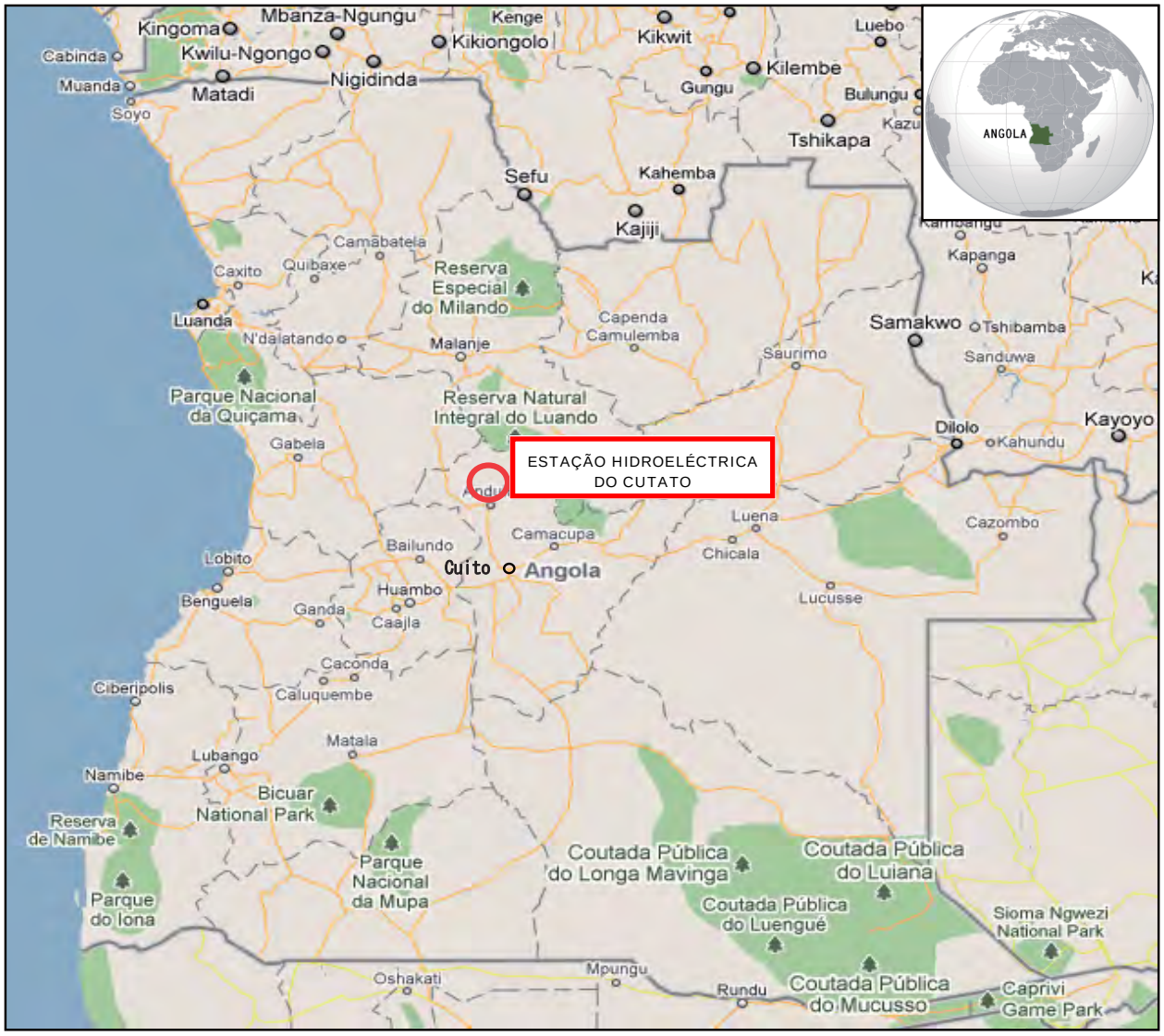
ANEXO 2

PERFIL DO PLANO DE APROVEITAMENTO HIDROELÉCTRICO DO CUTATO

ESTAÇÃO HIDROELÉCTRICA DO CUTATO

LISTA DO TRABALHO DE CONSTRUÇÃO



REPÚBLICA DE ANGOLA
MINISTÉRIO DE ENERGIA E ÁGUAS

Junho de 2011

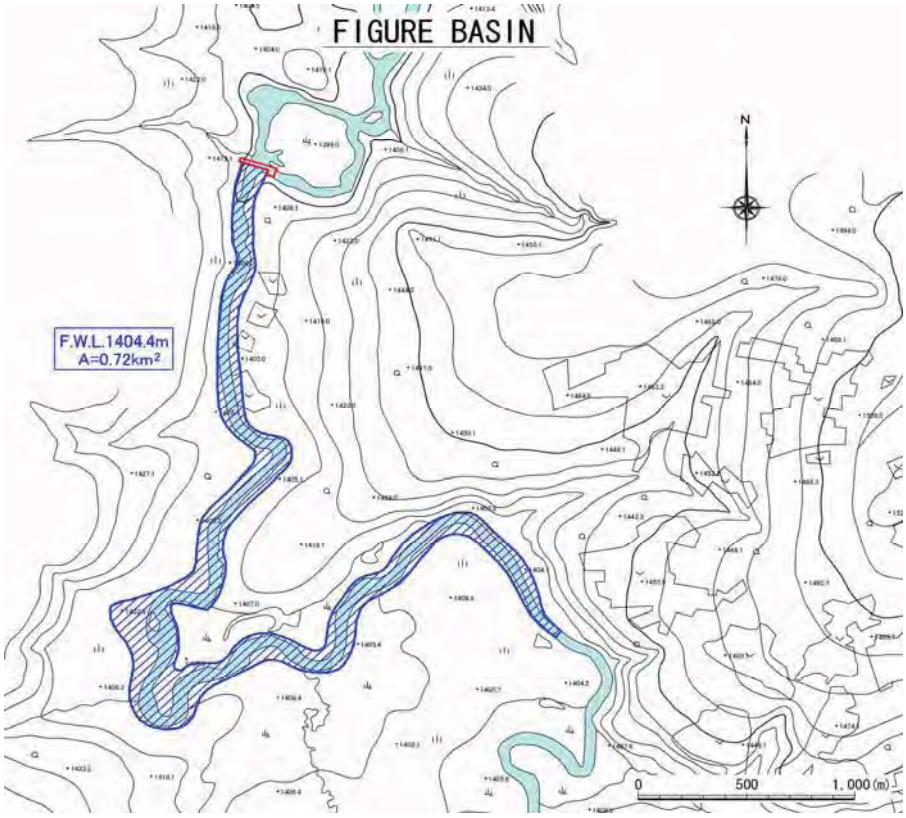
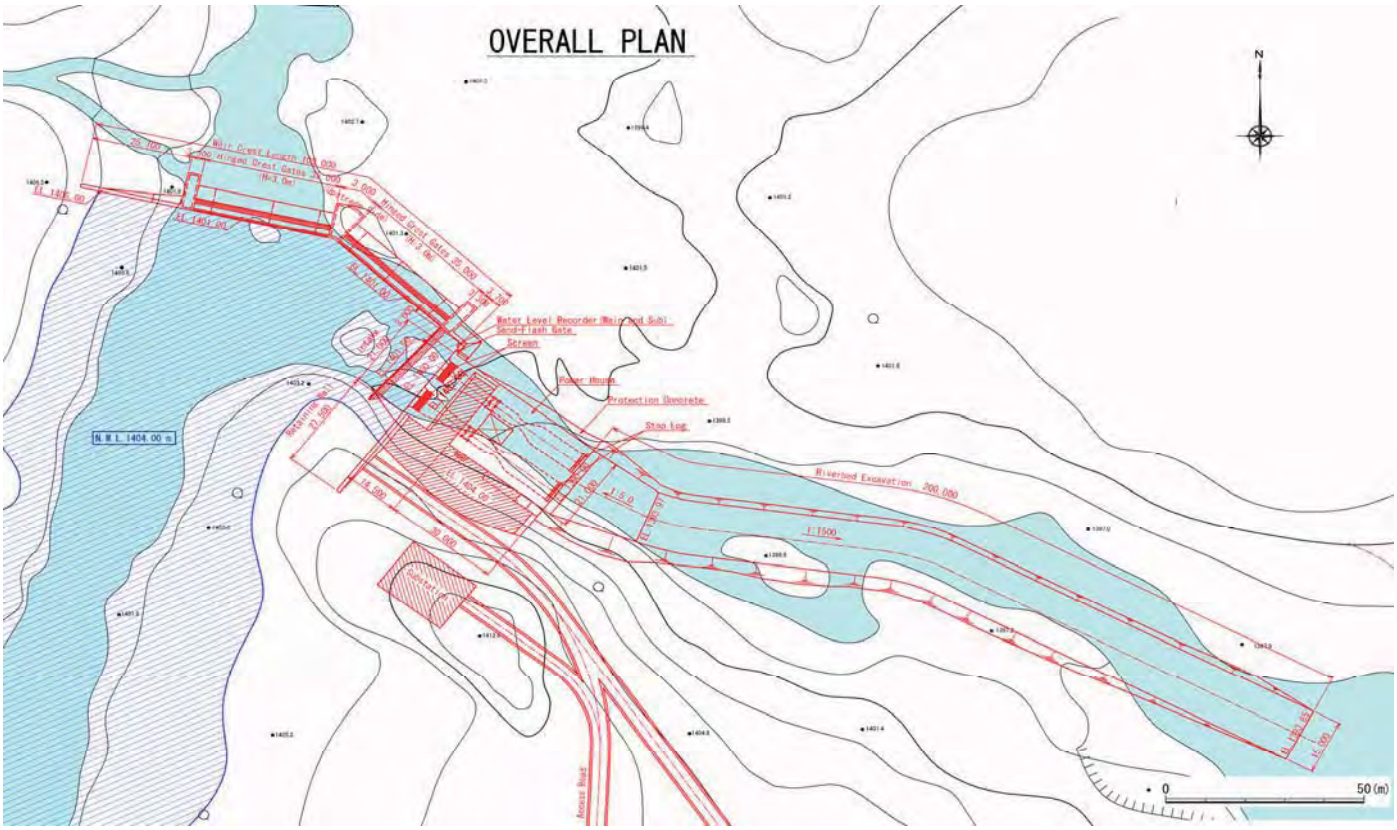
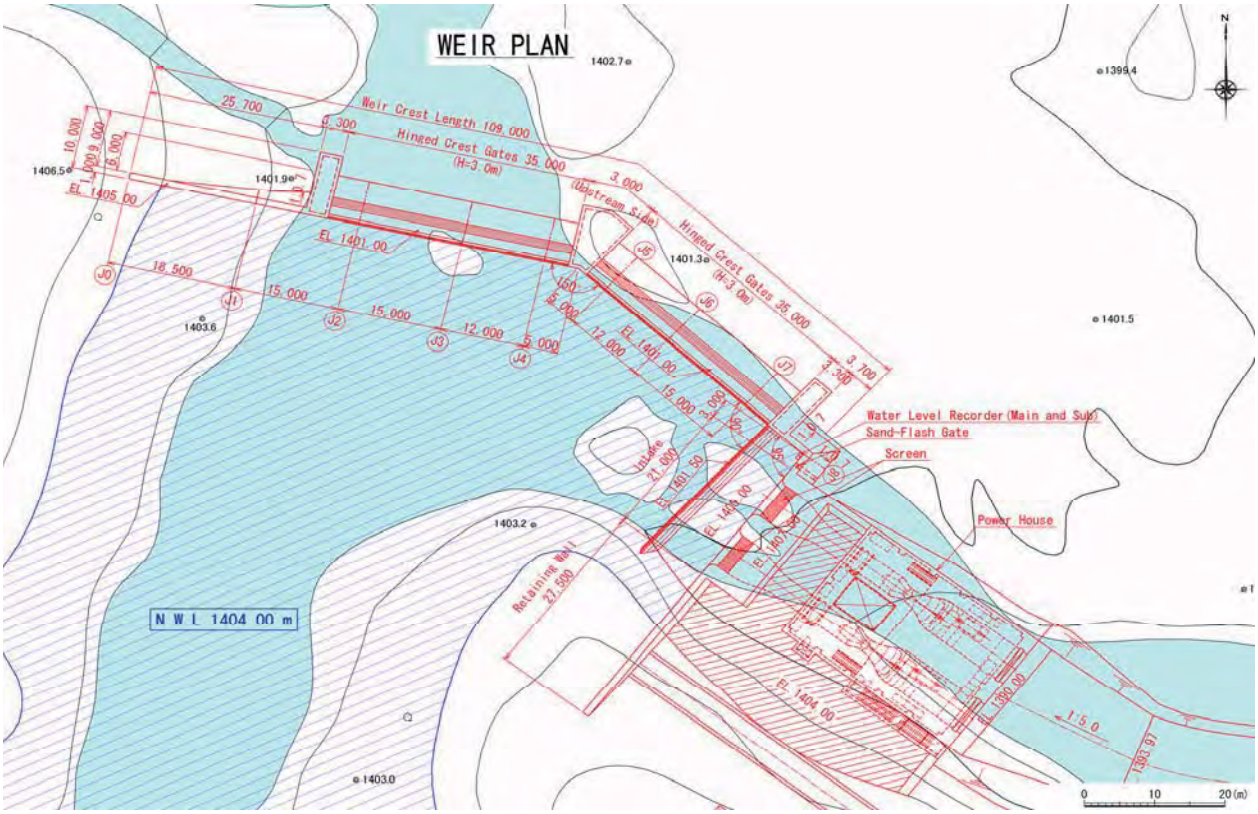


FIGURE BASIN
N
F.W.L.1404.4m
A=0.72km²
0
500
1,000(m)


OVERALL PLAN
N
Water Level Recorder
Sand-Flash Gate
Screen
Power House
Protection Concrete
Stop Log
Riverbed Excavation 200.000
N.W.L. 1404.00 m
Access Road
0
50(m)


WEIR PLAN
Weir Crest Length 109.000
Hinged Crest Gates 35.000
(H=3.0m)
Upstream Side
Hinged Crest Gates 35.000
(H=3.0m)
Water Level Recorder (Main and Sub)
Sand-Flash Gate
Screen
Power House
Intake
Retaining Wall
27.500
N.W.L 1404.00 m
EL 1405.00
EL 1401.00
EL 1401.50
EL 1404.00
EL 1407.00
EL 1390.00
1:5.0
1393.97
1402.7
1399.4
1406.5
1401.9
1401.3
1401.5
1403.6
1403.2
1403.0
J0
J1
J2
J3
J4
J5
J6
J7
J8
0 10 20(m)

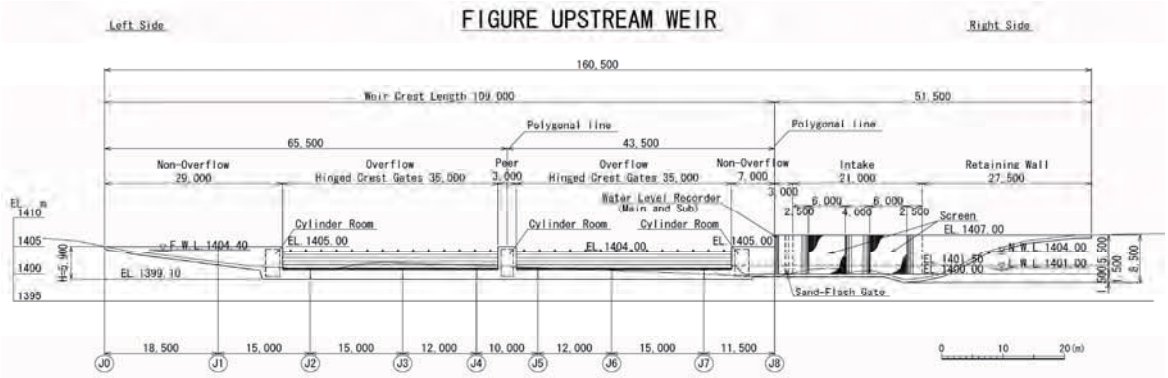
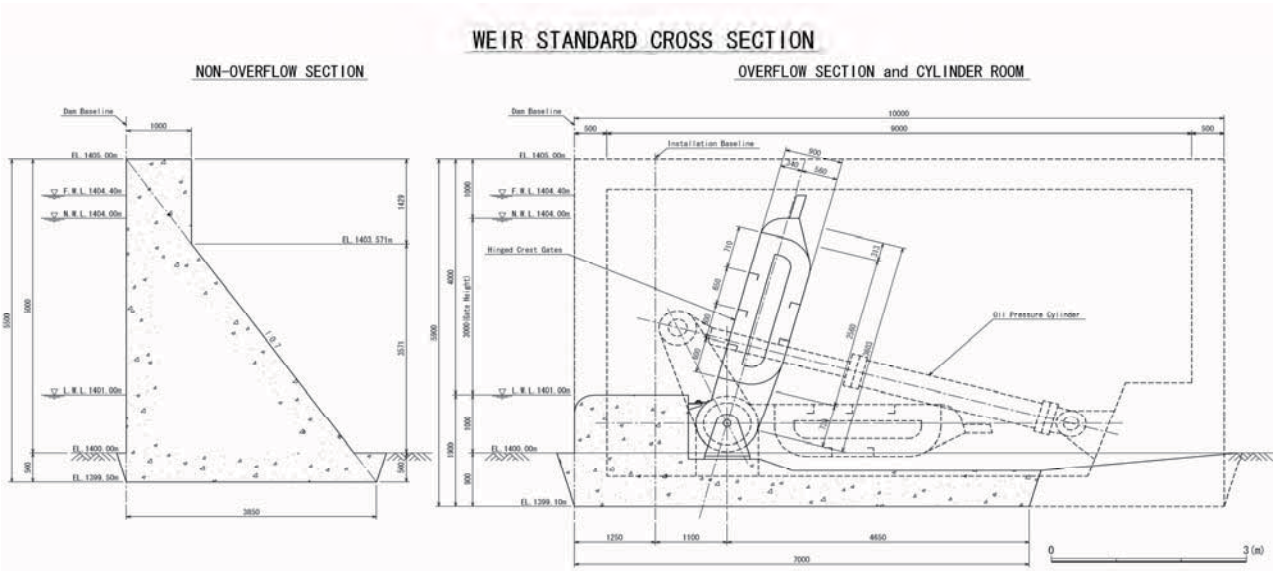
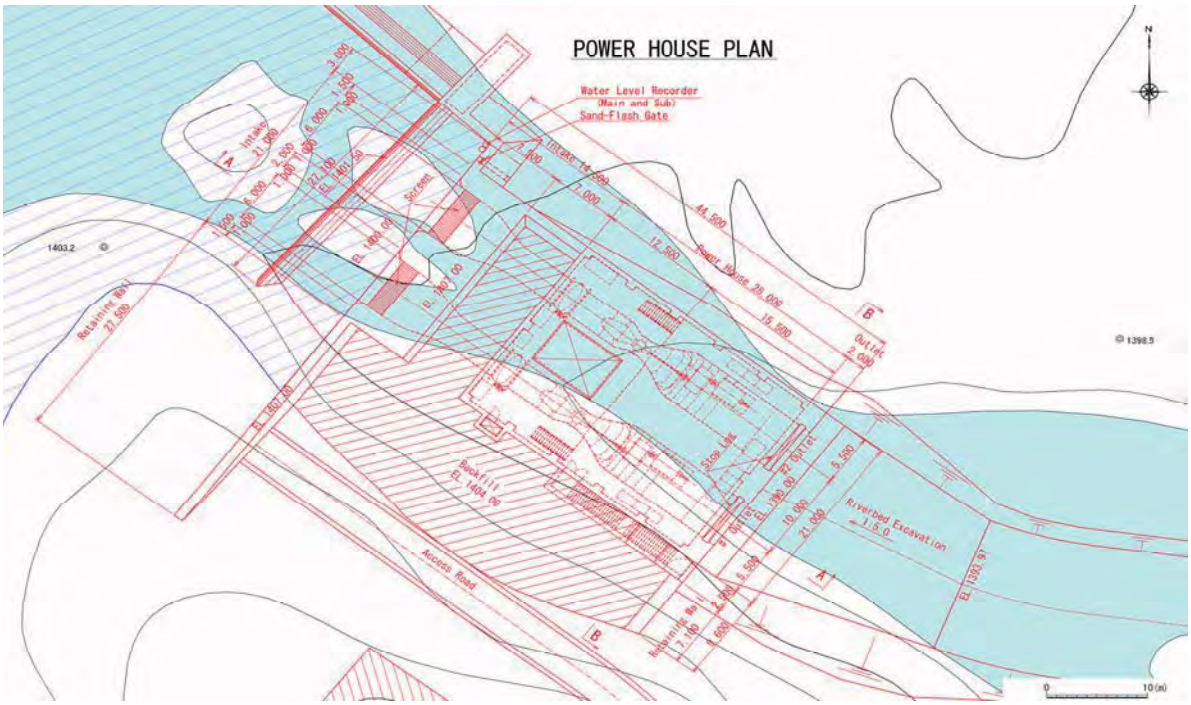
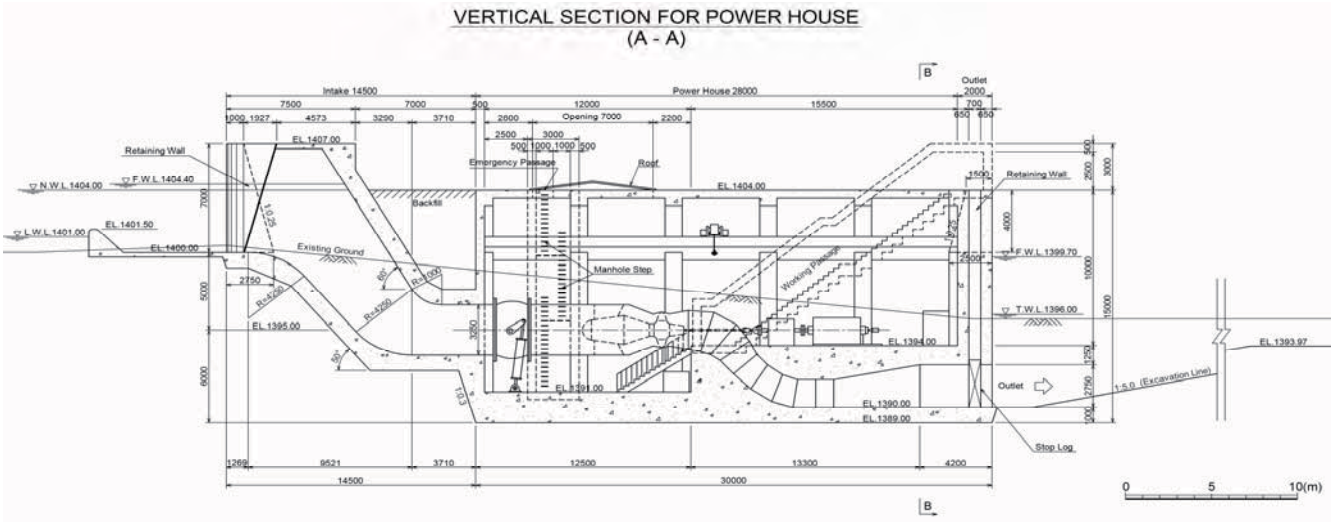
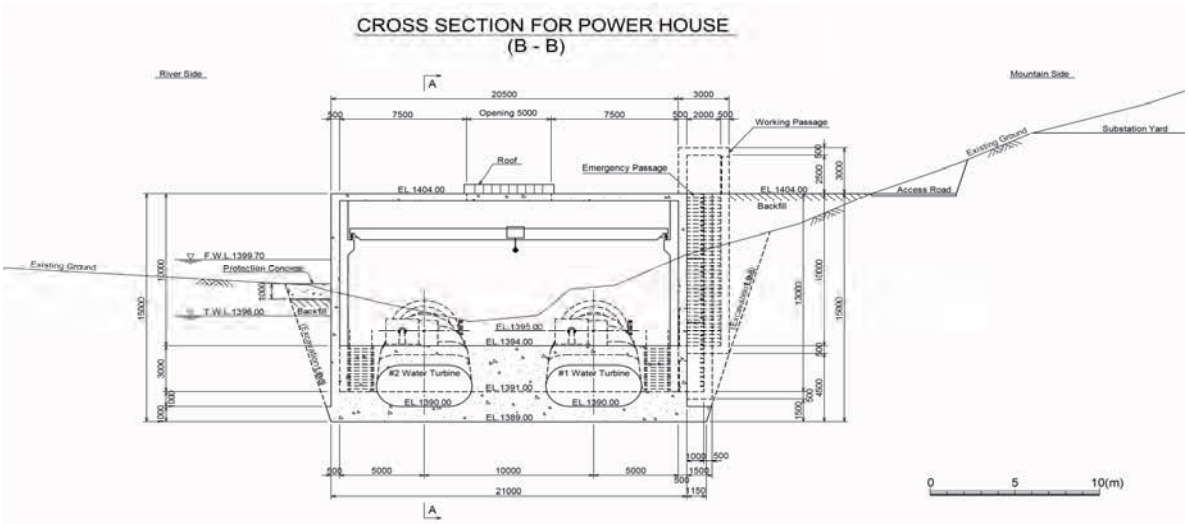


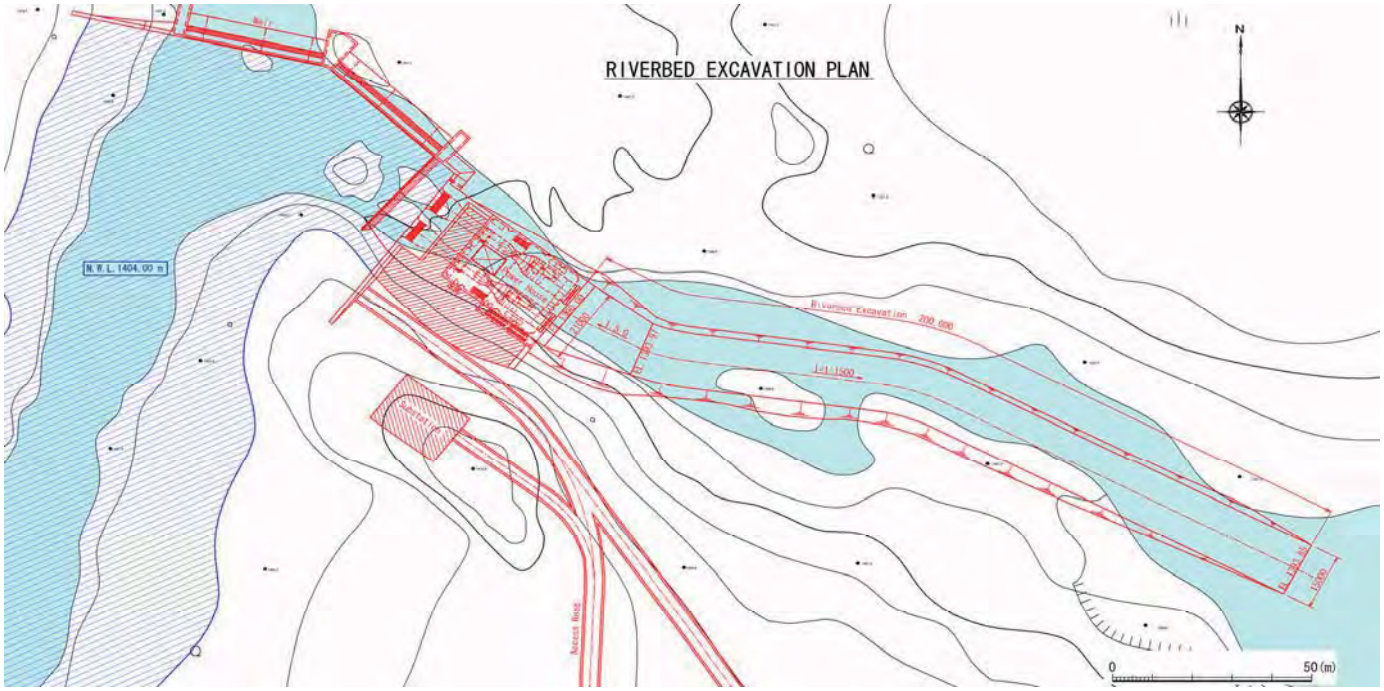
FIGURE UPSTREAM WEIR
Left Side
Right Side
160.500
Weir Crest Length 109.000
51.500
Polygonal line
Polygonal line
65.500
43.500
Non-Overflow
29.000
Overflow
Hinged Crest Gates 35.000
Pier
3.000
Overflow
Hinged Crest Gates 35.000
Non-Overflow
7.000
Intake
21.000
Retaining Wall
27.500
Water Level Recorder
(Main and Sub)
Screen
EL 1407.00
Cylinder Room
EL 1405.00
Cylinder Room
EL 1404.00
Cylinder Room
EL 1405.00
F.W.L 1404.40
N.W.L 1404.00
L.W.L 1401.00
EL 1401.50
EL 1400.00
EL 1399.10
Sand-Flash Gate
18.500
15.000
15.000
12.000
10.000
12.000
15.000
11.500
J0
J1
J2
J3
J4
J5
J6
J7
J8
0 10 20(m)

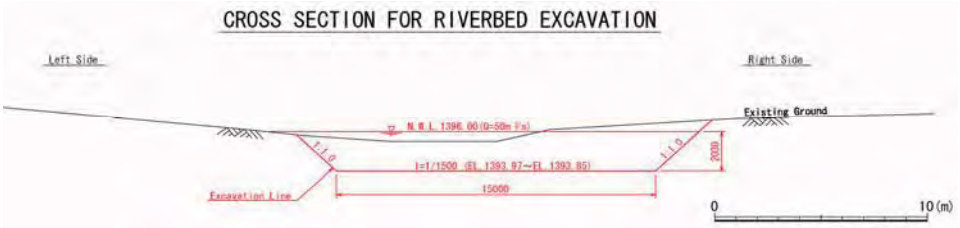

WEIR STANDARD CROSS SECTION
NON-OVERFLOW SECTION
OVERFLOW SECTION and CYLINDER ROOM
Dam Baseline
Installation Baseline
Hinged Crest Gates
Oil Pressure Cylinder
0 3(m)


POWER HOUSE PLAN
Water Level Recorder
(Main and Sub)
Sand-Flash Gate
Intake
Screen
Retaining Wall
Backfill
Access Road
Power House 28,000
Outlet
Riverbed Excavation
1:5.0
Slope Line
EL 1393.97
EL 1398.5
EL 1403.2


VERTICAL SECTION FOR POWER HOUSE
(A - A)
Intake 14500
Power House 28000
Opening 7000
Outlet
Retaining Wall
N.W.L 1404.00
F.W.L 1404.40
L.W.L 1401.00
EL 1401.50
EL 1400.00
EL 1407.00
Backfill
Existing Ground
Emergency Passage
Roof
EL 1404.00
Manhole Step
Working Passage
F.W.L 1399.70
T.W.L 1396.00
EL 1395.00
EL 1394.00
EL 1391.00
EL 1390.00
EL 1389.00
EL 1393.97
1:5.0 (Excavation Line)
Stop Log
14500
30000
0
5
10(m)

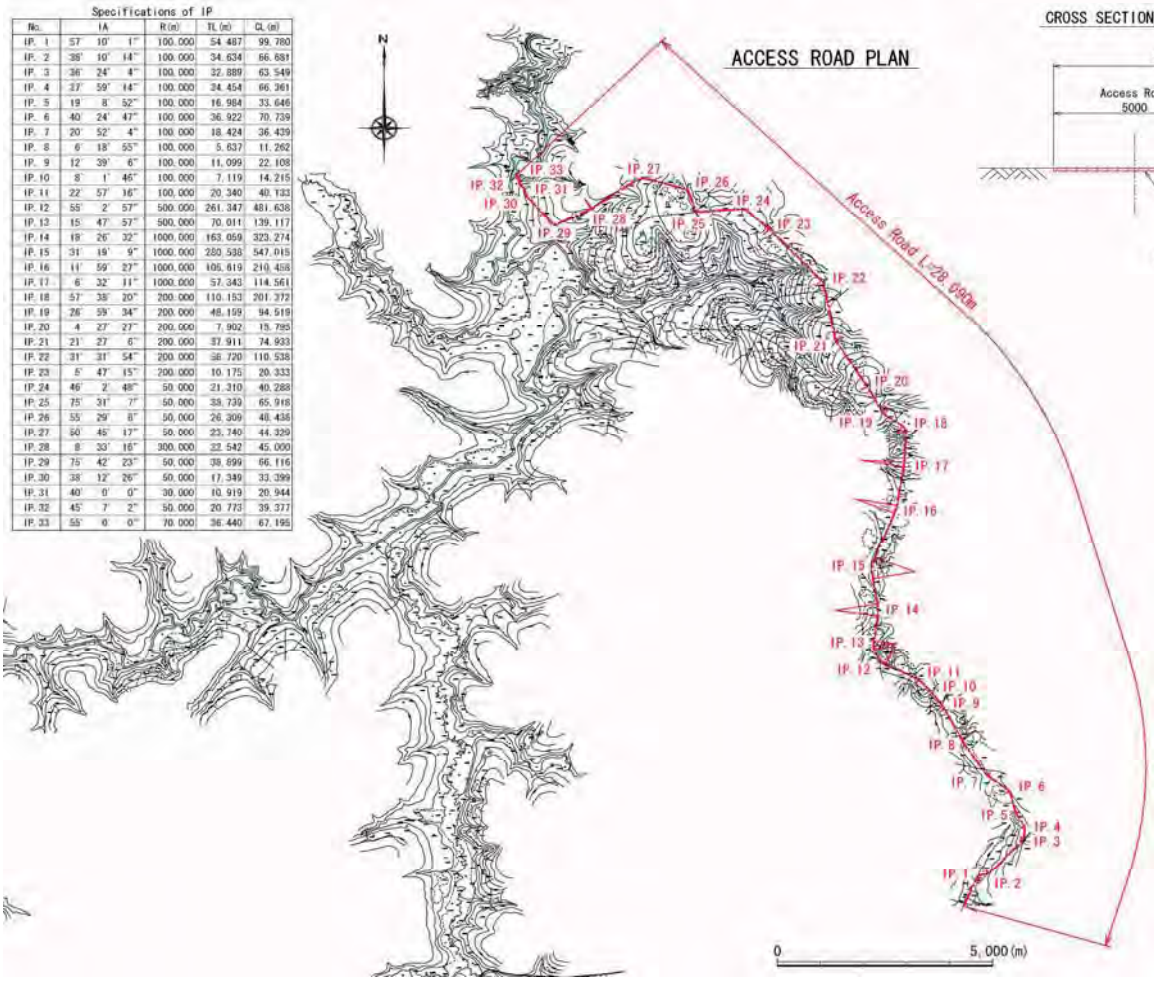

CROSS SECTION FOR POWER HOUSE
(B - B)
River Side
Mountain Side
Opening 5000
Working Passage
Roof
Emergency Passage
EL 1404.00
Backfill
Access Road
Existing Ground
Substation Yard
F.W.L 1399.70
Protection Concrete
T.W.L 1396.00
EL 1395.00
EL 1394.00
EL 1391.00
EL 1390.00
EL 1389.00
#2 Water Turbine
#1 Water Turbine
20500
21000
0
5
10(m)

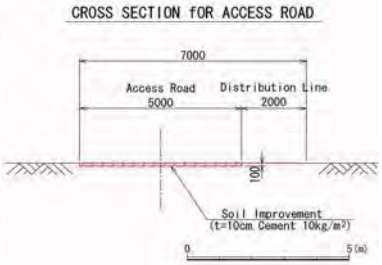


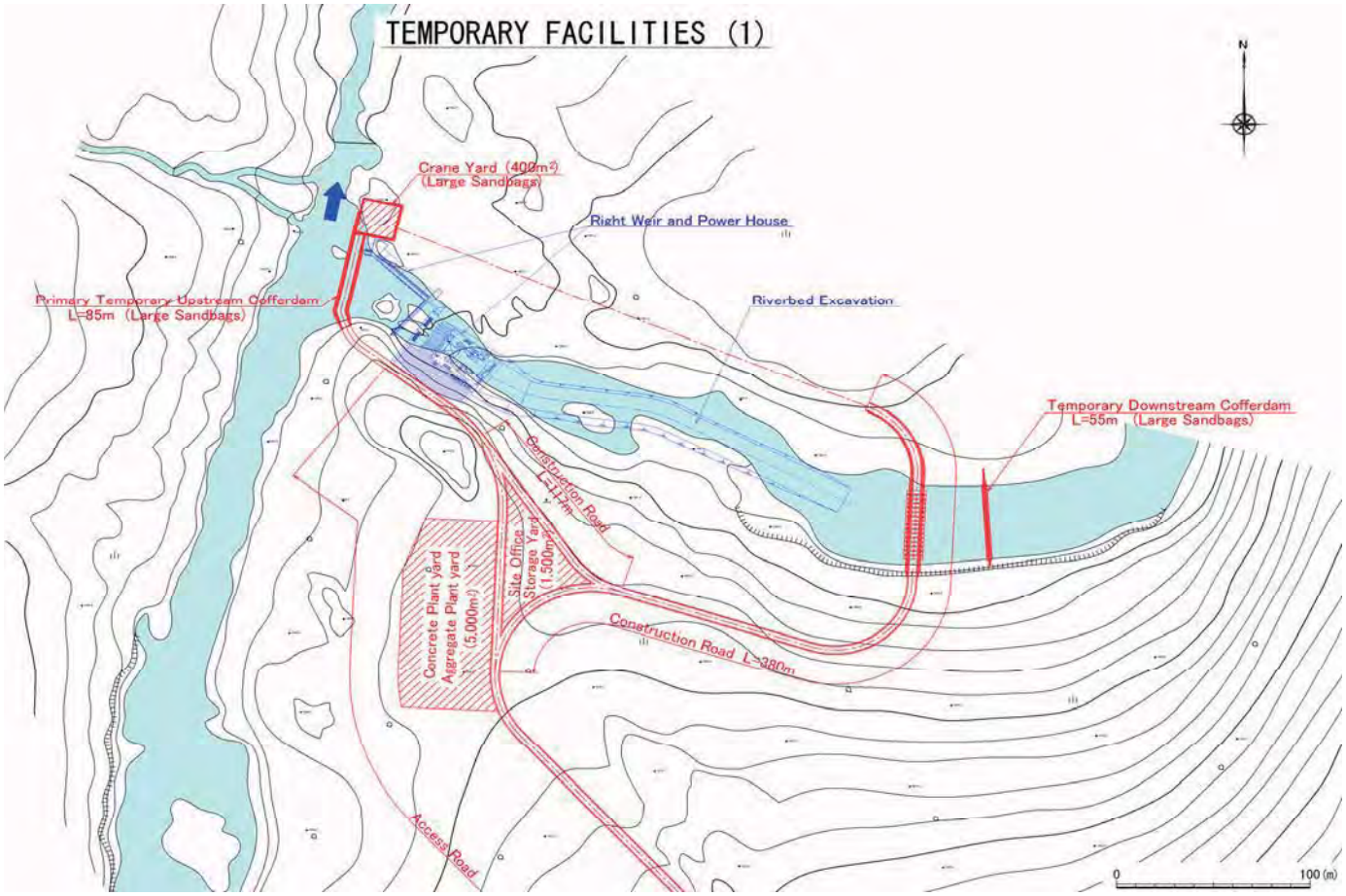


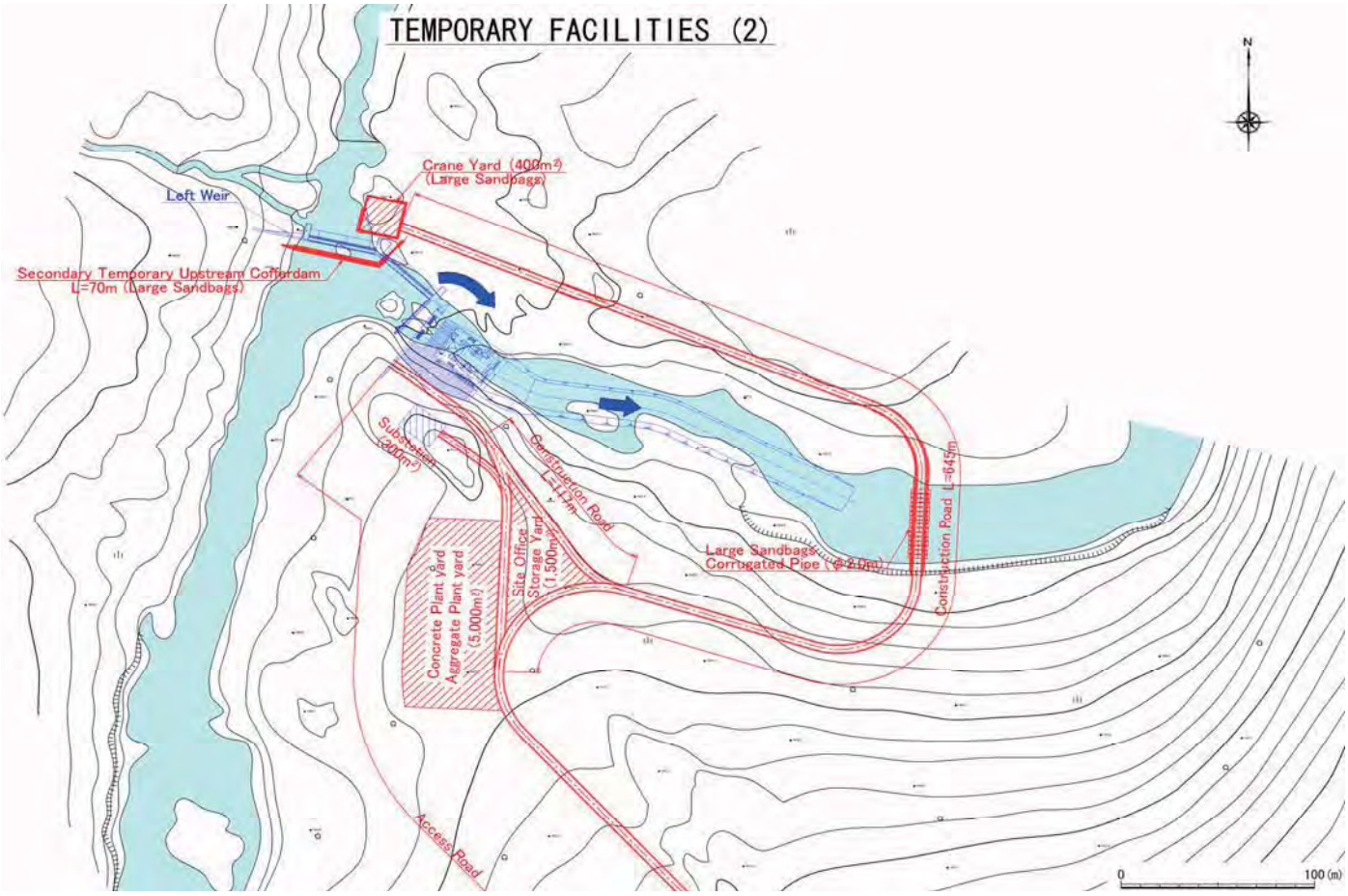
Specifications of IP

No.	IA			R(m)	TL(m)	CL(m)
IP. 1	57°	10'	1"	100.000	54.487	99.780
IP. 2	39°	10'	14"	100.000	34.634	66.881
IP. 3	36°	24'	4"	100.000	32.889	63.549
IP. 4	37°	59'	14"	100.000	34.454	66.361
IP. 5	19°	8'	52"	100.000	16.984	33.646
IP. 6	40°	24'	47"	100.000	36.922	70.739
IP. 7	20°	52'	4"	100.000	18.424	36.439
IP. 8	6°	18'	55"	100.000	5.637	11.262
IP. 9	12°	39'	6"	100.000	11.099	22.108
IP.10	8°	1'	46"	100.000	7.119	14.215
IP.11	22°	57'	16"	100.000	20.340	40.133
IP.12	55°	2'	57"	500.000	261.347	481.638
IP.13	15°	47'	57"	500.000	70.011	139.117
IP.14	19°	26'	32"	1000.000	163.059	323.274
IP.15	31°	19'	9"	1000.000	280.538	547.015
IP.16	11°	59'	27"	1000.000	105.619	210.458
IP.17	6°	32'	11"	1000.000	57.343	114.561
IP.18	57°	38'	20"	200.000	110.153	201.372
IP.19	26°	59'	34"	200.000	48.159	94.519
IP.20	4°	27'	27"	200.000	7.902	15.795
IP.21	21°	27'	6"	200.000	37.911	74.933
IP.22	31°	31'	54"	200.000	56.720	110.538
IP.23	5°	47'	15"	200.000	10.175	20.333
IP.24	46°	2'	48"	50.000	21.310	40.288
IP.25	75°	31'	7"	50.000	38.739	65.918
IP.26	55°	29'	8"	50.000	26.309	48.436
IP.27	50°	45'	17"	50.000	23.740	44.329
IP.28	8°	33'	16"	300.000	22.542	45.000
IP.29	75°	42'	23"	50.000	38.899	66.116
IP.30	38°	12'	26"	50.000	17.349	33.399
IP.31	40°	0'	0"	30.000	10.919	20.944
IP.32	45°	7'	2"	50.000	20.773	39.377
IP.33	55°	0'	0"	70.000	36.440	67.195

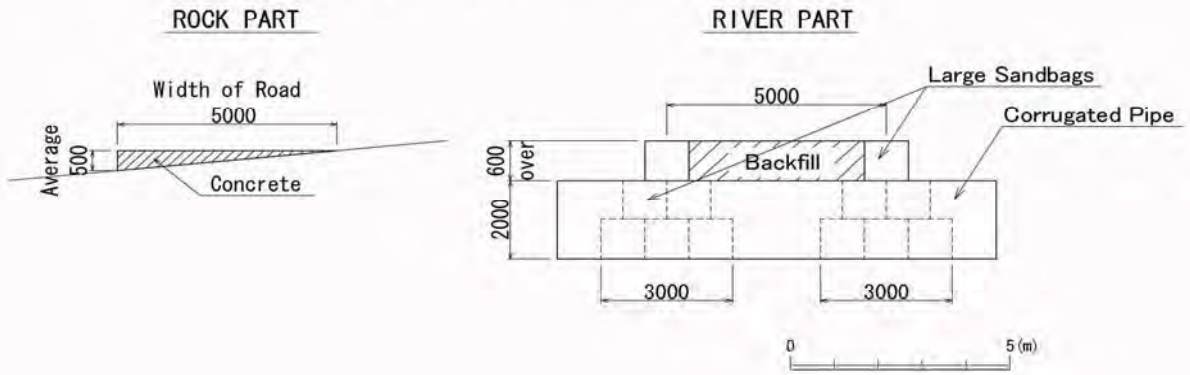




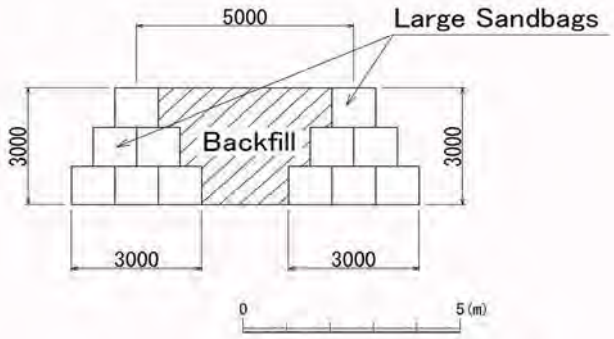

TEMPORARY FACILITIES (1)
N
Crane Yard (400m²)
(Large Sandbags)
Right Weir and Power House
Primary Temporary Upstream Cofferdam
L=85m (Large Sandbags)
Riverbed Excavation
Temporary Downstream Cofferdam
L=55m (Large Sandbags)
Construction Road
L=1,7km
Concrete Plant yard
Aggregate Plant yard
(5,000m²)
Site Office
Storage Yard
(1,500m²)
Construction Road L=380m
Access Road
0
100 (m)


TEMPORARY FACILITIES (2)
N
Crane Yard (400m²)
(Large Sandbags)
Left Weir
Secondary Temporary Upstream Cofferdam
L=70m (Large Sandbags)
Substation
(300m²)
Construction Road
L=1,7km
Concrete Plant yard
Aggregate Plant yard
(5,000m²)
Site Office
Storage Yard
(1,500m²)
Large Sandbags
Corrugated Pipe (φ2.0m)
Construction Road L=645m
Access Road
0
100 (m)

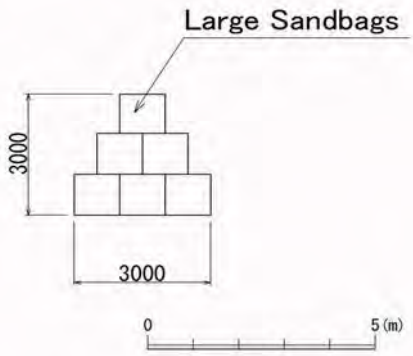
CROSS SECTION FOR CONSTRUCTION ROAD



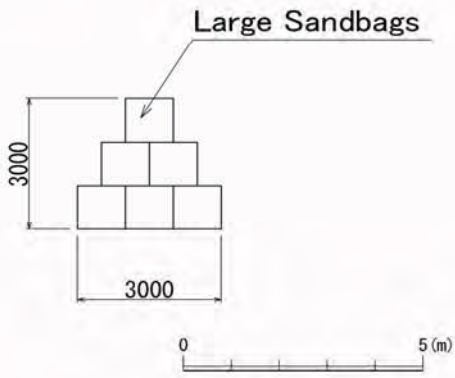
CROSS SECTION FOR PRIMARY TEMPORARY UPSTREAM COFFERDAM



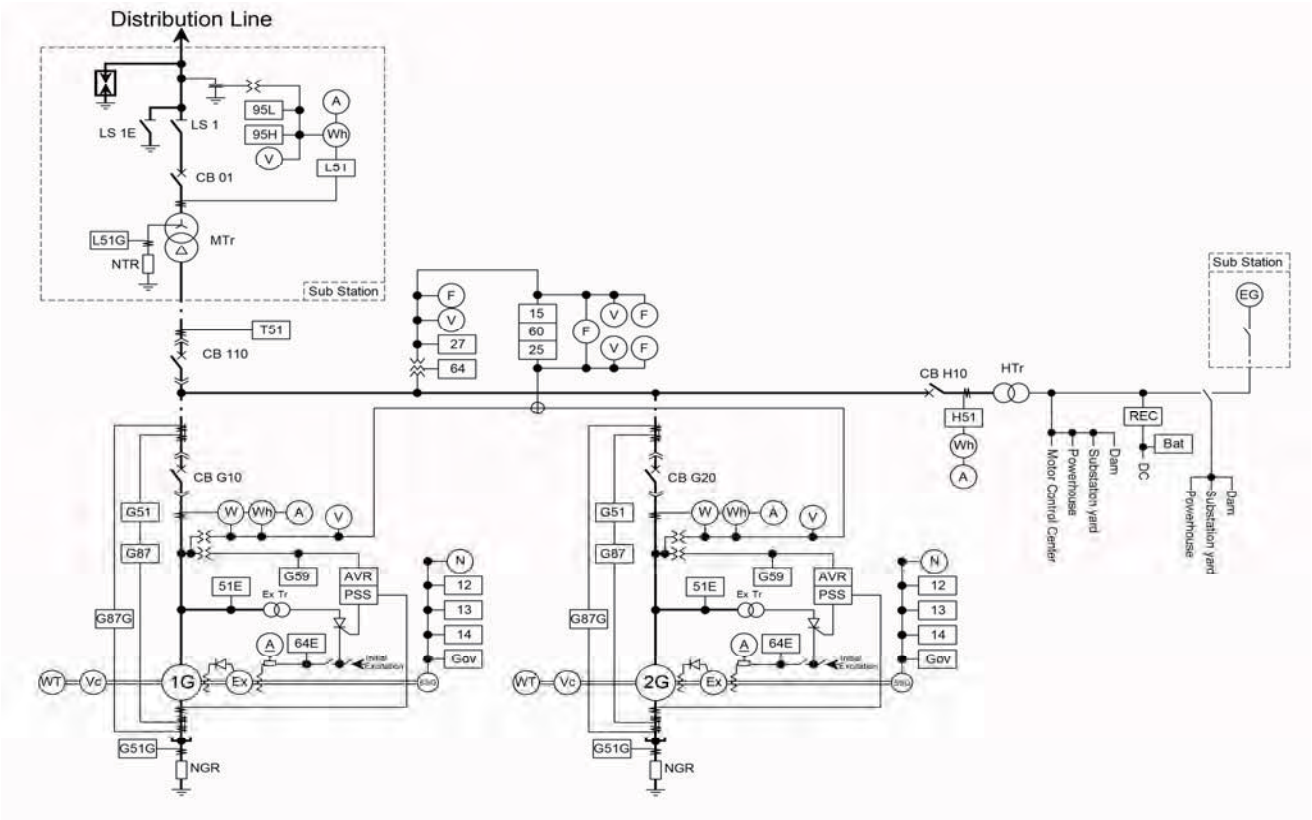
CROSS SECTION FOR TEMPORARY DOWNSTREAM COFFERDAM



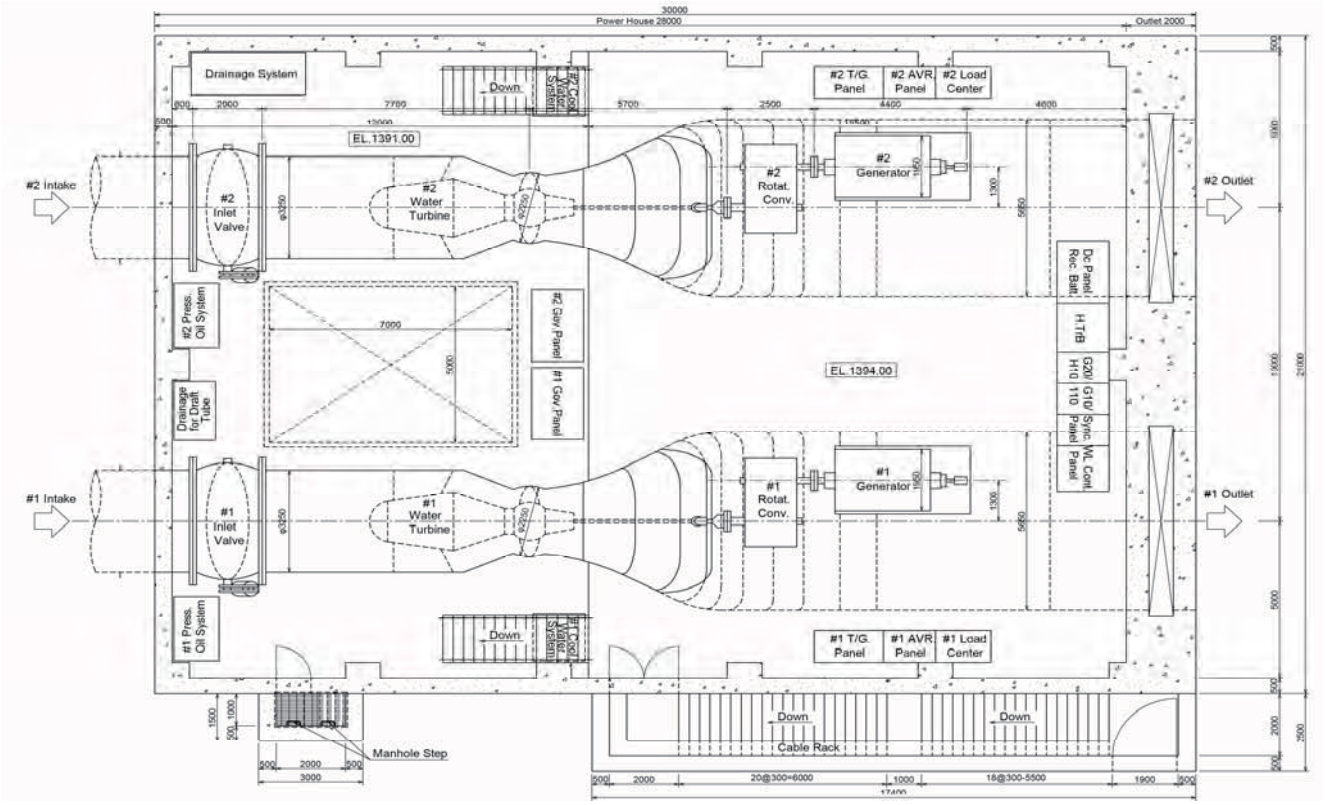
CROSS SECTION FOR SECONDARY TEMPORARY UPSTREAM COFFERDAM



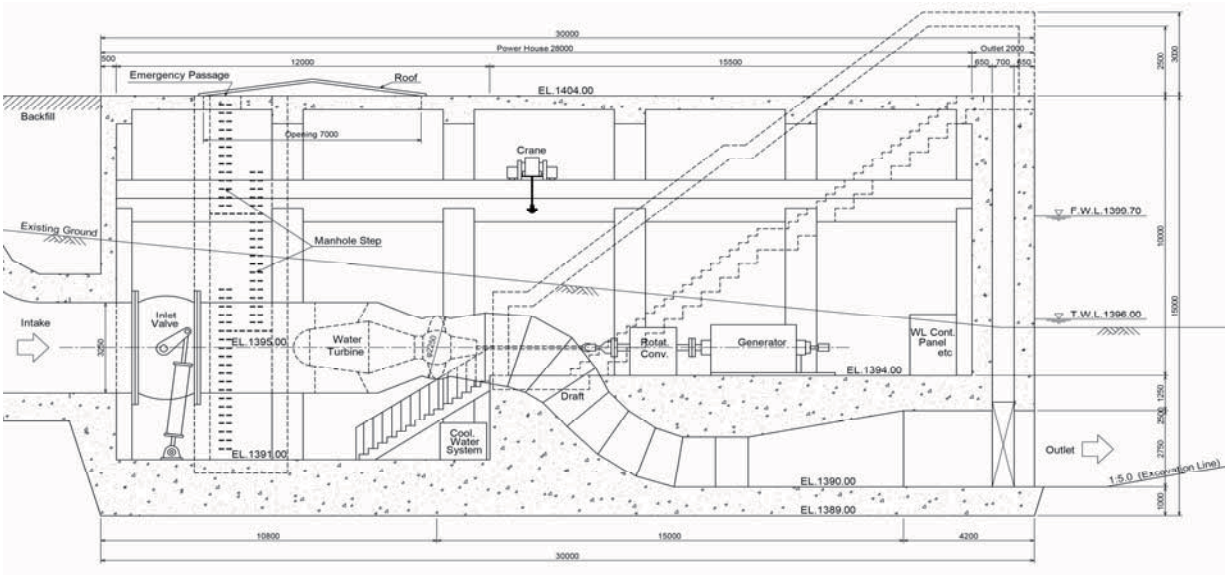
SINGLE LINE DIAGRAM



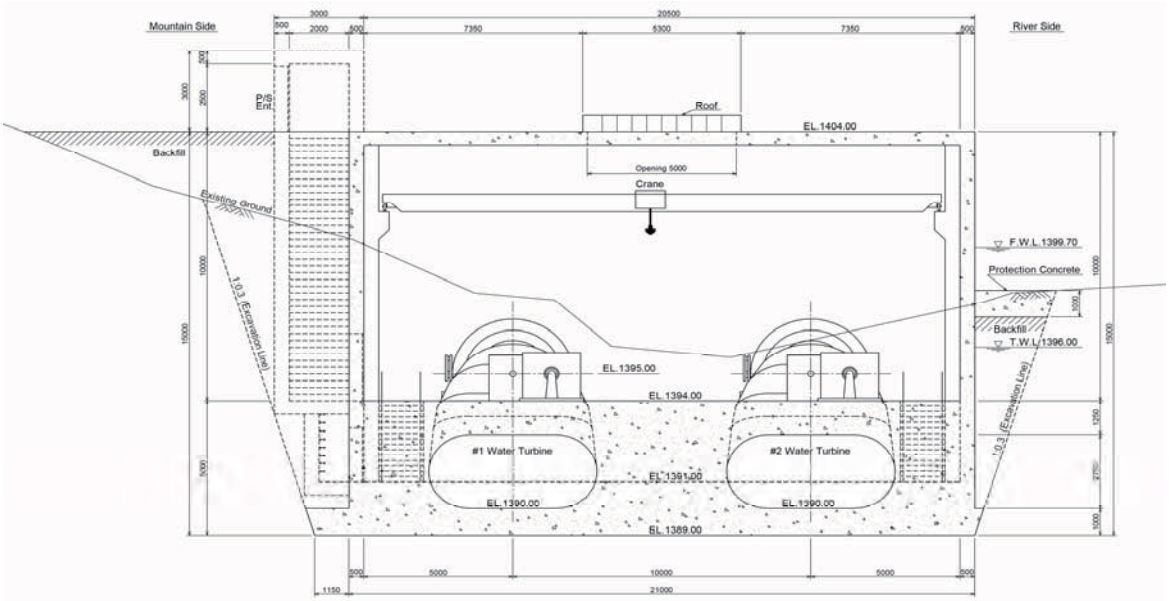
POWER HOUSE LAYOUT



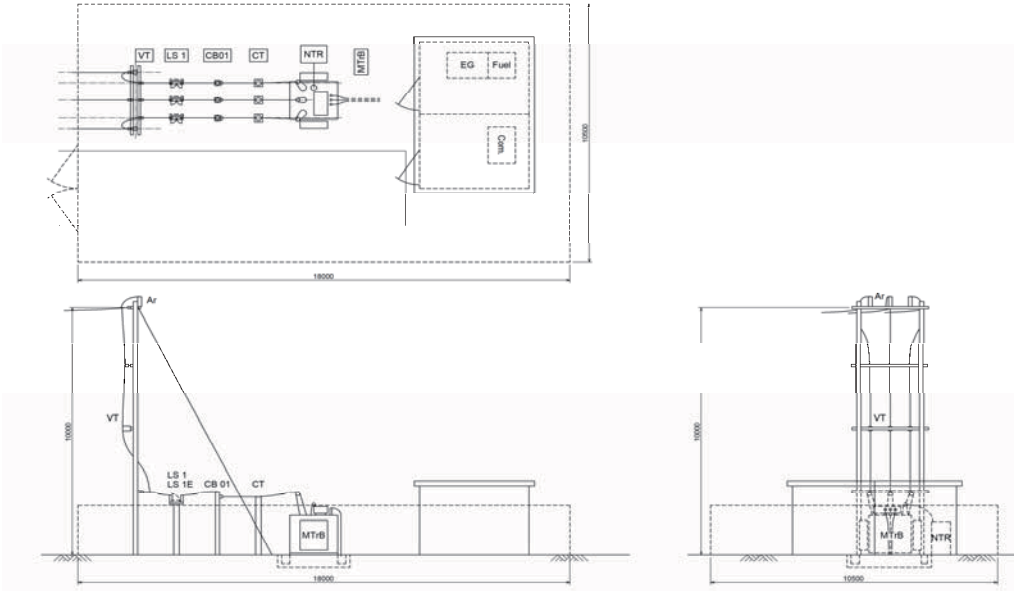
VERTICAL SECTION FOR POWER HOUSE

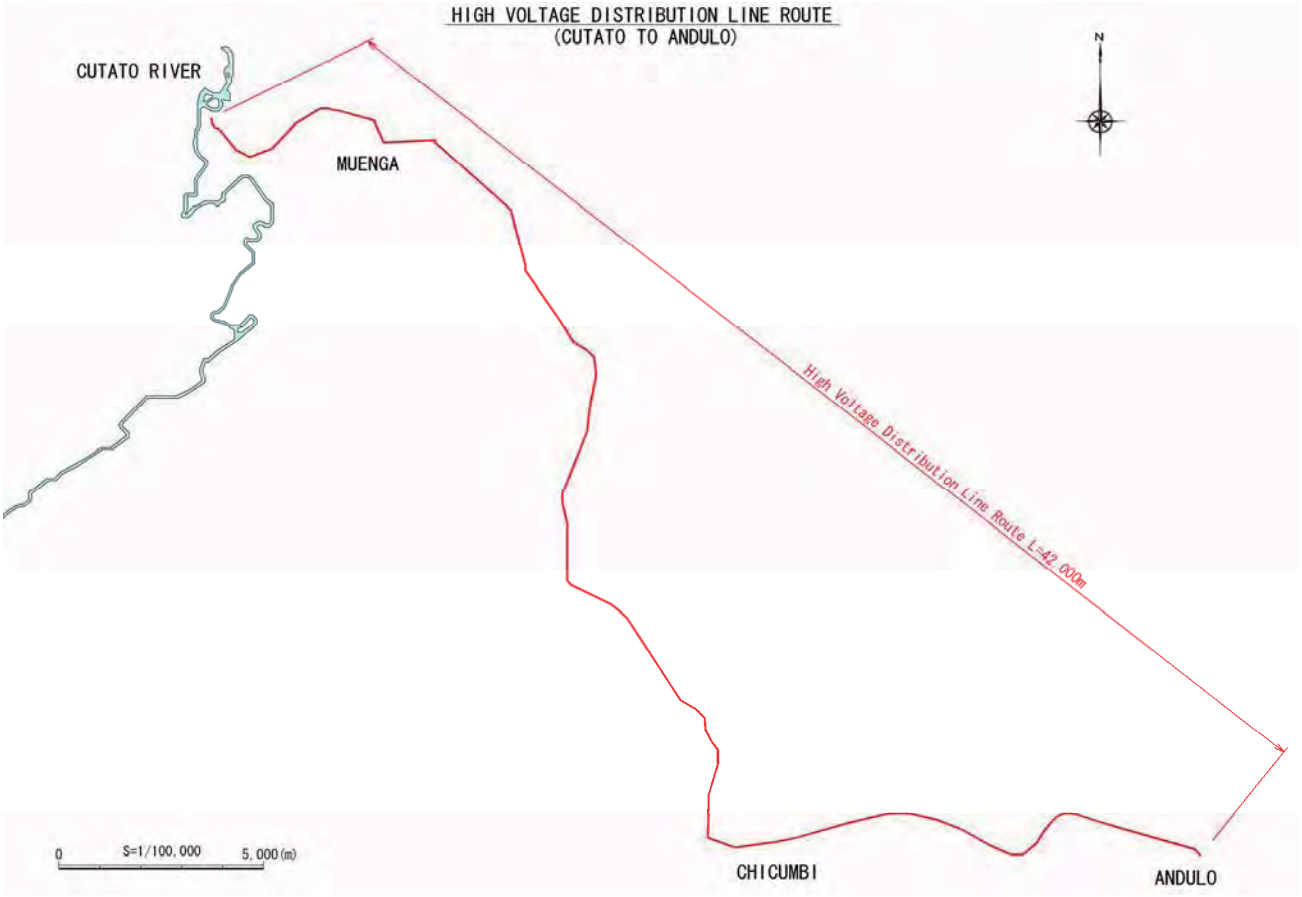


CROSS SECTION fOR POWER HOUSE

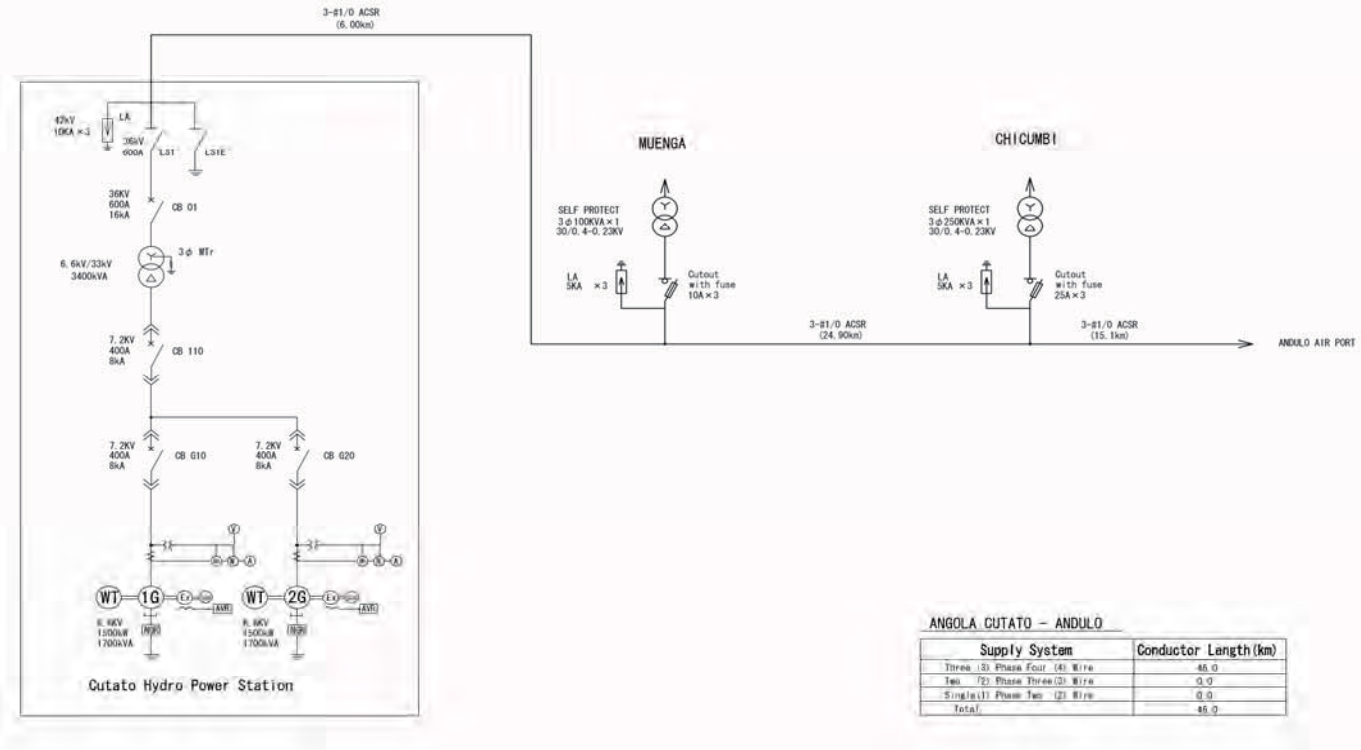


SUBSTATION LAYOUT





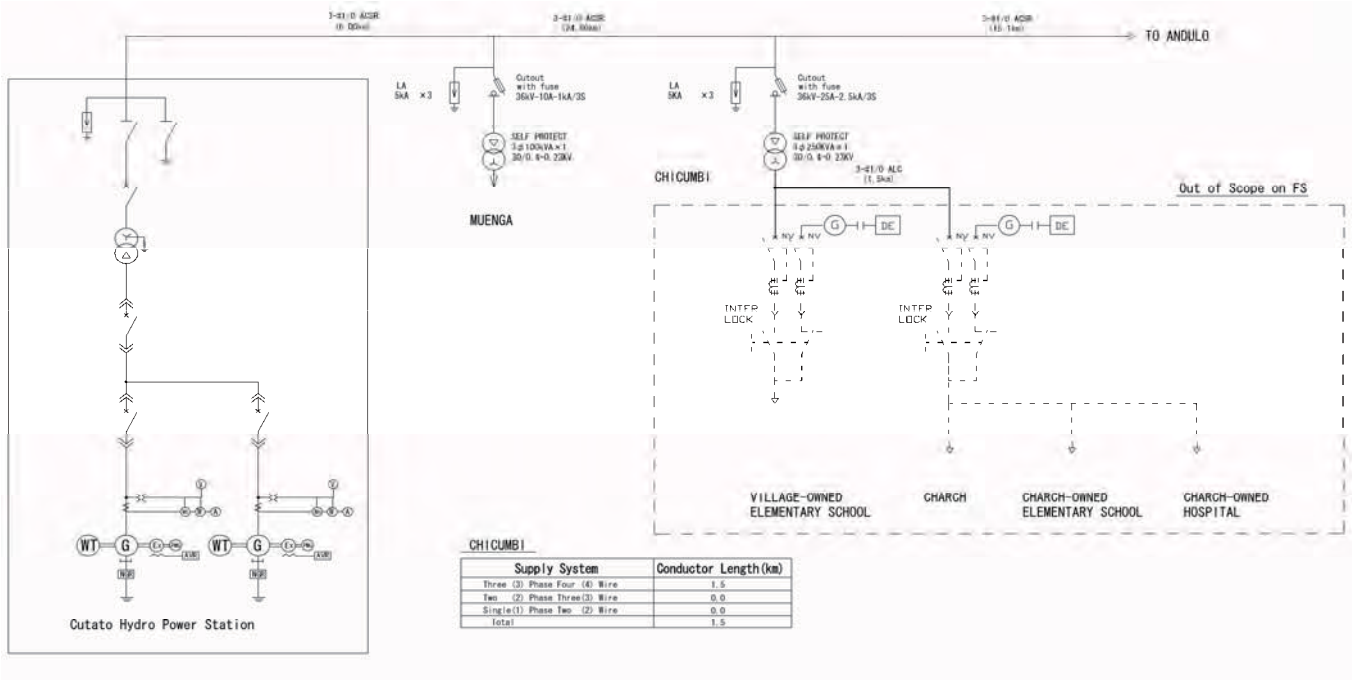
DISTRIBUTION LINE (30kV) FROM CUTATO TO ANDULO



ANGOLA CUTATO – ANDULO

Supply System	Conductor Length(km)
Three (3) Phase Four (4) Wire	46.0
Two (2) Phase Three(3) Wire	0.0
Single(1) Phase Two (2) Wire	0.0
Total	46.0

DISTRIBUTION LINE(400-230V)
LOW VOLTAGE FOR CHICUMBI

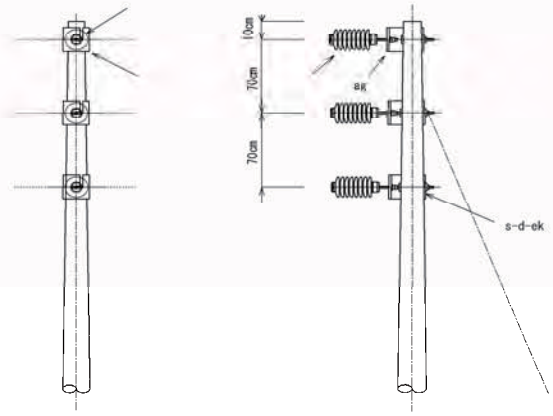


CHICUMBI

Supply System	Conductor Length(km)
Three (3) Phase Four (4) Wire	1.5
Two (2) Phase Three(3) Wire	0.0
Single(1) Phase Two (2) Wire	0.0
Total	1.5

POLE DRAWING (CUTATO - ANDULO)

30kV, THREE PHASE 0° TO 5° ANGLE (VERTICAL TYPE)

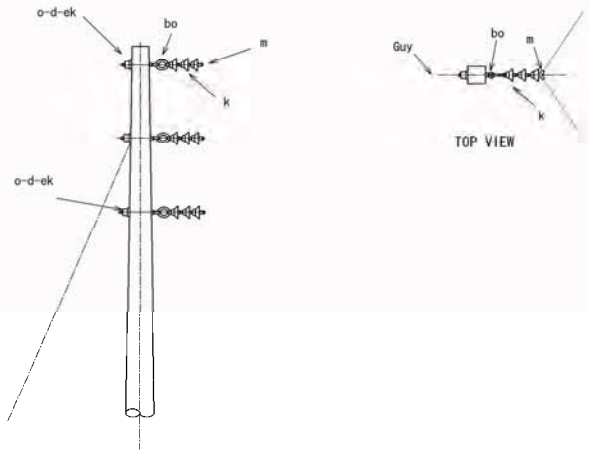


ELEVATION

SIDE VIEW

Item	Materials
a-	Line Post Pin Type Insulator
ag-	Angle
d-	hole washer
s-	Single arm bolt
ek-	lock nut

30kV, THREE PHASE 30° TO 60° ANGLE (VERTICAL TYPE)

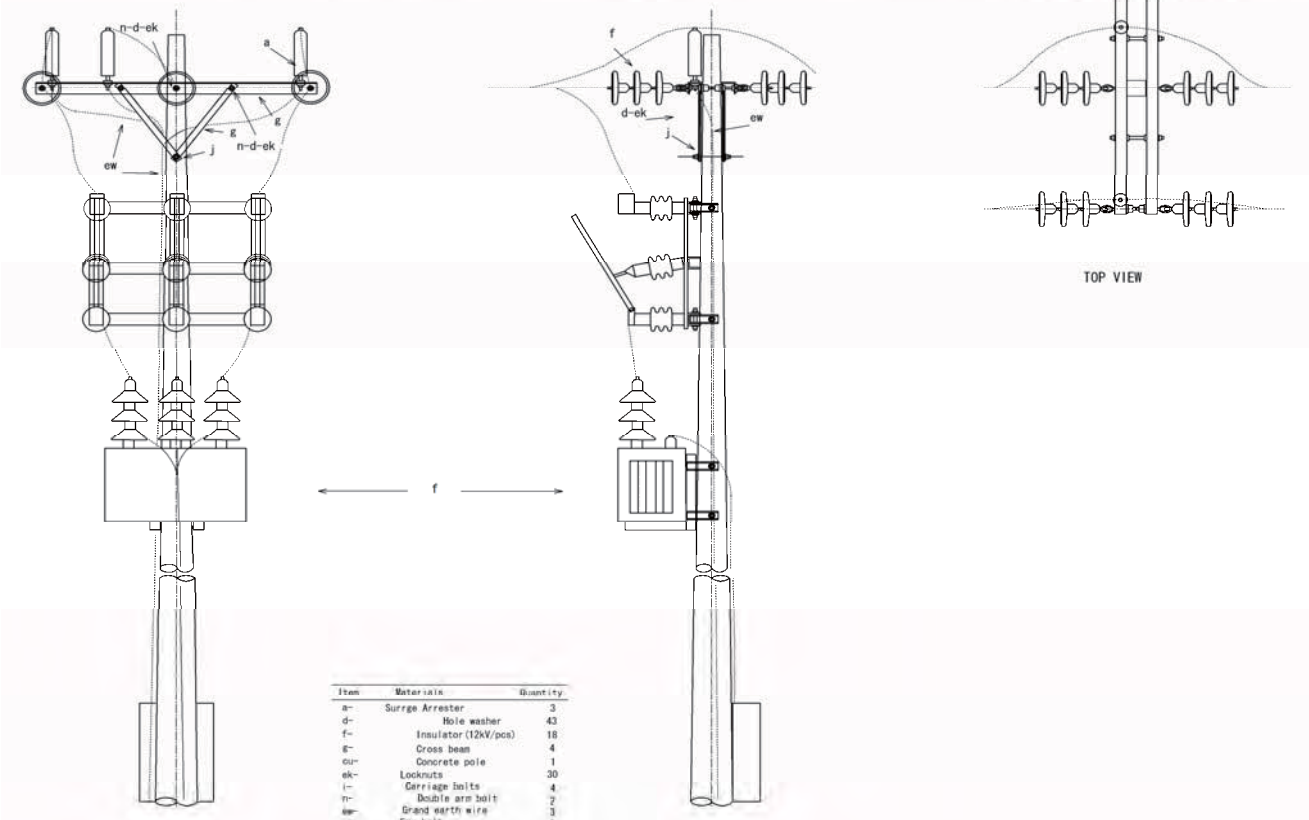


ELEVATION

Item	Materials
d-	Hole washer
k-	Suspension insulator
o-	Eye bolt
m-	Suspension clamp
bo-	Anchor shackle
ek-	locknuts

POLE TR & CUT OUT SW INSTALLATION VIEW (100kVA) FOR MUENGA

30kV. THREE PHASE



TOP VIEW

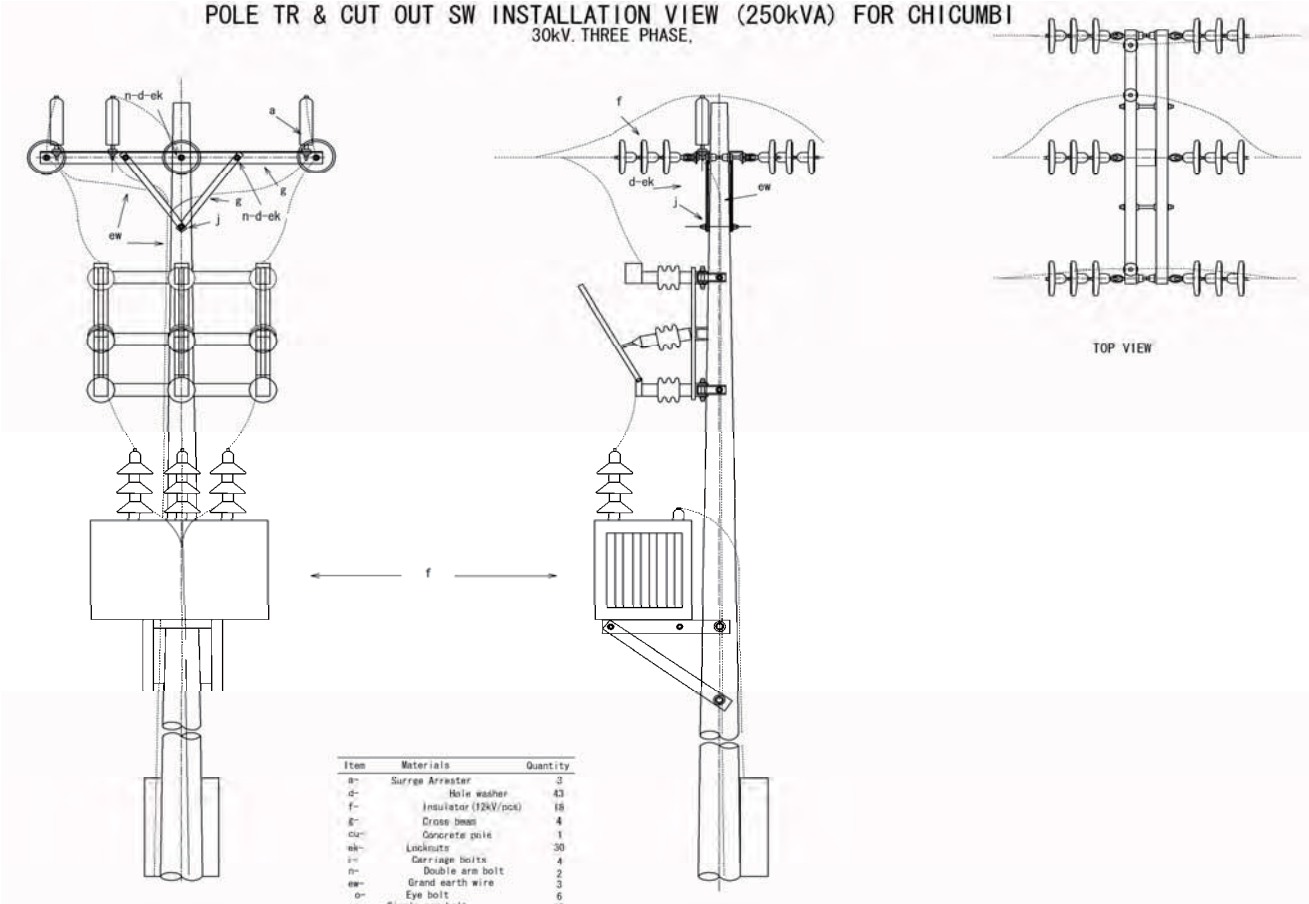
FRONT VIEW

SIDE VIEW

Item	Materials	Quantity
a-	Surrge Arrester	3
d-	Hole washer	43
f-	Insulator (12kV/pcs)	18
g-	Cross beam	4
cu-	Concrete pole	1
ek-	Locknuts	30
i-	Carriage bolts	4
n-	Double arm bolt	2
ew-	Grand earth wire	3
o-	Eye bolt	6
s-	Single arm bolt	10
tr-	Transformer	1

POLE TR & CUT OUT SW INSTALLATION VIEW (250kVA) FOR CHICUMBI

30kV. THREE PHASE.



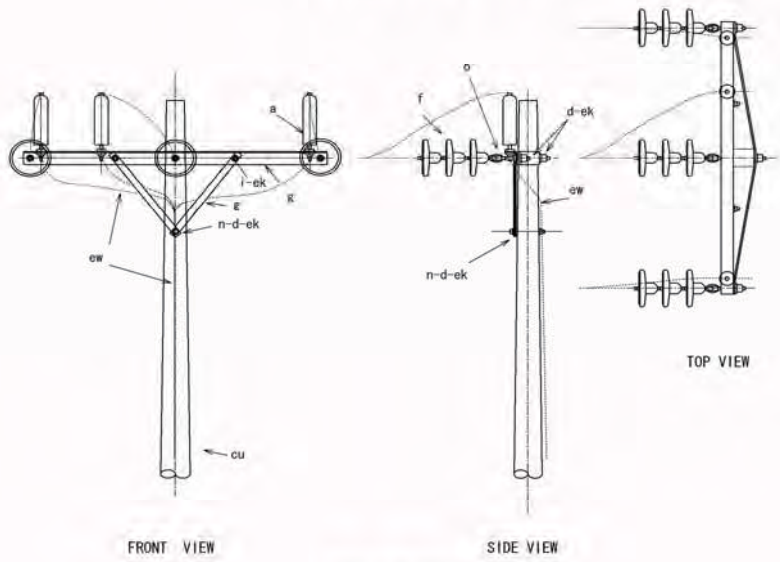
TOP VIEW

FRONT VIEW

SIDE VIEW

Item	Materials	Quantity
a-	Surrge Arrester	3
d-	Hole washer	43
f-	Insulator (12kV/pcs)	18
g-	Cross beam	4
cu-	Concrete pole	1
ek-	Locknuts	30
i-	Carriage bolts	4
n-	Double arm bolt	2
ew-	Grand earth wire	3
o-	Eye bolt	6
s-	Single arm bolt	10
tr-	Transformer	1

END POLE
30kV. THREE PHASE 0° TO 5° ANGLE



Item	Materials	Quantity
a-	Surrge Arrester	3
d-	Hole washer	16
f-	Insulator (12kV/pcs)	9
g-	Cross beam	2
cu-	Concrete pole	1
ek-	Locknuts	9
i-	Carriage bolts	2
n-	Double arm bolt	0
ew-	Grand earth wire	3
o-	Eye bolt	3
s-	Single arm bolt	1

Trabalhos da Hidroeléctrica do CUTATO

Os danos causados pela guerra civil, que continuou até 2002, ao fornecimento de energia eléctrica em Angola foi grave. E a falta de estações eléctricas em funcionamento é o mais sério problema para o desenvolvimento económico e redução da pobreza do país.
Esta Estação Hidroeléctrica do Cutato é proposta para a electrificação rural e bem da região.

Item	Estação Hidroeléctrica do Cutato	Observações
Tipo	Tipo Hidroeléctrico	
Descarga Máxima	50 m^3/s	
Queda Bruta	8,0 m	
Queda Efetiva	7,5 m	
Geração Máxima	3MW (1,5MW X 2 Unidades)	
Energia Gerada Anual	21,1 GWh	
Zona da Bacia Hidrográfica	9.400 km^2	
Barragem		
Tipo	Barragem por Gravidade	
Altura	4,0 m	
Volume	970 m^3	
Fluxo	560 m^3/s	
Nível Cheio de Água	Cota 1404.4 m	
Área de Acumulação de Água	0,72 km^2	
Comporta de Desaguadouro	2 Jogos de Comportas Articuladas Largura: 35,0m, Altura: 3,0 m	
Comporta de Drenagem de Areia	1 Jogo de Comporta de Deslizamento Largura: 0,5m, Altura: 0,5m	
Entrada		
Largura	21,0 m	
Comprimento	14,5 m	
Altura	7,0 m	
Filtro	2 Jogos, Largura: 6,0 m, Altura: 7,25 m	
Central Eléctrica	Tipo semi-subterrâneo	Estrada de Acesso 28 km (Largura: 5,0m)
Largura	21,0 m	
Comprimento	28,0 m	
Altura	15,0 m	
Cota de Hall de Máquinas	Cota 1391,0 m & Cota 1394,0	
Exterior		
Largura	21,0 m	
Comprimento	2,0 m	
Altura	15,0 m	
Comportas de Saída	1 Jogo de Barreiras (Stop Log) Largura: 6,0 m, Altura: 3,0m	
Turbina	(tipo sS Tubular HK-1RT)	
Capacidade	1.500 kW	
Frequência	50 Hz	
Número de Unidades	2 Unidades	
Transformador Principal		(Sub Estação)
Capacidade	3.400 kVA	
Voltagem	6,6 kV / 33 kV	
Número de Unidades	1 Unidade	
Linha de Transmissão-Distribuição	30 kV	
Número	1	
Comprimento	31 km (Cutato-Chicumbi) 15 km (Chicumbi-Andulo) Total 46 km (Cutato - Andulo)	

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