No.

BASIC DESIGN STUDY

ON
THE PROJECT FOR
THE CONSTRUCTION OF
PRIMARY AND SECONDARY SHCOOLS
IN MAPUTO CITY

IN
THE REPUBLIC OF MOZAMBIQUE

MARCH, 2001

JAPAN INTERNATIONAL COOPERATION AGENCY
MATSUDA CONSULTANTS INTERNATIONAL CO., LTD.

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PREFACE

In response to a request from the Government of the Republic of Mozambique, the Government of Japan decided to conduct a basic design study on the Project for the Construction of Primary and Secondary Schools in Maputo City and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Mozambique a study team from October 11 to November 12, 2000.

The team held discussions with the officials concerned of the Government of Mozambique, 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 Mozambique 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 Mozambique for their close cooperation extended to the teams.

March, 2000

Kunihiko Saito

President

Japan International Cooperation Agency

March, 2000

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for the Construction of Primary and Secondary Schools in Maputo City in the Republic of Mozambique.

This study was conducted by Matsuda Consultants International Co., Ltd., under a contract to JICA, during the period from October 11, to November 12, 2000. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Mozambique 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,

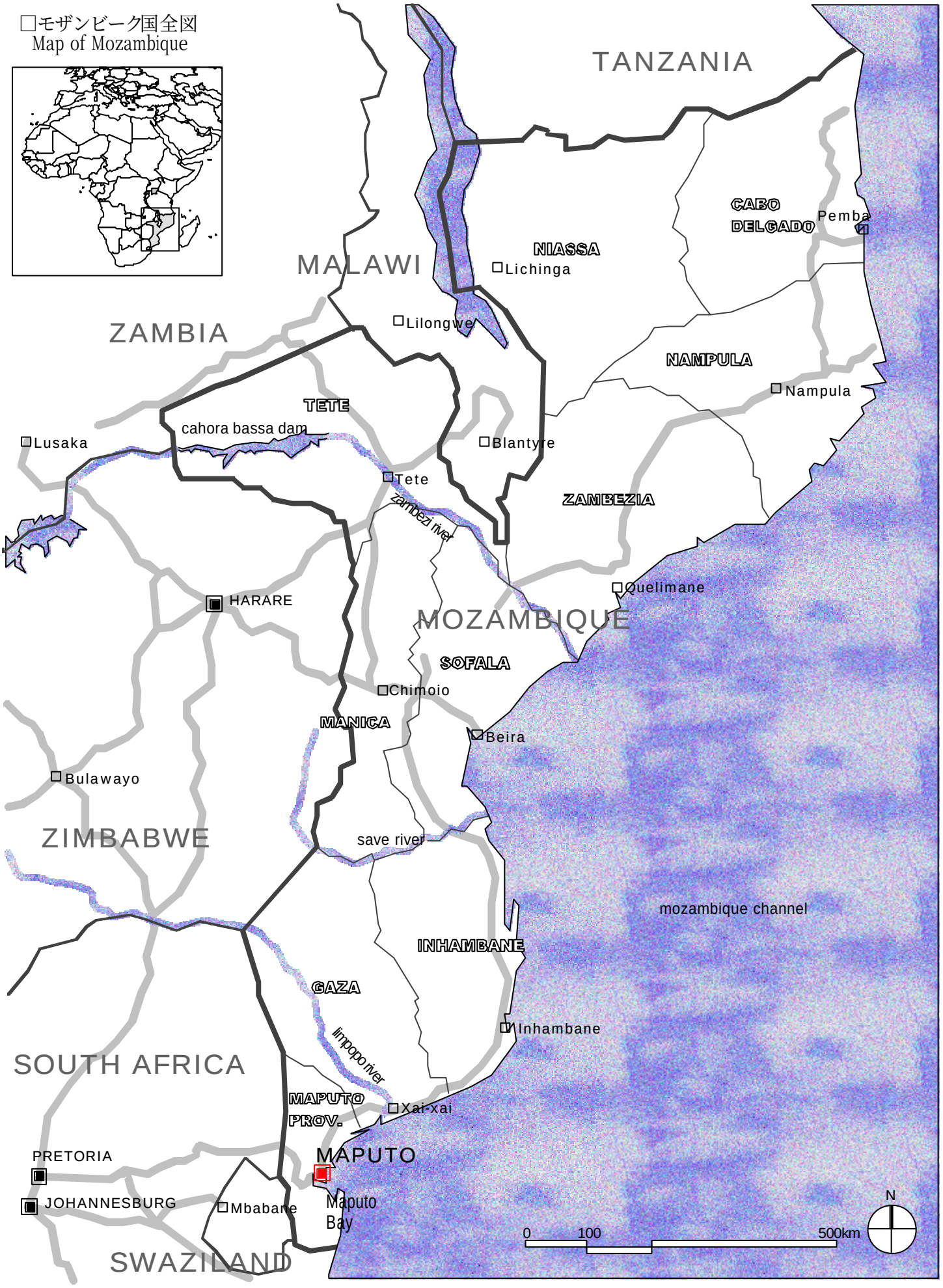
Yasuaki Kawabe

Project Manager,

Basic design study team on

the Project for the Construction of the Primary and Secondary Schools in Maputo City

Matsuda Consultants International Co., Ltd.


□モザンビーク国全図
Map of Mozambique
TANZANIA
MALAWI
ZAMBIA
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SOUTH AFRICA
SWAZILAND
MOZAMBIQUE
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Pemba
NIASSA
Lichinga
Lilongwe
NAMPULA
Nampula
TETE
cahora bassa dam
Lusaka
Blantyre
Tete
ZAMBEZIA
zambezi river
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Beira
Bulawayo
save river
mozambique channel
INHAMBANE
GAZA
Inhambane
limpopo river
MAPUTO PROV.
Xai-xai
PRETORIA
JOHANNESBURG
MAPUTO
Mbabane
Maputo Bay
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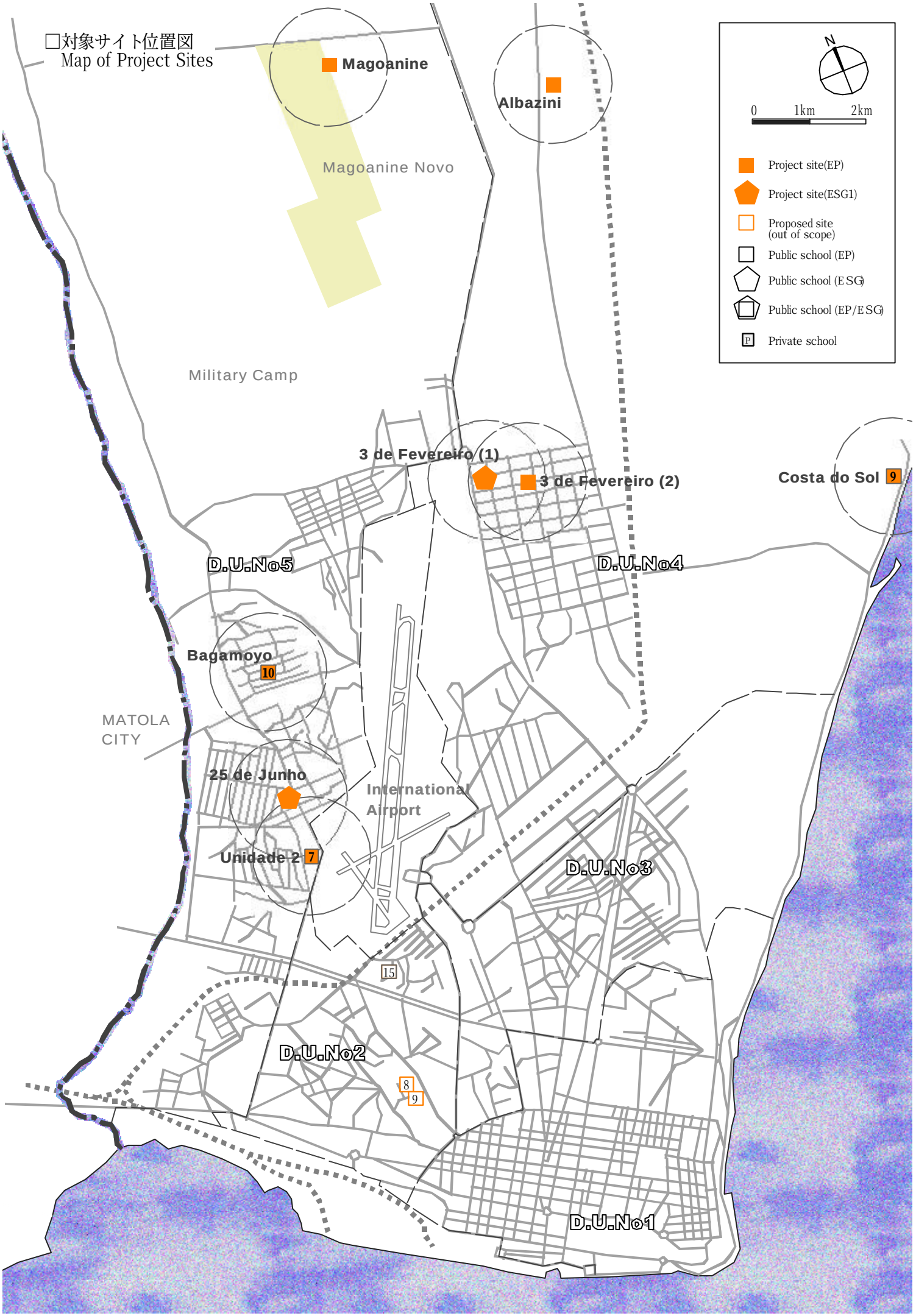
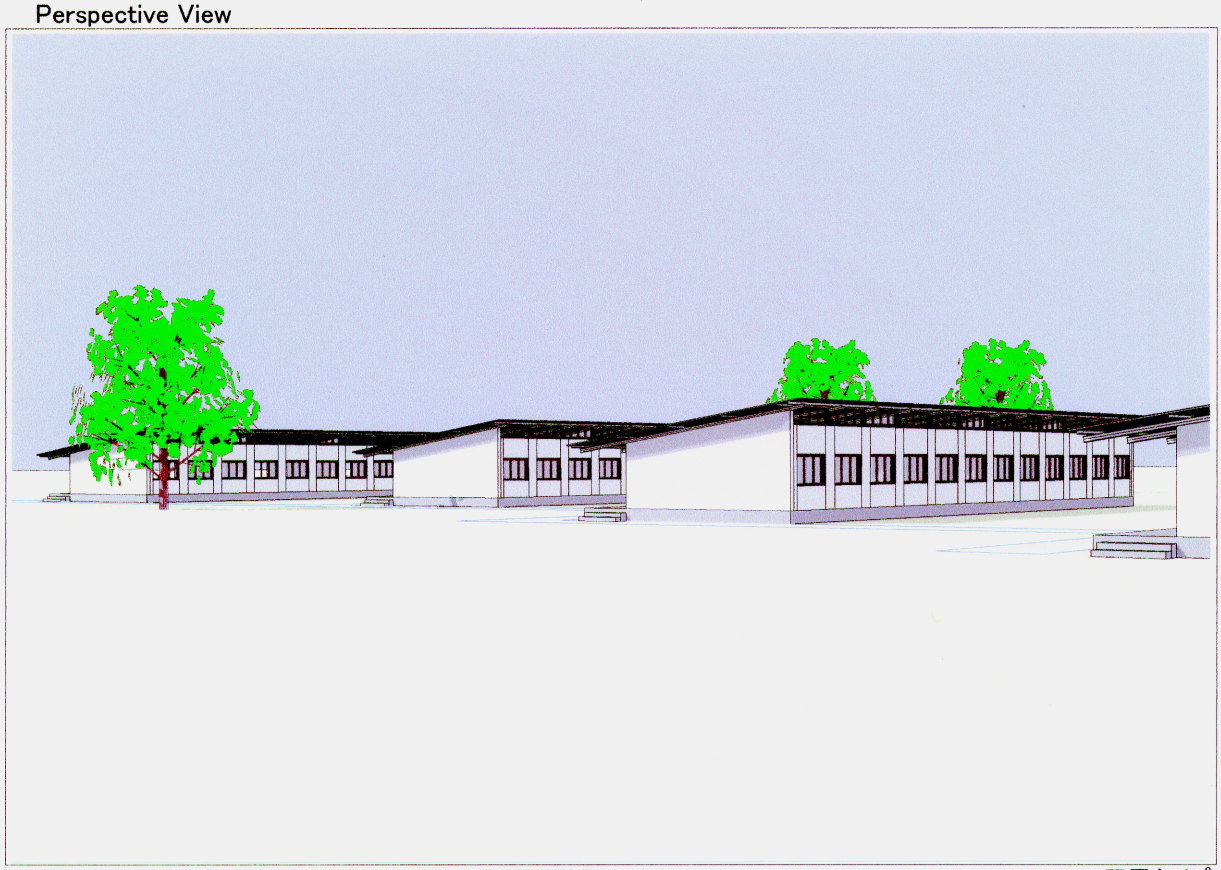
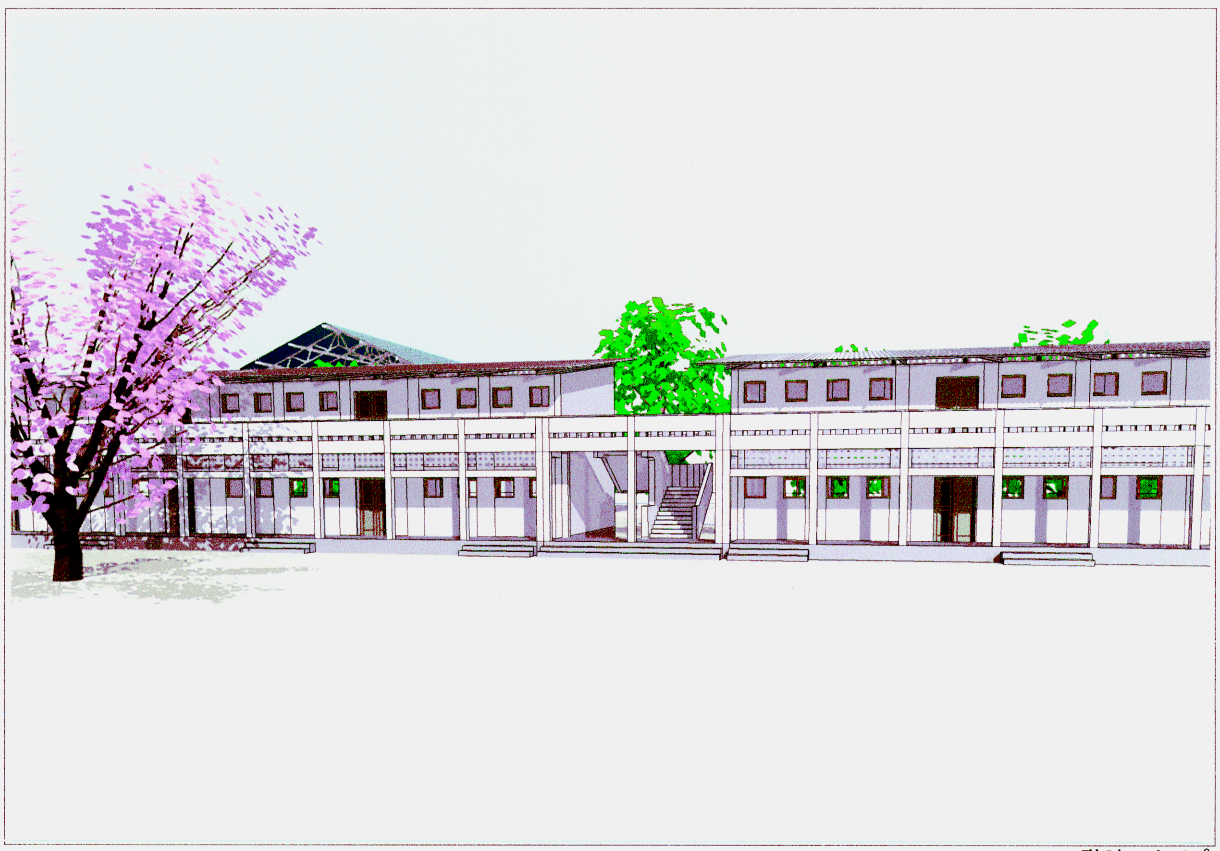

□対象サイト位置図
Map of Project Sites
Magoanine
Albazini
Magoanine Novo
Military Camp
3 de Fevereiro (1)
3 de Fevereiro (2)
Costa do Sol
9
D.U.No5
D.U.No4
Bagamoyo
10
MATOLA
CITY
25 de Junho
International
Airport
Unidade 2
7
D.U.No3
15
D.U.No2
8
9
D.U.No1
N
0
1km
2km
Project site(EP)
Project site(ESG1)
Proposed site
(out of scope)
Public school (EP)
Public school (ESG)
Public school (EP/ESG)
P
Private school

口完成予想図
Perspective View



平屋タイプ
1 storey type building



2階建てタイプ
2 storey type building

ABBREVIATIONS

EP1	Ensino Primario 1 ° ciclo
EP2	Ensino Primario 2 ° ciclo
ESG1	Ensino Secundario 1 ° ciclo
ESG2	Ensino Secundario 2 ° ciclo
ESDP	Education Sectorial Development Plan
ESSP	Education Sector Stragic Plan
ERP	Economy Rehabilitation Program
GEPE	Gestao de Projectos Educacionais
IMAP	Institute de Magisterio Primario
IMP	Institute Medio Pedagogico
INDE	Institute Nacionale Development Educacionais
MINED	Ministereo da Educacao
UEM	Universidade Eduard Mondlane
UP	Universidade Pedagogico
DEMM	Directorate of Education of the Municipality of Maputo
VAT	Value Added Tax

SUMMARY

Mozambique is situated in the southeastern part of the African Continent and stretches long in the north-south direction along the Indian Ocean. It has a national land area of 800,000 km^2 and a population of 16.95 million (1998). Since the end of the civil war in 1994, the democratisation of the country and post-war rehabilitation have been in progress under the Five Year Economic Development Programme (1995 – 1999). Following the lead by this Programme, the Ministry of Education has formulated the Educational Sector Strategic Plan: 1999 – 2003, the key issues of which are (i) increased opportunities for primary education, (ii) improved quality of education and (iii) improved system and finance to continue such an increase and improvement.

In the post-civil war period, while the number of enrolled children at schools has been steadily increasing (an 80% increase between 1990 and 2000), both the gross enrolment ratio*1 and the net enrolment ratio*2 at the first phase of primary education (EP1: Grade 1 through Grade 5) in 2000 of 90.6% and 53.8% respectively are low. Although the construction of school facilities has been taking place, the pace has failed to catch up with the increased number of pupils, creating a situation of a general school shortage. In rural areas, the ratio of complete schools with classes from Grade 1 through Grade 5 is low while the necessity to employ a three shift teaching system reduces the overall number of lessons received by pupils in urban areas. As a result, the quality of education has declined in both rural and urban areas. The high repeater ratio of 29.1% (1991, EP1) has worsened the facility shortage situation. The ESSP estimates that the construction of 2,500 classrooms a year at a cost of $140 million is required to eliminate the facility shortage. The ESSP intends to request international aid organizations and donors for assistance for the construction of classrooms and the World Bank and many other donors have so far positively responded.

*1 Gross enrolment ratio = total number of pupils/number of suitably aged children for EP1 (6-10 years old)
*2 Net enrolment ratio = number of pupils of right age (6-10 years old)/number of suitably aged children (6-10 years old)

The classroom shortage is particularly acute in Maputo. Despite the new construction/rebuilding of 227 classrooms for 20 primary and secondary schools through a series of education sector projects (1988 – 1998) of the World Bank and 84 classrooms for nine primary and secondary schools by NGOs, 92% of the schools in the capital still employ a three shift teaching system, indicating an urgent need for improvement.

The ESSP calls for the development of human resources with a high educational background, which are required for the economic development process of a country, as an important theme for secondary education. The concrete target is to double the number of pupils enrolled at secondary schools. In Maputo, the capital, where the need for highly educated personnel is particularly high, secondary schools are concentrated in old quarters and few are situated in suburban areas with a rapid population increase, indicating that the construction of secondary school facilities in suburban areas is urgently required.

Under these circumstances, the Government of Mozambique made a request to the Government of Japan for the provision of grant aid for the Project to Construct Primary and Secondary Schools in Maputo. In response to this request, the Government of Japan decided to conduct the Basic Design Study and the Japan International Cooperation Agency (JICA) dispatched the Basic Design Study Team to Mozambique from 11th October to 12th November, 2000. This Study Team conducted a site survey in addition to holding a series of discussions with officials of the MINED and the Maputo Municipal Authority. On its return to Japan, the Study Team examined the suitability, operation and maintenance system and cooperation effects of the Project based on the field survey findings, determined the appropriate scope and size of the facilities, selected equipment and compiled the Summary for the Basic Design. From 16th to 25th February, 2001, this Summary was explained by the Study Team members to the Mozambique side in Mozambique.

It was confirmed that the scope of the Project would include Grade 1 through Grade 7, i.e. first and second phases of primary education, and Grade 8 through Grade 10, i.e. first phase of secondary education. The subject sites for selection were increased to 11 as six sites were added during the field survey to the originally requested five sites (six new school sites and five existing school sites).

Maputo consists of five districts and three of the requested sites are located in District 2 which comprises the old quarters. Because of the ongoing process of urban sprawl around these sites, the construction of a permanent building is likely to hinder urban redevelopment efforts in the future. Accordingly, it was judged that the inclusion of these sites in the Project would be inappropriate. In regard to the remaining eight sites, an appropriate school site was calculated based on (i) the local enrolment need, in turn determined by the basic data gathered from all primary and secondary schools in Maputo, and (ii) the standard school size of 14 classrooms for primary schools and 12 classrooms for secondary schools. For this calculation, it was assumed that the site and access conditions are adequate and that the location is suitable in view of the school map for Maputo.

In regard to the configuration of the new school facilities, the standard design in Mozambique, the state of actual use of various facilities and the suitability of each facility were examined through a series of discussions with the Mozambique side. It was then decided that a primary school would consist of ordinary classrooms, an administration block incorporating the principal's office, vice-principal's office and administration office, etc. and a sanitary building. In the case of secondary schools, a library, science room and gymnasium were added to the facilities for primary schools. Having evaluated the standard design put forward by Directorate of Education of the Maputo Municipal Authority, the specifications for these facilities were determined to ensure low cost, durability, compatibility with the natural conditions in Maputo and easy, low cost maintenance after completion.

In regard to educational equipment and teaching aids, it was judged that the provision of such fixtures as desks, chairs, blackboards and cabinets for classrooms and administration rooms/offices would be appropriate. Moreover, such basic teaching aids as rulers, etc. for teachers, charts to be hung on the wall and globes, etc. would be provided for primary schools while science teaching aids for demonstration or display purposes would be additionally provided for secondary schools.

Based on the examination results described above, it was decided that the Project would be implemented at eight sites[*3], involving the construction of five new primary schools, the rebuilding of two primary schools and the construction of two new secondary schools together with the provision of basic teaching aids.

*3 A primary school and a secondary school will be constructed at the 3 de Fevereiro (1) site, making the scope of the Project nine schools at eight sites.

The finalised scale of the facilities under the Project is listed in the table below.

Name	District	Type of School	New/ Rebuilding	No. of Classrooms	Total Floor Area (m^2)
1) 3 de Fevereiro (1)	4	ESG	New	12	2,332.3
		EP	New	14	1,559.3
2) 3 de Fevereiro (2)	4	EP	New	14	1,633.1
3) Magoanine	5	EP	New	14	1,368.5
4) Albazini	4	EP	New	14	1,383.5
5) 25 de Junho	5	ESG	New	12	2,232.3
6) Bagamoyo	5	EP	New	22	2,459.4
7) Costa do Sol	4	EP	Rebuilding	14	1,645.0
8) Unidade 2	5	EP	Rebuilding	22	2,459.4
Total		EP		114	12,408.1
		ESG		24	4,564.6
		Total		138	16,972.7

The responsible agency for the Project on the Mozambique side will be the MINED while the Directorate of Education of the Maputo Municipal Authority will be in charge of the actual work, from planning to the completion of the facilities, as the implementation agency under the control of the Bureau of Education of the MINED. the Directorate of Education of Municipality of the Maputo (DEMM) will be responsible for the management of the schools to be constructed under the Project although the responsibility for their daily operation and upkeep will fall on the school committee of each school. The required maintenance skills can be sufficiently provided by the principal and other staff members and the maintenance cost will not exceed the conventional level of such cost. The implementation of the Project will necessitate the recruitment of 213 and 60 new teachers for primary schools and secondary schools respectively.

The required period for the implementation of the Project will be seven months from the detailed design to the tender and 12 months for the construction work, consisting of four months for the procurement and import of the construction materials and 10 months for the actual construction work with two months overlapping the procurement and installation period. The total project cost as a Japanese grant aid project is estimated to be ¥989 million (Japanese portion of ¥950 million and Mozambique portion of ¥39 million).

The implementation of the Project is expected to achieve the following beneficial effects.

- Improvement of the educational environment due to the new construction and rebuilding of primary schools

  A three shift teaching system is a necessity for 92% of the primary schools in Maputo and the resulting shorter teaching hours (80% of the level of the two shift teaching system) has caused a decline of the quality of education. Five new schools will be constructed under the Project together with the rebuilding of two more schools. The resulting 112 new classrooms will directly improve the educational environment for 11,200 pupils (7.3% of the total). Moreover, the educational environment for 19,800 pupils (12.7% of the total) at existing schools near the project sites will be directly improved as the transfer of many pupils to the newly constructed schools will eliminate the three shift teaching system at 198 classrooms.

- Improvement of the educational environment due to the construction of new secondary schools

  Many secondary schools in Maputo are concentrated in District 1, the old quarters, with District 4 and District 5 having only one secondary school each, creating a major barrier to school attendance by potential secondary school pupils. Under the Project, one new secondary schools with 12 classrooms will be constructed in both District 4 and District 5

where the population increase has been conspicuous. These 24 new classrooms will directly provide the opportunity for school enrolment for 1,920 pupils (constituting a 6.6% increase of the present number of secondary school pupils).

- Improvement of learning with new teaching aids

  Many schools currently rely on blackboards and textbooks because of the lack of teaching aids. The provision of such teaching aids as charts and tables, etc. is expected to achieve a major improvement of learning among pupils. In the case of secondary schools where not all pupils possess textbooks, the provision of teaching aids for science education promises a major contribution to improving the quality of teaching.

- Improvement of the public hygiene environment

  Under the Project, those schools with municipal water supply will receive flush toilets combined with a simple septic tank while those schools without water supply will receive toilets with a tank for night soil collection. The introduction of these toilets will improve the hygiene conditions at the new schools. At those sites with municipal water supply, wash basins will also be provided to establish the custom of hand-washing after using the toilets. This will constitute education on hygiene. As separate toilets will be introduced for boys and girls, access to educational opportunities at schools will improve for girls of school age.

- Benefit to Local Community

  Secondary schools in Maputo employ the three shift teaching system to compensate for the shortage of classrooms and the use of the classrooms in the evening for regular teaching deprives the community of the opportunity for informal evening education. The implementation of the Project will increase the opportunity to use the classrooms for wide-ranging activities by the local community, including informal literacy education and meetings of local groups.

As wide-ranging beneficial effects are expected to occur with the implementation of the Project together with the contribution to improving primary and secondary education in Maputo, the implementation of the Project as a grant aid project of the Government of Japan is judged to be highly appropriate. While the Mozambique side has sufficient human resources, technical expertise and budget to continually manage the new facilities following the implementation of the Project, it must still deal with the following tasks for the smooth and effective implementation of the Project.

- Recruitment and re-training of teachers

  For the effective implementation of the Project, it will be necessary to recruit 213 and 60 new teachers for primary schools and secondary schools respectively and it appears that these figures can be easily met in view of the annual number of graduates from the teacher training school and college. In Maputo, 394 primary school teachers and 131 secondary school teachers are still unqualified and the re-training of these teachers is essential for a qualitative improvement of the universal education in the city.

- Utilisation of science rooms at secondary schools

  The science curriculum for secondary education includes laboratory experiments which are seldom conducted at present, However, these laboratory experiments are important to improve the quality of education and it is planned to actively incorporate such experiments in the teaching. Having positively evaluated the fact that teachers capable of supervising scientific experiments in school laboratories are currently being trained, a science room with some equipment will be introduced under the Project for each secondary school. The Mozambique side will be required to procure and store other essential equipment, re-agents and consumables for laboratory experiments and will also recruit teachers capable of supervising such experiments. It is also hoped that the science rooms will be used for diverse purposes, including meetings and group discussions, beyond their principal use.

- Promotion of infrastructure development in Magoanine area

  The Magoanine area is a designated resettlement area for refugees created by the great flood in 2000 and urban infrastructure, including electricity supply, has not yet been developed. As the population in this area is increasing at a faster pace than planned because of the additional inflow of people from the over-crowded old city quarters, the need to use the classrooms in the evening is likely to emerge soon. This prospect calls for the early extension of electricity supply to this area.

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CHAPTER 1

BACKGROUND OF THE PROJECT

CHAPTER 1 BACKGROUND OF THE PROJECT

After independence from Portuguese rule in 1975, Mozambique saw a continuing armed conflict between the government (led by the FRELIMO) and the opposition (led by the RENAMO) until the signing of the General Peace Agreement in October, 1992. The first presidential and parliamentary general elections under the multi-party system since independence were held in October, 1994 and re-elected President Chissano formed a new government in December of the same year. Since then, the Peace Agreement has been maintained and some 1.7 million refugees produced by the long civil war and other causes have returned to Mozambique, illustrating the steady progress of the country's democratisation and rehabilitation efforts.

Since 1987, Mozambique has been implementing a structural adjustment programme with the assistance of the World Bank and the IMF. In addition to agricultural development and reform of the public finance and taxation system, an economic rehabilitation programme is being implemented to achieve such targets as vitalisation of the private sector, liberalisation of the economy and the elimination of poverty, etc. In recent years, Mozambique's macroeconomy has recorded favourable annual economic growth of an average of more than 5% and there has been an increase of direct investment by South Africa and other countries. Nevertheless, the country still faces such structural problems as a worsening of the foreign reserves due to oil imports, slow rehabilitation of the economic infrastructure destroyed by the civil war and economic dependence on South Africa. The level of foreign debt, which is approximately four times higher than the GNP, poses another important problem to be dealt with.

In its Five Year Economic Development Programme (1995 – 1999), the Government of Mozambique aimed at, among others, (i) the maintenance of peace, (ii) the establishment of a stable state, (iii) the elimination of poverty and (iv) the promotion of education, health care and rural development and the creation of employment opportunities to improve the national standard of living. Following the lead by this Programme, the Ministry of Education has formulated the Educational Sector Strategic Plan: 1999 – 2003, the key issues of which are (i) increased opportunities for primary education, (ii) improved quality of education and (iii) improved system and finance to continue such an increase and improvement. In addition to increased opportunities, the targets for primary education include (i) rationalisation of the facilities and teacher deployment through the integration of the first and second stages and (ii) improved quality of education through the adoption of a continuous curriculum.

The 12 year long universal education in Mozambique consists of primary education [first stage (EP1) for Grade 1 through Grade 5 and second stage (EP2) for Grade 6 and Grade 7]

and secondary education (first stage (ESG1) for Grade 8 through Grade 10 and second stage (ESG2) for Grade 11 and Grade 12]. The enrolment ratio for each stage is 88.4% for EP1, 8.1% for EP2, 3.1% for ESG1 and 0.4% for ESG2. The gross enrolment ratio and net enrolment ratio for EP1 are 90.6% and 53.8% respectively while the gross admission ratio is 113.3% (Educational Statistics in 2000). The promotion, drop-out and repeater ratios in 1999 were 63.1%, 7.8% and 29.1% respectively and the extremely high drop-out and repeater ratios indicate problems of the educational environment and quality of education.

The gross enrolment ratio of 127.7% and net enrolment ratio of 79.8% in Maputo, the capital, are much higher than the national average. However, the shortage of classrooms due to the population concentration means that a three shift teaching system is employed at 92.9% of all primary schools. The teaching hours under the three shift teaching system are only 80% of the teaching hours under the two shift teaching system and a decline of the quality of education due to incompletion of the curriculum can be pointed out. Refugees caused by the great flood from February to March, 2000 have moved to a resettlement area in suburban Maputo and the classroom shortage is particularly critical in this area. In the field of secondary education, the development of facilities is given priority to double the admission figure in response to the increasing need for people with a higher educational career as a result of economic development.

The construction of 2,500 classrooms a year is required to achieve the target 90% admission rate for EP1 of the Educational Sector Strategic Plan: 1999 – 2003. The cost of classroom construction and the recruitment of new teachers totals US$ 140 million a year which is impossible for the Government of Mozambique to fully meet based on self-help efforts and it is estimated that financial aid of US$ 50 million a year is necessary from international aid organizations and through bilateral aid schemes. As mentioned earlier, there is a significant shortage of primary education facilities in Maputo due to the excessive population concentration and such measures as the three shift teaching system to combat the situation are approaching their limits, making the construction of new classrooms an urgent necessity. The three shift teaching system (the third shift is in the evening) is also employed in secondary education and it appears difficult for Mozambique to achieve the target of the Strategic Plan "to double the number of pupils in secondary education" based on self-help efforts.

Under these circumstances, the Government of Mozambique formulated the Project to Construct Primary and Secondary Schools in Maputo in August, 1999 and made a request to the Government of Japan for the provision of grant aid for the construction of and provision of equipment for 42 classrooms for three primary schools and 24 classrooms for two secondary schools. In response to this request, the Government of Japan conducted the Basic

Design Study from 10th October to 13th November, 2000. The project sites and the contents of the facilities and equipment, confirmed through discussions with the Mozambique Ministry of Education, are listed below.

1) Project Sites

- Originally requested sites : three primary schools and two secondary schools
- Additionally requested sites : six primary schools

2) Facilities

- Primary schools : classrooms; principal's office; vice-principal's office; administration office; teachers' room; teaching aid room; sanitary block
- Secondary schools : classrooms; principal's office; vice-principal's office; administration office; teachers' room; teaching aid room; sanitary room; science laboratories; library; gymnasium

3) Equipment

- Desks and chairs
- Teaching aid equipment

CHAPTER 2

CONTENTS OF THE PROJECT

CHAPTER 2 CONTENTS OF THE PROJECT

2.1 Basic Concept of the Project

The development of education in Mozambique has been slow due to the destruction of school facilities and the qualitative decline of the educational system, organization and human resources during a long period of civil war. Both the literacy rate (40% in 1997) and the school enrolment rate (60% gross in the 1994 – 1996 period) are quite low. In Maputo, the capital, there is a significant shortage of classrooms due to the deterioration of existing facilities and the concentration of population, forcing most primary schools to adopt a three shift teaching system. The resulting failure to complete the curriculum is another reason for the qualitative decline of education.

Under these circumstances, the Government of Mozambique has prepared the Educational Sector Strategic Plan: 1999 – 2003 which aims at increasing the opportunities for primary education through the construction of new classrooms and improving the quality of education by means of the rationalisation of facilities and teacher deployment through the integration of the first and second stages and the use of a continuous curriculum.

In regard to secondary education, the Plan gives priority to the construction of new secondary schools in response to the growing need for better educated people to support the ongoing process of economic development. One concrete target is to double the present number of secondary school pupils between 1999 and 2003.

Against this background, the Project intends the construction of new primary and secondary schools together with the provision of educational equipment in those districts of Maputo where an acute shortage of educational facilities is apparent because of the recent rapid increase of the population in order to increase the educational opportunities for secondary education and to improve the quality of education by eradicating the three shift teaching system in primary education.

2.2 Basic Design for Requested Japanese Assistance

2.2.1 Design Policy

(1) Scope of the Study

During the visit by the Study Team to Mozambique, six sites were added to the originally requested five sites. Meanwhile, the Government of Mozambique agreed with the Study Team that the subject grades for improvement would be all seven grades based on an integrated curriculum in the case of primary schools and three ESG1 grades in the case of secondary schools, excluding ESG2 which is characterised as a preparatory course for higher education. The requested sites are listed in Table 2-1 in order of priority.

Table 2-1 List of Requested Sites (Schools)

Site Name	District (Maputo)	Category
< Original Request >		
3 de Fevereiro (1)	4	ESG
Magoanine	5	EP
Albazini	4	EP
25 de Junho	5	ESG
Bagamoyo	5	EP
< Additional Request >		
3 de Fevereiro (2)	4	EP
Costa do Sol	4	EP
Unidade 2	5	EP
Unidade 16	2	EP
Unidade 11	2	EP
Aeroporto	2	EP

(2) Selection Criteria for Subject Schools

The following criteria are adopted for the selection of the subject schools for cooperation under the Project.

- Site access is available for construction vehicles.
- The land use rights are clearly established.
- The site is of sufficient size for the envisaged construction work.

- No problems are anticipated in regard to the construction work.
- No adverse impacts on the surrounding environment are anticipated.

As the Project aims at eliminating the three shift teaching system and improving the quality of education through the construction of classrooms, an increase of the number of pupils or elimination of the three shift teaching system must be achieved at each site. Accordingly, the following criterion is added for the selection of the subject schools.

- At the existing schools, the existing buildings will be replaced by new buildings with the implementation of the Project, resulting in an increase of the number of classrooms.

In connection with the last criterion, the expected effect of an increase of the number of classrooms is limited in the case of Unidade 11 and Unidade 16 in view of the fact that the construction of only seven classrooms is possible to replace the existing five classrooms and four classrooms respectively. In the case of Aeroporto, the construction of only two or three classrooms is possible to start with. By district, the classroom shortage in District 2 is approximately half of the corresponding shortage in District 4 and District 5 where the classroom shortage is more acutely felt. In addition, urban sprawling is much more evident around the above three sites and the construction of a permanent building is likely to hinder urban redevelopment efforts in the future.

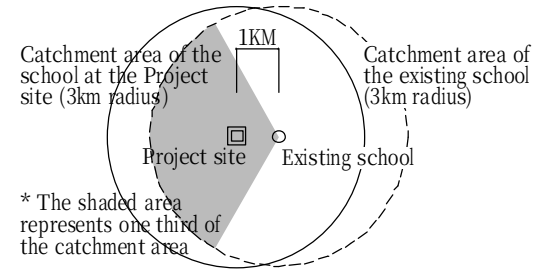
Based on the above assessment, it has been decided to remove the three sites in District 2 from the scope of cooperation, leaving the sites in District 4 and District 5 with an acute shortage of classrooms as the subject sites for cooperation under the Project.

(3) Determination of School Size for Primary Schools

To determine the school size for primary schools, the required number of classrooms is calculated to eradicate the over-crowding at any existing school within a radius of 1 km* of the project site. The final selection of the subject schools and determination of the school size is then conducted using the contractable number of classrooms in view of the physical limitations and other specific information of each site.

*** Basis for 1 km Radius**

At an existing school, the switch from a three shift teaching system to a two shift teaching system will produce a surplus of one-third of the existing pupils. It is reasonable to believe that these pupils live within a 3 km radius (radium of the average catchment area) of a project site. In this way, pupils of an existing school located within a 1 km radius of



the project site can be considered as constituting the potential enrolment need of a project site.

The standard number of classrooms which can be constructed at each project site is 14, consisting of two classrooms each for seven grades. The minimum and maximum number of classrooms at each site is set at 7 and 21 respectively based on the number of grades involved. Based on the above concept, Fig. 2-1 shows the selection flow for the subject primary schools and the calculation of the planned number of classrooms.

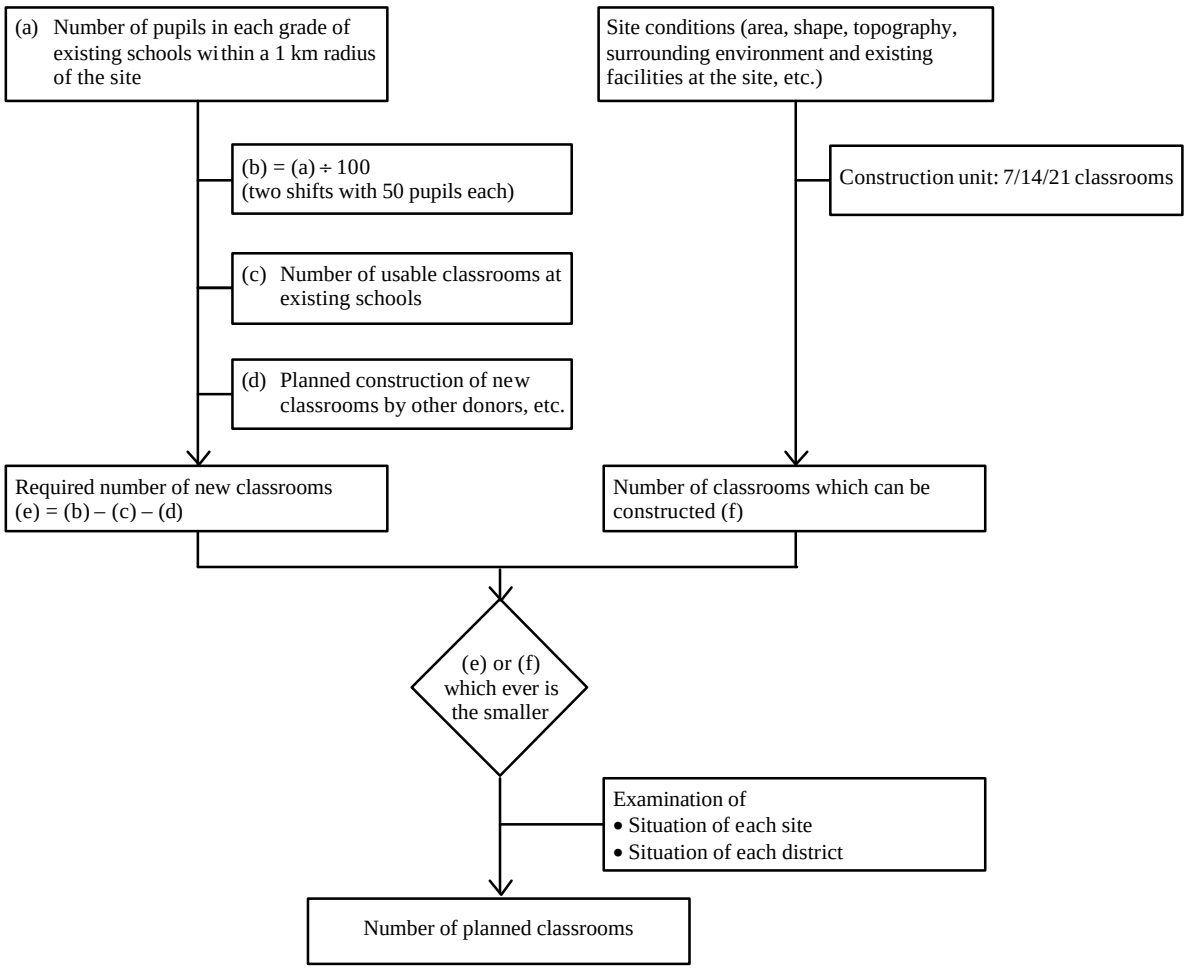


Fig. 2-1 Flow for Calculation of Required Number of Classrooms (EP)

Table 2-3 shows the calculation results of the planned number of classes based on the calculation flow. In addition, the following situation at each site is also taken into consideration.

• Albazini

The existing need is calculated for 11 classrooms. However, given the facts that local pupils not accepted by existing schools attend those in other areas and that the area is anticipating a population increase in the coming years, the enrolment need is assumed to be higher than the calculated figure.

• 3 de Fevereiro

As shown in Table 2-3, there is a strong enrolment need in the catchment area of 3 de Fevereiro. The 3 de Fevereiro (1) site is sufficiently large and the MINED has expressed a strong desire for the construction of an additional EP on the same site. An EP with 14 classrooms will, therefore, be constructed under the Project in addition to the requested ESG.

• Magoanine

The population of 6 – 12 year olds in the area estimated in the manner shown in Table 2-2 is approximately 4,000. As 2,440 children are already enrolled at existing schools, some 1,600 children constitute the potential need for school enrolment.

Table 2-2 Estimated Population of 6 – 12 Year Olds

Total Population of District 5 (1997)			Total Population of Magoanine Novo (2000)	
	Population of 6-12 Year Olds	Ratio		Estimated Population of 6-12 Year Olds
(a)	(b)	(c) = (b)/(a)	(d)	(e) = (d) × (c)
211,008	41,076	19.5%	20,450	3,988

Table 2-3 Calculation of Classroom Shortage by EP Site

No.	School Number and Name (Existing schools within a 1 km radius of the project site; the school number is based on the existing school map)	Number of Pupils							No. of Required CRs	No. of Usable Existing CRs	No. of Planned New CRs	CR Shortage	No. of Classrooms Which Can be Constructed	No. of Planned Class-rooms
		G1	G2	G3	G4	G5	G6	G7	(a)	(b)	(c)	(d)=(a)-(b)-(c)	(f)	
3 de Fevereiro-1.2														
10	Laulane	1,144	1,262	1,187	1,001	747	774	482		21				
18	10 de Nobembro	-	-	-	-	-	656	658		8				
Sub-Total		1,144	1,262	1,187	1,001	747	1,430	1,140					14+14=	14+14=
		12	13	12	11	8	15	12	83	29	-	54	28	28
Magoanine														
23	Anexa 19 de Outubro	1,005	507	487	251	190	-	-		-				
		11	6	5	3	2	-	-	27	-	12	15	14	14
Albazini														
13	Albazini	477	413	458	320	168	-	-		10				
		5	5	5	4	2	-	-	21	10	-	11	14	14
Bagamoyo														
09	Bagamoyo Maputo	620	673	688	631	567	-	-		16				
10	Ep2 de Bagamoyo	-	-	-	-	-	1,499	1,312		15				
12	Infulene Benfica	171	137	192	182	165	455	362		13				
15	Unidade 29	602	570	635	704	446	-	-		15				
Sub-Total		1,393	1,380	1,515	1,517	1,178	1,954	1,674						
		14	14	16	16	12	20	17	109	59	-	50	21	22
Costa do Sol														
09	Costa do Sol*	166	112	111	95	55	-	-		-				
06	Triunfo	468	402	389	312	289	254	223		11				
Sub-Total		634	514	500	407	344	254	223						
		7	6	5	5	4	3	3	33	11	-	22	14	14
Unidade 2														
07	Unidade 2*	293	304	432	301	293	-	-		-				
04	Unidade-B	391	434	417	396	304	-	-		12				
06	25/Junho Rua 7	201	196	192	114	121	936	703		11				
Sub-Total		885	934	1,041	811	718	936	703						
		9	10	11	9	8	10	8	65	23	-	42	21	22

(4) Basic Principles for Site Selection and School Size Calculation

The construction of ESG1 schools in Maputo has been quite slow and the present situation is far from achieving the national target (doubling of pupils) under the Educational Sector Strategic Plan. Although there are 14 ESG1 schools in the city, eight of these are concentrated in District 1, indicating the biased distribution of these schools vis-à-vis the overall distribution of the municipal population. As most of the schools have an evening shift, there is little opportunity for adult education which usually takes place in the evening.

Table 2-4 shows the calculation results of the required number of classrooms based on the present number of ESG1 pupils to eliminate the over-crowding at existing schools. Because of the biased distribution of the existing ESG1 schools as described earlier, many pupils travel to schools in District 1 from other districts. To correct this bias, the ratio of EP2 school leavers by district (c) is also used in the calculation. The table indicates a general situation of a shortage of ESG1 classrooms in every district.

Table 2-4 Enrolment Need of ESG1 Schools by District

Item	District					Total
	1	2	3	4	5	
Number of ESG1 Pupils (a)	15,360	3,648	5,222	2,159	2,480	28,869
Number of ESG1 Leavers (b)	3,189	2,168	2,344	1,659	2,465	11,825
Ratio of EP2 Leavers (c) = (b)/total of (b)	27%	18%	20%	14%	21%	100%
Number of ESG1 Pupils Corresponding to (c) (d) =total of (a)×(c)	7,794	5,312	5,716	4,042	6,005	28,869
Number of Required Classrooms (e) = (d)/80	97	67	72	51	75	362
Number of Usable Classrooms (f)	63	22	37	12	20	154
Classroom Shortage (g) = (e) – (f)	34	45	35	39	55	208

Source: Statistics of the Bureau of Education, Maputo Municipal Authority (2000)

Both of the requested sites appear to be appropriate because of few schools nearby and the good location covering a fairly large catchment area. Both sites are sufficiently large enough for the construction of 12 classrooms or more and are included in the scope of the Project. However, because of the lower level of urgency compared to primary schools,

the construction scale will be 12 classrooms (four classrooms for each grade), i.e. the minimum ESG1 school size, as requested by the Mozambique side.

(5) Subject Schools for Cooperation and Number of Classrooms to be Constructed

Based on the above examination results, the subject schools for cooperation and the number of classrooms to be constructed are shown in Table 2-5.

Table 2-5 Components of the Project

School Name	District	Conditions of Subject Site									Plan Under the Project				
		Existing School			Infrastructure		Existing Buildings		Scale of Classroom Shortage	No. of Classrooms Which Can be Constructed			No. of Planned Class-rooms	No. of Required Teachers	
		No. of Pupils	No. of Class-rooms	No. of Qualified Teachers	Water	Electricity	Removal	Re-location						Calculated Figure	(b)-(a)
1) 3 de Fevereiro (1)	4	-	-	-	500m away	○	○	Houses	39	24	ESG	New	12	30	30
									54	14	EP	New	14	30	30
2) 3 de Fevereiro (2)	4	-	-	-	○	○	-	Water Supply Station		14	EP	New	14	30	30
3) Magoanine	5	-	-	-	Well	×	-	-	15	21	EP	New	14	30	30
4) Albazini	4	-	-	-	100m away	100m away	-	Houses Cemetary	11	22	EP	New	14	30	30
5) 25 de Junho	5	-	-	-	○	○	○	-	55	24	ESG	New	12	30	30
6) Bagamoyo	5	-	-	-	○	○	-	-	50	21	EP	New	22	47	47
7) Costa do Sol	4	539	5	11	Well	○	○	-	22	14	EP	Re-building	14	30	19
8) Unidade 2	5	1,623	10	20	○	○	○	-	42	21	EP	Re-building	22	47	27
Total								EP	194		EP	7 schools	114	244	213
								ESG1	94		ESG	2 schools	24	60	60
											Total	9 schools	138	304	273

(6) Design Principles for Facility Specifications and Grade

In general, the construction of primary school buildings in Maputo is based on either the standard design of the World Bank or the standard design of the Maputo Municipal Authority. The former, the World Bank design, incorporates generally higher specifications that those adopted for Japanese grant aid while the latter sets forth the minimum specifications for classrooms and has already been used for the projects of several donors. While this design is relatively popular, the actual details slightly vary from one project to another.

For the Project, the standard design of the Maputo Municipal Authority is evaluated in view of the specific character of a Japanese grant aid project and is modified where necessary. The specification differences of the municipal standard design and the design adopted by the Project and the reasons for modifications are listed in Table 2-6. The main points of improvement and the underlying reasons are outlined below.

- While the standard design only deals with one story buildings, the Project adopts a two story building design to allow the construction of school buildings on small sites in urban areas and also to reduce the construction cost.
- The standard design incorporates toilets and classrooms in the same building. The Project separates toilets and classrooms in order to avoid odour and moisture from toilets reaching the classrooms and to ensure more efficient construction work.
- Conversely, the standard design houses administration rooms in a separate building. The Project houses such rooms and the classrooms in the same building in view of better school management and cost reduction.
- Although the standard design does not provide a ceiling, some schools do have a boarded ceiling. The Project does not plan a ceiling in view of better work efficiency, cost reduction and lower maintenance requirement.
- The standard design uses a gable roof. In the case of the Project, a shed roof with a simple structure is adopted to remove the joints of members which are vulnerable to rain damage and to improve the work efficiency and cost performance.
- The standard design does not provide windows on the corridor side to prevent the entry of light from the corridor side and to ensure the concentration of pupils during lessons. The Project introduces windows on the corridor side to improve the lighting conditions. However, the window height is set above the height of seated pupils and sun-shading measures will be separately introduced.
- The shower booths provided in the standard design are not installed under the Project.

Fig. 2-2 Standard Design of Maputo Municipal Authority (Tender Document)

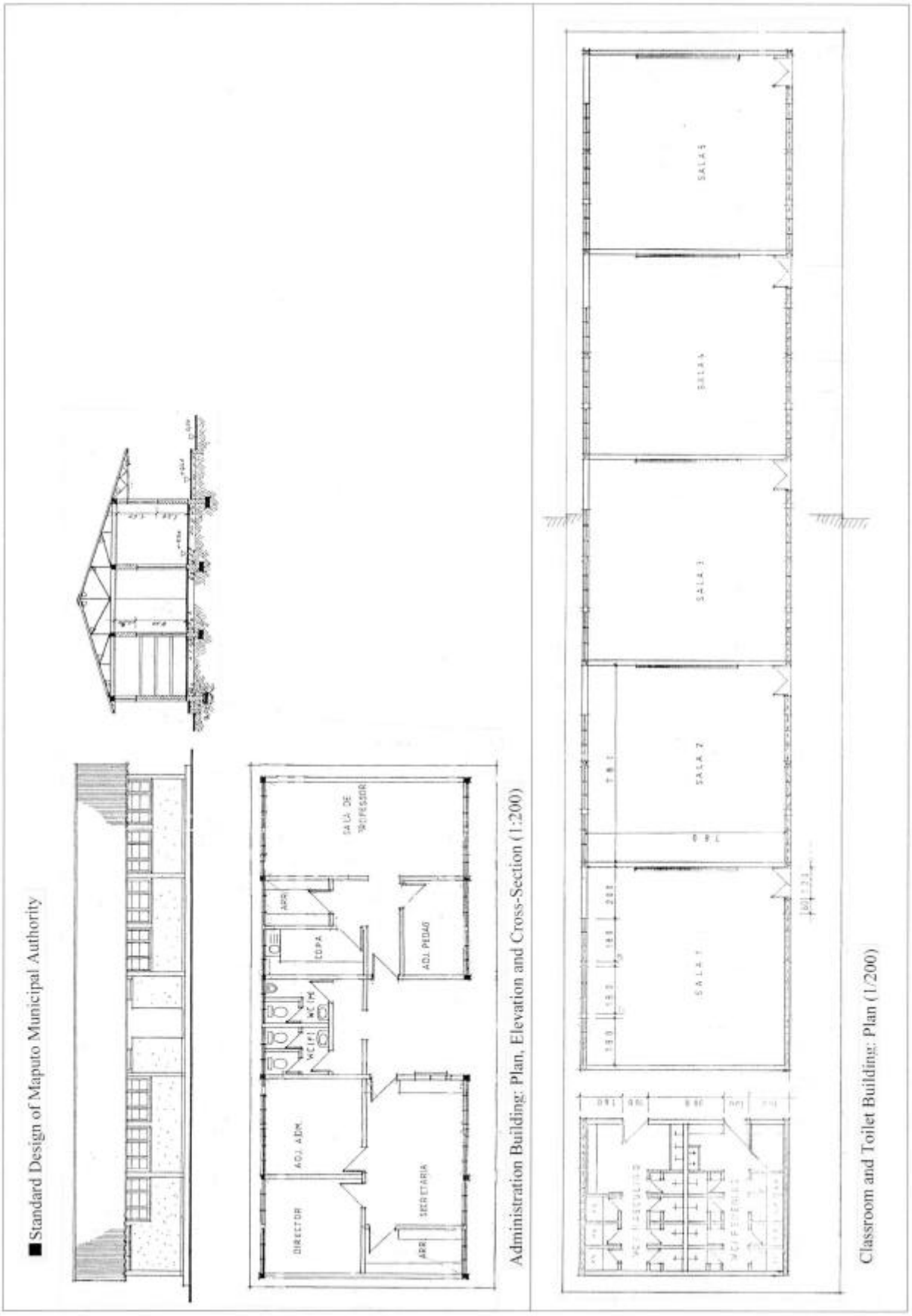


Table 2-6 Comparison of Specifications Between Standard Design of Maputo Municipal Authority and the Project

Item	Standard Design	Project	Reason for Modification or Adoption of Standard Design
Size and Structure	Single story only	Single story and two story	In principle, a two story building is adopted in view of cost reduction and the efficient use of land. A single story building is adopted for those sites where such a building is judged to be appropriate in view of the surrounding environment.
	Five classroom type school only	Several types ranging from four classrooms to eight classrooms	As the standard school size is 14 classrooms, several classroom building types are introduced to ensure an optimal building layout for the conditions at each site.
	Separate administration and classroom buildings	Administration rooms and classrooms in the same building	These rooms are housed in the same building in view of cost reduction.
	Toilets and classrooms in the same buildign	Separate sanitary block	A separate sanitary block is planned to prevent odour and condensation in the classrooms and in view of simpler construction work.
	RC frame and CB non-bearing walls	As left	These are judged to be appropriate.
	Weak structural cross-section with a column pitch of 4,000 mm	Reinforced structural cross-section with a column pitch of 2,800 mm	South African standards are used to improve the safety and durability. The same skeleton is used for both single story and double story buildings.
	Gable roof with a simple beam and RC truss structure	Shed roof with a simple beam and steel frame structure	The number of joints vulnerable to rain damage is reduced. The structure is simplified in view of better workability and economy. Lighting from the eaves side is improved.
	Cement slate roofing (coloured steel sheeting used at all existing schools)	Coloured steel sheeting	Coloured steel sheeting is selected among the non-asbestos roofing materials with durability to ensure low maintenance being the deciding factor.
Classrooms	8 m × 8 m = 64 m^2	7.5 m × 8.4 m = 63 m^2	An efficient size in terms of the lighting conditions is selected.
	High windows and corridor windows only	Waist-high windows in addition to corridor windows and high windows	Waist-high windows are introduced to improve the classroom lighting.
	Floor: mortar finish; walls: mortar and paint; no ceiling	Floor: exposed concrete; walls: mortar and paint; no ceiling	These are decided in view of workability and economy.
	No teacher's desk and mortar blackboard	As left	These are judged to be suitable.
	Glass jalousie windows or fixed windows	As left	Jalousie windows with steel plates are used in places where shading is required.
	Single entrance with double doors (W=1,200 mm)	Single entrance with double doors (W=1,300 mm)	While the standard design is suitable, the door width is increased.
Offices	Principal's room, vice-principal's room, administration office and teachers' room, etc.	Same room configuration	The necessity for these rooms has been confirmed by the field survey.
	20 m x 8 m = 160 m^2	7.5 m × 16.8 m = 126 m^2	The size of each room is reduced.
	Toilet facilities	As left	The necessity has been confirmed by the field survey.
Toilet Block	Seven cubicles (boys and girls) per five classrooms (1.4 booths per classroom)	10 cubicles (boys and girls) per 14 classrooms (0.7 cubicles per classroom)	The number is finalised based on examples in other African countries. The size of the septic tank is that recommended by the standard design.
	Shower booths	None	No necessity for shower booths was found by the field survey and the interview survey.
	Flush toilets with a simple septic tank for treatment	As left. Dipping will be conducted at sites without water supply.	

Unlike primary schools, there is no standard design for secondary schools. Each school building has been constructed by the World Bank or a NGO, etc. based on its own specifications. For the Project, the specifications for primary schools are used as the basis and the actual design specifications for the planned secondary schools are decided with reference to the primary school specifications if necessary.

(7) Design Principles for Project Components

1) Administration Rooms

The standard design of the Maputo Municipal Authority provides for an administration building housing a principal's office, vice-principal's office, head administrator's office, teachers' room, administration office, various storage places and staff toilets. The administration buildings built in accordance with the World Bank standard design or prior to independence have a similar room configuration as it is the custom in Mozambique to provide offices/rooms reflecting job titles. For the Project, the floor area of each room suggested by the municipal standard design is re-examined with a view to reducing the size while preserving the function of each office/room.

2) Library (ESG1)

The existing ESG1 schools have a library as a standard school facility. However, because of the limited budget, the size of the collection is quite limited and it is difficult to describe the existing libraries as being effectively utilised. Many pupils use the classrooms to do their own work because of their poor housing conditions, illustrating the strong need for self-learning space. In short, even though the priority for a library is not particularly high, a library is an important facility to improve the quality of secondary education. Accordingly, the project design includes a library to provide the minimum space for self-learning and to establish a system to accept book donations by NGOs and the PTA, etc. in addition to self-help efforts to build up a collection.

3) Science Room (ESG1)

Three laboratories, i.e. biology, chemistry and physics laboratories, were originally requested. Even though a science room is a standard facility at the existing ESG1 schools, it often lacks laboratory equipment and reagents, etc. because of insufficient budgetary appropriation. In some cases, the science room has been converted to an ordinary classroom.

Meanwhile, scientific experiments are an essential requirement to improve the quality of secondary education and there is a strong need for such experiments in the future. At present, scientific experiments are included in the curriculum of teacher training colleges to train ESG1 teachers with the technical cooperation of Germany. While there are currently no plans to commence scientific experiments at the ESG1 level, the preparation of an environment in which such experiments can be conducted as part of school teaching as soon as the conditions are ripe is necessary in order to ensure the high quality of secondary education in the future.

The introduction of the minimum size science room accompanied by a preparation room under the Project is deemed appropriate. An anatomical model of the human body and celestial models, etc. will be provided under the Project mainly for display purposes to assist science education.

4) Gymnasium

As the soil in Maputo is powdery sandy soil which is unsuitable for outdoor physical education, a gymnasium hall is a standard facility at ESG1 schools and EP schools have a concrete sports ground as a standard facility. The existing of such sports grounds was confirmed during the field survey. The analysis results of the current curriculum indicate that the gymnasium utilisation rate is some 70% and all of the schools visited conduct physical education. A simple gymnasium hall facility is, therefore, planned for the ESG1 schools under the Project.

As 70% of the ESG1 pupils are more than 16 years old, the introduction of a separate changing room for girls is necessary. In addition, a storage room for the storage of balls, nets and mattresses, etc. and an auxiliary room with facilities for feet washing will be introduced. The basketball poles and balls, etc. will, however, be provided by the Mozambique side.

5) Sanitation

A sanitary block with hand washing basins will, in principle, be constructed. The toilets for boys and girls will be separate to contribute to school access for girls. Staff toilets will be provided in the administration building in accordance with the municipal standard design.

(8) Basic Principles for Educational Equipment

Educational equipment which contributes to the quality of education will be provided based on the following selection criteria.

- Compatibility with the curriculum
- Usability without specialist knowledge
- No maintenance cost
- Unlikely to be damaged or lost
- Books, including textbooks, are not provided

The provision of appropriate science teaching aid equipment/tools is necessary to ensure the effective use of the science room to be introduced under the Project. The following criteria are applied for the selection of items from the list of requested items. The selection priority is given to those items used for demonstration by a teacher at the teacher's desk and those for display.

- Equipment for advanced experiments and advanced equipment is not included
- Glass apparatus liable to breakage is not included
- Equipment using electricity is not included

2.2.2 Design Principles for Natural Conditions

The Project Area, Maputo, is characterised by a sub-tropical climate. However, there are large temperature fluctuations within a year as illustrated by the minimum temperature of approximately 0°C and the maximum temperature of more than 45°C. The relative humidity of 90% is high throughout the year. The annual precipitation is approximately 900 – 1,000 mm but substantially varies from one year to another. Downpours often cause damage during the rainy season (November – February). Maputo is located at 26°S and, unlike countries near the equator, special design features should be considered to shut out low lying sun, particularly in June. At some sites, the sandy soil may require measures to deal with minor sandstorms caused by strong wind during the dry season.

Given the climatic conditions described above, the planned facilities should be designed based on the following principles.

- The structural design should ensure natural ventilation in view of the high temperature and high humidity climate.
- The structure should have openings which can be closed to prevent the inflow of outside air when the outdoor temperature is low and to prevent the inflow of sand.
- The structural design should encourage natural lighting to reduce the maintenance cost.
- The main axis of the building should run from east to west to avoid solar radiation in the morning and evening as much as possible.
- The structural design should take the possibility of temporary flooding due to a downpour into consideration.

2.2.3 Design Principles for Social Conditions

The Project Area consists of areas with different characteristics, ranging from densely populated urban areas to a suburban resettlement area. The optimum layout plan should take the form of either a single story or two story building to reflect the surrounding environment and other conditions of each site. At those sites which currently lack municipal water supply, the extension of the water supply system or the construction of a well will be required. In these areas, it is often the case that the local residents are facing hardship because of the lack of water supply. The optimal plan should be formulated through discussions with the Government of Mozambique in view of also providing the supply of water for local residents.

As far as the facility grades are concerned, it is necessary to take the minimisation of damage, the prevention of theft and the reduction of the maintenance cost over a long period of time into consideration while complying in principle with the local standard specifications.

2.2.4 Design Principles for Use of Local Construction Companies and Local Materials

The long civil war has exhausted domestic industries in Mozambique and most construction equipment and materials are imported from South Africa. The use of locally available equipment and materials, domestically produced or imported, as much as possible under the Project is planned to reduce the construction cost as well as the maintenance cost.

A similar decline has been observed in the case of local construction companies. Major construction work in Maputo in recent years tends to be conducted by South African and other foreign companies although the number of local skilled workers appears to be increasing. As the Project relies on local specifications, a high technical level on the part of

subcontractors will not be required. A suitable system will be the employment of several subcontractors with similar technical capability so that the construction work can be simultaneously conducted at multiple sites.

2.2.5 Design Principles for Operation and Management of School Facilities

The planned school facilities will be managed by the Directorate of Education of Municipality of the Maputo Authority (DEMMA). Because of the severe fiscal situation, it will be necessary to rely on school funds, i.e. donations by the PTA of each school, for the repair of the facilities and the cost of eaching materials and expendables. The facility design should, therefore, feature low as well as easy m aintenance which does not require special maintenance skills.

2.2.6 Design Principles for Construction Work and Schedule

The Project involves the construction of 138 classrooms at eight suburban sites in Maputo. Given the construction capability of local construction companies, it will be possible to simultaneously conduct the construction work at all sites by means of assigning 3 – 4 sites to each company. If the use of imported reinforcing bars is assumed, a procurement period of approximately four months should be planned prior to the commencement of the reinforcing and foundation work as some four months is required to complete the import process. Accordingly, the total construction period will be 12 months by overlapping two months of the procurement period of four months with the actual construction period of 10 months.

2.2.7 Basic Design

(1) Land Use and Facility Layout Plan

The optimal layout plan will be formulated based on the principles listed below taking the site conditions, surrounding environment, distribution of existing facilities and necessity to provide substitute classrooms during the construction period, etc. at each site into consideration.

- In principle, the main axis of the building(s) will run from east to west to prevent the entry of morning and evening sunshine into the building(s).
- The layout plan will secure school grounds of sufficient size.
- If land is available, the layout plan will allow space for future facility extension.

- An appropriate overall layout plan will be formulated taking the distribution of existing facilities into consideration.
- The distribution of temporary classrooms will be planned within the scope of a suitable layout plan for the future.
- The layout plan will take the possibility of the flooding of the school premises into consideration.

(2) Ground Plan and Room Size

The optimal plan for the ground plan and room size is formulated using the standard design of the Maputo Municipal Authority with the necessary revisions being made, taking the actual use of the facilities, the activities of pupils, local climate, social customs, economy and maintainability, etc. into consideration.

1) Ordinary Classrooms (EP/ESG1)

The required seating capacity for an EP classroom is 50 and two seater desks and chairs which are standard classroom furniture set by the MINED will be used. While the standard design stipulates a classroom size of 64 m^2 (8 m × 8 m), the classroom design for the Project will employ a size of 8.4 m × 7.5 m (63 m^2) (2.8 m × 3 spans along the longer axis of the building) with a longer corridor length, taking the aisle width, leg space and distance between the blackboard and the front row into consideration.

The required seating capacity of an ESG1 classroom is 40 and single seat desks and chairs will be used with a floor area of 63 m^2 (8.4 m × 7.5 m).

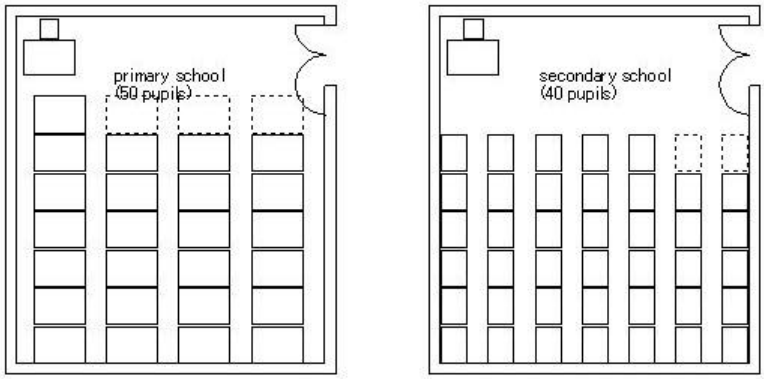


Fig. 2-3 Ordinary Classroom

2) Administration Block (EP/ESG1)

Within the administration block, the administration office with a reception desk to deal with various applications and payments, etc. and the teachers' room which is expected to face the busy movements of teachers will be located on one side of the central corridor while such individual rooms as the principal's office and the vice-principal's office will be located on the other side. As these rooms will be housed in the same building as the classrooms, the same span as that for the classrooms of 2.8 m will be adopted for this block which will be houses within six spans, i.e. equivalent to the length of two classrooms. This design will allow the administration block to support first floor rooms if so required.

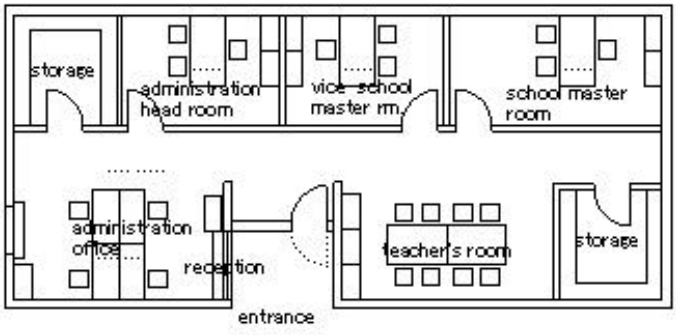


Fig. 2-4 Administration Block

Table 2-7 Floor Area by Room in Administration Block

Room	Standard EP Design (m^2)	ESG1 World Bank Design (m^2)	Project (m^2)
Principal'sOffice	16.0	16.0	16.8
VicePrincipal'sOffice	11.0	16.0	12.6
Secretary'sOffice	16.0	17.5	12.6
AdministrationOffice	24.0	17.5	25.2
Teachers'Room	32.0	40.0	25.2
TeachingAidRoom	8.0	5.0	8.4
StorageRoom	5.0	5.0	8.4
Toilets	16.0	16.0	15.0
Corridor/Porch	24.0	27.0	16.8
Kitchenette	8.0	-	-
Reception (Meeting) Room	-	16.0	-
Total	160.0	176.0	141.0

3) Library (ESG1)

A six seater table will be placed in the centre with open bookshelves around them. As the employment of a librarian is not planned, the library will be located next to the administration office so that the library can be managed by a clerk. The entrance will face the central corridor of the administration block to permit direct access by pupils from the corridor.

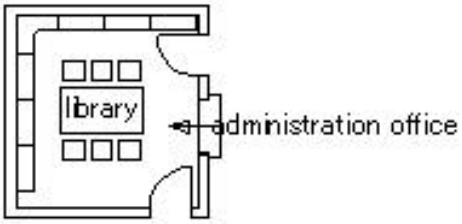


Fig. 2-5 Library

4) Science Room (ESG1)

six seater tables for pupils will be placed with enough space each other so that pupils can gather round one table to observe experiments. Water and electricity will only be supplied to the teacher's table so that some experiments can be demonstrated. Minor physical experiments on "the action of levers" and "the action of a pendulum", etc. will be conducted at the tables for pupils. A preparation room will also be provided for experiment preparation and for the storage of laboratory equipment and expendables.

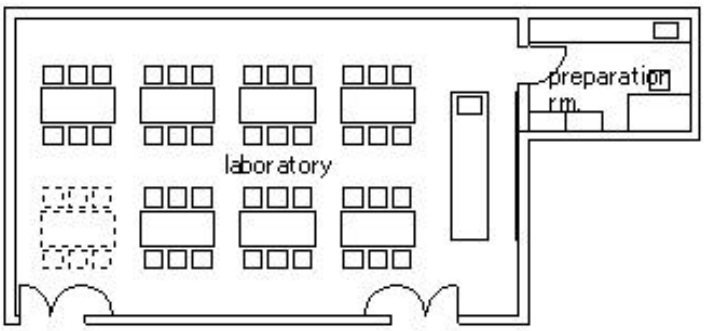


Fig. 2-6 Science Room

5) Gymnasium (ESG1)

In consideration of Maputo's climate, the provision of a roof to prevent scorching sun and rain is essential. Given the sandy ground, a concrete floor will be introduced to consolidate the ground to allow sporting activities. Gymnasiums without walls are popularly used in Mozambique and this type of gymnasium is believed to be fully functional. This open-style will allow air flow during hot weather, ensuring comfort for users. For the present design, a lockable equipment storage will be constructed from the viewpoint of crime prevention. The floor size will be based on competitive basketball games for secondary schools with a surrounding 3 m perimeter. A changing room, storage room and area for the washing of feet will be added as auxiliary facilities.

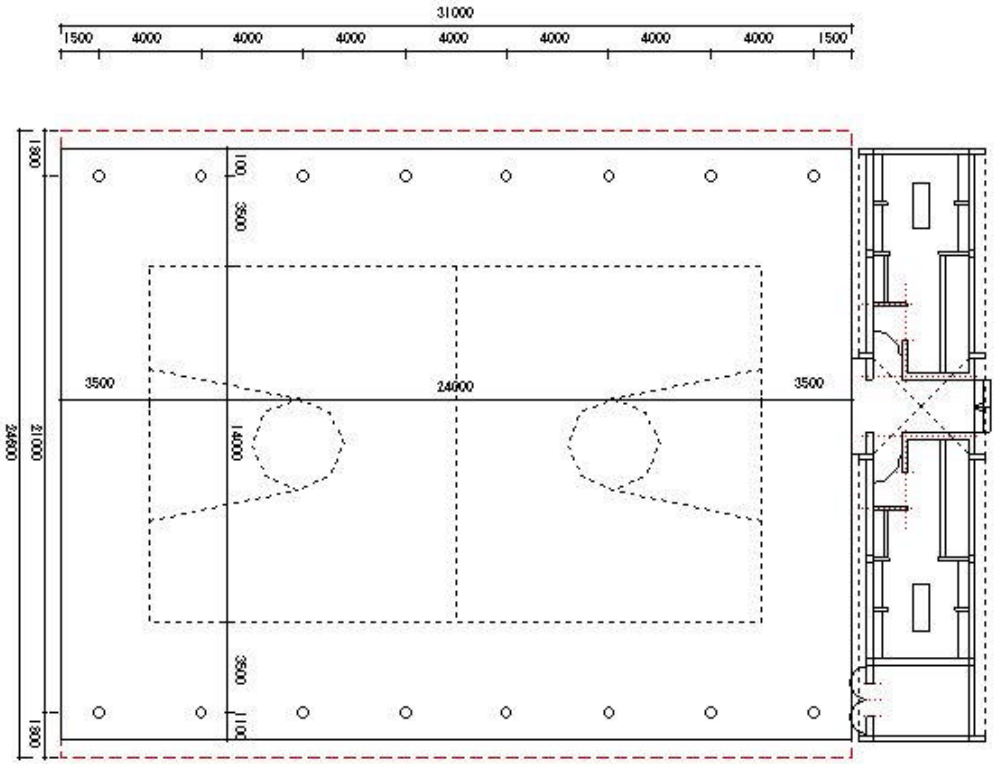


Fig. 2-7 Gymnasium

Table 2-8 Floor Area by Building Type

	School	District	Level of Education	No. of Class-rooms	Classroom Building Type	Electrical System	Floor Area																Total Area (m^2)
							Classroom Building												Sanitary Block Building			Gym-nasium	
							Two Story Building									Single Story Building							
							4A	6	4ALa	4ALb	6Aa	6Ab	8a	8b	STR	2Aa	2Ab	4	WC(A)	WC(B)	LT		
1	3 de Fevereiro(1)	4	ESG1	12	2 story	○				1				1	1				1			1	2,332.265
			EP	14	2 story	○						1		1	1					1			1,559.265
2	3 de Fevereiro(2)	4	EP	14	2 story	○					1		1							1			1,633.085
3	Magoanine	5	EP	14	Single story	×											1	3			1		1,368.505
4	Albazini	4	EP	14	Single story	*1 ○										1		3		1			1,383.485
5	25 de Junho	5	ESG1	12	2 story	○				1				1	1				1			1	2,232.265
6	Bagamoyo	5	EP	22	2 story	○	1	3							2				2				2,459.410
7	Costa do Sol	4	EP	14	2 story	○					1		1								1		1,644.985
8	Unidade 2	5	EP	22	2 story	○	1	3							2				2				2,459.410
Total				138			2	6		2	2	1	2	3	7	1	1	6	6	3	2	2	16,972.675

* Work by the Mozambique side will also be required.

(3) Section and Elevation Plan

The section will be planned to primarily secure sufficient lighting (indirect lighting) and good ventilation while preventing strong direct sunlight in the morning and evening from entering the building.

A shed roof will be adopted to omit joints which are vulnerable to rainwater leakage and also to simplify the work. Wide openings will be introduced to secure good natural lighting and ventilation. The local standard design and existing schools adopt high windows for the corridor side to prevent pupils from looking outside during lessons. This window arrangement means that the corridor side is relatively dark at existing schools. Under the Project, the window sill level on the corridor side is planned to be slightly higher than the eye level of pupils when sitting down in order to encourage their concentration vis-à-vis their lessons. A suspended ceiling will not be introduced under the Project and sound insulation and heat insulation will be provided by the thickness of the roofing materials and section planning which easily allows good ventilation.

To prevent direct sunlight in the morning and evening from entering the classrooms, it is desirable to locate the corridor on the north side of the building. Nevertheless, if it is found necessary to locate the corridor on the south side because of other factors, jalousie windows using a sunshading material, such as steel plate, instead of glass will be installed. These windows will be shut during the morning and evening.

Meanwhile, the structural arrangement will allow the introduction of high windows on the ground floor (1F) immediately below the slabs for the first floor (2F) to ensure adequate ventilation and lighting. Similarly, high windows on 2F will be introduced immediately below the roof to adjust the ventilation and lighting as shown in Fig. 2-8. These arrangements are designed to create good natural ventilation and the bright ceiling and high internal walls are expected to brighten the rooms through indirect light while avoiding direct light.

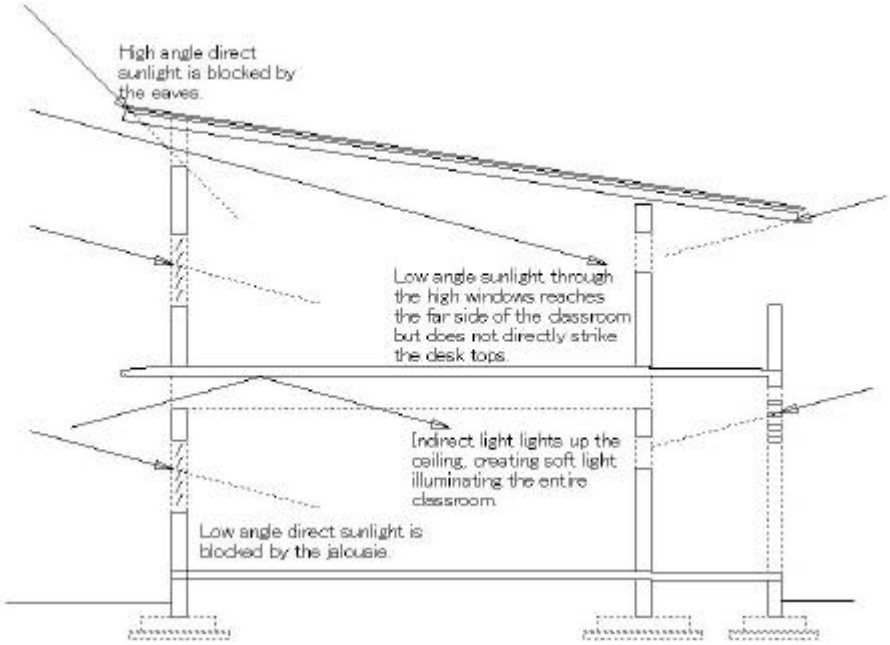


Fig. 2-8 Planning Concept for Section for Two Story Classroom Building

(4) Structural Planning

Mozambique has no building standards of its own. As most schools constructed in recent years are built with overseas aid, the standards of the respective donors are used. In general, however, South African standards are used because of the strong geographical and economic link between the two countries. Taking the geographical proximity into consideration, South African Building Standards (SABS 0160-1989, as amended in 1990, 1991 and 1993) will be used for the Project.

1) Structural Method

The main structure will be a rigid structure incorporating in-situ RC columns and beams while concrete blocks will be used for the partition walls. The roofing materials will be placed directly on a steel frame, adopting a simple beam structure without roof slabs.

2) Loads and External Forces

- Live load classrooms : 2.0 kN/m^2
  corridor/staircase : 3.0 kN/m^2
- Wind force : based on standard formula
- Seismic load : not considered
- Soil bearing capacity : 100 kN/m^2

3) Main Structure

The ground at all of the project sites consists of sandy soil and a good soil bearing capacity of 100 kN/m^2 or higher was visually confirmed by the Study Team. The planned foundation structure is RC independent footing of which the design assumes a bearing capacity of 100 kN/m^2. Because of the absence of earthquakes, concrete underground beams are omitted. The floor of the ground floor will consist of slabs on earth while the floor of the first floor will consist of in-situ concrete slabs and will only be supported by two crossbeams with a 2.8 m interval. This structure will allow the introduction of openings immediately below the slabs. H sections will be used for the roof beams because of their simplicity and excellent durability and workability to minimise the on-site work to bolt tightening.

4) Structural Materials

The import of such structural materials as structural steel will be necessary. Although locally produced cement is available, the use of imported cement will be considered in view of concern in regard to the uneven quality of the former. The main structural materials to be used are listed below.

- Concrete Grade 20 : F28 = 20 Mpa
  Grade 25 : F28 = 25 Mpa
- Cement : ordinary Portland cement
- Aggregates : crushed stone; river sand
- Reinforcing bars : round bars; deformed bars; welded wire mesh (SABS 0100-1: 250 Mpa, 450 Mpa)
- Steel : H sections; C sections

(5) Equipment Planning

1) Electrical Equipment

The EP2 and ESG1 schools, excluding the EP2 school at the Magoanine site, will require a lighting system to serve adult education in the evening. Lighting equipment will be planned to provide an appropriate luminous intensity for a learning environment.

2) Water Supply

In principle, flush toilets will be introduced at those sites where water supply is available. At those sites where the boring of a well is necessary by the Mozambique side, night-soil-collection type toilets will be provided for regular collection by

vacuum car. Hand washing facilities will also be provided at all sites from the viewpoint of facilitating hygiene education.

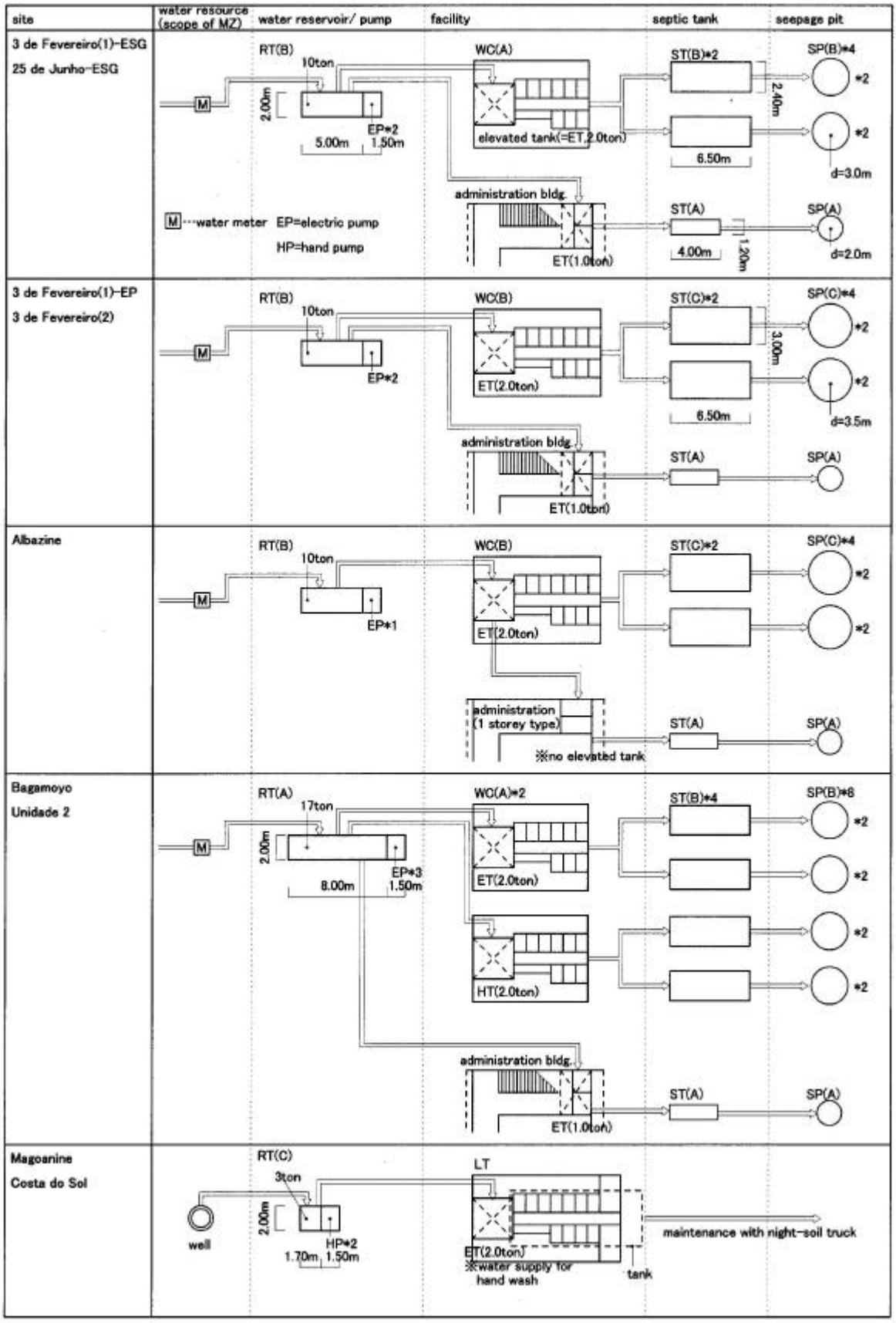
The municipal water supply service in Maputo is suspended from midday (12:00) to early in the following morning (03:30). The water pressure in District 4 and District 5 is inadequate because of the higher elevation of these districts compared to other areas. The water pressure of densely populated areas is also inadequate, partly because of the high leakage rate. For the Project, a water tank, elevated water tanks (on the roof of the sanitary block building and administration block building) and a water pump will be required for those project sites with municipal water supply. The water tank size is calculated based on the assumption that each pupil of the three shift teaching system uses the toilet once a day and the tank capacity includes the storage capacity of the elevated water tanks. As the elevated water tanks will produce the necessary gravity to convey water to the toilets and hand washing facilities, the elevated water tank capacity will be the same for all of the sites.

Groundwater from a well is used at the Magoanine and Costa do Sol sites. In the case of the Costa do Sol site, the provision of an electric water pump, a water tank, a water pump for an elevated water tank and an elevated water tank is planned to use the available power supply. In the case of the Magoanine site, the provision of two hand pumps (one to draw water from the well and one to feed water to the elevated water tank), a water tank and an elevated water tank is planned in the absence of power supply. At both sites, the elevated water tank will be used to provide water for hand washing.

3) Drainage System

There is no existing sewerage system at any of the project sites. At those sites where municipal water supply is available, flush toilets are planned and foul water will be treated by a simple septic tank prior to infiltration via an infiltration tank on the premises. As the planned schools are likely to adopt a three shift teaching system, the capacity of the required drainage system is calculated on the basis of the septic tank construction standards in Mozambique and the relevant JIS standards in Japan, assuming a three shift teaching system. Miscellaneous waste water and rainwater will be channelled to an infiltration tank on the premises.

Fig. 2-9 Water Supply and Dranage System



(6) Furniture

The school furniture listed in Table 2-9 will be provided under the Project. These items should be made of sturdy wood and should meet the specifications set by the MINED. Procurement from several furniture factories in the suburbs of Maputo is planned.

Table 2-9 List of School Furniture

Room/Office	Furniture	Quantity/Room
Classroom (EP)	- Two seater desk and chair for pupils	25 sets
	- Teacher's desk and chair	1 set
Classroom (ESG)	- Single seat desk and chair	40 sets
	- Teacher's desk and chair	1 set
Principal's Office; Vice-Principal's Office; Secretary's Office	- Desk	1
	- Chair	1
	- Visitor's Chair	2
	- Cabinet	2
	- Notice Board	1
Administration Office	- Desk	4
	- Chair	4
	- Notice Board	1
	- Cabinet	2
Teachers' Room	- Table	2
	- Chair	8
	- Cabinet	3
	- Notice Board	1
Library	- Table	1
	- Chair	6
	- Bookshelves	6
Science Room	- Teacher's Chair	1
	- Laboratory Table	7
	- Pupil's Chair	42
Preparation Room	- Desk	1
	- Chair	1
	- Cabinet	2

(7) Teaching Aid Equipment

In accordance with the basic concept of the Project, some teaching aid equipment and items will be provided as listed in Table 2-10.

Table 2-10 Teaching Aid Equipment

		Item	Quantity
EP	Science	Human Skeleton Chart	4 per school
		Circulatory System Chart	4 per school
		Respiratory System Chart	4 per school
		Digestive System Chart	4 per school
		Excretive and Urinary Organs Chart	4 per school
		Globe	2 per school
		Water Cycle Chart	2 per school
		Biological Cell Chart	2 per school
		Botanical Chart	2 per school
	Geography	Map of Africa	2 per school
		Climatic Map of Africa	2 per school
		Industrial Map of Africa	2 per school
		Historical Map of Africa: 18th Century	2 per school
		World Map	2 per school
	Arithmetic	Clock Model	2 per school
		Geometric Cubic Model	1 per two classrooms
		Protractor for Teacher	1 per two classrooms
		Ruler for Teacher (1m in length)	1 per two classrooms
		Triangle for Teacher	1 per two classrooms
		Compass for Teacher	1 per two classrooms
ESG	Geography	Celestial Map/World Map	2 per school
		Globe	2 per school
	Mathematics	Geometric Cubic Model	4 per school
		Ruler for Teacher (1 m in length)	4 per school
		Triangle for Teacher	4 per school
		Compass for Teacher	4 per school
		Protractor for Teacher	4 per school
	Biology	Microscope for Pupils	2 per school
		Slides for Microscopic Examination (in box)	1 per school
		Human Skeletal Model	1 per school
		Human Heart Model	1 per school
		Human Brain Model	1 per school
		Human Kidney Model	1 per school
		Human Ear Model	1 per school
		Human Eye Model	1 per school
	Physics	Diapason (with acoustic box and hammer)	1 per school
		Magnets (O-type and I-type)	1 per school
		Optical Bench	1 per school
		Prism	1 per school
	Chemistry	Periodic Table	1 per school

2.2.8 Basic Design Drawings

(1) Unit Plan Schedule

(2) Classroom Building (Single or Two Story)

- Detail Section
- Plan
- Elevation

(3) Sanitary Building

- Detail Section
- Plan
- Elevation

(4) Gymnasium

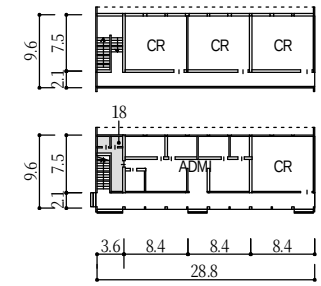
- Detail Section
- Plan

(5) Site Plan

(1) 施設標準タイプ図 / UNIT PLAN SCHEDULE

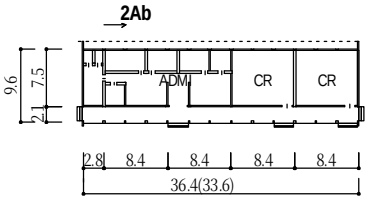
4A

	sqm
CLASS RM	252.00
ADMI.	144.00
CORRIDOR	120.96
STAIR	36.00
TOTAL	**552.96**



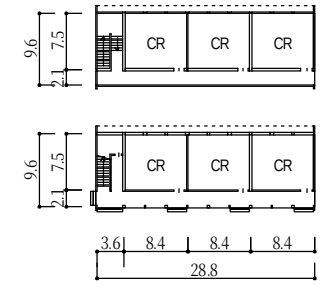
2Aa(2Ab)

	sqm	
CR.	126.00	(126.00)
ADMI.	147.00	(126.00)
COR.	76.44	(70.56)
TOTAL	**349.44**	**(322.56)**



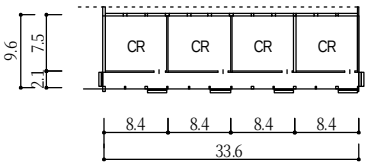
6

	sqm
CLASS RM	378.00
CORRIDOR	120.96
STAIR	54.00
TOTAL	**552.96**



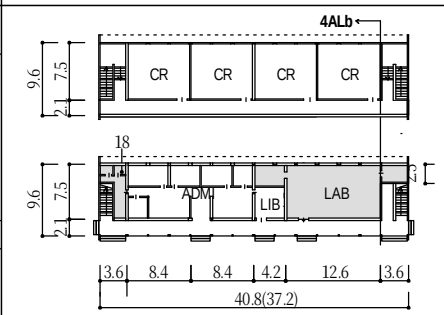
4

	sqm
CLASS RM	252.00
CORRIDOR	70.56
TOTAL	**322.56**



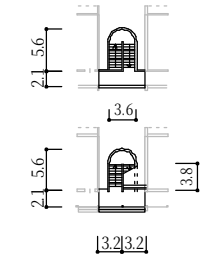
4ALa(4ALb)

		sqm
CR.	252.00	(252.00)
ADMI.	144.00	(144.00)
LAB.	116.10	(107.10)
LIB.	18.90	(18.90)
COR.	171.36	(156.24)
STR.	81.00	(36.00)
TOTAL	**783.36**	**(714.24)**



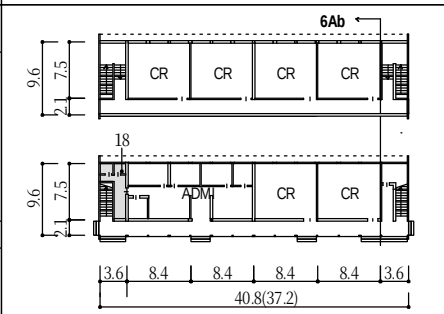
STR

	sqm
CORRIDOR	26.88
STAIR	37.54
TOTAL	**64.42**



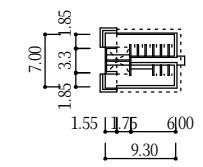
6Aa(6Ab)

		sqm
CR.	378.00	(378.00)
ADMI.	144.00	(144.00)
COR.	171.36	(156.24)
STR.	90.00	(36.00)
TOTAL	**783.36**	**(714.24)**



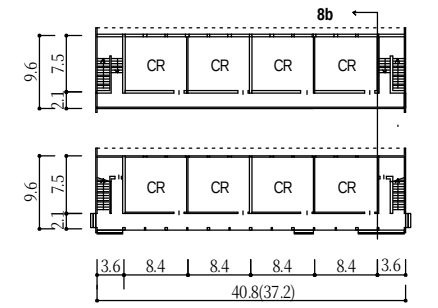
WC(A)

	sqm
	59.365



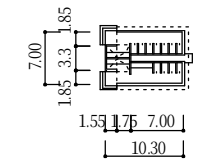
8a(8b)

		sqm
CR.	504.00	(504.00)
COR.	171.36	(156.24)
STR.	108.00	(54.00)
TOTAL	**783.36**	**(714.24)**



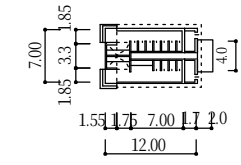
WC(B)

	sqm
	66.365

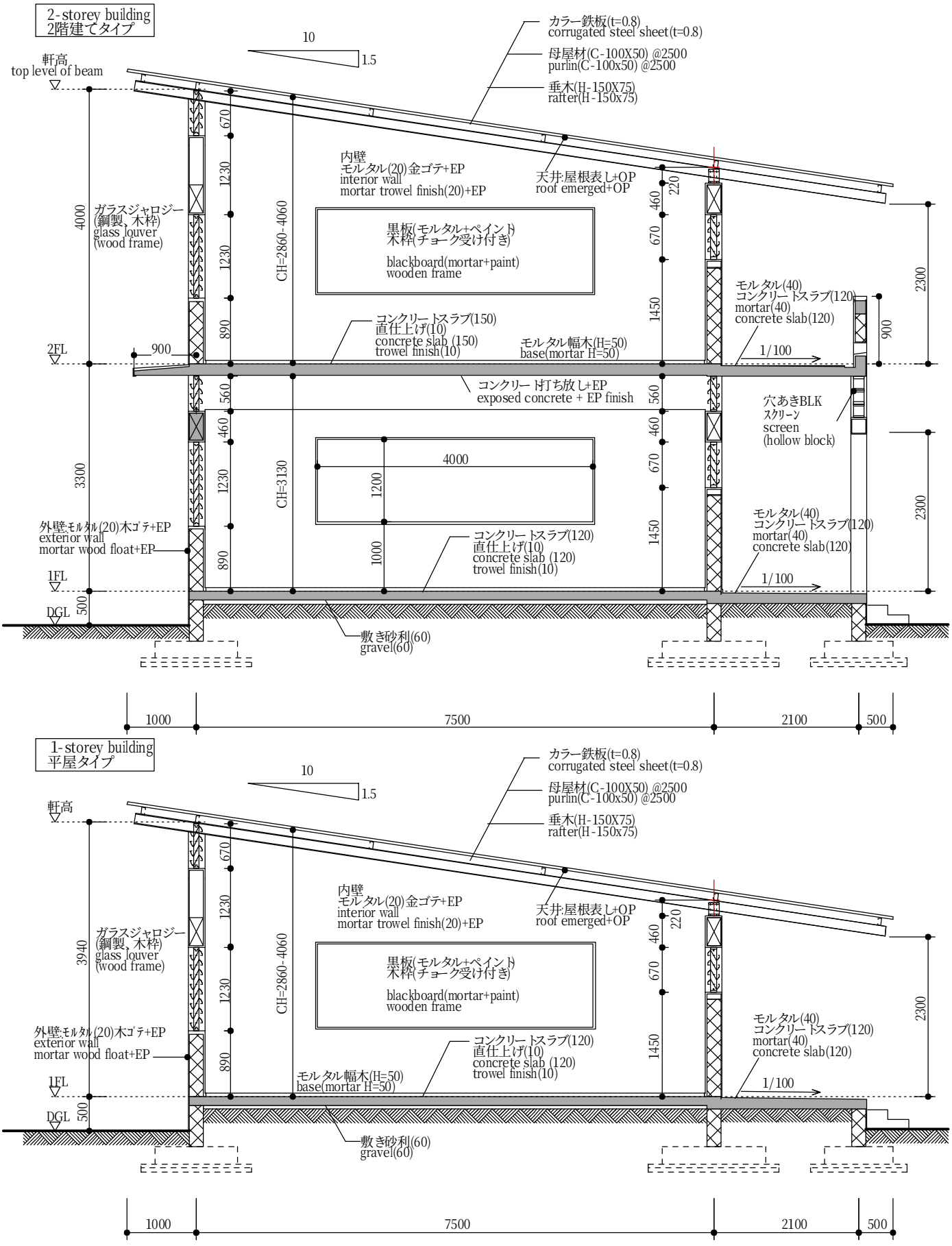


LT

	sqm
	78.265

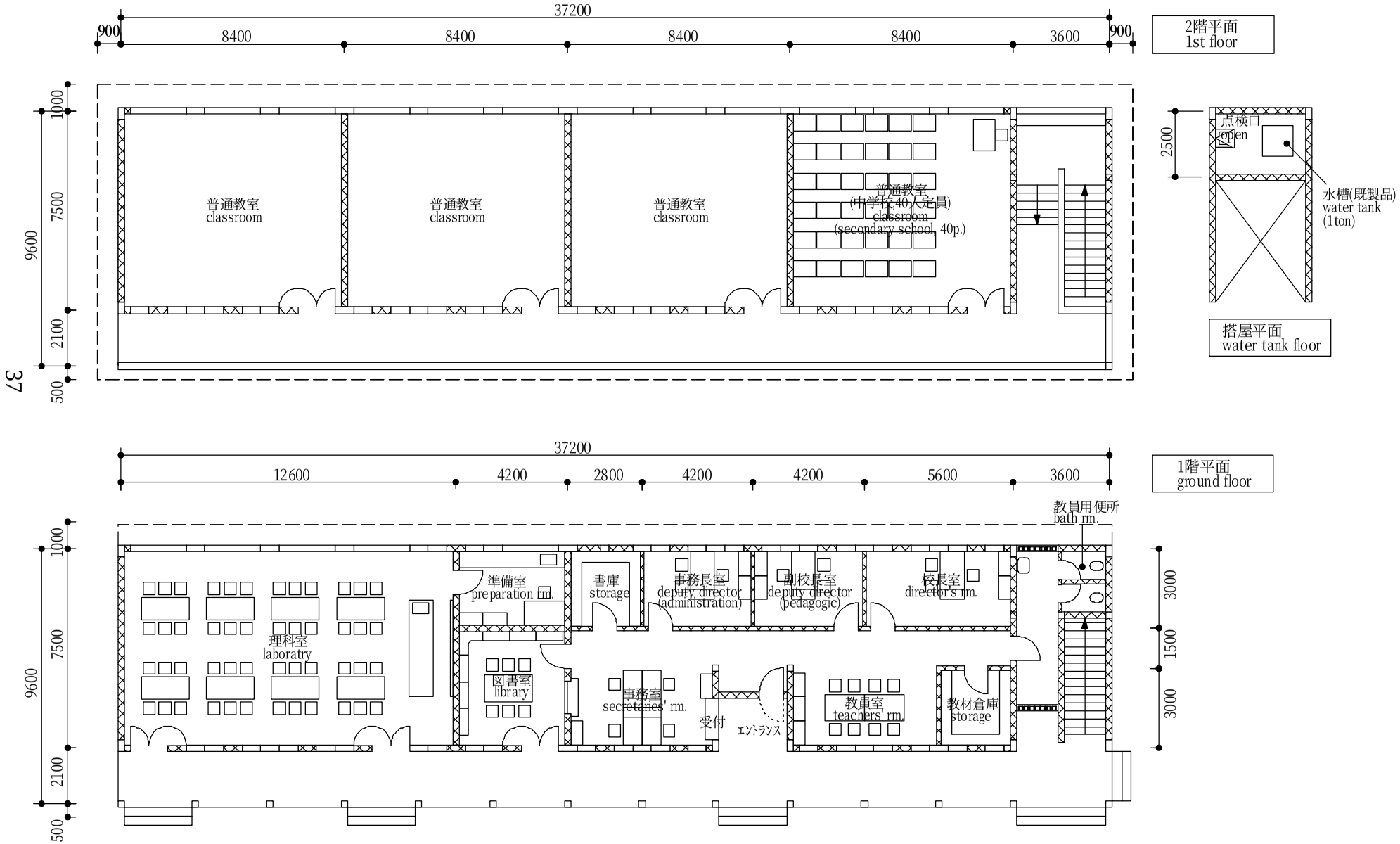


(2) 教室棟一般図 / Classroom building
・矩計図 / DETAIL SECTION S=1/75

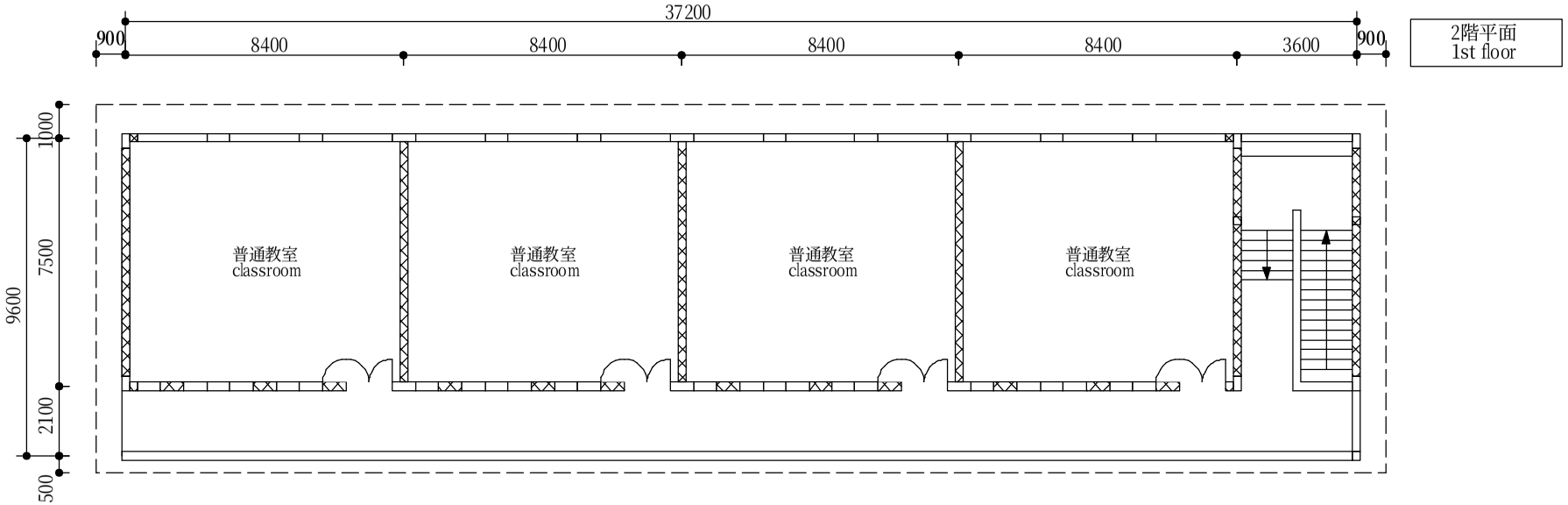


(2) 教室棟一般図 / Classroom

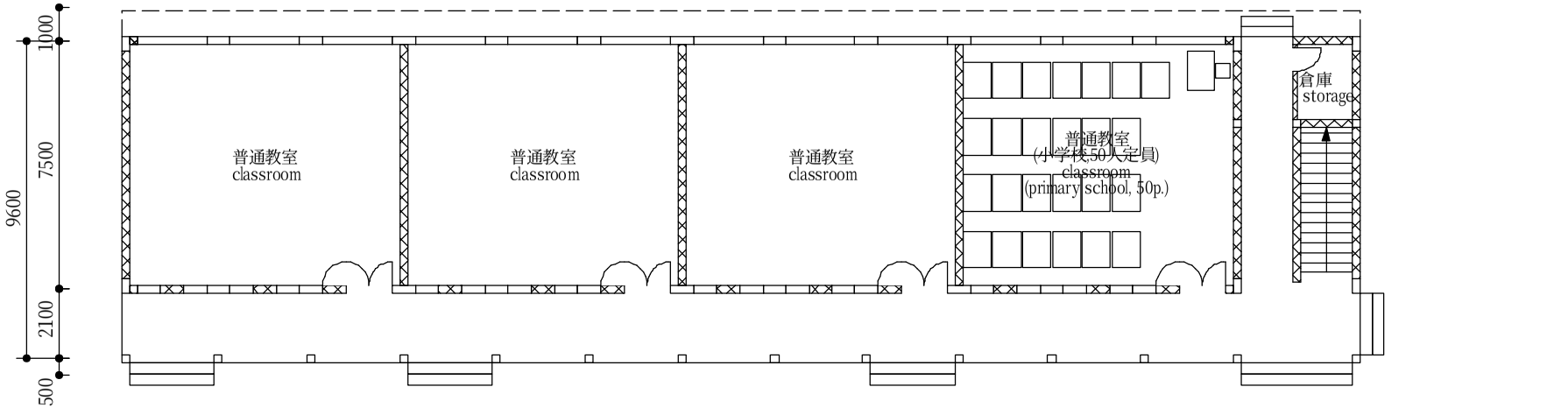
・平面図(4ALb type) / PLAN (4ALb type) S=1/200



・平面図(8b type) / PLAN (8b type) S=1/200

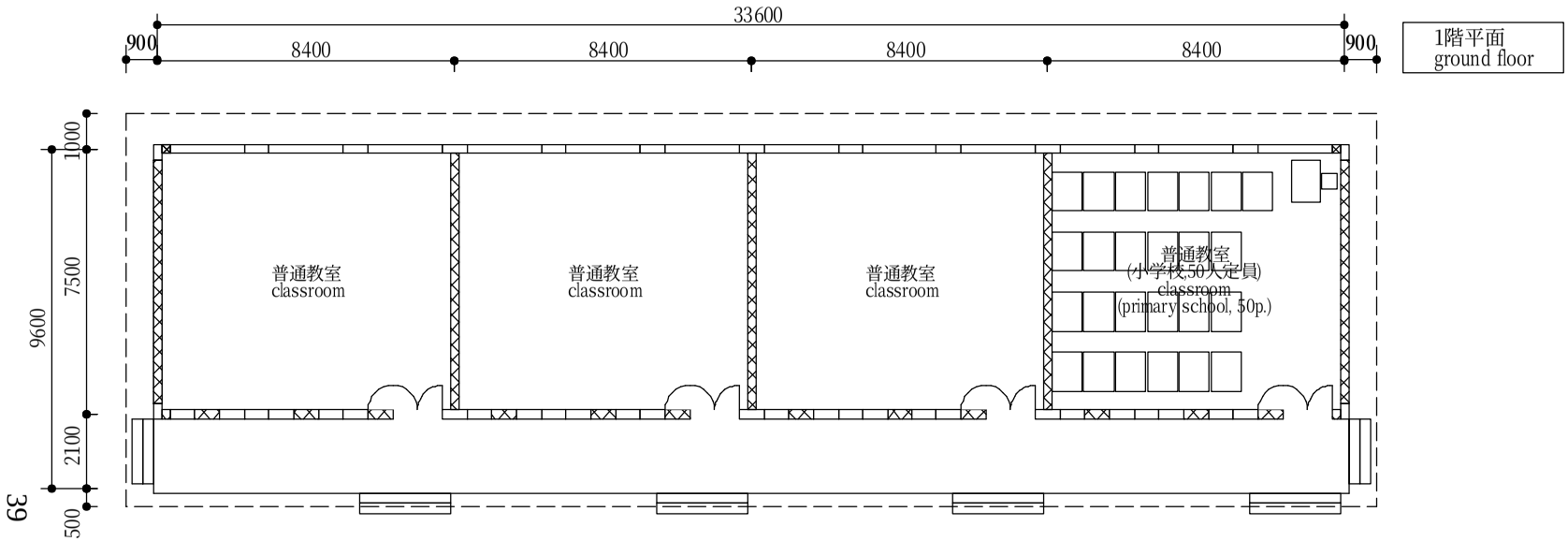


2階平面
1st floor



1階平面
ground floor

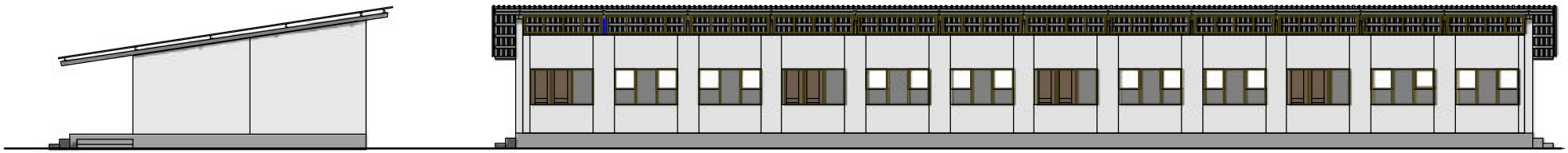
・平面図 (4 type) / PLAN (4 type) S=1/200



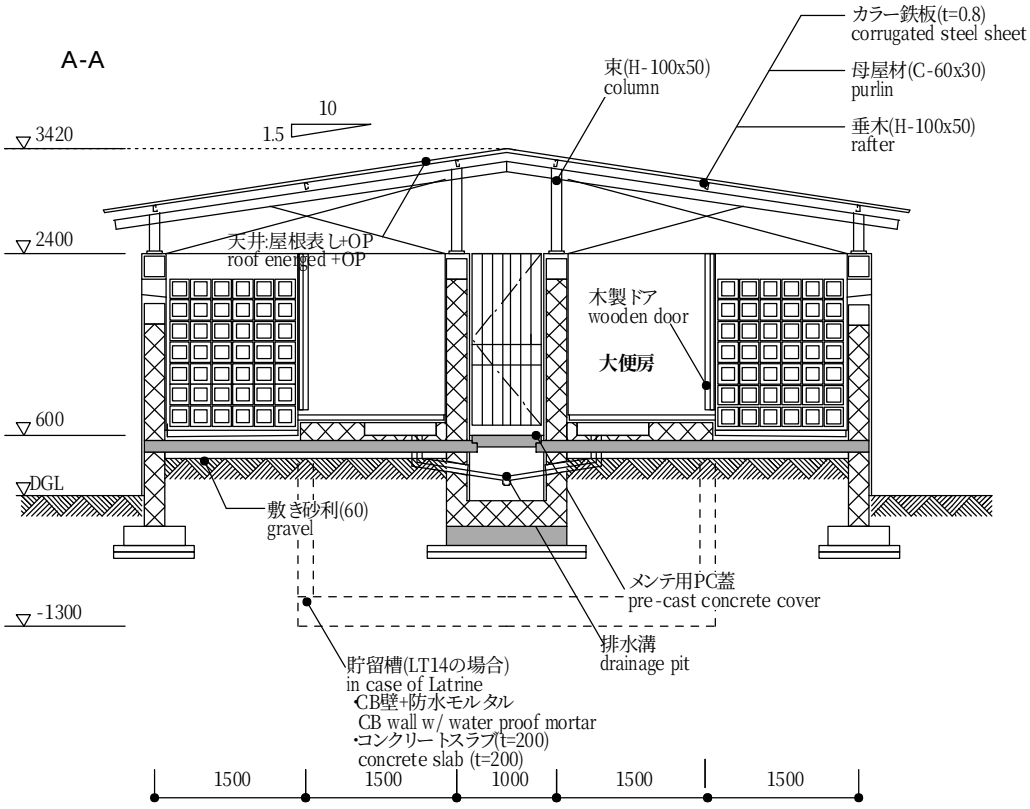
1階平面
ground floor

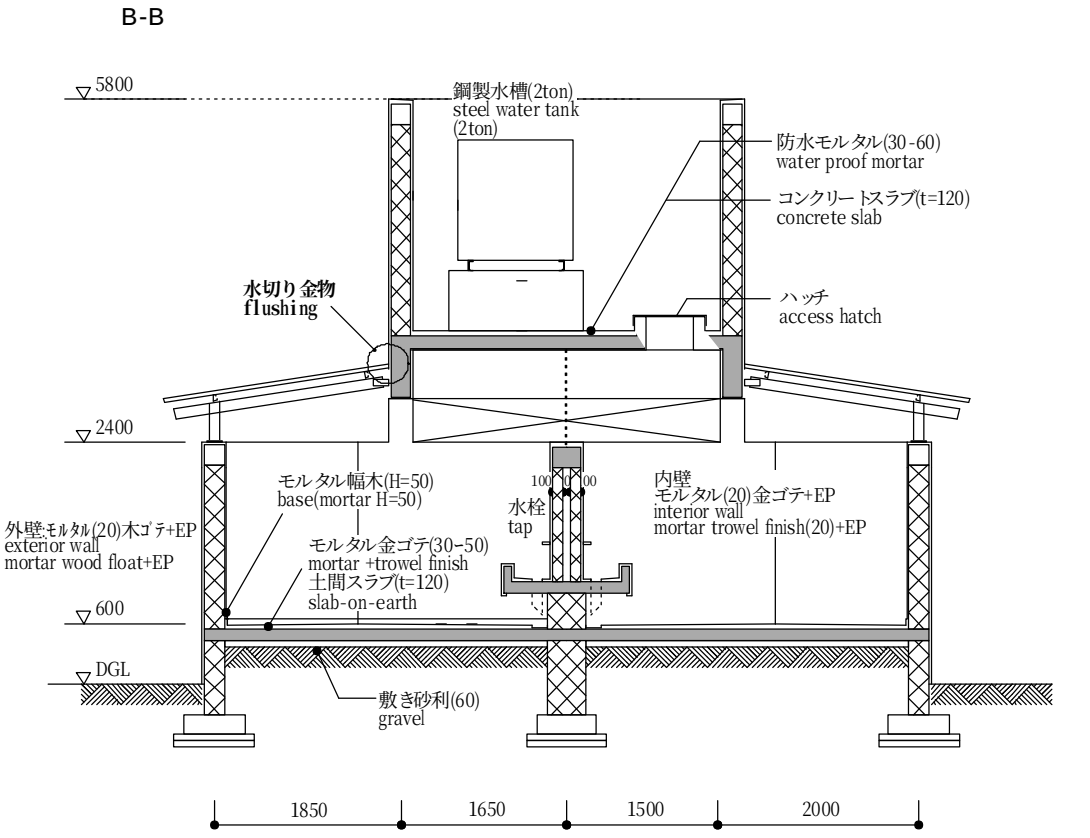
(2) 教室棟一般図 / Classroom
・立面図(8b type) / ELEVATION S=1/200

・立面図(4 type) / ELEVATION S=1/200

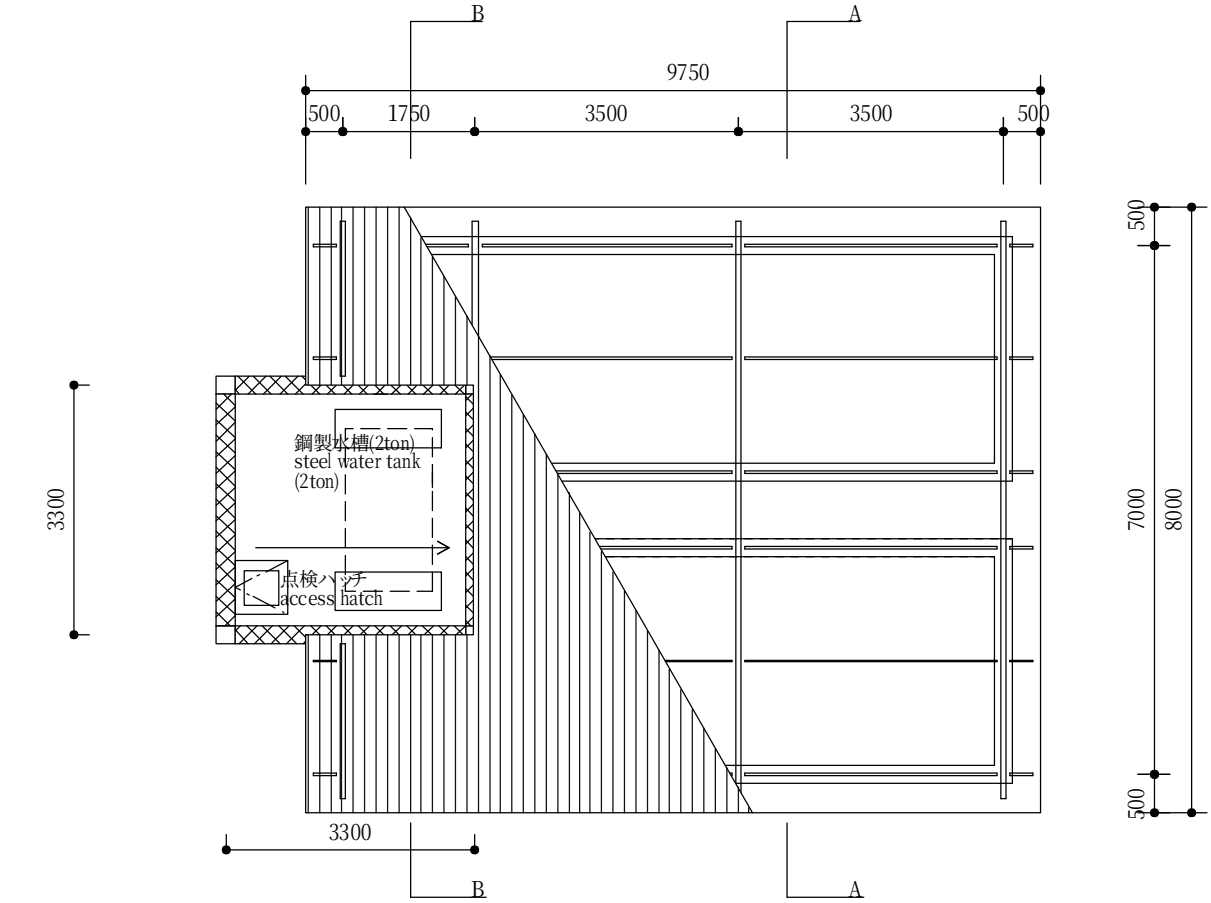


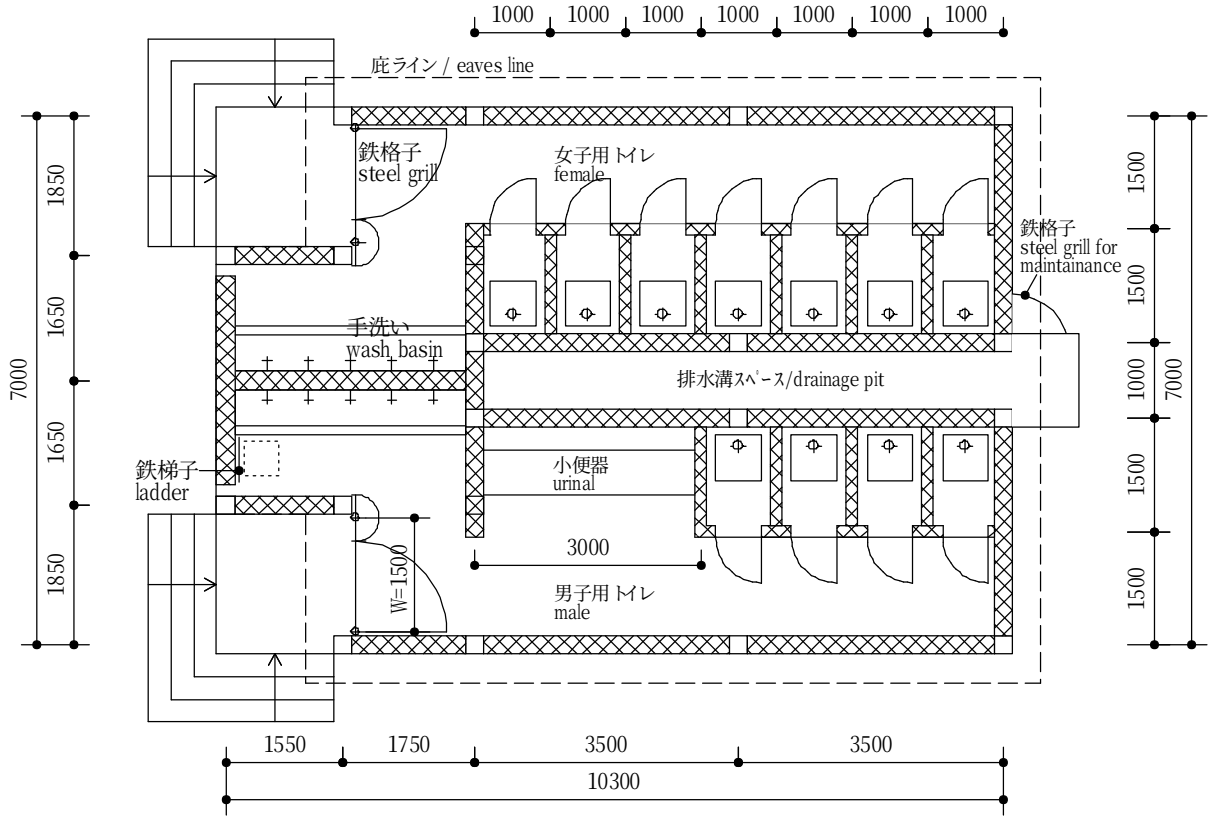
(3) 便所棟一般図 / Sanitary building
・矩形図 / DETAIL SECTION S=1/75



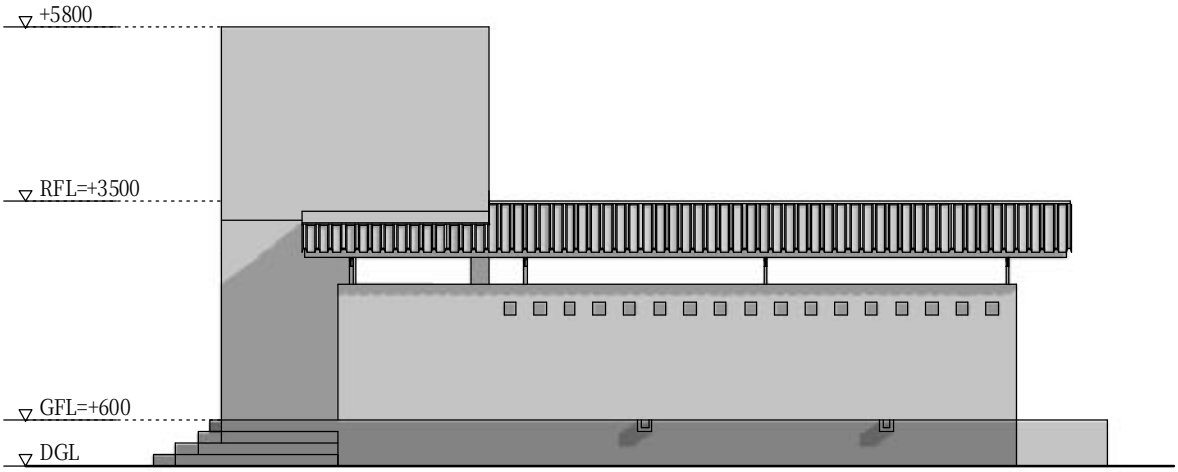


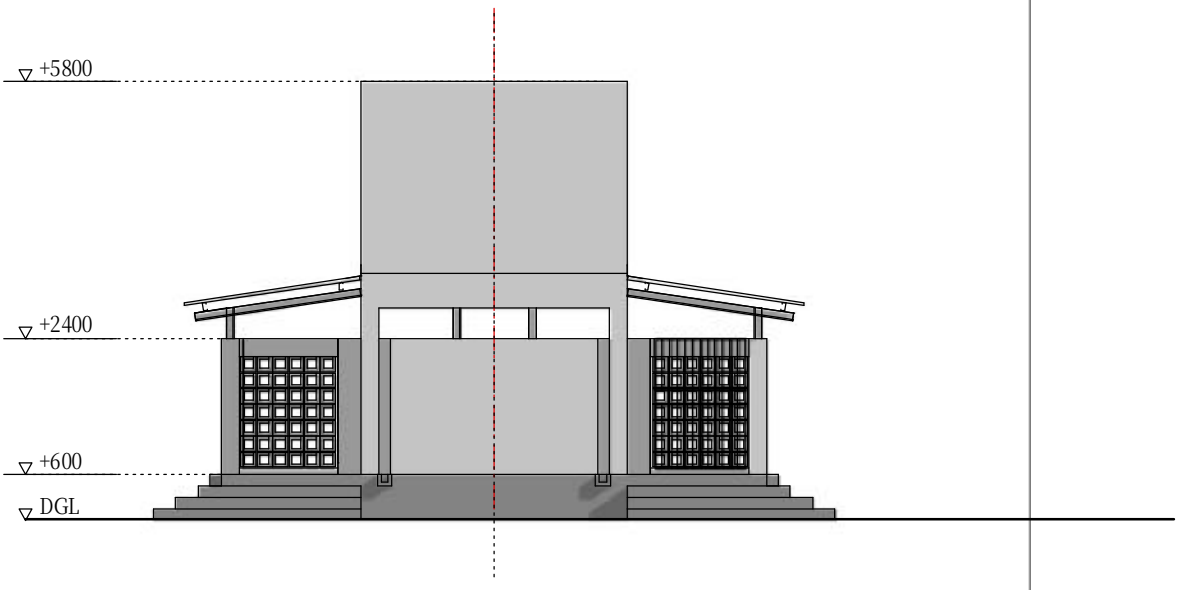
・平面図 / PLAN S=1/100



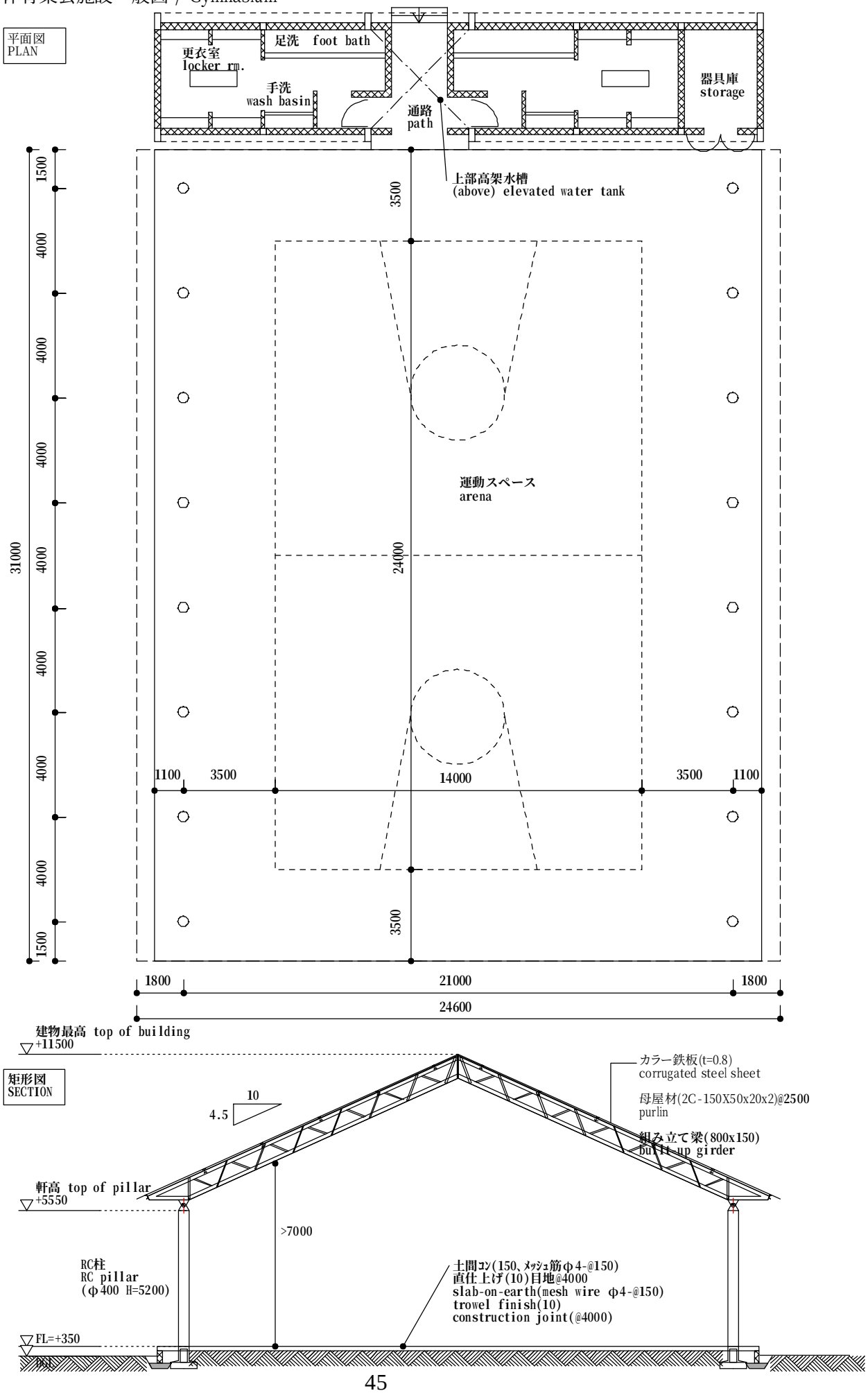


・立面図 / ELEVATION S=1/100

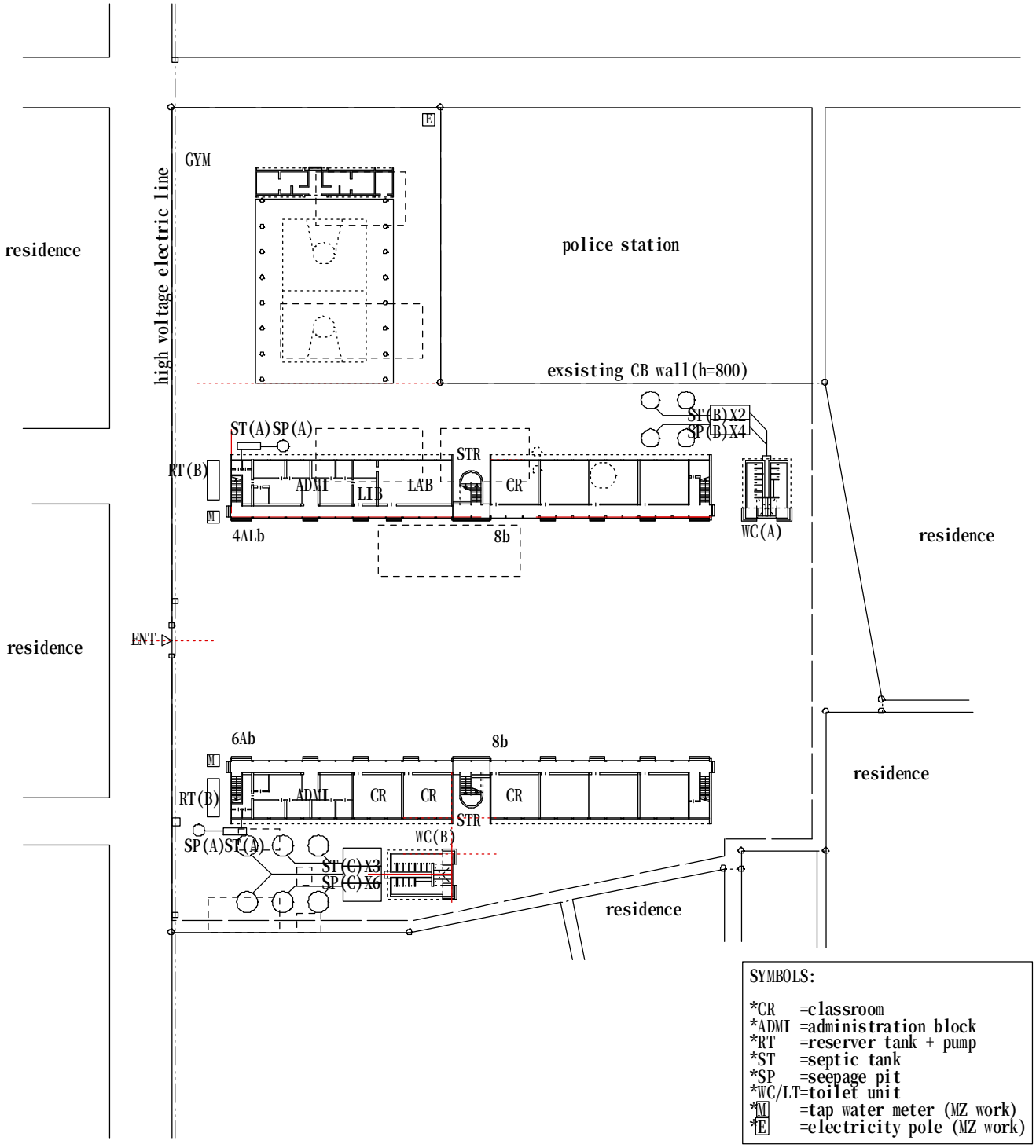




(4) 体育集会施設一般図 / Gymnasium

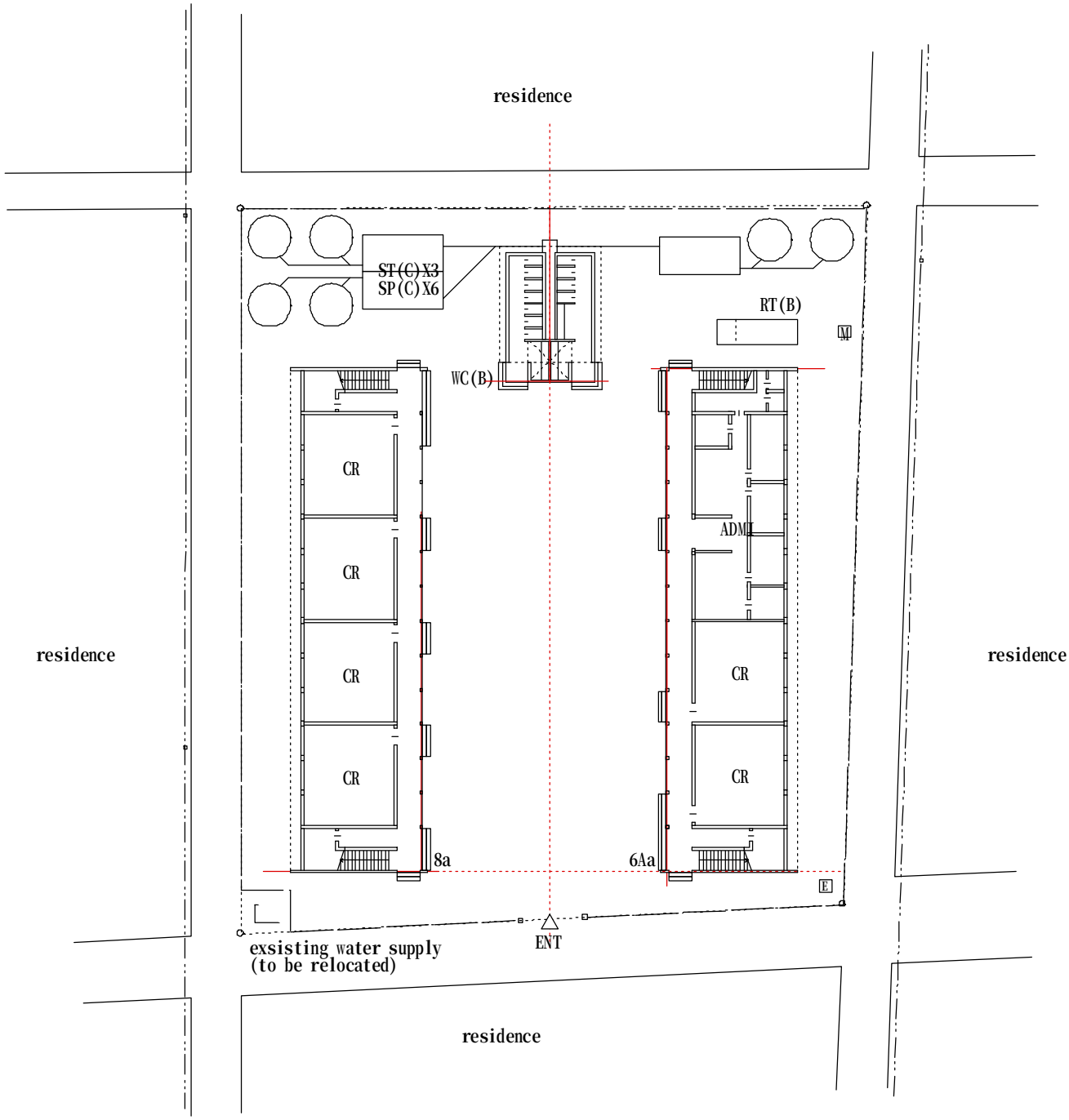


(5) 施設配置図 / SITE PLAN



SCALE=1/1000

1	EP+ESG	*New Site *Area :12,100msq. *Nos.of cl.rooms:12(ESG) 14(EP)	*Water :tap water (intake to site by MZ) *Electriciy :available *Demolishing :need *Filling Soil:no need	*Building type:4ALb+8b+STR+GYM(ESG) 6Ab+8b+STR(EP) *Floor Level :GL+500 *Sun Protect :applied for all *Sanitary type:WC(A) (ESG) WC(B) (EP)	20°
District No.4 3 de Fevereiro(1)					



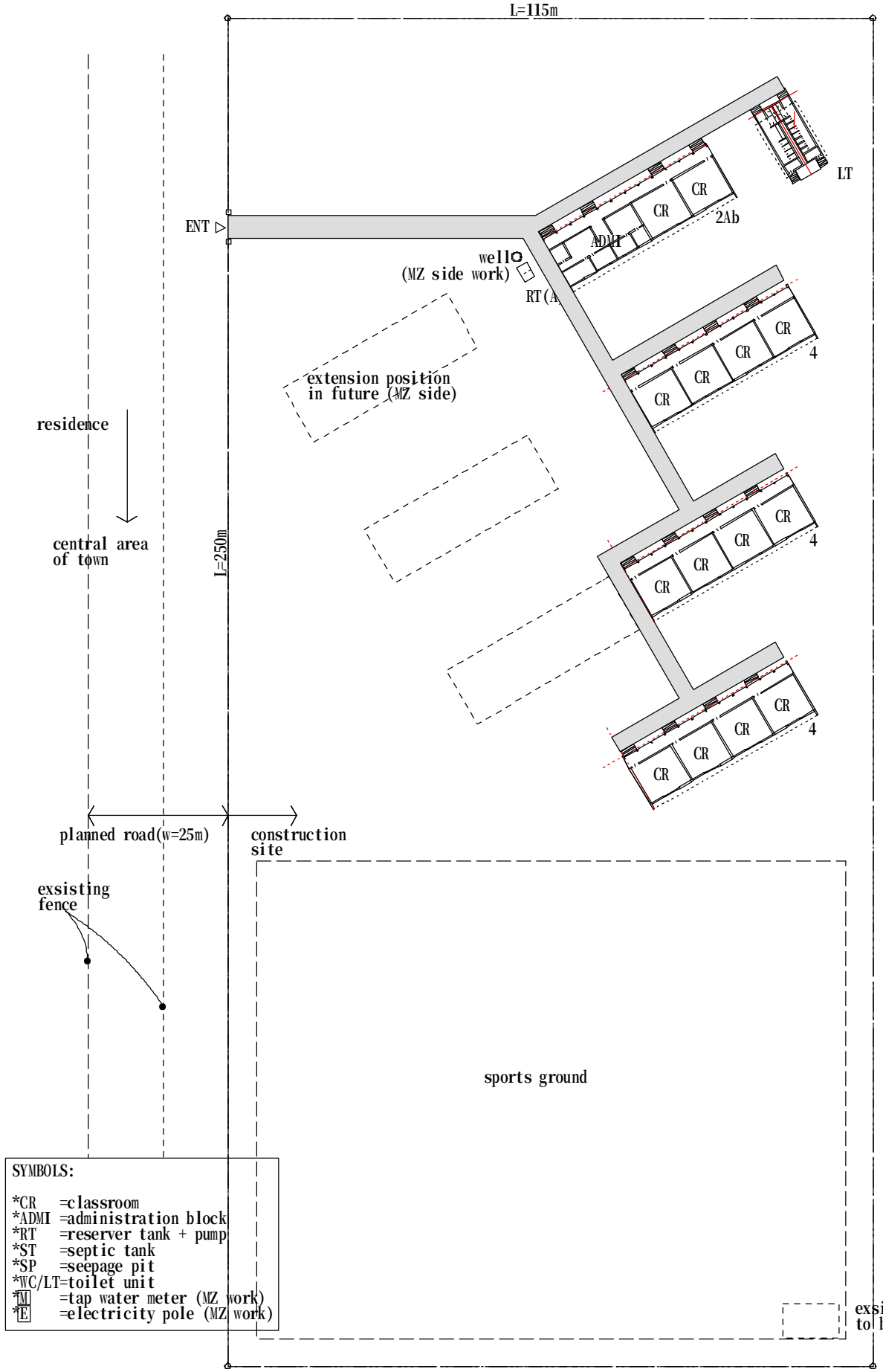
SYMBOLS:

*CR =classroom
*ADMI =administration block
*RT =reserver tank + pump
*ST =septic tank
*SP =seepage pit
*WC/LT=toilet unit
*M =tap water meter (MZ work)
*E =electricity pole (MZ work)

exsisting buildings, to be demolished

SCALE=1/500

2	EP	*New Site *Area :2,800msq. *Nos.of cl.rooms:14	*Water :tap water (available) *Electriciy :available *Demolishing :no need *Filling Soil:no need	*Building type:6Aa+8a *Floor Level :GL+500 *Sun Protect :applied for all *Sanitary type:WC(B)	20°
District No.4 3 de Fevereiro(2)					

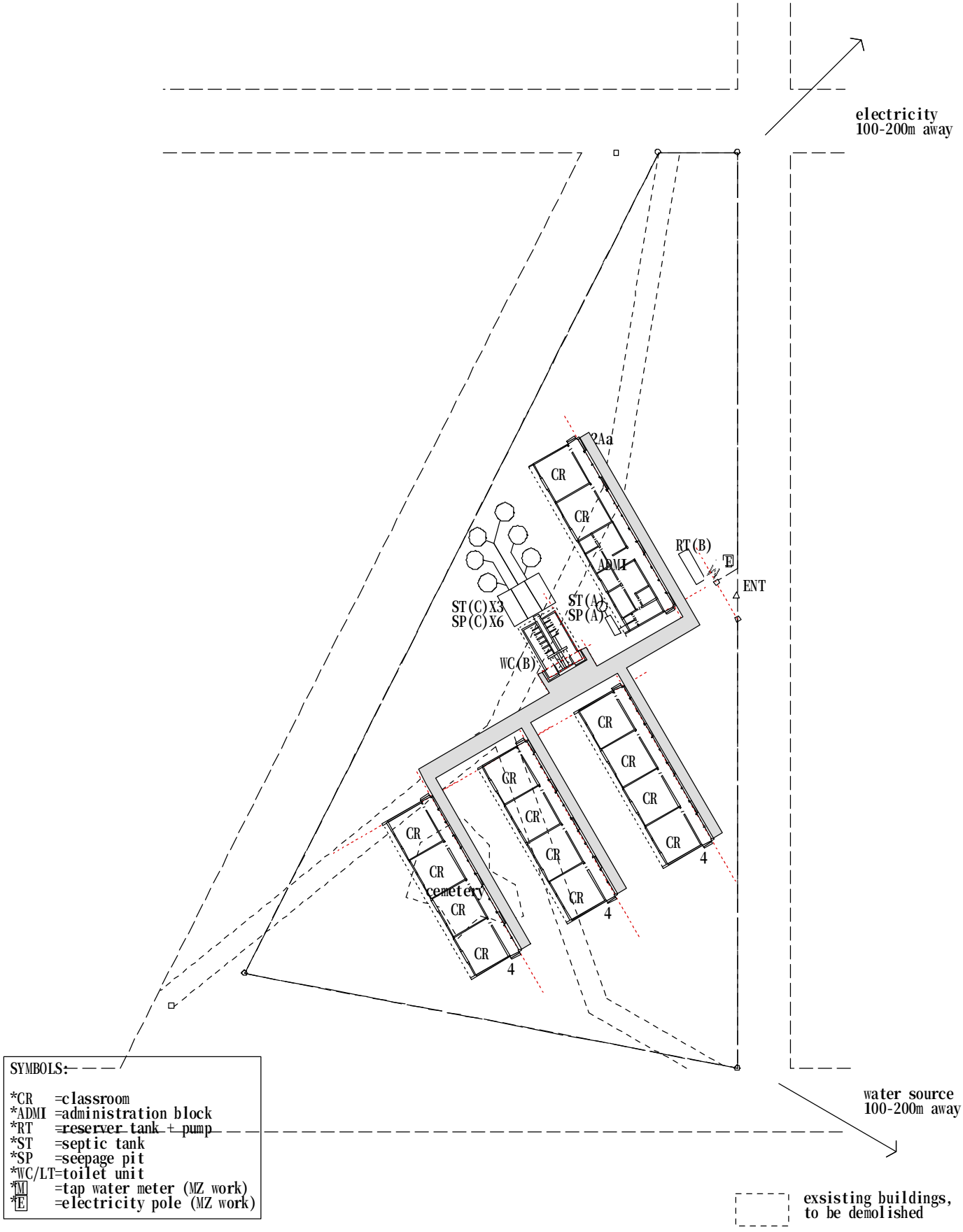


SYMBOLS:

*CR =classroom
*ADMI =administration block
*RT =reserver tank + pump
*ST =septic tank
*SP =seepage pit
*WC/LT=toilet unit
*M =tap water meter (MZ work)
*E =electricity pole (MZ work)

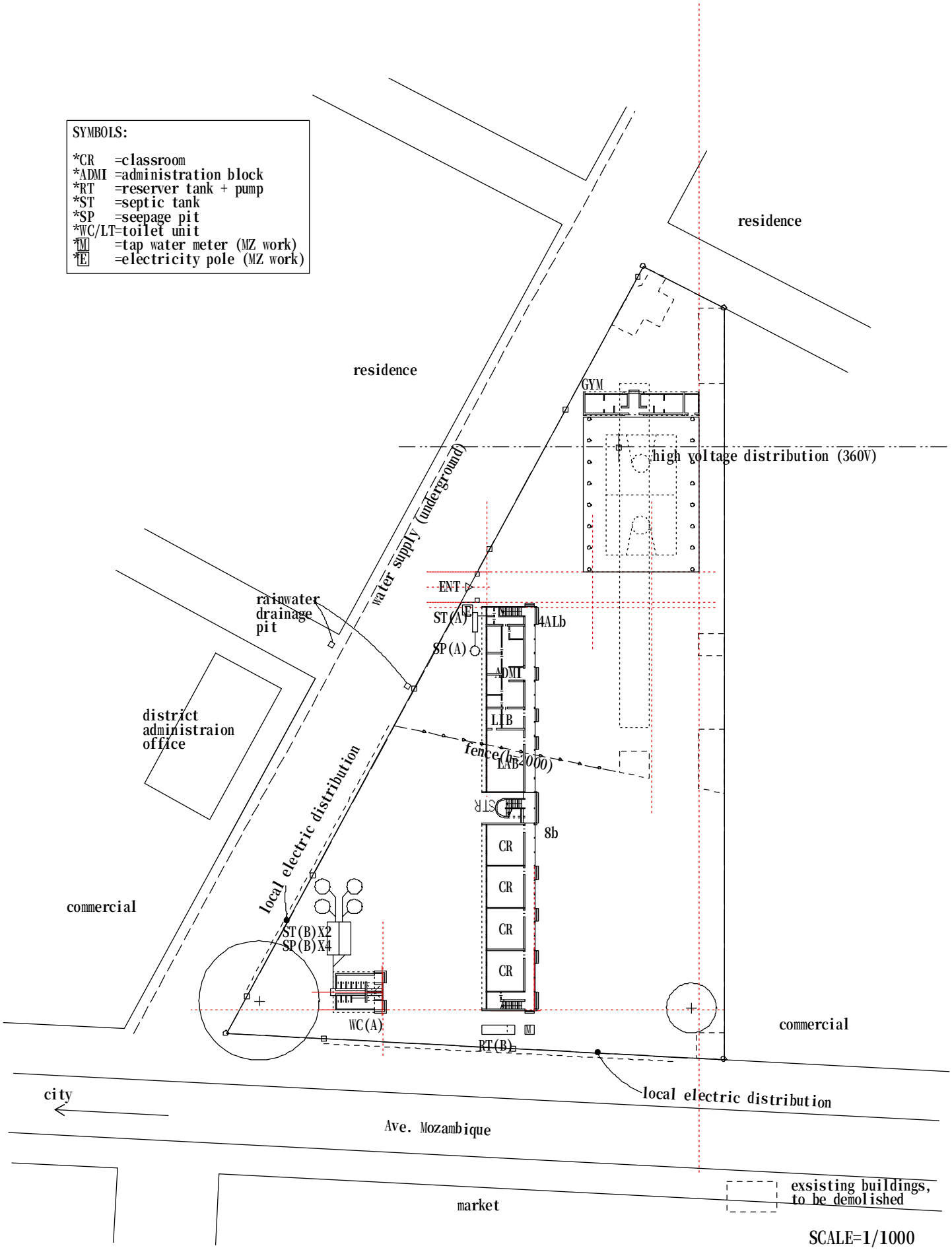
SCALE=1/1000

3	EP	*New Site *Area :28,750msq. *Nos.of cl.rooms:14	*Water :well(by MZ) *Electriciy :no available *Demolishing :no need *Filling Soil:no need	*Building type:4x3+2Ab *Floor Level :GL+1000 *Sun Protect :not applied *Sanitary type:LT	30
District No.5 Magoanine					

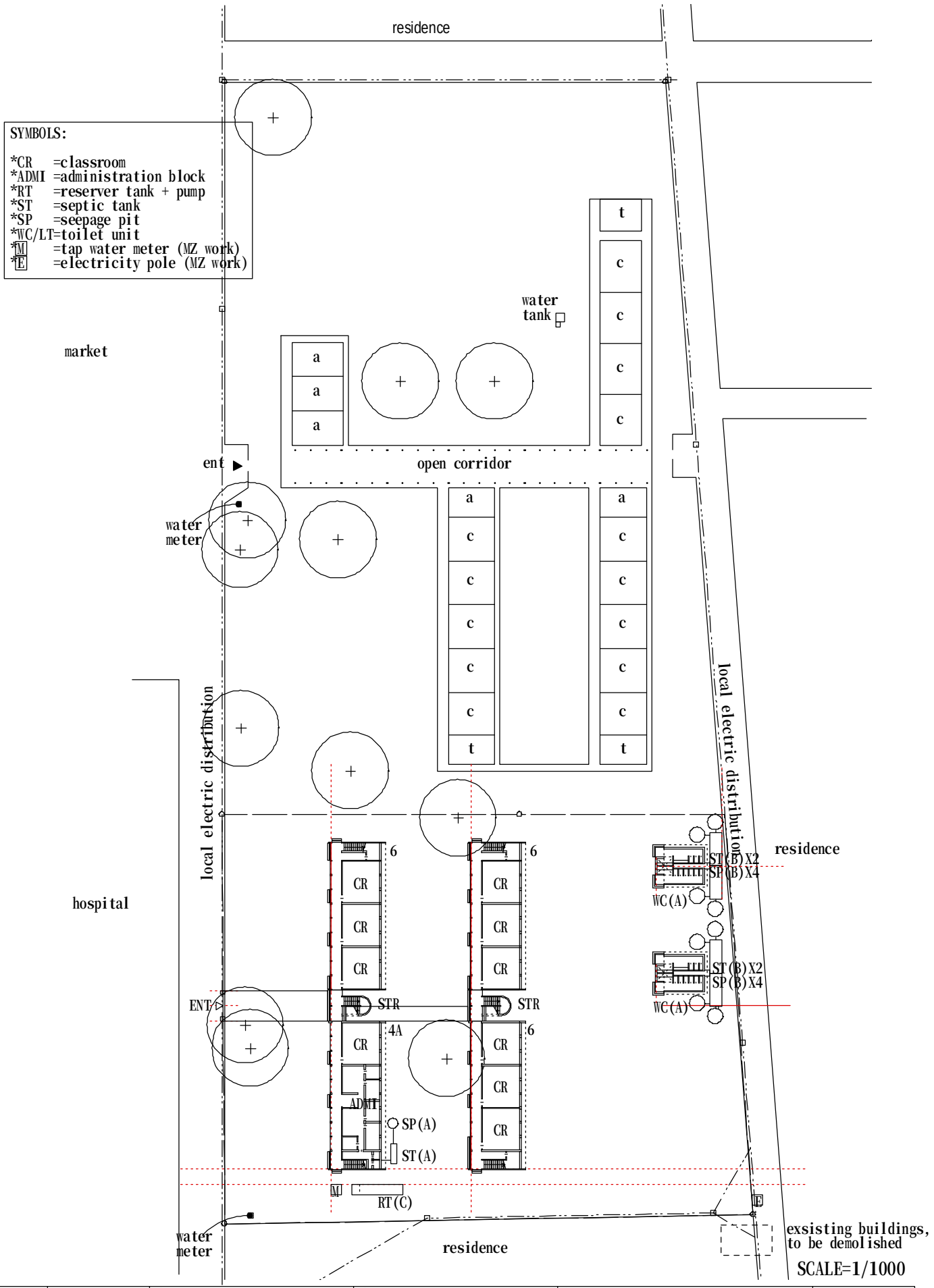


SCALE=1/1000

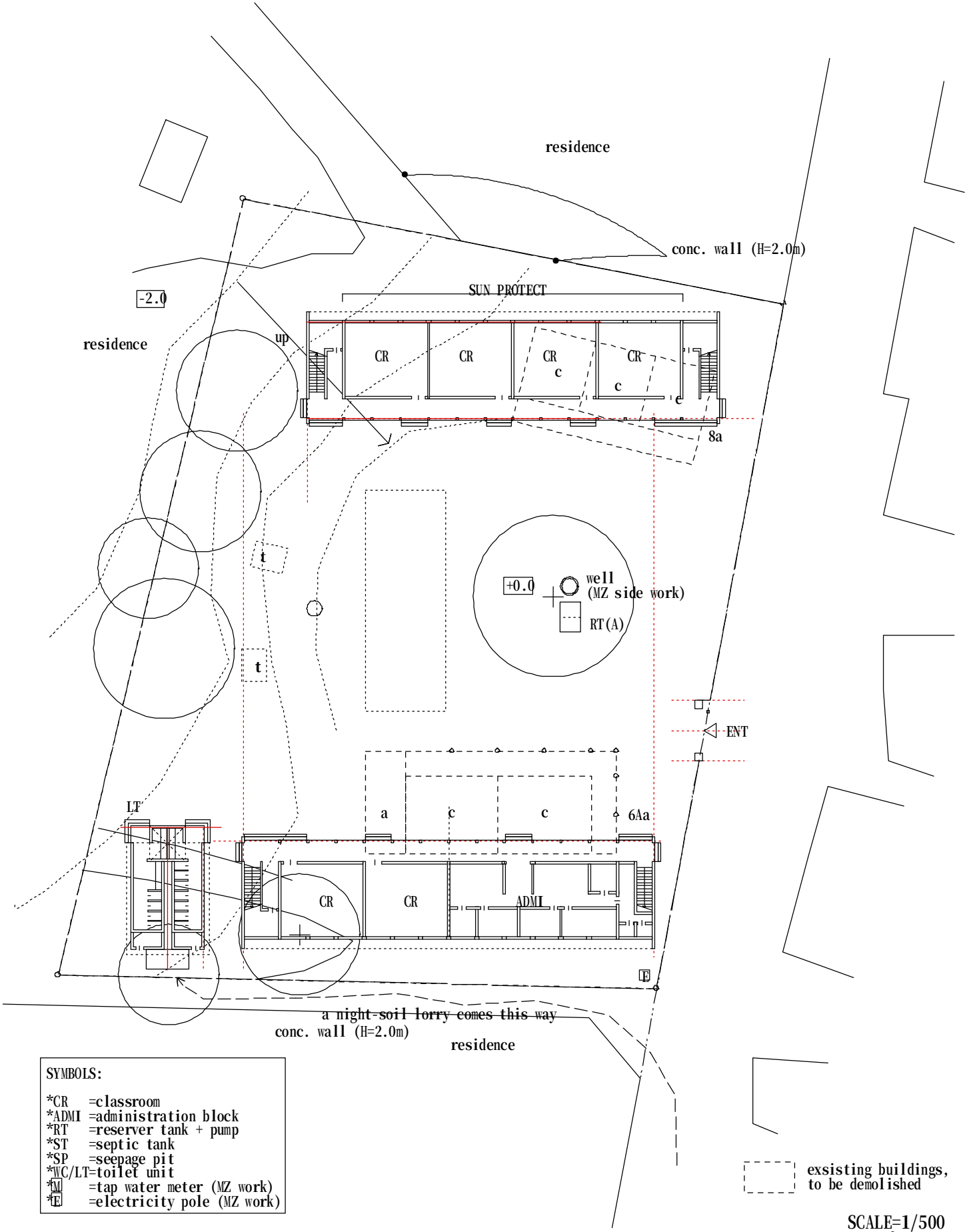
4	EP	*New Site *Area :9,300msq. *Nos.of cl.rooms:14	*Water :tap water (intake to site by MZ) *Electriciy :available (intake to site by MZ) *Demolishing :need *Filling Soil:no need	*Building type:4x3+2Aa *Floor Level :GL+500 *Sun Protect :not applied *Sanitary type:WC(B)	30°
District No.4 Albazini					



5	ESG	*New Site *Area :9,200msq. *Nos.of cl.rooms:12	*Water :tap water *Electriciy :available *Demolishing :need *Filling Soil:no need	*Building type:8b+4ALb+STR *Floor Level :GL+500 *Sun Protect :not applied *Sanitary type:WC(A)	5°
District No.5 25 de Junho					



6	EP	*Exsisting Site *Area :8,000msq. *Nos.of cl.rooms:22	*Water :tap water *Electriciy :available *Demolishing :no need *Filling Soil:need	*Building type:4A+6x2+STRx2 *Floor Level :GL+500 *Sun Protect :not applied *Sanitary type:WC(A)x2	5°
District No.5 Bagamoyo					



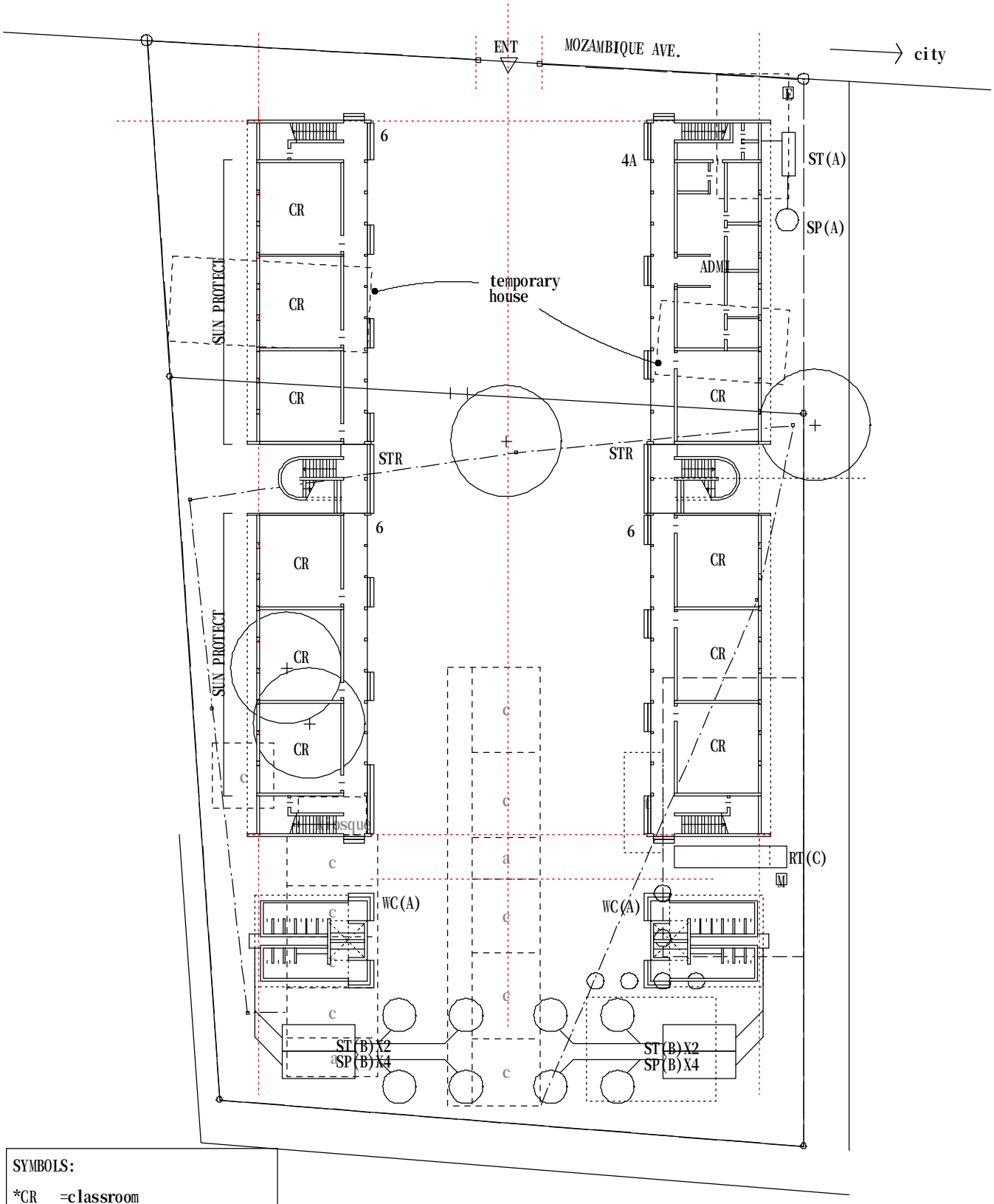
SYMBOLS:

*CR =classroom
*ADMI =administration block
*RT =reserver tank + pump
*ST =septic tank
*SP =seepage pit
*WC/LT=toilet unit
*M =tap water meter (MZ work)
*E =electricity pole (MZ work)

exsisting buildings, to be demolished

SCALE=1/500

7	EP	*Exsisting Site *Area :4,200msq. *Nos.of cl.rooms:14	*Water :well water (bored by MZ) *Electriciy :available *Demolishing :need *Filling Soil:need	*Building type:6Aa+8a *Floor Level :GL+500 *Sun Protect :applied for 8a *Sanitary type:LT	15°
District No.4 Costa do Sol					



SYMBOLS:

*CR =classroom
*ADMI =administration block
*RT =reserver tank + pump
*ST =septic tank
*SP =seepage pit
*WC/LT=toilet unit
*M =tap water meter (MZ work)
*E =electricity pole (MZ work)

exsisting buildings, to be demolished

SCALE=1/500

8	EP	*Exsisting Site *Area :5,300msq. *Nos.of cl.rooms:22	*Water :tap water *Electriciy :available *Demolishing :need *Filling Soil:no need	*Building type:4A+6x3+STRx2 *Floor Level :GL+500 *Sun Protect :applied for 6x2 *Sanitary type:WC(A)x2
District No.5 Unidade 2				

2.2.9 Implementation Plan

2.2.9.1 Implementation Concept

(1) Basic Requirements for Project Implementation

For the implementation of the Project for Construction of Primary and Secondary Schools in Maputo City in the Republic of Mozambique (the Project), the cabinet approval of the Government of Japan is required after examination of the Project by various related organizations in Japan based on this Report. The Project will advance to the implementation stage following the signing of the Exchange of Notes (E/N) for project implementation by the two governments after the cabinet approval mentioned above. The Japanese Consultant and Japanese Contractor will be responsible for the preparation of the detailed design and the actual construction work respectively. The Consultant and Contractor will conclude a consultancy agreement and construction agreement respectively with the implementation body on the Mozambique side in accordance with the grant aid scheme of the Government of Japan. These agreements must be certified by the Government of Japan.

(2) Project Implementation System

The overall responsible organization for the implementation of the Project on the Mozambique side is the Ministry of Education (MINED) (the Directorate of Planning will be in charge) and the E/N for the implementation of the Project will be signed by the Ministry of Foreign Affair and Cooperation and the Embassy of Japan in Mozambique. Under the supervision of the MINED's Directorate of Planning, the Directorate of Education of Municipality Authority (DEMMA) will act as the project implementation body. The MINED will also act as the party to the detailed design and supervision agreement with the Consultant and the construction agreement with the Contractor. the DEMMA will be responsible for the work to be conducted by the Mozambique side, including the preparation of the proposed school sites, the extension of water supply and power supply to the said sites and the construction of a well at some of the sites.

(3) Consultant

Following the signing of the E/N by the two governments, the MINED will conclude a design and supervision agreement, featuring the detailed design and work supervision, with a Japanese consultant (the Consultant). The Consultant which is appointed to conduct the basic design study for the Project will be awarded the contract to conduct the detailed design and work supervision in order to ensure the smooth implementation of

the Project. After certification of the agreement by the Government of Japan, the Consultant will conduct the detailed design for the facilities and equipment and will prepare the tender documents based on the basic design study report and results of consultations with the MINED's Directorate of Planning and the DEMM Government. After approval of the detailed design and tender documents by the MINED, the Consultant will act as the agent for the tender procedure to select the Contractor and will conduct the supervisory work up until the end of the construction work in accordance with the design and supervision agreement.

(4) Contractor

The actual work under the Project will consist of the construction of school facilities and the procurement and supply of equipment. The Contractor to be responsible for this work will be selected by an open tender to be held for suitably qualified Japanese construction companies. In principle, the bidder with the lowest bid price will be selected as the successful bidder (the Contractor) and will conclude a construction agreement with the MINED. The Contractor will complete the assigned work within the period specified in the agreement and will hand over the completed facilities and equipment to the MINED after their satisfactory completion inspection.

(5) Use of Local Consultants and Local Construction Companies

The design of school facilities in Mozambique is centrally controlled by the GEPE in the case of the construction of such facilities with a loan provided by the World Bank, the African Development Bank and others. In the case of facilities constructed by bilateral aid, NGO grant aid or central government funding, provincial governments are responsible under the supervision of the Planning and Project Implementation Department of the MINED's Directorate of Planning. School facility design in Maputo City (which has the same rank as a province) is supervised by the DEMMA. Both the GEPE and the DEMM have their own design engineers and do not use outside consultants. Accordingly, there is no local consultant specialising in school facilities. While the planned facilities under the Project do not require a high level of construction technology, the inclusion of someone who is familiar with the construction of school facilities in Mozambique in the supervisory team is deemed desirable in order to ensure the efficient supervision of a uniform technical standard at the many planned sites.

Because of the stagnant economy throughout the 1980's, large local construction companies have failed to emerge in Mozambique. However, foreign-affiliated construction companies have been active in recent years following the inflow of foreign capitals to establish businesses in Mozambique. These foreign-affiliated construction

companies have superior technological strength and machinery to local companies even though the latter have been gradually accumulating experience and technical expertise due to the recent boom in the construction industry. These foreign-affiliated construction companies or local construction companies will act as subcontractors of the Japanese Contractor and will conduct the actual construction work under the Project.

Although the construction scale at each site under the Project is relatively small, the total scale of the construction work involving eight sites is fairly large. The capability of local construction companies should be carefully assessed in view of the desirable use of more than one subcontractor to simultaneously proceed with the work at different sites. In addition, it will be necessary for the Contractor to introduce schedule control techniques, etc. in view of the strict enforcement of the standardised construction schedule to ensure the completion of the work within the set period.

2.2.9.2 Implementation Conditions

(1) General Situation and Characteristics of Local Construction Industry

1) Construction Industry

The construction industry in Mozambique was practically stagnant during the period of civil war with little progress of investment by the private sector until 1992 when the civil war ended. In recent years, however, development projects led by South African and other foreign capitals have been implemented in and around Maputo, stimulating the establishment of foreign-affiliated construction companies even though the growth of local construction companies has still been slow. The construction demand is not strong except in city areas and the main construction work of local construction companies is in the form of civil engineering work for the construction of public roads and bridges, etc. with government funding. The leading construction companies are affiliated to South African, Chinese and Portuguese capitals and construction companies established by domestic capitals are either small or medium size.

2) Workforce

While ordinary labourers can be recruited in Maputo, there are few skilled workers or foremen for work regarding forms, reinforcing bars, plastering and equipment installation, etc. Given the situation of the local workforce and the technical level, the recruitment of skilled workers through several construction companies will be necessary to ensure the progress of the planned construction work with a uniform

technical standard. In addition, many foremen should be deployed to guide and train ordinary labourers to the level of skilled workers.

3) Construction Materials

The only construction materials produced in Mozambique are gravel, sand, cement, bricks, timber, furniture and wooden windows and doors and all other materials are imported. The quality of locally produced cement widely varies. Even though locally produced cement can be used for mortar and flooring, the use of imported concrete is preferable in the case of structural concrete. Bricks are hand-made and their hardness and dimensions are not uniform. These bricks are unsuitable for masonry work and are used as a base for mortar and as core bricks for omni-slabs. Most construction materials are imported from South Africa and, therefore, South African standards are commonly used. As the import procedure is complex and time-consuming, it is essential to consult the related offices in advance to ensure the timely import of the required materials in suitable quantities.

4) Transport

The conditions of all state road class trunk roads out of Maputo are fairly good, posing no problem in regard to the transportation of equipment and materials from neighbouring countries. Within Maputo itself, there are no vehicle access problems at any of the sites except the Magoanine site. The unpaved state of the roads at the Magoanine site will make the use of 4 WD vehicles necessary. It will also be necessary to check the road conditions immediately prior to a planned journey, taking the vehicle type and weight, etc. into consideration.

(2) Points to Note for Construction Work

The following points must be noted for the construction of the school facilities under the Project.

Regular meetings attended by the DEMM (the project implementation body) should be held to receive and discuss the reporting of the work and to facilitate understanding of and cooperation for the Project and the implementation of budgetary appropriation by the Mozambique side.

The construction work plan should ensure prompt and efficient work while maintaining a uniform technical standard at all of the sites which are distributed over a wide area.

Demonstrations should be held to facilitate the understanding of workers of the key requirements, processes and objectives, etc. of each job type and to facilitate the transfer of skills.

The transportation and work schedule should ensure the maximum and efficient use of the planned construction period. The construction schedule should take the rainy season into consideration.

Prior to the selection of locally produced materials, their quality and supply potential should be thoroughly checked and multiple supply routes should be selected to encourage competition between suppliers while ensuring a steady supply of these materials.

As most construction materials are expected to be imported from South Africa, the relevant import procedure (process and time required) should be properly understood in view of the preparation of an appropriate construction schedule which includes the time required for material procurement (import).

2.2.9.3 Scope of Work

(1) Division of Construction Work

The appropriate division of the construction work between the Japanese and Mozambique sides is outlined below.

1) Work to be Undertaken by Japanese Side

- Construction of School Facilities

  Construction of classroom building (classrooms and administration block), sanitary block building and gymnasium (secondary schools only)

Table 2-11 Number of Classrooms by Site

	Type of School	Number of Classrooms
1) 3 de Fevereiro (1)	EP	14
	ESG1	12
	Sub-Total	26
2) 3 de Fevereiro (2)	EP	14
3) Magoanine	EP	14
4) Albazini	EP	14
5) 25 de Junho	ESG1	12
6) Bagamoyo	EP	22
7) Costa do Sol	EP	14
8) Unidade 2	EP	22
Total	EP	114
	ESG1	24
	Total	138

- Teaching Aid Equipment (for science, geography and arithmetic lessons at primary schools and geography, mathematics and science lessons at secondary schools)

2) Work to be Undertaken by Mozambique Side

- Provision and preparation of land

- Extension of power supply to the site boundary at those sites where power supply to the new facilities is planned and provision of a water supply system (by means of extension of the municipal water supply or excavation of a well)

- Removal or relocation of the existing building(s) and structures which are obstacles to the new facilities

- Preparation of the sports ground and construction of such auxiliary outdoor features as landscaping, gates, fencing and outdoor lighting, etc.

2.2.9.4 Consultant Supervision

(1) Basic Principles and Points to Note for Detailed Design and Work Supervision

The Consultant will discuss all relevant issues with the Government of Mozambique, will conduct the detailed design for the planned facilities and equipment and will prepare the necessary tender documents, taking the main concept indicated by the basic design into consideration. At the supervisory stage of the construction work, the Consultant will dispatch a full-time supervisor to Mozambique to provide guidance for the Contractor and to liaise with the MINED, the DEMM and other related public offices. The concrete work to be conducted by the Consultant is listed below.

- Detailed Design

  Preparation of the tender documents (specifications and detailed drawings) for the construction work and equipment-related work

- Facilitation of Tender and Construction Agreement

  Decision on the construction agreement principles, preparation of the draft construction agreement, internal study of the work details and selection of the construction company, i.e. the Contractor (public announcement of the tender, pre-qualification, bid evaluation and witnessing of the signing of the agreement)

- Inspection and Approval of Shop Drawings

  Inspection and approval of the shop drawings, construction plan, material and finishing samples and equipment submitted by the Contractor

- Work Guidance

  Examination of the work plan and schedule plan to provide relevant guidance for the Contractor

- Reporting of Work Progress

  Reporting of the work progress to the project implementation body and other related bodies and management of the monthly meetings between the DEMM and the Contractor

- Assistance Regarding Payment Approval Procedure

  Examination of invoices, etc. related to remuneration payable to the Contractor midway through and after the completion of the construction work and assistance regarding payment approval

- Inspection

  Inspection of the quantities and quality of the work executed during the entire construction period

(2) Supervisory System

The Consultant will be responsible for controlling the quality, schedule and safety of the school facility construction work at many sites in different parts of Maputo under the Project. A Japanese engineer acting as the on-site supervisor and a local (or third country) engineer acting as an assistant supervisor will be assigned on a full-time basis to provide appropriate guidance, to coordinate with the related municipal as well as central government offices and to facilitate the smooth implementation of the work based on the design documents. In addition, Japanese engineers (chief engineer and building engineer) will be dispatched at the time of work commencement and completion inspection.

(3) Relationship Between Various Organizations at Implementation Stage

Many organizations, ranging from the Government of Mozambique and the Government of Japan to the Contractor, local subcontractors, the Consultant and others, are involved at the project implementation stage. The relationship between these organizations is shown in Fig. 2-10.

(4) Work Management System

The Japanese Contractor will use more than one local construction company as subcontractors for the construction work. It will be essential for the Contractor to assign an adequate number of personnel and to establish an appropriate work implementation system to ensure the application of uniform construction technologies/skills and quality among the subcontractors. A construction office will be established in Maputo to manage the work at the eight sites. This office will be accompanied by a stock yard for equipment and materials, a reinforcing bar workshop and a form workshop, etc. A site office will be set up at each of the eight sites.

The required site management system in view of the scale and contents of the facilities planned under the Project is shown in Fig. 2-11.

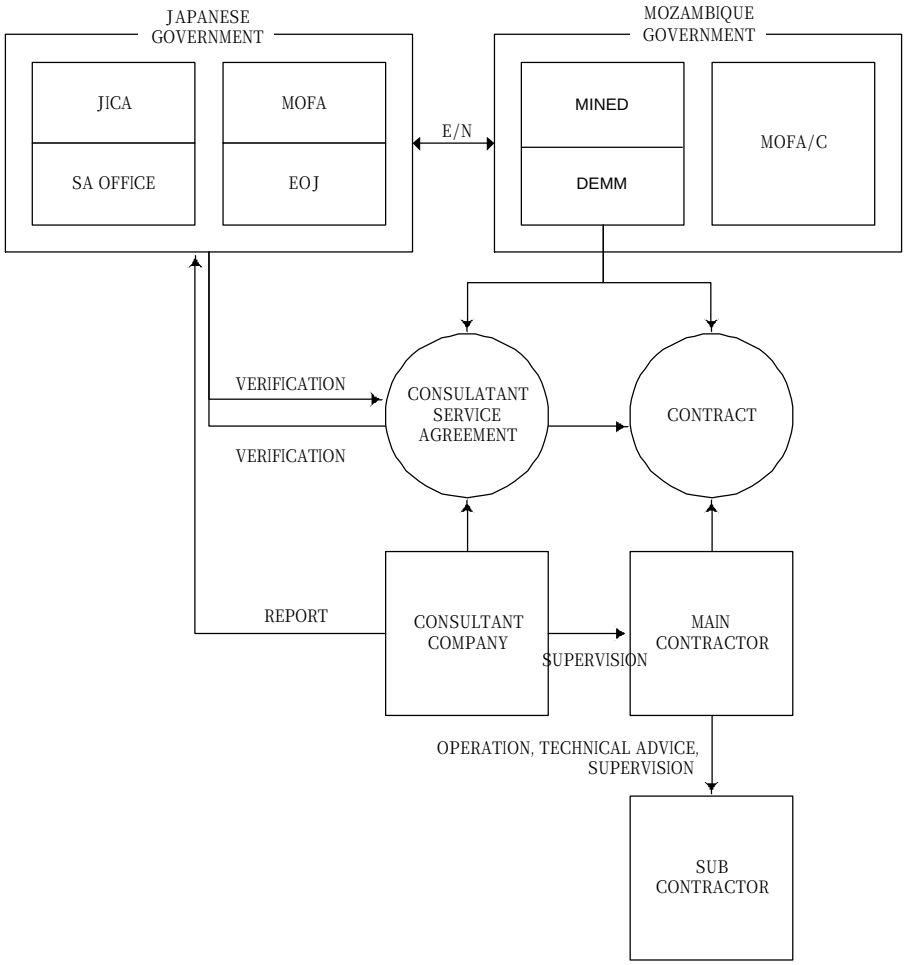


Fig. 2-10 Relationship Between Various Organizations Involved in the Implementation of the Project

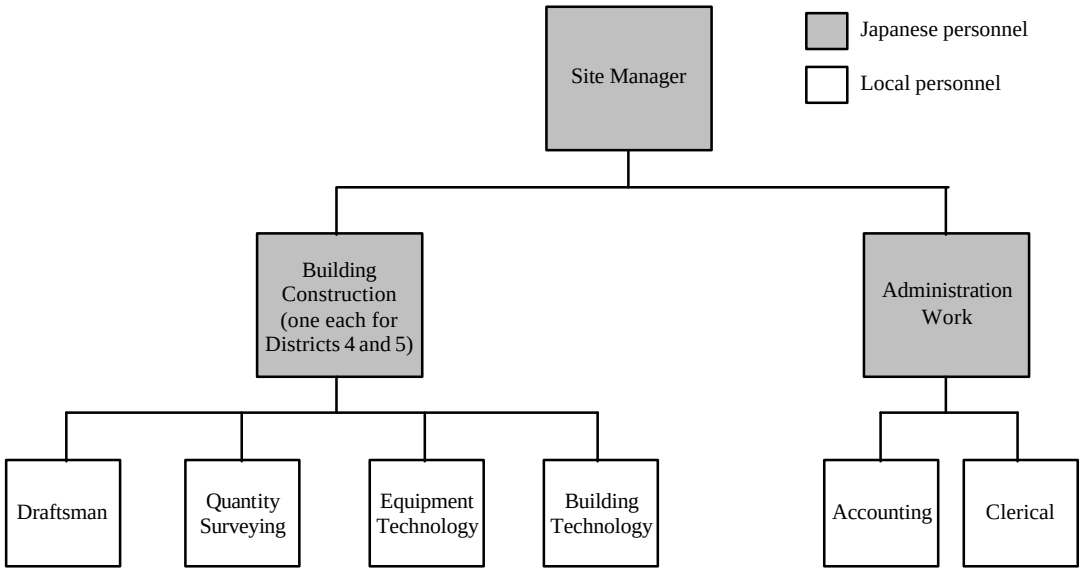


Fig. 2-11 Site Management System

2.2.9.5 Quality Control Plan

(1) Confirmation of Soil Bearing Capacity

During the basic design study period, a test pit was dug at all of the sites and good soil bearing capacity of 100 kN/m^2 or higher was visually judged. A simplified loading test at the level of the foundation bottom (standard: GL –500 mm) will be conducted prior to the construction work to confirm the design soil bearing capacity required to support the planned buildings.

(2) Confirmation of Site Conditions and Staking Out

The site boundaries, conditions of existing structures and underground structures, drainage route(s) at the site, waste water treatment method, differences in altitude and situation of existing trees, etc. will be confirmed in an integrated manner using the site survey map. This will be followed by line marking using hydrated lime or staking out so that the relative relation between the planned buildings and the surrounding area can be confirmed or adjusted in the presence of representatives of the Consultant and the project implementation agency on the Mozambique side.

(3) Benchmark, Profiling and Setting Out

A benchmark will provide the reference altitude of existing objects and new posts, etc. The surrounding area of a benchmark should be protected to prevent movement of the benchmark. Profiling and setting out are important throughout the construction period, acting as accurate standards for the dimensions and locations. Suitable survey equipment (auto-levels and theodolites, etc.) should be used and it will ultimately be necessary for a Japanese engineer or supervisor to confirm their accuracy at all of the sites. Concrete sub-slabs will be placed below the planned foundation level for setting-out purposes as part of the foundation work.

(4) Scaffolding

The scaffolding logs should be carefully selected to ensure worker safety and work accuracy. Logs with significant damage, deformation or rot or logs with cracks, knots and/or a slanting grain pattern, constituting a major weakness of the strength, should not be used.

(5) Excavating and Back-Filling

Excavation of the foundations should be conducted at a width of 30 cm or more than the planned foundation width so that the work to remove the forms can be easily as well as

accurately conducted. This excavation work will be manually conducted. A work manual assuming deep excavation should be prepared in advance to set out concrete measures to deal with problems associated with rough grading. In regard to back-filling, a type of sandy soil which allows water binding, such as pit sand with a low humus and clayey soil content, should be used.

Back-filling will be conducted while compacting the soil every 30 cm in thickness and surplus filling should be conducted taking subsidence depending on the soil type into consideration. In regard to compacting, a vibration compactor will be provided at an approximate rate of one machine per two sites.

(6) Reinforcing Bars

The procurement and import of round bars, deformed bars and wire mesh reinforcement is judged to be advantageous in view of the tax-free cost, mass procurement and better schedule control.

In principle, delivery by the same supplier should be made to each site and the tensile test of at least 10 bars each delivery should be conducted to confirm the required quality of these materials. A reinforcing work manual should be prepared, detailing the test procedure, test report, storage, bending, tools, specifications for splicing, anchoring depth, hook shape, protective concrete cover thickness and use of a spacer, etc. The correctness of this manual must be confirmed prior to the construction work.

(7) Form Work

As plywood forms are commonly used in Mozambique, these will also be used for the Project. These plywood forms for concrete should comply with the agricultural and forestry standards of Japan and should be carefully selected to avoid poor hardening of the concrete surface. The relevant manual should be prepared and the correctness of its contents should be confirmed to ensure the quality of the form work.

(8) Concrete Work

The proportioning of concrete will be based on volume rather than weight in order to achieve a uniform quality. Mixing will be conducted on site using a small mixer. The cement will be stored in a roofed temporary warehouse at each site to keep it dry and to prevent theft. A work manual detailing the series of work from proportioning to mixing and placing, including the cement storage method, storage period, measures required for long storage and aggregate size control, should be prepared to facilitate understanding of

the work by workers. The work should be conducted with great care and proper checking of the key aspects of the work.

The concrete quality should be controlled in each area of concrete placement. At the time of placement, a slump test should be conducted and test pieces should be sampled to confirm the required strength by means of the compressive destruction test at a public laboratory. Three test pieces should, in principle, be sample for each of one week and four week strength tests. If there is no reliable testing laboratory in the area, a portable tester should be used to enforce self control.

(9) Structural Steel Work

Structural steel made in South Africa will be used. Given the level of local welding skill and schedule control, all steel will be fastened using bolts instead of welding to achieve the required quality. This means that the entire processing work, including the attachment of pieces and plates, will be conducted in South Africa and the installation precision of such pieces and plates must be confirmed.

(10) Plaster Work

As the finishing work will mainly take the form of cement plastering, the quality and accuracy of the plastering work will largely determine the effect of the building. In the case of sand, the use of river sand should, in principle, be given priority. If pit sand is used, the mud and organic matter contents should be carefully checked to confirm its suitability. The sand grading should be classified as Grade A for the base coat for the walls and floor and Grade B for the finishing coat for the walls. Ordinary Portland cement will be used with the following proportioning.

Table 2-12 Mix Proportions

Base	Application Location	Base Coat Cement : Sand	Finishing Coat Cement : Sand
Concrete	Floor	-	1:2.5
Concrete Blocks	Interior Walls	1:2.5	1:3.0
	Exterior Walls	1:2.5	1:3.0

At the time of base coating, wire mesh or similar should be applied at adjoining sections of the concrete and masonry work to prevent cracks. At the end of base coating, scratching should be conducted using a metal brush or similar. In principle, the mortar

should be mixed using a mixer at the site and the series of work processes should be compiled in the form of a work manual. All of the work must be conducted in accordance with this manual.

(11) Masonry Work

In principal, concrete blocks will be the principal masonry material and will be manufactured at either a special yard or at the site. For the manufacture of cored concrete blocks, special attention should be paid to the avoidance of any cracks or breakage.

(12) Doors and Windows

The entrance doors will be wooden panel doors in consideration of strength and maintenance and will be procured from furniture factories in suburban Maputo. The windows will have a wooden frame and steel jalousie. The jalousies will be procured and imported from South Africa.

(13) Painting Work

Exterior emulsion paint with a good weatherproof performance and ordinary emulsion paint will be used for the exterior and interior respectively. The work schedule should be carefully planned to allow sufficient time for preparation, inspection, drying and curing after painting.

2.2.9.6 Procurement Plan

The main construction materials will be imported from South Africa. The supply capacity, durability and quality of the materials will be carefully examined with dealing with South African suppliers. The procurement plan for the main materials is outlined below.

(1) Structural Work

- Cement : To be imported from South Africa. Locally produced cement will be used for concrete work other than structural work.
- Reinforcing bars : To be imported from South Africa or another third country.
- Aggregates : Fine aggregate (river sand) and coarse aggregate (crushed stone) to be obtained near the sites.
- Forms : In principle, plywood forms will be used. The manufacturing method will be carefully examined for forms for columns and beams to ensure good structural precision.

- Concrete blocks : To be made on site.
- Roofing steel : To be imported from South Africa, Sections should be of a transportable length which can be assembled on site, if necessary, using bolts. On site welding will not be conducted because of the lack of reliability.

(2) Finishing Work

- Plastering materials : Cement mortar will be produced on site. River sand obtained near the sites or pulverised crushed stone will be used. The cement for finishing work will be procured in Maputo.
- Paint : To be imported from South Africa or another third country.
- Wooden doors and windows: Local timber will be procured and the grade, quality, drying level and termite-resistant treatment will be controlled.
- Steel window frames (jalousie windows) : To be imported from South Africa or another third country.
- Glass : 4-5 mm thick transparent glass will be imported from South Africa.
- Metalware : To be imported from South Africa.
- Roofing materials : Corrugated coloured steel sheets will be imported from South Africa or another third country.

(3) Sanitary Services

- Plumbing materials : To be imported from South Africa.
- Valves : To be imported from South Africa
- Sanitary fixtures : To be imported from South Africa.
- Water pumps (for wells) : To be imported from South Africa.

(4) Electrical Installations

- Lighting equipment : To be imported from South Africa.
- Cables : To be imported from South Africa.
- Conduits : To be imported from South Africa
- Wiring accessories : To be imported from South Africa
- Distribution panels : To be imported from South Africa

(5) School Equipment

- Furniture : Wooden school furniture will be locally manufactured.
- Teaching aid equipment : To be imported from South Africa.

Table 2-13 Procurement Sources for Equipment and Materials

Item	Mozambique	S.A.	Japan	Remarks
Aggregate (Sand)	○			Good river sand is available.
Aggregate (Crushed Stone)	○			There is a quarry in a suburb of Maputo.
Cement (Structural)		○		
Cement (Non-Structural)	○			
Reinforcing Bars		○		
Concrete Blocks	○			
Forms	○			
Tiles		○		
Paint		○		
Wooden Furniture	○			
Wooden Doors and Windows		○		
Steel Windows		○		
Glass		○		
Metalware		○		
Roofing Materials (Coloured Sheet Iron)		○		
Plumbing Materials		○		
Valves		○		
Sanitary Fixtures		○		
Water Pumps		○		
Lighting Equipment		○		
Electric Cables		○		
Wiring Accessories		○		
Temporary Construction Equipment		○	○	
Vehicles		○	○	

2.2.9.7 Implementation Schedule

Should it be decided that the construction of the planned school facilities under the Project will be conducted by grant aid provided by the Government of Japan, a design and supervision agreement will be concluded between the MINED of the Government of Mozambique and the Consultant after the signing of the E/N by the two governments and the Consultant will prepare the detailed design drawings and tender documents. This will be followed by the pre-qualification and tender, leading to the signing of a construction agreement between the MINED and the construction company (the Contractor) selected through the open tender. The Contractor will then proceed to the construction of the facilities.

(1) Detailed Design

The Consultant will prepare the detailed design and tender documents based on the basic design. These documents will consist of the detailed design drawings, specifications and bill of quantities. During the detailed design period, the Consultant will maintain close contact with related organizations in Mozambique to produce the detailed design documents. Approximately four months will be required from the signing of the detailed design agreement to the completion of the detailed design documents.

(2) Tender

Following the completion of the detailed design work, the Consultant will announce the pre-qualification for the tender for the construction work on behalf of the MINED which is the responsible organization for the Project on the Mozambique side. This tender will be a competitive tender among Japanese construction companies which have passed the pre-qualification and will be held in Japan and witnessed by related persons. When the bid of the lowest bidder is evaluated as being appropriate, the bidder in question will be declared the successful bidder and will conclude a construction agreement with the MINED. This agreement will become valid on its certification by the Government of Japan. Approximately six and a half months will be required from the signing of the design and supervision agreement with the Contractor to the signing of the construction agreement.

(3) Construction Work

Following the signing of the construction agreement, the actual work will commence with the certification of the said agreement by the Government of Japan. Four months will be required for work preparation and the import of construction materials, etc., 10 months will be required to construct the two story school buildings and seven months

will be required to construct the single story school buildings. If the work to construct the two story buildings commences simultaneously at all of the relevant sites, the total construction period will be shortened to 12 months, presupposing an overlap of the procurement period and the construction period of two months.

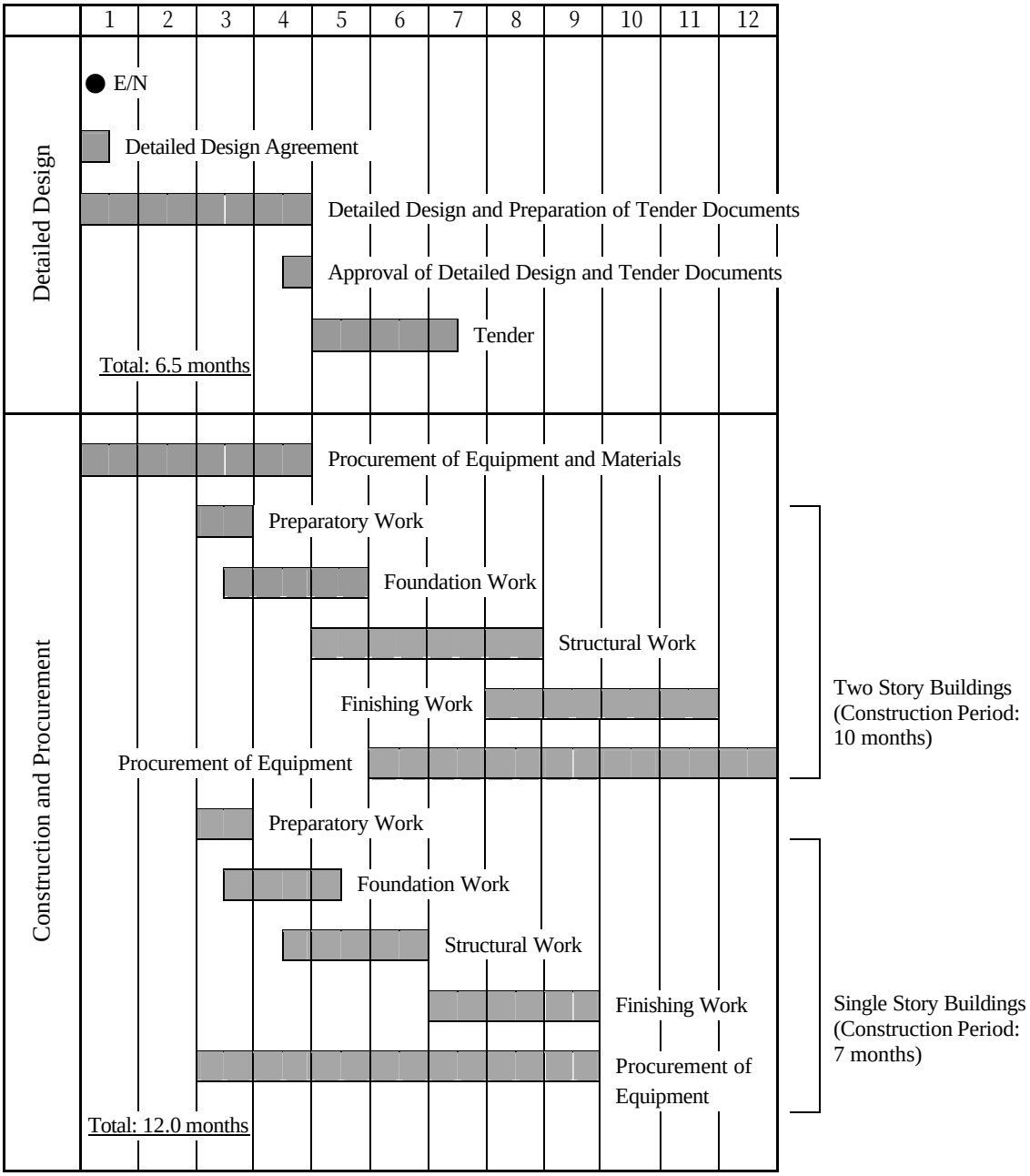


Fig. 2-12 Project Implementation Schedule

2.3 Obligations of Recipient Country

The Mozambique side will be responsible for the following in view of the smooth implementation of the Project as confirmed by the Minutes of Discussions for the Basic Design Study.

(1) Provision of data and information necessary for the Project

(2) Provision of school sites which are cleared and/or banked if necessary prior to the commencement of the construction work

(3) Provision of sufficient budget and school staff for the proper and efficient management and maintenance of the facilities constructed and equipment supplied with the Japanese grant aid

(4) Ensuring of the speedy unloading, customs clearance, tax exemption and local transportation of the equipment and materials procured with the Japanese grant aid

(5) Accordance of Japanese nationals whose services may be required in connection with the supply of products and services under certified contracts such facilities as may be necessary for their entry into Mozambique and stay therein for the performance of their work

(6) Exemption of Japanese nationals whose services may be required in connection with the supply of products and services under certified contracts from domestic taxes and levies in Mozambique, including customs duty and VAT (Value Added Tax)

(7) Bearing of all Project-related expenses other than those to be borne by the Japanese grant aid

(8) Bearing of the fee for the A/P and commission of a Japanese bank for payment transactions and other banking services based on the banking arrangements

(9) Construction of the perimeter fencing and gates

(10) Electricity, water and sewerage connection to the sites and other auxiliary work

The estimated costs to be borne by the Mozambique side are shown below.

1)	Ground clearance and levelling work cost	:	502.4	million MT	(¥3.33 million)
2)	Existing building removal work cost	:	94.7	million MT	(¥0.63 million)
3)	Power supply extension work cost	:	50.2	million MT	(¥0.33 million)
4)	Water supply extension work cost	:	13.6	million MT	(¥0.09 million)
5)	Gate and fence construction cost	:	3,264.9	million MT	(¥21.65 million)
6)	Well drilling cost	:	231.0	million MT	(¥1.53 million)
	Total	:	4,156.8	million MT	(¥27.56 million)

2.4 Project Operation Plan

The responsible body for the maintenance of the facilities after their handing over will be the school committee led by the principal. The maintenance cost will be met by a grant provided by the DEMMA and by the school welfare fund to which parents make contributions. In essence, the operation and maintenance work will mainly be conducted by the principal and teachers.

(1) Calculation of Required Number of Teachers

●Primary Schools (EP1 + EP2: Grade 1 – Grade 7)

1) Calculation Conditions

- Adoption of a two shift teaching system
- Assumption of 20 EP1 classes and eight EP2 classes for a 14 classroom school and 32 EP1 classes and 12 EP2 classes for a 22 classroom school
- Assignment of a teacher responsible for each EP1 class (Grade 1 through Grade 5)
- Assignment of teachers for each subject group (three groups) of EP2 (Grade 6 and Grade 7)
- Not more than 24 lessons/week for each teacher
- Use of an integrated curriculum which is planned for implementation in 2004

2) Calculation Results

- EP1 14 classrooms： 20 (number of teachers = number of classes)
  22 classrooms： 32 (same reason as that cited above)
- EP2 14 classrooms： 10 (based on the table below)
  22 classrooms： 15 (based on the table below)
- EP1 + EP2 14 classrooms： 30
  22 classrooms： 47
- Assumption of 20 EP1 classes and eight EP2 classes for a 14 classroom school and 32 EP1 classes and 12 EP2 classes for a 22 classroom school

Table 2-14 Calculation of Required Number of EP2 Teachers

Subject Group	No. of Lessons/Week	Required No. of Teachers	
A (Language Group)	10.5	10.5 × 2 grades × 2 classes × 2 shifts ÷ 24 lessons/teacher	4
		10.5 × 2 grades × 3 classes × 2 shifts ÷ 24 lessons/teacher	6
B (Arithmetic and Social Studies Group)	9.0	9.0 × 2 grades × 2 classes × 2 shifts ÷ 24 lessons/teacher	3
		9.0 × 2 grades × 3 classes × 2 shifts ÷ 24 lessons/teacher	5
C (Art and PE Group)	7.5	7.5 × 2 grades × 2 classes × 2 shifts ÷ 24 lessons/teacher	3
		7.5 × 2 grades × 3 classes × 2 shifts ÷ 24 lessons/teacher	4
Total	27.0		10
			15

●Secondary Schools (ESG1: Grade 8 – Grade 10)

1) Calculation Conditions

- Adoption of a two shift teaching system
- Assignment of teachers for each subject
- Not more than 24 lessons/week for each teacher
- Use of the current curriculum

2) Calculation of Teacher Requirement

Based on the following table, it is possible to estimate that the required number of ESG1 teachers is 30.

Table 2-15 Calculation of Required Number of ESG1 Teachers

Subject	Calculation Formula
Portuguese	5 lessons × 12 C/R × 2 shifts ÷ 24 lessons = 5
English	3 × 12 × 2 ÷ 24 = 3
Mathematics	5 × 12 × 2 ÷ 24 = 5
Biology	3 × 12 × 2 ÷ 24 = 3
Physics	3 × 12 × 2 ÷ 24 = 3
History	2 × 12 × 2 ÷ 24 = 2
Geography	2 × 12 × 2 ÷ 24 = 2
Chemistry	2 × 12 × 2 ÷ 24 = 3
Art	2 × 12 × 2 ÷ 24 = 2
PE	2 × 12 × 2 ÷ 24 = 2
Total	30

(2) Calculation of Other Necessary Personnel

Each primary or secondary school requires such management personnel as a principle and vice-principals (responsible for teaching and administration). The vice-principal responsible for teaching plays the role of acting principle when evening classes are held.

According to the interview results at the DEMM, a 14 classroom type EP requires four administrative staff members, i.e. book-keeper, typist, receptionist and clerk, while a 21 classroom type EP requires six such staff members. The necessity for this manpower level was confirmed during the visits to existing schools. Referring to the distribution of school staff members appearing in the Official Gazette (dated 25th June, 1990), the recruitment of four administrative staff members, i.e. book-keeper, typist, receptionist and clerk, is assumed for both primary and secondary schools under the Project.

In addition, it is assumed that four cleaners and four guardsmen will be required for each school. As in the case of administrative staff members, the number of guardsmen has been finalised based on the results of interviews at the DEMM and existing schools and the distribution of school staff members suggested by the Gazette.

Table 2-16 Distribution of School Staff Members (Official Gazette of 25th June, 1990)

Position	EP1	EP2	ESG	Position	EP1	EP2	ESG
A. Senior Positions				d) Management Positions			
Principal	1	1	1	Senior Administrator			1
Vice-Principal (Teaching)	1	1	2	Class 1 Administrator		1	1
Secretary	1	1	1	Class 2 Administrator		1	1
Dormitory Warden		1	1	Class 3 Administrator	1	1	1
				Assistant	1	1	1
Sub-Total	3	4	5	Sub-Total	2	4	5
B. Professional Positions				d) Clerical Positions			
a) Teachers				Class 1 Typist		1	1
Grade A			45	Class 2 Typist	1	1	1
Grade B		10	31	Sub-Total	1	2	2
Grade C	15	37	76	e) Auxiliary Positions			
Grade D	15	37	15	Mail Boy		1	1
Grade E (Unqualified)	20	10		Cleaner	1	6	10
Sub-Total	50	94	167	Porter	1	12	16
b) Technical Positions				Driver		1	1
Documentation Technician (C)		1	1	Gardener	1	2	2
Laboratory Technician (C)			3	Guardsman	1	2	3
Farming/Stock Raising		1	1	Cook		2	2
Technician (C)				Cooking Assistant		4	4
Sub-Total		2	5	Sub-Total	4	30	39
				Grand Total	60	136	223

(3) Number of New Recruits Under the Project

The calculated number of new recruits under the Project is shown in Table 2-17.

Table 2-17 Staff Strength of Subject Schools

Position	EP (14 Classrooms) 4 New and One Existing (with 11 Qualified Teachers) Schools		EP (22 Classrooms) One New and One Existing (with 20 Qualified Teachers) Schools		Sub-Total
	Per School	Calculation	Per School	Calculation	
Principal	1	×4 = 4	1	×1 = 1	5
Vice-Principal	2	×4 = 8	2	×1 = 2	10
Teacher	30	×5 – 11 = 139	47	×2 – 20 = 74	213
Clerk	4	×4 = 16	4	×1 = 4	20
Cleaner	4	×4 = 16	4	×1 = 4	20
Guardsman	4	×4 = 16	4	×1 = 4	20

Position	ESG Two New Schools		Sub-Total
	Per School	Calculation	
Principal	1	×2 = 2	2
Vice-Principal	2	×2 = 4	4
Teacher	30	×2 = 60	60
Clerk	4	×2 = 8	8
Cleaner	4	×2 = 8	8
Guardsman	4	×2 = 8	8

(4) Possibility of Successful Recruitment of Teachers

1) EP Teachers

Under the Project, the new recruitment of 213 qualified EP teachers will be necessary. The teacher training school in Maputo (IMAP) now has 300 first year students and 200 second year students, suggesting that the IMAP should be able to train some 200 new teachers a year (Estatistica da Educazao Leventamento Escolar – 2000). This means that by the time of the opening of the newly constructed schools under the Project in early 2003, some 400 new teachers will have been trained. The new recruitment of qualified teachers for the subject EPs of the Project should not, therefore, be difficult.

Given the salary level of teachers on a par with that of civil servants, teaching should prove to be an attractive profession in Mozambique where there is an abundance of employment opportunities due to the undeveloped state of domestic

industries. The recruitment of teachers for positions in Maputo which has much better infrastructure than rural areas should be relatively easy.

2) ESG Teachers

The new requirement of 60 qualified ESG teachers will be necessary under the Project. The teacher training college (UP) produces some 100 graduates every year and, by early 2003, 200 newly qualified teachers will have been trained. In addition, the university (UEM) is to establish a new faculty of education and, therefore, it should not prove difficult to recruit qualified teachers for the subject ESGs of the Project.

As a science room with some teaching aids will be provided under the Project, six science teachers capable of conducting scientific demonstrations will be required at each ESG (12 in total). The teacher qualification for secondary schools consists of five categories. Assuming that an equal number of teachers is trained in each category, some 20 science teachers are trained every year. By 2003, some 60 newly qualified science teachers should be available and the recruitment of 12 teachers under the Project should not prove difficult.

3) Administrative and Other Staff Members

The filling of such senior administrative positions as principal and vice-principal, etc. should not prove very difficult as in the case of teacher recruitment. In addition, clerical personnel, cleaners and guardsmen will be required. As the standard practice is the recruitment of four persons each for each of these three job categories, the recruitment of 36 persons (4×9 schools) will be required. The filling of these positions should not be difficult as there is a high demand for employment, including clerical jobs, in Maputo.

(5) Management and Maintenance Cost

1) Personnel Cost

The Project aims at constructing new school buildings or rebuilding existing school buildings for the subject schools to improve the quality of education at these schools. With the implementation of the Project, the number of ESG1 schools and EP schools will increase by 1,920 and 9,038 respectively. At the same time, the number of classrooms will increase by 48 for ESG1 schools and by 183 for EP schools. Such an increase of the number of classrooms will necessitate the new

recruitment of 213 EP teachers and 60 ESG1 teachers, representing an increase of 5.6% and 7.0% respectively of the present number of teachers in Maputo.

The estimated annual personnel cost for the newly recruited teachers at the subject schools is shown in the following table.

Table 2-18 Annual Personnel Cost for Newly Recruited Teachers

	EP (Five New and Two Existing Schools)	ESG1 (Two New Schools)
Senior Positions	Principal and two vice-principals/each	Principal and two vice-principals/each
	784 million MT	314 million MT
Teachers	213 new teachers	60 new teachers
	4,187 million MT	2,019 million MT
Staff (Administrative)	Book-keeper, receptionist, typists and clerical staff	Book-keeper, receptionist, typists and clerks
	344 million MT	137 million MT
Staff (Auxiliary)	Guardsmen and cleaners	Guardsmen and cleaners
	469 million MT	188 million MT
Total	5,784 million MT	2,658 million M T

The total annual personnel cost is estimated to be 8.4 billion MT (¥56 million) which will be equivalent to 5.6% of the total personnel cost of 151.5 billion MT under the education budget of the Maputo Municipal Authority. The Government of Mozambique will be required to secure the funding for this budget requirement.

2) Power and Water Charges

Under the Project, lighting and power receptacles will be installed at eight schools, excepting one school to which extension of the power supply will be difficult. The annual power and water charges are calculated on the basis of the following assumptions.

- At a site capable of receiving water supply, a water pump to feed water from the water tank to the elevated water tank will be installed. A new pump will be installed at one site where water supply is unavailable.
- Because of the anticipated use of the classrooms for adult education in the evening, the power charge for an average of half an hour per day is estimated for lighting.
- The municipal water charge is used to calculate the water charge for seven schools, excepting two schools where the use of groundwater from a well is planned.

As shown in Table 2-20, the annual power and water charges are estimated to be US$ 30,000. This figure is equivalent to 32% of the annual power and water charges (US$ 94,400 in 1998) under the educational budget of the Maputo Municipal Authority. Efforts should be made to reduce these costs by means of the efficient operation of the facilities. At the same time, it is recommended that a request is made to the government to secure the funding to meet these costs.

3) Maintenance and Repair Cost

The annual maintenance cost for the planned new facilities under the Project is estimated based on the following assumptions which reflect the current situation of schools in Maputo.

- One-tenth of the fluorescent lamps will be replaced every year.
- Clearing and emptying of the septic tank will be conducted with the cooperation of local residents and will not be costed.
- While the adequate management of the facilities will keep the need to replace broken window class low, it is assumed that one-twentieth of the window glass will require replacement every year.
- Some one-twentieth of such school furniture as desks and chairs will require repair every year.

Based on the above assumptions, the estimated annual maintenance cost is shown in Table 2-20.

Table 2-19 Annual Maintenance Cost (Total for All Sites)

Item	Frequency	Annual Cost per Classrooms	
Replacement of fluorescent lamps	1/10 of all every year	US$ 13,700	(¥1,490,000)
Replacement of broken window glass	1/20 of all every year	US$ 3,400	(¥370,000)
Repair of furniture	1/20 of all every year	US$ 23,000	(¥2,520,000)
Sub-Total		US$ 40,100	(¥4,370,000)
Water Charge		US$ 7,400	(¥810,000)
Power Charge		US$ 22,800	(¥2,490,000)
Sub-Total		US$ 30,200	(¥3,300,000)
Total		US$ 70,300	(¥7,670,000)

CHAPTER 3

PROJECT EVALUATION AND RECOMMENDATIONS

CHAPTER 3 PROJECT EVALUATION AND RECOMMENDATIONS

3.1 Project Outputs

In post-civil war Mozambique, the Five Year Economic Development Programme (1995 – 99) has been formulated and economic development mainly focusing on education, health care and rural development has been promoted. Following the lead of this Programme, the Ministry of Education has been proceeding with the development of the educational sector with emphasis on (i) increased opportunities for primary education, (ii) improved quality of education and (iii) improved system and finance under its Educational Sector Strategic Plan: 1999 - 2003. In the field of secondary education in particular, a target of doubling the admission figure has been adopted in response to the increasing need for people with a higher educational career to further forward economic development.

Maputo is no exception to the nationwide shortage of schools due to the population increase and most schools in the city employ the three shift teaching system. This trend is especially apparent in such suburban districts as District 4 and District 5 where the process of sprawling is rapidly taking place. The construction of and the provision of teaching aid materials and equipment for primary and secondary schools in these districts under the Project are expected to have the following outputs.

① Improvement of the educational environment due to the new construction and rebuilding of primary schools

A three shift teaching system is a necessity for 92% of the primary schools in Maputo and the resulting shorter teaching hours (80% of the level of the two shift teaching system) has caused a decline of the quality of education. The existing schools are suffering from a poor educational environment as the deterioration of facilities often means the absence of desks and chairs, forcing pupils to sit on the ground.

Five new schools will be constructed under the Project together with the rebuilding of two more schools. The resulting 112 new classrooms will directly improve the educational environment for 11,200 pupils. Moreover, the educational environment for 19,800 pupils at existing schools near the project sites will be indirectly improved as the transfer of many pupils to the newly constructed schools will eliminate the three shift teaching system at 198 classrooms of these nearby schools.

② Improvement of the educational environment due to the construction of new secondary schools

The construction of secondary schools has been particularly slow in Maputo. Even though there are 11 secondary schools in the city, many of these schools are concentrated in District 1 with District 4 and District 5 having only one secondary school each. In these two districts, the shortage of secondary schools is the major barrier to school attendance by potential secondary school pupils.

Under the Project, one new secondary school with 12 classrooms will be constructed in both District 4 and District 5 where the population is rapidly increasing. These 24 new classrooms will directly provide the opportunity for school enrolment for 1,920 pupils, constituting a 6.6% increase of the present number of secondary school pupils.

③ Improvement of learning with new teaching aids

Although it is apparent that the use of such teaching aids as charts and tables for display purposes promises significant educational effects, many schools currently rely on blackboards and textbooks because of the lack of such aids. Moreover, textbooks are not distributed to all pupils and the ratio of secondary school pupils in possession of textbooks is particularly low.

The provision of teaching aids for demonstration or display purposes for both the primary and secondary schools to be newly constructed or rebuilt under the Project is expected to achieve a major improvement of learning among pupils. In the case of secondary schools, the provision of a science laboratory together with teaching aids for science education promises a major contribution to improving the quality of science education.

④ Improvement of the public hygiene environment

Schools in Maputo used to have flush toilets combined with a simple septic tank. However, as these toilets are now out of order at many schools due to deterioration, simple dug pits are used for daily use, worsening the hygiene conditions on the school premises.

Under the Project, those schools with municipal water supply will receive flush toilets combined with a simple septic tank while those schools without water supply will receive toilets with a tank for night soil collection. The introduction of these toilets will improve the hygiene conditions at the new schools. At those sites with municipal water supply,

wash basins will also be provided to establish the custom of hand-washing after using the toilets. This will constitute education on hygiene. As separate toilets will be introduced for boys and girls, access to educational opportunities at schools will improve for girls of school age.

⑤ Benefit to Local Community

Secondary schools in Maputo employ the three shift teaching system to compensate for the shortage of classrooms and the use of the classrooms in the evening for regular teaching deprives the community of the opportunity for informal evening education.

The implementation of the Project will end the three shift teaching system, thereby increasing the opportunity to use the classrooms for wide-ranging activities by the local community, including informal literacy education and meetings of local groups.

3.2 Recommendations

While the Mozambique side has sufficient human resources, technical expertise and budget to continually manage the new facilities following the completion of the Project, it must still deal with the following tasks for the smooth and effective implementation of the Project.

① Recruitment and re-training of teachers

For the effective implementation of the Project, it will be necessary to recruit 213 and 60 new teachers for primary schools and secondary schools respectively and it appears that these figures can be easily met in view of the annual number of graduates from the teacher training school and college. In Maputo, 394 primary school teachers and 131 secondary school teachers are unqualified and the re-training of these teachers is essential for a qualitative improvement of the universal education in the city.

② Utilisation of science room at secondary schools

The science curriculum for secondary education includes laboratory experiments which are seldom conducted at present. However, these laboratory experiments are important to improve the quality of education and it is planned to actively incorporate such experiments in the teaching. Having positively evaluated the fact that teachers capable of supervising scientific experiments at schools are currently being trained, a science room with some equipment will be introduced under the Project for each secondary school. The Mozambique side will be required to procure and store other essential equipment, re-agents and consumables for laboratory experiments and will also recruit teachers

capable of supervising such experiments. As this science room will be larger than ordinary classrooms, it is desirable that this room be used for diverse purposes, including meetings and group discussions, beyond their principal use.

③ Promotion of infrastructure development in Magoanine area

The Magoanine area is a designated resettlement area for refugees created by the great flood in 2000 and urban infrastructure, including electricity supply, has not yet been developed. As the population in this area is increasing at a faster pace than planned because of the additional inflow of people from the over-crowded old city quarters, the need to use the classrooms in the evening is likely to emerge soon. This prospect calls for the early extension of electricity supply to this area.

The following recommendations are made in regard to technical cooperation by the Government of Japan and collaboration with other donors.

④ Technical cooperation

In Maputo, 10.5% of primary school teachers and 19.0% of secondary school teachers are unqualified. For the successful achievement of the “100% extension of primary education” and “doubling of the number of admissions to secondary schools”, teacher training, particularly the re-training of existing teachers, must be actively conducted in addition to the construction of school facilities.

Technical cooperation for the re-training of existing teachers is expected to achieve significant effects in regard to improvement of the quality of education. In particular, while scientific experiments are included in the curriculum, they are not put into practice at many schools. Technical cooperation for practical education accompanied by experiments and the training of the relevant teachers are expected to have direct positive effects. One precedence in this field is the technical cooperation of Germany for education on laboratory experiments at the EM University.

⑤ Collaboration with other donors

The major aid projects of other donors in the educational sector are the Educational Sector Development Programme (ESDP), 1999 – 2003 of the World Bank which provides comprehensive support for the Educational Sector Strategic Plan (ESSP), 1999 – 2003 of the Ministry of Education and the School Fund (Caixa Escolar) of the SIDA Sweden.

The construction of school facilities in Maputo by the World Bank ended with the Second Phase Educational Project, 1991 – 1998 which has been succeeded by the construction and rehabilitation of primary and secondary school facilities in local areas under the ESDP, 1999 – 2003. There is, therefore, no project which overlaps with the present Project in Maputo.

Under the School Fund project, the SIDA Sweden is continuing aid in such soft areas as the supply of textbooks, assistance for vocational and adult education and assistance for the EM University. Linkage of the construction of school facilities under the Project to the soft aid of the SIDA is feasible.