundred priests Bishops of the establishment for choice to handle for six months precisely as the soldiers of my youth were handled.”

However, in view of the railway policy for provision of recreational places for its staff and suffering of Europeans soldiers on account of venereal diseases, the Punjab railway company from its earliest days in Lahore, was fully convinced for the provision of Clubs/Institutes and construction of residences for the married staff. The European drivers, guards and mechanics were allowed to bring their families in Lahore.

Besides the European employees of the number of Railway colonies for the increasing numbers of employees was also increased, when Lahore was declared as the headquarters of the North Western Railway (NWR) in January 1886. This followed an amalgam of the Sindh, Punjab and the Delhi Railway (SPDR) [50]. Establishment of the Mughalpura workshops during the first decades of the twentieth century further added to their numbers.

### 3.4.3 Railway Institutes

One of the important features of the railway colonies were the railway institutes or clubs which played an important role towards the social life of the residents. These institutes had special place in the layout planning. The Punjab Railway Institute was first introduced during the year 1863 for the European community of Foremen, Drivers, Guards, Firemen and Mechanics. This institute came into existence when the European employees of the railway numbered eighty at its Naulakha establishment in Lahore. It was located to the south of the railway line at the northern corner of the Dunlop Road. The project was initiated on the advice of the chief engineer (J. Harrison) and the Punjab Railway Agent (R.W. Stevens). The District Engineer (Mr. Edwin E. Baines), who previously had designed the Punjab Exhibition Building (1863) in Lahore, also designed this building. The spaces provided in this building were a reading room (30' x 20') with a small book-room, “Khansamah’s room” (Cook’s
room), verandah, dancing floor, swimming pool (44' X 27') with two dressing-rooms. The water arrangement for the swimming pool of ten (10) feet depth was made from a well and the city “Rajabaha” (water channel) which originated from the Bari Doab Canal. The building was constructed at a cost of Rs 11352-6-3 whereas estimated cost was Rs 12571-3-3 [51].

Figure 3.9: Punjab Railway Institute for Mechanics and other European Employees built in 1863. In 1916 it was converted into a Rest House for Officers.

Source: Railway Archives at Railway Headquarters Lahore

The annual progress report of the Public Works Department (P.W.D.) for the year 1864-65, confirms that this was first railway institute constructed in Lahore. The report states that:
“A railway Institute, with reading, library, and coffee rooms, and swimming bath attached, was opened in June for the use of all members of the railway staff and European Mechanics of all departments, at a monthly subscription of one rupee each, for the objects stated in last year’s report, and will most satisfactory results as regards the general health, recreation, and good conduct of those for whose use it was chiefly erected” [52].

According to ‘Annual Progress Report of Public Works Department’ for the year 1871-72, one hundred and seventy-five European and Eurasian railway employees were members of this Institute in 1872. However, this institute continued to cater to the social requirements of European staff till 1914, when its building was converted into an office for the Land Acquisition Officer. According to railway’s record in 1916, the same was converted into a rest house for officers. Currently, this building, following a number of changes, is in use by the Family Planning Department of the Pakistan Railways.

The railway population was rapidly increasing. Therefore, a large Institute for entertainment and recreation was constructed and opened during early 1913 [53]. Initially, the Institute was known as “New Theatre – Institute” but later on it was named after Sir Henry. P. Burt (K.C.I.E), who served in the N.W. Railway as the General Manager Operation from 1907-1913 [54]. The Institute was also known as the “NachGhar” (dance house) by the natives and this name is still more popular than other. The building was followed Italian architecture in design. According to its original architectural plan and many other text sources it comprised of spaces such as a “Theater and Ball Room”, a large “Gallery”, “Stage”, “Reading Room”, “Library”, “Tea and Coffee Room”, “Bar Room”, “Gentlemen Cloak Room”, “Ladies Cloak Room”, “Property Room”, “Car Porch”, “Ladies and Men’s Dressing Room”, “Office”, “Godown”, “Toilets” and “verandah”. These spaces refer to the activities of this building, which was usually in operation every evening. Similarly according to the Station News of 1927-28, the Burt Institute was holding various functions which included children’s sports, cinema, children’s fancy-dress Carnival, of the programme schedule. The European and the Anglo Indian staff used to come here daily after long working in the railway workshops and other railway establishments. Adjacent to this institute a playground, spread over 9.75 acres, and a pavilion were constructed exclusively for
outdoor games for the railway’s European staff. During 1910 another ground of 4.06 acre and pavilion was constructed for Indians and it was named as the Carson Institute.

Figure 3.10: Burt Institute in Station Colony built in 1913.

According to the Gazetteer of Lahore District 1916, the European population of Railway colony numbered up to twelve hundred. More than 70 percent of this population was housed in the old Naulakha Settlement and the remaining in the new colony at Moghalpura. In addition to the Europeans railway staff, Anglo-Indians and Eurasians were also present in significant numbers. Under these circumstances the old railway institute was insufficient to meet the socio-cultural requirements of the Europeans and their Anglo-Indian subordinates. Therefore, another Institute named the ‘Griffin Institute’ was established to fulfill the needs of the residents of the workshop colony at Mughalpura with an attached recreational ground of 14.52 acres. Although these institutes had gone long before into crumbling conditions due
to absence of their users and hence the maintenance but once these were centers of railway housing settlements holding variety of activities and were acting as catalyst in social life of the residents of railway colonies. The impact of these Institutes on the social interaction of railway employees was very healthy and significant. These were bonding agents among the residents of the railway colonies.

Another place of social interaction among the residents of railway colonies was the Railway Co-operative Stores which were located on the Grand Trunk Road, at a walking distance from the Burt Institute and were known as the “Co-operative Stores”. Although the stores have disappeared the place where they were located is still known in local parlance as the “copper store”. Here all general supplies, such as rice, flour, drapery, furniture, etc., were available on reasonable rates. The Gazetteer Lahore District 1883-84, states that

“---- it is useful institution which not only supplies groceries and oilman’s stores, but also good English clothing, as well as meat and bazaar commodities, and makes its own bread and soda water.”[55]

In addition to the stores, markets were also constructed separately for the residents of the station and the workshops colonies. To make the housing sustainable, the markets, and vegetable gardens, a beef stall and a dairy farm for pure milk, were introduced. The process for the supply of milk by the Indians was interesting. It was a routine matter for the “dood-walah” (milkman) to bring along a cow or a buffalo depending upon the choice of user. At the site, typically on the sanitary road, the animal was milked into a “daikchee” (vessel) handed to the milkman by the khitmatgar (butler), and after collecting payment the milkman would depart.[56]. However, regarding the provision of a variety of facilities in accordance with the needs of the users, the railway colonies could have been be considered as self-contained, at least during the colonial period in Lahore.

In addition to the provision of Institutes and clubs, the introduction of a Golf course was another facility provided exclusively to the railway officers in Lahore. The Railway Golf Club was introduced after the establishment of the officers’ housing in Lahore, in 1920. The site was located between two railway lines creating a triangular area. Presently, the land of the Railway Golf Club is in use by the Royal Palm Club on a lease basis and its membership
is only affordable for the persons of higher economic status. In addition to the Golf facility, the railway officers residing in Mayo Garden used to spend their evenings in the Punjab Club or the Lawrence & the Montgomery Halls, just a short distance from their housing.

### 3.4.4 Layout Concepts

An overall review of the railway residential settlements has revealed that in any colony layout the highest consideration was given to sanitation, health issues, and the climatic aspects. The house to house relation was also very important to achieve good lighting and ventilation conditions. For laying-out of the bungalows of the Mayo Garden, wind direction was an important consideration. It was an established principle that space would be left all around the building and this resulted in low-density housing and created a low ratio between the covered and the open areas. The compound sizes varied from .75-5 acres. The percentage of the covered to the compound area remained in the limit of between four to twenty percent. According to the Gazetteer of Lahore District 1916, one house in the walled city was occupying an area of 0.027 acre [57]. If we compare the two figures, it seems that between 27.7 and 185 walled city residences could be accommodated within the minimum and the maximum plot limits of a single bungalow of a railway colony. This clearly proves that the railway housing for the senior staff, especially, was a very low density housing.

In the Mayo Garden scheme, the servant quarters were located to the rear of the bungalows and they were constructed at an appropriate distance from each other, often at a distance of between 50-70 feet. The most important feature of the layout of railway residential colonies was the provision of a sanitary road on the rear side of the bungalows, thus restricting the movements of servants and night soil conservancy to these roads only. The kitchen, till 1920, was also located to the rear of the main building; later, it was made a part of the main building. [Figures 3.11, 3.12 and 3.13].
Fig 3.11: Layout of Barracks and Bungalows with Out-Houses near the Railway Station at Robson Estate built for the European Traffic staff between 1862-1900: The layout exhibits that the bungalows and the Barracks (light- and dark-brown colors, respectively) were surrounded by large lawns (light-green color). The main source of water for irrigating these lawns was the City Rajbah (light-blue color), which branched off from the Bari-Doab Canal. The location of out-houses including the kitchen, the cook’s house, the coachman’s house, and the stable were on the rear side of the Barracks and Bungalows. The Indian servants performed various activities in these out-houses. Note a separate road, the sanitary road, purposely built for servants and night soil conservancy carts’ movement. The main road in front of the residences was for use by the bungalows’ residents.
Fig. 3.12: Layout of Subordinates’ Bungalows near the Workshops colony, Moghalpura 1908-1947.
Fig 3.13: Layout of Bungalows at the Mayo Garden, 1921-1947. Note the open and the covered areas, location of Servant Quarters on the rear side of the bungalows next to the sanitary road, which was smaller in width as compared to the main road on which these bungalows fronted

3.5 Strangers’ Home

In the European community of Lahore there was always a low class which was poor and jobless. These people were dependent on help from other Europeans. According to Kerr, the attitude of rich European towards these people was a mixture of embarrassment and concern. The reason behind embarrassment was the status of these people in an environment where Europeans were thought of as rich and superior, and as such these poor people were a stigma on the image of Europeans in the locals’ eyes, at least so it was imagined by the well-off Europeans. In 1872, the local print media like the Lahore Chronicle and other publications, were continuously highlighting the plight of these people that by stating that “can nothing be done to relieve the flood of European destitution which sweeps over and eddies about in Lahore?”

The railway department went a step forward and built a “Strangers Home” in the station colony on Mayo Road near “Shahoo-ki- Garhi”. It was intended to provide temporary shelter and food to all out of work men, of either a European or a Domiciled European background.
3.6 Conclusion

Four railway housing settlements, generally known as Station, Workshops, Canal Bank and Mayo Garden colonies are identified. The former two were built for subordinates during later half of the nineteenth century, while the latter two, constructed for the officers, in the earlier decades of the twentieth century. The class of the employees (subordinate or officer) and work area were the major determinants to decide location and distance between their housing settlements. In case of the subordinates’ housing a strong relationship between work and residential area was created by placing the both at walking distances. Likewise, the ethnic background of the employees was strongly observed in maintaining the social distance between their housing. This distance was usually referred as ‘buffer space’ in drawings pertaining to housing lay-outs. In addition the housing was strategically located linking with railway station (building designed to serve as safe place in case of any revolt) as well as cantonment (army station). The officers and subordinates’ housing were also found different in terms housing layouts. An officer house was supposed to be on a larger plot between 1.5 - 8 acres.

It is also concluded that physical planning of railway housing settlements was made with various considerations to support the individual buildings in terms of climatic conditions, sanitation and environment. Each colony was planned with wide roads for single storied buildings. With respect to climatic conditions of summer in Lahore the houses were placed in individual plot of large sizes with suitable orientation. The heights of the buildings were restricted to single storey with wide roads and plantation.

The lower-status European employees, mostly belonging to the middle-class of Europe, were placed together as their social intercourse with other European communities of the city was difficult because of the distances involved. This led to the development of the railway clubs, institutes, cooperative stores, churches, markets and play-grounds, which played a vital role and made railway colonies self-sufficient in this regard. The railway housing for the Europeans was low-density whereas housing for the Indians was a high-density one. Moreover, a clear social and cultural distance was observed in the housing for Europeans and Indians. Additionally, buffer spaces were created to further differentiate the
two types of residential developments. The Barracks, Bungalows and Quarters were planned with several considerations relating to health, sanitation, orientation and wind direction.

Reference and Notes

1. “Rules Relating to the construction or purchase of residences for government officials and the rent to be charged for such buildings”, “PPAP, Home Department proceedings (A files), General, No. 25-88, October 1896: 28. Quoted by Glover in “Making Lahore Modern”.


4. Martin J.R., who served for twenty-two years in various parts of India in different capacities, such as President of the East India Company’s Medical Board, as member of the Royal Commission on Army Sanitation, as a surgeon in hospital and private practice, wrote thoroughly on the Influence of Tropical Climates on Europeans, including observation on the nature and treatment of the diseases of Europeans on their return from tropical climates.


9. In 1845, the Governor General of India ordered the constitution of a committee comprising of W.E. Baker, Major, Engineers, as president, T.E Dempster, Surgeon, First Brigade Horse Artillery, as member, and H. Youle, Lieutenant, Engineers, as member. The committee was assigned to report on causes of the unhealthiness which has existed at Kurnaul and other portions of the country along the line of the Delhi Canal. The
committee was also asked to report whether an injurious effect on the health of the people of the Doab was likely or not to be produced by the contemplated Ganges Canal. The committee traveled 1400 miles, visited 300 inhabited localities and personally examined 12000 individuals.


21. Baines, Edwin E., District Engineer prepared a plan of the Lahore passenger station in 1869, showing the occupation of offices in 1869 at the Lahore Passenger Station. Drawing No.L – 4-11772/18 LHR.


32. The Old record room of the Lahore Cantonment Board holds a number of applications on such complaints where action was also taken. This particular case was filed vide No.9221, dated 11-01-1939.


35. A Catalogue of the Plants of the Punjab and Sindh, the Americian Mission Press, Loodiana, Punjab, India, 1869.


42. Mahmud T., “When Tariq Mahmud moved from Dhaka in the 1970s, Lahore still had a colorful population of Anglo-Indians. Who were they? And where did they go?” Friday Times September 23-29, 2011, Vol. XXIII, No. 32.


50. History of Indian Railways constructed in progress, p.146, Govt. of India Press Simla, 1927.


54. Lari Y., ‘Pakistan Railways in Historical Perspective’, Pakistan Railways Board.


Chapter - 4

Housing Typologies: Form and Meanings

4.1 Introduction

In the previous chapter it was identified that several housing settlements were built for railway employees, who were allotted residential spaces as per their ranks. This housing could broadly be categorized into two types: a) Housing for Officers, and b) Housing for the Subordinates.

For each category, the houses were built according to the hierarchy of ranks, which, therefore, produced a large variety of housing typologies. The major objective of this chapter is to identify those typologies, their respective functional spaces, their plan configurations, and the evolution of these plan forms. To illustrate these objectives, a general survey and analysis of the residential buildings were carried out and different criteria were laid down to place each building-type in the respective niche it occupied in that particular typology. This criterion has been based on their plan form, the total number of main rooms in each, whether the buildings under consideration were attached or detached, and the number of residential units in one plan. The chapter concludes that there was a large variety of housing typologies that existed in the British colonial railway residential buildings in Lahore.

4.2 Railway Residential Buildings

The railway residential colonies were constructed during different phases. Work on the first one, located near the railway station, was started in 1862. It contained a variety of housing typologies, classified as the Barrack, the Bungalow or the Quarter type, in official documents of the time. Those railway residential building types still carry their old names in the contemporary official documents. The housing established in the vicinity of railway station was generally known as the ‘Station Colony, generally meant for the European subordinate staff. This housing comprised of ‘Bungalows’ and ‘Barracks’ with large variations in their plan types, construction materials and roofing systems. During the railway’s earlier period, Indians and Anglo Indians, except for the artisan class, were employed with the railway to a very limited extent. Residences for this staff were called‘
Quarters’, and these were located separately in the Station Colony, and appear as a densely populated segment of the railway housing [1]. The layout plan of housing typologies (Fig. 4.1) prepared after verification process of original drawings and extensive field survey which reveals that in the station colony the most prominent residences were Barracks and Bungalows.

![Housing Typologies in the Station Colony 1862-1947](image)

**Figure 4.1: Housing Typologies in the Station Colony 1862-1947**

Similarly, housing was established with the construction of North Western Railway Workshops at Mughalpura during the first decade of 20th century and this settlement was known as the Workshops Colony. The newly built network of workshops was the largest amongst the Indian Railway’s workshops. It had 11000 employees during the year 1914. By
this time the Indians and the Anglo Indians had also become regular part of the railway staff. Relatively few of the Indians were provided accommodation in the Workshops Colony while the rest were commuting daily, either from the Walled City or other areas of the town. According to the Gazetteer of Lahore 1916, 300 Europeans resided in the Workshop Colony [2]. This settlement comprised of Bungalows for the senior staff and Quarters for the subordinate staff. The Europeans employees were housed in bungalows and quarters purposely built for them, whereas the Indians and the Anglo Indians were housed in quarters which were different in many respects from the European quarters—see Fig.4.2 below.
Figure 4.2: Housing Typologies in the Workshops Colony, 1908-1947
The third phase of railway settlement started in 1908 near the Bari Doab Canal and culminated in 1920, when the high officials’ housing settlement was developed adjacent to the Mayo Road--currently ‘Allama Iqbal Road’. Built exclusively for the Europeans, the former was known as the Canal Bank Colony and the latter as the Mayo Garden, and each evolved with a gradually phased addition of Bungalows. These settlements had Bungalows for officers of different ranks, therefore, these two contain a large variety of housing typologies. It reveals from the architectural plans of these housing typologies that a large variation and steady evolution in plan forms existed. Although some officers’ bungalows were constructed during early period of the Punjab Railways (1862-1884) and the North Western Railways (1884-1947) in Station and Workshop colonies but, the Mayo Garden development in Lahore was the only housing colony developed exclusively for Europeans in the senior officer cadre of the railways. Figs. 4.3 and 4.4 below, illustrate the housing typologies developed in the Canal Bank and the Mayo Garden housing schemes.

Figure 4.3: Housing Typologies at Canal Bank, 1908-1920
Figure 4.4: Housing Typologies at Mayo Garden, developed between 1920-1947

4.2.1 The Barrack

“Barrack” is a residential building established during the British period in India for the use of army soldiers in cantonments. It was a rectangle block divided into rooms arrayed in a single or a double row (back to back) with verandah on front and rear sides. Common bathing, washing and kitchen facilities were provided on the outside. As the design evolved, these facilities were linked with the residential building via a covered corridor. In the later British period, the baths became part of the main barrack building. It is evident from various plans of railway and army barracks that these were designed and built with a single or a double layer of rooms. The Single Layer Barrack (SLB) was comprised of main rooms laid in one row. In case of Double Layer Barrack (DLB) the main rooms were laid in two back to back rows, each fronted by a verandah (corridor/covered walkway). Initially, the SLB was preferred because of its suitability for the India’s climate, especially in the plains. The DLB was deficit in terms of ventilation but economical in terms of the overall building cost and maximizing accommodation. The Barrack remained under improvements throughout colonial period in India in many respects. The most marked improvements occurred in space requirements per person in cubic feet, and in the roofing system and ventilation [3]. Plans of
railway Barracks in Lahore reflect the flexibility to accommodate single as well as married European employees.

### 4.2.2 Single Layer Barrack

During the early days of Punjab Railway Company in Lahore, the “Barrack” type residences were preferred and constructed for employees because of its ability to accommodate relatively large number of employees in a cost-effective manner. This first site for this type of accommodation was selected near the railway station and the “City Rajbaha” (a water channel originating from Bari Doab Canal and irrigating different areas of the city and ending outside the wall of the Lahore city at the circular gardens) on the Mayo Road. Initially, a set of four barracks was constructed to provide accommodations for the subordinate staff; their number and quality increased with the passage of time.

The Barracks at the Mayo Road were planned following the design principles of army barracks of India. These typically consisted of single layer of rooms with a verandah on the front and the rear sides. Each block of the Railway Barracks on the Mayo Road was rectangular shaped with dimensions of 108 feet by 38 feet. All these blocks were plotted independently, in compounds of 1.19 acres each, leaving more open space on the rear side. Out-houses were provided at extreme ends of the compound accessible from the rear side through a cart track. In this way the distance between the out-houses and the main building was more than 150 feet, about double the width of the front lawn. To avoid the heat, the longer faces of all the blocks were placed along the SW and the NE directions. In terms of planning, each block comprised of two sets of accommodations for the subordinate staff. In each portion the chief feature of architectural planning was a central sitting measuring 18' x 16', sandwiched between two bedrooms, measuring 14'x16' each. An 8'-0" wide verandah was provided on the front and the rear sides of each set, with one small room measuring 8'x7' on each corner for dressing, bathing and storage. Figures 4.5a and 4.5b below show the plans and the front view of a Single Layer Barrack (SLB).
In main rooms the doors were placed in front of each other on external walls. Windows for cross-ventilation and light, measuring 3'-3' x 4'-6'', followed the same pattern. Main rooms [4] were provided with fire-places and their flue pipes terminated at the top of building, creating chimneys on the roof. Building façade was enriched with round arches.
resting on heavy brick piers. Ceiling height of the living room and the bedrooms was 17'-3", whereas the verandah’s height was 11'-6". This difference was utilized for locating ventilators in the walls of the larger rooms. All walls of this building were 18" thick and built with English and the small Indian Bricks (chhotieent), laid in mud or lime mortar, as per the structural requirements. The walls were covered with lime plaster internally and externally. A study of some railway buildings has revealed that it was common practice to cover exteriors of buildings with lime plaster on the face of Indian bricks while English bricks were left exposed. SLBs had flat roofs with double rail girders, karees (wooden batten), brick tiles, and a final mud layer on top, which consisted of “kutcha” plaster (mud plaster with wheat straw).

The typical spaces of the out-houses in all blocks comprised of five rooms for different activities such as the Cook House (15’ x 11’) for cooking purpose, a verandah (6’-6" wide) in front of the cook house to provide the cook with the space for cutting of vegetables, a cook-room (10’ x 10’) for rest during off-hours, a fuel storage (10'x10’) for storing wood and coal, a pantry (10’ x10’) for storage of crockery and utensils, one stable room in which horses were kept for movement/outing and a room for the coachman to reside and take care of horses and train residents in horse-riding.

Each barrack was originally designed to accommodate two families of European employees but in the early days of the Punjab Railway in Lahore, these four blocks of barracks provided accommodation to forty-eight bachelor European guards, drivers, firemen and points-men. Later on two families of married European drivers and guards resided in each block. This building was used for different purposes at various times without any major changes in its planning and structural scheme which proves its flexibility in terms of design and planning. For instance in 1929, one block was converted into the Subordinates Rest House, whereas the other was converted into a dispensary. At present one block is occupied by a vocational training school and the remaining three are being used as residences for the lower-scale staff. Although some blocks have been surrounded by number of quarters but their original design is still intact.

During the time when Barracks at the Mayo road were under construction, another block with Barrack-like design was planned at Hope Road near the Shalimar Bridge, as
‘running rooms’ (rest-rooms) for European Drivers and Guards. The Hope Road project shows some improvement over the Mayo Road Barracks in terms of orientation, room area, width of the verandah, and its roofing system. The dimension of each room was maintained as 18'x18' resulting to an area of 324 sq.ft accommodating six persons in one room. The shorter axis of the building faces West and East direction whereas the longer axis, particularly the south was protected by a verandah. The verandah was 10'-0" wide, an increase of two (2’) over the SLB in the Mayo Garden development. Kitchen and out-houses were, as usual, located to the rear of the building. The chief interest in this building lies in its vaulted roofing system and the improved form of ventilation by providing openings in the roof. The vaulted roof increased the cubic foot space per person as the highest internal point of the vault from the finished floor level was 18’.

The Barrack-type planning of ‘running rooms’ for Europeans drivers and guards continued, with some modifications, till 1947. For example, in 1925, the running rooms for Europeans drivers and guards were introduced with increase in space per person. At this time, the room dimensions appeared as 20'x18' constituting an area of 360 sq.ft, which resulted in an increase of 36 sq.ft per room. That translates to 6 sq.ft more per person as compared to the previous barracks. On the flipside the room height was decreased from 17' to 16'-3” as compared to the earlier running rooms, which decreased the space in terms of ft³ per person. Verandahs’ width remained at 10'-0", with pointed arches prominent on the facade of the building. The most prominent change in this case was the attachment of kitchen with the main building. The whole building was roofed with Jack Arches which was in fact the vaulted roof at a smaller scale [Fig. 4.10-Running rooms for European guards and drivers Q-23]. With similar concepts some blocks of SLBs were also constructed on Victoria Road to the north of the railway lines.
4.2.3 Double Layer Barracks

In addition to the SLB style of accommodation for the married and the bachelor employees, the railway administration started constructing Double Layer Barracks (DLB) formed by back-to-back joining of two single layer barracks. Four blocks were constructed on the North side of the lines at Hope Road near the Signal Shops during the period 1864-1880. The blocks were meant for Europeans Guards and Drivers-Fig 4.7.

It revealed from architectural planning of each block that plan of double layer barrack became more economical in terms of covered and open space as two single room layers barracks were joined back to back in one compound of 1.69 acre with covered area of 6137 sq.ft as 10% of plot area. In comparison to the SLB-style, the notable feature of the DLB-style is expansion of its shorter axis. In architectural plans the space types and plan
configuration was similar to the Single Layer Barracks. The average size of each room was 18’ x 14’. This plan was flexible enough to accommodate either six single or four married European subordinates. So instead of a two-family accommodation like the barracks on the Mayo Road, this barrack-style accommodated four married couples instead. Kitchens and out-houses for the two blocks were also planned back-to-back on the dividing line of the compound between the two blocks.

Figure 4.7b: South-East view of the Double Layer Barrack (DLB) at Hope Road, with Vaulted Roof, 1896. Image by Author, 2010.

Figure 4.7a: Double Layer Barrack plan configuration, 1896
The division of two compounds was made with soft boundaries and this was a common practice in all residential buildings. Although like the Single Layer Barrack (running rooms for Europeans Drivers and Guards) this building has vaulted roof with roof ventilators, high wall ventilators, fireplaces in every main room, walls of small Indian bricks and round arches on facade but major improvement observed was related to climatic aspects. It was oriented to face North and South on longer faces. Secondly, its external wall or envelope was made 22.5" thick, which reflects that climatic and structural considerations were combined for climatic and structural reasons. All internal walls were made 18.5" thick. The internal height of the building was kept 20' to the highest internal point of the vault, and 15'-6" from the spring point of the vault. In comparison to the previous barrack-type, an increase of three feet in the internal height of the roof significantly increased the cubic feet space of the main rooms [Fig.4.8].

Figure 4.8: Additions and Alterations to the Double Layer Barrack to accommodate the increasing strength of employees. The Anglo Indian staff was mostly accommodated in these Barracks, 1937.
The cross-ventilation was relatively deficient in this building due to the back-to-back construction of two rows of rooms. In 1896, the railway management felt deficiency in the ventilation scheme of this building and decided to implement an improved form of ventilation by closing some doors and introducing some new openings. Although it increased the possibility of cross-ventilation but the new planning was feasible for a single person only. This building again underwent new changes in planning in 1937 when it was decided to convert it into six units for married Anglo Indian and Indian subordinate staff. At this time the windows introduced in 1896 were closed and building design reverted to the original one in respect of its openings. However, some additions were also introduced to make the residences compatible to Indians and the Anglo Indian requirements of dwellings. Provision of courtyard within the compound was really a meaningful addition to create an open space within an open space to reduce the space at certain level in view of the socio-cultural requirements of the occupants so that they could feel a sense of privacy at home. Furthermore, the introduction of hard boundary was a totally new element in the railway colonies. Similarly, the inclusion of kitchen as an integral part of the house was something different as compared to the planning of this building during the previous century. Similarly, like Indian courtyard houses, the provision of one latrine for each unit was constructed at one extreme corner of courtyard on its boundary line for easy access of the night soil conservancy carts; refer to Fig 4.8.

The other barracks of double layers of rooms was constructed on the area between the Mayo Road and the Pringle Road during 1880-92. At that time this and the adjacent area behind the Pringle Road was known as the “Robsons Estate”; probably, the Estate Advisors in Lahore, who were rendering services for acquiring land for railway expansion. Many other names also appeared on old records and railway maps from whom the land was acquired by the railway. For example, the land on the left and the right sides of the Nicholson Road, where railway bungalows were later constructed, was known as “Muhammad Raffi’s Estate”. Similarly, the land where the Burt Institute and the pavilion for Europeans’ recreational ground were constructed was “Mr. Siddler’s Estate”. Likewise, the land near the old railway institute at the northern corner of the Dunlop Road was famous as the “Nawab Fateh Ali Khan’s Estate”. However, the Robson Estate was dotted with number of barracks
during 1880-1897. Among these, the two earliest barracks in this area were constructed during 1880-82. The first was constructed for ten single Europeans.

Figure 4.9b: A view of Double Layer Barrack for the Bachelor European Guards in the Robson Estate, near the railway station 1881.

Source: Image by the Author - 2010

Figure 4.9a: Plan of Double Layer Barrack for the Bachelor European Guards in Robson Estate, 1881

Source: Railway Archives Lahore Division, Lahore.

guards with double layers of rooms. In each set there was one sitting, one bedroom, one store, one bath and a common space of the verandah. In terms of the building materials,
roofing system, ceiling height and other details, the building had similarity with old barracks of the Mayo Road but it was comparatively better oriented for summer conditions of Lahore than the older Barracks of the Mayo Road. Although the building measured 206‘ x 62’ but its double layer of rooms was indicative of the trend of expansion towards shorter axis [Figs. 4.9a and b].

In 1892, development of a new set of Barracks, comprising of five blocks for the subordinates of the traffic staff, was begun in the Robson’s Estate on the Boghey and Pringle Roads.[Fig.4.10]. Each block measured 100' x 56’, comprised of double layers of room constituting two sets of accommodation each measuring 50' x 56'.

The blocks were laid in independent compounds of 1.05 acres each leaving more space to the rear following the previous layout scheme for the Quarters in the Robeson’s Estate. The covered area was 15.8% of the compound area. Out-houses were located on the rear at one extreme end of the compound. This type of Barrack inherited various planning characters from other double layer barracks of the past built on Hope Road and in the Robson Estate. Provision of verandah on sides up to the depth of double layer of rooms was the feature of Barrack of married guards in Robson’s Estate whereas dimensions of main rooms and their grouping around fireplaces clearly relate to the design features of Barrack for single guards in the Robson’s Estate. The overall arrangement of different spaces such as bedrooms [18'x18'], dress [18'x12'], bath [13'x12'], store[1'3x12'] and verandah [18'x9'], was planned in such a way that one unit became almost square in shape which was in fact the planning characteristic inherited from the double layer barracks of Hope Road. The addition of a large dress room in Barrack plan initially appeared as a requirement of the European subordinates.
Figure 4.10: Double Layer Barrack in Robson Estate, 1897. The plan includes a number of changes/improvements in the Double Layer Barrack Plan compared to the earlier one and at this stage it was close to a Bungalow Plan.

Source: Railway Archives Lahore Division, Lahore.

4.2.4 Single and Double Layer Barracks (SDLB)

The Barrack in Robson Estate built during 1882 with three sets of accommodation each, comprising of three main rooms for Europeans married guards, was an interesting layout. Contextually, except for the double layers of main room at both extreme ends of the rectangular building (143’ x 48’), all the other main rooms were planned on lines similar to those observed in other single layer rooms Barrack. However, the mixing of single and double layers rooms in one barrack and extending part of those rooms outward had broken the monotonous character of barrack planning and its overall plan form. Similarly, the provision of verandah on the shorter axis of the rectangle was another improvement in constructing residences for railway subordinates in the barrack-like option. The sitting room
was planned as 18' x 16' and bedrooms size was 14' x 16'. The building was constructed with a flat roof and English brick masonry walls 18” thick [Fig.4.11]. The plan of this barrack reflects that its plinth level was raised from the ground and steps were provided at different locations to access different spaces.

Figure 4.11: Plan of Barrack, comprised of amalgam of single and double layer Barrack plan, 1882.

Source: Railway Archives Lahore Division, Lahore.

The comparative analysis of all three types of Barrack-type plans concludes that Railway Barrack style started from a single layer of rooms, succeeded by a double layer Barrack, and finally an amalgam, the Single and Double Layer Barracks. This evolving plan form/configuration in Fig 4.12 reveals that the chief planning feature in architectural plans was a central sitting area with bedrooms. Moreover, verandah was a common feature in all Barracks. Kitchen was not the part of main building. The internal height of the main rooms
ranged between 17'-3"-18'-6" The roofing system was flat to begin with and ended up as a single vault or double vault for whole roof. Besides high wall ventilators, the roof ventilation through “mug” was also introduced in vaulted- roofed Barracks. Considerations for orientation were observed more appropriately in Barracks of later period.

Figure 4.12: Various Plan Configurations of Railway Barracks and its typologies during 1862-1925.

Source: Drawing by the Author
4.3 The Bungalow

In 1911 a book with the title “Bungalows” was published by an American author, Saylor H. Henry, who defined the characteristics of an Indian Bungalow. According to Saylor, the bungalow is a “Bengalese house,” but in India it is not the typical native’s dwelling. He further mentioned that “the only bungalows to be seen in India are the Rest Houses” built by the British Indian Government along the main roads for the convenience of European travelers and troops. Saylor remarked that these single storey Rest Houses as inn or hotels which were consisted of a large central building consisted of large rooms linked with a kitchen through a covered passage. The bedrooms were located separately in an adjoining structure under a low roof and approachable from a straight corridor [5].

Like the British Indian Army’s Rest Houses; the Public Works Department (P.W.D.) also built Rest Houses at different locations in the British-controlled Punjab for its officers. Similarly, the Irrigation Department built ‘Inspection Bungalows’, one for every fifty (50) square miles in the relevant area for the use of the touring inspection officers.[6]. The planning of these bungalows differed from the army’s Rest Houses. A typical bungalow belonging to either the Public Works or the Irrigation Department was a single storey structure, comprising of main rooms in the center, verandah on all sides, and baths/dress/store on the corners of the verandah. The growth in height of these bungalows indicates that the central portion of the bungalows comprising of the main rooms, was made higher than the verandah and the side rooms. The façade of the bungalows were augmented with verandahs supported by columns and arches.

During the last quarter of twentieth century, an urban sociologist, Anthony King, gave the interpretation of term “Bungalow” in depth which holds significant weight among the architectural academia. King traced the origin of ‘bungalow’ and its spelling during different times. According to King :

“----- in the seventeenth century, ‘bangla’ (with various spelling) was an Indian term used both by Europeans and Indians to describe the Indian structure. As this was adapted and Europeanised in the eighteenth century, so also was the term:‘bungelow’ and ‘bungelo’ (1711).’Bangallaa’ (1747),
‘bungalo’ (1780), with the modern English spelling of ‘bungalow’ first recorded in 1784. After 1820, spellings other than this are rare” [7].

King also explained that in the late eighteenth century the ‘bangla’ or ‘bungalo’ was referred to three types of houses such as the native Bengali hut, Anglo-Indian dwelling adapted from the native Bengali hut, and finally, any kind of a small European house in India. As early as 1788, the print media of England had accepted the second meaning widely and in their earliest dictionary definition it was described as “a thatched house with walls of mud or matting.” King referred to two early encyclopedias of 1832 and 1838, wherein the term has been defined as “an Indian term for a house with a thatched roof.” In 1850, the Imperial Dictionary has defined this term as ‘in India a house or villa of a single floor’. The dictionary further states that ‘native bungalows are generally built of wood, bamboo, etc., but those erected by the Europeans are generally of sun-dried bricks and either thatched or tiled. By the early twentieth century the term ‘bungalow’, which was initially defined in European encyclopedias and dictionaries according to structural attributes, had changed its meaning in accordance with the users. During this time a ‘bungalow’ was usually considered as a single storey building, with a pyramidal thatched roof, for the residence of Europeans in India [8].

Applying King’s findings to the railway bungalows in Lahore reveals that although the roofing system of the bungalows remained under continuous development, its structural attributes, though, never helped to define its overall meaning. Through gradual evolution, though, by the time the term had begun to be applied to the British-developed residential colonies in Lahore, the class and the status of the user were important tools to define the characteristics and overall form/statement of the bungalows.

In railway the development of bungalows took place from three directions. The first was development of bungalows from the Single Layer Barrack, secondly from the Double Layer Barrack, and thirdly from the earlier to the later bungalows. The later bungalows had also inherited planning of the central core area from the double layer barrack. In some exceptional cases the central part of the main building had no similarities with the double layer Barrack. However, in all these channels of development, the bungalow plan refers to a variety of plan configurations and requirements for each space. However, a railway
bungalow was a single storey residential building for the use of a European railway subordinate and officer in a housing settlement, usually close to the work area. It was laid out in a large compound leaving plenty of open space on all sides. The size of the compound, number of main rooms, and scale of the building, were major guidelines for defining the class and status of the users. The main building in the compound comprised of Main Rooms (Drawing Room or ‘Sitting’, Dining, Bedroom, Office), Side Rooms (bath, dressing room, store, pantry) and a verandah. Cook house, coach room and stable were located to the rear of the bungalow and remained detached from the main building throughout the colonial period in Lahore. The Kitchen (cook room, fuel store, godown) was not a part of the main building till 1920 when Mayo Garden was established [9].

4.3.1 Three-Room Bungalows

During the period 1862-1896, in several parts of the Station Colony, 3-room bungalows, which planning characteristics evolved from the single layer Barrack, were constructed and remained in the use of the European railway subordinates [Fig.4.13]. These bungalow lots were constructed on both sides of the railway lines near the railway station and the signal shops. On the Southern side they were located on the Dunlop, Nicholson and Mayo Roads, and on the Northern side they were located on Stanton, Wallace, Gordon, Victoria and Penberton Roads. The Kitchen, Cook House, Stable and the Coach Room were not part of the main building but located in the compound on the rear of the bungalows.

The first bungalow of this type was constructed in 1869 and its architectural plan proves that it was exactly the half of a single layer Barrack. The plan comprised of a central sitting sandwiched by two bedrooms. In addition to these main rooms the other spaces included the Bathroom, Dress and Store, which were provided on the four corners of the rectangle plan. A verandah was provided on front and back of the main building. Kitchen and all out-houses were detached and located at a distance on the rear of these bungalows. The plan of this bungalow was implemented at various sites in the station colony [Fig.4.13].
Note: This analysis reveals that the plan of three room bungalow under gone to various developments in size and spatial configurations. The most common spaces were provision of central sitting, bed, verandah, dress room, store and attached baths. The provision of these spaces in plan remained throughout at a particular locations. Kitchen is not found in these plans during the whole period.

Source: Drawing by the Author based on information gathered from architectural plans

The origin of three-room bungalows from the single layer Barrack-type, subsequently, experienced a number of modifications, though, the sitting, bed, bath, dress, store and the verandah remained the most common spaces in all of its architectural plans. A study of the evolution of the plan configuration reveals that central sitting with a bedroom on
its either side in a single row remained a common planning character till 1896. Thereafter, arrangement of the main room in a single row was discontinued during construction of the Drivers’ bungalows in the Station Colony. This major change in plan configuration of the three-room bungalows significantly impacted the overall plan form. A detailed study of a whole series of three-room bungalows revealed that during the period 1862-1896, due to the continuous evolution in the plan form, the rectangular plan form gradually changed into a square one. The biggest driver of this change was the need, location and larger floor area requirements of the Dressing Room. [4.14].

![Figure 4.14: Evolution of Bungalow Plan for European Railway Subordinates, 1862-1896.](image)

Note: The central sitting (blue color) and the verandah (yellow color) were the common essential planning features. This analysis reveals that three room railway bungalow evolved from Barrack Plan and culminated into the Bungalow form. The bungalow form attained in 1896 was meant for European Drivers.

Source: Drawing by the Author using original plans/ drawings
Figure 4.15: Development of Bungalow Plan from European Senior Subordinate from Double Layer Barrack (DLB) during 1864-1896.

Note: The central core area in DLBs and Bungalows Plans (pink color) shows the origin of Bungalow plan from DLB. The verandah (brown color) appeared as significant plan feature in this development process of Bungalow planning.

Source: Drawing by the Author using original plans
In 1896, the average floor area of the dress room in a bungalow was about 20% of the total covered area which was 6% more as compared to the period from 1870 to 1895. The reason for this increase related to lifestyle of the colonial cultural environment in India. These changes marked a strong departure from the Barrack plan. Further changes in the 3-room Bungalow plans also occurred during this period.

It is evident from Fig. 4.15 that besides the development of Bungalow from Single Layer Barrack, the Double Layer Barrack also influenced the evolution of the Bungalow plans in the railway housing in Lahore. The bungalows owing square form were repeatedly constructed in the Workshops Colonies for the European subordinates between the years 1908 to 1947.

4.3.2 Four-Room Bungalows

The four-room bungalows were generally constructed for European officers, designated as the Assistant District Officer or of equivalent status. A few of these bungalows were constructed in the Subordinates Housing near the railway station’s building. The remaining were located in the railway’s housing settlements of the Canal Bank and the Mayo Garden, built exclusively for officers.

The first bungalow built of this group has been identified near the Lahore Railway Station, —currently ‘No 31’, although in the old official records it was listed as No 1. It is the oldest-known railway bungalow in Lahore, and was constructed in 1862 [Fig.4.16]. Old records of the Punjab Railways and the North Western Railways, reveal, that there was a system of allocating number to each residential building in a constructional sequence. However, with the passage of time the system could not survive or it would have been easy to determine the construction chain of the residential buildings. This occurred for various reasons during the pre- and the post-1947 periods. The major reason in this regard was the sub-division of existing bungalows and plots to accommodate an increase in railway employment. The old records at the Railway Headquarters, along with the building plan form, materials, roofing system and external appearance are good ways to determine the specific time-period of any residential building.
Figure 4.16: Plan of First Railway Bungalow in Lahore, 1862 and its impact on future bungalow.

Note: The extreme left is plan of oldest Bungalow of Railway in Lahore (1862). On top the images are related to its verandah and a view. The verandah view speaks on simple / massive columns, bow window, and heavy wooden beams. The other two plans were built in 1870 and 1925. The notable features in these plans are central core area, bow windows, verandah and a central corridor. The last seems to be the most important in planning. The plan of 1925 also reveals on roof ventilation through mugs (four squares in each main room).

Source: Drawings from Railway Archives Lahore Division and Image by Author in 2010.
The plan of the first railway bungalow with dimensions of 63’ x 67’ was almost square, in form and was located in a large triangular compound. The compound area was about eight times more than the covered area of main building. Drawings have been supplemented by physical surveys of the existing buildings. This bungalow was planned with four main rooms separated into two twins by a central corridor. Each Bedroom measured 18’ x 16’, whereas the Sitting and the Drawing Room each measured 18’ x17’. The primary or main spaces of the bungalows were surrounded by comparatively low height auxiliary spaces such as pantry and store with dining room, lamp room next the drawing room, baths and dress room with beds, godowns at one corner of the bungalow, and verandah on the front and the rear. The internal height of the main rooms at 19’-9”, as indicated on the drawings per a common practice of the nineteenth century, was 6’-0” higher than the verandahs and the auxiliary spaces. The kitchen, servant quarters and out-houses were placed at some distance, to the rear of the bungalow.

Other prominent features of this type of bungalow were the fire-places with their chimneys visible above the roof, high wall-ventilators, windows of smaller areas, bow windows on front face, and lime ‘parnala’ (spout for rainwater disposal through a water channel built in walls with lime-mortar). The bungalow was constructed with Indian small bricks (chotieent), and thickness of wall was maintained as 22.5 inches for outer walls of main rooms and 13.5 -18 inches for internal walls following English brick size to ensure the required stability and increase in time lag of brick masonry. The use of Indian small bricks helped to identify the age of the building. The house remained under the occupation of European officers at various times. All bungalows had a flat roof except the verandah where a sloping roof of corrugated sheets resting on heavy wooden sections was utilized.

The plan of railway’s first bungalow experienced a number of improvements, mainly related to ventilation through the roof and external appearance. In the revised plan arches were introduced in place of heavy brick columns. A comparison of the original and the revised plans points to no significant change in the bungalow’s plan. In both the core area of the bungalow followed the double layer Barrack with only the introduction of the central corridor as a separator for the two layers.
In 1875, the plan for the Assistant District Officers’ bungalow was introduced with the plan of its core rooms being the same as that of the Double layer Barrack type. In terms of functional spaces and many architectural features the bungalow was similar to first railway bungalow, except for the central corridor. However, for some reason it failed to flourish on a large scale and only three bungalows were constructed in the station colony. Later on the bungalow was divided into two sets for use as subordinates’ residences [Fig. 4.17].

Figure 4.17 Plan of European subordinate Bungalow, 1875.

Note: The core area of this bungalow derived planning pattern from the Double Layer Barrack

Source: Railway Archives Lahore Division
In 1886, a bungalow was constructed at Mayo Road’s Station Colony [Fig. 4.18]. This bungalow’s plan relates to the first railway bungalow in terms of its spaces but indicates variations in planning of all the previous four-room bungalows.

Figure 4.18: Plan of Bungalow, 1886.

Note: The drawing and dining are the new spaces, Central corridor (blue color) an important feature of past railway bungalows appeared as key factor in planning. Porch is later addition in 1924. The drawing (Red color) indicates an additional bed room in 1924 to convert this bungalow into an officer’s residence.
It was the first time that the central corridor which was usually termed as a ‘passage’ in drawings was brought to the front of the house to approach different spaces conveniently, without disturbing the privacy of other spaces. Introduction of a central passage increased the. In 1924, one bedroom with dress & bath, along with a porch, were added to this plan. The addition of an extra bedroom disturbed the overall balance of its plan. However, this addition was introduced after giving due consideration to ventilation.

The plan of the first railway bungalow was once again applied for the residence of the Assistant District Officer in the Canal Bank in 1914 with various improvements Fig 4.19.

Figure 4.19: Plan of a European Assistant District Officer’s Bungalow at Canal Bank, 1914.

Note: Central Passage (green color) a prominent feature of plan

Source: Railway Archives at Railway Headquarters Lahore
A drawing room, exclusively meant for guests, replaced the more private sitting room. Similarly, another space was part of this bungalow with the nomenclature of office mostly for the use of leftover cases during duty hours. Use of the Jack Arched roofing system for the bungalow, as noted from the drawings, was confirmed by site visits. The overall forms of the plan resemble to square and planning of central rooms creates linkages with any four main rooms of double layer Barrack [Fig 4.19].

In 1920, a more compact form of Assistant District Officer (ADO) Bungalow was adopted in the Mayo Garden, Figs 4.20a & 4.20b. Its plan was similar to the ADO bungalow in the Canal Bank with some improvements. The first was provision of kitchen with main building which was unprecedented in such type of bungalows in past. Its planning was composed off our spaces in the sequence of a godown, fuel store, and cook room and in front of all these a verandah which was connecting the kitchen with main building through the pantry and next dining room. The bungalow had a Jack Arched roof. The planning of central rooms was similar to those of the four rooms in the double layer Barrack except for the central passage. The front elevation revealed that main room, side room, verandah and kitchen were designed in vertical growth with same theme as it was observed in other bungalows of the past. An arcade of pointed arches resting on piers and horizontal bands of cornices were chief features of the composition.
Figure 4.20b: Front Elevation of a European District Officer’s Bungalow, at Mayo Garden, 1920

Note: The first time the Kitchen (brown color) was attached with the Bungalow. In past, it was located on the rear side of the bungalow. Central passage (blue color) is main planning feature.

Source: Railway Archive at Railway Headquarters Lahore. Color added by author
In 1922 another plan was implemented in Mayo Garden for the bungalow of the Assistant District Officer, where the overall plan form was changed from square to rectangular. There is no change in the types of functional paces in this plan [Fig. 4.21].

Figure 4.21: Plan and front elevation of a European District Officer Bungalow at Mayo Garden, 1922.
Note: Central corridor is still important planning feature. Kitchen has become part of main building.

Source: Railway Archives Railway Headquarters Lahore
However, the central passage was introduced in these bungalows linked the front and the rear verandahs. In this way a complete segregation between public and the private spaces is visible from the plan. The plan of this bungalow suggests that although it differed in form from other bungalows of the past in terms of overall form but the basic principle for its horizontal and vertical planning of primary and secondary spaces remained the same as in the previously designed bungalows of the Canal Bank and the Mayo Garden. The front elevation of the bungalow reveals that this bungalow had an arcade of round arches.

From 1929, a visible difference is found in the overall covered area of the four main rooms in bungalows for the Assistant District Officers. At this stage the plan was configured with the same functional spaces as in the other bungalows of this category in the Mayo Garden. No significant change in planning was made but the central passage was configured with core spaces of the bungalow in more appropriate way without chamfering the corners of any main room. However, this option directly placed the doors of the two main rooms before visitors.

In 1937, with the advent of the last decade of the British Raj in India, the plan of the Assistant District Officer bungalow was introduced in the Mayo Garden. It included all those planning considerations which were once part of the railway bungalows during the nineteenth century. Among the four-room bungalows in any scheme, it had the smallest covered area. Its prominent plan feature was the articulation of verandah space and elimination of the central passage. These bungalows were few in Mayo Gardens but do not hold such expression as these are visible from the bungalows of earlier period in Mayo Garden [Fig. 4.22].
Fig. 4.22: Plan and Elevation of a European Assistant District Officer Bungalow at Mayo Garden, 1937.

Note: Drawing and Dining (green color).

Source: Railway Archives, at Railway Headquarters Lahore
However, it reveals that there various typologies existed in this category. Their plan configurations in Fig. 4.23 further explain that with the passage of time the nomenclature of some spaces changed and some were discarded from plan being not required.

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Fig. 4.23: Various Plan configurations of four-room bungalows for European Officers, built during 1862-1947.

Note: This analysis reveals that evolving plan form of four room officers’ bungalows undergone to many developments during different times. The bedrooms, dining room, store, pantry, bath, dress were regular spaces of the bungalows whereas the sitting room was replaced by the Drawing room in 1914. The kitchen was attached with bungalow in 1920. Central corridor and verandah appeared as regular feature of plan.

Source: Drawing by the Author

### 4.3.3 Five- to Seven-Room Bungalows

The 5-7 room bungalows were generally constructed for European officers, designated as a District Officer or of equivalent standing. However, in the early day of the railway in Lahore, the bungalow of the Station Superintendent near the railway station’s building had five rooms in 1864. Similarly, another bungalow was constructed in 1887 with six rooms for railway officer on the Mayo Road. These two bungalows existed in the housing settlements for subordinates but the housing exclusively for officers was initiated in 1908 at
the Canal Bank and in 1920 at the Mayo Garden. The latter was at a larger scale and was built for the highest officials. Till the construction of the bungalows at the Canal Bank and the Mayo Garden, the higher officials of the railways were provided rented accommodations in the cantonment or civil station areas. The remaining ones were housed near the railway station, particularly, at Abbott Road. In the early days some old buildings of the Mughal period were also used as accommodation for high officials of the Punjab Railways. The residence of the First District Engineer of the Punjab Railway in Lahore was an old building dating from the Mughal period and was located in the premises of the Mughalpura workshops. A road was exclusively constructed to link Mr. Baines’s residence with the railway station’s building in 1863 [Fig.4.24].

Fig. 4.24: Part-Map of Lahore, 1867 indicating railway station (RS) and residence of Mr. Baines, the first Railway District Officer in Lahore.

Source: Earthly Paradise [10]
Beside many contributions towards design of the early railway, Baines also designed, in 1863, the Punjab exhibition building in Lahore [11].

In 1864, the Station Superintendent’s bungalow, one of the earliest of the five-room type, was constructed near the railway station. It’s important feature in planning was a central hall measuring 40’x20’ with an internal height of 19 feet, which occupied a proportionately large space. This large hall divided the whole bungalow into two parts. The hall was used for sitting and dining purposes as was usually the norm in the Europeans houses. It was approachable from the shorter sides. The height of the primary or the main rooms was greater as compared to the secondary spaces. The wall thickness for this bungalow ranged between 18”-27”. Kitchen and all out-houses were located at a distance from the main building and to its rear.

According to the Staff Movement Register, this bungalow remained under the occupation of the European officers in the railway and the last one to reside it was C.I. Hammill, Station Superintendent, who vacated it on 2-12-1953. Hammil was drawing a salary of Rs 650/month, whereas he was paying Rs 20-15-0 as the monthly rent for this house to the railway, which was 4% of the capital cost of the house. It indicates that the capital cost of the bungalow was about Rs 525/-

In 1897, a six-room bungalow was constructed on the Mayo Road and planning of this bungalow was different from the plan of the Station Superintendent’s bungalow. In it two layers of main rooms were created one after another. The sitting and dining areas were placed separately in the first layer and in between this layer a central passage was created to link all the main spaces instead of a central hall as in the previous case. This was the major difference between this bungalow and the previous one. All other spaces such as baths, dress, store, lamp room and the verandah were planned around the main rooms. The verandah and an arcade of round arches with keystones resting on piers, were the chief features of this bungalow on its front exterior [Fig.4.25].
In 1890, another six-room bungalow was constructed on the Shalimar Road, with sitting, dining, pantry, three beds and an office, as its major spaces. The bungalow’s core
comprised of four equal-sized rooms thus creating a similarity with the planning of the double layer barrack [Fig. 4.26]. The bungalow was vertically planned with three heights 19', 15' and 10'-6" from internally for main rooms, dress rooms and verandah respectively. The main rooms had 18" thick (two English bricks in full length) brick masonry walls, whereas in all other spaces the standard wall thickness remained at 13.5" (one and a half English brick in length). In the century, the increasing strength of railway employees demanded division of this bungalow into two sets of accommodations for junior officers. In new plan the distribution of spaces was amongst drawing, dining, pantry, one bed, one large dress room, one bath, one godown and a verandah. This plan remained very popular and was repeated in different areas of the Station and the Workshops Colonies because of very little intervention in terms of additions/alterations and a relatively minor cost-factor. It is also evident from many other plans of bungalows and Barracks in the twentieth century that sub-division was often resorted to for accommodating the increasing strength of railway subordinates, particularly, in the Station and the Workshop Colonies.

Figure: 4.26: Plan of a bungalow on Shalimar Road in Station Colony, 1890
Source: Railway Archives, Lahore Division
The year 1908, was a landmark in the history of European railway officers’ residences in Lahore. It was the time when the project of housing settlements for officers was initiated and bungalows were constructed. The bungalow of District Officer in this settlement called ‘Canal Bank’ comprised of seven main rooms and other spaces. The main rooms included four bed-rooms, one office, a sitting and a dining area. In secondary spaces, bath, dress verandah, store, godown, pantry and lamp room, were all part of the bungalow. Kitchen was still provided at a distance on the rear side of the bungalow [Fig.4.27].

Figure 4.27: Plan of District Officer Bungalow at Canal Bank, 1908.

Note: Introduction of an office (the room on rear side of sky light) and skylight (brown color) were first time appeared in railway bungalows in Lahore. Central Passage (green color) is still an important part of architectural planning.

Source: Railway Archives at Railway Headquarters Lahore
However, the typical plan of this bungalow revealed that main rooms were planned in a triple layer, one after another. The plan shows that monotony of the planning was broken with introduction of various functional spaces which also became a trend in the future bungalows. In this regard an 8’ wide central passage, starting from the front verandah and ending at the start of the second layer of rooms, was introduced. At this point the central passage terminated in an area of a lobby measuring 16’x16’, to provide independent access to bedrooms and the office. The corners of spaces at the third layer were chamfered as a way of breaking the monotony in the architectural plan and creating an approach for the bedrooms. The lobby was provided natural light by creating a roof-opening in roof measuring 4’x6’, 4’ in height above the roof, with side openings and covered at the top. The new feature of a skylight, however, could not be continued in the Canal Bank and the Mayo Garden schemes because of other means, such as the height differential between the various spaces of a building.

The year 1920, witnessed another housing settlement for higher-ranked railway officials in Lahore. The bungalow plan forwarded by the railway authorities for this particular housing was different in many respects from railway bungalows of the past. The first change in the plan was attachment of kitchen with the main building. The second development observed in the Mayo Garden was about the conscious layout of bungalows in terms of orientation and wind direction. It was the first time when instructions on drawings were given for orientation limits. The type of functional spaces, except for the addition of the car porch and the garages, remained similar in these bungalows. The lamp room, however, was eliminated, because of the arrival of electricity in 1910 [12]. Concepts of planning resembled the bungalow of the Assistant District Officer in the same settlement. The only difference in both cases was the difference of total covered area and obviously the area of spaces.

A District Officer bungalow usually possessed 5 to 7 main rooms including one office/ study as compared to the bungalow for the Assistant District Officer (ADO), which had four rooms. The main rooms were arranged in double layer with central passage starting from verandah and ending in front of the office. As in the bungalow for the ADO the private and public visitors’ spaces were segregated through a passage. This differentiated it from the
plan of the main rooms for the part plan of the DLB. Later, this plan was duplicated on a large scale in the Mayo Garden [Fig 4.28].

Figure 4.28: Plan of a District Officer Bungalow in the Mayo Garden, 1920

Source: Railway Archives at Railway Headquarters Lahore.

In 1933, the typical bungalows of Divisional and other officers of equal standing were constructed with some changes. In these the space for an office was deleted while the space allocate for a kitchen was reduced, and it was integrated to some extent with the main building. The main entrance was emphasized by projecting a part of the verandah outwards; this also broke the monotony of the façade of the front, while other spaces were maintained as usual [Fig. 4.29].
In Mayo Garden, the ‘Kohthi’ (Bungalow) No. 2 was constructed in 1922 for a ranking official of the railway. The bungalow’s plan was unprecedented till that time. This double-storied bungalow with a covered area of only 4% in a compound of 5.4 acres, occupied a prominent position amongst the buildings of the Mayo Garden. The house was divided into three zones such as visitors, private and servants’ area, with three separate entrances. The internal spaces such as the drawing, dining and the bedrooms also occupied larger space. The kitchen was completely integrated with the house plan and a covered yard buffered the domestic spaces from the kitchen area. In addition to extra space, sixteen servant quarters were also attached with this bungalow [Fig 4.30].
Figure 4.30: Plan and Front Elevation of the bungalow of the North Western Railway Agent, 1922 and Front view in 2001.

Source: Railway Archives, Railway Headquarters Lahore
The analysis of functional space of 5-7 room bungalows [Fig 4.31] revealed that ‘sitting’ was replaced by ‘drawing room’, in 1920. ‘dining’, ‘office’, ‘veranda’ and central corridor remained common spaces. ‘Kitchen’ was attached with bungalow in 1920. With the introduction of a central corridor in 1908, the architectural plan of bungalows became more functional than the earlier bungalows. The comparative analysis of various architectural spaces of bungalows built during different time also reveals that plan form under gone to numerous developments during different times and produced various bungalow typologies as shown in fig 4.31.

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Fig.4.31: Various Plan Configurations in 5-7-room bungalows for European officers.
Source: Drawing by the Author

4.4 Railway Quarters

The term ‘Quarter’ has remained in use in Lahore for almost every kind of residential building of the colonial railway. In early drawings it was referred to as the ‘Barrack’ accommodation. During the period 1862-1896, in many drawings of Barracks, the term ‘Staff Quarter’, which referred to European subordinates, was inserted instead. At that time the residential accommodation for Indian servants on the rear side of the Barrack or the Bungalow was known about-house. Similarly, old drawings revealed that when a residence was occupied by a senior officer it was called a bungalow instead. It is evident from various drawings that the three residences of almost equal covered area, similar in functional spaces, and space arrangement for European subordinates, were constructed during the year 1863 to 1896 but one was titled ‘3 Room Bungalow for Drivers’, another as ‘Single Block for
married Guards L.H.R.’, and the third as ‘Staff Quarter’ for the foremen. The comparison of these residences clearly reflects the willful intervention in the title of residences despite their same character in planning and almost equal in covered area. The only difference was the status of the resident in service. These evidences supports the interpretation that in the nineteenth century the size of the residence was not the consideration to designate a residence as Quarter, Barrack or Bungalow but the status of the employee was the major factor behind the term used to describe the specific building type.

The practice of using the term ‘Quarter’ continued till the introduction of the independent Officers’ housing, during the first quarter of the twentieth century. At this time the term ‘Quarter’ appeared with much confusion. In 1920, the title of the officer housing was “N.W.R. PROPOSED LAYOUT OF SITES FOR OFFICERS QUARTERS AT L.H.R.”. However, this housing was later known as Mayo Garden in memory of one of the former Viceroy of British India. Soon after the construction of a few residences of North Western Railway’s high officials the title started appear on drawings as ‘Plan of Mayo Garden Lahore showing Site of Bungalows and Watering Arrangements’. At this stage the railway was employing a large number of Indians and Anglo Indians in its subordinate staff establishment; soon the nomenclature for their residence waw established as ‘Quarter’ in railway documents and among the residents. During this time the term ‘out-houses’ was also replaced by Servant Quarters and Menial Quarters depicting residences for their servants, if they numbered between six to sixteen.

The term ‘Quarter’ was used extensively, from by the British Indian Army for its officers and soldiers housing. Even today the term is in practice and is being used for other than residential buildings. In Pakistan Army, an official designated as ‘Quarter Master’ is supposed to allot residences, and is for the repair and maintenance of the buildings in an area under his control. Under this information it is evident that like ‘Barrack’ the term ‘Quarter’ came in the railway from the army and is rooted in army buildings.

However, the railway built various types of Quarter for its staff and it has been observed from drawings and physical presence of Quarters at various sites in railway housing settlements that covered area, number of main rooms, open spaces, class of user, and attached
or detached status of the residence, were major considerations in planning of these residences for the subordinate staff. An Indian employee was supposed to live in a quarter of small covered area whereas the European employee of same designation was allowed to live in a large quarter. Such type of discriminatory space allocation on racial grounds was a common practice in railway colonies. The quarters of the Indians and the Anglo Indian staff were limited to a few rooms. The Indians were mostly housed in a two-room quarter with multiple units in row. The Quarters for the Anglo Indians were in duplex form, with two main rooms in each set. The Quarters of the European subordinates were usually in a detached position comprising of 3-4 rooms. However, in this type some quarters were also constructed with three main rooms in combined form. The number of rooms with reference to class and status of user clearly illustrates that racial and class segregation were basic considerations in planning of Quarters. These quarters were extensively constructed in different areas in the Railway colonies.

Like many other drawings of railway residential buildings the standard notes on drawing for execution of plans were also given on the drawing of each typology providing information on design of foundation for a particular soil, types of bricks for internal and external walls, types of mortar for brick masonry at various places, wire gauze for external doors and windows, and length/section of rolled steel joists for construction of roofing system through Jack Arches. The specifications and materials for the residences for the three groups were the same; however, the European Quarters had wire-gauze on the exterior doors.

4.4.1 Two-Room Row Type Quarters

These Quarters were meant for Indian subordinates of junior status and their plans had two rooms of 12’ x 12’, one kitchen measuring 7’ x 5’-6”, one bath of 5’-6" x 7' and a verandah 6' wide and 13' in length. This plan has similarities with the Barrack Plan of the single layer but it also reflected the Indian living traditions. An Indian lifestyle values a courtyard and a verandah as active living spaces and can be utilized for a range of activities during the day and night time. The facing of verandah to courtyard was usual practice in Indian houses in the city and it seems from plan of this quarter that this aspect was configured in plan consciously. Similarly, the concept of a dry latrine was also a feature of the Indian housing incorporated in their Quarter. The latrine was located at the extreme end...
of the courtyard, adjacent to the next Quarter’s; this was useful for sanitary purposes and also helped their cleaning [Fig. 4.32].

Fig. 4.32: Two-Room Row Type quarter for Indians, 1937.

Note: Courtyard (green color).

Source: Railway Archives at Railway Headquarters Lahore.
4.4.2 Two-and Three-Room Combined-Type Quarters

These two- and three-room combined-type Quarters were built for Anglo Indian and the European subordinate staff respectively. The Quarters were planned as two units in one set with a courtyard on the rear side of each case. The Quarter for an Anglo Indian was comprised of a living room, one bedroom, bath, latrine, store, pantry, kitchen and a verandah. These spaces reveals that that in planning quarters for Anglo Indians was amalgam of the Indian and European traditions of house spaces. In a Quarter designed for the Europeans, spaces were similar but the major difference related to the scale of spaces and provision of bedrooms with attached baths. In an Indian quarter the bath was only available for bathing purpose, whereas in a European quarter, the bath was provided with each bedroom for bathing and use as a toilet as well. In Anglo Indian Quarter the toilet was at the extreme end of courtyard in detached position from Quarter and accessible through the courtyard only. Like the planning strategy of the bungalows and other quarters, internal heights of the main rooms were kept higher than other spaces. This was irrespective of whether it was a small quarter or a large bungalow Fig [4.33]
Figure 4.33: Two-room combined-type Quarter for Anglo Indians

Note: Courtyard (green color)

Source: Railway Archives at Railway Headquarters Lahore.
4.4.3 Three to Five Room Isolated-Type Quarters

A quarter of this category was built as an independent residence for a European subordinate with a courtyard on the rear side. A Three-room Quarter was meant for a junior subordinate, whereas four- and five-room Quarters were built for upper and senior-upper subordinates respectively. This hierarchy of status of an employee not only defined the number of main rooms in each Quarter but the overall covered area and the types of spaces also varied per his rank.

The covered area for each Quarter from junior to senior-upper subordinate was calculated from the original drawings as 1876, 2764 and 3165 sq. ft. respectively. From the plan configurations of Quarters it is evident that the common spaces were the living room, bed, bath, store, pantry, kitchen and a verandah. In four- and five-room quarters the dining space was additional. The plan configurations further explain that in these quarters the living space was the central area which provided links to bedrooms, kitchen, dining and the verandah. A living room was usually provided a verandah towards the front side. It also appeared from the drawings that a verandah was an essential element in all quarters with kitchen. However, the provision of the kitchen joined to the main building was not implemented in the Quarters developed for the Europeans till the 20th century.

Height differentials for lighting and ventilation were used as before. The building exteriors were accentuated by exposed brick and round arches on the front verandahs. Flat roofs gave way to Jack Arches as roofing systems; the latter also helped with the ventilation through the roof with the help of siphon ventilators [Figs. 4.34, 4.35, 4.36].
Fig. 4.34: Three-Room Combined-Type Quarter for European Subordinates

Note: Open space (green color) on rear side of the house.

Source: Railway Archives at Railway Headquarters Lahore.
Figure 4.35: Three-Room Isolated-Type Quarter for European Subordinates

Source: Railway Archives at Railway Headquarters Lahore.
Fig 4.36: Four-Room Isolated-Type Quarter for Senior European Subordinates

Source: Railway Archives at Railway Headquarters Lahore.
An overall analysis the railway Quarters has revealed that Quarters for the Europeans were of the isolated- and combined-types. The major difference between the planning of Indian and European quarters was the life-style, and differences in the lifestyles. A comparative analysis of all the Quarter-Types is provided in Fig. 4.37, with reference to provision of various functional spaces and different racial and ethnic groupings.

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Figure 4.37: Various plan configurations in 2-5-Room Quarters for Indians, Anglo Indians and Europeans subordinates

Source: Railway Archives at Railway Headquarters Lahore

This analysis proves that house layout and spaces were planned on ethnic basis. Indians were housed in row type houses of two rooms and Anglo Indians were provided combined type quarters mostly two in one set. The European were given Isolated houses with 3-5 rooms accommodation. Similarly the Indian quarters were planned with the spaces of Indian traditions whereas Anglo Indians quarters possessed the spaces of Indians as well as European traditions.
However, the ethnic origin was a dominant factor in determining the size and type of residence allotted to a particular racial/ethnic group.

The drawing of bungalow for European Drivers in the Station Colony Fig 4.38 reveals that a European driver was allotted a large-sized Bungalow with additional facilities provided along with it. Whereas the Quarter Fig 4.32 explains that an Indian driver was entitled to live in a small two-room quarter, with a small courtyard in front.

Figure 4.38: Bungalow of European Driver in Station Colony during 1896.
Source: Railway Archives at Railway Headquarters Lahore.
4.5 Conclusion

The major housing typologies in the British Indian Railway housing settlements at Lahore generally included the following: ‘Barrack’, ‘Bungalow’ and the ‘Quarter’. These differed from each other in terms of plan-forms and configurations. In each case, two types of spaces such as primary and secondary have been identified. In case of the ‘Barrack’ the primary space type referred to bed and sitting areas, whereas the secondary spaces were the verandah, store, godown, and bath(s). In case of a ‘Bungalow’, the primary spaces can be identified as a sitting or the drawing room, dining room, bedroom(s) and an office space. The secondary spaces in the ‘Bungalow’ types were the bath, dress, store, a godown, lamp room and a pantry. In case of ‘Quarters’, the primary spaces can be identified as the living area, and bed room(s), whereas secondary spaces were the bath, latrine, kitchen, pantry and store. In ‘Barrack’ types and Bungalows, the kitchen and out--houses were not part of the main building till 1920, these, instead, were located to the rear of the compound.

The house plan, its size, and spaces were all based on the lifestyle, and the living traditions of each group and their ethnic origin. Each major typology underwent numerous changes during the evolution of its plan-form, giving rise to sub-typologies. The ‘Barrack’ plan borrowed its planning character from the barracks of the British Indian Army. It started from single layer and evolved into double layer, and finally the amalgam of the single and the double-layer emerged during the period 1862-1897. During the process of evolution of this plan-form, six Barrack-type plans can be identified. It is worth mentioning that the single- and the double-layer Barrack-types greatly influenced the later planning and development of railway Bungalows.

In case of bungalows the plans comprised of three to seven rooms. In three-room bungalows the plan started as a rectangle in 1869 and ended as a square in 1896., during which period nine sub-typologies were evolved. It can be concluded from plan configurations of all these Bungalow-types that the most common feature in all these sub-typologies was the location of the central sitting area between two bedrooms. In case of the four-room bungalows the plan comprised of four main rooms in two layers with a central passage which differentiated a four-room Bungalow from a double-layer Barrack-type. Till 1920 the kitchen was located at a distance from the main residence.
Eight plans can be identified in the category of four-room Bungalows which were allotted designed and built for the Assistant District Officer or other officers of equal standing. In four-room bungalows the sitting continued till 1914 when the room was named as the Drawing room which was a more public space as compared to the sitting-space, considered more of a private space. Similarly, in 1914, the introduction of dining as a separate room brought a number of changes in the bungalow plan. Previously, in the same bungalow category, the dining activity was made a part of the sitting room. Similarly in 1920, the attachment of kitchen with the bungalow brought about a new grouping and flow of spaces, particularly for the dining, pantry, store, godown, fuel storage and the cook room. By the year 1920, the sitting area in the Bungalows had been replaced by the drawing rooms, which was more of a formal space as compared to the sitting area.

Reference and Notes


4. “Main Rooms (MR)”, frequently referred to living, drawing, bedrooms and office in the movement registers of railway colonies’ residents, whereas all other rooms like baths, dress, store, pantry, etc., were referred to as “Side Rooms” (SR).


8. Ibid. pp. 36-38.

9. The Design Office of Railway Headquarter, Lahore, holds office files and a huge collection of drawings related to railway residential buildings of the colonial period, which provide information on architectural spaces; type, class and status of employees for a particular building; and other information.


5.1 Introduction

In various railway housing typologies plan configurations, various types of functional spaces, their location, volumes, and relations between them were extremely important. This chapter delves further and deeper into a detailed analysis of architectural spaces and planning features. The analytical method utilized is a two-step process: Firstly, the statistical data of various typologies related to covered and floor areas, was calculated, and, secondly, the heights for every space were noted. This data was tabulated and spaces of each typology were analyzed on a comparative basis with reference to input towards the overall magnitude of the building. This comparison highlighted the architectural spaces at various scales which were further explored in view of the writings of various scholars of British India time on colonial residential buildings. The major objective of this analysis was to enable interpretation of most common functional spaces and features of various typologies to help in determining the meaning and expression of railway residential buildings.

5.2 Functional Spaces and Planning Features

It has been established from the study of housing typologies from various dimensions in the previous chapter that functional spaces are those spaces which refer to the use or function in residential buildings whereas planning features are those characteristics of building which may or may not be concerned with function but seem to regularly become part of the building. Moreover features are also associated with the visual appearance. A feature may be long-lasting or for a limited time. In this perspective when railway buildings were viewed some interesting results appeared. In all housing typologies there are some common spaces and features. For example bedroom, bath, store and verandah were common spaces in all typologies throughout in railway housing but among all these the verandah was regarded as a common feature due to its multiple functions and visually striking character.
Similarly, each typology had its own spaces and features, some were typical and some were changing with the passage of time in response to changing trends and concepts of living and lifestyle. The sections of this chapter which follow, discuss the functional spaces and features of railway housing’s typologies and to interpret their meanings and role in residential buildings.

5.3 **The Main Rooms (MR)**

There are many sources which confirm that each railway residential building comprised of three major components, the Main Rooms, Side Rooms, and a Verandah. For instance, the Movement Register of railway employees and Rent Assessment Record housed in Land Department of Railway Division of Lahore, revealed that during the entire period of colonial railway in Lahore the house spaces were generally grouped as the Main Rooms (MR), the Side Rooms (SR), and the verandah, for rent assessment, cost estimation and all other practical purposes [1]. “How many rooms in your home? This has been a census question in UK since 1871” [2]. Similarly, it is known from plan configurations of various housing typologies in previous chapter that railway residential buildings of any period possessed three main groups of spaces on the basis of location in building plan, size/magnitude, and function. The group of rooms located in the core/central area of the building, were known as the main rooms, possessing comparatively the largest floor area and volume. On the outer periphery of the main rooms, spaces of lesser size, magnitude and volume were located and known as side or secondary rooms. The location of the verandah was also in the same area where side rooms were located.

The number of main rooms varied in Bungalows and Quarters and this variation was linked with the status, class, and ethnicity/race of the employee. The bungalows having three (3) Main Rooms were generally for European subordinates such as Mechanics, Drivers, Guards, Foreman, etc. Similarly, the 4-room bungalows were residences for the Assistant District Officer or officers of equivalent status; and bungalows of 5-7 main rooms were for high officials. The same was true of the railway Quarter where the strongest criterion in the allocation of different type and size of the quarter-type accommodation was the racial/ethnic one.
The comparative analysis of internal heights in each housing typology revealed that it was an accepted rule that the main rooms will be higher than the side rooms and the verandah (refer to appendices B 1-5). This arrangement was so feasible with respect to climate and overall expression of the buildings that it was applied in every kind of building and became a planning feature of railway buildings [3]. Similarly, the residential buildings of other government departments of the British colonial period in Punjab were also planned with this feature. Besides Europeans residences in Lahore, the tradition of constructing main rooms with high roofs in the residential building of Indians also existed on a large scale in the Walled City. In Indian tradition it was deeply rooted and learned on years of experience that indoor thermal condition of a house can be improved during summer with the provision of high roof. The Europeans engineers in India had also pointed out during different times that natives’ buildings must be investigated on their sustainability against climate [4].

In terms of climatic conditions during summer, the high roof contributes greatly in low surface-volume ratio (SVR) which is referred in the past studies as a good technique for obtaining comfortable indoor thermal condition during summer in a climate like Lahore [5]. Ventilation through high wall ventilators is an additional advantage under high roof during summer. However, on the other side, the high roof was a great problem in railway bungalows during severe winter conditions as it was much difficult to heat the large space of the main rooms by natural or artificial means. Therefore, provision of fire-places in all railway residential buildings, as a regular feature is understandable [6]. Besides the actual role of fireplaces, their provision in all typologies was symbolic representation of well-off Europeans’ indoor living style. According to King, this regular feature of colonial residential buildings was related to mental satisfaction of the Europeans in India creating a home-like feeling. It has been observed from the standard design of fireplaces that their materials were in accordance with the service status of the employee. Fireplaces occupied a prominent location in rooms and thus created a focal point for visitors. Users could use the cornice as a place for display of photographs, post-cards and souvenirs, reflecting the service and professional achievements of the occupant [7].

In addition to cultural and climatic role during winter, fireplaces with chimneys were also useful for removing heat from the rooms in summer. The chimneys were normally
extended 3'-4' above the roof-top and it was a regular feature of the railway residential buildings. This was sometimes carried to extremes as in the bungalow design for the North Western Railway Agent in the Mayo Garden, where it was raised fifteen feet above the roof.

According to the comparative analysis of the internal heights of various spaces in different housing typologies, the average internal height of Main Rooms is found as 18' in Barrack (appendix B-1), 17' in three-room Bungalows for Europeans subordinates (appendix B-2), 17'-19' feet in four- room Bungalows (appendix B-3) and 17'-19' in 5-7-room bungalows (appendix B-4). In Quarters for the Indians, Anglo Indians and the Europeans, Main Rooms were constructed with an internal height of 11', 14', and 16', respectively (appendix B-5). This comparison indicates that the Barrack, Bungalows and Quarters for Europeans were constructed with the greater height than the Indians and the Anglo Indians staff. The difference of internal height in the houses of locals and Europeans prompts that it was related to the climatic compatibility during summer. Furthermore, it was also intended that the single storey bungalows of Europeans should create harmony with their status as ruling class.

The British felt more comfortable at places of higher altitudes like Simla, Murree, Abbotabad and Dalhousie as these places were providing them home like climate. The reason to establish summer capital of the British-Indian Empire at Simla (1865 to 1939) was also to find escape from the heat of plains. The internal heights of living rooms in European residences for the officers and the subordinates were maintained differently at ‘plain’, ‘semi hill’ and ‘hill stations’. The internal heights were lower in plains than at the higher altitudes [8]. It can therefore be inferred that internal ceiling heights were intentionally maintained railway residential buildings in view of the climatic considerations.

The comparative analysis of the proportion of the floor areas of functional spaces and cross-sectional area of walls with the total covered area, discovered that in Barrack typologies, the average area of walls was 23 % of the total covered area (appendix A-1). In typologies of three-room bungalows it was 21% (appendix A-2). In four- room bungalows it was 22% (appendix A-3). In five- to seven-room bungalows, the area was 22% of the total covered area (appendix A-5). This significant percentage of wall area in relation to covered area in various typologies discloses that walls were of inordinately thick.
The walls of Main Rooms were kept comparatively thicker as compared to the walls of the side rooms, and furthermore, in a majority of the cases it was discovered that envelope/outer walls of the core area were made thicker. This thickness varied between 18"-27" and between 13.5"-18" in the Main and the Side Rooms, respectively. The thickness of the walls was in excess of the structural requirements and the reason seemed to be the climatic considerations.

Thickness of the main walls also remained an important design consideration in other British colonial bungalows in India. In 1868, just a few years after the establishment of the railway in Lahore, T. Roger Smith presented a paper at the Royal Institute of British Architects on the subject of tropical architecture. Smith’s work was based on his experiences in India and an overview of the evolution of the bungalow during last hundred years. His study was concerned solely with the buildings occupied by the Europeans. Smith analyzed almost every aspect of a bungalow, starting from its compound and including its horizontal and vertical growth, and its aesthetic considerations. While discussing the main walls, doors, windows and verandah he explained that:

- "------the main wall had to be screened from heat and rain, windows and doors should admit every breeze, and walls be as thick as possible" [9].

The comparison of Smith’s analysis with railway bungalows reveals that in both cases the major role of thick main walls was to control indoor climatic condition during the hot days of summer.

In the upper zone of the main walls the high wall ventilators (HWV) were also a regular feature of the railway’s residential buildings and served the purpose of better ventilation and lighting. The provision of electricity in Lahore was made during the year 1910 but even after these ventilators were an important need of the Main Rooms for daylight. Beside wall the ventilation through roof was also achieved. For example, during the period 1862-80, many Barracks and Bungalows were provided with ‘mugs’ for ventilation through the roof. A ‘mug’ was usually in square or rectangular in plan constructed with brick masonry walls of 2'-3' high from roof top of the building with vents on all sides and covered
from top. These were easy to construct in flat roofs, based on Rolled Steel Joists (RSJ) or Double Headed Rail Joists (DHR). But in case of the single vaulted brick roof spanning over the whole building, the provision of these ventilators permitted water penetration resulting dampness spots on interior surface. However, the provision of mugs in roof continued till the twentieth century when ‘Jack Arch’ replaced all previous roofing systems and achieved popularity in all respects. At this stage, the provision of ‘mugs’ in roof was reviewed and new system of ventilation called ‘Syphon Ventilator’ was introduced, a ventilation technique already introduced by Dr Chowne in Europe in 1850 with the name “Patent Air-Syphon System of Ventilation” [10]. This system was restricted to the Side Rooms, verandah and Quarters of smaller size.

The Siphon ventilator was a device, made of 6’’ diameter from burnt clay, 3’ in height, straight from the lower part with au-shaped bent at its exposed end to prevent rain- water from passing into the room. The pipe was exposed for a length of between 2-2.5’ feet above the roof top. The ‘siphon ventilator’ was easily available and no extra effort was required to embed them in Jack Arch during construction at any desired location [11].

5.3.1 The Sitting

It is learned from drawings of British period for railway residential buildings that as early as 1862, this space was part of architectural plan of Barrack, Bungalow and Quarter for the use of European employees. It was replaced by the ‘Drawing Room’ during the first decade of the twentieth century when officers’ bungalows were constructed at Canal Bank in 1908. However, on some drawings it was still denoted as ‘Sitting Room’. Some time its nomenclature appeared as ‘Living Room’ on drawings for Quarters of European subordinates.

The old drawings and articles on town-houses of the nineteenth century in England disclosed that both terms ‘Sitting’ and ‘Living’ are rooted in English traditions and both have almost a similar connotation. The comparative analysis of plan configurations in various housing typologies made in previous chapter revealed that the sitting was centrally located. It was also discovered from the architectural plans of various housing typologies that the functions of the sitting room such as relaxation, entertainment, eating, and its link with all the core areas were the main reasons defining the central location of this space. A study of the
Plans of the subordinates’ and officers’ bungalows proves that provision of an eating space in the sitting room was related to the socio-economic and service status of the employee. For example, in Barracks and subordinates’ bungalows this space was used for sitting and eating with the dimensions of usually 18’x18’ that is 324 sq. ft. Officers’ bungalows had a separate dining ranging between 252’-478’ sq. ft.

In 1914, a space titled the “Drawing Room” was introduced in the bungalow for the Assistant District Officer. This was the result of changing trends in functional spaces of the railway bungalows. In Lahore, the concept of a drawing room in railway bungalows started appearing in the 20th century with more clarity when an exclusive scheme of Bungalows were constructed at the Mayo Garden for high officials of the railways. This space was usually considered as less private as compared to a sitting room. However, the spaces of the railway bungalows remained, design-wise, completely under the influence of the European bungalows throughout the British period. Although the bungalow development was at its height in Mayo Garden but anything belonging to British was still attractive in building plan. The plans of some bungalows built in 1937 were still following the old bungalows of England constructed before 95 years from typical pattern book which was published and distributed at large scale in Britain and its colonies during the first half of the 19th century [12].

The comparison of spaces of railway bungalows with the writings of the British authors on houses in England during the mid of nineteenth discovers that a strong relationship existed between the both. A series of papers with the title “The Handy-Book of House-Building” was published in England in 1869, when railway administration in Lahore was constructing one after another residential building for European. These papers provide a complete concept of the town-houses in England. The first article stated that:

“A good house should be suited to our climate, and to the mode of life that modern English manners and customs have brought about. Its main essential are convenience, comfort, privacy and a pleasing appearance. The simplest complete dwelling-house for a family must provide three sets of apartments for the purpose of (1) living, (2) sleeping, (3) service; internal
communications; and at least two entrances. Frequently a fourth department (4) for children required.”

This small but important paragraph unfolded in general the major design and planning considerations and requirements of an English ‘dwelling-house’ in England. The first component of a house’s “living room” in this article was linked with the requirement of English habit where for a simple house, at least two living rooms were required, one for meals termed as “dining room” and one for receiving visitors called the “drawing room.” In bigger houses, a larger sized breakfast room, business room, billiard room, smoking room and a gun room were also additional requirements. The paper further disclosed that a right size, right place, and a right shape were major determinants for coping with the requirements of a British house. [13].

5.3.2 The Drawing Room

The comparative analysis of various functional space types in different housing typologies revealed that the ‘Drawing Room’ was a space which replaced sitting room in officers’ bungalows during 1914 and remained a part of the officers’ bungalows ever since. The concept of this space and its nomenclature are both rooted in the European tradition where this room was generally used for entertainment and receiving the guests. Its size and placement in plan depended on the intended uses. In England, this room accommodated a number of activities especially social gatherings. The handy-book on house design in England while describing the drawing rooms, states that:-

“------, a Drawing Room requires, If there is to be dancing, both plenty of length, and a few such nooks and flirtling places as bay windows, balconies, and a conservatory afford. It will often, however, be filled by persons walking about in groups, and on such occasions it is desirable to give as free circulation as possible. For this reason it is that greater width in proportion to its length has been prescribed for the drawing-room than the dining-room requires. ------------ . In every good drawing room there must be at least one convenient place for a pianoforte.”
The residences for Europeans in India generally inherited all those functions which were usually part of a house in England. In India, every possible effort was made to create home-like feelings for the European community by emphasizing housing so that absence of home should not create any health ill-effects for any individual. In railway the situation was different because of the variety of subordinates’ positions, and consequently, their house-types. Therefore, as provision of a drawing room was not possible in every house so a sitting room was provided for each subordinate bungalow. The social gatherings which were held in the drawing room of an officer bungalow were also managed for subordinates in social centers usually located at a convenient place within the housing settlement. However, in the bungalows of the railway’s high officials, the drawing rooms were purposely built to accommodate the activities of social gatherings and parties.

A comparative analysis of the various functional spaces for officers’ bungalows revealed that a drawing was occupied 5-9% of the covered area, its usual dimensions being 16'-18' x 20'-24'. In exceptional cases, the bungalow of the ‘North Western Railway Agent’, a room drawing measured 18' x 36' [Appendix---A]. It was discovered from drawings and a physical survey of existing bungalows that the drawing room was a separate compartment, directly approachable from the verandah and the central corridor.

5.3.3 The Dining Room

Like the ‘Drawing Room’, the provision of a ‘Dining Room’ was also linked with the service status of the employee. A European subordinate residing in a ‘Barrack’ or a bungalow had provision to dine in a sitting room, but for an officer, a separate room in a bungalow was provided for dining. The concept of this space also belongs to European traditions. The article on an English house stated that:-

“In dining room the chief purpose of the room is sitting at a dinner-table, and therefore, as custom in this country enlarges our dining-tables only in one direction that of the their length, a dining room ought rarely to be much wider than is required for a dining-table, a double row of guests and an ample space for service; but if entertainments on large scale are contemplated, it may fairly be of considerable length.” [14]
In railway, the dining room was generally large in size and almost equivalent to the drawing room’s size. It was usually an independent rectangular room, so that the food could be set up in privacy by the domestic staff. It was linked through the pantry at one end with the kitchen and at the other side through the central passage with the drawing room.

European dining habits required special dining chairs, a dining table, cutlery with which to eat, and receptacles for serving food were basic necessities in a dining room. Alcohol consumption and meat-eating also required special equipment, as a result a storage space with side-boards, cabinets, and a small store was provided.[15]

5.3.4 The Office

The concept of office with a house came from European traditions where one room in the house was left for the “library” or “business”[16]. This tradition continued in the British Indian Empire in bungalows for senior officers. In early bungalows this was also called the ‘kutchery’. In such cases a bedroom-sized space was usually provided for various functions such as official work, meeting with departmental officials, and study of books and magazines. It was approachable from the central passage or the verandah from the back side. The official visitors usually entered this office through the back verandah, which was also used as its waiting area. On original drawings it was shown in the core area of the bungalow [17].

5.3.5 The Bedroom

The ‘Bedroom’ had always remained part of the core area in all typologies. Its numbers varied with the service status of the employee. In general, compared with those for the other groups, the European residences had bedrooms of larger dimensions--18’x16’-21’-- and which also were more luxurious. In an Anglo Indian Quarter the bedroom size was usually 13’x13’, whereas in the Indian Quarters it was 12’ x 12’. In each typology the floor area of a bedroom was one of the major constituents of the overall covered area.

5.4 The Side Rooms [SR] or Secondary Spaces

The service spaces of a residence such as the baths, dress rooms, storage and the lamp rooms were generally referred to as the ‘side rooms’. They were of a lesser height as
compared to the Main Rooms. These rooms were basically auxiliary spaces but they were typically located on the outer periphery of the main rooms in all typologies.

These rooms had important functions in many respects. Structurally, they served as the buttresses to the main rooms. Functionally, they served as important auxiliaries to the core rooms. And design-wise they served as heat buffers and manipulation of their height served an aesthetic purpose for the building’s elevation.

*Lamp Room:* Often, because of changing technologies some types of service rooms were deleted from designs. For example, the lamp room remained a requirement of residential buildings till the first decade of the 20th century, however, when electricity was introduced in Lahore in 1910 its use came to an end. The railway was an independent producer of some amount of electricity for its use through the power house it owned, which was located at Mughalpura. The power house is long gone but its chimney holds a unique position in Lahore with reference to its height of 220’ and an excellent brick masonry structure without use of any steel. A lamp room in the bungalow was a place where several lamps were stored and readied for use every evening. It was generally 48’-80’ sq. ft in area, and was located along the width of the verandah near the sitting or the drawing room. It was accessible from the verandah and was maintained by an Indian servant called the ‘mishalman’, who lit the lamps for the house every evening around dusk.

*Godown:* Similarly, a godown was another space which remained part of residential buildings till the first decade of 20th century. The basic function of this space was to accommodate various commodities for living, as animal transportation was the main source of supply from railway station to various places. Till 1926, the routes for animal transportation such as the Cart Track, the Camel Path and the Mule Path were part of the maps of Lahore. Besides the lamp room and the godown, provision of at least one store of between 64-100 sq. ft., formed a permanent part of the subordinates and officers residences during the whole period of British colonial railway. The stores and godowns were generally located at the corners of the verandahs for internal and external access.
5.4.1 Bath and Dress Rooms

Bath: Architectural drawings show that baths were located at specific spots in the house. Two important factors determined their position: First was ease of cleaning which prompted their location on an exterior wall with an exterior access for cleaners. Since these cleaners, generally referred to as ‘sweepers’ were considered inferior, this arrangement limited their interaction with the house members. The second factor in location of baths was related to climatic considerations to protect bedrooms from direct solar radiation. So these were mostly located with bedrooms at the corners of the buildings. It revealed from drawings that an extra bath was provided for the residences of higher railway officials.

Dress Room: The dress rooms were comparatively larger in size to accommodate the long coats, hat, stick and long shoes which were usually part of the dress paraphernalia of a colonial officer in India. Moreover the dress rooms were also used as physical exercise rooms.

The area and size of bathrooms, dress rooms and the store varied with time for all types of residential buildings.

5.5 The Verandah

Statistical analysis reveals that a verandah was given much importance in planning. In all typologies its percentage of the total covered area was significant. In the Barrack typologies the average percentage of verandah area was 23% of the covered area (appendix A-1). In three-room bungalow typologies it was 17% (appendix A-2). In four-room bungalows the average was 22% (appendix A-3). In 5-7-room bungalow it was 19% (appendix A-4). On the basis of these percentages of the verandah in relation to the covered area of the buildings, it is discovered that a verandah was an important and an essential element and an architectural feature in all types of railway residential buildings. The reason why a verandah became an important feature of residential building has been traced from a critical review of railway residential buildings.

An overview of the architectural drawings of the colonial railway residential buildings declares that as an accepted principle, that 10'-12' wide verandah and side rooms would have to enclose the main rooms to protect them from direct solar affects during
summers. Verandah was a buffer space between main rooms and external environment. This approach protected more than 70% of the surface area of main rooms from direct solar radiation. In addition the main rooms’ exterior surfaces are protected from rainwater penetration. A few earlier verandas were 6'-8' wide but the later ones were generally 8'-12' wide.

It is learned from various sources that the verandah depth was primarily related to the climate and it varied from place to place. Per established housing literature, British India was divided into hilly, semi-hilly and the plain areas and the building codes varied for each area. Since Lahore was in the plain area, of the width of the verandah here was the maximum. However, putting aside the climatic aspect, the verandah played a key role in overall composition and ultimately the expression of the building. In almost every building the piers, arches, cornices and the drip-course were key elements of a verandah’s elevation treatment. Putting all these elements together in their requisite order with the depth of verandah and placement around a simple rectangle or square box of greater height defines the leading role of this element for the whole composition of the bungalow. In this way one can visualize the importance of verandah in building composition. Its presence in the composition of bungalow was so important and meaningful that without any doubt its absence means collapses of whole bungalow composition.

Besides structural, climatic and aesthetic roles of the verandah in the colonial railway residential buildings, the other roles played by the verandah in the cultural life of the European residents here have also invited the attention of scholars. In colonial culture it was one of the standard operating practices that the British officers or their families would not usually expose themselves to the public, therefore, it was uncommon for them to visit an Indian bazaar frequently with the family. The only option left for the wife of a British colonial railway officer (memsahib) was to perform maximum shopping at home from sellers who were visiting the bungalow periodically. These sellers usually formed a small shop in the verandah by displaying different items in a small area for the glimpse of the memsahib on all items. Here the bargaining over prices was done by the memsahib. The verandah was also used for sewing of clothes by a tailor (darzee) under the instructions of the Memsahib. The
status of a tailor (dherzi) was usually that of a sub-contractor than a servant, as he sat for
days in the verandah and continued sewing for hours at a time.

The verandah was also used by permanent servants of the bungalow for different
activities. It was a routine matter for a gardener (Malee) to sit at one side of the verandah
and arrange flowers in new vases. The verandah space was also used by the attendant of the
bungalow to polish the sahib’s shoes, gun and other items and to place them in their assigned
locations.

Being 18”-24” above the ground level, the verandah allowed view of the garden
around the bungalow. It was a usual practice during free hours of colonial subordinates to
spend some time in the verandah while sitting on a chair and taking tea/coffee with family
members. The officer class utilized the verandah in accordance with their socio-economic
status and lifestyle developed in the colonial culture. A colonial officer usually utilized some
of his free time while relaxing on a long extended armchair with a foot-rest or sitting with
family members. It was almost a routine practice to use this relaxing chair during summers
for a morning shave in the verandah from an Indian barber even while still half-asleep in the
cool morning breeze.

In case of bungalow of an officer of high rank, sometimes a subordinate or an
attendant had to wait in the verandah. It was also used for, walking, smoking, lounging and
even sleeping during long dreary summer spells in Lahore. This place was also used to attend
the guests of comparatively of lower status which under the norms of colonial culture could
not be brought into the drawing room. Although it was not considered desirable for the
British officers to bring children to India due to several reasons, but in some cases the
verandah was also an attractive place for the children to play and still remain close to the
main rooms.

In brief the verandah was a screening space for defining the inside and the outside
activities’ spaces of the bungalow. In that sense it was a transitional space between the public
and the private zones. Briefly, a verandah was utilized for many activities and it defined in
many ways the railway bungalows of Lahore.
5.6 The Central Passage

The study of archival drawings reveals that Central Passage was only the part of the officers’ bungalows. It was generally known as the central passage or the corridor. In some drawings it was also referred to as a Hall. In a majority of the 5-7-room bungalows, its floor area varied between 180-462 sq.ft, thus covering 4-7% of the covered area of the bungalows. In four-room bungalows of senior officers, its floor area was 96-368 sq.ft, contributing 3% in covered area (appendix A-1).

It was an important space in terms of planning of bungalows and various functions. It was centrally located to regulate the entrance to the core area of the bungalow from the front verandah. Besides linking all the main rooms, it segregated private from the public areas. In the bungalows of high officials where dinners and parties were held on regular intervals, this space acted as a transitional space before the entry to the drawing room and exchange of welcoming words and warm expressions by the host. As this space was an entry space to the drawing or other central spaces, it was usually decorated with paintings and photographs.

5.7 The Kitchen

Till the beginning of the 20th century, a kitchen was generally located at some distance from the main residence and to its rear but in the 20th century, kitchen became part of the main building, and was located near the pantry and the dining room [18].

During the 19th century the kitchen remained detached from the bungalow on various grounds. The frequent incidence of fire in the kitchen was the main reason to locate it away from the main building. The incidence of the great fire of London was still green in the minds of Europeans; therefore, no risk was taken in terms of its location in the compound and materials of roofing system. As a rule the kitchen had to be roofed with ‘pucca’ and non-combustible materials. To further avoid the bungalow from fire incident, the high hydrants were also placed between kitchen and main building [19].

Another consideration to place the kitchen away from main building was to avoid its heat during the summer. The social distance between the Indian domestic workers and the Europeans was also one of the reasons for placement of kitchen at a distance from the main
building. As the Indian servants were easily available on much lower rates therefore cooking and other activities in kitchen were in the hands of Indians and under the prevailing colonial cultural norms the Europeans were supposed to maintain a distance from the Indian domestic staff. The nineteenth century practices began to give way to the changing social trends in the twentieth century. [20].

Records and site visits inform us that in the officers’ bungalows built in the 1908-1920 period, kitchen became an integral part of the building. It was connected through its shorter side with the bungalow while the cooking area was located at its farther end; this created a link between the kitchen and bungalow through the pantry and the verandah. The placement of the cooking area in the kitchen was kept at the end farthest from the main building for these reasons: to protect the main building from threat of fire; penetration of kitchen heat, and also to keep the bungalow away from smoke and fuel smell. A kitchen for the nineteenth century subordinate staff mostly comprised of the cook’s room, a cook-house and a fuel store. In the twentieth century, kitchen of an officer’s bungalow comprised of a godown, a fuel store, cook-house and a verandah.

Like kitchen, the location of servant quarters and other out houses was also important for various reasons as stated by the Platt stated:

“Indians dwellings and servants’ houses should be at a safe distance. Indian servants often have their families with them; their ways of living are not ours, and for hygienic reasons, especially in malarious and unhealthy districts, close proximity is not desirable.”[21]

In the twentieth century railway bungalows constructed in the Mayo Gardens and the Canal Bank, 8-16 servant quarters were provided. The Indian servants resided in these quarters for various jobs in the bungalow. They quarters were located to the rear of the building at a distance of 50'-100' to keep the Indian servants away from the calm and peaceful environment of the bungalow as they were habitual of chitchatting and talking loudly during free hours.
5.8 Putting together all ‘Spaces and Features’

In the previous sections, the railway residential buildings have been critically reviewed with the help of various statistical and theoretical analyses. The analysis in terms of percentage of the floor area of each space to the total covered area revealed that each space has its own particular share in the covered area which defined its importance. In terms of relative importance the most important were the ‘primary’ spaces, those allocated for living, relaxing and sleeping. According to plan configuration, the location of these spaces and their share in total covered area in a ‘Barrack’, ‘Bungalow’ and the ‘Quarter’ defined the ‘core area’ of each. Similarly, in addition to share of each space to total covered area and its location in plan, the analysis of internal heights of various spaces in each typology defined the spaces as ‘secondary’ or ‘auxiliary’ spaces. All these spaces were enclosed spaces. In case of semi-enclosed space the only space existed in all typologies was ‘verandah’ and can be placed in the category of secondary space. The statistical analysis revealed that its percentage to total covered area remained under the limit of 18-29 percentage. The statistical analysis also revealed that in all housing typologies the walls were made extra ordinary thick. In majority of the cases the combined percentage of verandah and walls (area occupied by walls in horizontal plane) exceeded 45 percent. Similarly the changing trends in space type and plan configurations are readable from the results of comparative analysis of various architectural spaces during different time. However, from the results of various analyses it can be concluded that there were some common spaces and architectural features which continued in railway residential buildings throughout British period in Lahore.

The regular features of railway residential buildings had multiple roles. The provision of a verandah was made for climatic, social and cultural reasons. Similarly, walls contributed significantly towards the overall covered area because for reasons of climate control, they were made thicker than was structurally required. The relatively greater height of the primary spaces as compared to that of the secondary spaces had multiple aims. Two important reasons can be listed: aesthetic and climate control. Similarly, the verandah and secondary rooms with low height were acting as bracing for the high walls of the primary rooms then at the same time these were contributing towards overall composition of the building. Removing these from buildings means disintegration of architectural composition. These
arguments clearly indicate that in all common features, dealing with the climate control aspect seems to appear regularly in almost every residential building of railway. Other aims of the design and spaces seem to change and this leads one to conclude that in the railway residential buildings, climate was the prime consideration in design and planning. Past studies on the colonial buildings also support this conclusion.

In 1863-64 an article on Anglo Indian architecture was published by Major J.G. Medley, the principal of Thomson College, Roorkee. Railway had been introduced to Lahore a short time prior to that and the first residential buildings for its staff were under construction. This article discussed the state of architectural affairs in India and pointed out the grey areas of buildings built by the Europeans in India and gave a number of suggestions. Medley pointed out that revival of past in architecture of England was adopted in India and buildings constructed under this scenario were not less than the buildings of any European Capital. Medley gave much attention for suitability of buildings in Indian climate rather making any other factor as prime requirement. In this regard he explained that instead of building had been built in Europe, local building techniques and styles needed investigation for their sustainability in the local climate. He stated that:

“It must I think be allowed that the true principles of architectural construction for buildings in the East, which are to be used by men habituated to an entirely different climate, have not as yet been discovered; a mosque for instance has a pleasant temperature both in winter and summer, while a Gothic Church in India is as rule either very hot or very cold. I do not say that Gothic Churches are unsuitable in India, but only that they are so as we now build them. In the same way many of our houses with lofty rooms, numerous openings and thin walls, are far less cool and pleasant than native houses, low and badly ventilated as they are, with thick walls and few door-ways. I do not say that we ought to live in native houses, but simply that we have not as yet hit upon the right way of constructing our own.”[22]

Another study by Smith in 1868, as generally concerned with climatic aspects of residential buildings for European in India. It explained that:-
“--------the main wall had to be screened from heat and rain, windows and doors should admit every breeze, and walls be as thick as possible: ‘a screen called a verandah is essential and it becomes, in fact ..... the leading features of buildings in the tropic.’ This was usually 10 feet wide with the roof running over it in a continuous line. The rooms provided by the verandah served as work place for ‘native people’, or were used by the occupants for lounging, smoking, walking and even dining and sleeping in’ Indian life, ‘being much fresco, and privacy little studied compared with comfort [23].

The findings of smith fully support to the ways the railway buildings were planned to sustain against summer conditions in Lahore. However, from all this information it is rather easy to understand that according to Smith the main determinant behind the planning and development process of a bungalow was the climate.

In fact the climate of the plains areas was a great problem for the European community in India during the summer. There were many European and Americans who lived as missionaries in India and mentioned the climatic problems in India in letters to their families in their home countries. One of these letters written by an English-person to his parents back home, from Allahabad in 1861, stated that “in this country we cannot do the same kind or quantity of work we can in our climate at home” [24].

The incompatibility of the British physique with the Indian climate was affecting the quantity and quality of work which could be accomplished here. It also led to a high mortality rate amongst the European residents in India on account of different diseases; this indeed was a matter of serious concern for them.

The diary of William Owens Clark, the Chief Judge of the Punjab High Court in Lahore from 1898-1909, is evidence of the Europeans’ serious concern with the weather in the Indian plains. He maintained a diary which covers the period from 1877 to 1906, wherein he regularly recorded the temperature of the main rooms and the verandah at different times of the day in his residence in Lahore. In addition Clark also regularly measured the rainfall and observed the changes in the condition of the sky. His diary reveals that there was significant temperature fall in the main rooms as compared to the verandah. On 11 August
1878, Clark mind gave graphical expression in the form a sketch, which he titled ‘Design for a house’. This obviously was the reason for Clark keeping the diary about the weather.

Although Clark was neither an architect nor an engineer by profession, but his concern with the relationship of climate and design of appropriate residential building for the Europeans in a climate like Lahore’s, was evidence of that concern at the general level. The house sketched by Clark was rectangular shaped, with the main rooms, side rooms and a verandah. The main rooms comprised of a sitting room, a dining room, two bedrooms and a ‘kutchery’[a room used for official work and dealing with official visitors]. The side rooms included two dress rooms, three baths and two stores. Like the railway bungalows of that time, the kitchen was not part of the main building.

This small sketch comprised of all these spaces was meaningful because of its production by a person who was so intensely interested in figuring out in depth, the relationship between the climatic effects on the design of a suitable house in this climate. The main concept behind the architectural planning of the house was to protect it from solar heat during the summers. In this regard the first step was to face the shorter faces of the house towards West and East to minimize the penetration of the solar radiations inside the house. In the second step the main rooms were further protected from direct solar rays from the East, West and the South sides either by a verandah or auxiliary spaces. This approach resulted provision of a verandah to almost all outsides of the main rooms which were grouped together in a double layer of rooms. The bathrooms, stores and other auxiliary spaces of the houses were adjusted in the verandah without encroaching upon the space of the main rooms. After having satisfactorily developed the climate control plan, Clark went for the aesthetic aspect of the house and broke the monotony of the rectangle by creating a curved roof in front of the Sitting Room to define the entrance of the house and giving more depth to the verandah [25].

A comparison of railway residences with Clark’s sketch proves that the major concepts of architectural planning remained the same in both the cases. Creating suitably planned and designed residences for the Europeans was the leading aim of both. Although railway residences were started fifteen years before the house design of Clark but similarity
in basic concepts of architectural planning confirms that the main objective behind the planning of railway houses was to sustain against the hot climatic conditions of summer.

After determining the climatic role of architectural features of railway residential buildings the area of building expression cannot be ignored on the part of these features. The placement of railway residential building on single larger canvas brings forward many similarities, which links the smallest scale house to the largest bungalow and creates an impression of their origin from a single source. This impression was a result of planned strategy relating to political aspects of housing. The Europeans were of the strong view that object learning is the most effective tool to create power supremacy over the Indians. The standard details of various typical features of residential buildings were implemented in all typologies and deviation from these was strictly prohibited [26]. A residential building of colonial period can be identified with reference to its architectural elements and its overall form emerged with the placement of the main and the side rooms.

In the early period when frontage of the buildings was limited to a verandah with simple brick masonry columns, the only factor which gave them some aesthetic meaning was the height difference between the main and side rooms/verandah. The brick masonry of exterior walls was concealed with lime plaster, although engineers like Medley were against the application of plaster to the building exteriors. He suggested exposing it to viewers instead. Brick masonry with well-bonded, fine joints has its own beauty and meaning. In railway buildings, Medley’s recommendations prevailed for those building where the English brick was used but in case of buildings where Indian bricks, wherever, they were used, they were covered with plaster. [27]. The railway engineers were reluctant to expose Indian bricks to the external weather conditions. In addition an Indian product on exterior surfaces of British buildings was not acceptable. During these early stages of railway residential buildings in Lahore the other part of the British India were under the influence of residential architecture in cantonments. According to a British Royal Engineer in 1866:-

“Until very lately we did not shine in designing public or private buildings at home; witness the heterogeneous rows of suburban villas in the neighborhood of London, or the unmitigated monotony and ugliness of many of our modern
streets. But certainly surpassed ourselves in India, and succeeded in inventing a style of building, (irreverently known as the Military Board Style) which for ugliness beat every thing that ever was constructed by man. Who does not know the sense of desolation that comes over one at first sight of some of our Indian cantonments; the straight and dusty roads, the rows of glaring white rectangular barracks, the barn-like church, differing only from a barrack in the presence of a square tower and classical portico, the Roman Catholic chapel ditto, only smaller and with bright green doors all around. The house evidently built after the model of Barrack [28].”

The railway bungalows grew out of Barrack plan. Chapter -4 of this thesis unfolding this aspect. According to Smith in 1869, European buildings in India should reflect the high standard of European art. He stated that:

“As our administration exhibits European justice, order, love of law, energy and honour, so our building ought to hold up a high standard of European art…..[such buildings] ought to be European, both as rallying point for our ourselves, and as raising a distinctive mark of our presence, always to be upheld, by the natives of the country.” [29]

As late as 1896, James Fergusson stated:

“In the early times “European were then a small ad dependent community, and were continent to copy the manners and art of the natives, who were then superior in rank and power. The process has been since then entirely reversed; we are now in the position of the rulers of India and the natives have unfortunately taken to copy us and our arts, as we adopted their habits and copied their arts when we first settled in their country” [30]

In the twentieth century, however, the physical structure became more important for conveying the status of the user. At this stage many new elements belonging to European architecture were introduced, which included verandah piers with simple details, variety of Roman and Gothic arches, cornices, drip course and gargoyles.
5.9 Conclusion

The interpretation of various functional spaces and planning features of the railway residential buildings helps us in concluding that, ultimately, there were three major objectives behind their planning: Firstly, climatic comfort was of primary concern for the Europeans during the long dreary spell of summer in Lahore. Secondly, to ensure that the Europeans felt as if they were residents of their own cultural territory. Thirdly, the building typologies and designs should help the Europeans in maintaining racial and intellectual supremacy over the Indians.

To attain the first objective, various strategies in terms of design, materials and construction were adopted. For their second objective, the functional space-types were borrowed from the Europeans building traditions to create a more familiar ambience. The plans were configured with these spaces after due consideration of the colonial cultural environment in India. For the third objective the Europeans thought that exploitation of the cultural, racial and intellectual bases would help them in preserving their position as the supreme rulers of India. The reflection of this concept was also transformed into the physical form by making the European residences very lavish and extremely generous in terms of space consumption. A European driver was entitled to live in a Bungalow of many rooms whereas the Quarter of an Indian driver was only limited to two small rooms located in a densely populated area. The repetition of standard building designs with Classical European motifs and features helped ensure the preservation of an ordered environment and a dominant English presence everywhere.

References and Notes

1. The main rooms include drawing, dinning, bedrooms and an office in case of an officer’s bungalow whereas side rooms include baths, dress rooms, stores, lamp room and etc. As the main rooms were larger than side rooms in terms of size and volume therefore the construction cost per unit for these rooms were higher than side rooms. Kitchen, cook room, menial quarters, stable and coach rooms were not the part of rent assessment process. These were considered as facilities to the staff which were
extended to different staff members in accordance to their status in service. However, status of an employee and his entitled facilities can be determined from number of main rooms in any colonial railway quarter or bungalow. The houses were known by the number of main rooms and these rooms also define the status of an employee in service. The monthly rent of a house was assessed as 4% on capital cost that means the recovery was planned within 25 months on a rented house. This scheme remained very very successful and became one of the reasons for the construction of large number of railway bungalows and quarters which were built regularly in railway colonies.

6. It is evident from drawings and field surveys that irrespective of types of house or user the provision Fire Place was a regular feature in railway residential building.


18. Although the kitchen and the out-houses were roofed with the Jack Arch, there lurked the fear of fire, due to many previous incidents in the kitchen and the servant quarters, in the minds of the Europeans. The great fire of London in 1866 was still green in the minds of the British. Therefore, in the railway residential a building of the nineteenth century, the kitchen was located on rear side of the house along with other out-houses to save the main building from fire. This was important because the roofing system of the main building was made of fire-catching materials. Later on in the twentieth century, when the Jack Arch system of roofing was extended to the bungalows, kitchen was attached to the main building.

19. Hydrants are identified from the Map of Lahore 1926 and from the drawings layout plans of railway colonies and afterward the field survey.


Chapter 6

Materials and Construction Technology

6.1 Introduction

The colonial railway residential buildings of Lahore hold a unique status in terms of building materials and construction technology which evolved with the passage of time from European and local practices. A variety of materials and roof-types practiced during different times. An overview of the 85-year span of colonial railway residential architecture in Lahore (1862-1947) reveals that in the beginning the great difficulties were being faced for provision of permanent roofing to buildings and to obtained suitable materials for construction. On the other side the similar situation was with the Public Works Department and Army in dealing with building projects in all over the India. However, railway remained comparatively in better position for finding various solutions and an additional advantage with them was the availability of waste steel which they had efficiently utilized and produced sustainable solutions by exploring local and European practices. This chapter mainly discusses the various roofing systems which were in practiced in the plains of India and also by the railway. It further explores that how the railway administration resolved the problem and what kinds of material and construction technology they adopted for sustainable solutions.

6.2 Architectural Linkages between British India and England

In 19th May 1862, a paper “On the Architecture of India” was read by a European artist, William Simpson, at the Royal Institute of British Architects (R.I.B.A). During the discussion on efforts in the way of Architecture in India the article stated that “-------India is now so close to England in point of time, that whatever improvements take place here will soon be followed there. I believe that a complete change is taking place for the better among ourselves, and that the day is not far distant when better deeds will be done, and that we shall, as great nation, leave some worthy memorial of our power for future age.” [1].

The Simpson’s comments on ‘Indian Architecture’ can be interpreted in different ways but, most importantly, his study established the architectural linkage of England and India. New
inventions in technology, construction techniques, structural systems and several other construction-related developments in England set the path for India as well. Considering the example of the Jack Arch: A typical structural system of colonial buildings in the India, was a roofing system for the factories and other industrial buildings in England. In addition to the Indian subcontinent, the system also spread East ward and to West Asia. In fact, the rapid growth of industry as a result of the industrial revolution in Europe, required large-span roofs, for which steel was considered the most suitable material. It made construction of trusses and Jack Arched Roofs possible to fulfill the functional requirements of the industrial buildings [2]. According to another study carried out by Hilton in 1997, construction of the Jack Arch originated in the early nineteenth century in England and the first structure was constructed in 1801[3]. The basic principle involved in the Jack Arch arched roofs, was a 4.5” brick arch supported by a steel joist of the required weight and section. However, origin of the Jack Arch indicates that it was primarily invented to cater to the large span requirements of Industrial buildings in England but in British India the system was extended to the roof construction of every type of building. This practice further increased the demand of steel in India where it was already in use for wide and increasing activity in the construction of bridges, water tanks, railway lines, stations, locomotives and wagons.

The advent of steel helped to construct unique and wonderful bridges and water-works in India. The world’s largest pressed-steel water-tank, with a capacity of 3.25 million gallons of drinking water at Dunga Gali for the town of Murree, in the Punjab, was completed in 1932. The tank contains 3000 plates and 4.25 miles of joints constructed at the site involving 103000 bolts [4]. The foundations of the reservoir consisted of 1066 trapezoidal pillars of cement concrete. The contract was carried out by Messers Braithwaite and Company, Ltd., Bombay, under the supervision of the Punjab Public Works Department [5]. Like Murree, in other cities of the British Punjab, steel became an effective material for rapid construction of large water-works. Steel water-tanks of the colonial period are also one of the features of the railway colonies in Lahore and a useful means to assess the population of area. However, an enormous consumption of steel on different projects had placed the India as one of the largest consumers of English steel products, therefore, import of steel from England was a frequent practice to meet the colony’s requirement and to safeguard the English steel industry. In railway, waste steel in the form, Double Headed Rail Joists (DHRJ), was an additional provision and incentive to construct Jack
Arch roofing for buildings of every nature without any major cost involvement. Furthermore, the railway was also providing all types of plants and equipment to the contractors for erection of girders without any charge [6].

6.3 Introduction of Jack Arch Roofing in India

Despite the widespread use of the Jack Arch, except for a few articles written by engineers of British Public Works Department of India, much has not been written on the construction of the Jack Arch roofing so far. These engineers realized the importance of this roofing system in structural stability, economy and for helping resolve the problems posed by the local climate for the Europeans in the Indian plains. On the other side the Public Works Department as a whole was also conscious on the matter. For instance in 1906, L.M. Jacob, C. S. I., Secretary to the Government of India in the Public Works Department, wrote a letter to H. S. Wildeblood, Superintending Engineer of Buildings and Roads in the United Provinces, expressing his desire that he should put in writing in view of his practical work experiences “On Problems of roof in the Plains of India. Wildeblood responded, and presented a comprehensive writing on the subject. The article was published in 1907 which discusses and compares Indian traditional roofs, single and double Jacked Arched, Reinforced Cement Concrete Roofs (R.C.C.) and Light Sloping Roofs, constructed in different parts of India.

The main focus in comparison of roofs revolves around economy, construction methods, their life-span, fire-protection and climate of Indian plains. The roofs of the nineteenth century were also summarized in this article by painting a detailed picture of the Indian and European dwellings. While commenting on the roofs of nineteenth century, Wildeblood remarked these as unsuitable for modern buildings on the basis of their temporary nature, involvement of greater cost in their renewal, their combustibility, and span limitation. These roofs included: thatched roofs, brick tiles on wooden trusses, concrete on tiles, stones resting on wooden joists, semicircular tiles laid on bamboo framing or round timbering cut from saplings and simply stripped of the bark. The use of these roofs was common in Europeans residences and traditional Indian dwellings [7]. The article further explains that the first step towards the construction of a more substantial structure was the introduction of the Jack Arch roof in European bungalows. Despite suitability of roofs in hot climate of Punjab Plains and its use at a large scale in all types of Government buildings, the author criticized the roofs as not good in some cases in terms of
reverberation of sound in the rooms and interior view of the rooms. Therefore, improvements were made at different sites by concealing the steel joists with different materials and techniques. Further, the arches to break up the long lengths of segmental barrels were introduced and thus providing panels carrying attractive moldings in it. This type of Jack Arched roof was considered sound in its acoustic properties of the ceiling and looked good in appearance, but at the same time the Wildeblood criticized them as heavy and inexpensive.

The most important aspect of Wildeblood’s writing involved the experimental studies by him and his staff on the load-bearing capacities of the strand-wire concrete roofs and the indoor thermal environment under Jack Arch roofing. The article reports that through experimental studies, and subsequently, the implementation of results, the following was observed: A concrete roof 8" thick, with seven strand wires running through it at 12" spacing, having a span of 6' between the steel joists was capable of bearing distributed loads of over 900 lbs./psf. In this type of roof, concrete was made from forty (40) parts of the ordinary pure Kankar lime-mortar of the plains and a hundred (100) parts of 1" gauge brick ballast. The article further elaborates that recent results of an experiment on use of barbed wires instead of plain wires have proved that such types of roofs are cheaper than Jack Arches and appearance of flat surface can be further enhanced by providing a layer of plaster. The experiments were also carried out on double roofs with an air gap in-between for climatic purpose. In this type, different options were tried such as one Jack Arch resting on lower flanges of steel joists and another on the upper flanges of the Joists, thus creating a space between the two layers of the Jack Arches. Similarly, the concrete roofs with wire-strands were the subject of experiments. Another experiment reported in this article was performed for calculating the tensile strength of pure ‘kankar-lime’, which proved that it can attain a tensile strength of 356 lbs. psi, which was comparable to the Portland cement, provided the lime was kept in the ground for twenty-one (21) days.

In all cases the experiments were carried out with satisfactory results in case of single and double reinforcement concrete roofs.

W. S. Dorman is another official of the PWD, Punjab, who wrote an exclusive on the Jack Arched Roofs in 1914, during his active service as Executive Engineer of the King Edward Memorial Division, Lahore. In addition to methods of constructing the Jack Arch Dorman’s
article deals with an interesting aspect related to interior expression under such roofs. Although there was no example taken from Lahore in this article and reference was made to some buildings of the United Provinces, Allahabad, and the Government Circuit House, Benares, both of which were constructed with Jack Arch roofing similar in many aspects to the buildings in Lahore. The article provides guidelines with different sketches to show the methods through which the view of the Jack Arch can be improved in terms of interior aesthetics. Dorman has almost discussed all types of jack Arched roofs used in India such as the flat, curved, and the simple plain barrel arch. The latter was extensively used in Lahore for colonial buildings including the railway bungalows and quarters [8].

When Dorman was attempting for a pleasing look for the Jack Arch, reinforcement concrete was being considered as a successful mode for constructing roofs in Europe and America. Despite different solutions for improvement in the appearance of the jack Arch, the consulting architects of the Government of India insisted on following European and American practices in the roofing system of buildings. The report on architectural work in India for the year 1911-12 states that:

“...It has been for long a standing complaint of the architect in India that in certain parts of the country he had no choice except between ‘Jack Arch’ and ‘tees and tiles’ – both of which have serious objections alike from the structural and the aesthetic points of view. Reinforced concrete was prohibitive in price, except in the coast towns where the cost of imported cement was at a minimum, and besides it did not lend itself readily to Indian conditions on account of the difficulty in obtaining the particular sort of ‘skilled-unskilled’ labour required, and also of the comparative scarcity of the right sort of overseer to give that close supervision essential at all stages of the work. The architect has been wont to sigh for the many excellent and inexpensive methods of constructing ‘pucca’ or fire proof floors which are available in Europe and America. One of these by no means of the least highly esteemed, has just made its debut in India in the ‘Kleine’ floor for which an agency has been established in Calcutta prepared to do work almost anywhere in India where the particular shape of hollow bricks involved can be manufactured. We chiefly welcome it as a means of superseding the hated
‘jack-arch’; and, while wishing well to this particular venture, the architects of India, would not be sorry if its advent were to pave the way to that of its—we hope friendly rivals. It is only in the arts that entire wholesomeness of competition can be questioned.” [9].

This makes clear that the consulting architects to the Government of India wanted change in roofing system of buildings. This report, on the other hand, stated better solutions than the “hated jack arch” can be borrowed from Europe and America. The India-based British technical professionals, however, understood quite well that it was an economical mode of roof construction on the basis of the local availability of the materials and widespread expertise of the local Master Builders. It is evident from the large numbers of Indian buildings constructed during the pre-colonial period in India that Indian Master Builders (the traditional artists), were the experts in the subject of brick masonry arch construction. Whereas Europeans having scientific and technological knowledge on structural system of buildings were experts in making scientific calculations pertaining to designs of structural members resulting in cost effectiveness and strengths of the roofing materials. Resultantly, the combination of both sides resulted in “Jack Arch” roofing system as a sustainable and an economical solution for the colonial buildings in India.

Besides the Jack Arch, working of the Europeans with the Indian Master Mason had also produced remarkable brick masonry structures in Lahore. The chimney of the Power House constructed in 1908, near the railway workshops at Mughalpura is, still, the highest pure brick masonry structure in Lahore. The height of the chimney is 225' without a single piece of steel and it is surviving for the past 105 years. This structure has never suffered any damage due to an earthquake and or wind pressure. Similarly the brick masonry of the Lahore Railway Station and the Saint Andrews School has much importance in the building stock of Colonial Lahore. Although use of the Jack Arch roofing system based on local and foreign expertise continued for a long time in Lahore, but “Kleine Floor” could not spread over India, as the particular shape of the hollow bricks and concrete involved in its manufacturing, and local expertise in that area was limited. However, after experimenting with different kinds of roof-types the ultimate best choice turned out to be the Jack Arch. This was due to the simple technique involved in its construction,
its faster mode of construction, greater structural strength, long life, and the most importantly, its cost effectiveness.

The popularity of Jack Arched roofing reached its height at the turn of the 19th century and this practice continued till 1947. The archived drawings of buildings belonging to various Government departments of that period reveal that brick Arches resting on steel joists was the most acceptable and the common solution for construction of buildings roofs. Irrigation was one of the major government departments which in addition to providing residences for its engineers, was also constructing Inspection Bungalows, one in every fifty (50) square miles [10]. The most prominent feature of the roofs of these bungalows was the double-roof construction with air space cavities- Jack Arched roof at the bottom and the other, stone or brick tiles supported by bricks, at the top. It reveals from roof specifications and sectional drawings of the bungalows that instead of leveling the upper surface of the arches with concrete, the air channels were created by constructing one and two brick flat at the crown of the arch and top of the steel joist, respectively, to support the stone (slate) tiles. Sometimes this layer was formed with brick tiles. However, the roof was further layered with 1” concrete and mud cover at the top; these specifications were supposed to minimize the indoor temperature during summer. The Department of Irrigation used these kinds of roofs in the construction of its bungalows at different locations such as Amritsar, Karnal, Jhelum, Sargodha, Jhang and Gugera, in the Punjab plains.

Army was another department of the British Indian Empire which built bungalows, quarters and barracks at various cantonments, and Rest Houses at different locations for the convenience of its troops. Considering these buildings in the plains of Punjab, the application of the Jack Arch roof remained very limited and the other modes of roof construction like steel trusses, wooden trusses, wooden joists with brick tiles and tee-tiles were abundantly used in residential and other types of military buildings because of much faster and more appropriate construction was needed for a department like the military. The erection of barracks with standard design for European Infantry in Punjab during the year 1855, revealed that:-
“----- frame work of the roof is Iron; the floors of slate, procured from the neighboring hills. It is believed that no Barracks, as yet constructed in India, are better built or surpass these in comfort and healthiness” [11].

The administrative report on Punjab territories for the year 1859-60, states about the military work:-

“the iron barracks at Mooltan are finished, except the permanent flooring. Two iron-frame barracks at Meean Mir, on a plan very superior to those at Mooltan, are also ready. If these barracks were only a little higher, they would probably be as good as any in India. Similar Barracks are nearly ready for the troops at Ferozepoor.” [12]

In these barracks the roof coverings was made of galvanized iron sheets. Similarly, the wood trusses with Allahabad tiles were also a common mode of roof construction for barracks in Lahore during the last quarter of the 19th century. It appeared from some drawings that Jack Arch had been used for ceiling purpose beneath the steel or wooden trussed roofs. The lower flanges of the steel joists were used for construction of Jack Arch whereas the upper ones were for supporting the trusses. In Lahore, some Military barracks were also roofed by the vault system following the vaulted roof of Sind and there is no use of steel or wooden joists in their construction. Some roofs still exist in the Lahore Cantonment. However, these roofs spanning wall to wall were non-combustible, and economical as the steel or wood joists were not required in their construction [13].

6.4 Roofing System – Railway Residential Buildings

In 1863, a circular was issued from the office of the Governor General of India which directed the PWD and other concerned departments that all civil and military buildings should be re-roofed with a suitable inflammable material, in lieu of thatch. The specifications of roofs which emerged after this circular were also implemented for the Kutchha Buildings (semi-permanent) as well [14]. When this circular was issued, the Punjab Railway in Lahore had already been established for two years. Therefore, the future construction of roofs for railway buildings with combustible materials was out of question. Before the directive, some bungalows
in the vicinity of the Lahore Passenger Station had been constructed with wooden joists and iron-sheet coverings. However, in the railway, due to the availability of steel joists, wooden joists were used minimally in roof construction. Till the last decade of the nineteenth century most of the roof construction in the station colonies was carried out using steel joists [Fig5.1]. The steel joists were mostly provided to cover spans of 16’-18’ from wall to wall with an in-between spacing of 3’-6’, supporting the *karries* (wooden beams), which had dimensions of 3’-6’ in length and a 3” x 4” x-section. The spacing of these “Kurries” was synchronized with the length of 2” thick shingle and cement concrete tiles or clay tiles laid as roof covering above the batten. Brick tiles were another option, used in a few cases. However, after laying tiles, a mud layer of 6” with “katcha plaster” completes the specification for the roofs. A cost comparison of these roofs along with their sections, presented to the Chief Engineer, North Western Railway, during the year 1896, reveals that the construction cost of these roofs was within one rupee/sf.

Roofing of some railway staff quarters during the 19th century was constructed with another type of roof, which was introduced in Sind during the year 1851.

![Diagram](image)

**Figure 6.1:** Roofing System of Railway Residential buildings during 19th century

**Source:** Railway Archives at Railway Headquarters Lahore.
These roofs were known as “ Vaulted Roofs in Sind” and the first article was published on their construction techniques and other aspects in professional papers on Indian Engineering in 1863-64. The largest building on which these roofs were used in Sindh was the Collector’s “ katchery” at Shekarpur, in 1851. The building comprised of eighteen rooms, 18’ x 20’ feet. These roofs were also implemented in the Military Barracks in the Lahore Cantonment. The railway barracks and bungalows in the station colony were built with vaulted roofing 115 years ago, and can offer lessons in economic building, especially using less steel, an expensive material, Fig. [5.2], [15]. These types of roofs were the most suitable in terms of cost and fire safety, therefore, Railway Engineers implemented these with some modifications in railway staff quarters and in fact it was much improved form of vaulted roof of Sind. The most prominent addition in the roof was introduction of “Iron Tie Bars” which have not only provided adequate strength and stability for critical points at both ends of the vault but open the door for another type of roof closer to vaulted roof, called “Jack Arch” [Fig 5.3].
Although this roof was well known among railway engineers as it was implemented in old railway barracks and Lahore Passenger Station in 1861 and many railway and other colonial buildings in India but its application could not extended to railway bungalows and quarters at greater extent till the end of the 19th century when every railway building was roofed with “Jack Arch”. The steel joists were easily available as it was mandatory to replace Double Headed Rail Joists at main and branch lines after losing 10% and 15% weight respectively. The unserviceable Rail Joists of main line were suitable to work at branch line till 5% loss in weight. This ultimate railway waste was strong enough to meet the structural requirements of the railway buildings for the construction of Jack Arch roofs. In this way the railway waste was efficiently utilized by railway engineers as structural steel in building roofs [16]. The end arches are usually tied with one inch diameter steel known as “Tie-Rod” lain in concrete from both ends passing through a wall-plate made of pieces of “old rail” and tied with nuts on the outer side of wall plate. The major role of “Tie Rods” is to keep the arch in original position and to counter act the structural stresses. This process had been studied in India by a British military engineer, Alaric Robertson, by implementing his theory on some new projects and finally published his work with detailed analysis and sketches in the Professional Papers on Indian Engineering in 1865 [17]. These professional papers and Papers of the PWD and many other modes of sharing knowledge by Europeans on practical experiences in India resolved many problems related to building construction and roofing systems. Examples of Railway, Irrigation and Military bungalows from the Punjab reveal that there was little difference in construction and roofing system of these bungalows. These similarities prove that engineers working in different areas of Punjab were fully aware of improvements and new work of their professional colleagues. This shared
knowledge made the construction of roofs simpler by introducing agreed standard details for structural elements. These standards remained very helpful in new projects and also for the supervisory staff for strict implementation.

A study in 1994 by Scriver Peter on “Rationalization, Standardization and Control in Design in the Public Works Department of British India, 1855-1901” reported that one of the objectives behind standardization in design was to manage and control in Design. Scriver supported his argument with many government directives issued from time to time on the subject related to standardization in design. One of the directives, issued in 1864, states that

“No deviation from standard was allowed. It was clearly conveyed that “Executive Engineers may be reminded that no variation in a Standard Plan ought, on any account, to be carried out without previous departmental permission. No deviation from a Standard Plan is permissible without the sanction of Chief Engineer, (*P.W. Code XIX, iv.17) and under para.10, i, IV of the code, Executive Engineers are held responsible that no breach of this rule take place” [18].

In railway bungalows and quarters the treatment of “Jack Arched Roof” from the top was also a set procedure. These were leveled at the top by providing a concrete layer between the meeting point of the arches and crown of the arch. Furthermore, it was standard practice to provide 1.5 inches thick layer of “Pucca plaster” and then 4.5 inches mud layer with mud plaster on concrete of the arches to save them from rain water penetration and temperature cracks. The roof section reveals that overall thickness of roof varied at different points from 11 to 15 inches but in most of the area it remained 15 inches thick which has been proven in various studies, helpful in increase time lag and therefore useful in controlling indoor thermal conditions during summer. Although the Jack Arch had been used mostly in single storied bungalows and quarters but its use for double storied flats proves that system was equally good for two floors buildings. However, during the year 1920 some experiments were carried out to check the limitations of Jack Arch for external loading which proved that it can support loads up to 11648 pounds per square foot. The experiment was made for a span of 6 feet roofed by an arch of 6 inches rise constructed in lime mortar and resting on walls not on DH Rail or rolled steel joists.
The failure of this arch at loading of 11648 lbs proves that arch resting on steel joists shall survive under more loading conditions. The experiment further proves that the use of steel joists in railway bungalows and quarters for Jack Arch roofing was to achieve more stable and strengthened structure [19].

6.5 Walls and Foundations

During the year 1863 when construction of railway bungalows and quarters was in progress near the Lahore Railway Station; an article with the title

“Peculiarities of Indian Engineering was published in Professional Papers on Indian Engineering, by a Royal Engineer in India which provides information on availability of bricks and its construction in the plains of Punjab. The article reports that “In the great plain of Bengal, Hindustan and the Punjab, however, Brick is the only available material. The English sized bricks or those of a still larger size are now coming into general use. The Native bricks are very small, excellently burnt, laid with little attention to bond, and with a profuse expenditure of mortar. Bricks are burnt with wood fuel in kilns of several kinds, or in stacks like English clamps with dried cow–dung instead of coal”[20].

These statements confirm that from the very beginning when the railway was started in Lahore the Natives bricks were frequent in practice for construction of buildings in Punjab and at the same time the general use of English brick was prevailing over its seldom use. The old drawings and physical presences of railway bungalows in Lahore further confirms that size, shape, thickness and interrelationship of dimension vary significantly between Natives and British sized brick. The Natives brick were mostly square in shape with size of 6” x 6” x 1” which evolves a very simple inter-relationship in dimensions leading to limited options of bond. To make the brick well burnt in wood fuel, the thickness of brick was maintained from 1-1.5 inches, as no coal worth working was discovered in India till 1863. However, these bricks were extensively used in Indian traditional houses and early railway bungalows in Lahore. On the other side, the use of English Brick appeared first time in Lahore during the year 1861 in the construction of Lahore Railway Station. It was rectangle in shape with size of 9” x 4.5” x 3” evolving a very interesting inter-relationship among its dimensions leading to variety of bonds in
construction. Almost every building was built with these bricks during colonial Lahore and it has been proven so practical and suitable that during post-colonial Lahore its use is on mass scale in public and private sector buildings. Bricks for special purpose

In some cases like “Lahore Passenger Station” and some old railway bungalows, the use of Natives and English bricks was made side by side. Although the partial or entire use of Natives brick in British buildings creates some confusion for the observers to assess the construction period but Kunhya Lal an Executive Engineer in Public Works Department of colonial Lahore had removed many difficulties in this regard while giving commentary on history of Lahore. He explained that how the Natives brick became part of railway and other colonial bungalows in Lahore. Kunhya Lal unfolds that ruins of old buildings outside the walled city were excavated deep into their foundations by many building contractors for obtaining and selling bricks on cheaper rates. These bricks of smaller size were used in many buildings of early British period in Lahore as these were readily available on cheaper rates as compare to English Bricks. Kunhya Lal further states that Mian Muhammad Sultan, one of the contractors of Public Works Department (PWD) was famous in selling of old Indian bricks in Lahore. He provided and used Indian bricks in construction of Lahore Railway station, railway bungalows and other government buildings [21].

Kunhya Lal, provides information on availability of old Indian bricks there he unfolds the depth of foundation made with this material in old buildings of Lahore prior to British occupation. According to him these foundations were mostly 8-15 feet deep and huge quantity of Natives bricks were evolved in their construction. On the other side the British railway engineers, instead of relying on Indian traditional patterns of constructing foundations, followed the Indian Public Works Department and designed the foundations of bungalows after considering the load requirements of building and load bearing capacity of soil. It appeared from notes on several drawings that maximum pressure on foundations was considered as .8 ton/sft. To execute the foundation in accordance with design, all necessary information were usually given on drawings in the form of notes/instructions relating to soil, materials and specifications required for construction of foundation. The note/ instructions related to foundations appear on drawing as:-
“Foundations have been designed for average soil (reasonably firm mixture of clay and sand in varying proportions) if Divisional Engineers finds soil substantially less stable than the average. He should report to Head Quarters and obtain instructions.”

These new approaches in constructing building foundations had not only reduced the overall depth and breadth of the foundations but a significant reduction was made in the cost of building by reducing the bricks masonry requirements in foundations.

It is known from drawings of bungalows and quarters that brick foundations were mostly laid on, 8-18 inches thick and 2 to 5 feet wide lime concrete bed, which was called as “Pucca Concrete”; a term which had been frequently used in drawings of colonial bungalows with other associated terms such as “Katcha”, and “Katcha-Pacca” [Type Q 40, 19, 20]. The words “Katcha” and “Pacca” are basically Indian words and have vast meanings which stand for temporary and permanent nature of anything respectively. Mullen Wayne linked the application of term “Katcha” with British early structure and settlements in India. He states that

“Although the British were present in India from the seventeenth century, the British originally had little faith in the tenure of their territorial rule in the subcontinent. Consequently, many of the structures and settlements that they built were of a somewhat transient nature and were termed cutcha (neither constructed out of the most durable of materials or with the posterity in mind)” [22].

The remarks of Mullen on early British buildings reveals that “Katcha” or “Pacca” terms can be used for single or group of buildings. However, in colonial railway bungalows and quarters these terms were associated with various materials which were applied at different locations in building components. In those parts of building components where more strength or stability was required there “Pucca” construction was made with lime concrete, lime mortar and cement mortar and these parts were shown hatched in drawings. In bungalows and quarters these parts includes; lime concrete bed for foundations, brick masonry foundation with lime mortar, verandah columns of brick masonry laid in lime mortar, fire places with brick masonry lime mortar, wall corners with brick masonry lime mortar, first two courses of Jack Arch butting against Rolled Steel beams with cement mortar and brick masonry with lime mortar around the
openings frames. Similarly in case of those parts of buildings where strength risk was not much involved there brick masonry was laid in mud mortar. The materials and specifications related to “Katcha” and “Pacca” disclose that application of materials at different parts of the bungalows was in accordance with the structural requirement and ultimate the cost saving.

However the structural system of railway residential buildings was strong enough to sustain against internal and external forces during critical conditions. For example during the earthquake of 1905 many colonial buildings of Lahore suffered damages but railway bungalows remained intact with their original conditions. The clock tower of Lahore railway station, towers of Victoria Jubilee Town Hall, clock tower of between Lawrence and Montgomery Halls/ roof of Montgomery Hall, Building of Lahore Exhibition and building of General Post Office were damaged severely during the earthquake of 1905 [23].

6.6 Conclusion

There had been number of roofing systems practiced in British colonial residential buildings during nineteenth century in India which were mostly temporary in nature. Furthermore, due to high cost of the cement in other than coastal areas and non availability of local expertise for construction of concrete roofs there was only option left with the engineers of Public Works Department (P.W.D.) and Railway to search for such types of roofs which should be permanent in nature and their materials must be fire resistant as well.

At the turn of nineteenth century the ‘Jack Arch’ a roofing system of industrial buildings in England was implemented in residential and other buildings which became the most successful on the basis of its fast, economical and local available expertise. This system was much feasible for the department like railway where availability of waste steel of railway lines was extensively available. The span limit in railway residential buildings remained limited to the size of the steel joist which is found 20 ‘maximum and span of one Jack Arch measured as 4’-6’.

As the design and construction of railway residential buildings were under the supervision of engineers who were trained from engineering schools of England therefore, structures were designed, based on scientific calculations as per load requirement. The ‘Kutchas’
and ‘Pucca’ brick masonry were implied with mud mortar and lime/cement mortar respectively where required. The standard details were prepared and used as per case.

**Reference and Notes**


Conclusions and Recommendations

7.1 Conclusions

This research on “Architectural Analysis of British Colonial Railway Residential Architecture in Lahore”, analyzed railway residential buildings and settlements in a critical and multi-scale spatial framework. The geographic analysis of the railway complexes presents a clearer perspective on the spatial development of Lahore to the east and the south-east. The analysis brought about the fact that there existed a clear and logical relationship between these housing colonies and other railway establishments. It is concluded that the spatial logic of these housing settlements was an outgrowth of the social relationships which permeated the interaction between various ethnic and social groups.

The thesis has determined the significance of security and the class-system in the siting, configuration, and provision of buffer-spaces between different housing types. A new concept of housing settlement inspired by the European tradition was introduced. It provided linear streets, tree-lined main roads and well laid-out water and sanitary systems. This was in marked contrast to the narrow and winding streets and lanes of the Walled City. These concepts were applied keeping in view all kinds of future vehicular traffic. The idea of sanitary roads was implemented for the first time in Lahore in these railway settlements. In addition, sufficient open spaces were utilized in the land-use planning for keeping were kept to keep the construction density as low as possible. This also helped make the settlements more airy and enjoyable.

Three major housing typologies, the Barrack, Bungalow and the Quarter, were been identified through this research. A careful analysis of the research data revealed that their plot-sizes and layouts evolved gradually. It was also identified that climatic, social and technological factors were decisive in bringing about the changes/improvements referred to above. Another conclusion arrived at was that the architectural forms were inspired mainly by the European and local architectural design traditions.
The railway housing settlements constitute an important historical heritage with regards to the architecture and physical planning heritage of the city of Lahore. A number of design philosophies have been implemented in Planning and Design of residential buildings. These settlements were planned as self-sufficient and self-sustaining communities in terms of water supply, sanitation, food-supply and socio-cultural infrastructure.

7.2 Recommendations and Future Studies

The Railway residential settlements and buildings identified and analyzed in this thesis are representative of the particular design and planning concepts proposed and implemented for this region. These were based upon innovative construction, materials and technology. Therefore, the study should be extended to investigate the influence of sustainability features of British Colonial Bungalow form, spaces and materials on the housing after independence.

The study should also be extended to other types of colonial Railway Buildings such as railway stations, administrative, recreational, health, educational and religious buildings. That will help us to fully understand the complete design philosophy, lifestyle and the British colonial culture as it was exercised in the railway department, one of the most important of British India’s government departments.

The Railway housing settlements constitute one of the most important planning and architectural heritage of the city of Lahore. A number of design philosophies have been implemented in planning and design of residential buildings ranging from design of low- to medium-density housing. They culminated in the suggested layout of new settlements employing the ‘Garden City’ concepts. At the same time there was a wide variety of housing typologies ranging from single room quarter to a large bungalow comprised of many rooms.

This heritage, more than a hundred and fifty (150) years old, is in a state of neglect and it deserves more attention for its conservation. Some of the old bungalows are being replaced with new ones. This important heritage is being lost due to ignorance and neglect. Such heritage must be preserved in its true sprit to revive the old glory of the past. Simultaneously, some of these neglected spaces and structures, need to be preserved for appropriate adaptive reuses.
There are a large number of original drawings of railway residential buildings, churches, power-houses, stations, institutes, administrative offices, hospitals, pavilions, buildings, steel water tanks, and bridges, lying unattended and on the verge of disappearance forever. It is, therefore, recommended that an archive may be established so that these may be preserved as a precious record for future investigation into an important era of our not so old history.
### Comparative Analysis of Various Functional Spaces of Barracks for European Subordinates with Reference to Percentage in Covered Area

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## Comparative Analysis of Various Functional Spaces in 3-room European Subordinates Bungalows with reference to percentage in covered area

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### Appendix A-4

**Comparative Analysis of Various Architectural Spaces of 5-7 Room European Officers Bungalows with Reference to Percentage in Covered Area**

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<td>9'-3&quot;</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>18'-3&quot;</td>
<td>17'-9&quot;</td>
<td>11'-4&quot;</td>
<td>11'-4&quot;</td>
<td>11'-4&quot;</td>
<td>9'-3&quot;</td>
<td>11'-4&quot;</td>
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</table>
# Appendix B-2

## Comparative Analysis of Internal Heights in 3-Room European Subordinate Bungalows

<table>
<thead>
<tr>
<th>Year</th>
<th>Typology</th>
<th>Sitting</th>
<th>Bed</th>
<th>Bath</th>
<th>Dress</th>
<th>Store</th>
<th>Ver</th>
</tr>
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<tbody>
<tr>
<td>1869</td>
<td></td>
<td>20'-0&quot;</td>
<td>20'-0&quot;</td>
<td>13'-6&quot;</td>
<td>-</td>
<td>13'-6&quot;</td>
<td>13'-6&quot;</td>
</tr>
<tr>
<td>1870</td>
<td></td>
<td>16'-3&quot;</td>
<td>16'-3&quot;</td>
<td>10'-9&quot;</td>
<td>10'-9&quot;</td>
<td>10'-9&quot;</td>
<td>10'-9&quot;</td>
</tr>
<tr>
<td>1875</td>
<td></td>
<td>16'-0&quot;</td>
<td>16'-0&quot;</td>
<td>10'-9&quot;</td>
<td>-</td>
<td>-</td>
<td>10'-9&quot;</td>
</tr>
<tr>
<td>1875</td>
<td></td>
<td>15'-0&quot;</td>
<td>15'-0&quot;</td>
<td>10'-3&quot;</td>
<td>10'-3&quot;</td>
<td>-</td>
<td>10'-6&quot;</td>
</tr>
<tr>
<td>1880</td>
<td></td>
<td>16'-0&quot;</td>
<td>16'-0&quot;</td>
<td>10'-6&quot;</td>
<td>10'-6&quot;</td>
<td>10'-6&quot;</td>
<td>10'-6&quot;</td>
</tr>
<tr>
<td>1882</td>
<td></td>
<td>15'-0&quot;</td>
<td>15'-0&quot;</td>
<td>11'-3&quot;</td>
<td>11'-3&quot;</td>
<td>11'-3&quot;</td>
<td>11'-3&quot;</td>
</tr>
<tr>
<td>1896</td>
<td></td>
<td>20'-0&quot;</td>
<td>20'-0&quot;</td>
<td>13'-5&quot;</td>
<td>11'-3&quot;</td>
<td>13'-5&quot;</td>
<td>13'-5&quot;</td>
</tr>
<tr>
<td>1896</td>
<td></td>
<td>20'-0&quot;</td>
<td>20'-0&quot;</td>
<td>11'-10&quot;</td>
<td>13'-0&quot;</td>
<td>15'-2&quot;</td>
<td>15'-2&quot;</td>
</tr>
<tr>
<td>1896</td>
<td></td>
<td>18'-0&quot;</td>
<td>18'-0&quot;</td>
<td>13'-6&quot;</td>
<td>13'-6&quot;</td>
<td>10'-5&quot;</td>
<td>10'-0&quot;</td>
</tr>
<tr>
<td>Average</td>
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<td>17'-3&quot;</td>
<td>17'-3&quot;</td>
<td>11'-7&quot;</td>
<td>10'-6&quot;</td>
<td>10'-7&quot;</td>
<td>10'-6&quot;</td>
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## Comparative Analysis of Internal Heights in 4-Room European Officers Bungalows

<table>
<thead>
<tr>
<th>YEAR</th>
<th>TYPOLOGY</th>
<th>INTERNAL HEIGHTS (FT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>DRG</td>
</tr>
<tr>
<td>1862</td>
<td></td>
<td>19'-9&quot;</td>
</tr>
<tr>
<td>1914</td>
<td></td>
<td>16'-9&quot;</td>
</tr>
<tr>
<td>1920</td>
<td></td>
<td>22'-0&quot;</td>
</tr>
<tr>
<td>1922</td>
<td></td>
<td>16'-0&quot;</td>
</tr>
<tr>
<td>1929</td>
<td></td>
<td>17'-3&quot;</td>
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<tr>
<td>1922</td>
<td></td>
<td>17'-6&quot;</td>
</tr>
<tr>
<td>1929</td>
<td></td>
<td>17'-0&quot;</td>
</tr>
<tr>
<td>1937</td>
<td></td>
<td>17'-0&quot;</td>
</tr>
</tbody>
</table>

### Average

16'-9" | 17'-9" | 18'-9" | 11'-3" | 10'-8" | 10'-7" | 17'-4" | 12'-7" | 11'-2" | 11'-5" | 12'-3" | 12'-3" | 10'-7" |
### Comparative Analysis of Internal Heights in 5-7 Room European Officers Bungalows

<table>
<thead>
<tr>
<th>YEAR</th>
<th>TYPOLOGY</th>
<th>INTERNAL HEIGHTS (FT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>DRG</td>
</tr>
<tr>
<td>1864</td>
<td></td>
<td>_</td>
</tr>
<tr>
<td>1880</td>
<td></td>
<td>_</td>
</tr>
<tr>
<td>1890</td>
<td></td>
<td>_</td>
</tr>
<tr>
<td>1908</td>
<td></td>
<td>17'-9&quot;</td>
</tr>
<tr>
<td>1920</td>
<td></td>
<td>17'-6&quot;</td>
</tr>
<tr>
<td>1922</td>
<td></td>
<td>15'-7&quot;</td>
</tr>
<tr>
<td>1935</td>
<td></td>
<td>17'-0&quot;</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>16'-7&quot;</td>
</tr>
</tbody>
</table>
## Appendix B-5

### Comparative Analysis of Internal Heights in 2-5 Room Quarters for Indians, Anglo Indians and European Subordinates

<table>
<thead>
<tr>
<th>YEAR</th>
<th>TYPOLOGY</th>
<th>INTERNAL HEIGHTS (FT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CLASS</td>
<td>LIVING</td>
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<tr>
<td>1862</td>
<td>2- Room Row Type INDIA</td>
<td>-</td>
</tr>
<tr>
<td>1914</td>
<td>3- Room Combined ANGLO INDIAN</td>
<td>14'-0&quot;</td>
</tr>
<tr>
<td>1920</td>
<td>3- Room Combined EUROPEAN</td>
<td>15'-9&quot;</td>
</tr>
<tr>
<td>1922</td>
<td>3- Room Isolated EUROPEAN</td>
<td>15'-9&quot;</td>
</tr>
<tr>
<td>1929</td>
<td>4- Room Isolated EUROPEAN</td>
<td>15'-9&quot;</td>
</tr>
<tr>
<td>1937</td>
<td>5- Room Isolated EUROPEAN</td>
<td>15'-9&quot;</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>15'-5&quot;</td>
</tr>
</tbody>
</table>
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India
Archives of Rail Museum Delhi

Old Record Room Archives
Old Record Room, Archives, Design Office, Pakistan Railway Headquarter, Lahore
Old Record Room, Design Office, Lahore Division, Lahore
Old Record Room, Design Office of Workshops Division, Lahore

Case Files and Drawings
Old Record Room Archives, Design Office, Pakistan Railway Headquarter, Lahore
Design Office of the Lahore Division
Design Office of the Workshops Division Lahore

General
No. 18-L.H.R 1869
“Punjab Railway Lahore Passenger Station”

No. N.W.R. H.Q. Plan No. 111758/ 1888

“T. S. R Institute” This drawing deals with plan and sectional details of Institute at Saharanpur”
No. 36-Church/1908/Lahore
“Railway Church” This file deals with plans of Railway Church near Railway Headquarter Building Lahore.

No. N.W.R. H.Q. Plan No. 12691/ 1916
“Completion Drawing of A.T.S Bungalow at Lyallpur”

No. N.W.R. H.Q. Plan No. 11637/ 1916
(Completion Plan District Locco Superintendent’s Bungalow at Ludhiana, District Saharanpur)

No. M.C.H 6 / Q.T.A 15-04-1933
Completion Plan of European Institute at Mach Quetta (This drawing provides information on Architectural plans and uses of various spaces)

No. HQ Plan No 4275/R1, Dated 20-03- 1936
(Typical plan and section of single and Double Fire Places)

No. N.W.R. H.Q. Plan No. 12359/ 1935
“Additions and alterations in connection with providing Dancing Hall to the existing European Institute at Rohri.” This drawing deals with plan and sectional details of Institute.

No 235 W/82, 1941
Arch Roofing and Lintels (Details of Jack Arch roofing and Table for selection of required Rolled Steel Beams).

No.N.W.R –H.Q.E 12691/2 and No. 149 B Lyallpur 1916
Completion Plan of ATS Bungalow at Lyallpur

No.H – 28- LHR /30-06-1931
N.W.R. Plan of Lahore Station yard showing Road Ways and names of various roads

Design Type No -1  2nd Division Bari Doab Cannal, 1906
Plan, Elevation and sectional Drawings of a Divisional Officer’s Residence at Amritsar

Design Type No -2  2nd Division Bari Doab Cannal, 1906
Plan, Elevation and sectional Drawings of a Divisional Officer’s Residence at Amritsar

Design Type No - 4  III Division Lower Jhelum Cannal, 1908
Typical Plan, Elevation and sectional Drawings of an Executive Engineer’s Bungalow, Sargodah
Design Type No - 3  Karnal W. J. Canal, 1907
Typical Plan, Elevation and sectional Drawings of an Executive Engineer’s Bungalow, Karnal

Design Type No – 3. 2nd Division Bari Doab Cannal, 1906
Typical Plan, Elevation and sectional Drawings of combined Rest House and Assistant Engineer’s Bungalow, Bari Doab Cannal

Design Type No – 5. Jhang  Division Chenab Cannal, 1900
Typical Plan, Elevation and sectional Drawings of combined Sub Divisional Officer’s Bungalow, Gojra.

Design Type No – 4. Gucera  Division, 1900
Typical Plan, Elevation and sectional Drawings of combined Sub Divisional Officer’s Bungalow, Gucera Division.

Residential Settlements
No. D-181-LHR/ 09 04 1892/ Lahore
(N.W.R Quarters for European Traffic Staff to be built at Robson Estate)

(Proposed alterations to improve ventilation conditions in Double Layer Barrack for European staff at Hope Road)

No. D-201-LHR/ 07-11- 1897/ Lahore
(N.W.R Quarters for Married European Guards to be built at Robson Estate)

No. D-201-LHR/ 07-11- 1897/ Lahore
(N.W.R Quarters for Married European Guards to be built at Robson Estate)

No. C. 92 / Carson Institute /15-01-1907
(This file / drawing provides information on Architectural plan, Elevations and Sectional details of Carson Institute which was planned near Burt Institute for native)

“Site Plan for temporary Latrine for European Pavilion” (This drawing and many other drawing related to sanitary aspects of housing/ building bear the signature/approval of medical specialists.
The drawing was finally approved by the Lt. Col. D. T. Lane, Civil Surgeon in Lahore under Indian Medical Services)

No. 5-I- Swimming Bath / 1911
“Plan of proposed new swimming Bath for Indians at Lahore” The drawing comprised of plans and sectional details was checked by Baghat Ram and traced by Natma Singh. It was also signed by Chirag Din General Secretary, Indian Club.

No. 92 / 1913
“New Theater –Institute” later on known as Burt Institute (This drawing provides information on Architectural plans and uses of various spaces)

No. O-97 / 27-05- 1914/ Lahore
(N.W.R Conversion of portion of old Institute into an office for the Land Acquisition Officer at Lahore.”

No. D-1262 / 23-02- 1916/ Lahore
(N.W.R Conversion of portion of old Institute into Rest House for officers)

No. Q-23/1925/ Lahore
(Plan Elevation and Sectional details of Running Room for European Guards and Drivers)

No. D-364 / 23-10- 1924/ Lahore
(Addition of one bedroom in four rooms Bungalow at Mayo Road, Lahore).

No. Q-9 / 1926/ Lahore
(Typical Plan of Quarter for Indian Intermediate staff).

No. H.Q. Plan No. 12790/ 1927/ Lahore
(Typical plan of Quarter for European Sergeants and Inspector of Punjab Government Railway Police)

“Proposed Institute and Pavilion for new carriage Shop Colony at Moghulpura, Lahore.” (Plan, Elevation and Sectional details)

No C.R.E. W-140/19-01-1943
“Institute for 1000 men, office of the G.E Lahore Cantonment.” (Plan and Sectional details)

No.Q-20/ 1908
(Typical plan, Elevation and Section of District Office Bungalow at Canal Bank, Lahore).
**No.W-465/H.Q. 1914**

(Plan Elevation and sectional details of typical Assistant District Officer’s Bungalow at Canal Bank, Mughalpura, Lahore.

**No. O– 105- LHR-CEN /27-08-1930**

(Detail of Doors and Windows for Assistant Officers Bungalows, Mughalpura, Lahore). Architect Ronald Walliam Harvey Vallis, the consulting architect in North Western Railway (1920- 1935) had designed these doors and prepared the details.

**No. H.Q. Plan No. 9381/LHR/ 1935**

(Detail of Doors and Windows for Assistant Officers Bungalows, Mughalpura, Lahore). Architect Ronald Walliam Harvey Vallis, the consulting architect in North Western Railway (1920- 1935) had designed these doors and prepared the details.

**No. 13-MYO/GDN/1920.**

“Proposed Layout sites for Officers Quarters at Lahore” (This plan indicates division of whole site into number of large compounds, site for the Bungalow of North Western Railways’ Agent, Plinth Level for Bungalows, demarcation of levels at various points, existing water courses, proposed water channel from Bari Doab Canal and its branches for site, Main, Secondary and Sanitary Roads).

**No. 27-MYO/GDN/1920**

(Typical Plans, Elevation and Sections of Bungalows No. 10, 13, 33, 35 and 41).

**No 117-MYO/GDN/1920**

“Proposed Officers Bungalows at Lahore: Detail of double leaf Doors”

**No. 30-MYO/GDN/1921.**

“Proposed Layout sites for Officers Quarters at Lahore” (This plan indicates the layout of bungalows at various sites, location of Servant Quarters, relationship between covered and open area, relationship between the bungalows, plantation scheme and types of plants)

**No. 39-MYO/GDN/ 1922**

(Typical Plans, Elevation and Sections of Bungalows Nos. 5, 6, 7, 8, 24, 25, 27 and 42 at Mayo Garden)

**No. 41-MYO/GDN/1922**

(Typical Plans, Elevation and Sections of Bungalows Nos. 3,4,11,12,20,21,22,23,37,39 and 40 at Mayo Garden).

**No. 47-MYO/GDN/1922**
Bungalow of North Western Railways’ Agent at Mayo Garden (Plan, South Elevation, Section, detail of pillars, cornices, parapet and Rolled Steel Joists).

No. 96-MYO/GDN/1922
“Agent’s Bungalow at Mayo Garden, Section of First Floor for Drawing, Dining Room and Hall” (This drawing is comprised of plan and roof sections giving details of Jack Arched roof constructed with Rolled Steel Beams, Shingle Cement Concrete and expanded metal).

No. 102-MYO/GDN/1922
“Agent’s Bungalow at Mayo Garden, Detail of Truss” (This drawing provided information on detail of truss constructed with F.F. Rails, G.I. Batten of Kail Wood and single layer of Allahbad Tiles).

No. 124-MYO/GDN/1922
Officers Bungalows at Mayo Garden (Detail of Flat and Gauged Arches and Coke Breeze Lintels over Doors and Windows).

No. Q-19-1925
(Plans, Elevation and Section of Assistant District Officer Bungalows at Mayo Garden)

No. Q-20-1926
(Typical Plan, Elevation and Section of District Officer Bungalow at Mayo Garden).

No. 09-MYO/GDN/1931
(Typical Plans, Elevation and Sections for Bungalows Nos. 18, 28, 32, 34, 36 and 38 at Mayo Garden).

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No. 170-MYO/GDN/1939
(Typical Plans, Elevation and Sections of Bungalows lot Nos. 45, 46, 47, and 48 at Mayo Garden).

D-471-LHR/13-8-1941, LHR
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Map of India showing railways open and under construction on 31 March 1926

Map of India showing railways open to traffic under construction and under survey on 31 March, 1888.

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