

THE DEPARTMENT OF EDUCATION, CULTURE AND SPORTS
THE REPUBLIC OF THE PHILIPPINES

BASIC DESIGN STUDY REPORT ON THE PROJECT FOR THE IMPROVEMENT
OF EDUCATIONAL FACILITIES (PMASEV) IN THE REPUBLIC OF THE PHILIPPINES

BASIC DESIGN STUDY REPORT


ON

THE PROJECT FOR
THE IMPROVEMENT OF EDUCATIONAL FACILITIES (PHASE V)

IN

THE REPUBLIC OF THE PHILIPPINES

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**THE DEPARTMENT OF EDUCATION, CULTURE AND SPORTS
THE REPUBLIC OF THE PHILIPPINES**

**BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR
THE IMPROVEMENT OF EDUCATIONAL FACILITIES (PHASE V)
IN
THE REPUBLIC OF THE PHILIPPINES**

DECEMBER, 1998

**JAPAN INTERNATIONAL COOPERATION AGENCY
MOHRI, ARCHITECT & ASSOCIATES, INC.**

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PREFACE

In response to a request from the Government of the Republic of the Philippines, the Government of Japan decided to conduct a basic design survey study on the Project for the Improvement of Educational Facilities (Phase V) and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Philippines a study team from July 26 to September 8, 1998.

The team held discussions with the officials concerned of the Government of the Philippines, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to the Philippines in order to discuss a draft basic design, and as this result, 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 Republic of the Philippines for their close cooperation extended to the teams.

December, 1998



Kimio Fujita
President
Japan International Cooperation Agency

December, 1998

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for the Improvement of Educational Facilities (Phase V) in the Republic of the Philippines.

This study was conducted by Mohri, Architect & Associates Inc., under a contract to JICA, during the period from July 21, 1998 to December 25, 1998. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of the Philippines 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,

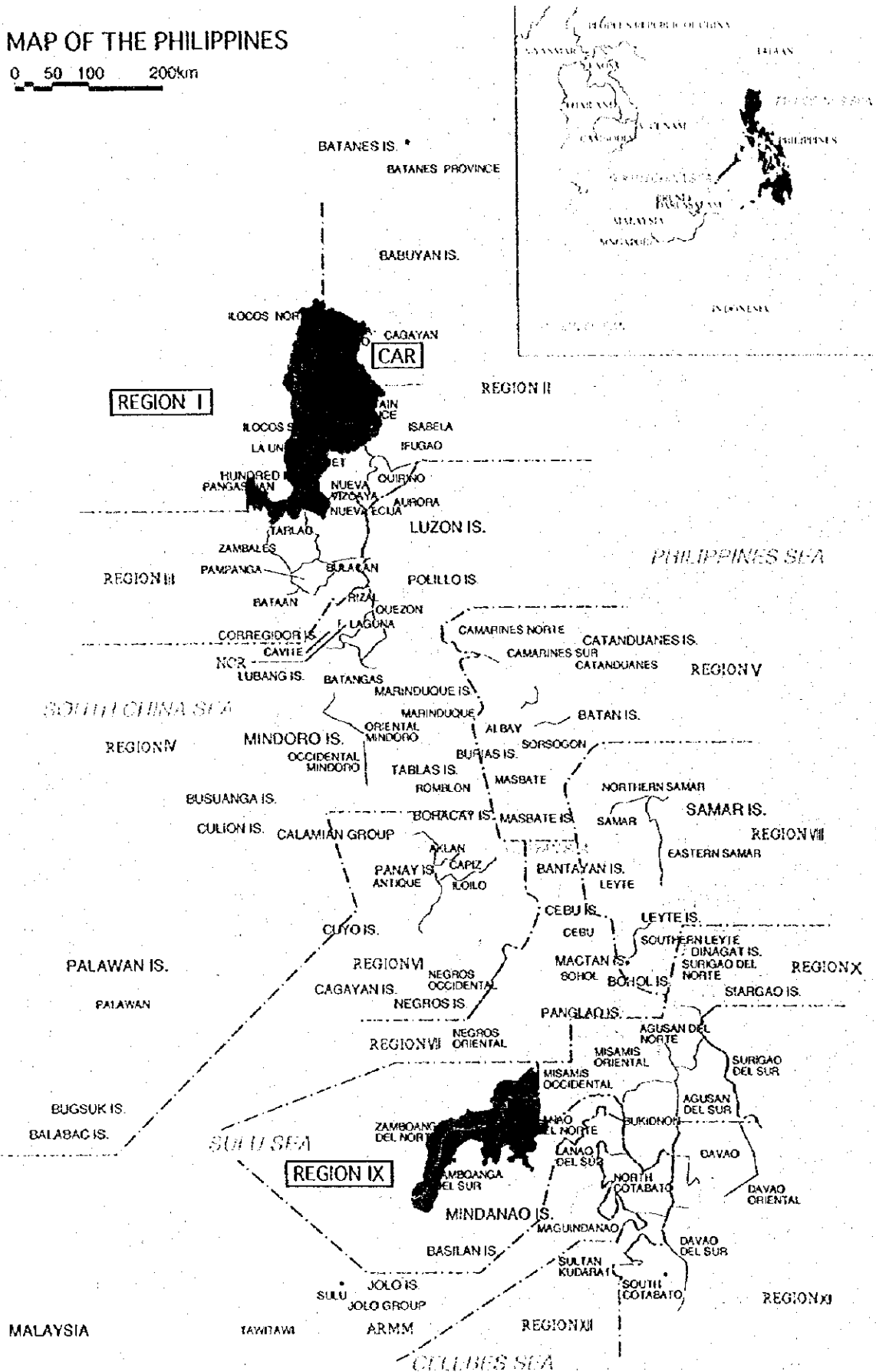


Nobuhiro Mohri
Project Manager
Basic design study team on
The Project for the Improvement of
Educational Facilities (Phase V)
Mohri, Architect & Associates Inc.

MAP OF THE PHILIPPINES

MAP OF THE PHILIPPINES

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REGION I

REGION II

REGION III

REGION V

REGION IV

REGION VIII

PALAWAN IS.

REGION X

REGION IX

REGION XI

REGION XII

MALAYSIA

TAYITAWI

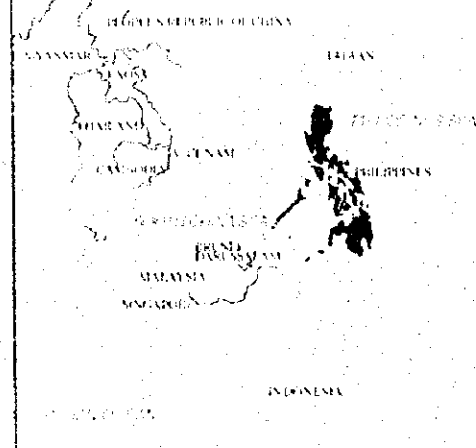
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CELEBES SEA

PHILIPPINE SEA

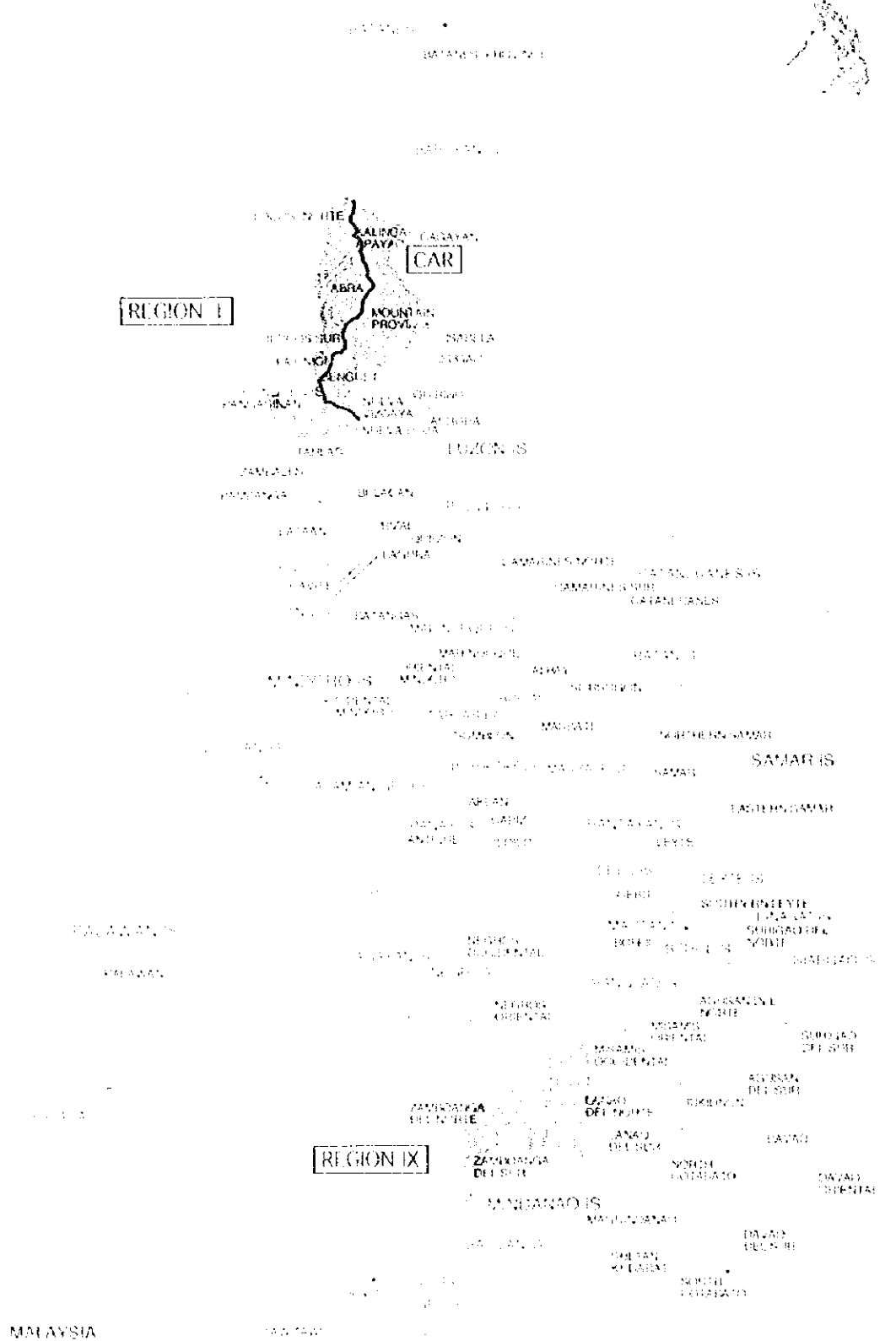
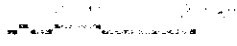
SOUTH CHINA SEA

SULU SEA

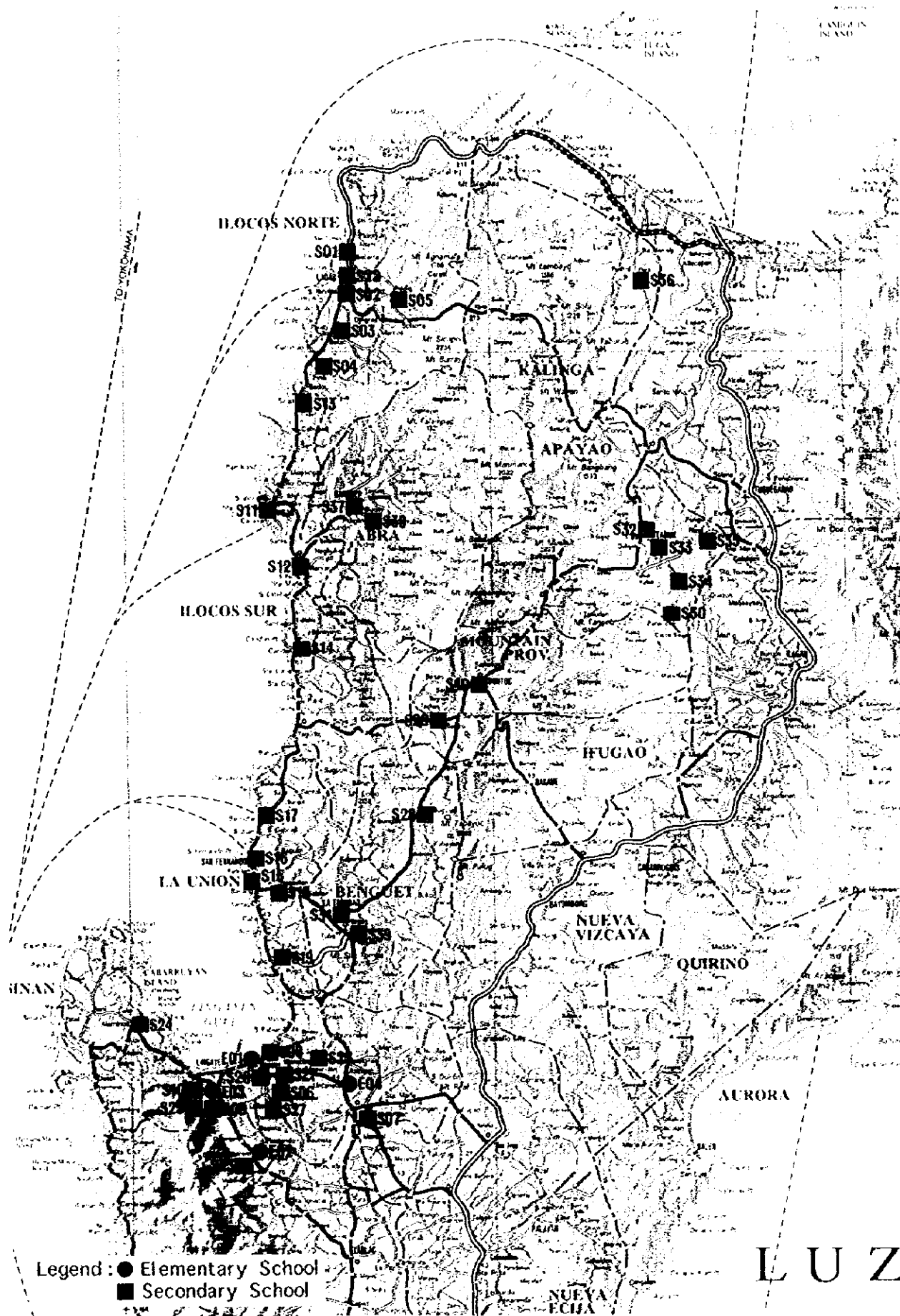


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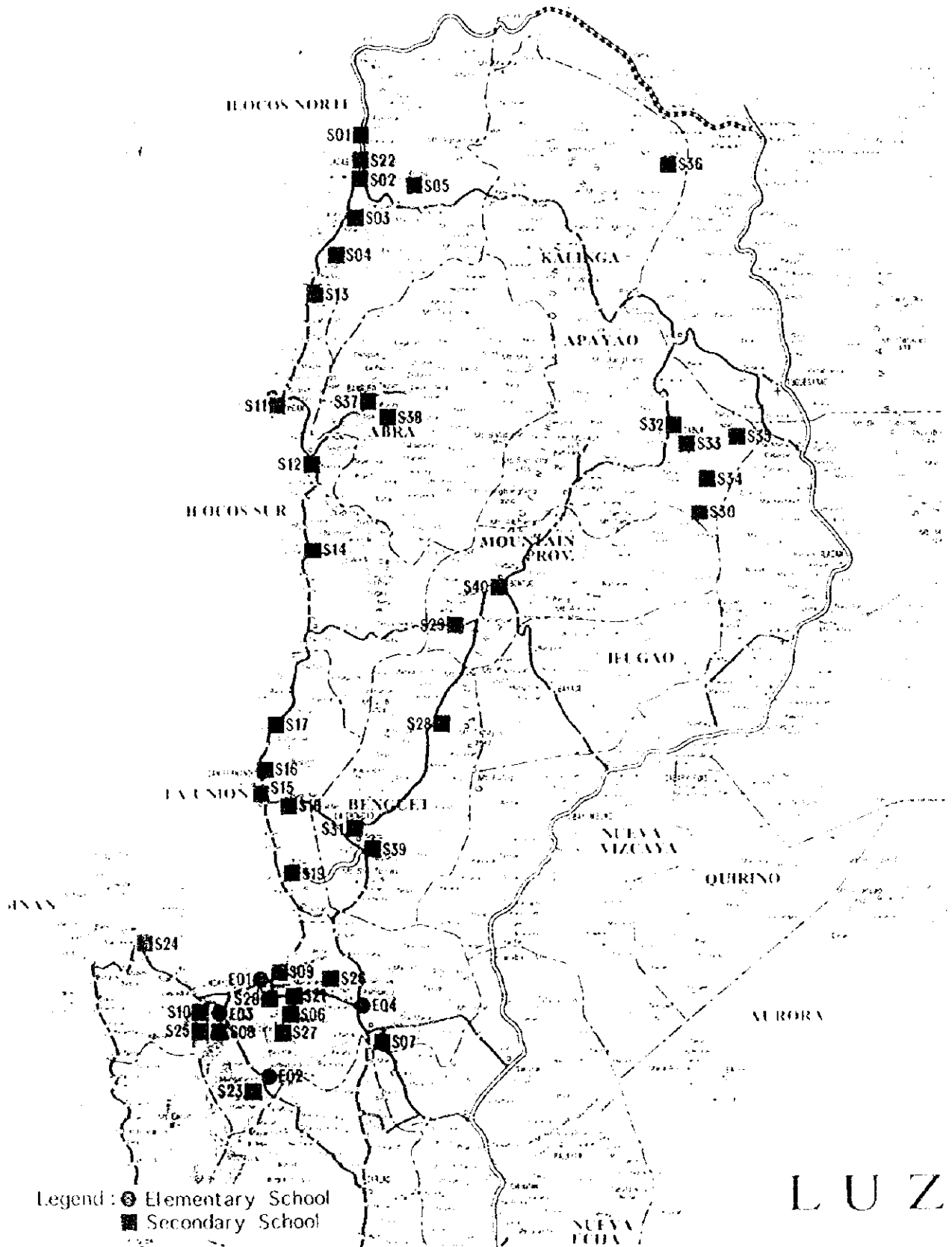
MAP OF THE PHILIPPINES



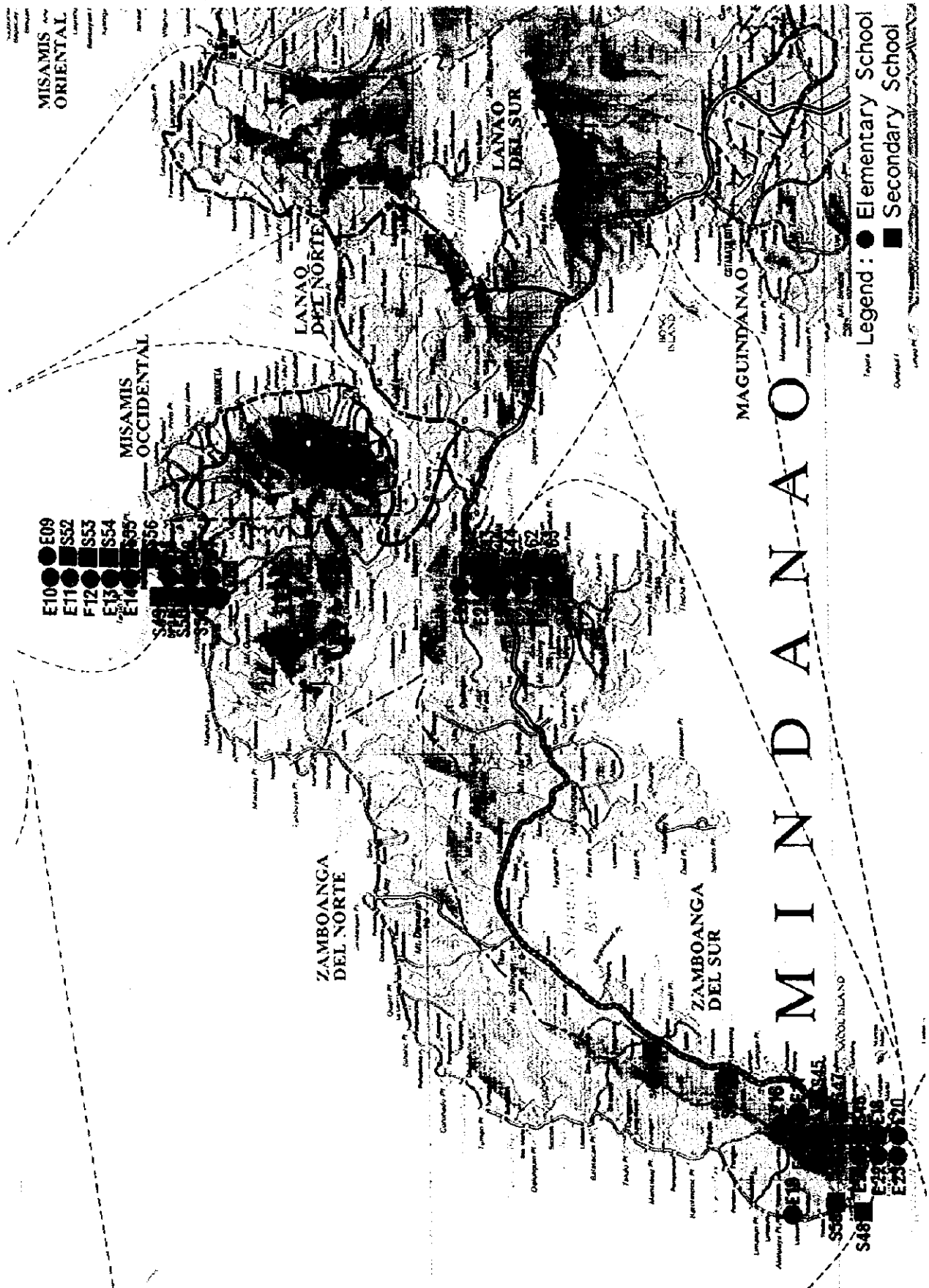
PROJECT LOCATION MAP (1)

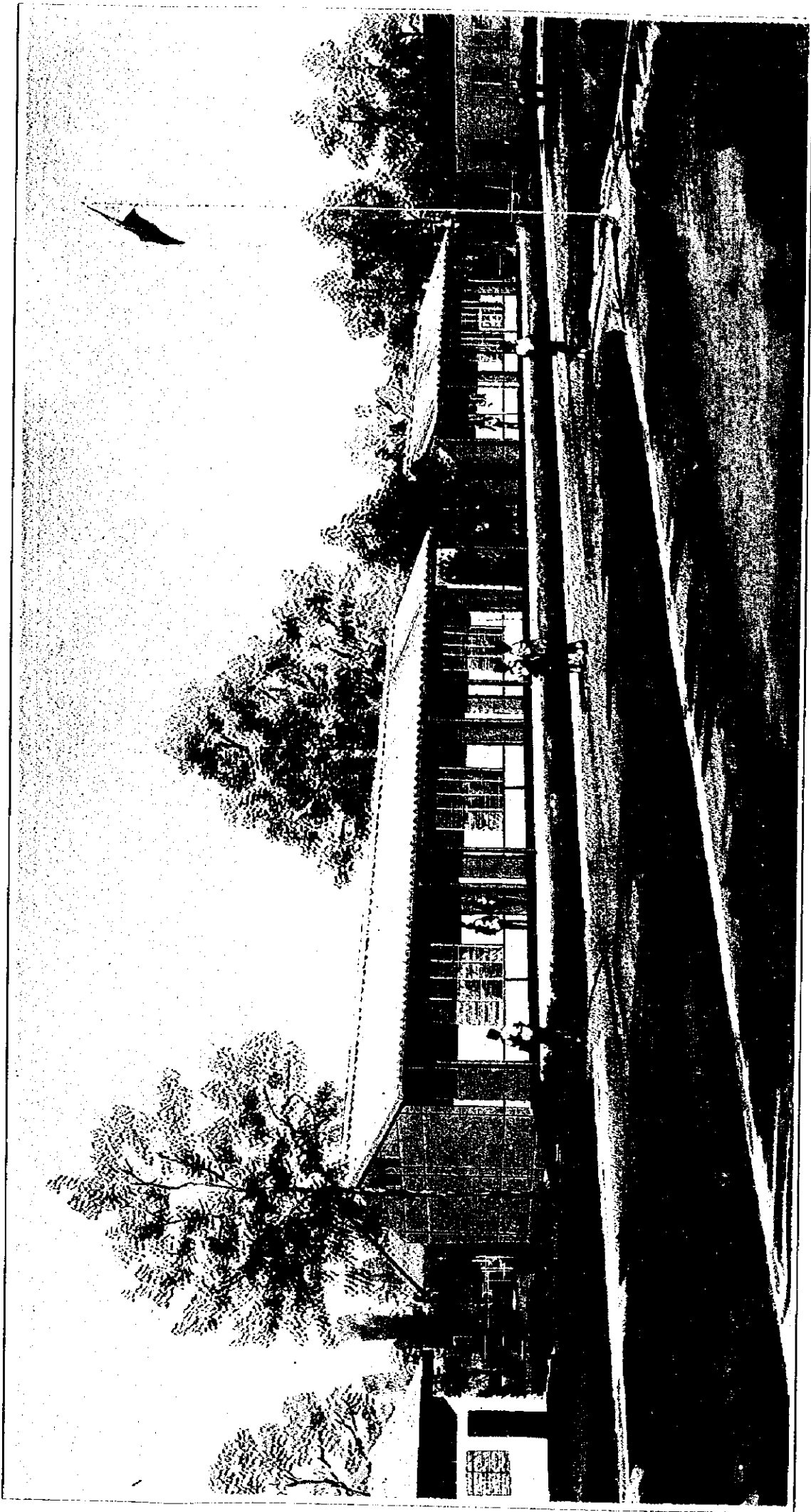


PROJECT LOCATION MAP (1)



PROJECT LOCATION MAP (2)





PERSPECTIVE (1)



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PERSPECTIVE (2)

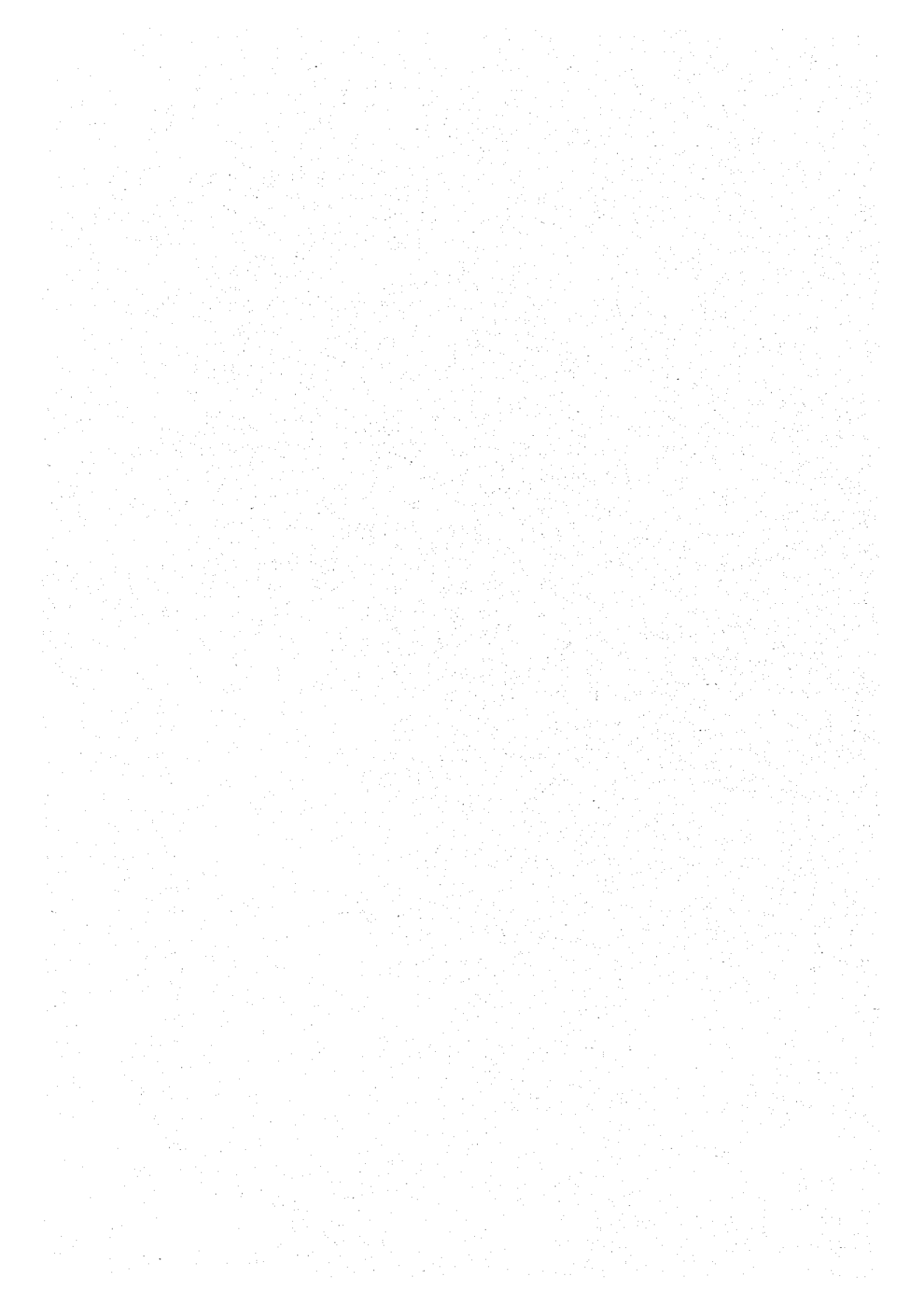
ABBREVIATIONS

ADB	:	Asian Development Bank
CAR	:	Cordillera Administrative Region
DBM	:	Department of Budget and Management
DECS	:	Department of Education, Culture and Sports
DOH	:	Department of Health
DOST	:	Department of Science & Technology
DPWH	:	Department of Public Works and Highway
EDPITAF	:	Educational Development Projects Implementation Task Force
EFIP	:	Educational Facility Improvement Project
ESEP	:	Engineering and Science Education Project
ESF	:	Economic Support Fund
LGU	:	Local Government Unit
MOOE	:	Maintenance and Other Operation Expenditures
NEDA	:	National Economic and Development Authority
NGO	:	Nongovernmental Organization
RESP	:	Rural Environmental Sanitation Project
SEDIP	:	Secondary Education Development and Improvement Project
SEDP	:	Secondary Education Development Project
SEIEP	:	Science Education Instructional Equipment Project
SPCPD	:	Southern Philippines Council for Peace & Development
SRA	:	Social Reform Agenda
TEEP	:	Third Elementary Education Project
TRSBP	:	Typhoon Resistant School Building Project
WB	:	World Bank

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CHAPTER 1. BACKGROUND OF THE PROJECT



Chapter 1 Background of the Request

The school education system of the Philippines can be divided into two parts. Basic education comprises of six years of elementary school and four years of secondary school. Higher education comprises of colleges and technical schools. Elementary school is free and compulsory, the starting age having been lowered from seven to six in 1995. In 1996, the entire number of elementary school students in the Philippines was 11.97 million. The number of schools was 37,670 with a total gross participation rate of 114% and a net participation rate of 94.3%. As for secondary schools, the number of students was 4.91 million, the number of schools 6,411, the total gross participation rate 77.1% and the net participation rate 63.4%.

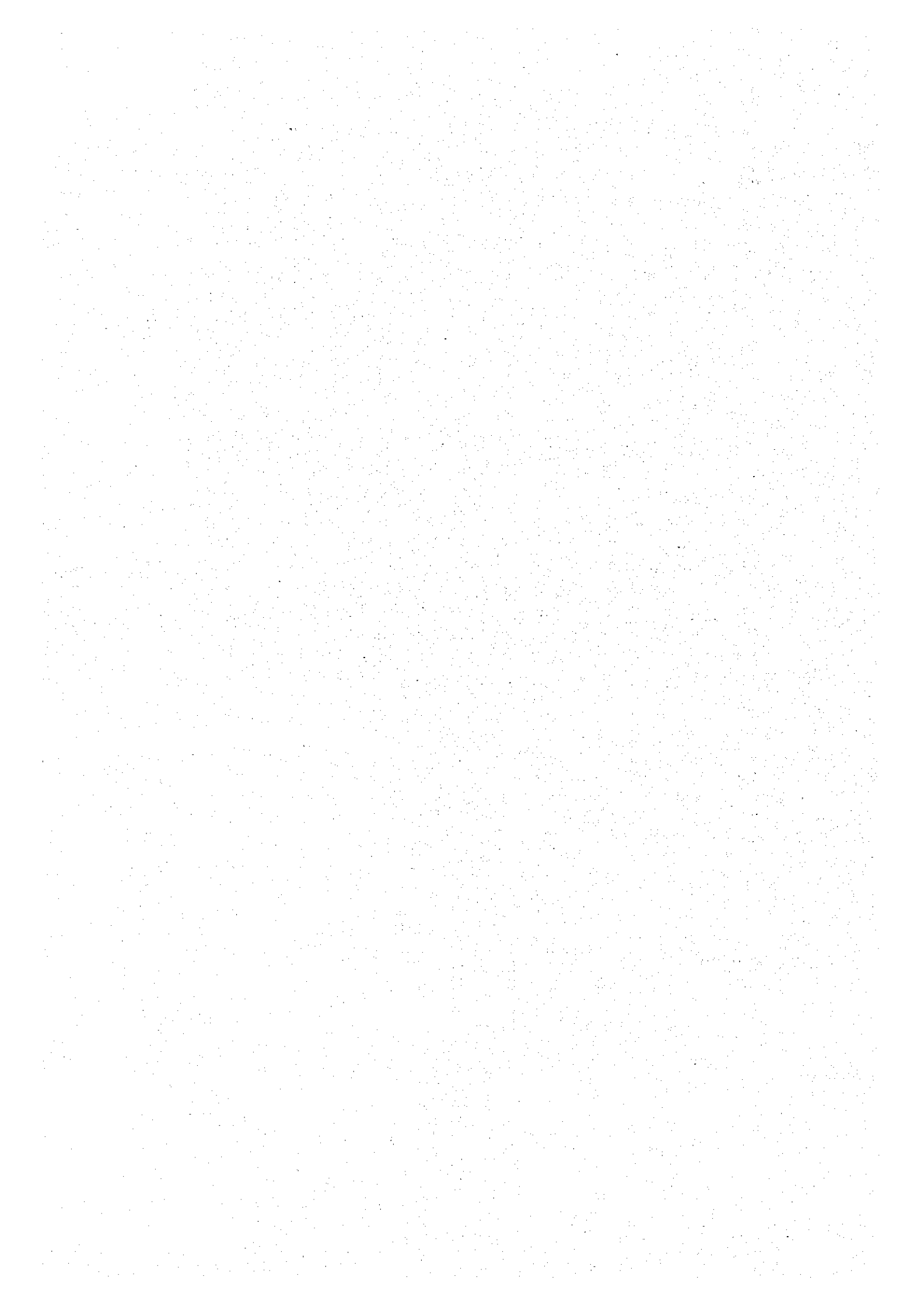
The government of the Philippines has been placing emphasis on improving the basic education field. Elementary and secondary school education is also emphasized in the Updated Medium Term Philippine Development Plan (1996-1998) which is in progress. In the Master Plan for Basic Education (1996-2005), which is the priority project in the educational field, the most important items stated are the improvement of educational opportunities, educational quality and efficiency. However, the shortage of classrooms (56,000 in public elementary schools and 9,000 in public secondary schools), shortage of teachers (nearly 14,000 in elementary and secondary schools) plus nearly 2% increase in population (3% in the student population) are posing a problem in the progress of the project. In order for the Master Plan to be successful, the Department of Education, Culture and Sports has considered solving the shortage of classrooms and teachers a major priority. However, it is practically impossible to solve the problems through the country's own budget due to cut backs.

Project Region 1 (ILOCOS REGION) located in Northern Luzon with a population of 3.80 million, has the lowest increase in population in the country. The average yearly income per household is around 102,000 Pesos which is low compared to other areas (the national average is 123,881 Pesos). CAR (CORDILLERA) located in the north central mountains of Luzon with a population of 1.30 million, is composed of many minority races. There are five provinces in this region, all of which are designated as low income provinces in the Social Reform Agenda given out by the then President Fidel V. Ramos. Their average yearly income is 111,595 pesos which is lower than the national average and they are the areas that need immediate improvement within the

Philippines. Region 9 (WESTERN MINDANAO) with a population of 2.90 million has a large Moslem population. The average yearly income is 89,370 pesos much lower than the national average and the death rate of children under the age of five is one of the highest in the country. As the death rate of infants is high and the activity and literacy levels of the children are low, the need for basic education is great.

Our country has continued to cooperate in the building of school facilities in the Philippines. One recent example entitled the Improvement of Educational Facilities Project, carried out in four phases between 1993 and 1998, aided in the construction of 322 schools and 1,208 classrooms in eleven of the Philippines' sixteen regions. This Project is a continuation of these series of cooperative projects and will now center on new areas such as Northern Luzon and Western Mindanao.

CHAPTER 2. CONTENTS OF THE PROJECT



CHAPTER 2 CONTENTS OF THE PROJECT

2-1 Objectives of the Project

The objective of the Project is as stated in the Improvement of Educational Facilities proposed by the Government of the Philippines, in which 630 elementary and secondary school buildings will be constructed within six years, using the traditional type of construction methods. In this Project, 91 school buildings, including classrooms, science laboratories and toilets, will be constructed in Regions 1, 9 and CAR. By also supplying basic classroom items and science equipment, the shortage of school facilities in the regions will be improved, educational opportunities for elementary and secondary school students will be increased, thereby the educational environment will be improved.

2-2 Basic Concept of the Project

(1) Selection Criteria of Schools to be Included in the Project

Some of the candidate schools requested by the Government of the Philippines may not be suitable for this Project. Thus, the following standards for selection were defined.

In addition to these selection criteria, the elementary schools located in CAR were not included in the study survey area because they are overlapping with the recipient schools under the Third Elementary Education Project (hereinafter referred to as TEEP), financed by the World Bank and Overseas Economic Cooperation Fund (OECF). Therefore, only secondary schools in CAR were surveyed.

① Confirmation of Economic Factors of Project Regions

In the case of the proposed Region being economically wealthier than the national average, it will be omitted from the Project. Survey results show that the average income in Region III is higher than that of the national average and the average expenditure in Region III is higher than that of the national average. Thus, the proposed schools in Region III will be omitted from this Project.

The decision for entirely eliminating the proposed schools in Region III was made based on the Japanese Ministry of Foreign Affairs' political judgement.

Table 2-1 Regional average Annual Family Income and Expenditures (1997)

	Average Annual Family Income	Average Annual Family Expenditure
National average	P 123,881	P 100,194
Region 1	P 102,741	P 83,472
CAR	P 112,595	P 87,254
Region 3	P 133,831	P 107,104
Region 9	P 89,370	P 69,896

- ② Confirmation of the title for land ownership, demolition permit and right of way documents
- The sites for the Project Schools should have documents which are legally recognized for land ownership and right of use.
 - Certification of building condemnation as issued by the office of audit, demolition plans and budget allocations should be submitted.
 - As a condition for selection, those schools requiring substitute facilities during the construction period shall require a signed memorandum promising the facilities. Furthermore, if any site other than the schools must be passed during the construction, a road right-of-way shall be submitted before Construction work may begin.
- ③ To have sufficient access for the transportation of construction material by vehicle.
- Those schools that could not be accessed by the study team's vehicles during site study shall in general be omitted from the Project. However, those planning to improve access conditions shall be included. Those schools that cannot be accessed by car during the wet season shall also be omitted.
- ④ Configuration of school sites and their surrounding area, confirming the suitability for the construction of new facilities
- School sites adjacent to cliffs or valleys will be disqualified due to the risks of landslides or sudden floods after heavy rain. Moreover, sites such as those near rivers, where erosion may occur in the future, were omitted from the Project.
- ⑤ Soil conditions of school sites should be appropriate for the construction of new facilities
- Those schools located on reclaimed land or in swampy areas with the possibility

of uneven settlement of ground shall be omitted from the Project. In order to roughly estimate the ground bearing strength of the sites, simple penetration tests were conducted during the site study. Those schools that did not have 8 tons/m² (with a minimal margin of error) were omitted from the Project.

⑥ Confirmation of space necessary to construct the school building

Aside from special cases, those sites not requiring the removal of existing buildings or trees were selected for the Project. The sites were measured for adequate space by using a measuring tape and, as a result, those that did not have the required space were omitted from the Project. According to the condition of the existing building and the types of trees on the site, confirmation was made to see if permits were needed for their removal.

⑦ Confirmation of degree of Reclamation and securing of land to develop

School sites located on slopes requiring enormous reclamation work will be omitted from the Project.

⑧ Schools with other similar projects financed by foreign assistance either under implementation or planned for the future will be disqualified

*Confirmation of involvement with other such projects will be undertaken by referring to the project listings, by interviews with representatives of each school and actual inspection of each school site during site survey. If the schools have received or are receiving aid from other organizations for academic classrooms, those schools were omitted from the Project. In cases where schools are receiving aid from other organizations for science laboratories, toilets and science equipment, they will not receive these items under this project.

⑨ Confirmation of the Shortage of Classrooms

Confirmation of a sufficient number of students and teachers who will utilize the project classroom and the existence of a shortage of classrooms are essential. Schools with a shortage of less than 3 classrooms in Luzon and of less than 2 classrooms in Mindanao will be disqualified.

As for Mindanao, there are almost no records of school construction by the Japanese Grant Aid Program in the past. Thus, as many schools as possible were considered and those schools with a shortage of less than 2 classrooms were omitted.

*The shortage of classrooms is calculated using the following equation:

$$\text{Shortage of classrooms} = \frac{\text{Total number of students in the school}}{\text{Number of students in the classroom}} - \text{Existing number of usable classrooms.}$$

Note: Total number of students in the school: The number of students at the time of the Basic Design study.

Number of students per class: Elementary school 40, secondary school 42.

Number of existing classrooms: The number of rooms used as ordinary classrooms in the project schools. Classrooms that are thought to be dangerous or unsuitable due to deterioration or defective construction shall not be counted.

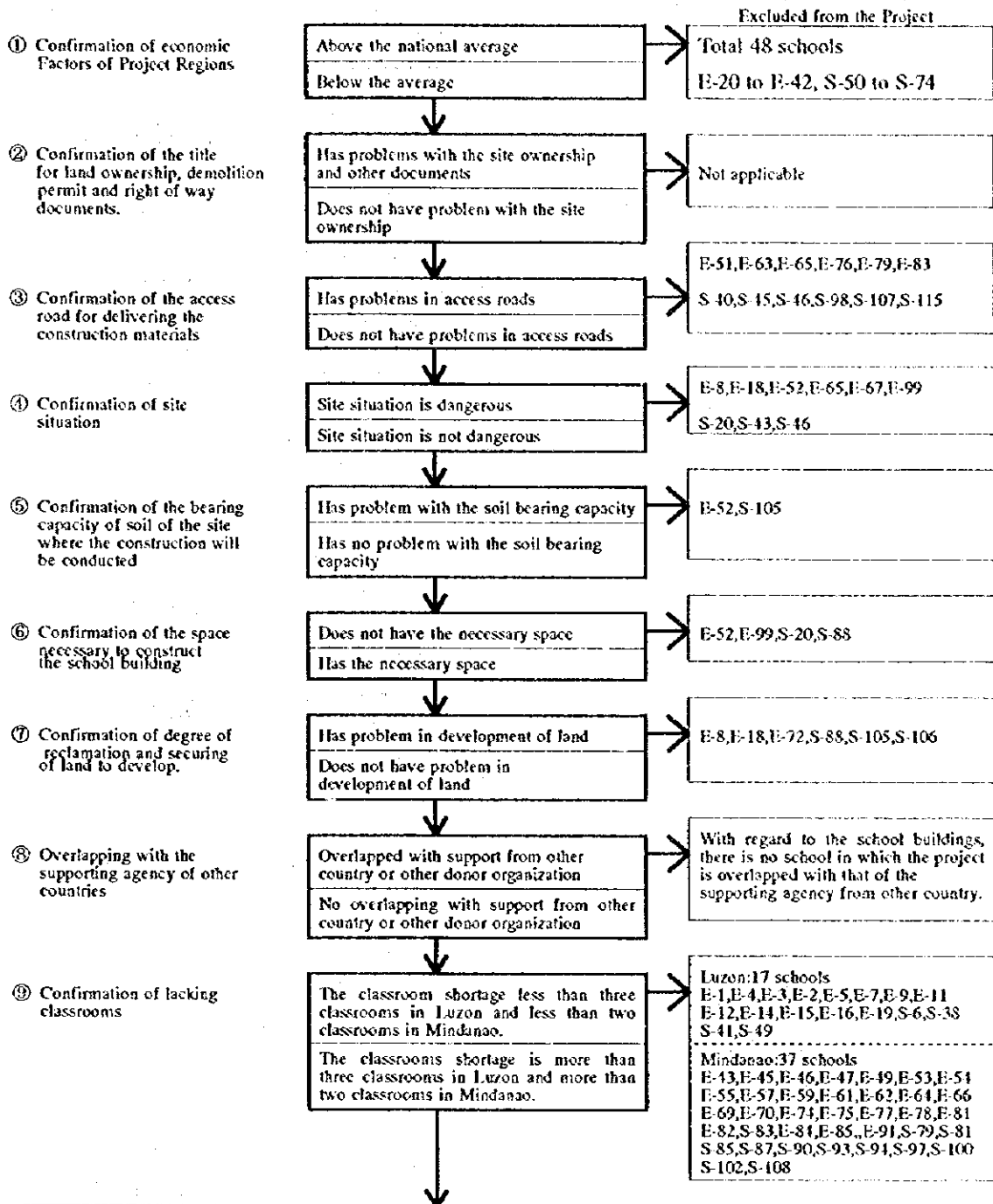
Site studies of the 216 candidate schools were conducted by 5 study teams from August 4 to August 22, 1998. For future reference, the schools were numbered and the letter "E" for elementary schools and "S" for secondary schools was added before the number. The site study schools were indicated with the original number and the Project schools were indicated with the new number. Table 2-2 shows the number of schools surveyed by regions.

Table 2-2 Number of Schools Surveyed by Regions

	Region I		CAR		Region III		Region IX		Total
	Original Number	Number of Candidate Schools	Original Number	Number of Candidate Schools	Original Number	Number of Candidate Schools	Original Number	Number of Candidate Schools	Number of Candidate Schools
Elementary School	E-1 ~ E-19	19	—	0	E-20 ~ E-42	23	E-43 ~ E-101	59	101
Secondary School	S-1 ~ S-29	29	S-30 ~ S-49	20	S-50 ~ S-74	25	S-75 ~ S-115	41	115
Total	48 schools		20 schools		48 schools		100 schools		216 schools

As a result of these site surveys, 125 schools were determined not to be included in the project and 91 schools were selected for the project. Figure 2-1 shows the evaluation process of the schools. Table 2-3 lists the remaining 91 schools selected for the project and Table 2-4 shows the number of schools selected for the Project by Regions.

Figure 2 - 1 Evaluation Process of the Schools Included in the Project



Project Schools (91 schools)		
Elementary School	Region I (4 schools)	E-6, E-10, E-13, E-17
	Region IX (24 schools)	E-44, E-48, E-50, E-55, E-58, E-60, E-68, E-71, E-73, E-80, E-86, E-87, E-88, E-89, E-90, E-92, E-93, E-94, E-95, E-96, E-97, E-98, E-100, E-101
Secondary School	Region I (27 schools)	S-1, S-2, S-3, S-4, S-5, S-7, S-8, S-9, S-10, S-11, S-12, S-13, S-14, S-15, S-16, S-17, S-18, S-19, S-21, S-22, S-23, S-24, S-25, S-26, S-27, S-28, S-29
	CAR (13 schools)	S-30, S-31, S-32, S-33, S-34, S-35, S-36, S-37, S-39, S-42, S-44, S-47, S-48
	Region IX (23 schools)	S-75, S-76, S-77, S-78, S-80, S-82, S-84, S-86, S-89, S-91, S-92, S-95, S-96, S-99, S-101, S-103, S-104, S-109, S-110, S-111, S-112, S-113, S-114

Note: Numbers are from the site survey conducted in August. (Original Number)

Table 2-3 List of Schools Selected for the Project (1)

No.	NEW SCH.NO	ORIGINAL SCH.NO	NAME OF SCHOOLS	BARANGAY/ MUNICIPALITY	PROVINCE/DIVISION
REGION I					
ELEMENTARY SCHOOL					
1	E- 1	(E- 6)	Bonuan Boquig ES	Bonoan	Dagupan City
2	E- 2	(E- 10)	Ojo ES	Mangatarem	Pangasinan I
3	E- 3	(E- 13)	Umanday CS	Umanday, Bagallon	Pangasinan I
4	E- 4	(E- 17)	Urdaneta CS	Urdaneta	Pangasinan II
SECONDARY SCHOOL					
5	S- 1	(S- 1)	Bacarra Nat'l. Comp. HS (Main)	Bacarra	Ilocos Norte
6	S- 2	(S- 2)	San Nicolas NHS	San Nicolas	Ilocos Norte
7	S- 3	(S- 3)	Batac NHS	Batac	Ilocos Norte
8	S- 4	(S- 4)	Pinili NHS	Pinili	Ilocos Norte
9	S- 5	(S- 5)	Don Safustiano Aquino Mem. NHS	Piddig	Ilocos Norte
10	S- 6	(S- 7)	Malasique NHS	Malasique	Pangasinan II
11	S- 7	(S- 8)	Rosales NHS	Rosales I	Pangasinan II
12	S- 8	(S- 9)	Salomague NHS	Bugallion	Pangasinan
13	S- 9	(S- 10)	Bonuan Boquig NHS	Bonoan	Dagupan City
14	S- 10	(S- 11)	Polong NHS	Bugallom	Pangasinan I
15	S- 11	(S- 12)	Ilocos Sur NHS	Vigan	Ilocos Sur
16	S- 12	(S- 13)	Narvacan NHS	Narvacan	Ilocos Sur
17	S- 13	(S- 14)	Sinait NHS	Sinait	Ilocos Sur
18	S- 14	(S- 15)	Candon NHS	Candon	Ilocos Sur
19	S- 15	(S- 16)	Don Eulogio De Guzman Mem. HS	Bauang	La Union
20	S- 16	(S- 17)	La Union NHS	San Fernando	La Union
21	S- 17	(S- 18)	Bacnotan NHS	Bacnotan	La Union
22	S- 18	(S- 19)	Naguilian NHS	Naguilian	La Union
23	S- 19	(S- 21)	Tubao NHS	Tubao	La Union
24	S- 20	(S- 22)	Calasiao Comprehensive NHS	Calasiao	Pangasinan
25	S- 21	(S- 23)	Daniel Maramba NHS	Sta. Barbara	Pangasinan
26	S- 22	(S- 24)	Ilocos Norte NHS	Laoag City	Laoag City
27	S- 23	(S- 25)	Mangatarem NHS	Mangatarem	Pangasinan I
28	S- 24	(S- 26)	Alaminos NHS	Alaminos	Pangasinan I
29	S- 25	(S- 27)	Umanday NHS	Bugallion	Pangasinan I
30	S- 26	(S- 28)	Manaoag NHS	Manaoag	Pangasinan II
31	S- 27	(S- 29)	Tandoc NHS	San Carlos City	San Carlos City
CAR					
SECONDARY SCHOOL					
32	S- 28	(S- 30)	Sinipsip NHS	Sinipsip, Buguias	Benguet
33	S- 29	(S- 31)	Guinzadan NHS (Main)	Guinzadan, Bauko	Mt. Province
34	S- 30	(S- 32)	Butique NHS	Butique, Paracelis	Mt. Province
35	S- 31	(S- 33)	Benguet Public H.S.	Wangal, La Trinidad	Benguet
36	S- 32	(S- 34)	Bibak NAS	Bulanao, Tabuk	Kalinga
37	S- 33	(S- 35)	Tabuk NHS	Poblacion Tabuk	Kalinga
38	S- 34	(S- 36)	Agbannawag NHS (Main)	Agbannawag, Tabuk	Kalinga
39	S- 35	(S- 37)	Rizal NHS	Poblacion Rizal	Kalinga
40	S- 36	(S- 39)	Flora NHS	Poblacion East, Flora	Apayao
41	S- 37	(S- 42)	Abra NHS	Poblacion Bangued	Abra
42	S- 38	(S- 44)	Cristina B. Gonzales Mem. HS	Poblacion Bucay	Abra
43	S- 39	(S- 47)	Baguio City NHS (Loakan)	Baguio City	Baguio City
44	S- 40	(S- 48)	Mt. Province Gen. Comp. HS (Main)	Bontoc	Mt. Province

Table 2-3 List of Schools Selected for the Project (2)

No.	NEW SCH.NO	ORIGINAL SCH.NO	NAME OF SCHOOLS	BARANGAY/ MUNICIPALITY	PROVINCE/DIVISION
REGION IX					
ELEMENTARY SCHOOL					
45	E- 5	(E- 44)	Olingan ES	Dipolog City	Dipolog City
46	E- 6	(E- 48)	Barra ES	Dipolog City	Dipolog City
47	E- 7	(E- 50)	Sicayab ES (Dipolog City)	Dipolog City	Dipolog City
48	E- 8	(E- 56)	Upper Dicayas ES	Dipolog City	Dipolog City
49	E- 9	(E- 58)	Sulangon CS	Dapitan City	Dapitan City
50	E- 10	(E- 60)	Aseniero ES	Dapitan City	Dapitan City
51	E- 11	(E- 68)	Taguilon ES	Dapitan City	Dapitan City
52	E- 12	(E- 71)	Sicayab ES (Dapitan City)	Dapitan City	Dapitan City
53	E- 13	(E- 73)	Canlucanl ES	Dapitan City	Dapitan City
54	E- 14	(E- 80)	Kauswagan ES	Dapitan City	Dapitan City
55	E- 15	(E- 86)	Arena Blanco ES East	Zamboanga City	Zamboanga City
56	E- 16	(E- 87)	Sta. Maria CS	Zamboanga City	Zamboanga City
57	E- 17	(E- 88)	Southcom ES	Zamboanga City	Zamboanga City
58	E- 18	(E- 89)	Southern Support Command ES	Zamboanga City	Zamboanga City
59	E- 19	(E- 90)	Labuan CS	Zamboanga City	Zamboanga City
60	E- 20	(E- 92)	Pasonanca ES	Zamboanga City	Zamboanga City
61	E- 21	(E- 93)	Buenakapok ES	Zamboanga City	Zamboanga City
62	E- 22	(E- 94)	Don GEMS ES	Zamboanga City	Zamboanga City
63	E- 23	(E- 95)	Sta. Barbara CS	Zamboanga City	Zamboanga City
64	E- 24	(E- 96)	Balintawak ES	Pagadian City	Pagadian City
65	E- 25	(E- 97)	Gubang ES	Pagadian City	Pagadian City
66	E- 26	(E- 98)	Dao ES	Pagadian City	Pagadian City
67	E- 27	(E- 100)	Napolan ES	Pagadian City	Pagadian City
68	E- 28	(E- 101)	Lala ES	Pagadian City	Pagadian City
SECONDARY SCHOOL					
69	S- 41	(S- 75)	Tawagan Sur NHS	Pagadian City	Pagadian City
70	S- 42	(S- 76)	Napolan NHS	Pagadian City	Pagadian City
71	S- 43	(S- 77)	Zamboanga del sur NHS	Pagadian City	Pagadian City
72	S- 44	(S- 78)	Lala NHS	Pagadian City	Pagadian City
73	S- 45	(S- 80)	Manicahan NHS	Zamboanga City	Zamboanga City
74	S- 46	(S- 82)	Southcom NHS	Zamboanga City	Zamboanga City
75	S- 47	(S- 84)	Culanan NHS	Zamboanga City	Zamboanga City
76	S- 48	(S- 86)	Ayala NHS	Zamboanga City	Zamboanga City
77	S- 49	(S- 89)	Zamboanga del Norte NHS	Dipolog City	Dipolog City
78	S- 50	(S- 91)	Galas NHS	Dipolog City	Dipolog City
79	S- 51	(S- 92)	Sicayab NHS	Dipolog City	Dipolog City
80	S- 52	(S- 95)	Dapitan City NHS	Dapitan City	Dapitan City
81	S- 53	(S- 96)	Potungan NHS	Dapitan City	Dapitan City
82	S- 54	(S- 99)	Sulangon NHS	Dapitan City	Dapitan City
83	S- 55	(S- 101)	Dakak NHS	Dapitan City	Dapitan City
84	S- 56	(S- 103)	Aseniero NHS	Dapitan City	Dapitan City
85	S- 57	(S- 104)	Arena Blanco NHS	Zamboanga City	Zamboanga City
86	S- 58	(S- 109)	Talisayan NHS	Zamboanga City	Zamboanga City
87	S- 59	(S- 110)	Tictapul NHS (Annex of Vitali NHS)	Zamboanga City	Zamboanga City
88	S- 60	(S- 111)	Bunguiao NHS	Zamboanga City	Zamboanga City
89	S- 61	(S- 112)	Divisoria NHS (Annex)	Zamboanga City	Zamboanga City
90	S- 62	(S- 113)	Manga NHS	Pagadian City	Pagadian City
91	S- 63	(S- 114)	Pagadian City National Comp. HS	Pagadian City	Pagadian City

Table 2-4 Number of Schools Selected for the Project by Regions

	Region I	CAR	Region IX	Total
Elementary School	4	0	24	28
Secondary School	27	13	23	63
Total	31	13	47	91

(2) Project Facilities

The facilities for this Project include classrooms, toilets and science laboratories. The size of the facilities depends on the shortage of classrooms, calculated by the present number of students and existing classrooms. A minimum of 3 classrooms for Region I plus CAR and 2 classrooms for Region IX are planned since there are almost no records of school construction by the Japanese Grant Aid Program in the past. Thus, as many schools as possible were considered in Mindanao. Based on the policy of providing a maximum of 1 classroom per grade for both elementary and secondary schools, 6 classrooms shall be provided for elementary schools and 4 classrooms for secondary schools. Toilets shall be provided to schools where they have not yet been provided by other aid organizations. Science laboratories shall be provided to secondary schools, where again they have not been provided by other organizations.

In order to meet the requirements for site conditions, facility size and the necessary number of classrooms for each Project school, 8 types of facility were planned and the appropriate type for each project was selected. Other major points of the plan are as follows:

- The facility will be constructed using standard reinforced concrete, with one or two stories depending on the site conditions. Two-storied buildings will be constructed according to local architectural regulation, and one fire-escape stair way, in addition to the main stairway will be provided to ensure 2 ways of evacuation.
- Ordinary classroom dimension shall be based on the DECS's 7m x 8m (56 m²).
The capacity for the classrooms will be 40 students for elementary and 42 for secondary schools.

- Lighting fixtures and a plug receptacle shall be planned. Conduit piping shall also be installed to allow the easy installation of ceiling fans in the future.
- Water supply to these facilities from town or well water will be conducted by the Philippines side. However, due to the inadequate water supply situation in the country, a low pressure water supply method using a cistern tank was planned. Therefore, rainwater may be used in times of emergency.
- A local standard reinforced concrete septic tank will be installed for waste water drainage. The treated water will be filtered into the ground.

(3) Project Equipment

The items planned for the Project are classroom equipment and educational material. Classroom equipment shall include basic furniture such as desks and chairs for students and blackboards. As they are meant for elementary and secondary schools, they will not be luxurious but durable. The materials shall be procured in the Philippines. For ease of manufacturing and obtainability, they shall be of steel and plywood or plastic. The main points of the plan are as follows:

- ① The students' desk and chair for elementary school classrooms shall be for two. Three sizes shall be provided to meet the size of the students.
- ② Secondary school classrooms should be furnished with the desk-chair type, for use by one person, is generally used in the Philippines.
- ③ Three-person type tables for the students and a demonstration workbench for the teacher should be installed in the science laboratories.
- ④ The storage cabinets to be provided in the science laboratories should have sufficient capacity to store the laboratory instruments.

As for educational equipment in secondary schools, equipment for general science, biology, chemistry and physics shall be provided to those schools that have not received science equipment from other organizations. The items and the quantity were decided with the advice of local specialists, and are in accordance with school texts and the types of lessons in the school curriculum.

2-3 Basic Design

2-3-1 Design Concept

Based on the request of the Government of the Philippines and the results of discussions held with DECS during the site survey period, the Basic Design of the Project was prepared along with the following policies:

(1) Policy For Natural Conditions

The Project Area is located in the hot, high humidity tropical zone. To provide a comfortable environment for educational activities, the design of facilities should be prepared by taking into account natural ventilation and heat insulation capabilities. Earthquakes frequently occur throughout the Philippines and yearly typhoons frequently hit especially in northern Luzon, thus floods occur due to heavy rain. Presuming that the project facilities must be used as refuge places in times of such natural disasters, the conditions of the site shall be carefully considered. As a result, the durability of the facilities shall be secured and the ground level shall be raised to prepare for possible natural disasters. The structure of the facilities in northern Luzon shall be designed to be stronger than that of the project area in Mindanao due to strong winds caused by typhoons. As the roof is the most affected during typhoons, the durability shall be carefully considered in order to keep damage to a minimum.

(2) Design Policies for Social Condition

In designing the facility, the schoolbuilding standards of the Philippines and the living mode of the people must be respected. As the school facilities may be used as places of refuge during natural calamities, and to accommodate double-shift classes or night classes for non-formal education, the design should be such as to accommodate these conditions. Furthermore, in compliance with the Accessibility Law of the Philippines (BATAS PAMBANSA BILANG 344), ramps and toilets for handicapped will be provided so that the facilities comply and accommodate physically handicapped students.

(3) Design Policies for Local Construction Field Situations

Similar to the Japanese building standards, there is the National Building Code of the Philippines, and procedures such as confirmation applications are necessary.

The technical level of the local construction and consulting companies is generally high compared to neighboring countries. Thus, if appropriate companies are selected for the Project, they may be adequate. Labor is abundant and work requiring high technical skills may also be conducted with appropriate guidance.

Taking the above into consideration, the quality and number of workers need to be secured according to the work content and schedule.

(4) Policies for Using Local Firms, Equipment and Materials

Due to security problems in the Mindanao area, local contractors and local consultants will be stationed in at the construction site. Due to reasons of safety, Japanese personnel will not be stationed for long periods in the Mindanao area but, at their base in Manila. There is no problem using local contractors and consulting firms. They will work under the guidance of Japanese engineers and be involved in the transfer of technology of construction management and quality control.

As for the construction materials the quality of local products are thought to be satisfactory. However, for those materials, such as concrete, where the strength is affected by the accuracy of the construction, a durability test will be conducted.

(5) Design Policies for the Project Implementing Agency's Maintenance and Management Capabilities

By taking into consideration the financial difficulties being experienced by the Government of the Philippines, school facilities shall be planned by placing top priority on easy, minimum cost maintenance and management work once facility construction has been completed. In addition, consideration shall be given to the use of domestic materials for effecting simple repairs to damaged or deteriorated facilities.

(6) Design Policies for the Scope and grade of Project Facilities and the Equipment to be provided

The contents of the Project include the construction of classrooms and toilets for elementary schools, and classrooms, science laboratories, and toilets for secondary schools, and for the furnishing of associated basic education equipment. The facilities and equipment will provide the basic necessities for education and they should be planned so as to allow comfortable daily classroom activities.

For facility design, emphases shall be placed not only on classroom use for study purposes but also for multipurpose use, such as places of refuge during natural calamities.

The equipment plan will make provision for the supply of the necessary basic classroom equipment, such as blackboards and furniture; and locally available items will be used in view of easy maintenance.

Science equipment shall be procured in Japan, considering costs and quality.

(7) Policy on Construction Schedule

It is difficult to implement the project within one fiscal year because the project sites are widely scattered, including many schools where access is difficult. Therefore, the construction schedule is planned so as to implement Region IX and Region I plus CAR separately.

As numerous school buildings will be constructed simultaneously, construction site offices will be set up in each region to supervise the construction work in that area and to set up a detailed construction plan in order that the buildings may be completed according to schedule.

(8) Policy to Use the Participation of Residents

The maintenance of educational facilities is funded by donations from local residents, as DECS is unable to provide sufficient funds for such work. Local residents will be encouraged to participate in the work to be undertaken by the Philippines side, including site preparation, and work such as gardening and fencing, which will help to motivate them to stay involved in the maintenance of educational facilities even after the completion of the Project.

2-3-2 Examination of Design Conditions

The size of the facilities for each Project school will generally be based on the number of lacking classrooms. The maximum number of classrooms shall be six for elementary and four for secondary schools. Different facility types will be planned according to the size of the facility and site conditions of each school and the appropriated type will be selected.

The facility types range from four types of one-storied building with two to five ordinary classrooms, traditional toilet building type, toilet and science laboratory type and a two-storied type for small sites and attain efficiency of land use. The two-storied type will have four or six classrooms with or without a science laboratory and toilets. Thus, eight facility types will be planned. Table 2-5 shows the facility size and contents for each type.

Table 2-5 Facility Size and Contents for Each Type

Name of Room	Type	Floor Area (m ²)	Number of Stories	Number of Schools	Remarks
Classroom	2A	138.74	Single storey	11	2 classrooms
	3A	208.11	Single storey	23	3 classrooms
	4A	277.48	Single storey	44	4 classrooms
	5A	346.85	Single storey	2	5 classrooms
	2-4A	390.87	Two-storied	5	4 classrooms
	2-6A	538.36	Two-storied	5	6 classrooms
Classroom + Science Laboratory room + Toilet	2-2A+S	408.77	Two-storied	4	2 classrooms Toilet (Male, Female, Handicapped)
	2-4A+S	556.26	Two-storied	3	4 classrooms Toilet (Male, Female, Handicapped)
Science Laboratory, Toilet	S + T	155.37	Single storey	34	Toilet (Male, Female, Handicapped)
Toilet	T	43.00	Single storey	44	Toilet (Male, Female, Handicapped)

The size was set at 8m by 7m (56 m²) for the classroom and 8m by 10.5m (84 m²) for the laboratory according to the facility standards of the DECS. The capacity for the classrooms will be 40 students for elementary and 42 for secondary schools. This is slightly smaller than that of Japan, but considered appropriate considering the layout of furniture. Several types of the 8m x 7m classroom wing will be proposed for the elementary and secondary schools. Considering the fact that the students in the adjoining existing classrooms will use the toilets, the size shall be slightly larger than the country's standard size. In addition, the height of the ceiling was determined as 3.47m taking into consideration the room temperature. Table 2-6 shows the comparison between the applicable laws and the sizes adopted in the project.

Table 2-6 Comparison between Philippine Construction Standards and the Adopted Sizes

		Philippines Design Standard	Project Facilities	
Floor Area	Classroom	8m × 7m (56 m ²)	8m × 7m (56 m ²)	
	Science Laboratory	8m × 10.5m (84 m ²)	8m × 10.5m (84 m ²)	
	Toilet	Male & Female	1 Booth / 50 Students 1 Urinal / 50 Students	1 Booth / 50 Students 1 Urinal / 50 Students
		Handicapped	1 Booth	1 Booth
Capacity	Elementary School	40 Students / Classroom	40 Students / Classroom	
	Secondary School	42 Students / Classroom	42 Students / Classroom	
Ceiling Height		More than 2.7 m	3.47 m	

Study results indicated that 20 of the 63 Project secondary schools already had science laboratories built by other aid organizations. Thus, science laboratories shall be omitted from their plans. Among the 91 Project schools, the four schools that already have toilet facilities through Japan's Aid project "Rural Environment Sanitation Project", and through the World Bank's "Phase I Water Supply, and Sanitation Project", shall not be supplied with toilet facilities in this Project. Furthermore, 19 of the Project's 63 secondary schools have already been provided with science equipment through the Secondary Education Instructional Equipment Program or through other organizations. Thus, science equipment shall not be provided to these schools. The total number of schools receiving science equipment in this Project shall be 44. Table 2-7 shows the contents of Project facilities, size and the supply of equipment for each Project school.

Table 2-7 Scale of Entire Project (1)

Region I

New Scl. No.	Name of School	No. of Classrooms	Project Facilities				Building Type	Floor Area m ²	Remarks	
			C	S	T	E				
1	E- 1	Bonuan Boquig ES	6	0	0	0	2 x 3A, T	459.22		
2	E- 2	Olo ES	6	0	0	0	2 x 3A, T	459.22		
3	E- 3	Umanday CS	3	0	0	0	3A	208.11	Toilet facilities already provided by RESP (Japan).	
4	E- 4	Urdaneta CS	6	0	0	0	2-6A	544.79	Toilet facilities already provided by RESP (Japan). Two-storied building due to site conditions.	
5	S- 1	Bacarra Nat'l Comp HS (Main)	4	0	0	0	4A, S+T	432.85		
6	S- 2	San Nicolas NHS	4	0	0	0	4A, T	320.48	Laboratory and equipment already provided by SEDP (ADB).	
7	S- 3	Batac NHS	4	0	0	0	4A, S+T	432.85		
8	S- 4	Pinili NHS	3	0	0	0	3A, S+T	363.48		
9	S- 5	Don Sebastiano Aquino Mem. NHS	4	0	0	0	4A, S+T	432.85		
10	S- 6	Malasique NHS	4	0	0	0	4A, S+T	432.85		
11	S- 7	Rosales NHS	4	0	0	0	2-4A, T	440.30	Laboratory already provided by ESF (USAID). Two-storied building in order to secure open area.	
12	S- 8	Salomague NHS	4	0	0	0	4A, S+T	562.69		
13	S- 9	Bonuan Boquig NHS	4	0	0	0	4A, S+T	432.85		
14	S- 10	Potlong NHS	3	0	0	0	3A, S+T	363.48		
15	S- 11	Ilocos Sur NHS	4	0	0	0	4A, T	320.48	Laboratory and equipment already provided by ESEP (WB).	
16	S- 12	Narvacan NHS	4	0	0	0	4A, S+T	432.85		
17	S- 13	Sinait NHS	4	0	0	0	4A, T	320.48	Laboratory and equipment already provided by ESEP (WB).	
18	S- 14	Candon NHS	4	0	0	0	4A, S+T	432.85		
19	S- 15	Don Eulogio De Guzman Mem. HS	4	0	0	0	4A, S+T	432.85		
20	S- 16	La Union NHS	4	0	0	0	4A, T	320.48	Laboratory and equipment already provided by ESEP (WB).	
21	S- 17	Bacnotan NHS	4	0	0	0	4A, S+T	432.85		
22	S- 18	Naguilian NHS	4	0	0	0	2-4A+S	562.69	Two-storied building due to small site.	
23	S- 19	Tubao NHS	4	0	0	0	4A, T	320.48	Laboratory and equipment already provided by SEDP (ADB).	
24	S- 20	Calasiao Comprehensive NHS	4	0	0	0	4A, S+T	432.85		
25	S- 21	Daniel Maramba NHS	4	0	0	0	4A, S+T	432.85		
26	S- 22	Ilocos Norte NHS	4	0	0	0	2-4A, T	440.30	Laboratory and equipment already provided by ESEP (WB). Two-storied building in order to secure open area.	
27	S- 23	Mangatarem NHS	4	0	0	0	4A, S+T	432.85		
28	S- 24	Alaminos NHS	4	0	0	0	4A, S+T	432.85		
29	S- 25	Umanday NHS	4	0	0	0	4A, T	320.48	Laboratory and equipment already provided by SEDP (ADB).	
30	S- 26	Manoag NHS	4	0	0	0	4A, S+T	432.85		
31	S- 27	Tandoc NHS	4	0	0	0	4A, S+T	432.85		
Total			127	31	19	29	20		12,819.91	

CAR

New Scl. No.	Name of School	No. of Classrooms	Project Facilities				Building Type	Floor Area m ²	Remarks	
			C	S	T	E				
32	S- 28	Sinipsip NHS	2	0	0	0	2-2A+S	415.20	Two-storied building due to small site	
33	S- 29	Guinzadan NHS (Main)	3	0	0	0	3A, T	251.11	Laboratory and equipment already provided by SEDP (ADB).	
34	S- 30	Butigue NHS	4	0	0	0	4A, S+T	432.85		
35	S- 31	Benguet Public H.S.	4	0	0	0	4A, S+T	432.85		
36	S- 32	Bibak NAS	4	0	0	0	4A, S+T	432.85		
37	S- 33	Tabuk NHS	4	0	0	0	4A, T	320.48	Laboratory and equipment already provided by ESEP (WB).	
38	S- 34	Agbannawag NHS (Main)	4	0	0	0	4A, S+T	432.85		
39	S- 35	Rizal NHS	4	0	0	0	4A, T	320.48	Laboratory and equipment already provided by SEDP (ADB).	
40	S- 36	Flora NHS	4	0	0	0	4A, S+T	432.85		
41	S- 37	Abra NHS	4	0	0	0	4A, T	320.48	Laboratory and equipment already provided by ESEP (WB).	
42	S- 38	Cristina B. Gonzales Mem. HS	4	0	0	0	4A, S+T	432.85		
43	S- 39	Baguio City NHS (Lookan)	4	0	0	0	2-4A, T	440.30	Laboratory and equipment already provided by SEDP (ADB), ESEP (WB). Two-storied building in order to secure open area.	
44	S- 40	Mt. Province Gen. Comp. HS (Main)	4	0	0	0	4A, T	320.48	Laboratory and equipment already provided by ESEP (WB).	
Total			49	13	7	13	7		4,985.63	

C: Classrooms, S: Science Laboratory, T: Toilet, E: Science Equipment

Table 2-7 Scale of Entire Project (2)

Region 9

New Sch. No	Name of School	No. of Classrooms	Project Facilities				Building Type	Floor Area m ²	Remarks
			C	S	T	E			
1	E- 5	Olingan ES	2	○			2A	138.74	Toilet facilities already provided by DOH (WB).
2	E- 6	Barra ES	5	○			5A	346.85	Toilet facilities already provided by DOH (WB).
3	E- 7	Sicayab ES (Dipolog)	6	○		○	2 x 3A, T	459.22	
4	E- 8	Upper Dicayas ES	3	○		○	3A, T	251.11	
5	E- 9	Sulangon CS	3	○		○	3A, T	251.11	
6	E- 10	Aseniero ES	3	○		○	3A, T	251.11	
7	E- 11	Taguilon ES	2	○		○	2A, T	181.74	
8	E- 12	Sicayab ES (Dapitan)	2	○		○	2A, T	181.74	
9	E- 13	Canlucani ES	2	○		○	2A, T	181.74	
10	E- 14	Kauswagan ES	2	○		○	2A, T	181.74	
11	E- 15	Arena Blanco ES East	6	○		○	2-6A, T	587.79	Two-storied building in order to secure open area.
12	E- 16	Sta. Maria CS	6	○		○	2 x 3A, T	459.22	
13	E- 17	Southcom ES	6	○		○	2-6A, T	587.79	Two-storied building due to small site.
14	E- 18	Southern Support Command ES	6	○		○	2 x 3A, T	459.22	
15	E- 19	Labuan CS	2	○		○	2A, T	181.74	
16	E- 20	Pasonanca ES	6	○		○	2-6A, T	587.79	Two-storied building due to small site.
17	E- 21	Buenakapok ES	2	○		○	2A, T	181.74	
18	E- 22	Don GEMS ES	6	○		○	2 x 3A, T	459.22	
19	E- 23	Sta. Barbara CS	6	○		○	2-6A, T	587.79	Two-storied building in order to secure open area.
20	E- 24	Balintawak ES	2	○		○	2A, T	181.74	
21	E- 25	Gubang ES	2	○		○	2A, T	181.74	
22	E- 26	Dao ES	5	○		○	5A, T	389.85	
23	E- 27	Napolan ES	5	○		○	2A,3A, T	389.85	
24	E- 28	Lala ES	4	○		○	4A, T	320.48	
25	S- 41	Tawagan Sur NHS	4	○	○	○	4A, S+T	432.85	
26	S- 42	Napolan NHS	2	○		○	2A, T	181.74	Laboratory and equipment already provided by SEDP (ADB).
27	S- 43	Zamboanga del sur NHS	4	○		○	4A, T	320.48	Laboratory and equipment already provided by ESEP (WB).
28	S- 44	Lala NHS	2	○	○	○	2-2A+S	415.20	Two-storied building due to small site.
29	S- 45	Manicahan NHS	2	○	○	○	2A, S+T	294.11	
30	S- 46	Southcom NHS	4	○	○	○	4A, S+T	432.85	
31	S- 47	Culianan NHS	4	○		○	4A, T	320.48	Laboratory and equipment already provided by SEDP (ADB).
32	S- 48	Ayala NHS	4	○		○	4A, T	320.48	Laboratory and equipment already provided by ESEP (WB).
33	S- 49	Zamboanga del Norte NHS	4	○		○	4A, T	320.48	Laboratory and equipment already provided by ESEP (WB).
34	S- 50	Galas NHS	4	○	○	○	4A, S+T	432.85	
35	S- 51	Sicayab NHS	4	○	○	○	4A, S+T	432.85	
36	S- 52	Dapitan City NHS	4	○	○	○	4A, S+T	432.85	
37	S- 53	Potungan NHS	3	○	○	○	3A, S+T	363.48	
38	S- 54	Sulangon NHS	4	○		○	2-4A, T	440.30	Laboratory and equipment already provided by SEDP (ADB). Two-storied building in order to secure open area.
39	S- 55	Dakak NHS	3	○	○	○	3A, S+T	363.48	
40	S- 56	Aseniero NHS	4	○	○	○	4A, S+T	432.85	
41	S- 57	Arena Blanco NHS	2	○	○	○	2-2A+S	415.20	Two-storied building due to small site.
42	S- 58	Talisayan NHS	3	○	○	○	3A, S+T	363.48	
43	S- 59	Tactipan NHS (Annex of Vibal NHS)	4	○	○	○	4A, S+T	432.85	
44	S- 60	Bunguiao NHS	2	○	○	○	2-2A+S	415.20	Two-storied building due to small site.
45	S- 61	Divisoria NHS (Annex)	4	○	○	○	2-4A+S	562.69	Two-storied building due to site conditions.
46	S- 62	Manga NHS	4	○	○	○	4A, S+T	432.85	
47	S- 63	Pagadian City National Comp. HS	4	○	○	○	4A, S+T	432.85	
Total			173	47	16	45	17	16,973.51	

C: Classrooms, S: Science Laboratory, T: Toilet, E: Science Equipment

2-3-3 Basic Design

When finalizing the plan, several improvements were made to Project Facilities in Phase I through IV, based on the Philippines standard design. The major improvements were as follows:

1) Improvements made in the Phase II project facility:

1. Adopted a low pressure water supply system having an elevated water tank set at a height of 2m instead of 4m height. It became possible to put well water by hands and rain water by gravity flow into the tank when water supply is suspended.
2. The science laboratory and toilet that were in separate buildings in Phase I Project were combined into one building in order to provide more convenient and economical water supply and drainage systems.
3. An air vent opening was provided at the upper part of the concrete block wall of the toilet.

2) Improvements made in the Phase III Project facility:

1. The Phase II Project had 9 different types of classroom buildings having 3 to 9 classrooms. But, in the Phase III Project, only one building type having 3 classrooms was adopted to avoid concentration of schools in city areas where classroom demand is high, and to allocate as many schools as possible in economically disadvantaged rural areas.
2. In view of environmental preservation in the Philippines, wooden back boards of furniture units were replaced with plastic boards.

3) Improvements made in the phase IV project facility:

1. Connections of roofs and open areas such as windows and doors, should be further reinforced to withstand the strong typhoons experienced in the Philippines.

2. Science laboratory instruments shall be selected by taking into consideration the contents of the educational curriculums and teachers' opinions. In addition, items that can be procured in the Philippines with quality and quantity shall be adopted in order to make maintenance easier and to economize the Project costs.

Based upon the results of discussions with DECS, the following modifications provide improvements to those previous plans:

1. Facility types

Different facility types are planned according to the size of the facility and site conditions of each school.

The facility types range from a one-storied building with two to five academic classrooms, a toilet building type, a toilet and a science laboratory type. A two-storied type for small sites will be introduced thus obtaining efficient land use.

The two-storied type will have four classrooms for secondary schools and four or six classrooms for elementary schools with or without a science laboratory and toilets, depending upon the receipt of such facilities from other donors.

In addition to these types, a two-storied type with 2 or 4 classrooms, science laboratory, and toilet integrated into one building will be newly adapted to the project. This type is very effective for a secondary school having limited site availability where the school can have only classrooms without a science laboratory or in the worst case, both a science laboratory and toilets.

A two-storied type is also effective for the schools presently having relatively sufficient land to build two single-storey buildings instead of a two-storied building, but are expected to have a big student growth rate in the near future thus requiring additional classroom buildings within the remaining land.

Thus, eight facility types will be provided in the plan.

2. Structure Plan

The Project will cover the two different regions of northern Luzon and southern Mindanao. Thus, the construction plan should be in accordance with the characteristics of each region. Regarding the design criteria, it will generally be based on the Philippine standards and the regional coefficients for seismic forces and wind forces.

3. Ceiling Substrate

Site survey has revealed that most old buildings have collapsed ceilings. Alterations and modifications in the ceiling material have been made in the previous phases of the Project. However, the substrate of the ceilings for this Project will be altered from wood to a lightweight steel-frame for durability.

4. Coating

The coating for metal parts on the building exterior will also be considered in order that the building may be easily managed and maintained.

(1) Site and Layout Plan

As the site conditions vary from school to school, the most appropriate layout plan for each Project school shall be prepared after examining the school site configuration, infrastructure development conditions and the existing building arrangement. The main layout-plan policies are as follows:

- 1) The arrangement of existing school facilities must be taken into consideration and the new buildings shall be arranged to match them.
- 2) A new building will be constructed on flat land if possible to ensure the structural safety of the buildings foundation.
- 3) By taking into account the prevailing wind directions and thereby utilizing natural ventilation to its maximum extent, new buildings will be constructed at sufficient distance from existing ones.
- 4) A location that is liable to be damaged during typhoons or floods should be avoided.
- 5) A new building shall be arranged so as not to adversely affect existing facilities. The building shall be arranged to allow for the economical and easy installation of water supply, drainage facilities and electrical supply lines. Especially where there

is no water supply, the location of the toilet and science laboratory should be carefully reconsidered with regard to the location of the well to be drilled by the Philippine side.

- 6) Except for two storey buildings utilizing a limited available site, thus having a science laboratory and toilet on the 1st. floor together with a classroom on the 2nd. floor, toilets and science laboratories should be arranged independently away from the classroom buildings. Their arrangement should be made by taking into consideration the movement routes between them and existing facilities. Also, toilet locations should be decided upon by first giving careful consideration to the surrounding environment, such as odor problems.

The toilet entrance for the two storey building, having toilets, science laboratories and classrooms integrated in one building, should be located outward to minimize odor problems.

- 7) Except for those schools having space limitations, classroom buildings should be arranged in an east-west direction in view of the country's climatic conditions.
- 8) Where one-storied buildings are not possible due to the smallness of the site and to provide for the addition of classrooms in the future for the schools with severe classroom shortage, two-storied buildings shall be planned.

(2) Architectural Plan

A. Floor Plan

For the Project, the adopted room sizes were 8m x 7m for classrooms and 8m x 10.5m for science laboratories. The minimum size of the module unit was 8m x 3.5m (two units for classrooms and 3 units for science laboratories).

By arranging the concrete columns on the outer walls, the classroom will be rectangular in shape with no protrusions, allowing easy arrangement of furniture. Multipurpose use classrooms will have movable partitions (walls).

A movable partition shall be installed in the classrooms for both elementary and secondary schools, in order that the 2 classrooms may be used as one large room. Thus, it may be used as a multipurpose room, such as for medium sized meetings by students

and local residents.

For secondary schools, science laboratories and toilets will be located next to each other. The water to the laboratory and toilet will be supplied by the cistern. The science laboratories will have work counters below the windows with five sinks.

To be prepared for rainy seasons, a 1.8m wide outer corridor will be built on each facility. A slope and a special toilet will be set up for physically handicapped people. Table 2-8 shows the comparison of project facility features to those having Philippine standards.

Table 2-8 Comparison of Project Facility Features to Those Having Philippine Standards

Structure	Type	Year Constructed	Classroom Size (m x m)
Wood/Timer	Gabalton Type	1910	7.00 x 9.00
	Army Type	1950 to 1960	6.00 x 7.00
	Magsaysay Type	1950	6.00 x 7.00
Steel	Marcos Pre-Fab.	early 1970's	6.00 x 7.00
	Typhoon Resistant Schoolbuilding Project I - V	1989 to 1994	6.75 x 8.00
	FVR Type	1993	7.00 x 8.00
	Demountable Schoolbuilding	1994 to 1995	7.00 x 8.00
Concrete	R.P./U.S. Bayanihan (funded by USAID)	1973	6.00 x 7.35
	Bagong Lipunan Type I -III	1970 to 1984	6.00 x 8.00
	Imelda Type	1983	6.00 x 8.00
	BSF (funded by USAID)	1982	6.00 x 8.00
	Pagcor/PMS (President's Social Fund)	1988 to present	6.00 x 8.00
	SEDP (funded by ADB)	1988 to 1995	7.20 x 8.00
	LGHF (Local Government Infrastructure Fund)	1994 to 1995	7.00 x 8.00
	The Project for the Improvement of Educational Facilities (Phase I , II , III & IV)	1993 to 1997	7.00 x 8.00
	Third Elementary Education Project (funded by OECP, WB)	1997 to present	7.00 x 8.00
	The Project for the Improvement of Educational Facilities (Phase V)		7.00 x 8.00

Below are the provisions for two exits as stipulated in the National Building Code and Fire Code of the Philippines that should be taken into consideration during preparation of the plans:

Under the National Building Code, Section 1207-Stairs, Exits and Occupant Loads stipulates as follows;

- (b)-(1)Number of Exits: In all occupancies, floors above the first storey having an occupant load of more than 10 shall not have less than two exits...
- (b)-(2)Width: The total width of exits in meters shall not be less than the total occupant load served divided by 165...
- (e)-(1)Width: Stairways serving an occupant load of more than 50 shall not be less than 1.10 meters. Stairways serving an occupant load of 50 or less may be 900 millimeters wide...

Under The Fire Code, Division 4-Section 3.403-Interior Stairs and Smokeproof Tower stipulates as follows;

- General. All Stairs, as a required means of egress, shall be permanently fixed constructions.

Division 4-Section 3.409-Fire Escape Stairs, Ladders and Slide Escapes stipulates

- Fire Escape Stair (1) General... Fire escape stairs shall not constitute more than (50%) percent of the required exit capacity in any case. Fire escape stairs shall not be accepted as constituting any part of the required means of egress for new buildings.

Division 8-Section 3.801 (B)-(7) Exit Arrangement stipulates as follows;

- Exits shall be arranged so that at least two (2) separate exits will be available from every floor area...

The necessity to install evacuation routes such as stairs, ladders or slopes in more than two locations is indicated in the above points. Regarding the type of evacuation route, ladders are considered dangerous for elementary and secondary schools and the construction of slopes would require adequate space to secure a 1:12 slope. Thus, stairs are thought to be the most appropriate form of evacuation. In accordance with the Fire Code of the Philippines, two emergency staircases shall be installed. The width shall be 1.3m and 0.9m based on the National Building Code.

B. Section Plan

DECS' standard design states that the ceiling height should be approximately 2.7 to 3.0m. Some have finished ceilings, however, most of the ceilings are without finish. Because of this, it is often seen that roofs absorb the heat under the tropical climate of the Philippines. Thus, heat is stored inside the classrooms and the temperature during the day reaches rather high temperatures, hindering the ability for comfortable and pleasant classes.

This project aims to improve the educational environment for the teachers and students by installing the ceilings and insulating material under the roofs and also, the height of the ceiling shall be 3.47m, relatively high, to relieve the heat in the classroom. Moreover, in consideration of obtaining an adequate natural ventilation, ventilation openings in the ceiling void and large windows shall be installed.

Eave lengths were examined from the viewpoint of intercepting direct sunshine, rain and wind. As a result, it was decided to have eave lengths of 2.5m (1.8m from the building walls to the center of the corridor columns and 0.7m to the tip of the eaves). On the other side of the building, the eaves are to be 1.45m.

To provide as much natural ventilation as possible, ventilation blocks shall be installed in the wall. The standard section is shown in Figure 2-2 .

Figure 2-2 (1) Standard Section of Project Buildings (Single Storey)

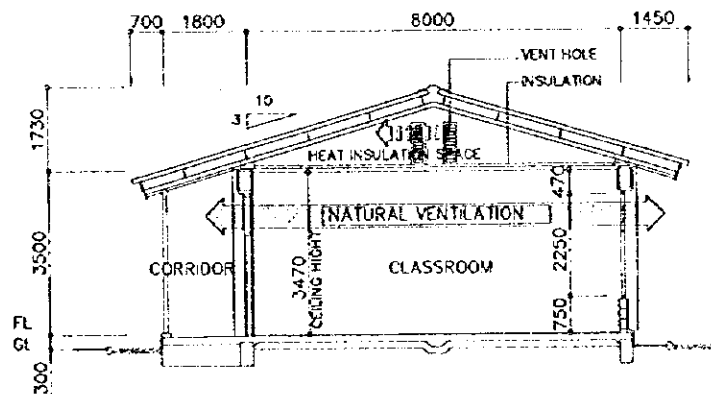
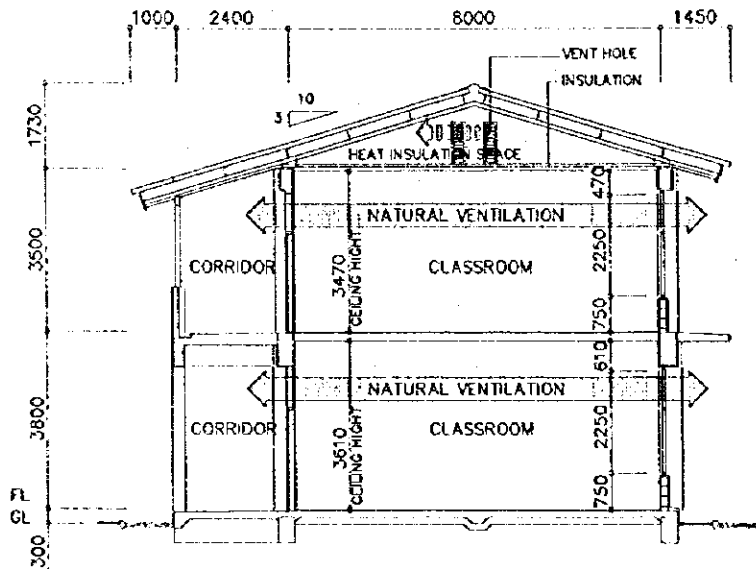


Figure 2-2 (2) Standard Section of Project Buildings (Two-Storeyed)



C. Structure Plan

As the Project will be conducted in the two different regions of northern Luzon and western Mindanao, a structure plan corresponding to the regional characteristics shall be set up. The design criteria shall in general be based on the Philippine standards. The regional coefficients for seismic forces and wind forces shall be utilized.

1. Construction Method:

The foundation, floor, columns and beams shall be of reinforced concrete, which is the standard method in the Philippines. The wall shall be of concrete block and the framework supporting the roof shall be of steel-frame truss. Thus, it will be a combined structure.

2. Loads and External Forces

Loading conditions will generally be based on the National Structural Code of the

Philippines. This Standard stipulates the regional coefficients for seismic forces and wind forces.

Regarding wind force, the regions of the country are classified into Zones 1 to 3 according to the frequency of typhoons and the regional coefficients are decided based on these zones. Considering the damage that typhoons may cause to school facilities, the structural plan for wind forces until Phase IV of the Project was decided by using the regional coefficient of the worst typhoon hit area. However, Western Mindanao, which is included in the Project, is less hit by typhoons compared to other areas. Thus, a smaller regional coefficient may be used for this area.

As for seismic forces, it was decided to use the same regional coefficient nationwide as stated in the Standards, except for part of Palawan and the southwestern part of Zamboanga. (When conducting structural analyses, if the seismic forces are bigger than the wind forces, wind forces will not affect the analyses). The structural plan will thus be conducted using these values.

Furthermore, the live loads will also be reviewed within the safety limit and a more rational and economical structural plan will be conducted.

(1) Live Loads Classroom Floors: 204.1 kg/m^2 (2,000 pa)
Corridor Floors: 490.0 kg/m^2 (4,800 pa)

(2) Wind Loads $P = C_e \cdot C_g \cdot g_s$
Where P = wind load per square meter
 C_e = coefficient of height
 C_g = wind force coefficient
 g_s = wind speed at the building location
Ruzon : 200KPH
Mindanao : 150KPH

(3) Seismic Force $V = Z \cdot I \cdot C/R_w \times W$
Where:
 Z = Seismic zone factor (0.4)
 I = Importance factor (1.0)
 R_w = Numerical coefficient (5.0)
 W = The total seismic dead load

$$C = 1.25/T^{2.5} \times S$$

Where:

S = Site coefficient for soil characteristics

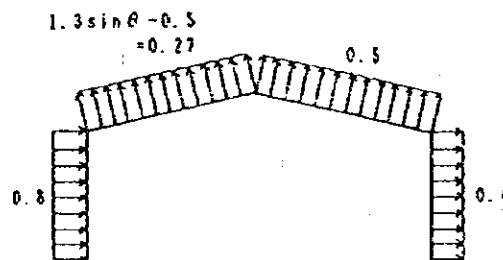
T = Fundamental Period of vibration

3. Building Structure Plan

Vertical forces, such as fixed loads and uplift forces of wind, should be taken by the 8m span steel frame truss and reinforced concrete columns and beams. Horizontal forces, such as wind loads and seismic forces in the building's longitudinal direction should be taken by the rigidity of the reinforced concrete foundations and columns. Horizontal forces in the buildings' cross sectional direction should be taken by the rigidity of the reinforced concrete columns and frame structure.

Building structure design will be made on the bearing strength of 75 KN/m^2 (7.35 tons/m^2). Although some school sites have soil layers weaker than 8 tons/m^2 which are underlaid by more than 8 tons/m^2 at a depth of 1.5 to 2.0m below ground surface, building structure design will be made based on the bearing strength of 8 ton/m^2 because the ground will be reinforced by placing rapped concrete. Wind force coefficients for building design are as shown in Figure 2-3.

Figure 2-3 Wind Force Coefficients



4. Structure Member Material

Two types of materials, wood and steel frames, can be used for the roof's frame trusses. As lumber products are difficult to procure and also the quality is not uniform in

the Philippines, it was decided upon to adopt steel frames. The most commonly used equal angle section bars will be used.

As the quality of reinforcing bars and concrete may differ according to the region, quality control must be carefully conducted. Materials to be used for the Project must have the following strengths:

- a) Concrete: $F_c = 180 \text{ kg/cm}^2$ 2,500 PSI
- b) Reinforcing Bars: $F_y = 2,376 \text{ kg/cm}^2$ 33,000 PSI
- c) Steel Frames: $F_y = 2,592 \text{ kg/cm}^2$ 36,000 PSI

D. Facility Plan

(1) Electrical Facility Plan:

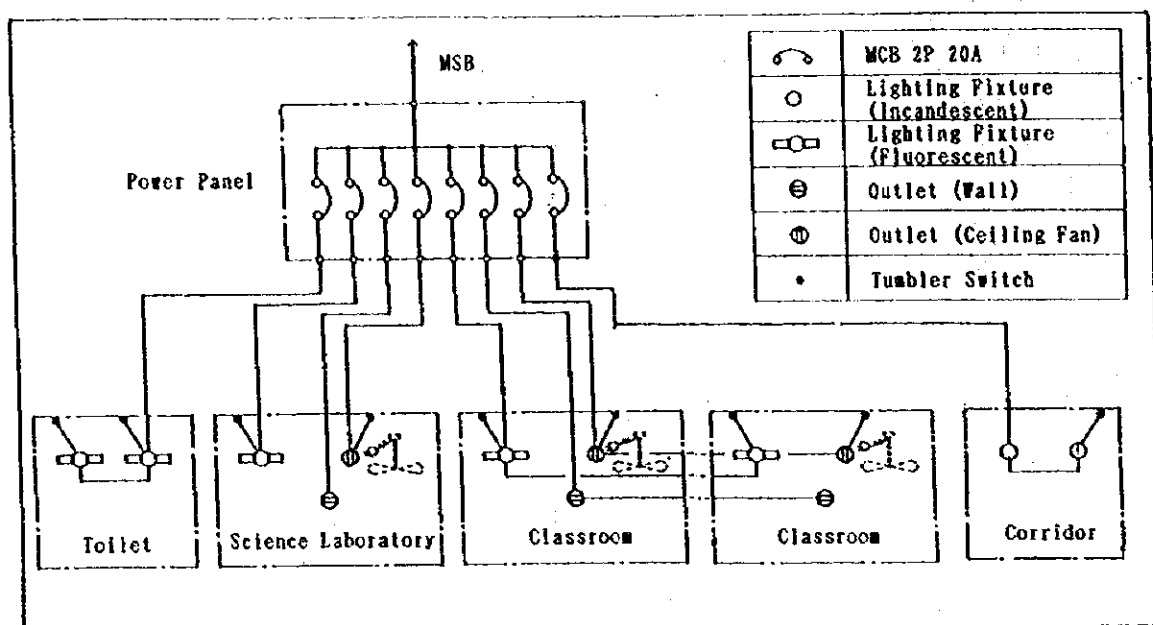
Project schoolbuildings will not only be used for ordinary classroom activities but also for non-formal education and as meeting places for area residents. It is assumed that the schoolbuildings will also be used at night time. Thus, electrical facilities are planned to be installed in all Project schoolbuildings. All materials for the electrical facilities will be procured in the Philippines. The installation of lighting fixtures, outlets, and ceiling fan receptacles is planned.

Electrical wiring and switches for ceiling fans is planned under the Project by taking into consideration the Philippine side's plan for future ceiling fans installation. Electricity is not supplied to some of the Project schools. The number of fluorescent lighting fixtures, outlets for ceiling fans, switches, and outlets per room are shown in Table 2-9. The lighting and outlet wiring diagram are shown in Fig. 2-4.

Table 2-9 The Designed Number of Electrical Appliance, Outlet and Switches per Room

Type of Room	Fluorescent Lighting Fixtures	Incandescent Lighting Fixtures	Outlets (Ceiling Fans)	Switches	Outlets
Classroom	4	0	2	2	2
Science Laboratory	6	0	3	3	4
Corridor	0	1	0	1	0
Toilets (Males)	1	0	0	1	0
Toilets (Females)	1	0	0	1	0
Toilets (Handicapped)	1	0	0	1	0

Figure 2-4 Lighting and Outlet Wiring Diagram



Note: Only the conduit but not the lighting fixtures will be installed in those schools not having power supplies.

(2) Water Supply Facility Plan:

Site survey results reveal that the types of water sources at Project schools vary from school to school. In general, their water supply conditions are very poor. Although some of the Project schools have city water supplies, stable water supplies are not maintained due to the malfunctioning of water supply lines, difficulty in securing water sources, and excessive pressure drops. Even at schools having their own wells, it is very difficult to maintain a stable water supply because of pump failures and insufficient amounts of well water.

By taking into account the above situations, the water supply system having an elevated water tank and an electrically operated pump will not be adopted for the Project. A water supply system having a water tank that is approximately 2m high above ground level will be used for the Project. Water will be supplied to the tanks by the Philippine side. In the event of a water shortage, water should be carried manually in buckets to the tanks from nearby water sources.

Although there are problems with the quality of rainwater and with roof gutter maintenance, it would be most useful to utilize rainwater in emergency situations. Thus,

it will be planned to install roof gutters so that rainwater can be used in toilets and science laboratories.

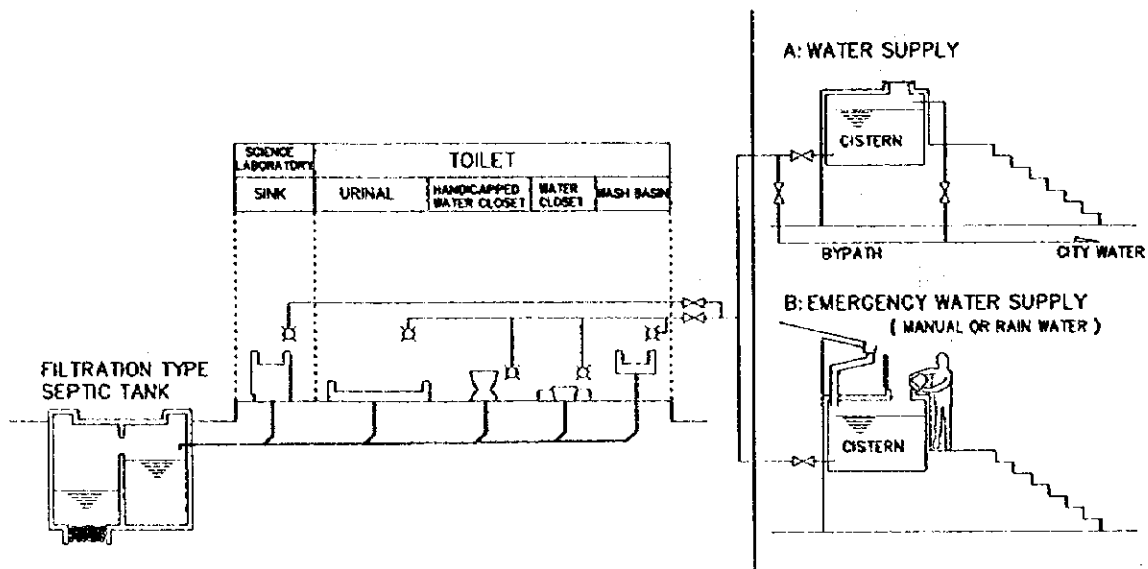
Cistern:	Reinforced concrete
	Volume : 1.16 cm ³ (toilet)
	1.20 cm ³ (toilet + science laboratory)
Water supply piping :	PVC pipes
Gutter :	PVC gutter
Down spout :	PVC pipes

(3) Sewerage Facility Plan:

It will be necessary to install sewage treatment facilities for sewage of toilet wash basins, urinals, and water closets, and waste water from science laboratory sinks. It is planned to treat sewage and waste water using the combined system of simple infiltration and septic tanks commonly used in the Philippines. The water supply and sewerage system is as shown in Fig. 2-5. The sewerage facility includes the following items:

- Water Closets: Squat type (2 in the boy's toilet;
3 in the girl's toilet)
Western type (1) (for handicapped pupils)
- Urinals: Multiple unit type, partially tiled (1.7m)
- Wash Basins: Reinforced-concrete and tiled.
Ready-made units will be used for handicapped toilet.
- Piping Material: PVC pipe
- Septic Tanks: Reinforced-concrete made; infiltration type

Figure 2-5 Water Supply and Sewerage System Diagram



E. Schoolbuilding Material Plan

1. Basic Requirements:

In the Project, all building construction materials shall be obtained on the local market firstly, to minimize construction costs so that the maximum number of classrooms can be constructed and secondly, to simplify the completed buildings' maintenance and management work.

2. Major Materials to be Used:

a) Structure Material

The reinforced concrete that is commonly used in the Philippines shall be used for foundations, columns and beams. As the quality of cement and aggregate material differ according to locality, measures for quality control must be carefully conducted.

As for truss structures to support roofs, wooden trusses are widely used throughout the country. However, as lumber is difficult to obtain in the Philippines at present, steel frame trusses shall be used for the Project.

b) Roofing Material

In the Philippines, most of the schools are roofed with zinc plated steel sheet; thus, leakage occurs as a result of corrosion. For the Project, aluminum-zinc alloy plated steel sheets are to be used because some of the sites are along the coast and corrosion caused by sea water is prevalent.

c) Windows/Doors

Wooden jalousies are most commonly used in the Philippines. Jalousies shall be adopted for the Project. However, some Project schools presently are without power supplies; therefore, glass jalousies shall be installed to efficiently utilize natural lighting. By taking into account glass protection and security, steel-bar frames will be installed to each jalousie. As for doors, only the frames shall be made of steel. The door body shall be made of wood to allow for easy opening and closing by students.

d) Floors, Walls and Ceilings

Reinforced concrete will be used for floors as it is very durable, and be finished with colored cement mortar. Concrete blocks will be used for exterior walls in view of their insulation capability. Mortar will be put on the walls and painted. The inside partition walls will be made of hollow cement blocks, except walls where movable partitions are located, will be made of painted plywood on lightweight steel frames.

e) Ceiling Support Material

Site study has revealed that many of the ceilings of old buildings had fallen. The supports of the ceilings in this Project shall be of a lightweight steel frame, to increase durability.

The major materials to be used for Project schoolbuildings are shown in Table 2-10.

**Table 2-10 Construction Methods to be Used in the Project
and Reason for Selection**

Building Portion		Local Method	Project Method	Reason for Selection
Foundation		Reinforced Concrete	Same	Corresponds to local method
Column / Beams		Reinforced Concrete	Same	Corresponds to local method
Floor	Base	Reinforced Concrete	Same	Corresponds to local method
	Finish	Cement Mortar	Colored Cement Mortar	Durability, Easy maintenance
Exterior Wall	Base	CHB	Same	Corresponds to local method
	Finish	Cement Mortar + Paint	Same	Corresponds to local method
Roof	Base	Wood Trussed Roof	Steel Trussed Roof	Durability, Typhoon resistance
	Finish	Zinc Plated Corrugated Steel Sheets	Aluminum Zinc Plated Steel Sheets	Durability, Anti-corrosive Typhoon resistance
	Steel Portion	Paint	Dipping	Anticorrosion resistance, Durability
Ceiling	Lower floors	Cement Mortar + Paint	Same	Corresponds to local method
	Top floors	None	Ordinary Plywood + Paint, and Insulation	Insulating effect, Lighting Effect
Interior Wall	Base	CHB	Same	Corresponds to local method
	Finish	Cement Mortar + Paint	Same	Corresponds to local method
Fixtures	Window	Wood Jalousie	Glass Jalousie	Maximize natural lighting
	Steel Grill	Paint	Dipping	Anticorrosion resistance, Durability
	Door	Marine Plywood Flush Door	Same	Corresponds to local method
	Movable Partition Wall	None	Ordinary Marine Plywood + Paint	Flexibility

f) Comparison between this project and those of other donors

The other school improvement program in progress is the TEEP. Similar to this Project, the TEEP aims to construct new school buildings as well as the rehabilitation or repair of existing buildings.

The candidate schools for the TEEP are the elementary schools located in the 26 poorest provinces of the Philippines, which were identified under the Social Reform Agenda of the then President Fidel V. Ramos. The schools are ranked in priority based on the following criteria; (a) incomplete schools, (b) increase in student enrollment, (c) classroom shortages, and (d) state of deterioration of existing facilities. The schools are ranked from highest priority to least priority and a cut-off is set depending on the budgetary allocation determined by the project, per province. This is regardless on whether or not the local government units in the specific provinces are able to generate their 25% equity as required by the TEEP. The local government units determine the program of work and size of the project.

The TEEP's facility plan is divided into three distinct geographical locations of the schools: Highland Schools, Lowland Schools and Coastal Schools. The classroom plan for each type is different depending on whether the school conducts "mono-grade classes" or "multi-grade classroom instruction". Each classroom has a science corner in order to accommodate simple science experiments under the elementary educational curriculum. Toilets are built attached to each classroom and not as a separate building. The floor plan, ceiling height and other dimensions are of standard design. However, the roof frame, roofing, wall material and window sash are planned in order that they may be changed at the discretion of the local government, due to regional and site conditions as well as procurement situations. The following table shows the comparison of the major items in the TEEP and this Project:

Table 2-11 Comparison of the Major Items in the TEEP and This Project

		TEEP	This Project
Floor Area	Monograde	56.0 m ² (7.0m × 8.0m)	56.0 m ² (7.0m × 8.0m)
	Multigrade	72.0 m ² (8.0m × 9.0m)	None
Ceiling Height		3.5m	3.5m
Corridor Width		1.8m	1.8m
Building Type		Single Story Bldg. <ul style="list-style-type: none"> • 2 C.R. with Toilet • 2 C.R. with Toilet + Office • 2 C.R. with Toilet + Office + Clinic + Sleeping Quarter 	Single Story Bldg. <ul style="list-style-type: none"> • Classroom Bldg. (2 ~ 5 C.R.) • Sci. Lab. + Toilet • Toilet Two Story Bldg. <ul style="list-style-type: none"> • Classroom (4 or 6 C.R.) • Classroom (3 or 5 C.R.) + Sci. Lab. + Toilet
Structure Method		<ul style="list-style-type: none"> • R.C. + Steel Trussed Roof • R.C. + Wood Trussed Roof 	<ul style="list-style-type: none"> • R.C. + Steel Trussed Roof
Roof Shape		Gable Roof	Gable Roof
External Finishes	Roof	<ul style="list-style-type: none"> • Pre-Painted Metal Roofing • Clay Tile 	<ul style="list-style-type: none"> • Aluminum Zinc Plated Steel Sheets
	Eaves Ceiling	<ul style="list-style-type: none"> • Cement Board 	<ul style="list-style-type: none"> • Cement Board
	Wall	<ul style="list-style-type: none"> • CHB, Cement Mortar + Paint 	<ul style="list-style-type: none"> • CHB, Cement Mortar + Paint
	Window	<ul style="list-style-type: none"> • Wood Jalousie + Grille • Glass Jalousie + Grille 	<ul style="list-style-type: none"> • Glass Jalousie + Grille
	Door	<ul style="list-style-type: none"> • Marine Plywood Flush Door 	<ul style="list-style-type: none"> • Marine Plywood Flush Door
	Corridor Floor	<ul style="list-style-type: none"> • Cement Mortar 	<ul style="list-style-type: none"> • Cement Mortar
Internal Finishes	Ceiling	<ul style="list-style-type: none"> • Ordinary Plywood + Paint 	<ul style="list-style-type: none"> • Cement Board
	Wall	<ul style="list-style-type: none"> • CHB, Cement Mortar + Paint 	<ul style="list-style-type: none"> • CHB, Cement Mortar + Paint
	Movable Partition Wall	<ul style="list-style-type: none"> • Ordinary Plywood + Paint 	<ul style="list-style-type: none"> • Ordinary Plywood + Paint
	Floor	<ul style="list-style-type: none"> • Colored Cement Mortar • Timber 	<ul style="list-style-type: none"> • Colored Cement Mortar
Toilet Finishes	Ceiling	<ul style="list-style-type: none"> • Marine Plywood + Paint 	<ul style="list-style-type: none"> • Cement Board
	Wall	<ul style="list-style-type: none"> • CHB, Cement Mortar + Paint 	<ul style="list-style-type: none"> • CHB, Cement Mortar + Paint
	Floor	<ul style="list-style-type: none"> • Local Mosaic Tile 	<ul style="list-style-type: none"> • Local Mosaic Tile

(3) Equipment Plan

In order to fulfill the educational activities after the Project facilities are opened, proper equipment must be provided. Upon completion of the classrooms and science laboratories in the Project schools, various types of equipment will be used. Based on the contents of the request made by the Government of the Philippines for the Project and the results of the field surveys, the basic education equipment and science laboratory instruments will be provided as a part of the Project.

1) Educational Equipment:

The selection of educational equipment was made by taking into consideration the standard types used in the elementary and secondary schools in the Philippines as well as the following aspects;

- ① The students' desk and chair for elementary school classrooms shall be for two. Three sizes shall be provided to meet the size of the students.
- ② Secondary school classrooms should be furnished with the desk-chair type for use by one person is generally used in the Philippines.
- ③ Three-person type tables for the students and a demonstration workbench for the teacher (one workbench per room) should be installed in the science laboratories.
- ④ The storage cabinets to be provided in the science labs should have sufficient capacity to store the laboratory instruments.

As the equipment units to be provided by the Project will be used in elementary and secondary schools, they should be strong and durable, but not highly priced. The material for the units should be procured in the Philippines. By taking into consideration the availability of manufacturing technology and materials, the quality of materials to be used for the equipment should either be a combination of steel and plywood or plastic. The types of equipment and the number of units to be provided for each Project school classroom and science lab are listed in Table 2-12.

Table 2-12 Equipment Types and Number of Units to be provided for Each Project Schools Classroom

	Name of Room	Name of Item	No. of Units for One Room	Quantity		
				Region 1 & CAR	Region 9	
Elementary Schools	Classroom	. Teacher's desk	1	21	91	
		. Teacher's chair	1	21	91	
		. Teacher's filing cabinet	1	21	91	
		. Student's desks	24	504	2,256	
		. Student's closets	8	168	752	
		. Blackboard	1	21	91	
		. Bulletin board	1	21	91	
Secondary Schools	Classroom	. Teacher's desk	1	155	79	
		. Teacher's chair	1	155	79	
		. Teacher's filing cabinet	1	155	79	
		. Student's armchair	42	6,510	3,318	
		. Student's closets	8	1,240	632	
		. Blackboard	1	155	79	
		. Bulletin board	1	155	79	
	Science Laboratory		. Experiment workbenches	14	364	224
			. Student's closets	5	130	80
			. Demonstration table	1	26	16
			. Stools (1 for Teacher, 42 for Students)	43	1,118	688
			. Blackboard	1	26	16
			. Bulletin board	1	26	16
			. Storage shelves . Steel shelves	1 1	26 2	16 16

2) Science Laboratory Instruments:

Science laboratory instruments to be used in phases I through III, were selected from the subjects which were conducted in the science laboratory, i.e. general science, biology, chemistry and physics. Science instruments only available in Japan were included in the Project, and those obtainable in the Philippines were to be procured by DECS but were not obtained due to insufficient DECS funds. As a result, science teachers faced difficulties in conducting appropriate science experiments. Thus, the contents of instruments were improved in the 4th phase of the project, by including such necessary instruments.

In this Project, further improvement was made by taking into consideration the conformity with curriculum and easy handling for teachers.

Instruments that require electrical facilities, chemicals that are difficult to obtain and consumable items, such as chemicals, were excluded from the Project.

a) Appropriateness of Items

The items were selected from the standard list provided by the DECS and took into account the state of usage in the class. They are also in accordance with the contents of the school curriculum and school texts.

An evaluation was made according to the following standards:

- ① To be in accordance with the curriculum.
- ② To be in accordance with the school textbooks.
- ③ To include the views of the DECS and the experience from the teacher training projects.
- ④ Items that are difficult to maintain or manage shall be omitted.
- ⑤ Expendable items such as reagents and paper shall be omitted.

As a result of reviewing the science equipment list implemented in phase IV of the project and in line with the above mentioned standard criteria, the items indicated in Table 2-13 were added to the list for the project.

Table 2-13 Selection Evaluation for Science Equipment

No.	ITEM	REASON
Items to be altered.		
1.	Mercury thermometer (-5 °C~ 110 °C)	
As this temperature zone can be measured using an alcohol thermometer and considering the difficulties of handling mercury in the event of it being damaged, this was replaced with an alcohol thermometer.		
2.	Mercury thermometer (-20 °C~ 50 °C)	
As this temperature zone can be measured using an alcohol thermometer and considering the difficulties of handling mercury in the event of it being damaged, this was replaced with an alcohol thermometer.		
3.	Beaker (200ml)	
As 300ml beakers are used more frequently than 200ml beakers, this was replaced with 300ml beakers.		
Items to be omitted.		
4.	Medicine Dropper	
The rubber part easily deteriorates. As a polysyringe is included in the list, this was omitted.		
5.	Logic gates for students	
The skill level required in order to conduct these experiments is above that of the students. Therefore demonstration by the teacher is seen as being adequate, and this was omitted from the list.		
6.	Water pressure sensor	
It will not be used frequently and maintenance is difficult. Therefore it was omitted.		
Items to be added.		
7.	Funnel Holder	This is needed to stand the funnel.
8.	Tool set for electric work	
This is needed to assemble appliances for electrical experiments and for necessary repairs.		
9.	Bottle w/wide mouth	
This is frequently used for various chemical experiments.		
10.	Aquarium plastic (300 x 150)	
To be used in water replacement and biology experiments.		

b) Appropriateness of Specifications

The equipment should be of a level suitable for secondary school level science lessons and differ from those of higher education schools or research institutions. Items that are not reliable, durable will be avoided.

c) Appropriateness of Quantity

The quantity of the science equipment is decided upon the assumption firstly, that there are 42 students per class in the secondary school and secondly, that it is appropriate to teaching methods, such as class grouping during science lessons. The following criteria will be used to estimate the planned quantity:

- ① Three-person type tables for the students and demonstration workbench for the teacher should be installed in the science laboratories.
- ② There will be 7 groups, each of which consists of 6 secondary students, in science laboratories since one secondary class is planned to have 42 students.
- ③ The science teachers show the demonstration teaching method during science lessons.

The quantity of the science equipment is decided by taking the above criteria and is shown in the Table 2-14.

Table 2-14 List of Science Laboratory Instruments to be Provided to Each School (1)

No.	Items	Purpose	Reason	Quantity			Quantity	
				Student	Teachers	Total	Region I & CAR	Region IX
1	Platform Balance	Measurement	1/group	7	1	8	216	136
2	Hand lens	Observation	1/group	7	1	8	216	136
3	Magnetic Compass	Magnetic field	1/group	7	1	8	216	136
4	Stop Watch (Digital)	Measurement	Demo		1	1	27	17
5	Mercury Thermometer (-5 °C~110°C)	Measurement	1/group	7	1	8	216	136
6	Mercury Thermometer (-20 °C~ 50 °C)	Measurement	1/group	7	1	8	216	136
7	Mercury thermometer (0 °C~ 300 °C)	Measurement	Demo		1	1	27	17
8	Globe (300mm dia)	Earth Science	1/room			1	27	17
9	Graduated Cylinder (10ml)	Measurement	1/group	7	1	8	216	136
10	Alcohol Lamp	Heating exp	1/group	7	1	8	216	136
11	Beaker(50ml)	Exp. basic use	1/group	7	1	8	216	136
12	Beaker(100ml)	Exp. basic use	1/group	7	1	8	216	136
13	Beaker(300ml)	Exp. basic use	1/group	7	3	8	270	170
14	Beaker(500ml)	Exp. basic use	1/group	7	1	8	216	136
15	Evaporating Dish (50ml dia)	Heating & Evaporating	1/group	7	1	8	216	136
16	Meter Stick (plastic)	Measurement	1/group	7	1	8	54	34
17	Cork Stopper (15/set)	Exp. Basic use	2set/room			2 set	27	17
18	Cork Borers (12 bits)	Exp. Basic use	1/room			1	27	17
19	Cork Squeezer	Exp. Basic use	1/room		1	1	27	17
20	Compound Microscope	Observation	Demo		1	1	27	17
21	Slide Glass (box by 50)	with Microscope	Demo		1set	1set	27	17
22	Cover Glass (box by 100)	with Microscope	Demo		1set	1set	27	17
23	Mitosis Model	Study of cells	Demo		1	1	27	17
24	Chart of Chromosomes	Study of biology	Demo		1	1	27	17
25	Chart of Dominance	Study of biology	Demo		1	1	27	17
26	Dissecting set	Study of biology	Demo		1	1	27	17
27	Dissecting pans	Study of biology	Demo		1	1	27	17
28	Petridish (90mm dia)	Exp. Basic use	1/group	7	1	8	27	17
29	Mortar and Pestle (120mm dia)	Exp. Basic use	Demo		1	1	27	17
30	Test Tube (15mm dia. 50 pcs/set)	Exp. Basic use	1set/room			1set	27	17
31	Test Tube (18mm dia. 50pcs/set)	Exp. Basic use	1set/room			1set	27	17
32	Test Tube Stand	Holding test tubes	1/group	7		7	189	119
33	Test Tube Box (Polypropylene)	Keeping test tubes	1/room			1	27	17
34	Dropper (Polypropylene 5ml)	Exp. Basic use	1/group	7	1	8	216	136
35	Triple Beam Balance	Measurement	Demo		1	1	27	17

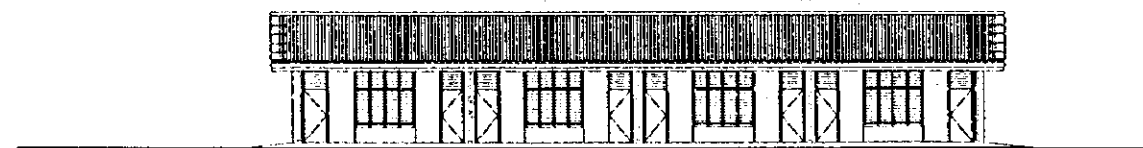
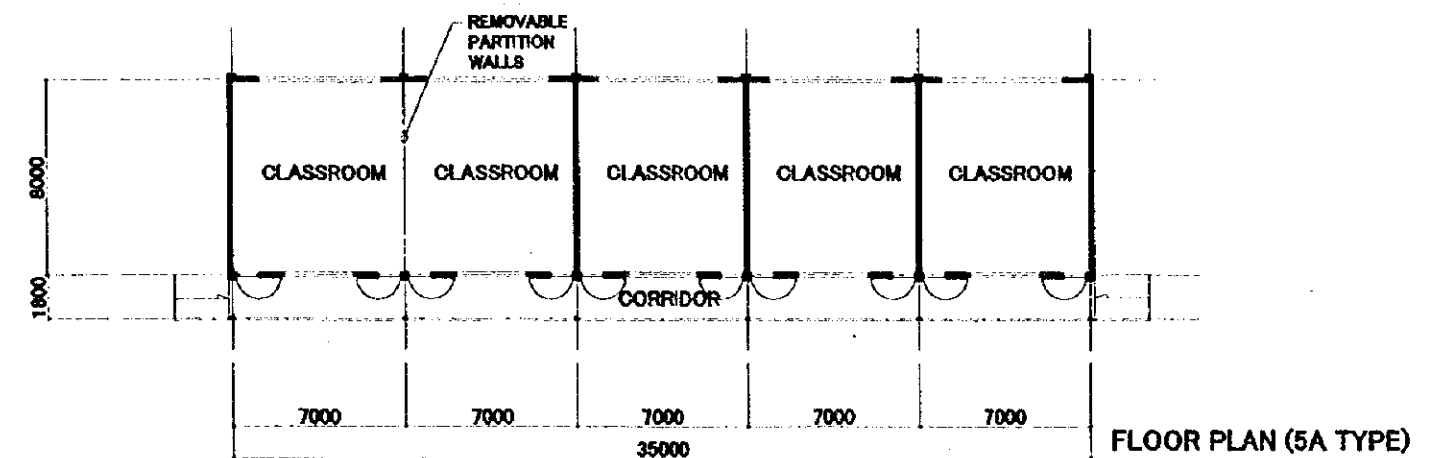
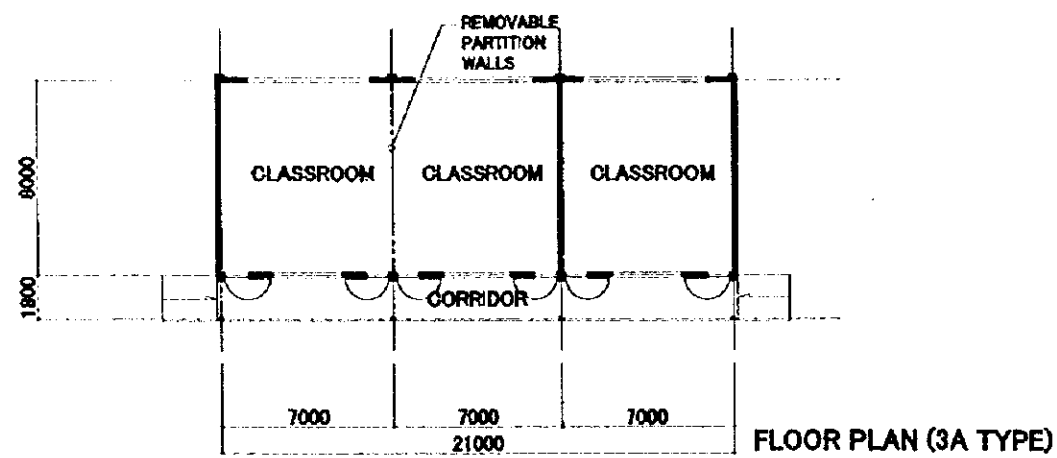
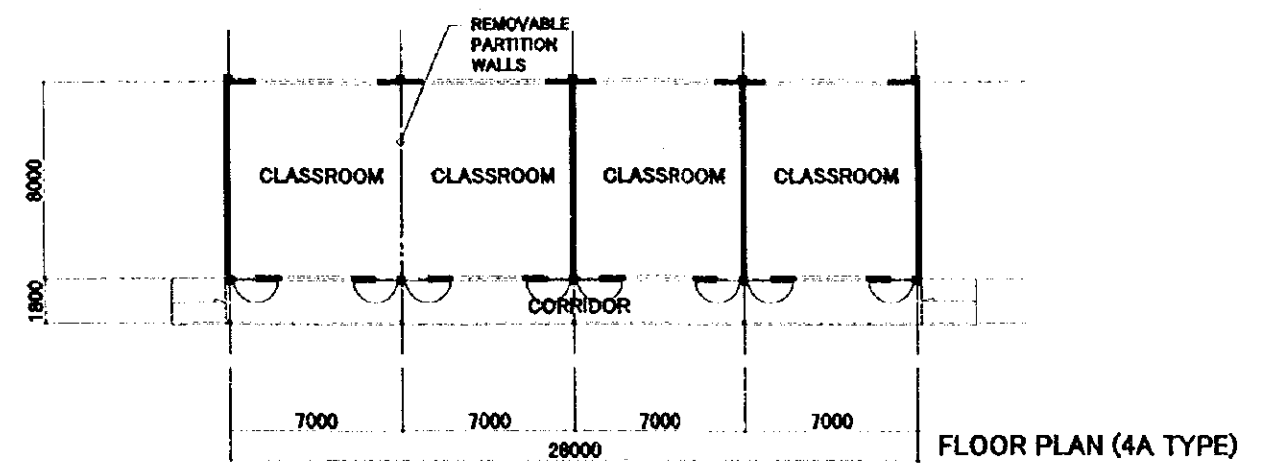
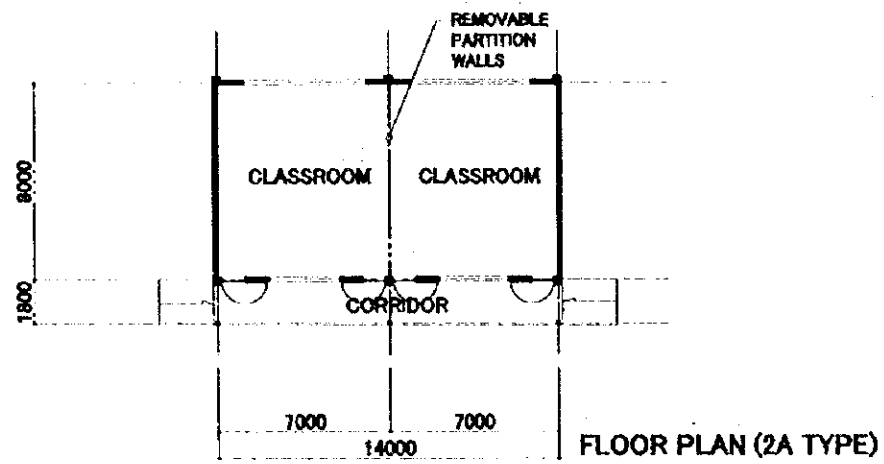
Table 2-14 List of Science Laboratory Instruments to be Provided to Each School (2)

No.	Items	Purpose	Reason	Quantity			Quantity	
				Student	Teachers	Total	Region I & CAR	Region IX
36	Graduated Cylinder (Plastic 25ml)	Measurement	1/group	7	1	8	216	136
37	Graduated Cylinder (glass w/safety ring 100ml)	Measurement	1/group	7	1	8	216	136
38	Erlenmeyer Flask (250ml)	Exp. Basic use	1/group	7	1	8	216	136
39	Flask Round Bottom (250ml)	Exp. Basic use	1/group	7	1	8	216	136
40	Pipet (10ml)	Exp. Basic use	1/group	7	1	8	216	136
41	Iron Stand (universal type)	Exp. Basic use	1/group	7	1	8	216	136
42	Tripoid Stand	Exp. Basic use	1/group	7	1	8	216	136
43	Wire Gauze	Exp. Basic use	1/group	7	1	8	216	136
44	Test Tube Holder	Holding test tubes	Exp. 1/group	7	1	8	216	136
45	Glass Tube (5kinds/set)	basic use	1set/room			1set	27	17
46	Watch Dish (100mm dia.)	Exp. basic use	Demo		1	1	27	17
47	Funnel (90mm dia.)	Exp. Basic use	1/group	7	1	8	216	136
48	Stirring Rod	Exp. Basic use	1/group	7	1	8	216	136
49	Spoon (S,M,L size, stainless steel)	Exp. Basic use	1/group	7	1	8	216	136
50	Convex and Concave Mirrors	Study of light	1/group	7	1	8	216	136
51	Spring Balance	Measurement	1/group	7	1	8	216	136
52	Dynamic Carts	Study of dynamics	Demo		1	1	27	17
53	Electroscope	Study of Static Electric	Demo		1	1	27	17
54	Prism Set	Study of light	Demo		1	1	27	17
55	Magnet (U-shape)	Study of magnet	1/group	7	1	8	216	136
56	Magnet (Alcomax)	Study of magnet	1/group	7	1	8	216	136
57	Magnet (Bar)	Study of magnet	1/group	7	1	8	216	136
58	Multi-tester (Analog)	Measurement	Demo		1	1	27	17
59	Logic Gates for Teachers	Study of Computer	Demo		1	1	27	17
60	Set of Tuning Forks	Study of Sound	Demo		1	1	27	17
61	Resonance Apparatus	Study of Sound	Demo		1	1	27	17
62	Electric Motor/Generator	Study of electricity	Demo		1	1	27	17
63	Science Calculator	Exp. Basic use	Demo		1	1	27	17
64	Biconvex and Biconcave lens set	Study of light	1/group	7	1	8	216	136
65	Lead line with Alligator Clip Attached	Study of electricity	1/group	7	1	8	216	136
66	Copper Wire (0.3, 0.5, 1.0mm dia.)	Study of electric circuit	1set/room			1	27	17
67	Electric Circuit Experimental Apparatus	Exp. basic use	Demo		1	1	27	17
68	Vacuum Experimental Equipment (cylinder type)	Study of vacuum	Demo		1	1	27	17
69	Water wave projector (sunlight type)	Study of wave motion	Demo		1	1	27	17
70	Funnel Holder	Basic use	Demo	7	1	8	216	136
71	Electric tool set	Basic use	1/room			1	27	17
72	Bottle w/wide mouth	Exp. Basic use	1/group	7	3	10	270	170
73	Aquarium plastic (300 × 150)	Exp. Basic use	1/group	7	1	1	216	136

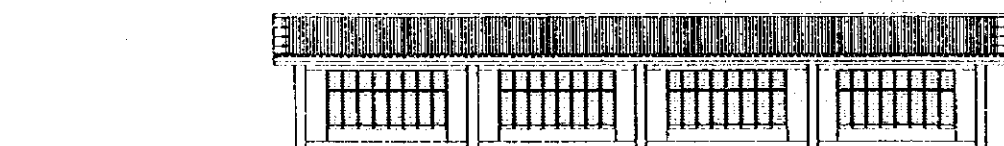
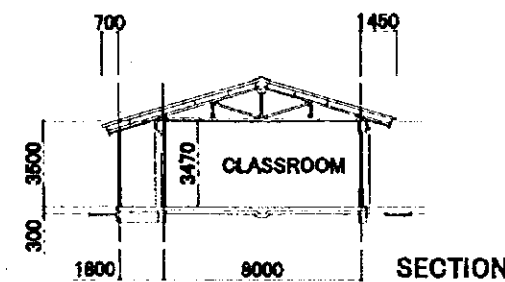
(4) Basic Design Drawings

Drawing List

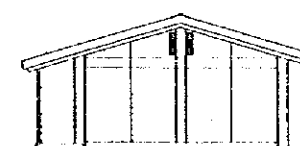
<u>No.</u>	<u>Title</u>
01	Classrooms building (2A, 3A, 4A & 5A type) Floor plan, Elevation, Section
02	Classroom building (2-4A & 2-6A type) Floor plan, Elevation, Section
03	Classrooms, Science Laboratory and Toilets (2-2A+S & 2-4A+S type) Floor plan, Elevation, Section
04	Science Laboratory and Toilet Floor plan, Elevation, Section (S+T & T type)
05	Furniture Layout, Lists



ELEVATION (4ATYPE)

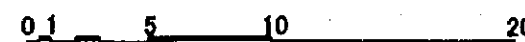


ELEVATION (4ATYPE)



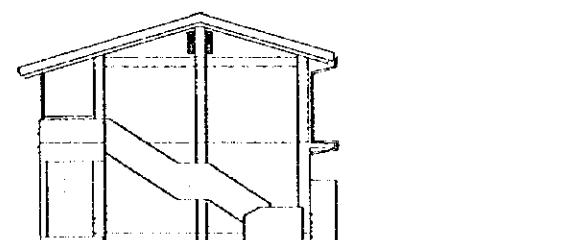
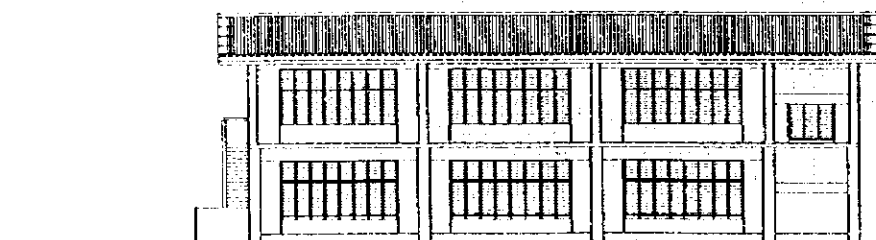
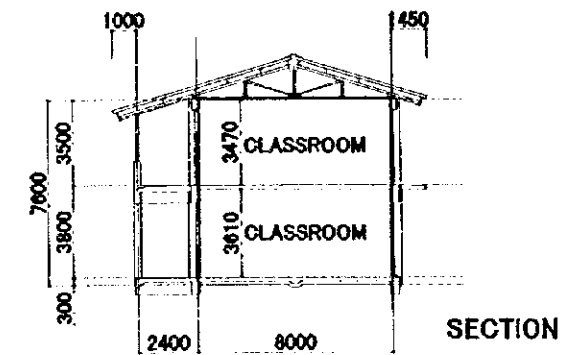
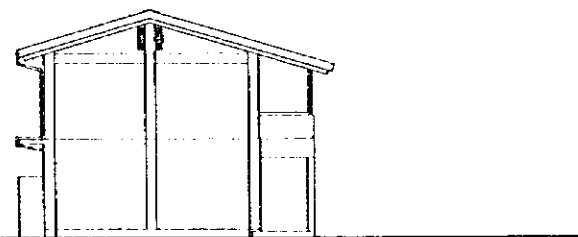
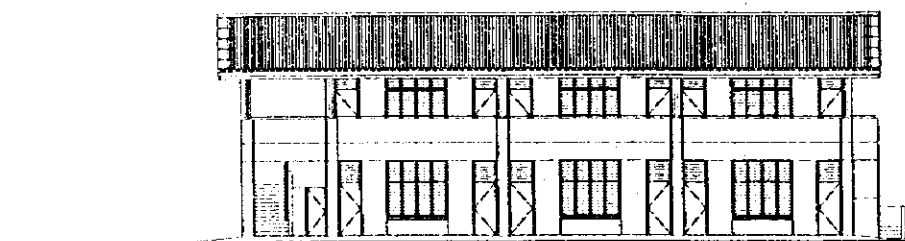
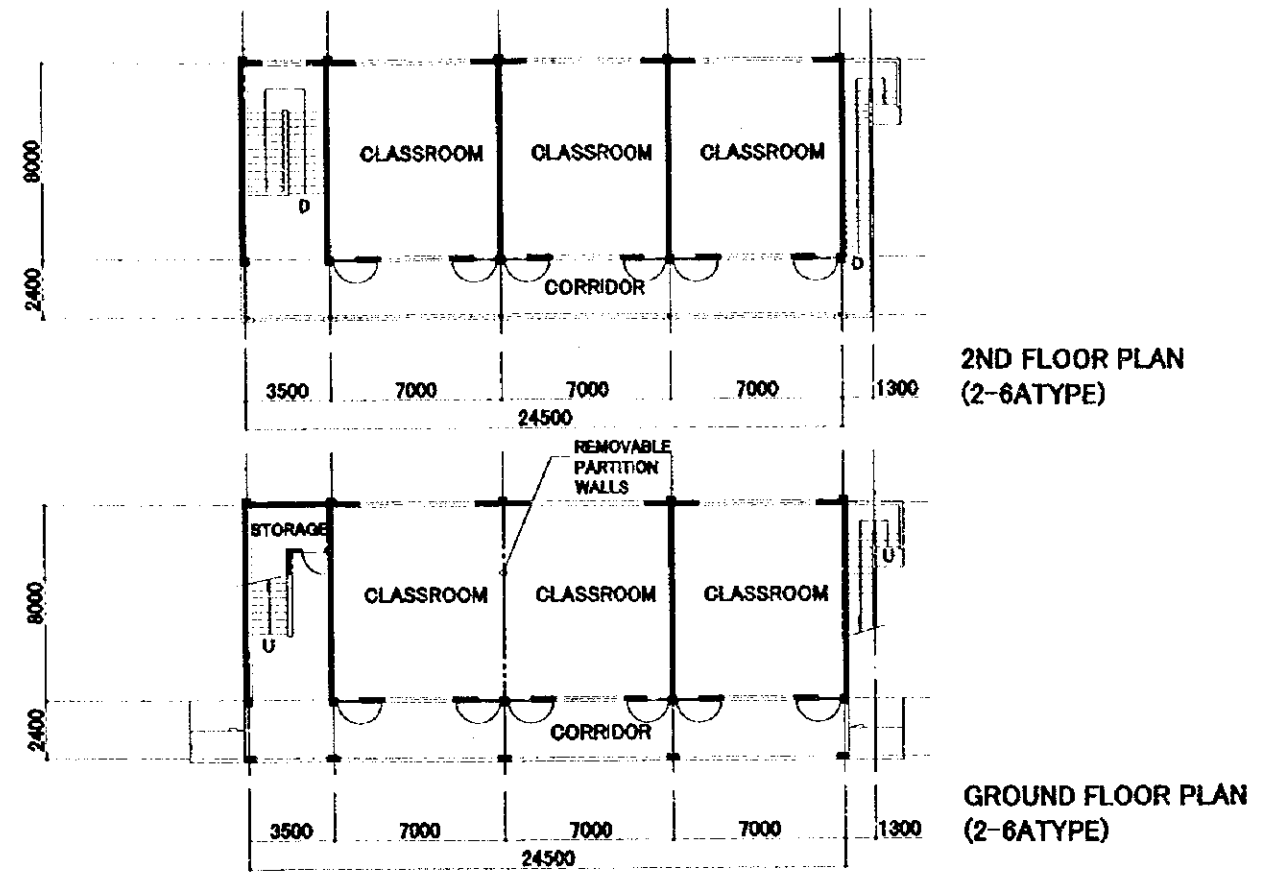
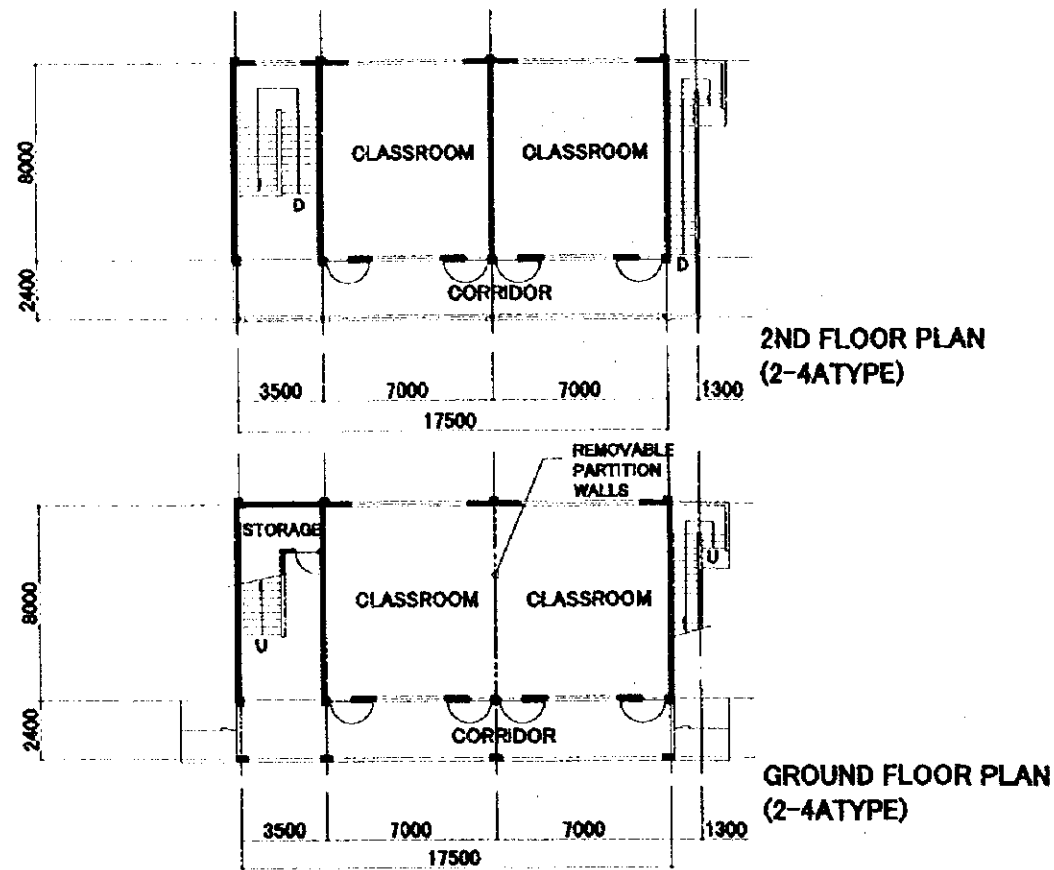
ELEVATION

THE PROJECT FOR IMPROVEMENT OF EDUCATIONAL FACILITIES
(PHASE V)



CLASSROOM BUILDING (2A,3A,4A,5A TYPE)
FLOOR PLAN,ELEVATION,SECTION

01

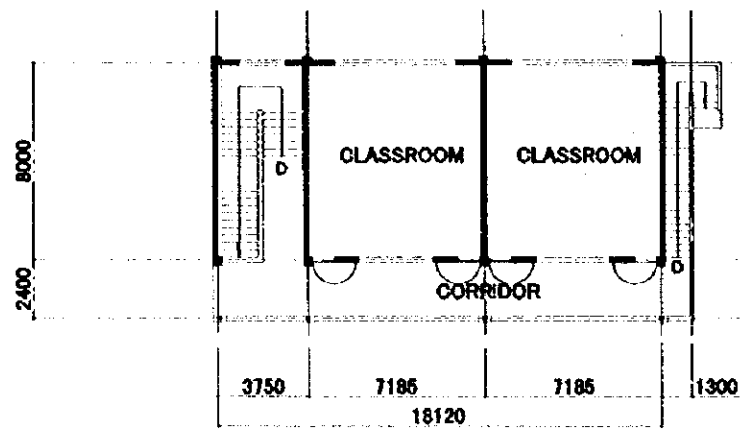


THE PROJECT FOR IMPROVEMENT OF EDUCATIONAL FACILITIES
(PHASE V)

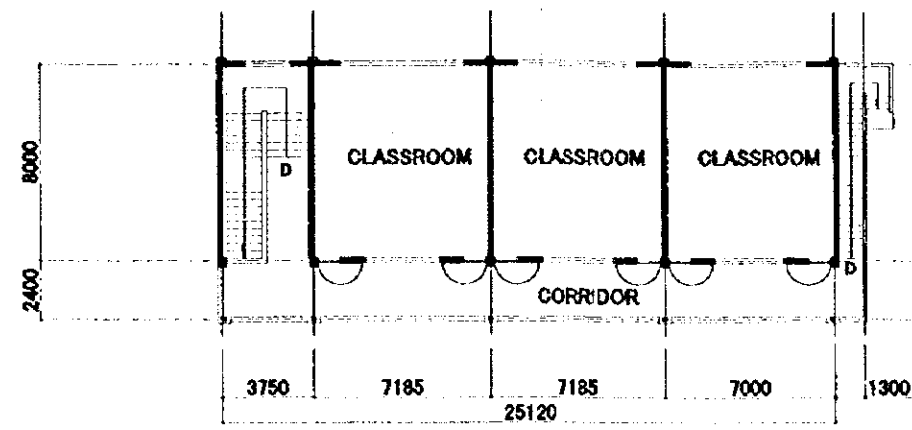


CLASSROOM BUILDING (2-4A,2-6A TYPE)
FLOOR PLAN,ELEVATION,SECTION

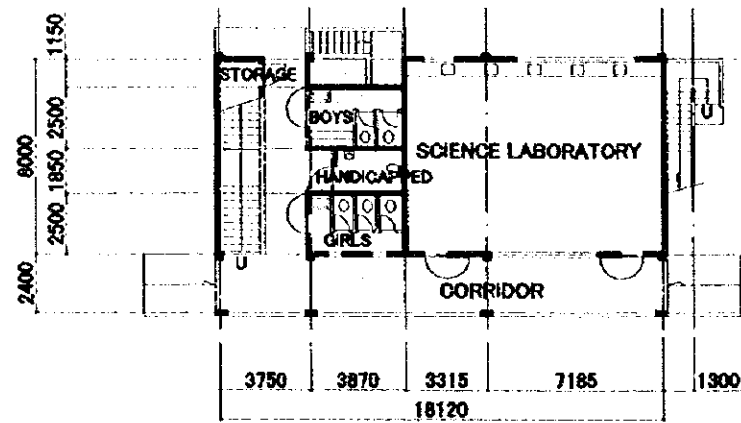
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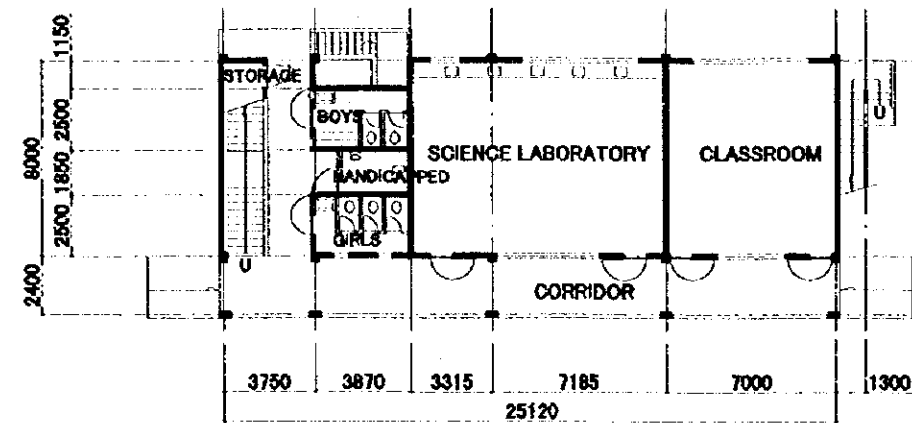
2ND FLOORPLAN
(2-2A+S TYPE)



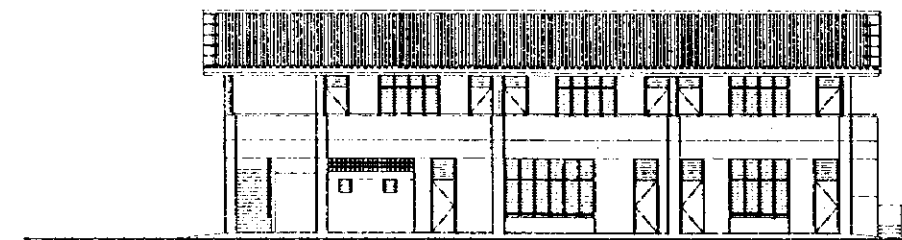
2ND FLOORPLAN
(2-4A+S TYPE)



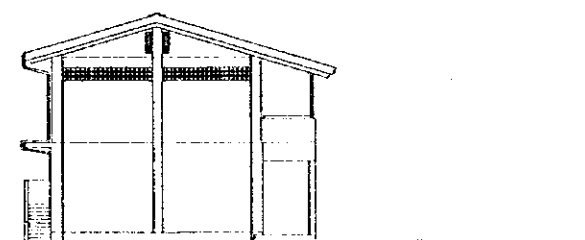
GROUND FLOORPLAN
(2-2A+S TYPE)



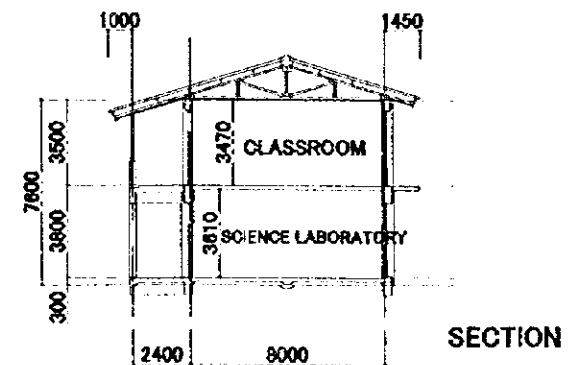
GROUND FLOORPLAN
(2-4A+S TYPE)



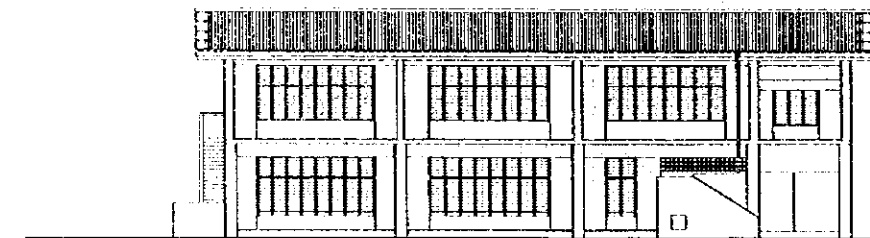
ELEVATION (2-4A+STYPE)



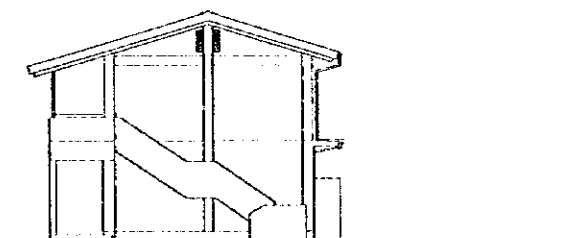
ELEVATION



SECTION

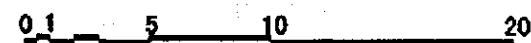


ELEVATION (2-4A+STYPE)



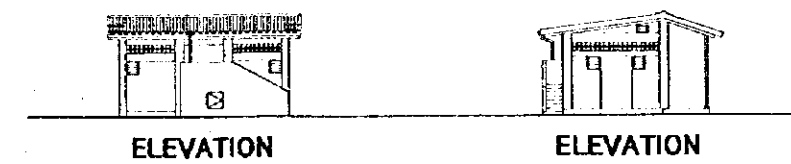
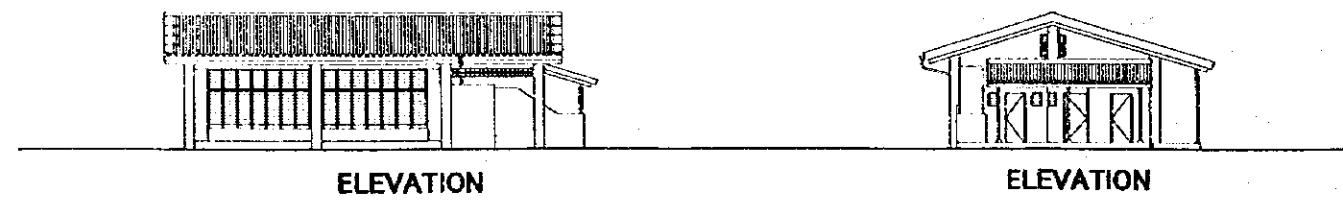
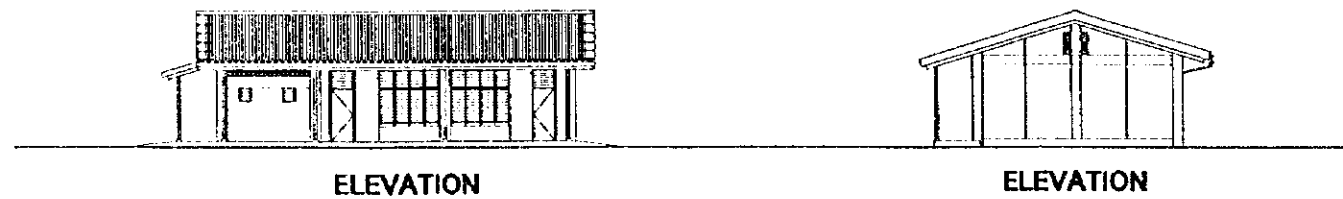
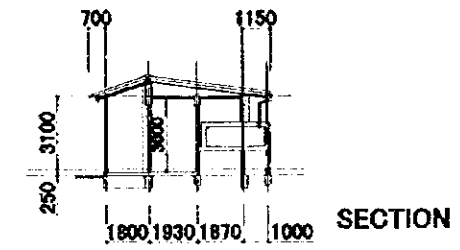
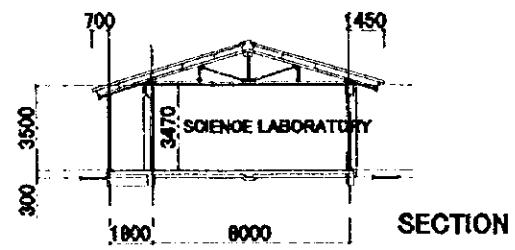
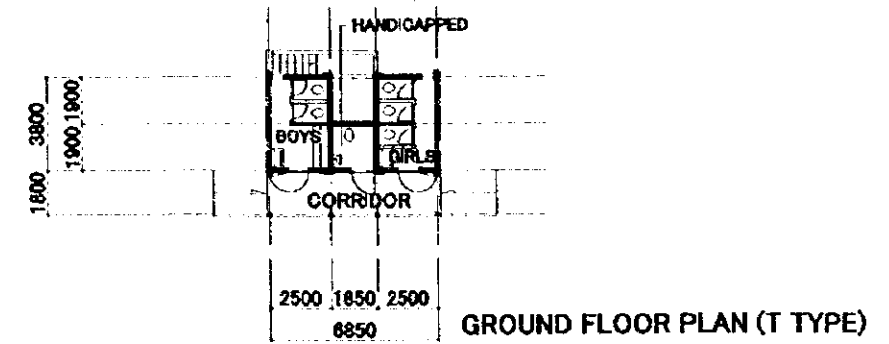
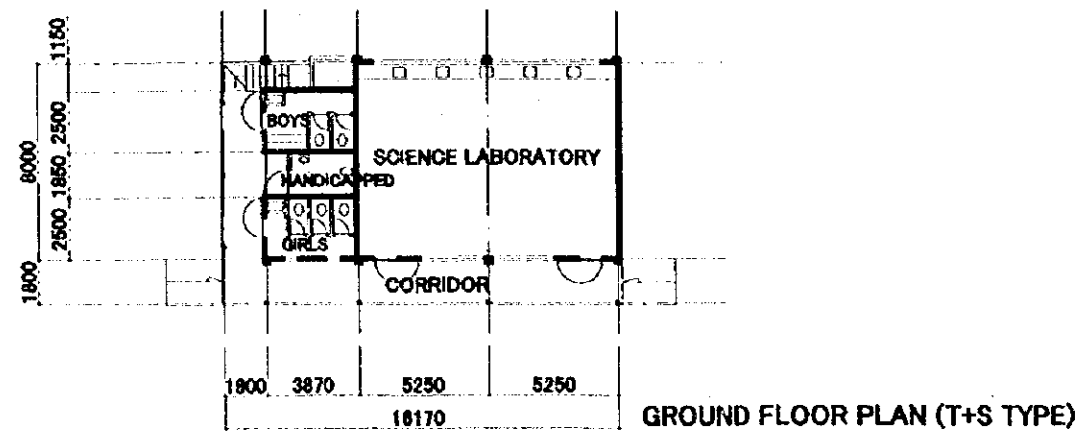
ELEVATION

THE PROJECT FOR IMPROVEMENT OF EDUCATIONAL FACILITIES
(PHASE V)



CLASSROOM + LABORATORY + TOILET
(2-2A+S, 2-4A+S TYPE)
FLOOR PLAN, ELEVATION, SECTION

03



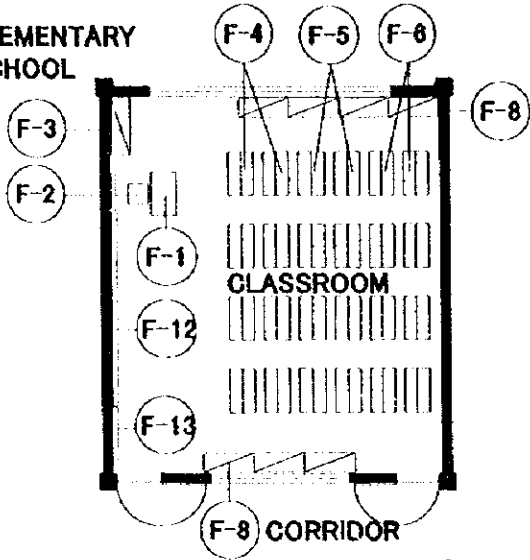
THE PROJECT FOR IMPROVEMENT OF EDUCATIONAL FACILITIES
(PHASE V)



SCIENCE LABORATORY, TOILET (S+T, T TYPE)
FLOOR PLAN, ELEVATION, SECTION

04

ELEMENTARY SCHOOL



FURNITURE LISTS				
NO.	CODE NO.	ITEM	DESCRIPTION	QTY.
ELEMENTARY SCHOOL				
1	F-1	TEACHER'S DESK	900 x 500 x 760	1
2	F-2	TEACHER'S CHAIR	410 x 410 x 860	1
3	F-3	TEACHER'S CABINET	1200 x 400 x 1800	1
4	F-4	STUDENT'S CHAIR S	905 x 530 x 645	8
5	F-5	STUDENT'S CHAIR M	905 x 530 x 670	8
6	F-6	STUDENT'S CHAIR L	905 x 530 x 700	8
7	F-8	STUDENT'S CLOSET	1040 x 400 x 650	7
8	F-12	BLACKBOARD	4800 x 1200	1
9	F-13	BULLETIN BOARD	1200 x 1200	1
SECONDARY SCHOOL				
1	F-1	TEACHER'S DESK	900 x 500 x 760	1
2	F-2	TEACHER'S CHAIR	410 x 410 x 860	1
3	F-3	TEACHER'S CABINET	1200 x 400 x 1800	1
4	F-7	STUDENT'S TABLE ARMCHAIR	453 x 553 x 800	42
5	F-8	STUDENT'S CLOSET	1040 x 400 x 650	7
6	F-12	BLACKBOARD	4800 x 1200	1
7	F-13	BULLETIN BOARD	1200 x 1200	1
SCIENCE LABORATORY				
1	F-8	STUDENT'S CLOSET	1040 x 400 x 650	7
2	F-9	EXPERIMENT TABLE	1800 x 600 x 850	14
3	F-10	DEMONSTRATION TABLE	1800 x 600 x 850	1
4	F-11	STOOL	330 φ x 600	43
5	F-12	BLACKBOARD	4800 x 1200	1
6	F-13	BULLETIN BOARD	1200 x 1200	1
7	F-14	STORAGE SHELF	1200 x 400 x 1800	1
8	F-15	STEEL SHELF	900 x 400 x 1830	1

SECONDARY SCHOOL

