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Abbreviation

ADB	Asian Development Bank
BHN	Basic Human Needs
EFA	Education for All
EGSPRS	Economic Growth Support and Poverty Reduction Strategy
ESDP	Education Sector Development Program
GDP	Gross Domestic Product
IMF	International Monetary Fund
I-PRSP	Interim-Poverty Reduction Strategy Paper
MOSTEC	Ministry of Science, Technology, Education and Culture
SEDP	Secondary Education Development Project
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund

Summary

Mongolia has been a socialist state for about 70 years; however, under the new Constitution, the country changed itself into a capitalist country in 1992. The shift of its political system and the introduction to a market economy brought a great deal of confusion to the whole country in the 1990s. In 1999, as the country was gradually recovering from the confusion, the Government of Mongolia made the “Mongolian Action Programme for the 21st Century.” The Program, in response to the challenge of human resource development, clearly mentions the importance of education for sustainable economic and social development. Also, the Government made the “Mongolia Education Sector Strategy 2000-2005”. Under this strategy, the Ministry of Science, Technology, Education, and Culture (hereinafter referred to as MOSTEC) has been working towards its goal to achieve quality primary and secondary education and improve educational facilities.

In Mongolia, many school facilities were constructed in the 1970s and 1980s. Most of those facilities which are old and deteriorated due to the severe weather conditions and continuous use, require major rehabilitation and reconstruction¹. Especially in Ulaanbaatar City (hereinafter referred to as UBC), because of the recent massive inflow of people from rural areas, the existing education facility shortages have gotten much more serious. As a result, approximately 27.6% out of all public schools have had to adopt a triple-shift system as of 2001. Many schools with chronic classroom shortages are also obliged to use the corridors and lobbies for temporary classrooms. In spite of the fact that the number of school age children increased to approximately 30,000 from 1998 to 2002 in UBC, it was only one public school that was newly built by national budget in the same period. Furthermore, as the residential areas are gradually expanding out from the center of the city to the outskirts because of rapid increase of people in UBC, the number of horos without school facilities is increasing in the outskirts. Also, taking it into consideration that under the education sector reform the present 10-year (4-4-2) education system will change to 11-year (5-4-2) and the current primary school starting age of 8-years-old will be lowered to 7-years-old since 2005, the school age population in UBC is expected to increase continuously.

To improve above-mentioned situations in basic education, the Government of Japan has been assisting the Government of Mongolia through the grant aid, in the Project for

¹ Mongolia Education Sector Strategy 2000-2005

the Improvement of Primary Education Facilities, targeting UBC for the Phase I and Darkhan-uul and Orkhon for the Phase II. The Government of Mongolia requested the Phase III of the Project in UBC where the classroom shortage is getting more serious.

The Basic Design Study Team was dispatched by the Government of Japan to Mongolia from August 25 to September 22, 2003. The Team had discussions with representatives of MOSTEC and other associated people to discuss Project feasibility and a detailed plan, while the Team conducted a site survey at each school and obtained other necessary information. After the Team came back to Japan, the relevance of the Project, maintenance and management systems, and effects of the Project were analyzed based on the results of the study. Then the Japanese side set the appropriate facility components and the scale of the Project, selected materials, and calculated a rough cost estimate for implementation for the Project. In order to explain those outlines of basic design of the Projects to the Mongolia side, the Draft Report Explanation Team was dispatched from January 12 to January 21, 2004.

Among the total of 33 schools (27 existing schools and 6 new schools to be built), the Project schools were selected based on the following criteria agreed between the countries of Mongolia and Japan.

Schools/sites satisfying the following criteria will be given priority

- 1) It is urgently needed to construct additional classrooms because of the overcrowding even after the introduction of double-shift or multi-grade classes.

Schools /sites to be selected must fulfill the following criteria:

- 2) Present and future demand can be quantitatively estimated by a set of data such as the number of school-aged children, the rates of population growth, enrollment ratio, etc.
- 3) Sufficient teachers, budget allocation, and necessary cooperation from concerned people for the proper operation and maintenance of the facilities are secured.
- 4) No other program or plan for new/undergoing classroom construction by MOSTEC, local government, other donors, NGOs and so forth.
- 5) Ownership of land for construction is legally secured, and the evidence of land ownership will be provided to the Japanese side by 19 September 2003.
- 6) Access road for the movement of materials and for the construction works are properly constructed.
- 7) Topographically safe and appropriate-sized land for construction is secured.

- 8) No foreseen natural and environmental or social hazard.

The number of classroom shortage is calculated based on the projected number of students in 2005 when the new 11-year school system takes effect. The number of classroom shortage is calculated by subtracting two rooms kept for vocational training classes from the total number of existing classrooms (ordinary classrooms and special classrooms). Those schools with a shortage of less than 6 classrooms shall be excluded, because they increase the construction cost which defeats the principles of effective cost performance and the basic rationale of architectural planning.

Based on this formula, 17 schools (12 existing schools and 5 new schools to be built) were finally selected for the Project.

The Project components include classrooms, teachers' rooms, cloakrooms and toilet facilities as the minimum necessary for the managing of a school. The Project facility components for each school are shown in Table 1.

Table 1 Facility Plan of Each Project School

12 Existing Schools: P: Primary level, S: Secondary level, C.S: Complex School

	School	District	Classrooms To Be Constructed	Bldg. Type	Furniture Equipment		Water Tank	Septic Tank	Boiler	Floor Area (m ²)
					P	S				
1	No. 14 School	Bayanzurkh	8	2R	●	●	—	—	—	1,579.10
2	No. 17 School	Chingeltei	8	2R	●	●	●	●	—	1,579.10
3	No. 33 School	Bayanzurkh	8	2R	●	●	—	—	—	1,579.10
4	No. 39 School	Chingeltei	6	1R	●	●	●	●	—	1,263.45
5	No. 44 School	Bayanzurkh	8	2R	●	●	—	—	—	1,579.10
6	No. 48 School	Bayanzurkh	18	4R	●	●	—	—	—	2,799.02
7	No. 68 School	Bayanzurkh	6	1L	●	●	●	—	—	1,263.45
8	No. 87 School	Bayanzurkh	18	4L	●	●	●	●	—	2,799.02
9	No. 97 School	Bayanzurkh	6	1R	●	●	—	—	—	1,263.45
10	Iredui C. S.	Songinokhairkhan	8	2R	●	—	—	—	—	1,579.10
11	Goromt C. S.	Nalaikha	18	4L	●	●	—	—	—	2,799.02
12	Borovsrol C. S.	Bganor	12	3L	●	—	—	—	—	1,984.95
Total			124	—	—	—	—	—	—	22,067.865

5 New Schools

	School	District	Classrooms To Be Constructed	Bldg. Type	Furniture Equipment		Water Tank	Septic Tank	Boiler	Floor Area (m ²)
					P	S				
1	No. 61 School	Chingeltei	18	4BL	●	●	●	●	●	2,853.76
2	No. 112 School	Songinokhairkhan	18	4BR	●	●	●	●	●	2,853.76
3	No. 114 School	Khan-uul	18	4BR	●	●	●	●	●	2,853.76
4	No. 115 School	Songinokhairkhan	18	4BR	●	●	●	●	●	2,853.76
5	No. 116 School	Sukhbaatar	18	4BR	●	●	●	●	●	2,853.76
Total			90	—	—	—	—	—	—	14,268.80

Table 2 shows the educational furniture necessary for schools operation provided by the Project.

Table 2 List of Furniture

Room	Furniture
Classroom	Student Desk (Large, Medium, Small), Student Chair (Large, Medium, Small), Teachers' Desk, Teachers' Chairs, Blackboard, Bulletin Board
Teachers' Room	Meeting Table, Chairs, Cabinet

As for the requested educational and other equipment, based on the relevance to the curriculum and necessity, the following items at the basic minimum level will be provided shown in Table 3.

Table 3 Quantity of Educational and other Equipment at each Project School

Category	Items of Educational and Other Equipment
Charts and Tables	Geographic Map of Mongolia, Political & Administrative Map of Mongolia, Map of Mineral Resources of Mongolia, Botanical Map of Mongolia, Zoological Map of Mongolia, World Geographic map, The World Political and Administrative Map, Diagram of Chemical Element Cycle, Diagram of Physical Measuring Unit, Human Body Chart, Mongolian Alphabet Card, Multiplication Table
Basic Education Equipment	Wall Thermometer, Azimuth Compass, Tape measure, Geometric Block Models, Abacus, T-square, Scales, OHP (Over Head Projector)
Maintenance Equipment	Maintenance Tool Set

The estimated Project cost is 2,886 million Japanese Yen (2,869 million Japanese Yen for the Japanese side work and 17 million Japanese Yen for the Mongolian side). The whole implementation schedule (including the period of Detail Design Work) requires approximately 55.5 months.

The following effects can be expected upon implementation of the Project.

【Direct Effects】

1) Increasing Capacity in UBC to Accommodate Students

By constructing the Project's 214 classrooms (building 5 new schools and expanding 12 existing schools), an additional 17,120 students can be accommodated in those Project classrooms in UBC where school enrolment is rapidly expanding.

2) Improving the Learning Environment in the Project's Existing Schools

By constructing 124 classrooms at 12 existing schools under the Project, the total number of ordinary classrooms at the 12 schools will increase from 371 to 495 in 2007, and the number of students per classroom will be reduced from 68.4 to 51.3 students. As a result of Project implementation, a more desirable learning environment for class operations will be realized at those Project schools which have been forced to conduct classes under triple shift system and have been using non educational facilities as temporary classrooms.

3) Improving Children's Access to Schools and the Learning Environment in the Neighboring Existing Schools

Through the Project's construction of 90 classrooms at 5 new schools, 7,200 more students can be accommodated. As a result, the access to schools for children is improved, especially for those who have been forced to ride the bus or walk 30 to 40 minutes through dark ger areas without street lamps. In addition, since a certain number of students will be transferred from the neighboring existing schools into the new (to-be-built) Project schools, classroom shortages will also be alleviated and an improvement of the learning environment will be realized at those neighboring schools.

4) Improving Conditions of the Toilet Facilities

By constructing an adequate number of toilet facilities in accordance with the number of classrooms built in the Project, toilet shortages will be significantly alleviated. Also, by constructing toilet facilities with doors and locks to keep privacy, the physical conditions will also be greatly improved, especially for girls.

【Indirect Effects】

Use of Facilities for Non-Formal Education Programs

Project facilities are expected to be used not only for the purpose of “formal” basic education, but also for “non-formal” education which is currently being provided mainly by the NGOs in Mongolia. In terms of providing learning space for those non-formal education programs that target dropouts and street children, it is expected that the Project will contribute to the surrounding community.

The Project will help to realize the many benefits mentioned above, and in a broader sense, contribute to the improvement of BHN (Basic Human Needs) of local communities. Thus, the implementation of the project through the Japanese grant aid scheme deemed worthy and meaningful. To this end, the issues mentioned below are expected to be taken up and improved for the realization of the larger benefit.

1) Monitoring and Technical Support of School Facility Maintenance by the Government

In the Project, it is expected that proper maintenance activities will be implemented at the schools. In the site survey, however, it was found that since allocated budgets for prevention and minor repair are limited compared with the one for major repair, maintenance activities at schools are mainly supported by the contributions from the parents and community. In order that proper maintenance activities are continuously and effectively implemented at all Project schools, it is indispensable to establish a follow-up system in order that the government officials periodically visit the schools and monitor the maintenance activities to provide the necessary managerial and technical support to the schools, as well as to make better adjustment of the budget distribution.

2) Support for Opening New Schools

In that 5 schools will be newly opened in the Project, the preparation activities such as the scheduling of Opening Day, the forming of classes for students who will be transferred into the new schools from the existing schools, the new head teacher appointments and regular teacher assignments, etc, are expected to be done mainly at the government level. Although there has been little experience regarding the opening of new schools in UBC since the 1990s, the above-mentioned activities should be done appropriately and according to proper scheduling and procedure. The government is

also expected to support other preparation work at the school level such as the setting up of special classes, club activities and school regulations, as well as establishing school management committee and PTA and procuring any necessary equipment, etc.

3) Organizing the Appropriate Number of Special Classes

In the Mongolian public schools, there are two types of classes: “general classes”, to which entry requires no entrance examination and accepts children living in horos within that school area; and, “special classes”, to which there are no area restrictions, but entry is limited to only those children who pass the entrance examination. It was found in the site survey that some schools restrict their number of “general classes” in favor of organizing more “special classes” which are promoted by the Government. Because of this tendency to increase “special classes”, the shortage of classrooms for “general classes” gets worse. In this way, if each Project school vastly increases its number of “special classes” after completion of the Project, it is expected that the targeted “Project Effect” of improving the total educational environment will suffer and not be achieved. Therefore, any organization of “special classes” should be closely examined along with securing adequate number of “general classes”.

4) Additional Facilities for Five New Project Schools

Components of the facilities to be constructed by the Project are: classrooms, teachers’ rooms and toilets. It is realized that other facilities such as gymnasiums, special classrooms, libraries, and head teacher’s offices, etc. are also required to make the schools fully equipped. Thus, it is recommended that the Mongolian side, to secure a better leaning environment at all the new Project schools, construct these additional facilities by its own efforts.

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Chapter 1 Background of the Project

Chapter 1 Background of the Project

In Mongolia many school facilities were constructed in the 1970s and 1980s. Most of those facilities which are old and deteriorated now due to the severe weather conditions and continuous use, require major rehabilitation and reconstruction¹. Especially in Ulaanbaatar City (hereinafter referred to as UBC), because of the recent massive inflow of people from rural areas, the existing education facility shortages have gotten much more serious. As a result, many schools with chronic classroom shortages are obliged to adopt a triple-shift system and to use the corridors and lobbies for temporary classrooms. Furthermore, as the residential areas are gradually expanding out from the center of the city to the outskirts because of rapid increase of people in UBC, the number of hours without school facilities is increasing in the outskirts. In those neighbouring schools which accept students who are coming to schools, often taking more than 40 minutes to get there from their homes, the classroom shortages are getting more serious.

Considering this situation, in 1999 the government of Mongolia made the “Mongolia Education Sector Strategy 2000-2005”, which states the “improvement of school facilities and educational equipment, especially in primary and secondary education” as one of its medium term objectives². However, in Mongolia the national budget has consistently been in short supply, and within the last 10 years very few new schools have been built through the country’s own efforts and financing. In UBC, even though there has been an increase of about 30,000 students in the public schools between 1998 and 2002 (135,995 in 1998; 164,069 in 2002)³, only one school was constructed in UBC in the last 5 years. In addition, under the education sector reform, the present 10-year (4-4-2) education system will change to 11-year (5-4-2) starting in 2005, and the current primary school starting age of 8-years-old will be lowered to 7-years-old at the same time. Thus, the school age population in UBC is expected to continue to increase.

To improve the educational environment at the basic education level under the situation, the Government of Japan has been assisting the Government of Mongolia through the grant aid, in the Project for the Improvement of Primary Education Facilities, targeting UBC for the Phase I and Darkhan-uul and Orkhon for the Phase II. The Government of

¹ Mongolia Education Sector Strategy 2000-2005

² “Improving teacher pre-service and in-service training”, “Refining curriculum, methodology and structure”, “Developing a quality assurance system” and “Improving educational research” are also stated as medium term objectives of the strategy.

³ Figures were taken from the database of the Department of Education, UBC

Mongolia requested the Phase III of the Project in UBC where the classroom shortage is getting more serious. At the request, the Government of Japan dispatched the Basic Design Study Team from August 25 to September 22, 2003 and the Draft Report Explanation Team from January 12 to January 21, 2004.

Chapter 2 Contents of the Project

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

2-1-1 Overall Goal and Project Purpose

Because of the recent massive inflow of people from rural areas, the existing education facility shortages in UBC have gotten much more serious. Many schools are obliged to conduct classes in a triple-shift system and to utilize the corridors and lobbies for classrooms. Also, there are many horos¹ in the outskirts that have no school facilities. In addition, under the education sector reform, the present 10-year (4-4-2) education system will be extended to 11-year (5-4-2) starting in 2005, so the school age population in UBC is expected to continue to increase.

Considering this situation, in 1999, the government of Mongolia made the “Mongolia Education Sector Strategy 2000-2005”, which states the “improvement of school facilities and educational equipment, especially in primary and secondary education” as one of its medium term objectives².

With all this taken into consideration, the Project’s overall goal is to “improve educational environment in UBC”. The Project purposes are: to “alleviate classroom shortage” at existing schools; and, to “improve access to education in areas without schools” by constructing new schools.

2-1-2 Outline of the Project

To achieve the above mentioned purposes, the Project will construct classrooms, teachers’ rooms, cloakrooms and toilet facilities, as well as provide educational furniture, basic teaching materials and maintenance tools for each of the 12 existing schools and the 5 new (to-be-built) schools which were selected from the original 33 schools (i.e. 27 existing schools and 6 new schools) the Government of Mongolia requested aid for.

¹ In UBC, there are 9 districts with 4-20 horos in each as sub-districts.

² “Improving teacher pre-service and in-service training”, “Refining curriculum, methodology and structure”, “Developing a quality assurance system” and “Improving educational research” are also stated as medium term objectives of the strategy.

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

2-2-1-1 Principles of the Project

The Project schools are to be selected from 33 schools (27 existing schools and 6 new schools) that the Mongolian side originally requested aid for. They should be those schools which are deemed to not have enough classrooms to accommodate all its students when operating under the double shift system at 40 students per classroom. As primary and secondary schools are unified in Mongolia, this Project aims to improve educational facilities at both primary and secondary level.³

The number of classroom shortage is calculated based on the projected number of students in 2005 when the new 11-year school system takes effect. The number of classroom shortage is calculated by subtracting two rooms kept for vocational training classes from the total number of existing rooms (ordinary classrooms and special classrooms). Those schools with a shortage of less than 6 classrooms shall be excluded, because they increase the construction cost which defeats the principles of effective cost performance and the basic rationale of architectural planning.

The facility component for the Project is based on the “minimum necessary” required for school operation: ordinary classrooms, a teachers’ room, a cloakroom, and toilets. Blackboards, desks, and chairs are provided for classrooms, and desks, chairs, and cabinet for the teachers’ office. In addition, basic teaching materials and maintenance tools are provided as equipment.

2-2-1-2 Policy Regarding Natural Conditions

(1) Regarding the Continental Climate

Mongolia has a typical continental climate where the temperature changes greatly within one day and differs quite a bit during the year, sometimes going down to below minus 30°C during the winter. Because of this severely cold weather, it is absolutely necessary that the facility designs include an effective heating system so that the learning process is not impeded. The most effective one is the hot water heating system which does not exhaust air thus not requiring the frequent opening and closing of

³ Iredui Complex School and Borovsrol Complex School are two exceptions as the Project only targets facility improvement at primary level.

windows to change or refresh the inside air during the severe winter. Another necessary feature is to have enough insulation for exterior walls and roofs and openings, and to form air-tight closures at the doors, windows and other openings, in order to prevent heat loss.

Insulation has the double function of helping to keep classroom interiors cooler by countering the effects of temperature rise on exterior wall surfaces which can make the classrooms too hot in the short but very strong sunlight of the Mongolian summer. In addition, if schools are near roads with heavy traffic, air-tight insulation also acts to lower any noise coming into the school, thereby contributing to a quieter learning atmosphere. Also, it helps to prevent sand from coming inside the buildings during the frequent spring sandstorms.

The floor plans will include a vestibule at the building entrance to help prevent interior heat from going out through the front doorway in the winter. Also, as the area in front of the cloakroom can expect to be fairly crowded when class shifts are taking place, a hall of sufficient size shall be included in the designs. The section plans show that the level of the foundations will be set below the frost penetration depth to protect buildings against the effects of frost heaving when the ground surface freezes during the winter.

For the most effective insulation, materials with a low coefficient of heat transmission, such as bricks and concrete, will be used. The use of metallic materials, which have a high coefficient of heat transmission and so are easily affected by outside air temperatures, will be avoided as much as possible to lower the risk of people's direct touch on the metal surfaces in the severe cold. Also, the measures necessary to prevent the freezing of pipes during the winter will be taken.

(2) Regarding the Natural Sunlight

In order to fully utilize the natural light of the many sunny days throughout the year in Mongolia, classrooms will, as long as the conditions of land shape and size are met, be designed to maximize the effects of solar heat and energy. This is especially important for keeping the classrooms warm during the winters.

Another way to fully utilize the sunlight in the winter is to locate the buildings in a southward facing position so that classrooms can gain maximum solar heat. Southward facing classrooms also allow for the longest possible time to use the natural sunlight to see by, which is especially useful for saving electricity in a double-shift system where classes are conducted until dark.

(3) Regarding Natural Ventilation

One drawback to designing buildings with as much insulation as possible is that the amount of area for openings, which allow for natural ventilation in the summer, tends to be limited. Although the Mongolian summer period is short, the temperatures can go up pretty high. In order that natural ventilation is secured, the locations of buildings as well as the methods and styles of openings should be carefully designed to attain a functional balance between good insulation and good ventilation. In addition, because it is difficult to accurately control the temperatures in each room using the hot water heating system, where the upper floors tend to be hotter than the lower floors, openings are also necessary to release hot air as needed to maintain a constant indoor air temperature during the winter.

(4) Regarding Earthquakes

The area around UBC is considered a moderately active earthquake zone, having experienced a 4 on the JMA seismic scale in the past. Therefore, the structure of the facilities should be designed to withstand earthquakes of that intensity, which is equivalent to a 7 on the MSK scale.

2-2-1-3 Policy Regarding Social Economic Conditions

Many of the existing candidate school buildings in the Project were built by the former Soviet Union in the 1960s and 1970s. The size of the land for schools was mainly decided according to expected future enrollment as projected in the country's national development plan. However, since the shift to a market economy, the inflow of population has increased more than expected, the land sizes are now not large enough to accommodate the increase. This is true especially in the ger areas, where people from the rural areas have steadily been moving and building gers. Thus, it is getting difficult to secure enough land of sufficient size to construct new schools in those areas without the benefit of any public planning. In general, because of the large population inflow and lack of public planning, the availability of land for public schools is shrinking. Because of these conditions, all those Project school buildings shall be built as four story buildings.

2-2-1-4 Policy Regarding Construction Conditions

(1) Building Permits

In Mongolia, the agency responsible for buildings permits is the Government Implementing Agency for Construction, Urban Development and Public Utilities of Mongolia. In UBC, all applications and documents for permits of buildings to be constructed in UBC will be examined and approved by the following institutions shown below, with final approval by the GIA.

the Government Implementing Agency for Construction, Urban Development and Public Utilities; the General Architect of UBC; the UBC Fire Fighting Department and Specialized Supervision Department; other related agencies of UBC (ex. Heating Stoves Utilization Board, Department of Environment, etc); the Government Implementing Agency for Construction

Since modern architectural methods were introduced by the former Soviet Union during its socialist regime, the architectural standards of the former Soviet Union are still followed in Mongolia. While Mongolia is currently developing its own national architectural standards, it is necessary to confirm all approvals for design content and details from the related agencies, at the time of the detailed design and at the time of the application for building permits. After application, it generally takes about four months to get the building permits; the application procedures will be conducted in consideration to the construction schedule of this Project.

The agency responsible for inspections during construction and at the completion of facilities is the State Supervision Agency, which was established in January 2003 and is under the direct control of the Prime Minister's Office. The State Supervision Agency is responsible for inspecting all public infrastructure like buildings, roads and bridges, both during the construction and at its completion. It is comprised of 40 technical experts who used to belong to separate ministries. Each technical expert is in charge of a different field, like city planning, architecture, oil, water, sewage, geology, electricity, communication, heating and roads, etc. The State Supervision Agency performed 125 inspections in the first half of this year, 46 of which were construction completion inspections. Under the State Supervision Agency, there are 21 Specialized Supervision Departments in 18 provinces and 3 cities throughout the country.

The State Supervision Agency is responsible for buildings with more than 2,000 m² of total floor area; for buildings with less than 2,000 m², each local province or city

Specialized Supervision Department is in charge. The State Supervision Agency handles projects assisted by foreign donors, and so will be in charge for this Project.

(2) Regarding Local Materials and Equipment

For ease of maintenance of the completed facilities, materials and equipment which can be locally procured should be used in the construction of the Project facilities. Basic construction materials, such as aggregate, cement, reinforcing bars, bricks, timber, pre-cast concrete products and furniture are locally produced. Other materials, such as sashes made of aluminum or resin, glass and paint, etc, which are currently being imported from China, Korea and Russia, are widely available in the local market in Mongolia. Therefore, the facilities should be designed to utilize these locally available materials and equipment.

(3) Regarding Concrete Work

As UBC is located in an area where the winter temperatures are between minus 10 °C and minus 40 °C, it is virtually impossible to pour concrete and do other exterior work at the construction sites during the winter. In addition, the local construction firms usually close down their construction sites during the winter because the excavating of frozen soil requires special equipment and any interior work requires heating, both of which become expensive.

Nowadays in Mongolia, the foundations, beams and columns of building structures are usually constructed with reinforced concrete, the walls with bricks, and floors with pre-cast concrete panels. Structures of traditional masonry, using bricks or concrete blocks, are now used only for small-sized construction projects. Thus, the demand for concrete in construction is inevitably increasing. Although the total amount of concrete production in the country is basically sufficient on an overall yearly basis, it will be difficult to secure the necessary quantities when many construction works require the large amount of concrete simultaneously in the spring, because the daily production capacity per plant is very limited, only about 40-60m³ per day. In addition, this Project has a short construction period that overlaps with other construction projects, and the general demand for concrete also begins at virtually the same time in the spring. Thus real difficulties to secure the quantity and quality of concrete structures and to complete the facilities within the scheduled construction period are predicted.

Therefore, one batcher plant will be built especially for this Project, in a convenient location where the equipment and materials for the production of concrete can be easily brought in, as well as be convenient for providing concrete to each construction site. For

the Baganor District, which is far from UBC, the completion of concrete work before the onset of winter has been given the highest priority by installing a concrete mixer at the construction site.

2-2-1-5 Policy Regarding Local Human Resources

(1) Local Consultants

Since Mongolia has been under the great influence of the former Soviet Union for many years, construction in Mongolia follows the former Soviet architectural standards. Thus, it is vital for Japanese consultants not familiar with the former Soviet construction situation to cooperate with local consultants, especially with those whose expertise is in the field of structural design. Further, the local consultants play significant roles in helping the process of preparing documents and drawings to make the getting of permits smoother.

(2) Local Contractors

Several contractors in UBC have worked with the Japanese Contractor in Phase I of the Project, the Japanese Embassy in Mongolia, and the Japan Center. Their construction standards are much higher than those at the local level. Thus, as long as careful examination of their construction experience and technical standards is made, no problems are foreseen regarding the use of these contractors for this Project.

2-2-1-6 Policy Regarding Maintenance and Management Capabilities of the Project Implementing Agency

The funds allocated from the country's national budget, which are then distributed to each Project school, are used mostly for teachers' salaries and heating, with very little left for maintenance expenses. Each school asks for donations from parents and from the business sector for the repair and maintenance of facilities, but this amount is not sufficient. The Project is designed to help lessen the severe financial burdens at each school by trying to reduce maintenance cost through the utilization of local materials and equipment; as well as adopting, as much as the budget allows, durable finishing materials and fixtures.

2-2-1-7 Policy Regarding the Grade of Facilities and Equipment

The grade of equipment and materials for the Project facilities is set as the "necessary minimum." This is based on cost reduction considerations and on the careful reviewing of the designs adopted in Phases I and II of the Project while still following the policies regarding the natural and social conditions as mentioned above.

It is important to note here that in designing facilities there is a trade-off in trying to save maintenance cost and trying to save initial construction cost: the effort to reduce maintenance expenses usually requires more costly materials and thus higher initial construction costs; whereas, the effort to reduce initial construction costs by using less costly materials usually requires more frequent maintenance and thus higher maintenance costs.

Mongolia is different from other developing countries of tropical or sub-tropical zones in that the severely cold climate inevitably requires heating and other utilities to attain the basic living conditions. Also important, is that during the socialist era, the country had a fairly good quality of facilities and buildings to conduct its educational activities. Those facilities are still in use, even though the shift to a market economy brought with it the accompanying result of building dilapidation due to insufficient maintenance. Thus, for this Project to secure the appropriate learning environment, it is absolutely necessary to install electrical, heating, ventilation, and drainage facilities at the "necessary minimum" level".

Educational equipment will be limited to daily used items, which follows the same principle as in Phase II of the Project.

2-2-1-8 Policy Regarding Construction Schedules

The most important thing to bear in mind about the construction work in Mongolia is that it is impossible to pour concrete at the construction sites during the winter when the temperatures go below minus 30 °C. Therefore, in considering the construction schedules for this Project, excavation work needs to start in the spring immediately when the frozen soil starts melting, and all the concrete pouring work should be completed by the end of the summer.

To be more precise, excavation work should start at the beginning of April and the foundation work should follow as soon as possible. The structural work should be completed by the middle of September for the four story buildings, by pouring one floor

of concrete in three weeks. In order to do that, the production of pre-cast concrete panels should start a few months before excavation begins. It is desirable to start all the initial preparation aspects of the construction work as early as possible to secure the transportation of aggregates and to send out the orders for reinforcing bars to the factories as they tend to be closed down during the winter. In addition, because construction is concentrated in the summer, the special batching plant for the Project should be set up in UBC to avoid an unstable supply of concrete which would negatively affect the construction schedules.

After the completion of the structural work, the masonry work for the brick exterior walls should begin; and during the winter, the building interior work should be completed in about four months with heating already installed. The totals here amount to one year for the whole construction.

From a design point of view, the followings are effective to shorten the construction period:

- 1) To reduce the amount of excavation work underground, the building construction areas are to be minimized by constructing simple four-story rectangular buildings;
- 2) To increase work efficiency at the construction sites, especially for reinforced concrete, the building shapes are to be simplified;
- 3) To reduce the amount of cast-in-place concrete that might negatively affect the construction schedules at the sites, pre-cast concrete panels producible in factories during winter are to be used for the floors;
- 4) The building shapes are to be simple rectangular so that the types of panels can be minimized;
- 5) The vertical shafts for ventilation are to be arranged in one place at each level without the ones in each classroom so that the use of pre-cast concrete panels is maximized;
- 6) Building sizes are to be adjusted according to standard panel sizes so that only pre-cast concrete panels are used for the floors of classrooms and corridors.

2-2-2 Basic Plan

2-2-2-1 Selecting Project Schools, Contents & Sizes of Project Components

(1) Selection Process of Candidate Schools

Based on discussions with the Education Department of UBC, the following changes were made to the original list of schools requested by the Mongolian side:

- 1) In addition to the 31 schools originally requested, 3 schools (No.68, No.115 and No.116) were added to the list;
- 2) No.84 School was excluded from the Project because of heating pipelines in the ground directly beneath the site of the school which would interfere with foundation digging, and the size of the lot is too small to relocate the school building.

Based on the above changes, 33 schools were chosen as candidate schools for the Project. Table 2-1 shows the list of those candidate schools.

(2) Criteria for Selecting Project Schools

Criteria for selecting Project schools specified in the Minutes of the Discussions are as follows:

Schools/sites satisfying the following criteria will be given priority

- 1) Urgently need construction of additional classrooms because of overcrowding even after the introduction of double-shift or multi-grade classes.

Schools /sites to be selected must fulfill the following criteria:

- 2) Present and future demand can be quantitatively estimated by a set of data such as the number of school-aged children, the rates of population growth, enrollment ratio, etc.
- 3) Sufficient teachers, budget allocation, and necessary cooperation from concerned people for the proper operation and maintenance of the facilities are secured.
- 4) No other program or plan for new/undergoing classroom construction by MOSTEC, local government, other donors, NGOs and so forth.
- 5) Ownership of land for construction is legally secured, and the evidence of land ownership will be provided to the Japanese side by 19 September 2003.

- 6) Access road for the movement of materials and for the construction works are properly constructed.
- 7) Topographically safe and appropriate-sized land for construction is secured.
- 8) No foreseen natural and environmental or social hazard.

Table 2-1 List of Candidate Schools

No.	Name of School	District	Priority Order by Mongolian side
Existing Schools			
1	No. 2 School	Sukhbaatar	3
2	No. 3 School		6
3	No. 16 School		24
4	No. 35 School		15
5	No. 5 School	Chingeltei	21
6	No. 17 School		23
7	No. 39 School		5
8	No. 19 School	Bayangol	9
9	No. 20 School		20
10	No. 40 School		22
11	No. 73 School		7
12	Mongeni Complex School		27
13	No. 12 School	Songinokhairkhan	11
14	No. 42 School		25
15	Iredui Complex School		10
16	No. 52 School	Khan-uul	26
17	No. 14 School	Bayanzurkh	8
18	No. 21 School		12
19	No. 33 School		16
20	No. 44 School		19
21	No. 48 School		1
22	No. 68 School		17
23	No. 79 School		18
24	No. 87 School		4
25	No. 97 School		2
26	Goromt Complex School	Nalaikha	13
27	Borovsrol Complex School	Baganor	14
New Schools			
1	No. 61 School	Chingeltei	1
2	No. 112 School	Songinokhairkhan	2
3	No. 113 School	Bayanzurkh	6
4	No. 114 School	Khan-uul	3
5	No. 115 School	Songinokhairkhan	5
6	No. 116 School	Sukhbaatar	4

(3) Selection of Project Schools

Project schools were selected according to the selection criteria mentioned above.

Selection Criteria 1) Urgently need construction of additional classrooms because of overcrowding even after the introduction of double-shift or multi-grade classes

The Project schools were selected in the following ways:

1)-1 Preconditions

① Shifts

The calculations of this Project are all based on a double-shift class system being used in the schools.

② Number of Students in the Classrooms

According to the Architectural Standards for Educational Facilities in Mongolia, the number of students per classroom is 35 (except 30 for the 1st grade). However, the actual current situation in UBC is that 40 to 50 students are in a classroom. The Project sets the number of students in each classroom at 40, the same as it was in Phase I of the Project.

③ The Year for Calculating Classroom Shortages

The calculation of classroom shortages is based on the projected number of students in the year 2005, the beginning year of compulsory school enrollment for 7-year old children.

④ Method for Calculating Expected Enrollment

a. Enrollment Estimates at Existing Schools

The site survey found that the enrollment rates from 1st through 9th grades are 100% and that around 40% of 1st graders are 7 years old. Considering that in 2005 when enrollment of 7-year olds becomes compulsory, the enrollment is projected to increase because of those who would have enrolled at the age of 8 will enroll at the age of 7, which is equivalent of 60% of 1st graders.

On the other hand, the growing population inflow of people moving to UBC from the rural areas will result in increase in school-age population. At each school, the

projected increase of enrollment in 2005 is calculated based on the average increase rates found in the enrollment records of the past 5 years (1998-2003).

b. Enrollment Estimates at New Schools

As the new (to-be-built) schools do not have existing school buildings, the estimation of enrollment is based on the school-age population in the school zones. There are several horos⁴ specified as the newly proposed school zones of the new (to-be-built) schools. The projected enrollment of students at each new (to-be-built) school in 2005⁵ is based on the average increase rate of school-age population living in these horos between 1999 and 2002. Based on the results of the site survey, it is assumed that the 2005 school enrollment rate will be 100% of all school children in the 1st through 8th grades, and 70% in the 9th and 10th grades.

⑤ Overlapping School Zones

A certain number of the students currently going to existing Schools No.19 and No.42 are expected to transfer to new No.115 School, as these 3 schools have overlapping school zones. The half of expected number of students of No.115 School is each subtracted from the estimated number of students at No.19 School and No.42 School.

⑥ Planned Project Buildings Used For Primary Education

Site survey found that both the Iredui Complex School and Borovsrol Complex School would use the Project classrooms for only primary grade level students. Therefore, unlike all the other Project schools, which base their calculation of classroom shortages and new classrooms on the entire enrollment of all grade levels of students including the secondary level, these two schools are basing their calculations on the enrollment of only primary grade level students.

⑦ Distinctions for Categorizing “Ordinary Classrooms” from “Special Classrooms”

a. Special Classrooms

According to the Architectural Standards for Educational Facilities in Mongolia, which were based on the standards of the former Soviet Union, each school is

⁴ Although each public school basically considers horo, which the school belongs to, and its outskirts as school zones, there should be only one school in each horo.

⁵ In spite the fact that No. 61 school has the existing school buildings, only the number of children in the 1st grades through 5th grades were estimated in the site survey, and it is impossible to project the number of school-age children in the 6th grades through 10th grades.

supposed to have special classrooms for subjects including Mongolian language, foreign languages, mathematics, history, geography, physics, chemistry, biology, astronomy, computer science, military training, and so on. However, even though the existing buildings at all of the candidate schools have these special classrooms, most schools use them simply as ordinary classrooms to make up for severe classroom shortages.

Among the many special classrooms at each existing school, two rooms (one each for boys and girls) are kept for vocational training. In the Project, the two vocational training rooms at each school will be categorized and counted as special classrooms and will continue to be used for vocational training. Regarding the special classrooms for science classes, while some schools use those rooms frequently for science experiments, other schools just convert them to "ordinary classrooms," whereas lab experiments are either conducted in these "ordinary classrooms" or not done at all. According to the Ministry of Education, the curriculum for pre-service teacher training includes the conducting of science experiments, and all the schools are supposed to do them in their lessons. But as a detailed syllabus of standards for all schools is still in development, each school uses these rooms as they see fit. In the Project, all the science rooms will be categorized and counted as "ordinary classrooms."

There are also rooms for foreign languages including English, Russian and Japanese. However unlike special classrooms for other subjects, these rooms are much smaller as they were designed for small group lessons. In this sense, they will not be considered "special classrooms" nor "ordinary classrooms".

In summary, in this Project, only 2 rooms at each school that are used for vocational training (1 for boys, 1 for girls) will be categorized and counted as "special classrooms." And the rest of all the existing classrooms will be categorized and counted as "ordinary classrooms."

b. Partitioned "Corridor" Classrooms

Most of the existing schools have very wide corridors so students can use them for exercise activities during the extremely cold winter. The site survey found that many schools have installed partitions to make classrooms in these corridor spaces. Some of these "partitioned" rooms, like other ordinary classrooms, have an acceptable environment in terms of size and heating standards, etc. In this Project, they will be categorized and counted as "ordinary classrooms" as they have secured a sufficient learning environment; and also, the schools have no intention to return the space

back to the original corridors.

However, all the other "partitioned" rooms do not follow environmental standards in that they lack heating system and are too small in size or have irregular (for example long and narrow) shapes. In this Project, these rooms will not be regarded as "ordinary classrooms."

c. Primary School Buildings Originally Used for Kindergarten

The Iredui Complex School and No.79 School have been using buildings originally built for kindergarten classes. Since the rooms inside all meet the standards in terms of size and learning environment, they will be categorized and counted as "ordinary classrooms" in the Project.

d. School Buildings Originally Used for Military Housing

The buildings of No.87 School were originally used as military housing facilities. Only 1 room in this school building meets the classroom standards. So, in this Project, only this one room will be categorized and counted as an "ordinary classroom."

e. School Buildings Originally Used for Residential Housing

No.61 School currently has students from the 1st through the 5th grades. The School has the intention to demolish the existing school buildings (originally used as housing but transferred into classrooms) and to become a complete school with all grade levels in the near future.

Therefore, although No.61 School has existing buildings, the Government of Mongolia categorized this school as part of the new schools in the request. In addition, some of the classrooms in the existing buildings of No.61 School have columns at the center of the rooms as well as insufficient heating systems. So, so as they are not considered appropriate classrooms, they will not be regarded as "ordinary classrooms." In conclusion, School No. 61 will be considered a new school as requested, and no rooms will be counted as "ordinary classrooms."

f. School Using Apartment Rooms

Because of serious classroom shortages at the Borovsrol Complex School, the school rents 8 rooms at an outside residential apartment building to use for 1st grade classes. The site survey confirmed that in case this school would be selected as a Project school, those rooms would not be used after the completion of Project classrooms. In this Project, those rooms will not be counted as "ordinary classrooms."

1)-2 Method for Calculating the Number Classrooms Shortages

The number of classroom shortages is calculated by the following formula:

$$\begin{aligned} \text{Classroom Shortage} = & \\ & [\text{Enrollment} / 80] \text{ minus } [\text{the Number of Existing Ordinary Classrooms}] \\ & (80 = 40 \text{ students times } 2 \text{ shifts}) \end{aligned}$$

1)-3 Selecting the Project Schools

Schools with shortages of 6 or more classrooms will be included in the Project. Schools with shortages of less than 6 classrooms will not be included in this Project. The reason for this is because the unit construction cost and maintenance costs increase to the point where it is no longer practical to build, and thus would lower the effectiveness of the Project's purpose.

Selection Criteria 2), 3), 4) and 6)

As all the requested schools fall within the above selection criteria 2), 3), 4) and 6), no schools are excluded from the Project due to the failure to meet those criteria.

Selection Criteria 5) "Ownership of land for construction is legally secured, and the evidence of land ownership will be provided to the Japanese side by 19 September 2003"

Public schools in UBC can acquire the right to use land through the following two procedures;

- ① The UBC mayor issues a letter ordering the UBC Land Management Department to enter into a contract with each school regarding land use. (issued in June, 2001)
- ② Based on ①, the UBC Land Management Department enters into a contract with each school regarding the land use.

According to the Director of the UBC Land Management Department, only the contract specified in ② is legally binding to assure that each school attains the rights to continuously use the land. As for new schools, however, presentation of the contract specified in ② is not required for the following reasons: (1) the school management system as the subject of the contract is not established yet; and (2) it is possible to testify the sufficient right to use the land only by ① (the letter from the UBC mayor). The UBC Land Management Department will enter into contracts with new schools

regarding the land use after the appointments of principals. The copies of documents that testify the right to use the land had been submitted by all the candidate schools. Therefore, there are no schools excluded from the list of the candidate schools by selection criteria 5).

Selection Criteria 7) “Topographically safe and appropriate-sized land for construction is secured”, and Selection Criteria 8) “No foreseen natural and environmental or social hazard”

At the future site of No 113 School (new school), six gers illegally occupy the land. These gers should be relocated under the agreement between the residents and the Government of Mongolia. Also, the relocation will require proper compensation and support in accordance with the domestic law of Mongolia. Besides, the Mongolian side must relocate the gers after following the process based on the discussion and agreement between the Mongolian side and the Japanese side. However, it is difficult to develop a relocation plan within a given period. Therefore, No 113 School is excluded from the list of the candidate schools.

Also, No 116 School (new school) is located in low land along a river and is in danger of possible future flooding. Thus, the school is included in this Project only on the condition that the Mongolian side fills the ground at the site to avoid future flooding.

Table 2-2 shows the results of the selection process:

Table 2-2 Results of the Selection Process

Selection Criteria	Contents	Schools to be excluded from the Project
1)	Urgently need construction of additional classrooms because of overcrowding even after the introduction of double-shift or multi-grade classes (with 6 or more classroom shortage).	No. 2, 3, 5, 12, 16, 19, 20, 21, 35, 40, 42, 52, 73, 79 School, Mongeni Complex School*
2)	Present and future demand can be quantitatively estimated by a set of data such as the number of school-aged children, the rates of population growth, enrollment ratio, etc.	None
3)	Sufficient teachers, budget allocation, and necessary cooperation from concerned people for the proper operation and maintenance of the facilities are secured.	None
4)	No other program or plan for new/undergoing classroom construction by MOSTEC, local government, other donors, NGOs and so forth.	None
5)	Ownership of land for construction is legally secured, and the evidence of land ownership will be provided to the Japanese side by 19 September 2003.	None
6)	Access road for the movement of materials and for the construction works are properly constructed.	None
7)	Topographically safe and appropriate-sized land for construction is secured.	None
8)	No foreseen natural and environmental or social hazard.	No.113 School

* Mongeni Complex School selects students by entrance examination regardless of where they live. All the classes are special classes for the selected students, and many students come to the school from long distance. Thus, Mongeni Complex School has the characteristics different from ordinary public schools. Therefore, it is inappropriate to include the School in this Project from the standpoint of Project's benefits to the community.

(4) Setting Building Types and the Number of Classrooms to be Constructed

Three types of buildings were originally requested, ones with 8 classrooms, 12 classrooms and 18 classrooms respectively (8 and 12 classrooms for existing schools, 18 classrooms for new schools). In this Project, the types of buildings are determined, while considering the request as much as possible, on the principle of "necessity" from an architectural planning point-of-view, and the special situation of each school.

1) Existing Schools

Considering that the Government of Mongolia originally requested the construction of 8 or 12 classrooms for each existing school, the 8 classroom type and the 12 classroom type are to be prepared. Also, the 18 classroom type is to be provided for existing schools with shortages of more than 18 classrooms. In addition, to avoid any over-concentration of Project classroom construction at the large-sized schools, those schools with shortages of 6 or 7 classrooms will be covered in the Project. For those schools, the 6 classroom type of buildings will be prepared. In summary, there are 4 types of buildings in the Project:

- TYPE-1. 3-story, 6 classrooms
- TYPE-2. 4-story, 8 classrooms
- TYPE-3. 4-story, 12 classrooms
- TYPE-4. 4-story, 18 classrooms

The choice of the type of building for each Project school is based on the type which is closest to, but not exceeding, the number of classroom shortages of the school. For example, TYPE-3 will be constructed for a shortage of 15 classrooms, and TYPE-2 building will be constructed for schools with shortages of 11 classrooms.

2) New Schools

Because of the steadily increasing rate of school aged children who will go to the new schools, even the construction of the 18 requested classrooms will probably not fully satisfy the needs of the new schools. Considering that classrooms at existing schools also need to be built within the budget, the Project sets the maximum number of 18 new classrooms for each new school.

- TYPE-4B. 4-story, 18 classrooms with boiler room

Each type will have 2 symmetrical versions (R for Right and L for Left) of buildings that mirror each other so they harmonize with other buildings at the site. In total this Project has the following 9 types of school buildings except TYPE-3R which is not appropriate for any candidate schools

TYPE-1R, TYPE-1L, TYPE-2R, TYPE-2L, TYPE-3L, TYPE-4R, TYPE-4L, TYPE-4BR, TYPE-4BL

The list of Project schools and the number of classrooms to be constructed is shown in Table 2-3.

Priority Order by Mongolian Side	School	District	Shift	Year 2003 (present)			Horo Number in the School Zone	Average Increase Rate of School-Age Population in the School Zone (Year 1999-2002)	Estimated Number of Students (Year 2005)	Number of Necessary Classrooms	Number of Classrooms to be Constructed	Number of Classrooms Shortage	Number of Classrooms to be Constructed	Remarks
				Enrollment										
				Grade 1 to 8	Grade 9 & 10	Total								
New School	N1 No.61 School	Chingeltei	3	615	-	615	No. 12	2.33%	2,677	34	34	18	Currently using housing facilities. Now the School has 5 grades but will have all the grades including secondary level in the near future	
	N2 No. 112 School	Songinokhairkhan	-	-	-	-	No. 7 (half), No. 9 (half)	6.17%	3,241	41	41	18		
	N3 No. 114 School	Khan-uul	-	-	-	-	No. 9 *1	7.56%	2,378	30	30	18		
	N4 No. 116 School	Sukhbaatar	-	-	-	-	No.15 (half), No.16 (half)	26.97%	4,712	59	59	18		
	N5 No. 115 School	Songinokhairkhan	-	-	-	-	No.1(half), No.20 (half)	8.75%	3,091	39	39	18		
	N6 No. 113 School	Bayanzurkh	-	-	-	-	No.2	5.01%	3,760	47	47	0	Due to the illegal gers within the site, No. 113 School is excluded from the Project according to the Selection Criteria No.5	
Total			-	-	-	-	-	-	250	250	90			

Priority Order by Mongolian Side	School	District	Shift	Year 2003 (present)										Average Increase Rate of Enrollment (Year 1998-2003)	Estimated Number of Students (Year 2005)	Number of Necessary Classrooms (40/classroom)	Number of Classrooms Shortage	Number of Classrooms to be Constructed	Remarks
				Enrollment			Number of Classrooms												
				Grade 1 to 8	Grade 9 & 10	Total	Ordinary Classroom	Originally Used as Special Classrooms Originally used as kindergarten	Special Classroom	No. of Ordinary Classrooms * 2	Total	Number of Students per Classroom							
Existing Schools	1 No., 48 School	Bayanzurkh	4&3	3,102	488	3,590	15	0	14	0	29	27	66.5	8.9%	4,519	57	30	18	
	2 No 97 School	Bayanzurkh	2	1,996	339	2,335	15	0	11	2	28	26	44.9	2.8%	2,617	33	7	6	
	3 No. 2 School	Sukhbaatar	2	2,068	303	2,371	29	0	5	6	40	38	31.2	2.6%	2,650	34	0	0	
	4 No. 87 School	Bayanzurkh	3	1,205	191	1,396	1	0	0	3	4	2	349.0	14.9%	1,958	25	23	18	Classrooms were originally used as military housing
	5 No. 39 School	Chingeltei	2	2,016	184	2,200	22	0	3	8	33	31	35.5	13.8%	3,038	38	7	6	
	6 No. 3 School	Sukhbaatar	2	1,872	356	2,228	18	0	11	0	29	27	41.3	-0.1%	2,359	30	3	0	
	7 No. 73 School	Bayangol	3&2	1,186	218	1,404	11	0	1	8	20	18	39.0	3.7%	1,601	21	3	0	
	8 No. 14 School	Bayanzurkh	3	1,821	382	2,203	13	0	12	1	26	24	45.9	4.1%	2,527	32	8	8	
	9 No. 19 School	Bayangol	3	1,043	169	1,212	15	0	0	5	20	18	33.7	0.7%	584	8	0	0	720 students, half of 1440 (18 classrooms * 40 students * 2 shifts) currently at No. 19 will transfer to No. 115 School (new to-be-built
	10 Iredui C. S.	Songinokhairkhan	2	4,220	-	4,220	50	12	0	0	62	62	34.0	9.6%	5,765	73	11	8	No special classrooms are counted as the Project building will be used for primary education. The classrooms originally used as kindergarten will be counted as ordinary classrooms
	11 No. 12 School	Songinokhairkhan	3	1,576	300	1,876	22	0	3	7	32	30	31.3	2.7%	2,098	27	0	0	
	12 No. 21 School	Bayanzurkh	2	1,253	331	1,584	16	0	6	2	24	22	36.0	6.6%	1,902	24	2	0	
	13 Goromt C. S.	Nalaikha	3&2	4,878	695	5,573	44	0	17	3	64	60	46.4	4.6%	6,926	87	27	18	As the school have 2 buildings for secondary level, 4 rooms (2 rooms per building) will be counted as special classrooms
	14 Borovsrol C. S.	Baganor	3&4	2,639	-	2,639	18	0	9	0	27	27	48.9	5.7%	3,347	42	15	12	No special classrooms will be counted as the Project building will be used for primary education.
	15 No. 35 School	Sukhbaatar	2	1,742	235	1,977	22	0	0	9	31	29	34.1	3.6%	2,256	29	0	0	
	16 No. 33 School	Bayanzurkh	3&2	2,142	470	2,612	17	0	12	2	31	29	45.0	5.6%	3,085	39	10	8	
	17 No. 68 School	Bayanzurkh	3&2	1,063	221	1,284	4	0	11	2	17	15	42.8	13.4%	1,747	22	7	6	
	18 No. 79 School	Bayanzurkh	2	2,210	234	2,444	13	12	0	13	38	36	33.9	5.3%	2,886	37	1	0	Classrooms originally used as kindergarten are counted as ordinary classrooms
	19 No. 44 School	Bayanzurkh	2	1,884	314	2,198	23	0	0	12	35	33	33.3	20.0%	3,357	42	9	8	
	20 No. 20 School	Bayangol	2	2,529	385	2,914	31	0	1	12	44	42	34.7	3.2%	3,298	42	0	0	
	21 No. 5 School	Chingeltei	3	2,006	311	2,317	23	0	0	13	36	34	34.1	0.2%	2,472	31	0	0	
	22 No. 40 School	Bayangol	2	1,795	272	2,067	19	0	7	5	31	29	35.6	1.5%	2,260	29	0	0	
	23 No. 17 School	Chingeltei	2	2,438	279	2,717	22	0	1	14	37	35	38.8	12.4%	3,652	46	11	8	
	24 N.o. 16 School	Sukhbaatar	2	1,372	247	1,619	23	0	0	11	34	32	25.3	5.3%	1,904	24	0	0	
	25 No. 42 School	Songinokhairkhan	3	2,279	330	2,609	24	0	4	9	37	35	37.3	4.8%	2,324	30	0	0	720 students, half of 1440 (18 classrooms * 40 students * 2 shifts) currently at No. 42 will transfer to No. 115 School (new to-be-built
	26 No. 52 School	Khan-uul	2	1,876	278	2,154	23	0	1	8	32	30	35.9	4.2%	2,485	32	2	0	
	27 Mongeni C. S.	Bayangol	3	1,294	257	1,551	27	0	0	8	35	33	23.5	8.1%	1,920	25	0	0	All the classes are special classes for selected students
Total			-	-	-	-	-	-	-	-	-	-	-	959	176	124			

*1 Horo No.9 in Khan-uul District was divided into half in 2000, so the calculation is based on the data after 2000.

*2 All the classrooms at existing schools (except two rooms kept for vocational trainings) are counted as "ordinary classrooms"

Table 2-3 The Calculation Result of Project Classrooms for Candidate Schools

(5) Setting Project Components

1) Requested Components -

The following components were originally requested by the Government of Mongolia:

- For Each Existing School : classrooms, teachers' room, cloakroom, basic educational furniture, basic teaching materials and maintenance tools.
- For Each New School : classrooms, teachers' room, toilets, gymnasium, music classrooms, other special classrooms, basic educational furniture, basic teaching materials and maintenance tools.

The UBC Department of Education first asserted the importance of having gymnasiums constructed for the new schools. However, the Japanese side explained that to fully maximize the benefits of the school facilities that will be constructed within the limited budget, gymnasiums, music classrooms and other special classrooms can not be included in the Project; to which the Mongolian side eventually concurred and accepted. In addition, toilets for existing schools and cloakrooms for the new schools were added to the components. In the final analysis, the components selected for both the new and the existing schools are the same. For each school, they are:

- classrooms, a teachers' room, a cloakroom, toilets, basic educational furniture, basic teaching materials and maintenance tools.

2) Necessity of Components

① Classrooms

As this Project's aim is to alleviate classroom shortages in UBC caused by rapid increases in population and expansion of the basic education system (extending 4 years of schooling to 5 years at the primary level), classrooms are an indispensable component of the Project.

② Teachers' rooms

A teachers' room in the buildings of each school is necessary for teachers' meetings, class preparation and the storing of teaching materials & equipment. In addition, the construction of a teacher's room is clearly specified in the architectural standards. At the new schools, this room can also be used for the principals and school staff.

③ Cloakrooms

The heavy clothing that students bring into the classrooms during the winter take up a

lot of space, and personal belongings are easily lost. Thus, because the construction of a cloakroom at each school will help relieve these inconveniences, cloakrooms are indispensable school facilities in Mongolia and also specified in the architectural standards. When constructing the cloakrooms, it is important to bear in mind that a sufficient size of space in front of the cloakroom is necessary as many students concentrate in that area during the times when they arrive at and leave the school.

④ Toilets

There is a shortage of toilets in most of the existing school buildings. Thus, toilets will be installed in this Project, their numbers commensurate with the number of students accommodated in the Project buildings.

⑤ Furniture

The furniture necessary for basic school operation is provided in this Project. They are desks & chairs for students, desks & chairs for teachers, blackboards & bulletin boards for the classrooms, and chairs & tables & cabinets for the teachers' rooms. Other furniture and fixtures are not covered in this Project as the Mongolian side is expected to provide these things themselves.

⑥ Basic Teaching Materials

The basic teaching materials requested are the same as those requested in Phase I of the Project. The basis of the selection criteria for these materials is: 1) they are in accordance with the curriculum, 2) they are regularly used, 3) they can be easily utilized and maintained by teachers, and 4) they can be used in ordinary classrooms.

The Mongolian side also requested overhead projectors (they were also provided in Phase II of the Project). For the schools that already have the projector, it is often used in all the grades for subjects such as Mongolia language, mathematics, and science classes. However, because of the difficult financial situations, many schools do not have the overhead projectors, and even the schools that have them are experiencing shortage. Therefore, one overhead projector per Project school will be provided.

⑦ Maintenance Tools

Repair tools will be provided in this Project, as they are indispensable to maintain the facilities and fixtures in this Project.

2-2-2-2 Site and Layout Plans

As described in the above Selection Standards of the Project Schools, from the viewpoint of the natural environment and the shape and topography of the land, the sites at each school under this Project are in acceptable condition to safely have school facilities constructed on them. Although the level of infrastructure and the surrounding environment differ from site to site, particularly between the existing schools and the new to-be-built schools of this Project, the basic preparation plans and arrangement concepts are the same for each site. They are:

- The buildings at each of the existing schools shall be arranged so a school yard can be secured; and for future expansion at the new Project schools, as much empty space for school yards as possible shall be planned for.
- Unlike Phases I and II of the Project, most of the school buildings in this Project will be four stories high. Also, so that the buildings do not appear oppressive, a sufficient clearance space between each of the buildings shall be secured, in that none of the buildings are in the shade of any other buildings.
- Heating pipes are often installed underground at the school sites, and the relocating costs of these facility systems are expensive. Thus, as a general principle regarding the preparation of building arrangement plans, locations over underground pipes shall be avoided.
- As long as site conditions allow, the preparation of the arrangement plans should carefully have the buildings at locations which allow for convenient access to and from the existing school buildings as well as to the gates.
- When Project schools need to have coal storage, water storage or septic tanks installed, the placement of buildings should allow for vacuum or water supply vehicles to easily enter and access the facility.
- As Mongolia is situated at high latitudes and daytimes are short in the winter, classrooms should be situated on the south sides of the buildings so that they utilize the natural heat and light from the sun as much as possible. Even if it is difficult to arrange the school buildings in a southerly facing direction due to the shape of the land or existing infrastructure conditions, it is important that classrooms should never be arranged facing north.

2-2-2-3 Architectural Plans

(1) Floor Plans

All the four types of Project buildings as described in Section 2-2-2-1 have the same basic floor plan concept. This basic floor plan concept is as follows:

- A corridor shall be planned for one side of each building in such a way that maximum exposure to the natural sunlight is utilized, allowing the sunshine to enter all the rooms equally at each Project school.
- A stairway shall be arranged at both ends of each corridor in such a way that each is safe in emergencies, and set up for the convenience of handling large movements of people.
- At one end of each school building corridor, a main entrance with a vestibule shall be installed (for winter considerations). Also, an access door, that can also be used as an emergency exit, shall be installed at the other end of the corridor.
- In order to increase construction efficiency and shorten the construction period so that work can be concentrated during the summer season, the shape of all the Project buildings shall be simple rectangular with no projections, except for the entrance vestibule.
- Construction costs shall be reduced by keeping the classroom depths and corridor lengths short, thereby decreasing the building area as well as the total surface area of the buildings. This, in turn, will lessen the amount of exterior finishing materials needed, thereby reducing the heat load and heating expenses.
- The size of both the floor area of teachers' rooms and the toilet rooms are smaller than the classrooms in all the three types of Project school buildings. Because of these size differences, the column spacing of the teachers' and toilet rooms is also different from the classrooms. This offers the advantage of being able to effectively place either a teachers' room or a toilet room at the same location on every floor.
- Both a machinery room and a cloakroom that do not require any natural lighting shall be arranged in the basement. The cloakroom next to the hall in front of the reception counter shall be located close to the building entrance.
- The corridor widths and classroom dimensions shall be adjusted to fit the dimensions of the standard pre-cast concrete panels, which will be used for most of the building floors. In order to avoid the use of irregular-sized floor panels, all floor openings (for air duct shafts, etc) shall be arranged at the same location on every floor where the cast-in-place concrete is to be poured, thereby reducing the cost for making

irregular-sized panels.

a) Classrooms

The same as in Phase II of the Project, classroom sizes for this phase shall be decided by following 1) the architectural standards, and 2) the principle of keeping classroom depths short to reduce the distance between the blackboard and the rear most students, and 3) the principle of securing a sufficient window height. The sufficient window height will be secured by arranging a column at the center of the longitudinal axis (beam) which means having the beam height shortened.

However, as mentioned earlier, the classroom dimensions shall be adjusted to fit the pre-cast concrete panels on the floor and the brick arrangement on the exterior walls. The resulting size of all classrooms shall be 7.6m×7.28m (see Fig. 2-1). Also, duct spaces which were arranged at one corner of the classrooms in Phases I and II of the Project (and created irregular room shapes which limited desk arrangement) are not needed in the classrooms anymore because of the change of location of duct shaft. Thus, the classrooms can retain their perfect rectangular shape and desks can be arranged in any of several different ways, such as four rows with five desks in each row.

b) Teachers' Rooms

The teachers' rooms will be used as places for teachers to meet and prepare for classes as well as for storing teaching materials used in the classes. Homeroom teachers and special subject teachers, who need a place to go when not teaching, will use the teachers' rooms. The total number of teachers at a school is calculated by multiplying the number of classrooms to be constructed in this Project by 1.4, which is the average number of teachers in each shift as based on the site survey results since there is no standard for deployment of special subject teachers in Mongolia.

Also, based on architectural planning rationale, the three types of buildings for the existing schools (TYPE 1 = 6 classrooms, TYPE 2 = 8 classrooms, TYPE 3 = 12 classrooms) shall all have the same sized teachers' rooms with an area of 2.5m² per teacher as specified in the Architectural Standards of Mongolia. As for the new (to-be-built) Project school buildings (TYPE 4 = 18 classrooms), due to large size of planned buildings and the number of users, the teachers' rooms shall be located on the first floor (to supervise the building entrance and the underground hall), which is desirable from a management point of view. In addition, the size of one teacher's room is 1.5 times larger than one classroom, thus more than fulfilling the architectural standards required.

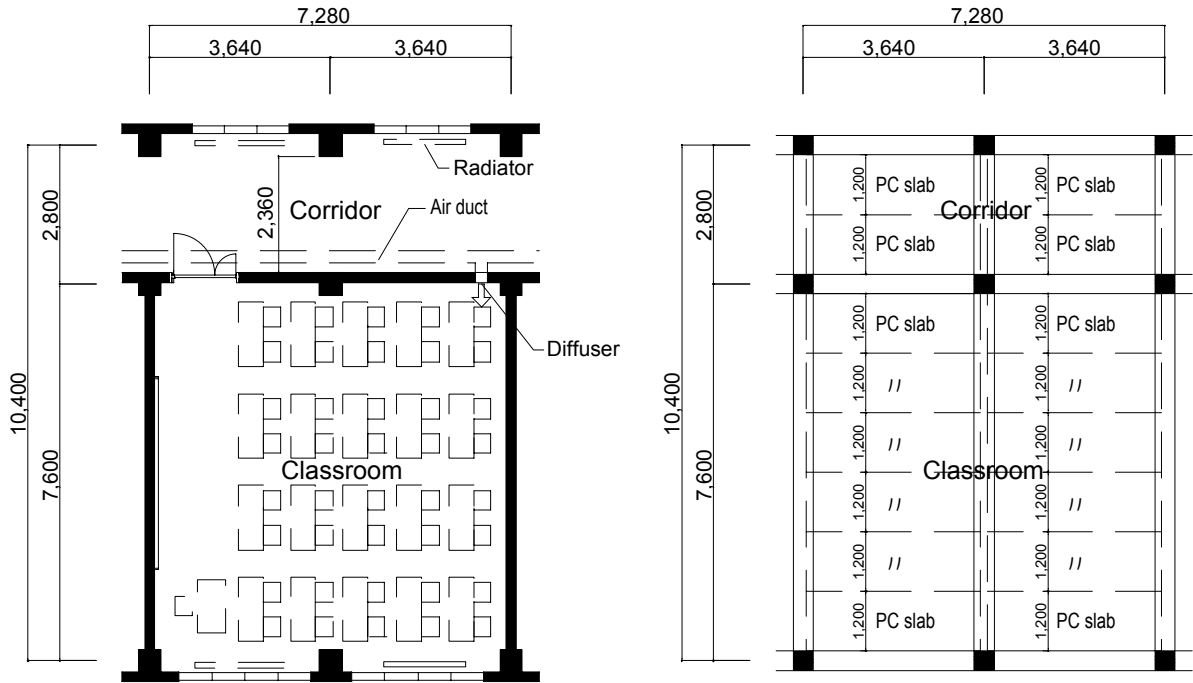


Figure 2-1 Classroom Floor Plan and Layout of PC Panels

c) Toilets

The types of toilets that will be selected from the 3 kinds available for installation and the decision of whether one or two toilet rooms will be built depend on the size of each Project school. The architectural standards specify a minimum of one toilet bowl per 30 girls and one toilet (types, bowls or urinals, are not specified) per 40 boys, and the number of faucets for washing hands a minimum of one per 30 students. As for boys' toilet, in accordance with the architectural standards, and from actual inspection of the installing situation at each existing school, the Project shall install one urinal per 40 boys and one toilet bowl per 60 boys, the same as in Phases I and II of the Project.

The site survey also found that students at the existing schools, as well as students at other Phase I Project schools, did not know how to use the western-type toilet bowls and so the toilets were not properly used. Thus, squat-type toilets (Asian type), that are durable and simple to maintain, shall be adopted for this phase of the Project. The urinals to be installed for boys shall be the durable and easy-to-clean continuous ditch-type urinals, instead of the independent "stool-type" standing urinals.

One or two teachers' toilets, depending on the number of teachers, shall also be installed at each Project school as it was in Phases I and II of the Project. Western type toilet bowls shall be installed for the teachers' toilets.

d) Corridors

The architectural standards specify the corridor widths as not less than 2.2m. The corridor widths for the Project shall be 2.36m in order to fit the standard pre-cast concrete panel sizes. In Phases I and II of the Project, corridors slightly wider than the standard width were adopted so that students could also use them as play areas in the winter. However, the corridor widths for this phase of the Project shall instead be the minimum, because the basement hall in front of the cloakroom can be used as a play area during the winter.

e) Entrances

The building entrance shall be located at one end of the building corridor, the end which is more convenient for people to go in and out from the school yard. A vestibule shall be built at the entrance in order to prevent cold air from entering into the building during the severe winters.

Also to prevent cold air from coming in, the outside door and the inside door of the vestibule shall not directly face each other, but rather be at angles to each other. The outside door of the vestibule shall be located facing south as much as possible, and be on the same side as the classroom windows. Further, because a lot of students wearing thick winter clothing can be quite suffocating, a floor with sufficient space shall be secured at the entrance.

f) Cloakrooms

In the winter, students come to school wearing thick coats, winter boots, hats, gloves and mufflers. If they bring these items into their classrooms, an extremely large space will be needed to store them and personal belongings or class items can easily become lost among so many bulky things. For this reason, the architectural standards specify the installation of a cloakroom in the school buildings. Also, a sufficient number of coat hooks shall be provided for the cloakrooms, the actual amounts depending on the number of students to be accommodated in each type of building.

In order to minimize costs while making good use of the deep pits under buildings where the foundations have to be constructed because of the extremely cold weather, the cloakrooms, which were on the first floor in Phases I and II of the Project, will be below the buildings in this Phase to efficiently take full advantage of that underground space which was not previously used in Phases I and II of the Project. Also, a large spaced multi-purpose hall shall be built underground in front of the reception area of the cloakroom. This large hall will help to lessen the congestion in front of the reception

area counter when many students congregate while arriving and leaving during the double-shift class change period. Those students will not need to wait outside in the winter. In addition, the hall will be used as a play space and exercise area for students in the winter when it is difficult to go outside. The hall, with a high ceiling space that connects to the entrance on the first floor, shall allow the natural sunlight to come inside thereby keeping the electricity and other operation costs of artificial lighting to a minimum. Another advantage of this high ceiling hall is that it can accommodate various kinds of activities.

Table 2-4 shows the Facility Plan of each Project school

Table 2-4 Facility Plan of Each Project School

12 Existing Schools

	School	District	Classrooms to be constructed	Building Type	Furniture/ Equipment		Water Tank	Septic Tank	Boiler	Floor Area (m ²)
					P	S				
1	No. 14 School	Bayanzurkh	8	TYPE-2R	●	●	—	—	—	1,579.10
2	No. 17 School	Chingeltei	8	TYPE-2R	●	●	●	●	—	1,579.10
3	No. 33 School	Bayanzurkh	8	TYPE-2R	●	●	—	—	—	1,579.10
4	No. 39 School	Chingeltei	6	TYPE-1R	●	●	●	●	—	1,263.45
5	No. 44 School	Bayanzurkh	8	TYPE-2R	●	●	—	—	—	1,579.10
6	No. 48 School	Bayanzurkh	18	TYPE-4R	●	●	—	—	—	2,799.02
7	No. 68 School	Bayanzurkh	6	TYPE-1L	●	●	●	—	—	1,263.45
8	No. 87 School	Bayanzurkh	18	TYPE-4L	●	●	●	●	—	2,799.02
9	No. 97 School	Bayanzurkh	6	TYPE-1R	●	●	—	—	—	1,263.45
10	Iredui C. S.	Songinokhairkhan	8	TYPE-2R	●	—	—	—	—	1,579.10
11	Goromt C. S.	Nalaikha	18	TYPE-4L	●	●	—	—	—	2,799.02
12	Borovsrol C. S.	Bganor	12	TYPE-3L	●	—	—	—	—	1,984.95
Total		—	124	—	—	—	—	—	—	22,067.86

P: Primary level, S: Secondary level, C.S: Complex School

5 New Schools

	School	District	Classrooms to be constructed	Building Type	Furniture/ Equipment		Water Tank	Septic Tank	Boiler	Floor Area (m ²)
					P	S				
1	No. 61 School	Chingeltei	18	TYPE-4BL	●	●	●	●	●	2,853.76
2	No. 112 School	Songinokhairkhan	18	TYPE-4BR	●	●	●	●	●	2,853.76
4	No. 114 School	Khan-uul	18	TYPE-4BR	●	●	●	●	●	2,853.76
5	No. 115 School	Songinokhairkhan	18	TYPE-4BR	●	●	●	●	●	2,853.76
6	No. 116 School	Sukhbaatar	18	TYPE-4BR	●	●	●	●	●	2,853.76
Total		—	90	—	—	—	—	—	—	14,268.80

Table 2-5 shows the facilities according to the building type.

Table 2-5 Facilities by Project Building Type

Type	TYPE-1 (6 classrooms)	TYPE-2 (8 classrooms)	TYPE-3 (12 classrooms)	TYPE-4 (18 classrooms) TYPE-4B (18 classrooms)	
Number of Floor	Above ground 3 Underground 1	Above ground 4 Underground 1	Above ground 4 Underground 1	Above ground 4 Underground 1	
Total Floor Area (m ²)	1,263.45	1,579.10	1,984.95	2,799.02 (TYPE-4) 2,853.76 (TYPE-4B)	
Number of Classrooms	6	8	12	18	
Teachers' Room	Area (m ²)	46.41	46.41	46.41	88.61
Cloak Room	Area (m ²)	59.07	59.07	88.61	88.61
	Number of Coat Hooks	240	320	480	720
Toilet	Area (m ²)	46.41	92.82	92.82	118.15
	Number	1	2	2	2
Drinking Fountain	Number	1	2	2	2

(2) Section Plans

a) Effective Use of Underground Space

The ground in Mongolia freezes from the surface down to a depth of 2 to 3m in winter and frost heaving (a phenomenon where the ground volume increases thereby pushing buildings up) occurs. To protect buildings from frost heaving, the foundations shall be constructed deeper than that level, resulting in an approximate 3m deep space between

the first floor level and the foundation. The cost for constructing this underground space makes up an extremely large percentage of the total building costs. Therefore, in this Project, this underground space shall be utilized for not only a machinery and storage room, but also as a cloakroom and a multi-purpose hall.

b) Number of Building Stories and the Floor-to-floor Heights

In order to lower the construction costs of each Project building, the limited areas of the construction sites shall be used more effectively by making the ratio of the underground space area to the total building floor area as small as possible. One general principle by which this can be achieved is to make all the Project school buildings 4 stories high (except a building type with 6 classrooms that should be three-storied), the maximum allowed in the architectural standards. The taller the buildings the less total area per floor, which means less excavation work, resulting in less expensive underground construction costs. The floor-to-floor height of the above-the-ground floors (where the classrooms are) shall be 3.3m, the minimum figure for an appropriate educational environment as specified in the architectural standards. Further, because of the considerable amounts of snowfall in the winter and the possibility of floods in the summer, the level of the first floors shall be 750mm higher than the ground surface.

c) Roof Specifications

As Mongolia is not a country of heavy rainfall, flat roofs covered with asphalt waterproofing are quite common in the UBC area. Thus, following Phases I and II of the Project, this phase of the Project shall adopt flat roofs that will be provided with outside insulation and waterproof asphalt sheets. As the yearly and daily temperature changes are so great in Mongolia, 25mm thick plates, that are easier to remove than protective in-situ concrete, shall be placed on the waterproof asphalt sheets in order to prevent them from cracking due to repeated contraction and expansion.

d) Insulation Plans

Established by the Department of Heating, the school buildings in Mongolia are required to have a heat transmission coefficient of less than 0.4 in all parts of those building enclosures which come in contact with the outside air, such as roofs, exterior walls, floors, windows, etc. If this rule is not met, the Department of Heating will suspend the flow of heat from the public supply source. The Project will observe this rule and maintain the required heat transmission coefficient. Insulation shall be the outside insulation type which eliminates heat bridges that occur when poor insulation

covers the building, especially the roofs. Fig. 2-2 shows the detailed cross sections of the roofs and exterior walls used in the Project. These cross sections are designed to satisfy the requirements of the above-mentioned heat transmission coefficient.

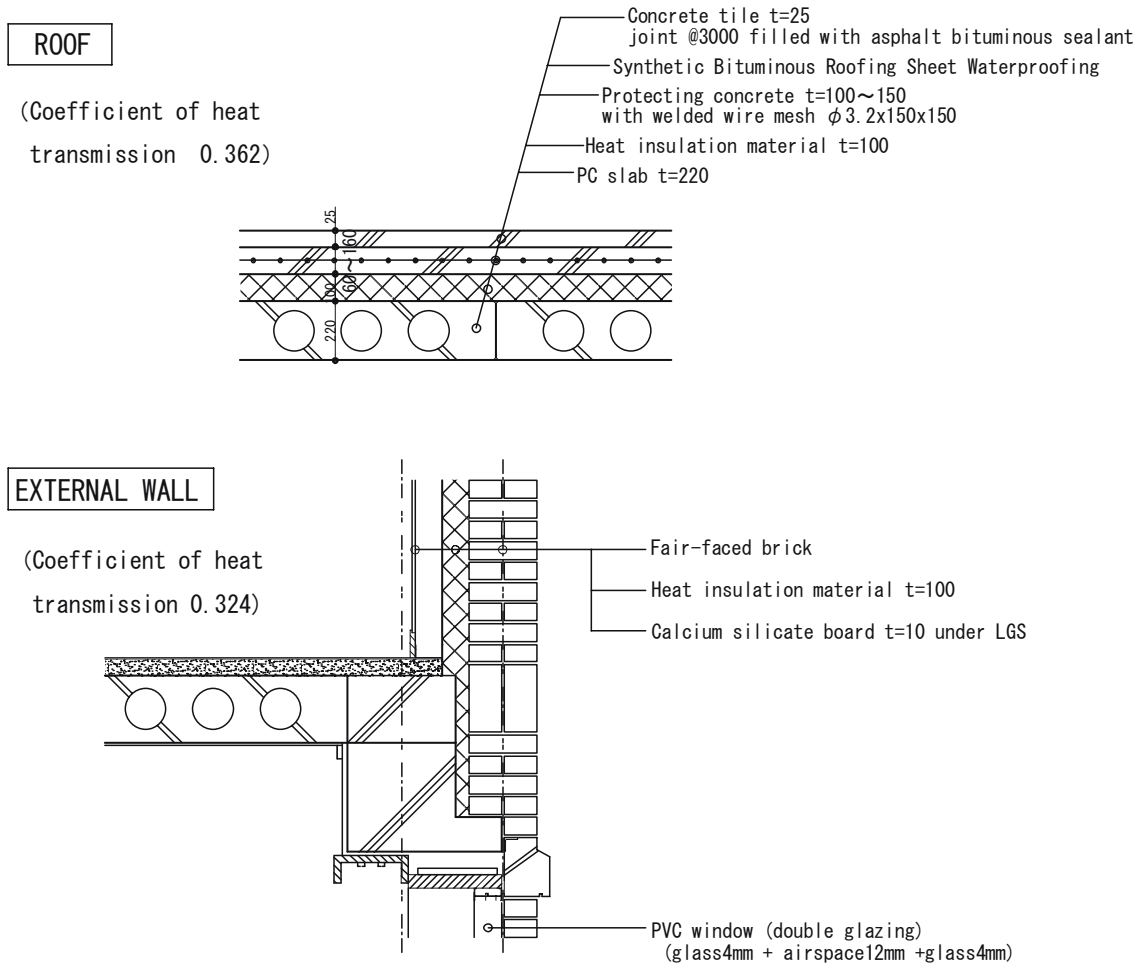


Figure 2-2 Section Details of the Roof and Exterior Walls

e) Windows

Because of the cold weather, double windows have been used for a long time in Mongolia. Phases I and II of the Project also adopted the double windows with aluminum sashes for the outer sides and plastic sashes for the inner sides. However, single windows with double-glazing are now available on the Mongolian market and their use is quickly spreading. They are widely used for new construction as well as for renovation work of apartment buildings, offices and school buildings. Thus, for purposes of cost reduction and to shorten the window installation work periods, as well as for ease of handling, the Project will adopt the double-glazed single windows with frames of hard plastic. There are several factories making pair-glass in UBC, so there are no technical problems foreseen regarding the replacing of broken glass. However, windows on the first floors shall be provided with steel louvers to protect them from breaking by destructive actions like ball games, etc. Further, in order to utilize the natural lighting as much as possible in the short daylight of winter, large windows shall be installed under the minimized beam height by reducing the beam span length.

(3) Structure Plans

To shorten the construction time periods, this phase of the Project shall adopt reinforced-concrete frame structures for buildings and pre-cast concrete panels for floors, the same as in Phases I and II of the Project. One structural frame unit for the classroom portions of the 3 and 4 storied buildings shall be 7.6m × 3.64m, and 2.8m × 3.64m for the corridor portions. This best fits the size of the standard pre-cast concrete panels, and using these panels minimizes the amount of cast-in-place concrete, thereby increasing construction efficiency. The ground in the UBC area is generally very strong, with a bearing capacity of around 20 tons/m². Thus, the Project shall adopt the independent footing type foundations for the buildings. The level of the foundation base shall be approximately 3m from the ground surface, which is deeper than the ground freezing level. Also as a general principle, JIS (Japanese Industrial Standards) reinforcing steel bars shall be used as they are easily procurable in Mongolia. Therefore, based on the Mongolian Architectural Standards, the structure designs should be prepared as follows:

① Earthquake Standards

The seismic standards in Mongolia were set up from the earthquake-resistant design standards of the former Soviet Union. The seismic standards specify different scales for different regions. The design of all buildings must be based on these seismic scales. The

MSK seismic scale in UBC is in the 6 to 8 range (figures in 1983), which is equivalent to the Japan Meteorological Agency's seismic scale in around 4. The Project school sites, including the remote areas of Nalaikha and Baganor, belong to a region where the seismic scale is in the 6 to 7 range. Thus, shear modulus in case of the earthquake is set as 0.08 in designing facilities. Even so, there are no building damage records from past earthquakes in UBC. It is known only that a small earthquake occurred in 1957.

Table 2-6 Seismic Intensity Scales in UBC

	Mountainous Areas	Center of the City	Areas with Plains along River
MSK Seismic Scale	6	7	8
JMA Seismic Scale	4	4 – 5	5
Max. Acceleration (Gal)	Approx. 40	Approx. 80	Approx. 150

② Standards for Wind Forces and Snow Load Factors

The standards for wind forces and snow load factors are set up as follows:

Wind forces: 35kg/m² (second zone)

Snow load: 50kg/m² (second zone)

③ Standards for Live loads

The standards of the former Soviet Union are used for live loads, as follows:

Classroom floor: 200kg/m²

Corridor floor: 300kg/m²

(4) Facility Services Plans

① Water Supplies

In areas where city water is available, a pipe should be tapped into the existing supply main and brought to the Project school site. According to the site survey, the city water pressure is 2.5 to 5.5kg/cm² depending on the school, which is enough to supply water to toilets on the third floor of buildings. Thus, it is not necessary to install any elevated water storage tanks or booster pumps. For school buildings constructed in areas where no city water is available, water receiving tanks that are heated, to prevent water from freezing, shall be set up on the basement floors. The water to these receiving tanks shall be supplied either by water wagons or from wells, of which construction will be undertaken by the Mongolian side. Water from the receiving tanks shall be distributed to the buildings by pumps. The use of water wagons is a common way to supply water in

areas without city water, so no problems to operate these supply systems are foreseen. (See Fig. 2-3).

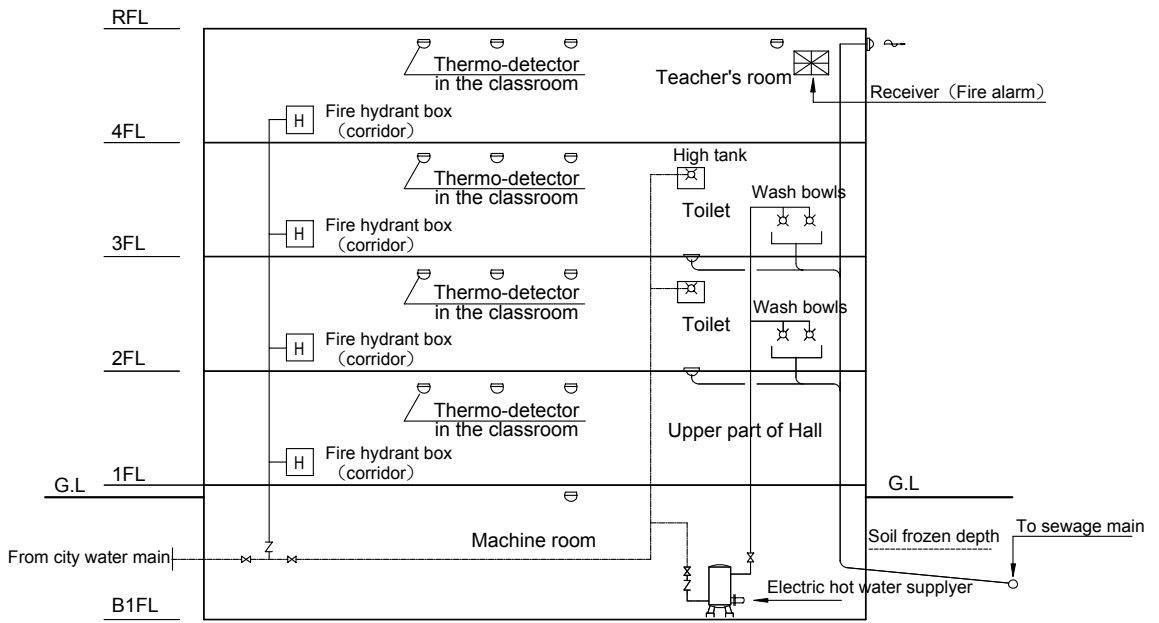
② Sewage Systems

For those Project schools that are located in areas with an existing public sewer system, pipes shall be connected to the public sewer main. For new Project schools constructed in areas with no access to the public city sewer system, sewage tanks shall be installed on the sites and the sewage from them should be transported to sewage treatment plants by vacuum vehicles. The use of vacuum vehicles is a common way to transport the sewage in areas with no access to the public city sewer system, so no problems to operate these sewage systems are foreseen.

Rainwater will be allowed to infiltrate naturally into the ground. (See Fig. 2-3)

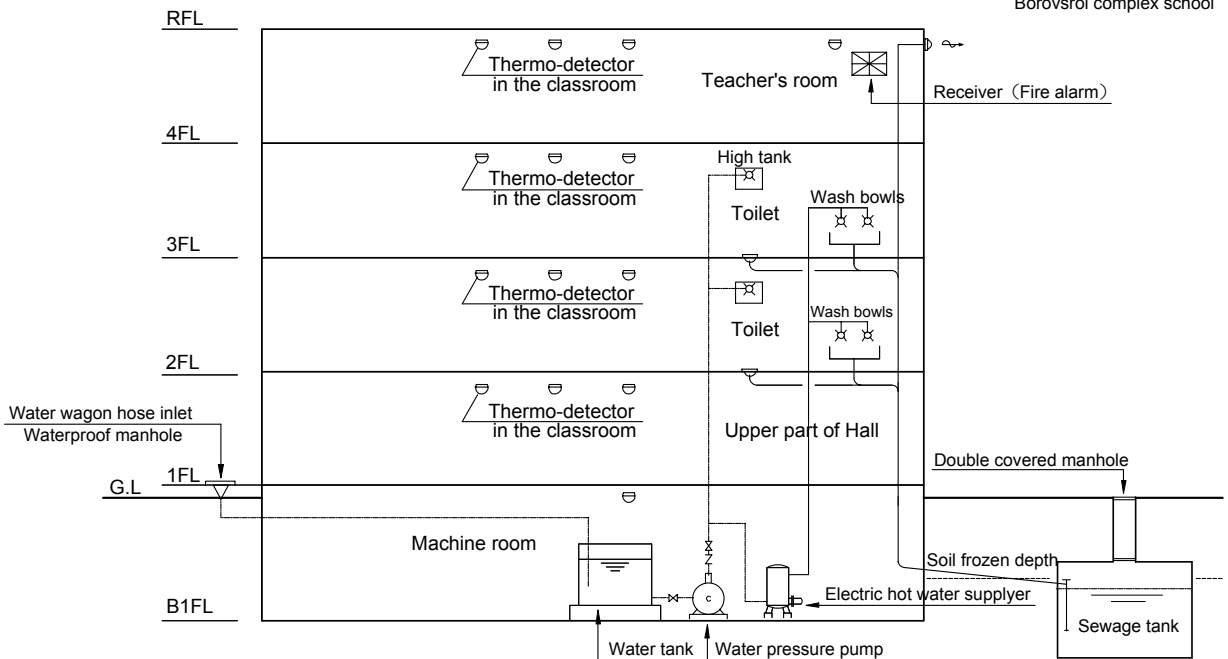
③ Regarding Hot Water Supply Systems

All Project school buildings shall be equipped with a tank-type electrical hot water heater that is easy to handle and operate.



In case there are city water and sewage lines

- Applicable to:
- No.14
 - No.33
 - No.44
 - No.48
 - No.68(no city water main)
 - No.97
 - Iredui complex school
 - Goromt complex school
 - Borovsrol complex school



In case there are no city water nor sewage line

- Applicable to:
- No.17
 - No.39
 - No.61
 - No.68(no city water main)
 - No.87
 - No.112
 - No.114
 - No.115
 - No.116

Figure 2-3 Water Supply and Drainage System Diagram

④ Sanitary Facilities

The Project shall adopt squat-type (Asian type) toilet bowls for students, western type toilet bowls for teachers, and continuous ditch-type urinals for boys. The number of toilet bowls, urinals and faucets for washing hands shall comply with the Architectural Standards for Educational Facilities. In addition to the toilets, water faucets for drinking and for science experiments and workshops, etc, shall also be installed. The calculation of the number of sanitary facility units is based on the architectural standards as shown in Table 2-7.

Table 2-7 Sanitary Facility Units to be Provided

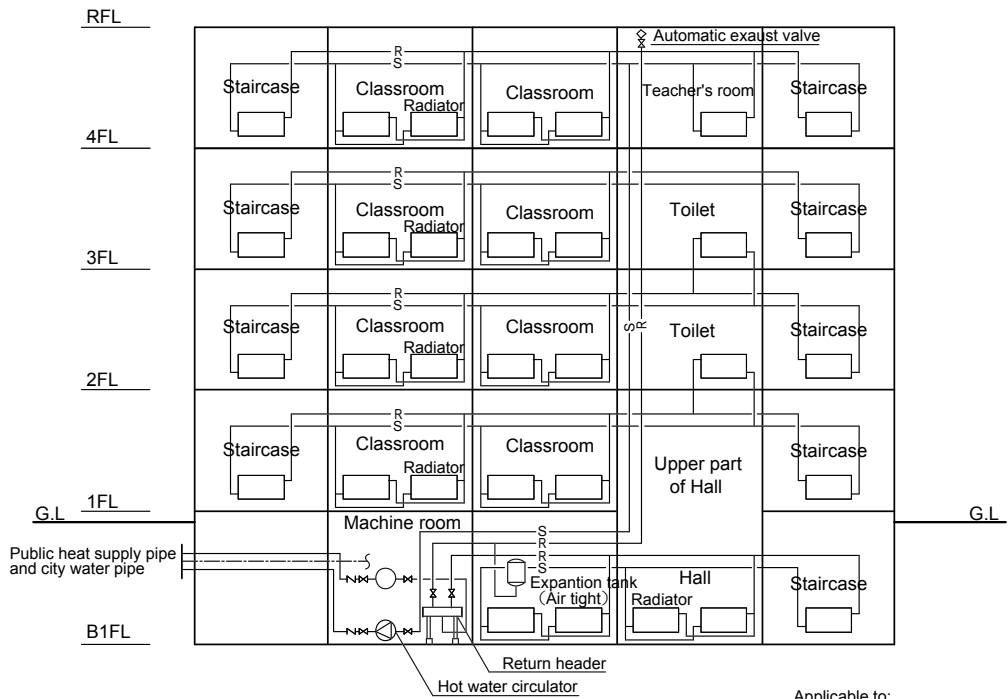
		TYPE-1 (6 classrooms)	TYPE-2 (8 classrooms)	TYPE-3 (12 classrooms)	TYPE-4 (18 classrooms)
Toilet	Urinal for boys	1 (1 per 3 boys)	2 (1 per 3 boys)	2 (1 per 3 boys)	2 (1 per 5 boys)
	Toilet Bowl for boys	2	4	4	6
	Toilet Bowl for girls	4	6	8	12
	Sink for cleaning	1	1	1	1
	Hand washing Tap	8	12	16	24
	Toilet bowl for teachers (western)	1	2	2	2
	Washbowl for teachers	1	2	2	2
Drinking Place	Drinking Water Tap	1	2	2	4

⑤ Regarding Fire Extinguishing Systems

According to fire department specifications, thermo-detecting type fire alarms will be installed in each building for all the Project schools. For those Project schools that have access to the city water supply system, indoor fire hydrants together with alarm systems will be installed on each floor at 50m intervals. For those Project schools that do not have access to the city water supply, fire extinguishing units will be installed. In addition, emergency exit signs will be installed at every exist on each floor and at the doorways of the school buildings at all the Project schools.

⑥ Regarding Heating Systems

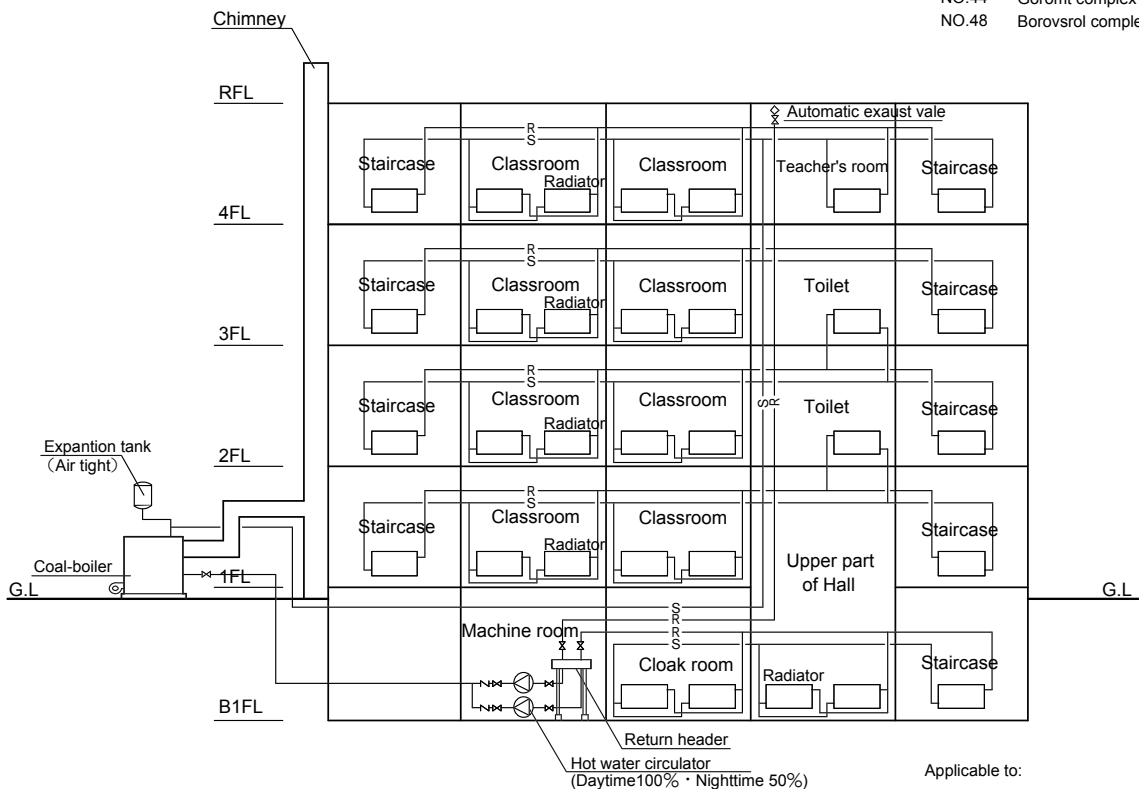
Heating is provided by circulating hot water through radiators installed inside the buildings. The heat source for existing schools shall be tapped from the public heating supply system of the UBC Department of Heating. For new to-be-built schools located in areas without access to public heating supplies, new boilers shall be installed to supply hot water. (See Fig. 2-4)



IN CASE OF PUBLIC HEAT SUPPLY

Applicable to:

- NO.14 NO.68
- NO.17 NO.87
- NO.33 NO.97
- NO.39 Iredui complex school
- NO.44 Goromt complex school
- NO.48 Borovsrol complex school



IN CASE OF BOILER TYPE

Applicable to:

- NO.61 NO.115
- NO.112 NO.116
- NO.114

Figure 2-4 Heating System Diagram

⑦ Ventilation Systems

As school buildings are generally airtight and windows are seldom opened in the winter, the rooms must be periodically ventilated. The architectural standards stipulate the installation of a ventilation system. The intake of air from outside should be heated through the exchange of heat from the hot water heating system and delivered to each classroom through forced-fan ducts. The exhaust air from the classrooms should be carried away to the outside of the buildings through the corridors by exhaust fans installed in the toilet rooms and at the upper parts of the stairways. (See Fig. 2-5)

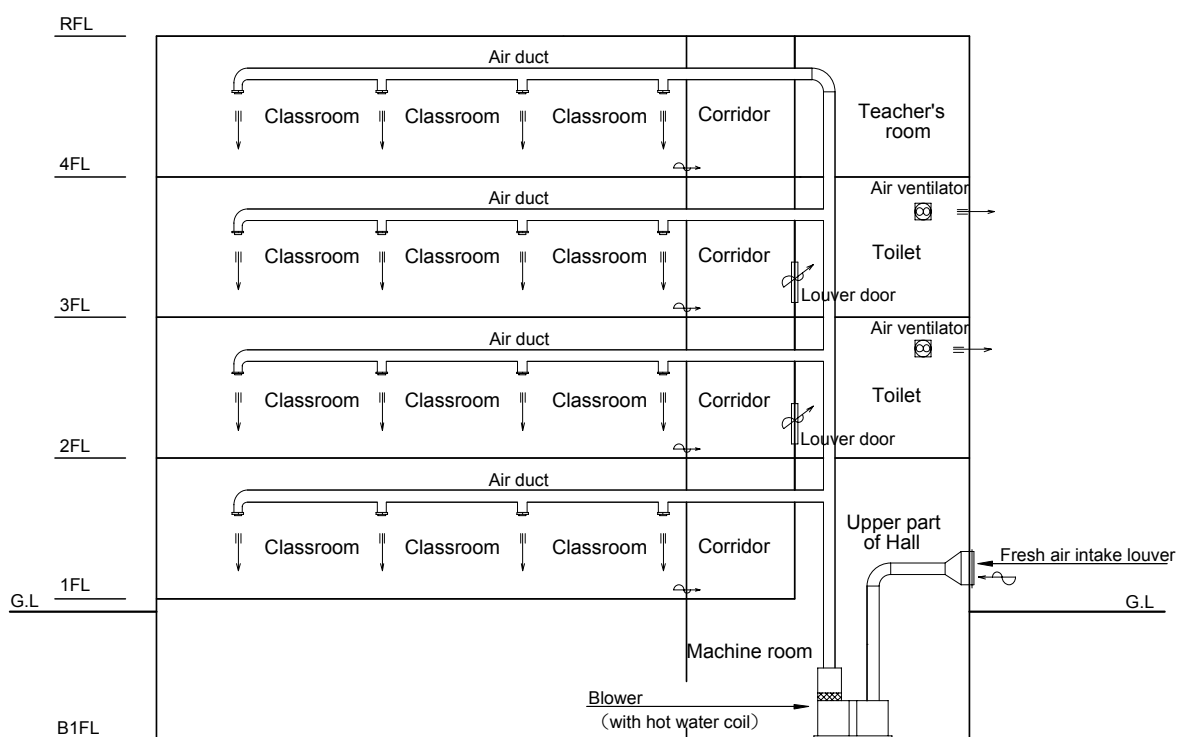


Figure 2-5 Air Ventilation System Diagram

⑧ Air Circulation Systems

Under the central radiation heating system, heated air moves upwards through the stairways. Rooms located on the upper levels become warmer than rooms on the lower levels. So when the temperature is comfortably set in the upper level rooms, the lower level rooms get cold. Likewise, when the temperature is comfortable in the lower level rooms, the upper level rooms get hot and the windows often have to be opened, resulting in wasted and unnecessary heating expenses. To solve this problem, the air circulation system shall be installed in such a way that it circulates warm air from the top floors to the bottom floors. This kind of circulation system consists of a small fan and duct, and

the installation costs are low. Overall, the initial installation costs for this type of circulation system are more than paid off through significant savings in long term operating costs.

⑨ Electrical Systems

The power supply system in Mongolia is 3 phase, 380V, 50Hz, with power delivered either through underground conduits or electrical poles. The power connection to each Project school site shall be designed to suit the supply methods available at each site. The Project shall install a power receiving unit, a transformer unit, a lighting system, outlets, motor units for pumps, an emergency alarm system and a thermo-detecting type alarm system in each Project school building.

⑩ Telephone Systems

Considering the possibility that telephone lines will increase in the future, one empty telephone wire conduit will be installed from the machine room distribution panel in the basement to the teachers' room, and a wire outlet unit will also be installed in the teachers' room.

(5) Plans Regarding Construction Materials

This phase of the Project covers the UBC region, so the cold weather and climate characteristics, as well as the construction materials and supplies, are quite similar to those in Phase I of the Project. Thus, the methods and criteria for selecting construction materials should be basically the same as in Phase I of the Project in that care should be taken (except for the elimination of double windows because of the adoption of double-glazed single windows) to consider the right balance between durability and costs. In addition, considering the local construction customs and technical levels, materials that require low maintenance costs should be selected for the Project. All exterior portions, such as roofs, copings, exterior walls, berms and entrance porches should be finished with plain concrete and brick. Any kind of stone panels or tiles for the exterior finish should be completely avoided because of the tendency to crack or spall in freezing weather. Table 2-8 shows the selected specifications for the Project and the reasons for the selections.

Table2-8 Specification to be Adopted and the Reason

Parts	Conventional Local Method	Adopted in this Project	Reason for the Adoption
Main Structure			
Foundation	Reinforced concrete	Reinforced concrete	To follow local method
Column and Beam	Pre-cast concrete or Bricks	Reinforced Concrete	Better earthquake resistance
Roof and Floor	Pre-cast concrete panel	Pre-cast concrete panel	To follow local method
Wall	Bricks or pre-cast concrete panel	Bricks	To follow local method
Exterior			
Exterior Wall	Bricks or pre-cast concrete panel	Bricks	To follow local method
Roof	Exposed asphalt sheet waterproofing	Waterproof asphalt sheet and concrete tile	Better durability
Outside Window	Paint finish on wood sash	Hard plastic sash	Better heat insulation, sound insulation, durability and air tightness, and easier maintenance
Inside Window	Paint finish on wood sash		
Window Glass	Single Glass	Pair-glass	Better Insulation
Interior			
Floor	Polyvinyl chloride sheets, wood, in-situ polished terrazzo etc.	Polyvinyl chloride sheets	To follow local method and architectural standard
Toilet Floor	Ceramic Tiles	Ceramic Tiles	To follow local method
Baseboard	Paint on wood	Paint on wood	To follow local method
Interior surface of exterior wall	Paint finish on plaster	Paint finish on calcium silicate board with expanded polystyrene	Better insulation and easier construction
Interior Wall (partition)	Paint finish on plaster	Paint on mortar trowel finish	Better durability
Ceiling	Paint finish on plaster	Paint finish on mortar	Safer for users
Classroom door	Paint finish on wood	Paint finish on wood	To follow local method

(6) Architectural Standards for Educational Facilities

When applications for building permits are submitted, an evaluation of the applications is processed in accordance with the Architectural Standards for Educational Facilities. The building plans of the Project must be prepared following these standards. When the standards deviate from actual construction needs, or if requests from MOSTEC are in conflict with the standards, these subject matters shall be discussed with the bureau and approval shall be obtained. Such matters shall be re-confirmed in writing during the detailed design and at the building permit stage. Items adopted for the Project

based on the architectural standards are listed in Table 2-9.

Table 2-9 Architectural Standards for Educational Facilities

Items		National Architectural Standards for Educational Facilities	This Project	Remarks
<Floor Plan>				
Class-room	Maximum number of classrooms per school	33	No limit	Discussed with the Architectural Bureau based on the request from MOSTEC
	Air volume per students	Minimum: 4 m ³	4.5m ³	Floor area per student × Ceiling height
	Maximum number of students per classroom	Grade 1: 30 Grade 2~9: 35	40	<ul style="list-style-type: none"> ● 40 for all the grades ● Discussed with the Architectural Bureau based on the request from MOSTEC
	Floor area per student (m ²)	Grade 1 2.0m ² Above Grade 2 1.5m ²	1.5 m ²	
Usable corridor width (m)		2.2m	2.36m	Column span: 2.8m
Teacher's Room (m ²)		Number of teachers × 2.5 m ²	More than requirement	Refer to other table
Cloakroom (m ²)		Number of students × 1.5 m ²	Area to accommodate coat hooks for all students	
Entrance Hall (m ²)		Number of students × 1.0 m ²	More than requirement	Refer to other tables
<Section Plan>				
Stories		4 or less stories for urban area with more than 200,000 population, 3 or less stories in other areas	3 or 4 stories	
Floor-to-floor story height		Minimum 3.3m	3.3m	
<Facility Plan>				
Toilet	Number of Toilet Bowl	Girls: 1 per 30 students Boys: 1 per 40 students	Girls: 1 per 30 students Boys Urinal: 1 per 60 students Bowls: 1 per 40 students	The ratio of toilet bowls for boys to urinals is not specified. Use the same ratio as the Phase II.
	Number of Washbowls	1 per 30 students	1 per 20 students	
Washbowls		Supply cold and hot water	Supply cold and hot water	
Illuminance	Classrooms	Minimum 300 Lx	300 Lx	
	Teachers' Room	Minimum 200 Lx	280 Lx	
	Corridor & Toilet	Minimum 75 Lx	100 Lx	

2-2-2-4 Equipment Plans

(1) Furniture and Equipment

The amount of furniture and equipment units to be provided in the Project will be as follows.

① Desks and Chairs for Students

20 desks (2 students per desk) and 40 chairs (a student per chair) are provided for each classroom in 3 different sizes: small for grade 1- 2, medium for grade 3 - 6, and large for grade 7-11. The number ratio of those sizes is that 20% are small, 40% are medium, and 40% are large.

The Project buildings for the Iredui and Borovsrol Complex schools are for primary education only, so only 2 sizes of desk & chair sets are provided, small and medium, at a ratio that 40% are small and 60% are medium.

② Teacher's Desk and Chairs in the Classroom

1 set of desk and chair for the teacher will be provided in each classroom.

③ Chairs and Meeting Tables for the Teachers' Rooms

The number of chairs in teachers' room is based on the total number of planned classrooms multiplied by 1.4, which gives the number of teachers to use the teacher's room in each shift. For meeting tables, basically one table for every six teachers at each school is provided.

④ Storage Cabinet for Teaching Materials

One storage cabinet for every two classrooms will be installed in the teachers' room.

⑤ Blackboard and Bulletin Board

1 blackboard and 1 bulletin board will be installed in each classroom.

Table 2-10 List of Furniture

Name of School	Existing Schools												New Schools					Total
	No. 14 School	No. 17 School	No. 33 School	No. 39 School	No. 44 School	No. 48 School	No. 68 School	No. 87 School	No. 97 School	Iredui CS	Goromt CS	Borovsrol CS	No. 61 School	No. 112 School	No. 114 School	No. 115 School	No. 116 School	
Project Classrooms [Classroom]	8	8	8	6	8	18	6	18	6	8	18	12	18	18	18	18	18	
Teachers' Desk	8	8	8	6	8	18	6	18	6	8	18	12	18	18	18	18	18	214
Teachers' Chairs	8	8	8	6	8	18	6	18	6	8	18	12	18	18	18	18	18	214
Student Desk (For 2, Large)	64	64	64	48	64	144	48	144	48	0	144	0	144	144	144	144	144	1,552
Student Chair (For 1, Large)	128	128	128	96	128	288	96	288	96	0	288	0	288	288	288	288	288	3,104
Student Desk (For 2, Medium)	64	64	64	48	64	144	48	144	48	96	144	144	144	144	144	144	144	1,792
Student Chair (For 1, Medium)	128	128	128	96	128	288	96	288	96	192	288	288	288	288	288	288	288	3,584
Student Desk (For 2, Small)	32	32	32	24	32	72	24	72	24	64	72	96	72	72	72	72	72	936
Student Chair (For 1, Small)	64	64	64	48	64	144	48	144	48	128	144	192	144	144	144	144	144	1,872
Blackboard	8	8	8	6	8	18	6	18	6	8	18	12	18	18	18	18	18	214
Bulletin Board	8	8	8	6	8	18	6	18	6	8	18	12	18	18	18	18	18	214
[Teachers' Room]																		
Meeting Table	2	2	2	2	2	5	2	5	2	2	5	3	5	5	5	5	5	59
Chairs	12	12	12	9	12	25	9	25	9	12	25	17	25	25	25	25	25	304
Cabinet	4	4	4	3	4	9	3	9	3	4	9	6	9	9	9	9	9	107

(2) Educational Equipment

The selection of educational equipment provided in this Project is arrived at by considering and comparing the equipment list proposed by the Mongolian side, and the list of equipment actually provided in Phases I and II of the Project, with the following criteria: how appropriately the equipment corresponds to current curriculum; how easily the equipment can be operated by the teachers; whether the equipment can be used in ordinary classrooms, as this Project provides only ordinary classrooms; whether the equipment can be procured locally when necessary for reasons of damage, breakage, replacement, etc. The quantities of each material to be provided are determined by grades to use it. The equipment necessary for both primary and secondary level will be

provided in each planned classroom. The equipment will be provided in every 2 classrooms for grade 1-5 at primary level and for grade 6-9 at lower secondary level, and 4 classrooms for grade 8 and 9. The basic educational materials to be provided in the Project are listed in Table 2-11.

Table 2-11 List of Basic Educational Equipment

	Items	Subject	Summary	Target Grade	Number	
					School with both Primary & Secondary grades	Primary Grades only (Iredui CS & Borovsrol CS)
1	Geographic Map of Mongolia	Social Science	Color Wall chart	1~9	1 per Project classroom	1 per classroom
2	Political & Administrative Map of Mongolia	Social Science	Color Wall chart	6~9	1 per 2 Project classrooms	None
3	Map of Mineral Resources of Mongolia	Social Science	Color Wall chart	6~9	1 per 2 Project classrooms	None
4	Botanical Map of Mongolia	Social Science	Color Wall chart	1~5	1 per 2 Project classrooms	1 per Project classroom
5	Zoological Map of Mongolia	Social Science	Color Wall chart	1~5	1 per 2 Project classrooms	1 per Project classroom
6	World Geographic map	Social Science	Color Wall chart	6~9	1 per 2 Project classrooms	None
7	The World Political and Administrative Map	Social Science	Color Wall chart	6~9	1 per 2 Project classrooms	None
8	Diagram of Chemical Element Cycle	Science	Color Wall chart	8, 9	1 per 4 Project classrooms	None
9	Diagram of Physical Measuring Unit	Science	Color Wall chart	8, 9	1 per 4 Project classrooms	None
10	Human Body Chart	Science	Color Wall chart	6~9	1 per 2 Project classrooms	None
11	Mongolian Alphabet Card	National Language	Color Wall chart	1~5	1per 2 Project classrooms	1 per Project classroom
12	Multiplication Table	Arithmetic	Color Wall chart	1~5	1 per 2 Project classrooms	1 per Project classroom
13	Wall Thermometer	Life Science, Science	For temperature measurement	1~5	1 per 2 Project classrooms	1 per Project classroom
14	Azimuth Compass	Life Science, Science		1~5	1 per 2 Project classrooms	1 per Project classroom
15	Tape measure	Life Science, Science	30m	1~5	1 per 2 Project classrooms	1 per Project classroom
16	Geometric Block Models	Arithmetic	Blocks	1~5	1 set per 2 Project classrooms	1 set per Project classroom
17	Abacus	Arithmetic	Abacus	1~5	1 per 2 Project classrooms	1 per Project classroom
18	T-square	Arithmetic	90 cm for blackboard	1~9	1 per Project classroom	1 per Project classroom
19	Scales	Arithmetic	Triangles, a compass & a graduator for blackboard	1~9	1 set per Project classroom	1 set per Project classroom
20	OHP (Over Head Projector)	All		1~9	1 set per Project school	1 set per Project school

Table 2-12 Quantity of Educational and other Equipment at each Project School

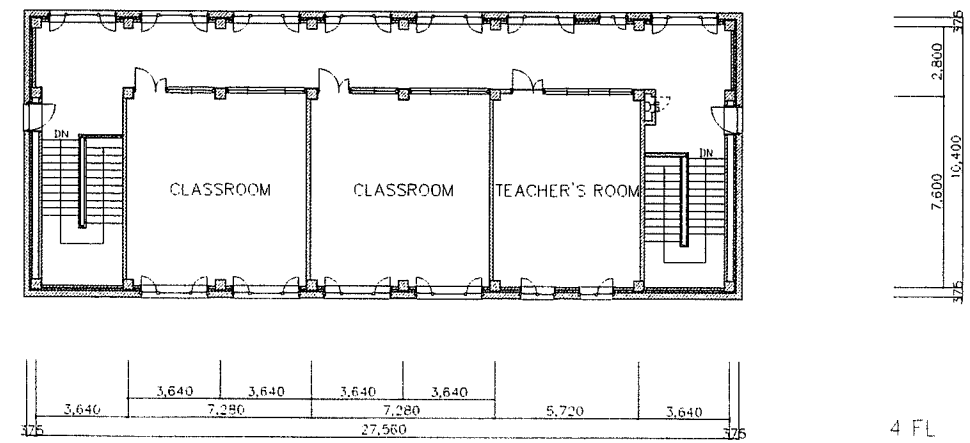
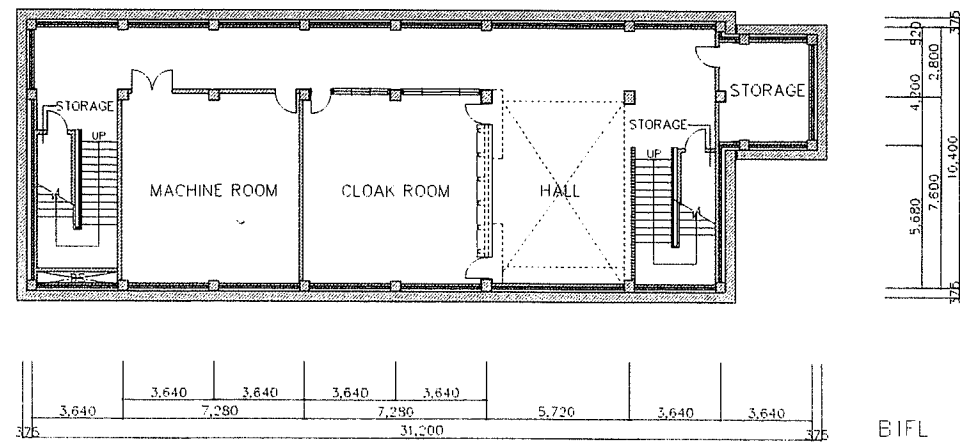
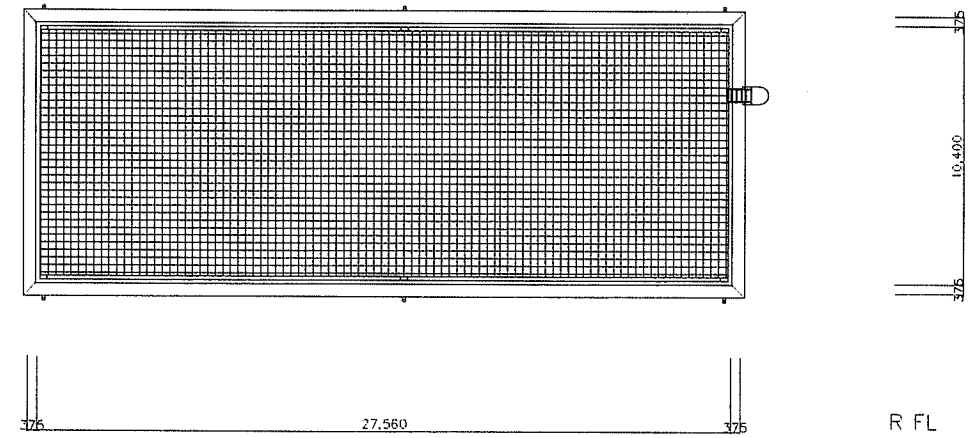
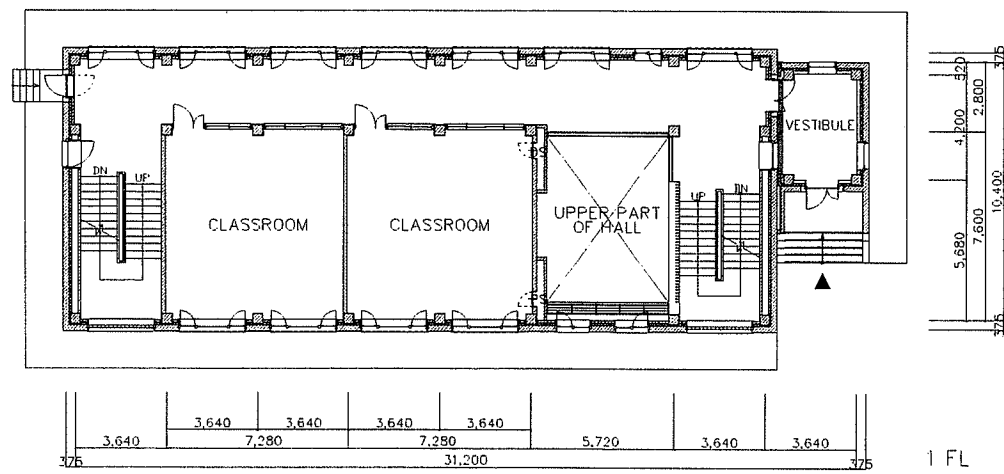
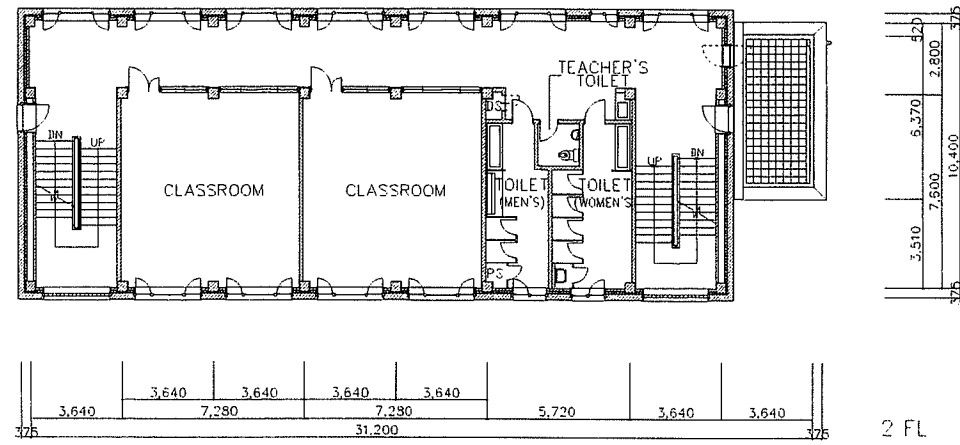
	School Name	Existing Schools											New Schools					Total	
		No. 14 School	No. 17 School	No. 33 School	No. 39 School	No. 44 School	No. 48 School	No. 68 School	No. 87 School	No. 97 School	Iredui CS	Goromt CS	Borovsrol CS	No. 61 School	No. 112 School	No. 114 School	No. 115 School		No. 116 School
	Classrooms	8	8	8	6	8	18	6	18	6	8	18	12	18	18	18	18	18	18
1	Geographic Map of Mongolia	8	8	8	6	8	18	6	18	6	8	18	12	18	18	18	18	18	214
2	Political and Administrative Map of Mongolia	4	4	4	3	4	9	3	9	3	0	9	0	9	9	9	9	9	97
3	Map of Mineral Resources of Mongolia	4	4	4	3	4	9	3	9	3	0	9	0	9	9	9	9	9	97
4	Botanical Map of Mongolia	4	4	4	3	4	9	3	9	3	8	9	12	9	9	9	9	9	117
5	Zoological Map of Mongolia	4	4	4	3	4	9	3	9	3	8	9	12	9	9	9	9	9	117
6	World Geographic map	4	4	4	3	4	9	3	9	3	0	9	0	9	9	9	9	9	97
7	The World Political and Administrative Map	4	4	4	3	4	9	3	9	3	0	9	0	9	9	9	9	9	97
8	Diagram of Chemical Element Cycle	2	2	2	2	2	5	2	5	2	0	5	0	5	5	5	5	5	54
9	Diagram of Physical Measuring Unit	2	2	2	2	2	5	2	5	2	0	5	0	5	5	5	5	5	54
10	Human Body Chart	4	4	4	3	4	9	3	9	3	0	9	0	9	9	9	9	9	97
11	Mongolian Alphabet Card	4	4	4	3	4	9	3	9	3	8	9	12	9	9	9	9	9	117
12	Multiplication Table	4	4	4	3	4	9	3	9	3	8	9	12	9	9	9	9	9	117
13	Wall Thermometer	4	4	4	3	4	9	3	9	3	8	9	12	9	9	9	9	9	117
14	Azimuth Compass	4	4	4	3	4	9	3	9	3	8	9	12	9	9	9	9	9	117
15	Tape measure	4	4	4	3	4	9	3	9	3	8	9	12	9	9	9	9	9	117
16	Geometric Block Models	4	4	4	3	4	9	3	9	3	8	9	12	9	9	9	9	9	117
17	Abacus	4	4	4	3	4	9	3	9	3	8	9	12	9	9	9	9	9	117
18	T-square	8	8	8	6	8	18	6	18	6	8	18	12	18	18	18	18	18	214
19	Scales	8	8	8	6	8	18	6	18	6	8	18	12	18	18	18	18	18	214
20	OHP	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	17
21	Maintenance Tool Set	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	17

(3) Facility Maintenance Equipment

In accordance with Phase II of the Project, tool set for facility maintenance (pliers, hammers, screwdrivers, electrical testers, saws, files, tape measures, and shovels) will be provided in the Project, so that teachers and parents can use those equipment for repairing the school facilities.

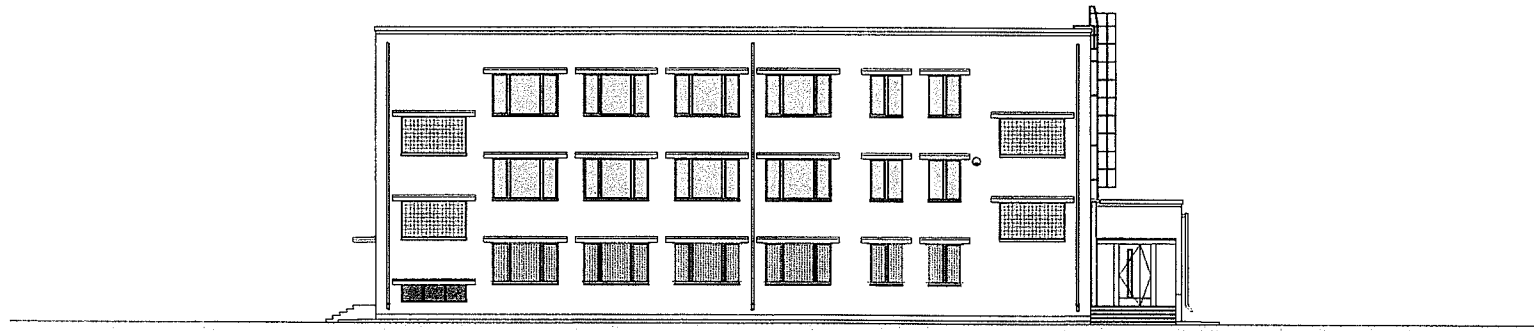
2-2-3 Basic Design Drawings

The basic design drawings prepared for the Project are as attached hereafter.

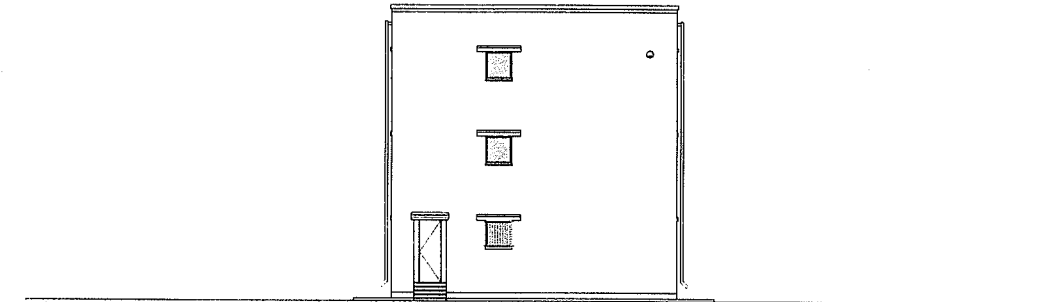


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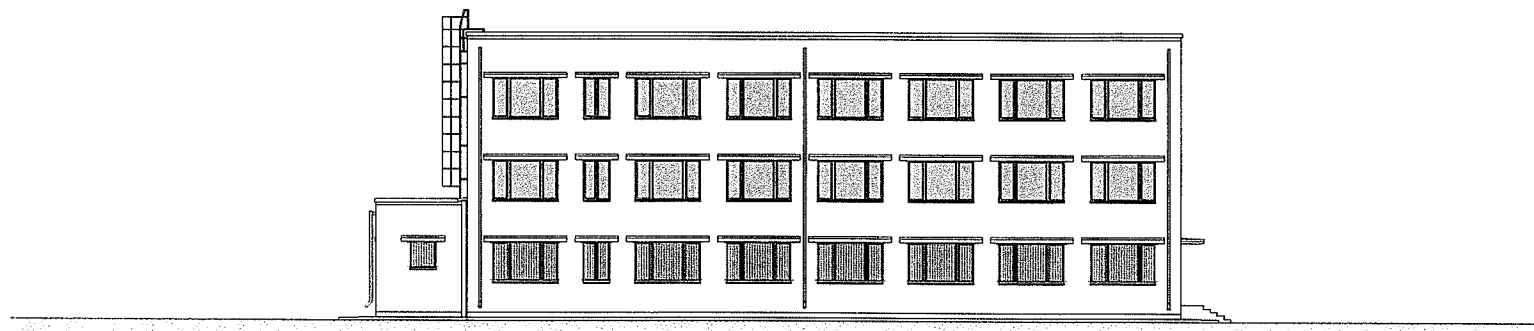
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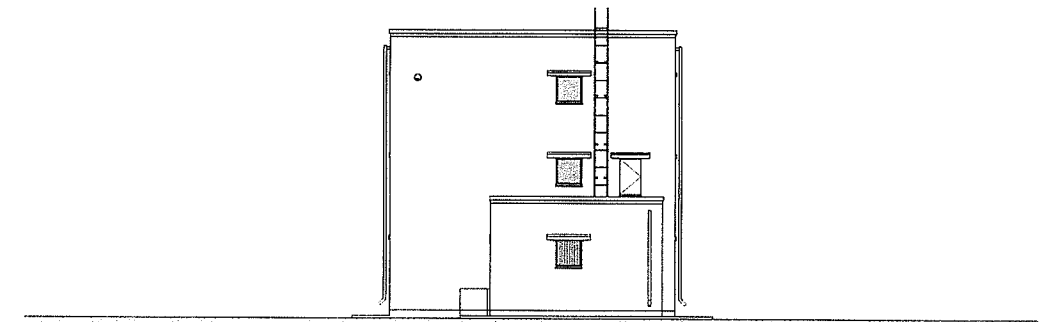
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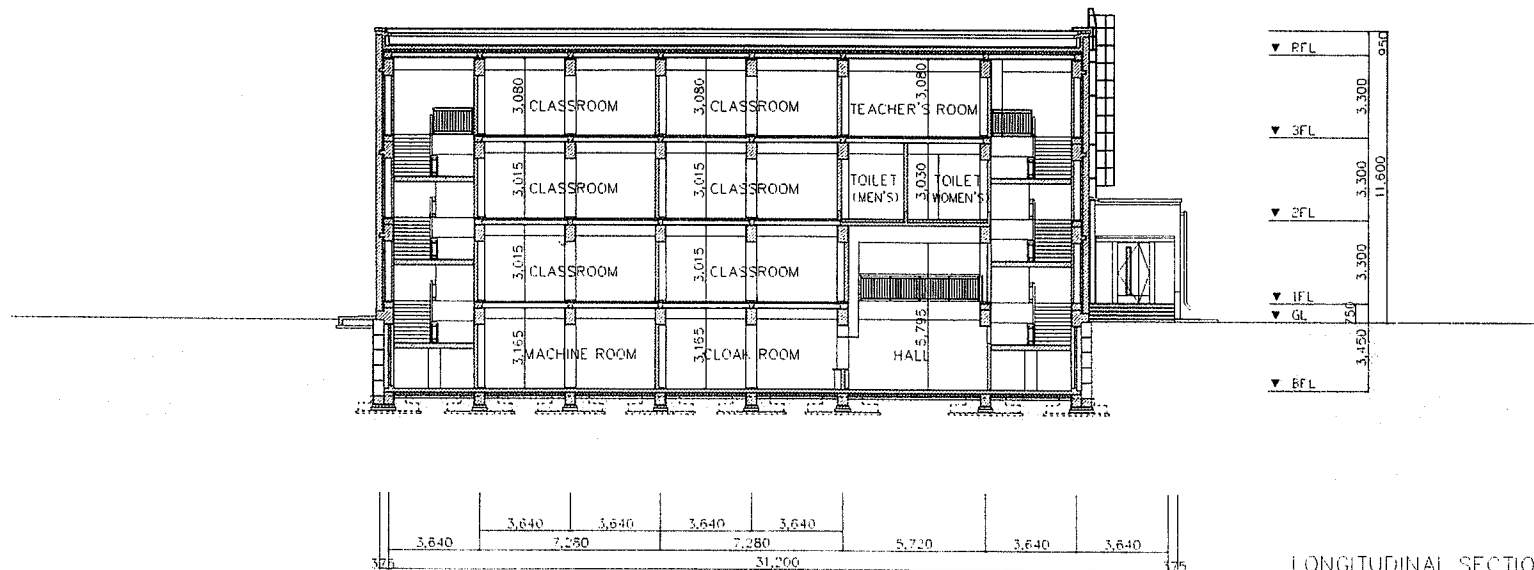
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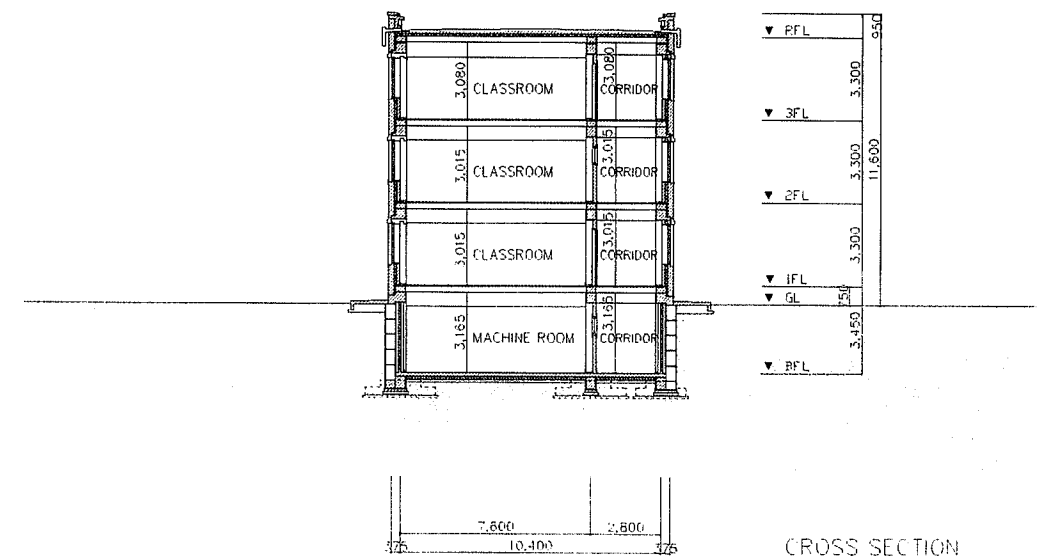
ELEVATION (CORRIDOR SIDE)



ELEVATION (ENTRANCE SIDE)



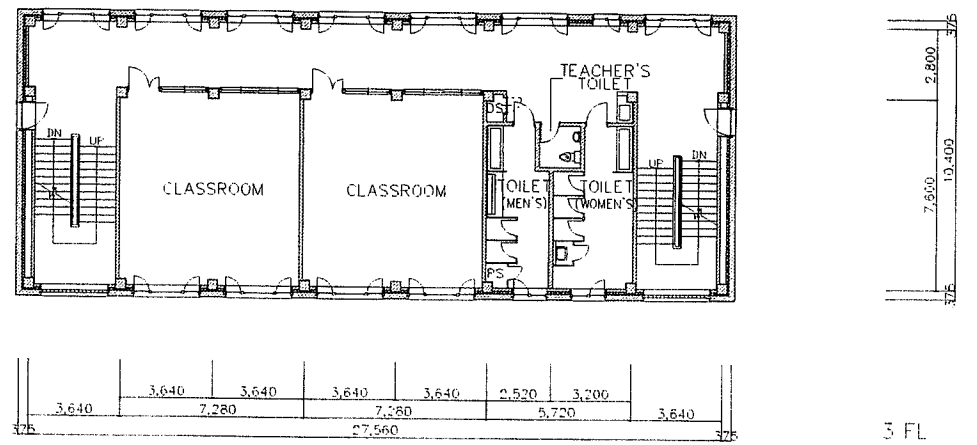
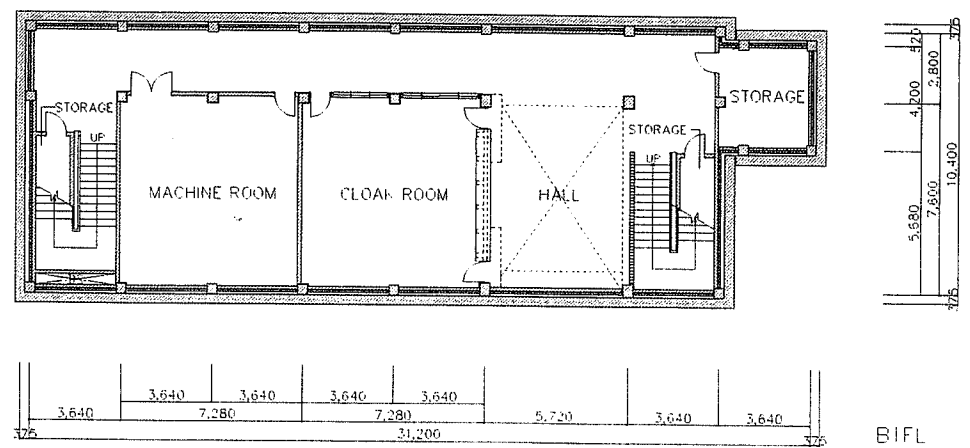
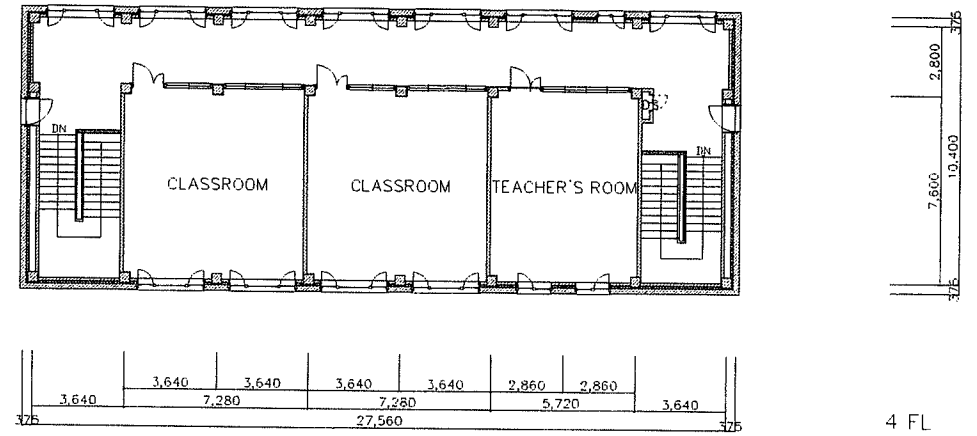
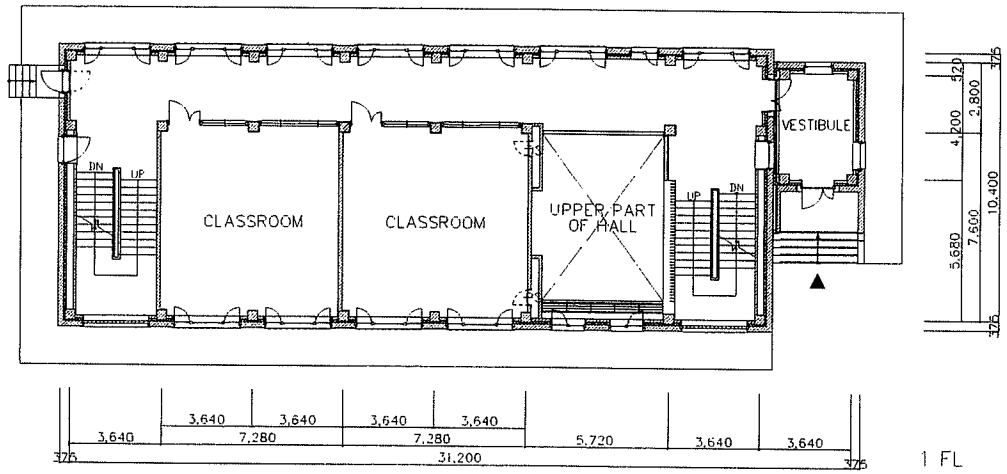
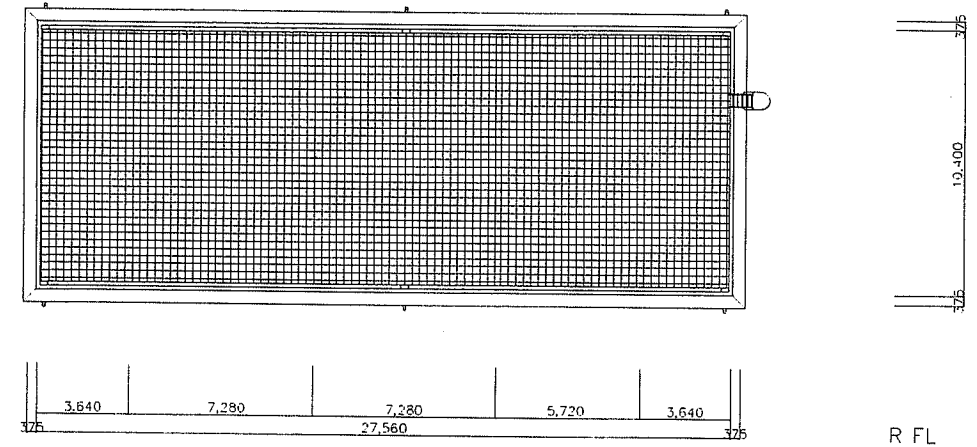
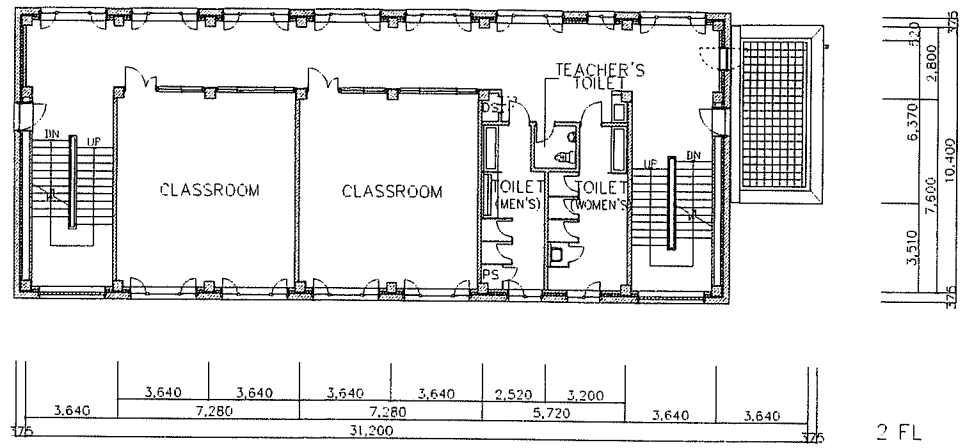
LONGITUDINAL SECTION



CROSS SECTION

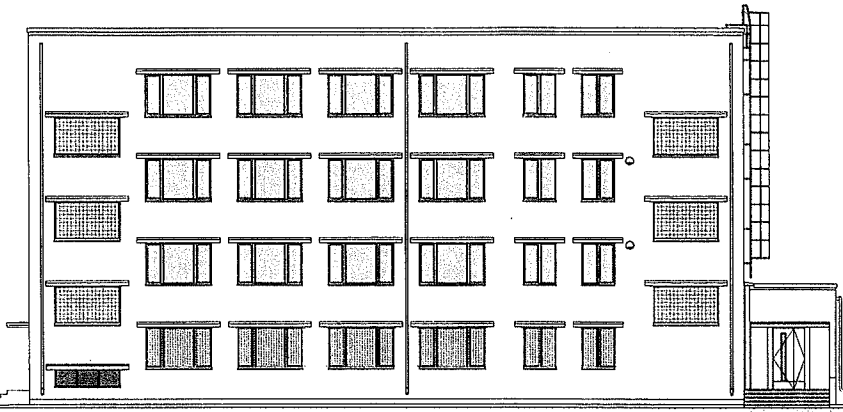
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※The drawings show R type. L type shall have mirrored plans of R type.

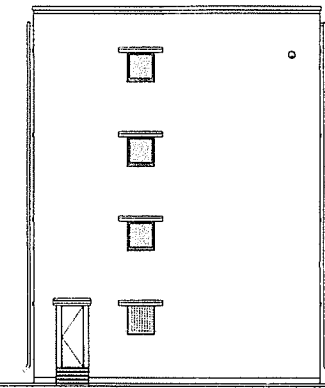


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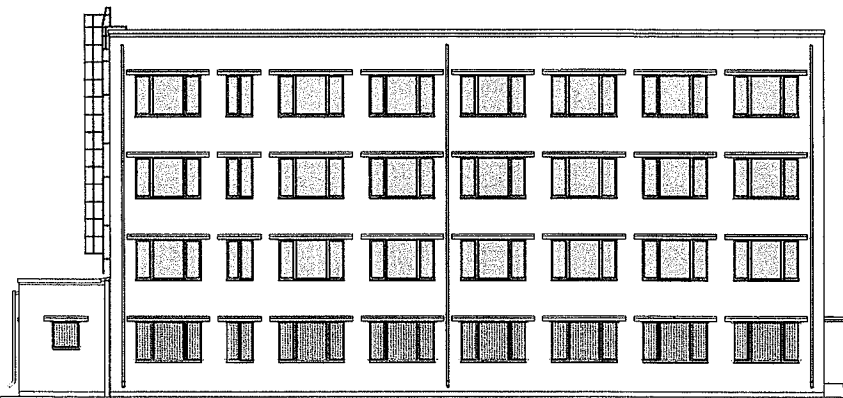
※The drawings show R type. L type shall have mirrored plans of R type.



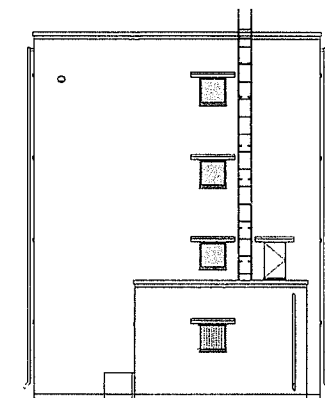
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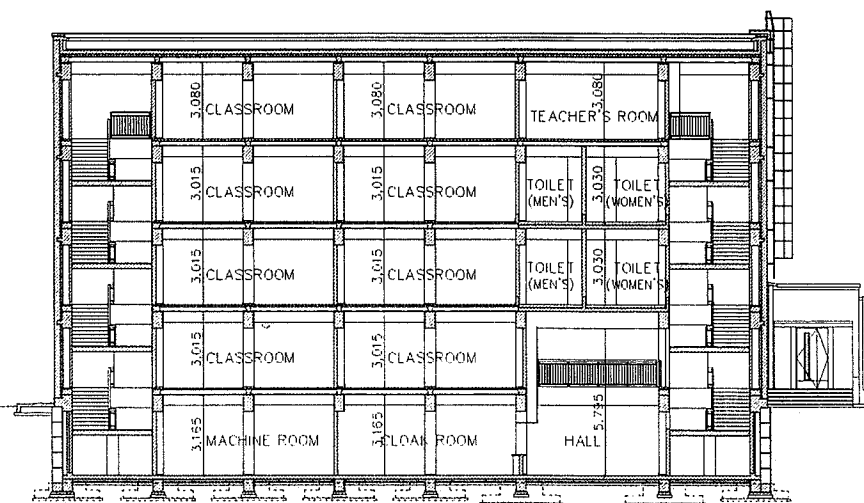
ELEVATION (SUB ENTRANCE SIDE)



ELEVATION (CORRIDOR SIDE)



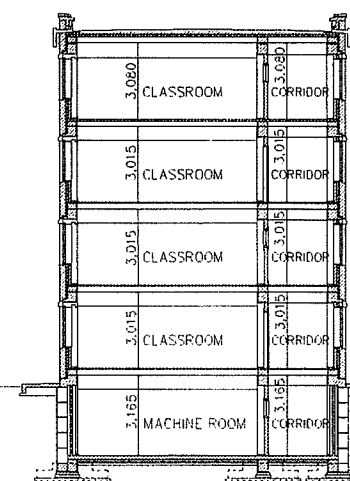
ELEVATION (ENTRANCE SIDE)



▼ RFL	950
▼ 4FL	3,300
▼ 3FL	3,300
▼ 2FL	3,300
▼ 1FL	3,300
▼ GL	750
▼ BFL	3,450
14,900	

3,640	3,640	3,640	3,640	3,640	5,520	3,200	3,640	3,640
7,280		7,280		5,720		31,200		

LONGITUDINAL SECTION



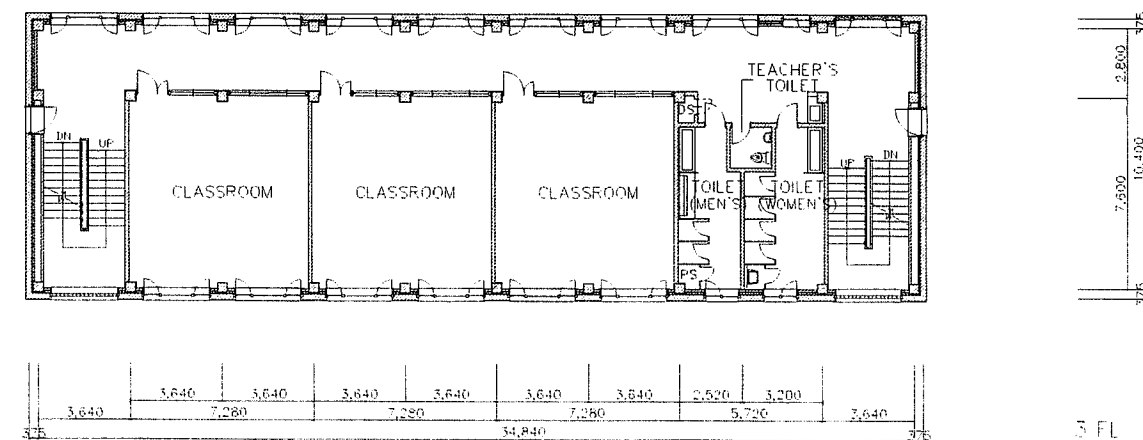
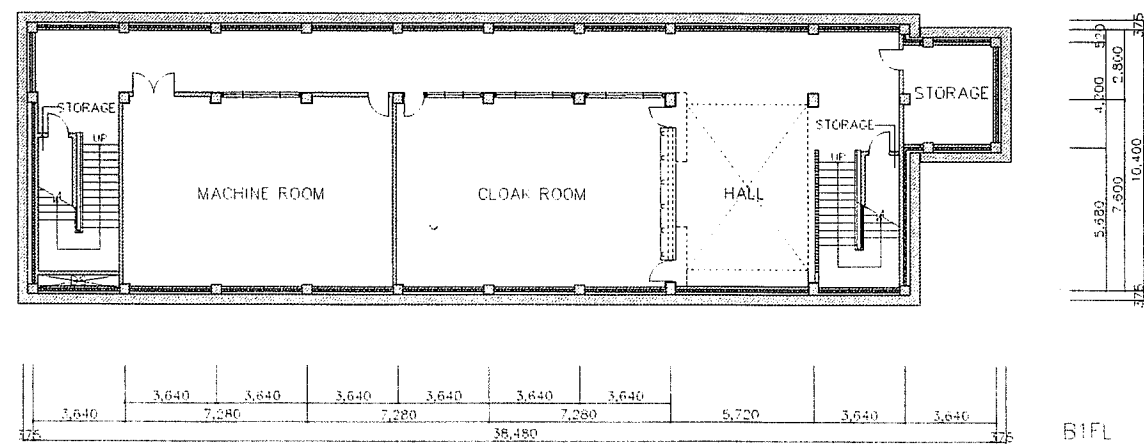
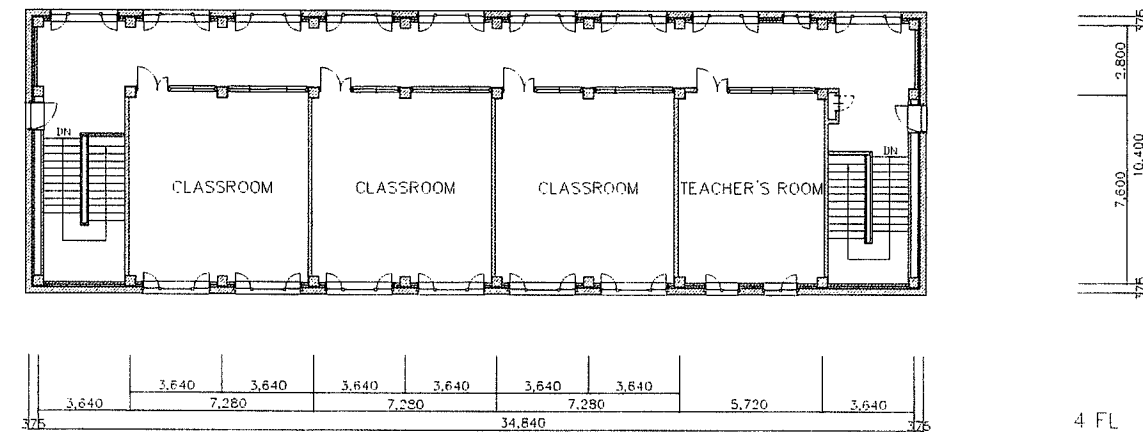
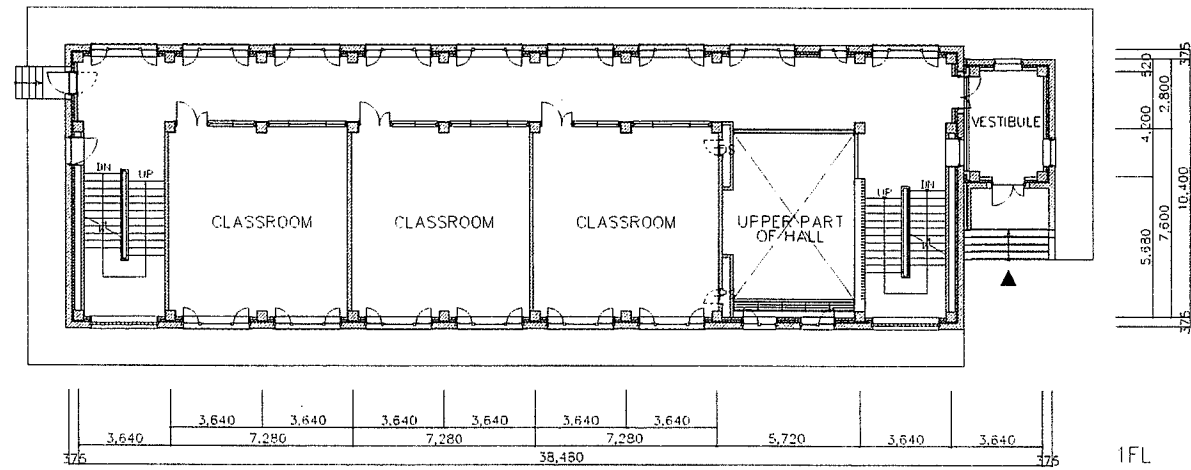
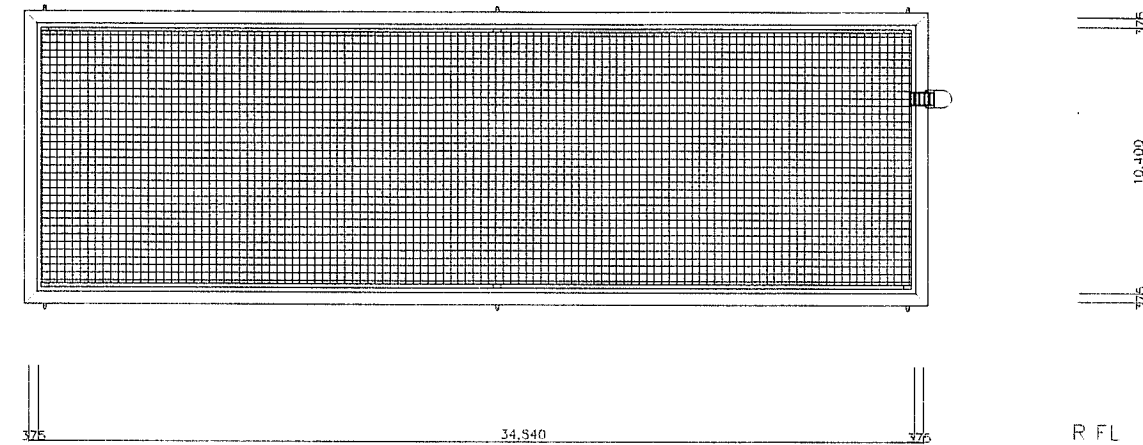
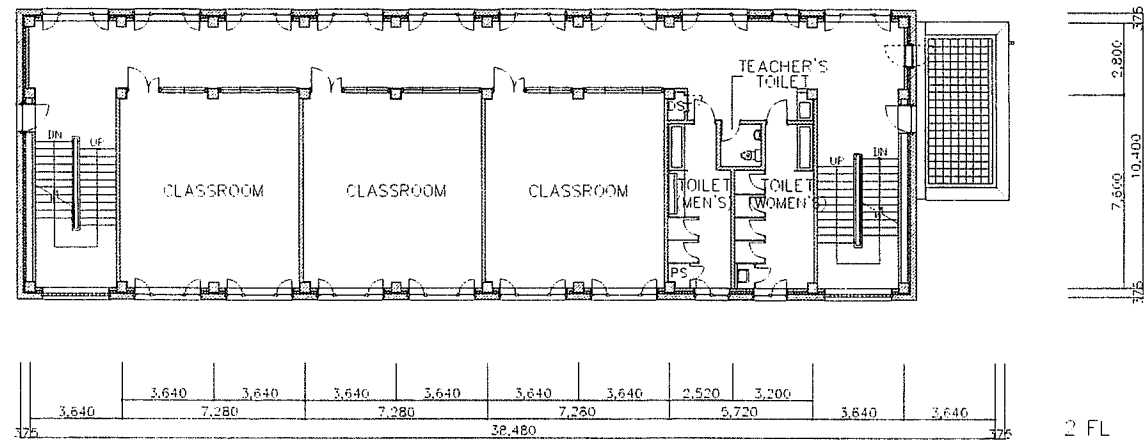
▼ RFL	950
▼ 4FL	3,300
▼ 3FL	3,300
▼ 2FL	3,300
▼ 1FL	3,300
▼ GL	750
▼ BFL	3,450
14,900	

7,600	2,800
10,400	

CROSS SECTION

TYPE-2 (8 CLASSROOMS) ELEVATION-SECTION
SCALE 1 : 300

※The drawings show R type. L type shall have mirrored plans of R type.



TYPE-3 (12 CLASSROOMS) PLAN
SCALE 1 : 300

※The drawings show R type. L type shall have mirrored plans of R type.