

CHAPTER 2 CONTENTS OF THE PROJECT

2.1 Object of the Project

In order to achieve the target to train middle level managerial, administrative and technical personnel set forth by the UNTAET/ETTA, the Project aims at establishing the Faculty of Engineering of the East Timor National University through the rehabilitation of facilities and the supply of equipment to provide theoretical teaching and practical training for a total of 450 students, i.e. 50 for each of the electrical, mechanical and civil engineering courses for each of three years under the D3 level curricula (108 units in three years) prepared by the Study Team to Assist Curriculum Development. It is expected that the new courses will be able to produce intermediate-level engineers and managers who are in short supply in East Timor and improve the general technological level in East Timor.

To be more precise, the Project intends the rehabilitation of the former physics and chemistry laboratory building to house the administration department, library, computer room and classrooms and the conversion of the former mechanical engineering workshop to new mechanical and electrical engineering workshops and the former civil engineering workshop to a new civil engineering workshop. In addition, the practical training equipment required under the curriculum for each engineering course will be supplied to enable students to have practical experience of the theories taught in the classroom. At the same time, building service systems (plumbing, electrical installation and mechanical systems) will be provided, as they constitute essential infrastructure for the operation of the facilities.

2.2 Basic Design of the Requested Japanese Assistance

2.2.1 Design Policy

(1) Basic Design Principles

1) Priority Repair of Repairable Facilities

The Project aims at the urgent restoration of the destroyed facilities and equipment to their previous state. Repair of the existing facilities will be given priority to ensure the usability of the facilities and equipment as much as possible by the time of the planned opening of the Hera campus in 2002 as such repair work can be conducted with a short construction period and at a low cost. In regard to infrastructure facilities, the repairable pump room and elevated water tank will be rehabilitated even though the existing equipment is beyond repair and requires replacement.

2) Repair Reflecting Master Plan for Future Extension

The existing facilities are distributed in accordance with the master plan. The repair plan should be prepared so as not to hinder the future demolition of those buildings which cannot be rehabilitated by the Faculty of Engineering to extend its facilities.

3) Safe Study Environment

Many of the destroyed buildings have scattered glass, roof tiles and steel frames, etc.,

presenting a safety hazard. Those facilities (buildings) which are located at a distance from these destroyed buildings will be rehabilitated to provide a safe study environment.

4) Compact and Efficient Layout of Rehabilitated Facilities

The rehabilitated facilities will be located in a compact area as much as possible in view of conducting efficient education and creating facilities with minimum energy loss. While the allocation of the planned rooms in the existing buildings is likely to result in a waste of space, given the limited scope for the rehabilitation of the existing buildings, the planned rooms will be located in those buildings which can be repaired.

5) Rehabilitation Work Within Capability of Local Workers

The planned rehabilitation work will use materials which can be procured in East Timor and local common and simple construction methods so that unskilled local workers can participate in the work.

2.2.1.1 Priority and Size of Facilities

The existing temporary university building at Dili has no facilities or equipment for practical training and teaching is conducted entirely in the classrooms. The Project aims at providing essential facilities and equipment for the full implementation of the new curricula, which include practical training, by rehabilitating the campus of the former Poly-tech.

The Draft Regulations on the Establishment of the Universidad Nacional de Timor Lorosae envisages the use of the former Poly-tech facilities at Hera for the Faculty of Engineering and the facilities of the neighboring agricultural college for the Faculty of Agriculture. As the facilities of the former Poly-tech are the only facilities which can be used to provide educational facilities, including practical training facilities, in areas not far from Dili by means of urgent rehabilitation, the relocation of the Faculty of Engineering is planned to use the facilities of the former Poly-tech at Hera. The priority ranking of the urgently required facilities and equipment for the implementation of the curricula, including the practical training subjects, are described below.

(1) Priority Ranking of Educational Facilities

1) Practical Training Facilities (Workshop)

Practical training equipment for the three courses and space for its installation

2) Lecture Facilities

Classrooms and classroom furniture

Special rooms: physics laboratory, chemistry laboratory, computer room, drawing room and the relevant equipment

Self-study facilities: library and library equipment

3) Administration Facilities

Senior staff rooms: Dean's office, Vice-Dean's office and furniture

Lecturer's rooms: lecturers' and technicians' rooms and furniture

Administration: administration office and furniture

- Meeting room and furniture
- 4) Toilets
- 5) Canteen and Furniture
- 6) Infrastructure Facilities
- 7) Accommodation
 - Student Dormitory
 - Staff Quarters

(2) Contents of Planned Facilities

The facilities required in accordance with the curricula and their priority ranking are described in more detail below.

1) Practical Training Facilities (Workshop)

The curriculum for each of the electrical, mechanical and civil engineering courses includes practical training subjects as shown in Table 2-1. As some types of practical training equipment are heavy, produce noise and/or vibration and/or require large space, this equipment will be installed in the existing workshop for use for practical training. As the total quantity of equipment for the Faculty of Engineering is smaller than that used by the former Poly-tech which emphasized the teaching of practical skills, all of the equipment can be accommodated in the existing two workshop buildings. In case of expansion of equipment installation area in future, remaining a workshop building will be able to use. While the existing facilities include an automobile maintenance and repair workshop, this space is not required because of the absence of the relevant training in the curricula of the Faculty of Engineering. However, it will be used as storage space for the existing equipment which could hinder the rehabilitation work.

Table 2-1 Practice Hours in a Week at Workshop

Dept. Name	1 semes.	2 semes.	3 semes.	4 semes.	5 semes.	6 semes.	Total
Elec. Engineering	6	6	6	6	12	10	46
Mech. Engineering	12	12	12	12	12	15	75
Civil Engineering	0	6	1	0	12	10	29
Total	18	24	19	18	36	35	150

Total Practice Hours at Workshop in 1, 3, 5 semesters

By Elec. Engineering (hours/week	24 ×2class	Total	48 hours/week
By Mech. Engineering (hours/wee	36 ×2class	Total	72 hours/week
By Civil Engineering (hours/week	13 ×2class	Total	26 hours/week

Total Practice Hours at Workshop in 2, 4, 6 semesters

By Elec. Engineering (hours/week	22 ×2class	Total	44 hours/week
By Mech. Engineering (hours/wee	39 ×2class	Total	78 hours/week
By Civil Engineering (hours/week	16 ×2class	Total	32 hours/week

* Mech. Engineering should review total practice hours at Workshop, because 78 hours is twice of weekly study hours.

2) Classrooms

25 Seats Classrooms

These will be used for theoretical study during the six terms (two terms/year). A total of eight classrooms will be required based on six days/week teaching with six lessons/day. With the introduction of some optional subjects which will be determined as part of the forthcoming syllabus, there will be a need for one extra classroom to host teaching on optional subjects for a class of 25 students which will be divided into 2 – 3 groups. Accordingly, the total number of classrooms will be nine. Chairs with a table which are currently used at the main campus of the University will be used for these classrooms for the seating of students in view of the small floor space required by such chairs. One classroom will be equipped with a blackout curtain so that a OHP and screen can be used.

50 Seater Classroom

As such general subjects as languages will be taught for classes of 25 students because of the emphasis on better learning effects, a 50 seater classroom to house the entire 50 students of each year will be unnecessary.

Table 2-2 Calculation of Class Room Numbers

Study Hours per a Class in a Week

Semester	1 semes.		2 semes.		3 semes.		4 semes.		5 semes.		6 semes.		Total	
	Class Room	Other	Class Room	Other	Class Room	Other	Class Room	Other	Class Room	Other	Class Room	Other	Class Room	Other
Elec. Engin.	18	12	22	9	18	9	17	9	10	12	7	18	92	69
(total/week)	30		31		27		26		22		25		161	
Civil Engin.	15	6	22	6	21	6	18	0	15	12	7	18	98	48
(total/week)	21		28		27		18		27		25		146	
Mech. Engin.	15	18	22	15	20	12	12	12	8	12	6	24	83	93
(total/week)	33		37		32		24		20		30		176	
Total	48	36	66	30	59	27	47	21	33	36	20	60	273	210
(total/week)	84		96		86		68		69		80		483	

Total study hours at Class Room in 1, 3, 5, semesters

At Class Room (hours/week) 48+59+33= 140 × 2 class Total 280 hours/week

Total study hours at Class Room in 2, 4, 6, semesters

At Class Room (hours/week) 66+47+20= 133 × 2 class Total 266 hours/week

6 study hours/day, 6 study days/week

The 2 semes. of Mech. Engin. has a day/week with 7 hours study, because 2 semes. has 37 hours st 6 study hours/day is reasonable, because some practices such as Drawing extend it's study hours o

•Calculation of Required Class Rooms

280÷(6 hours×6 day)= 7.78 8 class rooms is required

266÷(6 hours×6 day)= 7.39 8 class rooms is required

Following the forthcoming completion of the syllabus, the optional subjects for each course will be decided. For optional subjects, a class of 25 students will be divided into two or three groups to pursue their own subjects, making the addition of one classroom necessary. Consequently, a total of nine classrooms will be required.

Table 2-3 Classroom Size of Similar Facilities

Facilities	Seating Capacity	Floor Area (m ²)	Floor Area/ Student (m ²)	Furniture	air-conditioning	Remarks
General Classrooms at Main Campus	50	55	1.1	Chair with attached table	No	Maximum use of space
Large Classroom, Faculty of Education	60	92	1.53	4 seater and single seater desks and chairs	Yes	Floor area per students is relatively small because of large number of students
General Classroom, Faculty of Education	32	59.4	1.86	4 seater and 2 seater desks and chairs	No but ceiling fan	Nearest facility to planned classroom accommodating 25 students under the Project
Present Project	25	40*	1.6	Chair with attached table	No	

* The floor area under the Project is a target figure. The actual area may differ from this figure because of the fact that the

work is the rehabilitation of existing facilities.

Workshop Classroom

Practical training is conducted in the workshop and the level of understanding on the part of the students can be enhanced by providing the necessary lectures during training. This makes the introduction of a 25 seater classroom for each of two workshops necessary.

3) Special Classrooms

Physics Laboratory

As no large-scale equipment is used, the necessary laboratory equipment is taken into a general classroom to conduct experiments. Followings are the subject of experiment; droppings, reservation of momentum, air column resonance, special heat of metal and diffracting grating and these experiments can be done in the general class room. A physics laboratory is, therefore, unnecessary.

Table 2-4 Study Hours/ Week of Physics Lab. Subject

Dept.	Category	Subject	1 class (hours/week)	Total Classes	Semester (hours/week)	
					1, 3, 5	2, 4, 6
Elec. Engin.	General	Physics Lab.	3	2	0	6
Civil Engin.	General	Physics Lab.	3	2	0	6
Mech. Engin.	General	Physics Lab.	3	2	0	6
Total			9	6	0	18

Chemistry Laboratory

It is dangerous for the teacher and students to do the chemical experiment without qualified chemical teacher because it use strong medicine and poison for the experiment. The chemical teacher should have ability and technique to handle strong medicine and poison for the experiment. Because of the current absence of teachers capable of supervising chemical experiments, no such experiments will be conducted until the

Table 2-5 Study Hours/ Week of Chemistry Subject (Lecture only)

Dept.	Category	Subject	1 class (hours/week)	Total Classes	Semester (hours/week)	
					1, 3, 5	2, 4, 6
Elec. Eng.	General	Chemistry	2	2	4	0
Civil Eng.	General	Chemistry	2	2	4	0
Mech. Eng.	General	Chemistry	2	2	4	0
Total			6	6	12	0

recruitment of a suitable teacher. Chemistry experiment equipment or a chemistry laboratory is, therefore, unnecessary. When chemistry experiments are conducted in the future, it will be possible to rearrange one classroom in the workshop building to serve both chemistry experiments and theoretical teaching providing with water supply and drainage facility, ventilation facility, desk and chairs and medicine cabinet with lock set.

Computer Room

PCs will be used for the subjects listed in Table 2-6, making computing facilities to simultaneously serve 25 students and the relevant floor space necessary. Basic PC operation will be taught in Computer I, a general subject in the first semester. Basic design, simulation and skills will be taught in the subsequent special subjects. Back up generator for the operation of computers will be installed.

At the university's main campus in Dili, computer lessons featuring basic PC operation are currently given in a room equipped with 21 PCs. As the function of these lessons is completely different from the intended function of the computer room, there will be no overlapping between them.

Table 2-6 Computer Practical Subject

Dept.	Category	Subject	1 class (hours/week)	Total Classes	Semesters (hours/week)	
					1, 3, 5	2, 4, 6
All Dep.	General	Computer I	3	6	18	-
Elec. Engin.	Basic Special	C Language & Assembly	3	2	-	6
	Special	Advanced C Language	3	2	6	-
		Numerical Analysis	3	2	-	6
		Microprocessor & Interface II	3	2	-	6
Civil Engin.	Special	CAD	3	2	-	6
Mech. Engin.	Basic Special	Computer Programming	3	2	-	6
	Special	CAD/CAM System	3	2	-	6
Total			21	14	24	36

Computer practical study in 2, 4, 6 semesters is 36 hours in a week, that is same study hours as a week total. Balance between 1, 3, 5 semesters should be reviewed.

Table 2-7 Planning Computer Room Size and Similar Facility

Facility Name	Computer Nos.	Student	Room Size (m ²)	Size/Computers (m ²)	Remarks
University Main Campus Computer Room	21	20	65	3.1	Air-condition
Planning Computer Room	26	25	80*	3.1	Air-condition

* Space is a target size. Actual size might be different with the target, because required rooms should be layout in existing buildings.

Drawing Room

The drawing room requires sufficient space to simultaneously accommodate drawing tables and drawing equipment for 25 students. Although lessons using the drawing room may continue for a long time, even until the evening, the number of lessons using the drawing room is not many as shown in Table 2-8. The introduction of one drawing room for the three courses will be sufficient.

Table 2-8 Practice Subject in Drawing Room

Dept.	Category	Subject	1 class (hour/week)	Total Classes	Semesters (hours/week)	
					1, 3, 5	2, 4, 6
Elec. Engin.	Basic Special	Technical Drawing	3	2	6	-
Civil Engin.	Basic Special	Engineering/Technical Drawing	3	2	6	-
Mech. Engin.	Basic Special	Engineering/Technical Drawing	3	2	6	-
		Engineering/Technical Drawing	3	2	-	6
Total			12	8	18	6

4) Self-Study Facilities: Library

The required units to complete such general subjects as mathematics I, II and III and statistics include self-study. In general, it is difficult to rely only on official lessons and students are required to conduct self-study using technical reference books and others. At present, while there is no exclusive library or collection for the Faculty of Engineering, some donors are planning to donate books. The university itself is also planning to purchase books and, therefore, the introduction of a library to house these books is necessary. Books for the Faculty of Engineering will be sent to the Faculty after indexing at the library on the main campus. It is planned to transfer one PC for book search purposes to the Faculty of Engineering from the library of the main campus. The library is designed to house 3,000 books, i.e. 1,000 for each engineering course, and 25 seats based on the size of comparable libraries.

Table 2-9 Planning Library Size and Similar Facility

Facility Name		Student Nos.	Book Nos.	Reading Sheets	Sheets/St udents(%)	Room Size(m ²)	Remarks
University Main Campus	Existing Library	5,000	3,850	18	0.4%	63	Too tight layout
	New Library	5,000	34,000	100	2.0%	420	Completion in October 2001
Educational Faculty	Library	817	35,000	84	10.3%	203	Book storage 77+30 + Reading room 96
Planning	Library	450	3,000	25	5.6%	100*	Expecting 1,000 books in each Dept.

* Space is a target size. Actual size might be different with the target, because required rooms should be layout in existing

5) Administration Facilities

Senior Staff Rooms: Dean's Office, Vice-Dean's Office and Course Directors' Office

For the smooth operation and management of the Faculty of Engineering, it is necessary for senior staff members to be located near to each other for the frequent exchange of opinions and information. Given the present organizational structure of the Faculty, office space will be required for the Dean, two Vice-Deans (in charge of academic affairs and administrative affairs respectively) and three Course Directors. Judging from the existing arrangements for similar needs at the main campus and at the Faculty of Education, the Dean and the Vice-Dean responsible for academic affairs will be given their own office while space for the Vice-Dean responsible for administrative affairs will be introduced in the administration office. The three Course Directors will be housed in one room.

Table 2-10 Planning Senior Staff Rooms and Similar Facility

Facility Name	Room Name	Capacity	Room Size (m ²)	Furniture	Air-condition	Remarks
University Main Campus	Rector Room	1	25	Desk, Meeting Table, Chair, Safe, Book Shelf, Cabinet, Computer, Printer	Air-condition	Equipped secretary room (25 m ²)
	Vice Rector	1+3	29	Desk, Chair, Cabinet, Computer, Printer, Scanner	Air-condition	
Educational Faculty	Dean Room	1	36	Desk, Chair, Cabinet, Sofa, Computer, Printer	Air-condition	
Planning	Dean Room	1	25*	Desk, Chair, Cabinet	Air-condition	
	Vice Dean	1	20*	Desk, Chair, Cabinet	Air-condition	

* Space is a target size. Actual size might be different with the target, because required rooms should be layout in existing buildings.

Lecturer's Rooms: Lecturers' and Technicians' Rooms

Lecturers and technicians will require a room to prepare lessons and to assess student performance, etc. They will be housed in a single room to facilitate communication. At present, the electrical engineering course, mechanical engineering course and civil engineering course have 20, 16 and 14 lecturers and technicians respectively. For the proper implementation of the planned curriculum, each course will require some 20 lecturers and technicians and it is needed that this manpower requirement for each course will be arranged 6 months before the time of opening in October, 2002 for the preparation of lessons. One room capable of accommodating 20 persons is, therefore, planned for each course.

Table 2-11 Planning Lecturer's Room and Similar Facility

Facility Name	Room Name	Capacity	Room Size (m ²)	Size/Lecturer (m ²)	Furniture	Air-condition	Remarks
University Main Campus	Engineering Faculty	30	67	2.2	Desk, Chair, Cabinet, Computer, Printer	Air-condition	Too tight. 30 chairs equipped, but it is difficult to accommodate 30 persons.
Educational Faculty		12	57	4.8	Desk, Chair	Air-condition	1 desk for 1 person
Planning Lecturer's Room		20	96*	4.8	Desk, Chair, Cabinet	Air-condition	Depending on existing structure span

* Space is a target size. Actual size might be different with the target, because required rooms should be layout in existing buildings.

Administration: Administration Office

At present, the Faculty of Engineering has four administrative staff members, including one Vice-Dean who is also the secretary of the Faculty. This number is expected to increase to six by the time of the opening of the new courses in October 2002. The administration office of the Faculty is currently located in the same building along with the administration office of the main campus. When it is moved to the Hera campus, the staff strength will be increased to six because of the loss of cooperation of the staff of the main campus administration. The new administration office will combine storage for student data, etc., space for the Vice-Dean and space for ordinary administration staff members.

Meeting Room

This room will be used for meeting related to the operation and management of the Faculty of Engineering, including annual planning meetings and regular meetings, etc. by senior staff members, regular meetings and others for each course and meetings to assess student performance, etc. A sufficiently large space to accommodate meetings attended by all teachers and technicians (20 persons) of one course is required.

6) Others

Toilets

The existing three workshop buildings have no toilet facilities and there is a separate toilet building. The rehabilitation work for this toilet building will involve the replacement of damaged sanitary ware and piping, the construction of a new septic tank and the rehabilitation of both the interior and exterior finishing, etc., tantamount to almost the construction of a new building. The scale of the existing toilet building is much larger than the scale required to serve 450 engineering students and it will be more economical to place new toilet facilities in one workshop building in terms of the construction and maintenance costs. New facilities will, therefore, be introduced in one workshop building, providing separate toilets for teachers, male students and female students in accordance with the local custom.

Canteen

During the Poly-tech period, there were no restaurants for students in Hera and a canteen was introduced to serve students to save their one hour return journey to Dili. This situation is unchanged today and it will be necessary to rehabilitate the existing canteen. As in the case of the Poly-tech period, it is planned to entrust an outside caterer to operate the canteen.

Gate House

Gate house is required for 24 hours security of the Campus.

7) Dormitory and Staff Accommodation

There were three student dormitories in the campus and one of the center dormitory damaged severally by fire and it seemed impossible to rehabilitate. However other two dormitories do not have fire damage, so they can be accommodated with the repair of water and electricity supply system, sewage treatment system. Teachers and staffs accommodations were damaged severally by fire, they seemed impossible to rehabilitate by weakness and neutralization of concrete.

The campus is located on mini-bus routes between Dili and local cities (costing US\$ 2 for a return journey). As a mini-bus operates every four minutes or so during the morning and afternoon rush hours and the Faculty of Engineering has one mini-bus that is donated by Australian private company and with 18 seats, it is possible for students to travel daily to the campus.

2.2.1.2 Selection of Equipment

For the selection of equipment, the necessity for each of the requested equipment has been examined in view of the curriculum contents. The equipment to be provided under the Project has been selected based on the following selection conditions and criteria so that the selected equipment is appropriate and suitable for the purpose of the Project and is easy to operate and maintain.

(1) General Criteria for Equipment Selection

- 1) The equipment must be essential for curriculum implementation.
- 2) The equipment represents the minimum requirement for basic experiments or practical training at the Faculty of Engineering.
- 3) The equipment must be identical or similar to equipment (or facility) used by the former polytechnic or is used by a faculty of engineering of a university in a neighbouring country.
- 4) The equipment must not incur an excessively high operating/maintenance cost.

- 5) The equipment must not present any problems in view of the local environmental standards (or Japanese environmental standards if no local standards exist).
- 6) The equipment must not require either large-scale machinery or a special method for its installation.

Based on the above criteria, the equipment selection priorities are decided..

- A : minimum equipment to implement the curriculum
 B : equipment required widening the scope of scientific experiments or practical learning
 C : equipment required widening the scope of scientific experiments or practical learning but of which the frequency of use is lower than B
 D : equipment which is convenient if available but of which the absence does not cause much problem for scientific experiments or practical training

The various types of equipment, etc. required for each engineering department and others are outlined below.

- Electrical Engineering Department:
Basic engineering tools, basic measuring equipment, electronic circuit experiment equipment, equipment related to electrical appliances, control equipment
- Mechanical Engineering Department:
Measuring equipment, machine tools, material testing equipment, equipment related to internal combustion engines
- Civil Engineering Department:
Surveying equipment, material testing equipment (concrete strength tester, soil tester and Marshall pressure tester, etc.)
- Drawing equipment :
Drawing instruments and drawing tools, etc.
- Computer equipment :
PCs, printers, UPS and software, etc.
- Physics laboratory equipment :
Minimum range of laboratory equipment required for a faculty of engineering at the university level (for five themes)
- AV equipment : TVs, VCRs, OHP screens
- Common fixtures : furniture and fixtures, etc. for Dean's office, Vice-Dean's office, department head offices, computer room, meeting room, classrooms, workshops and library, etc.

(2) Equipment Grade

The planned equipment is selected with emphasis on the conditions listed below. Highly advanced and costly equipment and equipment of which the use is limited among the originally requested

equipment were revised at the time of examination in Japan.

- 1) The selected grade should correspond to basic experiments or practical training suitable for a faculty of engineering at the university level.
- 2) The selected grade should promise durability of the equipment.
- 3) The selected grade should reflect easy maintainability.

(3) Equipment Quantity

The curriculum contents and number of students of each course are used as the basis to determine the quantity of each equipment.

- 1) The basic number of students of the faculty for each year is 150, i.e. 25 students x 2 classes x 3 courses. The standard class size is 25 students.
- 2) For the individual implementation of scientific experiments or practical training, 26 units (25 for students and one for the teacher) will be provided.
- 3) In the case of equipment for scientific experiments or practical training in groups, one group will comprise five students (five groups in total). The total quantity of equipment will be six units as each group and the teacher will be provided with one unit.
- 4) In the case of equipment of which the shared use is possible, only one or two units of equipment will be provided for scientific experiments or practical training which will be used by each group in rotation.

Furthermore, the requested equipment quantity will be changed in the following manner.

- 5) If it is judged that existing equipment or equipment planned under another project can substitute the requested equipment, the equipment in question will be withdrawn or the quantity will be reduced.
- 6) If it is judged that the frequency of use for educational purposes is small, the equipment in question will be withdrawn or the quantity will be reduced.

(4) Equipment Layout

The layout plan for the planned equipment will consider the introduction of space to allow safe movement by students without disrupting scientific experiments or practical training while referring to the equipment layout adopted by the former polytechnic.

2.2.1.3 Natural Conditions

(1) Temperature and Solar Radiation

While there are no meteorological data records since October, 1999, the meteorological conditions at Hera are said to be practically the same as those at Dili. According to statistics for 1997 when East Timor was still part of Indonesia, the maximum and minimum daily temperatures are approximately 30°C and 22°C respectively throughout the year. The relative humidity is fairly stable all year round with a highest of 73% in January and a lowest of 63% in August. As Hera is located at 8°S, the level of directly felt solar radiation is much stronger than the actual temperature suggests. The existing buildings are constructed to suit the local meteorological conditions and the rehabilitation work will copy the style and structure of the existing buildings.

(2) Rainfall

There are two seasons, i.e. the rainy season from November to May and the dry season from June to November. The annual rainfall at Dili of approximately 700 mm is low but rainfall tends to result from many squalls. The campus site gently slopes from the trunk road at the southeastern side of the site towards the northwestern side. Rainwater drains from the northwest via drainage ditches around the buildings. There is a river running from the southwestern border of the campus to the northwestern border. During the rainy season, this river is used to drain rainwater to the hinterland. The rehabilitation work will use the existing facilities.

(3) Lightning

The Hera area experiences many thunderstorms and the main existing buildings have a lightning rod on the roof but no grounding system. A new lightning rod with a grounding system will be necessary to mount on the rehabilitated elevated water tank, workshop buildings and laboratory building.

(4) Earthquakes

All records during the period of Indonesian rule have been lost to fire and no records have subsequently been kept. East Timor was classified as Zone 2 when the Indonesian government introducing zoning in 1981. The seismic factor for Zone 2 is 0.07 which is approximately one-third of the 0.2 for Japan, indicating a lower likelihood of a major earthquake compared to Japan. The existing buildings were constructed in 1989 presumably in accordance with the said seismic factor. Accordingly, no special seismic-proof measures will be employed and the rehabilitation work will inherit the structure of the existing buildings.

(5) Salt Damage

The planned new campus of the Faculty of Engineering is situated some 2 km inland from the coast and the wind blows from the coast every day. The existing buildings show little sign of salt damage because of the little use of steel materials for their exterior. Under the Project, the minimum use of steel materials is planned for the exterior of the rehabilitated buildings as in the case of the existing buildings.

2.2.1.4 Socioeconomic Conditions

(1) Work to be Conducted by East Timor Side and Reduction of Running and Maintenance Costs

Even though East Timor has recently developed a new source of revenue through the extraction of oil, it is basically an agricultural country with 80% of the population relying on agriculture for their livelihood. There is no major industry other than agriculture. Because of the absence of industries generating major tax revenue in the near future, the budgetary allocation for each government ministry or university is expected to remain very tight under the limited tax revenue.

1) Removal of Existing Equipment

There are many pieces of equipment which were used at the time of the Poly-tech and which are no longer usable. While the removal of such equipment prior to the commencement of the rehabilitation work is necessary in view of this equipment constituting an obstacle to the workshop rehabilitation work, some equipment requires heavy machinery for its removal. Given the difficulty of the University of East Timor to finance the leasing of such heavy machinery, the removal of equipment requiring the use of heavy machinery will be included in the scope of the cooperation.

2) Low Running and Maintenance Costs

The procurement priority for materials will be given to locally available, durable and weather-resistant materials to reduce the maintenance cost. The quantities of air-conditioning equipment and lighting equipment will be the minimum to reduce the running cost and this equipment will be of the type, which allows independent use. The procurement priority will be simple equipment and equipment and systems that are not popularly used will not be procured.

(2) Rehabilitation Respecting Architectural Style of Existing Buildings

The exterior finishing of the target buildings for rehabilitation is shown in Table2-12.

Table 2-12 Exterior Finishing Material

	Physics and Chemistry Laboratory Buildings	Workshop Buildings	Canteen
Roof	Roof tiles	Corrugated aluminum sheeting	corrugated poly vinyl chloride
Outer Walls	RC frame + CB wall + mortar + paint finish	- RC frame + mortar + paint finish - Concrete blocks	CB wall + mortar + paint
Windows	Aluminum frames	Aluminum frames	Aluminum frame

The rehabilitation work will respect the existing exterior finishing of these buildings and will use the same or similar materials and colors. The roof of the physics and chemistry laboratory buildings and Canteen where the roof tiles and corrugated poly vinyl chloride require replacement to prevent rainwater leakage will be replaced by a metal roof as tiles cannot prevent leakage. However, tiles will be used for the eaves which do not affect leakage in order to create a similar

atmosphere to the existing buildings.

There is some leakage on the ceiling, so the corrugated poly vinyl chloride shall be changed to Galvanized steel sheets. The shape of the roof is sphere, it need special technique to change the roofing material.

(3) Voltage Fluctuation and Power Cut Reduction System

Power supply to Hera is made from a diesel engine power station via urban Dili. The transmission distance between the power station and the campus is as long as some 20 km and the old overhead transmission cable running along the trunk road in front of the campus suffers a voltage drop of as much as 20%. The generating capacity of the power station is insufficient to meet the demand and regular power cuts lasting some 3 hours/day are implemented even in Dili. There was an accident in power station in Dili by breaking crankcase by crankshaft and one of the generator is under over all maintenance in September 2001. Because of the absence of two sets out of five generator sets become more power situation worse, and there were more blackout happened frequently.

Given the prospect of likely frequent power cuts due to voltage drop, a transformer which is capable of stepping up and an automatic voltage regulator (AVR) will be installed to deal with voltage drop. In addition, an uninterruptive power supply (UPS) system will be introduced to protect the computers.

By the deteriorate of electrical generating capacity of the power station, the team planed to install small size of generator set for computer room, electrical and mechanical workshop and civil workshop for the smooth operation of minimum practical lessons even in the blackout.

(4) Security Considerations

From the period of Indonesian rule prior to September, 1999, the Hera area is a small village and there are not so many houses around the campus. It is recommended to have own security system and the windows of the workshop buildings have steel grills to prevent burglaries. Similar steel grills will be mounted to the windows of the rehabilitated workshop buildings and the computer room will be located on the first floor to facilitate the prevention of theft of the computer equipment.

2.2.1.5 Conditions of Local Construction Industry

(1) Use of Locally Available Materials

Construction materials imported mainly from Indonesia, Australia and Singapore are available in the local market while gravel and sand are locally produced. Durable and low maintenance materials will be selected from the locally available construction materials for the rehabilitation work.

(2) Recruitment of Skilled Technicians from Abroad and unskilled worker from Local workers

- 1) During the period of Indonesian rule, construction work was generally conducted by simple workers employed in East Timor and Indonesian skilled workers recruited in Surabaya and other areas. Even though rehabilitation work is in progress in Dili and other places, there is an acute shortage of local skilled technicians, making the recruitment of skilled technicians from Australia,

Malaysia and the Philippines, etc. necessary. The minimum required number of overseas skilled technicians will, therefore, be recruited.

- 2) To increase the employment opportunity for local workers, the consultant shall describe to minimize the use heavy equipment for demolishing existing Administration Building and most of the renovation works which are not affect the construction schedule shall employ the local workers in the general condition of contract.

- Objected renovation work : Canteen, Guard House
- Objected demolishing work : Existing Administration Building

(3) **Relevant Laws and Regulations Related to Rehabilitation Work, Including Building Permit**

Although the preparation of laws and regulations relating to buildings is currently in progress, there is no definite timetable for their enactment because of the fact that priority is given to dealing with the political agenda. Because of the absence of statutory regulations, it is unnecessary to apply for a building permit or to submit drawings, etc. However, because of the loss of the land register and other documents due to fire, clarification of the land ownership rights is essential. (Refer to Appendices) The draft building standards and code are based on the Australian standards and code while the standards for electrical installation are based on the relevant Indonesian standards. Accordingly, these standards and code will be used for the rehabilitation work. Disaster (fire) prevention equipment, which cannot be maintained because of the absence of a local agent, will not be selected for the Project.

(4) **Legal Disposal of Demolished Materials**

The UNTAET has decided that the demolished materials should be disposed of at Tibar, some 7 km west of Dili. This disposal site at Tibar has separate areas for asbestos and other materials. Asbestos must be packed into plastic bags at the demolition sites and must be buried underground at the disposal site as required by the regulations issued by the UNTAET. As the ceiling boards of the workshop buildings to be rehabilitated are asbestos cement boards, these boards containing carcinogenic substances will be removed and disposed of in accordance with the relevant regulations.

2.2.1.6 Local Construction Companies

The indigenous construction companies in East Timor are very small. The leading local construction companies are subsidiaries of Australian and Singaporean companies established after the withdrawal of Indonesian companies. Local companies are mainly involved in rehabilitation work using materials imported from Indonesia, Australia and Singapore. The rehabilitation work under the Project will, therefore, use materials which are familiar to local construction companies.

2.2.1.7 Operation and Management Capability of Project Implementation Body

(1) **Easy to Operate Facilities and Systems**

The present staff members of the Faculty of Engineering include those who acted as assistant

maintenance staff during the Poly-tech period. However, as they did not play a main role, the technical level of their maintenance work is not high and complicated operation and maintenance are beyond their ability. As such, the procurement priority for the Project will be given to the same building service systems as the existing systems and equipment which is easy to operate.

(2) Easy to Inspect and Repair Facilities and Systems

All of the facilities will use locally available materials to facilitate their easy repair. Because of the virtual absence of companies or agents capable of conducting repair work at the moment in East Timor, facilities and systems requiring professional maintenance skills will not be introduced. Training on operation, inspection and repair techniques will be planned prior to the handing over of the equipment and systems to the East Timor side.

2.2.1.8 Facility and Equipment Grades

(1) Facility Grades

Because of the Project's purpose of urgently rehabilitating destroyed facilities to create facilities to implement the new curricula, the grade of the facilities are decided based on the following principles.

- The grades of the existing facilities will be restored.
- Rehabilitation will be conducted using the same materials which were used for the existing facilities and which can be procured locally.
- If the same materials used for the existing buildings cannot be locally procured, similar materials that are locally available will be used.
- The same mechanical and electrical systems used by the existing facilities will be selected and the grade of the equipment will be the same as or similar to the grade of the equipment to be replaced.

2.2.1.9 Construction Method, Procurement Method and Construction Schedule

Given the scale of the facilities to be rehabilitated, the work is expected to be completed in approximately nine months using locally available materials. As equipment procurement and installation is judged to be feasible within the same period.