

(3) Present Situation of Teaching Staff

Teaching staff at the public schools in Tuvalu were employed as public workers, with most of these staff having graduated from either Kiribati Teachers College before independence or from Fiji Teachers College since independence. Because of an insufficient number of regular teachers, temporary teachers and some volunteers were employed as support. One teacher should be responsible for 25 students according to National Standards, but usually a teacher has 30 students under his or her charge and sometimes a teacher can be responsible for 40 students at one time in a primary school. The qualification of these teachers in Tuvalu are mixed between Teachers Certificates, Diplomas and Bachelor's Degrees.

Based on the above-mentioned situation, the improvement and reinforcement of the teaching quality is in progress. At present, more than 20 trainees have been sent to overseas' universities for the improvement of their skills in eleven different subjects including English, Mathematics, Science, etc. For primary education, three teachers will be increased every year up to reach the role of National Standards.

(4) The Present Condition in Each Educational Sector

1) The Primary Sector (Y1 - Y8)

There are twelve Primary schools in Tuvalu, including nine public schools on each of islands and three private schools. The Public schools provide free education and almost 100% of children are attending the schools and advancing to Year 8.

The number of Primary School students in these nine public schools is shown in Table 2-8; there are 73 teachers in total, an average of 22.7 students per teacher although this varies widely.

Table 2-8 Number of Students in Primary Schools

No.	Name of Facility	Organization of Management GOVT/COUNCIL)	Number of Teachers	Number of Students								TOTAL
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	
1.	Kaumaile	Nanumea		20	32	24	18	21	9	20	11	155
2.	Lotohoni	Manumega		16	18	10	8	21	12	25	10	120
3.	Uepelec	Niutao		17	23	22	16	18	30	22	14	162
4.	Vaipuna	Nui		11	15	13	13	23	16	8	19	118
5.	Jolise	Vaitupu		28	22	43	27	31	32	28	33	244
6.	Tutasi	Nukufetau		21	18	22	19	15	7	23	16	141
7.	Nauti	Funafuti		83	96	72	63	81	69	106	71	641
8.	Faikimua	Nukulaelal		3	8	11	7	7	10	7	8	61
9.	Niulakita	Niulakita		2	6	2	1	1	1	2	1	16
Total			73	201	238	219	172	218	186	241	183	1,658

Source: Education Department, 1994

Despite the fact that the National Standard for the ratio of pupils against teacher is 25 pupils per teacher, the real ratio is presently 30 - 40 pupils per teacher. At present, there is a plan that three teachers will be added annually.

In the case of the primary school at Funafuti, 20 teachers have 648 pupils under their charges, and sometimes a teacher teaches three different subjects. Usually, there are two classes in each school year with a total of 17 classes sharing 13 classrooms. There will be an additional 12 classrooms constructed with the assistance of the French Government in the near future.

2) The Secondary Sector (Y9~Y12)

<Motufoua Secondary School>

Please refer to Paragraph 2-1-4 (Present Situation of Motufoua Secondary School).

<Fetuvalu Secondary School>

Besides Motufoua Secondary School, Fetuvalu Secondary School, a church-run school, exists on Funafuti and provides education for F3 to F5 for three years. There are 60 new students accepted every year, and numbers of the students are shown in Table 2-9. Because of failures from the selection examination at the completion of F4, the number of students in F4 is swollen. At the completion of F5, Tuvalu Form 5 Examination is held, and then, the students who have passed the examination can go on to study further in Fiji, New Zealand, Australia, etc., if they are financially allowed to do so. There are 15 teachers including 5 expatriates at the School. Differently to Motufoua Secondary School, there is no dormitory at Fetuvalu Secondary School. The school hours are from 8:00 to 15:00 five days a week. The curriculum of the school is shown as below:

Table 2-9 Number of Students

Year	Number of Students	Number of classes
F3 (Y9)	60	2
F4 (Y10)	150	5
F5 (Y11)	26 - 27	1
Total	186 - 187	8

Curriculum of Fetuvalu Secondary School

F3 and F4: Religious Education, Tuvalu's Cultural Education, English, Mathematics, General Science, Social Science, History, Commercial Study

F5: The following subjects are added to the above subjects. Accounting and Economics, Home Economics, Technical Drawing, Music, Agriculture Science, Physics (Woodwork and computer courses will be available in the near future)

The school has been trying to limit the number of students per class to 20, however the recent increase in students made classrooms crowded. The available facilities in Fetuvalu Secondary School are as follows:

General classrooms	10 rooms
Science classrooms	2 rooms
Home Economics rooms	2 rooms
Staffs' office	
Teachers' accommodation	

The annual budget of the school is around A\$90,000 to A\$100,000 (excluding teachers' payments). The schooling fees are A\$45 per term and A\$90 per year and supporting expenses for student's transport, books, stationery, etc., are available from the church. (The annual fee will be raised soon to A\$120 including the transport expenses.)

3) Vocational Training

<Amatuku Maritime School>

Seamen's training is carried out for one year at Amatuku Maritime School, which was established with the assistance of the Australian Government. The training is available to people of ages 17 to 22, and their fees are covered by the National Budget. There are around 80 students usually attending the School every year. The curriculum is composed of three courses including Engine, Deck and Catering. The School is currently run with assistance from Australia and Germany and two visiting German trainers (a Captain and an Engineer). The number of students in 1993 and 1994 are as shown in Table 2-10.

Table 2-10 Students in Amatuku Maritime School

Date	(Unit: persons)			
	Seniors	Intermediates	Juniors	Total
8 January, 1994	23	25	26	84
11 October, 1993	35	23	25	83

4) The Tertiary Sector

<USP Extension Centre>

The USP Extension Centre on Tuvalu is one of ten Extension Centres provided by USP (University of the South Pacific) for students who are not able to study at the principle school in Fiji.

USP is run by the Cook Islands, Fiji, Kiribati, Nauru, Niue, Marshall Islands, Solomon Islands, Tokelau, Tonga, Vanuatu, West Samoa and Tuvalu in twelve countries. The Principle School is located on Fiji with an Agriculture Department located on West Samoa, and the provision of 10 Extension Centres and 2 Research Institutes in other countries.

The USP Extension Centre was established for students who could not go to USP nor to University overseas, primarily due to financial difficulties or from being excluded from scholarships, and most of these students who study at the Centre also have their own jobs. The Centre has only a Principal and a few lecturers, and the students mainly study themselves in the resource centre. The completion certificate is given to students who pass an examination at the end of term.

The existing facilities of the Centre were constructed with the assistance of the UK in 1988, and there are classes for 100 people in the first term during February through June and for another 20 people in the second term during July through November.

All of the operating capital of the Centre is supported by USP in Suva (Fiji), and therefore the Education Department of Tuvalu is unable to interfere with the programmes of the Centre (there are some different opinions existing between them).

2-1-4 Present Situation of Motufoua Secondary School

(1) Overview

The subject school of this project, Motufoua Secondary School was originally established by the London Missionary Society in 1905, but since independence in 1978 the School was operated by GOT and the Church of Tuvalu, and after 1993, it was governed by GOT exclusively. The School is the only public secondary school, providing Junior Secondary School and Senior Secondary School. The School used to admit pupils having completed six years of Primary schooling (Ages of 6 to 11) before the implementation of the EFL Programme, and provided six years of education. However since the transformation of the educational system, the School is now providing four years of Secondary Schooling.

(2) Number of Students and Teaching Staff

<Number of Students>

The School has no entrance examination to restrict the number of pupils who wish to be admitted, but the number of students in one class is limited to around 30. Table 2-11 shows the latest numbers for students in each class by sex.

Table 2-11 Students in Motufoua Secondary School

Grade	Class	Boys	Girls	Total
F3	A	15	14	29
	B	16	13	29
	C	16	13	29
	D	17	13	30
	E	17	13	30
TOTAL		81	66	147
F4	A	9	15	24
	B	7	18	25
	C	12	12	24
	D	13	10	23
TOTAL		41	55	96
F5L	A	6	17	23
	B	8	11	18
TOTAL		14	28	42
F5U	A	9	14	23
	B	9	14	23
TOTAL		18	28	46
GRAND TOTAL		154	177	331

Source: By field survey

<Number of Teaching Staff>

Motufoua Secondary School has 20 teaching staff including 8 regular teachers, 11 temporary teachers and a volunteer. At present, the Principal of the school is studying overseas, and therefore the head-teacher is the acting Principal of

the School. Temporary teachers are normally employed, a person who hold teachers' certificate, for one year term. The School, which is the highest available schooling facility on Tuvalu, is anticipating to have all its teaching staffs at the level of above bachelor's degree or above. Lodging facilities for these teachers are generally not sufficiently provided (there are only seven houses for 20 teachers including the Principal, at the school). Because of this negative factor recruitment of new teaching staff from other islands in the South Pacific and from overseas is difficulty, and therefore the School is hoping to improve these facilities.

(3) Curriculum

The curriculums of the School in 1994 are F3, F4, F5L and F5U. All subjects in F3 and F4 are compulsory and F5 provides both compulsory and optional subjects. Table 2-12 shows the available subjects in the School including the compulsory subjects of Physical Education, Religious Education and Vernacular, which do not belong to the assessment subjects at the completion of the year.

In F5, students take English, Mathematics and Science of three subjects and one optional subject at minimum (maximum of three subjects is allowed). In other words, students are required to complete four subjects at minimum and six subjects at maximum including the compulsory subjects, to achieve graduation.

Table 2-12 Curriculum of Motufoua Secondary School

Code	Subject	Completed Year				Type of Class (sexes)
		F3	F4	F5	F6	
1) E	English	C	C	C	C	Mixed
2) M	Mathematics	C	C	C	C	Mixed
3) SCI	Science	C	C	C		Mixed
*1) PHY	Physics				O	Mixed
*2) CHE	Chemistry				O	Mixed
*3) BIO	Biology				O	Mixed
4) SS	Social Science	C	C			Mixed
5) G	Geography			O	O	Mixed
6) H	History			O	O	Mixed
7) TD	Technical Drawing	C	C	O		Mixed
8) WW	Woodwork	C	C	O		Boys
9) HEC	Home Economics	C	C			Girls
10) CT	Cloth & Textile			O		Girls
11) EC	Economics	C	C	O	O	Mixed
12) PE	Physical Education	C	C	C	C	Mixed
13) RE	Religious Education		C	C		Mixed
14) VN	Vernacular	C				Mixed

1. C: Compulsory subject O: Optional subject
2. *1)-3) are new subjects from the year 1995.
3. In 1997, management and computer courses will be added to the curriculum.
4. Metal work will be added to the curriculum 8) Woodwork formulated as Industrial Arts.

Source: By field survey

The syllabus of Motufoua School is considered to be similar to Japanese Secondary Schools and the initial term of High School. After provided F6, the syllabus of the School will be considered almost similar to Japanese High School.

Originally the curriculums, syllabuses and completion examinations were planned to be original to Tuvalu. However in reality there were no originals in Tuvalu. For instance, the curriculums and syllabuses of Form 3 and 4 were brought from the Fiji Junior Certificate, using the imported examination papers from Fiji and even marked in Fiji. For Form 5, however the School has already prepared education materials based on New Zealand School Certificate's, and for Form 6 the School will have prepared their original course by the year 1995.

Furthermore, in order to implement new curriculums, the new curriculums, syllabuses and examination papers are required to be submitted to SPBEA (South Pacific Board of Education Assessment) for assessment, so as to keep conformity in the standards of curriculums and completion certificates within the South Pacific region.

2-2 Outline of the Request and Main Components

2-2-1 Background of the Requests

Because in Tuvalu, the socio-Economic growth is severely hindered by a shortage of sufficiently educated and trained people, the Government of Tuvalu rates Human resource development as the top priority issue, and decided to implement the EFL Programme.

Particularly, it is planned that all applicants for Junior Secondary schooling will be able to enter and study, where currently only a quarter of applicants are able to be admitted to Junior Secondary Schooling. Consequently, in order to satisfy the plan, Motufoua Secondary School, the only public secondary school in the country, is urgently required to expand its facilities.

Under these circumstances the Government of Tuvalu has formed a project for the "Upgrading and Expansion of Education Facilities at Motufoua Secondary School" with the highest priority rating within the National Development Plan IV - a very important and urgent project to be implemented in order to accomplish the EFL Programme. In concern with this, the Government of Tuvalu has requested the Japanese Government for grant aid assistance.

2-2-2 Contents of the Requests

The contents of the Requests from the Government of Tuvalu to the Japanese Government are described as below:

- | | | |
|-----|---|------------------------------------|
| 1. | Multi-purpose Hall - Mancaba | |
| 2. | 8 General Classrooms (30 students/room) | |
| 3. | Administration Office | |
| | - Entrance Hall | |
| | - Principal's Office | |
| | - Staff Common Room | |
| | - Conference Room | |
| | - Computer Room | |
| 4. | 8 Special Classrooms | |
| | - 2 Home Economics | (Food Preparation, Sewing) |
| | - 3 Science Labs | (Chemistry, Physics, Biology) |
| | - Music | |
| | - 2 Workshops | (Carpentry, Mechanical Technology) |
| 5. | Students' Dormitories | |
| | - For boys | 150 |
| | - For Girls | 150 |
| 6. | Dining Hall and Canteen | |
| 7. | Medical / First Aid Room / Sick Bay | |
| 8. | Water Cistern | |
| 9. | Seawall, road and Fencing | |
| 10. | Intercom | |
| 11. | Street Lighting | |
| 12. | Generator Shed | |
| 13. | Gymnasium | |
| 14. | 2 tennis Courts | |
| 15. | Four volleyball / Basketball Courts | |

Because the Japanese Government had a different view on the contents of the Requests mentioned above, these difference were discussed during the field survey, and the result of a series of discussions are described in Chapter 3.

2-3 Project and Programme of Other Donors

In regard to overseas development assistance in the education sector, the EFL Programme has been prepared with the assistance of international organizations (i.e., UNDP, UNESCO, ILO, the USP and SPBEA) and bilateral assistance from Australia, New Zealand and the United Kingdom. Now the Government of Tuvalu is expecting further assistance from overseas for the implementation of the Programme. Other donor countries which support this Programme are Japan, France and Taiwan. Taiwan is planning to assist with the construction of a new building for the Education Department in Motufoua Secondary School, and France is arranging assistance for the extension of facilities at the Primary schooling and a facility improvement project for TTEC.

Australia, the biggest donor country until now, is preparing for; (1) development of curriculums and training of teaching staff; and (2) reinforcement of administration and management ability for the Education Department, through AIDAB. However, there are no tangible ideas for these plans nor facilities to be constructed as yet. For Motufoua Secondary School, we have found that there is only one project, approved by Canadian Government, for horticultural assistance (A\$9,900.-) in 1994.

CHAPTER 3 OUTLINE OF THE PROJECT

3-1 Objectives of the Project

The immediate objectives of this project are the upgrading and expansion of educational facilities and equipment at Motufoua Secondary School, the only public secondary school on Tuvalu. However, the extent of the effect contributed by this project should be great; developing human resources, improving the living standard and enhancing the spirit of independence for all the people who live there. We envisage thus the ultimate goal of the project is to contribute to the evolvement of the country of Tuvalu.

3-2 Study and Examination on the Request

3-2-1 Propriety and Necessity of the Project

Based on the perception that the evolvement of the country is enhanced by the development of human resources, the Government of Tuvalu has been implementing the EFL (Education for Life) Programme. Consequently since 1991, the education system of Tuvalu has been gradually adjusted from the old system (Primary schooling for 6 years and Secondary schooling for 6 years) to the new system (Primary schooling for 8 years, Junior Secondary schooling for 2 years, and Senior Secondary schooling for 2 years) with 10 years of compulsory education until the completion of the Junior Secondary Schooling.

However, despite the fact that the number of pupils has been increasing recently, there is only one public Secondary school on Tuvalu: Motufoua Secondary School. At present, while approximately 200 pupils complete their Primary Schooling, only 50 - 60 pupils go to the church-run Secondary School, Fetuvalu Secondary School, and the rest all go to Motufoua Secondary School. At capacity, Motufoua Secondary School is able to admit 300 students in total, but there are currently 330 students studying in a confined environment. Therefore, in order to overcome the pressure from an ever increasing number of students in Motufoua Secondary School, an extension of its facilities is urgently required (up to 600 students).

The extension of the facilities at Motufoua Secondary School will give an opportunity for more people to study secondary education, which will lead to improvements in productivity in various sectors of industry, and in turn contributing to the evolvement of the whole country of Tuvalu.

In light of the above, it is concluded that the Project should be proceeded with entire propriety and urgent necessity.

3-2-2 Study on the Contents of the Project

(1) Examination on the Project components

First of all, the upgrading and expansion of the facilities and equipment of Motufoua Secondary School have been requested from GOT. As will be seen later in Paragraph 3-2-2 (Location and Condition of Project Site), there are many items to be repaired and replaced. Therefore, the restoration work will be initially executed, and then the school facilities extended to satisfy the increased number

of students. Furthermore, improvements to the school equipment will be examined based on the basic requirements for Secondary schooling as a component of the Project.

Although there was no requirement in the Requests, improvements to teachers' accommodation have been additionally requested in order to attract teachers to stay and to increase the number of qualified teaching staff.

(2) Conditions of determination of the proposed facility scale

1) Projected number of students

Before proceeding with this project, an assumption of the student population must be examined. Based on the Requests from GOT (the subjected population is 600 students) and the meetings held during the field survey, the following assumptions are established:

Based on the new educational system of the EFL Programme, the following three examinations will be executed for Primary and Secondary schooling.

1. At the completion of Year 8, the National Year 8 Monitoring Examination is held, but regardless of the result, all pupils who have completed their Primary schooling are able to enter Year 9 (F3), except those who are going to Fetuvalu Secondary School (approx. 50 - 60 students).
2. 70% of Y10 (F4) students are assumed to go on to Year 11 (F5) through the National Year 10 Examination.
3. 60% of Year 11 (F5) students are assumed to go on to Year 12 (F6) through the National Year 11 Examination.

Table 3-1 Projected Population of Students in Motufoua Secondary School

Year / School year	1994	1995	1996	2001	
Y9 (F3)	147	150	150		194*	← National Year 8 Examination (100%)
Y10 (F4)	96	147	150		194	← National Year 10 Examination (x 70%)
Y11 (F5)	42	67	103		136	← National Year 11 Examination (x 60%)
Y12 (F6)	46	25	40		82	
Total	331	389	443		606	

* The projected population of school ages in the year 2001 was estimated based on the EFL Programme (1993) (see Appendix of the EFL Report: Table-17 Projection of School Age Population). The figure was projected by the number of the Junior Secondary Students ages between 14 and 15 years old (507 students) was divided by two (year grades), then minus the number of students who go on to Fetuvalu Secondary School instead (50 - 60 students)
 $507/2 - 50 (-60) = 203.5 (-193.5)$

As shown in the above table, the student population of Motufoua Secondary School is projected to be approximately 600 students by 2001.

According to Table 2-8 in Paragraph 2-1-3 (Present Conditions in Each Educational Sector), there are a total of 1,658 pupils who go to the public schools and approximately 207 pupils who will graduate every year from the public primary schools for the following eight years. Even though they are of small scale, three private schools exist on Tuvalu, and approximately 20 children of emigrated laborers to Naura come back to Tuvalu to study their Secondary education every year. In consideration of the above, the assumptions which projected 200 new students to enter Year 9 (F3) by 2001 is considered to be an underestimated figure. However at present, this assumption is applicable.

Furthermore, according to information which the field survey team has received, Fetuvalu Secondary School may possibly be closed due to financial difficulties in the Church. Thus, the future student population will reach 600 more rapidly, and thereby urgent measures should be taken.

Based on the above projections and conditions, the projected number of students as 600, which was provided by the Tuvalu side as the requested figure, is reasonable as an assumption for the project. Therefore, the upgrading and expansion of the school facilities and equipment will be designed and planned based on this assumption (see Paragraph 4-2 Study and Examination on Design Criteria).

2) Estimation of Teachers' Population

In terms of teachers' population, there are presently 21 teachers teaching in Motufoua Secondary School, but this will be increased to 27 by 1997 according to the EFL Programme. If 600 students study under these teachers, this will mean that a teacher is responsible for 23 students; lower than the national standard of 25 students per teacher.

(3) Study of the requested facilities and equipment

Related Ministries of the Japanese Government have reviewed and examined the requested facilities and equipment from GOT (see Paragraph 2-2-2 Contents of the Requests), and the urgency and necessity of this project has been recognized. The requested items are revised as the following facilities and equipment, based on the specific conditions of grant aid by the Japanese Government:

Facilities and Equipment to be expanded and upgraded at Motufoua Secondary School.

1. Addition of 8 General Classrooms (with a capacity of 30 students)
2. Extension of Dormitories (for 150 boys and 150 girls)
3. Addition of 8 Special Classrooms (for Food Preparation, Sewing, Chemistry, Physics, Biology, Music, Woodwork and Mechanical Course)
4. New Canteen and Multi-purpose Hall
5. New Administration Office
6. New First Aid Room, Gymnasium, Tennis Courts, External Lighting and other related facilities

During the field survey, the above items (Japanese plan) and the Requests from GOT (see Paragraph 2-2-2) have been compared in order to determine the final plan, and the following four items are also included as necessary conditions for the Tuvalu side to review:

- a) Increase in the number of the students
- Examination of facility size for projected student population
- b) Keeping a sufficient number of teaching staff (especially for special subjects)
- Evaluation of reinforcement of teaching staff
- c) Water and Fuel Supply
- Consideration of facility planning
- d) Operation and Maintenance Systems (secure an operation and maintenance budget and technicians)
- Examination of the operation and maintenance system

The confirmed contents of the facilities and equipment decided by the field survey of the Basic Design Study and through a series of discussions are summarized as below, with the examination results of these four conditions explained in various paragraphs (mainly in Chapter 4).

The contents of the Requests from the Tuvalu side have been confirmed in the following priority order (refer to the Minutes of Discussion in Appendix-4).

1. Classrooms (general/special)
2. Student dormitories
3. Dining Hall and Kitchen
4. Administration Office
5. Medical/First-aid Room/ Sick Bay
6. Gymnasium
7. Staff Quarters
8. Multi-Purpose Hall (Maneaba)
9. Tennis, Volleyball and Basketball Courts

- Note:
1. Both sides confirmed that each item mentioned above includes the necessary utilities such as electricity and water cisterns as well as equipment. The details of such utilities and equipment will be discussed between the consultants and the Tuvalu side.
 2. The Tuvalu side understood that the construction and/or installation of roads, street lighting and fencing, within the school campus, would be borne by the Tuvalu side in principle. However, the Tuvalu side further requested the Team to apply such a principle flexibly, taking the budget conditions of the Government of Tuvalu into consideration.

<Study and Examination on the contents of facilities>

A: The confirmed items of facilities to be upgraded and extended

1) Classrooms

The expansion and upgrading of general and special classrooms was given the top priority within the project, and combined into the item as "Classrooms". In terms of their size and design (especially for special classrooms), this will be determined very carefully based on the present conditions of the existing classrooms, the proposed curriculums and the projected student population.

2) Student Dormitories

Because Motufoua Secondary School is a boarding school in principle, the expansion of the dormitories is inevitable in order to cope with the future increase in the student population from 300 to 600 students. The expansion of the dormitories, therefore, has been placed as second in the priority order.

3) Dining Hall and Kitchen

At present, the dining hall caters for 300 students at one time, but this building is very old and its condition has deteriorated. In order to cope with the doubling of the student population in the future, the construction of a new dining hall with a kitchen able to cater for 600 students at one time, is requested.

4) Administration Office

At present, the resource centre serves as the principal's room as well as the teachers' room. These central facilities for the administration office have been requested to be located in a new individual building.

5) Medical/First-aid Room/ Sick Bay

Although the item is listed as an individual item, these may be combined within the building for the administration office.

6) Gymnasium

In order to still have sporting activities (i.e., volleyball, basketball) when it is raining, the construction of a gymnasium has been requested.

7) Staff Quarters

Despite this item not having been included in the original request, it was strongly requested in the discussions with the Tuvalu side. Considering the physical location of the School, the improvement and addition to Staff Quarters has been requested so as to secure a sufficient number of teachers. The grade and type of building should be adjusted to Tuvalu's standards.

8) Multi-Purpose Hall (Maneaba)

Although there was a suggestion to keep the existing Maneaba as it was designed to reflect Tuvalu's tradition, the construction of a new facility or the restoration of the old building with durable materials was requested, because of the importance of the facility in accommodating various activities and occasions in the future.

9) Tennis, Volleyball and Basketball Courts

These sports are played as a part of the Physical Education programme as well as being popular recreations on Vaitupu Island. The construction of these facilities is anticipated to be within the budget.

B: Facilities which were determined to be outside the subject scope after discussions between the Study team and Tuvalu side

10) Church

The roof of the school church was damaged in a cyclone and has not been repaired and so consequently the Maneaba room is being used instead. However, the extent of Japan's Grant Aid does not include religious facilities such as a churches and therefore the church was decided to be outside the subject scope of this project.

11) Seawall

The result of the investigation regarding past cyclone damage to Motufoua Secondary School showed there had been relatively little damage caused by high tides compared with the damage caused by the strong winds and rain. There was only one occasion when the School was flooded below the floor, but other damage was not directly related to the school facilities. Therefore,

the construction of a seawall was decided not necessary to be included within this project.

As a result of an examination after the Basic Design Survey, the Multi-Purpose Hall (8) and the Tennis, Volleyball and Basketball Courts (9) were changed to be outside of the subject scope, and this was confirmed in the meetings of the Basic Design Survey of the Draft Report Explanation.

<The restoration plan for the existing facility>

As shown in Table 3-3 (Present Conditions of the Existing Facilities), some facilities require the restoration of their roofs, ceilings, lighting, etc. These facilities will be restored in accordance with their needs without interfering with classes. Re-utilizing the existing facilities as much as possible will minimize the new facilities to be constructed.

<Study and examination on the contents of equipment>

As a specific request was not given beforehand regarding school and education equipment, it was requested at the time of the field survey to those who are responsible for each field in the school, to make a list of necessary equipment. It was also requested to make the list using a standard form prepared beforehand, filling in the following items as well as the name and quantity of equipment so that it could be used as basic data for the evaluation of its appropriateness:

- Degree of necessity
- Purpose of user
- Frequency of use
- Past use

The contents of the equipment in the list, appropriateness of the quantity, grades of each equipment, etc. were discussed with those who are responsible for each field in the school and the Education Department so as to form the final request equipment list (See attached Appendix-8).

Therefore, this request list mostly contains the appropriate basic equipment required for a secondary school education. After the field survey, compliance with school activities and curriculum will be analyzed in the country and the quantity of the equipment will also be reviewed, taking the existing equipment into consideration.

The fields and contents of the request equipment numbered 351 items in 16 fields as follows:

- 1) Mathematics Equipment: 11 items including models, set squares, etc.
- 2) English Equipment: 6 items including video recorders, video teaching materials, etc.
- 3) Social Science Equipment: 16 items including world globes, reference books, etc.
- 4) Science Equipment: 96 items including laboratory tables, demonstration equipment, etc.
- 5) Drawing Equipment: 8 items including drawing boards, drawing tools, etc.

- 6) Industrial Arts Equipment: 55 items including circular saw, grinders, etc.
- 7) Home Economics Equipment: 41 items including a freezer, pedal sewing machines, etc.
- 8) Physical Education Equipment: 16 items including volleyball goods set, track sports goods set, etc.
- 9) Gardening Equipment: 19 items including wheel-barrows, shovels, etc.
- 10) Music Equipment: 13 items including electric guitar, a keyboard, etc.
- 11) Furniture: 4 items including desks & chairs for students, etc.
- 12) Library Equipment: 4 items including bookshelves, card cabinet, etc.
- 13) Administration & General Equipment: 31 items including a copy machine, computer, etc.
- 14) First Aid Equipment: 16 items including an autoclave, a first aid set. etc.
- 15) Kitchen Equipment: 12 items including electric ovens, rice cooker, etc.
- 16) Dining Hall Equipment: 3 items including dining tables & chairs, etc.

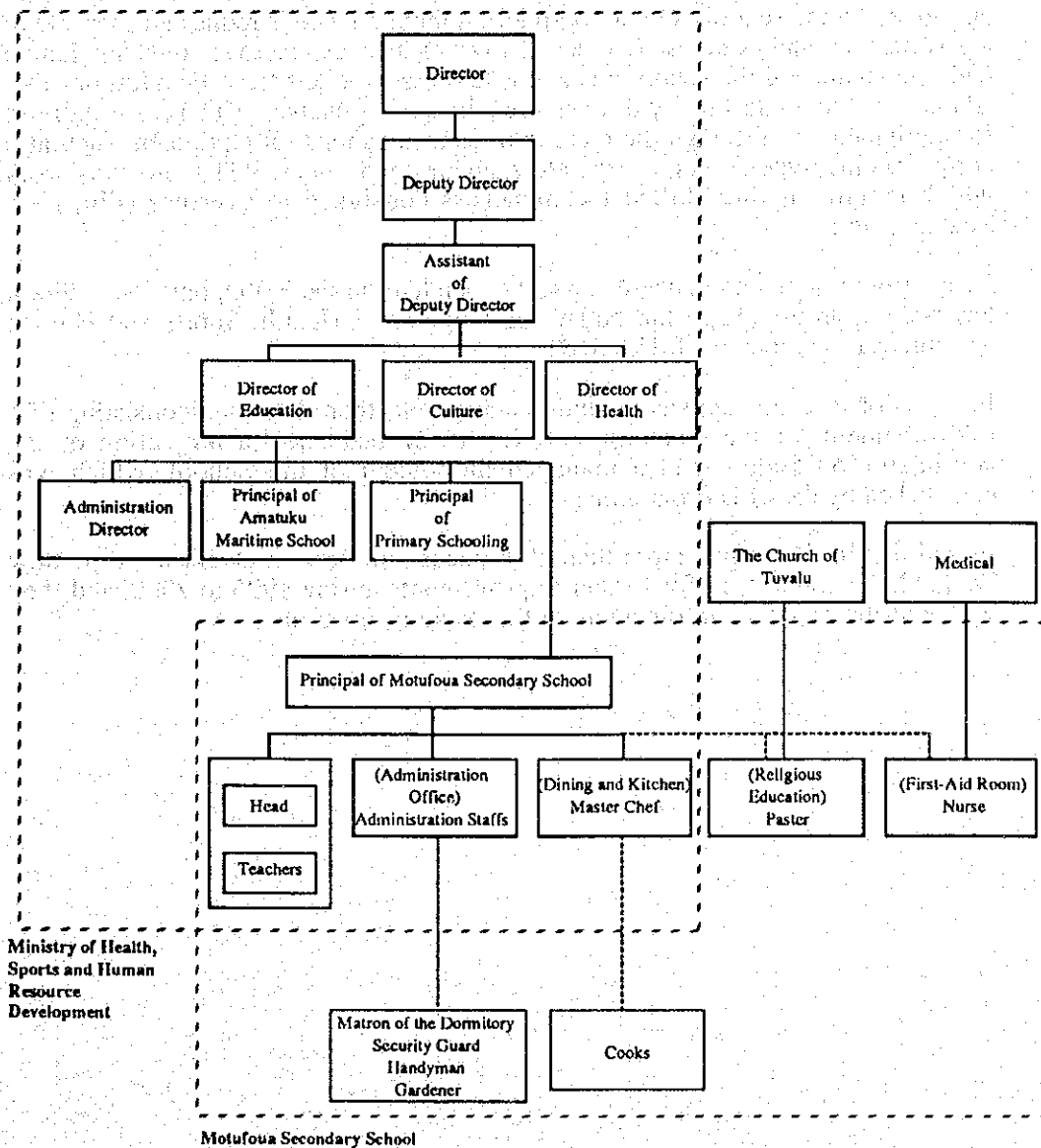
3-3 Project Description

3-3-1 Execution Agency and Operational Structure

(1) Implementation body of the project

The Ministry of Foreign Affairs and Economic Planning is the main organization responsible for this project. The Education Department in the Ministry of Health, Sports and Human Resource Development will be in charge of implementation of the Project. Motufoua Secondary School is a part of this Organization as shown in Figure 3-1, and the Principal, teachers and regular staff are public workers belonging to this Department.

Figure 3-1 Organization of the Ministry of Health, Sports and Human Resource Development and Motufoua Secondary School



(2) Maintenance and management system

Motufoua Secondary School was originally established by the British Assistance and administrated by the church, but since independence the school has to rely on their own support to extend some facilities. Despite the fact that the existing facilities require some repair works, they are still possible to use. With regard to the existing equipment, the School is using equipment in the classes and are supplied continuously.

The educational equipment currently used in the special classrooms and some chemicals for laboratory use are maintained in a reasonably, and therefore the grant equipment will be fully used and maintained.

At present, simple repairs to both facilities and equipment were done by a worker employed by the school. Other complicated maintenance is requested to PWD or a private company as the need arises. However, because there is no technician on Vaitupu Island and the school must depend on technicians from Funafuti or other islands, and so it takes many days and repairs are expensive. This is especially so for equipment, as although there are two repairing shops for equipment such as a copy machine, typewriters, refrigerators, an air-conditioner, VTRs, etc., any work which requires highly skilled technicians is consigned to overseas (Fiji, New Zealand, etc.)

Originally these maintenance fees were dependent on the PWD, but since 1992 it has been appropriated in the budget of Ministry of Health, Sports and Human Resources Development (MHSHRD).

In terms of teachers' expansion and management, there is a plan consisting of a reinforcement for the teaching staff (up to 27 teachers), a projection of the administration budget and a management system of the School, which was established by the EFL Programme.

In addition to the above, more than 20 trainees will be sent Overseas (Fiji, New Zealand, Australia, etc.) for further improvements during 1995 to 2000, and they will contribute to the reinforcement of the teaching situation.

(3) Maintenance and Management Budget

The budget for maintenance and management of Motufoua Secondary School is appropriated in the budgets of MHSRD and Education Department. The actual expenditures in 1993 and the budgets for 1994 and 1995 are as shown in Table 3-2; they are estimated in consideration of the reinforcement of the teaching staff and expansion of the facilities and equipment.

Table 3-2 Actual Result and Budget of Maintenance and Management Expenses

(Unit: US\$'000)

Expenditures	1993 (actual)	1994 (estimated)	1995 (estimated)
Personnel Expenses (Regular Teachers)	149.4	149.4	150.0
Personnel Expenses (Temporary Teachers)	39.5	42.8	44.9
Transports and Communications	23.7	10.5	20.0
Maintenance and management expenses (facilities)	22.4	36.0	36.0
Maintenance and management expenses (equipment)	-	0.25	0.27
Maintenance and management expenses (cars, etc.)	3.3	0.32	0.4
Other expenses (fuel and light, food, etc.)	212.2	276.3	519.1
TOTAL	450.5	515.6	770.7

As shown in Table 3-2, the budget for the maintenance and management expenses for the financial year 1995 has been increased. According to the breakdown of expenses in this table, the expenses for food, fuel and light and educational equipment have particularly been increased in order to cope with the increase in the student population. The maintenance and management expenses for the school facilities will be also increased approximately 50% from the actual expenditure in 1993 to the year 1995.

The payments for both regular and temporary teachers is appropriated in the personnel expenses in this table. Non-teachers expenses included in the personnel expenses for regular teachers total about US\$10,000 for one Chief Cook, one Executive Officer and one Clerk/typist. However, even though an increase of teachers is planned in the EFL programme, an increase in personnel expenses is not expected. Therefore further discussions should be made with the Tuvalu side.

The budget for the training of teachers or any manpower training in Tuvalu does not included under the national budget. All manpower training to date has come under bilateral or third country award arrangement/agreements with overseas friendly Governments,

Recruiting other staff members to work at the school is the sole responsibility of the Education Department. If a need is perceived then a submission is made to the cabinet with all relevant documentary justification and job description with the appropriate duties. Once it is approved by the cabinet, financial provisions are made in the national budget for the periods expected.

The budget for the MSHRD, the organization in charge of human resource development is about US\$7,355,330 in 1994, and it forms 26.8% of the national budget of Tuvalu, about US\$27,416,935.

3-3-2 Location and Condition of Project Site

Motufoua Secondary School is situated on the eastern edge of Vaitupu Island, approximately 100 km north-west of Funafuti Atoll. The Island, is elongated along the north-south direction, stretching some 5.2 km and 3.3 km at its widest. It has the second biggest population after Funafuti Atoll and is anticipated to be the proposed site for the new Governmental Offices for decentralization including the Education Department.

It takes about 8 hours from Funafuti to the Island by boat, and there are only two boats available in Tuvalu. Because one of these boats has deteriorated and was specifically built for fishing, there is only one boat left for cruising around the nine islands, and this takes about two weeks for a round trip.

There is only one public mini-bus operating on Vaitupu Island; the others are a mini-bus and a tractor at Motufoua Secondary School and a privately owned truck and tractor. The people of the Island are utilizing these vehicles as their needs arise.

(1) Present Conditions of Facilities at Motufoua Secondary School

Based on results of the field survey, the present conditions of the School facilities are summarized as below, and the requests from GOT will be reviewed accordingly:

1) Layout of the facilities

The layout of the existing facilities of Motufoua Secondary School are as shown in Figure 3-2.

The school site is situated along the east shoreline, approximately 1.5 km east of village centre. The site is flat and elongated along the north-south direction, stretching approximately 450 m and is 250 m at its widest. The elevation of the site is about 3 - 4 m above the sea level. The main facilities of the School are all single storey buildings and arranged in north-south aspects around the resource centre; the canteen is situated to the west, boys' dormitory to the north west, girls' dormitory along the south, and a classroom building, church and Maneaba classroom to the east.

These facilities mentioned above occupy a quarter of the site in the north-east. Teachers' accommodation is located along the shoreline beyond the girls' dormitory except for the principal's house in the north-east corner of the site. Teachers' accommodation, Maneaba, the resource centre, the dining hall and social science classroom are arranged parallel to the shoreline, and the science building, home economics building, general classroom building and the students' dormitories are face at right angles to the shoreline. The axes of these buildings are adjusted on the north-south and the east-west directions 30 degrees clockwise. Due to this arrangement, room 8 (R8) and room 9 (R9) in the woodwork building, room 11 (R11), room 12 (R12) and room 15 (R15) in the social science building are exposed to the morning sun during early classes, and the buildings placed at right angles to the shoreline have an air circulation problem, due to the aspect of the buildings being parallel to the prevailing east trades.

The infrastructure which expands to the outer area is only an unpaved 4 m wide road extending to the village centre, two peripheral roads and radio communication equipment (operated by solar energy) in the resource centre.

Electrical power is supplied by two 40 kVA diesel power generator sets placed on the site (managed and maintained by TEC), working in turns. Water supply is dependent upon the abundant precipitation collected from roofs; there is a shallow well in front of the resource centre however, it is not used except in emergency or for a small amount of domestic use (see Paragraph 3-3-2, (2)).

2) Present condition of the facility

Motufoua Secondary School was established by the London Missionary Society as a mission school in 1905, and since the independence of Tuvalu in 1978 the Government of Tuvalu and the Church of Tuvalu ran the School together, until the year 1993, when the Government of Tuvalu took sole charge of the school. The oldest building is the home economics building constructed in 1962 and the newest building is the resource center constructed by British aid in 1991 (see Table 3-3).

As described in Table 2-13, not only have the old buildings deteriorated, but new buildings are also affected by the sea breezes especially materials and structures exposed to the winds. For instance, the roof of the church has been blown away and left in disrepair, and the gable wall, roof and eaves on the east side (sea side) of the general classroom building and the roof on the gable end on the east side (sea side) of the science building have been damaged badly. Because of salt spray, the lighting fixtures of old buildings have become rusted, especially for the general classroom building, and it is required to change all of them.

Furthermore, because of the hot and humid climate, the wooden structures under the ceiling or eaves have been damaged by dry rot and termites, and semi hard boards for ceiling have holes and have come off of the corners of the general classroom building.

The roof material generally used is corrugated galvanized iron, which has not been severely affected by salt damage because of its thickness. For the science building, the spandrel panels (200 mm wide metal) are an exception.

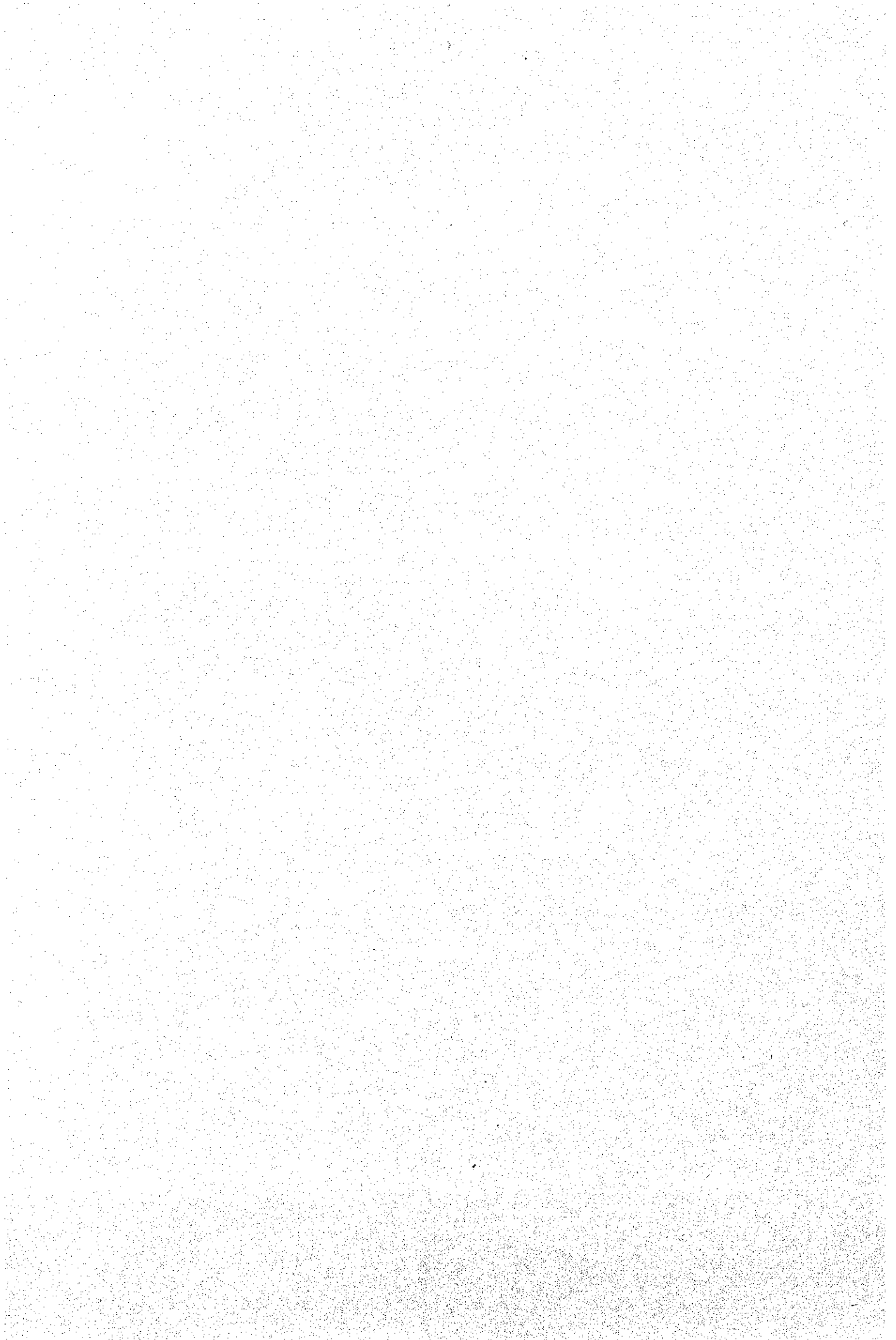
The water supply system by rain water is composed of a collection system, a reservoir, etc. and satisfies the minimum needs. However because of the insufficient maintenance of the system (clogged pipes, broken pumps), it is not fully usable (the distribution pipe is currently being re-laid by PWD). The flushing of the toilet in the resource center (the newest building) is done by buckets of water from the well in front of the building (see Paragraph 3-3-2, (2)).

Table3-3 Condition of Existing Buildings

No.	Building , Facility	Built in (Year)	Total Floor Area(m2)	Structure	Present Conditions and Problems
1	Science Bldg. R1 : Chemistry R2 : Physics	1980	261	Wooden Construction. / Single-Story Roof : Alumium Spandrel (200W) Plancier : Appearing Trussed External : Mortar Cement Spray Wall : Finish on Metal Lathing Doors & : Jalousie Window, Windows : Wooden Louver, Wooden Flash Door Floor of : Appearing Under Ground Appentice : Beam Flooring : Slab-on-earth with P.V.C. Tile (FL:GL+50mm) Internal : Plywood with Paint Wall : Ceiling : Truss Roof with Heat Insulating Materials(Aluminum Foil)	* Donor : UK * With Appentices. Sufficient eaves to avoid direct sunlight. * Skylight in the preparation room * Lots of holes on the roofs and eaves on the sea side. * Roof should be renovated : 35m2 * Eaves should be repaired.
2	General Classroom Bldg. (Industrial Arts) R4 : Wood work R5 : Technical Drawing R6~R9 : Classroom	1968 (R9 Renov. Expansion : 1989)	489	C.B. / Wooden Construction (R4 : Wooden). Single-Story With External Corridor Roof : Corrugated Galvanized Metal External : C.B. with Paint Wall : Column : R.C.150square of Corridor Flooring : Slab-on-earth of Corridor (FL:GL+200mm) Plancier : Semi Hard Board T= 9 mm Doors & : Jalousie, Wooden Flash Windows : Door Flooring : Slab-on-earth (FL:GL+200mm) Internal : C.B. /Plywood with Paint Wall : Ceiling : Semi Hard Board T= 9 mm	* Second oldest building, out of service because of damage. * Worse ventilation, exposed to morning sun. * R9 used to be used as an administration office. * Several times renovation and expansion has been made for R9 . * One third of ceiling and 80-90% of jalousie are damaged. * Three of the eleven columns have lost bearing capacity due to the deterioration of their legs, and reinforcing bars were exposed. One of them especially has been deteriorated to 2/3 of its original . * Fluorescent lighting fixtures are rusted by salt. * Some of ceiling boards are lost because of loss of roof nails. * Ceiling boards are bent because of the humid climate.
	Home Economics Bldg. R10,R11 : Home Economics First Aid & Rest Room Toilet / Shower / Laundry	1962 (Renovation : 1992)	214	C.B. / Wooden Bldg., Single-Story Roof : Corrugated Galvanized Metal External : C.B. with Paint Wall : Doors & : Jalousie Window, Windows : Wooden Flash Door Flooring : Slab-on-earth (FL:GL+200mm) Internal : C.B. with Paint Wall : Ceiling : Wooden Prinsipal Rafter, no Ceiling	* Before it had been two-story building (dormitory on the second floor), but due to destruction by cyclone, it was reconstructed as single-story building in 1992. * Although it is the oldest building, there are no problems in it's use.
4	Social Science Bldg. R12, R13, R15 : Classroom	1990	155	Wooden Construction / Single-Story Roof : Corrugated Galvanized Metal External : Plywood with Paint Wall : Doors & : R12,R13:only window Windows : frame (no glass).R15 : Jalousie Window Wooden Flash Door Flooring : Slab-on-earth (FL:GL+200mm) Internal : Structureal framesork and Wall : plywood exposed in three dimensional wall. No Painting Ceiling : Trussed Roof, No Ceiling	* It looks like a temporary building, because it took only two weeks to construct the building.

No.	Building, Facility	Built in (Year)	Total Floor Area(m2)	Structure	Present Conditions and Problems
5	Resource Center South Wing : Library Center : Administration North Wing : Teachers' Room	1991	282	R.C./C.B./Wooden Construction / Single-Story Roof : Aluminum External : C.B. with Paint Wall Doors & : Wooden Jalousie, Windows Wooden Flash Door Flooring : Slab-on-earth (FL:GL+200mm) Internal : R.C. / C.B. / Plywood Wall with Paint Ceiling : Plywood with Paint	• Donor : UK • Newest building • High ceiling with jalousie on the high side light part. • Restoration of water supply for toilets is required, because it is out of service presently.
6	Maneaba Function, Assembly, Moral Education, General Subject	1976	309	Wooden Local Construction Method, Single-Story Roof : Palm Leaf Roofing External : Wainscot(C.B.) Wall Flooring : Slab-on-earth (FL:GL+200mm)	• Constructed by local method. • Pandanus Trees were used for structural method. • Expansion or reconstruction are requested because the existing building is without durable materials.
7	Dining / Kitchen Bldg.	1975	276 (Dining 170, Kitchen 106)	C.B. / Wooden Construction Single-Story Roof : Corrugated Galvanized Metal External : C.B. / Plywood with Paint Wall Door & : Out swinging wooden Windows flash window, Single swinging flash door. Flooring : Slab-on-earth (FL:GL+200mm) Internal : C.B. / Plywood with Paint Wall Ceiling : Trussed Roof, No Ceiling	• Dining room and Kitchen are separated. • The building is very old and deteriorated. • Dining room has space for 330 students at one-time. • It is also used as a general classroom.
8	Canteen	1986	30	Wooden Construction / Single-Story Roof : Corrugated Galvanized Metal External : Plywood with Paint Walling Doors & : Jalousie window, Windows Flash Door	• Daily goods and snacks etc. are sold. • Solar energy is used for refrigerator.
9	Students Dormitories 4 Bldgs For Boys (Green, Blue, Red, Orange) 4 Bldgs for Ladies (Green, Blue, Red, Orange)	Boys : 1982 Girls : 1980 (Green : 1993)	1140+244 Rd,Or : 138 each (Annex : 72) Gr. & Bl. : 276 (Annex : 35,35) Bl,Rd,Or : 136each (Annex : 34each) Gr : 180 (A:Share with R10)	C.B. / Wooden Bldg, Single-Story Roof : Corrugated Galvanized Metal External : C.B. / Plywood with Paint Wall Door & : Out swinging flash window, Windows Flash Door Flooring : Slab-on-earth (FL:GL+200mm) (G-Green:Wooden Construction) Foundation : Isolated Footing Flooring : Plywood Flooring	• 152beds for boys (Doublebunk 20+20+18+18) • 176 beds for girls. • Walls of each buildings are painted in Green, Blue, Red and Orange. • 2.8~4.0m2/bed, doublebunk. • Each Building consist of toilets and laundries. • Difficult to take refuge from a disaster, such as a fire. • Girls dormitory has a marion room.
10	Staff-quarters 1)Principal's Quarter 2)Chaplain Quarter 3)C-class Quarter 4)D-class Quarter	1978 1970 1979 1993	123 120 92 80 (Annex : 29)	Wooden Construction / Single-Story C.B. / Wooden Cons./Single-Story Wooden Construction / Single-Story Wooden Construction / Single-Story	• Existing quarters are old and deteriorated. Especially, due to the use of local materials without durability, most of them are deteriorated. • In addition to the quantity, their quality is lacking too. • The quarters dominate the beach front without a visual barrier. • C-class quarter / With laundry. • D-class quarter / With toilet, bathroom and laundry.
11	PWD Workshop	1993	166	Wooden Construction / Single-Story	• Belonging to PWD
12	Power House	1988	67	Steel structure and wooden Construction	

(Source : Field Survey)



(2) Present conditions of Infrastructure and Utilities

1) Existing Well Conditions

There are about ten wells sunken on Vaitupu Island, and we have surveyed eight wells of these. There is only one well in Motufoua Secondary School, two wells in the village and other five wells are scattered around the north side of the island.

These eight wells are all dug wells of 1 - 3 meters in diameter and 1.5 - 3 meters in depth, and their walls are retained by local coral stones. These wells used to supply precious potable water for the locals, however, since corrugated galvanized sheet iron has been introduced for the roofing material of the local houses, rainwater can be collected very easily and used by the local people instead.

At present, wellwater only caters for domestic animals on the Island, and the maintenance of the wells has not been observed.

For a water source for Motufoua Secondary School, the dug well requires a large amount of labour to draw the water, and the effective capacity of the well is not expected to be sufficient. Therefore, as the island situated in a tropical climate zone with an abundant precipitation (average annual rainfall: >3,000 mm) throughout the year, the utilization of the rainwater should be appropriate and practical instead.

2) Power supply and lighting systems (see Figure 3-3)

There is only one source of electrical power supply, for the public of Vaitupu Island, located at Motufoua Secondary School. This electrical power is generated by two sets of 40 KVA generators granted from Australian Government in 1991 and service Motufoua Secondary School and it's neighbourhood.

Although these power generators used to be operated and maintained by the School until January 1993, the operation management was transferred to the Tuvalu Electricity Corp. (TEC) in February 1993. TEC has stationed two operators on Vaitupu Island and the generators have been well maintained. Therefore, the operation and maintenance of new generator for the extension project of the school should be judged as a satisfiable.

At present, power is supplied from 5:00 to 14:00 and from 18:00 to 24:00 each day. Two generators operate in turns switched manually and never operate concurrently in parallel operation. However, there is a plan for changing the existing control panel to make it possible for parallel operations in the near future.

The charge for electricity is normally thirty-four (34) cents/kwh. The electricity will also be supplied to the School on request during the off-hours of the time mentioned above, but in this case, an additional fee of ten (10) dollars per hour will be charged.

Motufoua Secondary School is paying around seven hundred to eight hundred dollars per month to TEC (A\$700 - A\$800/month) for electricity.

Although there is an issue for the fuel supply for generators, there is a regular service (by boat) once a week and fuel have been supplied continuously. However, because the regular boat does not operate for two to three weeks

during its maintenance, it should be considered that the fuel for power generators should be reserved on the Island. There was a request from TEC for the installation of a reserve tank for the fuel with a capacity of 5,000 litres, at the time of the extension of the power generator system. For the reason above, this request is considered to be reasonable.

TEC is planning to remove the generators installed at Motufoua Secondary School, and construct a new power plant half way between the village and the school, with electricity supplied from this plant instead. However, this plan is only at the preparation stage in a master plan and there is no definite implementation schedule at this time, and neither is there any donor country to aid the project.

In terms of solar energy, engineers in Tuvalu are not positive toward its use and consider it to be costly and not effective as a power source. There are two solar energy systems at Motufoua Secondary School, one at the resource centre and another to the side of the teachers' room. These solar energy systems are used as the power source for small items such as a mobile telephone and refrigerator, and thus the system itself has not been fully extended yet. If there is no electrical supply in an area, a solar energy system is an option for a power supply, however in the case of the school facility, installing a conventional power generator system is more economical, practical and effective.

The existing class rooms are all provided with lighting fixtures. Considering the darkness during squalls and for night classes, installation of proper lighting fixtures is necessary. However, the luminous intensity in Tuvalu is very low comparing to it the Japanese standard, and therefore, instead of applying Japanese design standards, the existing luminous intensity will be considered for calculating the lighting system. Furthermore, because of the adverse damage in the existing lighting fixtures by salt spray, the selection of new fixtures should consider the use of salt proof materials.

3) Water supply systems (see Figure 3-4)

There are two underground storage tanks each with a capacity of 250 m³ and other small water tanks for reserving rainwater. This water is used for drinking and domestic purposes.

The reserve tank near the boys' dormitory has not been used, because the distribution pipe has been clogged and the tank has been emptied for repairing work. The reserve tank near the girls' dormitory has only water up to 30% of its capacity and part of the inlet pipe has been blocked, largely due to fallen leaves and litter from the roof through into the inlet pipe.

Lift pumps have been used for transferring the water from the underground water tanks to the elevated water tank, but the lift pump is out of order and has not been used.

Drinking water is boiled, but there are no sterilization measures used for protecting against infectious diseases like cholera.

There is a well in front of the resource centre, but the water contains some salts and is not suitable for drinking purposes, although it has been used for other domestic purposes by the students sometimes.

4) Sewage and drainage systems (see Figure 3-4)

The sewerage from toilets is treated by a septic tank with soak-pit system. The waste water from shower rooms, kitchens and wash basins is directly connected to the soak-pit. As for the maintenance of the existing sewerage system, sludge and sedimentation are scooped out from the bottom of the septic tank, and these deposits are buried in the site.

This system is undesirable from the view point of sanitary conditions, but most atoll countries are dependent on this system. Although installing high-tech waste water treatment system is a possibility, there are some problems for obtaining chemicals and it's long term operation and maintenance. Therefore, as the method does not depend on electrical power, nor requires complicated maintenance works, a simple septic tank with a soak-pit-system, which is presently applied, is the most appropriate system of waste water treatment on this island.

In terms of conservation of the environment, we have questioned PWD, especially concerning environmental pollution in enclosed water features such as lagoons, atolls, etc., affected by the above system. However there exists no damage at this time. We have also investigated the turbidity of the sea water, smell, and existence of water-floom or red tide, but there is no indication of any water pollution. We have confirmed that the system does not affect the existing coral reef nor sea-biota.

In view of the above, we analyze that the natural purification system of the soil is acting properly, resulting from a relatively small amount of discharge from the small population on the Island. Therefore, there is no anticipated pollution affecting the enclosed water features, if the size of the proposed septic tank and soak-pit are properly designed to treat the increased amount of waste water by the extension of the School.

5) Sanitary Fixture

The existing water closets are western style low-tank type. As the urinals in the boys' dormitory are combined in a one piece concrete structure for common use, it is not hygienic, and the new urinal in the proposed dormitory should be a stool or a wall hung type. A flush valve can not be adopted due to the low water pressure of the system, and therefore a high-tank system should be used.

There is a dish washing place beside the existing dining room where the students are able to wash their used dishes and some relevant fixtures for this place should be necessary.

6) Gas

A gas system is used for the laboratory in the science room and for cooking in the kitchen. The volumes of gas cylinders are 10 kg for the science room and 50 kg for the kitchen, but the gas cylinder for the kitchen has not been supplied for nearly two months and because of this, the gas stoves have not been used. For cooking, a temporary open air kitchen (with a roof) is currently being utilized and coconut husks are used for fuel to cook rice.

The heat source for the proposed kitchen will rely on electrical power, largely due to the unreliable situation in the existing gas supply. However, because the existing gas stoves are still able to be used, they will be relocated to the new kitchen for supplementary use.

Because the existing gas arrangement in the science room has a problem in the piping, where by part of the distribution pipe is covered by sticky tape to protect from leakage, the pipe should be studied to be changed for safety reasons.

7) Fire Extinguishers

Although there is no fire law in Tuvalu, there are some placements of fire extinguishers in the resource centre, the science room and the kitchen.

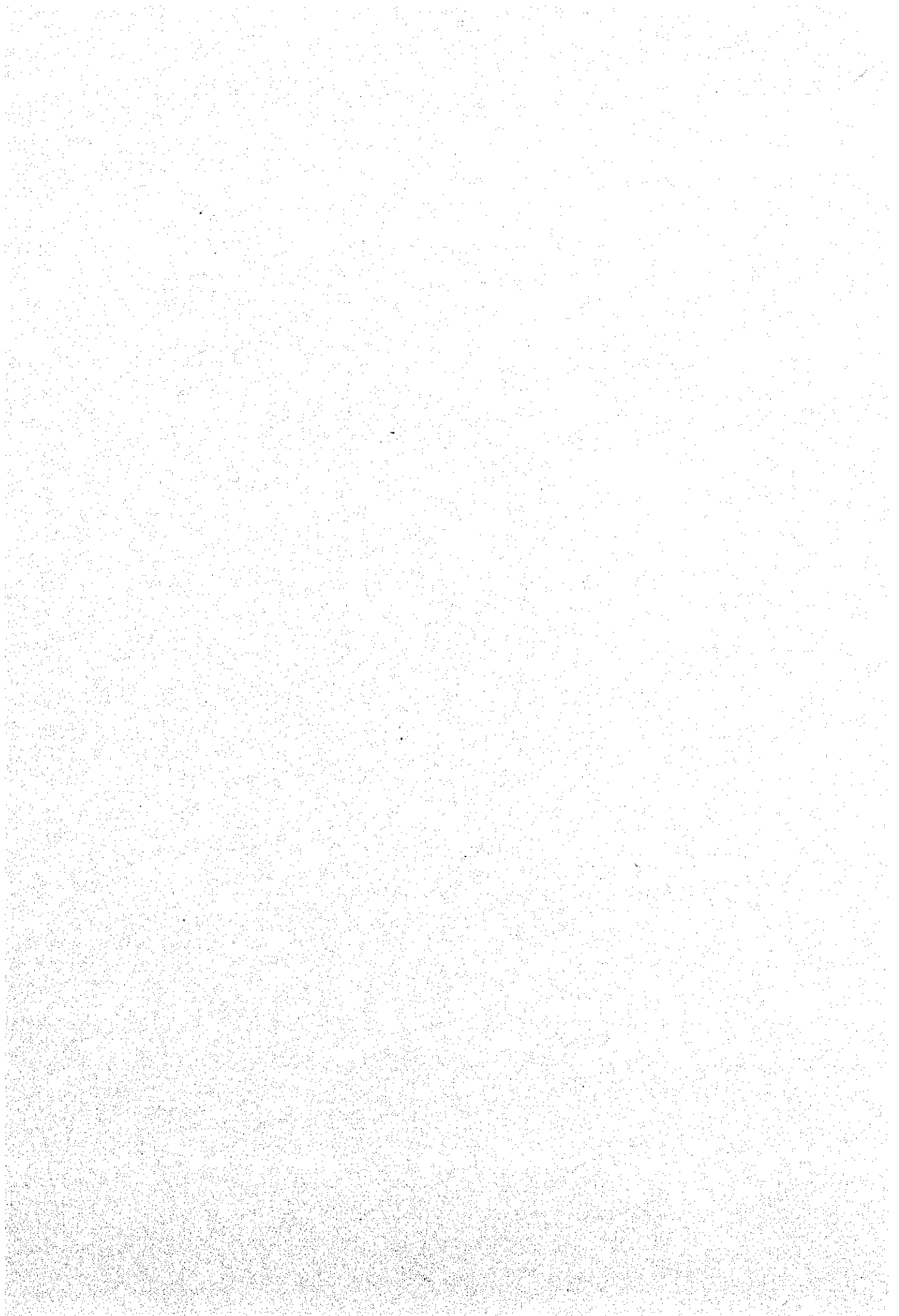
8) Air conditioning and ventilating system

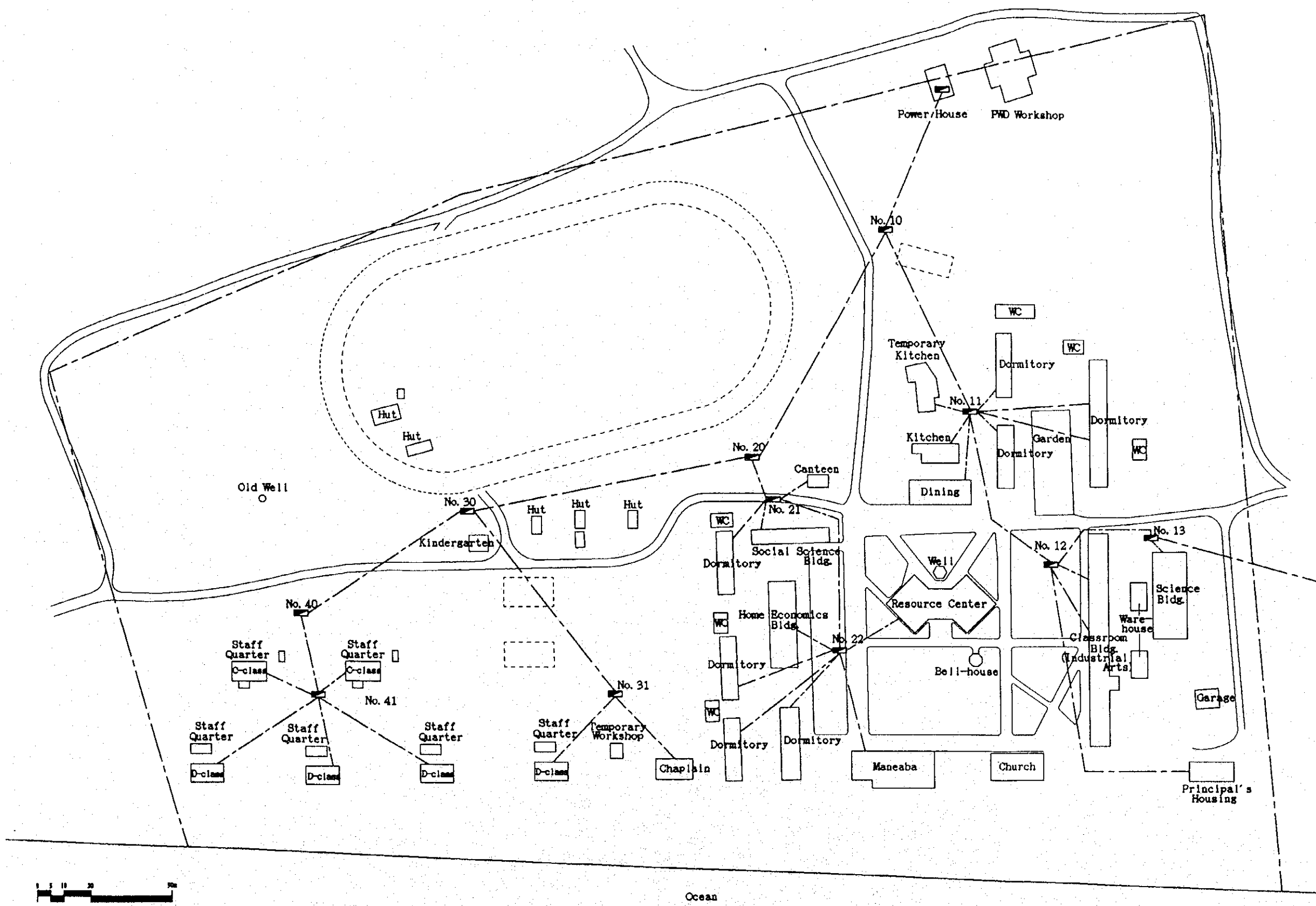
There is no air conditioning system in the School at the moment, except the window type air-conditioner furnished in the copy room within the resource centre.

There is also no mechanical ventilation system except for ceiling fans installed in the resource centre and the special classroom (the general science room).

All existing facilities including the general and special classrooms, the dormitories, the toilets, the dining room, etc., are furnished with Jalousie windows ventilating naturally.

There is no need for mechanical air conditioning nor ventilation systems considering the electrical power supply and the maintenance involved, except that in the computer room and the dark room at the proposed teachers' room there should be installed window type air conditioners. In other rooms, ventilation systems such as Jalousie windows will be furnished to enhance the natural ventilation. In the general and special classrooms, however, in order to prevent the loss of students' concentration because of a hot and humid atmosphere, ceiling fans should be installed.





UPGRADING AND EXPANSION OF EDUCATIONAL FACILITIES
AT MOTUFOUA SECONDARY SCHOOL

 PACIFIC CONSULTANTS INTERNATIONAL

Fig. 3-3 EXISTING ELECTRICAL WIRING

Scale:	Date: 94. 10. 28	Dwg. No.
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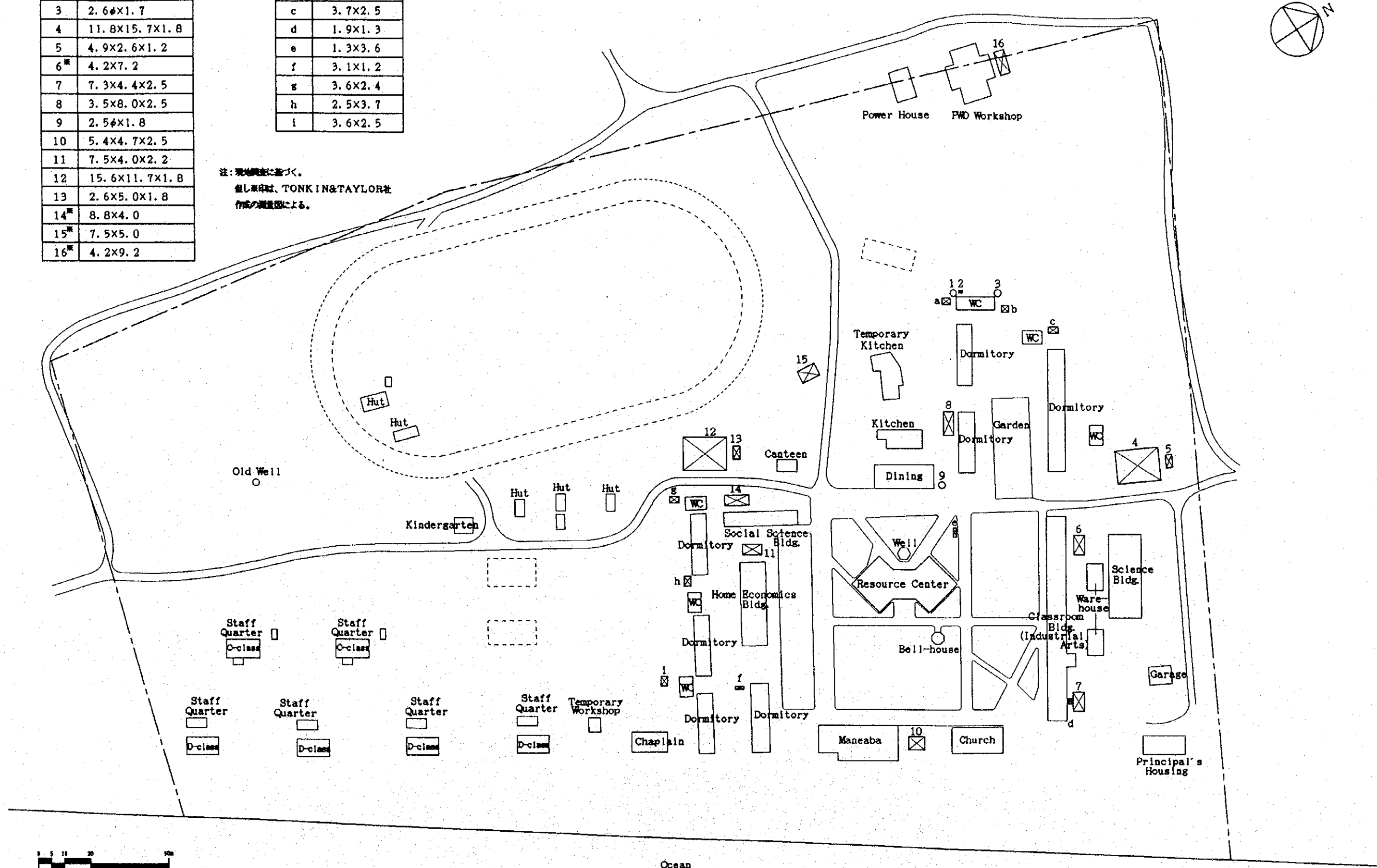
Water Tanks

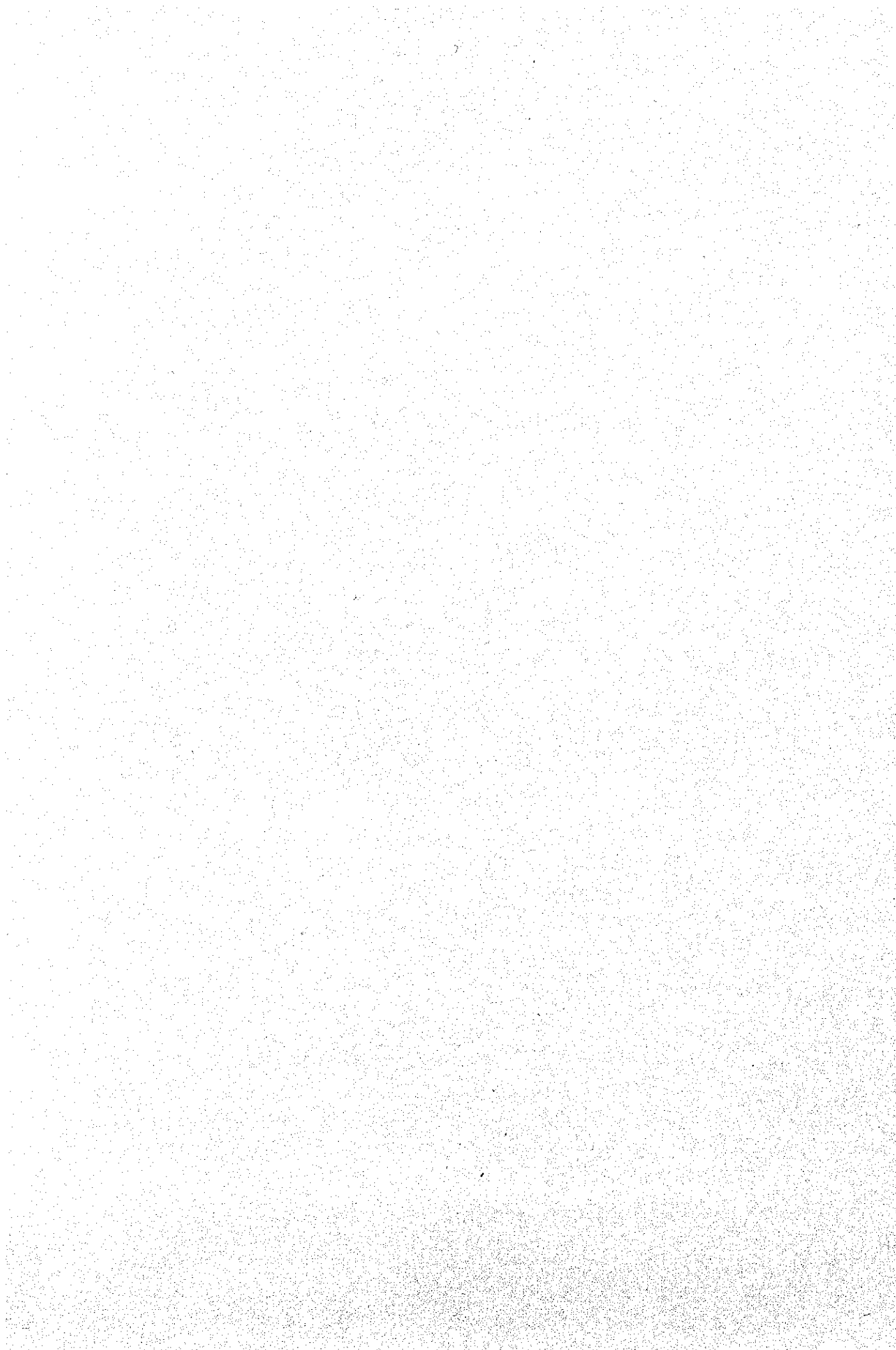
1	2.6φx1.7
2	1.6x0.9x1.0
3	2.6φx1.7
4	11.8x15.7x1.8
5	4.9x2.6x1.2
6 [※]	4.2x7.2
7	7.3x4.4x2.5
8	3.5x8.0x2.5
9	2.5φx1.8
10	5.4x4.7x2.5
11	7.5x4.0x2.2
12	15.6x11.7x1.8
13	2.6x5.0x1.8
14 [※]	8.8x4.0
15 [※]	7.5x5.0
16 [※]	4.2x9.2

Septic Tanks

a	3.1x2.5
b	2.8x2.4
c	3.7x2.5
d	1.9x1.3
e	1.3x3.6
f	3.1x1.2
g	3.6x2.4
h	2.5x3.7
i	3.6x2.5

注：現地調査に基づく。
但し車庫は、TONKIN&TAYLOR社
作成の測量図による。





3-3-3 Outline of the Existing Equipment and Furnitures

It is said that both educational and administrative equipment owned by Motufoua Secondary School covers the minimum required range in quantity. However, most of the equipment is not in a good condition due to it's deterioration and failure.

The maintenance system is far from satisfactory, and a lot of defective equipment is left unattended without being repaired. This is mainly because of an insufficient repair system and a shortage of budget for repairs. This indicates the need to take such measures as selecting the most simple and solid equipment and providing enough of spare parts.

Causes of the failures are, in many cases, the climate with high temperatures and humidity, and damage from the salty breezes. All metal parts are covered with rust.

Major existing equipment and the current condition are described below;

- 1) Social Science Equipment
Video software: 3 (in good condition)
- 2) Science Equipment
D.C. Power Supply: 2 (one is in good condition but the other is defective)
Leaf Electroscope: 13 (defective due to rust on the upper metal part)
Voltmeter: 34 (3 are defective)
Ammeter: 23 (all are in good condition)

Other experiment equipment: many are operational because they are relatively new, but both content and quantity are not sufficient.
- 3) Drawing Equipment
Drawing board: As there are no drawing boards, classroom desks are being used.
T-Square: 40 (in good condition)
Square Set: 40 (in good condition)
Compass: 40 (all are defective due to rust)
- 4) Woodwork Equipment
Lathe (Wood): 1 (operative, installed about 20 years ago)
Circular Saw: 1 (defective, installed about 20 years ago)
Thicknesser: 1 (operative, installed about 20 years ago)
Other tools: Few
- 5) Home Economics Equipment
Gas Oven: 1 (in good condition)
Electric Oven: 1 (defective)
Sewing Machine, Pedal: 8 (4 are defective)
Other equipment: Few
- 6) Physical Education Equipment
Table Tennis Goods Set: 3 sets (As there is no table, classroom desks are being used.)
Other balls: Few
- 7) Gardening Equipment
Wheel Barrows: 2 (defective)
Shovels: 3

- 8) Music Equipment
 - Guitar: 4
 - Ukulele: 4
 - Keyboard: 1 (defective)
- 9) Furniture
 - Chairs: about 200 (students without chairs sit directly on the floor.)
 - Desks: about 200 (students without desks place their textbooks on their knees.)
 - Blackboard: 14 (all are defective with cracks)
- 10) Library Equipment
 - Book Shelves: 25 (all are in good condition)
- 11) Administration & General Education Equipment
 - Copy Machine: 2 (both are defective)
 - VTR: 1 (defective)
 - Monitor TV: 1 (defective)
 - Typewriters (Manual): 2 (one is defective and the other is good for tentative use)
 - Duplicating Machine: 4 (3 are defective, one is good for tentative used)
 - Mini-bus: 1 (defective)
 - 35 mm Slide Projector: 1 (defective)
- 12) First Aid Equipment
 - There is nothing special that can be regarded as equipment
- 13) Kitchen Equipment
 - Gas Oven: 2 (in good condition)
 - Freezer: 2 (in good condition)
 - Refrigerator: 1 (in good condition)
 - Other Cooking Tools: Equipment to meet the minimum needs
- 14) Dining Hall Equipment
 - Dining Tables: 36 (good for tentative use)
 - Dining Chairs: 36 (good for tentative use)

3-3-4 Schooling Expense/Operation and Maintenance Costs

Because Motufoua School is a public school, teachers' labour costs are appropriated in the budget of Ministry of Health, Sports and Human Resources Development. Students are required to pay a schooling fee of A\$60 per term or A\$180 per annum, but other expenses such as admission fees, boarding and lodging charges, the cost for teaching materials (loaned from the School), etc., are borne by the Government.

The School has also received assistance from overseas including the construction of the resource centre by the UK, furnishing of the students' lockers and water tank of the science laboratory, installation of the power generators, and so forth. The situation of assistance from overseas is shown in Table 3-4.

Table 3-4 Overseas Aids to Motufoua Secondary School

Donors	Granted items and facilities	Grant Amount (A\$)
UK	Science room	65,000.00
	Water tank for science laboratory	1,300.00
	Notice board	700.00
	Construction equipment (i.e., tractor, trailer)	36,375.00
	Lockers for students	12,430.94
	Resource centre	311,000.00
New Zealand	Bookkeeping	1,251.44
	VSA	3,048.78
	VSA	2,240.12
	Furnishing	3,663.32
Australia	Centre for industrial art	15,000.00
	Sports equipment	3,000.00
Canada	Manufacturing of dormitory beds	27,000.00
	Transportation of the beds	6,600.00
Others	Power generator	2,590.00
	Water supply system	96,000.00
	Carport for tractor	3,200.00
	Fixtures for the generator	200.00
	Books and educational equipment	1,900.00

Source: By field survey

THE HISTORY OF THE UNITED STATES OF AMERICA

FROM THE EARLIEST PERIODS TO THE PRESENT

BY CHARLES C. SMITH

THE EARLY PERIODS	1
THE DISCOVERY OF AMERICA	15
THE FIRST SETTLEMENTS	30
THE STRUGGLE FOR INDEPENDENCE	50
THE CONSTITUTION	70
THE FEDERAL GOVERNMENT	85
THE WESTERN EXPLORATIONS	100
THE FRONTIER MOVEMENT	115
THE INDUSTRIAL REVOLUTION	130
THE CIVIL WAR	150
THE RECONSTRUCTION PERIOD	165
THE GROWTH OF THE UNION	180
THE PRESENT	195

CHAPTER 4 BASIC DESIGN

4-1 Design Policy

The basic design of the facilities and equipment in the Project is based on the following design policies; with due consideration of the result of the field survey, the environmental and social conditions of Tuvalu, the construction and procurement conditions, the maintenance and management ability of the facility and equipment and the construction schedule under Japan's Grant Aid assistance:

- (1) The new facilities should be arranged in consideration of the distance between buildings, flow lines of students, zoning, the existing pipe lines, etc. to meet with the existing facilities so as to functionally unify effectively as a whole;
- (2) Determine the reasonable scale and extent of the project based on the study and analysis of both the existing and future number of students, curriculums and other similar projects in Pacific regions and in Tuvalu;
- (3) In order to secure a comfortable environment for students to study in the classrooms without any machinery measure, the physical conditions of Tuvalu should be taken in consideration. The building design should be able to endure natural disasters, such as cyclones;
- (4) For the procurement of construction materials, Tuvalu relies on mostly imports except for sands and concrete aggregates. Therefore, the transportation plan will be the main issue for determining the construction schedule. Especially the necessary terms for material imports and the route of transportation should be examined very carefully. Besides this, use of the materials and construction methods should also be considered in view of the local conditions;
- (5) For the building design and construction plans, due to the construction conditions in Tuvalu, the facilities should be designed to a rational design without reasonable and useless items. Besides this, in consideration of the maintenance and operation costs for the facilities after construction, the selected materials should be as maintenance free as possible so as to keep the costs as low as possible;
- (6) For the planning of educational equipment, the local infrastructure condition, the difficulties of maintenance and the acquisition of spare parts should be considered. The equipment should therefore have a high durability and maintainability;
- (7) On the premise that this project is executed by Japan's Grant Aid assistance, the design and implementation method of the project should be rational and in line with the schedule and guidelines required by the assistance;
- (8) In order to determine the content and extent of the new facilities and equipment, the restoration of some existing facilities should be considered so as to minimize the project cost.

4-2 Study and Examination on Design Criteria

4-2-1 Determination Policy of the Scale of the Project

Presently, the number of students and teachers at the Motufoua Secondary School are 331 persons and 19 persons respectively. The ratio of the students between boys and girls is 47% and 53%.

The number of students and classes are shown on Table 4-1.

Table 4-1 Number of Students and Classes per Level

	Number of Students (persons)	Number of Classes (Classes)	Remarks
Form 3	147 Boys 61 Girls 66	5	30 persons x 2 classes 29 persons x 3 classes
Form 4	96 Boys 41 Girls 55	4	25 persons x 1 class 24 persons x 2 classes 23 persons x 1 class
Form 5L	42	2	23 persons x 1 class 19 persons x 1 class
Form 5U	46	2	23 persons x 2 classes
Total	331	13	

In accordance with the EFL Programme Report and "Study on the Contents of the Project" mentioned in Paragraph 3-2-2 the number of students will be expected increase in number to 600 and teachers to 27-30 by the year 2001. The number of classrooms is estimated based on the expected number of students above and is shown in Table 4-2.

Table 4-2 Number of Students and Classes per Level in 2001

	Number of Students (persons)	Number of Classrooms (classes)	Number of Students per class (persons)
Form 3	200	7	29
Form 4	200	7	29
Form 5	140	5	28
Form 6	85	3	28
Total	625	22	

4-2-2 Estimation of Number of Classes

(1) General classrooms

The number of periods of utilization of a classroom is found from multiplying the total number of study periods, which is calculated based on the expected number of classes per level, curriculums and time table, by the satisfaction rate. Shown in Table 4-3 are the number of projected classrooms calculated by dividing the calculated number of periods of utilization of the classroom by the

total number of periods (30 periods) and the upper limit of the utilization rate of classrooms (80%). The estimation of the required number of classrooms is 13 in total.

Reduce the number of existing classrooms (5) from the above necessary number of classrooms (13) to determine the projected number of classrooms, i.e., 8.

Table 4-3 Estimation of Required Number of General Classrooms Calculated from the Planned Number of Classes based on the Existing Curriculums

	Eng-lish	Mathe-matics	Geo-graphy	His-tory	Econo-mics	Physi-cal Educa-tion	Reli-gious Educa-tion	Verna-cular	Remarks
Form 3	(4 x 7) 28	(4 x 7) 28			(1 x 7) 7	(1 x 7) 7		(1 x 7) 7	(Period x Class)
Form 4	(4 x 7) 28	(4 x 7) 28			(1 x 7) 7	(1 x 7) 7	(1 x 7) 7		
Form 5	(4 x 5) 20	(4 x 5) 20	(3 x 5) 15*1	(3 x 5) 15*1	(3 x 5) 15*1	(1 x 5) 5	(1 x 5) 5		
Form 6	(4 x 3) 12	(4 x 3) 12	(3 x 3) 9*1	(3 x 3) 9*1	(3 x 3) 9*1	(1 x 3) 3			
Total Number of Periods	88	88	12*2	12*2	26*2	22	12	7	
General Classroom Plan Satisfactory Rate (%)	100	100	100	100	100	0*3	100	100	
Number of Periods for General Classroom Utilization Periods	88	88	12	12	26	0	12	7	Total number of period 245
Number of Necessary Classrooms	3.6	3.6	0.5	0.5	1.08	0	0.5	0.29	
Planned Number of Classrooms	4	4	1	1	2	0	1		Total number of classrooms 13

- Note: *1 Optional Subjects.
 *2 The estimations regarding the classrooms for Optional Subjects are derived as 50% of the classes.
 *3 Physical education is held in the gymnasium or sport field.
 *4 As classrooms for the vernacular subject is 0.29, vernacular and religious education are considered as one classroom.

(2) Special classrooms

The number of special classrooms is calculated in the same way as general classrooms. The figure is found by multiplying the total number of study periods for curriculums and time table, by the satisfaction rate and this number of periods of utilization of the classroom.

Shown in Table 4-4 are the numbers of projected special classrooms calculated, consisting of Science rooms (4), Social Science rooms (2), Home Economics and Cloth & Textiles rooms (3), Technical Drawing rooms (2), Woodwork rooms (2), as 13 in total. However, for Home Economics, due to the difference of the curriculum and equipment used between Food preparation and Cloth & Textiles, it is required to have 2 classrooms for each subject. Therefore, the number of projected special classrooms is calculated as 14.

The projected two special classrooms for woodwork will be used for woodcraft and metalwork in the future.

Deduct the number of existing special classrooms (8) from the above necessary number of special classrooms (14) to determine the project number of special classrooms, i.e., 6.

Table 4-4 Estimation of Required Number of Special Classrooms Calculated from the Planned Number of Classes based on the Existing Curriculums

	General Science	Physics	Chemistry	Biology	Social Science	Home Economics	Cloth & Textile	Technical Drawing	Woodwork	Remarks
Form 3	(3 x 7) 21				(3 x 7) 21	(3 x 7) 21		(3 x 7) 21	(3 x 7) 21	(Period x Class)
Form 4	(3 x 7) 21				(3 x 7) 21	(3 x 7) 21		(3 x 7) 21	(3 x 7) 21	
Form 5	(4 x 5) 20						(3 x 5) 15*1	(3 x 5) 15*1	(3 x 5) 15*1	
Form 6		(4 x 3) 12*1	(4 x 3) 12*1	(4 x 3) 12*1						
Total number of periods	62	6	6	6	42	42	8*2	50*2	50*2	
Special classroom plan satisfactory rate (%)	100	100	100	100	100	100	100	100	100	
Number of periods for special classroom utilization periods	62	6	6	6	42	42	8	50	50	
Number of necessary classrooms	3.33*3				1.75	1.75	0.33	2.08	2.08	
Planned number of classrooms (existing)	4(2)				2(2)	2(1)	2(1)*4	2(1)	2(1)	Total number of classrooms 14

- Note: *1 Optional Subjects.
 *2 The estimations regarding the classrooms for Optional Subjects are derived as 50% of the classes.
 *3 Regarding general science, physics, chemistry, and biology are considered as one classroom.
 *4 Addition of one classroom for home economics due to the different curriculum and equipment.

(3) Examination on the estimation of number of classes

The number of projected classrooms calculated for the general classrooms (13) and special classrooms (14), is 17 in total by 2001. This is exactly the same as the number of teachers estimated in 2001 in accordance with the EFL Programme Report.

In future, the use of the classrooms will be same as in the present system which is with a settled teacher in each classroom and the students moving around in accordance with their curriculums and time-tables.

4-2-3 Calculation of Room Sizes

According to the number of classrooms and facilities estimated in Paragraph 4-2-2, the floor area of each facility will be calculated. The facility size will be formulated based on the existing facilities at Motofoua Secondary School,

Fetuvalu Secondary School and other similar projects undertaken by grant aid in the Pacific region.

(1) General Classrooms

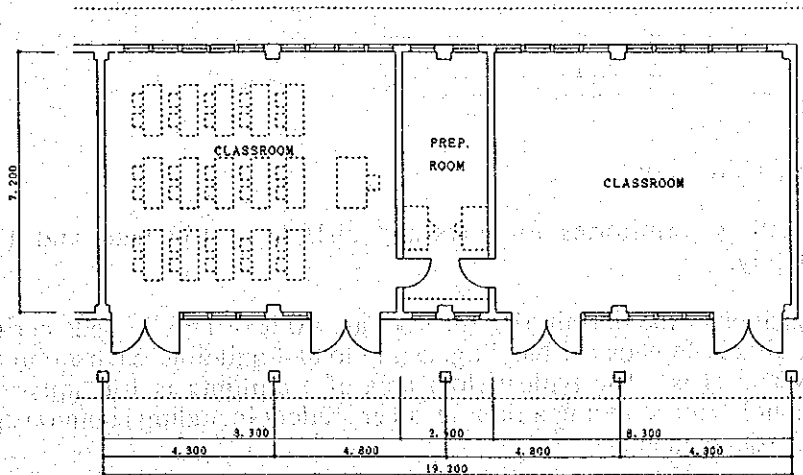
The floor areas of the existing classrooms of Motufoua Secondary School compared to others are shown in Table 4-5.

Table 4-5 Floor Area of General Classrooms

Location of Facility	Total floor Area (m ²)	Dimension (m)	Capacity (persons)	Floor area / person (m ²)
Existing Facility at the School	57.04	9.2 x 6.2	30	1.9
Master Plan Report (by Australian Government)	63.36	9.6 x 6.6	36	1.8
Fetuvalu Secondary School in Funafuti	54.0	9.0 x 6.0	-	-
Similar Projects in Pacific Region	-	-	-	1.7 - 2.4

According to Table 4-5, the floor area of the classroom should be considered as 2.0 square meters per person and 60 square meters per classroom. Including the preparation room, for which one is required for two classrooms and used for an anteroom by teachers and for storage of educational equipment, the proposed floor area of a general classroom is calculated as 9.6 m x 7.2 m = 69.12 m².

Figure 4-1 General Classroom



(2) Special Classrooms

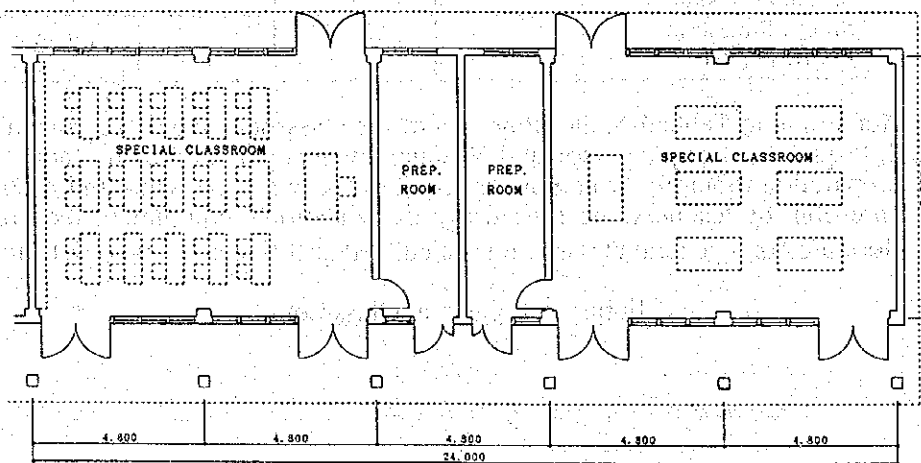
The floor area of other existing special classroom, calculated as 12.5 m x 10 m = 125 m² with a preparation room of 4 m x 10 m = 40 m², has enough space compared to similar projects in Pacific region which are approximately 70 - 85 square meters. However, the determination of the floor area for each special classroom should take in consideration the space requirement of the desks, chairs and equipment, and a preparation room should be included in a convenient location.

With reference to other similar projects, the proposed floor area of the special classroom is calculated as $7.2 \text{ m} \times 9.6 \text{ m} = 69 \text{ m}^2$ and the preparation room as $7.2 \text{ m} \times 2.4 \text{ m} = 17 \text{ m}^2$.

The design of each special classroom should consider the following matters:

- The special classroom for woodwork should consider sound problems.
- Food preparation room should consider services for water intake and outflow, as well as an energy source and its distribution.
- Cloth & Textile room should consider the provision and allocation of a laundry tray.
- The new science rooms will be used for chemistry and biology. As for the physics room, the existing science room will be restored.
- The special classrooms for chemistry, physics and biology should consider a drainage systems particularly concerning the discharge of various chemicals.

Figure 4-2 Special Classroom



(3) Students' Dormitories

The existing dormitories for boys and girls have 152 beds and 176 beds respectively.

The densities of the dormitories for boys are 40 beds and 36 beds per building and for girls is 44 beds per building, and in total 4 buildings each are in a cluster for boy and girls. The typical floor area of a building is 136 square meters, using double bunks, giving a floor area per student including common spaces as 3.1 - 3.7 square meters.

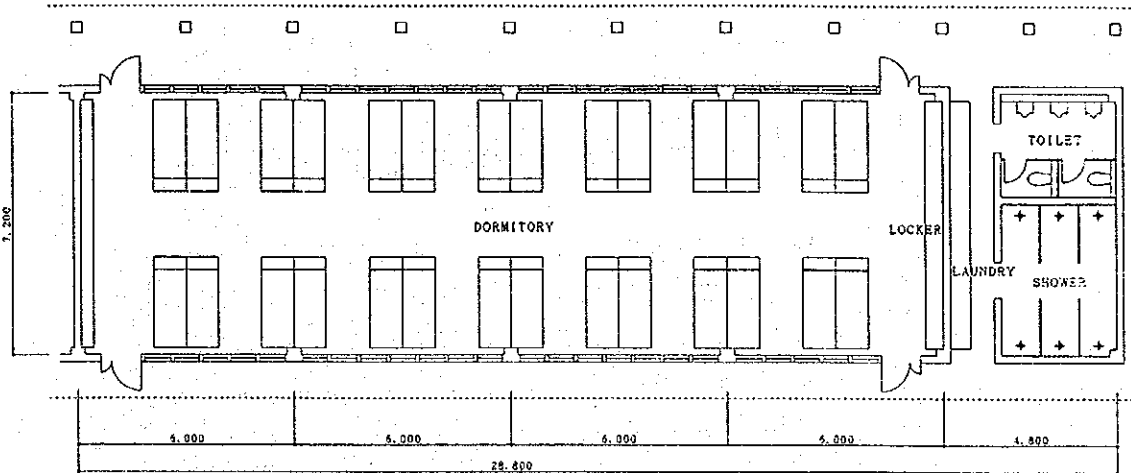
Assuming that the floor area per student is 3.0 square meters the proposed facility is required to be 900 square meters, considering the additional 300 students. As the additional number of students is assumed to be composed of 150 students each of boys and girls, the extension of buildings required is 450 square meters each for the boys and girls dormitories.

Assuming that the size of each building area is 150 square meters, 3 dormitories each are required for the boys and girls.

Besides this, the related facilities for the dormitories such as lavatories and laundry space are required for the boys and girls. The necessary floor area will

be discussed later. However, a matron's room is also required for the girls; this is currently 4.5 m x 2.0 m = 13.5 m².

Figure 4-3 Students' Dormitories



(4) Dining Hall

The existing facility, composed of a dining room and a kitchen with a canopy between the two buildings, has a total floor area of 296 square meters, 170 square meters and 106 square meters for dining room and kitchen respectively. However, this facility will be demolished with the construction of new a Dining Hall and Kitchen.

At present, the existing dining room can cater for meals for 330 students at one time, which means only 0.5 square meters per person is available for seating space .

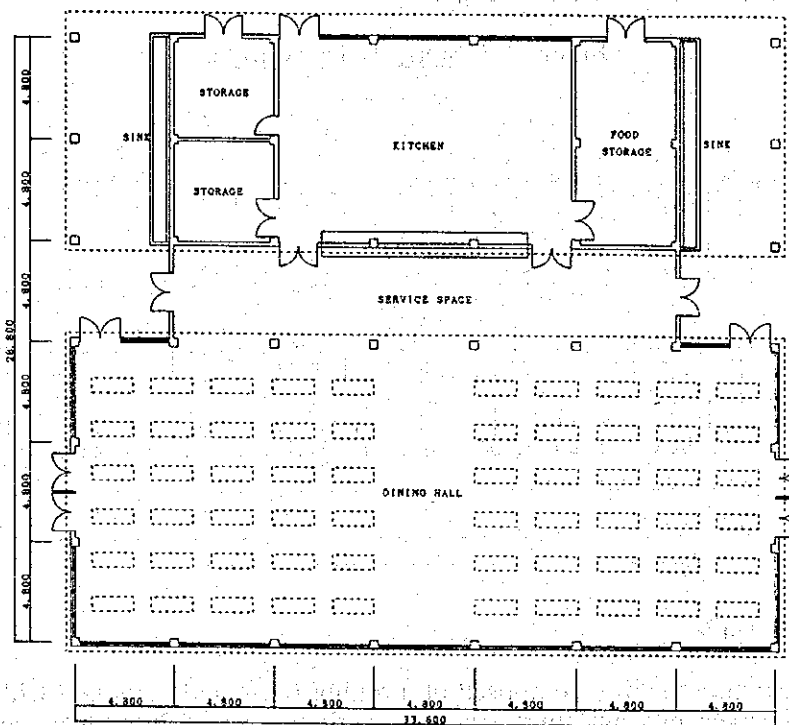
According to the "Collected Building Design Code", the existing facility has not enough space compared to a self-service restaurant which requires 0.9-1.1 square meters per seating space.

Assuming that the number of students will increase to 600, the proposed floor area of dining room will be required to be approximately 480 square meters with a floor area per student at 0.8 square meters.

At the side of the existing kitchen there exists approximately 60% of the floor area of dining room. However, in according with the "Collected Building Design Code", the proposed kitchen requires 240 square meters which is approximately 50% of the floor area of the dining room.

The existing dining hall and kitchen will be demolished after the completion of the new facility .

Figure 4-4 Dining Hall and Kitchen



(5) Administration Building

In the requirements, the administration building should be provided with the following facilities:

- Entrance hall
- Principal's office
- Teachers' room
- Administration office
- Computer room
- First-aid room

At present, there is no administration building in the existing facilities, but with its functions are served by various other buildings. For example, the principal's office is located in the centre of the resource centre, teachers are using part of a classroom as the teachers' room, and the computer room currently functions for student and event management purposes rather than for educational purposes, this room being located in the same place as the principal's office.

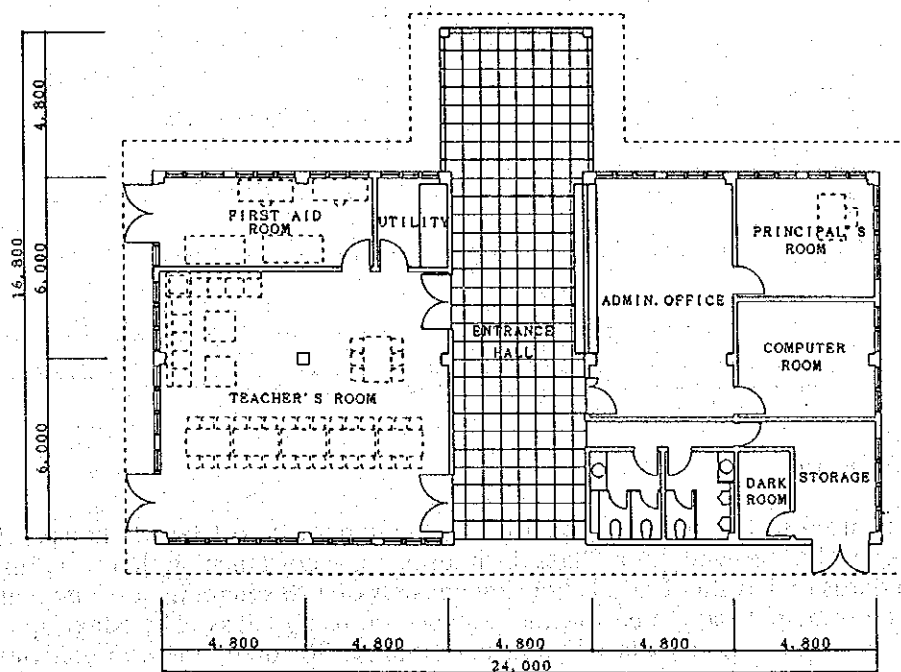
Because of the wide spread site, as well as the decentralized location of the buildings, the school requires a public address facility for the purpose of broadcasting calls and information.

According to the Master Plan Report prepared by the Australian Government, the administration building requires a floor area of 144 square meters. Although the total number of teachers is 21 in 1994, there will be 27 by 1997 according to the EFL programme. The purpose of the teachers' room is generally as a meeting and resting place for teachers, and thus it requires teachers' desks and other related furniture, as well as space for an enclosed room for meeting purposes. As for incidental facilities of the room, it requires a teachers' toilet, utilities for drinks and space for lockers and equipment.

Assuming that the floor area per teacher is 3.0 square meters, the proposed teacher's room requires 81 square meters. Other rooms in the administration building include the principal's office, the administration office and computer room and require a similar floor area to the teachers' room in total.

Also a first-aid room is required in the administration building. The existing first-aid room is 3.1 m x 7.2 m = 22.6 m² in total floor area with only one bed. At present, sick persons are using an area called the "Sick Bay". Therefore, the proposed first-aid room requires two beds within the facility.

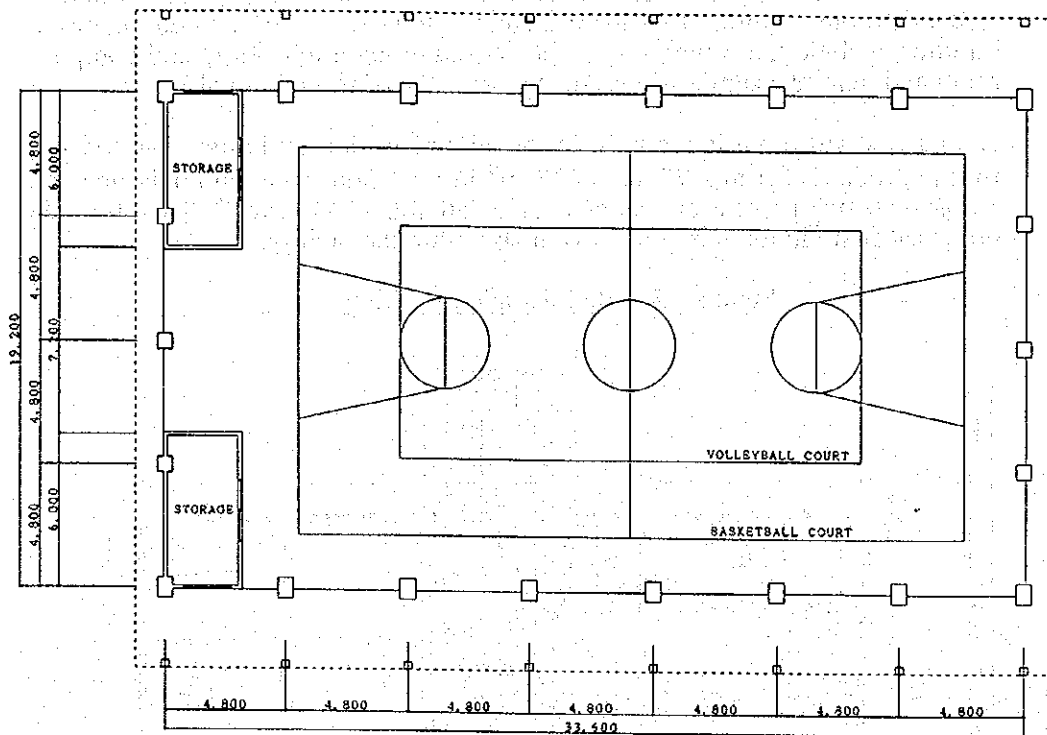
Figure 4-5 Administration Building



(6) Gymnasium

The basic function of the gymnasium is to cater for sporting facilities during rain. The size of the building should have enough space for volleyball (20 m x 10 m) and basketball (24 m x 14 m) games. For volleyball, the ceiling height needs to be a minimum of 12 meters. The determination of the size, therefore, requires 19.2 m x 33.6 m = 645 m², which is the minimum space for basketball and the height of the building will consider the standard height required for volleyball.

Figure 4-6 Gymnasium



(7) Staff Quarters

There used to be eight staff quarters in the school; two Class B houses, two Class C houses and four Class D houses in accordance with the Housing Standards of Tuvalu. Class B housing consists of 120 square meters and is used by the principal and the pastor, the teachers are using Class C housing (approx. 90 square meters) and Class D housing (approx. 80 square meters). However, other teachers who cannot stay at the staff quarters are currently renting local houses on the island, and it is the one of main causes of difficulty in inviting teachers to come to the school.

There 19 teachers currently teaching in the school, and this will be increased to 27 teachers by 2001 according to the EFL Programme.

According to similar projects in the Pacific region, the proposed staff quarters required area of a 2LK type of 90 square meters, which is equal to the Class C housing of the Housing Standard of Tuvalu.

(8) Multi-Purpose Hall

At present, the Maneaba has been used for functions, indoor games, social life and education, as well as a space for some of outdoor education (field education) when it is raining. The existing Maneaba was constructed in accordance with local methods, and wood has been used for the frame of the building and the roof is thatched with palm leaves.

Due to the fact that the existing Maneaba can still be used, and the new gymnasium can be also used as a multi-purpose hall too, the construction of a gymnasium has only been recommended. However, the construction of a new facility or the restoration of the existing building with durable materials was

requested by the Tuvalu side in order for the facility to serve various activities and occasions in the future.

The existing facility has a total floor area of 300 square meters and 330 students can be accommodated at one time, which means 0.9 square meters is required for one student. Assuming the increase in the number of students from 330 to 600 and in accordance with other similar projects where a reasonable floor area per student is 0.8 square meters per student, the floor area is required 480 square meters. However, subsequent to the study the construction of the Multi-Purpose Hall has been deleted from this Grant Aid assistance.

(9) Tennis/Volleyball/Basketball Courts

The required areas for these courts are 275 square meters, 162 square meters and 390 square meters respectively, giving 827 square meters in total. Although these facilities were requested from the Tuvalu side, the facilities have been deleted from the subject facilities of this Grant Aid assistance subsequent to the study.

(10) Others (Lavatory, Bathroom)

It is also required that the lavatories and bathrooms are in common facility. According to the "Standard of School Utility" by the Ministry of Education, Japan, the estimated number of water closets is one unit per 25 students for boys and one unit per 20 students for girls and the number of urinals is one unit per 50 boys. Assuming that the additional number of students is 300 with 150 students each of boys and girls, the proposed number of lavatories as a minimum is as shown in Table 4-6.

Table 4-6 Number of Closets and Urinals Required

Lavatory	Number of closets	Number of urinals
Boys	$150/25 = 6$	$150/50 = 3$
Girls	$150/20 = 8$	

As for the number of bathrooms, assuming that 150 students each of boys and girls use the bathroom within two hours, the proposed facility requires 28 square meters for changing rooms and 8 shower spaces according to the "Collected Building Design Code". Besides this, consideration of laundry space for boarders is also required.

For the facilities mentioned above, each facility should be decentralized in order to accommodate the users.

Table 4-7 Estimation of the Floor Area of Projected Facilities Rooms Based on the Similar Projects by Japan's Grant Aid

	Babau High School The Kingdom of Tonga (March 1983)	High School The Kingdom of Tonga (February 1991)	High School Marshall Islands (October, 1993)	Celefu High School Papua New Guinea (January, 1994)	Existing Moufoua Secondary School	Facility Size for this Project
1) General classrooms	7.2 m x 8.6 m = 62 m ² 1.72 m ² /person	7.2 m x 8.6 m = 62 m ² 1.72 m ² /person	8.0 m x 9.0 m = 72 m ² 2.57 ~ 2.40 m ² /person	56 m ² 1.8 m ² /person	9.2 m x 6.2 m = 57 m ² 1.9 m ² /person	7.2 m x 8.6 m = 60 m ² 2.0 m ² /person Preparation room: 7.2 m x 2.6 m = 18.7 m ²
2) Special classrooms	7.2 m x 9.6 m = 69 m ²	7.2 m x 9.6 m = 69 m ² 1.72 m ² /person 35 persons/class	Home economy lab.: 15 m x 8 m = 120 m ² Cloth Textile lab.: 12 m x 8 m = 96 m ² Computer lab.: 82 m ² Woodwork lab.: 221 m ²	1.5 times larger than general classroom: 84 m ²	Science room: 12.5 m x 10 m = 125 m ² Preparation room: 40 m ²	7.2 m x 9.6 m = 69 m ² 2.3 m ² /person Preparation room: 7.2 m x 2.4 m = 17.3 m ²
3) Students dormitory	-	-	7.2 m ² /person	-	3.1 m ² - 3.7 m ² /person	3.0 m ² /person
4) Dining hall and kitchen	-	-	-	-	0.5 m ² /person 170 m ²	0.7 m ² /person Capacity of 600 students
5) Administration building	3 m ² /person	-	261 m ² 3.6 m ² /person	Office: 4.5 m ² /person Staff's room: 0.95 m ² /person Principal's room: 18 m ² + Reception space	-	3 m ² /person
6) Gymnasium	-	-	962.50 m ² Arena, Dressing room, Stage, Storage	-	-	Basketball court: 24 m x 14 m 19.2 m x 33.6 m = 645 m ²
7) Staff-quarters	-	For married: 64.08 m ² For single: 30.00 m ²	-	Teacher's housing: 78 m ² Staff's housing: 45 m ²	Class B housing: 120 m ² Class C housing: 90 m ² Class D housing: 80 m ²	Class C housing: 90 m ²
8) Multi-purpose hall (Maneaba)	Basketball court: 1 court (630 m ²)	771.84 m ² Capacity: 630 persons 1.2 m ² /person	-	Basketball court: 20 m x 30 m = 600 m ²	308 m ² 0.9 m ² /person	0.8 m ² /person 480 m ²
9) Tennis/Volleyball/ Basketball Courts	-	-	-	Soccer, Tennis, Netball, Basket ball and Volleyball court 1 each Rugby oval 1	-	Tennis court: 1 Volleyball court: 1 Basketball court: 1
10) Others Lavatory and Bathroom	-	-	-	-	36 m ² /dormitory 0.9 m ² /person	Lavatory (boy) Urinal: 25 students/unit Water Closet: 55 students/unit Lavatory (girl) Water Closet: 20 students/unit

4-2-4 Rooms Required and Their Floor Area

The following table shows the required rooms and their floor areas. However item (8) (multi-purpose hall) and item (9) (Tennis, Volleyball and Basketball courts) are deleted from the subject facility of this Grant Aid assistance by the following reasons:

- This project should involve the cooperation of the Japan side and also Tuvalu's self-help effort;
- The existing Maneaba Hall is still usable;
- These two items are regarded as low priorities within the requested items;

Table 4-8 shows the rooms required and floor area of projected buildings.

Table 4-8 Rooms Required and their Floor Area

Room	Project floor area/room (m ²)	No. of rooms	Project floor area (m ²)	Corridor, Eaves, etc. (m ²)	Building area (m ²)	Remarks
(1) General classrooms						
1) Classrooms	59.76	8	478.08	238.20		59.8 m ² /class 18.7 m ² /preparation room
2) Preparation rooms	18.72	4	74.88			
		-	18.72			
Sub-total		12	571.68	238.2	809.88	
(2) Special classrooms						
1) Science	69.12	2	138.24			69.1 m ² /class 17.3 m ² /preparation room
2) Home economics/ Cloth & Textile	69.12	2	138.24			
3) Technical drawing		1	69.12			
4) Woodwork		1	69.12			
5) Preparation rooms	17.28	6	103.68			
Sub-total		12	518.40	216.00	734.00	
(3) Students' dormitories (Boy)				273.60		
1) Dormitories	172.80	3	518.40	273.60	930.24	172.8 m ² /building 50 persons/building 17.3 m ² /room
2) Lavatory/Shower/ Laundry	34.56	3	103.68			
3) Others (Pilotis)		-	34.56			
Sub-total		6	656.64	273.60	930.24	Number of Students: 150
(4) Students' dormitories (Girl)				273.60		
1) Dormitories	172.80	3	518.40	273.60	1,003.68	172.8 m ² /building 50 persons/building 17.3 m ²
2) Matron rooms	17.28	3	51.84			
3) Lavatory/Shower/ Laundry	34.56	3	103.68			
4) Others (Pilotis)		-	34.56			
Sub-total		9	708.48	295.20	1,003.68	Number of Students: 150

Note * In accordance with the construction of the proposed Dining hall, the existing Dining may be demolished. (The demolition cost will be allotted to the Tuvalu side.)

Room	Project floor area/room (m ²)	No. of rooms	Project floor area (m ²)	Corridor, Eaves, etc. (m ²)	Building area (m ²)	Remarks
(5) Dining hall and Kitchen*				(-> Common Space)		Number of students: 600
1) Dining hall		1	483.84			
2) Kitchen		1	138.24			
3) Service space		1	115.20			
4) Storage, etc.		3	92.16			
Sub-total		7	829.44		829.44	
(6) Administration Building				(-> Common Space)		
1) Teachers' room		1	86.40			
2) Administration office		1	38.40			
3) Principal's room		1	19.20			
4) First-aid room		1	21.60			
5) Computer room		1	19.20			
6) Toilet	7.20	2	14.40			
7) Utility		1	7.20			
8) Dark room		1	6.30			
9) Storage		1	12.90			
10) Corridor		1	4.80			
11) Others		-	80.64			
Sub-total		11	311.04		311.04	
(7) Gymnasium				(-> Common Space)		
1) Arena		1	609.12			Basketball court 1, Volleyball court 1
2) Storage	18.00	2	36.00			
Sub-total		3	645.12		645.12	
(8) Staff-quarters				52.8/bldg.		2 unit/bldg. x 5 bldgs.
1) Staff-quarters	77.0	10	770.00	264.0		
Sub-total	864.0	10	770.00	264.0	1,034.00	
(9) Multi-purpose hall						
1) Multi-purpose hall**		1	483.8			0.8 m ² /users
Sub-total			483.8		483.8	
(10) Tennis/Volleyball/Basketball Courts **			(827)			The area shows the required size of courts
Sub-total			(827)			
(11) Other (for (1)~(7) only)						
1) General Classrooms' Building (connecting Corridor)			-			(5), (6), (7)
2) Common Space (Canopy and corridor)			-	86.40		
Sub-total				833.14	919.54	
Total		69	5,494.6	2,206.54	7,701.14	Total Floor Area (1)~(8) + (11) = 5,010.80 m ² ***

Note ** The excluded facilities from the subject items of this Grant Aid assistance.
*** The total floor area of the subject facility of this Grant Aid assistance.

4-3 Basic Plan

4-3-1 Site Layout Plan

The layout of the existing facilities is with the resource centre at the centre of the site with academic buildings in the north-south aspects, boys' dormitories in the north west, girls' dormitories along the south.

The major building groups may be identified as follows:

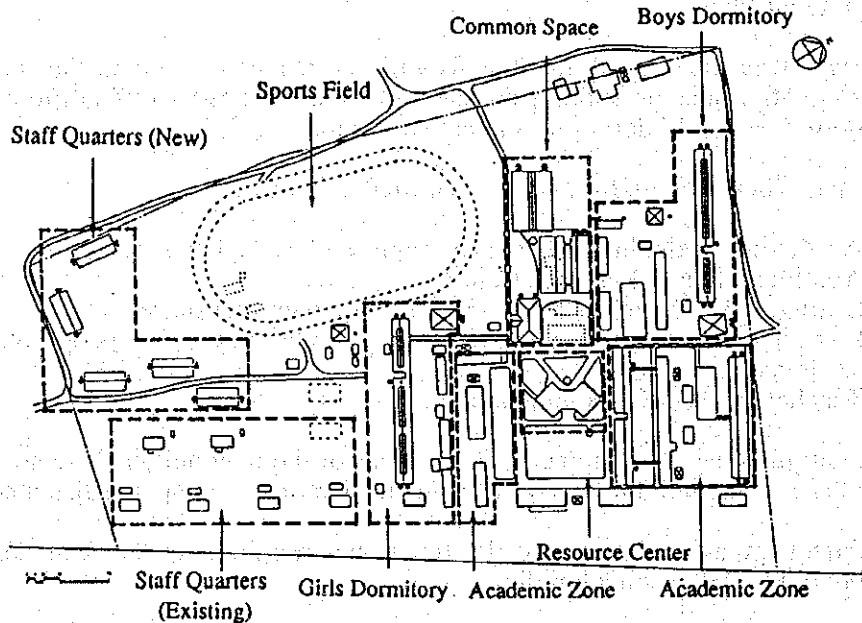
- 1) Academic - including general classrooms and special classrooms
- 2) Administration & Resource Centre
- 3) Dining hall and kitchen, Manecaba and other common space
- 4) Dormitories and their amenities - boys and girls being geographically separated
- 5) Teachers and staff accommodation.

A layout plan has been prepared on the basis of the new building's relationship with the existing buildings as well as in consideration of the points listed below.

- Attach great importance to the functional relationship between the new buildings and existing buildings;
- Consider distances between buildings and their orientation in order to secure good ventilation and good sunlight conditions, throughout the year, and also sound-proofing;
- Consider effective utilization of external spaces, such as court yards;
- Define the zoning of facilities based on the use of each building (academic, common facility, administration building, dormitories and staff quarters) clearly;
- Make use of the existing utilities, such as water supply and drainage, etc.;
- The houses for the teachers and staff and dormitories have been located separately in order to ensure their privacy.

Figure 4-7 shows the layout plan based on the above discussion.

Figure 4-7 Site and Layout Plan



4-3-2 Architectural Designs

(1) Floor plan

In terms of floor planning, the calculated areas in Paragraph 4-2-3 and the layout plan as mentioned above were used as a base with the following ideas:

- 1) Consider the functional relationship between the new buildings and existing building;
- 2) Proposed buildings should be single story in consideration of natural disasters (such as cyclones) the construction conditions of Tuvalu, construction work and schedule, etc.;
- 3) Shorten the distance between the existing resource centre and the new administration facility as much as possible;
- 4) In order to shorten the duration time for the procurement of equipment and construction work, materials should be standardized. To achieve this, set an appropriate module for the building and standardize the span required. 4.8 meters spans have been adopted in modules most commonly used in similar projects in Pacific region. Therefore, a 4.8 m module will be used for the floor planning of the project;
- 5) The classroom corridors have been made of the gallery type in consideration of the climatic conditions, with large protruded eaves in order for the students not to get wet in the rain during the changing of classrooms.
- 6) Room ventilation will be provided by openings of windows;
- 7) Consider the preparation rooms for the teachers for the general and special classrooms in order to meet the curriculum requirements (teachers remain in the classroom and students move around) of the Motufoua Secondary School;

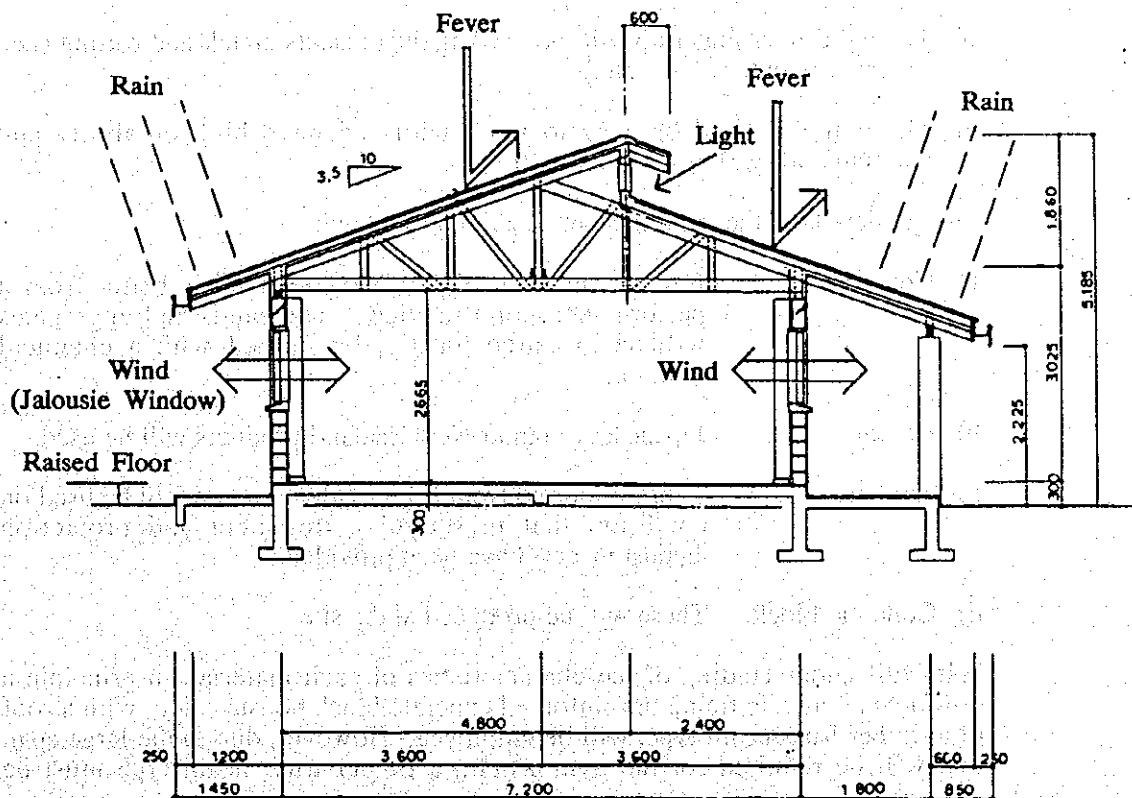
8) Consider the size and layout of the educational equipment and furniture

(2) Elevation and cross-section plan

In consideration of local building styles, local construction methods, etc., the planning of the elevation and cross section of the school buildings has been based on the following matters:

- 1) The level of the first floor will be raised 30 cm above the present ground level in order to prevent possible damage by flooding during cyclones and also radiant ground heat;
- 2) The roof will be sloped in order to quickly discharge rain water;
- 3) Gutters will be provided for collecting the rain water from the roof and stored in water tanks;
- 4) The eaves will protrude to protect classrooms from direct sunlight;
- 5) A suspended ceiling will be provided to create an attic to keep out radiant heat from the roof;
- 6) Wall surfaces will have as large a opening as possible. Fixed glass louvers (Jalousie Windows) will be provided in the general classroom buildings in order to enhance room ventilation and provide a balanced intake of sunlight;
- 7) The buildings should harmonize with the existing buildings and the surrounding landscape.

Figure 4-8 Elevation and cross-section plan



(3) Structural Plan

1) Basic policy

The structural design method shall be required to withstand long-term loads such as bending and vibration. In addition, the building shall have sufficient safety to withstand short-term loads, and not lose its durability against earthquakes, strong winds, etc. The structure plan and implementation method of Tuvalu should be sufficiently clear with consideration also given to local construction and maintenance conditions.

2) Standard for structural design

Adopting Japanese building standards which concern the shock of earthquakes (e.g. JASS) will provide enough strength, but it will be over-designed in some parts. For the structural design, therefore, the National Building Code for Tuvalu shall be used with Australian, New Zealand or Fijian building standards, as well as the existing buildings around the site, used as references.

3) Methods and materials

The most popular structure on Tuvalu is made of reinforced concrete with concrete blocks and timber frames. At present, only the Maneaba building has been made by the local methods within the existing buildings. Because the main structural materials (i.e., timber, cement, re-bars, etc.), are imported and their performance is not consistent, they will need to be carefully selected. Besides this, based on the situation of existing buildings, the selection of the materials was decided with consideration to the following matters:

- a) The materials must have strong resistance against salt damage.
- b) Treated timber materials will be used against insects attack and rotting (i.e., timber, cement, re-bars, etc.).
- c) The material shall be easy to work with and have high durability and maintainability after the construction.

Further details of the materials are described as below:

- a) Concrete: Cement made in Fiji or New Zealand is better from a performance point of view. The sands and aggregates will be procured locally, but mixed with a chemical mixture.
- b) Re-bar: Japanese, Fijian or New Zealand products will be used.
- c) Timber: Those imported from Fiji or New Zealand will be used on condition that preservative treatment and protection against insects have been provided.
- d) Concrete block: These will be produced at the site

With full understanding of the characteristics of each material, in principle a reinforced concrete frame or reinforced concrete block construction, with a roof of a timber truss beam type, will be employed. However, due to the large span that will be required for the gymnasium, a timber truss beam type must be

carefully considered. This construction method is commonly used in Tuvalu, and it will be constructed with instructions by a Japanese technician.

4) Basic structure

The character of the soil at the site is composed of a conglomerate of sand and corallite at the supporting layer.

The bearing capacity for the building foundation is 5 ton per square meter which is sufficient for a single-storied building with a mat foundation.

5) Design load

a) Loading capacity (Live load) (P: kg/m²)

	Slab	Beam/Pillar/Foundation
Classroom	230	210
Administration	300	180
Dormitory	180	130
Dining hall	230	210
Toilet	180	130
Roof (unworkable)	60	60

b) Wind load (W: kg/m²)

Tuvalu is occasionally hit by cyclones with wind speeds of 30 meters per second. Serious damage by gusty winds and high waves has occurred in the past, and so a wind velocity of 60 meters per second, similar to a standard in Japan, will be adopted for the design condition.

$$W = C \cdot q$$

C: Wind force coefficient $q = 60\sqrt{h}$
q: Speed pressure (kg/m²) h: height (m)

c) Earthquake load (Seismic Force) (K: kg/m²)

Because there are no earthquakes on Tuvalu, consideration of an earthquake load is unnecessary.

d) Combination of loads

The loads are as follows for the allowable response design method.

Long-term design load (permanent):

Fixed load (G) + Loading capacity (P)

Short-term design load (at the time of strong wind):

Fixed load (G) + Loading capacity (P) + Wind load (W)

e) Permissible stress in Materials (kg/m²)

The permissible stress of concrete is 210 kg/m². Chloride contamination in the concrete aggregate will be washed off so that the total salt content will be 0.3 kg/m³ or less in order to prevent the rusting of re-bars.