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**FEASIBILITY STUDY REPORT**  
**FOR**  
**EXPANSION PROJECT OF KYANGIN CEMENT MILL**  
**OF**  
**THE SOCIALIST REPUBLIC OF THE UNION OF BURMA**

July. 1979

**JAPAN INTERNATIONAL COOPERATION AGENCY**

**MPI**  
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## PREFACE

Upon the request from the Government of The Socialist Republic of The Union of Burma, The Japanese Government agreed to undertake the feasibility study for the expansion plan of Kyangin Cement Mill in Burma, and appointed Japan International Cooperation Agency to execute the said survey.

Japan International Cooperation Agency, in response to this appointment organized a survey team with six specialists as members headed by Mr. Yozō Matsura of Onda Engineering and Consulting Co., Ltd. The survey team was despatched to Burma for the period between 29th November and 27th December, 1978.

The survey team conducted investigation on the present situation of the existing facilities at Kyangin Cement Mill, field investigation of the expansion plan which was planned by the Burmese organizations, field survey of Htone Daung limestone quarry and the raw material produced in the area surrounding the Mill. The survey team also held discussion on the fundamental problems and policies of the present expansion plan with Burmese Ministry of No.1 Industry, Industrial Planning Department, Ceramic Industry Corporation and Construction Corporation.

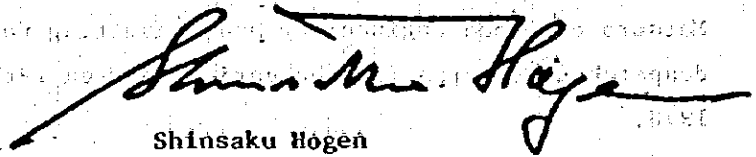
Upon returning to Japan, the survey team has completed the design work and prepared a summary report.

Contained in this report are the national development project of Burma and the forecast on the cement supply/demand. The report mainly discusses the study on the minable reserves of the limestone raw materials, measures against the rainy season, the basic plan of the expansion plan, rough estimation of the construction cost and economic evaluation of this project, and the notable point in execution of this project.

It is our earnest hope that this report would contribute to the economic development of Burma and to have a positive role in the development of the mutual friendship between The Socialist Republic of The Union of Burma and Japan.

I should like to express my deep appreciation to Burmese officials, the Japanese Embassy in Burma for their kind cooperation rendered to the survey team and congratulate the members of the survey team for their fine work.

Last but not least, I should also like to thank the Ministry of Foreign Affairs and the Ministry of International Trade and Industry who have offered us great support in the matters concerning the despatch of the survey team to Burma.



Shinsaku Hogen

President

Japan International Cooperation Agency

July, 1979

Mr. Shinsaku Hogen

President

Japan International Cooperation Agency

We have conducted the field survey of "the expansion project of Kyangin Cement Mill, the Socialist Republic of the Union of Burma" which we have been entrusted by Japan International Cooperation Agency. The survey was conducted during the period between 29th November, 1978 and 27th December, 1978. The results of the above survey was reported at the end of March, 1979.

Following the field survey, our research staff have been undertaking the study in Japan. I am pleased to inform you that the results of the study has now been completed.



Tadashi Matsumoto

Executive Vice President

Onoda Engineering and Consulting Co., Ltd.

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**Section Head (Accounting)**

**U Kyi Maung**

**Section Head (Quarry Extraction)**

**U Chan Nyein**

**Section Head (Quarry Equipment)**

**U Oo Myint**

**Mining Engineer**

**U Tha Htay**

**Mechanical Engineer**

**U Tin Htay**

**Section Head (Work shop, Transport)**

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**Mechanical Engineer**

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**U Thein Lwin**

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**Section Head (Railway)**

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**Metallurgical Engineer**

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**Mechanical Engineer**

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**Clerical Staff**

**Construction Corporation**

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**Managing Director**

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Account	Description	Amount
1000	...	...
1001	...	...
1002	...	...
1003	...	...
1004	...	...
1005	...	...
1006	...	...
1007	...	...
1008	...	...
1009	...	...
1010	...	...
1011	...	...
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Account	Description	Amount
1021	...	...
1022	...	...
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1024	...	...
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1038	...	...
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## INTRODUCTION

The initial boost of the economic development in The Socialist Republic of The Union of Burma was brought about by the success of the Second 4-year project. Following this success, Burma is now attempting to convert herself into an industrial country on the base of agriculture with the execution of the Third 4-year project. It is considered, however, that the production capacity of the existing cement mills in Burma will not be sufficient to supply the required quantity of cement which is the basic material to execute these projects smoothly.

With the above situation in the background, the expansion plan for Kyangin Cement Mill chosen from the existing mills has been under examination in Burma. On the basis of the results of this examination, the Burmese Government requested The Japanese Government to undertake an investigation in relation to the expansion plan of Kyangin Cement Mill. Upon this request, The Japan International Cooperation Agency (JICA) prepared a detailed investigation plan, and conducted the said investigation as a part of technical cooperation of Japan to overseas countries.

The purpose of this investigation was to examine the economic & technical factors in relation to the expansion of the mill facilities, quarry facilities and other related facilities of Kyangin Cement Mill which is planned to be equipped with the production facilities which are capable of the daily production of 800 tons on completion of the expansion plan, and to provide adequate proposal.

Field investigation started with the departure of the survey team on 29th November, 1978. Greatly helped by the kind cooperation of the Burmese Industrial Planning Department, Ceramic Industry Corporation and the staff of Kyangin Cement Mill, the investigation progressed smoothly throughout the entire period and concluded on 27th December, 1978.

Upon the return of the survey team to Japan, the results of the field investigation were sorted and analyzed, and the sample collected in Burma were tested. The Post-investigation included designing of the quarry. This report containing the Summary of the results of the above work was completed on July, 1979.

The outline of the investigation is described in the following.

**1. Summary of Present situation of the cement industry and cement supply/demand in Burma.**

**1-1 Trend in the supply/demand of cement**

**1-2 Forecast of the future market trend**

**2. Investigation in relation to the expansion of Kyangin Cement Mill**

**2-1 Present situation of the existing facilities**

**2-2 Investigation in relation to the raw materials**

**2-3 Preparation of the basic plan for the improvement of the facilities and additional installation**

**3. Investigation in relation to the infrastructures which require re-arrangement**

**4. Study of the utility**

**5. Study of the economic factors**

**5-1 Estimation of the construction cost**

**5-2 Study of the profitability**

**6. Presumed contribution offered by this development project**

## CHAPTER 1 OUTLINE

### 1-1 Premises

This report has been prepared on the basis of the following premises.

#### 1-1-1 Production capacity and the installed capacity of the facilities to be additionally installed

The following fundamental conditions were determined through the discussion held with Industrial Planning Department (IPD) and Ceramic Industry Corporation (CIC) during the field investigation, in relation to the production capacity and the installed capacity of the facilities to be additionally installed.

(1) Daily production capacity of the facility to be additionally installed shall be 800 t/day. Additional installation of 2 units of facility having the capacity of 400 t/day each was already studied at the time of installation of the existing facility. The site, therefore, has already been planned and readjusted and stands available.

(2) The maximum capacity of the unloading facility of Rangoon Port is 40 tons, however, limited capacity in normal practical operation is approximately 30 tons. In consideration of this factor, the facility with the production capacity of 400 t/day is estimated to be the maximum size possible.

Note: In case of the facility having the production capacity of 800 t/day, the unit weight will exceed 60 t.

(3) The existing facilities include 3 units of kilns of a same type having the capacity of 400 t/day each, one unit at Thayet Mill and 2 units at Kyangin Mill.

For this reason, it is considered to be advantageous, in view of interchangeability of the spare parts, to install 2 units manufactured on the specification same as the above 3 units.

(4) The construction period will be shorter, and the training of the operators will be easier, if the machineries and the production system same as that of the existing facilities (wet long kiln) are employed.

For the above reason, the installed capacity shall be two(2) units of 400 t/day wet long kilns.

## 1-1-2 Raw Materials

Principal raw materials being used in the existing facilities shall be used for the additionally installed facilities.

### (1) Limestone

Htone Daung Quarry limestone

Boring investigation was conducted by Burmese party. We have confirmed the reserves through the field investigation, and inspected the said report and the quality of the limestone.

### (2) Clay

Clay extracted from the hill near the Mill.

### (3) Siliceous Materials

Silica sand collected from River Irrawaddy. It is to be used only when the use of this material is called for by the material mixing calculation.

### (4) Iron material (Laterite)

Than Taung laterite

### (5) Gypsum

Hsipaw gypsum

Field investigation was not conducted for item (5).

## 1-1-3 Utility

### (1) Electric power

As in the case of the existing facilities, electric power is to be supplied from the gas turbine power station of Electric Power Corporation (EPC) at Myanaung.

### (2) Natural gas

As in the case of the existing facilities, natural gas is to be supplied from Shwe Pyi Tha gas field of Miyama Oil Corporation (MOC) by the exclusive gas pipe line.

### (3) Water

As in the case of the existing facilities, surface water of River Irrawaddy will be used.

## 1-1-4 Infra-structure

### (1) Roads

All-weather type paved road is available between the loading facility on

the bank of River Iwarraddy and the mill site. This road will be used for the transportation of the facilities to be newly installed.

**(2) Communication facility**

The means of communication with Rangoon currently available are exclusive teletype circuit and radio telephone. Public telephone circuit has not yet been provided. However, microwave circuit is being constructed at present, therefore, the level of communication is expected to be greatly improved when this circuit is completed.

**1-1-5 Basic Data for the Profit Calculation**

**General Conditions**

**(1) Foreign currency exchange rate**

1 US\$ = 6.4 KS

1 US\$ = ¥200

Note: KS: Burmese currency (Kyat)

**(2) Depreciation**

(i) Residual value 10%

(ii) Durable years

Building and structure .....	40 years	2.5%/year
Machinery and electrical equipment .....	20 years	5%/year
Heavy machine for quarry .....	5 years	20%/year

**(3) Financial source**

**(i) Fund for the facilities**

Loan ..... 51.5%

Owned capital ..... 48.5% (Invested by the Burmese Government)

**(ii) Working capital**

Owned capital ..... 100% (Invested by the Burmese Government)

**(4) Interest**

Table 1-1-1

Interest	7%/year	3%/year	2.75%/year
Repayment period	20 years	25 years	30 years
Grace period	7 years	7 years	10 years

(5) Price and unit price  
With December 1978 set as the reference point, no escalation in prices shall be considered.

(6) Tax  
Goods and services tax  
Ex-Mill price x 0.25

(7) Ex-Mill price of cement  
410 K\$/t. cement

(8) Operation rate of the Mill  
80% of the rated plant capacity, that is:

$$\begin{aligned} 800\text{t/d} \times 300\text{d} \times 0.8 &= 192,000\text{t (clinker)} \\ &= 200,640\text{t (cement)} \end{aligned}$$

#### 1-1-6 Relationships between the Existing Facilities and the Additional Facilities to be installed

- (1) Rehabilitation works on the existing facilities currently being planned by the Burmese party shall be finished by the time this project is completed.
- (2) The limestone stockyard with the capacity of 200,000t is designed with the allowance for the limestones required for existing facilities, however, the construction cost has been calculated as the capacity for the additional installation in calculation of profitability.
- (3) The report was made on the presumption that the construction of a paper bag manufacturing plant is to be planned by the Burmese party separately.

#### 1-2 Summary

##### 1-2-1 Existing cement mills in Burma

- (1) Burma has two cement mills at present, Thayet Mill and Kyangin Mill with the total nominal production capacity of 440,000t annually.
- (2) Thayet Mill was established in 1937, and its annual production capacity was 60,000 tons initially. The Mill was nationalized in 1954, and was expanded thereafter to the current production capacity of approximately 240,000 tons annually.
- (3) The construction of Kyangin Mill started in 1971, and was completed in 1976. The annual production capacity of this Mill is approximately 200,000 tons.

(4) Kyangin Mill is located on the west side River Irrawaddy, approximately 240km north of Rangoon.

(5) Thayet Mill is located approximately 100km north of Kyangin Mill.

#### 1-2-2 Outline of the Existing Facilities at Kyangin Mill

##### (1) Htone Daung Quarry

Htone Daung quarry is located approximately 8.4km south of the Mill.

Transportation between the Mill and the quarry is done by an exclusive single line railway. The quality of the limestones produced here is suitable for the wet process.

Climate characteristic in Burma is that the year is clearly divided into the rainy season and the dry season. The rainy season generally covers the six months from May to October. The strongly adhesive nature of the Htone Daung limestone becomes particularly so in the rainy season. Due to this property, limestones adhere on various transport facilities from face at the quarry, primary crushing, storage bin, loading to unloading facilities, resulting in the radical reduction in the quantity delivered. In the rainy season the limestone output is reduced to almost half of the output in the dry season. This is the root of the problem in the present situation; ie. reduced cement production due to insufficient supply of limestone.

##### (2) Other raw materials

Other raw materials required include clay, laterite and gypsum. The available quantities are quite sufficient in the present situation.

##### (3) Mill facilities

Equipped with two(2) units of long kiln with the capacity of 400t/day each for wet process totaling to production capacity of 800 tons/day. As for the fuel, natural gas supplied from the gas field approximately 20km east of the mill is used.

Electricity is supplied from the gas turbine power station adjacent to the above gas field.

Surface water of River Irrawaddy is pumped up near the cement shipping facility which is installed on the bank of River Irrawaddy and supplied to the mill by the pipeline approximately 10km in length.

Currently, all the cement is shipped packed in paper bags. It is packed at the plant and transported to the shipping facility on the bank of River Irrawaddy by an exclusive railway.

There is no significant problem observed in the cement manufacturing facility. However, there is deficit in the loading capacity which utilizes manpower. This manual loading capacity can not cope with the capacity of the packer, causing the poor delivery efficiency.

**(4) Foreshore shipping facility**

Most of the shipping of bagged cement is undertaken by the boats travelling River Irrawaddy, but part of it is transported by the trains of the Burmese National Railway on the line available between Kyangin and Bassein.

Foreshore shipping facility for the loading onto the boats are available on the riverbank of River Irrawaddy at the site approximately 10km north-east of the Mill. The bagged cement delivered from the Mill by the railway is unloaded by manpower, and then loaded onto the boats by the belt conveyor system directly connected to the ship loading facilities. This facilities also include the warehouses for temporary storage of cement while boats are being shifted.

**1-2-3 Demands for cement**

Burmese economy is still in the undeveloped stage. Reflecting this economic factor, the cement consumption is extremely low at approximately 7kg per capita.

Nevertheless, as Burma seemed to have reached the start line of the economic development with the successful Second 4-year-project, and if the Third 4-year project and other projects following this are to progress satisfactorily, the cement consumption is expected to grow as such successful projects will bring the potential and substitute demands out into the light.

**1-2-4 Raw Material**

**(1) Limestone**

Limestone produced at Htone Daung Quarry is suitable for the wet process as they contain 75 ~ 98% CaCO<sub>3</sub> which is the main component, and also the contents of harmful component is less than the allowable limit.

The quantity of minable reserves of this quarry is approximately 30 million tons which would last approximately 40 years at the production capacity of 1,600 t/day (clinker basis) after expansion.

Limestone is excavated by drilling and blasting, then after going through the secondary blasting and primary crushing process, part of it



will be stored in outdoor stockyard (capacity: 100,000t) as a compensation for the rainy season, and the rest will be temporarily stored in ore bin and transported to the Mill by railway.

At the Mill, after the secondary crushing, part of the limestone will be stored in the roofed stockyard (capacity: 100,000t) for use in the rainy season and the rest will be placed at the material stockyard.

**(2) Clay**

Clay shall be quarried from the clay deposit near the Mill.

The method employed shall be bench-cut method. Clay will be excavated and loaded by dozer/shovel and transported by dumptrucks to the stockyard at the Mill. The minable quantity is considered to be practically limitless.

**(3) Siliceous material**

Will be used as a corrective agent in the material mixing. Result so far shows that this material has hardly been used in the past.

**(4) Laterite**

Shall be obtained from Than Taung quarry (procured ore).

The minable quantity is considered to be practically limitless.

**(5) Gypsum**

Hsipaw gypsum will be used (procured ore).

Though the field investigation was not conducted, sufficient amount can be provided according to the explanation offered by the Burmese party.

**1-2-5 Outline of the Expansion Project**

**(1) Limestone quarry**

In order to compensate the decrease in limestone output in the rainy season with the increased output in the dry season, quarry faces shall be expanded and heavy machines for the quarry shall be purchased.

Approximately 3,500 t/day limestone output shall be required in the dry season.

The additional primary crusher, ore bin, as well as outdoor stockyard (capacity: 100,000t) shall be provided to store about 650 t/day of limestones out of daily output of 3,500 t/day. The remaining 2,850 t/day of limestones shall be transported to the Mill by the railway.

The limestone output in the rainy season is expected to be approximately 1000t/day. The limestones of approximately 100,000t stored in the

outdoor stockyard will be mixed at a rate of 650 t/day to make up a total delivery of 1,650 t/day to be transported to the Mill by the train.

**(2) Limestone receiving facilities**

As well as additional installation of receiving hopper for the train and secondary crusher, roofed stockyard for limestones (capacity: 100,000t) shall be installed. In the dry season, approximately 650 tons out of 2,850 tons daily transported to the Mill shall be stored in the roofed stockyard, and the rest of 2,200 tons limestones, shall be sent to the kiln.

In the rainy season, 100,000 tons of limestones which are stored in the roofed stockyard will be added at a rate of 650 t/day to 1,650 tons of limestones which arrive at the Mill daily to make up a total of 2,300 t/day to be sent to the kiln.

**(3) Cement manufacturing facilities**

As there is no particular problem with the existing cement manufacturing facilities, the additional facilities to be installed will be of exactly the same specification as the existing facilities with due consideration given to interchangeability of the parts and easiness of operation. The capacity of the additional installation shall be 2 units of 400 t/day each.

**(4) Cement shipping facilities**

**(i) Shipping facilities at the Mill**

The transportation between the Mill and the foreshore shipping facilities on the bank of River Irrawaddy currently employs the railway transport. The efficiency is unsatisfactory as the packer capacity and the loading capacity which utilizes manpower are not well balanced. For this reason, in addition to the installation of 2 more packers, loading to the two wagons from one unit of packer shall be planned.

**(ii) Foreshore shipping facilities**

Two units of loading facilities for loading onto the ship are currently available. As well as the additional installation of another unit, warehouse will be installed for the temporary storage of the bagged cement.

1-2-6 Study of the Profitability

(1) Construction cost

Table 1-2-1 x 10<sup>3</sup> KS

	Foreign currency portion	Domestic currency portion	Total
Quarry roads, etc.	-	1,700	1,700
Civil construction cost	34,000	116,600	150,600
Facility cost	233,000	102,000	335,000
Detail: Machinery & equipment	(203,000)	(89,000)	(292,000)
Heavy machines	(30,000)	(13,000)	(43,000)
Erection cost	7,000	4,000	11,000
Construction expenses	-	1,700	1,700
<b>Total</b>	<b>274,000</b>	<b>226,000</b>	<b>500,000</b>
Construction interest	-	24,660	24,660
Working capital	-	7,300	7,300
<b>Grand total</b>	<b>274,000</b>	<b>257,960</b>	<b>531,960</b>
Grand total 10 <sup>3</sup> US\$	≈42,810	≈40,310	≈83,120
Grand total 10 <sup>3</sup> YEN	≈8,562,000	≈8,062,000	≈16,624,000

Note: 1. At the loan interest of 3%/year.

2. Foreign exchange rate

1 US\$ = 6.4 KS

1 US\$ = 200 Yen

(2) Divisional construction cost

Table 1-2-2

Division	Foreign currency portion	Domestic currency portion	Total
Quarry	30,000	13,000	43,000
Primary crushing	31,500	32,500	64,000
Raw material receiving	17,500	20,500	38,000
Raw material grinding	28,000	20,500	48,500
Kiln cooler	51,500	40,000	91,500
Cement grinding	27,000	26,500	53,500
Packing & shipping	7,500	8,000	15,500
Foreshore shipping	13,500	14,500	28,000
Industrial water	12,500	10,000	22,500
Electricity	31,500	30,300	61,800
Laboratory equipment, etc.	3,000	1,300	4,300
Miscellaneous	4,000	1,700	5,700
Spare parts	16,500	7,200	23,700
<b>Total</b>	<b>274,000</b>	<b>226,000</b>	<b>500,000</b>

(3) Production cost

Table 1-2-3

(Interest 3%/year)

	10 <sup>3</sup> K\$/year	K\$/t-cement
<b>Direct cost</b>		
Raw material	3,683	18.35
Natural gas	1,463	7.29
Diesel oil	1,060	5.28
Fire bricks	1,069	5.33
Grinding media	726	3.62
Lubricants	175	0.87
Electricity	4,243	21.15
Repair cost	975	4.86
Paper bag	12,038	60.00
<b>Total of direct cost</b>	<b>25,432</b>	<b>126.75</b>

(To be continued)

	10 <sup>3</sup> KS/year	KS/t. cement
<b>Fixed cost</b>		
Labour cost	1,148	5.72
Depreciation	24,916	124.18
Interest	8,220	40.97
General expenses	1,705	8.49
<b>Total of fixed cost</b>	<b>35,989</b>	<b>179.37</b>
<b>Total of production cost</b>	<b>61,421</b>	<b>306.12</b>

(4) Profitability

Profitability in the following cases have been studied.

Table 1-2-4

Case No.	Operation rate %	Ex-Mill price	Loan condition
1	80	410 KS	Annual interest 3%, 7-year grace period, repayable in 25 years.
2	80	450	As above
3	80	370	As above
4	90	410	As above
5	80	410	Annual interest 2.75%, 10-year grace period, repayable in 30 years.
6	80	450	As above
7	80	370	As above
8	80	410	Annual interest 7%, 7-year grace period, repayable in 20 years.
9	80	450	As above
10	90	410	As above

Economic index (Table 1-2-6) obtained from break-even-point (Table 1-2-5) and DCF analysis etc. are studied and the profitability of this project is described below.

In the case of state-owned cement mill as this project, excessive profitability is not demanded, though deficit operation is not desirable of course from the point of national policy. The profitability studied from this point of view is as described in the following.

- (i) At the interest on the loan of 7%/year which is regarded to be the ordinary commercial rate, the profitability is deteriorated. However, profitability can be recognized at a lower interest on the loan.
- (ii) Break-even point is recognized to be satisfactory with the exception of case No. 3, 7, 8 and 10.
- (iii) As for the economic index, the profitability is recognized with the exception of case No. 3, 7, 8, 9 and 10.
- (iv) The profitability can be much improved by the increase of the operation rate as shown in case No. 4 and 10.

Table 1-2-5 Break-even point (in %)

Case No.	Year	Break-even point		Cash break-even point	
		Operation rate 80%	Ratio to the rated plant capacity	Operation rate 80%	Ratio to the rated plant capacity
1	4	89.1	71.3	27.4	21.9
	20	71.0	56.8	9.3	7.5
2	4	76.9	61.5	23.7	18.9
	20	61.3	49.0	8.0	6.4
3	4	106.0	84.8	29.9	23.9
	20	84.5	67.6	11.1	8.9
4	4	79.2 (90%)	71.3	24.4 (90%)	22.0
	20	63.1 (90%)	56.8	8.3 (90%)	7.5
5	4	87.4	69.9	25.7	20.6
	20	75.3	60.2	13.6	10.9
6	4	75.4	60.3	22.2	17.8
	20	65.0	52.0	11.7	9.4
7	4	104.0	83.2	30.6	24.5
	20	89.5	71.6	16.2	12.9
8	4	116.9	93.4	55.1	44.1
	20	68.8	55.0	7.1	5.7
9	4	100.8	80.7	47.6	38.1
	20	59.3	47.5	6.1	4.9
10	4	103.9 (90%)	93.5	49.0 (90%)	44.1
	20	61.1 (90%)	55.0	6.3 (90%)	5.7

Table 1-2-6 Economic Index

Case No.	Average Profit ratio of the investment (%)	Average Profit ratio of the sales (%)	Payout (year)	IRR	
				To Burmese investment (%)	To Construction cost (%)
1	1.6	11.9	15.2	3.5	2.8
2	2.9	19.7	13.1	6.7	4.5
3	0.3	2.4	18.1	-	1.0
4	2.6	17.4	13.5	6.0	4.1
5	1.4	10.6	15.5	5.4	2.9
6	2.7	18.6	13.0	8.5	4.6
7	0.2	1.7	18.0	1.6	1.0
8	0.8	6.0	16.1	-	2.2
9	2.1	14.4	13.8	1.8	3.8
10	1.8	12.2	14.3	1.2	3.5

1-2-7 Economic evaluation (forecast of the contribution to the development)

The influence of this project on the outside economy, in other words, the evaluation of the project from the view point of the economy of the nation or the regional economy shall be described in the following.

The evaluation of this project from the viewpoint of profitability and payability shall be omitted as it is described in the preceding section 1-2-6.

(1) Saving of the foreign currency

Supposing the total amount of the cement to be produced in this project were to be supplied through importation, the amount would be approximately  $65,000 \times 10^3$  KS per year. Even if the purchase costs of spare parts to be imported after completion of the project are taken into consideration, foreign currency equivalent to approximately  $46,500 \times 10^3$  KS/year would be saved.

(2) Domestic supply of the development material

As the development material, cement is to be domestically supplied, the supply to the Construction Corporation and other consumers will be secured. This would mean the direct contribution to the development of infrastructure.

(3) Promotion of employment

The execution of this project will offer an opportunity of employment

to approximately 655 persons. This in other words means that a total of approximately 2,600 persons including the families of new employees will be influenced by this opportunity.

In addition to the above, opportunity for employment which would be created in related industries under the indirect influence of this project is considered to be not too slight at all.

**(4) Regional development**

Eastern region of Burma on the east side of River Irrawaddy has been developed in the past. It is expected that the execution of this project will contribute to the development of the western region.

**(5) Improvement of the industrial technology**

Improvement in the industrial technology is well expected through execution of this project.

**(6) Effective utilization of the underground resources**

Underground resources in the vicinity of Htone Daung quarry and the Mill will be effectively utilized.

**(7) Contribution to the national economy**

Execution of this project will contribute to the national economy, which will be brought about by profit, salary and goods and services tax. The contribution is estimated to be approximately  $22,000 \times 10^3$  KS annually.

**1-2-8 Conclusion**

In general reflection of the above study, the expansion project of Kyangin Mill is feasible both economically and technically, and the effect on the economical development of Burma is evaluated to be very high.

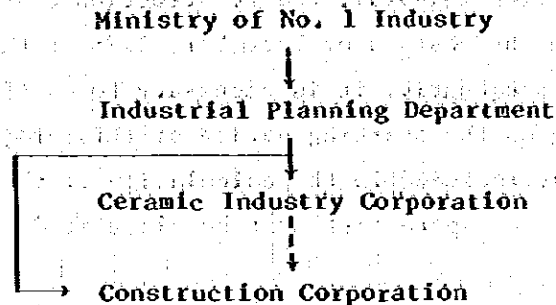
**1-3 Problems and Suggestions for Execution of the Expansion Project**

- (1)** It is essential for a project such as this project which requires an enormous investment to acquire financial aids from foreign countries or an international financial organization. On the other hand, it is also essential that a part of such investment should be owned capital. In the present study on this project, such owned capital is presumably invested by the Burmese Government. This report is made on the basis that, of the required investment, 51.1% is to be acquired from foreign aids and the rest 48.5% is to be invested by the Burmese Government. As the interest on loans holds considerably high share in this project,



It is desirable to have lower interest rate on the loans from overseas and the longer term of repayment.

(2) Burmese administrative organizations responsible for this project as listed below:



The roles of the above department and corporations are:

- (i) Industrial Planning Department (IPD)
  - a) Preparation/Planning of this project
  - b) Determination of the scope of the project
  - c) Planning of the execution schedule
  - d) Execution of the feasibility study
  - e) Negotiation for the contract agreement
  - f) Provides the consultation services and the coordinating services with the other governmental agencies for the smooth execution of this project.
- (ii) Ceramic Industry Corporation
  - a) Contract with the machinery and equipment supplier
  - b) Execution of all the construction works excluding civil work
- (iii) Construction Corporation
  - a) Execution of civil work

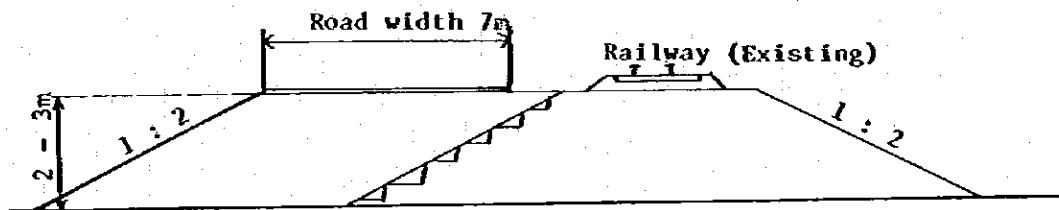
This means all the construction works are planned to be undertaken by the Burmese Corporations under the supervision of the machinery and equipment supplier. As this project is an expansion project with the additional installation of the specification same as that of the existing facilities, smooth and satisfactory execution of the construction work supported by the accumulated technology acquired through the previous project, can well be expected. As for the operation of the cement mill, the production capacity is set at 80% of the installed capacity. Considering that the increase in the operation rate will

greatly improve the economical aspect of the project it is well recommended to operate the Mill under the guidance of internationally trusted consultants for a certain period after the start of operation to achieve an improved operation rate.

- (3) As described in item 1-1-5(5), the construction cost is calculated in this report with the cost as of December, 1978 as the reference in calculation. Consequently, it is necessary to consider the rise in the prices depending on the starting period of this project. Although the spare cost is not included in the calculation of the profit, approximately 3 ~ 5% of the spare cost must be calculated in actual execution of this project.
- (4) Fixture of the extension building and the existing building  
When building an extension to the raw material and clinker stockyard, raw grinding mill and cement mill room where the vibration is liable to occur, if recognizable vibration exists at the end of the building to which reinforced concrete building is to be extended, it is necessary to temporarily suspend the operation in the existing building.
- (5) Pre-investigation of the underground obstacles  
In order to carry out the construction work safely and smoothly, it is important to investigate beforehand the existence and location of the water supply pipes, cables and other obstacles under the site for the extension building, and prepare necessary countermeasure.
- (6) Topographical Survey  
It is necessary to conduct topographical survey in the area from the site for the additional primary crusher at the limestone quarry to the existing ore bin.
- (7) Roads  
Due to the absence of the access road between the Mill and the limestone quarry, the personnel and the equipment for the quarry are transported by the railway normally used for the limestone transportation. The working hours of the quarry personnel is 8 hr/day for quarrying (1 shift) and 24 hr/day (3 shifts) for crushing and loading. The system equivalent to the current system will be required after the additional installation.  
The problems assumable to be caused due to the absence of the access road are as described in the following:

- (i) Efficiency of limestone quarrying may deteriorate if the train schedule becomes irregular causing the delay in the arrival of the personnel.
- (ii) The quantity of the limestone delivery will be reduced if the transport train schedule becomes irregular due to the loading/unloading of the equipment and the personnel.
- (iii) Urgent transport of the personnel and equipment is highly difficult. However, it can be expected that the above problems will be mostly eliminated by operating extra locomotives and wagons after the expansion project is completed. For this reason, the access road is not an absolute requirement for this project for the time being. However, from the view point of safety, smooth quarrying and transport of the limestone, and improved traffic condition for the regional residents, construction of the access road along the existing railway route is desirable. The reason for suggesting the access road to be along the existing railway is described below: The river bridges (5 places with the bridge length over 12m) and bridges over ditch (11 points) and other infrastructures have been almost completed along the existing railway for the possible double tracking of the railway. However, double tracking will not be required even after the expansion of the Mill. Therefore, it is possible, and economical to use these infrastructures for the road. The height of the road should be levelled to the base surface of the existing railway in view of the natural conditions in the rainy season. Average height of the bank is estimated to be 2 ~ 3m (distance approximately 8.5km). If the bank is built connected to the bank of the railway, it will be effective also for the prevention of the sinking of the railroad ground.

Fig. 1-3-1

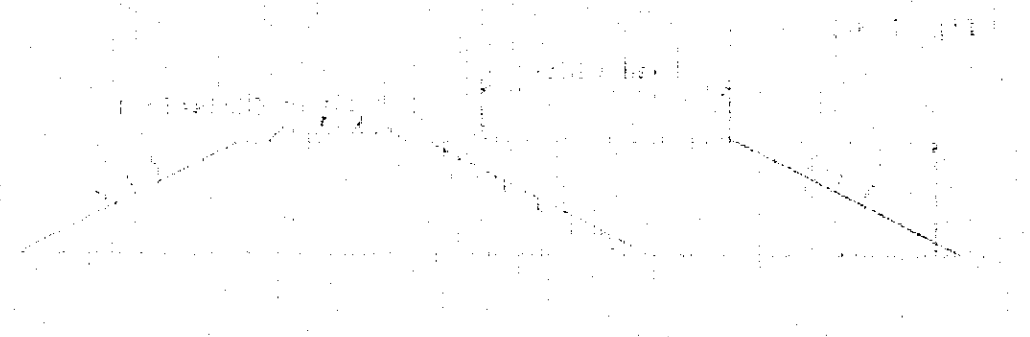


**(8) Water**

Water is currently supplied from River Irrawaddy approximately 10km (6.4 miles) east of the Mill. According to the data supplied by Burmese office, the mud concentration is 1,000 p.p.m. It is anticipated that more sand/soil will flow in the rainy season.

Currently water is transported directly from the pump to the reservoir at the Mill. The high mud content, however, is feared to cause various troubles including abrasion or clogging of the piping and the pump.

For this reason, it is desirable to provide sand sedimentation reservoir near the pump station, and install the sending pump at the outlet of the reservoir.



CHAPTER 2. NATURAL CONDITIONS IN KYANGIN DISTRICT AND  
THE NATIONAL DEVELOPMENT PROJECT OF BURMA

2-1 Location of Kyangin Cement Mill

Kyangin is situated approximately 240km (150 miles) north of Rangoon, on the west side of River Irrawaddy. Kyangin Cement Mill is situated approximately 10km (6.4 miles) west from the riverside of the Irrawaddy. The altitude of the mill site is approximately 30.5m (100 feet). The limestone quarry is located approximately 8.4km (5.3 miles) south of the mill site (See DWG. No. C-2).

2-2 Natural Conditions

2-2-1 Climate

(1) Temperature, humidity, rainfall, etc.

Table 2-2-1 shows the yearly average data for the last 10 years (1968-1977).

Table 2-2-1

Year	Temperature (°F)	Relative humidity at 9:30 B.S.T.	Rainfall (inches)	No. of rainy days (day/year)	No. of days with thunder (day/year)
1968	79.84	79.90	7.87	111	20
1969	80.73	80.10	8.07	101	17
1970	73.85	79.75	7.06	111	11
1971	73.92	81.66	8.02	119	1
1972	80.73	82.08	6.08	103	8
1973	79.93	81.91	7.91	128	4
1974	79.25	74.41	7.29	119	12
1975	79.53	79.25	7.27	118	-
1976	79.72	81.58	7.22	113	13
1977	79.97	83.16	6.60	115	8

(2) Table 2-2-2 shows the data on temperature, relative humidity and rainfall classified by month.

Table 2-2-2

Month	Monthly average of the max. daily temperature (°F)	Monthly average of the min. daily temperature (°F)	Monthly average of the temperature (°F)	Relative humidity	Rainfall (inches)	No. of rainy days (day/month)
1	89.0	65.7	84.2	59	0.03	0.1
2	94.3	61.4	77.9	59	0.06	0.1
3	100.8	67.5	84.0	45	0.11	0.1
4	103.1	74.5	88.8	49	0.63	0.9
5	97.1	77.7	87.5	66	6.04	8.8
6	88.5	76.6	82.6	84	12.16	17.5
7	86.6	76.2	81.4	86	12.07	19.2
8	86.8	75.6	81.2	87	10.45	17.5
9	88.3	75.5	81.1	86	8.47	13.8
10	89.6	74.3	82.0	84	5.04	7.0
11	87.7	69.6	78.7	75	2.14	2.6
12	85.9	62.2	74.1	67	0.41	0.5

(3) Table 2-2-3 shows the wind velocity and its direction.

Table 2-2-3

Year/Month	Observation time	Wind velocity (mile/h)	Direction. (Observation days/month)						
			NE	S	SW	W	N	NW	Calm (days/month)
1977, 1	9:30	1.4					9		22
	18:30	0.1							31
2	9:30	1.2		2		5			21
	18:30	0		-		-			28
3	9:30	0		-					31
	18:30	0.6		1		3			27
4	9:30	0.2	1						29
	18:30	2.1		5	4	4	1	1	15
5	9:30	0.4		1		1			29
	18:30	0.7				4			27
6	9:30	1.1		7					23
	18:30	0.4		3					27
7	9:30	1.4		7	1				23
	18:30	0.2		1					30
8	9:30	0.7		5					26
	18:30	0.1		1					30
9	9:30	0.0							30
	18:30	0.0							30
10	9:30	1.0	2			3			26
	18:30	0.4				2			29
11	9:30	1.3				7			23
	18:30	0.0							30
12	9:30	0.6				3			28
	18:30	0.0							31

(4) Records of minimum and maximum figures

(i) Temperature

Maximum ..... 107.6(°F) [42(°C)]

Minimum ..... 41.3(°F) [5.1(°C)]

(ii) Relative humidity

Maximum ..... 92%

Minimum ..... 46%

(iii) Rainfall

- 10 minutes ..... 15 mm
- 30 minutes ..... 30 mm
- 60 minutes ..... 50 mm

(iv) Wind velocity

- Strong wind ..... 40 ~ 60 miles/hr (17.8 ~ 26.8 m/sec.)
- Storm ..... 70 miles/hr (31.3 m/sec.)

(v) Record of the river floods

	Prome Station	Kyangin Station	Henzada Station
a) Maximum high level (cm)	3025	2342	1446
b) Minimum low level (cm)	1631	1048	212
(Difference)	(1394)	(1294)	(1234)
c) River			

Table 2-2-4 shows the maximum and minimum water levels of River Iwarraddy in Kyangin area in the last 10 years.

Table 2-2-4

Year	Maximum water level			Minimum water level			Difference m
	ft	m	Month	ft	m	Month	
1968	73.75	22.48	July	38.25	11.65	March	10.83
1969	71.10	21.67	July	36.10	11.00	March	10.67
1970	73.60	22.43	Aug.	35.80	10.91	Feb.	11.52
1971	75.45	23.00	Sept.	36.50	11.12	April	11.88
1972	71.00	21.64	Aug.	36.50	11.12	March	10.52
1973	75.30	22.95	Aug.	34.40	10.48	April	12.47
1974	76.85	23.42	Aug.	35.50	10.82	March	12.60
1975	71.30	21.73	Aug.	35.10	10.70	April	11.03
1976	75.90	23.13	July	36.75	11.20	Feb.	11.93
1977	75.20	22.92	Sept.	36.50	11.12	March	11.80

(5) Earthquake

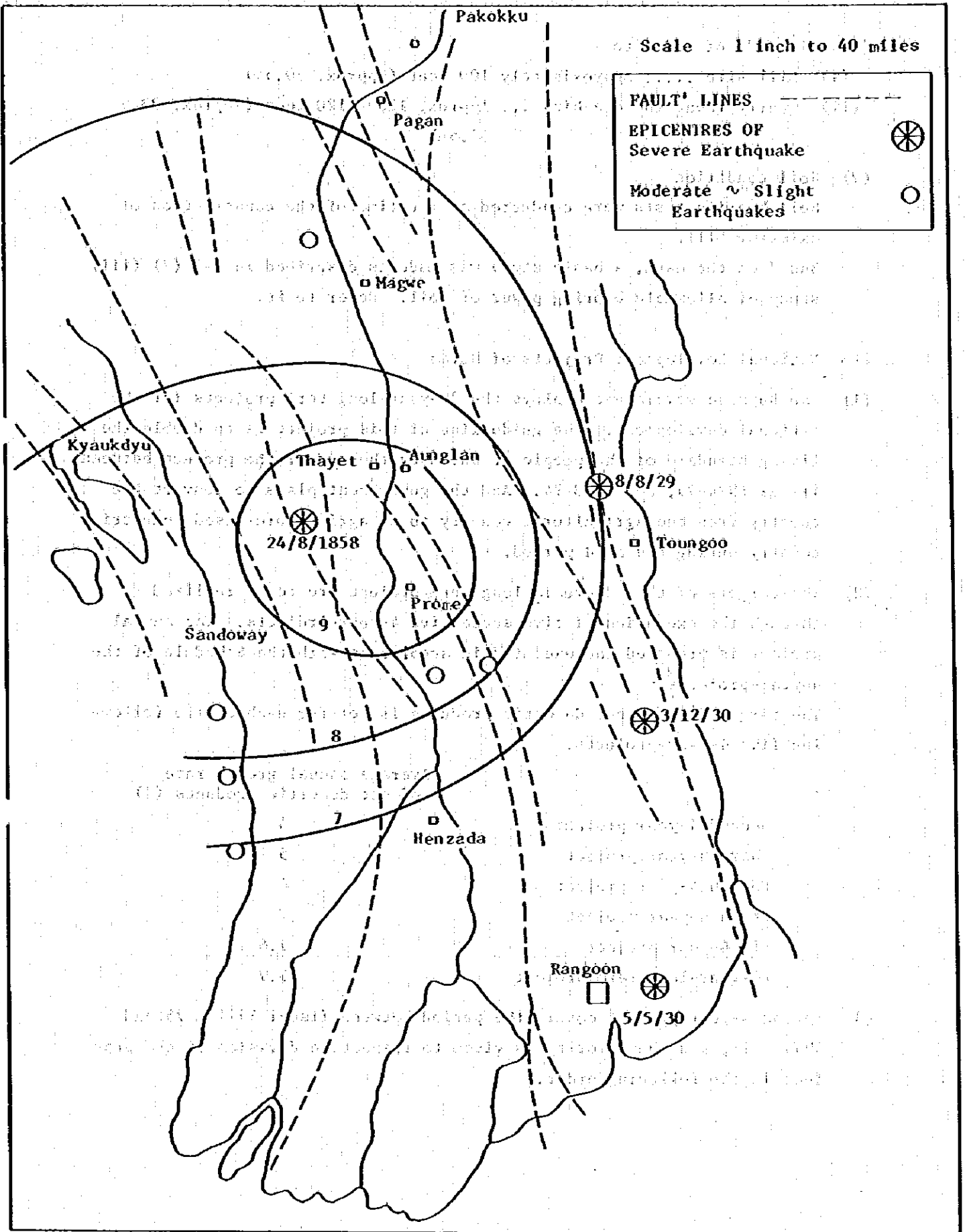
Record of earthquakes in the past in Kyangin

- o Magnitude ..... 8 (in accordance with N.H. seismic intensity scale)  
According to the Japanese seismic intensity scale,  
this corresponds to intensity scale 5.
- o Record ..... 24/August, 1858

Fig. 2-2-5 shows the isoseismic lines of the earthquake occurred on 24th August, 1858 in Central Burma.



Fig. 2-2-5 Isoseismic lines of the 24th August 1858 earthquake of Central Burma



(6) Altitude of the site

(i) Mill site . . . . . Approximately 100 feet (approx. 30.5m)

(ii) Quarry (near the ore bin) . . . . . Approx. 110 ~ 120 feet (approx. 33.5  
36.5m)

(7) Soil condition

Soil bearing tests were conducted at the time of the construction of existing Mill.

Based on the data, a basic study was made as described in 7-3 (2) (iii) study of allowable bearing power of soil. Refer to it.

2-3 National Development Projects of Burma

(1) The Burmese government employs the 20-year-long term projects for the national development. The guide line of this project is to double the living standard of the people of Burma by the end of the project between fiscal 1974-75, and 1993-94. And the government plans to convert the country from the agricultural country to an agriculture-based industrial country during the said period.

(2) The targets of this 20-years-long term project are to be realized through the execution of five successive 4-year-projects. The annual project is prepared and executed in accordance with the Schedule of the 4-year-projects.

The target for the net domestic products is set for each of the following five 4-year-projects.

	Average annual growth rate of net domestic products (%)
Second 4-year project	4
Third 4-year project	5
Fourth 4-year project	6
Fifth 4-year project	7
Six 4-year project	7.6
<hr/>	
20-year-long term project	5.9

(3) Second 4-year project covers the period between fiscal 1974 - 75 and 1977 - 78, and the priority is given to respective division of the project in the following order.

Priority order in the project	Divisions
1	Agriculture
2	Forestry
3	Mining
4	Transportation and communication
5	Livestocks
6	Electricity
7	Manufacturing industry
8	Construction
9	Social
10	Trade
11	Other services

(4) The average economic growth rate of the respective division is preestimated as shown below.

Division	Average growth rate in Second 4-year project (%)
(i) Agriculture	4.0
(ii) Fishery and livestock	3.4
(iii) Forestry	3.1
(iv) Mining	2.4
(v) Industry	7.5
(vi) Electricity	9.1
(vii) Construction	1.0
<b>Total</b>	<b>4.0</b>
<b>Service</b>	<b>3.8</b>
<b>Trade</b>	<b>4.9</b>
<b>Gross Domestic Products</b>	<b>4.5</b>

(5) The general guideline described in the following has been set for the execution of Second 4-year project.

- i) Further emphasis shall be placed upon the full utilization of the existing means of production.
- ii) Sufficient materials and investment will be allotted to the manufacturing divisions.
- iii) Numerous consumable materials are to be imported in order to raise the living standard of the people.
- iv) The transport division shall be improved in order to solve the problems in the distribution and sales.

v) Exportation will be increased in order to obtain as much foreign currency as possible to execute the new projects, whereby Gross National Products shall be increased.

(6) Second 4-year project commenced on 1st April, 1974 and completed on 31 March 1978.

The project was executed in accordance with the general guideline, and as a result of the cooperative efforts made by various divisions, satisfactory development was brought in all division.

The actual growth from the basis of 1973 - 74 was attained as shown in the following:

Table 2-3-1

(10<sup>6</sup> KS)

Division	1973-74 (Base Year)	1974-75	1975-76	1976-77	1977-78
<u>Production</u>	<u>10910</u>	<u>11055</u>	<u>11756</u>	<u>12392</u>	<u>13410</u>
Agriculture	3619	3565	3729	3893	4092
Fishery and Livestock	1030	1021	1071	1103	1167
Forestry	363	420	405	426	487
Mining	210	210	215	247	313
Manufacturing Industry	4967	5116	5583	5904	6447
Electricity	116	114	121	139	156
Construction	605	609	627	670	748
<u>Service</u>	<u>4006</u>	<u>4232</u>	<u>4367</u>	<u>4670</u>	<u>5029</u>
Transportation	995	1029	1046	1039	1112
Communication	45	46	47	56	51
Financial	229	253	215	325	307
Social/administration	1765	1911	2045	2213	2490
Others	972	993	1014	1038	1034
<u>Trade</u>	<u>3247</u>	<u>3366</u>	<u>3494</u>	<u>3664</u>	<u>3862</u>
<u>Total amount</u>	<u>18163</u>	<u>18653</u>	<u>19617</u>	<u>20726</u>	<u>22301</u>
<u>Used between the domestic industries</u>	<u>7351</u>	<u>7552</u>	<u>8056</u>	<u>8482</u>	<u>9267</u>
<u>Gross Domestic Products</u>	<u>10812</u>	<u>11101</u>	<u>11561</u>	<u>12244</u>	<u>13034</u>

(7) Comparison of the production value as described above shows the degree of economical development attained by execution of the Second 4-year project.

That is, an annual average growth rate of 5.7% was achieved in production division, and 6.4% and 4.7% was achieved in service division and commercial division, respectively.

The total average growth rate of the total value of production was 5.6%. The annual growth rate of G.D.P. has increased to 5.1%.

- (8) The following table shows the comparison between the target and the actual achievement of Second 4-year-project.

<u>Division</u>	<u>Target</u>	<u>Actual achievement</u>	<u>Difference</u>
<u>Production</u>	<u>4.6</u>	<u>5.7</u>	<u>(+) 1.1</u>
Agriculture	4.0	3.2	(-) 0.8
Fishery and livestock	3.4	3.3	(-) 0.1
Forestry	3.1	8.5	(+) 5.4
Mining	2.4	12.2	(+) 9.8
<u>Manufacturing industry</u>	<u>7.5</u>	<u>7.4</u>	<u>(-) 0.1</u>
<u>Electricity</u>	<u>9.1</u>	<u>8.6</u>	<u>(-) 0.5</u>
<u>Construction</u>	<u>1.0</u>	<u>5.9</u>	<u>(+) 4.9</u>
<u>Service</u>	<u>3.8</u>	<u>6.4</u>	<u>(+) 2.6</u>
<u>Trade</u>	<u>4.9</u>	<u>4.7</u>	<u>(-) 0.2</u>
<u>G.D.P.</u>	<u>4.5</u>	<u>5.1</u>	<u>(+) 0.6</u>

- (9) Although the actual achievement made is less than the planned target in some of the divisions, the achievement exceeded the target by 1.1% in production division as a whole, 2.6% in service division, and 0.6% in G.D.P. The achievement in the trade division shows (-) 0.2% reduction from the target. In general, however, the execution of Second 4-year-project was a success.

- (10) With Remnant force of the economic development accomplished in Second 4-year-project and based on the experience acquired in the Second 4-year-project, the Third 4-year-project will be executed in the period from 1st April, 1978 upto 31st March, 1982.

The targets set for Third 4-year-project are as listed below.

<u>Division</u>	<u>Average growth rate</u>
<u>Production</u>	<u>7.7</u>
Agriculture	5.8
Fishery and livestock	5.0
Forestry	5.8
Mining	12.2

<b>Manufacturing Industry</b>	<b>12.2</b>
<b>Electricity</b>	<b>14.3</b>
<b>Construction</b>	<b>11.8</b>
<b>Service</b>	<b>5.5</b>
<b>Transportation</b>	<b>8.6</b>
<b>Communication</b>	<b>12.3</b>
<b>Financial</b>	<b>9.7</b>
<b>Social/Administration</b>	<b>4.7</b>
<b>Others</b>	<b>3.1</b>
<b>Trade</b>	<b>5.4</b>
<b>G.D.P.</b>	<b>6.6</b>
<b>Import</b>	<b>12.7</b>
<b>Export</b>	<b>10.8</b>
<b>Investment</b>	<b>11.2</b>

(11) The above average growth rates were determined for the third 4-year-project, and the annual targets for the respective divisions were allotted separately.

#### Contents of Third 4-Year-Project

##### 1) Under the control of Ministry of No. 1 Industry

1. Jute Plant Project (Myaungmya)
2. Spinning/weaving factory (Shvedaung)
3. Sheet glass factory (Bassein)
4. Expansion project of the glass factory (Syriam)
5. Marble plant project (Sagyin)
6. Marble plant project (Naybudaung)
7. Expansion project of steel rolling plant (Ywama)
8. Rubber ball factory
9. Ball-point pen factory
10. Expansion project of the sugar plant (Pyinmana)
11. Mono sodium glutamate manufacturing project
12. Cement mill project

##### 2) Under the control of Ministry of No. 2 Industry

1. Second project for the paper-making factory
2. Third project for the match factory
3. Petrochemical plant (Hinbu)
4. Urea fertilizer factory

5. Factory for manufacturing welding electrode
6. Expansion project of the paper-manufacturing factory
7. Second project for the gas manufacturing plant
8. Tyre and rubber manufacturing plant
9. Diesel injection pump and nozzle manufacturing plant

**3) Under the control of Ministry of Trade**

1. 50 ton rice mill project ..... 3 projects
2. Tapioca flour mill (Mergui)
3. Rice bran refinery (Bassein)
4. Bran acidity preservation plant ..... 20 projects
5. 100 ton rice mill project ..... 9 projects
6. 150 ton rice mill project ..... (Khanaung-To)
7. 60 ton rice mill project ..... 3 projects
8. 150 ton rice processing factory project

**4) Ministry of Agriculture and forestry**

1. Plywood factory
2. Furniture factory
3. 10,000 ton lumber mill
4. 6,000 ton lumber mill

## CHAPTER 3 SURVEY ON THE DEMAND FOR CEMENT

### 3-1 Present Situation of Demand/Supply of Cement

The past results of the production and consumption of cement in Burma are as shown in Table 3-1-1. According to these results, the average annual growth of the domestic consumption of cement in the period between fiscal 1960/61 and 1977/78 is 4.4%. However, annual growth is irregular and varies greatly. Negative growth rates are recorded in fiscal 1962/63, 1963/64, 1969/70, 1974/75, 1975/76 and 1977/78.

Considerable amount of cement exportation is observed in fiscal 1977/78 and 1978/79. This export is said to have been conducted sacrificing the domestic consumption in order to obtain foreign currency required for the import of the material for repairing of the cement mill. Influenced by this, the domestic consumption in these years decreased.

As for the production capacity of the cement, current facilities available are at Thayet Mill and Kyangin Mill, and their total production capacity is 440,000 t/year.

The first cement plant in Burma is Thayet Mill which was constructed in 1937, and its initial production capacity was 60,000 t/year. Thayet Mill was nationalized in 1954, and the Mill was extended in 1963 to the production capacity of 240,000 t/year, which is the current production capacity of the Mill.

Kyangin Cement Mill, the other cement mill in Burma was completed in 1976 and its production capacity is 200,000 t/year.

The cement production capacity when viewed as the installed capacity is as described above. However, the actual production is limited to approximately 70% (approx. 300,000 t/year) of the installed capacity. This is due to the various problems, such as unfavourable raw materials properties, deterioration of burning efficiency owing to the low grade of the raw material, and decrease in the material transport in the rainy season (June - November).



Table 3-1-1 Results of the Cement Production and Consumption in Burma

Fiscal	Production (t)	Import (t)	Export (t)	Consumption (t)	Growth rate (%/year)
1960/61	40,500	99,000	-	139,500	-
1961/62	32,800	128,000	-	160,800	15.3
1962/63	120,100	38,000	-	158,100	(-) 1.7
1963/64	115,800	-	-	115,800	(-) 26.8
1964/65	137,800	-	-	137,800	19.0
1965/66	141,000	-	-	141,000	23.2
1966/67	145,700	-	-	145,700	3.3
1967/68	158,200	-	-	158,200	8.6
1968/69	180,000	-	-	180,000	13.8
1969/70	164,200	-	-	164,200	(-) 8.8
1970/71	171,900	-	-	171,900	4.7
1971/72	172,400	-	-	172,440	0.3
1972/73	220,100	-	-	220,100	27.6
*1973/74	50,060	-	-	50,060	-
1974/75	202,040	-	-	202,040	(-) 8.2
1975/76	197,760	-	-	197,760	(-) 2.1
1976/77	255,320	-	50,320	205,000	3.7
1977/78	272,980	-	70,980	202,000	(-) 1.5

Note: Asterisk(\*) indicates 6-month-result because of the change of fiscal year.

### 3-2 Forecast on the Demands for Cement

#### 3-2-1 Background of the Demands Forecast

The Burmese Government administrates the economy on the guideline of 20-year-long term project composed of five 4-year-projects. With fiscal 1974/75 as its reference fiscal, the 20-year-long term-project aims at raising the living standard of the people to twice as high as the living standard in the reference year, during the period between Second 4-year-project (1974/75 - 1977/78) and Sixth 4-year-project (1990/91 - 1993/94).

Target of this long term development project is the establishment of an agriculture-based industrial country. The emphasis is placed on the development of the agriculture and other primary industries including fishery, forestry, mining, and manufacturing industries which utilize the products of the above industries as raw materials.

Until the execution of Second 4-year-project, the Burmese economy remained at a low level, and the growth rate of the Gross Domestic Products was also very low at the annual average of less than 3%.

Second 4-year-project brought satisfactory results with the annual average growth rate of 5.1% during this period, which was a great improvement as compared with the average growth in the low growth period. Table 3-2-1 shows the progress of GDP during Second 4-year-project classified by division, and Table 3-2-2 shows the achievement made in each division during the above period as compared with the aimed achievement and the target set for the Third 4-year-project (1978/79 - 1981/82).

The annual average growth rate of 5.1% in the above period slightly exceeds the target figure set at annual average of 4.5%. High growth rate was observed in the mining, forestry and construction industry. Manufacturing industry which showed the annual average growth rate of 7.4% compensated for those divisions whose achievements were lower than the target figure. This greatly contributed to the growth of GDP.

On this basis of almost satisfactory results attained through the Second 4-year-project, annual average growth rate in GDP of 6.6% is set as target figure for the Third 4-year-project as shown in table 3-2-2.

Table 3-2-1 Progress of GDP in Second 4-year-project (10<sup>6</sup> KS)

	1973-74 (Base Year)	1974-75	1975-76	1976-77	1977-78
<b>Production division</b>	<b>10910</b>	<b>11055</b>	<b>11756</b>	<b>12392</b>	<b>13410</b>
Agriculture	3619	3565	3729	3893	4092
Fishery/livestock	1030	1021	1071	1103	1167
Forestry	363	402	405	426	487
Mining	210	210	215	247	313
Manufacturing industry	4967	5116	5583	5904	6447
Electricity	116	114	121	139	156
Construction	605	609	627	670	748
<b>Service division</b>	<b>4006</b>	<b>4232</b>	<b>4367</b>	<b>4670</b>	<b>5029</b>
Transportation	995	1029	1046	1039	1112
Communication	45	46	47	56	51
Financial	229	253	215	325	307
Social/administration	1765	1911	2045	2213	2490
Others	972	993	1014	1038	1034
Trade	3247	3366	3494	3664	3862
<b>Total amount</b>	<b>18163</b>	<b>18653</b>	<b>19617</b>	<b>20726</b>	<b>22301</b>
<b>Used between domestic industries</b>	<b>7351</b>	<b>7552</b>	<b>8056</b>	<b>8482</b>	<b>9267</b>
<b>Gross Domestic Products</b>	<b>10812</b>	<b>11101</b>	<b>11561</b>	<b>12244</b>	<b>13034</b>

Table 3-2-2 Achievement against the target in Second 4-year-project and the target for Third 4-year-project (Annual average growth rate %)

	Target	Results	Difference	Target for Third
<b>Production division</b>	<b>4.6</b>	<b>5.7</b>	<b>(+) 1.1</b>	<b>7.7</b>
Agriculture	4.0	3.2	(-) 0.8	5.8
Fishery/livestock	3.4	3.3	(-) 0.1	5.0
Forestry	3.1	8.5	(+) 5.4	5.8
Mining	2.4	12.2	(+) 9.8	12.2
Manufacturing industry	7.5	7.4	(-) 0.1	12.2
Electricity	9.1	8.6	(-) 0.5	14.3
Construction	1.0	5.9	(+) 4.9	11.8
<b>Service division</b>	<b>3.8</b>	<b>6.4</b>	<b>(+) 2.6</b>	<b>5.5</b>
<b>Trade division</b>	<b>4.9</b>	<b>4.7</b>	<b>(-) 0.2</b>	<b>5.4</b>
<b>Gross Domestic Products</b>	<b>4.5</b>	<b>5.1</b>	<b>(+) 0.6</b>	<b>6.6</b>

As we have been discussing, Burmese Economy has at last escaped from the low period with the satisfactory results of the Second 4-year-project and now seems to be on the start line of the economic development. However, the present situation does not allow to make a forecast on the degree of fully successful development of the Burmese Economy. Such evaluation must be postponed until the results at the Third 4-year-projects are obtained.

It is generally recognized that the consumption of cement has high interrelation with GDP as cement is a fundamental material that supports the activities in all areas in the economy of a nation.

Observation of this interrelation in the developing countries tells us that the said relationship is not very high, but obvious interrelation is observed when the results of the development projects start to show and the economic development of the country concerned progresses satisfactorily.

Despite the fact that Burmese economy is now at the starting point of development greatly owing to the execution of Second 4-year-project, it is still in the stage where one could hardly say that the economic development is definite.

Reflecting this present situation, though a certain significant interrelation between the consumption of cement and GDP is recognizable such interrelation is not yet very obvious as will be analyzed later.

Consequently, an accurate forecast on cement demand is extremely difficult at present and such a forecast will inevitably involve uncertain factors.

### 3-2-2 Analysis of the Demand Forecast

The demand forecast in this investigation is accomplished by the tendency analysis which forecasts the future tendency from the past trend, and the interrelation analysis based on the interrelation between the demands and GDP. The analysis results attained through the above two methods shall be studied in comparison with the patterns observed in the other developing countries. Table 3-2-3 shows the data used for the analysis. Results of the cement consumption shown are those between fiscal 1960/61 and 1977/78. Though the figures show a generally increasing trend, they fluctuate very widely from year to year. For this reason, the analysis was conducted on the basis of the data based on the average of 5-year-movement.

(1) Tendency analysis

As the results obtained from the analysis of the applicability of the smooth curve of the average of 5-year-movement to various equation models by computer, the consumption tendency of cement is most applicable to the Quadratic curve which is represented by the following equation:

$$y = 131.667 + 3.754t + 0.145t^2$$

$$r = 0.980$$

where y : Estimated annual cement consumption  
(unit:  $10^3$  t/year)

t : Number of years past with fiscal 1962/63 as  
the first fiscal year

r : Coefficient of correlation

Table 3-2-3 Progress of population, GDP and cement consumption in Burma

Fiscal year	Population (10 persons)	GDP		Cement consumption		
		Total amount ( $10^3$ KS)	Per capita (KS)	Total amount (t)	Per capita (Kg)	Average of 5-year-movement (t)
1960/61	22,200	-	-	139,500	6.3	
61/62	22,688	-	-	160,800	7.1	
62/63	23,187	8,806	380	158,100	6.8	142,400
63/64	23,697	8,272	349	115,800	4.9	142,700
64/65	24,218	9,106	376	137,800	5.7	139,680
65/66	24,751	8,715	352	141,000	5.7	139,700
66/67	25,303	8,355	330	145,700	5.8	152,540
67/68	25,867	9,200	356	158,200	6.1	157,820
68/69	26,444	9,503	359	180,000	6.8	164,000
69/70	27,034	9,976	369	164,200	6.1	169,350
70/71	27,637	10,308	376	171,900	6.2	181,730
71/72	28,262	10,641	377	172,440	6.1	187,940
73/73	28,886	10,538	365	220,100	7.6	195,510
73/74	29,521	10,812	366	*(211,080)	7.2	200,680
74/75	30,170	11,101	368	202,040	6.7	207,200
75/76	30,834	11,561	377	197,760	6.4	203,580
76/77	31,512	12,244	389	205,000	6.5	(220,600)
77/78	32,206	13,034	405	202,000	6.3	(228,900)

Notes: 1. Total amount of GDP given above is the total of the net domestic products converted in price for fiscal 1969/70.

Note 2. Asterisk(\*) indicates that the figure is a modified figure from 6-month-result of 50,060t because of the change of fiscal year.

3. ( ) indicates an estimated figure.

## (2) Correlation analysis

In the analysis, correlation between GDP and average cement consumption of 5-year-movement was first sought, and it was applied to the estimated figures obtained as a result of the tendency analysis of GDP, and the future cement consumption was estimated thereby.

As was done in the tendency analysis of the cement consumption described in the preceding item (1), the applicability of the actual results of GDP to the various equation models were analyzed by the computer.

The results obtained show that the tendency of GDP is most applicable to the Quadratic curve represented by the following equation, and furthermore, considerably high correlation with the actual results was observed.

$$y = 8.916 - 131.51t + 25.36t^2$$

$$r = 0.9900$$

where  $y$  : Assumed value of GDP (Unit,  $10^6$  KS)

$t$  : No. of years past with fiscal 1962/63 as the first fiscal year

$r$  : Coefficient of correlation

Significant correlation as shown in the following was recognized in the correlation between GDP and cement consumption when viewed in the light of actual result.

$$y = -50.5 + 0.02258x$$

$$r = 0.9505$$

where  $y$  : Assumed value of cement consumption (Unit,  $10^3$ t/year)

$x$  : GDP (Unit,  $10^3$  KS/year)

$r$  : Coefficient of correlation

## (3) Results of analysis

Table 3-2-4 shows the forecast of the respective method attained as results of the analysis described in the preceding items (1) and (2), and Fig. 3-2-5 and 3-2-6 show the graph representing the above forecast. As described earlier, Burmese economy before the execution of the Second 4-year-project hung low, and the growth in the cement consumption during this period was slow and varied greatly. Consequently, the forecast figure shown in the Quadratic curve based on the data mainly of this

period is assumably too low as compared with the reality, if the success of the future development is taken into consideration,

For the same reason, the cement consumption forecasted based on the interrelation with GDP shows the interrelation slightly lower than that generally observed, though the significance is observed therein, and the regression coefficient which affects the cement consumption is small, too.

Quadratic curve showing GDP tendency has high interrelation, and according to this forecasted value, GDP per capita by the end of fiscal 1993/94 shows the figure 688KS which is only slightly lower than twice the figure shown in 1973/74 which was 365KS. This means that the GDP tendency curve is in conformity with the policy target of 20-year-long term project which is to double the living standard at the end of the project. Thus the figure is regarded to be a satisfactory forecast. It is expected, therefore, that the value of cement consumption forecasted by GDP interrelation reflects the economic development in Burma accomplished through 20-year-long term project more than the figure attained through the tendency analysis. Nevertheless, the value forecasted through the GDP interrelation analysis is still too low as a result as the increase in the regression coefficient is expected if Burmese economy is to satisfactorily progress in the economic development.

### 3-2-3 Demands Estimation

Generally speaking, in the developing countries, during their development, cement consumption growth rate often exceeds GDP growth rate. (See ANNEX 3-2-1 and 3-2-2.)

Particularly, in the case of Indonesia, Korea, Malaysia, the growth rate of the cement consumption has reached the figure more than twice of GDP growth rate at the period when the economical development of these countries was regarded to have gone on the right track.

As the Burmese Economy has just reached the start line of development, the situation does not allow us to produce any definite conclusion until the future progress is studied. Nevertheless, existence of enormous potential demands for cement and substitute demands in Burma is doubtless and this allows us to expect that these demands would be actualized in step with the progress of the development taking the same pass as the other developing countries.

In other words, it is well assumable that if Third 4-year-project (1978/79 - 1981/82) and the projects thereafter are to progress satisfactorily, growth rate of the cement consumption will exceed the GDP growth rate at the initial stage, and it will reach the level exceeding the annual average of 10% at the stage close to Sixth 4-year-project (1990/91 - 1993/94).

On the premises of the successful progress of 20-year-long term project, the growth rate up to the final fiscal year (1993/94) is assumed at the annual average of 8% which is rather conservative estimate, and the correction was made on the figure attained through the interrelation analysis.

Table 3-2-7 shows the forecast on the demands for cement in Burma with the assumed growth rate of annual average of 8%.

The forecast of the production is on the basis of the following conditions:

- (1) In view of the present level, the production of the existing plants will be maximum 70% of the installed capacity (total 440,000 t/year of Thayet and Kyangin Mills), and the production is to be increased up to 80% of the installed capacity (200,000 t/year) through improvement of the existing plant at Kyangin Mill by the end of fiscal 1981/82.



Table 3-2-4 Forecast on GDP and cement consumption

Fiscal year	GDP (A)		Tendency analysis value (B)		Interrelation analysis value (C)		Corrected forecast value (D)		Population (10 <sup>3</sup> )
	Total (10 <sup>6</sup> KS)	Per capita (Kg)	Consumption (t)	Per capita (Kg)	Consumption (t)	Per capita (Kg)	Consumption (t)	Per capita (Kg)	
1978/79	14,000	426	237,400	7.2	265,900	8.1	256,400	7.8	32,900
79/80	14,700	438	246,300	7.3	283,000	8.4	276,900	8.2	33,600
80/81	15,500	452	255,400	7.4	301,200	8.8	299,000	8.7	34,300
81/82	16,400	467	264,800	7.5	320,600	9.1	322,900	9.2	35,100
82/83	17,300	482	274,500	7.6	341,100	9.5	348,700	9.7	35,900
83/84	18,300	499	284,500	7.8	362,800	9.9	376,600	10.3	36,700
84/85	19,300	515	294,800	7.9	385,600	10.3	406,700	10.8	37,500
85/86	20,300	530	305,400	8.0	409,500	10.7	439,200	11.5	38,300
86/87	21,500	550	316,200	8.1	434,600	11.1	474,300	12.1	39,100
87/88	22,600	566	327,400	8.2	460,900	11.6	512,200	12.8	39,900
88/89	23,800	585	338,800	8.3	488,300	12.0	553,200	13.6	40,700
89/90	25,100	605	350,600	8.4	516,800	12.5	597,500	14.4	41,500
90/91	26,400	626	362,600	8.6	546,500	13.0	645,300	15.3	42,200
91/92	27,800	647	374,900	8.7	577,200	13.4	696,900	16.2	43,000
92/93	29,200	667	387,500	8.8	609,200	13.9	752,700	17.2	43,800
93/94	30,700	688	400,400	9.0	642,300	14.4	812,900	18.2	44,600

Note: The forecast on the population was made by the estimation on the basis of the population in the year 2,000 forecasted in the World's Development Report 1978 (World's Bank), with the growth rate set at 2.2% for 1978/79 - 1984/85, 2.0% for 1985/86 - 1989/90, and 1.8% for 1990/91 thereafter.

Fig. 3-2-5 GDP Tendency Curve In Burma

(A): GDP Quadratic Curve  
 x : Actual records

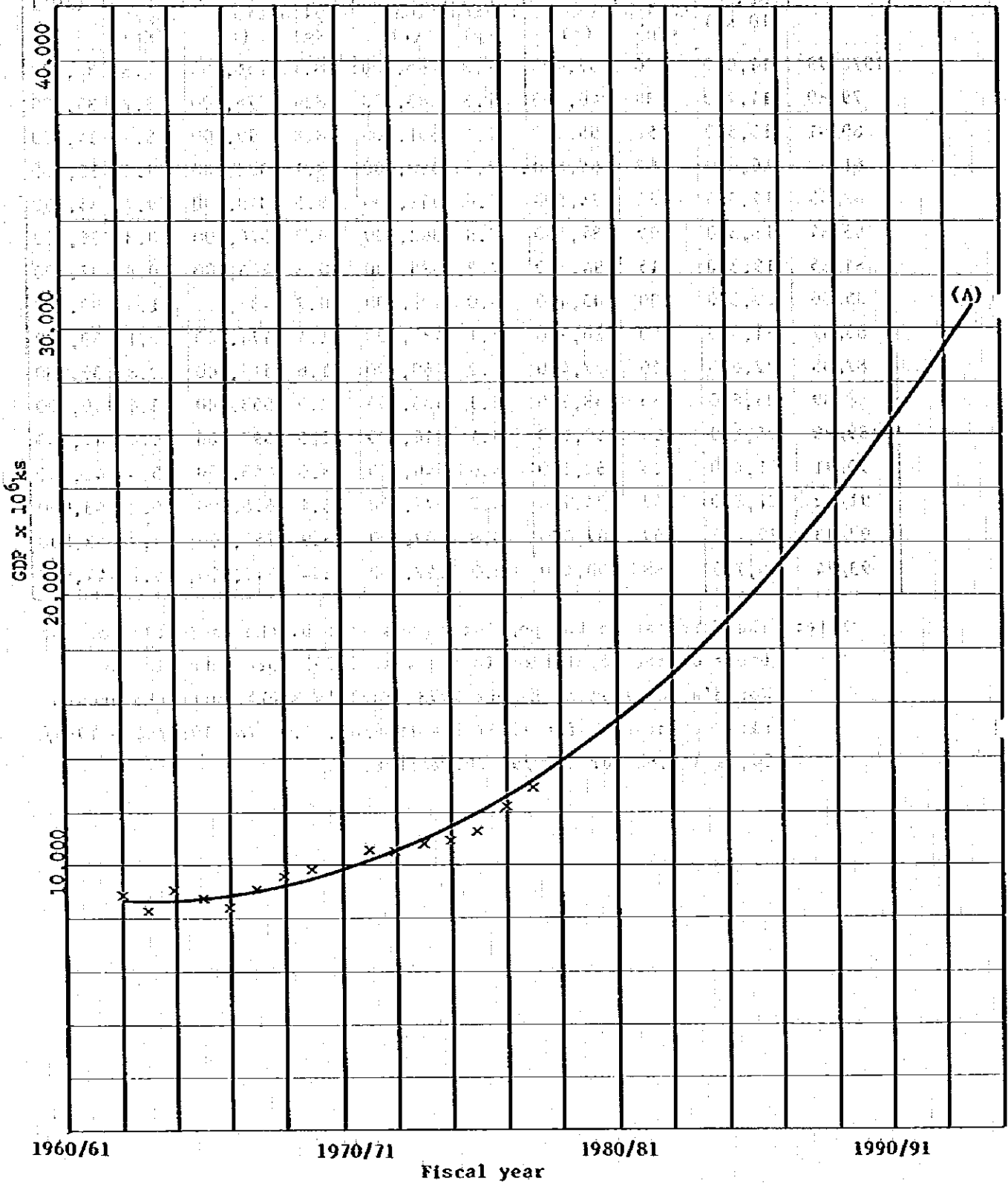
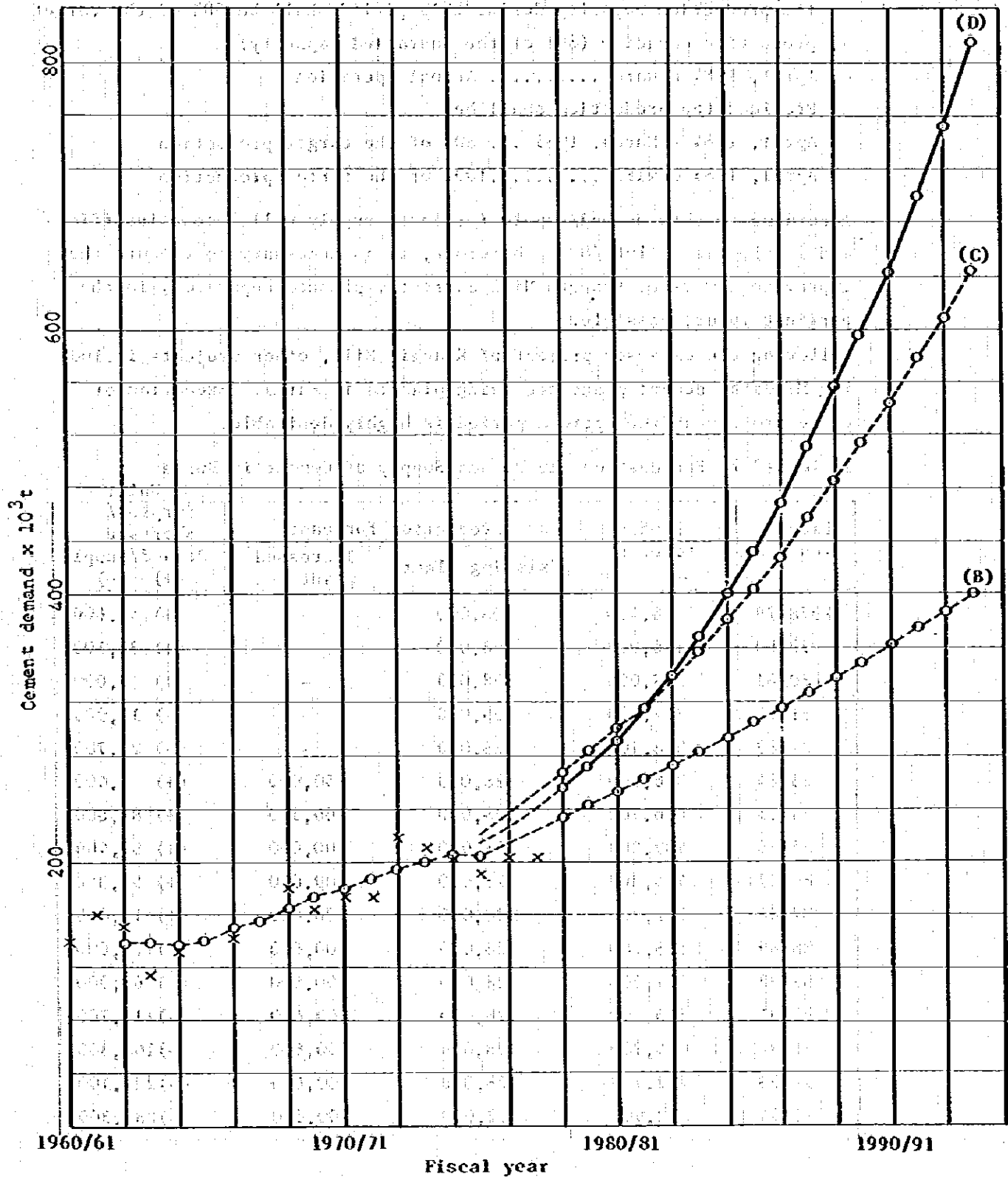


Fig. 3-2-6 Cement Demand Forecast in Burma

- (B): Five-year moving average and Tendency curve (Quadratic)
- (C): GDP correlation analysis curve
- (D): Corrected cement demand curve
- x : Actual records



(2) Schedule for the expansion project of Kyangin Mill shall be assumed as follows:

- o October, 1979 ..... Commencement of the international tender
- o October, 1983 - March, 1984., Test run period

The production capacity during this period shall be 50% of the target production capacity (80% of the installed capacity)

- o April, 1984 onward ..... Actual operation

Provided the production shall be:

April, 1984 - March, 1985 ... 80% of the target production

April, 1985 onward .....100% of the target production

According to this demand/supply forecast, supply will become insufficient in the fiscal 1981/82. Therefore, it is necessary to execute the improvement work of Kyangin Mill currently planned separately in the earliest future possible.

Following the expansion project of Kyangin Mill, other projects including Mandalay cement plant are being planned in Burma. Execution of these project at the optimum period is highly desirable.

Table 3-2-7 Forecast on the Demand/Supply of Cement in Burma

Unit: t

Fiscal year	Demand forecast	Production forecast		Surplus/Shortage Demand/supply	
		Existing plant	Increased plant	(+)	(-)
1978/79	256,400	308,000	-	(+)	51,600
79/80	276,900	308,000	-	(+)	31,100
80/81	299,000	308,000	-	(+)	9,000
81/82	322,900	308,000	-	(-)	14,900
82/83	348,700	328,000	-	(-)	20,700
83/84	376,600	328,000	50,000	(+)	1,400
84/85	406,700	328,000	160,500	(+)	81,800
85/86	439,200	328,000	200,600	(+)	89,400
86/87	474,300	328,000	200,600	(+)	54,300
87/88	512,200	328,000	200,600	(+)	16,400
88/89	553,200	328,000	200,600	(-)	24,600
89/90	597,500	328,000	200,600	(-)	68,900
90/91	645,300	328,000	200,600	(-)	116,700
91/92	696,900	328,000	200,600	(-)	168,300
92/93	752,700	328,000	200,600	(-)	224,100
93/94	812,900	382,000	200,600	(-)	284,300

ANNEX 3-2-1 Comparison Chart of the Growth Rates of Cement Consumption and GDP in Principal Asian Countries

Country	GDP (%)		Cement consumption (%)		Growth rate/capita (%) (1960-70)		GDP/capita (1976) US\$	Cement consumption kg (1976)	Population increase rate	
	1960-70	1970-76	1960-70	1970-76	GDP	Cement			1960-70	1970-76
Afganistan	2.1	4.4	7.0	14.7	0	6.9	160	7	2.2	2.2
Burma	2.6	3.3	3.7	4.6	0.7	1.5	120	7	2.2	2.2
China	6.2	6.6	(9.3)	(12.0)	5.2	10.3	410	56	1.6	1.7
Hong Kong	10.0	7.5	7.1	13.4	6.5	6.7	2,110	357	2.5	1.9
India	3.6	2.7	7.4	4.3	1.3	3.3	150	29	2.3	2.1
Indonesia	3.5	8.3	7.7	17.2	3.4	8.8	240	21	2.2	2.4
Korea	8.5	10.3	26.4	11.8	7.3	17.0	670	250	2.6	1.8
Malaysia	6.5	7.8	(13.9)	10.5	3.9	9.4	860	151	2.9	2.7
Nepal	2.5	2.7	16.9	16.0	0.2	14.7	120	17.2	2.1	2.1
Pakistan	6.7	3.6	(12.8)	(2.4)	3.1	10.4	170	(43)	2.8	3.0
Philippines	5.1	6.3	14.6	5.0	2.4	7.6	410	81	3.0	2.8
Singapore	8.8	8.9	(16.4)	(10.6)	7.5	12.7	2,700	(646)	2.3	1.7
Sri Lanka	4.6	2.9	4.7	0.4	2.0	0.7	200	(30)	2.4	1.7
Taiwan	9.2	7.8	14.1	13.2	6.3	10.8	1,070	496	3.1	2.0
Thailand	8.2	6.5	18.7	7.4	4.5	9.9	380	90	3.1	2.9

Data: World's Development Report 1978 (World Bank) and CEMBURAU

( ) indicates estimated value

## Cement Consumption in Asian Countries

Country	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Afghanistan	(30)	(60)	(65)	(80)	(120)	(85)	143	174	177	(127)	(88)	(75)	105	95	80	100	72	70	137	157
	(3)	(5)	(5)	(6)	(9)	(6)	9	11	11	8	5	4	6	5	4	5	4	4	7	8
Burma	152	136	144	140	153	(174)	162	127	143	173	177	(183)	157	175	198	194	165	181	233	207
	8	7	7	6	8	(8)	7	5	6	7	7	(7)	6	6	7	7	5	6	7	7
China	(9640)	(13400)	(11200)	(6800)	(5800)	(8200)	(10200)	(15300)	(16900)	(13700)	(19300)	(22300)	(26400)	(30550)	(37300)	(39800)	(36300)	45600	47600	49900
	15	21	17	10	9	12	15	22	24	26	29	34	39	47	53	49	44	54	56	58
Hongkong	412	478	537	559	760	1034	1212	1333	1060	642	619	734	901	1301	1182	1200	1280	1190	1597	2009
	153	167	175	176	223	286	328	350	285	167	163	190	221	321	289	289	301	272	357	445
India	6183	6672	7717	8183	8563	9304	9659	10545	11031	11273	11767	13464	13833	14756	15500	14801	14058	15839	17864	18277
	16	17	18	19	19	20	20	22	22	22	22	25	26	27	28	26	24	26	29	29
Indonesia	413	757	454	788	633	525	616	733	491	547	661	956	1200	1435	1621	2056	2522	2681	2856	3188
	5	8	5	8	7	5	6	7	5	5	6	8	10	12	13	17	20	21	21	22
Korea	558	455	534	573	977	1063	1154	1479	1902	2722	3371	4304	5332	6102	5672	7182	7653	8435	9080	11177
	25	20	21	23	37	40	42	52	65	93	111	138	169	190	174	215	229	243	250	305
Malaysia	(304)	(264)	(307)	(399)	(503)	(570)	(575)	(627)	(708)	829	936	941	951	1101	1284	1455	1644	1890	1859	2016
	(42)	(35)	(40)	(50)	(61)	(67)	(61)	(70)	(79)	86	91	90	89	103	117	130	141	159	151	160
Nepal	-	-	-	-	41	43	78	88	35	64	72	97	88	92	107	159	215	156	225	-
	-	-	-	-	4.2	4.4	7.9	8.7	3.4	6.1	6.6	8.7	7.6	7.8	8.9	12.9	17.1	12.1	17.2	-
Pakistan	1191	1081	1336	1451	1423	1858	2577	1979	2074	2016	(2989)	(3021)	(2657)	(2497)	(2404)	(3396)	(3569)	(3275)	(3080)	(3275)
	14	12	14	15	15	19	26	19	19	19	(24)	(24)	(44)	(40)	(39)	(53)	(59)	(47)	(43)	(44)
Philippines	672	777	817	1027	971	1184	1399	1605	1708	2278	2676	2898	2399	1998	2832	2846	2721	3549	3572	3290
	26	28	30	37	34	40	45	51	52	68	77	81	65	53	73	71	66	83	81	73
Singapore	(196)	(171)	(198)	(257)	(325)	(363)	(371)	(405)	(457)	436	570	739	770	898	1084	1126	(1200)	(1235)	(1474)	1287
	(107)	(90)	(101)	(125)	(154)	(170)	(167)	(177)	(198)	223	287	366	372	426	504	514	(541)	(549)	(646)	557
Sri Lanka	205	292	245	300	301	281	263	283	329	290	405	413	(391)	410	401	454	464	(383)	(412)	(390)
	22	31	25	30	29	26	24	25	29	25	34	34	(31)	32	31	34	35	(28)	(30)	(28)
Taiwan	852	954	1118	1197	1342	1320	1454	1793	1929	2352	3077	3451	3548	4134	4737	5517	5908	6552	8107	8791
	85	91	105	107	117	111	119	142	148	177	225	241	242	279	313	354	391	405	496	523
Thailand	464	481	429	496	821	877	973	1189	1553	1960	2208	2379	2612	2545	2860	3067	3015	3336	3866	(4300)
	22	22	16	18	29	30	33	39	49	60	66	68	73	72	74	77	74	79	90	(98)
Japan	13306	15692	20808	22661	26870	27809	30946	30699	35739	40080	45201	48730	54804	57135	65144	77745	70267	63222	64522	69381
	145	169	223	241	283	290	319	313	361	401	447	477	528	544	616	715	639	547	572	608
Total of Asian Countries	40500	49000	62200	60000	67300	67400	74800	77950	90950	98200	106350	121650	131850	143750	162200	180200	173700	186300	198450	215650
	26	30	35	33	37	36	40	43	49	52	54	64	67	70	82	79	75	85	88	94

Note: 1 Upper row shows total of cement consumption in 10<sup>3</sup> tons

2 Lower row shows per capita cement consumption in kg

3 Total of Asian Countries includes Middle East Asia

4 The numbers in parentheses are assumed

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### 3-3 Marketing of Cement

All cement is produced by Ceramic Industry Corporation in Burma, and is directly sold to the other corporations, governmental organizations and co-operatives.

Sales to the civilian users are undertaken by Commercial Corporation and co-operatives.

The cement available is generally Portland cement only, and it is available in 50 kg-paper-bags. The products are shipped from Kangin and Thayet Mills, and delivered to various parts of the country via warehouses at Rangoon and Mandalay.

The price of cement is government controlled.

The recent prices are listed below.

Ex-Factory 278.75 KS/t (as of 1976/77)

Ex-warehouse in Rangoon 410 KS/t

Ex-warehouse in Mandalay 431.65 KS/t

The export price is:

Fiscal 1976/77 Average 28 US\$/t

Fiscal 1977/78 Average 32 US\$/t

No import has been recorded for the last several years.

With the execution of a series of development projects, demands for cement and other construction materials are increasing in Burma.

For this reason, a high priority is given to the cement industry among the development projects.

Protective measures for the domestic products are available, which include the customs duty imposed on the imported cement equivalent to 25% of CIF price, and the reduction in commodity tax for the exportation of the domestic product.

### 3-4 Summary

Burmese economy is still in the undeveloped stage, and reflecting this, the consumption of cement is as low as only 7kg per capita.

However, the economy of the country appears to have reached the starting point of the economic development through the execution of the Second 4-year-project. If the Third 4-year-project and the other projects to follow are to progress satisfactorily, the enormous potential



demands and substitute demands in the country can be well expected to be actualized.

The future demands for cement has been analyzed by the computer. However, the forecast figure obtained through this analysis might be far from the actual figure, if the future economic development is to go onto the right track, for the reason that the above analysis had to depend upon the data attained in the period when the Burmese economy was still hanging low.

To cope with the possible inaccuracy of the estimation as described above, the results of analysis were modified on the premises that the Burmese economy will undergo satisfactory progress in accordance with the guideline of 20-year-long term project, and the growth rate up to fiscal 1993/94 was set at the annual average of 8%.

With respect to the distribution of cement in Burma, the expansion and rationalization of the distribiton facilities and systems will be required to cope with the future increase in the demand and the various regional development in Burma.