AA-2-2-1. Annual Operation Plan (Sample case -3000)

Appendix-2-2-1 Annual Operation Plan

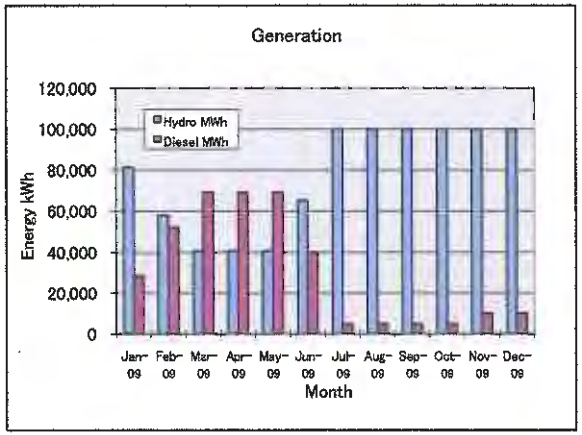
Case- 3,000

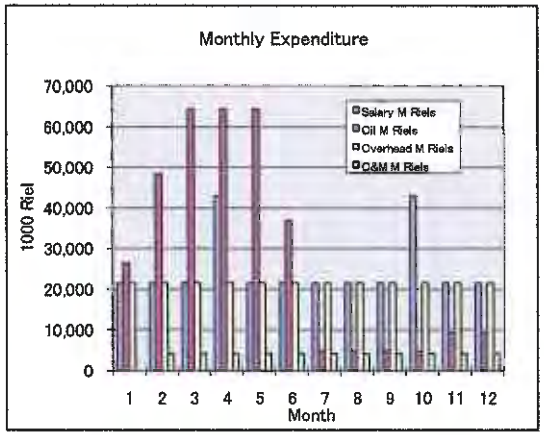
Tariff 1,568 Riel/kWh
Profit 10.0%

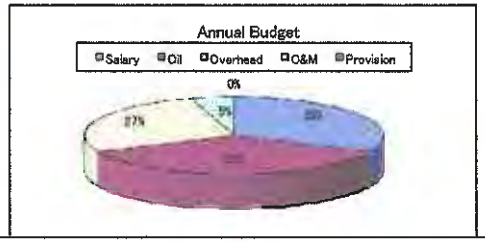
Exchange Rate 4,000 Riel/US$
Oil Price 3,000 Riel/Litter
Fuel Efficiency 0.31 Litter/kWh
Over head Expense 100%

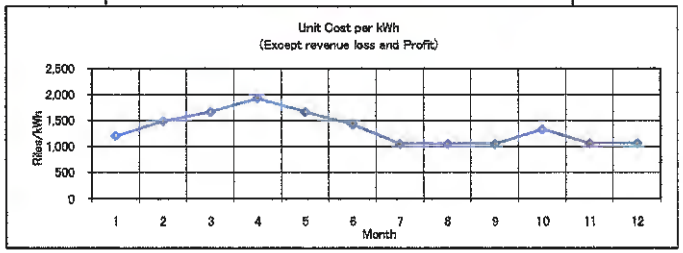
0.750

	Date	Generation Hydro MWh	Diesel MWh	Total MWh	Oil Spend Litter	Consumption E MWh	Loss 1	Tariff Riel/kWh	Invoice M Riels	%	Revenue M Riels	Salary M Riels	Oil M Riels	Overhead M Riels	O&M M Riels	Sub-total M Riels	(Deposit for Future) Hydro M Riels	O&M M Riels	Total M Riels	Cost Total M Riels	kWh/Cost (Inovice) Riels	Profit M Riels	%
3	20-Jan	81,500	28,500	110,000	8,835	82,500	25%	1568	129,360	5%	122,892	21,500	26,505	21,500	0	69,505	7,580	22,500	30,080	99,585	1,207	23,308	19%
4	20-Feb	58,000	52,000	110,000	16,120	82,500	25%	1568	129,360	5%	122,892	21,500	48,380	21,500	4,000	95,380	5,394	22,500	27,894	123,254	1,494	(362)	0%
5	20-Mar	40,750	69,250	110,000	21,468	82,500	25%	1568	129,360	5%	122,892	21,500	64,403	21,500	4,000	111,403	3,790	22,500	26,290	137,692	1,669	(14,800)	-12%
6	20-Apr	40,750	69,250	110,000	21,468	82,500	25%	1568	129,360	5%	122,892	43,000	64,403	21,500	4,000	132,903	3,790	22,500	26,290	159,192	1,930	(38,300)	-30%
7	20-May	40,750	69,250	110,000	21,468	82,500	25%	1568	129,360	5%	122,892	21,500	64,403	21,500	4,000	111,403	3,790	22,500	26,290	137,692	1,669	(14,800)	-12%
8	20-Jun	65,200	39,800	105,000	12,338	78,750	25%	1568	123,480	5%	117,306	21,500	37,014	21,500	4,000	84,014	6,064	22,500	28,564	112,578	1,430	4,728	4%
9	20-Jul	100,000	5,000	105,000	1,550	78,750	25%	1568	123,480	5%	117,306	21,500	4,650	21,500	4,000	51,650	9,300	22,500	31,800	83,450	1,060	33,856	29%
10	20-Aug	100,000	5,000	105,000	1,550	78,750	25%	1568	123,480	5%	117,306	21,500	4,650	21,500	4,000	51,650	9,300	22,500	31,800	83,450	1,060	33,856	29%
11	20-Sep	100,000	5,000	105,000	1,550	78,750	25%	1568	123,480	5%	117,306	21,500	4,650	21,500	4,000	51,650	9,300	22,500	31,800	83,450	1,060	33,856	29%
12	20-Oct	100,000	5,000	105,000	1,550	78,750	25%	1568	123,480	5%	117,306	43,000	4,650	21,500	4,000	73,150	9,300	22,500	31,800	104,950	1,333	12,356	11%
13	20-Nov	100,000	10,000	110,000	3,100	82,500	25%	1568	129,360	5%	122,892	21,500	9,300	21,500	4,000	56,300	9,300	22,500	31,800	88,100	1,068	34,792	28%
14	20-Dec	100,000	10,000	110,000	3,100	82,500	25%	1568	129,360	5%	122,892	21,500	9,300	21,500	4,000	56,300	9,300	22,500	31,800	88,100	1,068	34,792	28%
		926,950	368,050	1,295,000	114,096	971,250	25%		#######		########	######	342,287	258,000	44,000	945,287	86,206	270,000	356,206	1,301,493	1,340	######	10.0%
						Total (1000 US$)			380.73		361.69	75.25	85.57	64.50	11.00	236.32	21.55	67.50	89.05	325.37	0.335	36.32	









AA-2-4-1. Sample of Billing Book

Appendix AA-2-4-1 Sample of Billing Book 1

ព្រះរាជាណាចក្រកម្ពុជា

ជាតិ សាសនា ព្រះមហាក្សត្រ

មន្ទីរឧស្សាហកម្មរ៉ែ និងថាមពលខេត្តមណ្ឌលគិរី

អង្គភាពអគ្គិសនីខេត្តមណ្ឌលគិរី

ផ្នែកគណនេយ្យទូទាត់

Bill Management Section

របាយការណ៍សរុបក្នុងការចេញវិក័យបត្រជូនអតិថិជនតាមត្រង់ស្វូប្រចាំខែ (តុលា ២០០៩)

	[illegible] Number of Transformer	[illegible] Total of Customers	[illegible] Total of Kwh	[illegible] Total Income	[illegible] Total of [illegible]	[illegible] Total Invoice not issuse	[illegible] Total Invoice Issuse
	P-01	29	6061	10,060,100 R	8	1	28
	P-02	27	5508	8,915,200 R	5	1	26
	P-03	26	820	1,243,800 R	1	1	25
	P-04	58	4451	7,099,500 R	7	2	56
	P-04 H	1	2089	3,133,500 R	0	0	1
	P-05	35	2056	3,084,000 R	0	0	35
	P-06	31	1729	2,593,500 R	0	0	31
	P-07	23	1739	2,776,900 R	2	1	22
	P-08	17	1123	1,781,500 R	1	0	17
31	P-09	25	1237	1,895,300 R	2	1	24
	P-10	10	1007	1,594,100 R	1	0	10
	P-11	41	4860	7,568,800 R	6	0	41
	P-12	16	1016	1,566,200 R	4	0	16
	P-13	6	601	981,900 R	2	0	6
	P-14	50	3880	6,122,200 R	5	1	49
	P-15	46	4585	7,254,500 R	4	0	46
	P-16 (01)	254	15860	24,472,800 R	8	7	247
	P-16 (02)	18	1844	2,857,400 R	2	0	18
	P-17	43	3887	6,116,900 R	3	1	42
	P-18	11	464	704,600 R	1	0	11
	P-19	75	3310	5,025,400 R	2	4	71
	P-20	49	2030	3,075,200 R	2	1	48

P-21	32	1002	1,503,000 R	0	1	31
P-22	19	1238	1,868,200 R	1	0	19
P-23	17	800	1,200,000 R	0	0	17
P-24	5	202	303,000 R	0	0	5
P-25	12	996	1,626,600 R	1	1	11
P-26	14	525	789,700 R	0	1	13
P-27	13	345	517,500 R	0	0	13
P-28	6	128	192,000 R	0	0	6
P-29	32	2215	3,414,500 R	2	0	32
P-30	29	1286	1,929,000 R	0	2	27
P-31	21	1993	3,202,100 R	3	0	21
P-32	32	1187	1,780,500 R	0	0	32
P-33	20	926	1,389,000 R	0	1	19
P-34	17	2089	3,133,500 R	0	0	17
P-35	11	1064	1,596,000 R	0	1	10
Street-Light	1	972	1,458,000 R	0	0	1
P- 36 OR 066	2	88	132,000 R	0	0	2
Total	***1174***	***87213***	***135,957,900 R***	***76***	***27***	***1146***

ថ្ងៃទី ខែ ឆ្នាំ ២០.....

បានឃើញ និង ឯកភាព

ប្រធានគណនេយ្យ

ថ្ងៃទី ខែ ឆ្នាំ ២០.....

គណនេយ្យទូទាត់

ថ្ងៃទី ខែ ឆ្នាំ ២០.....

បានឃើញ និង.....

ប្រធានអង្គភាពអគ្គិសនី

Appendix AA-4-1 Sample of Billing Book

ព្រះរាជាណាចក្រកម្ពុជា

ជាតិ សាសនា ព្រះមហាក្សត្រ

មន្ទីរឧស្សាហកម្មរ៉ែនិងថាមពលខេត្តមណ្ឌលគិរី

អង្គភាពអគ្គិសនីខេត្តមណ្ឌលគិរី

ផ្នែកគណនេយ្យទូទាត់

Bill Management Section

ប្រចាំខែ តុលា ២០០៩

បញ្ជីសរុបអតិថិជនប្រើប្រាស់ថាមពលអគ្គិសនីនៅតាមត្រង់ស្វូលេខៈ ០១

List of Customers used Energy Recoord For Transformer Number: 01

SYMBOL

កំណត់បង្ហាញ

A= Bill issued Normal Price — A= ចេញវិក័យបត្រជាយតំលៃធម្មតា

B= Bill issued by Special Price — B= ចេញវិក័យបត្រជាយតំលៃពិសេស

C= 0 Kwh (Bill not issued) — C= ០គីឡូវ៉ាត់ មិនចេញវិក័យបត្រ

D= Doubt Metter Broken or Stopped (Bill not issued) — D= សង្ស័យថាកុងទ័រខូចរឺគាំង មិនចេញវិក័យបត្រ

E= Expire or Not Pay and stop suplied till pay — E= ផុតកំណត់ រឺមិនបានបង់ប្រាក់ និង ផ្តាច់ភ្លើងជាបន្ត

N°	ID NUM	Invoice code	Name of Customers	Category	Telephone Number	Symbol	Metter Location		Metter Serial	Type Current	Breaker	Previous	current	Kwh	Rate	Total	Mark
1		១	អាន់ ស៊ីនអេង	ផ្ទះធម្មតា		A	P-01 117		38215	10(30)A	6A	117	128	11	1,500 R	16,500 R	
2		២	សេង ហាក់	ផ្ទះធម្មតា		A	P-01 208		38702	10(30)A	6A	407	442	35	1,500 R	52,500 R	
3		៣	អ៊ុក ស៊ីន	ផ្ទះធម្មតា		A	P-01 116		38154	10(30)A	6A	648	660	12	1,500 R	18,000 R	
4		៤	ឡេង សុវណ្ណារ័ត្ន	ផ្ទះធម្មតា		A	P-01 114		39506	10(30)A	6A	279	280	1	1,500 R	1,500 R	
5		៥	ចាន់ ថន	ផ្ទះធម្មតា		A	P-01 226		38766	10(30)A	6A	2285	2570	285	1,500 R	427,500 R	
6		៦	ជ្រើប ប្រែន	ផ្ទះធម្មតា		A	P-01 222		38722	10(30)A	6A	1152	1290	138	1,500 R	207,000 R	
7		៧	ជឹម ទូច	ផ្ទះធម្មតា		A	P-01 226		38186	10(30)A	6A	610	692	82	1,500 R	123,000 R	
8		៨	ណេត លីមគុណ	ផ្ទះសំណាក់បក្សីមាស		B	P-01 301		4182	3x20(60)A	63A	12901	14007	1106	1,700 R	1,880,200 R	
9		៩	សេង សុខណេត	ផ្ទះសំណាក់មារុណរ៉ះ		B	P-01 303		4199	3x20(60)A	6A	23297	25192	1895	1,700 R	3,221,500 R	
10		១០	ម៉ែន ម៉ុយ	ផ្ទះធម្មតា		C	P-01 308		39383	10(30)A	6A	20	20	0	1,500 R	0 R	
11		១១	គុជ វណ្ណា	ផ្ទះសំណាក់		B	P-01 107		38419	10(30)A	6A	3408	3449	41	1,700 R	69,700 R	
12	·	១២	គុជ វណ្ណា	ផ្ទះធម្មតា		A	P-01 110		38346	10(30)A	6A	630	732	102	1,500 R	153,000 R	
13		១៣	គុជ ម៉េងធូ	ផ្ទះធម្មតា		A	P-01 110		38912	10(30)A	6A	415	459	44	1,500 R	66,000 R	
14		១៤	ទូច រស្មី	ផ្ទះធម្មតា		A	P-01 222		38700	10(30)A	20A	793	884	91	1,500 R	136,500 R	
15		១៥	ស៊ុំ យ៉េង	ផ្ទះធម្មតា		A	P-01 224		38960	10(30)A	6A	685	753	68	1,500 R	102,000 R	
16		១៦	ប៉ង រីន	ផ្ទះធម្មតា		A	P 01-222		038934	10(30)A	10A	433	460	27	1,500 R	40,500 R	

N°	ID NUM	Invoice code	Name of Customers	Category	Telephone Number	Symbol	Metter location		Metter Serial	Type Current	Breaker	លេខចាស់ Previous	លេខថ្មី current	Kwh	Rate	Total	Mark
17		១៧	គួរ សុផាន៉ា	ផ្ទះធម្មតា		A	P 01-226		038673	10(30)A	6A	431	471	40	1,500 R	60,000 R	
18		១៨	ទន់ សុវណ្ណារ៉ា	ផ្ទះធម្មតា		A	P 01-226		038394	10(30)A	6A	455	480	25	1,500 R	37,500 R	
19		១៩	សេង ខ្សែកាប	ចូលចុងខ្សែកាប		B	P 01-117		038234	10(30)A	6A	966	1080	114	1,700 R	193,800 R	
20		២០	មាស អិន	ផ្ទះធម្មតា		A	P 01-112		038969	10(30)A	6A	367	404	37	1,500 R	55,500 R	
21		២១	ផ្ទះសំណាក់បក្សីមាស	ផ្ទះសំណាក់		B	P 01-301		039414	10(30)A	6A	941	1165	224	1,700 R	380,800 R	
22		២២	ឡុង វិបុល	ធម្មតា		A	P 01-310		039231	10(30)A	20A	844	918	74	1,500 R	111,000 R	
23		២៣	ជាង សេង	ធម្មតា		A	P 01-212		039313	10(30)A	6A	397	412	15	1,500 R	22,500 R	
24		២៤	រ៉េត សុខសាមឌី	ធម្មតា		A	P 01-307		039082	10(30)A	6A	400	438	38	1,500 R	57,000 R	
25		២៥	ជួប ជុំ	ធម្មតា		A	P 01-304		038885	10(30)A	6A	241	275	34	1,500 R	51,000 R	
26		២៦	បាន តុម៉ា	ខាំអ៊ុខ		B	P 01-310		039241	10(30)A	20A	1632	1810	178	1,700 R	302,600 R	
27		២៧	កែប ស៊ីណាង	បីហ្វា		B	P-01 203		004184	10(30)A	20A	3588	4263	675	1,700 R	1,147,500 R	
28		២៨	ភាត ធន្នីម៉ាលី	ធម្មតា		A	P-01 307		038951	10(30)A	6A	295	354	59	1,500 R	88,500 R	
29		២៩	ក្រុមហ៊ុន ០៩៧	អជីវកម្ម "០១៦"		B	P-01 266		038296	10(30)A	6A	841	1451	610	1,700 R	1,037,000 R	
												អនុភាពសរុប:		6061	ទឹកប្រាក់សរុប:	10,060,100 R	

ប្រធានគណនេយ្យ

ថ្ងៃទី......ខែ.......ឆ្នាំ..........

អ្នកធ្វើតារាង

AA-2-4-2. Sample of Invoice

Appendix AA-2-4-2 Sample of Invoice

អង្គភាពអគ្គិសនី ខេត្តមណ្ឌលគិរី

Electricity Unit of MondulKiri Province

(EUMP)

DOÉUM SROL , SENMONOROM .CITY

ឈ្មោះអតិថិជន:	[illegible]		P-01 117
ប្រភេទប្រើប្រាស់:	ផ្ទះធម្មតា		1

គិតចាប់ពីថ្ងៃទី: 20/01/2009 ដល់ថ្ងៃទី: 20/02/2009

METER	PREVIOUS	CURRENT	MULTIPLIER	CONSUMPTION	RATE	VALUE
38215	000117	000126	1	11	1,500 R	17,600 R

សូមជួយសន្សំសំចៃថាមពល ! Please save Energy !

ទឹកប្រាក់សរុបត្រូវបង់	TOTAL :	17,600 R
ថ្ងៃផុតកំណត់បង់ប្រាក់	PAY BY :	2009/2/3
ថ្ងៃបង់ប្រាក់	PAY DATE :	
ចំនួនទឹកប្រាក់បានបង់	AMOUNT :	

អ្នកទទួលប្រាក់

អង្គភាពអគ្គិសនី ខេត្តមណ្ឌលគិរី

Electricity Unit of MondulKiri Province

(EUMP)

DOÉUM SROL , SENMONOROM .CITY

ឈ្មោះអតិថិជន :	[illegible]		P-01 117
ប្រភេទប្រើប្រាស់:	ផ្ទះធម្មតា		1

គិតចាប់ពីថ្ងៃទី: 20/01/2009 ដល់ថ្ងៃទី : 20/02/2009

METER	PREVIOUS	CURRENT	MULTIPLIER	CONSUMPTION	RATE	VALUE
38215	000117	000138	1	11	1,600 R	17,600 R

សូមជួយសន្សំសំចៃថាមពល ! Please save Energy !

ទឹកប្រាក់សរុបត្រូវបង់	TOTAL :	17,600 R
ថ្ងៃផុតកំណត់បង់ប្រាក់	PAY BY :	2009/2/3
ថ្ងៃបង់ប្រាក់	PAY DATE :	
ចំនួនទឹកប្រាក់បានបង់	AMOUNT :	

អ្នកទទួលប្រាក់

AA-2-5-1. Annual data submissions by smaller licensee

Appendix AA-2-5-1 (1)

Annual data submissions by smaller Licensee

Sample table	Contents
AS 1	Data of generation
AS 2	Detail information on power purchase (buying power)
AS 3	Detail information on staff payment
AS 4	Payment for operation and maintenance
AS 5	Detail information on payment for administration and general management
AS 6	Detail information on soft loan
AS 7	Detail information on the total fixed assets
AS 8	Detail information on depreciation
AS 9	Calculation of reasonable profit
AS 10	Calculation correct payment
AS 11	Income from electricity tariff is carrying out
AS 12	Information on energy

Appendix AA-2-5-1 (2) Table AS 1

Data of Generation

really/certainly figure for last year

		Item	unit	Jan.	Feb.	Mar.	April	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
A		**Technical dara**														
	1	Installed capacity of Generator														
		(certify model)	kVA													
		(certify model)	kVA													
	2	Power generate	kWh													
	3	Using power for generation	kWh													
		Using power for generation	%													
	4	Power Transmission (2-3)	kWh													
	5	Power coefficient	%													
	6	Amount of operation hours	h													
B		Fuel-oil (D.O) data														
		Sources (certify the Name)														
	7	Amount of fuel-oil for buy-in	Liter (L)													
	8	Amount of fuel-oil for using	Liter													
	9	Average price of fuel-oil	Reals/L													
	10	Payment for fuel-oil	(000 Leals)													
		Sources (certify the Name)														
	11	Amount of fuel-oil for buy-in	Liter													
	12	Amount of fuel-oil for using	Liter													
	13	Average price of fuel-oil	Reals/L													
	14	Payment for fuel-oil	(000 Leals)													
	15	**Using for fuel-oil rate**	**L/kWh**													
		Sources (certifyfy the Name)														
	16	Amount of lubrication-oil for buy-in	Liter													
	17	Amount of lubrication-oil for using	Liter													
	18	Average price of lubrication-oil	Reals/L													
	19	Payment for lubrication-oil	(000 Reals)													
		Total payment for fuel-oil and lubrication-oil (10+14+19)	**(000 Reals)**													
	20	**Using for lubrication-oil rate**	**L/kWh**													

Appendix AA-2-5-1 (3) Table AS 2

Detail information on power purchase (buying Electricity)

Really/certainly figure for last year

			Jan.	Feb.	Mar.	April	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
A		Sources 1 (Name)													
	1	Payment for capacity (000 Riel)													
	2	Payment on power purchase (000 Riel)													
	3	Total payment (000 Riel)													
	4	Total amount power purchase (000 kWh)													
	5	Average payment (Riels/kWh)													
B		Sources 2 (Name)													
	1	Payment for capacity (000 Riel)													
	2	Payment on power purchase (000 Riel)													
	3	Total payment (000 Riel)													
	4	Total amount power purchase (000 kWh)													
	5	Average payment (Riels/kWh)													

Appendix AA-2-5-1 (4) Table AS 3

Detail information on staff payment

Really/certainly figure for last year

No	Category of Staff	Number of Staff at the end of the year	Basic Salary	Supplementary money 1 (certify)	Extra money 2 (certify)	fortune and other benefit (certify)	Benefit/ bonus (certify)	Others (certify)	Total
			(000 Riels)	(000 Riels)	(000 Riels)	(000 Riels)	(000 Riels)	(000 Riels)	(000 Riels)
	Administration Division								
1	Chief (Director)								
2	Vice-chief (Deputy Director)								
3	Accounting or Cashier								
	Technical Division								
	Generation Section								
1	Operators								
2	Technician or Machinery								
3	Other (by category)								
	Distribution Section								
1	Operators								
2	Electrician								
3	Other (by category)								
	Total								

Appendix AA-2-5-1 (5) Table AS 4

Payment for operation and maintenance

No	Item	Really/certainly figure for last year		
		Generation Section	**Distribution Section**	**Total**
		(000 Riels)	(000 Riels)	(000 Riels)
1	Spare part			
2	Material (equipment)			
3	Repairing and maintenance			
4	Payment for hiring			
5	Water and Electricity			
6	Bad debt			
7	Other (please certify)			
8				
	Total			

Appendix AA-2-5-1 (6) Table AS 5

Detail information on payment for administration and general management

	Item	Really/certainly figure for last year
		(000 Riels)
1	Bank service	
2	License fee	
3	Payment for the regulation service	
4	Payment for transportation	
5	Payment for Mission and welcome guest	
6	Posts service and telecommunications	
7	Payment for office material (stationery)	
8	Payment for temporary staff	
9	Commission	
10	Tax on corporation/ tax on profit	
11	Other tax	
	Tax on transportation	
	Tax on exploitation	
	Tax on patent (business Licenses)	
	Other (please certify)	
12	Other payment (please certify)	
	Total	

Appendix AA-2-5-1 (7) Table AS 6

Detail information on soft loan

	Detail information on soft loan		Item	Really/certainly figure for last year
				(000 Riels)
1	Reference:		Debt of beginning of the year	
	Creditor (lender)		Soft loan received in the year	
	Soft loan		Payback in the year	
	Date of payback		Debt at the end of the year	
	Condition of interest		Payment for interest in the year	
2	Reference:		Debt of beginning of the year	
	Creditor (lender)		Soft loan received in the year	
	Soft loan		Payback in the year	
	Date of payback		Debt at the end of the year	
	Condition of interest		Payment for interest in the year	
	Soft loan for distribution service			
3	Reference:		Debt of beginning of the year	
	Creditor (lender)		Soft loan received in the year	
	Soft loan		Payback in the year	
	Date of payback		Debt at the end of the year	
	Condition of interest		Payment for interest in year	
4	Reference:		Debt of beginning the year	
	Creditor (lender)		Soft loan received in the year	
	Soft loan		Payback in the year	
	Date of payback		Debt at the end of the year	
	Condition of interest		Payment for interest in the year	
			Total Debt at the end of the year	
			Payment for total interest in the year	

Appendix AA-2-5-1 (8) Table AS 7

Detail information on the total fixed assets

	Fixed assets item	Fixed Assets at beginning of last year	Addition fixed Assets in last year	Take off fixed Assets in last year	Balance fixed Assets at the end of last year
		(000 Riels)	(000 Riels)	(000 Riels)	(000 Riels)
		(a)	(b)	©	(d)=(a)+(b)-©
	Fixed Assets for Generation Section				
1	Land				
2	Building				
3	Generator, by each category				
4	Other material of generation				
5	Switch board current include linkage/splice cable				
6	Please certify other fixed Assets by each category				
	Total				
	Fixed Assets for Distribution Section				
1	Land				
2	Building				
3	Switch board current include linkage/splice cable				
4	Transmission line				
5	Poles (Tower)				
6	Please certify other fixed Assets by each category				
	Total				

Note: At the time registration for fixed assets on table above Licensee need to take off consumer contribution and all other assistance. Because some fixed Assets have been received assistance from the Government and have been shown the price higher than market price, so the Licensee should certify of which Fixed Assets that received from the Government.

Appendix AA-2-5-1 (9) Table AS 8
Detail information on depreciation
Really/certainly figure for last year

	Fixed Assets Item	Total cost fixed Assets	depreciation balance consolidate on total of beginning of the year	depreciation rate	Payment for depreciation in year	depreciation balance consolidate on total at the end of the year	fixed Assets only
		(000 Riels)	(000 Riels)	(000 Riels)	(000 Riels)	(000 Riels)	(000 Riels)
		(a)	(b)	©	(d)=(a)x©	(e)=(b)+(d)	(f)=(a)-©
	Fixed Assets for Generation Section						
1	Land						
2	Building						
3	Generator, by each category						
4	Switch board current include linkage/splice cable						
5	Please certify other fixed Assets by each category						
	Total						
	Fixed Assets for Distribution Section						
1	Land						
2	Building						
3	Switch board current include linkage/splice cable						
4	Transmission line						
5	Please certify other fixed Assets by each category						
	Total						

Note: In the table above Licensee shall register of the fixed assets make the same on the structure of distribution for fixed assets

Appendix AA-2-5-1 (10) Table AS 9

Calculation of reasonable profit

	Item	Sample Table	Really/certainly figure for last year
			(000 Riels)
	Generation Section		
1	Total original cost of fixed assets (minus contribution from consumer and assistant)		
2	Provision/arrangement stock for mobile capital		
3	Total cost of fixed assets		
4	Take off, depreciation consolidate	AS8	
5	**Fixed assets cost only**		
6	Soft loan for fixed assets is using	AS6	
7	**Really personal capital (5-6)**		
8	Profit rate of really personal capital		
9	Profit of really personal capital by the rate above		
10	**Reasonable profit**		
	Distribution Section		
1	Total original cost of fixed assets (minus contribution from consumer and assistant)		
2	Provision/arrangement stock for mobile capital		
3	Total cost of fixed assets		
4	Withdrawal depreciation plus reference	AS8	
5	**Fixed assets cost only**		
6	Soft loan for fixed assets is using	AS6	
7	**Really personal capital (5-6)**		
8	Profit rate of really personal capital		
9	Profit of really personal capital by the rate above		
10	**Reasonable profit**		

Note: Need to provide method calculation for mobile capital

Appendix AA-2-5-1 (11) Table AS 10

Calculation correct payment

		Item	Sample Table	Really/certainly figure for last year
				(000 Riels)
A		**Payment for Generation Section**		
	1	Payment for fuel-oil (D.O)	AS1	
	2	Payment for lubrication-oil	AS1	
	3	Payment for staff of Generation Section	AS3	
	4	Payment for operation and maintenance	AS4	
	5	Payment for Administration and General Management	AS5	
	6	Payment for depreciation	AS8	
	7	Interest	AS6	
	8	Reasonable profit	AS9	
		Total correct payment for Generation Section		
	9	Transmission Power for kWh		
	10	Generation cost per kWh		
B		**Payment for Distribution Section**		
	1	Payment for Power Purchase (buying E-ty)	AS2	
	2	Payment for staff of Distribution Section	AS3	
	3	Payment for operation and maintenance	AS4	
	4	Payment for Administration and General Management	AS5	
	5	Payment for depreciation	AS8	
	6	Interest	AS6	
	7	Reasonable profit	AS9	
		Total correct payment for Distribution Section		
		Total payment (Generation +Distribution)		
C		Minus other income behind from Electricity tariff source		
D		Total income yearly is existed (A+B+C)		
E		Total income from electricity tariff at present		
F		Profit/(loss) pre-revise electricity tariff (E-D)		
G		Effect on revision for electricity tariff		
H		Profit/(loss) after revise electricity tariff (E+G-D)		

Note: (G) and (H) need to fulfill while revision for electricity tariff have been done by Licensee

Appendix AA-2-5-1 (12) Table AS 11

Income from electricity tariff is carrying out

Really/certainly figure for last year

			List of tariff rate			Relaved data income from selling energy	Income by invoice a full year				Income is collected			
	Category of consumers	Amount of consumer at the end of the year	Electricity tariff rate	Section 2 (please certify Name and factor)	Section 3 (please certify Name and factor)	Selling electricity	Income from selling electricity	Income from selling through a price of type 2	Income from selling through a price of type 3	Total	Income from selling electricity	Income from selling through a price of type 2	Income from selling through a price of type 3	Total
			Riels/kWh			kWh	000 Riels			000 Riels	000 Riels			000 Riels
1														
2														
3														
4														
	TOTAL													

Appendix AA-2-5-1 (13) Table AS 12

Information on energy

Really/certainly figure

	Item	Unit	Jan.	Feb.	Mar.	April	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1	Selling Electricity	kWh													
	Electricity sold of low Voltage	kWh													
	Electricity sold of medium Voltage	kWh													
2	Loss on the distribution line	kWh													
		%													
3	Need power only	kWh													
	Power Generation only	kWh													
	Power purchase (Buying E-ty)	kWh													
4	Total power for selling	kWh													
5	Over/(less)	kWh													

AA-2-5-2. Request for tariff revision by smaller licensee

Appendix AA-2-5-2

Request for tariff revision by smaller Licensee

Samble table	Contents
TS 1	Data of generation
TS 2	Detail information on power purchase (buying power)
TS 3	Detail information on staff payment
TS 4	Payment for operation and maintenance
TS 5	Detail information on payment for administretion and general management
TS 6	Detail information on soft loan
TS 7	Detail information on the total fixed assets
TS 8	Detail information on depreciation
TS 9	Calculation of reasonable profit
TS 10	Calculation correct payment
TS 11	Income from electricity tariff is carrying out - Estimated figure for next year
TS 12	Income from electricity tariff new request - Estimated figure for next year
TS 13	Informantion on energy

Appendix AA-2-5-2 Table TS 1
Data of Generation

		Item	unit	Estmated figure for next year
A		**Technical dara**		
	1	Installed capacity of Generator		
		(certify model)	kVA	
		(certify model)	kVA	
	2	Power generate	kWh	
	3	Using power for generation	kWh	
		Using power for generation	%	
	4	Power Transmission (2-3)	kWh	
	5	Power coefficient	%	
	6	Amount of operation hours	h	
B		Fuel-oil (D.O) data		
		Sources (certify the Name)		
	7	Amount of fuel-oil for buy-in	Liter (L)	
	8	Amount of fuel-oil for using	Liter	
	9	Average price of fuel-oil	Reals/L	
	10	Payment for fuel-oil	(000 Leals)	
		Sources (certify the Name)		
	11	Amount of fuel-oil for buy-in	Liter	
	12	Amount of fuel-oil for using	Liter	
	13	Average price of fuel-oil	Reals/L	
	14	Payment for fuel-oil	(000 Leals)	
	15	**Using for fuel-oil rate**	**L/kWh**	
		Sources (certify the Name)		
	16	Amount of lubrication-oil for buy-i	Liter	
	17	Amount of lubrication-oil for using	Liter	
	18	Average price of lubrication-oil	Reals/L	
	19	Payment for lubrication-oil	(000 Reals)	
		Total payment for fuel-oil and lubrication-oil (10+14+19)	**(000 Reals)**	
	20	**Using for lubrication-oil rate**	**L/kWh**	

Appendix AA-2-5-2 Table TS 2

Detail information on power purchase (buying Electricity)

Estimated figure for next year

			Jan.	Feb.	Mar.	April	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
A		Sources 1 (Name)													
	1	Payment for capacity (000 Real)													
	2	Payment on power purchase (000 Real)													
	3	Total payment (000 Real)													
	4	Total amount power purchase (000 kWh)													
	5	Average payment (Reals/kWh													
B		Sources 2 (Name)													
	1	Payment for capacity (000 Real)													
	2	Payment on power purchase (000 Real)													
	3	Total payment (000 Real)													
	4	Total amount power purchase (000 kWh)													
	5	Average payment (Reals/kWh)													

Appendix AA-2-5-2 Table TS 3

Detail information on staff payment

Estimated figure for next year

No	Category of Staff	Number of Staff at the end of year	Basic Salary	Supplementa-ry money 1 (certify)	Extra money 2 (certify)	fortune and other benefit (certify)	Benefit/ bonus (certify)	Others (confirm)	Total
			(000 Reals)	(000 Reals)	(000 Reals)	(000 Reals)	(000 Reals)	(000 Reals)	(000 Reals)
	Administration Division								
1	Chief (Director)								
2	Vice-chief (Deputy Director)								
3	Accounting or Cashier								
	Technical Division								
	Generation Section								
1	Operators								
2	Mechanician or Machinery								
3	Other (by categiry)								
	Distribution Section								
1	Operators								
2	Electrician								
3	Other (by categiry)								
	Total								

Appendix AA-2-5-2 Table TS 4

Payment for operation and maintenance

No	Item	Estimated figure for next year		
		Generation Section	**Distribution Section**	**Total**
		(000 Reals)	(000 Reals)	(000 Reals)
1	Sparepart			
2	Material (equipment)			
3	Repairing and maintenance			
4	Payment for hiring			
5	Water and Electricity			
6	Bad Debt			
7	Other (please confirm)			
8				
	Total			

Appendix AA-2-5-2 Table TS 5

Detail information on payment for administretion and general management

	Item	Estimated figure for next year
		(000 Reals)
1	Bank service	
2	License fee	
3	Payment for the regulation service	
4	Payment for transportation	
5	Payment for Mission and welcome guest	
6	Posts service and telecommunications	
7	Payment for office material (stationery)	
8	Payment for temporary staff	
9	Commission	
10	Tax on corporation/ tax on profit	
11	Other tax	
	Tax on transportation	
	Tax on exploitation	
	Tax on patent (business Licenses)	
	Other (please certify)	
12	Other payment (please certify)	
	Total	

Appendix AA-2-5-2 Table TS 6

Detail information on soft loan

	Dtail information on soft loan		Item	Estimated figure for next year
				(000 Reals)
1	Reference:		Debt of beginning of the year	
	Creditor (lender)		Soft loan received in the year	
	Soft loan		Payback in the year	
	Date of payback		Debt at the end of the year	
	Condition of interest		Payment for interest in the year	
2	Reference:		Debt of beginning of the year	
	Creditor (lender)		Soft loan received in the year	
	Soft loan		Payback in the year	
	Date of payback		Debt at the end of the year	
	Condition of interest		Payment for interest in the year	
	Soft loan for distrubution service			
3	Reference:		Debt of beginning of the year	
	Creditor (lender)		Soft loan received in the year	
	Soft loan		Payback in the year	
	Date of payback		Debt at the end of the year	
	Condition of interest		Payment for interest in the year	
4	Reference:		Debt of beginning of the year	
	Creditor (lender)		Soft loan received in the year	
	Soft loan		Payback in the year	
	Date ofpayback		Debt at the end of the year	
	Condition of interest		Payment for interest in the year	
			Total Debt at the end of the year	
			Payment for total interest in the year	

Appendix AA-2-5-2 Table TS 7

Detail information on the total fixed assets

	Fixed assets item	Fixed Assets at beginning of last year	Addition fixed Assets in last year	Take off fixed Assets in last year	Balance fixed Assets at the end of last year
		(000 Reals)	(000 Reals)	(000 Reals)	(000 Reals)
		(a)	(b)	©	(d)=(a)+(b)-©
	Fixed Assets for Generation Section				
1	Land				
2	Building				
3	Generator, by each category				
4	Other material of generation				
5	Switch board current include linkage/splice cable				
6	Please certify other fixed Assets by each category				
	Total				
	Fixed Assets for Distribution Section				
1	Land				
2	Building				
3	Switch board current include linkage/splice cable				
4	Transmission line				
5	Poles (Tower)				
6	Please certify other fixed Assets by each category				
	Total				

Note: At the time redistration for fixed assets on table above Licensee need to take off consumer contribution and all other assistance. Because some fixed Assets have been received assistnce from the Government and have been shown the price higher than market price, so the Licensee should certify of which Fixed Assets that received from the Government.

Appendix AA-2-5-2 Table TS 8
Detail information on Depreciation
Estimated figure for next year

	Fixed Assets Item	Total cost fixed Assets	depreciation balance consolidate on total of beginning of the year	depreciation rate	Payment for depreciation in year	depreciation balance consolidate on total at the end of the year	fixed Assets only
		(000 Reals)	(000 Reals)	(000 Reals)	(000 Reals)	(000 Reals)	(000 Reals)
		(a)	(b)	©	(d)=(a)x©	(e)=(b)+(d)	(f)=(a)-©
	Fixed Assets for Generation Section						
1	Land						
2	Building						
3	Generator, by each category						
4	Switch board current include linkage/splice cable						
5	Please certify other fixed Assets by each category						
	Total						
	Fixed Assets for Distribution Section						
1	Land						
2	Building						
3	Switch board current include linkage/splice cable						
4	Transmission line						
5	Please certify other fixed Assets by each category						
	Total						

Note: In the table above Licensee shall register of the fixed assets make the same on the structure of distribution for fixed assets

Appendix AA-2-5-2 Table TS 9

Calculation of reasonable profit

	Item	Sample Table	Estimated figure for next year
			(000 Reals)
	Generation Section		
1	Total original cost of fixed assets (minus constribution from consumer and assistant)		
2	Provision/arrangement stock for mobile capital		
3	Total cost of fixed assets		
4	Take off depreciation plus reference	AS8	
5	**Fixed assets cost only**		
6	Soft loan for fixed assets is using	AS6	
7	**Really personal capital (5-6)**		
8	Profit rate of realy personal capital		
9	Profit of realy personal capital by the rate above		
10	**Reasonable profit**		
	Distribution Section		
1	Total original cost of fixed assets (minus constribution from consumer and assistant)		
2	Provision/arrangement stock for mobile capital		
3	Total cost of fixed assets		
4	Take off depreciation plus reference	AS8	
5	**Fixed assets cost only**		
6	Soft loan for fixed assets is using	AS6	
7	**Realy personal capital (5-6)**		
8	Profit rate of realy personal capital		
9	Profit of realy personal capital by the rate above		
10	**Reasonable profit**		

Note: Need to provide methot for calculation mobile capital

Appendix AA-2-5-2 Table TS 10

Calculation correct payment

		Item	Sample Table	Estimated figure for next year
				(000 Reals)
A		**Payment for Generation Section**		
	1	Payment for fuel-oil (D.O)	AS1	
	2	Payment for lubrication-oil	AS1	
	3	Payment for staff of Generation Section	AS3	
	4	Payment for operation and maintenance	AS4	
	5	Payment for Administration and General Management	AS5	
	6	Payment for depreciation	AS8	
	7	Interest	AS6	
	8	Reasonable profit	AS9	
		Total correct payment forGeneration Section		
	9	Transmission Power for kWh		
	10	Generation cost per kWh		
B		**Payment for Distribution Section**		
	1	Payment for Power Purchase	AS2	
	2	Payment for staff of Distribution Section	AS3	
	3	Payment for operation and maintenance	AS4	
	4	Payment for Administration and General Management	AS5	
	5	Payment for depreciation	AS8	
	6	Interest	AS6	
	7	Reasonable profit	AS9	
		Total correct payment for Distribution Section		
		Total payment (Generation +Distribution)		
C		Minus other income behind from Electricity tariff source		
D		Total income yearly is existed (A+B+C)		
E		Total income from electricity tariff at present		
F		Profit/(loss) pre-revise electricity tariff (E-D)		
G		Effect on revision for electricity tariff		
H		Profit/(loss) after revise electricity tariff (E+G-D)		

Note: (G) nad (H) need to fulfill while revision for electricity tariff have been done by Licensee

Appendix AA-2-5-2 Table TS 11
Income from electricity tariff is carrying out
Estimated figure for next year

			List of tariff rate			Relaved data income from selling energy	Income by invoice a full year				Income is collected			
	Category of consumers	Amount of consumer at the end of the year	Electricity tariff rate	Section 2 (please certify Name and factor)	Section 3 (please certify Name and factor)	Selling electricity	Income from selling electricity	Income from selling through a price of type 2	Income from selling through a price of type 3	Total	Income from selling electricity	IIncome from selling through a price of type 2	Income from selling through a price of type 2	Total
			Reals/kWh			kWh	000 Reals			000 Reals	000 Reals			000 Reals
1														
2														
3														
4														
	TOTAL													

Name of Licensee

Annex 4

Appendix AA-2-5-2 Table TS 12

Income from electricity tariff new request

Estimated figure for next year

			List of tariff rate			Relaved data income from selling energy	Income by invoice a full year				Income is collected			
	Category of consumers	Amount of consumer at the end of the year	Electricity tariff rate	Section 2 (please certify Name and factor)	Section 3 (please certify Name and factor)	Selling Electricity	Income from selling electricity	Income from selling through a price of type 2	Income from selling through a price of type 3	Total	Income from selling electricity	Income from selling through a price of type 2	Income from selling through a price of type 3	Total
			Reals/kWh			kWh	000 Reals			000 Reals	000 Reals			000 Reals
1														
2														
3														
4														
	TOTAL													

Table TS 12

Informantion on energy

	Item	Unit	Estimated figure for next year
1	Selling Electricity	kWh	
	Electricity sold of low Voltage	kWh	
	Electricity sold of medium Voltage	kWh	
2	Loss on the distribution line	kWh	
		%	
3	Need power only	kWh	
	Power Generation only	kWh	
	Power purchase (Buying power)	kWh	
4	Total power for selling	kWh	
5	Over/(less)	kWh	

Annex – 1-2

Ministry of Industry, Mines and Energy of Kingdom of Cambodia

The Project for Operation and Maintenance of Rural Electrification on Micro-hydropower in Mondul Kiri

Guidelines and Manuals for Operation and Maintenance of the Electric Unit of Mondul Kiri Province

Volume II

(Technical)

February 2011

Japan International Cooperation Agency

Electric Power Development Co.,Ltd.

The Chugoku Electric Power Co.,Inc

Section I

Guideline for Operation and Maintenance

This Guidelines and Manuals for Operation and Maintenance is divided into followings:

Volume I : Administration Items

Volume II : Technical Items
- Section I : Guideline for Operation and Maintenance
- Section II : Civil Structure
- Section III : Electromechanical Equipments
- Section IV : Transmission and distribution Facilities

Volume III : Reference Data

Contents

Volume II

Volume II : Technical

Section I Guideline for Operation and Maintenance

Chapter 1 General Provisions

1.1 Purpose

The purpose of this Standard is to stipulate basic rules and regulations for appropriate operation and maintenance of power facilities such as power station and transmission and distribution line, which will contribute to an efficient management of the equipment, a prevention of an accident and thereby securing a reliable and stable supply of electric power to consumers.

1.2 Scope of application

Operation and maintenance work for the power facilities shall be done in accordance with this Standard unless otherwise governed by government laws and regulations or higher company rules and regulations.

1.3 Definitions

(1) "Administration office" means whole management organization of power facilities with maintenance and administration works.

(2) "Load dispatch" means operation ordering to hydropower stations and diesel power station shall be done in accordance with "Plan of load dispatch control rules".

(3) "Power station" means a whole generating facilities including hydro turbine, generator, control equipment and transmission lines.

(4) "Operation" means operation of hydropower stations, diesel power station and transmission/distribution lines by the operators. The operators have to take responsibility for 24 hours monitoring and operation at sites.

(5) "Maintenance" means maintenance of hydropower stations, diesel power station and transmission/distribution lines by the maintenance staff. The maintenance staffs have to take responsibility for 24 hours monitoring and maintenance at sites.

(6) "Patrol and Inspection" means making plan and implementation of periodical inspections such as daily patrol, weekly, monthly and yearly inspections including recording, repairing and replacement work.

1.4 Tasks for head of an organization

Head shall command and supervise member personnel under his organization to achieve necessary job as a whole by promotion of maintenance job in a safety manner.

Head shall also train them not only for promotion of professional knowledge and technical skill but also for good local public relations. The tasks shall be referred to Chapter 1 :Management, in Volume I : Administration.

1.5 Tasks of member personnel under an organization Head

(1) Each personnel shall fully understand the Standard and always comply with the related rules and regulations under supervision of the Head so that reliable results may be secured in pursuing the operating and maintenance work in an efficient and orderly manner. He shall also do his best effort to secure and improve the power station functions, by trying equipment improvement, efficient job management and technical improvement.

(2) He shall do his best effort to be familiar with the structure and performance of equipment and transmission system including civil constructions and communication systems so that he could adequately know measures to be taken in various types of possible accidents.

(3) He shall always watch and know the condition of equipment. When he finds an abnormality, malfunction or accident, he shall immediately report them in accordance with a procedure stipulated in Clause 2.4 "Reporting". In an emergency where an urgent measure is required, he shall report it in an urgent manner to the operating chief and do his best effort to get a quickest restore from the accident by an appropriate remedial operation or a first aid measure.

(4) He shall always obey relevant safety rules so that a human injury or accident may be prevented. He shall also make necessary improvement on the equipment for such purposes.

1.6 Deployment of operation and maintenance work

(1) The Director shall assign responsible posts for a Deputy Director and Chief of administration division and leaders of administration staff for management of EUMP.

(2) The Director shall also assign responsible posts for a Deputy Director, Chief of technical division and leaders of operation & maintenance staff and transmission line staff in charge of various site works.

(3) Assignment of substitutes

The Director shall assign substitutes of absent operators in charge of shift operation work.

1.7 Revision of Guideline, Operation and maintenance manual

The "Guideline, Operation and maintenance manual" for administration, electrical equipment & civil structures in Mondul kiri shall be revised about instructions and actual operation and maintenance work procedures, etc. The parts of revision in the manual shall be prepared by the staff and approved with Board (director and deputy directors) of EUMP.

The revised manual except Appendixes shall finally be published and approved by the JSC.

1.8 Mutual support in operation and maintenance

In an area where power stations and substations located adjacent to each other, they are often designed to rely upon their mutual help in operation and maintenance job. In such case, an organization can request a help in accordance with rules for such mutual support arrangement, and shall help other power station on his request.

1.9 Environment conservation

Power station shall prevent environmental contamination and degradation by waste water, solid wastes, noises, etc., and shall also execute measures necessary to preserve natural environmental conditions.

1.10 Dangerous materials

Explosives and inflammables such as oil, fuel, grease, chemicals shall be stored and treated in accordance with relevant government laws and regulations.

1.11 Equipment for accident prevention

Equipment for accident prevention and protection shall be well prepared in accordance with "Rules for measures for emergency and accidents". Daily patrols, inspections, tests shall be practiced so that appropriate maintenance would be secured.

1.12 Safety management

As the safety management of a power station operation work, measures shall be taken in various important aspects, such as safety precautions in equipment, safety education and training of personnel, establishing rules for safe operation deployment and safe work procedures.

1.13 Storage of parts and materials

Storage and handling of spare parts and other materials shall be made in accordance with "Rules for storage and handling of parts and materials", refer to Chapter 3 Maintenance.

1.14 Technical training

In order to maintain and promote technical and workmanship level of personnel, freshman education, job rotation education and OJT training shall be made in accordance with "Rules for technical training and education".

1.15 Measures to be taken in an emergency

Adequate and appropriate measures shall be taken in accordance with "Rules for measures in an emergency" when an emergency occurs or likely to occur in tornado, heavy rain, flood, heavy wind, earthquake and other natural disasters, big fire, explosion, or the like.

Chapter 2 Operation

2.1 Operation work

Operation work here means jobs to operate the generating equipment or manage them in accordance with the load dispatch order, which basically includes the followings.

(1) Load dispatch ordering and related work under "Load dispatch control rules".
(2) Supervision of generating stations, civil facilities and substations, and watching weather condition.
(3) Supervising and watching conditions of relating transmission lines.
(4) Operation of the equipment and facilities.
(5) Recorded data collection as necessary.
(6) Normal communicating and reporting.
(7) Grasping condition of an accident or a failure, identifying its cause, doing an emergent remedy, communicating and reporting.
(8) Maintenance and cleaning of powerhouse and control equipment.
(9) Design of the operating procedure table or chart.
(10) Publishing and retrieving operating order sheets.
(11) Collecting, communicating and reporting data in dam operation and management

2.2 Load dispatch ordering

Load dispatch ordering to hydropower stations and diesel power station shall be done in accordance with "Plan of load dispatch control rules" such as daily, weekly, monthly and yearly operation plan.

Load dispatch operation shall be made by an order of a load dispatch control group (hereinafter referred to "Dispatch order") in accordance with "Load dispatch operation rules". When an operation is made without load dispatch order, it shall be reported immediately to the corresponding load dispatch control organization.

2.3 Measures to be taken in an emergency or an accident

In an emergency or an accident, division chief, operators and maintenance staff shall do their best effort to know as exactly and quickly as possible the actual conditions and causes, operating properly the equipment in accordance with "Load dispatch operation rules". The

situation shall be communicated with and reported to various corresponding responsible persons by procedures stipulated otherwise.

2.4 Recording

Load dispatch operations, important operations, orders, announcements, communications and reports shall be filed together with personnel names, time and date on "Work shift record file".
Operation diary shall be inspected to see the reports were properly made in stipulated items at proper timing. The records in operating diary shall be summed up and compiled for reporting to relating organizations.
The chief of technical division shall report Director or Deputy Director every morning about operation records and status of each power station and get approval with signatures.

2.5 Operating work shifts

The operation of power plants shall be executed by operators who are working in 3 shifts such as morning time, day time and night time work.
Each operator shall take over his job in detail to the subsequent shift operator in terms of the transmission condition, equipment operating condition, operating schedule, maintenance work progress, and other items deemed necessary to transfer. Important items shall be transferred by filing them in "Work shift record file"
The operator shall report a daily operation records by VHF communication and written data sheets to the chief of technical division at administration office every morning (excepting holiday), at least, total generation kWh/day, maximum output kW/day, total running ours/day, weather conditions, events, failures and/or operation conditions, etc.

2.6 Direct operation of power station

In the case of a direct operation of a power station at periodical inspection, the operator at the direct operation shall act on behalf of the division chief during inspection.
As for direct operations in the case of maintenance work, operation shall be done in accordance with "Rules for maintenance work management".

Chapter 3 Maintenance

3.1. Maintenance work

Maintenance work here means the diagnostic inspection of equipment and facilities and the repair or replacement, etc. as the results of inspection, which shall be performed for the purpose of maintaining and improving the power station equipment and civil facilities performance and also preventing accidents and failures in equipment and facilities. The maintenance work

basically includes the following items.

(1) Maintenance management

The work is necessary not only for smooth and efficient maintenance of equipment and facilities but also for efficient equipment management.

(a) Watching and evaluating equipment and facilities condition

Watch equipment and facilities condition through inspection and test, and evaluate degradation of the equipment and facilities.

(b) Work planning

Make the following plans for maintenance work in order to manage and process them in orderly manner.

- Yearly work plan
- Monthly work plan
- Work execution plan

(c) Planning items and procedures

Make the following planning in accordance with stipulated procedure.

- Budget request *(Long run maintenance planning rules)*
- Shutdown request
- Alteration on relay setting
- Equipment planning of transmission protection
- Operation of civil facilities data
- Operation of measuring system
- Items stipulated time to time by minutes of meetings.

(d) Preparation of documents and their reporting

Regular items and accident – emergency items shall be reported in accordance with "Rules for preparing documents and reporting for equipment"

(e) Management and utilization of records and files

Post inspection records and test records shall be filed orderly manner so that these records may be utilized for future operation references. Analyses of these records shall be made when necessary and the analyses shall also be recorded.

Specifications, drawings, control sequence diagrams and their setting values list shall be prepared for use in maintenance work.

(2) Maintenance work

Protective maintenance, inferring maintenance and post maintenance of power stations, and

substations shall be executed as follows.

(a) Protective maintenance

The following maintenance work shall be made for the purpose of maintaining functions and preventing failures of facilities, equipment and systems.

- Daily inspection

Daily patrol and inspection shall be made by means of maintenance personnel's knowledge, experiences and five senses for the purpose of early picking up and restoration of abnormal conditions of facilities, equipment and systems.

(Inspection Standard for facilities, equipment of hydro-electric power stations and substations)

- Periodical inspection

Internal condition shall be inspected periodically with equipment shutdown. Best function maintenance shall be made by making appropriate repair or replacement for the equipment having abnormal condition such as wear or degradation.

(Inspection Standard for facilities, equipment of hydro-electric power stations and substations)

- Special inspection

A special inspection shall be made when an abnormal condition is found on the equipment and the facilities in daily patrol or inspection. The purpose of the inspection is to prevent failure repetition in the subject equipment judged from past failure experiences, and prevent also similar failures in same type of the equipment and the facilities.

(Inspection Standard for facilities, equipment of hydro-electric power stations and substations)

(b) Inferring maintenance

For the purpose of maintaining functions and preventing a failure of equipment and facilities, function degradation or failures shall be inferred being base upon various experience data and theories. Therefore, preventive maintenance work such as inspections, replacements, improvements shall be designed with appropriate interval, timing and items so that the equipment data, performance, failures may be obtained and archived in view of inferring technology including statistical concept, which will result in an efficient and cost effective maintenance outcome.

(Inspection Standard for facilities, equipment of hydro-electric power stations and substations)

(c) Equipment and facilities improvement

Being judged from the records of equipment failures, malfunctions, inspections, repairs, inferring maintenance work and post inspection maintenance work, the equipment and the facilities shall be repaired, improved or renovated depending upon extent and nature of the equipment degradation, in order to restore or improve function of the equipment. For realizing the provisions, the equipment design shall initially be well incorporated with concepts for safety, easy maintenance, high reliability and cost effectiveness, which will result in comprehensive cost effective labor saving maintenance.

(d) Post inspection maintenance

In a failure, accident or emergency, not only quick and appropriate measures but also preventive measures shall be done for consequential damages in the course of restoration work with extra caution to human safety.

- First aid measures

Watch and confirm quickly the exact condition including causes of the failure or accident, and take fast appropriate remedial measures, followed by confirmation tests and a normal operation restoration.

- Permanent measures

Research thoroughly the causes of such failures, and repair, improve or renovate the equipment and the facilities in permanent sense for further long run operation, with concept based upon the research.

- Prevention of failure repetition

After the equipment and the facilities were recovered from a failure, case studies shall thoroughly be made for cause identification and condition analyses. Then extra effort shall be made to prevent repetition of similar failure in reference to the study, and information gained in the case shall also transferred to related departments for their preventive work references

(3) Other work items

(a) Local community relations

The Director shall be responsible for communicating and making agreement with local communities for items requested by local communities, in terms of "Causing limiting of electric power supply", such as water level limitations or generation limitations raised by local communities.

The Director shall be responsible also for other items which would time to time be raised by local communities to a necessary extent.

(b) The Director shall be responsible for negotiating with other external relating

organizations and also for preparing documents to be used for applications and reports to public organizations.

3.2. Responsibility of management of maintenance work

Work to be done by own personnel

The Deputy Director shall determine the work procedure for maintenance and responsible for the management.

Subcontract and assigned work

Subcontractor or assignee shall be responsible for the management of maintenance work itself and in addition also for securing safety on lands, buildings and installations inside the power station premises. Final responsibility shall be assessed to the Director for the safety of the equipment.

Therefore, clear distinct scope shall be required in safety management. For this purpose the Director shall make clear sharing agreements on safety management with subcontractors and assignee, in terms of management organizations and scope of management work. These agreements shall be well informed to power station maintenance personnel and let them cooperate closely with the subcontractors and assignees.

3.3 Execution of maintenance work

All maintenance work shall be executed on prior approval of the Director in accordance with "Rules for the management of maintenance work". In the case of a work affecting power station operation, the work shall be processed on prior report to the division chief in accordance with "Rules for the work sheet procedure".

(1) Shutdown procedure

In the case of shutting down the equipment (hereinafter referred to "work with shutdown" affecting supply and demand of the electricity, the shutdown procedure shall be made in accordance with "Rules for shutting down electrical equipment".

(2) Grounding for maintenance work

Grounding for maintenance work is defined as a ground provided on transmission line or equipment for the purpose of execution of "work with shutdown". The ground of this type shall be provided in accordance with "Rules for the ground for maintenance work".

(3) Procedure of altering set value of a protective relay

When an alteration is required in set value of a protective relay on processing the maintenance work, the alteration shall be made in accordance with "Rules for the protective relay operation".

(4) Work sheet

On processing a work, necessary work sheets shall be published in accordance with "Rules for work sheet use", and the work shall be processed in accordance with the work sheets for the purpose of clarifying the responsibility on work and preventing an accident or failure.

(5) Confirmation of safety precautions

The Director shall pay extra attention to good safety management through advice and reports by getting the safety manager confirm that the safety is secured at every work step, and also getting the chief safety personnel confirm the progress of work.

(6) Organizing work deployment

On starting the maintenance work, the Director shall organize a work deployment by appointing persons out of power station personnel as required by "Rules for the management of maintenance work"

3.4 Spare parts management

EUMP provides spare parts list to manage the parts for take-out or in from the stockroom. The spare parts shall be controlled existing assets with quantity of parts by the authorized person of EUMP. The spare parts list shall be recorded when the parts has used or procured any time.

The authorized person shall be appointed by Director of EUMP.

Example of Spare Parts List (for O'Moleng PS)

Name of parts (Parts No.)	**Date of Out/In**	**Consuming Quantity**	**Existing Quantity**	**Remarks**
Volt meter (OM-001)	2008/10/16		1	Original spare
User' Name				
Mr. Khim	2009/3/22	1	0	Meter broken
Mr. Vichet	2009/5/1		1	New buy

Chapter 4 Construction

4.1 Construction work management

Construction management is performed by the contractor himself to comply with standards and specifications to complete the construction works economically and safely within the contracted period.

For assuring the quality and function and for controlling the progress of work, the contractor makes a construction plan, check in timely whether the work is being carried out as schedule, makes correction if the work delayed.

The construction management has 1) Progress control, 2) Quality control and 3) Payment control as follows.

4.2 Progress control

Management of progress control is the construction process for assuring the execution of work performance and safety control within the construction period.

In particular, the countries where dry and rainy seasons can be clearly recognized, the construction works are concentrated in dry season and this will impose extra restriction on time, and thus progress control must be made with extra care. Between civil and electrical works must be close coordination and adjustment for installation of equipment.

Various time schedules should be graphically prepared for progress control and then use as standards for implementation, review and handling.

4.3 Quality control

Quality control is used to maintain the standards of quality set forth in the design and specifications.

For performing quality control, standardization must first of all be made.

The standardization is established 1) Standards for materials, 2) Quality standards, 3) Work standards and 4) Test and inspection standards.

4.4 Payment control

Payment control is necessary to ensure that the civil work have been built in conformity with the contract requirements set forth and intended by the owner.

The installation of electrical equipment is also managed the work progress then each payment will be made by the "Certificate of Performance" against term of payment in the contract.

Photographic records are made as supplementary data for later confirmation of the progress of the works including conditions before and after the works.

4.5 Installation works

The installation works for turbine, generator and auxiliary equipment are required the following procedures at appropriated timing and places for safety work.

1) Heavy machine

Heavy machinery (loading, moving and lifting) of the required number for transporting materials, parts and equipment on the site should be secured for the required period.

2) Manpower

The numbers of direct laborers and technicians required varies depending on the types, capacities, sizes and installation method of turbine and generator, equipment etc.

3) Temporary facilities

- Temporary power source and distribution panels
- Accommodation facility
- Warehouse
- Site construction office

4) General tools and consumable materials

- As required

5) Classified assembly and installation works

- Inspection of dimensions and level of concrete foundation
- Transport of materials, parts and equipment
- Unpacking
- Preparing scaffolds
- Assembly and installation
- Welding and gas cutting
- Piping work and flushing
- Hydraulic pressure test
- Non-destructive test
- Centering, leveling and Shaft alignment
- Wiring
- Painting

6) Site tests and trail operation

- Preparation of instrument, materials and tools

  Prior to commencement of the tests, test load should be provided as a dummy load, if an actual load is not available at site.
- Preparation of test procedures
- Preliminary test items (Dry test)

  a) Appearance test for all components

Appendix

TG-1 Agent List
TG-2 Equipment List

TG-1 Agent List

Appendix TG-1
Mondul Kiri Electrification project, cambodia

Agent List

No.	Name of Agent	Adress	Telephone	e-mail	Staff	Supplier	Adress	Telephone	e-mail	Staff	Equipment No. in table TG-2
1)	Mitsubishi Morters (www.mitsubishi-motors.com)					Futurebud International Co., Ltd.	KS Bld.1-12-6 , Nihonbashi, Kaigarachou, Chuo-ku, TOKYO, 103-0014, JAPAN	+81-3-5847-1036 Fax. +81-3-5847-1038		Mr.Hideki Watanabe	
2)	Mitsubishi Fuso Truck & Bus Corporation					Futurebud International Co., Ltd.	KS Bld.1-12-6 , Nihonbashi, Kaigarachou, Chuo-ku, TOKYO, 103-0014, JAPAN	+81-3-5847-1036 Fax. +81-3-5847-1038		Mr.Hideki Watanabe	
3)	Konoike Construction	2-7-5, Minamisuna, Koto-ku, Tokyo, Japan	+81-3-5617-7861 Fax. +81-3-5617-7864	yamashita_tk@konoike.co.jp	Mr. Takashi Yamashita	Konoike Phom Penh Office	No.63 St.240 Sangkat Chaktomuk, Khan Daun, P.P	+855-23-217802, Fax. +855-12-8055457			1 & 3
						Pisnoka	No. 51 St. 322 beng Keng kang 1, Chamcar Mon, P.P	+855-23-720958 Fax. ;855-23-211176	khou soklav@pisanoka.com	Mr. Khou Soklay	
4)	Takaoka Engineering	2-5-2 Nishikannda, Chuo-ku, Tokyo, Japan	+81-3-3556-7511 Fax.+81-3-3556-7510	Yoshinori_terashima@notes.takaoka.co.jp	Mr. Yoshinori Terashima	Tanaka Suiryoku	1-9-10 Sasazuka, Shibuya-ku, Tokyou, Japan	+81-3-3466-0451 Fax. +81-3-3466-0701	yu-motohashi@mx7.ttcn.ne.jp	Mr. Yukio Motohashi	2 & 4
						Yawata Electric	2805 Honjyou, Yawatanishi, Kitakyushu-city, Japan	+81-93-691-2331 Fax. +81-93-603-2556	shida@yawata.co.jp	Mr. Natsumi Shida	2 & 4
						Daihatsu	2-2-10 Nihonbashi-Honchou, Chuo-ku, Tokyo, Japan	+81-3-3279-0868 Fax. +81-3-3245-0395	naohiro.matsumura@dhtd.co.jp	Mr. Naohiko Matsumura	5
						Taiyo Electric	1－16－8Uchikanda, Chuo-ku, Tokyo Japan	+81-3-3293-0918 Fax. +81-3-3292-7003	o-sasaki@taiyo-electric.co.jp	Mr.Osamu Sasaki	5
								+81-3-3293-8453 Fax. +81-3-3293-1990		Mr. Shinya Maegasako	5
5)	Toenec Corporation	3-1-32 Chitose, Minato-ku, nagoya-city, Japan	+81-52-659-1122 Fax.+81-52-659-1170	masafumi-noda@eng.toenec.co.jp	Mr. Masafumi Noda	EM Construction	No. 85 St.344 Sangkat Boeung Salang, Khan Tuol Kok, P.P	Tel:+855-23-885-341 Fax:+855-23-885-341	E.M@online.com.kh	Mr.EAV MENG	6

TG-2 Equipment List

Appendix TG-2

Equipment List

Mondul Kiri Electrification project, cambodia

a	b	c	d	e	f	g	h	i	j	k
No.	Name of Equipment	Q'ty	Unit	Supplier	Type/No.	Origin	Delivery Pl.	Japanese Agent	Agent Tel.	Agent e-mail
1)	Load breaker switch	2	set	Toenec	Outdoor use 24kV-LBS	Viet nam	DIME			
2)	Arrester	48	set	Toenec	Outdoor Vari STAR UHS	Viet nam	DIME			
3)	Cut out switch	33	set	Toenec	F127100A08N Fuse link type	Viet nam	DIME			
4)	22kV Conductors	1	lot	Toenec	AAC, AAAC, CU, GSW	Viet nam	DIME			
5)	Pin insulator	1	lot	Toenec	Class 56.2	Viet nam	DIME			
6)	Tension insulator	1	lot	Toenec	24kV, 70kN	Viet nam	DIME			
7)	Suspension insulator	1	lot	Toenec	24kV, 70kN	Viet nam	DIME			
8)	Concrete pole	1	lot	Toenec	Type-S, A, T	Viet nam	DIME			
9)	End terminal materials	1	lot	Toenec	Quick Term II	Viet nam	DIME			
10)	Cramp	1	lot	Toenec	AL16-150	Viet nam	DIME			
11)	Gye wire	1	lot	Toenec	Guy wire set	Viet nam	DIME			
12)	Step up transformer	3	set	Toenec	01T/N-005	Viet nam	O'R, O'M, DG			
13)	Stepdown transformer	1	lot	Toenec	22Kv/400v	Viet nam	DIME			
6.2	Pole mounted transformer	1	lot	Toenec	01T/001-004	Viet nam	DIME			
6.3	Outdoor substation	1	lot	Toenec	kiosk outdoor	Viet nam	DIME			
1)	Outer Cubicle	2	set	Toenec	Type SM-6	Viet nam	DIME			
2)	LBS cubicle	6	set	Toenec	IM500	Viet nam	DIME			
3)	Transformer cubicle	4	set	Toenec	QM500	Viet nam	DIME			
6.4	22kV/400V underground cable	1	lot	Toenec	XLPE	Viet nam	DIME			
6.5	400V conductors	1	lot	Toenec	-	Viet nam	DIME			
1)	Distribution lines	1	lot	Toenec	XLPE、ABC, IV, CU/PVC	Viet nam	DIME			
2)	Distribution panels	37	set	Toenec	TypeA-1, A-2, A-3, B-1, B-2, B-3	Viet nam	DIME			
3)	Cross arm materials	1	lot	Toenec	Crossarm V75, U120, U140	Viet nam	DIME			
4)	Concrete poles	1	lot	Toenec	Type-S, A, T	Viet nam	DIME			
6.6	Watt hour meters (WhM)	1	lot	Toenec	1P: CV131EMIC 3P: MV3E4 EMIC	Viet nam	DIME			
6.7	WhM box	1	lot	Toenec	Meter cabinet	Viet nam	DIME			
6.8	VHF system	1	lot	Toenec	VHF radio	Cambodia	DIME			
6.9	Tools	1	lot	Toenec	-	Japan	DIME			
6.10	Spare parts	1	lot	Toenec	-	Viet nam	DIME			

Appendix TG-2

Equipment List

Mondul Kiri Electrification project, cambodia

a	b	c	d	e	f	g	h	i	j	k
No.	Name of Equipment	Q'ty	Unit	Supplier	Type/No.	Origin	Delivery Pl.	Japanese Agent	Agent Tel.	Agent e-mail
4.1	Turbine	1	set	Tanaka Suiryoku	20110-1 Cross flow turbine	Japan	O'M			
4.2	Inlet valve	1	set	Tanaka Suiryoku	073-64 Batterfly	Japan	O'M			
4.3	Dummy load unit	1	set	Tanaka Suiryoku	20110-1 Dummy load	Japan	O'M			
4.4	Speed incleaser	1	set	Tanaka Suiryoku	2008-0102	Japan	O'M			
4.5	G.V servo. Motor	1	set	Tanaka Suiryoku	K9521501	Japan	O'M			
4.6	Generator	1	set	Tanaka Suiryoku	Q81043101	Japan	O'M			
4.7	Gen. Control panel	1	set	Tanaka Suiryoku	20110-1	Japan	O'M			
4.8	Dummy load panel	1	set	Tanaka Suiryoku	20110-1	Japan	O'M			
4.9	Spare parts	1	lot	Tanaka Suiryoku	01T/N-005	Japan	O'M			
5	Diesel p.s	1	set	Daihatsu	-		DIME	Daihatsu Diezel	+81-3-3279-0868	naohiro.matsumura@dhtd.co.jp
5.1	Diesel engine	1	set	Daihatsu	DL-16-021⑦	Japan	DG			
5.2	Turbo charger	1	set	Daihatsu	DL-16-021⑦	Japan	DG			
5.3	Fuel supply system	1	set	Daihatsu	DL-16-021⑦	Japan	DG			
5.4	Lub. Oil supply ststem	1	set	Daihatsu	DL-16-021⑦	Japan	DG			
5.5	Air supply system	1	set	Daihatsu	DL-16-021⑦	Japan	DG			
5.6	Exhust system	1	set	Daihatsu	DL-16-021⑦	Japan	DG			
5.7	Governor unit	1	set	Daihatsu	Wood ward Gov.	Japan	DG			
5.8	Cooling system	1	set	Daihatsu	DL-16-021⑦	Japan	DG			
5.9	Fuel storage tank	1	set	Konoike	Out door	Cambodia	DG			
5.10	Generator	1	set	Daihatsu	07-3266-01	Japan	DG			
5.11	Gen. Control panel	1	set	Daihatsu	Metal crad	Japan	DG			
5.12	Auxiliary control panel	1	set	Daihatsu	Metal crad	Japan	DG			
5.13	Spare parts	1	lot	Daihatsu	01T/N-006	Japan	DG			
6	Transmission Line (T/L & D/L)				-		DIME	Toenec Corporation	+81-52-659-1122	masafumi-noda@eng.toenec.co.jp
6.1	22kV T/L	1	lot	Toenec	Air insulated	Viet nam	DIME			

Appendix TG-2

Equipment List

Mondul Kiri Electrification project, cambodia

a	b	c	d	e	f	g	h	i	j	k
No.	Name of Equipment	Q'ty	Unit	Supplier	Type/No.	Origin	Delivery Pl.	Japanese Agent	Agent Tel.	Agent e-mail
1	O'Romis p.s Civil				-		DIME			
1.1	Intake gate	1	set	Konoike		Viet nam	O'R	Konoike Construction	+81-3-5617-7861	yamashita_tk@konoike.co.jp
1.2	Sand flushing gate	1	set	Konoike		Viet nam	O'R			
1.3	Sedimentation gate	1	set	Konoike		Viet nam	O'R			
1.4	Sedim. Gate at Head T.	1	set	Konoike		Viet nam	O'R			
1.5	Intake screen	1	set	Konoike		Viet nam	O'R			
1.6	Sedim. Screen	1	set	Konoike		Viet nam	O'R			
1.7	penstock (600A)	1	lot	Konoike		Viet nam	O'R			
1.8	penstock (800A)	1	lot	Konoike		Viet nam	O'R			
	O'Romis p.s Electric									
2.1	Turbine	1	set	Tanaka Suiryoku	20110-2 Cross flow turbine	Japan	O'R	Tanaka Suiryoku	+81-3-3466-0451	yu-motohashi@mx7.ttcn.ne.jp
2.2	Inlet valve	1	set	Tanaka Suiryoku	073-64	Japan	O'R			
2.3	Dummy load unit	1	set	Tanaka Suiryoku	20110-2 Dumy load	Japan	O'R			
2.4	Speed incleaser	1	set	Tanaka Suiryoku	2008-0101	Japan	O'R			
2.5	G.V servo. Motor	1	set	Tanaka Suiryoku	K9521401	Japan	O'R			
2.6	Generator	1	set	Tanaka Suiryoku	Q81043102	Japan	O'R			
2.7	Gen. Control panel	1	set	Tanaka Suiryoku	20110-2	Japan	O'R			
2.8	Dummy load panel	1	set	Tanaka Suiryoku	20110-2	Japan	O'R			
2.9	Spare parts	1	lot	Tanaka Suiryoku		Japan	O'R			
3	O'Moleng p.s Civil				-		DIME	Konoike Construction	+81-3-5617-7861	yamashita_tk@konoike.co.jp
3.1	Intake gate	1	set	Konoike		Viet nam	O'M			
3.2	Sand flushing gate	1	set	Konoike		Viet nam	O'M			
3.3	Sedimentation gate	1	set	Konoike		Viet nam	O'M			
3.4	Intake screen	1	set	Konoike		Viet nam	O'M			
3.5	Sedim. Screen	1	set	Konoike		Viet nam	O'M			
3.6	penstock (600A)	1	lot	Konoike		Viet nam	O'M			
3.7	penstock (1,000A)	1	lot	Konoike		Viet nam	O'M			
4	O'Moleng p.s Electric							Tanaka Suiryoku	+81-3-3466-0451	yu-motohashi@mx7.ttcn.ne.jp

Section II:

Civil Structure

Contents

Volume II

Appendix:

Section II: Civil Structure

Chapter 1: The general

1.1 Aim

This manual stipulates the operation and maintenance work for civil structure of O'Moleng and O'Romis hydropower station and the objective is to ensure the function of civil structure, to promote the adequate and safe operation and to prevent the accident.

1.2 Application

This manual is applied to the operation and maintenance works for civil structure of O'Moleng and O'Romis hydropower station.

1.3 Definition of the word

1) "Civil structure" means reservoir, intake weir, intake, waterway, sedimentation basin, head tank, spillway, penstock, powerhouse, outlet, access path and the facilities of those.

2) "Patrol" means the work to check the existence or nonexistence of the abnormity by seeing the appearance, function and gauge with five senses of the patrolman.
"Patrol" includes garbage removing, sand removal, minor maintenance or adjustment of gate and facilities etc.

3) "Maintenance" means the work to keep the good condition of the facilities and equipment.
"Maintenance" includes the cutting bushes, removing mad from the ditch, cleaning around the civil structure, adjustment or replacement of the consumables for the equipment and filling oil to the moving part, etc.

4) "Operation" means the work to operate the electric power system to supply stable electricity to the customers.
"Operation" of the civil facilities includes the measuring the water level, open or close the gate and recording the data, etc.

5) "Head of hydropower station" is responsible for the safety and steady implementation of operation and maintenance work.
"Head of O'Moleng hydropower station" is the person who is in charge of "Section head of O'Moleng hydropower station".
"Head of O'Romis hydropower station" is the person who is in charge of "Section head of O'Romis hydropower station".

Chapter 2: Maintenance

2.1 Maintenance work

The contents of maintenance work are as follows;

(1) Document control (Result of the patrol and maintenance record, etc)

(2) Implementation of patrol and keeping the civil facilities good condition

(3) Research and study for repair and improvement

(4) Others necessary for maintenance of civil structure

2.2 Checking items of patrol

Patrol should be done periodically, that is daily, weekly and monthly.

Checking items of patrol are shown in appendix 1 (for O'Molemg hydropower station) and appendix 2 (for O'Romis hydropower station).

Principally daily patrol, weekly patrol and monthly patrol should be done every day, on Monday and first commercial day of the month respectively.

The results of the patrol should be recorded with the format of appendix 3-8 and be approved by the head of hydropower station.

2.3 Repair and improvement

If some troubles are found in the patrol, repair or improvement should be planned and done.

Priority of repair and improvement should be set according to the result of patrol, checking, and measurement etc. Matters of trouble in function for dairy operation or necessary for safety should have the first priority.

Records of repair and improvement should be kept and facilities book or drawings should be updated if the specification or appearance of civil structure is modified.

2.4 Contents of patrol and maintenance

1) Access path

Access path should be well maintained so that EUMP staff can reach every hydropower facility safely and smoothly.

For example,

Sand or mad accumulated in the side ditch should be cleared away;

Damaged surface of the path should be refilled with crushed stone;

Weeding should be done periodically; etc.

2) Intake weir

Intake weir should be well maintained so that water for power generation can be taken through intake surely all the time.

For example,

Intake weir body should be repaired when clacks or leaking water is detected;
Garbage and drifting tree on the screen should be cleared away in order to keep off the head loss;
Sedimentation in front of the screen should be cleared away to prevent the sedimentation coming into waterway when the surface level of sedimentation reaches near to the intake level;
Intake gate and sand flushing gate should be well maintained in order to ensure the function; etc.

3) Sedimentation basin

Sedimentation basin should be well maintained so that the function is always kept.
For example,
Sedimentation basin body should be repaired when clacks or leaking water is detected;
Sedimentation accumulated on the bottom of basin should be cleared away;
Garbage and drifting tree on the screen should be cleared away in order to keep off the head loss; etc.

4) Water way (O'Romis hydropower station only)

Water way should be well maintained so that it can convey the water from sedimentation basin to head tank surely all the time.
For example,
Water way basin body should be repaired when clacks or leaking water is detected;

5) Head tank (O'Romis hydropower station only)

Head tank should be well maintained so that the function is always kept.
For example,
Head tank body should be repaired when clacks or leaking water is detected;
Sedimentation accumulated on the bottom of tank should be cleared away;
Garbage and drifting tree on the screen should be cleared away in order to keep off the head loss; etc.

6) Penstock

Penstock should be well maintained so that it can convey the water from sedimentation basin or head tank to powerhouse surely all the time.
For example,
Re-painting on the penstock should be done when rusting is detected on its surface;
Checking of the status of the penstock should be done, that is checking the abnormal vibration or looseness of the volt; etc.

7) Power house

Power house should be well maintained so that the operator can carry out their job surely and safely.
For example,

Retaining wall should be repaired when clacks, deformation or depression is detected; etc.

8) Outlet

Outlet should be well maintained so that the function is always kept.

For example,

Sand, mad or another obstacles in front of the outlet should be cleared away so that smooth discharge should be kept; etc.

Chapter 3: Operation

3.1 Operation work

The contents of operation work are as follows;

(1) Gate operation

(2) Record and report of operation

(3) Measurement of discharge or water level

(4) Emergency measures when accident happens

3.2 Operation of the gate

Principally, gate should be operated by the command of head of the hydropower station except for the cases bellows;

A) Emergent case when accident happens etc

B) Control of discharge for generation

3.3 Taking or stopping water discharge

1) The maximum discharge is as bellows;

O'Moleng hydropower station: 1.45 cms

O'Romis hydropower station: 1.05 cms

2) Abortion of taking water should be done at the cases bellows;

A) When the taking water becomes difficult for example machine trouble or low river flow.

B) When the risk that may give some damages to the civil structure is seen for example flood.

3.4 Measurement of water flow

1) Measurement of water level

Measurement of water level should be done at intake weir, sedimentation basin, waterway and head tank.

Principally, measurement should be done three times a day.

2) Actual measurement of discharge

Actual measurement should be done at the waterway of O'Romis hydropower station. Actual measurement should be done every 3 months.

-End-

Appendix:

Volume III Reference Data

Document for Civil Structure

AP-S-II-01 Check items of civil facilities (O'Moleng hydropower station)

AP-S-II-01

Check items of civil facilities

(O'Moleng hydropower station)

Name of facility	Item	Maintenance point	Daily	Weekly	Monthly	Remarks
Access path	Side ditch	Clean the side ditch		○		If necessary
	Weeding	Weeding around the path			○	If necessary
	Road surface	Check the condition of road surface		○		
	Slope protection	Check the condition of slope or guard fence		○		
	Appearance	Check the appearance, others	○			
Intake Weir	Intake screen	Remove the trash on the screen	○			If necessary
	Sedimentation	Flush out the accumulated sand in front of the intake			○	Rainy season, if necessary
	Gate	Check the function of the gate If necessary, put the oil on the gear			○	
	Locking	Check the locking of gate handle and gurad fence	○			
	Structure	Water leakage, deformation and crack, etc		○		
	Appearance	Check the appearance, others	○			
Sedimentation Basin	Screen	Remove the trash on the screen	○			
	Sedimentation	Flush out the accumulated sand in front of the intake			○	If necessary
	Structure	Water leakage, deformation and crack, etc		○		
	Appearance	Check the appearance, others	○			
Penstock	Vibration	Check the abnormal vibration or noise from the structure			○	
	Bolt	Clench the bolt			○	If necessary
	Appearance	Check the appearance, others	○			
Powerhouse	Retaining wall	Deformation or depression of the structure		○		
	Appearance	Check the appearance, others	○			
Outlet	Sedimentaion	Remove the sand or mad in front of the outlet			○	If neccessary
	Appearance	Check the appearance of outlet	○			

AP-S-II-02 Check items of civil facilities (O'Romis hydropower station)

AP-S-II-02

Check items of civil facilities

(O'Romis hydropower station)

Name of facility	Item	Maintenance point	Daily	Weekly	Monthly	Remarks
Access path	Side ditch	Clean the side ditch		○		If necessary
	Weeding	Weeding around the path			○	If necessary
	Road surface	Check the condition of road surface		○		
	Slope protection	Check the condition of slope or guard fence		○		
	Appearance	Check the appearance, others	○			
Intake Weir	Intake screen	Remove the trash on the screen	○			If necessary
	Sedimentation	Flush out the accumulated sand in front of the intake			○	Rainy season, if necessary
	Gate	Check the function of the gate If necessary, put the oil on the gear			○	
	Locking	Check the locking of gate handle and gurad fence	○			
	Structure	Water leakage, deformation and crack, etc		○		
	Appearance	Check the appearance, others	○			
Sedimentation Basin	Screen	Remove the trash on the screen	○			
	Sedimentation	Flush out the accumulated sand in front of the intake			○	If necessary
	Structure	Water leakage, deformation and crack, etc		○		
	Appearance	Check the appearance, others	○			
Waterway	Structure	Water leakage, deformation and crack, etc		○		
	Appearance	Check the appearance, others	○			
Head tank	Screen	Remove the trash on the screen	○			
	Sedimentation	Flush out the accumulated sand in front of the intake			○	If necessary
	Structure	Water leakage, deformation and crack, etc		○		
	Appearance	Check the appearance, others	○			
Spillway	Structure	Water leakage, deformation and crack, etc		○		
	Appearance	Water leakage, deformation and crack, etc	○			
Penstock	Vibration	Check the abnormal vibration or noise from the structure			○	
	Bolt	Clench the bolt			○	If necessary
	Appearance	Check the appearance, others	○			
Powerhouse	Retaining wall	Deformation or depression of the structure		○		
	Appearance	Check the appearance, others	○			
Outlet	Sedimentaion	Remove the sand or mad in front of the outlet			○	If neccessary
	Appearance	Check the appearance, others	○			

AP-S-II-03 Check sheet of civil facilities for daily patrol (O'Moleng hydropower station)

AP-S-II-03

Check sheet of civil facilities for daily patrol

(O'Moleng hydropower station)

Day _____ Month _____ Year _____ Name _____

Name of facility	Item	Condition		Status if "NG"	Treatment
Access path	Appearance	☐ OK	☐ NG		
Intake Weir	Intake screen	☐ OK	☐ NG		
	Locking	☐ OK	☐ NG		
	Appearance	☐ OK	☐ NG		
Sedimentation Basin	Screen	☐ OK	☐ NG		
	Appearance	☐ OK	☐ NG		
Penstock	Appearance	☐ OK	☐ NG		
Powerhouse	Appearance	☐ OK	☐ NG		
Outlet	Appearance	☐ OK	☐ NG		

AP-S-II-04 Check sheet of civil facilities for weekly patrol (O'Moleng hydropower station)

AP-S-II-04

Check sheet of civil facilities for weekly patrol

(O'Moleng hydropower station)

Day _____ Month _____ Year _____ Name _____

Name of facility	Item	Condition		Status if "NG"	Treatment
Access path	Side dirch	☐ OK	☐ NG		
	Road surface	☐ OK	☐ NG		
	Slope protection	☐ OK	☐ NG		
Intake weir	Structure	☐ OK	☐ NG		
Sedimentation basin	Structure	☐ OK	☐ NG		
Power house	Structure	☐ OK	☐ NG		

AP-S-II-05 Check sheet of civil facilities for monthly patrol (O'Moleng hydropower station)

AP-S-II-05

Check sheet of civil facilities for monthly patrol

(O'Moleng hydropower station)

Day _____ Month _____ Year _____ Name _____

Name of facility	Item	Condition		Status if "NG"	Treatment
Access path	Weeding	☐ OK	☐ NG		
Intake weir	Sedimentation	☐ OK	☐ NG		
	Gate	☐ OK	☐ NG		
Sedimentation basin	Sedimentation	☐ OK	☐ NG		
Penstock	Vibration	☐ OK	☐ NG		
	Bolt	☐ OK	☐ NG		
Outlet	Structure	☐ OK	☐ NG		

AP-S-II-06 Check sheet of civil facilities for daily patrol (O'Romis hydropower station)

AP-S-II-06

Check sheet of civil facilities for daily patrol

(O'Romis hydropower station)

Day _____ Month _____ Year _____ Name _____

Name of facility	Item	Condition		Status if "NG"	Remark
Access path	Appearance	☐ OK	☐ NG		
Intake Weir	Intake screen	☐ OK	☐ NG		
	Locking	☐ OK	☐ NG		
	Appearance	☐ OK	☐ NG		
Sedimentation Basin	Screen	☐ OK	☐ NG		
	Appearance	☐ OK	☐ NG		
Waterway	Appearance	☐ OK	☐ NG		
Headtank	Screen	☐ OK	☐ NG		
	Appearance	☐ OK	☐ NG		
Spillway	Appearance	☐ OK	☐ NG		
Penstock	Appearance	☐ OK	☐ NG		
Powerhouse	Appearance	☐ OK	☐ NG		
Outlet	Appearance	☐ OK	☐ NG		

AP-S-II-07 Check sheet of civil facilities for weekly patrol (O'Romis hydropower station)

AP-S-II-07

Check sheet of civil facilities for weekly patrol

(O'Romis hydropower station)

Day _____ Month _____ Year _____ Name _____

Name of facility	Item	Condition		Status if "NG"	Remark
Access path	Side ditch	☐ OK	☐ NG		
	Road surface	☐ OK	☐ NG		
	Slope protection	☐ OK	☐ NG		
Intake Weir	Structure	☐ OK	☐ NG		
Sedimentation Basin	Structure	☐ OK	☐ NG		
Waterway	Structure	☐ OK	☐ NG		
Headtank	Structure	☐ OK	☐ NG		
Spillway	Structure	☐ OK	☐ NG		
Powerhouse	Retaining wall	☐ OK	☐ NG		
Outlet	Appearance	☐ OK	☐ NG		

AP-S-II-08 Check sheet of civil facilities for monthly patrol (O'Romis hydropower station)

AP-S-II-08

Check sheet of civil facilities for monthly patrol

(O'Romis hydropower station)

Day _____ Month _____ Year _____ Name _____

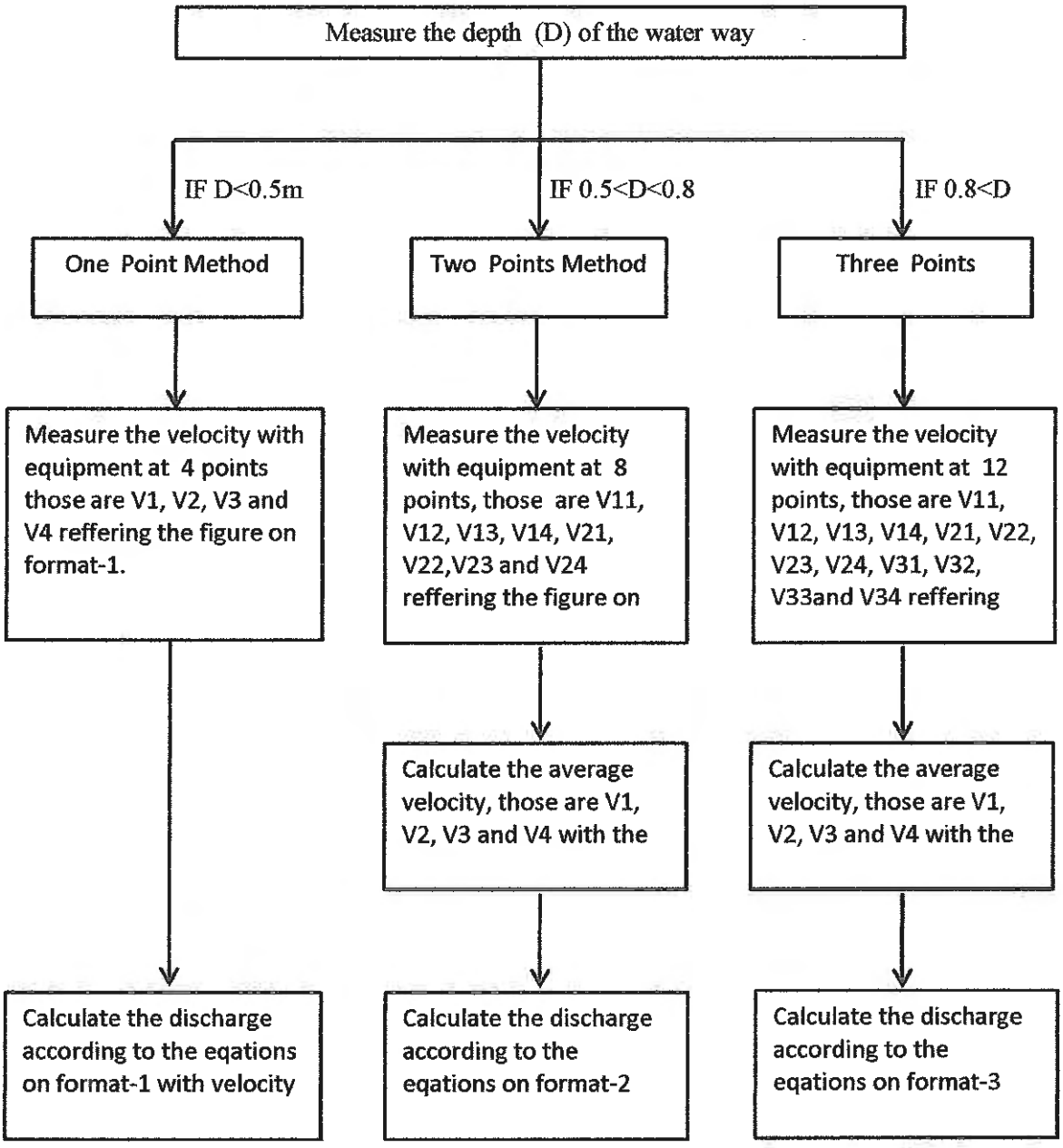
Name of facility	Item	Condition		Status if "NG"	Remark
Access path	Weeding	☐ OK	☐ NG		
Intake Weir	Sedimentation	☐ OK	☐ NG		
	Gate	☐ OK	☐ NG		
Sedimentation Basin	Sedimentation	☐ OK	☐ NG		
Headtank	Sedimentation	☐ OK	☐ NG		
Spillway	Appearance	☐ OK	☐ NG		
Penstock	Vibration	☐ OK	☐ NG		
	Bolt	☐ OK	☐ NG		
Outlet	Sedimentaion	☐ OK	☐ NG		

AP-S-II-09 How to measure the discharge of O'Romis waterway

AP-S-II-09

How to measure the discharge of O'Romis waterway

Measurament of discharge of O'Romis waterway should be done following the flow below;

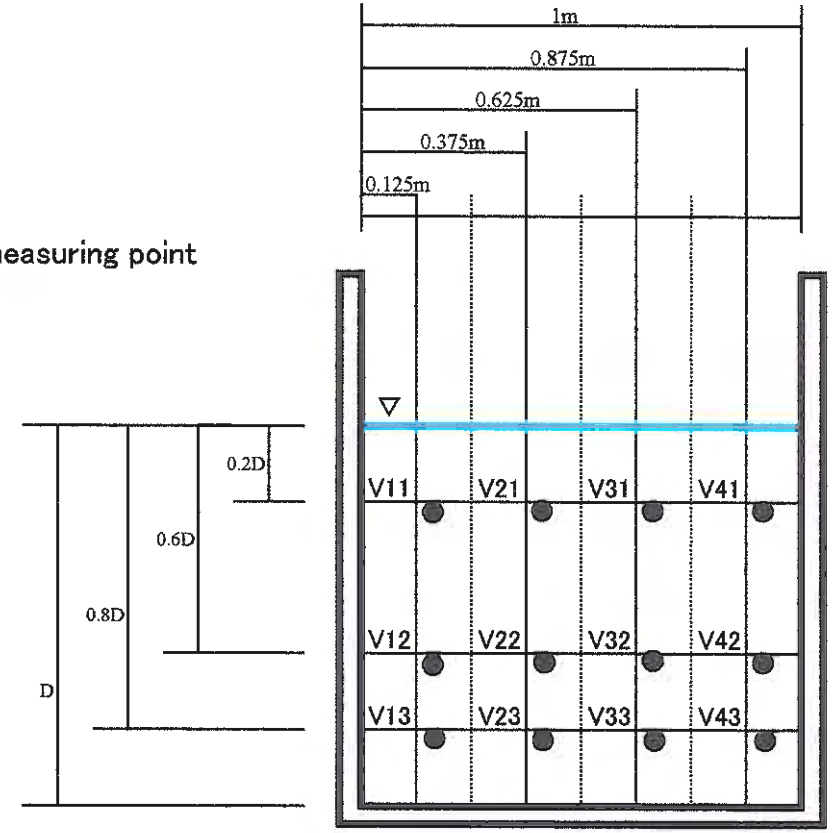


O'Romis Waterway water flow mesurament record sheet (Three Points Method)

Date

0.8m < D

● : measuring point



D= m

V11=	m/s	V31=	m/s
V12=	m/s	V32=	m/s
V13=	m/s	V33=	m/s
V21=	m/s	V41=	m/s
V22=	m/s	V42=	m/s
V23=	m/s	V43=	m/s

V1= (V11+2V12+V13)/4= m/s

V2= (V21+2V22+V23)/4= m/s

V3= (V31+2V32+V33)/4= m/s

V4= (V41+2V42+V43)/4= m/s

Q= 0.25×D×(V1+V2+V3+V4)

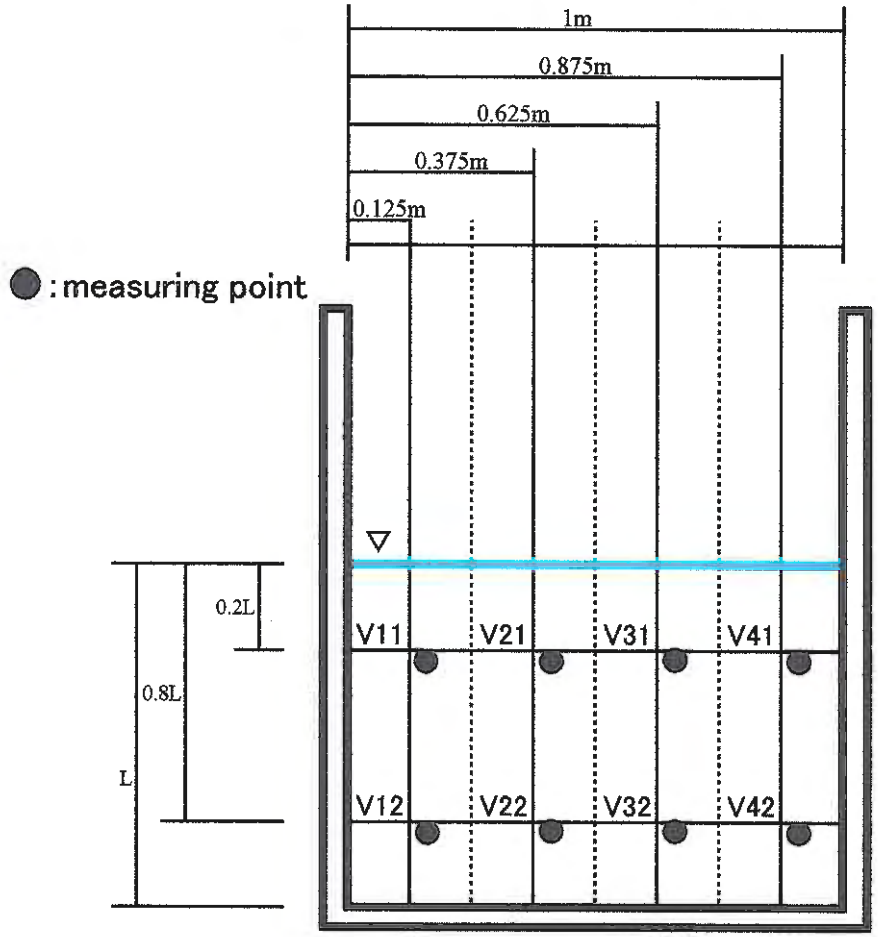
= [ ] m3/s

Format - 2

O'Romis Waterway water flow mesurament record sheet (Two Points Method)

Date

0.5m< D < 0.8m



D= m

V11= m/s V31= m/s

V12= m/s V32= m/s

V21= m/s V41= m/s

V22= m/s V42= m/s

V1= (V11+V12)/2= m/s

V2= (V21+V22)/2= m/s

V3= (V31+V32)/2= m/s

V4= (V41+V42)/2= m/s

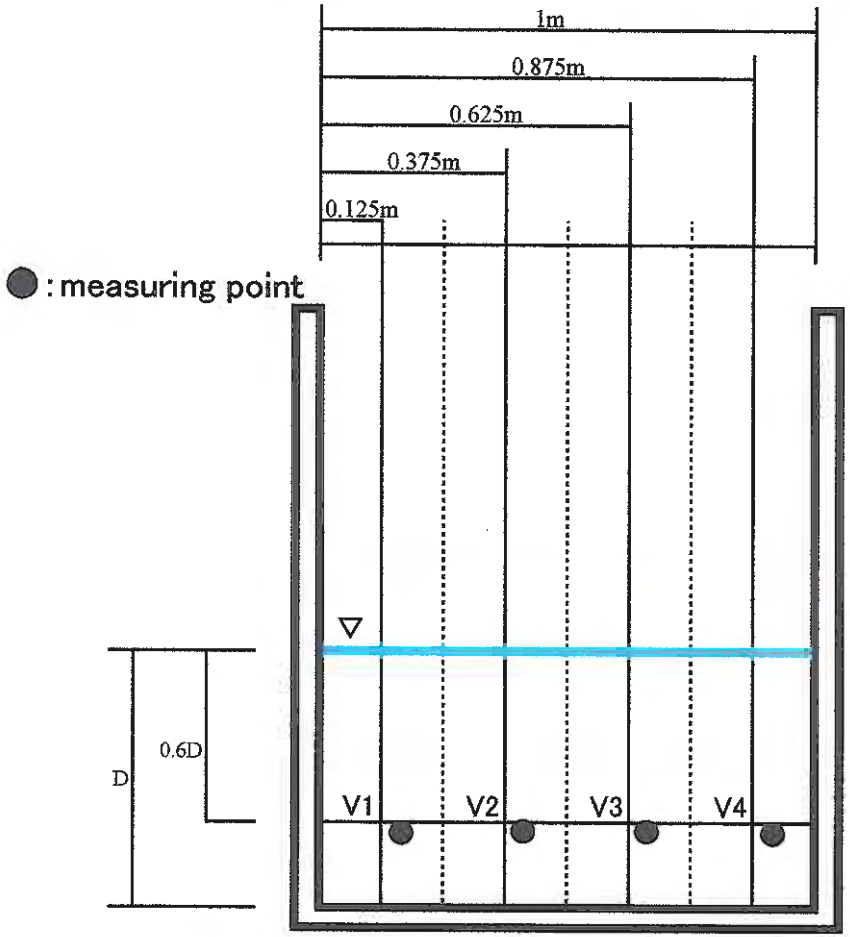
Q= 0.25×D×(V1+V2+V3+V4)

= [ ] m3/s

O'Romis Waterway water flow mesurament record sheet (One Point Method)

Date

D < 0.5m



D= m

V1= m/s

V2= m/s

V3= m/s

V4= m/s

Q= 0.25×D×(V1+V2+V3+V4)

= m3/s