PURBELI DHAKA PRODUCTION AND EXHIBITION CENTER

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BY:

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Abstract

This paper focuses on the Dhaka industry in eastern Nepal, often referred to as Purbeli Dhaka. Dhaka cloth is a traditional handloom technique that originated with the indigenous Limbu people. It can be identified by intricate patterns woven from different colored threads. The project's major goal is to promote the learning, development, and preservation of traditional Dhaka craftmanship. This includes providing chances for Dhaka production, employment development, and tourism marketing. The project's goal is to create an atmosphere appropriate to Dhaka fabric manufacturing while promoting young participation in reviving the sector.

DECLERATION

I hereby declare that the thesis titled "**PURBELI DHAKA PRODUCTION AND EXHIBITION CENTER"** is a record of work carried out by **RUTINA CHAMLING RAI** (Roll no: 750139) in partial fulfillment of the requirement for the degree of Bachelor Science & Technology in Architecture, Department of Architecture, Khwopa Engineering College, Purbanchal University, Bhaktapur, Nepal. I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work. This report has not been submitted elsewhere for grant of any other degree.

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CHAPTER 1 INTRODUCTION

1.1 Project introduction and background

This study is undertaken as part of an architectural thesis report focusing on the design of the Dhaka Production and Exhibition Facility. Dhaka, formerly known as Thaka, is a traditional handwoven cloth produced by the indigenous Limbu population in eastern Nepal. It has one-of-a-kind handcrafted designs that are becoming increasingly popular among cultures throughout the world. Dhaka has gained popularity for its unique designs, brilliant colors, and skillful craftsmanship. This cloth has great cultural significance, notably in Limbu traditional costume, and its creativity is passed down through generations. The Dhaka fabric are produce mainly in two regions of Nepal: Western, as khown by Palpali Dhaka, and Eastern, also known as Parbail Dhaka. Each group demonstrates various qualities that reflect regional and ethnic cultures. This project has focused on Purbeli Dhaka from the eastern area features elaborate motifs and brilliant colors, making it a valuable cultural asset.

Despite its rich history and cultural value, Dhaka fabric lacks enough manufacturing facilities and exposure venues. My goal is to establish a manufacturing facility that would provide a favorable atmosphere for Dhaka fabric production while also educating people about its past. Furthermore, the exhibition center will highlight Dhaka fabric and traditional craftsmanship, promoting its prominence both locally and globally. I also tend to highlight the dhaka fabric products with the fashion of Nepal.By building production houses and display centers, this production center can help to preserve and promote Nepal's traditional handicrafts while simultaneously promoting economic growth and tourism.

This project will provide basically three main functions Dhaka fabric manufacturing unit, product manufacturing unit and exhibition unit. Some of the secondary functions will be based on the needs and services for the employees and need of the projects.

1.2 Project Justification

The Dhaka fabric industry in Nepal has long been admired for its intricate designs and cultural significance, yet it faces significant hurdles to realize its full potential. Despite its historical roots and craftsmanship passed down through generations, the absence of dedicated production houses and exhibition centers has hindered its growth and recognition in the market. This lack of infrastructure has constrained artisans' ability to meet demand

and showcase their products effectively, relegating the industry to a cottage-level status. By addressing these challenges through the establishment of production houses and exhibition centers will aim to revitalize the Dhaka fabric sector. Not only will this initiative provide a conducive environment for production, but it will also create much-needed job opportunities for local artisans and workers. Additionally, showcasing Dhaka fabric in specialized exhibition centers will not only attract tourists but also foster greater appreciation for Nepal's cultural heritage. Furthermore, centralizing production will ensure better management of resources, enhance product quality, and promote sustainability. Ultimately, this project seeks to promote traditional craftsmanship, support economic growth, and enrich tourism experiences in Nepal.

1.3 Objectives

- To Provide opportunities for skill development and education in traditional Dhaka fabric craftsmanship.
- To Promote the history and significance of Dhaka fabric to encourage passion and awareness among craftsmen and the community.
- To Increase Dhaka's fabric manufacturing capability through improved infrastructure and improved techniques.
- To support local livelihoods by creating work opportunities in the Dhaka fabric industry.
- To promote Dhaka fabric as a cultural attraction for tourists, helping to promote the tourism sector.

  To create a safe, regulated environment for Dhaka fabric manufacturing that promotes worker well-being and productivity.

1.4 Scopes and limitation

This research does not cover other region of Dhaka fabric and only limited to eastern region of Dhaka fabric.

1.5 Methodology

Various methods were employed in this project to achieve its goals and collect data and information. These methods included filling out questionnaires, conducting interviews, and live observations of different sectors of people, including owners, locals, weavers, and retailers. Surveys for locals were conducted both live and online, while interviews with retailers and weavers were conducted in person.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

Textile are any flexible materials created by weaving, knitting, crocheting, or felting fibers together. These fibers can be natural (cotton, wool, silk, or linen) or synthetic (polyester, nylon, or acrylic). Over time, the industry has seen major advances in science and technology, resulting in the rise of mineral-based textiles and synthetics as key sectors in the global textile landscape. The textile industry is one of the world's oldest, having begun with the weaving of natural fibers derived from animals and plants. The textile business has evolved through numerous epochs, with one of the most prominent periods ranging from prehistoric times to the 19th century.

During the Middle Ages, the textile industry received a great deal of attention. Turkish tribes displayed proficiency in the production of carpets, felted linens, towels, and rugs as early as the Middle Ages. Following the Arab invasion of Sicily in 827 CE, Palermo's royal workshops began producing magnificent textiles. Around 1130, talented weavers from Greece and Turkey arrived in Palermo, introducing the manufacture of exquisite silk laced with gold elements. Following the French invasion of Sicily in 1266, these weavers moved to Italy, namely Lucca. However, in 1315, the Florentines seized Lucca and moved the Sicilian weavers to Florence.

The Licchavi dynasty ruled Nepal until the eighth century AD, when it was overtaken by the Thakuri dynasty. While historical documents from the four centuries of Thakuri reign are limited, evidence of cotton fabric weaving and the presence of the earliest surviving Nepalese book displaying diverse textiles have been established from this time. Several sources confirm the presence of cotton cloth weaving during this historical period, as manuscripts were frequently wrapped in huge, square pieces of fabric to protect them from insects and severe temperatures. Furthermore, beginning in the eleventh century AD, handspun and woven cotton became an essential component in the creation of early Nepalese *Thanka* religious paintings influenced by Buddhism. The oldest known evidence of Nepalese textile industry comes from Indian records going back to the Asoka dynasty. *Kautilya's Arthasastra*, often known as "The Science of Politics," particularly lists Nepalese blankets as commodities in the laws controlling the superintendent of the treasury. Given the established trading links between Nepal and India as early as the third century BC, it is plausible to assume that woolen textile manufacture had been prospering for some

time previous to this reference. Furthermore, it implies that indigenous artistic practices were well established earlier than the arrival of Indian culture in Nepal through trade, journey, and, settlers. (Susi Dunsmore,1993)

2.1.1 Dhaka Fabric in Nepal

Textiles play an important role in Nepali culture, with weaving traditions reaching back centuries. Each area and ethnic group in Nepal have its own unique weaving techniques, designs, and motifs that represent local cultures, beliefs, and lives. When ready-made garments were unavailable, individuals would weave their own from cotton using a number of complicated methods. Each ethnic had their own way of representing the way of clothing.

There are many raw materials for textile manufacture include a broad variety of materials such as cotton, jute, bamboo, wool, silk, alllo and so on. These materials are made from both animals and plants. Some of the animal sources such as sheep wool, silkworms (silk), goats (cashmere, mohair), rabbits (angora) and so on. These fibers are valued for their warmth, softness and insulation properties. Cotton, linen, hemp, jute, and bamboo are plants-based materials. These fibers, derived from plant stems, seeds, or leaves, are well-known for their breathability, absorbency, and comfort. These materials are harvested, spun, twisted into a continuous yarn into different required thickness and made into textiles.

Nepal produces a wide range of handcrafted textiles, including Pashmina, woolen, silk, cotton, and Dhaka products which are made from different raw materials. Among all the products Dhaka fabric has carried historical and cultural significance in Nepal due to its production and use. The Dhaka is the handwoven fabric which are produced in Nepal with different colored thread. Dhaka, formerly known as Thaka, is a traditional handwoven cloth linked with the indigenous Limbu people of eastern Nepal. Dhaka fabric holds an importance in Nepali culture and heritage both domestically and international due to its quality and design. Over time different Dhaka fabric products such as coat, shoes, bag, shirts can be found in market.

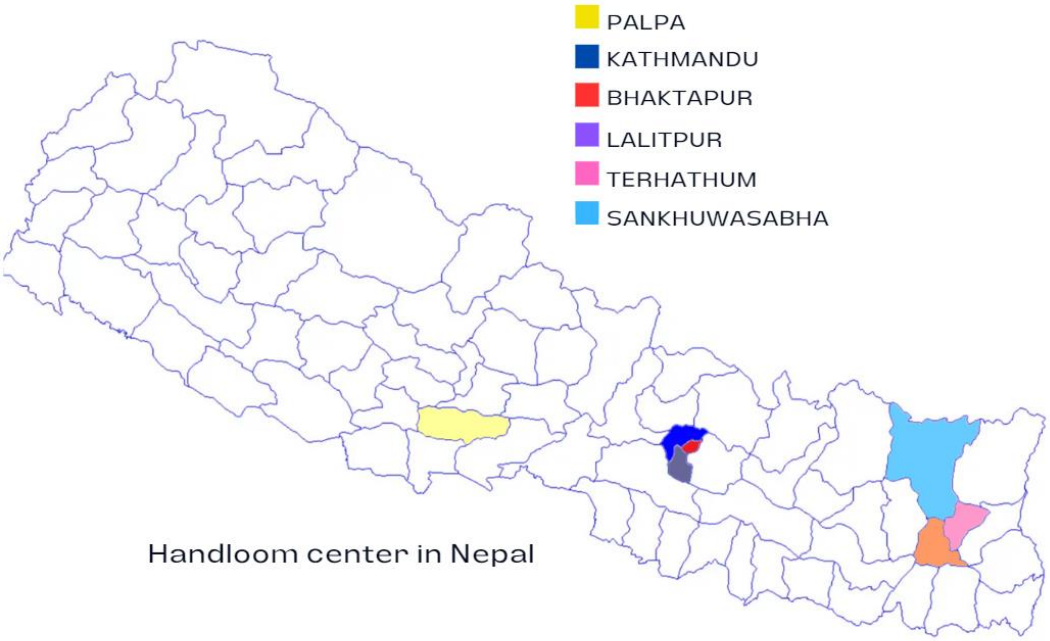


Figure 2.1: Dhaka Handloom Centers in Nepal

2.1.2 History of Dhaka fabric in Nepal

There are different historical narratives about the beginning of Dhaka fabric. It is Believed that colorful topi, which has largely replaced the plain, often black, topi, was introduced by a minister who returned with the idea from Dhaka (Bangladesh); others believe the name was given to the cloth simply because many items, such as cloth and thread, came to Nepal from or through Dhaka, or because Dhaka muslin resembled fine Nepalese weaving. However, the type of pattern weaving employed in Dhamaka, known as *Jamdani*, differs significantly from that practiced by Nepalese weavers. It's also conceivable that Hindu weavers fled Dhaka after the Muslim takeover and resided in or near Nepal, influencing Nepalese weavers. It is odd, however, that the primary center of Dhaka weaving, Terhathum, is located in a location of the central Himalayas that was difficult to access until recently and is not near a border. The National Museum in Kathmandu has a few fragments of excellent, handspun cotton inlay-pattern weaving that are considered to date from as late as the early twentieth century. According to the elders of a Terhathum weaver, this sort of weaving has been practiced for years. Previously, the designs were mostly applied to the ends of sashes and waistbands, not topis. (Susi Dunsmore,1993)

2.1.3 Technique and Process of Dhaka fabric in Nepal

Weaving equipment and techniques have evolved gradually throughout time. Several handlooms designed for certain types of Dhaka textiles have been created, with each loom varied significantly in size. As a result, there are no standard sizes for these handlooms. The bulk of handlooms, known as *Thaak*, shuttles, and wrapping drums, are made of wood. During the weaving process, the weaver stands in front of one of the fabric beams, to which one end of the warp is tied. As the fabric is weaved and looped onto the cloth beam, the weaver adjusts the tension string, enabling the warp to move toward them as necessary. This adjustment speeds up the weaving process and ensures that the cloth has the correct tension and quality before being sent to the heddles for further processing. Before the starting in front of loom, the threads tied in multiple bundles for prepared black warp of the cloth in the wrapping drum set.

There are different patterns prepared by the weavers themselves with their own creativity and design. The difficult patterns take long time to prepare as well as gets expensive as compared simpler pattern. They give their own way of naming their created pattern. Zigzag, floral patterns, diamonds, butterfly's patterns can be seen in the market. The pattern of the fabric determines how it is finished. If the fabric pattern is complex, it takes ten days; if the pattern is simple, it takes five to six days. The price of Dhaka cloth varies depending on the pattern. Three sarees can be made in a month, and the employee's income is determined by their pattern-making skills. A person with better skill and a difficult pattern can earn around 1700 to 1800 rupees. There are total of 13 thread colors used on the fabric but only few colors are combined in the single fabric. Red, yellow, black, blue, orange and white are most used colored thread for the fabric.

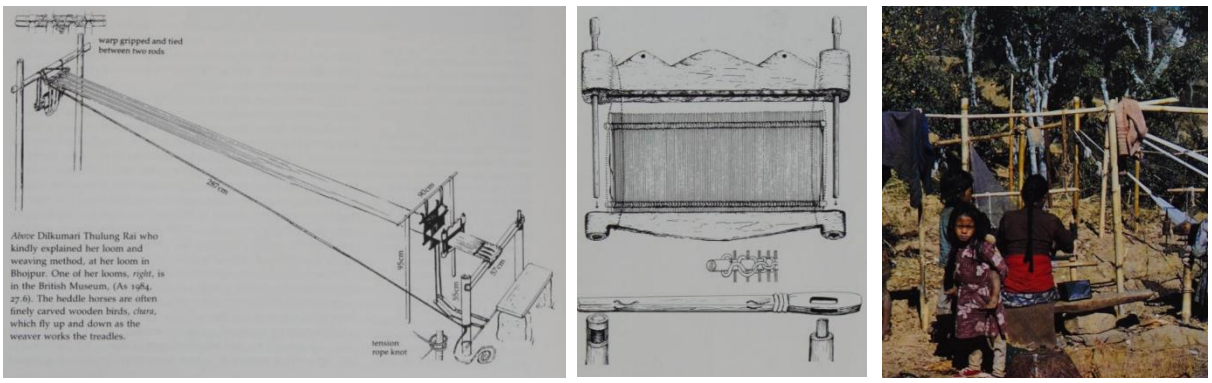


Figure 2.2: Traditional Handlooms of weaving Dhaka fabric

(Source: Nepalese Textile,1993)

Figure 2.3: Modern Handlooms for weaving Dhaka fabric

2.1.4 Types of Dhaka Fabric in Nepal

Dhaka type is mainly found in three different types in Nepal i.e., Eastern development region (Purbeli Dhaka) , western development region (Palpali Dhaka) and Newari Dhaka.

- **Purbeli Dhaka**

It has almost infinite, from bold geometric shapes and temple outlies to complex floral patterns. Each line of inlay pattern is followed by single pick of ground weaves. The fabric Dhaka is made only from handloom. The main traditional colors are red, orange, black, green and blue.

Figure 2.4: Different patterns of Purbeli Dhaka fabric

- **Palpali Dhaka**

It has thin and soft fabric compared to eastern region. The main traditional colors are black, red, yellow, orange and white. They often use supplementary- weft patterns followed by two picks of ground weaves. They use three types of looms : Handloom, Jaguardloom, Pitloom.

In 2015 B.S., a man called Ganesh Man Maharjan came to Nepal after learning to weave fabric in India and created a textile company in Palpa known as Swodesi Bastrakala Palpali Dhaka. In addition to market issues, raw materials had to be purchased from India, making it impossible to compete with higher-quality imported textiles, posing a challenge to the industry's survival. In 2019, B.S. Maharjan, who had traveled to Kathmandu for training, noticed that Shree Teen Janga Bahadur Rana's daughter Dambar Kumari, who lived in Banaras (Varanasi) in India, used a unique type of colorful, fine, and valuable textile fabric known as 'Dhaka fabric', which was made in a place called Dhaka in the then-undivided State of Bengal. This cloth was known as 'Dambar Kumari Dhaka' in Nepal and was worn by Rana family and other rich individuals. After being inspired by 'Dambar Kumari Dhaka', he returned to Palpa and used the technique to weave Dhaka in Palpa. This is how the colorful and patterned 'Palpali Dhaka' was created (Bk, 2021).

Figure 2.5: Different patterns Palpali Dhaka fabric *(Source: pda.org.np)*

- **Newari Dhaka**

It has simple design patterns such as lines, flowers .These fabrics are made from Handloom mostly by Newari people. The threads used for fabric are thick and colors like green, red white, yellow are use.

Figure 2.5: Different patterns Newari Dhaka fabric *(Source:nitya.com.np)*

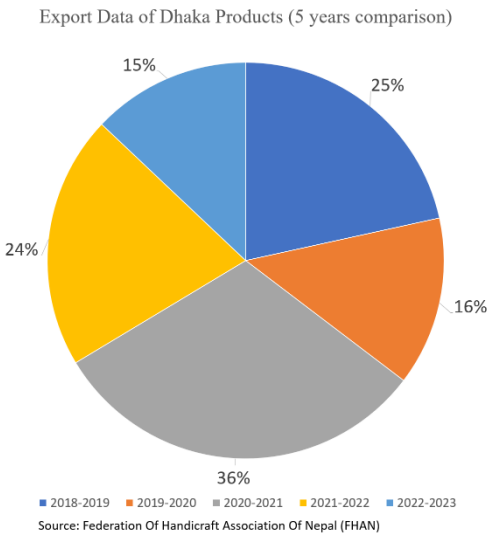
2.1.5 Demand and supply of Dhaka products in Nepal

The Dhaka fabric has gained high popularity from the past years. It has high demand in the market. People of different ethnic group have shown their interest in the fabric. These fabrics are used during different ceremonies such as marriage, Gunyo Cholo and so on. The fabric's utility in Nepal has grown beyond its original use for certain festivals and community gatherings, being more generally used for a variety of reasons. Dhaka's manufacturing methods and trading practices have evolved throughout time, from traditional designs and processes to more sophisticated approaches and patterns. In contrast, modern Dhaka items today provide a varied choice of styles and patterns on the market. Variety of products made from Dhaka fabric such as hand bag, shoes, ties, coat, scarves, jackets, and much more. Even more products are being woven by artisans such as gowns, table cloths, cushion covers, wallets. These fabric and products have been exported to different parts of country including the USA, Europe, Japan, Australia, China and other western countries. The Nepali Dhaka fabric business has grown dramatically as a result of greater market presence in international nations and increased market penetration inside Nepal, creating a demand for more weavers. This field has been the major source of income for many people living in rural area. Mostly for the students and women do not have proper source of income.

Export of Dhaka Goods by Destination (2065/66)(NRs.)

Country	Export NRs	Percent Share
USA	1,308,103	39.7
Netherlands	822,448	24.9
Germany	764,714	23.2
Belgium	227,213	6.9
Switzerland	90,077	2.7
UK	26,880	0.8
Italy	12,596	0.4
Others	45,542	1.4
Total	3,297,600	100

Source: FHAN



2.1.6 Fashion trends of Dhaka fabric

The use of Dhaka cloth has increased significantly over time, to the point that Dhaka hats or topis are now embedded in our national character. They have also taken on an important societal importance, serving as required clothing for a variety of religious rites ranging from birth to death. For example, the Chhetri community wears Dhaka daura surwal to weddings, whilst the Newars use it to conduct funeral ceremonies. Due to its unique color, patterns and texture of Dhaka cloth , has always been high demand in the market.Dhaka clothing was only limited to topi, choki,saree but now people has increase its wide ranges of products such as Blazer coat, outer, one piece, formal dress, skirt, coat, kurti, shoes, handbag and other accessories for furnishing like mat, cushion. As change is unavoidable, the Dhaka prints accessible in today's market have seen substantial transformations from their historic counterparts. Not only have the color combinations changed, but there is also a significant variation in patterns. The addition of new colors such as blue, green, and brown to the originals has provided a fresh viewpoint. For those looking for real Dhaka with a modern touch, the modern Dhaka boutiques in Kupondole provide a great assortment. Dhaka Weaves, Kalamandir, and Mahaguthi are some of the renowned enterprises that showcase beautiful Dhaka items. Their products include shawls, stoles, tablecloths, place mats, bed coverings, pillow covers, and ties. (Eva Manandhar,2010)

Dhaka weaving has become the most well-known of Nepalese textiles, including classic black, white, red, and orange topis and blouses, as well as modern dhaka textiles made from a variety of colors and yarns to compliment, rather than replace, this long-established material. Each of these weavings is a unique artwork that combines new and traditional

concepts (Susi Dunsmore,1993). Dhaka patterns have a wide range of designs that emphasize individual inventiveness. The variety of patterns and colors caught people's imagination, raising demand for Dhaka cloth. Dhaka cloth has piqued the interest of Nepalese fashion designers since it allows for creations with exceptional ingenuity and effort. More of youth deginers are interested on using dhaka fabric for their clothing design. Different showcases and fashion show has been held in Nepal and international. UNAE held a Dhaka collection fashion show on the event MIT Mr & Miss Nepal Australia 2014 showcasing gowns with modern design. Rajesh Nepal one of the Nepali Fashion Designer had launched his label " RAJESH NEPAL" on Banglore fashion week 2017. He used fabric like Dhaka, handloom HEMP, cotton for the cloths. This shows that dhaka fabric is not only limited to traditional attire but are expanded to modern attire.

Figure 2.6: Past trends of Dhaka products

(Source: Nepalese Textile,1993)

Figure 2.7: Different design products of Dhaka fabric in present market

Figure 2.8: Modern dress design for Fashion in Canada

(Source: neostuffs.com)

2.2 Introduction to Garment industry

The garment industry, also known as the clothing industry, includes many different trades and procedures linked to clothes and fashion. It involves the manufacture of raw materials such as cotton, wool, fur, and synthetic fibers. Textile makers produce the textiles and fibers required for tailoring clothing. After textiles, the process moves on to decoration, which includes embroidery, printing, and other ornamental methods. The fashion business closely observes and defines trends, providing a steady supply of the most recent non-functional apparel. Finally, garment merchants sell clothing to customers in physical stores, internet platforms, and even second-hand shops.

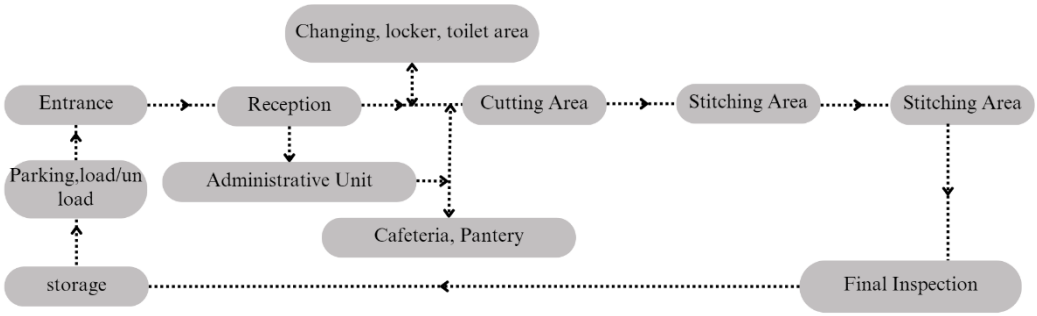
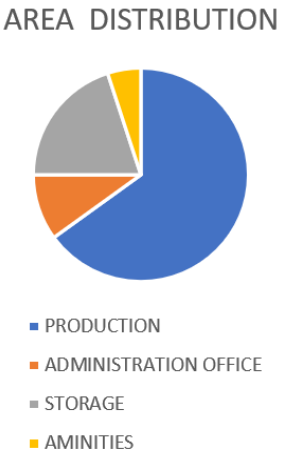


Figure 2.9: General flow diagram in Garment industry

2.2.1 Area distribution in garment industry



Manufacturing

- production 60-70% (decreases as size increases)
- storage 20% and less (increases as size increases)
- office 10-15% (increases as size decreases)
- amenities 5-9% (increases as size increases)

Distribution

- storage 80%
- above office 10-20% (greater need in some types of distribution)
- amenities 0-5 %

2.3 Layout of working station in garment industry

Workstation layouts may be tailored to the flow of work in the garment industry, as well as production requirements and available space. However, no perfect arrangement can last forever, so be prepared for systematic adjustments. Some common workstation configurations are as follows:

1. Straight -line layout system

A straight- line production system is one where machines are set out in a fixed line, usually at both sides of central table or conveyor (i.e., belt driven or overhead conveyor)

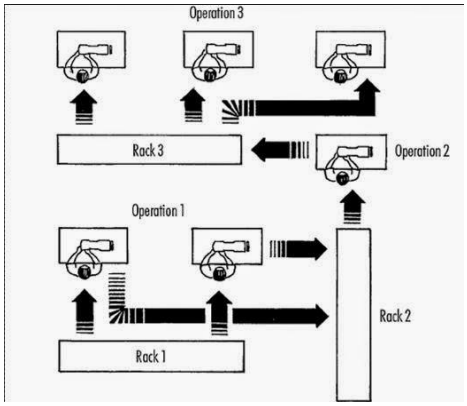


Figure 2.10: Straight -line layout system

(Source: researchgate.net)

2. Bundled layout system

This production system requires work-in progress to be collected from and returned to a central storage facility between operations. It requires heavy material- handling and a careful selection of containers for holding and carrying bundles. It is costly to control and requires a longer setup time when adding new styles to be successful. Workers with a wide range of skills are required. It has some disadvantages and is no longer recommended.

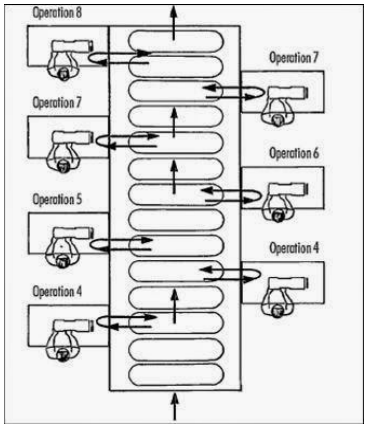


Figure 2.11: Bundled layout system

(Source: researchgate.net)

3. Progressive line layout system

A progressive line system is one where the workers pass their work from one operator to the next with buffer stocks, using appropriate racks, gravity or tilted tables. In this system, line balancing is critical requires more storage space than straight- line system. A space allocation of about $4m^2$ per work station is adequate.

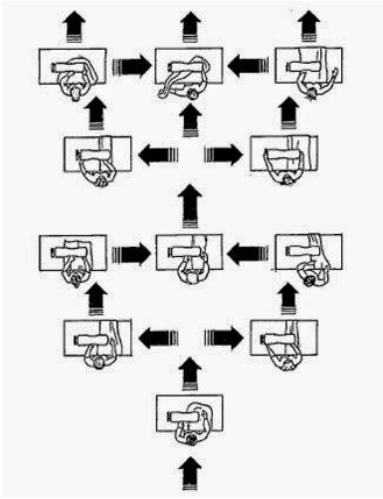


Figure 2.12: Progressive line layout system

(Source: researchgate.net)

4. Progressive bundle layout system

A progressive bundle unit system is a production strategy that sets machines in the order required to produce a certain garment. Work-in-progress bundles are stored in racks or containers between operations, where workers can access them as required. Line balance is critical in this system, and work-in-process stock is often higher than in a progressive line system. Adequate supervision is essential to keep production running at normal hours ideal for producing regular or large volumes of items.

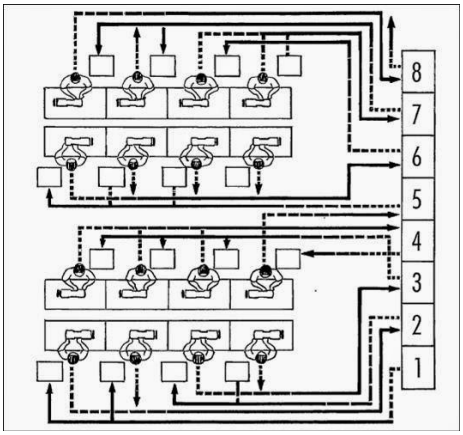


Figure 2.13: Progressive bundle layout system

(Source: researchgate.net)

5. Inter flow layout system

This manufacturing method is intended to accept a wide range of styles and goods at the same time. Similar to the progressive bundle system, it keeps track of work-in-progress for each style between operations. The system can run manually or automatically. It is distinguished by work specialization; however, the flow of work-in-progress may not follow a planned pattern. The material flow in this system may be complicated, necessitating the use of specialized handling equipment. While the system is adaptable, it requires multi-skilled individuals to efficiently oversee its operations.

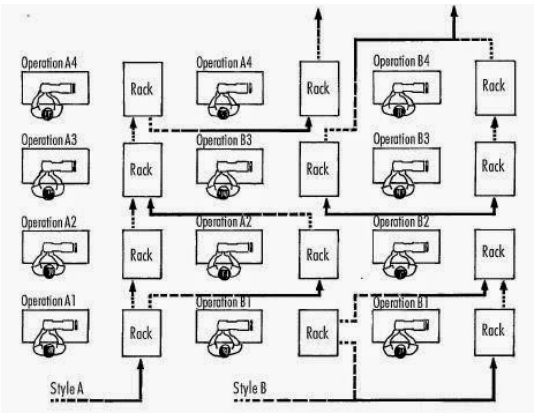


Figure 2.14: Interflow layout system

(Source: researchgate.net)

6. Flexible flow layout system

This technology allows the simultaneous manufacturing of several styles. Alternatively, it may be used to create individual styles using only a piece of the system. Depending on the types of styles being processed, a large number of racks and receptacles are necessary. Workers in this system are multi-skilled, doing a variety of tasks, making it ideal for short production runs. Furthermore, shared racks may support numerous processes in this arrangement, increasing efficiency and flexibility.

2.4 Work Station General standards

A workstation is a distinct place within a facility where employees conduct specialized duties as part of the manufacturing process. These spaces are outfitted with the equipment, machines, and materials required for the assigned job, and the arrangement is intended to maximize efficiency and workflow. Workstations are critical for structured and streamlined manufacturing, with ergonomics, safety, and adaptability to changing production needs all taken into account. Monitoring productivity and providing a comfortable working environment are critical components of efficient workstations in business. A sewing workstation requires around four-square meters of horizontal floor space and larger goods, such as drapes, tents, or carpets, might require up to 8 square meters of floor area.

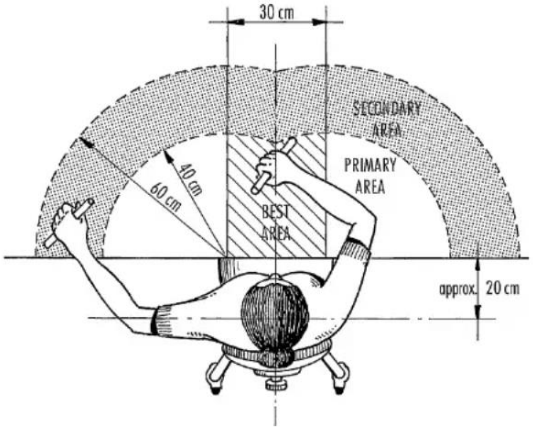


Figure 2.15: Normal and extended reach areas at table-top

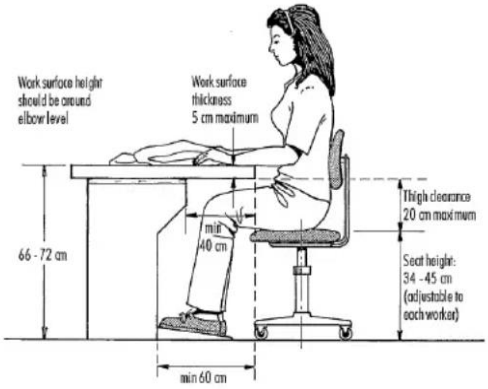


Figure 2.16: Recommended dimension for seated Task

(Source: International Labour organization, 1998)

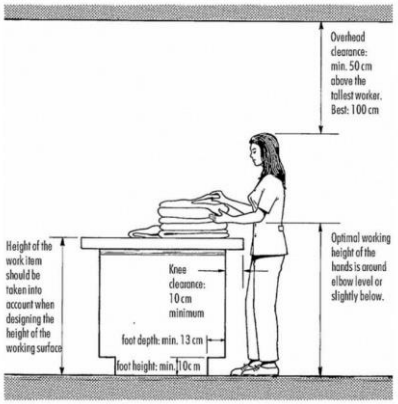


Figure 2.17: Recommended Task for standing Task

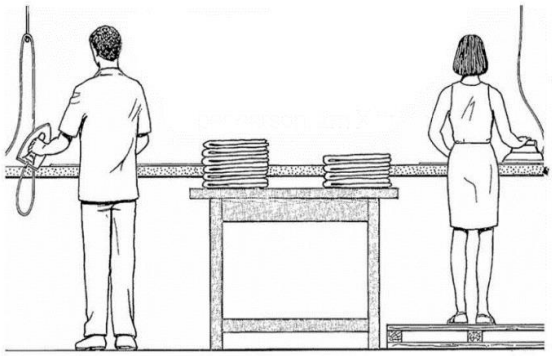


Figure 2.18: Ironing work station requires a foot plat form for smaller workers.

(Source: International Labour organization, 1998)

Some of the rules for designing efficient workstations and good quality products:

- Double height work desks are very practical for trimming and finishing tasks.
- Silk-screening tasks are better carried out 10-20 cm below elbow height.
- This ironing workstation requires a foot platform for a small worker to ensure an appropriate work height slightly below elbow height. The space per person should be 4 sq. m.
- Raising workplace using platform to reach the hangers.

2.5 Circulation standards

2.5.1 Passageway standards

- Workstations aligned in grid with passage- ways in between.
- Double aisle passage with a minimum width of 2 m to move the trolleys in between of working space.
- 10 cm thick colored lines should be indicated to clearly define workspace and passage ways and workspace.

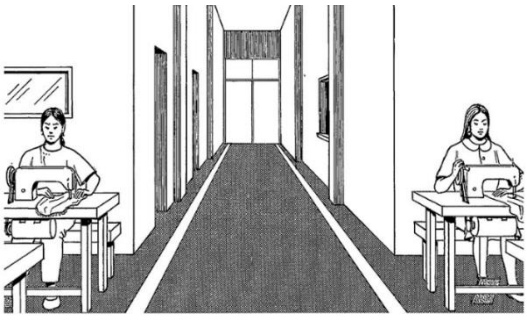


Figure 2.19: Thick colored lines to define passage ways

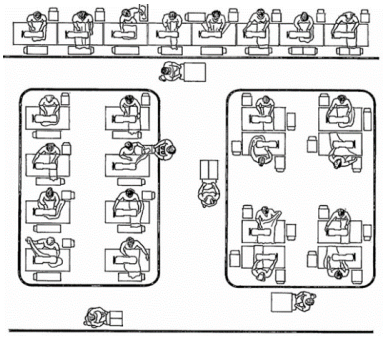


Figure 2.20: Double aisle passage

(Source: International Labour organization, 1998)

2.5.2 Flooring and Bridging Standards

The flooring should have a flat surface, and any gaps between tile seams should be kept to a minimum to allow trolleys to travel smoothly. It is critical that the flooring material has non-slip qualities to reduce the danger of accidents. Any abrupt changes in height or gaps on the floor should be handled by placing fillers and bridges to ensure the continuous passage of trolleys and carts throughout the industry.

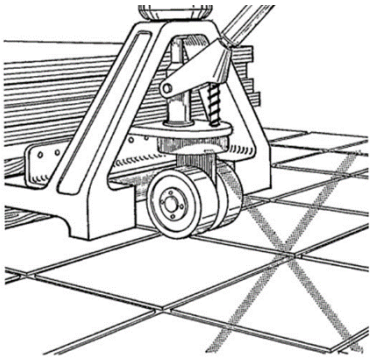


Figure 2.21: Minimizing the gaps of tiles

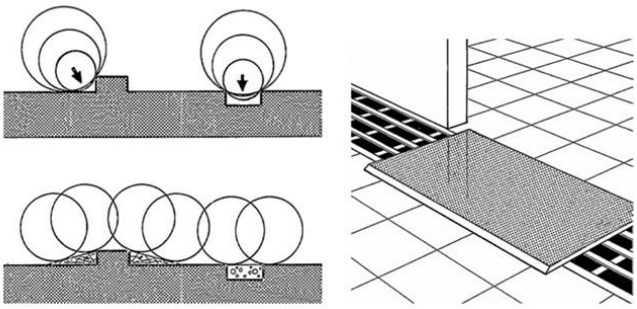


Figure 2.22: Avoide gaps and sudden changes on the floor

(Source: International Labour

2.5.2 Ramps and stairways

Ramps should always be preferred over stairways to ensure that people and materials move smoothly. The ramp's gradient should be a minimum of 1:12 and no more than 1:20. Additionally, for ramp runs longer than 6 meters or instances of a change in ramp direction, a landing with a width of 1.8 meters should be included. Ramps must be at least 1 meter wide, with railings added for elevations more than 0.6 meter. Staircases should have a minimum width of 1.2 meters, with individual treads of 0.3 meters and risers of no more than 0.15 meters. Avoid using winders or spiral staircases. To avoid slipping incidents, both stairs and ramps should have nonslip mats or strip bands installed.

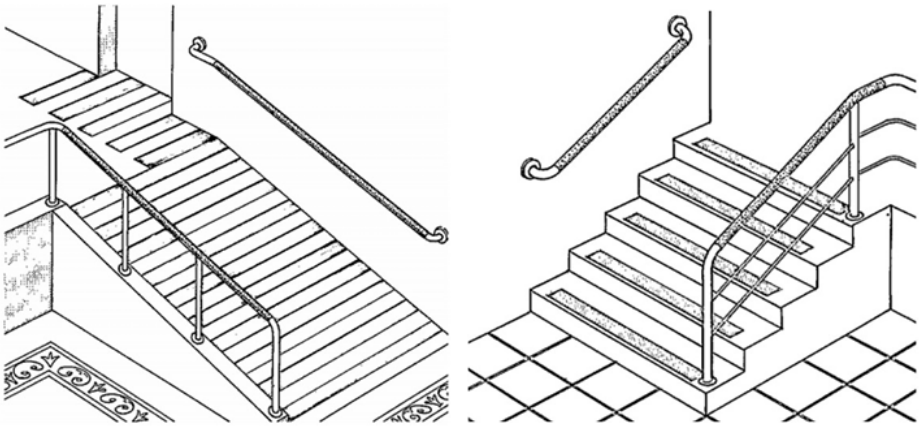


Figure 2.23: Proper staircase and stairways should be provided

2.6 Storage and Material Handling

Storage containers are essential for combining items into loading units in order to maximize space usage, transport capacity, and decrease handling. Stackable crates, which are generally made of wood or plastic, pallets (including flat pallets, pallets with side rails, and pallets with extra equipment), and conventional containers are becoming more popular. The

key goals are to improve space management, increase transit efficiency, and reduce the need for unnecessary handling. The better storage space provides better working space and increase the speed of work.

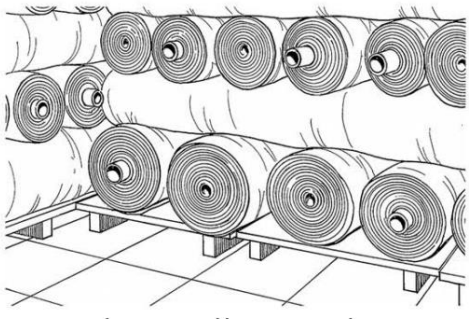


Figure 2.24: Wooden pallets to keep fabric.

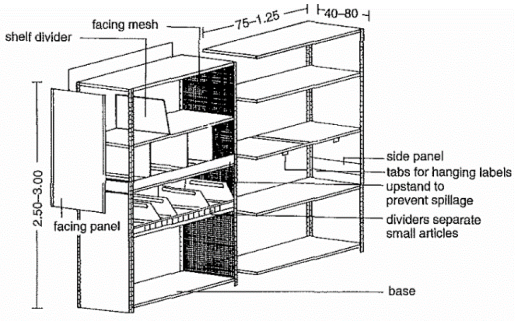


Figure 2.25: Typical dimension of flat shelving system

(Source: Neufert architect data fourth edition,2012)

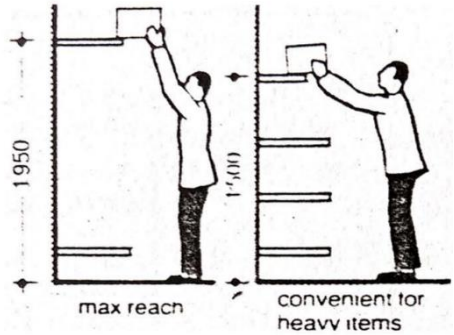


Figure 2.26: The storage shelf should be of convenient height

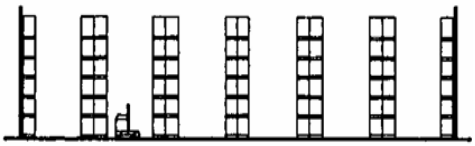


Figure 2.27: Fork-lift in block stack

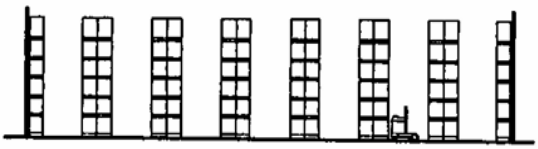


Figure 2.28: Reach fork-lift in pallet racking

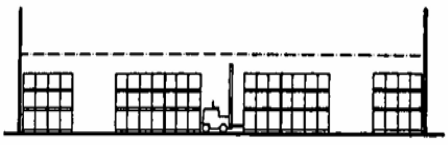


Figure 2.29: Reach fork-lift in block stack

Figure 2.30: Fork-lift in pallet racking

(Source: Neufert architect data fourth

Movable carts are used in the garment industry to handle materials. These carts are user-friendly and improve productivity. The loading dock's height should match that of the loading vehicle. This facilitates faster loading and unloading of products.

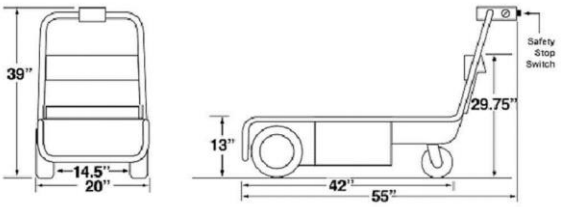


Figure 2.31: moveable cart standards

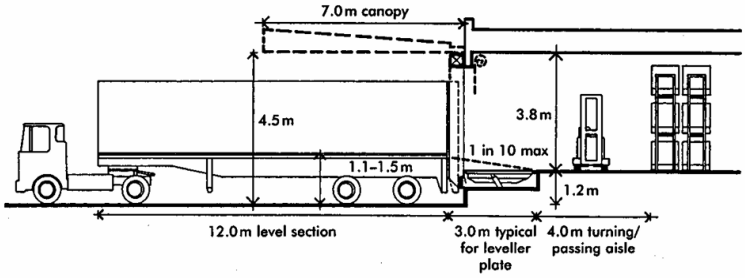


Figure 2:32: Loading dock's height match the truck vehicle

(Source: Neufert architect data fourth edition,2012)

2.7 Lighting in the garment industry

Improved workplace illumination is critical for both workers and manufacturers. Inadequate lighting can cause eye strain, weariness, and accidents, whereas excessive illumination can create safety and health concerns such as headaches and stress from glare. Both scenarios contribute to higher mistakes, which result in more reworks, worse quality, and lower productivity. Implementing improved illumination in industries has resulted in up to a 10% boost in productivity and a 30% drop in mistakes. Lighting requirements depends upon three factors:

- Nature of the task
- The sharpness of the worker's eyesight
- The environment of the working area

2.7.1 Natural lighting

Natural lighting is important in the garment business since it provides several benefits in addition to illumination. In this fast-paced and detail-oriented industry, strategic use of natural light not only improves the working environment but also impacts productivity, quality control, and employee well-being. By using the power of natural light, garment makers may create a more friendly and productive environment, thereby improving different aspects of their operations. To benefit the workers, the total surface area of windows and skylight should be 1/3rd of the floor area.

Approaches to achieve suitable natural lighting

- The higher the window, the lighter it gives. Sky lights give double the light of the low window which tent to get blocked by machines and storage containers.

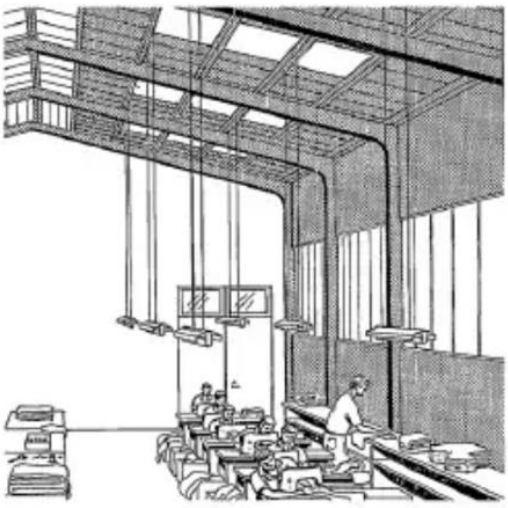


Figure 2.33: Clean skylights and high windows

(Source: International Labour organization, 1998)

- Opaque roof panels can be replaced by translucent plastic or fiberglass.

2.7.2 Use of interior finishes

- Cost savings in lighting expenses can be achieved by as much as twenty-five percent through judicious selection of paint colors and ceiling finishes. Additionally, this approach enhances visual conditions and fosters a pleasant working environment conducive to high standards of cleanliness and organization.
- The benefits include minimized loss of reflected light, improved light diffusion, and decreased brightness contrast. To evenly disperse reflected light throughout the interior, ceilings should be painted as close to white as possible, utilizing a matte finish of whitewash or white tiles.
- To mitigate harmful glare, opt for pale, matte colors instead of bright, shiny, or glossy ones, with a slightly darker shade at eye level being beneficial.
- Harmonizing the color of equipment, such as sewing machines and workbenches, with the walls is recommended. Modern sewing machines are available in colors like beige, cream, and light green, which reflect light in dark-colored fabrics without causing glare for the worker, thus preferred over traditional glossy black machines that reflected more glare.

2.7.3 Use of artificial lighting

Artificial lighting is critical in the garment industry to provide ideal working conditions and efficiency. It supplemented natural light by providing consistent lighting for operations such as stitching and fabric inspection. Properly adjusted lighting ensures color accuracy and quality control. Advanced LED technology provides energy-efficient solutions that may be customized for specific jobs, increasing worker comfort and efficiency.

Selection of lamps

In the garment work, choosing the proper lighting is essential for ensuring efficient operations and product quality. Many factors must be addressed, including the work type, required light intensity and color temperature, energy efficiency, and cost-effectiveness. Task lights with adjustable brightness and directionality are best suited for difficult jobs like sewing and fabric inspection. These lights offer concentrated lighting, reducing glare and shadows and increasing visibility. T5 HO fluorescent tubes are the most effective bulb type utilized in the clothing industry today. The primary reason for choosing this light type is its following features:

- Luminous efficacy: 110 lumens/watt.
- 54-watt bulbs that emit 5000 lumens
- Lifespan of 90,000 hours

Figure 2.34: T5 HO Florescent tubes

(Source: homedepot.com)

2.7.3.1 Arrangement of the lamps

- Perpendicular arrangement of fluorescent lamps ensures more even light distribution than that of a parallel arrangement.

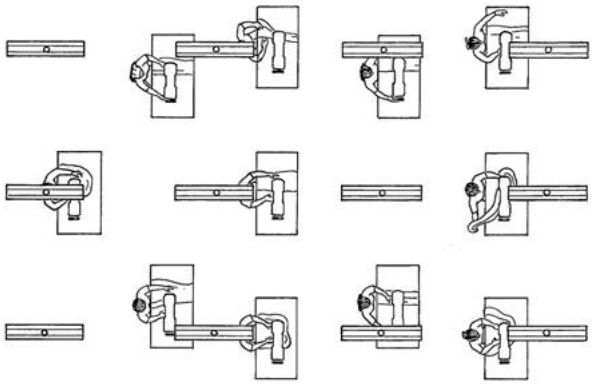


Figure 2.35: Perpendicular arrangement of Fluorescent lamps

(Source: International Labour organization, 1998)

- In perpendicular arrangement, light should be positioned along the machine head, not above, to prevent shadows.

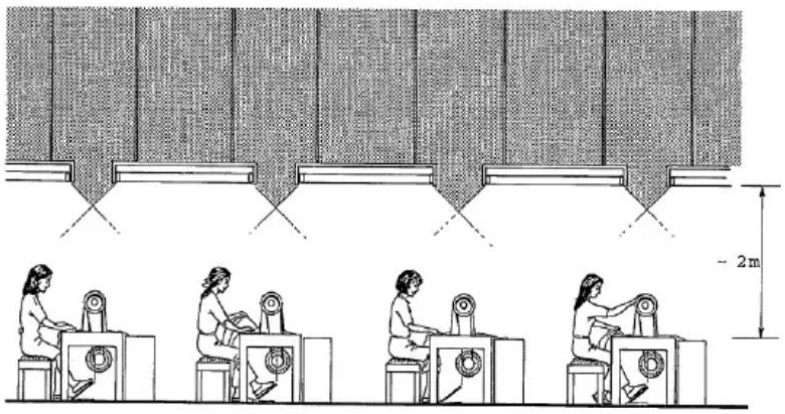


Figure 2.36: Fluorescent lamps positioned along the machine head.

(Source: International Labour organization, 1998)

- The average ratio of light fittings to machines should be 6:7, i.e., almost one fitting per machine.
- To conserve energy, individual switch should be provided to eat light fixture and the workers should be trained to turn them off after the work is completed.
- Bench light fittings should be provided for special tasks like quality control and packing.

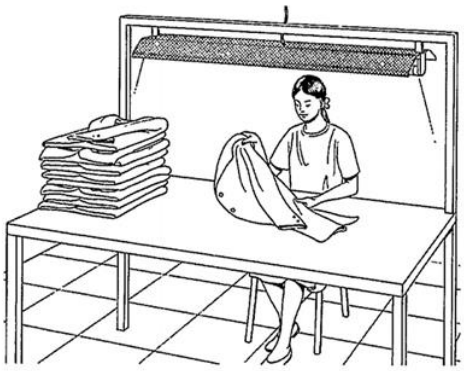


Figure 2.37: Bench lighting for folding clothes

(Source: International Labour organization, 1998)

- Extra local lighting should be provided for precision tasks and elder workers.

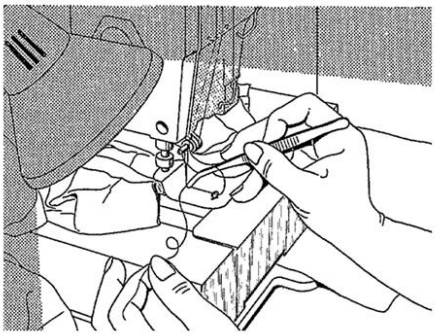


Figure 2.38: lighting for sweing clothes

(Source: International Labour organization, 1998)

2.7.3.2Positioning of the lamps

The positioning of light source, specially while using single unit source, creates considerable effects on the workstations which are given as follows:

- When light is provided from the front and above, the working point is difficult to see due to glare.

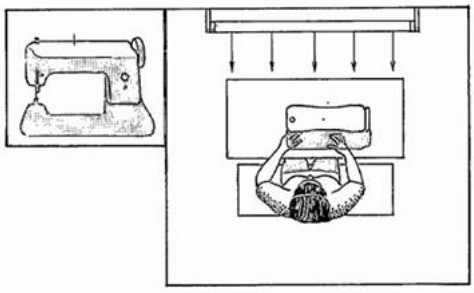


Figure 2.38: lighting from front and above

(Source: International Labour organization, 1998)

- When light is provided from the right and above, much of the working point is still in shadow.

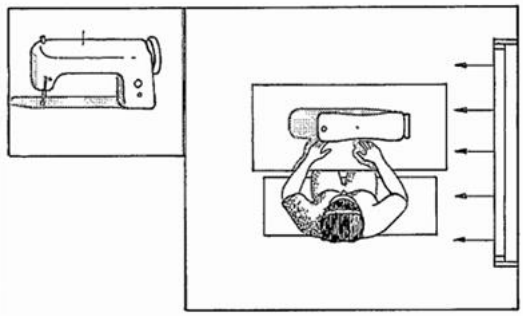


Figure 2.39: lighting from right and above

(Source: International Labour organization, 1998)

- When light is provided from the left and above, minimal shadow is produced and is regarded as the best option.

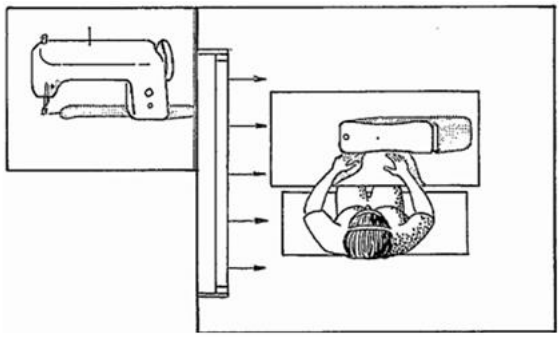


Figure 2.40: lighting from left and above

(Source: International Labour organization, 1998)

- When light is provided from the back and above, the worker's body creates the shadow.

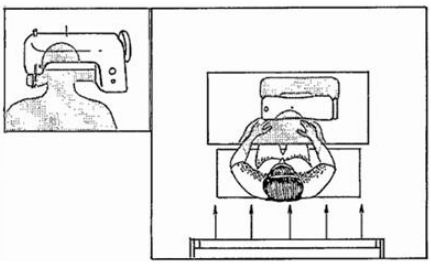


Figure 2.41: lighting from back and above

(Source: International Labour organization, 1998)

2.7.3.3 Spacing of lamps

Assuming the distance from the work surface to the light surface to be h, the following thumb rules are applied for the spacing of light fixtures:

- Where there is a passageway near the wall, the fixture should be at a distance of 0.75h from the wall.

- If the workstation is close to the wall, the fixture should be at a distance of 0.5h from the wall.
- The distance between two adjacent fixtures should be 1.5h.

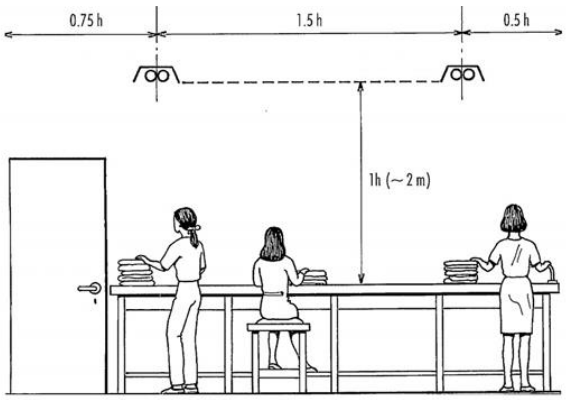


Figure 2.42: Spacing of light fixtures in working station

(Source: International Labour organization, 1998)

2.7.3.4 Avoiding of glare

In the garment business, minimizing glare is essential for creating a positive work environment. Glares, or unwanted bright spots or dazzling patches in the field of view, contribute to mistakes, poor quality, and decreased productivity. They create pain, annoyance, and eye fatigue, reducing employees' ability to see well. Eliminating glare can improve visibility greatly without increasing light intensity. Glares are classified into two types: direct glare, which is created by a light source in the worker's field of vision (for example, a bare bulb or direct sunlight), and reflected (indirect) glare.

1. **Reduction of glare from window**

- Reduction of glare from windows
- Use of blinds, curtains, louvres, shades, trees, or vines
- Replacement of clear glass windows with translucent materials or glass blocks
- Altering the orientation of workstations
- Placing workers side-on to windows. Workers facing away from low windows are working in the shadow of their own bodies.

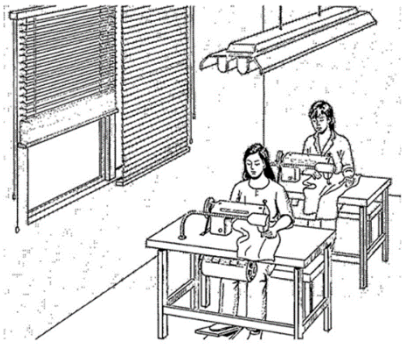


Figure 2.43: Use of blinds, curtains, louvres to reduce glare

(Source: International Labour organization, 1998)

2. Reduction of glare from lamps

- Positioning the naked light bulbs or tubes in the view of the worker when looking at the working area
- Employing of deep shades or shields
- Mounting of the shades low enough to ensure that all bright surfaces are completely hidden, or high enough to ensure that they are well outside the normal field of view of the nearby workers.

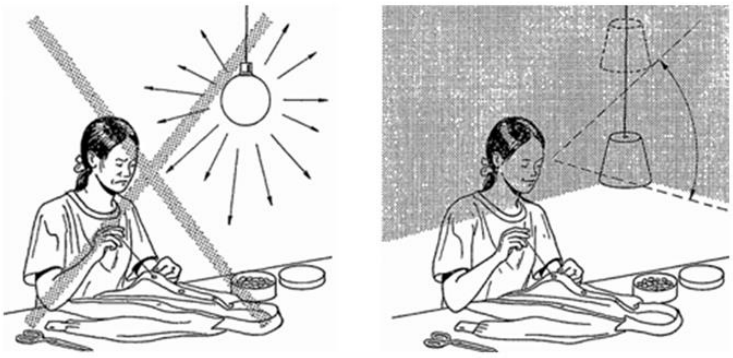


Figure 2.44: Avoid glare from naked bulbs and place shaded lamp at an appropriate height

(Source: International Labour organization, 1998)

3. Reduction of indirect glare

Light reflections from polished surfaces and shiny tabletops cause indirect glare and affect the vision of the workers. These can be reduced by the following methods:

- Changing the position of the light source
- Lowering the brightness of the source

- Making the immediate background brighter by placing a light-colored surface behind the work desk
- Covering the tabletop with clean matt paper, white fabric, or other appropriate non glossy material
- Reorienting the workstations by 90˚ or less to the right or left.

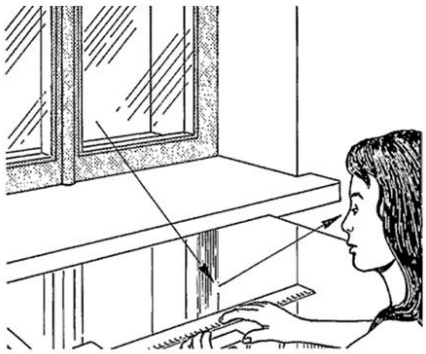


Figure 2.45: Glare due to ineffective orientation of workstation

(Source: International Labour organization, 1998)

2.8 Thermal comfort in garment industries

Thermal comfort is an important concern in garment industry design since it directly affects worker productivity and well-being. A well-ventilated and conditioned environment allows workers to work comfortably. Because thermal comfort is subjective and varies across individuals, the International Labour Organization has set a comfort range of 22.0 - 29.1°C and 22.3 - 30.4°C for the cool-dry and hot-dry seasons, respectively, with a preferred velocity of 0.3-3 m/s.

Methods for achieving acceptable thermal comfort can be classed as active or passive. These approaches include a variety of tactics for managing the interior environment in order to provide ideal working conditions for personnel.

1. Active methods of controlling thermal comfort

The active methods of controlling thermal comfort are the equipment that can be installed inside the space for air circulation, heating, or cooling. Some of the major examples of active methods are:

- Fans
- Air-conditioners
- Heaters

2. Passive methods of controlling thermal comfort

The passive methods of controlling thermal comfort are the steps formulated during the design and construction of the building or space. This includes considerations like design steps, selection of materials, orientation, etc. Some of the major examples of passive methods of thermal control are:

- Passive building design
- Thermal mass
- Ventilation
- Thermal insulation

General considerations for thermal insulation

Thermal insulation is the reduction of heat transfer (i.e., the transfer of thermal energy between objects of differing temperature) between objects in thermal contact or in range of radiative influence. Thermal insulation can be achieved with specially engineered methods or processes, as well as with suitable object shapes and materials. The general considerations applied for thermal insulation are given as follows:

- Use of vegetation:

Various trees, bushes and climber plants are considered as the natural methods of heat insulation in the walls and roof of a building. These elements provide thermal insulation by preventing heat absorption through the walls and roof.

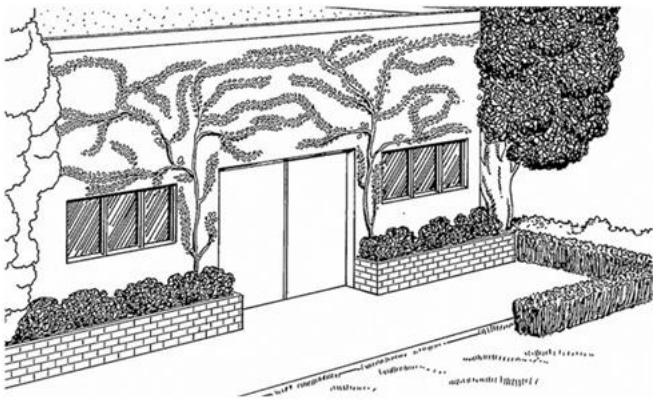


Figure 2.46: Vegetation on the walls of the building.

(Source: International Labour Organization,1998) *(Source:archdaily)*

- Use of false ceilings:

The construction of false ceiling is considered as an effective way of reducing penetration of radiant heat through the roof.

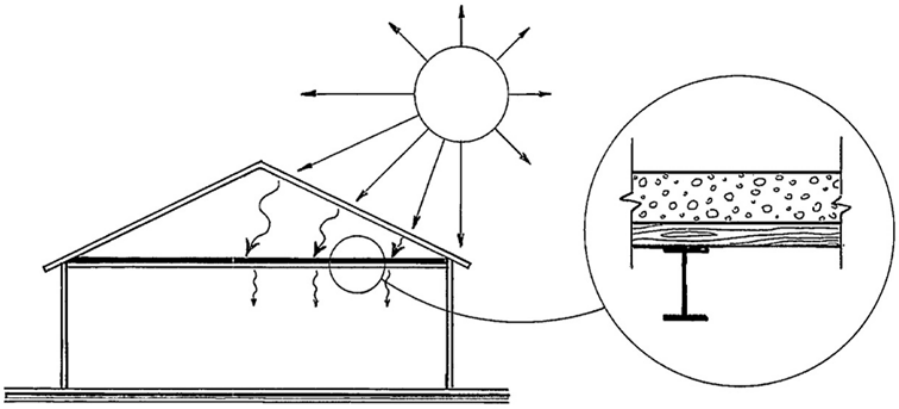
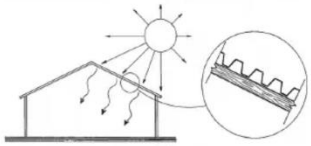
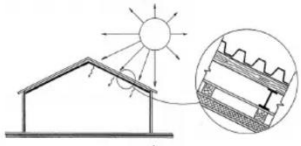


Figure 2.47: Construction of false ceiling

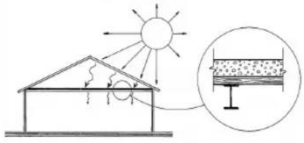
(Source: Timesaver standards)



A factory roof and walls made of single metal sheets gives a very low level of thermal insulation.



An appropriate ceiling and double layered walls can considerably reduce heat and cold penetration.



The construction of a flat ceiling is another effective way of reducing the penetration of radiant heat. Adopting this solution depends on the height at which the ceiling can be placed.

- Use of sun-shading devices

The heat entering the building can be prevented and controlled by providing fixed or adjustable louvres as sun-shading devices.

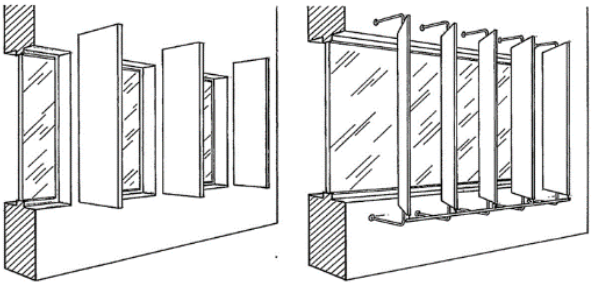


Figure 2.48: Fixed and adjustable louvres

(Source: Timesaver standards)

- Use of thermal mass

Thermal mass is the ability of a material to absorb, store and release heat. Thermal lag is the rate at which a material releases stored heat. For most common building materials, the higher the thermal mass, the longer the thermal lag. Materials with high thermal mass and long lag times are often simply referred to as 'thermal mass'. These are typically heavyweight construction materials like concrete, brick and stone. Materials with low thermal mass are typically lightweight construction materials, like timber frames.

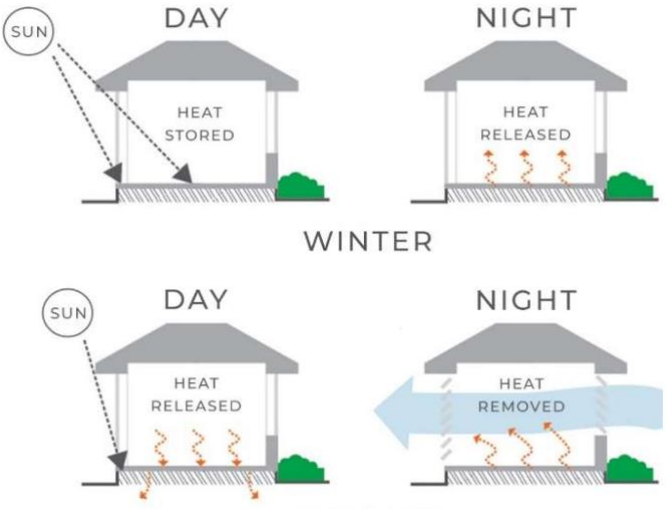


Figure 2.48: Effects of thermal mass

(Source: www.yourhome.gov.au)

2.9 General considerations for ventilation

Ventilation is an important feature of maintaining a healthy and productive work environment, particularly in sectors such as garment manufacturing where workers spend long hours performing diverse activities. Proper ventilation not only protects worker safety, but it also contributes significantly to total production efficiency.

Inadequate ventilation is a major issue in industrial facilities, causing air to get contaminated quickly with dust, ironing fumes, and gasses. A healthy and effective working environment requires adequate air exchange. In an ordinary workshop, the air should be changed eight to twelve times each hour, with a minimum of ten cubic meters of air per worker. In smaller spaces, larger air flow rates are required.

The various methods of providing ventilation in industrial buildings are given as follows:

- Proper provisions for ventilation and air circulation can be achieved by using mechanical devices likes fans and air-conditioners.

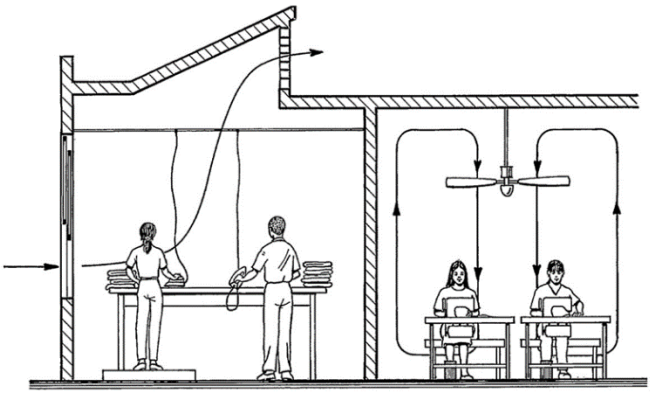


Figure 2.49: circulation of air in room

- Natural airflow routes can be created through adjustable openings on walls and roof.

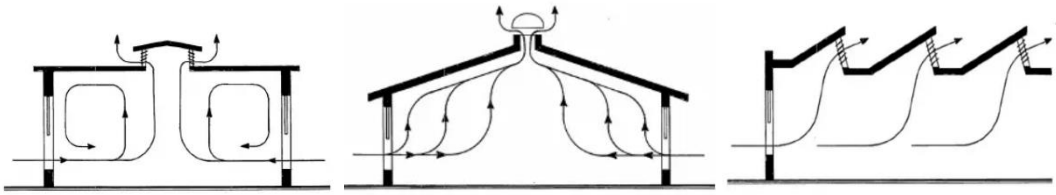


Figure 2.50: Different method of air circulation

(Source: Neufert architect data fourth edition,2012)

- In hot tropical countries, walls provided with special bricks and pre-cast concrete panels with fixed louvres improve the intake of fresh air.

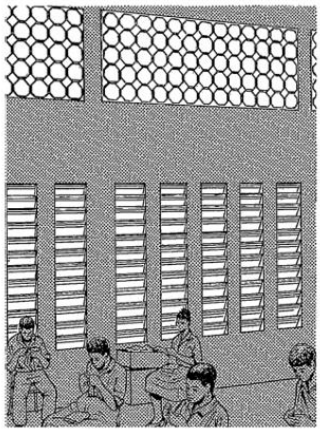


Figure 2.51: precast on the wall

(Source: International Labour Organization,1998)

- Provision of s-type louvred ventilators on the walls direct air flow inside the spaces.

Figure 2.52: S-type louvred ventilator

- Horizontal slots in the upper part of ceilings help to cool the roof allowing the intake of cooler air.

2.10 Fire and Hazard Protection

Fire and hazard protection are the most important considerations in a garment industry. The necessary measures for prevention and risk mitigation should be integrated in the building to prevent from severe damages caused due to fire. The most probable reason for fire in garment industries are short circuit and damaged electronic appliances like iron. Thus, proper measures should be taken to prevent these hazards and the damages caused by them. The following measures should be taken:

- Every workspace should have at least two ways out and these exits should be unobstructed and unlocked.

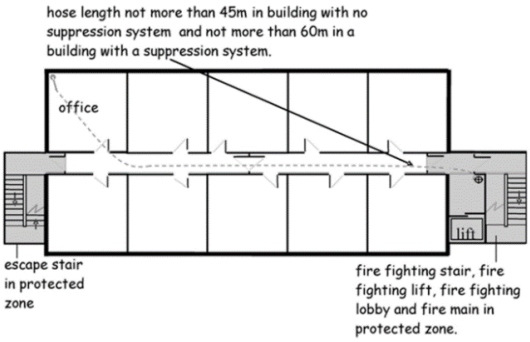


Figure 2.54: Two way exist plan

- Clearly marked escape routes and signage should be provided.
- Fire extinguishers should be placed near the sources of potential fires and should be within easy reach, properly maintained and can be operated by workers.

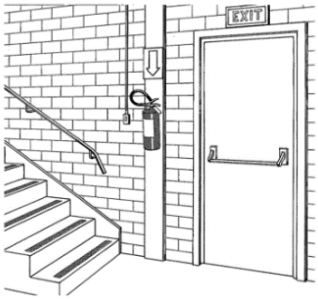


Figure 2.54: Fire extinguisher near the exit door
(Source: International Labour Organization,1998)

- Properly designed emergency action plans with the participation of the workers. Every occupant in the building should be aware of the action plan in case of emergency.

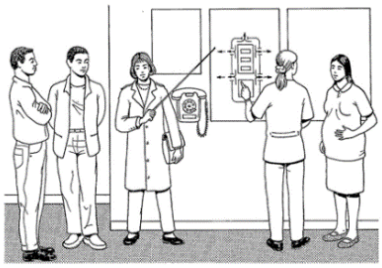


Figure 2.55: Awareness of fire safety
(Source: International Labour Organization,1998)

2.10.1 Fire extinguishing systems

Fire extinguishing systems are critical components of safety infrastructure in many sectors, including the garment industry. These systems are intended to detect and extinguish flames as quickly as possible, minimizing potential damage to property and equipment while also protecting crew safety.

1. **Sprinkler system**

A sprinkler system consists of pipes along a ceiling that contain water under pressure, with an additional source of water for a constant flow. Attached to the pipes, automatic sprinklers are placed at selected locations. When a fire occurs, a seal in the sprinkler head ruptures at a pre established temperature, and a steady stream of water flows.

2.10.2 Gas extinguishing system

A gas extinguishing system works by using a gaseous extinguishing chemical to put out flames by either oxygen displacement, which lowers oxygen levels, or physical actions such as heat extraction. Unlike sprinkler systems, which merely suppress flames, gas extinguishing systems are meant to completely extinguish fires. They are used in situations where standard extinguishing chemicals like water, foam, or powder may not be effective or might cause major damage. Common uses include electrical switch rooms, information technology facilities, and server rooms. CO2, nitrogen, and argon are frequent extinguishing agents in these systems.

2.11 Safety measures

- Easily recognizable ON-OFF switches.

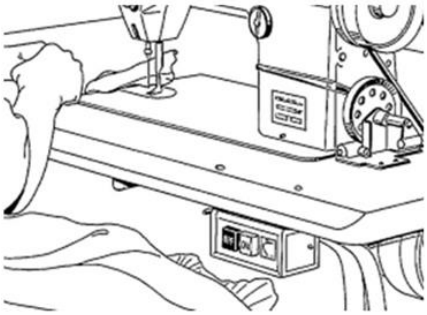


Figure 2.56: Switch on the work desk easily reachable

(Source: International Labour Organization,1998)

- Metal rod in snap fasteners provided with cover.

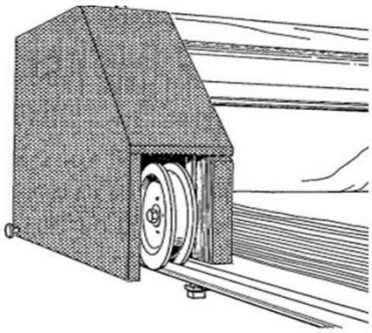


Figure 2.57: Covered snap fasteners

(Source: International Labour Organization,1998)

- Chainmail (metal mesh) glove allows safe operation when cutting small garment parts.

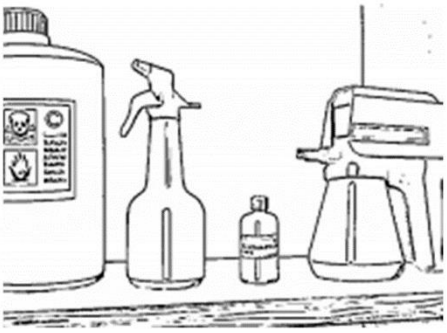


Figure 2.58: Storage of chemicals

(Source: International Labour Organization,1998)

- Dangerous chemicals should be replaced with safer ones. Proper storage for solvents, oils and other hazardous chemicals should be provided ensuring all containers are closed properly after use.

Figure 2.59: Storage of chemicals

(Source: International Labour Organization,1998)

- Light cloth masks to prevent the workers from allergies due to dust, cotton and other fabric fibers.

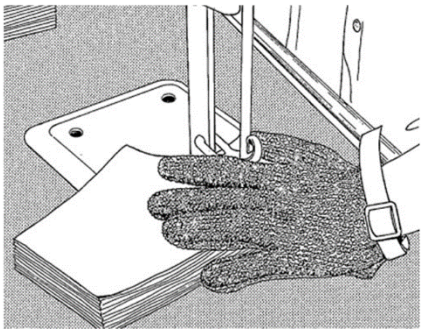


Figure 2.60: Use of masks to protect against allergies

(Source: International Labour Organization,1998)

2.12 Sanitary measures

The following measures should be taken:

- Solvents used for cleaning fabrics and garments may cause fatigue, headache, and dizziness.
- Dust and solvents, when breathed, can lead to lung diseases and are very dangerous.
- Regular sweeping and vacuuming help keep the workspace clean.

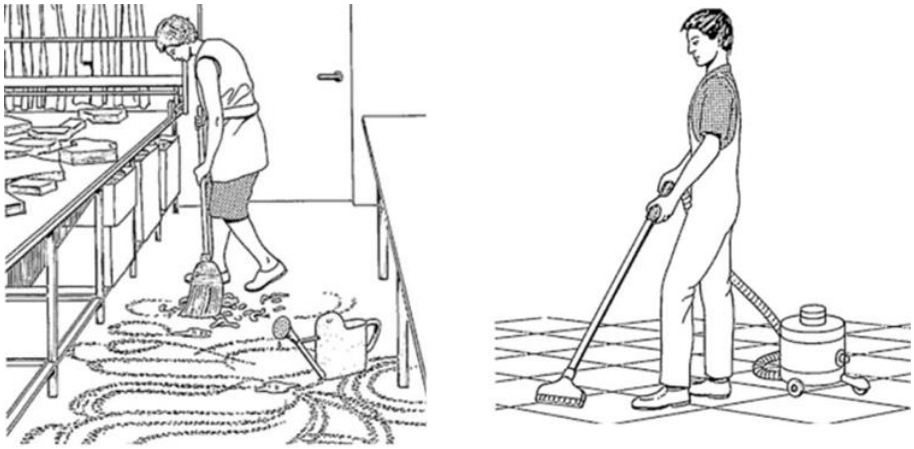


Figure 2.61: Regular cleanliness of workspace

(Source: International Labour Organization,1998)

- A litter bag attached to the worktable of every sewing machine can help maintain a clean and neat workstation.
- Useless outputs can be collected directly into a litterbox through a hole in the table, connected to an adjustable slide.

Figure 2.62: Litterbox attached to workstation

(Source: International Labour Organization,1998)

2.13 Administrative Area Standards

- Area per person in an office reception = 0.9 sq. m
- Size of a private office = 9 to 27 sq. m
- Size of a semi-private office = 13.5 to 36 sq. m for two occupants
- Pantry space per person = 0.9 sq. m

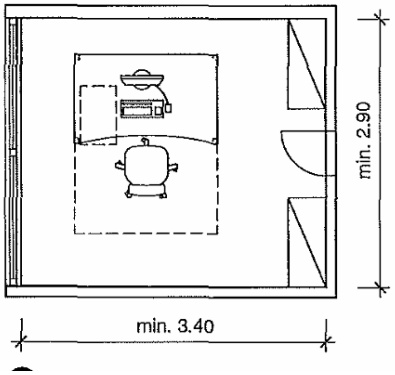


Figure 2.63: Private Office Space Analysis

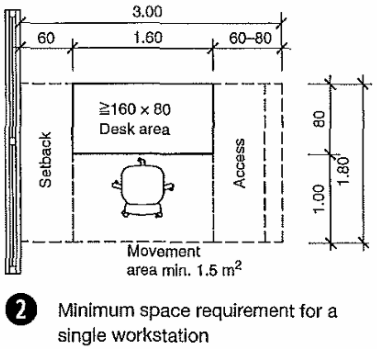


Figure 2.64: Typical Office room arrangement

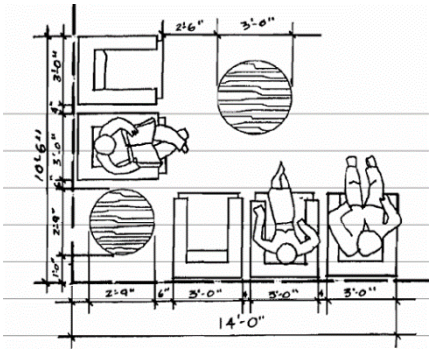


Figure2.65: Reception area

	in	cm
A	40–48	101.6–121.9
B	24 min.	61.0 min.
C	18	45.7
D	22–30	55.9–76.2
E	78 min.	198.1 min.
F	24–27	61.0–68.6
G	36–39	91.4–99.1
H	8–9	20.3–22.9
I	2–4	5.1–10.2
J	4	10.2
K	44–48	111.8–121.9
L	34 min.	86.4 min.
M	44–48	111.8–121.9
N	54	137.2
O	26–30	66.0–76.2
P	24	61.0
Q	30	76.2
R	15–18	38.1–45.7
S	29–30	73.7–76.2
T	10–12	25.4–30.5
U	6–9	15.2–22.9
V	39–42	99.1–106.7

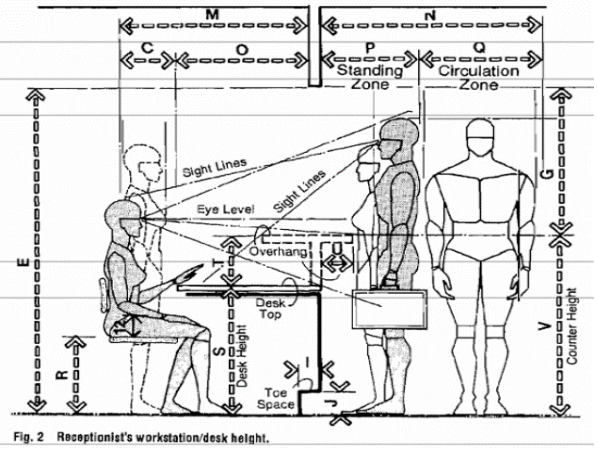


Figure2.66: minimum height requirements for help desk

2.14 Conference room

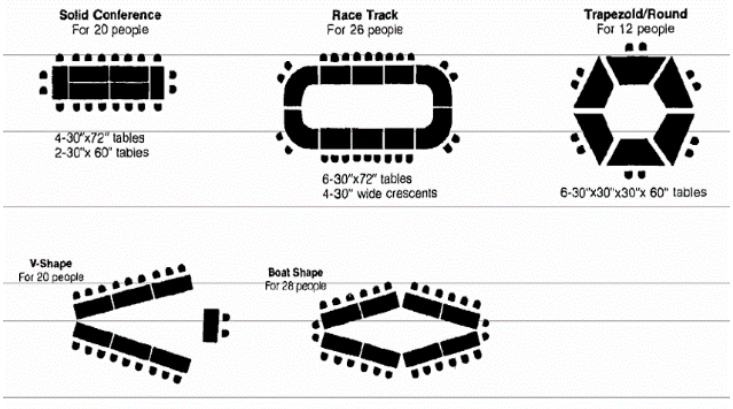


Figure 2.67: Different seat arrangements of Conference room

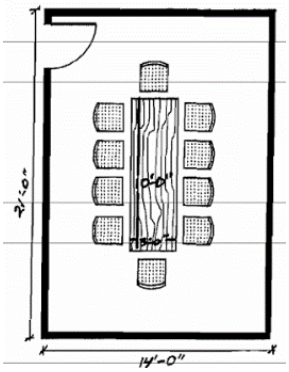


Figure 2.68: Typical conference room floor plan

(Source: Neufert architect data fourth edition,2012)

Shops

- Planning guidelines
  - occupation in stores - 1 person per 5 to 6 sq. m; 1 person per 1.8 sq. m in peak hours
  - shelf units - shelf units should not be higher than 1.8m and not lesser than 0.3m.
- Shop width

The most common used shop widths are 6, 7.6, 9.14 m the last being the most flexible one. Emergency corridors for customers must be at least 2 m wide and a width of 1.40 m is sufficient if corridors are intended for sales areas.

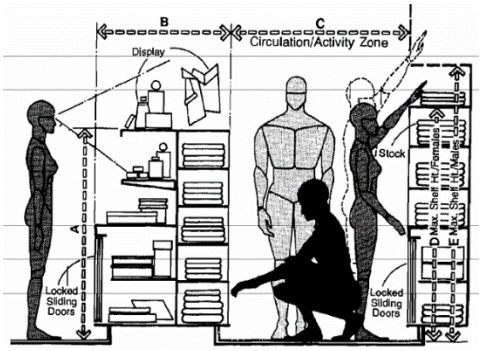
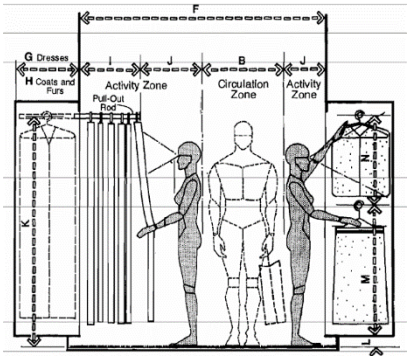


Figure 2.69: Typical clothing passage dimension

(Source: Neufert architect data fourth

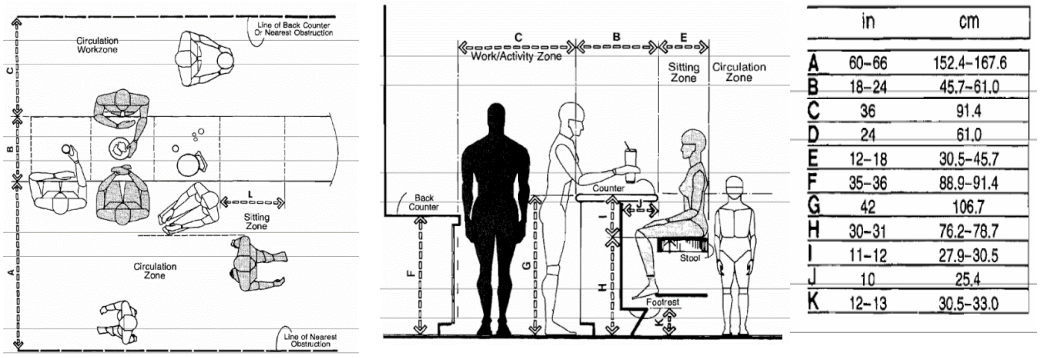


	in	cm
A	48 max.	121.9 max.
B	30–36	76.2–91.4
C	51 min.	129.5 min.
D	66	167.6
E	72	182.9
F	84–96	213.4–243.8
G	20–26	50.8–66.0
H	28–30	71.1–76.2
I	18–24	45.7–61.0
J	18 min.	45.7 min.
K	72 max.	182.9 max.
L	4	10.2
M	42	106.7
N	26 min.	66.0 min.

- Minimum heights for shop spaces of the following are as follows:
- Up to 400 sq.m retail floor space: 3.0m
- Over 400 sq. m retail floor space: 3.30m
- Over 1500 sq. m retail floor space: 3.50m

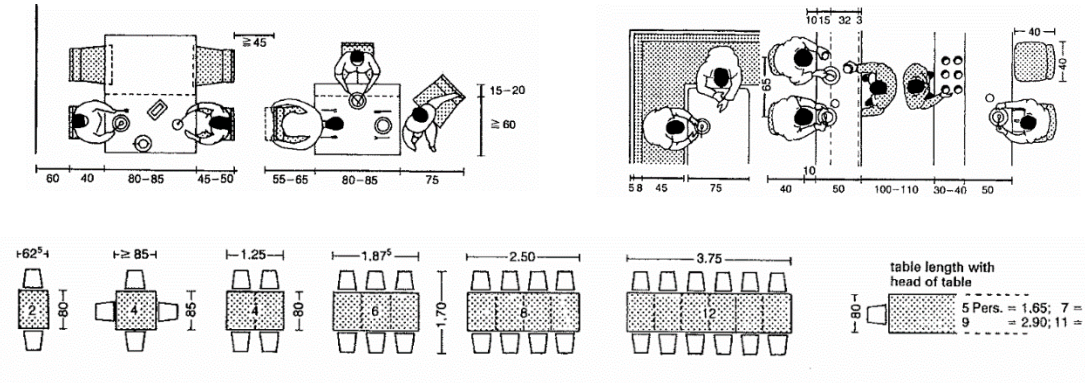
2.15 Canteen

- For a self-service cafeteria, area per person = 1.4-1.7 sq. m per person
- Minimum table size for table of two = 0.6 m x 0.6 m
- Minimum table size for table of four = 0.6 m x 1.1 m



	in	cm
A	60–66	152.4–167.6
B	18–24	45.7–61.0
C	36	91.4
D	24	61.0
E	12–18	30.5–45.7
F	35–36	88.9–91.4
G	42	106.7
H	30–31	76.2–78.7
I	11–12	27.9–30.5
J	10	25.4
K	12–13	30.5–33.0

Figure 2.70: space required for serving



(Source: Neufert architect data fourth

2.16 Kitchen area

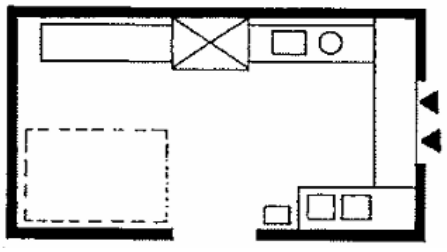


Figure 2.71: Typical Dishwasher plan

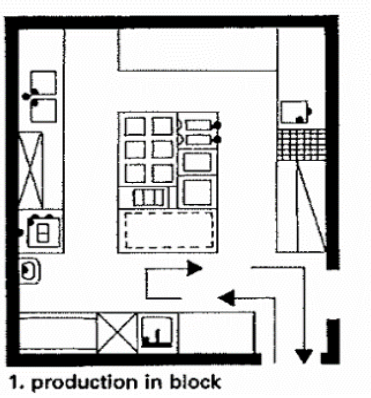
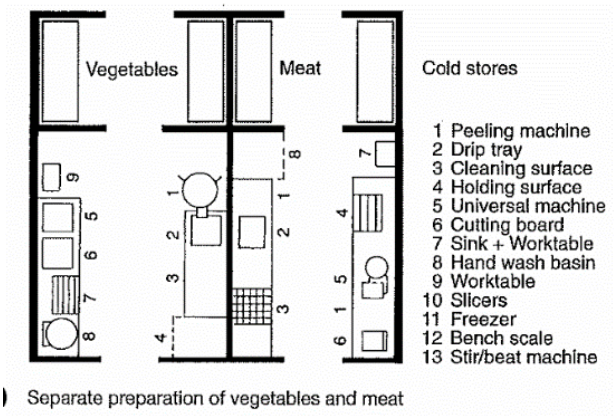
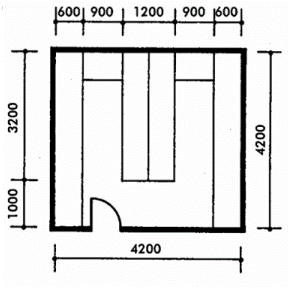


Figure 2.72: Dry store area(17.5m^2)

(Source: Neufert architect data fourth



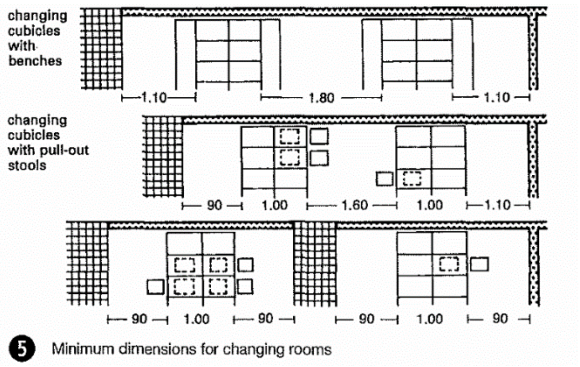


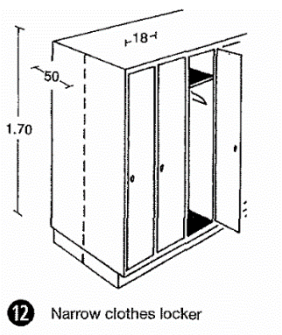
(Source: Neufert architect data fourth

2.17 Locker and changing room

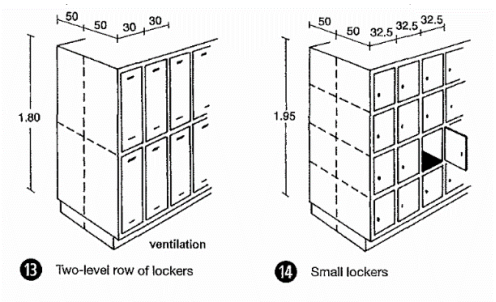
Changing rooms and locker spaces should be provided in garment production units for the workers to change their clothes and keep their belongings safely and in an organized manner. The standard dimensions for changing and locker rooms are given as follows:

- 1 locker per person
- Changing room area = 0.5 sq. m per person
- Infirmary area = 9.29 sq. m per person





No.	people	Width a_P [1)]
1	up to 5	0.88
2	up to 20	1.00
3	up to 100	1.25
4	up to 250	1.75
5	up to 400	2.25



(Source: Neufert architect data fourth

2.18 Toilet and wash area standards

No. of workers to wash basin ratio:

- For clean works = 1:20
- For dirty works = 1:10 1
- washbasin and hand dryer per 6 w/c
- 1 soap dispenser per 1/2 basin
- 1 mirror per 2-3 basins

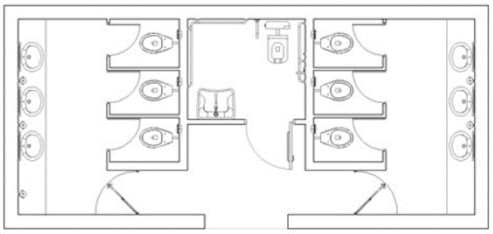
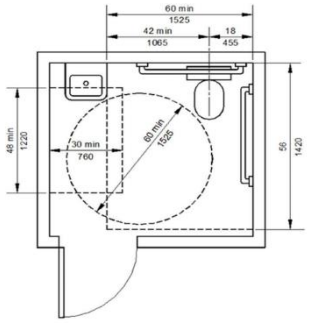


Figure 2.73: Typical toilet plan

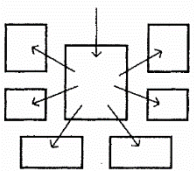


(Source:www.archweb.it)

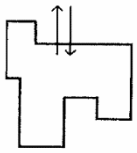
2.19 Exhibition

An exhibition is a public display or presentation of art, goods, antiques, or other objects of interest. It is usually structured to highlight and convey these objects to a specific audience, letting users to view, enjoy, and participate with the shown material. A handloom production center can display the fabric, products to the visitors. It will attract more public and international people and give them idea about present products. Some of the basic type of layout for exhibition are

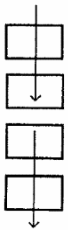
- Open plan
  - Features: Large and visually autonomous items on display, free circulation.
  - Function rooms are typically located in the basement.



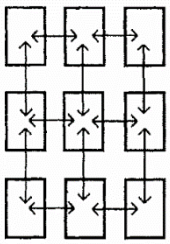
- Core and satellite rooms
  - Main room serves as orientation in the museum or exhibition.
  - Side rooms for autonomous displays with specific themes or collections.



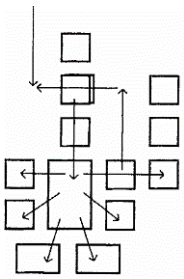
- Linear chaining
  - Linear sequences of rooms with controlled circulation.
  - Clear orientation, separate entrance, and exit.



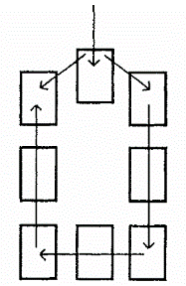
- Labyrinth
  - Free circulation with a variable guided route and direction.
  - Entrance and exit may be separate.



- Complex
  - Combined groups of rooms with typical features of layout types 0 to 4.
  - Complex organization of collection and display concept.



- Round tour (loop)
- Similar to linear chaining
- Controlled circulation leads back to the entrance



Display and storage rooms vary in size and height according on the works and collection, with a minimum height of 4 m clear.

- Area per person: 9 sq. m
- Area per picture: 3-5 sq. m hanging surface
- Area per sculpture: 6-10 sq. m ground surface

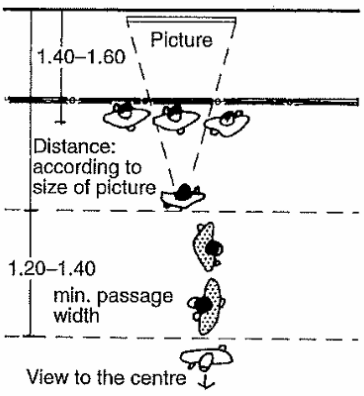


Figure 2.74: distance for view and traffic

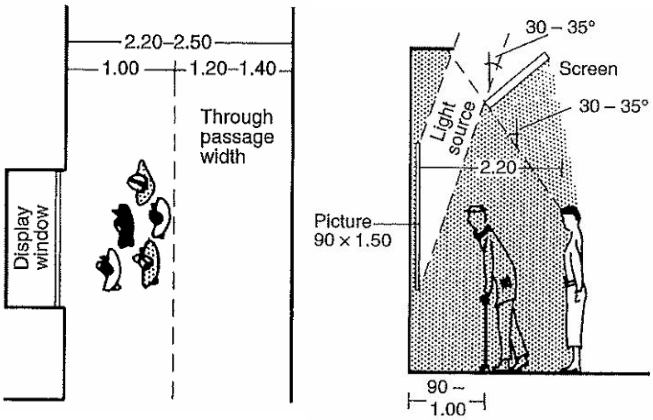


Figure 2.75 : distance and light form display

General data for room climate in store and display area

- Temperature
- Winter: 15-18°C
- Summer: 20-22°C
- Summer peaks should not exceed 26°C.
- Photo and film material should be stored cool and dry, ideally at around 5°C.

- Relative Humidity

Optimal values for different materials:

- Wood: 55-60%
- Canvas: 50-55%
- Paper: 45-50%
- Fabric: 30% - 50%
- Metals: Maximum 40%

Relative Humidity Variation:

- Short-term variations within one hour should not exceed 2.5%.
- Daily variations should not exceed 5%.
- Seasonal variations should not be more than +5% in summer or -5% in winter.

2.19.1 Lighting in exhibition

Typically, display lighting seeks to correctly show exhibits in terms of both their overall look and fine details, while also increasing the display's appeal. This frequently incorporates a combination of ambient and accent lighting, with lights that give outstanding color rendering. The lighting intensity should be balanced between illuminating the exhibited object and the surrounding visual field, with displays being the brightest for maximum visibility.

When developing the display lighting system, a variety of elements must be considered:

- Psychological factors include how exhibits are seen, the ambiance of the gallery, and the illumination of paths. Artificial light gives a consistent viewing experience, but natural light causes dynamic variations that might influence perception.
- Physiological factors include light intensity, contrast, reflection, glare, color rendering, and photo deterioration. Excessive contrast can strain vision, and museum exhibits often utilize greater contrast ratios than image galleries.

The recommended illumination levels (lux) for various places are: Office lighting: 300 lux ambient 500 lux task.

- Seating sections in the demonstration theatre are 300 lux.
- Lighting in the demonstration areas is set at 600 lux.

- The lighting in the exhibition hall varies from 500 lux for the main area to 300 lux for peripheral sections and 100 lux for background areas.

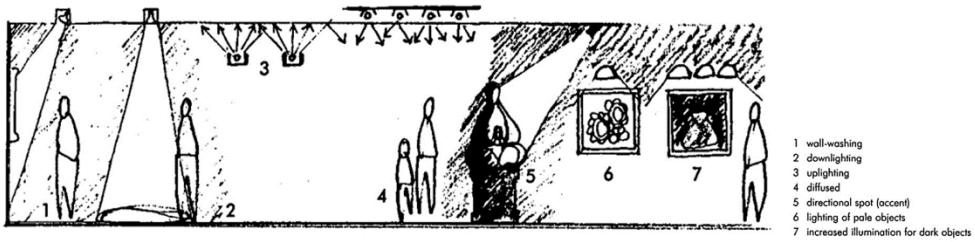


Figure 2.76 : Various lighting types in exhibition spaces

(Source: The Architects' Handbook)

2.20 Fashion shows

It comes in a variety of forms, each with its own unique traits and aims. A fashion show's physical structure usually includes decorations, backgrounds, runways, lighting settings, and props, all of which are meticulously coordinated to create the intended ambiance. Here are the primary types of fashion shows

- Production Fashion presentations: These are the most complex and lavish fashion presentations, with intricate backgrounds, sophisticated lighting effects, scripted performances, and entertainment components. They are frequently large-scale events that need extensive resources and organization.
- Formal Runway Shows: This style of fashion show features models strolling down a designated runway, displaying outfits and accessories in a planned sequence of presentation. These displays are more formal and organized, with an emphasis on displaying the designs to an audience.
- Informal Fashion Shows: These presentations are more informal and casual, sometimes taking place in locations such as a manufacturer's showroom or a retail store's sales floor. Models move among the crowd, displaying outfits and accessories while holding placards with product information.
- Tearoom Modeling: In this unusual style, models wander from table to table in a restaurant, talking with customers to exhibit and discuss the clothes they are wearing. This compact environment provides a more personal and engaging experience for the audience.

In fashion, a runway, catwalk, or ramp is a small, typically flat platform that models use to exhibit clothes and other items during a fashion show.

- The stage is a platform onto which models enter.
- The runway is a lengthy platform that stretches into the crowd. The "T" represents extra staging perpendicular to the runway
- T-shaped runways are ideal for showing a whole line of apparel at the final.

There is no extra length for a runway stage. A basic rule of thumb for establishing the length of a runway is to first calculate the size of the venue and then build your runway to be two-thirds the length of the room. The runway length will also be determined by the amount of room required for your backstage, depending on the venue.

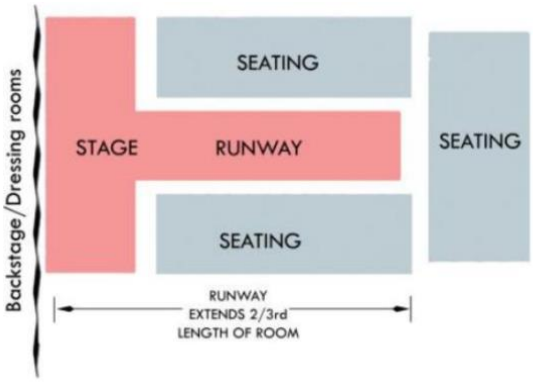


Figure 2.77: Runway spacing

The breadth of a fashion show runway varies depending on the volume of clothing on display and the number of models walking at the same time. A conventional runway width is roughly 4 feet, which can adequately accommodate one model at a time displaying apparel products. This breadth is appropriate for small and medium-sized fashion shows withlimited space.

Larger venues, such as banquet halls, malls, arenas, or gyms, need have a wider runway, usually approximately 8 feet. A bigger stage allows more models to walk at the same time, which improves the watching experience for larger crowds. Furthermore, it gives additional area for displaying bigger clothing such as bridal dresses or prom gowns, boosting the overall

presentation of show.

Chapter 3 Data analysis

3.1 Site introduction

Dharan stands as a sub-metropolitan city nestled within Sunsari District of Koshi Province, located in eastern Nepal. Dharan ranks third in population size among eastern Nepali cities. It is famous for the clothing fashion among all the places of Nepal. It is also famous for the production of Dhaka fabric in eastern region.

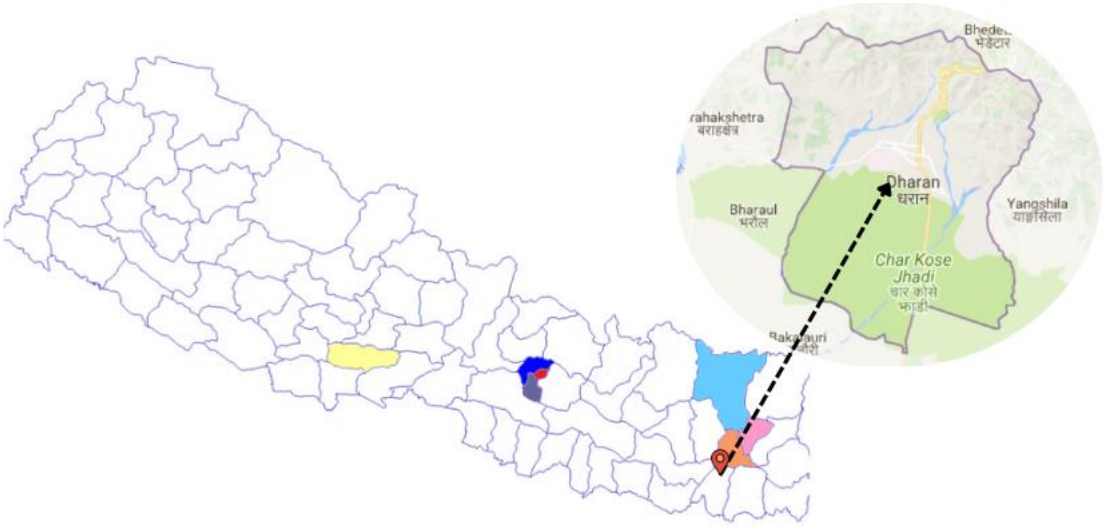


Figure 3.1:Handloom sectors of Nepal

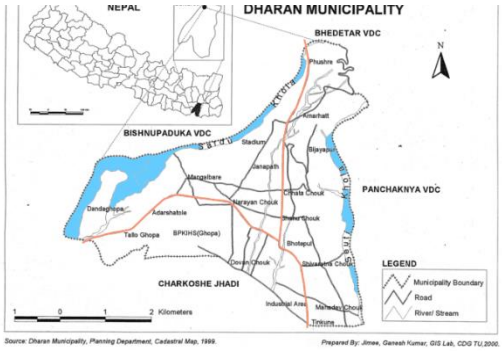
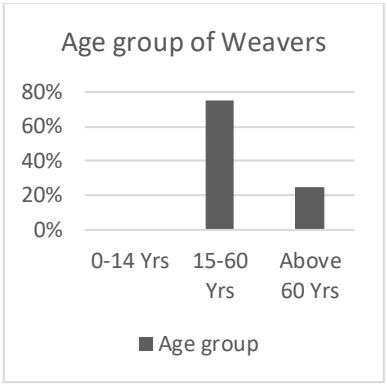


Figure 3.2: Small industry and shops of Dhaka in Dharan

(Source: Google map)

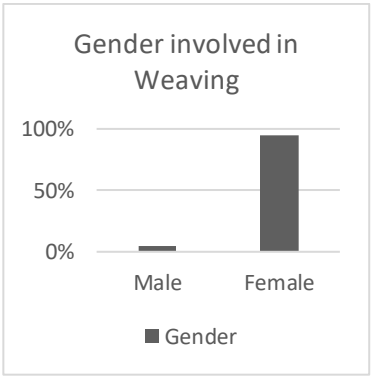
3.2 Dhaka Weavers status

3.2.1 Age group



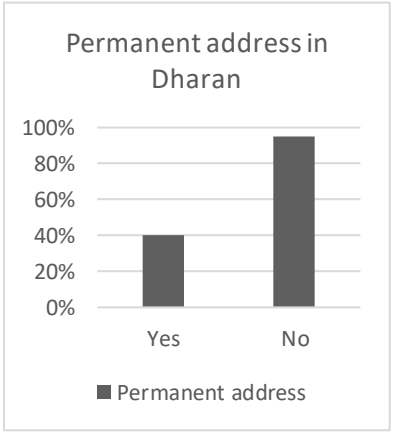
As per the survey conducted ,75% of age group 15-60 years are highly involved in this field who are housewives and students. Whereas 25 % of age group are women who are interested in weaving Dhaka fabric.

3.2.2 Gender



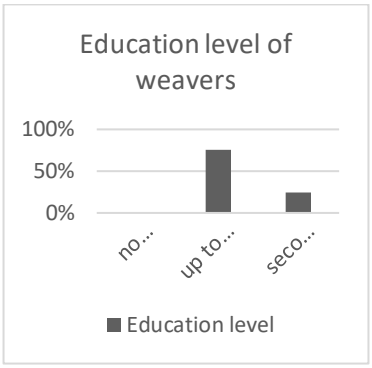
As per the survey conducted ,95% of female are involved in weaving compared to male.

3.2.3 Permanent address



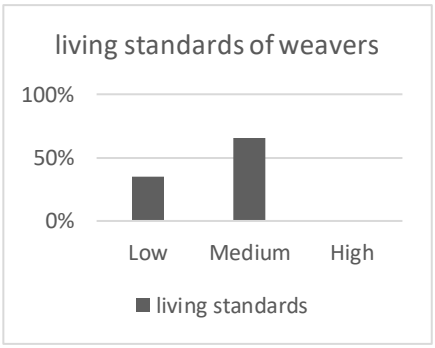
As per the survey conducted ,60 % of people do not live permanently in Dharan. They are from different places such as Biratnagar, Bhojpur, Khotang, Ithari , Dhankuta .

3.2.4 Education



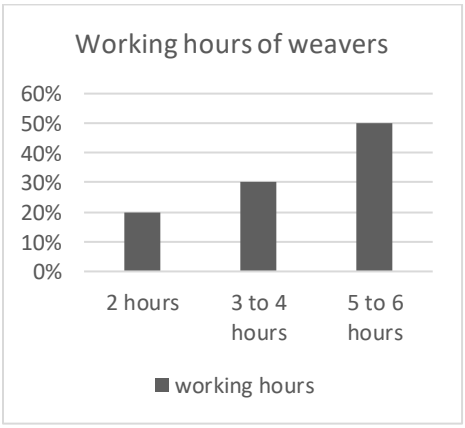
As per the survey conducted ,Every weavers are educated up to certain level , they have shown their interest in this field

3.2.5 Standards of living



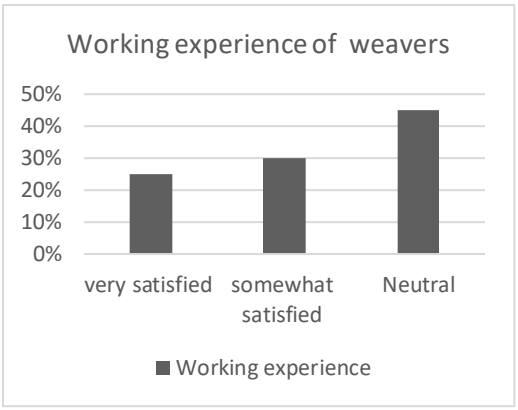
As per the survey conducted ,65% have medium and 37% have low living standard life which shows that they are also involved in this field to get income for living.

3.2.6 Working hours per day



As per the survey conducted ,50% of weavers have given more time on weaving and about 20% to 30% of people have to go to study or look after their family

3.2.7 Overall working experience in Factory

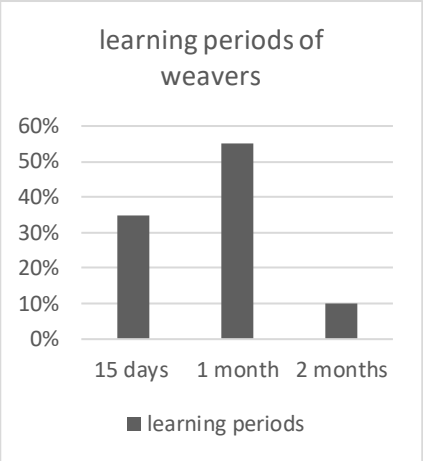


As per the survey conducted ,45% of people shows neural satisfaction where as 25 % are satisfied with the working environment which shows there still need to be improvement for working environment of industry.

3.2.8 Involvement of employee

As per the survey conducted ,80% of weavers are self imployed with their interest where as 20% are heired for work showing employment opportunity from small amount of investment.

3.2.9 learning periods

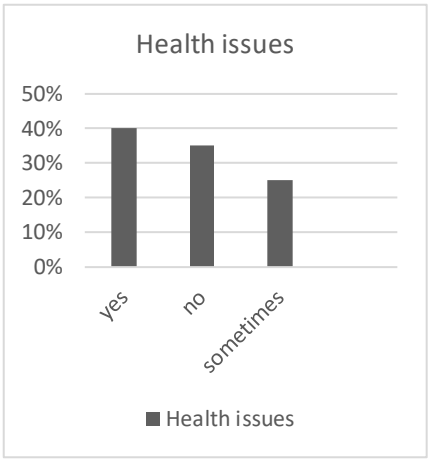


As per the survey conducted ,10 % of weavers have done 2 months of training and 55% of weavers have done 1 month and 35% have been learning from their family and friends. This shows that a significant portion of weavers learn their skills through short-term training programs, whereas the majority rely on informal learning methods such as family and friends. Only a tiny minority have received more intensive instruction.

3.2.10 Wage of weavers per month

As per the survey conducted ,20% of weavers, who possess higher experience, receive salaries ranging from NRP 12000 to 15000, indicating opportunities for better pay. Meanwhile, 10% of weavers receive payments between NRP 4000 and 6000, which are determined by their weaving skill level.

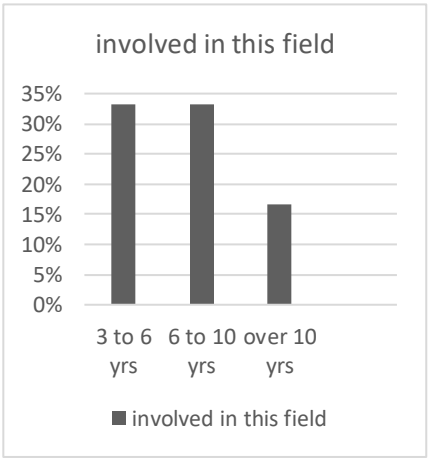
3.2.11 Health issues faced by weavers



As per the survey conducted ,40% of weavers have health concerns, showing a lack of suitable assistance for them. These health problems, which include eye discomfort, headaches, back pain, and hand pain, are frequently related to insufficient illumination and uncomfortable working conditions at their workplace.

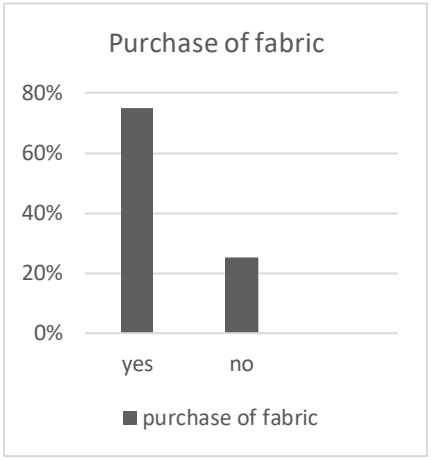
3.3 Retailers analysis

3.3.1 Involved in this field



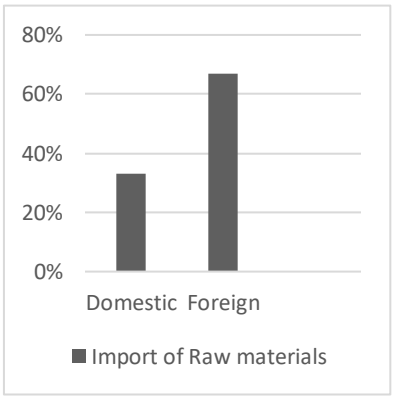
As per the survey conducted ,16.6% of owners have involved in this filed for over 10 years which shows that this industry has been gaining market from long time.

3.3.2 Purchase of Dhaka fabric other than Dharan by Retailers



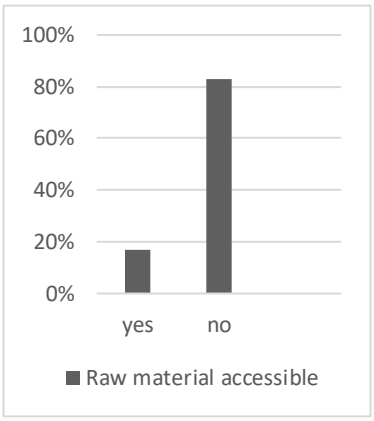
As per the survey conducted ,Most retailers (75%) buy fabric from places like Terathum, not just Dharan. This suggests that factories in Dharan may not be producing enough fabric for the market. There are only few factories in Dharan but the demand is very high in market. These factories cannot meet the demand by the clients and have to bring fabrics from others parts of eastern region.

3.3.3 Import of raw materials



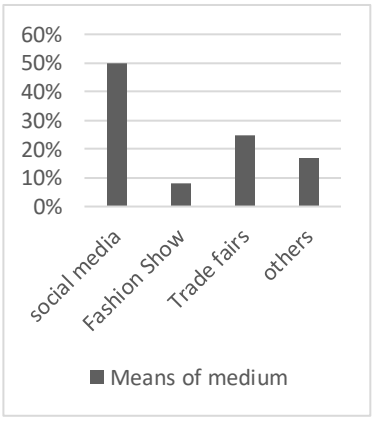
As per the survey conducted ,66.7% of owners buy thread from foreign markets like India,due to poor quality thread dyeing locally. 33% purchase domestically from cities like Kathmandu, Biratnagar, and Birgunj. Most of the threads are obtained from the Kathmandu, cotton yearn are obtained from India to Kathmandu and these cottons are dyed and made thread for fabric.

3.3.4 Raw material accessible



Approximately 83.4% of owners face challenges in accessing fabric threads easily due to delays in transportation and imports. The threads are sourced from Biratnagar, Kathmandu, and India, resulting in time-consuming transportation processes.

3.3.5 Medium for Market Fashion



As per the survey conducted ,50% of people get the products information through social media and 8.33% through fashion show which shows that there's opportunity for fashion industry. 17% of people get to know while travelling to different places of industry and retails to get know about Dhaka fabric. This data suggests that people really want to know about products, especially through social media. They also pay attention to fashion shows and visiting different places. In short, there's a big demand for information about products in the fashion market.

3.4 Conclusion

The study of Dhaka weavers in Dharan reveals various important insights into the demographics, working environment, and issues encountered by workers in the business. Primarily, it emphasizes the enormous participation of women, with 95% of weavers being female, representing a gender-specific capacity in the trade. Furthermore, a large proportion of the workforce is between the ages of 15 and 60, with the majority being housewives and students, highlighting the different backgrounds of those involved in Dhaka weaving.

Despite their geographical diversity, with many weavers come from locations like as Biratnagar and Bhojpur, there is a consistency in education levels among them, showing a certain degree of educational achievement. This is consistent with their mutual interest in Dhaka weaving, which is motivated by the desire to create cash, as indicated by the different living circumstances among weavers, 37% of whom live in hardship. The industry's working dynamics show a combination of self-employment and hired work, with 80% of weavers self-employed, suggesting for creativity and financial independence. However, concerns about working conditions and job satisfaction remain, as indicated by the frequency of health issues among weavers, such as eye discomfort and back pain, which have poor lighting and uncomfortable workplaces.

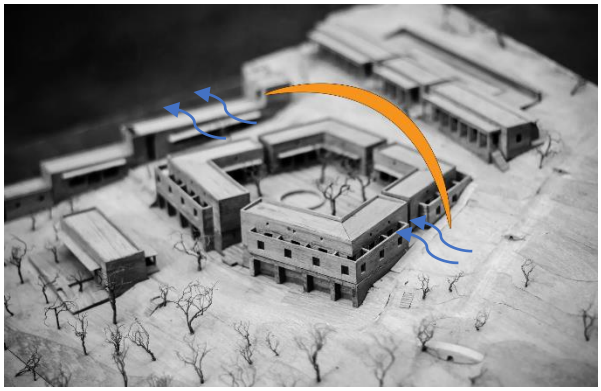
Furthermore, the analysis of retailers gives insight on the larger market dynamics around Dhaka fabric, suggesting a significant demand for the product outside of Dharan, necessitating the sourcing of materials from other regions like as Terathum and other markets like India. Access to raw materials is made more difficult by transportation . Nonetheless, there are significant market development opportunities, with social media emerging as an important channel for product distribution and fashion events providing as forums for promoting Dhaka cloth. This highlights the fashion industry's potential for development and innovation, which is supported by customer interest and evolving market trends.

In conclusion, while the Dhaka weaving industry in Dharan faces challenges ranging from weavers' health to logistical hurdles in material sourcing, there are opportunities for improvement and expansion, particularly through the use of digital platforms and addressing workforce concerns. Overall, a determined effort to improve working conditions, fulfill market demand, and tap into developing marketing channels will help the Dhaka weaving sector maintain its development and health in the area.

Chapter 4 Case Study

4.1 International Case Study

4.1.1Ganga Maki Textile Studio



(Source:architectuul.com)

The Ganga Maki Textile Studio in Uttarakhand is a collaboration between the Maki Textile Studio in Japan and Studio Mumbai, one of India's leading architecture organizations. This initiative distinguishes out for its amazing design, originality, and attention to people's needs. The complex is 1300 square meters and took four years to create. Architect Jain oversaw the design process, which required precise planning and the utilization of locally available materials such as bricks, stone, marble, bamboo and soon. The Ganga Maki Textile Studio sets on steep ground in the Himalayan foothills. It has a subtropical climate with an average annual temperature of 21.8°C and around 1285mm of rainfall. The region has spectacular vistas of the Himalayas and brown forest soil.

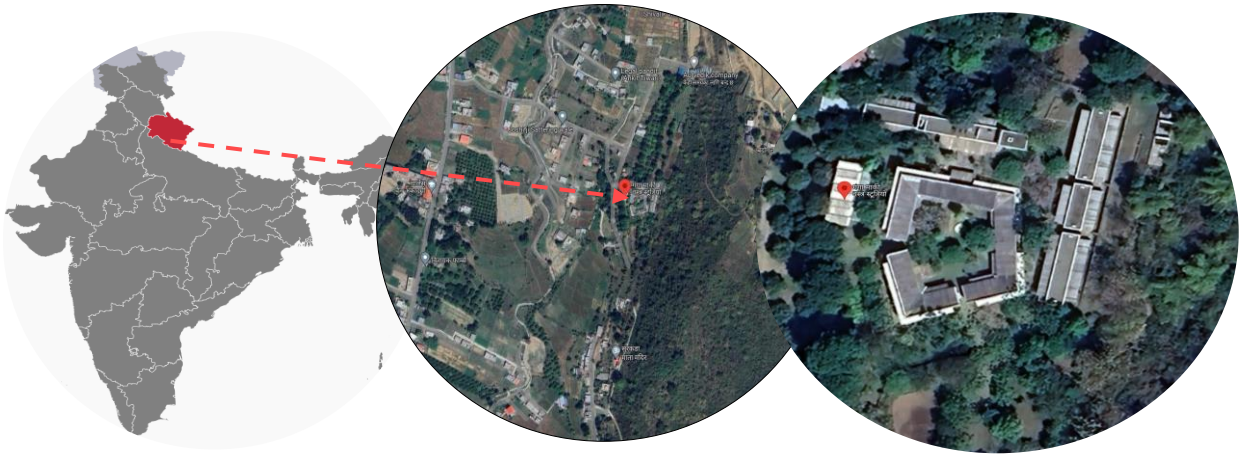


Figure 4.1: Location map of Ganga Maki Textile Studio

(Source:google map)

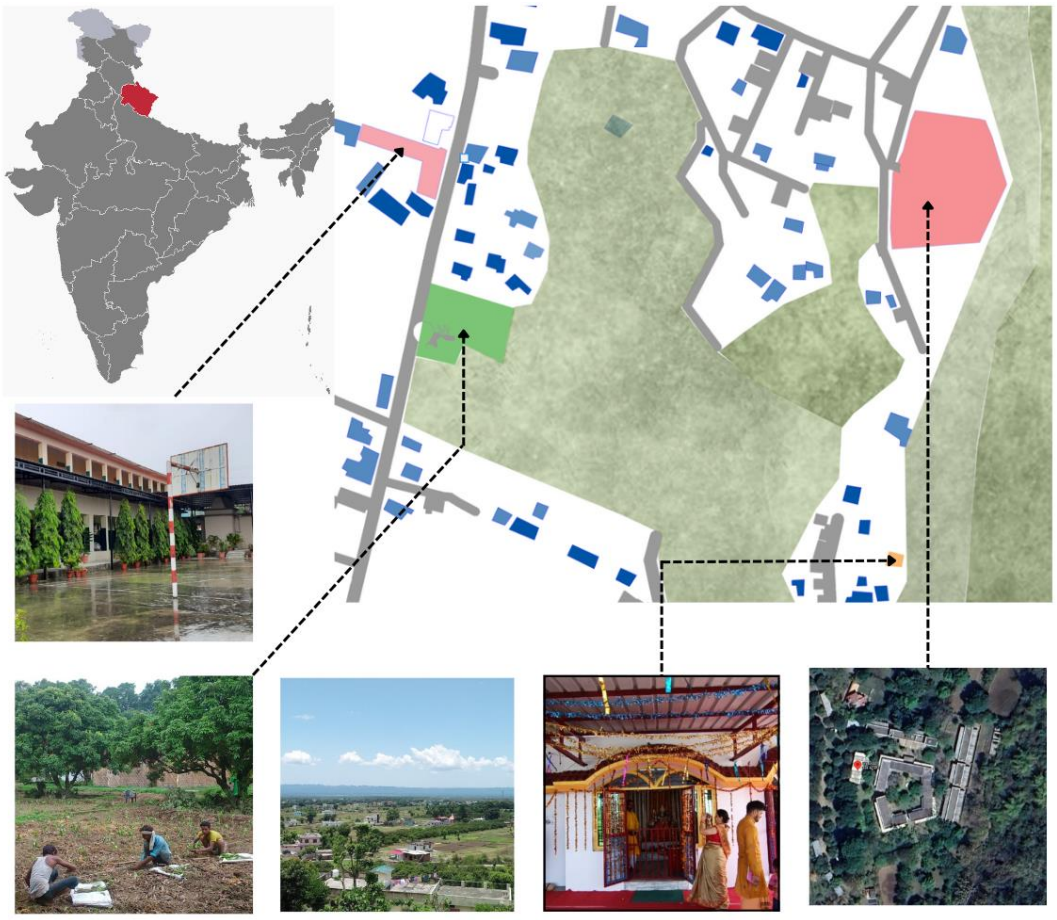
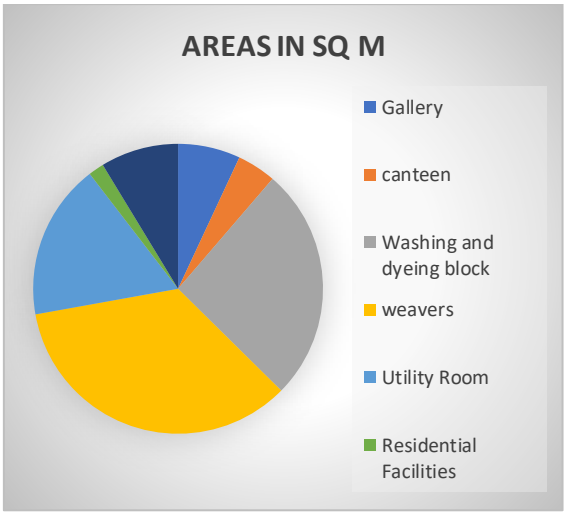


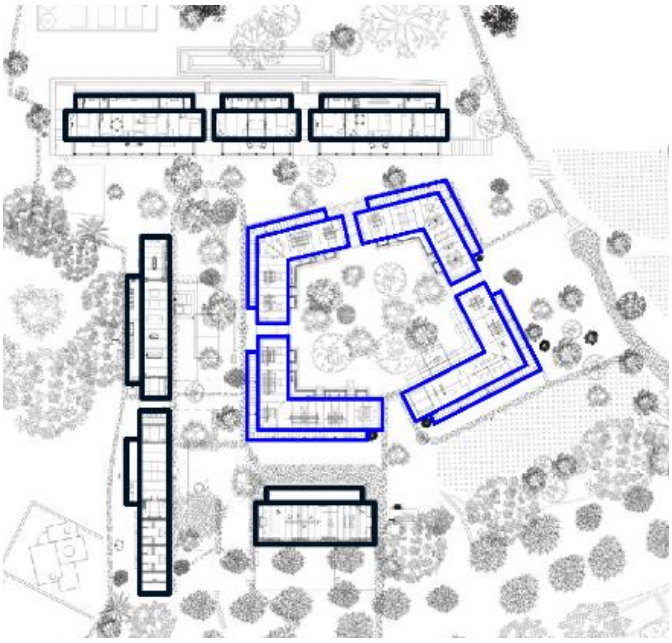
Figure 4.2: Site surrounding of Ganga Maki Textile Studio

Functional Analysis

UNITS	Areas in sq m	No of users
Gallery	80	20
Canteen	50	15
Washing and Dyeing block	300	
Weavers Workshop	400	30
Residential Facilities	200	10
Utility Room	20	
Chiaki's Workshop	100	1

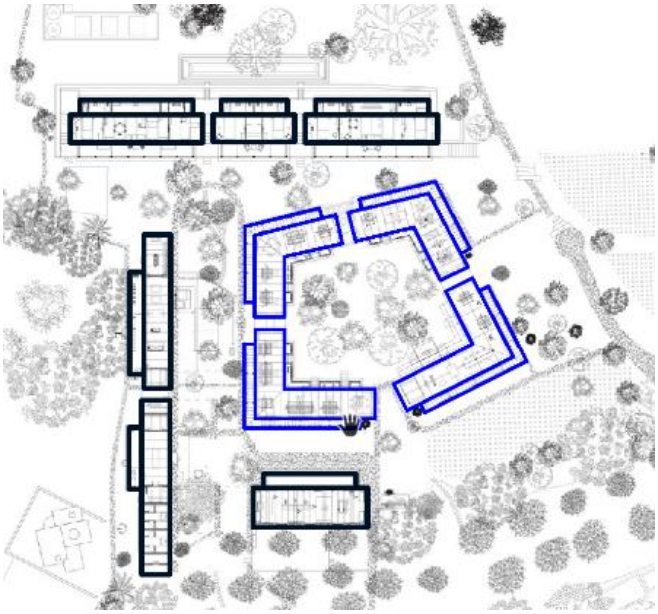


1. Orientation



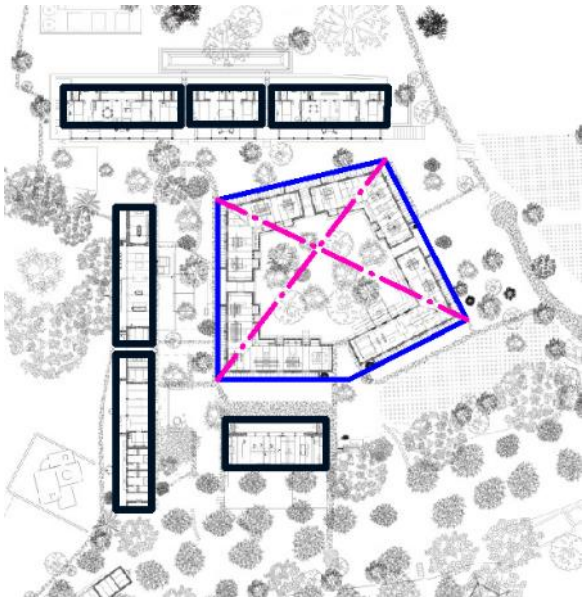
The buildings are arranged so that they shade each other, and because there are trees and buildings surrounding it from all sides, the courtyard receives the most shade.

2. Geometry



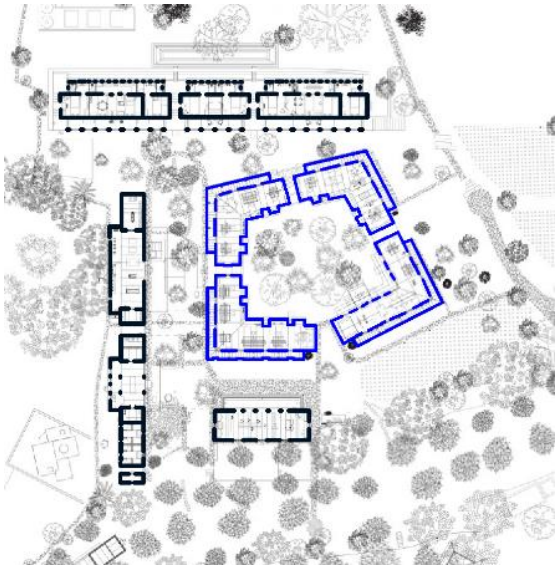
The complex has an orthogonal geometry, with four L-shaped workshops arranged around the courtyard, meeting at right angles.

3. Repetitive To Unique



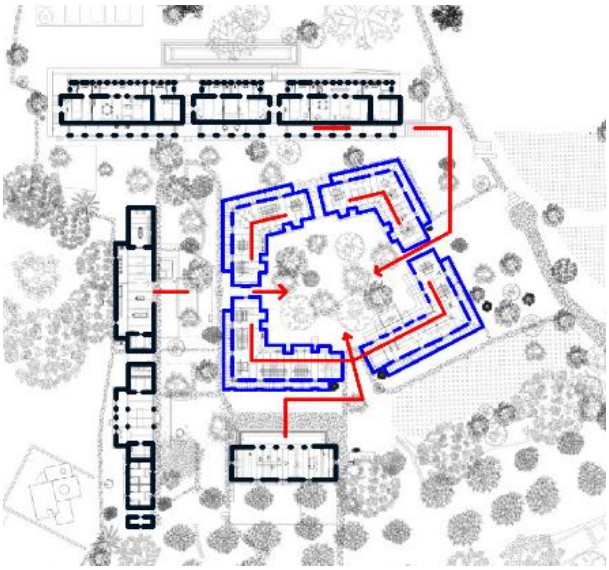
The complex primarily consists of two distinct forms, with a repetitive pattern visible throughout all of its structures.

4. Structures



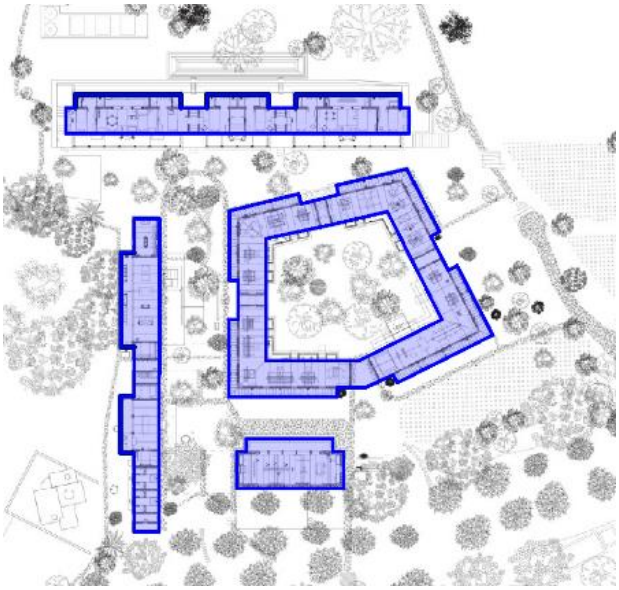
The structure is defined by columns and planes, which result in a consistent and orderly spatial arrangement.

5 Circulation



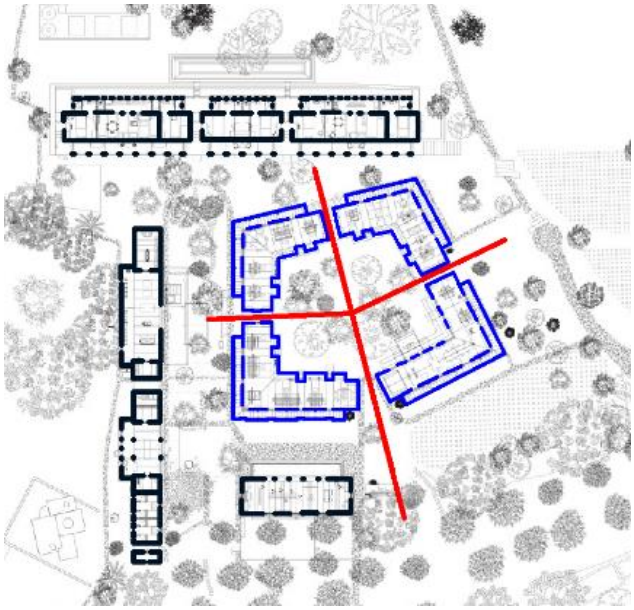
Buildings are strategically placed at various levels to create distinct circulation pathways. Furthermore, landscape features serve to define and direct movement across the site.

6 Built To Unbuilt Relationship



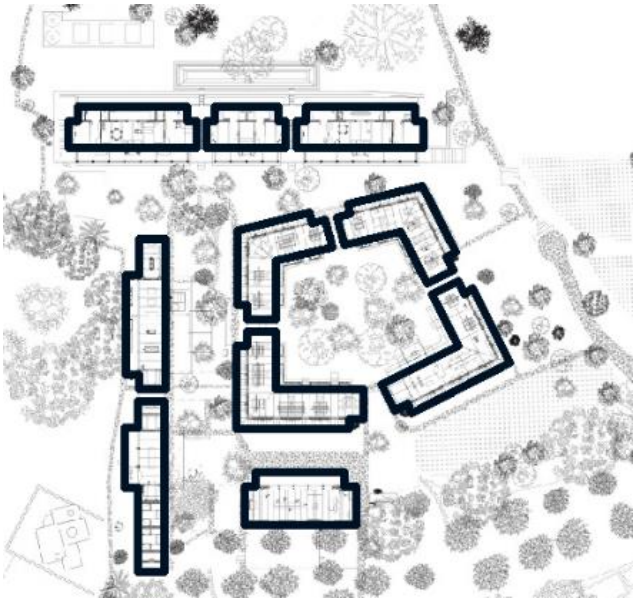
70% of the site is made up of open spaces designed for circulation. Void spaces are essential for organizing the environment and ensuring the site's functionality.

7 Axis

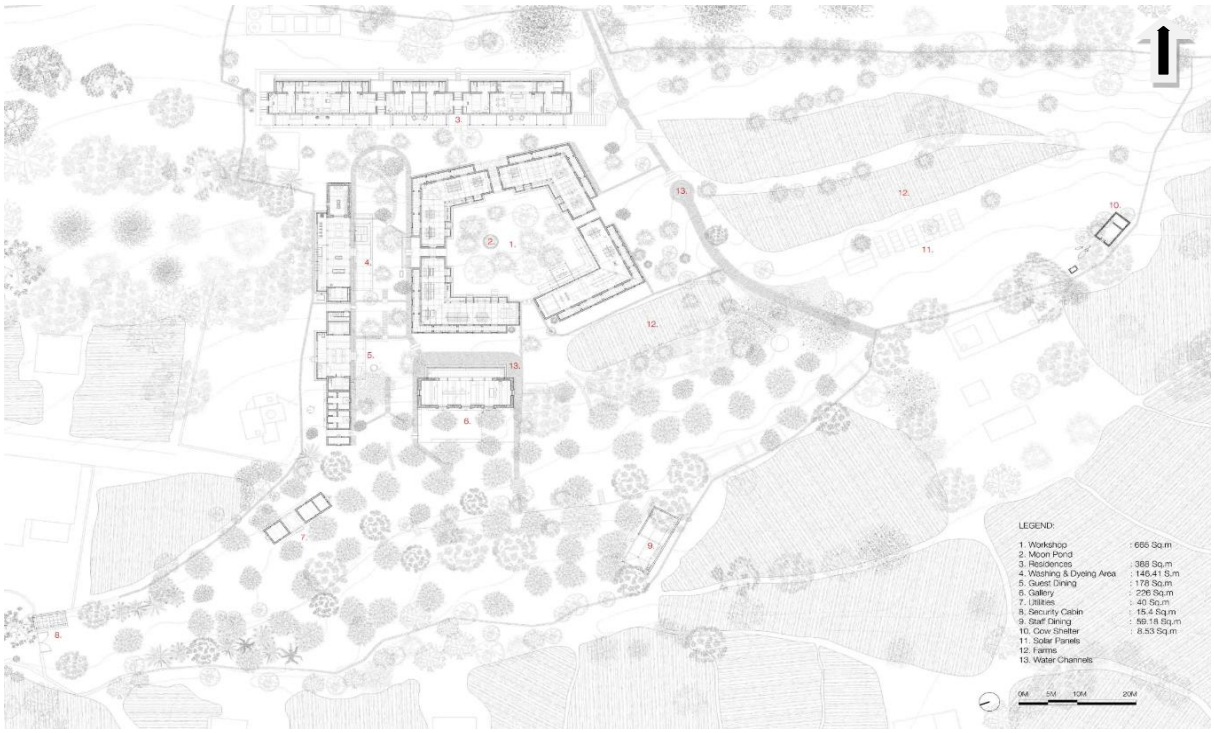


The main axis passes through center of the court yard and this area is the main activity area. A water trough is positioned in the courtyard to reflect a full moon.

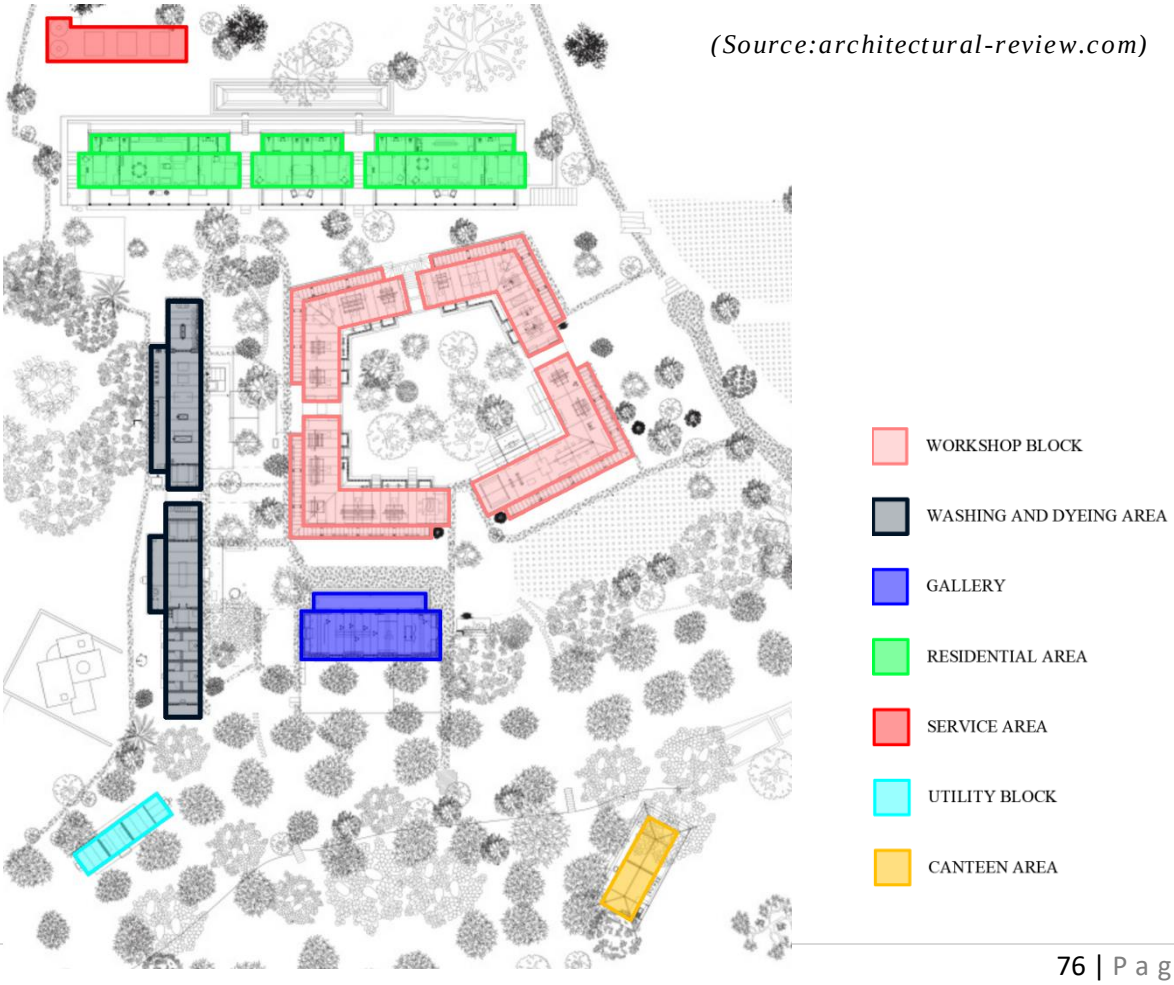
8 Unit To Whole



Although each unit is distinct and separate from one another, the arrangement of the spaces around the courtyard emphasizes the concept of unity.



(Source:architectural-review.com)



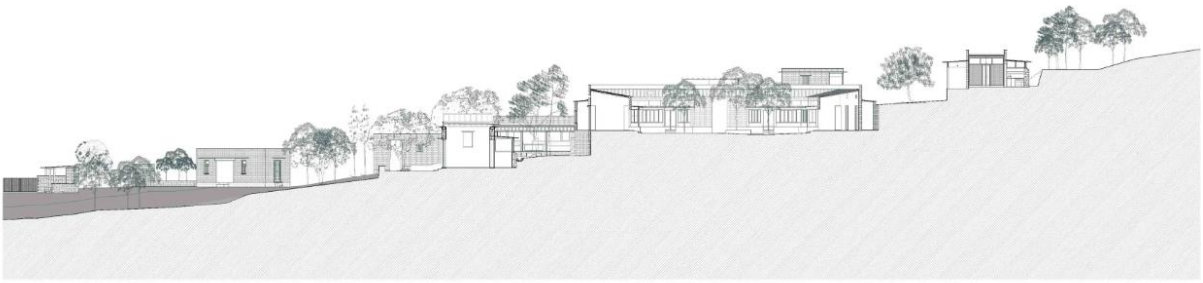


Figure 4.4: Site Section

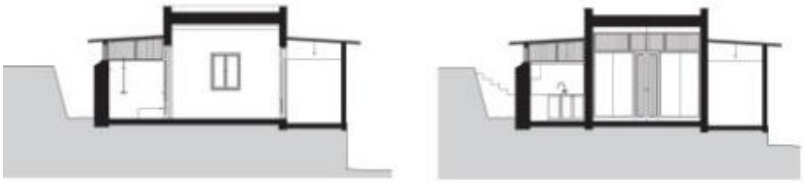


Figure 4.5: Section of canteen

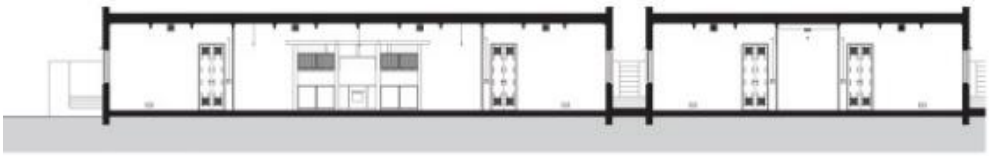


Figure 4.5: Section of workshop block

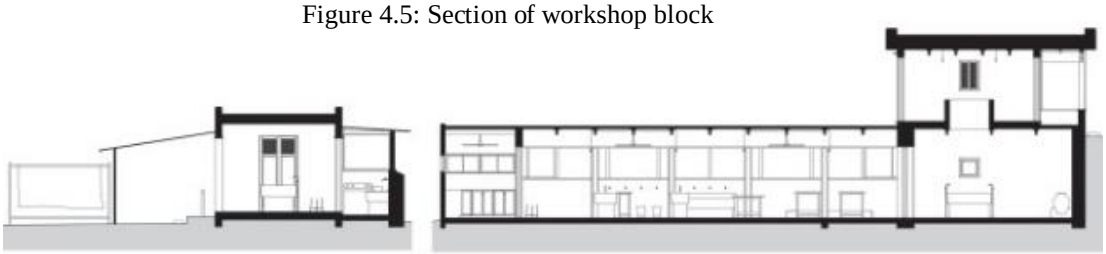


Figure 4.6: Section of Dyeing and Washing area

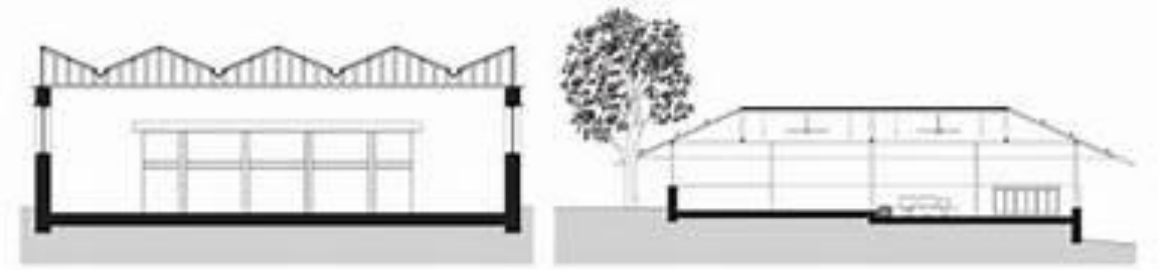


Figure 4.7: Section of Gallery

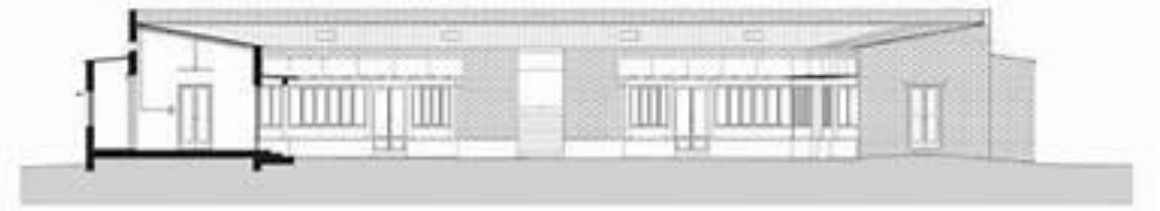


Figure 4.8: Section of Work shop

(Source:architectural-review.com)

Material Used

The center of the facility is made up of four L-shaped studios where weavers and craftspeople create handwoven fabrics. The studios have brick walls, lime finishes, asbestos-free cement sheet roofs, and stone floors. One unique studio, designed for Maki, stands out with bamboo frames, mud-dung plaster, and a clear roof. Men weave under skylights in the central courtyard, while women knit on a raised work surface. North of the courtyard, there are blocks for dyeing, guest dining, and facilities. The owner and guest residences are located at the top. The entrance gallery, topped by a translucent white marble roof, greets visitors and displays local craftsmanship influenced by Japanese and Swiss artisans. The project's significance stems not only from its use of natural materials, but also from how these materials are used to reflect their fundamental character and function. Collaboration with local makers and artisans ensures that materials are meaningfully used, reflecting a purposeful and aesthetic-driven approach to design and construction.

Figure 4.9: Use of bamboo, wood mud and stone with lime finishes. *(Source:architecturaldigest.in)*

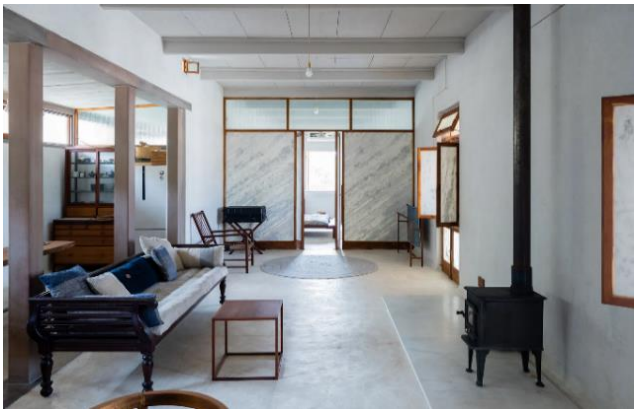


Figure 4.10: Private Apartment for staffs

Figure 4.11: Dyeing workshop

(Source:architecturaldigest.in)

Figure 4.12: A translucent white marble roof on the gallery.

Figure 4.13: Looms are located in the central, skylit area, and yarns are knit, stitched, and spun on the raised workspace.

Figure 4.14: courtyard space for gathering around l- shaped studios.

Figure 4.15: one of the workshop made with brick on walls and covered with lime.

(Source:architecturaldigest.in)

Construction Details

The load-bearing structure is made of brick and stone, with lime wall finishes and sloping roofs of marble, corrugated cement sheets, and bamboo. The walls are 4-6 meters high and 30 cm thick,

4.2.2 İpekyol Textile Factory

Project details

(Source:www.emrearolat.com)

- Location: Edirne, Turkey
- Site area: 15000 Sq.M
- Architect: Emre Arolat Architects
- Topography: Flat
- Climate: In winter, the climate is affected by the sea, with occasionally showers and warm temperatures. However, temperatures may drop to -1.0ºC in January/February. Summers are hot and dry, with temperatures reaching 32ºC in July/August. Spring and fall can be wet. The yearly average temperature is 13.5ºC.
- Precipitation : 600mm annually
- Average humidity: 60 ºC

The Ipekyol factory, designed for a top-tier textile producer, displays a successful collaboration between client and architect, balancing productivity goals with staff well-being. The core design aims concentrate around a single U-shaped building that maximizes site usage, uses indigenous materials, reduces energy consumption, and improves thermal efficiency.

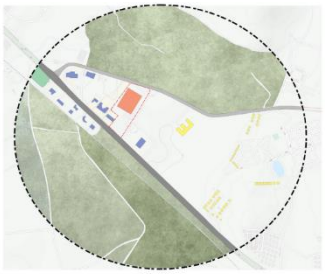


Figure 4.15: Location map of Ipekyol Factory

(Source: turkeymap360.com)

(Source: google map)

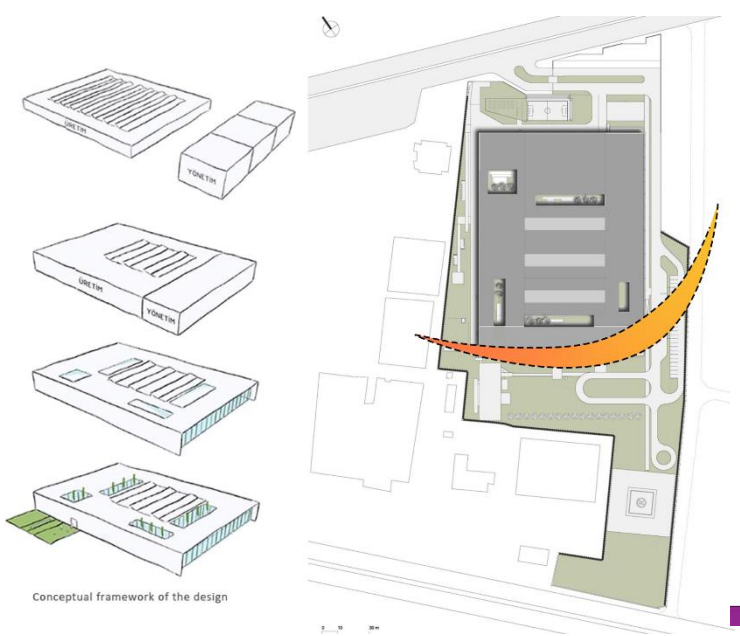


Figure 4.16: Master plan of Ipekyol Factory

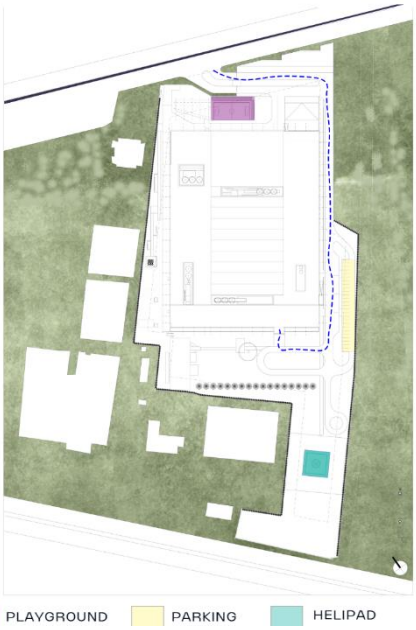
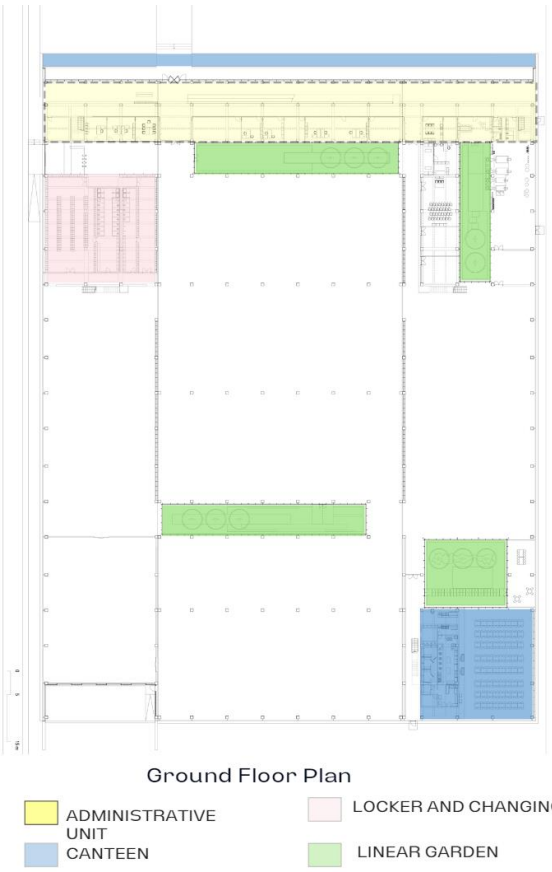


Figure 4.12: landscape elements of factory



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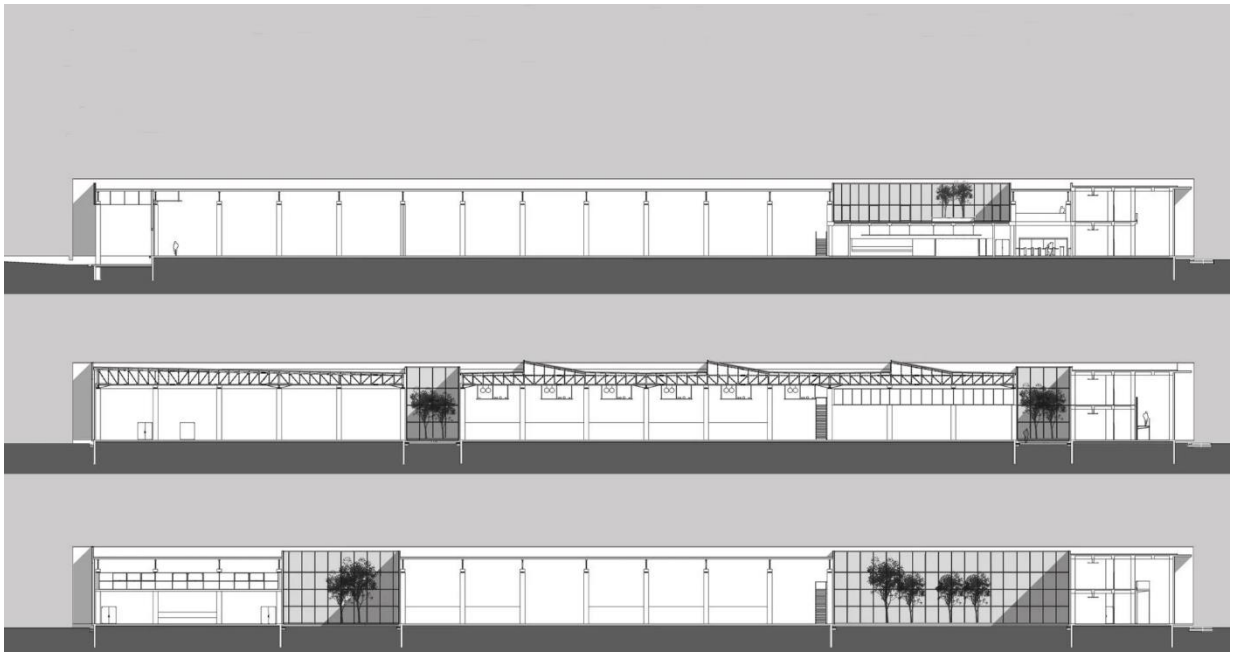


Figure 4.13: sections

Figure 4.17: Water splinker system

Figure 4.18: Production Unit

Figure 4.19: Administrative Unit

(Source:www.emregro

Material Used

- Reinforced concrete: Used for the columns, foundations, and roof over the south facade.
- Mild structural steelwork: Used for the spanning trusses
- Metal Cladding: Grey metal cladding utilized on three elevations.
- Glazed Panels: For the south elevation and interior courtyards, glazed panels with openable tilt windows provide airflow.
- The roof above the main factory is made of flat metal deck, which is covered with insulation, waterproofing, and a white membrane.

4.2 National Case Study

4.2.1 Chaubise Dhaka Kapada Udhyog

Figure 4.20 : Entry road of Chaubise Dhaka Kapada Udhyog

- Location: Chemjong path, Dhara
- Site area: 105.28 Sq .M
- Site Orientation: north
- Owner: Basanta Chemjung
- Property type: Privately owned small- scale industry
- Types of products manufactured: Dhaka muffler, Dhaka Saree, Dhaka coat
- Raw material for fabric: Cotton Thread, silk thread
- Working hours: 4-5 hours a day
- No of employees: 4

Climatic condition

- Climate : tropical monsoon climate category, temperate climate
- Temperature: The temperature reaches up to 39 ° c during summer and 7°c at winter
- Precipitation: 814.7 mm annually
- Wind Direction: SW at days and NE at winter

Chaubise Dhaka Kapada Udhyog was establish by Basanta Chemjung in Dharan in 2048 B.S and has been committed to helping financially underprivileged women. The factory aspires to improve its female workforce's economic possibilities and self-sufficiency through training programs and job opportunities, so favorably impacting their lives and general well-being. The factory has total of 10 handlooms with 7 saree handlooms, 1 muffler handloom and 1 coat handloom.

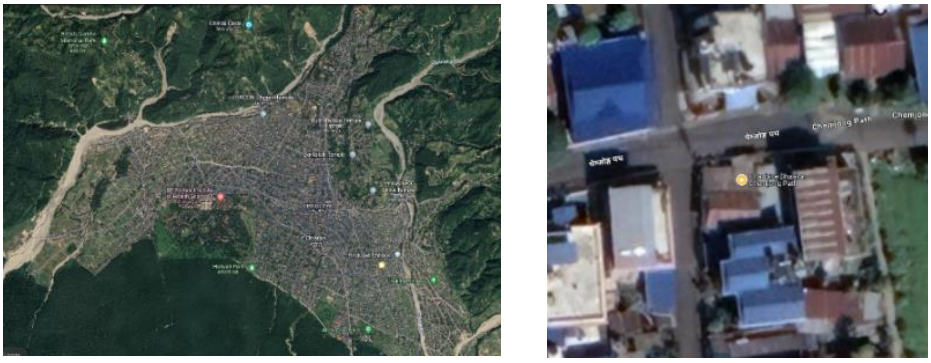


Figure 4.21: Location of Chaubise Dhaka Kapada Udhyog

Procedures Followed by the Facility

Cotton thread and silk thread used by the factory are imported from India, Biratnagar and Kathmandu. The imported threads are stored in storage room which is situated in the ground floor of owner house. Then right amount of thread is taken for the use and weaved in the wrapping drum set which create small bundle of thread tried before placing them in handloom. The handlooms are made up of wood called Sakhuwa on factory with different sizes . This process is done by one of the male employee.

All the works are supervised by the head of the facility. After the completion of the fabrics they are checked again for its quality and placed them into storage before distribution to different places. So, the overall process includes supervision, quality checking, storage and to the market.

Site Planning and zoning of Chaubise Dhaka Kapada Udhyog

Chaubise Dhaka Kapada Udhyog, located 1.7 kilometers from the Dharan bus park, is strategically placed on the east side, away from the center region and surrounded by institutional and small-scale industrial companies. Nestled on level ground, the facility is surrounded by residential structures, and its two entrances, north and west, perform unique functions. The north gate allows for efficient loading of goods from the plant, whilst the west gate serves as the major entry and departure point for everyday activities.

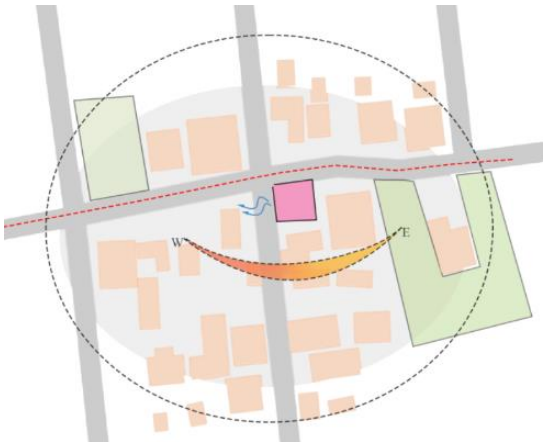


Figure 4.22: Surrounding area of factory

The owner's home and the factory are both accessible through the same entry, which represents a smooth transition between living and working areas. A designated water facility zone and a modest but useful parking lot are located next to the entrance. There is a separate small carpentry room for making handlooms for factory with different sizes depending on their needs.

An additional door provides access to the manufacturing unit, highlighting a clearly defined flow throughout

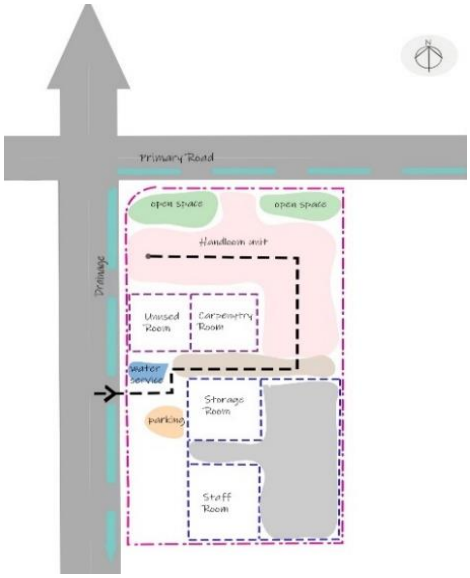


Figure 4.23: Space distribution of space

the building. One thing that is noticeable is the distribution of necessary areas in the owner's home, where a staff room and storage facility are located on the ground level and are well blended ithe household environment. The practicality and effectiveness of Chaubise Dhaka Kapada Udhyog's everyday activities are guaranteed by this well-considered layout.

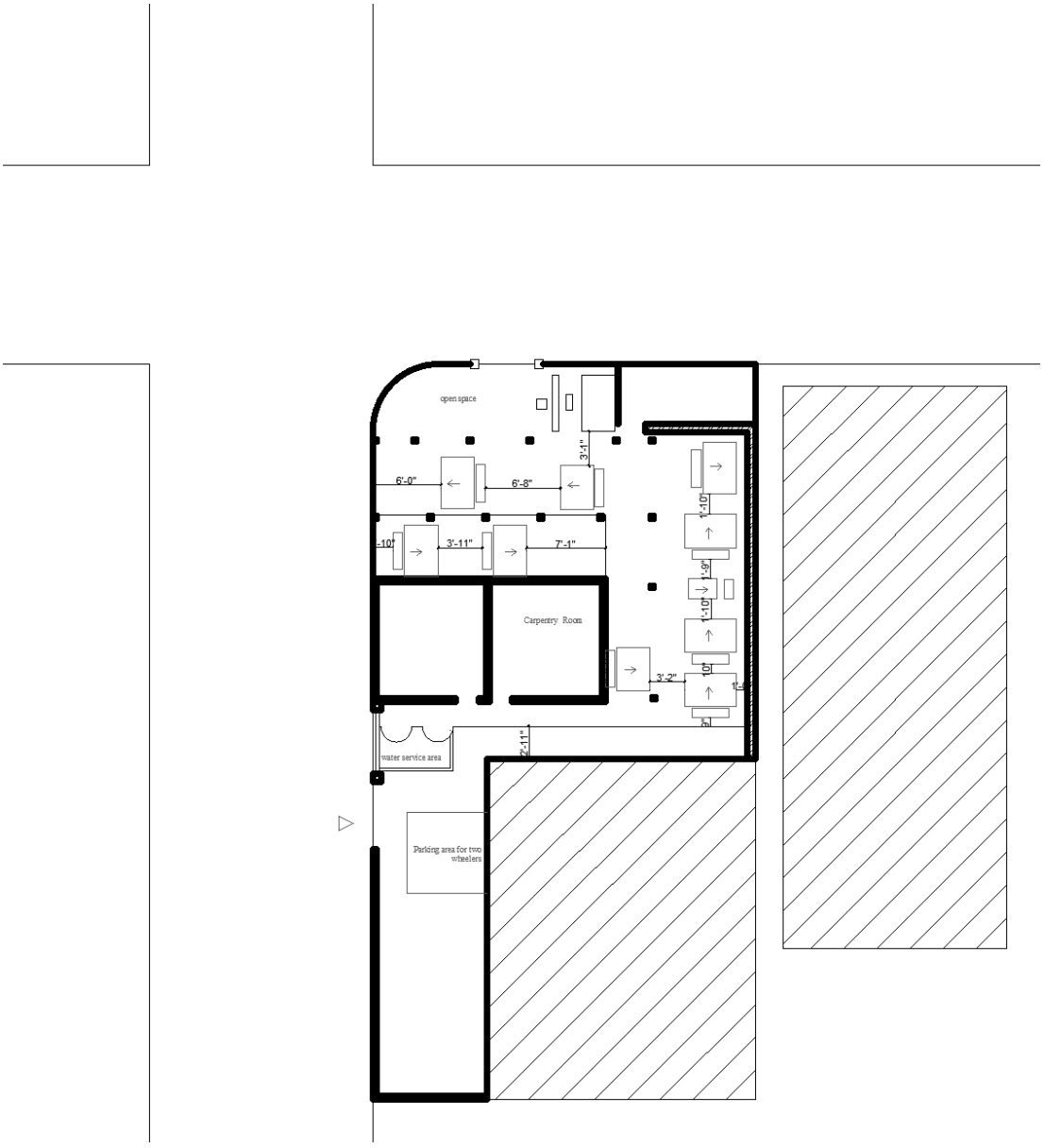


Figure 4.24: Site plan of Chaubise Dhaka Kapada Udhyog

Weaving in handloom

Handlooms are the traditional weaving machine operated manually with the interlink of different colored fabric. These handlooms have been used for centuries by the people of eastern region. Likewise, All the fabrics are produced by handlooms on this factory. Handloom sizes are different depending upon their production of their product type. The handloom used to weave sarees is bigger than the one used to weave mufflers because smaller goods can be produced more easily on smaller handlooms. The completion of fabric depends upon the pattern and its length. The employee can complete a simple pattern in 5-6 days and where as a complex pattern of saree and coat takes 10-12 days. A single person can complete 4 complex pattern sarees in a month. The wages of worker on average NRP 3000 per completion of work.

Figure 4.25: Weaving saree

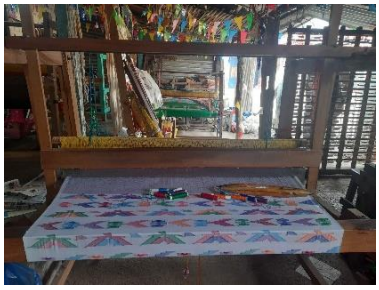


Figure 4.26: Handloom for coat

Figure 4.27: Preparing thread on comb before weaving by weavers

Figure 4.28: Handloom for scarf and topi

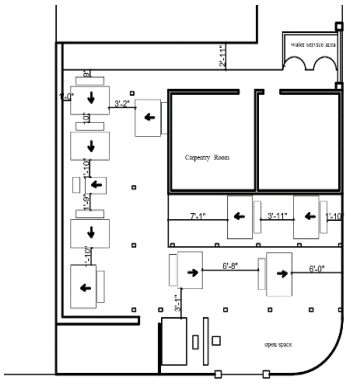


Figure 4.29: Arrangement of handlooms

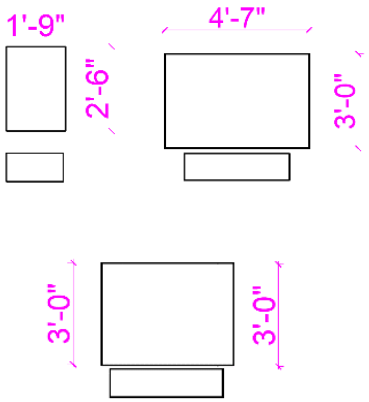


Figure 4.30: Dimension of Handlooms for different length of fabric

light and ventilation

The room has ten artificial lights in total: five long fluorescent lights placed at least five feet six inches above the floor and five light bulbs strung five to six feet above it. The light in the room was insufficient, coming mostly from the north side of the courtyard. Notably, the space lacks designated doors and windows; instead, an extended aperture, roughly measuring six feet in length, has been added to the east side to promote better ventilation.

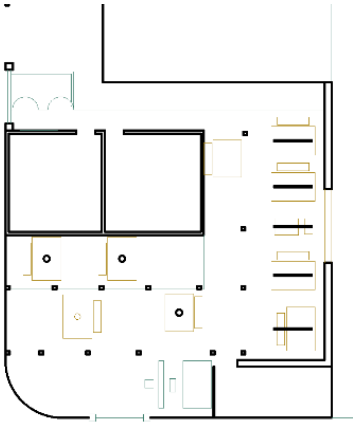


Figure 4.31: Arrangement of light bulbs

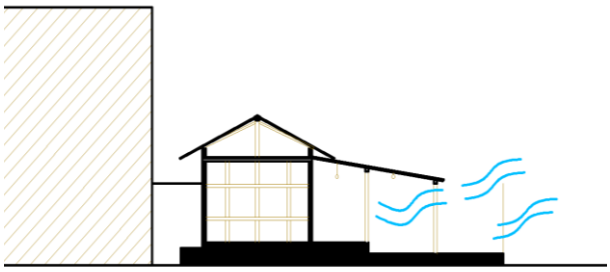


Figure 4.32: Air circulation of factory

Other services room details

- Area of carpentry room: 9.6 sq m
- Area of parking: 5.5 sq m

Figure 4.33: Water Service Area

Figure 4.34: Parking Area

Analysis of Chaubise Dhaka Kapada Udhyog

With 32 years of operation, Chaubise Dhaka Kapada Udhyog is one of Dharan's oldest factories. Even though the factory has been around for a long time, there are still issues with the working environment. There aren't enough designated spaces for completing products, and the factory's cramped layout makes it difficult for employees to move about efficiently. In addition, the lack of proper sanitary facilities on the manufacturing grounds adds to the general demand for better circumstances. Resolving these issues could have a substantial positive impact on both worker welfare and overall operational efficiency. The incorporation of enhanced circulation areas, the creation of a specific location for completed goods, and the execution of better cleanliness practices are important elements that require consideration. In addition to improving worker welfare, these improvements may also have a favorable effect on Chaubise Dhaka Kapada Udhyog's overall sustainability and production quality.

4.2.2 SABAH NEPAL

- Location: Kusunti, Lalitpur
- Site Orientation: west
- Date of operation: 2009 AD
- Property type: Adaptive Re-use
- Types of products manufactured: Garment,Home décor, Furniture and Accessories
- Raw material for fabric: Cotton, Allo(Himalayan Nettle) and Banana fiber
- Working hours: 8 hours per day
- No of employees: 18 (administration) and 20 (production)

Climatic condition

- Climate: warm and temperate climate
- Temperature: max 40°c – min 23°c in summer and max 27°c – min 7°c in winter
- Precipitation: 100 mm annually

Site layout and zoning

Figure 4.34: Site Circulation Sabha Nepal

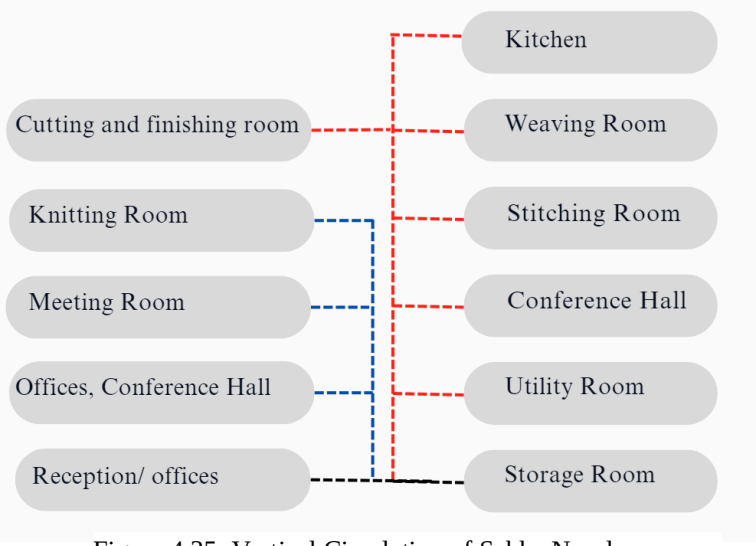


Figure 4.35: Vertical Circulation of Sabha Nepal

Weaving room details

Capacity : 6 people

Natural light flows in with four 6-foot-wide windows, while six fluorescent lamps set perpendicularly on the ceiling give additional artificial illumination for the workspace. The light is coming from the top and left, which helps with thermal comfort and good lighting. Three wall-mounted fans help with the cooling, while two electric heaters provide the heat. A worker may produce up to 8 inches (0.2 meters) of Dhaka fabric in a single day of

weaving. A worker usually needs seven to ten days to weave one meter of Dhaka, while the exact time required will depend on the fabric's unique pattern.

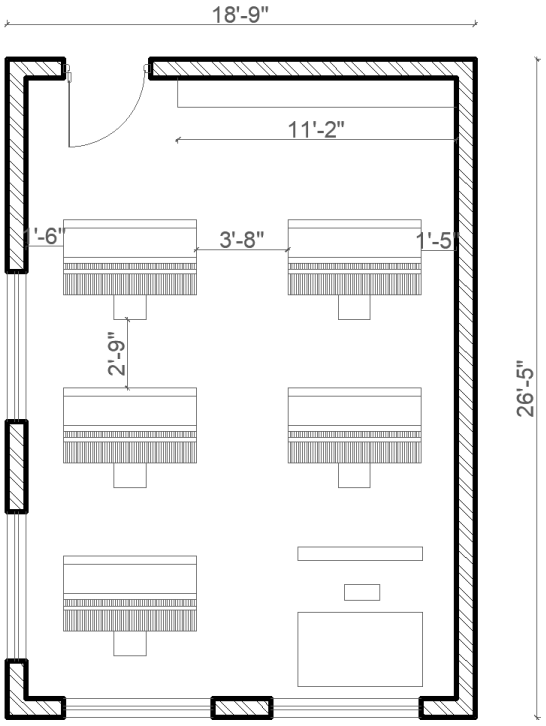


Figure 4.36: Arrangement of handlooms

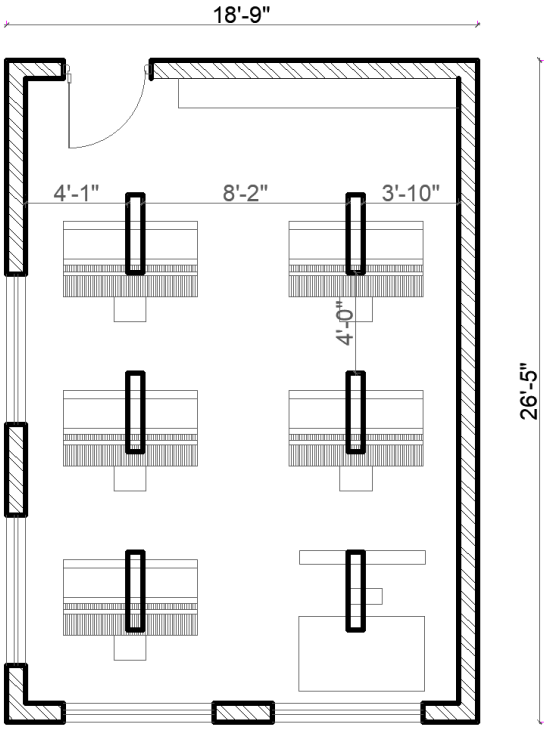


Figure 4.37: Perpendicular arrangement of lights

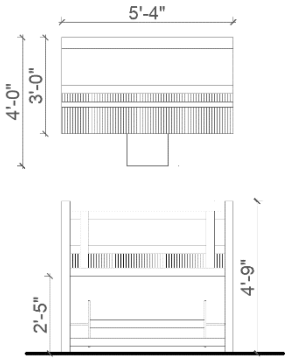


Figure 4.38: Dimension of Handloom

Figure 4.39: Weaving unit

Cutting room details

- Capacity: 2-3 people

Three windows, each measuring six feet across, give natural light and ventilation to the workspace. In addition, two perpendicularly positioned T5 fluorescent bulbs enable artificial lighting. There is one electric heater for heating and one table fan for cooling to regulate the temperature. The space's lighting and thermal comfort are rated as adequate overall.

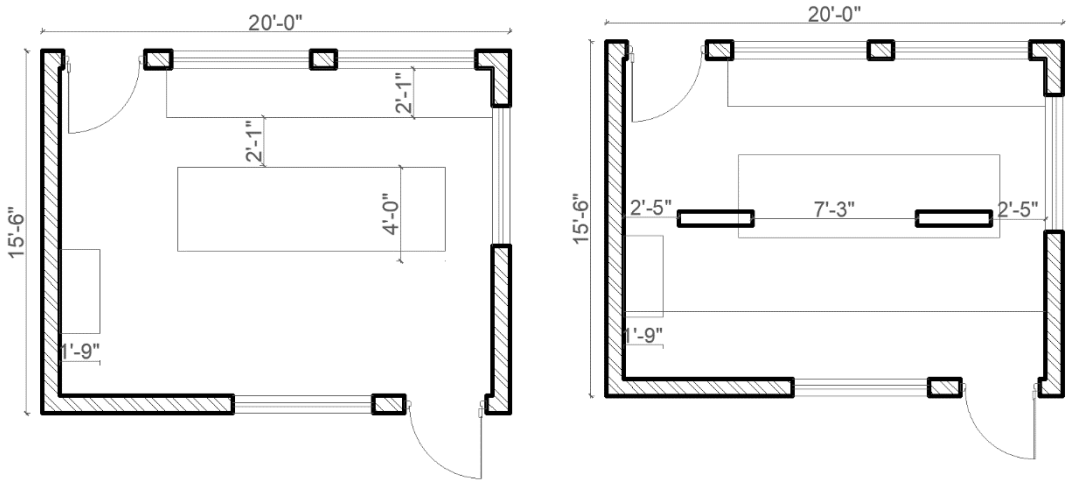


Figure 4.40: Plan of cutting room

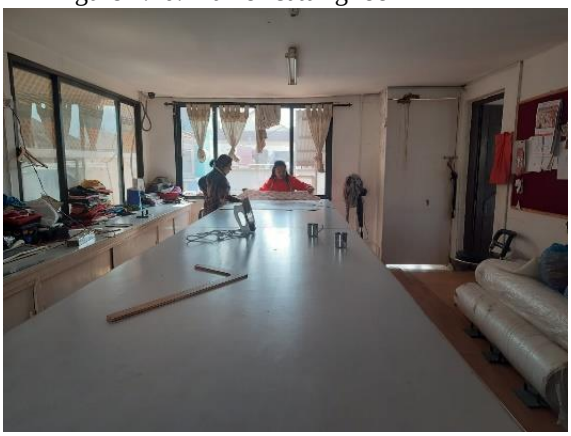


Figure 4.41: Cutting room

Lamp spacing

- Work station and lamp height:5’
- Distance between passage and lamp: 2’ ft 5”
- Distance between two lamps: 7’
- Distance between lamp and wall:2’ 5”

Snitching Room Details

- Capacity:13 people
- Area per person: 3.5 sq m

Light and ventilation

14 T5 fluorescent ceiling-mounted lamps, oriented perpendicularly and with light coming from the top and left, provide artificial lighting for the building. The building has two electric heaters and three wall-mounted fans for heating and cooling purposes respectively. The walls, tables, and equipment are all painted the same shade of white, which helps to provide the room with adequate lighting and thermal comfort.

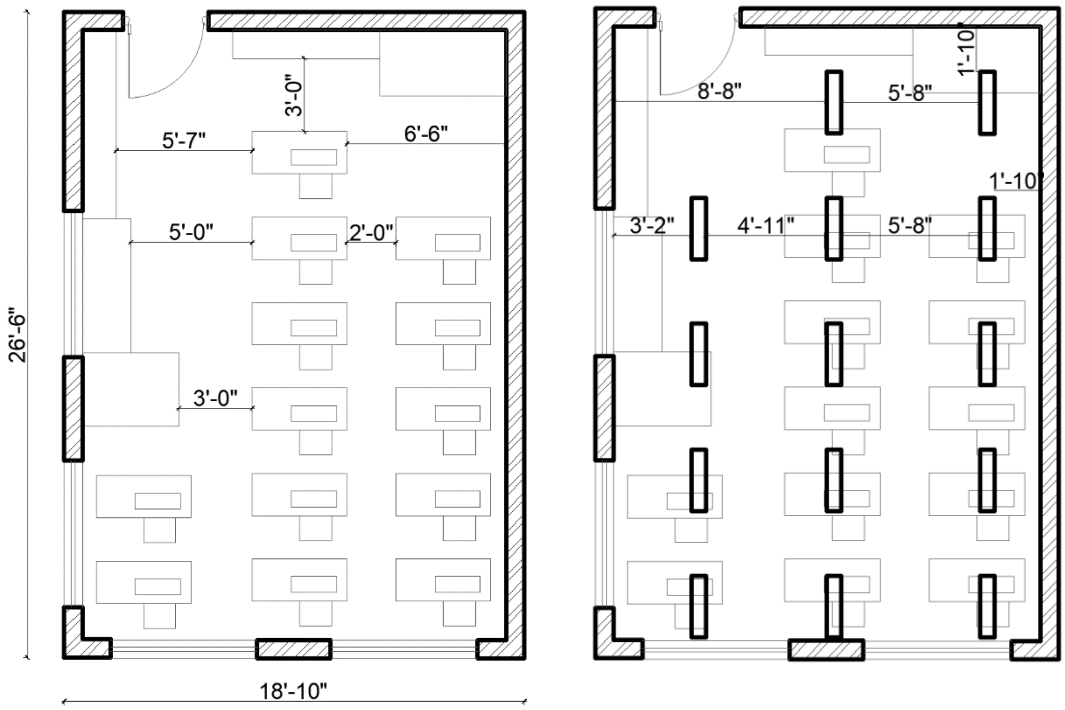


Figure 4.42: Plan of stitching room

Figure 4.43: Stitching room

Lamp spacing

- Height of lamp and work station:5 ft
- Distance between lamps: 6 ft 10 inch and 5 ft 6 inch
- Distance between passage and lamps: 3 ft 2 inch

Finishing Room Details

- Capacity:2-3 people

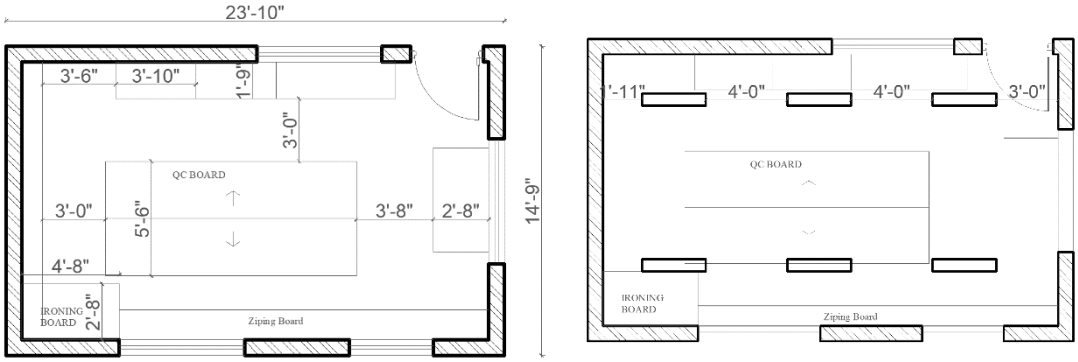


Figure 4.44: Plan of finishing room

Area per person: 15.2 sq m

There are four 4-foot (1.2 m) and three 6-foot (1.82 m) broad windows that provide ventilation and lighting to the room. In addition, six perpendicularly positioned T5 fluorescent ceiling lamps provide artificial lighting. The building has one electric heater and two wall-mounted fans for heating and cooling temperature management. The space's overall lighting and thermal comfort are deemed adequate.

Figure 4.45: Finishing room

Lamp spacing

- Height of lamp and work station: 5 ft
- Distance between lamps: 7 ft 6 inch
- Distance between passage and lamp: 1 ft 11 inch

Storage Room Details

- Capacity: 2 people
- Area per person: 12 sq m

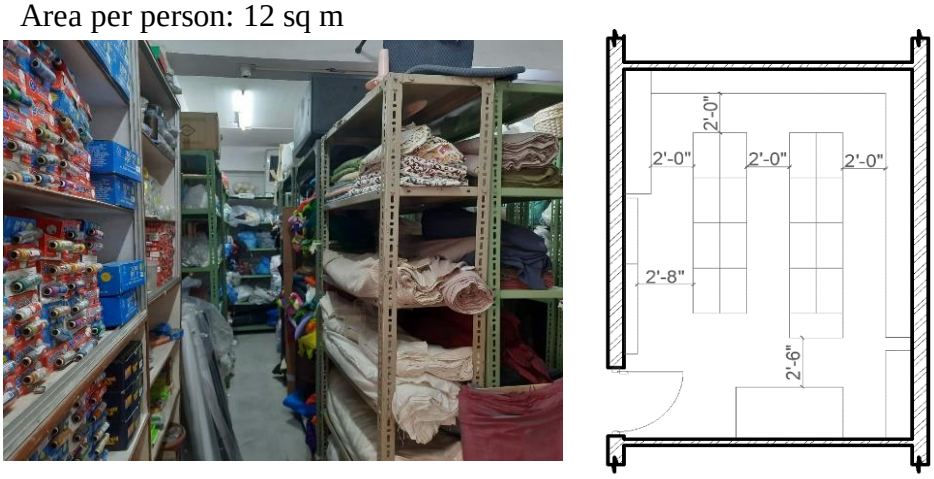


Figure 4.46: Storage room

Meeting Room Detail

- Capacity: 12
- Area per person:1.92 sq m

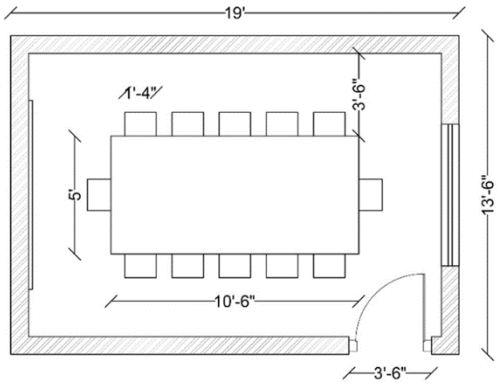


Figure 4.47: Plan of Meeting room

Chapter 5 Site Analysis

5.1 Site Introduction

Location: Dharan, Sunsari

Topography: Flat

Dharan, known as Nepal's Fashion Capital, was chosen as the project location owing to its important regional linkages and easy access from Biratnagar. The chosen location is in Ward No. 19, near Dharan's access point from Itahari. Currently, the location is unused and overgrown by greenery. However, its closeness to the new smart bus terminal under construction provides a considerable benefit to the project.

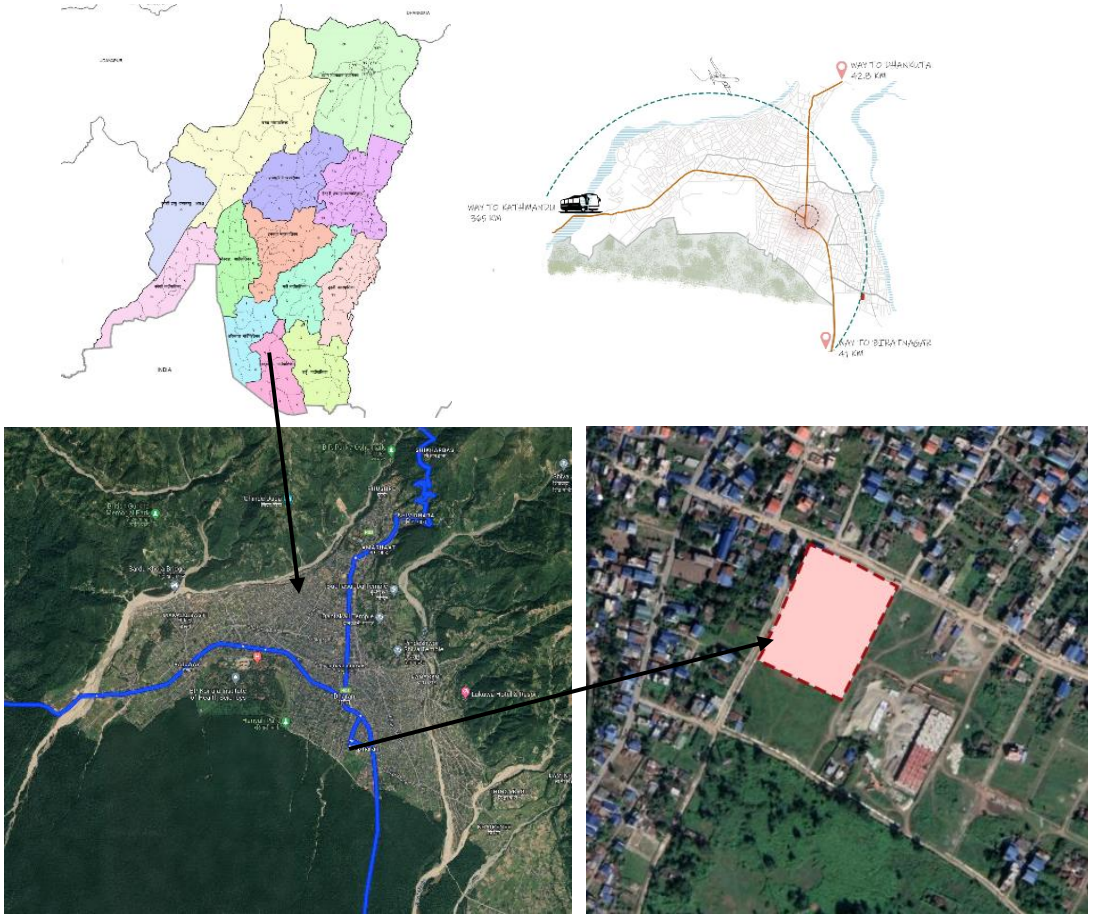
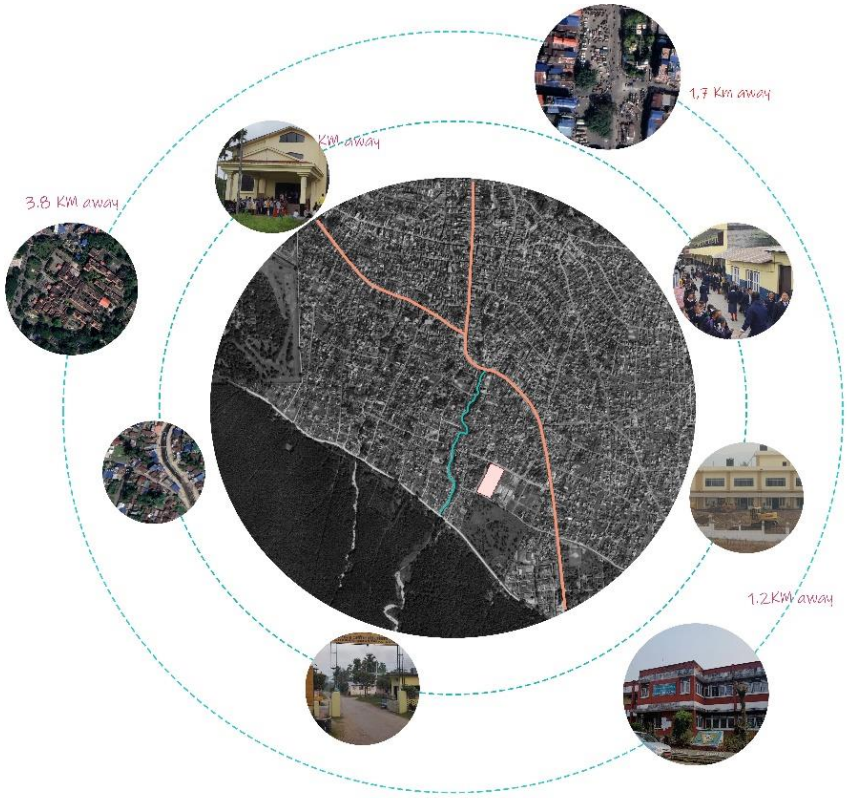


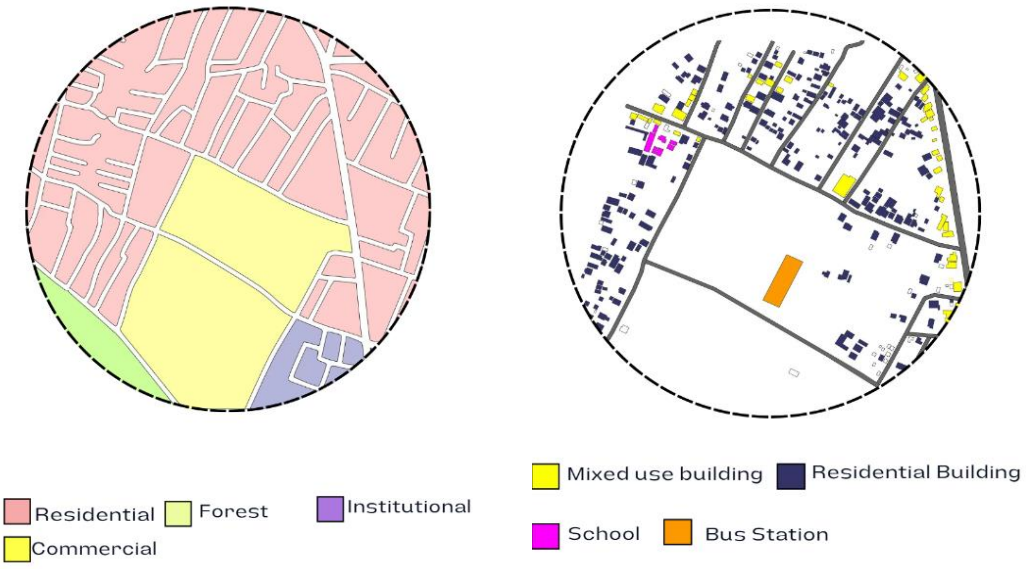
Figure 5.1: location map of site

5.2 Proximity Analysis



The site is located at the end of the Dharan area. As Dharan is highly facilitated city provide with infrastructures. BP Koirala Institute of health and Sciences is 3.8km away from site. All the Dhaka shops are 2 km away from the site. The site is surrounded by churches, monasteries and school which is 1 km away from sites. The site has less settlement compared to core area but it can be easily accessible for the workers and visitors.

5.3. Land Use



Most of parts of land covered by residential land use and few institutional area. All the institutional buildings like real estate of Dharan and Purwanchal Engineering Campus at the end of the Dharan. The forest area covers most part of land .

5.5 Access and Approach

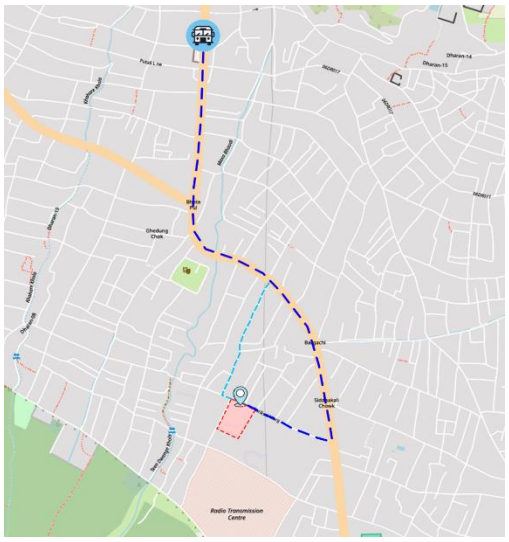


Figure 5.2: Site approach from Bhanu Chowk

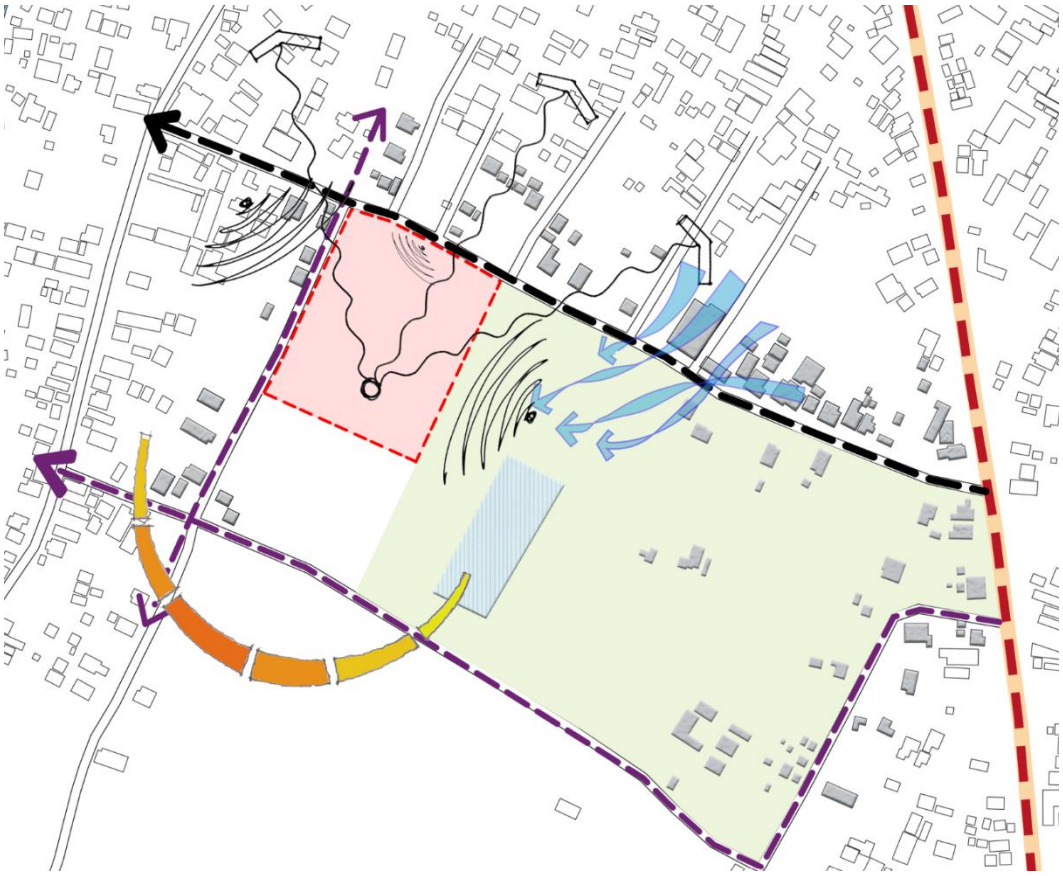
Figure 5.3: Site approach from secondary roads

The site is mostly accessible through the Koshi Highway, a 15-meter-wide road on the north side. A secondary entry point exists on Bhirkuti Road, which is 9 meters wide. Several minor 4-meter roads link the highway to the site, but the 9-meter Bhirkuti Road provides the most accessible access.

5.3 Micro Analysis

- **Orientation**

The site is oriented towards north east. The gets the sun predominantly in the morning, avoiding the hottest afternoon rays as the site has sub-tropical climate. This lower cooling demands and provide more pleasant interior environments in the afternoons.

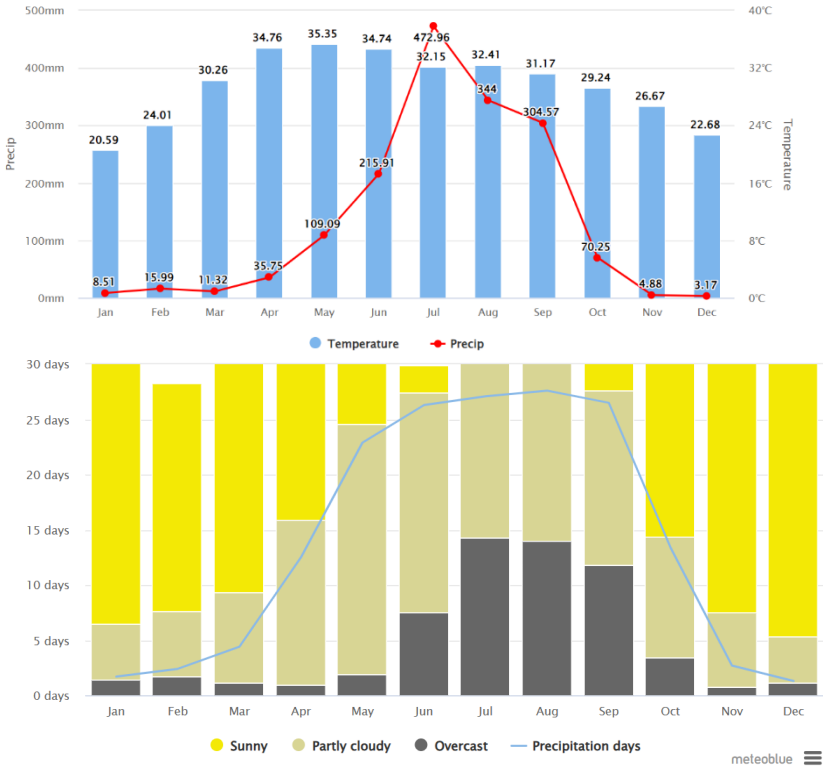


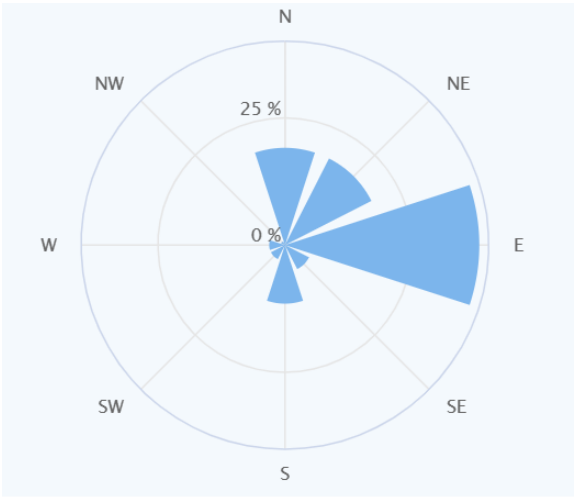
- **Vegetation**

The site is filled with bushes and unused. There are tropical plants like coconut, papaya tree and areca tree.

- **Climate and sensory**

Dharan has sub-tropical Climate which is hot and humid during summer. The Annual high temperature:32.75ºC (90.95ºF) and Annual low temperature:23.01ºC (73.42ºF). The month of maximum warmth in a year is month: May (38.77ºC / 101.79ºF) and Coldest Month: January (14.19ºC / 57.54ºF).In winter, there is much less rainfall than in summer with Average annual precip:133.04mm (5.24in). Most of the sound noise comes from Highway from east and from the near school from west.





- **View**

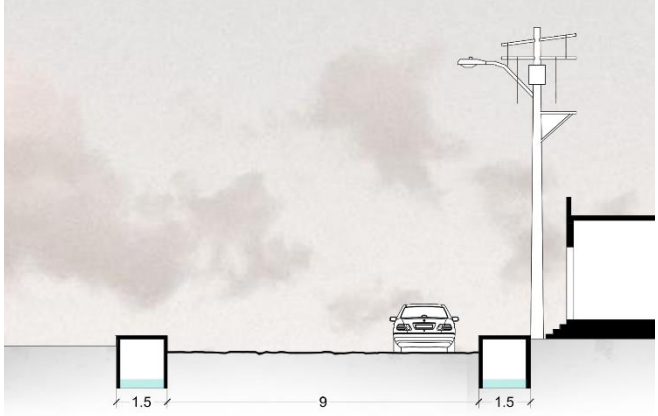
Dharan has slope land and the proposed site located and bottom of slope due to which view of hills can be seen from north to east.

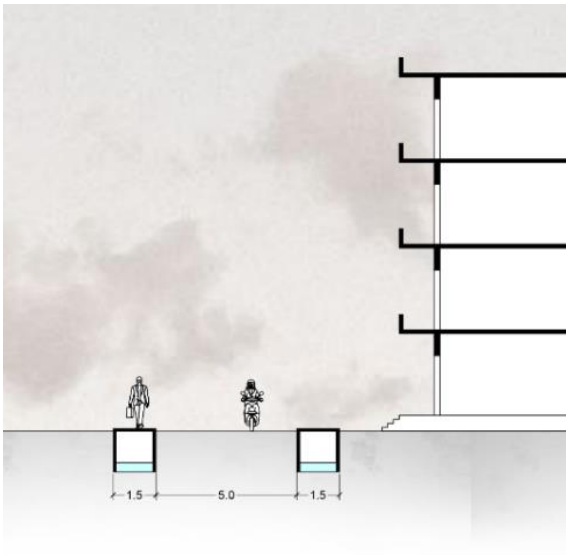
Figure 5.4: view towards north

Figure 5.5: view towards east

- **Road Condition**

The site is connected with two roads of 9 m and 5 m road. These road has 1.5 m drainage on both site of road. These two roads are not paved.





Building Bye laws

Floor Area Ratio (FAR): 2.5

Set Back: 3 m

Ground Coverage: 50%

5.4 Program formulation

Type of space	No. of Space	No. of occupant/unit	Area per occupant	Total area(Sq. m)
1. Entrance				
Guard post	1	1	4	4
Guard House				
Information Desk	1	3	8	24
Accommodation	1	2	26	52
Circulation	20% of the total net			
Total area of guard house				96
2.Exhibition Unit				
lobby	1	20	4	80
Exhibition Room	1	30	6	180
lobby	1	20	4	80
Multipurpose hall	1	123	2.3	290
Stage	25% of the seating area			72
Vip lounge	1	15	2.6	39
Male green room	1	10	3.2	32
Female Green room	1	10	3.2	32
Wardrobe room	1			12
Utility room	1			14
Circulation	30% of total area			
Total area				1080

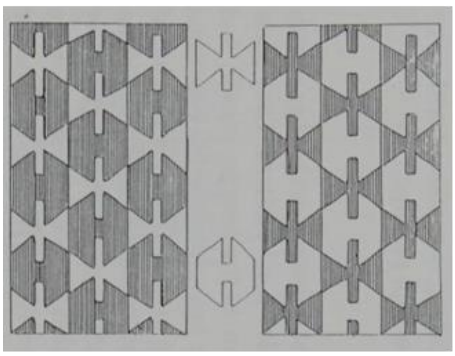
3. Boutique Unit				
Boutique				
Reception	1	4	2.5	10
Fabric Distplay	1	4	7	28
Fabric store	1			23
Display area	1			87
Finished dress	1			20
Designer room	1	3	4.6	14
Vip Room	1	5	16.4	82
Sewing room	1	5	15	78
store	1			14
Toilet				
Male	1	1	2.4	2.4
Female	1	1	2.4	2.4
Shop	1			74
Circulation	30% of total area			564.4
Photo studio				
Reception	1	4	7	28
Photo studio	1	5	20	104
Changing Room				
Male Changing Room	1	2		6
Female Changing Room	1	2		6
Toilet				
Male	1	1	2.4	2.4
Female	1	1	2.4	2.4
Café				
Reception	1	2	4	8
Indoor Dining	1	21	4.1	87
Outdoor Dining	1	32	2.8	91
kitchen	1	5	10	50
Toilet				
Male Toilet	1	6	2.6	16
Female Toilet	1	4	2.5	10
Circulation	30% of total area			533.2
Production Unit				
Checking area	1	15	3.4	51
Changing room				
Male Changing room	1	16	1.2	20
Female Changing room	1	16	1.2	20
Handloom Weaving	1	30	11	350
Fabric storage	1			54

Distribution Office Room	1	2	16.5	33
Labeling and packaging	1	10	6.8	68
Distribution Room	1			132
Raw Material Storage	1			78
Receiver Office Room	1	2	13.5	27
Toilet				
Male toilet	1			17
Female toilet	1			17
Circulation	30 % of total area			
Total area				1127
Administrative Unit				
Reception	1	2	2.5	5
Production Staff Room	1	4	8	32
Infirmary	1	4	10	40
Store	1			8
Toilet				
Male Toilet	1			3
Female Toilet	1			3
General Manager Room	1			26
Meeting Room	1	10	2.6	26
Production Head Room	1			24
Pantry	1			22
Toilet	1			
Male Toilet	1			3
Female Toilet	1			3
Administrative Department				
Shared Work space	1	4	10	40
Department Head	1	1		24
Accountacy Department				
Shared Work space	1	5	10.4	52
Department Head	1	1		28
Marketing Department				
Shared Work space	1	5	10	50
Department Head	1	1		24
Chief Room	1	1		28
Secretary Room	1	1		14
Exhibition Department				
Shared Work space	1	5	11.2	56

Department Head	1	1		38
circulation	30 % of total area			713
Training Unit				
Reception	1	10	4	40
store	1			13
Sewing Room	1			
locker Room	1	8	6.7	54
Male locker room	1	8	1.5	12
Female Locker Room	1	8	1.5	12
Fabric And Thread Storage	1			37
Weaving Room	1	8	14	112
Store	1			115
Toilet				17
Male toilet	1			12
Female Toilet	1			12
Equipment Storage	1			13
Fabric storage	1			9
Design lab(Acessories)	1	8	4	33
Equipment Storage	1			9
Fabric storage	1			9
Design lab (Dress)	1	8	4	33
store	1			11
Theory Classroom	1	16	4.8	78
staff room	1	6	7	43
Toilet				17
Male toilet	1			12
Female Toilet	1			12
Circulation	20% of total area			843
Residentail Unit(2)	6			162
Service Unit				
Janitor's Room	1	4	4.5	18
Equipment Room	1			40
Parking				
Loading Truck	1	4	214	857
Car	1	33	21	716
Motor Bike	1	100	3	300
Cycle	1	14	4.2	59

Chapter 6 Design Development

6.1 Concept

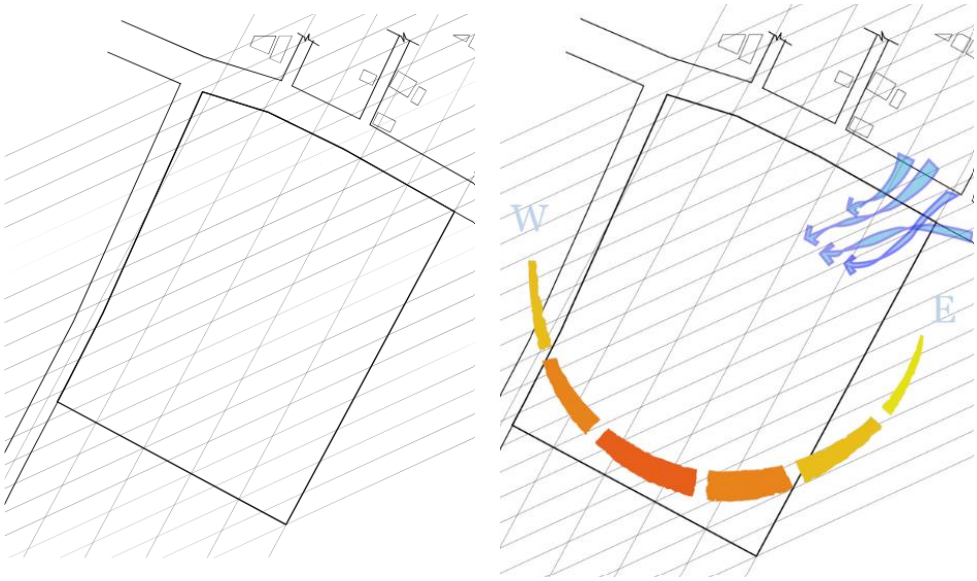


My concept is inspired by the Dhaka Pattern which is popular in Dharan.

6.2 Design Development

- **Design approach**

Different lines were created through the symbols of pattern. Thus, created 2 diagonal lines and 1 straight line .

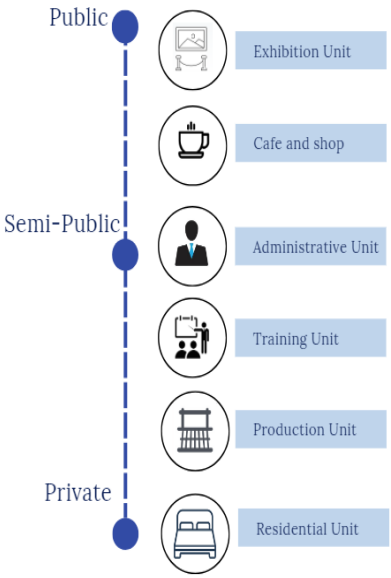


These reference lines were placed on site based on the site climate

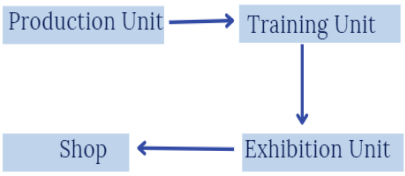
- **Zoning**

The zoning of the buildings are placed based on the flow of the public: public, semi public and private. Along with the public flow, functional flow has also divide the zoning of building.

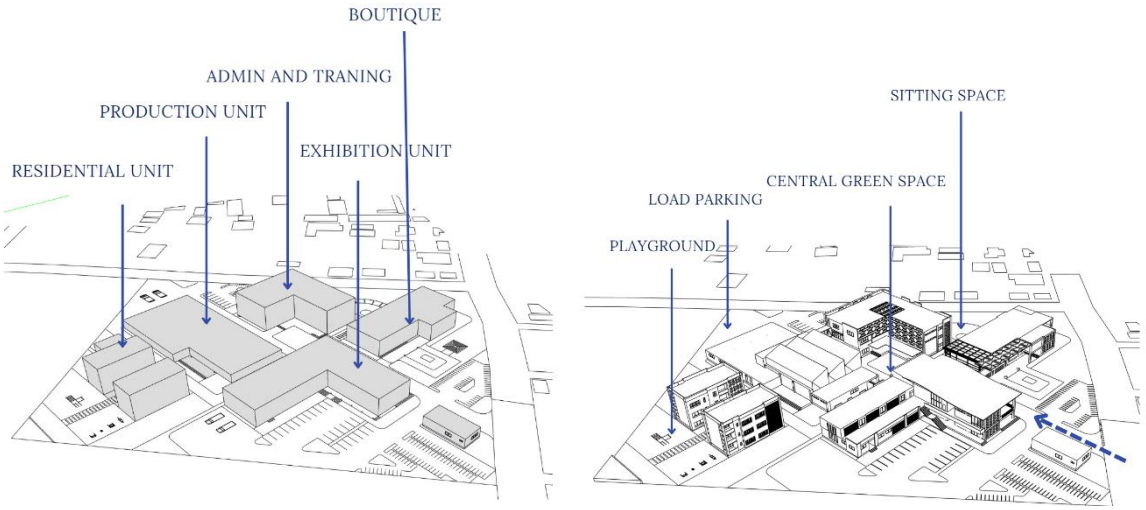
The public zone contains exhibition, café, multipurpose hall, boutique, shop and photo studio. These spaces are arranged towards the entrance. The semi-public zone contains administration, training and production spaces which are in between of private and semi private zone.



FABRIC FLOW WITH THE SPACES



- **Massing**



Form of the building is the repetitive pattern of the rectangular form based on the climatic condition of the site. The larger area of the building is faced towards the north east direction for less direct sunlight during summer. With the massing of the form different landscape is provided with green spaces.

The public can enter via a 9-meter road that leads to the shop, café, photo studio, exhibition area, multipurpose hall, and canteen. There is also access to the canteen from the rear, connected to the exhibition unit. Staff members have a separate entry through a 5-meter

service road, ensuring that their movement does not disturb either the public or other staff members.

Parking for the public, as well as for loading goods for the canteen, is provided at the front for easy access. Similarly, parking for staff and loading of raw materials for production are located at the back of the site.

6.3 Programs

6.3.1 Entrance

The entry of building is through north where information booth and guard house has been provided.

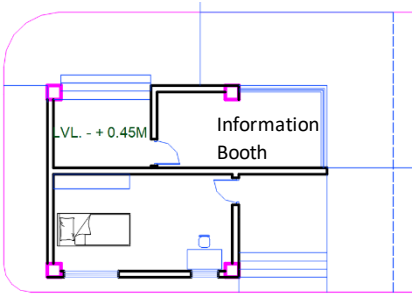


Figure 6.1: Plan of Guard House

6.3.2 Boutique Unit

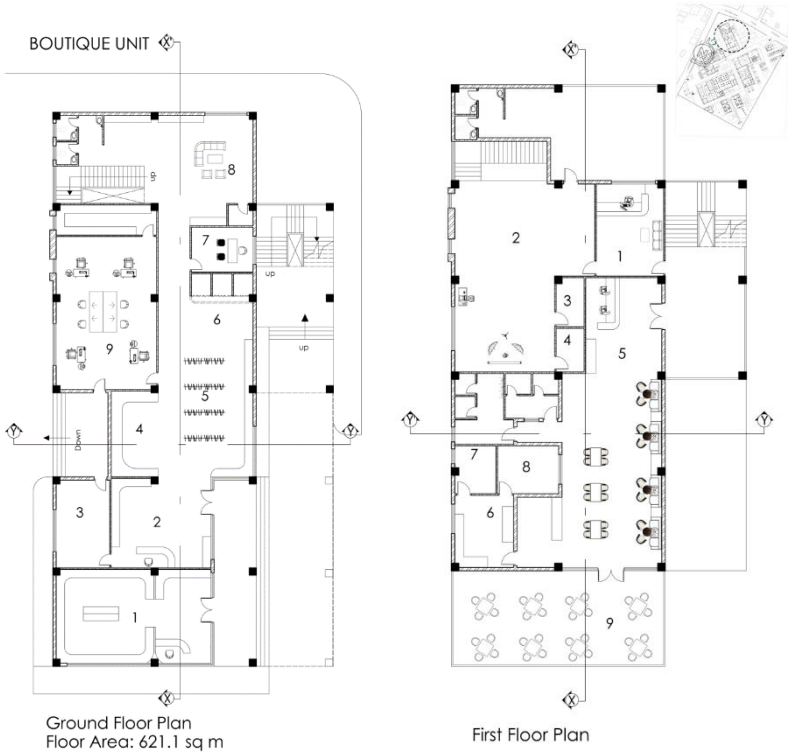
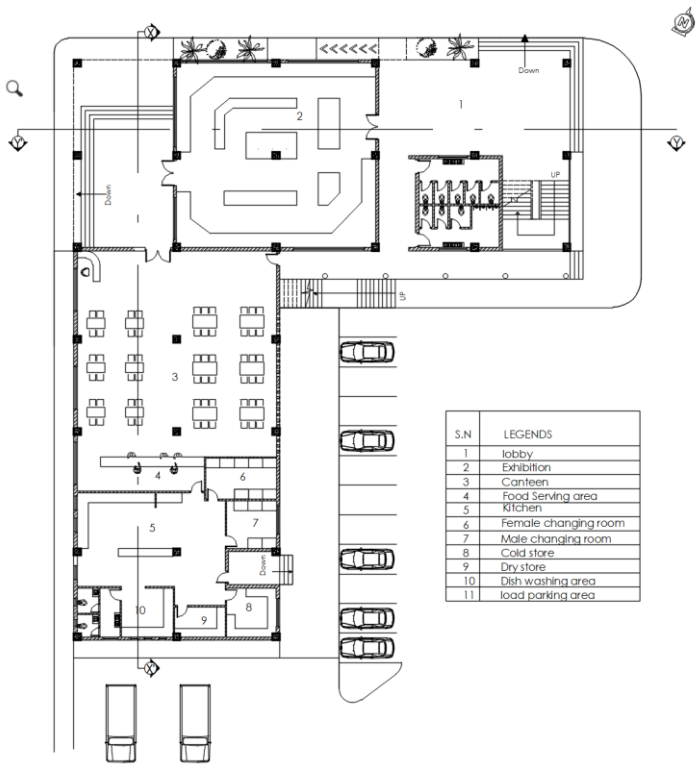


Figure 6.2: Entry of Boutique Unit

The boutique unit is located near to the entry for better public flow. This unit has shop and Boutique at the ground floor. The shop consist of all the accessories like shoes, bag whereas boutique consist of fabric display and all designed clothes as per customer requirements. Photo studio and café are in first floor. The photo studio will be internally connected with the boutique.

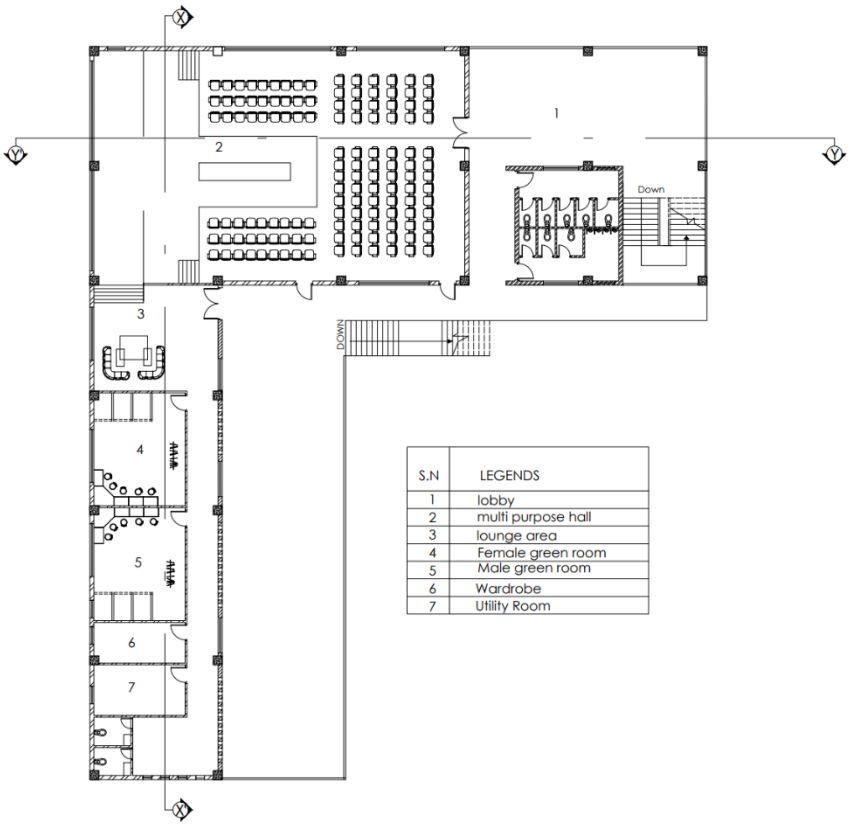
6.3.3 Exhibition Unit

EXHIBITION UNIT



S.N	LEGENDS
1	lobby
2	Exhibition
3	Canteen
4	Food Serving area
5	Kitchen
6	Female changing room
7	Male changing room
8	Cold store
9	Dry store
10	Dish washing area
11	load parking area

Ground Floor Plan



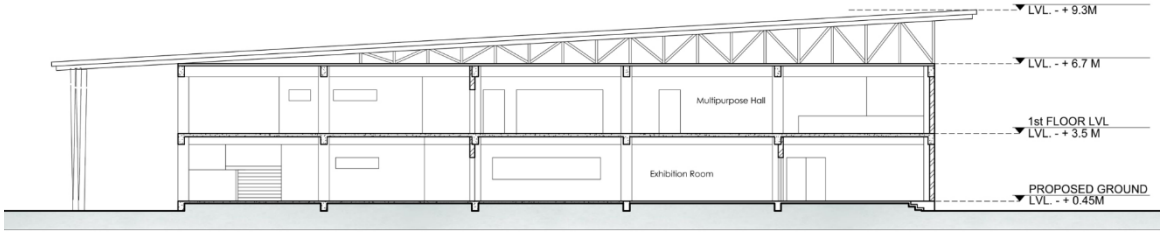
S.N	LEGENDS
1	lobby
2	multi purpose hall
3	lounge area
4	Female green room
5	Male green room
6	Wardrobe
7	Utility Room

First Floor Plan

Figure 6.3: Exterior view of Exhibition Unit

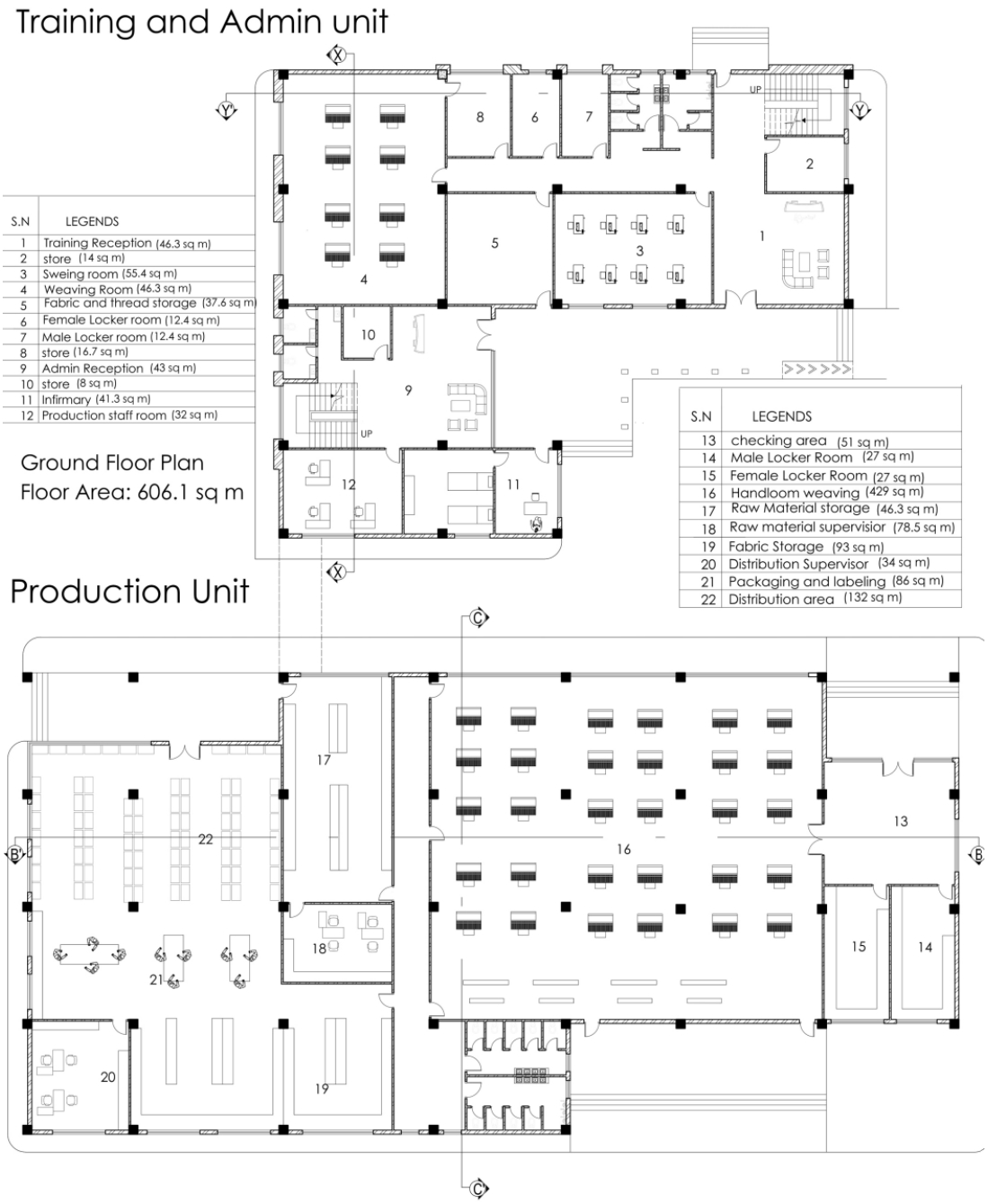
Exhibition Unit consist of exhibition all at the ground floor connected with the canteen with the capacity of 60 people. All the products made by trainers or other people are exhibited on exhibition hall. Multipurpose Hall is located at the first floor with the capacity of 130 people. Different events can be held such as fashion show, orientation programs can be held in multipurpose hall. Vip lounge , Green room are provided near to the multipurpose hall.

Figure 6.4: Interior view of Exhibition Unit



SECTION AT Y-Y'

6.3.4 Training Admin and Production Unit



Floor Area: 1305.8 sq m

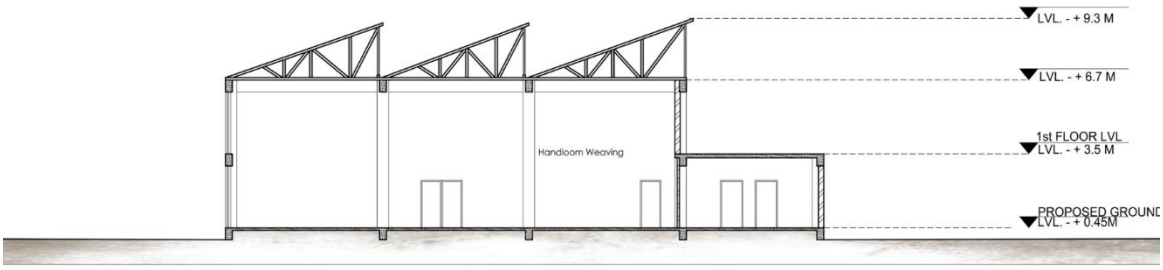
Training and admin unit have different entry for the staff and trainers. Sewing and handloom class is given in ground floor and theory class room and design class room at the second floor. The total of 16 trainers can train in the training unit. The program has focused on dress design and accessories design with their own fabric storage.

Infirmary is located near to the production unit for easy access for workers. Staff room for production supervisor is given in ground floor. All the management offices such as accountancy, administration and marketing are given in first floor and second floor.

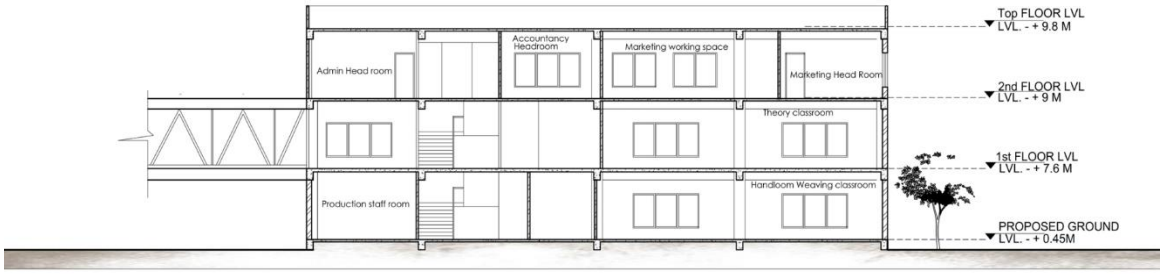
As the entry of production unit, checking area has been provided and locker room near to the production room. 30 handlooms are given in the room with four drum set for the fabric production. 3 m lobby has separated the production and material storage room. The completed fabric is store in open fabric storage which is connected with packaging and labeling. All the packaged fabrics are kept in distribution room and is near to the service parking. All the raw materials are kept on separate room which is supervised by raw materials staffs.

Figure 6.5: Exterior view of production Unit

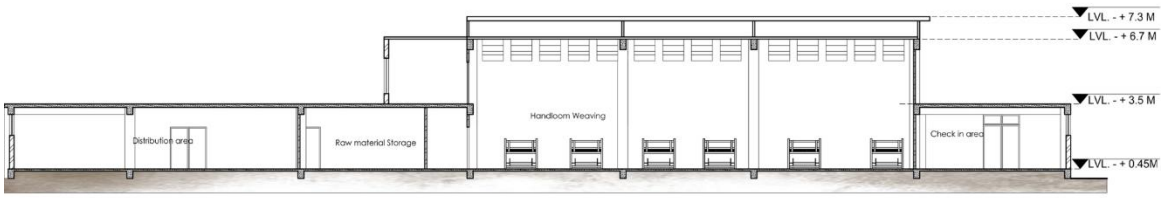
Figure 6.6: Exterior view of admin and training Unit



SECTION AT C-C'

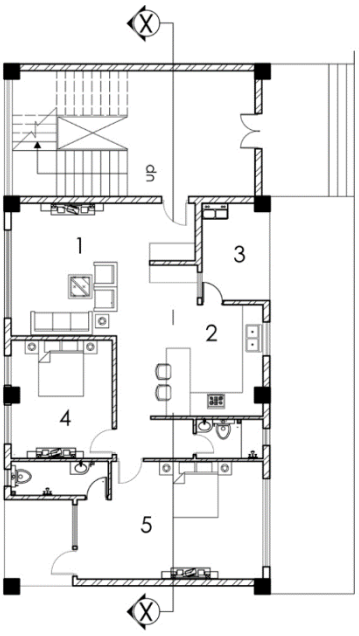


SECTION AT X-X'



SECTION AT B-B'

6.3.5 Staff Unit



S.N	LEGENDS
1	Living Room (24 sq m)
2	Kitchen (18 sq m)
3	Balcony (7 sq m)
4	Bedroom (14 sq m)
5	Master Bedroom (23 sq m)

Figure 6.7: Exterior view of Staff Unit

Figure 6.7: Outdoor landscape of Staff Unit

Separate staff Unit for the workers family has been provided.

6.3.6 Service Unit

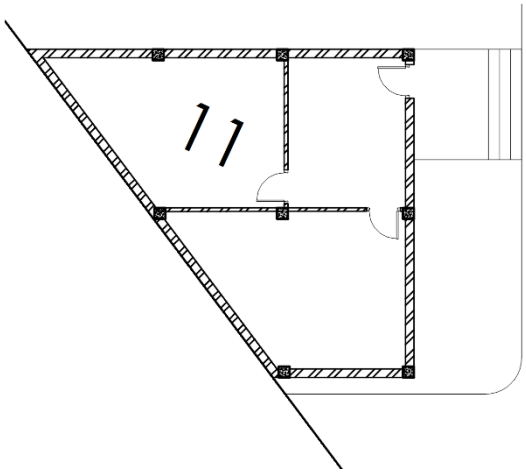


Figure 6.7: Plan of Service Unit

6.4 Material and Facade

Material like wood and brick can be seen in Dharan and used same type of material on my project. Metal cladding of Dhaka pattern has been place on the façade.

7. REFERENCES

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8. ANNEX

Questionnnaire for Dhaka weavers

a. Respondents details

Name:

Age:

Occupation:

No of Family members:

No of female: No of male:

1. How long have you been in this field?
   - Less than 3
   - year 3-6 years
   - 6- 10 years
   - Over 10 years
2. How satisfied are you with your overall working experience in this factory?
   - Very satisfied.
   - Somewhat satisfied.
   - neutral
   - slightly dissatisfied
3. How would you describe the working environment in this factory?
   - Friendly and supportive
   - Stressful challenging
   - Collaborative and team-oriented
   - Independent and self-sufficient
   - Other (Please specify)
4. Have you had enough training and development opportunities to perform your job effectively?
   - Yes, definitely
   - Yes, but could be better.
   - No, not really.
   - No, at all.

5. Do you believe there are opportunities for career development and advancement of Dhaka factory?
    - There are plenty of opportunities
    - Yes, but there are limited opportunities
    - There are very few opportunities
    - No, not at all
6. How would you rate the work-life balance provided by Dhaka factory?
    - Excellent
    - Good
    - Average
    - Poor
7. Which of the following issues did you face while working at the small cottage Dhaka factory?
    - Insufficient ventilation
    - Lack of appropriate safety equipment
    - Long work hours
    - Low wages
    - Limited access to safe drinking water
    - Discrimination
    - Lack of training opportunities
    - Other
8. What do you think the small cottage Dhaka factory can do to improve working conditions and employee experience?
    - Health and safety measures
    - Training and development Programs
    - Maintain equipment and machinery
    - Provide employee benefits and compensation
    - Others

Questionnnaire for local

Respondents details

Name:

Age: Occupation:

No of Family members :

No of female: No of male:

9. How long have you been living in Dharan?
   - Less than 3
   - year 3-6 years
   - 6- 10 years
   - Over 10 years
10. Are you familiar with the fabric production industry in Dharan, Nepal?
    - Yes
    - No
11. Have you or anyone in your family ever worked in the fabric production industry in Dharan?
    - Yes
    - No
12. Have you or anyone in your family ever work in this field?
    - Yes
    - No
13. Where do you usually get Dhaka cloth: from local shops or directly from factories?
    - Local shops
    - Direct from factories.
    - Both
    - No, I don't use Dhaka cloth
    - Unsure

14. How do you believe dhaka production benefits the local economy in Dharan?
    - Creates job opportunities
    - Increases revenue for local business
    - Boosts other industries (eg retail, transportation)
    - None of the above
15. Do you believe that fabric manufacture provides enough job opportunities in Dharan?
    - Yes
    - No.
16. How do you see the social impact of fabric production in Dharan?
    - Positive, encouraging community pride and identity.
    - Negative, worsening social inequalities.
    - No significant impact
    - Other
17. How does fabric production help to preserve or promote Dharan's cultural heritage?
    - Using traditional textile designs and techniques.
    - By highlighting local craftsmanship.
    - Through cultural activities and festivals
    - No significant contribution
    - Other
18. How do you see Dharan's fabric production industry evolving over time?
    - Rapid expansion
    - Consistent growth
    - Stagnant
    - Declining
    - Unsure
19. Are there any educational or skill development programs available to help people interested in entering the fabric production industry in Dharan?
    - Yes, there are formal training programs
    - Yes, but they have limited availability
    - These programs are not available
    - Not sure

Questionnnaire for Retailers and owners

Name:

Age: name of shop:

No of Family members :

No of female: No of male:

20. How long have you been living in Dharan?
    - Less than 3
    - year 3-6 years
    - 6- 10 years
    - Over 10 years
21. Who are your primary customers?
    - Individuals
    - Garment manufactures
    - Retailers
    - Others
22. What are your customers' typical preferences for fabric types, colors, and patterns?
    - Vivid colors
    - Floral Patterns
    - Neutral colors
    - Geometric patterns
    - Other
23. What kind of Dhaka fabric product they prefer the most?
    - Saree
    - Coat
    - Bag
    - Cholo
    - Others
24. where do you get Dhaka product from?
    - Self -produced
    - Locally produced

- Imported

25. How do you keep up with the latest trends in this business?
    - Social media
    - Fashion shows
    - Trade fairs
    - Others
26. Do you import any fabrics or materials from international suppliers?
    - Yes
    - No
27. Which countries do you typically import raw materials for production?
28. What kind of raw materials do you import the mostly?
29. Are there any specific reasons or advantages to importing raw materials from these countries?
    - Cost effectiveness
    - Quality
    - Proximity to manufacturing hubs
    - Others
30. Do you source any fabrics or materials from other factories of Dharan?
    - Yes
    - No
31. Where do you supply your fabrics within Nepal?
32. Which countries do you commonly export fabrics to?
    - China
    - India
    - Bangladesh
    - Other
33. What is the typical price range of fabrics available in your store?
    - Low
    - Medium
    - High

34. Are there any factors that influence the pricing of fabrics?

    - Fabric type

- Quality Design
- complexity
- Other

35. What are the key factors influencing your decision to export fabrics?

- Market demand
- Competitive advantage
- Government incentives
- Other

36. What problems have you encountered while running this business?

- Transportation issues
- Import delays
- Quality control issues
- Inventory management challenges
- Others

37. Are there any expansion plans for your fabric business in Dhaka?

- Yes
- No

38. If so, could you please elaborate on the areas for expansion you are considering?

- Expanding production Capacity
- Establishing new retail locations
- Expand product
- others