# POLITECNICO DI MILANO

**School of Architecture Urban Construction Engineering**

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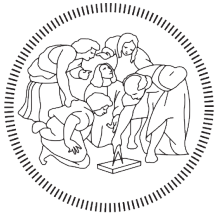

POLITECNICO
MILANO 1863

A BLIND CHILDREN SCHOOL IN LHASA, TIBET


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# Chapter one – Introduction and background

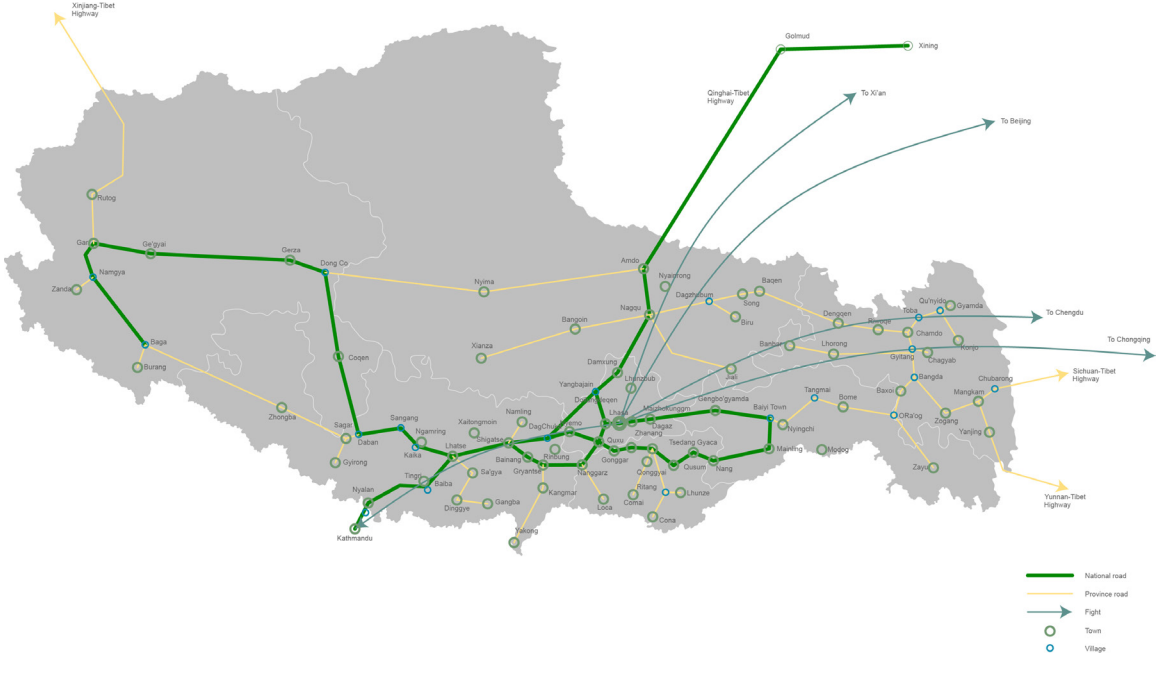
## 1.1 Tibet introduction

The Tibet Autonomous Region is located in the southwest part of the Qinghai-Tibet Plateau. It borders on Sichuan and Yunnan provinces to the east, Qinghai and Xinjiang to the north, and shares borders with India, Nepal, Sikkim, Bhutan and Burma to the south, and bounded by Kashmir to the west. The region covers more than 1.2 million square kilometers, accounting for one eighth of China's total land mass, and ranking second in China.

Tibet has various complex landforms such as high and steep mountains, deep valleys, glaciers, bare rocks and gobi deserts. All places in the region lie at an average altitude of more than 4,000 meters. It is roughly divided into four areas: the north Tibet plateau, the south Tibet valley, east Tibet mountains and valleys, and Himalaya Mountains. It is bitterly cold in winter, with a marked difference in temperature between daytime and night. It features scarce precipitation and a sharp contrast between the dry and wet seasons. It is dry in winter and spring, with frequent occurrence of strong winds, as well as a low oxygen content. Tibet is so sunny as to have an annual sunshine of between 1,500 and 3,400 hours. It has a short frost-free period, usually ranging from 120 to 140 days a year. Tibet has a population of 2.61 million, 92.2 percent of whom are Tibetans, or 2.41 million. Apart from Tibetans, there are other ethnic groups such as Han, Hui, Monba, Lhoba.

Tibet's Population Increases 400,000 in Ten Years. The fifth census of the Tibet Autonomous Region shows that Tibet 's population has shot up 420,300 in ten years. The region currently has a total population of 2.62 million, up 420,300, compared to the figure of 2.2 million as indicated in the fourth census, rising at an average annual rate of 40,700, or 1.7 percent. of all residents in the region. Tibetans number 2.41 million, accounting for 92.2 percent. Han people the majority in most of China, number 155, 30, 5.9 percent of the total. Other ethnic minorities have a combined population of 49, 90, 1.9 percent of the total.


Location & boundary of Tibet

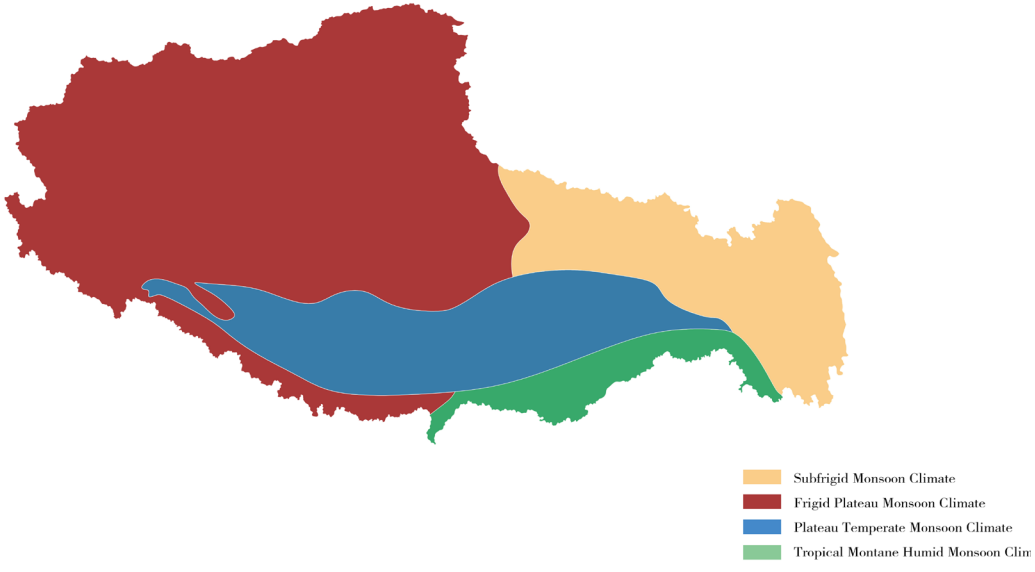



Traffic situation in Tibet

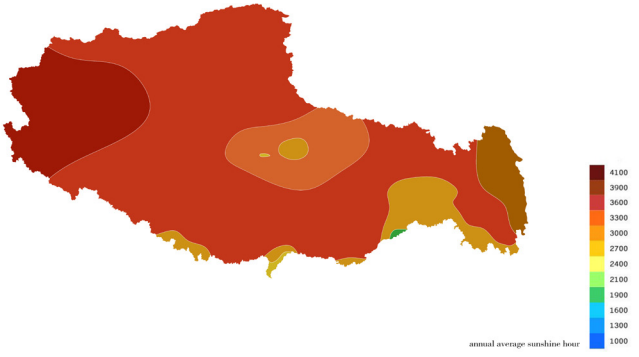
### 1.1.1 Climate

Although Tibetans refer to their land as Gangs-ljongs or Kha-ba-can (“Land of Snows”), the climate is generally dry. Most of Tibet receives only 18 inches (460 mm) of precipitation (both rain and snow) annually, with much of that falling during the summer months. The Himalayas act as a barrier to the monsoon (rain-bearing) winds from the south, and precipitation decreases from south to north. The perpetual snow line lies at some 16,000 feet (4,800 meters) in the Himalayas but rises to about 20,000 feet (6,100 meters) in the northern mountains. Humidity is low, and fog is practically nonexistent.

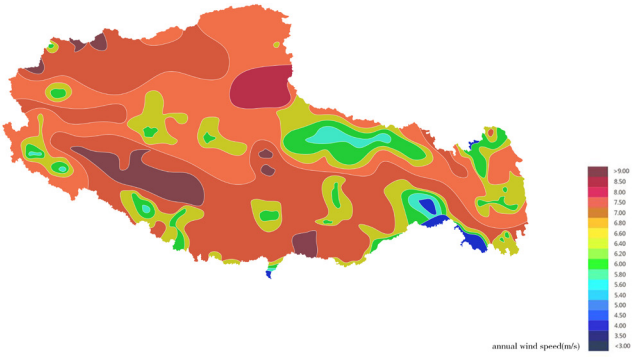
Temperatures in the higher elevations are cold, but the lower valleys and the southeast are mild and pleasant. Seasonal variation is minimal, and the greatest temperature differences occur diurnally (i.e., during a 24-hour period). Lhasa, which lies at an elevation of 11,975 feet (3,650 metres), has a daily maximum temperature of 85 °F (30 °C) and a minimum of −2 °F (−19 °C). The bitterly cold temperatures of the early morning and night are aggravated by the gale winds that blow throughout the area most of the year. Because of the cool dry air, grain can be safely stored for 50 to 60 years, dried raw meat and butter can be preserved for more than one year, and epidemics are rare.




Climate zone in Tibet




Annual solar radiation hour in Tibet




Annual wind speed in Tibet

### 1.1.2 Population composition

The population of the region is almost entirely Tibetan, with Han (Chinese), Hui (Chinese Muslims), Monba, Lhoba, and other minority nationalities. Thus, the majority of the people of Tibet have the same ethnic origin, have traditionally practiced the same religion, and speak the same language.

The Tibetan and Burmese languages are related, although they are mutually unintelligible in their modern forms. Spoken Tibetan has developed a pattern of regional dialects and subdialects, which can be mutually understood. The dialect of Lhasa is used as a lingua franca. There are two social levels of speech—zhe-sa (honorific) and phal-skad (ordinary); their use depends upon the relative social status of the speaker and the listener. The use of Chinese has become more common in the egion since the 1960s.

Tibetan is written in a script derived from that of Indian Gupta about 600 CE. It has a syllabary of 30 consonants and five vowels; six additional symbols are used in writing Sanskrit words. The script itself has four variations—dbu-can (primarily for Buddhist textbooks), dbu-med and 'Khyug-yig (for general use), and 'bru-tsha (for decorative writing).

Bon is considered to be the first known religion in Tibet, although there is some argument as to the time of its establishment. It is a form of shamanism, encompassing a belief in gods, demons, and ancestral spirits who are responsive to priests, or shamans. With the rise of Buddhism, Bon adopted certain Buddhist rituals and concepts, and the

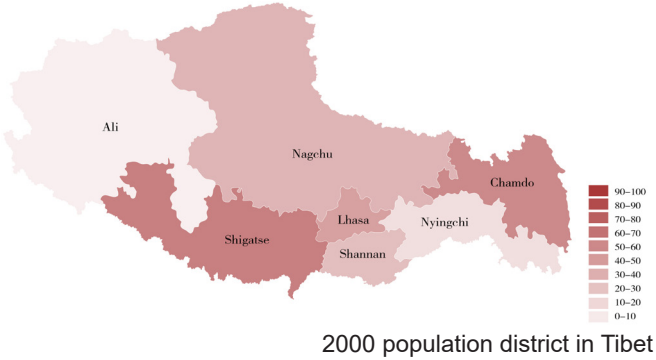
Buddhists also adopted certain features of Bon, so that the two religions came to have many points of resemblance.

Although Chinese Buddhism was introduced in ancient times, the mainstream of Buddhist teachings came to Tibet from India. The first Buddhist scripture may have arrived in the 3rd century CE, but active promulgation did not begin until the 8th century. In later centuries numerous Buddhist sects were formed, including the Dge-lugs-pa, which emphasizes monastic discipline; also known as the Yellow Hat sect, in the 17th century it gained political supremacy that lasted until 1959.

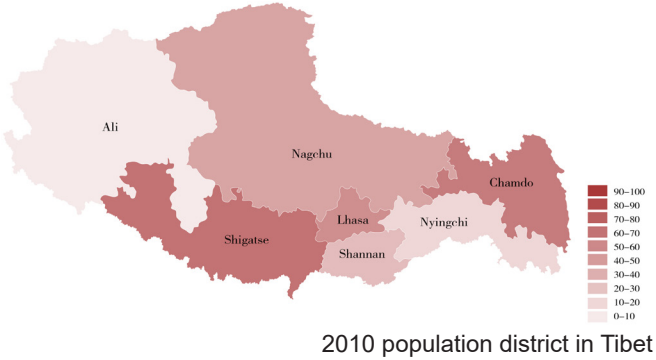
The overwhelming majority of Tibetans traditionally have been Buddhists. Before the 1950s, prayer flags flew from every home and adorned the mountain slopes. Monasteries were established throughout the country, and the Dalai Lama, the spiritual head of Tibetan Buddhism, was the supreme political head of the nation. A minority, however, were adherents of Islam, Hinduism, Bon, or Christianity. The Dalai Lama went into exile in 1959 after the outbreak in Tibet of an armed rebellion against Chinese authorities that was suppressed by the Chinese army. Since then the Chinese at times have attempted to eliminate the influence of religion in Tibetan life.

1950 population district in Tibet

1990 population district in Tibet



2000 population district in Tibet



2010 population district in Tibet

| City Name | Qianlong Region | Xuantong Region | Republic of China |
|---|---|---|---|
| Lhasa | 5000 households | 50000 | 40000-50000 |
| Shigatse | N/A | 20000 | 20000 (9000 permanent) |
| Gyangze | N/A | 30000, soldiers 7500 | N/A |
| Tingri | N/A | 250 households | 250 households |
| Chamdo | N/A | 1200 | N/A |
| Nyallam | N/A | N/A | Over 300 households |
| Gyirong | N/A | Over 400 households | Over 400 households |
| Pagri | No mention | N/A | About 2000 |
| Ganba | No mention | N/A | About 2000 |
| Tsongkha | No mention | Soldiers 200 | N/A |

Distribution of Tibetan urban population in Qing Dynasty and republic of China

### 1.1.3 Settlement patterns

Tibet was traditionally divided into three regions, called the Chol-kha-gsum (chol-kha, “region,” and gsum, “three”). The Dbus-Gtsang region stretches from Mnga’-ris skor-gsum at the border of the Kashmir region to Sog-la skya-bo near the town of Sog. The Khams, or Mdo-stod, region consists of the territory between Sog-la skya-bo and the upper bend of the Huang He (Yellow River), now located in Qinghai province. The A-mdo, or Mdo-smad, region reaches from the Huang He to Mchod-rten dkar-po in Gansu province, comprising most of present-day Qinghai. Traditionally, Tibetans have said that the best religion comes from Dbus-Gtsang, the best men from Khams, and the best horses from A-mdo. Within the Chol-kha-gsum approximately one-third of the area is uninhabitable, about one-fifth is roamed by nomads, and the rest is occupied by seminomads and agriculturalists, with a small percentage claimed by trappers in the forest belt.

## 1.2 Lhasa – characteristic, statics and development process

Lhasa is a city with some 1,400 years of history. In AD 633, the Tubo Tsampo Songtsan Gambo moved the capital from Yarlung of Shannan Region to today's Lhasa. He ordered the construction of the Potala Palace, the Jokhang and Ramoche monasteries, turning the place into the most populous town on the Tibet Plateau and laid the foundation for Lhasa.

Since the Tubo Kingdom collapsed in the late half of the 9th century until the early Ming Dynasty in the 14th century, Lhasa was controlled by different regional powers and developed slowly. However, the circular pilgrim route around the Jokhang Monastery gradually flourished, forming the embryo of the city. In time it would become known as the Barkhor Bazaar.

In the late Ming Dynasty, three major monasteries of the Gelug or Yellow Sect of Tibetan Buddhism were constructed in Lhasa. Especially in the 17th century, with the support from Qing Dynasty rulers, the Dalai Lama reincarnation system gained the supreme political and religious power of Tibet and set up the Gandain Phodrang local regime. As Lhasa rose to be the power centre of Tibet again, the Potala Palace and Jokhang Monastery also gained renovation after centuries of devastation in warfare. Since then until the early 20th century, residential houses, shops, hotels and restaurants mushroomed to form busy streets surrounding the old pilgrim route around the Jokhang Monastery.

As the city became Tibet's most important commercial centre, the population also grew quickly. Under the feudal serf system which combined religion with politics, splendid monasteries, the grand Potala Palace, as well as prominent nobles' residences dwarfed the shabby cottages or tents of the common people. In 1951, when Tibet was peacefully liberated, Lhasa had a population of less than 30,000, including beggars and tramps. The urban area was no more than 3 square kilometres nearby today's Barkhor Bazaar. Among the haggard houses, the narrow streets were strewn with rubbish. All sorts of diseases were rampant in the city.

In 1960, Lhasa became a city, and then in 1965, when the Tibet Autonomous Region was set up, Lhasa became the capital of the region. The center of the city is occupied by the four-story Tsuglagkhang, or Gtsug-lag-khang (Jokhang), Temple, built in the mid-7th century CE and considered the holiest place in Tibet. It was temporarily converted into a guesthouse by the Chinese after 1951, but restoration of its artistic and architectural heritage began in 1972–75, and its religious functions were restored in 1979. Other city landmarks include Klu-khang (Lukhang) temple

; Potala Palace, once the winter residence of the Dalai Lama; and the former summer palace of the Dalai Lama, the Norbuglingka (Nor-bu-gling-ka; Jewel Palace), which is now called the People's Pleasure Park. The monasteries of 'Bras-spungs (Drepung) and Se-ra, two of the largest in Tibet, have received renovation.

Over the past 30 years, the rebuilding of the old Lhasa has been carried out under the principle of maintaining the city's traditional appearance. Electricity, tapped water and underground sewage disposal systems were completed one by one in the sphere of the old city. At the same time, heavy construction has been carried out to the north and west of the old city. Well-equipped Tibetan and modern-style architectures quickly rose to modify the skyline of Lhasa. After China entered the opening and reform era, especially in the past 10 years, Lhasa has been changing rapidly every day. While maintaining the regional and ethnic colours, the city has been updating its infrastructure including social services, public cultural, education and hygiene facilities, transportation and communications. A modern city is already taking shape. At present, the urban area of Lhasa covers 45 square kilometers.

In 1982, Lhasa became one of the first 24 historical and cultural cities in China declared by the State Council. The Jokhang Monastery, Potala Palace, Norbulingka, Drepung Monastery, Sera Monastery and Gandain Monastery are world-famous tourism attractions. At the centre of the old city, the Barkhor Bazaar (due to the Sichuan dialect, the place was called "Bajiao" Bazaar in the past) has faithfully maintained the old city's appearance. It was the pilgrims circulating the Jokhang Monastery who first trekked out this street. It is fair to say that Barkhor Bazaar had appeared long before the city of Lhasa came into being. Nearby the Barkhor Bazaar are over 100 historical and cultural relic sites. To name just a few: the Ramoche Monastery built at the same time with the Jokhang Monastery; the oldest bazaar in Lhasa - Chongsaikang; the old Lhasa official building before the democratic reform and the old residence of Qing Dynasty officials to Tibet. Over the past centuries, Barkhor Bazaar has been the largest trade centre of Tibet. Today, it still takes up an important place in the trade of small commodities, especially ethnic and traditional handicrafts. The bazaar is lined up with stands selling daily necessities, traditional handicrafts, religious items and antiques. Amid the bustling atmosphere of commerce, the streams of pilgrims presenting their holiest worship to the Jokhang Monastery add solemnity to the business center.

## 1.3 Site with surrounded proposal

The site locates close to the old city of Lhasa which has connect with the relatively new developed area. The new blind children school is not far from the old one so that the communication between two schools could be more frequent. There are a lot of restaurants, shops and hotels next to the site so that the interaction for blind students to the society could be more convenient. Moreover, there are also more commercial area, monument, and government agency nearby from the site.

When researching the street views, all of the shops and restaurants are used traditional Tibetan windows and bricks to decorate their façade which could ensure the unique style of whole street.


Street view from north of site

## 1.4 Education System in Tibet

### 1.4.1 Low educational rate

Tibet has highest illiteracy rate in China: 42 percent in 2000. This is an improvement though from the past. According to the 1990 census, 72.8 percent of ethnic Tibetans over the age of 15 were illiterate. In the 1950s the figure was 95 percent. Many Tibetans are held back by a lack of education. A surprising number can't read or write, speak Chinese or do basic math. Those that work in markets often rely on intermediaries, often Muslim Huis, to do the calculating, weighing and marketing of their products in markets. Only 78 percent of Tibetan children enter elementary school and only 35 percent enter middle school. Although even the poorest families consider education to be of utmost importance, many families can't send their children to school because schools are in short supply and children are needed for agricultural and herding chores. Poor families that value education often spend what little money they have for education on one child. The others often cannot read or write.

The Communist Chinese have greatly improved education in Tibet. They have built hundreds of schools. Before their arrival there were only a handful of non-religious schools on Tibet. Only a small minority received any kind of education at all. According to the Chinese government: “Education in the Tibetan areas used to be monopolized by the monasteries. Some of the lamas in big lamaseries, who had learned to read and write and recite Buddhist scriptures and who had passed the test of catechism in the Buddhist doctrine, would be given the degree of Gexi, the equivalent of the doctoral degree in theology. Others, after a period of training, would be qualified to serve as religious officials or preside over religious rites. For the most part, Tibet has been closed to Western scholars and researchers. In many cases, the work of Chinese scholars has also been curtailed.

### 1.4.2 Modernizing Tibetan Education

Tim Sullivan of Associated Press wrote: “In Tibetan culture, change has traditionally come at a glacial pace. Isolated for centuries atop the high Himalayan plateau, and refusing entry to nearly all outsiders, Tibet long saw little of value in modernity. Education was almost completely limited to monastic schools. Magic and mysticism were — and are — important parts of life to many people. New technologies were something to be feared: Eyeglasses were largely forbidden until well into the 20th century. No longer. Pushed by the Dalai Lama, a fierce proponent of modern schooling, a series of programs were created in

exile to teach scientific education to monks, the traditional core of Tibetan culture. “The Tibetan culture, meanwhile, is increasingly imperiled. Ethnic Han Chinese, encouraged by generous government subsidies, now outnumber Tibetans in much of Tibet. The traditional Tibetan herding culture is dying out as people move to cities. Many young Tibetans now speak a tangle of Chinese and Tibetan. Amid such tumult, the Dalai Lama — a man raised to live in regal isolation as a near-deity — has instead spent much of his life seeking ways that Tibetans can hold onto their traditions even as they find their way in the modern world. He has encouraged modern schooling for exile children. There are job programs for the armies of unemployed young people."

### 1.4.3 Schools in Tibet

The Chinese have built an education system virtually from scratch in Tibet. In 1951, there were no public schools in Tibet by 1999, there were over 2000. Unlike schools outside of Tibet, elementary schools and middle schools in Tibet charge no tuition fees. High schools charge about $70 a semester, including board. The government goes through great lengths to encourage Tibetan students to stay in school. Free transportation is offered to children of nomads.

Many Tibetan cities and towns have new schools with facilities that are much better than their counterparts in provincial China. The situation is different in the Tibetan countryside. In some poor rural schools, many classes are conducted standing up because there are no chairs in the classrooms. In others, children have no pencils and they sit on cement floors to save wear and tear on their desks. Teachers in these schools receive less than $1 a month for school supplies. In some places the schools are only in session when inspectors are around.

Students are discouraged from engaging in any kind of religious activity. In some schools, Tibetan children are forced to say things like "I am a Chinese citizen” and that Tibet is a land of savages and that Tibetan Buddhism is a superstition. Elementary school students are taught the importance of achieving a per capita GNP of a developed country by 2050 and told: "We must achieve the goal of modern socialist construction...We must oppose the freedom of the capitalist class, and we must be vigilant against the conspiracy to make a peaceful evolution towards imperialism."

### 1.4.4 Chinese-Run School in Tibet

The government has encouraged wealthier Chinese cities to finance school construction in Tibet. In the city of Shigatse, four hours from

Lhasa, the Tibet-Shanghai Experimental School was completed in 2005 with an investment of $8.6 million from the Shanghai government. The principal, Huang Yongdong, arrived in January from Shanghai for a three-year posting. Nearly 1,500 students, all Tibetan, attend junior and senior high schools here. “A portrait of Mao hangs in the lobby. All classes are taught in Mandarin Chinese, except for Tibetan language classes. Critics of the government ethnic policies say the education system in Tibet is destroying Tibetans’ fluency in their own language, but officials insist that students need to master Chinese to be competitive. Some students accept that.

“My favorite class is Tibetan because we speak Tibetan at home," said Gesang Danda, 13. “But our country mother tongue is Chinese, so we study in Chinese." On a blackboard in one classroom, someone had drawn in chalk a red flag with a hammer and sickle. Written next to it was a slogan in Chinese and Tibetan: "Without the Communist Party, there would be no new China, and certainly no new Tibet."

Tibetan kids in a Chinese-Run School

Students in breaktime

### 1.4.5 Schools and Language in Tibet

Schools in Tibet often have separate classes for Tibetan and Chinese children. This is done mainly for linguistic reasons, with the Han Chinese receiving instruction in their language and Tibetans being taught in Tibetan. Many Tibetan students take courses in Tibetan and Chinese while Chinese students take Chinese and English. Chinese is displacing Tibetan as the main teaching medium in schools despite the existence of laws aimed at preserving the languages of minorities. Young Tibetan children have most of their classes taught in Tibetan. They begin studying Chinese in the third grade. When they reach middle school, Chinese becomes the main language of instruction. An experimental high school where the classes were taught in Tibetan was closed down.

In schools that are technically bilingual, the only classes entirely taught in Tibetan are Tibetan language classes. There are no textbooks in Tibetan for subjects like history, mathematics or science and tests have to be written in Chinese. A Tibetan student told Reuters, “I want to be a lawyer and for me Chinese plays a very important role both in my life and my study...If someone can't speak Chinese then they might as well be mute."

Today, 90 percent of school lessons in Tibet are still in Chinese. For the remainder, students can choose between Tibetan and English. An envoy of the Tibetan government-in-exile Dawa Tsering told a forum in Taipei organized by the Taiwan New Century Foundation: “Take me: I don't speak Tibetan very well, even though I grew up in Tibet and my parents speak only Tibetan. That's because I attended elementary school during the Cultural Revolution and the Tibetan language was not allowed in school," Dawa said, adding that although Tibetan language instruction was later permitted, it was more for “cosmetic” purposes. He added, “A civilization that loses its language becomes one that is only good for display in a museum. “Most Han Chinese teachers know little or no Tibetan. They teach their classes either in Chinese or English. At one school a Chinese principal who didn't speak one word of Tibetan told the Washington Post, "Tibetans don't have a vocabulary for science. Some science terms that are two words in Chinese, like 'electrical resistance,' when you translate then into Tibetan come up with a whole long string that you can't even write on the blackboard." Tibetan middle school and high school teachers are supposed to teach in Mandarin although many teach in Tibetan.

Tibetan students are encouraged to learn Chinese because they need to know the language if they want to do well on the all-important university entrance exam, gain admission to a university, get a good job and generally get ahead in life in China and Chinese-controlled Tibet. One 17-year-old Tibetan in Shigatse told the Washington Post, “I use Tibetan at home, but I use Chinese with my friends. My teacher said that is the best way. Now

my Chinese is better than my Tibetan. That's the future." Tibetan children in exile study in Tibetan until they are 10 so they are rooted in their culture and then switch to English.

### 1.4.6 Further challenges

he distinguished achievements of education in the Tibet Autonomous Region of China comprises of several aspects. Kindergarten and preliminary schools are fast developing where the attendance of kids aged three to six had reached 52 percent until the end of 2013. Besides the great results from compulsory education in Tibet, education in high schools has been expanding and the scales of schools are continuously enlarging. The fast-development of high school education in Tibet are highly reliable on scientific planning, rational mapping, and have an active construction of education funds and reasonable allocations of teaching resources.

The autonomous regional government in Tibet also takes high concerns on sharing equal opportunities to children with disabilities, where schools with special support are given priority to these kids. In addition, the policy of covering all expenses on study and accommodations for children of herdsmen in Tibet are gradually improving while related treatments are continuously being enhanced since 1985.

However, despite the brilliant accomplishment of educational development in Tibet, due to various external difficulties and constraints, some apparent problems and barriers still exist and can be enumerated as follows:

First, the natural conditions in Tibet are harsh and this results into higher educational costs. Tibet is located in the roof of the world, with wide areas and sparse populations. It lacks oxygen in the plateau where climate varies drastically with vast temperature differences between day and night. The construction and operational costs of schools are relatively high, as the budgets for schools in rural and pastoral areas are three to five times higher than the schools in the Mainland.

Second, the economic foundation and industrial development in Tibet are quite poor. Due to the smaller levels of revenue and resources, there is generally a gap in financial and social progress in Tibet. It is quite difficult for the majority of herdsmen in Tibet to increase their incomes. Hence, with respect to such kind of fiscal status, it would be difficult for Tibet itself to allocate sufficient funds to develop education. In some areas of Tibet, the education concepts have placed constraints on the consolidation of development on compulsory education. There is also insufficient capacity of senior high school education which is becoming more and more prominent, and this will come back to have an impact on the future popularization,

consolidation, and improvement of compulsory education in Tibet.

The third issue is related on the structural defects of training students in advanced education. It is rather hard to accumulate a large number of highly educated personnel in Tibet as for most areas, attracting and retaining talented professionals of all kinds are everlasting problems. This leads to an overall scarcity of high-end talents. Furthermore, the existing problems such as equality and quality of education, welfare towards poor families, and efficiency of education in Tibet also requires intensive attention.

# Chapter two – Blind children school

## 2.1 Urban development & Urban village

### 2.1.1 Period before People Republic of China

In the early stage of 20th century (Qing Dynasty), the local government promulgated the protocols concerning aforementioned government agencies. During this period of time, according to an account by a son of Shedra, Kalon Tripa: the locals, in anger, clamored, sang mantras, pled for rain and protested when the British officials arrived in Jokhang and other holy places. During the occupation that lasted several weeks, Francis Younghusband lived in the house owned by the Lhalu Family, which was at that time owned by the nephew of the 13th Dalai Lama. The British renamed Barkor and Potala Palace as Piccadilly Ring and Winshaw Castle, and left the city until they had obtained a treaty that granted them some privileges. Among other things, the Treaty dictates that Gyangze, gadak (Today's Gar, capital of the Ngari Prefecture), Dromo would be opened as commerce portals. Half a million pounds were to be paid as reparations. When the news reached Qing Emperor Guangxu, the outraged emperor ordered the Tibet Amban Youtai to not sign the treaty. Throughout the modern history, Lhasa had been an area for the international forces who dueled for supremacy. Yet underneath the overt serenity, unrest was brewing.

IThe 13th Dalai Lama was a significant champion of modernization in the post-Xinhai Revolution era Tibet. In 1912, modeled on the Qing postal system, the Drakkhang system was formulated. In 1914, a military reform was announced. As part of the reform, Japanese and Russian officers were hired to train the Tibetan military forces, who were trained both using the Han Chinese system as well as the British system. In 1915, the first modern weaponry manufacturing facility – Chaxi Machinary began operation. In 1931, 13th Dala Lama ordered that several mints situated in Meiji, Luodui, Dorde respectively to be merged with Tzashen Mint, Dorde hydro-power station-the new entity called 'Tashi Lekung' became the largest Tibetan enterprise consortium at that time. All these achievements sped up the process of Lhasa becoming a modern city.

Lhasa's traditional appearance survived the Republic era largely intact. However, its urban infrastructure saw little improvement. In 1916, French scholar explorer Alexandra David, disguised herself as a pilgrim, arrived in Lhasa after a long tenuous journey. She described Lhasa as crowded and noisy, a beehive of activities.

‘Despite of its relatively small population, the streets were often congested. Aside from small opening in the center area, the streets were generally wide with expensive space in between. They were usually clean, though indoors another government agency specifically responsible for urban administration. Headed by a rank-four official, the main responsibility was to maintain social order, enorce market rule, overseeing lawsuits and moderating disputes between officials and civilians. In additions, there was also Nyitsang Lekung in charge of sanitation and construction materials – timber, pottery and thatch to Potala Palace and Norbulingka, reparing the sewerage and building public toilets, preventing unlawful private construction to fetter effectiveness of streets and alleys. In additions, it was also responsible for fire prevention, thief prevention and Jokhang’s sanitation. During the first half of the 20th century, Lhasa became more differentiated from other Tibetan cities. A number of factors contributed to this development: foreign intervention, war, commercial and economic growth, modern industry, introduction of modern urban administration system and infrastructure. As a result, Lhasa’s lead over other cities became greater all the time. All these led to different development patterns on both banks of south of Yarlung Tsangpo River. Some new development during this period are: 1. The city’s role shifted: aside from traditional urban function such as administration, religion and commerce, burgeoning manufacturing industry became a new driving force. Up until peaceful Liberation, Lhasa was the only Tibetan city with a population more than 10,000.

Among Tibet’s hierarchy of cities, Lhasa’s claim to the top spot is beyond dispute. Underneath, Shigatse, Chamdo and Gyangtse and other Jiqiao-Level cities formed second tier. Further down below, there was the larger and medium Zongxi-level towns, which was further divided up into two classes. All these cities contributed to Lhasa’s development in their own ways.

### 2.1.2 Change and construction after peaceful liberation

In May 1951, Lhasa was liberated. The advance detachment, office of the 18th corps, and the independent detachment of People’s Liberation Army met little resistance when entering the city. Until 1960, Lhasa was officially listed as a city by the national government. In 1961 Chengguan District was established as an admiration unit, the district government oversees six agencies, namely Degyi, barkor, Kyire, Parilku, Nachen, Tselgung Tang, twelve neighborhood committees and eleven townships. Among them, Degyi Lam, Barkor, Kyire, were under the auspices of the old city. From 1988 to 1990, on Barkor, Kyire, Gyabumgang (In 1981

Bird view of old city of Lhasa in 1912

Degyi was renamed Gyabumkhang, Tromsikkhang and Tashi, two lekung – level units were established, between the two, Tromsikkhang was under the auspices of the old city). This move grew the total number of Banshichu – level

neighborhood committees in Lhasa's Chengguan District to six. At present, the city has seven banshichu-level units, namely Tromsikkhang, Barkor, Kyire, Gyabumkhang, Drabchi, Kundeling, Garma Gonsar, adminsetering a total of 28

neighborhood committee-level units. Among them, Tromsikkhang, Barkor, Kyire Gyabumkhang, four in total, were within the old city area, administering 15 neighborhood committee – level units.

Urbanization picked up speed after the peaceful liberation. By 1951, Lhasa's population was around 30,000, the total urban area measured about three square kilometers, the vast majority of the urban population lived in old city area and the rest scattered across a large area surrounding it. In total, the constructed surface in the old city area measured 230,000m2. The buildings were generally of low quality with insufficient drainage capacity: roads were mostly unpaved. In 1952, a number of new public facilities coming into being, in particular, hospitals and schools. In 1956, a tarmacked road was built between Jokhang and Norbulingka, in 1958, Lhasa Locomotive repair factory began to operate. In the same year, Lhasa Wood Procession Factory and Lhasa Carpet Factory were established. A municipal government office building and employee dormitory building were completed. In its wake, public sanitation saw substantial improvement – the building of more public toilets, garbage landfills, drainage pipelines all contributed to the improvement of Barkor and the city Lhasa Riot, material law was announced and Nachen Hydro-power Station went into operation, electrical lighting was increasingly common in old city.

In retrospect, while Lhasa's urban development followed some common patterns also seen in other cities, some unique factors were at play. One such factor is its status as the religious center, which had great implication on its appearance, layout, architectural style, cultural characteristics and distinct atmosphere. Aside from being a religious and political center, Lhasa was also an economic motor of the entire Tibet. To sum up, Lhasa's status as political and religious center contributed to its industry and commerce development. Its geopolitical position and cross border trade routes made it uniquely positioned as a regional commercial center and transportation hub.

## 2.2 Current situation of blind school in Lhasa

### 2.2.1 General education and living condition

There were two blind children schools in Tibet and one of them locates in Lhasa and the other one is in Shigatse. Both of these two schools are established by a German named Sabriye Tenberken in 1988. All principles in schools also have visual impairment and they get used of using Tibetan and English during communication rather than Mandarin. Only several staffs could use Mandarin if service process with visitors. The blind

people will accept basic education and living skills during study period without tuition fee in order to utilize them in further study or social living after the graduate. To be conclude, there are 40 blind children and the age of them are between 6 to 20.The capital source of this blind children school in Lhasa is mainly relied on social donation and there is only property owner will donate regularly in every year, which means capital chain is hard to maintain the daily operation of school. The lunch for these children includes one meat dish as well as one vegetable dish but it is not enough to fulfil the children's demand. There are 6 teachers in this school in total and the salary of them are 1000 RMB per month which means it even difficult to cover the basic consumption in Lhasa but the teachers still insist on without complain. Furthermore, this 'school' is just the residential building locates at the corner of a deep alley without enough adequate activity space and the place for children to sleep has to occupied by three-level bed, which means they need to climb up and down in daily time. As there is no enough space so that the whole number of students in school are 40. Besides these 6 official staffs, there are also several undergraduate students come here for volunteering but only few of them would be willing to stay here due to the low salary but high price level in Lhasa. At present, all of these 6 teachers are local people and the education level of them are high school which means the new coming volunteers need to have high education level and teaching experience to teach not only students but also practice teachers in both English and Mandarin.

Blind children school in Lhasa

Canteen in Blind children school of Lhasa

### 2.2.2. Vocational / skills training

The following are possible professions or skills that can be performed by blind people in the T.A.R.:

Tibetan and Chinese medical massage, pulse diagnosis, acupressure: The professions of medical masseur and physiotherapist are within the PR China reserved for the blind and the deaf. Two blinds in Chengdu educated medical massage trainers were found who started up this program in the autumn of 2000. In May 2001, April 2002 and April 2003a blind physiotherapist from Switzerland, Monique Assal, came to Lhasa to train the trainees and one massage btrainer in the basics of physiotherapy.

Musical training: especially talented blind students are trained by a professional musician in singing, composing and playing musical instruments.

Animal husbandry: Milk, yoghurt, cheese production (Summer 2004)

Agriculture: Cultivating vegetable and grain. (Summer 2004)

Handicrafts: Knitting, weaving, pottery, carpentry, basket making. (Summer 2004)

Compost production: Students are being trained how to make compost. In the center in Lhasa the students are trained in the use of a computer.

To provide reading and working materials for the students attending the school and the vocational training program, a workshop for the production of Tibetan Braille materials has been established. A computer program to convert written Tibetan into Tibetan Braille has been developed by a German blind mathematician, Eberhard Hahn. Tibetan texts can be typed into a computer through Wylie transliteration, and the program converts this transliteration into Tibetan Braille, which is then printed in Braille. The first Tibetan Braille books were produced in August 2001.

## 2.3 Demands and weakness of blind school

### 2.3.1 Demands in Blind Children School Construction

By comparing with normal school, blind children school has some different demands:

People with visual impairments have specific and special difficulties and needs. Blindness denotes the inability of a person to visually capture the images projected from surrounding objects. To a visually impaired person tactile perception is very important because it allows contact, knowledge

of objects and reading by means of the Braille system. For orientation and mobility, hearing is another important sense for the user with visual impairment, because it allows spatial relationships to be perceived. Smell may provide clues for orientation and the location of environments such as the kitchen and gardens, for instance. Kinaesthesia is the sensitivity to perceive muscle or joint movements. This capability alerts humans to the position and movement of the body when raising an arm, for example, or when going up or down a slope, thus it is perceived without sight as well.

In this context, Wayfinding Design, is an important concept. It involves elements in a system that helps spatial orientation of users. The design of environments with Wayfinding in mind must be based on clear circulation routes with well-marked entries, exits and vertical access points. Tactile maps, models, printed maps, indication signs, the location of the information desks, among others, are important elements for Wayfinding design. For persons with visual impairments, Wayfinding systems must include special attention to physical elements, such as: layout and wall configurations, baseboards and tactile warnings. The design of handrails, ramps and the correct placement of tactile ground surface indicators must be carefully considered in design for all. Wind and sun are natural elements that may help orientation and sensorial elements such as smell from flowers and sound from water can be explored as well (Arthur & Passini, 1992; Gibson, 2009; Golledge, 1999; Meuser & Pogade, 2010; Passini, 1984).

For schools' buildings Wayfinding design must be based on the analysis of special needs of children, including those with visual impairments. A participatory design process is recommended so that proposals incorporate needs and desires of users. This type of design process should have an analytical, a decision-making and a creative or propositional phase. The analytical phase involves data collection, often as Post-Occupancy Evaluations – POE of existing buildings. The development of data collection instruments for studies that involve the participation of children is however a challenging task. This becomes even more challenging when these participants are blind.

Preiser and Nasar (2014) in a recent review on assessing building performance - BPA, as Post-Occupancy Evaluation - POE is denominated today, have shown that these evaluations are important for a design process to be successful in providing users with buildings that respond to their needs and desires. These authors also showed that such assessments should employ participatory methods. A renewed interest in evaluation at the intersection of the physical and the social is therefore detected in the literature and this,

represents a return to the origins of POE in environmental psychology. It also reinforces that building evaluation currently strongly favours 'bottom up' approaches to evaluation, which value the opinions of the user (Preiser & Nasar, 2008). Many studies have shown that in order to assess usability, one has to focus on the effect of the building on the user organization's fulfillment of goals, as well as the end users' satisfaction and experience (Blastad, 2010; Baker, 2011; Kowaltowski et al., 2013, 2014).

For better quality school buildings Dudek (2008) recommends a greater involvement of users in the design process. Attempting user involvement is not without its own difficulties. The participation of children in the design process is however strongly recommended by many in the field of school architecture including the schoolyard (Curtis, 2003; Addo-Atuah, 2012). In school building assessment one of the difficulties encountered is the fact that children of varying ages should participate in the design process. Children, before they have learned to read and write, should not be excluded. To overcome some of the hurdles of user participation in a school design process, and evaluate buildings against a "criteria of quality", Cleveland and Fischer (2014) recommend a mixed-method approach to data collection. Walkthroughs, questionnaires, interviews and focus groups are employed.

Within learning environment research, the investigation of learners' perceptions tends to rely on verbal skills of participants, and this could prioritise certain aspects. With children these verbal methods can be enhanced with storytelling, gaming, mental maps and drawings that give young users the opportunity to express their preferences and desires. However, such methods need to be accompanied by a multidisciplinary team that includes educators and psychologists, and such processes will always need parent consent (Kowaltowski, 2011).

Woolner (2009) explored the pros. and cons. of participatory processes in school design. She detected enthusiasm within both education and architecture for the inclusion of students and other users of the school building in the design process. Such processes are seen as a way for architects to achieve a better understanding of the business of education and therefore supporting the design of more appropriate buildings and outdoor spaces. However, such involvement is not without difficulties, according to Woolner (2009). Within the educational context, examining previous waves of school building reveals that in the past consultation has tended to leave out certain users. Woolner (2009) recommends that, if participatory processes in school design are to aim to be genuinely inclusive, avoiding past experiences of narrow understanding, they must involve as wide a cross-section of the school community as possible. This should include teachers, support staff, technicians,

administrators, cleaners, lunchtime supervisors, students of varying ages, parents and the local community. Involving such a diverse range of people produces many practical considerations, especially in the choice of research methods to be adopted to ensure a high-quality participatory process, a process that results in school premises that offer a good fit to the needs and aspirations of the school's users.

Woolner et al. (2010) further argue that for both educationalists and social researchers' visual methods are particularly appropriate for the investigation of people's experiences of the school environment. The authors have applied a range of visual methods, based on photographs and maps, to investigate the views of a diverse sample of school users. Methods which make more use of visual and spatial material are therefore seen as being able to widen participation to include all users, and are particularly appropriate for examining the contribution learning of the physical setting (Lodge, 2007; Prosser, 2007). It is vital to grapple with the issue of choices about research tools, because inevitably they affect research results, as Dewey put it in 1938: ''a tool is also a mode of language, for it says something to those that understand it: about the operations of use and their consequences'' (Woolner et al., 2010).

In her study on participatory school design processes Woolner (2009) does not include pupils with varying disabilities. How to assure an inclusive process is therefore still a challenge. Special difficulties arise when users, and particularly children, are visually impaired or blind. A further problem arises with the inclusion of blind children in a participatory design process when they have not yet mastered the Braille system. Visual methods are no longer appropriate and verbalization or articulation of preferences cannot be ascertained through normal written questionnaires. For the inclusion of such children to be made possible special tools and methods are paramount.

The tactile map used in this case study was developed to support interviews with the 10 children of the test. The main reason for introducing a tactile map was to promote interaction between students and the interviewer (applicator), substituting a walkthrough POE method.

The interview was in the form of a play-interview. Special care when interviewing children must be taken. Interview methods need to match children's developing cognitive, linguistic, social and psychological competencies (Gibson, 2012). Children often have a limited attention span and for this reason lengthy interviews should be avoided. Storytelling and playing or gaming technics should be employed to ensure a child's response to the topics of the interview. The language the interviewer uses should be appropriate to the vocabulary of the group of children being studied.

### 2.3.2 Teaching Strategies for Blind Children School

Classroom accommodations will be quite varied and should be individualized according to the specific needs of the student. However, there are some basic best practices that can guide the development of the most effective adaptations.

One thing to always consider is that it is often difficult for these students to become as fully independent as they are capable of being. The classroom teacher should encourage independence as often as possible to avoid the trap of "learned helplessness." Encourage the student to move independently through the classroom, and organize your classroom accordingly. Materials, desks, and other objects in the classroom should be maintained in consistent locations. Ensuring that cabinets are fully closed, chairs pushed in, and doors are not left half ajar will help with safety in navigating the classroom. Part of becoming independent for students with a visual impairment is learning when to advocate for assistance. Not all instructional tasks will be immediately possible for a student with a visual impairment, even with accommodations. The key is to design your instruction so that the student has the most opportunity to act independently. The student's orientation and mobility specialist and teacher of students with visual impairments can assist with room arrangements and room familiarization.

Adapting your classroom to accommodate a student with a visual impairment is a relatively easy task—it just requires an awareness of the student's level of visual functioning (how the student sees) and how the student works and learns. For example, for the student with low vision, make sure that he is near the front of the room where he can see the blackboard. Control lighting variables when presenting learning materials to those students who are sensitive to light and glare. Use verbal cues with those students who cannot see body movements or physical cues. A trained teacher of student's visual impairments can help you make a few simple changes to classroom design that may mean all the difference in the education of the student with a visual impairment.

One key accommodation that is absolutely essential is access to textbooks and instructional materials in the appropriate media and at the same time as their sighted peers. For students who are blind this may mean braille and/or recorded media. For the student with low vision, this may mean large print text or the use of optical devices to access text and/or recorded media while in class. Working closely with a student's teacher of students with visual impairments in advance helps ensure accessible materials and availability of these materials in a timely manner.

### 2.3.3 Assistive Technology for Blind Children School

In order to access print information, students with visual impairments must be trained in the use of a number of adaptive devices, methods, and equipment that are collectively referred to as assistive technology. Some of this technology allows access to information presented on a computer while others are devices to be used independently. Computer hardware and software are continuously advancing, allowing for more access to information than ever before.

### 2.3.4 Computer adaptations for Blind Children School

Braille translation software and equipment: converts print into braille and braille into print.

Braille printer: connects to a computer and embosses braille on paper.

Screen reader: converts text on a computer screen to audible speech.

Screen enlargement software: increases the size of text and images on a computer screen.

Refreshable Bbraille display: converts text on computer to braille by an output device connected to the computer.

Braille notetakers: lightweight electronic note-taking device that can be connected to a printer or a braille embosser to produce a printed or brailled copy.

Optical character reader: converts printed text into files on a computer that can be translated into audible speech or Braille with appropriate equipment and software.

Electronic braillewriter: produces braille, translates braille into text or synthetic speech.

Talking calculators: calculates with voice output.

Optical devices: illumination assisting

Closed Circuit Television (CCTV): enlarges an image to a larger size and projects it on a screen

Magnifiers: enlarges images

Telescopes: used to view distant objects

A specially trained teacher of students with visual impairments can help supply many of these devices and can provide training for the student to become independent and proficient in using assistive technology.

### 2.3.5 Organizations for Blind Children School

There are a number of organizations that can help support classroom instruction for students with visual impairments. The information presented in this module is intended as a brief description of visual impairment and its impact on learning. Much more in-depth information and instructional strategies can be accessed through the following organizations:

### 2.3.6 The weakness of blind children school in China

#### 2.3.6.1 Limited using area and lack of long-term planning

The majority part of blind children schools in China was established at early stage of this century which resulted the unclear initial plan and developing strategy for general design. The insufficient of project area could be regarded as a main problem among blind children school, especially for student dormitory area. Besides this, the training space and related equipment are also scarce in sports area (gym and sports classroom) and recover area.

#### 2.3.6.2 Small land area of classroom and unattractive internal design

The area of classrooms and special functional classrooms are too small which could only fulfill the basic instructional functions. Furthermore, the space for extracurricular activities and individual tutorial are missed in most part of classrooms. The whole space of classroom lacks various layers as well as targeted spatial organization.

#### 2.3.6.3 Crowded living conditions in dormitories.

As mentioned above, this is a ubiquitous issue among the blind children schools in China. Most schools adapt bunk beds to create as much space as they can. However, this kind of arrangement is inconvenient for blind children. Moreover, the usage area of student in dormitory is also less than standard level which leads to the crowded of whole dormitory.

#### 2.3.6.4 Corridor and stair are too narrow for passing and the accessibilities facilities are defective

Narrow corridor and stair raise the accident rate as crashing might happen frequently during walking process, which would bring psychologic obstacle for students. Besides this, the design of inner

height difference obstacle digestion and persuasive communication lack for targeted consideration.

#### 2.3.6.5 The insufficient design of detail in space as well as acoustic and sound atmosphere

The whole atmosphere and colour environment in blind children school are rather dull and lack of pervasive detailed design. The light quality, bright differences and uniformity of illumination in classrooms are pervasive problems. As for acoustics environment, some schools or classrooms are close to main avenue and local market which result the noise affect students' study and daily life.

#### 2.3.6.6 Physical and medical limitation

In this study, three informants all claimedthat they did not require any medical care regarding their eyes‟ condition. Two of them relied on Braille and audio programmes on phone or computer to "read"; while one of them did not learn much Braille but he thinks that Audio programmes and devices were adequate enough to support his study, work and daily life. Without vision, three informants all depended on guide dogs and the blind canes to walk around and it did not prove difficult for them to do so. However, one informant claimed that it was ot easy for her to travel around, specially to unknown environments. Regarding the difficulties they had in study, they all agreed that mathematics and physical education.

#### 2.3.6.7 Environmental limitation

This study found that environmental limitation for a blind person tends to be that without audio guidance, a blind person might have difficulties to tell which bus or train is coming and how to find a seat on them.

I kind of need some help from people because I cannot see signs or anything when I travel and to find seat on the train or the bus, and, so, I need help from people, yes. Sometimes I have a guide with me and helps me or sometimes I just ask people around me: can you help me to find a seat,.

Informant pointed out that schools or universities should simplify the process or provide some support to blind students for registration. She introduced a case where she was wrongly registered in the university as being disabled to reading instead of being blind. This error in registration caused her so much trouble and she was put into the risk of attending the university at the first year without any books and reading materials. She said that: The first year when I went to university I was registered in the wrong category

I wasn't registered as blind, I was just registered as being disabled to READING (loud). So, I didn't have right to get anything produced. I literally came to uni. First year without anything. I have no idea how that happened. They have known I was blind since 1995. So, I have no idea how that happened. I think I kind of try to do it on my own. But none of us understood how the paper things worked.

Most designers still lacking of basic realization of blind children which result the final project has restricted differences with normal schools. The whole blind children school are always designed for satisfy the basic functional demands rather than specific targeted design. In this way the majority part of blind children school in China have problem in spatial scale, equipment settlement and flexible functional space.

# Chapter three - Regulation and Rules in Blind Children School

The number of blind children school in China is still at a low level and each school has to face to whole capital city or even whole province. Moreover, the type of blind children school are primary school and secondary school. As for site selecting, all schools prefer site with high quality as well as convenient transportation, suitable environment, adequate sunshine and necessary infrastructure. Besides these, as for blind schools, surrounded environment, noisy environment, traffic environment and terrain environment are also needed to be considered due to sensitive interaction among blind students and surroundings and also impact from the atmosphere to blind children.

## 3.1 Site Choosing

### 3.1.1 Local surrounded environment

First of all, blind children should not be regarded as a group which was isolated from society. Integrating society and joining mainstream are the main trend for developing of blind children education. Blind children school, as the main studying and living space for these students, should also keep touch and commination with with external environment in substance and information in order to promote the blind children to participate social activities frequently. The site of blind children should not be far form cultural and educational facilities, medical facilities, welfare facilities as well as parks in order to help students approach social resources immediately, which means provide more methods for blind children to integrate into society. For example, blind children school are always not far from normal schools which could promote the communication and visit between these schools to enrich psychological identity and confidence of blind children. Moreover, the location of blind children school needs to avoid closing to entertainment venues, farm markets and fire station.

Local surrounded of Guangzhou Blind children school

### 3.1.2 Noisy environment

Due to lacking for complete ability in vision, the blind children have advantages in other sensory abilities by comparing with general children. Sounds are widely regarded as main method for blind children to acquire information for outside due to these children are extremely sensitive with sounds. This characteristic requires a quite studying atmosphere for students which have more strict rules on noise control than general schools so that the school must be far away from noise source. To be specific, the decibel in blind children should be less than 60db in daytime and 45db at night.

### 3.1.3 Traffic environment

Besides the basic convenient rules of school design, the blind school should also provide pedestrians with adequate wide and space for student to pass, even some blind roads as well as the connection to inner school. The entrance of school needs to avoid cross of people flow by keeping distance to bus station, metro and footbridge.

### 3.1.4 Terrain environment

Some height difference could be accepted in bind children school design but not too much. Moreover, the site should not be close to river and the pool was also forbidden in blind children school design to avert happening of dangerous issue.

## 3.2 Scale and land use indicators

Blind children schools get used to adapt lodging policy which means that schools are the place for children to studying, eating, living and playing. Besides that, blind children school needs more functions than general schools such as rehabilitation training and career training which means demanding for more building land. On the other hand, due to special requirements of blind people, the space of each room is larger for study and activities. All these facts cause the blind children school has more construction rules and land using indicators than normal schools.

## 3.3 Functions and partition

A general school has educational area, sports area, life service, medical rehabilitation, psychological counselling, career guiding, community service and school medical spot.

As for blind children school, educational area, medical rehabilitation area, career guiding area, life service area and sport area are five main functional areas and office area will only take related limited space. Inside. Educational area is main space to have basic lessons which includes normal classrooms, special purpose classrooms, public using classrooms and some related service rooms. This area has the highest using rate in whole school because it is regarded as the spatial carrier for educational activities of blind children.

| Type of school | School scale | Using area | Using area per student |
|---|---|---|---|
| Blind School | 9 classes | 15419 | 122 |
| Blind School | 18 classes | 23244 | 92 |
| Blind School | 27 classes | 30503 | 81 |

The scale and using area in Blind Children School

## 3.4 Blind children school spatial functional analysis

### 3.4.1 Organization about functional buildings

#### 3.4.1.1 Regular classrooms

Regular classrooms could be regarded as the highest using rate area in the whole school with proper environment in ventilation, natural daylight as well as avoiding noise. According to different in different lessons and the variety of children's development, the classroom of same grades needs to be arranged at the same level and the order of different grades should also follow from lower to higher. Besides this, the circulation flow should also keep the independent of each grade rather than in a crowded system. Considering the behaviours boundedness of blind children, the classrooms should be lower than 4th floor and the open design of window should also pay attention to escape from shield from surrounded buildings.

#### 3.4.1.2 Special purpose classrooms

Special purpose classrooms include language classrooms, geography classrooms, computer classrooms, music classrooms, experiment laboratory and handwork classroom. Other assisting classrooms or preparing rooms should also be settled close to the classrooms and the special classrooms should be cooperated with regular classroom for daily using.

#### 3.4.1.3 Public teaching room

This part includes library and multi-functional hall. By considering the requirements and demands of students, these kinds of rooms are always at the ground floor and in different activities zone to avoid crowded of people flow in emergency situation. Moreover, the connection and side entrance with outside should also be considered in design stage.

#### 3.4.1.4 Living and working classrooms

These kinds of classrooms are mainly combined with several living classrooms in order to educate the blind people in basic living rules and ability to adapt social family. The design routes of water, gas need to be paid attention in those building to avoid releasing to other parts of schools.

#### 3.4.1.5 Recover and training rooms

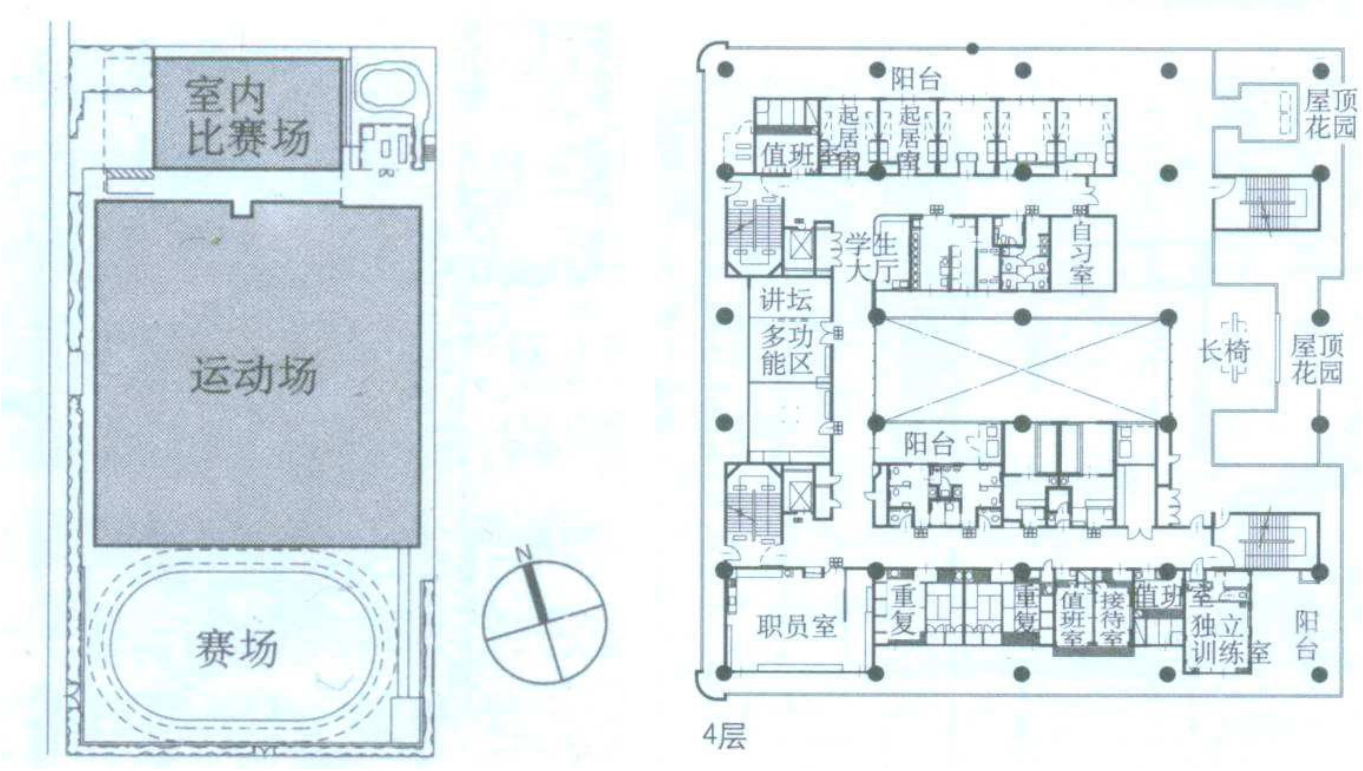
In recovering and training room, vision testing, orientational walking practice and recovering should be achieved in this spatial in order to analyse and collect data conveniently. Meanwhile, the training room should be designed not far from one of entrances of school to keep in touch with outside whenever the accident happens.

#### 3.4.1.6 Living service rooms

Living service room include student dormitory, canteen, public toilets and manage rooms. The canteen could be designed as a single volume according to the site usage of the school or at the bottom level of student dormitory in other cases. By considering the special demands of blind children, the dormitory should be designed lower than 4th floor for security reason.

### 3.4.2 Functional organization

The functional layout in spatial organization should follow the rules with concentration, regular layout, clear people flow and functional division, conveniently usage as well as easy recognized. Due to the difficulties blind children have in behaviours and clarify, curve and complex component should be avoided in design process. Corridors needed to be considered as the main connection and transportation methods to promote natural lighting and ventilation. Furthermore, the corridor needs to form as a circulation to access to any rooms in school. The normal classrooms should locate toward adequate natural lighting direction in order to promote the daily teaching and the whole volume of classrooms need to combined together as a system.




Example of concentration functional organization in Tokyo Blind school

### 3.4.3 Regulation classroom size

Desks in normal classroom

The proportion of classroom should be decided by number of desks and layout arrangement. In order to promote the accessibility of blind children in classroom, the desk size needs to be in 100mm x 50mm or the shape of 'L' as a single desk. A small shelf or drawer should be on one side of desk to collect blind books and written tools. Each side of desk needs to be 15mm higher than the plane to make it convenient for blind student to handle the tools on the desk. A small lamp is also needed in some specific situation to enrich the lighting condition in classroom. The distance between two desks should be more than 0.5 meters in horizontal direction and 0.6 meters in vertical direction. The front desk should keep more than 2 meters from the black board and the last desk should be more than 1.5m of the back wall. In case the drawer or washing tube at the back wall, the distance drawer and the last row of desks should be more than 2 meters. The cabinet should also be added in the classroom to collect blind books as well as teaching tools. The blind children mainly relied on touching to communicate with outside so that keeping hands clean is mandatorily for them which means the washing tube is also needed in classroom.

### 3.4.4 Special Purpose classroom

#### 3.4.4.1 Language classroom

This kind of language is main focus on foreign language teaching. The table used for language classroom is 0.55 meters x 1.7 meters for double people. The way to arrange the interior is similar with normal primary school which means settle in line face to the blackboard. By considering the inconvenient of blind children, the passing corridor need to be left close to each desk for children to move. The distance between two desks in straight row should be kept more than 1.2 meters and the distance between desk and wall should be more than 0.8 meters. In order to satisfy the demand of routing and tube, the moving panel should be settled under the floor panel.

#### 3.4.4.2 Geography Classroom

The desk size in geography classroom should be large than 0.6m x 0.8m and both side of desk needs to have 5 cm boundary which is higher than the desk. Some teaching tools such as tellurion are needed in the classroom. The layout of desks should use double group with face to face in the most suitable way. Meanwhile, the cabinet is also needed at the back part of classroom or on the side to collecting teaching tools. Desks should keep desistance to the cabinet to avoid the inconvenient from the tools in the cabinet. The washing tank is also needed here as blind children need touching feeling frequently during class time which means the cleaning security is serious here.

**3.4.4.3 Computer Classroom**

In computer classroom everyone is required to operate one computer in the class. The location of computer should be located on the parallel to the blackboard. Furthermore, some interior places to put texts books, teaching tools, and other machines should be added in if necessary. A preparing room is also needed for each computer room. Two computers might share one prepare rooms if the space is limited.

**3.4.4.4 Music Classroom**

The basic music knowledge and singing skills are required to achieve in the music classrooms. Besides this, music schools are also required to have small space for performance with one or two instruments, therefore, vocal music classroom and instrument music classroom are needed here, piano room could also be added if subjective conditions are necessary. The layout of music classroom is similar with normal schools to promote enough space to satisfy the requirements of teaching, apricating and singing. Specially, the instrument music classroom needs larger space which includes playing area as well as instrument collecting area. A small performance stage could be put in the front part of classroom for assembly situation.

**3.4.4.5 Laboratory**

Laboratory in Blind children mainly focus on experiment with physics, biology and chemistry, even could be natural classroom for the primary school. The blind children school needs two laboratories which usually are one chemistry laboratory and one chemistry laboratory and both of them need related preparing rooms. The desks in chemistry laboratory are 0.6m x 0.8m and flanch is also needed on both sides. Furthermore, a small washing tank size 0.6m x 0.4m should be closed to each desk. The ventilation condition in chemistry

should be promoted and floor materials are suggested in rigid but easy washing. The size of desks in geography classroom and biology classrooms are the same as what in chemistry classrooms. The water tube is not needed close to every desk but a public using washing tank is needed at the back part of classroom.

#### 3.4.4.6 Hand working Classroom

Hand working class mainly focus on feeling of touching and harmony with two hands. The hand working class in blind children school targets on paper hand-making, tiler, handcraft and weaving and classrooms could be added in 2 or 3 according to the different requirements of whole school. The specific desk in different kind of classroom could be different size to meet the requirement of different functions. For example, in paper hand-making classroom, single desk is the most common way and the size of each desk is 0.6m x 0.8m. Partition is also needed on both side of classroom to avoiding the falling of tools. The location of desks could be in 'U' flow toward blackboard or small group with facing to facing. Some basic tools as blackboard, exhibition board, washing tube and cabinet are necessary in hand working classroom. Meanwhile, the prepare room with processing equipment, teaching tools and water tank is also needed close to the hand working classroom.

### 3.4.5 Public Teaching room

#### 3.4.5.1 Library

This library includes book storage, reading area for blind children as well as amblyopia children. The distance between bookshelves should be larger than normal library to make it convenient for blind people to borrow books. The interior part of library needs good lighting conditions as well as assisted service for blind book, non-blind book and videos resources. Due to blind book has larger scale with moral books, the reading desks are also required larger scale by normal desk. A four people using desk should be larger than 1m x 1.6m and the distance between two table should also be enlarge to more than 1.5m to consider the vision limitations of blind children. The width of vertical corridor should be more than 1.1 meters. Beside this, listening area with earphone is also needed. Meanwhile, the reading area needs reading supporting tools, listening tools and moving equipment for daily using.

#### 3.4.5.2 Multi-functional rooms

Multi-functional means activities, performance as well as relaxing in one complex volume. This kind of room always use large scale of plan to satisfy

the requirement of assemble. The height of the main hall should be more than 3.8 meters and enough free space for relax and prepare. As for natural day lighting, large and tall side window is the first choice here to promote the lighting. Besides this, the bathroom would be better to designed at the corner of the main hall to use.

### 3.4.6 Living and working classroom

#### 3.4.6.1 Cooking practice classroom

This kind of classroom teach blind children to self-service and ability to adapt the society through cooking lessons. Inside cooking classroom there contains teaching area, operating area, tasting area and kitchen ware collecting area.
The teaching area needs to have operation desk which contains cooer, water and electric to operate. The gap between teaching desk and other area should be left enough for security. As for student operating area, the operating desk and cooker are also necessary and the student should be divided into several groups with 2 or 3 members in each group. The operating desk needs basic tools and source as well as enough space for teacher to guide students. Tasting and eating area should add chairs to provide a space not only for students to taste, but also to listen to discussion. The location of this area could between teaching area and operatig area. As for kitchen ware collecting area, it is usually designed as a cabinet to put the tools inside.

#### 3.4.6.2 Living practice classroom

This kind of classroom help blind children get familiar with family life and daily activity surroundings to practice their self-caring ability which means interior layout needs to focus on the basic apartment living units, which include living room, bed room, kitchen and dining hall as basic unit. The square of each room should be larger than normal living units to make it convenient for teachers to guide these blind children. Different room could have different colours or materials to enrich the information that blind children could acquire from. The design of accessibility is also an important factor that needs to be paid attention to, especially in the kitchen. According to flexible change of interior space, the other space could be larger scale and divide with specific functional requirement later to satisfy demands of users.

### 3.4.7 Recovering and training room

#### 3.4.7.1 Massaging training room

Massaging could be regarded as the main method for blind people to work after they graduate. In order to make learning and practicing on the same step, the interior part is consisted with teaching area and practicing area. As for teaching area, it includes teaching desk, learning desk, book shelf and some teaching tools. The practicing area uses two desks as one group and the practice mode are interactive practice, which means the bed provided for students to operate need to keep distance with others in order to teaching and viewing. Also, the Diagnosis table and cabinet are needed in the massaging training room, besides this, the water tank should be added here to wash after operating. The massaging room needs to promote the ventilation and natural daylight in daily life, especially in operating period.

#### 3.4.7.2 Massaging intern classroom

Intern classroom has close relationship with practice room, however, by considering the service toward public, these kinds of rooms always have special and independent entrance to avoid crowded with other people flow. These kinds of rooms should provide space for resting and seeking for medical advice.

#### 3.4.7.3 Orientanol walking classroom

Through walking period, it is possible to make student form the concept of correct of time and space as well as the basic knowledge and skills about orientational walking. The target of this training is help student walk safely, effectively, independently in interior, school and public space. In order to raise their ability in adapting to society. The orientanol walking practice is not only inside classroom but could also be expanded to entire school to make use of entire spatial space of school. Basic conceptual practice, training before walking and leaning to use tactile sticks are main practicing programme in walking classroom. Training ground is the core of whole classroom, in which has different signal to show advancing, turning and stopping. By considering the security, the article warning should be on the boundary of training ground and keep adequate distance to the wall. Resting area and cabinet should also be settled close to the wall.

#### 3.4.7.4 Vision practicing room

Vision practicing room mainly focus on students with low vision and develop their potential possibilities by using assisting machine in a

relatively relaxing atmosphere. According to different functions, this practicing room could be divided into reading area, vision evaluate area and resting area. The private bathroom could be arranged inside of each dormitory to make it convenient for blind children to use, especially at night.

### 3.4.8 Living service room

#### 3.4.8.1 Dormitory

The dormitory should be divided by gender and each child needs to have 5 square meter using area. There are 4 or 5 beds (no double-layer bed) in each dormitory according to specific size of each dorm.

#### 3.4.8.2 Canteen

School Canteen uses window-selling method to sale food to raise the independent ability of blind children. The location of eating table needs to respect the behaviour habits of blind children to avoid crashing accident when students pass across the table. Meanwhile, the distance between two desks should be wide enough to allow dining car to pass. As for the location of cabinet, it needs to follow the people flow in the whole circulation of canteen as well as the programme order as waiting in row, buying food, eating, finishing and leaving. The proper flow is trying to avoid the across of flow and the open one the façade needs to promote the ventilation as well as dry of floor.

### 3.4.9 Space Joint and detail design

#### 3.4.9.1 Entrance

The entrance of blind children school has relationship with other factors as transformation of height, guide to people flow and information guideline, which requires wider entrance by comparing with normal entrance. If there is a height difference between outside and inside, stairs or ramps need to be designed to connect these two parts directly. Besides this, the location of the door should be in an obvious position to let blind people easy to clarify. If the entrance uses glass door it should be different with other glass curtain wall on the same volume. Furthermore, back space of the door should be left to make sure that the door could be open smoothly. If the lobby is needed, it needs to have a wider space without obvious orientation, which means like a hall in room.

### 3.4.9.2 Corridor

Due to the action radius of blind children is limited, the corridor could be regarded as a transporting space to connect each room, but also main activity space for breaktime activities. Through researching, a number of blind children like to run and play in the corridor, but the corridor has two types of functions as transporting space and interactive space, which means a larger space is required in blind children school. The rules require that the width of corridor should be wider than 2.1m to promote two people could pass at the same time.

### 3.4.9.3 Stairs

The stairs need to solve two problems as transforming of height and crowed evacuating. Basing on the specific characteristic of blind children, the design needs to consider more in humanization aspect. Besides satisfying the basic rules in normal school, the staircase in blind children school should also strengthen other two methods as liquidity and persuasive communication. As for liquidity, the width of stairs should be promoted to allow two people to pass as the same time. The rules show that the width of stairs should be more than 1.8m. A narrow staircase might cause the potential risk when blind children pass by. Also, the handrails are needed for the students. The requirements for the height of handrail is 0.9m for higher handrail and 0.5m for lower handrail. As for persuasive communication part, there should be the sing at the starting point and end point of each stair. Moreover, a yellow warning strip should be put in front of the first step of stairs to shunt the people flow. The warning strip could also be added at the middle part of the staircases.

### 3.4.9.4 Toilets

The location of toilet should be fixed by specific using and there should be a small space in the front of each toilet to avoid has direct connection with corridor. The urinal and toilet device should follow the instruction of blind people's needs in order to make sure that blind children could find the position of each device. The handrail on the both sides of device is also convenient for other disabled people such as people with wheelchair.

### 3.4.9.5 Door

Door is regarded as a space bound to divide outside and inside. Besides this, the door is also

the connecting point of different behaviour environment. The design of door needs to consider security, liquidity and recognizable. Due to the low version condition of blind children as well as the limited activity radius, the width of door should be enlarged by comparing with door in normal school, which requires the width should be wider than 0.9m. Moreover, the doors' types could also be designed in different to satisfy the different functional rooms in blind children school which includes auto-open door, sliding door and vertical hinged door, the swing door is forbidden. For the vertical hinged door, the direction of door needs to toward interior to avoid disturbing to people flow in the corridor. Furthermore, due to blind children's unawareness to unexpected obstacles which might result bump against, the door needs to be added as the shape with 'indent' without threshold if the door opens toward outside. Meanwhile, the altitude difference between inside and outside should be less than 0.15m and transformed by ramp. In some specific cases, the inspection windows are also necessary at the doors which is convenient for teachers to observe the students in class. A 0.35m apron should also be added on the door to avoid collision when blind children open the door. The handrails should be added on both sides of door and the handrails should be larger to fit different requirements of children such as the shape of 'L'.

Recognizable includes the position of door as well as name attribute of the door. In order to help blind children to clarify orientate the entrance of the door, some blind children school distinguish the material and colour between door and the wall to make a comparison as well as send the information in a more direct method. As for name attribute of different door, which requires the sign of language and braille for reminding and it should be easy touched by blind children. The height of these signs should be 1.2m to 1.4m above the ground. Meanwhile, prompt buttons could be added combines with position of signs to transform related information by voice system.

**3.4.9.6 Window**

The window needs to satisfy the function with natural daylight and ventilation, which means the interior space should have a uniform light condition. The width of window should be less than 1.2m and the height should be between 0.8m to 1.2m to leave a space for radiator below the window. If using the French window or lower window, the protected fence high 0.9m should also be added.
The classroom's wall that faces to inner corridor needs to open the window to promote the light balance inside room and the sliding door in proper in this situation to avoid influences to people flow in corridor when open the window to the outside.

#### 3.4.9.7 Wall

As main envelope enclosure of the rooms, the wall needs to have its own façade characteristics besides heat insulation property and sound insulation property. Due to blind children have behaviour in touching, the façade of the wall needs to choose relative clean materials to promote the smooth and abradable. By considering the touching frequency of the building, the protective enclosure should be added at the bottom of the wall and the height of it needs to be controlled around 1.2m with materials that contain elasticity, easy to be scrubbed, sounds absorption. As for music classrooms, acoustics panel or other sounds absorbing materials need to be added at the wall to avoid disturbing for other rooms. When design the connection parts of walls and pillars, the protruding part of pillars should be controlled the outer parts of corridor to avoid it appeared inside the rooms in order to promote the simply accessibility of whole space.

#### 3.4.9.8 Ground

The floors in functional rooms, staircases, corridor should be skid proof and easy to be cleaned. As for recovering room and utility rooms, they require the relatively soft but stretchy floor, such as glued wood flooring, plastic flooring and coil flooring to promote that the thermal of floor as well as shock reduction, only in this way it is suitable for blind children to have recovering training and sports activities. As we mentioned above, the floor in music classrooms need panel with good property to absorb acoustics to avoid the disturb the other floors below. Meanwhile, the differences of floor panel in different functions of rooms is beneficial for blind children to build realizing memory about different space such as main hall, corridor as well as interior rooms.

### 3.4.10 Environmental factors

#### 3.4.10.1 Acoustics

Acoustics could be regarded as the most important medium for blind children to experience the outer world. Due to obstacle in vision, blind children are sensitive with surrounded sounds, which requires the blind children school needs to create a quite atmosphere by comparing with normal school to help students receive information effectively.

On the one hand, it asks for the sound proof about outside environment, the site of blind children school should be in low noisy environment. The rules indicate that the noisy

level should be lower than 60db at daytime and 45bdb at night. Students dormitory should be far away from main city avenue. If the site is limited, the green area or green belt should be added surrounding the schools to reduce the noise as much as possible.

On the other hand, the school design needs to pay attention to noisy disturb among each classroom inside the school, which requires to divide different fictional rooms in different areas. For example, the utility room needs an independent area which is separated with other classrooms. Meanwhile, the design about sound insulation (wall, floor, window and fence) should try to reduce the disturb to the outside. As for interior part, the equipment that easy to produce noise should be covered with sound absorb material to create a peaceful interior space.

**3.4.10.2 Light**

In blind children school, some students are low-vision people which means they obtain remaining vision and light sensation. So that a lighter environment compared with normal school is required in blind children school. As location of classrooms should promote inside daylighting and the orientation of classroom could be in north to south direction to make inner light condition in balance. The width of the wall between two windows should be reduced and the rate of window and ground needs to be raised. When there is only one side open in the classroom, promoting the sunshine is released from left side of students' desks. As for artificial lighting, fluorescent lamp is the main choice due to its high light efficiency, long time and also with slants cold light color, which is beneficial for students to concentrate on. The distance between hanging light and desk should be larger than 1.8m and the layout order of lights should follow the axis perpendicular to the blackboard. The illuminance on the desks in classroom and laboratory should be more than 400Lux. As for students have lower vision conditions, local lighting condition is occupied to raise the lighting at the table and the rocker arm lamp.

**3.4.10.3 Heat**

The internal thermal environment includes air temperature and air humidity and these two factors have impact on students' living, studying and recovering, the speed that blind children touch the braille will be slow when the temperature is lower than 8 degree. Moreover, when temperature is lower than 5 degree, the constantly touching could only last for about 1 or 2 minutes. So that to promote the daily health and study, the interior temperature control is very important. The related rules indicate that the interior temperature in

classrooms of blind children school should be higher than 18 degree and temperature in massaging room should be higher than 22 degree. The heating facilities should also be adjusted according to the specific weather conditions in local area. In some area, terrestrial heating and radiator might be necessary to added. As for sports room or recovering room, the air conditions are needed to keep cool in summer and the position of the air conditions need to avoid accident. Air humidity affects evaporative cooling of students' skins and it might result the blind children feel uncomfortable in unproper conditions. Some rooms like toilets, canteens should pay attention to the dehumidification, ventilation. To be specific, in Tibet, the moisture conditioning is necessary to insurance the comfortable inside.

#### 3.4.10.4 Barrier free system

According to characteristic of physical and mental about blind children, the barrier free system should be targeted which means more detailed content with normal free system. In this part it includes liquidity, security, recognizable, comfortable and continuity.

### 3.4.11 Liquidity

The whole people flow of blind children needs to be easy accessed for blind children. Due to students get used to walk along the wall. Especially for the wall on both sides of staircases, it needs to reduce the barrier on the walking direction of blind children. As for outside walking path, the sports facilities, landscape monuments need to be surrounded with fence in case of accident.

### 3.4.12 Security

The security mainly solved the problem with the harm from outer environment and equipment to falling blind children. Main factors that result the damage are the edges and corners. So that these potential risks should be eliminated in the environment that blind children could touch. Some sharp corner should be hidden with cover and the materials of floor should use antiskid materials with good elasticity. Some activity rooms need protection pad on the wall to avoid accident and some inner columns should also be covered with protection pad.

### 3.4.13 Recognizable

Recognisable bases on three methods as hearing, touching and residual vision to remedy the limitation when blind children acquiring information

in order to provide the information guideline for them. As for the information guideline, foot information and hand information are two main methods for touching.

Foot information means feedback from blind children to ground, including the different materials of ground and design of blind road in training room. Adapting different touching materials in different functions of rooms is helpful for students to recognize the space directly. Moreover, the blind children could also have better walking behaviour in this solution. As for blind path, there are two kinds of blind path as blind walk road and warning blind sidewalk. The first one mainly guides blind children to walk straight with foot touching so that the walk road is straight and each slide is 5mm higher than the brick surface. As for second one, which reminds the turning point and end points of the blind path and the texture on these kinds of bricks are nodes which are 5mm higher than bricks surface. So that students could have a preparation in these points to avert unnecessary accidents. As a relative bright colour, yellow is always used in blind road.

On the other aspect, hand information bases on characterise of walking process to create logo with blind words to make it convenient for blind children to touch. Beside this, the blind words button and blinds words maps are also necessary at information desks and elevators.

Some students in blind children school still have residual vision which has grant help in their daily life. So that strong colour on the warning board is beneficial for transport the information to blind children.

### 3.4.14 Comfortable

By considering the issue of comfort in blind children school design, physiological limitation and human ergonomics are main aspects needed to be considered. The size of facilities and equipment needs to satisfy the using habit of blind children for providing convenience as much as possible. The warning board, button on the elevators and button of light should be designed at proper position for students to open.

### 3.4.15 Continuity

The path, stairs and barrier free paths should form a system to insurance the continuity of whole school. Besides this, the design of corridor and pillars should also be in grid system which is suitable for blind children when they are walking. The tip settings should keep faces together to avoid mixing the judgements of students.

| Room type | Critical illumination (lx) | Lowest daylight factor | Rate between window and ground |
|---|---|---|---|
| Classrooms | 200 | 3 | 1/3.5 |
| Offices | 100 | 1 | 1/7 |
| Corridor& toilet& stair | 50 | 1 | 1/7 |

The daylight factor and rate between window and ground in different rooms

Protection pad of column

Protection pad on handball frame

# Chapter four - Case Study research

## 4.1 Case study in China

This part of analysis is not only confined to blind children school but also other types of special schools. As one typical type of special schools, the blind children schools have commons with deaf school, school for mental retarded and special educational school. The spatial details could also be considered in designing blind children school. Researching in multiple types of schools is beneficial for blind children school to have a more comprehensive solution. Guangzhou, Beijing, Shanghai, Hangzhou and Nanjing are relatively developing areas for blind children school which means the current situation in these areas contain represented and reference value for design.

### 4.1.1 Guangzhou Blind Children School

#### 4.1.1.1 General Information

This blind child school was built in 1989 and located in Tianhe District, in which includes three educational methods as lodging, daily school and accompany study. The glossy architectural area is 4800 square meters which contains one teaching building and one dormitory. The initial school has 9 classes and 120 students which has expand to 19 classes and 220 students until now. Due to the raise of application, the hardware of school is lacked. Some special classes had to be changed to normal teaching class and the dormitory use double layer beds for blind children to sleep. The outdoor activity space is also insufficient so that school needs to borrow other schools' place in case of special performance.

#### 4.1.1.2 Current situation of Guangzhou Blind Children School

The school is close to local fruit market which means the traffic jam among people and cars, besides that, the narrow car lane and noisy are also potential safety hazard to blind children. The master plan of whole school could be regarded as a shape of trapezoid and the east part is more narrow than west part.

Due to the limitation of site, this school use centralization layout and the major part is teaching building and dormitory which are connected with each other. The main entrance is connected with Xinghua street and settles several massaging rooms open to the street but also connect with

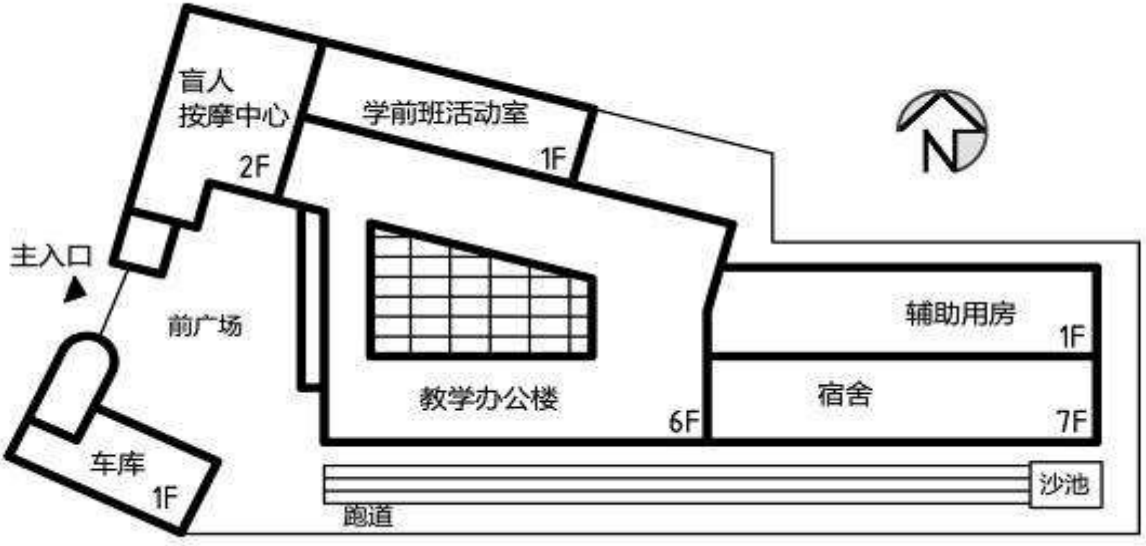
interior campus., which means this space is suitable for students to practice their skills. The teaching area formed in a winding corridor with 6 floors and one courtyard is in the middle for natural daylight. The first floor contains preschool education and sports recovering rooms. 2 to 6 layers are normal classrooms and special rooms. Due to the number of students are much more than required, some of special classrooms and recovering rooms have been adjusted to normal classrooms. The space of normal classroom is relatively small (43 square meters) but have 16 students in common. The whole atmosphere is classroom is crowded without free space for activity. Beside this, there is no heave on the boundary of desks so that the books might fell easily during class. There is no cabinet at the back of classroom as well as no other space to collect books and teaching tools.

As for massaging rooms close to street, it provides opportunity for students to experience and solves part of career issues at the same time. But for the massaging classroom in school, it has to be added in multiple functional meeting rooms and staggers hour with meeting time. Then turn to dormitory, all the beds in dormitory are double layers which is inconvenient for blind children. There are more than ten beds in one dorm so that the aisle is narrow which causes bad light and ventilation condition inside. Moreover, the number of bathrooms is in the dormitory which causes the bad light and ventilation condition inside. Moreover, the number of bathrooms is not adequate so that students have to wait in line at morning peak. The staircase in dormitory is narrow which cannot allow two people to pass at the same time. One of the most weakness part is that outside activity space is limited (only three tracks and one sand court close to the south wall). Meanwhile, the tracks are along the long side of teaching building which has disturb for daily teaching. Due to lack for interior public activity space, school overlapping a glass ceiling at the courtyard of teaching building to form a central activity space. Besides the main entrance pf teaching building, the width of other staircase is narrow so that it is inconvenient for blind children. The yellow warning tips are tagged at the beginning and ending of the staircase for reminding. As for other facilities in school, potting that close wall needs fence to protect to avoid accident and whole barrier-free facilities in campus needs to be designed in a clearer way.

#### 4.1.1.3 Research Conclusion

To be concluded, due to false in site choosing and site using limitation, Guangzhou Blind Children School could be regarded as a typical example which needs to consider not only the present demands but also the further development. As for architectural aspect, the layers of teaching building in Guangzhou Blind Children School has reached

6 floors which is higher than the requirements (no more than 4 floors). The current space in classroom and the dormitory is not enough and the sports activity space is also not satisfied with requirements.




Roof Plan of Guangzhou Blind Children School

Exercise in inner courtyard

Tracks close to building

### 4.1.2 Beijing Blind Children School

#### 4.1.2.1 General Information

This blind child school was built in 1874 and it was also the first blind children school in China, which is located close to Kunyu River. As the only blind school in capital, the whole architectural area of school reaches 31000 and includes basic education from primary school until high school.

#### 4.1.2.2 Current situation of Beijing Blind Children School

The school is surrounded with community and there is railway cross on the south 150m far from the campus. The old school entrance was in a small alley but after the expanding, the main entrance is moved to the north part of the school which is convenient for students and cars. Meanwhile, the blind massaging rooms are also planned to be added at the north part and also open to be public. This blind child school is combined by old campus and another technique school so the whole masterplan could be regarded as a shape of letter 'L'. The old entrance is kept but a new main entrance has been opened on the north of campus. The initial building layout are in line order from north to south which is teaching building, administration building, playground, dormitory and recovering building. Canteen is at the bottom layer of playground and connect with teaching building as well as dormitory with corridor. Meanwhile, outdoor recovering rooms are settled at north-east, middle and south part to have close relationship with volumes.


Roof Plan of Beijing Blind Children School

During constructing period, the basic educational activities are happened in old teaching building at the south part of whole campus. After the completion of new teaching building, the old one will be transformed to recovering building. The area of one normal classroom is small at present but will raise to 72 square meters when move to new building. There are two vocational education in Beijing Blind children school as Acupuncture and tuina as well as piano attunement. The major of tuina is the most popular major in this school which owns good reputation on society. The educational impact on the major of piano attunement is not effectively due to lack of connection with society. The tuina classroom is consisted with information desk, teaching area and practicing area. The information desk faces to the main entrance and connects to teaching area and practicing area which follows the real situation. Besides teaching tuina techniques, manners and behaviours are also taught here to help students get close to real working conditions.

As for interior multi-functional activity room, it locates at the second floor of playground and includes one basketball court as well as several activity rooms. The main structure of whole court is truss and wooden protecting panel are added at the bottom part of the wall. By different with normal basketball ground, the basketball hoop is hanged on the structure to eliminate the interior obstacle. The dormitory is divided into two part according to the different ages. The size of each dorm is 6.9 x 3.3m with 6 beds. Due to limited space, the bathroom is public rather than private. As the dormitory is new so that it keeps in a clean condition with full equipment. Beside this, school also uses the free between buildings to create sports recovering ground. One main activity space is football playground between dormitory and recovering building. There are green areas surrounding the football playground with mentioned board at the entrance. A number of students come here to play in leisure time besides sports class. After transforming, the handrails are added on both sides of staircases and office building. Moreover, red waning tips are added before first step to help student distinguish height difference.

#### 4.1.2.3 Research Conclusion

In a word, Beijing Blind Children school could be regarded as a successful case in transforming and functional adjusting. New master plan is in separate layout and there is connection between teaching and living area to create a complete spatial atmosphere. The courtyard between each building was used so that blind children could have recovering training more conveniently. As for architectural aspect, the usable area of each room is adequate and leave space for interior activities, individual tutorial and preparing room. According to its specific condition, Beijing Blind children school uses blind belt to replace handraril to satisfy the demands of blind children in more flexible way.

Ordinary Classroom

Massaing Room

Inner basketball court

Outdoor activity space

### 4.1.3 Zhejiang Blind Children School

#### 4.1.3.1 General Information

Zhejiang Blind Children School was built in 1989 in Fuyang and the whole architectural area is 13060 square meters. This school contains 23 classes in total right now (2 preschool educational school, 14 primary school class, 4 practicing classes and 3 high school classes). The current student are 241 and 87 teachers.

#### 4.1.3.2 Current situation of Zhejiang Blind Children School

This school locates on the side road of Jiangbing avenue which is surrounded by villages and field so that the whole campus is in a quite atmosphere. There is a big square in front of school with parking space to provide convenient for students. The general master plan is in a rectangle shape which is consisted with lobby square, sports activity area, teaching area, living area and recovering area. Each unit is settle separated according to different functions and connected with each other by corridor to keep the horizontal connection. The new teaching building was completed in 2002 at the south part of campus. The dormitory is divided into 4 floors by genders and ages and settled with canteen as one group. A new recovering building was built in 2011 at the north part of campus.

The size of normal classroom in Zhejiang Blind children school is 7.7m x7m with 6 to 14 students, which means that the general space is enough. Besides that, there are cabinets on the back and side along the wall to collect the teaching tools and books. The blind library is on the first floor of recovering buildings which is also a part library of Zhejiang library, in which collect both blind book and normal book. There are book collecting area, reading area and electric reading area. The whole space and ventilation are adequate inside but the floor uses white ceramic which is easy for student to slip when they are walking.

As for recovering building, as I mentioned before, it locates at the north part of whole campus and the inner corridor could reach at 2.1m. Inside it has vision training rooms, touching training rooms, low-vision self-study room, group tutorial room, individual tutorial, music room and tuita room. The inner multiple functional activities room is at the top floor of the teaching building and the size is 27.5m x 25m x 5.5m. There is one gate ball court at the central part which is also the core place to practice recovering training. A platform and some seats are also surrounded to stratified the main performance. The height of window is a little bit low with 0.9m without protecting net, which is unbeneficial for ball gaming. The whole floor uses wooden panel but

no soft protecting pad so that might happen during activity. There is one playground at the northern-west and adds some tools for blind children to do activities. Furthermore, a standard basketball court and swimming pool are between new teaching building and dormitory building. The size of swimming pool reaches 25m x 15m and the yellow waning pads are tagged on the boundary of pool. Besides this, there are two specific entering points for blind children along two ling sides of the pool. As for designs about stairs and corridor, the wooden handrails are on the both sides of the corridor and the waning pads is also added at the beginning of main entrance. As for corridor inside the old teaching building, the width is only 1.2m which cases the tracks when students are playing inside. As for the width of stairs, the width could reach 3.2m with handrails on both sides to connect with corridor. However, the surface of stairs use concrete slab with low property about slip resistance.

#### 4.1.3.3 Research Conclusion

To be concluded, the whole using area of Zhejiang Blind children school is adequate and the masterplan is in a trend of separate. Different functional building is designed in individual volume to be clarified and connected with corridor. The project considers the further developing and expanding issues which means they leave the enough spaces for the future. As for architectural aspect, different functional buildings and related educational equipment are complete for daily teaching. The width of some parts of corridor and materials about stairs need to adjusted and improved in the future to reduce negative impact.

Blind reading area in library

Low vision reading area in Library

### 4.1.4 Shanghai Blind Children School

#### 4.1.4.1 General Information

The Shanghai blind children the oldest blind children school as well as the only special school in Shanghai. The school was built in 1912 and moved into new site in 1931. The whole architectural area is 13000 square meters with unitive architectural style (a core square grass at center and surrounded buildings). There are 210 students with 45% blind children, 55% low vision student, 10% disabled children. Besides this, this school has the only one blind print factory in China.

#### 4.1.4.2 Current situation of Shanghai Blind Children School

The school locates in Hongqiao District which is surrounded by resident's community so that the whole atmosphere is relatively quiet. The front square is crowded and collect with public roads bblind roads so that the whole blind system is complete. There are two tuina shop close to main gate and open to public in order to provide social service to surrounded community. The general using area is adequate and the main entrance locates at north-east part, besides this, there is also one entrance for logistics at the west part. The

As for teaching building, the layout shows the corridor is outside but only one side. There are total four floors include normal classrooms, computer classrooms and chemistry laboratory. The size of normal classroom is 8m x 6. 9m (55 square meters in total), the cabinets are at the back of classrooms. There are 12 to 14 students in one classroom and the assisted lighting is put at each desk. Handcrafting classrooms include paper cutting, ceramics and flower arrangement. The size of window inside is not enough for inside and the floor is little of slipper. Meanwhile, the width of corridor is narrow in 1.2m which is not enough for 2 people to pass at the same time. This is a security problem for emergency situation. The playground is at the central part of the green area and has connection with other blind pathways. There are three one-hundred tracks and one football court on the south of teaching building but without enough relief area for blind people. The corridors are used to connect dormitory, canteen and administrative building which means the general layout of campus is separate and the corridor is helpful to build barrier-free accessibility. Meanwhile, the corridor could be expanded in continue to strengthen the communication among teaching building, dormitory and canteen. The width of corridor in teaching building is 1.5m with wooden handrail on both sides Moreover, some part of area is enlarged (staircase, the entrance of toilets) to create a space of hall. The width of staircase is about 2.5m also with wooden handrails on both beginning

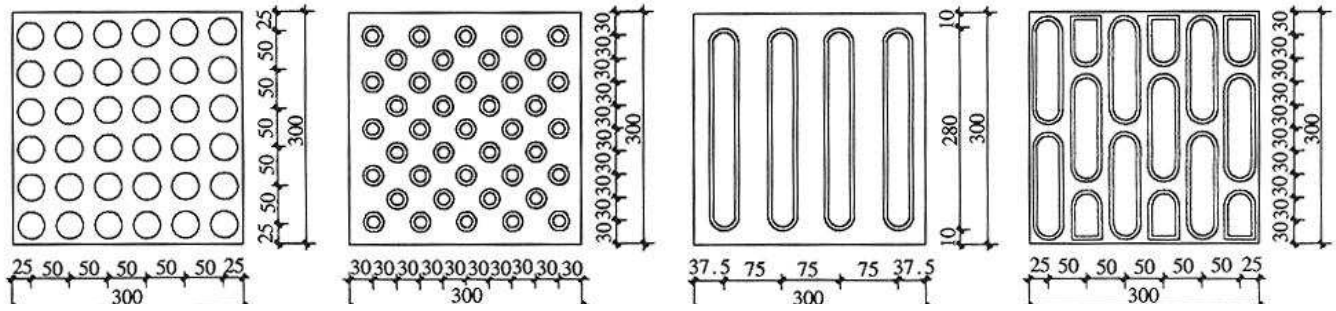
sides. Meanwhile, the warning pad is tagged at the of staircase in yellow and black to help low vision students clarify the height difference. As for other barrier free design. Shanghai Blind children school adds a blind map at the main entrance of campus to help student experience environment of whole school directly and build general system of whole space. The whole barrier free system of school is complete but the connection between these units need to be strengthened to emphasize the connection in horizontal direction.

#### 4.1.4.3 Research Conclusion

The whole urban design of Shanghai Blind Children School is uniform and the master plan is units surrounded. As for architectural aspect, due to dormitory is historical building, which means the improvement and changed could only be allowed in interior design and equipment update rather than exterior design. The initial corridor inside is narrow and the natural daylight inside is not enough is difficult to solve due to objective environment.

Computer room in Shanghai Blind School

Corridor to connect different buildings




Blind Path in Shanghai Blind Children School

### 4.1.5 Blind Children School in Nanjing

#### 4.1.5.1 General Information

This initial form of this blind children school was a blind and dumb school which was built in 1927. The school was separated as two in 1981 and rebuild the new blind children school in 2004. The gross architectural area is 10052 square meters and there are 76 teaching staffs, 202 students in nowadays.

#### 4.1.5.2 Current situation of Nanjing Blind Children School

The main street in front of entrance is crowded by car flow which affects the daily teaching and activity in school. Due to lack for enough buffer zone, the school is close to the city road and leave the ground empty to create the main entrance.

The general plan is in a concentration trend and the main volume is teaching building and dormitory, the connection part among these two volumes is administrative building. A public square and sports playground are located at the open space surrounded by other buildings. The first and second floor in teaching building contains preschool education classrooms and normal classrooms. The high school classrooms and special classrooms are at three and forth floor. The size of normal classroom is 8.4m x 6.9m and there are 10 to 14 students in each class. The interior space is adequate and the cabinets are at the back part of the classroom. The size of multiple activities room is 24m x 14m x 3m, the height is a little bit lower for interior activity. There is one blind gate ball court with yellow warning pad on each boundary. Meanwhile, the wooden protecting panel is added at the wall but the window lacks the protecting screening. The recovering equipment in school is complete and the touching training room, vision training room are both designed at the first floor of teaching building. Meanwhile, the multi-functional training room, orientational walking room and shape-up exercise room are in the negative layer. The floor in orientational walking uses PVC plastic ground and two steel tool tips on both sides of boundary. Nanjing Blind children school also has a massaging room that faces to the public to provide opportunity for students to experience the society and solve the career problem in a way. The massaging room includes rooms for massaging, tuina, pedicure and acupuncture. The first floor of dormitory is canteen and dorms are in 2 to 5 floors. There are 6 beds in one dorm and the bathrooms are close to the entrance. The balcony is at the bottom of whole room so that the only way to get natural day light is from the door of balcony. Due to lack of enough using area, there is not annulus tracks in the school but 5 one hundred tracks and one basketball court on the opposite of the main

entrance. As for corridor, all of corridors are on slide with 1.7m to 2.2m wide and handrails. The warning pad was tagged before the door of each room to remind student. The width of staircases is 4.2m and also added yellow warning board at the

#### 4.1.5.3 Research Conclusion

Due to the limited using area, close to city road, loud noisy and large people flow, this blind school uses concentrating layout to create a close relation among each building. But the inner circulation is a little bit chaos such as the people go to massaging rooms might have cross with blind children who wants to go to canteen. As for architectural aspect, the equipment in every room is adequate and the space of staircases is relatively loose. However, the dormitory building has 5 floors which does not satisfied the rules. Furthermore, the natural light conditions in dormitory and some teaching rooms is not enough.

Vocal music classroom

Instrumental music classroom

Touching experience classroom

Vision practice classroom

## 4.2 International case study

### 4.2.1 Centre for the Blind and Visually Impaired in Mexico

The Centre for the Blind and Visually Impaired was created as part of a program by the Mexico City government to provide services to one of the most disadvantaged and highly-populated areas of the city; Iztapalapa is the district with the largest visually impaired population in the Mexican capital.

The 14,000 sqm complex is on corner plot bordered by two avenues. A blind wall encircles the complex on its four sides and acts as an acoustic barrier as well as a retaining wall/blank to hold the earth moved from neighbouring wasteland areas. In contrast to the abstract exterior, the internal facade of the boundary wall creates banks that change shape, height, and orientation, thus creating various courtyards. The floor plan, meanwhile, can be read as a series of filters which stretch out from the entrance in parallel strips. The first filter is the building that houses the administrative offices, cafeteria, and utility area.

The second consists of two parallel lines of buildings organized symmetrically along a central plaza. These buildings contain a store, the "tifloteca-sonoteca" (a sound and touch gallery) and five arts and crafts workshops.

The third filter has the classrooms facing the gardens and the most private courtyards. Perpendicular to the entrance, a series of double-height volumes house the library, gymnasium-auditorium, and swimming pool. The buildings are rectangular prisms, based on concrete frames and flat roofs. Each group explores different spatial and structural relationships, making each space identifiable for the user and varying size, light intensity and weight of materials: concrete, tepetate bricks, steel, and glass.

For Mauricio Rocha architecture must be genuine, where a totally new configuration which may include a remembrance of the past, but transformed or framed in terms of its significance for today, as a good example the Centre for the blind and visually impaired show how regionalism work in contemporary architecture.

‘The buildings are rectangular prisms, based on concrete frame and flat roofs. Each group explores different spatial and structural relationships, making each space identifiable for the user and varying size, light intensity and weight of materials: concrete, tepetate bricks, steel and glass.’

The centre aims to enhance spatial perception, activating the five senses as experience and source of information. A water channel runs through the centre of the plaza, so that the sound of water guides users along their way. Horizontal

and vertical lines in the concrete at hand height offer tactile clues to identify each building. Six types of fragrant plants and flowers in the perimeter garden act as constant sensors to help orientate users within the complex.

The project focuses on the importance of integrating all the elements that characterize a place, such as climate, topography, light, sense of touch, construction mode among others. He also incorporates aspects that are within the cultural context.

The Centre aims to enhance spatial perception, activating the five senses as experience and source of information. A water channel runs through the centre of the plaza, so that the sound of the water guides users along their way. Horizontal and vertical lines in the concrete at hand height offer tactile clues to identify each building. Six types of fragrant plants and flowers in the perimeter gardens act as constant sensors to help orientate users within the complex.

Centre for the Blind and Visually Impaired in Mexico

### 4.2.2 Kagoshima Prefectural Kagoshima School for the Blind

In this blind school, Space designed with utmost care so that children can live safe and secure. A corridor that runs straight from the entrance to the field—from north to south—is at right angles to the school buildings to form the spine of the entire space. The simple space structure ensures easy movement and worry-free activities by children. Overall features of the facilities Kagoshima Prefectural Kagoshima School for the Blind is designed such that children with visual impairment can learn safely, securely and without inconvenience when possible. Layouts and colour schemes that help spatial recognition are adopted. The school building is built away from busy public roads to minimize external stimuli such as car noise and exhaust to children with acute senses of hearing and smell. Facilities with maximum safety and security when moving from one place to another. A corridor that runs straight from the entrance to the field—from north to south—forms the spine of the entire space. The simple space structure ensures easy movement and worry-free activities by children. Spaces such as an administration building, classroom buildings, a clinical building and a dormitory are all at right angles to the corridor to help children find where they are. Blue colorlines with finely textured surfaces are painted in the centre of the corridor floor so that totally blind children can also check the central position by feeling the line under their feet. A colour scheme to facilitate discerning by the visually impaired is implemented using the difference between warm advancing colours such as red and yellow on one hand and cold retreating colours, such as green and blue on the other. Dark brown baseboards are used in corridors and classrooms to make the boundary line between the floor and wall easily discernible. Colour contrast is adopted for treads and risers of stairs to help recognition and blue rubber are used to prevent skidding. For the indoor swimming pool, a colour scheme based on blue and yellow is used to clearly distinguish the pool sides from the water surface. The school is bright as a whole. However, emergency exits against the sun are equipped with shading curtains to avoid excess light preventing sight.

The first aim of the school is improving the learning and living spaces, the school follow the rules to ensure that facilities with maximum safety and security when moving from one place to another. For example, (1) The boundary between the floor and the wall is highlighted by a dark baseboard and blue antiskid rubber is attached to stairs so that children with visual impairment can easily recognize and use them safely. (2) Emergency exits against the sun are equipped with shading curtains to avoid excess light preventing sight. (3) An opalescent polycarbonate roof of the

connecting corridor. (4) Benches for rest are installed in corridors in a way that they do not get in the way of other children. (5) For the indoor swimming pool, a colour scheme based on blue and yellow is used to clearly distinguish the pool sides from the water surface. The pool is equipped with an aeration function (bubbling from the bottom) at the five-meter line from the goal. (6) Handrails are installed also on doors so that the handrails on corridor walls continue seamlessly for children who walk holding on to them.

Another target is meeting educational needs of each child so that all facilities and equipment to support each child's learning. (1) Power is supplied from the ceiling in classrooms to enable the use of visual aid equipment in daily learning. (2) Blackboards are used to make chalk lines more easily discernible. (3) Perforated boards are used for walls of the gymnasium to reduce echoing. The lower parts of walls are covered with cushioning material to improve safety.

An opalescent polycarbonate roof is used for the corridor connecting classroom buildings to the dormitory and the gymnasium to reduce ultraviolet rays. Benches for rest are installed in corridors in a way that they do not get in the way of other children. Handrails are installed also on doors so that the handrails on corridor walls continue seamlessly for children who walk holding on to them. An emergency exit and outdoor stairway are installed at the end of the corridor of almost all buildings two stories or higher. In addition, equipment such as guidance lights with sound, call alarms and security cameras are installed for emergencies. Furthermore, there are als o some designing facilities to help each child's learning activities. Classrooms are equipped with image-enlarging video systems and desk lamps, and have enough space and power available to use them. Power is supplied not from the floor but from the ceiling to prevent cables from obstructing moving from one place to another. Image-enlarging video systems are also in special rooms such as the library and science rooms so that they are available whenever needed. Blackboards are used to make chalk lines easily discernible. For indoor lighting, equipment with twice the illumination of standard equipment is used. Their illumination is adjustable with a dimmer control. Windows are equipped with shading curtains to adjust the light from outside.

A third target is developing spaces conducive to the improvement of vocational education in partnership with business firms. This part includes (1) The practical training room of the clinical building has therapy booths to ensure the privacy of users and an auto-flush hand-wash station for hygiene control. (2) The clinical building has an entrance, a reception desk and a waiting room dedicated for people of the community who

come to use the service. (3) In addition, there is a physical therapy room equipped with room runners and various instruments for preparation for certification exams. Perforated boards are used for walls of the gymnasium to reduce echoing and because children can sense the movement of the ball and people through hearing when playing a ball game. In addition, the lower parts of walls are covered with cushioning material to reduce the impact of collision. The advanced course of the high school provides training to be certified as massage and finger pressure practitioners, acupuncturists, and moxibustion practitioners. The school has a large clinical room for practice, where children provide service to people of the community as part of their practical training. The clinical building has an entrance, a reception desk and a waiting room dedicated for people of the community who come to use the service. In addition, there is a physical therapy room with equipment necessary for preparation for certification exams.

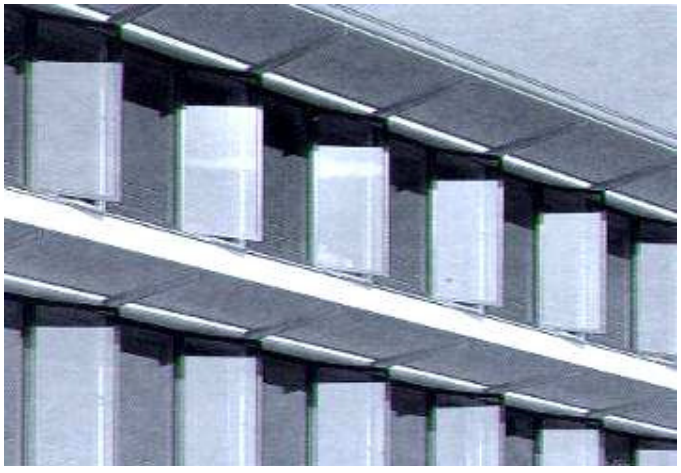
The school moved to this place in April 2011 due to the aging of the former school building. The old school building was used also as training facilities, which was the cause of its complex traffic lines. When designing the new school building, we pursued safety, security and amenity through colour schemes and corridors with good visibility, for example, believing that “a school should be a place where children feel safest.” However, we feel the need for efforts such as on-site training using external facilities that are not barrier-free to help children become self-reliant in the real world.

Though individual elements of the consideration for the visually impaired are found also in other schools for the blind, only a few schools pay such great attention to detail. Furthermore, the process of planning where about 20 meetings with participation of the teacher were held to gather opinions serves as a useful reference. On the other hand, the waiting room for outpatients could be designed as an independent room rather than an open space for air-conditioning efficiency and privacy reasons.

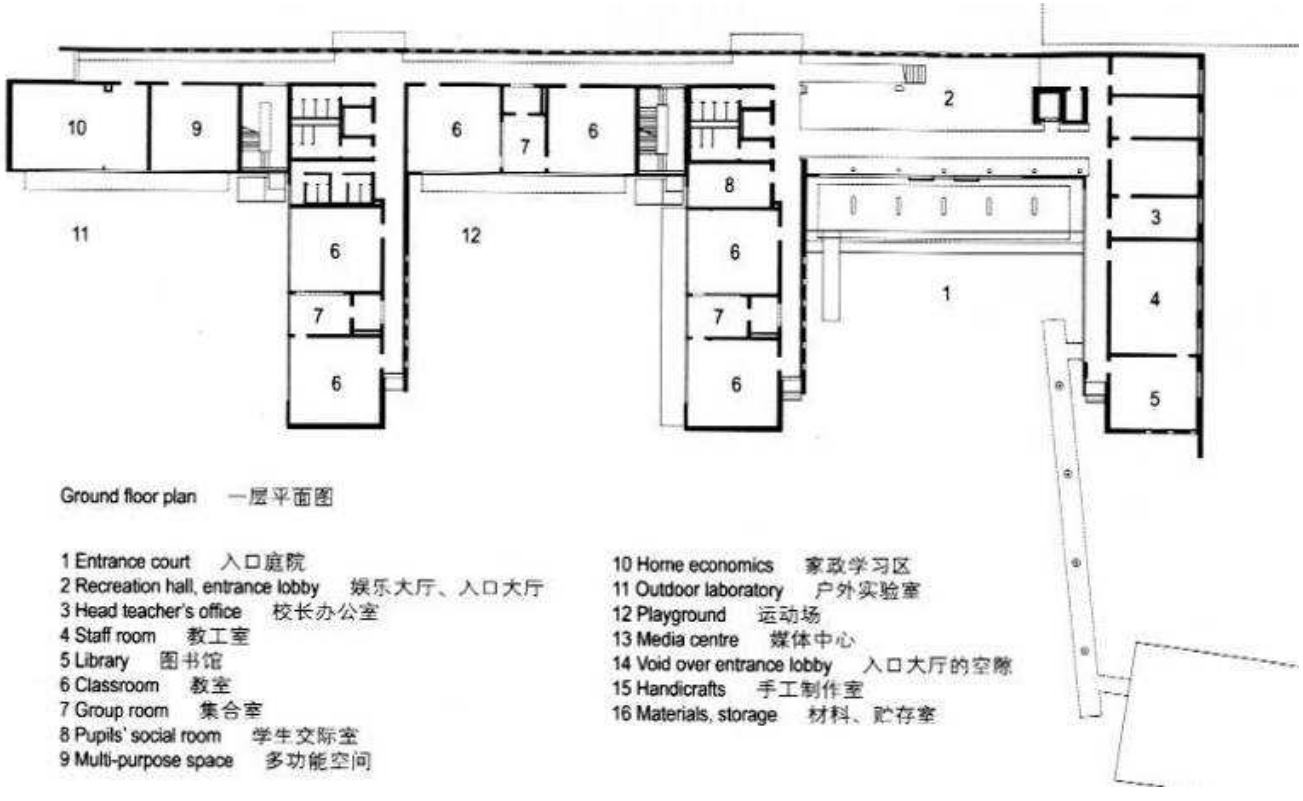
Multiple functional activity space

Cooking training classroom

Ordinary Classroom



Windows on facade




First floor plan of Kagoshima Prefectural Kagoshima School for the Blind

# Chapter five – Design Strategy

## 5.1 Volume & courtyard & frame

There are a number of places and historical monuments in Lhasa and the floor plan of these buildings have special local characteristics. The columns, grid system as well as the design courtyard have inspiration for our design proposal. We collect the resources of these buildings in order to find some factors and items that could be used in our design. As for old buildings, the old residential buildings could be a main research target to investigate related to the blind children school.

The general layout type of Tibetan residential buildings is inner courtyard cloisters from which includes two or three layers. There is a well in the courtyard and the toilet is always locates at the corner of courtyard. As for buildings in city or town are mainly self-constructed flat building with private courtyard by handcraft or framers. To be concluded, there are three types of local buildings as nobility mansion, larger resident building and house for normal family. Generally, all these types of building include at least one courtyard which is the rectangle shape in the house of normal family. The nobility mansion is more dedicated than other two types which has more strict demands in material quality and detail techniques. This type of building has three floors of main building with several annexe buildings. The main building follows the rules with symmetry and strict order of classes. As for annexe buildings, the highest floor is usually decorated with ornamentation on the door and window as well as balcony to create a stately atmosphere. The annexe is usually one floor lower than main building and surrounds the main courtyard, which also has a corridor towards room upstairs. The ground floor of both two types of buildings are used for stable and warehouse. Larger resident building belongs to government agency or wealthy temples in the old time, which is used a temporary break point for business man at the beginning and develop to residential building accompanied with the development of city. The design of traditional residential building does not pay attention to positive symmetry and the third floor is usually painted by loam bricks to ensure the firm of whole building. Inside the building there are also few of embellish room which is provided for the host and relations. As for the building for business man, it usually has two floors with exquisite craft. This type of building is not only provided for people to live, but can also be used like shops and warehouse.

### 5.1.1 Pomdatsang mansion

Pomdatsang is located at the intersection of Barkor South and Barkor East. This is an important corner where the Barkor branches off into a narrow alley earlier used for religious processions. The building was entirely rebuilt after several damage in violent outstanding of Chinese garrison in 1921. This was undertaken by Pomdatsang's owner, Tsarong, the main reformer during the region of the 13th Dalai Lama. In 1923, Tsarong decided that the town was too crowded that mov to a new big house near the Kyichu River, at the time well outside Lhasa. The Barkor Residence was sold to the very successful East Tibetan trader, Pomdastsang. The new layout of this mansion has clear circulation and volume arrangement which follows the traditional rules of Tibetan buildings. From the plan we could discover that each volume has clear connection with others but also independent at the same time. Besides that, the layout of the columns is also similar with the traditional layout of temple in Lhasa. During this resident's house the designer considers the orientation of the house, the height of which volumes in vision, the connection with urban surrounded and the relation between courtyard and surrounded buildings could also be used for reference for further design. This type of building is always transformed form the hotel for business so that the detail keeps simple type and functionality.

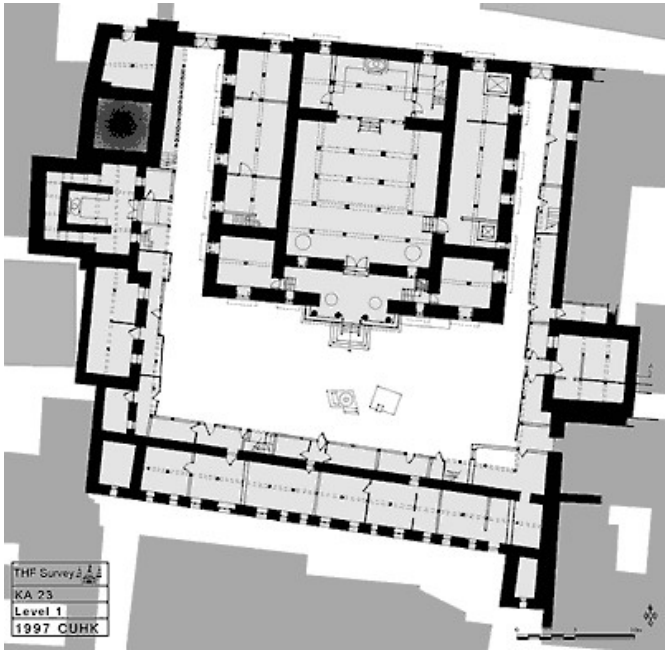
### 5.1.2 Muru Nyingba Monastery

The typical layout of a temple is consisted by a main building which is surrounded with annexe buildings. The annexe buildings are sued for residential houses for Buddhists (a number of these buildings have transformed to public buildings in nowadays). The height of main temple could reach at four floors with religion symbol and decoration at roof top. The main temple is represented by an individual building without courtyard. There is an open public space in front of the building for religious rates. These kinds of buildings have various different heights and the low-status Buddhists always have activities from first floor to the third floor. The general floor shape could be in simple but quadrate or in mandala.

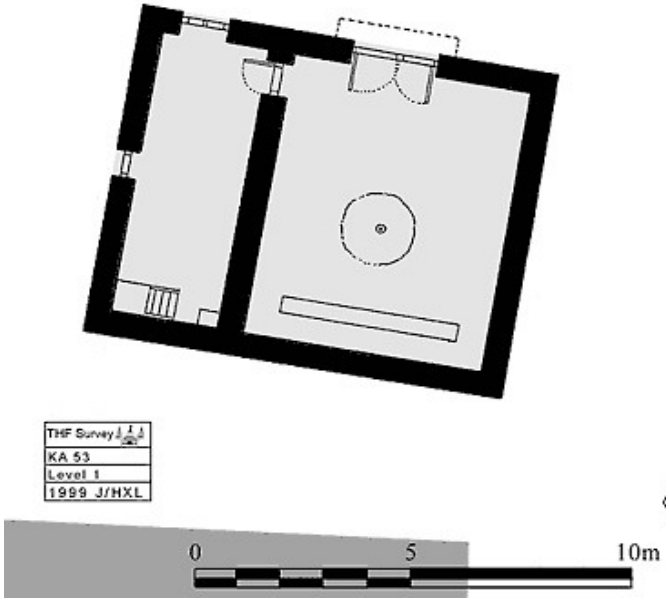
Another important building in this temple is Ma-ni-ha-khang, which has two rooms in side, two care monks are living in one side room and the other one room is occupied with runner and small altars. All of pilgrims will enter the room to rotate the runner. The runners are fulfilled with written scriptures and carven scriptures.

By comparing with pervious residential building, this temple has bigger scale as well as complex functional room combinations. However, the layout regulation rules and circulation about people flow

still have similar with old residents' buildings. To be specific, all of other rooms are surrounded along the outer wall and the open space between main hall and other buildings could be used as sacrifice site as well as corridor. Each volume seems to have close connection with others but also keep independent property from façade view. Furthermore, the boundary of the path is also clear enough in different functional area to distinguish.




First floor plan of Muru Nyingbo Monastery




First floor plan of Ma-ni-ha-khang

## 5.2 Façade Design

During this paragraph we investigate two types of facades in Tibet. The first is the façade of temple and the other one is the façade of residents. As for temple façade, it has strict impact from religious order, which means the colours, the façade, the the open orders of windows have strict orders. To be specific, the main temple and chanting temple always have small and narrow which results a little natural daylight release into the interior, in this way it would create a solemn and respectful respectful

atmosphere during Buddhists activities. However, the larger windows are always at the living space or dormitory of monks as they require a lighter inner environment. During we find that we found that the window opened regulation in religious building do not follow the functional rules but the religious standard which is not suitable in our project so we turn our attentions to residential buildings in Lhasa. The residential building decreases some parts of complex elements from religious buildings but still keep the Tibetan style. The window open follows the demands of different functional rooms to satisfy the natural daylight of each room as much as possible. Besides this, the transition od window and window frame could also be adapted and improved to used for the blind school project. By considering this, we concluded tree main elements of traditional Tibetan residential buildings and try to transform it in a more modern way to fit with the blind children school project.

### 5.2.1 Eaves and façade regulation

In every Tibetan residential building it is covered by the eave to prevent the building from sunshine and also emphasize the independent of each volume clearly. To be specific, eave of each building could be regarded as not only decoration but also a symbol. However, due to the complexity and religious meaning contained in old eave, the new eave in blind children school would keep the colour and the function of it rather than the complete form, which could also be called as a new type of eave.

### 5.2.2 Characteristics of windows

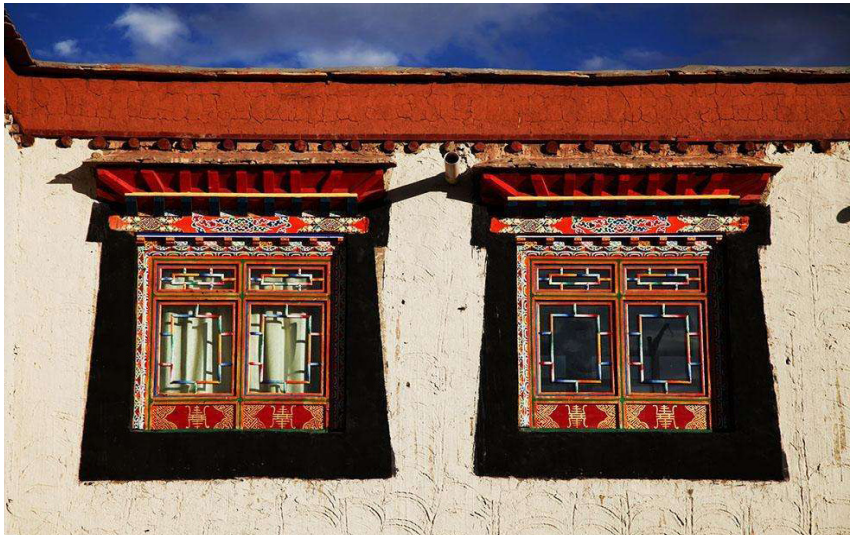
#### 5.2.2.1 The scale division of windows

The scale division of traditional residential buildings are still in an old fashion which copy the window from temples, which lacks creations and change. The new windows would not be in very large scale to preserve the heat of building. On the other hand, a relatively simple but clear sale division of windows could also from a contrast between windows and heavy wall of façade. The new size of window division satisfies functional demands as well as light shadow effect.

#### 5.2.2.2 Window decoration

The new type of decoration of the window is also selected from traditional shape but in a more conceptual and abstract style. One of this is window with wooden frame and the other one is multiple small eave windows. To be concluded, the similar functional rooms are required to used one type of windows to also clarified the public and

The traditional window of Lhasa



Traditional decoration of Lhasa

Typical window in Lhasa

private. The classrooms would be one type, dormitory would be one, office and other rooms could also be another type.

### 5.2.3 Architectural colour and materials

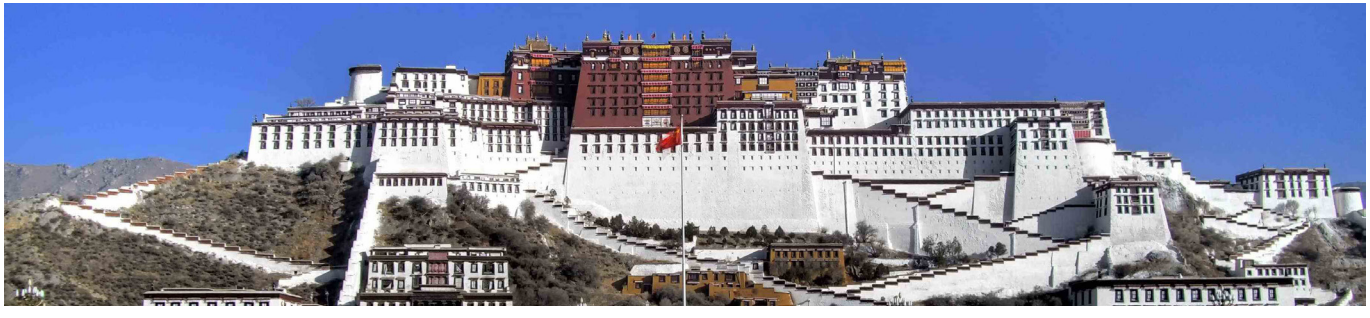
In Tibetan culture, white represents religious meaning, such as the Potala Palace, which brings impression with divine and shows a sacredness and strength. In a scientific sense, white can resist strong ultraviolet radiation on the plateau.

Red represents noble, extraordinary and refined, and is generally used for the decoration of palaces, temples, and aristocratic manor walls to show majesty.

The low walls in the residential buildings, the doors and window trims are told to use black. The exterior wall of the courtyard is also decorated with black, which means exorcism and demon to prevent invasion by foreign enemies.

White architectural element in Lhasa

Red architectural element in Lhasa



Potala Palace

# Chapter six - Design Drawings

1909 1:80000

1948 1:100000

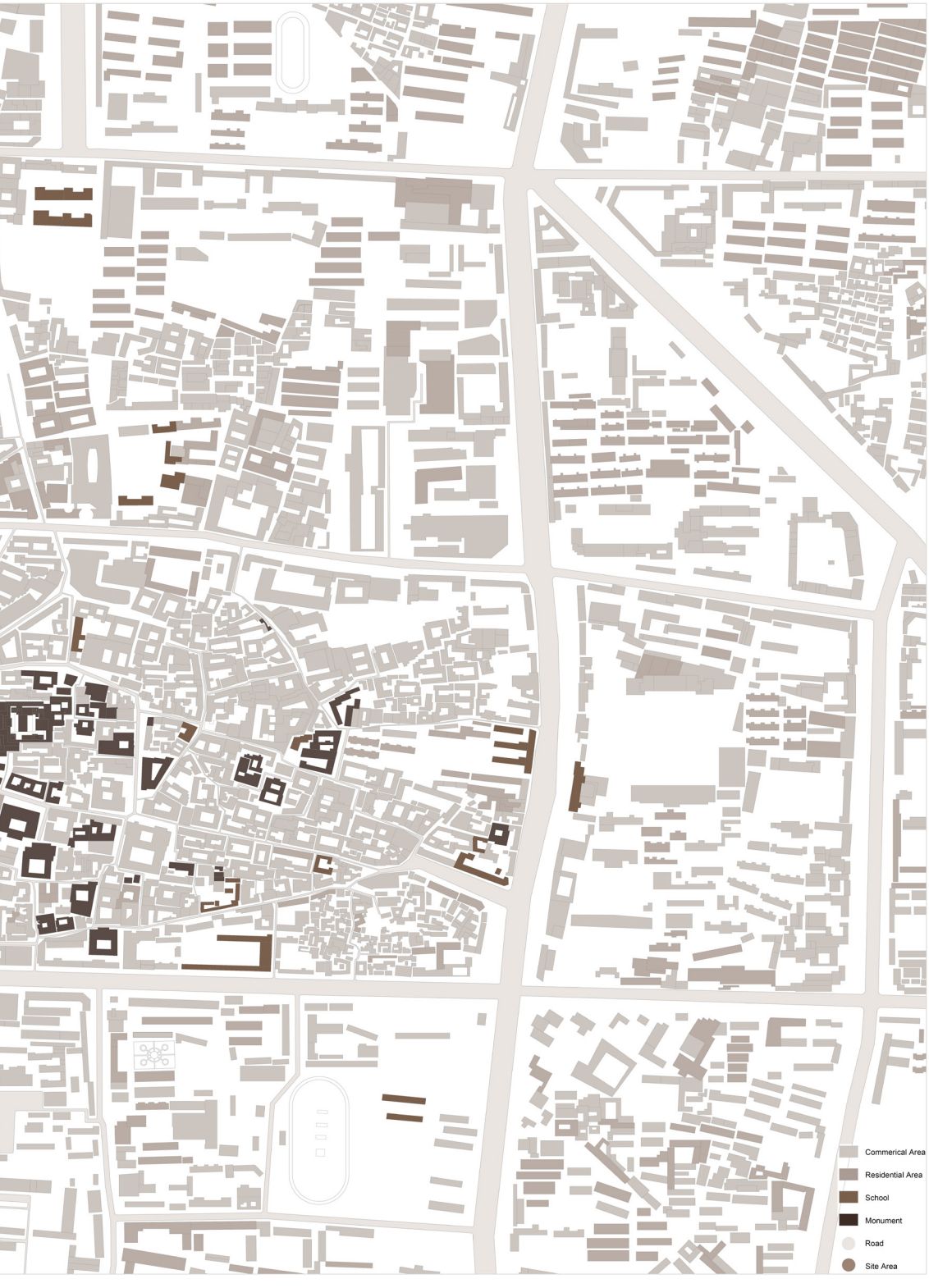
1959 1:100000

1985 1:20000

DEVELOPING PROCESS OF LHASA 1:5000


1905
1948
1959
1985
After 1985

FUNCTIONAL DIVISION OF LHASA 1:2000


Commerical Area
Residential Area
School
Monument
Road
Site Area


Number of schools in regions of Tiibet in 1950


Number of schools in regions of Tiibet in 2010

The bli
impairm
educatio
utilize th
The cap
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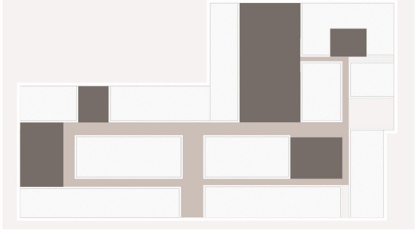
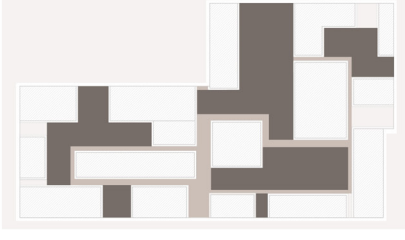
## DESIGN STRATEGY

The initial idea is four courtyards as one main large courtyard and three relatively small courtyards. All of these courtyards could be connected by corridors. After that, we start to adjust the shape and composition of each courtyard as some courtyard might have tiny connections with other second level courtyards. Besides that, the four main courtyards also expand or merge to other open space in school to create the new form of courtyard.



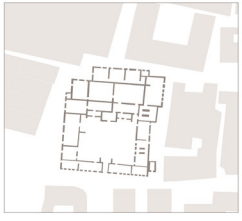


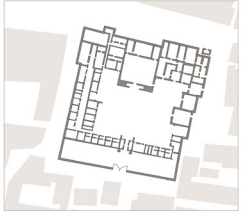
nd children in Lhasa, it towards blind children with visual ent from every corner of Tibet. The blind people will accept basic on and living skills during study period without tuition fee in order to em in further study or social living after the graduate.

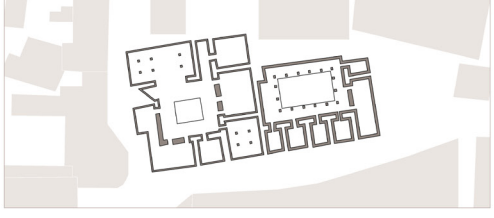
ital source of this blind children school in Lhasa is mainly relied on onation every year.

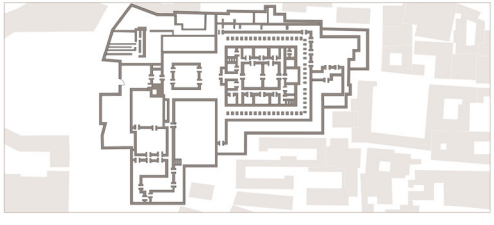
hool' is just the residential building locates at the corner of a deep hout enough adequate activity space and the place for children to as to occupied by three-level bed. The whole number of students in re 40.

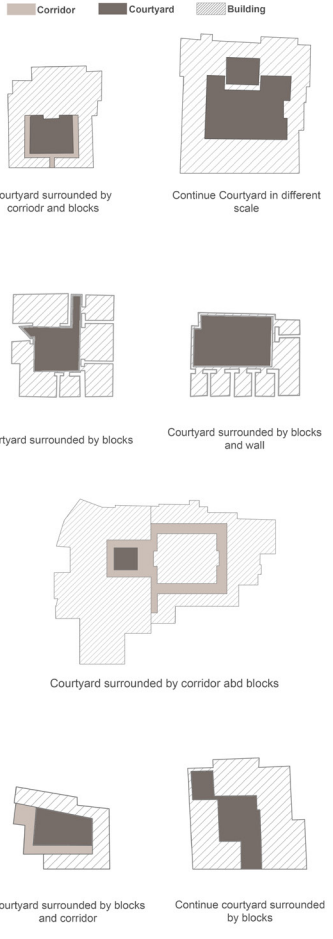
**Current situation of blind childrenschool in Lhasa**

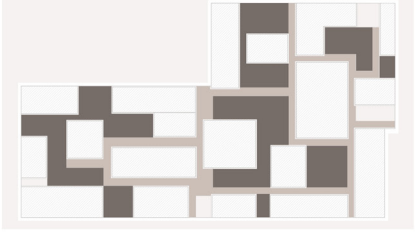








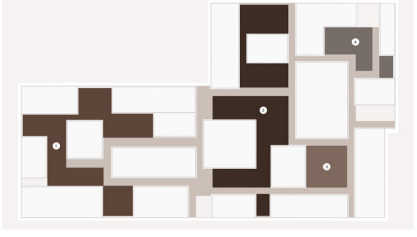


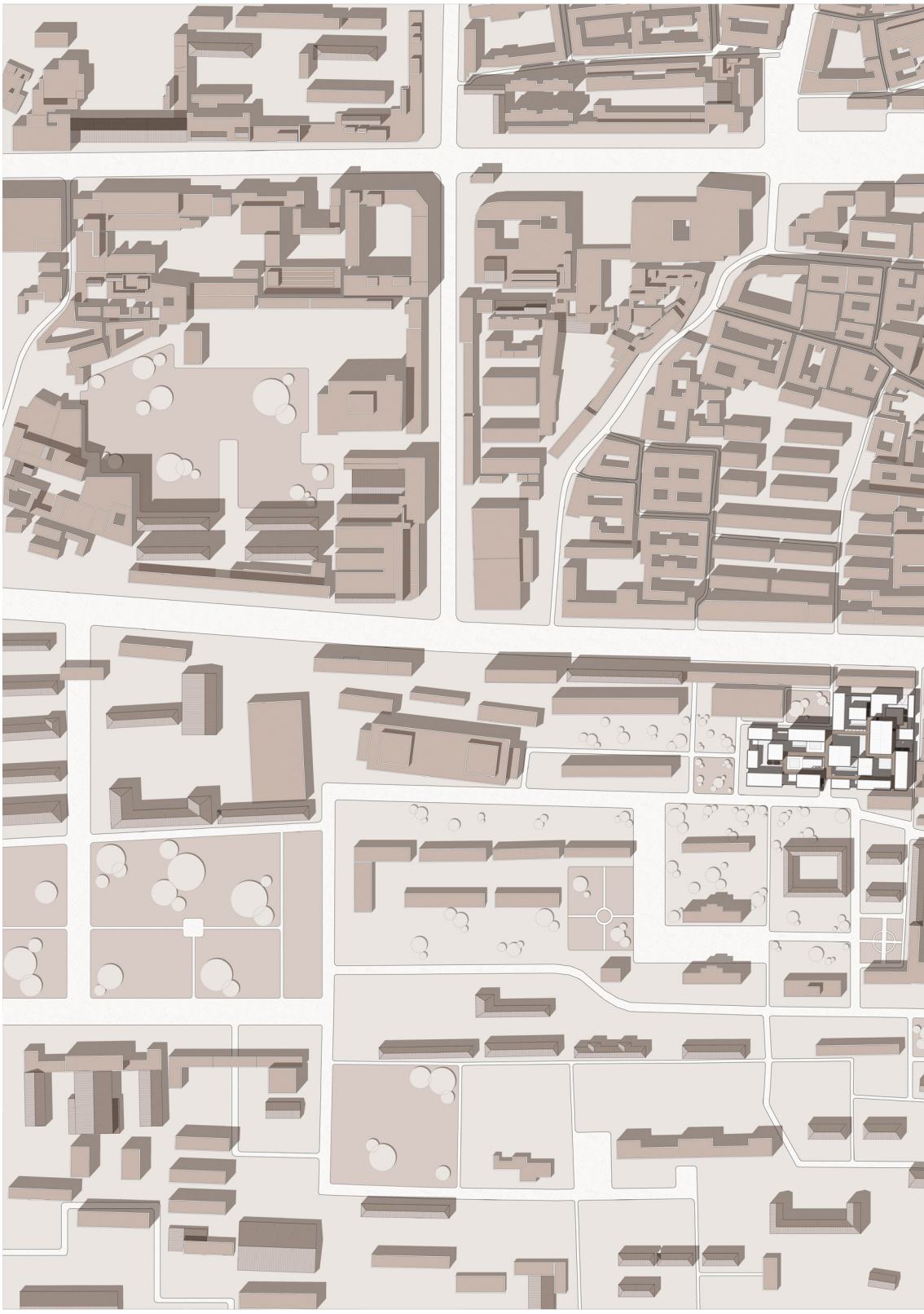



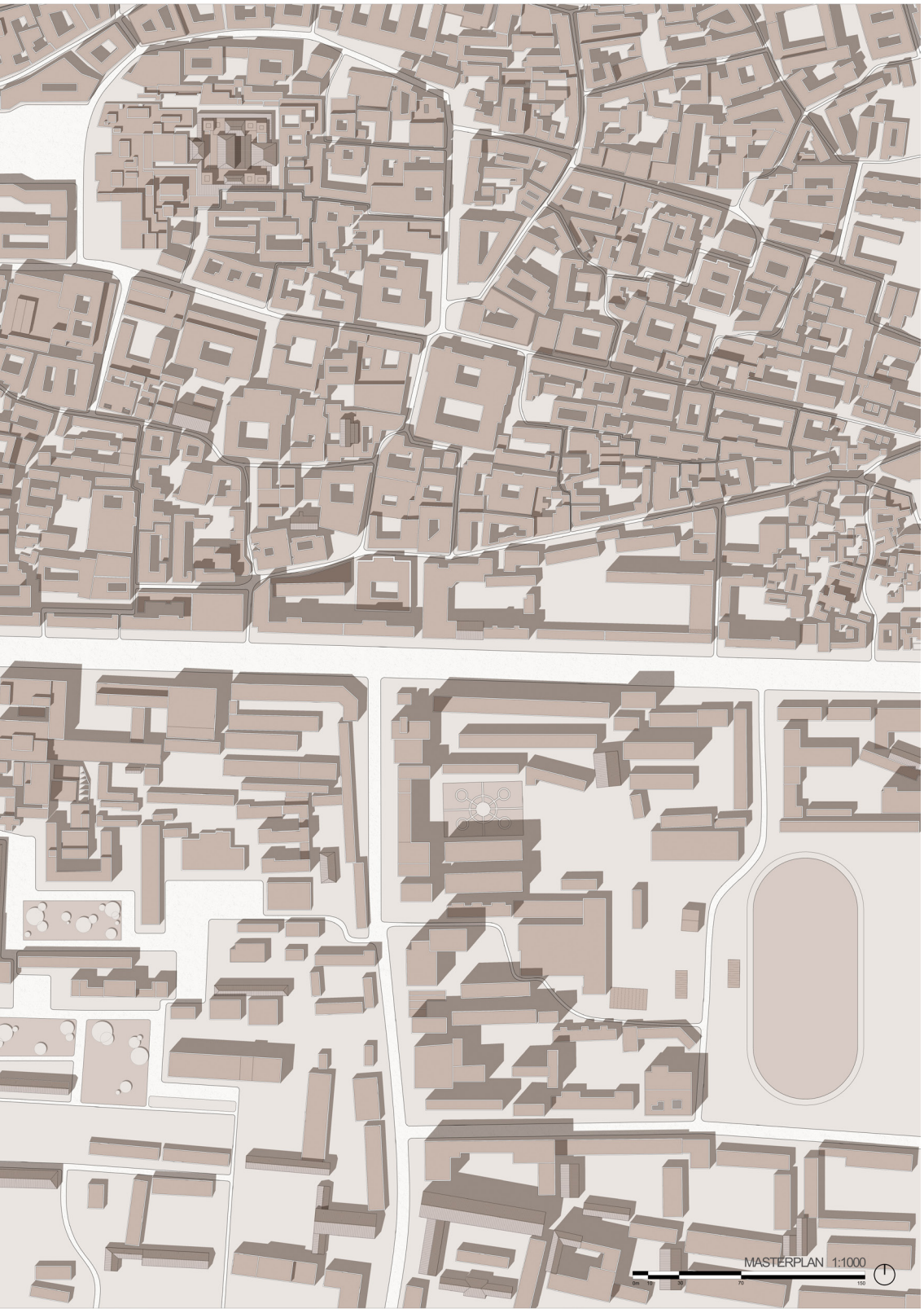
## DESIGN STRATEGY

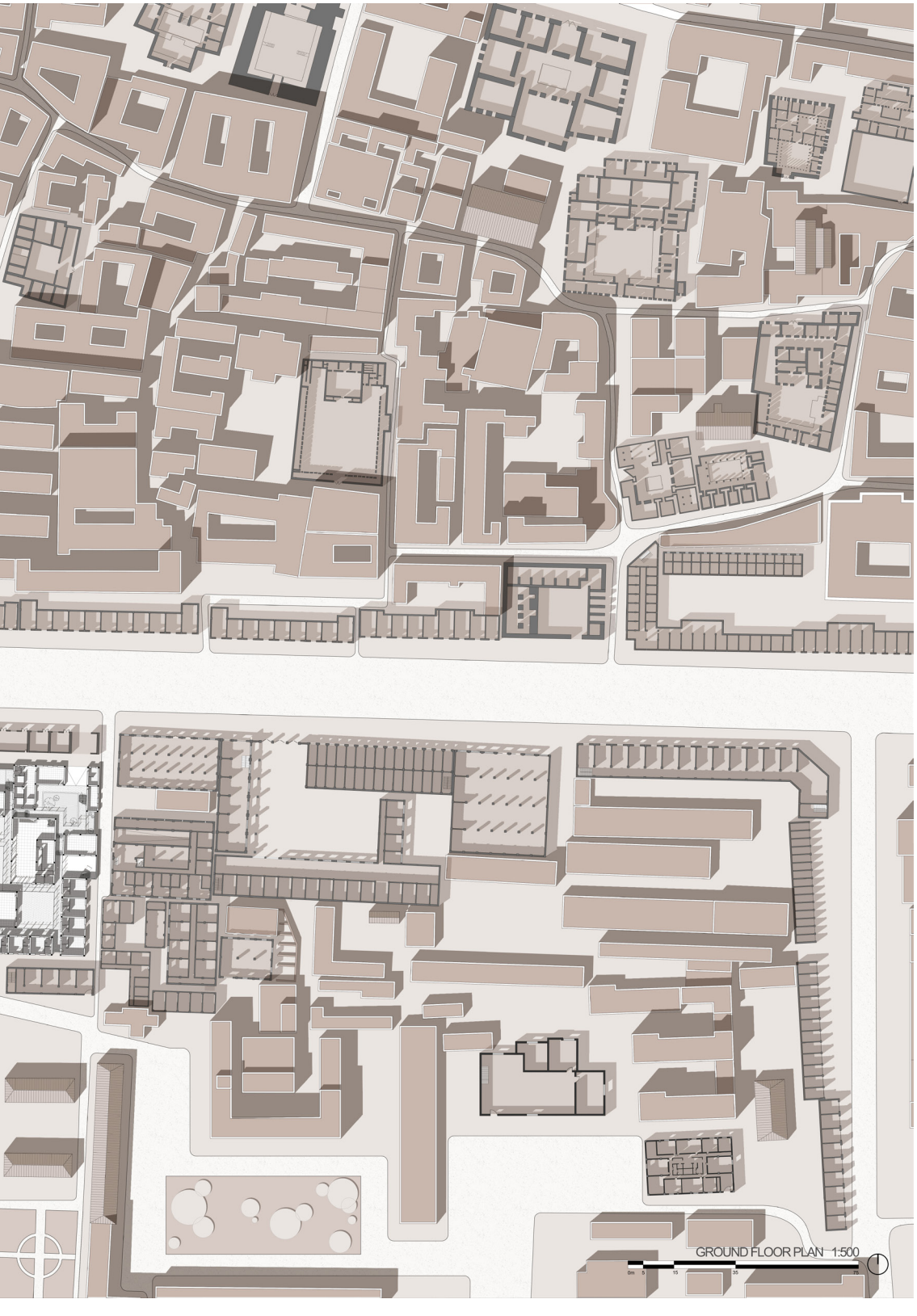
Ther are several elements (blocks, walls and corridors) that compose the courtyards in different ways.

1. This courtyard is composed by walls and blocks
2.This courtyard is composed by corridor and blocks
3.This courtyard is composed by corridor
4.This courtyard is composed by corridor and blocks

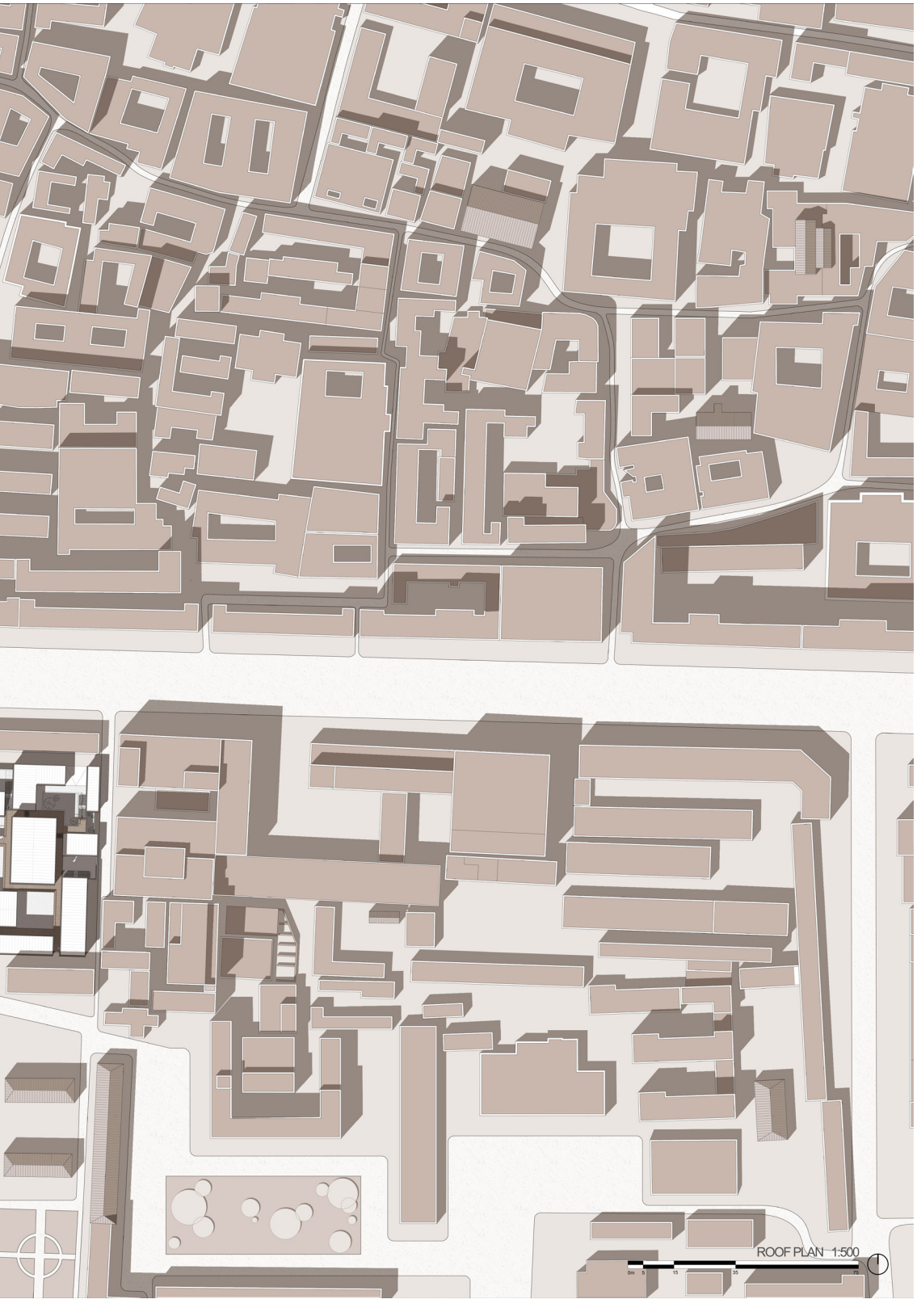




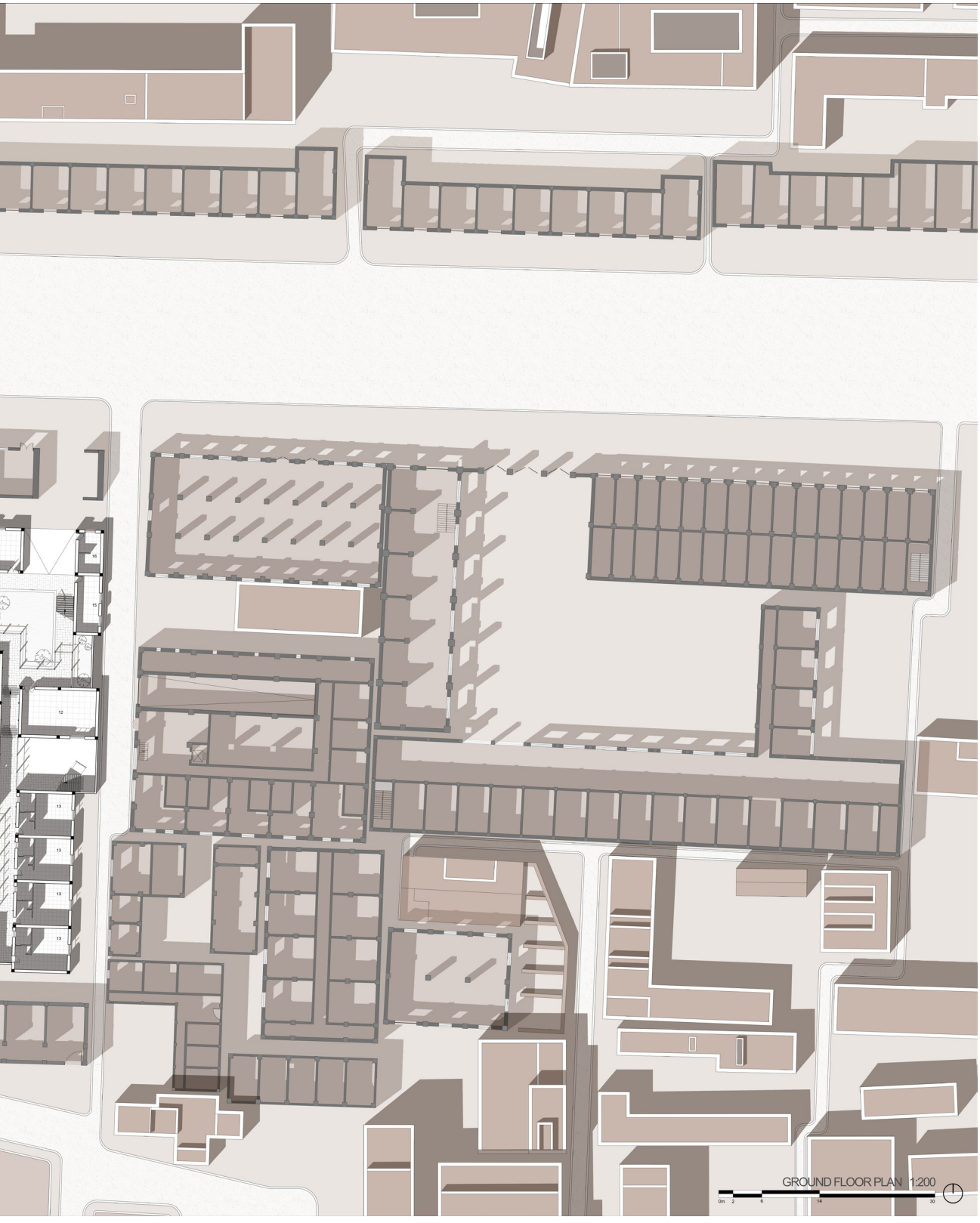

MASTERPLAN 1:1000


GROUND FLOOR PLAN 1:500

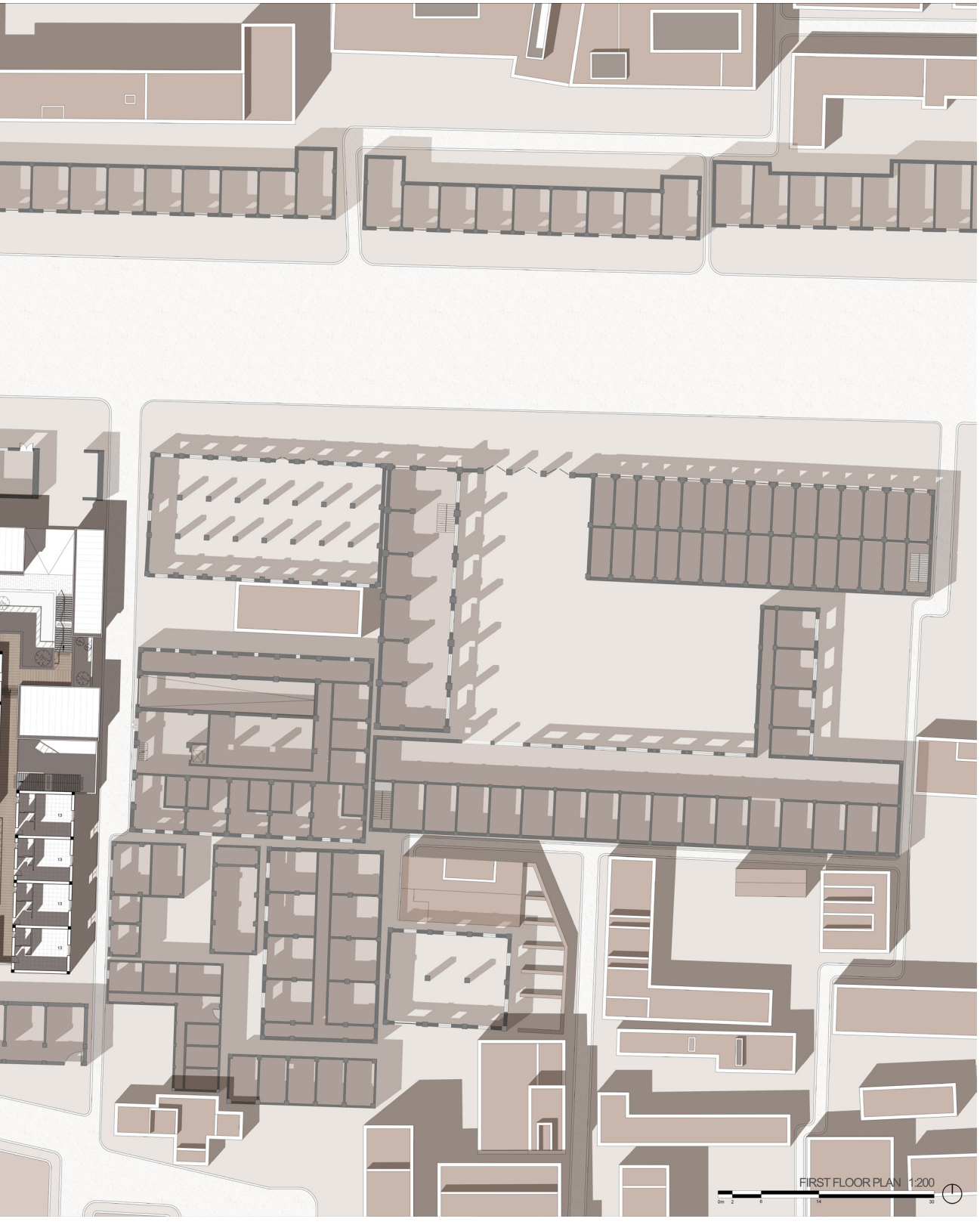

FIRST FLOOR PLAN 1:500


ROOF PLAN 1:500

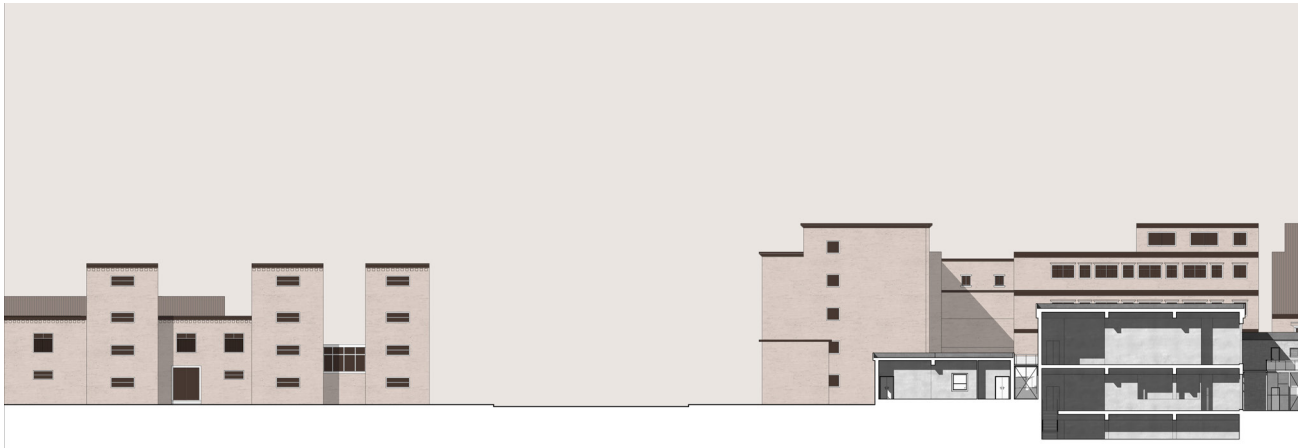

LEGEND
01 Ordinary Classroom
02 Geograpy Classroom
03 Massage Training Room
04 Vocal Rehearsal Room
05 Life Skills Practicing Room
06 Library
07 Vision Recovery Room
08 Canteen
09 Cooking Training Room
10 Teacher Office
11 Meeting Room
12 Tools Collecting Room
13 Student Dormitory
14 Sports Activity Room
15 Medical Recovery Room
16 Concierge
17 Toilet

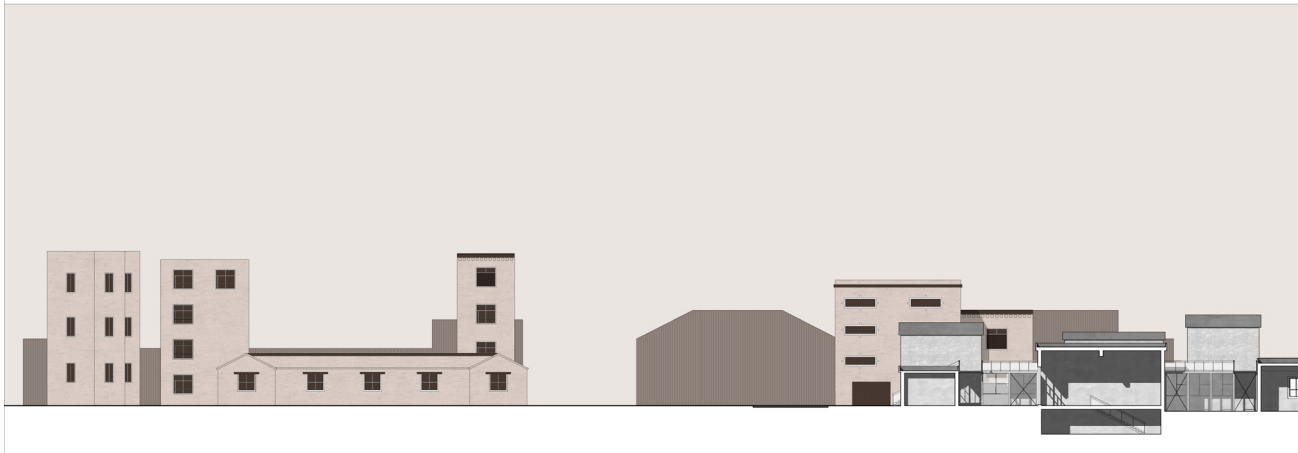

GROUND FLOOR PLAN 1:200

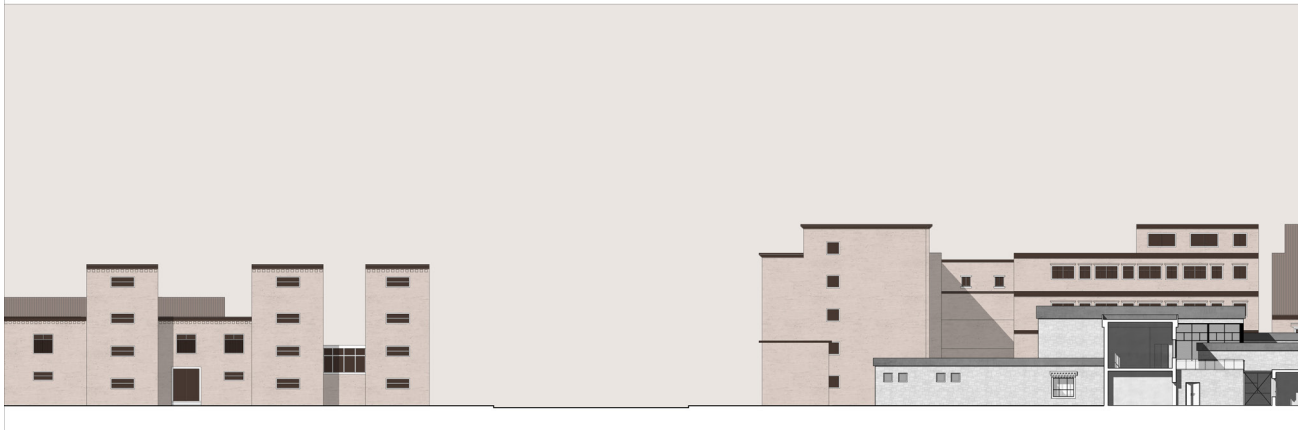

LEGEND
13 Student Dormitory
18 Computer Classroom
19 Mobility Orientational Traning Room
20 Life Experience Room
21 Multiple-Functional Room & Bar

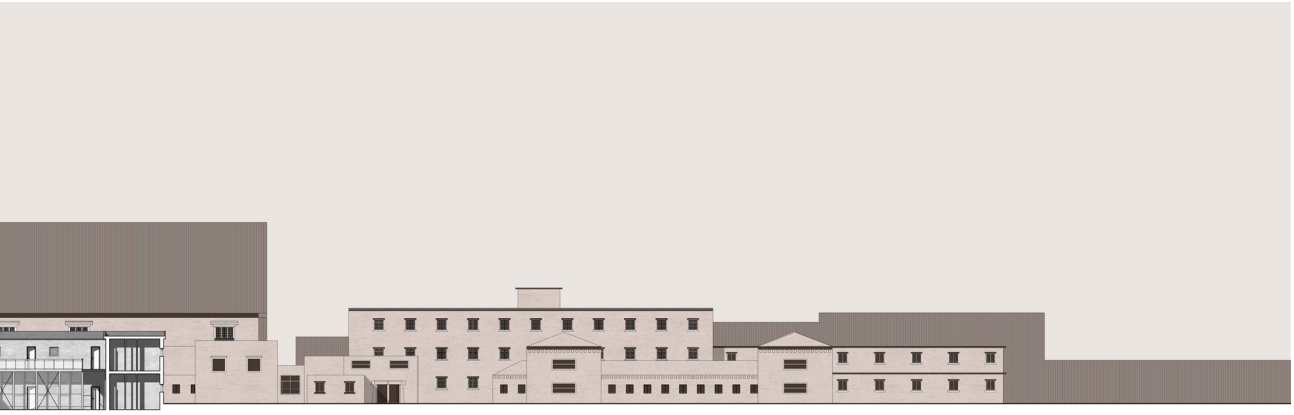

FIRST FLOOR PLAN 1:200


ROOF PLAN 1:200

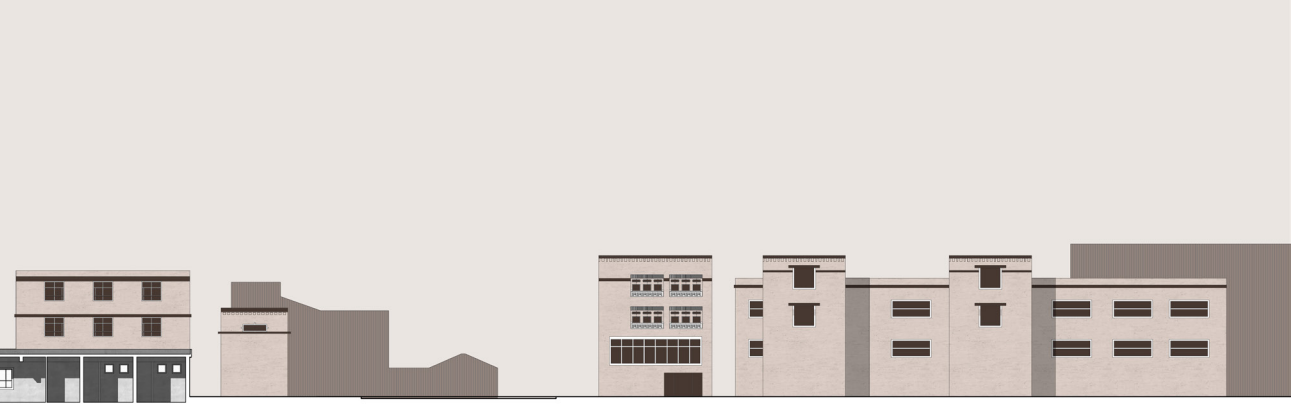




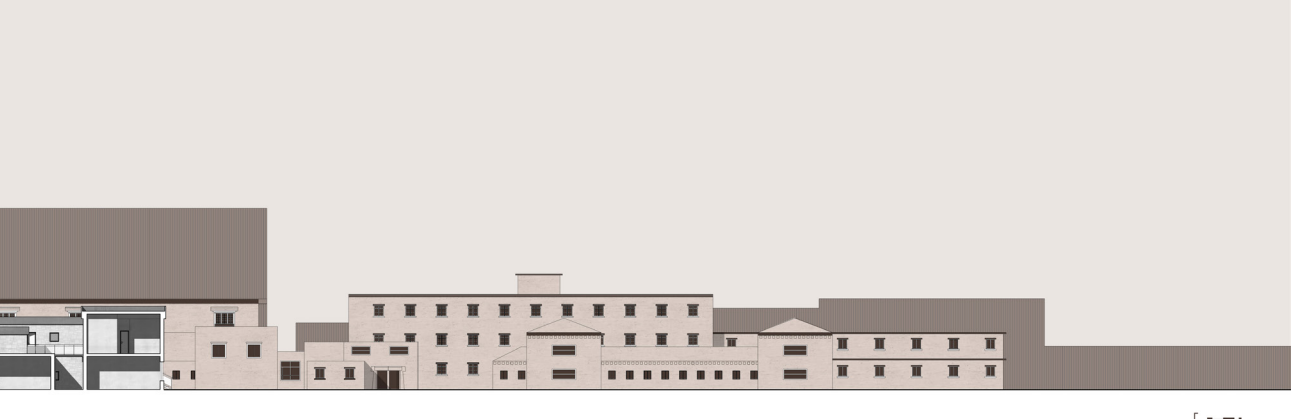




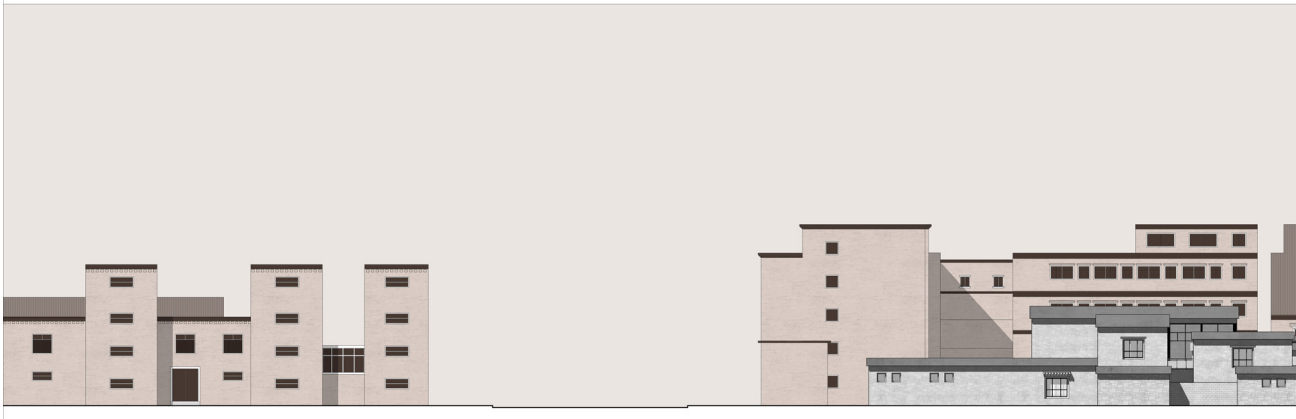
Section AA' 1:200

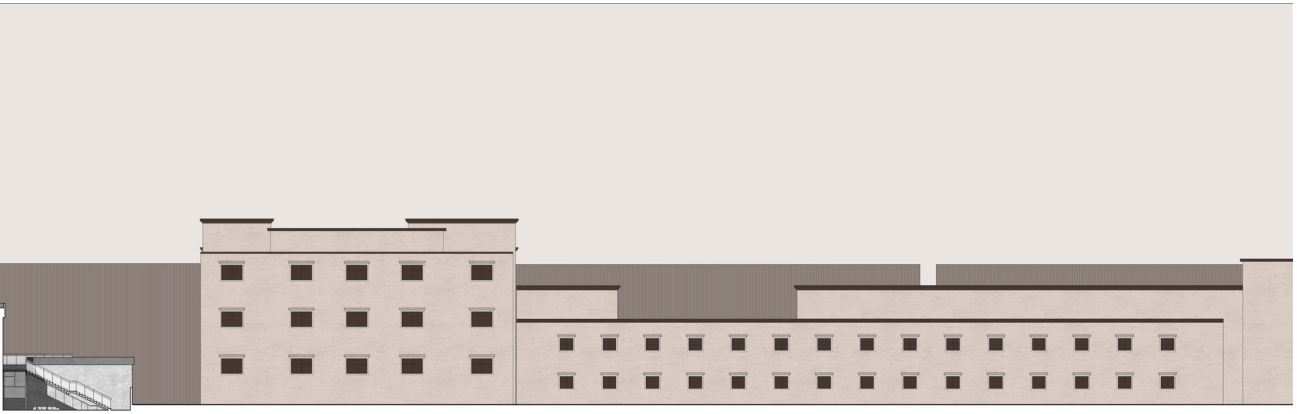


Section BB' 1:200

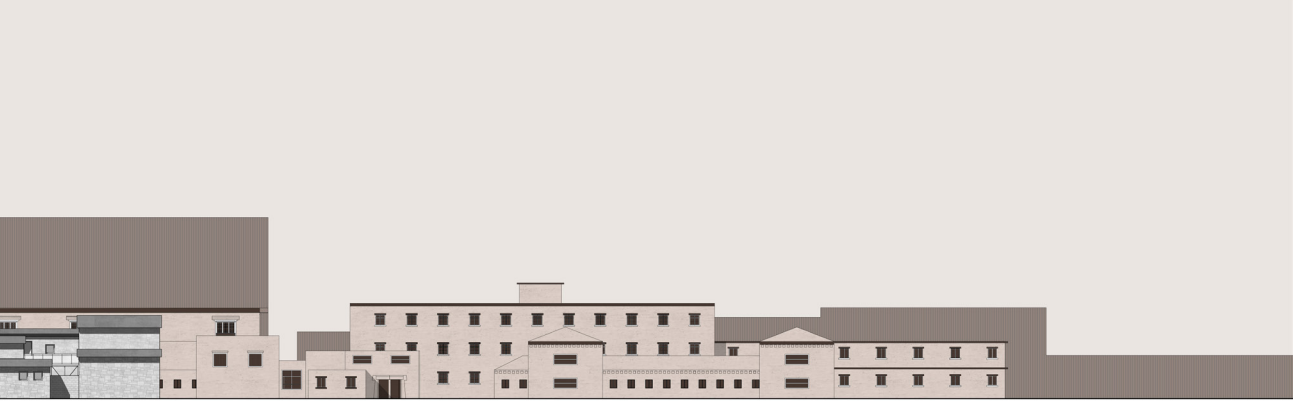


Section CC' 1:200

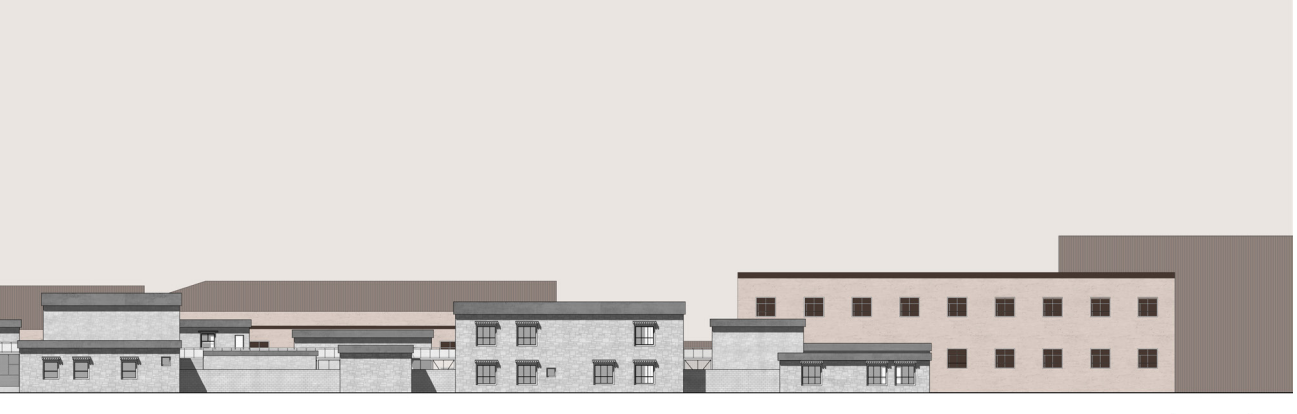




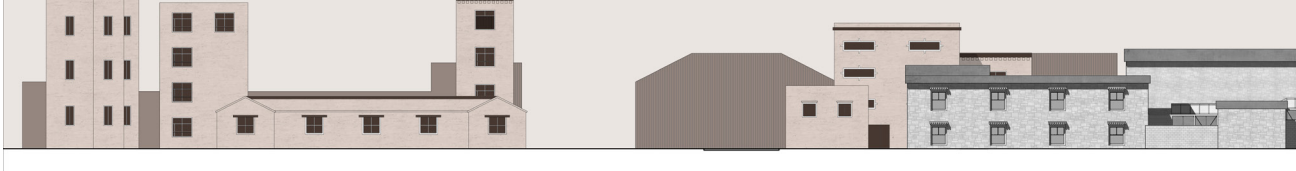
Section DD' 1:200

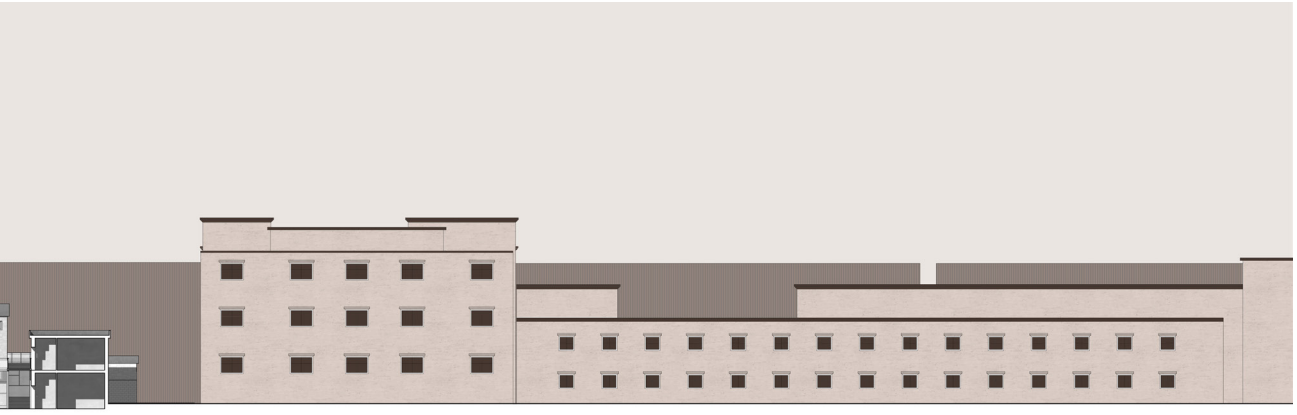


West Facade 1:200

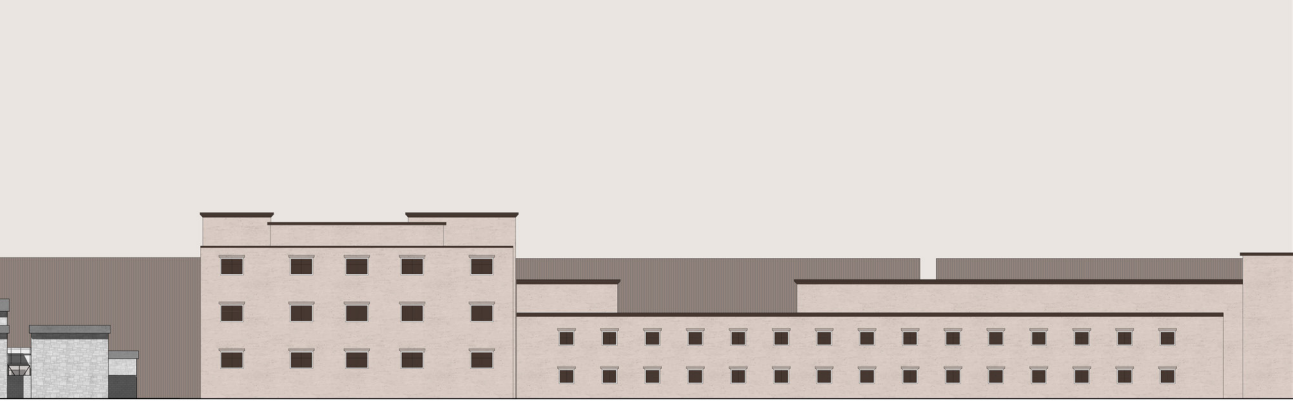


North Facade 1:200

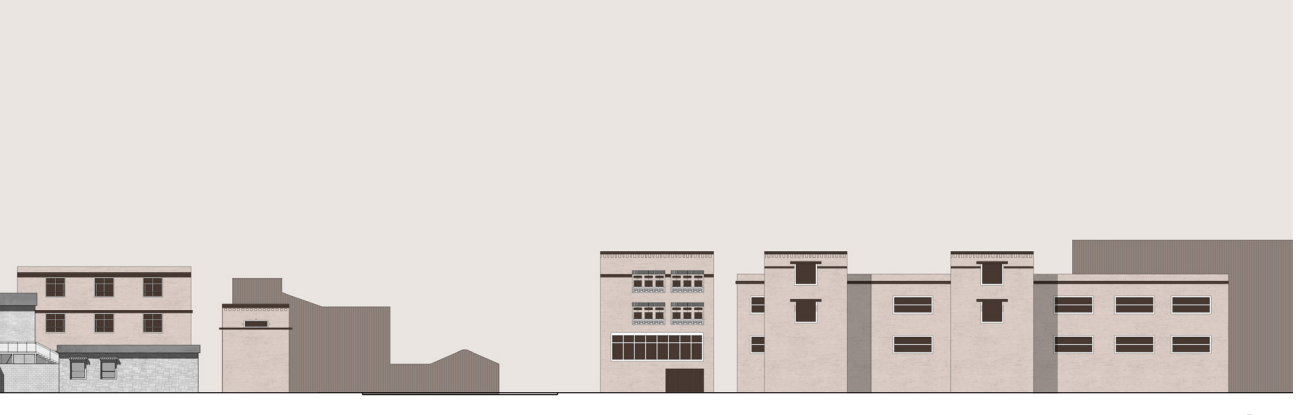




Section EE' 1:200



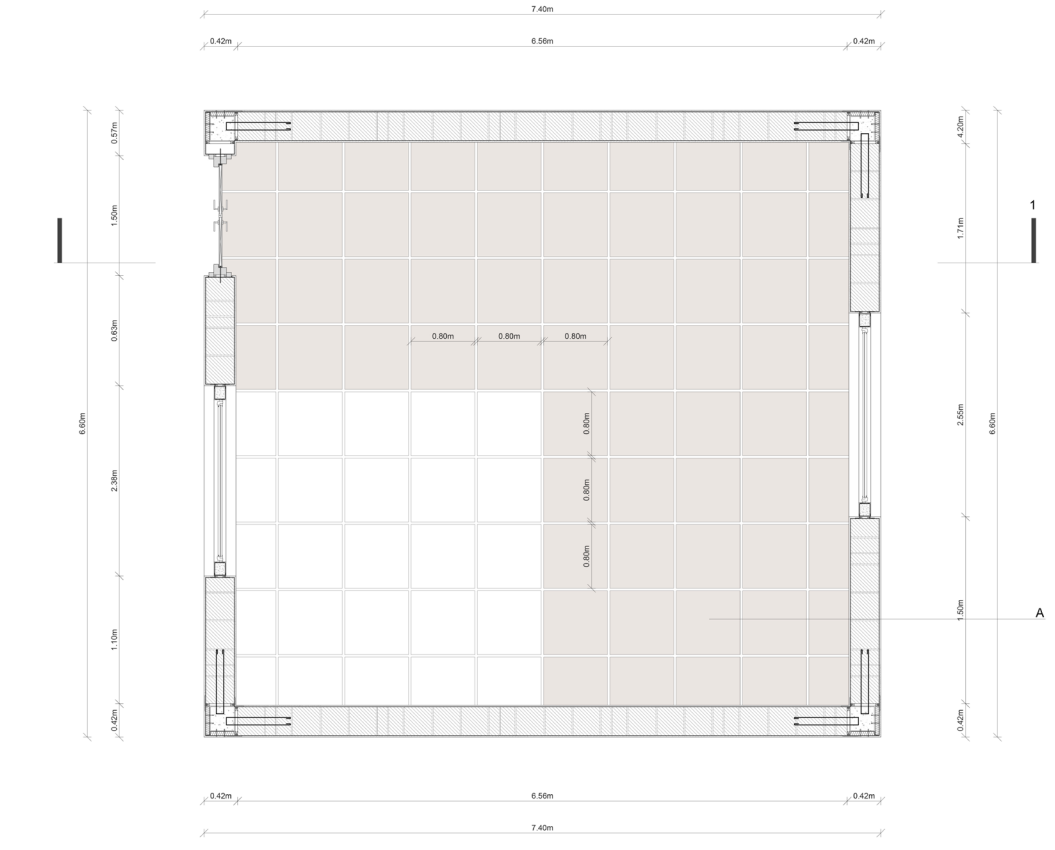
South Facade 1:200



East Facade 1:200

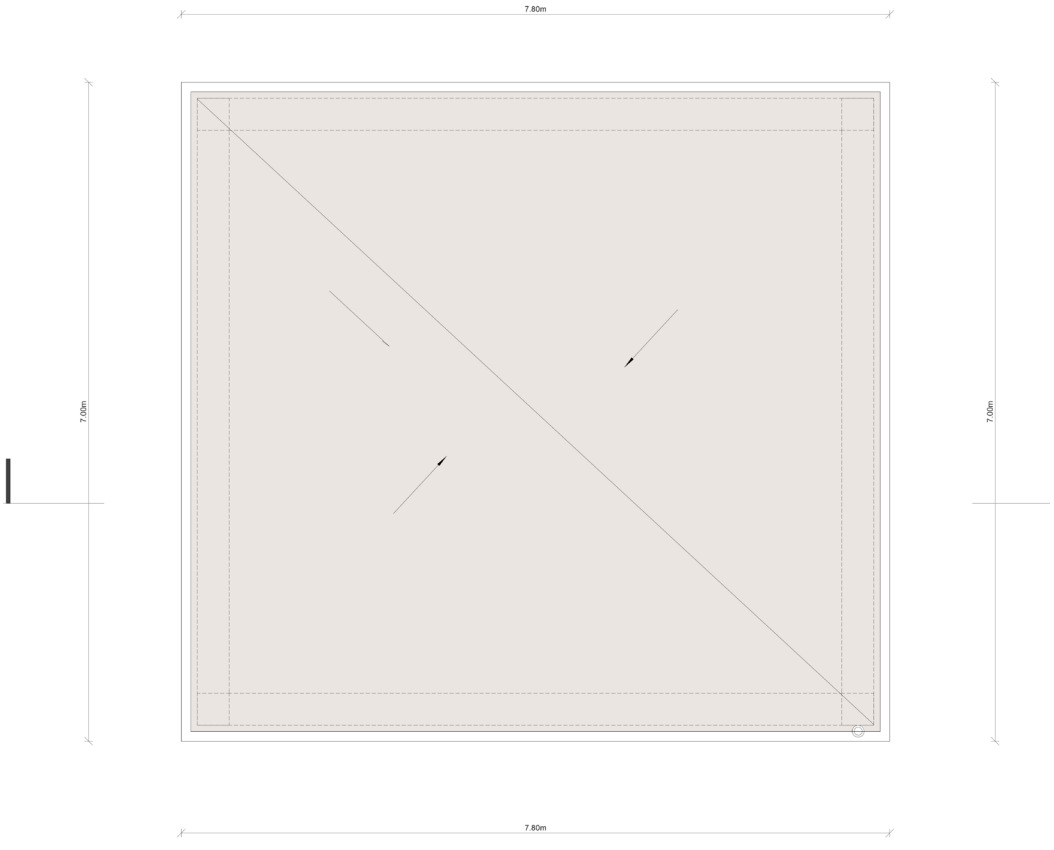
AXONOMETRIC VIEW

AXONOMETRIC SECTION



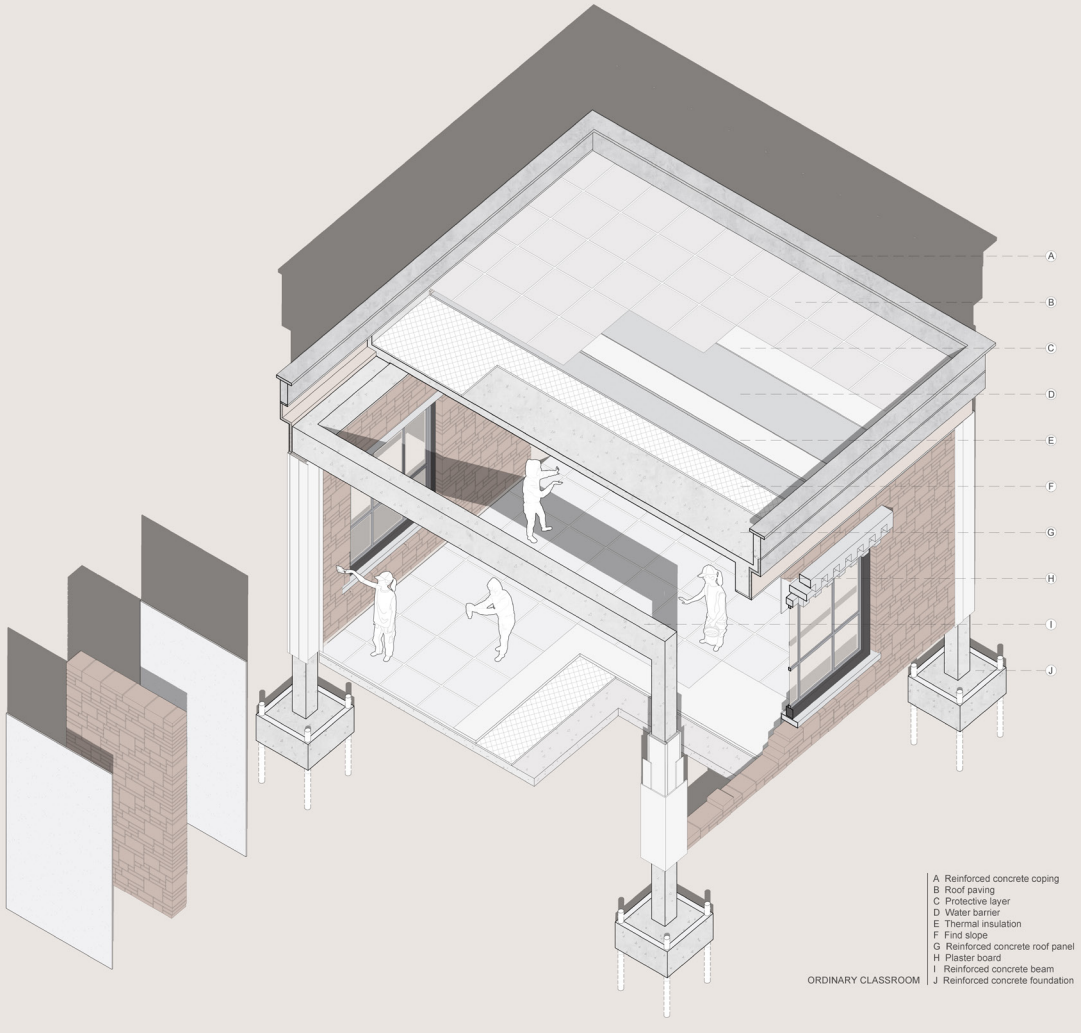

FLOOR PLAN 1:20


SECTION 1 1:20



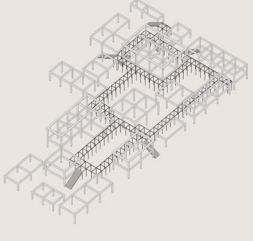

ROOF PLAN 1:20


SECTION 2 1:20

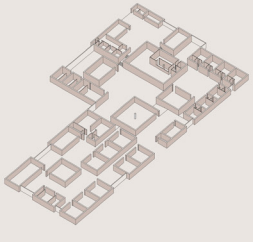



ORDINARY CLASSROOM

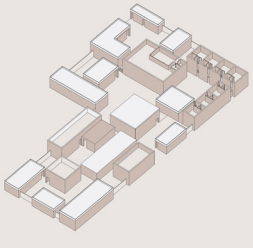
A Reinforced concrete coping
B Roof paving
C Protective layer
D Water barrier
E Thermal insulation
F Find slope
G Reinforced concrete roof panel
H Plaster board
I Reinforced concrete beam
J Reinforced concrete foundation



Beam & Column Structure

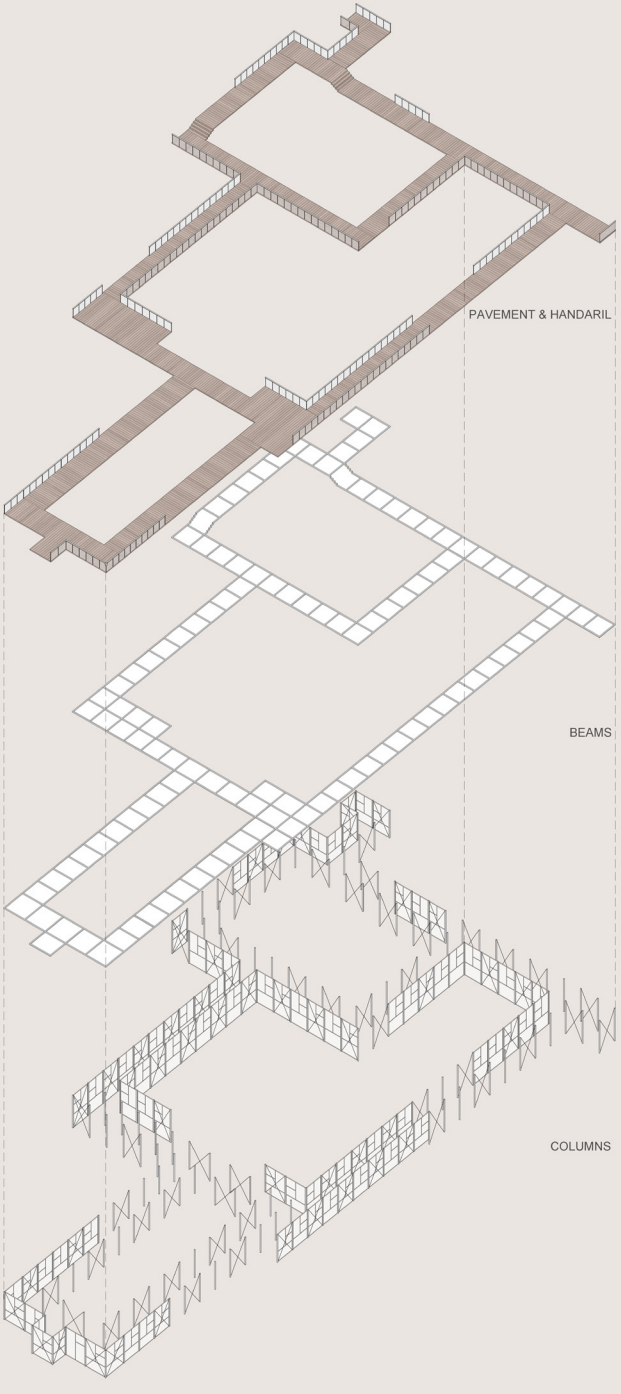


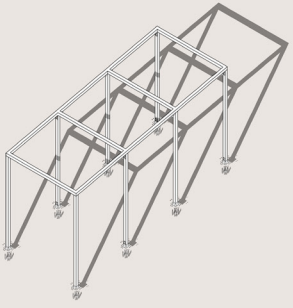
Ground Floor



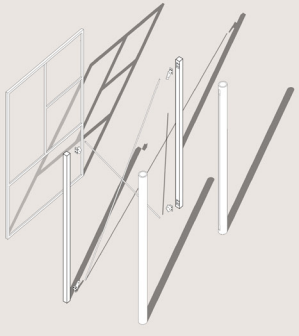
First Floor

**AXONOMETRIC STRUCTURE**

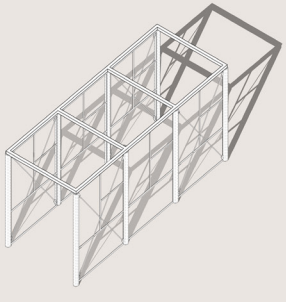


Foundation of steel frame



Connection of one units of frame



Connection of several frames

**FRAME STRUCTURAL DETAIL**

## Bibliography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