

# Design for Flexibility: Case of Chandigarh and Hospital Buildings in India

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## Abstract

*Architecture of present is for the future also. Whatever we design is not for few years but for at least next seventy years hence, our buildings and cities should have a capacity to accommodate more functions than it is designed for and being expanded in future, as the number of masses presently coming into it tend to increase in future, this may be termed as designing for flexibility. If we don't keep this in mind then our design will become obsolete in short duration than its intended period. The present paper therefore discusses how we can make our designs of different buildings, cities flexible. It has been discussed through various examples of famous cities such as Chandigarh and complex buildings such as hospitals from across India and taking inferences out of these that what transformations the designs of these cities and buildings have undergone and the reasons resulting in overburdening of these, followed by subsequent remedial measures to be taken to overcome these in the initial as well as the operational stages of such projects. Modular approach in designing is good as it provides flexibility so that one can add similar modules in future as the demand will increase. Apart from this, the analysis of various other aspects such as the type of users of cities and buildings will show that in-depth analysis of various sects and communities, their lifestyle, occupation means of transport etc. are most likely to influence the design and hence, it is very important to keep these in mind before designing to retain the flexibility of the designs of these cities and buildings respectively.*

**Keywords:** Hospital Design, flexibility, Chandigarh, India

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## INTRODUCTION

The flexible or design for flexibility has been explained through the examples from a planned city (Chandigarh) and hospitals from across the country because the planning and designing of both of these is very complex and intricate. The complexity and intricacy of both of these is because of the analysis of their users hence, a detailed survey has to be done with respect to the

type of communities they are going to serve also ample space should be allotted as space for future expansion so that the city's plan don't get exhausted within a period of 60–70 years. As in case of Chandigarh, one can see the current day situation of its public realm elements such as streets/avenues and roundabouts which are dotted by hawkers, vendors and peddlers whereas on one hand and its informal

shopping areas in the central sectors such as sector 15 in which the shoppers have encroached upon the pedestrian pathways, thereby reducing the effective circulation widths of the pathway meant for the passers-by on the other. Unlike Chandigarh city, the hospitals on the other hand should also be flexible with respect to the changing disease profile of the various regions of the country and also changing health care diagnostic and treatment technologies therefore, the flexibility issue should be thought off at every stage right from the selection of site to the commissioning of the building.

### CHANDIGARH: THE STUDY CONTEXT

The Chandigarh city is a planned city; its ailments such as the transformations in its sector markets could easily be seen. The sector 16 market tells us this story which is devoted to various types of medical products, as there is a government hospital in its close proximity which was proposed and built there since the inception of the city. Though, this serves a wide range of choice within the same market but has totally modified the initial concept on which the sector was planned i.e., self-reliant neighbourhood. As every sector was planned to be a self-reliant module hence, compelling its inhabitants to go to other places for their daily shopping. Depending upon the clientele most of the markets are divided into two categories of medium and low price markets<sup>[1]</sup>.

### The Public Realm Elements: The Avenues

The master plan of Chandigarh is derived from its grid iron patterned avenues locally known as *maargs* and paths and as any city it is generally characterized by its avenues, the sustenance of their sanctity is of utmost importance. Roads patterns are generators of cities forms and constitute their skeletons. If we see the present day scenario of these avenues, these are dotted by hawkers and vendors. The road sections

devised by planners reveal no potential to absorb migrant hawkers as participants in these spaces<sup>[2]</sup>. These hawkers sell the daily basic necessity to the people and hence, should be properly thought off in pace as the population grows and their needs consequently grow. Earlier, the roads were single lane roads which were around 40' wide but with the introduction of the divider in between the road width has just halved and furthermore, as *rehris* are parked in these reduced road widths, they prove to be hazardous. Had the provisions and considerations been made on the proposed plan in this regard, it would have resulted in to the much better sustenance of these public realms.



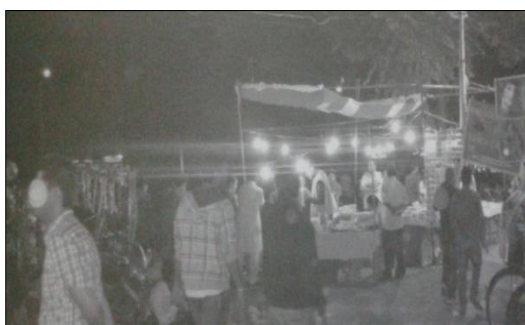
**Fig. 1:** *Obstruction of Pedestrian Movement due to Stacking and Display of Goods in the Corridors<sup>[1]</sup>.*

### THE HOSPITALS OF PAST AND NOWADAYS

Though during the initial post-independence era, the growth of healthcare facilities was very limited. Although, last two decades have seen tremendous improvements in health services. Most of the hospitals of yesteryears especially, the government hospitals have become obsolete and incapable of quality healthcare to the users and also the management of the hospital has failed to meet the need of the users due

to unavailability of hospital personnel and facilities which is evident from large queues of patients in the hospital premises. Many of them don't get accommodation or rather admission in the hospital. Therefore, a need arises that we improve them and raise their standard comparable to those of the developed countries. But the approach of planning and designing of healthcare facility in these developed countries is very different from that of ours and also their population growth is far behind as compared to ours.

Though there has been a sustained growth in the last 10–15 years, but the growth has been restricted to the metro cities only. Also, the growth pattern has been much better in South-west India; the rest of India has lagged behind by about 10–20 years. However, to cope up with situation over a period of time, the multispecialty hospitals run by voluntary and private sector have raced on in an attempt to provide the patient the best services. A recent survey has shown that about 40% of patients visiting the super specialty centres in Delhi are coming from other towns for treatment<sup>[3]</sup>.

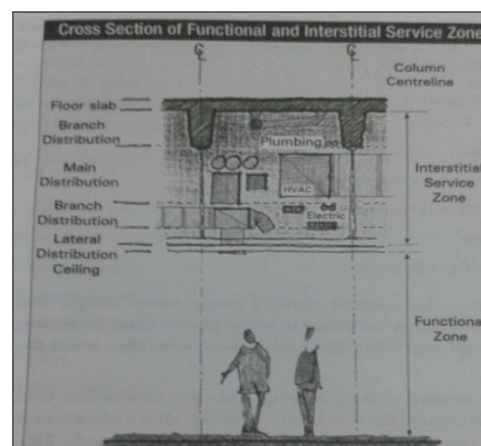


**Fig. 2:** Market Place Occupied by Hawkers in an Unplanned Manner Creating Kiosk<sup>[1]</sup>.

## THE NEED FOR FLEXIBILITY IN HOSPITALS

The hospital by its very nature is a complicated entity and its designing is an intricate job. During the planning stage, the architect and engineers should study the

construction aspects of the project to determine the most economical and practical systems for the foundation, structural framing, plumbing, electrical wiring, ventilation, air-conditioning and other engineering problems. Keeping all these things in mind, an architect should prepare proposals and plans to ensure its expansion without much or rather with negligible alteration within the building in future because a hospital is also an entity which has a large scope of expansion. And the proposals of today will become obsolete in the next 10 years due to rapidly changing technology in field of healthcare delivery systems.



**Fig. 3:** Cross Section drawing showing how the flow of various building services (electrical, plumbing, HVAC, etc.) Can be planned above the false ceiling, in an interstitial service zone, directly above the functional space<sup>[4]</sup>.

Let us take following examples to explain the scope of expandability of hospitals.

### Narayana Hrudayalaya, Bangalore

It was founded in year 2000<sup>[5]</sup>. It is now known as Narayana Health and having grown up into a hospital chain offering world class tertiary care in fields of cardiology, bone marrow transplant.

Formerly, it was situated on a 12 acre land and housed in a 2 lakh square feet building having 10 operating rooms and 200 beds. It performed 25 heart surgeries per day on the completion of second phase of its expansion it was proposed to accommodate 780 beds and 30 operating rooms with necessary infrastructure to perform 70 major heart surgeries a day. It was also proposed to have a teaching institute to train cardiologists, surgeons, nurses and other healthcare professionals<sup>[4]</sup>. The hospital chain has now 6200 beds spreading across hospitals in 17 cities. In the similar ways, many other hospitals have grown from a single entity of hundred beds to that of thousand beds and from one unit to a chain of hospitals thus indicating that there is a large scope of expansion in these buildings.

### A Hospital from North Central India

Planning is an integral part of hospital architecture. And designing should not be taken up until the planning is complete and the facility brief have agreed between the promoters and architects. Initial investigations and surveys such as patient mix and average length of stay are rapidly changing worldwide, especially in Indian Hospitals, which has been revealed by a case study of hospital of north central India. It was planned with 550 beds and only 6 Operating rooms and 16 outpatient consulting rooms. The study says that even if only 40% beds were surgical it would have hurt the hospital in revenues as the bed occupancy would only have been 58% due to insufficient number of operating room<sup>[4]</sup>. Thus, there should be careful analysis of all the spaces of a hospital and then the space requirements should be synthesized carefully so that not a single bed remains unoccupied.

### All India Institute of Medical Sciences, New Delhi

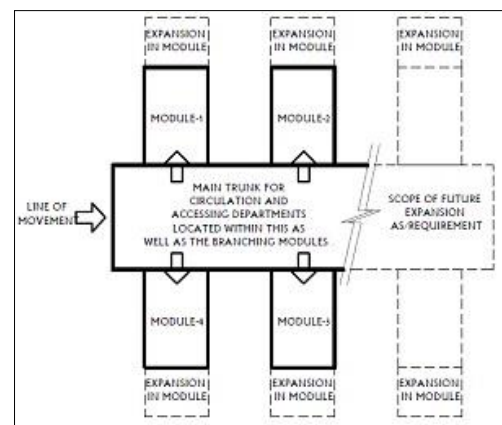
The huge crowds in All India Institute of Medical Sciences (AIIMS) and its incapability of expansion within the same premises in Delhi have made it to expand it's another branch in Jhajjar, Gurgaon on a 300 acre plot. Showing the initiative to meet the ever increasing need of expansion.

### FLEXIBLE DESIGN PROPOSAL FOR HOSPITALS

The following open ended layouts could be opted to make a hospital building flexible or open ended structure.

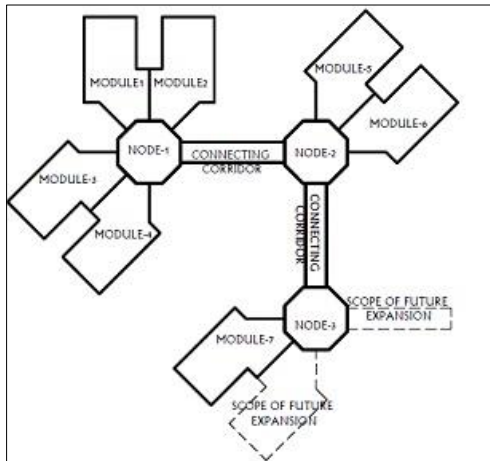
#### Provision for horizontal expansion

It should not be only the main spine which can be expanded but the different modules or the departments which are complete in itself (self-functioning units) should also be expanded to ensure the flexibility and sustainability of the building in terms of space. For this, we have to adopt the modular approach, be it the spinal layout or the nodal layout or any other layout which has a tendency of growing by addition of the modules in due course of time to the main block as the need will continuously increase.

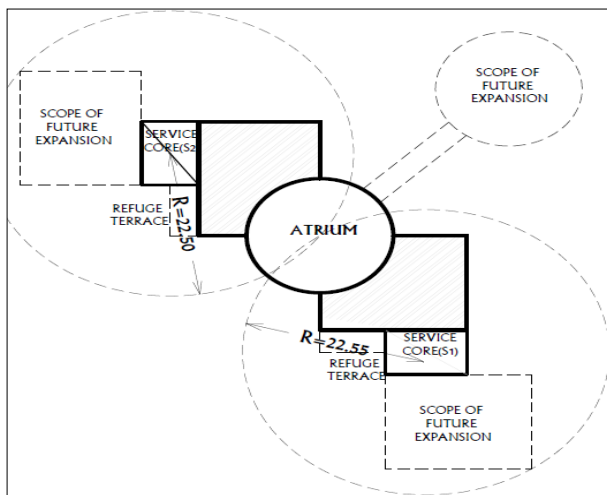


**Fig.4:** Flexibility in the Building Planned on Rectangular Grid Pattern, an Open Ended Structure to Ensure Future Expansion.





**Fig. 5:** Layout with Nodes, Which Will Avoid Sharp Turns at Different Junctions and Will Also Lead to an Expandable Layout as Required.

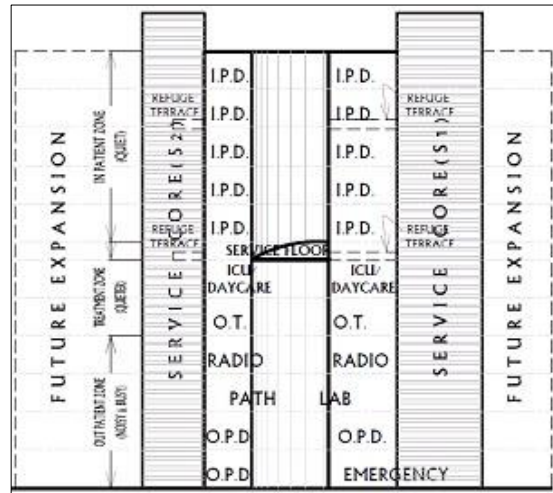


**Fig. 6:** The Provision of Flexibility in High-Rise Hospital Building.

In these types of high-rise hospitals the lifts, staircases, electrical rooms, AHU's, FHC's, garbage suites etc. should be at peripheral location, to ensure their usage by future expansion blocks. The two circles of equal radii are drawn with centre at the centre of the two service cores S1 and S2 respectively to ensure that the distance travelled by a person at extreme end to the fire staircase or fire lift is not more than as given by the fire department. The service floor apart from serving its intended

### Provision for Vertical Expansion

If the building is planned as high-rise hospital due to the unavailability of land or shortage of land or in case of prime location for keeping the rest of land for future expansion and future plans, then the operation theatre department shall be on the fourth and fifth floors respectively. Since the diagnostic area serves the outpatients as well as the inpatients it should be located at the fourth floor whereas the operation theatre departments, except the emergency. O.T. shall be above the radio diagnostic department. Below the radiology, should be the path labs and blood bank and then the O.P.D.'s below them. The service core should preferably be at the periphery with three sides open to ensure or help their usage in future expansion blocks.



purpose will also serve as a buffer between the I.P.D. and O.P.D.

### CONCLUSION

All these examples show us that, every city or hospital and other buildings have a tendency to expand though at a different pace. As it is evident from the Vendor Markets and Avenues of Chandigarh which are not planned but dotted by hawkers so provisions should have been made for this and also implemented to avoid the

kiosk/accidents at the nodal points or roundabout of the city. Therefore, the cities should have ample space or right of way not only for the growth/ widening of its roads but also intervening spaces for such type of activities such as hawkers and vendors etc. visible, accessible yet segregated not scattered around along the avenue or scattered randomly in a market. As the predictions are not always 100% correct hence, at a very initial stage of planning some sort of factor of safety in areas allocated to different uses should be taken to increase the flexibility of the design. All such intervening spaces should be left as miscellaneous spaces for future activities which are likely to take place depending upon the occupation of the immigrants who are likely to occupy the avenues and markets in order to meet the daily needs of the people. Hence, an immigration survey should be done to see the occupation of the immigrants over last ten to twenty years for similar town layouts such as Gandhinagar in Gujarat and these activities should be equally spaces over the entire layout so that people could travel easily without much walking. In other words, we can say that each and every entity of a city should be sustainable meeting the current needs and fulfilling the future goals. In context of the hospitals, after getting the site survey reports of geotechnical testing after getting these reports we should do the workload analysis based on promoter's objectives i.e., what type of patient's will be handled by the hospitals during peak period in a day and around the year.

This is followed by strategic facility planning in which different departments are designed with their exact square footage, the total staff that will work in these rooms so that purpose and adequate amount of workspaces could be provided for them. Hence, at the end of this stage 90% of spaces allocated for each activity are completed in detail. The various layouts as shown in this paper could be opted for making the hospital flexible and expandable.

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