

IMPLEMENTATION REVIEW STUDY REPORT  
ON  
THE PROJECT  
FOR  
IMPROVEMENT OF PRIMARY EDUCATION FACILITIES  
(PHASE II)  
IN  
MONGOLIA

MAY 2005

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JAPAN INTERNATIONAL COOPERATION AGENCY  
GRANT AID MANAGEMENT DEPARTMENT

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## **PREFACE**

In response to a request from the Government of Mongolia, the Government of Japan decided to conduct a implementation review study on the Project for Improvement of Primary Education Facilities (Phase II) in Mongolia and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Mongolia a study team from January 30 to February 8, 2005.

The team held discussions with the officials concerned of the Government of Mongolia, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Mongolia for their close cooperation extended to the teams.

May, 2005

Seiji Kojima  
Vice President  
Japan International Cooperation Agency



May, 2005

## Letter of Transmittal

We are pleased to submit to you the implementation review study report on the Project for Improvement of Primary Education Facilities (Phase II) in Mongolia.

This study was conducted by The Consortium of Mohri, Architect & Associates Inc., and Yokogawa Architects and Engineers, Inc. under a contract to JICA, during the period of 5 months from January, 2005 to May, 2005. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Mongolia and formulated the most appropriate implementation review for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

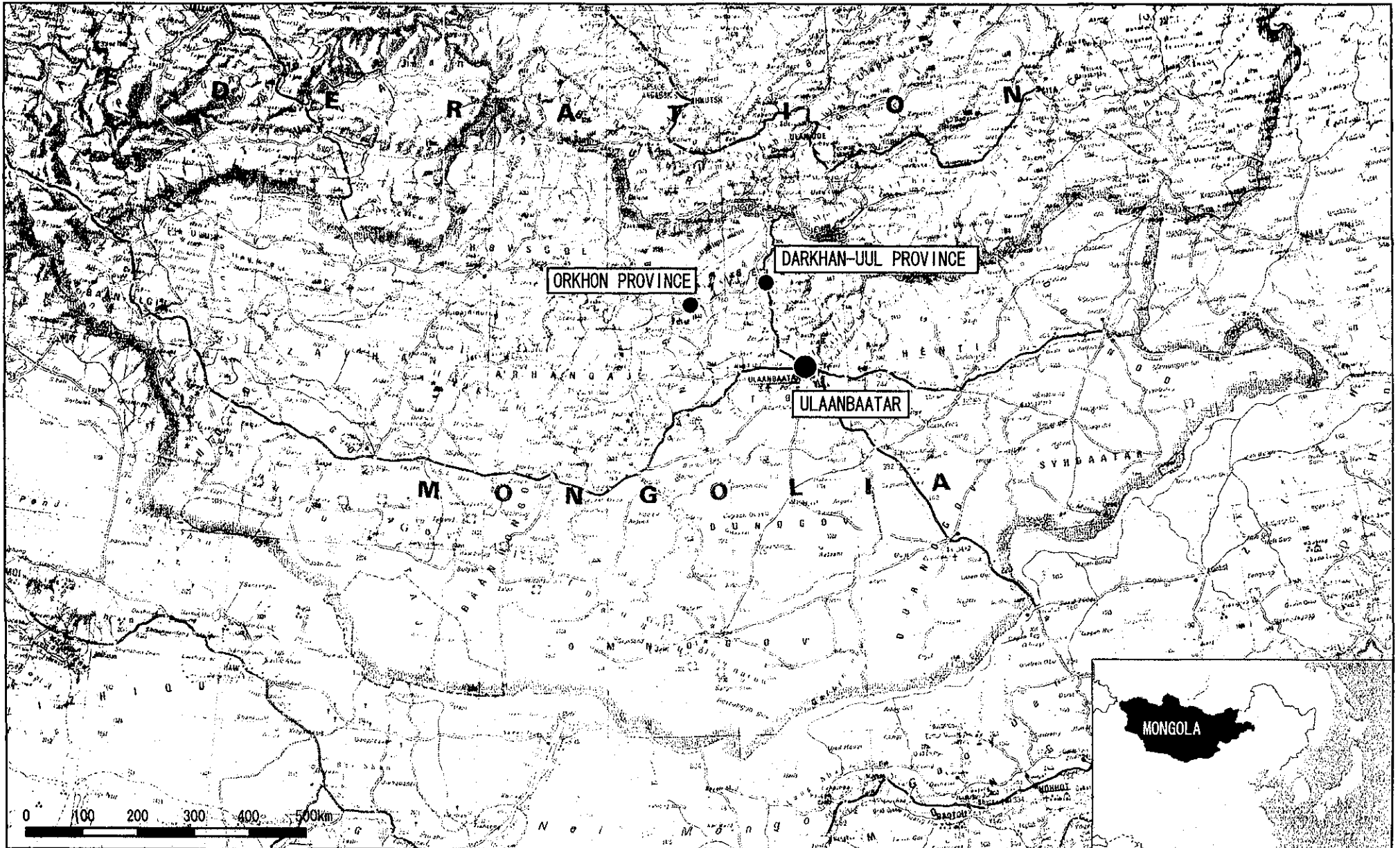
Hisafumi Michikawa  
Project Manager  
Implementation Review Study Team on  
the Project for Improvement of  
Primary Education Facilities (Phase II)  
in Mongolia

The Consortium of  
Mohri, Architect & Associates, Inc. and  
Yokogawa Architects and Engineers, Inc.

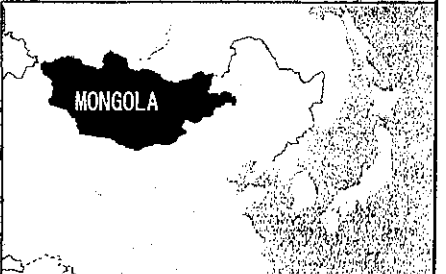




# MONGOLIA

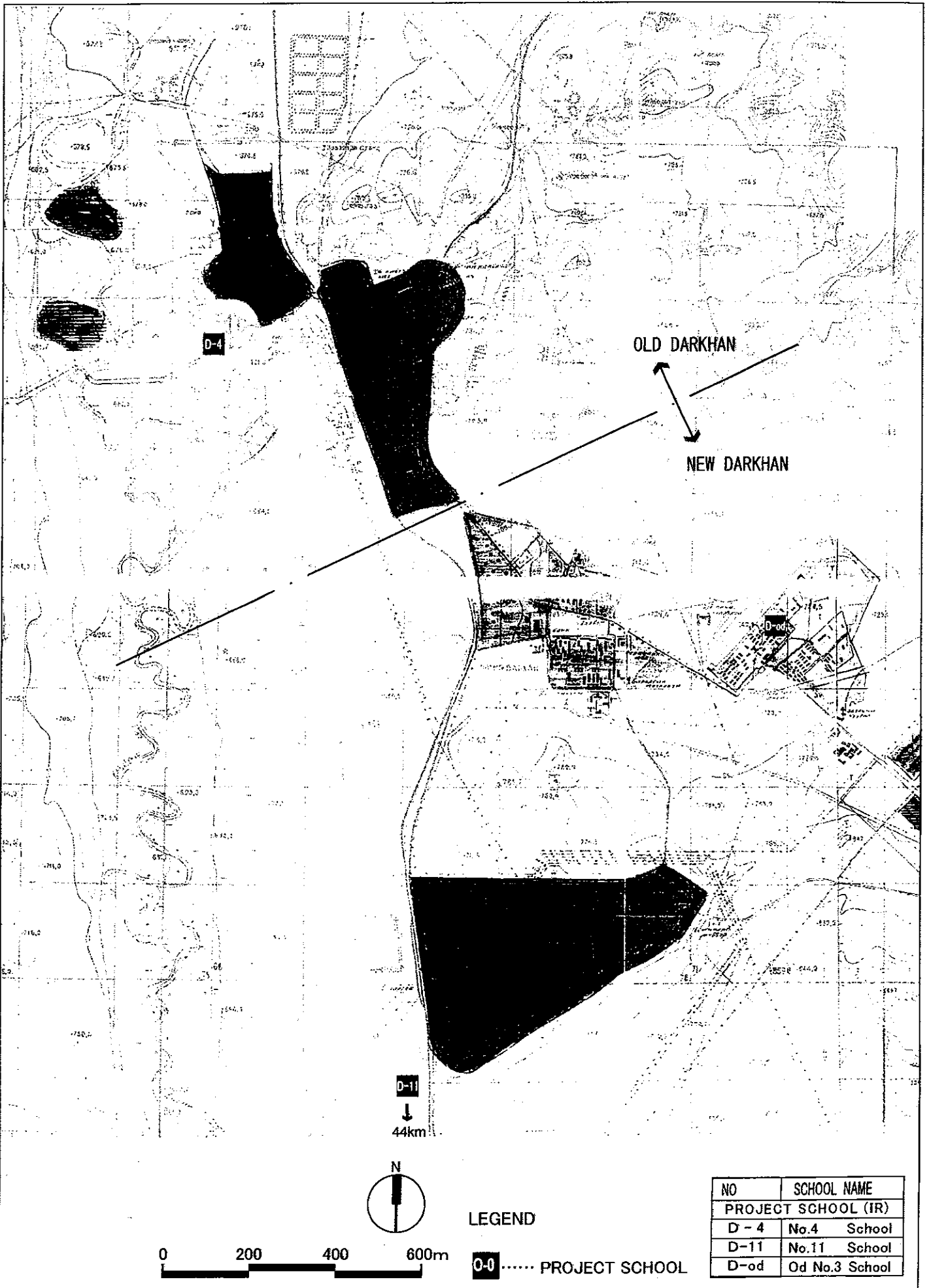


SITE LOCATION MAP





# PROJECT LOCATION MAP - 1 (DARKHAN-UUL)



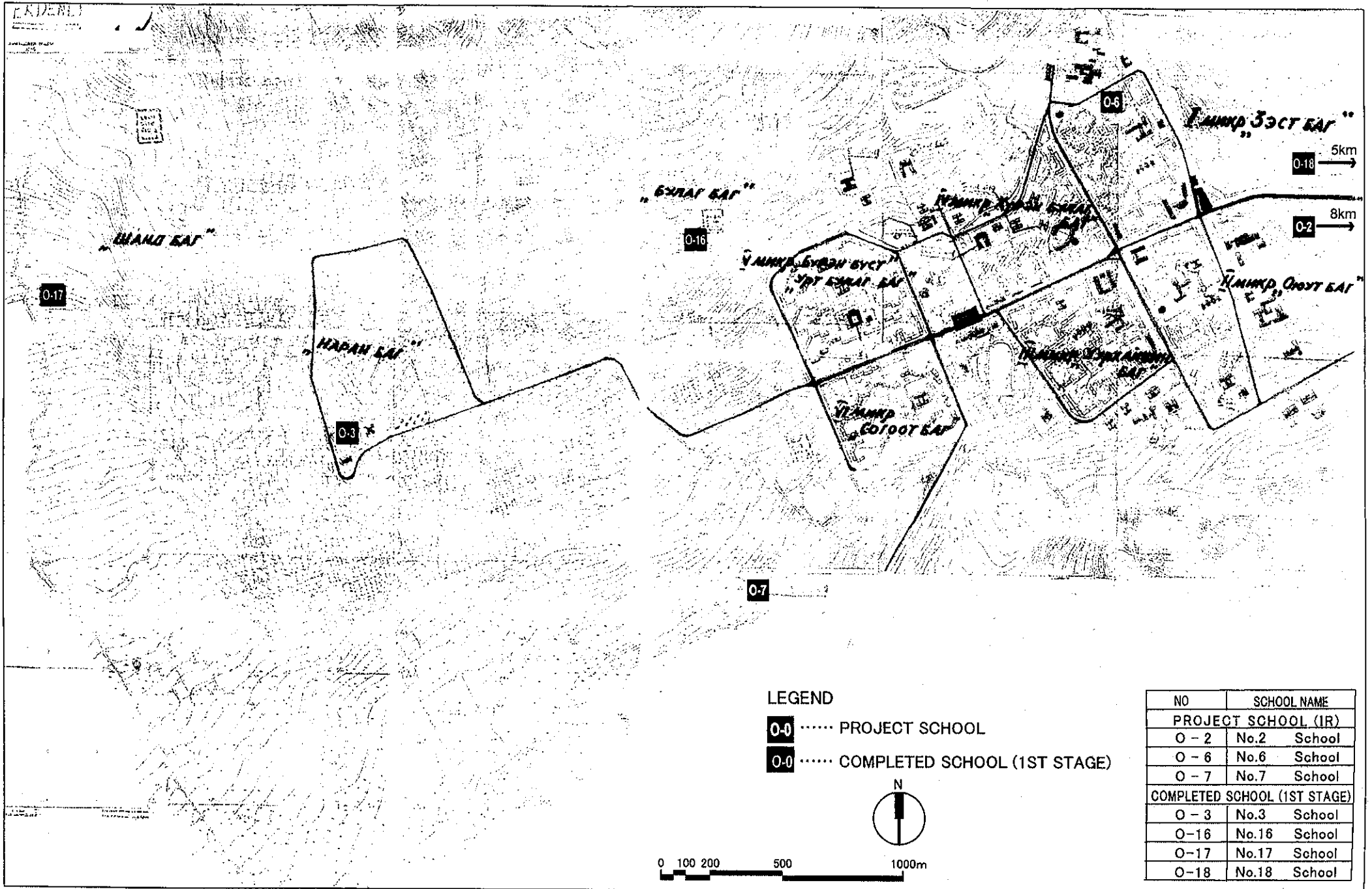
NO	SCHOOL NAME
PROJECT SCHOOL (IR)	
D - 4	No.4 School
D-11	No.11 School
D-od	Od No.3 School

LEGEND

0-0 ..... PROJECT SCHOOL

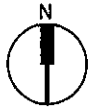


# PROJECT LOCATION MAP - 2 (ORKHON)



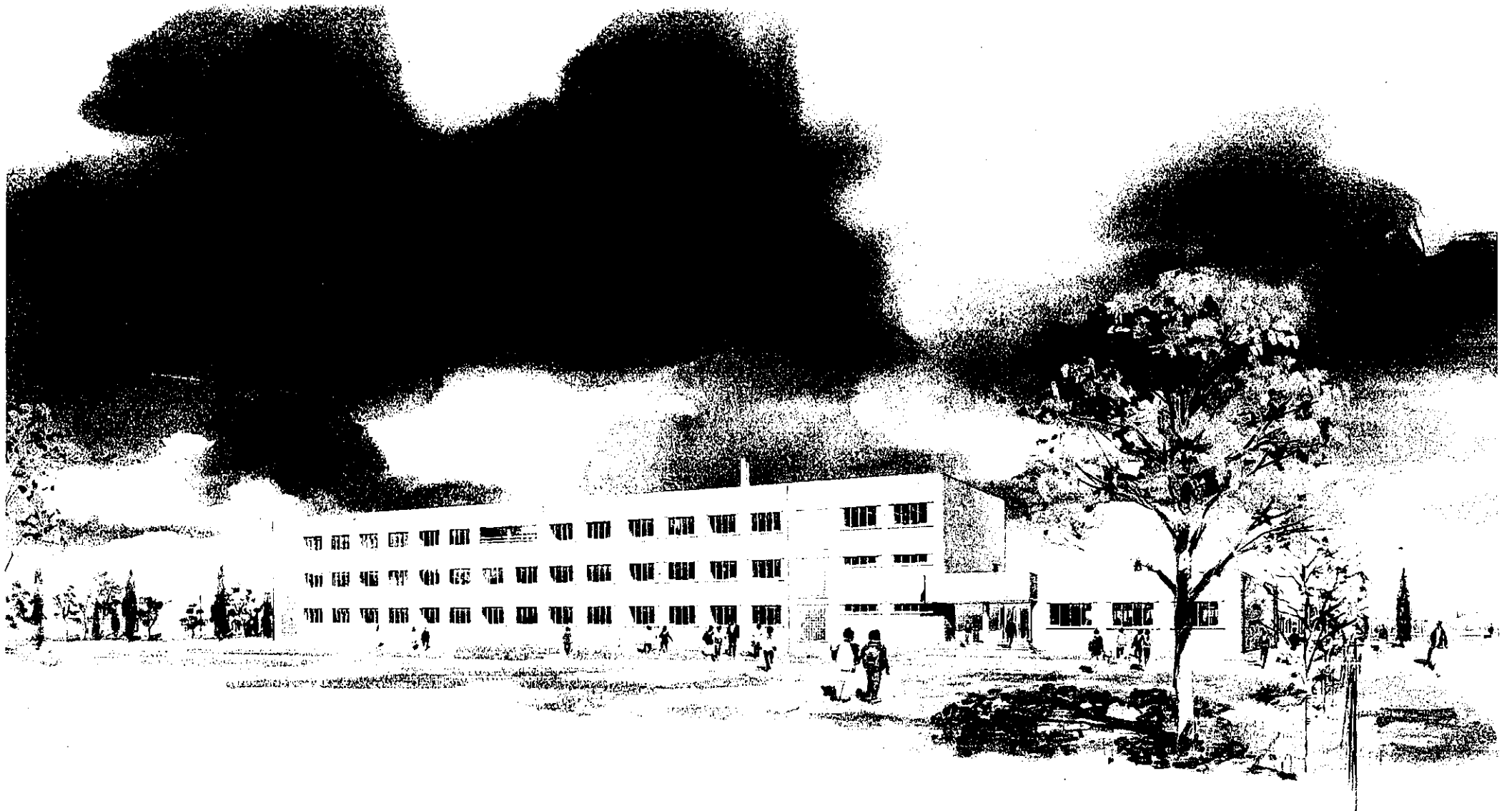
### LEGEND

- O-0 ..... PROJECT SCHOOL
- O-0 ..... COMPLETED SCHOOL (1ST STAGE)



NO	SCHOOL NAME
<b>PROJECT SCHOOL (IR)</b>	
O - 2	No.2 School
O - 6	No.6 School
O - 7	No.7 School
<b>COMPLETED SCHOOL (1ST STAGE)</b>	
O - 3	No.3 School
O-16	No.16 School
O-17	No.17 School
O-18	No.18 School





PERSPECTIVE





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## Abbreviations

<b>ADB</b>	<b>Asian Development Bank</b>
<b>ESDP</b>	<b>Education Sector Development Program</b>
<b>MOSTEC</b>	<b>Ministry of Science, Technology, Education and Culture</b>
<b>SEDP</b>	<b>Secondary Education Development Project</b>
<b>UNESCO</b>	<b>United Nations Educational, Scientific and Cultural Organization</b>
<b>UNICEF</b>	<b>United Nations Children's Fund</b>

## Summary

Mongolia is a landlocked country located in the middle of the Asian continent and is bordered by Russia and China. The country covers an area of 1,566,500 m<sup>2</sup> with the population of 2.4 million people. Darkhan-Uul and Orkhon Provinces, Project areas are situated in the northeastern part of the country. The climate in the area is typical continental climate with very little annual rainfall and large temperature gap between winter and summer.

In the 1980's, the Government of Mongolia had set the development of human resources, namely education, as one of the country's most important targets; and as a result, achieved the primary enrolment rate of 98%, the adult literacy rate in the country's of 96%, and a ratio of education budget to GDP (Gross Domestic Product) of 14% by the end of the decade. However, the national economy became badly off because of its economic and social confusion caused from shifting its system to a market economy. As a result of it, the education budget was reduced (for example, the ratio to GDP decreased to 3.8%), which brought about the lack of teachers, the more seriously damaged educational facilities and equipment, and the charge for dormitory fee. In 1994, the educational indicators such as the primary enrolment rate (81%) and adult literacy rate (82.2%) were decreased. In addition, the capacity of existing education facilities in Mongolia, especially in urban areas, has been too limited to accommodate the large growing numbers of students that came with the large population inflow from the rural areas. Dealing with the expected severe problem of a great deficiency in the number of classrooms, many schools have to adopt a three-shift teaching system.

Under that situation, in 1997, the Government of Mongolia spelled out in "The Basic Laws for Educational Reform" and amended the "Education Laws" in 1998, in which high quality and efficiency of the education system, and education reform including decentralization and improved management are given as main targets. In "Mongolia's 21<sup>st</sup> Action Plan", the Government also clearly mentioned the followings as important issues in education sector:

- Provision of equal educational opportunity and access;
- Provision of primary education for meeting the needs in the market;
- Establishment of modern education system.

Based on that request from the Government of Mongolia, the Government of Japan

implemented the "Project for Improvement of Primary Education Facilities in Mongolia (Phase I)" and 182 classrooms for 16 schools have been constructed in three phases from 2000 through 2003. This time, the Government of Mongolia requested again for the provision of Japan's Grant Aid to construct educational facilities at 15 primary and secondary schools located in Darkhan City (Darkhan-Uul Province) and Eldenet City (Orkhon Province) which are the second and third largest cities in the country. Japan International Cooperation Agency (JICA) conducted a Basic Design Study from June 2001 to February 2002 and summarized a Basic Design Study Report that contains the assistance for the construction of 117 classrooms, teachers' rooms and toilets and the procurement of furniture and educational equipment in 10 school sites in Darkhan-Uul Province and Orkhon Province.

After that, based on the Basic Design Study Report, the Exchange of Notes for "The Project for Improvement of Primary Education Facilities Phase II (1/2)" was signed in June 2002, and the construction of 60 classrooms at 4 school sites in Orkhon Province was completed in March 2004. Subsequently, the Exchange of Notes for "The Project for Improvement of Primary Education Facilities Phase II (2/2)" was signed in August 2003, which aimed to construct 57 classrooms at 6 school sites in Darkhan-Uul and Orkhon Province, and the tender was held in March 2004 after the detailed design stage. However, since the tender ended in a rupture, it became difficult to secure sufficient construction period.

Therefore, the Government of Japan decided to limit the contents of the Project in the fiscal year of 2003 to the design stage and tender stage only, and returned the balance of the budget to the Treasury. And the Government of Japan decided to conduct the reexamination study for the Cabinet meeting in the fiscal year of 2005, and in August 2004, the Government of Mongolia accepted this.

In the light of the above-mentioned circumstances the necessary review of the existing design and cost estimate have been conducted by JICA in this Implementation Review Study in order to submit to the Cabinet meeting for a Project of the fiscal year of 2005.

In this Implementation Review Study, the list of the schools and components of the Project requested by the Mongolian side are the same as those of "The Project for Improvement of Primary Education Facilities Phase II (2/2)". Therefore, the study team set the six requested schools as the candidates, and conducted the review of the original design and cost estimate as follows:

### 1. Verification of the appropriateness of the requested number of classrooms

The appropriateness of the requested number of classrooms was verified based on the school age population in the school zone of each target school. As a result of this, it was confirmed that the requested number of classrooms was appropriate because the shortage of classrooms for all the candidate schools exceeds the number of requested classrooms.

### 2. Review of the original design

As three years has passed since the Basic Design stage, there might have been some changes in the condition of the existing facilities, infrastructure, and so on. Through the site survey, it was found that the following changes must be carried out:

#### ① Review of the building level for Darkhan No.4 school

In Mongolia, generally, the underground water rises in the summertime when it rains a lot and the water goes down by a few meters in the wintertime when it seldom rains. However in the site of Darkhan No.4 school, it has been observed through several measurements after the Basic Design Study until now that the water table is continuously high throughout the entire year. Therefore it became necessary to review the building level to prevent the water from coming out during the construction. And since the soil is slightly softer at the level of the foundation bottom after the building is raised, the designed bearing capacity of the foundation should be changed from 35t/m<sup>2</sup> to 20t/m<sup>2</sup>.

#### ② Review of the material for interior wall

In the Basic Design stage, particle board was installed as a interior wall material. However, according to the 'Fire Safety Standard' issued by the Ministry of Infrastructure in 2003 it became compulsory that the interior wall must be constructed of noninflammable material. Therefore, in this Implementation Review Study we have changed the interior wall from particle boards to silicate calcium boards.

### 3. Review of the Construction Organization

Construction Organization shall be revised as follows according to the change of the construction condition at the sites.

#### ① To set up the material procurement base at Ulaanbaatar

In the Basic Design stage, it was planned that the construction materials imported

from China or Russia would be directly delivered to both Darkhan and Orkhon construction bases. However it was found during this Implementation Review Study that the pre-cast concrete (PC) factory, which is the only one in Darkhan, has been closed since 2004, and there is no plan to reopen it. Further, the PC factory in Orkhon has scaled down its production capacity because the quantity of orders has been drastically reduced in the last few years. Therefore the contractor will have to order most of the PC panels from the factories in Ulaanbaatar.

PC panel is one of the major materials and it is important to conduct factory inspections from time to time. Therefore the material procurement base should be established in Ulaanbaatar.

Setting up the procurement base in Ulaanbaatar, where most of the material suppliers, trading companies and concerned government authorities have their offices, provides an advantage in controlling the procurement.

② To add a Japanese architectural engineer in the Darkhan area

Since there is no plant specializing in concrete batching in Darkhan area, concrete used to be mixed by the above-mentioned PC factory. As the PC factory has been closed, the concrete should be made by installing a temporary batcher plant at the construction sites. Therefore, more careful attention will be needed than before to control the quality of the concrete. In addition, No.4 school is located in the Darkhan area. The site of this school has a high underground water table. In addition, No.11 school is located in a remote area far from the city and the condition of the access road is poor. Judging from these conditions, in order to carry out appropriate quality control, one Japanese engineer should be dispatched during the structural work period, from March to October.

③ To extend the dispatch period of the Japanese mechanical and electrical (M&E) engineer

In Mongolia, interim inspection and final inspection are conducted by the fire department and the architectural section of the Province during the construction stage. The items to be inspected are electrical, heating, boiler, indoor fire hydrants, fire alarms, thermo-detecting alarms, fire extinguishers, interior materials, evacuation route and so on. In the Basic Design stage, it was planned to dispatch one Japanese engineer for 5.5 months. However inspection has become stricter year by year since the Fire Code was issued in 2003, and higher professional knowledge and more detailed shop drawings have been required. Considering all of the above, the dispatch period of

Japanese M&E engineer shall be extended from 5.5 months to 7 months.

#### 4. Review of the cost estimate

During the site survey, the survey team collected the information of the latest unit costs of the construction materials and the labor costs, and this information was utilized to review the cost estimate for the Project.

Even after the above mentioned review, the facilities, furniture and educational equipment to be provided under the Project are same as those selected in "The Project for Improvement of Primary Education Facilities Phase II (2/2)", and shown in Tables 1, 2 and 3 respectively.

Table 1: Facility to be Constructed for Each Project School

No.	Schools	No. of Floor	No. of Clrms	Teacher's room, Cloak, Toilet	Water Tank	Septic Tank	Boiler	Floor Area * (m <sup>2</sup> )
D-4	Darkhan No. 4	3	21	○	○	○		2,765.32 (2,522.03)
D-11	Darkhan No. 11	3	9	○			○	1,510.86 (1,454.64)
D-od	Darkhan Od-No. 3	3	8	○				1,392.44 (1,270.89)
O-2	Orkhon No. 2	2	4	○				726.65 (660.91)
O-6	Orkhon No. 6	2	6	○				962.89 (881.41)
O-7	Orkhon No. 7	3	9	○				1,425.35 (1,304.64)
Total			57					8,783.51 (8,094.52)

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

\* The figures in the parentheses show the floor areas in the Basic Design Report. The difference of figures between the Basic Design Report and this report is not caused by the change of the building floor plans but the different measuring way of dimensions. They were measured between the column centers in the Basic Design Report and, on the other hand, the wall centers in this Implementation Review Study Report.

**Table 3 List of Equipment**

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

Taking the volume of the construction into consideration, the construction period will be planned as a one-year, one-stage project.

The estimated Project cost is 920 million Japanese Yen (917 million Japanese Yen for the Japanese side work and 3 million Japanese Yen for the Mongolian side). The whole implementation schedule (including the period of tender stage) requires approximately 21 months.



(1) Direct Effect

By implementing the Project, at the Project schools, the classroom shift will become two or less with the number of students per classroom less than 36 (total 72) which is the standard of Mongolia. As a result of it, the educational environment will improve by alleviating the congested situation. At six Project schools, the number of the students per classroom will decrease from 133 in 2004 to 65 in 2007 which is the target year of the Project. In those schools, if the Project will not be implemented, the number of the students per classroom would increase to 202 in 2007.

Table 4: Comparison of the Number of Students per Classroom

School		2004			2007			
		Enrollment	No. of existing clrms	No. of students per clrm	Projectved Enrollment	No. of clrms After Project	No. of students per clrm (w/o Project)	No. of students per clrm (after Project)
Darkhan-Uul	No.4	885	0	—	1,436	21	—	68
	No.11	412	4	103	678	13	170	52
	Od-No.3	120	0	—	439	8	—	55
Orkhon	No.2	720	9	80	899	13	100	69
	No.6	634	6	106	739	12	123	62
	No.7	812	8	102	1,259	17	157	74
Total/ Average		3,583	27	133	5,450	84	202	65

\* No. 11 in Darkhan has small classrooms with capacity of 20 students, but included in the calculation

① Indirect Effects

5 Project schools, except Orkhon No. 6 school at the city center, are located in Ger areas. Because Ger areas grow rapidly to accommodate inflow from rural areas to urban areas, infrastructure development, including public facilities, has been quite insufficient. Thus, without available facilities for community activities for residents, community meetings have to be held outside. It is expected that the Project schools will be used not only for school-related activities by the parents and PTA (Parents and Teachers Association) members, but also as public facilities by area residents. It is also expected that the Project facilities will be utilized for other non-formal education programs in the area.

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, if the items mentioned below are improved, this Project will be implemented more smoothly, and thus more effectively contribute to improve the general educational environment.

(1) Correspondence to Further Increase of the Enrollment

In both Darkhan-Uul and Orkhon Provinces, lowering the age for the primary education to 7 has been already done. However, another possibility exists where the starting school age of 6 could begin in both Provinces earlier than in other Provinces of the country. If this is the case, the situation of classroom shortages may get worse.

Therefore, it is suggested that MOSTEC and the administrations in both Darkhan-Uul and Orkhon Provinces take the appropriate budget actions to construct the necessary number of classrooms, before shortages get too serious.

(2) Correspondence to the Admission to Schools in the Districts other than One's Own.

One major reason for the overcrowding of schools in city areas is, as mentioned above, the insufficient capacity of schools outside the urban areas to keep a high enrollment, so many students go to the urban area schools. Many students, however, especially those of the junior secondary level (grade 5-8), tend to prefer to go to so-called "popular schools" which are regarded as the more advantageous and "best schools" for advancing to a higher education. The selecting of those schools instead of schools in their own residential area greatly contributes to the overcrowding of the city area schools. Such a tendency may make the alleviation of classroom congestion impossible to achieve.

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## Chapter 1 Background of the Project



## Chapter 1 Background of the Project

Japan International Cooperation Agency (JICA) conducted a Basic Design Study from June 2001 to February 2002 and summarized a Basic Design Study Report that contains the assistance for the construction of 117 classrooms, teachers' rooms and toilets and the procurement of furniture and educational equipment in 10 school sites in Darkhan-Uul Province and Orkhon Province.

After that, based on the Basic Design Study Report, the Exchange of Notes for "The Project for Improvement of Primary Education Facilities Phase II (1/2)" was signed in June 2002, and the construction of 60 classrooms at 4 school sites in Orkhon Province was completed in March 2004. Subsequently, the Exchange of Notes for "The Project for Improvement of Primary Education Facilities Phase II (2/2)" was signed in August 2003, which aimed to construct 57 classrooms at 6 school sites in Darkhan-Uul and Orkhon Province, and the tender was held in March 2004 after the detailed design stage. However, since the tender ended in a rupture, it became difficult to secure sufficient construction period.

Therefore, the Government of Japan decided to limit the contents of the Project in the fiscal year of 2003 to the design stage and tender stage only, and returned the balance of the budget to the Treasury. And the Government of Japan decided to conduct the reexamination study for the Cabinet meeting in the fiscal year of 2005, and in August 2004, the Government of Mongolia accepted this.

In the light of the above-mentioned circumstances the necessary review of the existing design and cost estimate have been conducted in this Implementation Review Study in order to submit to the Cabinet meeting for a Project of the fiscal year of 2005.





## **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

Since the 1990's, when the migration of people from rural areas began, urban areas like Eldenet and Darkhan Cities (Project target area) have seen an explosive increase in population growth, including a lot more children than the existing educational facilities could not accommodate. Especially in the city centers, the capacity of existing schools is limited to accommodate the large growing numbers of students, so classroom shortages have become a serious problem in most urban schools. Add to that one more thing currently, children first enter primary school at 8 years old in Mongolia. However, in the interests of children receiving a better primary school education, the Government of Mongolia has promoted a plan to lower that age to 7, and eventually to 6. This will add to the already soaring numbers of children in the schools. Many schools, in dealing with these severe classroom shortages, have had to adopt a three-shift teaching system as well as use rooms for special education as a general classrooms.

In 1999, the Government formulated its "Mongolia Education Sector Strategy 2000-2005" as a medium-term education development plan to focus mainly on alleviating facility shortages. The "Education Law", revised in 1998, stipulates that 20% of the nation's budget should be appropriated to the education sector. However, utilities (fuel, electricity, etc.) and teachers' salaries consume approximately 80% of those funds. Hence, the biggest problem lies in the fact that, under the current system, only a small percentage of the education budget is available to allocate for expansion or improvement of education facilities.

The number of students in public primary school and secondary schools has risen significantly during the 5-year period from 1997 to 2001. Orkhon Province shows a marked increase of 35% from 15,517 to 20,995, while Darkhan-Uul Province has had an increase of 20% from 17,773 to 21,368. Only one school in Orkhon Province was constructed during the same period. The schools in the urban areas of both Provinces have primarily accommodated the swelling population of students by increasing the number of shifts. In other words, the overcrowded conditions of each school have been advancing without being rectified.

In light of such circumstances, the overall goal of the Project is to alleviate the shortage of education facilities in both Provinces. Its primary purpose is to ease the overcrowded classrooms at all target schools, thereby creating a more comfortable learning environment. The index used to attain the objective is to ensure that space in the classroom is larger than the current standard of 1.5m<sup>2</sup>/per person, under the less than two-shift teaching system.

## 2-1-2 Outline of the Project

In order to achieve the above-mentioned goal, the Project will be implemented at three schools in Orkhon Province and three schools in Darkhan Province. In the Project, the necessary financial assistance will be provided for the construction of 57 classrooms, as well as teachers' rooms and toilets, and for the procurement of basic educational furniture and equipment.

## 2-2 Basic Design of the Requested Japanese Assistance

### 2-2-1 Design Policy

#### 2-2-1-1 Principles of the Project

##### (1) Selection of Project Schools for Analysis in Japan

In this Implementation Review Study the Government of Mongolia requested the following schools and components, which were the same as those of the Basic Design Study. These requested schools were surveyed in the Implementation Review Study as candidate schools.

Candidate schools : Darkhan-Uul Province No.4, No.11. and Od-No.3 schools

Orkhon Province No.2, No.6 and No.7 schools

Components : 57 classrooms, teachers' rooms, cloak rooms, educational furniture and educational equipment

Table 2-1 List of Requested Schools

Selected School for analyses (Final Requested Sites)		Problem explained from Mongolian side
Darkhan-Uul Province	No.4 school	<ul style="list-style-type: none"> <li>• Over-aged building</li> <li>• Not enough capacity for the number of students in the school district</li> </ul>
	No.11 school	<ul style="list-style-type: none"> <li>• Classroom size is not standard</li> <li>• Presently overcrowded and the construction of dormitory is planned for students who live too far to walk to school</li> </ul>
	Od-No.3 school	<ul style="list-style-type: none"> <li>• No school exist for secondary education program (too far to existing schools)</li> <li>• Non standardized classroom</li> </ul>
Orkhon Province	No.2 school	<ul style="list-style-type: none"> <li>• Overcrowded by population increase in <i>Bag</i> area</li> </ul>
	No.6 school	<ul style="list-style-type: none"> <li>• Overcrowded</li> <li>• No school for secondary education program</li> </ul>
	No.7 school	<ul style="list-style-type: none"> <li>• Overcrowded by population increase and special &amp; vocational education program</li> </ul>

Since no problem could be found in 1) land-ownership, 2) overlap with other projects, 3) accessibility to the sites, 4) the size and the lay of the land for construction, or 5) security from natural disaster, the six requested schools were finally regarded as the objects of further analysis.

## (2) Existing Problems at Project Sites

The existing problems at project schools can be summarized as follows:

### ① Double or More Shift Classes (Overcrowdings in the classrooms)

Due to the shortage of classrooms, the schools are forced to use the existing classrooms in shifts (double or more) to accommodate all of the classes being held in the school.

### ② Areas with Highest Population Increases and Without Schools

Although the population continues to increase in the new Bag areas, there are no schools, so students have to walk long distances to go to existing schools.

### ③ Problems Regarding School Facilities

Based on the results of the site survey, the following conditions were taken into consideration for determining the number of existing classrooms:

#### 1) Safety

Except for School No.4 in Darkhan-Uul where some parts of the main structures have collapsed and are seriously damaged, and a stable is being used as a classroom, the existing buildings at the Project schools can be regarded as continuously usable.

#### 2) Classrooms Standards Not Being Met

Some of the proposed schools have converted other buildings, constructed previously for purposes other than education, into use as classrooms in order to meet the urgent needs that have developed from the increasing number of school-age children. However, it is reported that these classrooms are difficult to use.

Classrooms which are too small to accommodate the maximum number of 36 students like the ones at School No.11 (Darkhan-Uul), are being utilized at the moment. It is judged that these classrooms are usable. Classrooms with center columns in the middle of the room (Od-No.3 School in Darkhan-Uul) obstruct the students' view of the blackboards, so they should not be counted as existing classrooms and will be omitted.

#### 3) Classrooms Used for Other Purposes

School No.7 (Orkhon) is the only one in the Province that offers classes for vocational training and for handicapped children. The problem is that both of these classes cannot be conducted in their own classrooms. The class for

handicapped children are forced to double with other classes in "shifts," while the vocational classes can only be held every other day.

#### 4) Classrooms as Dormitories

School No.11 (Darkhan-Uul) is in a remote area, and more than half of all the students come to school from great distances, even during the severe winter and early spring. In order to improve this situation, the Darkhan-Uul provincial office plans to utilize six out of ten classrooms on the second floor as dormitories for those students coming from far away. From the viewpoint of providing equal opportunity to students who have limited access to basic education due to living in locations far from schools, this plan is meaningful and agrees with the spirit of the promotion of compulsory education.

### (3) Calculation of Number of Classrooms to be Constructed

From inspection results, the request were deemed appropriate and approved. The scale of the Project will be determined on the basis of the amount of classroom shortages existing at 6 proposed schools.

#### ① Basic Policy

Based on the results of the site survey, the basic principles for determining the number of classrooms are set up as follows:

##### a) Double-shift

The estimate of classroom shortages will be based on the number of double-shift classes at the schools.

##### b) School Districts

Each Province, Soum and Bag sets up its own approximate rules for school districts. Basically, students are supposed to go to schools in their own districts. And although this guidance is followed comparably well in the primary schools, there are many students on the secondary school level who do not follow this guidance and go to schools that are outside the districts in which they belong and live. School districts are established in both Darkhan-Uul and Orkhon Provinces. Usually, a school district and a Bag (local government administrative unit) coincide; however, they do not in the urban areas with rapid population growth.

**Table 2-2 School District of Requested Schools**

	Name of School	School District		Remarks
		Soum	Bag	
Darkhan-Uul	No.4 school	Darkhan	Part of No. 1, and No.2 and No. 3,	
	No. 11 school	Horgon	No. 3	
	Od-No.3 school	Darkhan	Mangeruto in No. 15	
Orkhon	No. 2 school	BayonUnduul	Govil	
	No. 6 school	BayonUnduul	Zest	No. 6 school is established as the complex school with Nos. 4, 10 and 13 Schools.
	No. 7 school	BayonUnduul	Denzi	

c) Target Year of the Project

Assuming that Project implementation begins in 2006 and Project construction is carried out in two phases, the completion year of the Project is estimated to be 2007. So the estimate of the number of schools children and the accommodation capacity of the existing classrooms which are needed to determine the Project scale should be done, based on the estimated number as of 2007 which is calculated from the latest population statistics in 2004.

d) Number of Students per Classroom

Taking into consideration the "Architectural Standards for Educational buildings and Facilities" and the present existing number of students, there are to be 36 students per class. The number of students in a classroom should be an even number because all the schools in both Provinces have "two-seat" type desks with chairs.

e) Lowering the Starting School Age and Changing the School Year System

In Mongolia, the reform of education laws that will a) change the current 10-year primary and secondary school system (4-4-2 years) to a 12-year school system (6-3-3 years), and b) lower the current school starting age from 8 to 6, has been examined. The details include measures for introducing reform in the urban areas first, and then the rural areas.

The calculation of the number of students for the Project is based on that the starting age of 7 for primary schools has been fully in place in both Provinces by 2004. The details for introducing the school starting age of 6, and the shifting of the school year system to 6-3-3 years, has not yet been



established. Thus, measures for the introduction of the school starting age of 6 and the 6-3-3 school year system shall not be examined for the Project.

f) Classrooms for Secondary Education Programs (Grades 9 and 10)

For the students who desire to enter a higher school level after they complete Grade 8, they can select 10-year system schools in accordance with their needs without regard to school district.

Out of the six requested schools for the Project, School No. 2 and No. 7 (Orkhon) are the 10-year system schools. Those schools with their own curriculum offer vocational education courses, and/or special classes such as science, mathematics and foreign languages.

In Phase I of the Project, the number of classrooms for secondary education (Grade 9 and 10) in the 10-year school system, was originally set at 10% of the total number of classrooms. However, due to the variations of the curriculum in each school, the calculation of the number of necessary classrooms for each school will from now, be based on either data regarding the number of students during the past five years, or the estimated number of students in the school district.

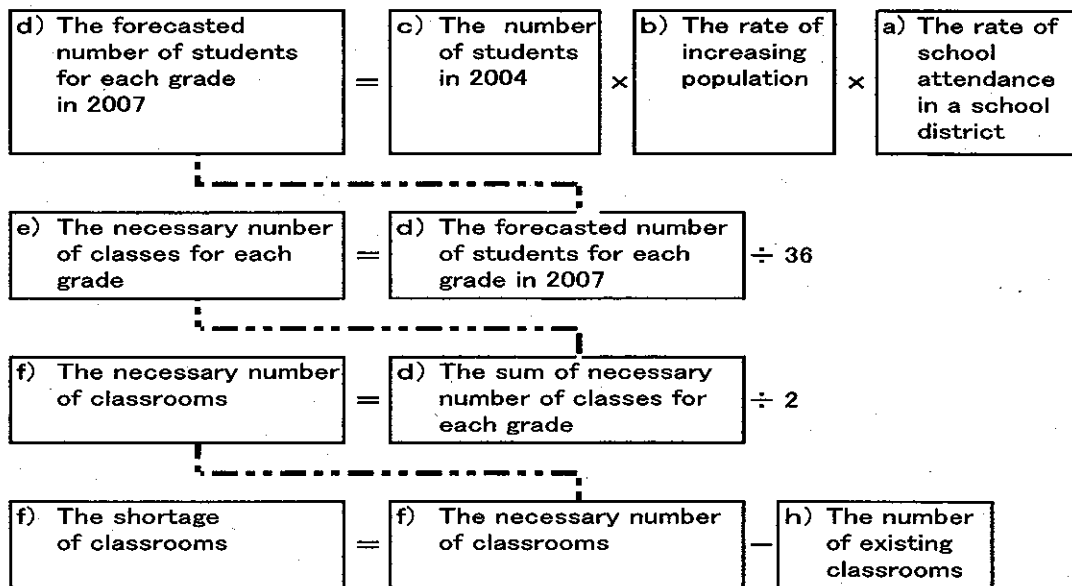
② Calculation of Classroom Shortages

The calculation for the shortage of classrooms is shown in Figure 2-1, Table 2-3.

- a) The rates of school attendance in a school district can be calculated by dividing the number of the children who go to school in the district by the number of school-age children in the same school district. The figures obtained by this calculation method will be used in the future for adjusting the predicted number of school-age children.
- b) Increase trends of the population rates in each school district (of the candidate schools) can be calculated using the population statistics. The rates obtained will be used for adjusting the predicted number of students.
- c) The estimated number of 2 to 10-year old children who will be primary school students (7 to 15 years old) in 2007 can be found in the population data of each Bag area in the school district. As described in the section of prerequisite conditions, it is assumed that all Provinces will be following the regulation of "the school starting age at 7" by 2004.
- d) The number of students calculated in section c) should be adjusted in

- accordance to trend patterns found in sections a) and b).
- e) The calculation of the number of classes for each Grade should be based on the maximum number of students of 36 in a class.
  - f) The necessary number of classrooms should be calculated on the basis of the number of classes calculated in e). Since two-shift classes will be conducted, obtained figures in Paragraph e) should be divided by 2. (classrooms = classes/2).
  - g) The number of classrooms to be built by the Project can be calculated by subtracting the number of existing classrooms from the number of needed classrooms calculated in f).

Figure 2-1 Flowchart of the Calculation of Classroom Shortages for Each School



After the above-mentioned calculation, it is found that the estimated number of students in 2007 in each proposed school exceeds the estimated number of students in 2005 calculated during the Basic Design Study. (Table 2-4) Therefore the requested number of classrooms is judged as appropriate and the requested number of classrooms shall be constructed in the Project.

**Table 2-3 Calculation of Necessary Number of Classrooms**

School	Item	Grade										No. of C.R. needed (Half of class.)	h) Existing usable C.R.	i) No. of lacking C.R.	j) No. of C.R. to be constructed	Remarks (Ratio for Adjustment)		
		1	2	3	4	5	6	7	8	9	10						#	
Darkhan-Uul	c) 2003-2004 population	132	250	183	154	345	282	254	356			1,936						<ul style="list-style-type: none"> <li>From population change of Bag in school zone, we estimate 10% of population increase</li> <li>After construction new building, we estimate 80% (1to4) and 60%(5-8) of students will go to the school</li> <li>Demolition of existing building is needed. Existing cow house is not appropriate for class rooms</li> </ul>
		145.2	275	201.3	169.4	379.5	288.2	279.4	391.6			2,130		22	21			
		116.16	220	161.04	135.52	227.7	172.92	167.64	234.96			1,436		0	9			
		4	7	5	4	7	5	5	7			44		4	9			
		49	44	41	45	34	53	36	37			339		13	8			
D-11	d) x2.0 (Grade 1-8)	98	88	82	90	68	106	72	74			678		4	9	<ul style="list-style-type: none"> <li>By comparing No. of school-age children and student enrollment, it becomes twice in each Grade (except for Grades)</li> <li>Although population increase can be seen in 3rd Bag of Hongol Soum, its possible to cope with by the above mentioned adjustment</li> <li>We predict 6 of 10 small classroom will convert to dormitory, 4 will convert to normal</li> </ul>		
		98	88	82	90	68	106	72	74			678		0	8			
		3	3	3	3	3	4	3	4			26		9	8			
		83	82	110	82	158	73	66	77			731		0	8			
		100	98	132	98	190	88	79	92			877		9	8			
D-04	e) x0.5 (Grade 1-8)	50	49	66	49	95	44	40	46			439		0	8	<ul style="list-style-type: none"> <li>By comparing No. of school-age children and student enrollment, it becomes 1.2 times in each Grade.</li> <li>From the gap between estimated enrollment and enrollment in Bag, more than 30% (1 to 4) and less than 60% (5 to 8) of students are supposed to go to this school</li> <li>Existing building is not deemed as appropriate for classroom</li> </ul>		
		2	3	2	2	3	2	2	2			18		4	40			
		63	82	110	82	158	73	66	77			731		4	38			
		100	98	132	98	190	88	79	92			877		44	38			
		50	49	66	49	95	44	40	46			439		4	38			
Orkhon	c) 2003-2004 population											44	4	40	38	<ul style="list-style-type: none"> <li>Considering population increase, multiply school-age children by 1.3 (Grade 1-8)</li> <li>Although enrollment tend to be larger than school-age children, it's possible to cope with by above adjustment</li> <li>Impossible to implement 2nd shift in one each class of Grade 1-4 due to long hour class operation by special course</li> <li>One standard classroom for special education is secured. 4 small classrooms will be used for non-formal education.</li> <li>Large population increase cannot be seen in Bag as school district.</li> <li>A half of school-age children (5-8) in community are supposed to go to No. 4 school</li> <li>Considering population increase, multiply school-age children by 1.3 (Grade 1-8)</li> <li>10% of students (5-8) are supposed to go to other schools</li> <li>We predict 5 of 14 existing classrooms will convert to special education for handicapped, 1 will convert to a vocational classroom.</li> </ul>		
												17 (13+4)	9	8	4			
												12	6	6	6			
												20	8	12	9			
												49	23	26	19			
												720	60	60	60			
												899	62	60	899			
												899	62	60	899			
												30	2	2	30			
												1,030	125	131	1,030			
O-2	b) x1.3 (Grade 1-8)	86	75	64	66	82	92	76	95	62	60	720		9	8	4	<ul style="list-style-type: none"> <li>Considering population increase, multiply school-age children by 1.3 (Grade 1-8)</li> <li>Although enrollment tend to be larger than school-age children, it's possible to cope with by above adjustment</li> <li>Impossible to implement 2nd shift in one each class of Grade 1-4 due to long hour class operation by special course</li> <li>One standard classroom for special education is secured. 4 small classrooms will be used for non-formal education.</li> <li>Large population increase cannot be seen in Bag as school district.</li> <li>A half of school-age children (5-8) in community are supposed to go to No. 4 school</li> <li>Considering population increase, multiply school-age children by 1.3 (Grade 1-8)</li> <li>10% of students (5-8) are supposed to go to other schools</li> <li>We predict 5 of 14 existing classrooms will convert to special education for handicapped, 1 will convert to a vocational classroom.</li> </ul>	
		86	98	83	86	81	120	101	124	62	60	899		17 (13+4)	9	8		
		88	98	83	86	81	120	101	124	62	60	899		12	6	6		
		3	3	3	3	3	4	3	4	2	2	23		6	6	6		
		105	112	130	101	214	112	125	131			1,030		12	6	6		
O-6	d) x1.0 (Grade 9-10)	105	112	130	101	214	112	125	131			1,030		6	6	6	<ul style="list-style-type: none"> <li>Considering population increase, multiply school-age children by 1.3 (Grade 1-8)</li> <li>10% of students (5-8) are supposed to go to other schools</li> <li>We predict 5 of 14 existing classrooms will convert to special education for handicapped, 1 will convert to a vocational classroom.</li> </ul>	
		105	112	130	101	214	112	125	131			1,030		12	6	6		
		3	4	4	3	3	2	2	2			23		6	6	6		
		149	102	97	89	85	102	66	68			758		6	6	6		
		194	133	128	118	111	133	86	88			985		12	6	6		
O-7	e) Estimated number of classroom in 2007	194	133	128	118	111	133	86	88			985		8	12	9	<ul style="list-style-type: none"> <li>Considering population increase, multiply school-age children by 1.3 (Grade 1-8)</li> <li>10% of students (5-8) are supposed to go to other schools</li> <li>We predict 5 of 14 existing classrooms will convert to special education for handicapped, 1 will convert to a vocational classroom.</li> </ul>	
		194	133	128	118	111	133	86	88			985		8	12	9		
		6	4	4	4	4	3	4	3	3	4	40		23	26	19		
		6	4	4	4	4	3	4	3	3	4	40		49	23	26		
		6	4	4	4	4	3	4	3	3	4	40		49	23	26		

(note) a) : Rate of school-age children who go to school in their school district  
 b) : Population increase of school-age children for recent 5 years

Table 2-4 Appropriateness of the Requested Number of Classrooms

Province	Name of School	No. of Requested Classrooms	Calculated Shortage of Classrooms	Judgment	No. of Classrooms to be Built
Darkhan-Uul	No. 4	21	22	OK	21
	No. 11	9	9	OK	9
	Od3	8	9	OK	8
Orkhon	No. 2	4	8	OK	4
	No. 6	6	6	OK	6
	No. 7	9	12	OK	9

## 2-2-1-2 Policy Regarding Natural Conditions

### (1) Measures for the Environment and the Cold Winters

Mongolia is a landlocked country located in the middle of the Asian continent and is bordered by Russia and China. Darkhan-Uul and Orkhon Provinces (Project area) are situated in the northeastern part of the country. The approximate latitude is N 49° and the elevation is about 700m above sea level. The distance of both Provinces to the border with Russia is about 300km. The area is vast grassland. The climate in the area is typical continental climate and the temperature difference between winter and summer is large. Annual rainfall is very little.

Under these conditions, the most important priorities to be taken into consideration in the designing of the Project construction are measures for the environment and the cold winter, as follows:

- ① Use of environmentally acceptable insulation (non-hazardous material) to prevent heat loss;
- ② Use of an efficient, economical, and environmentally acceptable heating facility;
- ③ A lighting plan fully utilizing the natural light and heat from the sun;
- ④ Providing anti-freeze measures to all piping systems;
- ⑤ Construction schedules and methods taking the cold weather into account.

### (2) Earthquake and Another Natural Phenomena

According to seismic intensity maps, both Provinces are located in earthquake zones. Therefore, Project structures and facilities should be designed to be earthquake resistant. In addition, relatively strong northwest winds prevail throughout the year in both Provinces. So floor plans and the arrangements of facilities should take wind

direction into consideration.

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

#### (1) Ethnic Minorities

Ethnic minorities such as the Kazaf and the Briyaat live in Mongolia, but there are no racial problems to speak of. And due to the influences of socialism over a long period of time, there is virtually neither sexual discrimination nor religious conflicts in the education sector of the country. Although disparity in wealth has been increasing since the change to a market economy, it is still small compared to other developing countries.

#### (2) Regulation

For many years, Mongolia received a large percentage of its foreign assistance from the former Soviet Union. As a result, some regulations is encountered which were introduced under the aegis of the Soviet Union and still remain effective in various social aspects. For instance, as for printed materials concerning the regulations of each ministry or the provincial government, some documents still carry regulations from the former Soviet Union written in the Russian Language. These old regulations have been gradually replaced by new regulations that Mongolia has been making in parallel with its progressing socio-economic system reforms.

Notwithstanding, the old regulations adopted under the influence of the former Soviet Union still function in the periphery of the legal system because detailed regulations and rules have not yet been sufficiently addressed yet by the Government of Mongolian. What is needed to bear in mind is that there is no clear documents about relationships old regulations taken from the former Soviet Union and new regulations stipulated by the Government of Mongolia. As a result, it cannot be confirmed if the regulations are former Soviet Union ones or not unless Mongolian officials make it sure in charge of each case. It is critical, for submitting the applications for building approval, to hold thorough discussions with the Provincial governments and the Building Standards Bureau on the differences between the standards of Mongolia and the regulations of the former Soviet Union.

## 2-2-1-4 Policy Regarding Construction Conditions

### (1) Building Permits

#### ① Application of Building Permits

In Mongolia, construction work can be started after obtaining building permits from the Bureau of Architectural Standards, the Architectural and Urban Planning Bureau, as well as from the Heating, Drinking Water and Sewers, Electricity, Telecommunication, Fire Fighting, and the Health and Sanitation Bureaus of both Provinces and then the Bureau of Architectural Standards of the central government. The time period necessary for the issuing of building permits is approximately four months. The schedule for the design and planning of Project facilities should be prepared with this time period in mind.

#### ② Environment Impact Assessment (EIA)

When a development project is implemented in Mongolia, the contents and the particulars of a project should be submitted to either the central government or the provincial government for examination of the project's environmental impact. However, construction of educational facilities as in our case (the Project), is not subjected to examination by the central government. Thus, the Project will basically be examined only by the Governments of both Provinces. But, if exhaust gases from newly installed boilers, or water discharge from infiltration-type septic tanks exceeds a certain level, those facilities will be assessed in detail by the central government.

a) When installing boilers, as long as the concentration of the exhaust gases does not exceed the following figures, the boiler will not be subjected to central government assessment:

SO<sub>2</sub>: 500ppm (instantaneous value), 30ppm (daily average)

NO<sub>2</sub>: 85ppm (instantaneous value), 40ppm (daily average)

From the site surveys, it was cleared that few Project schools need installation of coal burning boilers. For the ones that do, boilers should be designed to clear the above criteria in view of environmental considerations. Thus, any boilers installed by the Project will not be subject to assessment by the central government.

b) According to the standards of provincial governments, an infiltration-type septic tank and a drinking well must be separated. The area around School No. 4 (Darkhan-

Uul) is presently surrounded by housing areas or will be developed in the future. Residents in those housing area use a drinking well, so infiltration-type septic tanks could not be installed with enough distance as stipulated in the "Standards", so a sewage water tank should be installed and sewage water will be transferred to sewage treatment plants in both the Provinces. Thus, the Project is not subjected to the central government's assessment.

### ③ Construction Materials

Only a small number of construction materials are produced locally in Mongolia. Most construction materials are foreign products. Locally available materials are limited to aggregates, reinforcing bars, pre-cast concrete products, furniture and wood. Those locally available materials should be used for the Project as much as possible. The construction methods of the former Soviet Union (such as pre-cast concrete floor slabs) have been widely used in Mongolia for the following reasons:

- (1) Demand for concrete is very high in the summer season, and supply often cannot catch up with demand. Thus, pre-cast concrete products that can be manufactured in the winter are frequently used in order to reduce the volume of concrete pouring in the summer;
- (2) Exterior and structure work cannot be done in the winter. Thus the excavation and structural work must be done during the time between spring, when the frozen soil melts, and winter, which begins in October. The period for doing the structure work is short, so it is necessary to reduce the amount of work at the sites by using pre-made factory products;
- (3) Demand for pre-cast concrete (PC) panels is also high in the summer season and supply often cannot meet demand, because of the limited capacity of the PC factories. To avoid this risk, it is highly recommended to have the tender and the signing of the contract as early as possible so that the contractor can order and produce the PC panels during the wintertime when the demand is relatively low.

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

### (1) Local Consultants

It takes a great deal of time to obtain building permits in Mongolia. So, the building permits for construction of the Project should be obtained without delay. The

Mongolian side is responsible for obtaining the building permits of the Project. However, the Project design to submit for examination are needed to apply for the permits, and that is the responsibility of the Japanese side. Thus, the Japanese side must have careful discussions with the concerned officials of the Bureau of Architectural Standards. For this reason, the Study Team would like to utilize local consultants who are recognized by the Bureau.

## (2) Local Subcontractors

It seems that no problems will be encountered for utilizing several subcontractors in Darkhan-Uul and Orkhon Provinces for Project construction. As Project sites are scattered over wide areas outside of and within city limits, careful construction supervision is necessary at each site to keep the construction quality at a certain level.

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

Since decentralization is advanced in Mongolia, both Provinces shall be responsible for the operation and maintenance of buildings constructed by the Project. General directions and budgets for operation and maintenance have been distributed to each school by the provincial governments. Each school has a 'Steering Committee for School Maintenance' and is organized by the parents, and neighbors with a head teacher in charge. The committee does the fund-raising and arranges for any repair works to the buildings and equipment. However, regular expenses like teachers salaries and heating cost are arranged by head teacher(s).

Almost all of a provincial educational budget goes to teachers' salaries and heating cost, with the small remaining amount being used for maintenance. Thus, appropriate maintenance cannot be carried out as it should. And so, to be as free from maintenance as possible after completion of the Project, the followings shall be considered carefully in the designs and plans:

- Construction methods for cold winter climates;
- Selection of finishing materials with long durability;
- Selection of material which do not get dirty easily and is easy to clean;
- Preparation of an 'operation and maintenance manual' for mechanical and electrical equipment.



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

Based on Project concepts for assisting in construction of classrooms and/or other buildings as Japan's Grant Aid Cooperation, the grade or quality of the Project facilities and equipment should follow those of Stage 1 of the Project which are based on the minimum necessary level. The Project equipment should be based on the accepted, nation-wide curriculum standard in Mongolia

## 2-2-1-8 Policy Regarding Construction Schedules

### (1) Construction Schedule

Because the Project area is located in a cold region, the ground freezes in the winter season, so excavation work is extremely inefficient from an economical viewpoint. So, the beginning of excavation work should begin in early April. However, the signing of the contract should be done as early as possible in order to produce PC panels in the wintertime. It is desirable that all exterior work and heating facility installations are completed before November (prior to the cold winter), so that interior work can be carried out thereafter. All preparation work should begin in March so that excavation work can begin in the end of March; also, building structures should be completed by September. As it takes approximately four months to obtain building permits, it is necessary to complete the detailed design preparations and apply for the building permits by the end of September.

### (2) Construction Stages

The Project plan is to construct buildings for ten schools, of which three schools are in Darkhan-Uul Province and three are in Orkhon Province. Each school will be get from 4 to 21 classrooms. The total floor area will be approximately 8,800 m<sup>2</sup>. Even though the two construction areas are separated from each other, judging from the construction capability of the subcontractor in each Province, it is possible to complete construction work at all sites within one year.

## 2-2-2 Basic Plan

### 2-2-2-1 Building Plan

#### (1) Architectural Plan

##### ① Architectural Standards for Educational Facilities

The Bureau of Architectural Standards set up certain the "Standards" in 1990, and will check the plan that is submitted for construction permits according to the "Standards". Designs of the Project facilities will be prepared to meet the Standards as much as possible. However, if there are some items that do not agree with the "Standards", or if requests made by MOSTEC contradict the "Standards", those matters should be discussed with the appropriate officials of the Bureau of Architectural Standards and, if necessary, prior approval should be obtained. Any such items should be double-confirmed in the submitting of documents for the construction permits. The list in Table 2-5 shows the applicability of items in the "Standards" related to the Project.

##### ② Layout Plan

Mongolia is situated at high latitudes, so daylight hours during the winter are very short. In general principle, classrooms should be arranged facing south to get the best exposure to sunlight. But, depending on the shape of the school site or a pre-existing infrastructure location, or if classrooms cannot be arranged facing south, they should be arranged facing east so that they can receive the morning sunlight.

New school buildings will be laid out with enough space between them and any other existing buildings. In case a site has size limitations or an odd shape which make enough distance between buildings impractical or impossible, the arrangement of said building should be decided on only after discussions with officials of the Bureau of Architectural Standards. The distance between roads and new school buildings should be more than 10m.

Table 2-5 Architectural Standards for Educational Facilities

Items		National Standards for Educational Facilities	This Project	Remarks
<Layout Plan>		Locate as far as possible from the north or south side of existing buildings	Locate as far as possible from the north or south side of existing buildings	Discussing with the Architectural Bureau if building site is limited or if existing building is odd shape
Spacing between new and existing buildings				
Classroom	No. of classroom per school	33	No Limit	MOSTEC's request
	Air volume per students	More than ?	4.68 m <sup>3</sup>	Floor area per students × ceiling height
	Limit No. of students in a classroom	First Grade: 30 2nd to 9th Grade: 35	36	Flexible use may be possible if the special limit is not applied to first grade because a class arrangement is made every year
	Floor area per a student	First Grade: 2.0 2nd to 9th Grade: 1.5	1.56	
Corridor width (m)		2.2	Usable width 2.5	Column span = 3m
Teachers' room ( ? )		No. of teachers × 2.5	No. of teachers × 2.5	Refer to other table
Cloak area ( ? )		No. of students × 1.5	Coat hooks for all students	Refer to other table
Entrance hall ( ? )		No. of students × 1.0	No. of students × 1.0	Refer to other table
<Section Plan>		Urban areas having more than 200,000 population: 4 Other areas: 3 or less	Less than 3 stories	
Stories				
Story height		3.3m	3.3m	
Window height		As high as possible	As high as possible	To be discussed with the Bureau
<Facility Plan>		Female: 1 per 30 students Male: 1 per 40 students	Female: 1 per 30 students Male (bowls): 1 per 60 Male (urinal): 1 per 40	The ratio of toilet bowls to urinals is not specified. Use the same ratio as the Phase 1 of the Project
Toilets	No. of Toilets			
	No. of washbowls	1 per 30 students	1 per 30 students	
Washbowl		Supply cold and hot water	Supply cold and hot water	
Light	Classroom	300 Lux	300 Lux	
	Teachers' room	200 Lux	200 Lux	
	Corridor & Toilets	75 Lux	100 Lux	

### ③ Floor Plan

While the basic layout plan of arranging classrooms in a straight line was decided on from Phase I of the Project, the floor dimensions of classrooms were changed to 7.5m×7.5m (from 6m ×9m in Phase I of the Project). The area and specifications of other rooms are compatible to the "Standards". As the prevailing winds in Mongolia are from a northeastern direction, toilets are to be arranged on the east side of school buildings so that toilet odor does not enter into the classrooms.

Barrier-free facilities (for the handicapped) will be introduced in School No.7

(Orkhon province) which has special classrooms for the handicapped, according to a request from MOSTEC. A ramp (for wheelchairs, the handicapped) will be arranged at the main entrance, and other barrier-free areas will be introduced in the entrance hall, corridors, and classrooms on the ground floor. Teachers' toilets will also be fitted for use by the handicapped.

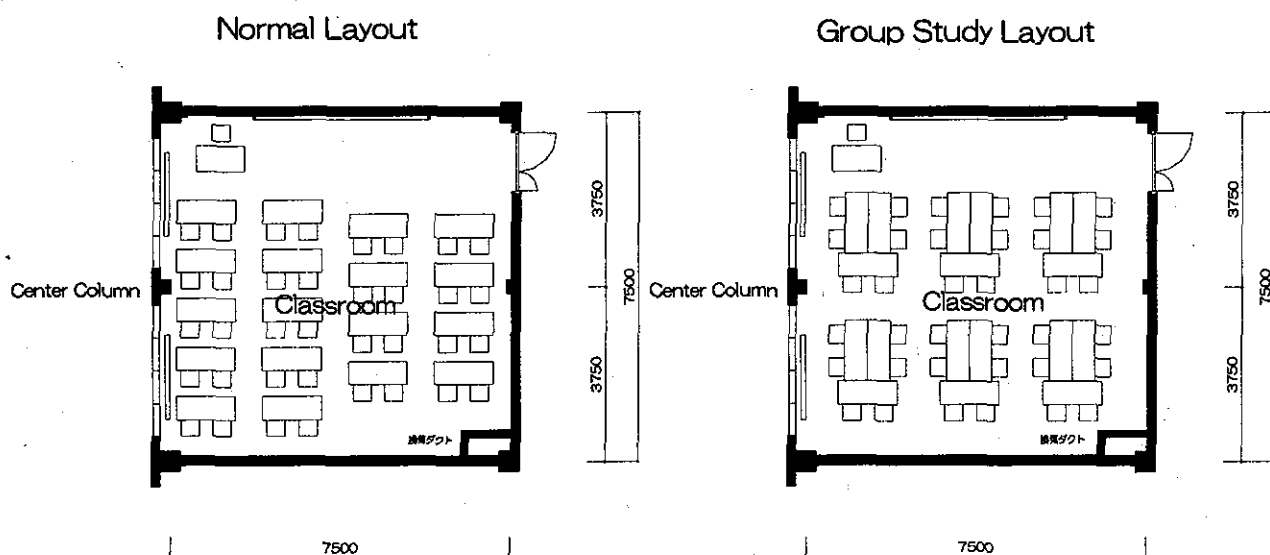
a) Classroom

Phase I of the Project adopted a rectangular-shaped classrooms with dimensions of 6m×9m (the standard of the former Soviet Union). But after discussions with MOSTEC, it was decided to adopt a square-shaped classroom with dimensions of 7.5m×7.5m for the Project. The following merits can be regarded as reasons for the adoption:

- Students seated to the rear part of the classroom will have a better view of the blackboard
- Construction costs will be minimized because the corridor length is shorter than that found in Phase I of the Project
- Heating costs will be cheaper because the total area of the exterior walls is smaller, although the floor area is the same as in Phase I of the Project

Another additional column will be designed in the middle of the span of the corner columns to reduce the distance of column span and the height of the beam. In this way, all the windows will be able to be designed higher in the same floor height as in Phase I of the Project. The outside windows will be made of aluminum and the inside windows will be made of steel with plastic cover, so that not to develop water condensation (Figure 2-2).

Figure 2-2 Standard Classroom Floor Plan



#### b) Teachers' Room

Teachers' room will be planned in the school building(s) so that teachers can hold the meetings, do class preparation, and store basic teaching equipment and supplies. Taken it into account that the number of non-class teachers was approximately estimated as half of the number of class teachers, the number of teachers at each school building was assumed to be 1.5 times of the number of classrooms. According to the "Standards", the floor space per teacher should be 2.5 m<sup>2</sup>. By following this rule, different types of teachers' room could be planned according to the size of the school buildings.

#### c) Toilets

Although western style toilets are utilized and maintained well at Project schools in Phase I of the Project, the Project areas in Phase 2 are located in rural areas, so children may not be familiar with those toilets. Thus, squat style toilets (Asian style toilets) will be installed.

The estimation of the number of toilet bowls should be based on the "Standards". The rules specify installing one toilet bowl per every 30 or less female students, one toilet bowl per every 40 or less male students, and one washbowl per every 30 or less students. However, the "Standard" do not specify the number of urinals for male students. So, it was decided to install one urinal per every 40 male students and one

toilet bowl per every 60 male students, the same as in Phase I of the Project.

Four types of toilet arrangements were planned, and one or two of them will be installed at each Project school. As more than half of all teachers are female, one or two toilets for the teachers will be installed based on the number of teachers at each school as stipulated in Phase I of the Project. Toilets for teachers will be western style.

#### d) Corridor

Due to the severe cold of the winter, people tend not to go outside almost all day. Similarly, during recess, when temperatures drop to minus 30, children generally stay inside the classroom. Thus, school corridors are regarded as spaces not only for walking through, but also for activities like relaxing and doing light exercises. They will be designed as spaces where students can just sit and be comfortable for a certain time period. Some schools in both Provinces have corridors 6m wide which serve multi-purpose uses. For these reasons, and in line with the guidelines in Phase I of the Project, the width of the Project school corridors is set at 3m by the pillar/column span, with a usable width of 2.5m.

#### e) Entrances Hall

A main entrance will be installed at one end of each school building, and a second entrance at the other end. To prevent cold air from entering the building and to keep warm air from escaping from the building during the cold winters, an anteroom of sufficient size and volume will be installed. In addition, exterior and interior doors will be staggered. When students arrive at school and go home, the entrance hall in front of the cloakroom becomes congested. Thus, it will have sufficient space.

#### f) Cloakroom

In the winter, students come to school wearing heavy coats, arctic boots, caps, gloves, and mufflers. If they bring these items into their classrooms, an extremely large wall space would be needed to hang them, and personal belongings or class items might become lost among those clothing items. Thus, the "Standards" specify the installation of a cloakroom in school buildings.

Although the "Standards" specify installing a cloakroom of 0.15 m<sup>2</sup> per student, the amount of space designed at each Project school building is slightly smaller than that figure (Table 2-6). But, as shown in Figure 2-3, it is possible to arrange coat hooks for students to hang their winter wear. It is deemed that the designed space is sufficient.

Figure 2-3 Cloakroom Types and Coat Hook Arrangement

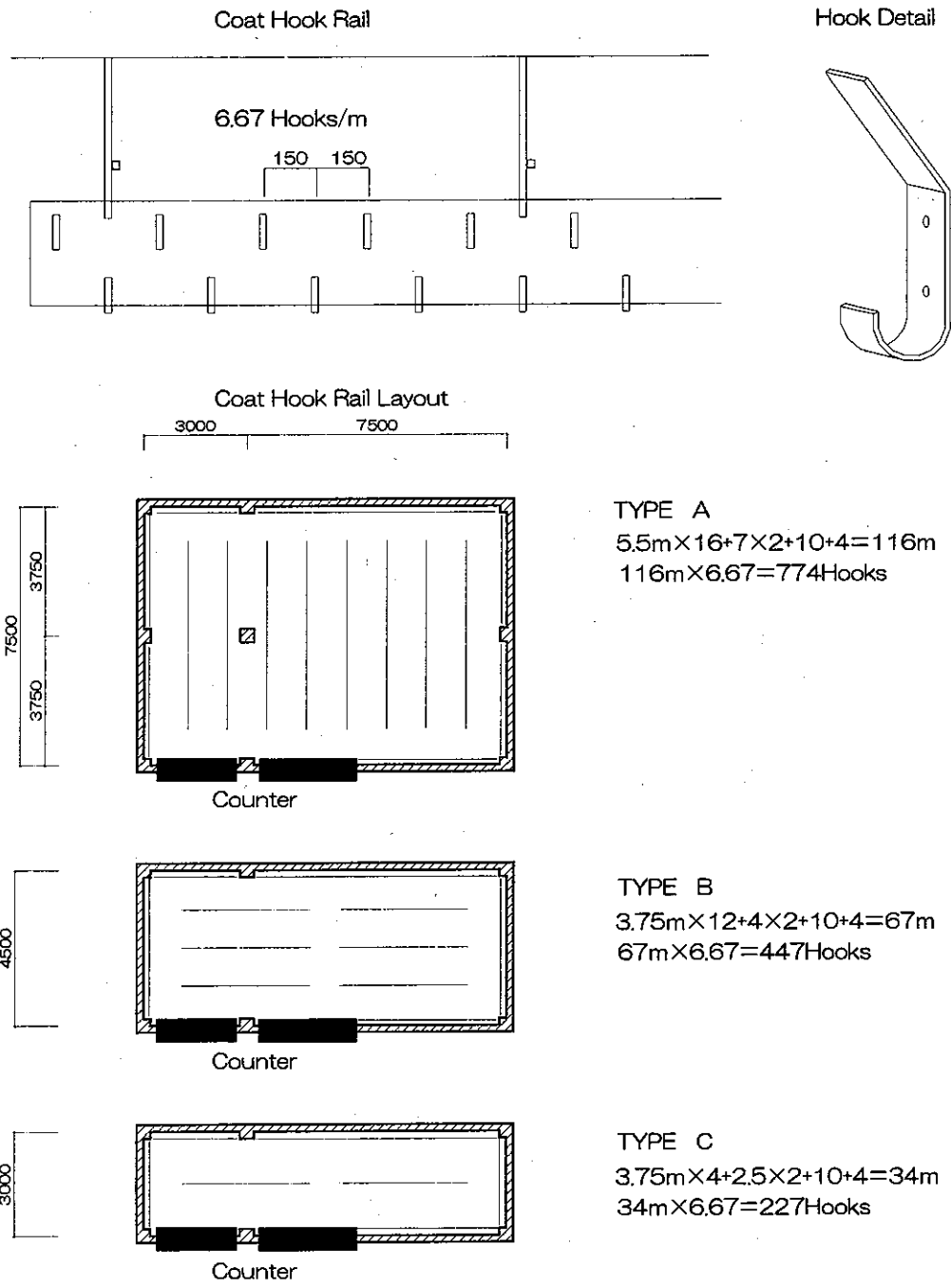


Table 2-6 Cloakroom in Each Project School

School	D-4	D-11	D-od	O-2	O-6	O-7
Number of Students	756	288	324	144	216	324
Required Space (m <sup>2</sup> )	114	44	49	22	33	49
Designed Space (m <sup>2</sup> )	<u>78</u>	47	<u>47</u>	31	<u>31</u>	<u>47</u>

Area of all rooms mentioned above can be referred in Table 2-7.

Table 2-7 Facilities for Each School

School		Darkhan-Uul			Orkhon			Total
		D-4	D-11	D-od	O-2	O-6	O-7	
Building Stories		3	3	3	2	2	3	
Floor area (except basement) (m <sup>2</sup> )		2,765.32	1,510.86	1,392.44	726.65	962.89	1,425.35	8,783.51
Number of Classrooms		21	9	8	4	6	9	57
Teachers' room	Area (m <sup>2</sup> )	56.25	45.00	45.00	33.75	33.75	45.00	
Cloakroom	Area (m <sup>2</sup> )	78.75	47.25	47.25	31.5	31.5	47.25	
	Number of coat hooks	773	446	446	226	226	446	2,563
Toilet	Area (m <sup>2</sup> )	92.70	68.40	68.40	39.15	39.15	68.40	
	Number	2	2	2	1	1	2	10
Drinking faucet	Number	2	1	1	1	1	1	7
Water Tank		○	-	-	-	-	-	1
Sewage Tank		○	-	-	-	-	-	1
Boiler		-	○	-	-	-	-	1

#### ④ Sections Designs

##### (a) Setting the Numbers of Floors

In winter, the ground surface freezes down to 3m, and volume increases thereby effectively "lifting" up buildings (this phenomenon is called frost heaving). For this reason, the bottom of building foundations should be at least as deep as the 3m level. From the point of view of keeping construction costs to a minimum, the ratio of the total floor area to the dead space should be as small as possible.

However, the "Standards" stipulate that school buildings must be three-storied or less in an area having a population of less than 200,000 people. In addition, there is a limit to the number of stories to a building from the viewpoint of the construction schedule that may be largely influenced by the cold winter. For these reasons, the Project's school buildings will basically be three-storied except for small schools that



need only a small number of classrooms. Those small schools will have two-storied buildings.

(b) Insulation Design

In Mongolia, every part of a school building, such as the roof, exterior walls, floors, openings, etc., must have a heat transmission coefficient of less than 0.4 that is specified by the Bureau of Heating. If this rule is not met, the Bureau of Heating will suspend the public heating supply. The Project school buildings should maintain the set value by following this rule. To avoid heat bridges (building portions having a large heat transfer rate) where insulation material cannot be placed, outside insulation should be provided. Figure 4 shows the detailed design of the roofs, exterior walls and floors of the Project schools. These portions are designed to have the heat transmission coefficient smaller than 0.4. The doors and windows of the school buildings will be "double-doors" and "double-windows" that are "double-sealed" with air between the front and back surfaces for better insulation capability.

(c) Review of the building level for Darkhan No.4 school

In Mongolia, generally, the underground water rises in the summertime when it rains a lot and it goes down by a few meters in the wintertime when it seldom rains. However in the site of Darkhan No.4 school, it has been observed through several measurements after the Basic Design Study until now that the water table is continuously high throughout the entire year. Therefore it became necessary to review the building level to prevent the water from coming out during the construction. The measurements of the water table are as follows:

Basic Design	August, 2001	-1.5m
Detailed Design	September, 2003	-1.0m
Voluntary Survey 1	February, 2004	-1.2m
Voluntary Survey 2	December, 2004	-1.5m
Implementation Review	February, 2005	-1.5 m to -2.0m

Thus, the water table stays between -1.0m to -2.0m and, according to the interview of the neighbors, the water never exceeds the -1.0m level. Therefore, the construction will not be affected by the underground water if the bottom of the foundation is set as -1.0m by raising the building level. And since the soil is slightly softer at the level of the foundation bottom after the building is raised, the designed bearing capacity of the foundation should be changed from 35t/m<sup>2</sup> to 20t/m<sup>2</sup>.

## (2) Structure design

As Mongolia has the following the "Standards", the structures of the Project school buildings will be designed based on the below standards. Also, Japan Industrial Standards (JIS) of reinforce steel bars is available in Mongolia, so structure design of reinforce steel bar will follow the JIS standard.

From the results of the hole boring surveys and loading tests, the site investigation report shows that there is sand from ground surface down to 4 or 5 meter depth, and loam at depths of more than 5 meter in the stratum of School No. 4, 11, Od3 (Darkhan Uul). The load bearing capacity is from 10 to 15 ton/m<sup>2</sup> at the 1.5m depth. The report also shows that there is loam from the ground surface down to 4 or 5 meter depth, and lock in depth more than 5 meter in the stratum of School No. 2 (Orkhon).

### ① Standards for Earthquakes

The seismic scales of the Provinces are as shown in Table 2-8. The preparation of structure designs will be based on these figures.

Table 2-8 Seismic Intensity Scales in Both Provinces

	Darkhan-Uul	Orkhon
MSK Seismic Scale	7	7
JMA Seismic Scale	4-5	5
Max. Acceleration (Gal)	Approx. 80	Approx. 150

Note: JMA : Japan Metrological Agency

### ② Standards for Wind Forces and Snow Loads

The standards for wind forces and snow loads are established in both Provinces as follows:

Wind forces, first zone: 27kg/m<sup>2</sup>

Snow load, first zone: 70kg/m<sup>2</sup>

### ③ Standards for Live loads

The standards of the former Soviet Union (used in Mongolia) are as follows:

Classroom floor: 200kg/m<sup>2</sup>

Corridor floor: 300kg/m<sup>2</sup>

### ④ Structure of Foundations

The structure of foundations will be the independent footing type. The bottom of

the foundations will be placed more than 3m deep from the ground surface. The exact depth of the foundations will be decided in accordance with the soil survey results.

#### ⑤ Structure

In order that the construction period be as short as possible, building floors, lintels, window sills, parapet copings, and stairs will be of pre-cast concrete as much as possible so as not to push up the demand for ready-mixed concrete in the summer when supplies are limited. Expansion joints will be provided to prevent cracking on building surfaces which exceed lengths of 40 m.

#### (3) Mechanical and Electrical Plan

Darkhan-Uul Province and Orkhon Province are relatively new developed industrial regions where urban infrastructure is well developed. However, in the Gel residential areas, installation of infrastructure has not yet caught up with the dramatic increases in population. Approximately one half of the Project schools, particularly the new schools, are located in the Gel residential areas. Based on the results of the site survey relating to water supplies, sewers, heating sources, and hot water, the following measures were planned for each facility type.

#### ① Water Supply Facility

In an area where city water is available, pipes will be tapped into the existing supply main and brought to the school site. The pressure of the city water is 5kg/cm<sup>2</sup>. Thus, there is no need to increase the water pressure by installing an elevated tank or a booster pump. However, at School No.4 (Darkhan-Uul), no city water supply is available. Water receiving tanks will be built in underground pits. Water to these receiving tanks will be supplied either by water wagons or from wells which the Mongolian side will provide. The water receiving tanks will be located in underground pits to prevent freezing.

#### ② Sewage System

For the Project schools having a public sewage system, sewer pipes will be connected to the public sewer main. For School No.4 (Darkhan-Uul) that does not have access to the city public sewer system, sewage tanks will be installed. The sewage should be transported to a Provincial sewage treatment plant by vacuum vehicles provided by the provincial offices. Rainwater should be allowed to filter naturally into the ground.

### ③ Hot Water Supply System

If a public hot water supply system is usable, a hot water pipe should be connected to the supply main. If a public hot water supply is not available, building water should be supplied through a heat exchange unit.

### ④ Sanitary Facility

The squat style (Asian style) toilet bowls will be installed for students and western style toilet bowls for teachers. Urinals will be installed in male toilets in accordance with Phase I of the Project. The number of toilet bowls and sinks/washbowls will be as stipulated in the "Standards". In addition to this, MOSTEC requested additional sinks/washbowls in such other rooms as science experiment class and handicraft class as well as in the toilet facilities. The number of sanitary facility units to be provided to each Project school is listed in Table 2-9.

Name of Item		Darkhan-Uul			Orkhon			Total
		D-4	D-11	D-od	O-2	O-6	O-7	
Teachers' Room	Teachers' Room	1	1	1	1	1	1	6
Toilets	Urinal for male	10	4	4	3	3	4	28
	Toilet bowls for males	6	2	2	2	2	2	16
	Toilet bowls for females	12	6	6	4	4	6	38
	Sink for cleaning	2	2	2	1	1	2	10
	Hand washing tap	24	12	12	8	8	12	76
	Toilet bowls for teachers (western)	2	1	1	1	1	1	7
	Washbowl for teachers	2	1	1	1	1	1	7
Drinking Fountain	Drinking water tap	4	3	3	2	2	3	17

Table 2-9 Sanitary Facility Units to be Provided to Each Project School

### ⑤ Fire Extinguishing System

For those Project schools that have a city water supply system, indoor fire hydrants together with alarm systems will be installed on each floor at 50m intervals. In the Basic Design stage, according to the specifications of the Bureau of Fire Stations, stated that thermo-detecting type fire alarms should be provided only for those Project schools that do not have a city water supply system. However in the Detailed Design

stage, because the Fire Bureau again instructed the design team to provide fire alarms for all the Project schools, we decided to follow the instruction.

In addition, emergency exit signs will be installed at every exit and at other appropriate locations on each floor of the school buildings.

#### ⑥ Heating system

In general principle, the heating system of each Project school will be connected to a public heat supply main. However, School No.11 (Darkhan-Uul) relies on the heating system of the Railroad Bureau, which is not equipped to supply any new school buildings. So, new heating boiler will be installed at this school.

In the Basic Design stage, the boiler was installed in the machine room in the basement. However, in the Detailed Design stage, since the design team was instructed by the Government Implementing Agency for Construction, Urban Development and Public Utilities to shift the boiler location from the basement to an independent building on the ground floor, the design team followed these instructions and changed the design.

#### ⑦ Ventilation System

As school buildings will be built airtight and the doors will not be opened very often in winter, the rooms will be periodically ventilated. The "Standards" stipulate the installation of a ventilation system. The intake air from outside should be heated by hot water from the heating system and delivered to each room by an air supply fan. The exhaust air from the room should be vented to the outside of the building by exhaust fans located in corridors, toilets, and the upper part of stairways.

#### ⑧ Electrical System

The power supply system in Mongolia is 3 phase, 400V, 50Hz. Electric power is delivered either through underground conduits or electrical poles. Thus, power connections to each Project school will be designed to suit the locally available supply methods. As stipulated in Phase I of the Project, the power supply system for Project schools will consist of 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.

#### ⑨ Telephone System

Considering the possibility of future increase of telephone lines, a telephone wire conduit and a wire outlet unit will be installed from the basement equipment room to the teachers' room.

#### (4) Construction Material Plans

The climate in the Project area is similar to the findings of Phase I of the Project. Thus, construction materials for the Project will be basically the same as those used in Phase I of the Project. In view of the construction customs and local technical skill, construction materials that will not require high maintenance costs should be selected for the Project.

Exterior portions, such as roofs, copings, walls, aprons and entrance steps, will be finished with plain concrete or bricks which as the structure material. Exterior finish with mortar, tiles or stone will be completely avoided because they tend to crack in the cold winter. Interior floors will be finished with terrazzo-tiles instead of long-sized polyvinyl chloride sheets that were used in Phase I of the Project. Finishing methods to be used for the Project are listed in Table 2-10.

As for interior portion, in the Basic Design stage, particle board was installed as a wall material. However, according to the 'Fire Safety Standard' issued by the Ministry of Infrastructure in 2003 it became compulsory that the interior wall must be constructed of noninflammable material. Therefore, in this Implementation Review Study we have changed the inside surface of the exterior wall from particle board to silicate calcium board.

Table 2-10 Finishing Method to be Used for the Project and Reason

Portion	Common Local Method	Adopted Method	Reason for Use
<b>Main Structure</b>			
Foundation	Reinforced concrete	Reinforced concrete	To follow local method
Column and Beam	Precast concrete or Bricks	Reinforced concrete	Better earthquake resistance
Roof and floor	Precast concrete plate	Precast concrete plate	To follow local method
Wall	Bricks or Precast concrete plate	Bricks	To follow local method
<b>Exterior Finish</b>			
Exterior wall	Bricks or Precast concrete plate	Bricks	To follow local method
Roof	Asphalt sheets with anti dew treatment	Asphalt sheets plus waterproof concrete	Better durability
Outside window	Paint finish on wood	Aluminum sash	Easy maintenance
Inside window	Paint finish on wood	Plastic sash	Easy maintenance
<b>Interior Finish</b>			
Building floor	Long-size polyvinyl chloride sheets, wood, or in-situ polished terrazzo	Terrazzo tiles	Easy installation work and better durability
Toilet floor	Ceramic tiles	Ceramic tiles	To follow local method
Baseboard	Wood	Terrazzo tiles	Better durability
Inside surface of exterior wall	Paint finish on plaster	Silicate Calcium Board EP for h > 2000 VE for h < 2000	Better insulation capability. Anti-foul paint on lower portion.
Interior wall (partition)	Paint finish on plaster	Trowel finish of mortar: EP for h > 2000 VE for h < 2000	To follow local method.  Anti-foul paint on lower portion.
Ceiling	Paint finish on plaster	Paint finish on plaster	To follow local method.
Classroom door	Paint finish on wood	Paint finish on wood	To follow local method.

## 2-2-2-2 Equipment Plan

### (1) Furniture and Equipment

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

#### ① Desk and Chairs for Students

18 desks (2 students to 1 desk type) and 36 chairs will be installed in each classroom. They will be of two different sized desks and chairs, half of them large and the other half small, in accordance with Phase I of the Project.

#### 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 Desk and Chairs in the Teachers' Room

The number of part-time, special class or substitute teachers is assumed to be the equivalent of one half the number of classrooms (0.5 times the number of classrooms). Thus, total number of teachers is 1.5 times the number of class teachers. The number of chairs equivalent to this figure will also be provided to each Project school.

#### ④ Conference Table for Teachers

Depending on the number of teachers which is estimated in ③ above, 2 or 4 conference tables will be provided.

#### ⑤ Storage Cabinet for Teaching Materials

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

#### ⑥ Blackboard and Bulletin Board

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

### (2) Educational Equipment

The Educational Equipment and Furniture shown in Table 2-11 are the same as those selected in the Basic Design of the Project.



Table 2-11 List of Basic Educational Equipment

	Item	Subject	Target Grade	Number
1	Geographic map of Mongolia	Social Science	1-8	1/CR
2	Political and Administrative Map of Mongolia	Social Science	5-8	1/2CR
3	Map of Mineral Resources of Mongolia	Social Science	5-8	1/2CR
4	Botanical Map of Mongolia	Life Science	1-4	1/2CR
5	Zoological Map of Mongolia	Life Science	1-4	1/2CR
6	World Geographic Map	Social Science	5-8	1/2CR
7	World Political and Administrative Map	Social Science	5-8	1/2CR
8	Diagram of Chemical Element Cycle	Science	7,8	1/4CR
9	Diagram of Physical Measuring Unit	Science	7,8	1/4CR
10	Human Body Chart	Science	6-8	1/8CR
11	Mongolian Alphabet Chart	National Language	1-4	1/2CR
12	Wall Thermometer	Life Science, Science	1-4	1/2CR
13	Azimuth Compass	Life Science, Science	1-4	1/2CR
14	Tape Measure	Life Science, Mathematics	1-4	1/2CR
15	Geometric Block Models	Mathematics	1-4	1set/2CR
16	Abacus	Mathematics	1-4	1/2CR
17	T-Square	Mathematics	1-8	1/CR
18	Scales	Mathematics	1-8	1set/CR
19	Multiplication Tables for Primary Education	Mathematics	1-4	1/2CR
20	Political and Administrative Map of Mongolia	All Subjects	1-8	1 set/ school

CR=Classroom

### (3) Facility Maintenance Equipment

In accordance with Phase I of the Project, manual-use tools such as pliers, hammers, screwdrivers, electrical testers, saws, files, tape measures, and shovels, will be provided in the Project, so that teachers and students' parents can repair and maintain the school facilities. However, cleaning equipment for daily use such as brooms, dustpans, buckets, deck brushes, rubber hoses, and rakes, will not be provided by the Project.

### (4) List of Furniture and Equipment to be Provided

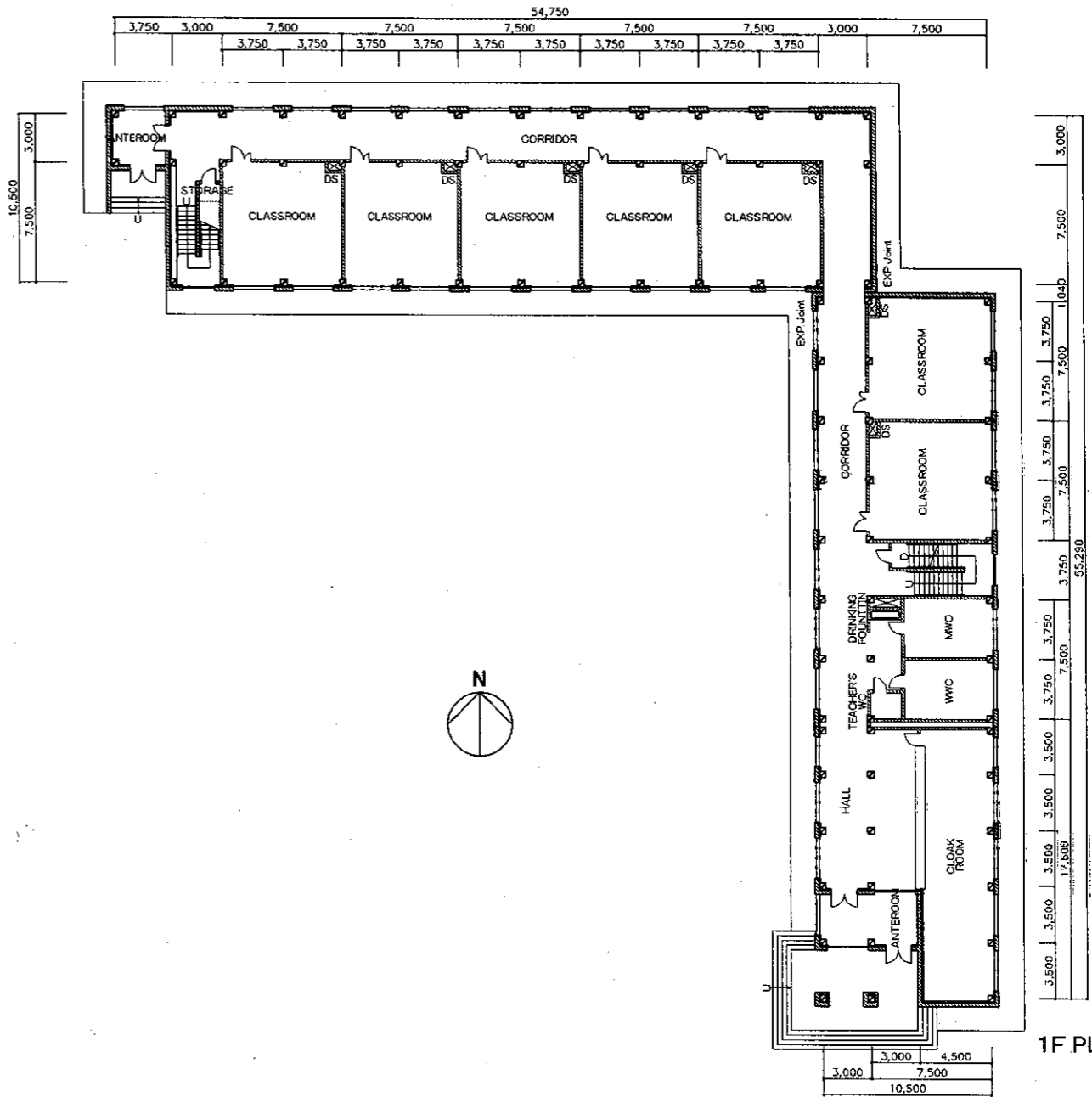
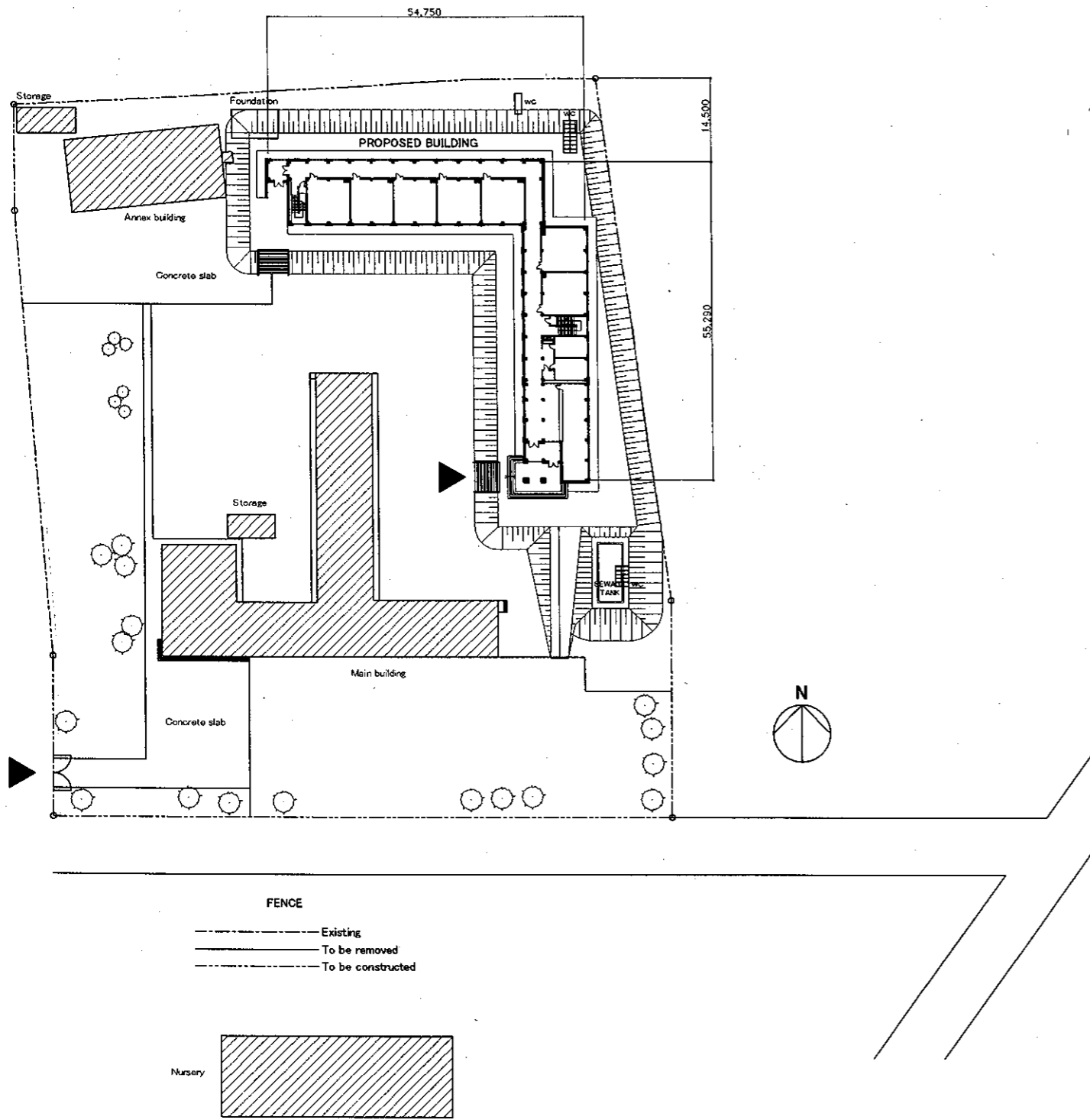
The furniture and equipment units are listed in Table 2-12.

Table 2-12 List of Furniture and Equipment Units to be provided by the Project

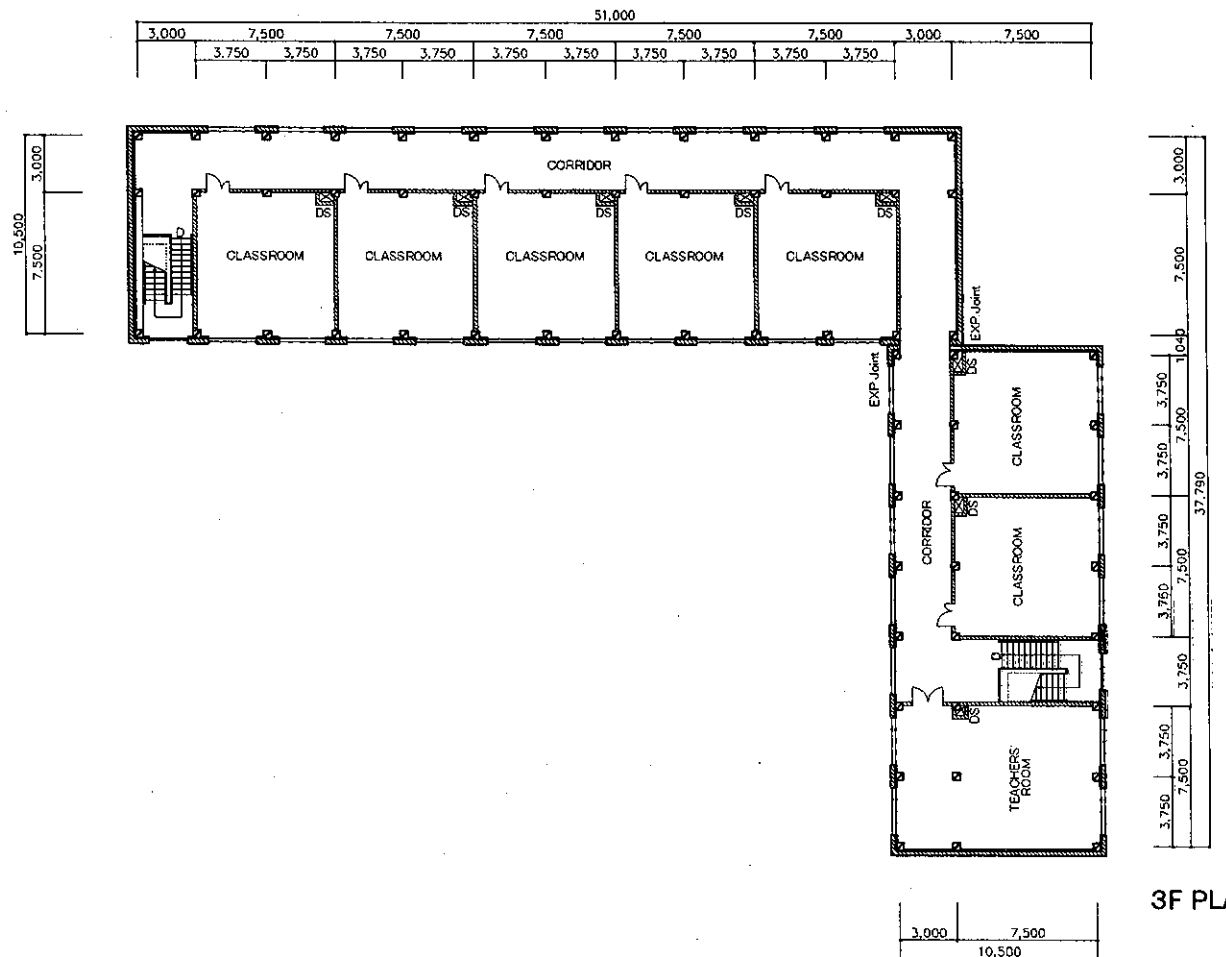
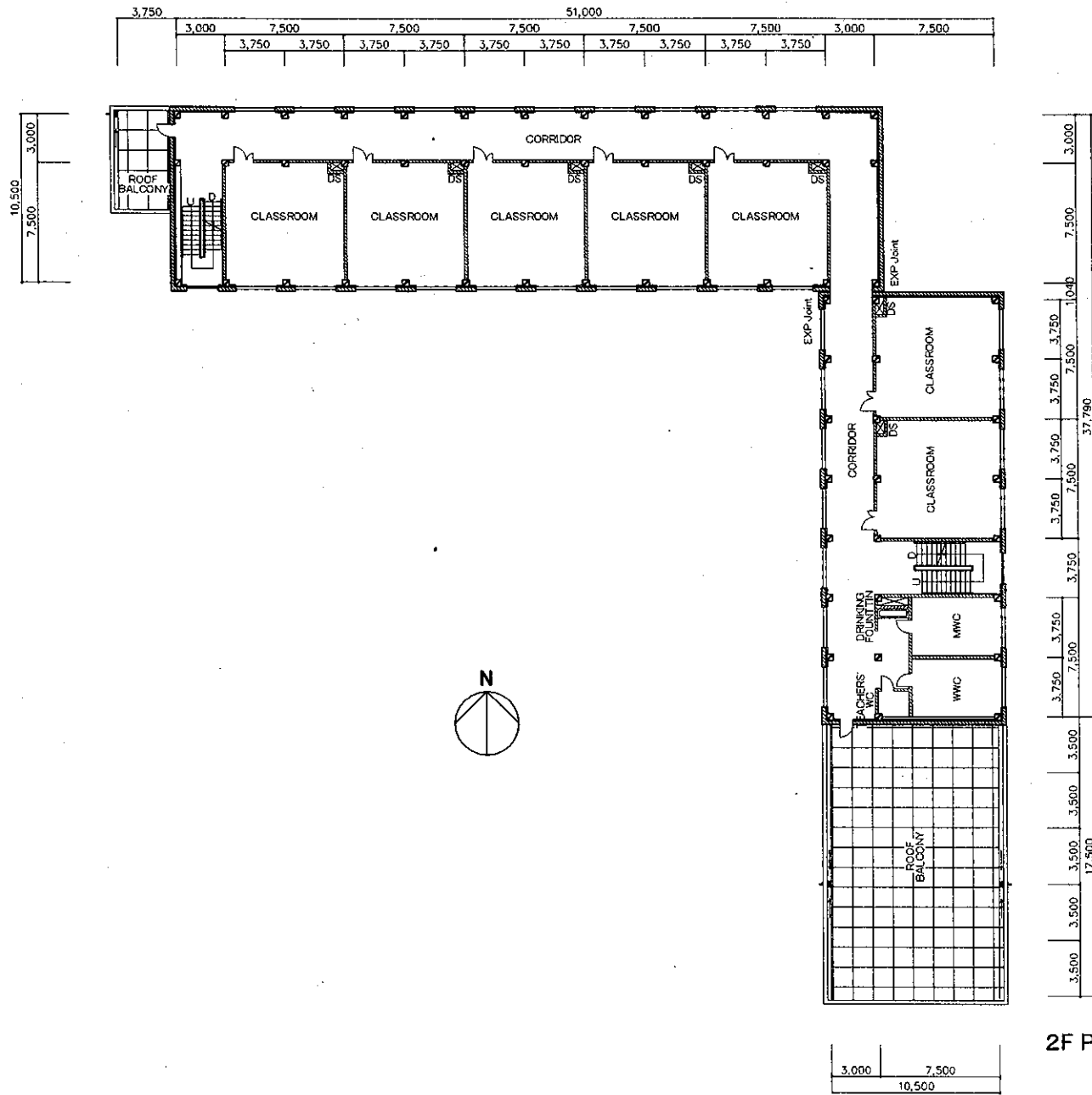
		Darkhan-Uul			Orkhon			total
		D-4	D-11	D-od	O-2	O-6	O-7	
		Darkhan-Uul			Orkhon			TOTAL
		D-4	D-11	D-od	O-2	O-6	O-7	
<b>Furniture</b>								
Classroom	Teacher's Desk	21	9	8	4	6	9	57
	Teacher's Chair	21	9	8	4	6	9	57
	Student's 2seater desk (large)	180	72	72	36	54	72	486
	Student's 1seater desk (large)	360	144	144	72	108	144	972
	Student's 2seater desk (small)	198	90	72	36	54	90	540
	Student's 1seater desk (small)	396	180	144	72	108	180	1080
	Blackboard	21	9	8	4	6	9	57
Bulletin board	21	9	8	4	6	9	57	
Teacher's room	Meeting table	4	3	3	2	2	3	17
	Chair	24	14	14	8	8	14	82
	Cabinet	9	4	4	2	2	4	25
<b>Basic Educational Equipment</b>								
1	Geographic Map of Mongolia	21	9	8	4	6	9	57
2	Political and Administrative Map of Mongolia	11	5	4	2	3	5	30
3	Map of Mineral Resources of Mongolia	11	5	4	2	3	5	30
4	Botanical Map of Mongolia	11	5	4	2	3	5	30
5	Zoological Map of Mongolia	11	5	4	2	3	5	30
6	World Geographic map	11	5	4	2	3	5	30
7	The World Political and Administrative Map	11	5	4	2	3	5	30
8	Diagram of Chemical Element Cycle	6	3	2	1	2	3	17
9	Diagram of Physical Measuring Unit	6	3	2	1	2	3	17
10	Human Body Chart	8	4	3	2	3	4	24
11	Mongolian Alphabet Card	11	5	4	2	3	5	30
12	Wall Thermometer	11	5	4	2	3	5	30
13	Azimuth Compass	11	5	4	2	3	5	30
14	Tape measure	11	5	4	2	3	5	30
15	Geometric Block Models	11	5	4	2	3	5	30
16	Abacus	11	5	4	2	3	5	30
17	T-square	21	9	8	4	6	9	57
18	Scales	21	9	8	4	6	9	57
19	Multiplication Table	11	5	4	2	3	5	30
20	OHP(Over Head Projector)	1	1	1	1	1	1	6
21	Maintenance Tool Set	1	1	1	1	1	1	6

### 2-2-3 Basic Design Drawings

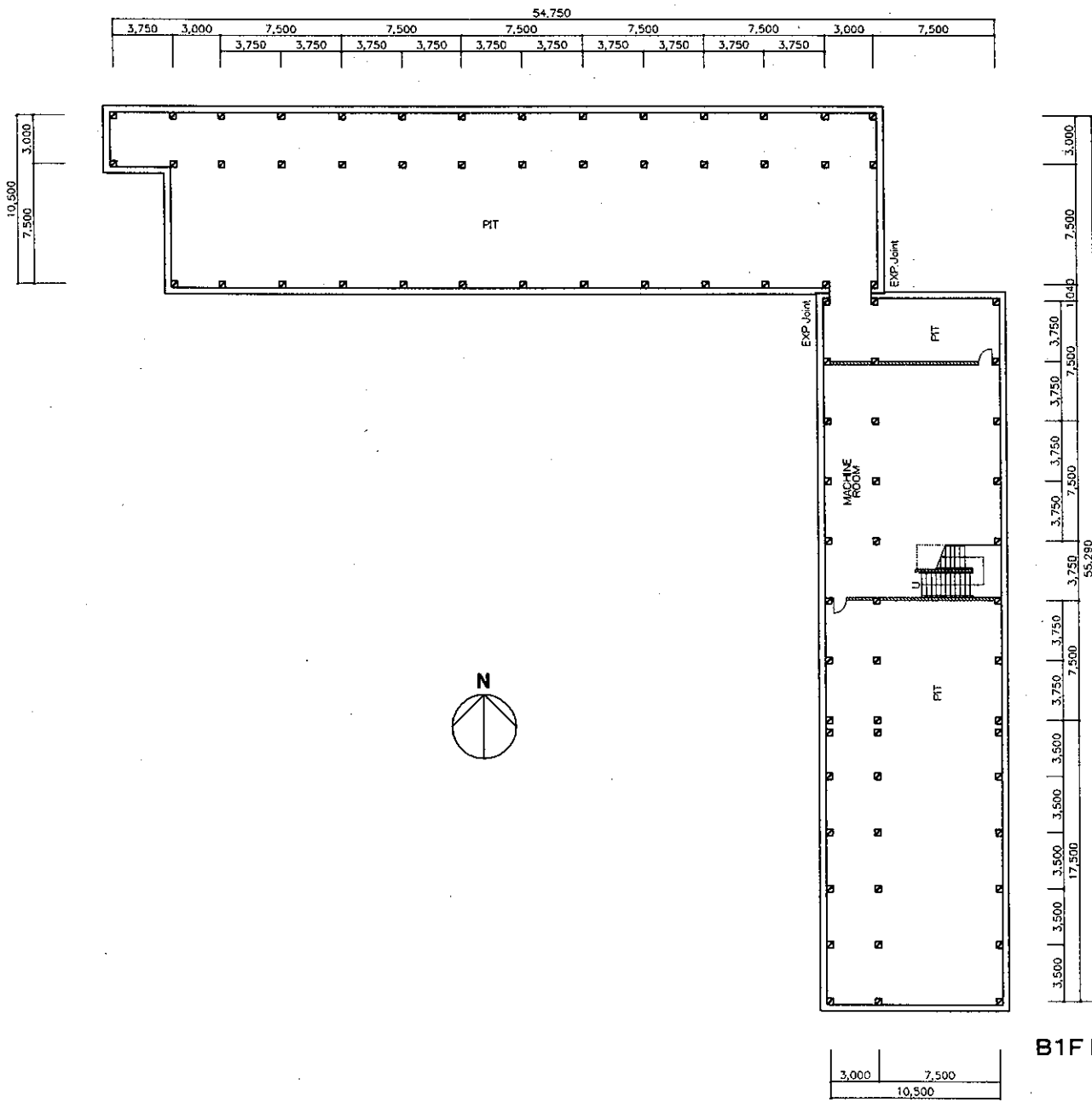
The basic design drawings prepared for the Project are as attached hereafter.



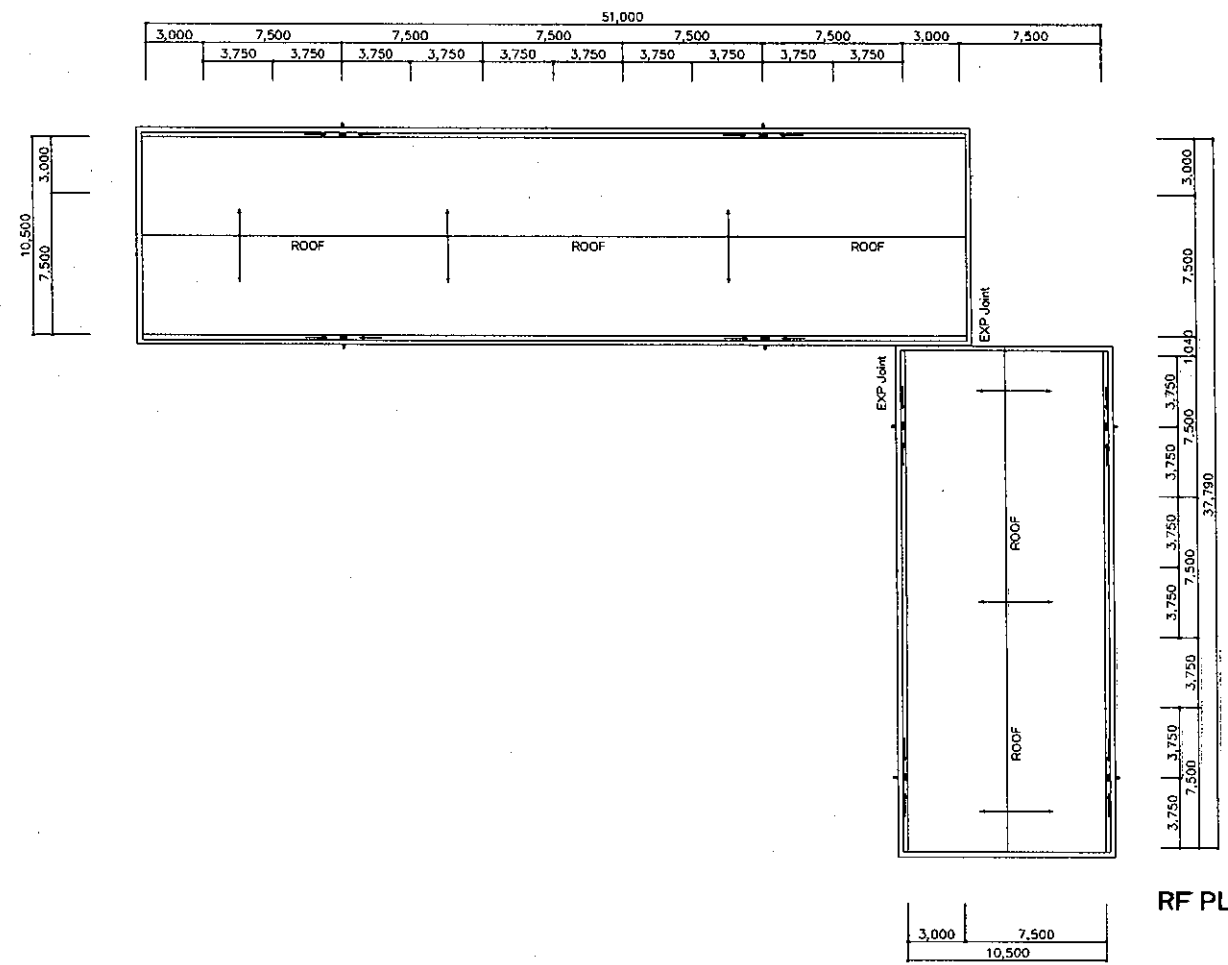
<p>THE PROJECT FOR IMPROVEMENT OF PRIMARY EDUCATION FACILITIES IN MONGOLIA (PHASE II-2/2)</p>	<p>CLIENT</p>	<p>DARKHAN-UUL NO.4 SCHOOL PLOT PLAN, 1F PLAN</p>	<p>NUMBER OF SHEET</p> <p>SCALE</p>
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	<p>THE PROJECT FOR IMPROVEMENT OF PRIMARY EDUCATION FACILITIES IN MONGOLIA (PHASE II-2/2)</p>	<p>CLIENT</p>	<p>DARKHAN-UUL NO.4 SCHOOL 2F/3F PLAN</p>	<p>NUMBER OF SHEET</p> <p>SCALE</p>
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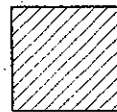
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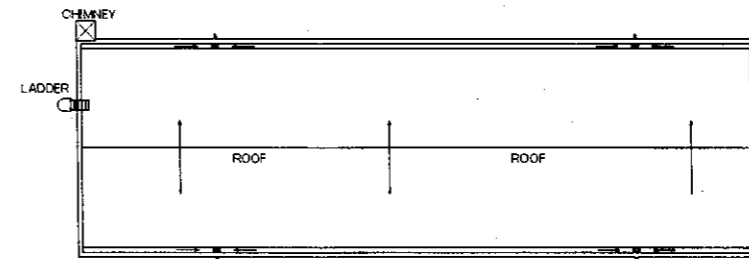
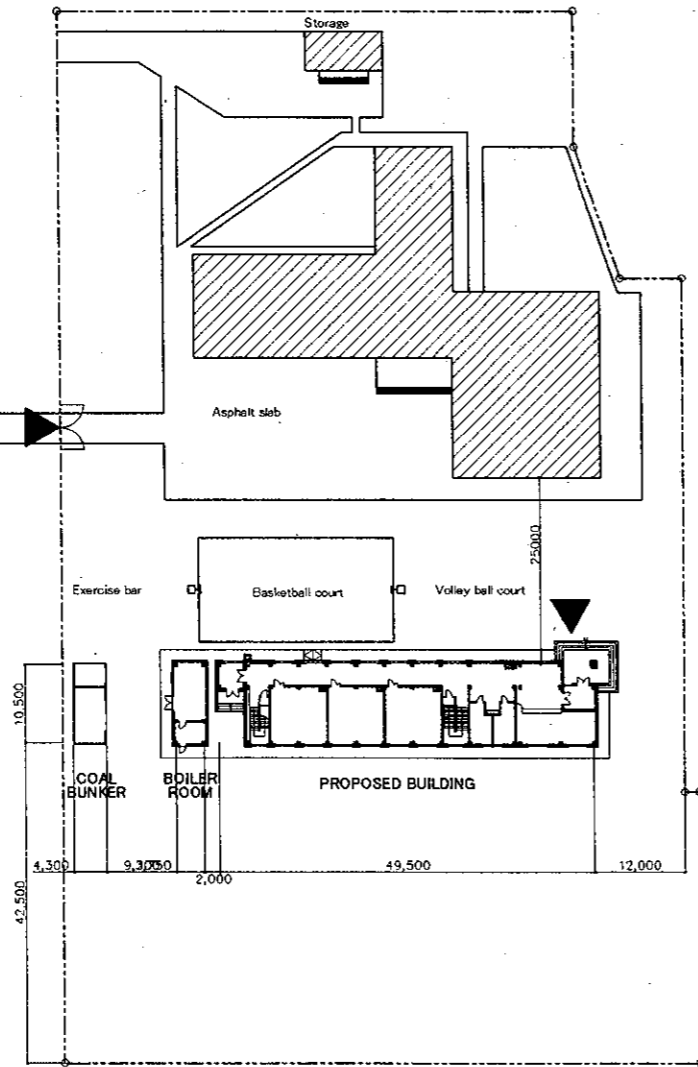
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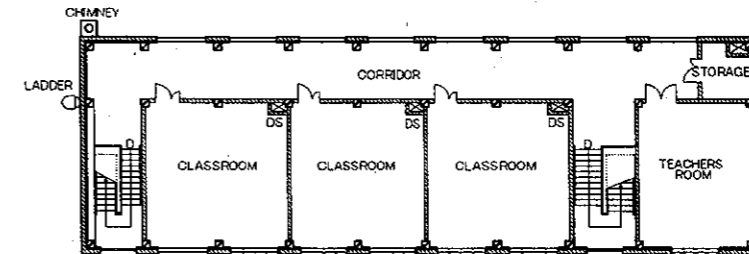
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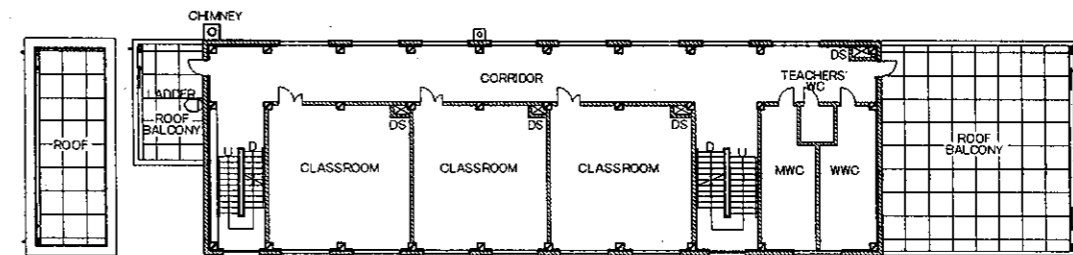
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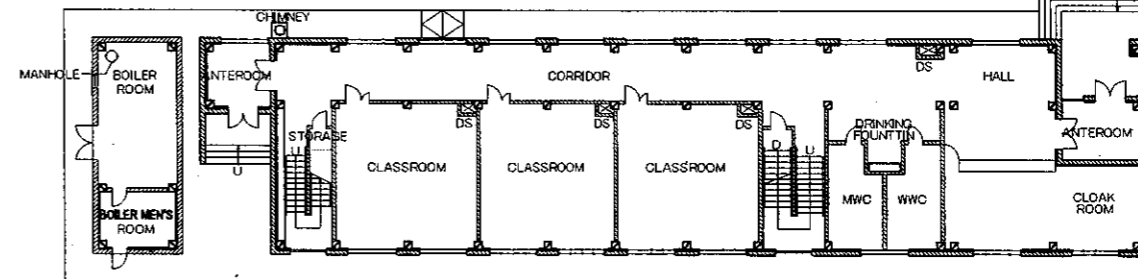
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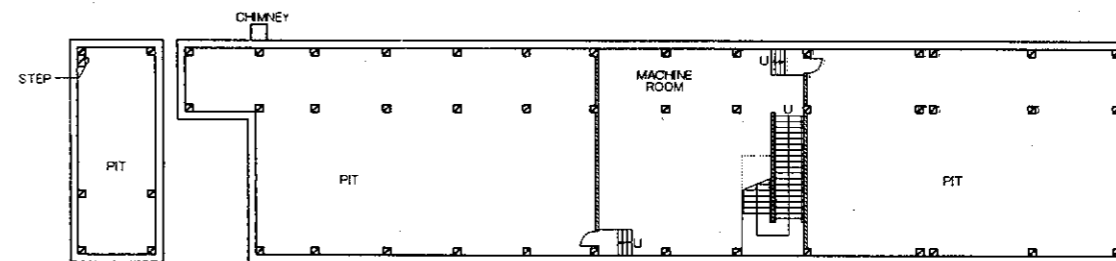
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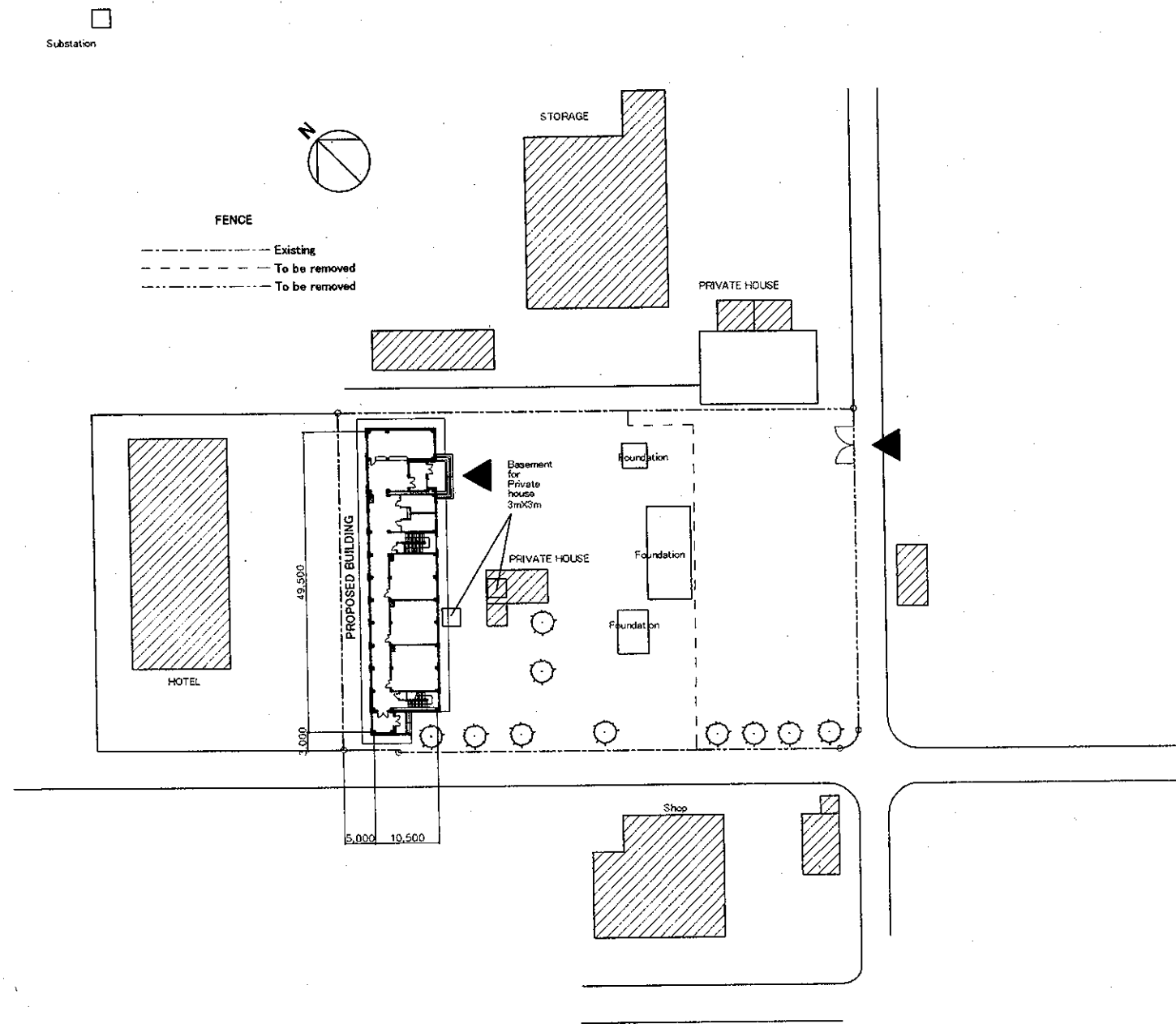
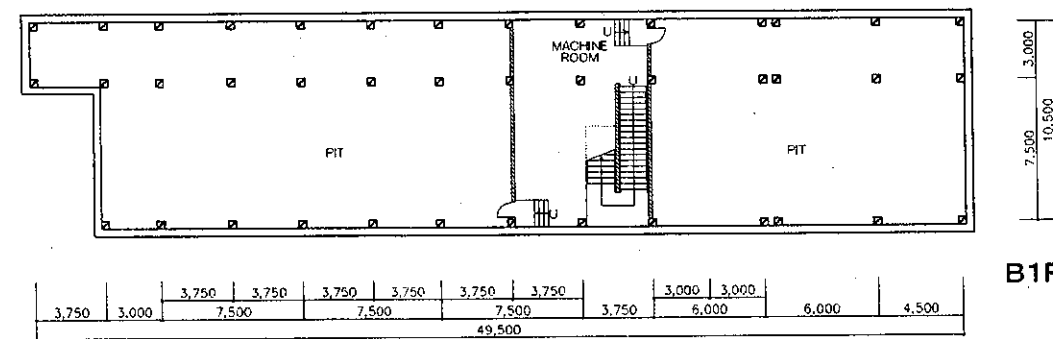
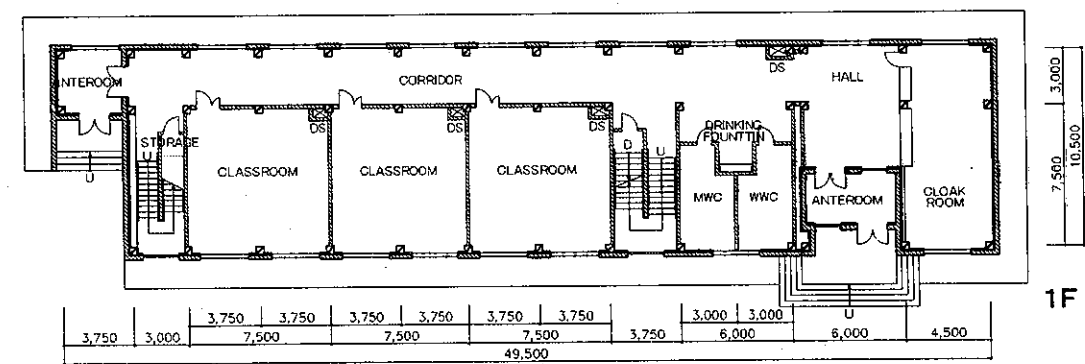
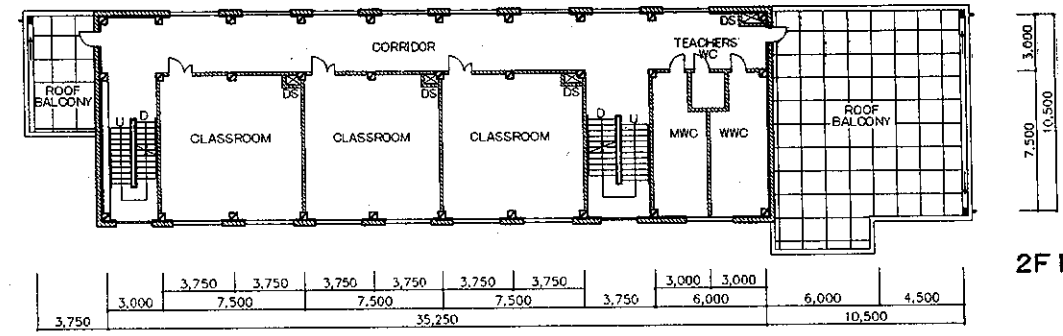
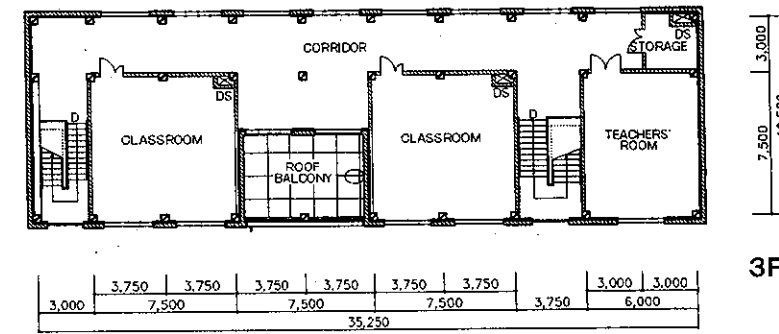
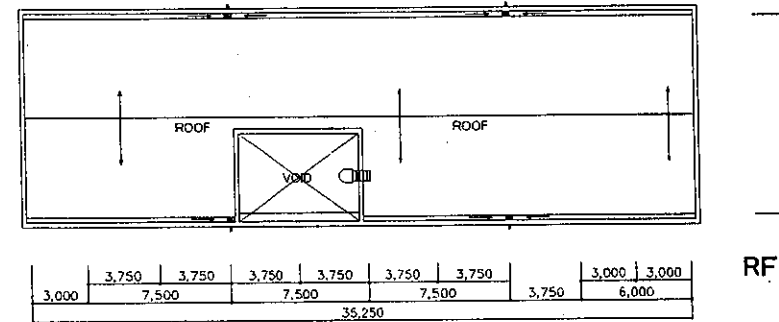
THE PROJECT FOR IMPROVEMENT  
OF PRIMARY EDUCATION FACILITIES  
IN MONGOLIA (PHASE II-2/2)

CLIENT

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NUMBER OF SHEET

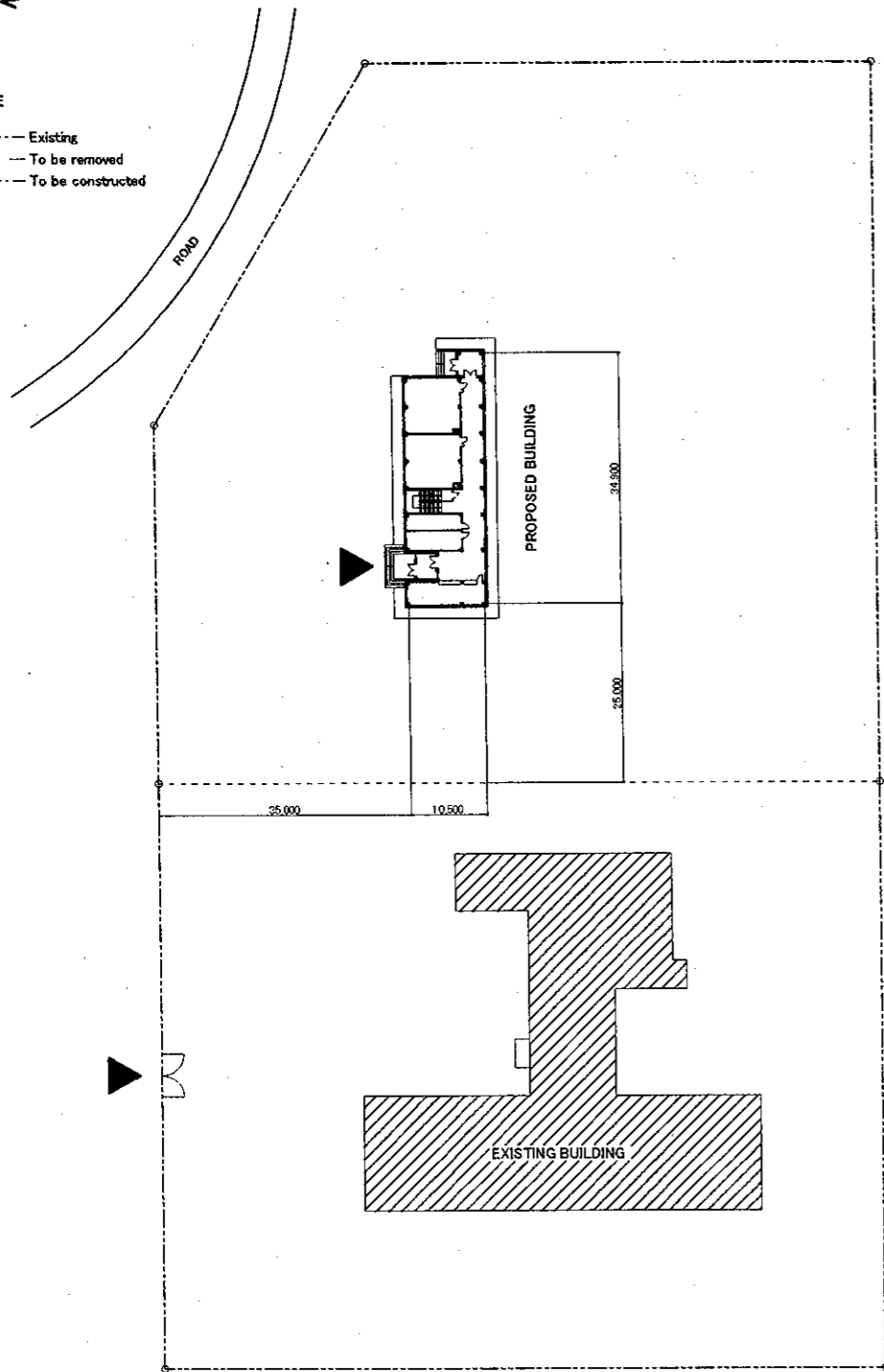
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THE PROJECT FOR IMPROVEMENT OF PRIMARY EDUCATION FACILITIES IN MONGOLIA (PHASE II-2/2)	CLIENT	DARKHAN-UUL OD NO.3 SCHOOL PLOT PLAN, B1F/1F/2F/3F/RF PLAN	NUMBER OF SHEET
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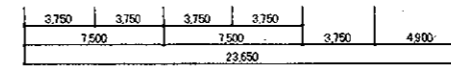
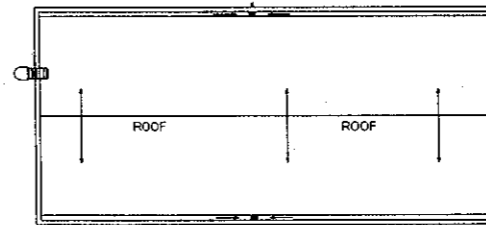
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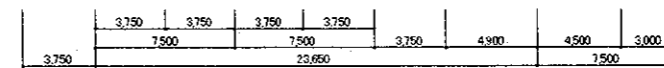
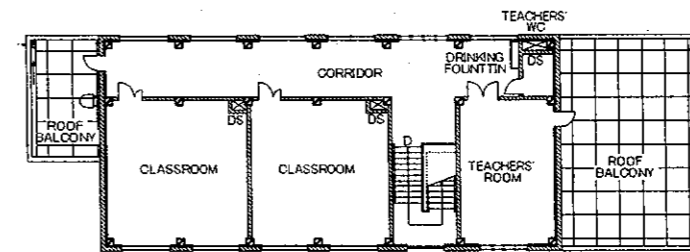
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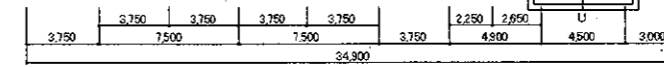
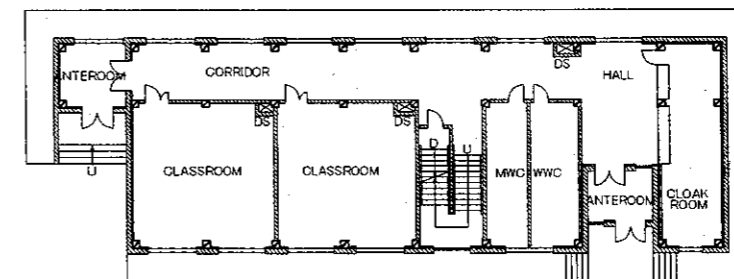
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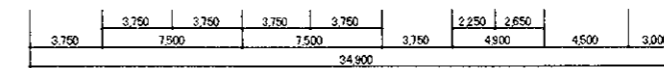
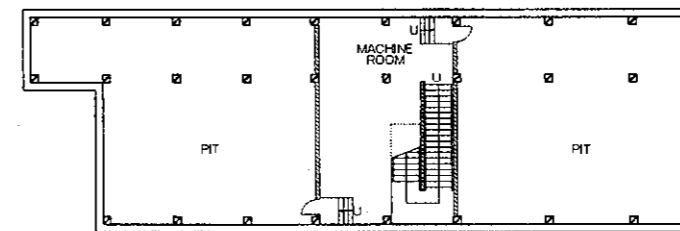
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2F PLAN scale 1:400



1F PLAN scale 1:400



B1F PLAN scale 1:400

THE PROJECT FOR IMPROVEMENT  
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 IN MONGOLIA (PHASE II-2/2)

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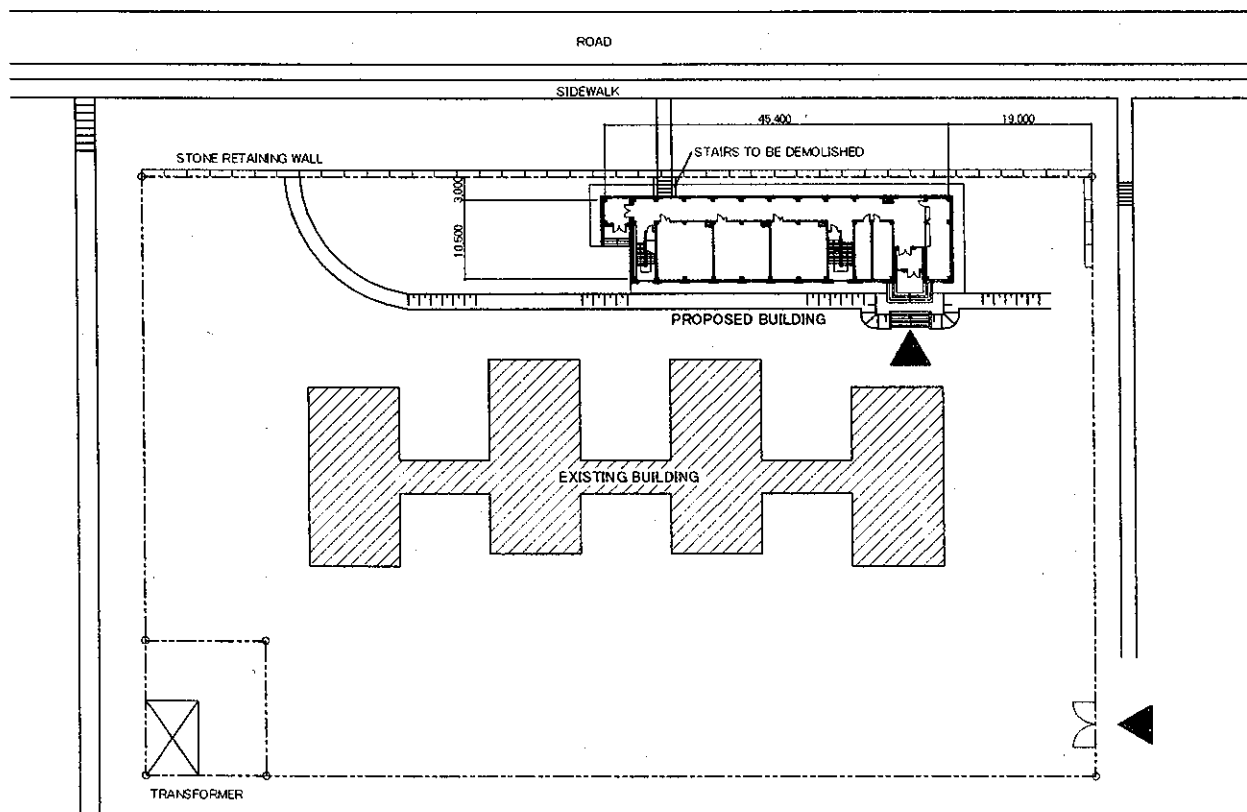
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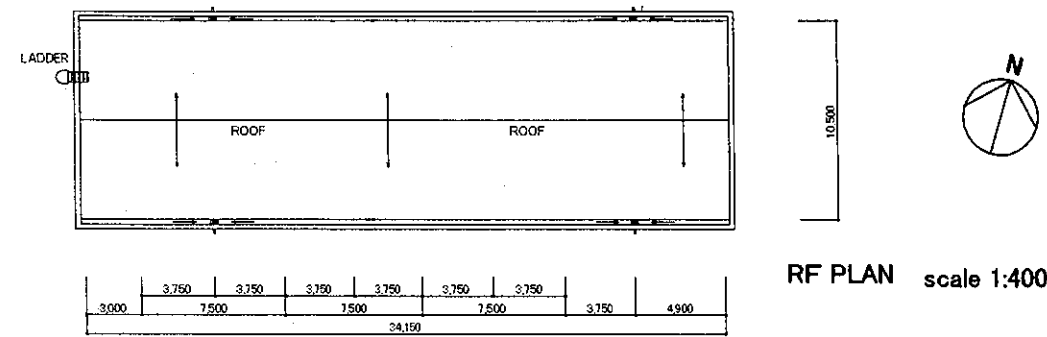
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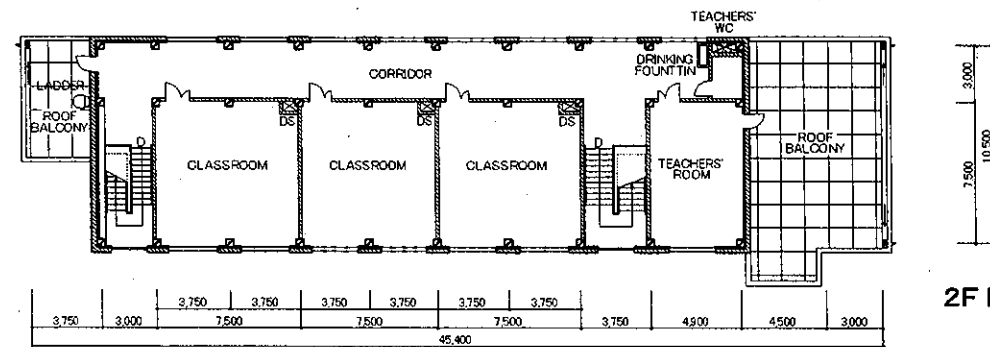
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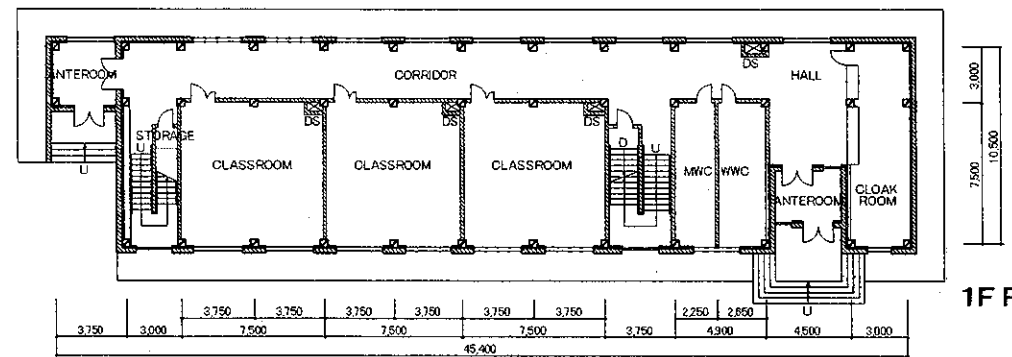
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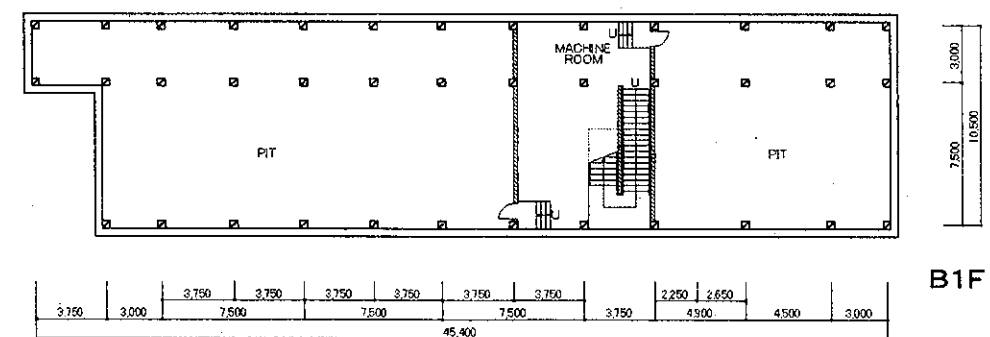
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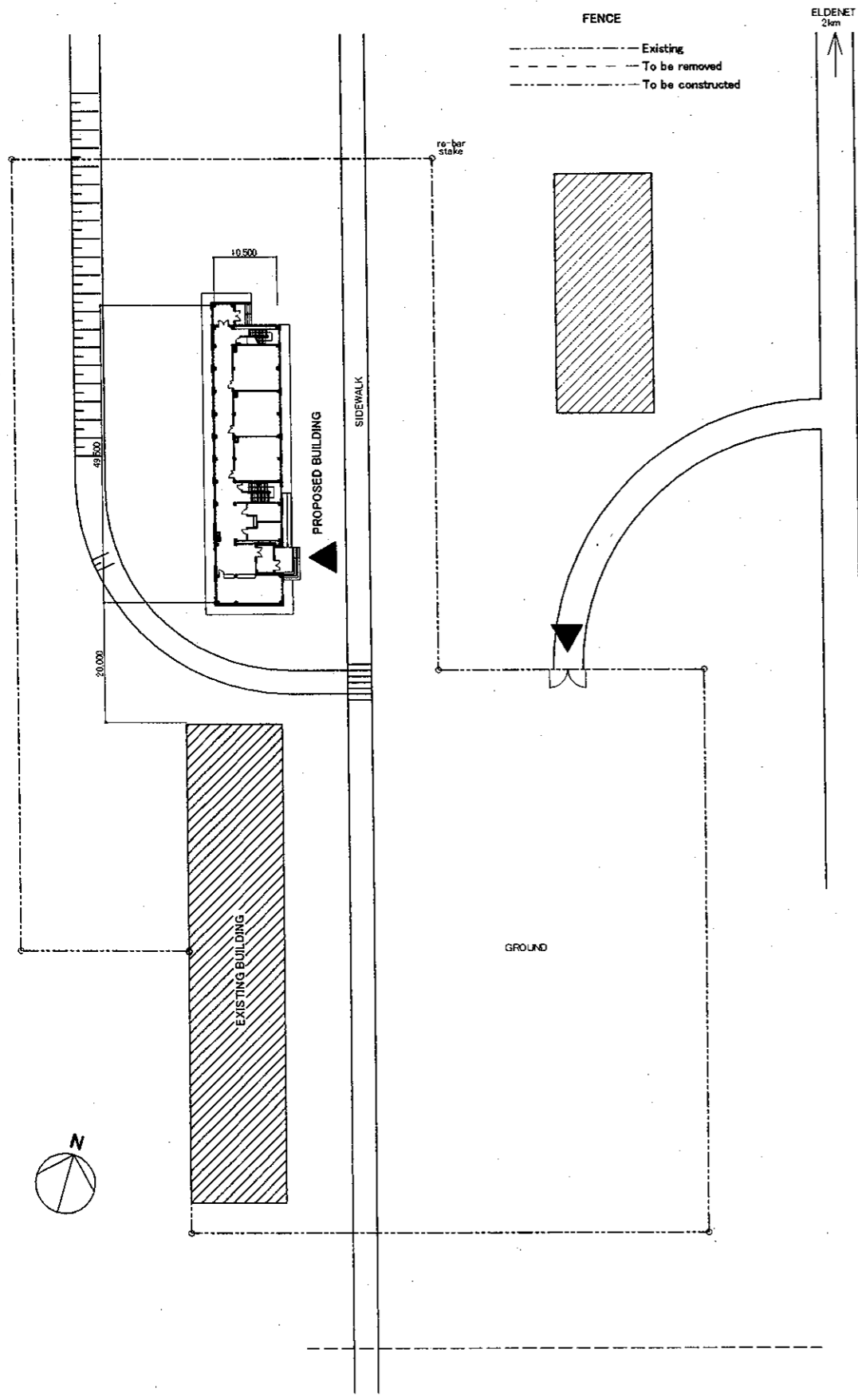
THE PROJECT FOR IMPROVEMENT  
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 IN MONGOLIA (PHASE II-2/2)

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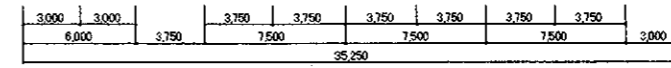
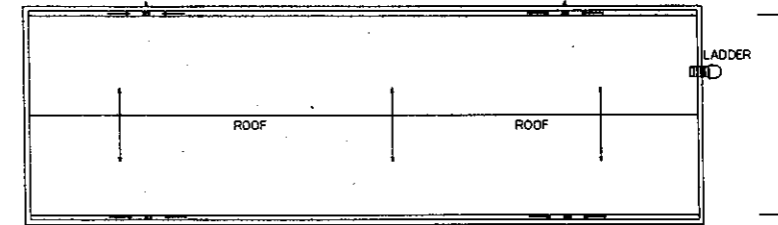
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NUMBER OF SHEET

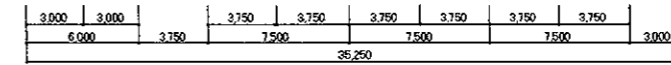
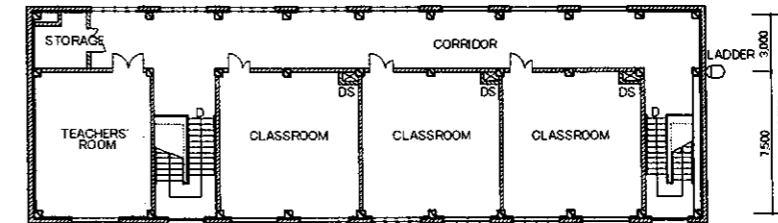
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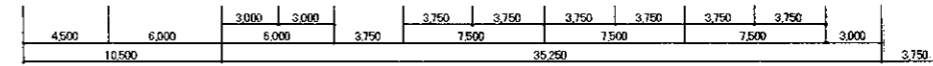
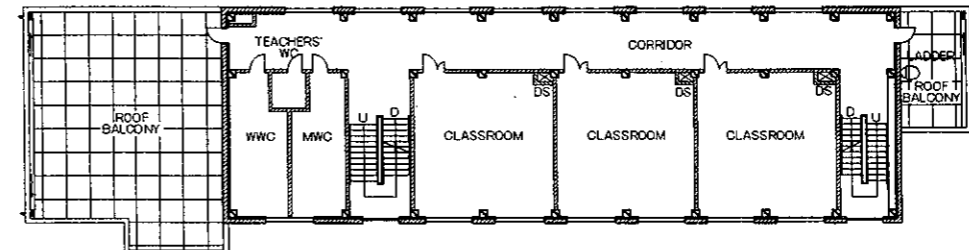
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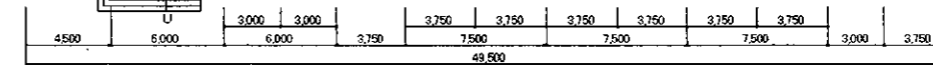
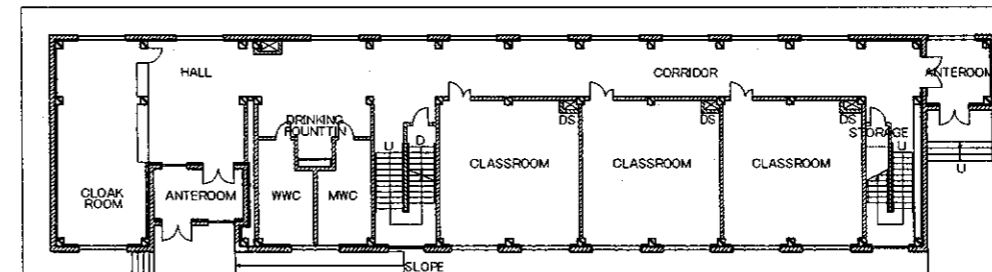
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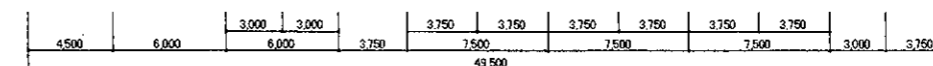
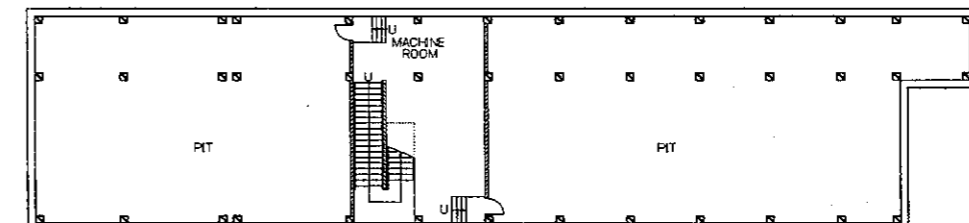
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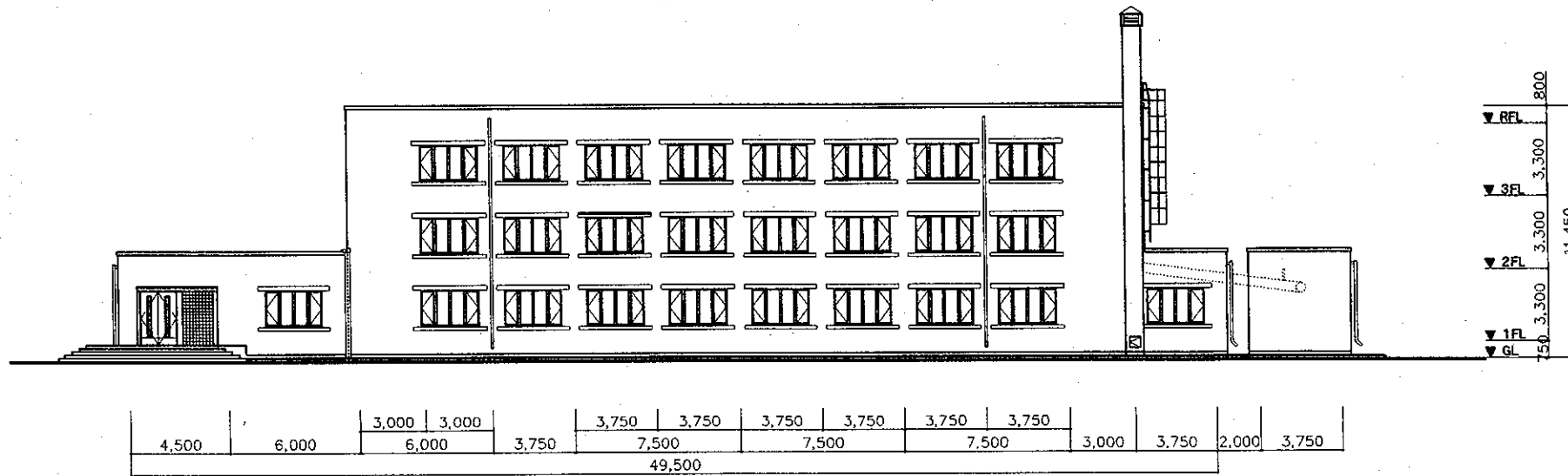
THE PROJECT FOR IMPROVEMENT  
 OF PRIMARY EDUCATION FACILITIES  
 IN MONGOLIA (PHASE II-2/2)

CLIENT

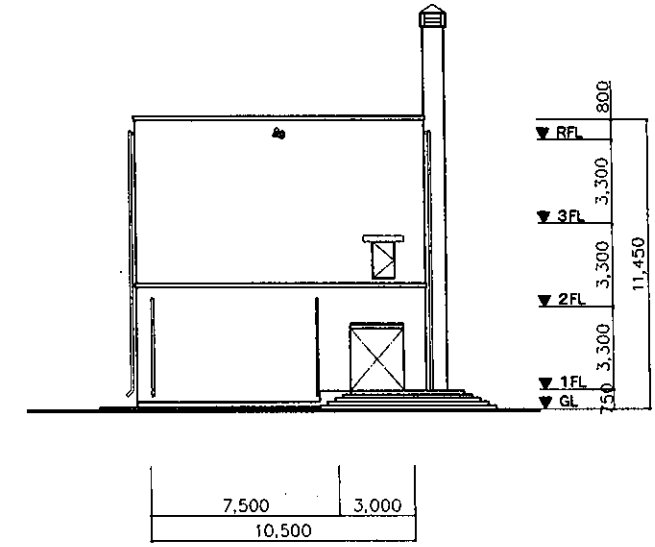
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 PLOT PLAN, B1F/1F/2F/3F/RF PLAN

NUMBER OF SHEET

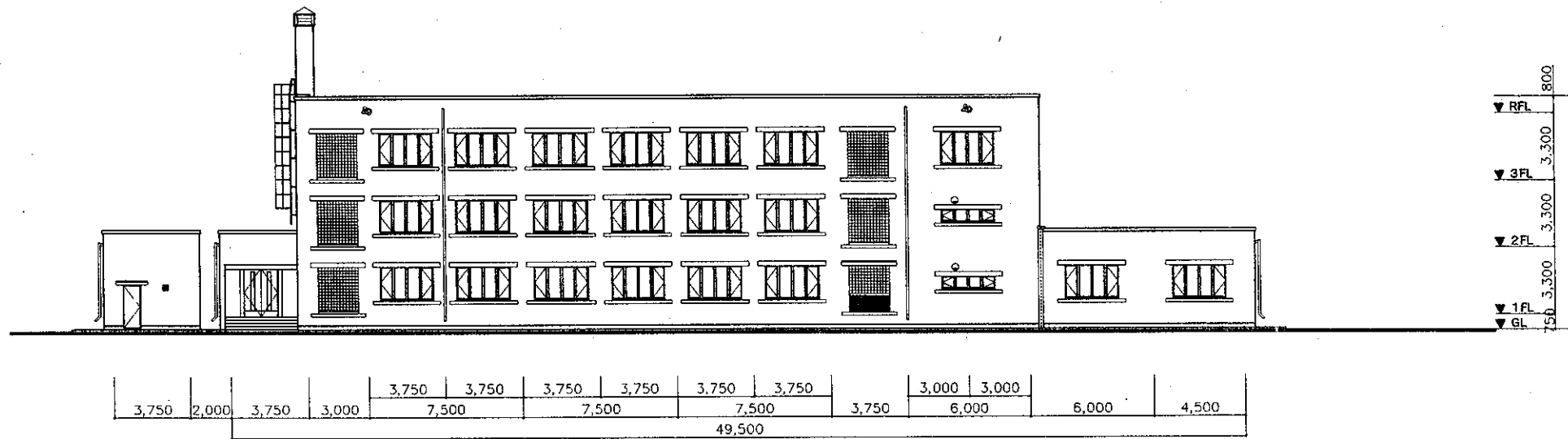
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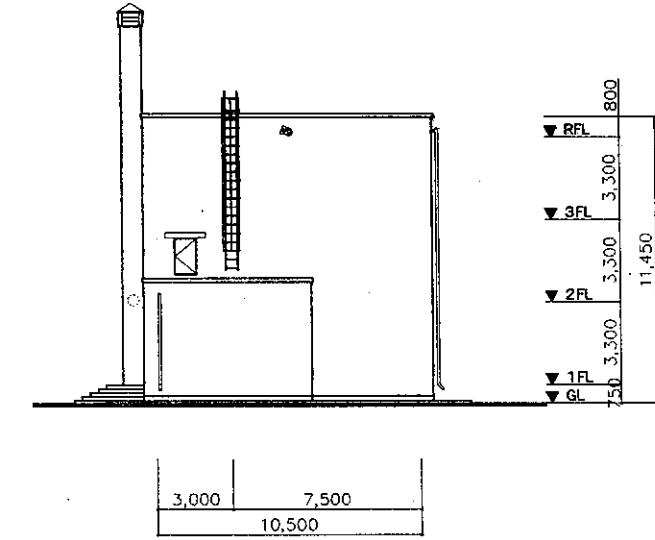
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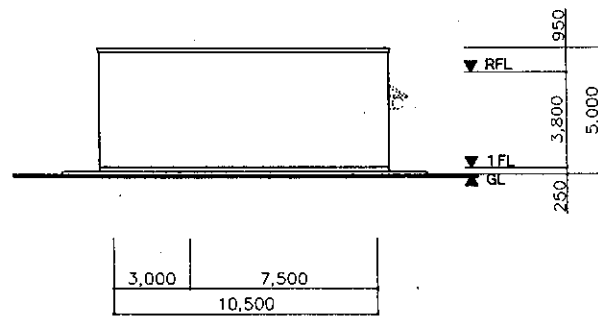
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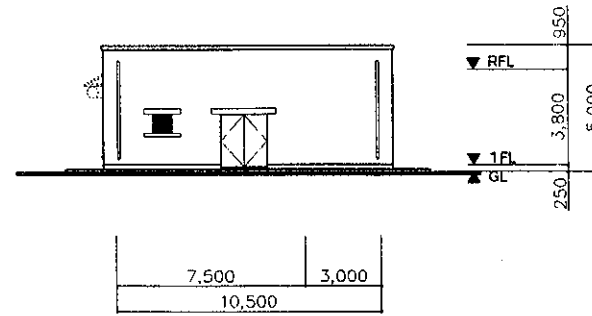
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WEST ELEVATION scale 1:300



BOILER BUILDING EAST ELEVATION scale 1:300



BOILER BUILDING WEST ELEVATION scale 1:300

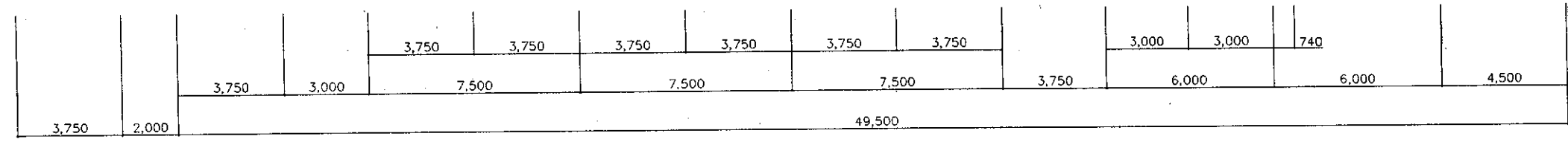
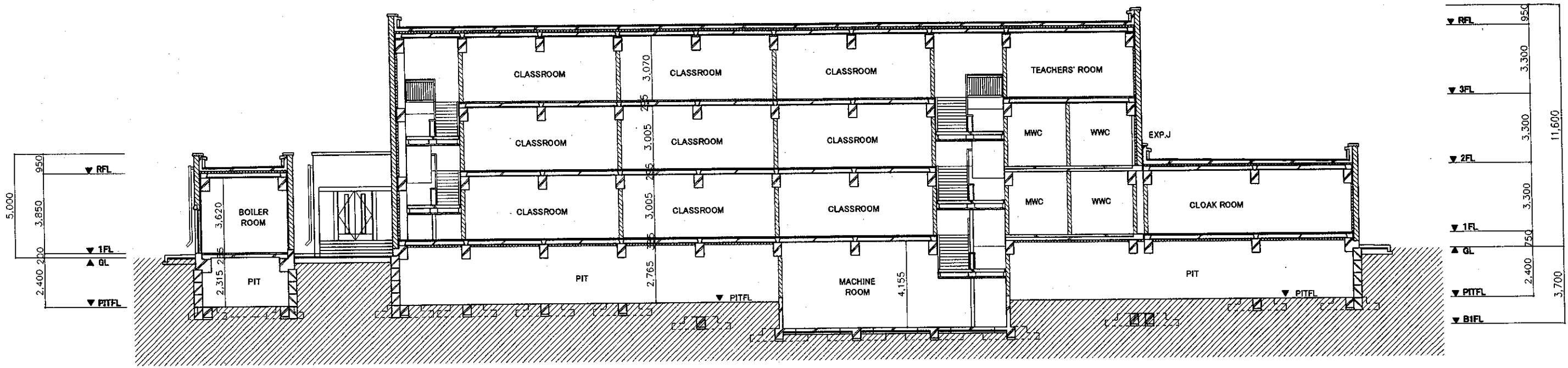
THE PROJECT FOR IMPROVEMENT  
OF PRIMARY EDUCATION FACILITIES  
IN MONGOLIA (PHASE II-2/2)

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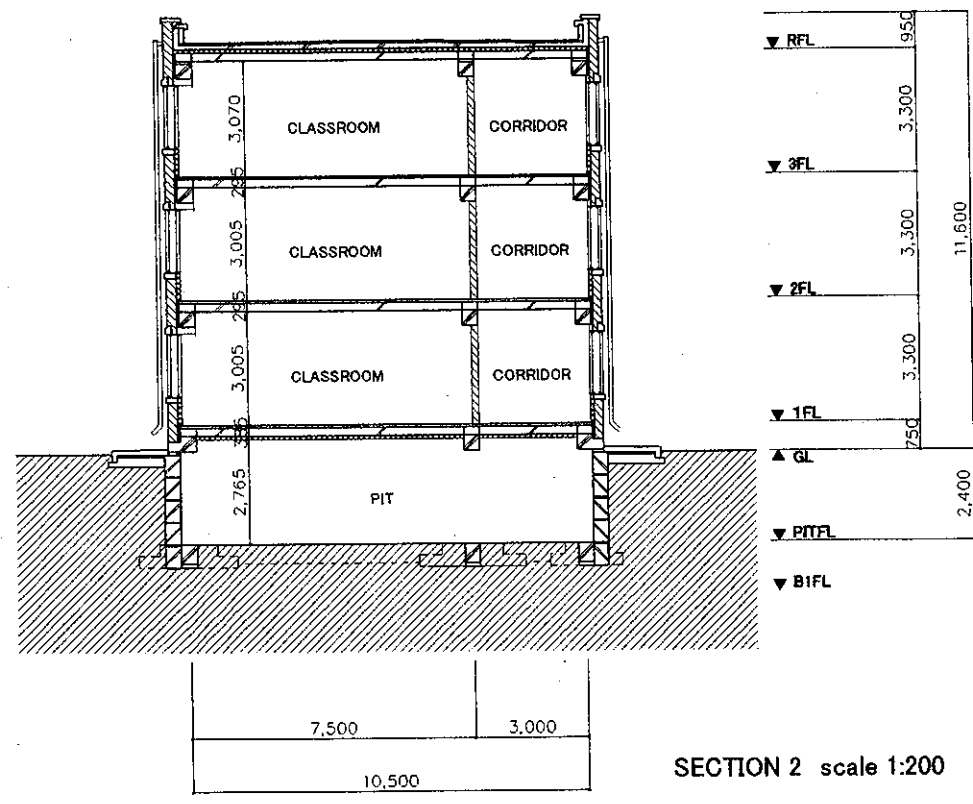
DARKHAN-UUL NO.11 SCHOOL  
ELEVATION

NUMBER OF SHEET

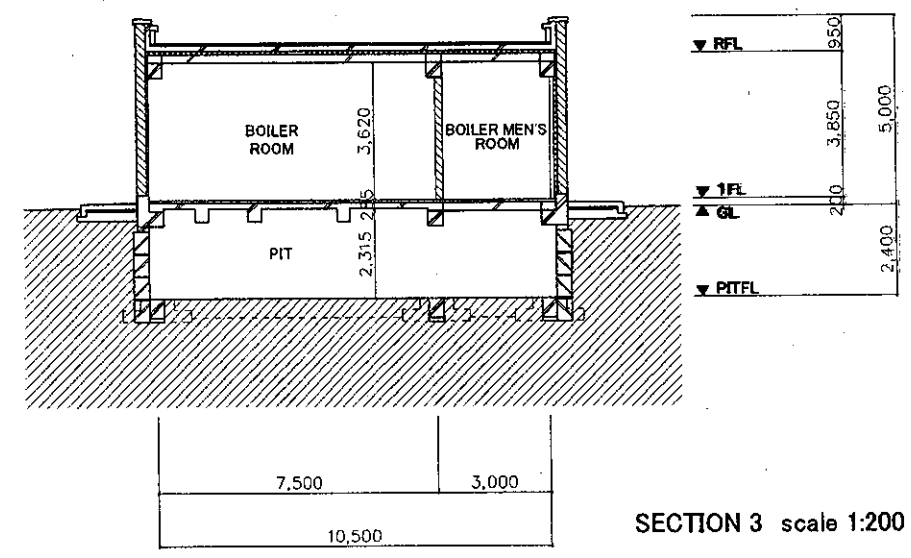
SCALE



SECTION 1 scale 1:200



SECTION 2 scale 1:200



SECTION 3 scale 1:200

- Legend
- : RC ( Girder or Slub )
  - : Brick Wall
  - : Heat insulatoion material
  - : PC.Wall / PC.Slab

## 2-2-4 Implementation Plan

### 2-2-4-1 Implementation Policy

The Project is to construct the facilities for 6 schools and provide educational equipment and furniture within a period of specified time with avoiding the cold winter and utilizing local contractors and locally available materials as much as possible. It is necessary to prepare construction plans fully, taking into account the construction capabilities of the Mongolian side, including local construction and material procurement.

#### (1) Principles for Project Implementation

The Project will be implemented on the basis of this report. After Project approval by the Japanese Government Cabinet Meeting, the Exchange of Notes for the Project will be signed by both the Mongolian and Japanese Governments. Then, the Project will be implemented in accordance with the following principles:

- ① The Project will be funded with tax money paid by the Japanese people and implemented under the rules of Japan's Grant Aid Cooperation within Japanese budgetary system.
- ② The Government of Mongolia will sign a contract with a consultant of Japanese nationality and entrust them a) to prepare the detailed designs of the Project, and b) to assist in tendering procedures for selection of a contractor, and c) to conduct construction supervision work in accordance with this report.
- ③ The Government of Mongolia will select a Japanese corporate contractor through a competitive bidding process and then sign a full term contract with the selected contractor for the construction of the Project and the procurement of necessary equipment and furniture.

#### (2) Principles for Project Construction

- ① To efficiently conduct construction within a limited time period and to employ local consultants and contractors who are familiar with local construction and material procurement as much as possible.
- ② To efficiently conduct construction under strict safety standards and quality control, as well as adhere to strict management of the construction schedules. Also, to transfer to the Mongolian side, the knowledge and practice of the Japanese contractor in regards to those management and other standards and procedures.

- ③ To use, as much as possible, locally manufactured or easily available imported construction materials, equipment and furniture for the purpose of simple and economical maintenance completed facilities as well as equipment provided in the Project.

### (3) Project Implementation Structure

As regards to the structure of implementation for the Project, the responsible agency concerned with the Mongolian side is MOSTEC. Actual work concerned with Project implementation will be undertaken by the Economic Monitoring and Assessment Department of MOSTEC. MOSTEC will take actual and full responsibility for the items listed below:

- ① The signing of the contract between the Japanese consultant and the contractor;
- ② The opening of and paying fees for the Project's bank account;
- ③ The issuing of the Authorization to Pay (A/P);
- ④ The approval of all necessary designs and documents;
- ⑤ The supervision of both Provinces which are the implementation agencies for the Project

The implementing agency on the local Province level will be the Steering Committee for School Building Construction (SCSBC). This agency, established by both involve Provinces, will be organized only for purposes relating to the Project and under control of MOSTEC. The Committee will take responsibility for items listed below:

- ① The applying for and acquiring of all necessary permits to start construction work;
- ② The re-confirmation of land possession and boundary lines;
- ③ The implementation and completion of all works borne by the Mongolian side.

### 2-2-4-2 Implementation Conditions

The Project schools are located in Darkhan City of Darkhan-Uul Province (approximately 220km from Ulaanbaatar) and also in and around Erdenet City of Orkhon Province (approximately 180km from Darkhan City). The Project is to construct school buildings in a fairly vast area of which the climate is very severe. Thus, it is necessary to prepare very precise construction plans to suit the area

conditions.

The following are policies regarding preparation of the construction plans.

(1) Review of the Construction Organization

Construction Organization shall be revised as follows according to the change of the construction condition at the sites.

① To set up the materials procurement base at Ulaanbaatar

In the Basic Design stage, it was planned that the construction materials imported from China or Russia would be directly delivered to both Darkhan and Orkhon construction bases. However it was found during this Implementation Review Study that the pre-cast concrete (PC) factory, which is the only one in Darkhan, has been closed since 2004, and there is no plan to reopen it. Further, the PC factory in Orkhon has scaled down its production capacity because the quantity of orders has been drastically reduced in the last few years. Therefore the contractor will have to order most of the PC panels from the factories in Ulaanbaatar.

PC panel is one of the major materials and it is important to conduct factory inspections from time to time. Therefore the material procurement base should be established in Ulaanbaatar.

Setting up the procurement base in Ulaanbaatar, where most of the material suppliers, trading companies and concerned government authorities have their offices, provides an advantage in controlling the procurement.

② To add a Japanese architectural engineer in the Darkhan area

Since there is no plant specializing in concrete batching in Darkhan, concrete used to be mixed by the above-mentioned PC factory. As the PC factory has been closed, the concrete should be made by installing a temporary batcher plant at the construction sites. Therefore, more careful attention will be needed than before to control the quality of the concrete. In addition, No.4 school is located in the Darkhan area. The site of this school has a high underground water table. In addition, No.11 school is located in a remote area far from the city and the condition of the access road is poor. Judging from these conditions, in order to carry out appropriate quality control, one Japanese engineer should be dispatched during the structural work period, from March to October.

③ To extend the dispatch period of the Japanese mechanical and electrical (M&E) engineer

In Mongolia, interim inspection and final inspection are conducted by the fire department and the architectural section of the Province during construction. The items of the inspections of M & E sector are electrical, heating, boiler, indoor fire hydrants, fire alarms, thermo-detecting alarms, fire extinguishers, interior materials, evacuation route and so on. In the Basic Design stage, it was planned to dispatch one Japanese engineer for 5.5 months. However inspection has become stricter year by year since the Fire Code was issued in 2003, and higher professional knowledge and more detailed shop drawings have been required. Considering all of the above, the dispatch period of Japanese M&E engineer shall be extended from 5.5 months to 7 months.

(2) Construction Periods

Taking the volume of the construction into consideration, the construction period will be planned as a one-year, one-stage project.

(3) Schedule Planning

Project implementation includes a) the building construction work, b) the mechanical/electrical work, and c) the furniture and equipment procurement work. Each work-step requires procurement of necessary materials and equipment, and the arrangement of skilled workers who can follow the work schedules. As various types of work will be conducted simultaneously at every Project site, the coordination of procurement and all the work arrangements, etc will be very detailed and complicated. In order to accomplish the necessary work within the limited period, the preparation of a precise and detailed work schedule is necessary as to avoid any re-work, down-time and suspension of work.

(4) Construction Measures for Cold Winter Climate

In Mongolia, the quality and scheduling of work is influenced by the frozen ground and snow in the winter. Special attention to the condition of laborers will be considered during work on severely cold days. This should be observed and considered carefully in the preparation of the working schedule.

(5) Preparation Work by Mongolian side Prior to Construction

Prior to commencement of work by the Japanese side, the following works must



be carried out by the Mongolian side:

- To remove the playground equipment at Darkhan No.4 site,
- To remove the basketball court at Darkhan No.11 site,
- To relocate an electric pole and power line at Darkhan Od-3 site, and
- To remove the streetlights at Orkhon No.6 site.

#### (6) Prevention of Accidents to Students and School Staff

At the Project sites on existing school grounds where new buildings will be constructed, strict safety measures should be initiated to prevent students and school staff from possible injury.

#### (7) Procurement Plan

All the construction and finishing materials, furniture and school equipment, etc. will be provided to areas in both Provinces that are far from Ulaanbaatar, and the road between these Provinces and Ulaanbaatar is still under construction. Also, the climate conditions are extremely severe in the winter. So, procurement schedules, including enough space to store supplies and material, must be prepared with utmost care and detail.

#### (8) Skilled labor

The supply of skilled laborers in both Provinces is small. Especially for finishing work, it may prove to be difficult finding enough good finishers/laborers/technicians. Thus, in the choosing of the sub-contractor, that person's capability shall be confirmed carefully.

### 2-2-4-3 Scope of Works

#### (1) Scope of Japanese Side

In accordance with the principles laid out in the Grant Aid Cooperation Project of the Government of Japan, the following works will be undertaken by the Japanese side to provide:

- ① Construction of school buildings including 57 classrooms, toilets, and teachers' rooms;
- ② Basic school furniture;
- ③ Basic educational equipment.

## (2) Scope of Mongolian Side

In accordance with the principles laid out in the Grant Aid Cooperation Project of the Government of Japan, the following works will be undertaken by the recipient country, in this case, Mongolian:

- ① Securing of Land for the Project;
- ② Land preparation work;
- ③ Removal of existing obstructions, including buried objects;
- ④ Securing of access roads to each Project site;
- ⑤ Securing of space for storage of construction materials;
- ⑥ Securing and connecting of temporary electrical power, water, and sewage lines for construction;
- ⑦ Securing and connecting of infrastructure lines to each Project site including but not limited to, power lines, heating supply lines, water supply pipes, drainage lines, and telephone lines;
- ⑧ Installation of gates and fences, planting of trees, and landscaping work;
- ⑨ The providing of equipment and furniture other than those covered by the Project

## 2-2-4-4 Consultant Supervision

The total floor area of the school buildings is fairly large: approximately 8,800 m<sup>2</sup>. In order to complete the Project construction of six school buildings within the limited time period, it is absolutely necessary that construction supervision is done carefully and completely, including frequent reporting to, and close communication with the implementing agency, as well as giving appropriate directions and guidance to contractors. The supervision work will be done in cooperation between the offices in Mongolia and Japan, and will proceed simultaneous communication to the resident architect as follows:

### (1) General Supervision

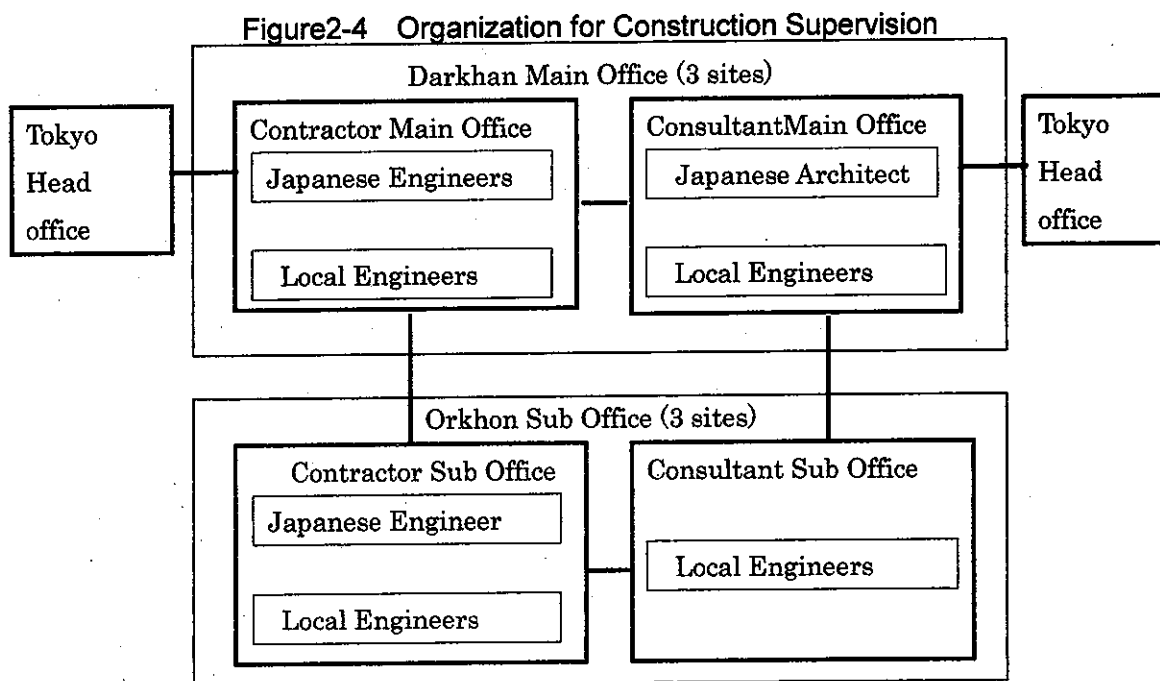
Control of overall Project schedules, including all works to be accomplished in the Project, overall technical evaluation, advice and assistance on all items outside the resident architect's expertise, and all necessary and periodic reporting to JICA headquarters will be conducted by the general supervisor. Architects and engineers who have been involved in the Project since the Basic Design Study stage will support

the general supervisor.

(2) Supervision by Resident Architect

A senior architect who has experiences as a supervisor for the Japanese grant aid projects will be assigned as a resident architect for Project construction in Mongolia. The resident architect will undertake, with the assistance of local consultants, various duties including consulting of daily work schedules, evaluation and advice on the shop drawings, approval of methodology, quality control guidance and use of materials, technical guidance and direction to contractors, necessary and periodic reporting to the Project implementing agency of both Provinces, to MOSTEC and to JICA's local office as well as to the Japanese Embassy, intermediate and completion inspections, collection of information and data related to the Project control and preparation of construction supervision reports.

The organization structure for construction supervision is as shown in Figure 2-4.



The construction work of the 3 schools in Darkhan-Uul Province of which the total area is 5,667 m<sup>2</sup>, and 3 schools in Orkhon Province of which the total area is 3,113 m<sup>2</sup>, will be implemented in the Project. As the distance between the center of both Provinces is far as 180km, the main office of the consultant and contractor will be established in the center of Darkhan-Uul Province, and sub-office in the center of Orkhon Province.

### 2-2-4-5 Quality Control Plans

As Mongolia is cold country, the Quality control of the Project shall be undertaken accordingly as follows:

- ① In the winter, if floor slabs, tanks, or utility pipes in the underground pits are raised by frost heaving, cracks in the structure and water leakage might occur. To avoid this, the floor slabs, tanks, and utility pipes, etc. must be laid below the level of the frozen soil, or laid on improved soil.
- ② Water leakage in the roof from capillary action must be avoided.
- ③ The checking of contractor's blueprints and all other related inspecting should be strict and careful, so as not to make heat bridges.
- ④ Keep water and sewage water in the pipes from freezing.
- ⑤ The methodological plan for pre-cast concrete (PC) must be strict, because the re-bar arrangements can not be checked after casting concrete is done in the factory. A good and reliable factory inspection system should be established. Since PC is produced in the winter, concrete specifications must follow winter concreting methods.

### 2-2-4-6 Procurement Plans

Regarding construction materials: cement, which originates in China, is available on the local market and the reinforcement bars and aggregates, which originate in Mongolia, are available on the local market. As for finishing materials: bricks, which are produced in Russia, are available on the local market. Most other finishing materials, which come from China, are also available on the local market. Based on the field study results attained during the Basic Design Study period, the materials shown in Table 2-13 will be procured for the Project. Any materials which originate in Mongolia will be given priority after checking the quality.

Table 2-13 Building Materials to be Procured for the Project

Materials & Equipment	Procurement	Product Origin	Remarks
<b>Building construction:</b>			
Cement	UlanBator	China	Easily availability. No quality problem.
Concrete aggregates	Darkhan	Darkhan	Easily availability. No quality problem.
Reinforcing bars and steel frames	Darkhan	Darkhan	Easily availability. No quality problem. JIS standard products
Forms for concrete work	UlanBator	China	Easily availability. No quality problem.
Bricks	UlanBator	Russia	Easily availability. No quality problem.
Precast concrete products	Both Provinces	Both Provinces	Easily availability. No quality problem in Durkhan.
Lumber	Hovsgol	Hovsgol	Easily availability. No quality problem.
Finishing materials	UlanBator	China	Easily availability. No quality problem.
Wooden finishing material	UlanBator		Easily availability. No quality problem.
Metal accessories and fittings	UlanBator	China	Easily availability. No quality problem.
Glass, and glass blocks	UlanBator	China	Easily availability. No quality problem.
Paint and water proofing material	UlanBator	China	Easily availability. No quality problem..
Insulation material	UlanBator	China	Easily availability. No quality problem.
<b>Furniture and Educational Equipment:</b>			
Furniture	UlanBator	Ulaanbaatar	No problem in availability and quality
Maintenance Equipment	UlanBator	China	Easily availability. No quality problem.
Maps & drawings	UlanBator	China	Easily availability. No quality problem.
<b>Materials for Electrical Work:</b>			
Distribution board	UlanBator	China	Easily availability. No quality problem.
Cables & wires	UlanBator	China	
Conduit	UlanBator	China	
Lighting fixtures	UlanBator	China	
Small current equipment and alarms	UlanBator	China	
<b>Mechanical Equipment Materials</b>			
Galvanized steel pipes	UlanBator	China	Easily availability. No quality problem.
Valves and pipe fittings	UlanBator	China	
Pumps	UlanBator	China	
Radiators	UlanBator	China	
Boilers	UlanBator	China	
Sanitary wares	UlanBator	China	

## 2-2-4-7 Implementation Schedule

For smooth implementation of the Project, all work and proceedings borne by the Mongolian and Japanese sides shall be done without any delay. After the Exchange of Notes for the Project are signed by the Governments of Mongolia and Japan, implementation of the Project will proceed with the tendering and signing of contract stage, the building construction and equipment procurement stage.

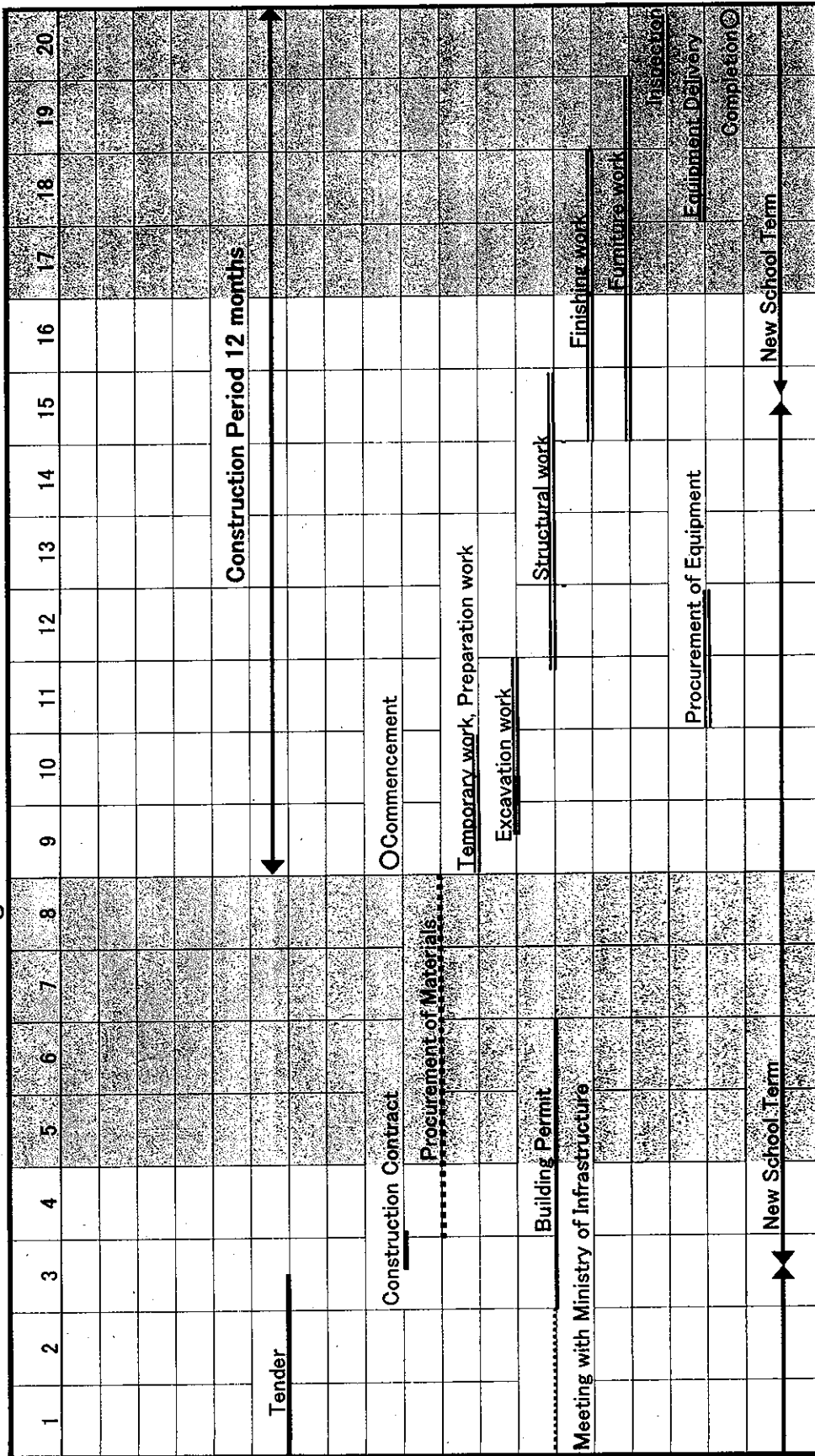
### (1) Tendering and Signing of Contract Stage

After the Detailed Design stage, evaluation of the candidate contractors will be conducted in Japan (called P/Q, pre-qualification). Based on those pre-qualifications, the project implementation agency of Mongolia will call for the tendering of the Project witnessed by official personnel related to the Project. The lowest bidder will be further evaluated if the tendering contents are appropriate. After successful evaluation, a bidder will be selected as the contractor and will sign the Project construction contract(s) with the Government of Mongolia, which means MOSTEC. It will take approximately 2 months for these procedures to take place and be completed.

### (2) Building Construction and Equipment Procurement Stages

After the signing of the contract and verification by the Government of Japan, the contractor will start procuring the special materials that have to be produced in the winter, and commence the construction work in the next spring when the defrost of the soil starts. From an experienced estimate of the total amount of work and components involved in the facilities, and supposing that the material and equipment procurement by the Mongolian side is smoothly conducted, it takes 12 months from the commencement of excavation to completion. The schedule is shown in Figure 2-5.

Fig 2-5 Construction Schedule



Legend  Cold Season  Very Cold Season

## 2-3 Obligations of Recipient Country

As a basic principle, the Government of Japan requests recipient country (Mongolia) to share the following obligations of the Project:

- (1) To provide the Japanese side, as soon as possible, the necessary information and materials required for the Project;
- (2) To secure the land for the Project, which the provincial government holds school building rights, and extend the construction site at School No. 7 (Darkhan-Uul) so that the school building can be conveniently arranged on the site;
- (3) To remove all existing obstacles on and under the ground within the site, then level the ground and fill up or cut the ground as required prior to the start of construction (Table 2-14). Also to secure temporary classrooms at sites where necessary so that classes are not interrupted during the construction period;
  - ① To transfer classes to the temporary classrooms as soon as possible at the site of School No. 4 (Darkhan-Uul) because the existing school building is structurally precarious;
  - ② To remove the playground equipment at Darkhan No.4 site, to remove the basketball court at Darkhan No.11 site, to relocate an electric pole and power line at Darkhan Od-3 site, and to remove the streetlights at Orkhon No.6 site.
- (4) To secure access roads leading to all construction sites planned in the Project, and improve them if necessary for easy access to each site. They must be in good enough condition so that vehicles carrying construction materials (pumping trucks and cement trucks, etc.) will be able to reach the sites safely;
- (5) To bear commissions, handing charges and other necessary fees related to the Bank Arrangement (B/A) and the Authorization to Pay (A/P) to a bank in Japan;
- (6) To acquire permits, approvals, and any other authorizations required for the work that is undertaken during the implementation process of this Project;
- (7) To ensure prompt unloading of and customs clearance at ports of disembarkation in the country and internal transportation therein of products, machinery, equipment, and materials purchased Japan's grant aid;
- (8) To exempt Japanese nationals from customs duties, internal taxes and fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts;



- (9) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work;
- (10) To extend infrastructure to the construction site at the time of completion and do so according to the Japanese side request based upon its work schedule;

① Power Source for Heating Facility and Hot-water Supply System

When the Japanese side judges that it is possible to use a heating facility of a Province or region adjoining the construction site, the Japanese side will execute the piping work within the school site at Project own expense. On the other hand, the Mongolian side shall be responsible for the piping work outside the site and for bringing the equipment infrastructure to the site, and submitting an application to the Heating Bureau at its own expense. When the Japanese side judges that it is impossible to use a heating facility of the Province, the Japanese side will install a coal boiler at Project expense, whereas the Mongolian side shall pay fuel expenses. (Table 2-14)

② Water Supply and Drainage

When the Japanese side judges that it is possible to use a water supply pipe or main drainage pipe, the Japanese side will carry out the piping work within the school site. On the other hand, the Mongolian side shall be responsible for piping work outside the site, extension work, and applying for water service and sewage disposal at the Water Supply Bureau and the Sanitation Bureau at its own cost. When the Japanese side judges that it is impossible to use a water supply pipe or main drainage pipe of the Province, the Japanese side will install a water tank with a capacity for two-days supply and a sewage tank with the capacity for one week. The Mongolian side shall take responsibility to replenish water to the storage tank and collect waste from the waste tank by vacuum car. (Table 2-14)

③ Electricity

The Japanese side will build a lead-in pole at the boundary to the road within the school site and install a main cable at Project cost. The Mongolian side shall install an integrating wattmeter and provide a cable to the wattmeter (only a portion outside the site), or build a lead-in pole outside the site, and apply for electricity service to the Power Bureau at its own expense.

④ Telephone

The Japanese side will carry out the conduit installation work from the terminal board of the underground machine room to the outlet in the teachers' room. The Mongolian side shall

be responsible for terminal equipment, wiring, and application for telephone lines to the Telephone Bureau.

⑤ Party-line Television System and Cable System

The Japanese side will not install a joint TV receiving system nor a cable system.

- (11) To conduct additional work such as landscaping and installing gates and fences if necessary after the completion of the construction;
- (12) To use, manage, and maintain properly and effectively the facilities and equipment provided under this Project using Japan's grant aid;
- (13) To ensure all expenses required for the implementation of this Project outside the coverage of the grant aid;
- (14) To coordinate and settle various potential problems that may be posed by neighboring residents in relation to the implementation of the Project.

Table 2-14 List of Works Allotted to Mongolian Side

Province	School	Preparation & leveling works	Infrastructure		
			Heating system	Water supply	Sewerage
Orkhon	2nd school	-	Province	City water	Public sewerage
	6th school	Removal of 3 streetlights	Province	City water	Public sewerage
	7th school	-	Province	City water	Public sewerage
Darkhan-Uul	4th school	Removal of playground equipment	District	(Supplying by water wagon)	(Dipping up by vacuum wagon)
	11th school	Removal of a basketball court	(Operation of the new boiler)	City water	Regional sewerage
	Od-3 school	Removal of an electric pole	Province	City water	Public sewerage

## 2-4 Project Operation Plan

Upon the completion of the Project, the two Provinces will be responsible for the management and maintenance of the facilities. Hence, they will be obligated to manage and maintain these facilities appropriately.

### 2-4-1 Operation Plans

A major purpose of the Project is to eliminate the number of schools adopting three or more shift classes. Hence, even though the number of classrooms may increase as a result of Project construction, it is not anticipated that the number of teachers will rapidly increase soon. However, if the number of students increases as a result of natural population growth or inflow from outside, the number of teachers will rise along with such an increase in the number of students. Table 2-15 indicates an increase in the number of teachers at each target school under this Project. The calculation is done based on the current number of students in 2004 and the forecasted number of children in 2007. The increased number of classes should be equal to the increased number of teachers. Concerned with it, there are many qualified teachers who are seeking jobs in the urban districts of these two Provinces. Therefore, it is relatively easy to employ new teachers. Hence, neither the scarcity of teachers nor the issue of unqualified teachers will pose a problem.

Table 2-15 Increase Number of the Teachers

School	D-4	D-11	D-od	O-2	O-6	O-7	Total
Number of Students in 2004	885	412	120	720	634	812	3,583
Number of Classes in 2004	25	12	4	20	18	23	102
Number of Students in 2007	1,434	678	439	899	739	1,259	5,450
Number of Classes in 2007	40	19	13	25	21	35	153
Increase of Classes	15	7	9	5	3	12	51
Increase of Teachers	15	7	9	5	3	12	51

At Darkhan No.11 school where a new boiler is installed, it will be necessary to hire two boiler engineers, thereby also increasing the cost of labor.

## 2-4-2 Maintenance Plans

The maintenance activities of school facilities have been carried out under the responsibility of the schoolmaster within the budget appropriated to the school by the Province, including simple repairs such as repainting, re-flooring, and changing broken glass and/or light. Each school has a "School Management Committee" constituted of teachers, parents, and residents in the neighborhood. The Committee functions as the main organization for school management and maintenance. In many cases the school depends upon the Committee for maintenance work including labor in the repair of school equipment and furniture. The larger scale repair work goes beyond the Provincial budget. At the same time, it is hardly possible to receive any subsidy from the National budget.