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FINAL REPORT

Micro Hydro Power (MHP) Alasa

Fulolo Village, Alasa Sub-district, Nias District, North Sumatra Province, Indonesia

Prepared for :

The United Nations Industrial Development Organization (UNIDO)

June 2009

23703

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A. INTRODUCTION & OVERVIEW

1. Background

1.1 The Project

In the meeting with the UNIDO delegation held in Gunung Sitoli, Nias, on July 13, 2005, the Head of the district known as BUPATI of Nias stated that despite 60 years of independence, still electricity supply in the island only covers 45 percent of the population. For this reason, the Bupati strongly endorsed the proposed micro hydro power (MHP) project in the island and offered all local support.

In lieu of the above, UNIDO requested PT. Entec Indonesia, an engineering consultant specializing in micro/mini hydro power, to conduct a study in order to explore the possibility of finding potential sites in Nias Island. Between 18th – 29th October 2005, PT. Entec Indonesia undertook site visits to some potential sites in Nias island, and Sawang sub-district in North Aceh district, Nanggroe Aceh Darussalam (NAD) Province. Selection of potential project sites was based on information and suggestion by the local government and institutions, namely: Agency for Rehabilitation and Reconstruction for Aceh and Nias (BRR), State Electricity Company (PLN), World Bank, Directorate Irrigation and Water Resource and Meteorology and Geophysics Agency (BMG).

Finally, based on the visit and report, PT. Entec Indonesia, UNIDO and BRR conducted the second site visit in Nias Island in the beginning of February 2006. The objective of this visit was to prepare detailed feasibility study of micro hydro power development through the exploitation of water resources in river Alasa for rural electrification in Fulolo village.

1.2 The Contracts

The implementation of the Micro Hydro Power (MHP) Alasa in Fulolo village was carried out under 3 (three) different contracts. These contract assignments are presented in the following table:

This final report only focuses on item no.1; contract no.: 16001191, UNIDO Project No.: XP/INS/05/005, dated: 2nd August 2006 which was signed between UNIDO-Headquarters in Vienna and PT. Heksa Prakarsa Teknik in Bandung.

1.3 Participating Institutions and Companies

Several institutions and companies were involved in the development of micro hydro power project in Fulolo, village, Alasa sub-district, Nias district. These are:

United Nations Industrial Development Organization (UNIDO) of which Representative Office is located Jakarta, was the initiator of the micro hydro power plant development in Nias island and provided financial support for the project.

Agency for Rehabilitation and Reconstruction of Aceh and Nias (BRR). BRR has a representative office in Nias island, and also provided financial support for the remaining parts of civil works (headrace structure) and the transmission lines works.

PT. Entec Indonesia which is located in Bandung, was assigned as a consultant a responsible for supervising and monitoring the implementation of Alasa MHP.

PT. Heksa Prakarsa Teknik which is located in Bandung, was assigned as a contractor for the implementation of Alasa MHP and was responsible for the civil works, supply of the electro-mechanical equipment and transmission lines installation.

Finally, Committee for the Acceleration of the Village Settlement and Infrastructure Development (Komite Percepatan Pengembangan Pemukiman dan Prasarana Desa - KP4D). This local institution, was established by UNIDO and BRR. The objective of KP4D establishment was to ensure smooth and successful implementation of Alasa MHP project, including problem solving for the non technical/social problems.

2. Project Description

2.1 Project Location

Micro Hydro Power (MHP) Alasa is located in Fulolo village in Nias island which is located in the western part of Sumatra island. The village belongs to the Alasa sub-district, Nias district, North Sumatra Province. The village is laid at an altitude of 60 – 220 m above sea level and about 40 km west of Gunung Sitoli or 2.5 hours car drive from Gunung Sitoli, the capital city of Nias district.

2.2 Project Objective

The objective of the MHP project was to provide rural community in Fulolo village with opportunity for improving their livelihood through productive use of electricity for greater economic benefits.

2.3 Project Design

The micro hydro power plant was designed to exploit the river Alasa of which catchment area is approximately 5.9 km^2 and the mean annual rainfall is 2,799 mm (year between 2000 and 2004).

By utilizing the discharge 270 l/s from the river Alasa and net head about 23 m, the output capacity was designed to be about 40 kW (assuming the total plant factor is 67%). The power output was expected to cover the current and the future power demand in Fulolo village.

2.4 Project Measures

The proposed hydro power project under this contract includes the following measures:

a. Construction of intake area;
b. Construction of sand trap area;
c. Construction of forebay area; and
d. Construction of power house, including tailrace and protection wall.

A detailed civil works of the micro hydro power scheme are presented in the following sections:

a. Weir and Intake

The intake structures comprise a cyclopean concrete weir body of 8.32 m wide, a flushing opening, an intake orifice and a side wall out of stone masonry on the right river bank, preventing water from bypassing the weir. The actual intake section of the weir is 2.87 m wide. At the end of January 2008 the crest elevation of the weir was increased by 15 cm to allow increased inflow to the water conveyance structure;

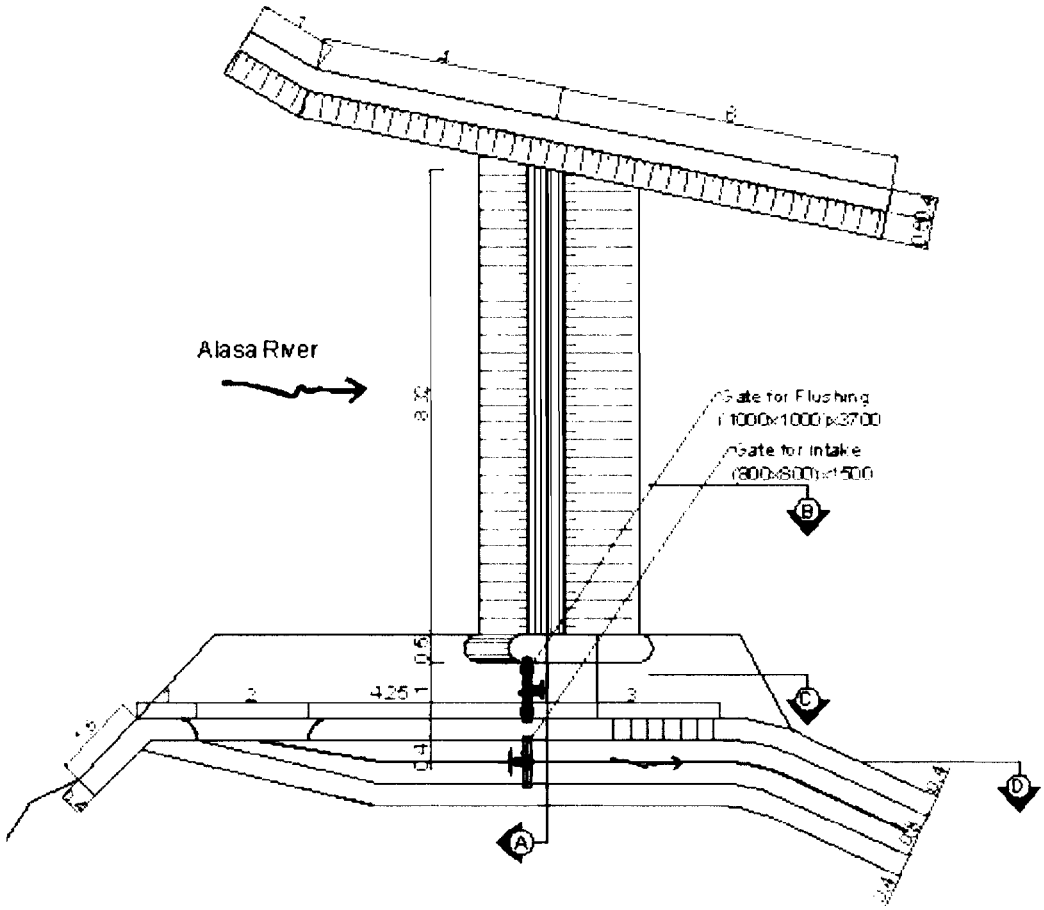


Figure 1 : *Layout of Weir & Intake structures at the Alasa river*

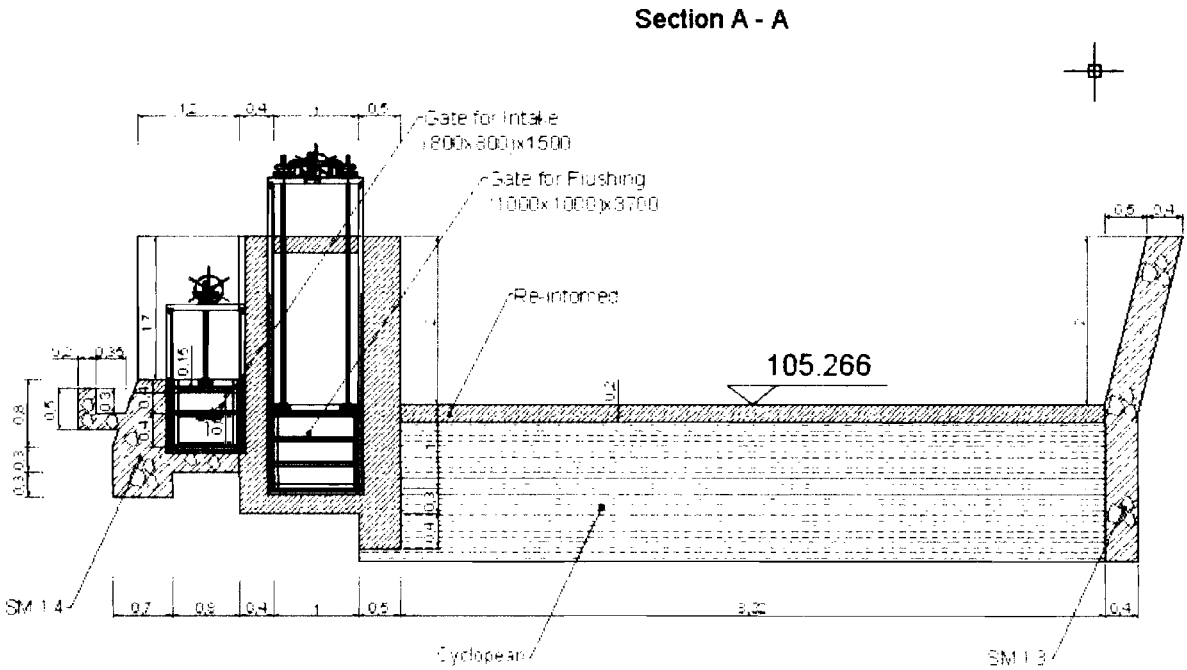


Figure 2 : *Cross-section A-A of the Weir & Intake structures*

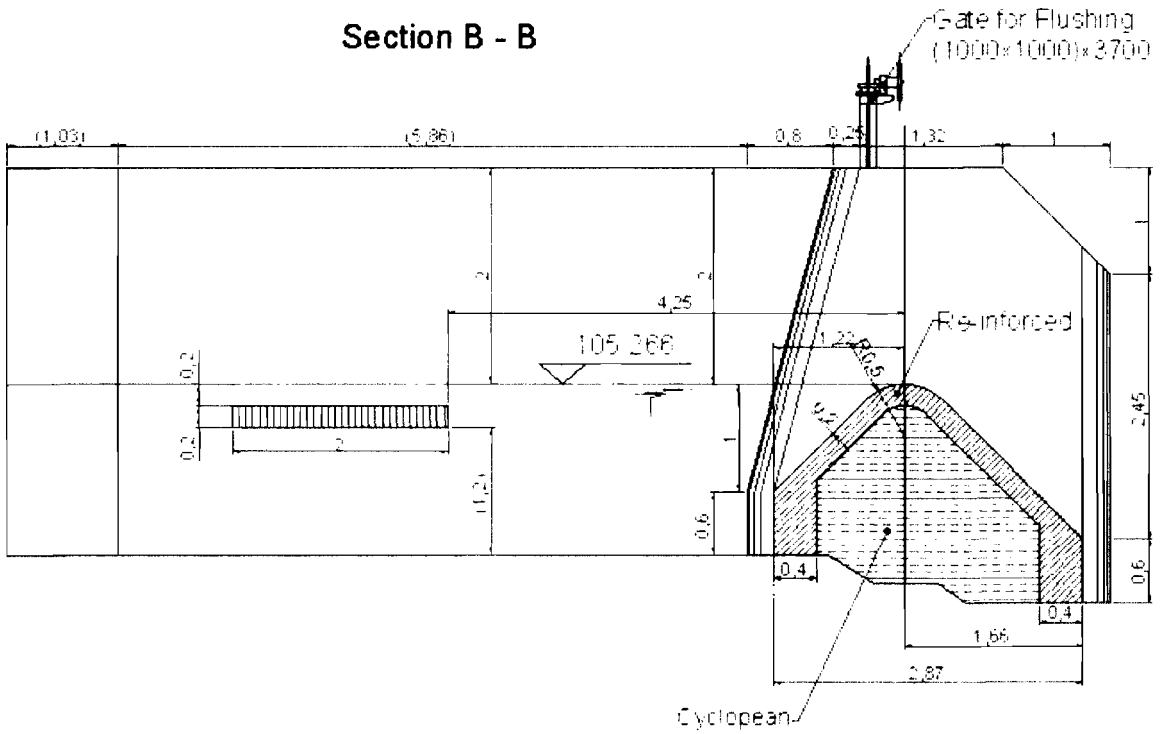


Figure 3 : *Cross-section B-B of the Weir & Intake structures*

b. Sand Trap

The sand trap is located on the right riverbank directly after the intake. The basin is 8 m long and 2 m wide (inside dimensions) and lined with stone masonry. The purpose of the sand trap is to let fine particles in the water (i.e. sand) settle in the basin rather than in the conveyance and forebay structures. On the left side of the basin there is a side spillway with a crest length of 6.5 m. The upper edge of the crest is 0.1 m lower than the crest of the weir at the intake. With this arrangement, excess water will first flow over the spillway at the sand trap, and only then over the spillway at the weir. At the back end of the sand trap there is a sluice gate at the bottom of the basin, allowing to periodically flushing the settled sediments out of the basin, over the spillway and into the river again. At the end of January 2008 the crest elevation of the sand trap was increased by 15 cm to increase the possible inflow to the headrace channel during the wet season;

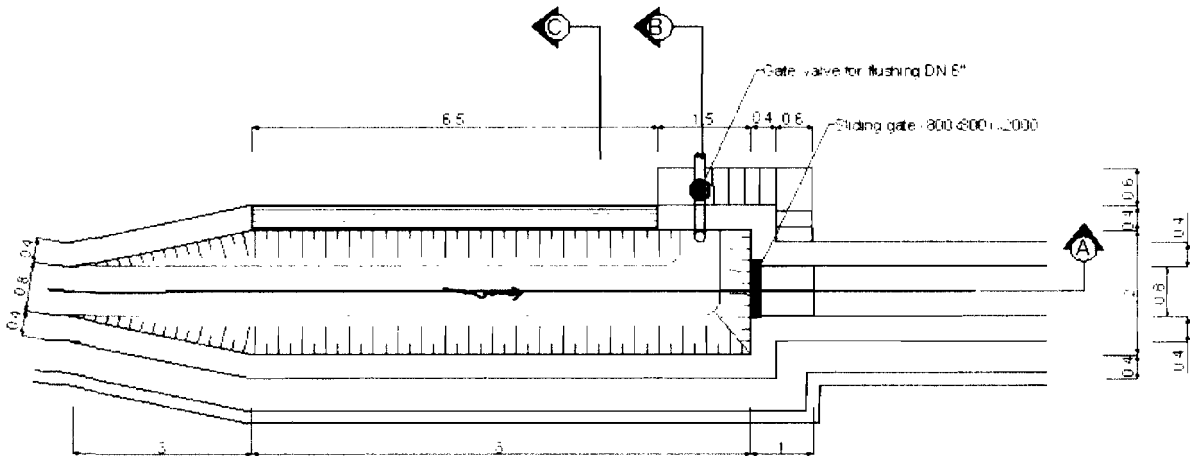
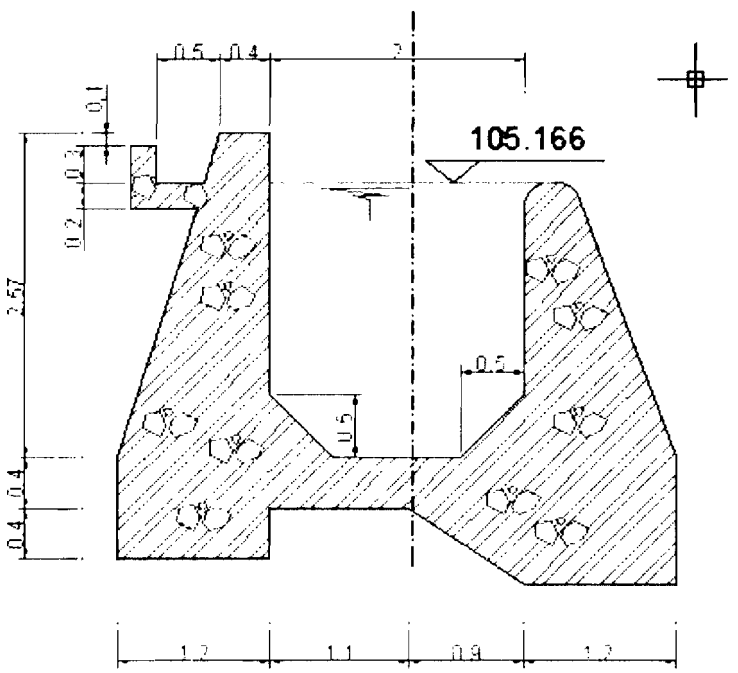


Figure 4 : *Situation of the Sand Trap*



Section B - **B**

Figure 5 : *Cross-section of the Sand Ttrap*

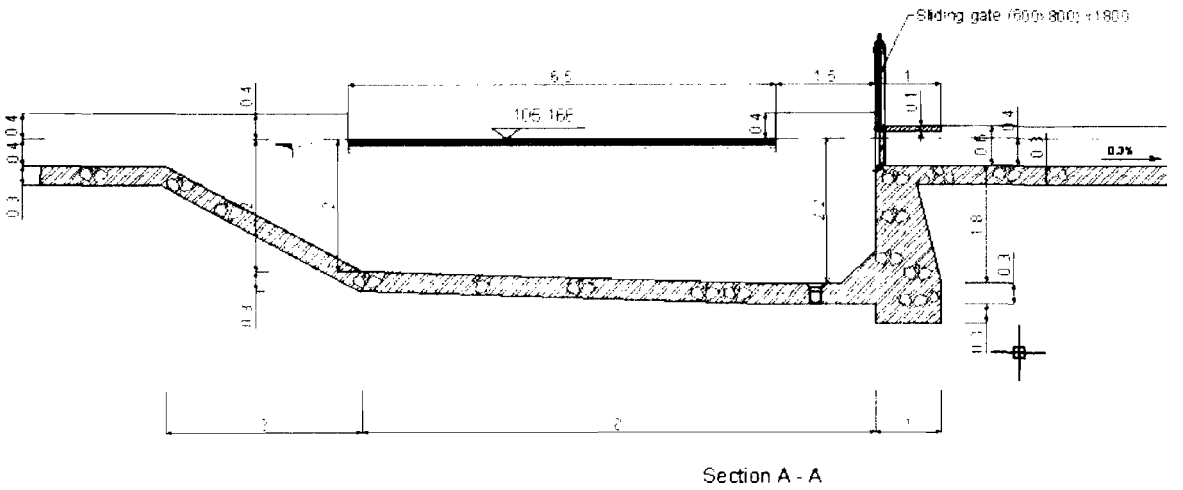


Figure 6 : *Long-section of the Sand Trap*

c. Forebay

The forebay is located at the end of the headrace channel, on the right side of the river. The size of the forebay is 3 m wide and 8 m long, including the intake structure to the penstock. The spillway conveying surplus water to the river is made from a masonry flume;

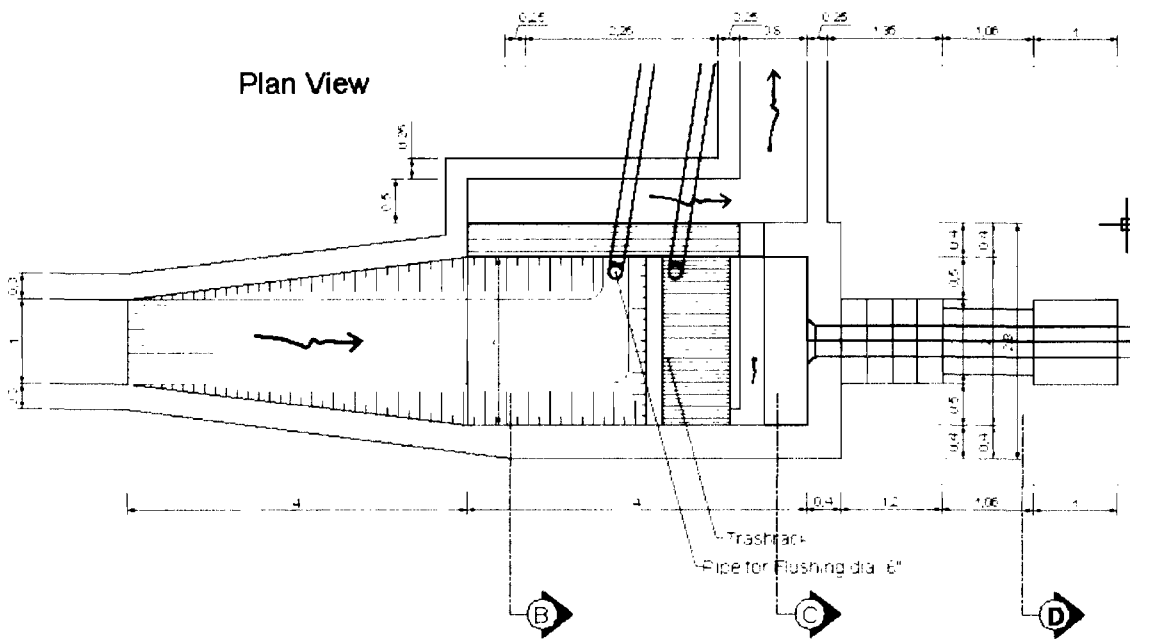


Figure 7 : *Situation of the Forebay*

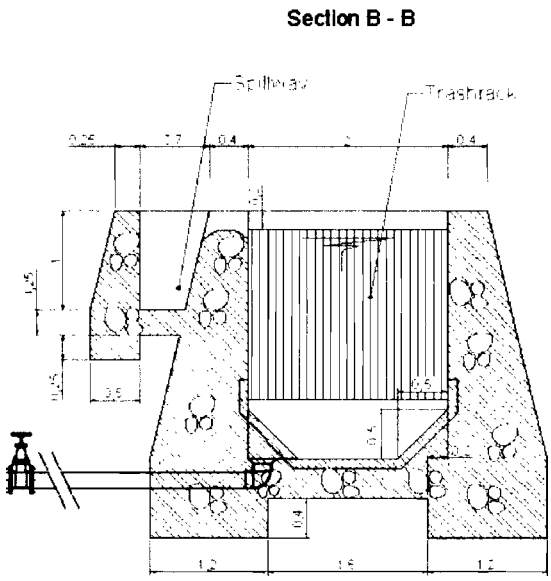


Figure 8 : *Cross-section of the Forebay*

d. Penstock

The total penstock length is 70.6 m. There are three bends with angles of 11.09°, 20.21° and 148.70° after 3.1 m, 40, 26.4 m and 1.1 respectively. The prefabricated steel pipe has an internal diameter of 380 mm and flanged pipes are welded on site. There are two expansion joints after the anchor block. The penstock is supported by 3 anchor blocks out of stone masonry (every 6 m).

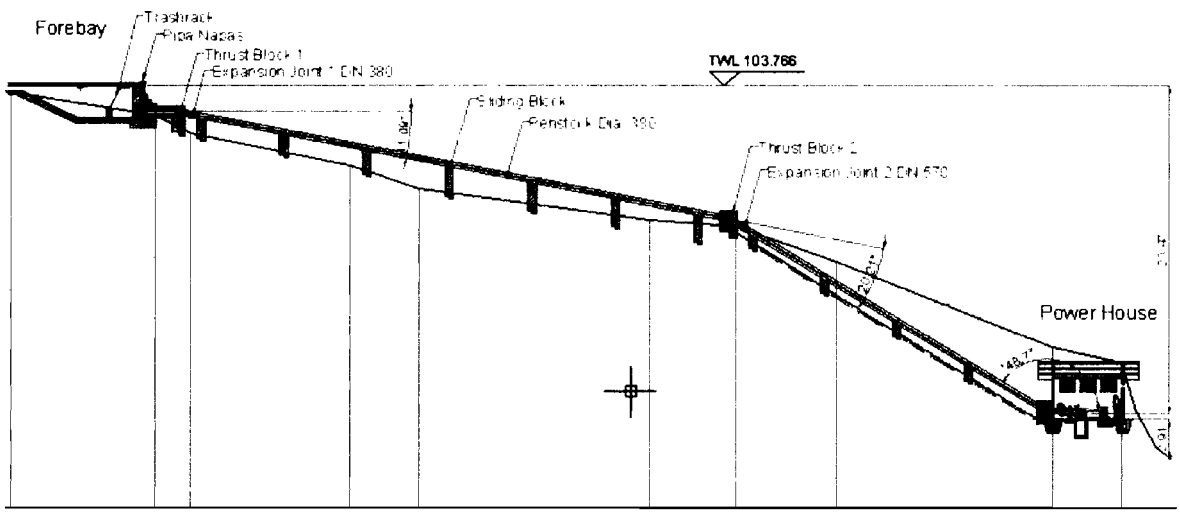


Figure 9 : *Long-section of the Penstock*

e. Power House

The powerhouse is located on the right side of the river Alasa and has a reinforced concrete base with a ground size of 4 x 5 m and brick walls. The total length of the tailrace structure conveying the water from the powerhouse back into the river is 4 m;

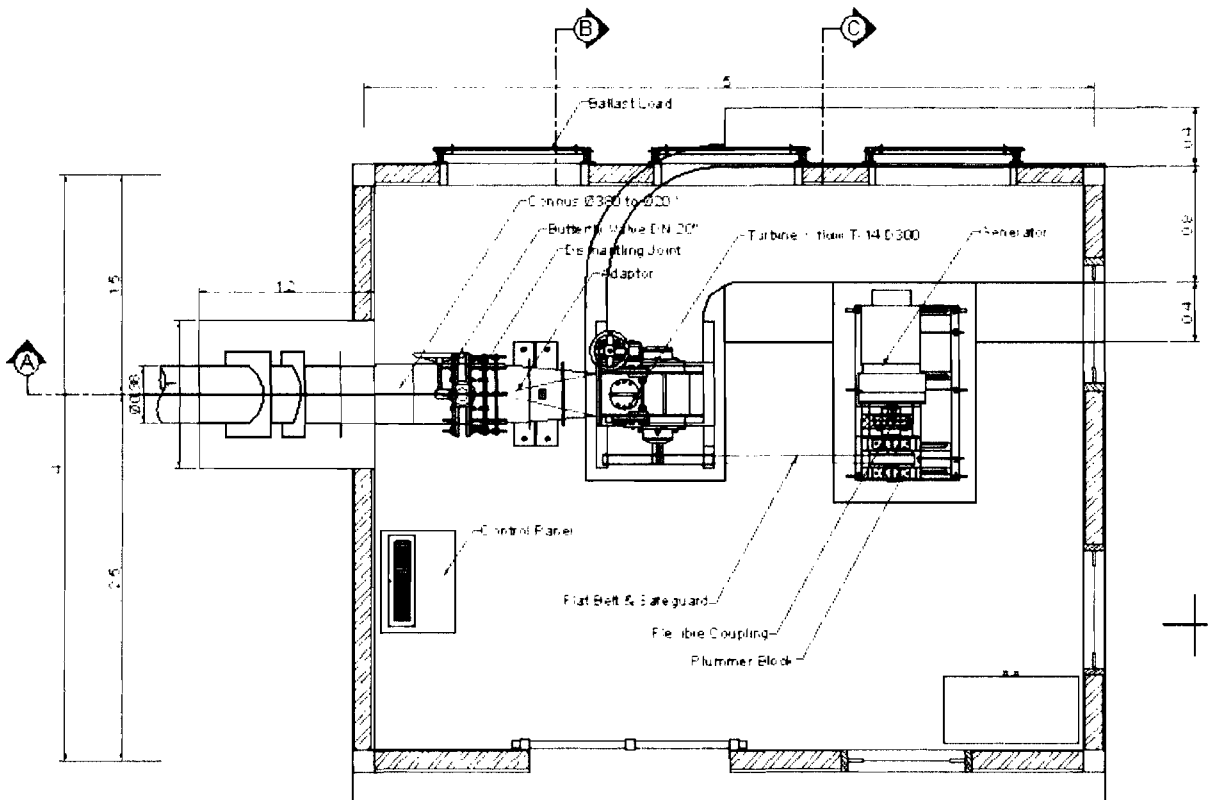


Figure 10 : *Situation of the Power House*

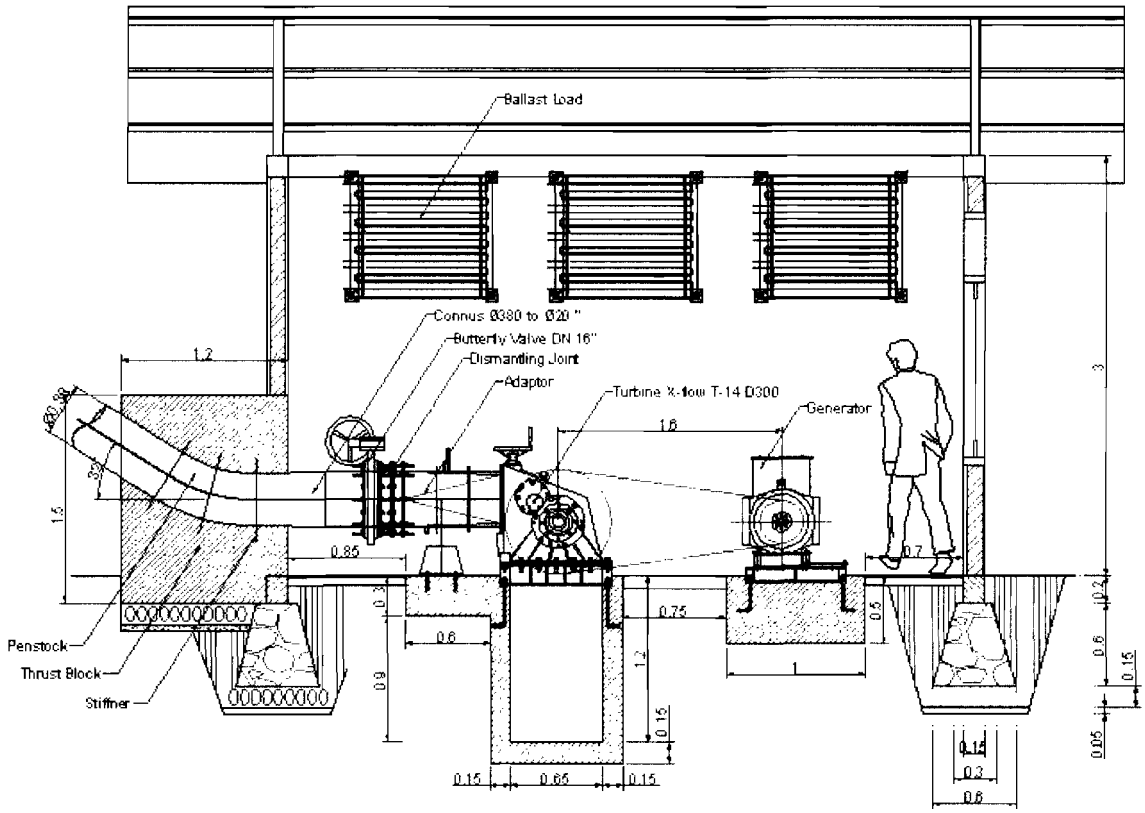


Figure 11 : *Cross-section of the Power House*

B. PROJECT REPORT

1. Project Cost

The cost for the implementation of the civil works for micro hydro power scheme at the Fulolo village is summarized below:

Bill of Quantity (P= 40 kW, Qd = 270 l/s)		1 USD = 9,200 IDR	
NO.	DESCRIPTION	TOTAL PRICE [IDR]	TOTAL PRICE [USD]
	Summary		
A	Civil works	391,446,000	42,549
	Total Project Cost (Rupiah)	391,446,000	42,549
A	**Civil works**		
1	Intake	59,960,615	6,517.46
2	Sand Trap	54,120,442	5,882.66
3	Fore bay dan Spillway	51,181,129	5,563.17
4	Penstock dia. 380 mm	163,649,646	17,788.01
5	Power House Ukuaran 4 m x 5 m	48,399,341	5,260.80
6	Tail Race	7,397,994	804.13
7	Protection Wall	6,735,838	732.16
	Total Section A: Civil works	**391,446,000**	**42,549.00**

Table 1 : *Cost estimate of civil works*

Meanwhile, the overall cost for the micro hydro power scheme is provided below:

Bill of Quantity (P= 40 kW, Qd = 270 l/s)		I USD = 9,200 IDR	
NO.	DESCRIPTION	TOTAL PRICE [IDR]	TOTAL PRICE [USD]
	Summary		
A	Civil Works	1,040,116,000	113,056
B	Electro-Mechanical Equipment	248,750,000	27,038
C	Transmission Lines, LV 220/380 V	326,272,000	35,464
D	Land Acquisition	50,000,000	5,435
E	Supervision of Construction	199,817,000	21,719
F	Contingencies	174,059,000	18,919
		2,039,014,000	221,632

Table 2 : *Cost estimate for the micro hydro power scheme*

2. Term of Payment

So far contractor already received payment in the amount of US$ 30,000 (Thirty thousand United States Dollar from UNIDO under the contract. The total payment which has been received by contractor is presented in the following table:

Phase	Date	Description	Percentage [%]	Price [USD]
I	August 4, 2006	Down Payment (DP)	9.4	4,000.00
II	April 30, 2008	Second payment	61	26,000.00

Table 3 : *The phase of payment*

3. Milestone

NO.	ITEMS	SCHEDULE	ACTUAL
1.	**Contract Signing**		August 2, 2006
2.	**Intake**		
	Excavation start	August 7, 2006	September 18, 2006
	Excavation finish	August 19, 2006	November 30,2006
	Intake structure start	August 21, 2006	January 8, 2007
	Intake structure finish	September 9, 2006	March 16, 2007
3.	**Sand Trap**		
	Excavation start	August 14, 2006	August 16, 2006
	Excavation finish	August 24, 2006	September 16, 2006
	Sand Trap structure start	August 25, 2006	September 18, 2006
	Sand Trap structure finish	September 16, 2006	November 30, 2006
4.	**Forebay**		
	Excavation start	August 14, 2006	August 16, 2006
	Excavation finish	August 22, 2006	August 31, 2006
	Forebay structure start	August 23, 2006	September 4, 2006
	Forebay structure finish	September 9, 2006	November 20, 2006
5.	**Penstock**		
	Penstock arrival on site	September 12, 2006	October 22, 2006
	Pipe welding start	September 13, 2006	October 28, 2006
	Pipe welding finish	September 16, 2006	November 13, 2006
	Excavation start	September 13, 2006	November 1, 2006
	Excavation finish	September 16, 2006	November 20, 2006
	Penstock erection start	September 18, 2006	November 6, 2006
	Penstock erection finish	October 4, 2006	November 25, 2006
	Finishing	October 7, 2006	November 30, 2006
5.	**Power House & Protection Wall**		
	Excavation start	September 25, 2006	August 16, 2006
	Excavation finish	September 30, 2006	December 9, 2006

	PH structure start	October 2, 2006	December 11, 2006
	PH structure finish	October 21, 2006	January 29, 2006
	Protection wall start	October 6, 2006	February 12, 2007
	Protection wall finish	October 14, 2006	March 5, 2007
	Finishing	October 31, 2006	March 12, 2007

4. Progress Report

A detailed progress for the implementation of the civil works is as follows:

4.1 August 2006

Month : August 2006

NO.	DESCRIPTION	QTY	UNIT	PERCENTAGE [%]	THIS MONTH		LAST MONTH		TOTAL	
					QTY	PERCENTAGE	QTY	PERCENTAGE	QTY	PERCENTAGE
A	**Civil Works**									
1	**Intake**									
1.1	Galian tanah	35	m3	0.13	0.00	0.00			0.00	0.00
1.2	Galian batu	6	m3	0.22	0.00	0.00			0.00	0.00
1.3	Urugan tanah	5	m3	0.01	0.00	0.00			0.00	0.00
1.4	Urugan pasir	5	m3	0.23	0.00	0.00			0.00	0.00
1.5	Pasangan batu kosong	12.5	m3	0.18	0.00	0.00			0.00	0.00
1.6	Lean concrete	2	m3	0.29	0.00	0.00			0.00	0.00
1.7	Concrete Class C	17	m3	3.46	0.00	0.00			0.00	0.00
1.8	Tulangan beton U-24	1440	kg	3.99	0.00	0.00			0.00	0.00
1.9	Cetakan beton	120	m2	2.22	0.00	0.00			0.00	0.00
1.10	Pasangan batu kali 1:4	27	m3	3.17	0.00	0.00			0.00	0.00
1.11	Plesteran 1:5	45	m2	0.38	0.00	0.00			0.00	0.00
1.12	Sluice gate (800x1000)x2000	1	Set	1.58	0.00	0.00			0.00	0.00
1.13	Coarse trash rack 2x0.2	1	Set	0.20	0.00	0.00			0.00	0.00
				16.06						
2	**Sand Trap**									
2.1	Galian tanah	99.7	m3	0.38	99.70	0.38			99.70	0.38
2.2	Galian batu	10	m3	0.36	2.00	0.07			2.00	0.07
2.3	Urugan tanah	10	m3	0.02	0.00	0.00			0.00	0.00
2.4	Urugan pasir	5	m3	0.23	0.00	0.00			0.00	0.00
2.5	Pasangan batu kosong	15	m3	0.21	0.00	0.00			0.00	0.00
2.6	Lean concrete	1	m3	0.15	0.00	0.00			0.00	0.00
2.7	Concrete Class C	0.22	m3	0.04	0.00	0.00			0.00	0.00
2.8	Tulangan beton U-24	22	kg	0.06	0.00	0.00			0.00	0.00
2.9	Cetakan beton	1.1	m2	0.02	0.00	0.00			0.00	0.00
2.10	Pasangan batu kali 1:4	82	m3	9.62	0.00	0.00			0.00	0.00
2.11	Plesteran 1:2	95	m2	1.05	0.00	0.00			0.00	0.00
2.12	Control gate (800x800)2000	1	Set	1.55	0.00	0.00			0.00	0.00
2.13	Gate Valve for flushing DN 6"	1	Set	0.80	0.00	0.00			0.00	0.00
				14.49						

3	**Fore bay dan Spillway**									
3.1	Galian tanah	58	m3	0.22	58.00	0.22			58.00	0.22
3.2	Galian batu	3	m3	0.11	3.00	0.11			3.00	0.11
3.3	Urugan tanah	10	m3	0.02	0.00	0.00			0.00	0.00
3.4	Urugan pasir	3.9	m3	0.18	0.00	0.00			0.00	0.00
3.5	Pasangan batu kosong	9.75	m3	0.14	0.00	0.00			0.00	0.00
3.6	Lean concrete	0.5	m3	0.07	0.00	0.00			0.00	0.00
3.7	Concrete Class C	3.5	m3	0.71	0.00	0.00			0.00	0.00
3.8	Tulangan beton U-24	410	kg	1.14	0.00	0.00			0.00	0.00
3.9	Cetakan beton	25	m2	0.46	0.00	0.00			0.00	0.00
3.10	Pasangan batu kali 1:4	47	m3	5.51	0.00	0.00			0.00	0.00
3.11	Plesteran 1:2	68.5	m2	0.75	0.00	0.00			0.00	0.00
3.12	PVC pipe dia=6 " for flushing	24	m	0.96	0.00	0.00			0.00	0.00
3.13	PVC bend dia=6" for flushing	2	Set	0.21	0.00	0.00			0.00	0.00
3.14	Gate valve dia=6" for flushing	2	Set	1.61	0.00	0.00			0.00	0.00
3.15	Fine trashrack, dimensions = 1 m x 2 m	2	Set	1.61	0.00	0.00			0.00	0.00
				13.71						
4	**Penstock dia. 380 mm**									
4.1	Galian tanah	8.50	m3	0.03	0.00	0.00			0.00	0.00
4.2	Galian batu	1.00	m3	0.04	0.00	0.00			0.00	0.00
4.3	Urugan tanah	1.80	m3	0.00	0.00	0.00			0.00	0.00
4.4	Urugan pasir	0.20	m3	0.01	0.00	0.00			0.00	0.00
4.5	Pasangan batu kosong	0.40	m3	0.01	0.00	0.00			0.00	0.00
4.6	Lean concrete	0.80	m3	0.12	0.00	0.00			0.00	0.00
4.7	Concrete Class C	2.70	m3	0.55	0.00	0.00			0.00	0.00
4.8	Tulangan beton U-24	156.00	kg	0.43	0.00	0.00			0.00	0.00
4.9	Cetakan beton	5.00	m2	0.09	0.00	0.00			0.00	0.00
4.10	Pasangan batu kali 1:4	5.50	m3	0.65	0.00	0.00			0.00	0.00
4.11	Penstock,dia=380 mm, thickness=4 mm	70.00	m	28.12	0.00	0.00			0.00	0.00
4.12	Air vent, material dia=2,5", thickness=3	4.00	m	0.15	0.00	0.00			0.00	0.00
4.13	Expansion joint includes extra flange, bolts set and oring set, dia=380 flange t=20	2	set	5.62	0.00	0.00			0.00	0.00
4.14	Stiffener, material dia=380, thickness=4	8	set	0.86	0.00	0.00			0.00	0.00
4.15	Bend section, material dia=380, thickness=4	3	set	1.06	0.00	0.00			0.00	0.00
4.16	Saddle includes Teflon/asphalt layer, anchor and strap, dia 380	11	set	0.88	0.00	0.00			0.00	0.00
4.17	Flange includes bolts set and gasket set, dia=570, PN=	1	set	0.39	0.00	0.00			0.00	0.00
				39.00					0.00	
5	**Power House Ukuran 4 m x 5 m**									
5.1	Pondasi Turbine and Generator									
	Galian tanah	2.29	m3	0.01	2.29	0.01			2.29	0.01
	Galian batu	0.5	m3	0.02	0.50	0.02			0.50	0.02
	Urugan pasir	0.2	m3	0.01	0.00	0.00			0.00	0.00
	Pasangan batu kosong	0.5	m3	0.01	0.00	0.00			0.00	0.00
	Concrete Class B	1.5	m3	0.36	0.00	0.00			0.00	0.00
	Tulangan beton U-24	80	kg	0.22	0.00	0.00			0.00	0.00
	Cetakan beton	12	m2	0.22	0.00	0.00			0.00	0.00
	Pasangan batu kali 1:4	2.5	m3	0.29	0.00	0.00			0.00	0.00
	Plesteran 1:5	5	m2	0.04	0.00	0.00			0.00	0.00
5.2	Pondasi Rumah									
	Galian tanah	17.82	m3	0.07	0.00	0.00			0.00	0.00
	Galian batu	2	m3	0.07	0.00	0.00			0.00	0.00
	Urugan pasir	0.7	m3	0.03	0.00	0.00			0.00	0.00
	Pasangan batu kosong	1.8	m3	0.03	0.00	0.00			0.00	0.00

5.3	Dinding, Pintu dan Jendela									
	Pasangan Bata 1:4	58	m2	1.31	0.00	0.00			0.00	0.00
	Plesteran 1:5	116	m2	0.98	0.00	0.00			0.00	0.00
	Concrete Class C	1.39	m3	0.28	0.00	0.00			0.00	0.00
	Tulangan beton U-24	205	kg	0.57	0.00	0.00			0.00	0.00
	Cetakan beton	14	m2	0.26	0.00	0.00			0.00	0.00
	Pintu besi termasuk rel	1	set	0.94	0.00	0.00			0.00	0.00
	Jendela termasuk kusen	3	set	0.40	0.00	0.00			0.00	0.00
5.4	Atap									
	Struktur besi untuk rangka atap	400	kg	1.82	0.00	0.00			0.00	0.00
	Atap corrugated Zincalum lebar 80 cm	58	m1	1.30	0.00	0.00			0.00	0.00
	Nok corrugated Zincalum	7	m1	0.08	0.00	0.00			0.00	0.00
	Drainage: talang seng termasuk pipa PVC 3 inch	2	set	0.19	0.00	0.00			0.00	0.00
5.5	Lantai									
	Urugan pasir	1	m3	0.05	0.00	0.00			0.00	0.00
	Lantai beton 7 cm	4	m3	0.58	0.00	0.00			0.00	0.00
5.6	Teras dan Drainage									
	Galian tanah	28	m3	0.11	0.00	0.00			0.00	0.00
	Galian batu	2.5	m3	0.09	0.00	0.00			0.00	0.00
	Urugan pasir	1.4	m3	0.06	0.00	0.00			0.00	0.00
	Lean concrete	1.4	m3	0.20	0.00	0.00			0.00	0.00
	Pasangan batu kali 1:4	7	m3	0.82	0.00	0.00			0.00	0.00
	Plesteran 1:5	25	m2	0.21	0.00	0.00			0.00	0.00
5.7	Finishing									
	Pengecatan tembok	59	m2	0.34	0.00	0.00			0.00	0.00
	Pengecatan kayu/besi	10	m2	0.11	0.00	0.00			0.00	0.00
	Pengecatan lantai	17	m2	0.18	0.00	0.00			0.00	0.00
				12.96						
6	**Tailrace**									
6.1	Galian tanah	10.787	m3	0.04	0.00	0.00			0.00	0.00
6.2	Galian batu	1.0787	m3	0.04	0.00	0.00			0.00	0.00
6.3	Urugan tanah	2.69676	m3	0.01	0.00	0.00			0.00	0.00
6.4	Urugan pasir	2.3	m3	0.11	0.00	0.00			0.00	0.00
6.5	Pasangan batu kosong	5.75	m3	0.08	0.00	0.00			0.00	0.00
6.6	Lean concrete	0.2	m3	0.03	0.00	0.00			0.00	0.00
6.7	Concrete Class C	0.3	m3	0.06	0.00	0.00			0.00	0.00
6.8	Tulangan beton U-24	20	kg	0.06	0.00	0.00			0.00	0.00
6.9	Cetakan beton	1.1	m2	0.02	0.00	0.00			0.00	0.00
6.1	Pasangan batu kali 1:4	11.5	m3	1.35	0.00	0.00			0.00	0.00
6.11	Plesteran 1:5	23	m2	0.19	0.00	0.00			0.00	0.00
				1.98						
7	**Protection Wall**									
7.1	Galian tanah	0.5	m3	0.00	0.00	0.00			0.00	0.00
7.2	Galian batu	2.3	m3	0.08	0.00	0.00			0.00	0.00
7.3	Urugan tanah	0.55	m3	0.00	0.00	0.00			0.00	0.00
7.4	Urugan pasir	1.2	m3	0.06	0.00	0.00			0.00	0.00
7.5	Pasangan batu kosong	2	m3	0.03	0.00	0.00			0.00	0.00
7.6	Pasangan batu kali 1:4	13.5	m3	1.58	0.00	0.00			0.00	0.00
7.7	Plesteran 1:5	6	m2	0.05	0.00	0.00			0.00	0.00
				1.80						
	TOTAL			**100**		0.80		0.00		0.80
	SCHEDULE									21.08
	DEVIATION (+/-)									(20.28)

Table 4 : *Progress works in August 2006*

4.2 September 2006

Month : September 2006

NO.	DESCRIPTION	QTY	UNIT	PERCENTAGE [%]	THIS MONTH		LAST MONTH		TOTAL	
					QTY	PERCENTAGE	QTY	PERCENTAGE	QTY	PERCENTAGE
A	**Civil Works**									
1	**Intake**									
1.1	Galian tanah	35	m3	0.13	25.00	0.09	0.00	0.00	25.00	0.09
1.2	Galian batu	6	m3	0.22	0.00	0.00	0.00	0.00	0.00	0.00
1.3	Urugan tanah	5	m3	0.01	0.00	0.00	0.00	0.00	0.00	0.00
1.4	Urugan pasir	5	m3	0.23	0.00	0.00	0.00	0.00	0.00	0.00
1.5	Pasangan batu kosong	12.5	m3	0.18	0.00	0.00	0.00	0.00	0.00	0.00
1.6	Lean concrete	2	m3	0.29	0.00	0.00	0.00	0.00	0.00	0.00
1.7	Concrete Class C	17	m3	3.46	0.00	0.00	0.00	0.00	0.00	0.00
1.8	Tulangan beton U-24	1440	kg	3.99	0.00	0.00	0.00	0.00	0.00	0.00
1.9	Cetakan beton	120	m2	2.22	0.00	0.00	0.00	0.00	0.00	0.00
1.10	Pasangan batu kali 1:4	27	m3	3.17	0.00	0.00	0.00	0.00	0.00	0.00
1.11	Plesteran 1:5	45	m2	0.38	0.00	0.00	0.00	0.00	0.00	0.00
1.12	Sluice gate (800x1000)x2000	1	Set	1.58	0.00	0.00	0.00	0.00	0.00	0.00
1.13	Coarse trash rack 2x0.2	1	Set	0.20	0.00	0.00	0.00	0.00	0.00	0.00
				16.06						
2	**Sand Trap**									
2.1	Galian tanah	99.7	m3	0.38	0.00	0.00	99.70	0.38	99.70	0.38
2.2	Galian batu	10	m3	0.36	8.00	0.29	2.00	0.07	10.00	0.36
2.3	Urugan tanah	10	m3	0.02	10.00	0.02	0.00	0.00	10.00	0.02
2.4	Urugan pasir	5	m3	0.23	5.00	0.23	0.00	0.00	5.00	0.23
2.5	Pasangan batu kosong	15	m3	0.21	15.00	0.21	0.00	0.00	15.00	0.21
2.6	Lean concrete	1	m3	0.15	1.00	0.15	0.00	0.00	1.00	0.15
2.7	Concrete Class C	0.22	m3	0.04	0.00	0.00	0.00	0.00	0.00	0.00
2.8	Tulangan beton U-24	22	kg	0.06	0.00	0.00	0.00	0.00	0.00	0.00
2.9	Cetakan beton	1.1	m2	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2.10	Pasangan batu kali 1:4	82	m3	9.62	0.00	0.00	0.00	0.00	0.00	0.00
2.11	Plesteran 1:2	99	m2	1.05	0.00	0.00	0.00	0.00	0.00	0.00
2.12	Control gate (800x800)2000	1	Set	1.55	0.00	0.00	0.00	0.00	0.00	0.00
2.13	Gate Valve for flushing DN 6"	1	Set	0.80	0.00	0.00	0.00	0.00	0.00	0.00
				14.49						
3	**Fore bay dan Spillway**									
3.1	Galian tanah	58	m3	0.22	0.00	0.00	58.00	0.22	58.00	0.22
3.2	Galian batu	3	m3	0.11	0.00	0.00	3.00	0.11	3.00	0.11
3.3	Urugan tanah	10	m3	0.02	10.00	0.02	0.00	0.00	10.00	0.02
3.4	Urugan pasir	3.9	m3	0.18	3.90	0.18	0.00	0.00	3.90	0.18
3.5	Pasangan batu kosong	9.75	m3	0.14	9.75	0.14	0.00	0.00	9.75	0.14
3.6	Lean concrete	0.5	m3	0.07	0.50	0.07	0.00	0.00	0.50	0.07
3.7	Concrete Class C	3.5	m3	0.71	0.00	0.00	0.00	0.00	0.00	0.00
3.8	Tulangan beton U-24	410	kg	1.14	0.00	0.00	0.00	0.00	0.00	0.00
3.9	Cetakan beton	25	m2	0.46	0.00	0.00	0.00	0.00	0.00	0.00
3.10	Pasangan batu kali 1:4	47	m3	5.51	0.00	0.00	0.00	0.00	0.00	0.00
3.11	Plesteran 1:2	68.5	m2	0.75	0.00	0.00	0.00	0.00	0.00	0.00
3.12	PVC pipe dia=6 " for flushing	24	m	0.96	0.00	0.00	0.00	0.00	0.00	0.00
3.13	PVC bend dia=6" for flushing	2	Set	0.21	0.00	0.00	0.00	0.00	0.00	0.00
3.14	Gate valve dia=6" for flushing	2	Set	1.61	0.00	0.00	0.00	0.00	0.00	0.00
3.15	Fine trashrack, dimensions = 1 m x 2 m	2	Set	1.61	0.00	0.00	0.00	0.00	0.00	0.00
				13.71						

4	**Penstock dia. 380 mm**									
4.1	Galian tanah	8.50	m3	0.03	0.00	0.00	0.00	0.00	0.00	0.00
4.2	Galian batu	1.00	m3	0.04	0.00	0.00	0.00	0.00	0.00	0.00
4.3	Urugan tanah	1.80	m3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.4	Urugan pasir	0.20	m3	0.01	0.00	0.00	0.00	0.00	0.00	0.00
4.5	Pasangan batu kosong	0.40	m3	0.01	0.00	0.00	0.00	0.00	0.00	0.00
4.6	Lean concrete	0.80	m3	0.12	0.00	0.00	0.00	0.00	0.00	0.00
4.7	Concrete Class C	2.70	m3	0.55	0.00	0.00	0.00	0.00	0.00	0.00
4.8	Tulangan beton U-24	156.00	kg	0.43	0.00	0.00	0.00	0.00	0.00	0.00
4.9	Cetakan beton	5.00	m2	0.09	0.00	0.00	0.00	0.00	0.00	0.00
4.10	Pasangan batu kali 1:4	5.50	m3	0.65	0.00	0.00	0.00	0.00	0.00	0.00
4.11	Penstock,dia=380 mm, thickness=4 mm	70.00	m	28.12	0.00	0.00	0.00	0.00	0.00	0.00
4.12	Air vent, material dia=2,5", thickness=3	4.00	m	0.15	0.00	0.00	0.00	0.00	0.00	0.00
4.13	Expansion joint includes extra flange, bolts set and oring set, dia=380 flange t=20	2	set	5.62	0.00	0.00	0.00	0.00	0.00	0.00
4.14	Stiffener, material dia=380, thickness=4	8	set	0.86	0.00	0.00	0.00	0.00	0.00	0.00
4.15	Bend section, material dia=380, thickness=4	3	set	1.06	0.00	0.00	0.00	0.00	0.00	0.00
4.16	Saddle includes Teflon/asphalt layer, anchor and strap, dia 380	11	set	0.88	0.00	0.00	0.00	0.00	0.00	0.00
4.17	Flange includes bolts set and gasket set, dia=570, PN=	1	set	0.39	0.00	0.00	0.00	0.00	0.00	0.00
				39.00						
5	**Power House Ukuran 4 m x 5 m**									
5.1	Pondasi Turbine and Generator									
	Galian tanah	2.29	m3	0.01	0.00	0.00	2.29	0.01	2.29	0.01
	Galian batu	0.5	m3	0.02	0.00	0.00	0.50	0.02	0.50	0.02
	Urugan pasir	0.2	m3	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	Pasangan batu kosong	0.5	m3	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	Concrete Class B	1.5	m3	0.36	0.00	0.00	0.00	0.00	0.00	0.00
	Tulangan beton U-24	80	kg	0.22	0.00	0.00	0.00	0.00	0.00	0.00
	Cetakan beton	12	m2	0.22	0.00	0.00	0.00	0.00	0.00	0.00
	Pasangan batu kali 1:4	2.5	m3	0.29	0.00	0.00	0.00	0.00	0.00	0.00
	Plesteran 1:5	5	m2	0.04	0.00	0.00	0.00	0.00	0.00	0.00
5.2	Pondasi Rumah									
	Galian tanah	17.82	m3	0.07	2.00	0.01	0.00	0.00	2.00	0.01
	Galian batu	2	m3	0.07	0.00	0.00	0.00	0.00	0.00	0.00
	Urugan pasir	0.7	m3	0.03	0.00	0.00	0.00	0.00	0.00	0.00
	Pasangan batu kosong	1.8	m3	0.03	0.00	0.00	0.00	0.00	0.00	0.00
	Pasangan batu kali 1:4	6	m3	0.70	0.00	0.00	0.00	0.00	0.00	0.00
5.3	Dinding, Pintu dan Jendela									
	Pasangan Bata 1:4	58	m2	1.31	0.00	0.00	0.00	0.00	0.00	0.00
	Plesteran 1:5	116	m2	0.98	0.00	0.00	0.00	0.00	0.00	0.00
	Concrete Class C	1.39	m3	0.28	0.00	0.00	0.00	0.00	0.00	0.00
	Tulangan beton U-24	205	kg	0.57	0.00	0.00	0.00	0.00	0.00	0.00
	Cetakan beton	14	m2	0.26	0.00	0.00	0.00	0.00	0.00	0.00
	Pintu besi termasuk rel	1	set	0.94	0.00	0.00	0.00	0.00	0.00	0.00
	Jendela termasuk kusen	3	set	0.40	0.00	0.00	0.00	0.00	0.00	0.00
5.4	Atap									
	Struktur besi untuk rangka atap	400	kg	1.82	0.00	0.00	0.00	0.00	0.00	0.00
	Atap corrugated Zincalum lebar 80 cm	58	m1	1.30	0.00	0.00	0.00	0.00	0.00	0.00
	Nok corrugated Zincalum	7	m1	0.08	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage: talang seng termasuk pipa PVC 3 inch	2	set	0.19	0.00	0.00	0.00	0.00	0.00	0.00
5.5	Lantai									
	Urugan pasir	1	m3	0.05	0.00	0.00	0.00	0.00	0.00	0.00
	Lantai beton 7 cm	4	m3	0.58	0.00	0.00	0.00	0.00	0.00	0.00

5.6	Teras dan Drainage									
	Galian tanah	28	m3	0.11	0.00	0.00	0.00	0.00	0.00	0.00
	Galian batu	2.5	m3	0.09	0.00	0.00	0.00	0.00	0.00	0.00
	Urugan pasir	1.4	m3	0.06	0.00	0.00	0.00	0.00	0.00	0.00
	Lean concrete	1.4	m3	0.20	0.00	0.00	0.00	0.00	0.00	0.00
	Pasangan batu kali 1:4	7	m3	0.82	0.00	0.00	0.00	0.00	0.00	0.00
	Plesteran 1:5	25	m2	0.21	0.00	0.00	0.00	0.00	0.00	0.00
5.7	Finishing									
	Pengecatan tembok	59	m2	0.34	0.00	0.00	0.00	0.00	0.00	0.00
	Pengecatan kayu/besi	10	m2	0.11	0.00	0.00	0.00	0.00	0.00	0.00
	Pengecatan lantai	17	m2	0.18	0.00	0.00	0.00	0.00	0.00	0.00
				12.96						
6	**Tailrace**									
6.1	Galian tanah	10.787	m3	0.04	0.00	0.00	0.00	0.00	0.00	0.00
6.2	Galian batu	1.0787	m3	0.04	0.00	0.00	0.00	0.00	0.00	0.00
6.3	Urugan tanah	2.69676	m3	0.01	0.00	0.00	0.00	0.00	0.00	0.00
6.4	Urugan pasir	2.3	m3	0.11	0.00	0.00	0.00	0.00	0.00	0.00
6.5	Pasangan batu kosong	5.75	m3	0.08	0.00	0.00	0.00	0.00	0.00	0.00
6.6	Lean concrete	0.2	m3	0.03	0.00	0.00	0.00	0.00	0.00	0.00
6.7	Concrete Class C	0.3	m3	0.06	0.00	0.00	0.00	0.00	0.00	0.00
6.8	Tulangan beton U-24	20	kg	0.06	0.00	0.00	0.00	0.00	0.00	0.00
6.9	Cetakan beton	1.1	m2	0.02	0.00	0.00	0.00	0.00	0.00	0.00
6.1	Pasangan batu kali 1:4	11.5	m3	1.35	0.00	0.00	0.00	0.00	0.00	0.00
6.11	Plesteran 1:5	23	m2	0.19	0.00	0.00	0.00	0.00	0.00	0.00
				1.98						
7	**Protection Wall**									
7.1	Galian tanah	0.5	m3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.2	Galian batu	2.3	m3	0.08	0.00	0.00	0.00	0.00	0.00	0.00
7.3	Urugan tanah	0.55	m3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.4	Urugan pasir	1.2	m3	0.06	0.00	0.00	0.00	0.00	0.00	0.00
7.5	Pasangan batu kosong	2	m3	0.03	0.00	0.00	0.00	0.00	0.00	0.00
7.6	Pasangan batu kali 1:4	13 5	m3	1.58	0.00	0.00	0.00	0.00	0.00	0.00
7.7	Plesteran 1:5	6	m2	0.05	0.00	0.00	0.00	0.00	0.00	0.00
				1.80						
	TOTAL			**100**		1.41		0.80		2.21
	SCHEDULE									78.52
	DEVIATION (+/-)									(76.30)

Table 5 : *Progress works in September 2006*

4.3 October 2006

Month : October 2006

NO.	DESCRIPTION	QTY	UNIT	PERCENTAGE [%]	THIS MONTH		LAST MONTH		TOTAL	
					QTY	PERCENTAGE	QTY	PERCENTAGE	QTY	PERCENTAGE
A	**Civil Works**									
1	**Intake**									
1.1	Galian tanah	35	m3	0.13	10.00	0.04	25.00	0.09	35.00	0.13
1.2	Galian batu	6	m3	0.22	0.00	0.00	0.00	0.00	0.00	0.00
1.3	Urugan tanah	5	m3	0.01	0.00	0.00	0.00	0.00	0.00	0.00
1.4	Urugan pasir	5	m3	0.23	0.00	0.00	0.00	0.00	0.00	0.00
1.5	Pasangan batu kosong	12.5	m3	0.18	0.00	0.00	0.00	0.00	0.00	0.00
1.6	Lean concrete	2	m3	0.29	0.00	0.00	0.00	0.00	0.00	0.00
1.7	Concrete Class C	17	m3	3.46	0.00	0.00	0.00	0.00	0.00	0.00
1.8	Tulangan beton U-24	1440	kg	3.99	0.00	0.00	0.00	0.00	0.00	0.00
1.9	Cetakan beton	120	m2	2.22	0.00	0.00	0.00	0.00	0.00	0.00
1.10	Pasangan batu kali 1:4	27	m3	3.17	0.00	0.00	0.00	0.00	0.00	0.00
1.11	Plesteran 1:5	45	m2	0.38	0.00	0.00	0.00	0.00	0.00	0.00
1.12	Sluice gate (800x1000)x2000	1	Set	1.58	0.00	0.00	0.00	0.00	0.00	0.00
1.13	Coarse trash rack 2x0.2	1	Set	0.20	0.00	0.00	0.00	0.00	0.00	0.00
				16.06						
2	**Sand Trap**									
2.1	Galian tanah	99.7	m3	0.38	0.00	0.00	99.70	0.38	99.70	0.38
2.2	Galian batu	10	m3	0.36	0.00	0.00	10.00	0.36	10.00	0.36
2.3	Urugan tanah	10	m3	0.02	0.00	0.00	10.00	0.02	10.00	0.02
2.4	Urugan pasir	5	m3	0.23	0.00	0.00	5.00	0.23	5.00	0.23
2.5	Pasangan batu kosong	15	m3	0.21	0.00	0.00	15.00	0.21	15.00	0.21
2.6	Lean concrete	1	m3	0.15	0.00	0.00	1.00	0.15	1.00	0.15
2.7	Concrete Class C	0.22	m3	0.04	0.22	0.04	0.00	0.00	0.22	0.04
2.8	Tulangan beton U-24	22	kg	0.06	15.00	0.04	0.00	0.00	15.00	0.04
2.9	Cetakan beton	1.1	m2	0.02	0.80	0.01	0.00	0.00	0.80	0.01
2.10	Pasangan batu kali 1:4	82	m3	9.62	40.00	4.69	0.00	0.00	40.00	4.69
2.11	Plesteran 1:2	95	m2	1.05	0.00	0.00	0.00	0.00	0.00	0.00
2.12	Control gate (800x800)2000	1	Set	1.55	1.00	1.55	0.00	0.00	1.00	1.55
2.13	Gate Valve for flushing DN 6"	1	Set	0.80	0.00	0.00	0.00	0.00	0.00	0.00
				14.49						
3	**Fore bay dan Spillway**									
3.1	Galian tanah	58	m3	0.22	0.00	0.00	58.00	0.22	58.00	0.22
3.2	Galian batu	3	m3	0.11	0.00	0.00	3.00	0.11	3.00	0.11
3.3	Urugan tanah	10	m3	0.02	0.00	0.00	10.00	0.02	10.00	0.02
3.4	Urugan pasir	3.9	m3	0.18	0.00	0.00	3.90	0.18	3.90	0.18
3.5	Pasangan batu kosong	9.75	m3	0.14	0.00	0.00	9.75	0.14	9.75	0.14
3.6	Lean concrete	0.5	m3	0.07	0.00	0.00	0.50	0.07	0.50	0.07
3.7	Concrete Class C	3.5	m3	0.71	3.50	0.71	0.00	0.00	3.50	0.71
3.8	Tulangan beton U-24	410	kg	1.14	200.00	0.55	0.00	0.00	200.00	0.55
3.9	Cetakan beton	25	m2	0.46	15.00	0.28	0.00	0.00	15.00	0.28
3.10	Pasangan batu kali 1:4	47	m3	5.51	15.00	1.76	0.00	0.00	15.00	1.76
3.11	Plesteran 1:2	68.5	m2	0.75	0.00	0.00	0.00	0.00	0.00	0.00
3.12	PVC pipe dia=6 " for flushing	24	m	0.96	24.00	0.96	0.00	0.00	24.00	0.96
3.13	PVC bend dia=6" for flushing	2	Set	0.21	2.00	0.21	0.00	0.00	2.00	0.21
3.14	Gate valve dia=6" for flushing	2	Set	1.61	0.00	0.00	0.00	0.00	0.00	0.00
3.15	Fine trashrack, dimensions = 1 m x 2 m	2	Set	1.61	0.00	0.00	0.00	0.00	0.00	0.00
				13.71						

4	**Penstock dia. 380 mm**									
4.1	Galian tanah	8.50	m3	0.03	0.00	0.00	0.00	0.00	0.00	0.00
4.2	Galian batu	1.00	m3	0.04	0.00	0.00	0.00	0.00	0.00	0.00
4.3	Urugan tanah	1.80	m3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.4	Urugan pasir	0.20	m3	0.01	0.00	0.00	0.00	0.00	0.00	0.00
4.5	Pasangan batu kosong	0.40	m3	0.01	0.00	0.00	0.00	0.00	0.00	0.00
4.6	Lean concrete	0.80	m3	0.12	0.00	0.00	0.00	0.00	0.00	0.00
4.7	Concrete Class C	2.70	m3	0.55	0.00	0.00	0.00	0.00	0.00	0.00
4.8	Tulangan beton U-24	156.00	kg	0.43	0.00	0.00	0.00	0.00	0.00	0.00
4.9	Cetakan beton	5.00	m2	0.09	0.00	0.00	0.00	0.00	0.00	0.00
4.10	Pasangan batu kali 1:4	5.50	m3	0.65	0.00	0.00	0.00	0.00	0.00	0.00
4.11	Penstock,dia=380 mm, thickness=4 mm	70.00	m	28.12	35.00	14.06	0.00	0.00	35.00	14.06
4.12	Air vent, material dia=2,5", thickness=3	4.00	m	0.15	0.00	0.00	0.00	0.00	0.00	0.00
4.13	Expansion joint includes extra flange, bolts set and oring set, dia=380 flange t=20	2	set	5.62	1.00	2.81	0.00	0.00	1.00	2.81
4.14	Stiffener, material dia=380, thickness=4	8	set	0.86	0.00	0.00	0.00	0.00	0.00	0.00
4.15	Bend section, material dia=380, thickness=4	3	set	1.06	0.00	0.00	0.00	0.00	0.00	0.00
4.16	Saddle includes Teflon/asphalt layer, anchor and strap, dia 380	11	set	0.88	0.00	0.00	0.00	0.00	0.00	0.00
4.17	Flange includes bolts set and gasket set, dia=570, PN=	1	set	0.39	0.00	0.00	0.00	0.00	0.00	0.00
				39.00						
5	**Power House Ukuran 4 m x 5 m**									
5.1	Pondasi Turbine and Generator									
	Galian tanah	2.29	m3	0.01	0.00	0.00	2.29	0.01	2.29	0.01
	Galian batu	0.5	m3	0.02	0.00	0.00	0.50	0.02	0.50	0.02
	Urugan pasir	0.2	m3	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	Pasangan batu kosong	0.5	m3	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	Concrete Class B	1.5	m3	0.36	0.00	0.00	0.00	0.00	0.00	0.00
	Tulangan beton U-24	80	kg	0.22	0.00	0.00	0.00	0.00	0.00	0.00
	Cetakan beton	12	m2	0.22	0.00	0.00	0.00	0.00	0.00	0.00
	Pasangan batu kali 1:4	2.5	m3	0.29	0.00	0.00	0.00	0.00	0.00	0.00
	Plesteran 1:5	5	m2	0.04	0.00	0.00	0.00	0.00	0.00	0.00
5.2	Pondasi Rumah									
	Galian tanah	17.82	m3	0.07	15.82	0.06	2.00	0.01	17.82	0.07
	Galian batu	2	m3	0.07	2.00	0.07	0.00	0.00	2.00	0.07
	Urugan pasir	0.7	m3	0.03	0.00	0.00	0.00	0.00	0.00	0.00
	Pasangan batu kosong	1.8	m3	0.03	0.00	0.00	0.00	0.00	0.00	0.00
	Pasangan batu kali 1:4	6	m3	0.70	0.00	0.00	0.00	0.00	0.00	0.00
5.3	Dinding, Pintu dan Jendela									
	Pasangan Bata 1:4	58	m2	1.31	0.00	0.00	0.00	0.00	0.00	0.00
	Plesteran 1:5	116	m2	0.98	0.00	0.00	0.00	0.00	0.00	0.00
	Concrete Class C	1.39	m3	0.28	0.00	0.00	0.00	0.00	0.00	0.00
	Tulangan beton U-24	205	kg	0.57	0.00	0.00	0.00	0.00	0.00	0.00
	Cetakan beton	14	m2	0.26	0.00	0.00	0.00	0.00	0.00	0.00
	Pintu besi termasuk rel	1	set	0.94	0.00	0.00	0.00	0.00	0.00	0.00
	Jendela termasuk kusen	3	set	0.40	0.00	0.00	0.00	0.00	0.00	0.00
5.4	Atap									
	Struktur baja untuk rangka atap	400	kg	1.82	0.00	0.00	0.00	0.00	0.00	0.00
	Atap corrugated Zincalum lebar 80 cm	58	ml	1.30	0.00	0.00	0.00	0.00	0.00	0.00
	Nok corrugated Zincalum	7	ml	0.08	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage: talang seng termasuk pipa PVC 3 inch	2	set	0.19	0.00	0.00	0.00	0.00	0.00	0.00
5.5	Lantai									
	Urugan pasir	1	m3	0.05	0.00	0.00	0.00	0.00	0.00	0.00
	Lantai beton 7 cm	4	m3	0.58	0.00	0.00	0.00	0.00	0.00	0.00

5.6	Teras dan Drainage									
	Galian tanah	28	m3	0.11	28.00	0 11	0.00	0.00	28 00	0.11
	Galian batu	2.5	m3	0.09	2.50	0.09	0.00	0.00	2.50	0 09
	Urugan pasir	1.4	m3	0.06	0.00	0.00	0.00	0.00	0.00	0.00
	Lean concrete	1.4	m3	0.20	0.00	0.00	0.00	0.00	0.00	0.00
	Pasangan batu kali 1:4	7	m3	0.82	0.00	0.00	0.00	0.00	0.00	0.00
	Plesteran 1:5	25	m2	0 21	0.00	0.00	0.00	0.00	0.00	0.00
5.7	Finishing									
	Pengecatan tembok	59	m2	0.34	0.00	0.00	0.00	0.00	0.00	0.00
	Pengecatan kayu/besi	10	m2	0.11	0.00	0.00	0.00	0.00	0.00	0.00
	Pengecatan lantai	17	m2	0.18	0.00	0.00	0.00	0.00	0.00	0.00
				12.96						
6	**Tailrace**									
6.1	Galian tanah	10.787	m3	0.04	0.00	0.00	0.00	0.00	0.00	0.00
6.2	Galian batu	1.0787	m3	0.04	0.00	0.00	0.00	0.00	0.00	0.00
6.3	Urugan tanah	2.69676	m3	0.01	0.00	0.00	0.00	0.00	0.00	0.00
6.4	Urugan pasir	2.3	m3	0.11	0.00	0.00	0.00	0.00	0.00	0.00
6.5	Pasangan batu kosong	5.75	m3	0.08	0.00	0.00	0.00	0.00	0.00	0.00
6.6	Lean concrete	0.2	m3	0.03	0.00	0.00	0.00	0.00	0.00	0.00
6.7	Concrete Class C	0.3	m3	0.06	0.00	0.00	0.00	0.00	0.00	0.00
6.8	Tulangan beton U-24	20	kg	0.06	0.00	0.00	0.00	0.00	0.00	0.00
6.9	Cetakan beton	1.1	m2	0.02	0.00	0.00	0.00	0.00	0.00	0.00
6.1	Pasangan batu kali 1:4	11.5	m3	1.35	0.00	0.00	0.00	0.00	0.00	0.00
6.11	Plesteran 1:5	23	m2	0.19	0.00	0.00	0.00	0.00	0.00	0.00
				1.98						
7	**Protection Wall**									
7.1	Galian tanah	0.5	m3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.2	Galian batu	2.3	m3	0.08	0.00	0.00	0.00	0.00	0.00	0.00
7.3	Urugan tanah	0.55	m3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.4	Urugan pasir	1.2	m3	0.06	0.00	0.00	0.00	0.00	0.00	0.00
7.5	Pasangan batu kosong	2	m3	0.03	0.00	0 00	0.00	0.00	0.00	0.00
7.6	Pasangan batu kali 1:4	13.5	m3	1.58	0.00	0.00	0.00	0.00	0.00	0.00
7.7	Plesteran 1:5	6	m2	0.05	0.00	0.00	0.00	0.00	0.00	0.00
				1.80						
	TOTAL			**100**		28.06		2.21		30.28
	SCHEDULE									100.00
	DEVIATION (+/-)									(69 72)

Table 6 : *Progress works in October 2006*

4.4 November 2006

Month : November 2006

NO.	DESCRIPTION	QTY	UNIT	PERCENTAGE [%]	THIS MONTH		LAST MONTH		TOTAL	
					QTY	PERCENTAGE	QTY	PERCENTAGE	QTY	PERCENTAGE
A	**Civil Works**									
1	**Intake**									
1.1	Galian tanah	35	m3	0.13	0.00	0.00	35.00	0.13	35.00	0.13
1.2	Galian batu	6	m3	0.22	6.00	0.22	0.00	0.00	6.00	0.22
1.3	Urugan tanah	5	m3	0.01	0.00	0.00	0.00	0.00	0.00	0.00
1.4	Urugan pasir	5	m3	0.23	0.00	0.00	0.00	0.00	0.00	0.00
1.5	Pasangan batu kosong	12.5	m3	0.18	0.00	0.00	0.00	0.00	0.00	0.00
1.6	Lean concrete	2	m3	0.29	0.00	0.00	0.00	0.00	0.00	0.00
1.7	Concrete Class C	17	m3	3.46	0.00	0.00	0.00	0.00	0.00	0.00
1.8	Tulangan beton U-24	1440	kg	3.99	0.00	0.00	0.00	0.00	0.00	0.00
1.9	Cetakan beton	120	m2	2.22	0.00	0.00	0.00	0.00	0.00	0.00
1.10	Pasangan batu kali 1:4	27	m3	3.17	0.00	0.00	0.00	0.00	0.00	0.00
1.11	Plesteran 1:5	45	m2	0.38	0.00	0.00	0.00	0.00	0.00	0.00
1.12	Sluice gate (800x1000)x2000	1	Set	1.58	0.00	0.00	0.00	0.00	0.00	0.00
1.13	Coarse trash rack 2x0.2	1	Set	0.20	0.00	0.00	0.00	0.00	0.00	0.00
				16.06						
2	**Sand Trap**									
2.1	Galian tanah	99.7	m3	0.38	0.00	0.00	99.70	0.38	99.70	0.38
2.2	Galian batu	10	m3	0.36	0.00	0.00	10.00	0.36	10.00	0.36
2.3	Urugan tanah	10	m3	0.02	0.00	0.00	10.00	0.02	10.00	0.02
2.4	Urugan pasir	5	m3	0.23	0.00	0.00	5.00	0.23	5.00	0.23
2.5	Pasangan batu kosong	15	m3	0.21	0.00	0.00	15.00	0.21	15.00	0.21
2.6	Lean concrete	1	m3	0.15	0.00	0.00	1.00	0.15	1.00	0.15
2.7	Concrete Class C	0.22	m3	0.04	0.00	0.00	0.22	0.04	0.22	0.04
2.8	Tulangan beton U-24	22	kg	0.06	7.00	0.02	15.00	0.04	22.00	0.06
2.9	Cetakan beton	1.1	m2	0.02	0.30	0.01	0.80	0.01	1.10	0.02
2.10	Pasangan batu kali 1:4	82	m3	9.62	42.00	4.93	40.00	4.69	82.00	9.62
2.11	Plesteran 1:2	95	m2	1.05	95.00	1.05	0.00	0.00	95.00	1.05
2.12	Control gate (800x800)2000	1	Set	1.55	0.00	0.00	1.00	1.55	1.00	1.55
2.13	Gate Valve for flushing DN 6"	1	Set	0.80	1.00	0.80	0.00	0.00	1.00	0.80
				14.49						
3	**Fore bay dan Spillway**									
3.1	Galian tanah	58	m3	0.22	0.00	0.00	58.00	0.22	58.00	0.22
3.2	Galian batu	3	m3	0.11	0.00	0.00	3.00	0.11	3.00	0.11
3.3	Urugan tanah	10	m3	0.02	0.00	0.00	10.00	0.02	10.00	0.02
3.4	Urugan pasir	3.9	m3	0.18	0.00	0.00	3.90	0.18	3.90	0.18
3.5	Pasangan batu kosong	9.75	m3	0.14	0.00	0.00	9.75	0.14	9.75	0.14
3.6	Lean concrete	0.5	m3	0.07	0.00	0.00	0.50	0.07	0.50	0.07
3.7	Concrete Class C	3.5	m3	0.71	0.00	0.00	3.50	0.71	3.50	0.71
3.8	Tulangan beton U-24	410	kg	1.14	210.00	0.58	200.00	0.55	410.00	1.14
3.9	Cetakan beton	25	m2	0.46	10.00	0.19	15.00	0.28	25.00	0.46
3.10	Pasangan batu kali 1:4	47	m3	5.51	32.00	3.75	15.00	1.76	47.00	5.51
3.11	Plesteran 1:2	68.5	m2	0.75	68.50	0.75	0.00	0.00	68.50	0.75
3.12	PVC pipe dia=6 " for flushing	24	m	0.96	0.00	0.00	24.00	0.96	24.00	0.96
3.13	PVC bend dia=6" for flushing	2	Set	0.21	0.00	0.00	2.00	0.21	2.00	0.21
3.14	Gate valve dia=6" for flushing	2	Set	1.61	2.00	1.61	0.00	0.00	2.00	1.61
3.15	Fine trashrack, dimensions = 1 m x 2 m	2	Set	1.61	2.00	1.61	0.00	0.00	2.00	1.61
				13.71						

4	**Penstock dia. 380 mm**									
4.1	Galian tanah	8.50	m3	0.03	8.50	0.03	0.00	0.00	8.50	0.03
4.2	Galian batu	1.00	m3	0.04	1.00	0.04	0.00	0.00	1.00	0.04
4.3	Urugan tanah	1.80	m3	0.00	1.80	0.00	0.00	0.00	1.80	0.00
4.4	Urugan pasir	0.20	m3	0.01	0.20	0.01	0.00	0.00	0.20	0.01
4.5	Pasangan batu kosong	0.40	m3	0.01	0.40	0.01	0.00	0.00	0.40	0.01
4.6	Lean concrete	0.80	m3	0.12	0.80	0.12	0.00	0.00	0.80	0.12
4.7	Concrete Class C	2.70	m3	0.55	2.70	0.55	0.00	0.00	2.70	0.55
4.8	Tulangan beton U-24	156.00	kg	0.43	156.00	0.43	0.00	0.00	156.00	0.43
4.9	Cetakan beton	5.00	m2	0.09	5.00	0.09	0.00	0.00	5.00	0.09
4.10	Pasangan batu kali 1:4	5.50	m3	0.65	5.50	0.65	0.00	0.00	5.50	0.65
4.11	Penstock,dia=380 mm, thickness=4 mm	70.00	m	28.12	35.00	14.06	35.00	14.06	70.00	28.12
4.12	Air vent, material dia=2,5", thickness=3	4.00	m	0.15	4.00	0.15	0.00	0.00	4.00	0.15
4.13	Expansion joint includes extra flange, bolts set and oring set, dia=380 flange t=20	2	set	5.62	1.00	2.81	1.00	2.81	2.00	5.62
4.14	Stiffener, material dia=380, thickness=4	8	set	0.86	8.00	0.86	0.00	0.00	8.00	0.86
4.15	Bend section, material dia=380, thickness=4	3	set	1.06	3.00	1.06	0.00	0.00	3.00	1.06
4.16	Saddle includes Teflon/asphalt layer, anchor and strap, dia 380	11	set	0.88	11.00	0.88	0.00	0.00	11.00	0.88
4.17	Flange includes bolts set and gasket set, dia=570, PN=	1	set	0.39	1.00	0.39	0.00	0.00	1.00	0.39
				39.00						
5	**Power House Ukuran 4 m x 5 m**									
5.1	Pondasi Turbine and Generator									
	Galian tanah	2.29	m3	0.01	0.00	0.00	2.29	0.01	2.29	0.01
	Galian batu	0.5	m3	0.02	0.00	0.00	0.50	0.02	0.50	0.02
	Urugan pasir	0.2	m3	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	Pasangan batu kosong	0.5	m3	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	Concrete Class B	1.5	m3	0.36	0.00	0.00	0.00	0.00	0.00	0.00
	Tulangan beton U-24	80	kg	0.22	0.00	0.00	0.00	0.00	0.00	0.00
	Cetakan beton	12	m2	0.22	0.00	0.00	0.00	0.00	0.00	0.00
	Pasangan batu kali 1:4	2.5	m3	0.29	0.00	0.00	0.00	0.00	0.00	0.00
	Plesteran 1:5	5	m2	0.04	0.00	0.00	0.00	0.00	0.00	0.00
5.2	Pondasi Rumah									
	Galian tanah	17.82	m3	0.07	0.00	0.00	17.82	0.07	17.82	0.07
	Galian batu	2	m3	0.07	0.00	0.00	2.00	0.07	2.00	0.07
	Urugan pasir	0.7	m3	0.03	0.00	0.00	0.00	0.00	0.00	0.00
	Pasangan batu kosong	1.8	m3	0.03	0.00	0.00	0.00	0.00	0.00	0.00
	Pasangan batu kali 1:4	6	m3	0.70	0.00	0.00	0.00	0.00	0.00	0.00
5.3	Dinding, Pintu dan Jendela									
	Pasangan Bata 1:4	58	m2	1.31	0.00	0.00	0.00	0.00	0.00	0.00
	Plesteran 1:5	116	m2	0.98	0.00	0.00	0.00	0.00	0.00	0.00
	Concrete Class C	1.39	m3	0.28	0.00	0.00	0.00	0.00	0.00	0.00
	Tulangan beton U-24	205	kg	0.57	0.00	0.00	0.00	0.00	0.00	0.00
	Cetakan beton	14	m2	0.26	0.00	0.00	0.00	0.00	0.00	0.00
	Pintu besi termasuk rel	1	set	0.94	0.00	0.00	0.00	0.00	0.00	0.00
	Jendela termasuk kusen	3	set	0.40	0.00	0.00	0.00	0.00	0.00	0.00
5.4	Atap									
	Struktur besi untuk rangka atap	400	kg	1.82	0.00	0.00	0.00	0.00	0.00	0.00
	Atap corrugated Zincalum lebar 80 cm	58	ml	1.30	0.00	0.00	0.00	0.00	0.00	0.00
	Nok corrugated Zincalum	7	ml	0.08	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage: talang seng termasuk pipa PVC 3 inch	2	set	0.19	0.00	0.00	0.00	0.00	0.00	0.00
5.5	Lantai									
	Urugan pasir	1	m3	0.05	0.00	0.00	0.00	0.00	0.00	0.00
	Lantai beton 7 cm	4	m3	0.58	0.00	0.00	0.00	0.00	0.00	0.00

5.6	Teras dan Drainage									
	Galian tanah	28	m3	0.11	0.00	0.00	28.00	0.11	28.00	0.11
	Galian batu	2.5	m3	0.09	0.00	0.00	2.50	0.09	2.50	0.09
	Urugan pasir	1.4	m3	0.06	0.00	0.00	0.00	0.00	0.00	0.00
	Lean concrete	1.4	m3	0.20	0.00	0.00	0.00	0.00	0.00	0.00
	Pasangan batu kali 1:4	7	m3	0.82	0.00	0.00	0.00	0.00	0.00	0.00
	Plesteran 1:5	25	m2	0.21	0.00	0.00	0.00	0.00	0.00	0.00
5.7	Finishing									
	Pengecatan tembok	59	m2	0.34	0.00	0.00	0.00	0.00	0.00	0.00
	Pengecatan kayu/besi	10	m2	0.11	0.00	0.00	0.00	0.00	0.00	0.00
	Pengecatan lantai	17	m2	0.18	0.00	0.00	0.00	0.00	0.00	0.00
				12.96						
6	**Tailrace**									
6.1	Galian tanah	10.787	m3	0.04	10.79	0.04	0.00	0.00	10.79	0.04
6.2	Galian batu	1.0787	m3	0.04	1.08	0.04	0.00	0.00	1.08	0.04
6.3	Urugan tanah	2.69676	m3	0.01	0.00	0.00	0.00	0.00	0.00	0.00
6.4	Urugan pasir	2.3	m3	0.11	0.00	0.00	0.00	0.00	0.00	0.00
6.5	Pasangan batu kosong	5.75	m3	0.08	0.00	0.00	0.00	0.00	0.00	0.00
6.6	Lean concrete	0.2	m3	0.03	0.00	0.00	0.00	0.00	0.00	0.00
6.7	Concrete Class C	0.3	m3	0.06	0.00	0.00	0.00	0.00	0.00	0.00
6.8	Tulangan beton U-24	20	kg	0.06	0.00	0.00	0.00	0.00	0.00	0.00
6.9	Cetakan beton	1.1	m2	0.02	0.00	0.00	0.00	0.00	0.00	0.00
6.1	Pasangan batu kali 1:4	11.5	m3	1.35	0.00	0.00	0.00	0.00	0.00	0.00
6.11	Plesteran 1:5	23	m2	0.19	0.00	0.00	0.00	0.00	0.00	0.00
				1.98						
7	**Protection Wall**									
7.1	Galian tanah	0.5	m3	0.00	0.50	0.00	0.00	0.00	0.50	0.00
7.2	Galian batu	2.3	m3	0.08	0.00	0.00	0.00	0.00	0.00	0.00
7.3	Urugan tanah	0.55	m3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.4	Urugan pasir	1.2	m3	0.06	0.00	0.00	0.00	0.00	0.00	0.00
7.5	Pasangan batu kosong	2	m3	0.03	0.00	0.00	0.00	0.00	0.00	0.00
7.6	Pasangan batu kali 1:4	13.5	m3	1.58	0.00	0.00	0.00	0.00	0.00	0.00
7.7	Plesteran 1:5	6	m2	0.05	0.00	0.00	0.00	0.00	0.00	0.00
				1.80						
	TOTAL			**100**		37.72		30.28		67.99
	SCHEDULE									100.00
	DEVIATION (+/-)									(32.01)

Table 7 : *Progress works in November 2006*

4.5 December 2006

Month : December 2006

NO.	DESCRIPTION	QTY	UNIT	PERCENTAGE [%]	THIS MONTH		LAST MONTH		TOTAL	
					QTY	PERCENTAGE	QTY	PERCENTAGE	QTY	PERCENTAGE
A	**Civil Works**									
1	**Intake**									
1.1	Galian tanah	35	m3	0.13	0.00	0.00	35.00	0.13	35.00	0.13
1.2	Galian batu	6	m3	0.22	0.00	0.00	6.00	0.22	6.00	0.22
1.3	Urugan tanah	5	m3	0.01	0.00	0.00	0.00	0.00	0.00	0.00
1.4	Urugan pasir	5	m3	0.23	0.00	0.00	0.00	0.00	0.00	0.00
1.5	Pasangan batu kosong	12.5	m3	0.18	0.00	0.00	0.00	0.00	0.00	0.00
1.6	Lean concrete	2	m3	0.29	0.00	0.00	0.00	0.00	0.00	0.00
1.7	Concrete Class C	17	m3	3.46	0.00	0.00	0.00	0.00	0.00	0.00
1.8	Tulangan beton U-24	1440	kg	3.99	0.00	0.00	0.00	0.00	0.00	0.00
1.9	Cetakan beton	120	m2	2.22	0.00	0.00	0.00	0.00	0.00	0.00
1.10	Pasangan batu kali 1:4	27	m3	3.17	0.00	0.00	0.00	0.00	0.00	0.00
1.11	Plesteran 1:5	45	m2	0.38	0.00	0.00	0.00	0.00	0.00	0.00
1.12	Sluice gate (800x1000)x2000	1	Set	1.58	0.00	0.00	0.00	0.00	0.00	0.00
1.13	Coarse trash rack 2x0.2	1	Set	0.20	0.00	0.00	0.00	0.00	0.00	0.00
				16.06						
2	**Sand Trap**									
2.1	Galian tanah	99.7	m3	0.38	0.00	0.00	99.70	0.38	99.70	0.38
2.2	Galian batu	10	m3	0.36	0.00	0.00	10.00	0.36	10.00	0.36
2.3	Urugan tanah	10	m3	0.02	0.00	0.00	10.00	0.02	10.00	0.02
2.4	Urugan pasir	5	m3	0.23	0.00	0.00	5.00	0.23	5.00	0.23
2.5	Pasangan batu kosong	15	m3	0.21	0.00	0.00	15.00	0.21	15.00	0.21
2.6	Lean concrete	1	m3	0.15	0.00	0.00	1.00	0.15	1.00	0.15
2.7	Concrete Class C	0.22	m3	0.04	0.00	0.00	0.22	0.04	0.22	0.04
2.8	Tulangan beton U-24	22	kg	0.06	0.00	0.00	22.00	0.06	22.00	0.06
2.9	Cetakan beton	1.1	m2	0.02	0.00	0.00	1.10	0.02	1.10	0.02
2.10	Pasangan batu kali 1:4	82	m3	9.62	0.00	0.00	82.00	9.62	82.00	9.62
2.11	Plesteran 1:2	95	m2	1.05	0.00	0.00	95.00	1.05	95.00	1.05
2.12	Control gate (800x800)2000	1	Set	1.55	0.00	0.00	1.00	1.55	1.00	1.55
2.13	Gate Valve for flushing DN 6"	1	Set	0.80	0.00	0.00	1.00	0.80	1.00	0.80
				14.49						
3	**Fore bay dan Spillway**									
3.1	Galian tanah	58	m3	0.22	0.00	0.00	58.00	0.22	58.00	0.22
3.2	Galian batu	3	m3	0.11	0.00	0.00	3.00	0.11	3.00	0.11
3.3	Urugan tanah	10	m3	0.02	0.00	0.00	10.00	0.02	10.00	0.02
3.4	Urugan pasir	3.9	m3	0.18	0.00	0.00	3.90	0.18	3.90	0.18
3.5	Pasangan batu kosong	9.75	m3	0.14	0.00	0.00	9.75	0.14	9.75	0.14
3.6	Lean concrete	0.5	m3	0.07	0.00	0.00	0.50	0.07	0.50	0.07
3.7	Concrete Class C	3.5	m3	0.71	0.00	0.00	3.50	0.71	3.50	0.71
3.8	Tulangan beton U-24	410	kg	1.14	0.00	0.00	410.00	1.14	410.00	1.14
3.9	Cetakan beton	25	m2	0.46	0.00	0.00	25.00	0.46	25.00	0.46
3.10	Pasangan batu kali 1:4	47	m3	5.51	0.00	0.00	47.00	5.51	47.00	5.51
3.11	Plesteran 1:2	68.5	m2	0.75	0.00	0.00	68.50	0.75	68.50	0.75
3.12	PVC pipe dia=6 " for flushing	24	m	0.96	0.00	0.00	24.00	0.96	24.00	0.96
3.13	PVC bend dia=6" for flushing	2	Set	0.21	0.00	0.00	2.00	0.21	2.00	0.21
3.14	Gate valve dia=6" for flushing	2	Set	1.61	0.00	0.00	2.00	1.61	2.00	1.61
3.15	Fine trashrack, dimensions = 1 m x 2 m	2	Set	1.61	0.00	0.00	2.00	1.61	2.00	1.61
				13.71						

4	**Penstock dia. 380 mm**									
4.1	Galian tanah	8.50	m3	0.03	0.00	0.00	8.50	0.03	8.50	0.03
4.2	Galian batu	1.00	m3	0.04	0.00	0.00	1.00	0.04	1.00	0.04
4.3	Urugan tanah	1 80	m3	0 00	0 00	0 00	1 80	0.00	1.80	0.00
4.4	Urugan pasir	0 20	m3	0 01	0 00	0 00	0 20	0 01	0 20	0.01
4.5	Pasangan batu kosong	0 40	m3	0.01	0.00	0 00	0 40	0.01	0.40	0.01
4.6	Lean concrete	0 80	m3	0.12	0.00	0 00	0 80	0 12	0 80	0.12
4.7	Concrete Class C	2 70	m3	0 55	0 00	0 00	2.70	0.55	2 70	0.55
4 8	Tulangan beton U-24	156 00	kg	0 43	0 00	0 00	156.00	0.43	156.00	0.43
4.9	Cetakan beton	5 00	m2	0.09	0 00	0.00	5.00	0 09	5.00	0.09
4.10	Pasangan batu kali 1.4	5 50	m3	0 65	0.00	0.00	5.50	0.65	5 50	0.65
4.11	Penstock,dia=380 mm, thickness=4 mm	70 00	m	28.12	0 00	0.00	70.00	28.12	70.00	28 12
4.12	Air vent, material dia=2.5", thickness=3	4 00	m	0 15	0 00	0.00	4.00	0.15	4.00	0.15
4 13	Expansion joint includes extra flange, bolts set and oring set, dia=380 flange t=20	2	set	5.62	0 00	0.00	2 00	5.62	2.00	5.62
4.14	Stiffener, material dia=380, thickness=4	8	set	0.86	0.00	0 00	8 00	0.86	8.00	0.86
4.15	Bend section, material dia=380, thickness=4	3	set	1 06	0 00	0.00	3 00	1.06	3.00	1 06
4 16	Saddle includes Teflon/asphalt layer, anchor and strap, dia 380	11	set	0.88	0 00	0 00	11.00	0.88	11.00	0.88
4 17	Flange includes bolts set and gasket set, dia=570, PN=	1	set	0 39	0 00	0 00	1.00	0 39	1 00	0.39
				39.00						
5	**Power House Ukuran 4 m x 5 m**									
5.1	Pondasi Turbine and Generator									
	Galian tanah	2.29	m3	0 01	0.00	0 00	2.29	0 01	2 29	0 01
	Galian batu	0 5	m3	0 02	0.00	0.00	0.50	0.02	0 50	0.02
	Urugan pasir	0.2	m3	0 01	0.20	0.01	0.00	0.00	0 20	0.01
	Pasangan batu kosong	0 5	m3	0 01	0 50	0.01	0.00	0.00	0.50	0.01
	Concrete Class B	1.5	m3	0 36	1.50	0.36	0.00	0 00	1.50	0 36
	Tulangan beton U-24	80	kg	0 22	80 00	0 22	0 00	0.00	80.00	0.22
	Cetakan beton	12	m2	0 22	12 00	0.22	0 00	0.00	12.00	0 22
	Pasangan batu kali 1 4	2 5	m3	0.29	2 50	0.29	0 00	0 00	2.50	0.29
	Plesteran 1 5	5	m2	0.04	5 00	0.04	0.00	0.00	5.00	0.04
5.2	Pondasi Rumah									
	Galian tanah	17 82	m3	0.07	0 00	0.00	17.82	0 07	17 82	0 07
	Galian batu	2	m3	0.07	0 00	0.00	2 00	0.07	2.00	0 07
	Urugan pasir	0 7	m3	0 03	0.70	0.03	0 00	0.00	0 70	0.03
	Pasangan batu kosong	1.8	m3	0.03	1 80	0 03	0.00	0.00	1.80	0 03
	Pasangan batu kali 1 4	6	m3	0.70	6.00	0.70	0.00	0.00	6 00	0 70
5.3	Dinding, Pintu dan Jendela									
	Pasangan Bata 1:4	58	m2	1.31	0.00	0.00	0.00	0.00	0.00	0.00
	Plesteran 1:5	116	m2	0.98	0.00	0.00	0.00	0.00	0.00	0.00
	Concrete Class C	1.39	m3	0.28	0.00	0.00	0.00	0.00	0.00	0.00
	Tulangan beton U-24	205	kg	0.57	0.00	0.00	0.00	0.00	0.00	0.00
	Cetakan beton	14	m2	0.26	0.00	0.00	0.00	0.00	0.00	0.00
	Pintu besi termasuk rel	1	set	0.94	0.00	0.00	0.00	0.00	0.00	0.00
	Jendela termasuk kusen	3	set	0.40	0.00	0.00	0.00	0.00	0.00	0.00
5.4	Atap									
	Struktur besi untuk rangka atap	400	kg	1.82	0.00	0.00	0.00	0.00	0.00	0.00
	Atap corrugated Zincalum leber 80 cm	58	m1	1.30	0.00	0.00	0.00	0.00	0.00	0.00
	Nok corrugated Zincalum	7	mI	0.08	0.00	0.00	0.00	0.00	0.00	0.00
	Drainage: talang seng termasuk pipa PVC 3 inch	2	set	0.19	0.00	0.00	0.00	0.00	0.00	0.00
5.5	Lantai									
	Urugan pasir	1	m3	0.05	0.00	0.00	0.00	0.00	0.00	0.00
	Lantai beton 7 cm	4	m3	0.58	0.00	0.00	0.00	0.00	0.00	0.00

5.6	Teras dan Drainage									
	Galian tanah	28	m3	0.11	0.00	0.00	28.00	0.11	28.00	0.11
	Galian batu	2.5	m3	0.09	0.00	0.00	2.50	0.09	2.50	0.09
	Urugan pasir	1.4	m3	0.06	1.40	0.06	0.00	0.00	1.40	0.06
	Lean concrete	1.4	m3	0.20	1.40	0.20	0.00	0.00	1.40	0.20
	Pasangan batu kali 1:4	7	m3	0.82	7.00	0.82	0.00	0.00	7.00	0.82
	Plesteran 1:5	25	m2	0.21	0.00	0.00	0.00	0.00	0.00	0.00
5.7	Finishing									
	Pengecatan tembok	59	m2	0.34	0.00	0.00	0.00	0.00	0.00	0.00
	Pengecatan kayu/besi	10	m2	0.11	0.00	0.00	0.00	0.00	0.00	0.00
	Pengecatan lantai	17	m2	0.18	0.00	0.00	0.00	0.00	0.00	0.00
				12.96						
6	**Tailrace**									
6.1	Galian tanah	10.787	m3	0.04	0.00	0.00	10.79	0.04	10.79	0.04
6.2	Galian batu	1.0787	m3	0.04	0.00	0.00	1.08	0.04	1.08	0.04
6.3	Urugan tanah	2.69676	m3	0.01	2.70	0.01	0.00	0.00	2.70	0.01
6.4	Urugan pasir	2.3	m3	0.11	2.30	0.11	0.00	0.00	2.30	0.11
6.5	Pasangan batu kosong	5.75	m3	0.08	5.75	0.08	0.00	0.00	5.75	0.08
6.6	Lean concrete	0.2	m3	0.03	0.20	0.03	0.00	0.00	0.20	0.03
6.7	Concrete Class C	0.3	m3	0.06	0.30	0.06	0.00	0.00	0.30	0.06
6.8	Tulangan beton U-24	20	kg	0.06	20.00	0.06	0.00	0.00	20.00	0.06
6.9	Cetakan beton	1.1	m2	0.02	1.10	0.02	0.00	0.00	1.10	0.02
6.1	Pasangan batu kali 1:4	11.5	m3	1.35	11.50	1.35	0.00	0.00	11.50	1.35
6.11	Plesteran 1:5	23	m2	0.19	23.00	0.19	0.00	0.00	23.00	0.19
				1.98						
7	**Protection Wall**									
7.1	Galian tanah	0.5	m3	0.00	0.00	0.00	0.50	0.00	0.50	0.00
7.2	Galian batu	2.3	m3	0.08	2.30	0.08	0.00	0.00	2.30	0.08
7.3	Urugan tanah	0.55	m3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.4	Urugan pasir	1.2	m3	0.06	0.00	0.00	0.00	0.00	0.00	0.00
7.5	Pasangan batu kosong	2	m3	0.03	0.00	0.00	0.00	0.00	0.00	0.00
7.6	Pasangan batu kali 1:4	13.5	m3	1.58	0.00	0.00	0.00	0.00	0.00	0.00
7.7	Plesteran 1:5	6	m2	0.05	0.00	0.00	0.00	0.00	0.00	0.00
				1.80						
	TOTAL			**100**		4.99		67.99		72.98
	SCHEDULE									100.00
	DEVIATION (+/-)									(27.02)

Table 8 : *Progress works in December 2006*

4.6 January 2007

Month : January 2007

NO.	DESCRIPTION	QTY	UNIT	PERCENTAGE [%]	THIS MONTH		LAST MONTH		TOTAL	
					QTY	PERCENTAGE	QTY	PERCENTAGE	QTY	PERCENTAGE
A	**Civil Works**									
1	**Intake**									
1.1	Galian tanah	35	m3	0.13	0.00	0.00	35.00	0.13	35.00	0.13
1.2	Galian batu	6	m3	0.22	0.00	0.00	6.00	0.22	6.00	0.22
1.3	Urugan tanah	5	m3	0.01	5.00	0.01	0.00	0.00	5.00	0.01
1.4	Urugan pasir	5	m3	0.23	5.00	0.23	0.00	0.00	5.00	0.23
1.5	Pasangan batu kosong	12.5	m3	0.18	12.50	0.18	0.00	0.00	12.50	0.18
1.6	Lean concrete	2	m3	0.29	2.00	0.29	0.00	0.00	2.00	0.29
1.7	Concrete Class C	17	m3	3.46	0.00	0.00	0.00	0.00	0.00	0.00
1.8	Tulangan beton U-24	1440	kg	3.99	0.00	0.00	0.00	0.00	0.00	0.00
1.9	Cetakan beton	120	m2	2.22	0.00	0.00	0.00	0.00	0.00	0.00
1.10	Pasangan batu kali 1:4	27	m3	3.17	15.00	1.76	0.00	0.00	15.00	1.76
1.11	Plesteran 1:5	45	m2	0.38	0.00	0.00	0.00	0.00	0.00	0.00
1.12	Sluice gate (800x1000)x2000	1	Set	1.58	0.00	0.00	0.00	0.00	0.00	0.00
1.13	Coarse trash rack 2x0.2	1	Set	0.20	0.00	0.00	0.00	0.00	0.00	0.00
				16.06						
2	**Sand Trap**									
2.1	Galian tanah	99.7	m3	0.38	0.00	0.00	99.70	0.38	99.70	0.38
2.2	Galian batu	10	m3	0.36	0.00	0.00	10.00	0.36	10.00	0.36
2.3	Urugan tanah	10	m3	0.02	0.00	0.00	10.00	0.02	10.00	0.02
2.4	Urugan pasir	5	m3	0.23	0.00	0.00	5.00	0.23	5.00	0.23
2.5	Pasangan batu kosong	15	m3	0.21	0.00	0.00	15.00	0.21	15.00	0.21
2.6	Lean concrete	1	m3	0.15	0.00	0.00	1.00	0.15	1.00	0.15
2.7	Concrete Class C	0.22	m3	0.04	0.00	0.00	0.22	0.04	0.22	0.04
2.8	Tulangan beton U-24	22	kg	0.06	0.00	0.00	22.00	0.06	22.00	0.06
2.9	Cetakan beton	1.1	m2	0.02	0.00	0.00	1.10	0.02	1.10	0.02
2.10	Pasangan batu kali 1:4	82	m3	9.62	0.00	0.00	82.00	9.62	82.00	9.62
2.11	Plesteran 1:2	95	m2	1.05	0.00	0.00	95.00	1.05	95.00	1.05
2.12	Control gate (800x800)2000	1	Set	1.55	0.00	0.00	1.00	1.55	1.00	1.55
2.13	Gate Valve for flushing DN 6"	1	Set	0.80	0.00	0.00	1.00	0.80	1.00	0.80
				14.49						
3	**Fore bay dan Spillway**									
3.1	Galian tanah	58	m3	0.22	0.00	0.00	58.00	0.22	58.00	0.22
3.2	Galian batu	3	m3	0.11	0.00	0.00	3.00	0.11	3.00	0.11
3.3	Urugan tanah	10	m3	0.02	0.00	0.00	10.00	0.02	10.00	0.02
3.4	Urugan pasir	3.9	m3	0.18	0.00	0.00	3.90	0.18	3.90	0.18
3.5	Pasangan batu kosong	9.75	m3	0.14	0.00	0.00	9.75	0.14	9.75	0.14
3.6	Lean concrete	0.5	m3	0.07	0.00	0.00	0.50	0.07	0.50	0.07
3.7	Concrete Class C	3.5	m3	0.71	0.00	0.00	3.50	0.71	3.50	0.71
3.8	Tulangan beton U-24	410	kg	1.14	0.00	0.00	410.00	1.14	410.00	1.14
3.9	Cetakan beton	25	m2	0.46	0.00	0.00	25.00	0.46	25.00	0.46
3.10	Pasangan batu kali 1:4	47	m3	5.51	0.00	0.00	47.00	5.51	47.00	5.51
3.11	Plesteran 1:2	68.5	m2	0.75	0.00	0.00	68.50	0.75	68.50	0.75
3.12	PVC pipe dia=6 " for flushing	24	m	0.96	0.00	0.00	24.00	0.96	24.00	0.96
3.13	PVC bend dia=6" for flushing	2	Set	0.21	0.00	0.00	2.00	0.21	2.00	0.21
3.14	Gate valve dia=6" for flushing	2	Set	1.61	0.00	0.00	2.00	1.61	2.00	1.61
3.15	Fine trashrack, dimensions = 1 m x 2 m	2	Set	1.61	0.00	0.00	2.00	1.61	2.00	1.61
				13.71						

4	**Penstock dia. 380 mm**									
4.1	Galian tanah	8.50	m3	0.03	0.00	0.00	8.50	0.03	8.50	0.03
4.2	Galian batu	1.00	m3	0.04	0.00	0.00	1.00	0.04	1.00	0.04
4.3	Urugan tanah	1.80	m3	0.00	0.00	0.00	1.80	0.00	1.80	0.00
4.4	Urugan pasir	0.20	m3	0.01	0.00	0.00	0.20	0.01	0.20	0.01
4.5	Pasangan batu kosong	0.40	m3	0.01	0.00	0.00	0.40	0.01	0.40	0.01
4.6	Lean concrete	0.80	m3	0.12	0.00	0.00	0.80	0.12	0.80	0.12
4.7	Concrete Class C	2.70	m3	0.55	0.00	0.00	2.70	0.55	2.70	0.55
4.8	Tulangan beton U-24	156.00	kg	0.43	0.00	0.00	156.00	0.43	156.00	0.43
4.9	Cetakan beton	5.00	m2	0.09	0.00	0.00	5.00	0.09	5.00	0.09
4.10	Pasangan batu kali 1:4	5.50	m3	0.65	0.00	0.00	5.50	0.65	5.50	0.65
4.11	Penstock,dia=380 mm, thickness=4 mm	70.00	m	28.12	0.00	0.00	70.00	28.12	70.00	28.12
4.12	Air vent, material dia=2,5", thickness=3	4.00	m	0.15	0.00	0.00	4.00	0.15	4.00	0.15
4.13	Expansion joint includes extra flange, bolts set and oring set, dia=380 flange t=20	2	set	5.62	0.00	0.00	2.00	5.62	2.00	5.62
4.14	Stiffener, material dia=380, thickness=4	8	set	0.86	0.00	0.00	8.00	0.86	8.00	0.86
4.15	Bend section, material dia=380, thickness=4	3	set	1.06	0.00	0.00	3.00	1.06	3.00	1.06
4.16	Saddle includes Teflon/asphalt layer, anchor and strap, dia 380	11	set	0.88	0.00	0.00	11.00	0.88	11.00	0.88
4.17	Flange includes bolts set and gasket set, dia=570, PN=	1	set	0.39	0.00	0.00	1.00	0.39	1.00	0.39
				39.00						
5	**Power House Ukuran 4 m x 5 m**									
5.1	Pondasi Turbine and Generator									
	Galian tanah	2.29	m3	0.01	0.00	0.00	2.29	0.01	2.29	0.01
	Galian batu	0.5	m3	0.02	0.00	0.00	0.50	0.02	0.50	0.02
	Urugan pasir	0.2	m3	0.01	0.00	0.00	0.20	0.01	0.20	0.01
	Pasangan batu kosong	0.5	m3	0.01	0.00	0.00	0.50	0.01	0.50	0.01
	Concrete Class B	1.5	m3	0.36	0.00	0.00	1.50	0.36	1.50	0.36
	Tulangan beton U-24	80	kg	0.22	0.00	0.00	80.00	0.22	80.00	0.22
	Cetakan beton	12	m2	0.22	0.00	0.00	12.00	0.22	12.00	0.22
	Pasangan batu kali 1:4	2.5	m3	0.29	0.00	0.00	2.50	0.29	2.50	0.29
	Plesteran 1:5	5	m2	0.04	0.00	0.00	5.00	0.04	5.00	0.04
5.2	Pondasi Rumah									
	Galian tanah	17.82	m3	0.07	0.00	0.00	17.82	0.07	17.82	0.07
	Galian batu	2	m3	0.07	0.00	0.00	2.00	0.07	2.00	0.07
	Urugan pasir	0.7	m3	0.03	0.00	0.00	0.70	0.03	0.70	0.03
	Pasangan batu kosong	1.8	m3	0.03	0.00	0.00	1.80	0.03	1.80	0.03
	Pasangan batu kali 1:4	6	m3	0.70	0.00	0.00	6.00	0.70	6.00	0.70
5.3	Dinding, Pintu dan Jendela									
	Pasangan Bata 1:4	58	m2	1.31	58.00	1.31	0.00	0.00	58.00	1.31
	Plesteran 1:5	116	m2	0.98	116.00	0.98	0.00	0.00	116.00	0.98
	Concrete Class C	1.39	m3	0.28	1.39	0.28	0.00	0.00	1.39	0.28
	Tulangan beton U-24	205	kg	0.57	205.00	0.57	0.00	0.00	205.00	0.57
	Cetakan beton	14	m2	0.26	14.00	0.26	0.00	0.00	14.00	0.26
	Pintu besi termasuk rel	1	set	0.94	1.00	0.94	0.00	0.00	1.00	0.94
	Jendela termasuk kusen	3	set	0.40	3.00	0.40	0.00	0.00	3.00	0.40
5.4	Atap									
	Struktur besi untuk rangka atap	400	kg	1.82	400.00	1.82	0.00	0.00	400.00	1.82
	Atap corrugated Zincalum lebar 80 cm	58	m1	1.30	58.00	1.30	0.00	0.00	58.00	1.30
	Nok corrugated Zincalum	7	m1	0.08	7.00	0.08	0.00	0.00	7.00	0.08
	Drainage, talang seng termasuk pipa PVC 3 inch	2	set	0.19	2.00	0.19	0.00	0.00	2.00	0.19
5.5	Lantai									
	Urugan pasir	1	m3	0.05	1.00	0.05	0.00	0.00	1.00	0.05
	Lantai beton 7 cm	4	m3	0.58	4.00	0.58	0.00	0.00	4.00	0.58

5.6	Teras dan Drainage									
	Galian tanah	28	m3	0.11	0.00	0.00	28.00	0.11	28.00	0.11
	Galian batu	2.5	m3	0.09	0.00	0.00	2.50	0.09	2.50	0.09
	Urugan pasir	1.4	m3	0.06	0.00	0.00	1.40	0.06	1.40	0.06
	Lean concrete	1.4	m3	0.20	0.00	0.00	1.40	0.20	1.40	0.20
	Pasangan batu kali 1:4	7	m3	0.82	0.00	0.00	7.00	0.82	7.00	0.82
	Plesteran 1:5	25	m2	0.21	25.00	0.21	0.00	0.00	25.00	0.21
5.7	Finishing									
	Pengecatan tembok	59	m2	0.34	0.00	0.00	0.00	0.00	0.00	0.00
	Pengecatan kayu/besi	10	m2	0.11	0.00	0.00	0.00	0.00	0.00	0.00
	Pengecatan lantai	17	m2	0.18	0.00	0.00	0.00	0.00	0.00	0.00
				12.96						
6	**Tailrace**									
6.1	Galian tanah	10.787	m3	0.04	0.00	0.00	10.79	0.04	10.79	0.04
6.2	Galian batu	1.0787	m3	0.04	0.00	0.00	1.08	0.04	1.08	0.04
6.3	Urugan tanah	2.69676	m3	0.01	0.00	0.00	2.70	0.01	2.70	0.01
6.4	Urugan pasir	2.3	m3	0.11	0.00	0.00	2.30	0.11	2.30	0.11
6.5	Pasangan batu kosong	5.75	m3	0.08	0.00	0.00	5.75	0.08	5.75	0.08
6.6	Lean concrete	0.2	m3	0.03	0.00	0.00	0.20	0.03	0.20	0.03
6.7	Concrete Class C	0.3	m3	0.06	0.00	0.00	0.30	0.06	0.30	0.06
6.8	Tulangan beton U-24	20	kg	0.06	0.00	0.00	20.00	0.06	20.00	0.06
6.9	Cetakan beton	1.1	m2	0.02	0.00	0.00	1.10	0.02	1.10	0.02
6.1	Pasangan batu kali 1:4	11.5	m3	1.35	0.00	0.00	11.50	1.35	11.50	1.35
6.11	Plesteran 1:5	23	m2	0.19	0.00	0.00	23.00	0.19	23.00	0.19
				1.98						
7	**Protection Wall**									
7.1	Galian tanah	0.5	m3	0.00	0.00	0.00	0.50	0.00	0.50	0.00
7.2	Galian batu	2.3	m3	0.08	0.00	0.00	2.30	0.08	2.30	0.08
7.3	Urugan tanah	0.55	m3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.4	Urugan pasir	1.2	m3	0.06	0.00	0.00	0.00	0.00	0.00	0.00
7.5	Pasangan batu kosong	2	m3	0.03	0.00	0.00	0.00	0.00	0.00	0.00
7.6	Pasangan batu kali 1:4	13.5	m3	1.58	0.00	0.00	0.00	0.00	0.00	0.00
7.7	Plesteran 1:5	6	m2	0.05	0.00	0.00	0.00	0.00	0.00	0.00
				1.80						
	TOTAL			**100**		11.44		72.98		84.41
	SCHEDULE									100.00
	DEVIATION (+/-)									(15.58)

***Table 9 :** Progress works in January 2007*

4.7 February 2007

Month : February 2007

NO.	DESCRIPTION	QTY	UNIT	PERCENTAGE [%]	THIS MONTH		LAST MONTH		TOTAL	
					QTY	PERCENTAGE	QTY	PERCENTAGE	QTY	PERCENTAGE
A	**Civil Works**									
1	**Intake**									
1.1	Galian tanah	35	m3	0.13	0.00	0.00	35.00	0.13	35.00	0.13
1.2	Galian batu	6	m3	0.22	0.00	0.00	6.00	0.22	6.00	0.22
1.3	Urugan tanah	5	m3	0.01	0.00	0.00	5.00	0.01	5.00	0.01
1.4	Urugan pasir	5	m3	0.23	0.00	0.00	5.00	0.23	5.00	0.23
1.5	Pasangan batu kosong	12.5	m3	0.18	0.00	0.00	12.50	0.18	12.50	0.18
1.6	Lean concrete	2	m3	0.29	0.00	0.00	2.00	0.29	2.00	0.29
1.7	Concrete Class C	17	m3	3.46	17.00	3.46	0.00	0.00	17.00	3.46
1.8	Tulangan beton U-24	1440	kg	3.99	1440.00	3.99	0.00	0.00	1440.00	3.99
1.9	Cetakan beton	120	m2	2.22	120.00	2.22	0.00	0.00	120.00	2.22
1.10	Pasangan batu kali 1:4	27	m3	3.17	10.00	1.17	15.00	1.76	25.00	2.93
1.11	Plesteran 1:5	45	m2	0.38	20.00	0.17	0.00	0.00	20.00	0.17
1.12	Sluice gate (800x1000)x2000	1	Set	1.58	1.00	1.58	0.00	0.00	1.00	1.58
1.13	Coarse trash rack 2x0.2	1	Set	0.20	1.00	0.20	0.00	0.00	1.00	0.20
				16.06						
2	**Sand Trap**									
2.1	Galian tanah	99.7	m3	0.38	0.00	0.00	99.70	0.38	99.70	0.38
2.2	Galian batu	10	m3	0.36	0.00	0.00	10.00	0.36	10.00	0.36
2.3	Urugan tanah	10	m3	0.02	0.00	0.00	10.00	0.02	10.00	0.02
2.4	Urugan pasir	5	m3	0.23	0.00	0.00	5.00	0.23	5.00	0.23
2.5	Pasangan batu kosong	15	m3	0.21	0.00	0.00	15.00	0.21	15.00	0.21
2.6	Lean concrete	1	m3	0.15	0.00	0.00	1.00	0.15	1.00	0.15
2.7	Concrete Class C	0.22	m3	0.04	0.00	0.00	0.22	0.04	0.22	0.04
2.8	Tulangan beton U-24	22	kg	0.06	0.00	0.00	22.00	0.06	22.00	0.06
2.9	Cetakan beton	1.1	m2	0.02	0.00	0.00	1.10	0.02	1.10	0.02
2.10	Pasangan batu kali 1:4	82	m3	9.62	0.00	0.00	82.00	9.62	82.00	9.62
2.11	Plesteran 1:2	95	m2	1.05	0.00	0.00	95.00	1.05	95.00	1.05
2.12	Control gate (800x800)2000	1	Set	1.55	0.00	0.00	1.00	1.55	1.00	1.55
2.13	Gate Valve for flushing DN 6"	1	Set	0.80	0.00	0.00	1.00	0.80	1.00	0.80
				14.49						
3	**Fore bay dan Spillway**									
3.1	Galian tanah	58	m3	0.22	0.00	0.00	58.00	0.22	58.00	0.22
3.2	Galian batu	3	m3	0.11	0.00	0.00	3.00	0.11	3.00	0.11
3.3	Urugan tanah	10	m3	0.02	0.00	0.00	10.00	0.02	10.00	0.02
3.4	Urugan pasir	3.9	m3	0.18	0.00	0.00	3.90	0.18	3.90	0.18
3.5	Pasangan batu kosong	9.75	m3	0.14	0.00	0.00	9.75	0.14	9.75	0.14
3.6	Lean concrete	0.5	m3	0.07	0.00	0.00	0.50	0.07	0.50	0.07
3.7	Concrete Class C	3.5	m3	0.71	0.00	0.00	3.50	0.71	3.50	0.71
3.8	Tulangan beton U-24	410	kg	1.14	0.00	0.00	410.00	1.14	410.00	1.14
3.9	Cetakan beton	25	m2	0.46	0.00	0.00	25.00	0.46	25.00	0.46
3.10	Pasangan batu kali 1:4	47	m3	5.51	0.00	0.00	47.00	5.51	47.00	5.51
3.11	Plesteran 1:2	68.5	m2	0.75	0.00	0.00	68.50	0.75	68.50	0.75
3.12	PVC pipe dia=6 " for flushing	24	m	0.96	0.00	0.00	24.00	0.96	24.00	0.96
3.13	PVC bend dia=6" for flushing	2	Set	0.21	0.00	0.00	2.00	0.21	2.00	0.21
3.14	Gate valve dia=6" for flushing	2	Set	1.61	0.00	0.00	2.00	1.61	2.00	1.61
3.15	Fine trashrack, dimensions = 1 m x 2 m	2	Set	1.61	0.00	0.00	2.00	1.61	2.00	1.61
				13.71						

4	**Penstock dia. 380 mm**									
4.1	Galian tanah	8.50	m3	0.03	0.00	0.00	8.50	0.03	8.50	0.03
4.2	Galian batu	1.00	m3	0.04	0.00	0.00	1.00	0.04	1.00	0.04
4.3	Urugan tanah	1.80	m3	0.00	0.00	0.00	1.80	0.00	1.80	0.00
4.4	Urugan pasir	0.20	m3	0.01	0.00	0.00	0.20	0.01	0.20	0.01
4.5	Pasangan batu kosong	0.40	m3	0.01	0.00	0.00	0.40	0.01	0.40	0.01
4.6	Lean concrete	0.80	m3	0.12	0.00	0.00	0.80	0.12	0.80	0.12
4.7	Concrete Class C	2.70	m3	0.55	0.00	0.00	2.70	0.55	2.70	0.55
4.8	Tulangan beton U-24	156.00	kg	0.43	0.00	0.00	156.00	0.43	156.00	0.43
4.9	Cetakan beton	5.00	m2	0.09	0.00	0.00	5.00	0.09	5.00	0.09
4.10	Pasangan batu kali 1:4	5.50	m3	0.65	0.00	0.00	5.50	0.65	5.50	0.65
4.11	Penstock,dia=380 mm, thickness=4 mm	70.00	m	28.12	0.00	0.00	70.00	28.12	70.00	28.12
4.12	Air vent, material dia=2.5", thickness=3	4.00	m	0.15	0.00	0.00	4.00	0.15	4.00	0.15
4.13	Expansion joint includes extra flange, bolts set and oring set, dia=380 flange t=20	2	set	5.62	0.00	0.00	2.00	5.62	2.00	5.62
4.14	Stiffener, material dia=380, thickness=4	8	set	0.86	0.00	0.00	8.00	0.86	8.00	0.86
4.15	Bend section, material dia=380, thickness=4	3	set	1.06	0.00	0.00	3.00	1.06	3.00	1.06
4.16	Saddle includes Teflon/asphalt layer, anchor and strap, dia 380	11	set	0.88	0.00	0.00	11.00	0.88	11.00	0.88
4.17	Flange includes bolts set and gasket set, dia=570, PN=	1	set	0.39	0.00	0.00	1.00	0.39	1.00	0.39
				39.00						
5	**Power House Ukuran 4 m x 5 m**									
5.1	Pondasi Turbine and Generator									
	Galian tanah	2.29	m3	0.01	0.00	0.00	2.29	0.01	2.29	0.01
	Galian batu	0.5	m3	0.02	0.00	0.00	0.50	0.02	0.50	0.02
	Urugan pasir	0.2	m3	0.01	0.00	0.00	0.20	0.01	0.20	0.01
	Pasangan batu kosong	0.5	m3	0.01	0.00	0.00	0.50	0.01	0.50	0.01
	Concrete Class B	1.5	m3	0.36	0.00	0.00	1.50	0.36	1.50	0.36
	Tulangan beton U-24	80	kg	0.22	0.00	0.00	80.00	0.22	80.00	0.22
	Cetakan beton	12	m2	0.22	0.00	0.00	12.00	0.22	12.00	0.22
	Pasangan batu kali 1:4	2.5	m3	0.29	0.00	0.00	2.50	0.29	2.50	0.29
	Plesteran 1:5	5	m2	0.04	0.00	0.00	5.00	0.04	5.00	0.04
5.2	Pondasi Rumah									
	Galian tanah	17.82	m3	0.07	0.00	0.00	17.82	0.07	17.82	0.07
	Galian batu	2	m3	0.07	0.00	0.00	2.00	0.07	2.00	0.07
	Urugan pasir	0.7	m3	0.03	0.00	0.00	0.70	0.03	0.70	0.03
	Pasangan batu kosong	1.8	m3	0.03	0.00	0.00	1.80	0.03	1.80	0.03
	Pasangan batu kali 1:4	6	m3	0.70	0.00	0.00	6.00	0.70	6.00	0.70
5.3	Dinding, Pintu dan Jendela									
	Pasangan Bata 1:4	58	m2	1.31	0.00	0.00	58.00	1.31	58.00	1.31
	Plesteran 1:5	116	m2	0.98	0.00	0.00	116.00	0.98	116.00	0.98
	Concrete Class C	1.39	m3	0.28	0.00	0.00	1.39	0.28	1.39	0.28
	Tulangan beton U-24	205	kg	0.57	0.00	0.00	205.00	0.57	205.00	0.57
	Cetakan beton	14	m2	0.26	0.00	0.00	14.00	0.26	14.00	0.26
	Pintu besi termasuk rel	1	set	0.94	0.00	0.00	1.00	0.94	1.00	0.94
	Jendela termasuk kusen	3	set	0.40	0.00	0.00	3.00	0.40	3.00	0.40
5.4	Atap									
	Struktur besi untuk rangka atap	400	kg	1.82	0.00	0.00	400.00	1.82	400.00	1.82
	Atap corrugated Zincalum lebar 80 cm	58	m1	1.30	0.00	0.00	58.00	1.30	58.00	1.30
	Nok corrugated Zincalum	7	m1	0.08	0.00	0.00	7.00	0.08	7.00	0.08
	Drainage, talang seng termasuk pipa PVC 3 inch	2	set	0.19	0.00	0.00	2.00	0.19	2.00	0.19
5.5	Lantai									
	Urugan pasir	1	m3	0.05	0.00	0.00	1.00	0.05	1.00	0.05
	Lantai beton 7 cm	4	m3	0.58	0.00	0.00	4.00	0.58	4.00	0.58

5.6	Teras dan Drainage									
	Galian tanah	28	m3	0 11	0 00	0.00	28 00	0.11	28.00	0.11
	Galian batu	2 5	m3	0.09	0.00	0.00	2.50	0.09	2.50	0.09
	Urugan pasir	1 4	m3	0.06	0.00	0 00	1 40	0.06	1.40	0 06
	Lean concrete	1 4	m3	0 20	0 00	0 00	1.40	0.20	1 40	0.20
	Pasangan batu kali 1.4	7	m3	0 82	0.00	0 00	7.00	0.82	7.00	0.82
	Plesteran 1 5	25	m2	0.21	0 00	0 00	25.00	0.21	25.00	0.21
5.7	Finishing									
	Pengecatan tembok	59	m2	0.34	0.00	0.00	0.00	0.00	0.00	0.00
	Pengecatan kayu/besi	10	m2	0.11	0.00	0.00	0.00	0.00	0.00	0.00
	Pengecatan lantai	17	m2	0.18	0.00	0.00	0.00	0.00	0.00	0.00
				12.96						
6	**Tailrace**									
6.1	Galian tanah	10 787	m3	0.04	0.00	0 00	10.79	0.04	10 79	0.04
6 2	Galian batu	1 0787	m3	0 04	0 00	0.00	1 08	0 04	1 08	0.04
6 3	Urugan tanah	2.69676	m3	0 01	0 00	0 00	2 70	0.01	2 70	0 01
6.4	Urugan pasir	2.3	m3	0 11	0 00	0.00	2.30	0 11	2 30	0.11
6 5	Pasangan batu kosong	5 75	m3	0 08	0 00	0.00	5.75	0 08	5.75	0 08
6 6	Lean concrete	0 2	m3	0 03	0 00	0.00	0.20	0 03	0.20	0 03
6.7	Concrete Class C	0 3	m3	0 06	0.00	0.00	0.30	0 06	0 30	0 06
6.8	Tulangan beton U-24	20	kg	0.06	0.00	0 00	20 00	0 06	20 00	0 06
6.9	Cetakan beton	1 1	m2	0 02	0 00	0 00	1 10	0.02	1.10	0.02
6.1	Pasangan batu kali 1 4	11.5	m3	1 35	0 00	0 00	11 50	1.35	11.50	1.35
6.11	Plesteran 1.5	23	m2	0.19	0.00	0 00	23.00	0.19	23.00	0 19
				1.98						
7	**Protection Wall**									
7 1	Galian tanah	0.5	m3	0.00	0 00	0.00	0.50	0.00	0.50	0.00
7 2	Galian batu	2 3	m3	0.08	0 00	0 00	2.30	0.08	2.30	0.08
7.3	Urugan tanah	0.55	m3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.4	Urugan pasir	1.2	m3	0.06	0.00	0.00	0.00	0.00	0.00	0.00
7.5	Pasangan batu kosong	2	m3	0.03	0.00	0.00	0.00	0.00	0.00	0.00
7.6	Pasangan batu kali 1:4	13.5	m3	1.58	0.00	0.00	0.00	0.00	0.00	0.00
7.7	Plesteran 1:5	6	m2	0.05	0.00	0.00	0.00	0.00	0.00	0.00
				1.80						
	TOTAL			**100**		12.79		84.41		97.21
	SCHEDULE									100.00
	DEVIATION (+/-)									(2.79)

Table 10 : *Progress works in February 2007*

4.8 March 2007

Month : March 2007

NO.	DESCRIPTION	QTY	UNIT	PERCENTAGE [%]	THIS MONTH		LAST MONTH		TOTAL	
					QTY	PERCENTAGE	QTY	PERCENTAGE	QTY	PERCENTAGE
	Rangkuman									
A	**Civil Works**									
A	**Civil Works**									
1	**Intake**									
1.1	Galian tanah	35	m3	0.13	0.00	0.00	35.00	0.13	35.00	0.13
1.2	Galian batu	6	m3	0.22	0.00	0.00	6.00	0.22	6.00	0.22
1.3	Urugan tanah	5	m3	0.01	0.00	0.00	5.00	0.01	5.00	0.01
1.4	Urugan pasir	5	m3	0.23	0.00	0.00	5.00	0.23	5.00	0.23
1.5	Pasangan batu kosong	12.5	m3	0.18	0.00	0.00	12.50	0.18	12.50	0.18
1.6	Lean concrete	2	m3	0.29	0.00	0.00	2.00	0.29	2.00	0.29
1.7	Concrete Class C	17	m3	3.46	0.00	0.00	17.00	3.46	17.00	3.46
1.8	Tulangan beton U-24	1440	kg	3.99	0.00	0.00	1440.00	3.99	1440.00	3.99
1.9	Cetakan beton	120	m2	2.22	0.00	0.00	120.00	2.22	120.00	2.22
1.10	Pasangan batu kali 1:4	27	m3	3.17	2.00	0.23	25.00	2.93	27.00	3.17
1.11	Plesteran 1.5	45	m2	0.38	25.00	0.21	20.00	0.17	45.00	0.38
1.12	Sluice gate (800x1000)x2000	1	Set	1.58	0.00	0.00	1.00	1.58	1.00	1.58
1.13	Coarse trash rack 2x0.2	1	Set	0.20	0.00	0.00	1.00	0.20	1.00	0.20
				16.06						
2	**Sand Trap**									
2.1	Galian tanah	99.7	m3	0.38	0.00	0.00	99.70	0.38	99.70	0.38
2.2	Galian batu	10	m3	0.36	0.00	0.00	10.00	0.36	10.00	0.36
2.3	Urugan tanah	10	m3	0.02	0.00	0.00	10.00	0.02	10.00	0.02
2.4	Urugan pasir	5	m3	0.23	0.00	0.00	5.00	0.23	5.00	0.23
2.5	Pasangan batu kosong	15	m3	0.21	0.00	0.00	15.00	0.21	15.00	0.21
2.6	Lean concrete	1	m3	0.15	0.00	0.00	1.00	0.15	1.00	0.15
2.7	Concrete Class C	0.22	m3	0.04	0.00	0.00	0.22	0.04	0.22	0.04
2.8	Tulangan beton U-24	22	kg	0.06	0.00	0.00	22.00	0.06	22.00	0.06
2.9	Cetakan beton	1.1	m2	0.02	0.00	0.00	1.10	0.02	1.10	0.02
2.10	Pasangan batu kali 1:4	82	m3	9.62	0.00	0.00	82.00	9.62	82.00	9.62
2.11	Plesteran 1.2	95	m2	1.05	0.00	0.00	95.00	1.05	95.00	1.05
2.12	Control gate (800x800)2000	1	Set	1.55	0.00	0.00	1.00	1.55	1.00	1.55
2.13	Gate Valve for flushing DN 6"	1	Set	0.80	0.00	0.00	1.00	0.80	1.00	0.80
				14.49						
3	**Fore bay dan Spillway**									
3.1	Galian tanah	58	m3	0.22	0.00	0.00	58.00	0.22	58.00	0.22
3.2	Galian batu	3	m3	0.11	0.00	0.00	3.00	0.11	3.00	0.11
3.3	Urugan tanah	10	m3	0.02	0.00	0.00	10.00	0.02	10.00	0.02
3.4	Urugan pasir	3.9	m3	0.18	0.00	0.00	3.90	0.18	3.90	0.18
3.5	Pasangan batu kosong	9.75	m3	0.14	0.00	0.00	9.75	0.14	9.75	0.14
3.6	Lean concrete	0.5	m3	0.07	0.00	0.00	0.50	0.07	0.50	0.07
3.7	Concrete Class C	3.5	m3	0.71	0.00	0.00	3.50	0.71	3.50	0.71
3.8	Tulangan beton U-24	410	kg	1.14	0.00	0.00	410.00	1.14	410.00	1.14
3.9	Cetakan beton	25	m2	0.46	0.00	0.00	25.00	0.46	25.00	0.46
3.10	Pasangan batu kali 1:4	47	m3	5.51	0.00	0.00	47.00	5.51	47.00	5.51
3.11	Plesteran 1.2	68.5	m2	0.75	0.00	0.00	68.50	0.75	68.50	0.75
3.12	PVC pipe dia=6 " for flushing	24	m	0.96	0.00	0.00	24.00	0.96	24.00	0.96
3.13	PVC bend dia=6" for flushing	2	Set	0.21	0.00	0.00	2.00	0.21	2.00	0.21

4	**Penstock dia. 380 mm**									
4.1	Galian tanah	8.50	m3	0.03	0.00	0.00	8.50	0.03	8.50	0.03
4.2	Galian batu	1.00	m3	0.04	0.00	0.00	1.00	0.04	1.00	0.04
4.3	Urugan tanah	1.80	m3	0.00	0.00	0.00	1.80	0.00	1.80	0.00
4.4	Urugan pasir	0.20	m3	0.01	0.00	0.00	0.20	0.01	0.20	0.01
4.5	Pasangan batu kosong	0.40	m3	0.01	0.00	0.00	0.40	0.01	0.40	0.01
4.6	Lean concrete	0.80	m3	0.12	0.00	0.00	0.80	0.12	0.80	0.12
4.7	Concrete Class C	2.70	m3	0.55	0.00	0.00	2.70	0.55	2.70	0.55
4.8	Tulangan beton U-24	156.00	kg	0.43	0.00	0.00	156.00	0.43	156.00	0.43
4.9	Cetakan beton	5.00	m2	0.09	0.00	0.00	5.00	0.09	5.00	0.09
4.10	Pasangan batu kali 1:4	5.50	m3	0.65	0.00	0.00	5.50	0.65	5.50	0.65
4.11	Penstock,dia=380 mm, thickness=4 mm	70.00	m	28.12	0.00	0.00	70.00	28.12	70.00	28.12
4.12	Air vent, material dia=2.5", thickness 3	4.00	m	0.15	0.00	0.00	4.00	0.15	4.00	0.15
4.13	Expansion joint includes extra flange, bolts set and oring set, dia=380 flange t=20	2	set	5.62	0.00	0.00	2.00	5.62	2.00	5.62
4.14	Stiffener, material dia=380, thickness=4	8	set	0.86	0.00	0.00	8.00	0.86	8.00	0.86
4.15	Bend section, material dia=380, thickness=4	3	set	1.06	0.00	0.00	3.00	1.06	3.00	1.06
4.16	Saddle includes Teflon/asphalt layer, anchor and strap, dia 380	11	set	0.88	0.00	0.00	11.00	0.88	11.00	0.88
4.17	Flange includes bolts set and gasket set, dia=570, PN=	1	set	0.39	0.00	0.00	1.00	0.39	1.00	0.39
				39.00						
5	**Power House Ukuran 4 m x 5 m**									
5.1	**Pondasi Turbine and Generator**									
	Galian tanah	2.29	m3	0.01	0.00	0.00	2.29	0.01	2.29	0.01
	Galian batu	0.5	m3	0.02	0.00	0.00	0.50	0.02	0.50	0.02
	Urugan pasir	0.2	m3	0.01	0.00	0.00	0.20	0.01	0.20	0.01
	Pasangan batu kosong	0.5	m3	0.01	0.00	0.00	0.50	0.01	0.50	0.01
	Concrete Class B	1.5	m3	0.36	0.00	0.00	1.50	0.36	1.50	0.36
	Tulangan beton U-24	80	kg	0.22	0.00	0.00	80.00	0.22	80.00	0.22
	Cetakan beton	12	m2	0.22	0.00	0.00	12.00	0.22	12.00	0.22
	Pasangan batu kali 1:4	2.5	m3	0.29	0.00	0.00	2.50	0.29	2.50	0.29
	Plesteran 1:5	5	m2	0.04	0.00	0.00	5.00	0.04	5.00	0.04
5.2	**Pondasi Rumah**									
	Galian tanah	17.82	m3	0.07	0.00	0.00	17.82	0.07	17.82	0.07
	Galian batu	2	m3	0.07	0.00	0.00	2.00	0.07	2.00	0.07
	Urugan pasir	0.7	m3	0.03	0.00	0.00	0.70	0.03	0.70	0.03
	Pasangan batu kosong	1.8	m3	0.03	0.00	0.00	1.80	0.03	1.80	0.03
	Pasangan batu kali 1:4	6	m3	0.70	0.00	0.00	6.00	0.70	6.00	0.70
5.3	**Dinding, Pintu dan Jendela**									
	Pasangan Bata 1:4	58	m2	1.31	0.00	0.00	58.00	1.31	58.00	1.31
	Plesteran 1:5	116	m2	0.98	0.00	0.00	116.00	0.98	116.00	0.98
	Concrete Class C	1.39	m3	0.28	0.00	0.00	1.39	0.28	1.39	0.28
	Tulangan beton U-24	205	kg	0.57	0.00	0.00	205.00	0.57	205.00	0.57
	Cetakan beton	14	m2	0.26	0.00	0.00	14.00	0.26	14.00	0.26
	Pintu besi termasuk rel	1	set	0.94	0.00	0.00	1.00	0.94	1.00	0.94
	Jendela termasuk kusen	3	set	0.40	0.00	0.00	3.00	0.40	3.00	0.40
5.4	**Atap**									
	Struktur besi untuk rangka atap	400	kg	1.82	0.00	0.00	400.00	1.82	400.00	1.82
	Atap corrugated Zincalum lebar 80 cm	58	m1	1.30	0.00	0.00	58.00	1.30	58.00	1.30
	Nok corrugated Zincalum	7	m1	0.08	0.00	0.00	7.00	0.08	7.00	0.08
	Drainage talang seng termasuk pipa PVC 3 inch	2	set	0.19	0.00	0.00	2.00	0.19	2.00	0.19
5.5	**Lantai**									
	Urugan pasir	1	m3	0.05	0.00	0.00	1.00	0.05	1.00	0.05
	Lantai beton 7 cm	4	m3	0.58	0.00	0.00	4.00	0.58	4.00	0.58

5.6	Teras dan Drainage									
	Galian tanah	28	m3	0.11	0.00	0.00	28 00	0.11	28.00	0.11
	Galian batu	2.5	m3	0.09	0.00	0 00	2 50	0 09	2.50	0 09
	Urugan pasir	1.4	m3	0.06	0.00	0.00	1.40	0.06	1.40	0.06
	Lean concrete	1.4	m3	0 20	0 00	0.00	1.40	0.20	1.40	0.20
	Pasangan batu kali 1:4	7	m3	0 82	0 00	0.00	7.00	0.82	7.00	0.82
	Plesteran 1:5	25	m2	0 21	0 00	0 00	25.00	0.21	25.00	0.21
5.7	Finishing									
	Pengecatan tembok	59	m2	0 34	59 00	0.34	0.00	0.00	59.00	0.34
	Pengecatan kayu/besi	10	m2	0 11	10.00	0 11	0 00	0 00	10 00	0.11
	Pengecatan lantai	17	m2	0 18	17.00	0.18	0.00	0 00	17.00	0 18
				12.96						
6	**Tailrace**									
6.1	Galian tanah	10.787	m3	0 04	0 00	0 00	10.79	0.04	10.79	0.04
6.2	Galian batu	1.0787	m3	0 04	0.00	0 00	1.08	0.04	1.08	0.04
6.3	Urugan tanah	2 69676	m3	0 01	0 00	0 00	2.70	0.01	2.70	0.01
6.4	Urugan pasir	2 3	m3	0 11	0.00	0 00	2.30	0.11	2.30	0.11
6.5	Pasangan batu kosong	5.75	m3	0.08	0 00	0 00	5.75	0 08	5.75	0.08
6.6	Lean concrete	0 2	m3	0.03	0.00	0 00	0 20	0 03	0 20	0.03
6.7	Concrete Class C	0 3	m3	0.06	0.00	0.00	0.30	0 06	0.30	0 06
6.8	Tulangan beton U-24	20	kg	0 06	0.00	0.00	20 00	0.06	20.00	0.06
6.9	Cetakan beton	1 1	m2	0.02	0.00	0 00	1 10	0 02	1 10	0 02
6.10	Pasangan batu kali 1:4	11 5	m3	1 35	0.00	0.00	11 50	1.35	11.50	1.35
6.11	Plesteran 1:5	23	m2	0 19	0 00	0 00	23.00	0 19	23.00	0.19
				1.98						
7	**Protection Wall**									
7.1	Galian tanah	0 5	m3	0 00	0 00	0 00	0 50	0.00	0.50	0.00
7.2	Galian batu	2 3	m3	0 08	0.00	0 00	2.30	0.08	2.30	0.08
7.3	Urugan tanah	0 55	m3	0 00	0 55	0 00	0.00	0.00	0.55	0.00
7.4	Urugan pasir	1 2	m3	0 06	1.20	0.06	0 00	0.00	1.20	0.06
7.5	Pasangan batu kosong	2	m3	0.03	2.00	0 03	0 00	0 00	2 00	0 03
7.6	Pasangan batu kali 1.4	13.5	m3	1 58	13 50	1.58	0.00	0.00	13.50	1.58
7.7	Plesteran 1:5	6	m2	0.05	6.00	0.05	0.00	0.00	6 00	0 05
				1.80						
	TOTAL			**100**		2 79		97.21		100.00
	SCHEDULE									100.00
	DEVIATION (+/-)									0.00

Table 11 : *Progress works in March 2007*

4.9 Summary of Progress of Civil Works

No.	Month	Progress	Schedule	Delay
1	August 2006	0.80%	21.08%	-20.28%
2	September 2006	2.21%	78.52%	-76.30%
3	October 2006	30.28%	100.00%	-69.72%
4	November 2007	67.99%	100.00%	-32.01%
5	December 2006	72.98%	100.00%	-27.02%
6	January 2007	84.41%	100.00%	-15.58%
7	February 2007	97.21%	100.00%	-2.79%
8	March 2007	100.00%	100.00%	0.00%

Table 12 : *Summary of progress works*

5. Constraints and Solutions

The main problem during the civil construction of micro hydro power scheme in Fulolo village, Alasa sub-district is not the technical matters but the non technical ones.

The constraints faced by the contractor during the civil construction is summarized as follows:

5.1 Technical Constraints

Constraints	Solutions
a. Heavy Excavation The excavation of mostly hard rocky ground structure was done in Intake, Sand Trap and Power House area.	Use of better quality hand tools and equipment and labour management.
b. Improper Schedule of Civil Works Due to constraints in the financing, the civil works were not carried out in proper sequences (Headrace was built after the Sand Trap and Forebay structures).	Stake out was done carefully and accurately. Then the elevation must be checked when the Headrace structure is started.

5.2 Non Technical Problem

Constraints	Solutions
a. The Level of Community's Participation The community's participation and commitment for the project was very low. There was no local contribution from the community. This resulted in slow progress of the construction work.	UNIDO and BRR established "Komite Percepatan Pengembangan Pemukiman dan Prasarana Desa (KP4D)" to handle non technical problems
b. Labour It was difficult to manage labour which come from the Fuloo village.	The contractor coordinated with village head or KP4D for labour recruitment.

c. Material Supply Due to many projects in Nias island which took place simultaneously, it was difficult to order big number of cement from Gunung Sitoli.	The contractor made order the cement in Gunung Sitoli as earliest as possible and fully pay the price in advance.
d. The Weather The civil works could not do well between November and January, due to the rainy season in Nias island.	The contractor speeded up the civil works by good project management and using more labours.
e. Transport Delay One month delay of transport of Electro-Mechanical equipment and steel works from Bandung to site. (The correspondence is attached in annex 3)	The contractor tried to find other alternatives for delivering those equipment.

C. WORK EVALUATION

1. Intake Structure

The required materials and work days for unskilled labour and skilled labour can be seen in the following table:

No.	Item	Quantity	Unit
1	Filling sand	6.00	m^3
2	Split stone	15.00	m^3
3	Whole stone	33.00	m^3
4	Portland cement	274.00	bag
5	Masonry sand	15.00	m^3
6	Concrete sand	12.00	m^3
7	Concrete stone 3/5	15.00	m^3
8	Concrete iron	1,584.00	kg

Table 13 : *The number of required materials for Intake structure*

No.	Item	Quantity	Unit
1	Labour	266.50	man
2	Stone layer	32.94	man
3	Senior stone layer	0.49	man
4	Supervisor	1.52	man

Table 14 : *The number of work days for labours*

The detailed materials required and work days for labour analysis is attached in annex 2.

2. Sand Trap Structure

The required materials and work days for unskilled labour and skilled labour is provided in the following table:

No.	Item	Quantity	Unit
1	Filling sand	6.00	m^3
2	Split stone	18.00	m^3
3	Whole stone	99.00	m^3
4	Portland cement	447.00	bag
5	Masonry sand	42.00	m^3
6	Concrete sand	1.00	m^3
7	Concrete stone3/5	1.00	m^3
8	Besi beton	25.00	kg

Table 15 : *The number of required materials for Intake structure*

No.	Item	Quantity	Unit
1	Labour	359.80	man
2	Stone layer	54.89	man
3	Senior stone layer	0.55	man
4	Supervisor	1.65	man

Table 16 : *The number of work days for labours*

The detailed materials required and work days for labour analysis are attached in annex 2.

3. Forebay Structure

The required materials and work days for unskilled labour and skilled labour can be seen in the following table:

No.	Item	Quantity	Unit
1	Filling sand	5.00	m^3
2	Split stone	12.00	m^3
3	Whole stone	57.00	m^3
4	Portland cement	283.00	bag
5	Masonry sand	25.00	m^3
6	Concrete sand	3.00	m^3
7	Concrete stone 3/5	4.00	m^3
8	Concrete iron	451.00	kg

Table 17 : *The number of required materials for Sand Trap structure*

No.	Item	Quantity	Unit
1	Labour	180.50	man
2	Stone layer	30.38	man
3	Senior stone layer	0.30	man
4	Supervisor	0.80	man

Table 18 : *The number of work days for labours*

The detailed materials required and work days for labour analysis is presented in annex 2.

4. Penstock Erection

The required materials and work days for unskilled labour and skilled labour can be seen in the following table:

No.	Item	Quantity	Unit
1	Filling sand	1.00	m^3
2	Split stone	1.00	m^3
3	Whole stone	7.00	m^3
4	Portland cement	52.00	bag
5	Masonry sand	3.00	m^3
6	Concrete sand	3.00	m^3
7	Concrete stone 3/5	3.00	m^3
8	Concrete irone	172.00	kg

Table 19 : *The number of required materials for Penstock erection*

No.	Item	Quantity	Unit
1	Labour	50.10	man
2	Stone layer	4.87	man
3	Senior stone layer	0.05	man
4	Supervisor	0.30	man

Table 20 : *The number of work days for labours*

The detailed materials required and work days for labour analysis is attached in annex 2.

5. Power House Structure

The required materials and work days for unskilled labour and skilled labour can be seen in the following table:

No.	Item	Quantity	Unit
1	Filling sand	9.00	m^3
2	Split stone	13.00	m^3
3	Whole stone	49.00	m^3
4	Portland cement	290.00	bag
5	Masonry sand	25.00	m^3
6	Concrete sand	6.00	m^3
7	Concrete stone 3/5	7.00	m^3
8	Concrete iron	336.00	kg
9	Brick	231.00	no

Table 21 : *Required materials for Power House structure*

No.	Item	Quantity	Unit
1	Labour	773.50	man
2	Stone layer	180.70	man
3	Senior stone layer	2.20	man
4	Supervisor	5.19	man

Table 22 : *The number of work days for labours*

The detailed materials required and work days for labour analysis are attached in annex 2.

6. Electro-Mechanical Equipment

The installation of Electro-Mechanical equipment, namely: Cross Flow turbine, Generator, ELC, Ballast Load and its accessories was completed in January 2007. However, due to constraint in the financing, the Headrace structure has not been built yet at that time.

Finally, after several discussions between UNIDO and BRR, BRR agreeg to provide financial support for the construction of the remaining works (Headrace and Transmission Lines) of the Alasa MHP project. KP4D, On behalf of BRR-Nias and PT. Heksa Prakarsa Teknik signed an agreement on June 12, 2007 for this purpose.

The construction of Headrace structure started in July 2007 and completely finished in mid of December 2007.

Then the testing of Civil and Electro-Mechanical equipment was undertaken on December 17, 2007 for the first time. The testing was attended by Mr. Hari

Wibowo (PT. Entec Indonesia as supervising consultant), Mr. Rana Pratap Singh (UNIDO Project Manager), Mr. Johannes Verhelst (UNIDO National Project Manager), and Mr. Budieli Harefa (UNIDO Local Project Coordinator in Nias island).

The result of the test run of Electro-Mechanical equipment is summarized as follows:

No.	Test Run	Problems	Remark
1.	Mechanical Equipment :		
	- Turbine	No	Running well
	- Mechanical transmission	No	Running well
	- Generator	No	Running well
2.	Electrical Equipment :		
	- ELC	No	Running well
	- Ballast load	No	Running well

In general, mechanical equipment is running well. The only problem, was there was a small leakage at the valve connection before penstock adaptor and crack on the turbine foundation. Those problems were appropriately solved by the contractor by unfasteng and tightening again all the bolts, and re-concreting the turbine foundation.

7. Commissioning of MHP Scheme

Construction of civil works, electro-mechanical equipment and transmission lines were fully accomplished in January 2008. The commissioning of Alasa Micro Hydro Power scheme was conducted during February 2008 and the 1st week of March respectively.

The result of the commissioning of the micro hydro power scheme is presented as follows:

No.	Test Run	Problems	Remark
1.	Civil Works :		
	- Weir & Intake	No	Running well
	- Sand Trap	No	Running well
	- Headrace	Yes	Not running well
	- Forebay	No	Running well
	- Penstock	No	Running well

2.	Mechanical Equipment :		
	- Turbine	No	Running well
	- Mechanical transmission	No	Running well
	- Generator	No	Running well
3.	Electrical Equipment :		
	- ELC	No	Running well
	- Ballast load	No	Running well
4.	Transmission Lines :	No	Running well

In general, all project components of Alasa Micro Hydro Power scheme were running well and the plant produced an electricity approximately 26 kW. With the current condition, the plant could provide electricity to all consumers (108 houses in Fulolo village). At that moment, the peak load during the night was only less than 5 kW (excl. production house).

However, some problems during commissioning were identified as follows:

a. Head Loss; in order to protect the Power House from a big flood, the floor elevation was increased 1 m up. Accordingly, the total gross head was less than the designed gross head.
b. Headrace Slope; due to the difficult topography and improper civil works implementation, the Headrace slope was less than the designed slope.
c. Dry season; the rainfall intensity in the last one month was low (without raining in the last two weeks). This resulted in discharge in river Alasa decreased up to only 180 l/s.

To minimise the bad impact of these problems or to raise the plant factor, the consultant decided to increase 15 cm high of the Weir and Sand Trap crest elevation. With this correction, more discharge could enter the conveyance structure, which in turn increased the power output.

D. CONCLUSION

The development of Alasa Micro Hydro Power was technically difficult, and non-technical aspects contributed to the delayed completion of the project.

Two of the difficult non-technical aspect were the level of community's participation which was very low and even, created an uncomfortable environment to the contractor. The other non-technical aspect during the project implementation was the civil works sequences due to the constraints in the financing.

These conditions gave impact on the working environment during the construction and indirectly on the quality of works.

To anticipate the above mentioned problems from happening again in the future project in other location, particularly in Nias island, it is highly recommended that the project owner conduct an intensive Rural Participatory Appraisal (RRA) before the project starts in order to have the community's awareness and ownership of the project.

ANNEX 1

PROJECT SCHEDULE & REALIZATION

PT HEKSA PRAKARSA TEKNIK
Small Hydropower Engineering

TIME SCHEDULE (REALIZATION)

Micro Hydro Power (MHP) Alasa - Fulolo village, Alasa sub-district

NO.	DESCRIPTION	QTY	UNIT	PERCENTAGE (%)	IMPLEMENTATION (WEEKS)	REMARK
					Aug-06 I-II, III-IV; Sep-06 I-II, III-IV; Oct-06 I-II, III-IV; Nov-06 I-II, III-IV; Dec-06 I-II, III-IV; Jan-07 I-II, III-IV; Feb-07 I-II, III-IV; Mar-07 I-II, III-IV; Apr-07 I-II, III-IV; May-07 I-II, III-IV; Jun-07 I-II, III-IV; Jul-07 I-II, III-IV; Aug-07 I-II, III-IV; Sep-07 I-II, III-IV; Oct-07 I-II, III-IV; Nov-07 I-II, III-IV; Dec-07 I-II, III-IV; Jan-08 I-II, III-IV; Feb-08 I-II, III-IV; Mar-08 I-II, III-IV	
A	Civil Works					
1	Intake			16.06		Schedule / Realization
2	Sand Trap			13.49		
3	Fore bay dan Spillway			13.71		
4	Penstock dia. 380 mm			39.00		
5	Power House Ukuran 4 m x 5 m			12.96		
6	Tailrace			1.98		
7	Protection Wall			1.80		
B	Others (Preliminary Works & Headrace)					
	Total Region B (Others)					Implemented under different contract
C	Electro Mechanical Equipment					
	Total Region C (Electro Mechanical Equipment)					Implemented under different contract
D	Transmission and Distribution Lines					
	Total Region D (Transmission and Distribution Lines)					Implemented under different contract
E.	Contract Negotiation & Agreement (2nd Phase)					Between UNIDO & BRR
F.	Running Test (Civil, Mechanical and Electrical)					
G.	Commissioning					
H.	Inauguration Day (March 6, 2008)					
	TOTAL PERCENTAGE (SCHEDULE)	Week Total		100		
	TOTAL PERCENTAGE (REALIZATION)	Week Total				

TIME SCHEDULE

Micro Hydro Power (MHP) Alasa - Fulolo village, Alasa sub-district

NO.	DESCRIPTION	QTY	UNIT	PERCENTAGE (%)	IMPLEMENTATION (WEEKS)												PERCENTAGE (%)	REMARK
					Aug-06				Sep-06				Oct-06					
					I	II	III	IV	I	II	III	IV	I	II	III	IV		
A	**Civil Works**																100%	
1	**Intake**																	*Time Period :* 3 months
1.1	Galian tanah	35	m3	0.13	0.13													
1.2	Galian batu	6	m3	0.22	0.11	0.11												
1.3	Urugan tanah	5	m3	0.01		0.01												
1.4	Urugan pasir	5	m3	0.23		0.23												
1.5	Pasangan batu Kosong	12.5	m3	0.18			0.18											
1.6	Lean concrete	1	m3	0.29			0.29											
1.7	Concrete Class C	1.7	m3	3.46				3.46										
1.8	Tulangan beton U-24	1440	kg	3.99				3.99										
1.9	Cetakan beton	120	m2	2.22				2.22										
1.10	Pasangan batu kali 1:4	27	m3	3.17			1.00	0.50	1.67									
1.11	Plesteran 1:3	45	m2	0.38					0.38									
1.12	Sluice gate (80X(1000)x2000	2	Set	1.58				1.58										
1.13	Coarse trash rack 2x0.2	1	Set	0.20				0.20									90%	
				16.06														
2	**Sand Trap**																	
2.1	Galian tanah	99.7	m3	0.38		0.38												
2.2	Galian batu	10	m3	0.36		0.18	0.18											
2.3	Urugan tanah	10	m3	0.02			0.02											
2.4	Urugan pasir	5	m3	0.23			0.23											
2.5	Pasangan batu kosong	19	m3	0.21			0.21											
2.6	Lean concrete	1	m3	0.15				0.15										
2.7	Concrete Class C	0.22	m3	0.04					0.04									
2.8	Tulangan beton U-24	22	kg	0.06					0.06									
2.9	Cetakan beton	1.1	m2	0.02					0.02									
2.10	Pasangan batu kali 1:4	40	m3	9.62				0.50	3.00	6.12								
2.11	Plesteran 1:2	95	m2	1.05						1.05							80%	
2.12	Control gate (80)x80)x1000	1	Set	1.55					1.55									
2.13	Gate Valve for flushing DN 6"	1	Set	0.80					0.80									
				14.49														
3	**Pure bay dan Spillway**																	
3.1	Galian tanah	50	m3	0.22		0.22												
3.2	Galian batu	1	m3	0.11		0.11												
3.3	Urugan tanah	10	m3	0.02			0.02											
3.4	Urugan pasir	4.9	m3	0.18			0.18											
3.5	Pasangan batu kosong	9.75	m3	0.14			0.14											
3.6	Lean concrete	0.5	m3	0.07				0.07										
3.7	Concrete Class C	3.5	m3	0.71				0.71										
3.8	Tulangan beton U-24	410	kg	1.14				1.14										
3.9	Cetakan beton	25	m2	0.46				0.46									70%	
3.10	Pasangan batu kali 1:4	47	m3	5.51				1.00	4.51									
3.11	Plesteran 1:2	68.5	m2	0.75					0.75									
3.12	PVC pipe diam"6 " for flushing	26	m	0.96				0.96										
3.13	PVC bend diam"6" for flushing	1	Set	0.21				0.21										
3.14	Gate valve diam"6" for flushing	1	Set	1.61					1.61									
3.15	Pure trashrack, dimensions = 1 m x 2 m	2	Set	1.61					1.61									
				13.71														
4	**Penstock dia. 360 mm**																	
4.1	Galian tanah	0.30	m3	0.03						0.03								
4.2	Galian batu	1.06	m3	0.04						0.04								
4.3	Urugan tanah	1.40	m3	0.00						0.00								
4.4	Urugan pasir	0.20	m3	0.01						0.01								
4.5	Pasangan batu kosong	0.40	m3	0.01						0.01							60%	
4.6	Lean concrete	0.80	m3	0.12						0.12								
4.7	Concrete Class C	2.70	m3	0.55							0.30	0.25						
4.8	Tulangan beton U-24	136.00	kg	0.43							0.30	0.13						
4.9	Cetakan beton	5.00	m2	0.09							0.05	0.05						
4.10	Pasangan batu kali 1:4	5.50	m3	0.65							0.32	0.32						
4.11	Pen.stock,dia=360 mm, thickness=4 mm	70.00	m	28.12						7.00	8.00	8.00	5.12					
4.12	Air vent, material dia=2.5", thickness=3	4.00	m	0.15									0.15					
4.13	Expansion joint includes extra flange, bolts set and gasket set, dia=360 mm, flange t=20	2	set	3.62						1.00	2.00	1.62						
4.14	Reducer, material dia=360, thickness=4	1	set	0.86								0.86						
4.15	Bend section, material dia=360, thickness=4	2	set	1.06								1.06						
4.16	Saddle includes 2 teflon support layer, anchor and strap, dia 360	12	set	0.88								0.88						
4.17	Flange includes bolts set and gasket set, dia=370, PN4	1	set	0.39								0.39						
				39.00													50%	
5	**Power House Ukuran 4 m x 5 m**																	
5.1	Pembuat Turbin dan Generator																	
	Galian tanah	2.29	m3	0.01								0.01						
	Galian batu	0.5	m3	0.02								0.02						
	Urugan pasir	0.2	m3	0.01									0.01					
	Pasangan batu kosong	0.5	m3	0.01									0.01					
	Concrete Class B	1.5	m3	0.36									0.36					
	Tulangan beton U 24	80	kg	0.22									0.22					
	Cetakan beton	12	m2	0.22									0.22					
	Pasangan batu kali 1:4	2.5	m3	0.29									0.29					
	Plesteran 1:3	5	m2	0.04									0.04					
5.2	Pondasi Rumah																	
	Galian tanah	17.82	m3	0.07								0.07					40%	
	Galian batu	2	m3	0.07								0.07						
	Urugan pasir	0.7	m3	0.03									0.03					
	Pasangan batu kosong	1.8	m3	0.03									0.03					
	Pasangan batu kali 1:4	6	m3	0.70									0.50	0.20				
5.3	Dinding, Pintu dan Jendela																	
	Pasangan Bata 1:4	38	m2	1.31										1.31				
	Plesteran 1:3	116	m2	0.98										0.99				
	Concrete Class C	1.39	m3	0.28										0.28				
	Tulangan beton U-24	203	kg	0.57										0.57				
	Cetakan beton	14	m2	0.26										0.26				
	Pintu besi termasuk cat	1	set	0.94									0.60	0.34				
	Jendela termasuk kaca	2	set	0.40										0.40				
5.4	Atap																	
	Struktur besi untuk rangka atap	400	kg	1.82										1.40	0.42		30%	
	Atap corrugated Zincalum lebar 80 cm	36	m1	1.30										0.65	0.65			
	Nok corrugated Zincalum	7	m1	0.08											0.08			
	Drainage talang seng termasuk pipa PVC 3 inch	2	set	0.19											0.19			
5.5	Lantai																	
	Urugan pasir	1	m3	0.05										0.05				
	Lantai beton 7 cm	4	m3	0.58										0.58				
5.6	Teras dan Drainage																	
	Galian tanah	28	m3	0.11								0.11						
	Galian batu	2.5	m3	0.09								0.09						
	Urugan pasir	1.4	m3	0.06									0.06					
	Lean concrete	1.4	m3	0.20									0.20					
	Pasangan batu kali 1:4	7	m3	0.82										0.82				
	Plesteran 1:3	25	m2	0.21										0.21				
5.7	Finishing																20%	
	Pengecatan tembok	59	m2	0.34											0.20	0.14		
	Pengecatan kayu/besi	16	m2	0.11												0.11		
	Pengecatan lantai	17	m2	0.18												0.18		
				12.96														
6	**Tailrace**																	
6.1	Galian tanah	10.78704	m3	0.04								0.04						
6.2	Galian batu	1.078704	m3	0.04								0.04						
6.3	Urugan tanah	2.69676	m3	0.01									0.01					
6.4	Urugan pasir	2.3	m3	0.11									0.11					
6.5	Pasangan batu kosong	5.75	m3	0.08									0.08					
6.6	Lean concrete	0.2	m3	0.03									0.03					
6.7	Concrete Class C	0.3	m3	0.06									0.06					
6.8	Tulangan beton U-24	20	kg	0.06									0.06				10%	
6.9	Cetakan beton	1.1	m2	0.02									0.02					
6.1	Pasangan batu kali 1:4	11.5	m3	1.35									1.35					
6.11	Plesteran 1:3	23	m2	0.19									0.19					
				1.98														
7	**Protection Wall**																	
7.1	Galian tanah	0.5	m3	0.00								0.00						
7.2	Galian batu	2.3	m3	0.08								0.08						
7.3	Urugan tanah	0.55	m3	0.00									0.00					
7.4	Urugan pasir	1.2	m3	0.06									0.06					
7.5	Pasangan batu kosong	2	m3	0.03									0.03					
7.6	Pasangan batu kali 1:4	13.5	m3	1.58									1.58					
7.7	Plesteran 1:3	6	m2	0.05										0.05				
				1.80													0%	
	TOTAL PERCENTAGE (SCHEDULE)		Week	100	0.24	1.24	2.45	17.16	16.01	15.37	11.97	14.09	11.41	8.10	1.54	0.43		
			Total		0.24	1.48	3.93	21.08	37.09	52.46	64.43	78.52	89.93	98.03	99.57	100.00		

ANNEX 2

Material & Labour Analysis

Project : MHP Alasa, Fulolo village, Alasa sub-district, Nias district, North Sumatra province

Labour & Material Analysis

Item : Intake

No.	Position	man/day					Work Volume		Duration (day(s))		Actual Volume/man/day	
		Theory	Actual	Unit	Quantity	Unit	Quantity	Unit	Theory	Actual	Quantity	Unit
1	**1 M^3 GALIAN TANAH**											
	pekerja	1	**4**	man	0.526	day	**35.00**	m^3	18.41	**5.00**	0.48	m^3
	mandor	1	0.40	man	0.052	day			1.82	0.49		
2	**1 M^3 GALIAN CADAS/BATU**											
	pekerja	1	**4**	man	1.25	day	**6.00**	m^3	7.50	**25.00**	0.09	m^3
	mandor	1	0.40	man	0.125	day			0.75	2.50		
3	**1 M^3 URUGAN TANAH/BATU**											
	pekerja	1	**2**	man	0.192	day	**5.00**	m^3	0.96	**0.50**	0.18	m^3
	mandor	1	0.20	man	0.019	day			0.10	0.05		
4	**1 M^3 URUGAN PASIR**					**Total :**	**5.00**	m^3				
	pasir urug	1		m^3	1.2	m^3	6.00	m^3				
	pekerja	1	**3**	man	0.3	day			1.50	**0.50**	0.30	day
	mandor	1	0.10	man	0.01	day			0.05	0.02		
5	**1 M^3 PASANGAN BATU KOSONG**					**Total :**	**12.50**	m^3				
	batu pecah	1		m^3	1.2	m^3	15.00	m^3				
	pekerja	1	**4**	man	0.78	day			9.75	**4.00**	0.48	day
	mandor	1	0.20	man	0.039	day			0.49	0.20		
6	**1 M^3 BETON COR K-125 (1:2:3) OR MUTU C**					**Total :**	**19.00**	m^3				
	portland cement	1		bag	6.9	bag	131.10	bag				
	pasir beton	1		m^3	0.591	m^3	11.23	m^3				
	kerikil beton 2/3	1		m^3	0.753	m^3	14.31	m^3				
	pekerja	1	**4**	man	1.65	day			31.35	**10.00**	1.29	day
	tukang batu	1	0.67	man	0.275	day			5.23	1.67		
	kepala tukang batu	1	0.07	man	0.028	day			0.53	0.17		
	mandor	1	0.20	man	0.083	day			1.58	0.50		
7	**100 KG PEKERJAAN BESI BETON**					**Total :**	**1,440.00**	kg				
	besi beton	1		kg	110	kg	1,584.00	kg				
	kawat ikat besi beton	1		kg	2	kg	28.80	kg				
	pekerja	1	**2**	man	0.5	day			7.20	**5.00**	0.36	day
	tukang besi	1	2.00	man	0.5	day			7.20	5.00		
	kepala tukang besi	1	0.02	man	0.005	day			0.07	0.05		
8	**10 M^2 CETAKAN BETON (*FORMWORK*)**					**Total :**	**120.00**	m^2				
	kayu rangka cetakan (campuran borneo & alba)	1		m^3	0.02	m^3	0.24	m^3				
	triplex 4 mm	1		lbr	0.35	lbr	4.20	lbr				
	paku 4cm s/d 7cm	1		kg	0.4	kg	4.80	kg				
	pekerja	1	**2**	man	0.66	day			4.80	**4.00**	0.40	day
	tukang kayu	1	1.00	man	0.33	day			7.92	6.60		
	kepala tukang kayu	1	0.10	man	0.033	day			3.96	3.30		
	tukang bongkar cetakan dan siram beton	1	0.10	man	0.033	day			0.40	0.33		
9	**1 M^3 PASANGAN BATU KALI 1:4**					**Total :**	**27.00**	m^3				
	batu kali	1		m^3	1.2	m^3	32.40	m^3				
	portland cement	1		bag	5.05	bag	136.35	bag				
	pasir pasang	1		m^3	0.485	m^3	13.10	m^3				
	pekerja	1	**4**	man	1.5	day			40.50	**15.00**	1.01	day
	tukang batu	1	1.60	man	0.6	day			16.20	6.00		
	kepala tukang batu	1	0.16	man	0.06	day			1.62	0.60		
	mandor	1	0.20	man	0.075	day			2.03	0.75		
10	**1 M^2 PLESTERAN 1:5**					**Total :**	**45.00**	m^2				
	portland cement	1		bag	0.1296	bag	5.83	bag				
	pasir pasang	1		m^3	0.026	m^3	1.17	m^3				
	pekerja	1	**2**	man	0.2	day			9.00	**5.00**	0.18	day
	tukang batu	1	1.50	man	0.15	day			6.75	3.75		
	kepala tukang batu	1	0.15	man	0.015	day			0.68	0.38		
	mandor	1	0.10	man	0.01	day			0.45	0.25		

Project : MHP Alasa, Fulolo village, Alasa sub-district, Nias district, North Sumatra province

Labour & Material Analysis

Item : Sand Trap

No.	Position	man/day					Work Volume		Duration (day(s))		Actual Volume/man/day	
		Theory	Actual	Unit	Quantity	Unit	Quantity	Unit	Theory	Actual	Quantity	Unit
1	**1 M³ GALIAN TANAH**											
	pekerja	1	**4**	man	0.526	day	**99.70**	m^3	52.44	**15.00**	0.46	m^3
	mandor	1	0.40	man	0.052	day			5.18	1.48		
2	**1 M³ GALIAN CADAS/BATU**											
	pekerja	1	4	man	1.25	day	**10.00**	m^3	12.50	**10.00**	0.39	m^3
	mandor	1	0.40	man	0.125	day			1.25	1.00		
3	**1 M³ URUGAN TANAH/BATU**											
	pekerja	1	**2**	man	0.192	day	**10.00**	m^3	1.92	**1.00**	0.18	m^3
	mandor	1	0.20	man	0.019	day			0.19	0.10		
4	**1 M³ URUGAN PASIR**					**Total :**	**5.00**	m^3				
	pasir urug	1		m^3	1.2	m^3	6.00	m^3				
	pekerja	1	**3**	man	0.3	day			1.50	**0.50**	0.30	day
	mandor	1	0.10	man	0.01	day			0.05	0.02		
5	**1 M³ PASANGAN BATU KOSONG**					**Total :**	**15.00**	m^3				
	batu pecah	1		m^3	1.2	m^3	18.00	m^3				
	pekerja	1	**4**	man	0.78	day			11.70	**3.00**	0.76	day
	mandor	1	0.20	man	0.039	day			0.59	0.15		
6	**1 M³ BETON COR K-125 (1:2:3) OR MUTU C**					**Total :**	**1.22**	m^3				
	portland cement	1		bag	6.9	bag	8.42	bag				
	pasir beton	1		m^3	0.591	m^3	0.72	m^3				
	kerikil beton 2/3	1		m^3	0.753	m^3	0.92	m^3				
	pekerja	1	**2**	man	1.65	day			2.01	**2.00**	0.83	day
	tukang batu	1	0.33	man	0.275	day			0.34	0.33		
	kepala tukang batu	1	0.03	man	0.028	day			0.03	0.03		
	mandor	1	0.10	man	0.083	day			0.10	0.10		
7	**100 KG PEKERJAAN BESI BETON**					**Total :**	**22.00**	kg				
	besi beton	1		kg	110	kg	24.20	kg				
	kawat ikat besi beton	1		kg	2	kg	0.44	kg				
	pekerja	1	**2**	man	0.5	day			0.11	**0.10**	0.28	day
	tukang besi	1	2.00	man	0.5	day			0.11	0.10		
	kepala tukang besi	1	0.02	man	0.005	day			0.00	0.00		
8	**10 M² CETAKAN BETON (*FORMWORK*)**					**Total :**	**1.10**	m^2				
	kayu rangka cetakan (campuran borneo & alba)	1		m^3	0.02	m^3	0.00	m^3				
	triplex 4 mm	1		lbr	0.35	lbr	0.04	lbr				
	paku 4cm s/d 7cm	1		kg	0.4	kg	0.04	kg				
	pekerja	1	**1**	man	0.66	day			0.04	**0.10**	0.29	day
	tukang kayu	1	0.50	man	0.33	day			0.07	0.17		
	kepala tukang kayu	1	0.05	man	0.033	day			0.04	0.08		
	tukang bongkar cetakan dan siram beton	1	0.05	man	0.033	day			0.00	0.01		
9	**1 M³ PASANGAN BATU KALI 1:4**					**Total :**	**82.00**	m^3				
	batu kali	1		m^3	1.2	m^3	98.40	m^3				
	portland cement	1		bag	5.05	bag	414.10	bag				
	pasir pasang	1		m^3	0.485	m^3	39.77	m^3				
	pekerja	1	**5**	man	1.5	day			123.00	**40.00**	0.92	day
	tukang batu	1	2.00	man	0.6	day			49.20	16.00		
	kepala tukang batu	1	0.20	man	0.06	day			4.92	1.60		
	mandor	1	0.25	man	0.075	day			6.15	2.00		
10	**1 M² PLESTERAN 1:2**					**Total :**	**95.00**	m^2				
	portland cement	1		bag	0.2556	bag	24.28	bag				
	pasir pasang	1		m^3	0.02	m^3	1.90	m^3				
	pekerja	1	**4**	man	0.2	day			19.00	**10.00**	0.10	day
	tukang batu	1	3.00	man	0.15	day			14.25	7.50		
	kepala tukang batu	1	0.30	man	0.015	day			1.43	0.75		
	mandor	1	0.20	man	0.01	day			0.95	0.50		

Project : MHP Alasa, Fulolo village, Alasa sub-district, Nias district, North Sumatra province

Labour & Material Analysis

Item : Forebay & Spillway

No.	Position	man/day					Work Volume		Duration (day(s))		Actual Volume/man/day	
		Theory	Actual	Unit	Quantity	Unit	Quantity	Unit	Theory	Actual	Quantity	Unit
1	**1 M^3 GALIAN TANAH**											
	pekerja	1	**4**	man	0.526	day	**58.00**	m^3	30.51	**10.00**	0.40	m^3
	mandor	1	0.40	man	0.052	day			3.02	0.99		
2	**1 M^3 GALIAN CADAS/BATU**											
	pekerja	1	**4**	man	1.25	day	**3.00**	m^3	3.75	**2.00**	0.59	m^3
	mandor	1	0.40	man	0.125	day			0.38	0.20		
3	**1 M^3 URUGAN TANAH/BATU**											
	pekerja	1	**2**	man	0.192	day	**10.00**	m^3	1.92	**1.00**	0.18	m^3
	mandor	1	0.20	man	0.019	day			0.19	0.10		
4	**1 M^3 URUGAN PASIR**					**Total :**	**3.90**	m^3				
	pasir urug	1		m^3	1.2	m^3	4.68	m^3				
	pekerja	1	**3**	man	0.3	day			1.17	**0.50**	0.23	day
	mandor	1	0.10	man	0.01	day			0.04	0.02		
5	**1 M^3 PASANGAN BATU KOSONG**					**Total :**	**9.75**	m^3				
	batu pecah	1		m^3	1.2	m^3	11.70	m^3				
	pekerja	1	**4**	man	0.78	day			7.61	**2.00**	0.74	day
	mandor	1	0.20	man	0.039	day			0.38	0.10		
6	**1 M^3 BETON COR K-125 (1:2:3) OR MUTU C**					**Total :**	**4.00**	m^3				
	portland cement	1		bag	6.9	bag	27.60	bag				
	pasir beton	1		m^3	0.591	m^3	2.36	m^3				
	kerikil beton 2/3	1		m^3	0.753	m^3	3.01	m^3				
	pekerja	1	**2**	man	1.65	day			6.60	**4.00**	1.36	day
	tukang batu	1	0.33	man	0.275	day			1.10	0.67		
	kepala tukang batu	1	0.03	man	0.028	day			0.11	0.07		
	mandor	1	0.10	man	0.083	day			0.33	0.20		
7	**100 KG PEKERJAAN BESI BETON**					**Total :**	**410.00**	kg				
	besi beton	1		kg	110	kg	451.00	kg				
	kawat ikat besi beton	1		kg	2	kg	8.20	kg				
	pekerja	1	**2**	man	0.5	day			2.05	**2.00**	0.26	day
	tukang besi	1	2.00	man	0.5	day			2.05	2.00		
	kepala tukang besi	1	0.02	man	0.005	day			0.02	0.02		
8	**10 M^2 CETAKAN BETON (*FORMWORK*)**					**Total :**	**25.00**	m^2				
	kayu rangka cetakan (campuran borneo & alba)	1		m^3	0.02	m^3	0.05	m^3				
	triplex 4 mm	1		lbr	0.35	lbr	0.88	lbr				
	paku 4cm s/d 7cm	1		kg	0.4	kg	1.00	kg				
	pekerja	1	**1**	man	0.66	day			1.00	**1.00**	0.66	day
	tukang kayu	1	0.50	man	0.33	day			1.65	1.65		
	kepala tukang kayu	1	0.05	man	0.033	day			0.83	0.83		
	tukang bongkar cetakan dan siram beton	1	0.05	man	0.033	day			0.08	0.08		
9	**1 M^3 PASANGAN BATU KALI 1:4**					**Total :**	**47.00**	m^3				
	batu kali	1		m^3	1.2	m^3	56.40	m^3				
	portland cement	1		bag	5.05	bag	237.35	bag				
	pasir pasang	1		m^3	0.485	m^3	22.80	m^3				
	pekerja	1	**4**	man	1.5	day			70.50	**22.00**	1.20	day
	tukang batu	1	1.60	man	0.6	day			28.20	8.80		
	kepala tukang batu	1	0.16	man	0.06	day			2.82	0.88		
	mandor	1	0.20	man	0.075	day			3.53	1.10		
10	**1 M^3 PLESTERAN 1:2**					**Total :**	**68.50**	m^2				
	portland cement	1		bag	0.2556	bag	17.51	bag				
	pasir pasang	1		m^3	0.02	m^3	1.37	m^3				
	pekerja	1	**4**	man	0.2	day			13.70	**5.00**	0.14	day
	tukang batu	1	3.00	man	0.15	day			10.28	3.75		
	kepala tukang batu	1	0.30	man	0.015	day			1.03	0.38		
	mandor	1	0.20	man	0.01	day			0.69	0.25		

Project : MHP Alasa, Fulolo village, Alasa sub-district, Nias district, North Sumatra province

Labour & Material Analysis

Item : Penstock

No.	Position	man/day					Work Volume		Duration (day(s))		Actual Volume/man/day	
		Theory	Actual	Unit	Quantity	Unit	Quantity	Unit	Theory	Actual	Quantity	Unit
1	**1 M³ GALIAN TANAH**											
	pekerja	1	**4**	man	0.526	day	**8.50**	m^3	4.47	**4.00**	0.15	m^3
	mandor	1	0.40	man	0.052	day			0.44	0.40		
2	**1 M³ GALIAN CADAS/BATU**											
	pekerja	1	**2**	man	1.25	day	**1.00**	m^3	1.25	**4.00**	0.20	m^3
	mandor	1	0.20	man	0.125	day			0.13	0.40		
3	**1 M³ URUGAN TANAH/BATU**											
	pekerja	1	**1**	man	0.192	day	**1.00**	m^3	0.35	**0.50**	0.13	m^3
	mandor	1	0.10	man	0.019	day			0.03	0.05		
4	**1 M³ URUGAN PASIR**					**Total :**	**0.20**	m^3				
	pasir urug	1		m^3	1.2	m^3	0.24	m^3				
	pekerja	1	**1**	man	0.3	day			0.06	**0.10**	0.18	day
	mandor	1	0.03	man	0.01	day			0.00	0.00		
5	**1 M³ PASANGAN BATU KOSONG**					**Total :**	**0.40**	m^3				
	batu pecah	1		m^3	1.2	m^3	0.48	m^3				
	pekerja	1	**2**	man	0.78	day			0.31	**0.50**	0.24	day
	mandor	1	0.10	man	0.039	day			0.02	0.03		
6	**1 M³ BETON COR K-125 (1:2:3) OR MUTU C**					**Total :**	**3.50**	m^3				
	portland cement	1		bag	6.9	bag	24.15	bag				
	pasir beton	1		m^3	0.591	m^3	2.07	m^3				
	kerikil beton 2/3	1		m^3	0.753	m^3	2.64	m^3				
	pekerja	1	**2**	man	1.65	day			5.78	**4.00**	1.19	day
	tukang batu	1	0.33	man	0.275	day			0.96	0.67		
	kepala tukang batu	1	0.03	man	0.028	day			0.10	0.07		
	mandor	1	0.10	man	0.083	day			0.29	0.20		
7	**100 KG PEKERJAAN BESI BETON**					**Total :**	**156.00**	kg				
	besi beton	1		kg	110	kg	171.60	kg				
	kawat ikat besi beton	1		kg	2	kg	3.12	kg				
	pekerja	1	**2**	man	0.5	day			0.78	**1.00**	0.20	day
	tukang besi	1	2.00	man	0.5	day			0.78	1.00		
	kepala tukang besi	1	0.02	man	0.005	day			0.01	0.01		
8	**10 M² CETAKAN BETON (*FORMWORK*)**					**Total :**	**5.00**	m^2				
	kayu rangka cetakan (campuran borneo & alba)	1		m^3	0.02	m^3	0.01	m^3				
	triplex 4 mm	1		lbr	0.35	lbr	0.18	lbr				
	paku 4cm s/d 7cm	1		kg	0.4	kg	0.20	kg				
	pekerja	1	**1**	man	0.66	day			0.20	**0.50**	0.26	day
	tukang kayu	1	0.50	man	0.33	day			0.33	0.83		
	kepala tukang kayu	1	0.05	man	0.033	day			0.17	0.41		
	tukang bongkar cetakan dan siram beton	1	0.05	man	0.033	day			0.02	0.04		
9	**1 M³ PASANGAN BATU KALI 1:4**					**Total :**	**5.00**	m^3				
	batu kali	1		m^3	1.2	m^3	6.60	m^3				
	portland cement	1		bag	5.05	bag	27.78	bag				
	pasir pasang	1		m^3	0.485	m^3	2.67	m^3				
	pekerja	1	**2**	man	1.5	day			8.25	**7.00**	0.88	day
	tukang batu	1	0.80	man	0.6	day			3.30	2.80		
	kepala tukang batu	1	0.08	man	0.06	day			0.33	0.28		
	mandor	1	0.10	man	0.075	day			0.41	0.35		

Project : MHP Alasa, Fulolo village, Alasa sub-district, Nias district, North Sumatra province

Labour & Material Analysis

Item : Power House

No.	Position	man/day					Work Volume		Duration (day(s))		Actual Volume/man/day	
		Theory	Actual	Unit	Quantity	Unit	Quantity	Unit	Theory	Actual	Quantity	Unit
1	**1 M³ GALIAN TANAH**											
	pekerja	1	5	man	0.526	day	**48.11**	m^3	25.31	30.00	0.09	m^3
	mandor	1	0.49	man	0.052	day			2.50	2.97		
2	**1 M³ GALIAN CADAS/BATU**											
	pekerja	1	5	man	1.25	day	**5.00**	m^3	6.25	30.00	0.03	m^3
	mandor	1	0.50	man	0.125	day			0.63	5.00		
3	**1 M³ URUGAN PASIR**					Total :	**3.30**	m^3				
	pasir urug	1		m^3	1.2	m^3	3.96	m^3				
	pekerja	1	3	man	0.3	day			0.99	1.00	0.10	day
	mandor	1	0.10	man	0.01	day			0.03	0.03		
4	**1 M2 PASANGAN BATA MERAH 1:4 (1/2 bata)**					Total :	**55.00**	m^3				
	bata merah (Kelas 1)	1		no	70	no	231.00	no				
	portland cement 40 kg	1		bag	0.359	bag	1.18	bag				
	pasir pasang	1		m^3	0.04	m^3	0.13	m^3				
	pekerja	1	4	day	0.3	day			17.40	8.00	0.16	day
	tukang batu	1	1.33	day	0.1	day			5.80	2.67		
	kepala tukang batu	1	0.13	day	0.01	day			0.58	0.27		
	mandor	1	0.20	day	0.015	day			0.87	0.40		
5	**1 M³ PASANGAN BATU KOSONG**					Total :	**2.70**	m^3				
	batu pecah	1		m^3	1.2	m^3	3.24	m^3				
	pekerja	1	4	man	0.78	day			2.11	2.00	0.21	day
	mandor	1	0.20	man	0.039	day			0.11	0.10		
6	**1 M³ BETON COR K-125 (1:2:3) OR MUTU C**					Total :	**8.29**	m^3				
	portland cement	1		bag	6.9	bag	57.20	bag				
	pasir beton	1		m^3	0.591	m^3	4.90	m^3				
	kerikil beton 2/3	1		m^3	0.753	m^3	6.24	m^3				
	pekerja	1	4	man	1.65	day			13.68	10.00	0.56	day
	tukang batu	1	0.67	man	0.275	day			2.28	1.67		
	kepala tukang batu	1	0.07	man	0.028	day			0.23	0.17		
	mandor	1	0.20	man	0.083	day			0.69	0.50		
7	**100 KG PEKERJAAN BESI BETON**					Total :	**285.00**	kg				
	besi beton	1		kg	110	kg	313.50	kg				
	kawat ikat besi beton	1		kg	2	kg	5.70	kg				
	pekerja	1	2	man	0.5	day			1.43	2.00	0.18	day
	tukang besi	1	2.00	man	0.5	day			1.43	2.00		
	kepala tukang besi	1	0.02	man	0.005	day			0.01	0.02		
8	**10 M² CETAKAN BETON (*FORMWORK*)**					Total :	**26.00**	m^2				
	kayu rangka cetakan (campuran borneo & alba)	1		m^3	0.02	m^3	0.05	m^3				
	triplex 4 mm	1		lbr	0.35	lbr	0.91	lbr				
	paku 4cm s/d 7cm	1		kg	0.4	kg	1.04	kg				
	pekerja	1	2	man	0.66	day			1.04	1.00	0.34	day
	tukang kayu	1	1.00	man	0.33	day			1.72	1.65		
	kepala tukang kayu	1	0.10	man	0.033	day			0.86	0.83		
	tukang bongkar cetakan dan siram beton	1	0.10	man	0.033	day			0.09	0.08		
9	**1 M³ PASANGAN BATU KALI 1:4**					Total :	**18.80**	m^3				
	batu kali	1		m^3	1.2	m^3	18.60	m^3				
	portland cement	1		bag	5.05	bag	78.28	bag				
	pasir pasang	1		m^3	0.485	m^3	7.52	m^3				
	pekerja	1	4	man	1.5	day			23.25	10.00	0.87	day
	tukang batu	1	1.60	man	0.6	day			9.30	4.00		
	kepala tukang batu	1	0.16	man	0.06	day			0.93	0.40		
	mandor	1	0.20	man	0.075	day			1.16	0.50		
10	**1 M² PLESTERAN 1:5**					Total :	**146.00**	m^2				
	portland cement	1		bag	0.1296	bag	18.92	bag				
	pasir pasang	1		m^3	0.026	m^3	3.80	m^3				
	pekerja	1	4	man	0.2	day			29.20	8.00	0.18	day
	tukang batu	1	3.00	man	0.15	day			21.90	6.00		
	kepala tukang batu	1	0.30	man	0.015	day			2.19	0.60		
	mandor	1	0.20	man	0.01	day			1.46	0.40		
11	**1 M² PEKERJAAN CAT TEMBOK (3x)**					Total :	**59.00**	m^2				
	cat tembok Decolith	1		kg	0.175	kg	10.33	kg				
	plamir tembok Tamitex	1		kg	0.16	kg	9.44	kg				
	rol cat tembok	1		no	0.01	no	0.59	no				
	steger	1		ls	1	ls	59.00	ls				
	hamplas tembok	1		lbr	0.5	lbr	29.50	lbr				
	pekerja	1	4	day	0.16	day			23.36	10.00	0.09	day
	tukang cat	1	7.00	day	0.28	day			40.88	17.50		
	kepala tukang cat	1	0.75	day	0.03	day			4.38	1.88		
	mandor	1	0.25	day	0.01	day			1.46	0.63		
12	**1 M² PEKERJAAN CAT KAYU & BESI (3x)**					Total :	**10.00**	m^2				
	meni kayu	1		kg	0.175	kg	1.75	kg				
	plamir kayu	1		kg	0.16	kg	1.60	kg				
	cat kayu	1		kg	0.01	kg	0.10	no				
	hamplas kayu	1		lbr	1	lbr	10.00	ls				
	tinner	1		ltr	0.5	ltr	5.00	lbr				
	kuas 3"	1		no	0.16	no	1.60	no				
	pekerja	1	4	day	0.28	day			40.88	16.00	0.16	day
	tukang cat	1	7.00	day	0.03	day			4.38	1.07		
	kepala tukang cat	1	0.75	day	0.01	day			1.46	0.36		
	mandor	1	0.25	day		day			0.00	0.00		

Project : MHP Alasa, Fulolo village, Alasa sub-district, Nias district, North Sumatra province

Labour & Material Analysis

Item : **Tailrace**

No.	Position	man/day					Work Volume		Duration (day(s))		Actual Volume/man/day	
		Theory	Actual	Unit	Quantity	Unit	Quantity	Unit	Theory	Actual	Quantity	Unit
1	**1 M^3 GALIAN TANAH**											
	pekerja	1	**4**	man	0.526	day	**10.79**	m^3	5.67	**5.00**	0.15	m^3
	mandor	1	0.40	man	0.052	day			0.56	0.49		
2	**1 M^3 GALIAN CADAS/BATU**											
	pekerja	1	**4**	man	1.25	day	**1.08**	m^3	1.35	**4.00**	0.11	m^3
	mandor	1	0.40	man	0.125	day			0.13	0.40		
3	**1 M^3 URUGAN TANAH/BATU**											
	pekerja	1	**2**	man	0.192	day	**2.70**	m^3	0.52	**0.50**	0.10	m^3
	mandor	1	0.20	man	0.019	day			0.05	0.05		
4	**1 M^3 URUGAN PASIR**					**Total :**	**2.30**	m^3				
	pasir urug	1		m^3	1.2	m^3	2.76	m^3				
	pekerja	1	**2**	man	0.3	day			0.69	**0.50**	0.21	day
	mandor	1	0.07	man	0.01	day			0.02	0.02		
5	**1 M^3 PASANGAN BATU KOSONG**					**Total :**	**5.75**	m^3				
	batu pecah	1		m^3	1.2	m^3	6.90	m^3				
	pekerja	1	**4**	man	0.78	day			4.49	**2.00**	0.44	day
	mandor	1	0.20	man	0.039	day			0.22	0.10		
6	**1 M^3 BETON COR K-125 (1:2:3) OR MUTU C**					**Total :**	**0.80**	m^3				
	portland cement	1		bag	6.9	bag	3.45	bag				
	pasir beton	1		m^3	0.591	m^3	0.30	m^3				
	kerikil beton 2/3	1		m^3	0.753	m^3	0.38	m^3				
	pekerja	1	**4**	man	1.65	day			0.83	**0.50**	0.68	day
	tukang batu	1	0.67	man	0.275	day			0.14	0.08		
	kepala tukang batu	1	0.07	man	0.028	day			0.01	0.01		
	mandor	1	0.20	man	0.083	day			0.04	0.03		
7	**100 KG PEKERJAAN BESI BETON**					**Total :**	**20.00**	kg				
	besi beton	1		kg	110	kg	22.00	kg				
	kawat ikat besi beton	1		kg	2	kg	0.40	kg				
	pekerja	1	**2**	man	0.5	day			0,10	**0.10**	0.25	day
	tukang besi	1	2.00	man	0.5	day			0.10	0.10		
	kepala tukang besi	1	0.02	man	0.005	day			0.00	0.00		
8	**10 M^3 CETAKAN BETON (*FORMWORK*)**					**Total :**	**1.10**	m^2				
	kayu rangka cetakan (campuran borneo & alba)	1		m^3	0.02	m^3	0.00	m^3				
	triplex 4 mm	1		lbr	0.35	lbr	0.04	lbr				
	paku 4cm s/d 7cm	1		kg	0.4	kg	0.04	kg				
	pekerja	1	**1**	man	0.66	day			0.04	**0.10**	0.29	day
	tukang kayu	1	0.50	man	0.33	day			0.07	0.17		
	kepala tukang kayu	1	0.05	man	0.033	day			0.04	0.08		
	tukang bongkar cetakan dan siram beton	1	0.05	man	0.033	day			0.00	0.01		
9	**1 M^3 PASANGAN BATU KALI 1:4**					**Total :**	**11.50**	m^3				
	batu kali	1		m^3	1.2	m^3	13.80	m^3				
	portland cement	1		bag	5.05	bag	58.08	bag				
	pasir pasang	1		m^3	0.485	m^3	5.58	m^3				
	pekerja	1	**2**	man	1.5	day			17.25	**10.00**	1.29	day
	tukang batu	1	0.80	man	0.6	day			6.90	4.00		
	kepala tukang batu	1	0.08	man	0.06	day			0.69	0.40		
	mandor	1	0.10	man	0.075	day			0.86	0.50		
10	**1 M^2 PLESTERAN 1:5**					**Total :**	**23.00**	m^2				
	portland cement	1		bag	0.1296	bag	2.98	bag				
	pasir pasang	1		m^3	0.026	m^3	0.60	m^3				
	pekerja	1	**2**	man	0.2	day			4.60	**4.00**	0.12	day
	tukang batu	1	1.50	man	0.15	day			3.45	3.00		
	kepala tukang batu	1	0.15	man	0.015	day			0.35	0.30		
	mandor	1	0.10	man	0.01	day			0.23	0.20		

Project : MHP Alasa, Fulolo village, Alasa sub-district, Nias district, North Sumatra province

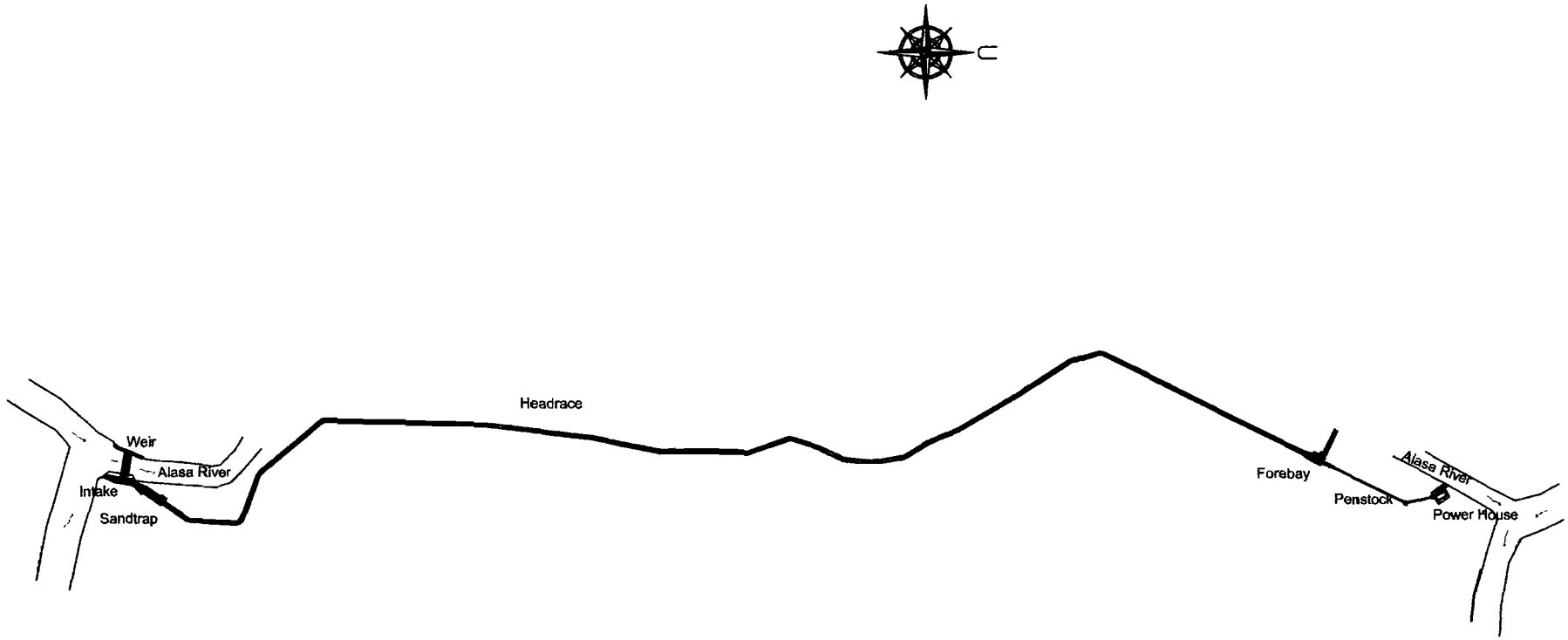
Labour & Material Analysis

Item : Tallud

No.	Position	man/day					Work Volume		Duration (day(s))		Actual Volume/man/day	
		Theory	Actual	Unit	Quantity	Unit	Quantity	Unit	Theory	Actual	Quantity	Unit
1	**1 M^3 GALIAN TANAH**											
	pekerja	1	**2**	man	0.526	day	**0.50**	m^3	0.26	**0.50**	0.14	m^3
	mandor	1	0.20	man	0.052	day			0.03	0.05		
2	**1 M^3 GALIAN CADAS/BATU**											
	pekerja	1	**2**	man	1.25	day	**2.30**	m^3	2.88	**5.00**	0.36	m^3
	mandor	1	0.20	man	0.125	day			0.29	0.50		
3	***1 M^3 URUGAN TANAH/BATU***											
	pekerja	1	**2**	man	0.192	day	**0.55**	m^3	0.11	**0.10**	0.10	m^3
	mandor	1	0.20	man	0.019	day			0.01	0.01		
4	**1 M^3 URUGAN PASIR**					**Total :**	**1.20**	m^3				
	pasir urug	1		m^3	1.2	m^3	1.44	m^3				
	pekerja	1	**2**	man	0.3	day			0.36	**0.50**	0.11	day
	mandor	1	0.07	man	0.01	day			0.01	0.02		
5	**1 M^3 PASANGAN BATU KOSONG**					**Total :**	**2.00**	m^3				
	batu pecah	1		m^3	1.2	m^3	2.40	m^3				
	pekerja	1	**4**	man	0.78	day			1.56	**2.00**	0.15	day
	mandor	1	0.20	man	0.039	day			0.08	0.10		
6	***1 M^3 PASANGAN BATU KALI 1:4***					**Total :**	**13.80**	m^3				
	batu kali	1		m^3	1.2	m^3	16.20	m^3				
	portland cement	1		bag	5.05	bag	68.18	bag				
	pasir pasang	1		m^3	0.485	m^3	6.55	m^3				
	pekerja	1	**4**	man	1.5	day			20.25	**8.00**	0.95	day
	tukang batu	1	1.60	man	0.6	day			8.10	3.20		
	kepala tukang batu	1	0.16	man	0.06	day			0.81	0.32		
	mandor	1	0.20	man	0.075	day			1.01	0.40		
7	**1 M^3 PLESTERAN 1:5**					**Total :**	**6.00**	m^2				
	portland cement	1		bag	0.1296	bag	0.78	bag				
	pasir pasang	1		m^3	0.026	m^3	0.16	m^3				
	pekerja	1	**2**	man	0.2	day			1.20	**2.00**	0.06	day
	tukang batu	1	1.50	man	0.15	day			0.90	1.50		
	kepala tukang batu	1	0.15	man	0.015	day			0.09	0.15		
	mandor	1	0.10	man	0.01	day			0.06	0.10		

ANNEX 3

AS BUILT DRAWINGS



Revisi				
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Disain	Digambar	Mengetahui	Menyetujui,Pimpro
Kus, Aa	Aa	Kus Rahardjo	

United Nations Industrial Development Organization

MHP ALASA

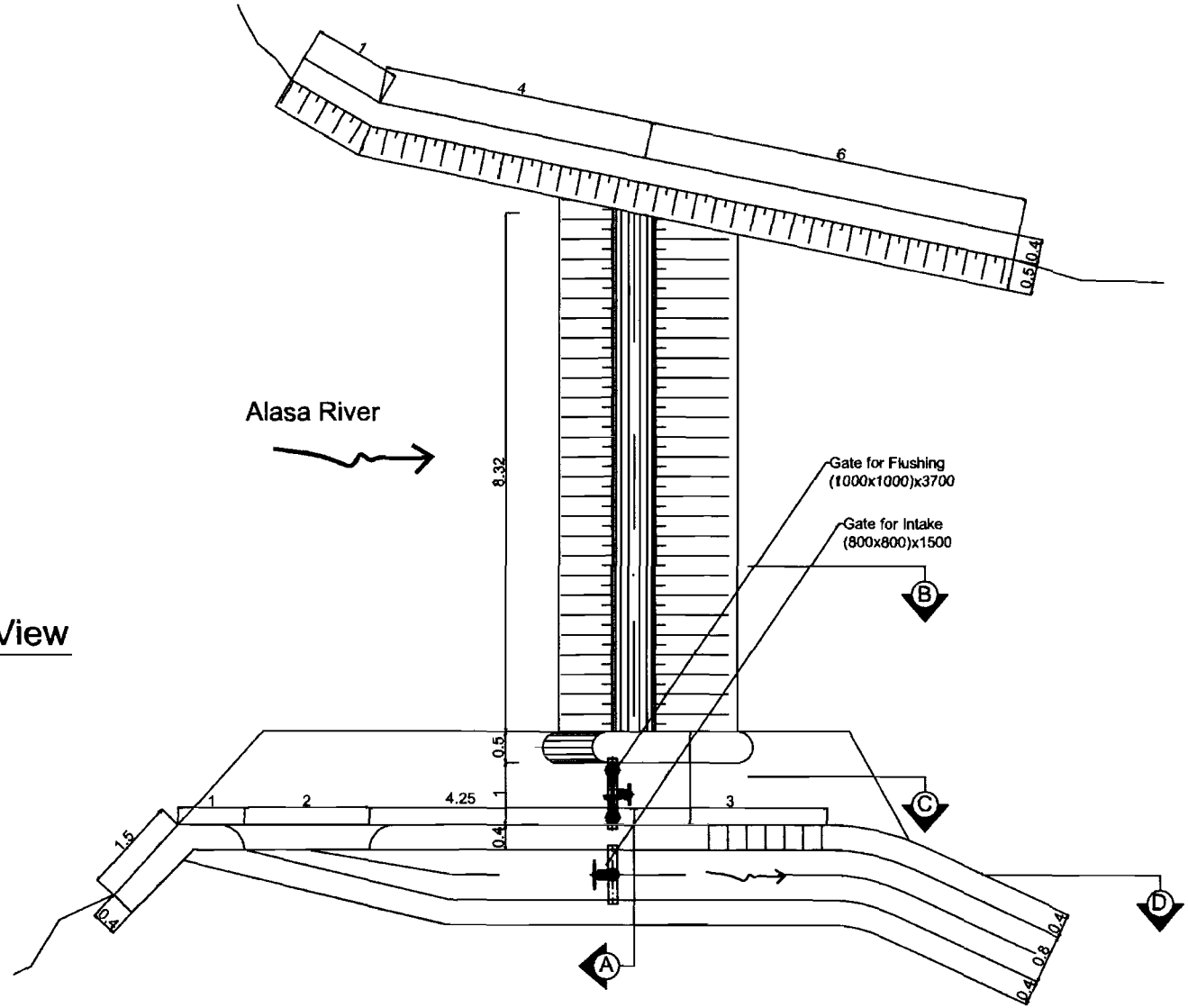
GENERAL PLAN VIEW

Plan View

PT.JEKSA PRANARSA TEKNIK

ENTEC CO

Propinsi	Sumatera Utara
Kabupaten	Nias
Kecamatan	Alasa
Skala	1 : 7750
Lembar	CVL 00-01



Plan View

Revisi				
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Disain	Digambar	Mengetahui	Menyetujui,Pimpro
Kus, Aa	Aa	Kus Rahardjo	

United Nations Industrial Development Organization

MHP ALASA

WEIR & INTAKE

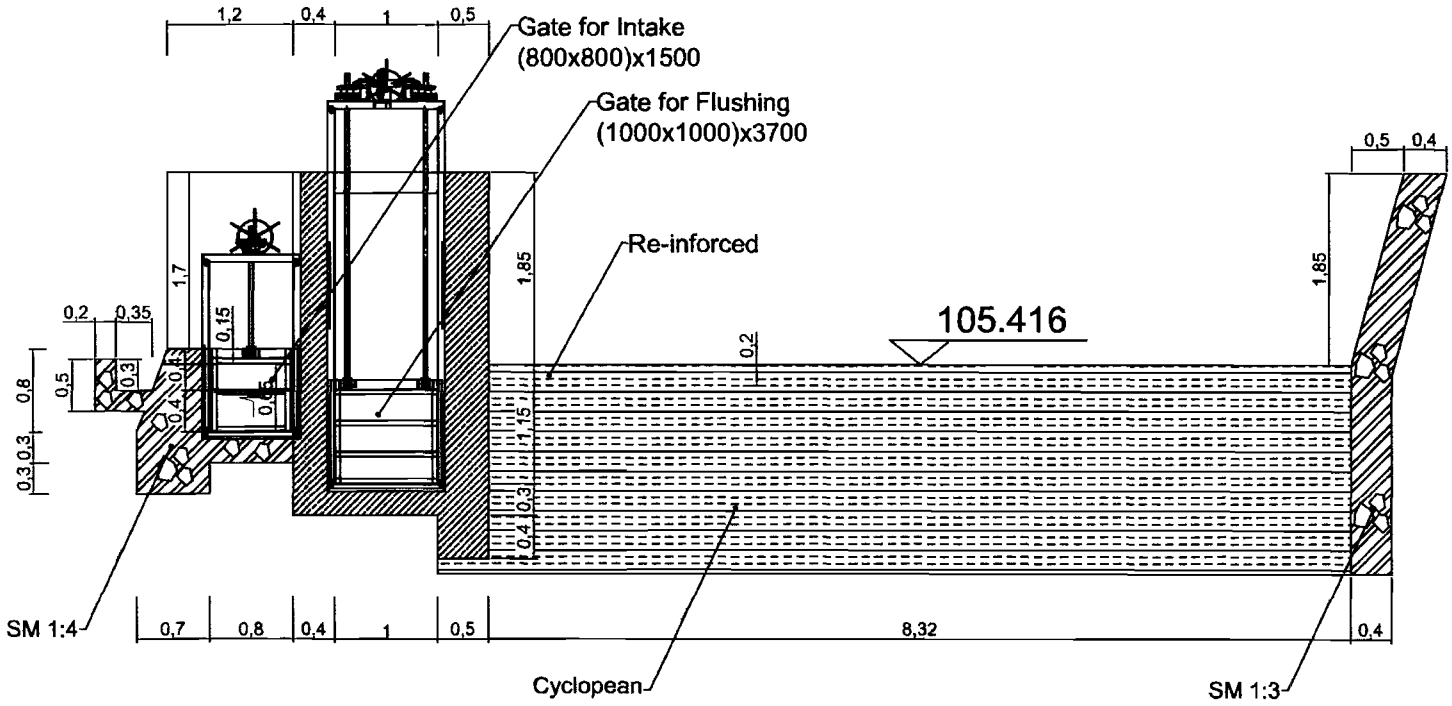
Plan View

PT.JEKSA PRAKARSA TEKNIK

ENTEC ID

Propinsi	Sumatera Utara
Kabupaten	Nias
Kecamatan	Alasa
Skala	1 : 75
Lembar	CVL 01-01

Section A - A



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Disain	Digambar	Mengetahui	Menyetujui,Pimpro
Kus, Aa	Aa	Kus Rahardjo	

United Nations Industrial Development Organization

MHP ALASA

WEIR & INTAKE

Section

PT.JESSA PRAKARSA TEKNIK

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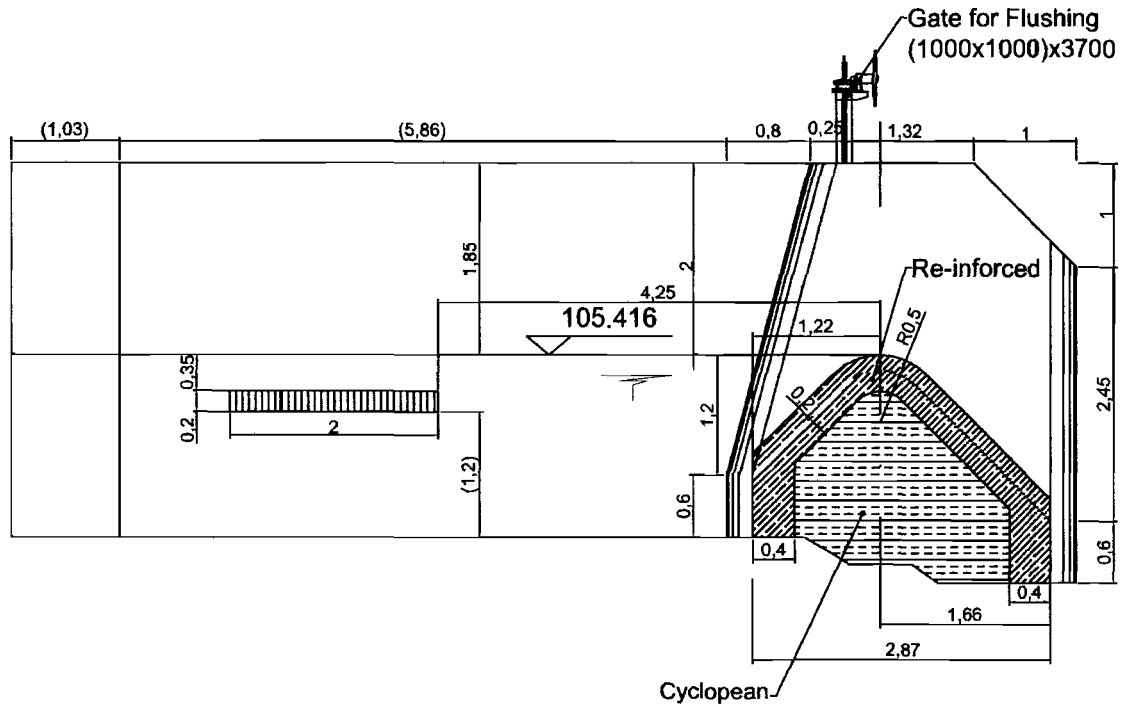
Kabupaten	Nias
Kecamatan	Alasa
Skala	1: 50
Lembar	CVL 01-02

Section B - B



Revisi				
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Masonry 1 : 4 | Masonry 1 : 3 | Reinforced Concrete | Non-reinforce Concrete | Cyclopean Concrete | Soil

Disain	Digambar	Mengetahui	Menyetujui,Pimpro
Kus, Aa	Aa	Kus Rahardjo	

United Nations Industrial Development Organization

MHP ALASA

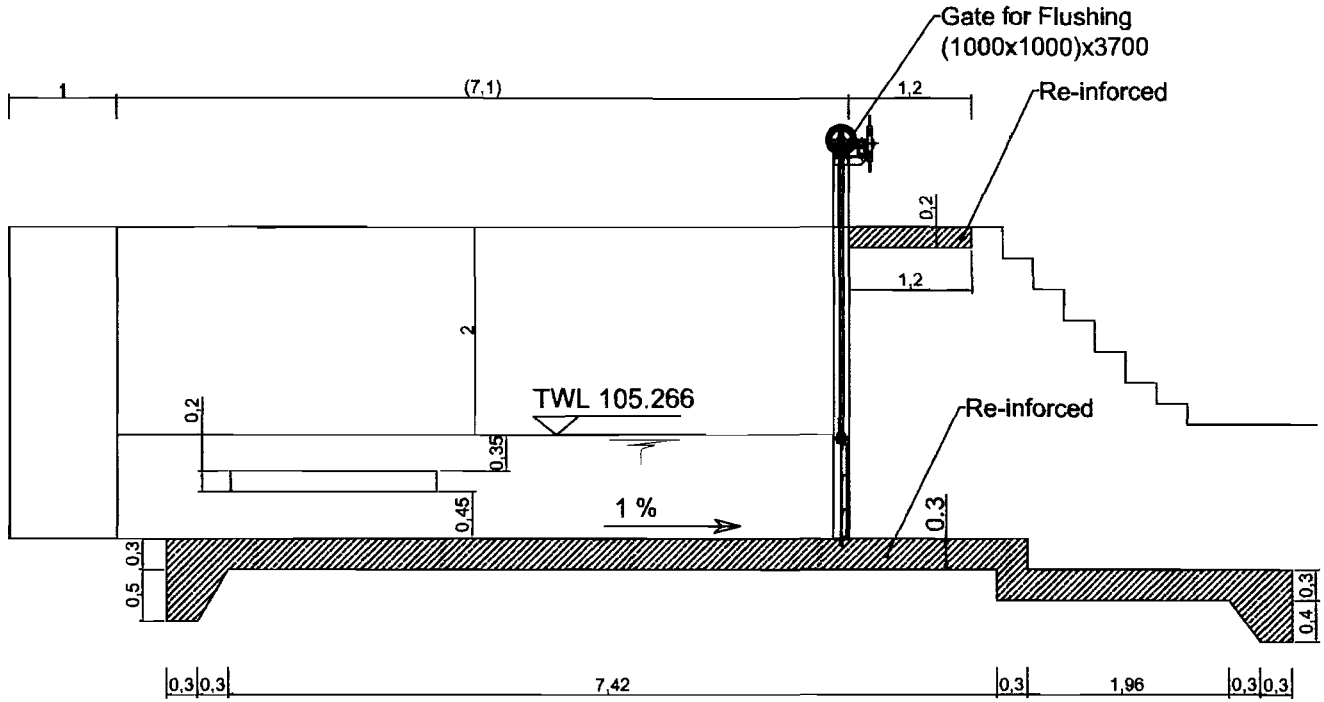
WEIR & INTAKE

Section

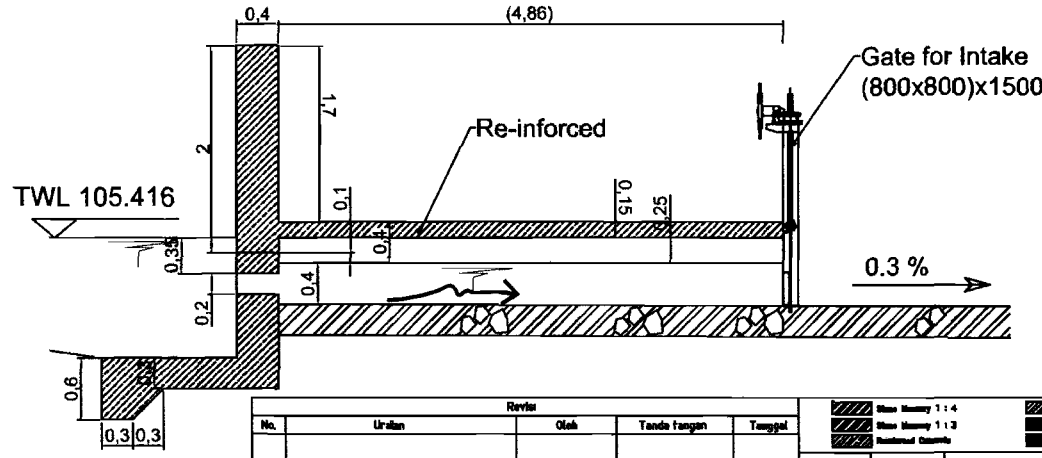
PT.JESSA PRAKARSA TEKNIK | ENTEC ID

Propinsi	Sumatera Utara
Kabupaten	Nias
Kecamatan	Alasa
Skala	1 : 50
Lembar	CVL 01-03

Section C - C



Section D - D



Revisi				
No.	Uraian	Oleh	Tanda tangan	Tanggal

Disain	Digambar	Mengetahui	Menyetujui,Pimpro
Kus, Aa	Aa	Kus Rahardjo	

United Nations Industrial Development Organization

MHP ALASA

WEIR & INTAKE

Section

PT.JERSSA PRAKARSA TEKNIK

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Kecamatan	Alasa
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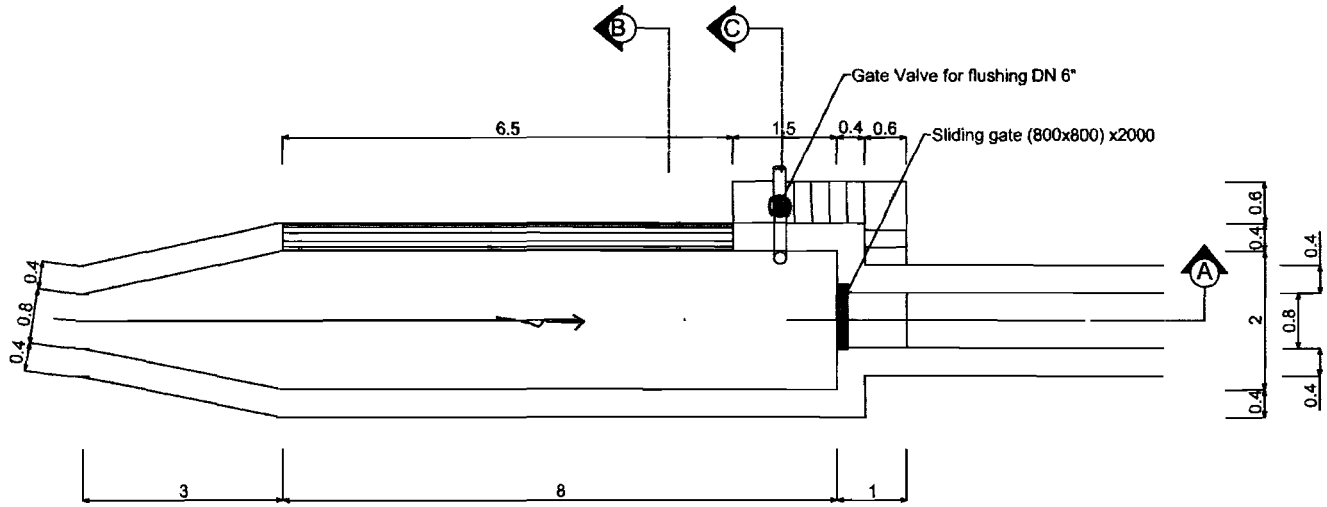
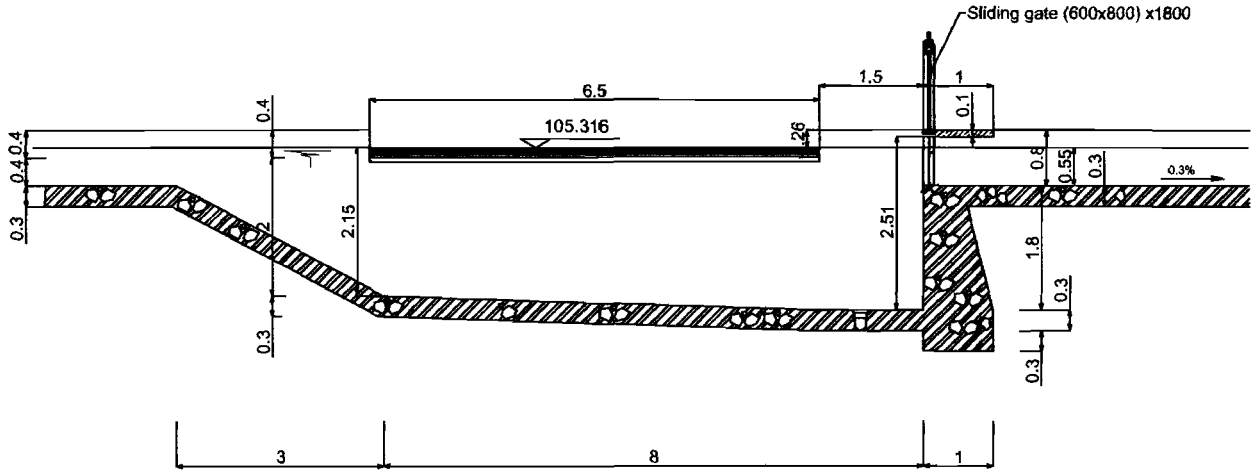
Lembar	CVL 01-04



Plan View



Section A - A

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Disain	Digambar	Mengetahui	Menyetujui,Pimpro
Kus, Aa	Aa	Kus Rahardjo	

United Nations Industrial Development Organization

MHP ALASA

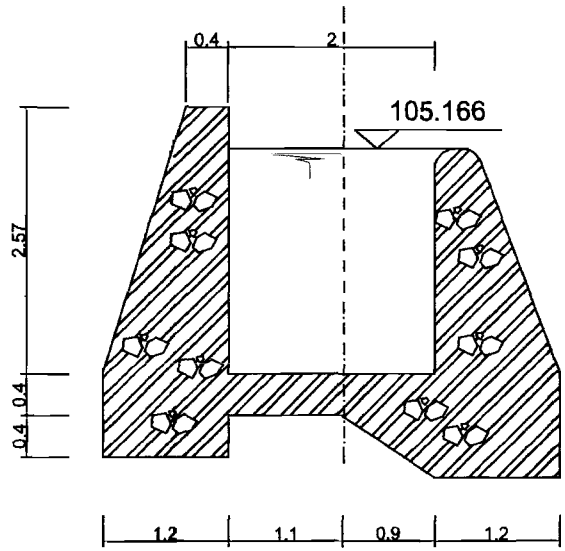
SANDTRAP

Plan View & Section

PT.MESSA PRAKARSA TEKNIK

ENTEC ID

Propinsi	Sumatera Utara
Kabupaten	Nias
Kecamatan	Alasa
Skala	1 : 75
Lembar	CVL 02-01



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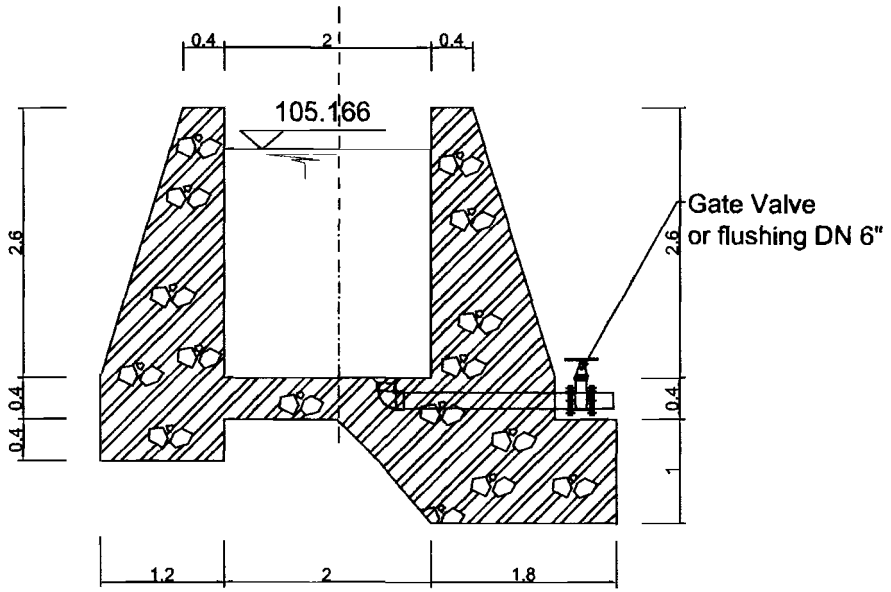

Section C - C

Revisi				
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Disain	Digambar	Mengetahui	Menyetujui,Pimpro
Kus, Aa	Aa	Kus Rahardjo	

United Nations Industrial Development Organization

MHP ALASA

SANDTRAP

Section

PT.JEKSA PRAKARSA TEKNIK

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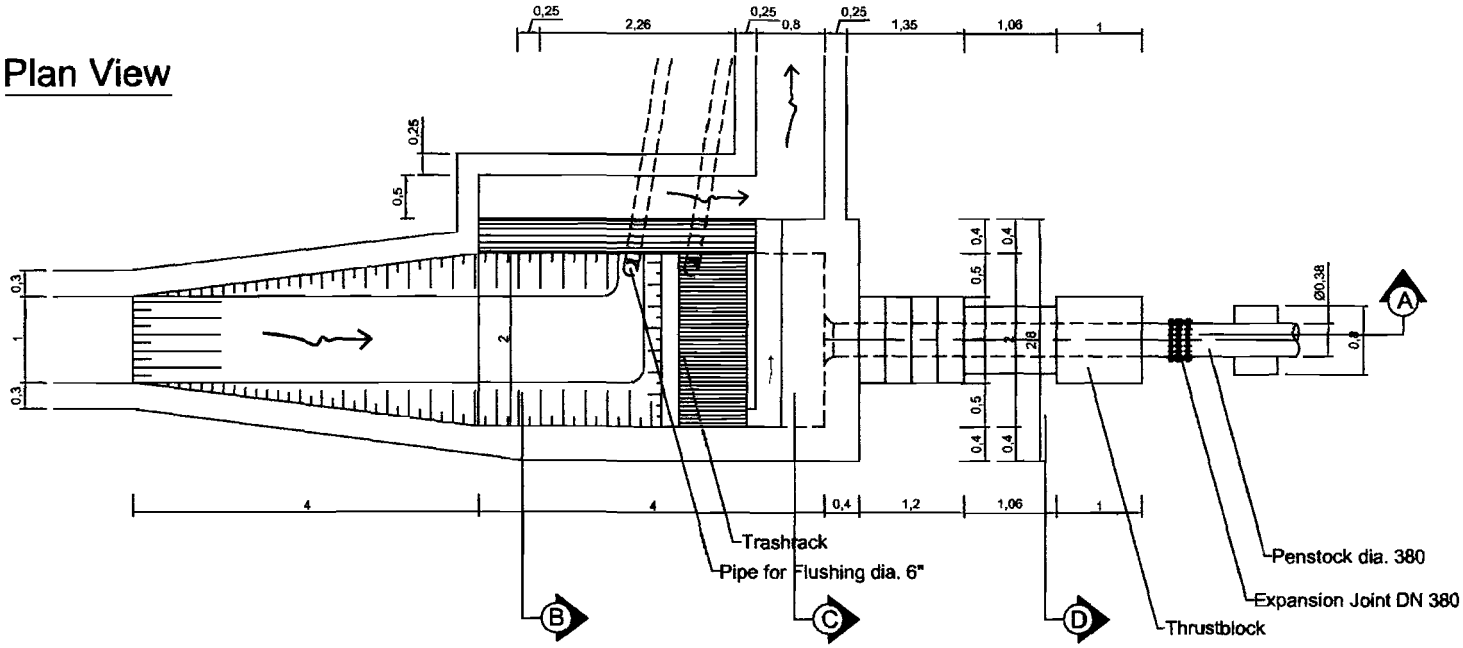
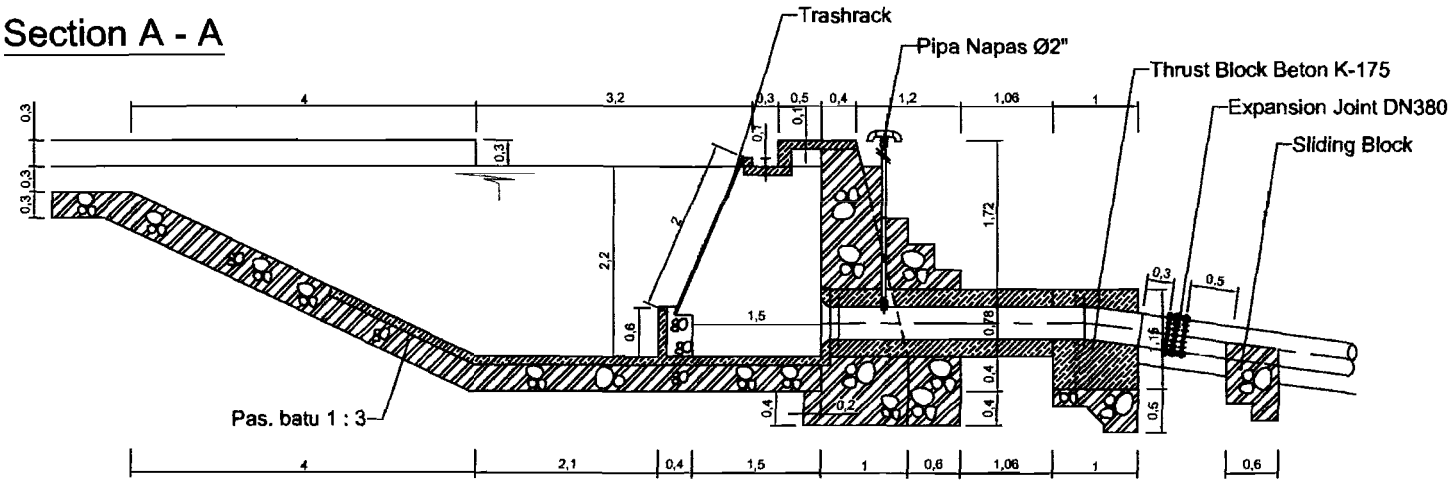
Kabupaten	Nias Selatan
Kecamatan	Alasa
Skala	1 : 50
Lembar	CVL 02-02

Plan View



Section A - A



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Disain	Digambar	Mengetahui	Menyetujui,Pimpro
Kus, Aa	Aa	Kus Rahardjo	

United Nations Industrial Development Organization

MHP ALASA

FOREBAY

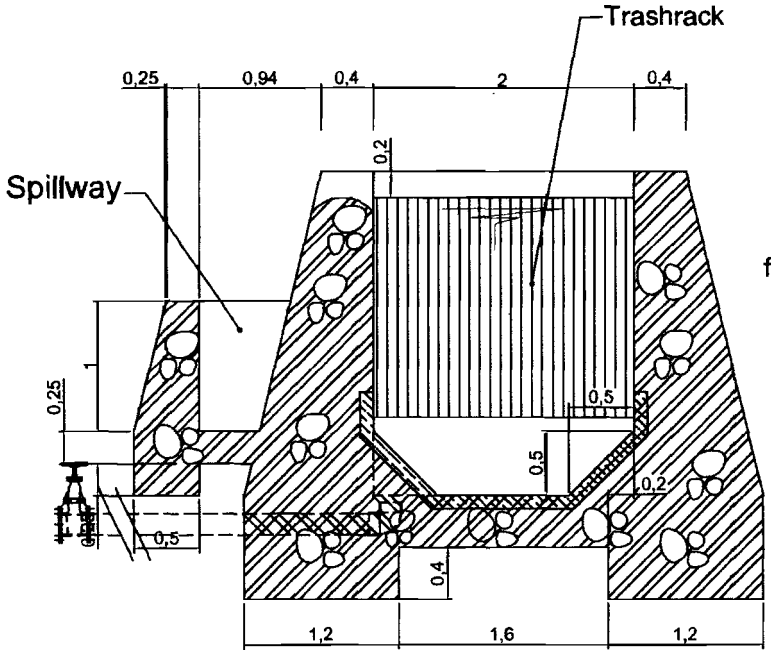
Plan View & Section

PT.MEKSA PRAKARSA TEKNIK

ENTEC ID

Propinsi	Sumatera Utara
Kabupaten	Nias
Kecamatan	Alasa
Skala	1 : 50
Lembar	CVL 03-01

Section B - B



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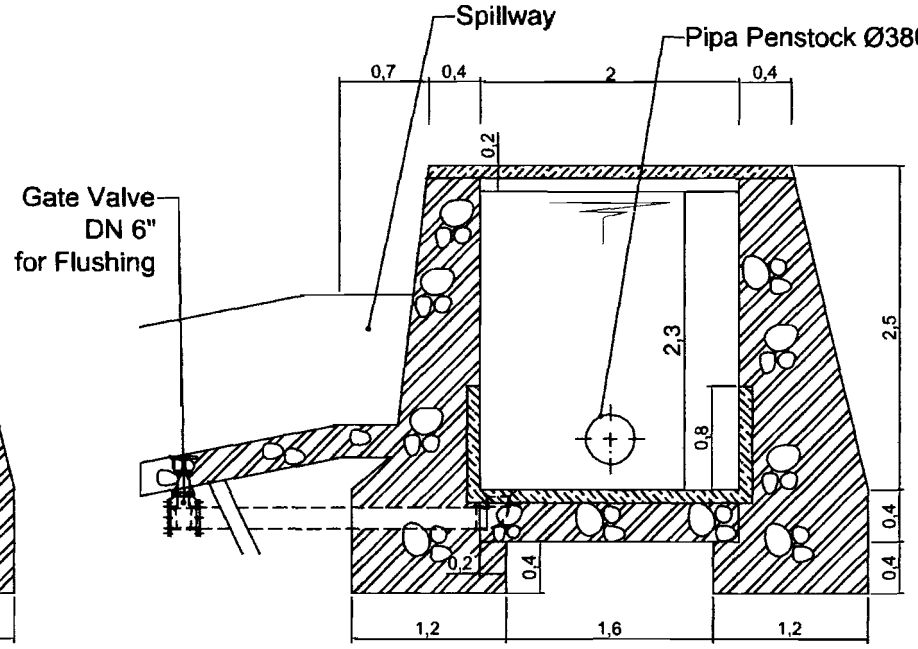

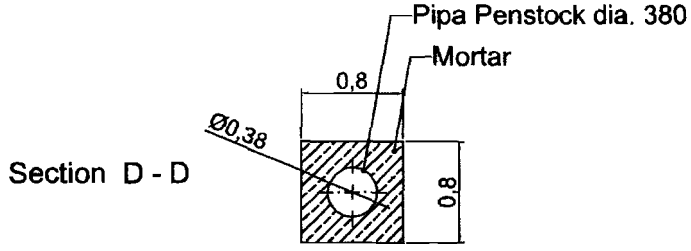

Section D - D

Revisi				
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Disain	Digambar	Mengetahui	Menyetujui,Pimpro
Kus, Aa	Aa	Kus Rahardjo	

United Nations Industrial Development Organization

MHP ALASA

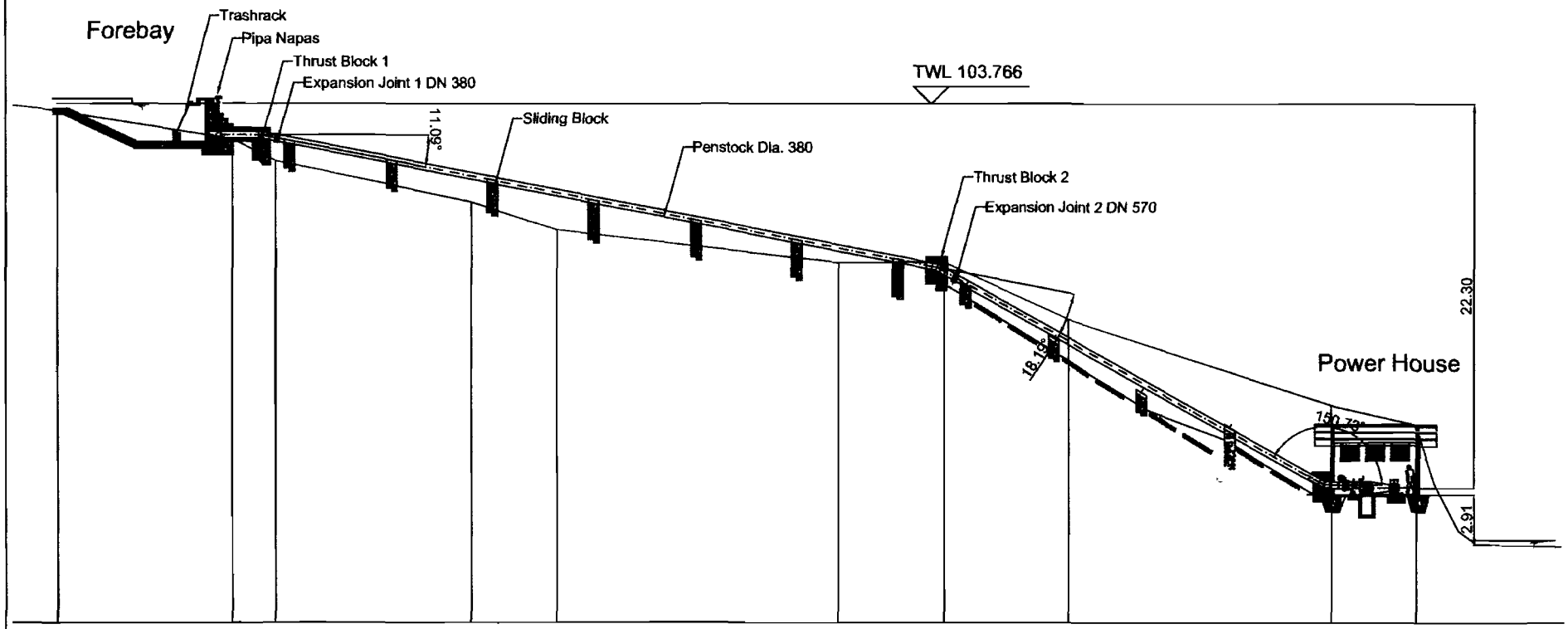
FOREBAY

Plan View & Section

PT.ARSSA PRAKARSA TEKNIK

ENTEC ID

Propinsi	Sumatera Utara
Kabupaten	Nias
Kecamatan	Alasa
Skala	1 : 40
Lembar	CVL 03-02



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Disain	Digambar	Mengetahui	Menyetujui,Pimpro
Kus, Aa	Aa	Kus Raharjo	

United Nations Industrial Development Organization

MHP ALASA

PENSTOCK

Longitudinal Section

PT.JESSA PRAKARSA TEKNIK

ENTEC ID

Propinsi	Sumatera Utara
Kabupaten	Nias
Kecamatan	Alasa
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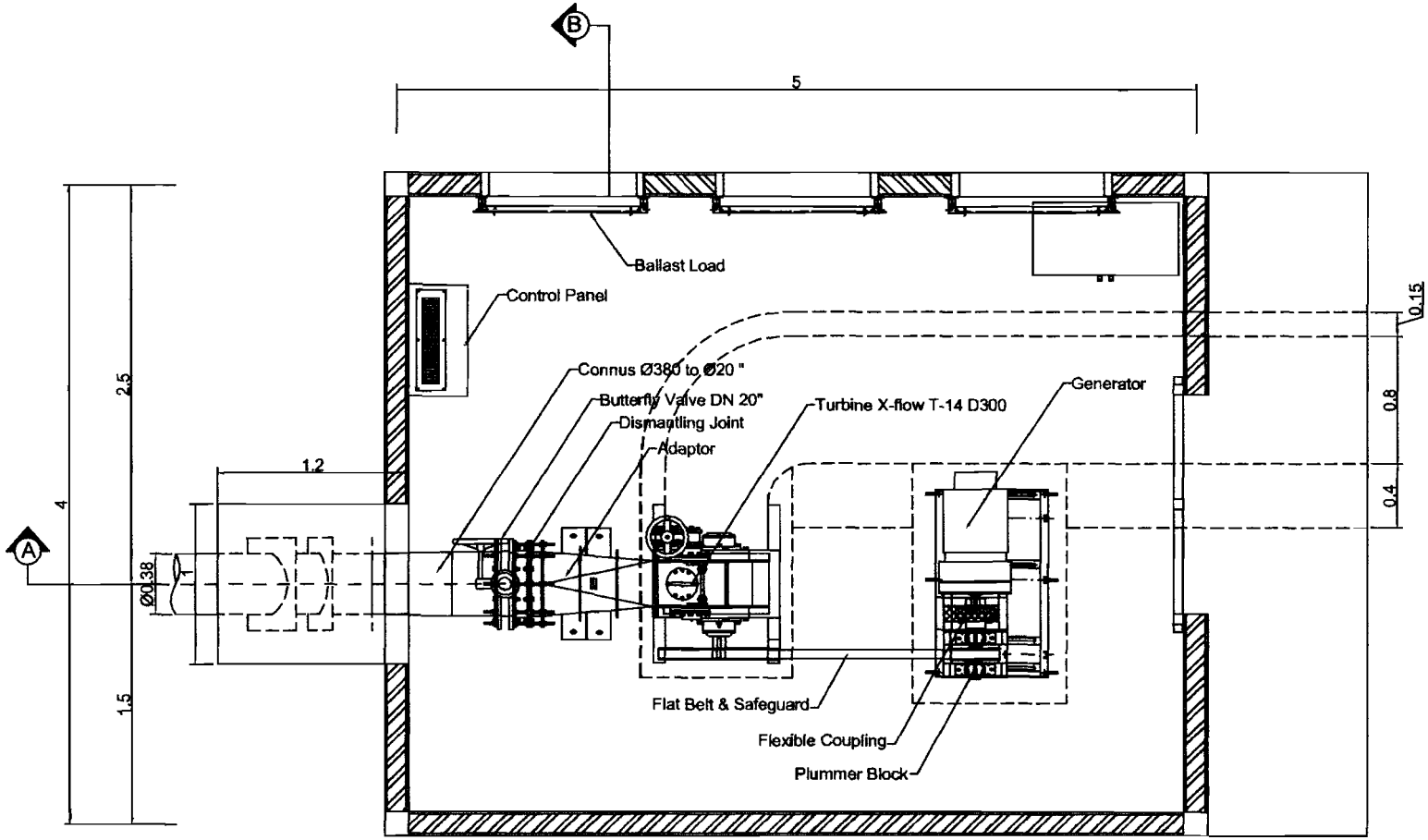
Lembar	CVL 04-01



PLAN VIEW

Revisi				
No.	Uraian	Oleh	Tanda tangan	Tanggal

Disain	Digambar	Mengetahui	Menyetujui,Pimpro
Kus, Aa	Aa	Kus Rahardjo	

United Nations Industrial Development Organization

MHP ALASA

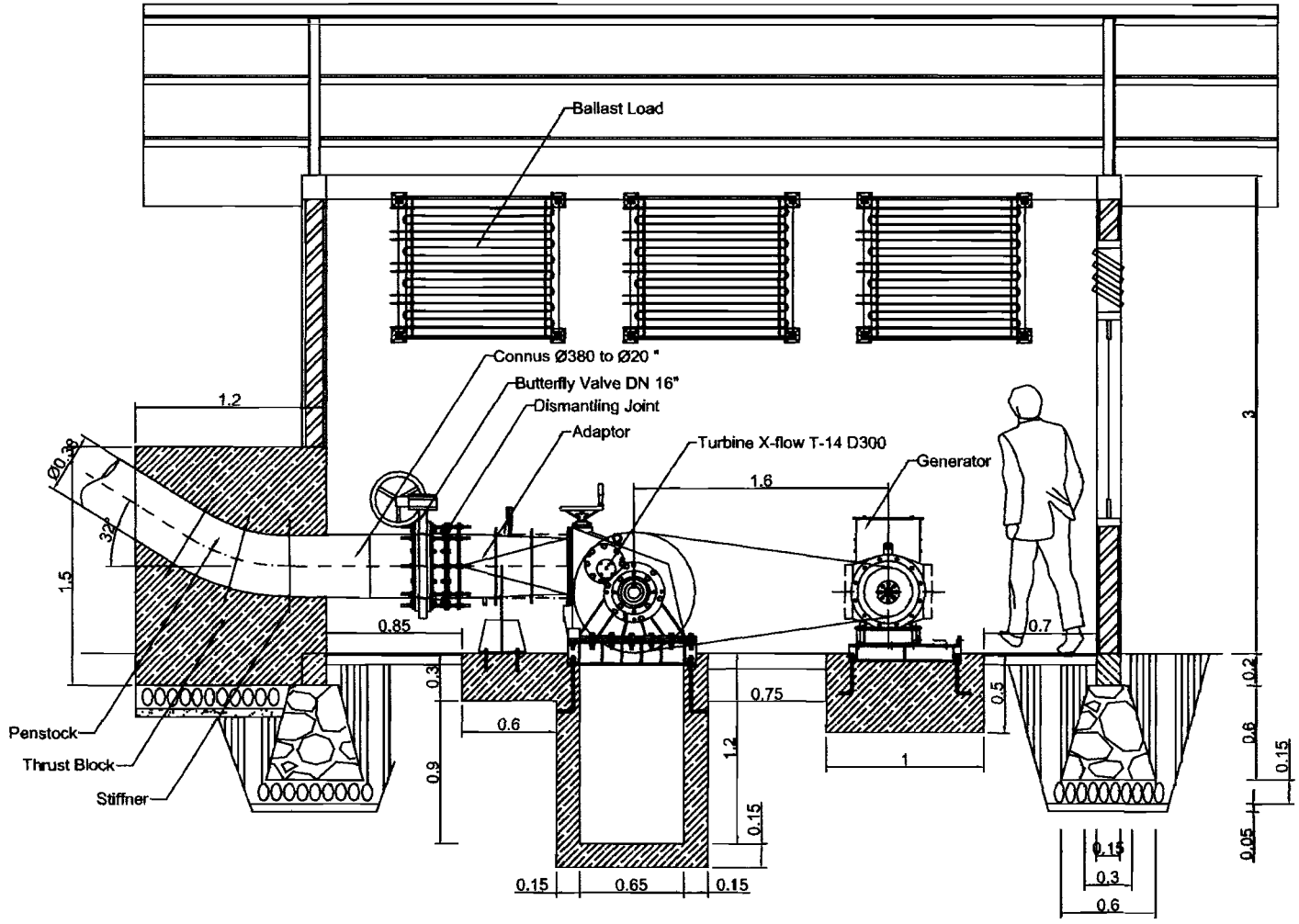
Power House

Plan View

PT.JASSA PRAKARSA TEKNIK

ENTEC ID

Propinsi	Sumatera Utara
Kabupaten	Nias
Kecamatan	Alasa
Skala	1 : 30
Lembar	CVL 05-01



SECTION A-A

Revisi				
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Disain	Digambar	Mengetahui	Menyetujui/Pimpro
Kus, Aa	Aa	Kus Rahar jo	

United Nations Industrial Development Organization

NHP ALASA

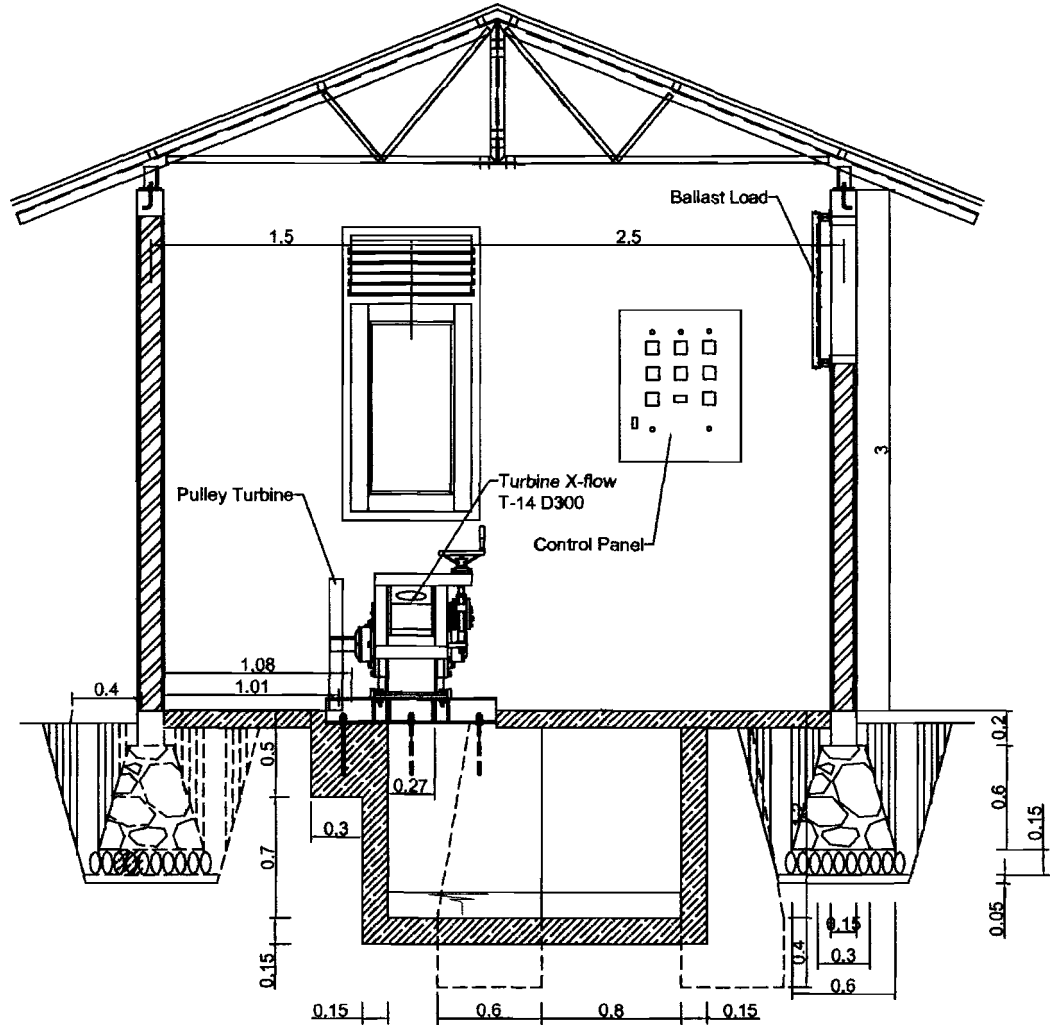
Power House

Section A - A

PT.ARSYA PRAKARSA TEKNIK

ENTEC ID

Propinsi	Sumatera Utara
Kabupaten	Nias
Kecamatan	Alasa
Skala	1 : 30
Lembar	CVL 05-02



SECTION B-B

Revisi				
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Disain	Digambar	Mengetahui	Menyetujui,Pimpro
Kus, Aa	Aa	Kus Rahardjo	

United Nations Industrial Development Organization

MHP ALASA

Power House

Section B - B

PT.JEKSA PRAMASA TEKNIK

ENTEC ID

Propinsi	Sumatera Utara
Kabupaten	Nias
Kecamatan	Alasa
Skala	1 : 30
Lembar	CVL 05-03

ANNEX 4

CORRESPONDENCE

PERUSAHAAN JASA PENGURUSAN TRANSPORTASI

Jl. Enggano No. 98 Tg. Priok Jakarta Telp. 4352222 – 4356666 (Hunting)
Fax . 4304859 – 4304867 PO BOX 1015 JKT 14010, E-mail : Gambiri @ indosat. net..id
Mengerjakan : - Pengiriman Barang / Kendaraan – Door to Door service
- Pengepakan (Packing / peti) Barang – barang yang akan dikirim
- Angkutan / Trucking dan Pergudangan
- EMKL / EMKU – Eksport /Import Clearance
- Agen Tiket Resmi Kapal Laut, Pesawat Udara (Int'l & Domestik)
(On-line dan Cetak langsung) Tiket dapat diantar.
- Rental Car. With dr
- HOTEL & RESTORAN

Bank : - BNI Adonara Cab. Tg. Priok
- BCA Tg. Priok
- Bank MANDIRI. Tg. Priok

Anggota GAPEKSI : No. 0114359898.L.
Anggota PPJK : BC.KINSP.I.II.III-SUTA

Jakarta, 14 September 2006

Kepada Yth :
Bapak Pimpinan
PT HEKSA PRAKARSA TEKNIK
Di Bandung

Hal : Pemberitahuan Penundaan Pengiriman Barang

Dengan hormat,

Dengan sangat menyesal kami beritahukan kepada Bapak bahwa sedianya barang Bapak yang rencananya di kirim tanggal 14-09-2006 ke Gunung Sitoli, tidak dapat kami laksanakan.

Hal tersebut dikarenakan pihak PT PELNI tidak dapat memuat barang tersebut, karena PT PELNI memprioritaskan barang Bank Indonesia yang segera harus di kirim ke Gunung Sitoli. Karena hal tersebut terpaksa pengiriman barang Bapak tertunda.

Dan akan kami kirim pada tanggal 28-09-06. Kami mohon maaf atas kejadian tersebut karena hal itu diluar kemampuan kami

Demikianlah surat ini kami sampaikan kepada Bapak. Atas kerjasamanya yang baik, kami ucapakan terima kasih.

Dengan hormat,

PT. GAMBIRI RAYA JAKARTA GODONTIKA

LIDIA N

PERUSAHAAN JASA PENGURUSAN TRANSPORTASI

Jl. Enggano No. 98 Tg. Priok Jakarta Telp. 4352222 – 4356666 (Hunting)
Fax . 4304859 – 4304867 PO BOX 1015 JKT 14010, E-mail : Gambiri @ indosat.net.id
Mengerjakan : - Pengiriman Barang / Kendaraan – Door to Door service
- Pengepakan (Packing / peti) Barang – barang yang akan dikirim
- Angkutan / Trucking dan Pergudangan
- EMKI. / EMKU – Eksport /Import Clearance
- Agen Tiket Resmi Kapal Laut, Pesawat Udara (Int'l & Domestik)
(On-line dan Cetak langsung) Tiket dapat diantar.
- Rental Car. With dr
- HOTEL & RESTORAN

Bank : - BNI Adonara Cab. Tg. Priok
- BCA Tg. Priok
- Bank MANDIRI. Tg. Priok.

Anggota GAPEKSI : No. 0114359898.L.
Anggota PPJK : BC.KINSP.I.II.III-SUTA

Jakarta, 28 September 2006

Kepada :
PT HEKSA PRAKARSA TEKNIK
Jl. Cimindi Raya
Bandung

Up : **Bapak Kusetiadi**

Hal : Penundaan Pengiriman Barang

Dengan hormat,

Dengan surat ini kami beritahukan kepada Bapak bahwa barang perusahaan Bapak yang seharusnya kami kirim dari Tg. Priok ke Gunung Sitoli tanggal 28 September 2006 tidak bisa kami laksanakan.

Karena kapal PT PELNI tidak bisa sandar di pelabuhan Gunung Sitoli. Kami mohon maaf atas kejadian ini karena hal ini diluar kemampuan kami.

Demikian surat ini kami sampaikan. Atas perhatian dan kerja samanya kami ucapkan terima kasih

Hormat kami,

Lidia N

PT. HEKSA PRAKARSA TEKNIK
Small Hydropower Engineering

Cimindi Raya AK-4
Bandung 40514, Indonesia
Telefax (022) 6613088
kus@raharjo.ri1.biz
heksahydro.com

HEKSA HYDRO

B/L- CONSIGNEE : **UNIDO MHP ALASA – Gunung Sitoli**
Desa Fulolo Kec. Alasa Kab. Nias Prop. Sumatera Utara.

B/L- NOTIFY : **United Nations Industrial Development Organization (UNIDO)**
Attn. Mr. Johannes Verhelst
National Project Manager for Aceh & Nias
Menara Thamrin 10th Floor
Jl. M.H Thamrin Kav. 3
Telp. (021) 31486689, 3923467 Fax. (021) 3907126
JAKARTA

26 September 2006

PACKING LIST

Customer : **UNIDO Jakarta & Programme Development and Technical Cooperation Division**

Contract Number : 1. 16001191 for UNIDO Project : XP/INS/05/005
2. 19022110 for UNIDO Project : FBINS05006-4501-2006
3. 18023812 for UNIDO Project : FBINS05006-2102-2006
4. 18024495 for UNIDO Project : XPINS05005-4503-2006.

Ref. :

No Peti/koli	Ukuran P xL x T (cm)	Keterangan Isi
1	110 x 102 x 125	Turbin Cross Flow T14 D300 Bo.240 , Pulley dan asesorisnya
2	85 x 66 x 44	Panel ELC MC-1 3P-220/380V, dan asesorisnya
3	127 x 12 x 33	Ballast Load dan asesorisnya
4	123 x 100 x 85	Generator , Plummer Block, Base Frame dan asesorisnya
5	120 x 90 x 121	Adaptor, Bend Section, Stiffner, Sedel, Butterfly Valve 16" dan asesorisnya
6	164 x 110 x70	Mesin Las , kabel las dan Alat Kerja Lapangan
7	104 x 80 x 65	Tool Box, cat, Kabel power & Instalasi dan asesorisnya
8	100 x 90 x 44	Gate Valve 6", Flange dan asesorisnya
9	174 x 104 x 12	Trash Rack, Daun Pintu Air, dan asesorisnya
10	307 x 10 x 10	Frame Pintu air, dan asesorisnya
11	240 x 40 x 40	Bahan Penstock D380, Besi Beton

12	240 x 40 x 40	Bahan Penstock D380, Besi Beton
13	240 x 40 x 40	Bahan Penstock D380, Besi Beton
14	240 x 40 x 40	Bahan Penstock D380, Besi Beton
15	240 x40 x 40	Bahan Penstock D380, Besi beton
16	240 x 40 x 40	Bahan Penstock D380
17	240 x 40 x 40	Bahan Penstock D380
18	240 x 40 x 40	Bahan Penstock D380
19	240 x 40 x 40	Bahan Penstock D380
20	240 x 40 x 40	Bahan Penstock D380
21	240 x 40 x 40	Bahan Penstock D380
22	**400 x 65 x 67**	**Frame Pintu Air, Kanal C, Pipa Napas**
23	**310 x 128 x 40**	**Daun Pintu Geser; Atap Power House (Zincalume) dan Asesoris**
24	**115 x 110 x 95**	**Daun Pintu Air, Lemari Hanka, Tool Kits Operator**

JUMLAH TOTAL : **24** (Dua Puluh Empat) Peti / Koli

MERK PETI /KOLI : Heksa Hydro

TUJUAN : Gunung Sitoli (Door to Port)

Hormat kami,
PT. Heksa Prakarsa Teknik

Ir. Kusetiadi Raharjo
Direktur

ANNEX 5

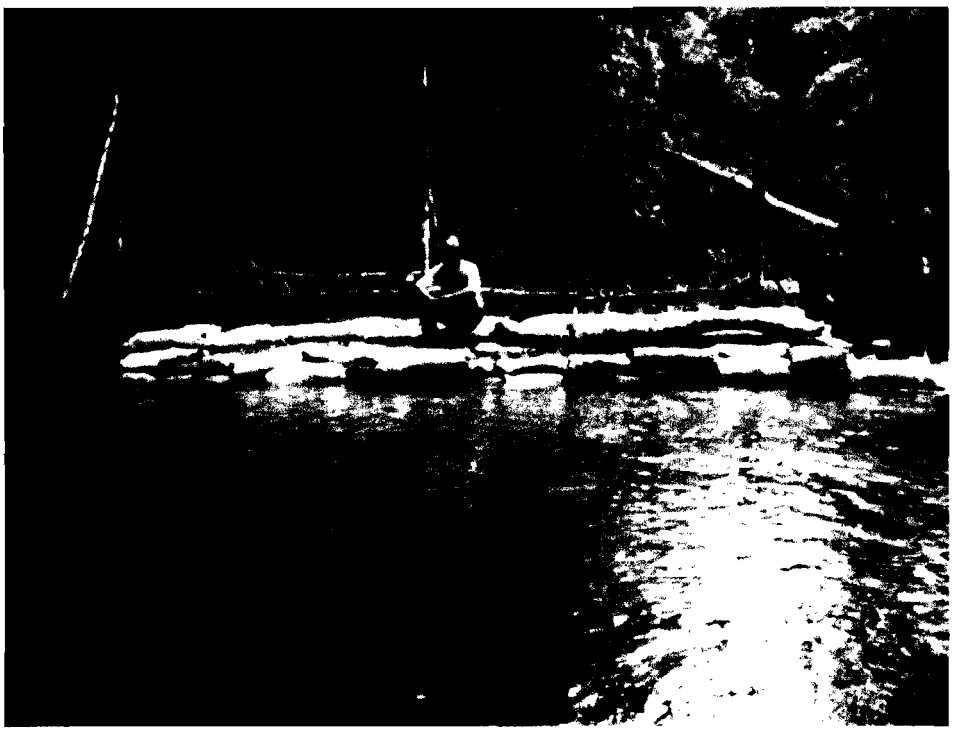
DOCUMENTATION

5.1 CIVIL WORKS

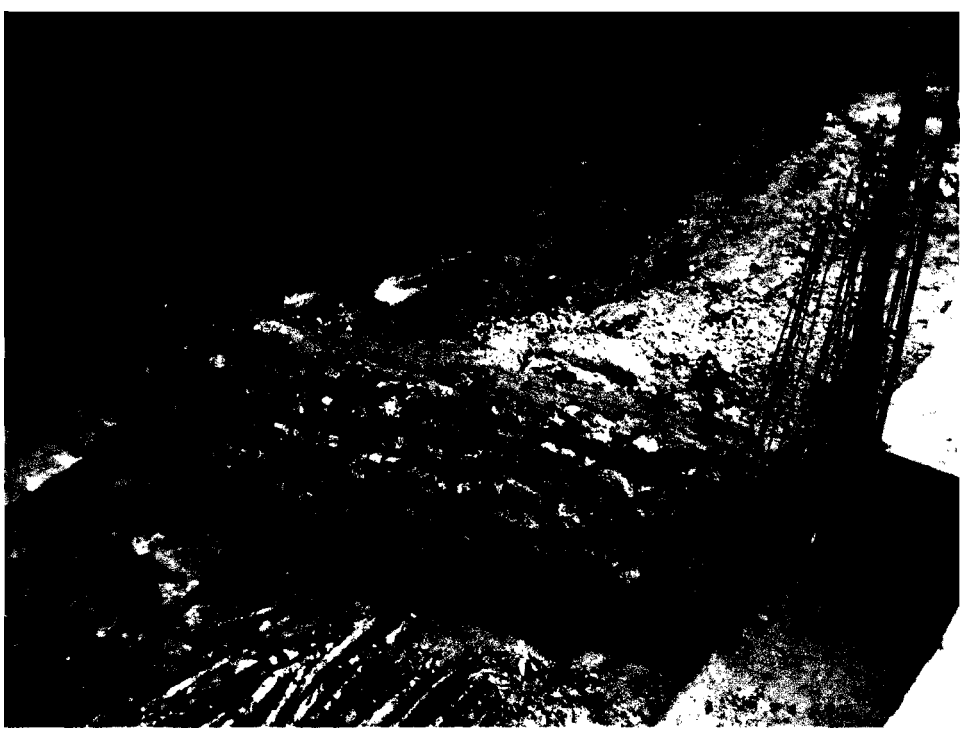
5.1.1 WEIR & INTAKE

Picture 1 : *Excavation work for protection work*

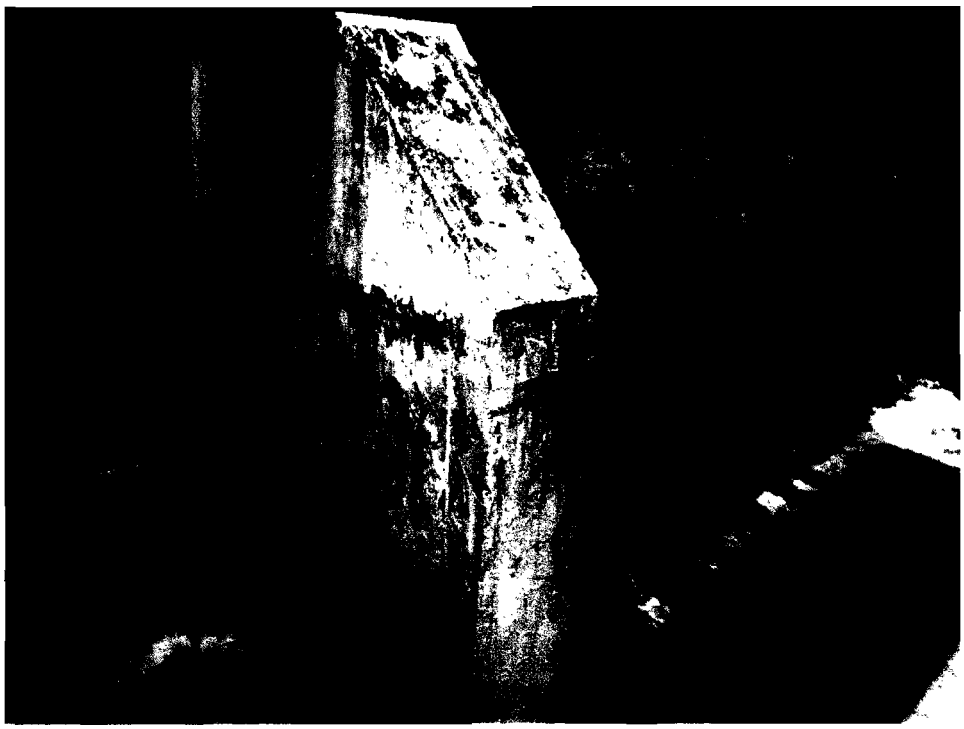
Picture 2 : *Excavation work for Intake structure*



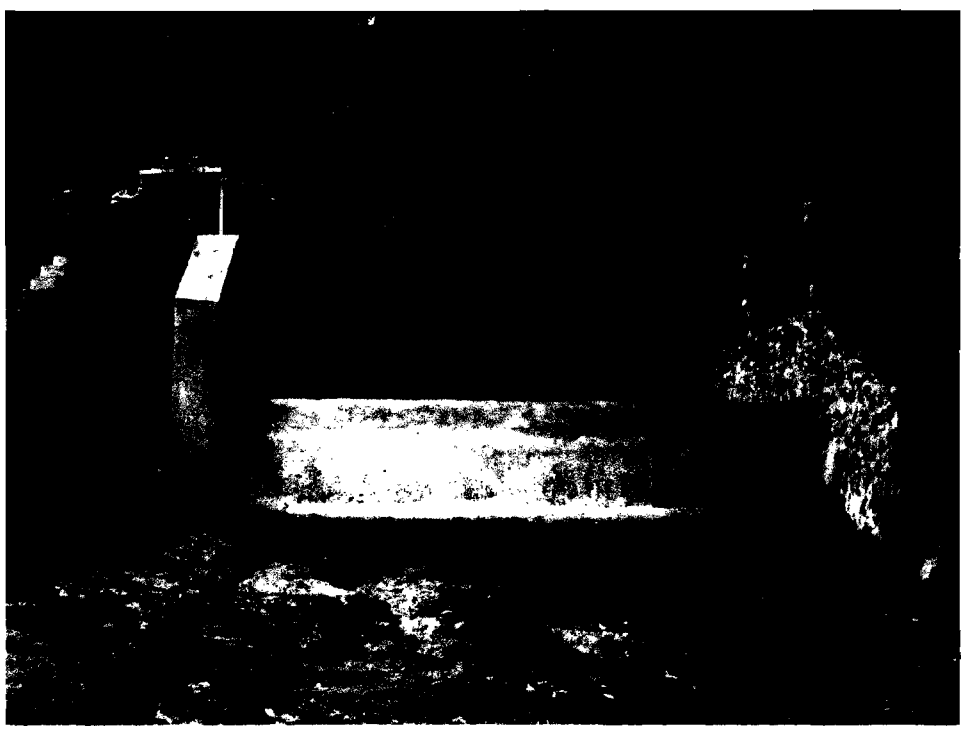
Picture 3 : *Temporary dam during the Weir & Intake structure*



Picture 4 : *Cyclopean work for Weir structure*



Picture 5 : *Completed Weir & Intake structure*



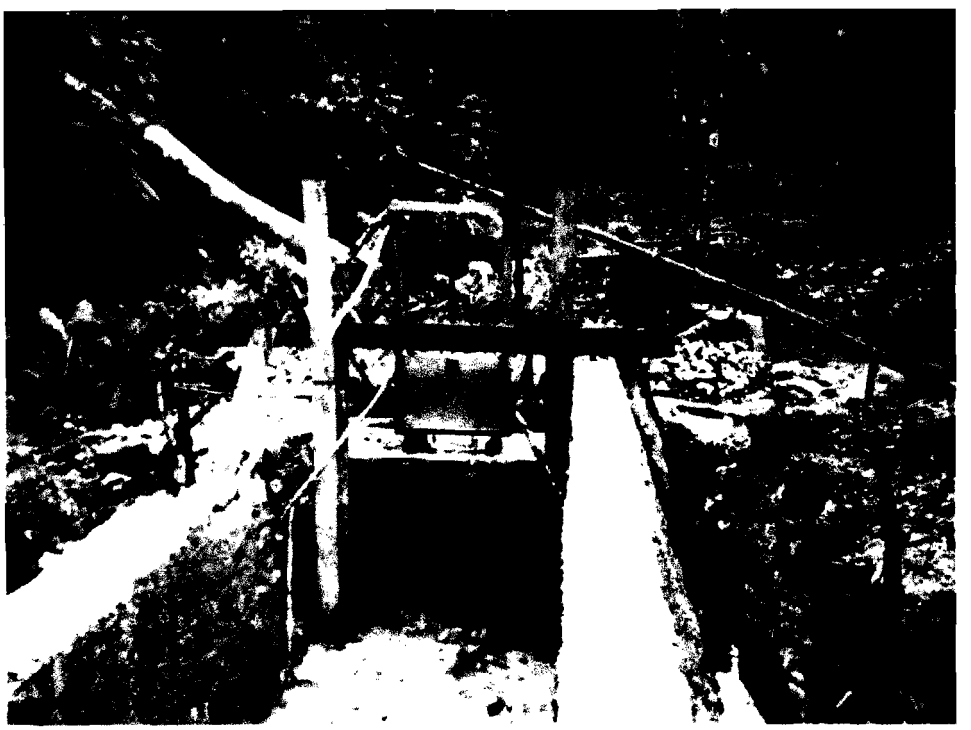
Picture 6 : *Weir & Intake structure after 15 cm additional height*

5.1.2 SAND TRAP

Picture 7 : *Excavation work*

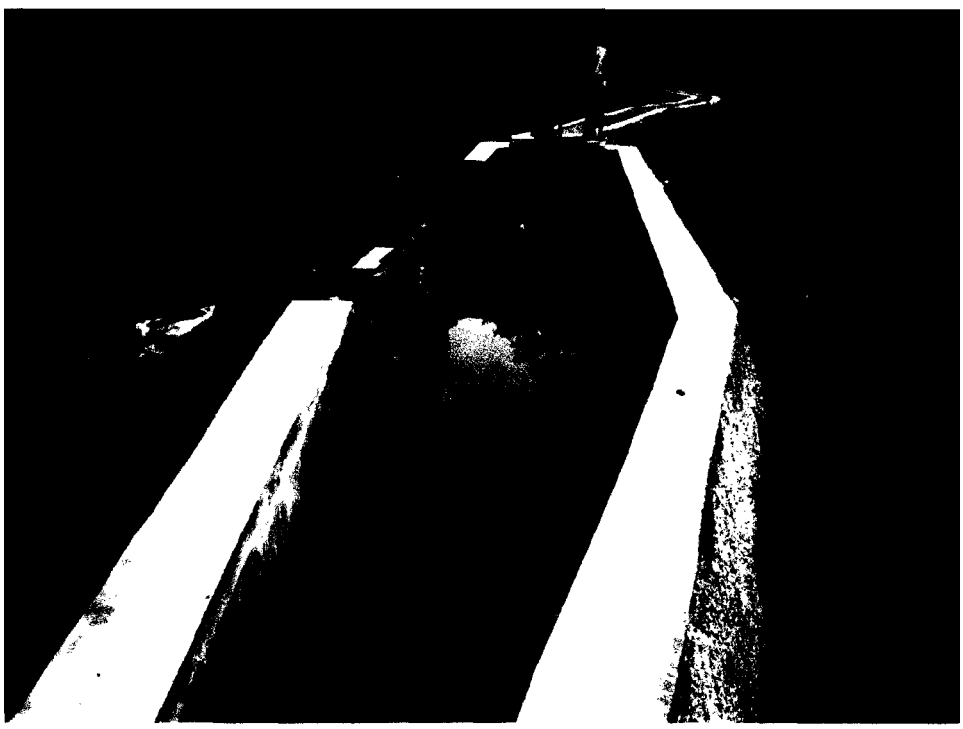
Picture 8 : *Stone masonry work*

Picture 9 : *Stone masonry work*



Picture 10 : *Gate installation*

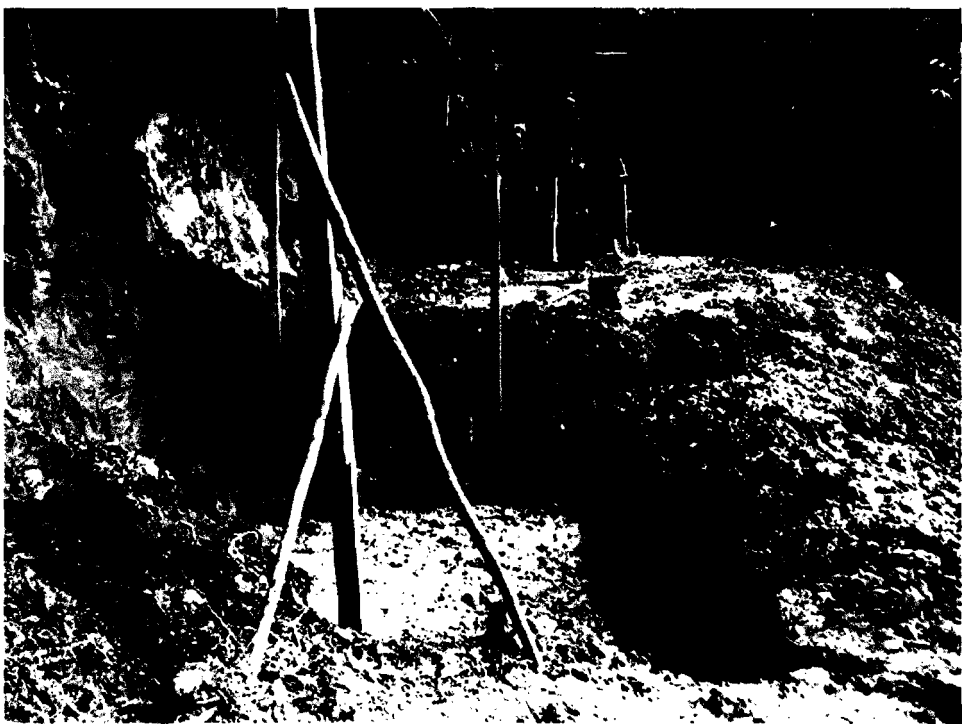
Picture 11 : *Completed Sand Trap structure (without Headrace)*



Picture 12 : *Completed Sand Trap(with Headrace)*

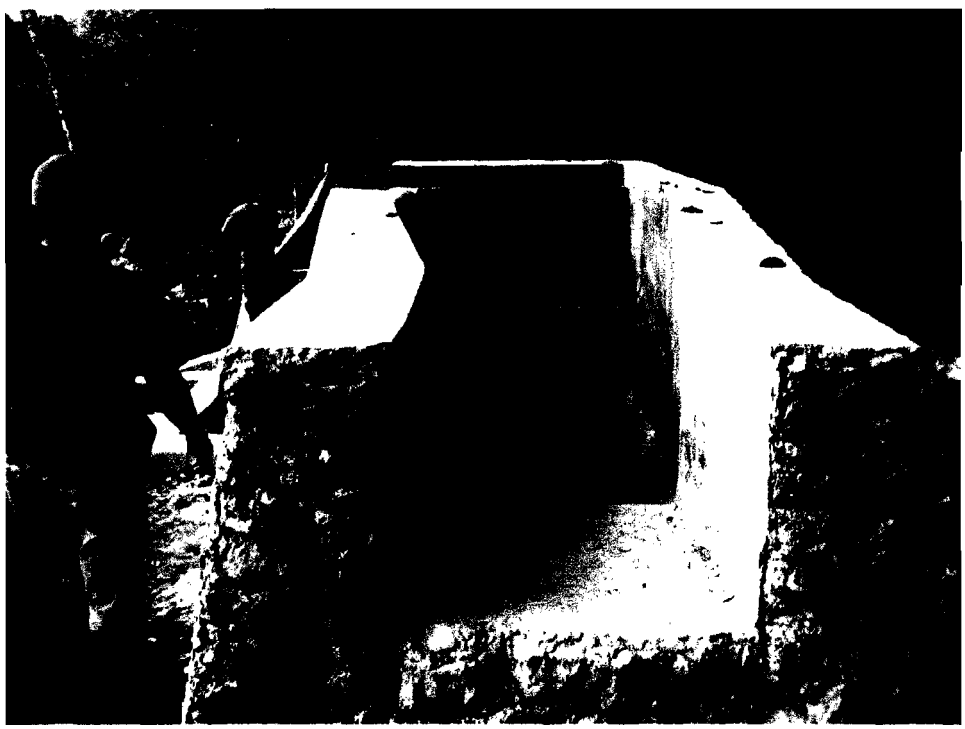
5.1.3 FOREBAY

Picture 13 : *Stake out work*

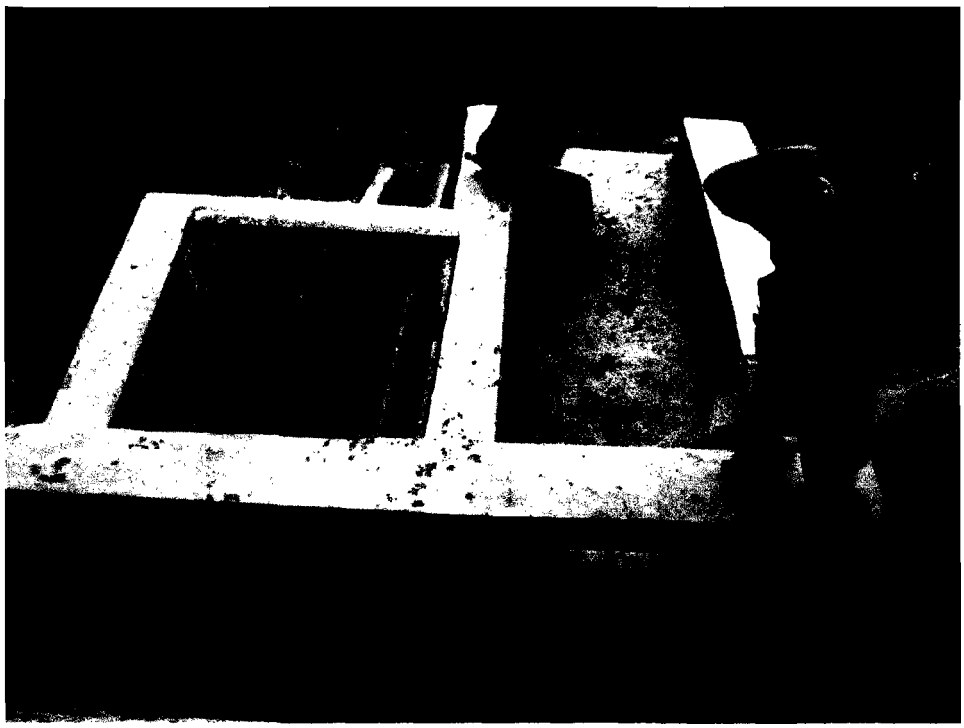


Picture 14 : *Excavation work*

Picture 15 : *Stone masonry work*



Picture 16 : *Completed Forebay structure (without Headrace)*

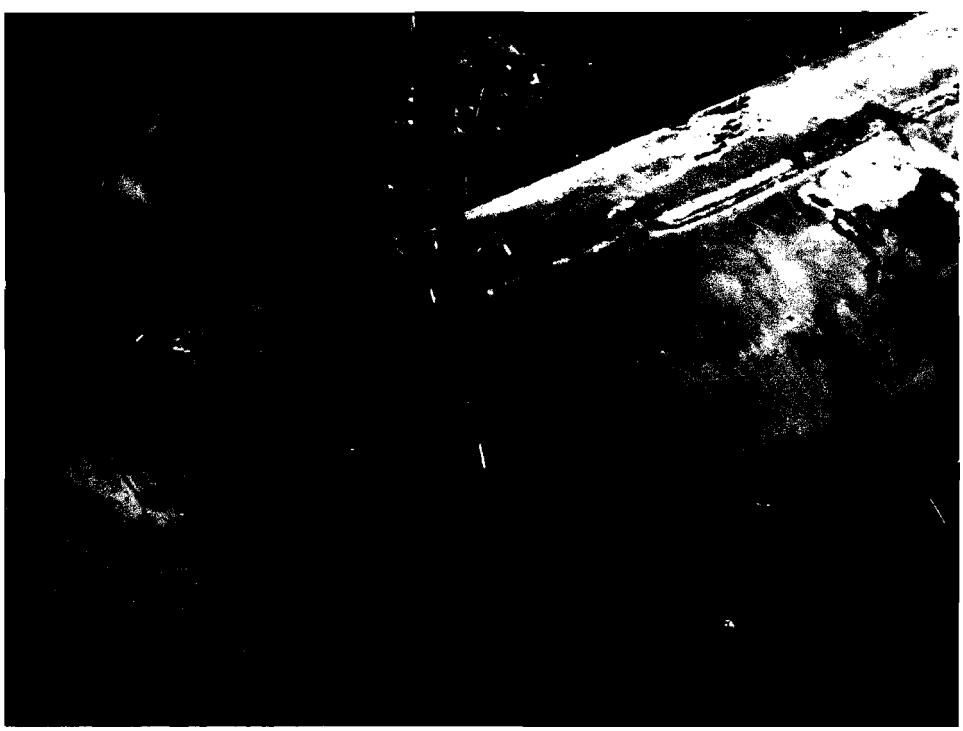


Picture 17 : *Spillway and flushing gates*

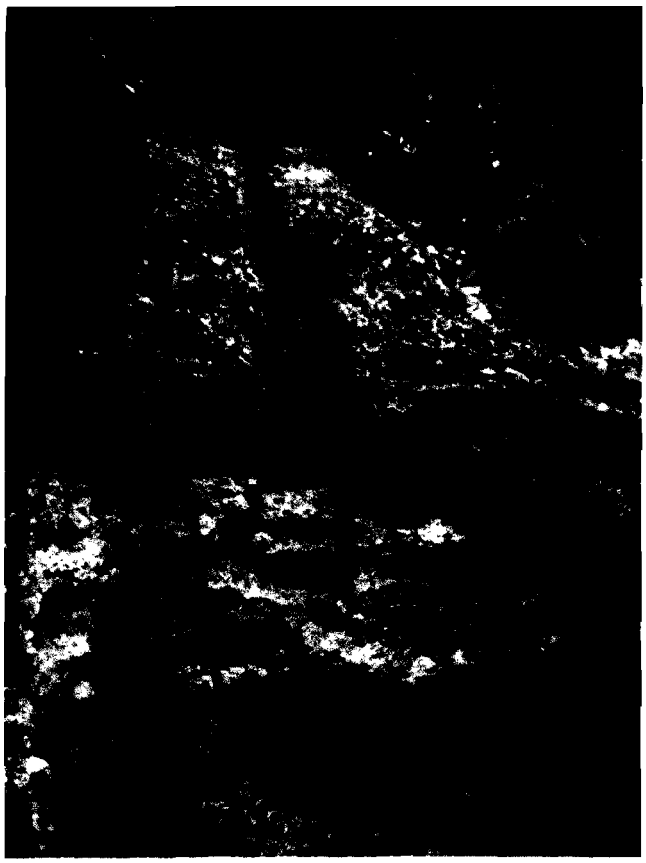
Picture 18 : *Completed Forebay structure (with Headrace)*

5.1.4 PENSTOCK

Picture 19 : *Transportation of Penstock pipe from workshop in Bandung*



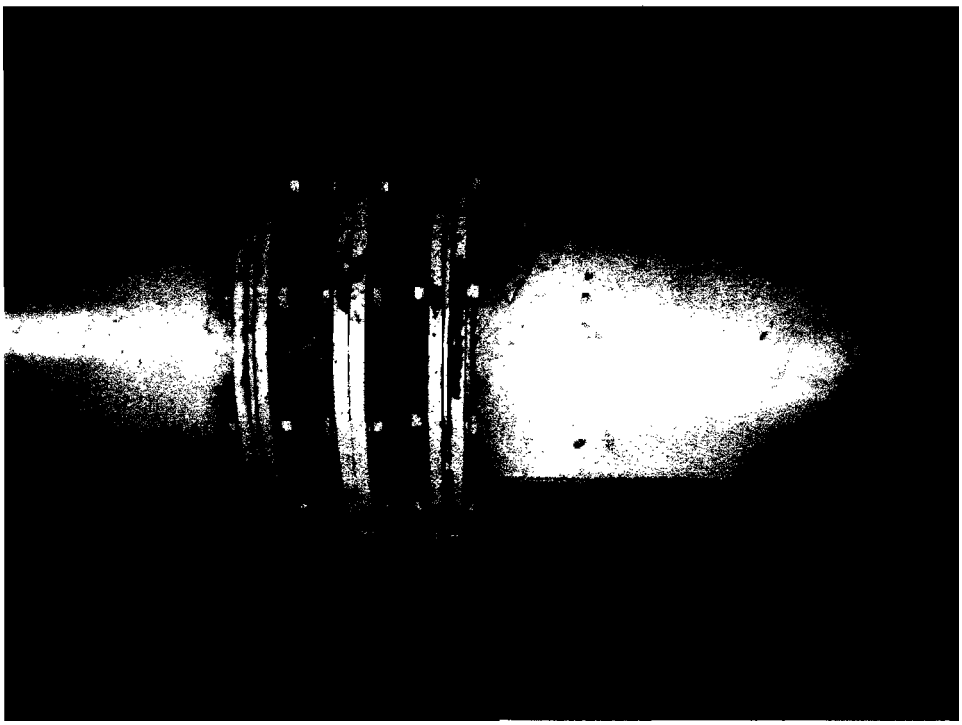
Picture 20 : *Welding work*



Picture 21 : *Excavation work*

Picture 22 : *Preparation for concrete work*

Picture 23 : *Erection of Penstock pipe*



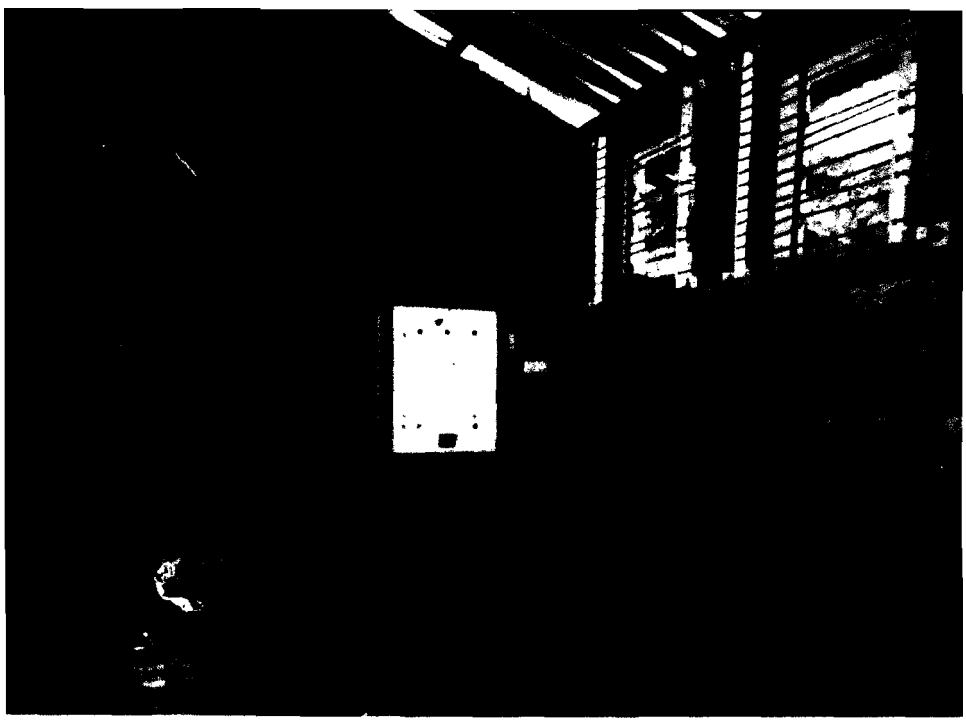
Picture 24 : *Expansion joint*

5.1.5 POWER HOUSE

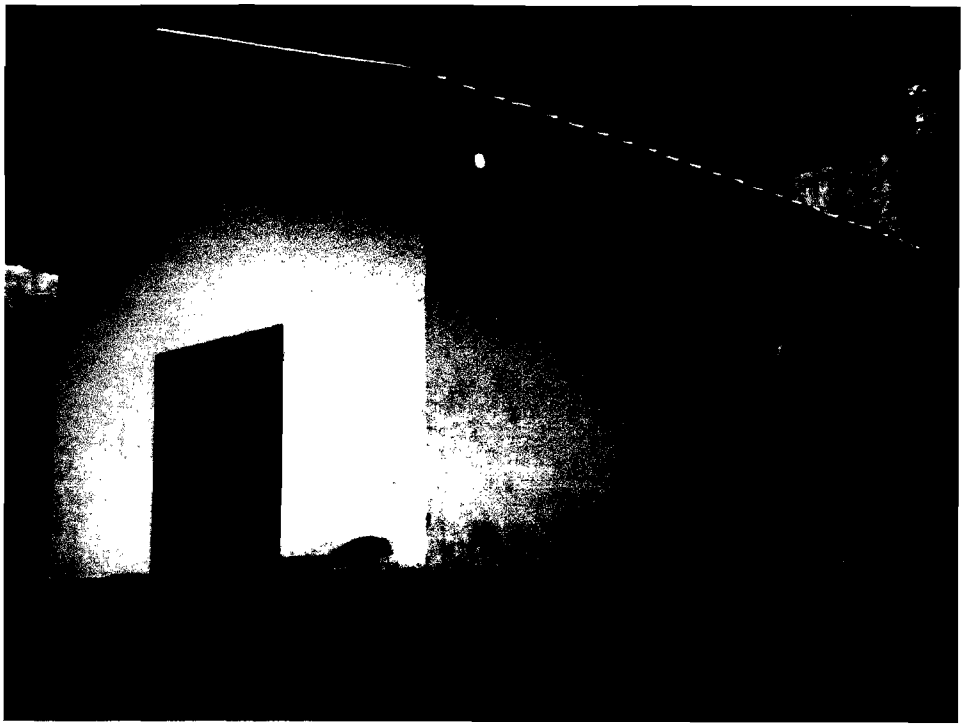
Picture 25 : *Excavation of soil structure*

Picture 26 : *Excavation of rocky ground*

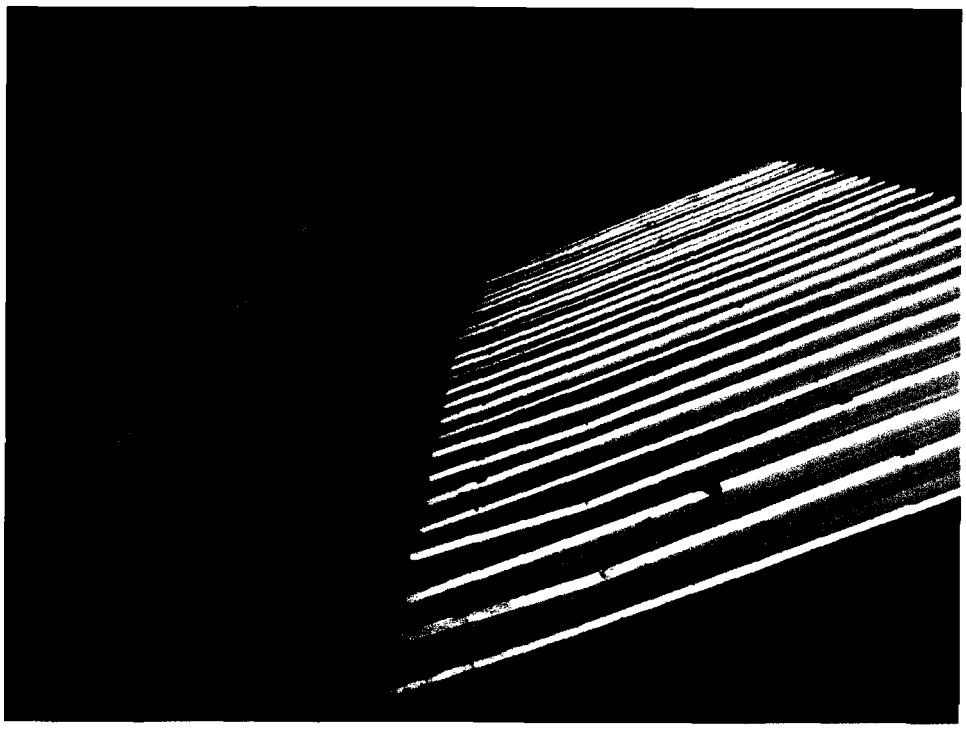
Picture 27 : *Partly finished PH structure*



Picture 28 : *PH inside condition*



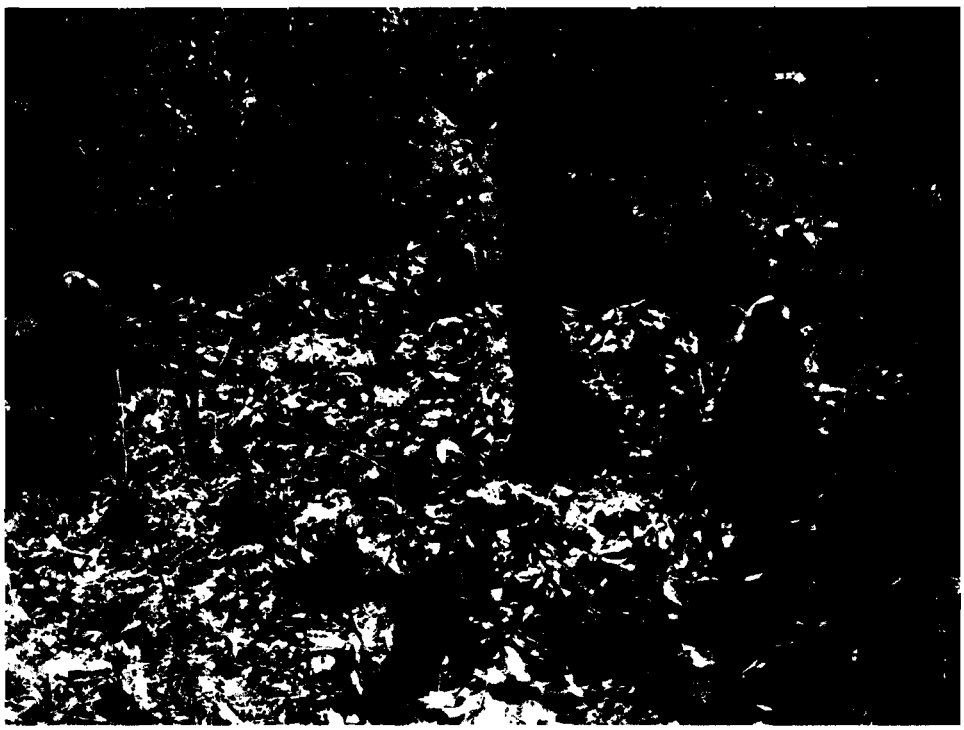
Picture 29 : *Completed PH structure*



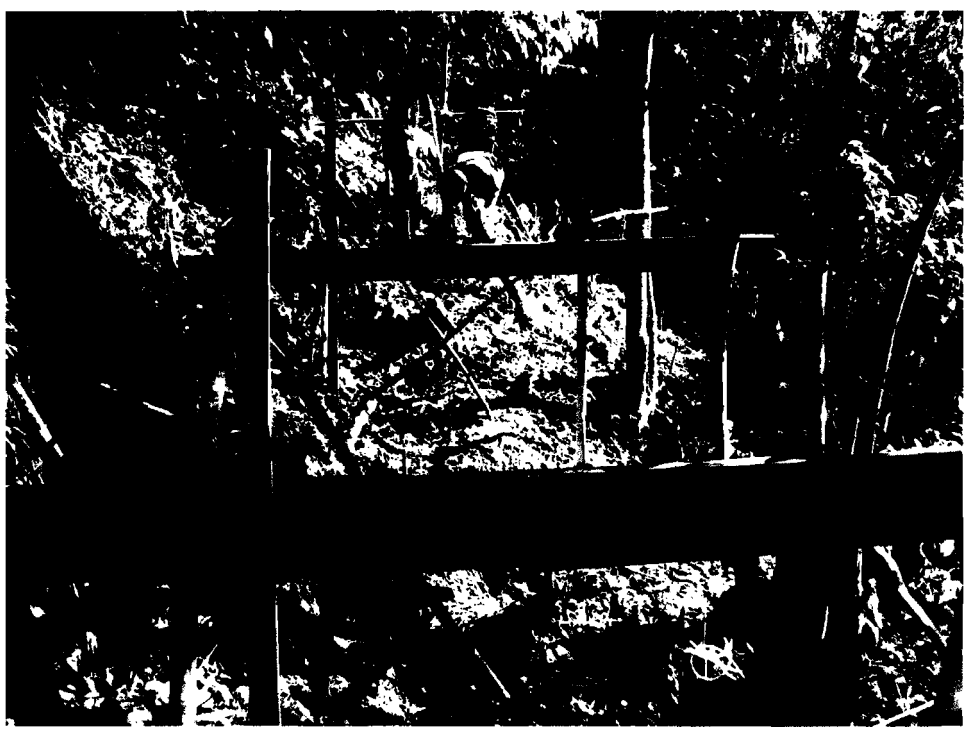
Picture 30 : *Completed protection wall and drainage canal*

5.2 MISCELLANEOUS

5.2.1 PRELIMINARY WORKS



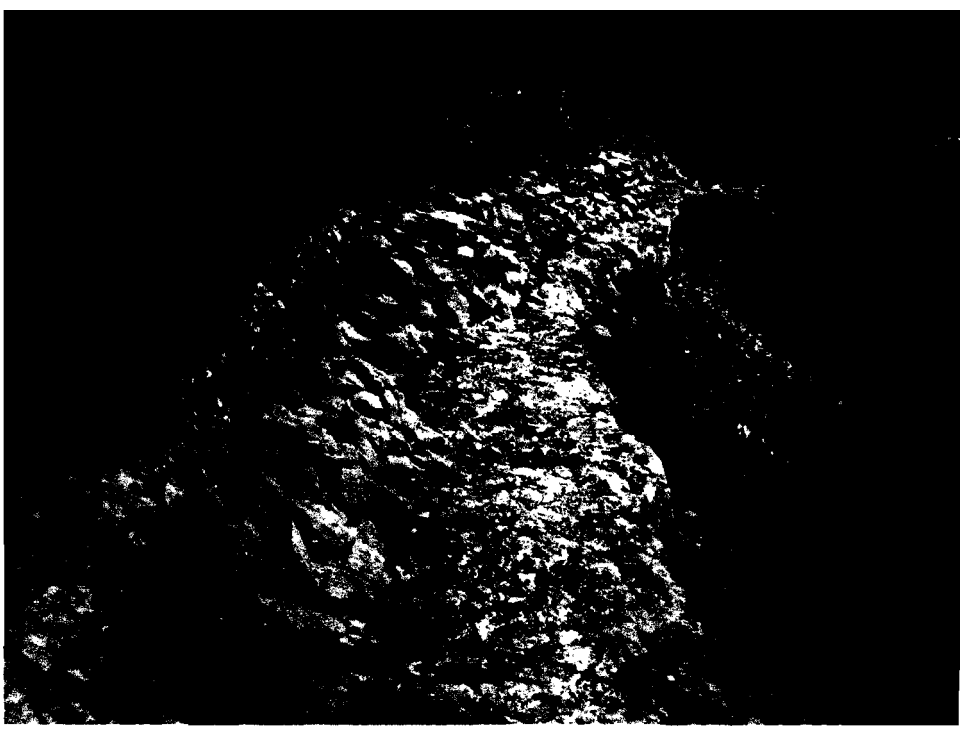
Picture 31 : *Site Clearance*



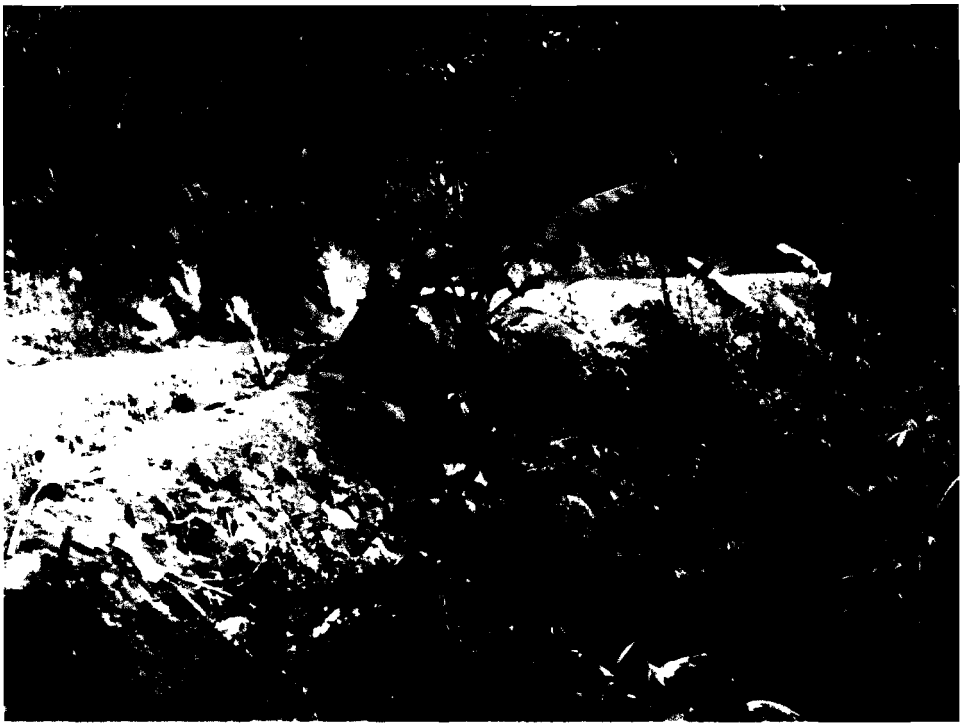
Picture 32 : *Stake out and Bouwplank installation*

5.2.2 HEADRACE

Picture 33 : *Excavation work*



Picture 34 : *Material preparation work*

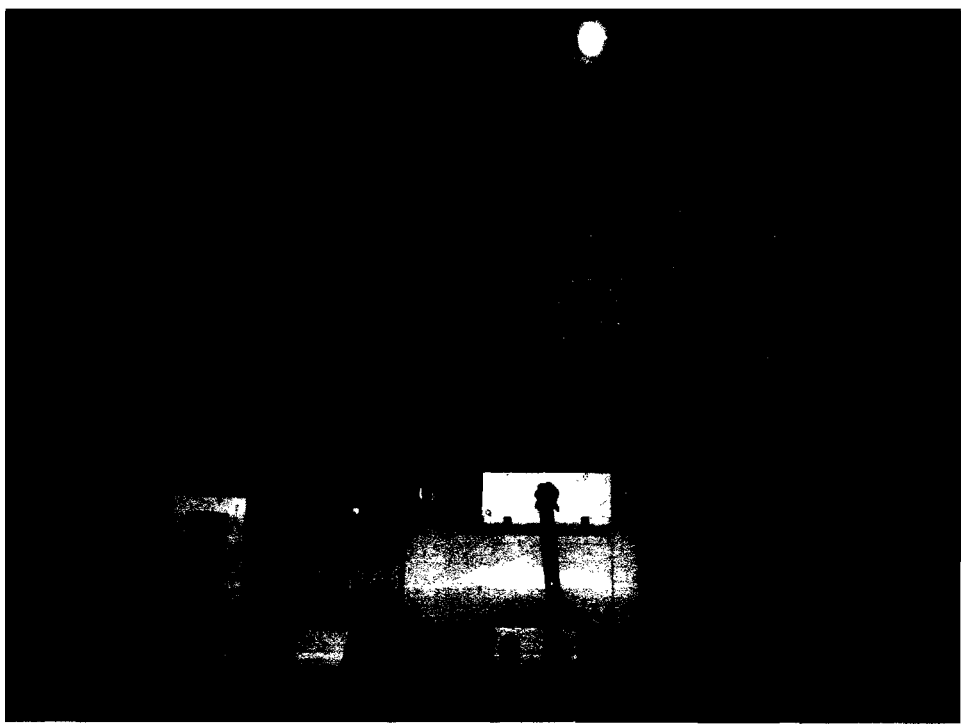


Picture 35 : *Completed Headrace structure*

Picture 36 : *The end part of Headrace structure*

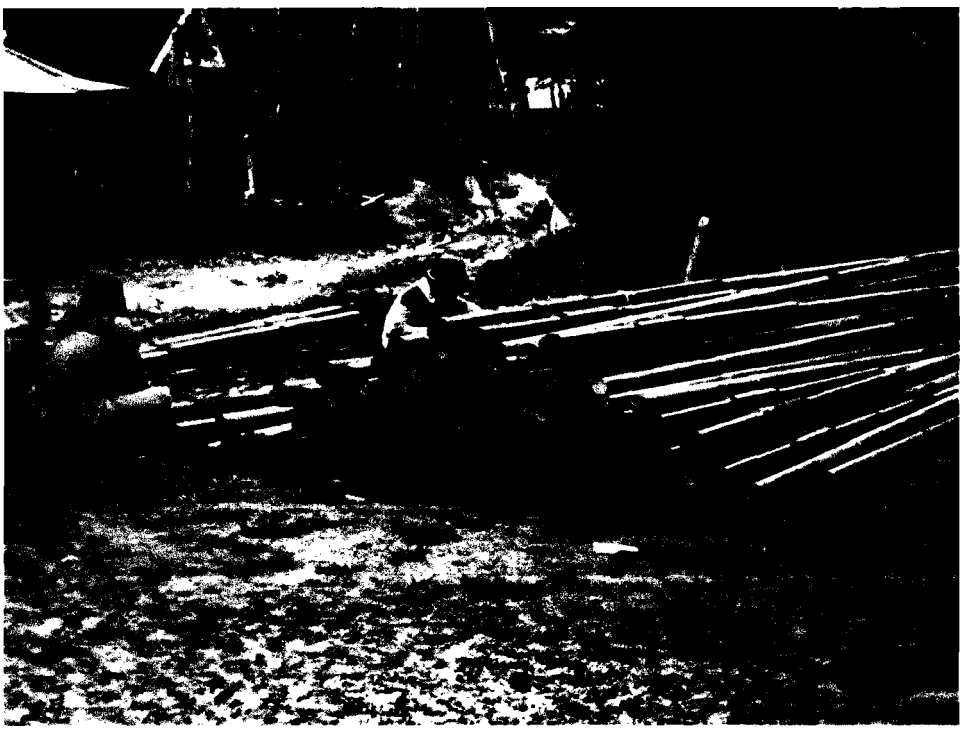
5.2.3 MECHANICAL & ELECTRICAL EQUIPMENT

Picture 37 : *Transportation of ME equipment from workshop in Bandung*



Picture 38 : *The installed Mechanical & Electrical equipment*

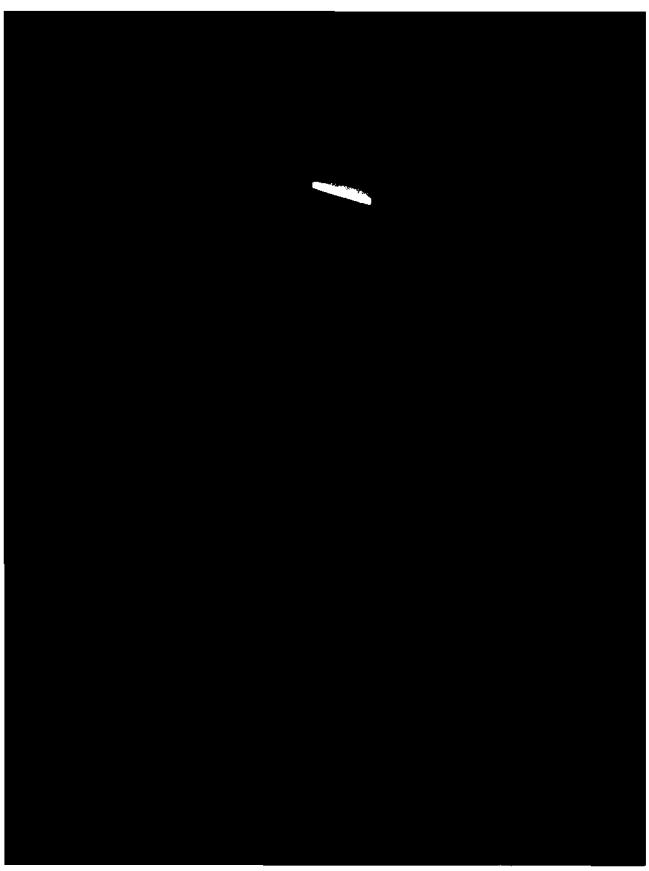
5.2.4 TRANSMISSION & DISTRIBUTION LINES



Picture 39 : *Welding work of poles*

Picture 40 : *Transmission lines instalation*

Picture 41 : *One of cable type which is used for transmission lines*



Picture 42 : *Evening light at every junction road*

5.2.5 RUNNING TEST

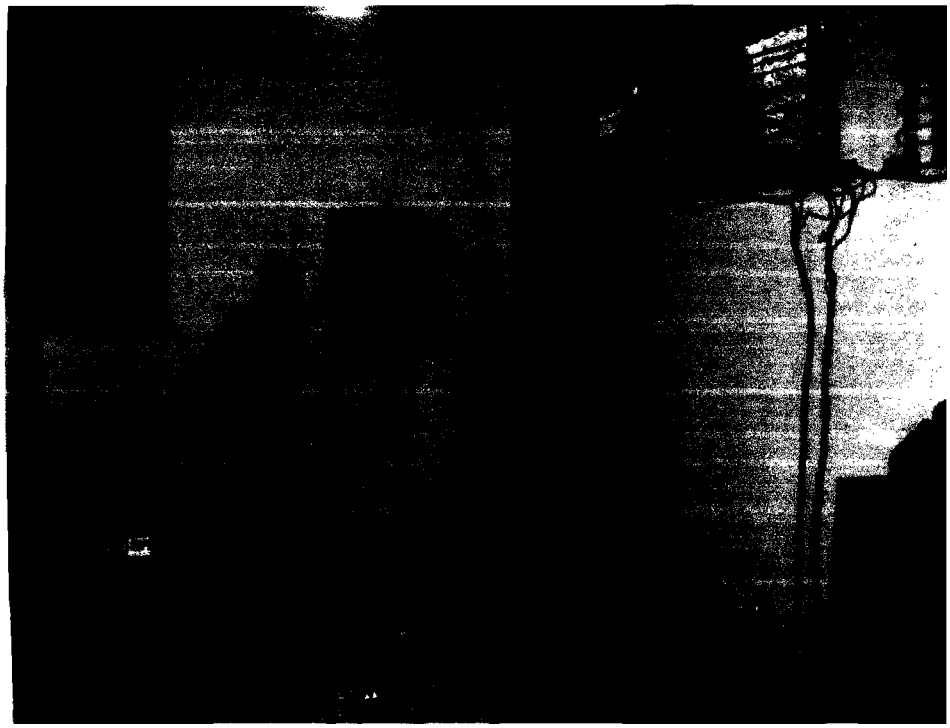
Picture 43 : *A water is coming out from valve connection before penstock adaptor*

Picture 44 : *The contractor is fixing the generator's position*

5.2.6 OPERATOR TRAINING

Picture 45 : *Keeping this water level during operational time*

Picture 46 : *Introducing the tools and supporting stuffs to the operator*



Picture 47 : *Explaining the control panel system*

Picture 48 : *Distribution lines installation at consumer's house*

5.2.7 INAUGURATION DAY

Picture 49 : *Mr. Kusetiadi Rahardjo (from Heksa) discussed with Mr. Rana Pratap Singh and Mr. Imran Farooque (from UNIDO)*

Picture 50 : *The signing of marble plaque*

Picture 51 : *Mr. Johannes Verhelst (from UNIDO) gave a brief report about the project*

Picture 52 : *Sightseeing at Power House location*