List of Tables and Figures

Abbreviations

BEMP	Basic Education Master Plan
BRU	Building Research Unit
COBET	Complementary Basic Education in Tanzania
ESDP	Education Sector Development Programme
JICA	Japan International Cooperation Agency
MEO	Municipal Education Officer
MOEC	Ministry of Education and Culture
NGO	Non-Governmental Organization
PCR	Pupils per Classroom Ratio
PTR	Pupils per Teacher Ratio
SA	Sector-Wide Approach
SC	School Committee
SM	School Mapping
UPE	Universal Primary Education
WEC	Ward Education Coordinator

Summary

The United Republic of Tanzania has been promoting educational development since its independence in 1961. In particular, a 98% school attendance rate was achieved in primary education in 1981. However, due to the economic slump, the downgrading of the public financial situation has affected the educational sector. Very severe educational situations such as inadequate educational facilities, shortages of teachers with proper certification, and limited budgetary funds have continued until now. The overcrowding of classrooms is especially serious. The average number of pupils per classroom is approximately 73 at the primary schools in Tanzania (1999 figure). Thus, it is extremely difficult to provide a proper education. In Dar es Salaam, due to a dramatic increase in population, the average number of pupils per classroom is 114 (1999 figure), which is approximately 1.5 times the national average. The need to increase the number of classrooms is urgent.

In order to improve the situations, the Government of Tanzania announced its "Education and Training Policy" in 1995, the "Basic Education Master Plan (BEMP)" in 1997, and the "Modification of the Basic Education Master Plan" in 2001, which is a more concrete plan focusing on basic education. Then in March, 1999, the Tanzanian Government adopted a sector-wide approach, and coordinating with donor countries and related agencies, established the document, "Educational Sector Development Program (ESDP)." Proposed in the document are: the introduction of Universal Primary Education (UPE), the improvement of education management, and the de-centralization of responsibility regarding school management in the education sector.

In the “construction of new classrooms in urban areas” section of the “Basic Education Master Plan (BEMP)”, the followings goals are set; 1) reducing overcrowded classrooms, 2) priority on construction of new classrooms at existing schools and in non-urban area. Furthermore, the construction of classrooms is regarded as a goal for responding to the expected increase of enrolment in the near future (from the ESDP, section on the “Primary Education Development Plan (PEDP).”)

In view of this background, the Government of Tanzania requested grant aid from Japan in order to conduct a study on school mapping in Dar es Salaam. Also requested, were specialists in the fields of science for teacher training as part of ESDP, and the building of 300 classrooms for 30 primary schools. After conducting preliminary studies in 1999, the Government of Japan dispatched a study team to do the Basic Design in April 2001, and for the explanation of the outlines of their paper, the Basic Design of School Facilities, in August 2001.

During the Basic Design study, the surveys were conducted at 29 out of 30 requested schools and site selection for the Project was conducted based on the following criteria;

① Give priority to sites that urgently need de-modeling of existing buildings due to the structural damage.

② Give priority to sites which urgently need construction of additional classrooms due to overcrowding, even if double shifts and/or multi-grade sessions are adopted.

③ Give priority to sites where the present and future demand for primary school facilities is high (estimated from the number of school-aged children, enrolment rates etc.).

④ Give priority to sites which are able to keep enough teachers and maintain schools properly.

⑤ Give priority to sites where the urgency and necessity for construction of additional classrooms has been confirmed (from the results of School Mapping).

⑥ Give priority to sites which are supported positively by staff, local authorities and persons in charge of school management.

⑦ Give priority to sites for new schools where the sustainable maintenance of facilities are feasible, and have no construction constraints, such as difficulty of land use rights, legal ownership, occupation of land, occupation of condemned houses, etc.

⑧ Give priority to sites that have no other school construction projects going on from international/bilateral donors or NGOs, which could possibly affect the smooth implementation of the Project.

⑨ Give priority to sites which are topographically safe and secure for movement of the materials and equipment needed for construction, and have the appropriate land size for construction.

⑩ Give priority to sites which, in the case of reconstruction to existing building(s), can secure alternative temporary classrooms during the construction period.

As a result of site selection based on above criteria the necessity of project implementation for 29 schools has been confirmed. However, any schools with a shortage of less than 4 classrooms will not be regarded as proper project sites. One reason is due to an expectation that the Government of Tanzania will construct school facilities by its own self-reliant effort. The other is that 3 classroom or less in a Grant Aid Project is not cost efficient. Thus, as 2 out of the 29 proposed schools will not be covered in this Project, the final number of Project schools is 27.

In the Project, classrooms, teachers' offices and toilets are regarded as minimum facilities necessary for school operation. Water supplies and drainage facilities for toilets

will also be provided. Desks, chairs, blackboards, and bulletin boards, regarded as furniture and equipment, are to be provided for classrooms and teachers' offices. New teachers' office(s) will be provided only for schools that do not have enough space to accommodate the proper number of teachers.

The number of classrooms to be constructed in the Project is based on the following calculation:

1) That there will be 45 pupils per classroom (in accordance with "Construction of Primary School Guidelines for Buildings and Furniture of Tanzania");
2) That, in compensation for classroom shortages, the rural areas will have 4 classrooms constructed per school (with single shifts/ six sevenths shifts), and the urban areas will have a maximum of 10 classrooms constructed per school (with double shifts/ four sevenths shifts);
3) That, in case the average number of pupils per classroom exceeds 69 (the Project's maximum number of pupils for new classrooms), additional classrooms will be constructed in order to reduce the number of pupils to less than 69 per classroom.

While the Project is based on local design standards found in the "Construction of Primary Schools Guideline for Building and Furniture," the improvement of natural lighting to buildings, the durability of roof materials, and the reduction of construction costs, etc., will be taken into consideration. As for the 2 schools where the required number of classrooms cannot be constructed in single storied buildings due to the small size of land, double storied buildings will be planned.

In the classrooms, desks and chairs for students and teachers, a blackboard, bulletin board(s) will be provided; and in the teachers' office, teacher's table(s) with drawer(s)

and chairs will be provided. Considering that there was no requests from the Government of Tanzania, educational equipment will not be included as a component of assistance.

The scale of entire project is shown in Table 1 as well as the list of the Furniture provided in the Project in Table 2.

Table 1 Scale of Entire Project

No.	Name of School	Project Facilities				Planned Number of Classrooms	Number of Building Stories	Toilet's Type(Boys)	Toilet's Type(Girls)	Teachers' Office Type	Floor Area (m²)
		C	T	TO	E						
Ilala											
I-1	Kinyerezi	○	○	—	○	4	1	SB	SG	—	307.45
I-2	Boma	○	○	—	○	5	1	SB	SG	—	371.20
I-3	Mchikichini	○	○	—	○	4	1	SB	SG	—	307.45
I-4	Tabata	○	○	○	○	10	1	MB	LG	MT	799.26
I-5	Ukonga	○	○	○	○	10	1	MB	LG	ST	770.76
I-6	Gongo La Mboto B	○	○	—	○	9	1	MB	LG	—	671.76
I-8	Msongola	○	○	—	○	4	1	SB	SG	—	307.45
I-9	Kiwalani	○	○	○	○	10	1	MB	LG	ST	770.76
I-10	Mvuti	○	○	—	○	4	1	SB	SG	—	307.45
Kinondoni											
K-1	Tandale Magharibi	○	○	—	○	10	1	MB	LG	—	735.51
K-2	Kimara B	○	○	○	○	4	1	SB	SG	MT	371.20
K-3	Uzuri	○	○	—	○	10	1	MB	LG	—	735.51
K-4	Mbezi	○	○	○	○	10	2	MB	LG	MT	924.90
K-5	Mabibo	○	○	○	○	10	1	MB	LG	ST	770.76
K-7	Mwananyamala B	○	○	○	○	10	2	MB	LG	ST	892.15
K-8	Kunduchi	○	○	—	○	12	1	LB	XG	—	876.03
K-9	Mburahati	○	○	○	○	10	1	MB	LG	MT	799.26
K-10	Kawe A	○	○	○	○	10	1	MB	LG	ST	770.76
Temeke											
T-1	Azimio	○	○	○	○	10	1	MB	LG	ST	770.76
T-2	Sokoine	○	○	○	○	10	1	MB	LG	ST	770.76
T-3	Mbagala	○	○	○	○	18	1	MB + MB	MG + LG	LT	1,431.70
T-4	Madenge	○	○	—	○	10	1	MB	LG	—	735.51
T-6	Rangi Tatu	○	○	○	○	11	1	LB	XG	LT	907.90
T-7	Ufukoni	○	○	○	○	4	1	SB	SG	ST	342.70
T-8	Temeke	○	○	—	○	5	1	SB	SG	—	371.20
T-9	Yale Yale Puna	○	○	○	○	4	1	SB	SG	ST	342.70
T-10	Vijibweni	○	○	○	○	5	1	SB	SG	ST	406.45
Total		27	27	16	27	223	—	—	—	—	17,569.30

Note)

C (Classroom), T (Toilet), TO (Teachers' Office), E (Equipment)

SG : Small Girls' Toilet (for 6) SB : Small Boys' Toilet (for 5) ST : Small Teachers' Office (for 10)

MG : Medium Girls' Toilet (for 11) MB : Medium Boys' Toilet (for 9)

MT : Medium Teachers' Office (for 20)

LG : Large Girls' Toilet (for 13) LB : Large Boys' Toilet (for 11) LT : Large Teachers' Office (for 30)

XG : Extra large Girl's Toilet (for 15)

Table 2　List of Furniture at Each Project School

No.	Name of School	Planned Number of Classrooms	Capacity of the Teacher's Office	Total of Student's Desks and Chairs	Student's Desks and Chairs (L)	Student's Desks and Chairs (S)	Teachers' Tables and Chair	Tables in Teachers' Office	Chairs in Teachers' Office	Blackboard	Bulletin Board
I-1	Kinyerezi	4	-	92	24	68	4	-	-	4	8
I-2	Boma	5	-	115	30	85	5	-	-	5	10
I-3	Mchikichini	4	-	92	24	68	4	-	-	4	8
I-4	Tabata	10	20	230	60	170	10	20	20	11	23
I-5	Ukonga	10	10	230	60	170	10	10	10	11	23
I-6	Gongo la mboto B	9	-	207	54	153	9	-	-	9	18
I-8	Msongola	4	-	92	24	68	4	-	-	4	8
I-9	Kiwalani	10	10	230	60	170	10	10	10	11	23
I-10	Mvuti	4	-	92	24	68	4	-	-	4	8
K-1	Tandale Magharibi	10	-	230	60	170	10	-	-	10	20
K-2	Kimara B	4	20	92	24	68	4	20	20	5	11
K-3	Uzuri	10	-	230	60	170	10	-	-	10	20
K-4	Mbezi	10	20	230	60	170	10	20	20	11	23
K-5	Mabibo	10	10	230	60	170	10	10	10	11	23
K-7	Mwananyamala B	10	10	230	60	170	10	10	10	11	23
K-8	Kunduchi	12	-	276	72	204	12	-	-	12	24
K-9	Mburahati	10	20	230	60	170	10	20	20	11	23
K-10	Kawe A	10	10	230	60	170	10	10	10	11	23
T-1	Azimio	10	10	230	60	170	10	10	10	11	23
T-2	Sokoine	10	10	230	60	170	10	10	10	11	23
T-3	Mbagala	18	30	414	108	306	18	30	30	20	39
T-4	Madenge	10	-	230	60	170	10	-	-	10	20
T-6	Rangi Tatu	11	30	253	66	187	11	30	30	13	25
T-7	Ufukoni	4	10	92	24	68	4	10	10	5	11
T-8	Temeke	5	-	115	30	85	5	-	-	5	10
T-9	Yale Yale Puna	4	10	92	24	68	4	10	10	5	11
T-10	Vijibweni	5	10	115	30	85	5	10	10	6	13
Total		223	240	5129	1338	3791	223	240	240	241	494

For the purposes of continuous, long-term use of school facilities at both existing and new Project facilities, a capacity building software program will be implemented in the Project. The purpose is to strengthen the School Committee in terms of school management (especially facility maintenance). The program includes holding school meetings to facilitate a sense of "ownership" (it is especially crucial since the feeling of ownership is weaker than before), and to raise the awareness level of the “people in

charge" in regards to maintenance work, etc. A manual will be prepared for them to acquire the necessary technical skills for adequate school management, especially maintenance activities. A long-range activity plan as well as an annual one will also be framed in the Project. On the basis of those activity plans, actual maintenance activities will be performed at each school. At the administrative level, a guideline for school facility maintenance will be prepared, which clarifies the policy and roles of the officials in the whole school management and maintenance system. Also suggested is that the current and future maintenance activities at the Project schools should be monitored for a certain period in order to make those activities permanent, as well as promote them.

The Project is the first school construction project in Tanzania, and a majority of school facilities will be constructed in scattered areas. This makes it difficult for the Japanese contractors to do all the works within a year, which is one of the requirements of Grant Aid by the Government of Japan. In view of this and the under-developed construction situation in Tanzania, it seems impractical to ensure construction quality at so many sites at the same time. Thus, in order to complete the Project, implementation will be divided into two stages of eleven months each, Phase Ⅰ and Ⅱ. So, the Project will be implemented in two years.

The expected impact of the Project's implementation is as follows;

①Improving the Educational Environment

It is calculated that there are 429 existing classrooms in use, and a shortage of 388 classrooms at 27 Project school. Each Project school is obliged to conduct classes in extremely overcrowded classrooms, or in temporary classrooms such as teachers' offices, even teacher's houses, or outdoors. After 223 classrooms are constructed by the Project, 10,035 seats (45 pupils a classroom) or 15,387 seats (maximum of 69 pupils a classroom)

will be available. Considering that all the 21 Project schools in the various urban areas will conduct classes in double-shifts, the number of pupils able to be accommodated in the newly built classrooms will be 25,911(69 pupils a classroom). That is 42.8% of the total number of pupils that can be accommodated in all 27 Project schools (60,603 pupils).

After the Project is fully implemented, there will be no need for temporary classrooms nor outdoor classes, as the present average of 91.5 pupils per classroom (average of 27 Project schools) will be reduced to 54.6. This will be less than the allowable maximum of 69, so the problem of overcrowded classrooms will be alleviated. As a result, schools which cannot presently provide adequate education will be able to conduct classes in accordance with educational objectives and curriculum guidelines, and the learning environment will greatly be improved.

②Improvement of Sanitary Conditions

At most of the Project sites, the number and the condition of toilet facilities are insufficient, without adequate cleaning and maintenance work. The inappropriate facility arrangement and the lack of gender consideration in existing toilet facilities are often the cause of embarrassment to students when using them, so they are not sufficiently used.

Considering this situation of existing toilet facilities, the plan will take gender arrangement into consideration respecting students' privacy. Rainwater storage tanks will also be installed so people to wash their hands. Furthermore, the number of pupils using one toilet bowl will be reduced from the present average of 172.7 pupils (of 27 Project schools) to 70.2 pupils. Not only the facility plans, but the software component of the Project is also expected to improve the sanitary conditions at the Project schools.

③Improving School Management

By implementing the capacity building program as a software component of the Project for each school committee (which serves as the main school maintenance body), it is expected that the ability for school managing will improve.

④Benefits to the Community

Facilities constructed by the Project will be used not only for primary education but also for community activities such as adult education and literacy education. In addition, it is expected that those facilities will be used in the future for non-formal education such as the Complementary Basic Education in Tanzania (COBET), which is for children who cannot attend formal primary schools.

In the summary, the Project not only promotes several direct and indirect effects, but in a broader sense, also contributes to the Basic Human Needs (BHN) of people in Tanzania. Thus, the appropriateness of implementing of the Project through Japanese Grant Aid system is legitimated. In addition, it is worthwhile to know that the Tanzanian side possesses enough personnel and funds to operate and maintain the system after the Project is implemented.

Contents

Chapter 1 Background of the Project

CHAPTER 1 BACKGROUND OF THE PROJECT

In the United Republic of Tanzania (hereinafter referred to as Tanzania), educational development has been promoted since independence in 1961. In particular, a school attendance rate of 98% was achieved for primary education in 1981. However, due to the economic slump, the downgrading of the public financial situation has affected the educational sector, and very severe educational situations such as inadequate educational facilities, shortages of teachers with adequate certification, limited budgetary funds, have continued until now. The overcrowding of classrooms is especially serious. The average number of pupils per classroom is approximately 73 at the primary schools in Tanzania (1999 figure). Thus, it is extremely difficult to conduct proper education. In particular, in Dar es Salaam, due to dramatic increase of population, the average number of pupils per classroom is 114 (in 1999) which is approximately 1.5 times the national average. The necessity of increasing the number of classrooms is urgent. In addition, due to the deterioration of educational facilities, about 70% of existing classrooms need to be repaired. The rebuilding of classrooms is indispensable for improving the educational environment.

In order to improve the situations, the Government of Tanzania announced "Education and Training Policy" in 1995, "Basic Education Master Plan (BEMP)" in 1997, and "the Modification of the Basic Education Master Plan" in 2001, which is a more concrete plan focusing on basic education. Then, the Government of Tanzania adopted Sector-wide Approach and established the main documents of "Educational Sector Development Program (ESDP)" in March, 1999, by coordinating with donor countries and related agencies. Proposed in the document are: the introduction of Universal Primary Education (UPE), the improvement of education management, and the de-centralization of responsibility regarding school management in the education sector.

In view of the above background, the Government of Tanzania requested the Grant Aid cooperation to conduct a study on School Mapping in Dar es Salaam, for the dispatching of specialists in fields of science teacher training as part of ESDP, and the building of 300 classrooms for 30 primary schools. After conducting preliminary studies in 1999, the Government of Japan dispatched the study team for the Basic Design in April 2001, and for the explanation of the outlines of the paper, the Basic Design of School Facilities, in August 2001.

Chapter 2 Contents of the Project

CHAPTER 2　CONTENTS OF THE PROJECT

2-1Basic Concept of the Project

2-1-1 Overall Goal and Project Purpose

In Tanzania, the budget in the educational sector has been reduced due to the worsening of the economic situation and the Structural Adjustment Policy since 1980s. The average number of pupils per classroom in the country in 1999 was 73[1], and that of Dar es Salaam was 114, which distinctly exceeds the country's standard (45 pupils per classroom)[2]. Due to such chronic classroom shortages as well as the re-introduction of the free primary education system in July 2001, the number of pupils is expected to further increase, which will cause a much more serious congestion of classrooms at primary schools in Tanzania.

In addition, some Project schools regulate the number of pupils due to the overcrowding, so it cannot be denied that classroom shortage is a factor to prevent children from having access to schools. In view of these situations, the Project's overall goal is to improve the schooling situation in Dar es Salaam, and the Project's purpose is to alleviate overcrowded classrooms by setting a maximum of 69 pupils per classroom at the Project schools.

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[1] MOEC "The Basic Statistic in Education 1999: Regional Data" (2000)

[2] Although the standard number of 45 is pupils per teacher ratio (PTR), in the Project it is also regarded as the standard number of pupils per classroom ratio (PCR).

2-1-2 Outline of the Project

For the accomplishment of the above-mentioned overall goal, the intent of the Project in the Project is to construct classrooms, toilet facilities and to provide necessary furniture and equipment for 27 schools in Kinondoni, Temeke and Ilala Municipalities in Dar es Salaam. The objectives of the Project are intended to alleviate the overcrowding in classrooms and to improve access to primary education in Dar es Salaam by increasing the number of pupils to be accommodated in the Project Schools. In addition, for the achievement of Project purpose, it is absolutely necessary to conduct appropriate facility maintenance, which will allow continuous use of the existing classrooms as well as newly constructed ones at each Project school. Thus, a series of activities for the re-strengthening of School Committee (SC) as existing management system at school level will be implemented as a software component of the Project, to be used in parallel to the construction work.

2-2Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

Based on the request from the Government of Tanzania and the result of discussions held with Ministry of Education and Culture (MOEC) during the site survey period, the Basic Design of the Project was prepared along with the following principles:

①Basic Principles of the Project

Among the 29 requested schools, the Project is targeting schools with a shortage of classrooms. This shortage is calculated by setting the number of pupils per classroom as 45 in accordance with the construction standards for the single shift system in the rural areas, and the double shift system in the urban areas. Schools whose classroom shortages are less than four will not be covered by this Project. Since the number of classroom constructed in the Project with Grant Aid is not enough to meet all the needs, so the Government of Tanzania is expected to build classrooms at those schools through its own efforts.

The scale of facility construction at each project site is 4 classrooms in the rural areas and a maximum of 10 in the urban areas. However, to achieve the equity after the implementation of the Project, when the site exceeds 69 pupils per classroom, the possible maximum number (in case that 3 pupils are sitting on the seat for 2 people), the necessary and the least number of classrooms will be provided.

As for the components of facilities, classrooms, teachers' offices and toilets are covered in the Project as minimum necessary facilities. Water supplies and drainage facilities for toilets will be also provided. Desks, chairs, blackboards, and bulletin boards are to be provided to classrooms and teachers' offices respectively as necessary associated furniture and equipment. Only for schools lacking space for teachers' office(s) to

accommodate the proper number of teachers, will new teachers' office(s) be provided in the Project.

②Considerations for the Natural Conditions

High temperatures and high humidity throughout the year characterize the climate of Dar es Salaam. There are two rainy seasons a year, with estimated rainfall from 100mm to 200mm a month during these times. In view of the climate conditions in the city, the facility design aims to improve environmental conditions in the classrooms by ensuring natural ventilation, providing good heat insulation and minimizing the effects of rain. As there is no danger from natural hazards at the proposed sites, safety of the sites is uniformly secured. Each Project site is relatively large, and it can be said that the Project will have no effect on the surrounding areas. As for external forces and ground conditions for structural design, seismic forces, wind forces, and ground bearing strengths were calculated by examining the local design standards, based on the site study results to secure financial prudence and safety of the Project facilities.

Dar es Salaam faces the Indian Ocean to the east and most of the Project schools are located approximately 25km from the coast. In the Project area, winds are either from the northeast or southeast throughout the year, making it necessary to take measures against salt damage. In addition, the existence of termite damage has been confirmed at many Project schools; selecting durable building materials and providing appropriate material treatment such as anti-termite treatment, will improve the durability of the facilities provided in the Project.

③Considerations for Social Conditions

Based on the results of interviews on the attitudes and needs regarding school facilities, which were conducted during the Basic Design Study with boys and girls and other

parties concerned, the facility plan of the Project will take the following gender perspectives into account:

1) Consideration for the Common Needs of Pupils

Because of harassment cases where students reported being watched by members of the opposite sex when using the toilet, the request for separate boys' and girls' toilets should be taken into every possible consideration in the floor and arrangement plan. To ensure safety, every possible precaution against danger such as trespassing by outsiders, facility use without permission and malicious mischief should be taken into account in the arrangement plan.

2) Consideration for the Special Needs of Girls

In relation to the reports that boys go into girls' toilets or play mischievous acts on girls, the toilet facility arrangements in the Project should be made so that such acts are prevented. On the other hand, although some girls attending primary school experience menstruation, such items as sanitary boxes in the girls' toilets do not exist at primary schools. From the point of view that this could hinder girls' attendance at school[3], the installation of sanitary boxes in all girls' toilets will be constructed in the Project.

④Considerations for the Local Construction Situation

1) Design Standards

"Construction of Primary Schools, Guidelines for Buildings and Furniture" was issued in October 2000, and will be used for basic design standards of all facility plans in the Project. However, since these design standards are only minimum required standards, some improvements will be made on the design and specifications.

2) Building Regulations and Permits Application Procedures

"Tanzania Building Regulation, 1997 revised" was the latest version of guidelines for building construction in Tanzania when the Basic Design survey was conducted. However, an updated version of regulations is expected in 2001, so the design of the Project facilities will be based on the new regulations. Also confirmed was that procedures for obtaining building permits is waived by the Municipal councils of Ilala, Kinondoni and Temeke, since the Project is regarded as a government one.

3) Building Materials

Major construction materials are supplied by local products or are imported. They do not always satisfy the quality we expect, although most of them can be procured in Dar es Slaam.

In consideration of the severe economic difficulties of the Tanzanian Government, local materials will be used for the sake of helping to reduce the maintenance costs of the Project facilities, and to help to make maintenance work simpler and easier. However, high quality materials should be selected whenever possible for those items requiring long life and durability.

⑤Use of Local Consultants, Contractors and Labor

With the capable number of contractors and laborers in Dar es Salaam, no problem in using local subcontractors can be found, as long as they are under the supervision of Japanese companies. As the Project sites are all over the city, careful supervision will be necessary at each stage of construction for all sites in order to maintain the quality control as well as to manage the construction schedule. As for local consultants, their technical level is generally high, so their abilities can be fully utilized.

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[3] From the hearing survey of CARE Tanzania International.

⑥Capacity of the implementing agency for Maintenance and Management

In the educational sectors of Tanzania, the decentralization has been promoted in the same manner as in other sectors. Instead of District/Municipal councils, the system in which each school and the surrounding community take responsibility for school maintenance and management has been established. It is mandatory that SC that undertakes responsibility for school maintenance and management is established and that the SC members (head teacher, selected teachers and/or parents) periodically hold the meetings regarding school management[4]. As for financial management, the role of SC to attain budgetary funds and make solid management plans has developed well, since the free education system was introduced in July 2001. Considering the role of SC in school management, a series of activities which detail capacity building of the SC members will be implemented as a software component in the Project.

⑦Facilities and Equipment Types and Specifications

The contents of the Project facilities include classrooms, teachers' offices and toilet facilities, which are basic education equipment and furniture. The Project facility designs, based on "The Construction of Primary Schools, Guidelines for Buildings and Furniture", will take natural conditions into consideration, and select the specifications which will reduce the burden of maintenance activities and cost, and put such partial improvements in the plan as widening the windows so that daily school activities will be comfortable. Other educational equipment, like furniture, blackboards and bulletin boards are also planned to be put in the contents of the Project. From the viewpoint of maintenance work, they should be based on local specifications.

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[4] The United Republic of Tanzania, No.10 of 1995, 14th September 1995
"An Act to amend the Education Act, 1978, to establish the Higher Education Accreditation Council, to provide the procedure for accreditation and other related matters." p.367
and The United Republic of Tanzania, No. 5 of 1978, 8th December 1978
"The National Education Act, 1978", Section. 39

⑧Construction Schedule

The Project is the first school construction project in Tanzania, and a majority of school facilities will be constructed in scattered areas. This makes it difficult for the Japanese contractors to do all the work within a year, which is one of the requirements of Grant Aid by the Government of Japan. With this situation, it also seems impractical to ensure construction quality at so many sites at the same time. Thus, project implementation will be divided into two stages of eleven months per each, Phase Ⅰ and Ⅱ in order to complete the Project. So the Project will be implemented in two years.

2-2-2 Basic Plan (Construction Plan/Equipment Plan)

2-2-2-1 Selection of Schools and Setting Up of Component Sizes for the Project

(1) Criteria for Site Selection

During the Basic Design study, it was confirmed that the Project schools should be selected among 29 schools requested by the Government of Tanzania. The followings are criteria for site selection for the Project upon which was agreed by both Tanzanian and Japanese sides:

① Give priority to sites which urgently need de-modeling of existing buildings due to structural damage.

② Give priority to sites which urgently need construction of additional classrooms due to overcrowding that cannot be solved, even if double shifts and/or multi grade sessions are adopted.

③ Give priority to sites where the present and future demand for primary school facilities has been estimated as high (from the number of school-aged children, and enrolment rates etc.).

④ Give priority to sites which are able to keep enough teachers and maintain schools properly.

⑤ Give priority to sites where the urgency and necessity for construction of additional classrooms has been confirmed (from the result of Study on School Mapping).

⑥ Give priority to sites which are positively supported by staff, local authorities and persons in charge of school management.

⑦ Give priority to sites (for new schools) where the sustainable maintenance of facilities are feasible, and which have no construction constraints, such as difficulty of land use rights, legal ownership, occupation of land, occupation of

condemned houses, etc.

⑧ Give priority to sites which have no other school construction projects going on, like those of international/bilateral donors or NGOs, that could possibly affect the smooth implementation of the Project.

⑨ Give priority to sites which are topographically safe, secure for the movement of materials and equipment needed for construction and have the appropriate land size for construction.

⑩ Give priority to sites which in case of reconstruction of existing building(s), can secure alternative temporary classrooms during the construction period.

Based on the above criteria, the necessity of building construction for all 29 requested schools has been confirmed.

(2) Calculation of the Number of Lacking Classrooms

The number of lacking classrooms at each Project school is calculated in accordance with the following procedures:

1) Prerequisites

① The number of pupils per classroom will be 45 in accordance with "Construction of Primary School Guidelines for Buildings and Furniture of Tanzania".

② The Project schools will conduct single shift system (six sevenths shifts) in rural areas and double shift system (four sevenths shifts) in urban areas[5].

③ Classrooms considered structurally dangerous are not regarded as existing classrooms, whether they are still in use or not.

[5] In rural schools, double shift is adopted for grade 1 and grade 2, and single shift from grade 3 to grade 7. In urban schools, double shift is adopted from grade 1 to grade 6, while single shift is used only for grade 7. Thus, the number of pupils to use a classroom at the same time is calculated by multiplying the number of total teachers by 6/7 for rural schools and by 4/7 for urban schools.

2) Equation

Number of Necessary Classrooms = Number of Pupils ×Class Shift Number (six sevenths in rural areas and four sevenths in urban areas) ÷ 45

Number of Classroom Shortage = Number of Necessary Classrooms − Number of Existing Classrooms in Use

3) The number of lacking classrooms at each Project school

The number of lacking classrooms at each Project school is shown in Table 2-1.

Table 2-1 Number of Lacking Classrooms at Project Schools

Municipality	No.	Name of school	Number of pupils (2001)	R: Rural U:Urban	Number of necessary classrooms	Number of existing classrooms	Number of lacking classrooms
Ilala	I-1	Kinyerezi	701	R	13	6	8
	I-2	Boma	1,685	U	21	17	5
	I-3	Mchikichini	1,255	U	16	16	4
	I-4	Tabata	3,740	U	47	24	24
	I-5	Ukonga	3,474	U	44	33	12
	I-6	Gongo la mboto B	1,752	U	22	14	9
	I-7	Uhuru Girls	874	U	11	12	1
	I-8	Msongola	535	R	10	6	5
	I-9	Kiwalani	1,951	U	25	7	18
	I-10	Mvuti	633	R	12	7	6
Kinondoni	K-1	Tandale Magharibi	2,171	U	28	11	17
	K-2	Kimara B	1,193	R	23	12	11
	K-3	Uzuri	2,265	U	29	19	10
	K-4	Mbezi	3,074	U	39	17	23
	K-5	Mabibo	3,327	U	42	21	22
	K-7	Mwananyamala B	3,165	U	40	25	16
	K-8	Kunduchi	2,921	U	37	13	25
	K-9	Mburahati	3,243	U	41	19	23
	K-10	Kawe A	3,253	U	41	20	22
Temeke	T-1	Azimio	1,838	U	23	14	10
	T-2	Sokoine	3,207	U	41	26	15
	T-3	Mbagala	4,854	U	62	23	39
	T-4	Madenge	2,381	U	30	20	11
	T-5	Gomvu	370	R	7	6	2
	T-6	Rangi Tatu	2,953	U	37	14	24
	T-7	Ufukoni	1,575	U	20	16	4
	T-8	Temeke	2,541	U	32	28	5
	T-9	Yale Yale Puna	309	R	6	2	4
	T-10	Vijibweni	607	R	12	3	9

(3) Selection of Project Schools

In the Project, a school with a shortage of less than 4 classrooms will not be covered by the Project sites for the following reasons: expectations of the self-reliant effort of the Government of Tanzania to construct school facilities, and the efficiency of the Project as Grant Aid cooperation. Thus, out of the 29 proposed schools, I-7 (Uhuru Girls) and T-5 (Gomvu) will not be covered. The final number of Project schools is 27.

(4) Number of Classrooms to Be Constructed

In accordance with Section 2-2-1-①, the number of classrooms to be constructed in the Project is calculated as follows:

① 4 classrooms per school will be built for schools in rural areas.

② The necessary number of classrooms (10 maximum) will be built for schools in urban areas

③ In case the average number of pupils per classroom exceeds 69 (the Project's maximum number of pupils for new classrooms after implementation of the Project), additional classrooms will be constructed in order to reduce the number of pupils to less than 69.

Table 2-2 Number of Classrooms to Be Constructed at Project Schools

No.	Name of Schools	R:Rural U:Urban	Number of lacking classrooms	Planned number of classrooms before adjustment	Number of pupils/ classrooms after the Project	Additional number of necessary classrooms	Number of pupils/ classroom after adjustment	Planned number of classrooms after adjustment
I-1	Kinyerezi	R	8	4	60.1	-	-	4
I-2	Boma	U	5	5	43.8	-	-	5
I-3	Mchikichini	U	4	4	44.8	-	-	4
I-4	Tabata	U	24	10	62.9	-	-	10
I-5	Ukonga	U	12	10	46.2	-	-	10
I-6	Gongo la mboto B	U	9	9	43.5	-	-	9
I-8	Msongola	R	5	4	45.9	-	-	4
I-9	Kiwalani	U	18	10	65.6	-	-	10
I-10	Mvuti	R	6	4	49.3	-	-	4
K-1	Tandale Magharibi	U	17	10	59.1	-	-	10
K-2	Kimara B	R	11	4	63.9	-	-	4
K-3	Uzuri	U	10	10	44.6	-	-	10
K-4	Mbezi	U	23	10	65.1	-	-	10
K-5	Mabibo	U	22	10	61.3	-	-	10
K-7	Mwananyamala B	U	16	10	51.7	-	-	10
K-8	Kunduchi	U	25	10	72.6	2	66.8	12
K-9	Mburahati	U	23	10	63.9	-	-	10
K-10	Kawe A	U	22	10	62.0	-	-	10
T-1	Azimio	U	10	10	43.8	-	-	10
T-2	Sokoine	U	15	10	50.9	-	-	10
T-3	Mbagala	U	39	10	84.1	8	67.7	18
T-4	Madenge	U	11	10	45.4	-	-	10
T-6	Rangi Tatu	U	24	10	70.3	1	67.5	11
T-7	Ufukoni	U	4	10	45.0	-	-	10
T-8	Temeke	U	5	10	44.0	-	-	10
T-9	Yale Yale Puna	R	4	4	44.1	-	-	4
T-10	Vijibweni	R	9	4	74.3	1	65.0	5

(5) Number of Teachers' Offices to Be Constructed

The number of teachers' offices to be constructed is determined in accordance with the following procedures:

1) Prerequisites

① New teachers' office will be constructed at schools with a shortage of existing teachers' offices.

② The appropriate number of teachers is set as the number of pupils divided by 45, which is based on the new policy on teacher assignment revised by MOEC.

③ There is a minimum floor space (2.5m^2) per teacher (approx. 50m^2 for 20 teachers,

based on standards).

2) Calculation Method

① The calculation of the appropriate number of teachers should be based on the number of pupils. In case that a school is divided into two separate schools after Project completion, the number of pupils in the new school should be calculated in accordance with the proportion of the number of both existing classrooms and newly built classrooms.

Appropriate number of teachers = Number of pupils ÷ 45

② According to the number of class shifts of Project schools, the number of teachers who use the teachers' office at the same time should be calculated by multiplying 6/7 to the appropriate number of teachers of Project schools in rural areas and 4/7 to the appropriate number of teachers of Project schools in urban areas.

Number of Teachers using the Teachers' Office at the Same Time

= (Appropriate Number of Teachers × 6/7 or 4/7)

③ Necessary office space for teachers should be calculated by using the number of teachers who use the office at the same time.

Necessary Teachers' Office Space

= Number of Teachers using Office at the Same Time × 2.5m^2

④ The lacking floor space of teachers' office should be calculated by subtracting the area of the existing teachers' offices from the necessary teachers' office space.

Teachers' offices will be built for Project schools that lack office space. For those Project schools that are to be separated from existing schools after the implementation of the Project, the necessary teachers' office space should be calculated based on the premise that the new schools do not have teachers' offices without regard to whether or not the existing schools have teachers' offices.

Lacking Floor Space of Teachers' Offices

= Necessary Teachers' Office Space － Floor Space of Existing Teachers' Offices

3) Space for Teachers' Office

① By dividing the lack of floor space of a teachers' office by 2.5m², the number of teachers to be accommodated corresponding to the lack of floor space should be calculated.

② In accordance with the Design Standards, office space for 20 teachers is equivalent to that of one classroom. Offices will be provided for each Project school based on the number of teachers to be accommodated as calculated above. Three types of teachers' offices is shown in Table 2-3 along with the necessary number of teachers' offices to be provided to each Project school.

③ The number of furniture units to be installed in teachers' offices is accordance with "the number of teachers to be accommodated" in Table 2-4:

Table 2-3 Size of Teachers' Office to Be Constructed

Number of teachers to be accommodated	Size of teachers' office to be constructed	Capacity of the planned office
0 – 4	No construction planned	―
5 – 14	Equivalent to 0.5 classroom	10
15 – 24	Equivalent to 1.0 classroom	20
25 – 34	Equivalent to 1.5 classrooms	30

4) Size of Teachers' Offices for Each Project School

Based on the above-mentioned procedures, the size of teachers' offices for each Project school is calculated and shown in Table 2-4:

Table 2-4 Size of Teachers' Office at Project Schools

No.	Name of School	R: Rural U: Urban	Number of pupils (2001)	Appropriate number of teachers	Number of teachers to use the office at the same time	Necessary area for teachers' office	Area of existing teachers' office	Area in shortage	Number of teachers to be accommodated	Size of teachers' office to be provided
I-1	Kinyerezi	R	701	16	14	35.0	60	-25.0	-	
I-2	Boma	U	1685	37	22	55.0	55	0.0	-	
I-3	Mchikichini	U	1255	28	16	40.0	36	4.0	2	
I-4	Tabata	U	3740	24	14	35.0	190	35.0	14	1
I-5	Ukonga	U	3474	18	11	27.5	76	27.5	11	0.5
I-6	Gongo la mboto B	U	1752	39	23	57.5	99	-41.5	-	
I-8	Msongola	R	535	12	11	27.5	80	-52.5	-	
I-9	Kiwalani	U	1951	43	25	62.5	40	22.5	9	0.5
I-10	Mvuti	R	633	14	13	32.5	54	-21.5	-	
K-1	Tandale Magharibi	U	2171	48	28	70.0	60	10.0	4	
K-2	Kimara B	R	1193	27	23	57.5	19	38.5	16	1
K-3	Uzuri	U	2265	50	29	72.5	67	5.5	3	
K-4	Mbezi	U	3074	68	40	100.0	55	45.0	18	1
K-5	Mabibo	U	3327	74	43	107.5	95	12.5	5	0.5
K-7	Mwananyamala B	U	3165	70	41	102.5	83	19.5	8	0.5
K-8	Kunduchi	U	2921	65	38	95.0	95	0.0	-	
K-9	Mburahati	U	3243	72	42	105.0	56	49.0	20	1
K-10	Kawe A	U	3253	72	42	105.0	78	27.0	11	0.5
T-1	Azimio	U	1838	41	24	60.0	27	33.0	14	0.5
T-2	Sokoine	U	3207	71	41	102.5	70	32.5	13	0.5
T-3	Mbagala	U	4854	47	28	70.0	208	70.0	28	1.5
T-4	Madenge	U	2381	53	31	77.5	81	-3.5	-	
T-6	Rangi Tatu	U	2953	66	38	95.0	28	67.0	27	1.5
T-7	Ufukoni	U	1575	35	20	50.0	26	24.0	10	0.5
T-8	Temeke	U	2541	56	33	82.5	80	2.5	1	
T-9	Yale Yale Puna	R	309	7	6	15.0	0	15.0	6	0.5
T-10	Vijibweni	R	607	13	12	30.0	0	30.0	12	

(6) Number of Toilets

The number of toilets is determined in accordance with the following procedures;

1) Prerequisites

① The number of students that may be accommodated in new classrooms built by the Project (45 pupils per classroom) will be the basis of determining the number of toilets.

② One half of the students should be girls and the other half boys.

2) Required Number of Toilets

① Based on "the Primary School Facility Building Standards" as the basic principle, one toilet bowl per 20 girls and one toilet per 25 boys will be installed. In the girls' toilet, toilet bowls for teachers will be installed (except for small schools).

② For boys, one-third of the total number of needed toilets will be toilet bowls and two-thirds will be urinals.

③ Based on the above calculation, seven types of toilets (four types for girls and three types for boys) were set up as shown in Table 2-5. Appropriate types will be selected for each school depending on the requirements.

Table 2-5 Calculation of the Number of Toilets

Girls' Toilets		Boys' Toilets	
No. of Units	Type	No. of Units	Type
6	SG	5	SB
11	MG	-	-
13	LG	9	MB
15	XG	11	LB

3) Number of Toilet facilities at Project Schools

The number and types of toilets required for each Project school are shown in Table 2-6.

Table 2-6 Number of Toilet Facilities at Project Schools

No.	Name of School	Number of classroom to be constructed	Number of pupils to be accommodated	Number of boys/girls	Stools for girls	Stools for boys	Toilet Type	
							Girls	Boys
I-1	Kinyerezi	4	180	90	5	4	SG	SB
I-2	Boma	5	225	113	6	5	SG	SB
I-3	Mchikichini	4	180	90	5	4	SG	SB
I-4	Tabata	10	450	225	12	9	LG	MB
I-5	Ukonga	10	450	225	12	9	LG	MB
I-6	Gongo la mboto B	9	405	203	11	9	LG	MB
I-8	Msongola	4	180	90	5	4	SG	SB
I-9	Kiwalani	10	450	225	12	9	LG	MB
I-10	Mvuti	4	180	90	5	4	SG	SB
K-1	Tandale Magharibi	10	450	225	12	9	LG	MB
K-2	Kimara B	4	180	90	5	4	SG	SB
K-3	Uzuri	10	450	225	12	9	LG	MB
K-4	Mbezi	10	450	225	12	9	LG	MB
K-5	Mabibo	10	450	225	12	9	LG	MB
K-7	Mwananyamala B	10	450	225	12	9	LG	MB
K-8	Kunduchi	12	540	270	14	11	XG	LB
K-9	Mburahati	10	450	225	12	9	LG	MB
K-10	Kawe A	10	450	225	12	9	LG	MB
T-1	Azimio	10	450	225	12	9	LG	MB
T-2	Sokoine	10	450	225	12	9	LG	MB
T-3	Mbagala	18	810	405	21	17	MG+LG	MB+ MB
T-4	Madenge	10	450	225	12	9	LG	MB
T-6	Rangi Tatu	11	495	248	13	10	XG	LB
T-7	Ufukoni	10	180	90	5	4	SG	SB
T-8	Temeke	10	225	113	6	5	SG	SB
T-9	Yale Yale Puna	4	180	90	5	4	SG	SB
T-10	Vijibweni	5	225	113	6	5	SG	SB

(7) Furniture and Equipment Component

The following furniture and equipment will be provided by the Project:

1) Furniture for Classroom

① Desks and chairs for pupils: Twenty-three (23) two-seat desk & chair units for 45 pupils will be provided. The size of one unit will be large enough for three pupils to share. Thus, the maximum of 69 pupils can be accommodated in a classroom.

② One teacher's desk and chair per classroom will be provided.

③ Blackboards: One blackboard per classroom will be provided.

④ Bulletin Boards: Two bulletin boards per classroom will be provided

⑤ A horizontal piece of timber will be installed on the backside wall of each classroom for the purpose of displaying exhibit items or for placing small shelves on. This piece of timber will be installed as a part of the interior work. The estimated cost of the timber should not be included in furniture and equipment costs.

2) Furniture for Teachers' Office

① Individual tables with drawers and chairs will be provided in accordance with the number of teachers to be accommodated in new teachers' offices.

② Built-in shelves will be installed for storage of textbooks and teaching materials.

(8) Facility Component

1) Electrical Facility

Teachers' offices constructed by the Project will be provided with empty wire conduits for lighting fixtures and outlet installation. In addition, slits for installing electrical wires will be provided on classroom walls.

2) Water Supply Facilities

For the purpose of washing one's hands, simple, fill-by-hand water storage tanks will be installed in the toilet areas. The tanks will be equipped with faucets. To complement the water supply, a rainwater collecting system will be installed.

For the purpose of securing water sources, rainwater storage tanks will be installed to collect rainwater from the roofs of classroom buildings at all Project schools. The

rainwater storage tanks will be equipped with a faucet. A simple soak pit will also be installed for drainage.

2-2-2-2 Site and Layout Plan

As the site conditions at each school are various, the most appropriate layout plan will be prepared after examining the school site configuration, infrastructure development conditions and the existing building arrangement. The main principles in the layout plan are as follows:

① New buildings will be arranged to complement the existing buildings. The corridor will be arranged to either the side of existing school buildings, the side of courtyards, or the side of school playgrounds.

② A new building will be constructed on flat land in order to ensure the structural safety of the building foundation. The minimum size of required foundation should be selected to suit the elevation difference of the site. The buildings will be arranged along the contour lines of the site to keep the amount of work to be undertaken by the Tanzanian side to a minimum. Furthermore, the safety of the buildings will be secured against possible rainwater erosion and flooding around the buildings.

③ Natural ventilation will be utilized to its maximum extent by taking into account the direction of the winds. New buildings will be constructed at sufficient distance from existing ones to allow the winds to aid in the ventilation.

④ Buildings will be arranged and constructed by taking into account: neighboring obstructions, the effects of sunlight from the west side and the natural lighting condition.

⑤ A location that is liable to be damaged during floods should be avoided.

⑥ Toilet buildings will be arranged by taking into account the odor and surrounding

environment and constructed separately from the classroom building.

⑦ Where single storied buildings are not possible due to the limited space at the site, two-storied buildings will be planned. The following two schools are the recipient of a two-storied building.

- K-4 Mbezi:

  This site is located on a hill with limited flat area for the facility to be built. If ten classrooms and a teachers' office are to be built as single story buildings, a large amount of land preparation work will be required. Thus, a two-storied building was decided upon for the school.

- K-7 Mwananyamala B:

  Surrounded by walls, this site is dotted with existing buildings, leaving little space for the construction of new buildings. The neighboring land, which belongs to the school, is a playground that is used by communities. The school strongly requested not to use the playground for new building construction. It is impossible to arrange a single story building on the site for ten classrooms and a teachers' office. Thus, it was decided upon to build a two-storied building.

⑧ Several basic facility units will be set up, and should be adapted to the needs and site conditions of each Project school.

⑨ As much as possible, based on site conditions, and if the school site conditions allow, facility arrangement will be made to create an outdoor open space in order to encourage community activities for area residents, and outdoor activities for students.

⑩ The teachers' office should be arranged at a convenient location by taking into consideration the moving line from classroom to classroom and their access to existing facilities.

⑪ In the event that more than two classroom buildings have to be closely built side by side according to the school size, corridors connecting the buildings should be built to provide cover for walking during rainy days. As for the corridors, just as for the foundation the safety should be secured against rainwater erosion and flood during the rainy seasons.

⑫ Gender perspectives should be taken into account in the layout plan especially for toilet facilities, as follows;

1) In order to maintain security, the entrance to toilet facilities will face the classrooms, the head teacher's office, or the teachers' office.

2) The entrance to boys' and girls' toilets will be arranged as not to be facing each other.

3) The boys' and girls' toilets will be arranged with a certain distance between them.

4) In order to minimize the frequency of boys passing the girls'toilets, the boys' toilets will be placed first in line before the girls' toilets when walking from the classrooms.

2-2-2-3 Architectural Plan

(1) Floor Plan

① Adequate openings and locations for natural ventilation and lighting will be planned, taking into account the direction of natural sunlight, ensuring to secure of a sufficient amount of light, and preventing the reflection of sunlight on the blackboards.

② As the locations and lengths of concrete-block walls are limited, openings will be arranged by taking into consideration the safety and costs of the walls. Thus, the size and locations of windows vary depending on a single story building or a two-storied building. But, in any case, the window size should be larger than that specified in the design standards. In order to improve the situation of darkness in classrooms in Tanzania, the window areas of Project schools will be designed as being equivalent to the one-fifth of the floor areas as specified in the Japanese design standards.

③ Common spaces including walkways will be planned as spaces not only for moving lines, but also for community meeting and adult education etc.

Each facility will be planned by taking into consideration the following matters:

1) Classroom

A basic unit of 6m×8.5m (51m^2) to accommodate 45 pupils will be set up for classrooms based on the design standards. The school building will have a walkway, 2m in width, on one side according to the natural ventilation and lighting conditions. A movable partition will be provided between two classrooms to accommodate making one large multipurpose room that can be used for community activities at each Project school.

The specifications of the movable partition should be a panel type door that does not

impair the classroom function that attaches greater importance on the acoustic function of the classroom and durability than the easiness to open and close. Two-storied buildings will have the same floor arrangement. The width of the walkway will have the same floor arrangement. One indoor and one outdoor stairway will be installed based on local building standards. The locations and number of blackboards, bulletin boards and entrances will be planned based on the design standards.

2) Teachers' Office

Considering adequate distance and direction from existing buildings, the teachers' office will be placed at a convenient place for the school management. The standard size of teachers' office will be equivalent to the size of a classroom. One of the three types of rooms will be set up to suit the number of teachers to be accommodated. Security of the office will be considered, and doors and windows will be installed in the openings.

3) Toilets

Toilet buildings will be separated from the other school buildings with the consideration of possible odor and hygienic conditions. As for the shape of toilet area and the number of booths, several standard types will be set up based on the site conditions and the necessary number of toilet bowls. The plan for the toilets will be made to secure natural ventilation and lighting by following the local standard types included in the design standards of Tanzania. Disposal of sewerage will be improved by the direct infiltration method which is a septic tank having a sedimentation chamber, septic chamber, and infiltration chamber. By taking into account gender-sensitive facility design, the floor plans for the toilet facilities will be made as follows:

① Boys' and girls' toilets will be constructed as separate buildings for all schools.

② A wall will be constructed outside the toilets booth to serve as a screen so that it is

not possible to see directly, when someone is going in or out of the toilets.

③ A sign will be installed at the entrances to clearly identify boys' and girls' toilets.

④ Sanitary boxes are placed in girls' toilets.

4) Classroom Types

As for school facilities, the basic units set for the Project are shown in Table 2-7. Also, a layout plan will be carried out, adjusting to the size of the facilities and the conditions of the sites.

Table 2-7 Basic Plan Unit for Each Room

Type of Facility	Building Type	Facility Type	No.of Bldg. Stories	Floor Area
Classroom (CR)	TYPE-3	3CR	1	191.25㎡
	TYPE-4	4CR	1	255.00㎡
	TYPE-5	5CR	1	318.75㎡
	TYPE-6	6CR	1	382.50㎡
Classroom (CR) ＋ Teachers' Office (TO)	2-TYPE-5ST	10CR＋TO(Small)	2	794.14㎡
	2-TYPE-5MT	10CR＋TO(Medium)	2	826.89㎡
	TYPE-2LT	2CR＋TO(Large)	1	223.12㎡
	TYPE-4ST	4CR＋TO(Small)	1	290.25㎡
	TYPE-5ST	5CR＋TO(Small)	1	354.00㎡
	TYPE-4MT	4CR＋TO(Medium)	1	318.75㎡
	TYPE-5MT	5CR＋TO(Medium)	1	382.50㎡
	TYPE-5LT	5CR＋TO(Large)	1	414.37㎡
Toilet	SB	Boys' Toilet(Large)： 3 Urinals＋2 Pit Latrines	1	20.43㎡
	MB	Boys' Toilet(Medium)： 3 Urinals＋2 Pit Latrines	1	32.49㎡
	LB	Boys' Toilet(Small)： 3 Urinals＋2 Pit Latrines	1	38.07㎡
	SG	Girls' Toilet(Small)： 6 Pit Latrines	1	32.02㎡
	MG	Girls' Toilet(Medium)： 10 Pit Latrines	1	58.08㎡
	LG	Girls' Toilet(Large)： 12 Pit Latrines	1	65.52㎡
	XG	Girls' Toilet(Extra Large) 14 Pit Latrines	1	72.96㎡

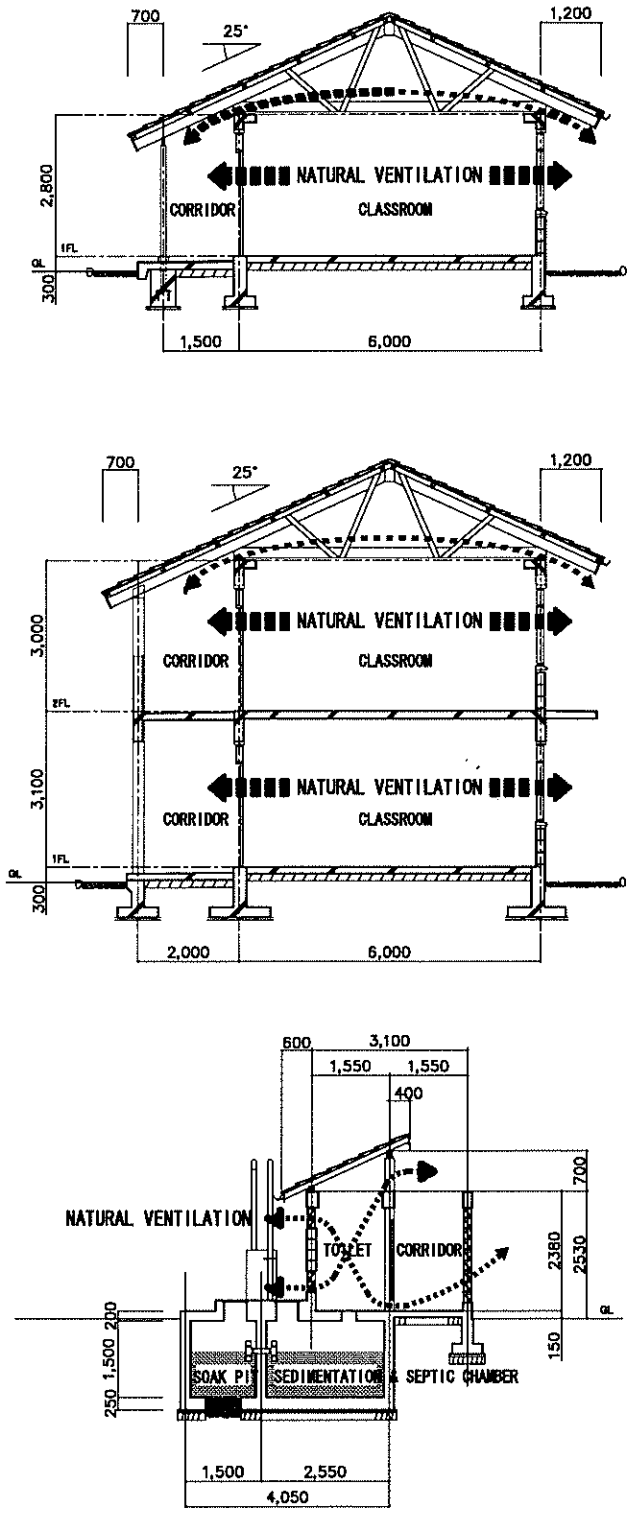
(2) Section Plan

The section plan will be made to suit the climatic conditions in the Project area characterized by the large amount of sunlight, high temperature and humidity by taking measures against radiant heat from roof surfaces. No ceiling will be installed in the rooms. Radiant heat from the roofs should be prevented by naturally ventilating the attic space and by the roof materials insulation capability. To secure the opening heights specified in the design standards, the story height will be 2.8m (at the top of roof beams) for a single-story building, and 3.1m in the first floor and 3.0m in the second floor for a two-storied building.

Roof designs will be sloped roofs of the gable type. The length of eaves should be 1.2m from the face of the non-walkway sidewalls to protect from rain. If the site has a slope, ditches will be constructed along the building to protect the foundation against soil erosion by rainwater. Moreover, as several Project schools experienced flood in the past, their floor heights will be decided upon based on the flood records.

Toilets roofs should be installed only on the booths to allow natural ventilation and lighting. Louver blocks should be built around the toilets for privacy. Standard sections of toilets and classroom are as shown in Fig. 2-1.

Fig 2-1 Standard Sections of Toilet Facility and Classroom



(3) Structural Plan

1) Structure Type

In order to improve building safety and strength, a reinforced concrete block structure that is an improvement over the local concrete block structure will be adopted for the Project.

The bearing walls of a building will be made of 15 cm thick concrete blocks. Wall girders that become one structure, combined with a continuous footing will be built at the bottom portions of the walls. On the top of the walls, roof beams will be built to secure the horizontal direction rigidity of the building. Reinforcing steal bars will be installed in both ends of every concrete block and are to be connected to the wall girders and roof beams. At both ends of each bearing wall a 100mm thick concrete pillar and steel bars will be installed to act as an axial reinforcement. By arranging bearing walls in balance, the safety of the building will be secured against normal loads and the lateral loads of typhoon wind forces and seismic forces.

The building foundation will be of the continuous footing type to be built on an elevation of GL-750mm. As a result of site survey, the normal bearing capacity of the ground will be 5tons/m^2 for sandy soil.

As the span length of the building roof is 6m, and the wooden Warren lattice truss type is commonly used in Tanzania. The wooden Warren lattice truss type has less structural members than the King Post truss type and it is easier to join the members. Thus, the wooden Warren lattice truss type was decided upon to adapt to the Project. Metal fittings should be used at the wooden joints and the truss should be firmly fixed to the roof beams.

The two-storied building will be the reinforced concrete block type. The second floor will be reinforced concrete slab. The floor beams will be arranged so that vertical forces can be directly transmitted to the bearing walls. The floor beams will be of a size that will

control cracking. The corridor floor will be a concrete slab that is to be supported by the floor beams arranged on concrete columns, which will be built outside of the building. The indoor stairway will be the slab type, supported by the first floor beam and the second floor beam. As for the exterior stairway, a reinforced concrete bearing wall will be built to support the vertical force of the stairway at its middle portion. The stairway slab will be designed as a cantilever type.

2) Load and External Force

Load conditions for facility design will be based on the Tanzanian "BRU Technical Guideline, Two Loads for Structural Design," and "The Tanzania Building Regulations." Those rules specify building structures. The application of the rules will be examined in reference to the Japanese building standards and site survey result.

① Seismic Force and Wind Force

There are no records of earthquake damage in Dar es Salaam. But, there are records showing magnitude 5 class earthquakes, and the acceleration of those earthquakes was 10 to 25 gals, around Dar es Salaam. Some roofs and walls of existing school buildings have been observed to have damaged caused by strong winds. By taking into consideration the above Tanzanian rules and the analysis results of the past earthquakes and wind records, it was decided upon to set the seismic shear coefficient as 0.1 and wind force as 30m/sec.

② Structural Analysis and Design of Structural Members

Structural analysis and the design of structural members will be prepared based on the British Standard that is conventionally used in Tanzania.

③ Structural Material

The specifications and the strengths of the structural materials to be used for the Project will be set as follows:

Name of Material	British Standard
① Concrete C40	Fc = 21N/mm^{2} equivalent
② Floor concrete and leveling concrete	C30 Fc = 16N/mm^{2} equivalent
③ Concrete block, local made	JIS Type "B" equivalent
④ Steel bar	σ_y = 250N/mm^{2} R10 and R12 SR 24 equivalent
	σ_y = 410N/mm^{2} Y10, Y12, Y16 SD 345 equivalent
⑤ Steel frame	SS390, STK390 (JIS)
⑥ Wooden truss, Cypress	Grade "E," "G" JAS Coniferous Class 1, Grade 1

(4) Facility Plan

1) Water Supply Facility

Some Project schools have existing water supply facilities. For the effective use of rainwater during the rainy seasons as well as the reduction of the maintenance costs, all Project schools will be provided with a simple soak pit and faucet-equipped rainwater storage tanks, which will collect rainwater from the roofs of the classroom buildings.

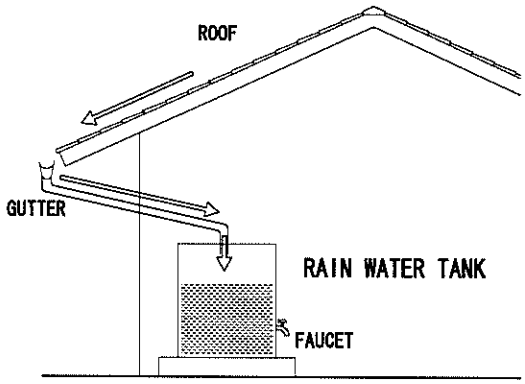
As for tank capacity, the design standards of the primary schools in Tanzania show the standard drawing of a 30-ton tank. But, its installation method and the required number of tanks are not specified. The number of storage tanks will be decided upon by taken into account the size of each Project school.

The monthly rainfall in Dar es Salaam and the amount of rainwater that can be collected from roofs (90m^{2}) from one building is as shown in Table 2-8. Based on the average amount of rainwater that can be collected in a week during the rainy seasons (a 5 month period: March through May, November, and December), and to avoid long-term water storage for sanitary reasons, the 5-ton capacity rainwater storage tank which can store a sufficient amount of water will be implemented in the Project.

Table2-8 Amount of Rainfall in Dar es Salaam

	Monthly Rainfall (mm)	Amount of Water to be Collected in a week (t)
January	82	1.5
February	57	1.1
March	130	2.5
April	263	5.0
May	179	3.4
June	37	0.7
July	29	0.5
August	27	0.5
September	26	0.5
October	60	1.1
November	121	2.3
December	113	2.1

Fig 2-2 Rainwater Storage Tank



For cases in which the amount of water to be used by students (3 liters a day per person) and teachers (9 liters a day per person), the amount of water necessary for one week and the required number of storage tanks are as shown in Table 2-9.

Table 2-9 Number of Rainwater Storage Tanks for Planned Classrooms

Number of Classrooms to be Built	Amount of Student Use Water (t)	Amount of Teacher Use Water (t)	Planned Amount of Water a Week (t)	Number of Rainwater Storage Tanks (5t)
4	0.36	0.02	1.92	1
5	0.45	0.03	2.40	1
9	0.81	0.05	4.32	2
10	0.90	0.06	4.80	2
11	0.99	0.07	5.28	2
12	1.08	0.07	5.76	2
18	1.62	0.11	8.64	3

For water for hand-washing, simple water tanks will be installed in toilets. The tank will be supplied with water by hand, directly from nearby water sources. The tanks will be equipped with faucets. For sanitary reasons, the tank capacity should be about 1 ton to prevent water from becoming stagnant. To supplement the water supply, rainwater-collecting facilities will be installed on the roofs of toilet buildings.

2) Sewerage Facility

As there are no public sewer lines in the Project areas, sewage will be disposed of by direct infiltration into the soil. The installing of septic tanks will help improve the current system of pit latrines (local style-direct infiltration method tank) by reducing the contamination level of the sewage. Septic tanks require a sufficient amount of water to function effectively. So, at the four Project schools (I-1 Kinyerezi, I-10 Mvuti, T-9 Yale Yale Puna, and T-10 Vijibweni) which have no source of water on or near their sites, pit latrines should be installed.

Soil at the Project sites is either sand or a sand-clay mix. And although it has been evaluated to have sufficient filtration capability, slits will be made in the septic tank walls in order to enhance this capability. As a measure against the groundwater table rising during rainy seasons, perforated pipes will be installed.

(5) Building Material and Equipment Plan

1) Roofing

Among damaged portions that were confirmed at many Project schools during the site survey period, roofs were the most severely damaged. The roofs were corroded due to poor materials and by salt. The corrosion is attributed to the leakage of rain through damaged portions, thus, causing the decay of wooden truss structure members. As for roof material, metal roof materials and roof tiles were compared with each other for durability, local procurement situations, quality, need for maintenance and cost. As a result, roof tiles were selected for the Project.

Table 2-10 Roof Material Comparison Table

	Corrugated Steel Sheet (GI sheet)		Color Steel Sheet		Galvanized Steel Sheet		Aluminum Sheet		Stainless Steel Sheet		Roof Tile (Adopted in the Project)	
Weather Resistance	×	Weak against salt	×	Weak against salt	△	Salt damage in long period	○	Very slight salt damage	◎	No salt damage	◎	No salt damage
Heat Insulation	×	Attic space need insulating	×	Attic space need insulating	×	Attic space need insulating	×	Attic space need insulating	×		○	Attic space insulating is less
Main-tenance	× ×	Need mainte-nance cost every few years	×	Need mainte-nance cost every 10 years	△	Need mainte-nance cost every 13 years	◎	Free	◎	Free	○	Need to replace damaged tiles. Need coating in 5 ～10 years.
Procure-ment Situation	◎	Local product is available	◎	Local product is available	○	Imported material is available	×	Need to be imported from third country	×	Need to be imported from third country	◎	Local product is available
Use Condition	◎	Existing schools	◎	Factories	×	Housing	×		×		◎	Housing and schools
Initial Cost	◎	Low	○	Low	△	Rather high	×	High	×	High	△	Rather high
Durability	×	Very short	×	Short	×	Short	◎	Long	◎	Long	○	Long

2) Walls

The building structure of Project schools was decided upon as being reinforced concrete block structure. Similar to the block masonry used in the local building method, school buildings should have a paint finish on a mortar base. To supplement the illuminance in classrooms, the coating color should be of high luminosity. To prevent surface cracking, expansion joints having appropriate intervals should be made. The roof-beam portion above the partition wall should be made of wooden trusses finished with plywood boarding.

3) Flooring

Some of the damage to existing school facilities were the sagging and surface cracking of floors. For Project facilities, floors will be reinforced with steel bars to increase their strength; also floor surfaces will have a direct concrete finish to increase their strength.

4) Openings

The design standard requires the installation of glass jalousies in classroom windows. However, in view of the maintenance, repair and the durability of their open and close functions, they were evaluated as inadequate. To allow natural ventilation, classroom windows should be steel-grid windows having wooden frames. Teacher office windows should be of glass for maintenance purpose reasons. Each entrance and exist should be provided with a wooden sliding door. To prevent termite damage, the doors and window frames should be of hard wood and be treated with insecticide.

5) Ceiling

As described above, no ceilings will be installed in Project facilities. To supplement illuminance, the underside of the roofs should be coated with high luminosity paint.

Comparison of the conventional local finishing methods and those to be adapted to each building portion for the Project are listed in Table 2-11.

Table2-11 Comparison of Finishing Methods

		Local Method	Method Adapted to the Project	Reason for Adaptation
Structure	Foundation	Concrete footing and block wall	Reinforced concrete with continuous footing	To improve building strength and rigidity.
	Floor	Plain concrete floor	Reinforced concrete floor	To prevent floor settlement and cracking.
			Install polyethylene water proof sheets	To prevent floor against moisture
	Main Structure	Block wall structure: No reinforcing steel bar in the walls: With reinforced concrete roof beams.	Reinforced concrete block structure.	To increase building strength and rigidity.
	Roof Building Method	Wooden truss with reinforcing metal fittings at joints.	Wooden truss with reinforcing metal fittings at joints. Provided with sheathing	To secure the plane direction rigidity of the roofs by sheathing.
	Roof Type	Gable roof	Gable roof with 120cm long eaves	To prevent rain.
Exterior	Roof	GI corrugated steel sheet or roof tiles	Roof tiles	Insulation and acoustic capabilities and corrosion resistance of roof. Longer durability.
	Wall	Cement blocks or bricks: Paint coating or spray on a mortar base.	Concrete blocks: Paint coating on a mortar base. Expansion joints.	To prevent cracking due to contraction and expansion.
	Door	Wooden sliding door.	Wooden sliding doors (hard wood). Anti termite treatment.	To prevent termite damage.
	Classroom Window	Glass jalousies and curtain	Wooden frames and steel louvers (12mm diameter).	To allow natural ventilation, and for easy maintenance and cost reduction.
	Teachers' Office Window	Sliding glass door	Sliding glass door.	Easy maintenance and security purpose.
	Walkway Floor	Mortar steel trowel finish or wooden trowel finish.	Direct concrete finish.	To prevent cracking and surface exfoliation.
Interior	Ceiling	Coating finishes on ceiling board (no insulation capability).	Direct ceiling. Coating finish of the underside of roof.	For cost reduction.
	Wall	Cement blocks or bricks: Paint coating or spray on a mortar base.	Concrete blocks: Coating finish on a mortar base. With expansion joints.	To prevent cracking due to contraction and expansion.
	Floor	Mortar steel trowel finish	Direct concrete finish.	To prevent cracking and surface exfoliation.
Toilets		Direct infiltration method	Improved direct infiltration method (simple septic tank)	To lower contamination level
Blackboard		No particular requirement	Made of plywood.	To prevent cracking and surface exfoliation.
Bulletin board		No special requirement.	Made of plywood.	To prevent cracking and surface exfoliation

2-2-2-4 Equipment Plan

(1) Basic Furniture

The number of the furniture in the ordinary classrooms is shown in Table 2-12.

Table 2-12 Furniture per Classroom

Items	Standard of Provision
Blackboard	1 per classroom
Bulletin Board	2 per classroom
Student's Desk and Chairs (Large：For Grade 6 and 7)	6 per classroom（ 23×2/7 grade）
Student's Desk and Chairs (Small：For Grade1～5)	17 per classroom（ 23×5/7 grade）
Teacher's Table	1 per classroom
Teacher's Chair	1 per classroom

The number of the furniture in teachers' office is shown in Table 2-13.

Table 2-13 Furniture in Teachers' Office

Items	Capacity of the Room		
	For 10	For 20	For 30
Blackboard	1	1	2
Bulletin Board	3	3	3
Teacher's Table	10	20	30
Teacher's Chair	10	20	30

The list of the furniture provided in the Project is shown in Table 2-14.

(2) Educational Equipment

In the Project, educational equipment is not included as a component of assistance.

Table 2-14 List of Furniture at Each Project School

No.	Name of School	Planned Number of Classrooms	Capacity of the Teacher's Office	Total of Student's Desks and Chairs	Student's Desks and Chairs (L)	Student's Desks and Chairs (S)	Teachers' Tables and Chair	Tables in Teachers' Office	Chairs in Teachers' Office	Blackboard	Bulletin Board
I-1	Kinyerezi	4	-	92	24	68	4	-	-	4	8
I-2	Boma	5	-	115	30	85	5	-	-	5	10
I-3	Mchikichini	4	-	92	24	68	4	-	-	4	8
I-4	Tabata	10	20	230	60	170	10	20	20	11	23
I-5	Ukonga	10	10	230	60	170	10	10	10	11	23
I-6	Gongo la mboto B	9	-	207	54	153	9	-	-	9	18
I-8	Msongola	4	-	92	24	68	4	-	-	4	8
I-9	Kiwalani	10	10	230	60	170	10	10	10	11	23
I-10	Mvuti	4	-	92	24	68	4	-	-	4	8
K-1	Tandale Magharibi	10	-	230	60	170	10	-	-	10	20
K-2	Kimara B	4	20	92	24	68	4	20	20	5	11
K-3	Uzuri	10	-	230	60	170	10	-	-	10	20
K-4	Mbezi	10	20	230	60	170	10	20	20	11	23
K-5	Mabibo	10	10	230	60	170	10	10	10	11	23
K-7	Mwananyamala B	10	10	230	60	170	10	10	10	11	23
K-8	Kunduchi	12	-	276	72	204	12	-	-	12	24
K-9	Mburahati	10	20	230	60	170	10	20	20	11	23
K-10	Kawe A	10	10	230	60	170	10	10	10	11	23
T-1	Azimio	10	10	230	60	170	10	10	10	11	23
T-2	Sokoine	10	10	230	60	170	10	10	10	11	23
T-3	Mbagala	18	30	414	108	306	18	30	30	20	39
T-4	Madenge	10	-	230	60	170	10	-	-	10	20
T-6	Rangi Tatu	11	30	253	66	187	11	30	30	13	25
T-7	Ufukoni	4	10	92	24	68	4	10	10	5	11
T-8	Temeke	5	-	115	30	85	5	-	-	5	10
T-9	Yale Yale Puna	4	10	92	24	68	4	10	10	5	11
T-10	Vijibweni	5	10	115	30	85	5	10	10	6	13
Total		223	240	5129	1338	3791	223	240	240	241	494