



## “Reviving Twentieth-century Medical Legacy – The Case of Banarasi Dass Women’s Hospital, Sadar Bazaar, Ambala Cantonment, India”

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### ARTICLE INFORMATION

Received: August 6, 2018  
Revised: October 13, 2018  
Accepted: November 9, 2018

Published online: January 8, 2019

#### Keywords:

Water sensitive development, regional planning, Integrated design, flood management, conservation of natural heritage.

### ABSTRACT

One of the notable advancements of late 19<sup>th</sup>-early 20<sup>th</sup> century British India was the introduction of ‘western-style’ medical care for women. Located within confines of the colonial or princely enclaves, a number of women’s hospitals, staffed with trained British female doctors, were established under the Dufferin Fund. But the benefits of medicalised childbirth did not extend to commonplace Indian women. At this point of time, history was also made by certain philanthropic and nationalist individuals who made some pioneering efforts to extend benefits of medicalised childbirth to the vast neglected body of commonplace Indian women.

The 48-bedded Banarsi Dass Hospital for Women, built in 1922 within the dense urban fabric of Ambala Cantonment, is one of the earliest of such pioneering structures. The architectural value of the building as seen in its ingenious spatial organization was devised to ensure generous access to sun and air, ensured thermal comfort in all seasons, a construction system representative of the era, and various ornamental elements that proclaim its ‘monumental’ status adds to its unique historic significance. Though the building is still in a good physical and structural condition, the advancement in medical world has rendered its infrastructure obsolete.

In the present scenario, we tend to lose a significant landmark of 20<sup>th</sup> century development in India. This paper presents an analysis of the historic, societal and architectural value of the property, the reasons for its disuse and the design interventions proposed to restore the original societal and architectural status of this majestic historic building.

DOI: <http://doi.org/10.15415/cs.2019.62004>

## 1. Historical and Social Context of Women and Child care in British India

Before the advent of the British in India the unmedicalization system of childbirth in India was adopted by local people. Child birth used to happen in a small room or in hut constructed of reed or bamboo matting built exclusively for this purpose in certain region. In order to give it the feel of a womb, the darkened room used to be enclosed and sealed. There also used to be fire in one corner of the room<sup>1</sup>. The lower caste Hindu midwife used to cut the umbilical cord.

It was recorded by the colonial authorities that the Indian mothers along with their newborns were more vulnerable to death due to the horrible way of childbirth.

(Supriya Guha, 1998) British administrators brought lot of advancement in mother and child care facilities in India. The very obvious reason for the advancement in mother and child care facilities in India was that due to the unavailability of the European wet nurses, the British mothers were dependant on the Indian wet nurses for breast feeding their babies as the European doctors, considering the debilitating climatic conditions of India, advised them not to nurse their newborns. Secondly, there was traditional non medicalized way of childbirth in India.

During the nineteenth century, it was a great struggle for the British missionaries to convince the Indians for the medicalized childbirth. This was because the Indian people

<sup>1</sup> Following the concept of the humoral theory of Indian medicine; which supports that the phenomenon of chills may occur due to excess of phlegm (kapha), a fire was lit in the room. The other reason for having the fire lit was to keep away the wandering spirits and malefic influences which were supposed to be harmful. According to the demotic healing traditions of India, it was also believed that on delivering a child, the mother’s body lost the warmth of the baby within. Thus, there is a need to comfort her with the help of external heat.



**Figure 1a.** “A Doctor’s Travelling Tent”; color postcard (London: All-British Picture Co., Ltd.; no. 9 in the “Indian Medical” series); 20th century. (Source: *Running Your Little Empire-BRITISH LIFE IN INDIA* <http://www.lib.lsu.edu/special/exhibits/e->)



**Figure 1b.** The youthful Superintendent of the Hill States inspecting with local Indian officials; photograph courtesy: the Centre of South Asian Studies, University of Cambridge; 20th century. (Source: *Running Your Little Empire-BRITISH LIFE IN INDIA* <http://www.lib.lsu.edu/special/exhibits/e->)

found that it was natural to deliver a baby at home. The strata of society following *purdah*<sup>2</sup> system never accepted women to see medical men, especially for delivery. So there was utmost requirement to involve local (Indian) females into medical practice and thus training of local people as medical personnel was given through various missionary hospitals. With the purpose of providing the Indian women with western health care; and to train the midwives, many private clinics were established by the missionaries. [Figure 1]

Many hospitals and dispensaries were opened under the Dufferin Fund<sup>3</sup> in early twentieth century which provided medical aid and employment to many Indian women. Initially there were few Indian female patients in hospitals and thus to encourage more females to various hospitals for child birth, various gifts normally in the shape

of clothes for them and their children were offered. The colonial government also took steps to displace traditional medical practitioners; the *dais*<sup>4</sup>. In the year 1941, against the registered 10,856 midwives, 522 *dais* and 622 assistant midwives, there were approximately 10 million childbirths in British India. (Samita Sen, 1999) Numbers of charitable hospitals were opened in North India by various British missionaries like St. Stephen hospital at Delhi<sup>5</sup>, Chalotte hospital at Ludhiana<sup>6</sup>, St. Catherine’s hospital for women at Amritsar<sup>7</sup>, Philadelphia hospital at Ambala<sup>8</sup> and many more. (Manpreet Kaur, 2004)

Various hospitals and dispensaries were established in and around Ambala for various classes of people. In 1883-84, a civil hospital at Ambala city and few dispensaries at Jagadhri, Sadhaura and Chhachhrauli<sup>9</sup> were opened.

<sup>2</sup>The seclusion of women from the sight of men or strangers

<sup>3</sup>Until the late 19th century there were no women doctors and therefore, no care for women except in missionary hospitals. This fact was brought to the attention of Queen Victoria. At that time Lady Dufferin was coming to India with her husband who was on government service. Queen Victoria briefed Lady Dufferine about the need for medical care for women and children in India and asked her to take special interest in this problem. Lady Dufferin wrote to her friends and influential people to get financial aid. Thus in 1885, Lady Dufferin started the ‘National Association for supplying Medical Aid by Women to Women of India’. This is commonly called the Dufferin Fund and continues to provide medical education for women, to train nurses and midwives for hospitals and private work, and to improve medical facilities for women (Reference : Medical Surgical Nursing by Basavanthappa)

<sup>4</sup>A dai is an untrained midwife. Role of dai in Indian society is to provide help for child birth.

<sup>5</sup>St. Stephen hospital was opened by group of missionary women at Delhi in 1885.

<sup>6</sup>Charlotte hospital, Ludhiana was opened by Dr. Edith Brown and Dr. Rose Greenfield. This was the first medical school for women in North. The hospital was popularly known as Miss Brown Hospital. By 1916, Ludhiana medical graduates proved their worth which made the Punjab Government recognize the school as the Women’s Christian Medical College.

<sup>7</sup>The Church of Zenana Mission opened the St. Catherine’s Hospital for Women at Amritsar in 1884.

<sup>8</sup>In 1880, Dr. Jessica Carleton started her work with a two room dispensary which gradually grew into the Philadelphia Hospital of Ambala City. It was announced by the Relations of the United Presbyterian Church in the USA and Commission on Ecumenical Mission that a strict *purdah* system was to be followed in the hospital where no man was to be allowed inside the building.

<sup>9</sup>Jagadhari, Sadhaura and Chhachhrauli are smaller towns of Yamunanagar District which is part of Haryana

Besides, there was an establishment of leper asylum hospital at Ambala City in 1856 and Lock Hospital at Ambala Cantonment in 1866. A few more dispensaries were opened towards the end of the 19th century. The Kalka dispensary began to function in 1886. Philadelphia hospital at Ambala City was opened in 1893 by the American missionaries. During early twentieth century various Indian charitable trusts also came forward to provide health facilities for women and child care. Banarsi Dass Women Hospital and Behari Lal Charitable Zenana Hospital were opened in 1922 and 1932 respectively in Ambala. (Ambala\_1984\_16)

Establishment of the B.D. Women hospital was a revolutionary moment for the people of Ambala Sadar Bazaar (the commercial - cum- residential area occupied by the natives of the cantonment town of Ambala that functioned as an important supportive element to the garrison) as women's access to hospitals was extremely restricted before the inception of this hospital and most of the people of this area were dependent on midwives for child birth. This hospital was primarily for mother and child and it also provided women medical professionals with opportunities that were unavailable in the area. Till 1990, this was one of the most preferred hospitals of Ambala as it possessed best medical facilities, best doctors and was affordable for the various classes of people.



Figure 2. Front Façade of the hospital building. (Source: Authors)

## 2. Understanding the Architectural Value of B.D. Women Hospital

B.D Women hospital is located in *Sadar Bazaar* area of Ambala Cantonment. This hospital was established by Rai Bahadur Banarsi Dass. At present this property is under Rai Bahadur Banarsi Dass Charitable Trust. At present B.D hospital is surrounded by dense low-rise mixed-use-neighborhoods within the dense fabric of the *Sadar Bazaar* area. The overall fabric of the area comprises of commercial area on the ground floor and residential on upper floors. This market caters to the needs of almost all the social strata of the town. [Figure 2] Historic building of B.D. Women hospital carries lot of significance whether it is Historic evolution, Architectural significance or Contextual significance. People of Ambala Cantonment have an emotional, economic, social and cultural values associated with it.

### 2.1 Planning of Hospital

The hospital comprised of out-patient department, labour room & wards on ground floor and rooms & accommodation of resident doctor on first floor. The hospital was planned along a central courtyard to have proper air circulation inside the rooms. This area used to be very crowded in British time also but the hospital was planned keeping in mind the composite climate of the area so as create overall comfortable atmosphere. The ceiling height was designed very high to keep the rooms naturally cool during the harsh summers. [Figure 3]



Figure 3. Central Courtyard of Hospital. (Source: Authors)

It was a charitable hospital but no compromise was made with the functionality and space requirements of hospital. There was proper provision of small courtyards & balconies attached to the rooms and also terraces for the patients. [Figure 4] Fireplaces in the rooms and chimneys on the roof terrace helped the inmates in the harsh winters and are also striking and important elements of the building. [Figure 5]

The central courtyard of the building block is surrounded by corridor which is supported on arcade. The second floor was entirely left as a terrace for the patients and attendants.



**Figure 4.** Terrace of first floor showing small courtyards attached to rooms. (Source: Authors)



**Figure 5.** One of the fireplaces inside the room. (Source: Authors)

## 2.2 Construction Technique

The building possesses a load bearing structure system. Walls were made 1'4" thick which took the load of the complete structure. Walls were made out of burnt bricks of size 9.5"x5"x3". The mortar used for the brick work comprised of lime mixed with *surkhi*<sup>10</sup> and *urad dal*<sup>11</sup>. The walls were made strong enough to bear all kinds of loads: live load, dead load, wind load etc. The Roof has purlins & joists as main supporting members covered by battens & brick tiles. Existing building of hospital was constructed with old traditional techniques and natural & climatic friendly materials thus prove to be environmental friendly design.

## 2.3 Front Elevation

Front Elevation showcases great workmanship and fine artistic creations. There are hand paintings of animals i.e. peacock, floral pattern, men & women and kings on the ceiling, walls and squinch. Front Elevation comprises of series of openings which opens into balcony which is supported on the brackets. The rooms in the front side of the building give the building a gigantic façade. The overall height of the structure is further being increased by some chambers above this room and finally a domical roof. There is mummy on both sides of central façade. Various characteristics of the building i.e. balconies, roof construction, organization of space etc. shows the relation of the building and local culture of the place. This creates an attractive front that is noticed from ever far away and acts as a landmark of the area which is one of the medium of way finding. [Figure 2&6]

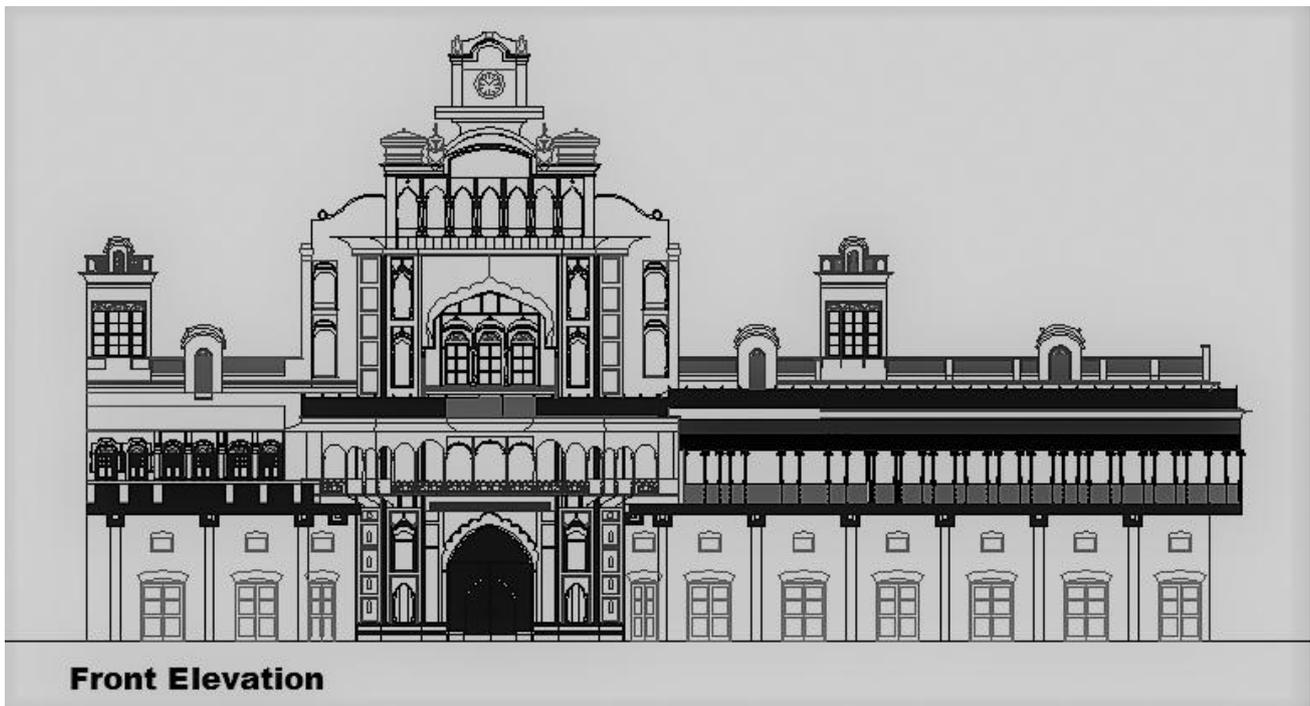
## 3. Historic Hospital and Present Scenario

At present this hospital is abandoned and various rooms features peeling paints, dusty furniture and piles of litter. There are several reasons for that; with the rapid change in lifestyles, everybody is looking for latest medical facilities which is lacking in this hospital. Hospital comprises of various areas which were designed as per the requirement of that time but spatial requirements have changed over the period i.e. there is provision of wards but now there is demand of single rooms. Finally the building is not in use and thus it lacks maintenance with result is in a state of neglect.

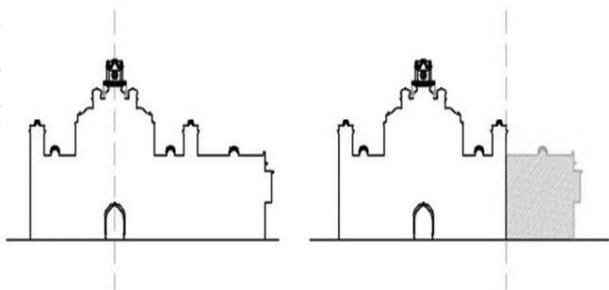
A feasibility study of this building was conducted. The SWOT (strength, weakness, opportunities & threat) analysis was developed based upon the data derived from public opinion along with the interpretations from the existing

<sup>10</sup> Surkhi is a finely powdered burnt clay which is generally made from the bricks that are slightly under-burnt. Surkhi Mortar is obtained by mixing of lime and surkhi with water. In other words, it is the lime mortar to which surkhi substitutes sand for better economy and strength.

<sup>11</sup> The "black lentil" is the whole urad bean or urad dal; where as the "white lentil" is the same lentil with its black skin been removed.



**Figure 6.** Front Elevation of Hospital. (Source: Group submission by M.Arch 4th semester students at C.S.P.A (Aradhana, Eva, Harveen and Sunanda))



**Figure 7.** The front Elevation of the hospital looks asymmetrical. If we further look into this, a part on the right hand side is given to the Bharmkumari Ashram from the very beginning. (Source: Authors)

**Strength:** The people of Ambala *Sadar Bazaar* have a sense of belonging for this place as this was only hospital in the entire region. Most of the people have certain memories related to birth of their near and dears in this historic building. Existing building have good thermal capacity (because of heavy mass). Thick walls, natural lighting, ventilation, and small windows are some elements, which helps to keep it cool and hence these elements would help in reducing energy consumption. The condition of the building is good so little alterations would be sufficient for converting the existing structure with contemporary standards. The skeleton and fabric of the existing building can be fully used.

**Weakness:** It is located in densely populated commercial cum residential area and simultaneously there are lot of encroachments which have resulted in decreased road width. There is continuous parking & traffic problems and noise pollution. As the building is not in use, this has resulted in disinterest among the owners and trust members for any future decisions. The building is in total state of neglect. Growing commercial development around the building leads to change in the character of immediate surroundings. As this historic building is not in use & it is not generating any revenue and thus lacks maintenance. Financial aid is required to upgrade the hospital.

**Opportunities:** Location of hospital serves large population as it is located in a densely populated residential cum commercial area of Ambala Cantonment. And also there is availability of public transport. There is also increase in public awareness regarding the heritage value of the historic building and thus is the utmost desire of people of Ambala to revive this. The existing building block is climate friendly. All the traditional practices which had been used for construction can be retained to make it an energy efficient design. The building is structurally sound, so lot of new construction can be done on existing terraces with appropriate retrofitting methods.

**Threats:** Lack of skilled labour to carry out interventions. The building is not in use so it has threat of future demolition.

The commercial area is increasing in immediate surroundings because of lack of control over the development plan of the area. This is resulting in lot of pollution.

### 3.1 *Points of consideration while deciding the appropriate function of B.D. Women Hospital*

As this old abundant hospital is under a charitable trust so this is strength of this historic monument as it can only be used for charitable purposes. Otherwise its location in a dense commercial area where shopkeepers are exploiting every inch of space and decision of reviving its original usage would not have been possible. Cooperative analysis for all possible charitable functions for this building was done by assessing its potential for conversion into a particular function i.e. school, dharamshala or any other community space. Various parameters were taken into consideration i.e. contextual relationship, architectural compatibility, structural grid, locational aspect, and economic viability & also a survey was conducted to find the opinion of people who are one of the main stake holders.

Finally the decision was taken to conserve and utilize the building for "Mother and Child care" which can cater to the entire *Ambala Sadar Bazaar* area:

- Retaining the old use will be less expensive.
- It is location in the residential cum commercial place and thus is easily approachable and accessible.
- The overall Structural layout of building is suitable to support the required infrastructure, spaces and functions of a hospital and thus interventions will be reduced.
- This will bring both Active and Passive use of the building i.e. generates income and also deal with the emotional bondage of the people concerned.
- As the original use is not changed so the existing furniture can be also be retained and used to great extent.
- The owner must be having some feelings when he established this project. By retaining the old use of this historic building, the authenticity of the structure is not retained.

And finally by reviving the old use of B.D Women hospital will be a sensitive adaption of the historic building which will cater to the present needs & benefit of users and building life.

## 4. Proposal of Mother and Child Care... Retaining its Original Use

There were many challenges in transforming the old Women hospital to modern Mother and Child care centre like to

provide adequate space requirements for new functions, advance equipments, in brief it should meet the standards of a contemporary hospital. An attempt has been made to demonstrate as to how to upgrade the existing fabric of historic building to contemporary well equipped hospital.

The basic considerations to frame the requirements for the hospital are the various activities performed in a typical mother and child care hospital. Foremost, the primary spaces; here there is a direct interface between the patient and the care providers such as the nurses, diagnostics and treatment. Then the secondary spaces; these include the activities which have no direct relationship with the primary processes. These are mainly focused on providing support and services in a general sense.

On translating the spatial facilities, the mentioned activities may be subdivided into three different zones:

- A. Facilities related to patient where the patients themselves need to be present;
- B. Facilities related to patient where patients themselves need not be present;
- C. General & technical support services. ("THE GENERAL HOSPITAL BUILDING GUIDELINES FOR NEW BUILDINGS", p.9)

The interventions have been proposed in existing building so that the building offers adequate space requirements with respect to the inter-relationship of activities. The Proposal is formulated with an aim so that minimum interventions are required and integrity of the structure is retained.

As per proposal, Ground floor will comprise of Paediatrics OPD: Family Planning Unit and MOT, Parent Craft classes room, Diagnostics section and services. First floor will comprise of: Private Rooms, General wards, Kitchen, Labour Complex will have Operation theatre & Post recovery room. Terrace floor comprises of Cafeteria and Services: Filtration Plant, Water tanks, Photovoltaic system, Gas bank, Filtration unit, Package AC units. (Refer figure no. 8)

### 4.1 *Mission and Vision: To convert the ancient building into hospital of Contemporary standards*

Some interventions are proposed in the existing building for additional spatial requirements and some interventions are proposed to meet the standards of contemporary hospitals. The suggested interventions can be categorized as:

- **Code compliance:** The alterations made to upgrade old building to contemporary standards and enhance facilities for disabled access, fire safety, structural stability and thermal efficiency to satisfy local building regulations.
- **Environment enhancement:** Incorporation of energy efficiency measures to improve internal comfort and indoor climate.

- **Spatial modifications:** Modifications of internal spaces according to present day requirement and the building regulations i.e. vertical and horizontal

circulation, expansion of existing spaces to house new functions. (“Custom Oxbridge Essays & Oxbridge Dissertations”, n.d.)

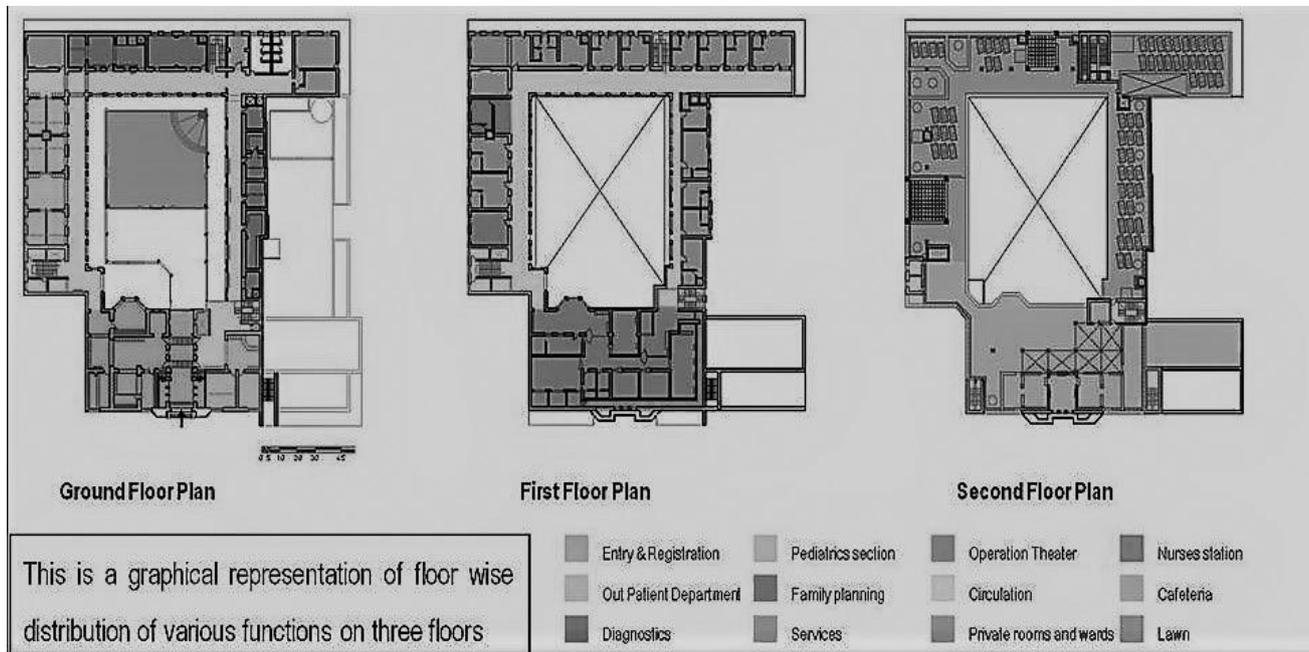


Figure 8. Floor wise zoning of various activities in the hospital. (Source: Authors)

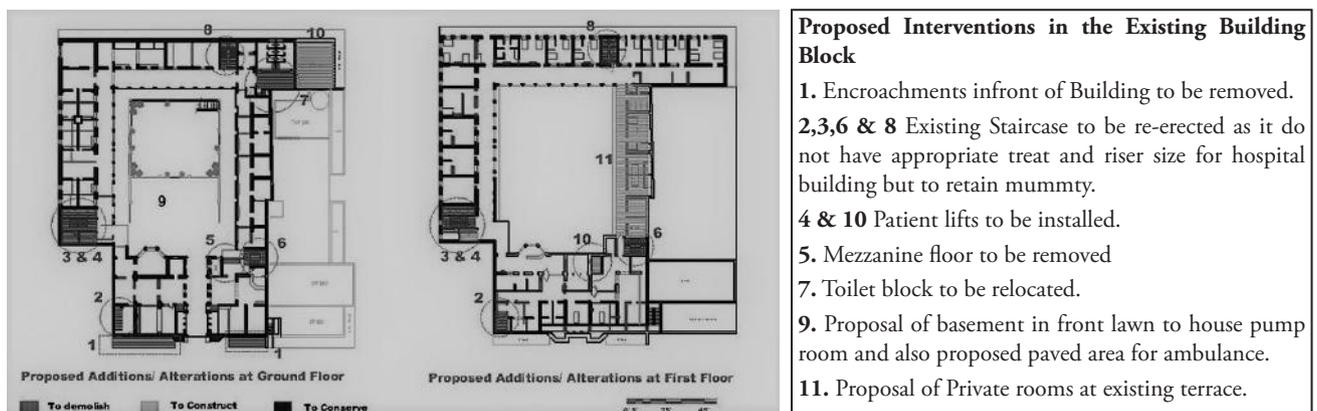


Figure 9. Interventions in the existing building block. (Source: Authors)

#### 4.2 Barrier Free Access

B.D Women hospital was not designed to cater for access of persons with a disability. At present all levels of the building are connected through narrow staircases. The staircases present here do not have appropriate riser and tread size. So certain alterations are proposed to provide easy access to all levels of building for disabled persons. Patients and visitor lifts have been proposed while maintaining the overall character of building. Provision of lift is a definite requirement in Women

and child care as pregnant females would often require wheel chair to access various areas i.e. Labour complex, Pathology department etc. One lift provision is proposed near the main entry from where the patients in emergency can be directly taken to the Labour complex. One lift has been proposed near Outpatient department for the access to Inpatient area. One room has been proposed at entry level for keeping stretcher and wheel chair.

The interventions have been proposed in such a manner so as to have barrier-free design, with a clear aim: to connect

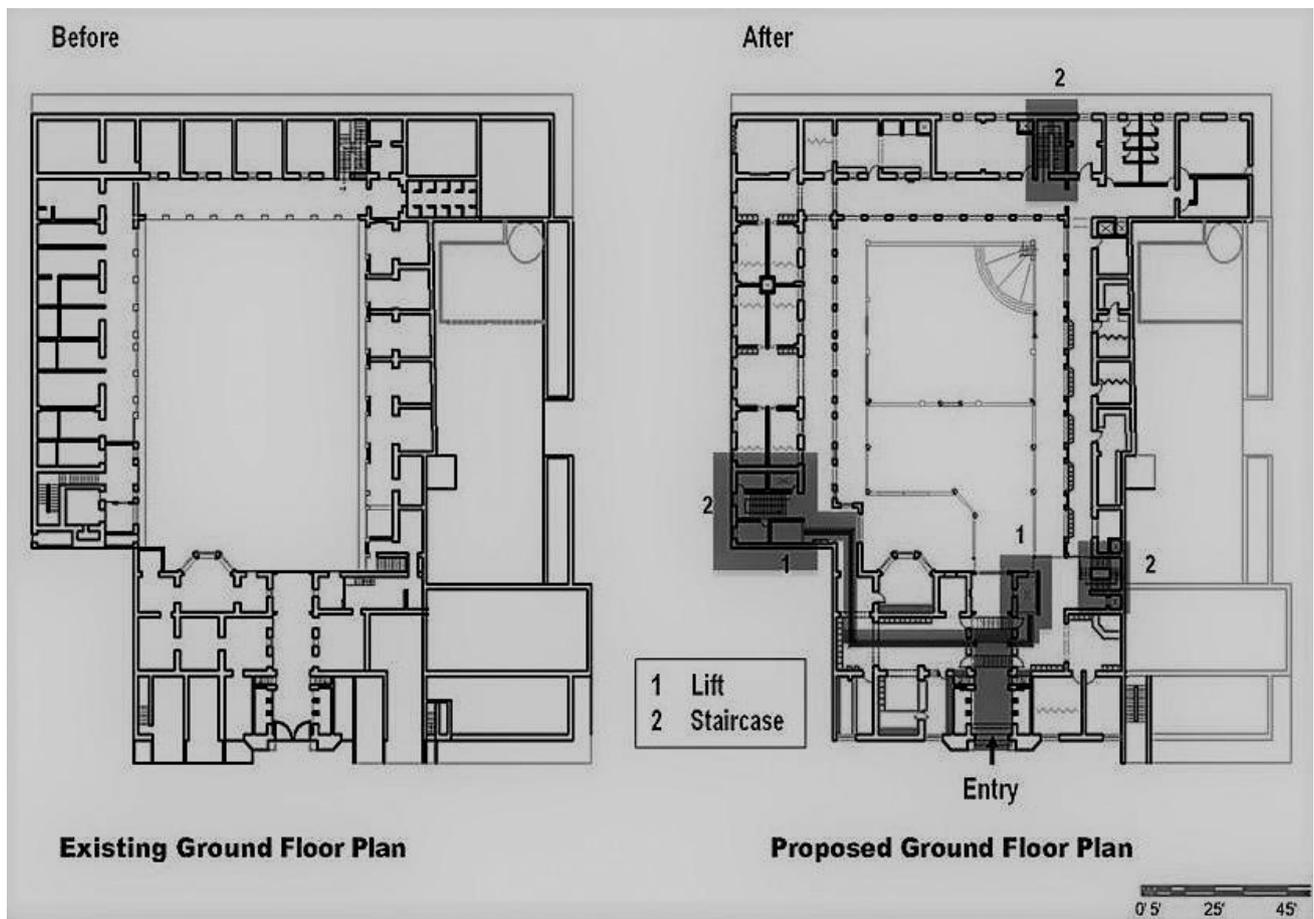


Figure 10. Existing and proposed ground floor plan showing the location of lift and staircase. (Source: Authors)

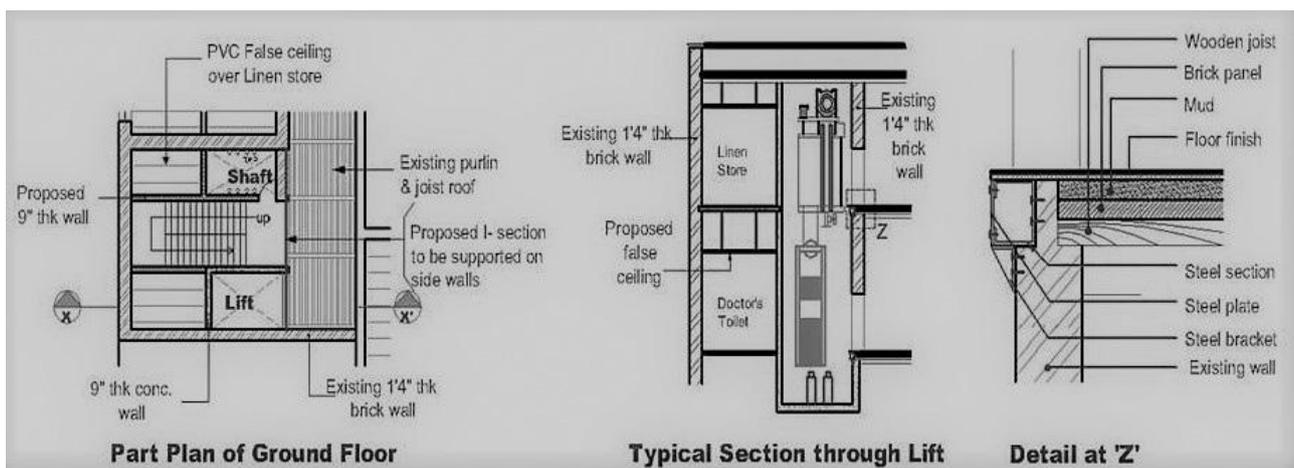
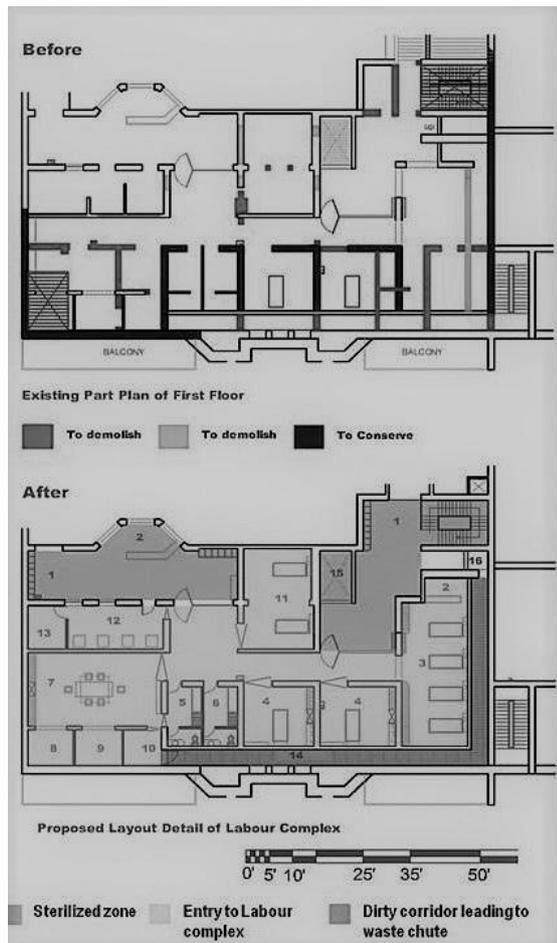


Figure 11. Typical details of housing lift in the existing building fabric. (Source: Authors)

various building components and making them accessible & usable by everyone, but without losing aesthetic value. Existing staircases will be retained but altered as it has non-compliant risers, treads and winders.

### 4.3 Integration of Modern Amenities

There is proposal to incorporate modern amenities in the existing fabric and some of the details are discussed in this article.



1. Entry cum waiting, 2. Nurses station 3. Pre labour room 4. Labour room 5. Doctor's scrub 6. Nurses room 7. Operation theatre 8. Anaesthesia 9. Sterilization 10. Dirty linen 11. Post recovery room 12. Neo Natal ward 13. Feeding room 14. Dirty corridor 15. Patient lift

**Figure 12.** Proposed labor complex and suggested interventions. (Source: Authors)

### Labour Complex

The labour complex (LC) in a Women hospital is the most important component and it is also said to be the backbone of the entire setup so there is an utmost requirement to upgrade this. LC has been proposed on first floor in front part of building. Location of labour complex in the hospital is so identified that it is segregated from the general traffic and air flow of the rest of the area. Proposed LC has been broadly divided into three zones; sterilized zone, dirty corridor and entry & exit to Labour complex (as it needs to

be connected to entry level at ground floor for emergency patients). The proposed LC comprises of operation theatre, labour rooms, pre & post operative unit, neo natal ward, adequate circulation and waiting area. [figure 12]

There will be provision to house equipments of latest technology so as to create stress free environment for surgeons and patients. There is a proposal of 4 nos. of Labour Delivery Pnerperium beds (LDRP) in pre labour room with electronically monitoring system. Proposal has been made for electronically operated LED overhead operating lights and centralized air conditioning system (Package AC unit: DVM plus III) which is mounted on terrace and is connected to LC through shaft) with filters that cleanse the air of microbiological particles. The flooring is recommended of bacteriostatic vinyl floors as these are environmental friendly, easy to maintain & can resist heavy load of machinery and for walls low VOC (volatile organic compound) is recommended.

### 4.4 Provision of additional space requirement

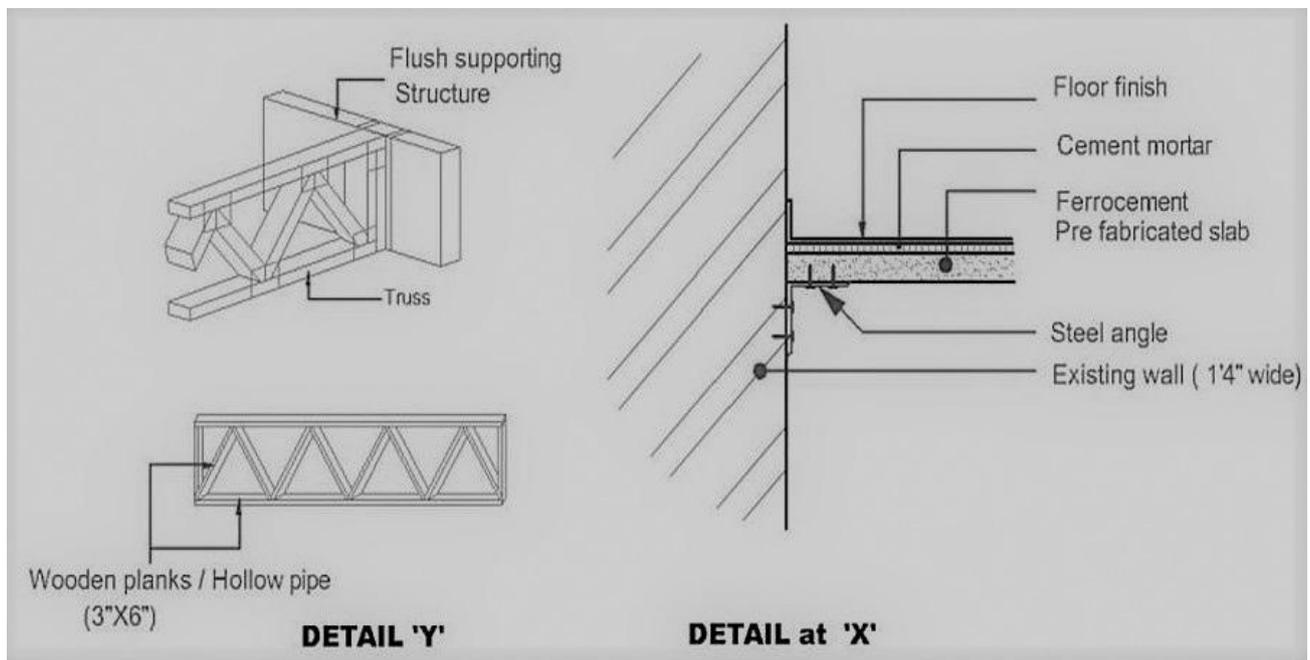
The existing hospital is enhanced by proposing additional covered area to meet new spatial requirements. The existing building block is abutting the surrounded commercial area so there is no scope of expansion in terms of addition of new blocks. The additional area requirements have to be housed in the pockets which are lying vacant in the existing building block. There are small courts which are attached to existing private rooms and terrace on one part of the building at first floor second floor which have been identified for the additional residential requirements, cafeteria and various building services like placing filtration plant, photovoltaic cells, central air conditioning system, water tanks etc. so as to make it an Energy Efficient building which is very much in demand in present scenario. Certain interventions in the structure of existing building are required like insertion of slab in small courtyards adjoining rooms on first floor; wall & slab construction for the provision of additional private rooms on the existing terrace of first floor, providing access to terrace for cafeteria & services. The proposed interventions are as follows:

- The slab is inserted in such a manner so that minimum load is transferred to the adjoining walls: the new roof slab is proposed of precast ferrocement<sup>12</sup> to reduce the dead load of the slab.
- Secondly depending upon the structural stability of the structure, the slab can be further supported on the light weight truss, the size of the truss can be decided such that service duct can easily pass through it.

<sup>12</sup> The term ferrocement refers to a mixture of Portland cement and sand when applied over the expanded or woven rebar of steel mesh and closely spaced steel rods of small diameter.



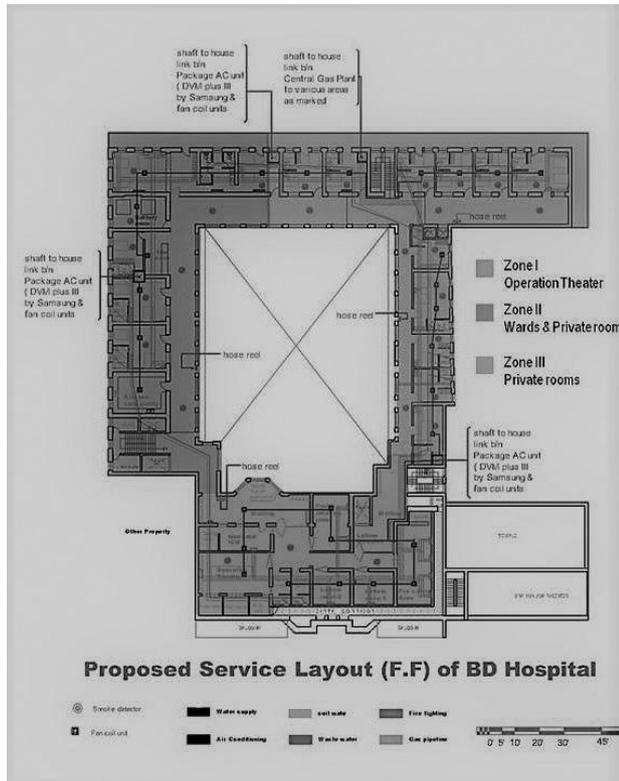
**Figure 13 a.** Transverse section shows insertion of slab and false ceiling at various places for the provision of Building services i.e. fan coil units, gas pipe lines, electrical conduits etc. The installation of truss will be as per the direction of Structure engineer. (Source: Authors)



**Figure 13 b.** Detail at X and Y as mentioned in the figure 13 a). (Source: Authors)

#### 4.5 Incorporation of Advance Building services in the hospital

Some interventions in the existing historic of B.D. Women hospital has been proposed to incorporate advance Building services.



**Figure 14.** Proposed service layout for the hospital. (Source: Authors)

**Air Conditioning:** The entire building block has been made centrally air conditioned. Certain interventions are proposed to house shafts, fan coil units etc. The entire building block is divided into three zones. Variable Refrigerant Flow system<sup>13</sup> (VRF) has been proposed for the conditioning of various areas. Labour Complex is segregated from the rest of the building so that appropriate air quality can be achieved. Division of zones is done so as to achieve the maximum recommended length<sup>14</sup> of pipe for the suggested Package AC unit; DVM PLUS III.

For the conditioning of various spaces interventions proposed are:

- To cover inner and outer balconies which will help in enclosing the space to keep a controlled

environment and also covering will provide barrier from the noise pollution of immediate surroundings.

- Proposing false ceiling in the rooms & wards and other spaces so that fan-coil units can be housed between the gaps.
- Provision of shafts for the connectivity of package unit with spaces to be conditioned on various floors. (details for the same are explained)

#### 4.6 Provision of shaft in the existing Structure to house services

Shafts are required at various places for housing new plumbing pipes, electrical conduits, gas pipe lines etc. The existing roof is made out of timber joists and covered with battens on the top. Various shafts can be carved in the existing roof as demonstrated below: [figure 15]

#### 4.7 Other building services

Automated fire fighting system is recommended in the building. Gas pipe line as per the requirement of hospital has been proposed. In addition to this there is an attempt to make building Energy Efficient by:

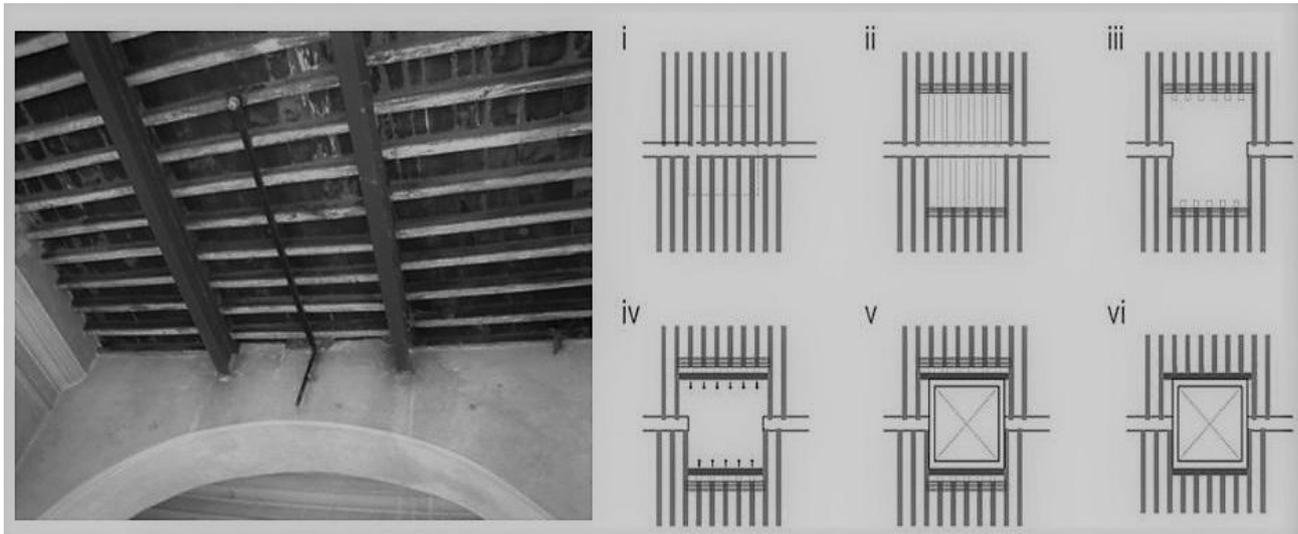
- Provision of waste water treatment plant so that waste water can be treated at site and can be reused in toilets and front lawn.
- Rainwater is collected from terrace and is proposed to be used partly for recharging and partly for using on the surface.
- LED lights & Low VOC paints should be used on wall surfaces are proposed.
- Air conditioning units and lights should be automated.
- Photovoltaic panels are proposed on the terrace with attached battery room on first floor so as to generate electricity.
- Provision of Electrical Inclinators so that hospital waste can be treated at site.
- Proposal of pavers with high Solar Reflective Index (SRI) to be used in the central courtyard so as to prevent the urban heat island effect.

## 5. Conclusions

New technologies and new patterns of care are changing the overall design of the hospital in several ways. Transforming

<sup>13</sup> The VRF systems are the improved versions of the ductless multi-split systems that permit more indoor units to be connected to every outdoor unit. It provides additional features such as simultaneous cooling and heating along with heat recovery.

<sup>14</sup> Actual piping length is 200m, with the maximum piping length of 45m from the first branch joint to the last indoor unit.



i. Mark the profile of proposed duct. Measure the width between the inside of the joist and add twice the width of the timber (50mm), this is the length of the central joist which needs to be removed. Mark the length on the joist to be removed. ii) Position two pieces of timber (25mmx75mm) across the top of the joist-these will help in supporting the joist/ceiling while making the hatch. iii) Cut away the central joist and the wall. iv) Put into position two cut pieces of joist across the sawn end with the help of nails. v) Construct walls as per design for the shaft to house a lift. vi) Remove two timber members which were screwed to the joist for temporary support.

**Figure 15.** Demonstration of carving a shaft in the existing wooden roof. (Source: Authors)

abandoned hospital into new hospital with contemporary standards of medical technology was the primary aim of this project. This was a prime question how to incorporate changes in existing built mass to have improved hospital design which can help in improving overall healthcare quality. In order to incorporate advance building services and to enhance spatial requirements, certain retrofitting details in existing historic building are proposed in such a manner to conserve the special elements of building. A conservative approach has been adopted in the devising the proposal for the revival of B.D. Women hospital so that the preservation of maximum original fabric is possible.

The alterations are proposed in the existing historic building are done while keeping in mind the basic principles of Adaptive-Reuse; firstly existing building to be well understood to avoid damage and secondly, minimum disturbance to the existing fabric. The overall concept of the proposal is to achieve overall sustainability which is based upon three E's- environment, economy and sociality. By upgrading the existing structure for the contemporary standards would help in generating revenue which would make the project economically viable and also it would be helpful for the upkeep of building and also owner would also be convinced for retaining of the building and also people of Ambala *Sadar Bazaar* area are very much attached to B.D. Women hospital and while interviewing, most of people witnessed its societal importance.

The very first discussion to revive the existing structure is an opportunity to improve the environmental impact of buildings as by doing so we are reducing the development footprint thus utilizing the embodied energy in the building. The extensive energy that was consumed in erecting the existing structure is presumed to be stored within it. This embodied energy within the structure represents an extensive amount of building's carbon footprint. By the process of Adaptive Reuse the transfer of energy from one programme to another takes place and thus burden of new construction, demolition & waste disposal which in turn leads to the exploitation of natural resources can be avoided to certain extent.

While devising proposal all the passive measures for the conservation of energy are considered i.e. rain water harvesting, inclinators; for the treatment of hospital waste, photovoltaic panels for the generation of electrical energy etc. Reviving B.D. Women hospital would be a sustainable approach as the proposal includes the use of high Solar Reflective Index (SRI) pavers within the hospital premises to prevent urban heat island effect and an emphasis is laid such that more and more natural light can enter the interiors. To reduce dependency on electricity, the hospital will have photovoltaic system. The proposal includes the emphasis on use of automated air conditioning system, open green central courtyard, low-emitting materials in adhesives and sealants, paints and coatings, flooring systems and controllability of systems-lighting thus focusing on the indoor air quality.

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