Ministry of Education, Youth & Sports
Tuvalu

PREPARATORY SURVEY REPORT

ON

THE PROJECT FOR IMPROVEMENT OF

EDUCATIONAL FACILITIES

AT MOTUFOUA SECONDARY SCHOOL

IN

TUVALU

FEBRUARY 2011

JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)

MATSUDA CONSULTANTS INTERNATIONAL CO., LTD. AND
INTEM CONSULTING INC.

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PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey on the Project for Improvement of Educational Facilities at Motufoua Secondary School in Tuvalu, and organized a survey team headed by Mr. Tomohiro OSAWA of Matsuda Consultants International Co., Ltd. and consists of Matsuda Consultants International Co., Ltd. and INTEM Consulting Inc. from February, 2010 to February, 2011.

The survey team held a series of discussions with the officials concerned of the Government of Tuvalu, and conducted field investigations. As a result of further studies in Japan, 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.

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

February, 2011

Nobuko Kayashima

Director General,
Human Development Department
Japan International Cooperation Agency

Summary

1. Overview of the Country

Tuvalu is an island country located about 1,000 kilometres south of the equator and about 1,100 kilometres north of Fiji, consisting of nine true atolls and reef islands that spread about 600 kilometres from northwest to southeast centring around Funafuti atoll in the Southern Pacific Ocean. It is one of the smallest countries in the world with a total land area of 25.9km^2 (about 1/3 of Hachijo-jima island) and a population of about 11,000 (2010 estimation by Secretariat of the Pacific Community). The average and the highest elevations are 2 meters and 4.5 meters above sea level respectively. Because of its low elevation, Tuvalu is known as "the sinking country" due to global warming. Tuvalu belongs to the tropical marine climate, which is hot and humid all year round with mostly constant humidity of around 80% and temperature between 28˚C and 31˚C. The annual precipitation is around 3,000mm in the northern and central islands and around 3,500mm in Funafuti and southern islands. There is no clear distinction between the rainy season (roughly from November to March) and the dry season (roughly from April to October). Tuvalu is affected by rough seas and hit by cyclones during the rainy season, and experiences drought that sometimes lasts for a few months during the dry season.

Tuvalu has very little natural resources, and it is considered extremely difficult for the country to achieve economic growth independently due to its exceedingly small economy and isolated geographical position away from major markets. Tuvalu's nominal and real GDP in 2008 were 35.3 million A$ (about 3.0 billion yen) and 32.9 million A$ (about 2.8 billion yen) respectively and per capita value of nominal GDP was 3,564 A$ (about 300,000 yen) according to data of the Central Statistics Division (the same applies to the figures hereinafter), while the nominal GNDI (Gross National Disposable Income) of the same year was 68.6 million A$ (about 5.8 billion yen), which is almost twice as much as the nominal GDP indicating the country's heavy dependence on externally generated income and foreign aid. Tuvalu's main income sources are fish license revenues, rent of "dot.tv" internet domain name, distributions from Tuvalu Trust Fund (contributed by six countries including Japan) and aid inflows in terms of government revenues. Inbound remittances from ship crews and other workers working overseas are also one of the primary income sources for families, all of which are susceptible to the decline of world economy, changes in employment environment, and other external factors. For this reason, Tuvalu's economic growth rate between 2001 and 2008 fluctuated heavily between +6.7% and -4.1% (1.6% on the average).

The country's industrial structure is made up of 23.2% primary, 9.3% secondary, and 67.5% tertiary sectors (in comparison to nominal GDP). However, nearly 90% of the agricultural and fishery industries is subsistence production. The government sector, including education and health, takes up the largest share of 31.5%, while no industry worth mentioning exists in the private sector. To counter the situation, the Government of Tuvalu has developed the National

Strategies for Sustainable Development (NSSD: Te Kakeega II 2005-2015) in an effort to stabilize its macro economy and normalize its finances by promoting private industries, developing human resources, improving investment environment, and implementing other measures.

2. Background and Outline of the Requested Project

The Government of Tuvalu positioned the "development of education and human resource" as one of the priority areas of its National Strategy for Sustainable Development and formulated the Tuvalu Education Strategic Plan (TESP 2006-2010) in 2006 in order to carry out educational reform that envisions "providing quality education for sustainable living for all." For the secondary education sector, the government has placed the improvement of the curriculum and assessment system, enhancement of Technical and Vocational Education and Training (TVET), and upgrading of facilities among the key strategic areas and has set out to create educational/training opportunities catered to the needs of each local community by introducing a TVET stream to Motufoua Secondary School (MSS) and re-establishing Community Training Centres[1] (CTC) in each island as an urgent measure to provide an alternative access to education especially for children who have "pushed out" or "dropped out" of the formal education system by failing an examination at each level.

MSS is the only public secondary school in Tuvalu. It is a full boarding school that provides 4-year education for children who have completed 8-year primary education and passed the national examination. MSS' facilities were expanded and upgraded under the Japan's Grant Aid in 1998 (hereinafter referred to as "the previous project") to the capacity that could enroll all applicants, who have completed primary education, to junior secondary level. However, due to subsequent fire at a girls' dormitory in the year 2000 and deterioration caused by aging, heavy wind and salty sea breeze, a number of old buildings, which were constructed before the previous project and had been used for more than 20 years under such a harsh environment, has become unusable, forcing MSS to operate the school using unsuited buildings as temporary classrooms. In addition, the Public Works Department strongly suggested immediate demolition of most of those old buildings from a view of safety, some of which are in critical condition with major cracks on structural elements. Even the facilities that were constructed under the previous project are suffering extensive damages caused by harsh climatic conditions on the edges of the eaves, doors and windows, and electrical and pluming installations, preventing MSS from functioning adequately as an educational institution of secondary level. Furthermore, due to lack of usable facilities, the TVET streams, which were launched in 2009 for students failing promotion exams, are being taught by putting students in two forms in a temporarily built shed as a classroom.

In view of these circumstances, the Government of Tuvalu has developed a plan to rehabilitate and

[1] CTC is established in each island to provide general education and skill training to children who did not pass the entrance examination to secondary school, along with technical/vocational training to young adults who dropped out of the formal education system.

expand facilities and procure equipment necessary for school operation, and requested the Government of Japan to extend Grant Aid for the implementation of the plan.

3. Summary of the Survey Results and Contents of the Project

In response to the above-mentioned request, Japan International Cooperation Agency (JICA) dispatched a study team to Tuvalu from March 9 to March 25, 2010, and again from June 8 to June 24 of the same year to have discussions with the Ministry of Education, Youth and Sports (MEYS) and its Department of Education, MSS, and other parties concerned on the Tuvalu side, and to conduct site surveys based on the confirmed contents of the request. Subsequently, the study team analysed the findings of the field surveys in Japan and selected the items to be covered by this Project, which consisted of rehabilitation and construction of facilities and procurement of equipment that are high on the priority list of the Tuvalu side and deemed indispensable for properly conducting educational programs. The result was summarized in the Outline Design as part of the Draft Preparatory Survey Report. The team visited Tuvalu again to explain the contents of the report from January 11 to 18, 2011 and compiled this Preparatory Survey Report.

The outline of this Project, which was summarized based on the discussions with the recipient side, is as follows.

1) Project Components and Scale of the Japanese Assistance

This Project will, based on the current educational programs of MSS (full boarding, Academic Streams Form 3~Form 6, Vocational Streams Form 5~Form 6), eliminate the use of the aged facilities and temporary classrooms in deteriorated conditions and construct new buildings to expand the school's capacity to a scale that will allow all enrolled students to complete 4-year education in an appropriate learning/living environment. More specifically, the number of newly enrolled students was estimated at 150 based on MSS' current and past operational status (curriculum, class composition, trends in promotion to higher grade or education level, etc.) and the total capacity was set at 624 students[2] based on the assumption that all enrolled students would complete the 4-year programs. We then calculated the number of classrooms, each accommodating up to 30 students, necessary for each educational program and set the planed number of classrooms at 22 in total, from which we subtracted the number of existing facilities that were still usable in order to identify which facilities would be lacking (12 general classrooms and dormitories for 150 boys and 150 girls) and determined that this Project would cover the lacking facilities and construct the Administration Building necessary for effective operation of such facilities. These facilities are high on the priority list of the Tuvalu side and are basic and indispensable components for a boarding school. It was decided to exclude from the Project construction of the Special Classroom Building and Multipurpose Hall, which the Tuvalu side had

[2] This figure is larger than 600 (=150 students x 4 Forms) because some students advance from Academic Stream Form 5 to Vocational Stream Form 5.

requested, as it was determined as a result of analysis that the purposes and functions of such buildings would be served or substituted by the existing facilities. It is also decided to include a minimum rehabilitation work on the five existing facilities (General Classroom Building, Special Classroom Building, Boys Dormitory, Girls Dormitory, and Dining Hall & Kitchen) and the water cistern facilities of the Boys/Girls boarding zones, which were constructed under the previous project and would continue to be used, to restore or maintain their indented functions, as all of these facilities are indispensable for school operation.

2) Outline Design of Facilities and Equipment

Layout, room configuration, floor area, and specifications of each facility were determined by reviewing those of the previous project and improving them from the standpoints of durability, feasibility of construction/procurement, ease of maintenance, and cost reduction while taking into account the harsh climatic conditions and the construction environment unique to the remote island. In designing facilities, Japanese standards were applied to design major structural components, while Australian or New Zealander standards, which are most familiar in Tuvalu, were applied to the electrical installations and other utilities because of the necessity of daily maintenance. Considering the limited available resources on the remote island, it was decided that the buildings would be single-storied and have simple square planes with a standard span (2.4m) and unified cross sectional shapes as much as possible to simplify the installation work and minimize the construction cost. Also, in order to ensure decent quality appropriate for Japan's Grant Aid and meet the construction schedule, it was decided to use steel frames with appropriate anti-salt-corrosion performance in the main structures and adopt the dry construction method utilizing industrialized materials as much as possible in order to minimize on-site work that would affect the quality and schedule.

It was decided to concentrate the rehabilitation work on only the five existing facilities constructed under the previous project and implement minimum work to restore the required functions of each of these facilities. In designing the rehabilitation plan, we reviewed how the existing facilities had been used and maintained to see any modifications would be necessary in the specifications and construction methods.

Equipment items to be procured were selected by taking into consideration the priorities of the recipient side and after confirming that they would be utilized and maintained properly based on the detailed status of the existing equipment (procured under the previous project) as examined in the site survey. Quantity of each item was determined by taking into account the quantity of still usable existing equipment and in accordance with the purpose of their usage (for demonstration, practical training, etc.) so as not to create excess or shortage.

Contents and scale of each facility to be newly constructed or rehabilitated under this Project are shown in Table 1.

Table 1　Contents of Facilities

	Building Name	Contents	Specifications	Floor Area
New Construction	General CR Block 1	8 CRs (each for 30 students) , 2 preparation rooms	RC continuous footing+ superstructure of structural steel framing, single storey	664.32 ㎡
	General CR Block 2	4 CRs (each for 30 students)		299.52 ㎡
	Boys Dormitory 1	2 rooms (each for 50 students)		468.00 ㎡
	Boys Dormitory 2	1 room (for 50 students) , ablution area		412.20 ㎡
	Girls Dormitory 1	2 rooms (each for 50 students)		468.00 ㎡
	Girls Dormitory 2	1 room (for 50 students) , ablution area		412.20 ㎡
	Administration Block	Principal/ Deputy Principal's room, Teachers' room, Printing room, First-aid room, WC and storage		276.48 ㎡
	TOTAL			3,000.72 ㎡
Rehabilitation	General CR Block	8 CRs (each for 30 students) , 4 preparation rooms	RC continuous footing+ superstructure of RC framing with wooden truss for roof structure, single storey	699.80 ㎡
	Special CR Block	6 CRs (Science labs, Technical/ Home economics workshops), 3 preparation rooms		648.00 ㎡
	Boys Dormitory	3 rooms (each for 54 students), ablution area		715.60 ㎡
	Girls Dormitory	3 rooms (each for 54 students), matrons' rooms, ablution area		813.60 ㎡
	Dining Hall & Kitchen	Dining hall for 300 students, kitchen, storages		622.10 ㎡
	Water Reservoir Facility for boys dormitory	Buried reservoir tank (225 ㎥), elevated water tank (4 ㎥)	Reinforced concrete	-
	Water Reservoir Facility for girls dormitory	Ditto		-
	TOTAL			3,535.10 ㎡

Contents of the equipment procured under the Project are shown in Table 2.

Table 2　Contents of Equipment

Category	Equipment	Purpose	Qty.
Educational equipment	Math equipment (4 items including squares and blackboard with grid lines)	For blackboard	1 set
	Social science equipment (Pacific region wall map)	For instruction	1 sheet
	Science lab equipment (30 items including molecular model, funnel stand, waste water treatment apparatus, optical bench, lab table)	For experiments in chemistry, physics, biology, and science	1 set
	Drawing equipment (drawing board + tool set)	For practical	30 sets
	Woodwork tools (20 items including thicknesser, wood lathe chisel, electric circular saw, belt grinder)	For practical	1 set
	Cooking tools (10 items including gas cooker and refrigerator)	For practical	1 set

	Sewing tools (tape measure, ironing board)	For practical	1 set
	Sports equipment (7 items including various types of balls)	For athletic training and extracurricular activity	1 set
Administ-rative equipment	Office equipment (3 items including PC)	For school administration	1 set
	Medical equipment (8 items including autoclave and blood pressure machine)	For first aid	1 set
Furniture	15 items including desks & chairs for teachers & students and cabinets	For expanded and rehabilitated buildings	1 set
	Total: 102 items		

4. Project Schedule and Estimated Project Cost

Taking into account the scale of the construction work, impeding factors due to climatic conditions, and the circumstances of the local construction industry, we estimated that the detailed design work, tender procedure, and construction/rehabilitation/procurement work would take 3.5 months, 2.5 months, and 12.5 months respectively or 18.5 months in total. The cost to be borne by the Government of Tuvalu associated with this Project is roughly estimated at 4.16 million yen.

5. Project Evaluation

1) Relevance

The Project, under the overall goal to improve the quality of and accessibility to secondary education in Tuvalu, aims to improve learning and teaching environment at MSS and to provide alternative educational/training opportunities for children and young adults who drop out of the formal education system, by expanding and rehabilitating the educational facilities of the only public secondary school in Tuvalu. Due to lack of usable facilities, MSS is forced to operate the school by using temporary classrooms and other inadequate facilities and struggling to carry out the TVET programs that were introduced in 2009, thus requiring urgent improvement measures. In addition, this Project is in alignment with and will contribute to the achievement of the goals of the NSSD (Te Kakeega II 2005-2015) and TESP 2006-2010, both of which place the improvement of educational facilities for the provision of quality education among the most important agendas.

This Project is required to meet certain quality standards, such as durability to withstand harsh climatic conditions, while minimizing the cost and meeting the schedule under unique circumstances of a remote island that has virtually no available resources. The effective approach to meeting these requirements is to utilize prefabricated or industrialized materials as much as possible to minimize on-site work. Use of Japanese technology and products would be particularly effective, because Japan, which is also an insular country, offers a wide variety of advanced anti-salt-corrosion technology and products that are also superior in terms of quality and cost.

2) Effectiveness

【Quantitative Effect】

Outputs of this Project that are expected to produce quantitative effects are as follows:

- Construction of 12 additional classrooms will enable MSS to eliminate the 6 temporary classrooms and 4 aged classrooms that are recommended to be removed. This will reduce the number of students per permanent classroom from 55 to 28.
- The number of total classrooms at MSS will increase from 19 (including 10 temporary and aged classrooms that are inappropriate as educational facilities) to 22, which will provide an environment that will allow about 150 newly enrolled students to complete 4-year educational programs. This will ensure new educational opportunities (TVET) for about 50 children annually who drop out of school by failing examinations, improving the percentage of cohort reaching the final form (Form 6) from the current 76.2% to a higher percentage.
- Construction of dormitories with total capacity of 300 and rehabilitation of the existing ones with total capacity of 324 will provide improved living environments to all the students who have been forced to stay in unsafe and poor conditions in terms of hygiene and functionality. This will improve the percentage of students who enjoy their stay in permanent facilities from 50% to 100%.

Table 3 Expected Quantitative Effects

Indicator	Baseline (2010)	Target (2016)	Note
No. of students per permanent classroom	55 students	28 students	10 of 19 classrooms in baseline year are temporary or aged.
Percentage of cohort reaching the final school year	76.2%	100%	No. of students in F 6 / no. of students in F 3 of the relevant cohort
Percentage of students living in permanent facilities	50%	100%	

【Qualitative Effect】

Outputs of this Project that are expected to produce qualitative effects are as follows:

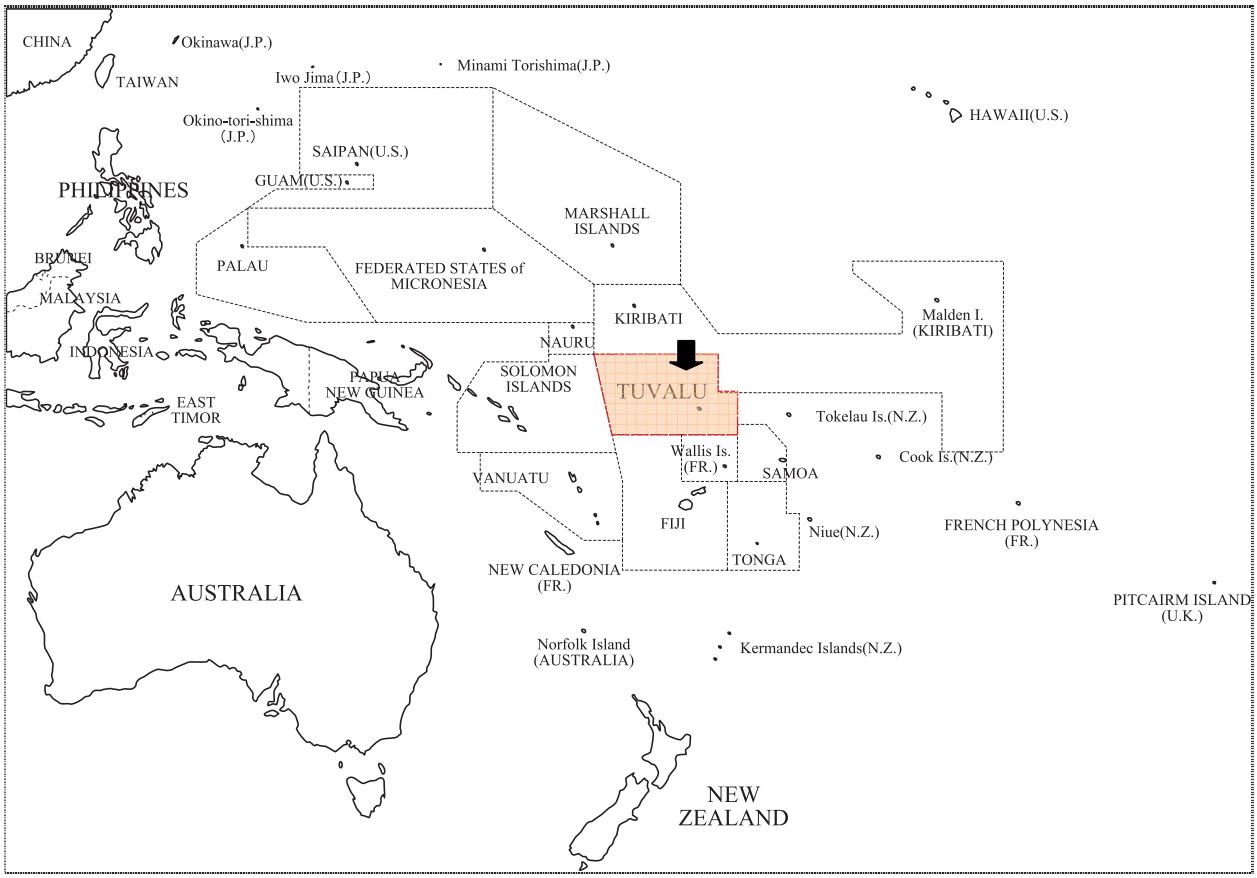
- Construction of the Administration Building that can accommodate all teachers will create an appropriate environment for teachers to carry out daily duties and hold meetings, which is expected to enhance classroom management and improve the quality of education through close communication among teachers.
- Replenishment and procurement of educational equipment that was lacking due to malfunctioning, etc. will enable teachers to teach classes effectively according to the curriculum and provide better-quality education, which will lead to the improvement of students' performance.

In addition to the above effects, this Project will support the achievement of the Tuvaluan government's priority agendas for the education sector, namely, "improvement of educational facility environment" and "enhancement of vocational and technical education and training" thereby contributing to the overall goal to "provide quality education for sustainable living for all." Therefore, the relevance of implementing this Project under Japan's Grant Aid is deemed high, and its effectiveness is sufficiently validated.

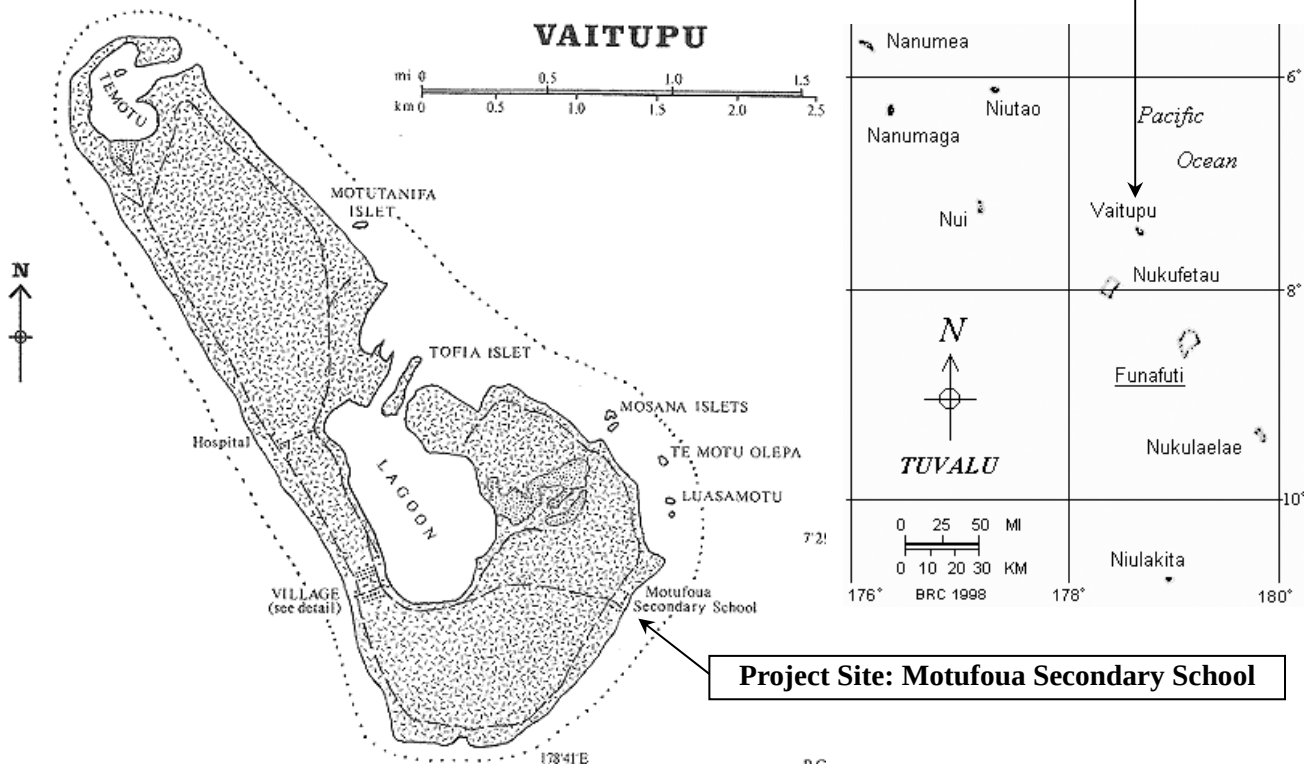
Contents

Appendices

Location Map



Project Site: Vaitupu



Project Site: Motufoua Secondary School

Perspective

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Abbreviations

AC/DC	Alternating / Direct Current
AIJ	Architectural Institute of Japan
A/P	Authorization to Pay
B/A	Banking Arrangement
CB	Concrete Block
CTC	Community Training Centre
DOE	Department of Education
EIA	Environment Impact Assessment
E/N	Exchange of Notes
FJC(E)	Fiji Junior School Certificate (Examination)
FY	Fiscal Year
G/A	Grant Agreement
GDP	Gross Domestic Product
GNDI	Gross National Disposable Income
GNI	Gross National Income
HOD	Head of Department
IEE	Initial Environmental Examination
IH	Induction Heating
JASS	Japanese Architectural Standard Specification
JICA	Japan International Cooperation Agency
JIS	Japanese Industrial Standard
LAN	Local Area Network
LCD	Liquid Crystal Display
LPG	Liquefied Petroleum Gas
M/D	Minutes of Discussions
MEYS	Ministry of Education, Youth and Sports
MSS	Motufoua Secondary School
MTEF	Mid-Term Expenditure Framework
NSSD	National Strategy for Sustainable Development
NYEE	National Year Eight Examination
OHP	Overhead Projector
OJT	On-the-Job Training
OS	Operation System
PC	Personal Computer
PC	Pre-cast Concrete
PEMAC	Physical Education, Music and Arts and Craft

P/Q	Pre-qualification
PSSC(E)	Pacific Senior School Certificate (Examination)
PVC	Polyvinyl Chloride
PWD	Public Works Department
RC	Reinforced Concrete
SPC	Secretariat of the Pacific Community
TEC	Tuvalu Electricity Corporation
TESP	Tuvalu Education Strategic Plan
TSC(E)	Tuvalu School Certificate Examination (Examination)
TVET	Technical and Vocational Education and Training
UPS	Uninterruptible Power Supply
WS	Workshop

Chapter 1. Background of the Project

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1-1 Background and Outline of the Request

The Government of Tuvalu positioned the “development of education and human resource” as one of the priority areas of its National Strategy for Sustainable Development (NSSD: Te Kakeega II 2005-2015) and formulated the Tuvalu Education Strategic Plan (TESP 2006-2010) in order to carry out educational reform that envisions “providing quality education for sustainable living for all.” For the secondary education sector, the government has placed the improvement of the curriculum and assessment system, enhancement of TVET, and upgrading of facilities among the key strategic areas and has set out to create alternative educational/training opportunities by introducing a TVET stream to MSS and re-establishing Community Training Centre (CTC) in each island as an urgent measure to provide access to education especially for children who have “pushed out” or “dropped out” of the formal education system by failing an examination at each level.

MSS is the only public secondary school in Tuvalu and a full boarding school that provides 4-year education for those who completed primary education and passed the national examination. The accommodation capacity of MSS was expanded to 600 students through facility upgrading under the previous Japan’s Grant Aid Project (hereinafter, “the previous project”) in 1998. However, due to subsequent fire at a girls’ dormitory in the year 2000 and deterioration caused by aging, heavy wind and salty sea breeze, a number of old buildings, which were constructed before the previous project and had been used for more than 20 years under such a harsh environment, has become unusable, forcing MSS to operate the school using unsuited buildings as temporary classrooms. In addition, the PWD strongly suggested immediate demolition of most of those old buildings from a view of safety, some of which are in critical condition with major cracks on structural elements. Even the facilities that were constructed under the previous project are suffering extensive damages caused by harsh climatic conditions on the edges of the eaves, doors and windows, and electrical and pluming installations, preventing MSS from functioning adequately as an educational institution of secondary level. Furthermore, due to lack of usable facilities, the TVET streams, which were launched in 2009 for students failing promotion exams, are being taught by putting students in two forms in a temporarily built shed as a classroom, which is not an appropriate environment for adequate education and training.

In view of these circumstances, the Government of Tuvalu has developed a plan to rehabilitate and expand facilities and procure equipment necessary for school operation, and requested the Government of Japan to extend Grant Aid for the implementation of the plan.

In response to the above-mentioned request, Japan International Cooperation Agency (JICA) dispatched a study team to Tuvalu from March 9 to March 25, 2010, and again from June 9 to June 25 of the same year to have discussions with the Ministry of Education, Youth and Sports (MEYS) and its Department of Education, MSS, and other parties concerned on the Tuvalu side. Although

construction of 10 new buildings, including teachers' quarters and gymnasium, and rehabilitation of 8 existing buildings, along with provision of 296 equipment items, were initially requested by the Tuvalu side, it was confirmed that the final contents of the request were modified as listed below based on the priorities of the Tuvalu side and the budgetary constraints of the Japanese side.

- Facilities to be newly constructed
  【Priority A】General Classroom Building, Boys/Girls Dormitories, Water Cisterns
  【Priority B】Special Classroom Building, Administration Building, Multipurpose Hall
- Facilities to be rehabilitated
  【Priority A】General Classroom Building, Special Classroom Building, Boys/Girls Dormitories, Dining Hall & Kitchen
- Equipment to be procured: 106 items in total

1-2 Natural Conditions

(1) Climate

Tuvalu is located at 5 -11˚ S slightly south of the equator and belongs to the tropical marine climate, which is hot and humid all year round with the average humidity of around 80% and the average monthly temperature fluctuating within a small range from 28 to 31˚C (the highest and lowest temperatures recorded since 1993 are 33.7˚C and 22.8˚C respectively). The annual precipitations are around 3,000mm in the northern and central regions and 3,500mm in Funafuti and southern islands. Tuvalu has rainfalls throughout the year, and heavy rains tend to occur in short spurs. Although there is no clear distinction between rainy and dry seasons, November – March is roughly considered as the rainy season and April – October as the dry season. Because the country is hit by cyclones and marine transportation often disrupted by rough seas during the wet season, ample precautions should be taken in drafting the construction/procurement plans. It should also be noted that drought conditions sometimes persist for three months or longer during the dry season, and northern islands and other areas with low annual precipitation suffer shortages of drinking water.

Table 1-1 Climatic Condition in Tuvalu

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
VAITUPU													
Precipitation (mm)	362.1	368.6	261.5	230.3	215.1	201.7	206.3	245.3	191.5	220.4	296.3	331.6	3,135.5
FUNAFUTI													
Precipitation (mm)	404.7	368.6	330.8	253.7	235.4	235.2	263.4	265.4	231.0	283.0	277.7	393.5	3,543.9
Mean temperature (℃)	28.1	28.0	28.1	28.2	28.2	27.9	27.6	27.7	27.9	28.1	28.2	28.1	28.0
Max. temperature (℃)	30.0	30.0	30.0	30.6	30.6	30.0	30.0	30.0	30.0	30.6	30.6	30.6	30.0
Min. temperature (℃)	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7
Wind velocity (m/sec)	6.3	5.4	5.4	4.9	5.4	6.3	6.3	6.3	6.3	5.4	4.9	4.9	5.8
Relative humidity (%)	82.2	79.3	81.2	81.8	81.0	83.0	82.2	82.3	82.7	81.5	81.3	81.7	81.7

Source: Global Historical Climatology Network (GHCN-Monthly) data base, etc.

Tuvalu is located in the trade wind zone where the wind direction is predominantly southeast – northwest (55 – 65%). While the average wind velocity is 11 knots (5.5m/sec), 2 – 4 % of winds blow at 22 knots (10.8m/sec) or higher. In Funafuti, strong winds exceeding 33 knots (16.7m/sec) occur for 50 to 60 days a year. 80% of strong winds blow between November and April accompanied by west-northwest winds.

(2) Natural Disasters

Tuvalu has no record of earthquake, and natural disasters are caused mostly by tropical cyclones. Because of its low altitude, the country is vulnerable to strong winds and high tides and often suffers damages on agricultural crops, houses, etc. In the past, Tuvalu has been hit by a cyclone with the maximum wind velocity exceeding 100 knots and suffered devastating damage. The cyclone occurrences in the Pacific Region are becoming increasingly frequent in recent years. MSS' facilities have also suffered frequent damage by strong winds around the roof edges, etc.

(3) Geological and Soil Conditions

Islands of Tuvalu, including Vaitupu, are atolls sitting on thin layers of coral sand accumulated over reefs that were formed in the Modern Era on top of volcanic seamounts. They were created over the last 3,000 years and considered geologically young. During the field study, we conducted a geological survey at the proposed construction site to obtain basic information necessary for the basic design of building structures. The geological investigation was sublet to a survey company in Fiji, which provided the following results. Further detail is attached to the end of this document.

Contents of investigation

- Scala Dynamic Cone Penetrometer (DCP) Test: 13 points (up to a depth of 2.0m)
- Laboratory tests:
  - Test items: natural moisture content, angle of repose, specific gravity and dry sieve analysis
  - Sample: 3 samples of sub-surface soil at the points of DCP testing
- Water Penetration Test (WPT): 3 locations (to a depth of 500mm for the absorption trench option, and to a depth of 1.5m for the soak pit option)

Locality of field tests

Locality (planned construction site for:)	Dynamic Cone Penetrometer Test	Water Penetration Test
Girls dormitory	2 points (DCP03,04)	1 point (WPT02)
Boys dormitory	2 points (DCP07,08)	1 point (WPT03)
General classroom 1	2 points (DCP05,12)	-
General classroom 2	2 points (DCP06,13)	1 point (WPT01)
Administration building	5 points (DCP01,02,09,10,11)	-
Total	13 points	3 points

Composition of subsurface soil

The general soil composition of the construction site is mostly fine sand mixed with silt (gray) in the 0.5-meter surface layer, below which is a layer of coral and coral sand mixed with gravel (light brown) down to 2 meters deep, underneath which impenetrable rocks were frequently observed. Based on the conditions of the existing wells, the underground water level is roughly estimated at -3.0 meters from the current ground level.

Percolation rate

We conducted tests to measure percolation rates at GL-0.5m assuming the use of soakage trenches and at GL-1.5m assuming soakage pits. The rates were almost identical at all 12 locations. Gray and light-brown sand can expect a percolation speed of 500mm/hr or higher and a final percolation rate of 41L/㎡/day. The test results indicate that the soil has a sufficient percolation capacity but requires due caution against underground water contamination because the soil may lack the capacity to remove impurities from wastewater. The sea level at the time of measurement was at mid level between high tide and low tide (about -1.5m to -2.0m from the average GL), and no rise in underground water level associated with the ebb and flow of the tide was observed.

Bearing capacity of the soil

Results of the dynamic cone penetrometer tests indicate that the bearing capacity of the soil differs at each test point. Bearing capacities between 3.5t/m^2 (west side of the planned site for General Classroom 1) and 17.5t/m^2 (south side of the planned site for Boys Dormitory) can be expected at the initially assumed bearing ground level (-0.75m), and over 7.0t/m^2 – 12t/m^2 at the level recommended by the survey company (-1.0m). A safety rate of 3.0 is applied to the bearing capacities listed below.

Locality (planned construction site for:)	Test points	Allowable gearing capacity at a depth of 0.75m
Girls dormitory	DCP 08, 07	175 kPa/120kPa
Boys dormitory	DCP 03, 04	120kPa/70kPa
General classroom 1	DCP05,12	120kPa/35kPa
General classroom 2	DCP06, 13	70kPa /120kPa
Administration building	DCP 01, 02, 09	120kPa /70kPa /100kPa
Administration building	DCP 10,11	70kPa /100kPa

1-3 Environmental and Social Consideration

(1) Impact of the Implementation of the Project on Natural/Social Environment

This Project will take place within the premises of an existing school to rehabilitate some of its

existing facilities and construct new buildings. The construction site is a flat area without large trees and does not require substantial alteration of land or vegetation. The Project will be designed in compliance with applicable environmental standards and regulations of Tuvalu, taking into full account the fragile environmental conditions of the isolated outer island in order to prevent as much as possible any foreseeable negative impact on its natural environment while observing the following guidelines:

- To the extent possible, new facilities shall be laid out in places without trees and the existing buildings to minimize the amount of waste generated from cutting trees and demolishing existing structures. Also, the Project shall be designed to seek positive ways to reuse remainder materials, such as using concrete waste as gravel fill.
- Construction waste generated at the Project site shall be minimized by bringing in materials and components that have been prefabricated at the site of procurement as much as possible.
- Existing facilities shall be utilized as much as possible as temporary facilities that will be needed during construction.
- Use of concrete will be limited to foundation and slab-on-grade so as not to require excavation of large amounts of aggregates (i.e., coral rocks and coral sand) in Vaitupu.
- Rainwater collection systems that are not functioning due to broken gutters, etc. will be rebuilt and fully utilized as a water source to minimize the consumption of well water currently used by the dormitories throughout the year thereby contributing to the conservation of groundwater resources.
- Wastewater will be treated in a septic tank and discharged into the ground through a soakage pit in accordance with the PWD standards. The soakage pit will be placed sufficiently away (30 meters or longer) from the well and at a level and location that will not affect the groundwater or soil in the surrounding areas by taking into account the groundwater levels that fluctuate depending on the sea level or the season.

As for social impact, no negative effect on the local community is expected, as the Project will not require relocation of existing houses or other changes in the living environment of the people in surrounding areas. An increase of approximately 14% in the total number of students is projected from 548 students in 2009, the largest number in the past five years, to up to 624. However, the impact of the increase on the local community or environment will be limited, since the students' activities are contained within the school properties.

Based on the foregoing, this Project is classified as Category C, as it is likely to have minimal or no adverse impacts on the environment or society.

(2) Environmental Impact Assessment, etc.

In Tuvalu, the Environmental Protection Regulations are set forth under the Environment Protection Act, in accordance with which it is required to undergo a certain procedure related to Environmental

Impact Assessment (EIA) prior to implementing a project. More specifically, a permit must be obtained for implementing a project by making a prior notification (Development Consent Application: DCA) to the EIA officer of the competent authority, which is the Department of Environment (DOE) under the Ministry of Foreign Affairs, External Trade, Environment and Tourism. DOE, upon receiving the notification, examines whether or not EIA is necessary for the project. If it is deemed necessary, the EIA procedure begins.

For this Project, a full-scale assessment will probably be deemed unnecessary, as it only involves rehabilitation and expansion of facilities within the school property, which is expected to cause no particular adverse environmental impacts. If this is the case, a Preliminary Environmental Assessment Report (PEAR) will be required in lieu of EIA. Durations of PEAR and EIA vary depending on the contents of the project and the degree of prior involvement of DOE. Generally speaking, it takes around two weeks to complete a PEAR procedure, and a few to several months in case of an EIA.

MEYS, the executing agency of this Project, will need to prepare necessary documents (including the facility layout plan) based on this Outline Design and complete the necessary procedure related to EIA in consultation with DOE before the commencement of the construction work under this Project.

Many of the various environmental regulations fall under the jurisdiction of Kaupule (Island Council). Therefore, it is important to closely communicate and coordinate with Kaupule with regard to such matters as excavation of aggregate, tree cutting, and waste disposal, which are necessary for implementing the Project, to make certain that all necessary procedures are followed without omission.

Chapter 2. Contents of the Project

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

(1) Overall Goal and Project Purpose

The Government of Tuvalu positioned the “Development of Education and Human Resource” as one of the priority areas of its National Strategy for Sustainable Development (NSSD: Te Kakeega II 2005-2015) and formulated the Tuvalu Education Strategic Plan 2006-2010 (TESP) in order to carry out educational reform that envisions “providing quality education for sustainable living for all.” For the secondary education sector, the government has placed the improvement of the curriculum and assessment system, enhancement of TVET, and upgrading of facilities among the key strategic areas and introduced a TVET stream to Motufoua Secondary School (MSS) as an urgent measure to provide access to education for children who have “pushed out” or “dropped out” of the formal education system by failing an examination at each level of education.

MSS, the target of this Project, is the only public secondary school in Tuvalu. It is a full boarding school that provides 4-year education for children who have completed 8-year primary education and passed the national examination. MSS’s facilities were expanded and upgraded under Japan’s Grant Aid in 1998 to the capacity that can enroll all applicants, who have completed primary education, to junior secondary level. However, due to deterioration by subsequent fire, aging, and so forth, usable facilities have been reduced, forcing MSS to operate the school using unsafe buildings and temporary classrooms. Even the facilities that were constructed under the previous project are suffering extensive damages on the edges of the eaves, doors and windows, and electrical and pluming installations caused by harsh natural conditions, preventing MSS from functioning adequately as an educational institution.

In view of these circumstances, this Project aims to provide a safe and appropriate learning environment for secondary students at MSS, the only public secondary school in Tuvalu, by rehabilitating and expanding the facilities and providing equipment to the extend necessary.

(2) Basic Concept of the Project

This Project aims to achieve the above objectives by rehabilitating the existing facilities of MSS, the conditions of which are deteriorating due to aging, salt corrosion, wind damage and so forth, and expanding its capacity to a scale that can allow all enrolled students to continue and complete the 4-year of secondary education, including the TVET course newly introduced in 2009.

Specific contents of the Project comprise:

- the rehabilitation of the existing five buildings (i.e., Boys Dormitory, Girls Dormitory, General Classroom Building, Special Classroom Building, and Dining Hall and Kitchen) that were constructed under the previous project,

- the construction of new facilities (General Classrooms, Dormitories, and Administration Building) that are necessary to make the school operational without aged and unsafe existing buildings and temporary classrooms, and to accommodate all enrolled students until they complete their curricula, and
- the procurement of equipment and furniture that are necessary for these facilities to function effectively.

Implementing the above will improve the learning environment at MSS and provide facilities and equipment necessary for quality secondary education, which will lead to enhancing the quality of education given by teachers, as well as the performance of students studying at MSS. In addition, providing an alternative opportunity for students, who have failed the promotion exams, to continue receiving education and training is expected to reduce the number of children who are "pushed out" or "dropped out" of formal education system and unable to find jobs or place in society.

2-2 Outline Design of the Requested Japanese Assistance

2-2-1 Design Policy

(1) Basic Policy

This Project will upgrade and expand the school facilities to the capacity that can allow all enrolled students at MSS to continue and complete 4-year secondary education currently provided at MSS in an appropriate learning/living environment, while eliminating inappropriate use of the deteriorated buildings (classrooms and dormitories). In selecting specific components of the Project, priority will be given to those that will directly assist the achievement of the Project purpose, which is to "create a safe and appropriate learning environment as a secondary educational institution." Minimal rehabilitation work will be included to restore the function of deteriorated existing facilities.

(2) Setting the Scope and the Scale of the Project

According to the above basic policy, conditions that provide basis for estimating various figures for the outline design are set as follows.

1) Setting the Scope and the Scale of the Project

Educational programmes to be covered by this Project will be limited to those that have already been launched and are being conducted at the time of this survey, as well as those that are clearly positioned in the sectoral and national strategies and will likely continue well into the future. The scale of this Project will be examined based on the following premises:

- Form 3/4, Junior Secondary: accepts students who have passed NYEE[3] and provides a 2-year

[3] National Year Eight Examination: an assessment test to be taken by students at the completion of the 8-year primary education from Y1 to Y8. Those who passed the examination will be promoted to secondary education.

programme (Form 3 students will be automatically promoted to Form 4).

- Form 5, Academic Stream: accepts students who have passed the examination and the internal assessment at the completion of Form 4, and provides a 1-year programme.
- Form 6, Academic Stream: accepts students who have passed TSCE at the completion of Form 5 and provides a 1-year programme.
- Form 5/6, Vocational Stream: accepts students who have not passed the examination at the completion of Form 4 and those who have not passed TSCE at the completion of Form 5, and provides a 2-year TVET programme.

2) Setting the Planned Number of Students

For each of the programmes defined above, the planned number of students, which provides basis for determining the scales of facilities, is calculated by estimating the number of students to be covered by this Project based on the operating conditions of MSS at present and in the past (see table below). Population increase in the age group for secondary education (14 to 17) will not be taken into account in calculating the number of students, as only a slight increase of 0.9% (annual average of 0.13%) is projected between 2009 and 2015 according to the statistics of the Secretariat of the Pacific Community (SPC).

Table 2-1 Projection of Number of Students by Educational Programme

Form	Curriculum /Course	Planned no. of students	Conditions of projection	Remarks
A: Number of students required for accepting the selected graduates from primary schools				
Form 3/4 (Year 9/10)	Regular course for Fiji Junior Certificate or its replacement	150 per form 300 in total	On the assumption that 50% of students who sit the entrance exam will pass and enter the school	Average number of students who sat NYEE was 304 per year during 2004-2009, with an average pass rate of 36.1%, which has improved to more than 40% over the past 3 years.
Form 5 (Year 11)	Academic course for Tuvalu School Certificate	120	On the assumption that 80% of Form 4 students will be promoted to Form 5.	Average pass rate of FJCE over the past 5 years was 56.9%, while actual promotion rate from Form 4 to Form 5 for the same periods was 84.6% on average.
Form 6 (Year 12)	Academic course for Pacific Senior Secondary Certificate	96	On the assumption that 80% of Form 5 students will be promoted to Form 6.	Average pass rate of TSCE over the past 5 years was 80.9%, while actual promotion rate from Form 4 to Form 5 for the same periods was 82.1% on average.
B: Number of students additionally required for retention of all the students until Form 6 level				
Form 5V	Vocational course	54	Accept failures of FJCE or its replacement from Form 4 (=30) and failures of TSCE from Form 5 (=24).	
Form 6V	Vocational course	54	No examination is required for promotion to Form 6.	
Total(A+B)		624		

3) Setting the Stream Configuration

Based on the planned number of students set above, the number of streams required (= planned number of streams), each accommodating up to 30 students, is calculated (see table below).

Table 2-2 Setting of Planned Number of Streams

Form	Planned Number of Students			Planned Number of Streams			Students/Stream		
	Regular/ Academic	Vocatio-nal	Total	Regular/ Academic	Vocatio-nal	Total	Regular/ Academic	Vocatio-nal	Total
Form 3	150	-	150	5	-	5	30	-	30
Form 4	150	-	150	5	-	5	30	-	30
Form 5	120	54	174	4	2	6	30	27	29
Form 6	96	54	150	4	2	6	24	27	25
Total	516	108	624	18	4	22	29	27	28

The result of the above analysis is summarized in the diagram below.

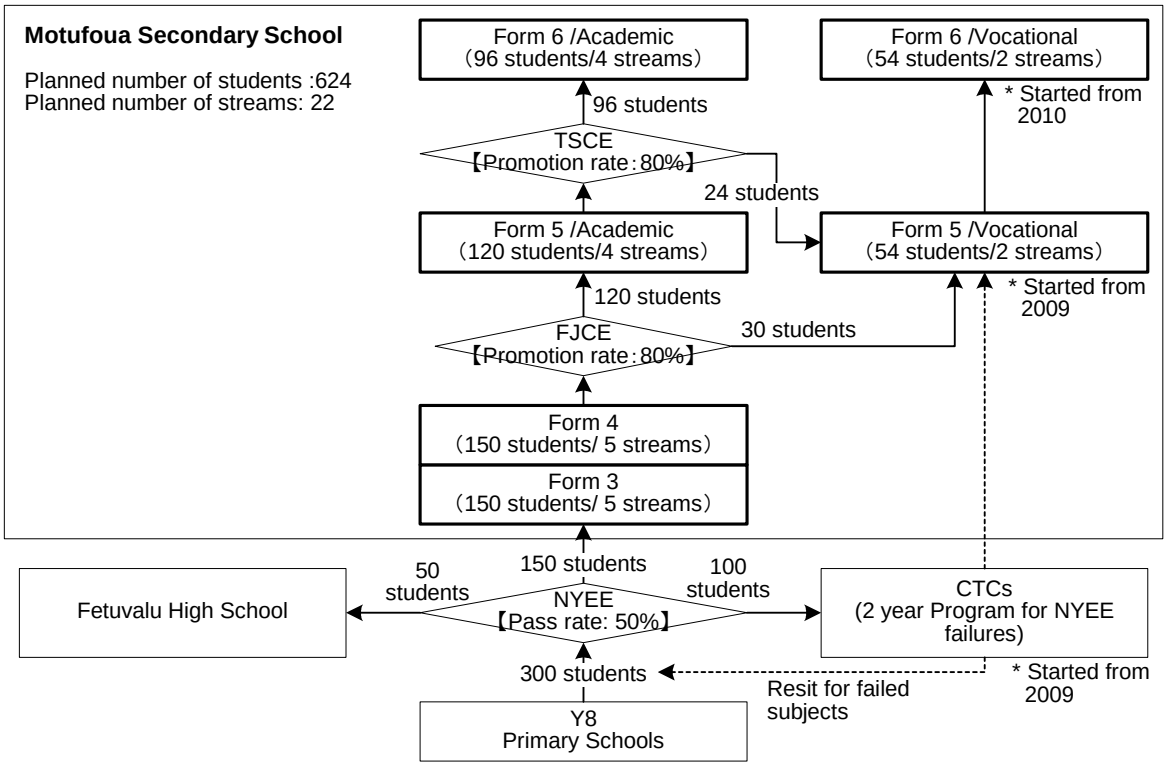


Figure 2-1 Setting the Planned Numbers of Students and Streams

4) Examining the Scale of Planned Facilities

Based on the planned numbers of students and streams set above, as well as the assessment of the existing facilities, the scales of facilities that need to be newly constructed or upgraded under this Project are examined.

General Classrooms

MSS is currently teaching classes in homeroom system. Thus, this Project will construct or upgrade a total of 22 general classrooms (including existing ones that are still usable), which equals the number of planned streams.

Of the existing buildings, a total of 10 classrooms, consisting of 8 classrooms in General Classroom Building (NB3) that was constructed under the previous project and 2 classrooms in Old Chapel (NB7, although there is only 1 classroom at present, it can be divided into two), are still usable. This means that additional12 classrooms need to be newly constructed.

Special Classrooms

Special classrooms needed for the present curricula are: 1) Laboratories (Form 3/4 - Science, Form 5/6 - Physics, Biology, Chemistry) and 2) Practical rooms (Form 3/4 – Basic Technology, Form 5 Academic – Technical Drawing/Woodwork, Food & Nutrition/Textile, Form 6 Academic – Design Technology, Form 5/6 Vocational – Practicals (Basic Technology, Hospitality, Sports)). As technical subjects, students in each Form can select either Technical Drawing & Woodwork or Food & Textile. This also applies to practical training in vocational programmes.

Based on the number of periods of the presently taught curricula and the number of planned streams, the occupancy rate of each special classroom is calculated, from which the required number of classrooms is derived by keeping the occupancy rate under 85% (see table below). The result of the calculations indicates that one laboratory or one practical room for each subject would be sufficient to cover all the curricula, including practical training of the vocational programme.

Table 2-3 Analysis on Necessary Number of Special Classrooms

Subject		No. of periods allotted per subject (per week) [B]											Percentage of periods for which special CR is used [C]	Result of calculation		
		Form 3/4	Form5 [TSC]					Form6 [PSSC]						Required no. of periods per week ΣAxBxC=[D]	Required no. of CRs *3	Occupancy rate [D]/40
	Planned no. of streams [A]	[FJC]	C	A	S	T	V	C	A	S	T	V				
		12	1	1	1	1	2	1	1	1	1	2				
Laboratory	Science	5											40% *4	24	1	60.0%
	Physics				7	7				7	7		100%	28	1	70.0%
	Chemistry				7	7				7	7		100%	28	1	70.0%
	Biology				7	7				7	7		100%	28	1	70.0%
Practical room	Basic technology/ Design technology *1	5				7	12				7	12				
	Woodwork	2.5				3.5	6				3.5	6	100%	34 *2	1	85.0%
	Tech. drawing	2.5				3.5	6				3.5	6	100%	34 *2	1	85.0%
	Food	2.5				3.5	6				3.5	6	100%	34 *2	1	85.0%
	Textile	2.5				3.5	6				3.5	6	100%	34 *2	1	85.0%

Stream for F5/F6: C=Commerce, A=Arts, S=Science, T=Technology, V=Vocational

*1 Periods for Basic Technology (Form 3/4), Technical Drawing & Woodwork/Foods & Textile (Form 5) and Design Technology (Form 6) are allocated evenly to the paired subjects (i.e. Technical Drawing=50%+Woodwork=50%, Food=50%+Textile=50%).

*2 As for Form 3/4 Basic Technology (Technical Drawing/Woodwork or Home Economics) and vocational subjects for Form 5V/6V, 2 classes are jointly given the lesson, so that number of target classes is multiplied by 1/2.

*3 Number of required classrooms is set for each subject so that calculated occupancy rate is not exceeding 85%.

*4 As for Form 3/4 Science, the calculation has been done on the assumption that 40% of lesson periods require a special classroom (laboratory).

Of the existing buildings, six rooms (Culinary, Textile, Chemistry, Physics, Technical Drawing, and Woodwork) in the Special Classroom Building (NB4), which was constructed under the previous project, and two rooms (laboratory) in Old Lab (OB9) are still usable. If the Old Lab, half of which is currently used as a general classroom due to lack thereof, are restored, the existing special classrooms will be able to cover the requirement.

5) Setting the Scale of Dormitories

Dormitories will need to be able to accommodate the planned number of students (624). Of the existing dormitories, the Boys Dormitory (NB1) and the Girls Dormitory (NB2) built under the previous project are still usable. Since each of the existing dormitories can house up to 162 students (54 persons x 3 rooms), an additional capacity of 300 (150 each for boys and girls) will be needed for dormitories to be newly constructed.

(3) Policy for Components

1) Facility Components

Of the requested components, those that were deemed finally to be of high priority after the field survey (Priority A or B) are listed below. Construction of Teachers' Quarters, Gymnasium, and Outdoor Sports Facility, as well as the rehabilitation of Old Science Lab and School Carpentry Workshop, were classified as Priority C as a result of discussions and therefore excluded from the Project.

New Construction:

【Priority A】General Classroom Building, Boys Dormitory, Girls Dormitory, Water Cisterns
【Priority B】Special Classroom Building, Administration Building, Multipurpose Hall

Rehabilitation:

【Priority A】General Classroom Building, Special Classroom Building, Boys Dormitory, Girls Dormitory, Dining Hall & Kitchen (all of which were constructed under the previous project)

All the components that have been confirmed as Priority A are basic and essential facilities for a boarding school. Necessity of the water cisterns will be examined as part of the planning of the entire water system. General Classroom Building and Boys and Girls Dormitories will be

constructed at the scales determined in the previous section. The existing buildings as a whole, except for main structures and roofs, are deteriorated (especially the edges of eaves, openings, and plumbing and electrical installations), and the Tuvaluan side is having difficulty maintaining the buildings at its own expense. If these facilities, which were constructed under Japan's Grant Aid, were left unattended, their values would continue to depreciate considerably. Therefore, minimal rehabilitation work enough to restore the original functions of the facilities will be included in the Project components.

Listed below are the result of examining the components, which were confirmed to be Priority B, and the policy for their implementation.

- Special Classroom Building: deemed unnecessary as a result of analysis of the occupancy rate based on the present curricula.
- Multipurpose Hall: A structure with covered space (with a minimum floor area of 600m^2) was requested that would be used both as a gymnasium and an assembly hall for ceremonies, examinations, cultural events, and other activities. Although MSS is presently using the School Chapel for conducting meetings and ceremonies involving all students, they say that, as a general rule, the use of the School Chapel should be limited to religious purposes. There is also "Maneaba", a meeting/cultural-event hall that can accommodate around 300 persons. Although Maneaba is currently converted into temporary classrooms, it will become usable again as a meeting facility if the school's classroom capacity is expanded through this Project. As for a gymnasium during rain, its necessity and frequency of use are deemed low, considering the fact that each stream has only one period of Physical Education per week. The budget limitation of the Japanese side also needs to be taken into account. Therefore, Multipurpose Hall will not be included in the Project.
- Administration Building: At present, part of Resource Centre houses the school's administrative division (i.e., Principal's and Vice-Principal's Room, Teachers' Room, Administration Office, Printing Room, and Computer Room). Because the present Teachers' Room is too small to accommodate all teachers (35 at present, may be increased to up to 49 in the future), they are using Preparation Room of each subject, etc. to do deskwork. The Computer Room is only a partitioned section within the Teachers' Room and unable to adequately satisfy increasing needs. The First-Aid Room is situated within a building that is recommended to be demolished and therefore needs to be relocated. Since establishing an appropriate work environment is essential for retaining quality teachers and providing quality education, it was decided to separate the administrative functions (i.e., Principal's and Vice- Principal's Room, Teachers' Room, and Printing Room) from the Resource Centre and construct Administration Building that will also house First-Aid Room under this Project. The vacant space in Resource Centre will be converted into a computer room, etc. at the expense of the Tuvaluan side.

2) Equipment Components

Equipment

Specific items to be provided under this Project, as well as their quantities, are decided based on the list of requested and high-priority (Priority A and B) equipment and from the following standpoints:

- As a general rule, priority of the Tuvaluan side shall be respected.
- Items that do not comply with one or more of the following criteria shall be excluded from the Project:
  - Necessary for teaching classes under the present curricula.
  - Users of the equipment have sufficient skills.
  - Maintenance is relatively easy (without requiring special techniques or expensive and unobtainable spare parts).
  - Cost-effectiveness is appropriate.
  - Indispensable to school operation/administration (administrative equipment).
  - Sufficient space is secured for installation.
  - Appropriate for Japan's Grant Aid scheme.
- Quantity of each equipment item shall be set according to the following guidelines:
  - Planned quantity shall be derived by subtracting the quantity of usable existing equipment from the required quantity.
  - Required quantity shall be determined based on how the equipment is used presently (for the purpose of demonstration or practical training, whether or not used by groups, the number of groups, etc.).
  - The required quantity of equipment for demonstration shall be one set, and that for practical training/experiment shall be equal to the estimated number of student groups plus one set for the teacher.

Most of the requested items are the same items as those provided under the previous project. They are being requested as replacements or replenishment of broken or aged equipment. Because these items have been used in classes on a daily basis, there will be no technical difficulty in their use.

Result of studying each item and the policy for procurement are shown in the table below.

Table 2-4 Result of Examining Requested Equipment

Category	Description	Policy
Mathematics	・Square set, etc. for blackboard	・Necessary quantities will be provided, as they are basic items.
	・Cabinet	・Excluded, as the existing storage space is sufficient.
English	・Cabinet	・Same as above.
Social science	・Wall map	・Necessary quantity will be provided, as it is a basic item.
	・Overhead projector	・Excluded , as procurement of expendables and spare parts would be difficult.
Science	・Equipment for chemistry/physics experiments, biology/geoscience equipment, common lab equipment	・Necessary quantities will be provided, as they are basic experiment tools for high school education and in alignment with the curricula, and MSS has a usage history thereof.
	・Fume cupboard	・Excluded, as the existing one is left broken and maintenance seems difficult. Also, treatment of exhausts would be difficult.
	・Lab tables, stools (for teachers and students)	・Existing furniture needs to be replaced. Necessary quantities will be provided based on the usage history.
Technical drawing	・Drawing boards, drawing tools	・Essential for teaching. Necessary quantities will be provided upon closely examining the contents.
	・Cabinet	・Excluded, as the existing storage space is sufficient.
Woodwork	・Woodwork equipment, woodwork/metalwork tools, etc.	・Necessary quantities will be provided, as they are basic items.
Home economics	・Cookware, cooking utensils, ironing board	・Necessary quantities will be provided, as they are basic items.
	・Electric cooker	・Switched to gas cooker, as it can be used for the same purpose.
	・Stools, chairs, etc.	・Furniture in Culinary Room needs to be replaced. Necessary quantities of products having specifications appropriate for usage history will be provided (cooking table will be built as part of construction work).
	・Cabinet	・Excluded, as the existing storage space is sufficient.
Physical education	・Ball game equipment, athletics equipment	・Necessary quantities will be provided, as they are widely used both during and outside the classes.
Agriculture science	・Agricultural equipment	・Necessary quantities will be provided, as they are basic equipment
Music	・Keyboard	・Its necessity is high although music is not a compulsory subject. Necessary quantity will be provided.
Administration & general equipment	・Copy machine, printer	・Excluded, although necessary for school administration, as their maintenance would be difficult and the two existing copiers are still operational.
	・Video camera set	・Excluded, as its use is unclear and it is not indispensable.
	・Vacuum cleaner	・Excluded, as it is for cleaning the copy machine, etc.
	・PC, PA system, etc.	・Necessary quantities will be provided, as they are needed for school administration and will be fully utilized.
First-Aid	・Autoclave, sphygmomanometer, bed, dental tool kit, etc.	・Necessary quantities will be provided, as they are basic items.

Furniture

Furniture items that are minimally necessary for operating the planned facilities are selected according to the following guidelines:

- For buildings to be newly constructed, following items shall be provided under the Project as

basic furniture minimally necessary for each room to function properly based on their usage history:

- General Classroom: desks & chairs for teachers/students, blackboards/pinning boards
- Preparation Room: desks & chairs for teachers, storage shelves
- Dormitories: double bunk beds for students, beds for superintendents, built-in lockers
- Administration Building: desks & chairs for Principal/Vice-Principal/teachers, meeting tables & chairs, storage selves, working table

- For the existing buildings to be rehabilitated, existing furniture shall be used as much as possible except for the following two items, which will be provided under this Project:
  - Blackboards for general and special classrooms that are severely damaged by sand dust.
  - Necessary furniture for Woodwork/Technical Drawing Rooms in the Special Classroom Building that are currently unfurnished.

(4) Policy for Natural Environmental Conditions

1) Measures against Climatic Conditions

Tuvalu belongs to the tropical marine climate, which is hot and humid all year round with an average annual humidity of over 80% and an annual average temperature between 28˚C and 31˚C. The annual precipitation exceeds 3,000mm in Vaitupu, and 200mm or so of monthly rainfall is experienced even during the dry season. Heavy rainfalls tend to occur in short spurs, and the country is hit by cyclones during the rainy season between November and March. Because Tuvalu is located in the trade wind zone, the wind direction is predominantly southeast - northeast, but strong west - northwest winds blow from November to April. In view of these climatic conditions, the Facility Plan is drafted according to the following guidelines:

- To bring in sufficient natural ventilation, residential facilities (dormitories) shall be laid out in such a way that openings will be positioned perpendicular to the predominant wind direction (southeast).
- Open corridors covered with long eaves shall be attached to both sides of students' rooms to block direct sunlight from entering the rooms during the day.
- Ceilings shall be installed parallel to the roof pitch to secure a sufficient amount of air in the room. Ceiling materials with good thermal-insulation and moisture-absorbing properties shall be used to create an air layer and reduce radiant heat from the roof surface.
- To secure maximum ventilation, openings as large as possible shall be installed. Louver windows and sliding doors shall be set in place on the assumption that they are normally left open.
- The dysfunctional existing rainwater collection system shall be completely restored so that it

will be able to utilize the abundant rainwater as water source as much as possible.

2) Measures against Natural Environment

The Project site directly faces the outer ocean, and the planned buildings will be situated within a 40 – 250m distance from the coastline at high tide. Although tall palm trees planted along the cost line work as a windbreaker, some areas of the site, depending on the wind direction, are directly exposed to saltwater droplets, requiring the most demanding architectural measures for salt resistance. In this Project, sufficient durability will be secured by: 1) using salt-resistant materials or paint, 2) selecting equipment with heavy-duty salt-resistant property, and 3) applying stringent anti-salt-corrosion measures to reinforced concrete.

3) Measures against Natural Disasters

Natural disasters that are likely to occur in the target area are mainly tropical cyclones. Because of its low altitude (2 meters above sea level on the average), Tuvalu is vulnerable to storms and high seas, which often cause destruction of houses and other damages. Structural design of this Project will ensure that the structural framework will withstand the largest wind velocity recorded in the past (80m/s) and that the roofs, external walls, doors, and windows will have sufficient wind resistance. Roofs in particular will have a sufficient purlins with adequate spacing to optimize upward wind loading. Edges of eaves, the weakest points, will be carefully designed so that the materials and components will be securely fastened and fixed.

Earthquakes seldom occur in Tuvalu, which has no record of earthquake damage. While Tuvalu is not completely free from the threat of tsunami caused by major earthquakes in distant locations, there has been no record of tsunami disaster due partially to the ocean bottom topography that is less likely to generate disastrous tide by tsunami.

(5) Policy for Socio-Economic Conditions

In each of the outer islands of Tuvalu, Kaupule (Island Council) is established to act as an administrative organ according to decisions made by Falekaupule (hall of Kaupule), a traditional autonomous local body. Kaupule has authority over a wide range of issues, including the development and resource management of the island and the provision of public services. While the secondary education sector, which is the target of this Project, falls under the direct jurisdiction of the Central Government, various matters necessary for the implementation of the Project, such as demolition of the existing buildings, disposal of waste, excavation of aggregates, cutting of trees, and employment of labourers, need to be carried out by obtaining consent from the Kaupule. Contents of the Outline Design will be drafted based on the labour cost, fees associated with aggregate excavation, and other standards set by the Kaupule, with which a close communication shall be established in the execution stage to ensure the smooth implementation of the Project.

(6) Policy for Construction/Procurement Environment, etc.

1) Applicable Laws, Regulations, Building Standards, etc.

No legal standards or regulations related to construction work are established in Tuvalu. Architectural designs are done by applying standards arbitrarily chosen by each architect, which are usually Australian or New Zealander standards. Generally, JASS and other Japanese standards are applied in Japan's Grant Aid projects because many projects use Japanese-standard structural materials, etc. Since this Project will also use many materials to be procured from Japan as part of the main structural components, it will use Japanese standards as a base and refer to Australian or New Zealander standards on an as-needed basis.

Although no construction permit system has been set in place, documents outlining this Project will be submitted to PWD, which supervises the construction/maintenance of public facilities, as well as to the Vaitupu Island Council (Kaupule), which administers development activities in the island, for their confirmation in order to ensure smooth implementation of the Project.

2) Situations Surrounding Construction/Procurement Work

Tuvalu's very small economy is reflected in the fact that construction work is not carried out regularly even in the capital city of Funafuti. Except for those financed by donors, construction projects that take place in Tuvalu are of small scale, consisting mostly of minor public works done by PWD and renovation of houses and other small buildings. The country's construction industry is not fully developed, and all materials, equipment, and labourers required for the construction work under this Project, except for aggregate (gravels and sand) and simple labourers, need to be imported and sourced from overseas countries. Transportation is especially limited in the outer island where the Project site is located, and no landing facilities or equipment are in place to handle large-sized materials and equipment to be procured by this Project. In view of these circumstances, we compared and analyzed from comprehensive viewpoints, the required performance, ease of installation, availability of materials, cost reduction effect, and other factors, to determine the most appropriate product specifications and construction methods based on the following guidelines:

- Use of concrete, which is material/labour/time intensive and prone to quality variance depending on the level of on-site management, shall be limited to the foundation and ground floor slabs. For the superstructures, the dry construction method shall be adopted using mainly prefabricated steel frames, thereby reducing material input and on-site work to cut overall cost.
- All buildings shall be single-storeyed so that their construction will not require large-scale heavy equipment or temporary structures.
- To reduce transportation cost, the number of trips to and from the procurement sites shall be minimized. The procurement plan should allow ample time for transportation to ensure systematic procurement.

- The most suitable routes and methods of transporting materials and equipment from procurement sites shall be determined by examining different options, such as use of regular liners, space charter or charter, and landing craft rental, from various angles, including cost, travel time, reliability, and safety.

(7) Policy for Utilizing Local Contractors

1) Construction Companies

Although as many as 11 construction companies (all located in Funafuti) are registered with PWD, orders for construction work are not placed on a regular basis even in the capital city. These companies carry out construction work by temporarily employing ordinary islanders for each project. Since there is no construction firm in Vaitupu, PWD had to dispatch an engineer and hire islanders via the Kaupule to construct a primary school that was completed a year ago. For this Project, it would be appropriate that a Japanese contractor establishes an execution system on site, comprised of engineering staff, including managers and skilled workers, and directly hires local labourers to carry out the construction work while transferring techniques to the locals.

2) Consultant

There is no individual consultant or consulting firm in Tuvalu that exclusively offers architectural engineering services. A few PWD staff members possess a certain amount of knowledge and experience in facility design and construction supervision. For this reason, third-country (such as Fiji, New Zealand, and Australia) consultants are widely used to design public facilities and provide other professional services in Tuvalu. In this Project, the design and construction supervision work will be carried out while consulting with PWD that has a wide range of know-how in construction projects in Tuvalu when it seems fit.

(8) Policy for Operation and Maintenance

After the completion of the Project, MSS will be operated and maintained by the teachers and other school staff under the supervision and guidance of the Principal. The maintenance team consisting of six technicians will take charge of the operation and maintenance of the facilities and equipment. Although these technicians can handle daily operations and first-aid repair work, they are not in a position to carry out systematic maintenance work due partially to lack of equipment, supplies, and funding. To cope with these situations, this Project will adopt the following guidelines:

- Buildings shall be designed based on the use of sturdy and durable materials and methods that will not require special techniques for maintenance.
- Problems in the design of the facilities constructed under the previous project shall be rectified by identifying the causes of defects. Simple and functional designs appropriate for the current operation of MSS shall be adopted by avoiding complicated fittings and sophisticated

specifications.

- For easy inspection and replacement of plumbing and electrical installations, exposed wiring and plumbing shall be used as much as possible. Materials shall be selected basically from Fiji-made products or those circulated in the Fijian market to make it easier to procure replacements.
- The maintenance team shall be invited to participate in the rehabilitation work under this Project to give them an opportunity to learn practical techniques for repairing facilities and equipment and improve their management skills through OJT.
- The facility and equipment plans shall include certain quantities of supplies and spare parts for major components that are needed for their general maintenance.

(9) Policy for Setting the Grade of Facilities, Equipment, etc.

This Project will rehabilitate the facilities that were constructed under the previous project and construct additional facilities to complement shortages relative to the number of students based on a mid-term projection. An appropriate grade for each facility will be determined by examining the contents and specifications of the facilities constructed under the previous project in terms of functionality, economy, ease of maintenance, and other factors, and making necessary adjustments based on how they have been used and maintained to obtain functions and durability needed by a secondary school.

Equipment items to be procured under this Project will be mostly replenishing or complementing those provided under the previous project, which have been utilized in actual classes. Their grades will be basically the same as those of the previous project with some modifications in specification and configuration so that they will be even better utilized in the classes and more suitable for the harsh environmental conditions.

(10) Policy for Construction/Procurement Method and Construction Period

Since this Project needs to procure most of the materials and equipment from abroad by ocean freight under various constraints, planning an appropriate transportation will be a critical factor in implementing the Project. Available delivery routes will be even more limited by stormy sea and cyclones during the rainy season between November and March. In addition, since the construction work needs to be carried out without interrupting the classes of Tuvalu's only secondary school, the procedure of the rehabilitation/expansion work needs to be carefully worked out so that each facility will be handed over to MSS as soon as it is finished before proceeding to the next facility to minimize the need for temporary facilities to be set up by the Tuvaluan side. Based on these conditions, the construction schedule of this Project will be planned according to the following guidelines:

- The dry construction method combining steel frames and industrialized materials shall be used

to construct the superstructure to shorten the overall construction period.

- Rehabilitation work of existing facilities shall be done first. Work on different buildings shall be staggered and carried out in the order so as not to disrupt the operation of the school.
- A preparation period (around 1.5 months) for delivering to the construction site materials and equipment that are necessary for setting up temporary structures and starting the initial work shall be included in the schedule.
- Construction work that affects the operation of the school shall be done during the three long vacations (two weeks between April and May, two weeks between July and August, and from late November to mid-January) as much as possible.

2-2-2 Basic Plan

The basic plan of facilities and equipment will be drafted by referring to and thoroughly reviewing the contents and specifications of the facilities and equipment planned under the previous project from the standpoint of cost effectiveness and by reflecting the findings of the site survey on the conditions of their usage, maintenance, and problems while securing sufficient performance to withstand the harsh climatic conditions. In addition, the plan will take into full consideration the unique circumstances of the outer island concerning construction and procurement, such as limited local resources (materials, machinery, and labour) and large cost associated with transporting materials and equipment and setting up temporary facilities so that the Project will be implemented without serious difficulties.

(1) Site Layout Plan

The site layout plan will be drafted based on the locations of the existing facilities and buried infrastructure and according to the following guidelines and concepts:

- Facilities shall be laid out based on the zoning of the existing facilities (Boys Boarding, Girls Boarding, Educational, and Administrative/Communal Zones) and in consideration of how the buildings are connected functionally and how people move from one building to another.
- Residential facilities shall be laid out parallel to the coast line (perpendicular to most of the existing buildings) in order to bring in as much natural ventilation as possible from winds blowing in the ocean-side – land-side direction.
- Each building shall have a 15-meter distance to the neighbouring buildings to allow good ventilation and to protect the educational environment in each building from disturbing noises and sights from the neighbouring buildings.
- New buildings shall be constructed in areas without existing facilities or trees as much as possible to minimize the site preparation work (demolition work, etc.) to be undertaken by the

Tuvaluan side.

- Effective vacant space as large as possible shall be set aside for constructing teachers' quarters and outdoor sports facilities, which are not included in this Project, and for future expansion.

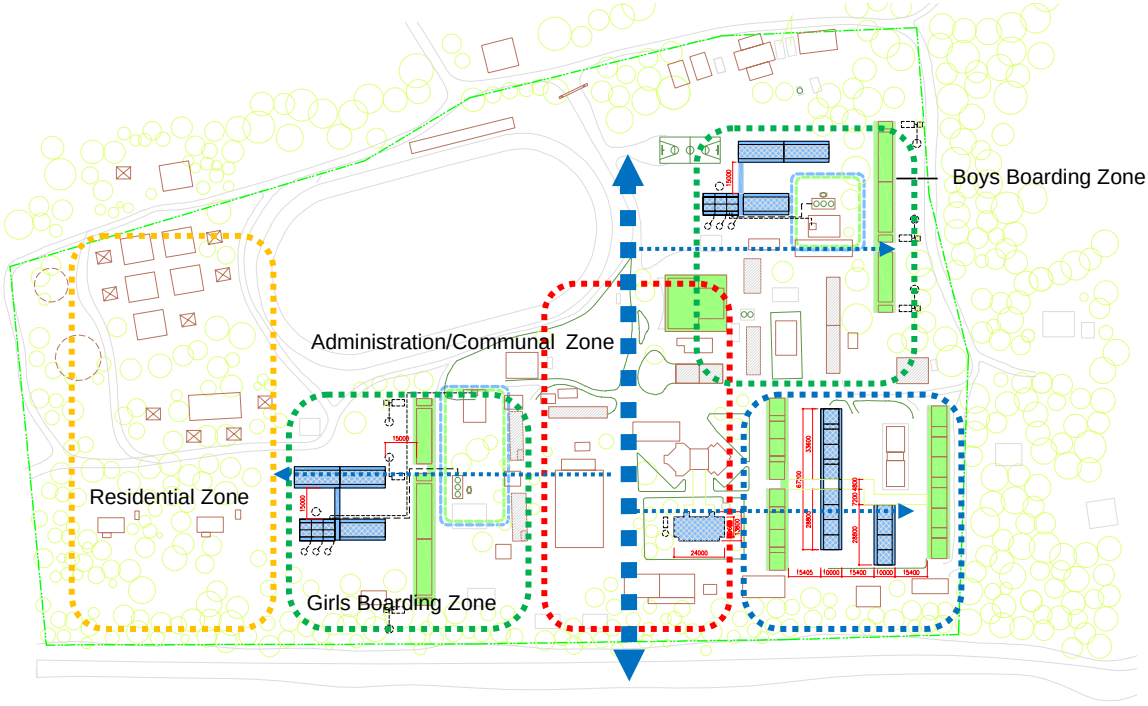


Figure 2-2 Concept of Facility Layout

(2) Architectural Plan

1) Floor Plan

The floor plan will be drafted based on that of the existing buildings constructed under the previous project and according to the following guidelines:

- All buildings shall be single-storeyed and have as simple a shape as possible in consideration of ease of construction, cost effectiveness, and easy maintenance. Roofs in particular shall have the simple-shaped structure such as gable or hip roof to minimize the number of joint sections that tend to break easily.
- All buildings shall have the standard span (2.4m) in the direction of the ridge (longitudinal) and an open corridor on the front and back sides of each building so that the buildings will share the common sectional details for the doors/windows and the eave edges. This will enable the unification of structural and finishing materials to facilitate construction work.
- The size of each room shall be reviewed by referring to the designs of the previous project and similar facilities in the region and adjusted to a scale at which the room can minimally satisfy the required function.

The floor plan and the scale of each facility component are as follows:

General Classroom Building 1 and 2

- Since the Educational Zone is crowded with existing buildings with no extra space for new facilities, the existing OB8 (General/Special Classroom Building) will be demolished to make space for constructing General Classroom Building 1 with 8 rooms and General Classroom Building 2 with 4 rooms in order to provide the required additional 12 classrooms. The 8-classroom building will have a passage that runs through the centre of the building to facilitate the movement of people from one building to another within the Educational Zone.
- Under the previous project, a preparation room was provided for each two classrooms to serve as a storage of teaching materials and an anteroom for teachers of each subject. This Project will provide two additional preparation rooms on the assumption that the two subjects (PEMAC[4] and Agricultural Science) that presently do not have preparation rooms will use them.
- An open corridor and an entrance/exit door will be attached to both sides of each classroom to ensure a smooth flow to other buildings and provide two evacuation routes in case of emergency.
- The size of general classroom will be reduced from that of the previous project (7.2×8.3m＝59.76 ㎡, 1.99 ㎡/person) to 7.2×7.2m (51.84 ㎡, 1.73 ㎡/person, maximum capacity: 30 students), which is determined to be the minimum size required for the classroom to function properly based on studying similar facilities (those built under Japan's Grant Aid projects in neighbouring countries, and existing classrooms at MSS).

Boys Dormitory / Girls Dormitory

The appropriate capacity of each dormitory room from the viewpoints of management and operation is 50 students per unit, which is similar to the unit capacity of the existing dormitories. Three units will be newly provided in each of the Boys and Girls Dormitories, each accommodating 150 students. Toilets, shower room, and laundry will be consolidated in one block (ablution block) within each of the Boys Dormitories and Girls Dormitories in consideration of cost effectiveness. Each ablution block will be divided into three compartments, each of which will serve for a unit of 50 students so that they can manage how to use it and maintain it effectively, including allotment of cleaning duties, under their own responsibility.

- Each dormitory will consist of two buildings connected by a covered passage with one building composed of two joined rooms and the other composed of one room plus an ablution block. A roofed corridor will be situated between the one room and the ablution block as a buffer.
- Each dormitory room will have a size enough to hold 25 double bunk beds and 1 bed for the superintendent. The room will be so designed that it can be divided into two living quarters,

[4] Physical Education, Music and Art & Craft. As of 2010, only Physical Education is a required subject in MSS.

each shared by a subgroup of a 50-student unit, by placing lockers in the middle of the room.

- The size of each dormitory room will be set at 21.6m (standard span x 9) x 6.8m (146.88 ㎡, 2.94 ㎡/person), using the floor area per person of 3.0 ㎡ as the base figure by referring to the room size of the previous project (24×6.8m＝163.2 ㎡, 3.0 ㎡/person) and those of similar facilities (Japan's Grant Aid projects, and existing facilities at MSS).
- Lockers will be installed along the gable-wall and in the middle of the room. In addition, wooden shelves will be built on the bottom part of wall panelling to provide sufficient space for storing private belongings.
- Toilet booths, shower booths, laundry spaces will be designed by referring to similar facilities and according to the following guidelines:
  - Toilet: Western-style toilets will be selected both for boys and girls. Based on the standard of 1 booth per 10 persons, 5 booths will be installed for each dormitory room.
  - Shower: 5 booths will be installed for each room, as is the case with the toilet booth.
  - Laundry: based on the standard of 1 unit per 10 persons, as is the case with the toilet booth, 5 sinks will be installed for each room.
- Based on the conditions of use and maintenance of the existing facilities, the following improvements will be made to the ablution block:
  - Toilet and shower booths will not have doors, but instead will be shielded by vinyl curtains, which are hard to break and easy to maintain.
  - Landry sinks will be of single-bowl type so that they can be used as a washbasin.
  - Space under the eaves will be used to hang laundry to complement the lack of drying space.
- The ablution block will have structural slab with an inspection pit underneath for easy maintenance of piping. Septic tanks will be built in the subfloor to reduce construction cost.

Administration Building

- Administration Building will be composed of Teachers' Room, which needs to be expanded, as well as Principal's Room, Vice-Principal's Room, and Printing Room, which are closely connected functionally, plus First-Aid Room, which needs to be relocated due to dilapidation of the existing building. Two toilets (for males and females) and a storage will be annexed.
- Principal's Room and Vice-Principal's Room will be private rooms each having a floor area of 15 – 20 m^2 to furnish a desk, cabinets, and a meeting table to perform his duties, such as deskwork, receiving guests, and having meetings with teachers.
- Teachers' Room will have a capacity to accommodate up to 47 teachers, which equals the number of established teachers (49) minus the Principal and Vice-Principal. The size of the room is calculated based on the standard floor area per person of 3.0 ㎡. More precisely, the room size will be 9.6×14.4m (standard span x 6) = 138.24 ㎡ (2.94 ㎡/person).

- Teachers' Room will be used for deskwork and as a lounge and a meeting room. Since it is frequently used to hold a meeting involving the entire teaching staff, it will be a large room without partitions. The room will be equipped to allow the use of a projector during a meeting and a PC on each teacher's assigned desk.
- Printing Room will have enough space to install the existing two copy machines and store expendable items and other supplies to carry out such tasks as copying documents and printing examination papers. To protect the equipment from sand dust, salt corrosion, and other damage, the room will have no windows or doors opening to outdoor space. An air conditioner will be installed to regulate the indoor environment.
- First-Aid Room is for a full-time school nurse to take care of the students' health and perform simple medical examination, tests, and treatment. The existing First-Aid Room has three beds and a desk for examination and is attached with a storage for keeping medical supplies, etc. They say that about two to three sick or injured students come to the First-Aid Room each day. To retain a similar function, the new First-Aid Room will have a floor area that can hold two beds and a space for medical examination/treatment and will be attached with a storage.

Floor Area of Each Room

Contents and the floor area of each facility, as determined based on the above considerations and the comparison with the design of the previous project, are shown in Table 2-5 below. The planned scale (floor area) of each facility to be newly constructed is shown in Table 2-6.

Table 2-5 Specification of Each Room

Room	Item	The previous Japan's Grant Aid Project	This Project	Rationales/ basis of planning
General Classroom Bldg. 1/2		739.69 ㎡・8CRs	963.84 ㎡・12CRs	
General CR	Capacity Dimensions (Floor area /head)	30 students 7.2×8.3m=59.76 ㎡ (1.99 ㎡/head)	30 students 7.2×7.2m=51.84 ㎡ (1.73 ㎡/head)	With reference to similar examples: ・Schools in the region: 1.72-2.43 ㎡/head ・Existing facilities:1.75-2.38 ㎡/head
Preparation room	No. of rooms Dimensions	1 room/2 CR 7.2×2.6m=19.72 ㎡	2 rooms 7.2×2.4m=17.28 ㎡	For 2 subjects currently having no preparation room
Boys & Girls Dormitory		795.09 ㎡-Boys 860.25 ㎡-Girls	844.20 ㎡- Boys 844.20 ㎡- Girls	
Dormitory room	Capacity Dimensions (Floor area /head)	54 students 6.8×24.0m=163.2 ㎡ (3.02 ㎡/head)	50 students 6.8×21.6m=146.88 ㎡ (2.94 ㎡/head)	With reference to similar examples: ・Grant aid projects: 3.0-4.1 ㎡/head ・Existing facilities: 3.1-3.7 ㎡/head
WC	No. of booth Floor area	6 booths/ dorm. room (1 booth/ 9 students) 12.0 ㎡	5 booths/ dorm. room (1 booth/ 10 students) 17.68 ㎡	1 booth for 10 students as a minimum requirement
Shower	No. of booth Floor area	7 booths/ dorm. room (1 booth/ 7.7students) 8.4 ㎡	5 booths/ dorm. room (1 booth/ 10 students) 20.40 ㎡	1 booth for 10 students as a minimum requirement
Laundry	No. of taps Floor area	6 (1 tap for 9 students) 12.24 ㎡	5 (1 tap for 10 students) Included in shower rm.	1 tap for 10 students as a minimum requirement

Drying area	Floor area	None	10.36 ㎡	Effective use of the space under eaves
Superinten-dent	Floor area	16.32 ㎡ (Girls dormitory only)	None	Not necessary for dormitory operation
Administration Building *1		311.04 ㎡	276.48 ㎡	
Principal	Floor area	19.20 ㎡	17.28 ㎡	Space for desk work, meeting with guests
Vice-principal	Floor area	None	15.36 ㎡	Space for desk work, meeting with guests
Teachers' room	Floor area (capacity) (Floor area /head)	86.40 ㎡ (27 persons) (3.2 ㎡/head)	138.24 ㎡ (47 persons) (2.94 ㎡/ head)	3.0 ㎡ per teacher as a minimum requirement for net working space
Printing	Floor area	None	13.44 ㎡	Machine area and working space
First-aid	Floor area	21.60 ㎡	28.80 ㎡	Clinic with 2 beds and store
Storage	Floor area	12.90 ㎡	7.2 ㎡	To store common material
WC	Floor area	14.40 ㎡	10.08 ㎡	For male & female

*1 Information from the Basic Design which had not been materialized at the implementation stage.

Table 2-6 Floor Area by Building

Code No.	Building / Room	Floor area /room	No. of rooms	Construction floor area *1	Floor area	Remarks
EXB-1	**General Classroom Bldg. 1**			**664.32 ㎡**	**449.28 ㎡**	
	General classroom	51.84 ㎡	8	414.72 ㎡	←	
	Preparation room	17.28 ㎡	2	34.56 ㎡	←	
	Corridor	107.52 ㎡	2	215.04 ㎡		Width: 1.6m
EXB-2	**General Classroom Bldg. 2**			**299.52 ㎡**	**207.36 ㎡**	
	General classroom	51.84 ㎡	4	207.36 ㎡	←	
	Corridor	46.08 ㎡	2	92.16 ㎡		Width: 1.6m
EXB-3	**Boys Dormitory 1**			**432.00 ㎡**	**293.76 ㎡**	
	Dormitory room	146.88 ㎡	2	293.76 ㎡	←	
	Corridor	69.12 ㎡	2	138.24 ㎡		Width: 1.6m
EXB-5	**Boys Dormitory 2**			**412.20 ㎡**	**312.36 ㎡**	
	Dormitory room	146.88 ㎡	1	146.88 ㎡	←	
	WC	17.68 ㎡	3	53.04 ㎡	←	
	Shower & laundry	20.40 ㎡	3	61.20 ㎡	←	
	Drying space	10.36 ㎡	3	31.08 ㎡	←	
	Passage	20.16 ㎡	1	20.16 ㎡	←	
	Corridor	99.84 ㎡	1	99.84 ㎡		Width: 1.6m
EXB-P1	**Boys Dormitory -Corridor**	36.00 ㎡	1	**36.00 ㎡**		Connecting corridor
EXB-4	**Girls Dormitory 1**			**432.00 ㎡**	**293.76 ㎡**	Same as EXB-3
EXB-6	**Girls Dormitory 2**			**412.20 ㎡**	**312.36 ㎡**	Same as EXB-5
EXB-P2	**Girls Dormitory -Corridor**	36.00 ㎡	1	**36.00 ㎡**		Width: 2.4m
EXB-7	**Administration Bldg.**			**276.48 ㎡**	**230.40 ㎡**	
	Teachers' room	138.24 ㎡	1	138.24 ㎡	←	
	Principal's room	17.28 ㎡	1	17.28 ㎡	←	
	Vice-principal's room	15.36 ㎡	1	15.36 ㎡	←	
	Printing room	13.44 ㎡	1	13.44 ㎡	←	
	First-aid room	28.80 ㎡	1	28.80 ㎡	←	Including a storage
	Storage	7.44 ㎡	1	7.44 ㎡	←	
	WC	10.08 ㎡	1	9.84 ㎡	←	
	Porch, etc.	46.08 ㎡	1	46.08 ㎡		
	TOTAL			**3,000.72 ㎡**	**2,099.28 ㎡**	

*1 Including corridors, covered passages, porches, etc.

2) Elevation and Cross-Section Plan

General Classroom Buildings 1/2, Boys/Girls Dormitories 1/2

General Classroom Buildings and Dormitories should harmonize with the existing buildings constructed under the previous project. To rationalize and streamline the design and construction processes, standardized forms and dimensions will be applied to the floor plan (open corridors on both sides), the span in the ridge direction (2.4 meters), floor height, eaves height, roof pitch, etc. Also, common methods to arrange the cross-sectional details will be used. The cross-section plan of each part is as follows:

- A similar amount of space to that of the previous project will be given to each room, by setting the eaves height at 3.0 meters (vs. 2.685 meters in the previous project) and the floor height of the ground floor at GL + 0.3 meter (vs. 0.28 meter in the previous project).
- The level of foundation bed will be set at GL-1.0m, where a better bearing capacity can be expected based on the findings of the geotechnical investigation. The bottom of the foundation will be lowered to the same level.
- The eaves will protrude further on both sides of each building (2.25m from the centre of the columns on the exterior walls, whereas it was 1.45m on the side without open corridor under the previous project) to protect the rooms from direct sunlight during the day between 8:00 and 16:00.
- The roofing will be a simple form of gable roof and avoid clerestory window or monitor roof that tends to cause leakage or other trouble and is hard to maintain regularly. The pitch of the roof will be uniformly set at 3.5/10, the same as most of the existing buildings.
- As a general rule, each room will be installed with false ceilings to block radiant heat from the roof surface. The ceilings will be mounted parallel to the roof pitch to the extent possible to allow the maximum amount of air in the room. Cemented excelsior boards with high heat-resistance and moisture-absorbing properties will be used as roofboards.

Administration Building

The Administration Building is one of the central facilities of MSS along with the Resource Centre and the Maneaba Building (traditional assembly hall) and thus will have a different roof style from that of other facilities with a roof pitch of 6/10, which aligns with the roof pitch of the existing chapel, to give it a distinct design as a core facility. The cross-section plan of each part is as follows:

- A standard span of 2.4 meters will be used in both the span and the ridge directions so that the fitting arrangement of doors and windows will be standardized.
- The roofing will use a simple hip roof form with the same 6/10 roof pitch as that of the neighbouring chapel. The roof surface will be large to give volume to the appearance of the building.

- Natural Pandunus mats[5] will be used as a ceiling finish on the base of plywood, in order to add traditional taste to the architectural design.
- Office rooms will have windows in two directions each having a width as close as possible to the span between the columns in order to bring in maximum natural ventilation.

3) Structural Plan

Type of Structure

- Main Structure: the concrete block masonry or the frame structure using columns and beams made of cast-in-place reinforced concrete is the most common in Tuvalu. A large amount of on-site work using the very limited material/labors would impose a great risk from many angles, including material procurement, quality assurance, and compliance to schedule. To avoid these challenges, this Project will use steel frames in the superstructure and adopt the dry construction method using as much industrialized materials as possible for the following reasons: 1) this approach can minimize material input and work at the construction site, 2) it can ensure a certain level of quality without depending on the skill levels of local labors, and 3) it can shorten the construction period thus reducing construction cost.
- Foundation Structure: the geotechnical investigation revealed that the bearing capacity of 70 kN/㎡ or more can be expected at 1.0-meter below the ground surface. Based on this finding, the RC continuous footing will be used, which can be most efficiently designed, with the embedment length set at 1.0 meter underground with a long-term bearing capacity of 70 kN/㎡. Locally available aggregate, i.e., coarse aggregate (coral rock) and sand, is available for making concrete. To prevent salt damage, the aggregate needs to be washed with water, and anti-corrosion treatment needs to the applied (use of re-bars coated with epoxy resin or rust-proofing admixture). Since coral aggregate is porous and generally hard to generate normal strength, the design strength will be set at one level down from the normal strength to Fc=18N/mm^2.
- Flooring Structure: Slab-on-grade with steel reinforcement, a common method in Tuvalu, treated with similar anti-corrosion measures to those for the foundation will be used.

Structural Standards

Since no architectural standards are established in Tuvalu, architects are designing buildings by arbitrarily complying with the standards of Australia, New Zealand, etc. As was the case with the previous project, this Project will be designed basically in compliance with Japanese standards (AIJ) while referring to the standards of Australia or New Zealand as necessary.

[5] A plant widely distributed in tropical regions. Its long, durable leaves are used to make a variety of goods, such as mats, construction materials, and baskets in the Polynesian region.

- Wind load: In consideration of the fact that Tuvalu frequently suffers damage caused by cyclones, the peak wind speed is set associated with a 100-year return period at 80 meters per second, against which the structural parts will be designed to ensure sufficient safety, and the roofs and exterior materials to have appropriate strength.
- Earthquake load: Since there is no record of earthquake occurrence or damage in Tuvalu, an earthquake load is not taken into consideration in structural design.

Structural Materials

All structural materials, except for sand and gravel (coral), need to be imported from outside Tuvalu. To reduce transportation cost, it is important to limit the number of supply sources and reduce the number of trips to transport the materials. Therefore as a general rule, this Project will procure main structural materials from Fiji and Japan according to the following design:

- Concrete: used only for foundation and slab-on-grade using local aggregate.
  - Structural concrete (foundation, footing beam, slab-on-grade, structural slab): Fc 18N/mm^2+ 3 N/mm^2
  - Plain concrete (other miscellaneous parts): Fc 15N/mm^2
- Aggregate: local aggregate that is removed of salt by rinsing with water will be used. When a trial mixing was conducted during the site survey, it was confirmed that the chloride content of concrete was lower than the allowable Japanese standard of 0.6kg/m^3 for concrete treated with anti-corrosion protection. Aggregate will be used in actual construction after confirming the results of a simple aggregate test and trial mixing. Coral stones to be used as coarse aggregate will need to be collected from those that are cast ashore. Because the amount of stones that can be gathered per day is limited, the procurement plan should be carefully and systematically worked out by allowing ample time in the procurement schedule.
- Cement: Fijian-made, general-purpose Type-GB cement (a blend of Type-A and Type-B slag cement complied with Australian standards), which is commonly sold in Tuvalu and has a good track record in Japanese Grant Aid projects, will be used.
- Rebar: deformed bars (JIS D10 – D22, made in Japan) coated with epoxy resin against salt damage will be imported from Japan.
- Structural steel: materials (complied with JIS) prefabricated in a factory in Japan will be shipped to the construction site. BCR295 columns that can provide high strength with a small cross-section and SS400 H section beams will be used. Steel materials will be treated with hot-dip galvanisation against rusting (to be comply with JISH0401 Class-2, HDZ55 for thick metal - minimum coating weight shall be 550g/㎡, and HDZ35 for thin metal minimum coating weight shall be 350g/㎡). Exposed parts will be treated with sweep blasting plus polyurethane coating over hot-dip galvanisation plating at a designated factory.

4) Building Services Plan

The building services plan will utilize the existing systems as much as possible for efficiency and adopt simple systems being manually operable in consideration of actual operation and usage of such equipment at MSS. The systems will have sufficient durability to withstand the harsh geographical and climatic conditions. The plan will consist of the following contents:

Electrical Installations

- Power source: the main switchboard inside the Battery Bank Room situated at the northwest part of the school premises draws power from the three sources listed below and, by manual switching, distributes power to the two branched out circuits of: 1) facilities constructed under the previous project and 2) existing facilities other than 1).
  - Solar power system (installed within MSS): generation capacity 46kW, battery capacity 297kWh (99kWh x 3), 415V/240V 3-phase 4-wire power supply
  - Local power house at MSS: 130kVA diesel generator (installed under the previous project), 415V/240V 3-phase 4-wire power supply, manual operation
  - Power supplied from the island's Main Power Station: 11kV power is transmitted to the substation within MSS. A transformer steps down the voltage to 415V/240V and supplies it to the main switchboard. The Main Power Station has two operating 100kVA diesel generators and one broken 60kVA generator (under repair). The generators are stopped and started manually by TEC resident staff. The operating hours are normally from 6:00 to 24:00.

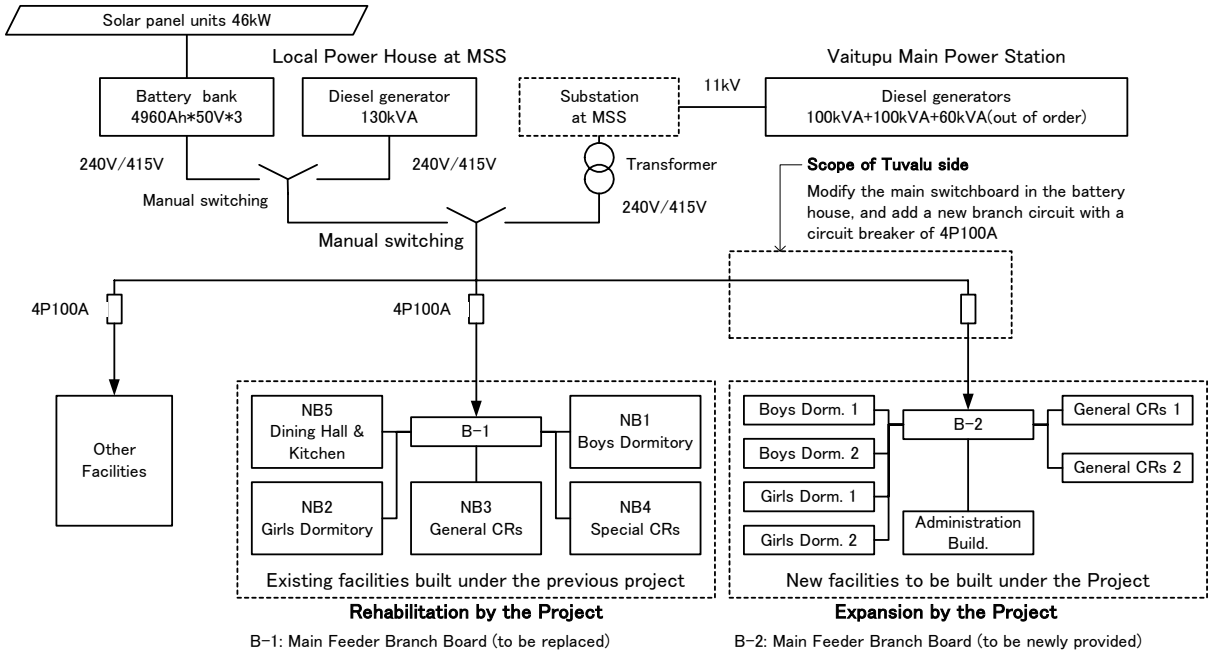


Figure 2-3 Schematic Diagram of Electric System

Currently, MSS receives electricity mostly from the solar power system during the day and at

night from the battery bank that stores excess power generated during the day. When the remaining power level of the battery bank falls below 60%, the generator of the local power house is turned on to send electricity by manually switching power sources. Electricity from the Vaitupu Main Power Station is used only in case of shortage of power from both of the sources at MSS.

The possibility of supplying power to the facilities of MSS, including those to be newly constructed under this Project, based on the current system that uses the solar power system as the primary power source is examined as follows:

- Weekday daytime, sunny days: estimated electrical load will be 18.0kW
  →Can be covered by solar power system (46kw), excess will be stored (28kW x 8h=224kW).
- Weekday daytime, cloudy/rainy days: estimated electrical load will be 41.5kW
  →Solar power system (46kW x average rate of output under cloudy conditions:0.2 = 9.2kW) alone would be insufficient. Needs to be supplemented by operating the diesel generator.
- Night time: estimated electrical load will be 35.5 kW
  →Power consumption is estimated at 35.5 kW x 5h = 177.5 kWh, which can be covered by sending electricity from the battery bank (297kWh).

According to the above estimation, the solar power system will be more than sufficient to cover the power demand of the entire school during the day on sunny days. However, the local generator needs to be turned on to supplement power shortage on cloudy or rainy days, in which case, power sources need to be switched manually by the TEC resident staff to supply electricity between 6:00 and 24:00. This, however, will not likely be a problem, considering the fact that MSS' operating hours are from 5:30 (rising) to 21:30 (lights out).

In view of the above analysis, it was determined that the existing electrical system would be able to supply sufficient power to cover all facilities of MSS, including those to be newly constructed. In this Project, the main switchboard in the battery bank room will be modified to install a new branch circuit to supply electricity via a main feeder branch board to the new facilities. Modification of the switchboard (installation of branch circuit and a circuit breaker) that is managed by the TEC shall be undertaken by the Tuvaluan side, and the rest of the electrical work will be undertaken by the Japanese side.

- Main feeder system: a buried cable will be installed to draw low-voltage electricity (3-phase, 4-wire, 415/240V, 50Hz) from the above-mentioned main switchboard to the main feeder branch board, from which a branch cable will extend to each of the building to be newly constructed. The additional main feeder branch board will be placed next to the existing main feeder branch board installed under the previous project for easy daily operation and maintenance. Both the additional main feeder branch board and the existing one (currently situated outdoor on the back side of the Kitchen), which will be replaced with a new one, will be installed inside the Kitchen for protection against salt damage. The distribution board of each

building will be selected from products, which have plastic casing and are available in Fiji. They will be installed indoor also.

- Lighting fixtures: Lighting fixtures with heavy-duty salt resistance (water-proof fixtures made of PVC that can be easily obtainable in Fiji) will be installed. By referring to the design of the previous project, each room will be designed to have at least the following illumination intensity:
  - General classrooms: 150Lx
  - Preparation rooms/rooms in Administration Building: 150Lx
  - Dormitories: 100Lx
  - Corridors, lavatories, etc.: 50Lx

  Since students' facilities are used also at night, bracket-type lighting fixtures will be mounted on the external walls of such buildings to illuminate outdoor areas to ensure safe walk paths, etc.
- Socket outlet system: two sockets will be provided for each general classroom. The number of sockets for other rooms will be determined to meet the estimated load. Electrical sockets and switches will be generally mounted on the walls in an exposed manner for easy maintenance.
- LAN equipment: The LAN cable will be extended from the existing Resource Centre to the new Administration Building, inside which a wireless access point (wireless LAN device) is installed to allow LAN connection from anywhere in the Teachers' Room.
- Communication system: the current telephone system is owned and managed by Tuvalu Telecom, which also undertakes the entire installation work. This Project will be responsible for carrying out only the architectural work needed for installing a telephone line into the Administration Building (sealing the through hole in the external wall, etc.). All other work, including installation of telephone equipment, leading in service line, and cabling, will be done by Tuvalu Telecom according to the request issued by the MEYS.
- Rehabilitation work of existing buildings: for the five buildings constructed under the previous project, the following renovation work will be carried out:
  - Replacement of the distribution board of each building, including the main feeder branch board.
  - Installation of electrical equipment of equivalent grade to that for the new buildings with exposed cables after removing the existing conduits, cables, lighting fixtures, and wiring devices on the downstream side of the distribution board in each building.

Water Supply, Drainage and Sewage System

- Water supply and rain water collection system: the rainwater-based water supply system, which was installed under the previous project, is not functioning or used at all because of damage in the rain water collection unit. PDW has installed a water system connected to a shallow well

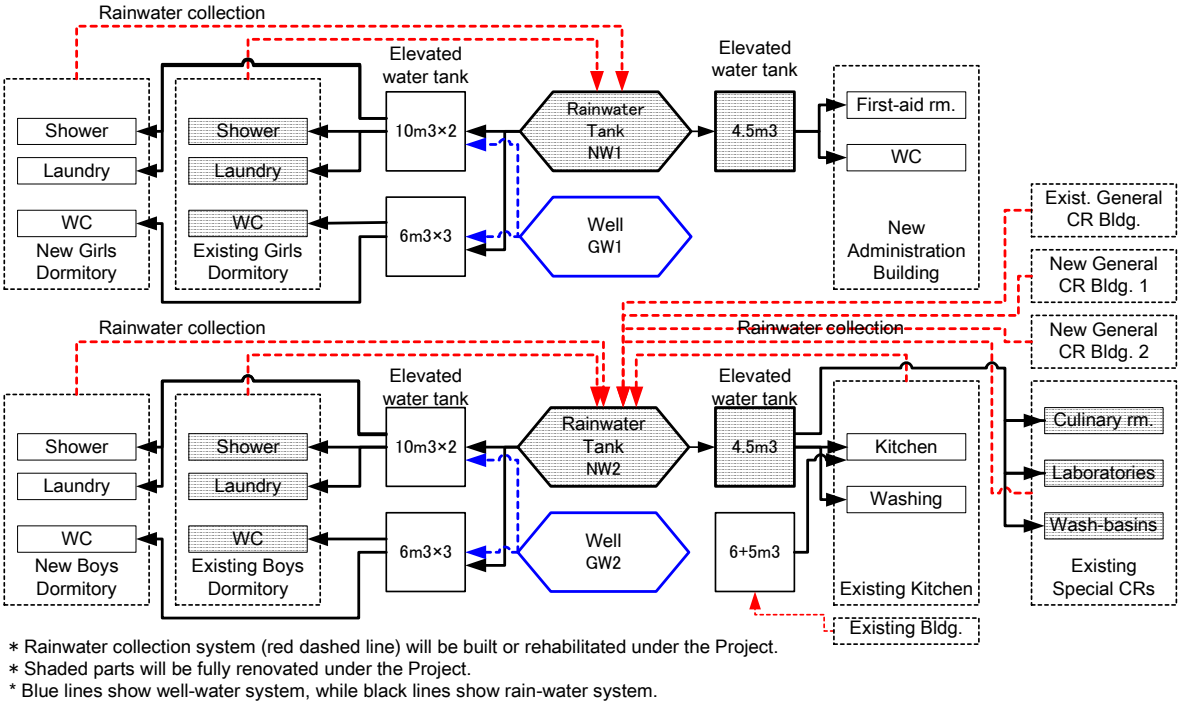
and a plastic tank (GW1-Boys Boarding Zone/GW2-Girls Boarding Zone) to supply water for daily living (not for drinking), and an exclusive drinking water system utilizing rainwater (with plastic tanks with a total capacity of 11 ㎥) on the back side of the Kitchen, both of which are operational. This Project will rehabilitate the rain water collection system, including eaves gutters and downspouts, as part of the rehabilitation work. It will also renovate the existing concrete water cisterns and elevated water tanks (NW1-Boys Boarding Zone/NW2-Girls Boarding Zone) by mending waterproofing and repairing/newly-installing screen boxes to enable both the well water system and the rain water system to operate properly.

In carrying out the rehabilitation work, function of the existing water cisterns and elevated water tanks will be restored first, and then the plumbing system will be reorganized to distribute water to different points by installing underground PVC pipes for facilities that will newly require water supply while utilizing existing pipes that are still usable as much as possible. Since the quality of well water is not good due to high salt content, the well-water will be used only for flushing toilets in the Dormitories, reserving it as a backup water source under normal conditions. In such a case, water from the rainwater cisterns will be sent to the remaining tanks for other supply points by manually switching the valves.

The configuration and the outline of the entire water supply system are shown in the diagram and the table below.

Table 2-7 Outline of the Water Supply System

	No.	Facility outline (existing)	System	Supplied to	Collected from	Contents of the work
Boys Boarding Zone	NW1	RC underground water cistern (225 ㎥) + elevated water tank (4.5 ㎥)	Rain-water	- Special CR Bldg. - For cooking in Kitchen & drinking - GW1 water tanks (dorm. shower/WC)	Boys dorm (exist./new), Dining Hall & Kitchen, General CR (new), Special CR (exist.) Total roof area: 4,602 ㎡	- Repair waterproofing inside water cisterns, replace screens. - Replace piping. - Install new lifting pump
	GW1	Shallow well + plastic water tanks (10 ㎥ ×2+6 ㎥×3) Total: 38 ㎥	Well/rain-water	- Boys Dorm. shower - Boys Dorm. WC/laundry - Kitchen dishwashing - Backup Girls dorm.	Shallow well (usable all year round)	- Replace piping.
Girls Boarding Zone	NW2	Same as NW1	Rain-water	- Admin. Bldg. - GW2 water tanks (dorm. shower/WC)	Girls Dorm. (exist./new), Admin. Bldg. (new), General CR (exist.) Total roof area: 3,237 ㎡	Same as NW1
	GW2	Same as GW1	Well/rain-water	- Girls Dorm. shower - Girls Dorm. WC/laundry	Shallow well (may dry up during dry season)	- Replace piping. - Install new lifting pump.
Other	-	RC water cistern + elevated water tanks (6+5 ㎥)	Rain-water	- For cooking in Kitchen & drinking	Neighbouring old facilities	- Leave as it is.
	-	Shallow well + desalination unit (8 ㎥/day)	Other	- Backup for cooking in Kitchen & drinking	Shallow well (usable all year round)	- Leave as it is.



∗ Rainwater collection system (red dashed line) will be built or rehabilitated under the Project.
∗ Shaded parts will be fully renovated under the Project.
* Blue lines show well-water system, while black lines show rain-water system.

Figure 2-4 Schematic Diagram of Rainwater Collection & Water Supply System

At present, dedicated staff manually operates a single-phase pump (installed above the ground), which is easily available locally, to lift water from the well or rainwater tanks. This Project will follow the same method and adopt a simple system that is appropriate to the skill levels of local people without installing a sophisticated control device.

- The existing system listed above has a water storage capacity of up to 263 ㎥ for each of the Boys Boarding Zone (NW1+GW1) and the Girls Boarding Zone (NW2+GW2). This translates to water storage that last for about 17 days for 312 students each, assuming that the minimum water consumption per student is 50 litres per day. The water storage and water supply capacities were estimated based on the average annual precipitation of Vaitupu (approx. 3,100mm) and the rainfall data (Funafuti) in 1999 when the country was hit by severe drought (see table below). As a result, it was found that each zone would be supplied with a sufficient volume of water, as the water supply capacity exceeds the water consumption under average precipitation conditions. Under drought conditions, however, the Girls Boarding Zone will suffer water shortage as much as 480 ㎥ per month or 15.5 ㎥ per day. Under this Project, water shortage will be supplemented by using well water for non-drinking purposes. A minimally required amount of water supply will be secured by installing a backup pipe that connects the Boys Boarding Zone to the Girls Boarding Zone, where a well that can be used during drought is installed.

Table 2-8 Analysis on Water Supply by Rainwater Collection System

		Month	1	2	3	4	5	6	7	8	9	10	11	12
1999- Funafuti		Precipitation	336.5	243.6	307.2	326.8	140.8	221.0	72.2	116.4	93.2	66.9	187.6	358.6
Average-Vaitupu		Precipitation	362.1	368.6	261.5	230.3	215.1	201.7	206.3	245.3	191.5	220.4	296.3	331.6
NW1	Year of drought	Supplied m3	1,548.6	1,121.0	1,413.7	1,503.9	648.0	1,017.0	332.3	535.7	428.9	307.9	863.3	1,650.3
		Balance m3	1,080.6	653.0	945.7	1,035.9	180.0	549.0	-135.7	67.7	-39.1	-160.1	395.3	1,182.3
		Remained m3	263.0	263.0	263.0	263.0	263.0	263.0	127.3	194.9	155.8	-4.3	263.0	263.0
	Normal year	Supplied m3	1,666.4	1,696.3	1,203.4	1,059.8	989.9	928.2	949.4	1,128.9	881.3	1,014.3	1,363.6	1,526.0
		Balance m3	1,198.4	1,228.3	735.4	591.8	521.9	460.2	481.4	660.9	413.3	546.3	895.6	1,058.0
NW2	Year of drought	Supplied m3	1,089.3	788.5	994.4	1,057.9	455.8	715.4	233.7	376.8	301.7	216.6	607.3	1,160.8
		Balance m3	621.3	320.5	526.4	589.9	-12.2	247.4	-234.3	-91.2	-166.3	-251.4	139.3	692.8
		Remained m3	263.0	263.0	263.0	263.0	250.8	263.0	28.7	-62.5	-228.8	-480.3	-341.0	263.0
	Normal year	Supplied m3	1,172.1	1,193.2	846.5	745.5	696.3	652.9	667.8	794.0	619.9	713.4	959.1	1,073.4
		Balance m3	704.1	725.2	378.5	277.5	228.3	184.9	199.8	326.0	151.9	245.4	491.1	605.4

・Rainwater catchment area: NW1＝4602 ㎡、 NW2＝3237 ㎡
・Daily water consumption per student: 50 l itre/day
→ Monthly water consumption of each area: 0.05 ㎥ x30 days x312 students =468 ㎥/month

- Water supply and sanitary fixtures: a low tank type pedestal toilet (one-piece type flush toilet without exposed metal piping) will be used for both boys and girls. An inspection pit will be built under the toilets of the new dormitories for easy maintenance of the plumbing system. Piping will be exposed as much as possible to minimize the concealed parts. As a general rule, showerheads, washbasins, water faucets, etc., including fastening fixtures, will be chosen from products made of plastic, stainless steel, or chrome-plated materials which are resistant to salt damage.

- Drainage and sewage system: sewage and gray water will be treated separately. Sewage will be treated in a septic tank and sent to a soakage pit to be naturally soaked up by the ground. Gray water such as drainage from floors and wastewater from washbasins will be sent directly to the soakage pit to be discharged into the ground. This is the most common method adopted in Tuvalu. The type and scale of the septic tank will be determined by complying with the PWD standards. The septic tank for the toilets of the Dormitories to be newly constructed will be built underneath the building using parts of the foundation structure in order to cut cost. The Project site sits on top of 2 – 3 meters of gravel-mixed sandy soil that has high water permeability.

  Precast soakage pits made of permeable porous concrete[6], which are easy to install, unlikely to get clogged, and suitable for the permeability of the local soil, will be procured in Japan and installed in the Project site. To enhance their durability, soakage trenches will be built with PVC perforated pipes to capture the overflow.

- Rehabilitation work: for the five buildings constructed under the previous project, the following rehabilitation work will be carried out:

  - Rehabilitation of water supply/rainwater collection system: as described above.

[6] A special type of concrete with high porosity that is attained by including an extremely small amount of fine aggregate. In Japan, a variety of porous concrete products are used for greenery projects, permeable concrete pavement, rainwater infiltration system, etc.

- Rehabilitation of water supply/drainage equipment and sanitary fixtures of the dormitory's ablution block (WC, shower, laundry): after removing the existing fixtures and piping, an entirely new set of fixtures, etc. of the same specifications as those for the new facilities will be installed.
- Total renovation of water supply/drainage system of Special Classroom Building: existing fixtures and piping of the Chemical Lab and the Culinary Room will be removed and replaced according to the new layout. Washbasins of the Textile Room and Preparation Rooms will be exchanged with new ones.
- Rehabilitation of existing wastewater treatment system: the septic tanks and grease traps will be reused after they are cleaned and removed of sludge by the Tuvaluan side. Infiltration facilities of the same specification as that for the expanded facilities will be newly installed, and the piping connecting to the existing septic tanks will be replaced.

Ventilation and Air-conditioning System

- Ceiling fan: each room, including dormitories, will have a ceiling fan to cope with the hot and humid climate throughout the year.
- Air-conditioning: a package-type room air-conditioner will be installed in the medical supply storage room in the Administration Building that require regulation of temperature and humidity, as well as in the Printing Room of the same building where precision equipment needs to be protected from sand dust, etc. The air-conditioners will be selected from products that are highly resistant to salt damage and are easily replaceable in case of breakage and have as simple a mechanism as possible on the assumption that it would be impossible to carry out sufficient maintenance work.
- Rehabilitation works: all ceiling fans installed in the five buildings constructed under the previous project will be exchanged with new ones. Dormitories without ceiling fans will be provided with ceiling fans after installing a new electrical circuit.

5) Building Material Plan

Specification and construction method of each element are determined by examining them from the standpoints of: 1) having sufficient resistance to harsh climatic conditions, 2) coping with limited local resources (materials, construction equipment, manpower), 3) easy maintenance by the Tuvaluan side, and 4) total cost reduction, including the transportation/procurement cost, while taking into account the basic and appropriate grades for a secondary school. The result is summarized in Table 2-9.

Table 2-9 Specifications of Major Elements

Element		The previous Grant Aid Project	This Project	Design policy / reason for selecting
Type	Storeys	Single storey	Single storey	・Advantageous in terms of construction period and cost, harmonizes with existing facilities.
	Floor plan	Side corridor (Open corridor)	Double corridor (Open corridor)	・Easier installation achieved by standardized cross-section arrangement. ・Enables approach/evacuation in 2 directions.
	Roof	Monitor roof, gable roof with clearstory	Gable roof, hip roof	・Simple shapes to minimize occurrence of defect.
Main structure	Foundation Floor slab	RC continuous footing + RC slab-on-grade	Same as on the left	・Commonly used in Tuvalu. ・Can reduce cost by the use of local aggregate.
	Super-structure	RC framing+CB masonry wall	Structural steel framing+ drywall construction (Extruded cement panel-factory painted)	・Stronger than wooden frame, lighter than RC. ・Less on-site work, easy to control quality.
	Roof	Wooden truss	Structural steel framing	・Allows overall cost reduction, including transportation cost.
Major elements	Roof (finish)	Ribbed seam roofing of hot-dip aluminum coated steel sheet	Ribbed seam roofing of hot-dip aluminum coated steel sheet	・No problem is found in the existing roofing that was installed more than 10 years ago.
	(base)	Asphalt felt on wooden roof board + insulation sheet	Asphalt felt on cemented excelsior board	・Use of material with high heat insulation property will simplify the composition.
	Ceiling (General)	Strip wood+ polyurethane resin paint (pitched)	Polyurethane resin coated plywood on plywood base (pitched)	・High durability and easy maintenance
	(Admi. Building)	-	"Pandanus" mat on plywood (pitched)	・Traditional taste as a core facility
	Eaves ceiling	Cement board+ polyurethane resin paint (pitched)	Cemented excelsior board exposed & strip wood for ventilation (flat)	・Harder to break than cement board due to its thickness.
	External wall	Fair-faced CB masonry +acrylic emulsion paint	Extruded cement panel-factory painted	・Reduction of the overall cost by adoption of dry construction method.
	Internal wall (bottom)	Mortar trowel on CB+ acrylic emulsion paint	Polyurethane resin coated plywood on plywood underlayment	・Sufficient impact resistance among dry construction method.
	Internal wall (upper)	Ditto	Coated plywood on plywood underlayment, vinyl chloride resin paint	Ditto
	Windows	Wooden frame+ aluminum louver window, glass blades	Same as on the left (with plastic handle and holders)	・Most commonly used in Tuvalu, inexpensive, and easy to maintain. ・Some product can avoid the problems seen in the existing buildings.
	External door	Single/double swinging, wooden flush door	Aluminum sliding door with wooden frame	・Can avoid damage from flapping caused by strong winds. ・Enables more effective space utilization.
	Internal door	Ditto	Single swinging wooden panel door	・Most commonly used in Tuvalu.
	Internal floor	PVC tile on concrete trowel finish	Urethane concrete floor coating on concrete trowel finish	・Inexpensive, easy to install, and highly resistant to abrasion.

As protection against salt damage, metal parts and fixtures that are highly resistant to salinity or made of plastic or other materials not prone to salt damage will be chosen.

- Reinforced concrete: will be made with local aggregate after rinsing with water. Protection against salt damage will be implemented by using re-bars coated with epoxy resin.
- Steel frame: shall be treated with high-grade hot-dip galvanisation (JIS-H0401 Class 2, HDZ55-zinc deposit: 550g/㎡ or higher). Exposed parts will be further treated with sweep blasting and coated with polyurethane paint in the factory.
- Other metal parts including support/fastening fixtures: shall be chosen from products made of plastic or stainless steel as much as possible. In case of steel-made parts, anti-salt-corrosion measures, such as hot-dip galvanisation or use of anti-corrosion paint, will be considered.

6) Rehabilitation Plan

Rehabilitation work will be done on the five buildings constructed under the previous project to the extent minimally necessary to restore their original function according to the plan shown in the table below. Painting, floor finish, and other work, that are not necessary for restoring the function will be excluded from the project but instead will be done by the Tuvaluan side on an as-needed basis.

Table 2-10 Contents of Rehabilitation Works

Item of Works	Scope of Rehabilitation Works					Remarks
Code No. Building	NB1 Boys Dorm.	NB2 Girls Dorm.	NB3 General CR Bldg.	NB4 Special CR Bldg.	NB5 Dining Hall & Kit.	
Floor Area(㎡)	751.60	813.60	699.80	648.00	622.10	Total: 3,535.10 ㎡
1. Rehabilitation of eaves, including replacement of fascia boards, gutters, downspouts, damaged ceiling boards, etc.	Whole length	Whole length	Whole length	Whole length	Whole length	To restore rainwater collection system
2. Re-installation of doors and windows	All openings	All openings	All openings	All openings *1	Damaged or lost parts	Including security nets
3. Rehabilitation of electrical installations						
・Distribution board	Replace-ment	Replace-ment	Replace-ment	Replace-ment	Replace-ment	Including a main feeder branch board
・Lighting and socket outlet system	Full repla-cement	Full repla-cement	Full repla-cement	Full repla-cement *2	Full repla-cement	By open wiring
・Ceiling fan	New installation	New installation	Full repla-cement	Full repla-cement	Full repla-cement	Ditto
4. Rehabilitation of ablution block (WC, showers and laundries)	Overall rehabilita-tion	Overall rehabilita-tion	—	—	—	Including plumbing for water supply, sewage and drainage
5. Installation of new soak pits with trenches	3 units	3 units	—	2 units	1 unit	Tuvalu side shall discharge sludge and clean up septic tanks
6. Rehabilitation of water supply and drainage system inside special classrooms	—	—	—	Full repla-cement *2	—	

*1 Doors on back side walls of classrooms will be replaced by fixed wooden panels with louver windows.

*2 Floor mounted outlets and plumbing fixtures for lab./work tables will be replaced by ones of wall mounted type.

Contents of rehabilitation work of each item are as follows:

- Eaves gutters/eave edges: edges of eaves and surrounding parts of all existing buildings, except for the Dining Hall & Kitchen Building, are severely damaged, and more than half of fascia boards and eaves gutters (box gutters) mounted on the outer edges of the boards are missing. Although eave edges are supported by extended upper chords of the wooden trusses, the support spans are so large (6.0m for Dormitories and 4.8m for General/Special Classroom Buildings) that the mid-sections are sagging, forming wavy lines along the eave edges. This Project will remove the existing fascia boards and eaves gutters along the entire length of the target parts, and then reinforce the eave edges with channel steel treated with rust inhibitor before mounting ready-made rain gutters made of plastic-coated steel plates having high strength and weather resistance properties along the eave edges. The channel steel will be fastened with brackets to the existing RC columns, and small RC columns will be added to the middle of each span to prevent the eave edges from sagging. Since the eaves gutters of the Dining Hall & Kitchen Building remain undamaged, rehabilitation work will consist only of the replacement and repair of sections with damaged fascia boards.

  Other works include: 1) replacement of damaged boards of eave ceilings and repainting, 2) replacement/restoration of downspouts and connection to the collection pipes, and 3) removal of rust from and re-application of anti-corrosion paint on the truss plate in the upper section of the supporting columns in the lower part of the open corridors.

- Doors and windows: most of the doors and windows of the existing buildings, except for those of the Dining Hall & Kitchen Building, are severely damaged, and many openings are missing doors or windows. In the Dormitories, all louver windows have been removed and replaced with wooden awning windows. Under this Project, remaining doors and windows, except for wooden frames, of the four buildings will be removed completely, and new doors and window of the same specifications of those for the new buildings, will be installed. As for anti-burglary meshes, existing metal nets will be taken off and replaced with new metal nets of the same specification of those for the new buildings (aluminum expanded metal) after removing rust from the surrounding parts. Since the Dining Hall & Kitchen Building has only minor damage on the doors and windows, only exterior doors with noticeable damage will be replaced.

- Electrical installations: will be rehabilitated as described under “4) Building Services Plan” of this chapter. Electrical appliances will be replaced at their present locations as a general rule. Socket outlets of the Woodwork Room, Chemical Lab, Textile/Culinary Room of the Special Classroom Building will be relocated based on the new layout plan after removing existing equipment.

- WC/shower/laundry rooms: will be rehabilitated as described under “4) Building Services Plan” of this chapter. Rehabilitation work will consist of: 1) removal of existing booths and installation of new booths (of the same specification as those for the new buildings) according to the present layout plan, 2) repairing of floor mortar, and 3) repainting of internal walls.

- Wastewater treatment system: as described under “4) Building Services Plan” of this chapter.
- Indoor water supply/drainage system (Special Classroom Building): as described under “4) Building Services Plan” of this chapter.

(3) Equipment Plan

Equipment items requested for this Project are classified into: 1) furniture needed for expanded facilities, 2) educational equipment for general subjects, 3) lab equipment for experiments, 4) equipment for practical training, 5) equipment for administrative work, and 6) equipment for First Aid Room. The list of requested equipment was reorganized by examining the priority and required quantity of each item based on the result of interviews during the site survey with the personnel in charge of managing each item with regard to their use, necessity, usage history and frequency, how the existing equipment had been maintained, etc. Priority levels are categorized into four levels from A to D as described below. The items categorized as priority levels C and D were deleted from the list and the result was summarized as the final list of requested equipment.

- A: Indispensable to teaching classes or operating the school.
- B: Desirable but further analysis is needed in Japan.
- C: Can be handled by other equipment, or easily procurable by the Tuvaluan side.
- D: Unnecessary as it is redundant with existing equipment, or inappropriate from the maintenance viewpoint.

As for furniture, items that will be built in the buildings or need to be made or assembled at the site will be included in the architectural works. The furniture plan will basically consist of movable ready-made products.

1) Furniture

The list of furniture items to be provided by this Project was narrowed to those that are minimally necessary for the expanded and rehabilitated facilities to function properly while utilizing existing furniture as much as possible in the rehabilitated buildings. Specification of each item is determined based on how existing furniture has been maintained and in accordance with the following guidelines:

- Products made of plastic, wood, stainless steel, aluminum, and other materials with high resistance to salt shall be given precedence.
- Products that are simple and universal and can be used for many purposes shall be chosen.

Table 2-11 List of Furniture

Cate-gory	Code No.	Item	Room	Specification	Q'ty
Furni-ture	FNT-01	Whiteboard	Teachers' rm	Mobile type with casters	2
	FNT-02	Student's Chair	General CRs/Drawing rm	Plastic, fully injection molded, stackable	390
	FNT-03	Student's Desk	General CRs/Drawing rm	Single desk, fixed top of 600x450mm	390
	FNT-04	Teacher's Chair	General CRs/Drawing rm/ Teachers' rm/Prep. rms	Plastic, fully injection molded, stackable	65
	FNT-05	Teacher's Desk 1	General CRs/Drawing rm	Laminated board, with drawers' pedestal and backboard, 1200 x 600mm	13
	FNT-06	Teacher's Desk 2	Teachers' rm/Prep. rms	General purpose table, powder coated metal frame, 1200 x 600mm	52
	FNT-07	Office Desk	Principal/Vice-principal's rm/First-aid rm	Laminated board, with drawers' pedestal and backboard, 1500 x 750mm	3
	FNT-08	Office Chair	Principal/Vice-principal's rm	Office revolving chair, medium back with arms	2
	FNT-09	Doctor's Chair	First-aid rm	Office revolving chair, armless	1
	FNT-10	Meeting Table	Principal/Vice-principal's rm	General purpose table, powder coated metal frame, 1500 x 750mm	2
	FNT-11	Meeting Chair	Principal/Vice-principal's rm/First-aid rm	Meeting armless chair, with fabric covering, powder coated metal frame	14
	FNT-12	Cabinet	Principal's rm	Double swing door and open shelves, laminated board, with adjustable shelves	3
	FNT-13	Bookcase	Prep. rms/Vice-principal's rm/ Printing rm/ Storage	Open shelving cabinet, laminated board, with adjustable shelves	18
	FNT-14	Cabinet	First-aid rm	Medical cabinet, upper section: glass door, lower section: panel door, laminated board	2
	FNT-15	Working Table	Printing rm	General purpose table, powder coated metal frame, 1200 x 600mm	2

Notes: 1. All of installation rooms are in the newly constructed buildings, except for the technical drawing room in NB-4 (Special Classroom Bldg.)

2. Furniture for laboratories in NB-4 (Special Classroom Bldg.) are listed on the equipment list shown in the next section.

2) Equipment

As a result of further analyzing the finally agreed-upon list of requested equipment after returning to Japan, we decided to remove the following items from the list because of little necessity or potential problems in maintenance, etc.:

- Filing cabinet and storage shelf (for each subject)

  Although these items were requested for storing documents and equipment in the preparation room of each subject, their necessity is low, as shelves have already been installed in such rooms.

- Overhead Projector (for teaching Social Science)

  OHP was requested to utilize the teaching materials (OHP sheets), which MSS already has. However, OHP would be difficult to maintain, as it requires specialized maintenance and

replenishment of expendables and spare parts. The existing projector is left unrepaired also.

- Fume Cupboard (for science experiments)

  Despite the high cost, its frequency of use and necessity for teaching the class are not necessarily high. The existing built-in fume cupboard is left broken. Also, there is a technical difficulty in securing an exhaust route.

- Electric Cooker (for practical training in Culinary Room)

  Although this item was requested for teachers to demonstrate cooking methods in case of shortage of gas, electric cookers are becoming increasingly difficult to procure due to dissemination of electromagnetic cooking appliance (IH cooking heater), the maintenance services for which are not available in Tuvalu or its neighbouring countries. Therefore, it is switched to the same gas stove as those for students.

- Copy Machine and Duplicating Machine (for administrative work)

  Of the existing three copy machines, one is broken and two are still operating. Although they are frequently used and their necessity is deemed high, it does not justify the procurement of an additional copy machine under this Project. As for the duplicating machine, although it was requested for printing test papers, etc. in large quantities, none of the limited number of manufacturers seems to be able to provide maintenance services in Tuvalu or neighbouring countries.

- Video Camera Set (for administrative work)

  The purpose of its use is unclear, and it may not be used or managed in a way that is appropriate for Japan's Grant Aid. Also, it is not indispensable to school administration. Therefore, this item is excluded from the Project.

- Vacuum Cleaner (for administrative work)

  Although this item was requested to clean the copy machines, it is excluded from the Project, as the existing cleaner can be used for this purpose also.

A list of planned equipment and the specification of each item are shown in Table 2-12.

Table 2-12 List of Equipment

Category	Code No.	Item	Specification	Q'ty	Unit
Math.	MAT-01	Compass Set for Blackboard	Wooden or aluminum arm, L=approx. 550mm	2	Pcs.
	MAT-02	Protractor for Blackboard	Resin made, Dia.=approx. 600mm	3	Pcs.
	MAT-03	Square set for Blackboard	Resin made, 45・30/60°, L=approx. 600mm	1	Set
	MAT-04	Blackboard	Ruled by square grid, movable, 900x900mm	1	Pc.
Social Sci.	SSC-01	Wall Map	Map of Pacific region、vinyl-coated	1	Pc.
Science	SCI-01	Molecular Model for Student	More than 5 colors of atom balls w/magnets, case	3	Sets
	SCI-02	Funnel Stand	Stainless steel, funnel support + funnel holder	7	Sets
	SCI-03	Burette Stand	Stainless steel, burette stand w/holders	6	Sets
	SCI-04	Wastewater Treatment Apparatus	Mannual batch processing, w/standard accessories	1	Set

Science	SCI-05	Falling Body Accelerate Bar	Body, plastic ball, strobescope and standard accessories	1	Set
	SCI-06	Drop Tube	Acrylic resin tube, vacuum pump and standard accessories	1	Set
	SCI-07	Heat Expansion Ball Handling	Metal ball and large/small metal rings	1	Set
	SCI-08	Water Pressure Experimental Apparatus	Transparent acryl resin water bath w/more than 4 holes on the side	1	Set
	SCI-09	Ripple Tank	Water trough, wave source, light source and standard accessories	1	Set
	SCI-10	Wave-Motion Demonstrator	L=1.0m or more, w/standard accessories	1	Set
	SCI-11	Laser Beam Apparatus	Red laser type （output 0.5～1mW）	1	Set
	SCI-12	Optical Bench	Metal body w/LED light source, lens and screen, approx. 600mm in length	1	Set
	SCI-13	Monochord	Double strings type, w/sounding box, accessories （spare bridges/strings）	1	Set
	SCI-14	Pipette Filler	Pump type	10	Pcs.
	SCI-16	Cylinder Microtome	Cylinder type, w/sample holder, razor and case	1	Set
	SCI-17	Material set for Aquarium	Temperature regulator, filtration apparatus, fluorescent lamp and air pump	1	Sets
	SCI-18	Celestial Globe	Hand operation type, w/lamp and display panel for four seasons	1	Sets
	SCI-19	Rain Gauge	Tipping bucket type of approx. 200mm dia., w/standard accessories	1	Sets
	SCI-20	Regulated DC Power Supply	AC/DC 0~20V 5A	8	Pcs.
	SCI-21	Thermometer Set	Mercury thermometers: -5~+105℃/0~+360℃、Alcohol thermometer	7	Sets
	SCI-22	Moving Coil Ammeter	Measuring range: 0~+5A/+500mA/+50mA	8	Pcs.
	SCI-23	Moving Coil Galvanometer	Current sensitivity-3.5 x 10^{-6}A, voltage sensitivity-4.55 x 10^{-4}A	5	Pcs.
	SCI-24	Digital Multimeter	Measuring DC(V/A), AC(V/A) and ohm, w/probes	8	Pcs.
	SCI-25	Glass Ware	28 items such as beaker, test tube, petri dish, etc.	1	Set
	SCI-26	Small Items for Experiment of Science	30 items such as mortar & pestle, test tube clamp, cork plug, color cord, etc.	1	Set
	SCI-27	Parts Case	PVC or wooden case, two-tiered	2	Pcs.
	SCI-28	Lab. Table for Student	Top: coated calcium silicate board, 1800 x 900mm	12	Pcs.
	SCI-29	Stool for Student	Resin made, approx. 330mm dia.	60	Pcs.
	SCI-30	Lab. Table for Teacher	Top: coated calcium silicate board, 2400 x 900mm	2	Pcs.
	SCI-31	Chair for Teacher	Plastic, fully injection molded	2	Pcs.
Tec. Drawing	TD-01	Drawing Board	A3 size, w/desktop stand, plywood veneer made	30	Sets
	TD-02	Drawing Tool Set	Triangles, combination compass, divider, multimodule drafting scale, adjustable triangle	30	Sets
Wood-work	WW-01	Electric Circular Saw	Handy type, w/two carbide blades	2	Sets
	WW-02	Belt Grinder for Wood	Motor:400W or higher, w/5 spare belts	1	Set
	WW-03	Thicknesser	Floor-standing, w/safety cover and spareblades	1	Set
	WW-04	Hack Saw	Fro woodwork, w/10 spare blades	10	Sets
	WW-05	Saw Set	Cross-cut saw, rip saw, back saw and file	2	Sets
	WW-06	Plane Set	2 types of western planes, w/2 spare cutters	2	Sets
	WW-07	Wood Lathe Chisel Set	Bench top, motor: 400W or more, w/5 types chisels	2	Sets
	WW-08	Measuring Tape Set	Metal tape, length: approx. 5m, w/stopper	6	Pcs.
	WW-09	Marking Gauge Set	Made of wood, western type	5	Pcs.
	WW-10	Claw Hammer Set	Length: approx. 265mm	6	Pcs.
	WW-11	Oil Stone	Approx. 150x50x25mm	5	Pcs.
	WW-12	Tap & Die Set	Die: approx. 25mm dia., 8 kinds of tap, w/case	2	Sets
	WW-13	Long Nose Pliers	Approx. 150mm	6	Pcs.
	WW-14	Combination Pliers	Approx. 175mm	6	Pcs.

Wood-work	WW-15	Socket Wrench Set	10 kinds or more, 10mm~, w/case	1	Sets
	WW-16	Spanner Set	3 kinds of adjustable spanner, w/case	2	Sets
	WW-17	Screw Driver Set	+/－, 4 kinds, plastic handle	6	Sets
	WW-18	Pipe Wrench	Approx. 300mm	4	Pcs.
	WW-19	Air Compressor	Capacity of tank- approx. 12lit, 20m hose andstandard accessories	1	Sets
	WW-20	Power strip	3 sockets, approx. 5m	6	Pcs.
Home Economics	HEC-02	Gas Cooker	2 burners or more, w/5m of rubber hose for LPG	4	Set
	HEC-03	Refrigerator	Freezer 100L/chillroom 200L or more	1	Set
	HEC-04	Blender	Capacity- approx. 1L	1	Set
	HEC-05	Kitchen Scale	Table-top type, capacity- 2kg	2	Pcs.
	HEC-06	Measure Spoon Set	2.5/5/15cc set of 3 pcs.	4	Set
	HEC-07	Non Stick Pot set	20cm single handle pan+ 22cm sauce pan	4	Set
	HEC-08	Non Stick Frying Pan	26cm frying pan, Teflon coating	4	Pcs.
	HEC-09	Wok	Steel pan w/double handles, approx. 330mm	3	Pcs.
	HEC-10	Tape Measure	For sewing, metal tape approx. 1.5m	16	Pcs.
	HEC-12	Ironing Board	Flame retardant fabric, approx. 900x600mm	2	Pcs.
	HEC-13	Stool for Student	Resin made, Dis=approx. 330mm	15	Pcs.
	HEC-14	Chair for Teacher	PET, fully injection-molded, stackable	1	Pc.
Physical Education	PED-01	Soccer Goal Set	Heavy-gauge aluminum goal w/ net and standard accessories, SG standard product	1	Set
	PED-02	Volley ball	Natural leather	10	Pcs.
	PED-03	Basket Ball	Natural leather	5	Pcs.
	PED-04	Rugby Ball	Rubber	5	Pcs.
	PED-05	High Jump Set	Glassfiber bars, Safety mat (approx. 2x3m)	3	Set
	PED-06	Roll Measure	100m glassfiber tape, w/ ABS resin case	4	Pcs.
	PED-07	Track and Field Sports Goods	Batons/ Whistle/ Stopwatch/ Color cones	1	Set
Agriculture	AGR-01	One Wheel Truck	For agricultural work	5	Pcs.
	AGR-02	Scoop	L= approx. 300mm	6	Pcs.
	AGR-03	Rake	Teeth/ handle -approx. 60mm/ 1300mm	1	Pc.
	AGR-04	Water Hose	Approx. 50m	1	Pc.
	AGR-05	Post Hole Spade	Head/ handle -approx. 400mm/ 650mm	4	Pcs.
	AGR-06	Flat Spade	Head/ handle -approx. 300mm/ 650mm	4	Pcs.
	AGR-07	Fork	Blade- approx. 300mm	5	Pcs.
	AGR-08	Hand Fork	Total length= approx. 300mm	6	Pcs.
	AGR-09	Bush Knife	Approx. 450mm、straight type	6	Pcs.
	AGR-10	Axes Set	Hand axe/ pruning axe	2	Set
Music	MSC-01	Keyboard	76 key or more, 8 tone colors	1	Set
Admini-stration	ADM-03	Personal Computer Set	Main unit/ LCD monitor/ keyboard & mouse/ printer/UPS, w/ OS and basic application	1	Set
	ADM-04	PA System/ Mobile	Wireless tuner unit/ 2 microphones, 25W or more	1	Set
	ADM-05	Loudspeaker	Max. output- 10W	2	Pcs.
First-aid	FAD-01	Autoclave	Table-top type	1	Set
	FAD-02	Electric Kettle	Capacity- 5L	1	Set
	FAD-03	Cast (Dressing Drum)	2 sets, stainless steel	1	Set
	FAD-04	Tray	Approx. 300x240x40mm, stainless steel	1	Pc.
	FAD-05	Blood Pressure Machine	Mercury Sphygmomanometer, table-top type	1	Set
	FAD-06	Tooth Extraction Set	Dental pliers (for foretooth/back tooth), dental mirror, cotton swabs dispenser	1	Set
	FAD-07	First Aid Set	Medical sissors/ triangle bandage/ bandage/ splint/ cut gauze/ adhesive tape/ clinical thermometer	1	Set
	FAD-08	Bed	Steel frame, 2000x900mm, w/mattress,pillow	2	Set

2-2-3 Outline Design Drawings

(1) Site Layout Plan

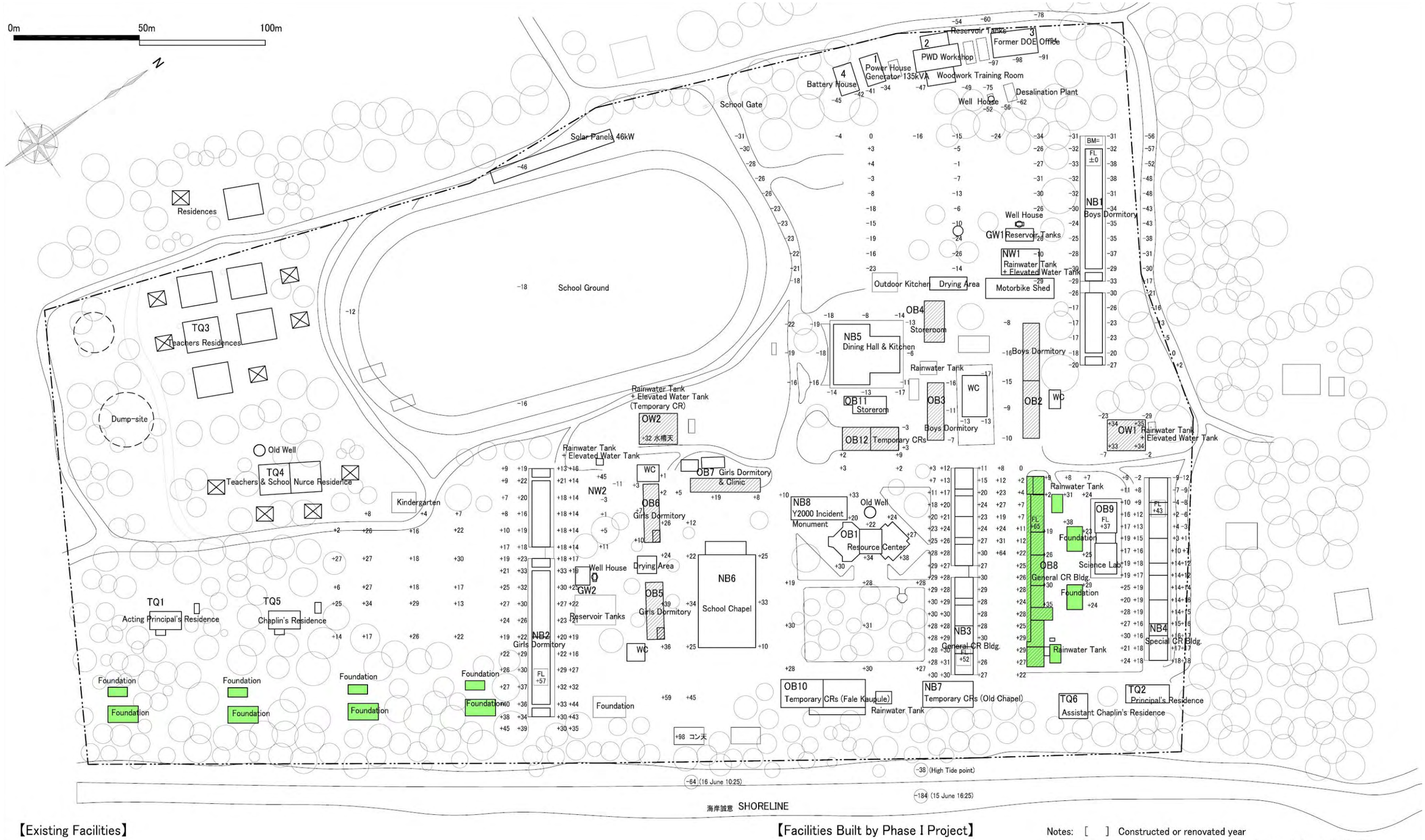
- A-00 Existing Facilities Layout Plan
- A-01 Site Layout Plan

(2) Expansion Work:

- A-02 EXB-1 General Classroom Building 1（8 classrooms）
- A-03 EXB-2 General Classroom Building 2（4 classrooms）
- A-04 EXB-3/5 Boys/Girls Dormitory 1 （2 rooms）
- A-05 EXB-4/6 Boys/Girls Dormitory 2 （1 room+ ablution block）
- A-06 EXB-7 Administration Building
- A-07 Sections: EXB-1/2, EXB-3/5, EXB-4/6, EXB-7

(3) Rehabilitation Work:

- A-08 NB-1 Boys Dormitory （3 rooms + ablution block）
- A-09 NB-2 Girls Dormitory （3 rooms + ablution block+ superintendent’s room）
- A-10 NB-3 General Classroom Building（8 classrooms）
- A-11 NB-4 Special Classroom Building （6 classrooms）
- A-12 NB-5 Dining Hall and Kitchen （300 seats）



【Existing Facilities】

TQ1. Acting Principal's Residence [1979]
TQ2. Principal's Residence [1978]
TQ3. Teachers Residence [after 1988]
TQ4. Teachers and School Nurse Residence [after 1988]
TQ5. School Chaplin's Residence [1979]
TQ6. School Assistance Chaplin's Residence [after 1988]
OB1. Resource Center [1991]
OB2. Boys Dormitory [1982]
OB3. Boys Dormitory
OB4. Storeroom [1982]
OB5. Girls Dormitory [1980]
OB6. Girls Dormitory [1980]
OB7. Girls Dormitory & Clinic [1990]
OB8. Old Long Bldg. (Special/General CRs) [1968]
OB9. Old Laboratories [1980]
OB10. Fale Kaupule (Temporary Classrooms) [1976]
OB11. Storeroom [1975]
OB12. Old Canteen (Temporary CRs) [around 1975]
OW1,2. Elevated & Reservoir Water Tank (Old)
GW1,2. Backup groundwater supply facilities [2001-2003]
NB6. School Capel [2004]
NB7. Old Chapel (Temporary CRs) [2003, renovated]
NB8. Year 2000 Incident Monument
1. Power House [1988]
2. PWD Workshop [1993]
3. Former DOE Office
4. Battery House for Solar Power System [2009]

【Facilities Built by Phase I Project】

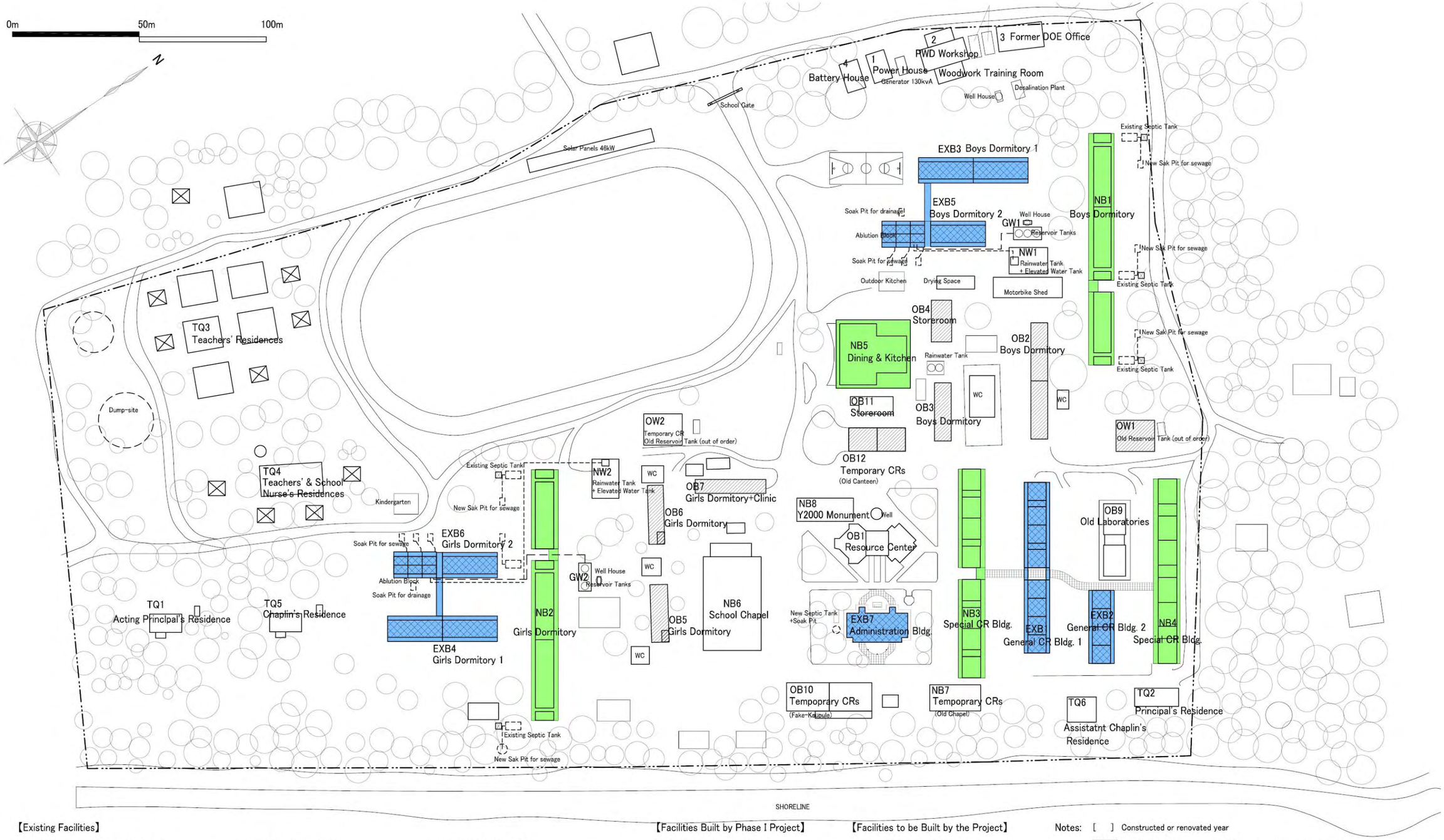
NB1. Boys Dormitory [1998]
NB2. Girls Dormitory [1998]
NB3. General Classroom Bldg. [1998]
NB4. Special Classroom Bldg. [1998]
NB5. Dining Hall & Kitchen [1998]
NW1,2. Elevated & Reservoir Water Tank [1998]

Notes: [ ] Constructed or renovated year
Facilities to be demolished after the completion of the Project, according to the recommendation by PWD
Sub-structures to be demolished under the Project, while super-structures to be demolished by Tuvalu side

現況施設配置図
EXISTING FACILITY LAYOUT PLAN S=1/1500

ツバル国モトフォウア高等教育施設整備計画
The Project for Improvement of Educational Facilities at Motufoua Secondary School

A-00



【Existing Facilities】

TQ1. Acting Principal's Residence [1979]
TQ2. Principal's Residence [1978]
TQ3. Teachers Residence [after 1988]
TQ4. Teachers and School Nurse Residence [after 1988]
TQ5. School Chaplin's Residence [1979]
TQ6. School Assistance Chaplin's Residence [after 1988]
OB1. Resource Center [1991]
OB2. Boys Dormitory [1982]
OB3. Boys Dormitory
OB4. Storeroom [1982]
OB5. Girls Dormitory [1980]
OB6. Girls Dormitory [1980]
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OW1,2. Elevated & Reservoir Water Tank (Old)
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NB7. Old Chapel (Temporary CRs) [2003, renovated]
NB8. Year 2000 Incident Monument
1. Power House [1988]
2. PWD Workshop [1993]
3. Former DOE Office
4. Battery House for Solar Power System [2009]

【Facilities Built by Phase I Project】

NB1. Boys Dormitory [1998]
NB2. Girls Dormitory [1998]
NB3. General Classroom Bldg. [1998]
NB4. Special Classroom Bldg. [1998]
NB5. Dining Hall & Kitchen [1998]
NW1,2. Elevated & Reservoir Water Tank [1998]

【Facilities to be Built by the Project】

EXB1. General Classroom Gldg. 1
EXB2. General Classroom Gldg. 2
EXB3. Boys Dormitory 1
EXB4. Girls Dormitory 1
EXB5. Boys Dormitory 2 (with ablution block)
EXB6. Girls Dormitory 2 (with ablution block)
EXB7. Administration Bldg.

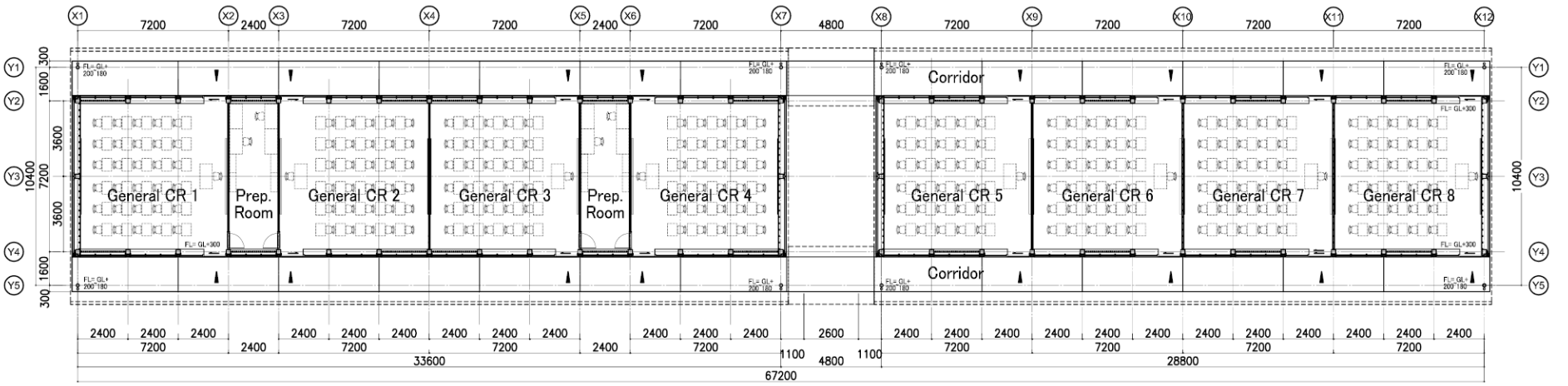
Notes: [ ] Constructed or renovated year

- Facilities to be demolished after the completion of the Project
- Facilities to be newly constructed under the Project
- Facilities to be rehabilitated under the Project
- Pavement by permeable concrete pavers (colored)

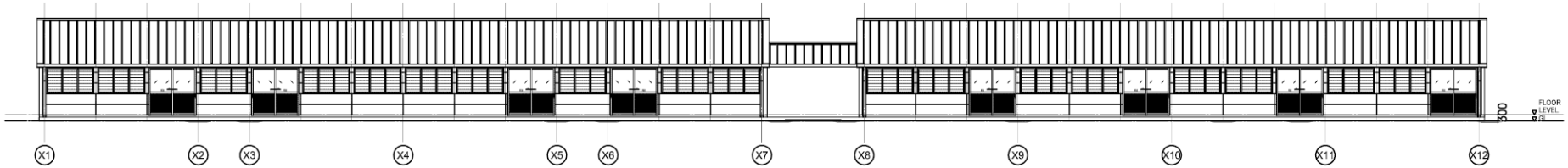
配置計画図
SITE LAYOUT PLAN S=1/1500

ツバル国モトフォウア高等教育施設整備計画
The Project for Improvement of Educational Facilities at Motufoua Secondary School

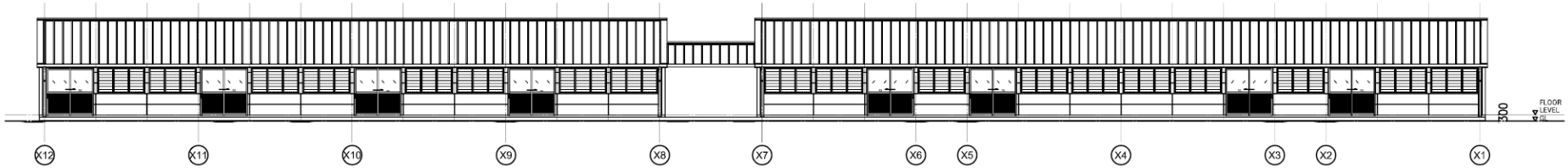
A-01



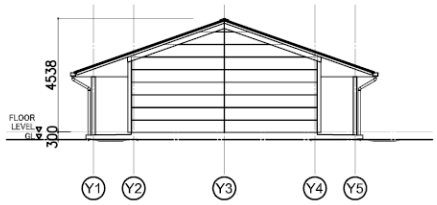
Floor Plan



South-Western Elev.



North-Eastern Elev.



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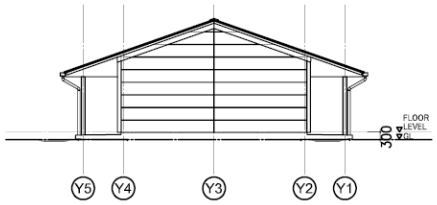
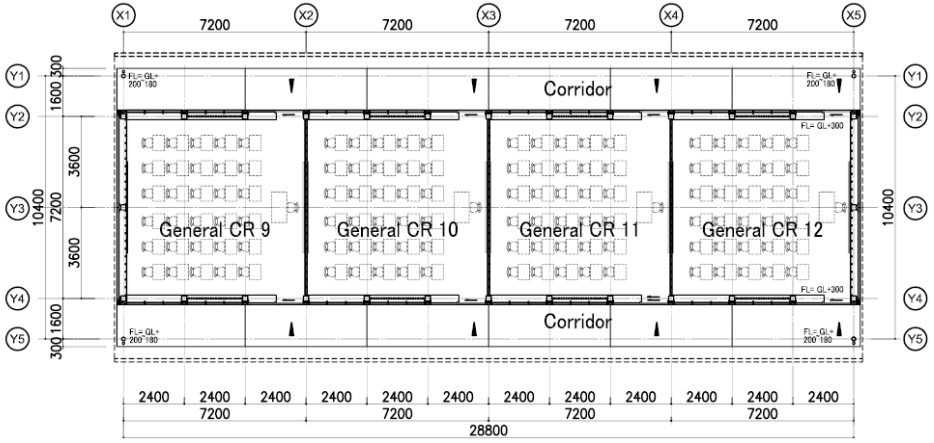


South-Eastern Elev.

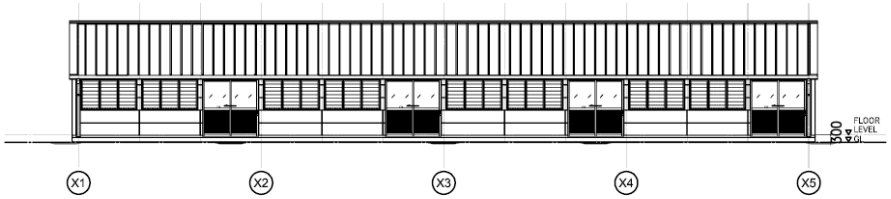
EXB-01 一般教室棟 1 平面図/立面図
GENERAL CLASSROOM BUILDING 1 FLOOR PLAN & ELEVATIONS S=1/300

ツバル国モトフォウア高等教育施設整備計画
The Project for Improvement of Educational Facilities at Motufoua Secondary School

A-02



Floor Plan



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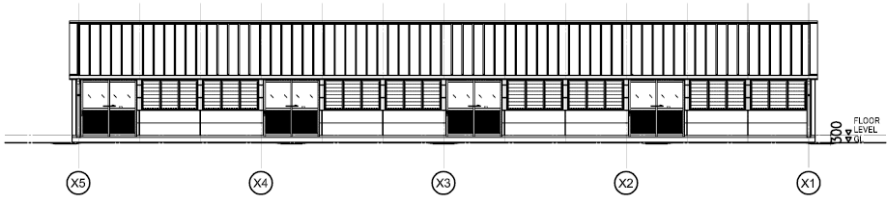

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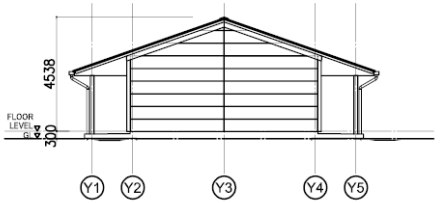

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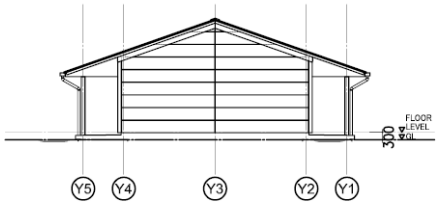
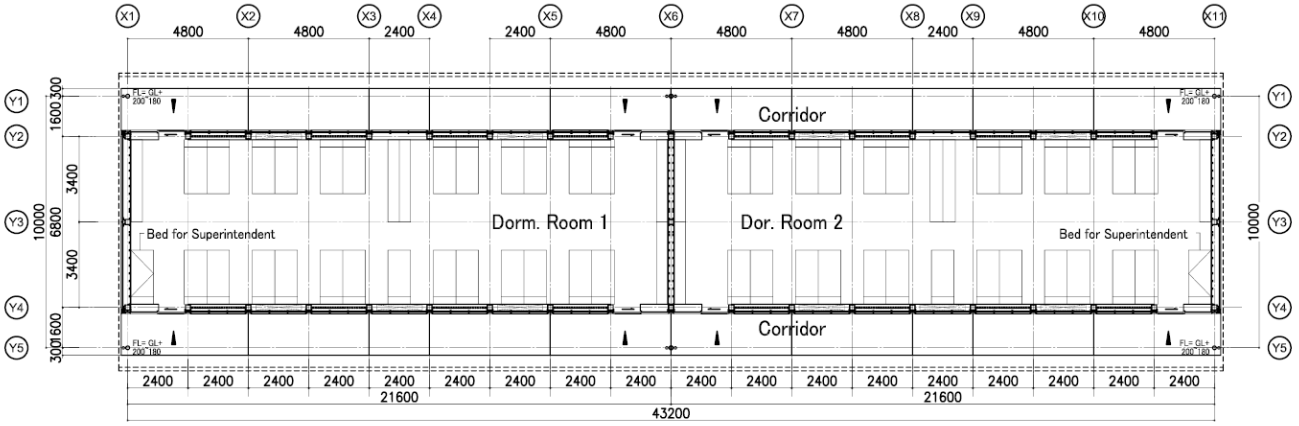


North-Western Elev.

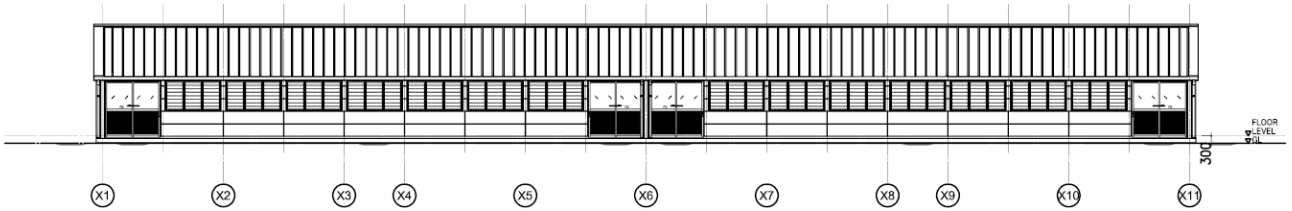
EXB-02 一般教室棟 2　　平面図/立面図
GENERAL CLASSROOM BUILDING 2　　FLOOR PLAN & ELEVATIONS　S=1/300

ツバル国モトフォウア高等教育施設整備計画
The Project for Improvement of Educational Facilities
at Motufoua Secondary School

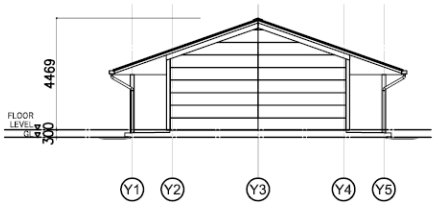
A-03



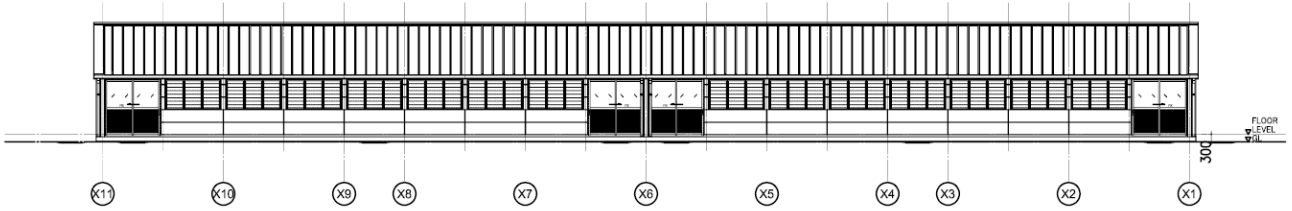
Floor Plan



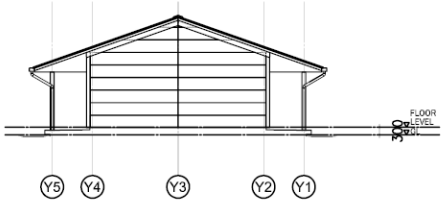
South-Eastern Elev.



South-Western Elev.



North-Western Elev.



North-Eastern Elev.

EXB-03/05 男子寮 1/女子寮 1 平面図/立面図
BOYS/GIRLS DORMITORY 1 FLOOR PLAN & ELEVATIONS S=1/300

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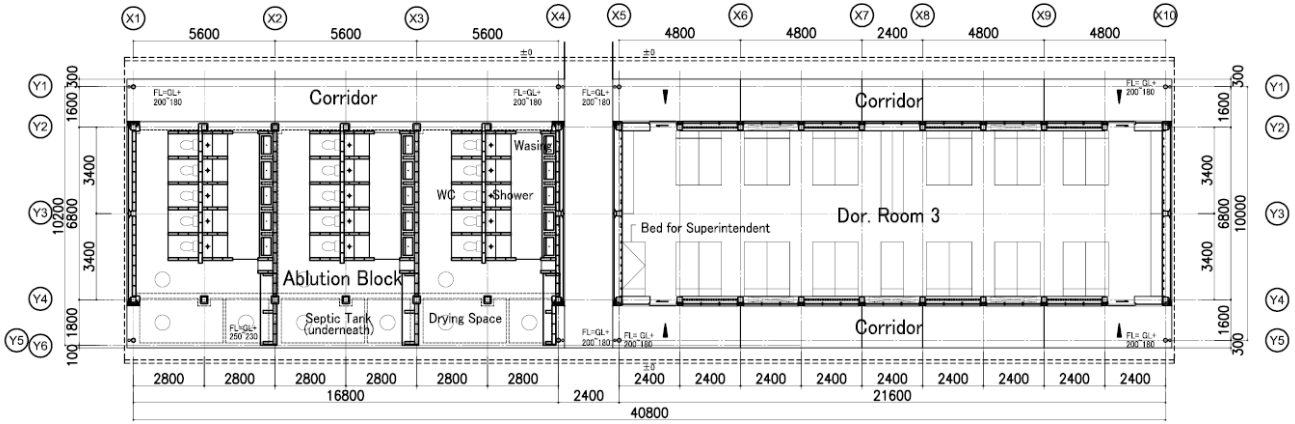
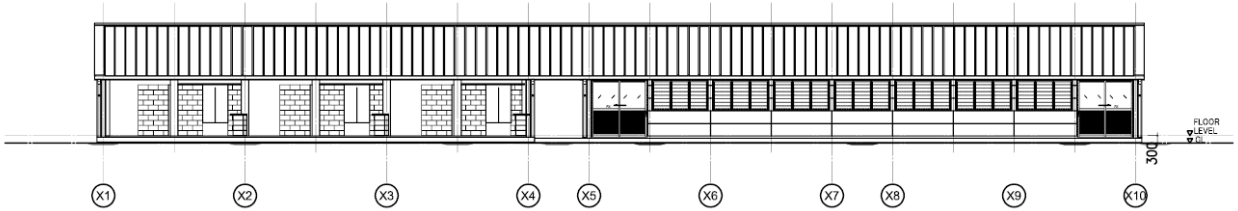
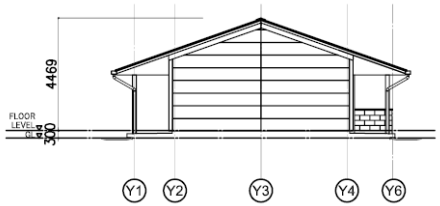


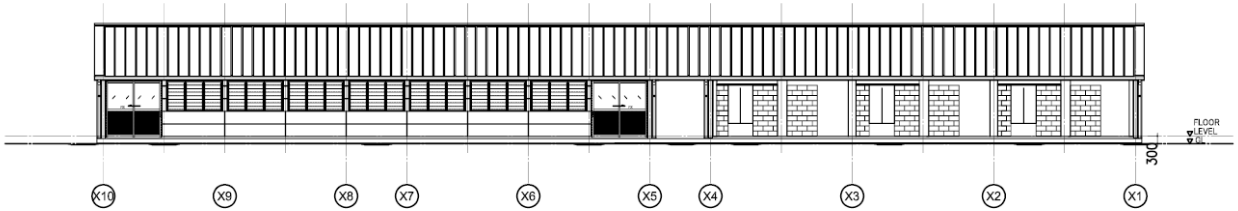
Floor Plan



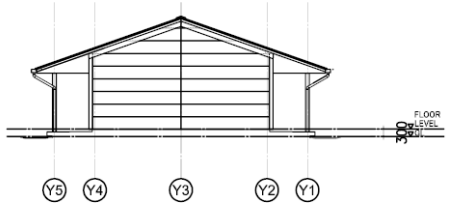
South-Eastern Elev.



South-Western Elev.



North-Western Elev.



North-Eastern Elev.

EXB-04/06 男子寮 2/女子寮 2 平面図/立面図
BOYS/GIRLS DORMITORY 2 FLOOR PLAN & ELEVATIONS S=1/300

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