CHAPTER 3 CONSTRUCTION METHOD OF RECONSTRUCTION OF SIMONGAN WEIR

3.1 General

The existing Simongan Weir of fixed type was constructed more than 100 years ago, and it is a main cause of flooding at the up-stream area of Simongan Weir. Therefore, the existing Simongan Weir is to be demolished and reconstructed as a gated weir at the same location to maintain the existing functions for water intake.

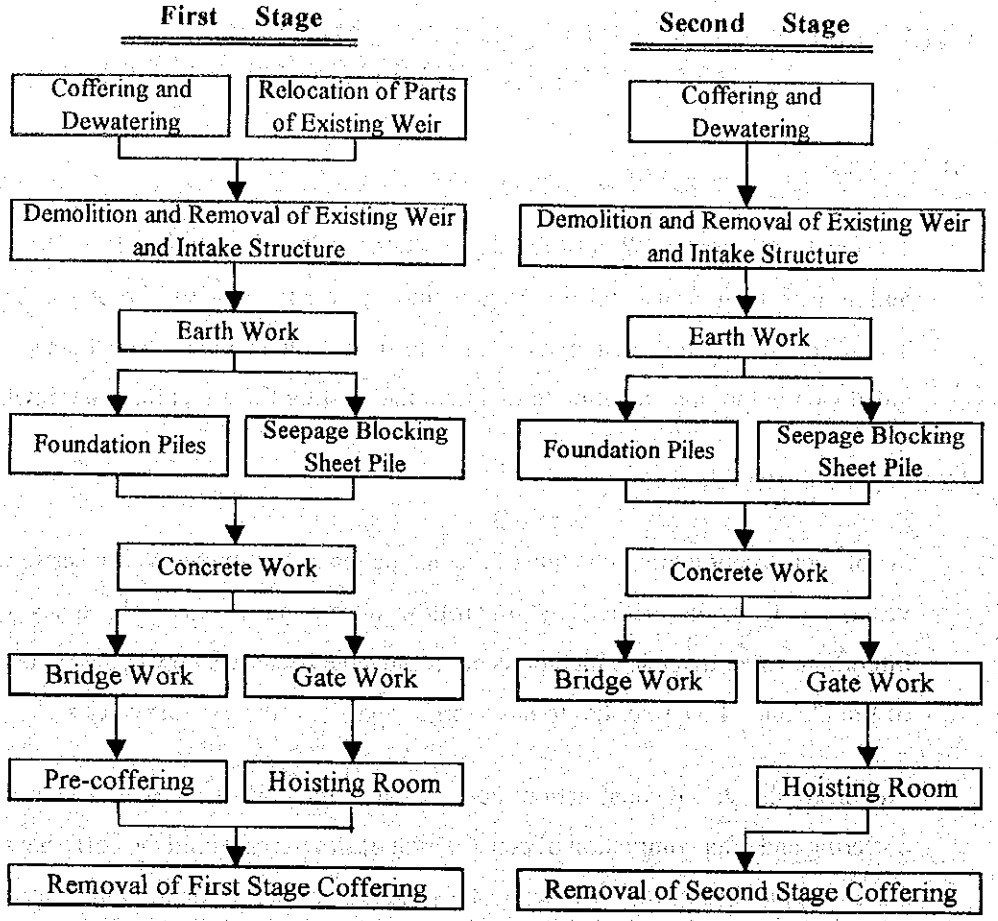
3.2 Staged Construction

Whole construction time schedule of reconstruction of Simongan Weir takes several years, so diversion method of streamflow during rainy season becomes very important. River diversion method is not reasonable because a new bypass structure of full closing of the river has to have same capacity as the existing river.

Therefore, the staged construction method, which the half of the river is closed by coffering and after completion of construction of structures within the coffering area the coffering is removed in order to keep enough capacity for the rainy season's streamflow, is applied for the river diversion of Simongan Weir reconstruction works.

The construction period of the first stage will need a period of one dry season. Even though the construction volume of the first stage is smaller than the one of the second stage, many kinds and numbers of construction equipment shall be concentrated in this stage because of a construction condition which the water level of the upstream of the weir shall be kept at EL. 5.20 m during the construction period.

Procedure of the two-stage construction is shown below.



3.3 Temporary Construction Road and Bridge

Location of temporary construction roads and bridge is shown in Fig.3.3.1 and table below.

Temporary Road	Upstream side	Downstream side
Left bank side	From crest to EL.6.400 of flood plain. L= 45 m	From crest to flood plain. L= 75 m
	From EL.6.400 to bottom of foundation (EL.1.000). L= 65 m	
Right bank side	From crest to EL.5.300 of bank. L= 60 m	From crest to flood plain. L= 75 m
	From EL.5.300 to bottom of foundation (EL.1.000). L= 55 m	

Temporary Bridge	Upstream side	Downstream side
Left bank side	Near the Water Gate 1unit	
Right bank side	—	At the Open Drainage 1unit

The dimension of temporary construction road is as follows:

- Width : more than 5.00 m
- Gradient : less than 1:10

The dimension of temporary construction bridge is as follows:

- Width : 3.00 m
- Length : 10.00 m
- Load Capacity : 20 t

3.4 Temporary Cofferdam

3.4.1 Water Level and Excavation Level

The water level should be kept about EL.5.200 m at the upstream side and the water level at the downstream side is about EL.-0.230 m. The bottom elevation of foundation excavation changes from EL. 0.100 m at the upstream side to EL.-1.700 m at the downstream side.

3.4.2 Type of Temporary Coffering

In consideration of above conditions, double steel sheet pile coffering is applied to the upstream side (water head becomes more than 5.0 m), earthfill type is applied to the downstream side and sandbags are used at the water flow side in principle. Typical cross section of each type of coffering is shown in Fig. 3.4.1.

3.4.3 First Stage Coffering and Dewatering

The first stage works are carried out at the left bank side, and first stage working area is closed by using a few types of coffering as mentioned above. After completion of the first stage works, the first stage coffering will be removed before rainy season remaining pre-constructed double steel sheet pile for a part of the second stage coffering that will be installed in nearly center of the river. Procedure of the first stage coffering is shown in Fig. 3.4.2. The maximum streamflow is 21 m^3/s under first stage coffering installation.

Since upstream side water head is very high, water leakage from sheet pile joints and seepage water through riverbed is predicted. Submersible pumps with flexible pipes are used for dewatering from the working area. Summary of coffering type and dewatering is as follows.

Coffering

Location	Coffering type	Remarks
Upstream side	Double steel sheet pile	Crest width: 6.5 m Pile length: 12.0 m Crest length: 25.0 m
Water flow side	Sandbags	2 lines by 3 layers Length: 60 m
	Double steel sheet pile (Pre-construction)	Crest width: 6.5 m Pile length: 3.8 m Crest length: 32.0 m
Downstream side	Earthfill type	Crest width: 6.0 m Height: 1.0～3.0 m Crest length: 75.0 m Slope : 1:1.5

Dewatering

Location	Equipment	Remarks
Upstream side	Submersible pumps	4" x 3 units
Downstream side	Submersible pumps	4" x 2 units

3.4.4 Second Stage Coffering and Dewatering

The second stage works are carried out at the right bank side.In principle, design of the second stage coffering and dewatering is same as the first stage. The driving work of double steel sheet pile (upstream coffering) will be commenced from the pre-construction portion to the bank side. In order to execute this driving direction, earthfill coffering is necessary for working place of crawler crane, and after finishing sheet pile driving, this earthfill coffering is used as access road to the riverbed. Procedure of the second stage coffering is shown in Fig. 3.4.3. The 530m^3/s of maximum streamflow are estimated in second stage coffering installated period. Summary of the coffering type and dewatering in the second stage is as follows.

Coffering

Location	Coffering type	Remarks
Upstream side	Earthfill type *1	Crest width: 5.0 m Height: 0～3.8 m Crest length: 38.0 m Slope : 1:1.5
	Double steel sheet pile	Crest width: 6.5 m Pile length: 12.0 m Crest length: 65.0 m
Water flow side	Sandbags	2 lines by 3 layers Length: 45 m
Downstream side	Earthfill type	Crest width: 5 .0 m Height: 1.0～3.0 m Crest length: 67.0 m Slope : 1:1.5

*1: To be used for working place of double sheet pile driving, and temporary access road.

Dewatering

Location	Equipment	Remarks
Upstream side	Submersible pumps	ϕ 100 mm x 2 units
Downstream side	Submersible pumps	ϕ 100 mm x 2 units

The capacity and number of the equipment for construction of temporary coffering work are as below.

- Backhoe : 0.35 m^3 x 1 unit
- Dump Truck : 10 t x 2 units
- Bulldozer : 15 t x 1 unit
- Vibratary Pile Driver : 35 kW x 1 unit
- Clamshell Bucket : 0.6 m^3 x 1 unit
- Crawler Crane : 40 t x 1 unit
- Truck with Crane : 4.5 t x 1 unit

3.5 Channel Diversion and Water Supply

3.5.1 For Semarang River

Required discharge to Semarang River is 0.50 m^3/s during the construction period. It is too big amount to supply by temporary pumps. Many numbers of pumps and big size of an intake structure is required. (for example ϕ 180 mm submergible pump : 2.5 m^3/min/unit x 16 units)

Since a new intake structure is to be constructed at almost same location as the existing intake structure for Semarang River, it is difficult to install open channel type temporary water supply facilities in this area. Therefore, corrugated pipe with gravity flow type is applied to supply water of 0.50 m^3/s to Semarang River.

Corrugated pipe will be embedded along the bank at EL. 4.80 m~4.00 m. After completion of installation of corrugated pipe with inlet and outlet protection, channel diversion will be done by means of closing the existing intake water gates and removing of coffering around inlet and outlet protection. (refer to Fig. 3.5.1)

The specification of the corrugated pipe for Semarang River is as shown below.

Facilities	Specification	Remarks
Corrugated Pipe	Flexible type ϕ 750 mm	Elevation : EL.4.80 m~4.00 m Pipe length: 65.0 m

The capacity and number of the equipment for construction are as below.

- Backhoe : 0.35 m³ x 1 unit
- Dump Truck : 10 t x 1 unit
- Vibratary Pile Driver : 30 kW x 1 unit
- Truck with Crane : 4.5 t x 1 unit

3.5.2 For Left Irrigation Channel

Rquired discharge to Left Irrigation Channel is 0.15 m^3/s during construction period. It is possible amount to supply by pumps, so submersible pumps set in a sump pit will be prepared at the upstream side of the coffering.

Water is pumped up to a temporary water tank which is installed on the left bank crest and flows down to the existing Channel Water Gate through open ditch by gravity flow (refer to Fig. 3.5.2). After completion of preparation of water supply facilities, channel diversion will be done by means of closing the existing Channel Gates which is located behind the Irrigation Channel Intake.

The specification of water supply for Left Irrigation Channel is as shown below.

Facilities	Specification	Remarks
Submersible Pump with flexible pipe	180 mm x 5 units Q = 2.5 m^3/min/unit	Effective head : 5.5 m Sump pit
Temporary Tank	1.0 m x 1.0 m x 0.8 m(H)	On the left bank crest.
Open Ditch	0.5 m(B) x 0.35 m(H)	From Temporary Tank to Existing Channel Gate Length : 85 m

The capacity of the equipment for construction are as below.

- Backhoe : 0.35 m³
- Dump Truck : 10 t
- Truck with Crane : 4.5 t

3.6 Temporary Drainage Channel on Left Bank

Two numbers of U-shape concrete channels run parallel in the downstream side of the Weir. Sandbags close the channels and drainage water is pumped up by submersible pumps to the downstream outside of construction area.

3.7 Temporary Retaining Wall

Since there are many works which are conducted closely to other works at SimonganWeir site, in consideration of above working conditions, single steel sheet pile is applied for retaining walls to protect excavated areas.

3.7.1 Water Supply for Semarang River

Since corrugated pipes are embedded in deep elevation beside the existing road, during the construction period retaining wall by steel sheet piles is required on both sides of the pipe. The inlet and outlet portion of the corrugated pipe is protected by steel sheet piles from earth pressure and water pressure.

3.7.2 Right Bank Intake Structure

During the construction of right bank intake structure, water is continuously supplied to Semarang River through the corrugated pipes. Since the water supply point is very near from the construction area, temporary retaining wall is needed to resist both earth and water pressure and to prevent water seepage.

3.7.3 Left Bank Intake Structure

Left bank Intake Structure is constructed near the same location of existing one and U-shape concrete channel, the existing open channel and a water gate which are located downstrean of the intake is remained.

During the relocation works of a part of the existing weir, temporary retaining wall by sheet piles are applied to support earth pressure and to separate working site from existing structures.

The capacity and number of the equipment for installation and removal of steel sheet piles are as below.

- Vibratary Pile Driver : 30 kW x 1 unit
- Truck with Crane : 4.5 t x 1 unit

3.8 Demolition and Removal of Existing Weir and Intake Structures

After completion of coffering works and construction of temporary access road, demolition and removal works of the existing Weir are commenced and the construction works of the Intake Structures will be followed. Since relocation works

at the left bank Intake Structure have first priority, the adjusting of procedure between Intake Structure and Weir is important.

Since the length of the closed work site area becomes long in the direction of the river flow, it is more effective to prepare two working parties.

Giant breaker and backhoe are used for these works and demolished material is hauled to a spoil bank through access road on both sides.

The capacity of the equipment for demolition and removal are as below.

- Backhoe : 0.35 m³ x 2 units
- Dump Truck : 10 t x 7 units
- Giant Breaker : 600 kg～800 kg x 2 units
- Backhoe : 0.6 m³ x 2 units

3.9 Earth Work

In principle, excavation area will be closed by coffering and dried up by pumps, so that excavation work can be carried out by backhoe and bulldozer under dry condition. Careful excavation work by backhoe and manpower shall be carried out near the existing structures under the protection of temporary retaining wall.

The excavated material and the demolished material of the existing structure are to be hauled to a spoil bank located 7.0 km away from the site by dump trucks through the public roads along the river and North Ring Road.

The capacity and number of the equipment for earth works are as below.

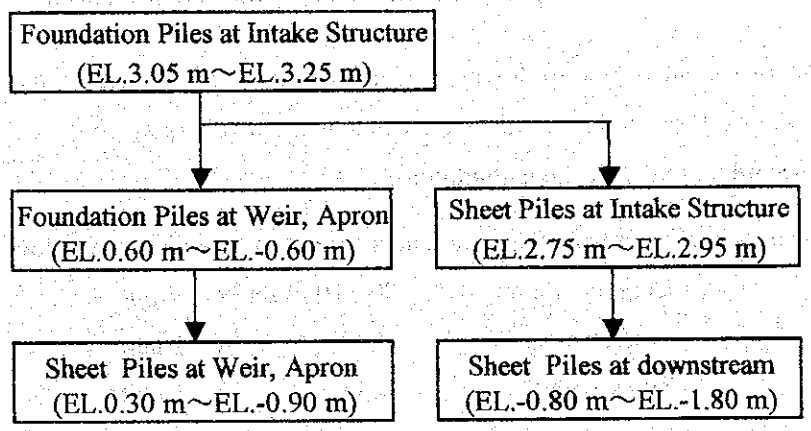
- Backhoe : 0.35 m³ x 2 units
- Dump Truck : 10 t x 14 units
- Bulldozer : 15 t x 1 unit

3.10 Foundation Piles and Seepage Blocking Sheet Piles

Immediately after excavation of enough area for test piles, pile driving for loading test and pile loading test shall be commenced. During the loading test foundation excavation work will be continued and after completion of excavation work and test piling, driving for remaining piles are carried out under the specified driving method.

Since whole construction schedule in the first stage is very tight and working area is not so large, driving sheet piles follows foundation pile works in principal.

Top elevation of both the foundation piles and the sheet piles of Intake Structures is 2.50 m higher than the one of the Weir and the apron, pile driving work for Intake Structure should be done first before excavation of the Weir foundation. Procedure of these two works is shown below.



The capacity and number of the equipment for pile work are as below.

- Pile Driver : 30 t x 2 units
- Vibratary Pile Driver : 30 kW x 2 units
- Crawler Crane : 40 t x 2 units
- Truck with Crane : 4.5 t x 1 unit

3.11 Concrete Work

Concrete Work consists of two parts, one is for foundation slab concrete and the other is gate pier concrete. After the completion of the foundation piles and the seepage blocking sheet pile works, concrete works are commenced, since concrete work becomes one of the critical paths in this package.

3.11.1 Foundation Slab Concrete

Maximum concrete volume among the blocks is about 460 m^3 and block's height is 2.20 m at the upstream and 1.60 m at the downstream. Construction joint is to be made at the height of 1.60 m of slab and separated two lifts, then the maximum concrete volume of the block becomes about 390 m^3.

Ready mixed concrete is transported from a concrete plant in Semarang City or the

one established by a contractor to the sites and concrete will be placed by concrete pump, concrete bucket and chute. The necessary capacity of the concrete pump is estimated at 90-110 m^3/hr.

3.11.2 Pier Concrete

Since pier concrete volume is not so big as slab, 1.80 m lift height with maximum volume of 72 m^3 is available for standard lift height for Simongan Weir.

25-ton truck crane is used for loading and unloading of form material and reinforcing bar at the work site and prefabricated independent scaffold or single-pole scaffold is used according to the working conditions.

The capacity and number of the equipment for concrete work are as below.

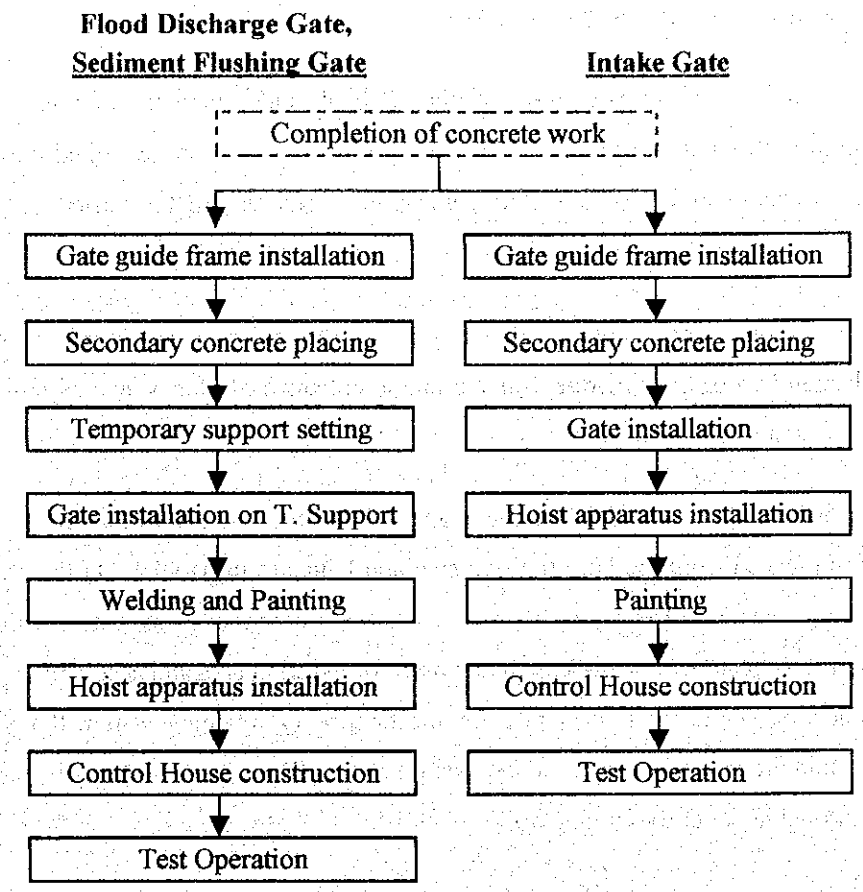
- Concrete Pump	:	90-110 m^3/hr	x	1 unit
- Truck Crane	:	25 t	x	1 unit
- Truck with Crane	:	4.5 t	x	1 unit
- Air Compressor	:	9.0 m^3	x	1 unit
- Concrete Mixer	:	1.5 m^3	x	3 units

3.12 Gate Installation Work

After completion of concrete work, gate guide frame installation work will be commenced. Installation of gate guide frame for flood discharge gates and sediment flushing gate will be done by 20-ton truck crane setting on EL.1.500 m of apron slab and concrete block.

Flood discharge gates and sediment flushing gates will be transported from a factory to the site by separated several pieces. These gate pieces are assembled on the support facilities setting on EL.1.500 m of slab at the exact location of the gates by 50-ton crawler crane with assistance by 25-ton truck crane and welding work follows. While intake gates will be transported from a factory to the site by one unit and installed by 20-ton truck crane.

Hoist apparatus for flood discharge and sediment flushing gates, which are separated into 3 blocks, will be installed on the winch deck by 50-ton crawler crane. Procedure of main works of gate installation is as follows (refer to Figs. 3.12.1 to 3.12.4).



The capacity and number of the equipment for gate installation work are as below.

- Crawler Crane	:	50 t	x	1 unit
- Truck Crane	:	25 t	x	1 unit
- Truck Crane	:	20 t	x	1 unit
- Generator	:	125 kVA	x	1 unit
- Air Compressor	:	9.0 m^3	x	1 unit

3.13 Control House

After completion of the hoist apparatus installation works, control house construction works are carried out. The construction space of the control house is limited only on the own floor deck area and moreover the floor deck is above the streamflow of rainy season in the first stage. Therefore, the all construction material and assembled parts are loaded from the maintenance bridge by 25-ton truck crane and hauling to the floor deck directly.

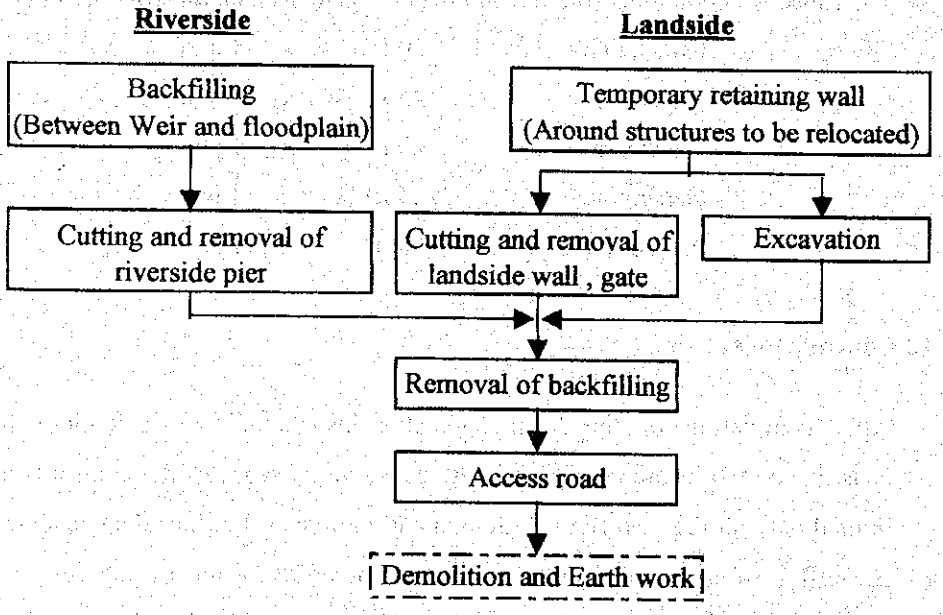
3.14 Relocation of Parts of Existing Weir

The existing Intake Structures on the left bank and a part of Simongan Weir is relocated to a area where a part of the existing structures are exhibited publicly as historical monument. Therefore, relocation works should be carried out before commencement of the demolition and removal of the existing Weir.

Relocation works consists of removal of the existing facilities, cutting and dismantling of the structure, transportation and store of blocks, and assembling of blocks at a relocation area.

In order to keep schedule cutting works of the structure relocation works will be commenced from the both the riverside and landside in parallel. On the riverside, before start of coffering of upstream side, water area that exists between the Weir and floodplain will be backfilled and used for working area and access road. On the landside, single steel sheet pile for the temporary retaining wall will be driven around the relocation parts and excavation work will be carried out step by step until reasonable depth for cutting work.

Working procedure is shown below and plan is shown in Fig. 3.14.1.



The wire sawing method and the wall sawing method are available for cutting work of structures, and they have advantages and disadvantages each other which are shown as below.

	Advantage	Disadvantage
Wire Sawing	Usefull for anykind of thickness	Cutting line is disturbed in lack of consolidation
Wall Sawing	Cutting line is kept straight in lack of consolidation	Usefull for thickness within 1.0 m

Presently, inside conditions of the structures cannot be grasped and some structures' thickness is more than 2.0 m, average structures' thickness becomes about 1.0 m. Considering these conditions it is better to use the wire sawing for structures with thickness of more than 1.0 m and the wall sawing for structures with thickness less than 1.0 m.

According to the working efficiency, safety and capacity of transportation condition, the maximum cutting block's weight shall be less than 5.0 t.

The capacity and number of the equipment are as below.

- Wire Saw Machine : 700 W x 2 units
- Wall Saw Machine : 520 W x 1 unit
- Truck Crane : 25 t x 2 units
- Truck with Crane : 4.5 t x 2 unit
- Air Compressor : 9.0 m^3 x 1 unit
- Ordinary truck : 10 t x 2 units

CHAPTER 4 CONSTRUCTION TIME SCHEDULE

4.1 Planning Condition

To establish construction plan, estimation of the workable days is most important factor for construction schedule.

4.1.1 Workable Days

(1) Dry and Rainy Seasons

One year is divided into the dry and rainy seasons for construction planning purpose as follows.

Dry Season	:	April to November (8 months)
Rainy Season	:	December to March (4 months)

(2) Construction Mode

Construction works, which are possible to be done even in rainy season by applying dewatering facilities, will be executed through a year. While construction works which are difficult to be done in rainy seasons will be executed in dry seasons.

(3) Suspension of Works by Precipitation

Period of the suspension of the works by precipitation (R mm) is assumed as below depending on the work items and the amount of precipitation.

Earth Works and Foundation Works	R ≥ 15 mm/day	one (1) day suspension
	R ≥ 30 mm/day	two (2) days suspension
Concrete Works and Installation of Gate	R ≥ 15 mm /day	one (1) day suspension

(4) Seasonal Workable Days

Since construction works along/within the river course are much influenced by rainfall and flooding, the construction period and workable days are estimated based on the rainfall data at the Semarang station for 10 years starting from 1987. In addition, national holidays and religious events are considered.

Workable days by season are calculated in Tables 4.1.1 to 4.1.4 and the result

is shown in Table 4.1.5. The summary of the workable days by season is tabulated below.

Work Items	Dry Season (Apr. – Nov.)	Rainy Season (Dec. – Mar.)	Through a Year
Earth Works and Foundation Works	176 days/8 mths = 22 days/mth	49 days/4 mths = 12 days/mth	225 days/year = 18 days/mth
Concrete Works and Installation of Gate	184 days/8 mths = 23 days/mth	68 days/4 mths = 17 days/mth	252 days/year = 21 days/mth

4.1.2 Daily Workable Hours

All construction works are planned to be carried out under the single shift working system of 9-hour labour per day including 2 hours of overtime work.

4.2 Construction Time Schedule, Mobilization and Demobilization of Construction Equipment

The balance of construction volumes including numbers of construction equipment and facilities is very important for cost estimation. The principal conception of the Construction Time Schedule for each package is described below.

4.2.1 West Floodway and Garang River Improvement

It is possible to start up at the same time both West Floodway and Garang River Improvement works, but it causes the concentration of equipment, facilities, manpower and materials from the beginning of the project. To avoid the concentration of works at the first year, commencement of Garang River Improvement works is brought to the second year.

"Construction time schedule" and "Mobilization and Demobilization of construction Equipment" of West Floodway and Garang River Improvement is shown in Tables 4.2.1 and 4.2.2.

4.2.2 Reconstruction of Simongan Weir

As described in " 3.1 General " of CHAPTER 3 or other section, the principal condition with regard to the upstream water level will affect to the construction time schedule. Especially at the first stage, all main works are on the critical path and the critical path continues from the relocation works of the existing structures to gate installation work.

Therefore, strict schedule control is required for each main work and reasonable arrangement of numbers of equipment and facilities shall be done quickly. "Construction time schedule" and "Mobilization and Demobilization of construction Equipment" of Simongan Weir is shown in Tables 4.2.3 and 4.2.4.

4.3 Site Office and Other Facilities

Each package needs own site office and facilities. Following items for office and other facilities are expected for Engineer and Contractor.

For Engineer

	Office and Facilities
1	Work Site Office
2	Ware house
3	Car Parking
4	Temporary Guard Fence

For Contractor

	Office and Facilities
1	Work Site Office
2	Living Quarter
3	Labour Quarter
4	Canteen
5	Ware house
6	Carpentry Shop
7	Bar Bending Shop
8	Repair Shop
9	Guard House
10	Car Parking
11	Temporary Guard Fence
12	Concrete Batching Plant (if necessary)

TABLES

Table 2.1.1 SUMMARY OF THE TEMPORARY CONSTRUCTION ROADS
(West Floodway/Garang River Improvement)

Location	Description	Length (m)
a) River mouth	Connect from right bank side of North Ring Road to New	120
	Dike.	
b) North Ring Road ~	Connect from right bank side of North Ring Road to flood-	50
National Road Bridge	plain.	
	Connect from left bank side of WF.40 to floodplain.	50
c) National Road Bridge ~	Connect from right bank side of National Road Bridge to	50
Simongan Weir	floodplain.	
	Connect from left bank side of National Road Bridge to	50
	floodplain.	
d) PDAM Water Intake	Connect from right bank crest to floodplain.	50
e) Ground Sill (Hydraulic Drop) ~	Connect from right bank crest to floodplain.	30
WF .130	Connect from left bank crest to floodplain.	30
	Connect from left bank crest to floodplain at WF.130.	30
f) WF.130~WF.160	Connect from right bank crest to floodplain at WF.135.	60
	Connect from right bank crest to floodplain at WF.145.	30
	Connect from left bank crest to floodplain at WF.133.	50
	Connect from left bank crest to floodplain at WF.147.	30
g) WF.160~WF.184	Connect from right bank crest to floodplain at WF.173.	40
	Connect from left bank crest to floodplain at WF.173.	30
Total		700

Table 2.2.1 WORK VOLUME OF CHANNEL EXCAVATION AND DIKE EMBANKMENT
(WEST FLOODWAY/GARANG RIVER IMPROVEMENT)

LOCATION / WORK ITEM, EQUIPMENT	River Mouth - NRR Bridge (WF.-9 - WF.15)	NRR Bridge - Simongan Weir (WF.15 - WF.96)	Simongan Weir - Kreo Junction (WF.101 - WF.184)	TOTAL
RIGHT BANK	(m^3)	(m^3)	(m^3)	(m^3)
Excavation above W.L.	27,671	147,015	176,616	351,303
Excavation below W.L.	120,462	247,399	71,153	439,013
Embankment	8,701	4,654	4,793	18,148
Earthfilling	11,130	14,598	4,779	30,507
LEFT BANK	(m^3)	(m^3)	(m^3)	(m^3)
Excavation above W.L.	934	83,581	81,552	166,067
Excavation below W.L.	99,396	130,969	65,795	296,159
Embankment	510	7,028	995	8,533
Earthfilling	464	10,097	1,024	11,585
TOTAL (RIGHT B. + LEFT B.)	(m^3)	(m^3)	(m^3)	(m^3)
Excavation	248,463	608,963	395,115	1,252,541
Embankment and Earthfilling	20,805	36,377	11,591	68,773
Material to be spoiled	227,658	572,587	383,524	1,183,769
NUMBER OF EQUIPMENT	unit	unit	unit	unit
Bulldozer 15 t	2	2	2	6
Backhoe 0.35 m^3	6	10	6	22
Backhoe 0.60 m^3			2	2
Giant Breaker 600/800kg			2	2
Dump Truck 10 t	18	50	46	114
Clamshell Grabbing 1.0 m^3	2			2
Pontoon 200 t	2			2
Barge 100 m^3	4			4
Tug Boat 15 t	2			2

Table 2.7.1 CONSTRUCTION TIME SCHEDULE OF RAISING OF THE EXISTING RAILWAY BRIDGE

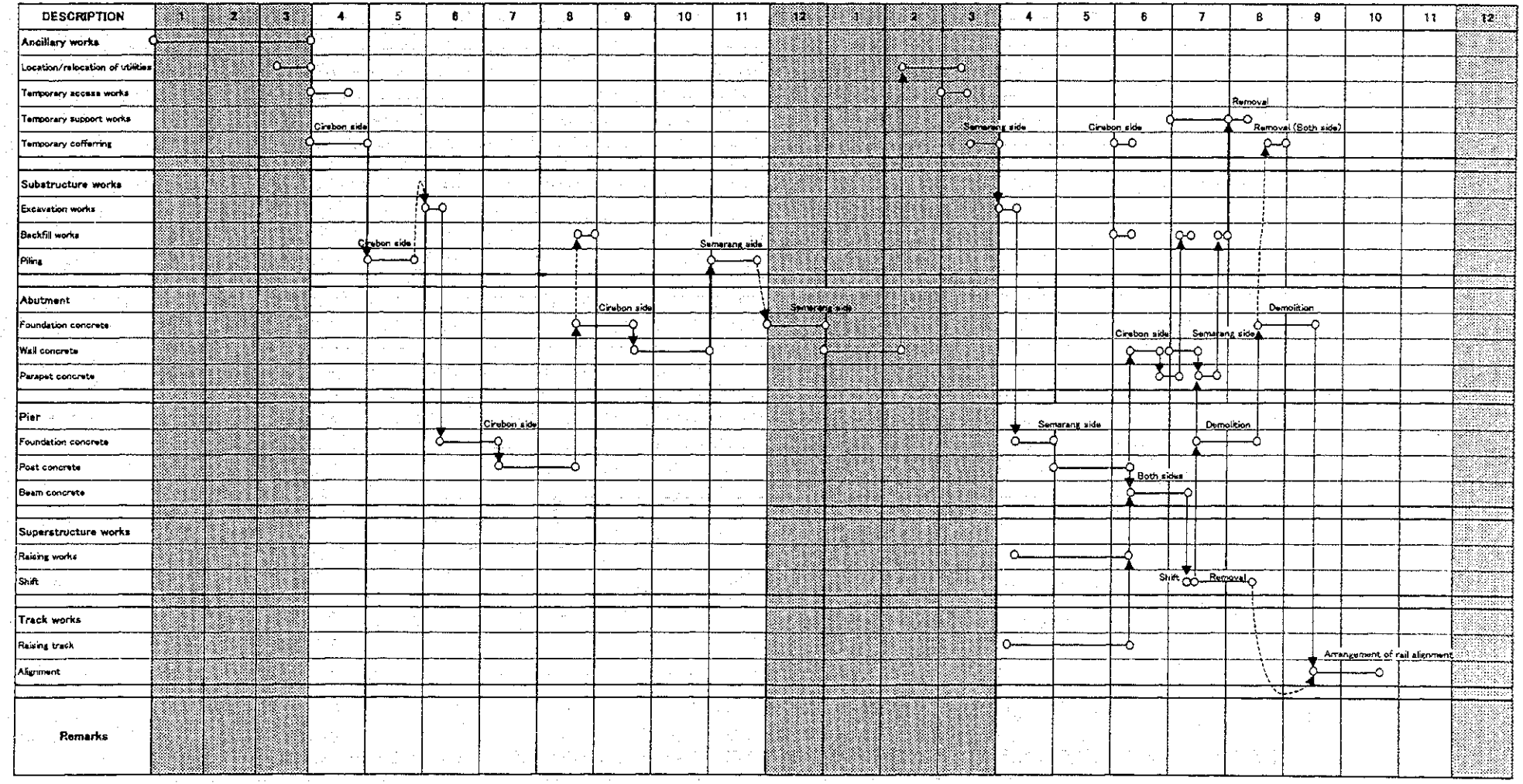


Table 4.1.1 MONTHLY RAINY DAYS AT SEMARANG METEOROLOGICAL STATION (BMG)

UNIT: day

Year	Rainfall	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1987	0 < R < 5 mm	0	0	0	0	1	0	0	0	0	0	0	3	4
	5 < R < 10 mm	0	0	1	0	3	2	0	0	0	1	1	6	14
	10 < R < 15 mm	3	1	2	1	2	0	0	0	0	0	0	1	10
	15 < R < 30 mm	3	5	2	2	0	1	1	0	0	0	3	4	21
	30 < R mm	9	6	4	0	1	0	1	0	0	0	4	9	34
1988	0 < R < 5 mm	4	1	2	0	1	0	0	2	2	2	2	3	19
	5 < R < 10 mm	4	2	3	0	1	1	1	0	1	1	3	1	18
	10 < R < 15 mm	3	4	2	0	1	0	0	1	1	1	2	3	18
	15 < R < 30 mm	2	6	3	3	4	1	1	0	0	4	2	4	30
	30 < R mm	7	5	6	5	2	0	0	0	0	2	2	11	40
1989	0 < R < 5 mm	3	2	2	2	3	4	3	1	2	4	2	3	31
	5 < R < 10 mm	2	2	2	3	2	0	1	1	0	2	1	3	19
	10 < R < 15 mm	2	5	1	3	1	2	2	0	0	1	4	0	21
	15 < R < 30 mm	4	2	4	3	1	3	0	0	0	3	6	3	29
	30 < R mm	4	10	8	4	4	2	1	0	1	1	3	5	43
1990	0 < R < 5 mm	6	2	5	1	3	1	1	1	2	1	4	3	30
	5 < R < 10 mm	2	2	3	2	1	0	1	2	1	2	1	6	23
	10 < R < 15 mm	1	4	2	1	0	3	0	1	1	2	2	2	19
	15 < R < 30 mm	3	6	4	4	0	3	0	2	1	0	2	4	29
	30 < R mm	8	1	2	1	2	1	1	0	0	0	2	7	25
1991	0 < R < 5 mm	5	6	2	3	0	2	0	0	0	2	4	5	29
	5 < R < 10 mm	2	2	5	2	0	0	0	0	0	1	1	5	18
	10 < R < 15 mm	2	1	0	6	1	0	1	0	0	0	5	0	16
	15 < R < 30 mm	6	6	1	2	0	0	0	0	0	0	4	6	25
	30 < R mm	10	4	2	4	2	0	0	0	0	0	3	2	27
1992	0 < R < 5 mm	3	2	1	4	5	4	0	6	2	5	6	2	40
	5 < R < 10 mm	2	2	3	4	0	1	1	0	1	3	4	0	21
	10 < R < 15 mm	1	3	5	3	3	0	0	0	2	4	0	1	22
	15 < R < 30 mm	3	4	6	2	2	2	0	1	2	4	1	2	29
	30 < R mm	4	3	3	3	2	1	0	3	2	1	1	7	30
1993	0 < R < 5 mm	6	1	6	2	2	3	1	1	1	0	1	3	27
	5 < R < 10 mm	1	4	5	4	0	1	1	2	2	1	2	1	24
	10 < R < 15 mm	2	3	2	3	1	1	1	1	1	0	2	3	20
	15 < R < 30 mm	5	3	1	2	0	3	1	0	0	1	1	2	19
	30 < R mm	6	4	3	4	1	1	0	0	1	0	2	3	25
1994	0 < R < 5 mm	2	0	5	5	0	1	1	2	0	0	6	2	24
	5 < R < 10 mm	2	5	1	2	0	0	0	1	0	0	2	3	16
	10 < R < 15 mm	4	3	0	1	1	0	0	0	0	2	2	1	14
	15 < R < 30 mm	6	5	9	3	2	0	0	0	0	1	1	4	31
	30 < R mm	9	2	8	2	0	0	0	0	0	1	5	6	33
1995	0 < R < 5 mm	9	6	1	2	3	10	0	0	0	1	6	3	41
	5 < R < 10 mm	2	1	5	5	2	2	0	0	0	3	0	4	24
	10 < R < 15 mm	1	2	3	1	1	2	0	0	0	1	4	2	17
	15 < R < 30 mm	2	5	5	1	1	3	0	0	1	2	6	6	32
	30 < R mm	6	4	6	0	3	2	0	0	1	0	4	8	34
1996	0 < R < 5 mm	7	3	4	4	3	1	3	2	2	9	4	4	46
	5 < R < 10 mm	4	0	3	2	1	2	1	2	1	4	5	6	31
	10 < R < 15 mm	1	2	4	2	1	1	1	1	0	1	1	5	20
	15 < R < 30 mm	8	11	4	1	1	0	0	1	1	4	4	3	38
	30 < R mm	2	9	4	0	1	0	0	1	1	1	2	5	26
AVERAGE	0 < R < 5 mm	4.5	2.3	2.8	2.3	2.1	2.6	0.9	1.5	1.1	2.4	3.5	3.1	29.1
	5 < R < 10 mm	2.1	2	3.1	2.4	1	0.9	0.6	0.8	0.6	1.8	2	3.5	20.8
	10 < R < 15 mm	2	2.8	2.1	2.1	1.2	0.9	0.5	0.4	0.5	1.2	2.2	1.8	17.7
	15 < R < 30 mm	4.2	5.3	3.9	2.3	1.1	1.6	0.3	0.4	0.5	1.9	3	3.8	28.3
	30 < R mm	6.5	4.8	4.6	2.3	1.8	0.7	0.3	0.4	0.6	0.6	2.8	6.3	31.7

Table 4.1.2 MONTHLY WORKABLE DAYS FOR CONSTRUCTION WORKS
[EARTH WORKS & FOUNDATION WORKS]

UNIT: day

Item	Month												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(1) Rainy Day & Suspended Day													
Calendar	31	28	31	30	31	30	31	31	30	31	30	31	365
5<R<10 mm : Rainy Day	2.1	2	3.1	2.4	1	0.9	0.6	0.8	0.6	1.8	2	3.5	20.8
: Suspended Day (Rainy Day x 0.0)	0	0	0	0	0	0	0	0	0	0	0	0	0.0
10<R<15 mm : Rainy Day	2	2.8	2.1	2.1	1.2	0.9	0.5	0.4	0.5	1.2	2.2	1.8	17.7
: Suspended Day (Rainy Day x 0.0)	0	0	0	0	0	0	0	0	0	0	0	0	0.0
15<R<30 mm : Rainy Day	4.2	5.3	3.9	2.3	1.1	1.6	0.3	0.4	0.5	1.9	3	3.8	28.3
: Suspended Day (Rainy Day x 1.0)	4.2	5.3	3.9	2.3	1.1	1.6	0.3	0.4	0.5	1.9	3	3.8	28.3
30 mm < : Rainy Day	6.5	4.8	4.6	2.3	1.8	0.7	0.3	0.4	0.6	0.6	2.8	6.3	31.7
: Suspended Day (Rainy Day x 2.0)	13	9.6	9.2	4.6	3.6	1.4	0.6	0.8	1.2	1.2	5.6	12.6	63.4
(2) Total of Rainy Day	14.8	14.9	13.7	9.1	5.1	4.1	1.7	2	2.2	5.5	10	15.4	98.5
(3) Total of Suspended Day	17.2	14.9	13.1	6.9	4.7	3	0.9	1.2	1.7	3.1	8.6	16.4	91.7
(4) Suspended Rate : (3)/(1)%	55.5	53.2	42.3	23.0	15.2	10.0	2.9	3.9	5.7	10.0	28.7	52.9	25.1
(5) Sunday & National Holiday	7	4	5	7	7	4	5	6	4	4	6	5	64.0
(6) Rainy Day in Sunday & National Holiday (5) x (4)	3.9	2.1	2.1	1.6	1.1	0.4	0.1	0.2	0.2	0.4	1.7	2.6	16.6
(7) Non Workable Day : (3)+(5)-(6)	20.3	16.8	16.0	12.3	10.6	6.6	5.8	7.0	5.5	6.7	12.9	18.8	139.1
(8) Workable Day : (1)-(7)	10.7	11.2	15.0	17.7	20.4	23.4	25.2	24.0	24.5	24.3	17.1	12.2	225.9
(9) Workable Rate : (8)/(1)%	34.5	40.1	48.4	59.0	65.7	78.0	81.4	77.5	81.8	78.4	57.1	39.5	61.9
(10) Applied Workable Day	11	11	15	18	20	23	25	24	25	24	17	12	225

Note: Data of average rainy day is given from 1987 to 1996 at Semarang Meteorological Station (BMG)

Table 4.1.3 **MONTHLY WORKABLE DAYS FOR CONSTRUCTION WORKS**
[CONCRETE WORKS & GATE INSTALLATION]

UNIT: day

Item	Month												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(1) Rainy Day & Suspended Day													
Calendar	31	28	31	30	31	30	31	31	30	31	30	31	365
5<R<10 mm : Rainy Day	2.1	2.0	3.1	2.4	1.0	0.9	0.6	0.8	0.6	1.8	2.0	3.5	20.8
: Suspended Day (Rainy Day x 0.0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10<R<15 mm : Rainy Day	2.0	2.8	2.1	2.1	1.2	0.9	0.5	0.4	0.5	1.2	2.2	1.8	17.7
: Suspended Day (Rainy Day x 0.0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15<R<30 mm : Rainy Day	4.2	5.3	3.9	2.3	1.1	1.6	0.3	0.4	0.5	1.9	3.0	3.8	28.3
: Suspended Day (Rainy Day x 1.0)	4.2	5.3	3.9	2.3	1.1	1.6	0.3	0.4	0.5	1.9	3.0	3.8	28.3
30 mm < : Rainy Day	6.5	4.8	4.6	2.3	1.8	0.7	0.3	0.4	0.6	0.6	2.8	6.3	31.7
: Suspended Day (Rainy Day x 2.0)	6.5	4.8	4.6	2.3	1.8	0.7	0.3	0.4	0.6	0.6	2.8	6.3	31.7
(2) Total of Rainy Day	14.8	14.9	13.7	9.1	5.1	4.1	1.7	2.0	2.2	5.5	10.0	15.4	98.5
(3) Total of Suspended Day	10.7	10.1	8.5	4.6	2.9	2.3	0.6	0.8	1.1	2.5	5.8	10.1	60.0
(4) Suspended Rate : (3)/(1)%	34.5	36.1	27.4	15.3	9.4	7.7	1.9	2.6	3.7	8.1	19.3	32.6	16.4
(5) Sunday & National Holiday	7.0	4.0	5.0	7.0	7.0	4.0	5.0	6.0	4.0	4.0	6.0	5.0	64.0
(6) Rainy Day in Sunday & National Holiday (5) x (4)	2.4	1.4	1.4	1.1	0.7	0.3	0.0	0.2	0.1	0.3	1.2	1.6	10.7
(7) Non Workable Day : (3)+(5)-(6)	15.3	12.7	12.1	10.5	9.2	6.0	5.6	6.6	5.0	6.2	10.6	13.5	113.3
(8) Workable Day : (1)-(7)	15.7	15.3	18.9	19.5	21.8	24.0	25.4	24.4	25.0	24.8	19.4	17.5	251.7
(9) Workable Rate : (8)/(1)%	50.7	54.8	60.9	64.9	70.2	80.0	81.9	78.6	83.5	80.1	64.5	56.5	69.0
(10) Applied Workable Day	16	15	19	20	22	24	25	24	25	25	19	18	252

Note: Data of average rainy day is given from 1987 to 1996 at Semarang Meteorological Station (BMG)

Table 4.1.4 WORKABLE DAYS

Work Items	Precipitation	Suspension	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Earth Works	R ≥ 15 mm/day	one(1) day suspension	11	11	15	18	20	23	25	24	25	24	17	12	225
Foundation Works	R ≥ 30 mm/day	two(2) day suspension													
Concrete Works	R ≥ 15 mm/day	one(1) day suspension	16	15	19	20	22	24	25	24	25	25	19	18	252
Gate Installation															

Table 4.1.5 SEASONAL WORKABLE DAYS

Work Items	Dry Season (Apr. ~ Nov.)	Rainy Season (Dec. ~ Mar.)	Through a year
Earth Works	$^{176\ days}/_{8\ mth} = 22$ days / mth	$^{49\ days}/_{4\ mth} = 12$ days / mth	$^{225\ days}/_{year} = 18$ days / mth
Foundation Works			
Concrete Works	$^{184\ days}/_{8\ mth} = 23$ days / mth	$^{68\ days}/4_{mth} = 17$ days / mth	$^{252\ days}/_{4\ year} = 21$ days / mth
Gate Installation			

Table 4.2.1 CONSTRUCTION TIME SCHEDULE OF WEST FLOODWAY/ GARANG RIVER IMPROVEMENT

Work Item	Unit	Quantity
1. West Floodway Improvemen		
Clearing and Grubbing	m^2	105,900
Dredging	m^3	163,000
Excavation	m^3	694,000
Filling on Floodplain	m^3	36,300
Earth Dike Embankment	m^3	20,900
Raising of Existing Floodwall	m	4,970
Revetment	m	4,000
Waterfront Facilities	L.S	1
Drainage Outlet	L.S	1
Protection Works for Bridge Pier	L.S	1
2. Garang River Improvement		
Clearing and Grubbing	m^2	17,100
Excavation	m^3	395,000
Filling of Channel and Floodplain	m^3	5,800
Earth Dike Embankment	m^3	5,800
Floodwall	m	160
Revetment	m	2,500
Ground Sill (WF 124)	L.S	1
Ground Sill (WF 176)	L.S	1
Waterfront Facilities	L.S	1
Sluiceway	L.S	1
Drainage Outlet	L.S	1
Protection Works for Bridge Pier	L.S	1

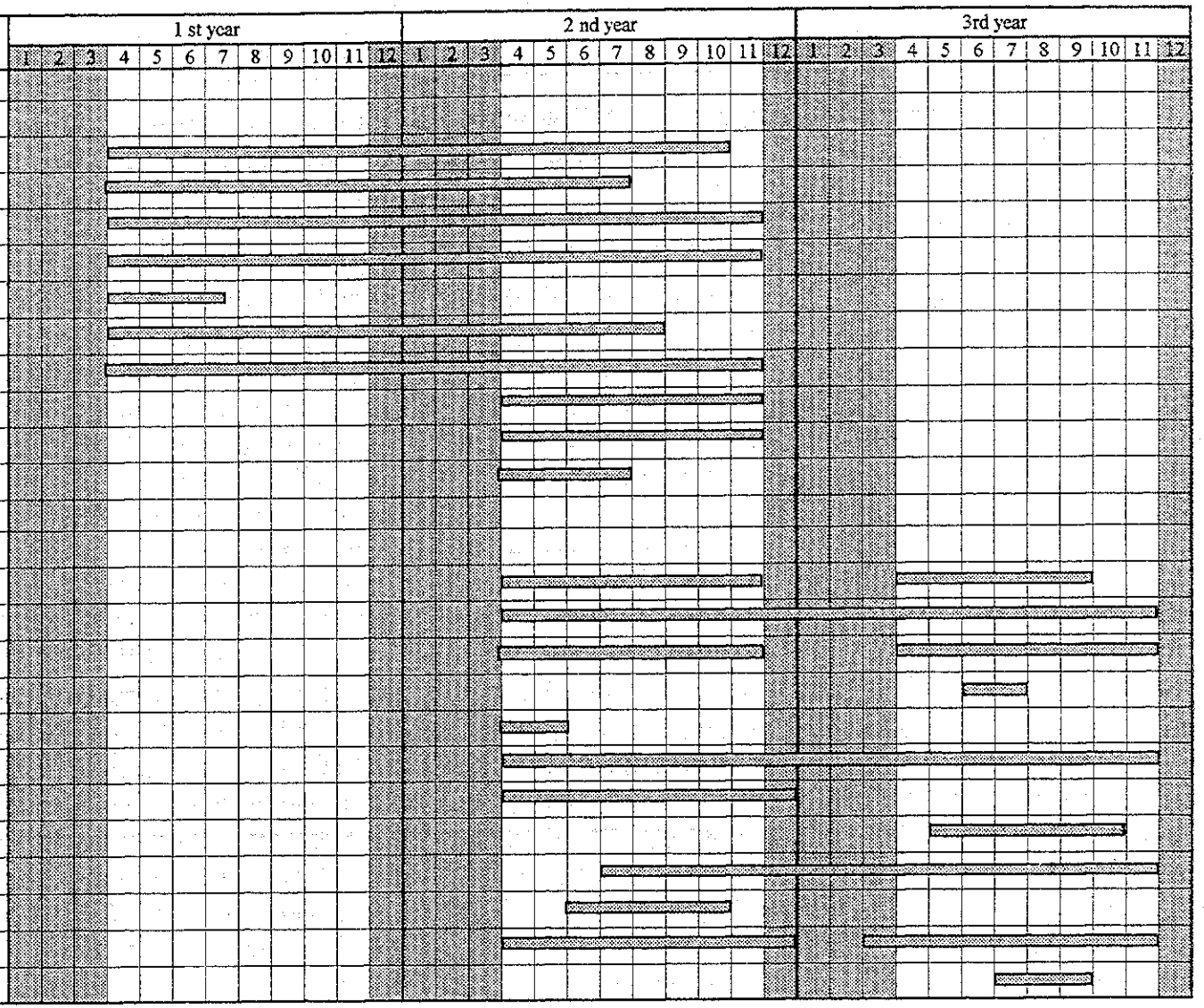


Table 4.2.2 MOBILIZATION AND DEMOBILIZATION OF EQUIPMENT AND FACILITIES (WEST FLOODWAY/GARANG RIVER)

No.	Construction Equipment	Capacity / Specification	1 st year												2 nd year												3rd year												TOTAL
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
01	Bulldozer A	15 ton				3	3	3	3	3	3	3	3	2	2	3	2	6	7	5	5	7	7	6	4	2	2	2	2	3	3	3	3	3	3	3	2	0	111
02	Bulldozer B	21 ton				1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
03	Backhoe A	0.20 m^3				5	5	5	5	5	5	5	5	5	5	5	5	5	6	5	6	5	5	4	5	0	0	0	0	0	1	0	0	1	0	0	1	0	104
04	Backhoe B	0.35 m^3				10	11	9	10	8	8	13	13	12	13	13	13	26	26	25	27	27	25	25	16	10	9	9	9	10	10	10	11	10	9	7	6	0	440
05	Backhoe C	0.60 m^3				0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	1	2	3	2	0	1	0	0	11
06	Giant Breaker	600/800 kg				0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	2	2	2	0	0	0	0	7
07	Clmshell Grubbing	1.0 m^3				2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
08	Pontoon	200 ton				2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
09	Barge	100 m^3				4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	64
10	Tug Boat	15 ton				2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
11	Dump Truck	10 ton				21	23	33	33	33	33	55	50	50	55	50	55	106	100	106	100	108	104	104	66	45	45	45	45	49	50	45	45	44	31	29	29	0	1,787
12	Truck with Crane A	4 ton				2	2	2	2	2	2	2	2	2	2	2	2	7	7	6	6	7	6	6	6	2	2	2	1	2	3	2	3	3	3	3	2	0	103
13	Clamshell bucket with Crane	0.60 m^3				0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
14	Crawler Crane A	40 ton				0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	0	2	2	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	13
15	Vibratary Pile Driver	30 kw				0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	2	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	8
16	Portable Concrete Mixer A	0.5 m^3				1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	4	4	4	4	1	1	1	1	2	2	2	2	2	2	2	2	0	64
17	Tamper	60/100 kg				8	8	8	8	8	8	8	8	8	8	8	8	11	12	11	12	11	11	10	11	3	3	4	4	4	5	4	4	5	4	4	5	0	234
18	Vibrating Roller B	10 ton				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	0	0	7
19	Tire Roller	8/12 ton				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	0	8
20	Motor Grader	2.8 m				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	0	0	7
21	Welding Machine Alternating	250 AMP				2	2	2	2	2	2	2	2	2	2	2	2	4	4	4	6	4	4	4	6	2	2	2	2	2	2	2	2	2	2	2	2	0	84
22	Air Compressor					2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34

Table 4.2.3 CONSTRUCTION TIME SCHEDULE OF RECONSTRUCTION OF SIMONGAN WEIR

Work Item	Unit	Quantity	1 st year												2 nd year												3rd year											
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1. Preparation Works	L.S	1																																				
2. Simongang Weir																																						
Coffering and Dewatering	L.S	1																																				
Relocation of Parts of Existing Weir	L.S	1																																				
Demolition and Excavation	m^3	66,400																																				
Filling and Embankment	m^3	14,200																																				
Foundation P.C.Pile, L=12m	pcs	680																																				
Steel Sheet Pile anc P.C. Sheet Pile	m	8,100																																				
Concrete	m^3	11,700																																				
Gate Works	L.S	1																																				
Retaining Wall and Revetment	L.S	1																																				
Bridge	L.S	1																																				
Control House	L.S	1																																				

Table 4.2.4 MOBILIZATION AND DEMOBILIZATION OF EQUIPMENT AND FACILITIES (SIMONGAN WEIR)

No.	Construction Equipment	Capacity/ Specification	1 st year											2 nd year											3rd year											TOTAL
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
01	Bulldozer A	15 ton		1	1	1	0	2	0	0	0	0	0	0	0	1	1	1	1	0	1.5	0.5	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	14
02	Backhoe A	0.20 m^3				0	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	13
03	Backhoe B	0.35 m^3		1	1	2	3	2	0	1	1	1	2	0	0	1	1	1	2	1	1.5	0.5	0	1	2	1	0	0	1	1	1	1	0	0	1	0	0	32
04	Backhoe C	0.60 m^3				0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
05	Giant Breaker	600/800 kg				0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
06	Dump Truck	10 ton		2	2	3	15	7	1	2	2	2	4	0	0	2	2	2	9	7	8	1	1	2	4	2	0	0	2	2	2	2	2	0	0	2	0	0	92
07	Ordinary Truck	10 ton		0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
08	Truck with Crane A	4 ton		0	1	1	0	2	3	2	3	2	3	2	1	2	2	1	1	0	1	1	1	1	1	0	0	0	0	0	1	2	1	1	2	1	0	0	39
09	Truck with Crane B	6 ton				2	2	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
10	Clamshell bucketwith Crane	0.60 m^3				1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4
11	Truck Crane A	20 ton				0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	6
12	Truck Crane B	25 ton				0	0	0	1	1	2	1.5	1	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	2	1	1.5	1.5	0	0	0	16.5
13	Crawler Crane A	40 ton		0	1	1	0	1	2	0	1	0	1	0	0	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	17
14	Crawler Crane B	50 ton				0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.5	0	0	1.5
15	Pille Driver	40 ton				0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
16	Vibratary Pile Driver	30 kw		0	1	1	0	1	2	0	1	0	1	0	0	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	17
17	Portable Concrete Mixer A	0.5 m^3				0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	13
18	Tamper	60/100 kg				1	2	2	1	2	2	2	2	0	0	0	0	0	0	0	1	1.5	1.5	1	2	2	1	0	0	0	0	1	1	1	0	0	0	0	27
19	Wire Sawing Machine	700 w				2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
20	Wall Sawing Machine	520 w				2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
21	Welding Machine Alternating	250 AMP				0	0	0	3	3	3	5	5	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	3	3	0	5	5	0	0	41
22	Welding Machine Direct-current	250 AMP				0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	4
23	Engine Welder	250 AMP				0	0	0	0	0	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	0	0	14
24	Diesel Engine Generator A	125 KVA				0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	7
25	Air Compressor	9 m^3				0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	0	1	1	0	0	10