2010

Civic Center for Municipal Corporation of Delhi

Akanksha Sharma

University of Massachusetts Amherst

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CIVIC CENTER FOR MUNICIPAL CORPORATION OF DELHI, INDIA

A Thesis Presented

by

AKANKSHA SHARMA

Submitted to the Graduate School
of the University of Massachusetts in partial fulfillment of the requirements for the degree of

MASTER OF ARCHITECTURE

September 2010

Architecture + Design Program
Department of Art, Architecture and Art History
CIVIC CENTER FOR MUNICIPAL CORPORATION OF DELHI, INDIA

A Thesis Presented

By

AKANKSHA SHARMA

Approved as to style and content by:

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ACKNOWLEDGEMENTS

I express my deepest gratitude to my professor Skender Luarasi, who gave me the vision to deal with this project and without whose support and guidance; I could not have done anything. He has been an excellent mentor throughout this semester and continuously motivated me in the right direction.

I express my heartfelt gratitude towards Kathleen Lugosch who was extremely helpful and helped me reach my deadlines by keeping timely checks. I thank all other faculty members who have been constantly supporting me and gave me the right feedback about my work.

I convey my thanks to all my friends and acquaintances whose presence boosted my confidence. I would like to thank Mohammed for his valuable inputs on my project renderings.

Also, I would like to thank my family and friends back home who have been a constant source of encouragement during the course of study.
ABSTRACT
CIVIC CENTER FOR MUNICIPAL CORPORATION OF DELHI, INDIA

SEPTEMBER 2010

AKANKSHA SHARMA, B.ARCH, JAMIA MILLIA ISLAMIA, NEW DELHI, INDIA
M.ARCH, UNIVERSITY OF MASSACHUSETTS AMHERST

Directed by: Skender Luarasi

The thesis project proposes to explore into the design possibilities for the Civic Center for Municipal Corporation of Delhi and extract the richness of the site conditions into architecture through means of computational design. The computational design approach will provide a degree of variance which will be an interesting thing to explore in terms of defining spaces, program and systems. The design would hinge on to one of the major centers of Delhi and aim to enhance social permeability through means of forms and articulation of spaces. It would cater to all classes of people and help in promoting small local businesses thereby weaving into the social and cultural fabric of India.
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INTRODUCTION

LETTER OF INTENT

A civic centre is the chief administrative, entertainment and cultural centre of the town as a whole. A civic centre represents the image of the region and its residents. The building is the centre of all societies, of all groups and of every activity.¹

The present such building known as town hall, is located in Chandni Chowk area, the oldest posh unplanned area of Delhi. It was built in 1864 for the office of superintendent with a little number of staff. At present the building is over crowded with the various offices and the increased requirements makes the building a slum. The partitioning and enclosing the verandahs of the building has very much affected the ventilation, lightening and sanitary services. In order to draft a more iconic image of a Civic Center In order to achieve good results, the new Civic Center is proposed at the heart of the city which is also a financial and commercial magnet. The older building is proposed to be converted into a museum. An efficient, well-organized civic centre can best be obtained by the planning for future growth, which characterizes the successful enterprises of an economy.

The major goal of this project is to accomplish an integrated design through means of parametric modeling which blends into the existing infrastructure, economy and social fabric and takes cares of sustainability and energy issues.

CHAPTER 1

PROJECT INTRODUCTION

The project is a Civic Center design for the Municipal Corporation of Delhi. The land for the project was allotted in 1983, but the construction finally began in 2004 due to administrative bottlenecks and lack of funds. I would be assuming the site as an undeveloped site with no construction and come up with a design proposal of my own. This project will not be just about designing an energy efficient and sustainable building but will also give an opportunity to design a response to ameliorate social condition.

Considering the fact that there are so many diverse social and economic situations in the country, it becomes imperative that any design weaves into the existing fabric just the right way. The site touches the centre of Delhi on one side, which is a thoroughly planned area by Edwin Lutyens and on the other side, the site it is bound by Old Delhi which was a Mughal ruled area, characterized by sprawl and unplanned growth. The immediate juxtaposition of a planned area versus an urban sprawl obviously brings problems like traffic management, byelaws, zoning etc.

Since the site lies amidst of a sprawl and has mixed-used adjacencies- commercial, residential, institutional and religious; there is no specific character of the site. The site is hinged by the biggest railway terminal in India and already observes a large amount of traffic volume throughout the day, the presence of some institutional centers nearby also aggravates the traffic situation. The construction of a civic center will drastically increase the traffic around the area. An important consideration for the thesis proposal will be to analyze the traffic situations and avoid congestion.
India has a diverse set of cultures, economic and social classes. A space that is being designed for a particular genre of people might not be visited by another set of people because of their economic and social standing. It does not imply that lone set of people will not be allowed to use a particular facility, but means that those people will have an automatic conscience that a particular public space is not meant for them as they do not economically engage in a certain kind of work and might possibly be discriminated against.

The site was originally inhabited by slum dwellers. The slums were cleared eventually for construction and pushed to the rear of the site. Even now the slums do exist and will tend to exist in the coming years. Constructing a bulky Civic Center will probably mean a social handicap for those people as they would be surrounded by a public space that will not be used by them.

The proposed design will therefore look at the possibility of filtering all kinds of social classes through the site by creating spaces that will be meant only for specific purposes and congregation opportunities and allow inter-mingling of all social classes.

The overall intent of the thesis project may thus be summed up as:

- Designing a public space/building/buildings
- Incorporate energy efficiency features
- Provide social permeability
CHAPTER 2

AREA OF INTEREST- REASON FOR SELECTION

The project not only deals with design but also gives an opportunity to take care of urban design issues, energy and sustainability requirements. It also allows taking urban growth patterns, economic and social background into consideration. The site has multifarious adjacencies with varied activities, this very condition gives more challenges to the project and gives a scope for better learning of various design, environmental and social issues.

The project program is basically categorized into: commercial, institutional and cultural. I intend to propose a architectural design of the cultural block. The reason for designing the cultural block is that its program requirements are quite varied as compared to the commercial and institutional spaces where the spatial elements would mostly be repetitive. Also, designing the cultural block would give a change to integrate outdoor spaces with the indoor spaces. India has a vast culture and diversity where there are certain types of activities that are particularly arranged in outdoor spaces and the climate/weather patterns allow for holding such events outdoor for most of the year. This would also help in creating a degree of social permeability and allow people from all social and economic classes to be a part of the same event which in other cases will be segregated gatherings had it not been a part of some iconic part of the city-civic center( Central Delhi- a major hub).
CHAPTER 3

SITE ANALYSIS

A proposal for construction of Civic Centre on the site was approved by MCD in 1961 and the land for construction was allotted in 1983. A national competition for design and construction of Civic Centre was conducted in 1984 and in the year 1989, the architect for construction was finalized. However the project could not be initiated for fifteen years owing to various administrative bottlenecks and scarcity of funds.

Site Location And Description

The proposed Civic Centre is located in New Delhi, at the intersection of Jawahar Lal Nehru Marg and Minto road, opposite to Delhi Stock Exchange building. The site is bounded on the 4 sides up in the immediate vicinity by the following:

East: The eastern fringe of the site is bounded by Waqf board land and M.T.N.L. building adjacent to the Waqf board land. G. B. Pant hospital, Zakir Hussain College and LNJP Narain hospital are other major sensitive receptors in a range of 500 to 700 m from the site. River Yamuna is at a distance of 3 km from the site in eastern direction.

West: Vivekananda road (Minto road) is towards the west of the site. New Delhi Railway Station (750 m), Police station (100 m) and MCD Dispensary (200 m) are other sensitive receptors in western direction. Delhi Ridge is at a distance of 2.5 kilometer from the site in western direction.
**North:** Jawahar Lal Nehru Marg runs along the northern boundary of the site. Ram Lila Ground and wholesale markets of Old Delhi are further North at a distance of about 3 km from the site.

**South:** In the immediate vicinity of the site in southern direction is CPWD hostel, Tagore hostels and Press enclave. Institutional area of ITO, which houses important offices as World Health Organization (WHO), Bureau of Indian Standards, Delhi Development Authority (DDA), Income Tax Offices. Sale Tax Office is in the radius of 2 Km from the site. Cultural hub comprising of Lalit Kala Academy. Mandi House. Sri Ram Centre, FICCI (Federation of Indian Chambers of Commerce and Industry) Auditorium is other important landmarks on the southern side of the site.

**Figure 1:** Location

**Figure 2:** Context Plan

Source: EIA Executive Summary, Civic Center, New Delhi
Figure 3: Site Plan

Figure 4: Context plan 2
Figure 5: Activities– Source: Google maps

Figure 6: Traffic– Source: Google maps
Figure 7: Vegetation – Source: Google maps

Figure 8: Sun path and wind diagram
Figure 9: Movement

Figure 10 Sectional Diagram 1

Figure 11: Sectional Diagram 2
Demographics:

- Population: 11,954,217
- Population density: 4909 persons per sq.km
- Urban transport- buses, metro train
Climate:

- Sub-tropical/ temperate
- Monsoon influenced

Figure 17: Climate Chart

<table>
<thead>
<tr>
<th>Land use</th>
<th>% of Land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>45-55</td>
</tr>
<tr>
<td>Commercial</td>
<td>4-5</td>
</tr>
<tr>
<td>Industrial</td>
<td>4-5</td>
</tr>
<tr>
<td>Green/ Recreational*</td>
<td>15-20</td>
</tr>
<tr>
<td>Public &amp; Semi-Public Facilities</td>
<td>8-10</td>
</tr>
<tr>
<td>Circulation</td>
<td>10-12</td>
</tr>
</tbody>
</table>

* This does not include green areas within the various gross land use categories. On an average the space required per person would be 40 sqm, covering about 920 sqkm of urban area for the projected population of 230 lakh in year 2021.
**Planning**

The site abuts the central part of Delhi which was designed by Edwin Lutyens. The Britishers had developed this part as a separate city with would cater to official and commercial purposes. This plan has a very strong sense of geometry and the overall design portrays a passionate and strong sense of order and symmetry, which was especially inherent to the architecture of the Mughals. Unencumbered and convenient to the existing metropolis, this well drained site offered virtually unlimited room for new buildings of all types with the additional attraction of vistas over landmarks encompassing the entire sweep of Indian history.²

But as one filters through this planned area-Connaught place to the site, the planning grows into more of an urban sprawl towards the Walled City-Old Delhi. The Walled City was known as Shahjahanabad during the rule of the Mughals and it served as their Capital. Lutyens and Baker laid out a geometric pattern of roads radiating from roundabouts while keeping the Mughal and pre-Mughal monuments as axis points. They thus achieved an architectural synthesis of history and, at the same time, extended the garden concept integral to the buildings of the Mughal period to the avenues of New Delhi.³

It is a big transition entering the site from one of these major radiating roads as the planned meets the unplanned. The main cause of this mismanagement and urban sprawl in Delhi is due to lack of proper urban development vision of Delhi Development

---

² Man makes the City: Urban Development and Planning

³ [http://delhibaba.blogspot.com/](http://delhibaba.blogspot.com/)
Authority, along with lack of awareness among villagers regarding urban laws. The neglect of urban villages by the municipality and other bodies are responsible for the deteriorating condition of peripheral villages of Delhi. Additionally high income from tenancy is yet another factor which has led to haphazard and mindless construction of buildings.⁴

**Zoning**

**Site area** - 46,702 sq. M (11.54 acres)

**Proposed ground coverage** - 23.5%

**Ground floor area** - 10,973 sq.m

**Total covered area** - 1,16,000 sq. m

**Landscaping and green area** - 60%

<table>
<thead>
<tr>
<th>S.NO</th>
<th>LANDUSE</th>
<th>AREA(sq.m)</th>
<th>% OF TOTAL AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Built up area</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Commercial</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Institutional</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>*cultural is included in these areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10973.79</td>
<td>23.50</td>
</tr>
<tr>
<td>2</td>
<td>Green areas</td>
<td>27855.98</td>
<td>59.65</td>
</tr>
<tr>
<td>3</td>
<td>Roads</td>
<td>7872.23</td>
<td>16.86</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>46702</td>
<td>100</td>
</tr>
</tbody>
</table>
### Table 5.4: Development Controls - Commercial Centres

<table>
<thead>
<tr>
<th>Use/use premises</th>
<th>Maximum Coverage (%)</th>
<th>FAR</th>
<th>Height (mtr)</th>
<th>Parking Standard ECS/100 sqm. Of floor area</th>
<th>Other controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Commercial Centres:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Convenience Shopping Centre / Local Shopping Centre / Local Level Commercial areas</td>
<td>40</td>
<td>100</td>
<td>15</td>
<td>2</td>
<td>Max. 10% additional Ground Coverage shall be allowed for providing atrium only in LSC.</td>
</tr>
<tr>
<td>ii. Service Market</td>
<td>40</td>
<td>100</td>
<td>15</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>iii. Organised Informal Bazaar</td>
<td>40</td>
<td>40</td>
<td>8</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>iv. Community Centre / Non-hierarchical Commercial Centre</td>
<td>25</td>
<td>125</td>
<td>NR*</td>
<td>3</td>
<td>Maximum 10% additional ground coverage shall be allowed for providing atrium</td>
</tr>
<tr>
<td>v. District Centre / Sub-Central Business District / Sub-City Level Commercial areas</td>
<td>25</td>
<td>150</td>
<td>NR*</td>
<td>3</td>
<td>Maximum 10% additional ground coverage shall be allowed for providing atrium</td>
</tr>
<tr>
<td>(b) Metropolitan City Centre Central Business District</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Commercial Plot: Retail &amp; Commerce Metropolitan City Centre i.e. Connaught Place &amp; its Extension</td>
<td>25</td>
<td>150</td>
<td>NR*</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

i. The size of the plot shall be as in the layout of commercial area and any subdivision of the plot in Connaught Place and its extension should not be permitted

ii. The development controls shall be in accordance with the comprehensive plan of the area to be framed by the local body.

iii. (a) In case of Connaught Place, the existing height shall be maintained and FAR could be achieved by increasing proportionate ground coverage.

(b) No basement shall be permitted in middle circle of Connaught Place.

(c) Mandatory Architectural Controls shall be applicable.
Traffic

The uncontrolled and ill planned growth of urban centers has resulted in a number of problems like traffic congestion, shortages of water and electricity, deteriorating environment and public health. The growing cities have generated the high levels of demand for travel by motor vehicles in the cities. To match the increasing travel demand commensurate efforts have not been made to develop the mass transport systems.\textsuperscript{5}

Based on the rate of increase in the number of trips between 1981 and 2001, it is estimated that the total trips would rise to 280 lakh by the year 2021, including 257 lakh motorized trips and 23 lakh non-motorized trips. In this context, it needs to be noted that roads already occupy 21 percent of the total area of the city, which clearly limits the potential for increase in road length. Apart from the problems and requirements of transportation at the macro level, there are special problems in specific areas, particularly the old city, which deserve special attention. Special requirements will also arise from the mega events such as the Commonwealth Games.\textsuperscript{6}

The major source of traffic around the site is the New Delhi railway Station. It handles an average of 350,000 passengers and 276 trains a day, is built on 87 hectares of land in the heart of the Capital’s business district.\textsuperscript{7}

Due to these high numbers the major roads surrounding the sites are always congested leading to some diversion on the arterial roads from the railway terminal to the site. This

\textsuperscript{5} Traffic Characteristics Of India, Proceedings of the Eastern Asia Society for Transportation Studies, Vol. 5, pp. 1009 - 1024, 2005

\textsuperscript{6} Delhi Master Plan 2021

\textsuperscript{7} http://www.livemint.com/Articles/2008/05/04230753/Railways-to-lease-out-land-in.html
causes pressure on the arterial roads leading to their degradation because these roads are not designed to experience such traffic volume. Moreover the plots along these arterial roads mostly have mixed land use-residential with commercial. So they have a distinct nature of their own, but the extra traffic creates problems. The modes of transport majorly used here are mostly public transport-bus, auto, metrorail, taxi (due to the railway station), followed by private vehicles-2 wheelers/4 wheelers and light pedestrian movement along the arterial roads. The construction of a civic center will increase traffic on the existing major roads and majorly cause congestion on the two intersections on the west front of the site. The change in traffic composition is hard to define because the people might adopt different means of transport according to their convenience and economic means. This will again depend upon the number of people belonging to different economic classes.
CHAPTER 4

BACKGROUND

Cultural

Delhi-- the capital of India reflects the cultural diversity and religious unity of India. It is difficult to define the culture and religion of India. As there is a continuous inflow of people from all parts of India, the cultural diversity is very prominent. These people have different beliefs and different ways of expressing their religion and faith. The history of Delhi is very rich and can be categorized into 3 major eras—Mughal period, British rule and the present modern Delhi. These different periods have left a strong impact on architectural styles.

Site: The site would obviously be visited by people from all types of cultural backgrounds and potentially different requirements. Also the site is surrounded by religious places and grounds used for religious activities and processions. For instance the Ramlila grounds in the vicinity of the site are used for annual religious processions visited by thousands of people.

Taking consideration of these adjacencies, any new development on the site should cater to cultural requirements of its users. This cannot be really reflected in the design for commercial and institutional spaces. Therefore, the cultural block should be designed to integrate these requirements by proposing different kind of outdoor and indoor spaces

http://www.delhitourism.com/heritage/culture.html
needed for holding various cultural events. This could also be reflected by using different architectural styles that depict cultural diversity.

**Social**

The quality of life in any urban centre depends upon the availability of and accessibility to quality social infrastructure. Social infrastructure can be looked at in terms of the facilities indicated in the City Level Master Plan, and Community Facilities, which are indicated at the layout plan level in various use zones. Together, these include social infrastructure facilities pertaining to health, education, sports facilities, socio-cultural activities, communications, security and safety, and other community facilities pertaining to recreation, religious activities, social congregations and community events, cremation / burial grounds etc. These are generally planned in terms of population norms with stipulated permissibility conditions and development controls.

**Site:** The site is bounded by multi-activity developments and land use. It is a sprawl with alternating land uses and no specific zones defined for a particular activity. However this phenomenon cannot be avoided and is included in the Master Plan with developmental controls. The basic infrastructural services are available near and around the site. The best way to tackle such growth pattern is to propose a design which would take care of adjacencies and take care of the problems that may arise due to this development in terms of traffic, infrastructure, service and amenities.
One-third of India’s population lives below the poverty line which basically means that these people are devoid of the basic necessities of life. Wealth distribution is uneven with the top 10% people earning 33% of the total income. The total economic force can be categorized as follows:

<table>
<thead>
<tr>
<th>Sectors</th>
<th>Work Force (in lakh)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Agricultural etc.</td>
<td>0.67</td>
<td>0.8</td>
</tr>
<tr>
<td>2) Manufacturing, Processing, Servicing, Repairs Household Industry</td>
<td>0.34</td>
<td>0.4</td>
</tr>
<tr>
<td>3) Other than Household Industry</td>
<td>17.52</td>
<td>20.9</td>
</tr>
<tr>
<td>4) Construction</td>
<td>5.95</td>
<td>7.1</td>
</tr>
<tr>
<td>5) Trade and Commerce</td>
<td>25.31</td>
<td>30.2</td>
</tr>
<tr>
<td>6) Transport, Storage &amp; Communications</td>
<td>6.20</td>
<td>7.4</td>
</tr>
<tr>
<td>7) Other Services *</td>
<td>27.83</td>
<td>33.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>83.82</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Source: Census of India and projections by DDA Sub-Group (MPD- 2021).

**Site:** The civic center will basically cater to the trade and commerce work force with constitutes almost 30% of the overall work force of Delhi. Since 50% of the civic centre’s area would be dedicated to commercial and institutional activities, it is quite suggestive that there is going a big flux of people using these services. However, there will be various classes of people that will be using civic center for different purposes like main official staff, clerical staff, janitorial staff etc, and these ‘classes’ would have different social and economic backgrounds.

Also the site is surrounded by the slums, which may be considered as socially lowest of living, since these people are not economically sufficient and voluntarily/involuntarily

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9 Wikipedia
do not have access to most of such places. The most viable approach is to open this civic center to all classes of people through design and program so that all the socio-economic conditions that already exist around the site are carried into the building/s.
CHAPTER 5

SLUMS

Today, the population of Delhi is over 14 million. More than 4 million of these people live in slum colonies that are chronically overcrowded and lack even the most basic amenities. Although India is experiencing significant economic growth and increased prosperity, the benefit of this does not trickle down to the level of the slum dwellers and so the gap between the rich and the poor is growing ever wider.

**Rapid population growth**

In 1947, there were 2 million people living in Delhi. There are now over six times as many inhabitants, with rapid and chaotic urbanization placing an enormous strain on the infrastructure of the city. The government of India is struggling to cope with the needs of a population of this size and the social problems that can accompany it. Meanwhile, population growth all over India means that people in rural areas find it even harder to earn a living from the land and so travelling to large cities in search of work remains an option. The density in slums is around 300,000 people per sq.km.

**Site**

The site was originally inhabited by slum dwellers; it was cleared in 2000 by the Ministry of Urban Affairs and employment when the project was proposed. These slums are

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10 http://www.asha-india.org/DelhiSlums/Background.aspx
11 http://www.asha-india.org/DelhiSlums/Scaleoftheproblem.aspx
surrounded by a college on one side and by the site on the other side. This gradation in such adjacent activities creates a kind of imbalance for the slum users as well as other occupants. This civic center must be designed with an understanding of the existing class environment so as not to put further restrictions on the lifestyle of slum dwellers and prevent them from accessing some of the other site adjacencies.
CHAPTER 6

BUILDING SYSTEMS

The proposed complex has to be sustainable and incorporate energy efficient features.

Therefore it is necessary to take care of all the building systems and make sure they perform in accordance with the established codes.

According to the Energy Conservation Building Code, India; here is the classification of the building systems that are needed to be considered while designing.

- **Building envelope**
  - fenestration
  - U-factors
  - SHGC
  - Air leakage
  - Opaque construction
  - building envelope sealing

**Prescriptive requirements:**
- exterior roofs and ceilings
- cool roofs
-- opaque walls
- vertical fenestration
- skylights
• **Mechanical systems and equipment**
  - natural ventilation
  - minimum equipment efficiencies
  - controls
  - piping and ductwork
  - system balancing
  - condensers

  **Prescriptive requirements:**
  - economizers
  - variable flow hydronic systems

• **Service water heating**
  - solar water heating
  - equipment efficiency
  - supplementary water heating system
  - piping insulation
  - heat traps
  - compliance documentation

• **Interior and exterior lighting**
  - lighting control
  - automatic lighting shut off
  - space control
- control in daylight areas
- exterior lighting control
- exit signs
- exterior building grounds lighting

**Prescriptive requirements**

- interior lighting power
- building area method
- space function method
- installed interior lighting power
- exterior lighting power

- **Electrical power and motors**
  - Transformers
  - Energy efficient motors
  - check metering and monitoring
  - power distribution systems

However the actual project proposal defines few of the building systems as below:

**Water Supply and Sewage System**

City water supply from Delhi Jal Board (018) would be the major source of water to the Complex. Two separate connections would be provided, one for MCD and other for the
remaining complex. Tube wells would be developed as an alternate water sources and for other uses like air conditioning etc. Water from tube well will feed the raw water tank and depending upon the analysis report, minimum of pressure filter, softener and chlorination are proposed for treatment of water. Two systems for water distribution, which include gravity system and hydro pneumatic system, are considered for the project. Gravity system with terrace water tank would-be utilized for 28-storied tower block, whereas for the 6-storey block, hydro pneumatic systems shall be employed.

**HVAC and Building Automation System**

The building would be fitted with a central air conditioning system using water cooled centrifugal chillers to provide summer / monsoon cooling and winter heating. The salient feature of the HVAC system design include optimization of power demand by installation of Energy Recovery Wheel (ERW) in the fresh air system, to reduce the refrigeration load by 80%, this in turn will also reduce the air conditioning plant load by 12-15%.

The design also envisaged mechanical ventilation for the car parking area, toilets, pantry, and plant room and other similar areas. Mechanical ventilation for basement involves 10 air changes per hour and in case of fire, same would be increased to 30 air changes per hour. It is proposed to use microprocessor based building automation system to achieve centralized intelligent control of HVAC system. Building automation system would be designed to facilitate efficient and centralized operation, ease in maintenance and strategic control of air conditioning equipment through a central work station.

**Captive Power Generation**

Captive power generation units will be provided for the emergency back-up power requirement. Captive power generation is proposed to be provided for 50% of the total
power requirement. It is assumed that air conditioning system will be shut down in case of power failure. Captive power generation unit include 6 numbers 1500 KVA and 2 numbers 750 KVA DG set for the complex.
CHAPTER 7
EGULATIONS-CULTURAL BLOCK

Occupancy Classification-A

Egress:

- The means of egress shall have a ceiling height of not less than 7’6”
- Walking surfaces as means of egress shall have a slip resistant surface and be securely attached.
- The path of egress travel along a means of egress shall not be interrupted by any building element.
- Elevators, escalators and moving walks shall not be used as a component of a required means of egress from any other part of the building.
- Travel distance between exits $\leq 100$ feet$^{12}$

Accessibility:

- Physical disability access to site/building
- At least one accessibility route connecting all buildings on the site.$^{13}$

Other requirements from the original proposal:

- Open area of 16 m between two blocks.
- Sprinkler system

$^{12}$ International Building Code 2009

$^{13}$ International Building Code 2009
CHAPTER 8

ARCHITECTURE STYLES OF DELHI

Figure 18: Rashtrapati Bhavan, New Delhi

Figure 19: Mughal Architecture
http://www.flickr.com/groups/pakistanphotography/discuss/72157604078214319

Figure 20: Rashtrapati Bhavan, New Delhi

Figure 21: Connaught Place, New Delhi

Figure 22: British Council Library
Source: http://www.flickr.com/photos/vedang/275315351/

Figure 23: Student Canteen- JMI, Delhi
CHAPTER 9

PRECEDENT ANALYSIS

Seattle Public Library14, Rem Koolhas, Seattle, Washington

Total area: 362,987 square feet

- The building is divided into eight horizontal layers, each varying in size to fit its function. A structural steel and glass skin unifies the multifaceted form and defines the public spaces in-between.

- The carpeted "Living Room" contains the fiction stacks while non-fiction is located on the "Dewey Ramp"; a four-story ramp that allows people to browse through books in a continuous sequence. The Reading room, on the top floor, has views of Puget Sound and the surrounding mountains.

Figure 24: Layout, SPL Source: http://www.arcspace.com/architects/koolhaas/Seattle/, OMA

Figure 25: Stacking, SPL Source: http://www.arcspace.com/architects/koolhaas/Seattle/, OMA

14 http://www.arcspace.com/architects/koolhaas/Seattle/
• Koolhaas sees the new library as a custodian of the book, a showcase for new information, a place for thought, discussion and reflection - a dynamic presence.

• The fact that the contents of a whole library can be stored on a single chip, or the fact that a single library can now store the digital content of all libraries, together represent potential rethinking: new forms of storage enable the space dedicated to real books to be contained; new forms of reading enhance the aura of the real book.

• The first operation has been the "combining" and consolidation of the apparently ungovernable proliferation of programs and media. By combining like with like, we have identified five platforms, each a programmatic cluster that is architecturally defined and equipped for maximum, dedicated performance. Because each platform is designed for a unique purpose, they are different in size, density, opacity.

The in-between spaces are like trading floors where librarians inform and stimulate, where the interface between the different platforms is organized - spaces for work, interaction, and play.

Figure 26: Circulation, SPL. Source: http://www.arcspace.com/architects/koolhaas/seattle/ OMA
Analysis

The cultural block has a program requirement of a 120,000 volume library which amounts to approximately 30000 sq.ft. This case study shows an effective organization of large spaces and connection between stacking, reading, official and other public spaces. It also portrays an effective technique of keeping different functions on different platforms and connecting them by a single circulation ramp. The spaces are well designed and show amicability to the occupants in terms of comfort, ambiance, sunlight etc.

Alliance Française, Delhi\textsuperscript{15}

The project has been designed to respect the low rise, light colored materials and integration with the Lodi Tombs, recommended by Joseph Allan’s master plan. The architects proposed to create an environment more than a building - a permeable built form, landscaped open spaces – pavilion in a garden of sorts. By combining what both the countries can offer the best: the High Craft of India associated with the High Tech of France, the project offers an unusual aesthetic. The built form can be understood as 3 layers:

1. The stone plinths that provide informal continuous space for events encourage the multiple uses of open areas and inspire the conviviality of the whole space.

2. The roof layer has louvers to cut unwanted solar radiations in summer months and allow the winter sun to come through while the transparent solar panels create energy for the UPS. This pergola creates a conducive microclimate for outdoor activities.

\textsuperscript{15} http://www.aecworldexpo.com/projects/institutional/alliance-franc\%C3\%A7aise-de-delhi
3. The image of France and India together is portrayed in the spirit of the design and in the detail of the project. The image is the result of the superimposition of distinct identity. Simple, strong geometric forms act as a common denominator for unity. The proposal of Shamiana (pergola roof structure) is in accordance with the French spirit of acceptance of the bold and the unconventional. The plinth layer encourages the Indian phenomenon of living and working in the outdoors and promotes the philosophy of multiplicity and coexistence of many things at the same time and same space.

**Analysis**

This case study is particularly effective in showing cultural familiarity in design besides taking care of the building systems. Designed by a French architect, Stephane Paumier, it
weaves the conventional and the unconventional approaches of design (plinths, local materials with pergolas) and emerges out to be a unique example of creating a conducive environment for indoor as well as outdoor spaces.

**Wolfsburg Cultural Center**

The Center was designed with the goal of providing a place for meetings and cultural activities to balance the monotonous life of a typical industrial city. The building consists of four parts: the municipal library, the dominant element; a small school for adult education; a sector for hobbies and entertainment; and another for club meetings and community events with terraces and lounges.

The building is designed in the form of faculty, closed around its central square. The four parts of the Center formed a single building, divided into separate volumes. This game joints characteristic of the architect, the Center provides its most important features, while separating the areas according to their functions. The link is provided between different units, after successive concatenated units.\(^{16}\)

![Image of Wolfsburg Cultural Center](http://www.greatbuildings.com)

Figure 31: Main Complex-view Source: www.greatbuildings.com

\(^{16}\) Wikipedia
Analysis

Designed by Alvar Alto, this building depicts an image of the Greek ‘Agora’ with a big public space in the center and the building edges as the arcade with multiple public entrances. The massing of this building seems to be pretty effective in juxta-positioning private and public spaces, indoor and outdoor spaces.
Marin Civic Center

Figure 33: Marin Civic Center Source: www.greatbuildings.com

‘The Marin County Civic Center Administration and Hall of Justice buildings dramatically illustrate the kinship of Wright's architecture to the surrounding landscape. The long horizontal buildings gracefully link the crowns of three separate hills. The circular theme is evident throughout the complex. Exterior balconies run down the outsides of both buildings. The decorative arches create a sense of rhythm, and are made of cement stucco on metal laths. Gold spheres outline the entire interior and exterior rooflines. They create the effect of rhythmic unity and exemplify the Oriental influence Wright displayed in his work. Wright first used many features now considered commonplace in these buildings. Atriums run down the center of each building. They widen as they rise from ground floor level to the fourth floor, to create an illusion of upward spiraling ramps. This also creates narrower walkways on the upper floors, where there is less foot traffic. Elevators and stairs link one floor to another. Atrium plantings provide employees and visitors with the
pleasing prospect of either looking inward to the planted, sky-lit malls or outward to green trees and hills.

The building complex abounds with detail. Elaborate grillwork, accents, and appliqués all follow the "flow of pattern" carefully orchestrated by Wright. Glass and panel partitions separate the walkways around the atrium from office spaces to create an airy, spacious effect. Art exhibits on the first and third floors contribute to the aesthetic harmony of the interior. The central architectural focus for the building is the 80-foot diameter dome with its 172-foot, slender gold spire. The spire creates a visual punctuation mark that breaks the horizontality of the two buildings. It was originally designed to serve as an exhaust outlet for the furnace and as a radio tower, which was precluded by new technology.¹⁷

For drawings: http://www.greatbuildings.com/buildings/Marin_Civic_Center.html

**Analysis**

This study is particularly useful in planning the commercial and the institutional parts of the project. Since this group of buildings consists majorly of offices, it is a good example which shows how to design such repetitive spaces without getting monotonous. It also helps in understanding placement of service cores, atriums and grid layout.

**Javits Convention Center- I. M. Pei**

"The exterior of this mammoth, five-block long building is an assemblage of rectilinear forms, all shaped by a framework of prefabricated steel modules fitted with clear glass. Inside, the structure is supported by tubular steel pillars that resemble chunky champagne

¹⁷ http://www.co.marin.ca.us/depts/CU/main/flw/cctourarch.cfm
glasses. At its south end there's a spectacular 150-foot-high lobby, dubbed the crystal palace. Also housed within the center's 1.8 million square feet is a 2,500 seat auditorium and acres of exhibition halls and meeting rooms. “18

Analysis

This building consists of large exhibit spaces/art galleries which is pertinent to the thesis program and will be helpful in planning similar spaces. It also proves to be a good example when it comes to structure and designing unobstructed large spaces.

India Habitat Center, Delhi- Joseph Allen Stein

The India Habitat Centre, located in New Delhi, was conceived to be a catalyst relationship between individuals and institutions (e.g. NGO’s) working in habitat related areas to increase their effectiveness. The centre provides a range of facilities like offices for various organizations, conference venues, exhibition halls, seminar rooms, restaurants and performance venues for cultural activities.

- The whole complex consists of five main building blocks with aerial walkways interconnecting the building blocks.
- These building blocks being separated manage to create interesting courtyards that are partially open to the elements.
Design review

- Though of an imposing nature, the building complex manages to blend in with its surroundings through its natural embellishments. In keeping with its habitat theme, the whole complex has been generously provided with natural greenery to provide an undiluted experience of open nature.
- The fountain just beyond the second entrance serves purpose not only by being spectacular, but also by relieving the surroundings of the heat.
- The interesting glass/steel structure near the second entrance provides natural light to the underground parking area.
- The building’s two entrances are not one and the same.
- The first entrance depicts a seemingly long deep corridor.
- The second entrance seems to hide the spacious courtyards.
- The absence of roof gutters rids the complex of clutter. Instead, separations between walls that are lined with tiles facilitate the disposal of rain water.
- The roof shading devices not only look spectacular in sky blue, but also serve to block out the Sun’s rays.
- The external facade of the Convention centre has a mundane appearance which masks the open inner space.
- The courtyards laden with various types of vegetation from tall trees to small shrubs create different spaces.
- The presence of an amphitheatre also marks an interesting feature of the complex.
• The area without the shading devices is laden with grass lawns to provide a different setting altogether.

**Energy Efficiency**

• The interesting blue sunshade provided between the two buildings in court helps to maintain the environment and gives a cool effect.

• The trees also help to maintain the environment and give the natural effect. Trees are planted at very part of the court.

• Fountains make the environment more cooler & give a effect of lightness.

• Allen stein planned the building in such a way so that the maximum part of the floor enjoys sunlight.

• Allen stein also planned to give sunlight in basement through very interesting ways.  

![Figure 37: Massing](http://www.archinomy.com/case-studies/270/indian-habitat-center-new-delhi)  
![Figure 38: Courtyard](http://www.archinomy.com/case-studies/270/indian-habitat-center-new-delhi)

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Analysis

This building is an excellent example of designing large spaces separately and providing effective connections between them. The courtyard spaces are an effective strategy for controlling sunlight and winds in such tropical climates and integrating them with the immediate spaces in order to enhance the functionality.

**Jawahar Kala Kendra, Jaipur, India**

Charles Correa

A contemporary building based on an archaic notion of the Cosmos; the very same Navgaraha mandala, with one of the squares moved aside, to recall the gesture that created the original plan for Jaipur.\(^\text{20}\)

\(^{20}\) http://www.mimoa.eu/projects/India/Jaipur/Jawahar%20Kala%20Kendra
Analysis

Culturally responsive spaces, well planned courtyards
CHAPTER 10

PROGRAM REQUIREMENTS

I will follow the program requirements as of the original project proposal. The program can be broadly categorized into: commercial institutional, cultural and parking. I will propose the master plan for the entire site (12 acres) but only design the cultural block of it.

The program divisions are listed in the remainder document.

**Area Chart for the entire Project Proposal:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLOT AREA</td>
<td>11.54 acres</td>
</tr>
<tr>
<td>NO. OF FLOORS</td>
<td>28 nos</td>
</tr>
<tr>
<td>TOTAL COVERED AREA</td>
<td>116755 sq.m</td>
</tr>
<tr>
<td>COMMERCIAL AREA</td>
<td>58377.5 sq.m</td>
</tr>
<tr>
<td>INSTITUTIONAL AREA</td>
<td>58377.5 sq.m</td>
</tr>
<tr>
<td>PARKING CAPACITY</td>
<td>2500 vehicles</td>
</tr>
<tr>
<td>AUDITORIUM</td>
<td>1000 seating capacity</td>
</tr>
<tr>
<td>LIBRARY</td>
<td>1,20,000 volume</td>
</tr>
<tr>
<td>ART GALLERY</td>
<td>2000 sq.m</td>
</tr>
<tr>
<td>BANQUET HALL</td>
<td>1500 person capacity</td>
</tr>
</tbody>
</table>

**Program: Macro and Micro**

Macro program deals with the general proposal for the site.
Micro program deals with sub-programs of the proposal and informs about what all functions are accommodated in a particular building or a set of buildings.

According to the actual proposal, the commercial and the institutional areas are accommodated into one building, each allocated 50% of space.
Micro program: Cultural Block

- Library: 30000 sq.ft
  (shelving, reading, other support spaces)
- Auditorium: 7000 sq.ft
- Art galleries: 21530 sq ft
- Banquet halls: 20,250 sq ft
- Open event areas: 25,000 sq ft
- Support offices
- Toilets
- Service areas

Parking

Parking facility for 2500 vehicle would be provided within the Civic Centre complex, with about 70,000 sq. m of area. 50 % of the parking would be for MCD officials and 50 % would be for commercial and cultural space. Parking would be distributed in incidental surface parking zones, as well as in three successive basements.
CHAPTER 11
DESIGN

The thesis project aims at exploring the parametric modeling techniques to develop an architecture that responds to the natural habitat of the site. It deals with merging the context with a certain degree of variance provided with the modeling capabilities of Rhino to create an ambient nest which would cater to the intense culture and social stratification in India.

Figure 44: Densities around the site

The design reflects the juxta-positioning of the different densities that happen around the site, overlaying of information from the planned and the unplanned and incorporating entropy into the various systems on the site. It is an exploration where the urban meets
the rural, economy meets the social conditions and where the bazaar system is carried into the normal daily lives of the people.

The building forms continue into the oscillating ground plane and flow back up into something more structural. The inbetween-ness of these intersections becomes an interesting space to be explored in terms of an abode where people would mingle and congregate. The buildings are more like a continuous flow of a structural system which sometimes elevates up and subsides down and under the horizontal plane at other instances. These intersections form certain structural passages which would be primarily occupied during the day time as they will cool and shaded. There are depressions which work like a public spaces and recede into the cave like forms, an unconscious
randomness leading people to all the spaces and program on the site.

The design is essentially a function of the roofs and ground, the walls are mostly screens which provide a connection between the undulating floor slabs and the roofs. The walls are translucent screens which help in bringing out the program from the interior to outside areas covered by the overhanging canopies and beyond into the open spaces which act as nodes where circulation paths intersect and become ‘nodes’.

The nodes may be defined as intersections where the density of people gathering would be the highest. They would cater as event spaces, information nodes, seating, informal eating spots, and other architectural symbolisms.

At some places, the roof canopies are supported on the exterior by steel columns, this is a suggestion of that the structure is carried out from the interior to the exterior thereby

Figure 47: Layers on Site
creating small niches around those columns, which would be the points of social
gathering and will also act as shading devices.

Figure 48: View through the Auditorium canopy into the event space

The occupancy of these spaces will be diurnal. Considering the climatic conditions the
occupancy of the indoor and the shaded spaces will be during the day time, as the sun
will recede, people will start coming out and occupying the central open spaces. During
the evening time the character of the place will considerably change as it will be a host to
cultural events and other social activities.

Figure 49: Local business at nodes
CHAPTER 12

PROCESS

The process followed to reach to this design involves a series of steps and experiments with images of different parts of the site.

1. The first step involved extracting two parts of the site- dense and sparse, overlaying them and creating a mesh out of it, analyzing the different densities on the mesh, color coding them and roughly identifying the spaces as open, built, circulation etc.

2. The next step involved overlaying this colored mesh on the site, developing a system of preliminary connections, identifying nodes and roughly zoning out the program according to the site conditions.
3. The third step involves using the same image (step 1) to generate a series of heightfields, keeping a few parameters constant and making the others as variables. These heightfields were then analyzed three dimensionally.

![Figure 53: Analysing heightfields three dimensionally](image)

4. These heightfields were then cut in section to study the variations in heights and information was extracted to develop sectional and elevational features.

![Figure 54: Extracting elevational features-Step 4](image)
5. The heightfields(two) generated in Step 3 were cut with a horizontal plane to get masses and voids, these compositions of lines were then used to derive open spaces, built forms and major water circulation systems.

![Figure 55: Cutting heightfields with horizontal planes](image)

6. A wire mesh was extracted from the same image (step 1); the mounds visible in the images were defined by lines of strong force and points and paths of inflection. These lines were extracted and used to develop circulation patterns.

![Figure 56: Extracting circulation patterns- Step 6](image)

![Figure 57: Developing roof forms- Step 7](image)
7. The masses and voids that were achieved in step 5 were cut by sectional curves separately; these compositions of curves were then lofted and developed into roof forms. Similarly the site ground plane was developed by lofting series of curves.

8. Then, step 6 and step 1 were again combined to develop a more formal system of nodes

![Figure 58: Step 8](image)

9. All the steps above were then combined, edited, modified and manipulated to achieve a formal basic diagram where zoned out the various programs and systems and open spaces.

![Figure 59: Step 9](image)

10. To blend with the built forms, the paths were then elevated to form a structural continuous system which would house the functions of many nodes.
11. This entire process was then thoroughly analyzed edited in accordance with the construction feasibilities.
Analysis

This project is a representation of densities. A study was done to analyze how abstract compositions of contours and points become suggestive of the functions and things happening at a certain instance on the site. Images were generated with different permutations of the layers of site and they were quite suggestive as the ground plane suddenly changed intensity at different levels. These intensities are of different magnitudes and give a visual perception of the intricacies of different program happening on the site.

Figure 61: Density analysis
Sustainable design features

1. Roofs- the roofs will be green roofs in patches; this will minimize the heat gain of the spaces below. The roofs modulate in such a manner that they will drain the water into the 3 major water channels on the site.

![Figure 62: Water channels](image)

2. Water channels- India has a very dry summer and a very wet monsoon season. According to the byelaws and construction over 100 sq.m has to incorporate rain water harvesting measures. There are four major water channels on the site in which the roofs will drain the water during the rainy season. They would act as an architectural landscape feature for most of the months during the year. The water will provide passive cooling by evaporation during the day time. When excess, the water will be used for auxiliary purposes of the buildings. Water from depressed central spaces would be collected and fed to these water channels.

3. Passive cooling-shading: the roofs cantilever out forming extensive canopies. They provided shaded niches where people would gather during the daytime. Since the walls are mostly translucent, these canopies will help in reducing the heat gain through glass surfaces of the building.
Civic Center for Municipal Corporation of Delhi, India

Context

Site Experiences

Sun & Wind

Movement

Activities

Traffic

Akanksha Sharma
ARCH DES 799-01 Masters Thesis Project

University of Massachusetts, Amherst
2008-2010
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STEP 1: Extracting heightfields from information derived from the site forming method which have variable directions, organizing the area as buildings and circulation etc.

STEP 2: Overlaying the colored mesh on the site, developing a system of preliminary connections illustrating the nodes and possible directions these nodes could have.

STEP 3: Using graphics of new parts of the site, superimposing them onto each other and extracting fields with a common set of variables.

STEP 4: Extracting information from heightfields to develop spaces.

STEP 5: Extracting systems Roots: Ground, Flow of water on site.

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ARCH DES 799-01 Masters Thesis Project
University of Massachusetts, Amherst
2008-2010
Civic Center for Municipal Corporation of Delhi, India

Contour: Site/Built

Contour: Site/Roof

Points: Site/Roof

Points: Site

West Elevation

Akanksha Sharma
ARCH DES 799-01 Masters Thesis Project

University of Massachusetts, Amherst
2008-2010
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