5.6 Junction Plans

The following three junctions exist in the project area:

a) North Junction, where Bagamoyo Road crosses the Keniyatta Drive and the Kinondoni Road.

b) West Junction, where United Nations Road joins Upanga Road.

c) South Junction, where Ocean Road joins Upanga Road.

Traffic control at junctions may be accomplished either with or without the use of traffic signals. According to the report of ASSHO, the limit of hourly traffic capacity of junctions without signals is:

a) When the road is 2-lane: the hourly capacity in terms of the total of the main road traffic and cross road traffic in both directions is:

From 650 to 750 vehicles

b) When the road is 4-lane: the hourly capacity (same as above) is:

From 1,100 to 2,025 vehicles

Each of the three Junctions in the Project area not only already has an hourly traffic of 1,800 to 2,400 vehicles, but also will have a design hourly traffic of 4,000 to over 5,000 vehicles in the target year of 1990. It is, thus, apparent that traffic control at these Junctions will have to be accomplished with the aid of traffic signals.

1) Design References

(a) Standard Saturation Traffic

The following flow volumes of standard saturation traffic are to be used:

Straight traffic : 2,000 p.c.u per green light hour per lane
Turning (left or right) traffic : 1,800 p.c.u. per green light hour per lane.

(b) Design Traffic Volume

An estimated 3,000 vehicles per hour is to be used as design traffic volume moving in one direction in the peak hour in 1990.

(c) Traffic Distribution by Direction

Fig. 5-6 shows future traffic distributions in 1990 by movement direction at the three junctions as distributed by the ratios of the existing traffic.

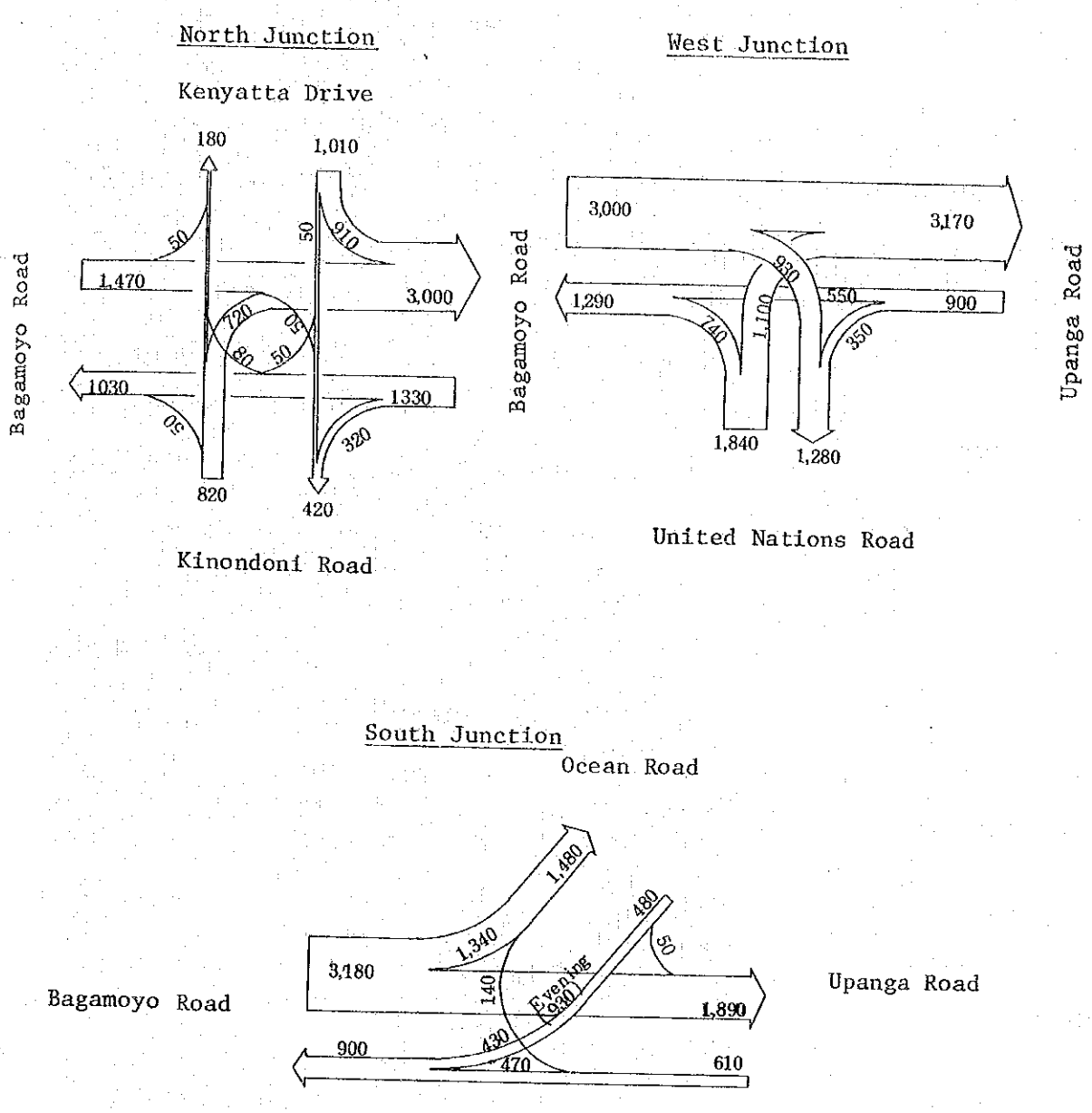


Fig. 5-6 Future Distribution of Traffic by Direction
(Passenger car units)

2) Signal Indications

Plans must be formulated in order that each of the three Junctions will be able to adequately handle the estimated traffic volumes in the target year. This Project will include the installation of traffic signals for the safe and smooth traffic control at the Junctions. The signal cycles are to be 180 seconds or less as a principle. Junction plans and signal indications for these Junctions are shown in Fig. 5-7, 5-8, 5-9.(See ANNEX C-VII for detail)

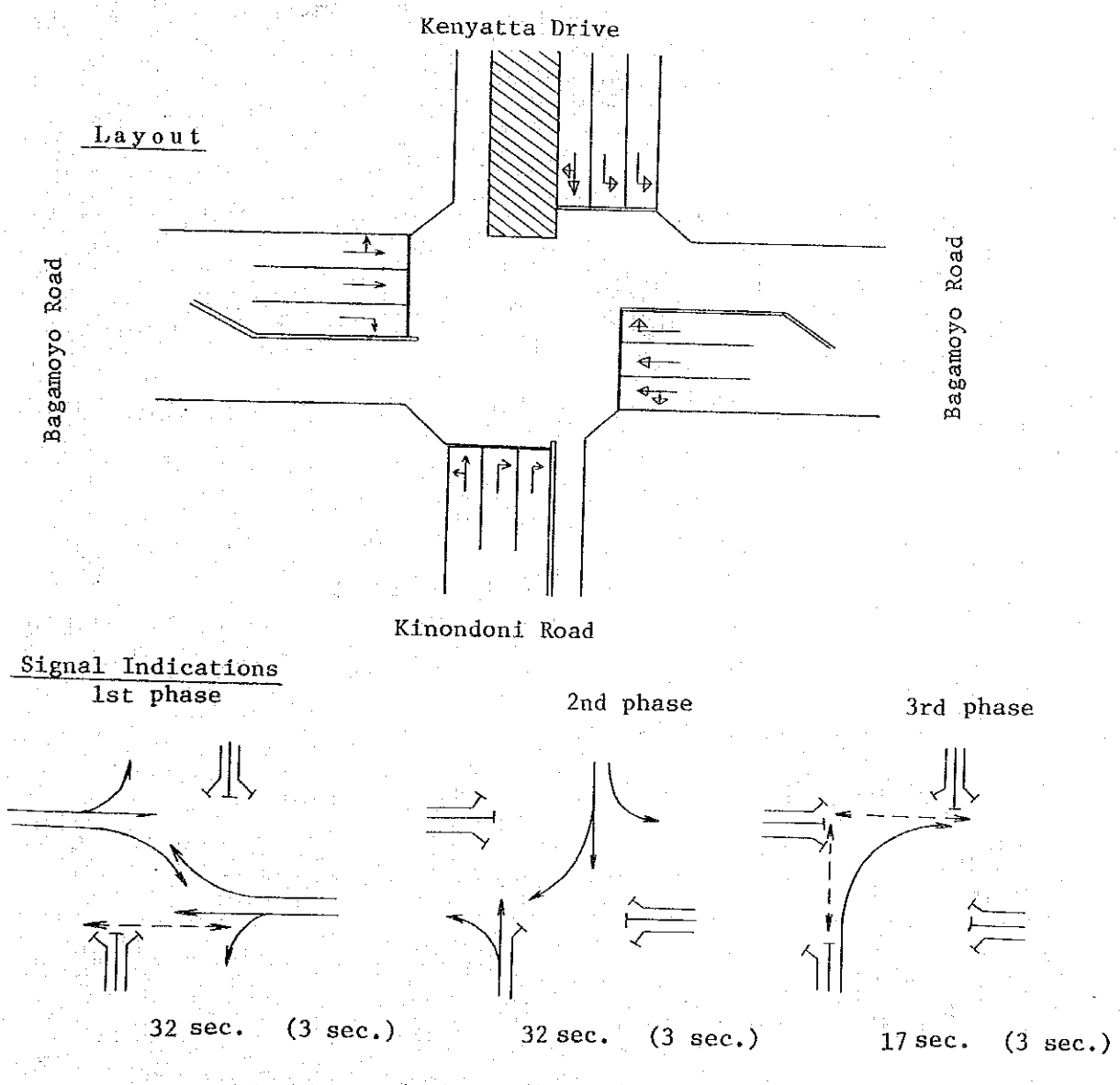
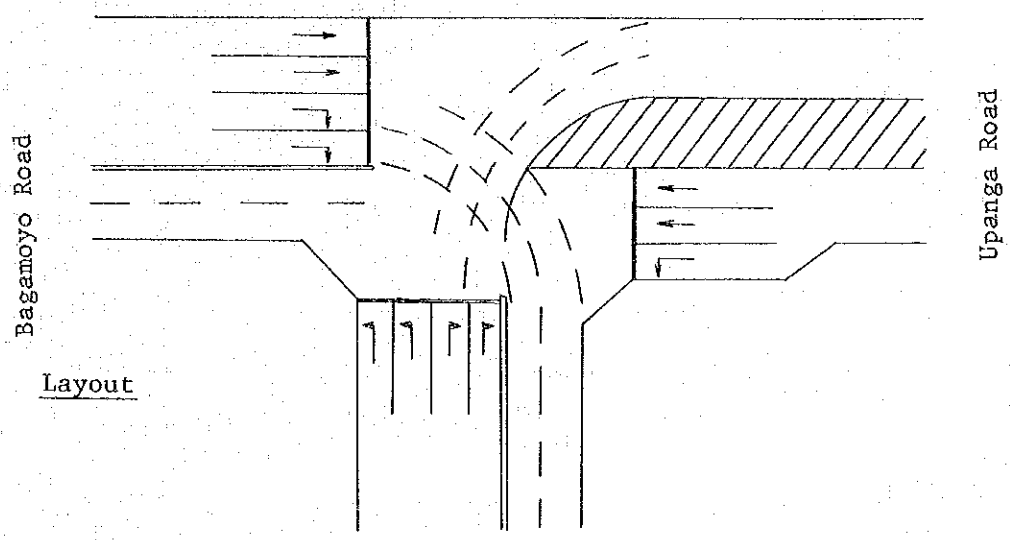


Fig. 5-7 North Junction Plan and Signal Indications



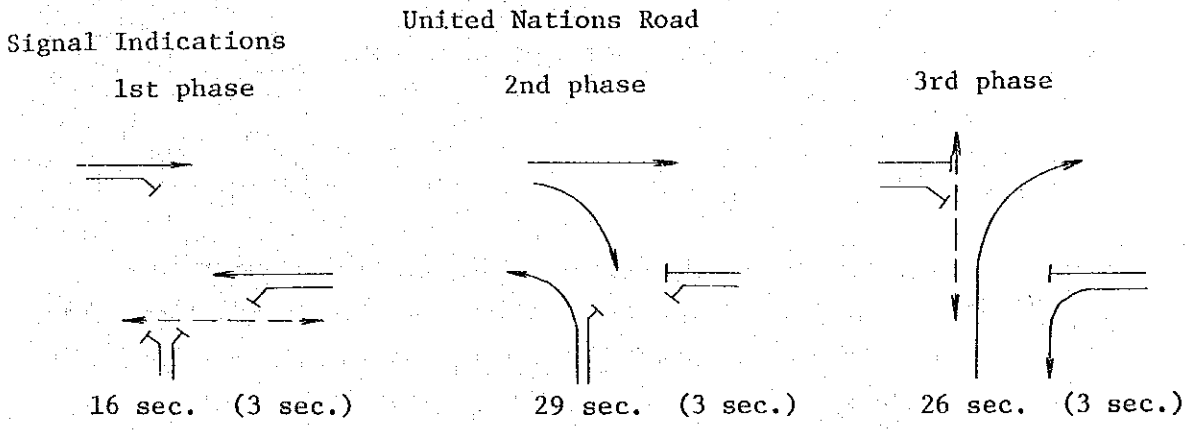
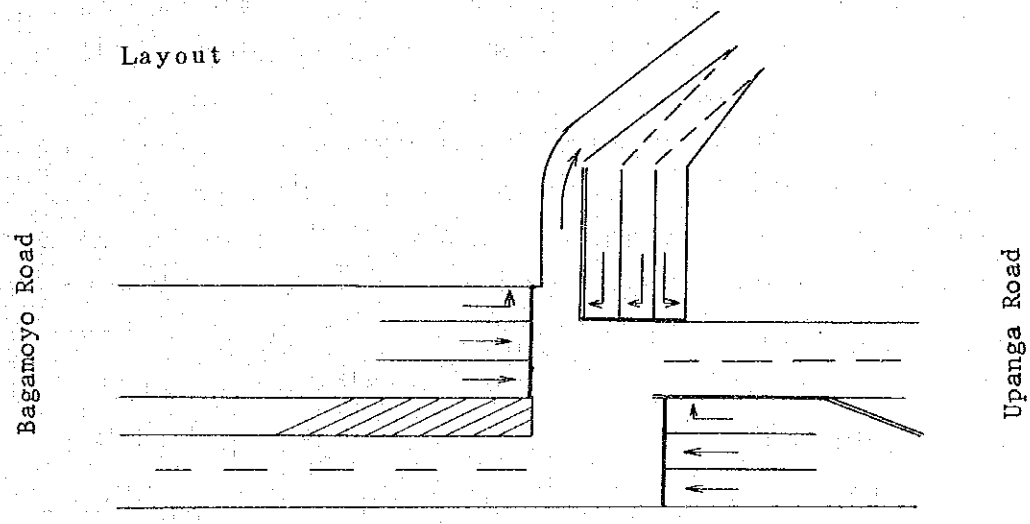


Fig. 5-8 West Junction Plan and Signal Indications



Signal Indications

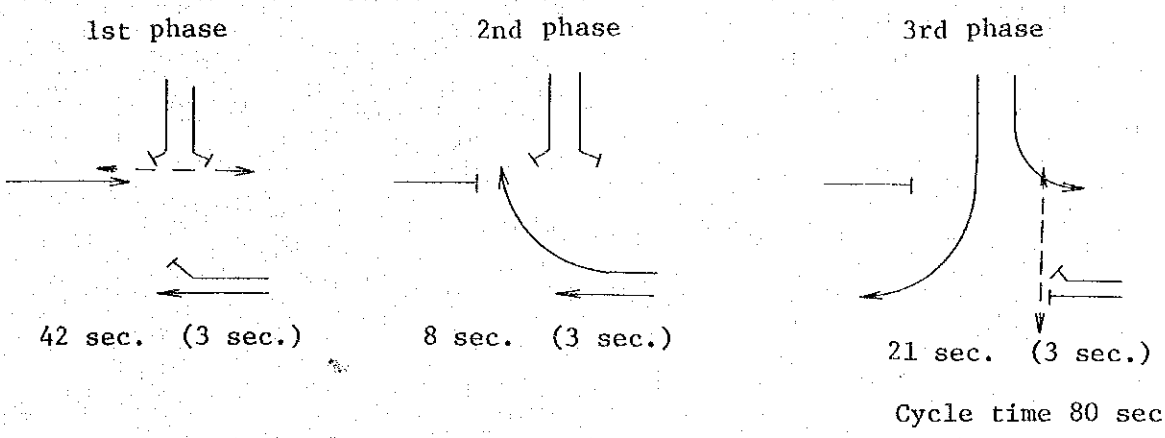


Fig. 5-9 South Junction Plan and Signal Indications

3) Traffic Channelization

Complicated traffic flow lines crossing within junction generally the cause for high incidence of traffic accidents and decline in the traffic handling capacity of the junction. Therefore, it has been decided that vehicle lanes for different directions will be separated from each other through the channelization technique as described below.

Junctions are often designed with a large inside land space, when such a junction is created, trash accumulates in other than traffic paths thereby degrading taffic safety. Such dead spaces may be utilized as traffic islands for the purpose of creating training lanes. Training lanes should have a just adequate width, not too wide, not too narrow. A greater raidus of the training lanes is more desirable, but in the interest of economy it has been decided that the radius of 20 meters and the width of five meters will be used. However, the 5-meter width has been selected based on ordinary size vehicles and, therefore, will be inadequate for larger vehicles.

If semi-trailers are considered, the 5-meter width would be 1.5 meters too narrow. In order to accommodate semi-trailers, islands embracing the training lane are to be set back by 0.75 meters each so that the total clearance will be 6.5 meters at the curvature (See Fig. 5-6).

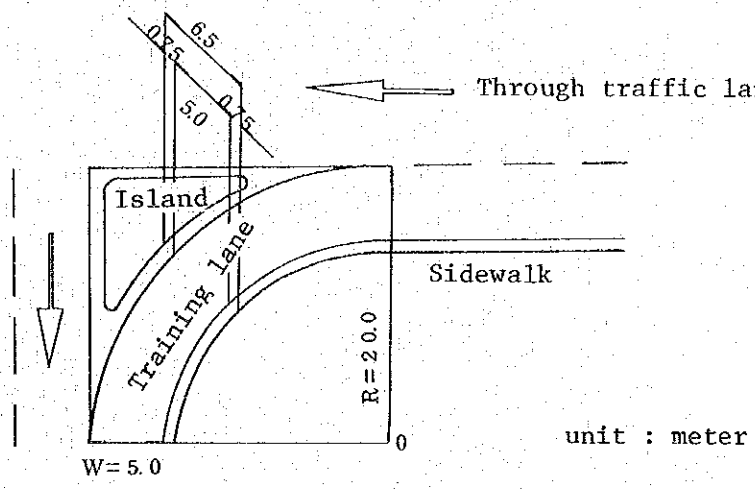


Fig. 5-10 Channelization

CHAPTER 6

PAVEMENT DESIGN

CHAPTER 6. PAVEMENT DESIGN

6.1 Design Plans

Asphalt concrete pavement is common in Tanzania. For this Project also, pavement will be by asphalt concrete for the following reasons:

a) The existing road is of asphalt concrete pavement.

b) Tanzanians are experienced in asphalt concrete pavement work.

c) Cement concrete pavement will inevitably have joints where uneasily-repairable cracks can start.

d) Cement concrete pavement requires that the concrete be cured for about one week before use and is, therefore, impractical for the purpose of existing road upgrading where existing traffic cannot be shutdown for a long time.

6.2 Carriageway Pavement

1) Existing Road Surface Condition

The existing road has pavement of 7- to 7.5- meter width and the following structure:

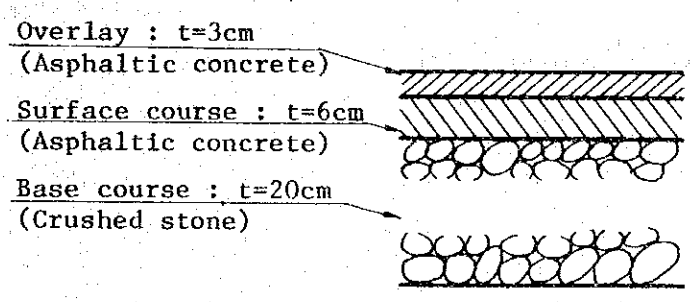


Fig. 6-1 Pavement Structure of Existing Road

A 20-centimeter thick base course of crushed stone is covered by a 6-centimeter asphalt concrete and, in some sections, an approximately 3-centimeter asphalt concrete overlay. The existing road surface is observed to have frequent cracks and is in an extreme condition--not that the operation of vehicles is currently hindered, but the road will have to go through a radical improvement in order to be able to effectively serve the increased volume of future traffic.

For the purpose of facilitating the determination of an appropriate pavement thickness, the Preliminary Study Team conducted a C.B.R. test of the improved subgrade soil along the road (See ANNEX D-1). This test revealed that the design C.B.R. of the improved subgrade soil could be expected at about 12%.

2) Pavement Design

Design conditions for the determination of pavement thickness are as follows:

a) Design CBR of improved subgrade : 12%

b) Large vehicles traffic volume : 830 vehicles in one direction per day (B traffic)

From these conditions, T_A = 17 centimeters, and the total thickness at least 26 centimeters.

Assuming the pavement structure illustreated below, T_A = 18.25 cm>17 cm, total thickness 40 cm > 26 cm and therefore, the necessary thickness is satisfied.

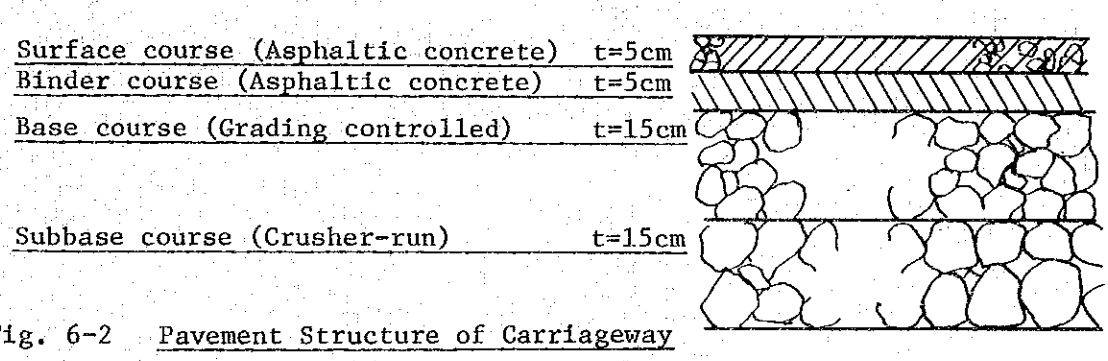


Fig. 6-2 Pavement Structure of Carriageway

6.3 Bridge Surface Pavement

In consideration of traffic load impacts and rain and other weather conditions, the pavement of the bridge surface must be one which can protect the bridge floor slab and, at the same time, facilitate smooth passage of traffic.

The following is the cautions which should be borne in mind when designing bridge surface pavement:

a) The pavement must have contact with and adequately adhere to the bridge floor slab and be resistent to repeated bending stress.

b) The pavement must be sufficiently waterproof, because penetrating rain and other water substantially deteriorates the durability of the bridge body.

c) The pavement must be highly flow resistent, because any mixed substances are liable to flow when placed on a slab with a high rigidity such as bridge floor slabs.

Today, bridges are usually paved with hot mixed asphalt or mastic asphalt. In this Project, however, dense grade asphalt concrete, which has a high water tighteness and which is used also for surface course of the road sections, will be used for the bridge pavement, provided that the pavement thickness will be 5 centimeters.

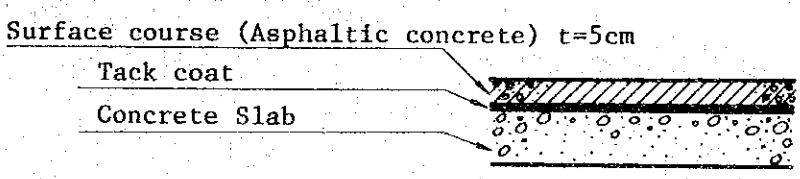


Fig. 6-3 Pavement Structure of Bridge Surface

6.4 Sidewalk/Bicycle Track Pavement

The pavement of bicycle tracks must be that which will facilitate smooth bicycle operation and be resistent to abrasion by bicycle traffic.

Requirements for sidewalk pavement are flatness, abrasion resistency, and sufficient friction to prevent pedestrian slipping. In this Project, both sidewalks and bicycle tracks will be made with borrowed soil which will be sufficiently compacted, and the surface will be made with sprayed bitumen material and receive a dust prevention treatment.

The road surface will be sloped down toward the edges by a gradient of 1.5% for rapid draining.

The bridge pavement will have somewhat different structure from that of road pavement for the reasons of impact on bridge girders and drainage.

The drainage facilities which will be installed between sidewalk and drive lanes will be shared by the two, therefore, the sidewalk will have down slope toward the center line of the bridge with a gradient of 1.5%

Bridge pavement structure is illustrated below.

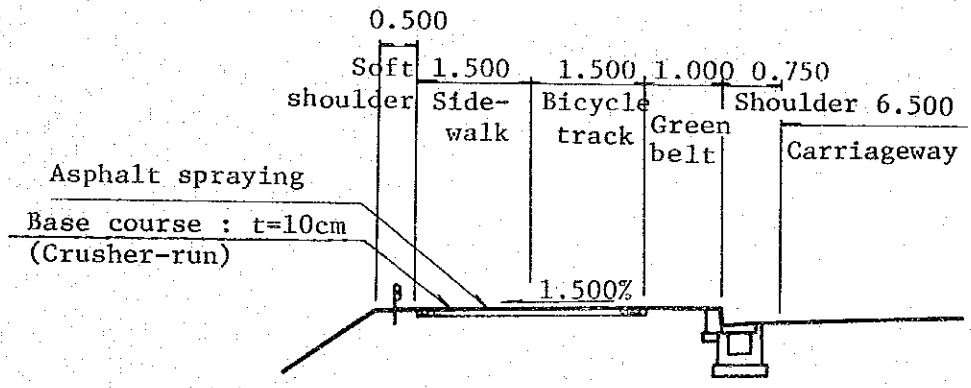


Fig. 6-4 Pavement Structure of Sidewalk/Bicycle Track in Embanked Section

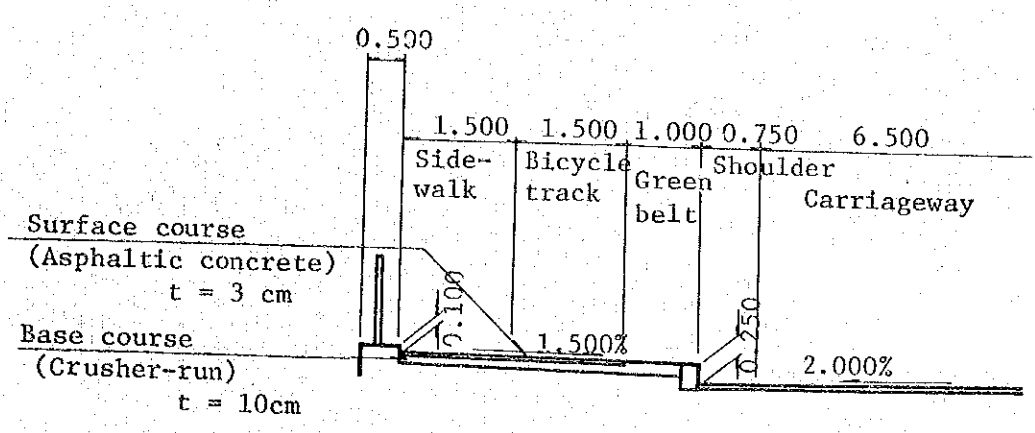


Fig. 6-5 Pavement Structure of Sidewalk/Bicycle Track in Bridge Section

CHAPTER 7

DESIGN OF TRAFFIC CONTROL FACILITIES

CHAPTER 7 DESIGN OF TRAFFIC CONTROL FACILITIES

7.1 Design Plans

Here, detail design is to be drawn of guard rails, road signs, road markings, and road lights, as well as effective traffic signals at Junctions in order to secure traffic safety on the Selander Bridge and a 1.2-kilometer road between North Junction and South Junction, in connection with the Selander Bridge expansion work.

7.2 Applicable Standards

Detail design is to be drawn based on the following standards and specifications:

- Japanese Industrial Standards (JIS)
- The Standards of the Japanese Electrotechnical Committee (JEC)
- The Standards of Japan Electrical Manufacturers Association(JEM)
- Japanese Highway Design Standards

7.3 Design of Traffic Signal Facilities

1) General

For the effective traffic control at North, West, and South Junctions, which occur in the area of the Selandar Bridge expansion work, traffic signals for both vehicles and pedestrians will be installed at each of these Junctions.

2) Positions and Number of signals

In view of the substantial width of both the main road and approach roads, two signals are to be installed on each direction.

3) Pedestrians Signal

At each Junction, pedestrians signals are to be installed on both ends of the crosswalk facing the pedestrian.

4) Selection of Signal Equipment

a) North Junction : Constant-cycle signal controller (The independent multi-stage controller to control each signal light, selecting one of the three patterns of indication times depending on the time zone)

b) South and West Junction : Constant-cycle signal controllers (The controller at each Junction to control each signal light, selecting one of the three patterns of indication times depending on the time zone; the West Junction controller to be coupled with the South Junction controller, the former receiving cyclic signals from the latter.)

c) Signals for vehicles are to be of a horizontal type with lens diameter of 300 millimeters, installed on a support. Signals for pedestrians are to be of a vertical type, installed independently or sharing the same support with the vehicle signal.

d) Supports

The supports are to be a steel pole or a tapered pole, melten zinc plated for rust proof, with a base plate.

e) Foundation of Supports

The concrete foundation of electric equipment shall be according to the design of civil engineering works specified in the ANNEX D-III, and the equipment shall be fixed firmly by using the designated anchor bolts.

5) Wiring and Piping

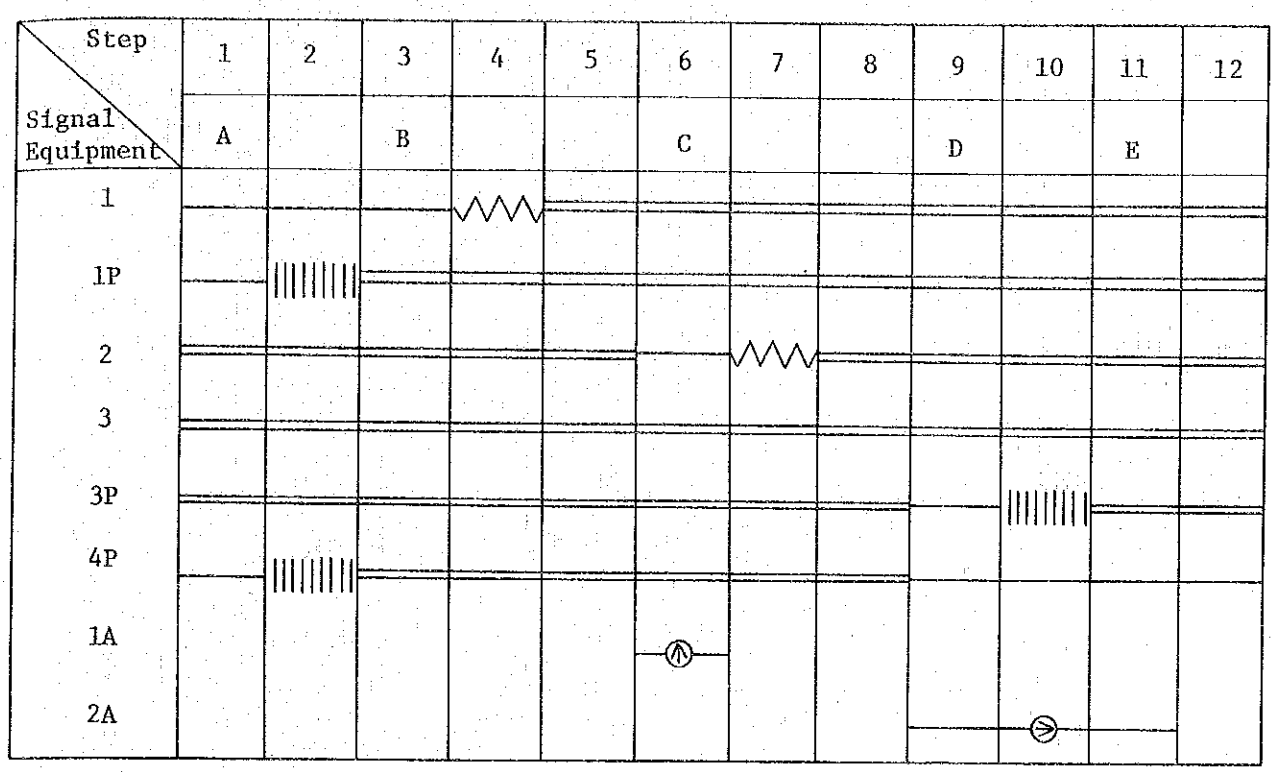
The wiring shall be of a buried type, laying rigid polyethylene pipes with spiral wave (FP) at the depth of 1.2 meters under the carriageway part and at the depth of 0.6 meters under the other portions to incorporate 600V cross-linked polyethylene insulated vinyl sheathed cable (CV cable) and polyvinyl chloride insulated and sheathed control cable (CVV cable) therein.

6) Design

Fig. 7-1, 7-2 and 7-3 show the step charts of actual indication, based on the ANNEX C-VII. By changing steps A,B,C,D and E, three patterns can be made (P_1 : morning and evening, P_2 : daytime, P_3 : midnight).

The indication time is changed into three types by changing over three patterns with the time switch for each time zone according to traffic conditions.

The signal controller at the West Junction is interlocked at some time lag with the signal controller provided with the interlock sending function which is installed at South Junction.



Pattern \ Step		1	2	3	4	5	6	7	8	9	10	11	12	Total
Set time (Sec)	P_1	21	5	6	2	1	32	2	1	11	5	1	3	90sec
	P_2	13		6			23			8		1		70sec
	P_3	29		6			40			15		1		110 sec

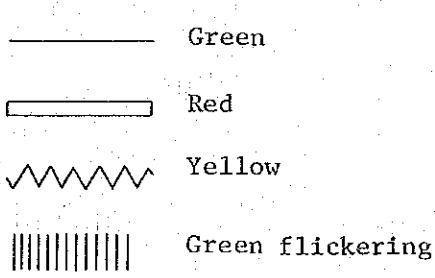
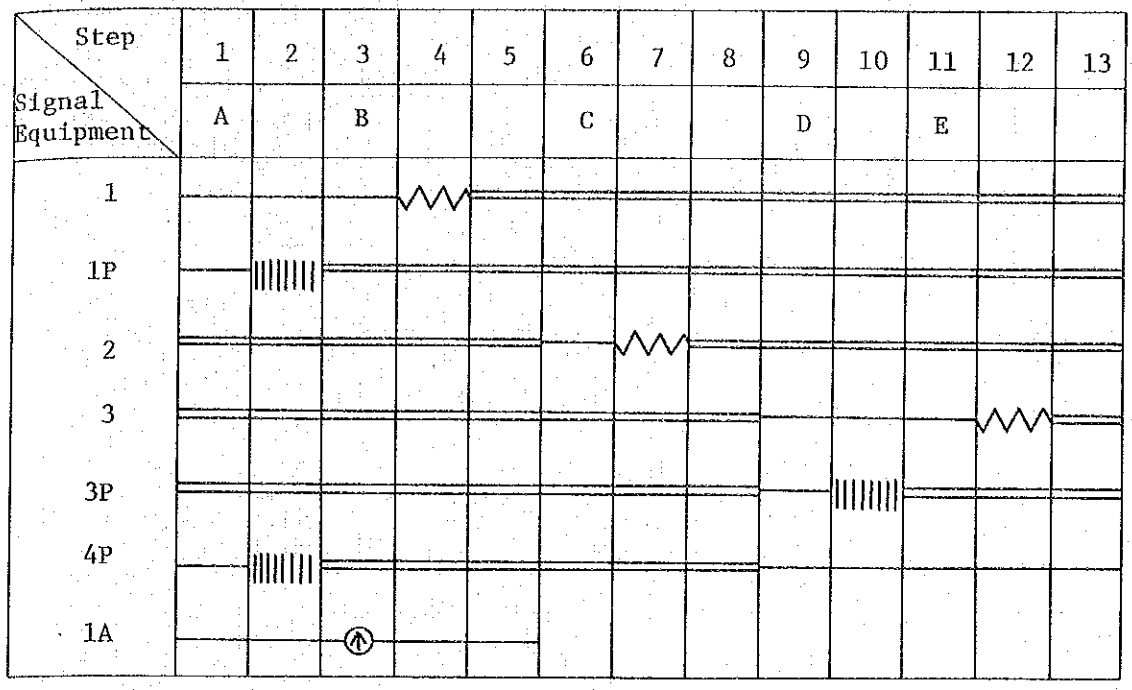


Fig. 7-1 North Juntion; "Step Chart of Actual Indication"



Pattern \ Step		1	2	3	4	5	6	7	8	9	10	11	12	13	Total
Set time (Sec)	P_1	10	5	1	2	1	29	2	1	20	5	1	2	1	80 sec
	P_2	8		1			22			9		1			60 sec
	P_3	15		1			37			27		1			100 sec

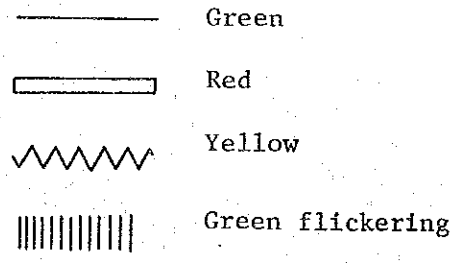
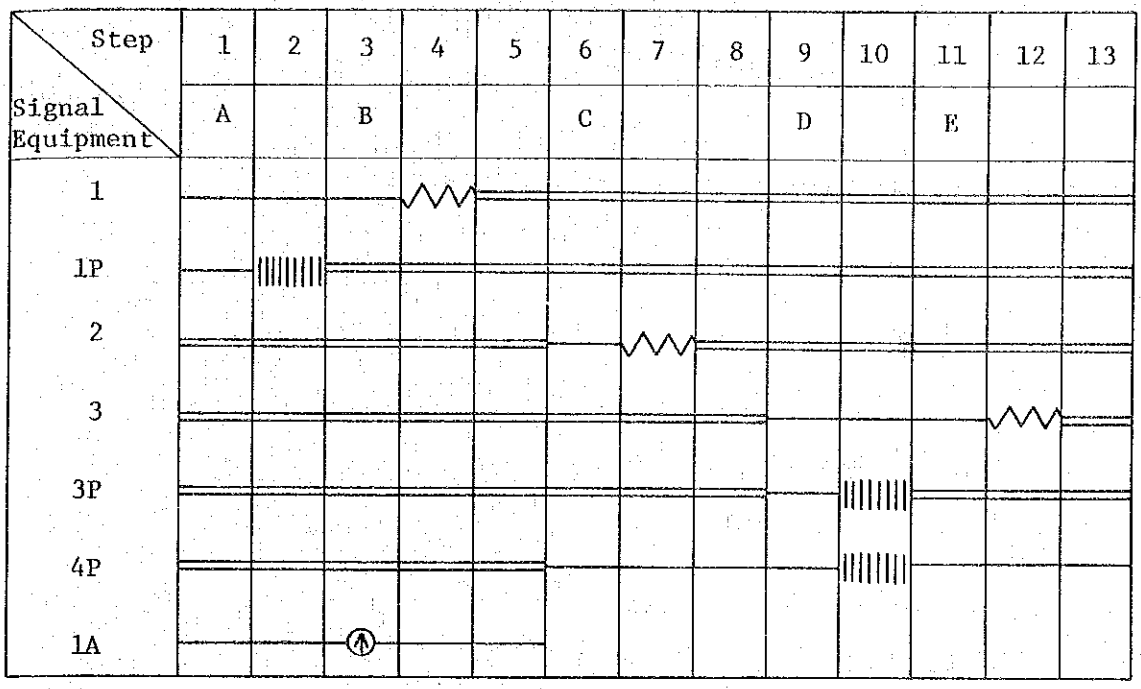


Fig. 7-2 West Junction; "Step Chart of Actual Indication"



Pattern \ Step		1	2	3	4	5	6	7	8	9	10	11	12	13	Total
Set time (Sec)	P_1	36	5	1	2	1	8	2	1	11	5	5	2	1	80 sec
	P_2	23		1			8			8		1			60 sec
	P_3	47		1			11			17		5			100 sec

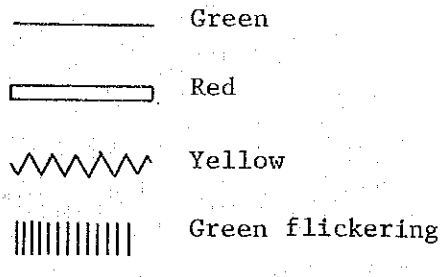


Fig. 7-3 South Junction; "Step Chart of Actual Indication"

7-4 Design of Roadway Lighting Facilities

1) Outline of Design

The lighting of Selander Bridge and the neighbourhood of South and North Junctions, is described herein.

2) Lighting System

Highway type lighting equipment will be fixed on a tapered pole at the prescribed position, so as to fully perform their functions economically without obstructing view from the road.

Lighting equipment will be arranged at both sides of the roads suitable for curved road or street road and roads provided with a median strip. Except at Junctions, running cost and maintenance expenses can be lessened by reducing light in midnight, with the decrease in traffic density taken into consideration.

No reduction in light will be made at crosswalks as well as Junction which are particularly critical places.

3) Average Brightness on Road Surface

Table 7-1 Average Brightness on Road Surface

Traffic Density(cars/day)	Average Illuminance on Road Surface (ℓx)	Brightness on Road Surface cd/m^2	
		Asphalt	Concrete
15,000 and more	15	1.0	1.5
7,000 to less than 15,000	10	0.7	1.0
Less than 7,000	7	0.5	0.7

Converted average illuminance shall be as follows:

Asphalt pavement 15 ℓx/nt
Concrete pavement 10 ℓx/nt

Average illuminance on pedestrians at each junction shall be 30 ℓx.

4) Selection of Lighting Equipment

a) Selection of Light Source

It is desirable that the light source of street lighting equipment will be long in average life, high in efficiency and large in wattage, because of long lighting time, large lighting area and inconvenience in replacement.

In the design, fluorescent mercury lamps are used since they meet the above-mentioned conditions, are low in price, good in color of light and most popular.

b) Selection of Lighting Equipment

Table 7-2 Selection of Lighting Equipment

Kind of Road			Lighting Equipment Type
National highway, etc.	Urban		Cut-off type
	Rural district	Trunk road	Semi-cut off type
		Other roads	Semi-cut off type

For urban street, semi-cut off type lighting equipment will be used. This type of lighting equipment considerably limits the glare and, is suitable for general roads and, in particular, roads with bright environment.

c) Supports

The supports will be a base-plate type tapered poles. For rust proof treatment, poles are to be molten zinc plated. A high power factor type stabilizer with a self-contained light adjusting relay and a waterproof type MCB-box are to be incorporated in each pole.

d) Foundation of Supports

The concrete foundation of electric equipment shall be according to the design of civil engineering works specified in the ANNEX D-III, and the equipment shall be fixed firmly by using the designated anchor bolts.

5) Wiring and Piping System

a) As a rule, wiring will be a buried type at most places but be an expose piping type at the bridge.

b) In the case of the buried type, the 600V cross-linked polyethylene insulated vinyl sheathed corrugated steel band armored vinyl corrosion proof cable (CVMAZV) will be laid directly at the depth of 0.6 meters. At cross-carriage-ways, the rust-proof carbon steel pipe for ordinary piping will be laid at the depth of 1.2meters with CVMAZV being incorporated therein. At the bridge, CVMAZV will be incorporated in the rigid polyvinyl chloride pipe and the expose piping shall be carried out.

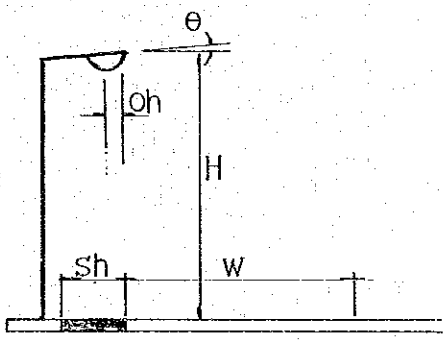
c) Voltage drops at the ultimate end of each circuit will be less than 6% of the rated voltage.

6) Design of Lighting

a) Height of Lighting Equipment

Table 7-3 Height of Lighting Equipment

Luminous Flux (ℓm)of Light Source per Light	Equipment Height(m)	Overhang Oh (m)	Angle of Inclination(°)
F < 12,500	8 ≦	-1≦Oh≦1	5≧
12,500 ≦ F 25,000	10 ≦		
25,000 < F	12 ≦		



W : Width of carriageway
Sh: Shoulder width of side belt
H : Height of lighting equipment
θ : Angle of inclination
Oh: Overhang

Table 7-4 Arrangement of Lighting Equipment

Lamp Equipment / Height Space / Arrangement	Semi-cut off Type	
	Height: H	Space : S
One side	≧ 1.2W	≧ 3.5H

Lighting equipment will be installed outside building limits, while the height, space, overhang , and angle of inclination will be according to Table 7-4 and Table 7-5

b) Calculation Formula of Lighting

$$\frac{F}{S} = \frac{W.E}{U.M}$$

F : Luminous flux of light source required (ℓm)
S : Space between lighting equipment (m)
W : Width of carriageway (m)
E : Standard illuminance (ℓx)
U : Coefficient of utilization
M : Maintenance factor

c) Switching System

Switching system will consist of automatic switching by natural light and automatic dimming by a timer. Automatic dimming will be made at two distribution panels according to the distribution system.

d) Distribution System

North Junction A distribution panel (Distribution STA. 0+00 ∿ STA.11+60)
South Junction B distribution panel (Distributing STA. 6+60 ∿ STA.11+60)
Distribution shall be made on 3-phase, 4-wire, 400V at 50hz.

7) Design for Power Source Equipment

a) Outline of Design

With the installation of low-voltage distribution panels at North Junction and South Junction, the equipment will receive power from each low-voltage distribution panel for the street lighting load and traffic signal equipment load.

b) Incoming System

The supply of power, 3-phase, 4-wire, 400V, 50 Hz, will be made by TANESCO, through 2 incoming points, South Junction and North Junction.

c) Distribution Panel

The distribution panel will be an outdoor, waterproof, and self-supporting type.

7.5 Handrails

Where embankment in excess of two meters above the existing ground continues, handrails are to be installed on the slope shoulder for pedestrian safety.

In this Project, handrails will be installed along the ocean side of sidewalk on the south side of the Selander Bridge (from STA.7+46.5). See ANNEX D-V for details.

7.6 Road Signs

Road signs are to be installed in order to facilitate, together with road markings, the smooth and safe flow of traffic, and their effects are substantial. Road signs are classified as follows by their purpose: (a) information signs, (b) warning signs, and (c) regulatory signs.

The details of traffic signs to be installed are presented in ANNEX D-VI, and their locations are indicated by the design drawings under separate cover.

7.7 Road Markings

Like road signs, road markings are indispensable to the smooth and safe flow of traffic. The effect of road markings are particularly high in congested areas.

Road marking includes border lines between vehicle lanes, indication of crosswalks, and traffic guidance markings. The details of road marking to be done are presented in ANNEX A-VII.

CHAPTER 8

WORK EXECUTION PROGRAM

CHAPTER 8 WORK EXECUTION PROGRAM

8.1 Outline of Work

The Selander Bridge Expansion Project consists of the following three types of work and is to be completed in 18 months :

- Construction of a new Selander Bridge (with the length of 75.75 meters and the width of 21.5 meters)

- Expansion and improvement of approach roads to the new Selander Bridge (for a total extension of about 1.2 kilometers and the width of 25.5 meters)

- Improvement of three junctions

This is not a very big project, in view of the kind and quantities of work (see on Table 9-1, Chapter 9). The Project will require, in addition to the ordinary civil engineering work, the installation of signals and other traffic control facilities and electrical work on lights.

These types of work are not technically difficult. However, the entire work procedure will inevitably be complicated because, on one hand, the work must be done half the width of the road at a time, thereby always maintaining a path for the present traffic, which cannot be shutdown, while, on the other hand the existing public facilities now in use, such as water mains and power and communication cables, must be relocated as necessary from time to time starting before the work commencement and during the progress of the work. It is, therefore, essential that a precise work program be formulated, necessary preparations adequately made, and work accomplished according to the program, if the Project is to be completed successfully within the prescribed period of time.

8.2 Site Office and Vehicle for Engineer's Use

The Engineer's office is to be constructed near the construction site under the direction of the Engineer. A station wagon will be provided for Engineer's use

8.3 Work Schedule

1) Work Days

The number of work days was calculated based on the number of non-working days such as Sundays and holidays and on natural conditions such as the soil and weather at the project site, and offers a base for the determination of various work capacities, work schedule, the kind and number of equipment, and the length of required construction period.

From the data of daily rainfall in Dar es Salaam, the number of non-working days was calculated as 47 days a year (Table 8-1), while the number of legal holidays in Tanzania is 13 days a year.

The number of work days is calculated as 21 days a month, llows: as follows:

$$\frac{365}{12}\left[1 - \left(\frac{13}{365} + \frac{1}{7}\right)\right] \times \left(1 - \frac{47}{365}\right) = 21$$

2) Work Schedule

Work schedule is shown on the Fig. 8-1.

Table 8-1 Non-Working Days due to Rainfall

Month	Daily Rainfall (mm)				Total (Days)
	0 ∿ 1	1 ∿ 10	10 ∿ 30	30 ∿	
JAN.	28	1	0	2	31
FEB.	25	2	0	1	28
MAR.	25	3	2	1	31
APR.	15	4	4	7	30
MAY	25	1	5	0	31
JUN.	23	6	0	1	30
JUL.	27	3	1	0	31
AUG.	29	2	0	0	31
SEP.	28	1	0	1	30
OCT.	30	0	1	0	31
NOV.	13	6	2	4	30
DEC.	26	0	2	3	31
Total days	299	29	17	20	365
Non-working coefficient (C)	0	0	1	1.5	
Number of non-working days (U)x(C)	0	0	17	30	47

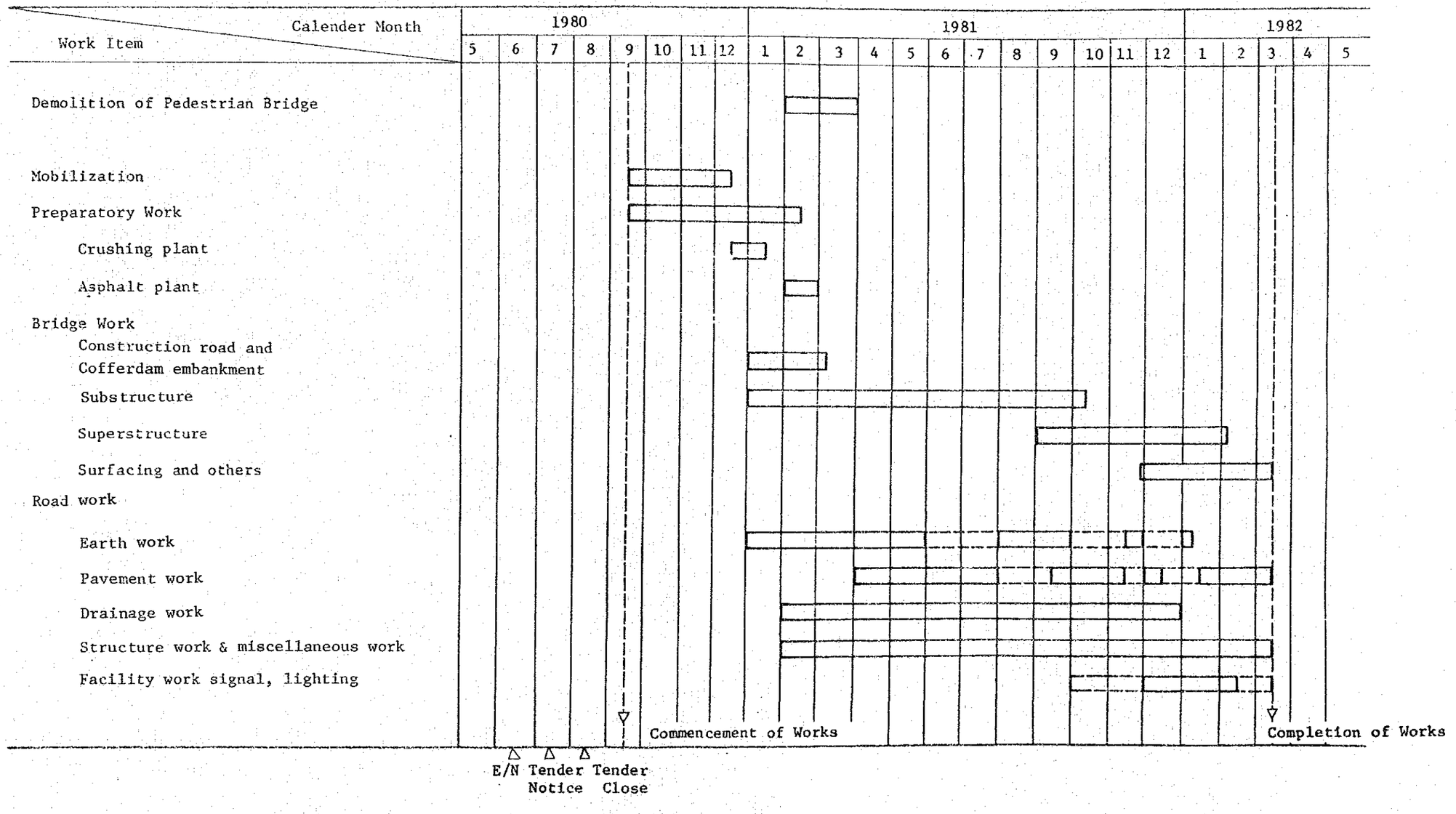


Fig. 8-1 Work Schedule

8.4 Work Program

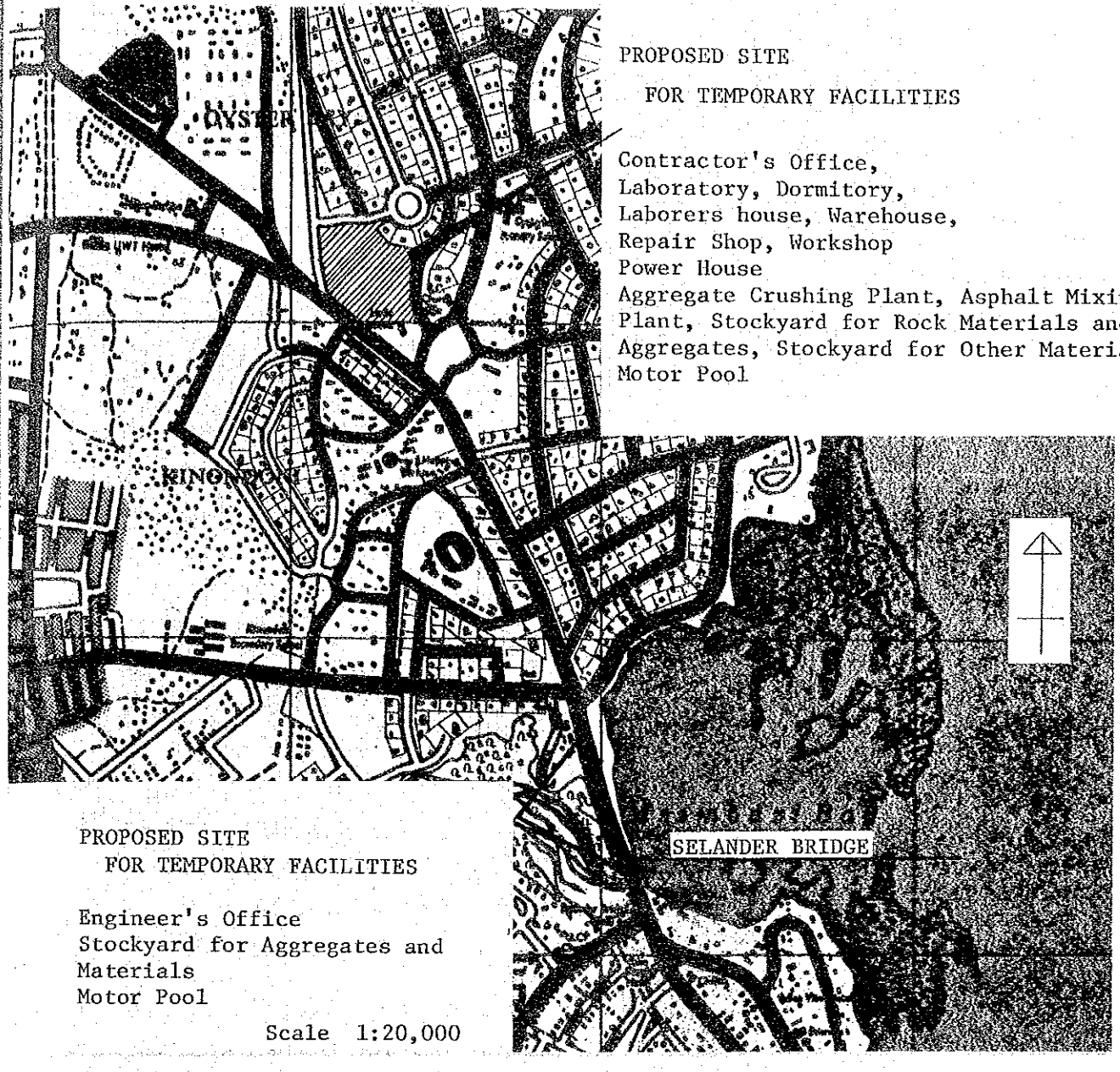
1) Preparatory Work

As soon as the contract is awarded, the necessary construction materials and equipment will be brought to the work site, and office, dormitory test laboratory, warehouse, and other necessary buildings will be constructed, temporary facilities erected, and various plants and material yard facilities will be established. The temporary facilities and the area size of land required are presented in Table 8-2. Materials unavailable in Tanzania will be purchased from abroad. Meanwhile, the project site will be surveyed, the detailed design checked, and temporary bench marks, reference points for basic stakes, and leading frame for work installed. The delivery of materials and equipment will require 3 months, and temporary facilities work, from 1 to 2 months.

Table 8-2 Temporary Facilities

	Building (Sq.m)	Area of land (Sq.m)
Office (contractor)	110	220
Dormitory	80	160
Laborers house	140	280
Laboratory	30	60
Warehouse (cement)	140	210
Warehouse	80	120
Repair shop, workshop	300	450
Stock yards for materials		2,000
Motor pool		800
Crushing plant Asphalt plant Stockyard for aggregates and rock materials		7,000
Total	880	11,300

Aggregate quarry	MSORWA
"	KUNDUCHI
River deposit	MPIJI



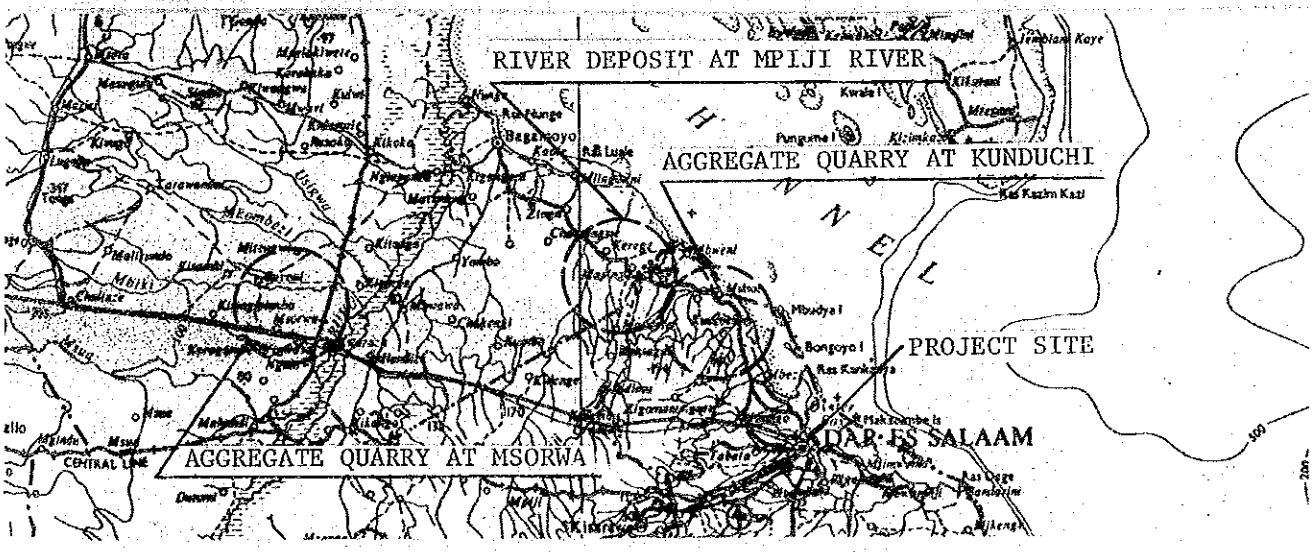


Fig. 8-2 Map of Temporary Facilities and Quarry Sites

2) Bridge

The existing pedestrian bridge must be taken down before new bridge construction can be started. However, the water mains and electric power lines which are attached to the existing pedestrian bridge and which are currently in service must be relocated before the bridge can be demolished. A staged program will be required for the removal of the bridge superstructure from above the sea and for pulling out stakes from the sea. The removal of the pedesrian bridge and the installation of necessary facilities therefor will be accomplished by the Government of Tanzania.

The bridge work flow is presented in Fig. 8-3. The abutment A_2 and piers P_2, P_3, and P_4 are located in the sea, but soil will be filled and a cofferdam embankment will be built with a top width of about 30 meters (for the width of the bridge to be worked on). Workability will improve as the work becomes shore work. Although only a little water flows under the bridge, it rises and falls by flux and reflux, and, therefore, a channel will be created between piers P_3 and P_4. Consequently, a temporary pier will be installed at the road work portion.

A diesel hammer installed on a scaffold will be used for driving steel pipe piles into the ground. In view of the high water level (EL.+ 2.50 meters at high tide), shuttering will be made with sheet piles before excavation is done manually or by the use of clamshells. Water from the excavated ground surface will be drained by water pump. Concrete will be placed by the use of a portable mixer and chute.

BRIDGE WORK

Working diagram of bridge works is as follows.

Bridge Work Procedure

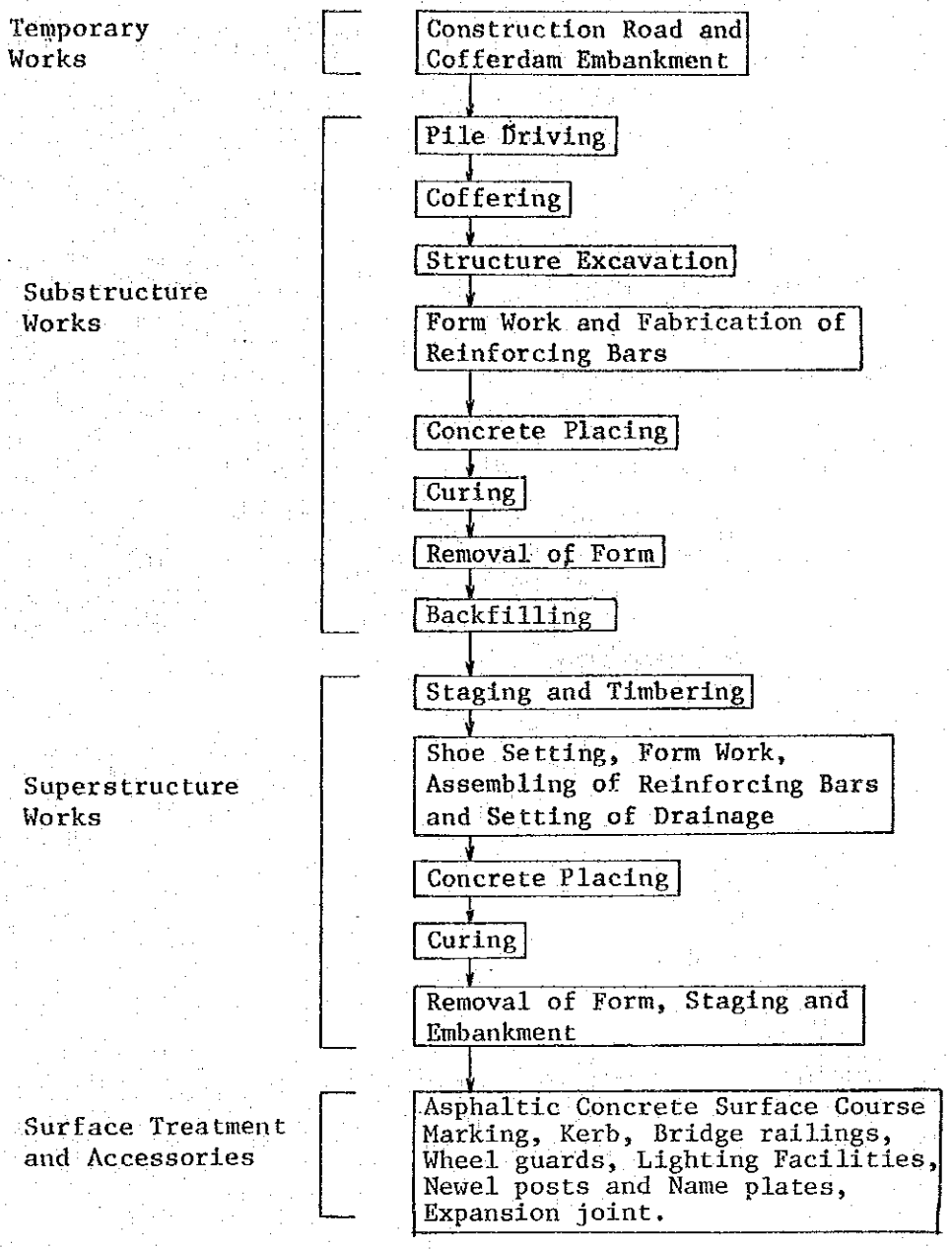


Fig. 8-3 Working Diagram of Bridge Work

3) Road

a) Work Phasing and Traffic Safety

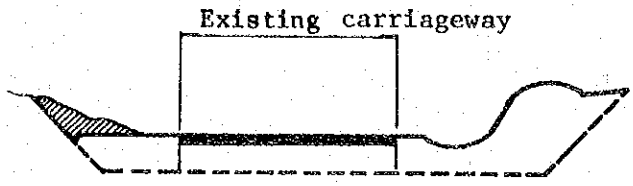
Existing traffic should not be shutdown even while the work is being done, since there is no suitable detour other than Kenyatta Drive. Therefore, it is inevitable that the work will be phased in such a way that drive lanes of a sufficient width will remain open for traffic at all times. The scope of road work is presented in Fig. 8-4 (see also Fig. 8-4).

Throughout the duration of the road work, appropriate marking, fences, and lights are to be used to mark off land used for traffic passage from the area which is currently worked on, thereby assuring traffic safety. Smooth and safe traffic flow at the Junctions is to be promoted by full advance discussions and the cooperation of the Tanzanian Police Authorities, and by assigning traffic control personnel to each Junction.

ROAD WORK

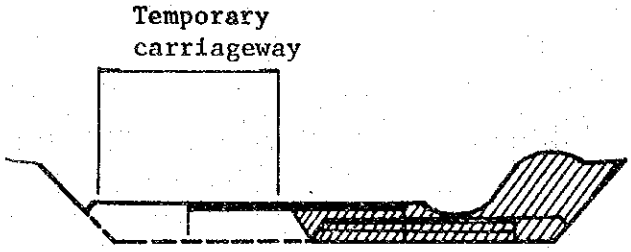
1st Stage

Expand width of existing carriageway



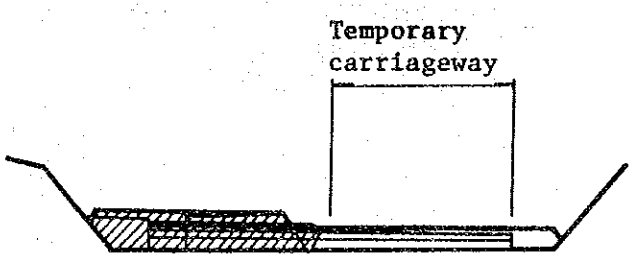
2nd Stage

Earth work is excuted to the required level. Following completion of it, subbase course and base course are carried out



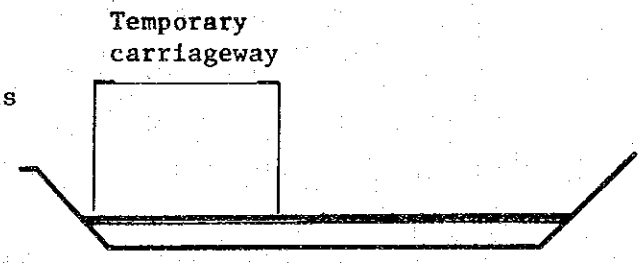
3rd Stage

Earth work and pavement work are carried out including some asphaltic concrete surface course.



4th Stage

The remaining asphaltic concrete surface course is excuted



5th Stage

The work at junctions and around traffic islands is executed.

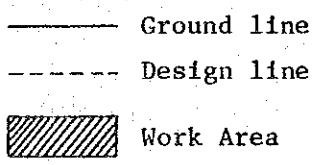


Fig. 8-4 Work Diagram of The Half-Width Staged Construction of Road

From the above, the length of time needed for each work is estimated as follows:

First and second stage work:	6.5 months
Third stage work:	3.5 months
Fourth and fifth stage work:	3.5 months
Total	13.5 months

b) Earthwork

Land is to be cleared and tree roots removed by the use of bulldozers, and cuttings and embankments done based on leading frame. Bulldozers are to be used for excavation, and tractor shovels (wheel type) and dump trucks for moving soil (depending on the distance of soil transportation). Inferior soil is to be sent to pre-designated dumps. Embankment material is to be evenly spread by bulldozer and motor greader and compacted by tire roller.

c) Pavement

(1) Subbase Course and Base Course

Subbase and base course materials are to be carried from the aggregate stockyard to the work site in small lots, spread by motor grader and/or bulldozer, and compacted by Macadam roller or tire roller. Small size vibration rollers and soil compactors are to be used for rolling the corners of bicycle tracks and structures. A water sprinkler truck is to be used for maintaining near optimum moisture content of the soil at all times. After compaction, prime coat is to be spread by engine sprayer.

(2) Binder Course work, and Surface Course Work

The entire amount of asphalt mix is to be made at the asphalt mix concrete plant, carried to the work site, and paved with the use of an asphalt finisher. The

plant with a capacity of 45 tons per hour is to be used. Macadam roller is to be used for initial roll and finishing roll, and tire roller for second roll. Pavement height at Junctions can easily cause draining difficulties, and, therefore, the work must be accomplished with utmost care.

d) Concrete Work

For concrete work, a portable concrete mixer (0.3 m^3) will be used. It has been planned that concrete channels, covers, and kerbstones which can be standardized will be manufactured at a casting yard to be established adjacent to aggregate stockyard, rather than cast in place.

e) Traffic Control Facilities

Traffic control facilities work can be divided into civil work (foundation work and plumbing) and the installation of facilities.

For foundation work and cable laying, subgrade is excavated after its completion. Adequate compaction is to be done after the laying of the foundation or the completion of pipe setting in place.

Erection of poles and installation of facilities are to be done, as a principle, after the completion of pavement work.

4) Aggregate Production

Coarse aggregate for use in the work is to be produced at the crushing plant which will be installed on the temporary facility site about 2 kilometers to the north of the project area. The total amount of coarse aggregate which will be necessary is 15,750 tons, or 25,200 cubic meters.

Table 8.3 Quantity of Coarse Agregate

Crusher-run subbase course Grading controlled base course Asphaltic concrete binder course	Approx.	11,150 tons
Asphaltic concrete surface course Cement concrete structure	Approx.	4,600 tons
Total		15,750 tons

Stone produced in the Kunduchi area about 14 kilometers to the north of Dar es Salaam is to be used to make aggregate for the subbase and base course works. That produced in Msorwa some 130 kilometers to the west is to be used as aggregate for asphalt surface course and concrete. The quantities of these stones to be quarried have been fixed at about 4,600 tons and 11,150 tons respectively. For quarrying, explosives will be used, provided that efforts will be made so that the stones will be obtained in small sizes in view of the small maximum coarse aggregate size. Broken stones will be carried by dump trucks to the stockyard or the crushing plant to be opened near the project site. Aggregate which is classified into various sizes at the crushing plant is to be carried in small lots to the stockyard and stored in bins separated by boards. Aggregate of an appropriate size is to be carried for use at various work. It is necessary that aggregate for concrete and that for asphalt surface course be washed at the crushing plant.

8-5 Construction Equipments

Major construction equipments employed in the Project are as follows:

Table 8-4 Construction Equipment

Equipment	Model	Number	Remarks
Bullodozer	11 tons	2	
"	21 tons	1	Riper
Tractor shovel	1.3 m^3	1	Wheel type
"	1.0 m^3	1	"
"	1.4 m^3	2	Crawler type
Crane	35 HP	1	Crawler type
Clamshell	0.3 m^3	1	Attachment only
Diesel pile hammer	ram=3.5 tons	1	
Vibrating hammer	22 kW	1	
Leader	ℓ = 20m	1	Piling
Welding machine	13 kW	1	
Motor grader	3.1 m	1	
Macadam roller	10∿15 tons	1	
Tire roller	25∿28 tons	1	
Vibrating roller	2.5 ton	1	
Asphalt finisher	2.5 m	1	
Engine sprayer	200 ℓ	1	
Soil compactor	1.6 t	1	
Concrete mixer	0.3 m^3	3	Portable type
Asphalt plant	45 t/h	1	
Crushing plant	30 t/h	1	
Jack hammer	3 m^3/min	10	
Hand breaker	15 kg	2	

Diesel generator	25 kVA	2	
	100 kVA	1	
Air compressor	37 kW	2	
	100 kW	1	
Vibrator	ϕ 60 mm	3	Engine
Water pump	13 kW	6	
Water tank	1 m^3	6	
Water truck	1,600ℓ	1	
Dump truck	8 tons	4	
"	11 tons	7	
Truck	2 tons	2	

8-6 Quality Control and Piecework Control

Quality control is accomplished at the stage of (1) material (2) processing and manufacturing, and (3) the execution of work so that the finished work will satisfy the required quality standards. Finished work is to be inspected for quality.

Specifications and standards of asphalt, cement, steel piles, facilities and equipment are given in Chapter 3. Materials for these components are to be accepted either upon the presentation of the certificate of successful testing or after being tested in the presence of the Engineer.

The material tests and quality inspections of aggregate, asphalt mix, and concrete are to be done in the presence of the Engineer at the test laboratory to be provided by the contractor. Major tests to be conducted at the laboratory are shown in Table 8-5. Control and test records are to be maintained at the time of work.

Table 8-5 List of Testing for Construction

Test for Slump of Concrete	JIS A. 1101
Grain Size Analysis by Screening	1102
Grain Size Analysis by Sedimentation	1103
Test for Unit Weight of Aggregates	1104
Test for Organic Impurity of Sand	1105
Test for Flexural Strength of Concrete	1106
Test for Compressive Strength of Concrete	1108
Test for Specific Gravity and Absorption of Fine Aggregate	1109
Test for Specific Gravity and Absorption of Coarse Aggregate	1110
Test for Surface Moisture Content of Fine Aggregate	1111
Test for Air Content of Fresh Concrete by the Volumetric Method	1118
Los Angeles Abrasion Test	JIS A. 1121
Test for Stability of Aggregate	1122
Method of Making and Curing Concrete Specimens	1132
Test for Moisture Content of Soils	1203
Grain Size Analysis of Soils	1204
Test for Liquid Limit of Soils	1205
Test for Plastic Limit of Soils	1206
Test for Moisture-Density Relation of Soils Using Rammer	1210
Test for the California Bearing Ratio of Soils	1211
Test for Density of Soil in Place by the Sand-Cone Method	1214
Bulk Specific Gravity of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens	ASTM-D1188
Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus	ASTM-D1559
Quantitative Extraction of Bitumen from Bituminous Paving Mixtures	ASTM-D2172

CHAPTER 9

METHOD FOR CONSTRUCTION COST ESTIMATE

CHAPTER 9 METHOD FOR CONSTRUCTION COST ESTIMATE

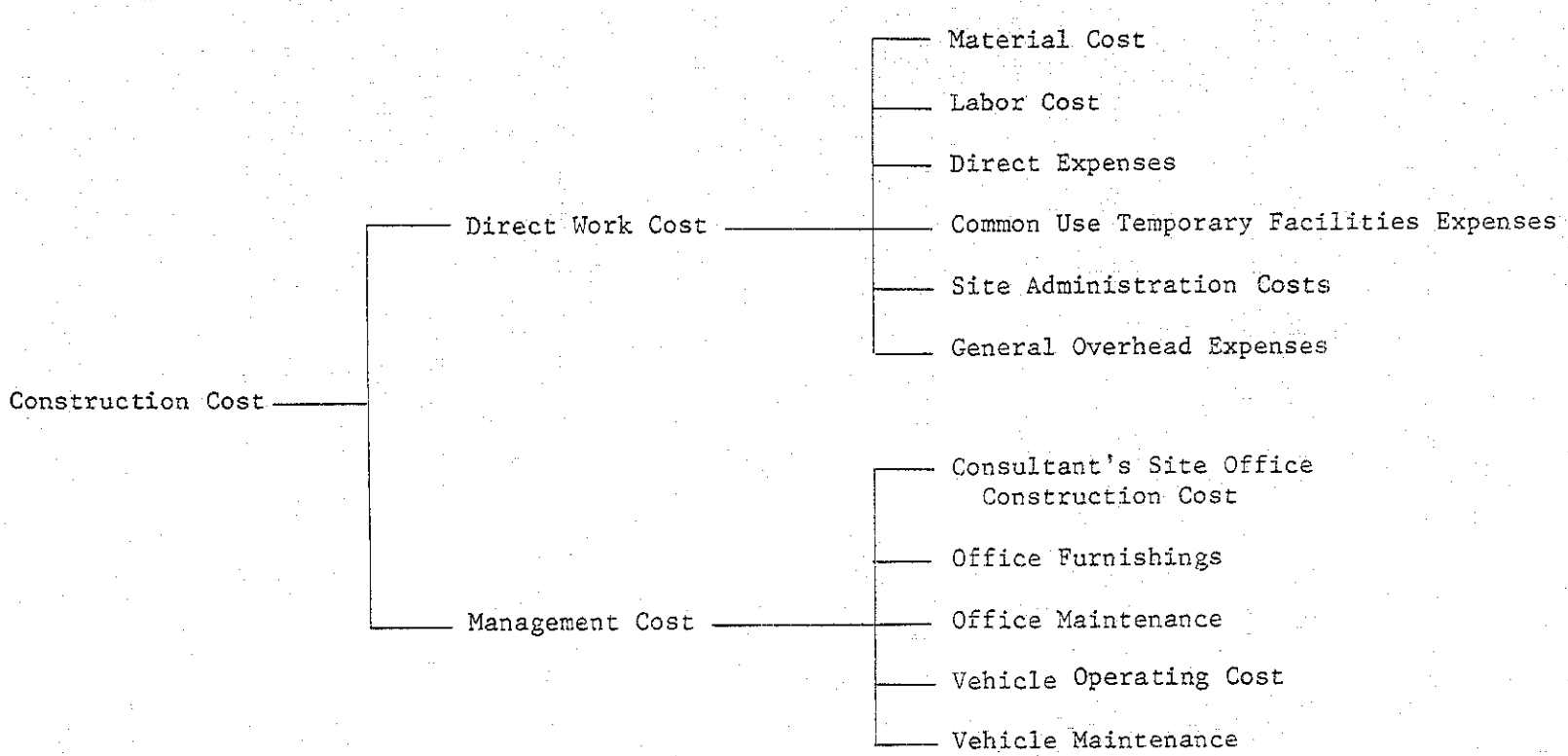
9.1 Outline

The total construction cost of this Project has been estimated as the sum of : (1) direct work cost, and (2) management cost, and each estimated by the so-called "block-building method" (each cost item estimated based on the quantity and unit price, as opposed to estimation by certain ratios) with the exception of those items noted below.

Direct work cost is the amount which is paid the contractor who accomplishes the construction work and consists of material cost, labor cost, direct expenses, common use temporary facilities expenses, site administration costs and general overhead expenses.

Management cost consists of the construction cost of site office for the consultant engaged for the purpose of project implementation, office accommodations, the cost of vehicle(s) furnished for use by the consultant, repair and maintenance of the office and the vehicle, and other expenses needed in order to make it possible for the consultant to perform his duty without difficulties.

The cost structure is illustrated as follows:


Construction Cost
Direct Work Cost
Material Cost
Labor Cost
Direct Expenses
Common Use Temporary Facilities Expenses
Site Administration Costs
General Overhead Expenses
Management Cost
Consultant's Site Office Construction Cost
Office Furnishings
Office Maintenance
Vehicle Operating Cost
Vehicle Maintenance

The parts of direct work cost are explained as follows:

Material cost is the cost of various materials used in the construction work as delivered on site and, therefore, includes delivery expenses.

Labor cost is the expenses to be incurred pertaining to laborers employed for the construction work.

Direct expenses are those which are to be paid for the machines and other equipment used for the construction work and include the costs of depreciation, delivery, periodical servicing, on-site repair, equipment custodian, labor, fuel, and spare parts.

Common temporary facilities expenses include delivery, preparatory, installation, safety, labor, technical management, and repair and maintenance expenses.

Site administration cost consists of the ordinary on-site administration expenses and, in addition, expenses for survey, testing, auxiliary clerks for design modifications, and wages.

General overhead expenses are applicable expenses incurred at the head office of the contractor(s), interest, and contractor profit.

Of these, material cost, labor cost, and direct expenses have been estimated by block-building method, while common use temporary facilities expenses, site administration cost, and general overhead expenses have been estimated by ratios to material cost, labor cost, and direct expenses in accordance with the Quantity Standard of the Japanese Ministry of Construction.

The Contractors are to be contracted based on unit price of each contract item, and quantities are to be adjusted after the work in accordance with the actual quantities. All parts of the direct work cost are to be covered by the contract, and as a principle, no payment is to be made for any item not covered by the contract.

Accordingly, total construction cost has been estimated by the block-building method using the quantities determined by the detailed design and unit costs.

9.2 Cost Items and Quantities

Cost items (that is, payment items) and quantities are as presented below. Bidding is to be done for each item. The work is defined in detail by the specification document.

Table 9-1 Bill of Quantities

Pay Item No.	Description	Unit	Quantities	Remarks
	Safety measures for traffics on existing road	LS	1	
102	Safety measure for existing public utilities	LS	1	
103	Safety measures for demolition of existing pedestrian bridge	LS	1	

Table 9-1 (continued 2)

Pay Item No.	Description	Unit	Quantities	Remarks
201	False work	LS	1	
202	Structure excavation	m^3	1,570	
203	Structure backfill	m^3	450	
204	Foundation cobblestone	m^3	70	
205	Concrete (class-A)	m^3	990	
206	Concrete (class-B)	m^3	625	
207	Concrete (class-D)	m^3	40	
208	Reinforcing bar-A	kg	47,790	
209	Reinforcing bar-B	kg	126,970	
210	Piling (ϕ600 steel pipe)	m	1,536	
211	Asphaltic concrete pavement	m^2	1,423	
212	Elastic bearing	each	60	
213	Bridge railing	m	303	
214	Newel post	each	4	
215	Expansion joint	m	19	
216	Drainage	each	8	
301	Clearing and grubbing	m^2	27,250	
302	Waste excavation	m^3	230	
303	Side borrow embankment	m^3	3,340	
304	Borrow-pit embankment	m^3	7,600	
305	Improved subgrade	m^3	920	
306	Slope protection sodding	m^2	2,360	
307	Slope protection rock riprap	m^2	220	

Table 9-1 (continued 3)

Pay Item No.	Description	Unit	Quantities	Remarks
401	Kerb stone	m	2,270	
402	Side ditch-A	m	1,210	
403	Side ditch-B	m	1,380	
404	Side ditch cover (G)	each	53	
405	Culvert	m	180	
406	Catch basin	each	39	
407	Outlet	each	5	
501	Crusher-run subbase course(t = 15cm)	m^2	18,490	
502	Grading controlled base course (t = 15cm)	m^2	19,380	
503	Asphaltic concrete binder course (t = 5 cm)	m^2	19,620	
504	Asphaltic concrete surface course (t = 5 cm)	m^2	20,800	
505	Sidewalk pavement	m^2	7,700	
601	Street lighting pole- I	set	55	
602	" " pole- II	set	28	
603	" " pole-III	set	11	
604	Traffic signal - I	set	10	
605	" " - II	set	16	
606	" " - III	set	4	
607	Cable laying and wiring for lightings	m	3,000	
608	Cable laying and wiring for traffic signals	m	640	

Table 9-1 (continued 4)

Pay Item No.	Description	Unit	Quantities	Remarks
609	Distribution pannel for lightings	each	2	
610	Control pannel for traffic signals	each	3	
611	Road sign - A	each	10	
612	" " B	each	6	
613	" " C	each	14	
614	Delineator	each	20	
615	Road marking	each	830	
616	Handrail	m	28	
701	Bus stop shelter	each	1	
702	Median strip	m^2	2,850	
703	Planting	each	550	
704	Office for Engineer's use	LS	1	
705	Vehicles for Engineer's use	LS	1	

9.3 Locally Procured Materials, Construction Equipments and Unit Labor Cost

The major materials to be locally procured, major construction equipment, and the unit cost of major types of laborers which have been used in the quantity estimation of this Project are enumerated below. The unit costs used represent the average estimation for the work duration of October 1980 to March 1982.

1) Locally Procured Materials

Table 9-2 Unit Prices of Major Locally Procured Materials

Description	Unit	Unit Price (Yen)
Cobblestones for riprap	m^3	6,400
Sand for concrete	m^3	8,100
Gravel	m^3	7,000
Wooden form	m^3	3,100
Turf (Sod)	m^3	170
Petrol	ℓ	240
Diesel oil	ℓ	130
Light oil	ℓ	115
Lubricating oil	ℓ	2,200
Cement	50 kg bag	230
Timber for trenches	m^3	1,700

2) Major Construction Equipments

Table 9-3 Major Construction Equipments

Description	Classification	Hourly, operating cost (Yen/hour)
Bulldozer	11 t	9,820
Tractor shovel	1.3 m^3	14,940
Cramshell	0.3 m^3	37,430
Back hoe	0.35	74,240
Macadam roller	10 ∿ 12 t	12,200
Tire roller	8 ∿ 20 t	16,390
Motor grader	3.1 m class	74,770
Asphalt finisher	2.4 ∿ 5.0 m class	24,800
Engine splayer	200	1,730
Crawler crane	35 t	15,170
Diesel hammer	35 type	-
Compressor	Portable 27 kw	24,320
Diesel generater	100/125 KVA	-
Dump truck	11.0 t	9,440
" "	8 t	3,440
Truck crane	2 t	8,610
Lift car	11 ∿ 12 m	4,640
Trailer	20 t class	-
Water tank	3 m^3	-
Station wagon	2,000 cc	-
Asphalt plant	45t/hr	105,760
Crushing plant	3.0t/hour	1,070
Concrete mixer	0.2 m^3	1,250

3) Unit Labor Cost

Table 9-4 Unit Prices of Major Types of Laborers

Description	Classification	Unit	Price (Yen)
Foreman		hour	600
Mechanician		"	500
Operator		"	430
Driver		"	380
Skilled labor	Plumber	"	300
	Carpenter	"	300
	Painter	"	300
	Mason	"	300
Semi-skilled labor		"	220
Unskilled labor		"	170

CHAPTER 10

SPECIAL INSTRUCTIONS

CHAPTER 10 SPECIAL INSTRUCTIONS

10.1 Bridge Work

1) Temporary Cofferdam Embankment, and Excavation

Excavation both ashore and in the sea for the foundation of abutments and bridge piers will be accomplished with the use of sheet piles. The cofferdam work must be designed to sustain a safe strength against the earth and water pressures throughout the duration of the work.

When work is conducted near an abutment or a pier of the existing bridge, any deformation of the existing structures due to boiling or piping phenomenon should be continuously watched against.

2) Steel Pipe Pile and Driving

The pile length should not be restricted to the design length but should be determined on site. The pile should be driven down until it has reached a bearing layer. Therefore, relatively long pipe piles should be used so that the number of on-site welded joints will be kept to the absolute minimum.

3) Bedding

The soil onto which the bridge pier and abutment footings will be bedded is very soft and, therefore, a sufficient thickness of cobble stone work should be done without being limited to the design thickness so that the footing concrete will not crack.

4) Abutment Backfilling

The backfilling of abutments should be accomplished with the use of crushed stone and should be fully compacted. Particular attention should be directed to the compaction of backfilling behind abutment parapets. Backfilling work should be approved by the Engineer.

5) Timbering

The timbering supporting ground must have an adequate surface. The surface layer must be replaced with a good quality soil/sand, if necessary, and be sufficiently rolled prior to the placement of concrete so as to prevent ununiform subsidence of the ground.

The timbering must be of a sturdy material and have a structure which will remain stable under any load to be placed thereon during the work.

6) Form Work

Outer forms must be of a highly water repllent material with a smooth surface and be set firmly with densely distributed timbers so as to minimize any warping after placing concrete.

Cylindrical forms are to be fixed with a drainage pipe to their bottoms for effective draining after placement and must be handled carefully so as not to cause any collapsing or other damage during the work. Fixture bands will be used at prescribed intervals to hold the cylindrical forms and prevent them from rising during the placement of concrete.

7) Concrete Work

The placement of concrete to form a continuous slab of this Bridge is to be started from span portions. The completion to an acceptable level of subsidence of the timbering and the forms is to be confirmed prior to the placement of concrete on support portions. Care must be taken to assure that cylindrical forms do not move while concrete is being placed. The bottom portions of cylindrical forms, where solid placement of concrete is difficult, must be well compacted by the use of a vibrator so as to prevent any harmful voids and pores.

10.2 Road Work

Attention should be directed to the following items in the construction of the road:

1) Flow of Existing Traffic During the Construction Period

Because the Project road is a major street, existing traffic may not be shutdown for the construction work. The work must be executed, while keeping two vehicle lanes with a sufficient width always open for traffic. Also, safety lights should be properly placed with utmost care in order to ensure the safety of traffic flowing through temporary lanes. The locations of materials and equipment yards should be determined and material delivery routes installed in such a manner as to keep the crossing of existing traffic and work traffic to a minimum.

2) Bench Mark Establishment and Survey Error Correction

The topographical map borrowed from the Tanzanian Government was adjusted based on supplementary survey findings and used for the purpose of detailed designing. No pass point had been established, and the adjustment was done by polar coordinates. Therefore, it will be necessary that pass points be established and errors corrected before the start of work.

3) Pavement of Expansion

Embankment for road expansion must be well compacted and the subsidence accelerated of road constituting the added width, so that there will be no level difference between the existing width and added width after the pavement of the added width. Also, in order to secure adequate contact between the old and the new pavement edges, the existing pavement edge must be worked on with a cutter and given a tuck coat.

ANNEX

A MINUTES OF DISCUSSIONS

B DATA FOR BRIDGE DESIGN

C DATA FOR ROAD DESIGN

D DATA FOR PAVEMENT DESIGN

E DATA FOR DESIGN OF TRAFFIC CONTROL FACILITIES

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A-I MINUTES OF DISCUSSION

of

The Preliminary Survey on the Selander Bridge Expansion Project in Dar es Salaam, Tanzania

The Japanese Government, on the request of the Tanzanian Government, dispatched the team from 22nd September, 1979, to 5th October, 1979, through the Japan International Cooperation Agency to carry out the Preliminary survey in the Selander Bridge Expansion Project in Dar es Salaam, Tanzania.

The team had a series of discussions with various government agencies concerned during their stay in Tanzania. The main items which were understood by both sides were as follows:-

1. The team confirmed that the Tanzanian side understood the system of Japan's grant aid programme to be extended by the Government of Japan.

2. It was confirmed that the Project covers the road section between the Kinondoni Road/Bagamoyo Road junction and the Ocean Road/Upanga Road junction.

3. It was clarified that the capacity of the proposed four-lane bridge and approach road would cope with the traffic volume in 1990 estimated in the reports obtainable.

4. The team recommended that the width of the carriageway from curb to curb should be around 16.25m.

5. It was confirmed that the design ratio of the turning - right volume to the total south-bound one at the United Nations Road junction could be presumably fixed at the present ratio, approximately 30%.

6. It was suggested by the team that the basic design of the Junctions based on a traffic-light system to be conducted by the basic design survey team.

7. It was suggested by the team that, in case the traffic demand exceeds the capacity of the proposed four-lane bridge and approach road, the proposed Inner Link Road should be constructed in relation to traffic conditions.

8. It was confirmed that bridge loads for designing should be based on the British Standards HA loadings and checked for HB loadings.

9. It was confirmed that the effect of corrosion should be fully considered in the selection of the type of structure and materials of the proposed new bridge.

10. The superstructure design should be decided taking into consideration the availability of local materials, ease in construction and maintenance problems.

11. The existing road bridge should continue to be used for light loadings for pedestrians and cyclists. The new road bridge shall be constructed on the ocean side of the existing road bridge.

12. The Tanzanian Government agreed to provide the land and its relevent facilities necessary for the implementation of the Project (inclusive of an additional right of way for widening).

13. The team was requested by the Tanzanian Government that the Government of Japan would dispatch the basic design survey team at latest by the end of November, 1979.

14. The team was requested by the Tanzanian Government to advise the Government of Japan to initiate the prompt implementation of construction work at the earliest time within the framework of the Japanese budgetary mechanism.

N. Narita

(NOBUYUKI NARITA)
Leader
of
Japanese Preliminary Survey Team
2nd October, 1979

(I.N. KIMAMBO)
Director of Roads &
Aerodromes Division
Ministry of Works

A-II MINUTES OF THE MEETING

ON

THE SELANDER BRIDGE EXTENSION PROJECT

DAR ES SALAAM, TANZANIA

At the request of the Government of the United Republic of Tanzania for the Selander Bridge Extension Project, the Government of Japan, through the Japan International Cooperation Agency, dispatched the basic design survey team, (hereinafter referred to as the Team) from 1st December 1979 to 21st December 1979 to conduct the basic design survey of the Project.

The Team had a series of discussions as well as field reconnaissance and exchanged views with various government agencies concerned during their stay in Tanzania.

As a result of the survey and discussions, both parties have agreed to recommend to their Government respectively to take necessary measures towards establishing the Project as stated in the Minutes of Discussion attached herewith.

December 8, 1979
Dar es Salaam, Tanzania

N. Narita

(NOBUYUKI NARITA)
Team Leader of the Japanese
Basic Design Survey Team

Kimambo

(I.N. KIMAMBO)
Director of Roads and
Aerodromes Division
Ministry of Works

1. It is confirmed that the Project shall cover:
   - Construction of the new Selander Bridge.
   - Modification/Improvement of Bagamoyo Road to 4 lanes divided highway between Kinondoni Road and Ocean Road including all the junctions.

2. The proposed Bridge shall be designed in accordance with the following conditions.
   - Design load: Type HA loading and thereafter to be checked by Type HB loading (45 Units)
   - Seismic load: KH = 0.05
   - Bridge type : Reinforced concrete
   - Span: 15.00m x 5 - span
   - Lighting facilities: to be provided
   - Clearance: not narrower than the existing bridge
   - Other design criteria than the above and design calculation method shall follow the Japanese standard.
   - General plan, profile and cross section shall be as shown in Exhibit - 1.

3. The proposed road and intersections shall be designed in accordance with the following conditions.
   - Design traffic : 3,000 pcus for south bound traffic
   - Typical cross section shall be as shown in Exhibit-2.
   - Approximate layout of the intersections shall be as shown in Exhibit-3 and Exhibit-4.
   - Pavement shall be of asphalt concrete surface.
   - Other design criteria than the above and design calculation method shall be in accordance with Japanese standard.

A-II (continued 3)

4. As stipulated in Japan's Grant Aid Program,

   1) The Tanzanian Government is required to clear the site and to remove/demolish the obstructive matters in advance of the actual commencement of the construction work.

   2) The anticipated obstructive matter will include the building, the foot bridge, the water pipe and other miscellaneous facilities. The detailed specification of these obstructive matters will be clarified in the design report to be prepared by the Japanese Government.

5. It was understood that the Japanese Government has taken note of importance of this project to the Tanzanian Government and will take utmost efforts to accelerate its implementation of the proposed Project to practically possible extent within the framework of Japanese budgetary mechanism.

6. Other items on the MINUTES of the Preliminary Survey Team, unless otherwise mentioned, remain unchanged.

A-III GIST OF DISCUSSIONS

ON

THE DETAILED DESIGN OF THE SELANDER BRIDGE EXPANSION PROJECT

The Japanese Detailed Design Survey Team for the Selander Bridge Expansion Project, headed by Dr. N. Narita, was dispatched by the Japan International Cooperation Agency to the United Republic of Tanzania from the 1st June, 1980 to the 12th June, 1980 to reach to the mutual consent on the detailed design, the scope of site clearance and the procedure and schedule necessary for tendering.

During its stay in the United Republic of Tanzania, the Survey Team exchanged views and had a series of discussions with the Tanzanian Ministries concerned in respect to necessary measures to be taken for the smooth implementation of the above mentioned Project.

As a result of discussions, both parties agreed to recommend to their respective Governments the matters referred to in the gist of discussions attached herewith.

Dar es Salaam, Tanzania — June 6, 1980

N. Narita

Nobuyuki Narita
Team Leader
The Japanese Detailed Design
Survey Team for the Selander
Bridge Expansion Project

F. Barozi
Director of Roads
Ministry of Works
Government of the United
Republic of Tanzania

A-III (continued 2)

GIST OF DISCUSSIONS

ON

The Detailed Design of the Selander Bridge Expansion Project

I. Detailed Design

It was confirmed that the contents of detailed design discussed by both parties were mutually agreed unless otherwise described below.

1) Access to the existing police station from the proposed road.

2) Alteration of the sidewalk adjacent to the New African Building near Upanga Road - United Nation Road Junction.

3) Arrangements by Tanzanian Government for possible inconvenience caused to Soviet Embassy and British Embassy.

II. Site Clearance

Regarding the measures to be done for obstructions, both parties agreed to be responsible for carrying out their roles respectively. (See attached list)

A-III (continued 3) LIST OF OBSTRUCTIONS FOR SELANDER BRIDGE EXPANSION PROJECT

Item	Obstruction	Location	Measures to be done	Time of Clearing
1.	Hedge/Fence	At the sea side of Ocean Road	Demolition	During main construction
2.	ditto	At both sides of United Nations Road	ditto	ditto
3.	Fence	At the north side of Kinondoni Road	ditto	ditto
4.	Concrete block wall	At the north side of United Nations Road	ditto	ditto
5.	Handrail	In front of the police box	ditto	ditto
6.	Police box including traffic signal controller	In and around the junction of Upanga Road and United Nations Road	Shift	ditto
7.	Underground communication cable and accessories (Tanzania Posts & Tele-communications Corp)	In the project area	Shift (if necessary)	By the end of November, 1980
8.	ditto (Ministry of Foreign Affairs)	A part of under the foot bridge	Shift	During preparation work for main construction
9.	Water mains and fittings	ditto	ditto	Before demolishing of the foot bridge
10.	Foot bridge	Along the Selander Bridge	Demolition	During main construction period

A-III (continued 4) No. 2

Item	Obstruction	Location	Measures to be done	Time of clearing
11.	Street lighting facilities	In the Project area excluding the part of Selander Bridge	Removal	ditto
12.	11 KV overhead distribution line	In and around each junction	shift	The end of November 1980
13.	Traffic signal facilities	In the junction of Upanga Rd. and United Nations Rd.	Removal	During main construction

A-III (continued 5) The divided table of the clearing work

Item	Cost	Construction	Compensation
1	Japanese side	Japanese side	Tanzanian side
2	ditto	ditto	ditto
3	ditto	ditto	ditto
4	ditto	ditto	ditto
5	ditto	ditto	ditto
6	Tanzanian side	ditto	-
7	ditto	Tanzanian side	-
8	ditto	Japanese side	-
9	ditto	Tanzanian side	-
10	Japanese side	Japanese side	-
11	Tanzanian side	Tanzanian side	-
12	ditto	ditto	-
13	ditto	Japanese side	-

A-III (continued 6)

III. Tender Procedure and Tender Schedule

As a result of the discussions by both parties, the tender procedure and its schedule are to be conducted as follows.

1) Tender documents and pre-qualifications for tenderers shall be prepared by the Consultant.

2) Tenderers to be invited shall be selected by Tanzanian side

3) The invitation letters shall be sent to tenderers by the Consultant.

4) The tender opening shall be carried out by the authorized agency to be named by both Governments.

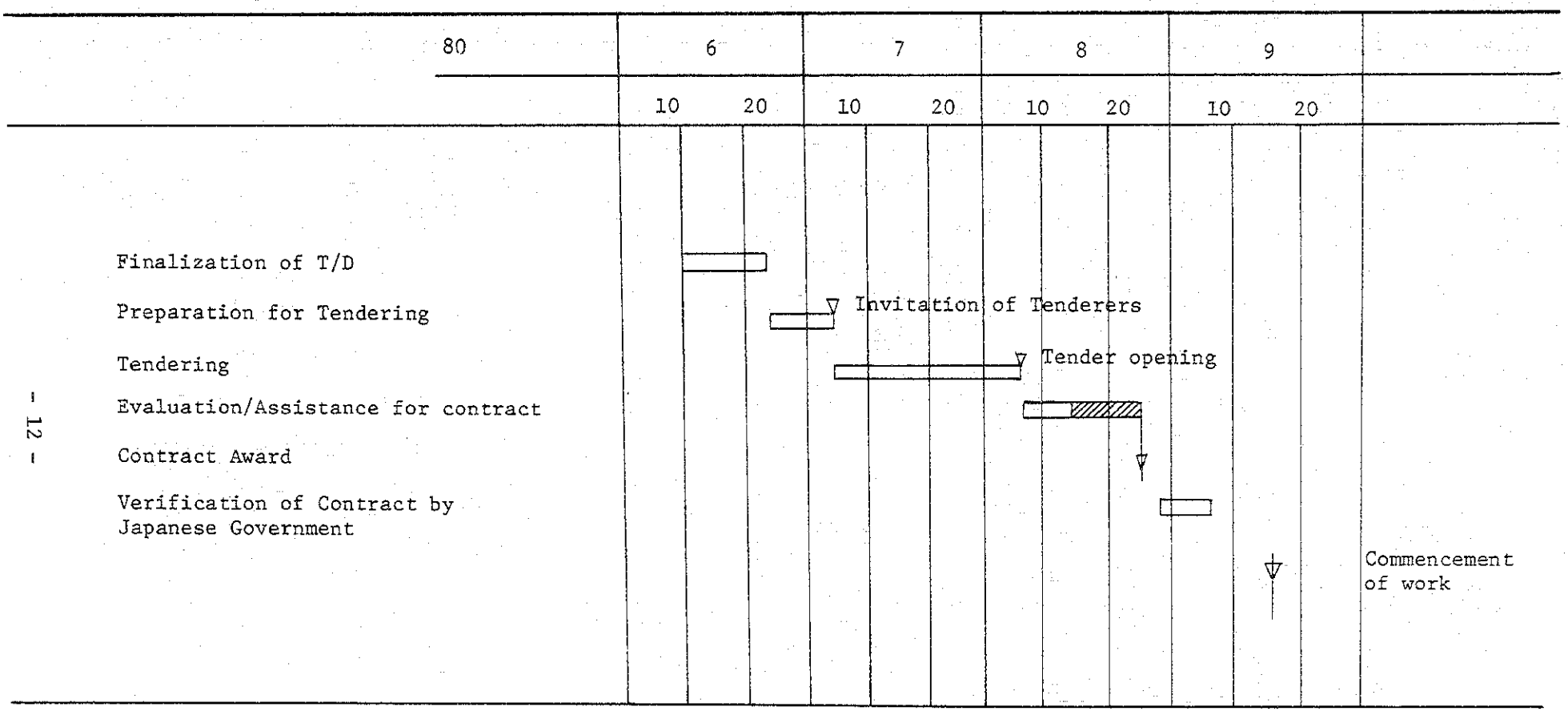
5) Evaluation for tenders shall be carried out by the Consultant.

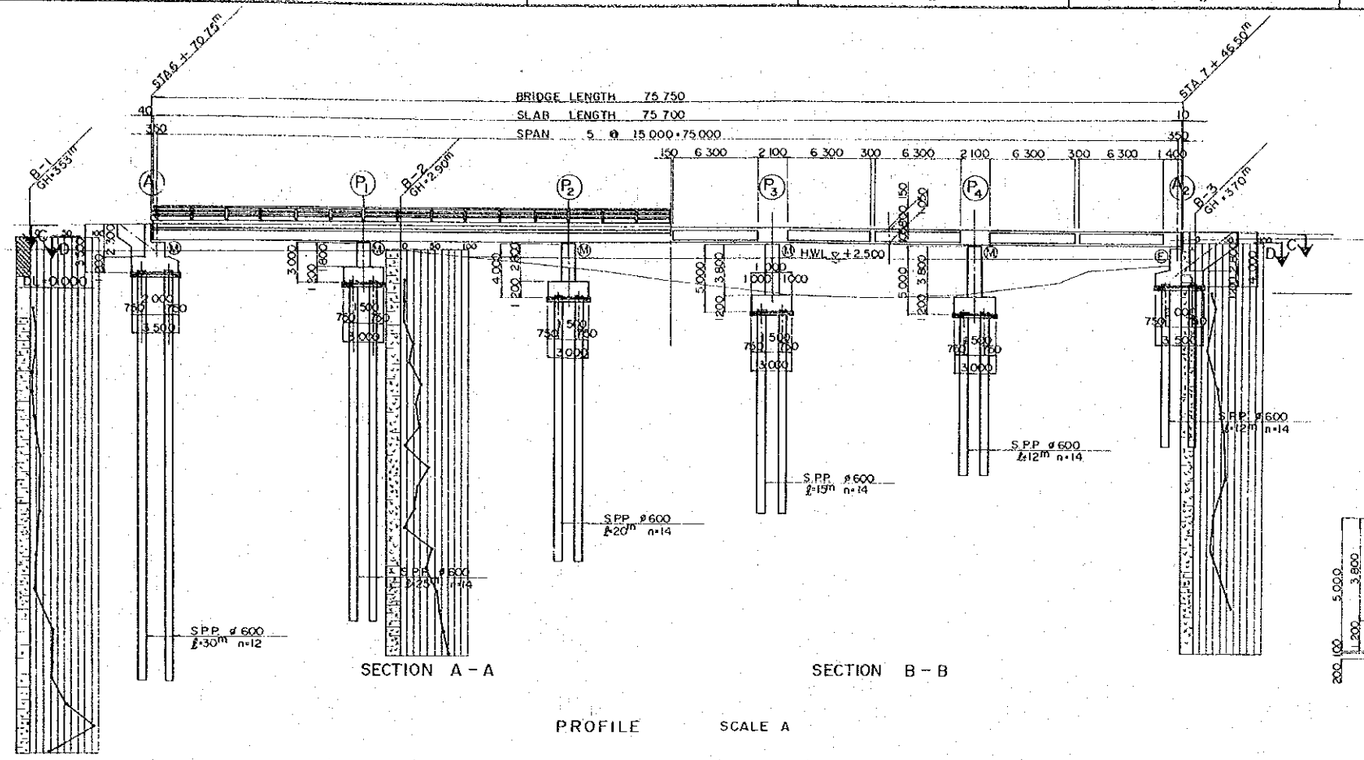
6) The Contract shall be awarded by Japanese Government and signed by Tanzanian Government.

7) The Contract shall be verified by Japanese Government. The time schedule for tendering is shown in the following figure.

A-III (continued 7)

Time Schedule for Tendering

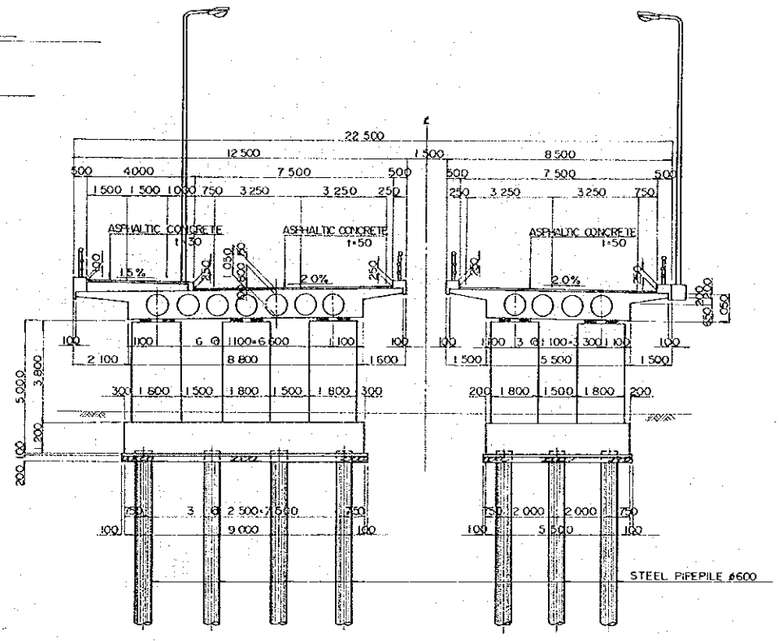




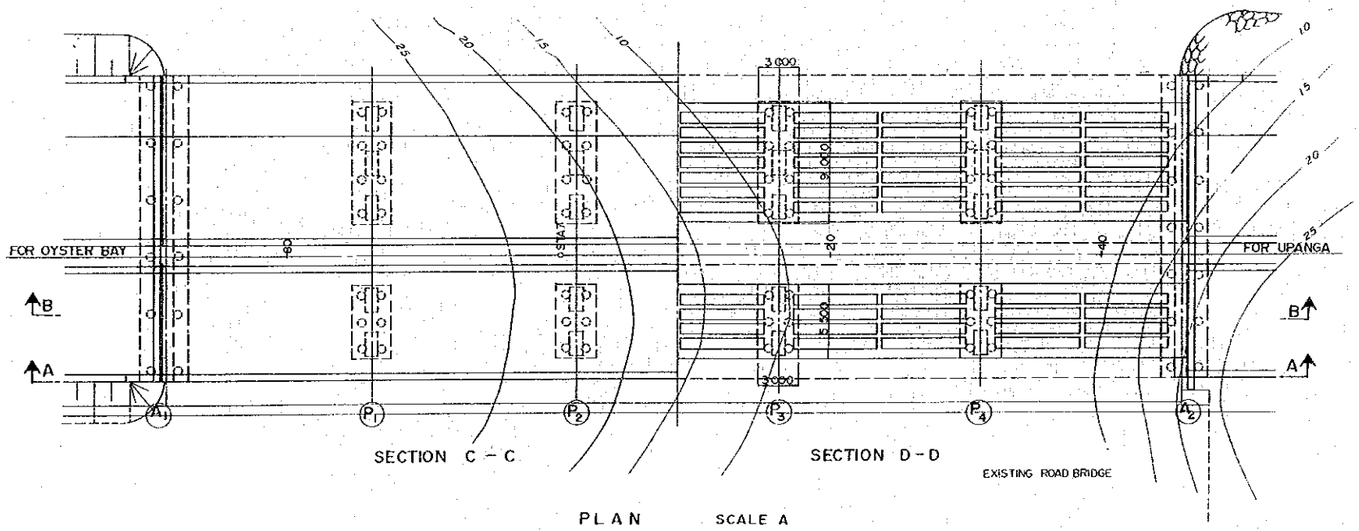
SECTION A – A

SECTION B – B

PROFILE SCALE A



CROSS SECTION (P_3) SCALE B



SECTION C – C

SECTION D – D

PLAN SCALE A

LEGEND ;

	FILL MATERIAL		CLAY
	SAND		SHELLS
	SILT		CORAL

NOTES ,

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE INDICATED

B-I General View of the proposed Bridge

SCALE A 0 10 20 m (1:200)

SCALE B 0 5 10 m (1:100)

REV NO	DATE	COORDINATE	REVISION	APPRO	DATE

THE SELANDER BRIDGE EXPANSION PROJECT
DAR ES SALAAM

MINISTRY OF WORKS

SELANDER BRIDGE
GENERAL VIEW

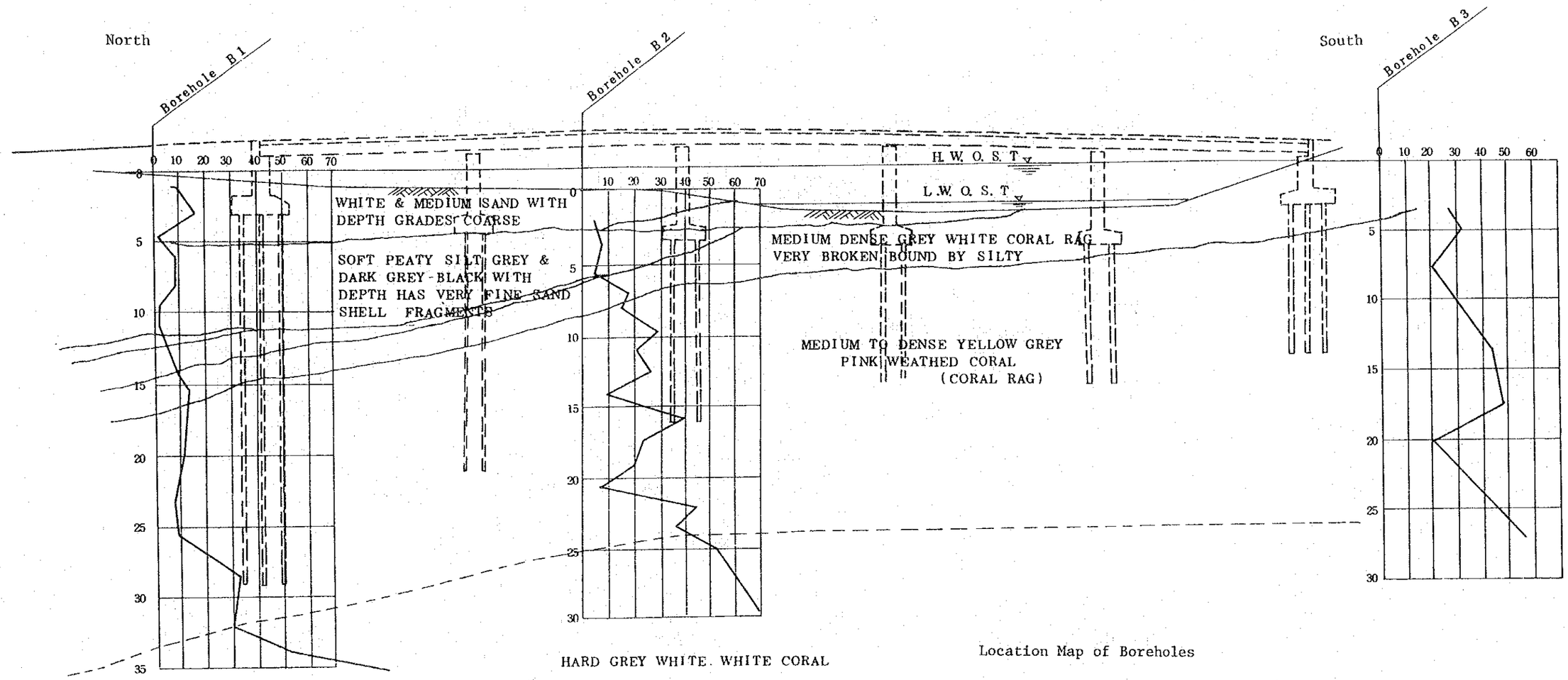
DWG. NO.

MINISTRY of WORKS

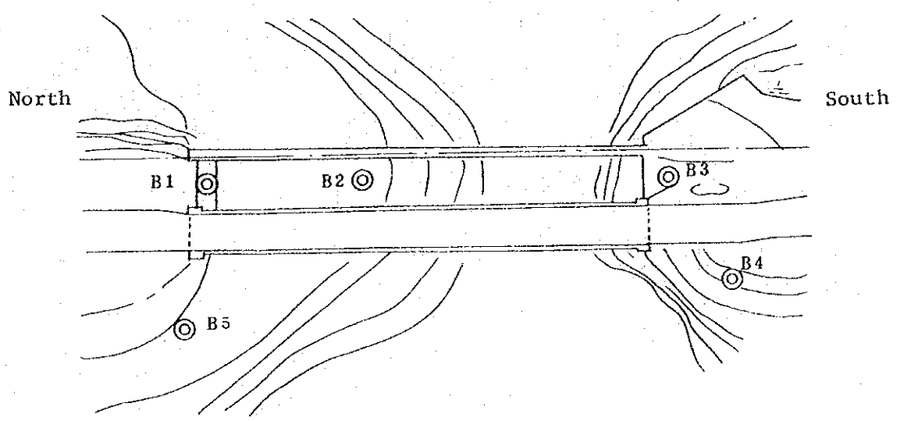
NIPPON KOEI CO. LTD
CONSULTING ENGINEERS
TOKYO JAPAN

DESIGNED
DRAWN
TRACED
CHECKED
APPROVED
DATE JUNE 30, 1980

B-II Geological Profile

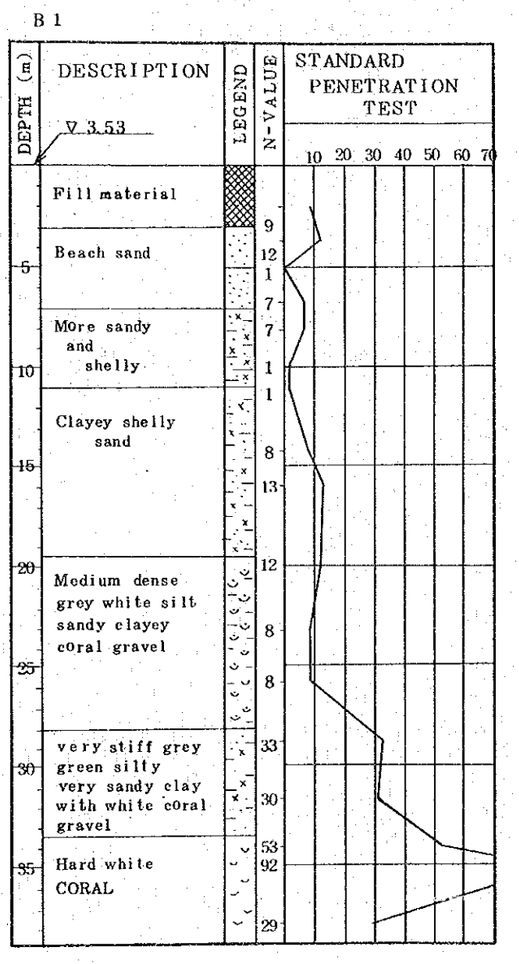


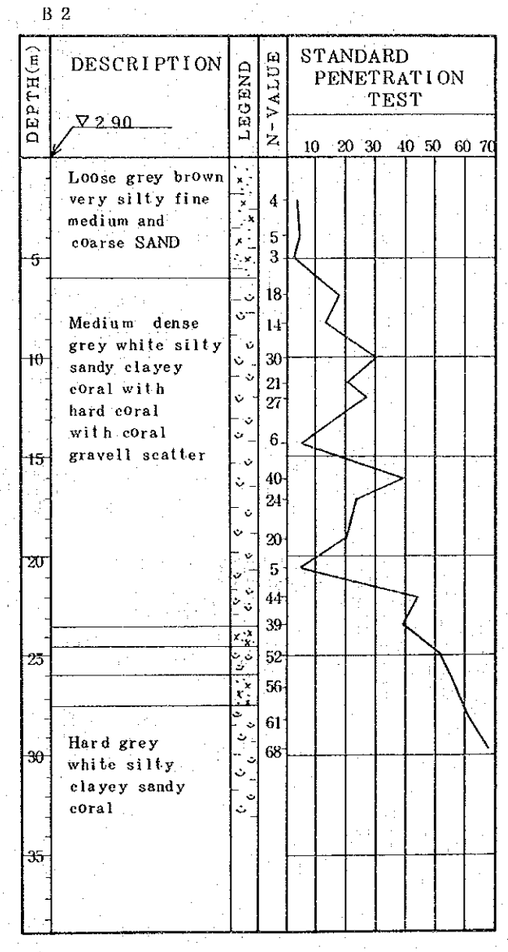
Location Map of Boreholes

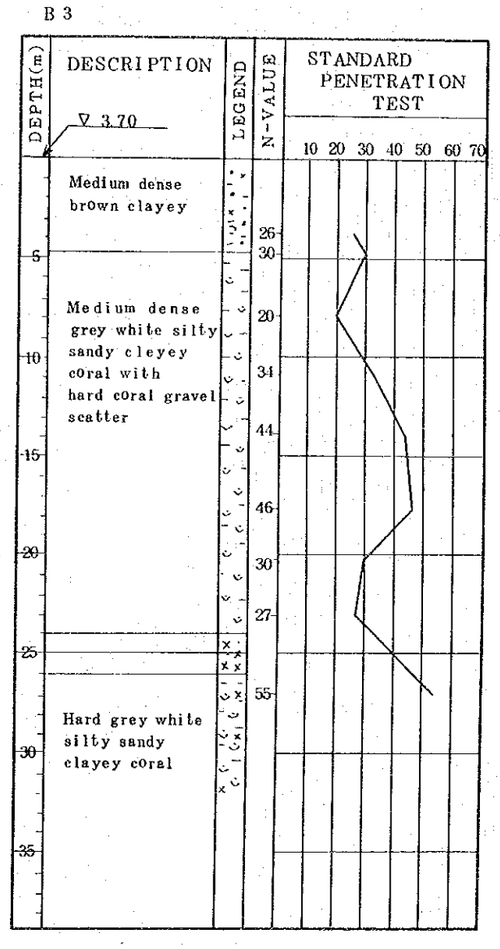


Source : Selander Bridge Extension. Construction of Bridges
COWI Consult, July 1978

B-III Boreholes Record





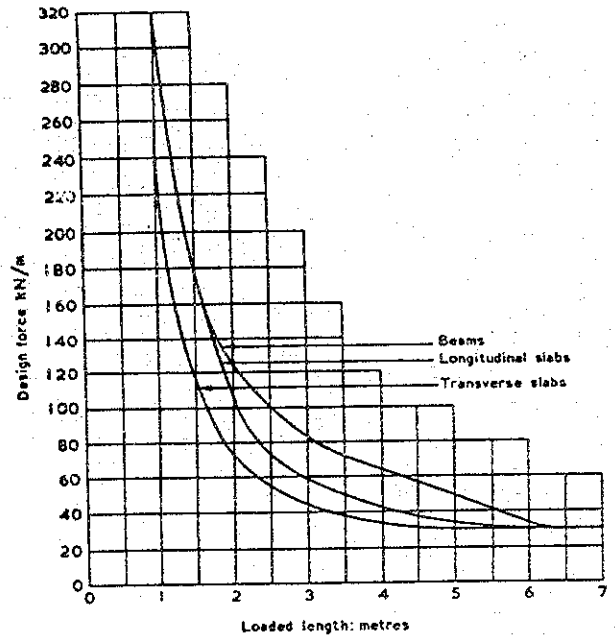


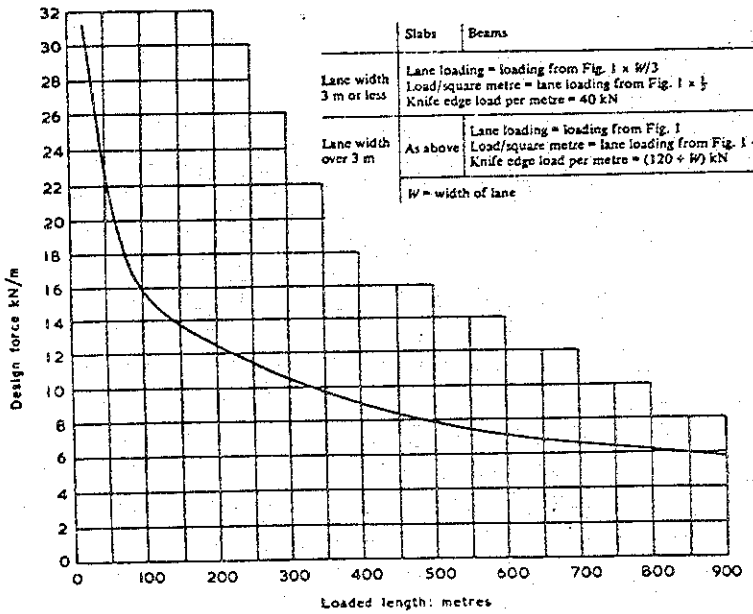
Source: Sclander Bridge Extension, Construction of Bridges
COWI Consult, July 1978

Equivalent uniformly distributed load (U.D.L.) to be used in conjunction with the knife edge load (see Fig. 1)

Loaded length	U.D.L. for beams per metre of lane	U.D.L. for longitudinal slabs per metre of lane	U.D.L. for transverse slabs and cross girders per metre of lane	Loaded length	U.D.L. for beams per metre of lane	U.D.L. for longitudinal slabs per metre of lane	U.D.L. for transverse slabs and cross girders per metre of lane
m	kN	kN	kN	m	kN	kN	kN
1.00	318.6	318.6	282.0	4.00	64.8	42.0	34.2
1.25	233.7	233.7	153.6	4.25	60.9	39.0	33.0
1.50	179.4	179.4	113.4	4.50	57.0	36.3	31.8
1.75	146.4	139.5	89.4	4.75	52.8	35.1	31.5
2.00	126.6	107.1	72.6	5.00	49.2	33.9	31.5
2.25	112.8	85.5	62.7	5.50	41.1	32.1	31.5
2.50	101.7	72.0	55.2	6.00	33.0	31.5	31.5
2.75	92.4	64.5	48.6	6.50–23.0	31.5	31.5	31.5
3.00	84.6	58.5	45.0				
3.25	77.4	53.4	41.7				
3.50	72.3	49.2	38.7				
3.75	68.4	45.3	36.3				

Loaded length	Force	Loaded length	Force	Loaded length	Force	Loaded length	Force
m	kN/m	m	kN/m	m	kN/m	m	kN/m
24.0	31.2	52.0	22.3	80.0	17.7	220	12.2
25.0	30.8	53.0	22.0	82.0	17.4	240	11.7
26.0	30.4	54.0	21.8	84.0	17.2	260	11.3
27.0	30.0	55.0	21.5	86.0	17.0	280	10.9
28.0	29.7	56.0	21.3	88.0	16.8	300	10.6
29.0	29.3	57.0	21.1	90.0	16.6	325	10.1
30.0	28.9	58.0	20.9	92.0	16.4	350	9.8
31.0	28.5	59.0	20.7	94.0	16.2	375	9.5
32.0	28.2	60.0	20.6	96.0	16.1	400	9.0
33.0	27.8	61.0	20.4	98.0	16.0	425	8.6
34.0	27.4	62.0	20.2	100	15.9	450	8.4
35.0	27.0	63.0	20.0	105	15.6	475	8.2
36.0	26.8	64.0	19.8	110	15.3	500	7.9
37.0	26.6	65.0	19.7	115	15.1	525	7.7
38.0	26.2	66.0	19.6	120	14.9	550	7.4
39.0	26.0	67.0	19.4	125	14.7	575	7.3
40.0	25.7	68.0	19.3	130	14.5	600	7.1
41.0	25.4	69.0	19.1	135	14.3	625	7.0
42.0	25.2	70.0	19.0	140	14.1	650	6.8
43.0	24.9	71.0	18.9	145	14.0	675	6.7
44.0	24.6	72.0	18.7	150	13.8	700	6.6
45.0	24.3	73.0	18.6	155	13.7	725	6.5
46.0	24.0	74.0	18.5	160	13.6	750	6.4
47.0	23.8	75.0	18.3	165	13.5	775	6.3
48.0	23.5	76.0	18.2	170	13.4	800	6.1
49.0	23.2	77.0	18.1	180	13.1	850	5.9
50.0	22.9	78.0	17.9	190	12.9	900	5.8
51.0	22.6	79.0	17.8	200	12.7		





	Slabs	Beams
Lane width 3 m or less	Lane loading = loading from Fig. 1 × W/3 Load/square metre = lane loading from Fig. 1 × ½ Knife edge load per metre = 40 kN	
Lane width over 3 m	As above	Lane loading = loading from Fig. 1 Load/square metre = lane loading from Fig. 1 ÷ W Knife edge load per metre = (120 ÷ W) kN

W = width of lane

B-V Relation between the Carriageway Width and Number of Traffic Lanes.

Carriageway width (m)	No. of lanes
4.60 up to and including 7.40	2
7.40 up to and including 11.1	3
11.1 up to and including 14.8	4
14.8 up to and including 18.5	5

B-VI Highway bridges Type HB unit loading.