

**EMPOWERING WOMEN OF BANGLADESH
IN THE GARMENT INDUSTRY**

A Thesis

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I would like to thank my parents, my three sisters and my husband for being supportive throughout this difficult but wonderful journey.

I am also grateful to my committee members, friends and classmates who help me through this process.

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ABSTRACT

Women's empowerment is an important aspect of the social, political and economic life of developing countries. Globally, women's economic and political empowerment performance has changed through education and labor, but it is still unsatisfactory. Bangladesh is a developing country with a key role in the global competitive Ready-Made Garment (RMG) industry where women are the majority. This paper discusses the existing societal inequalities in Bangladesh, the condition of female workers in the RMG industry, and challenges the current built environment of the garment industry. How can architecture influence the RMG Sector of Bangladesh leading to women empowerment? It includes literature pertaining to the rights of female workers, the environmental and safety issues of the garment industry in Bangladesh to identify the key problems and explore aspects of the built environment helping women to be self-independent and educated about their rights. Observation of factory practices and quantitative data based on interviews with female workers are the methods of this research. Analysis of architectural projects such as Knitexpo Limited, Whitex Limited and Nandan Apparels (Bangladesh) frame design issues within current RMG conditions, and MAS Intimates Thurulie and Ipekyol Factory offer opportunities to reconsider the Bangladesh factory environment as these examples are from RMG global counterparts in other countries and successful addressing users' need. This paper identifies the key elements of the garment manufacturing context to form a new architectural approach politically, culturally and socially to improve the condition of female workers in Bangladesh, elevate their value and provide opportunities leading to empowerment.

Key words:

Women empowerment, Ready-Made garment, female workers, built environment, Bangladesh

INTRODUCTION

According to World Development report 2012, women across the globe have made positive strides towards gender equality through education and labor force. Reducing the gender gap is a challenge in developing countries for economic and social progress. Therefore, it is a global issue to improve the rights, economic condition and social status of women particularly in developing countries.

Bangladesh is situated in South Asia with over 160 million people, struggling with education and unemployment problems, healthcare facilities, political and economic difficulties. The society is divided in different layers of inequalities. Women suffer discrimination in all those layers due to gender, less mobility, lack of self-awareness, education and healthcare services. They face hardship as a result of cultural, religious and social constraints of the society. Social inequality is the most crucial as it causes other inequalities in the society. Therefore, the status of women in Bangladesh has been ranked the lowest in the world based on twenty indicators including health, education, children, employment and social equityⁱ. Women are half of the population so, their participation in income activities are important to improve the social status, economic growth, and empowerment.

Empowerment means having increased life options, achievement of greater control over one's life and the capability of living life to one's wishes. It is a multidirectional process that is observed indirectly depending on context. Demographic, economic, social status and media exposure are the determinants of women's empowerment in which education, self-esteem, decision making, mobility and financial independence are the main indicators.ⁱⁱ According to the United Nations (Global Compact), the third principles of women's empowerment is to ensure the health, safety and wellbeing of all workers. The scope of the research is to explore a healthy and safe environment for female workers in Bangladesh. Education, training

and professional opportunities are the key aspects that can empower women and improve their economic and social condition which is the 4th principle.ⁱⁱⁱ

So, how can architecture ensure a healthy and safe environment, integrating the support of education and training facilities leading to women empowerment in the garment industry of Bangladesh? What are the design considerations that can provide transparency and play a role to create self-awareness among women in a built environment and construct positive change in the society?

METHOD

Literature about the social inequalities in Bangladesh, workplace and problems of garments industry is reviewed carefully. Face-to-face interviews are conducted with the female workers, owners and investors. knitexpo Limited, Whitex Limited and Nandan apparels are the case studies that have been chosen randomly in Bangladesh to explore current condition in the RMG sector. Case studies of the MAS Intimates Thurulie and Ipekyol Factory are selected due to their success regarding addressing users' needs through architectural considerations.

GENDER EQUALITY AND ITS IMPORTANCE

According to the World Development Report 2006, gender equality means equal access to the "opportunities that allow people to pursue a life of their own choosing and to avoid extreme deprivations in outcomes"—that is, gender equality in rights, resources, and voice. Equality of rights refers to equality under the law, equality of resources refers to have equal opportunity and equality of voice captures the ability to contribute to the political discourse and development process.^{iv} So, gender equality means that all women and men have the same rights, responsibilities and opportunities.

Gender equality is important to enhance the economic efficiency and progress.

Removing barriers to women in education and economic opportunities can generate wide productivity gain, improve the social status and produce better institutions and policy choices. According to the 2010 Millennium Development Goal (MDG), 2015 gender equality and women empowerment can reduce income and non-income poverty along helping to achieve other goals. ^v

GENDER INEQUALITY IN BANGLADESH



Figure 01: Location of Bangladesh

The family structure in Bangladesh is patriarchal. Women usually stay at home taking care of the family and household affairs while men are the head of the family working outside home. Girls are financial burdens to their families because parents prefer to invest money on the education of boys as they will take the responsibility of families in future. As a result, girls are raised within cultural and social restrictions. However, the family pattern is changing in cities due to globalization and extended families are broken into nuclear families. In Urban areas, sometimes women work outside the home along their husbands, but not all women can make household decisions.

Early marriage and pre-occupied mind set of the society about the mobility of women

limit the access of young women to education, employment opportunities and create a vulnerable situation to their health. Low parental education, high population growth, economic hardship, high rate of unemployment, unequal distribution of wealth and environmental change are the other considerations forming inequalities in the society.^{vi} Thus, girls and women face difficulties in Bangladesh. Though the role of women in families is altering in urban areas, the process is slow in villages. Several policies such as food for education, primary scholarships are provided by different non-governmental organizations (NGO) like World Bank, Bangladesh Rural Advancement Committee (BRAC), and government organizations to encourage girls in education.

THE GARMENT INDUSTRY IN BANGLADESH

The RMG industry has become an important key for exporting products, a leading source of foreign exchange, and employment opportunities particularly for women. Currently, there are approximately 5000 garment companies in Bangladesh providing employment to about 3.6 million workers of which 2.8 million are women^{vii}. This sector is a major contributor in the Gross Domestic Product (GDP) index of Bangladesh and almost 12 % of GDP comes from this sector in 2009 and 2010^{viii}. According to the statistics of Department of Commerce, Bangladesh stood 2nd just next to China in exporting RMG products worldwide. Despite the success of the garments industry for developing the GDP of Bangladesh, this sector might face a decline due to its poor working environment, lack of code compliance ^{ix} and frequent incidents. This is critical as the economic growth of the country and life of female workers depend on this industry.

CHEAP LABOR AND GENDER DISCRIMINATION

The garment industry is growing rapidly based on cheap labor and maximum production cost supporting the garment owners and ultimately their retail clients. The majority of garment workers in Bangladesh are young women who are the lowest paid. Workers receive a wage labor of US \$0.15 per hour in Bangladesh compared to the same work in the USA at \$ 16 per hour.^x Moreover, there is wage discrimination among men and female workers. Informal employment, sudden termination, irregular payment, and excessive work load occur in this sector. Owners exploit workers to keep pace with the global competitive market. Because most of the female workers are illiterate and unaware of their rights. Lack of alternative employment opportunities force illiterate women to work in factories. They work as cheap labor despite having a huge workload of 8-12 hours, six days in a week. An analysis of wage among workers of the selected case studies (Bangladesh) is shown in table 01:

Case Studies	Knitexpo Limited	Whitex Limited	Nandan Apparels
Wage per month including overtime	75-80 USD 5 pm-09/10pm overtime	100-125 USD 5 pm-09/10pm overtime	70-100 USD 5pm-09/10pm Overtime

Table 01: Wage analysis among factories

According to the authorities, wage labor is different due to the salary structure of each factory, overtime and workers `performance.

WORKING ENVIRONMENT AND HEALTH HAZARDS

The working environment is a serious problem in the garment industry. Most of the workplaces are not designed as factories. The rapid growth has emerged to use quickly and cheaply constructed

buildings for factory purposes, often without the required permits. They are constructed quickly and cheaply resulting in safety problems. Sometimes extra floors have been added to fulfill the demand of workforce and machinery. Overcrowded working space with inadequate lighting and ventilation make the space polluted to many contagious diseases. There are no proper exhaust fans to leave the toxic substances and dust outside. Dust from raw materials and toxic substance like dye from colored cloth create a polluted working environment. The working space, restrooms, and dining areas remain unhygienic. As a result, many female workers suffer fatigues, headache, anemia, eye burning, ear pain, cold, and urinary tract infection due to improper working environment and workloads.

SAFETY ISSUES

Safety issues have become a vital question in RMG sector. According to Bangladesh Institute of Labor Studies, at least 1,841 workers died due to building collapse and fire over the last 12 years. Recent statistics include in November, 2012 where 117 people died and about 200 workers were injured in a fire caused by faulty electrical circuit.^{xi} But the worst incident occurred on April 24, 2013, a collapse of 8 storied garments factory “Rana plaza” in Savar took lives of approximately 1137 workers and left more than 200 people still traumatized ^{xii}. Approximately 80,000 safety problems have been found in about 1106 factories after Rana plaza tragedy inspected by groups of European expert^{xiii}. Inappropriate fire egress and locked fire exit, lack of emergency plan and evacuation system, absence of sprinklers and fire extinguishers, faulty electrical circuits, and structural defects are the main causes. Moreover, safety matters like using safety google, hand gloves, needle guard, mask and hose pipe are not maintained properly.

Whitex Ltd. and Nandan Apparels provide a safer environment than Knitexpo Ltd. But, having major fire equipment does not ensure the safety of a factory. Owners

need to execute sudden evacuation practice and increase awareness among the workers. An analysis of case studies (Bangladesh) of the safety issues is shown in table 02 to understand the current condition of the garment built environment.

Safety	Knitexpo Limited	Whitex Limited	Nandan Apparels
First aid box	√	√	√
Fire Extinguisher	√	√	√
Smoke detectors	x	√	√
Fire alarm	x	√	√
Sprinkler	x	x	x
Emergency light	x	√	√
Fire egress	x	√	√
Fire door	x	√	x
Trained fire fighters	x	√	√
CCTV camera	x	√	√

Table 02: Safety

INSECURITY

The owners are not concerned about providing facilities for female workers including medical care and day care amenities. Due to lack of proper appointment letter the female workers feel insecure about their jobs and life. They can be fired anytime so they work in a low wage to support their families. Another important insecurity is the sexual harassment. Female workers are vulnerable to physical, psychological and sexual abuse in the workplace. According to a health survey on safety regulations in garment industry, sexual harassment is the

most dominant source of stress for garments workers. ^{xiv}

OBSERVATION AND INTERVIEW

Three factories have been selected in Bangladesh randomly where majority are female workers and all the products are exported abroad. Total 12 Interviews with female workers, 4 in each factory has been conducted during visits in Knitexpo Limited, Whitex Limited and Nandan apparels.

A general comparison among the factories are given below:

	Knitexpo Limited	Whitex Limited	Nandan Apparels
Location	Chittagong	KEPZ, Chittagong	Gazipur, Dhaka
Building	4 stories	6 stories	6 stories
Workers/square feet (sewing section)	48	63	34
products	Sweaters	Undergarments	Shirts
Female workers	60%	80%	75%
Child labor	yes	May be	No, medical test are done
Facilities			
Transport Allowance	√	√	√
Medical unit in the factory	x	√	√
Daycare unit	x	√	√
Bonus festival	√	√	√
Training	x	√	√
Lunch	x	√	x
Dining	x	√	√

Table 03: Overall comparison among the case studies (Bangladesh)

There is lack of architectural expression for factory buildings. Most of them have windows at regular intervals in all façade

without making consideration of the building orientation and climate.

Whitex and Nandan have the same type of elevation with windows and painted walls without any design tactics. According Saleha, working at Nandan "Sometimes I feel hot during work in spite of having ceiling fans in the workplace. Those who are near the windows are lucky as they get both daylight and ventilation." The landscape consists mainly of hardscape and concrete. However, positive response to reduce insecurity in the factory is observed at Nandan Apparels. Workers in each production line select his/her own representative. They work as a team to express their problems to the authority. A female representative is also employed in the administration to maintain balance between owners and workers. Any female worker can share problems with her. This is very helpful to reduce the gap.

WHAT DO WOMEN WANT?

"It is really hard for me to work 9-10 hours. I feel tired all the day and get only 6000TK (75 USD). It is not enough to pay house rent and buy foods. I never go to school. I want my children to go to school"

_ Salma Begum, a worker in sewing section.

"I do not have time to think about factory environment. I feel happy and relieved when I get the salary each month." _Rani, a worker in sewing section.

"I am only 15 years old and hide my age to get the job here. Sometimes, I realize that I don't want to spend my whole life working in factories. "_Nupur, a factory helper

A major observation during interviews is that female workers remain absent from dialogues about the garment industry. Most of them are more concerned receiving their wages rather than the conditions of the workplace. Sometimes they are given instructions to lie about their age, working hours and workplace. They come together

from the same settlement to avoid unwanted comments from stranger in the street. Therefore, it is clear that women have to fight against poverty, poor working environment and insecurity. A summary is given below from direct interviews

Age	Female workers	Education	Female workers
15-18	03	No education	09
19-29	09	Class I-V	03
30-35	_	Class V-X	_

Table 04: Age and education

Facilities	Satisfied	Un-satisfied	No comment
Workplace	05	_	07
Lighting	05	02	05
Ventilation	04	02	06
Transportation Allowance	02	_	10
Medical unit in the factory	03	04	05
Daycare unit	04	05	03
Bonus festival	03	02	07
Training	05	_	07
Lunch	04	_	08
Dining	03	06	03

Table 05 : Facilities and satisfaction level

The next two case studies ,Mas Intimas Thurulie (Sri Lanka) and Ipekyol Textile factory (Turkey) can be role models for Bangladesh garments because they are constructed to make a change in factory practices socially as they involve architectural considerations and clients–architects relation to improve the built environment and productivity gain. Mas Intimates Thurulie provides educational program, free meal, and good salary for female employees. On the contrary, green courtyards, external play area and training school are provided at Ipekyol Factory for the workers to reduce stress and increase productivity.

CASE STUDY 01: MAS INTIMATES THURULIE

MAS Intimates Thurulie is a LEED certified eco factory and has been chosen to understand how it influences the working environment of female workers with sustainable approach. The building seems different as it is situated in an industrial park area minimizing its foot print and maximizing open space. In fact, Mas Intimates Thurulie claims to be the world’s first clothing factory powered by carbon-neutral sources.

It is an East-West elongated two story building (10,000 sqft) with green roof on the top of the cafe reducing heat. Workers go to their production hall exploring the nature as trees are preserved on site. Each production block has its own courtyard to cut down the heat and act as micro climate modifiers. The café for the workers is located on the upper floor of the administrative block so that they can enjoy a view of the pond with its surrounding nature. There is also a shrine and medical units for the workers.

The building is designed based on passive cooling strategies including the building orientation, massing and volume, ventilation, surroundings, solar reflectivity of the facades and roof. The photovoltaic roof on the south side covers 200 square meters of the building with solar panels which transforms into electricity. The rain

water is collected on the roof for flushing. Wastewater is treated on the site in an anaerobic plant and is purified into the retention pond.

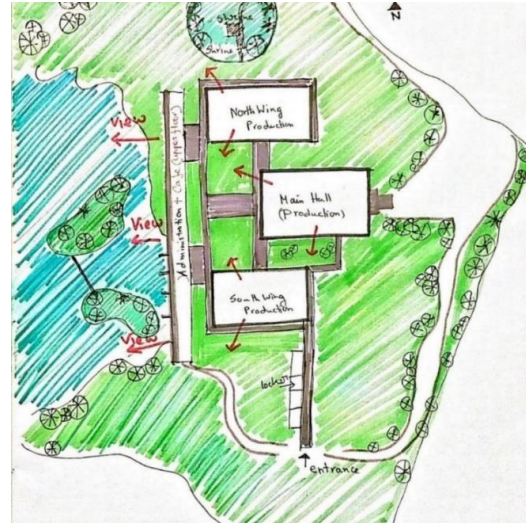


Figure 02: Surrounding of MAS Intimates, sketch by author

800 workers, predominately female, earn on average 11000^{xv} Sri Lanka Rupees a month, plus an allowance for transport, receive free breakfast, lunch and medical facilities. Large windows on the production space have been provided for natural ventilation and daylight. “We feel like we’re working in a natural environment. There are trees around and good ventilation though there is no air conditioning,”^{xvi} tells machine operator Harshini Maheshika. Moreover, MAS has developed “Women Go Beyond,” a program to educate and empower women, who comprise 85 percent of the plant’s workforce.

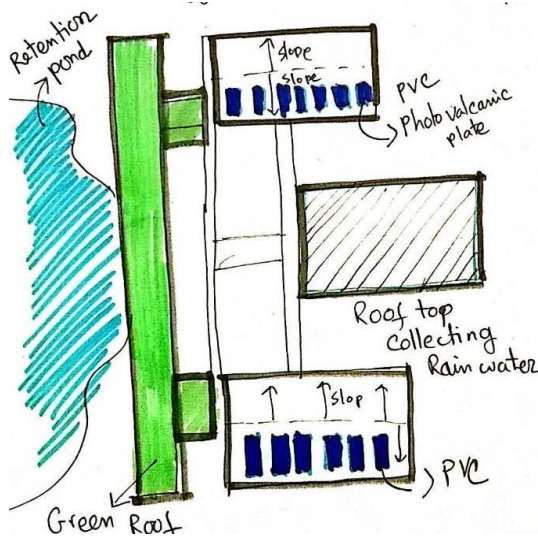


Figure 03: Roof plan showing sustainable features, sketch by author

The workers have to walk through a long corridor which offers them to see the natural surroundings. The café is facing the pond so they get a visual experience. Locally available materials have been used in order to make the workers comfortable. It is a good example as the energy consumption is 25% lower than that of comparable factories only using renewable and carbon neutral energy sources.

It is definitely one of the best factories that tries to provide human comfort addressing sustainable design approaches though passive cooling, green roof and recycling water as well as providing sensual experiences through vision, light, water and surrounding nature. It can be a good inspiration for factories in Bangladesh

CASE STUDY 02: IPEKYOL FACTORY

The Ipekyol is designed by EAA - Emre Arolat Architects winning Aga Khan Award in 2010. Most of the works of EAA are in Turkey and London practicing contemporary architecture. Ipekyol Factory is an example of successful collaboration between client and architect. Because it integrates the production target with the safety and comfort of its employees.

The architect believes that designing a large single structure for administration and production spaces under one roof improves internal communication and increases team work. The large structure is broken down by linear gardens. The shape of the building responds the function of the production line. Three light wells, five internal courtyard gardens, glazed southern façade with high ceiling provide each employee a pleasant environment and encourage natural ventilation with optimum lights and natural views.

The building is 20,000 m² and 14m high containing not only production facilities but also a training school, administration areas and catering^{xvii}. A pool in front of the entrance, a surface car park, an external play area and plant room are located on the outside. Thus it provides recreational areas for the workers. It is made with local materials. Water is collected from the roof and drained into the local system and is recycled by the factory.



Figure 04: Internal Courtyard

The Ipekyol factory is an excellent example as it allows a new design approach and construction that emphasizes architectural design and the comfort of the workers through the relationship between client and architects which is a positive stride to encourage this industry socially and economically. It tries to engage people with the internal courtyard. According to the jury citation of Aga Khan Award, Ipekyol Textile factory is a role model to be efficient and provides a pleasant working

environment combining the commercial advantage of the client.

DISCUSSION

It is high time we gave importance to female workers in Bangladesh. We must provide facilities that can elevate their social status culturally. Major social and architectural considerations that need to be taken:

- a) Working hours should be minimized with increment of regular salary
- b) Medical and training facilities should be provided
- c) Child care and education unit should be provided
- d) Quick action against those who misbehave with female workers
- e) The Bangladesh Garment Manufacturers Export Association (BGMEA) should be aware of the violations of labor law
- f) Structural and architectural plan should be executed per standard code
- g) Proper consideration for lighting method, ventilation and space quality
- h) Break out spaces should be provided
- i) Consideration of recycled materials and minimizing impact on local ecosystem

We can see that the MAS and Ipekyol have been successful to provide a safe environment that can also achieve good productivity. A new design approach has been developed to encourage daylight, natural ventilation and natural views for space quality that demonstrate how design can enlighten employees during production works and value their contribution. Women in garments deserve a better built environment, health care services, training facilities and education to be empowered and elevated in the society.

CONCLUSION

Best practices in design must include user needs and appropriate selection. However, in Bangladesh, site is not considered with importance. The government emphasizes to provide areas free from cumbersome processes for potential investors.

Bangladesh Export Processing Zone Authority (BEPZA) is the official organization that works in this issue. Karnaphuli Export Processing Zone (EPZ), located in Chittagong, is new in comparison to other 7 zones situated in different parts of the country under BEPZA. Any site in this zone can be a potential one because more than 14 investors from India, USA, Sri Lanka and Hong Kong have allotment for factories and can take initiatives for better factory practices. Figure 05 illustrates the design tactics and inter-relation based on observation and interviews.

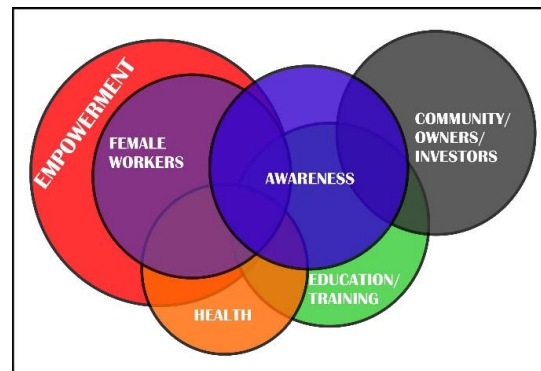


Figure 05: Design tactics based on observation and interviews

These architectural solutions can comfort women in the workplace, help them to experience a better built space, enhance their perception about life, and increase self-awareness. We need environment friendly design approach that integrates education, training facilities, working environment and employment that can advance poor women and support the society. Access to educational and social awareness program is required in the RMG industry to guarantee the rights of female workers and empower them in the society.

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ADDENDUM

My journey

I have always been attracted by the power of arts like sketches of surrounding environment and doing handmade crafts since my childhood. While studying in high school I realized that I want to be in a creative field and became passionate to study architecture.

Throughout my life, I always have tried to do something that reflects my way of thinking and the whole process of design helped me a lot not only to perceive spaces but also pushed me to explore myself more in architectural thought. The initiation of my formal architecture education occurred when I enrolled for undergraduate studies in the department of architecture at BUET, the most prestigious academic institution for architecture in our country.

My real journey begins in 2014 when I came to the United States of America to pursue my master of architecture at Miami University. I am the first student who came from Bangladesh in the department, so every day was a new experience and challenge for me. I believe that, the journey will continue through my professional career.

Why I choose this topic?

My thesis is about empowering women of Bangladesh in the garment industry. I choose this topic as in 2013 there was a terrible incident, a factory of 8 storied building suddenly collapsed where almost 2000 female workers died. From that incident, I was asking myself a question, how can we improve the situation through architecture? It is a social problem and some people think that we can't solve social problem through architecture but I do believe that architecture can create a different experience for the users. I believe that architecture can start that notion and change to create a better built environment in factories.

In the design process, I first started to consider urban issues, how the workers come from their home to factories, and what kind of spaces they experience every day. I realized that there is a huge gap between the working place and residential zone. So, my first proposal is to provide a pedestrian walkway and green spaces along it. I call it "green intervention through landscape, users' participation and activities". It is really important to provide spaces where the workers can interact and get proper facilities. Secondly, I wanted to change the way the factories work and introduce a more collaborative environment where, they can learn from each other and start their small business by learning different skills. Thirdly, I use fabric in exterior not only for sunscreen, noise protection and aesthetic reason but also for promoting their work. The fabric will have printed images including social awareness, and it will be a celebration, a celebration of their work and identity.

Presentation Feedback

My presentation was on April 18, 2016 and had a great conversation with the guests. I had a visual presentation focusing the soundscape of factories which helped them to understand the context. They appreciated fabric in exterior to give a new identity for garments. One of the aspects they suggest, is to explore more with fabric and how I can interpret culture within this concept .Tensile fabric might bring another dimension to the rigid mass and impact more in their lives which would be the next step to explore for this project. Overall, they agreed that the social role of architects is really important and the architects should come forward more on these social problems.

Conclusion

I really enjoyed the design process and I think that I have become more critical during the whole process. I wish that, the situation improves in factories and female workers raise their voice for their rights. It is very important that we provide a healthy, safe and a sensual experience through architecture. For this, we need the support of other sectors that impact the environment of factories.

“Dream something big so that you can achieve a part of it” and I believe so. It’s the imagination that drives me to create some spaces first in a blank paper, perceive that spaces and later translate all into three dimensional spaces. That happiness and feelings of creation is beyond expression and I believe that it provides a different experience for the users. I hope that one day I will be able to help underprivileged women in my country and be a role model for others.

**PAPER PRESENTATION
AND
DWELLING SYMPOSIUM : DESIGN +SPACE**

Empowering Women Of Bangladesh In The Garment Industry

Garment Industry



Freedom

Social status



Education

Safety

Female workers

Training

Empowerment

Bangladesh is a developing country with a key role in the global competitive Ready-Made Garment (RMG) industry where women are the majority of the garment workers.

How can architecture ensure a healthy and safe environment, integrating the support of education and training facilities leading to women empowerment in the garment industry of Bangladesh?

Built Environment

How can architecture influence the Garment Industry of Bangladesh leading to women's empowerment ?

PAPER PRESENTATION





SITE ANALYSIS

LOCATION OF BANGLADESH

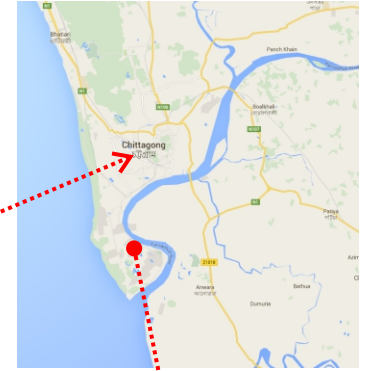


Bangladesh in world map

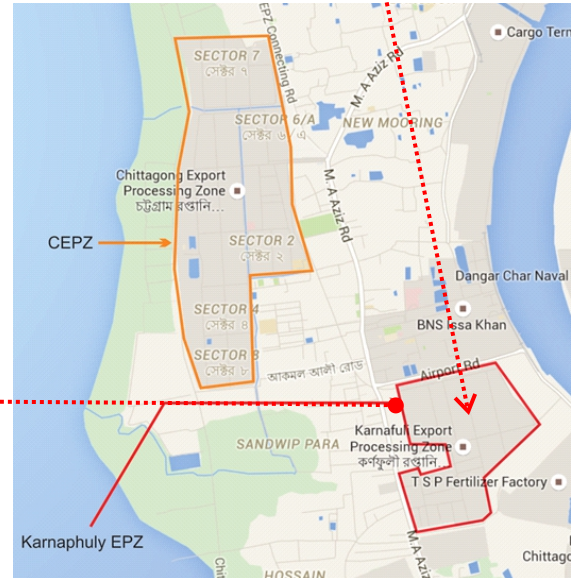


Map of Bangladesh

Chittagong District



Site



Karnaphuli Export Processing Zone

CHRONOLOGICAL DEVELOPMENT WITHIN THE AREA

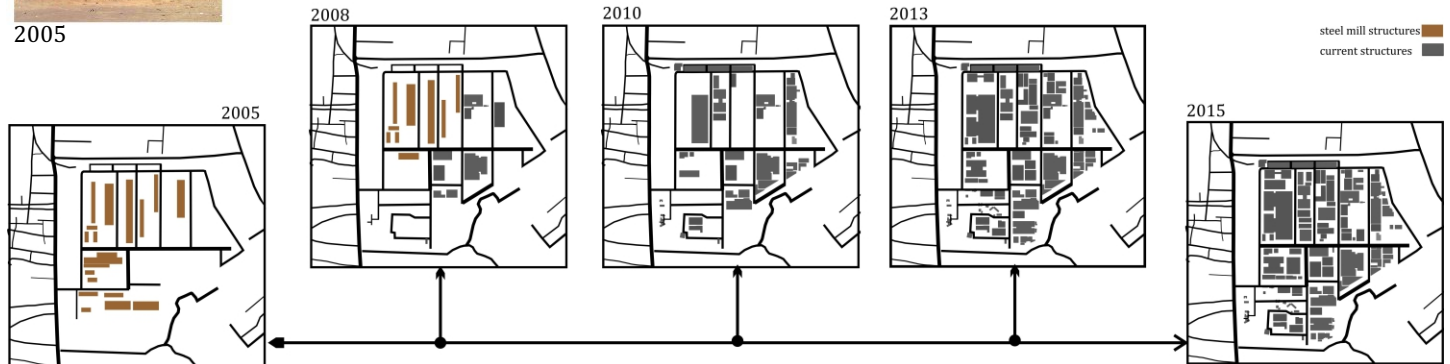


2005

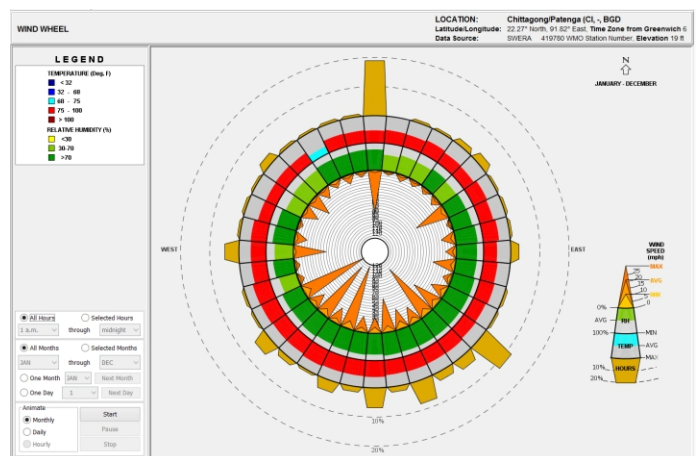
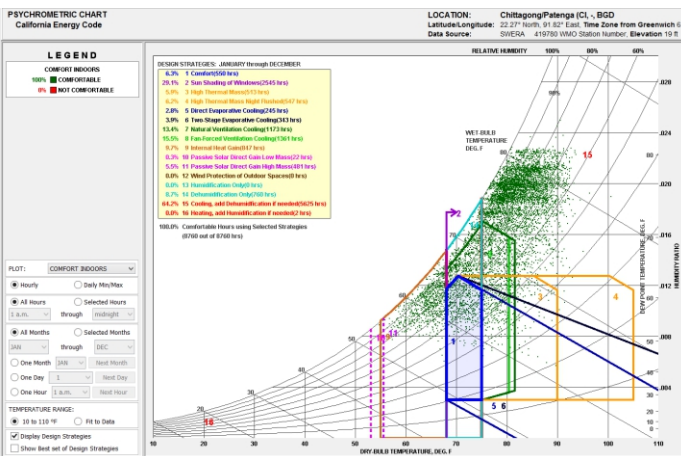
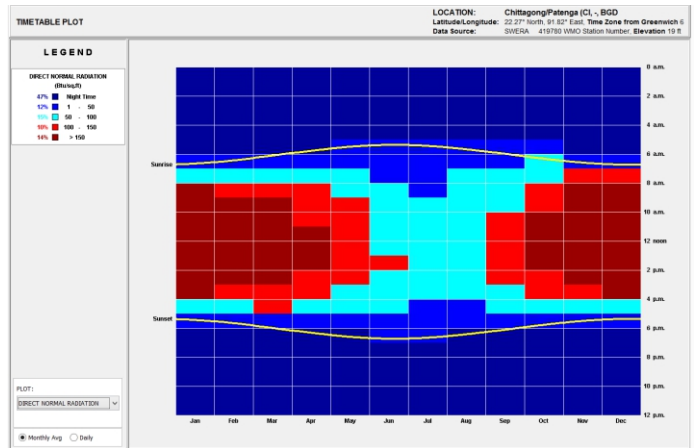
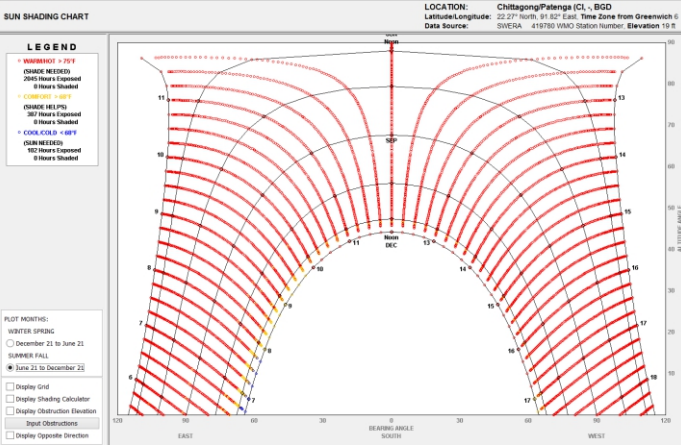
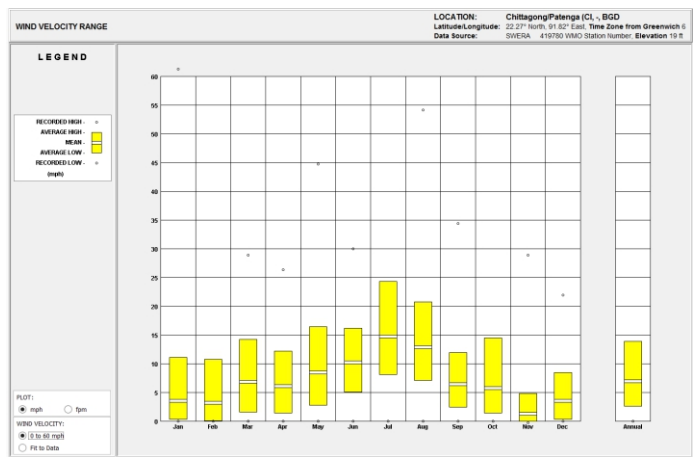
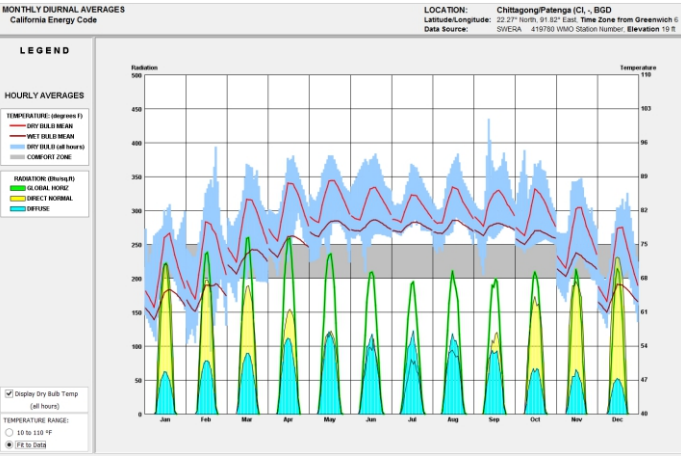
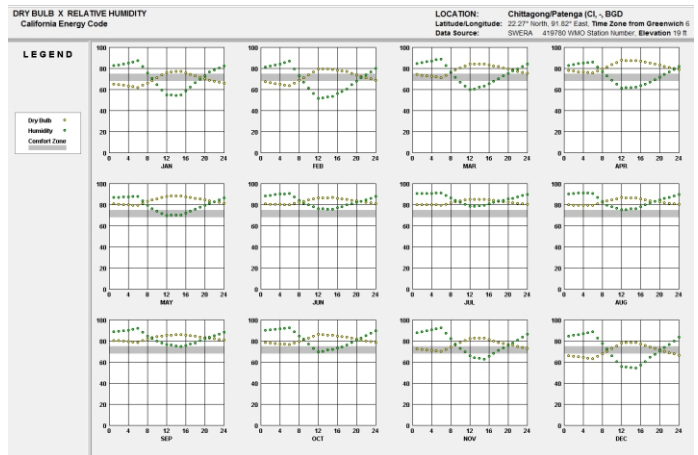
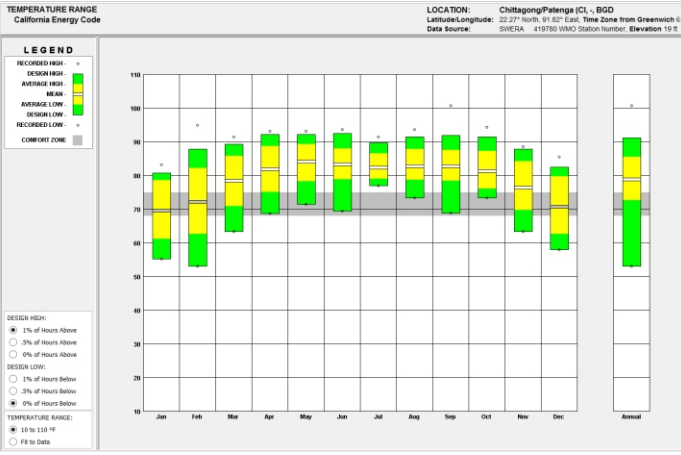
Rapid transformation happened in the area both developing the industrial district and urban fabric. Employment opportunities have been created so the residential mix area becomes denser. Prior that it was a steel mill industry but shut down in 2005 and the government decided to launch small and medium factories in that area.



2007



CLIMATE ANALYSIS



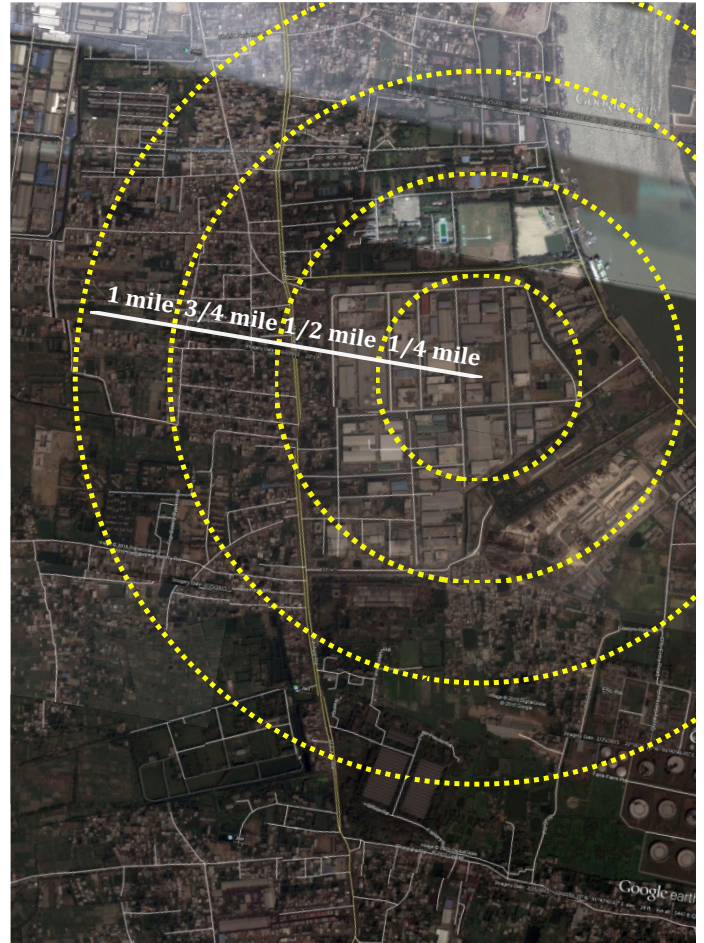
CONTEXT AND SURROUNDINGS

Workers come from different area in Karnphuli EPZ AND Chittagong EPZ by public bus , factory bus , rickshaw and walking Major Area from where the workers come:

- Bandar Tila
- Akmal ali Raod
- Steel meel Colony
- Katghor
- Surrounding area of airport
- Surrounding area of Naval

WALKABILITY

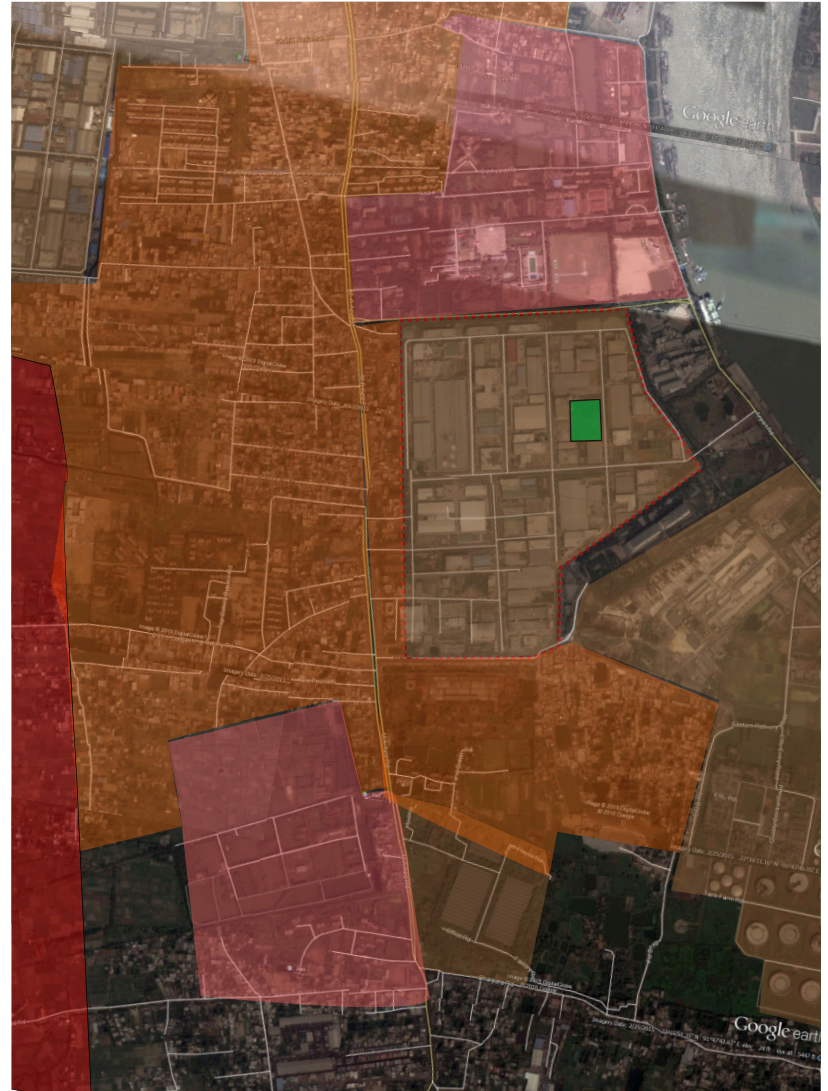
As KEPZ and Chittagong EPZ are situed in DPZ 01 , roads are large enough and have access of public transportation . During the day , we can see public buses , private cars ,rickshaws in the streets , but in nights large cargo , container trucks are seen in this area. These trucks are seen from evening entering or going out from the Chittagong city with supplied products . At that time , traffic jam occurs . Most of the lower and middle class employees use public transports , so public transports should be encouraged more in this area . Bus mainly stop in front of CEPZ , so workers have to walk or take rickshaws / small vehicles to reach KEPZ .





- Commercial (Coastal area)
- Manufacturing Processing Zone
- Mixed Use Zone
- Isa Khan Naval Beach

ZONING

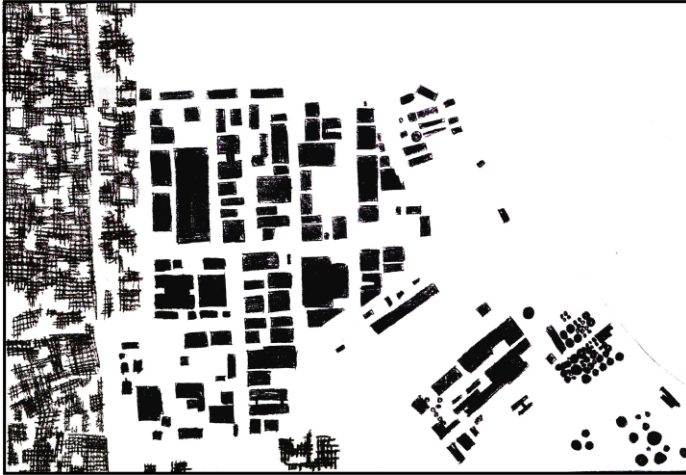


Karnaphuli Export Processing Zone



Solid-Void Space Relationship

The solid void space is dense in residential mixed use area but less dense than in the EPZ area.



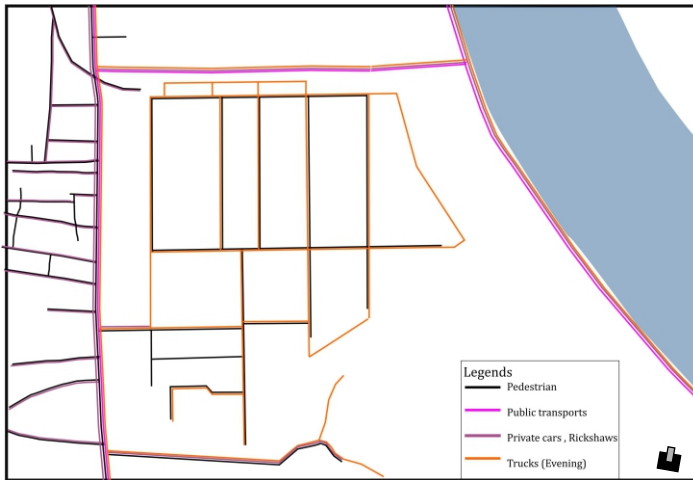
Street Patterns

Fragmented parallel streets in the KEPZ Area
Uneven distribution and wrapped parallel streets in the residential mixed use zone



Vehicular and Pedestrian Circulation

Public transports mainly seen in primary roads, private cars and rickshaws are seen in secondary roads and tertiary road are very narrow so mostly pedestrian



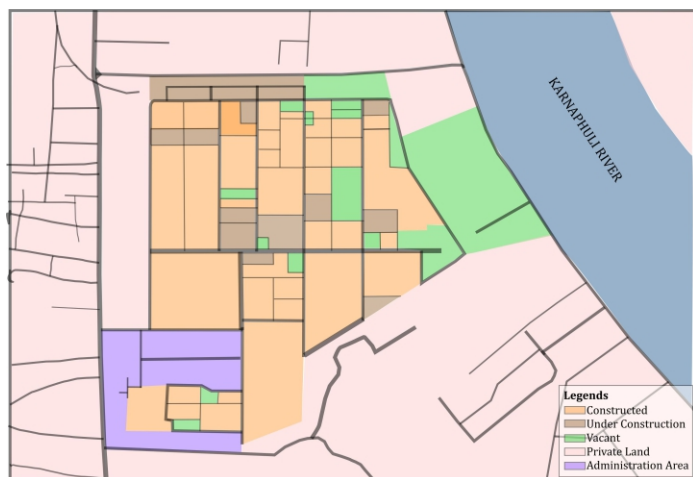
Building uses

The KEPZ area consists of ready made garments, less heavy and medium industrial factories and administration zones.



Existing condition

The KEPZ area is mainly surrounded by private lands.



Noise Analysis

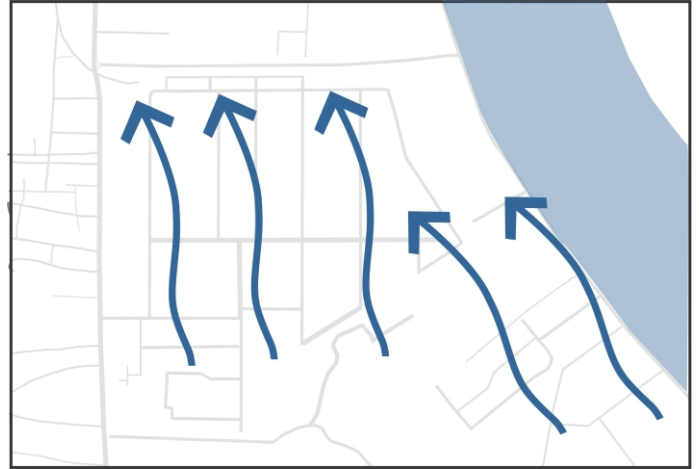
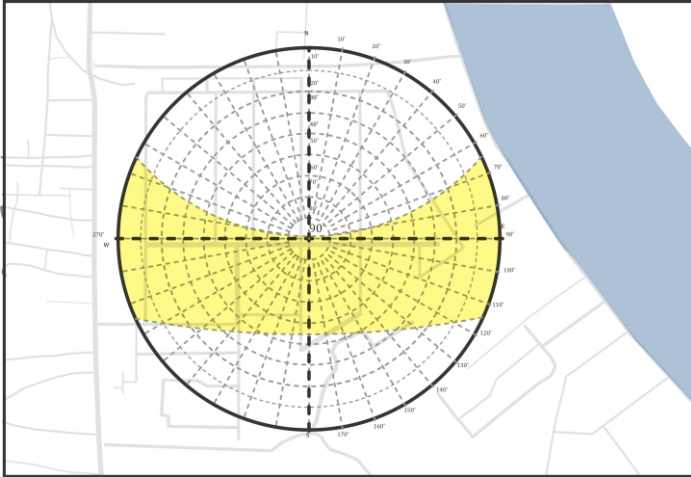
Noise source mainly on primary roads due to public transports, private vehicles and rickshaws.



Sun path

Wind analysis

Wind direction is mainly from south and south east .

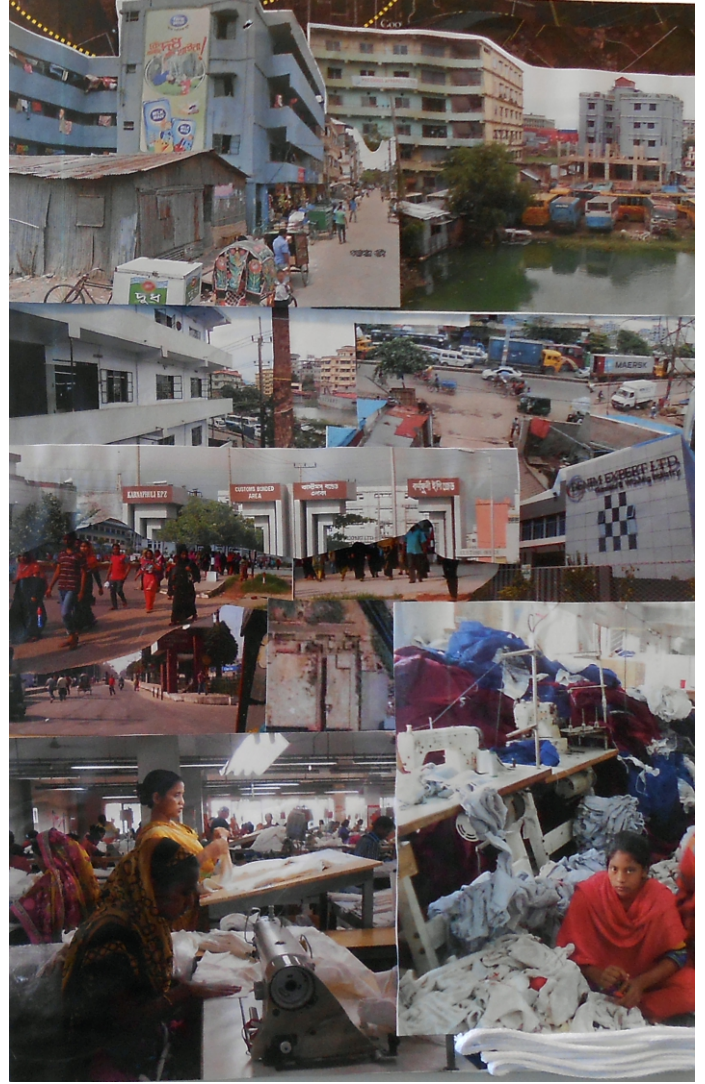


IMAGES OF KEPZ AREA

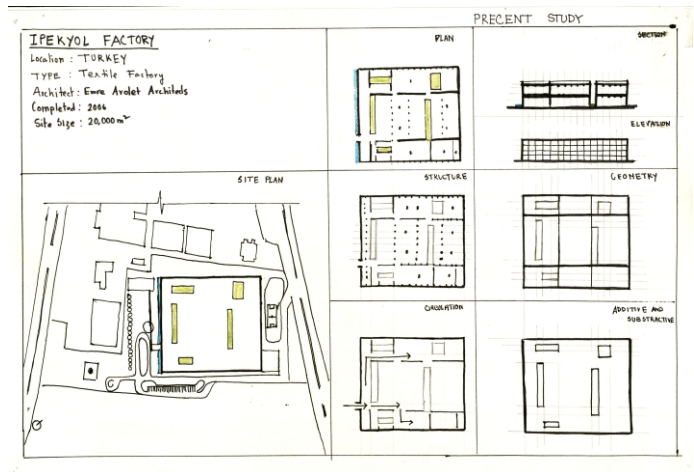
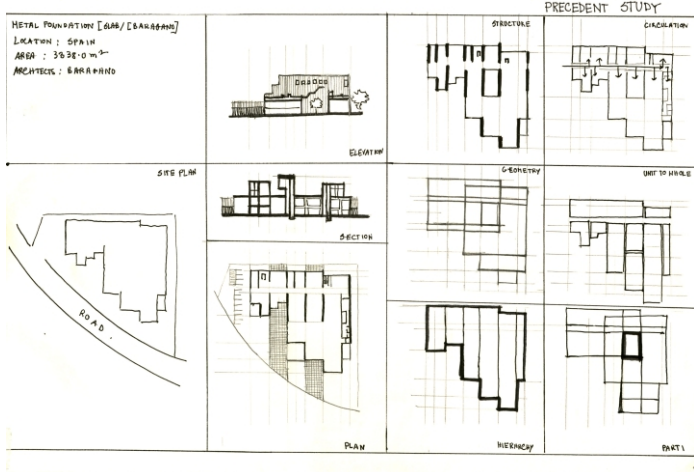


DESIGN PROCESS

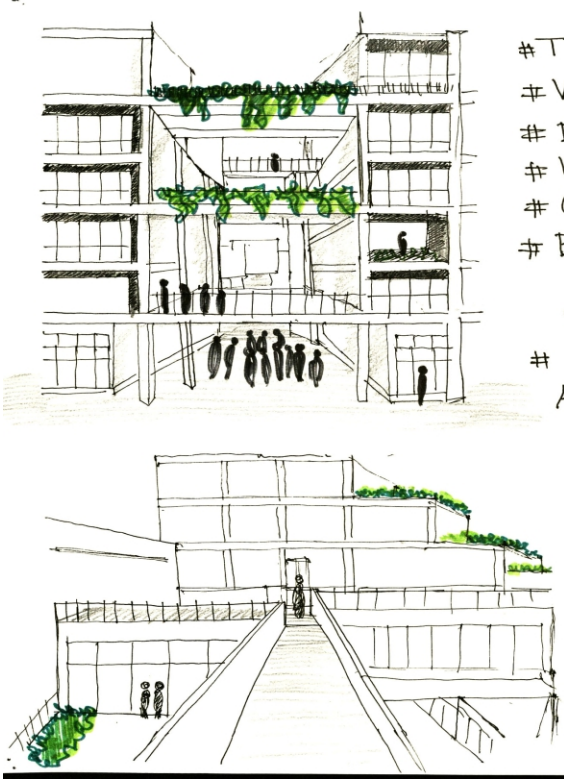
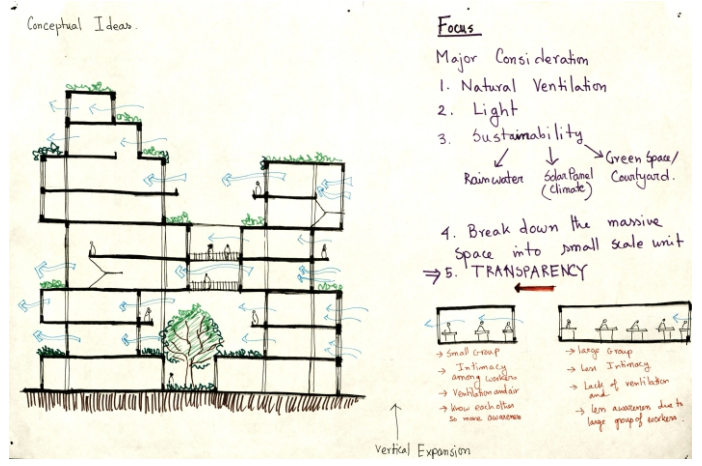
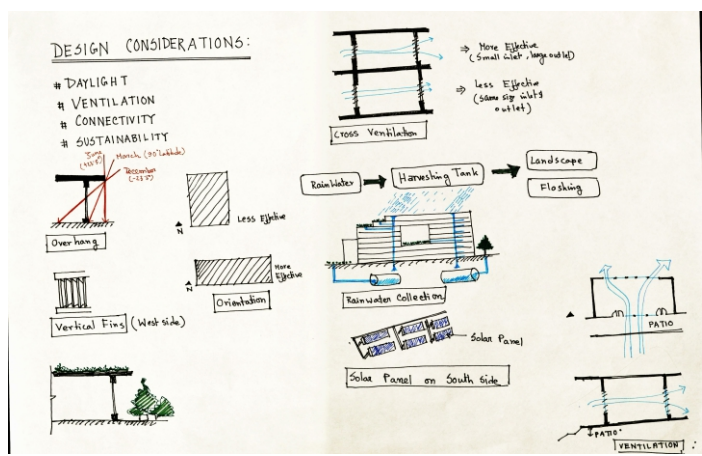
COLLAGES TO UNDERSTAND THE CONTEXT



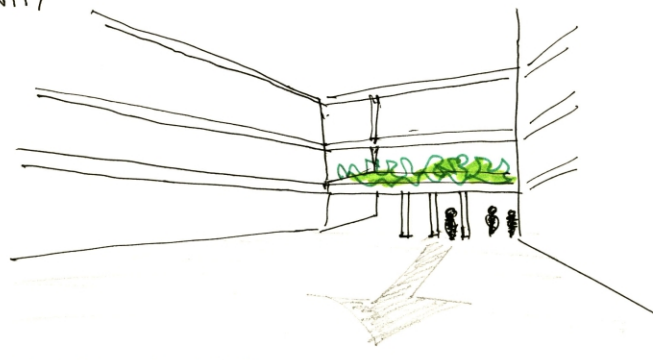
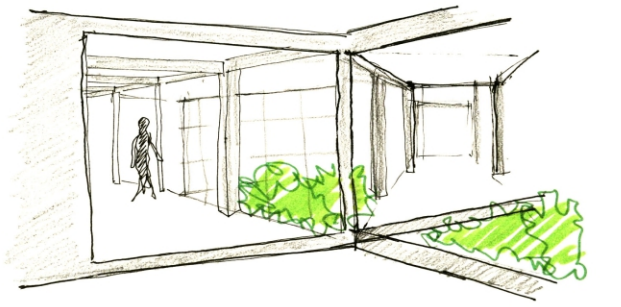
PRECEDENT STUDY



Conceptual Ideas

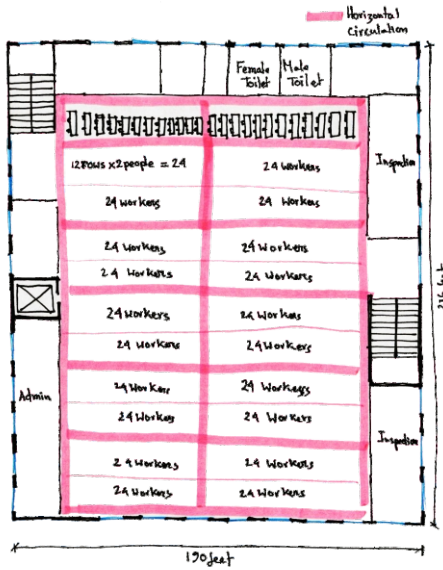


- # TRANSPARENCY
- # VISUAL CONNECTIVITY
- # DAYLIGHT
- # VENTILATION
- # GREEN TERRACE
- # BREAK DOWN MASSIVENESS OF PRODUCTION LINE
- # SMALL COMMUNITY ACTIVITY

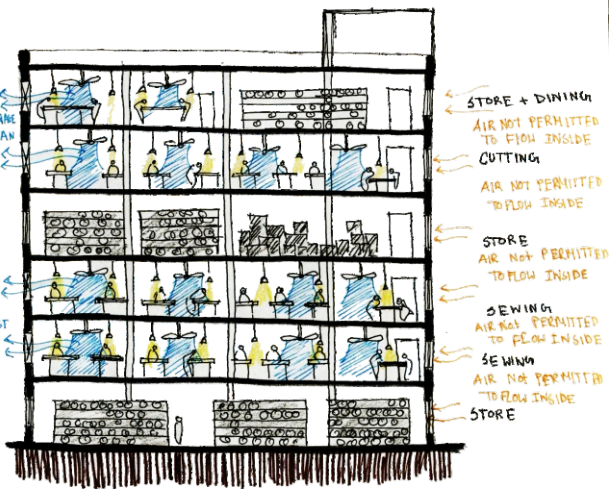


CONCEPTUAL IDEAS

CASE STUDY ANALYSIS: WHITEX LIMITED



Total Area = 4106 Jukt
 Approx. 1500 people
 Packaging = 530 x 2 = 1060 people
 Sewing = 530 x 2 = 1060 people
 Ck. n = 2700 people



SECTION

OBSERVATION

Small Group Activity

Groups of Workers

Green space vegetation

Houses

Balcony / Verandah
 → talk, gossip,
 → Cloth

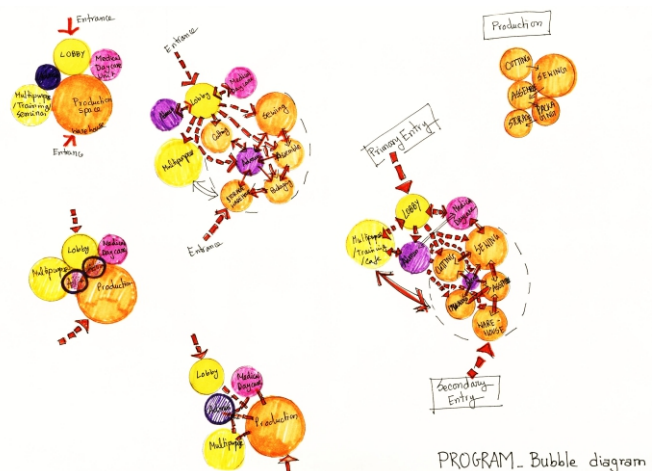
Factory

- windows
- No verandah
- No green space
- Large Production space

Program

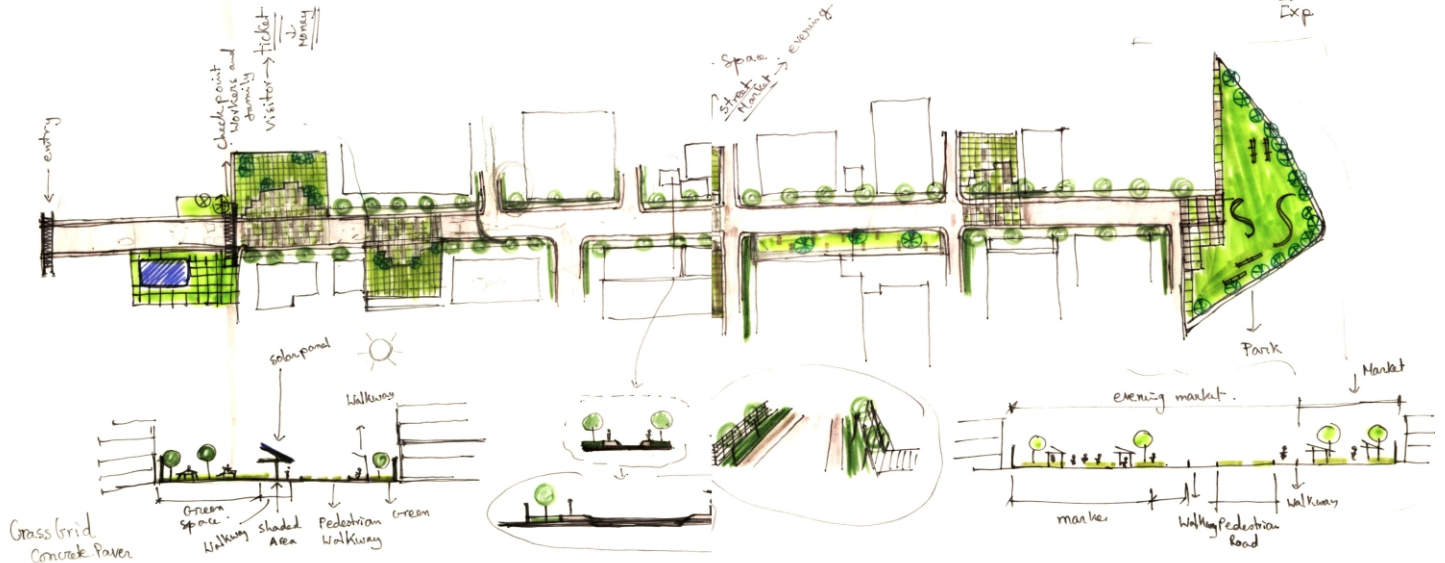
Criteria Matrix	PROGRAM CRITERIA MATRIX						Special consideration
	Adjacency	Public access	Daylight	ventilation	Privacy	Special require.	
01 Central lobby for workers	H	Y	Y	N	N		Adjacent to main entry
02 Lobby for admin	H	Y	Y	N	N		Adjacent to main entry
03 Administration room	M	Y	Y	M			
04 Cad pattern & research room	M	Y	N	M			
05 Cutting section	L	Y	Y	M			Convenient for workers
06 Sewing section	L	Y	Y	N			
07 Assemble products	L	Y	Y	M			
08 Packaging/freshing	M	Y	Y	M			
09 Storage/warehouse	H	L	N	M			Adjacent to main entry
10 Call, storage	H	Y	Y	N			Convenient for workers
11 Multipurpose/locker/atrium	M	Y	Y	M			Convenient for employees and close to entrance
12 Audio visual / seminar room	M	Y	N	M			Convenient for workers and visitors
13 Breakout space	L	Y	Y	H			Convenient for workers
14 Closet	L	N	N	H			
15 Bedroom	L	L	N	H			
16 Medical unit	H	Y	Y	M			
17 Daycare unit	M	Y	Y	L			
18 Display area	H	Y	N	M			

Legend:
 ● Immediately Adjacent
 ● Important
 ● Important Adjacency
 ● Reasonably Convenient
 ● Unimportant

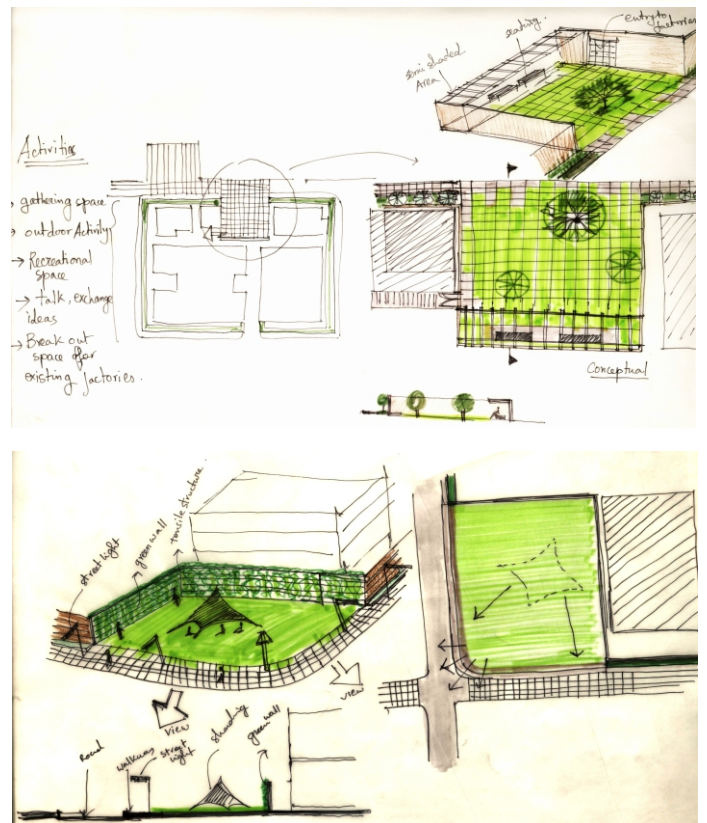
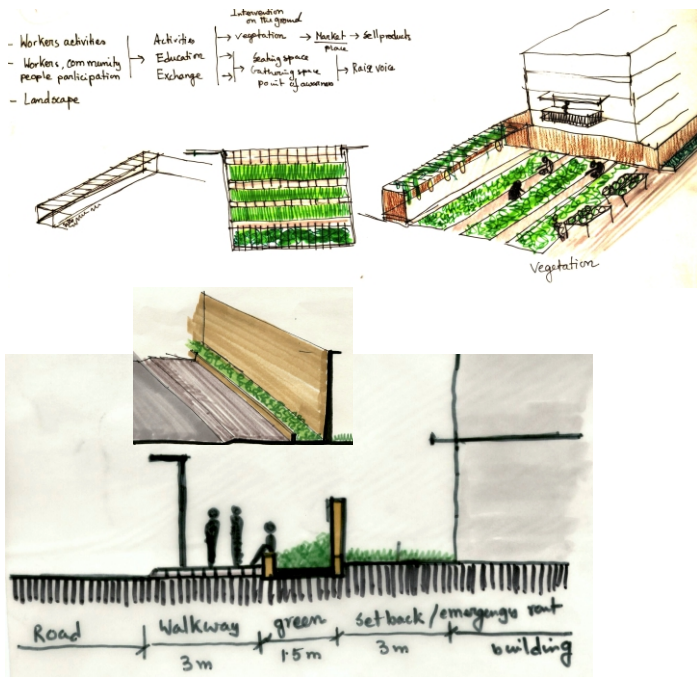


INTERVENTION THROUGH GREEN SPACE: 1ST PHASE

SKETCHES SHOWING DESIGN IDEAS



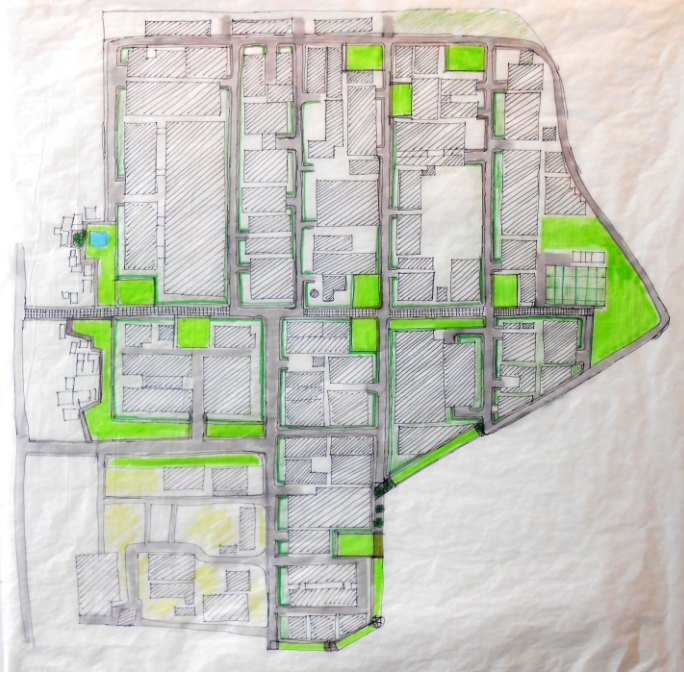
DESIGN IDEAS ABOUT THE GREEN SPACES



SHOWING PEDESTRIAN WALKWAY IN MODEL



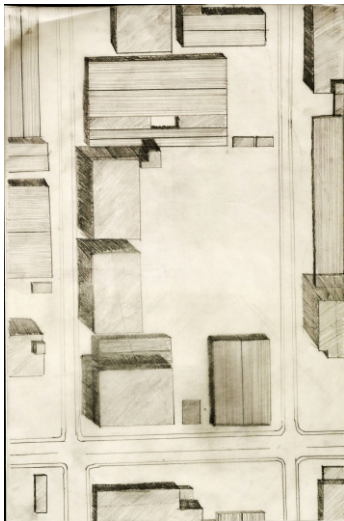
NETWORK OF GREEN SPACE : 2ND PHASE



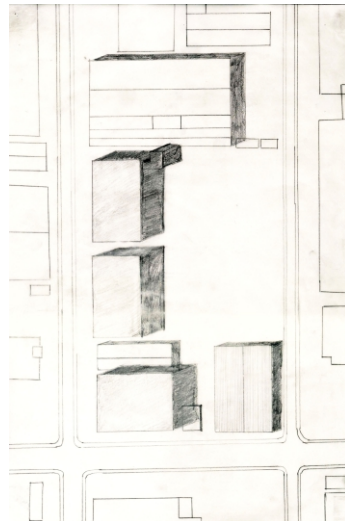
MODELS SHOWING THE MIXED USED RESIDENTIAL AREA AND INDUSTRIAL ZONE



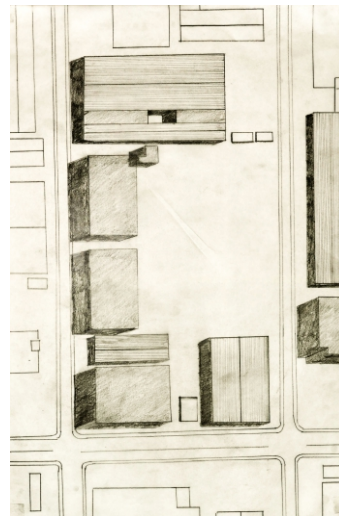
SHADOW AND DAYLIGHT ANALYSIS



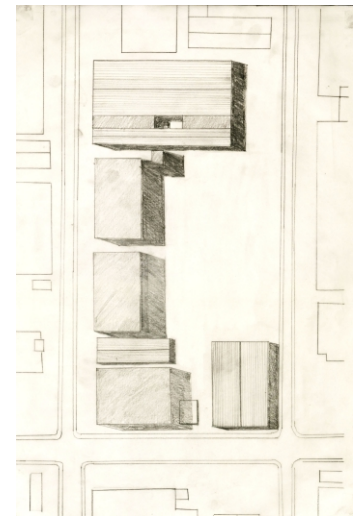
March : 11.00 AM



March : 04.00 PM



June : 11.00 AM



June : 04.00 PM

ADEQUATE DAYLIGHT

WINDOWS

Cross section showing lighting distribution from a single-sided window installation.

A general rule-of-thumb is that, for a vertical window, useful daylight penetration is up to a depth equal to 2.5 times the height of the effective window head above the horizontal surface of interest.

Lighting distribution with windows on two sides or with a reflective light shelf on only one side.

SKYLIGHTS

The effect of skylights on daylight distribution.

Skylights are apertures cut through the roof of a building. Whilst skylights give excellent daylight levels, it is difficult to control the direct beam solar radiation from the Sun when it is directly overhead. Angled louvers or some other form of seasonally adjustable shading must therefore be used, especially in hot climates.

Saw-tooth apertures are a top-lighting technique formed from a vertical glass element and a sloping roof. The light distribution element can be light-colored baffles or the sloping ceiling itself.

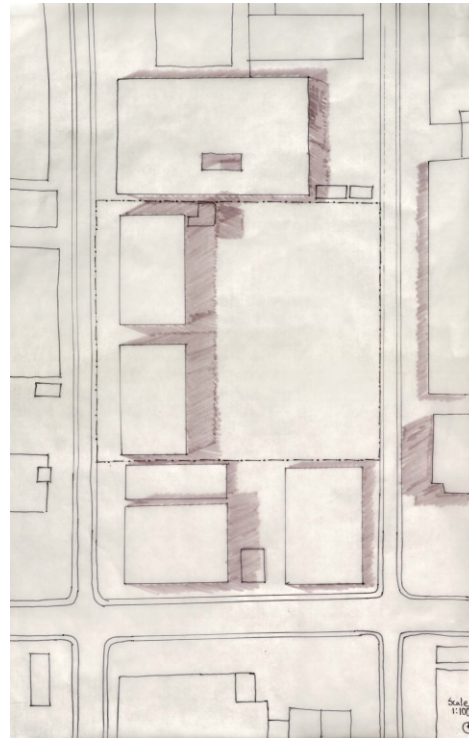
SAW-TOOTH

ROOF MONITOR

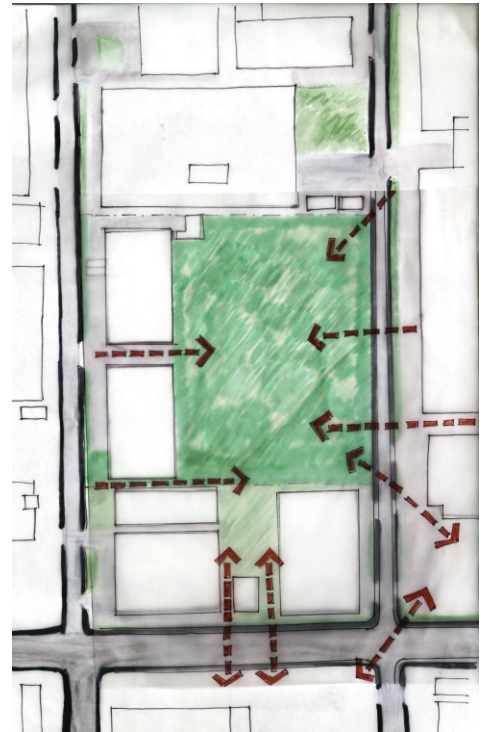
DESIGN STRATEGIES

WINDOWS

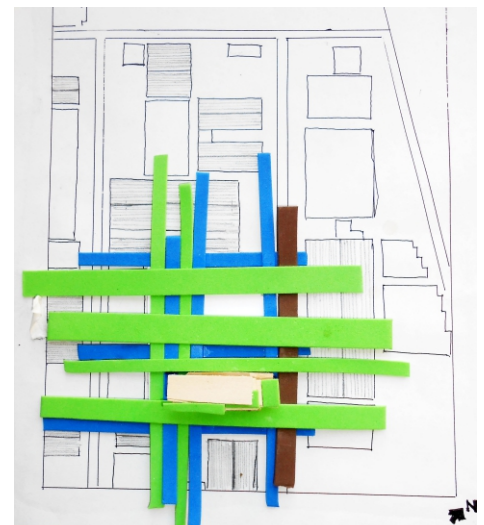
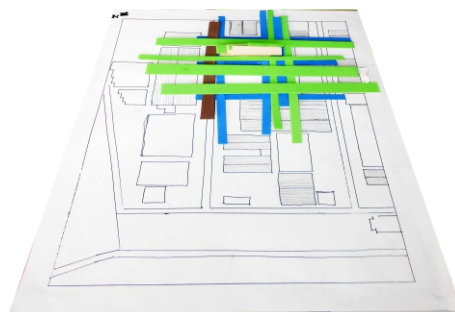
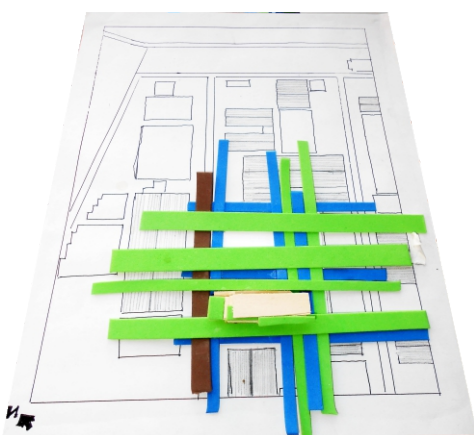
- Windows on both side
- North South Orientation
- Cross Ventilation
- Daylight



CONCEPTUAL DEVELOPMENT

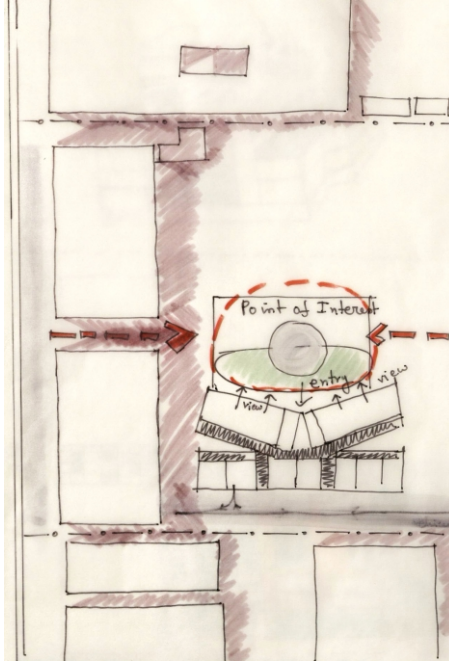


MODEL SHOWING CONCEPTUAL DEVELOPMENT

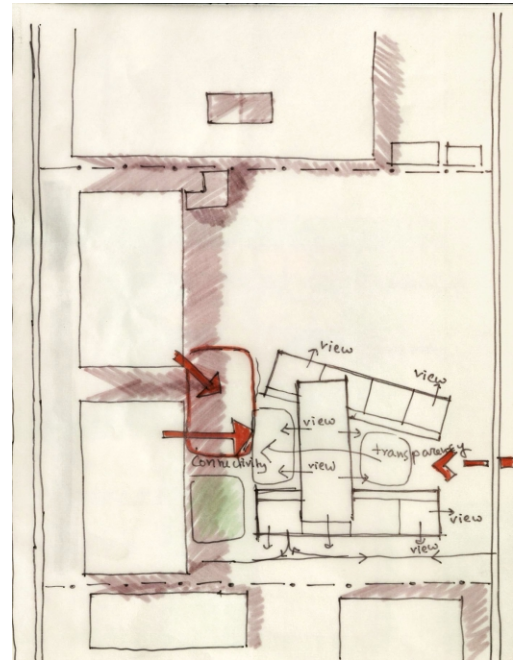




Option 01

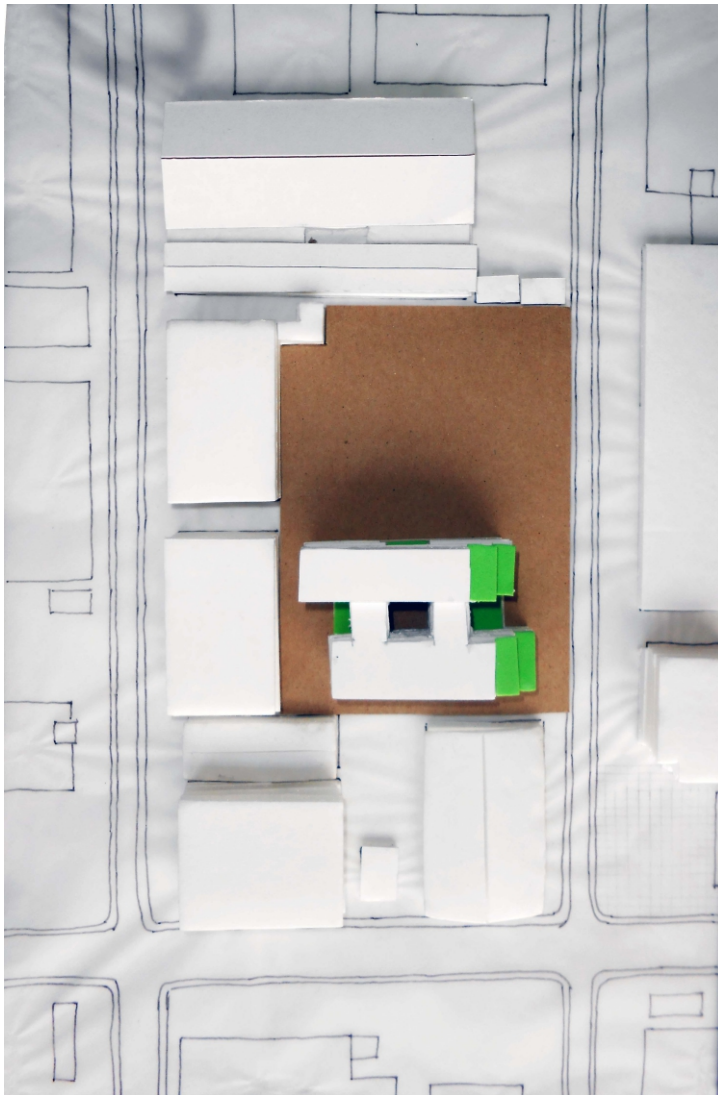


Option 02



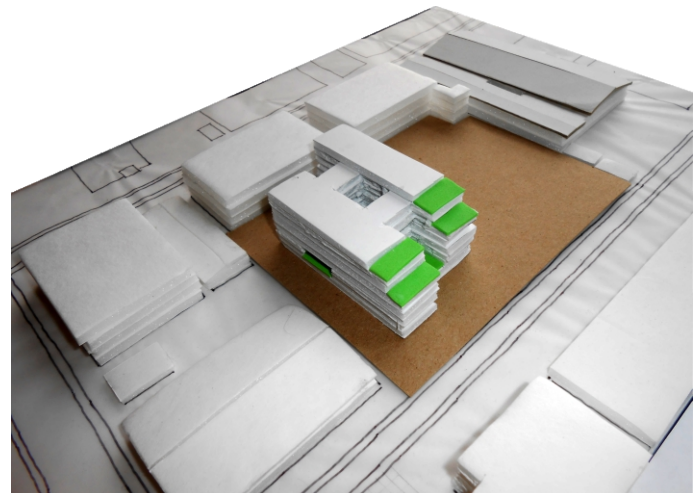
Option 03

Models exploring form



Option 01

Option 03



REVIEW 01

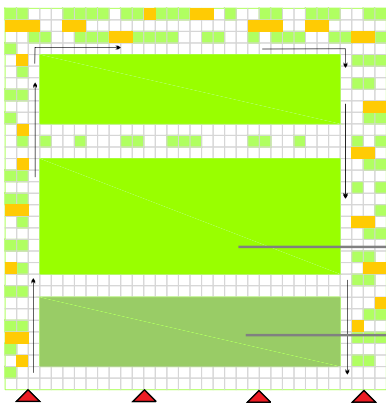
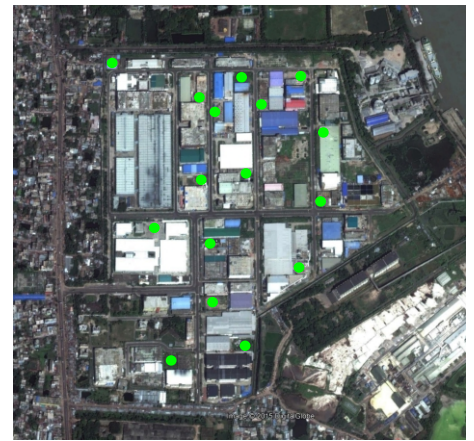
INTERVENTIONS BY CREATING LANDSCAPE ,USERS PARTICIPATION AND ACTIVITIES



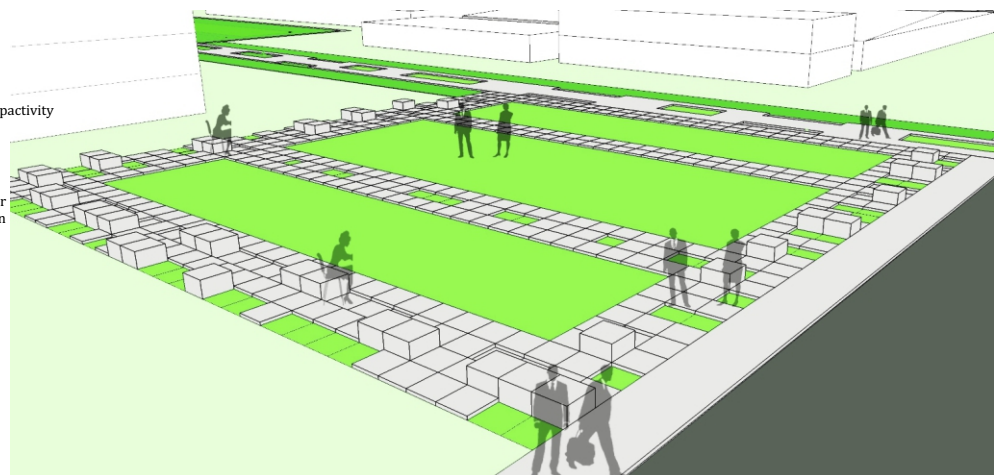
- Landscape:**
- GreenSpace
 - Walkway
 - Seating
 - Shading
 - Vegetation

- Activities**
- Groupdiscussion
 - Walk
 - relaxation
 - discussion
 - Streetmarket

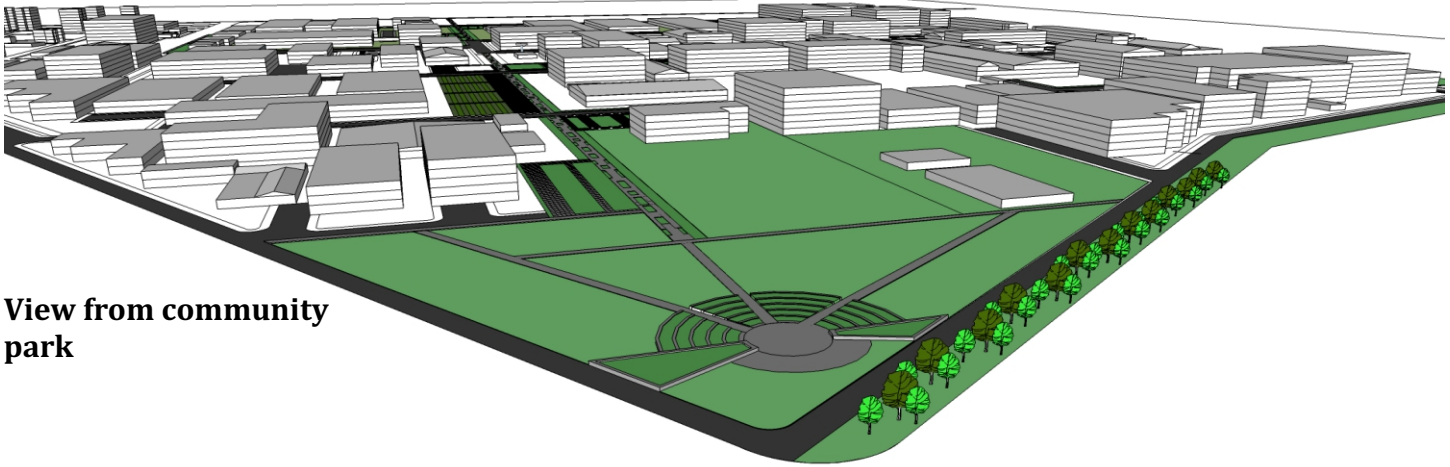
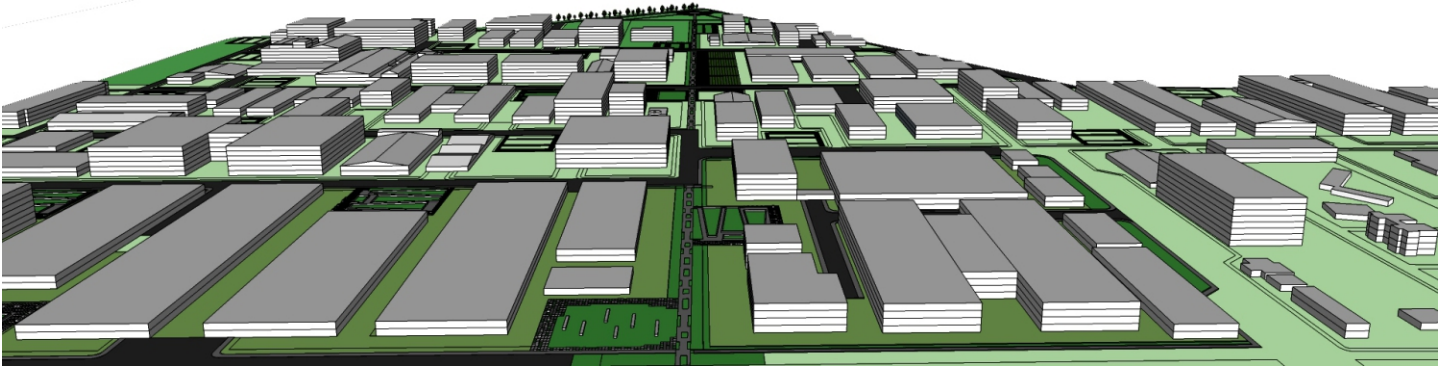
- Participation**
- Education
 - Idealexchange
 - Interaction



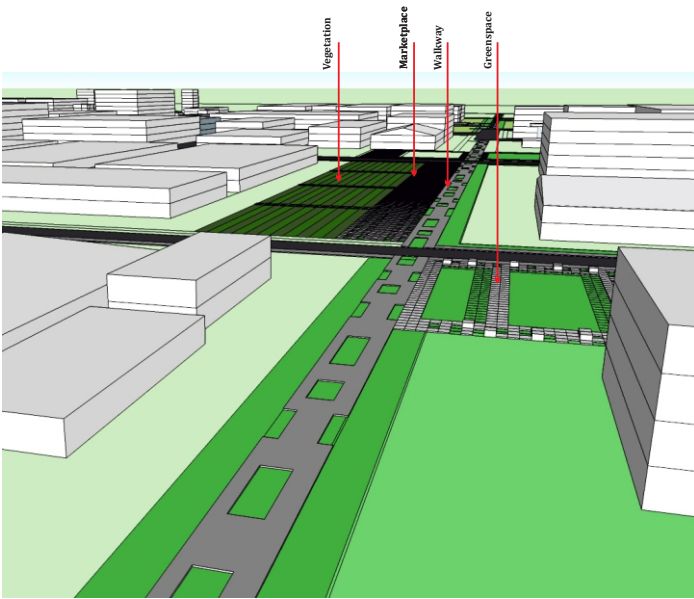
- Sitting and relaxation areas
- Gridgrass
- Greenspace
- Flower garden
- ▲ Accesses



PERSPECTIVES

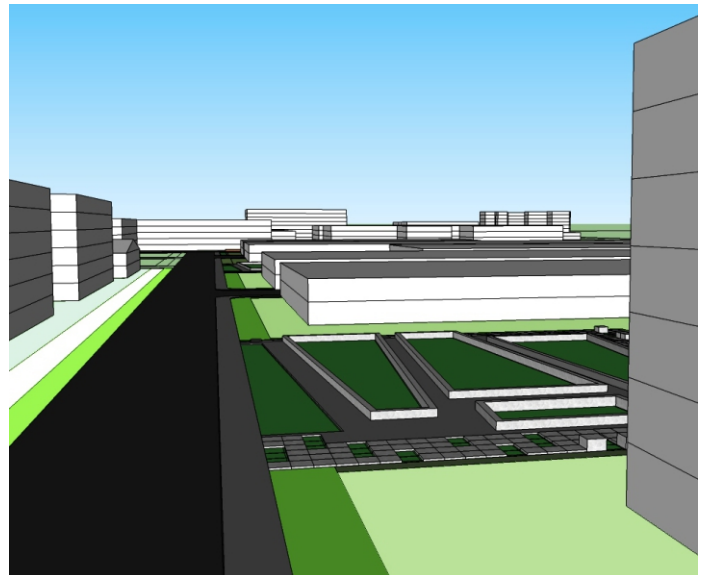
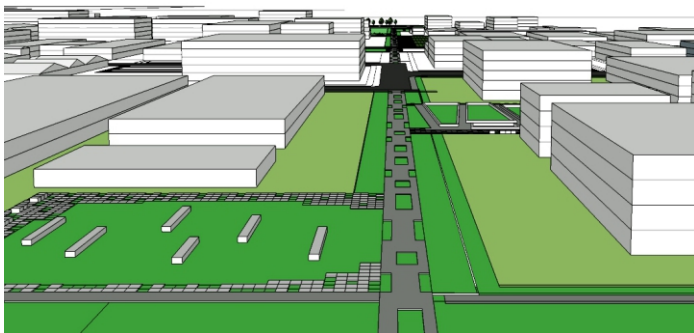


View from community park



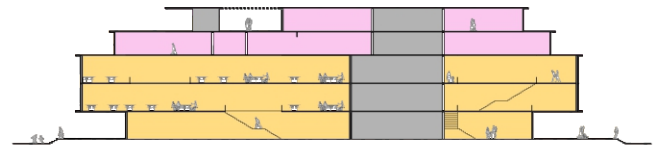
Vegetable Market

Entrance point

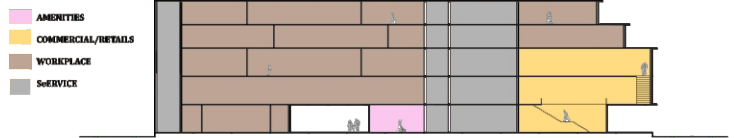


PLANS

Ground floor plan



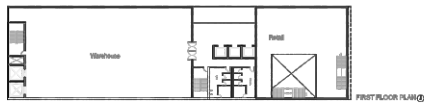
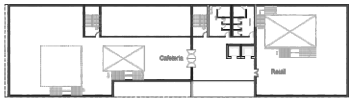
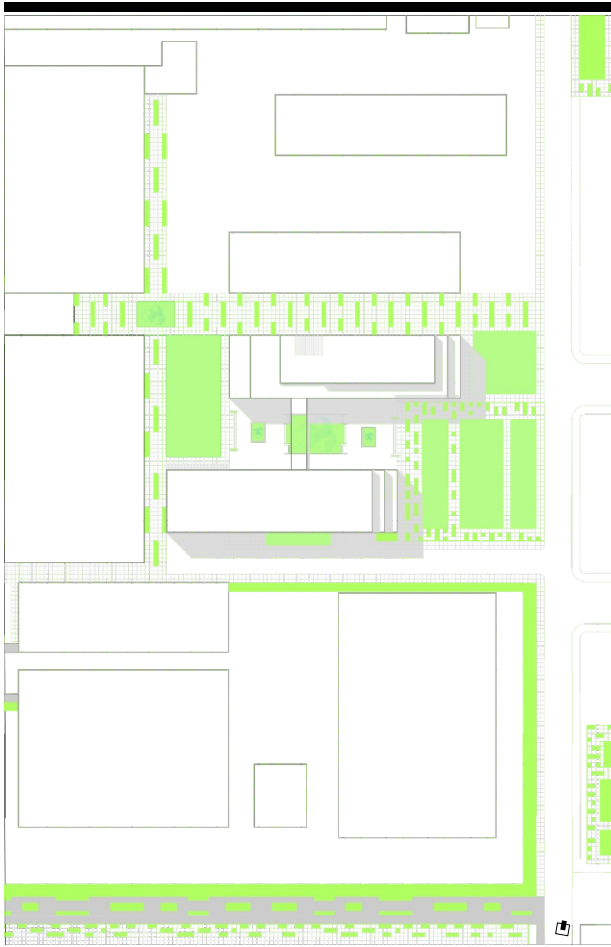
Section AA



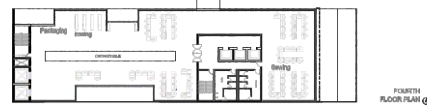
SECTIONS

Section BB

Site plan



FIRST FLOOR PLAN



FOURTH FLOOR PLAN



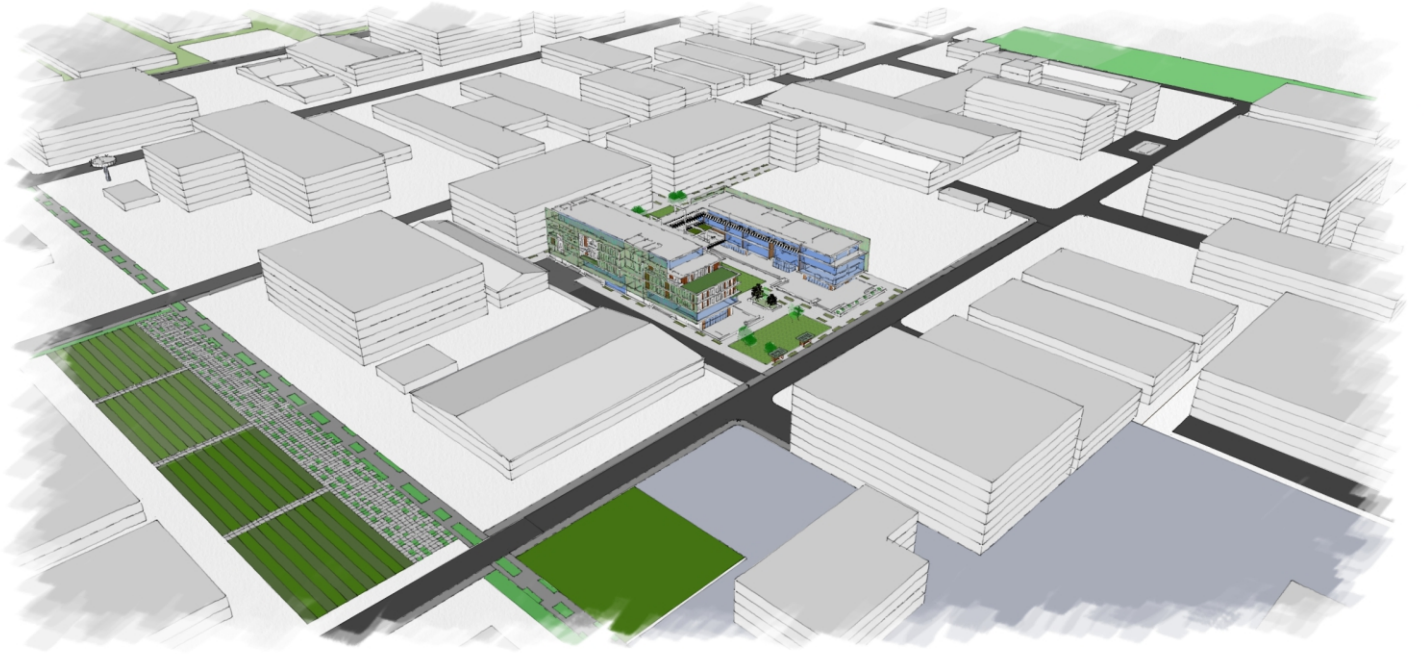
SECOND FLOOR PLAN



THIRD FLOOR PLAN

REVIEW 02

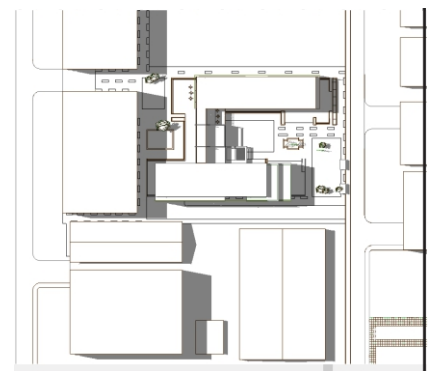
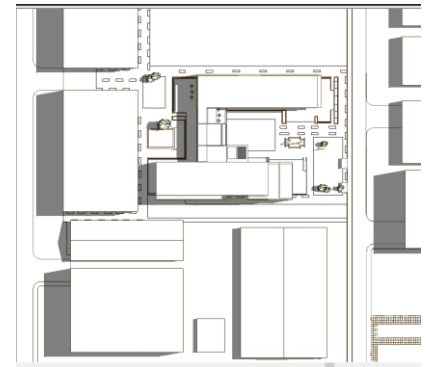
PERSPECTIVES



SHADOW ANALYSIS

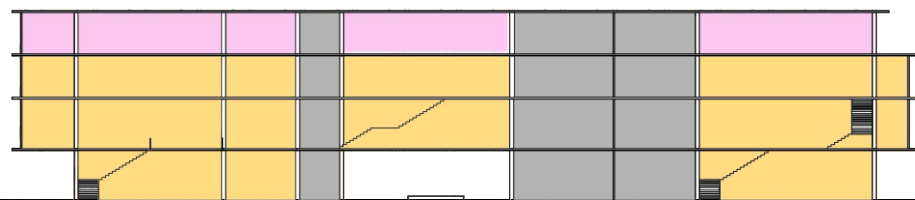


Ground floor plan

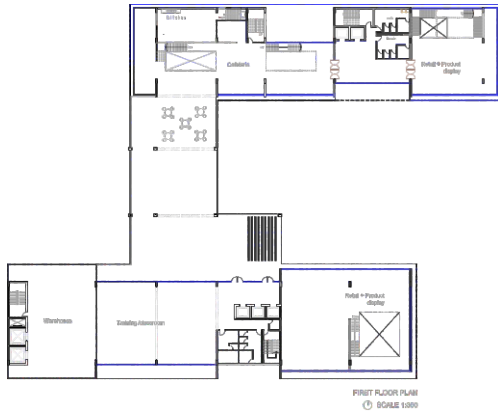


Section AA

- AMENITIES
- COMMERCIAL/RETAILS
- WORKPLACE
- SERVICE



PLANS



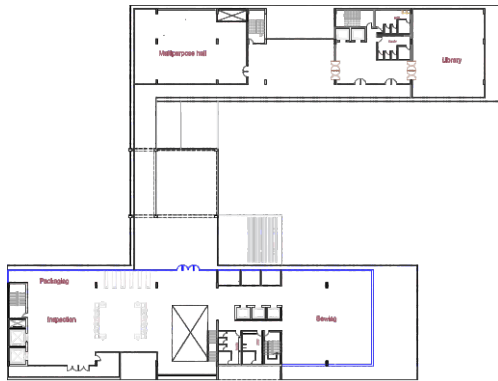
FIRST FLOOR PLAN
SCALE 1:800



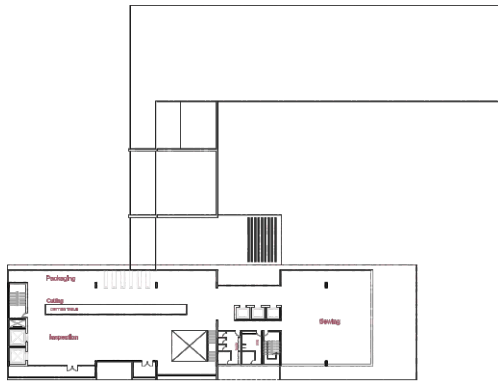
FIFTH FLOOR PLAN
SCALE 1:800



SECOND FLOOR PLAN
SCALE 1:800

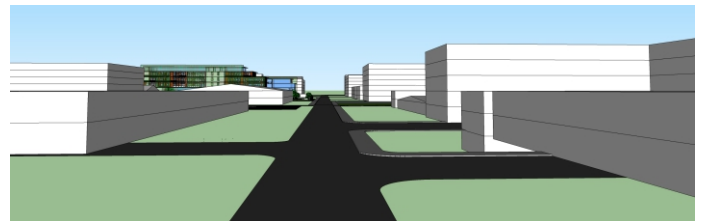
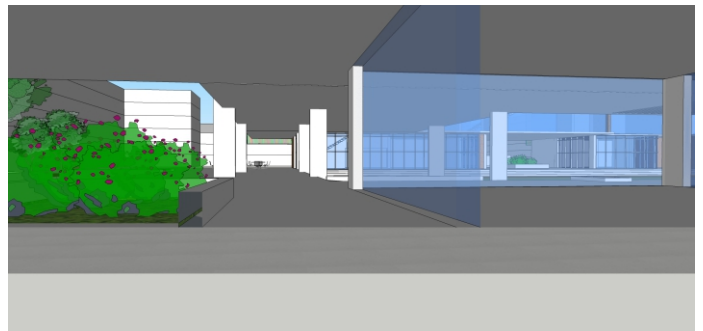


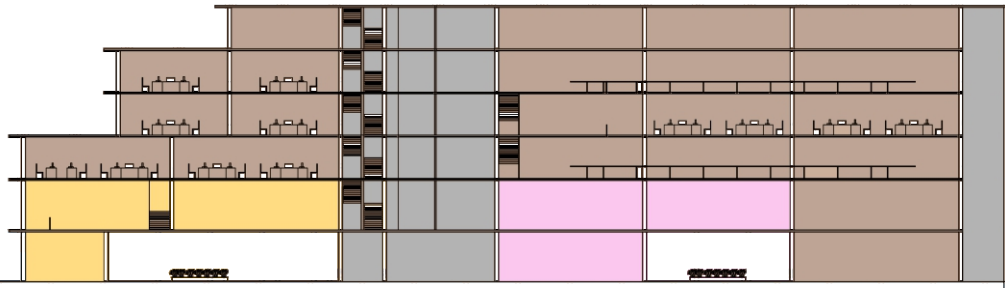
THIRD FLOOR PLAN
SCALE 1:800



FOURTH FLOOR PLAN
SCALE 1:800

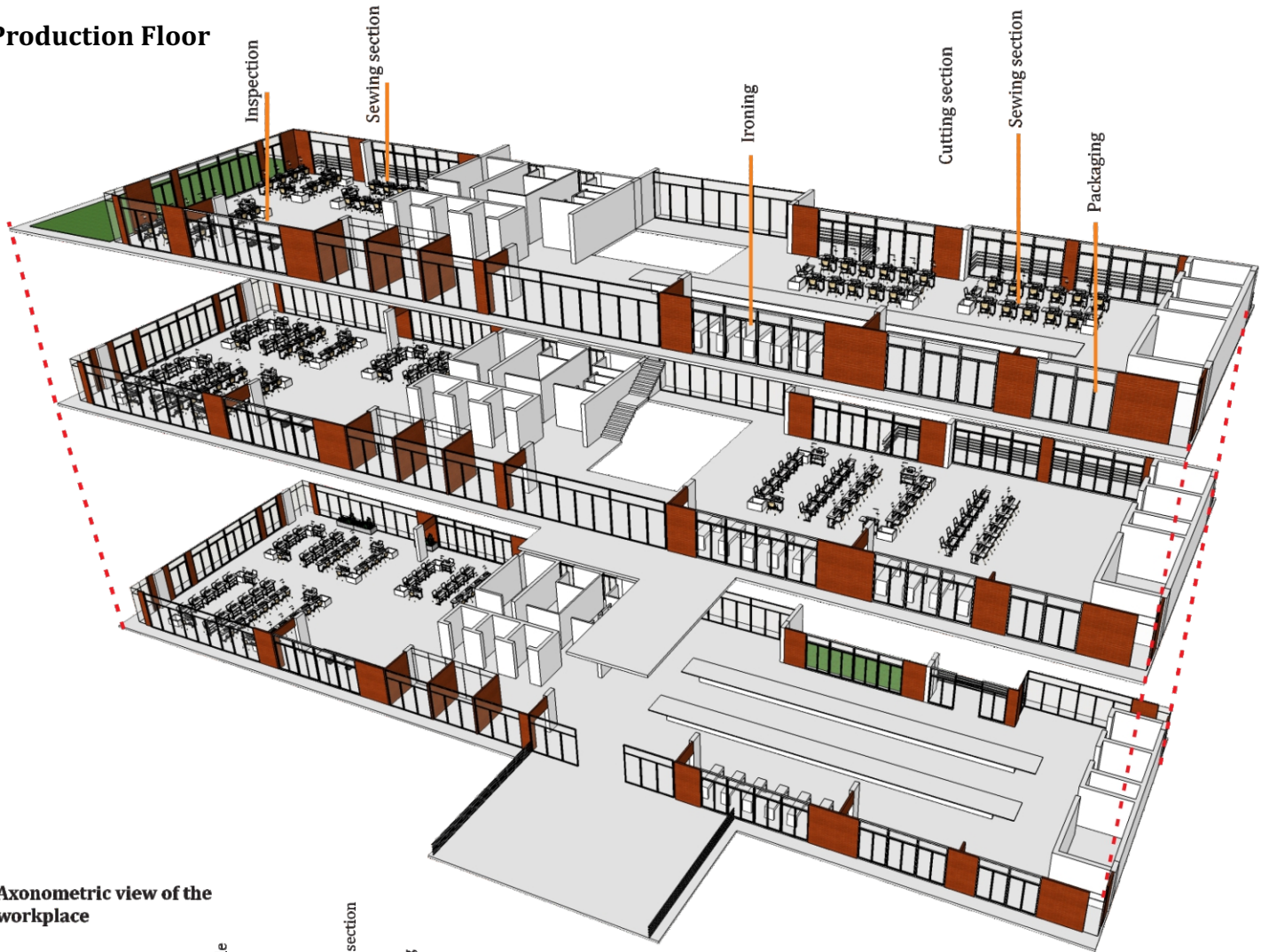
PERSPECTIVES



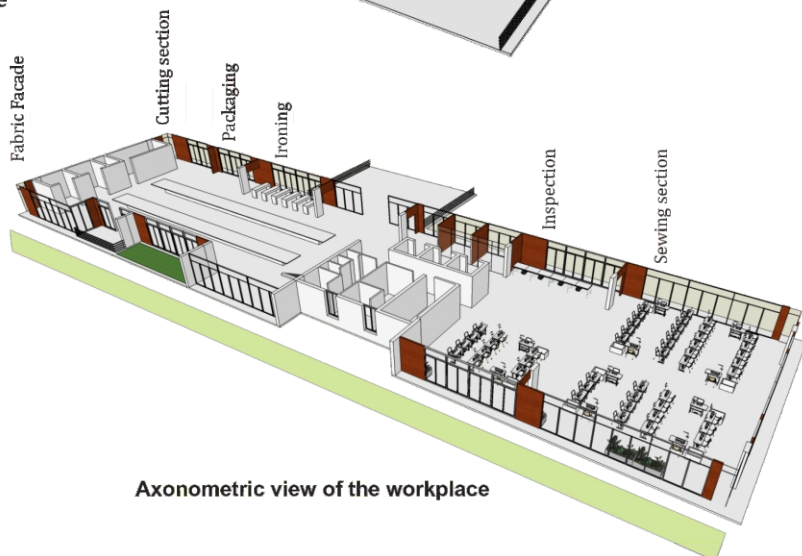


Section BB

Production Floor

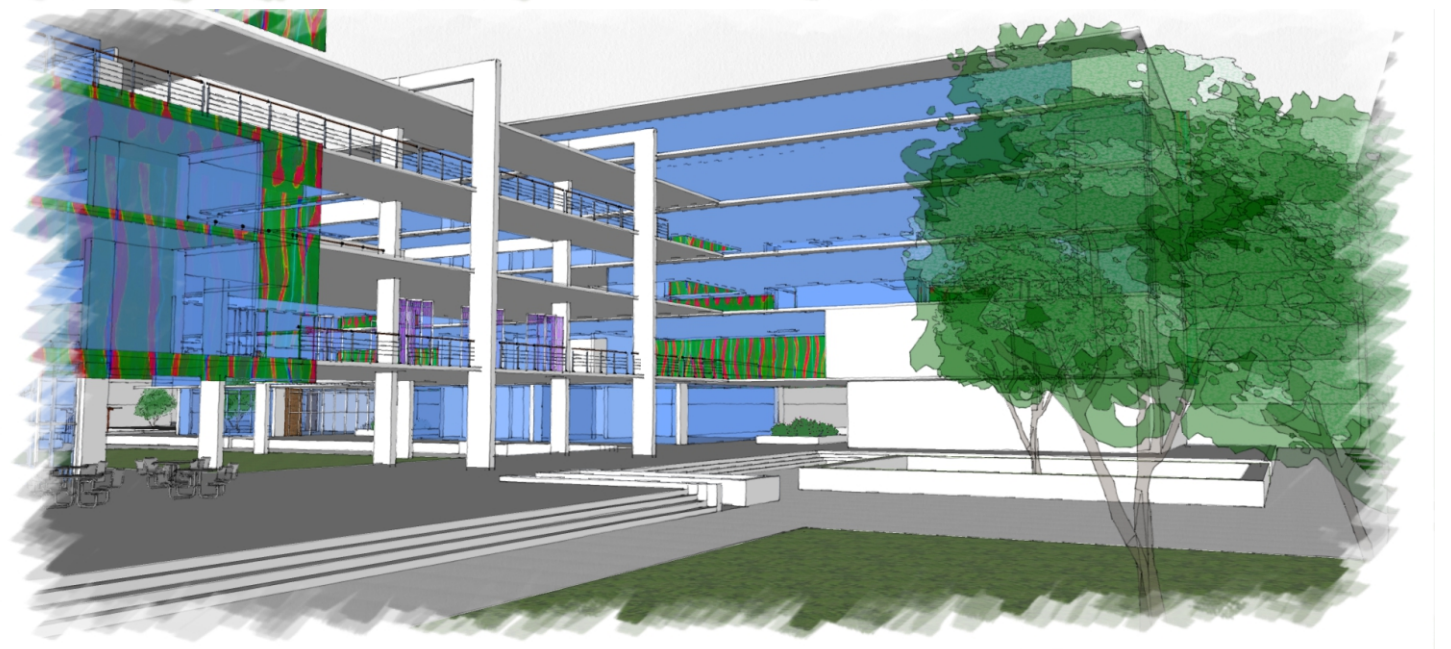
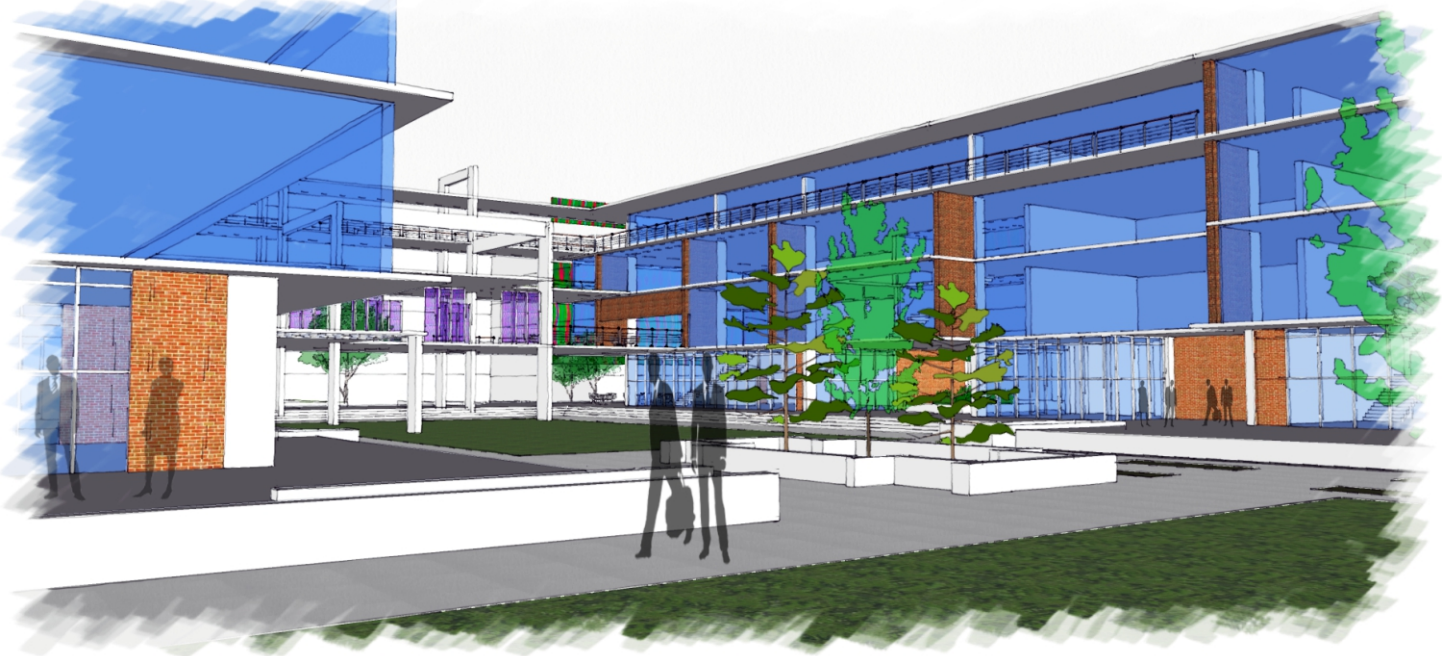


Axonometric view of the workplace



Axonometric view of the workplace

ENTRANCE POINT



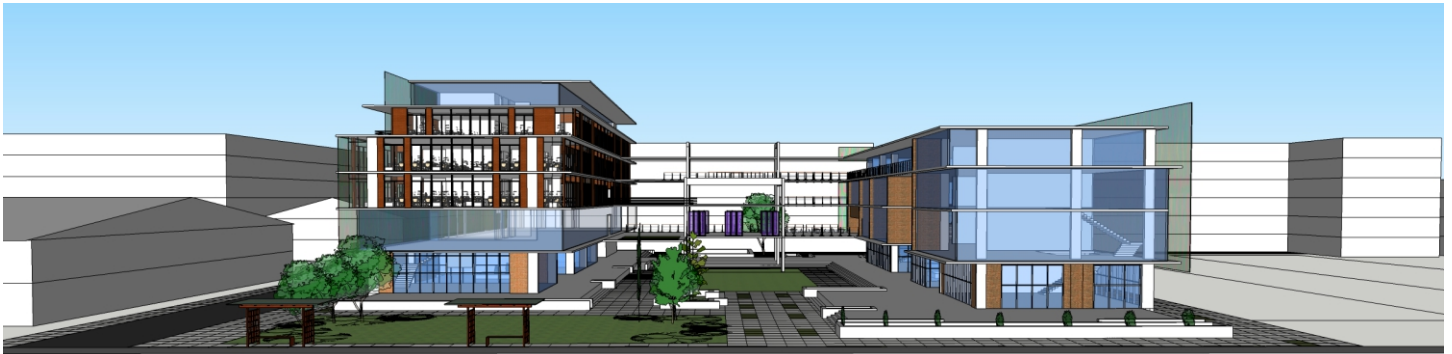
VIEW FROM ADJACENT FACTORIES

COURTYARD





South Elevation



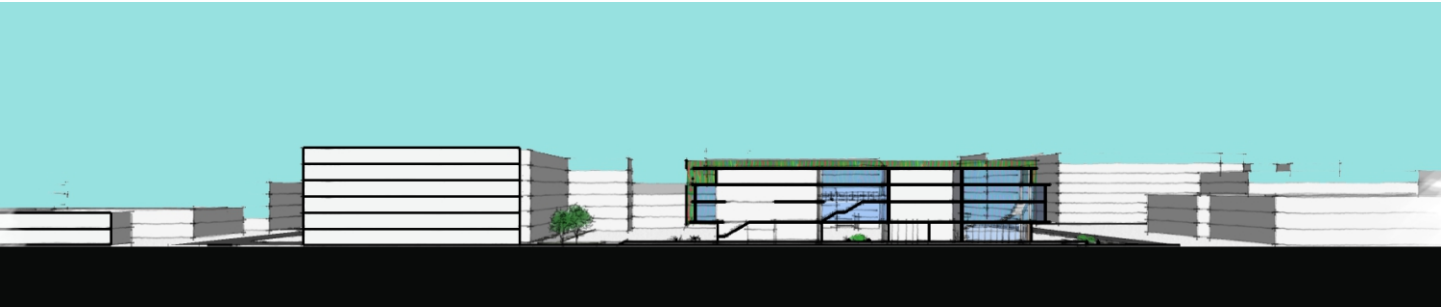
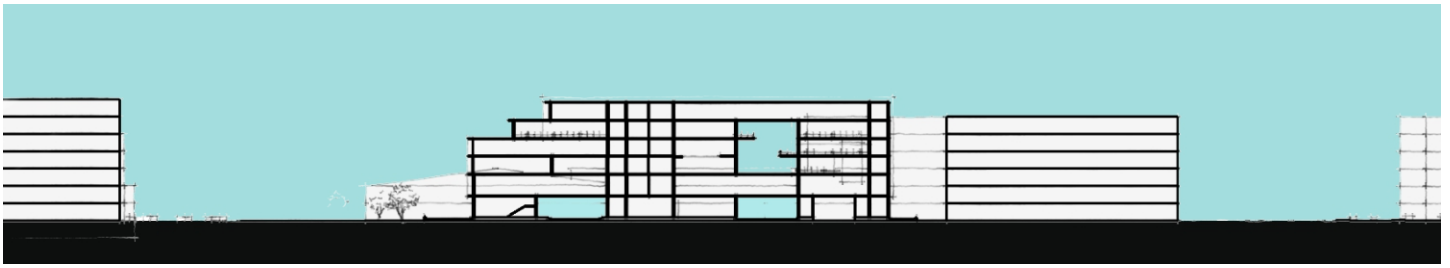
East Elevation

PERSPECTIVES



Perspective showing fabric in exterior

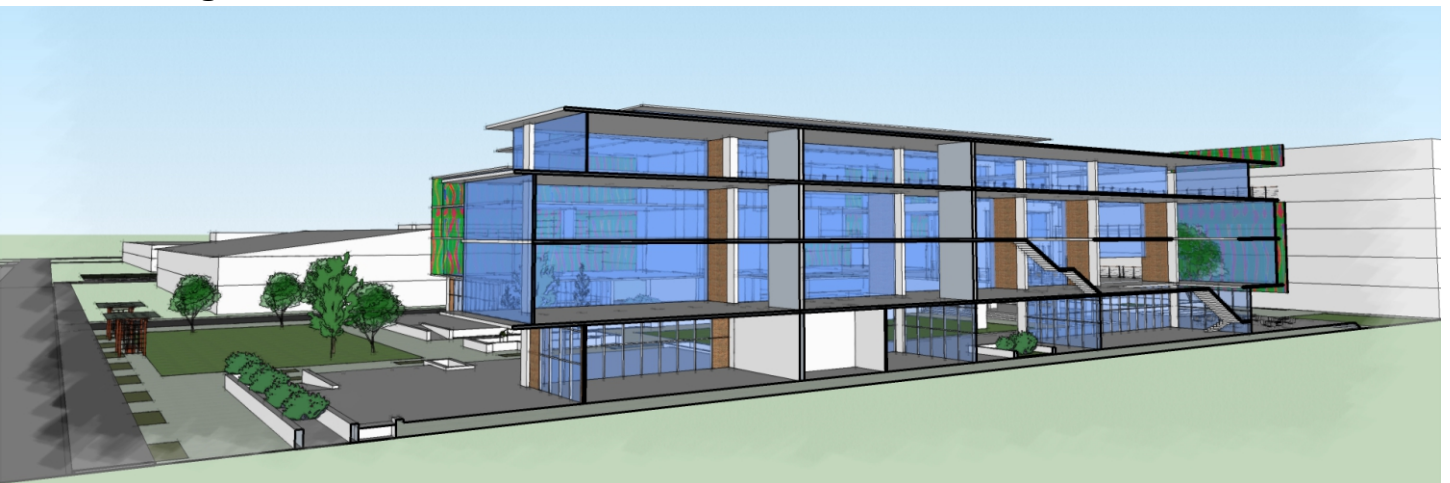




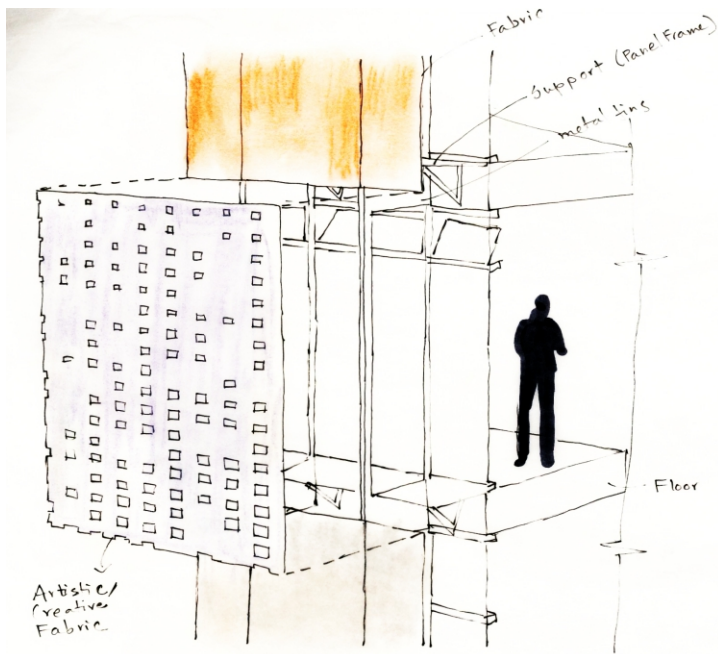
Section through the connecting mass



Section through the amenities block

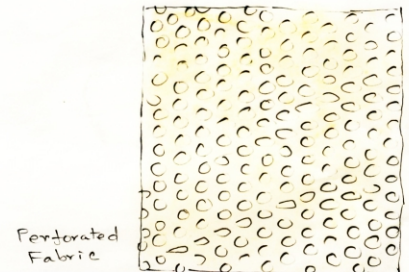
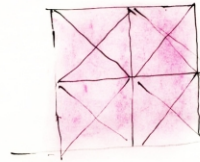
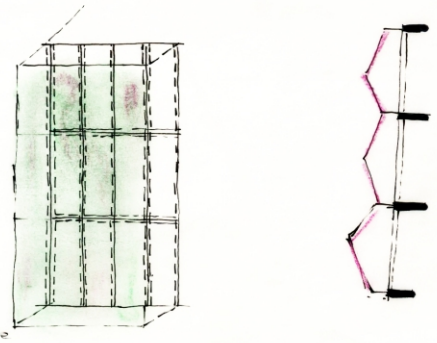


USING FABRIC IN EXTERIOR

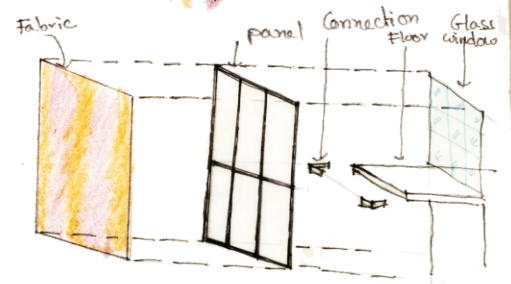
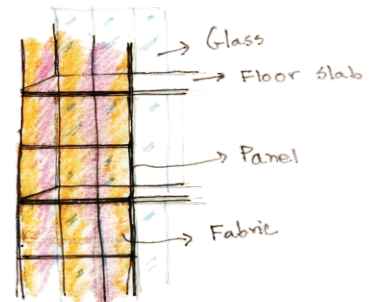
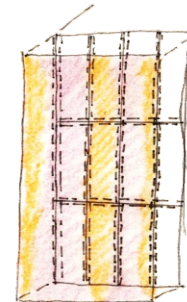
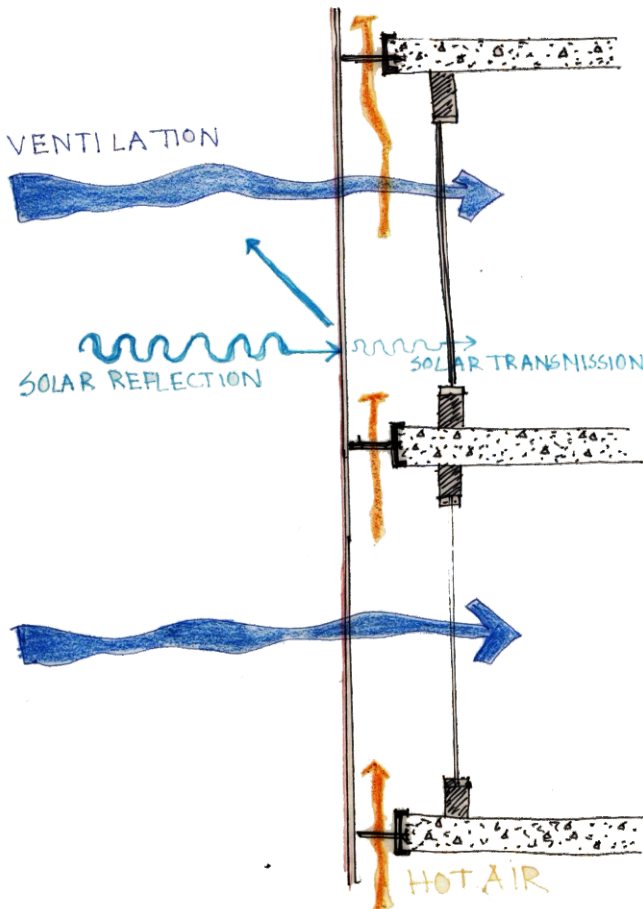


Construction Detail

DIFFERENT WAY TO USE FABRIC IN EXTERIOR

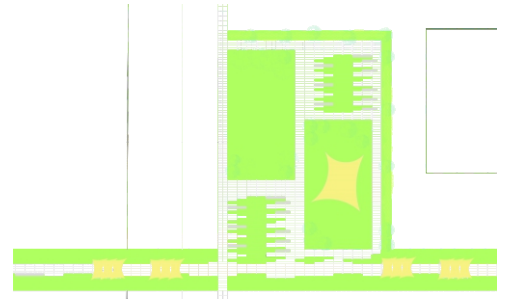


PRINCIPLES



REVIEW 03

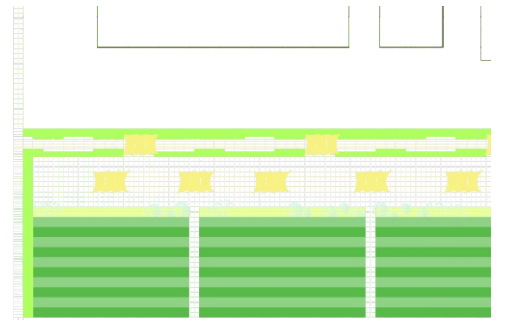
MASTER PLANNING



Green space

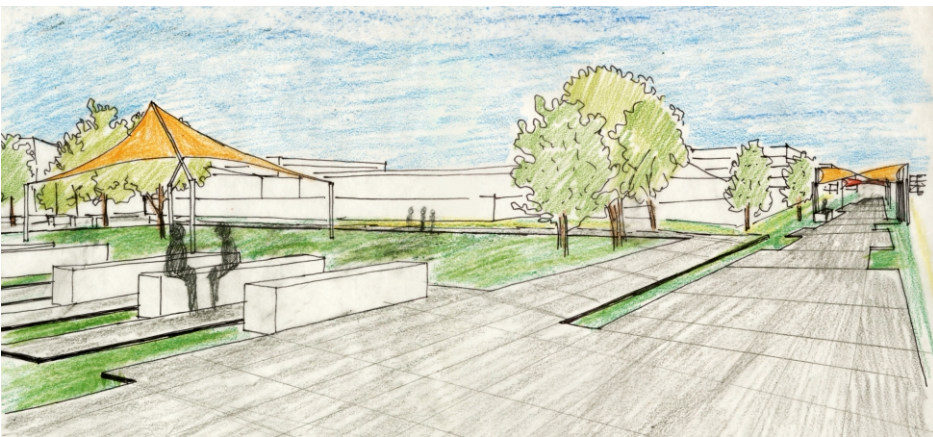


Street shopping

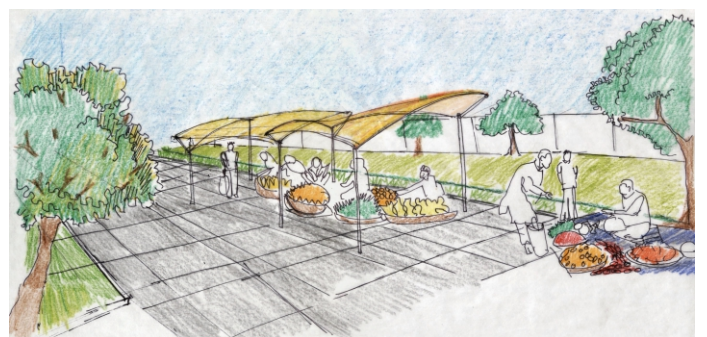
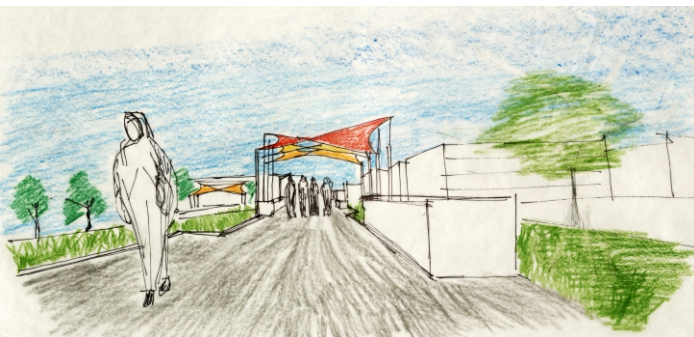


Vegetable market

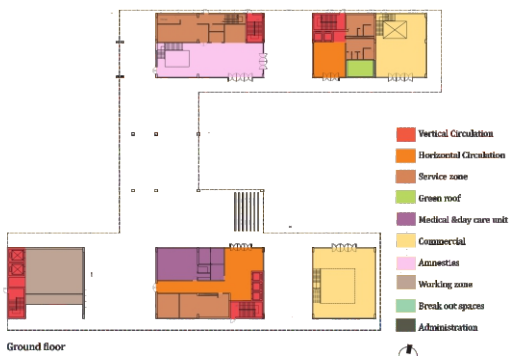
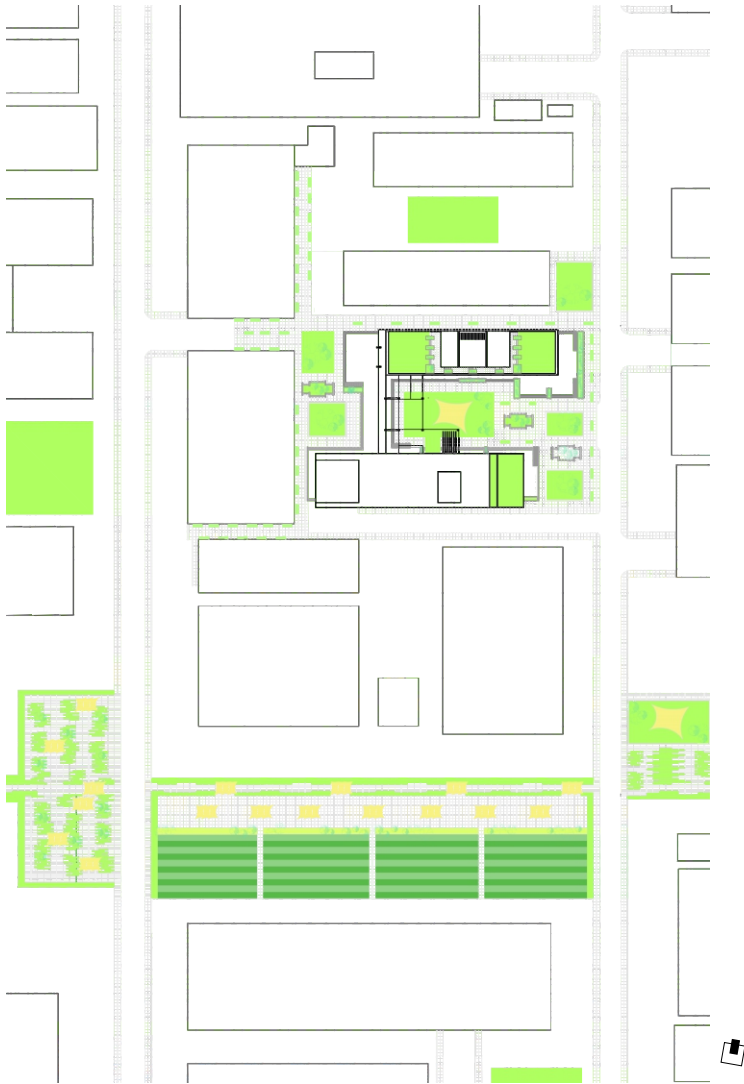
CONCEPTUAL SKETCHES



Vegetable market

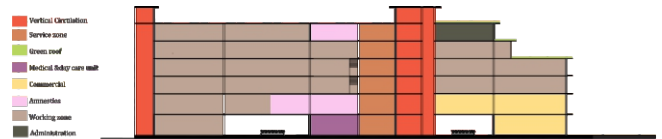


DESIGN PROPOSALS



- Vertical Circulation
- Horizontal Circulation
- Service zone
- Green roof
- Medical day care unit
- Commercial
- Assembly
- Working zone
- Break out space
- Administration

FLOOR DISTRIBUTION





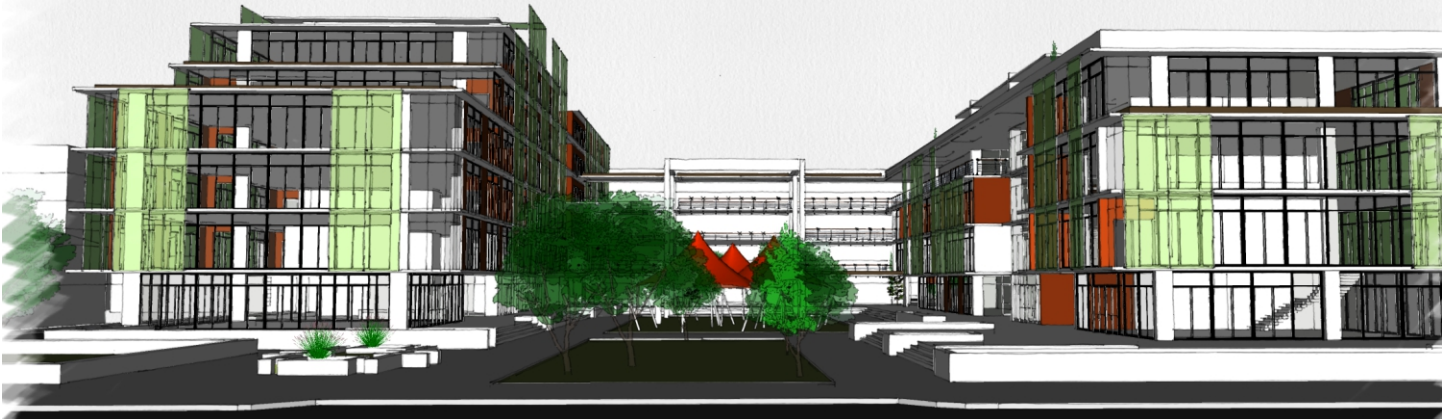
ENTRANCE POINT





VIEW FROM ADJACENT FACTORIES

COURTYARD



ELEVATIONS

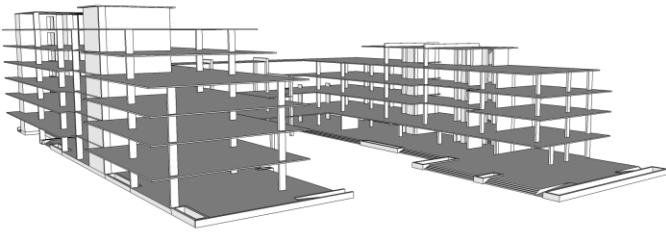
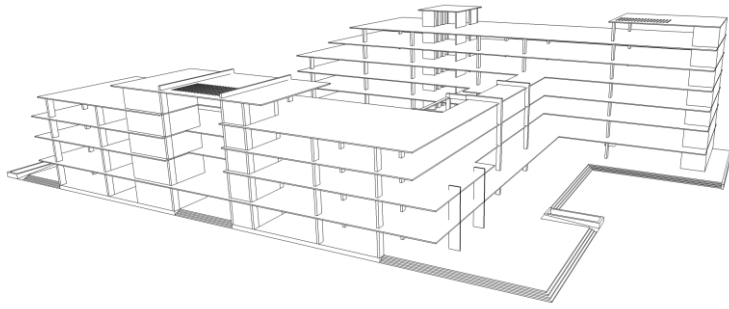


North Elevation

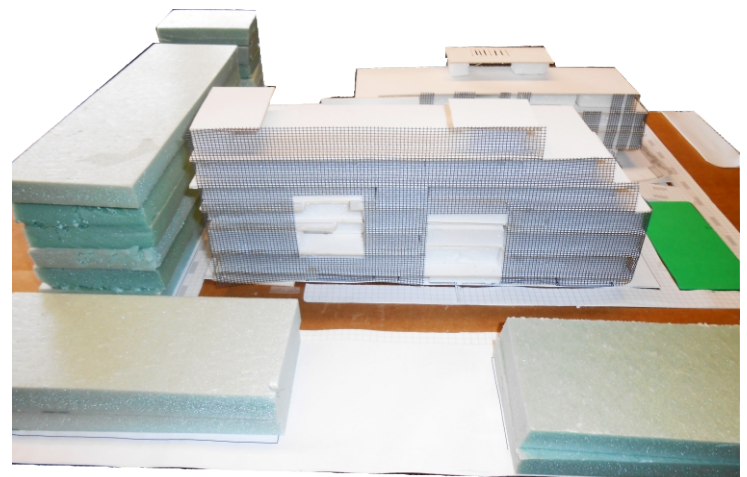
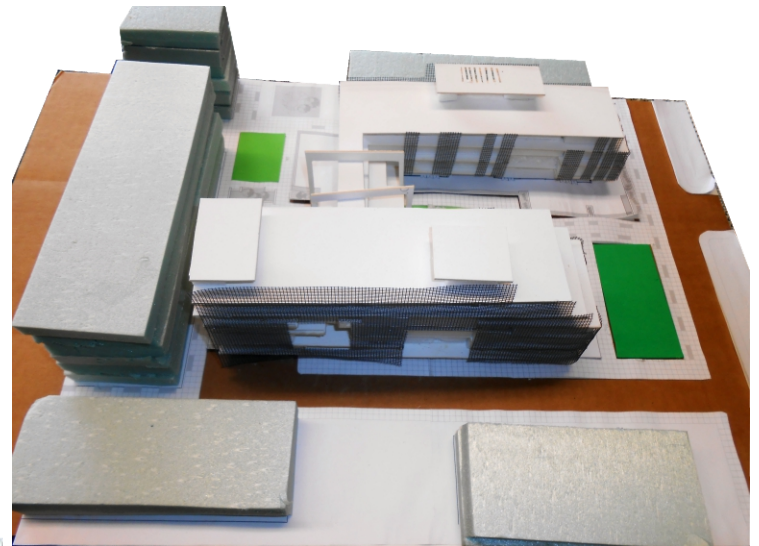
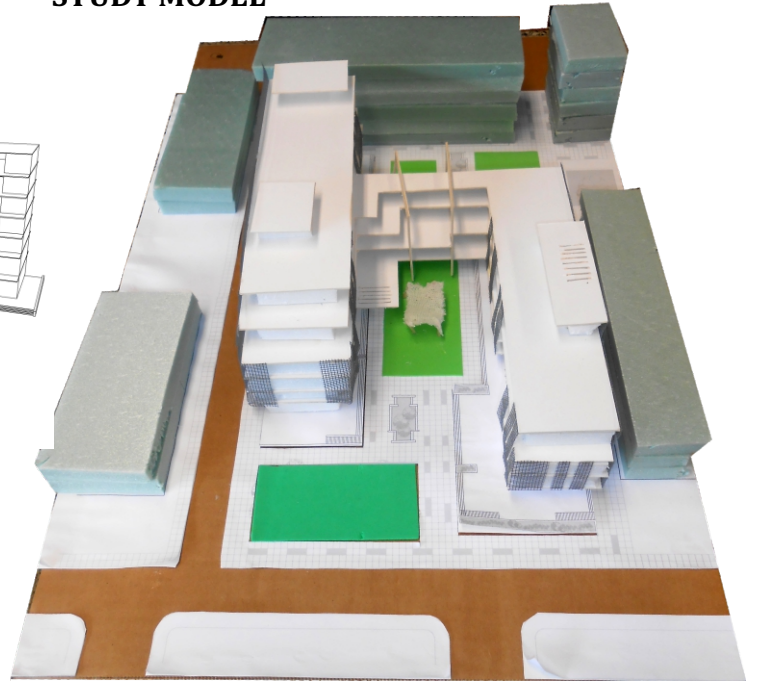
South Elevation



STRUCTURAL IDEAS



STUDY MODEL



Chute System

Vertical conveyor

Unit + On-Floor + No Accumulate

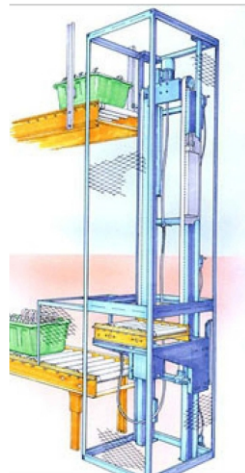
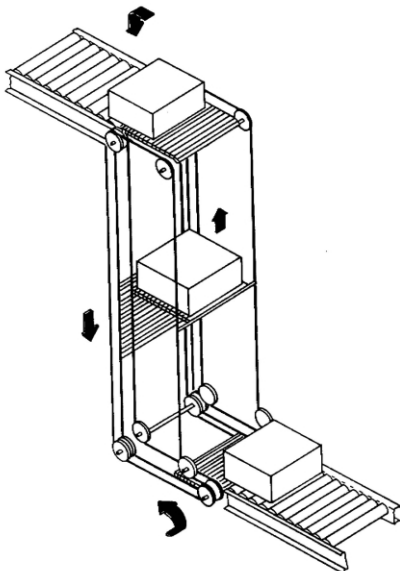
Used for low-frequency intermittent vertical transfers (cf. *vertical chain conveyor* can be used for continuous high-frequency vertical transfers)

Vertical Lift Conveyor

Carrier used to raise or lower a load to different levels of a facility (e.g., different floors and/or mezzanines)

Differs from a freight elevator in that it is not designed or certified to carry people

Can be manually or automatically loaded and/or controlled and can interface with horizontal conveyors



An architectural rendering of a modern building with a grid overlay. The building features a prominent green facade on the right side and a white facade on the left. A large tree is on the left, and a paved walkway leads towards the building. The text "FINAL DESIGN AND PRESENTATION DOCUMENTS" is centered over the image.

**FINAL DESIGN
AND
PRESENTATION DOCUMENTS**

Empowering Women Of Bangladesh In The Garment Industry

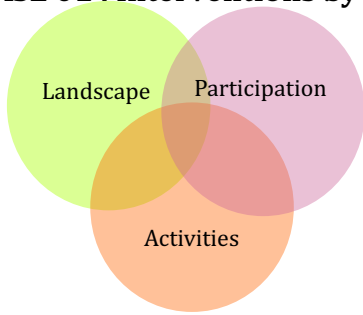
Bangladesh is a developing country with a key role in the global competitive Ready Market Garment (RMG) Industry where women make the majority of the garment workers.

How can architecture influence the garment industry of Bangladesh? How can architecture ensure a healthy and safe environment in the garment industry of Bangladesh leading to women empowerment?



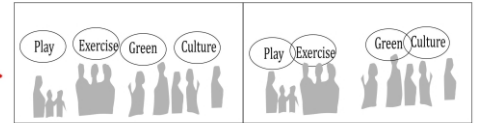
PROPOSED MASTERPLAN _ FUTURE PROPOSALS

PHASE 01 : Interventions by creating landscape, users participation and activities



Activities , programming and participation

Social circles are created by who share same interests
Symbiotic social circles are created by who share common and complementary interests



Landscape	Activities	Participation
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Green space
Walkway
Seating
Shading

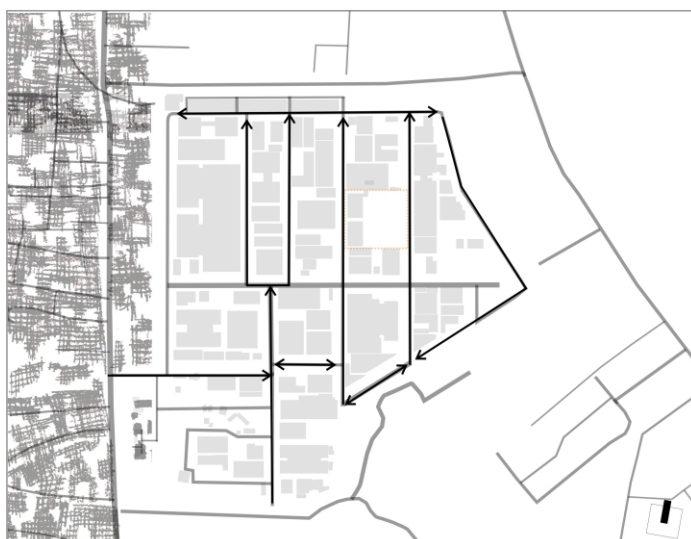
Group discussion
Exercise

Idea exchange
Education
Interaction

CONCEPTUAL SKETCHES



— Main Pedestrian access
— Vehicular access during night



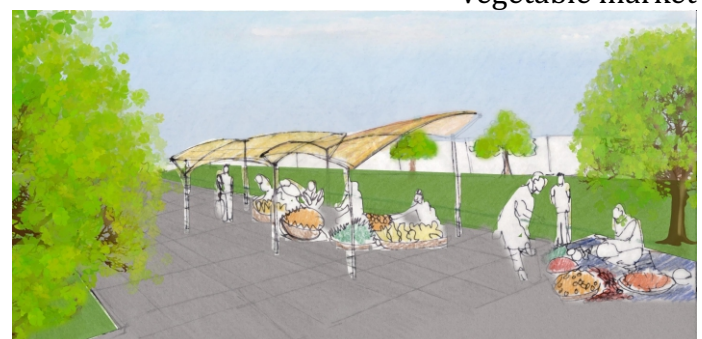
Entrance Point



Interaction space



Vegetable market



PEDESTRIAN WALKWAY

Developing a pedestrian walkway with green spaces will provide interactive spaces for female workers and will eventually start to change factory environment



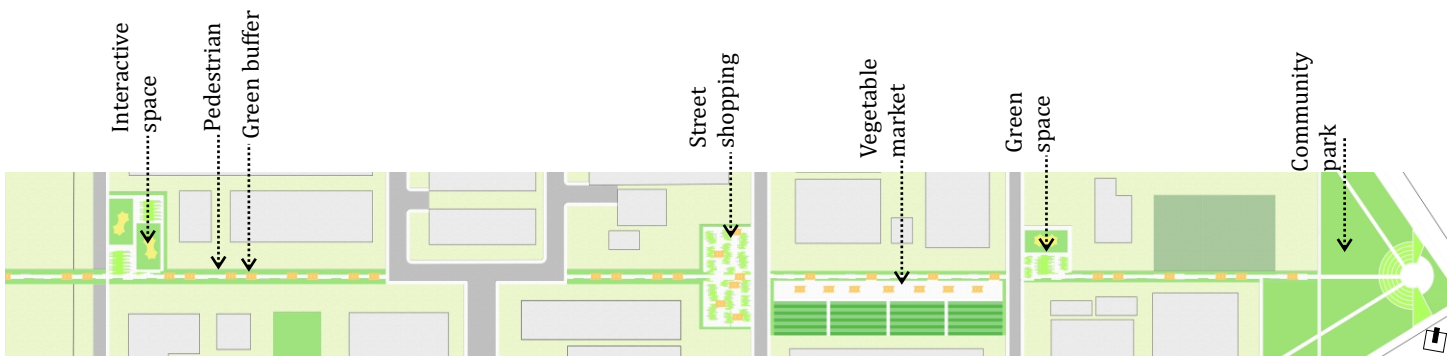
PHASE 02 : Interventions continue to create network and force the existing built spaces to break down into small units



Materiality



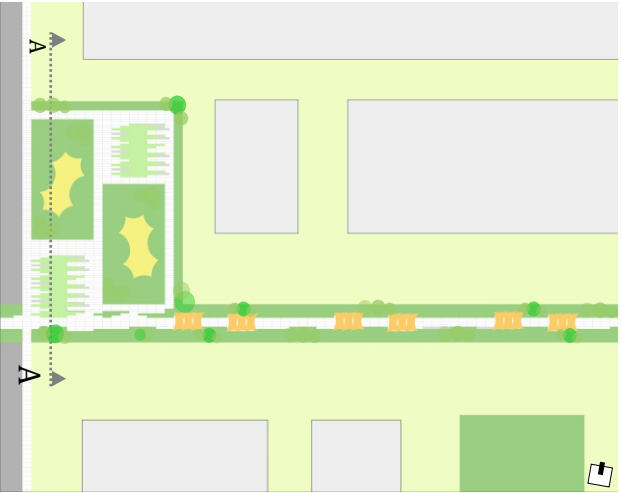
PEDESTRIAN ACCESS



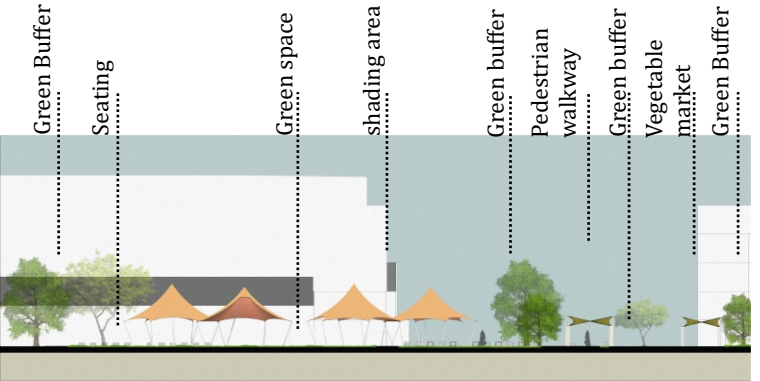


SECOND PHASE

INTERVENTION : GREEN SPACE

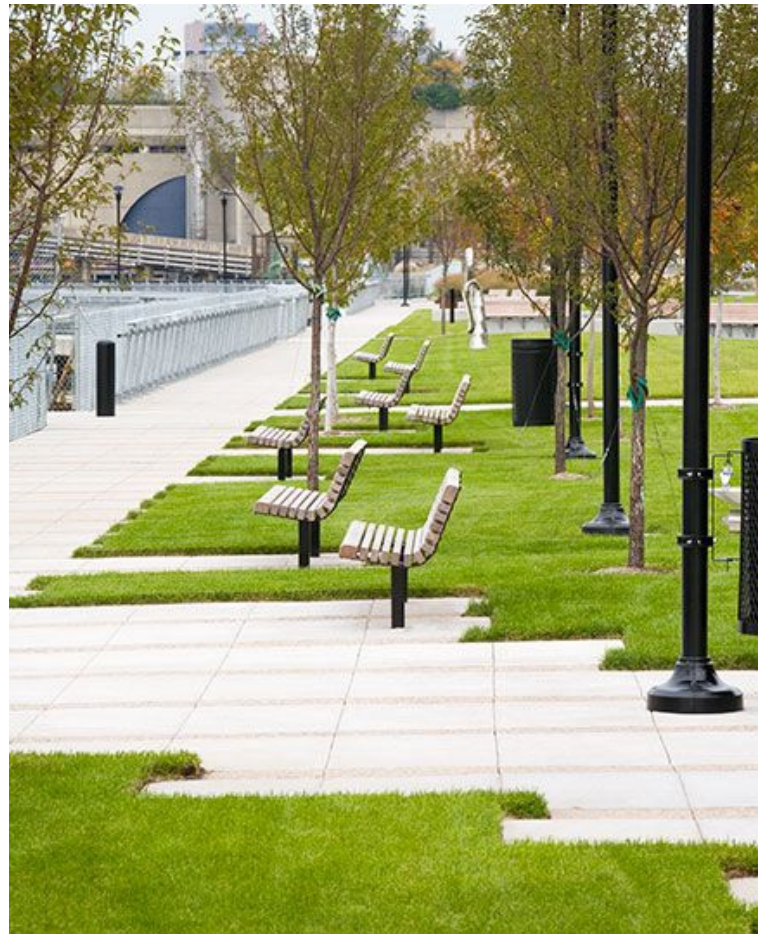


Section AA showing the hierarchy of space



INSPIRATION IMAGES

Fabric in exterior



Green spaces

Green roof



Transparency

DESIGN CONSIDERATION

Awareness & Transparency

Retails _Display of products

Interaction between workers and consumers

Exhibition of products and workers **design studio** ,Café

Awareness & Interaction

Small Working Unity

Skill Development

Education and Training facilities

Healthy Working Environment

Daylight , ventilation , green space

Sustainability

Green roof , collection of rainwater & materials

Celebration

Using fabric in the facade , will create an identity of celebration



VISUAL CONNECTIVITY



PEDESTRIAN ACCESS



CONCEPT

>Visual connectivity

>Daylight and Air

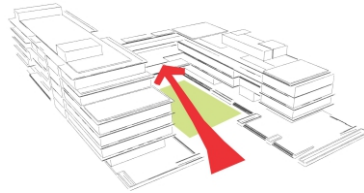
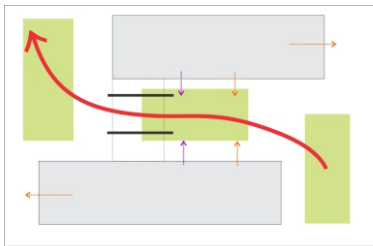
>Transparency

Interaction between building and landscape

>Pedestrian movement

>Courtyard

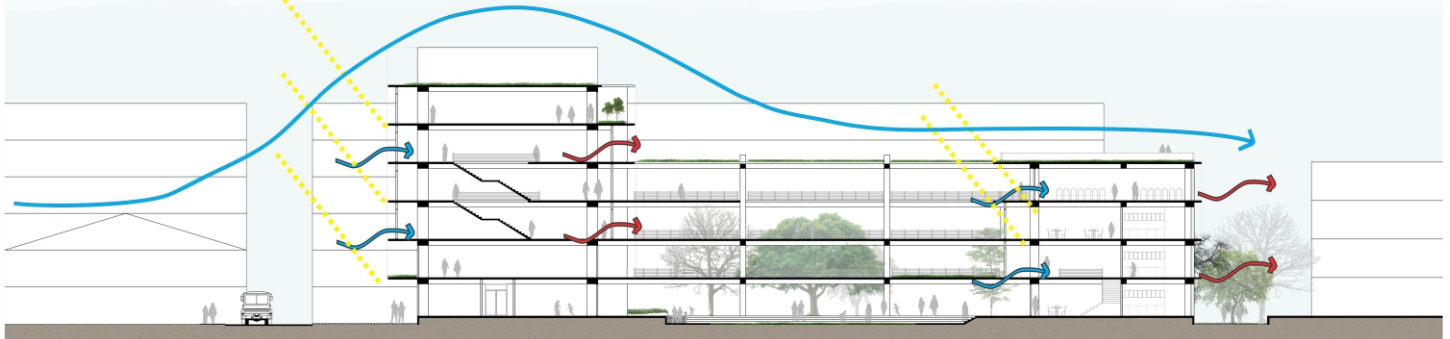
PARTI DIAGRAM



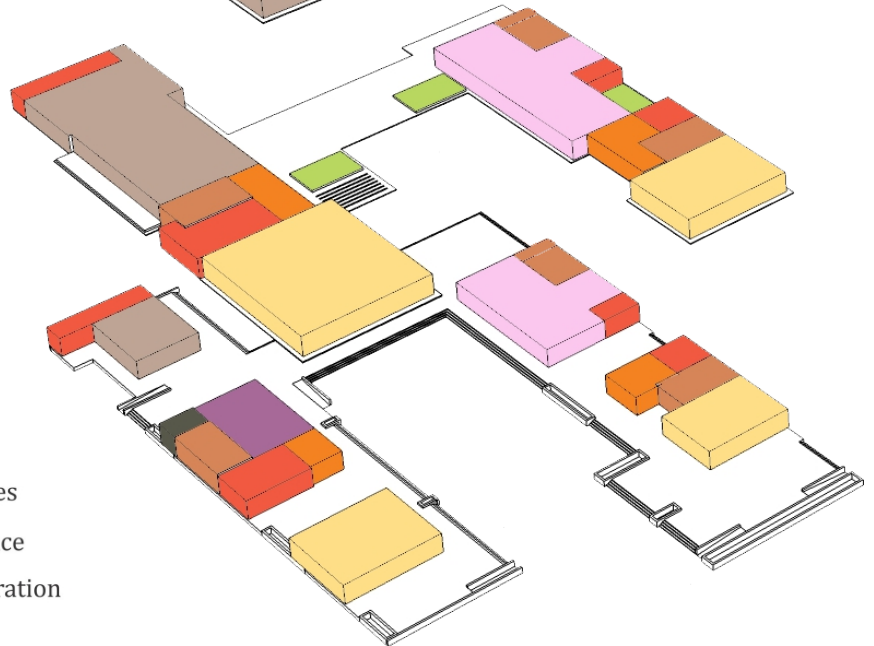
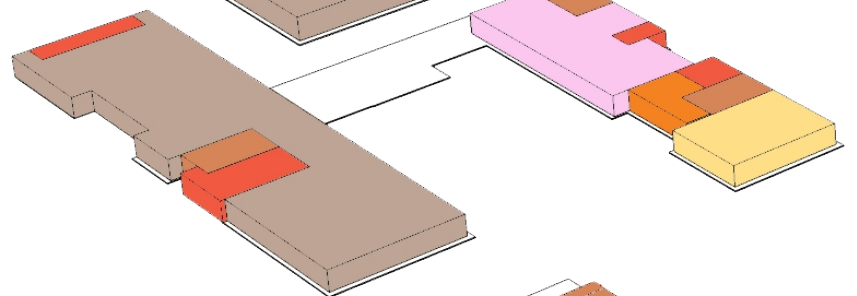
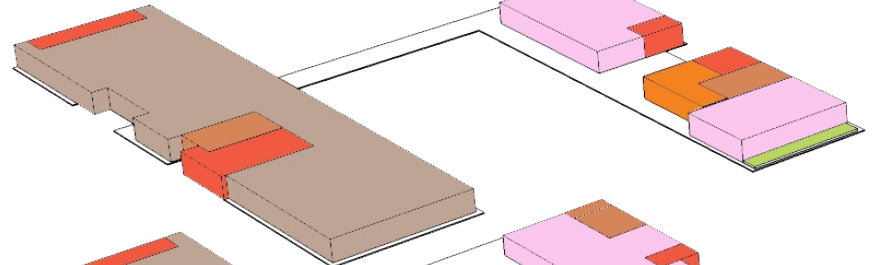
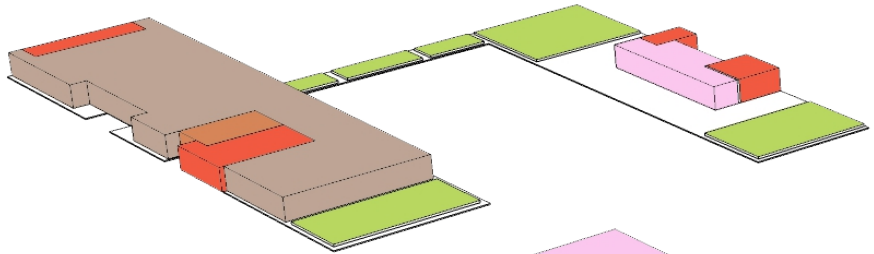
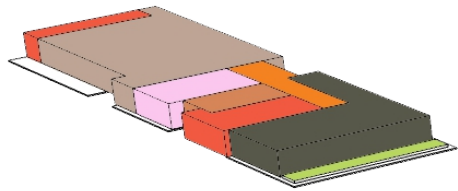
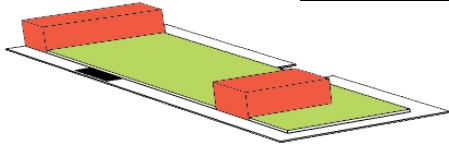
VISUAL POROSITY



LIGHT AND AIR



PROGRAM ANALYSIS



- Vertical circulation
- Service zone
- Green Roof
- Medical & child care unit
- Commercial
- Amenities
- Workplace
- Administration
- Lobby

SPACE	DESCRIPTION	SPACE REQUIREMENT (SFT)	NUMBER OF PERSON	REMARKS
WAREHOUSE				
RAW MATERIALS	1 INCHARGE, 2 WORKERS LOADING UNLOADING AREA (CONNECTED TO OUTSIDE)	4500	3	WORKERS FROM THE PRODUCTION FLOOR WILL BE SHIFTED WHEN REQUIRED
FINISHED PRODUCTS	1 INCHARGE, 2 WORKERS 1 P.C. LOADING UNLOADING AREA (CONNECTED TO OUTSIDE)	4200	3	WORKERS FROM THE PRODUCTION FLOOR WILL BE SHIFTED WHEN REQUIRED
TOTAL		8700		23% of total
MANUFACTURING				
CUTTING SECTION	CUTTING TABLE (3 no's) Manager 02 Supervisor 03 Cutting workers 12 Helper 03	5200	20	
CAD ROOM	Sample print for cutting the fabric	300	2	
TOTAL		5500	22	16% of total
SEWING SECTION				
Sewing area	18 group of 12-14 workers, 1 in charge	9000	225-230	
Ironing	1 person Per group	1000	18-20	
Inspection	1 person Per group	1200	18-20	
Packaging		1800	20-25	
Training facilities/classroom		3400		
TOTAL		19,400	280-290	61% of total
TOTAL OF Working Unit		37,000		
Medical and day care unit	1 doctor in medical unit , 1 supervisor in day care unit , capacity 20-25 children	1035		

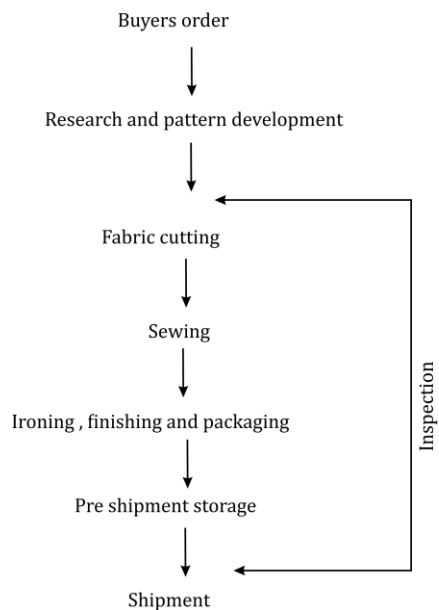
AMENITIES			
Café and dining	Designed not only for workers of the factory but also for surrounding workers, consumers and clients.	9800	250-300
Prayer space	5 times prayer time, but 3 times occurred during work hours	1050	
Library	1 person Per group	1500	
Seminar/ audio visual room		2750	220-225
TOTAL		14,380	

COMMERCIAL			
RETAIL 01 Interaction space	Display of products, interaction among workers, consumers and clients.	4920	
RETAIL 02 Interaction space	Display of products, interaction among workers, consumers and clients.	5490	
TOTAL	Important as it will promote small entrepreneurship	10410	

ADMINISTRATION			
GENERAL OFFICE ROOM DESK WITH 2P.C + 2 PRINTERS		230	2
MANAGERS' ROOM	SALES AND MARKETING, HR, PRODUCTION	120	1
DIRECTOR'S ROOM	DESK AND SMALL SEATING AREA	235	1
CONFERENCE ROOM	CAPACITY- 10 PERSONS SHOULD BE PROVIDED WITH SAMPLE DISPLAY AREA	300	
OFFICERS	DESK WITH PC PER PERSON , Accounts, general works related to administration with circulation	1280	1
TOTAL		1895	15 20

Green roof	Including roof garden	13,445	
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TYPICAL PROCESS FLOW CHART



CAD room



Inspection



Fabric cutting



Packaging



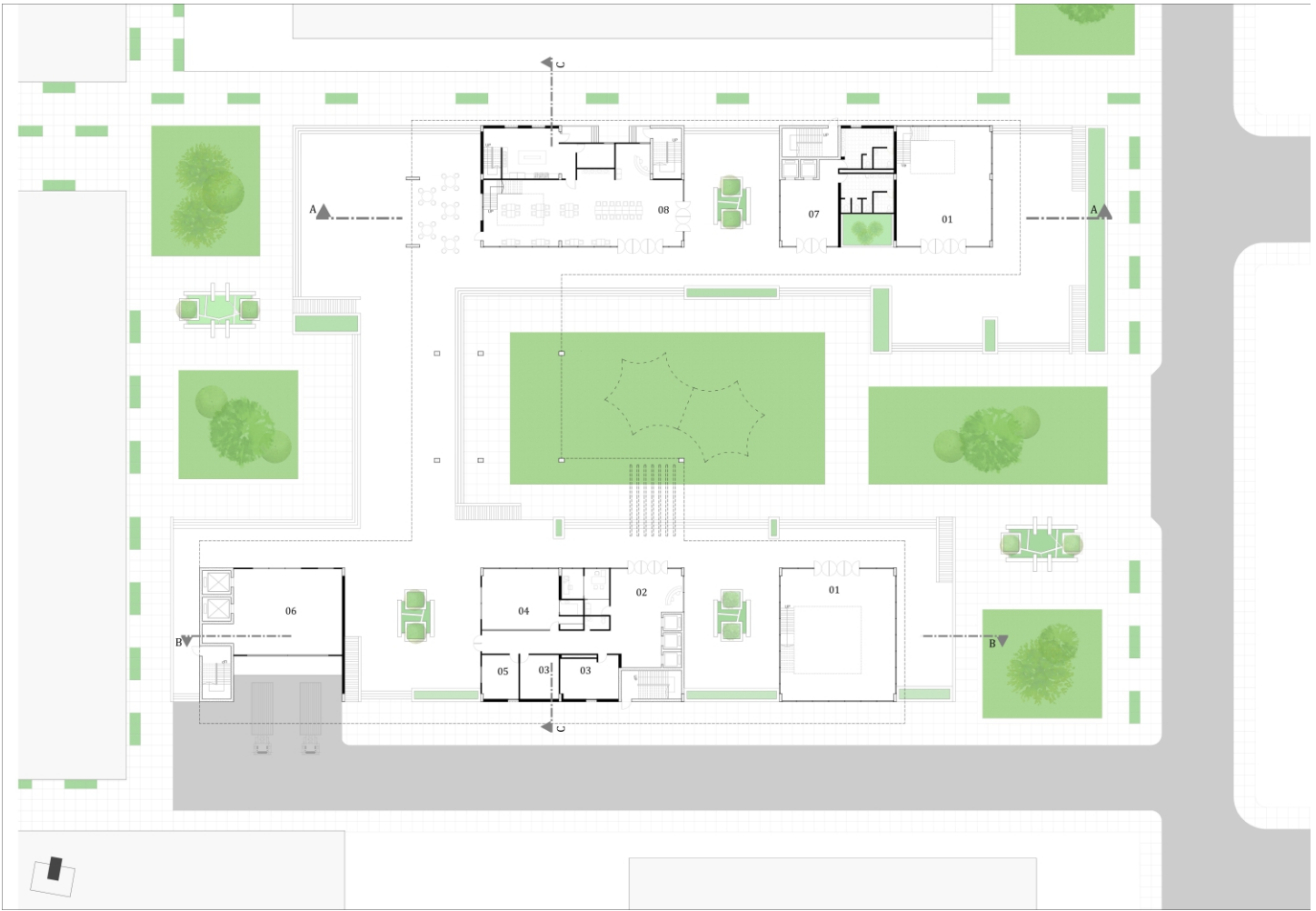
Sewing



Pre shipment storage

SITE PLAN





GROUND FLOOR PLAN



- 01. Interaction space _Retail
- 02. Lobby for workers
- 03. Lockers
- 04. Childcare and medical unit
- 05. IT Sections
- 06. Warehouse
- 07. Lobby
- 08. Dining and café space

FIRST FLOOR PLAN

SECOND FLOOR PLAN



THIRD FLOOR PLAN



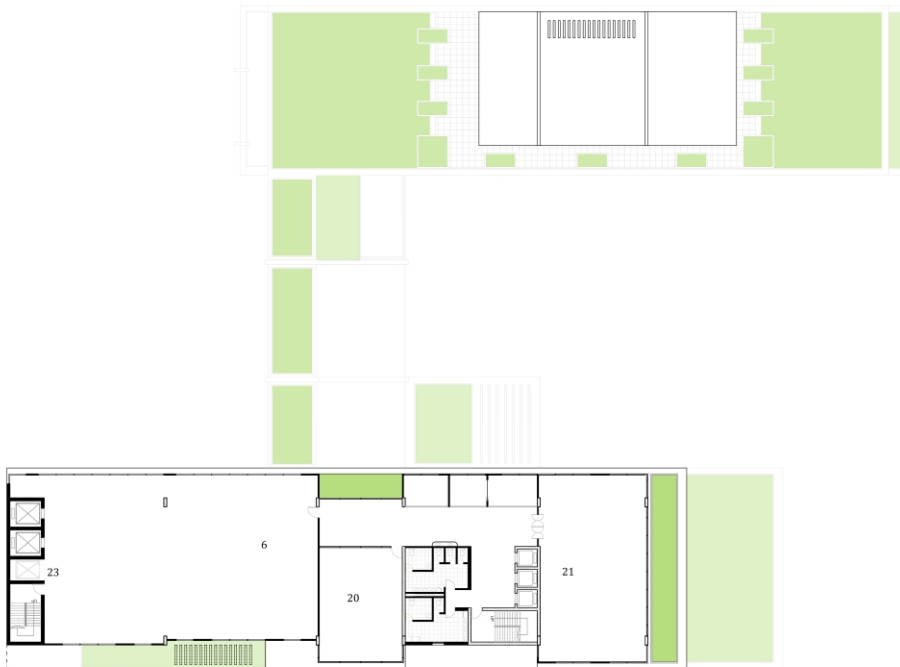
- 01. Interaction space _Retail
- 02. Lobby for workers
- 03. Lockers
- 04. Childcare and medical unit
- 05. IT Sections
- 06. Warehouse
- 07. Lobby
- 08. Dining and café space
- 09. Training /classroom
- 10. Semi open multipurpose space
- 11. Cutting section
- 12. Sewing section
- 13. Inspection
- 14. Cad room , supervisor room
- 15. Ironing
- 16. Packaging
- 17. Library
- 18.Seminar room
- 19. Roof garden
- 21. Prayer space
- 22.Adminstration
- 23. vertical chute system



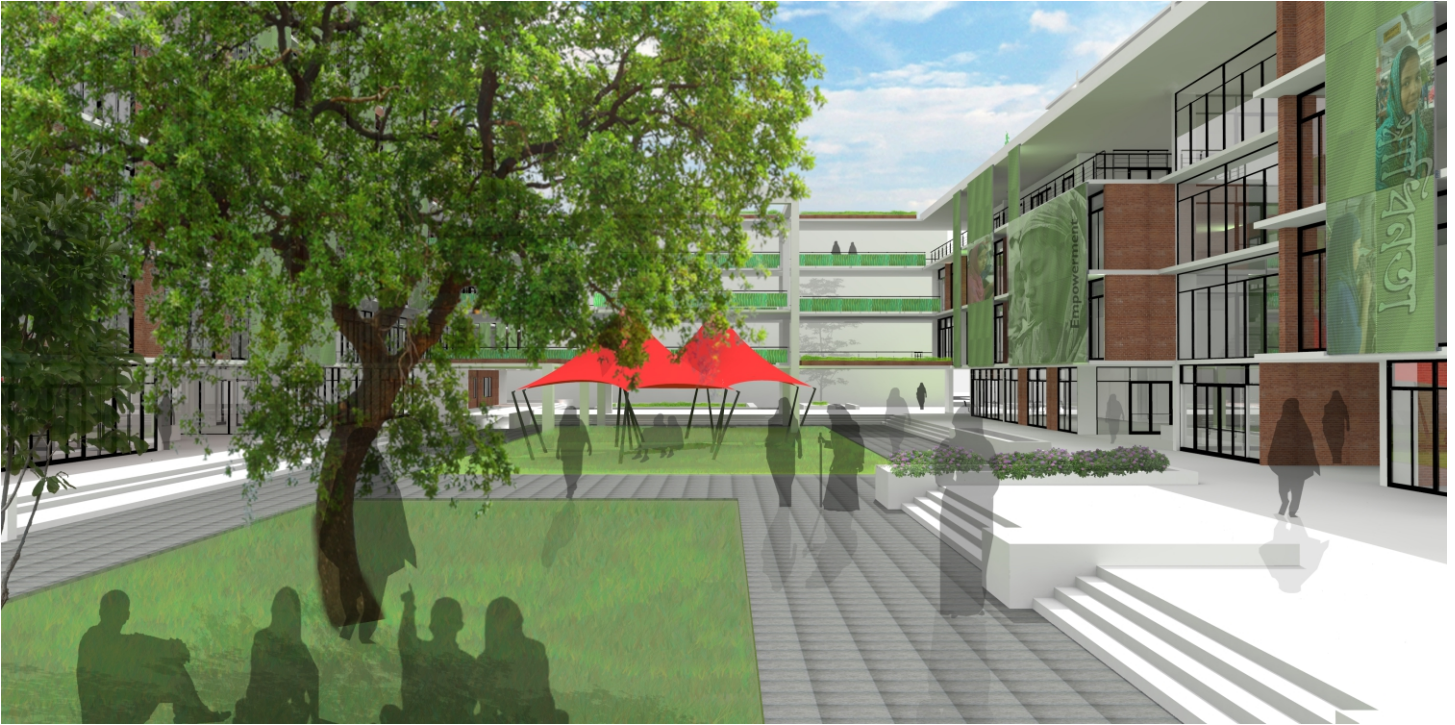
FOURTH FLOOR PLAN



FIFTH FLOOR PLAN



PERSPECTIVES

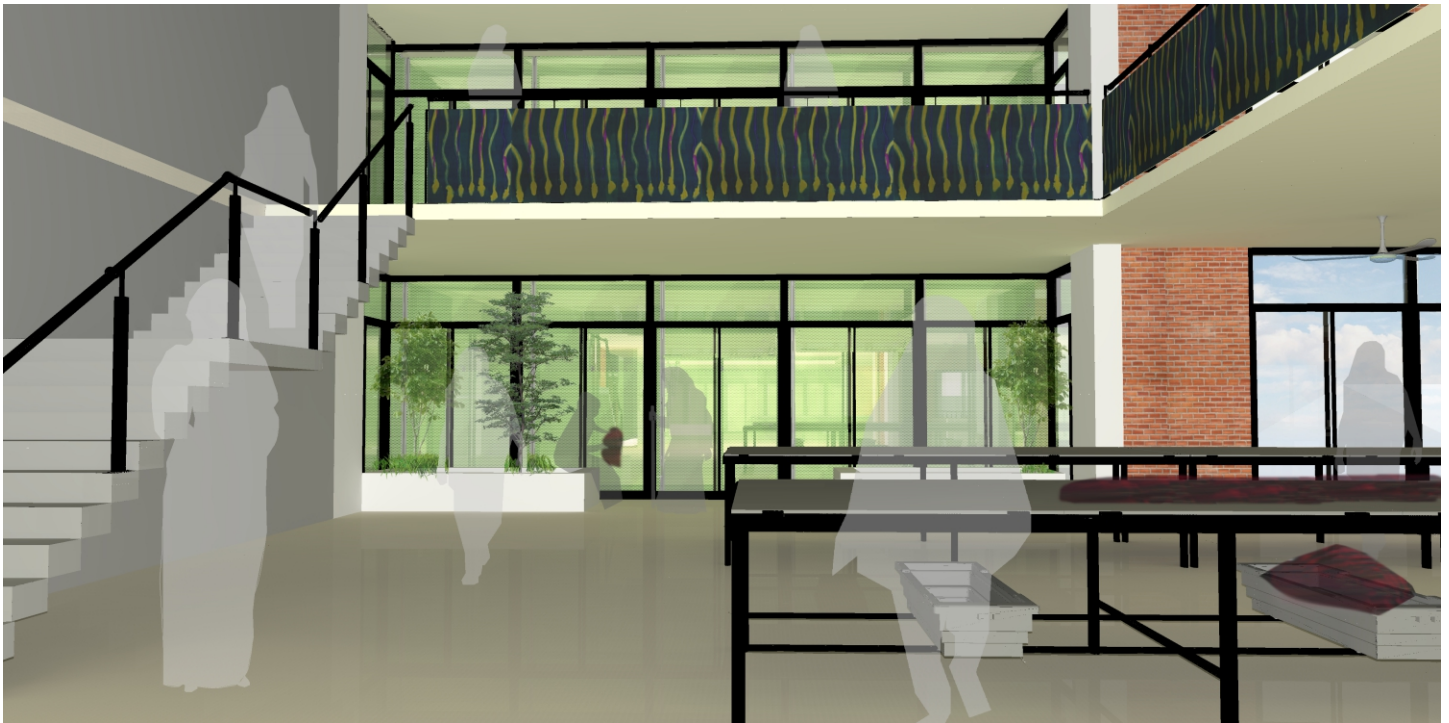


VIEW TOWARDS THE COURTYARD

ENTRANCE POINT



PERSPECTIVES



VERTICAL CONNECTION IN THE WORKPLACE

VIEWS FROM ADJACENT FACTORIES



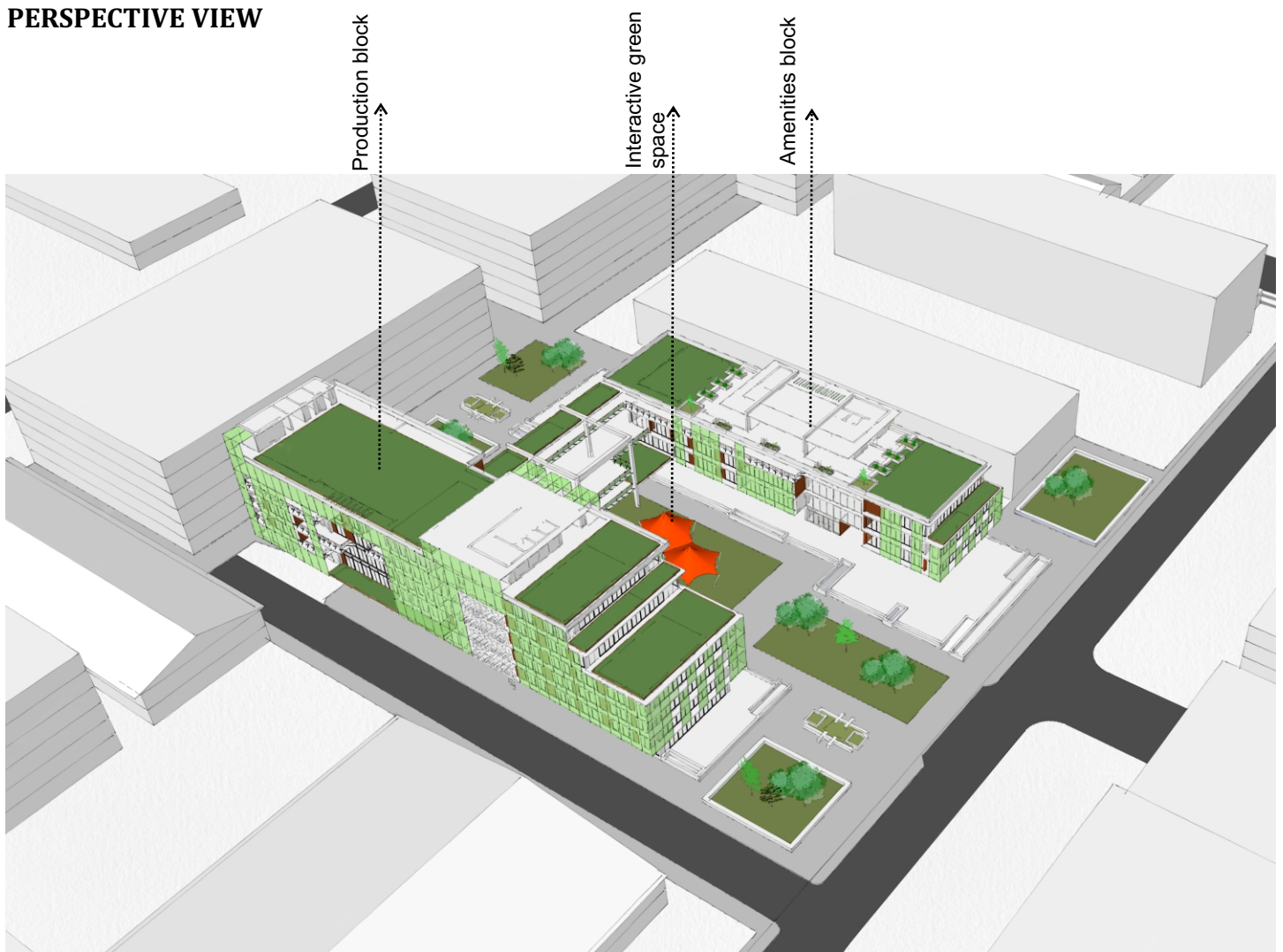


FEMALE WORKERS INTERACTING IN SEWING

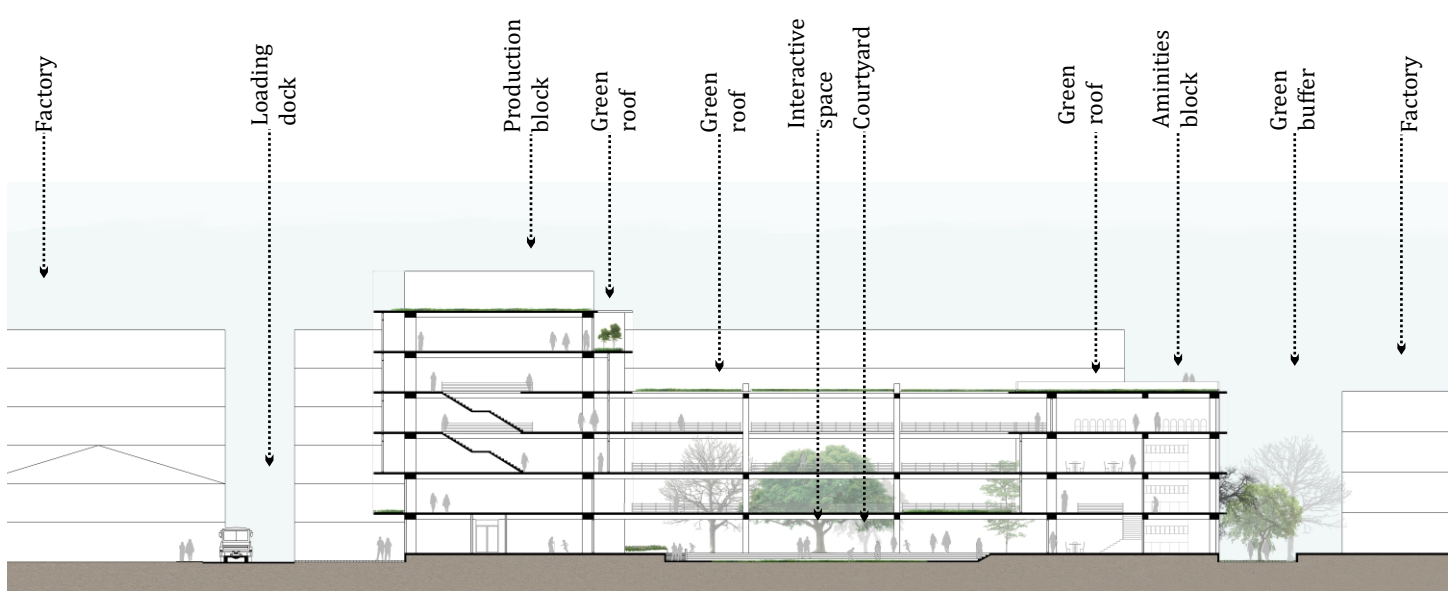
RELATION BETWEEN INDOOR AND OUTDOOR SPACES



PERSPECTIVE VIEW



SECTION



Section CC

ELEVATIONS

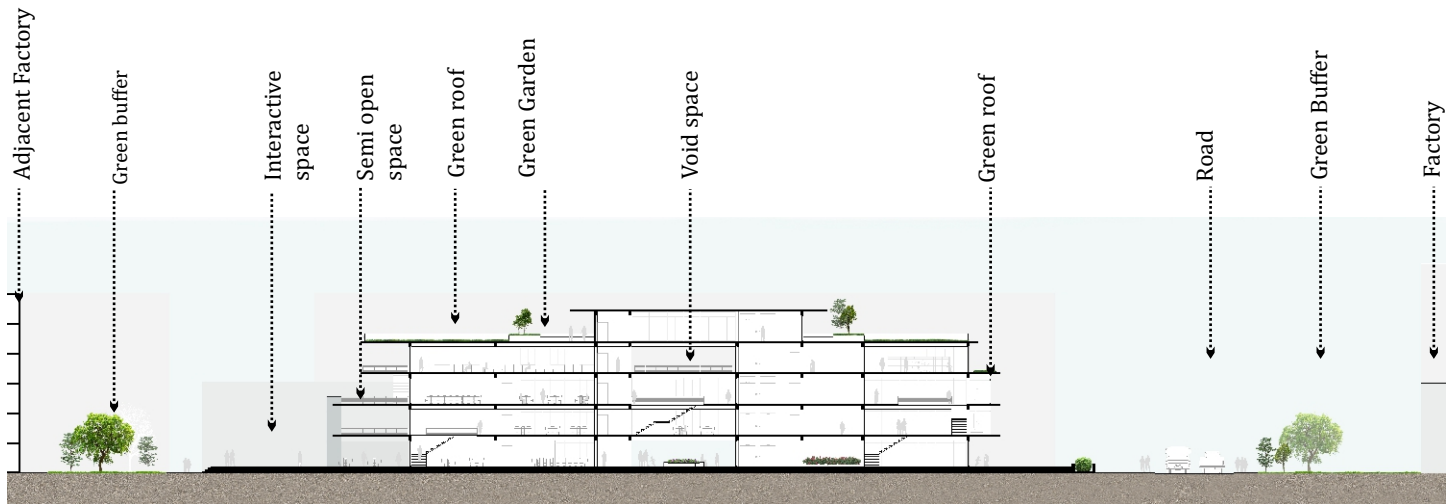


North Elevation

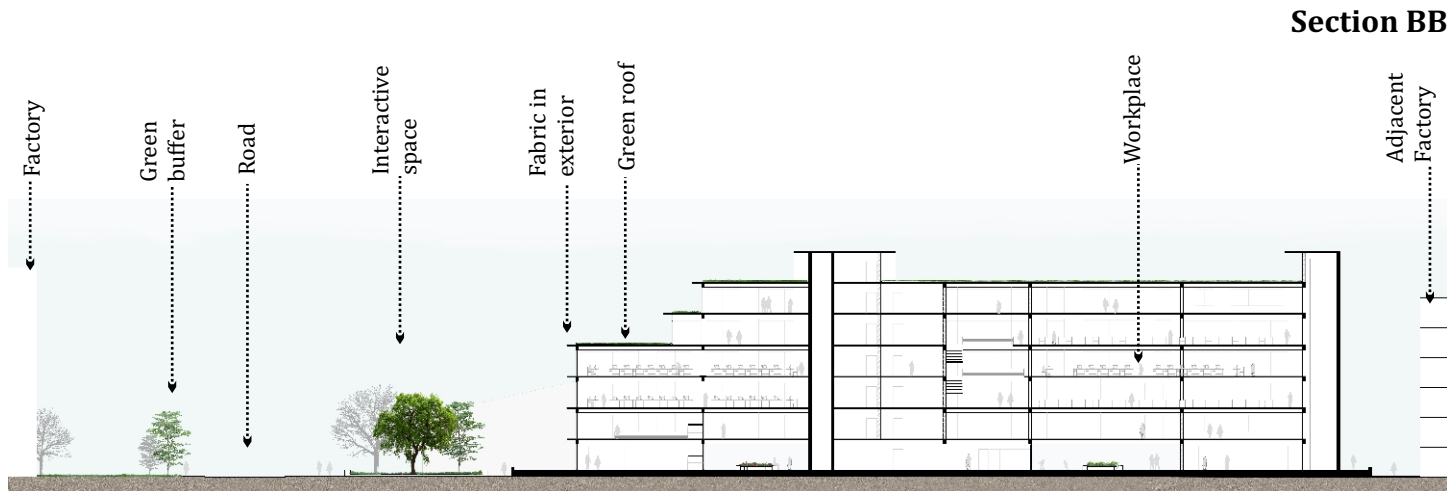


South Elevation

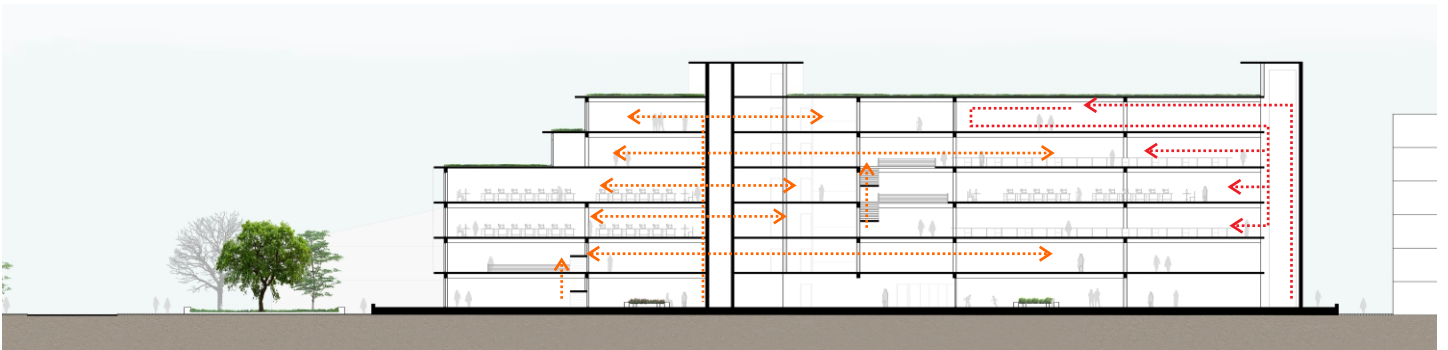
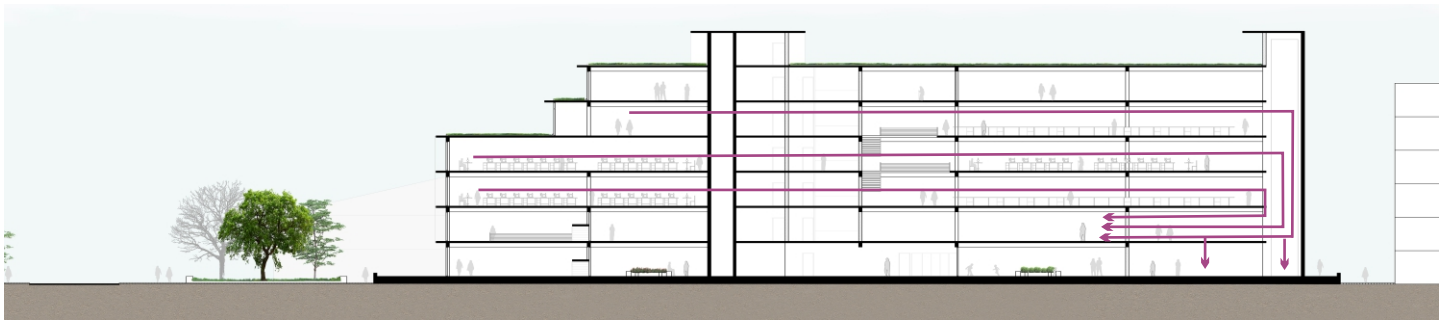
SECTIONS



Section AA



Section BB



Workers circulation

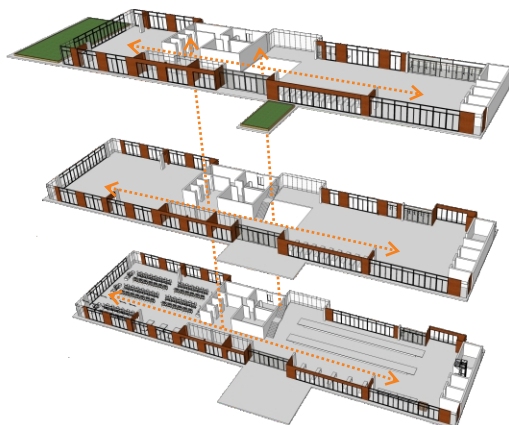
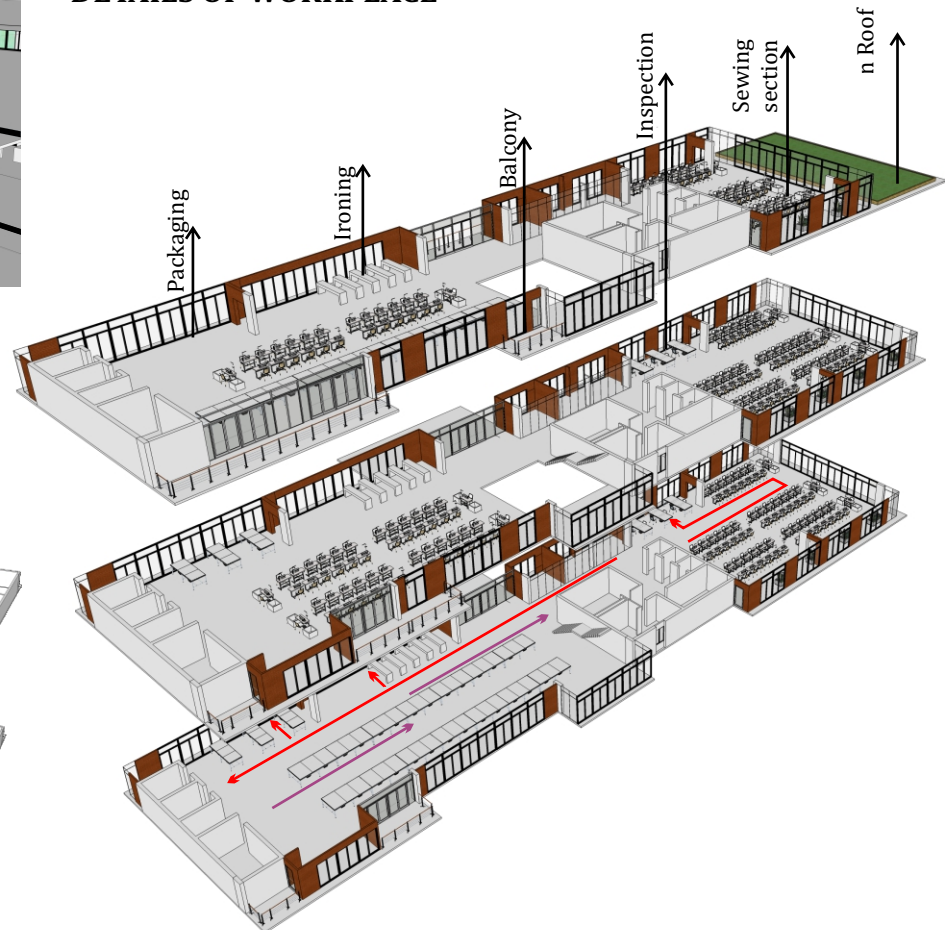
Finish product distribution

Raw materials distribution



Visual porosity

DETAILS OF WORKPLACE



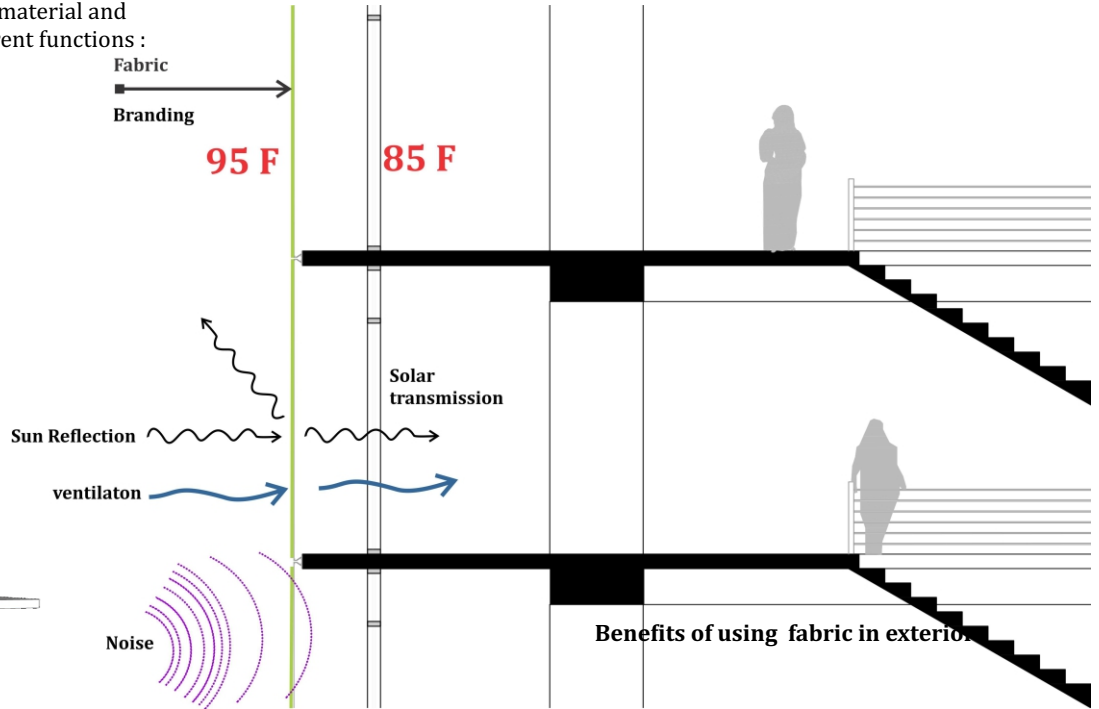
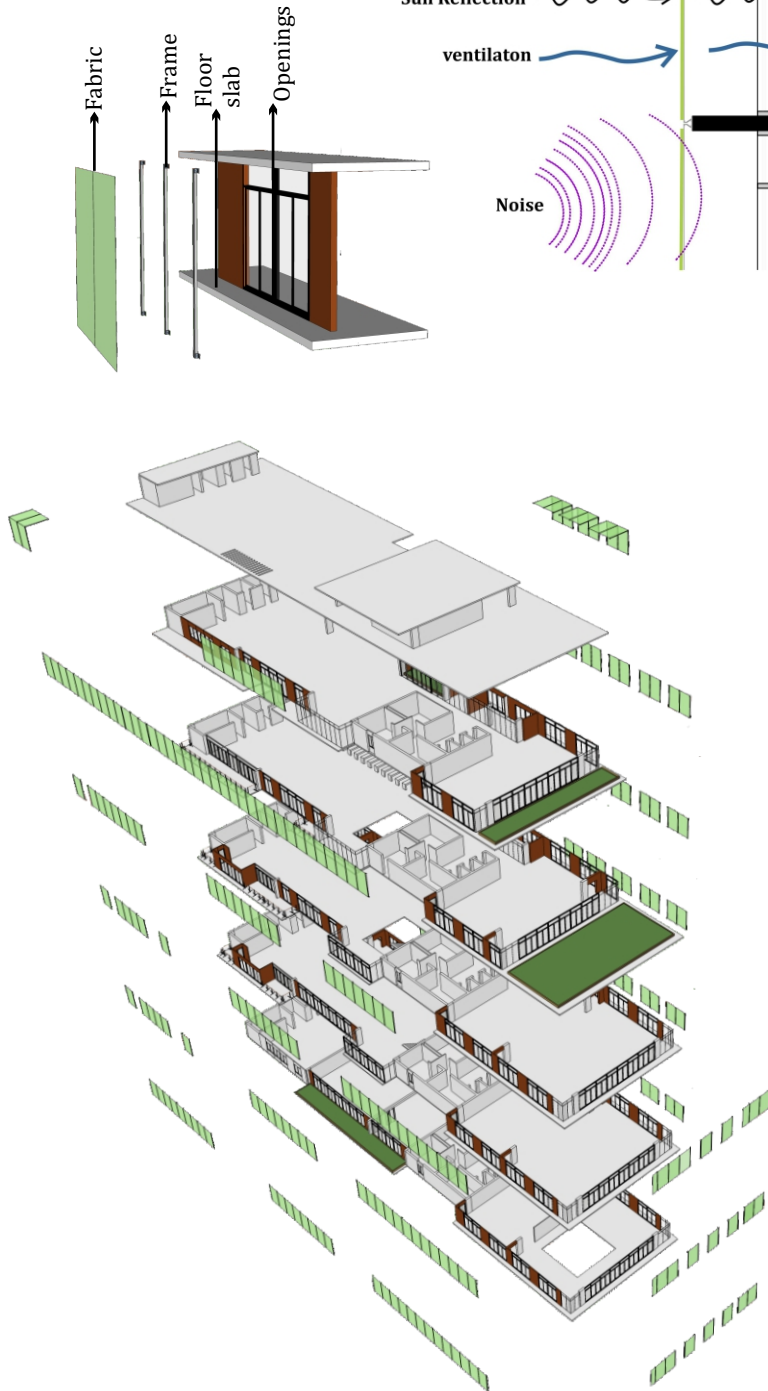
FABRIC FACADE

Fabric facade is a light weight cladding for external walls . Depending on the material and designed used facade fulfills different functions :

- 1.Sunscreen
- 2.Noise Protection
- 3.Building signage and branding
4. Sustainable
5. Cost and energy efficient

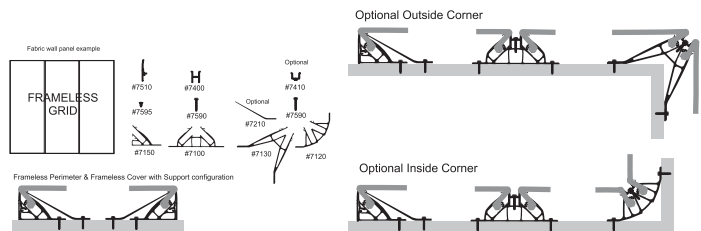
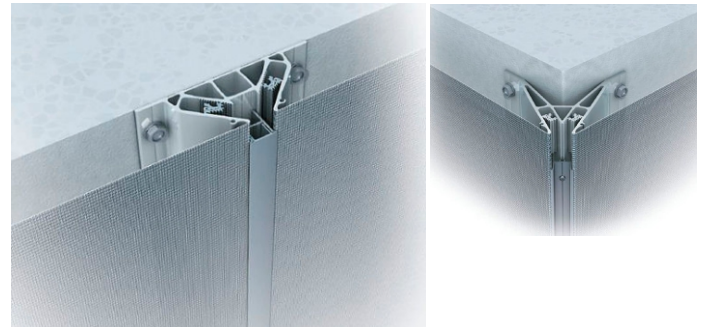
STRUCTURE

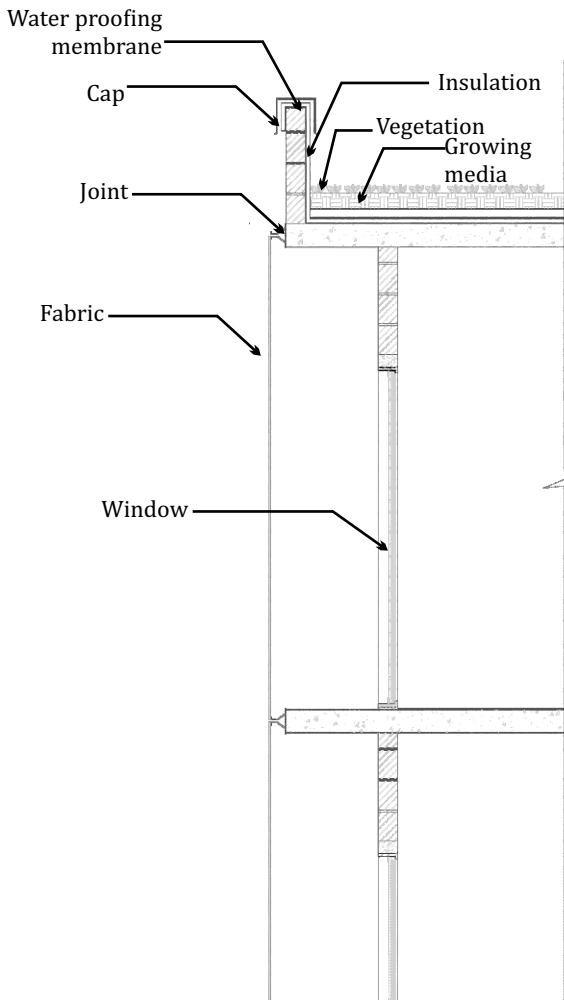
- >Concrete Column & beam
- >Brick wall
- >Glass
- >Fabric in exterior



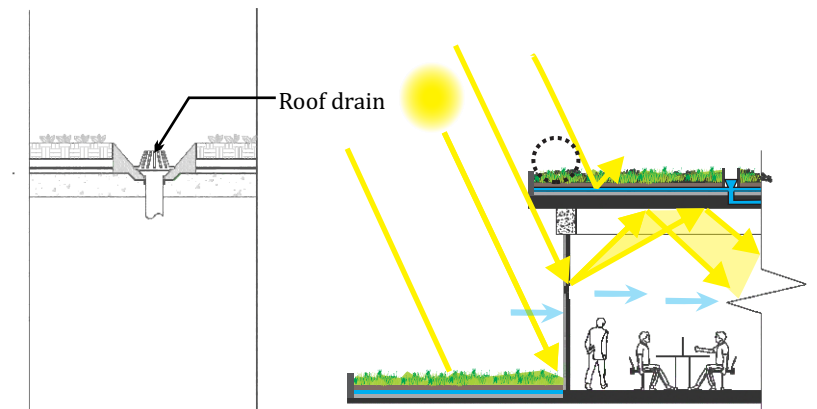
Benefits of using fabric in exterior

JOINT DETAILS



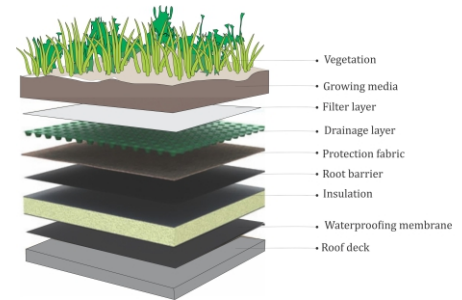


DETAIL WALL SECTION



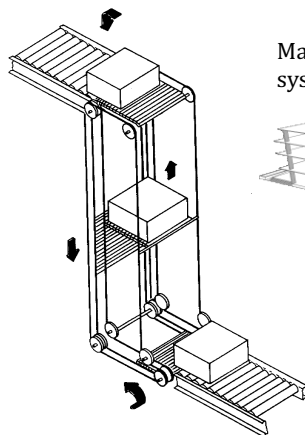
Green Roof reduces the *heat island effect* and improves indoor air quality. Daylight redirecting film thin windows penetrates more depth

Detail of green roof



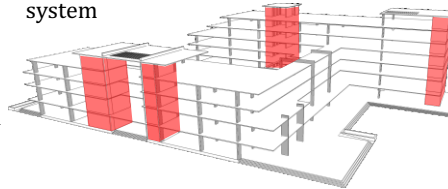
CHUTE SYSTEM _vertical conveyor

Unit + 0 n - floor + n c
accumulate
Used for low frequency
vertical transfers
Carrier used to raise or lower
a load to different levels
Only for products
Can be controlled manually
or automatically

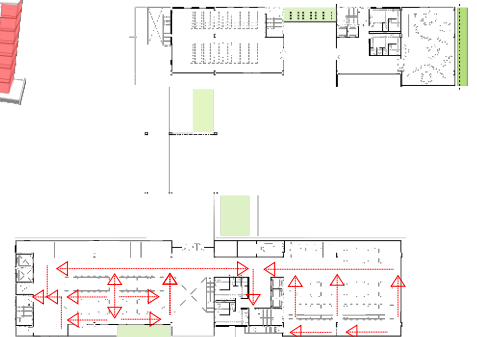


STRUCTURAL SYSTEM AND EMERGENCY PLAN

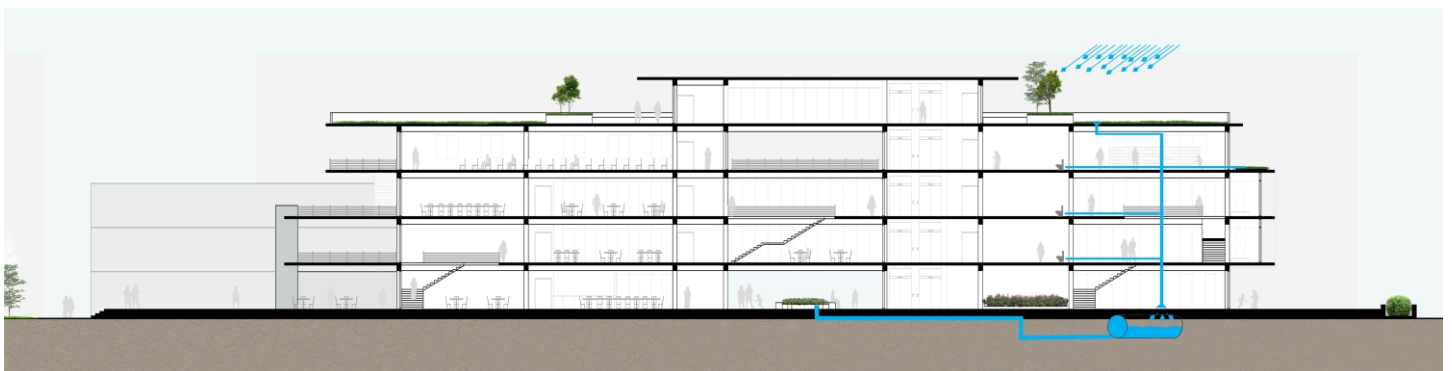
Massing study showing structural system



■ Fire stair
■ Column
← Emergency route



RAIN WATER COLLECTION

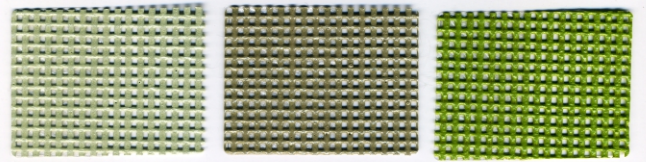
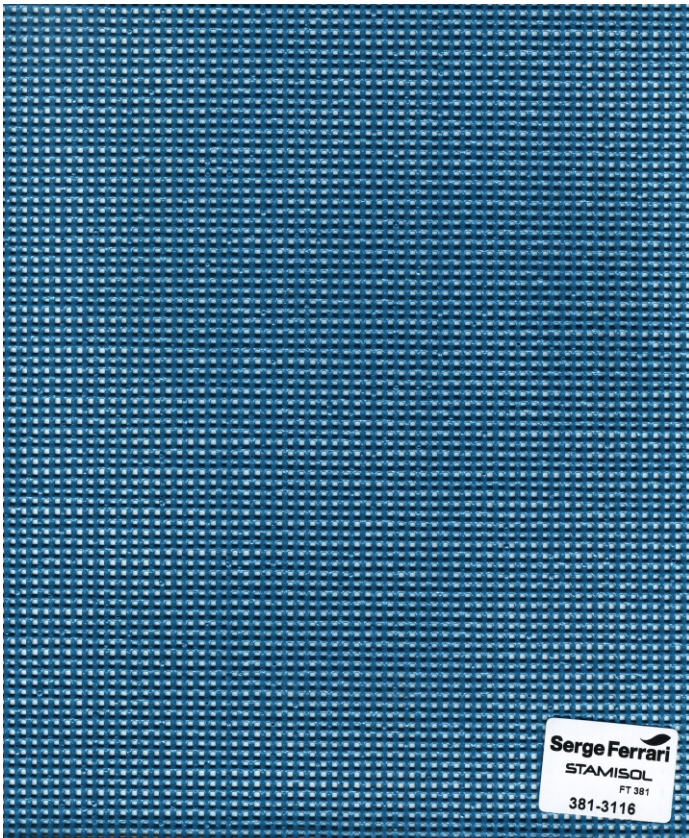


Fabric samples

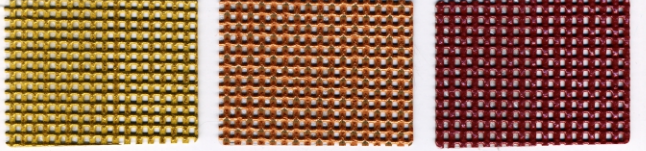
SOLTIS
FT 381



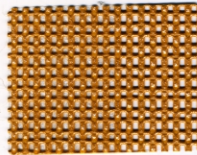
Serge Ferrari



Milky green 381-3119 Cactus-green 381-3118 Spring-green 381-3117



Temperament-golden 381-3124 Cinnamon-copper 381-3127 Glowing-red 381-3105



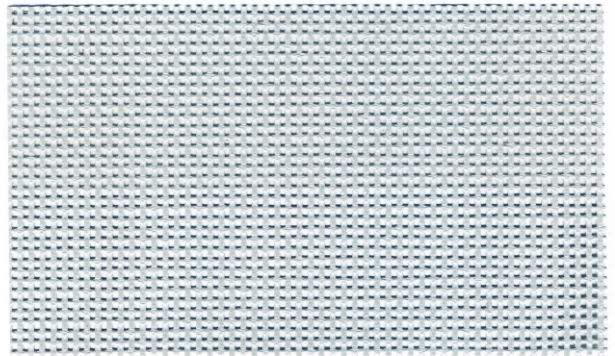
Pumpkin 381-3101

Solar and light properties (EN 14501)

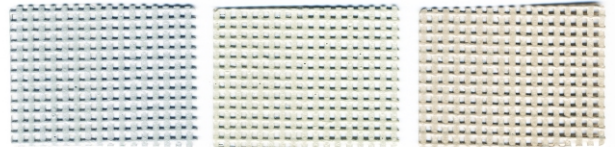
Reference	TS	RS	AS	TV n-h	g _a *
381-3101	30	27	43	28	0.22
381-3105	29	19	52	29	0.22
381-3108	27	10	63	27	0.21
381-3109	28	37	35	28	0.20
381-3113	27	9	64	27	0.21
381-3117	27	26	47	27	0.20
381-3118	28	30	42	28	0.20
381-3119	30	41	29	29	0.21
381-3120	28	6	66	28	0.22
381-3121	28	31	41	28	0.20
381-3125	28	31	41	28	0.20

TS: Solar Transmission (%)
RS: Solar Reflection (%)
AS: Solar Absorption (%)
TS + RS + AS = 100% of incident energy

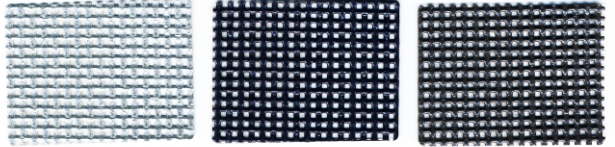
SOLTIS
FT 381



Interferential grey 381-3121



Interferential grey 381-3121 Ash-blond 381-3109 Sandy beige 381-3123

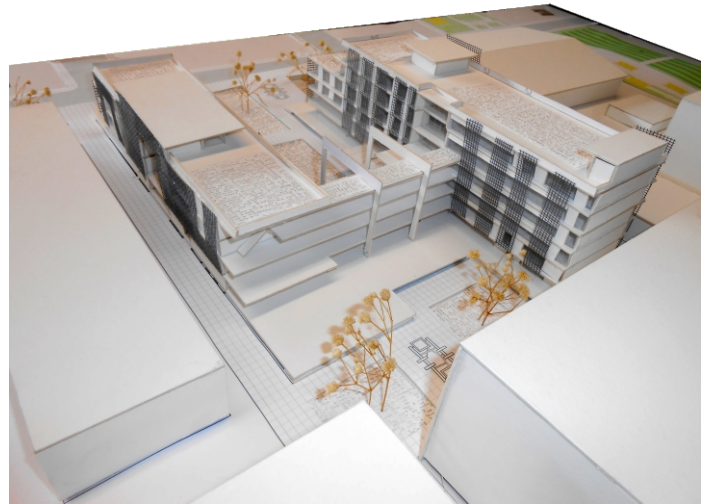


Silver-metallic 381-3128 Slate 381-3113 Choco 381-3108



Beaten metal 381-3125 Black-cherry 381-3120

FINAL MODEL



FINAL PRESENTATION





THANK YOU