

**IMPLEMENTATION REVIEW STUDY REPORT  
ON  
THE PROJECT  
FOR  
CONSTRUCTION OF PRIMARY SCHOOLS  
IN  
PHNOM PENH  
IN  
THE KINGDOM OF CAMBODIA**

**JULY 2004**

**JAPAN INTERNATIONAL COOPERATION AGENCY  
SYSTEM SCIENCE CONSULTANTS INC.**

GM
JR
04-101

## PREFACE

In response to a request from the Government of the Kingdom of Cambodia, the Government of Japan decided to conduct an Implementation Review Study on the Project for Construction of Primary Schools in Phnom Penh and entrusted the study to Japan International Cooperation Agency (JICA).

JICA sent a study team to Cambodia from February 28 to March 18, 2004. The study team held discussions with the officials concerned of the Government of Cambodia, 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 the Kingdom of Cambodia for their close cooperation extended to the Team.

July, 2004

Yasuo Matsui  
Vice President  
Japan International Cooperation Agency

July, 2004

Letter of Transmittal

We are pleased to submit to you the implementation study report on the Project for Construction of Primary Schools in Phnom Penh in the Kingdom of Cambodia.

This study was conducted by System Science Consultants Inc., under a contract with Japan International Cooperation Agency, during the period from February to July, 2004. In conducting the study, we examined the feasibility and rationale of the Project with due consideration to the present situation of Cambodia and formulated the most appropriate basic design 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,

Mutsumi Gando  
Project Manager  
Implementation Review Study Team on  
the Project for Construction of  
Primary Schools in Phnom Penh  
System Science Consultants Inc.



LOCATION OF PROJECT SITE



Perspective

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## Photographs of Situations at Project Sites

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### No.1 Bak Touk



Access Road  
Many stalls standing side by side



One-Story Classroom Building



Two-Story Classroom Building



Toilet Facilities for Pupils



Construction Site for Project  
Classroom Building  
Upper parts of the decrepit buildings to  
be demolished have been removed. The  
foundation still remains.

---

### No.2 San Thor Mok



Access Road



One-Story Classroom Building



Three-Story Classroom Building  
(granted by EC)



Three-Story Classroom Building  
(granted by EC)



Open Corridor in Three-Story  
Classroom Building



Scene of a class in progress in  
Three-Story Classroom Building

---



Construction Site for Project  
Classroom Building  
Upper parts of the decrepit buildings to be demolished have been removed. The foundation part still remains.

---

### No.3 Toul Kok



Access Road



One-Story Classroom Building



Same on the Left



Toilet Facilities for Pupils



Drainage Conduit  
Drainage main pipe will be installed parallel to the existing conduit shown in the picture.



Construction Site for Project  
Classroom Building  
Foundation part of the removed facilities remains.

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### No.4 Anu Wat Reach Theany



Access Road



Two-Story Classroom Building  
(granted by a Norwegian NGO)



Open Corridor of Two-Story  
Classroom Building

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Desks and Chairs Granted by Japan



Toilet Facilities for Pupils  
Newly built at the space underneath  
staircases after the Basic Design Study



Construction Site for Project  
Classroom Building  
Site control is required in that the site is  
sloped with slight grade

---

### No.5 Boeung Salang



Access Road



One-Story Classroom Building



Inside Classroom of One-Story  
Classroom Building

---



Toilet Facilities for Pupils



One-Story Classroom Building  
To be demolished instead of the existing  
administration building shown below.



One-Story Classroom Building with  
Reinforcing Bars Exposed

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Cracked Pillars and Beams of  
One-Story Classroom Building



Existing Administration Building  
Planned to be demolished in the Basic  
Design Study, but will continued to be  
used with thorough repair



Construction Site for Project Toilet  
Facilities

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**No.6 Phum Russey**

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Access Road



One-Story Classroom Building



Toilet Facilities for Pupils  
No longer used. To be demolished.

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Existing Canteen Building  
Granted by a French NGO. Required to be demolished as it hinders the construction of project classroom building



Confirmation of locations for existing canteen building and project classroom building

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## **Abbreviations**

ADB	Asian Development Bank
A/P	Authorization to Pay
B/A	Banking Arrangement
BHN	Basic Human Needs
CREP	Construction et Rehabilitation des Ecoles Primaires
EC	European Commission
EFA	Education for All
EMIS	Education Management Information System
EQIP	Education Quality Improvement Program
ESD	Education Sector Development
ESP	Education Strategic Plan
ESSP	Education Sector Support Plan
IMF	International Monetary Fund
JICA	Japan International Cooperation Agency
MoEYS	Ministry of Education, Youth and Sport
NPRD	National Program to Rehabilitate and Develop Cambodia
NPRS	National Poverty Reduction Strategy
PAP	Priority Action Program
P/Q	Pre-Qualification
SEDP	Socio-Economic Development Plan
SEDP2	Second Socio-Economic Development Plan
SSC	School Supporting Committee
TTC	Teacher Training Center
UNICEF	United Nations International Children's Fund
WB	World Bank

## SUMMARY

## Summary

The Government of Cambodia, in pursuing the realization of its overall goal in the education sector, “Education for All, EFA”, has drawn up the “Education Strategy Plan, ESP” and the “Education Sector Support Program, ESSP.” The ESP is a 5-year plan aiming at 1) encouraging equitable access to education; 2) improving the quality and efficiency of education services; and 3) improving the ability required for sustainable reforms of organizations and the decentralization of authority. In particular, in relation to 1) encouraging equitable access to education, the ESP has set 2005 as the target year for complete provision of additional classrooms to schools which currently suffer from overcrowded classrooms or are likely to do so in the near future. The ESSP, on the other hand, is a 5-year strategic action plan set forth in order to realize the goals in the ESP. The program includes the “Education Facilities Development Program 2001-2005” which aims at the expansion of access to a primary education through 1) shortening the distance to schools (within 3 kilometers); 2) easing extreme overcrowding; and 3) lessening the number of incomplete primary schools.

Meanwhile, a rapid increase in the number of school aged children is outstripping the construction of school facilities, which has created serious shortage of such facilities in the country. An influx of people from rural areas and other factors make the problem particularly serious in Phnom Penh, where the average number of pupils per classroom at the primary schools in the city was 96.3 in 2000; 95.2 percent of them were obliged to give classes under extremely poor environments: adopting the dual shift system or mobile classes; shortening the classroom time under the triple-shift classes; or even making use of decrepit or temporary classrooms.

Under such circumstances, Phnom Penh has been improving the class environments with assistance provided by donors and other bodies, but has not yet eliminated the problem of classroom shortage, and found it difficult to implement a large-scale project of constructing classrooms with its own self-help efforts on a limited budget. Accordingly, the Government of Cambodia in 1999 requested the Government of Japan to conduct a Grant Aid Cooperation concerning the reconstruction and extension of new buildings at primary schools in Phnom Penh.

Following the Request stated above, the Government of Japan conducted from March to September 2002 a Basic Design Study, in line with which it concluded an Exchange of Note in November 2002 with a maximum amount of grant of 577 million yen. The Project schools and components are tabulated on the next page.

Afterwards, a Detailed Design Survey was conducted in December 2002, and based on the results of the Survey, a tender for the Project under the Grant Aid Cooperation was held in January 2003, which ended in failure. In February and March, tenders were carried out again, but fell through again, making it difficult to secure the planned construction schedule, so that the Government of Japan in October 2003 announced the cancellation of this Project with the consent of the Government of Cambodia.

Following such backgrounds, the Government of Japan determined to review the Basic Design, among other things, necessary to implement this Project as a newly launched project, and dispatched a Implementation Review Study Team to the site from February 28 to March 18 2004.

<b>Outline of the 2002 Project for Construction of Primary Schools in Phnom Penh in the Kingdom of Cambodia</b>													
<b>a) Project Area</b>													
Phnom Penh City													
<b>b) Project Schools and Components</b>													
Name of School		Classrooms to be constructed	Facilities					Total Floor Area (m <sup>2</sup> )	Furniture/Fixings				
			Toilet				Student Desk & Chairs			Teachers' Desk & Chair	White Boards		
			No. of Female Toilet Bowls	No. of Male Toilet Bowls	No. of Male Urinals	No. of Toilets for the Disabled	Large		Small			Total	
1	Bak Touk	27	7	3	8	2	2,258.20	216	324	540	27	54	
2	San Thor Mok	36	9	4	8	2	2,915.99	288	432	720	36	72	
3	Toul Kok	21	5	2	6	2	1,730.60	168	252	420	21	42	
4	Anu Wat Reach Theany	24	6	3	6	2	2,031.58	192	288	480	24	48	
5	Boeung Salang	21	5	2	6	2	1,896.38	168	252	420	21	42	
6	Phuom Russey	18	5	2	6	2	1,514.60	144	216	360	18	36	
Total		147	37	16	40	12	12,347.35	1,176	1,764	2,940	147	294	

In the Implementation Review Study, the contents of the Project drawn at the time of its Basic Design (Project schools, components, size, costs, and so on) were reviewed on the premise that 1) half of the Project classrooms in San Thor Mok school, No.2 – 18 out of 36 classrooms scheduled to be constructed when the Basic Design was prepared – would be excluded from this Project, as Proposed by the Cambodian side for the purpose of cuts in the total Project costs, and 2) Phuom Russey school, No. 6 – 18 classrooms scheduled in the Basic Design – would also be excluded from the Project due to its difficulties in construction planning.

As a result of the Study, it was found that the number of pupils at the five schools covered by the Project, except for Phuom Russey school, No. 6, put out of the scope of the Project, would be below the estimate at the time when the Basic Design was drawn. But even if all the classrooms are constructed in accordance with the number determined in the Basic Design, the classrooms are expected to be fully taken advantage of partly because the number of shifts in San Thor Mok school is 2.46 whereas that of the remaining four schools is 1.7-1.9. Therefore, the numbers of Project classrooms will be set at 18 at San Thor Mok school, No.2, and at 93 at the remaining five schools as determined in the Basic Design. The total number of classrooms will be thus 111 as a whole.

The layout plan of Project facilities follows the Basic Design in principle, but as for Boeung Salang school, No.5, where the situation concerning the existing facilities has been changed, the type of classroom buildings, together with the arrangement of all the facilities, has been changed. For Anu Wat Reach Theany

school, Nol.4, at the same time, the arrangement of toilet facilities has been altered in line with the plan to install main drainage pipes which will be conducted by the Cambodian side.

Concerning the floor plan of the classroom buildings, the rectangular floors of 7m width and 8m length and the corridors of 2m width are the most common forms at primary schools in Cambodia, so that those set in the Basic Design are adopted. Also, a classroom and meeting room (movable partitions will used as walls between some classrooms: two to three classrooms will be connected and used as a large meeting room. Lighting equipment will be installed inside the room and all the corridors facing the room) is highly versatile and thus is expected to be taken advantage of as a place for the Cluster activities including teachers at neighboring primary schools. Thus, the contents of the Basic Design are preserved.

Where toilet facilities are concerned, as planned in the Basic Design, one booth or so will be installed per two Project classrooms. Also, one booth each for males and females of the toilet facilities for the disabled, which teachers can also use, will be installed. On the other hand, the drainage plan is changed – the septic tanks in the toilet facilities at all Project schools will be connected to the main drainage pipes, so that wastewater will be discharged to the main pipes. Phnom Penh city has already earmarked the budget for the installation of the drainage pipes for the Project schools.

Furniture and fixtures will include, as set in the Basic Design, desks and chairs for pupils and teachers, and whiteboards.

Apart from these, for two Project schools which the piling foundation is adopted, the pressed-in pile method will be applied for the purpose of caring neighboring residents in the urban areas, in that this method generates neither noise nor vibration.

The Project schools and components planned in the result of this Implementation Review Study are shown below.

**Table Project Schools and Components**

Name of School		Facilities					Furniture/Fixings					
		Classrooms to be constructed	Toilet				Total Floor Area (m <sup>2</sup> )	Student Desk & Chairs			Teachers' Desk & Chair	White Boards
			No. of Female Toilet Bowls	No. of Mail Toilet Bowls	No. of Male Urinals	No. of Toilets for the Disabled		Large	Small	Total		
1	Bak Touk	27	7	3	8	2	2,258.195	216	324	540	27	54
2	San Thor Mok	18	5	2	6	2	1,514.595	144	216	360	18	36
3	Toul Kok	21	5	2	6	2	1,730.595	168	252	420	21	42
4	Anu Wat Reach Theany	24	6	3	6	2	2,039.990	192	288	480	24	48
5	Boeung Salang	21	5	2	6	2	1,730.595	168	252	420	21	42
6	Phuom Russey	-	-	-	-	-	-	-	-	-	-	-
Total		111	28	12	32	10	9,273.970	888	1,332	2,220	111	222



The total cost estimation for the implementation of this Project under the grant aid cooperation of the Government of Japan is expected to amount to 598 million yen (495 million yen to be borne by the Japanese side, as 3 million yen by the Cambodian side). The total period required for the construction is approximately 16 months including the period for detailed designing.

The following benefits are expected after Project implementation:

[Direct Effect]

- 1) The construction of new classrooms will enable 8,880 pupils to learn at new classrooms in fresh environments, and eliminate triple-shift classes (in one school) and mobile classes (in three schools). It will also make it possible to give appropriate classes matching the educational targets and curriculums and to improve learning environments at the Project schools.
- 2) The installation of toilet facilities whose number is satisfactory in accordance with the number of classrooms, and whose facilities are appropriate enough, will relieve shortage of toilets and improve the sanitary conditions at the Project schools.

[Indirect Effect]

- 1) The shortage of toilet facilities for girls has been a serious problem. The improvement of such facilities is expected to help improving an access of girls to schools.
- 2) Classrooms which can also be used as a meeting room will be constructed in this Project. They are expected to be used as a place for the Cluster activities including teachers at neighboring primary schools. Therefore, the installation of these dual-purpose rooms will promote the Cluster activities and contribute to the improvement of the quality of educational services.
- 3) The facilities to be built in this Project can also be used for social learning activities for adults and community activities and other non-educational purposes, and thus are expected to contribute to the local communities.

The implementation of this Project will induce lack of teachers in some schools and surplus in others. However, this problem can be solved by reallocation of teaching staff among the schools whereas the numbers of teachers in all the five schools add up to a redundant number as a whole. Additional operational and maintenance costs (electric fees, water charges, and maintenance costs) accrued due to this Project will be approximately 24.2 million Riel, which account for 0.14 percent of all the budgets for fiscal 2002/2003 for education in Phnom Penh. Thus, the expenses will be able to be covered by the budget.

As described above, this Project is expected to generate many beneficial effects, and has no particular problem with its operation and maintenance. Thus, the implementation of this Project has a high value and

is deemed worthy and meaningful enough to receive Japan Grant Aid Cooperation. However, for efficient and effective implementation, the Cambodian side should conduct the following tasks:

- 1) Arrangement of appropriate maintenance of the Project facilities by persons concerned at the schools and the local communities.
- 2) Effective use of the facilities for informal education services, meetings for local residents, and other purposes by the local communities.

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**CHAPTER 1**  
**BACKGROUND OF THE PROJECT**

## **Chapter 1. Background of the Project**

### **(1) Background**

In Cambodia, a rapid increase in the number of school-aged children is outstripping the construction of school facilities, which has created serious shortage of such facilities in the country. An influx of people from rural areas and other factors make the problem particularly serious in Phnom Penh, where the average number of pupils per classroom at the primary schools in the city was 96.3 in 2000; 95.2 percent of them were obliged to give classes under extremely poor environments: adopting the dual shift system or mobile classes; shortening the classroom time under the triple-shift classes; or even making use of decrepit or temporary classrooms.

Under such circumstances, Phnom Penh has been improving the class environments with assistance provided by donors and other bodies, but has not yet eliminated the problem of classroom shortage, and found it difficult to implement a large-scale project of constructing classrooms with its own self-help efforts on a limited budget. Accordingly, the Government of Cambodia in 1999 requested the Government of Japan to conduct a grant aid cooperation concerning the reconstruction and extension of new buildings at primary schools in Phnom Penh.

Following the request stated above, the Government of Japan conducted from March to September 2002 a Basic Design Study, in line with which it concluded an Exchange of Note in November 2002 with a maximum amount of grant of 577 million yen.

Afterwards, a Detailed Design Survey was conducted in December 2002, and based on the results of the Survey, a tender for the Project under the Grant Aid Cooperation was held in January 2003, which ended in failure. In February and March, tenders were carried out again, but fell through again, making it difficult to secure the planned construction schedule, so the Government of Japan in October 2003 announced the cancellation of this Project with the consent of the Government of Cambodia.

The Implementation Review Study of this Project is aimed at reviewing the Basic Design, among other things, necessary to implement this Project as a newly launched project.

### **(2) Outline of Basic Design**

#### **a) Project Area**

Phnom Penh City

#### **b) Project Schools and Components**

The project schools and the components at the Basic Design Stage are shown in the table below.

**Table 1-1 Project Schools and Components at the Basic Design Stage**

School Name		Facility						Equipment				
		No. of Classrooms	Toilets				Total Floor Area (m <sup>2</sup> )	Desks & Chairs for Pupils			Desks & Chairs for Teachers	White Boards
			No. of Female Toilet Bowls	No. of Male Toilet Bowls	No. of Male Urinals	No. of Toilet Bowls for Disabled		Large	Small	Total		
1	Bak Touk	27	7	3	8	2	2,258.20	216	324	540	27	54
2	San Thor Mok	36	9	4	8	2	2,915.99	288	432	720	36	72
3	Toul Kok	21	5	2	6	2	1,730.60	168	252	420	21	42
4	Anu Wat Reach Theany	24	6	3	6	2	2,031.58	192	288	480	24	48
5	Boeung Salang	21	5	2	6	2	1,896.38	168	252	420	21	42
6	Phuom Russey	18	5	2	6	2	1,514.60	144	216	360	18	36
Total		147	37	16	40	12	12,347.35	1,176	1,764	2,940	147	294

## CHAPTER 2

### CONTENTS OF THE PROJECT (SCHEMATIC DESIGN LEVEL)



## **Chapter 2. Contents of the Project (Schematic Design Level)**

### **2-1 Outline of the Project**

#### **2-1-1 Overall Goal and Project Purpose**

Currently in Cambodia, it is difficult to construct enough primary educational facilities to cope with the problem of sharp increases in the number of students caused by the recent explosive growth in population. In Phnom Penh, in particular, classroom shortages have become a serious problem which was brought about primarily by the influx of people from rural areas. The average number of pupils per classroom at primary schools in the city was 96.3 in 2000. Quite a few primary schools have been obliged to hold classes in dual shifts or mobile classes, or shorten the study hours to give classes on the basis of three shifts. At the same time, such schools have no choice but to give lessons under extremely poor circumstances, such as making use of decrepit or makeshift classrooms.

To deal with the above-mentioned situation, the Government of Cambodia has developed the “Education Strategic Plan (ESP)” and the “Education Sector Support Program (ESSSP)”, in their effort to achieve an “Education for All (EFA)”, and has been striving for the solutions of these problems. The ESP is a five-year plan principally aiming at (1) assuring of equitable access to education, (2) improved quality and efficiency of education services, and (3) sustainable institutional development and capacity building for decentralization. Particularly in relation to (1) above which concerns assuring of equitable access to educational services, the ESP has set 2005 as the target year for complete provision of additional classrooms in all current as well as projected overcrowded schools in the near future. The ESSSP, on the other hand, is a five-year strategic action plan in conjunction with the ESP. The program incorporates an “Education Facilities Development Program 2001 to 2005” which promotes the construction of more facilities to expand access to primary education, in pursuit of (1) shortening the distance to schools (within 3 kilometers), (2) dissolving extreme overcrowding, and (3) reducing the number of incomplete cycle primary schools.

Under such circumstances, this Project intends to set “assuring equitable access to education” and “improved quality and efficiency of education services” under the ESP as the overall goal, and set the improvement of the learning environment at the schools to be covered by the Project as the project purpose.

#### **2-1-2 Outline of the Project**

In order to achieve the purpose stated above, this Project is designed to improve educational facilities at the six Project schools in Phnom Penh. Specific plans to be covered in the Project are to construct 129 classrooms and toilet facilities, and to procure educational furniture and fixtures.

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

### **2-2-1 Design Policy**

#### **2-2-1-1 Basic Policy**

In this Implementation Review Study, the contents of the Project (project schools, components to be

covered, the scale of project, the contents of the design, project cost and so on) formulated at the time of the Basic Design will be reviewed. However, the review will be carried out upon the premise that 18, a half, of the 36 classrooms at the San Thor Mok school initially included in the Basic Design of the Project will be excluded. The Cambodian side has agreed to the exclusion for the reduction of the total project costs.

### (1) The Current Situations of the Project Schools

The state of the six project schools as of 2004 is presented in the table below. All the schools except for the Phum Russey school, No.6, see reductions in the total number of pupils. In particular, the reduction in the number is substantial at three schools, Nos. 1, 2 and 3, located in the vicinity of the central part of Phnom Penh (a reduction of approximately 1,100 pupils at No.1, approximately 300 pupils at No.2, and approximately 700 at No.3). On the other hand, the magnitude of the reduction is relatively small at schools, Nos. 4, 5, and 6, which are all located on the fringe of the city (an increase of the number by approximately 30 to a drop of the number by 300).

**Table 2-1 Current Operating Conditions of the 6 Project Schools (2004)**

No	School Name	No. of pupils in 2001/2002 at the time of Basic Survey (No. of classes in the lower column)	No. of pupils in 2003/2004 (No. of classes in the lower column)							Average No. of pupils per class	No. of class shifts	No. of mobile classrooms	No. of classrooms in use	Average No. of pupils per classroom
			Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Total					
1	Bak Touk	7,748	941	1,012	1,106	1,162	1,118	1,250	6,589	40.9	2	26	60	54.9
		164	22	27	28	28	28	28	161					
2	San Thor Mok	6,891	1,099	1,001	1,075	1,143	1,068	1,208	6,594	45.5	2	8	49	67.3
		140	24	24	24	25	24	24	145					
3	Toul Kok	6,954	1,162	951	1,013	1,127	1,085	935	6,273	35.6	2	27	61	51.4
		172	33	28	28	30	30	27	176					
4	Anu Wat Reach Theany	2,802	563	428	458	492	456	375	2,772	41.4	2	0	18	77.0
		46	12	12	10	12	11	10	67					
5	Boeung Salang	2,982	613	400	388	422	389	399	2,611	37.3	3	0	24	36.3
		72	16	12	11	11	11	9	70					
6	Phum Russey	1,901	403	321	337	325	323	231	1,940	52.4	3	6	10	64.7
		34	5	6	7	7	7	5	37					
Total		29,278	4,781	4,113	4,377	4,671	4,439	4,398	26,779	40.8	-	67	222	58.6
		628	112	109	108	113	111	103	656					

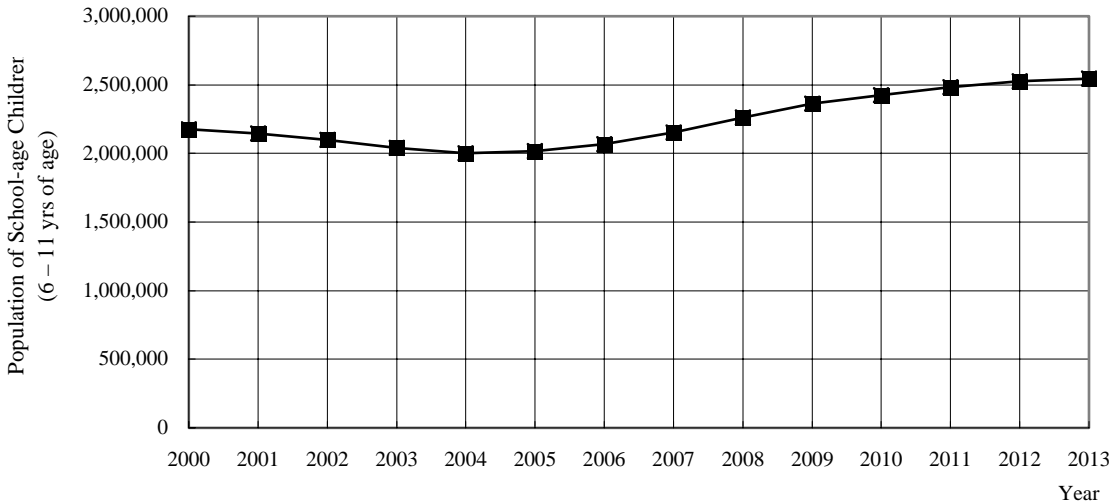
The Basic Design has estimated the number of pupils in the coming four years after the year when the survey was conducted. According to this, the total numbers of pupils at schools, Nos.1-3, will decrease whereas those at schools, Nos. 4-6, are expected to increase. (See the table below.)

**Table 2-2 The number of pupils in the target year (2005) at the project school, estimated at the Basic Design Stage**

No	School Name	Expected number of pupils in 2005/2006
1	Bak Touk	7,304
2	San Thor Mok	6,780
3	Toul Kok	6,645
4	Anu Wat Reach Theany	3,396
5	Boueng Salang	3,533
6	Phum Russey	2,285

The latest survey confirmed that the former, schools nos.1-3, saw larger reductions in the number of pupils than expected, whereas the latter, schools nos. 4-6 except for no.6 Phum Russey School, showed a downward trend in the number of pupils against the expectation. Sources of the Cambodian side and persons at each project school said that the following factors were responsible for the downward trends:

- (1) At Bak Touk school, No.1, and San Thor Mok school, No.2, the work to remove existing old classrooms (9 classrooms at No.1 and 12 at No.2), whose costs were borne by the Cambodian side, was completed so quickly (although the foundation parts of the facilities have remained existing), so that the capacity of the schools substantially declined, obliging some pupils to move out to different schools.
- (2) In urban areas where there are many families living in poverty, the residential environments and labor conditions are particularly severe. Accordingly, a large number of pupils are likely to move all at once when their parents are able to find jobs with good conditions or better residences somewhere else.
- (3) A nationwide reduction in birthrate during the period of the Pol Pot regime (1975 – 1978) occasioned a substantial fall in the number of pupils at primary schools afterwards. The period between 2000 and 2005 falls in the second cyclical period of such drops in the number of pupils. During this period, the number of pupils is expected to show a downward trend. (The drop is expected to come to a halt in 2004, and the number will increase in 2007 – 2008 up to the level marked in 2000. See the chart below.)



**Figure 2-1 Estimated Trends of the Population of School-age Children in Cambodia (2000 – 2013)**

Source: National Education for All 2003-2015

## (2) The number of Existing Classrooms at the Project Schools

The state of the existing classrooms as of 2004 is presented in the table below. The numbers of usable classrooms have changed since the time when the Basic Design was conducted at Toul Kok school, No.3, and Boeung Salang school, No.5. At Touk Kok school, No.3, the administration building has been demolished and removed: the facts that the building included one classroom and that another one existing classroom has been converted to a storage for equipment are the reason for the reduction in the number of usable classrooms. As for Boeung Salang school, No.5, the administration building scheduled to be demolished at the time of Basic Design has been reformed carefully, and has now been used as a facility incorporating rooms for the headmaster and the deputy head, office rooms, meeting rooms, and two classrooms. (Since the administration building was donated by the current Prime Minister, Hun Sen, and has been chosen as a core school under the cluster system, the Cambodian side wished to continue using the building.) Apart from this, the school possesses a decrepit classroom building (with five classrooms), wishing that it will be demolished. This decrepit classroom building has cracks and peels on various places, and is hazardous: the intension of the Cambodian side seems to be reasonable. Therefore, the decrepit classroom building stated above is determined to be subject to the demolition, and its five classrooms are excluded from the counting of the usable classroom.

Incidentally, at the time of Basic Design, Bak Touk school, No.1, SanThour Mok school, No.2, and Boeung Salang school, No.5, had classroom buildings to be demolished. However, the buildings at two out of the three sites, the schools Nos. 1 and 2, have been already demolished with the exception of the foundation parts. Temporary classrooms no longer exist, apart from one classroom at Boeung Salang school, No.5. Also, there is no classroom any more for the provision of classes for kindergarten.

**Table 2-3 Number of Existing Usable Classrooms at Project Schools**

No	School Name	No. of Classrooms in Use	No. of Temporary Classrooms	No. of Classrooms to be Demolished due to their poor conditions	No. of Kindergarten Classrooms	No. of Existing Usable Classrooms	No. of Usable Classrooms counted at the time of Basic Design
1	Bak Touk	60	0	0 (9 rooms already demolished)	0	<b>60</b>	60
2	San Thor Mok	49	0	0 (12 rooms already demolished)	0	<b>49</b>	49
3	Toul Kok	61	0	0	0	<b>61</b>	63
4	Anu Wat Reach Theany	18	0	0	0	<b>18</b>	18
5	Boueng Salang	24	1	5	0	<b>18</b>	22
6	Phuom Russey	10	0	0	0	<b>10</b>	10

## (3) Examination of the number of classroom shortages and the number of project classrooms determined at the time of Basic Design

At the time when the Basic Design was conducted, the expected number of classroom shortages was calculated on the basis of the number of usable classrooms as of 2002, and based on three basic

conditions: (1) the expected number of pupils in the target year (2005); (2) the number of pupils per classroom (40 pupils); and (3) the implementation of classes in the dual shifts. But in order to investigate the shortage or surplus of the number of project classroom at present when one and a half year has passed since the formulation of the plan by Basic Design, the number of classroom shortages at each project school is calculated with the formula and the conditions used in the Basic Design – dual shifts and 40 pupils per classroom – and the numbers of pupils and usable classrooms as of March 2004 (in the 2003/2004 academic year).

Necessary no. of classrooms = no. of pupils in 2003/2004 ÷ 2 shifts ÷ 40 pupils per classroom

No. of classroom shortages = no. of necessary classrooms - no. of existing usable classrooms

**Table 2-4 Conditions required for calculation of the number of classroom shortages**

	At the time of Basic Design	Calculation to investigate whether the calculation of the number of classrooms to be constructed in the Basic Design is appropriate
(1)	Number of pupils: expected number of pupils in the target year (2005/2006 academic year)	Number of pupils as of March 2004 (2003/2004 academic year)
(2)	Number of pupils per classroom: 40	Same as on the left
(3)	Method of giving classes (number of shifts): two shifts	Same as on the left

The table below shows the overs and shorts of the number of project classrooms obtained by comparing the number of project classrooms which was determined in the Basic Design and the number of classroom shortages calculated above. (As for San Thor Mok school, No.2, 18 classrooms, a half, of the 36 classrooms to be constructed, which was calculated at the time of the Basic Design, are excluded from the comparison.)

The examination of the shortage or otherwise of project classrooms under these conditions suggests that there will be 16 classroom shortages at San Thor Mok school where the number of project classrooms has been reduced. At other project schools, on the other hand, there are surplus of classrooms up to seven (at Anu Wat Reach Theany school, No.4), or three at minimum (at Toul Kok school, No.3 and Phum Russey school, No.6). There are 7 excessive classrooms at the six schools as a whole.

**Table 2-5 Examination of the number of classroom shortages in the 2003/2004 academic year at project schools and the number of Project classrooms determined at the Basic Design Stage**

No	School Name	No. of pupils in 2003/2004	No. of classrooms required	No. of usable classrooms	(A) No. of classroom shortages in 2003/2004	(B) No. of Project classrooms set in the Basic Design (2002)	Difference between No. of Project classrooms and No. of shortages (B) – (A)
1	Bak Touk	6,589	83	60	23	27	4
2	San Thor Mok	6,594	83	49	34	18*	-16
3	Toul Kok	6,273	79	61	18	21	3
4	Anu Wat Reach Theany	2,772	35	18	17	24	7
5	Boeung Salang	2,611	33	18	15	21	6
6	Phum Russey	1,940	25	10	15	18	3
	Total	26,779	338	216	122	129	7

Note: \* For San Thor Mok school, No.2, the number of project classrooms has been halved from 36 as set in the Basic Design to 18.

#### (4) Examination of the Number of Shifts

In order to examine the number of project classrooms determined at the time of Basic Design in terms of the number of shifts, the number of shifts at each project school is calculated, taking into account that the number of project classrooms determined in the Basic Design is added to the number of existing usable classrooms; the current number of pupils; and the condition that there are 40 pupils per classroom. (As for San Thor Mok school, No.2, 18 classrooms, a half, of the 36 project classrooms, which was determined at the time of the Basic Design, are excluded from the calculation.)

The results are shown in the table below. The number of shifts at the project schools, except for San Thor Mok school, No.2, falls in the range of 1.65 – 1.91. The number for San Thor Mok school, No.2, is 2.46. The average number of the six Project schools is 1.94.

**Table 2-6 Examination of Number of Shifts at Project Schools**

No	School Name	No. of pupils in 2003/2004	(A) No. of usable classrooms	(B) No. of Project classrooms set in the Basic Design	Sum of Nos. of usable classrooms and Project classrooms (A)+(B)	No. of shifts in cases where schools are operated with all classrooms ((A) + (B))	No. of pupils per classroom in cases where classes are conducted with all the rooms under dual shifts.
1	Bak Touk	6,589	60	27	87	<b>1.89</b>	37.87
2	San Thor Mok	6,594	49	18 *	67	<b>2.46</b>	49.21
3	Toul Kok	6,273	61	21	82	<b>1.91</b>	38.25
4	Anu Wat Reach Theany	2,772	18	24	42	<b>1.65</b>	33.00
5	Boeung Salang	2,611	18	21	39	<b>1.67</b>	33.47
6	Phuom Russey	1,940	10	18	28	<b>1.73</b>	34.64
	Total	26,779	216	129	345	<b>1.94</b>	38.81

Note: \* For San Thor Mok school, No.2, the number of classrooms to be constructed has been halved from 36 as set in the Basic Design to 18.

#### (5) The Number of Project Classrooms

As shown above, the number of pupils at the six schools covered by the Project is below the estimate at the time of Basic Design. If all the classrooms are constructed in accordance with the number determined in the Basic Design and classes are given in dual shifts, five schools (with the exception for San Thor Mok school, No.2) will have a surplus of seven classrooms, but it seems reasonable to proceed the Project for the five schools stated above according to the plan formulated in the Basic Design, due to the following reasons:

- (1) The downward trend in the number of pupils, a determinant for generating surplus of project classrooms, is observable nationwide and continues until 2005. But the trend is expected to turn around afterwards.
- (2) At Bak Touk school, No.1, and San Thor Mok school, No.2, the aggressive approach to this Project (extremely rapid action to demolish the buildings) triggered the outflow of some pupils, which resulted in part in surplus of classrooms at least on a calculation basis.
- (3) The implementation of this Project as determined in the Basic Design will not necessarily

produce redundant classrooms, in that the number of shifts for classes falls in the range of 1.7 – 1.9. Thus all the classrooms scheduled to be constructed are expected to be made full use of.

Therefore, 129 classrooms will be constructed under the Project – 18 classrooms for San Thor Mok school, No.2, and 111 classrooms for the remaining five schools as planned in the Basic Design.

#### **(6) Calculation of the Number of Toilet Facilities**

In the Basic Design, the number of toilets for the Project was calculated as 1 toilet booth for pupils per 2 newly constructed classrooms, and one toilet booth each for men and women for the disabled, which can also be used by teachers. In the light of the situations at local primary schools, the calculation set forth above is deemed as appropriate, and the number of toilet facilities will be set as determined in the Basic Design. However, as for San Thor Mok school, No.2, the number of toilets for pupils will be reduced in accordance with the reduction in the number of project classrooms.

#### **(7) Furniture and Fixtures, and Equipment Component**

In the Basic Design, it was determined that the provision of furniture and fixtures, and equipment component would be minimized; desks and chairs for pupils, tables and chairs for teachers to be used in the ordinary classrooms, together with whiteboards, were considered to be supplied.

Where desks and chairs for pupils and tables and chairs for teachers are concerned, the plan determined in the Basic Design is considered appropriate. Concerning whiteboards, only one school out of the six project schools makes use of whiteboards, while the remaining five use ordinary blackboards. However, the Ministry of Education, Youth and Sport, and the Education Bureau of Phnom Penh intend to encourage the use of whiteboards at schools in order to avoid pollution caused by chalk dust, and hence the Project will provide whiteboards as set forth in the Basic Design. Therefore, the contents of furniture and fixtures, and equipment component will be all provided as set in the Basic Design. However, the number of items will be reduced in accordance with the number of project classrooms at San Thor Mok school, No.2.

#### **(8) Facility Component**

In the Basic Design, it was determined that water supply and drainage facilities including a water storage tank and a septic tank for the toilet facilities; and lighting equipment for some classrooms which are also used as meeting rooms, the corridors in front of such rooms, and toilet facilities for the disabled, would be installed for the toilet facilities to be constructed under the Project. The provision of the water supply and drainage facilities with the toilet facilities is considered appropriate in the light of the situation of local primary schools. As for the lighting equipment, ordinary classrooms at some existing primary schools are equipped with lighting equipment in considering the dual or triple-shift system, but for the Project schools, the plan set forth in the Basic Design will be maintained for the purpose of minimizing the contents of facilities to be provided. Thus, the contents of facility component will be provided as set in the Basic Design.

## **2-2-1-2 Consideration for the Natural Environment**

### **(1) Soil Condition**

The nature of the soil in Phnom Penh is formed, as described in the Basic Design Study Report, of accumulated sediment from the Mekong River located to the east of the city. It is covered by a silt and clay pile mix about 10 to 15 meters in depth and has a low bearing capacity of soil. At the depth of lower than 15 meters below grade, the soil is composed more of sandy clay bed or a sandy bed with gravel, where the soil bearing capacity is as high as around 10 t/m<sup>2</sup>. At the depth of 25-30 meters below grade, the soil bearing capacity of the foundation bed in some sites reaches more than 50 t/m<sup>2</sup>, where the soil is composed of harder sandy clay beds.

Since the bearing capacity of soil varies among individual sites, most suitable types of building foundation, construction methods and construction schedules will be examined in accordance with the boring tests conducted at the time of Basic Design survey.

### **(2) Climate**

The policies presented in the Basic Design Study Report paid attention to the tropical monsoon climate conditions and were set as (1) to ensure heat insulation of the buildings to deal with the high temperatures; (2) to ensure large windows for air ventilation and high ceilings to allow large air volume flow inside the rooms in order to deal with the high temperature and humidity; (3) to heighten the waterproof performance of the buildings in the light of the large amount of rain; and (4) to store rainwater in a water tank and make use of it for toilet facility. These policies are drawn up in consideration for the situation at existing local primary schools, and incorporate methods commonly used, so that these are considered appropriate and will be taken advantage of.

Where the measures against high humidity mentioned in (2) are concerned, in particular, attention should be paid not only to the ventilation in the rooms but also to the vapor arising from inside the earth to the slab on grade – vapor-proof polyethylene film will be laid down underneath the slab on grade, and other measures will be taken.

### **(3) Earthquakes**

As confirmed in the Basic Design, there is no record concerning earthquakes for the past 30 years kept in the Department of Meteorology, the Ministry of Water Resources and Meteorology. At the same time, since earthquakes have not been taken into account in other similar projects implemented in Cambodia, they will not be taken into consideration in this Project either.

### **(4) Termites**

The Basic Design specifies that the bottom of excavation and backfilled soil must be treated with anti-termite chemicals in order to prevent termite damages. On top of this, anti-termite chemicals will be used for wooden fittings to be used for all the opening mouths of the facilities in the Project.



### **2-2-1-3 Consideration for the Social Conditions**

The considerations incorporated in the Basic Design that slope ramps on the first floor of classroom buildings will be installed, and that toilet facilities with slopes for the disabled will be provided, are appropriate. Thus the Project will follow these considerations.

### **2-2-1-4 Policy for the Construction Conditions**

The Basic Design paid attention to the Cambodian governmental policy for protection of forests, and the anti-termite measure, so that, concerning the roof frames of the Project facilities, wooden trusses widely adopted in the country would not be used, and the steel frame trusses would be used instead. In recent years, in fact, the situation has changed in the city of Phnom Penh, where wooden trusses are no longer used even for ordinary collective housings and commercial facilities, nor in the construction sites for primary schools, but steel frame trusses are utilized. Accordingly, as for the roof frames of the project facilities, steel frame trusses will be made use of as set in the Basic Design. Where furniture and fittings are concerned, wooden products will be provided as stated in the Basic Design.

### **2-2-1-5 Policy for Local Consultants and Contractors**

All the building contractors in Cambodia are private firms, and the registered contractors are divided into grades, 1, 2, and 3. In order to be qualified as registered contractors, the regulations require firms to have a certain number of engineers, to complete a certain number of constructions per year, and to have a certain number of business operations. The first grade contractors are allowed to participate in any size of construction works, whereas the second and the third grade contractors have limitations on construction works to engage in, in terms of the type and size of works. The construction work for this Project will make positive use of local contractors qualified as the second or upper grade.

There are quite a few small-sized providers of materials within the city of Phnom Penh, but they deal with products made in Cambodia and a limited number of items which are frequently used such as cements, reinforcing steels, tiles, tiles on roofs, paints, metal fittings, sanitary chinaware, and so on. On the other hands, items such as stainless-steel products and maintenance hatches are hardly available in Cambodia, so that such items will be procured from Thailand or other neighboring countries through middle- or higher ranking procurement agencies.

### **2-2-1-6 Policy for Facility Operation and Maintenance**

As stated in the Basic Design Study Report, in order to make maintenance work easier and to try to keep costs low in the Project, which would encourage the School Supporting Committee (consisting of the community people and representatives of parents and teachers, and taking the initiative to conduct the actual maintenance activities of individual school facilities) to actively participate in the maintenance activities, the following will be taken into consideration.

- (1) Finishing materials shall be resistant to stain and easy to clean so that maintenance is easier.

(2) Finishing materials shall be durable so that the Project buildings will have a long life and thus maintenance costs can be kept to a minimum.

### 2-2-1-7 Policy for the Grade of Facilities and Equipment, and for Cost Reduction

In the Basic Design, specific proposals were made in individual items in order to draw up facility plans with a primary focus on cost reduction for construction, while maintaining a certain minimum necessary quality in relation to, for example, safety, easy maintenance, and comfortable learning environment. The following are the contents given in the Basic Design and points to be altered.

**Table 2-7 Policy for Reduction in Construction Cost**

	Policies provided in the Basic Design	Points to be changed
(1) Construction Method	<ul style="list-style-type: none"> <li>The underside of roof sheathing is paint-finished without ceiling.</li> <li>Building openings will use wooden louvers that are less expensive, instead of using glasses.</li> <li>The walls of buildings should be constructed with a single layer of hollow bricks reinforced with steel bars instead of double layer of hollow bricks.</li> </ul>	<ul style="list-style-type: none"> <li>None</li> <li>None. But anti-termite chemicals will be used.</li> <li>Reinforced with steel bars and a single layer of hollow bricks or masonry by the equivalent material.</li> </ul>
(2) Finishing Work	<ul style="list-style-type: none"> <li>Corridor floors will be finished with mortar in order to reduce construction costs, and thus cement tiles widely used in the country will not be used.</li> <li>Toilets walls will be finished with smooth tiles till 2m above the floor. The toilet walls over the 2 m shall be finished with mortar for cost reduction purpose.</li> </ul>	<ul style="list-style-type: none"> <li>In order to secure the minimum durability, the corridor floors will be finished with cement tiles as the floors of classrooms.</li> <li>None</li> </ul>
(3) Structure	<ul style="list-style-type: none"> <li>Several considerations should be taken such as using steel frames for the roofs, one layer of hollow bricks for building walls, and change of concrete slab on the first floor from structural type to slab on grade. Thus, the weight of the building sitting on soil with low bearing capacity can be reduced. As a result, the amount of materials necessary for foundations will be decreased, contributing to the cost reduction.</li> </ul>	<ul style="list-style-type: none"> <li>None. The part made of one layer of hollow bricks, as stated above, will be reinforced with steel bars and a single layer of hollow bricks or masonry by the equivalent material.</li> </ul>
(4) Water Supply and Drainage Facilities	<ul style="list-style-type: none"> <li>By arranging septic tanks directly under the toilets, the amount of work for excavation, structure construction, and facility and piping installation can be reduced.</li> <li>Ditch-type urinals should be installed to reduce construction costs instead of urinals.</li> <li>By following the local customs, a Thai-type wash basin at each toilet booth will be installed, but independent basins shall not be installed by the Project, except in the toilets for the disabled.</li> </ul>	<ul style="list-style-type: none"> <li>None</li> <li>None</li> <li>None</li> </ul>
(5) Electrical Facilities	<ul style="list-style-type: none"> <li>Installation of electrical facilities shall be limited to lighting for the handicapped toilets, the dual-use "meeting room-classrooms" and the corridor in front of the "meeting room-classrooms"</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>
(6) Furniture	<ul style="list-style-type: none"> <li>The steel furniture imported from the third countries is avoided and wooden furniture that is domestic and low cost would be installed.</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>

### 2-2-1-8 Policy for Construction Method

As presented in the Basic Design Study Report, a traditional construction method, which is easy for local contractors, and does not require special skills, will be adopted.

### 2-2-2 Basic Plan

#### 2-2-2-1 Facility Plan

##### (1) Architectural Plan

##### (1)-1. Site Plan

In the Basic Design, it was determined that the items described in the table below were taken into consideration concerning the site plan. And our field surveys of the Implementation Review Study have proved that the plan in the Basic Design was generally appropriate. Thus, the Facility Plan will follow, in principle, the Site Plan presented in the Basic Design.

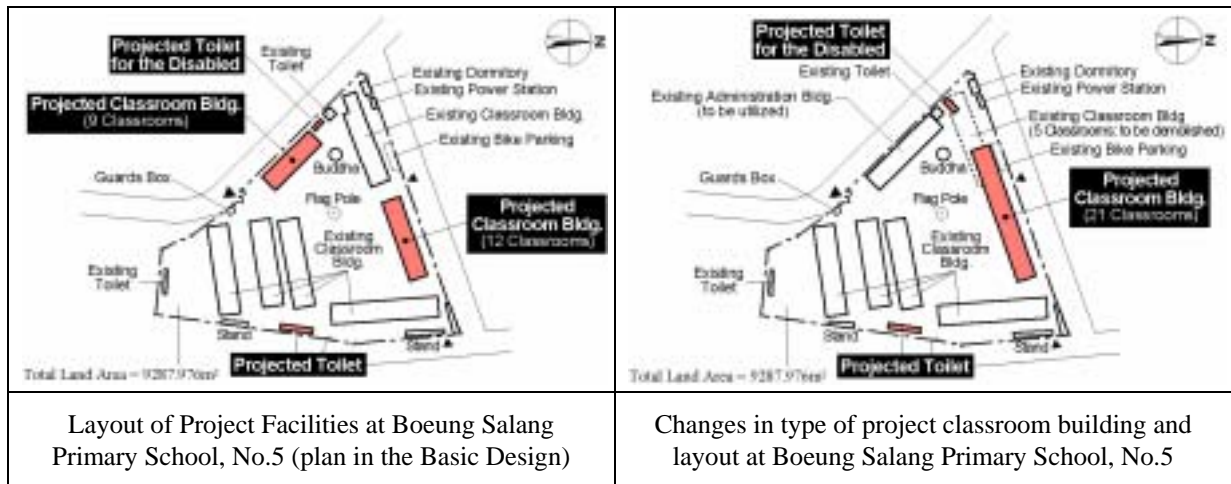
**Table 2-8 Items to be considered concerning the Site Plan**

	Items to be considered concerning the Site Plan presented in the Basic Design Study Report	Points to be changed
a)	Because of the limited extent of school playgrounds, the buildings will be located parallel to the school property line so that the area for playgrounds can be as large as possible.	None. The principle stated on the left will be applied to Boeung Salang school, No.5 where the type of classroom building and the layout of facilities will be changed.
b)	The corridor in the building will be placed on the playground side in order to keep the noise away from the classrooms.	None.
c)	The above-mentioned two issues should have a higher priority than the issue of classrooms facing to the south.	None.
d)	As a basic principle, toilets for students shall be arranged near the project buildings and the toilets for the disabled shall be located near the teachers' offices	None. Difficult to apply the principle to some Project schools due to the current arrangement of existing facilities, but the principle will be observed as much as possible.

The following is the points to be changed from the Basic Design.

#### **a) Changes in type of the classroom building and layout at Boeung Salang Primary School, No.5**

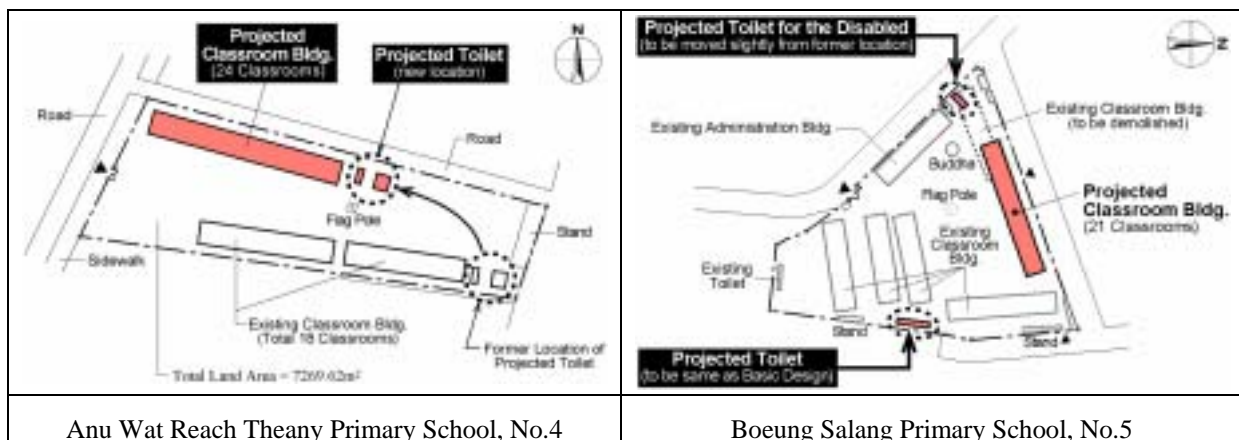
For Boeung Salang school, No.5, two separate classroom buildings with 9 and 12 classrooms respectively would be arranged in the Basic Design, but a change in the type of project classroom building and layout will be made in accordance with the request from the Cambodian side: the decrepit classroom building (with 5 classrooms) will be demolished instead of the existing administration building, and at the cleared place due to the demolition, a classroom building with 21 classroom will be built. The building (21 classroom) to be constructed under the revised plan will be the same type as the project classroom building at San Thor Mok school, No.3.



**Figure 2-2 Changes in type of project classroom building and layout at Boeung Salang Primary School, No.5**

**b) Change of the location of project toilets**

Where the location of project toilets at the Project sites are concerned, the toilet facilities for pupils and for the disabled at Anu Wat Reach Theany school, No.4, will be installed according to the drainage main pipe plan drawn up by the Cambodian side. As for Boeung Salang school, No.5, the location of toilets for the disabled will be changed in accord with the changes in the type of project classroom building and the building to be demolished.




**Figure 2-3 Changes in layout of project toilet facilities**

**(1)-2. Floor Plan**

The Floor Plan in the Basic Design is considered appropriate due to the reasons described below, so that it will be preserved.

**Table 2-9 Policy for the Floor Plan**

	Basic Design	Points to be changed
a)	<p>Floor Plan for Classroom: The size of the classrooms is 7m x 8m (the average size in Cambodia) with a corridor of 2m in width.</p> 	None. The Floor Plan shown left is the most common size seen in local primary schools.
b)	<p>Rooms to be used both as meeting room and classroom: The Project will install wooden movable partitions in the classrooms on the ground floor of the new school building located near the school entrance at every project school so that these rooms, by opening the partitions, can be converted into one large conference room for meetings. At each of the large schools, 3 classrooms will be constructed with two movable partitions; and at all the other Project schools, 2 classrooms will be constructed with a movable partition. In addition, lighting fixture will be installed in those rooms and corridor in front of those rooms for the night use.</p>	None. At some local primary schools, lighting fixture is installed at ordinary classrooms in consideration to the dual- or triple-shift system. However, the provision of facilities under this Project will be minimized.

The floor area of each Project school is presented in the table below.

**Table 2-10 List of Floor Area**

No	School Name	Site Area (m <sup>2</sup> )	No. of project classrooms	Total floor area of project classrooms bldg. (m <sup>2</sup> )	Total floor area of project toilet facilities (m <sup>2</sup> )	Grand total floor area of classrooms bldg. and toilet facilities (m <sup>2</sup> )
1	Bak Touk	10,843	27	2,192.670	65.525	2,258.195
2	San Thor Mok	14,258	18	1,461.780	52.815	1,514.595
3	Toul Kok	24,829	21	1,677.780	52.815	1,730.595
4	Anu Wat Reach Theany	7,270	24	1,976.670	63.320	2,039.990
5	Boeung Salang	9,288	21	1,677.780	52.815	1,730.595
6	Phuom Russey	4,680	18	1,461.780	52.815	1,514.595
	Total	-	129	10,448.460	340.105	10,788.565

Note 1) As for San Thor Mok school, No.2, of the two classroom buildings structurally disconnected by the expansion joint, the building (with 18 classrooms) with staircases faced on its both end near the main entrance will be included in this Project, the rest being excluded from the Project. The type of the toilet facilities for puppies to be constructed at this school will be the same as the type (for 18 classrooms) to be applied at Phuom Russey school, No.6.

Note 2) As for Boeung Salang school, No.5, the plan drawn up in the Basic Design will be altered – from two classroom buildings with 9 and 12 classrooms respectively to one classroom building with 21 rooms. For this, the type of the building to be used for Toul Kok school, No.3, will be applied for Boeung Salang school, too. The plan in the Basic Design will be preserved for the toilet facilities.

### (1)-3. Section Plan

The Section Plan drawn up in the Basic Design will be in principle preserved. However, partial alterations will be made as described below.

**Table 2-11 Policy for the Section Plan**

	Basic Design	Points to be changed
a)	<p><b>Roofs:</b> A steel truss frame will be selected for the roof structure with roofboard, tile batten and roof tile. Since only the roof tile is waterproof, a 60% roof pitch will be used to avoid water leakage from roof tile joints. For preventing the roof tiles from falling off, roof tiles are tied to tile batten with copper wires.</p>	<p>In principle, the plan will follow the policy described on the left. However, the upper part of the roofboard will be covered by asphalt-felt, and the roof tiles (painted tiles) will be fastened with screws on the tile batten (a common method in Cambodia.)</p>
b)	<p><b>Walls:</b> Hollow bricks are most popular material in Cambodia with high thermal insulation and ease of maintenance, so the Project will use a single layer of this material for wall construction. Fault joints will be installed in order to prevent wall cracks and leaking from wall cracks.</p>	<p>The walls will be reinforced with steel bars and a single layer of hollow bricks or masonry by the equivalent material*<sup>1</sup>.</p>
c)	<p><b>Floor Elevation on the Ground Floor:</b> The floor height on the ground floor of all the Project buildings should be equal to the existing buildings, and should be in the range of 400mm to 500mm above the ground level.</p>	<p>None. The floor height on the ground floor shall be 500mm above the ground level.</p>
d)	<p><b>Window Openings:</b> Wooden louvers, which can be locally produced, are cost effective and easy to maintain, and hence will be installed for window openings in the Project. In order to avoid burglary and theft, steel grills for all the windows on the first floor and steel grill doors at the stairways from the first to the second floor will be installed. For the purposes of pupil safety, steel grills will be installed on all outside facing windows on floors higher than the second floor. All classrooms shall have a louver block opening installed above the windows for air ventilation.</p>	<p>None.</p>
e)	<p><b>Canopy:</b> In order to prevent the exterior walls from exposure to the strong direct sunlight and rainwater, canopies will be installed outside the windows and corridors of the Project buildings.</p>	<p>None.</p>

Note) \*1: Bricks are the most commonly used material in Cambodia for walls, and will be used in principle in this Project. However, since brick walls are, by structure, nonbearing walls, if there is any other wall materials which weigh more less the same as bricks and can be used with reinforcing bars, such materials will not be rejected as the materials to be used for the Project on condition that its quality is equivalent to (or better than) brick in the light of workability, durability and so on.

## (2) Structure Planning

### (2)-1. School Building Structure

#### a) Soil Bearing capacity and Foundation

As presented in the Basic Design Study Report, at the sites of Bak Touk school, No.1, Anu Wat Reach Theany school, No.4, and Phuum Russey school, No.6, pile foundation will be required for the project classroom building in that the soil bearing capacity of the sites is under 5 t/m<sup>2</sup>. On the other

hand, spread foundation will be applied since the soil bearing capacity of 7.5 – 10 t/m<sup>2</sup> is secured for the sites of the remaining three Project schools.

It was planned in the Basic Design that, for the three schools where pile foundation will be applied, reinforced concrete piles with a sectional dimension of 200mm×200mm will be founded by the driven pile method on the layer of 27 – 50 of N-value as the foundation beds (12 – 18m depth). However, as a result of the field surveys conducted this time, the three points noted below have become revealed, which necessitates the plan be changed in some points: the method will be changed to the pressed-in pile method; the sectional dimension of the piles will be changed from 200mm×200mm to 300mm×300mm; and the layer with 25 or so of the N-value will be used as the foundation beds. Taking into account all these changes and the recalculated total number of required piles, size, shape, and bar arrangement of the bottom structure (footing and underground beams) of the Project facilities will be redesigned.

- 1) Piles with sectional dimension of 200mm×200mm planned at the Basic Design Stage are so small that they would be likely to cause various troubles if applied for the current soil conditions at the three sites, such as damages on piles and possible failure to found the piles vertically. It would be extremely difficult to knock in the piles to the required depth. At the same time, while it was not confirmed at the time of the Basic Design, the availability of piles with sectional dimension of 300mm×300mm was confirmed during the field survey of this Implementation Review Study.
- 2) In order to avoid causing noises and vibration problems to the neighborhood, the driven pile method with diesel hammer is no longer used within the urban districts of Phnom Penh, and the pressed-in pile method using a hydraulic jack is commonly applied. Accordingly, in the sites of the schools to be covered by this Project which are located in urban districts, it is necessary to adopt the pressed-in pile method.
- 3) It is impossible to apply the pressed-in pile method described above for the layer with 25 or higher of N-value.

The soil bearing capacity and the foundation type to be applied at each Project school is shown in the table below.

**Table 2-12 Soil Bearing Capacity and Foundation Type**

No	School Name	Soil Bearing Capacity (t/m <sup>2</sup> )	Foundation Type
1	Bak Touk	5.0	Pile foundation
2	San Thor Mok	7.5	Spread foundation
3	Toul Kok	10.0	Spread foundation
4	Anu Wat Reach Theany	5.0	Pile foundation
5	Boeung Salang	10.0	Spread foundation
6	Phuom Russey	5.0	Pile foundation

### **b) Main Structure Plan**

As shown in the Basic Design, rigid framed reinforced concrete structure placed on an 8m×7m grid will be used for all project classroom buildings.

### **c) Standards for Structural Planning**

As shown in the Basic Design, the following Japanese building standards will be applied to the structural planning of the Project.

- Architectural Standards;
- AIJ Recommendation for the Design of Building Structures;
- AIJ Standards for Structural Calculations of Reinforced Concrete; and
- Recommendations for the Design of Building Foundations.

### **d) Materials and the Strength**

There are three concrete batcher plants in Phnom Penh, all of which are able to provide concrete to any Project sites. Concrete is widely used in the country, and the concrete with the compressive strength of up to around 27N per square meter is available so that the concrete with the compressive strength of 21N per square meters will be used in this Project. Here, the batcher plants mentioned above will be made use of. Reinforcing bars, on the other hand, are not produced in Cambodia, where Thai- and Vietnamese-made bars are commonly used. In this Project, reinforced bars equivalent to the Thai-made SR23, SD40, will be used because those are easy to be procured, and their mill sheets are available. Where reinforced concrete piles are concerned, piles with sectional dimension of 300×300mm will be used in that they will bear the heavier weight than those with sectional dimension of 200mm×200mm, and do not require to be connected with other piles up to 12 meters.

### **e) Load and External Forces**

Where the load and external forces presented in the Basic Design Study Report are concerned, revisions have been made as shown in the table below because the design for the fixed loads (roofs, floors, and walls) were required to be more appropriate as a result of the Implementation Review Study on the procurement of materials and equipment, and as a result of the confirmation of material weights conducted in the series of the field surveys. In line with this, the size of sectional dimension of columns and beams has been revised.



**Table 2-13 Conditions related to load and external forces**

		Basic Design	Points to be changed
1)	Fixed Load	Roof: 85 kg/m <sup>2</sup> Floor: 310 kg/m <sup>2</sup> Wall: 160 kg/m <sup>2</sup>	136 kg/m <sup>2</sup> Load on beam revised. 420 kg/m <sup>2</sup> Load on finishing revised. 200 kg/m <sup>2</sup> Load on wall revised.
2)	Live Load	Roof: 0 kg/m <sup>2</sup> Classroom floor: 300 kg/m <sup>2</sup> (floor, beam, calculated) Stairs, floor: 230 kg/m <sup>2</sup> (grinder, column, calculated) Corridor floor: 360 kg/m <sup>2</sup> (floor, beam, calculated) 330 kg/m <sup>2</sup> (grinder, column, calculated)	None None None None None
3)	Earthquake Load	Not applicable.	None
4)	Wind Load	Wind pressure will be calculated by the formula shown below. W=C×q×A C: Coefficient of wind power q : Wind speed pressure (25 kg/m <sup>2</sup> ) A : Area (m <sup>2</sup> )	None

### (3) Facility Plan

#### (3)-1. Toilet Facilities and Sanitation

In the Basic Design, the calculation of the number of toilet bowl to be installed under this Project was based on the principle of “1 toilet for each 2 new classrooms”, and the total number of toilet units was divided equally between males and females. And a half of the mail toilet units would be toilet bowls, and double amount of another half would be urinals. (The number of urinals would used to calculate the actual length of straight urinal ditch, which would be installed instead of individual urinals.) Also, the Basic Design stated that the toilets would be constructed with a water tub in each toilet booth for washing and flushing, instead of installing independent water basins. On top of these, two toilet booths for the disabled (one booth each for males and females) will be installed. In these toilet booths, a western-style toilet bowl, a basin, an angled mirror, metal ware for the disabled, slope, and a sliding door will be installed. The number of toilet units and the features of basins and toilets for the disabled described above seem appropriate in the light of the current circumstances and thus will be preserved as shown in the Basic Design. The arrangement of the toilet units will be changed at Anu Wat Reach Theany school, No.4, and Boeung Salang school, No.5. (See (1)-1. Site Plan of (1) Architectural Plan)

### Number of Project toilet Bowls

No	School Name	No. of new classrooms	No. of Female toilet bowls	No. of male toilet bowls	No. of male urinals	No. of toilet bowls for the disabled
1	Bak Touk	27	7	3	8	2
2	San Thor Mok	18	5	2	6	2
3	Toul Kok	21	5	2	6	2
4	Anu Wat Reach Theany	24	6	3	6	2
5	Boeung Salang	21	5	2	6	2
6	Phuom Russey	18	5	2	6	2
Total		129	33	14	38	12

Note: Since the number of project classrooms has been halved to 18 rooms at San Thor Mok school, No.2, the number of toilet bowls will be reduced accordingly, and the type of toilet facilities (for 18 classrooms) to be adopted for Phuom Russey school, No.6, will be applied.

### (3)-2. Water Supply System

The installation of water supply system will be applied, as defined in the Basic Design, exclusively to the project toilet facilities. There was no water source pipe for the city water supply near Phuom Russey school, No.6, at the time when the Basic Design was drawn up. But now that water source pipe is laid nearby, the supply system for this school will take advantage of city water. Therefore, all the water supply systems at the project schools will rely on “city water, well, and rain water” in principle, although the system at San Thor Mok school, No.2 will make use of “city water and rain water” due to the absence of underground creek. At the site of Anu Wat Reach Theany school, No.4, although there is an underground creek, there is no water well, and thus the Cambodian side will dig and create a well facility at their own expense. Apart from these, repair of pumps for water wells, cleaning of wells, maintenance and repair of water pipes and other works shall be conducted by the Cambodian side, so as to secure water from the wells.

A list of water sources and the water supply and drainage systems are presented below.

**Table 2-14 Existing Condition and Water Supply Plan for the Project Schools**

No	School Name	Existing Water Supply Resource	Planned Supply Resource	Remarks
1	Bak Touk	City water / Well	City water / Well / Rain Water	
2	San Thor Mok	City water	City water / Rain Water	No underground creek exists
3	Toul Kok	City water / Well	City water / Well / Rain Water	
4	Anu Wat Reach Theany	City water	City water / Well / Rain Water	The digging well should be done (at the expense of the Cambodian side.)
5	Boeung Salang	City water / Well	City water / Well / Rain Water	
6	Phuom Russey	City water / Well (currently well is damaged and unusable)	City water / Well / Rain Water	Main pipes for city water have been laid down. Repair of existing well shall be done (at the expense of the Cambodian side.)

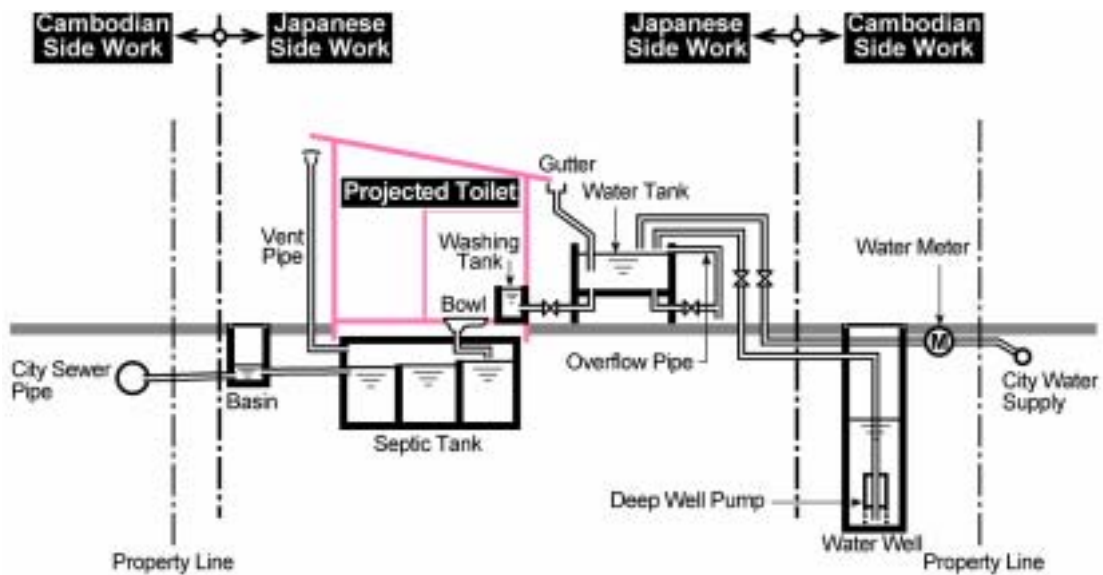
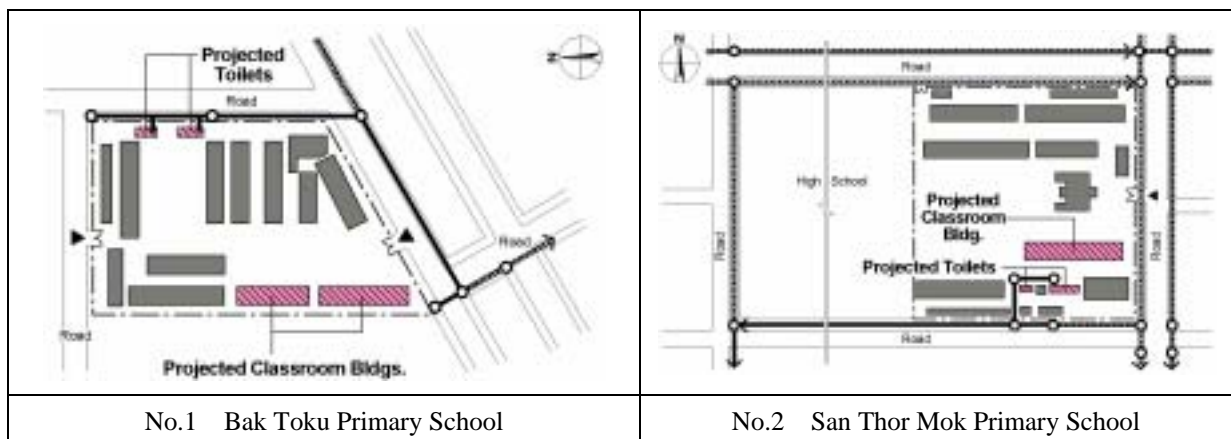


Figure 2-4 Diagram for Water Supply and Sewerage System

**(3)-3. Drainage Facilities**

Discharged water from the project toilets shall be passed through a septic tank and basins to the main pipe of the public drainage system (see below for the Project drainage pipe). Currently, wastewater is discharged to open unlined channel at Toul Kok school, No.3; the main drainage pipe, which is supposed to receive wastewater, does not exist at Boeung Salang school, No.5, and Phum Russey school, No.6; and wastewater has to be treated by the seepage pit within the school site due to the absence of drainage infrastructure nearby at Anu Wat Reach Theany school, No.4. However, Phnom Penh Municipality has drawn up a plan to newly construct public drainage pipes within the premises of all the Project schools and along the roads in front of the premises, and has earmarked the budget for the construction. Hence, wastewater from the basin at the project toilets will be drained through the new public drainage pipes. The work for the connection of drainage pipe from final basin of the project toilet facilities to the public pipes will be carried out by the Cambodian side. The following is an overview of the plan for construction of drainage pipeline by Phnom Penh Municipality



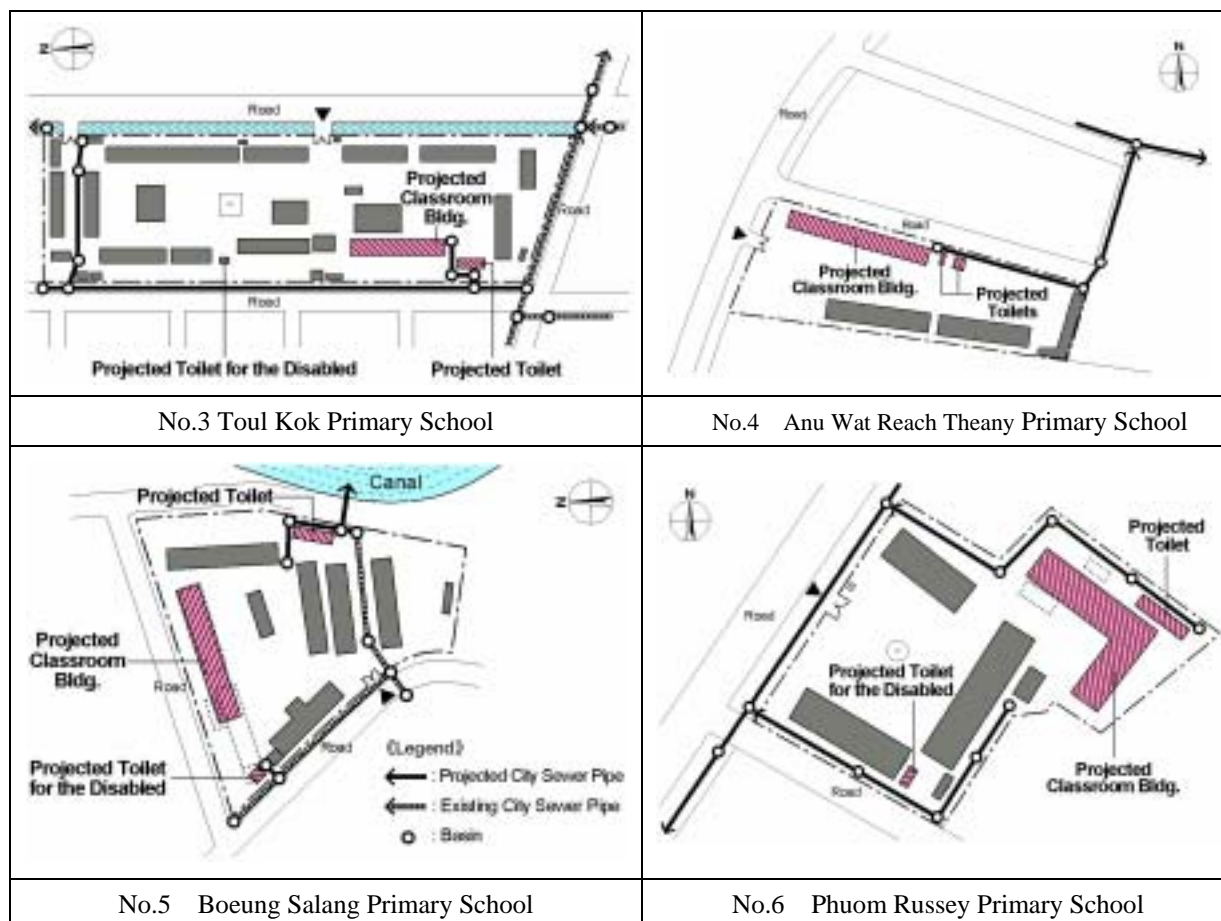
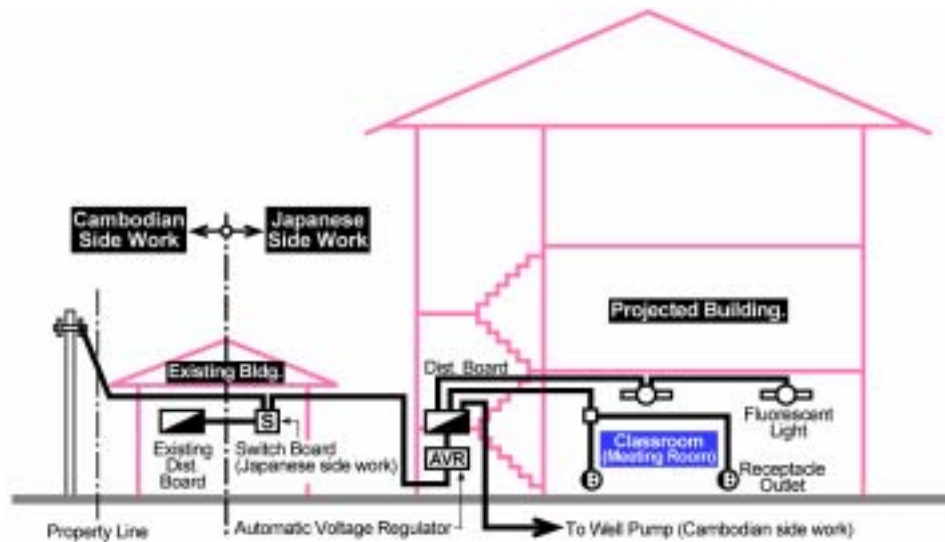


Figure 2-5 Plan for Construction of Drainage Pipeline by Phnom Penh Municipality

### (3)-4. Electrical Facilities

The provision of electrical facilities would be set at necessary minimum in the Basic Design, confined to the rooms to be used for meetings and classes and the corridors in front of the rooms; the toilet facilities for the disabled; and the electrical power for water wells. This plan drawn in the Basic Design will be preserved. The summary is as follows:

- a) Lighting fixtures will be installed in the "meeting and class rooms" of the project classroom building near the main entrance (3 rooms for the schools Nos. 1-3, and 2 rooms for the schools Nos. 4 – 6) and the corridors in front of those rooms; and in the toilet facilities for the disabled. Also the electrical supply facilities will be installed to ensure power supply for the pump for the water wells. The pumps and wells will be installed by the Cambodian side.
- b) For this, a switchboard will be installed to supply electricity to both the existing distribution board and a distribution board of project facility. From this distribution board of project facility, electricity will be supplied for the lighting fixtures and the water well pump which will be installed by the Cambodian side.
- c) Also, automatic voltage regulator (AVR) will be installed for the purpose of preventing damages of the equipment occasioned by voltage drops.



**Figure 2-6 Diagram for Electrical Power Supply System**

**(3)-5. Fire Extinguishing System**

As planned in the Basic Design, fire extinguishers will be installed in all the staircases on the second and third floors.

**(4) Building Material and Equipment Plan**

Building materials selected in the Basic Design are more or less appropriate and will be used in principle. The revisions partly made afterwards are presented below.

**Table 2-15. List of Selected Materials**

Part	Method and Materials adopted in Basic Design	Points to be changed
<b>I. Main Structure</b>		
Roof Framing	Steel Frame	None
Main Framing	Reinforced Concrete	None
Wall	Hollow Brick	A single layer of hollow bricks or equivalent
Floor	Upper Floor: Concrete Slab (structural)	None
	Ground Floor: Concrete Slab (non-structural)	None
<b>II. Exterior Finish</b>		
Roof	Colored Cement Roof Tile	None
Exterior Wall	Paint Finish over Mortar System	None
Openings	Paint Finish over Wood Window Frames	None

III. Interior Finish			
	Ceiling	Top Floor	Paint Finish over Exposed Roof Board None
		First & Second Floors	Classroom: Plaster System Paint Finish over Exposed Concrete (In plaster system, the coating is likely to be dangerously peeled off and drop.
			Corridor: Paint Finish over Mortar System Paint Finish over Exposed Concrete (In plaster system, the coating is likely to be dangerously peeled off and drop.
			Toilet: Paint Finish over Exposed Ceiling None
	Wall	Paint Finish over Mortar System None	
	Floor	Classroom: Cement Tile None	
		Corridor: Mortar Metal Trowel Finish From the viewpoint of durability, finish of the floor of corridor will be done with cement tiles as floors in classrooms.	
	Wall for Toilets	Upper Wall: Paint Finish over Mortar System Lower Wall: Tile None	
	Floor for Toilets	Mosaic Tile Finish None	

### 2-2-2-2 Equipment Plan

The criteria for the placement, and the number of furniture and equipment determined in the Basic Design seem appropriate and thus will be preserved. As for San Thor Mok school, No.2, however, since the number of project classrooms will be halved from 38 to 18, the number of furniture will be reduced in accordance with the criteria shown below.

**Table 2-16 Criteria for Placement of Furniture and Equipment**

Name of Furniture and Equipment	Place to Install Furniture/Number of Furniture
Whiteboard (1,200×2,400)	2 Boards per 1 New Classroom
Student Desk & Chair (Large: Grades 4, 5, and 6. For 2 persons)	20 Desks & Chairs for 40% * of New Classrooms
Student Desk & Chair (Small: Grades 1, 2, and 3. For 2 persons)	20 Desks & Chairs for 60% * of New Classrooms
Desk for Teacher	1 Desk per 1 New Classroom
Chair for Teacher	1 Chair per 1 New Classroom

Note) \* The percentages follow the statistics on primary schools in Phnom Penh in 2000, which indicated that the proportion of lower graders (grades 1 – 3) was 58.8, and that of upper grades (grades 4 – 6) 41.2 percent.

Facilities and furniture/fixings to be supplied to individual Project schools are shown in the table below.

**Table 2-17 List of Facilities and Furniture/Fixings at Project Schools (Schematic Design Level)**

Name of School		Facilities					Furniture/Fixings					
		Classrooms to be	Toilet				Total Floor Area	Student Desk & Chairs			Teachers' Desk & Chair	White Boards
			No. of Female Toilet Bowls	No. of Male Toilet Bowls	No. of Male Urinals	No. of Toilets for the Handicapped		Large	Small	Total		
1	Bak Touk	27	7	3	8	2	2,258.195	216	324	540	27	54
2	San Thor Mok	18	5	2	6	2	1,514.595	144	216	360	18	36
3	Toul Kok	21	5	2	6	2	1,730.595	168	252	420	21	42
4	Anu Wat Reach Theany	24	6	3	6	2	2,039.990	192	288	480	24	48
5	Boeung Salang	21	5	2	6	2	1,730.595	168	252	420	21	42
6	Phuom Russey	18	5	2	6	2	1,514.595	144	216	360	18	36
Total		129	33	14	38	12	10,788.565	1,032	1,548	2,580	129	258

**2-2-3 Basic Design Drawing**

The Basic Design drawings are attached as shown below to the subsequent pages.

- (1) No.1, Bak Touk: site plan
- (2) No.1, Bak Touk: floor plan
- (3) No.2, San Thor Mok: site plan
- (4) No.2, San Thor Mok: floor plan
- (5) No.3, Toul Kok: site plan
- (6) No.3, Toul Kok: floor plan
- (7) No.4, Anu Wat Reach Theany: site plan
- (8) No.4, Anu Wat Reach Theanyl: floor plan
- (9) No.5, Boeung Salang: site plan
- (10) No.5, Boeung Salang: floor plan
- (11) No.6, Phuom Russey: site plan
- (12) No.6, Phuom Russey: floor plan
- (13) No.1, Bak Touk: elevation & section plans
- (14) No.1, Bak Touk: toilet
- (15) No.4, Anu Wat Reach Theany: toilet



BAK TOUK HIGH SCHOOL

AREA=10842.97m<sup>2</sup>

FLAG POLE

CLASSROOM

WORKSHOP  
(WOODEN BUILDING)

CLASSROOM  
(WOODEN BUILDING)

CLASSROOM  
(WOODEN BUILDING)

CLASSROOM  
(WOODEN BUILDING)

CLASSROOM

CLASSROOM

CLASSROOM

CANTEEN  
(WOODEN HALL)

PARKING PLACE  
(WOODEN HALL)

ROAD No.139

LEGEND	DESCRIPTION
	TREE
	COCONUT TREE
	PERMANENT BUILDING
	CONTOUR LINE
	BRICK FENCE
	MANHOLES
	ROAD CENTER
	ELECTRIC POLE
	WELL

THE PROJECT FOR CONSTRUCTION OF PRIMARY SCHOOLS IN PHNOM PENH

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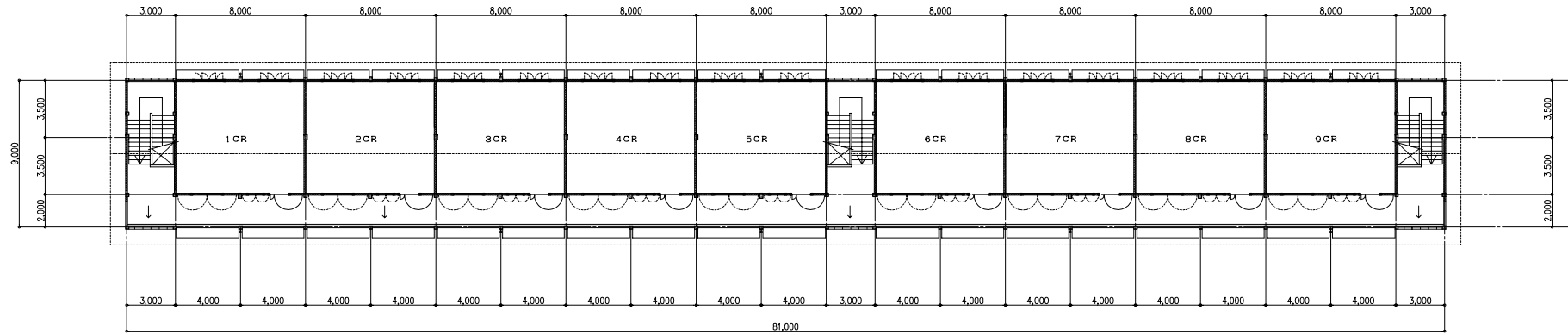
NO.1 Bak Tou : SITE PLAN

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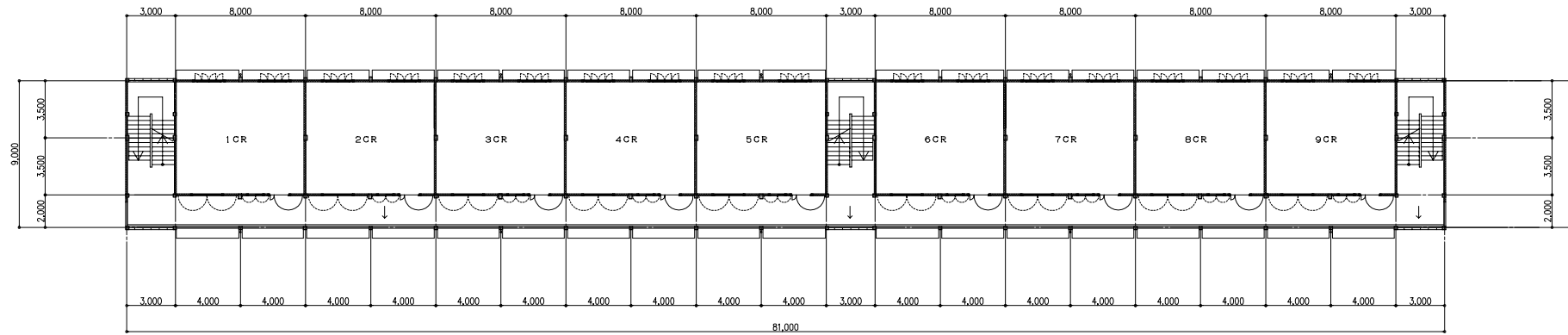
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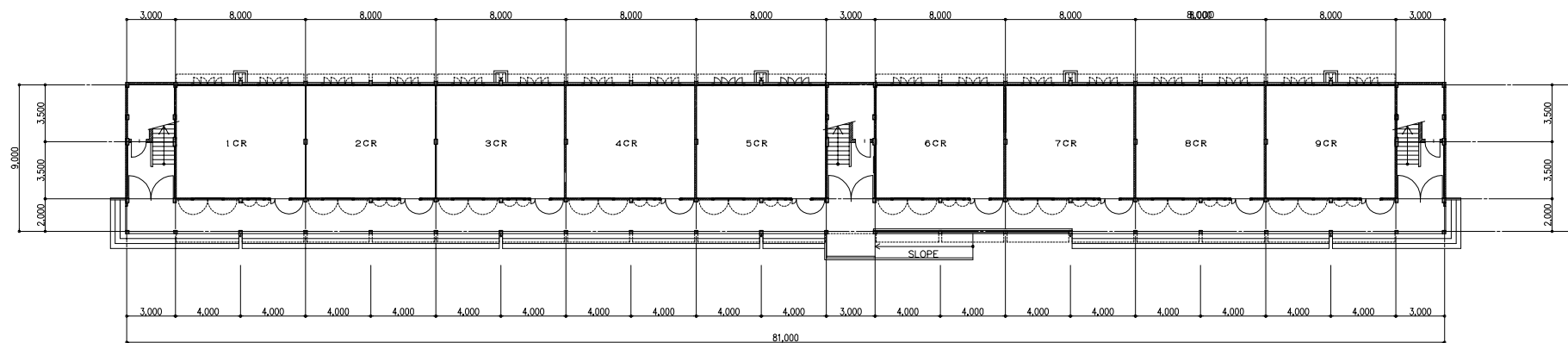




SECOND FLOOR



FIRST FLOOR



GROUND FLOOR

THE PROJECT FOR CONSTRUCTION OF PRIMARY SCHOOLS IN PHNOM PENH

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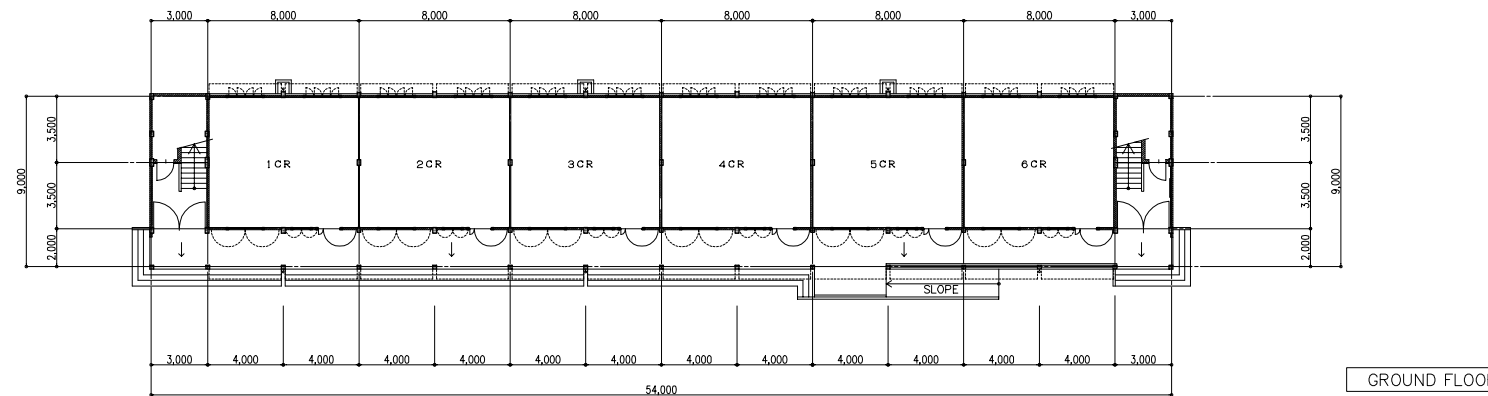
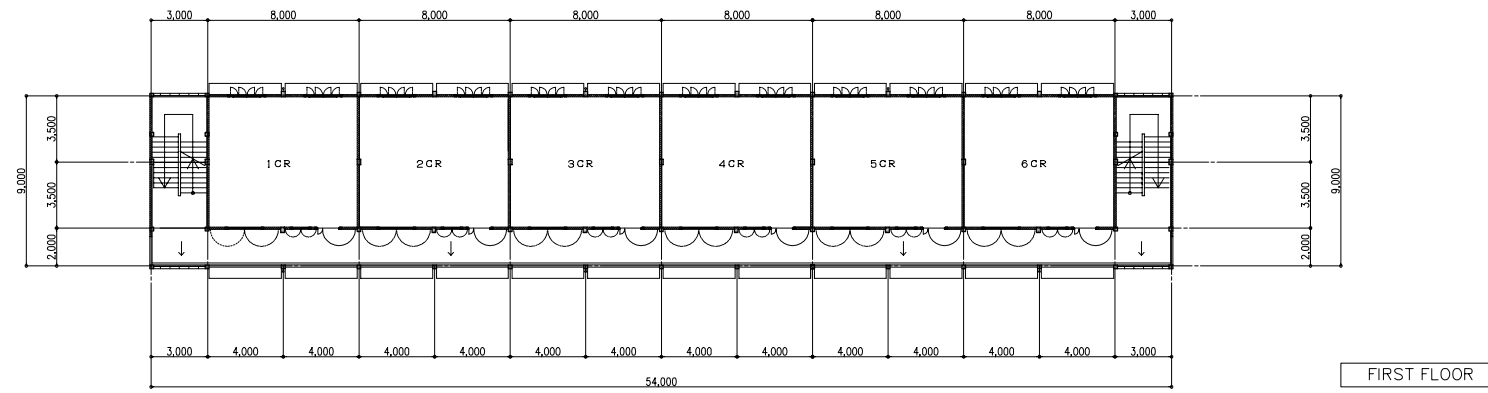
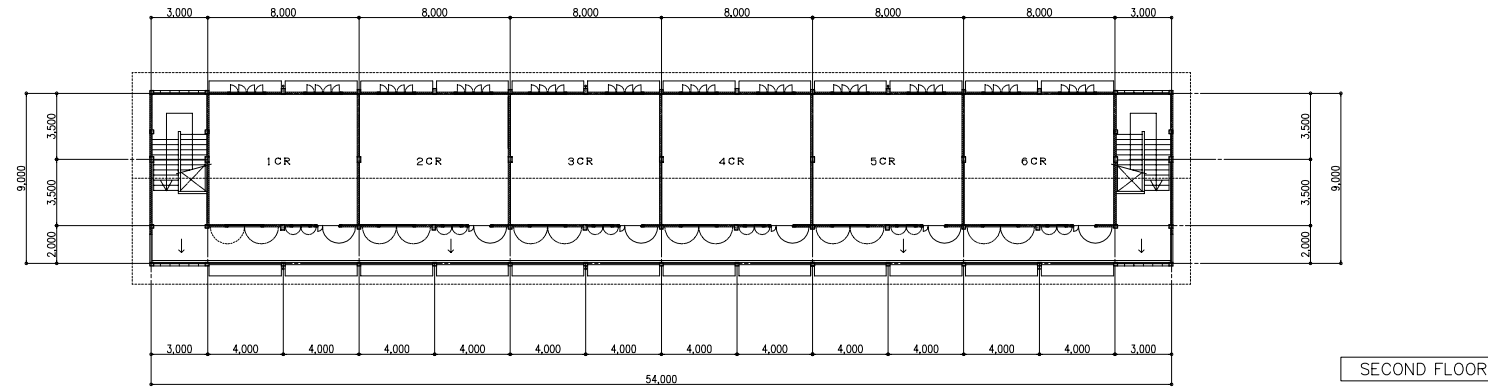
NO.1 Bak Touk : PLAN

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02





THE PROJECT FOR CONSTRUCTION OF PRIMARY SCHOOLS IN PHNOM PENH

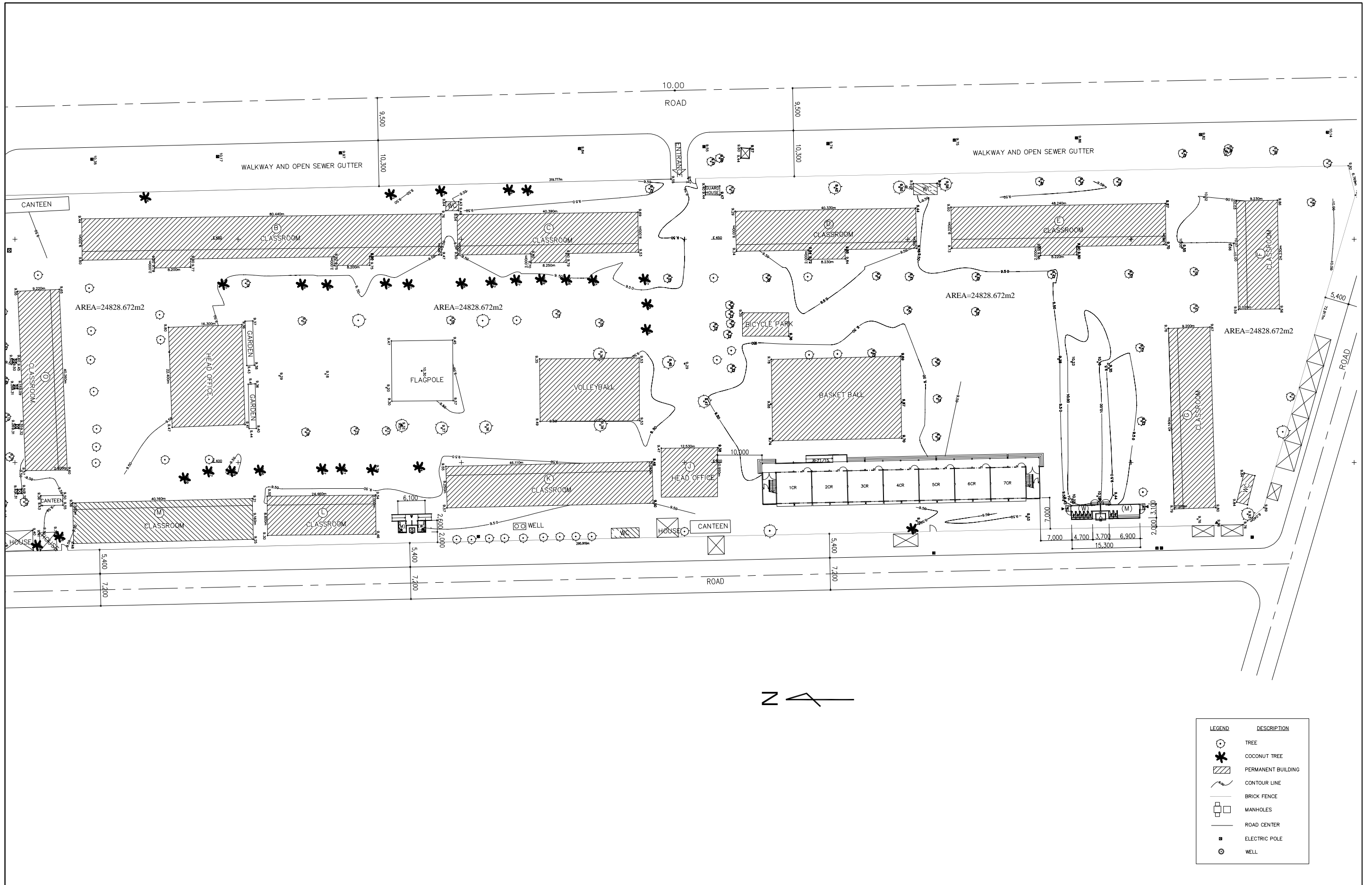
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NO. 2 San Thor Mok : PLAN

SCALE

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04



LEGEND	DESCRIPTION
	TREE
	COCONUT TREE
	PERMANENT BUILDING
	CONTOUR LINE
	BRICK FENCE
	MANHOLES
	ROAD CENTER
	ELECTRIC POLE
	WELL

THE PROJECT FOR CONSTRUCTION OF PRIMARY SCHOOLS IN PHNOM PENH

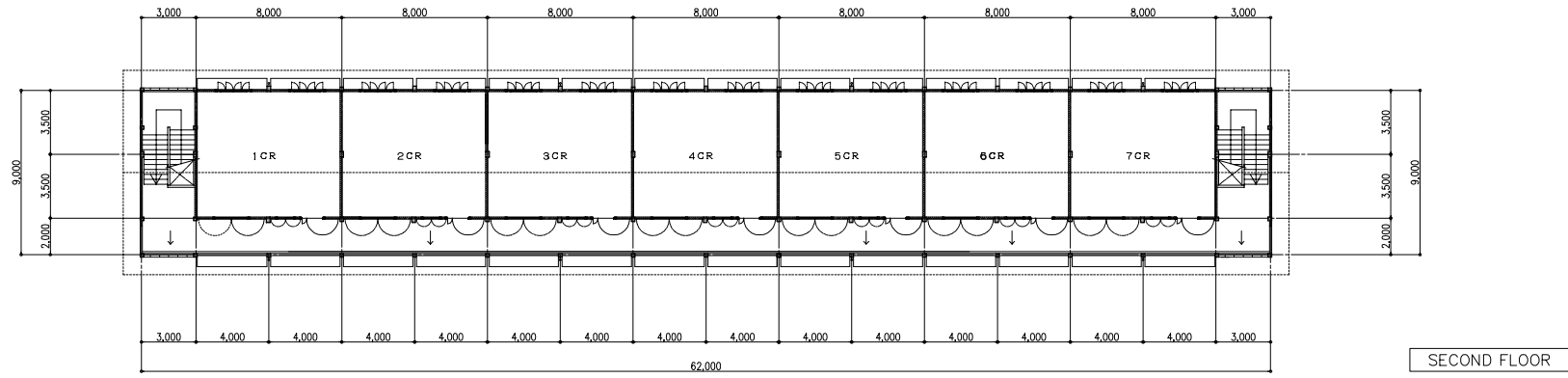
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No. 3 Toul Kok : SITE PLAN

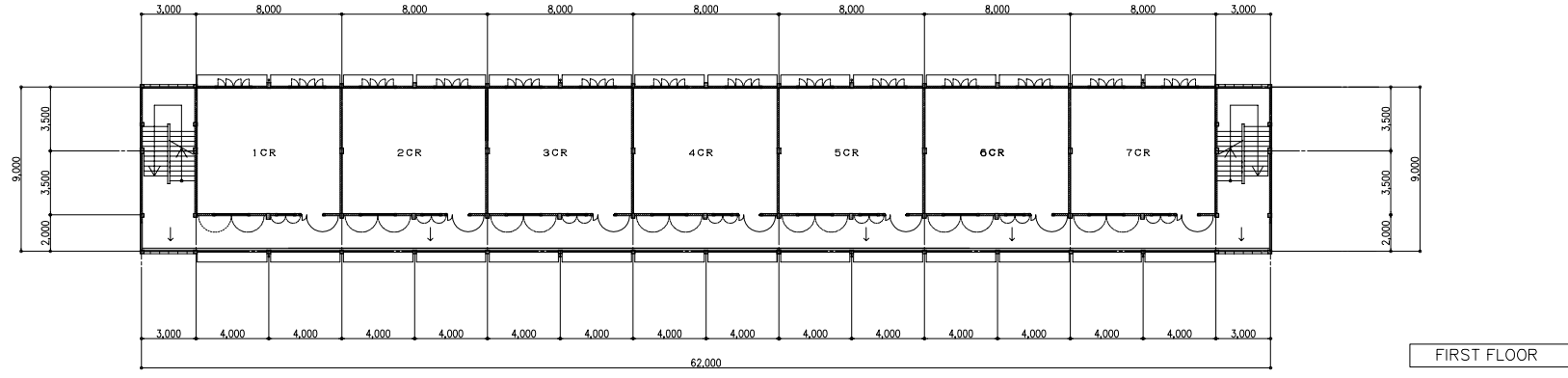
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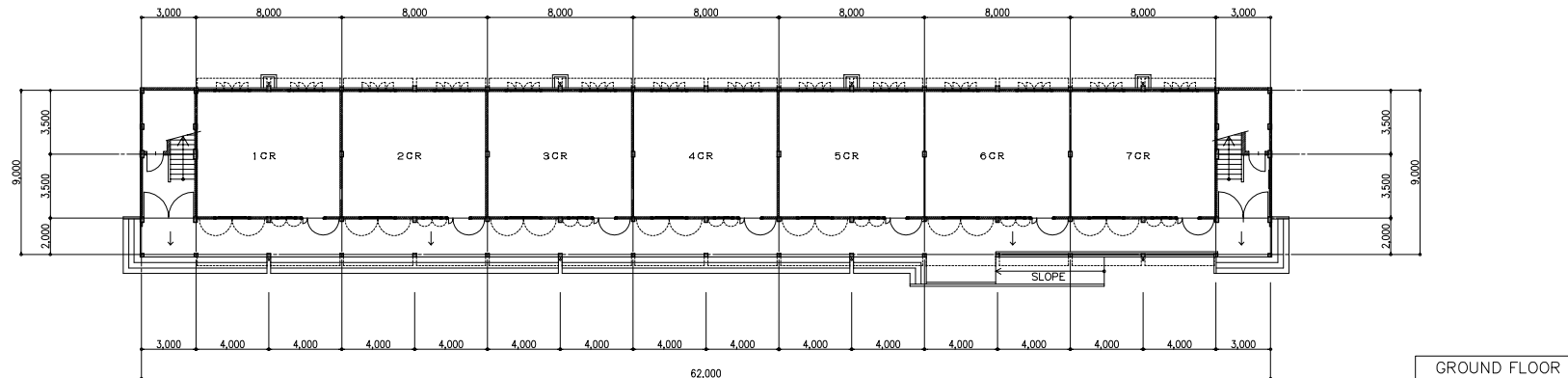
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SECOND FLOOR



FIRST FLOOR



GROUND FLOOR

THE PROJECT FOR CONSTRUCTION OF PRIMARY SCHOOLS IN PHNOM PENH

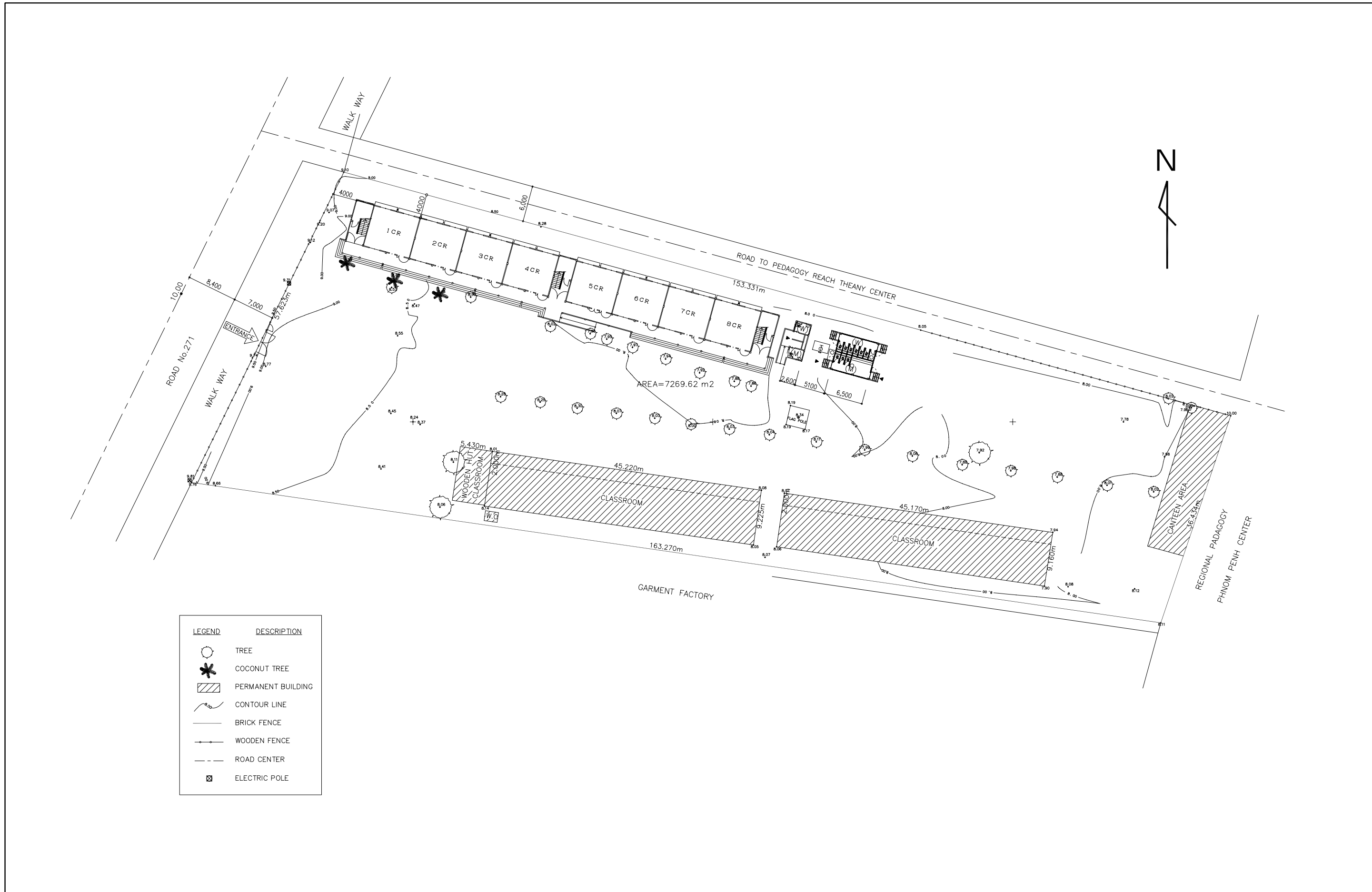
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No.3 Toul Kok : PLAN

SCALE

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06



LEGEND	DESCRIPTION
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	COCONUT TREE
	PERMANENT BUILDING
	CONTOUR LINE
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	WOODEN FENCE
	ROAD CENTER
	ELECTRIC POLE

THE PROJECT FOR CONSTRUCTION OF PRIMARY SCHOOLS IN PHNOM PENH

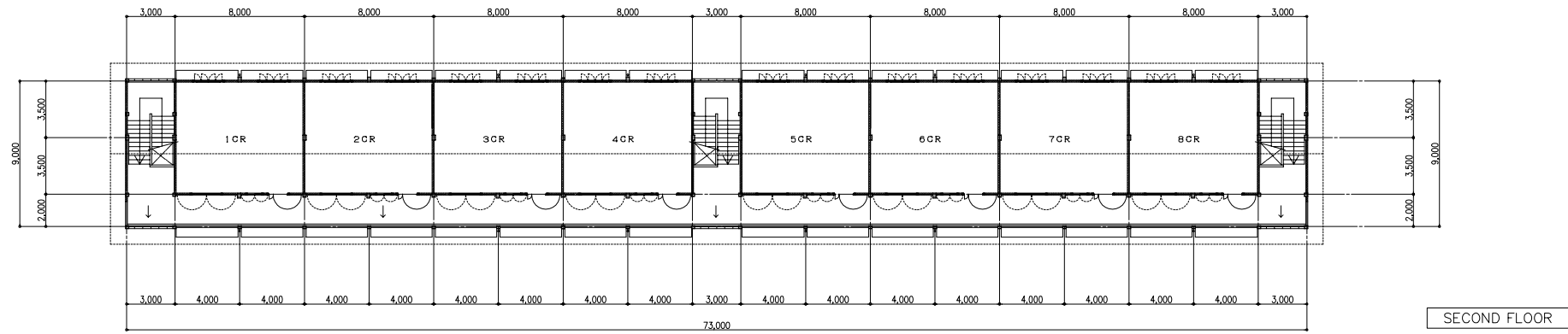
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No. 4 Anu Wat Reach Theany : SITE PLAN

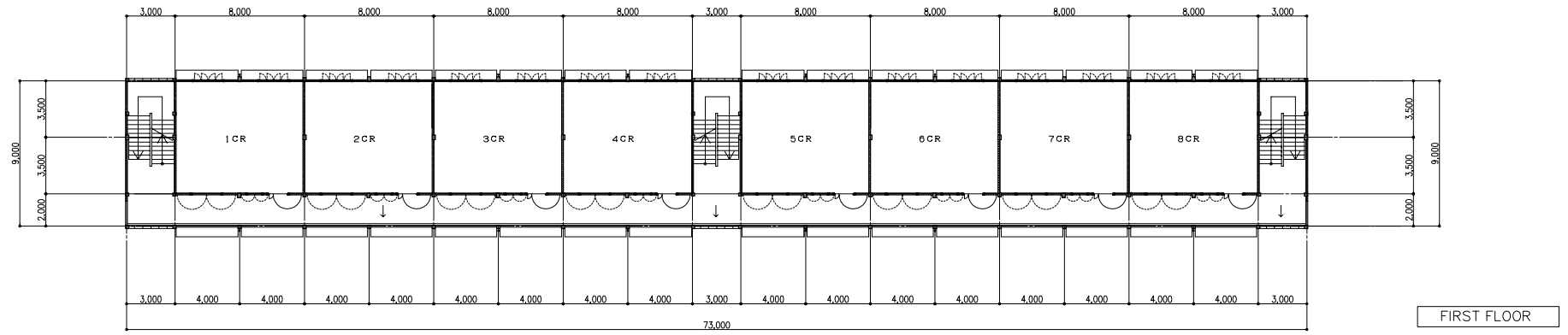
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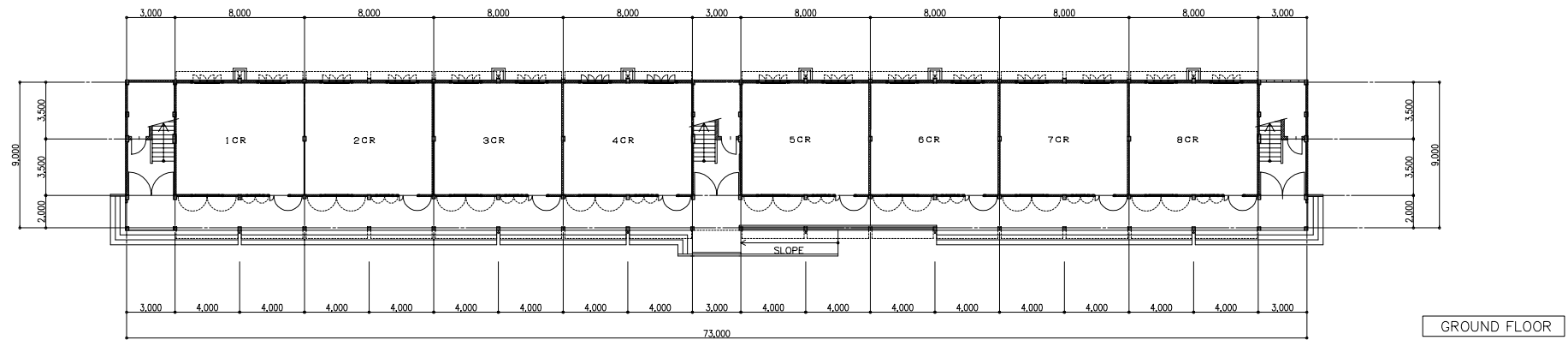
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SECOND FLOOR



FIRST FLOOR



GROUND FLOOR

THE PROJECT FOR CONSTRUCTION OF PRIMARY SCHOOLS IN PHNOM PENH

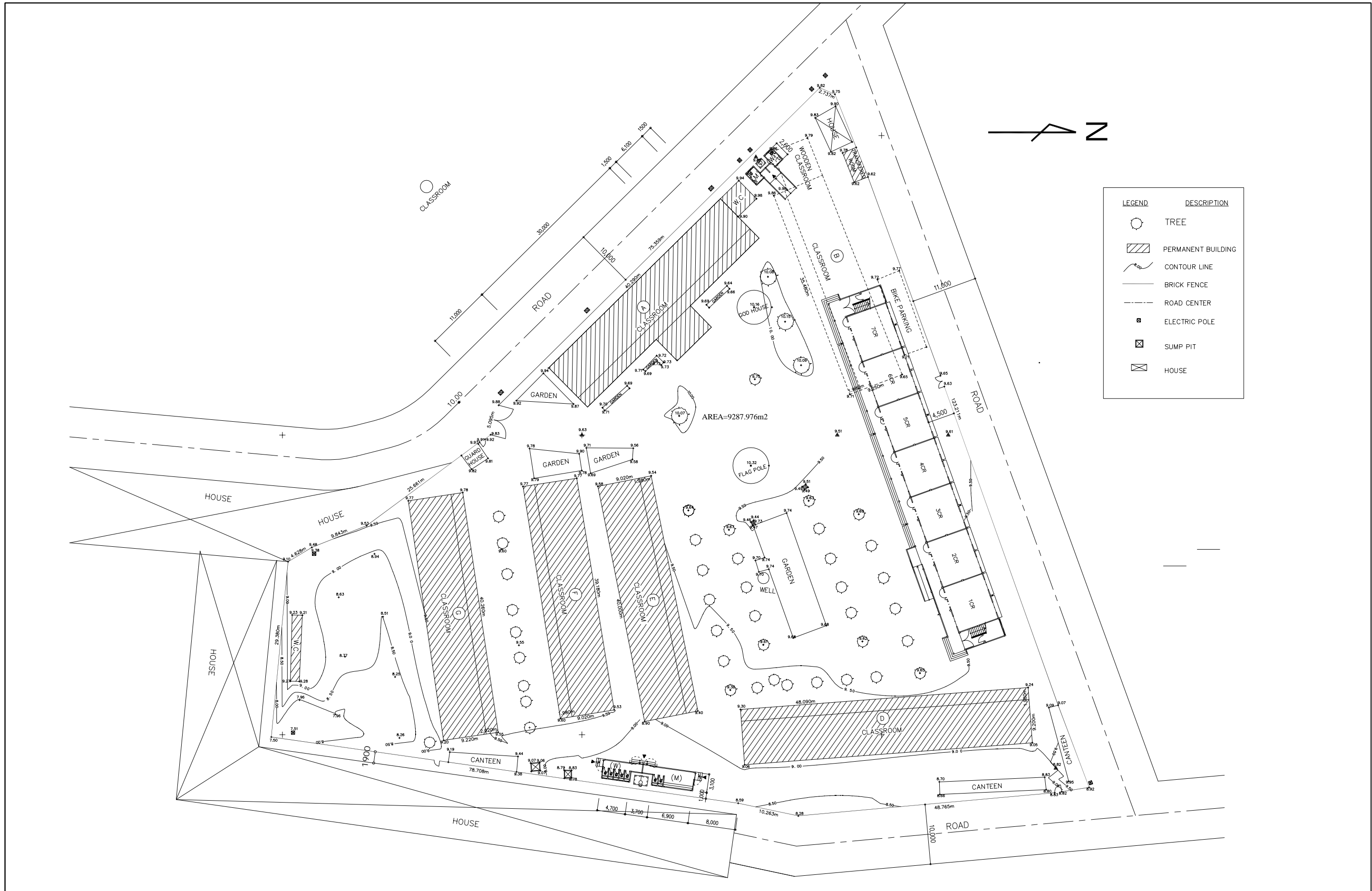
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No. 4 Anu Wat Reach Theany : PLAN

SCALE

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08



THE PROJECT FOR CONSTRUCTION OF PRIMARY SCHOOLS IN PHNOM PENH

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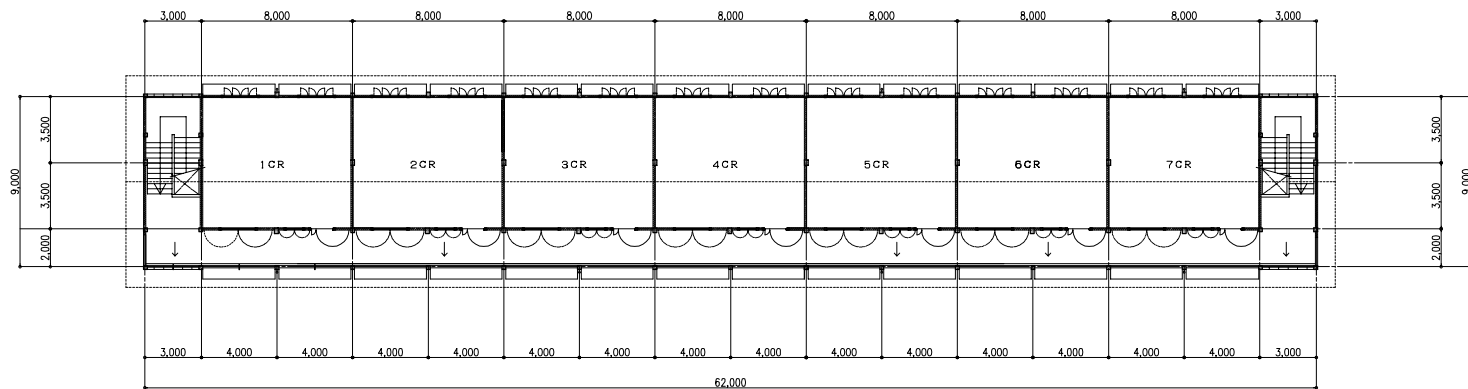
No. 5 Boueng Salang : SITE PLAN

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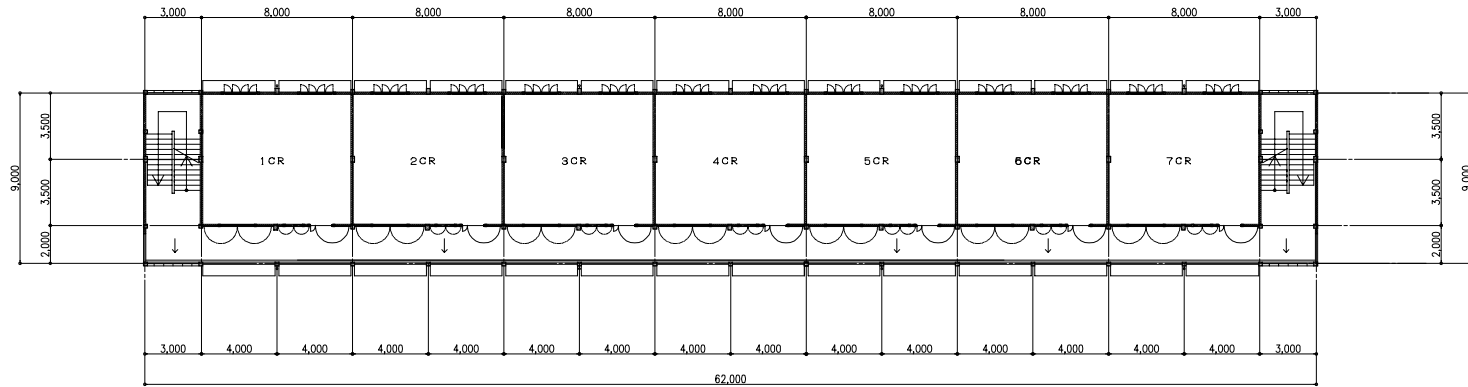
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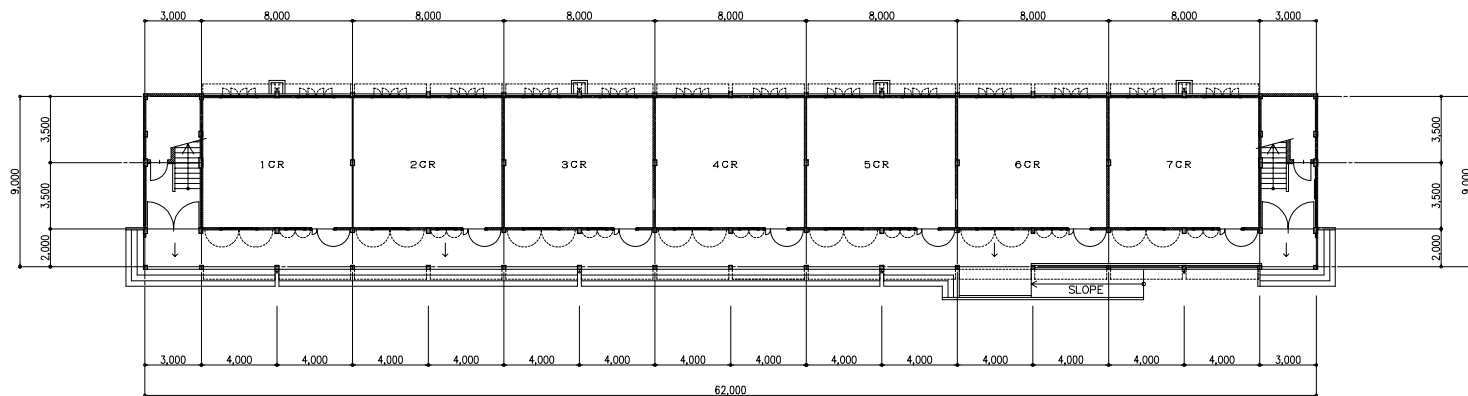




SECOND FLOOR



FIRST FLOOR



GROUND FLOOR

THE PROJECT FOR CONSTRUCTION OF PRIMARY SCHOOLS IN PHNOM PENH

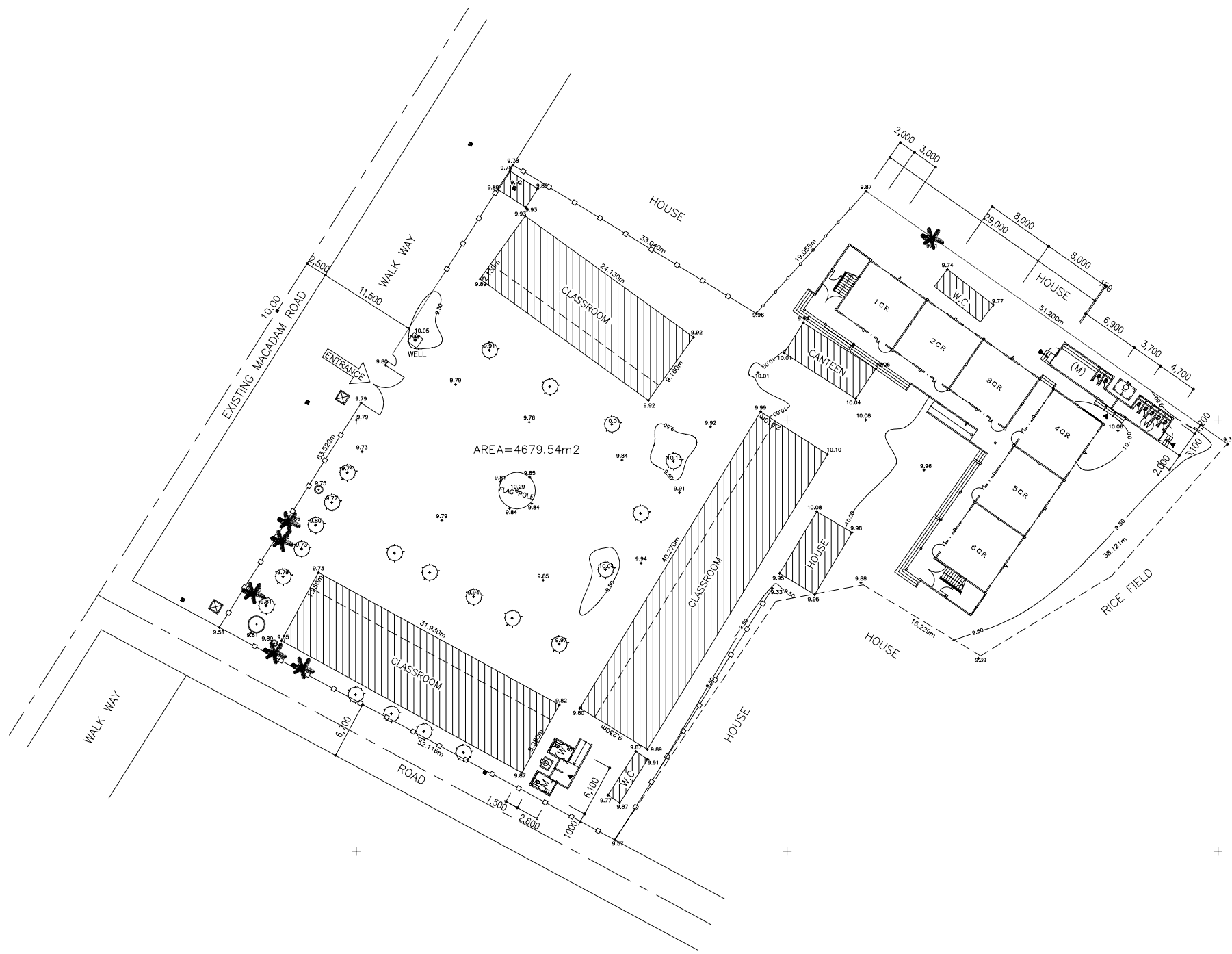
DRAWN TITLE

No.5 Boueng Salang : PLAN

SCALE

1/400

10



LEGEND	DESCRIPTION
	TREE
	COCONUT TREE
	PERMANENT BUILDING
	CONTOUR LINE
	BRICK FENCE
	WOODEN FENCE
	BARBED WIRE FENCE
	NO FENCE
	ROAD CENTER
	ELECTRIC POLE
	WELL
	SUMP PIT

THE PROJECT FOR CONSTRUCTION OF PRIMARY SCHOOLS IN PHNOM PENH

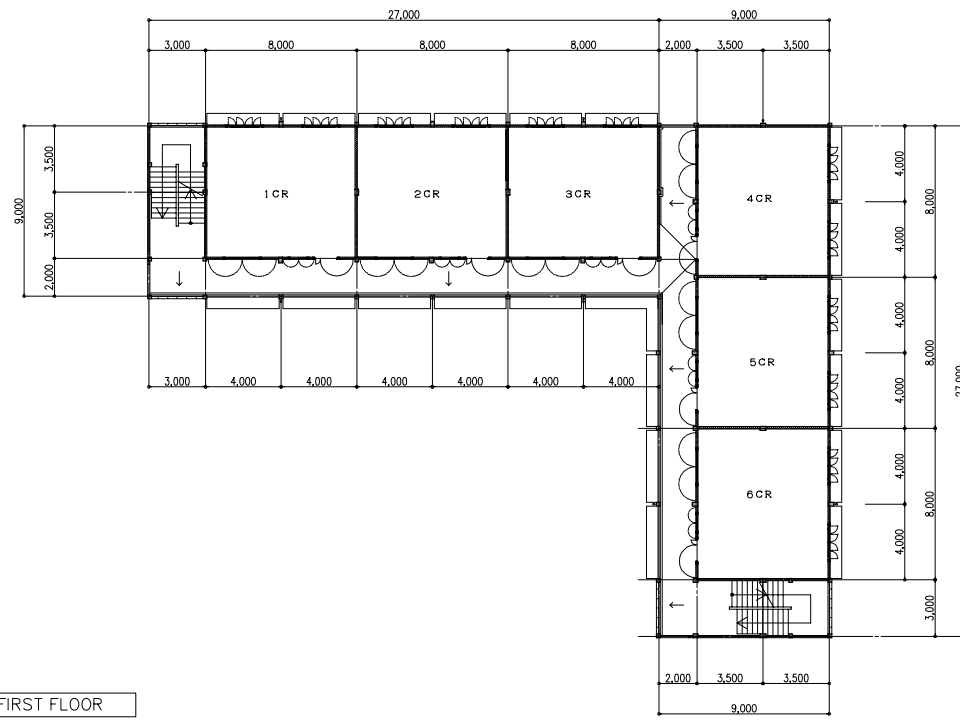
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No.6 Phum Russey : SITE PLAN

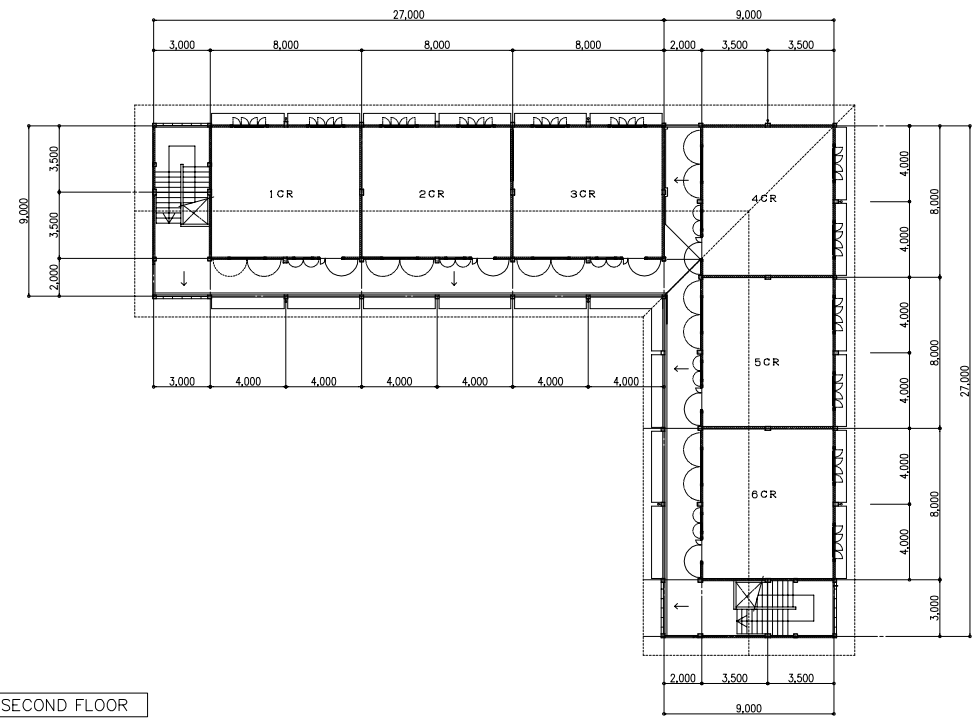
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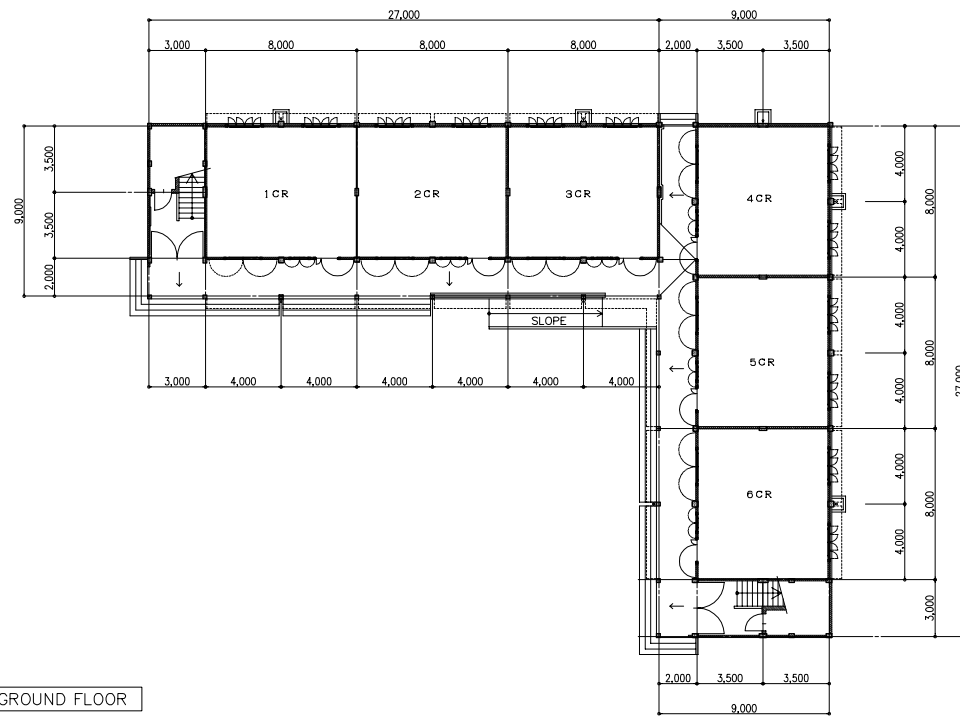
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FIRST FLOOR



SECOND FLOOR



GROUND FLOOR

THE PROJECT FOR CONSTRUCTION OF PRIMARY SCHOOLS IN PHNOM PENH

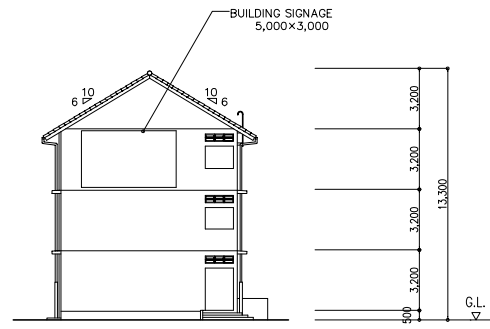
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No. 6 Phum Russey : PLAN

SCALE

1/400

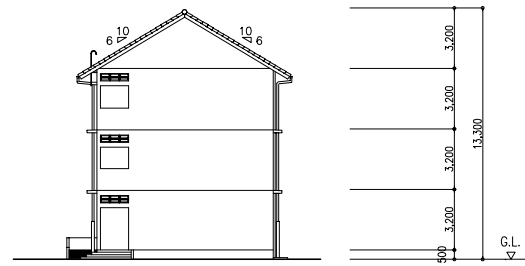
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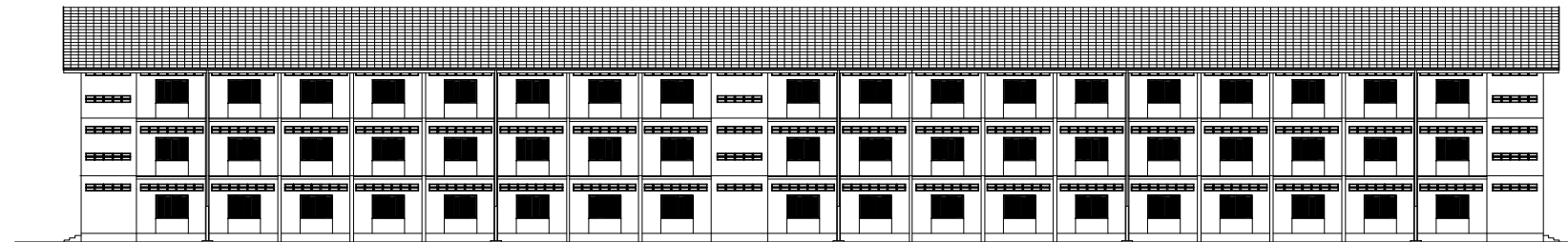
LEFT ELEVATION



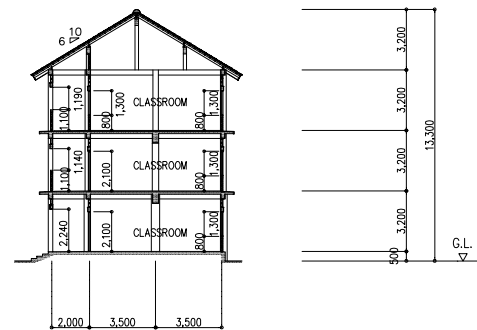
FRONT ELEVATION



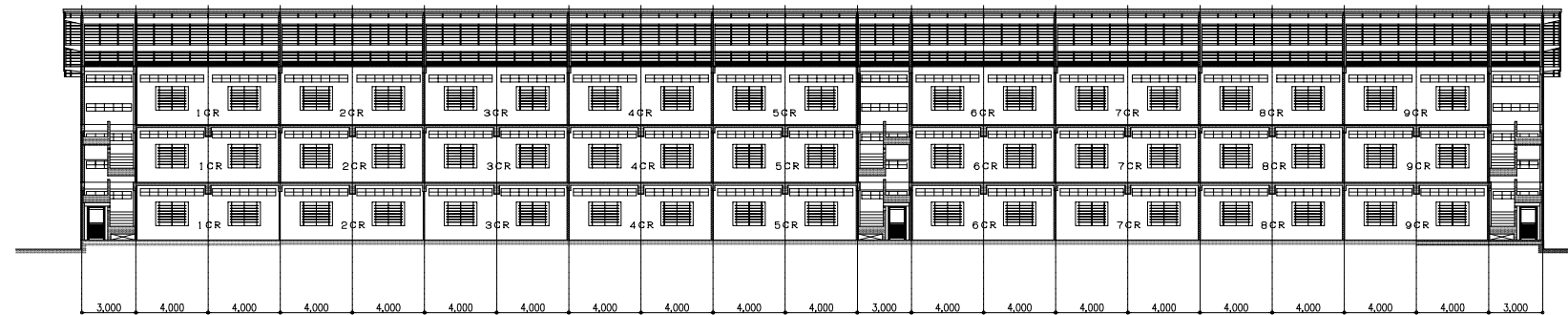
RIGHT ELEVATION



BACK ELEVATION



SECTION B-B



SECTION A-A

THE PROJECT FOR CONSTRUCTION OF PRIMARY SCHOOLS IN PHNOM PENH

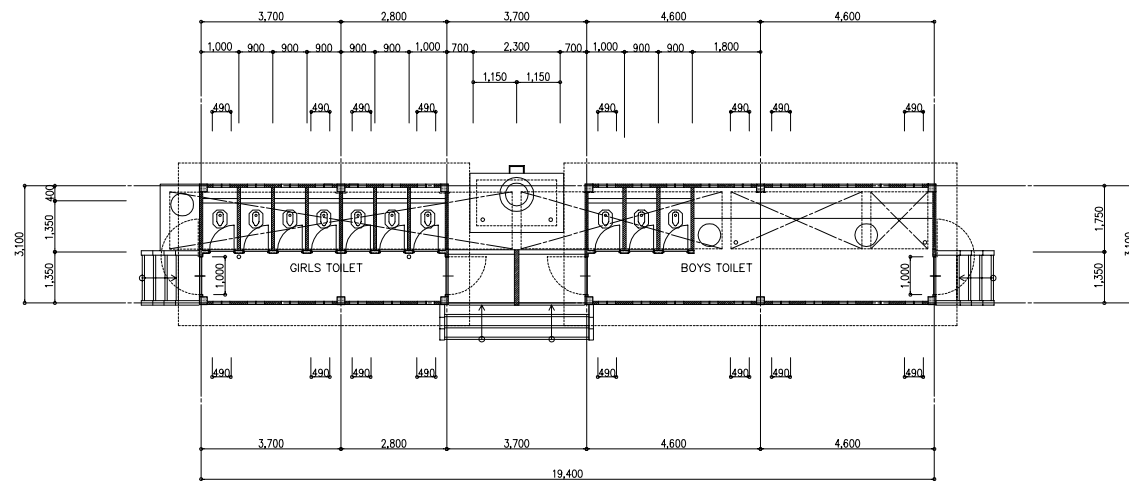
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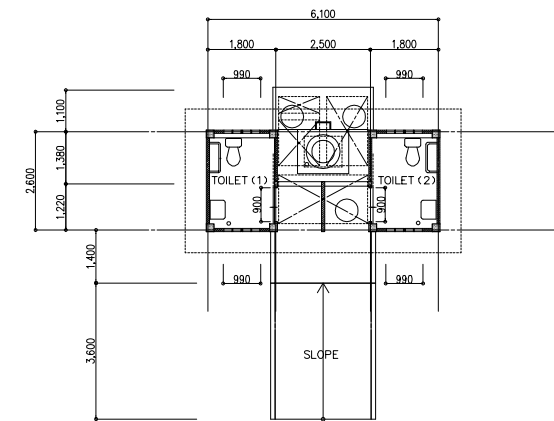
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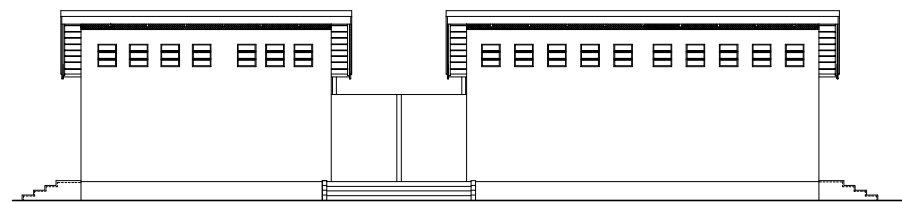
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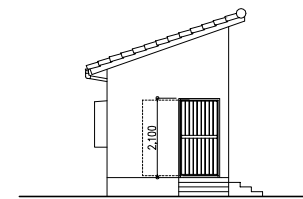
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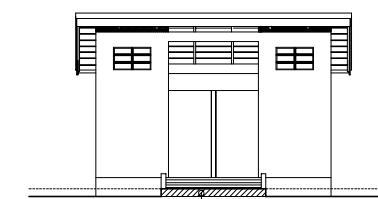
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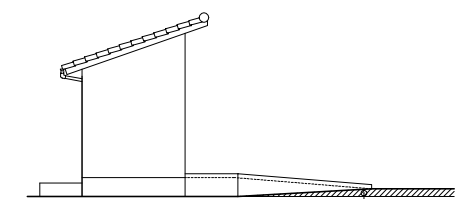
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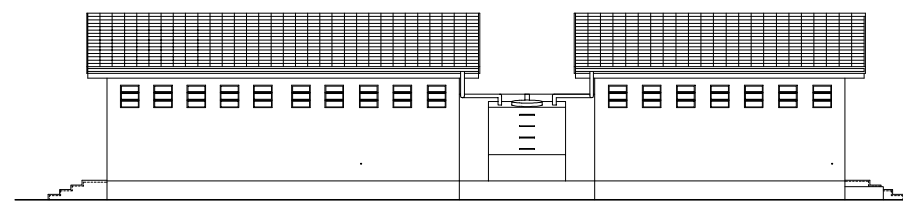
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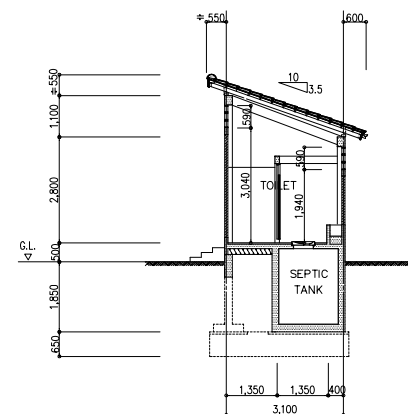
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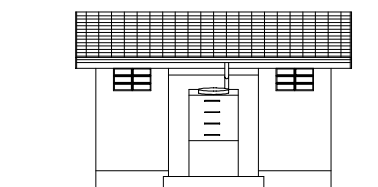
SIDE ELEVATION



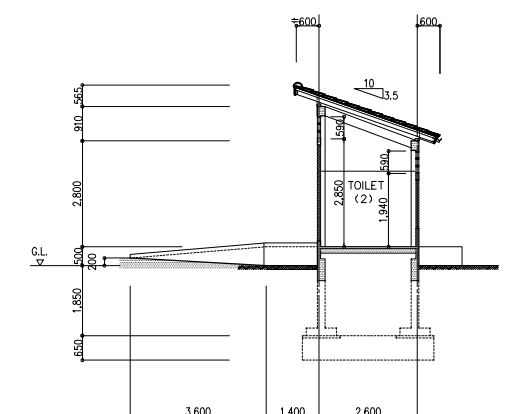
BACK ELEVATION



SIDE SECTION



BACK ELEVATION



SIDE SECTION

THE PROJECT FOR CONSTRUCTION OF PRIMARY SCHOOLS IN PHNOM PENH

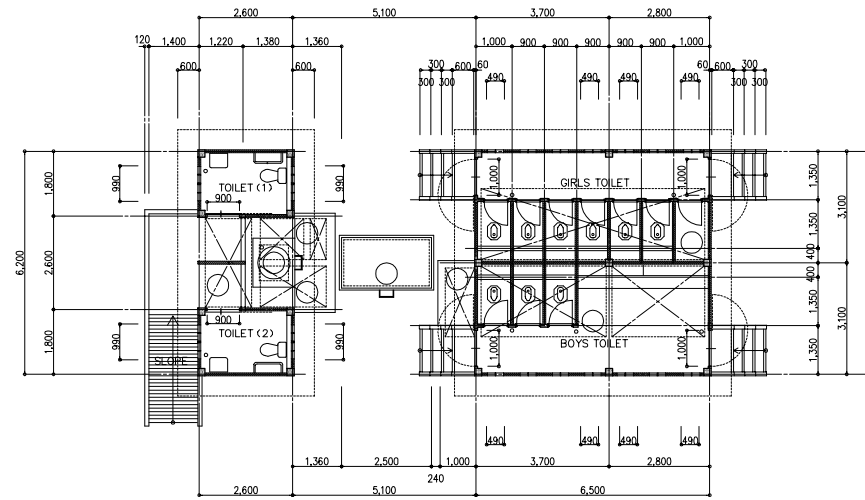
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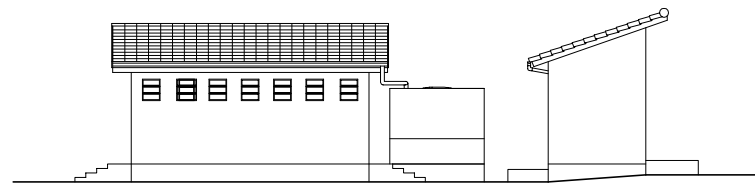
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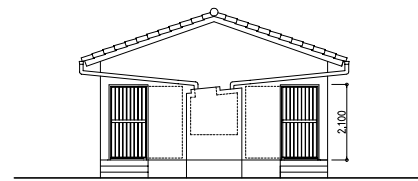
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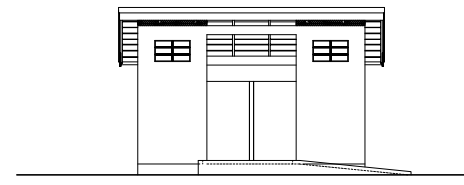
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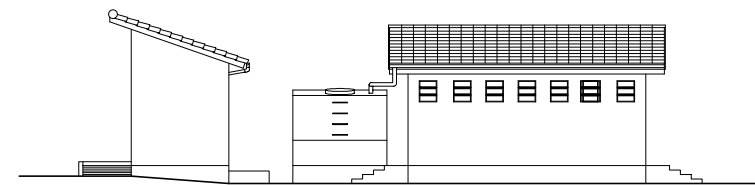
BACK ELEVATION



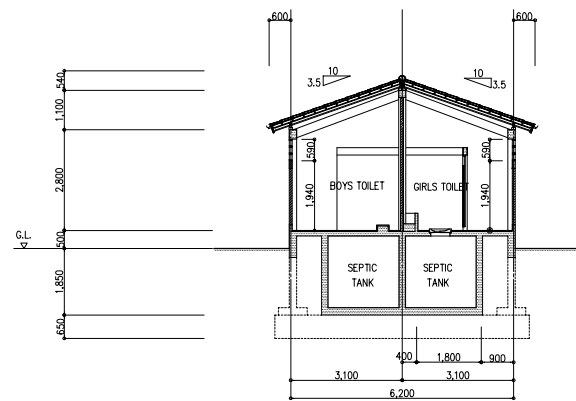
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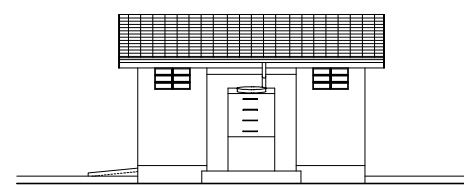
FRONT ELEVATION



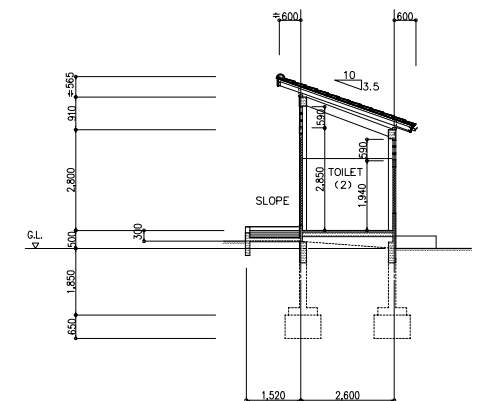
FRONT ELEVATION



SIDE SECTION



BACK ELEVATION



SIDE SECTION

THE PROJECT FOR CONSTRUCTION OF PRIMARY SCHOOLS IN PHNOM PENH

DRAWN TITLE

No.4 Anu Wat Reach Theany : TOILET

SCALE

1/200

15

## **2-2-4 Implementation Plan**

### **2-2-4-1 Implementation and Procurement Policy**

#### **(1) Basic Matters Regarding Project Implementation**

After the examination of the plan formulated by the Implementation Review Study by various related governmental agencies, Project implementation requires final approval from the Cabinet of the Government of Japan. After the approval, the Governments of Cambodia and Japan will sign the Exchange of Notes (E/N) for the Project, which will be implemented in accordance with the following principles:

- 1) The Project is to be implemented with budgetary funds from the Government of Japan, whose origins are taxes paid by the Japanese people in accordance with Japan's Grant Aid scheme.
- 2) The Government of Cambodia shall sign a contract with a Japanese consulting firm, entrusting the firm to prepare all the Detailed Designs of the Project, select Japanese contractors and supervise the Project construction, based on the Implementation Review Study.
- 3) The Government of Cambodia, with the assistance of the above-mentioned consultant firm, will select a contractor company through a general competitive tendering with a pre-qualification evaluation, and with the selected contractor, sign a blanket-contract for the Project implementation.

#### **(2) Basic Principles for Project Implementation**

As described in the Basic Design Study Report, the Project will be implemented in accordance with the following policies:

- 1) For smooth and efficient Project implementation, local consultants and contractors, who are familiar with the local construction system and procurement of materials, shall be employed as many as possible.
- 2) To strictly conduct safety management as well as quality control and schedule management at Project sites, construction plan will be drawn up to establish construction methods at each Project site.
- 3) To make it easy to maintain the project facilities after the completion of construction, furniture to be procured in this Project will be selected as many as possible among products manufactured in Cambodia or imported products which are always available at general market in the country. At the same time, traditional construction methods familiar to local contractors will be adopted as much as possible.

#### **(3) Cambodian Agencies Responsible for Project Implementation**

On the Cambodian side, the responsible agency for the Project is, as shown in the Basic Design Study Report, the Ministry of Education for Youth and Sport (MoEYS) and Phnom Penh Municipality, while the implementing agency for the Project is Education, Youth and Sport Service of Phnom Penh Municipality, which will act as the Japanese counterpart.

## **2-2-4-2 Important Matters Regarding Implementation and Procurement**

### **(1) Construction Schedule**

#### **1) Temporary Storm Drainage System**

During the rainy season (May to October), work efficiencies pertinent to traveling of vehicles, transportation of materials and equipment, and implementation of the Project itself may drop, so the work schedule during the period should be paid particular attention. In particular, the rainy season should be avoided when conducting work involved in piling, earthwork, and foundation work. At Toul Kok school, No.3, Anu Wat Reach Theany school, No.4, and Phuum Russey school, No.6, where overhead flooding of 20 – 30 cm height occurs during the rainy period, temporary drainage systems should be carefully planned. Since the sites of the three schools mentioned above are lower than the surrounding grounds, which make it difficult to drain rainwater naturally, various measures should be taken such as building breakwaters for the flood prevention purpose around the construction sites, and consistently discharge rainwater with submerged pumps. The site of Anu Wat Reach Theany school, No.4, in particular, is lower than the road in front of it by more than 1.5 meters, and subject to water flood coming in from the road, so that breakwaters will be built along the road to stop the flood of rainwater, and that ground level will be raised up by filling, if necessary, to avoid rainwater accumulated. As for the site of Phuum Russey school, No.6, the site for the Project implementation is located in the backland of the premises, and is lower than the ground nearby, making it difficult to let rainwater out. Thus, ground level will be raised up when the construction commences for the purpose of preventing rainwater from being accumulated.

#### **2) Pile Foundation**

While the pile foundation is required at Bak Touk school, No.3, Anu Wat Reach Theany school, No.4, and Phuum Russey school, No.6, due to their lower soil bearing capacity, these sites are located in the urban districts of the city. Hence, an appropriate piling method should be selected. More concretely, attention should be paid for the work which are likely to affect residents in the vicinity of the implementation sites, and the existing school building within the sites, as well as classes in progress at the schools. The driven pile method utilizing diesel hammers is highly likely to generate rocking vibration which may cause cracks or peeling of walls and other parts of the existing school buildings and neighboring residential buildings, and disturb classes by noises. Thus, the pressed-in pile method with ready-made concrete piles to be piled in with hydraulic jacks (concrete counterweight will be used), which is widely used at construction sites in the urban districts of Phnom Penh, will be adopted. However, while the bearing capacity can be directly measured in the driven pile method by observing the degree of bounding of a pile when it is hammered in, such observation is impossible in the pressed-in pile method, whereby it is inevitable to conduct loading test with a test pile to confirm the bearing capacity before the actual implementation of the work. Thus, taking into account that the period from the beginning to the completion of the loading test will take about one month, the implementation schedule will incorporate this period.



## **(2) Accident Prevention for a Third Party**

Since the construction work is conducted within the premises of the existing school sites, construction work areas will be clearly separated from the areas accessed by persons at the schools, the work areas will be isolated from the school area by temporary fences. If an entrance for persons involved in the work is not available, a temporary one will be built by breaking down part of the existing wall. Where construction vehicles come in and out, guards will be allocated to prevent unnecessary accidents.

## **(3) Procurement Plan**

Local materials will be made use of as much as possible, and a procurement plan for materials and equipment will be drawn up in order to meet the construction schedule. Where import materials and equipment are concerned, a detailed work schedule should be drawn up so that the procedures required for the shipment of such materials, tax exemption, custom clearance for the Government of Cambodia, and others can be carried out without delay.

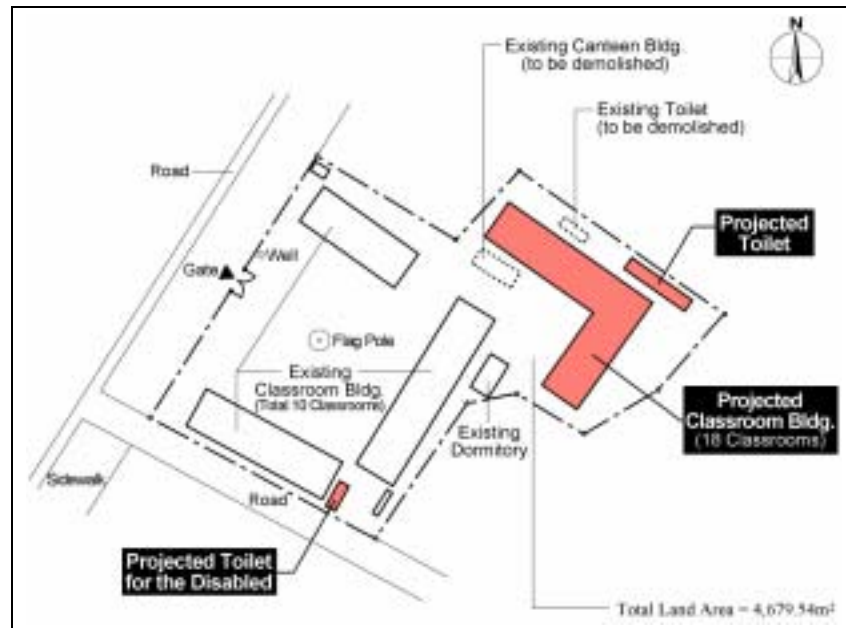
## **(4) Local contractors**

A majority of school facilities in Phnom Penh were built by international bodies and donors from foreign countries which made use of local contractors, but the degrees of perfection in their construction works of such local contractors are below the average level of Japanese contractors. Japanese construction firms will be required to carefully supervise the implementation of the work when making use of local contractors for this Project. In particular, thorough training concerning basic items of implementation procedures shall be given to such local contractors who have no experience in participating in any projects conducted under grant aid cooperation, since they are not familiar with the steps regarding the submission of shop drawings and approvals for them; the approval for building materials; the inspection and approval of frameworks and reinforcing steels works; and so on.

From the viewpoint of company size, this Project can be handled sufficiently by middle-ranking local contractors, but judging from the number of engineers at each contractor, it seems better to have one contractor responsible for two schools at a maximum.

## **(5) Implementation of Construction at Small Site, Phum Russey School, No.6**

Special consideration will be made as shown below for the implementation plan of Phum Russey school, No.6, whose area is small.



**Figure 2-7 Layout Plan of Phum Russey Primary School, No.6**

- 1) It is confirmed in the field survey of this Implementation Review Study with the presence of persons from the Cambodian side that the existing canteen building (an umbrella type building consisting of reinforced concrete roof and pillars without walls, donated by "Enfant du Cambodia", a French NGO, in 1996) and the existing toilets (which are no longer used and their septic tanks have been already removed) are too close to the project classroom building and may disturb the implementation of the work so that they are required to be demolished and removed. In fact, it is impossible to implement the construction work without demolishing such existing facilities, so that the Cambodian side will be required to make sure the implementation of the demolition of the facilities in question before the construction work starts.
- 2) Since the access to the premises is the main entrance alone, an entrance for the construction work will be built between the school building located in the north-east and the wall facing the boundary, and a temporary access road will be laid down which leads to the construction sites.
- 3) Since it is allowed to have a 3-meter width for the access road mentioned in 2), it is impossible for crawlers for piling work, cranes, and large trailers to come in. Thus, such large vehicles are obliged to pass through the campus temporarily. For this, safety personnel will be allocated so as to pay full attention to the safety.
- 4) Since it is impossible to have sufficiently large temporary yard in the site, contractor has to borrow a lot of empty lands in the vicinity of the site.
- 5) It is possible to use track cranes for lifting works, but the cranes takes large room for moving, and leave little space at the temporary yard. Thus, a tower crane, though expensive, may be installed.

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

The division of work and responsibility between the Japanese and Cambodian sides was presented in the Basic Design Study Report, in addition, the work concerning the construction of drainage pipelines which the Cambodian side has already formulated and earmarked the budget for shall be included. The list is shown below.

#### **(1) Works to be borne by the Japanese side**

- 1) Facilities (classrooms and toilet facilities)
- 2) Furniture and fixings

#### **(2) Works to be borne by the Cambodian side**

- 1) To secure land for the Project;
- 2) To clear, level and reclaim Project sites as necessary;
- 3) To demolish and remove obstacles existing on and under the ground within the Project sites as necessary;
- 4) To provide or secure access road;

An access road to each Project site should be cleared and secured for the safe passing of trucks transporting piles and cranes to carry piles (equipment concerning piles to be used in the pressed-in pile method) concrete pump and mixer trucks, also trucks transporting construction materials and other construction related vehicles.

- 5) To secure storage places for construction materials and equipment;
- 6) To provide facilities for the distribution of water, drainage and electricity;

To construct the main drainage pipeline within and outside the site; to obtain all necessary permits to connect electric power supply lines, water supply and drainage lines; to connect those lines; to construct a well and to install a pump; and to clean and maintain the existing well. Works listed below will be conducted in accordance with the work schedule requested by the Japanese side. Particular attention should be paid to the work related to construction of the main drainage pipeline within and outside the site, which was not mentioned in the Basic Design.

#### **[Water Supply]**

The Japanese side will undertake the installation of the water supply pipe work inside the Project site. Whereas the Cambodian side at its own expense, shall be responsible for pipe installation work outside the site, extension work, and making the necessary applications for water service at the Bureau of Water Supply. The drilling of wells plus the pump and pipe installation within the wells shall also be shouldered by the Cambodian side.

#### **[Drainage]**

The installation plan of drainage pipes drawn by the Cambodian side covers the installation of drainage pipes from outside the Project site to inside the site, and thus the work in the plan and the connection of drainage pipes from the final basin at the project toilet facilities will be borne

by the Cambodian side. Also the application for drainage service at the Bureau of Drainage will be made by the Cambodian side at its expense.

[Electrical Power Supply]

The Japanese side will install a switchboard adjacent to the road, and the Cambodian side will run cables to connect the power supply to the switchboard within the Project site. The Japanese side will complete the internal wiring work from the switchboard to the existing distribution board and to Project facilities.

- 7) To provide exterior work, such as landscaping, installation of gates and safety fences or other incidental facilities if necessary; and
- 8) To procure furniture and equipment not included in the Project.

#### **2-2-4-4 Consultant Supervision**

The consultant supervision in this Project is as presented in the Basic Design Study Report.

##### **(1) Basic Principle**

In order to complete all the construction work at the six Project sites (total construction area: more than 10,000 m<sup>2</sup>) and do so within the limited time period, the following supervision shall be effectively conducted: the reporting of work progress, the making of arrangements with the implementing agency at the Cambodian side, and the giving of timely and adequate guidance/directions to contractors. Thus, both the supervision work of the resident architect and the general supervision work in Japan shall be carried out at the same time.

##### **(2) General Supervision in Japan**

With the support of the Japanese engineers who were engaged in the Detailed Design, the experienced Japanese consultant will oversee all the construction schedules, make comprehensive technical judgments, support the resident architect (especially in areas of technical knowledge out of their expertise), and submit all regular as well as irregular reports to JICA Office.

##### **(3) Supervision of the Resident Architect**

A Japanese architect selected from the engineers who were engaged in the Detailed Design will be dispatched to Cambodia and employ the local worker, consult daily work schedules, examine and provide technical advice on the shop drawings and methodologies, approve the use of materials, supervise the contractor's work, prepare and submit all regular as well as irregular reports to MoEYS, the JICA office and the Japanese Embassy, also conduct interim and completion inspections, collect all necessary data and information, and prepare the supervision reports.

Phnom Penh Municipality, the responsible agency of the Project, will make a contract with the consultant and contractor. Instructions from Phnom Penh Municipality will be transmitted to the consultant's office, and after examining the instructions at the consultant's office, transmitted to the office of the contractor and to the local contractor(s). All progress and/or problems should be reported

from the local contractor(s) to the contractor first, then from the contractor to the consultant who passes it on to Phnom Penh Municipality. The Japanese consultant and contractor will employ local engineers. As all the Project sites are located within a 4km radius from the center of the city, the offices of the consultant and the contractor will also be located in this radius.

**2-2-4-5 Quality Control Plan**

**i) Principle Matters regarding Quality Control**

As specified in the design documents and construction supervision plans of the Project, the construction plans, construction drawings, materials and samples will be approved. At the same time, various tests shall be conducted at public laboratories, and construction sites shall be inspected as specified in the documents and plans mentioned above. The quality control plan of building construction is shown in the table below. Apart from those related to the construction, a list of items requiring inspections and approvals will be formed, according to which the quality control will be observed.

**Table 2-18 List of Quality Control Items**

Work Item	Quality Control Item	Inspection Method	Inspection Frequency
Piling Work	Soil bearing capacity against piling	Loading test	One location at each site
Earthwork	Soil surface	Visual inspection	Once at each site
	Rolling compaction	Visual inspection	Prior to concrete placing
	Anti-termite treatment	Confirmation of sprinkling certificate	Once at each site
		Visual inspection	Once at each site
Concrete Work	Materials	Cement: Strength test	For each batcher plant, each change in mixing ratio and each change in materials
		Aggregates: Grain test	
		Water: Quality test	
	Test mixing	Slump, temperature, and air volume	ditto
		Compression test	ditto
	Ready-mixed concrete	Slump and temperature	Prior to concrete placing
Compression test		One test piece sampling at every 30m <sup>3</sup> . Test at 1st and 4th weeks.	
Reinforcing Bar Work	Materials	Mill sheet inspection	For each lot
		Tensile strength test	For each diameter and type at every 15 tons
	Finished condition	Measuring test and visual inspection	Prior to concrete placing
Form Work	Finished condition	Measuring test and visual inspection	ditto

**ii) Control Standards**

The quality control related to the Project will comply with the design documents and JASS, but ASTM and other international standards applicable to the sites will be used, too.

#### **2-2-4-6 Procurement Plan**

Labor service, and construction materials and equipment will be procured in accordance with the following policies.

##### **(1) Labor service**

Construction works are conducted at various places in Phnom Penh, but the workload as a whole is not so large that the labor service can be procured without difficulty. However, attention should be paid to the procurement of skilled workers due to their scarcity.

##### **(2) Work Materials**

- 1) Principle materials (cement; reinforcing bars; roof materials; tiles; materials for electricity, water supply, drainage, and sanitary facilities, and so on) with the exception of sand, gravels, bricks and wooden materials, rely on import products, but their stocks in the market are ample, so that materials whose quality is satisfactory and which are stably supplied will be procured within Cambodia.
- 2) Reinforcing bars are available in Cambodia, but their quality is not guaranteed in many cases, so that the bars to be used in this Project will be procured from Thailand or other countries in order to secure the quality. The quality of procured bars will be checked by the tensile strength test.
- 3) Wooden fixtures will be procured from Thailand or other countries to secure quality, whereas whiteboards will be procured within Cambodia but the stringent quality control will be conducted.
- 4) Where items to be imported directly are concerned, attention should be paid to the time required for the procurement, import procedures, and procedures for tax exemption.
- 5) Since it is difficult to obtain dry wooden materials, the materials should be procured at an early stage after the commencement of the work, or raw materials should be procured early enough to dry them before using.

##### **(3) Furniture and fixings**

Sufficient period of time will be calculated for the production of desks and chairs, and whiteboards before the actual commencement of the production, because it requires a series of steps – 1) the submission of samples and their examinations; 2) modifications based on aspects pointed out in the examinations; 3) approval; and 4) the commencement of production.

A list of materials and equipment to be procured is provided below.

**Table 2-19 List of Materials and Equipment to be Procured**

Name of Material/Equipment	Place of Procurement			Remarks
	Cambodia	Japan	Third country	
<b>(Building Construction)</b>				
Portland Cement	100%			Reliable Availability / No Quality Problem
Aggregate	100%			Reliable Availability / No Quality Problem
Re-bar / Steel Member			100%	
Form of Concrete Work	100%			Reliable Availability / No Quality Problem
Hollow Brick	100%			Reliable Availability / No Quality Problem
Louver Block	100%			Reliable Availability / No Quality Problem
Colored Cement Roof Tile	100%			Reliable Availability / No Quality Problem
Wood Finish Material	100%			Reliable Availability / No Quality Problem
Interior Finish Material (Tiles)	100%			Reliable Availability / No Quality Problem
Wood Doors / Windows			100%	
Metal Accessory / Fitting	100%			Reliable Availability / No Quality Problem
Paint / Water Proof Materials	100%			Reliable Availability / No Quality Problem
Furniture	100%			Reliable Availability / No Quality Problem
Whiteboard	100%			Since there is no particular problem in terms of quality or availability in products in the market, this was determined to be procured from a third country in the Basic Design, but will be procured in Cambodia.
<b>(Electrical / Mechanical)</b>				
Distribution Boards	100%			Reliable Availability / No Quality Problem
Cables / Wirings	100%			Reliable Availability / No Quality Problem
Conduit	100%			Reliable Availability / No Quality Problem
Lighting Fixture	100%			Reliable Availability / No Quality Problem
Switch / Outlet	100%			Reliable Availability / No Quality Problem
<b>(Plumbing / HVAC)</b>				
Galvanized Steel Pipes	100%			Reliable Availability / No Quality Problem
Valves / Pipe Fittings	100%			Reliable Availability / No Quality Problem
Pumps	100%			Reliable Availability / No Quality Problem
Sanitary Equipment	100%			Reliable Availability / No Quality Problem

**2-2-4-7 Implementation Schedule**

The implementation schedule will be more or less the same as presented in the Basic Design Study Report. However, revisions will be made in line with the adoption of the pressed-in pile method of piling at the stage of construction and procurement of materials and equipment.

For smooth implementation of the Project, all proceedings and the division of work borne by the Cambodian and Japanese sides, within the framework of the Grant Aid scheme, shall be done without any delay. After the Exchange of Notes (E/N) is signed by the Governments of Cambodia and Japan, Project implementation will proceed with three stages – the Detailed Design approval stage, the tendering and signing of the contract stage, and the construction and procurement stage.

### **(1) Approval of Detailed Design**

The consultant shall submit to the Cambodian side the result of this Implementation Review Study on the contents of the designs (detailed design plans, specifications documents, documents specifying quantities, etc.), and get approval from the Cambodian side.

### **(2) Tendering and Signing of Contracts**

After the approval of the Detailed Design, Pre-Qualification (P/Q) of the candidate contractors will be conducted in Japan. Based on the result of the Pre-Qualification, Phnom Penh Municipality as project implementing agency of Cambodia will call for the tendering of the Project which will be witnessed by official personnel concerning the Project. The lowest tenderer will be further evaluated if the tendering contents are appropriate. After successful evaluation, a tenderer will be selected as the contractor and will sign the project construction contract(s) with Phnom Penh Municipality. It will take approximately two and half months for these procedures to take place and be completed.

### **(3) Building Construction and Procurement**

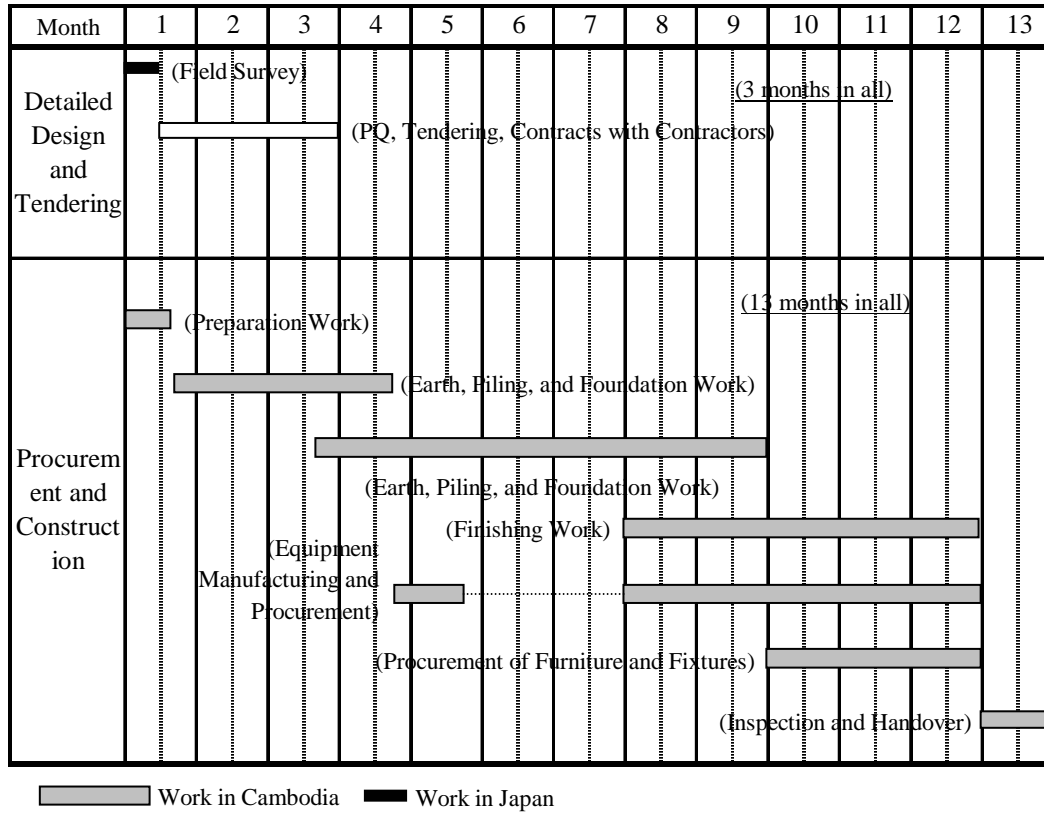
After the construction contract is verified by the Government of Japan, the construction work will start. The construction schedule was calculated as 12 months in the Basic Design. However, due to the piling work determined to be revised in this Implementation Review Study, which will adopt the pressed-in pile method utilizing the hydraulic pressure, it is now necessary to allow one and half month for the piling work including the piling test to confirm the soil bearing capacity against piling. Thus, the construction schedule will be expanded for another one month, making the total period of construction 13 months.

### **(4) Consideration for Rainy Seasons**

As stated in 3-2-4-2 (1) Construction Schedule, it is necessary to avoid the rainy seasons (May – October) for conducting the piling, earth, and foundation works.

The construction schedule is shown in the following page.





**Figure 2-8 Construction Schedule**

## **2-3 Obligations of the Recipient Country**

As a basic principle, the Government of Japan requested the Government of Cambodia to share the following obligations of the Project, and both government agreed and signed the Minutes of Discussion during the Basic Design Study of the Project. They also reconfirmed the contents of the Minutes of Discussion mentioned above in the Minutes of Discussions during the Implementation Review Study, and agreed and signed the Minutes.

### **(1) Throughout the Entire Project Implementation Period**

- 1) To provide data and information necessary for the Project to the Japanese side forthwith; and
- 2) To acquire permits, approvals, and any other authorizations required in Cambodia for construction work undertaken during Project implementation.

### **(2) During Preparation Period**

- 1) To secure the land necessary for the Project, and to obtain land-use rights and building permits to construct school facilities on the land; to remove obstacles within the Project sites (e.g. existing buildings, trees, or foundation underground) and to clear, level and reclaim the site of Anu Wat Reach Theany school.
- 2) To sign contracts for facilities design, facility construction and supervision work for the Project;
- 3) To bear all commissions, handling charges and other necessary fees for banking services related to the Bank Arrangement (B/A) and the Authorization to Pay (A/P); and
- 4) To approve all design documents for the Project.

### **(3) During the Project Construction Period**

- 1) To ensure prompt unloading at ports of entry and all inland transportation of materials, equipment and machinery procured by funds from the grant;
- 2) To exempt all Japanese nationals engaged in the Project from any customs duties, internal taxes and all other fiscal levies on products and services that come under the verified contracts;
- 3) To provide every convenience to all Japanese nationals engaged in the Project when they enter into and stay in Cambodia to perform work that comes under the verified contracts;
- 4) To coordinate and settle any various potential problems with third parties and neighboring residents in regards to Project implementation;
- 5) To secure temporary classrooms at the Project school where temporary classrooms are necessary to conduct classes during the construction period; and
- 6) To obtain all necessary permits to connect electric power supply lines, water supply and drainage line, and to connect those lines to the Project sites.

### **(4) After Completion**

- 1) To use and maintain the Project facilities and equipment adequately and effectively; and
- 2) To bear all necessary expenses for Project implementation that are not covered by the grant aid.

**Table 2-20 Site-Distinctive Obligations of the Government of Cambodia (Schematic Design Level)**

No	School Name	Demolition of the Existing Buildings	Site Control	Electrical Work	City Water Supply Work	Water Well Work	Installation of Drainage Pipes (*7)	Sewage Line Work
1	Bak Touk	Required (Footing remains *1)	Not required	Required	Existing	Existing	To be conducted	Required
2	San Thor Mok	Required (Footing remains *2)	Not required	Required	Existing	No underground creek exists	To be conducted	Required
3	Toul Kok	Required (obstacles underneath ground remain *3)	Not required	Required	Existing	Existing	To be conducted	Required
4	Anu Wat Reach Theany	Not required	Not required	Required	Existing	Required	To be conducted	Required (new*8)
5	Boeung Salang	Required (Changed buildings to be demolished *4 )	Not required	Required	Existing	Existing	To be conducted	Required (new*9)
6	Phuom Russey	Required (new*5)	Not required	Required	Required (new*6)	Existing (Repair work required )	To be conducted	Required

Notes) Asterisks in the table are items confirmed in the Implementation Review Study, and their contents are shown below:

- \*1: As for the building scheduled to be demolished, the upper structure has been already demolished and removed, with the footing remains.
- \*2: ditto
- \*3: At the site where Project facilities are scheduled to be built, there are obstacles – parts of foundation – under the ground. These were not confirmed at the time when the Basic Design was drawn up.
- \*4: The existing administration building which was decided to be demolished at the time of the Basic Design will continue to be used. Alternatively, an existing classroom building with five classrooms will be demolished.
- \*5: The existing canteen building and toilet facilities (with five booths, no longer used) will be added to the list of the buildings to be demolished.
- \*6: No main line of city water existed at the time of the Basic Design, but now the main pipes of city water have been laid down, enabling to extend the pipes to the site.
- \*7: Phnom Penh City has already drawn up a plan to install drainage main pipes within and outside all the Project schools, and earmarked the budget for the related work.
- \*8: Since the drainage infrastructure was not established at the time of the Basic Design, it was planned that wastewater would be treated within the site by the seepage pit. But thanks to the plan to install drainage main pipes mentioned above, it will be possible to discharge wastewater to the drainage pipe.
- \*9: At the time of the Basic Design, wastewater from the Project toilet facilities were planned to be discharged through the drainage ditch, but there was no such ditch to be connected to the facilities. But now, as shown in \*7, the plan to install the drainage main pipes has been established, enabling the connection.

## 2-4 Project Operation and Maintenance Plan

### 2-4-1 Operation and Maintenance Plan

#### (1) Operation Plan

The Project schools conduct the recruitment activities of teaching staff members every year, and the number of teachers at the six Project schools increased from 628 in 2002, when the Basic Design Study was conducted, to 675 in 2004, an increase of 47 teachers within two years.

After the implementation of the Project, the number of classes will increase due to an increase in the number of classrooms at the Project schools. Compared this increase to the current number of teachers, a majority of the Project schools will be likely to face the shortage of teachers. The number of shortages was estimated at 110 teachers for all the Project schools at the time of the Basic Design Study, but the recalculated number of shortages, which takes the number of teachers as of 2004 into account, is expected to be 15, as shown in the table below.

In the viewpoint of the Education, Youth and Sport Service of Phnom Penh Municipality, this will not cause any problem as mentioned in the Basic Design Study Report, because redundant teachers and those who are on the waiting list who are currently working as administrative staff will be allocated to the Project schools.

**Table 2-21 Number of Teachers Required for Project Schools**

No	School Name	No. of Classrooms after Project	No. of Classes after Project	No. of Teachers as of 2004	Defective Number of Teachers after Project
1	Bak Touk	87	174	170	4
2	San Thor Mok	67	134	145	-11
3	Toul Kok	82	164	177	-13
4	Anu Wat Reach Theany	42	84	69	15
5	Boeung Salang	39	78	77	1
6	Phuom Russey	28	56	37	19
Total		345	690	675	15

Note: There will be no shortage of teachers after the implementation of the Project at San Thor Mok school, No.2, and Toul Kok school, No.3. On the contrary, both schools will have an excessive number of teachers (11 and 13 teachers, respectively).

#### (2) Maintenance Plan

The Maintenance Plan is the same as presented in the Basic Design Study Report.

Maintenance activities are conducted at the school level, mainly by the School Supporting Committee (SSC) of each school which consists of community residents, priests, parents and teachers. The Committee is in charge of managing and distributing the maintenance budget disbursed from the Government as well as donated from the community. Each Committee performs the minor maintenance work, and for major maintenance work, the Committee asks MoEYS, through the Phnom Penh Municipality, to allocate funds for the repairs. The daily cleaning activities are performed by teachers and pupils, while some schools employ their own janitors.

The following necessary maintenance activities are required at each Project school in the Project:

cleaning of toilet facilities, repairing furniture (e.g. desks and chairs) and painting the exterior and interior of the Project buildings. Since the above-mentioned maintenance activities for the Project buildings can be carried out by the Committee, no special organization needs to be developed.

## 2-4-2 Costs for Operation and Maintenance

As presented in the Basic Design Study Report, all operation and maintenance fees with the exception of labor costs are borne by each school. The main sources of their incomes are categorized into three groups described below.

### 1) Budget Funds from the Government

The Government of Cambodia provides education budget to schools in its Priority Action Program (PAP). The items where such budgets are allowed to be allocated are predetermined in advance, including; a) equipment, b) minor maintenance and repair, c) activities for sports, culture and agriculture, and d) transportation costs. Thus the education budget funds can be taken advantage of for minor maintenance, whereas they are not allowed to be spent on power or water supply. Therefore, the cost for electricity and water will be raised from contributions from the local community shown below or the income from the lending of the school facilities.

2) Contributions from the local community: Contributions donated by local citizens who participate in events and other opportunities held by individual schools.

3) Income from the rentals of space and facilities of each school.

Rents of some classrooms or space of the schools rented by private groups.

The following table shows the breakdown of revenue and the annual income of the Project schools in fiscal 2002/2003, confirmed by the Implementation Review Study.

**Table 2-22 Breakdown of Annual Expenditure of Project School (in FY 2002/2003)** (Currency unit: Riel)

No	School Name	Equipment	Minor Maintenance	Sports, Culture and Agriculture	Others	Total
1	Bak Touk	23,784,700	10,861,000	4,879,500	13,319,900	52,845,100
		45.0%	20.6%	9.2%	25.2%	100.0%
2	San Thor Mok	20,555,000	10,862,600	4,749,800	4,225,500	40,392,900
		50.9%	26.9%	11.8%	10.5%	100.0%
3	Toul Kok	20,080,600	6,689,000	5,665,200	4,593,200	37,028,000
		54.2%	18.1%	15.3%	12.4%	100.0%
4	Anu Wat Reach Theany	6,953,200	5,479,200	985,000	645,300	14,062,700
		49.4%	39.0%	7.0%	4.6%	100.0%
5	Boeung Salang	12,306,700	2,728,100	1,728,600	1,497,600	18,261,000
		67.4%	14.9%	9.5%	8.2%	100.0%
6	Phuom Russey	3,636,100	852,200	909,000	284,100	5,681,400
		64.0%	15.0%	16.0%	5.0%	100.0%

Note: As for annual expenditures for 2002/2003, defined portions alone are presented due to the incompleteness of the calculation for expenditures at San Thor Mok school, No.2 and Phom Russey school, No.6.

**Table 2-23 Annual Revenue of Project School (in FY 2002/2003)**

(currency unit: Riel)

No	School Name	Budget from Government	Contribution from Local Community	Others (including Rents)	Total
1	Bak Touk	40,034,000	12,811,100	0	52,845,100
		75.8%	24.2%	0.0%	100.0%
2	San Thor Mok	40,392,900	0	4,000,000	44,392,900
		91.0%	0.0%	9.0%	100.0%
3	Toul Kok	37,028,000	6,007,600	4,000,000	47,035,600
		78.7%	12.8%	8.5%	100.0%
4	Anu Wat Reach Theany	12,906,400	1,156,300	0	14,062,700
		91.8%	8.2%	0.0%	100.0%
5	Boeung Salang	17,162,000	1,099,000	0	18,261,000
		94.0%	6.0%	0.0%	100.0%
6	Phuom Russey	11,538,000	100,000	1,200,000	12,838,000
		89.9%	0.8%	9.3%	100.0%

After the implementation of the Project, any new necessary costs can be classifiable to the operating and maintenance costs.

## (1) Operating Costs

### 1) Personnel Expenses

As stated above, no additional personnel expenses will be accrued, since newly required teachers due to the implementation of this Project will be covered by redundant teachers, those who are on the waiting list and those currently working as administrative staff members.

### 2) Electric Fees

Since the lighting systems will be installed at the classrooms which are also used as meeting rooms, the corridor in front of the rooms, and the toilet facilities for the disabled, the electric charges accrued due to such lighting systems will be increased among the operating costs of the individual Project schools. At the same time, although the city water, water from wells, and rainwater will basically be used for the toilet facilities to be built, it is expected that all the Project schools except for San Thor Mok school, No.2, will use water from wells, so that the electric costs due to the well pumps will be incorporated in the fees as additional costs. The estimated additional costs of the electricity for the Project schools are shown in the table below.

**Table 2-24. Electric Cost for Each Project School**

(Riel / Year)

No	School Name	No. of Project classrooms	No. of pupils to be Accommodated	Electric Costs of Lighting	Electric Costs of Pumping	Total
1	Bak Touk	27	2,160	111,720	531,468	643,188
2	San Thor Mok	18	1,440	111,720	-	111,720
3	Toul Kok	21	1,680	111,720	413,364	525,084
4	Anu Wat Reach Theany	24	1,920	111,720	472,416	584,136
5	Boeung Salang	21	1,680	111,720	413,364	525,084
6	Phuom Russey	18	1,440	111,720	354,312	466,032

Notes: Parameters for calculation of the electricity fees.

- 1) Annual school days: 38 weeks (38 weeks × 5 days per week = 190 days per year)
- 2) Hours of light use: 2 hours per day; 3 days per week (2 hours per day × 3 days per week = 6 hours per week)
- 3) Motor water pumping capacity: 6,000 liter per hour
- 4) Amount of water to be used: the number of pupils for the classrooms to be built × 3 liters per day
- 5) Electric capacity: 0.7 KWH for lighting at each school/ 3.7 KWH for pumping at each school. (The capacity for lighting was 1.0 KWH at each school at the time of the Basic Design)
- 6) Electric cost: 700 Riel /KWH (Reconfirmed at the field survey in this Implementation Review Study. Was 780 Riel / KWH at the time of the Basic Design.)

### 3) Water Expenses

Since San Thor Mok school, No.2 has no underground creek within the premises and is unable to use well, it will take advantage of city water and rainwater. But for the calculation of the water expenses, it is assumed that the school will rely on the city water alone, and its cost will be estimated as an additional expenditure. For this, the annual school days and amount of water use will be set as the same as the electricity fees calculated above, and the unit fees for city water as 1.03 Riel per liter, and then the annual costs for water will be calculated as 845,424 Riel.

It was designed that the Project schools except for San Thor Mok school, No.2, would use all the city water, water from wells, and rainwater, but it is assumed that basically the cheapest one, water from the wells, will be used, and that the city water will be used as a supplementary means, so that the fees for city water will not be included in the water expenses.

**Table 2-25 Water Expenses for the Project School**

(Riel / Year)

No	School Name	No. of Project Classrooms	No. of Pupils to be Accommodated	Costs of City Water	Total
2	San Thor Mok	18	1,440	845,424	845,424

Notes: Parameters for calculation of the expenses for city water

- 1) Annual school days: 38 weeks (38 weeks × 5 days per week = 190 days per year)
- 2) Motor water pumping capacity: 6,000 liter per hour
- 3) Amount of water to be used: the number of pupils for the classrooms to be built × 3 liters per day
- 4) Fees for city water: 1.03 Riel per liter (as shown in the Basic Design. Reconfirmed at the field survey of the Project.)

### (2) Maintenance Costs

As presented in the Basic Design Study Report, since all the Project buildings are school facilities which are simple and easy for their maintenance, the necessary maintenance cost (repair costs for

minor damages of painting, various parts of the facilities) is estimated at 0.2 percent per year of the total construction costs.

## 2-5 Cost Estimate of the Project

### 2-5-1 Cost Estimate of the Project

The total cost estimation for the implementation of this Project amounts to 513 million yen, based on the calculation for the schematic design level. Following the parameters of cost estimation shown in (3) below, the expenses to be borne by the Governments of Japan and Cambodia respectively, in accordance with the sharing of works described earlier are estimated as follows. The estimated costs to be borne by the Japanese side does not immediately define the maximum limit of the grant under the Exchange of Note, and will be reexamined further by the Government of Japan.

#### (1) Expenses to be Borne by the Government of Japan

Total Estimated Costs (borne by the Government of Japan) App. 509 million yen

(unit: one million yen)

Item		Estimated Project Cost		
Facility	Classroom Buildings	390	440	
	Toilet Facilities	13		
	Furniture and Fixtures	37		
Equipment		0		440
Implementation of Designing and Construction		69		

#### (2) Expenses to be Borne by the Government of Cambodia: 36,150 US\$ (app. 4 million yen)

**Table 2-26 Cost Estimation Borne by the Government of Cambodia (Schematic Design Level)**

Items	Expenses to be Borne (US\$)	Expenses Converted to Yen (Million Yen)
(1) Site Control	950	app. 0.1
(2) Removal of Obstacles	1,530	app. 0.2
(3) Infrastructure (Installation of Sewage Main Pipe, Placement of Infrastructure, and Maintenance and Cleaning of Wells)	24,680	app. 2.7
(4) Exterior Construction (Gate and Fence Placement, and Repair of Walls)	4,280	app. 0.5
(5) Bank Related Fees	4,710	app. 0.5
Total	36,150	app. 4.0

#### (3) Parameters of Cost Estimation

- Time of calculation March, 2004
- Exchange rate 1US\$ = 108.07 yen



1THB = 2.83 yen

- Project period Single fiscal year basis. Detailed Design and the period required for the construction work are shown in the construction schedule.
- Others This project will be implemented in accordance with the scheme of grant aid cooperation of the Japanese government.

### 2-5-2 Operation and Maintenance Cost

The annual revenue for fiscal 2003, and operation and maintenance costs to be increased due to the implementation of this Project at the Project schools are shown in the table below. The additional operation and maintenance costs accrued by the implementation of this Project account for 9.4 – 38.2% of the annual revenue for fiscal 2002/2003 at each Project school. Thus, the schools are likely to need subsidies from Phnom Penh City, but the amount of the additional costs totals 28,682,846 Riel, which accounts for 0.17% of all the budgets for the same fiscal year for education in the city. Thus, one can conclude that the amount will be able to be covered by the budget.

**Table 2-27 FY 2002/2003 Annual Revenue and Additional Annual Expenses due to Project Implementation at Each School** (Unit: Riel)

Item		No. 1 Bak Touk	No. 2 San Thor Mok	No. 3 Toul Kok	No. 4 Anu Wat Reach Theany	No. 5 Boeung Salang	No. 6 Phuom Russey
2002/2003 Annual Revenue	PAP	40,034,000	40,392,900	37,028,000	12,906,400	17,162,000	11,538,000
	Contribution	12,811,100	0	6,007,600	1,156,300	1,099,000	100,000
	Rents, etc.	0	4,000,000	4,000,000	0	0	1,200,000
	Total	52,845,100	44,392,900	47,035,600	14,062,700	18,261,000	12,838,000
Additional Expenditure accrued due to Product Implementation	Operational Cost	643,188	957,144	525,084	584,136	525,084	466,032
	Maintenance Cost	5,222,689	3,216,656	3,937,522	4,792,449	3,788,433	4,024,429
	Total	5,865,877	4,173,800	4,462,606	5,376,585	4,313,517	4,490,461
Proportion of Additional Expenditure to 2002/2003 Annual Revenue		11.10%	9.40%	9.49%	38.23%	23.62%	34.98%

**CHAPTER 3**  
**CONTENTS OF THE PROJECT**  
**(DETAIL DESIGN LEVEL)**

### Chapter 3. Contents of the Project (Detail Design Level)

#### 3-1 Results of Project Cost Estimation on the Detail Design Level

##### 3-1-1 Estimated Cost of Cooperation Project

Of the total cost required for implementing the Project mentioned in Chapter 2, the Project cost estimated on the Detailed Design level and to be borne by the government of Japan is as follows under the estimation conditions shown in paragraph (2) below (the cost to be borne by the government of Cambodia remains as mentioned before):

##### (1) Expenses to be Borne by the Government of Japan

Total Estimated Costs (borne by the Government of Japan) App. 560 million yen

(unit: one million yen)

Item		Estimated Project Cost		
Facility	Classroom Buildings	446	501	
	Toilet Facilities	14		
	Furniture and Fixtures	42		
Equipment				501
Implementation of Designing and Construction				59

##### (2) Parameters of Cost Estimation

- Time of calculation March, 2004
- Exchange rate 1US\$ = 110.12 yen  
1THB = 2.83 yen
- Project period Single fiscal year basis. The Detailed Design and the period required for the construction work are shown in the construction schedule.
- Others This project will be implemented in accordance with the scheme of grant aid cooperation of the Japanese government.

##### 3-1-2 Basic Principles

To suppress the Project cost estimated on the Detailed Design level and to be borne by the government of Japan to less than the Project cost (509 million yen) estimated on the schematic design level and to be borne by the government of Japan as mentioned in Chapter 2, it is required to further reduce the Project scale in addition to the halving of the number of project classrooms at San Thor Mok School, No. 2, -18 out of 36 Project classrooms scheduled at the time of the Basic Design are excluded from the Project- which is already agreed by the Cambodian side. So, all the components for Phum Russey School, No. 6, will be excluded from the Project, and the Project contents will be reviewed accordingly.

##### 3-2 Outline of the Project

The Project is to upgrade educational facilities at 5 Project schools in Phnom Penh. Specifically, the Project constructs 111 classrooms along with toilets, and procures school furniture and fixtures.

### 3-3 Basic Plan

The table hereunder shows each Project school's facility, furniture and fixing to be upgraded after reviewing the schematic design level.

**Table 3-1 List of Facilities and Furniture/Fixtures at Project Schools (Detail Design Level)**

Name of School	Facilities						Furniture/Fixings				
	Classrooms to be constructed	Toilet				Total Floor Area (m <sup>2</sup> )	Student Desk & Chairs			Teachers' Desk & Chair	White Boards
		No. of Female Toilet Bowls	No. of Mail Toilet Bowls	No. of Male Urinals	No. of Toilets for the Disabled		Large	Small	Total		
1 Bak Touk	27	7	3	8	2	2,258.195	216	324	540	27	54
2 San Thor Mok	18	5	2	6	2	1,514.595	144	216	360	18	36
3 Toul Kok	21	5	2	6	2	1,730.595	168	252	420	21	42
4 Anu Wat Reach Theany	24	6	3	6	2	2,039.990	192	288	480	24	48
5 Boeung Salang	21	5	2	6	2	1,730.595	168	252	420	21	42
6 Phuum Russey ( Excluded )	-	-	-	-	-	-	-	-	-	-	-
Total	111	28	12	32	10	9,273.970	888	1,332	2,220	111	222

### 3-4 Obligations of the Recipient Country

The table hereunder shows the obligations of the government of Cambodia after reviewing the schematic design level.

**Table 3-2 Site-Distinctive Obligations of the Government of Cambodia (Detail Design Level)**

No	School Name	Demolition of the Existing Buildings	Site Control	Electrical Work	City Water Supply Work	Water Well Work	Installation of Drainage Pipes (*5)	Sewage Line Work
1	Bak Touk	Required (Footing remains *1)	Not required	Required	Existing	Existing	To be conducted	Required
2	San Thor Mok	Required (Footing remains *2)	Not required	Required	Existing	No underground creek exists	To be conducted	Required
3	Toul Kok	Required (obstacles underneath ground remain *3)	Not required	Required	Existing	Existing	To be conducted	Required
4	Anu Wat Reach Theany	Not required	Required	Required	Existing	Required	To be conducted	Required (new*6)
5	Boeung Salang	Required (Changed buildings to be demolished *4)	Not required	Required	Existing	Existing	To be conducted	Required (new*7)
6	Phuum Russey (excluded)	-	-	-	-	-	-	-

Notes) Asterisks in the table are items confirmed in the Implementation Review Study, and their contents are shown below:

- \*1: As for the building scheduled to be demolished, the upper structure has been already demolished and removed, with the footing remains.
- \*2: ditto
- \*3: At the site where Project facilities are scheduled to be built, there are obstacles – parts of foundation – under the ground. These were not confirmed at the time when the Basic Design was drawn up.
- \*4: The existing administration building which was decided to be demolished at the time of the Basic Design will continue to be used. Alternatively, an existing classroom building with five classrooms will be demolished.
- \*5: Phnom Penh City has already drawn up a plan to install drainage main pipes within and outside all the Project schools, and earmarked the budget for the related work.
- \*6: Since the drainage infrastructure was not established at the time of the Basic Design, it was planned that wastewater would be treated within the site by the seepage pit. But thanks to the plan to install drainage main pipes mentioned above, it will be possible to discharge wastewater to the drainage pipe.
- \*7: At the time of the Basic Design, wastewater from the Project toilet facilities were planned to be discharged through the drainage ditch, but there was no such ditch to be connected to the facilities. But now, as shown in \*5, the plan to install the drainage main pipes has been established, enabling the connection.

### 3-5 Cost Estimate of the Project

#### 3-5-1 Cost Estimate of the Project

The total estimation of Project cost on the Detailed Design level, excluding Phnom Russey school, No.6, is 498 million yen. The breakdown of the expenses to be covered by Japan and Cambodia is estimated as follows under the calculation parameters shown in paragraph (3) below:

#### (1) Expenses to be Borne by the Government of Japan

Total Estimated Costs (borne by the Government of Japan) App. 495 million yen

(unit: one million yen)

Item		Estimated Project Cost		
Facility	Classroom Buildings	387	436	
	Toilet Facilities	12		
	Furniture and Fixtures	37		
Equipment		0		436
Implementation of Designing and Construction				59

#### (2) Expenses to be borne by the Government of Cambodia: 29,110 US\$ (approx. 3.2 million yen)

**Table 3-3 Cost Estimation Borne by the Government of Cambodia (Detail Design Level)**

Items	Expenses to be Borne (US\$)	Expenses Converted to Yen (Million Yen)
(1) Site Control	950	app. 0.1
(2) Removal of Obstacles	1,380	app. 0.1
(3) Infrastructure (Installation of Sewage Main Pipe, Placement of Infrastructure, and Maintenance and Cleaning of Wells)	18,200	app. 2.0
(4) Exterior Construction (Gate and Fence Placement, and Repair of Walls)	3,870	app. 0.5
(5) Bank Related Fees	4,710	app. 0.5
<b>Total</b>	<b>29,110</b>	<b>app. 3.2</b>

### **(3) Parameters of Cost Estimation**

- Time of calculation    March, 2004
- Exchange rate        1US\$ = 110.12 yen  
                              1THB = 2.83 yen
- Project period        Single fiscal year basis. Detailed Design and the period required for the construction work are shown in the construction schedule.
- Others                 This project will be implemented in accordance with the scheme of grant aid cooperation of the Japanese government.

#### **3-5-2 Operation and Maintenance Cost**

By excluding all the components for Phnom Russey school, No.6, the increased total operation and maintenance cost for the Project will be 24,192,385 riels (see Table 2-27). Aid from Phnom Penh is considered to be still required. Since the amount corresponds to 0.14% of the educational budget of Phnom Penh city, it seems that the amount can be covered by the city without difficulty.

In this case, Project schools will individually have teacher deficiency or excess. For the total 5 Project schools, 4 teachers will be made redundant. This surplus can be settled by reallocating the teachers among the schools in complementary manner (see Table 2-21).

## CHAPTER 4

# PROJECT EVALUATION AND RECOMMENDATION

## **Chapter 4. Project Evaluation and Recommendation**

### **4-1 Project Effect**

#### (1) Direct Effect

##### 1) Improvement of the Learning Environment

Primary schools in Phnom Penh are obliged to conduct overcrowded classes, classes in temporary rooms, multi-shift classes, mobile classes and continuous use of seriously-deteriorated, dangerous school buildings in order to handle chronic facility shortages. As a result of the completion of the 111 classrooms under the Project, additional 8,880 students will be able to learn in classrooms in a favorable environment.

Triple-shift classes and mobile classes will be eliminated. The Project schools that have difficulties in conducting adequate classes will be able to satisfactorily conduct classes in accordance with the country's educational targets and curriculum, and as a result, the learning environment will be greatly improved.

##### 2) Improvement of Sanitary Conditions

There is a shortage of toilets as well as classrooms at the Project schools.

However, as the Project will construct an adequate number of toilets in proportion to the number of classrooms, toilet shortages at the Project schools will be alleviated and the sanitary conditions will be improved.

#### (2) Indirect Effect

In addition to the direct effects mentioned above, the following indirect effects will be achieved from Project implementation

##### 1) Improvement of School Attendance of Female Students

The Project will construct an appropriate number of toilets to the number of classrooms and provided with respective doorways for male and female students. It is expected that more female students will go to school as the toilet facilities that have obstructed school attendance of female students should be improved.

##### 2) Promotion of Activities for Cluster-School Development

Classrooms, which can also be used as a meeting room, will be constructed at all the Project schools. It is expected that these rooms will be used not only for teachers' meetings but also for activities that include teachers from neighborhood schools to conduct the cluster-school development. Therefore, installation of these rooms will promote activities for cluster-school development, contributing to the improvement of the quality of education.

##### 3) Benefits to the Surrounding Communities

The school facilities constructed by the Project will be used not only for basic education purposes but also for other social educational activities such as adult education and other non-educational community activities. Thus, it is expected that the Project will benefit the surrounding communities.



## **4-2 Recommendations**

### **(1) Conducting Appropriate Facility Maintenance**

#### **1) Promotion of Maintenance by School Officials**

In order to obtain the maximum benefits from the Project, it is crucial for each Project school to conduct appropriate maintenance work of the Project facilities as well as existing facilities and to continue effective use of them.

Appropriate maintenance requires maintenance activities compiling into a manual and adequate monitoring, guidance and support by the administration side so the existing knowledge and techniques for facility maintenance can be spread and correctly transferred to the school teachers and officials during moving in and out.

#### **2) Promotion of Maintenance by the Community**

In Cambodia, the amount of maintenance budgetary funds disbursed to schools by the Government is mostly not sufficient. Thus, each school conducts periodical fund raising activities in the surrounding communities through the School Supporting Committee (SSC) and the Parents Association. For the adequate, effective and continuous use of school facilities including the Project facilities, continuation and promotion of such donations and contributions from the surrounding communities are indispensable.

To promote the giving of donations and contributions from the surrounding committees, it is very important for each school to leave a clear objective and a plan for facility management and maintenance, and periodically disclose to the outside the annual management and maintenance plans, the amount of donations and contributions required for implementing the plans, the donation and other income and expenditure, and so on.

### **(2) Effective Use of Facilities**

The Project plans to install movable partitions between 2 or 3 classrooms, so that the rooms can be combined to make a single large room for meetings, etc., besides classroom use. In addition, lighting equipment will also be installed in those classrooms so that they can be used at night. It is hoped that the personnel at the school level should create such environment that the community residents can positively use the school building so these spaces for meetings can be effectively used not only for teachers' meetings and cluster schools' assemblies but also for nonformal education, area residents' meetings, etc.