No. 15

## AFRICAN DEVELOPMENT BANK GOVERNMENT OF MAURITIUS

# CONTRACT FOR CONSTRUCTION

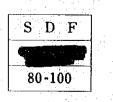
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## BEAU BASSIN - PORT LOUIS LINK ROAD

### CONFIDENTIAL VOLUME

SEPTEMBER 1980

## Japan International Cooperation Agency





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R2	Suggestions for a Brighter Future 1980-85, A socio-economic
· · · ·	Report Prepared by the Joint Economic Committee, July, 1979
R 3	Capital Budget with Memorandum as passed by the Legislative
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·	ditto, 1979 - 1980
R-4	Estimates with Memorandum as passed by the Legislative Assembly,
	1978 - 1979
	ditto, 1979 - 1980
R5	Righnmunl Direct of Statistics Dec. 1079 Ministry of Response
£-5	Bi-Annual Digest of Statistics, Dec. 1978, Ministry of Economic Planning and Development
	riddining and bevelopment
R-6	Mauritius Economic Review, 1975 - 1977
R-7	International Travel and Tourism, June, 1972,
· .	Ministry of Economic Planning and Development
R-8	Bi-Annual Survey of Employment and Earnings in Large Establish-
	ment, Ministry of Economic Planning and Development,
· · ·	Sept., 1976
	ditto, Sept., 1977
	ditto, Sept., 1978
R-9	Brief on Investment Conditions in Mauritius, Public Relations
· · ·	and Industrial Promotion Div. Ministry of Commerce and Industry,
	1978
R-10	Fact Sheet No. 1, Basic Data on the National Economy, July, 1978,
K-10	ditto
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R	F.S. No. 2, Investment Incentives - Industrial Priorities,
ı	July, 1978, ditto
R	F.S. No. 3, Labour Regulations and Remuneration, July, 1979, ditto
R-	F.S. No. 4, Consumables, Electricity - Water - Petroleum Products,
	July, 1978
R	F.S. No. 5, Communications, July, 1978, ditto
R-+1	F.S. No. 6, Taxation - Financial Services July, 1978, ditto
R-	F.S. No. 7, Formalities to be effected before starting a New Industry, July, 1978, ditto
R-	Government Notice No. 167 of 1979, The Central Water Authority Act. 1971
R-	A Consolidated Version of the Labour Act 1975
<b>R-</b> .	Government Notice No.194 of 1979, The National Pensions Act 1976
R-2	The Income Tax Bill, No. XXX VII of 1974
R-	Annual Report of the Ministry of Labour and Industrial Relations, 1977-78
R-2	General Notice No. 1377 of 1977, Holiday in 1979, (The Public
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	R-47	Prix de transport de Machinery
		June, 1976, Randabell and Sons Ltd.
	R-48	Hire Rate of Plant, 1st Aug., 1979
		Randabell and Sons Ltd.
	R-49	ditto, 1977
÷.,	R50	Feasibility Study Report, "Access Road to the New Air Port,
		Ministry of Works, BCEOM, February, 1976
· ·	R-51	Contract for Construction of The Relief Road to the North,
		Volume A, July 1976, BCEOM
	R-52	ditto, Addendum to Volume A
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	R-53	ditto, Volume C, Confidencial Documents
	R-54	ditto, Adjusted B/Q list, Oct, 1979
÷.	R-55	ditto, Instructions for Contractors wishing to apply for
		Prequalification
	R-56	Official Journal of the European Communities, vol 16, No. L287,
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	R-63	Civil Engineering Standard Method of Measurement, Institution
н. н. <sub>н</sub> .	·	of Engineers, 1976
	R64	Specification for Road and Bridge Works, Her Majesty Offices, 1969
	R-65	Meteorological Observations and Climatological Summaries, April, 1974
	R-66	Climate of Mauritius, Meteorological Services
	R-67	Explosives Ordinance, 12th Dec., 1959
	R-68	ditto, 1960
. * · · · ·	R69	Report of the Auditors to the Members, (Randabel and Sons Limited), Oct. 11, 1978

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#### 1. INTRODUCTION

This confidential volume is aimed to build up construction planning and a cost estimate for the Beau Bassin - Port Louis Link Road Project.

Taking into account the period for land acquisition, prequalification or other tender preparations, the prospective award time will be around July of 1981. The construction of project of this magnitude will require at least 36 months from so as to distribute the various works moderately in both the constructional period and space from the common sense of civil works.

The schedule of each work item will be analyzed in detail in Chapter 2 based on an appropriate operation system considering the weather conditions.

In order to make a fair and reasonable cost estimate, the unit price analysis method is employed for each cost item. The analysis covers both the Cost Elements (labour, equipment, materials cost, and overhead/ profit) and Cost Components (foreign exchange, local currency cost and taxes).

It is based on the price level in September of 1979 (Base Date), so an adjustment of construction cost will be made for the prospective award time. The procedure is presented in detail in Chapter 3.

In every aspect the cost estimate policy is compared with those of present or previous projects of a similar nature.

In order to assist in the evaluation of the construction period and future budget needs, the recommended construction schedule is prepared together with anticipated phased expenditures.

- 1 -

#### 2. CONSTRUCTION PLANNING

#### 2.1 General

The fundamental concept for construction method of each work is presented in the Unit Price Analysis Sheet appended to this volume. Using the production rates or operation systems thereof, the construction term of each work will be analyzed and arranged in proper order in the recommended construction schedule.

A moderate total construction period will be estimated as 3 years considering the various working conditions such as the "density of work in time and space" and working days rate, etc.

As viewed from the standpoing of financing, some of structures, earthworks and other ancillary works within or around Motorway Junction shall be executed in the latter part of the total contract period. (Phased Construction) The constructional procedure for the "Phased Construction will be given in detail in the Drawings.

#### 2.2 Analysis of Working Days Rate

2.2.1 Number of holidays

The following shows the number of public holidays subject to the "General Notice No. 1377 of 1977, Holidays in 1979." If Sunday overlaps on the public holiday, it will not be counted twice for the analysis of working days rate.

Date		Nos. of	Public Holiday
Monday	lst January		
Tuesday	2nd January		3 days
Sunday	28th January	,*	· · · · ·
Saturday	10th February		
*Saturday	10th February		3 days
Sunday	25th February		
Monday	12th March		· · · · · · · · · · · · · · · ·
Wednesday	14th March		3 days
Thursday	29th March		

- 2 -

Dat	e N	los. of Public Holiday
Saturday	14th April	2 days
Monday	16th April	2 days
Tuesday	lst May	1 day
Wednesday	15th August	······
Saturday	25th August	3 days
Monday	27th August	
Friday	5th October	
Saturday	20th October	3 days
Wednesday	24th October	
Thursday	lst November	2 days
Thursday	1st November	2 uayo
Sunday	4th November	
Tuesday	25th December	3 days
Wednesday	26th December	

2.2.2 Number of unworkable days due to weather conditions

The influential factors for the workability of the project are the intensity and duration of rainfall. Table 2.2-1 shows the average number of days per month on which rainfall reaches or exceeds the specified values on the 8 stations adjacent to the project road. These data derive from the Meteorological Service of Mauritius during the period 1931  $\sim$  1960. And also shown in Fig. 2.2-1 is a relationship between the monthly average for evaporation and rainfall at Plaisance Station during the same period. Hence, the weather conditions can be divided into the following 4 phases depending on the above relationship.

- 3 -

Phase	Month	Rainfall	Evaporation
I	September		·
	November	increasing	increasing
II	December	increasing	decreasing
	February	(large)	(large)
III	March	decreasing	increasing
	May	(small)	(small)
IV	June		
	July	decreasing	decreasing

The unworkable condition occurs on the rainy days and their succeeding, but not rainy days due to the charactristics both of rainfall and evaporation. So, the number of unworkable days during the period for each phase is summarized as follows according to the statistical data shown in "A Guide to Road Construction, 1976, Japan Road Association".

				-		· ·		
Data	Pl	nase I	Ph	ase II	Ph	ase III	Ph	ase IV
Rain- fall (mm)	1	s, of workable ys		. of orkable s	-	. of orkable s		, of orkable s
· · ·	Rainy day	Succeed- ing day	Rainy day	Succeed- ing day	Rainy day		Rainy day	Succeed- ing day
5-10	0	0	0.5	0	0	0	0.5	0
10-25	0.5	0	1 -	0.5	0.5	0	. 1	0.5
above 25	1	0.5	1	1.5	1	0.5	1	1.5

In case of earth-moving works:

In case of bridge super-structure works:

	· · ·			-	_		and the second	
5-10	0	0	0	0	0	0	0	0
10-25	0.5	0	0.5	0	0.5	0	1	0
Above 25	1	0	1	0	1	0	1	0

- 4 -

#### 2.2.3 Working days rate

From the analysis, the working days rate for earth-moving works and bridge superstructure works are shown in Table 2.2-2 and 2.2-3 respectively. In the tables, it is assumed that some of the unworkable days be absorbed in the number of holidays given in the percentage of holidays against calender days. In Phase II, the working days rate is very low and in particular lowest during the period from September to November. This tendency was verified in the performance of the Northern Entrance Road project by site investigation in March of this year. The annual number of working days is 218, the annual mean working days ratio comes to approximately 60 % for the earth-moving works. On the other hand, for the bridge superstructure works the number of working days is 254 and the rate is approximately 70 %.

## Table 2.2-1

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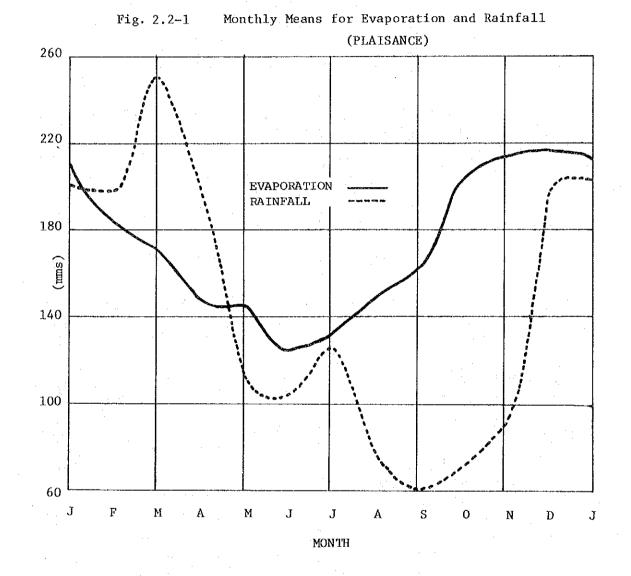
Average Number	of Days per Month	on Which	Rainfall Reached
	Specified Values		

.

Station :	Albion		Lat	itude	20°	12.7's	Lon	gltude	1 57*	24.0'E	A1	titude	: 40 feet
Mont Rainfall	th J	F	N	Y	М	J	J	Ą	S	0	N	Ð	Year
0.1 mm	0.1	10.7	13.0	7.9	5.0	5.2	5.5	4.0	3.0	3.6	4,2	8.6	78,8
1	6.3	9.0	6.3	6.3	4.2	2.9	3.0	2.5	1.8	2.2	2.9	8.0	60.2
5	3.7	4.5	5,6	3.3	1.5	1.5	1.2	0.5	0.6	0.6	1.6	4.4	29.1
10	2.2	2.9	4.0	1.7	0.0	0.9	0.5	0.2	0.5	0.2	0.8	2.9	17.6
25	0.8	0,9	1.2	0.7	0.1	0.2	0.0	0.0	0.1	0.0	0.3	1.4	5.7
50	0.7	0.5	0.4	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.7	2.6
<b>6 1 1 1</b>		_							·		•		
Station :		Lauzun	Lati	itude :	20* 1	10.1.2	Lon	gituda	: 57*	28.4'E	A1	titude	: 80 feet
Mont Rainfall	-h J	F	. H	<u>A</u>	M	J	J	Å	S	0	N	D	Year
0.1 mm	7.5	9.3	10.6	6.4	3.9	3.7	5.4	4.1	3.7	3.6	4.1	8.1	70.4
1	7.1	9.1	10.4	6.2	3.9	3.6	5.0	3.8	3.5	3.1	4.1	7.6	67.5
5	6.5	7.7	0.2	5.1	3.2	2.2	3.1	2.3	1.7	2.2	2.8	5.3	50.3
10	4.6	5.7	6.5	3,4	2.5	1.4	2.2	1.1	0.9	1.3	2.1	4.1	35.0
25	3.0	3.0	3.6	1.5	1.2	0.8	1.0	0.3	0.4	0.3	0.9	2.8	18.8
50	1.9	1.2	1.4	0.5	0.5	0.1	0.5	0.0	0.1	0.1	0.2	0.9	7.4
Mont Rainfall	h <sub>.</sub> J	F	м	λ	м	J	J	Å	s	0	N	D.	Year
0.1 mm	17.5	18.7	21.1	16.9	17.1	18.0	22.3	21.6	16.0	15.5	12.4	15.8	212.9
1	14.5	15.2	17.6	12.4	11.4	13.3	17.5	15.5	11.4	10.3	6.8	13.1	161.0
5	7.6	7.1	10.1	5.5	3.7	4.7	5.1	3.5	2.2	2.0	3.9	6.1	61.5
10	4.0	5.0	5.7	2.9	1.5	1.7	1.4	0.8	1.2	0.9	3.0	4.6	37.3
25	2.1	3.0	2.1	1.1	0.3	0.4	0.5	0.3	0.1	0.3	1.1	2.1	13.4
50	1.0	1.2	0.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	4.1
· ·									· .				
Station : 1	ion Des	ert (Al	na) 👘	Latitud	le : 2	0° 13.	3'S L	ongitu	<b>ie</b> : 5'	7° 31.6	'E A	ltitud	e : 1.27 f
						_				~	N		
Mont) Rainfall	'J	P	<u> </u>	. A	M	J	J	A	S	0	N	D	Year
Rainfall	, J 21.1	Р 19.3	<u> </u>		·····					15.2			
Rainfall	J		23.5	18.6	17.1	19.4	22.7	22.7	22.1		14.0	17.7	
Rainfall 0.1 mm	21.1	19.3	23.5	18.6 16.7	17.1	19.4	22.7	22.7	22.1	15.2	14.0	17.7	223.4
Rainfall 0.1 mm 1	J 21.1 17.6	19.3 16.3	23.5 20.7	18.6 16.7	17.1 14.9	19.4 16.6	22.7 20.1	22.7 19.6	22.1 13.4	15.2 12.6	1 <b>4.</b> 0 10.9	17.7 15.8	223.4 195.4
Rainfall 0.1 mm 1 5	21.1 17.6 10.6	19.3 16.3 9.7	23.5 20.7 12.3	18.6 16.7 9.1	17.1 14.9 7.3 3.4	19.4 16.6 6.9	22.7 20.1 8.6	22.7 19.6 6.1	22.1 13.4 4.5	15.2 12.6 3.8	14.0 10.9 4.6	17.7 15.8 9.2	223.4 195.4 92.7
Rainfall 0.1 mm 1 5 10	21.1 17.6 10.6 6.1	19.3 16.3 9.7 6.6	23.5 20.7 12.3 7.4	18.6 16.7 9.1 4.5	17.1 14.9 7.3 3.4	19.4 16.6 6.9 3.5	22.7 20.1 8.6 2.9	22.7 19.6 6.1 2.3	22.1 13.4 4.5 1.7	15.2 12.6 3.8 1.3	14.0 10.9 4.6 2.2	17.7 15.8 9.2 5.9	223.4 195.4 92.7 47.8

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						• •						•	
Station	: La Fer	Re	Latit	ude :	20° 15	5.2'5	Longi	tude :	57• 2	24.3'E	Alt	ltute :	460 feet
	nth J	P	M		N	J	J	A	S	0	N	D	Year
Rainfall 0.1 mm	10.8	12.0	13.0		~~~ <u>~</u> ~~~~		······································	<b>-</b>					**************************************
1	9.0	10.9	12.4										
5	4.5	6.0	7.5										
10	3.2	3.9	5.1				1.1						
25	1.6	1.0	1.9	0.5	0,2	0.2							
50	0.8	0.5	0.8	0.1	0.0	0.1	0.0						
	•												
Station :	Vacoas		Latit	ude : :	20* 17	.6'S	Longi	tude :	57• 2	9.4'E	Alti	tude :	1,390 feet
Mon	th J	7	м	Л	м	J	J	λ	S	0	N	D	Year
Rainfall 0.1 mma													
0.1 mea 1	22.3	20.9	24.7 20.3			22.1					16.8		
5	9.8	9.3	13.2	4.9 8.1	14.1 6.0	16.0 8.0		19.6 8.5	13.5		11.1	· .	
10	6.6	6.6	8.5	4.5	2.6		4.9	2.9	1.9	4.7		8.5 5.3	96.1 52.4
25	2.9	3.5	3.6	1.7	0.7		0.7	0.9		0.4			19.2
50	1.4	1.5	1.3	0.8	0.1	0.2	0.0	0.0	0.2	0.0			6.9
Station : Mon Rainfall		F	Latitud M	le : 20 A	)* 17. M	7'S 1 J	Longit: J	ide : ! A	57° 26 S	.8'E 0	Altit N	uđe: 1 D	.030 feet Year
Mon	+h												· · ·
Mon	+h	F		λ	M	J	J	A			N	D	· · ·
Mon Rainfall 0.1 mm 1	th J	F 15.0	м	<b>X</b> 12,5	M 10.9	J 12.9	J	<b>A</b> 12.5	S 8.8	<u>,</u> 0	N 8.8	D	Year
Mon Rainfall 0.1 mm 1 5	<sup>th</sup> J 13.0 11.8 5.2	F 15.0 14.2 8.0	M 17.1 16.1 10.1	<b>x</b> 12.5 11.1 <b>4.</b> 8	M 10.9 8.6 3.3	J 12.9 11.8 3.6	J 14.8 13.5 3.9	A 12.5 10.9	S 8.8	0 8.8	N 8.8	D 11.7	Year 146.8
Mon Rainfall 0.1 mm 1 5 10	th J 13.0 11.8 5.2 3.6	F 15.0 14.2 8.0 4.7	н 17.1 16.1 10.1 7.0	<b>A</b> 12.5 11.1 4.8 3.3	M 10.9 8.6 3.3 1.6	J 12.9 11.8 3.6 1.6	J 14.8 13.5 3.9 1.1	A 12.5 10.9	S 8.8 7.5	0 8.8 7.6	N 8.8 7.8	D 11.7 11.3	Year 146.8 131.2
Mon Rainfall 0.1 mm 1 5 10 25	th J 13.0 11.8 5.2 3.6 1.8	F 15.0 14.2 8.0 4.7 1.5	M 17.1 16.1 10.1 7.0 2.3	<ul> <li><b>x</b></li> <li>12.5</li> <li>11.1</li> <li>4.8</li> <li>3.3</li> <li>1.4</li> </ul>	M 10.9 8.6 3.3 1.6 0.5	J 12.9 11.8 3.6 1.6 0.2	J 14.8 13.5 3.9 1.1 0.3	A 12.5 10.9 2.2 0.5 0.2	S 8.8 7.5 2.3 0.5 0.2	0 8.8 7.6 1.6 0.4 0.0	N 8.8 7.8 3.7	D 11.7 11.3 6.9	Year 146.8 131.2 55.6
Mon Rainfall 0.1 mm 1 5 10	th J 13.0 11.8 5.2 3.6	F 15.0 14.2 8.0 4.7	н 17.1 16.1 10.1 7.0	<b>A</b> 12.5 11.1 4.8 3.3	M 10.9 8.6 3.3 1.6	J 12.9 11.8 3.6 1.6	J 14.8 13.5 3.9 1.1	A 12.5 10.9 2.2 0.5	S 8.8 7.5 2.3 0.5	0 8.8 7.6 1.6 0.4	N 8.8 7.8 3.7 2.7	D 11.7 11.3 6.9 4.6	Year 146.8 131.2 55.6 31.6
Mon Rainfall 0.1 mm 1 5 10 25 50	th J 13.0 11.8 5.2 3.6 1.8 0.6	F 15.0 14.2 8.0 4.7 1.5 0.6	н 17.1 16.1 10.1 7.0 2.3 1.1	A 12.5 11.1 4.8 3.3 1.4 0.5	M 10.9 8.6 3.3 1.6 0.5 0.1	J 12.9 11.8 3.6 1.6 0.2 0.1	J 14.8 13.5 3.9 1.1 0.3 0.0	A 12.5 10.9 2.2 0.5 0.2 0.0	S 8.8 7.5 2.3 0.5 0.2 0.2	0 8.8 7.6 1.6 0.4 0.0 0.0	N 8.8 7.8 3.7 2.7 1.0 0.0	D 11.7 11.3 6.9 4.6 2.0 0.6	Year 146.8 131.2 55.6 31.6 11.2 3.8
Mon Rainfall 0.1 mm 1 5 10 25 50 Station :	th J 13.0 11.8 5.2 3.6 1.8 0.6 Henriet	F 15.0 14.2 8.0 4.7 1.5 0.6	н 17.1 16.1 10.1 7.0 2.3 1.1	A 12.5 11.1 4.8 3.3 1.4 0.5	M 10.9 8.6 3.3 1.6 0.5 0.1	J 12.9 11.8 3.6 1.6 0.2 0.1	J 14.8 13.5 3.9 1.1 0.3 0.0	A 12.5 10.9 2.2 0.5 0.2 0.0	S 8.8 7.5 2.3 0.5 0.2 0.2	0 8.8 7.6 1.6 0.4 0.0 0.0	N 8.8 7.8 3.7 2.7 1.0 0.0	D 11.7 11.3 6.9 4.6 2.0 0.6	Year 146.8 131.2 55.6 31.6 11.2 3.8
Mon Rainfall 0.1 mm 1 5 10 25 50 Station :	th J 13.0 11.8 5.2 3.6 1.8 0.6	F 15.0 14.2 8.0 4.7 1.5 0.6	н 17.1 16.1 10.1 7.0 2.3 1.1	A 12.5 11.1 4.8 3.3 1.4 0.5	M 10.9 8.6 3.3 1.6 0.5 0.1	J 12.9 11.8 3.6 1.6 0.2 0.1	J 14.8 13.5 3.9 1.1 0.3 0.0	A 12.5 10.9 2.2 0.5 0.2 0.0	S 8.8 7.5 2.3 0.5 0.2 0.2	0 8.8 7.6 1.6 0.4 0.0 0.0	N 8.8 7.8 3.7 2.7 1.0 0.0	D 11.7 11.3 6.9 4.6 2.0 0.6	Year 146.8 131.2 55.6 31.6 11.2 3.8
Mon Rainfall 0.1 mm 1 5 10 25 50 Station : Mont Rainfall 0.1 mm	th J 13.0 11.8 5.2 3.6 1.8 0.6 Henriet	F 15.0 14.2 8.0 4.7 1.5 0.6 ta 1 F 16.2	M 17.1 16.1 10.1 7.0 2.3 1.1 Latitud M 19.0	A         12.5         11.1         4.8         3.3         1.4         0.5         ie : 20         A         14.6	M 10.9 8.6 3.3 1.6 0.5 0.1 • 19.9 M	J 12.9 11.8 3.6 1.6 0.2 0.1 'S I J 17.6	J 14.8 13.5 3.9 1.1 0.3 0.0 congitu J 22.5	A 12.5 10.9 2.2 0.5 0.2 0.0 de : 5 A 20.7	S 8.8 7.5 2.3 0.5 0.2 0.2 0.2 57° 28. S 14.7	0 8.8 7.6 1.6 0.4 0.0 0.0 1'E 0 12.9	N 8.8 7.8 3.7 2.7 1.0 0.0 Altitu N 12.3	D 11.7 11.3 6.9 4.6 2.0 0.6 xde : 1 D 15.0	Year 146.8 131.2 55.6 31.6 11.2 3.8 ,540 feet
Mon Rainfall 0.1 mm 1 5 10 25 50 Station : Mont Rainfall 0.1 mm 1	th J 13.0 11.8 5.2 3.6 1.8 0.6 Henriet th J 17.9 14.7	F         15.0         14.2         8.0         4.7         1.5         0.6         ta         p         16.2         15.1	<pre>H 17.1 16.1 10.1 7.0 2.3 1.1 Latitud M 19.0 18.0</pre>	x         12.5         11.1         4.8         3.3         1.4         0.5         e : 20         A         14.6         11.6	M 10.9 8.6 3.3 1.6 0.5 0.1 • 19.9 M 15.1 13.7	J 12.9 11.8 3.6 1.6 0.2 0.1 ''S I J 17.6 14.6	J 14.8 13.5 3.9 1.1 0.3 0.0 0 0 0 0 0 1 22.5 19.5	A 12.5 10.9 2.2 0.5 0.2 0.0 de : 5 A 20.7	s 8.8 7.5 2.3 0.5 0.2 0.2 0.2 57* 28. 8 14.7 11.0	0 8.8 7.6 1.6 0.4 0.0 0.0 1'E 0 12.9 19.5	N 8.8 7.8 3.7 2.7 1.0 0.0 Altitu N 12.3	D 11.7 11.3 6.9 4.6 2.0 0.6 xde : 1 D 15.0	Year 146.8 131.2 55.6 31.6 11.2 3.8 ,540 feet Year
Mon Rainfall 0.1 mm 1 5 10 25 50 Station : Mont Rainfall 0.1 mm 1 5	th J 13.0 11.8 5.2 3.6 1.8 0.6 Henriet th J 17.9 14.7 9.1	F 15.0 14.2 8.0 4.7 1.5 0.6 ta 1 F 16.2 15.1 9.1	M 17.1 16.1 10.1 7.0 2.3 1.1 Latitud M 19.0 18.0 12.4	x         112.5         11.1         4.8         3.3         1.4         0.5         ie : 20         A         14.6         11.6         6.3	M 10.9 8.6 3.3 1.6 0.5 0.1 • 19.9 M 15.1 13.7 6.0	J 12.9 11.8 3.6 1.6 0.2 0.1	J 14.8 13.5 3.9 1.1 0.3 0.0 congitu J 22.5 19.5 9.6	A 12.5 10.9 2.2 0.5 0.2 0.0 de : 5 A 20.7 17.0 7.9	S 8.8 7.5 2.3 0.5 0.2 0.2 37° 28. S 14.7 11.0 4.9	0 8.8 7.6 1.6 0.4 0.0 0.0 1'E 0 12.9 19.5 3.5	N 8.8 7.8 3.7 2.7 1.0 0.0 Altitu N 12.3 10.6 3.8	D 11.7 11.3 6.9 4.6 2.0 0.6 xde : 1 D 15.0 12.6 7.1	Year 146.8 131.2 55.6 31.6 11.2 3.8 ,540 feet Year 198.5 177.9 87.1
Mon Rainfall 0.1 mm 1 5 10 25 50 Station : Mont Rainfall 0.1 mm 1 5 10	th J 13.0 11.8 5.2 3.6 1.8 0.6 Henriet th J 17.9 14.7 9.1 5.9	F 15.0 14.2 8.0 4.7 1.5 0.6 ta I F 16.2 15.1 9.1 6.6	<pre>H 17.1 16.1 10.1 7.0 2.3 1.1 Latitud M 19.0 18.0 12.4 8.5</pre>	A         12.5         11.1         4.8         3.3         1.4         0.5         (e : 20)         A         14.6         11.6         6.3         4.2	M 10.9 8.6 3.3 1.6 0.5 0.1 • 19.9 M 15.1 13.7 6.0 2.9	J 12.9 11.8 3.6 1.6 0.2 0.1 <sup>17</sup> S 1 J 17.6 14.6 5.4 3.0	J 14.8 13.5 3.9 1.1 0.3 0.0 congitu J 22.5 19.5 9.6 4.4	A         12.5         10.9         2.2         0.5         0.2         0.0         de : 5         A         20.7         17.0         7.9         2.5	S 8.8 7.5 2.3 0.5 0.2 0.2 7° 28. S 14.7 11.0 4.9 2.2	0 8.8 7.6 1.6 0.4 0.0 0.0 1'E 0 12.9 19.5 3.5 1.3	N 8.8 7.8 3.7 2.7 1.0 0.0 Altitu N 12.3 10.6 3.8 3.3	D 11.7 11.3 6.9 4.6 2.0 0.6 xde : 1 D 15.0 12.6 7.1 5.5	Year 146.8 131.2 55.6 31.6 11.2 3.8 ,540 feet Year 198.5 177.9 87.1 50.5
Mon Rainfall 0.1 mm 1 5 10 25 50 Station : Mont Rainfall 0.1 mm 1 5 10 25	th J 13.0 11.8 5.2 3.6 1.8 0.6 Henriet th J 17.9 14.7 9.1 5.9 2.4	F         15.0         14.2         8.0         4.7         1.5         0.6         ta         1         P         16.2         15.1         9.1         5.6         2.8	<pre>M 17.1 16.1 10.1 7.0 2.3 1.1 Latitud M 19.0 18.0 12.4 8.5 3.8</pre>	A         12.5         11.1         4.8         3.3         1.4         0.5         e : 20         A         14.6         11.6         6.3         4.2         2.1	M 10.9 8.6 3.3 1.6 0.5 0.1 • 19.9 M 15.1 13.7 6.0 2.9 0.9	J 12.9 11.8 3.6 1.6 0.2 0.1 ''S I J 17.6 14.6 5.4 3.0 1.0	J 14.8 13.5 3.9 1.1 0.3 0.0 congitu J 22.5 19.5 9.6 4.4 0.2	A         12.5         10.9         2.2         0.5         0.2         0.0         de : 5         A         20.7         17.0         7.9         2.5         0.4	s 8.8 7.5 2.3 0.5 0.2 0.2 0.2 57* 28. 5 14.7 11.0 4.9 2.2 0.1	0 8.8 7.6 1.6 0.4 0.0 0.0 1'E 0 12.9 19.5 3.5 1.3 0.1	N 8.8 7.8 3.7 2.7 1.0 0.0 Altitu N 12.3 10.6 3.8 3.3 1.0	D 11.7 11.3 6.9 4.6 2.0 0.6 2.0 0.6 2.0 1.0 1.0 15.0 12.6 7.1 5.5 2.7	Year 146.8 131.2 55.6 31.6 11.2 3.8 ,540 feet Year 198.5 177.9 87.1 50.5 17.5
Mon Rainfall 0.1 mm 1 5 10 25 50 Station : Mont Rainfall 0.1 mm 1 5 10	th J 13.0 11.8 5.2 3.6 1.8 0.6 Henriet th J 17.9 14.7 9.1 5.9	F 15.0 14.2 8.0 4.7 1.5 0.6 ta I F 16.2 15.1 9.1 6.6	<pre>H 17.1 16.1 10.1 7.0 2.3 1.1 Latitud M 19.0 18.0 12.4 8.5</pre>	A         12.5         11.1         4.8         3.3         1.4         0.5         (e : 20)         A         14.6         11.6         6.3         4.2	M 10.9 8.6 3.3 1.6 0.5 0.1 • 19.9 M 15.1 13.7 6.0 2.9	J 12.9 11.8 3.6 1.6 0.2 0.1 <sup>17</sup> S 1 J 17.6 14.6 5.4 3.0	J 14.8 13.5 3.9 1.1 0.3 0.0 congitu J 22.5 19.5 9.6 4.4 0.2 0.0	A         12.5         10.9         2.2         0.5         0.2         0.0         de : 5         A         20.7         17.0         7.9         2.5         0.4         0.0	S 8.8 7.5 2.3 0.5 0.2 0.2 7° 28. S 14.7 11.0 4.9 2.2	0 8.8 7.6 1.6 0.4 0.0 0.0 1'E 0 12.9 19.5 3.5 1.3 0.1	N 8.8 7.8 3.7 2.7 1.0 0.0 Altitu N 12.3 10.6 3.8 3.3	D 11.7 11.3 6.9 4.6 2.0 0.6 2.0 0.6 2.0 1.0 1.0 15.0 12.6 7.1 5.5 2.7	Year 146.8 131.2 55.6 31.6 11.2 3.8 ,540 feet Year 198.5 177.9 87.1 50.5
Mon Rainfall 0.1 mm 1 5 10 25 50 Station : Mont Rainfall 0.1 mm 1 5 10 25	th J 13.0 11.8 5.2 3.6 1.8 0.6 Henriet th J 17.9 14.7 9.1 5.9 2.4	F         15.0         14.2         8.0         4.7         1.5         0.6         ta         1         P         16.2         15.1         9.1         5.6         2.8	<pre>M 17.1 16.1 10.1 7.0 2.3 1.1 Latitud M 19.0 18.0 12.4 8.5 3.8</pre>	x         112.5         11.1         4.8         3.3         1.4         0.5         e: 20         A         14.6         11.6         6.3         4.2         2.1         0.6	M 10.9 8.6 3.3 1.6 0.5 0.1 • 19.9 M 15.1 13.7 6.0 2.9 0.9	J 12.9 11.8 3.6 1.6 0.2 0.1 ''S I J 17.6 14.6 5.4 3.0 1.0	J 14.8 13.5 3.9 1.1 0.3 0.0 congitu J 22.5 19.5 9.6 4.4 0.2 0.0	A         12.5         10.9         2.2         0.5         0.2         0.0         de : 5         A         20.7         17.0         7.9         2.5         0.4	s 8.8 7.5 2.3 0.5 0.2 0.2 0.2 57* 28. 5 14.7 11.0 4.9 2.2 0.1	0 8.8 7.6 1.6 0.4 0.0 0.0 1'E 0 12.9 19.5 3.5 1.3 0.1	N 8.8 7.8 3.7 2.7 1.0 0.0 Altitu N 12.3 10.6 3.8 3.3 1.0	D 11.7 11.3 6.9 4.6 2.0 0.6 2.0 0.6 2.0 1.0 1.0 15.0 12.6 7.1 5.5 2.7	Year 146.8 131.2 55.6 31.6 11.2 3.8 ,540 feet Year 198.5 177.9 87.1 50.5 17.5
Mon Rainfall 0.1 mm 1 5 10 25 50 Station : Mont Rainfall 0.1 mm 1 5 10 25	th J 13.0 11.8 5.2 3.6 1.8 0.6 Henriet th J 17.9 14.7 9.1 5.9 2.4	F         15.0         14.2         8.0         4.7         1.5         0.6         ta         1         P         16.2         15.1         9.1         5.6         2.8	<pre>M 17.1 16.1 10.1 7.0 2.3 1.1 Latitud M 19.0 18.0 12.4 8.5 3.8</pre>	x         112.5         11.1         4.8         3.3         1.4         0.5         e: 20         A         14.6         11.6         6.3         4.2         2.1         0.6	M 10.9 8.6 3.3 1.6 0.5 0.1 • 19.9 M 15.1 13.7 6.0 2.9 0.9	J 12.9 11.8 3.6 1.6 0.2 0.1 ''S I J 17.6 14.6 5.4 3.0 1.0	J 14.8 13.5 3.9 1.1 0.3 0.0 congitu J 22.5 19.5 9.6 4.4 0.2 0.0	A         12.5         10.9         2.2         0.5         0.2         0.0         de : 5         A         20.7         17.0         7.9         2.5         0.4         0.0	s 8.8 7.5 2.3 0.5 0.2 0.2 0.2 57* 28. 5 14.7 11.0 4.9 2.2 0.1	0 8.8 7.6 1.6 0.4 0.0 0.0 1'E 0 12.9 19.5 3.5 1.3 0.1	N 8.8 7.8 3.7 2.7 1.0 0.0 Altitu N 12.3 10.6 3.8 3.3 1.0	D 11.7 11.3 6.9 4.6 2.0 0.6 2.0 0.6 2.0 1.0 1.0 15.0 12.6 7.1 5.5 2.7	Year 146.8 131.2 55.6 31.6 11.2 3.8 ,540 feet Year 198.5 177.9 87.1 50.5 17.5
Mon Rainfall 0.1 mm 1 5 10 25 50 Station : Mont Rainfall 0.1 mm 1 5 10 25	th J 13.0 11.8 5.2 3.6 1.8 0.6 Henriet th J 17.9 14.7 9.1 5.9 2.4	F         15.0         14.2         8.0         4.7         1.5         0.6         ta         1         P         16.2         15.1         9.1         5.6         2.8	<pre>M 17.1 16.1 10.1 7.0 2.3 1.1 Latitud M 19.0 18.0 12.4 8.5 3.8</pre>	x         112.5         11.1         4.8         3.3         1.4         0.5         e: 20         A         14.6         11.6         6.3         4.2         2.1         0.6	M 10.9 8.6 3.3 1.6 0.5 0.1 • 19.9 M 15.1 13.7 6.0 2.9 0.9	J 12.9 11.8 3.6 1.6 0.2 0.1 ''S I J 17.6 14.6 5.4 3.0 1.0	J 14.8 13.5 3.9 1.1 0.3 0.0 congitu J 22.5 19.5 9.6 4.4 0.2 0.0	A         12.5         10.9         2.2         0.5         0.2         0.0         de : 5         A         20.7         17.0         7.9         2.5         0.4         0.0	s 8.8 7.5 2.3 0.5 0.2 0.2 0.2 57* 28. 5 14.7 11.0 4.9 2.2 0.1	0 8.8 7.6 1.6 0.4 0.0 0.0 1'E 0 12.9 19.5 3.5 1.3 0.1 0.0	N 8.8 7.8 3.7 2.7 1.0 0.0 Altitu N 12.3 10.6 3.8 3.3 1.0	D 11.7 11.3 6.9 4.6 2.0 0.6 2.0 0.6 2.0 1.0 1.0 15.0 12.6 7.1 5.5 2.7	Year 146.8 131.2 55.6 31.6 11.2 3.8 ,540 feet Year 198.5 177.9 87.1 50.5 17.5
Mon Rainfall 0.1 mm 1 5 10 25 50 Station : Mont Rainfall 0.1 mm 1 5 10 25	th J 13.0 11.8 5.2 3.6 1.8 0.6 Henriet th J 17.9 14.7 9.1 5.9 2.4	F         15.0         14.2         8.0         4.7         1.5         0.6         ta         1         P         16.2         15.1         9.1         5.6         2.8	<pre>M 17.1 16.1 10.1 7.0 2.3 1.1 Latitud M 19.0 18.0 12.4 8.5 3.8</pre>	x         112.5         11.1         4.8         3.3         1.4         0.5         e: 20         A         14.6         11.6         6.3         4.2         2.1         0.6	M 10.9 8.6 3.3 1.6 0.5 0.1 • 19.9 M 15.1 13.7 6.0 2.9 0.9	J 12.9 11.8 3.6 1.6 0.2 0.1 ''S I J 17.6 14.6 5.4 3.0 1.0	J 14.8 13.5 3.9 1.1 0.3 0.0 congitu J 22.5 19.5 9.6 4.4 0.2 0.0	A         12.5         10.9         2.2         0.5         0.2         0.0         de : 5         A         20.7         17.0         7.9         2.5         0.4         0.0	s 8.8 7.5 2.3 0.5 0.2 0.2 0.2 57* 28. 5 14.7 11.0 4.9 2.2 0.1	0 8.8 7.6 1.6 0.4 0.0 0.0 1'E 0 12.9 19.5 3.5 1.3 0.1 0.0	N 8.8 7.8 3.7 2.7 1.0 0.0 Altitu N 12.3 10.6 3.8 3.3 1.0	D 11.7 11.3 6.9 4.6 2.0 0.6 2.0 0.6 2.0 1.0 1.0 15.0 12.6 7.1 5.5 2.7	Year 146.8 131.2 55.6 31.6 11.2 3.8 ,540 feet Year 198.5 177.9 87.1 50.5 17.5
Mon Rainfall 0.1 mm 1 5 10 25 50 Station : Mont Rainfall 0.1 mm 1 5 10 25	th J 13.0 11.8 5.2 3.6 1.8 0.6 Henriet th J 17.9 14.7 9.1 5.9 2.4	F         15.0         14.2         8.0         4.7         1.5         0.6         ta         1         P         16.2         15.1         9.1         5.6         2.8	<pre>M 17.1 16.1 10.1 7.0 2.3 1.1 Latitud M 19.0 18.0 12.4 8.5 3.8</pre>	x         112.5         11.1         4.8         3.3         1.4         0.5         e: 20         A         14.6         11.6         6.3         4.2         2.1         0.6	M 10.9 8.6 3.3 1.6 0.5 0.1 • 19.9 M 15.1 13.7 6.0 2.9 0.9 0.1	J 12.9 11.8 3.6 1.6 0.2 0.1 J 17.6 14.6 5.4 3.0 1.0 0.2	J 14.8 13.5 3.9 1.1 0.3 0.0 congitu J 22.5 19.5 9.6 4.4 0.2 0.0	A         12.5         10.9         2.2         0.5         0.2         0.0         de : 5         A         20.7         17.0         7.9         2.5         0.4         0.0	s 8.8 7.5 2.3 0.5 0.2 0.2 0.2 57* 28. 5 14.7 11.0 4.9 2.2 0.1	0 8.8 7.6 1.6 0.4 0.0 0.0 1'E 0 12.9 19.5 3.5 1.3 0.1 0.0	N 8.8 7.8 3.7 2.7 1.0 0.0 Altitu N 12.3 10.6 3.8 3.3 1.0	D 11.7 11.3 6.9 4.6 2.0 0.6 2.0 0.6 2.0 1.0 1.0 15.0 12.6 7.1 5.5 2.7	Year 146.8 131.2 55.6 31.6 11.2 3.8 ,540 feet Year 198.5 177.9 87.1 50.5 17.5
Mon Rainfall 0.1 mm 1 5 10 25 50 Station : Mont Rainfall 0.1 mm 1 5 10 25	th J 13.0 11.8 5.2 3.6 1.8 0.6 Henriet th J 17.9 14.7 9.1 5.9 2.4	F         15.0         14.2         8.0         4.7         1.5         0.6         ta         1         P         16.2         15.1         9.1         5.6         2.8	<pre>M 17.1 16.1 10.1 7.0 2.3 1.1 Latitud M 19.0 18.0 12.4 8.5 3.8</pre>	x         112.5         11.1         4.8         3.3         1.4         0.5         e: 20         A         14.6         11.6         6.3         4.2         2.1         0.6	M 10.9 8.6 3.3 1.6 0.5 0.1 • 19.9 M 15.1 13.7 6.0 2.9 0.9 0.1	J 12.9 11.8 3.6 1.6 0.2 0.1 ''S I J 17.6 14.6 5.4 3.0 1.0	J 14.8 13.5 3.9 1.1 0.3 0.0 congitu J 22.5 19.5 9.6 4.4 0.2 0.0	A         12.5         10.9         2.2         0.5         0.2         0.0         de : 5         A         20.7         17.0         7.9         2.5         0.4         0.0	s 8.8 7.5 2.3 0.5 0.2 0.2 0.2 57* 28. 5 14.7 11.0 4.9 2.2 0.1	0 8.8 7.6 1.6 0.4 0.0 0.0 1'E 0 12.9 19.5 3.5 1.3 0.1 0.0	N 8.8 7.8 3.7 2.7 1.0 0.0 Altitu N 12.3 10.6 3.8 3.3 1.0	D 11.7 11.3 6.9 4.6 2.0 0.6 2.0 0.6 2.0 1.0 1.0 15.0 12.6 7.1 5.5 2.7	Year 146.8 131.2 55.6 31.6 11.2 3.8 ,540 feet Year 198.5 177.9 87.1 50.5 17.5
Mon Rainfall 0.1 mm 1 5 10 25 50 Station : Mont Rainfall 0.1 mm 1 5 10 25	th J 13.0 11.8 5.2 3.6 1.8 0.6 Henriet th J 17.9 14.7 9.1 5.9 2.4	F         15.0         14.2         8.0         4.7         1.5         0.6         ta         1         P         16.2         15.1         9.1         5.6         2.8	<pre>M 17.1 16.1 10.1 7.0 2.3 1.1 Latitud M 19.0 18.0 12.4 8.5 3.8</pre>	x         112.5         11.1         4.8         3.3         1.4         0.5         e: 20         A         14.6         11.6         6.3         4.2         2.1         0.6	M 10.9 8.6 3.3 1.6 0.5 0.1 • 19.9 M 15.1 13.7 6.0 2.9 0.9 0.1	J 12.9 11.8 3.6 1.6 0.2 0.1 J 17.6 14.6 5.4 3.0 1.0 0.2	J 14.8 13.5 3.9 1.1 0.3 0.0 congitu J 22.5 19.5 9.6 4.4 0.2 0.0	A         12.5         10.9         2.2         0.5         0.2         0.0         de : 5         A         20.7         17.0         7.9         2.5         0.4         0.0	s 8.8 7.5 2.3 0.5 0.2 0.2 0.2 57* 28. 5 14.7 11.0 4.9 2.2 0.1	0 8.8 7.6 1.6 0.4 0.0 0.0 1'E 0 12.9 19.5 3.5 1.3 0.1 0.0	N 8.8 7.8 3.7 2.7 1.0 0.0 Altitu N 12.3 10.6 3.8 3.3 1.0	D 11.7 11.3 6.9 4.6 2.0 0.6 2.0 0.6 2.0 1.0 1.0 15.0 12.6 7.1 5.5 2.7	Year 146.8 131.2 55.6 31.6 11.2 3.8 ,540 feet Year 198.5 177.9 87.1 50.5 17.5



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Working Days Rate for Earthwork and Bridge Substructure Work

Table 2.2-2

					1 -   5				,	3				
			-	·									Unwork-	
• •				, , ,		1				- - - -			davs	Work-
IOM	Month Ca	calend. days	зларттон	calend. days		Rainy	iny days		Unworkal to rain	Unworkable days to rain	due		but over	:
				excl.	Holi-								101440-	247 0
		ਰ	(2)	Holiday	days (3)	5-10m/m	10-25m/m	above 25m/m	5-10m/m	10-25m/m	above 25m/m	Total (4)	Holidays $(3) X (4)$	s (rate)
Jan		31	9	25	6T.O	7.1	4.6	3.4	3.6	6.9	8.5	19.0	-3.7	9.7 (31%)
Ч <del>с</del> р.	q	58 78	Ø.	22	0.21	7.7	с Г	3.4	3.9	8.0	0 • 0	20.4	-4.4	(21%) (21%)
Mar		н е	2	24	0.23	6.9	6.6	3.7	0	С. Е	5.6	o a	-2.0	17.1 (55%)
Apr	н	0 M	Q	24	0.20	5.8	3.4	1.7	0	- 7	1.7	4.3	6°0-	20.6 (69%)
May	Ϋ́	те в	ப	26	0.16	4.1	2.0	0.7	0	0.1	·	2.1	ю - О -	24.2 (78%)
Jun	.9	08	4	56	0.13	4.3	2.2	0.7	2.2	3.3	1.8	7.3	1	19.7 (66%)
Jul		31	4	27	0.13	5.4	2.2	5 O	2.7		н М	7.3	6 0	20.6 (66%)
Aug	5	31	4	24	0.23	-44	1.3	0.3	2.0	2.0	0.8	4.8	г. г	20.3 (65%)
C S S	<u>.</u> Д	30	-4	26 <sup>.</sup>	0.13	-8 -8	1.2	е <b>.</b> 0	0	۰ و	0	ч. Ч.	-0 I	25.0 (83%)
ŏ	0ct	31	- <u>-</u>	54	0.23	2 <b>.</b> 5	г.о	0.2	0	0,5	0.3	0.8	-0-2	23.4 (75%)
NOV	Þ.	30	v	24	0.20	3.4	2.2	л-0 Т	.0	ц.	1.5	2.6	-0-2	21.9 (73%)
Dec	U U	31	Q	52	0.19	6.7	4.6	3.2	3°3	6.9	0.0	18.2	ທ ຕ	10.3 (33%)
Total		365	67	298	0.18									218.6 (60%)

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Working Days Rate for Bridge Superstructure Work

Table 2.2-3

	Work- - ing days	(rate)	17,0 (55%)	17.2 (61%)	18.6 (60%)	21.3 (71%)	24.6 (79%)	24.4 (81%)	25°6 (83%)	23_2 (75%)	25.2 (84%)	23_5 (76%)	22.3 (74%)	11.4 (34%)	254.3 (70%)
Unwork-	able days but over lapped	A A H O	-1.7	یں ا	-1.6	. 2 . 0 -	е <b>.</b> 0-	-0.2	-0.2	-0.2	-0-1	-0.2	-0.4	-1.1	
		Total (4)	8.7	6.1	7.0	ы. 4	1.7	1.8	1.6	г.о	6.0	0.7	2.1	ນ ບ	
	Unworkable days due to rain	above 25m/m	3.4	3.4	3.7	1.7	0.7	0.7	0.5	0.3	0.3	0.2	1.0	3.2	
		10-25m/m	2.3	2.7	3.3	1.7	1.0	1 - 1		0.7	0.6	0.5		5 10 10	
		5-10m/m		0	0	0	0	0	0	0	0	0	0	0	
	Rainy days	above 25m/m	э.4 Э.4	з. 4	3.7	1.7	0.7	0.7	0.5	0.3	е о	0.2	1.0	3.2	
		10-25m/m	4.6	5.3	6.6	3.4	2.0	2.2	2.2	с. Н	1.2	1.0	2.2	4.6	
		5-10m/m	7.1	7.7	6. 6	ຜ ທີ່	4.1	4 0	5.4	4	2.8	2.5	6 7	6.7	
	Ratio of Holi-	days (3)	0.19	0.21	0.23	0.20	0.16	0.13	0.13	0.23	0.13	0.23	0.20	0.19	0.18
	Calend. days excl. Holiday		25	22	24	24	26	36	27	24	26	24	24	52	298
	Holidays	(2)	ŵ	vo	~	Q	ഗ	শ	4	۲.	4	4	Q	Q	67
	Calend. days	(1)	Ë	58	31	30	31	000	Ë	н гн	OE OE	31	OE S	31	365
	Month		Jan	ъер Н	Mar	Apr	May	un j	זעד	Aug	Sep	0ct 0	Nov	Dec	Total

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#### 2.3 Distribution Plan of Excavated Materials

Fig. 2.3-1 shows schematically a distribution plan of materials from the roadway and structure excavations subject to the mass curve shown in the Drawings. In order to minimize the haulage distance, surplus materials shall be deposited in the areas near the projected road. Two deposit areas are tentatively allocated in the crown lands around Sta. 45 and Motorway Junction. The Employer shall prepare those deposit areas parallel to the land acquisitions before the work starts.

The quantity of deposited materials will reach to approximately 188,000 m<sup>3</sup>, of which 162,000 m<sup>3</sup> will be originated in the section Sta. 55+80 - Sta. 59+80, 15,000 m<sup>3</sup> in the section Sta. 62+82 - Sta. 65+57 and 9,000 m<sup>3</sup> in the realignment excavation existing Motorway as shown in the Drawings.

Viewed from the point of material distribution, sectioning of earthmoving will be as follows:

Section 1: Sta. 0 - Sta. 34+20 and Access Road (Excavation and embankment materials are balanced within the section)

Section 2: Sta. 34+20 - Sta. 60+78 and Coromandel I.C. (Surplus materials)

Section 3: Sta. 60+78 - Sta. 76+13, Motorway Junction and improvement of M1 M2 Road (Surplus materials)

Table 2.3-1 summarized the haulage distance and quantity of materials subject to the haulage system. In the phased construction stage, the stockpiled materials within or around the Motorway Junction will be used to accomplish the works as specified in the Drawings and stipulations of the Contract.

Two temporary working roads will be proposed, crossing Grand River Northwest and St. Louis River respectively for the execution of the bridges' substructure. The latter road aims to serve the hauling of materials (Approx. 15,000 m<sup>3</sup>) from the section Sta. 62+82 - Sta. 65+57to the deposit area tentatively established in the vicinity of the Motorway Junction.

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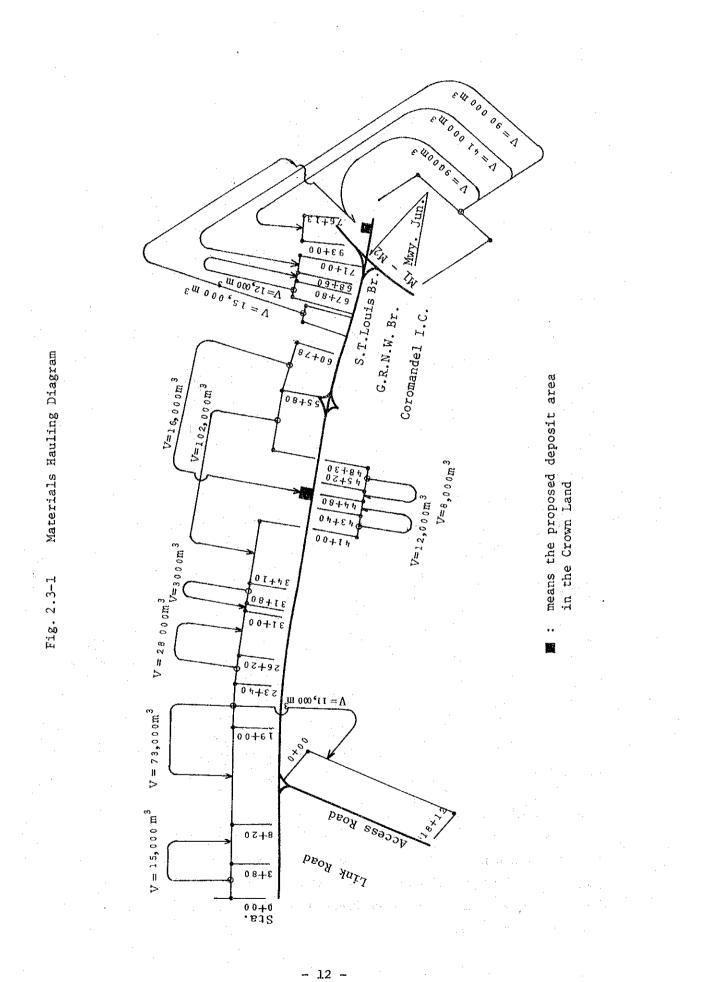


Table 2.3-1 Roadway Excavation and Mean Haulage Distance

This analysis is exclusive of the haulage of material in the phased construction period. Total Q'ty & Mean Haulage Distance (D) D=1,290m D=1,760m D=110m 29,100m<sup>3</sup> 9,500m<sup>3</sup> 101,400m<sup>3</sup> 89,800m<sup>3</sup> 205,100m<sup>3</sup> 102,300m<sup>3</sup> **D**=75m 83,800m<sup>3</sup> 621,000m<sup>3</sup> D=310m D=620m <u>D</u>=870m Sta60+78 - Sta76+13 ML M2 Road D=1,060m D=110m 5,400m<sup>3</sup> 89,800m<sup>3</sup> 5,100m<sup>3</sup> 15,300m<sup>3</sup> 65,300m<sup>3</sup>. 180,900m<sup>3</sup> **D**=350m <u>D</u>=70m D=274m Sta34+20 - Sta60+78 Coromandal I C D=1,300m D=1,355m D=1,760m 5,200m<sup>3</sup> 2,100m<sup>3</sup> 102,300m<sup>3</sup> 20,400m<sup>3</sup> 292,000m<sup>3</sup> 162,000m<sup>3</sup> D=80m D=220m Sta0+00 - Sta34+20 D=1,320m Access Road 18,500m<sup>3</sup> 27,800m<sup>3</sup> 2,300m<sup>3</sup> 16,700m<sup>3</sup> 83,800m<sup>3</sup> 149,100m<sup>3</sup> **D**=80m D=620m D=270m D=633m Dozer shovel Dump truck Hauling Equipment Bulldozer Bulldozer ditto ditto ditto ditto w Total Q'ty 500<br/>
D<1000 1500<b</>D<2000 Hauling Distance 1000<br/>D<1500 50<D<100 100<br/>200 В И E

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## 2.4 Construction Schedule Analysis

2.4.1 Bridge works

The schedule analysis for major bridges is shown in Table 2.4-1 to 2.4-23. In the analysis, the required construction term for each bridge is calculated on the actual working days basis, hereupon, it is converted to the calendar days basis using the working days rate (70%) as above discussed. An hourly production rate for equipment or labour derives from assumptions established in the Unit Price Analysis Sheet respectively, which are attached hereto as an appendix.

# 2.4.2 Earthworks

The operation system of earthworks and production rate are assumed as shown in Table 2.4-24, and Fig. 2.4-1 and 2.4.2. Based on those assumptions the construction term for each section is represented in Table 2.4-25, 2.4-26, and 2.4-2.

#### 2.4.3 Box culverts works

The schedule analyses for execution of box culverts are shown in the Table 2.4-28 and 2.4-29. The production rate of each work item such as concreting, form work or reinforcement bar work is based on the production speed set forth in the Unit Price Analysis Sheet, which is as follows.

Item	Equipment & Labourer	Nos.	Production rate
Foundation		· · · · · · · · · · · · · · · · · · ·	· · · · · ·
Excavation	Back hoe, $0.5 \text{ m}^3$	1 unit	$40 \text{ m}^3/\text{h}$
Bedding	Labourer	5 men	$1.2 \text{ m}^3/\text{h}$
Levelling concrete	Labourer	10 men	30 m <sup>3</sup> /h
Reinforce- ment bar	Wheel crane, 5t Truck, 6t Labourer	1 unit 1 unit 10 men	0.25 t/h
Formwork	Truck, 6t Labourer	l unit 5 men	3 m <sup>2</sup> /h

Item	Equipment & Labourer	Nos.	Production rate
Concreting		:	
Scaffolding	Wheel crane, 5t Truck, 6t Labourer	l unit l unit 5 men	20 m <sup>3</sup> /h
Formworks	Wheel crane, 5t Truck, 6t Labourer	l unit 1 unit 10 men	$20 \text{ m}^2/\text{h}$
Reinforce- ment bar	Wheel crane, 5t Truck, 6t Labourer	l unit l unit 10 men	0.25 t/h
Concreting	Concrete pump truck, 60 m <sup>3</sup> /h	1 unit	$40 \text{ m}^3/\text{h}$
	Concrete vibrator 4 kg	3 unit	
	Labourer	10 men	

### 2.4.4 Pavement works

The preparation on subgrade preceeding subbase work will be performed by the combination of a Motor grader (Blade width 3.7 m) and a 20 ton Tire roller, so that the hourly production is assumed to be approximately  $500 \text{ m}^2/\text{h} \times 8 \text{ hr/day} = 4,000 \text{ m}^2/\text{h}.$ 

The hourly production rate for the subbase work is assumed as 1,000 m<sup>3</sup>/day and 500 m<sup>3</sup>/day respectively for the carriageway and shoulder. The operational arrangement is as follows.

Item	Required number per 1,000 m <sup>3</sup> /day
Motor grader, 3.7 m class	2 units
Tire roller, 20 t class	2 units
Tire roller, 28 t class	l unit
Macadam roller, 12 t class	l unit
Vibrating roller, 1 t class	2 units
Water lorry, 5,000 & class	1 unit
Labourer	15 men

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The hourly production rate for the asphalt binder and wearing course work is estimated as 390 ton/day, for which following equipment and labourers are required.

Item	Required number per 390 ton/day
Asphalt finisher, 4.5 m class	4 units
Macadam roller, 12 t class	4 units
Tandem roller, 20 t class	4 units
Tire roller, 28 t class	4 units
Labourer	30 men

As based upon the above production rates the construction term is shown in Table 2.4-30 to 2.4-35.

#### 2.4.5 Recommended construction schedule

The recommended construction schedule is presented in Table 2.4-36 subject to the detailed analyses of construction term for main structures or sections of the project. From the contractual consideration the works around the Motorway Junction are to be assigned within the latter part of period for completion. (Phased construction)

In considering common civil engineering practices it will require at least three years for the completion of the project in order to distribute each work element over the project time and space.

In addition, the main equipment can be scheduled approximately as shown in Table 2.4-37.

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Table 2.4-1 Summary of Construction Period of Bridge

Name	(Accumulated Calendar Days)	
of Bridges 30	60 90 120 150 180 210 240 270 300 330 360	390 420 450
Hin. Temple Ped. Br.		
Sta. 22 Ov. Br.		
Cor. Int. E-Rp. Br.		
Cor. Int. F-Rp. Br.		
Cor. H-Rp. Br.		
Coromandel Ov. Br.		
A-1 Road Ov. Br.		
A-Le		
G.R.N.W. Br. B-Le		
Pailles Ov. Br.		
Bridge R-1 -		
*Motorway Junction A-Le		
l Br. B-Le		
*Motorway Junction A-Le		
2 Br. B-Le		
*Motorway Junction A-Le		
3 Br. B-Le		: Sub-structure
<sup>*</sup> Motorway Jun. E-Rp. Br.		
Motorway Jun. B-Rp. Br.		structure : Super-structure
Motorway Jun. G-Rp. Br.		* : means the phased
Beau Bassin Ped. Br.		

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	and the second			dth	Leng				Туре		
G.R.N.I	V. B-I	e.	8	.2 m	192	2.9 m	Simp	Le post	t-tension	ned g	girder
Sub- Structure	No.	Heig (m		Туре	•	Executi Founda			tion of crete	R	ewarks
Abutment	A 1 A 2									1	GETRE ALL ALL ALL ALL ALL ALL ALL ALL ALL AL
	P 1 P 2		Impre	veme	nt of	Existing	g Stru	tures			
Pier	P 3 P 4							:			•
P 5 P 6 Area o											
	Brid			Nos.		Erect		ection	of Gird	er	
Super-	uper- (82) tructure			Girde	e T	Gird		Truck	Crane	<b>S</b> 1	taging
tructure 1580			26.8	3m x .	35 pcs	х					
. *	yais o Durati		nstr	uctio	n Dura	tion (Ac	tual I	Vorking	; Day Ba	sis)	
Iten		1	dæy)	30	60	00 1			·		~ ~ ~
	1			÷		90 1	20	150	180 2	10	240
obilizatio	on					1 04	20	150	180 2		240
	on A 1						20	150	180 2		240
								150			240
	A 1								180 2: 120 days		
ub-Structure	A 1 A 2 P 1 P 2										
Sub-Structure	A 1 A 2 P 1 P 2 P 3										
eructur Sub-Structur Sub-Structur	A 1 A 2 P 1 P 2 P 3 - P 6										
Sub-Structure B-A	Al A2 Pl P2 P3 - P6 ation						t	otal:	120 days		240
Sub-Structure B-A	A 1 A 2 P 1 P 2 P 3 - P 6 ation tion der						t	otal:			
Sub-Structure B-A	A 1 A 2 P 1 P 2 P 3 - P 6 ation der on						t	otal:	120 days		
Prepar Prepar Produc of Gir Erecti	A 1 A 2 P 1 P 2 P 3 - P 6 ation tion der on c.		To				t	otal:	120 days		
Prepar Prepar Product of Gir Erecti	A 1 A 2 P 1 P 2 P 3 - P 6 ation tion der on c.	, te	To				t	otal:	120 days		

Table 2.4-2 Schedule Analysis of Bridge (Link Road Bridge)

.

N	lame of		.4~3				DITOR	e (Link		riage)	
Rolling Carl Calcumberts			<u>8e</u>	Width	Leng				Туре		
G.1	R.N.W.F	3-Le Т	T	8.2 m	192	.9 m	Simpl	e post-t	ention	ed gir r	der
Sub- Stru	cture	No.	Heigh (m)	t Type	2	Executi Founda		Executi Concr		Ren	arks
Abut	ment	A 1 A 2	7.5	Revers	e T	Coffer		Concre			an an an an an Anna an Anna Anna Anna A
		P 1	23.0	Column T		Back hoe Dozer shovel		pump t	ruck		
Pier			25.0 24.5	17		9 					
			25.5 25	"							
<del>.</del>	Р 6 <b>Агеа</b>		23.5	"			·				
Supe	uper- (m2) tructure		ige	Nos. Girde		Erect Gird	lon	ection o Truck C		······	ging
Stru			10	26.8m x	35pcs.	x					
Ite Mobil	em lizatio	n		ay) 30	60	90 :	120	150 1	80 2:	10 2	40
	A	1									
cture	A	2					-	total	140 (	lays	
Sub-Structure	P P	1							·····	:	
Sub-	·	3									
	Р4										
ure	Prepa										
ructi	Produce of Given	rder									
Super-Structure	Erect: Deck d		ete						tota]	: 180	lays
al	· •	concre	~~4					- E			1
Sul	Clean	etc.									
aven	Clean	etc.									

Table 2.4-3 Schedule Analysis of Bridge (Link Road Bridge)

- 19 -

	Tab	le 2.	44	Sc	hedul	e Ana	lysis of	Bridg	e (Link	Road Br	idge)	.*
	Name of	Brid	lge	W:	idth	Leng	th			Туре	·	
	ST.L.R	i.A-1	e.		8.2	27	7.6 m	Simpl	e post-	-tension	ned gir	der
Sub Str	ucture	No.	Heig (m)		Туре	2	Executi Founda			ion of rete	Rem	arks
Abu	tment	<u> </u>	rovei	ment	of E	x <del>istin</del>	g Abutme	ent				
	·····				······································		· · ·					
Pier	~											
t TG	L		<del> </del>			· · · ·					-	
- 1647- 1		Area	l i of	<b></b>		<u> </u>			action	of Gird		
Supe	-10	Bri	dge		Nos. Girde		Erect	ion	Truck	<u> </u>		ging
	ucture	(m	<u> </u>				Gird	er			อเส	g 111g
		22		26 9	Rm v <sup>r</sup>	5 pcs.	x					
		66	. U	120.0								
  I t		<u> </u>	of Co ion	onstr	uctio		ation (A	· · · ·			· · · · · · · · · · · · · · · · · · ·	40
	E	vsis d Durat:	of Co ion (		uctio	n Dura	ation (A					40
	D em lizatio	vsis d Durat:	of Co ion (	onstr day)	uctio	n Dura 60	ation (Ac	120			· · · · · · · · · · · · · · · · · · ·	40
Mobi	D em lizatio	vsis ( )urat: n	of Co ion (	day)	uctio	n Dura 60	ation (A	120			· · · · · · · · · · · · · · · · · · ·	40
Mobi	D em lizatio	vsis d Durat: n A l	of Co ion (	day)	uctio	n Dura 60	ation (Ac	120			· · · · · · · · · · · · · · · · · · ·	40
Mobi	D em lizatio	vsis d Durat: n A l	of Co ion (	day)	uctio	n Dura 60	ation (Ac	120			· · · · · · · · · · · · · · · · · · ·	40
	D em lizatio	vsis d Durat: n A l	of Co ion (	day)	uctio	n Dura 60	ation (Ac	120			· · · · · · · · · · · · · · · · · · ·	40
Mobi	D em lizatio	vsis d Durat: n A l	of Co ion (	day)	uctio	n Dura 60	ation (Ac	120		180 2:	· · · · · · · · · · · · · · · · · · ·	40
I doM Sub-Structure	E em lizatio	vsis o purat: A 1 A 2	of Co ion (	day)	uctio	n Dura 60	ation (Ac	120		180 2:	· · · · · · · · · · · · · · · · · · ·	40
I doM Sub-Structure	D em lizatio	vsis o purat: n A 1 A 2 ation	of Co ion (	day)	uctio	n Dura 60	ation (Ac	120		180 2:	· · · · · · · · · · · · · · · · · · ·	40
I doM Sub-Structure	Prepara Product	ation der	of Co ion (	day)		n Dur:	90 ta: 45	120		180 2:	· · · · · · · · · · · · · · · · · · ·	40
I doM Sub-Structure	Prepara Product of Girco	ation burat:	of Co ion(	day)		n Dura 60	90 ta: 45	120			· · · · · · · · · · · · · · · · · · ·	40
uper-Structure Sub-Structure id	Prepara Product Deck cc etc	ation burce	of Co ion(	day)		n Dur:	90 ta: 45	120 days			· · · · · · · · · · · · · · · · · · ·	40
uper-Structure Sub-Structure id	Prepara Product of Girco Deck.co	ation burce	of Co ion(	day)		n Dur:	90 ta: 45	120 days			· · · · · · · · · · · · · · · · · · ·	40
uper-Structure Sub-Structure id	Prepara Product Deck cc Cleanir	ation burce	of Co ion(	day)		n Dur:	90 ta: 45	120 days			· · · · · · · · · · · · · · · · · · ·	40

								1.0				
				•								
								 	÷			
	Tabl	le 2.	4-5	Sch	edu1	e Ana.	lysis of	Bridge	(Link	Road	Bridge	e)
N	ame of	Brid	ge	Wid	lth	Leng	th			Туре		
	ST.L.F	₹i.B-I	le.	8.2	m ·	82.	7 m	Simpl	e post-	tensio	ned gi	Irder
Sub- Stru	cture	No.	Heigh (m)		Туре		Executi Founda	1	Executi Conci		Ret	narks
Abut	ment	<u>A 1</u> A 2	10 12	Re	vers "	еŤ	Coffer		Concre			
		P1	14.2	Co.	lumn	т	Back h	oe	pump t	ruck		
		P 2	14.5		11						į	
Pier			·					2				
		· · · · · · · · · · · · · · · · · · ·		1				: * <b> </b>				
		Area	ofl	<u> </u>					ction o	f 01-1		
Super		Brid	ige		os. Girde		Erect	ion	Truck C			aging
	¥-	1 1 1							TTUCK O	raue l		
	r- cture	(m2	<u></u>				Gird	er	•			8
		<b>(m</b> 2			m x	15 pc		er	·			-00
					m x	15 pc		er	· <u> </u>	:		
	cture	659	)	26.8				er	orking	Day Ba		
	cture Analy	659	of Con	26.8 stru	ctio	n Dura	3. X ation (A	ctual W				
Stru	cture Analy	659 <b>/sis c</b>	of Con	26.8	ctio		3. X ation (A	ctual W			sis)	240
Struc	cture Analy	659 vsis c Durati	of Con	26.8 stru ay)3	ctio	n Dura	3. X ation (A	ctual W			sis)	
Ite Mobil	cture Analy E	659 vsis c Durati	of Con	26.8 stru ay)3	ctio	n Dura	3. X ation (A	ctual W			sis)	
Ite Mobil	cture Analy E em lizatio	659 Vsis c Durati On	of Con	26.8 stru ay)3	ctio	n Dura	3. x ation (A 90	ctual W	50 1		sis)	
Ite Mobil	cture Analy Dem lizatio P A	659 Vsis c Durati On	of Con	26.8 stru ay)3	ctio	n Dura	3. x ation (A 90	ctual W	50 1		sis)	
Ite Mobil	cture Analy Dem lizatio P F	659 vsis c Durati on A 1	of Con	26.8 stru ay)3	ctio	n Dura	3. x ation (A 90	ctual W	50 1		sis)	
Struc	cture Analy Dem lizatio P F	659 vsis c Durati on A 1 A 2 > 1	of Con	26.8 stru ay)3	ctio	n Dura	3. x ation (A 90	ctual W	50 1		sis)	
Ite Mobil	cture Analy Dem lizatio P F	659 vsis c Durati on A 1 A 2 > 1	of Con	26.8 stru ay)3	ctio	n Dura	3. x ation (A 90	ctual W	50 1		sis)	
Ite Ite Structure Sub-Structure Sub-Structure	cture Analy Dem lizatio P I I I I I I I I I I I I I I I I I I	659 ysis c burati yn A 1 A 2 > 1 > 2	) of Con (d	26.8 stru ay)3	ctio	n Dura	3. x ation (A 90	ctual W	50 1		sis)	
Ite Ite Structure Sub-Structure Sub-Structure	cture Analy Dem lizatio P F Prepar Produc	659 vsis c burati on A 1 A 2 > 1 > 2 ration	of Con (d	26.8 stru ay)3	ctio	n Dura	3. x ation (A 90	ctual W	50 1		sis)	
Ite Ite Structure Sub-Structure Sub-Structure	cture Analy Dem lizatio P P Prepar Produc of Gir	659 Fris c Puration A 1 A 2 D 1 D 2 Cation Cder	of Con (d	26.8 stru ay)3	ctio	n Dura	3. x ation (A 90	ctual W	50 1 days	80 2	sis)	
Ite Ite Structure Sub-Structure Sub-Structure	cture Analy Dem lizatio P P Prepar Produc of Gir Erecti	659 vsis c burati on A 1 A 2 > 1 > 2 ration der on	of Con (d	26.8 stru ay)3	ctio	n Dur:	3. x ation (A 90 to	ctual W	50 1 days		sis)	
Ite Mobil	cture Analy Dem lizatio P P Prepar Produc of Gir	659 rsis c Purati m A 1 A 2 P 1 P 2 ration cder con concre c.	of Con (d	26.8 stru ay)3	ctio	n Dur:	3. x ation (A 90	ctual W	50 1 days	80 2	sis)	

	а	-	· ·	:							
		le 2.	~	Schedu	le Ana	lysis of	Bridg	e (Ram	pway Bi	ridge)	-1
N	lame of	Brid	3e	Width	Leng	th			Туре		
Mwy	y.Jun.B	~ Rp. B	r.	9.1 m	53.	8 m	RC	ontinuou voided s	s, sim lab	bre	
Sub- Stru	icture	No.	Heigl (m)	nt Typ	e	Executi Founda		Execut Conc		Rem	arks
Abut	ment	<u>A 1</u>	4.5	Grav	ity		Consequences of the second			<b>1</b>	
		A 2	4.5	· · · · · · · · · · · · · · · · · · ·							
		<u>P1</u> P2	8.6	and the second	d frame		÷				
Pier	-	P 3									
						ļ					
					alla la Tata ana ina si ang ina ana di		-				
· .		Area	of	Nos.			Er	ection of	of Gird	l er	- <u>.</u>
Supe	r-	Brid (m2		Gir		Erect	ion	Truck (		Sta	ging
-		( 59.4	·/			Gird	er .				
Stru	cture										
Stru	cture	49	0					X			
Stru	cture	49	0					x 2200 m <sup>3</sup>	in sp	ace	
Stru				nstructi	on Dur	ation (A	ctual				
Stru	Analy	sis c	of Con	nstructi	on Dur	ation (A	ctual	2200 m <sup>3</sup>			
	Analy		of Con	nstructi lay) 30	on Dura	ation (A	ctuel	2200 m <sup>3</sup> Working	Day Ba	sis)	40
It	Analy	vsis o Durati	of Con	1ay) 30				2200 m <sup>3</sup> Working	Day Ba	sis)	40
It	Analy E em lizatio	v <b>sis</b> o )urati on	of Con	1ay) 30	60	90		2200 m <sup>3</sup> Working	Day Ba	sis)	40
It Mobi	Analy E em lizatio	vsis o Durati Pn A l	of Con	1ay) 30	60			2200 m <sup>3</sup> Working	Day Ba	sis)	40
It Mobi	Analy E em lizatio	vsis d Durati on A 1 A 2	of Con	1ay) 30	60	90	120	2200 m <sup>3</sup> Working	Day Ba 80 2	sis)	40
It Mobi	Analy E em lizatio	vsis c Durati on A 1 A 2 P 1	of Con	1ay) 30	60	90	120	2200 m <sup>3</sup> Working	Day Ba 80 2	sis)	40
It Mobi	Analy E em lizatio	vsis d Durati on A 1 A 2	of Con	1ay) 30	60	90	120	2200 m <sup>3</sup> Working	Day Ba 80 2	sis)	40
It Mobi	Analy E em lizatio	vsis c Durati on A 1 A 2 P 1	of Con	1ay) 30	60	90	120	2200 m <sup>3</sup> Working	Day Ba 80 2	sis)	40
It Mobi	Analy E em lizatio	vsis o Durati on A 1 A 2 P 1 P 2	of Con	1ay) 30	60	90	120	2200 m <sup>3</sup> Working	Day Ba 80 2	sis)	40
It idoM Sub-Structure	Analy E em lizatio	vsis o Durati on A 1 A 2 P 1 P 2 P 3	on ()	iay) 30 9	60	90	120	2200 m <sup>3</sup> Working	Day Ba 80 2	sis)	40
It idoM Sub-Structure	Analy E em lizatio Prepar Deck c	Pais of Contract o	on (	iay) 30 s	60 50	90	120 to	2200 m <sup>3</sup> Working	Day Ba 80 2	sis)	40
It idoM Sub-Structure	Analy E em lizatio Prepar	Pais of Contract o	on (	iay) 30 s	60 50	90	120 to	2200 m <sup>3</sup> Working	Day Ba 80 2	sis)	40
It idoM Sub-Structure	Analy E em lizatio Prepar Deck c	Pais of Contract o	on (	iay) 30 s	60 50	90	120 to	2200 m <sup>3</sup> Working	Day Ba 80 2	sis)	40
It Mobi	Analy E em lizatio Prepar Deck c	Pais of Contract o	on (	iay) 30 s	60 50	90	120 to	2200 m <sup>3</sup> Working	Day Ba 80 2	sis)	40

				•		N.	··· .	•					
Tab	1e 2.4	4-7	S	chedul	e Anà	lysis of	Bridg	e (Ra	mpway	Bride	ge)		
Name of	Brid	ge	W	idth	Leng	th	<b>T</b>		Туре			······································	
Mwy.Jun.	G-Rp.1	Br.	7	.8 m	39.	35 m	2 co simp	ntinuou le RC v	s span oided	n, & slab			-41
Sub- Structure	No.	Heig (m)		Туре	<u>.</u>	Execut i Founda	on of	Execut Conc	ion o	f	Remar	rks	
Abutment	A1 A2	4.5		Gravit Revers	е Т								
Pier	P 1 P 2	8.0 9.0		Rigid "	frame								
r lei						•		-					
	Area												-
Super-	Brid (m2	ige		Nos. Gird		Erect Gird	ion	ection ( Truck (		T	stagi	ng	
Structure								x					
	300	б:						1	:				
Analy	L		nsti	ructio	n Dura	ation (A		2300 m <sup>3</sup>					-
	ysis o	of Co	nsti	ructio	n Dura	ation (A		2300 m <sup>3</sup>			· · · ·		
	L	of Co	nsti day)	· · · · · · · · · · · · · · · · · · ·	n Dura 60		ctual V	2300 m <sup>3</sup> Norking			240	)	
. J	ysis c Durati	of Co	day)	· · · · · · · · · · · · · · · · · · ·			ctual V	2300 m <sup>3</sup> Norking	Day H	lasis)		)	
Item Iobilizatio	ysis c Durati	of Co Lon (	day)	· · · · · · · · · · · · · · · · · · ·			ctual V	2300 m <sup>3</sup> Norking	Day H	lasis)		)	
Item Iobilizatio	ysis c Durati On	of Co Lon (	day)	· · · · · · · · · · · · · · · · · · ·		90	ctual V	2300 m <sup>3</sup> Jorking	Day H	lasis)		)	
Item lobilizatio	ysis c Durati on A l	of Co Lon (	day)	· · · · · · · · · · · · · · · · · · ·		90	ctual V 120	2300 m <sup>3</sup> Jorking	Day H	lasis)		)	
Item lobilizatio	ysis c Durati on A 1 A 2	of Co Lon (	day)	· · · · · · · · · · · · · · · · · · ·		90	ctual V 120	2300 m <sup>3</sup> Jorking	Day H	lasis)		)	
Item (obilizatio	ysis c Durati on A 1 A 2 P 1	of Co Lon (	day)	· · · · · · · · · · · · · · · · · · ·		90	ctual V 120	2300 m <sup>3</sup> Jorking	Day H	lasis)		)	
Item Iobilizatio	ysis c Durati on A 1 A 2 P 1	of Co Lon (	day)	· · · · · · · · · · · · · · · · · · ·		90	ctual V 120	2300 m <sup>3</sup> Jorking	Day H	lasis)		)	
Item Item Iobilizatio	ysis o Durati On A 1 A 2 P 1 P 2 ratior		day)	· · · · · · · · · · · · · · · · · · ·	60	90	ctual 1	2300 m <sup>3</sup> Norking	Day H	lasis)		)	
Item Item Iobilizatio	ysis c Durati on A 1 A 2 P 1 P 2		day)	· · · · · · · · · · · · · · · · · · ·	60	90 tot	ctual 1	2300 m <sup>3</sup> Norking	Day H	lasis)		)	
Item Item Iobilizatio	ysis o Durati On A 1 A 2 P 1 P 2 ratior		day)	· · · · · · · · · · · · · · · · · · ·	60	90 tot	ctual 1	2300 m <sup>3</sup> Norking	Day H	lasis)		)	
Item Item Iobilizatio	ysis o Durati On A 1 A 2 P 1 P 2 ratior		day)	) 30	60	90 tot	ctual 1	2300 m <sup>3</sup> Norking	Day H	lasis)		)	
Item Item Iobilizatio au n n n n n n n n n n n n n	ysis o Durati On A 1 A 2 P 1 P 2 ratior		day)	) 30	60	90 tot	ctual 1	2300 m <sup>3</sup> Norking	Day H	lasis)			

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	Tabl	le 2.4	48	Schedul	.e Ana	lysis of	Bridg	e (Rampway Bri	rade)
M	lame of	Brid	ge	Width	Leng	th		Туре	<u></u>
Ċ	or.Int.	E-Rp		9.5 m	45.	7 m 📖	2 co RC v	ntinuous span oided glab	, simple
Sub- Stru	icture	No.	Heigh (m)	t Туре	2	Executi Founda		Execution of Concrete	Remarks
Abut	ment	<u>Λ1</u> Α2	4.0 4.0	Gravity "	• 	Back h		Concrete pump truck	
· · · · · · · · · · · · · · · · · · ·		Р1 Р2	9.0 8.5	Rigid f	rame	Dozer shovel		pump cruck	
Pier		P 3	9.5	tt					
	Area of			Nos.	of		Er	ection of Gird	1 ler
	Super- (m2) Structure			Gird		Erect Gird	1	Truck Crane	Staging
ətru	Structure 434							x	
<u> </u>								1500 m <sup>3</sup>	
	Analy	sis c	of Con	structio	n Dura	ation (A	ctual	Working Day Ba	usis)
	E	urati	on						· · · · · · · · · · · · · · · · · · ·
lt	em		(d	ay) 30	60	90	120	150 180 2	210 240
Mobi	lizatio	n	-	1					
	I	<b>1</b>							
Sub-Structure	· F	A 2			6263		tota	1: 100 days	
truc	I	21					_		· · · · · · · · · · · · · · · · · · ·
b–S	I	2					4		
Su	I	23				-			
				·					
Super-Structure	Prepai					total:	60 day	s	<u> </u>
truc	Slab d	concre	ete •						
èr-Si	· .								
Supe									+
Paver	nent						-		
	llary W	orks		 			+		<u>+</u>
				<b>I</b>				- I	-k

Table 2.4-8 Schedule Analysis of Bridge (Rampway Bridge)

			,							·
Tab	le 2.4	9	Schedu	le Ana	lysis of	Bridg	e (Rampw	ay Brid	dge)	
Name of	Brid	ge	Width	Leng	th			Туре		
Cor.Int.	F-Rp		9.5 m	47	.2 m	2 co RC	ontinuou voided S	s span lab	, simpl	.e
Sub- Structure	No.	Heigh (m)	t Typ	e	Executi Founda		Executi Concr		Rem	arks
Abutment	A 1 A 2	4.0	Gravit	сy	Back h Dozer		Concre pump t			
	P 1	9.5	Rigid	frame	LOZEI -	SHOVET	քաղթ շ	LUCK		
	P 2	9.0	11							
Pier	Р3	10.5			·					
				· .						
			1							
	Area Bri		Nos.	of	_		ection o	f Gird	er	
Super- Structure	(m		Gird	ler	Erect Gird		Truck C	rane	Stag	ging
ottucture							х			
	44	19								
Anal	ysis (	of Con	structi	on Dur	ation (A	ctual	Working	Day Ba	sis)	
	Durat:		<u> </u>					······································		
Item			ay)30	60	90	120	150 1	80 2	10 2	40
Mobilizatio	on									
						-		· · · · · · · · · · · · · · · · · · ·		
ncture			-					·.		
			To be de	eemed :	same wit	h Cor.	Int.E~Rp	ана (1997) 1		
Sub-Str						1				
Sub					······					•
	·					-				
						-				
t d	:								<u> </u>	
Super-Structure										
er - S					· · · · · · · · · · · · · · · · · · ·				+	<b> </b>
Supe			<u>· · · · · · · · · · · · · · · · · · · </u>							
Pavement							: .			
Ancillary h	lorke									
	IOLKS		·				<b>I</b>	L	1	L

Table 2.4-9 Schedule Analysis of Bridge (Rampway

Name c		· · · ·						dge	(0)	er Bride	Je)	
	of Brid	ge	W	idth	Leng	th				Туре		
PAILLE	S Ov.B	r.	7	.2 m	55.	5 m	Sim	ple	post	-tensior	ned gi	rder
Sub- Structure	No.	Heig (m		Туре	•	Executi Founda				tion of crete	Re	marks
Abutment	A ]	5		Wall		1		-			·	
ADGUMENC	A 2	5		t)	-							
	P1	9		igid 1	rame							
D. I	P 2 P 3	9		I)								
Pier	P 3	11		11								
			_									
	Area	of								of Gird		
Super-	Brid (m2	dge		Nos. Girde		Erect Gird	íon	<u> </u>	ruck			iging
Structure		33	7.0		0 pcs 5 5				prefei	( cable)	· · · ·	
Ana	lysi <b>s</b> c	of Co	nstr	uctio	n Dura	ation (A	tual	. Wo	orking	Day Ba	sis)	·
ltem Mobilizat	Durati ion	. (	day)	30	60	90 3	20	1	50	180 2	10	240
							_				<u> </u>	
	A 1			1			+					<u></u>
aru	A 1 A 2	·										
ructure			500000					to	al: 1	10 days		
-Structure	A 2							to	tal: 1	10 days		
Sub-Structure	A 2 P 1							to	al: ]	10 days		
Sub-Structure	A 2 P 1 P 2							to	al: 1	10 days		
	A 2 P 1 P 2 P 3	r						tot	al: 1	10 days		
	A 2 P 1 P 2 P 3 ration	r						tot	al: 1			
	A 2 P 1 P 2 P 3 ration ction c r	of						toi				
	A 2 P 1 P 2 P 3 ration ction c	of						to				
Prepa     Produ     J     Produ     J     Girde     J     Erect     J     Deck	A 2 P 1 P 2 P 3 ration ction c r ion concret	of										
y Prepa J Produ girde J Erect L Deck	A 2 P 1 P 2 P 3 ration ction c r ion concret	of										

Table 2.4-10 Schedule Analysis of Bridge (Over Bridge)

			• :								
	ole 2.		····	·····		ysis of	Bridg€	e (Over	: Bridg	e)	
Name o			Wid		engt				Туре		
A~1 KC	ad Ov.		25.	5 m	57.9	9 m	Simpi	e post-	-tensio	nea gr: T	raer
Sub- Structure	No.	Heigh (m)		Туре		Executi Founda		Execut Conc		Rem	arks
Abutment	A 1 A 2	4.0	Gra	vity verse T	1	Back ho		Concre			mence
	P1	8.0		id fra	-	Dozer s	shovel	pump t	ruck	after A-1 R	detouring 4
	P 2	9.5		11		. •					u.
Pier	P 3	12.0		11							
		· · · · · · · · · · · · · · · · · · ·									
	Area Brid			os. of	+	Erect		ction (	of Gird	er	
Super- Structure	(m2	)	• G	irder		Gird	5	Truck (	Crane	Sta	ging
				1 x 10 x 10	pcs.			3	2		
		່ 1 2	9.9 1.4	x 10 x 12	pcs.			2			,
Anal	vsis c	1 2	9.9 1.4 5.3	x 10 x 12 x 12		•		· · ·		cic)	• • • • • • • • • • • • •
· · ·		of Con	9.9 1.4 5.3	x 10 x 12 x 12			ctual W	· · ·		sis)	
· · ·	ysis c Durati	on	9.9 1.4 5.3 struc	x 10 x 12 x 12 x 12	Jura	tion (Ad		orking	Day Ba		40
Item	Durati	on (d	9.9 1.4 5.3 struc ay)30	x 10 x 12 x 12 x 12	Jura	tion (Ad		orking	Day Ba		40
· · · · · · · · · · · · · · · · · · ·	Durati on	on	9.9 1.4 5.3 struc ay)30	x 10 x 12 x 12 x 12	JUTA	• tion (Ad 90 ]		orking	Day Ba		40
Item Mobilizati	Durati on Al	on (d	9.9 1.4 5.3 struc ay)30	x 10 x 12 x 12 x 12	Jura	• tion (Ad 90 ]		orking	Day Ba		40
Item Mobilizati	Durati on Al A2	on (d	9.9 1.4 5.3 struc ay) 30	x 10 x 12 x 12 x 12	JUTA	• tion (Ad 90 ]	120	orking	Day Ba		40
Item Mobilizati	Durati on Al A2 Pl	on (d	9.9 1.4 5.3 struc ay)30	x 10 x 12 x 12 x 12	JUTA	• tion (Ad 90 ]	120	orking	Day Ba		40
Item Mobilizati	Durati on Al A2	on (d	9.9 1.4 5.3 struc ay) 30	x 10 x 12 x 12 x 12	JUTA	• tion (Ad 90 ]	120	orking	Day Ba		40
Item iobilizati	Durati on Al A2 Pl	on (d	9.9 1.4 5.3 struc ay) 30	x 10 x 12 x 12 x 12	JUTA	• tion (Ad 90 ]	120	orking	Day Ba		40
Item Mobilizati	Durati on Al A2 Pl P2	on (d	9.9 1.4 5.3 struc ay) 30	x 10 x 12 x 12 x 12	JUTA	• tion (Ad 90 ]	120	orking	Day Ba		40
Item fobilizati	Durati on Al A2 Pl P2	if Con on (d	9.9 1.4 5.3 struc ay) 30	x 10 x 12 x 12 x 12	JUTA	• tion (Ad 90 ]	120	orking	Day Ba		40
Item fobilizati	Durati on Al A2 Pl P2 P3 ration	if Con on (d	9.9 1.4 5.3 struc ay) 30	x 10 x 12 x 12 x 12	JUTA	• tion (Ad 90 ]	120	orking	Day Ba		40
Item fobilizati	Durati on Al A2 Pl P2 P3 ration rder	if Con on (d	9.9 1.4 5.3 struc ay) 30	x 10 x 12 x 12 x 12	JUTA	• tion (Ad 90 ]	120	orking	Day Ba		
Item fobilizati a y n y y y y y y y y y y y y y	Durati on Al A2 Pl P2 P3 ration rder	f Con (d	9.9 1.4 5.3 struc ay) 30	x 10 x 12 x 12 etion D 60	JUTA	• tion (Ad 90 ]	120	orking	Day Ba		

- 27 -

Name of	Brid	ge	Width	Leng	th		Туре	·
COROMAN	DEL O	v.Br.	5.91 m	69.	1 m	Simpl	e post-tension	ned girder
Sub- Structure	No.	Heigh (m)	t Туре	2	Executi Founda		Execution of Concrete	Remarks
Abutment	A 1 A 2	5.0	Reverse	e T	Back h		Concrete	
Pier	P1 P2 P3	8.5 9.5 9.3	Rigid 1	Erame	Dozer	shovel	pump truck	
	Area	of	Nos.	of		Er	ection of Gird	ler
Super-	Brid (m2	~	Girde		Erect Gird		Truck Crane	Staging
Structure	58	7 1	27.7m x 8 4.4 x 4 6.25 x 4	1	×X			

Table 2.4-12 Schedule Analysis of Bridge (Over Bridge)

.

Analysis of Construction Duration (Actual Working Day Basis)

	Duration	1.1					<u>.</u>			
It		(day)	30 6	0 9	0 1	20 1	50 1	80 2	10 2	40
Mobi	lization	99395								
	A 1		1	8996						
ure	A 2			63937					•	
tructure	Ρl				1	tota	1: 100	days	<b></b>	
S	Р2				f				1	
-du2	Р 3	*2000250			1			· · · · · · ·		
			1		† · · · · ·					
e L	Preparation		1		1					·.
Structure	Production of girder				†	· .				
Stru	Erection				1	tota	1: 95 (	lays		
Super-S	Deck concrete etc.									······································
S ul	Cleaning	. :							<b></b>	
Paver	nent				1	<b></b>				······
Anci	llary Works				1	<u> </u>		· · · ·		

Name of			Widt		Leng					Тур			
Cor.In	т.н-кр	). T	5.5 n	n	Z.Z	1. m <b>1<sup></sup></b>		Simpi	e post			ed gin	der
Sub- Structure	No.	Heigh (m)		уре		Execu Found		1	Execu Con	tion crete		Rem	arks
Abutment	A 1	5.0									ľ		
	A 2	4.0	) Grav	vity	У	- I			.*				
				·									
Pier													
						]							
						ł					·		
·	Area	l of [						Ere	ction	of G		۶r	
Super-	Bri (m			s. Irde		Ł	ctio	n	Truck		T		ging
Structure	140		·····	<u>.</u>		<u> </u>	rder ×	·	x	·	-+		
	12	21	21.3n	n x	4 pc	<b>;</b>							
· · · · · · · · · · · · · · · · · · ·					<b>~</b> ,	(prefe	rab	le)					
		<b>c a</b>					( Ann	uni N	lorin	Dan	Pag		
Anal	y815 (	DI COI	istruct	t10	n Dur	ation (	ACE	uar a	OTKTU	; Day	Das	318/	
			nstruci	t10:	n Dur	ation (			OIKIN	, Day		;1S)	
	Durat	lon	lay) 30		n Dur 60	90	12		150	, Day 180	21		40
ltem	Durati	lon			· · · · · · · · · · · · · · · · · · ·		 				'		40
ltem	Durat: on	lon ((	lay) 30		60	90	12				'		40
Item Mobilizati	Durat: on A 1	lon ((	lay) 30		60		12				'		40
Item Mobilizati	Durat: on	lon ((	lay) 30		60	90	12				'		40
Item Mobilizati	Durat: on A 1	lon ((	lay) 30		60	90	12		150		'		40
Item Mobilizati	Durat: on A 1	lon ((	lay) 30		60	90	12		150		'	0 2	40
Item Mobilizati	Durat: on A 1	lon ((	lay) 30		60	90	12		150		'	0 2	40
Item Mobilizati	Durat: on A 1	lon ((	lay) 30		60	90	12		150		'	0 2	40
Item Mobilizati	Durat: on A 1 A 2		lay) 30		60	90	12		150		'	0 2	40
Item Mobilizati	Duration		lay) 30		60	90	12		150		'	0 2	40
Item Mobilizati	Duration		lay) 30		60	90 : 30 da	12 12 12 12 12 12 12 12 12 12 12 12 12 1	0			'	0 2	40
Item Mobilizati	Duration		lay) 30		60	90	12 12 12 12 12 12 12 12 12 12 12 12 12 1				'	0 2	40
Item Mobilizati	Duration	lon ((	lay) 30		60	90 : 30 da	12 12 12 12 12 12 12 12 12 12 12 12 12 1	0			'	0 2	40
Item dobilizati e int nut s int S on S Prepa Produ Girde Erect	Duration Al A2 ration ction concre	lon ((	lay) 30	t	60	90 : 30 da	12 12 12 12 12 12 12 12 12 12 12 12 12 1	0			'	0 2	40
Item Mobilizati e unt s unt unt s unt s unt s unt s unt s unt s unt s unt s unt s unt s unt s unt unt unt s unt s unt s unt unt unt unt unt unt unt unt unt unt	Duration Al A2 ration ction concre	lon ((	lay) 30	t	60 total	90 : 30 da	12 12 12 12 12 12 12 12 12 12 12 12 12 1	0			'	0 2	40

Table 2.4-13 Schedule Analysis of Bridge (Over Bridge)

. . . . . .

	lame of	Brid		Width	Leng	lysis of	bridg	e (over	Туре	e)	
	ta. 22			5.5 m	**************************************	.0 m	2 con	tinuous ided sla		simpl	e
Sub- Stru	Icture	No.	Heigh (m)	t Type	e	Executi Founda	on of	Executi Concr	on of		marks
Abut	ment	A 1 A 2	4.0	al and the second s	y	Back ho	ρ.	Concre	+0	<b>)</b> 	₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩
		Р1 Р2	9.0 9.0	Rigid	frame	Dozer s		pump t			
Pier		P 3	10.0								
					indakai deri paper a						
		Area Brid	,	Nos.	of			ection o	f Gird	er	
Supe Stru	r- cture	(a)		Gird	er	Erect Gird		Truck C	rane	St	aging
		30	8					X		:	
	Analy	818 0	of Con	structio	n Dur	ation (A	ctual	2000 m <sup>3</sup> Working			
It	D	urati	on	ay) 30	60		120	· · · · · · · · · · · · · · · · · · ·		10	240
	lizatio	n				30	120		<u>ov</u> 2.		240
	r	A 1									
ture		A 2									
Sub-Structure	þ	P 1					tota	1: 95 da	/s		·
S-dus		P 2 P 3									
		<u> </u>						-			
ure	Prepar	ation				total	L 60 d	lays	······································		
ruct	Slab c	oncre	te					_			
Super-Structure	•	: 									-
Supe											
Paven	ent						·				
Ancil	lary W	orks									

Table 2.4-14 Schedule Analysis of Bridge (Over Bridge)

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	·	÷ *						· _		:	•	•		_	
		le 2.4		· ·				s of	Bridg	e (F		strian	Bri	dge	)
	ame of n. Temj			Wid 2.4		Leng	1 m		2_co	nținu		Type span, ab			
		T1		1,			T								· .
Sub- Stru	cture	No.	Heigl (m)		Туре			cuti unda	on of tion		oncr	on of ete	F	Rema	rks
Abut	ment	A 1	6.5		erse	T		ak h		Car		+ ~			
		A 2 P 1	5.5 7.3		11 			ck ho zer :	shovel		ncre np t	çe ruck			
Pier				_											
		Area	<u> </u>				<b> </b>	····.				6 61 1			<sup>1</sup>
C	·	Brid	lge		los. Girde		E	rect				f Gird rane	r	Stag	ing
Supe Stru	r- cture	<u>(m2</u>	2)					Gird	er	iruc		rane	C		111g
		137	7								x				
							· .								<u> </u>
	Anal	ysis c	of Co	nstru	ctio	n Dur	atio	n (A	ctual	Worki	ng l	Day Ba	sis)	) 	
	· ]	Durati			<u> </u>	<u> </u>									
!t	em		(	day) 3	0	60	90		120	150	1	BO 2	10	24	0
14-1-2	lizati	on		9											
MODI												Į –	1	1	
:	Г <u> </u>	1					tot	al:	55 day	's					<u></u>
	A			2:000			tot	al:	55 day						
:	A	. 1					tot	al:	55 day						
:	A	. 1					tct	al:	55 day						
Sub-Structure	A	. 1					tot	al:	55 day						
:	A	. 1					tot	al:	55 day						
Sub-Structure	A A P	. 1							55 day						
Sub-Structure	A A P P Prepa	1 2 1	·····												
Sub-Structure	A A P P Prepa	1 2 1	·····												
Sub-Structure	A A P P Prepa	1 2 1	ete												
	A A P P Prepa	1 2 1	ete												
Sub-Structure	A P P Prepa Slab	1 2 1	ete												

		4-16	*		lysis of	0			Bridge	
Name of	Brid	ge	Width	Leng	th			Туре		
B.B. Pe	d. Br	•	2.4 m	19	).l m	Sim	ole RC v	oided s	slab	
Sub- Structure	No.	Heigh (m)	Тур		Execut1 Founda		Execut Conc		Rema	irks
Abutment	A 1 A 2	8.5 8.5	Revers	se T				-		
Pier									*	
	Area	of	N			Er	ection	of Gird	er	
Super- Structure	Brid (m2		Nos. Gira		Erect Gird	ion	Truck		Stag	ing
Structure							x			•
Item Mobilizatio	Durati			60	90 total:	120		180 2	10 24	40
Sub-Structure										
Ib-Str								1	<u></u>	
S.									 	
				tot	al: 35 d	ays	· .			
				tot	al: 35 d	ays				
Super-Structure Su				tot	al: 35 d	ays				
				tot	al: 35 d	ays				

Table 2.4-16 Schedule Analysis of Bridge (Pedestrian Bridge)

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Name of	Brid	ge	Width	Leng	th			Туре		
Mwy.Jun.	A-Le.	1 Br.	8.9 m	30.	.l m	Simp	le post-	tension	ned gin	der
Sub- Structure	No.	Heigh (m)	t Туре	9	Executi Founda		Executi Concr		Rem	arks
Abutment	A 1 A 2	10.2 12.5		ет						
Pier							- - -			
	Area		Nos.	of		Er	ection o	f Girde	er	
Super- Structure	Bri (m		Gird		Erect Gird		Truck C	rane	Sta	ging
	.26	58	30m x 5	pcs	x (prefer	able)	x			
Anal	ysis (	of Con	structio	on Dur	ation (A	ctual	Working	Day Bas	sis)	
Item	Durati	1 .	ay) 30	60	90	120	150 1	80 21	10 2	40
lobilizati	0.0			Ť	1	120				1
	Al					otal:	80 days			<u> </u>
е	A 2									<u> </u>
Sub-Structure						1			·	
S-du?										
						-			· · ·	
0 Prepa	ratio									
J Produ Girde	ction r	of								 
Prepa Produ Girde S Erect Deck e n S Clean	ion concre	ete				t	otal: 11	) days		
od e s Clean	tc.					_				
avement										
	lorks									+

Table 2.4-17 Schedule Analysis of Bridge (Motorway Junction Bridge)

Mı	vy.Jun.	B-Le.	1 B	r (	3.9 m	20	.1 m	Simp]	le pos	t-tension	ned gin	rder
Sub- Stru	icture	No.	Heig (m		Туре	) 	Executi Founda			ution of ncrete	Ren	arks
Ahut	ment	A 1	A		Rever	se T	<u></u>			· .		ang dan pilang ang ang ang ang ang ang ang ang ang
nout		A 2	12.	5	fl		-					
		ļ					4		11			•
Pier	•	þ		~								
		ļ			×	····						
		Area	of				<b> </b>	۲۳	actio	n of Gird	or	
Supe	¥	Bri	lge		Nos. Gird		Erect					
	r- cture	(m	2)	ļ		~ •	Gird	er	iruc	k Crane	Sta	ging
		2					x	1	-	x		
		17	9	19.4	m x !	5 pcs.	(Prefera	ble)				
	Analy	vsis (	of Co	nstr	uctio	n Dur	ation (A	tual	Worki	ng Day Ba	ete)	
			1									
It		)urati		day)	30	60	90	120	150	180 2	10 2	240
	lizatic				Ĵ			1	1.			1
	<u> </u>								<u>:</u>			
	A	1			1. S.						1	
¢							total:	<u>60 day</u>	's		ļ	
ture	A	2					total:	60 day	's			
ructure	A						total:	60 day	<u>'S</u>			
-Structure	A						total:	60 day	/S			
Sub-Structure	A						total:	60 day	'S			
Sub-Structure	A						total:	60 day	/S			
		2						60 day	/S			
	Prepai	2 ration					total:	60 day	rs			
	Prepa	2 ration						60 day	rs			
	Prepar Produc of Gi Erect	2 ration rder ion					total:		rs tal:	100 days		
	Prepar Produc of Gi Erect Deck	2 ration rder ion								100 days		
Super-Structure Sub-Structure	Prepar Produc of Gi Erect Deck	2 ration ction rder ion concre								100 days		
Super-Structure	Prepar Produc of Gi Erect: Deck c el Clean:	2 ration ction rder ion concre								100 days		
Super-Structure	Prepar Produc of Gi Erect: Deck c el Clean:	2 ration ction rder ion concre tc, ing								100 days		

Table 2.4-18 Schedule Analysis of Bridge (Motorway Junction Bridge)

Name o	f Brid	ge	W	idth	Leng	th			Туре			
Mwy.Jun				8.9 m		2 m	Simp	le post		ioned	gi	rder
Sub- Structure	No.	Heig (m		Туре	)	Executi Founda		Execut Conc			Rema	arks
Abutment	A 1	14.0		Buttre	ess	· · · · · · · · · · · · · · · · · · ·						
	A 2	13.0		11								
	<u>P1</u>	18.4	_	Column "	<u>T</u>							
Pier	<u>P 2</u>	16.	<u></u>		*******							
								•				
			Ļ									
	Area			Nos.		Erect		ection o		der.		
Super- Structure	(m		L	Girde	er	Gird		Truck (	Crane	5	stag	ing
sciuciuie		•	26	0. 1	0	х		x				
· . :	7,9	4	26.	8m x 1 2 x								
	<u></u>	^····		· · · · · ·		(Prefer	L				. ' 	
	Durati	lon		· .		ation (A		<u></u>		•		
Item	Durati	lon	day)	· .	n Dura 60			<u></u>		210		40
Item	Durati	lon		· .				<u></u>		•		40
Item Mobilizati	Durat: on Al	lon		· .			120	150 1	80	•		40
Item Iobilizati	Durati	lon		· .			120	<u></u>	80	•		40
Item Iobilizati	Durat: on Al	lon		· .			120	150 1	80	•		40
Item Iobilizati	Durat: on A 1 A 2	lon		· .			120	150 1	80	•		40
Item lobilizati	Duration on A 1 A 2 P 1	lon		· .			120	150 1	80	•		40
Item fobilizati	Duration on A 1 A 2 P 1	lon		· .			120	150 1	80	•		40
Item fobilizati	Duration on A 1 A 2 P 1	(on)		· .			120	150 1	80	•		40
Item fobilizati	Duration			· .			120	150 1	80	•		40
Item fobilizati	Duration			· .			120	150 1 a : 95 c	80 ays	210	22	40
Item fobilizati	Duration	on (		· .			120	150 1 a : 95 c	80	210	22	40
Item fobilizati	Duration on A 1 A 2 P 1 P 2 Aration er cion concre	on (		· .			120	150 1 a : 95 (	80 ays	210	22	40
Item fobilizati a a b c c c c c c c c c c c c c	Duration on A 1 A 2 P 1 P 2 Aration er cion concre	on (		· .			120 tot	150 1 a : 95 (	80 ays	210	22	40

Table 2.4-19 Schedule Analysis of Bridge (Motorway Junction Bridge)

•

·														
	Tab	le 2.	4-20	Schedu	le Ana	lysis	ọf	Bridg	ge	(Mot	orway	Juncti	on Bride	
1	Name of	Brid	ge	Width	Leng	gth					Туре		w	
Mw	vy.Jun.	B-Le.	2 Br	8.9 m	91.	7 m		Simp	le po	ost-	tensio	ned gi	ed girder	
Sub- Stru	lcture	No.	Heigi (m)	it Typ	e			on of tion			ion of rete		marks	
Abut	tment	<u>A 1</u>	14.		ess	1			+					
<b>An Track State (1997)</b>		A 2 P 1 P 2	14.0 19.1 15.1	5 Colum	n T	4							r roadwa vation	
Pier	•											exca	vacion	
									н н н					
. : •		Area Bric		Nos.		Fre	ecti		ecti	on o	of Gir	der		
Supe: Stru	r- cture	(m2	25	Gird	ler	+	irde		Tru	ick (	Crane	Sta	aging	
	1		1			1								
			of Con	26.8m x 29.2 x 33.2 x structic	5 5	(Pret			Work		Day Ba	usis)		
Ite Mobil	D	vsis o Durati	of Con	29.2 x 3.2 x	5 5	(Pret	fera (Ac		Work	ing	Day Ba	•	240	
· · · · · · · · · · · · · · · · · · ·	D em lizatio	vsis o Purati n	of Con (d	29.2 x 3.2 x structio ay) 30	5 5 on Dura 60	(Pret ation	fera (Ac	tual		ing	Day Ba	•	غي جميع حص	
Mob1]	D em lizatio A	vsis o Purati n	of Con (d	29.2 x 3.2 x struction ay) 30	5 5 0n Dura 60	(Pret ation	fera (Ac 1	tual 20	150	ing 1	Day Ba	•	غي جميع حص	
Mob1]	D em Lizatio A A	rsis o Durati n .1 .2	of Con (d	29.2 x 3.2 x struction ay) 30	5 5 5 60 60	(Prei ation 90	fera (Ac 1	tual	150	ing 1	Day Ba	•	غي جميع حص	
Mob1]	D em Lizatio A P	sis o Durati n 1 2	of Con (d	29.2 x 33.2 x structio ay) 30	5 5 0n Dura 60	(Prei ation 90	fera (Ac 1	tual 20	150	ing 1	Day Ba	•	غي جميع حص	
· · · · · · · · · · · · · · · · · · ·	D em Lizatio A P	rsis o Durati n .1 .2	of Con (d	29.2 x 3.2 x struction ay) 30	5 5 5 60 60	(Prei ation 90	fera (Ac 1	tual 20	150	ing 1	Day Ba	•	غي جميع حص	
Sub-Structure	D em Lizatio A P P	sis o Durati n 1 2	3 2 of Con (d	29.2 x 33.2 x structio ay) 30	5 5 5 60 60	(Prei ation 90	fera (Ac 1	tual 20	150	ing 1	Day Ba	•	غي جي جي جي ا	
Sub-Structure	D em Lizatio A P	sis o Purati n 1 2 ation	3 2 3 2 3 3 3 2 3 3 3 2 3 3 3 3 3 2 3	29.2 x 33.2 x structio ay) 30	5 5 5 60 60	(Prei ation 90	fera (Ac 1	tual 20	150	ing 1	Day Ba	•	غي جي جي جي ا	
Sub-Structure	Em Lizatio A P P Prepar Produc	sis o Durati n 1 2 ation	3 2 3 2 3 3 3 2 3 3 3 2 3 3 3 3 3 2 3	29.2 x 33.2 x structio ay) 30	5 5 5 60 60	(Prei ation 90	fera (Ac 1	tual 20	150 95 d	ing 1 ays	Day Ba	210	غي جي جي جي ا	
Sub-Structure	D em lizatio A P P P P Prepar Produc Girder	sis o Purati n 1 2 ation tion o	3 2 of Con (d	29.2 x 33.2 x structio ay) 30	5 5 5 60	(Prei	fera (Ac 1	tual 20	150 95 d	ing 1 ays	Day Ba	210	غي جي جي جي ا	
uper-Structure Sub-Structure [] qow	Erectio	sis o Purati n 1 2 ation con	3 2 of Con (d	29.2 x 33.2 x structio ay) 30	5 5 5 60	(Prei	fera (Ac 1)	tual 20	150 95 d	ing 1 ays	Day Ba	210	غي جي جي جي ا	

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		1e 2.4		Sch	edul	e An	alys	sis of	Bridg	e (M	lotor	way	Junct	ion Br	
	Name of			Wid		_	gth				T	ype		***	
M	wy.Jun.	A-Le.	3 Br	15.	9 m	17	7.1 : 	m	Simpl	e RC	void	ed s	lab		
Sub- Stru	ucture	No.	Heigh (m)		Туре			xecuti Founda			ution ncre		Re	emarks	
Abut	tment	A 1 A 2	11.5 8.5	Bu	ittre	SS	_		···						
Pier	<b>c</b>														
							1			<u></u>					
G.		Area Brid	lge		08.0		·	Erecti		ection			<b></b>		
Supe Stru	er- Icture	(m2	2)	G	Girde	r		Girde		Trucl	k Cra	ne	Staging		
		26	7								<b>x</b>	1			
:	Analy	vsis o	f Con	struc	ctior	) Dur		on (Ac	tual W	1300 Iorkir	· · · · · · · · · · · · · · · · · · ·				
	 _ D	vsis o Durati	on							lorkir	ng Da	y Ba	sis)		
It	D em	urati	on (da	struc iy)30		60	rati 9				· · · · · · · · · · · · · · · · · · ·	y Ba		240	
It	D em lizatio	urati n	on (da	iy) 30			9	0 1	20	lorkir	ng Da	y Ba	sis)	240	
It. Iobi	D em lizatio	Durati n A 1	on (da				9		20	lorkir	ng Da	y Ba	sis)	240	
It fobi	D em lizatio	urati n	on (da	iy) 30			9	0 1	20	lorkir	ng Da	y Ba	sis)	240	
It fobi	D em lizatio	Durati n A 1	on (da	iy) 30			9	0 1	20	lorkir	ng Da	y Ba	sis)	240	
It fobi	D em lizatio	Durati n A 1	on (da	iy) 30			9	0 1	20	lorkir	ng Da	y Ba	sis)	240	
It. Iobi	D em lizatio	Durati n A 1	on (da	iy) 30			9	0 1	20	lorkir	ng Da	y Ba	sis)	240	
Iti Sub-Structure	D em lizatio	Durati n A 1 A 2	on (da	iy) 30			9 to:	0 1 tal: 5	20 days	Jorkir	ng Da	y Ba	sis)	240	
Iti Sub-Structure	D em lizatio	Durati n A 1 A 2 ation	on (da	iy) 30			9 to:	0 1	20 days	Jorkir	ng Da	y Ba	sis)	240	
Iti Sub-Structure	D em lizatio	Durati n A 1 A 2 ation	on (da	iy) 30			9 to:	0 1 tal: 5	20 days	Jorkir	ng Da	y Ba	sis)	240	
Iti Sub-Structure	D em lizatio	Durati n A 1 A 2 ation	on (da	iy) 30			9 to:	0 1 tal: 5	20 days	Jorkir	ng Da	y Ba	sis)	240	
Iti Sub-Structure	D em lizatio	Durati n A 1 A 2 ation	on (da	iy) 30			9 to:	0 1 tal: 5	20 days	Jorkir	ng Da	y Ba	sis)	240	
re Sub-Structure (10)	D em lizatio	Durati n A 1 A 2 ation	on (da	iy) 30			9 to:	0 1 tal: 5	20 days	Jorkir	ng Da	y Ba	sis)	240	
Iti Sub-Structure	D em lizatio	Durati n A 1 A 2 ation	on (da	iy) 30			9 to:	0 1 tal: 5	20 days	Jorkir	ng Da	y Ba	sis)	240	

	B-Le.	з вr.	10.	) m	17.	т ні Т		Simpl		. voi	.ueu	отс 1			
Sub- Structur	re No.	Heig (m)		Туре	:	Exect Four				ecut: Conci				Rem	ark
Abutment	A A			uttre evers											
Pier								-							
		a of		Nos.	of				ecti	on d	of G	ird	er		
Super- Structur	(n	dge 12)		Girde		•	ecti .rde		Tru	ick (	Cran	e		Sta	ging
Structur	C								800	x m3	in	spa	се		•
An	alysis	of Co	nstru	ictio	n Dur	ation	(Ac	tual						)	
	Durat	ion		<u> </u>									'		
Item		(	day)	30 1	60	90	1	20	150	1	.80	2	10 1	2	40
Mobiliza	tion												1.		
				+		<u> </u>	· · · ·				+		<u>+</u>		+
	A 1					total:	55	days				<u> </u>			
ture	A 1 A 2					total:	55	days		·······					
tructure	<u> </u>					total:	55	days		······································					
b-Structure	<u> </u>					total:	55	days		······································					
Sub-Structure	<u> </u>					total:	55	days							
Sub-Structure	<u> </u>					total:	55	days							
	A 2 paratio	. 1				total:									
	A 2	. 1													
	A 2 paratio	. 1													
	A 2 paratio	. 1													
o Pre	A 2 paratio	. 1													
	A 2 paratio	. 1													
Super-Structure	A 2 paratio k concr	. 1													

Table 2.4-22 Schedule Analysis of Bridge (Motorway Junction Bridge)

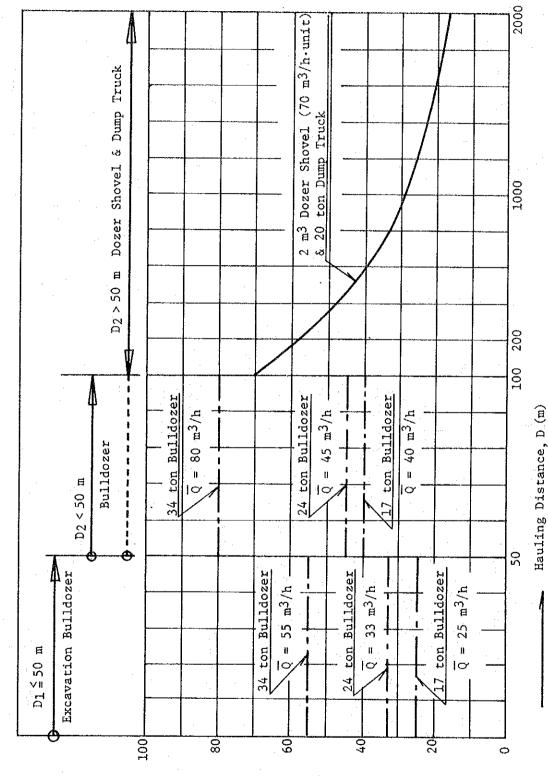
Mat	me of	Brid	ge	Widt	h	Leng	th				Туре				
Mwy	Jun.E-	-Rp. I	Br.	6.1	m	85	m .	Simpl	e pos	st-t	ension	ed giı	der		
Sub- Struct	ture	No.	Heigh (m)		ſype		Executi Founda			cuti	on of ete	Remarks			
Abutma	ont	A 1	8.0	) Rev	vers	ет									
		A 2	13.0	the second s	tre	A CONTRACTOR OF THE OWNER OWNER OF THE OWNER OWNE									
		P1 .P2	15.		. 1 UM	m T									
Pier		.82	10.						ĺ						
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		1.			·····										
			L						L						
		Area Bric	1		. 80		Erect		ectio	on o	f Gird	er			
Super-		(m.		G	irde	≥r	Gird		Truc	ck C:	rane	Sta	ging		
Struct	ture		· · .					•		x			- 		
							·		(pr	efer	able)				
- <del>6</del>	Analy	sis o	of Con	istruc	tio	n Dur	ation (A	ctual	Worki	lng	Day Ba	sis)			
	D	urati	Lon							:		<u>.</u>			
Iten	ם		(d	lay) 30	)	60	90	120	150	1	80 2	10	240		
Mobili	lzatio	_	1	<b>I</b> -			1								
		n			4						19. – 19.				
	i	A 1			·.						· · .		-		
LT CO	· · ·						t t	total:	90 d	ays					
ucture		A 1 A 2						cotal:	90 d	ays					
Structure		A 1 A 2 P 1						cotal:	90 d	ays					
b-Structure		A 1 A 2						cotal:	90 d	ays					
Sub-Structure		A 1 A 2 P 1						cotal:	90 d	ays					
Sub-Structure		A 1 A 2 P 1						total:	90 d	ays					
		A 1 A 2 P 1 P 2	n					cotal:	90 d	ays					
	Prepa	A 1 A 2 P 1 P 2 ratio						cotal:	90 d	ays					
	Prepa Produ of gi	A 1 A 2 P 1 P 2 ratio ction rder									davs				
	Prepa Produ of gi Erect Deck	A 1 A 2 P 1 P 2 ratio ction rder ion concr							90 a		days				
uper-Structure	Prepa Produ of gi Erect Deck e	A 1 A 2 P 1 P 2 ratio ction rder ion concr tc.									days				
uper-Structure	Prepa Produ of gi Erect Deck	A 1 A 2 P 1 P 2 ratio ction rder ion concr tc.									days				
uper-Structure	Prepa Produ of gi Erect Deck e Clean	A 1 A 2 P 1 P 2 ratio ction rder ion concr tc.									days				
Super-Structure	Prepa Produ of gi Erect Deck e Clean	A 1 A 2 P 1 P 2 ratio ction rder ion concr tc. ing									days				

Table 2.4-23 Schedule Analysis of Bridge (Motorway Junction Bridge)

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Table 2.4-24 Excavating and Collecting Material Rate

(=900m<sup>3</sup>/day) 113m<sup>3</sup>/h Average (1 day = 8 h) (=760m<sup>3</sup>/day)  $(=160m^3/day)$ Hourly Production 1040m3/day 65m<sup>3</sup>/h \ 130m<sup>3</sup>/h 20m<sup>3</sup>/h γ 95m<sup>3</sup>/h 30m3/h 45m<sup>3</sup>/h 35m3/h 30m<sup>3</sup>/h 20m3/h Jack hammer 20 kg, 8 units ' units Bulldozer 34 ton, 1 unit Bulldozer 24 ton, 1 unit Bulldozer 17 ton, 1 unit Bulldozer 24 ton, 1 unit Bulldozer 34 ton, 1 unit Bulldozer 17 ton, 1 unit Bulldozer 17 ton, 1 unit Air compressor 7.5m<sup>3</sup>/min, Combination Equipment ч 0 Excavation of Soil Material Excavation of Excavation of Unsound Rock Materials by blasting Sound Rock by ripping (Dl = 5Dm)(D1 = 50m)(DI = 50m)

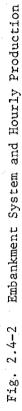


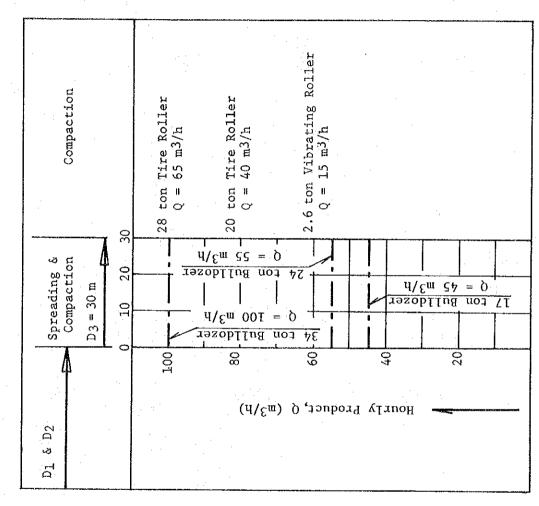
Hauling System and Hourly Production

Fig. 2.4-1

Hourly Production, Q (m3/h)

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at 149,000 m <sup>3</sup>	Mean Daily Product	900 m3/day for excavation		810 m3/day for embankment	agenciantes scorer									
Embankment	0 450													-
165,000 m <sup>3</sup>	330 360 390 420	•	.day					-				· ·	· ·	
Excavation	. Day Basis 240 270 300	ays	unit day unit. 1 x 184 = 184 1 x 184 = 184	l x 184 = 184	8 x 10 = 80	$2 \times 10 = 20$	1 x 184 = 184		l x 184 = 184	l x 184 = 184	3 x 184 = 552	I x 184 = 184	1 x 184 = 184	1 x 184 = 184
Sta.34+80 & Access Road	Actual Working 30 60 90 120 150 180 230	184 days	un la seconda de la second											
n Sta.0+00 ~ Sta.34+80	-	uo	34 ton Bulldozer 24 ton Bulldozer	17 ton Bulldozer	20 kg Jack hammer	7.5 m3/min Air compressor	34 ton Bulldozer	24 ton Bulldozer	17 ton Bulldozer	2.0 m <sup>3</sup> Dozer shovel	20 ton Dump truck	28 ton Tire roller	20 ton Tire roll <b>er</b>	2.6 ton Vibrating roller
Section		Duration	u	OLIEVB	эхд			umqiu		nanka Danka	m3 bn	e gn	t LueX	

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Table 2.4-25 Actual Working Day Analysis for Earth-moving Section

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Se	Section	Sta.34+20	∨ Sta.60+78 & Coromandel I.C. Excavation	ion 322,000 m3	Embankment	292,000 m3
			Actual Working Day Basis 30 60 90 120 150 180 210 240 270	<u>300 330 360 390 420</u>	420 450	Mean Daily Product
Du	Duration	uo				
<u> </u>		34 ton Bulldozer		unit ( 1 x	day unit.day 360 = 360	
	uo	24 ton Bulldozer		1 x	360 = 360	
	î j eve	17 ton Bulldozer		I ×	360 = 360	
	эхд	20 kg Jack hammer		8 ×	80 = 640	
		7.5 m <sup>3</sup> /min Air compressor		2 x	80 = 160	•
 זפ		34 ton Bulldozer		1 x	360 = 360	
unadtr		24 ton Bulldozer				
nbg u	ົງແອ	17 ton Bulldozer		I X	360 = 360	
Tem	anka	2.0 m <sup>3</sup> Dozer shovel		2 x	360 = 720	
	ma br	20 ton Dump truck		5 x	360=1 <b>,</b> 800	
	16 <b>3</b> 0	28 ton Tire roller		and the second	360 = 360	
	it Lush	20 ton Tire roller		1 ×	360 = 360	
		2.6 ton		1 ×	360 = 360	

Duration30 60 90Duration34 tonBuildozer34 tonBuildozer24 tonBuildozer24 tonBuildozer30 kgBuildozer30 kgJack hammer7.5 m3/minAir compressor30 kg	Actual Working Day Basis           120         150         180         240         270         300         330           206         days         206         days         1         1         1	360 390 420 450	Mean Daily Product
4 ton ulldozer 4 ton ulldozer 7 ton 11dozer 0 kg ack hammer .5 m3/min ir compressor	206 da 1 1 1		
34 t Bull Bull Bull Bull 20 k Jack Atr			
24 t 24 t 24 t 24 t 34 t 7.5 7.5			
Bull 17 t Bull 20 k Jack 7.5 Atr			
17 t Bull 20 k Jack 7.5 Atr			
20 k Jack 7.5 Air			
7.5 m3/min Air compressor	unit day unit.day 8 x 22 = 176	ЪУ	
	2 x 22 = 44		
34 ton Bulldozer	unit 1		
24 ton			
		· · · · · · · · · · · · · · · · · · ·	·
2.0 m <sup>3</sup> Dozer shovel	$\frac{760}{70 \times 8 h} = 2 \text{ unit}$		
	$\frac{760}{53 \times 8 \text{ h}} = 2 \text{ unit}$	5015-16-35Q	
	l unit		
Haulti 20 ton Tire roller		······	

Table 2.4-28 Summary of Construction Period for Box Culvert

r	- <del>r</del>				····	—1******			····	
Co				-						
l 8		-								
asis) 70								·		
day b										
(Calendar day basis) 40 50 60 70										
(Cale: 40										
30										
20										
10										
Nos. of span	4	0	e e		2	5	5		· .	
Nos. span									F-1	4
	49.66	28.40	40.60	39 - 60	31.82	32.03	28.40	17.36	18.13	28.22
Dimension	4.8 x	4.8 x	1.5 x	×	1.5 x	4.8 x 32.03	5.4 x	3.0 x	1.8 x	x 8 7
Dime	4.0 x 4	×	×	5 x 1.5	×	×	x	×	×	×
	- - -	5.5	2.5	2.5	1.5	5.5	4.3	4.3	1.8	5.5
	20	0	0 †	0	0	01	0	bad 0	ad	.0
STA.	+ 37.20	13 + 95.00	15 + 13.40	15 + 66.00	27 + 22.00	30 + 73.20	38 + 20.00	Feeder Road 2 + 65.00	Feeder Road 8 + 00	68 + 88.00
	6	13	15	15	27 -	30	1 38 1 38	Feed 2 +	Нее 8 +	68 +
		I				f f		ł		

- 46 -

						• .							
	20,											T	
	basis) 15 <sub>r</sub>											Ś	ipan)
Span	day				-							13 days	(13days x Nos. of span)
s for One	Duration for 1 span (Actual Working 5, 10,											╺╌┼╌╸	
Working Day Analysis for One Span Culvert	Dura 5											8 days	8 days +
iing I vert										 			
Actual Work of Box Culv	Mean Q'ty for 1 span	375.4 M3	14.3 M3 7.2 M3	65.0 M <sup>2</sup>	870.0 Kg	31.0 M <sup>3</sup>	361.4 M <sup>3</sup>	301.0 M <sup>2</sup>	7.86 Ton	93.3 M <sup>3</sup>			
Table 2.4-29		Excavation	Foundation & Leveling Concrete	Formwork	Reinforcement	Concreting	Scaffolding	Formwork	Reinforcement	Concreting	Curing & Removal of Form	total	Duration for J. Box Culvert
			uor	звbп	nog			Э.	angon	275			ੱਧ

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and the second second

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	· · · · · · · · · · · · · · · · · · ·	$sta.0 + 00 \sim 76 + 13$
Works	Daily Production	0 20 40 60 80 100 120 140 160 180 200 220 240 260 280
Preparation on subgrade	4,000 m <sup>2</sup> /day	
Subbase course	1,000 m3/day	30
Base course (carriage way)	1,000 m <sup>3</sup> /day	
Base course (shoulder)	500 m <sup>3</sup> /day	<b>□</b>
Asphalt binder course	390 ton/day	31
Asphalt wearing course & surface course	390 ton/day	40
Others		20
Total		160

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Table 2.4-30 Schedule Analysis of Pavement Work, Sta.0 + 00  $\sim$  76 + 13

- 48 -

		Do 4 1.					
	Works	Production	0	50		100	
	Preparation on subgrade	4,000 m <sup>2</sup> /day	۳I	•		• • •	
	Subbase course	1,000 m3/day					
-, <u>-, -, -, -, -, -, -, -, -, -, -, -, -</u> , -, -, -, -, -, -, -, -, -, -, -, -, -,	Base course (carriage way)	1,000 m <sup>3</sup> /day	N I	•			
	Base course (shoulder)	500 m <sup>3</sup> /day			· ·		
	Asphalt binder course	390 ton/day	'nĮ	·			
	Asphalt wearing course & surface course	390 ton/day	'n	•			
	Others		20			·	
	Total		35				

			- - - -
Works	Daily Production	0	001
Preparation on subgrade	4,000 m <sup>2</sup> /day		
Subbase course	1,000 m <sup>3</sup> /day	σĪ	·
Base course (carriage way)	1,000 m <sup>3</sup> /day	<b>1</b>	
Base course (shoulder)	500 m <sup>3</sup> /åay	<b>∩I</b>	
Asphalt binder course	390 ton/day	٣	
Asphalt wearing course & surface course	e 390 ton/day	[ى	
Others		20	
Total		45	

Table 2.4-32 Schedule Analysis of Pavement Work, Coromandel I.C.

- 50 -

Preparation on subgrade Subbase course (carriage way) (shoulder) Asphalt binder co Asphalt wearing c å surface course Others Othera	Works Production 0 50 100 $\frac{10}{10}$ 10 50 $\frac{10}{10}$	a 1,000 a <sup>3</sup> /day 1,000 a <sup>3</sup> /day	Base course 500 m <sup>3</sup> /day <sup>2</sup> (shoulder) 390 ton/day <sup>12</sup>	Asphalt wearing course 390 ton/day 14	30	
--	---	---	--	---------------------------------------	----	--

Schedule Analysis of Pavement Work, Phased Construction Part of Motorway Junction Table 2.4-34

	Daily			-			<b></b>
Works	Production	_0		50	100		
Preparation on subgrade	4,000 m <sup>2</sup> /day	<u>01</u>					
Subbase course	1,000 m3/day						<del> </del>
Base course (carriage way)	1,000 m <sup>3</sup> /day	v 1					
Base course (shoulder)	500 mm <sup>3</sup> /day	r1 X	۰,				
Asphalt binder course	390 ton/day	۲ N			 		
Asphalt wearing course & surface course	390 ton/day	~ <b>↓</b>	·				***
Others		15			·		
Total		21			→ → → → → → → → → → → → → → → → → → →	•	1

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		-				
Works	Daily Production		50		100	
Preparation on subgrade	4,000 m <sup>2</sup> /day	4 1				
Subbase course	1,000 m3/day	4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				
Base course (carriage way)	1,000 m <sup>3</sup> /day	4 ]		·		
Base course (shoulder)	500 m <sup>3</sup> /day					
Asphalt binder course	390 ton/day					
Asphalt wearing course & surface course	390 ton/day	~ ]				
Others		20		·		
Total		39				•

Table 2.4-35 Schedule Analysis of Pavement Work, Access Road

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Work Schedule
Proposed
Table 2.4-36

22 23 24 25 26 27 28 29 30 31 32 3			Sta. 0+0 ~ Sta. 34 + 20       Sta. 34 + 20       Sta. 34 + 20         Sta. 0+0 ~ Sta. 34 + 20       Sta. 34 + 20       Sta. 76 + 13 & Motorway Junc.         of       Sta. 76 + 13 & Motorway Junc.	f LIARIES St4.9+37.2	F. Rd. 2+ 45	B-Le Br. B-Le Br. B-Le Br. B-Le Br. B-Le Br.	nd Merician Strategy Br. Br. May Jun. G-Rb. Br. Merician Merician Merician Merician Strategy Br.	(Abutment) Cpr. Int H-Rp. Dv. Br. A-1 Rold Ov. Br. Sta. 57 Aq. Sta. 27 Aq. Sta. 22 Over Br. Pailles Ov. Br. B.B. Ped. Br.				Sta. D+00 % Sta. 7 6 + 13 Coromandel 1 C Access Roard	t of						
Bill No. Works	MS Flon	CLEARANCE tc. ruction Part	, art and	ks uction Part RETE AND AN		Link Road Bridges G.R.N.W. Bridge (2 nr) and Ancillaries ditto St. Louis River Bridge (2	anu An <u>utitaties</u> Rampway Bridges (4 nr) and Ancillaries	Over Bridges (5 nr) and Ancillaries Pedestrian Bridges (2 nr) Aquaduct Bridges (2 nr) and Ancillaries	Motorway Junction Bridges A-Le l Br. B-Le l Br. A-Le 2 Br.	B-Le 2 Br. A-Le 3 Br. B-Le 3 Br.	Vorks inc	Any other Works of Phased Construction PAVEMENT AND ANCILLARY WORKS Pavement, etc.	n Part	STORM DRAINAGE WORKS Fipe Culverts Other Drainage	Phased Construction Fart the Above G. MASONRY WORKS	cuctures and Construction ove	<ul> <li>H. LIGHTING INSTALLATIONS</li> <li>Point aux Sable / Coromandel</li> <li>Interchabge</li> </ul>	Phased Construction Fart the Above Mortorway Junction	Phased Construction Part

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Table 2.4-37 Arrangement Schedule of Main Constructional Equipment

 
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## 3. ESTIMATE OF CONSTRUCTION COST

3.1 General

3.1.1 Bill classification

With respect to the Clause 4.3.5 Construction Quantities of Scope of Work, it is recommended that the bill classification be modified as below in order to cover the characteristics of works in more detail for both the contracts of Roadway and Bridge Sections.

- (a) General items
- (b) Demolition and clearance works
- (c) Earthworks

(d) Structural concrete and concrete ancillaries works

(e) Pavements and road ancillaries works

- (f) Storm drainage works
- (g) Masonry works
- (h) Lighting installations
- (i) Daywork schedules

# 3.1.2 Cost estimate

The cost estimate of the project stands on the basis of the price level of September, 1979 (Base Date). In connection with the consultancy service of the Clause 4.3.6 Cost Estimate Scope of Work, the following unit price analysis method is employed. The Unit Price Analysis of Work Item Sheet appended to this volume consists of:

Cost elements vertically on the analysis sheet;

- (a) Equipment cost
- (b) Labour cost
- (c) Material cost
- (d) Overhead cost, and
- (e) Profit

Elements (d) and (e) are fixed as 20% and 5% of the sum of (a) to (c) respectively for all work items.

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Cost components horizontally on the sheet;

(a) Local currency cost

(b) Foreign currency cost, and

(c) Taxes (to be included in local cost component)

In the cost element column, the fuel consumption cost will be shown separately to conduct the sensibility analysis of its impact on total cost by inflation or any other reason, and as for the taxes in the cost component row they will be analyzed into import duties, corporate taxes and income taxes to give the option for financial cost reduction from the amount of the construction cost by the Employer.

(1) Labour costs

The basic data is wholly obtained from local sources. The costs by categorized labour are shown in Table 3.2-6. They include allowances and fringe benefits, but exclude indirect overburdens for the performance of work, almost all of which are billed in relevant items of General Items.

(2) Equipment costs

All information is derived from the Site investigation in September of 1979. Additional information is from the effective makers of plant/ equipment in Japan or other countries.

The costs are all indicated on the delivered hourly cost basis, but exclude the operator's hourly wages and allowances which are included in the labour cost element.

The results are summarized in Table 3.3-34 attached thereto and correspond well to the realistic prices of Mauritius at the Base Date.

(3) Material Costs

The material costs are shown on the basis of delivered cost to the Site. The material costs are classified into:

Imported material (e.g. cement)

Domestic products of which raw materials are imported (e.g. reinforcing steel bar)

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Domestic products of which raw materials are produced locally (e.g. aggregate)

Domestic products which consist of the above material elements (e.g. concrete)

Imported materials are classified into several classes by their rate of import duties. Analyses of cost components for materials are made in a manner principally the same as those for Work Items. The equipment cost which relates to the manufactureing or transporting process of materials will be taken into account.

## (4) Taxes

The tax components shown separately on the Analysis Sheet are corporate tax, income tax and import duties. The technical possibility to extract the 3 tax factors from the tax cost element is shown schematically in the attached figures.

#### 3.1.3 Adjustment of construction cost

All costs are expressed in Mauritius Rupee and are based on the price level of September 1979 (Base Date). Therefore, the financial analysis for the adjustment of the estimated amount so as to correspond to the influence of price fluctuations which may, for any reason occur. By the results of Unit Price Analysis, the following variation factors will be considered.

- (a) Influences of the currency devaluation in October of 1979
- (b) Influences of annual inflation factor
- (c) Influences of the remittance of foreign contractors:

The unit price analysis is based on the assumption that the construction is performed solely by local contractors. So, the rate of contract amount of the total amount for prospective foreign contractors shall be taken into consideration and reasonable adjustment for the foreign portion will be prepared.

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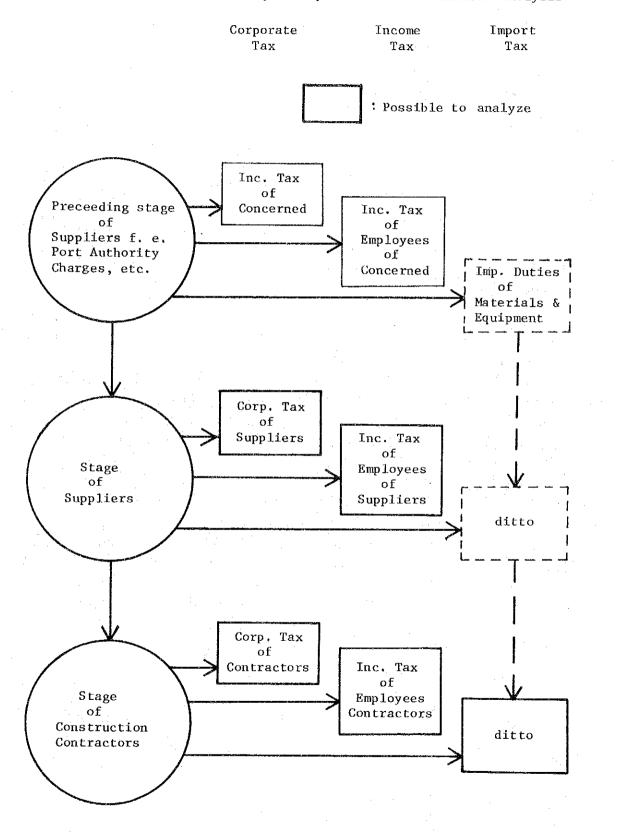


Fig. 3.1-1 Taxes separately shown on Cost Element Analysis

#### 3.2 Labour Cost

### 3.2.1 Description

The Labour Cost means the cost of the labour element computed in the Unit Plice Analysis of Work Item Sheets, which is required for the performance of a specified quantity of itemized work. The labour cost shall be shown in an appropriate classification according to the quality of labour. For the sake of convenience of analysis, each classified labour cost will be shown on an hourly cost basis.

The Labour Cost will be inclusive of hourly distributed wages, fringe benefits and expenses whatever directly or indirectly paid to the employee, but it excludes indirect overburden costs for the work performance such as labour control costs, insurances, facility costs for labourers, etc. These latter expenditures will be summed up in the overhead costs of each work item or separately in the relevant items of General Item of Bills of Quantities.

An analysis of labour cost is based on the information and data collected during Site Investigations in Mauritius in September of 1979. Consequently, the applicable labour cost at the prospective time of construction will be forecast on the basis of the above data.

The cost will be therefore reviewed and modified, if necessary, in another part of this volume for the proposed commencement date of construction taking into consideration the cost fluctuation factors such as the annual mark-up trend inflation, etc. which are in effect after the abovementioned base date for the analyses.

At the first step of analysis, almost all of the labour cost may be deemed as a local currency cost component on the assumption that the Contract be awarded only to a local contractor(s). In this respect, an additional review for the component analysis will be made together with contractual considerations for the awarding policies.

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#### 3.2.2 Mark-up trand of basic wage

Fig. 3.2-1 derives from the analyzed data during the period 1975 to 1978 by the Builders' Association of Mauritius. From this, the mark-up trend of the basic wage for each category of labour may be approximately 6 per cent per annum, so the wage level of 1979 and thereafter can be forecast as shown respectively in parentheses. Those forecast figures will be checked reckoning with the actual mark-up trand after the base date.

# 3.2.3 Classification of labour and labour cost

Table 3.2-1 shows the amount of labour employed in the construction field of Sugar Millers' Estate, and their lowest and highest monthly wages both in 1977 and 1978 subject to the labour category.

In the table, the wages of 1979 are forecasted by multiplying 1.06 to the figures of 1978. Also the hourly wages are based on an assumption that the number of working days of a calender month is 26 and working hours of a calender day is 8.

In a same manner, the information on the wages by category for the constructional labour of the Central Government are arranged in Table 3.2-2. The wage level shown above is deemed to be inclusive of the fringe benefits.

Table 3.2-3 shows the analyzed result of labour costs depending on the governmental guided basic wage in the Notice of 1979. The cost includes fringe benefits shown in Table 3.2-4 which are based on the analysis concept by Builders' Association of Mauritius.

In the table labour is classified into seven groups based on the hourly cost level. Also the various kinds of labourer in both the Sugar Estates and Central Government discussed above are classified into relevant classes by cost level.

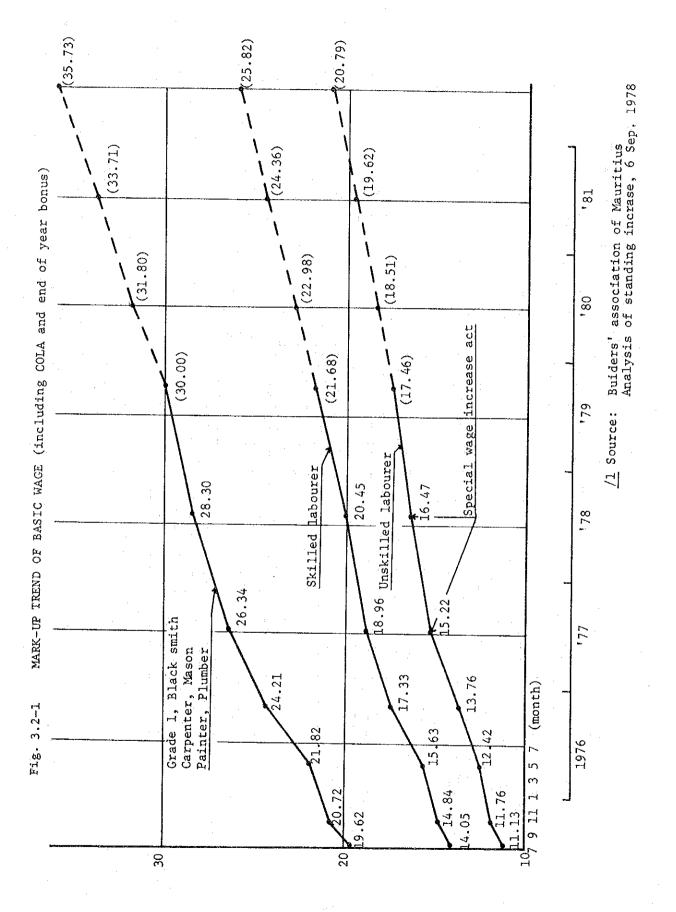
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# 3.2.4 Income tax rate for labour cost

The calculation of the income tax rate against labour cost is attempted in a manner as shown in the Table 3.2-5, which is referred to "A Consolidated Version of the Labour Act 1975" and "Year of Assessment 1979-1980, Notes for the Completion of Year Return."

From these foregoing analyses the hourly labour costs and income tax component rates are concluded as in the Table 3.2-6.

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Table 3.2-1 Hourly Wages by Labour Category in Sugar Millers' Estate

Houry Vage (Tasen) (Tas) 4.66 4.75 5.50 1979 5.69 5.33 4.37 6.79 **%** 6.18 5.55 Houry 5.39 6.10 5.53 4.62 4.83 5.52 4.03 16.4 4.45 7.12 4.5**6** 1979 6.55 61.3 \$0. V 4.07 age (ga) 7.85 4.66 1978/1977 (mean) I.129 1.060 1.170 1.076 L.026 1.076 1.129 1.066 1.079 1.069 1.072 1.108 1.110 1.002 1,041 0.927 1,065 1.094 1.087 1.061 1.075 (Rs) 1,197.50 958.10 873.13 798.95 898.75 1,056.83 790.63 962.50 1,212.86 1,068.33 1,085.88 1,214.06 803.07 1,084.00 902.50 1, 397.00 1,539.50 1,333.11 909.67 1, 285.44 906.95 Monthly salalies (mean) 1977 (Rs) 1,009.33 1,135.88 \$30.17 712.00 538.44 707.50 997.03 777.58 1,207.43 1,120.50 890.57 1,317.00 1,660.75 1,181.12 1,009.33 829.19 1,136.86 749.00 978.46 960.80 836.00 819.00 996.00 906.25 Monthly salaries (Rs) 1,056.90 983.84 1,115.00 803.14 1,539.50 1,240.72 1,121.00 1,481.22 1,210.00 1,214.61 1.038.44 1,170.00 965.00 835.64 962.00 1,539.50 1,316.38 978.90 Highest 1,185.00 \$35.50 877.75 762.25 927.00 840.00 1,056.75 1,056.75 1,185.00 1,056.75 762.25 1,254.50 1,185.00 835.50 1,254.50 1,123.50 998.00 840.00 4 1,539.50 835.00 803.00 Lowest 1978 employed 8 8 5 **\$** 8 13 \$ 2 4.4 46 59 3 8 126 22 5 327 207 e N 737.00 Monthly salaries (Rs) 965.38 749.00 1,163.75 1,010.30 46.998 1,077.35 880.88 1,456.50 1,034.90 894.50 Highest 1,865.00 1,254.24 777.66 1,237.35 1,133.00 1,034.90 1,319.22 1,057.42 915.88 728.00 815.75 687.00 844.25 983.75 777.50 983.75 777.50 749.00 899.50 761.00 1,106.00 1,106.00 983.75 261.00 687.00 1.177.50 1,108.00 777.50 1,177.50 Lowest 1,456.50 1,048.50 ۲, 1977 Nos. employed 2 8 5 214 ក្ត ភ្ល ភ្ល 8 % ŝ 96 33 14 84 97 62 5 T 37 Superior Superior Superior Superior Superior Grade . H Chief Chief H 11 Chief. H 11 H Chief н н н H 11 Ĥ (lorries, vans. buses cars, lollers, wheel fractors, (heavy machanical unit). Motor mechanic (automobile) Category light loaders) Carpenter He Lder Driver Piccer Driver

/1 Source: BI-ANNUAL DIGEST OF STATISTICS; December 1978, Ministry of Economic Planning and Development, Central Statistical Office.

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and the second					
Daily wages		wages t (Rs)	Daily highes	wages t (Rs)	Hourly wages
Category	1977	1978	1977	1978	1979
Fitter	28,88	31.11	49.96	53.00	5.26
Mechanic	28.88	31.11	49.96	53.00	5.26
Carpenter	28.88	31.11	49.96	53.00	5.26
Mason	28.88	31.11	49.96	53.00	5.26
Driver	25.53	27.50	40.65	43.53	4.44
Skilled labourer	19.73	21.26	25.53	27.50	3.05
Unskilled labourer	18.88	20.26	23.50	25.30	2.85

Table 3.2-2

Hourly Wages by Labour Category in the Central Government

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Table 3.2-3 Analysis of Labour Cost

	ATTRO							
	- Past	Arran nasoding	Peref -	LALLY SUPPORED	. Bourly	C.Lass	CLASSIFICATION	
Category	uage in 1978	1979 1979 (1)×1.06	in 1979 (2)×0.53	(2)+(3)	(4)/8 hr	Class	Rounded up hourly cost (2*)	Letter Le
	(Ra)	(KB)	(Ba)-	( <b>9</b> 7)	( <b>31</b> 2)			
	(1)	(2)	(6)	(9)	(2)		(9)	
Chief formen	50.5	53.16	28.17	81.33	10-17	-	10.5	
Foreman (2nd year)	34.15	36.20	19.19	55.39	6.92			
Stope masce	31.61	33.51	17 76	51.27	6.41	<b>7</b>	7.0	
Leading hand arrison	30.15	31.99	16.96	48.95	6.12			-
Machanic grade 1. Driver grade 1	26.72	28.32	15.01	43.33	5.42			हेक केने संस्थितर (5.33)
Black maith. Carpenter.								sechante
Mason, Materia						64)	5.5	* Fitter (5.58) * Machanic (5.58)
Flumber grade 1	26.12	27.69	14.67	42.36	5.30			ы
Bar bender grade 1	25.37	26.89	14.25	41.14	5.14			
Machanic grade 2, Driver grade 2,								## Carpenter (4.66) ## Driver Meavy Neft
Black smith.		•						(4.75)
uarpenter, Mason,					-	4	0.0	<pre># Driver (4.71) # Driver (4.37)</pre>
Painter. Plumber grade 2	22.69	24.05	12.75	36, 08	4.60	-		
Rer bender grade 2	21.72	23.02	12.20	35.22	. 07.4			
Driver (others)	19.18	20.33	10.78	31.11	5°68°6			* Specialized labourer
Plant operator	19.56	20.73	10.99	31.72	3.97	5	0.4	(3.23)
Skilled labourer	18.88	20.01	10.61	30.62	3.83			:
(Semiskilled labourer)						•	(3.5)	
Umekilled lebourer	15.20	16.11	75°8	24.65	3.06	~	0.6	a Urskilled labourar

 $L^1$  Data for Labour Calabification and Daily Basic Wage derive from the Governmental Notice No. 5 of 1979.

18 column "Remark", the Nourly Mages for both Sugar Millers' Estate and Central Government employees are shown as references marked by \*\* and \* respectively.

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# Table 3.2-4 Analysis of Ratio of Fringe Benefits for Basic Wage

	Effective working hours	Effective pay hours
Normal working hours		
in the year : assumed		
52 weeks x 45 hours/week;	2,340	2,340
Extra working hours : assumed		
5% of the above hours ;	117	176
	2,457	2,516
Less : Statutory paid leave		
Public holidays ; 20 x 8	-160	-
Annual leave ; 12 x 8	- 96	→
Sick leave		÷
on full pay ; 12 x 8	- 96	_
on half pay ; 24 x 8	-192	-96
	1,889	2,420
Add :		
Severance allowance ; $15 \times 8$	-	120
End of year bonus ; $26 \times 8$		208
6% contribution to National		
Pension Fund : assumed 6% x		
2,420 hours ;	1 880	145
	1,889	2,893

The following ratio is considered with effect from 1 July 1978;

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			1940 - A. C.						
Table 3.2	-5 Analysis	of	Income	Тах	Ratio	for	Hourly	Labour	Cost

	i			: 	For Hou			
Category	· ·		<b></b>		local	<del>ان به استانور را بو طفاران</del>		Expa-
Description	1	2	. 3	. 4	5	6	7	triat
Hourly cost (1)	10.5	7.0	5.5	4.0	3.5	3.0	3.0	45.0
Annual net income (2) (1) x 2748 hrs	Rs 28,854	19,236	15,114	13,740	10,992	9,618	8,244	123,66
Deductions								
Exclument relief 5% of (1), but limited to Rs5,000	Rs 1,443	962	756	687	550	481	412	5,00
. Unmarried dependent children, assume 2 in nos., Rs4,500	Rs 4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,50
. Dependent relatives assume 1 in nos., Rs1,000	Rs 1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,00
. Contribution to N.P.F., assume (1) x 73 hrs	Rs 767	511	402	365	292	256	219	3,28
<ul> <li>Medical expences &amp; contribution, assume 5% of (1), but limit to Rs1,500</li> </ul>	Rs 1,443	962	756	687	550	481	412	1,50
Provision for retire- mentannuities, 10% of (1), but limit to Rs5,000	Rs 2,885	1,924	1,511	1,374	1,099	962	824	5,00
. Relief for Life insurance premiums, 3.3%, but limit to Rs5,000	Rs 952	535	499	453	363	317	272	1,00
Total of deduction (3)	Rs 12,990	10,394	9,424	9,066	8,354	7,997	7,639	21,28
Chargeable income (4)	Rs 15,864	8,842	5,690	4,674	2,638	1,621	605	102,37
Tax payable		• - · -			,			,
5% of first Re5,000	R8 250	250	250	234	132	81	30	
10% of next Rs5,000	Rs 500 Rs	384	69					
20% of next Rel0,000 Total of tax payable (5)	1,173 Rs 1,923	634	319	234	132	81	30	41,28
		:					1	

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Category	Hourly labour cost (Rs)	Component		
		Local (Rs)	Foreign (Rs)	Tax (Rs)
Local				
Class 1	10.5	100% 10.5	0	7% 0.7
Class 2	7.0	100% 7.0	0	3% 0.2
Class 3	5.5	100% 5.5	0	2% 0.1
Class 4	5.0	100% 5.0	0	2% 0.1
Class 5	4.0	100% 4.0	0	0
Class 6	3.5	100% 3.5	0	. <b>O</b>
Class 7	3.0	100% 3.0	0	0
Expatriate	45.0	47% 21.0	53% 24.0	33% 14.9

Table 3.2-6 Cost Component of Hourly Labour Cost

/1 Local component includes taxes.

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#### 3.3 Equipment Cost

#### 3.3.1 Descriptions

The Equipment Cost means the cost of equipment element put into the Unit Price Analysis Sheet, which is required for the performance of specified quantity of itemized work. The cost will be analyzed on an hourly cost basis on assumptions that the equipment is delivered on to Site and ready for normal operations.

3.3.2 Current hourly cost of main construction equipment

The Table 3.3-1 shows the prevailing hourly use rate of main construction equipment at the base date i.e. September of 1979, which are obtained from the interviews with local contractors and the analyses of tender documents of previously executed projects in Mauritius.

In the table, it is noted that the mark-up trend of hourly costs between 1977 to 1979 is approximately 20-30 per cent. The tendency gives an index to the estimate of cost of construction equipment for the Works.

#### 3.3.3 CIF Port Louis value of imported construction equipment

The Table 3.3-2 shows the CIF values at Port Louis in September 1979 of heavy equipment, which are quoted by a major Japanese construction machine maker. The relationship between the delivered price in Japan and FOB value in Japan, or the rate of insurances/freight costs against the FOB value in Japan may be useful for the estimation of CIF value in Port Louis of general equipment.

So far as limited in the table, the CIF value goes 10 to 20 per cent higher than the FOB value in Japan, and the freight/insurance cost accounts for approximately 20 per cent of the FOB value in Japan. By comparing the CIF value at Port Louis with the delivered price in Japan for each item, the rate of increase becomes approximately 10 per cent. The trial calculation of hourly costs of main equipment which may be imported from Japan coincide with the prevailing cost levels in Mauritius shown in the Table 3.3-1.

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