

フィリピン共和国
フィリピンエネルギー省
イブガオ州政府

フィリピン共和国
小水力発電計画準備調査
(イブガオ州小水力発電計画)

報告書

概略設計図面集

平成25年3月
(2013年)

独立行政法人
国際協力機構 (JICA)

東電設計株式会社

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OR(3)

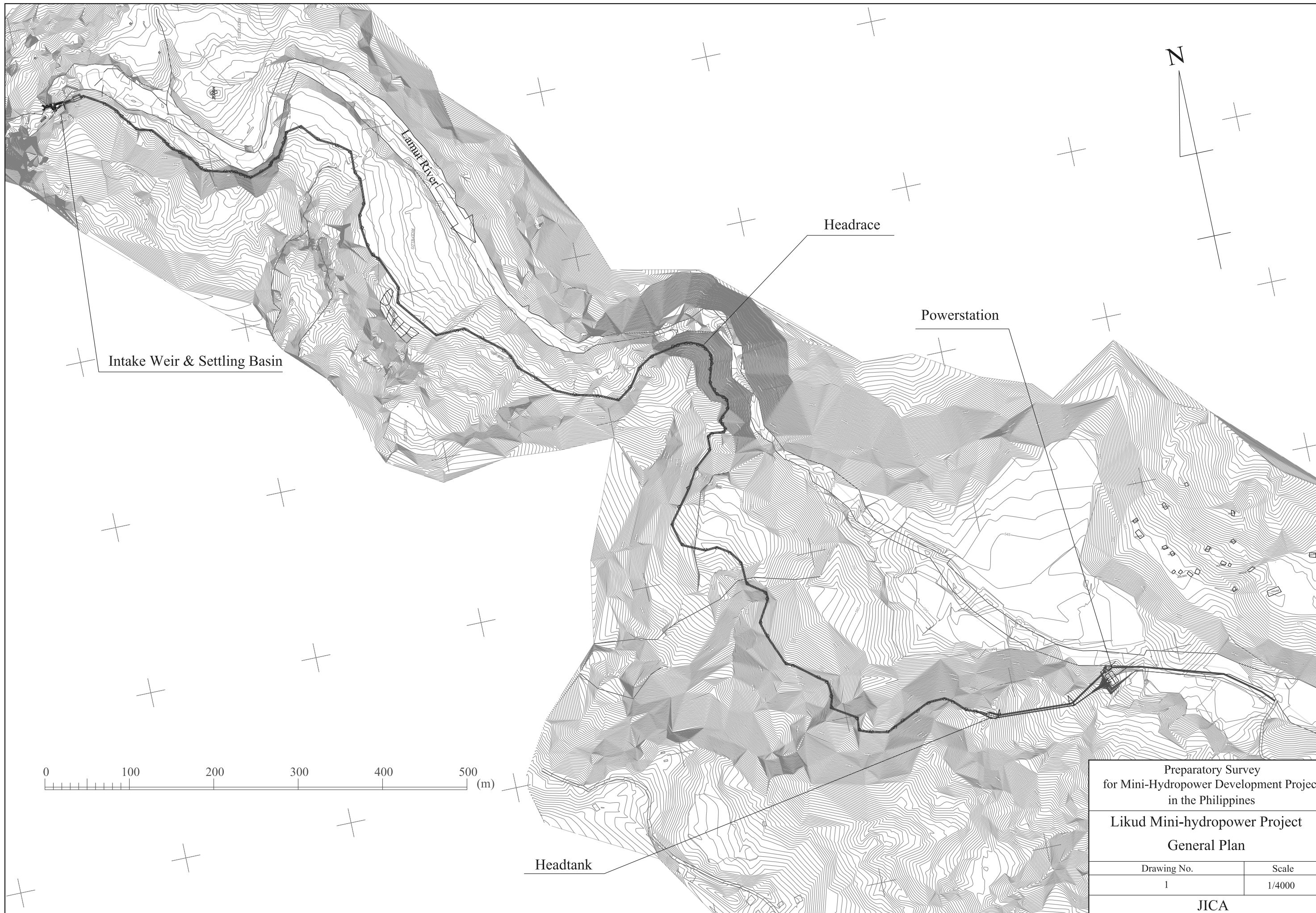
13-008

Preparatory Survey for Mini-hydropower Development in the Philippines
Mini Hydropower Project in the Province of Ifugao

Likud Mini-hydropower Project Drawing List

No.	Drawing Title	Scale
1	General Plan	1/4,000
2	Longitudinal Profile	VS=1/700 VH=1/7,000
3	Intake Weir	1/100
4	Settling Basin	1/100
5	Cross Section of Settling Basin	1/100
6	General Cross Section of Headrace	1/50
7	General Cross Section of Headrace	1/100
8	Overflow Spillway at Headrace	1/100
9	Flume at Headrace (IP-2~4)	1/100
10	Flume at Headrace (IP-15, 16)	1/100
11	Flume at Headrace (IP-56, 57)	1/100
12	Flume at Headrace (IP-89, 90)	1/100
13	Flume at Headrace (IP-90, 91)	1/100
14	Flume at Headrace (IP-94, 95)	1/100
15	Flume at Headrace (IP-105, 106)	1/100
16	Discharge Control Spillway at Headrace	1/100
17	Headtank	1/100

No.	Drawing Title	Scale
18	Cross Section of Headtank	1/100
19	Penstock Profile	1/500, 1/250
20	Spillway Profile	1/500
21	Anchor Block of Penstock (1/2)	1/100
22	Anchor Block of Penstock (2/2)	1/100
23	General Cross Section of Penstock and Spillway	1/100
24	Energy Dissipater of Spillway	1/100
25	Powerhouse	1/200
26	Cross Section of Powerhouse	1/200
27	Cross Section of Access Road	1/50
28	Single Diagram	-
29	Sub-Station Layout and Plan	-
30	Distribution Line Route (1/4)	-
31	Distribution Line Route (2./4)	-
32	Distribution Line Route (3/4)	-
33	Distribution Line Route (4/4)	-

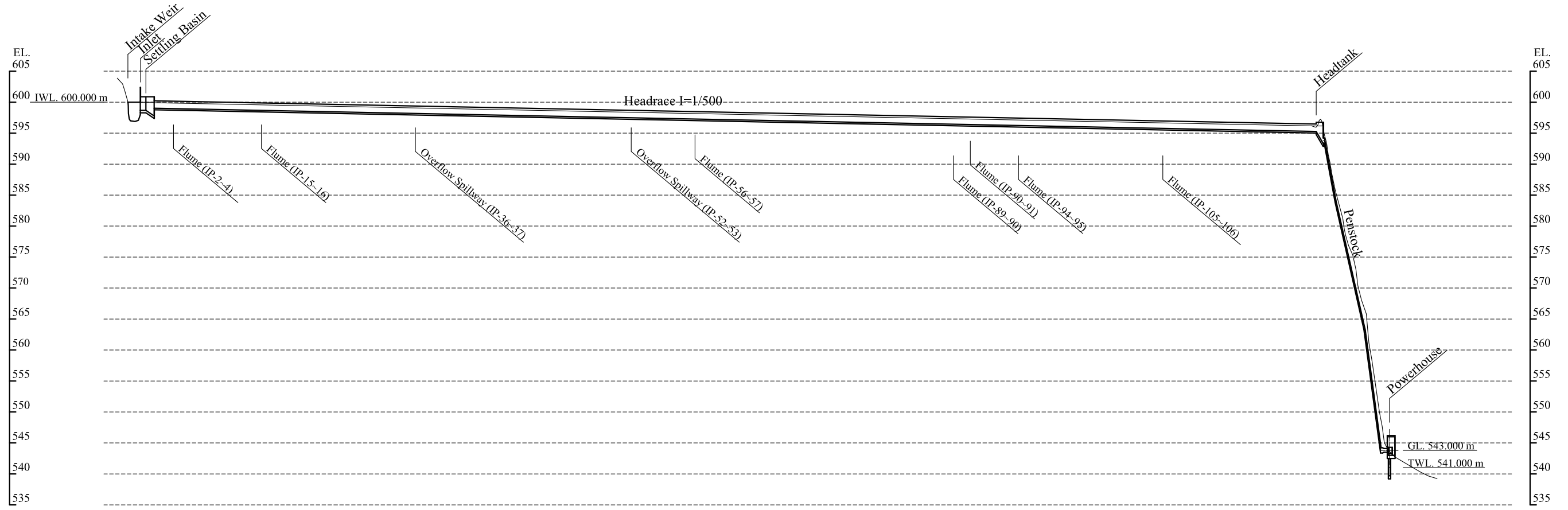


Preparatory Survey
for Mini-Hydropower Development Project
in the Philippines

**Likud Mini-hydropower Project
General Plan**

Drawing No.	Scale
1	1/4000

JICA



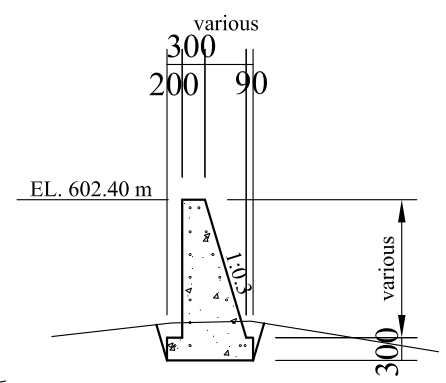
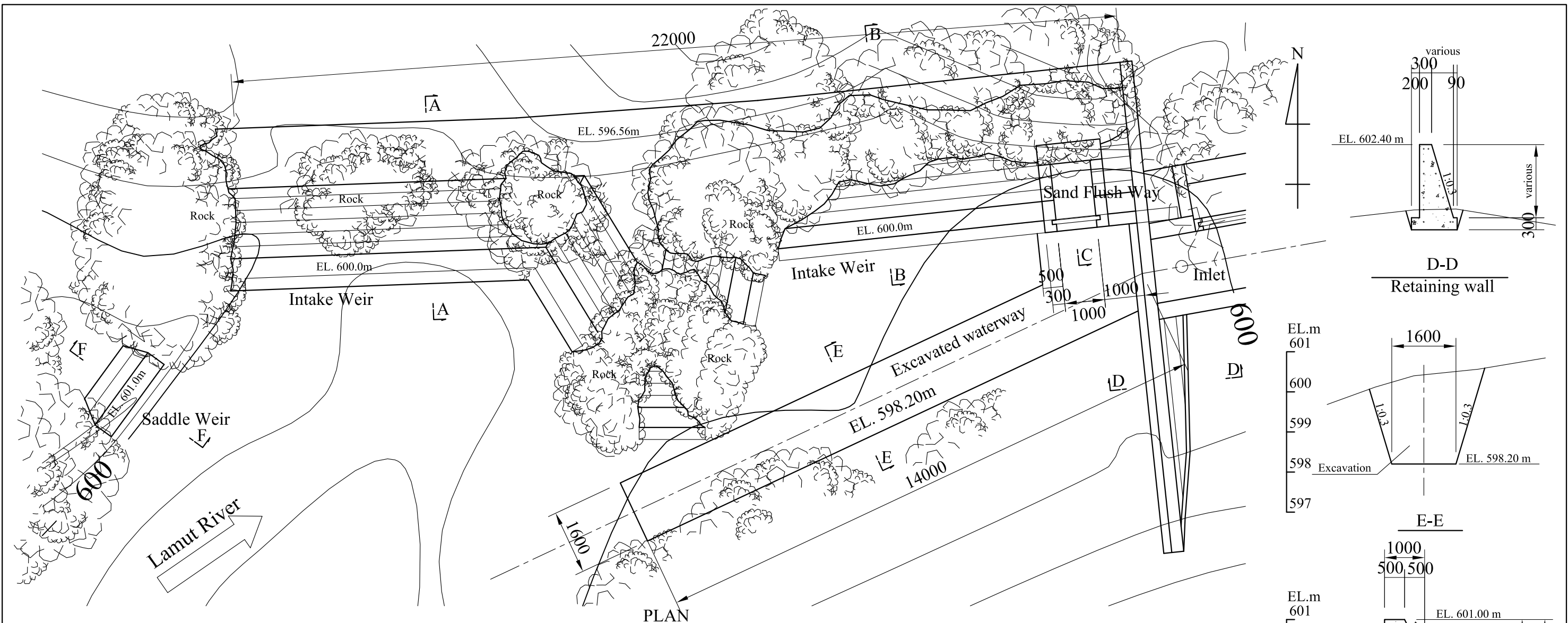
Altitude (EL. m)	Accumulated Distance	Distance (m)	Location
600.000	0.000	0.000	Intake Weir
599.976	9.000	9.000	Inlet
599.976	22.100	13.100	Settling Basin
599.911			IP-0
599.777	89.486	67.386	IP-5
599.649	153.486	64.000	IP-10
599.566	194.970	41.484	IP-15
599.467	244.112	49.142	IP-20
599.380	287.726	43.615	IP-25
599.308	323.726	36.000	IP-30
599.120	417.863	94.136	IP-35
598.929	513.188	95.325	IP-40
598.722	616.788	103.600	IP-45
598.426	764.788	148.000	IP-50
598.222	866.788	102.000	IP-55
597.984	985.788	119.000	IP-60
597.865	1,045.151	59.363	IP-65
597.804	1,075.651	30.500	IP-70
597.708	1,123.951	48.300	IP-75
597.630	1,162.651	38.700	IP-80
597.533	1,211.451	48.800	IP-85
597.277	1,339.160	127.709	IP-90
597.070	1,442.877	103.718	IP-95
596.828	1,563.877	121.000	IP-100
596.656	1,649.877	86.000	IP-105
596.468	1,743.877	94.000	IP-110
596.308	1,823.877	80.000	IP-115
596.222	1,866.521	42.643	IP-118
596.222	1,879.371	12.850	H/T
593.789	1,881.371	2.000	IP-1
576.000	1,922.692	41.321	IP-2
565.755	1,955.845	33.153	IP-3
563.816	1,978.091	22.246	IP-4
550.064	2,020.332	42.241	IP-5
543.800	2,029.191	8.859	No.1 G/T
543.000	2,036.465	7.274	

Preparatory Survey
for Mini-Hydropower Development Project
in the Philippines

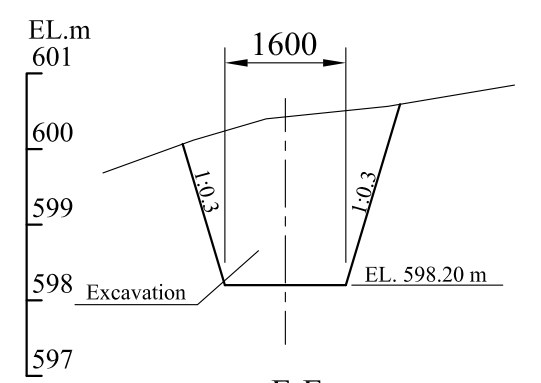
Likud Mini-hydropower Project
Longitudinal Profile

Drawing No.	Scale
2	VS=1/700 VH=1/7,000

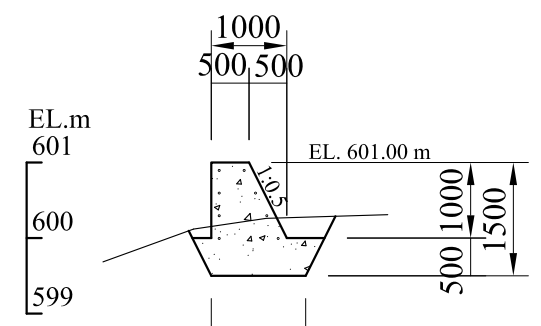
JICA



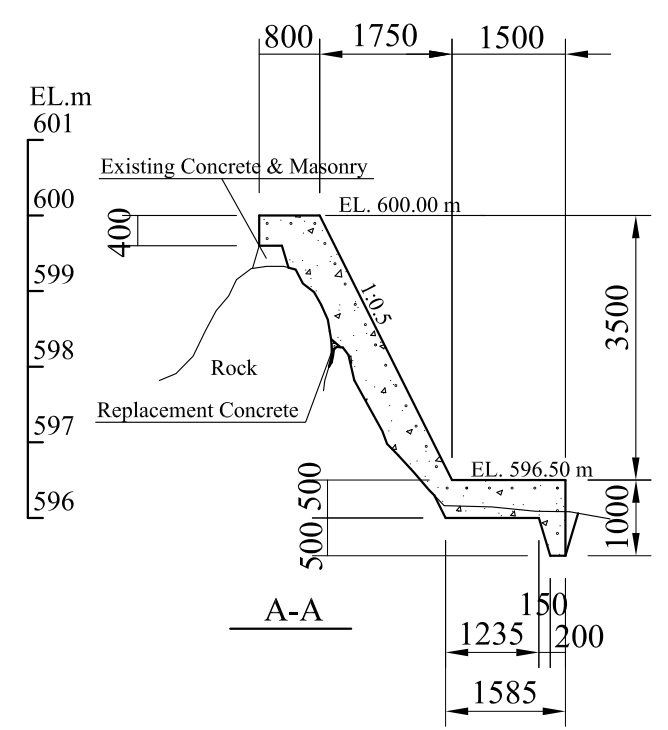
D-D
Retaining wall



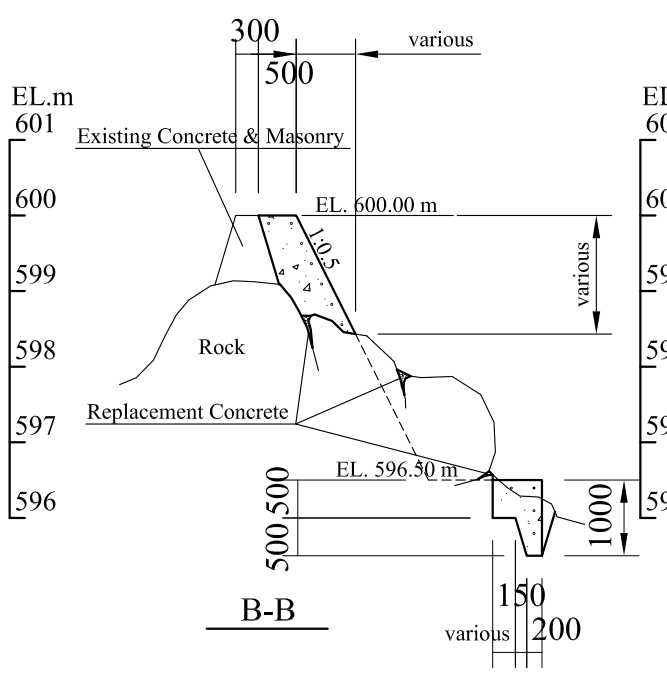
E-E



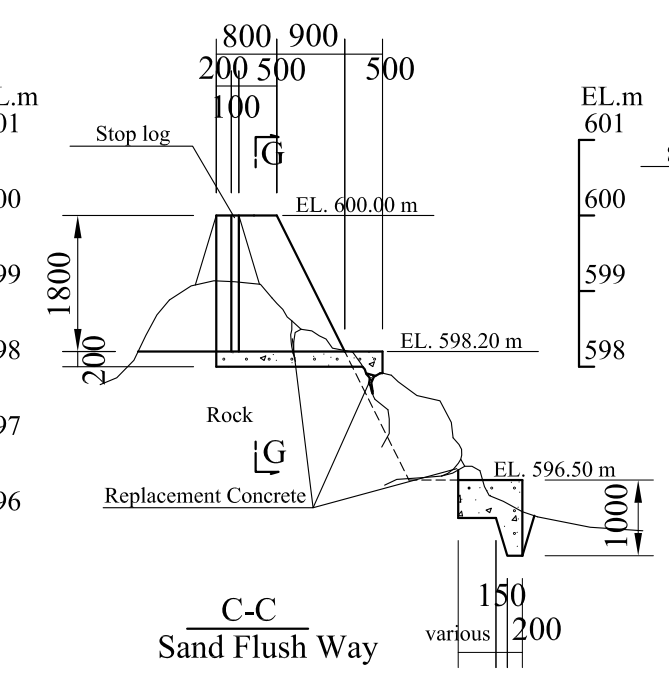
F-F
Saddle Weir



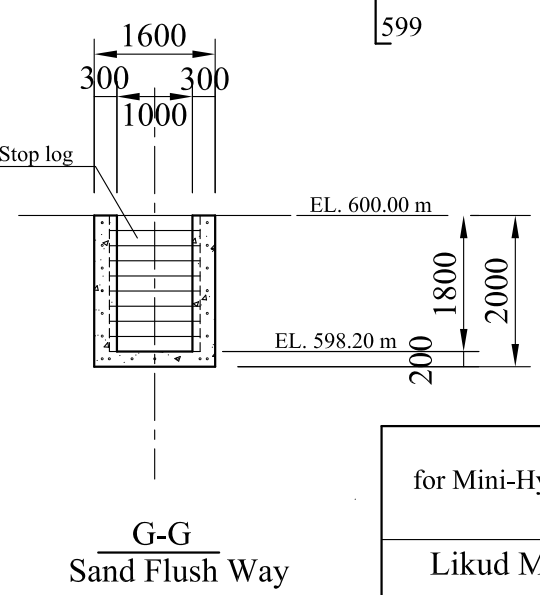
A-A



B-B

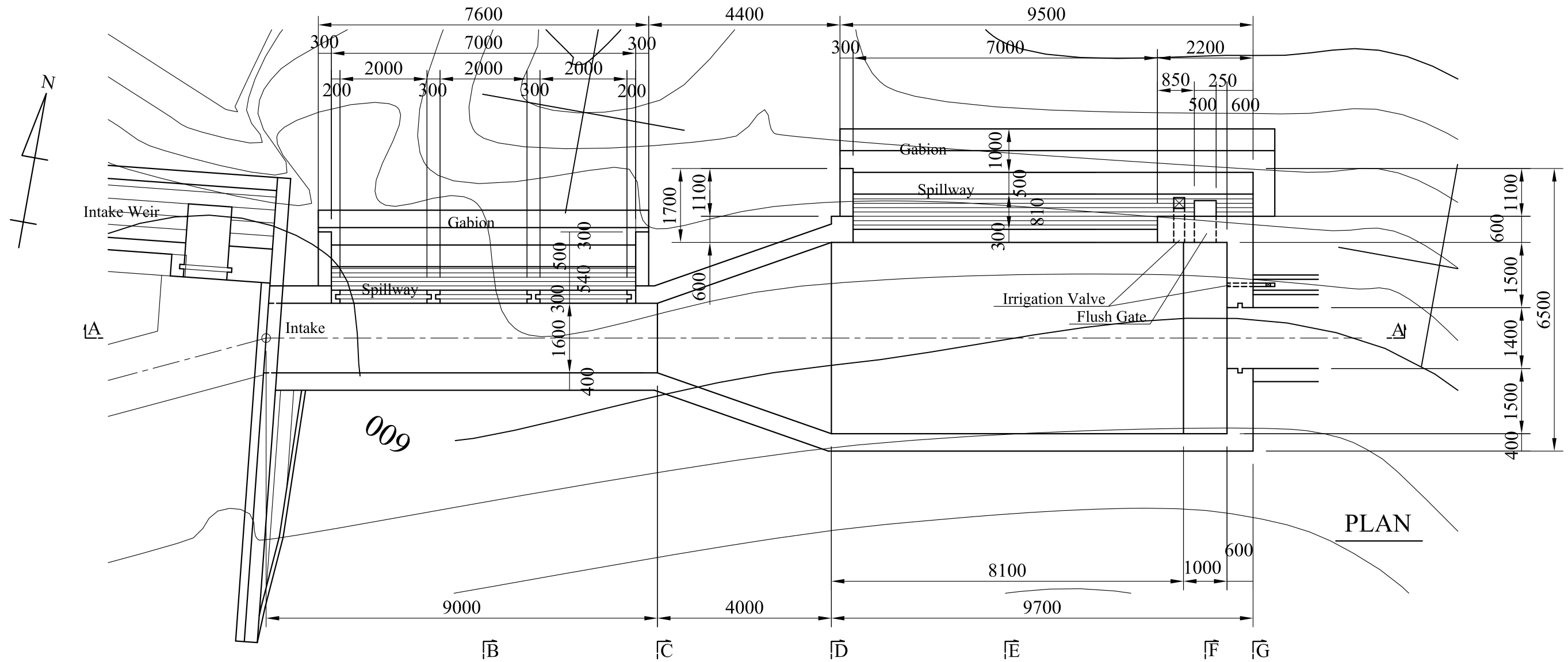


C-C
Sand Flush Way

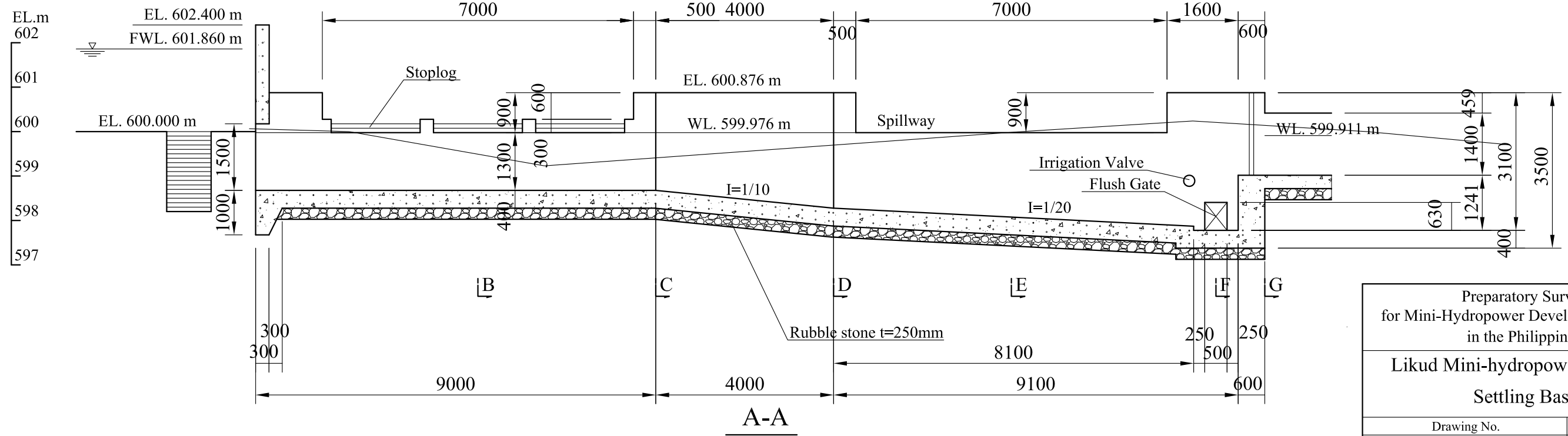


G-G
Sand Flush Way

Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project	
Intake Weir	
Drawing No.	Scale
3	1/100
JICA	

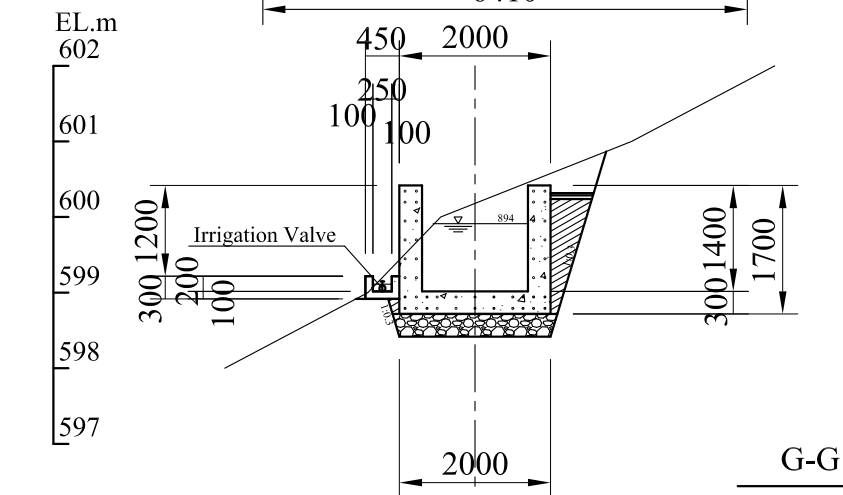
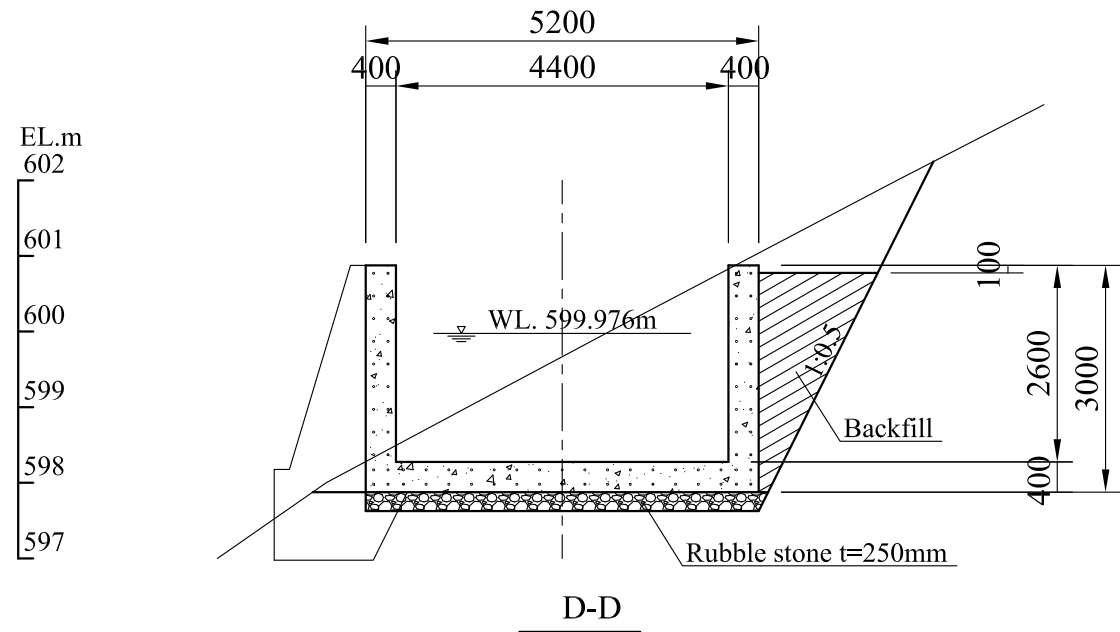
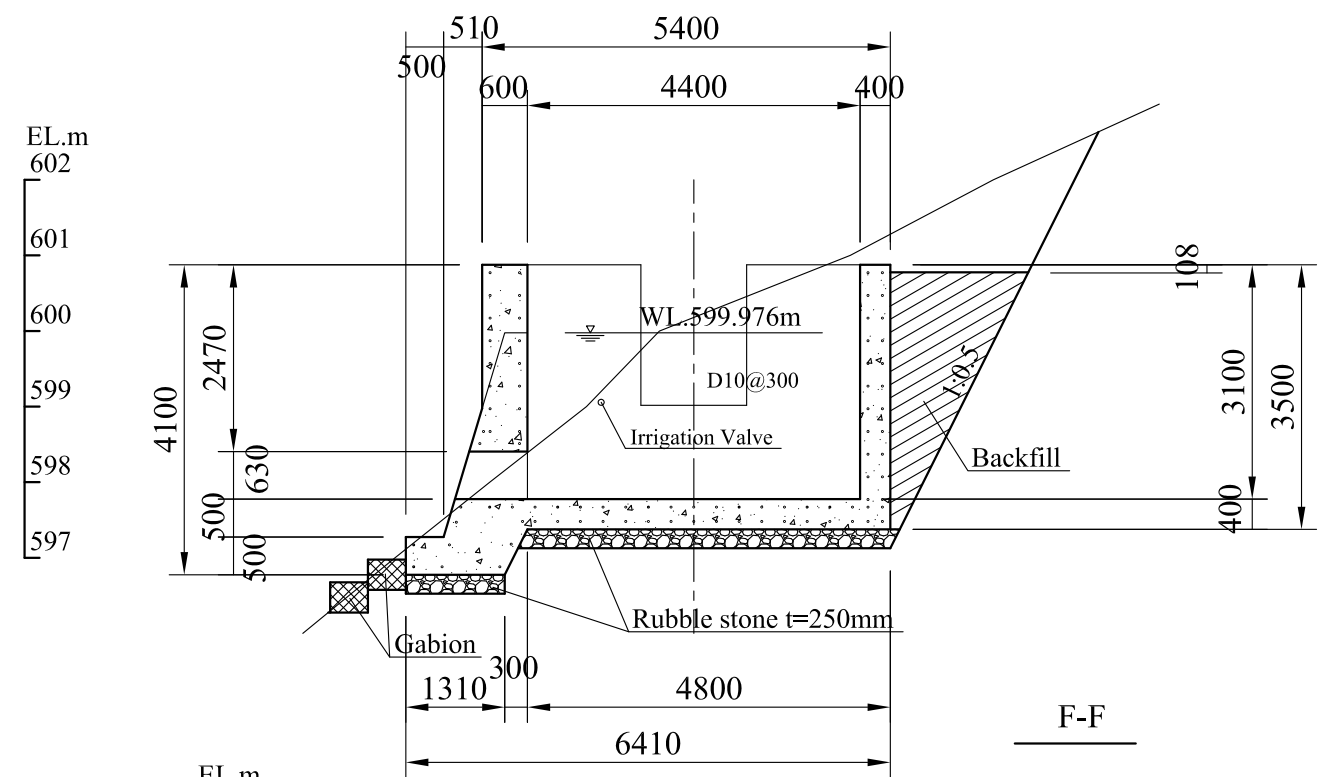
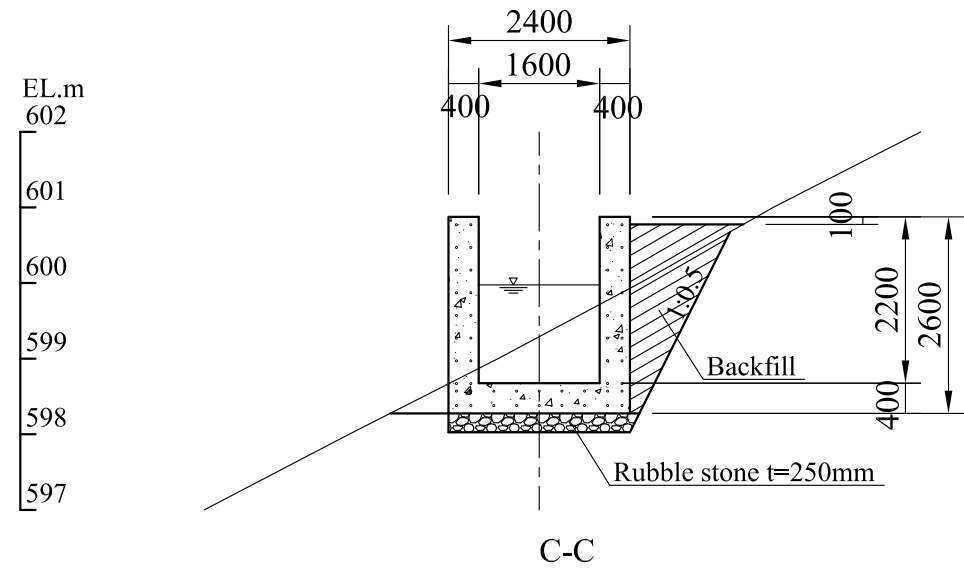
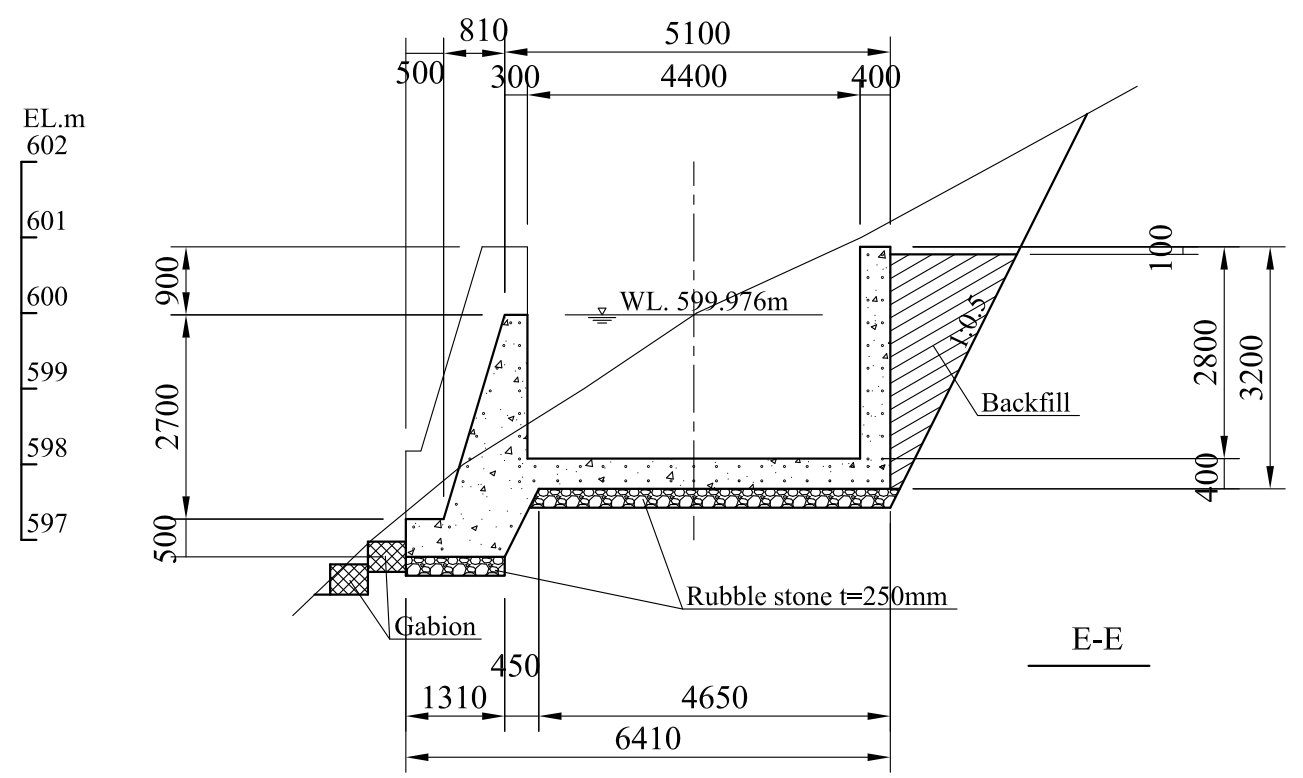
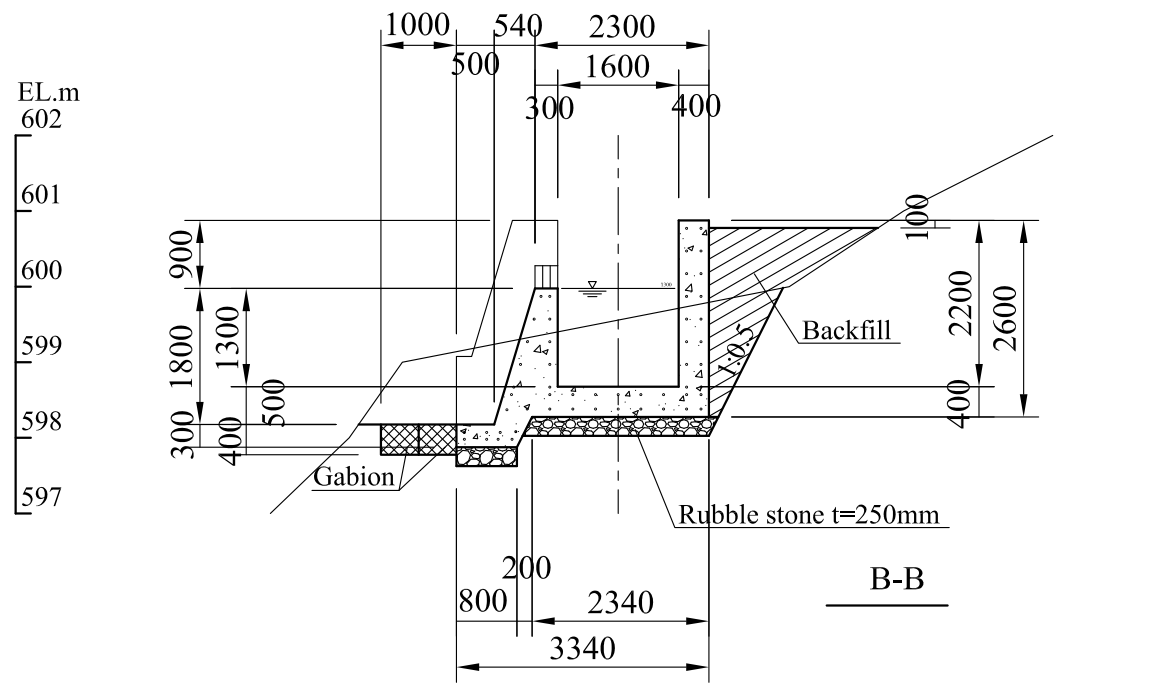


PLAN

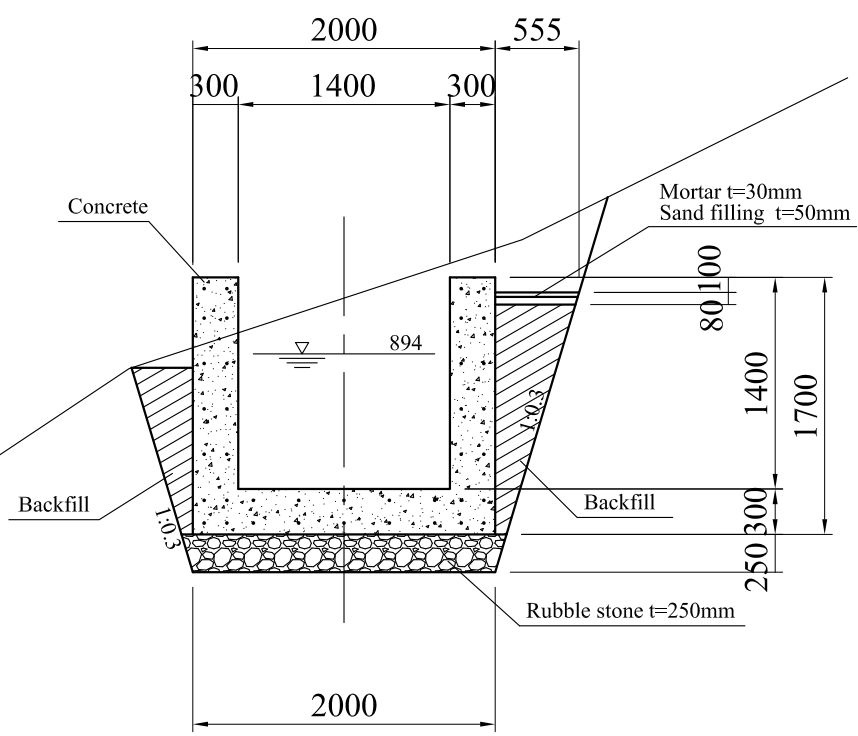


A-A

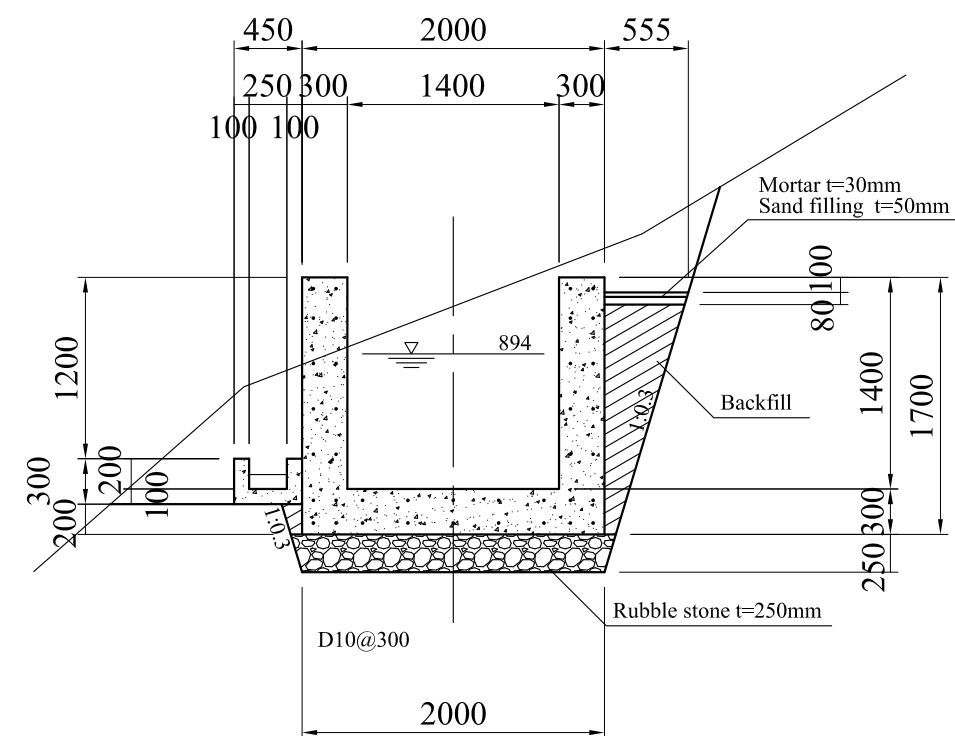
Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project Settling Basin	
Drawing No.	Scale
4	1/100
JICA	



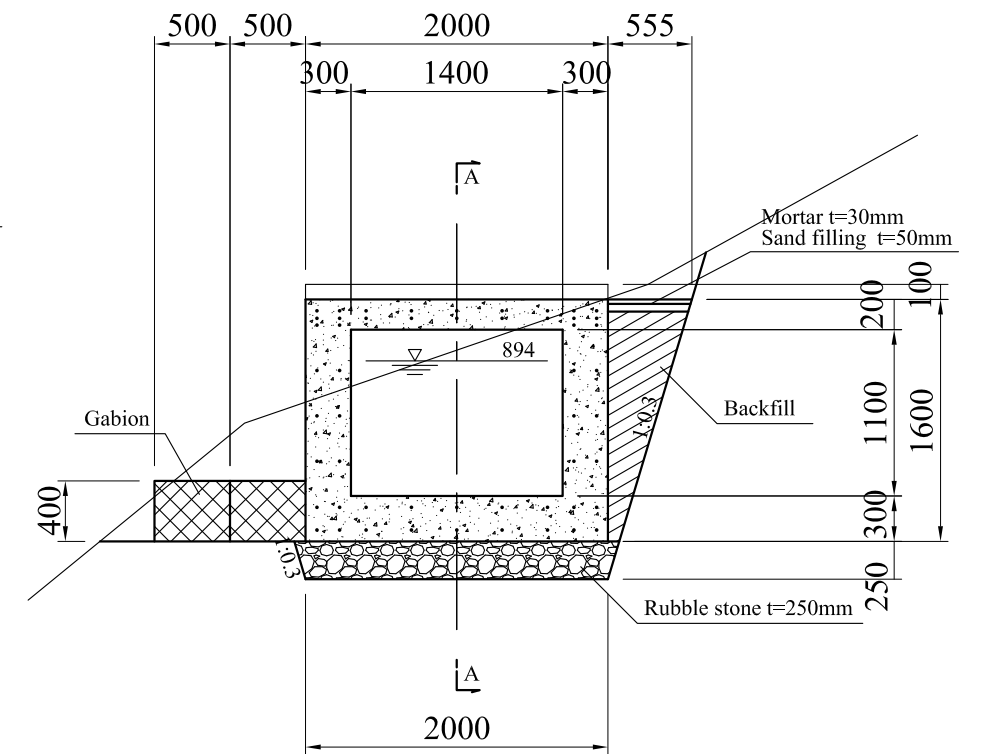
Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project Cross Section of Settling Basin	
Drawing No.	Scale
5	1/100
JICA	



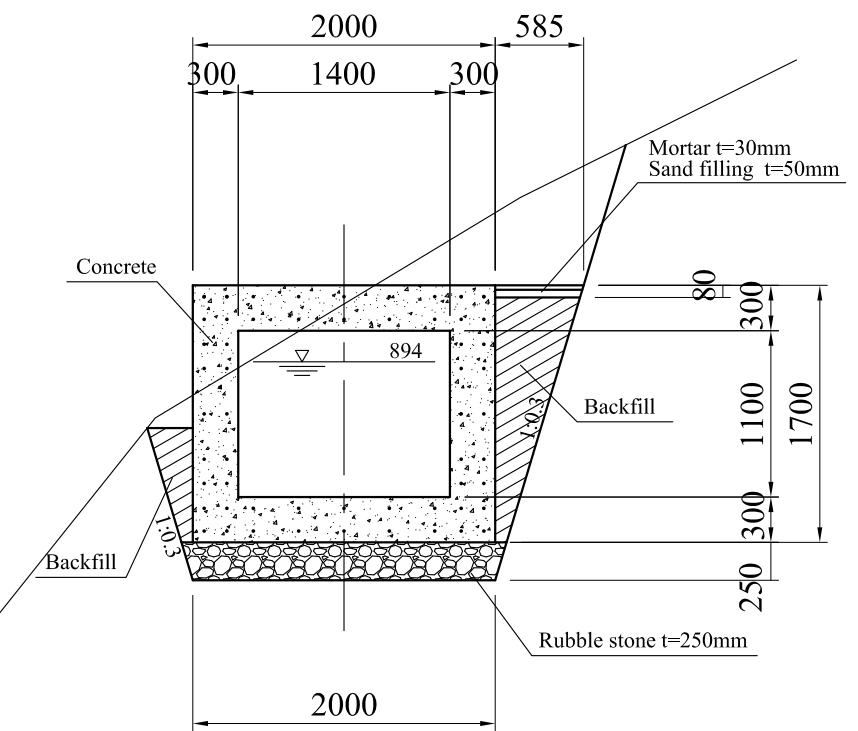
Type A
Open Channel



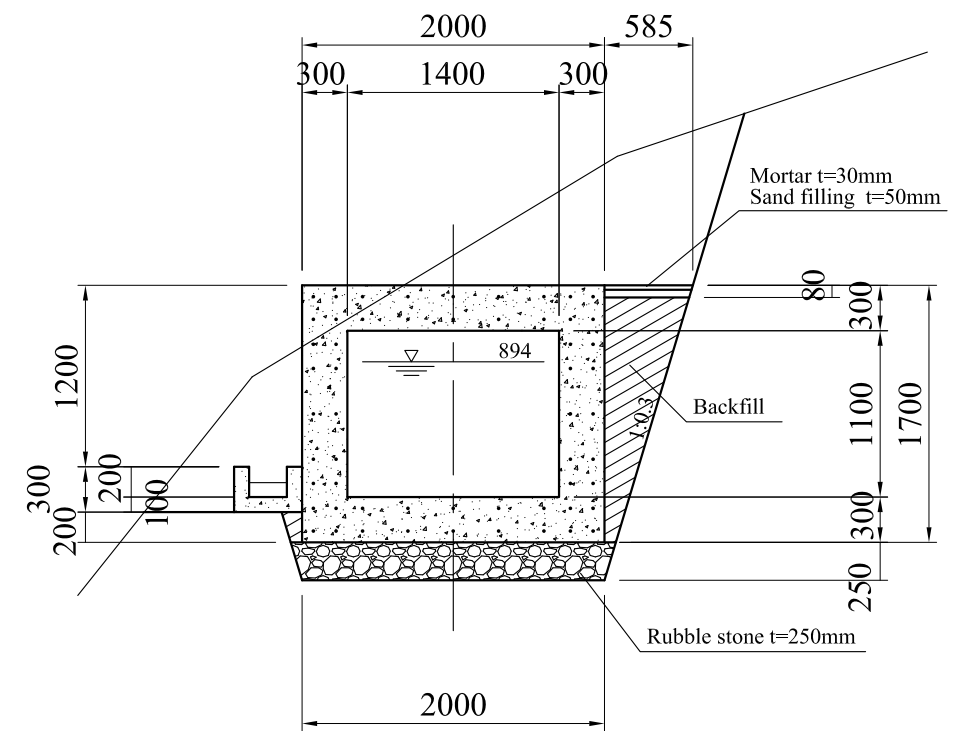
Type A
with Irrigation channel



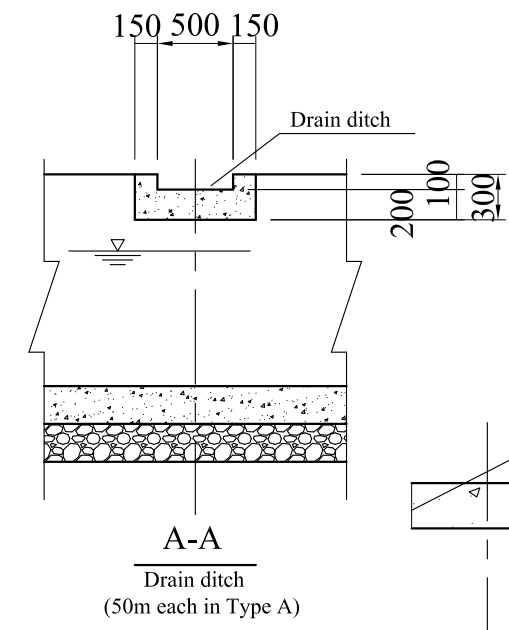
Type A
Drain ditch



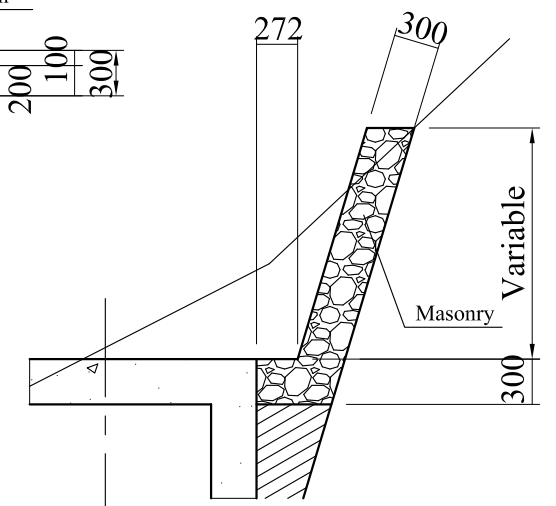
Type B
Culvert



Type B
with Irrigation channel



A-A
Drain ditch
(50m each in Type A)



Slope Protection
for steep portion

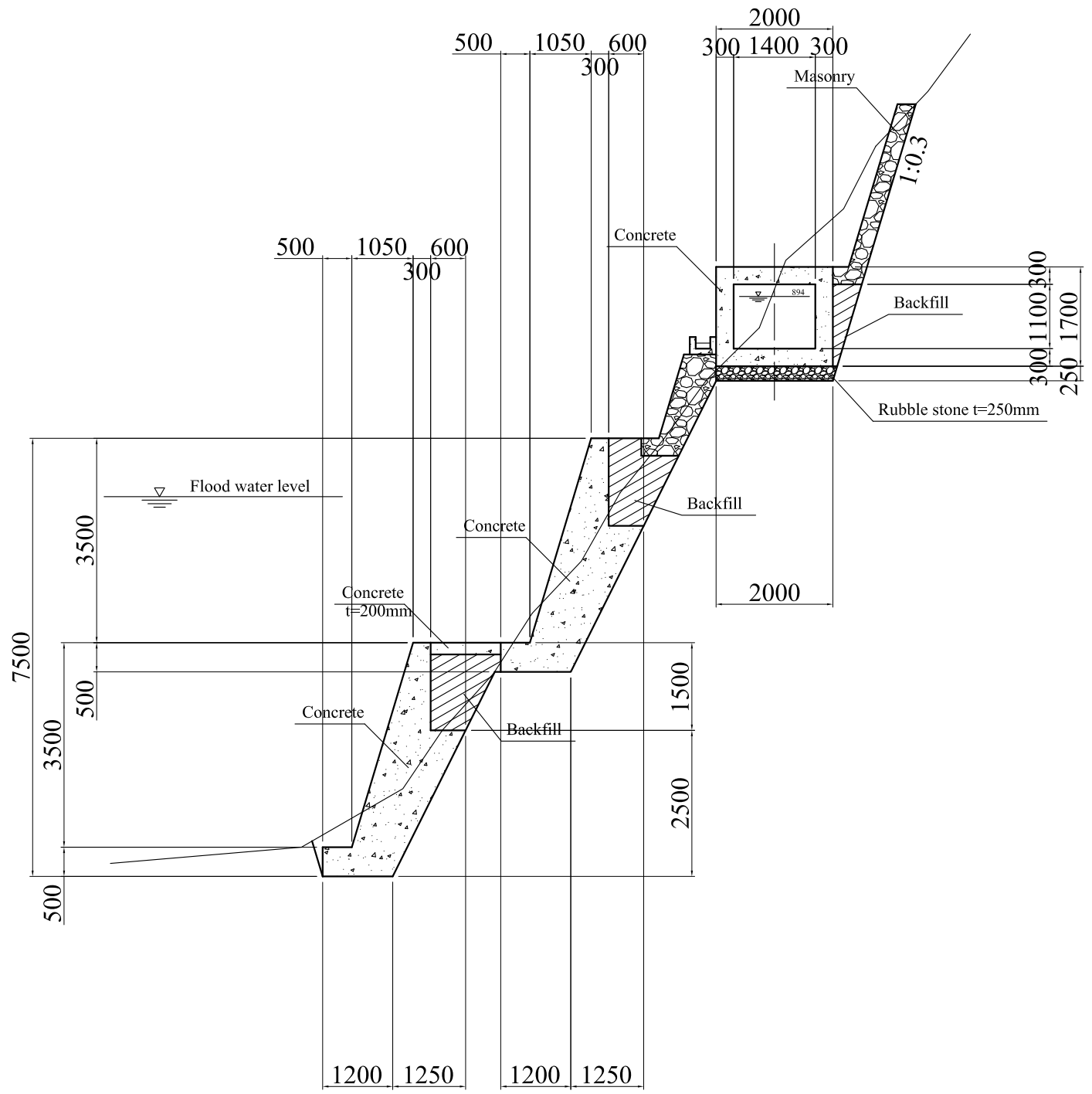
Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project General Cross Section of Headrace	
Drawing No.	Scale
6	1/50
JICA	

EL.
605

600

595

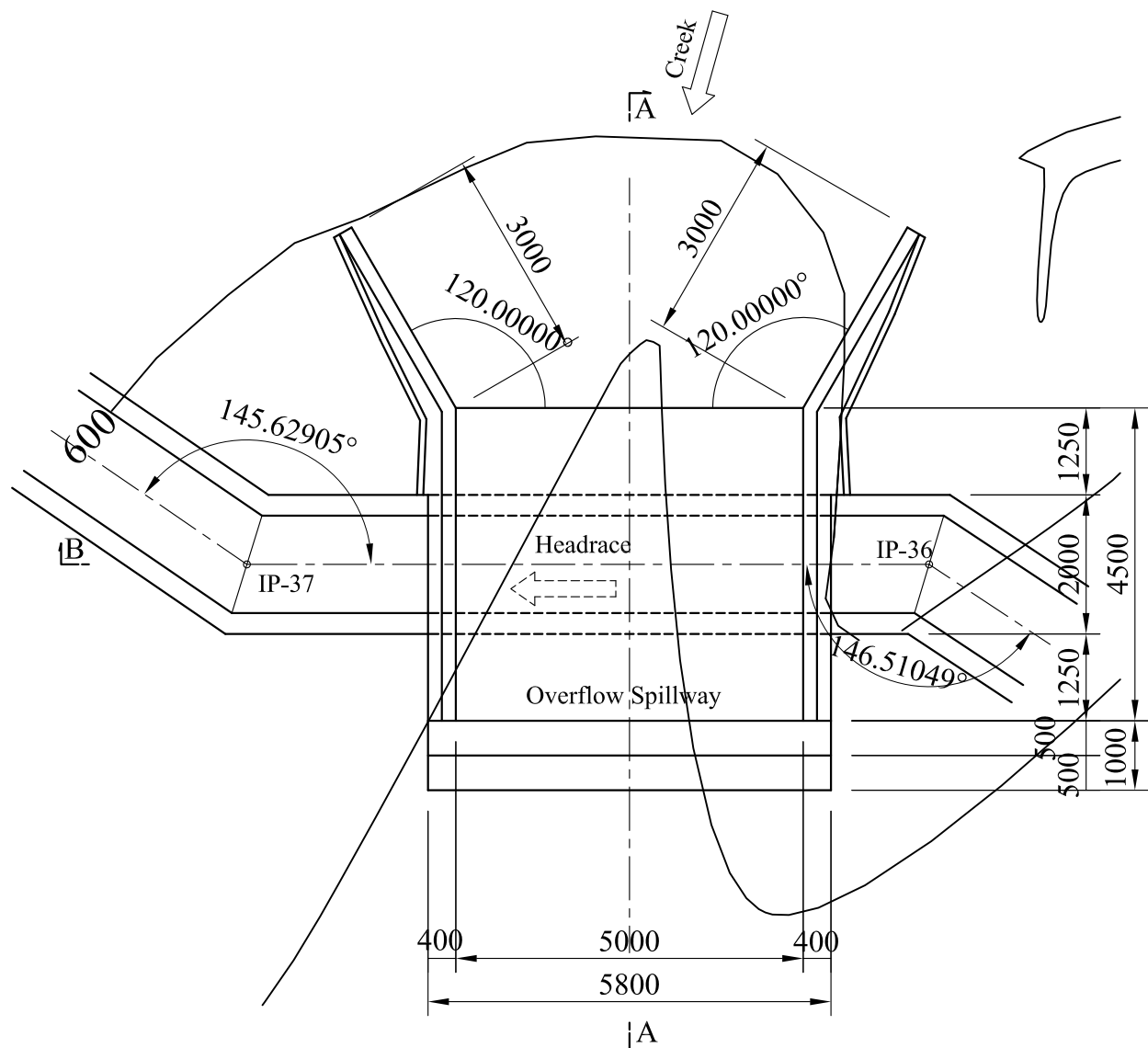
590



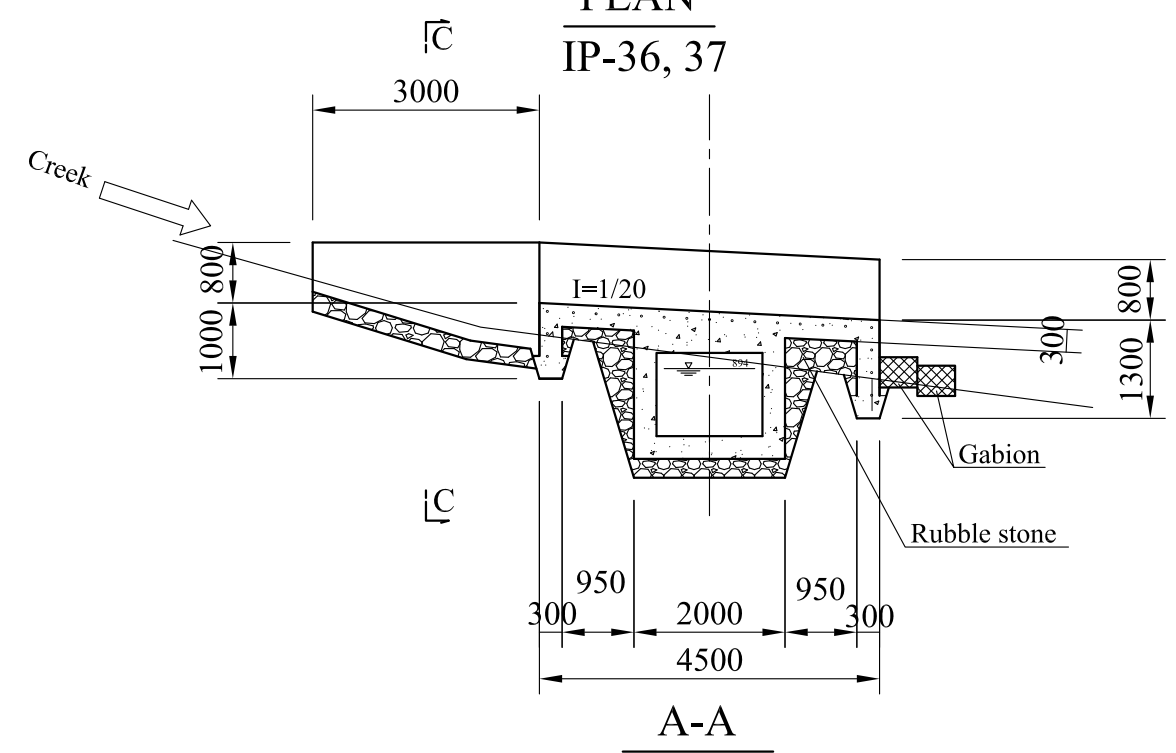
Type C
Steep slope zone

IP-16~31

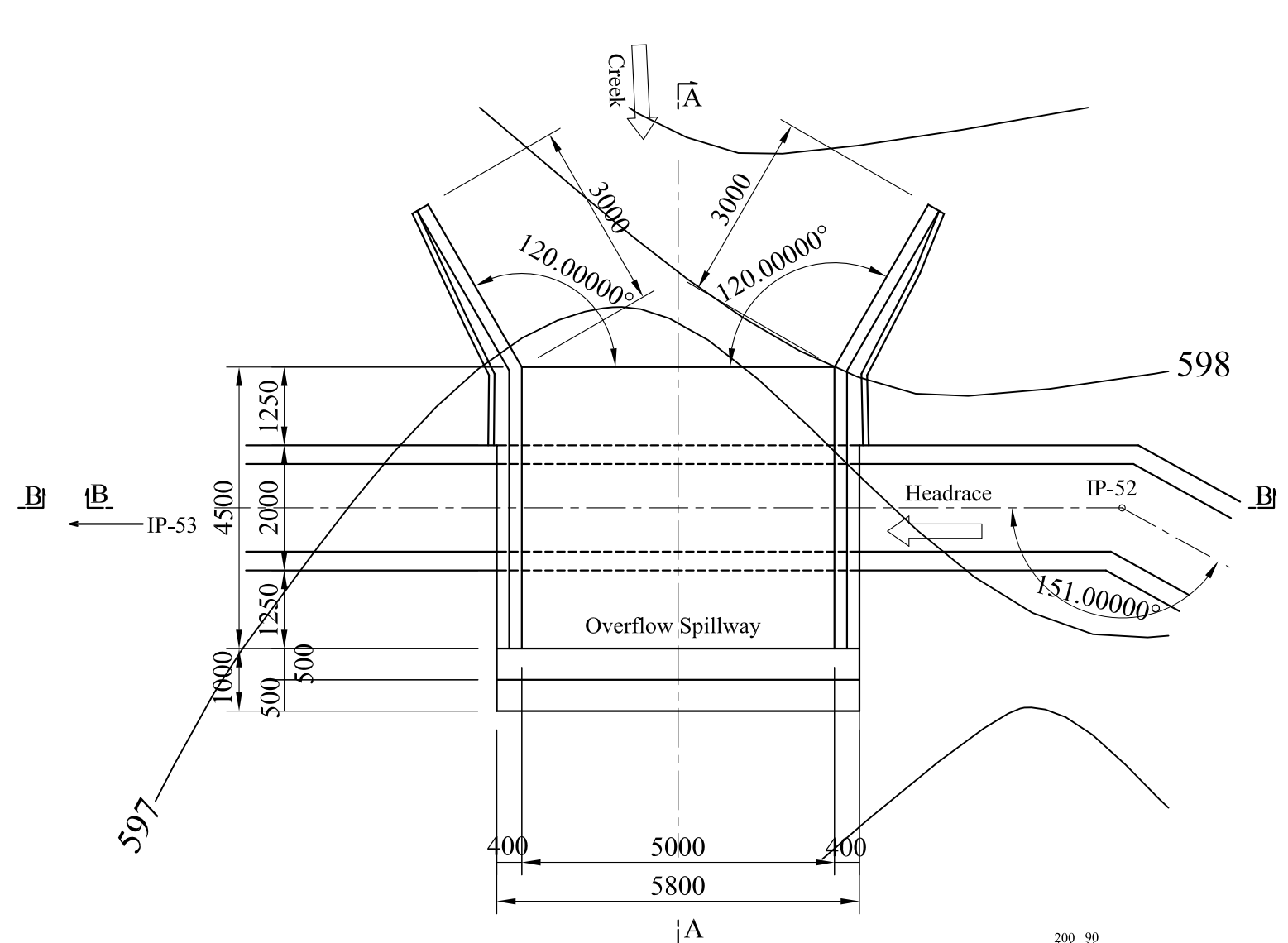
Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project General Cross Section of Headrace	
Drawing No.	Scale
7	1/100
JICA	



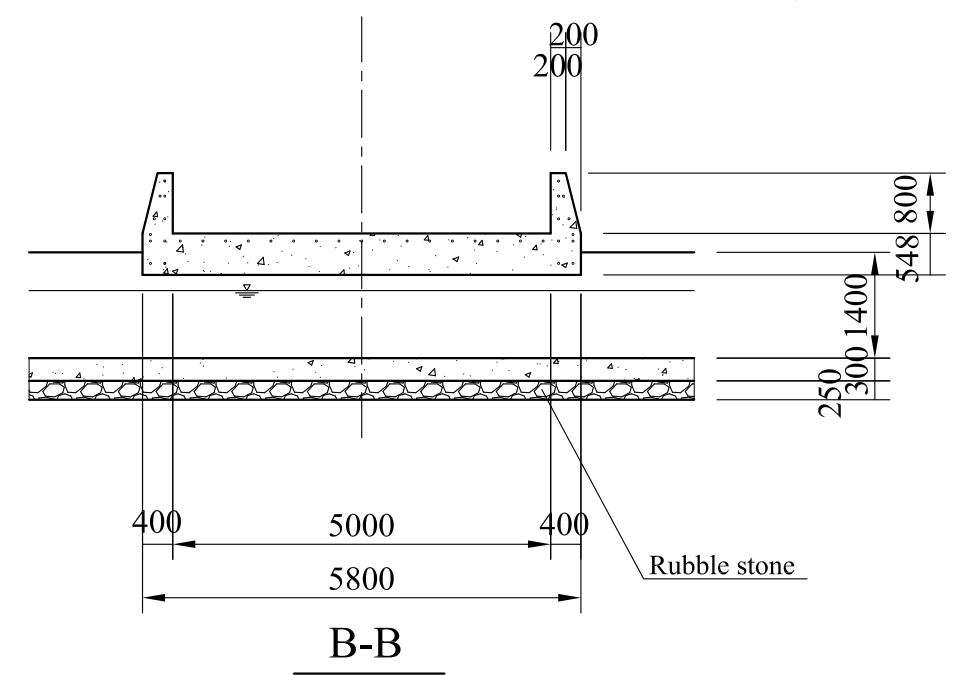
PLAN
IP-36, 37



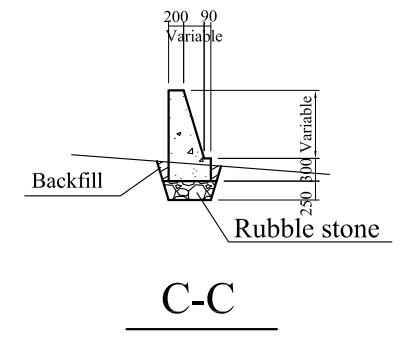
A-A



PLAN
IP-52, 53



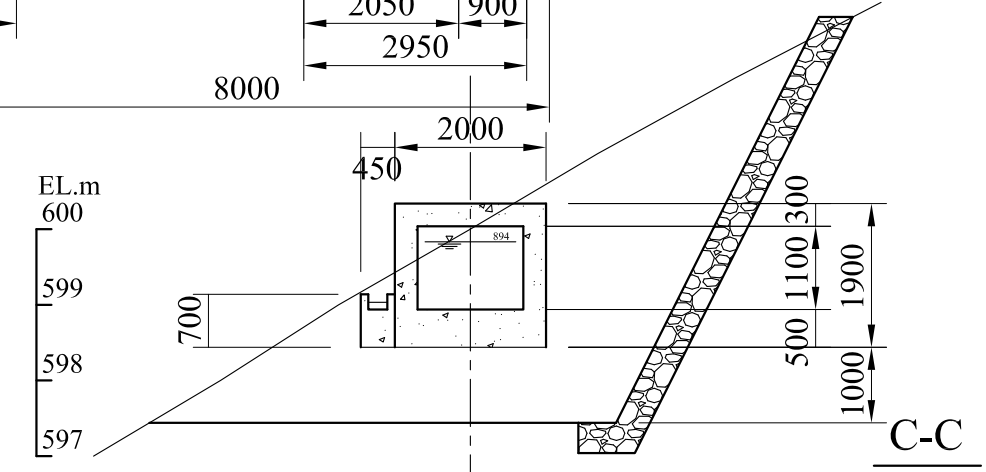
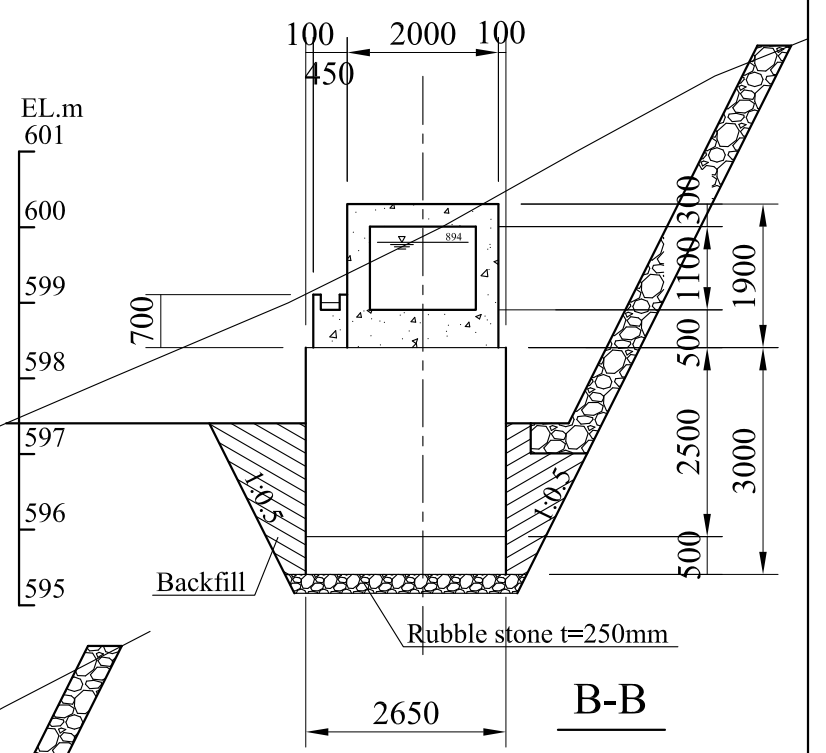
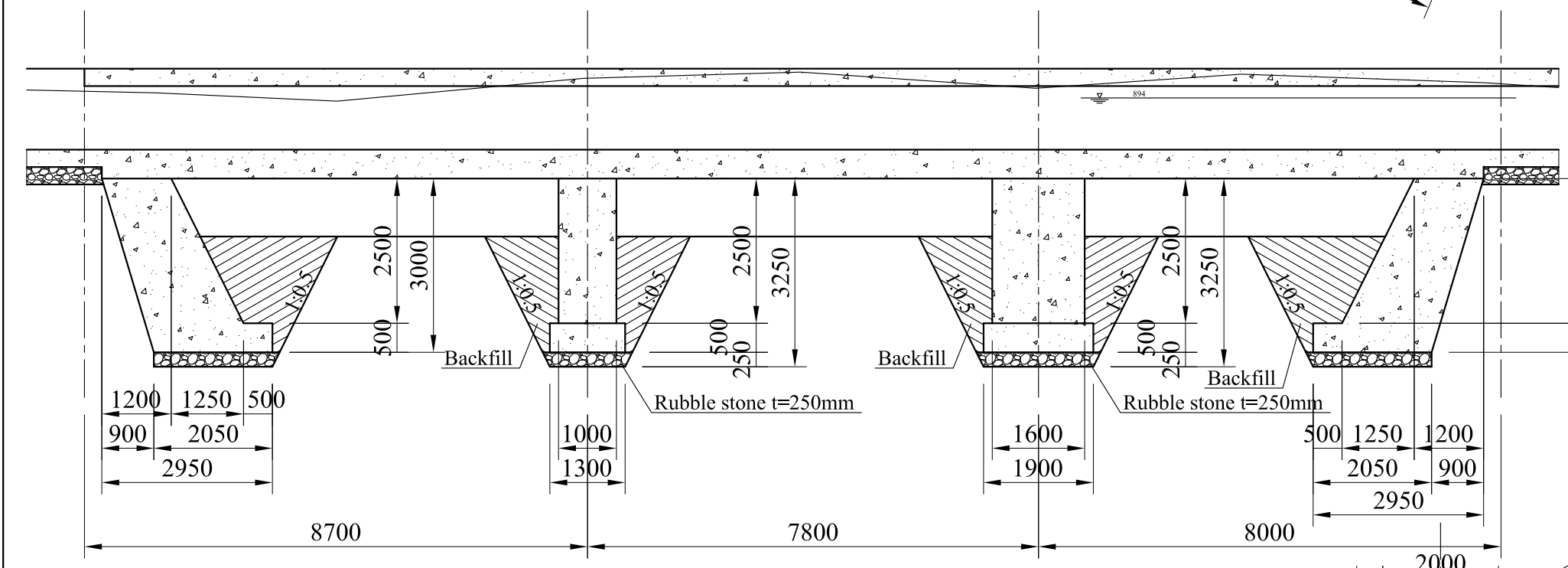
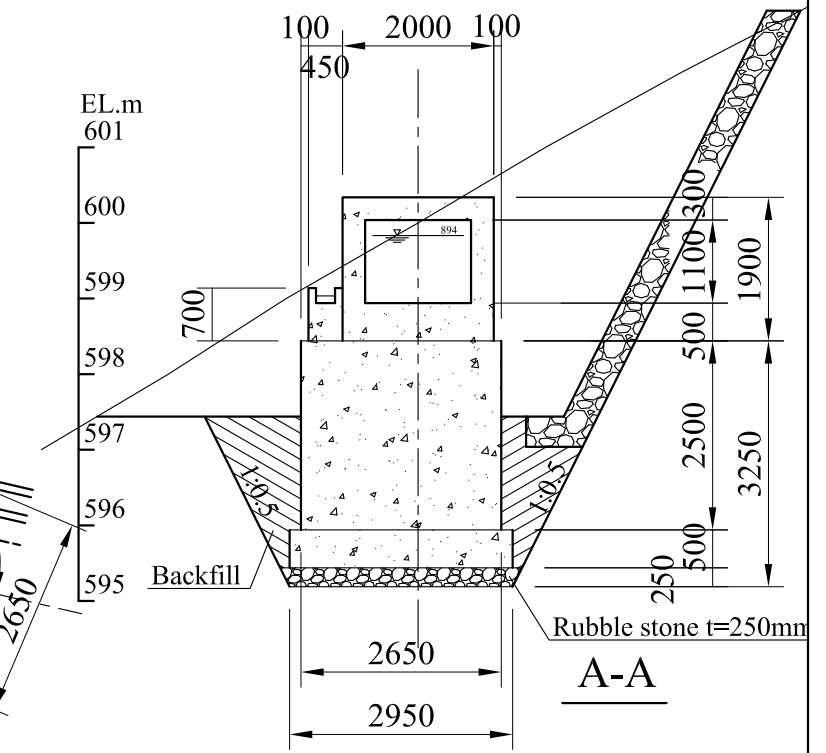
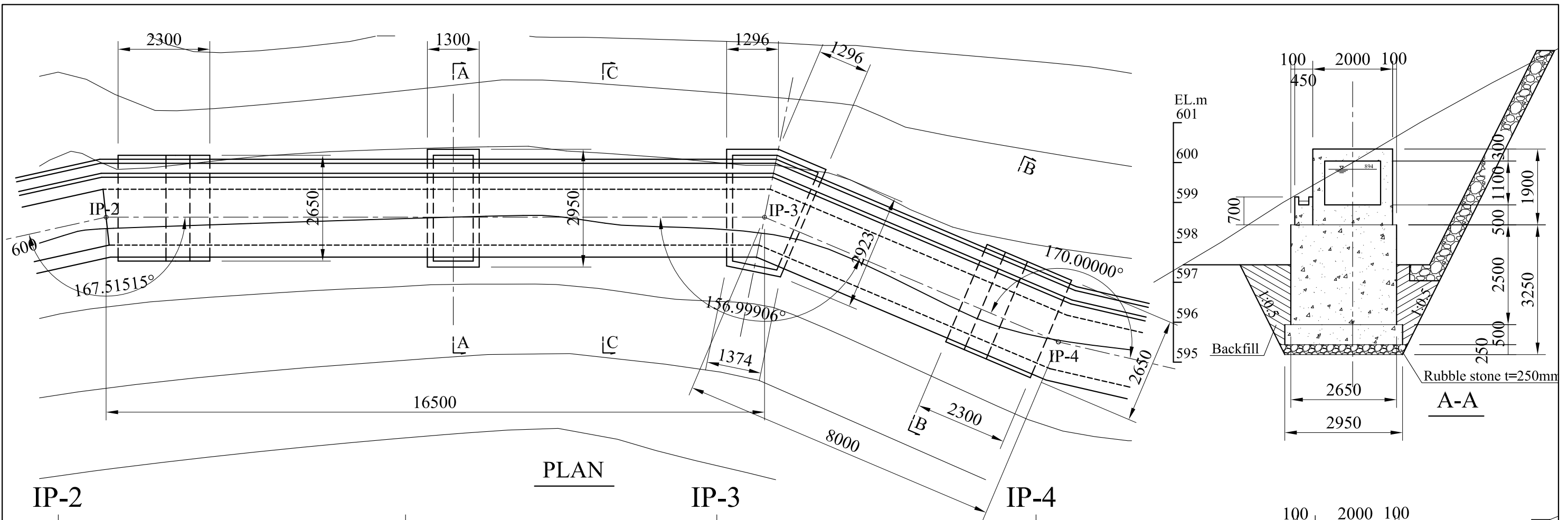
B-B



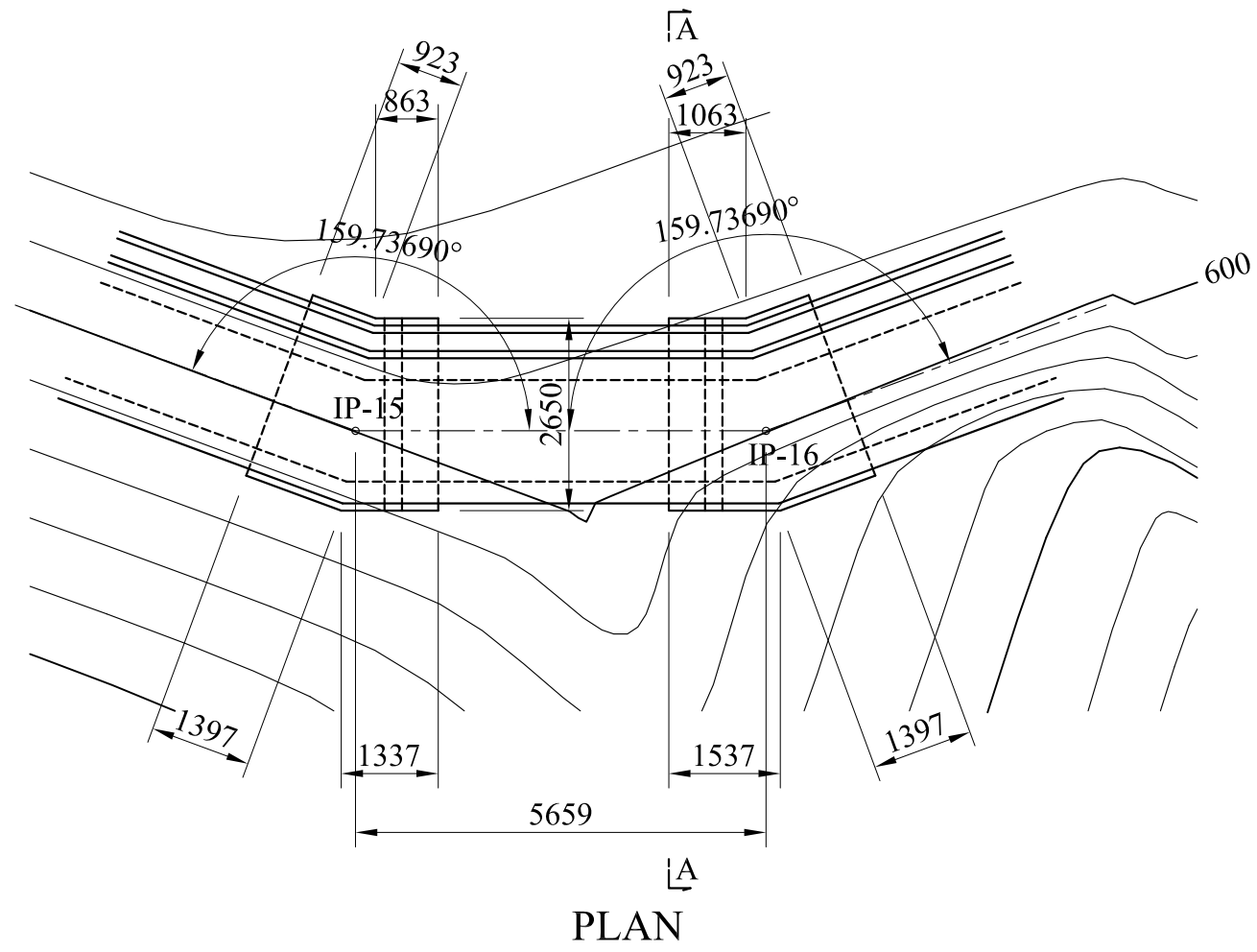
C-C

IP-36, 37
IP-52, 53

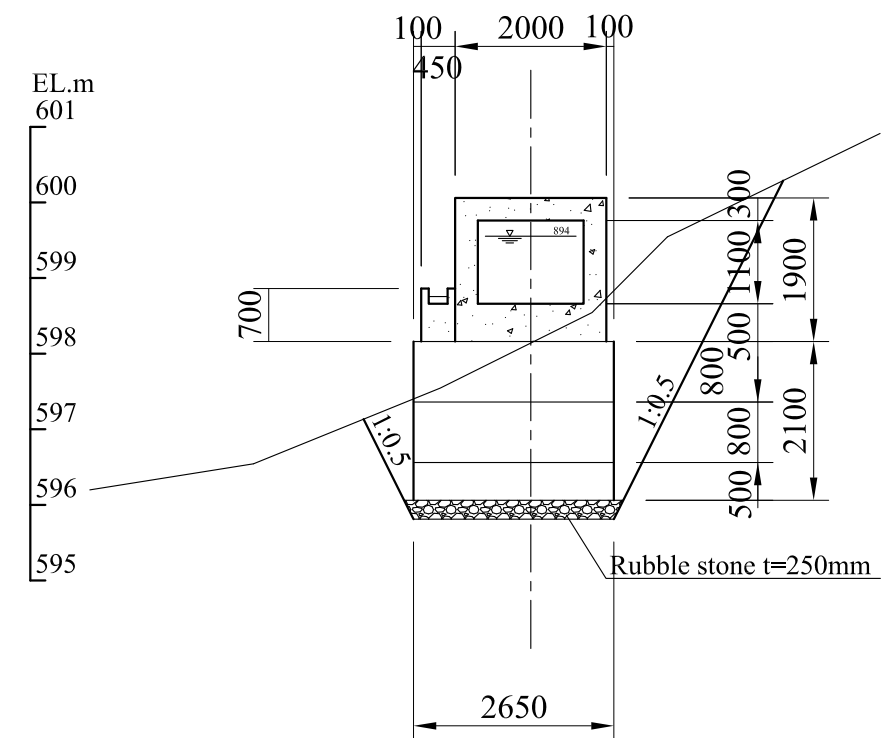
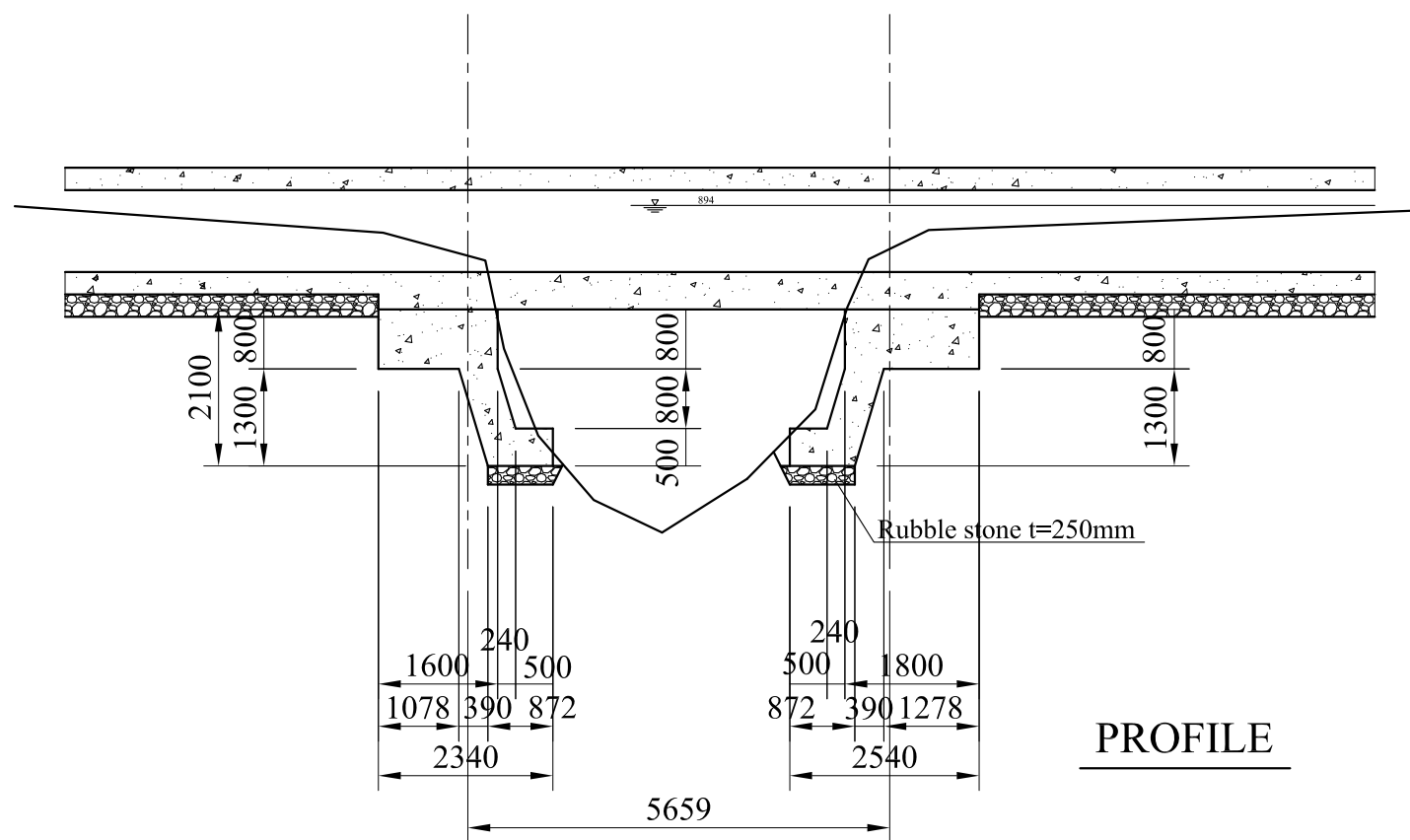
Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project Overflow Spillway at Headrace	
Drawing No.	Scale
8	1/100
JICA	



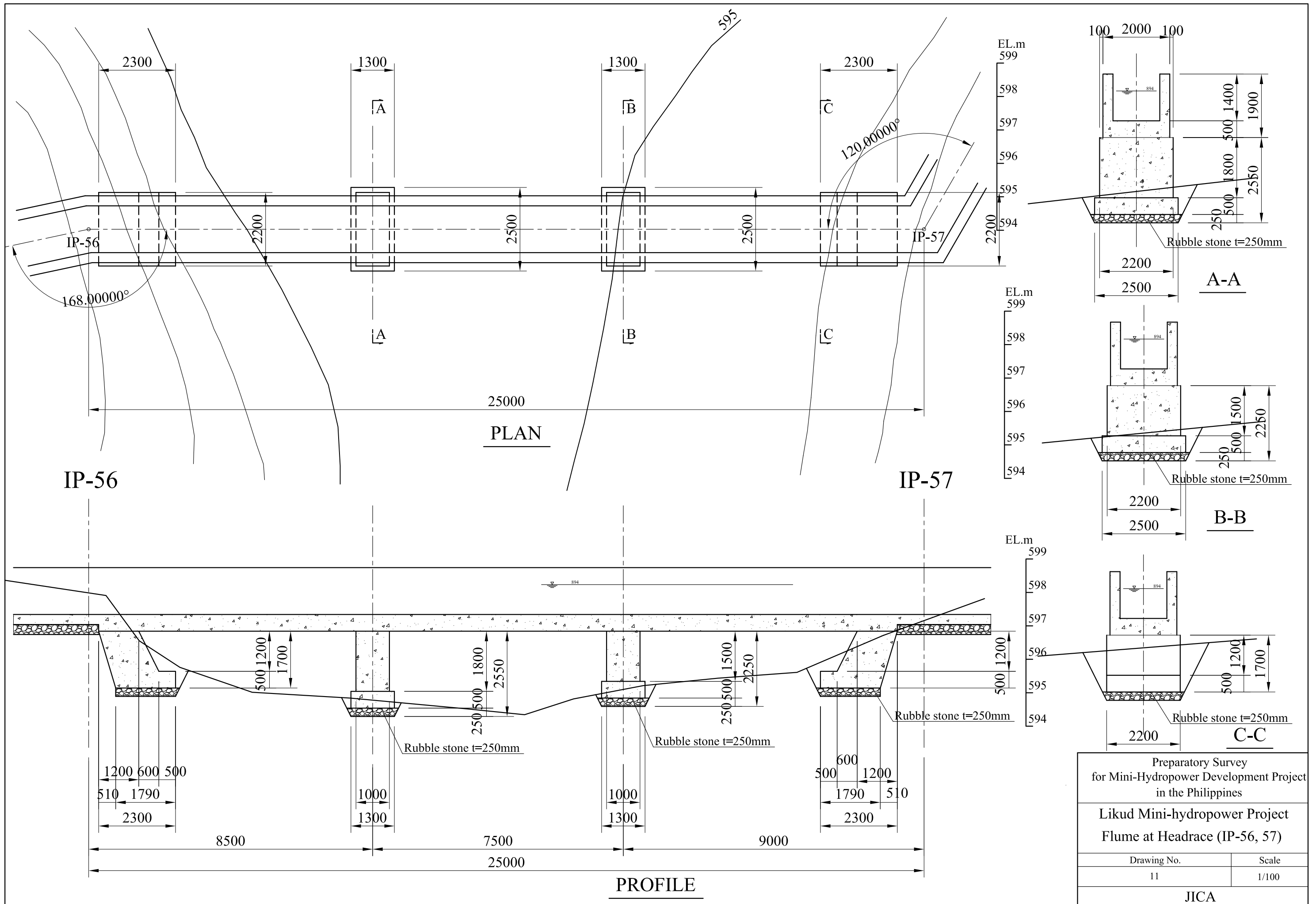
Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project Flume at Headrace (IP-2~4)	
Drawing No.	Scale
9	1/100
JICA	



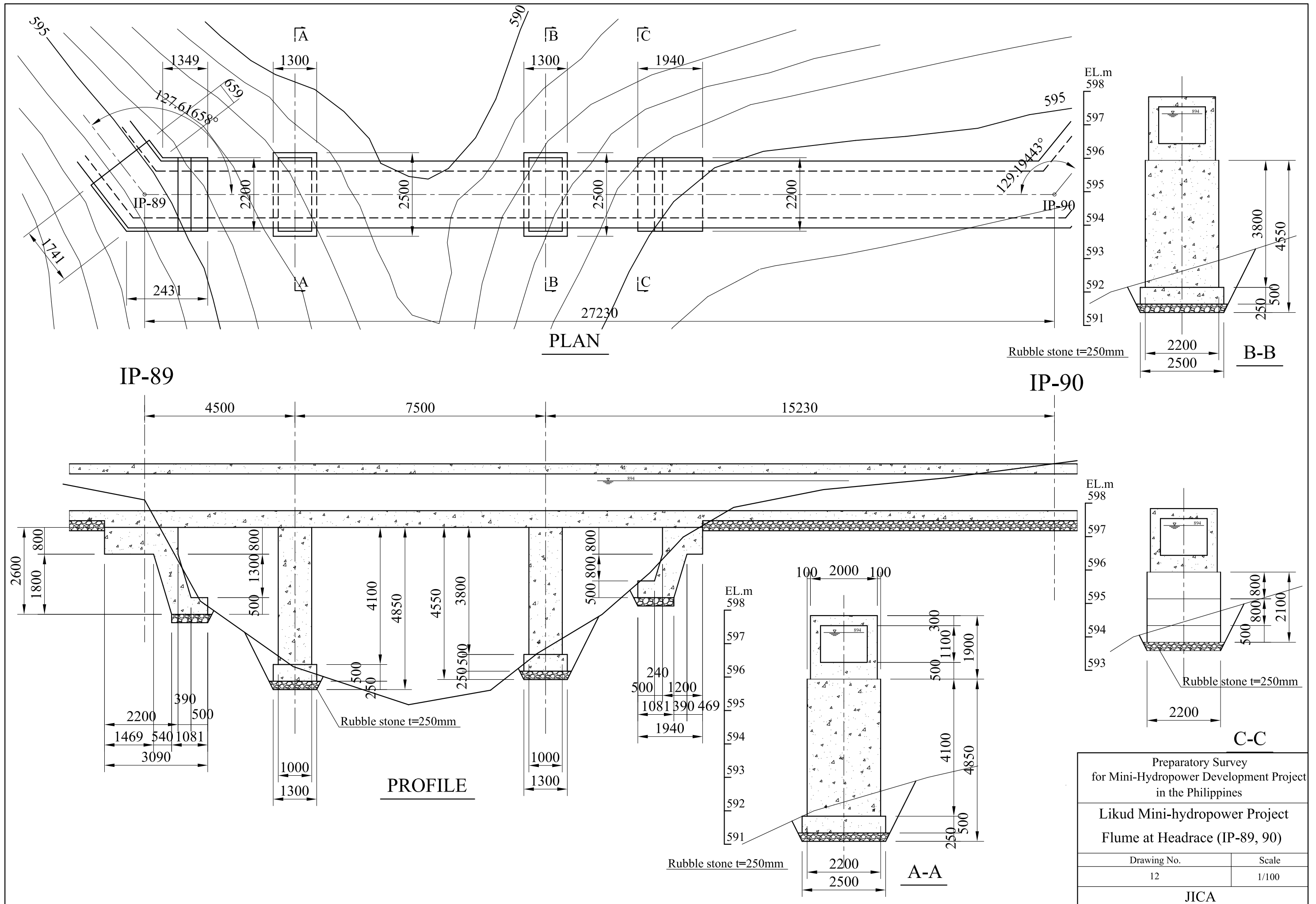
IP-15 IP-16



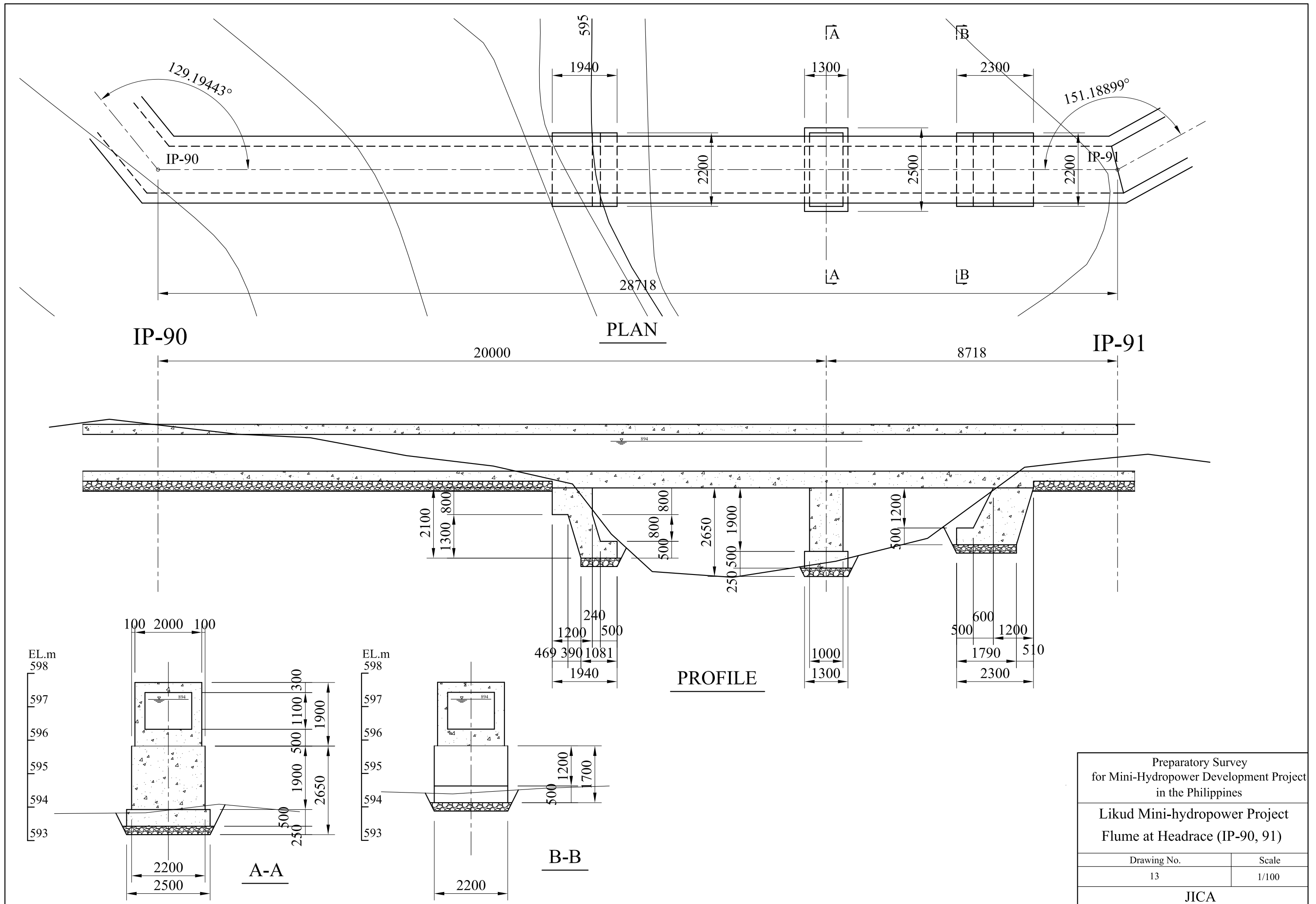
Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project Flume at Headrace (IP-15, 16)	
Drawing No.	Scale
10	1/100
JICA	

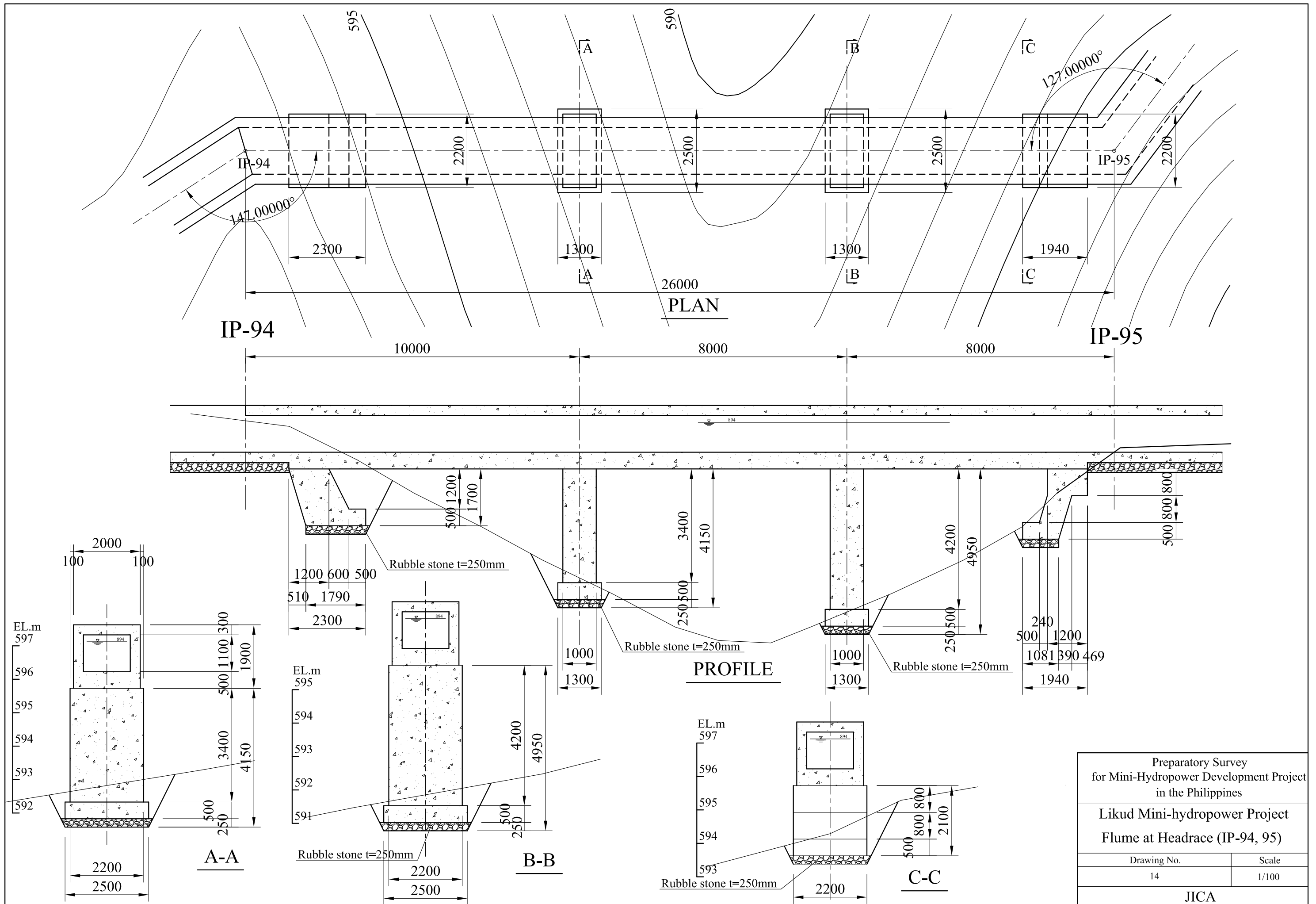


Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project Flume at Headrace (IP-56, 57)	
Drawing No.	Scale
11	1/100
JICA	



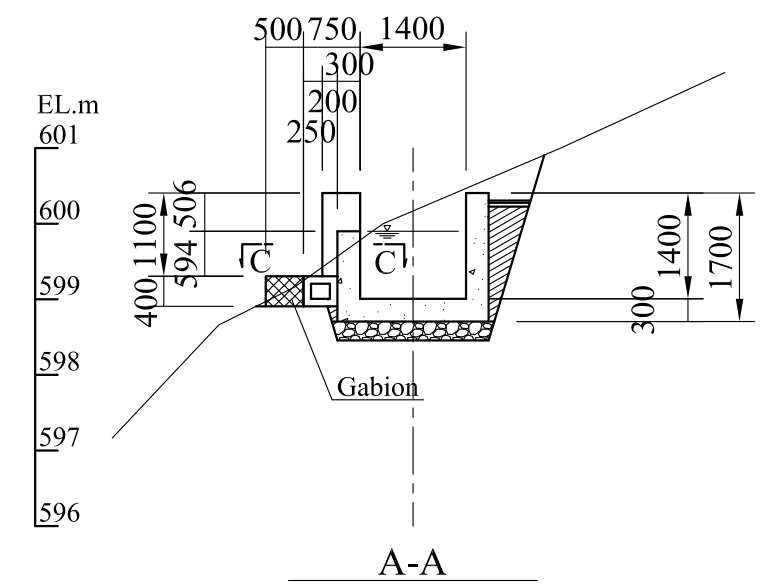
Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project Flume at Headrace (IP-89, 90)	
Drawing No.	Scale
12	1/100
JICA	



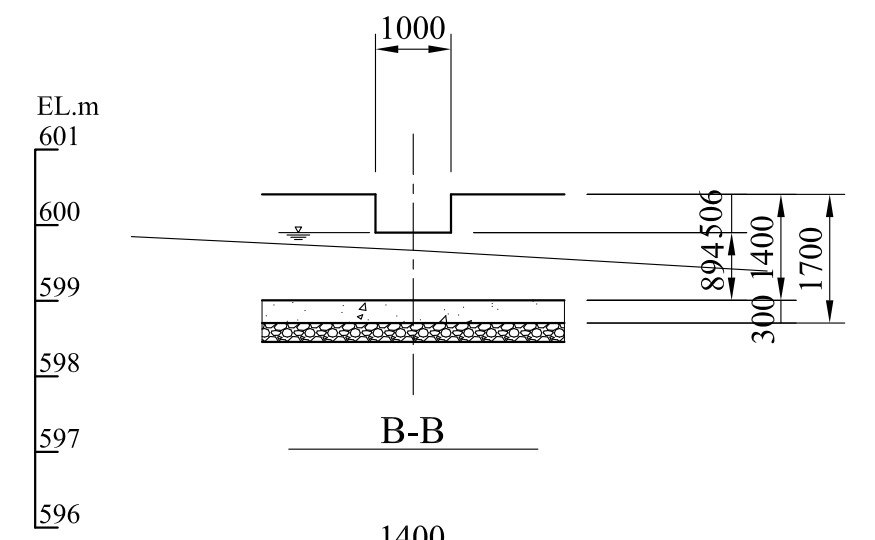




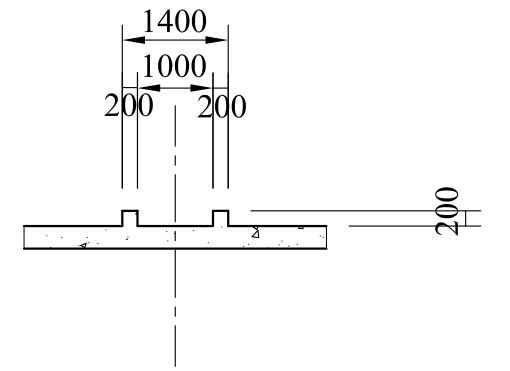
PLAN



A-A



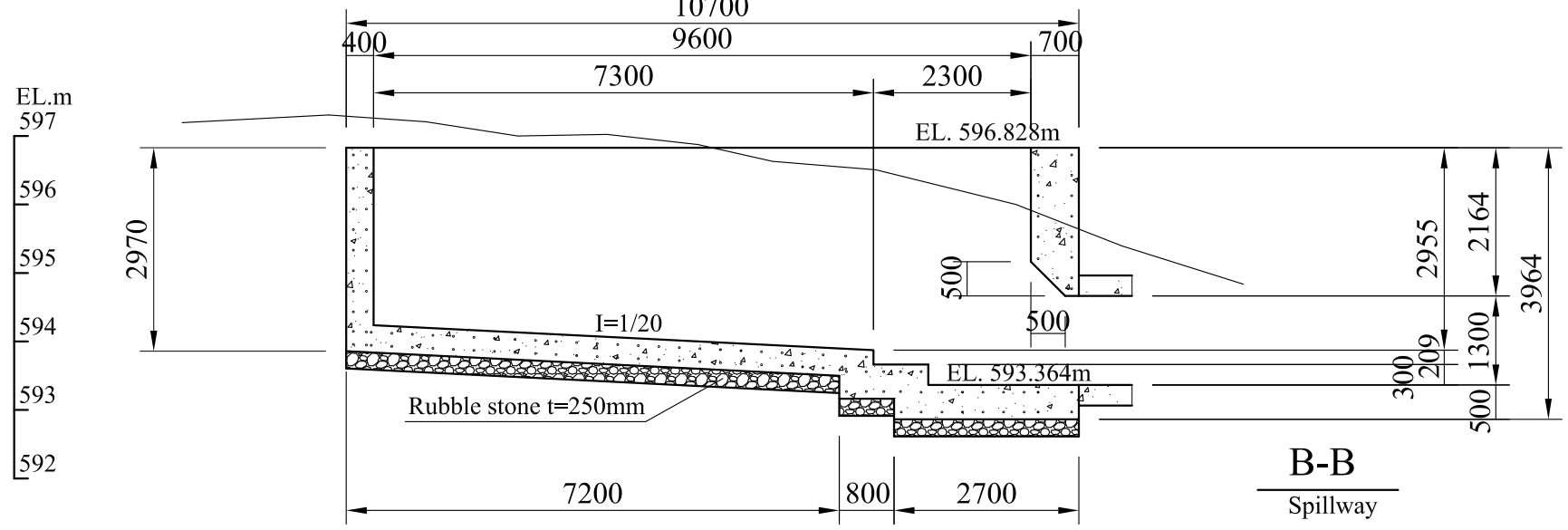
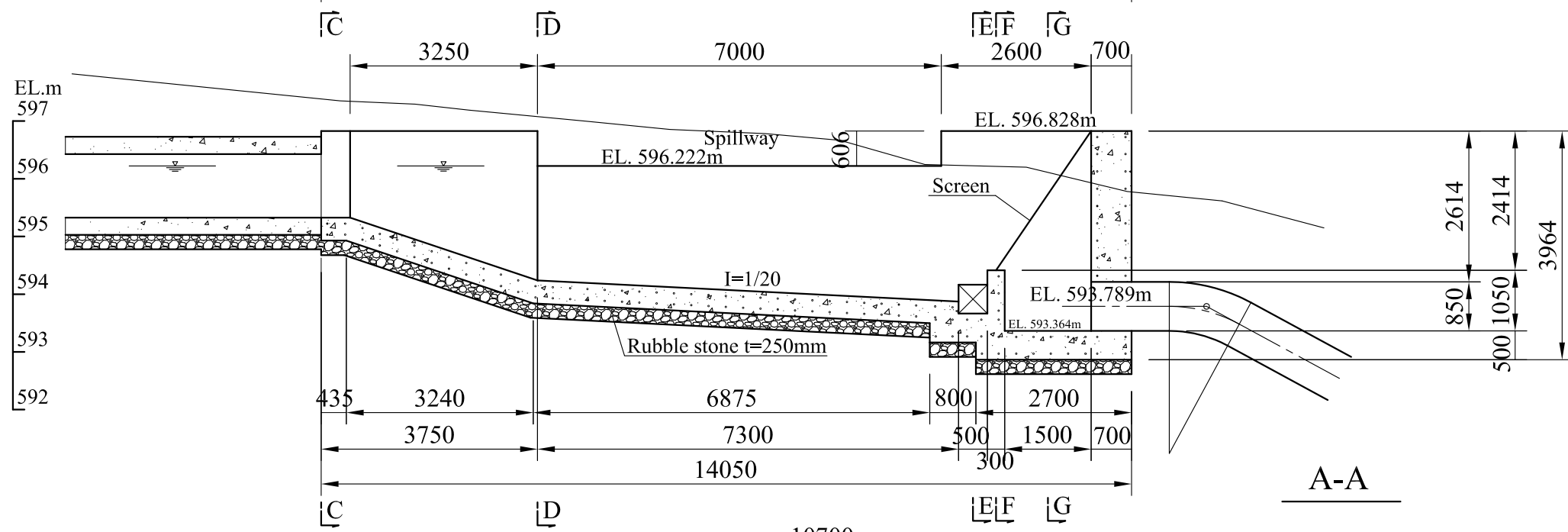
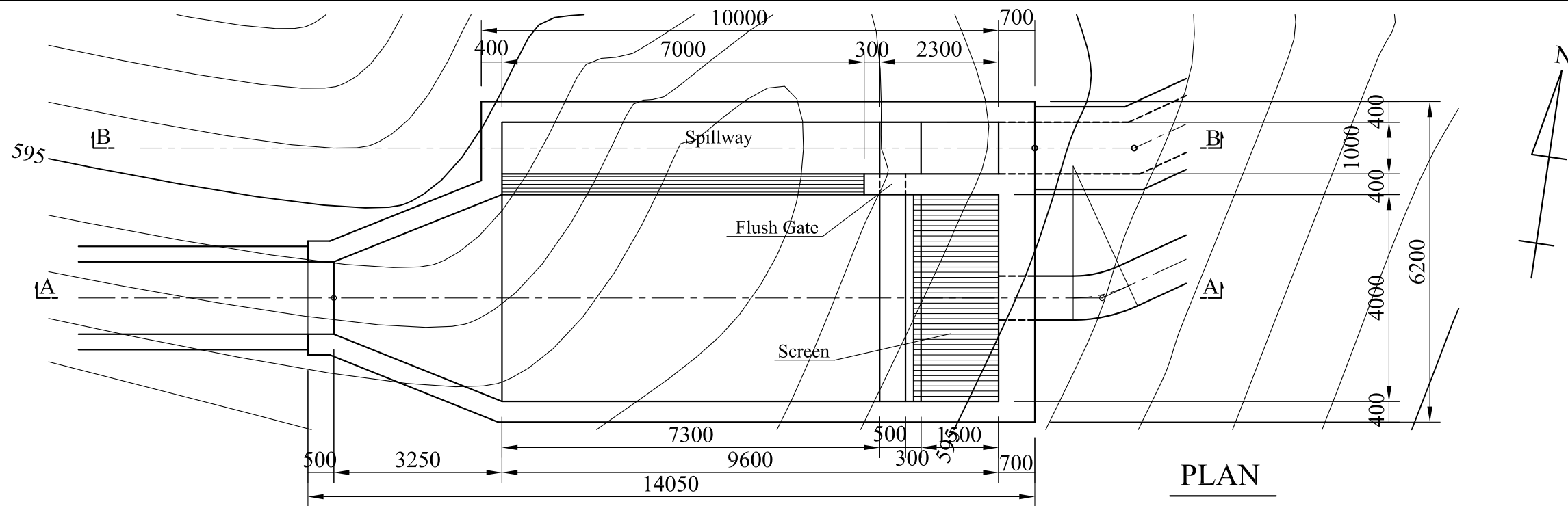
B-B



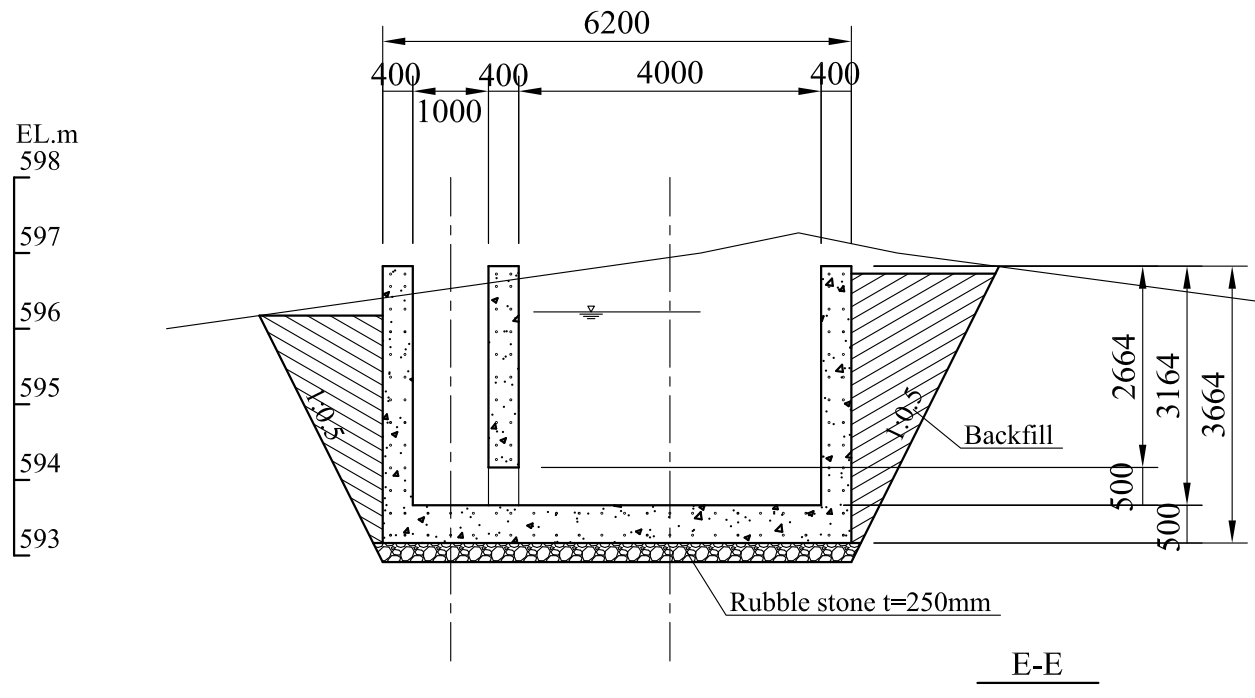
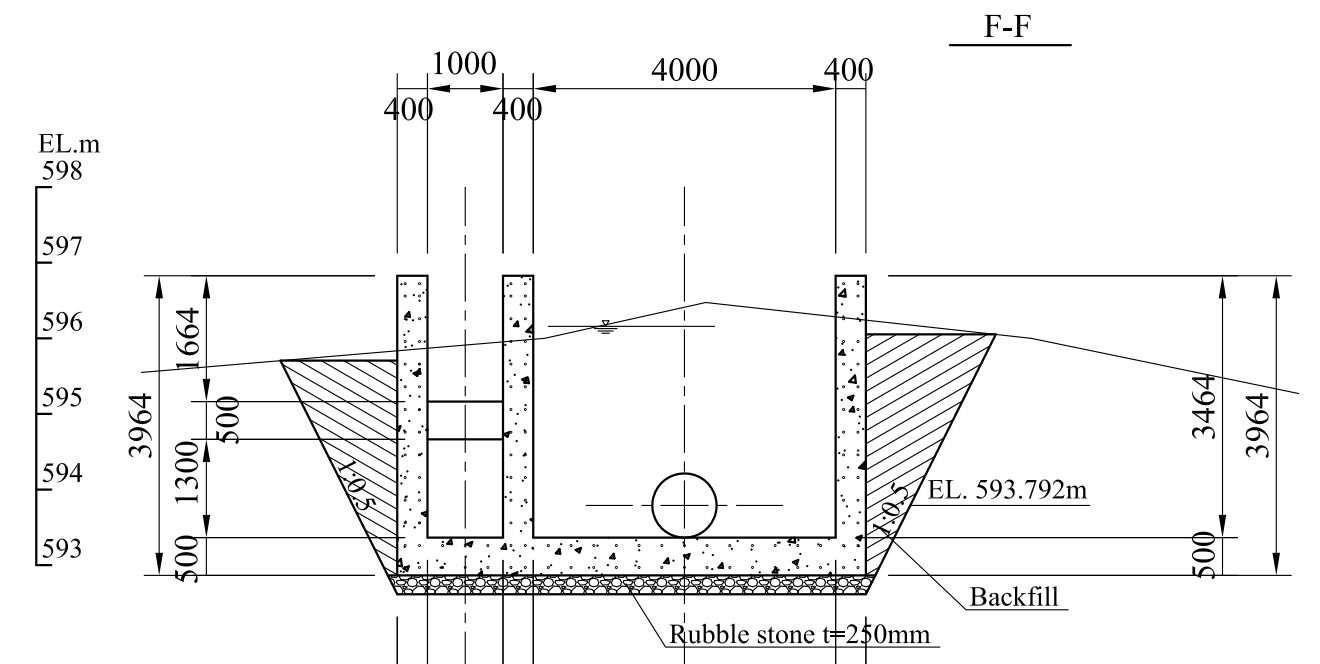
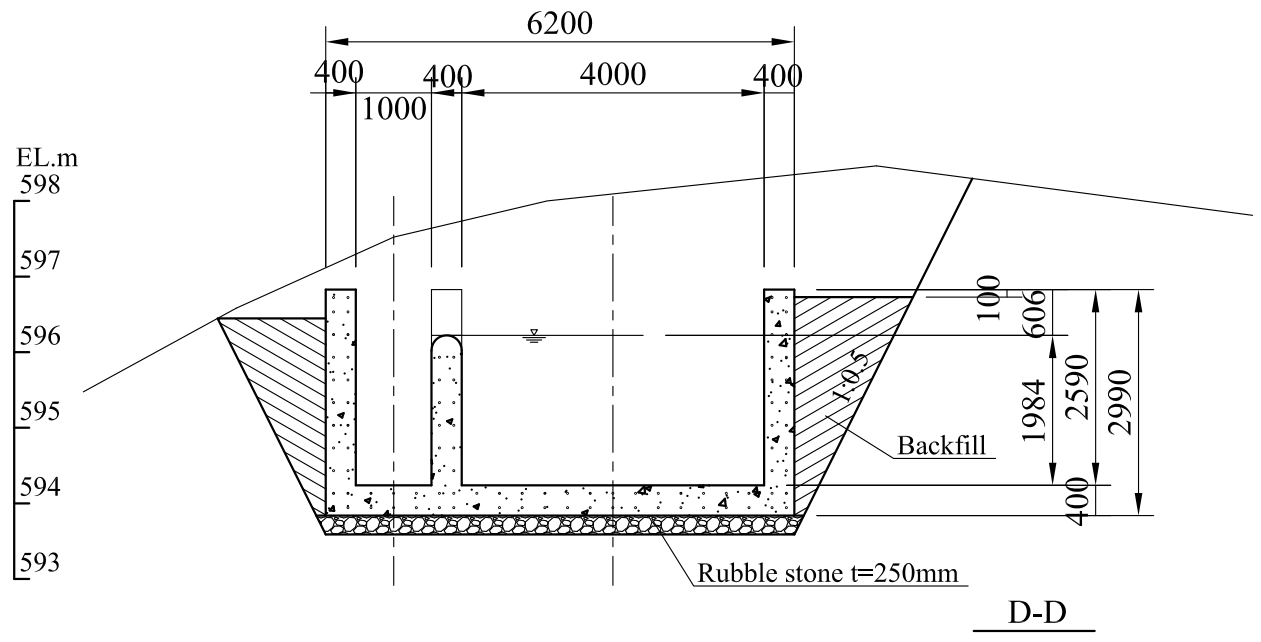
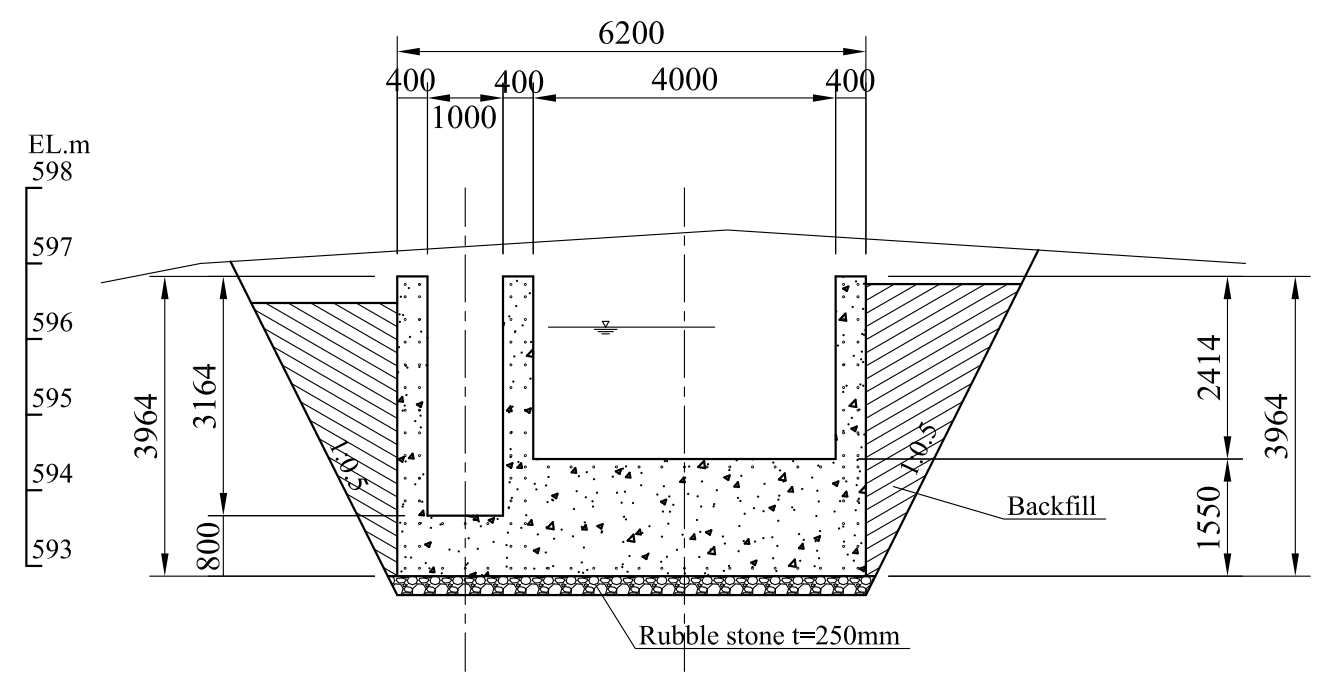
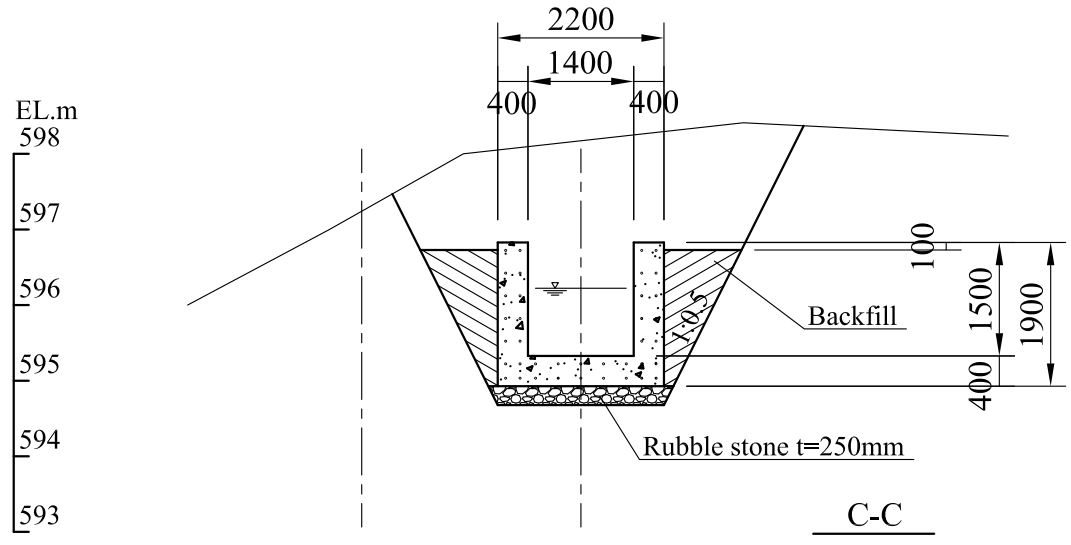
C-C

IP-2+2.50m

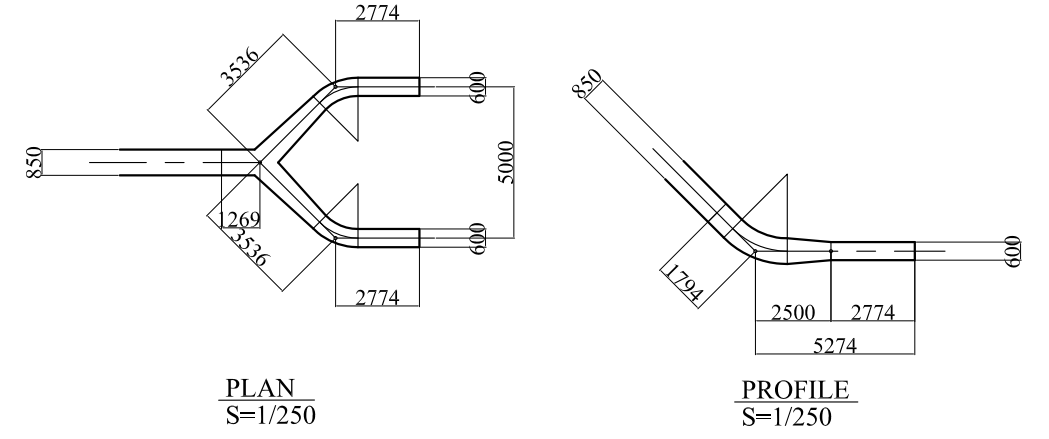
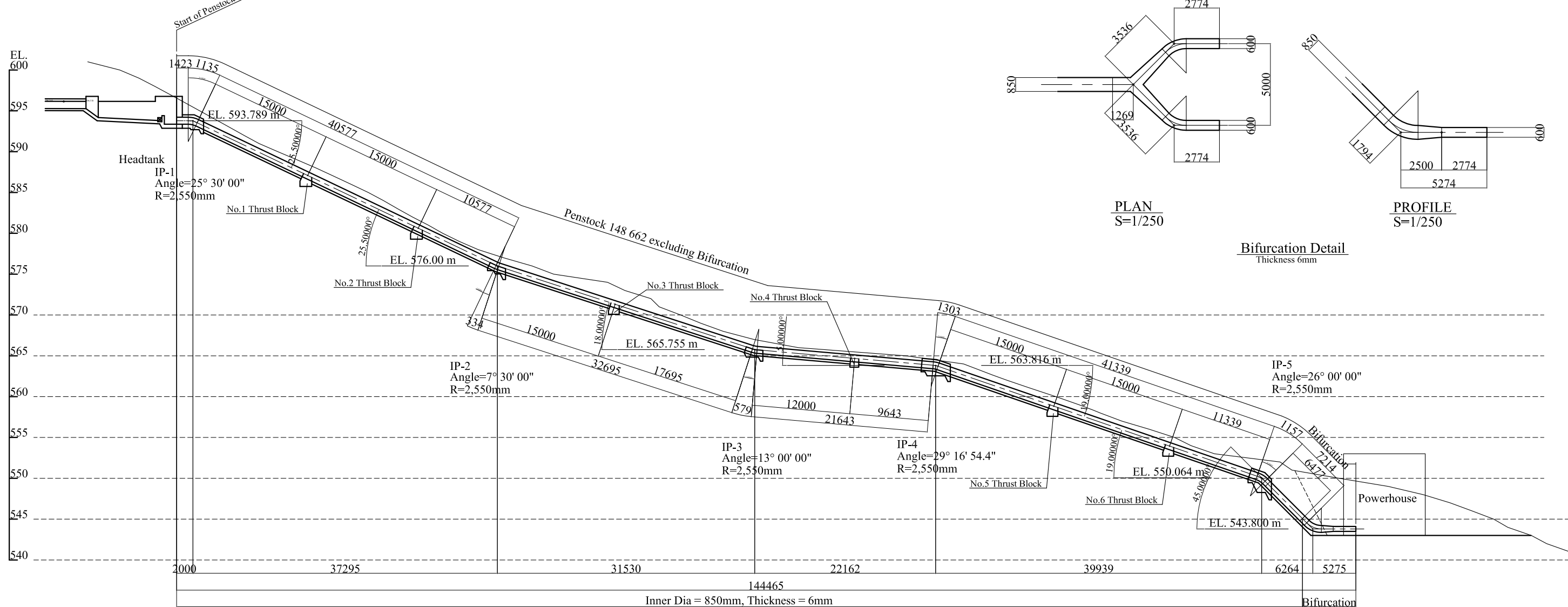
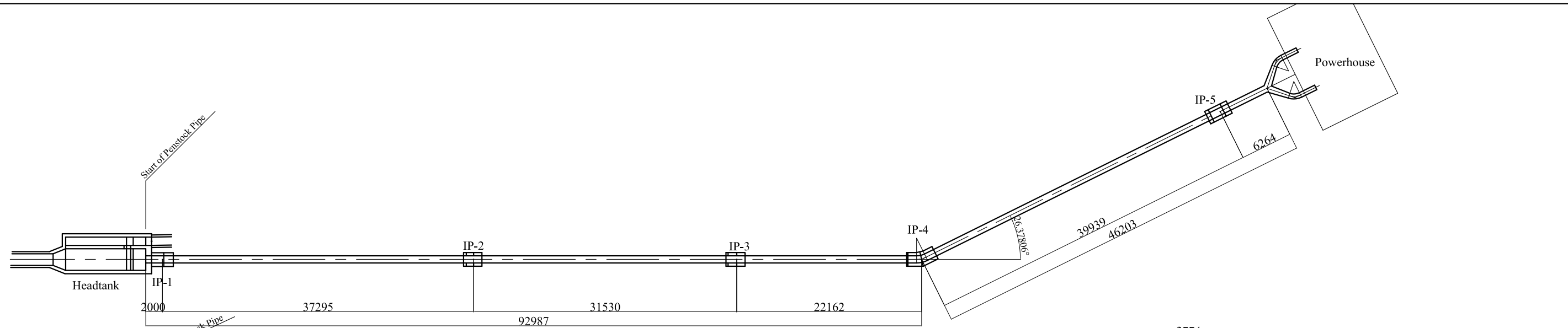
Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project Discharge Control Spillway at Headrace	
Drawing No.	Scale
16	1/100
JICA	



Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project Headtank	
Drawing No.	Scale
17	1/100
JICA	



Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project Cross Section of Headtank	
Drawing No.	Scale
18	1/100
JICA	



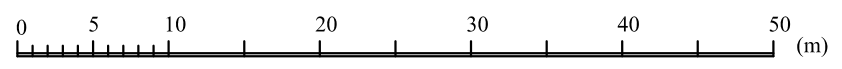
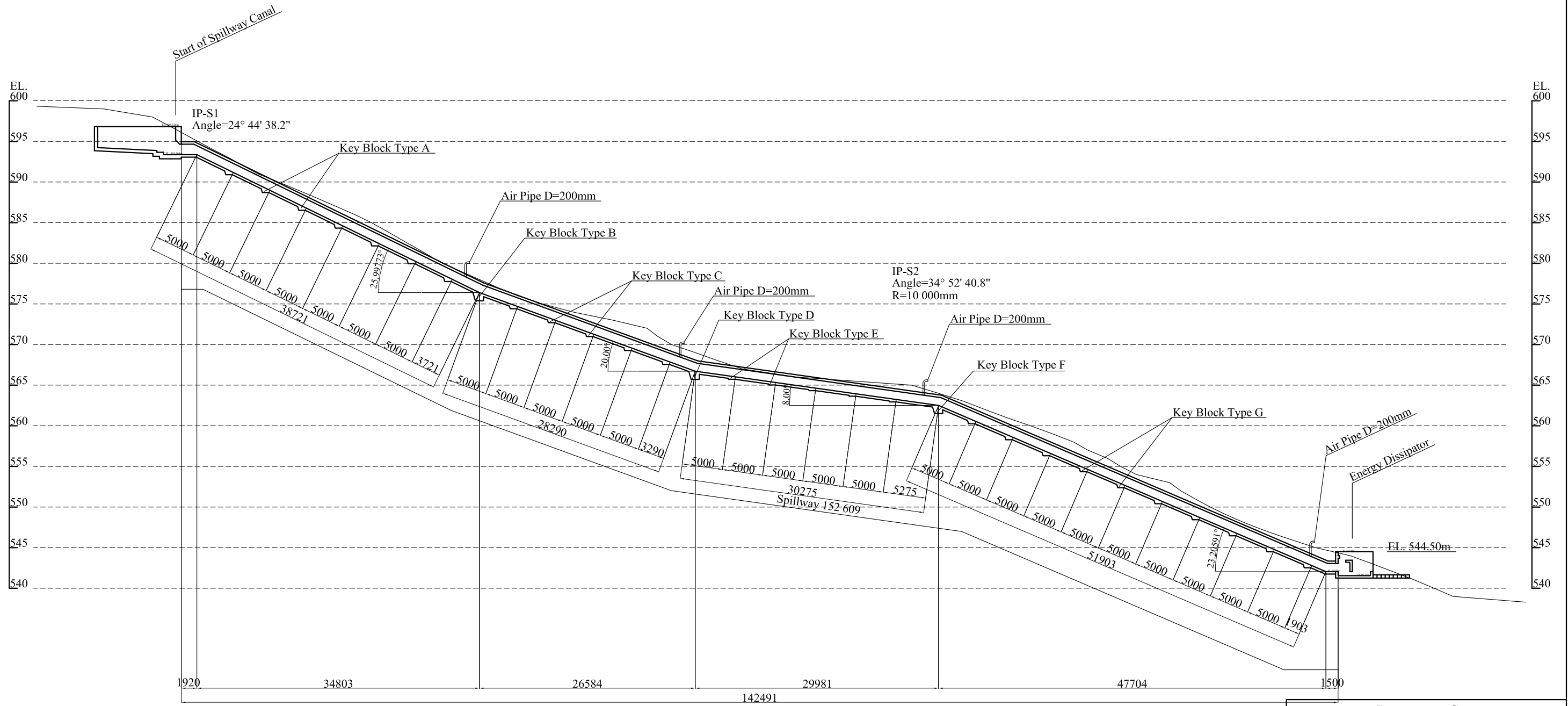
PLAN
S=1/250

PROFILE
S=1/250

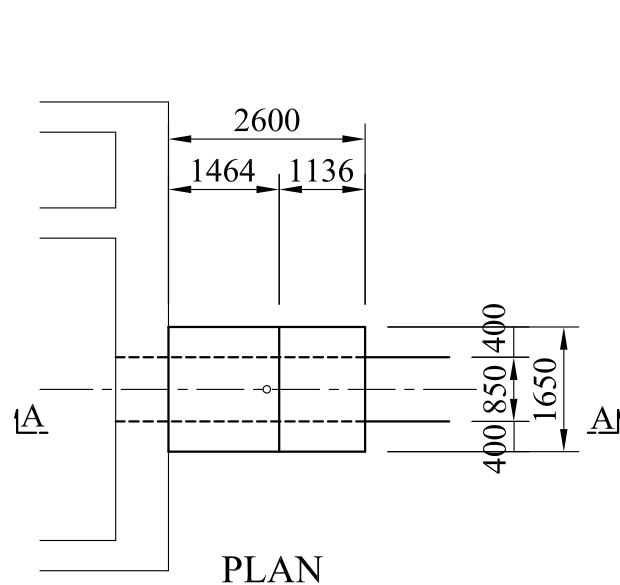
Bifurcation Detail
Thickness 6mm



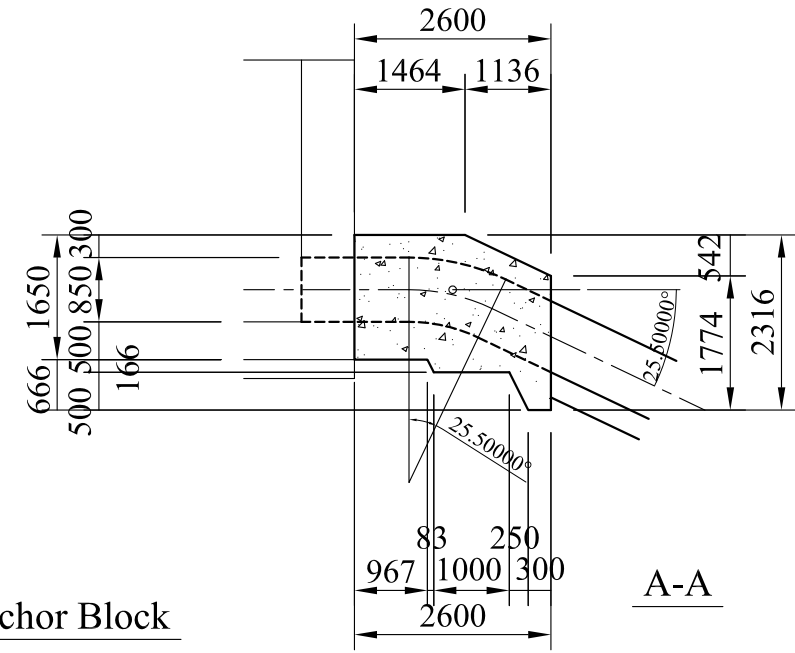
Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project Penstock Profile	
Drawing No.	Scale
19	1/500, 1/250
JICA	



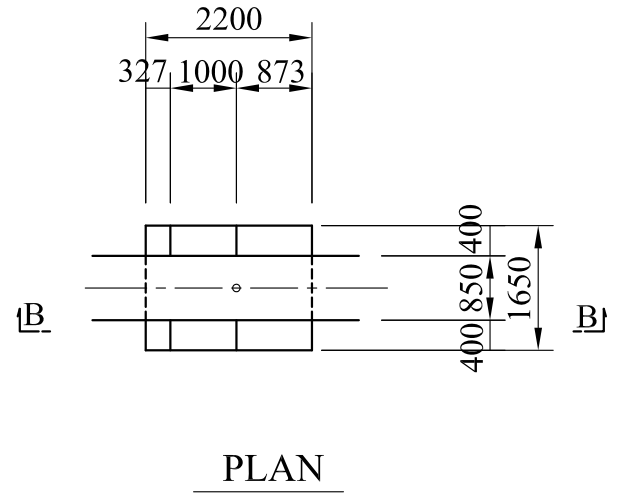
Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project	
Spillway Profile	
Drawing No.	Scale
20	1/500
JICA	



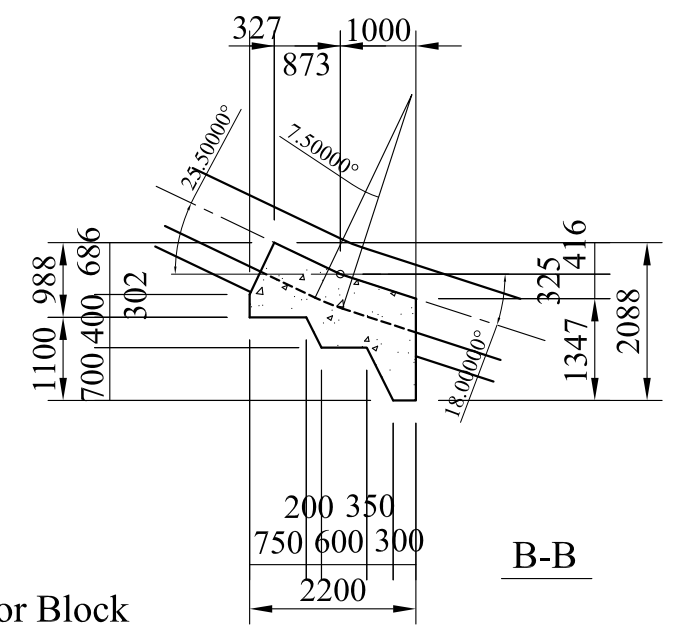
No.1 Anchor Block



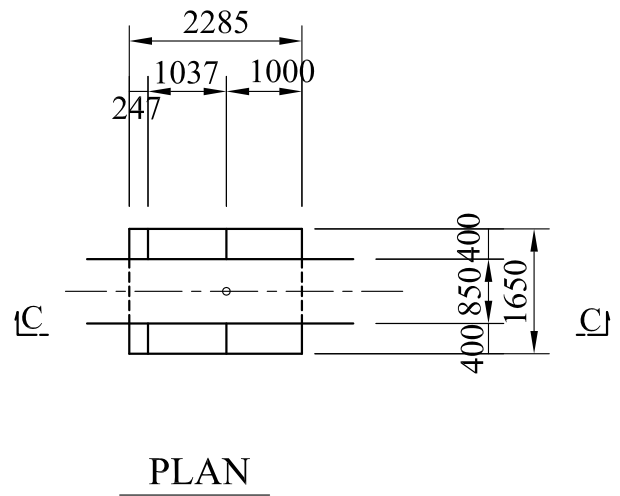
A-A



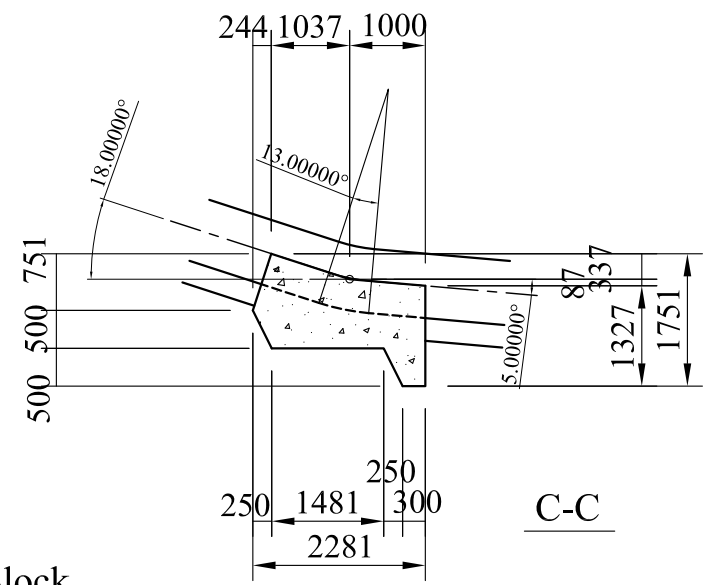
No.2 Anchor Block



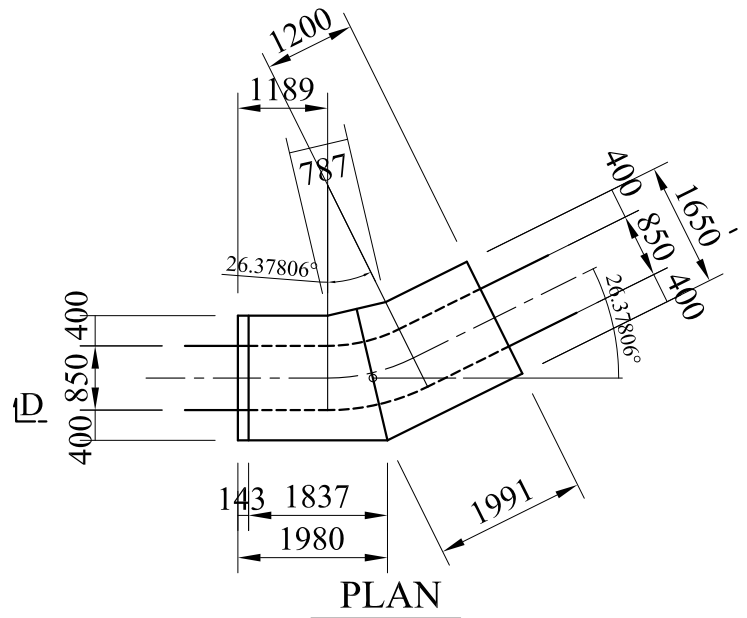
B-B



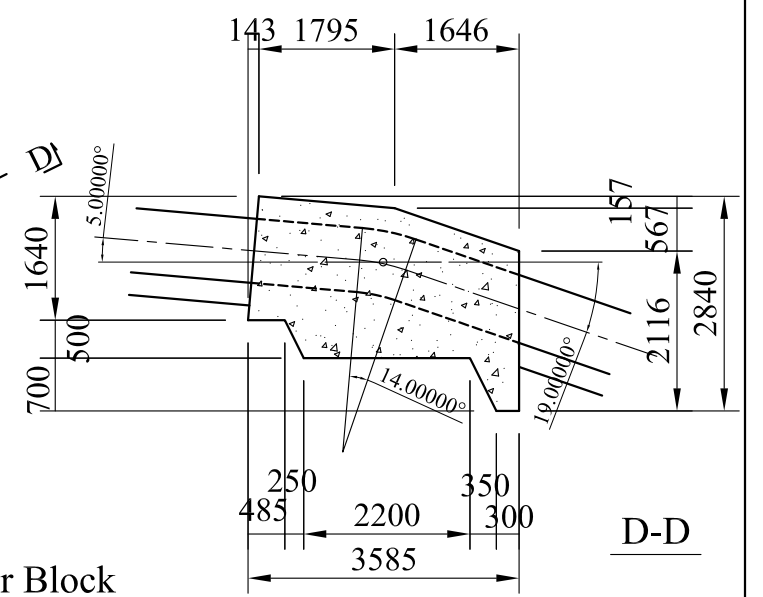
No.3 Anchor Block



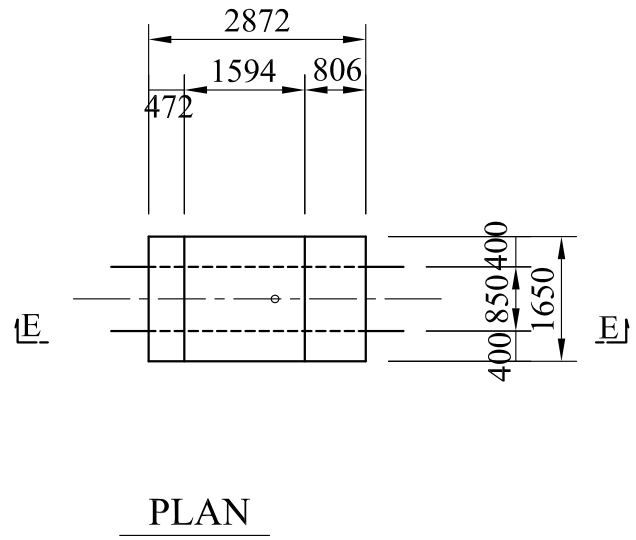
C-C



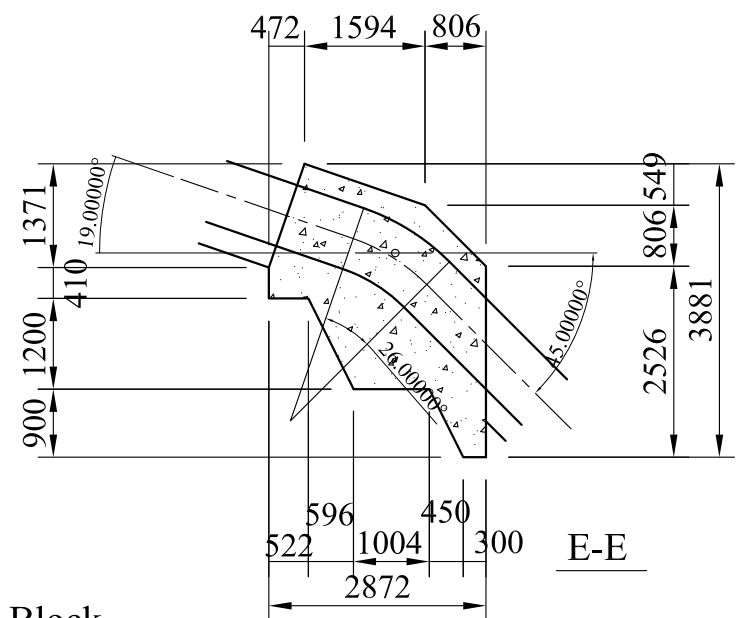
No.4 Anchor Block



D-D

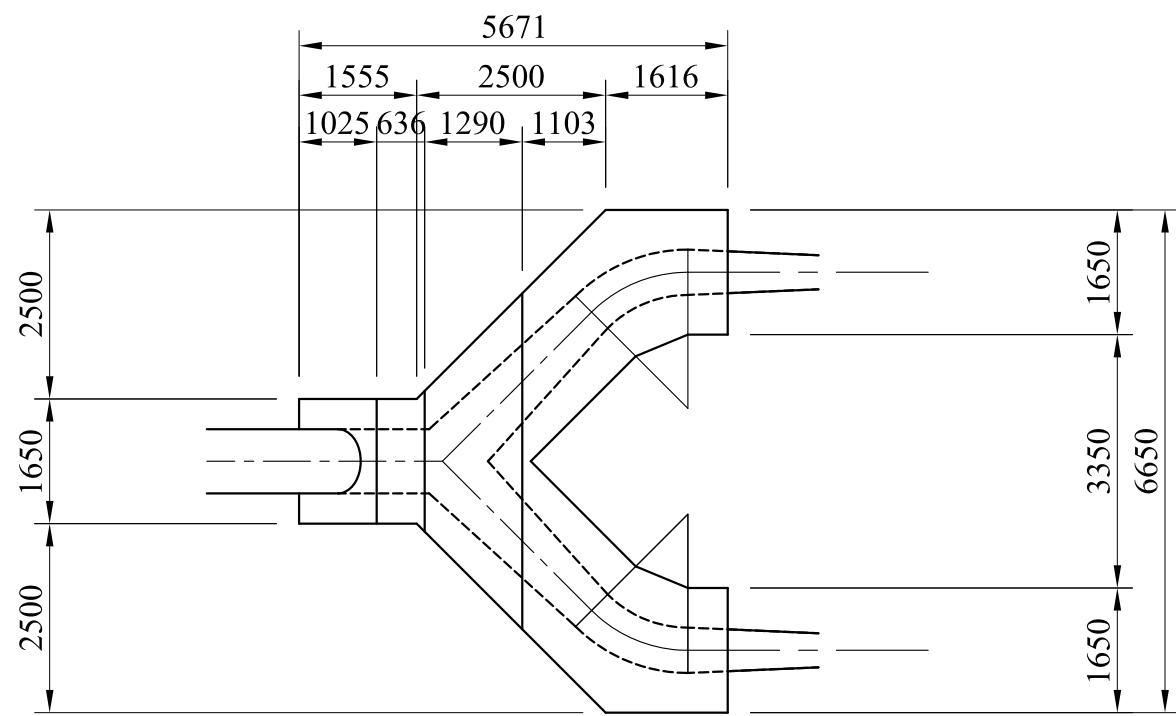


No.5 Anchor Block

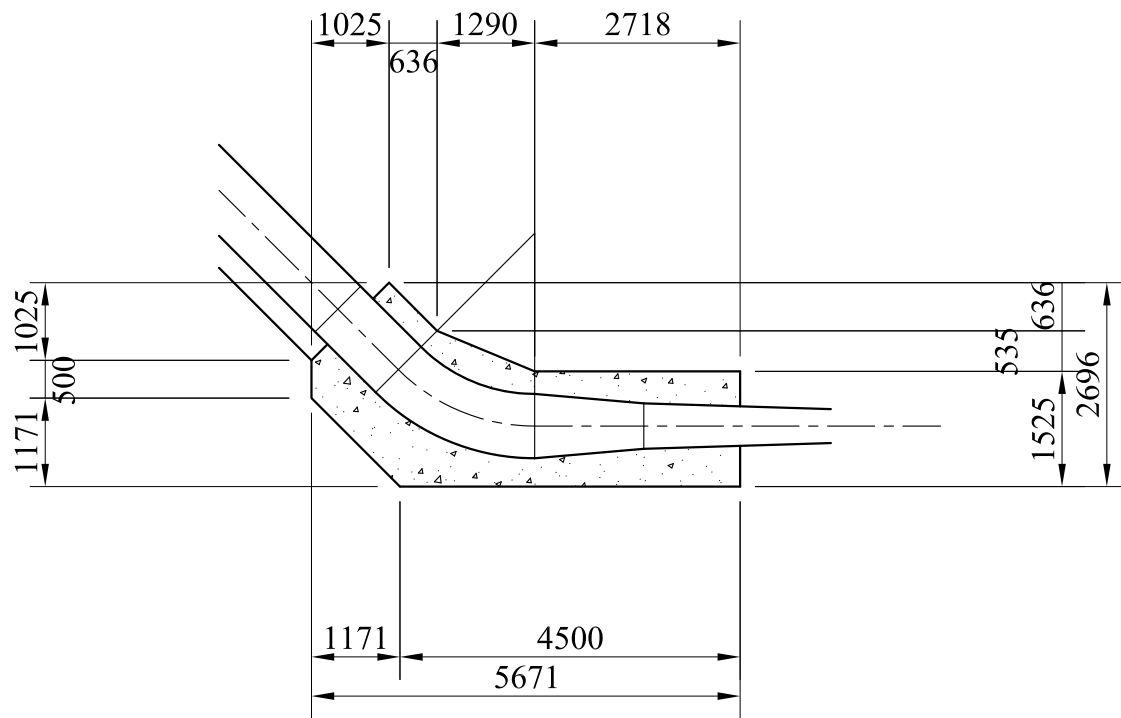


E-E

Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project Anchor Block of Penstock (1/2)	
Drawing No.	Scale
21	1/100
JICA	

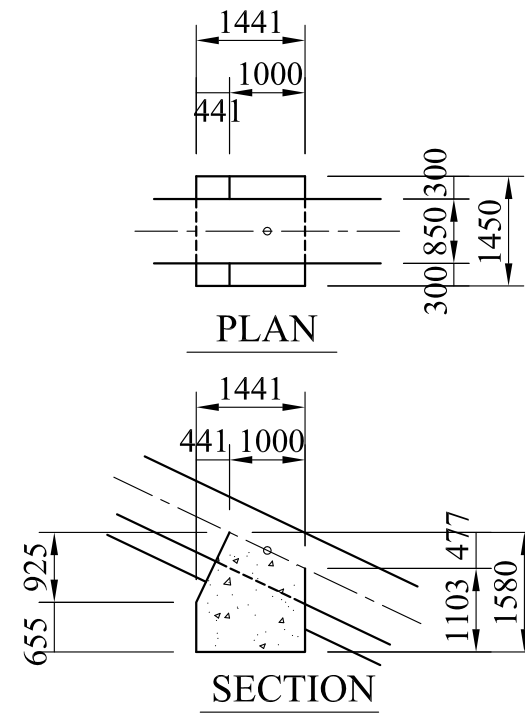


PLAN



SECTION

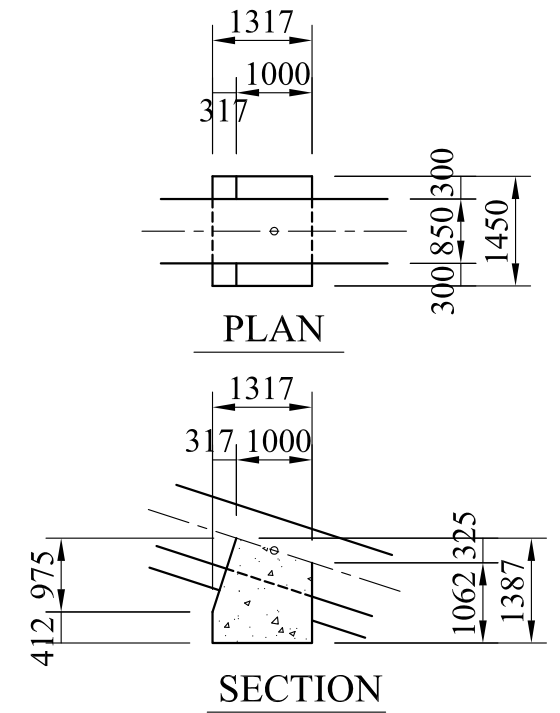
No.6 Anchor Block



PLAN

SECTION

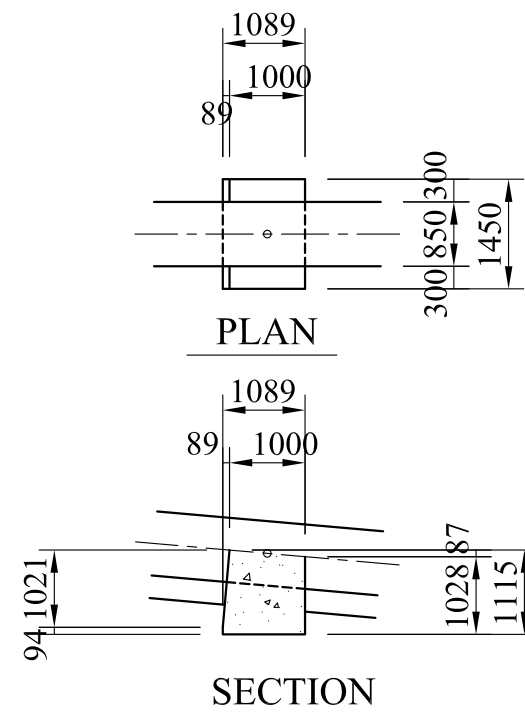
No.1 & No.2 Thrust Block



PLAN

SECTION

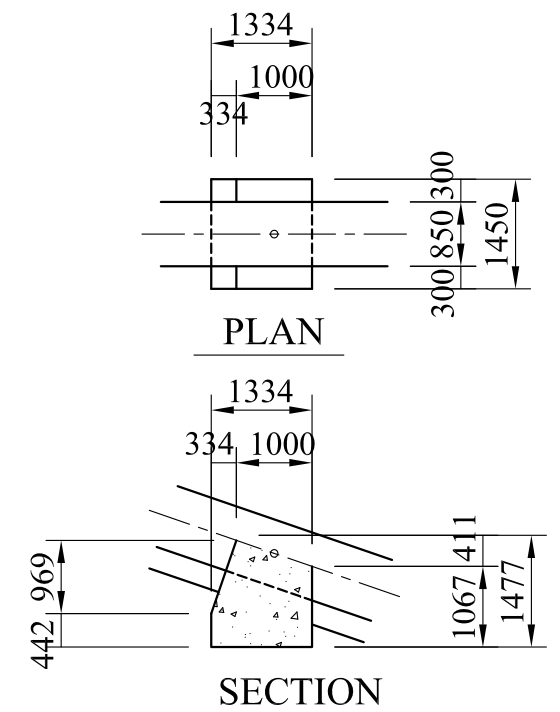
No.3 Thrust Block



PLAN

SECTION

No.4 Thrust Block



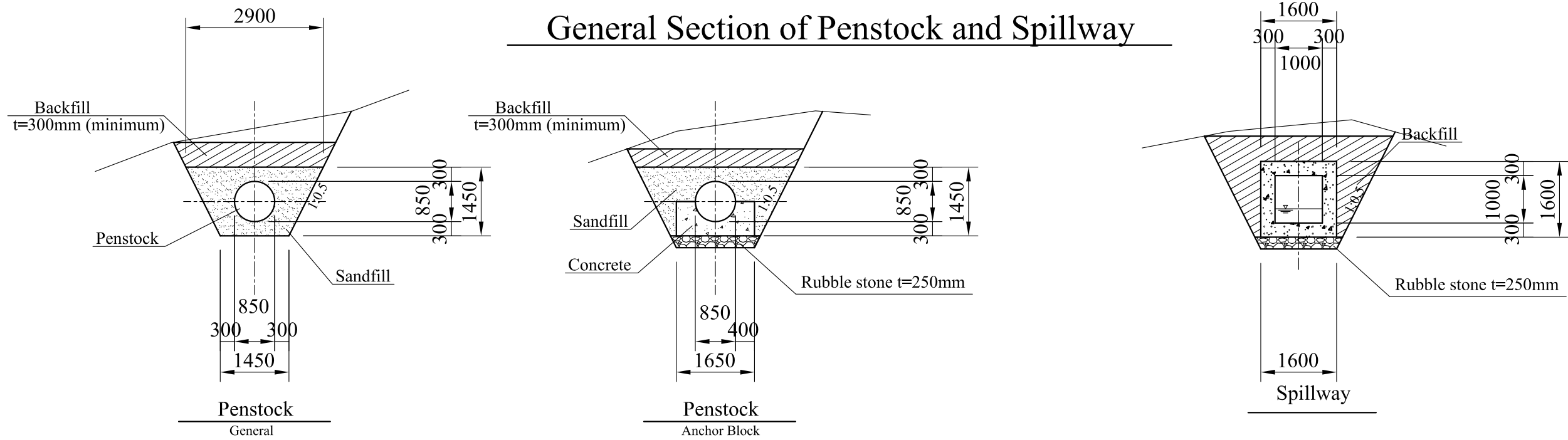
PLAN

SECTION

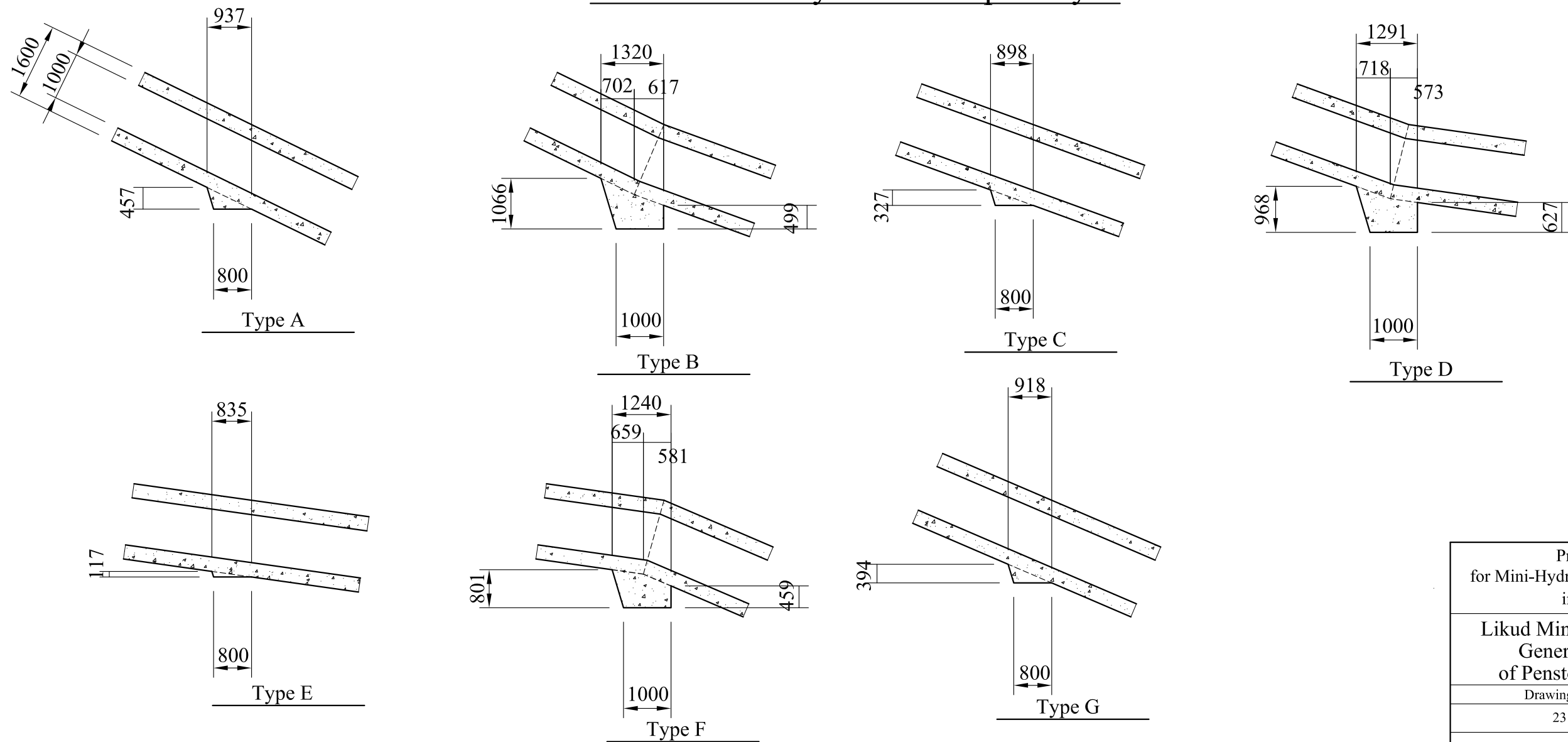
No.5 & No.6 Thrust Block

Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project Anchor Block of Penstock (2/2)	
Drawing No.	Scale
22	1/100
JICA	

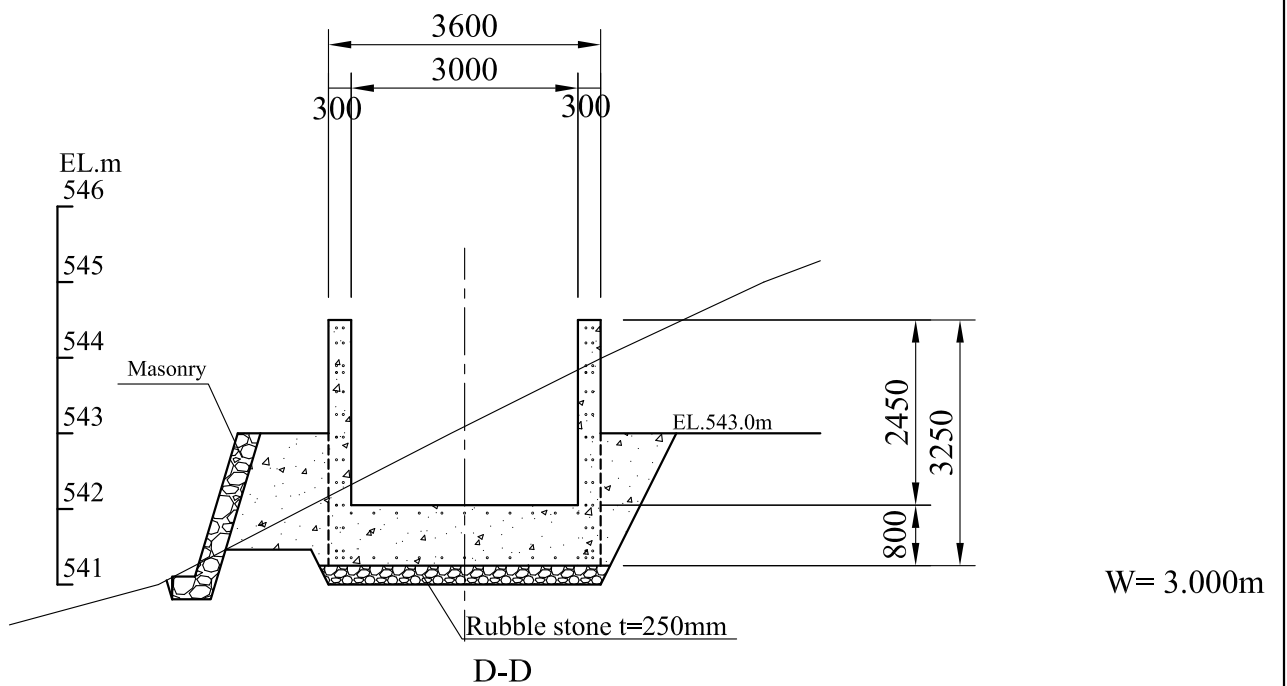
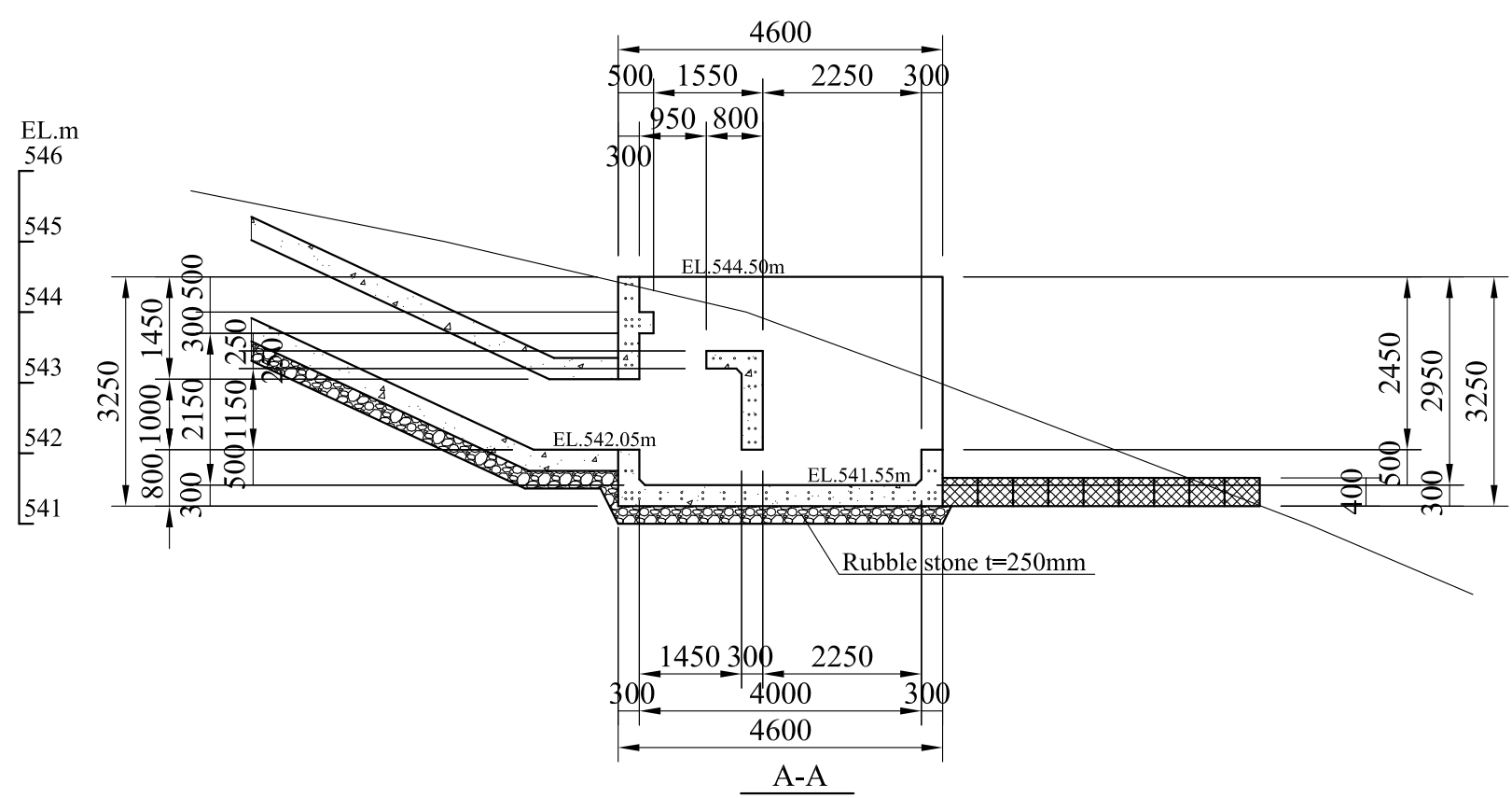
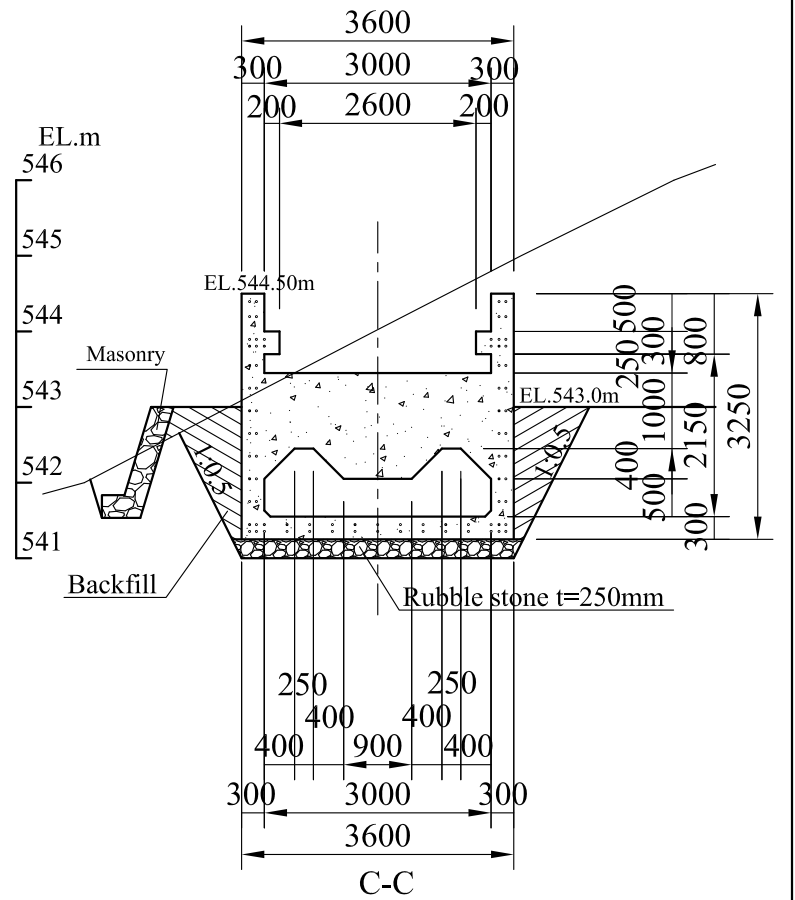
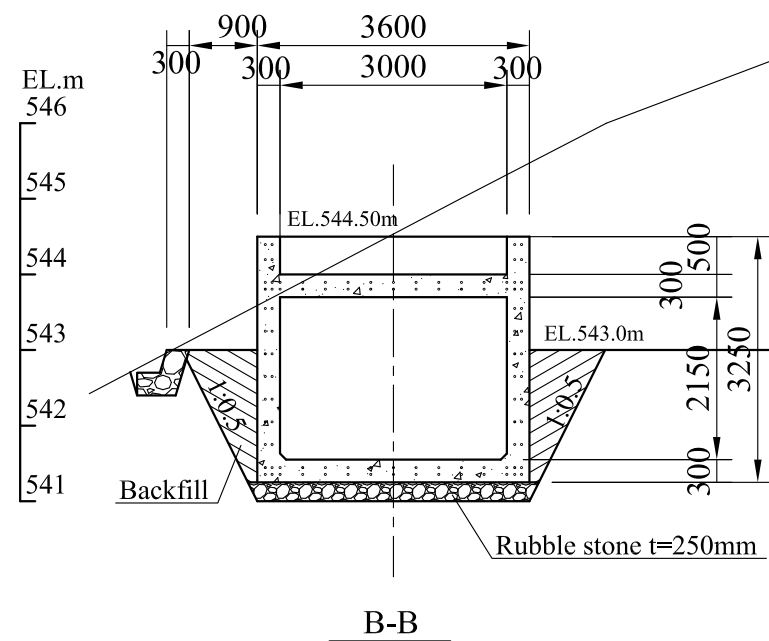
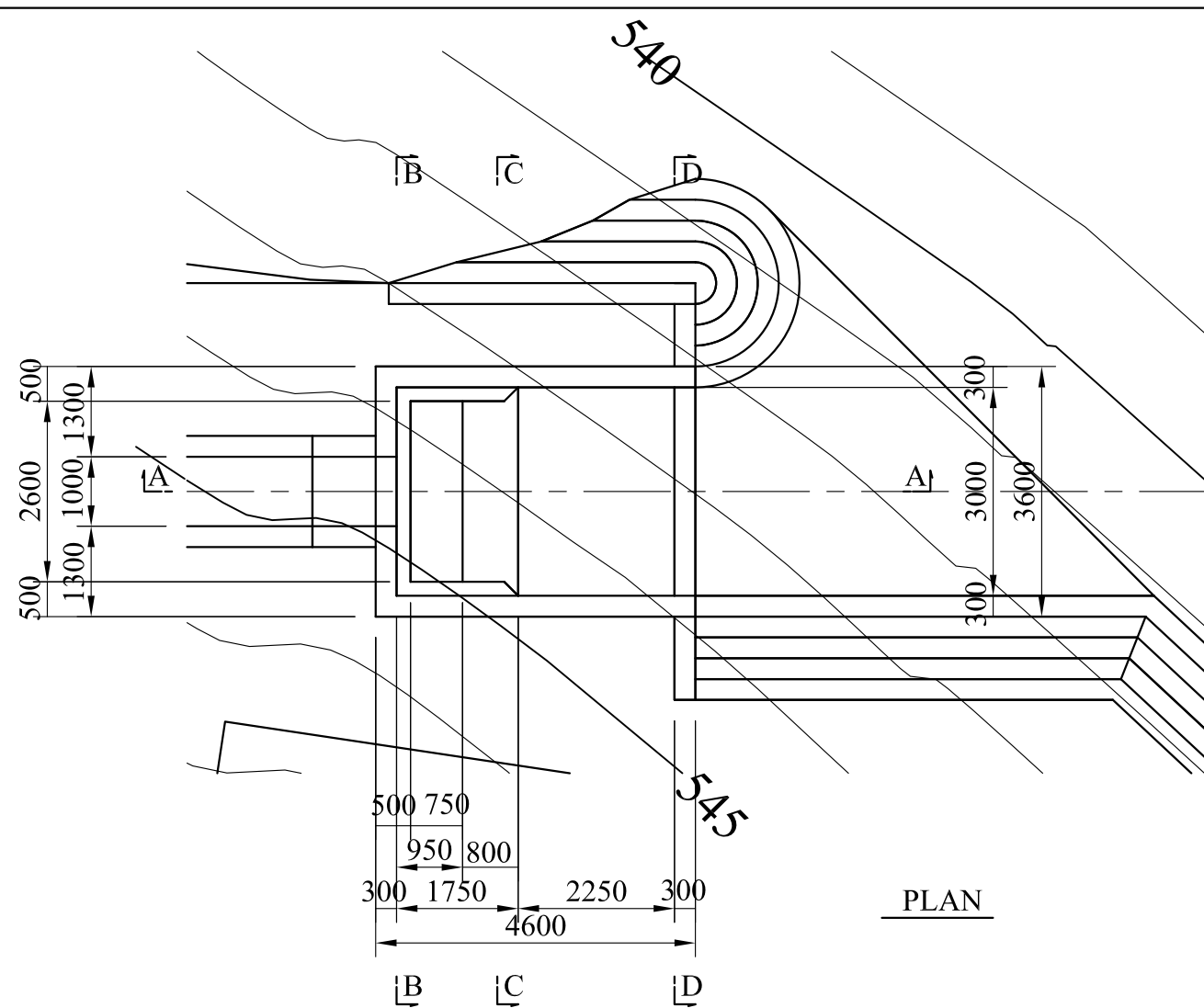
General Section of Penstock and Spillway



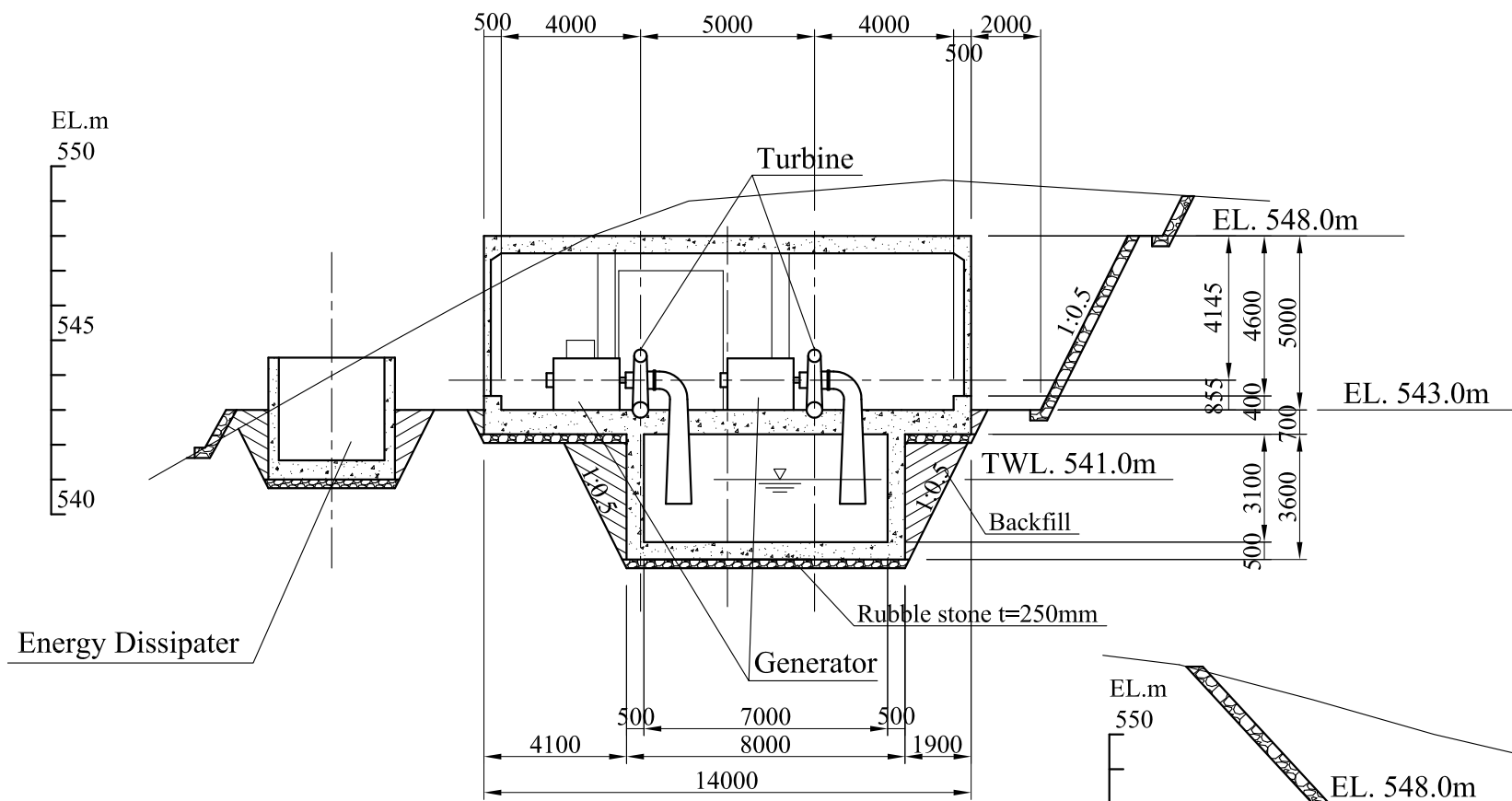
Profile of Key Block at Spillway



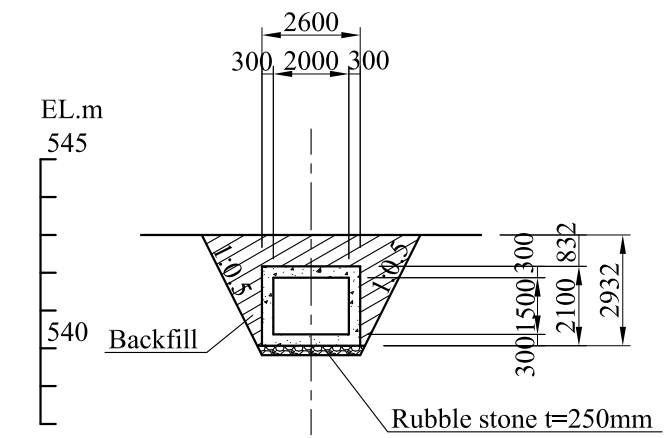
Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project General Cross Section of Penstock and Spillway	
Drawing No.	Scale
23	1/100
JICA	



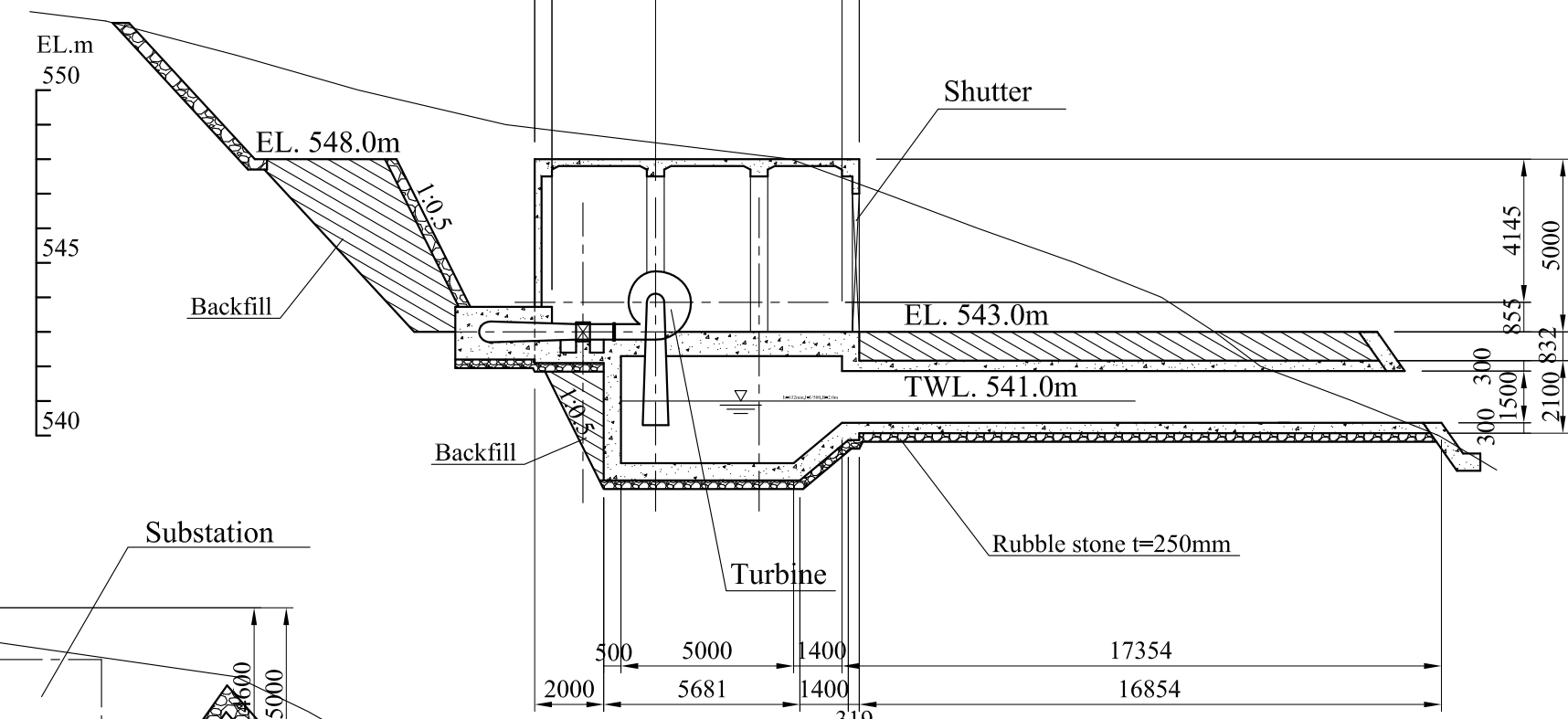
Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project Energy Dissipater of Spillway	
Drawing No.	Scale
24	1/100
JICA	



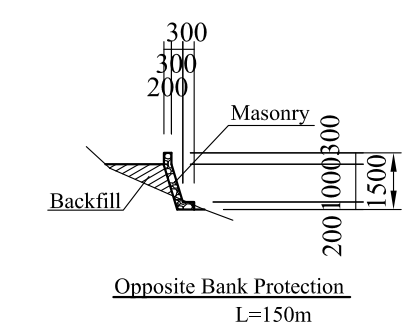
A-A



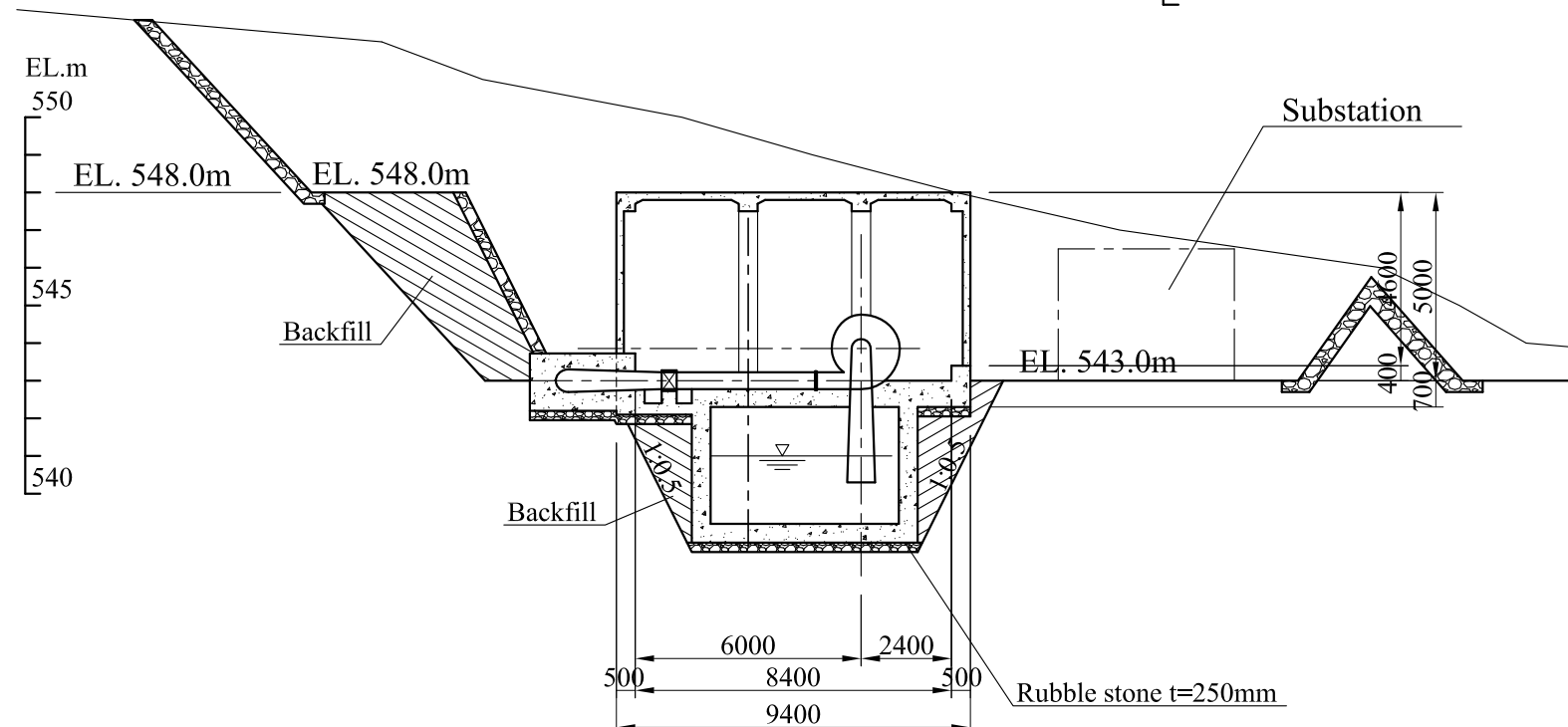
D-D



B-B

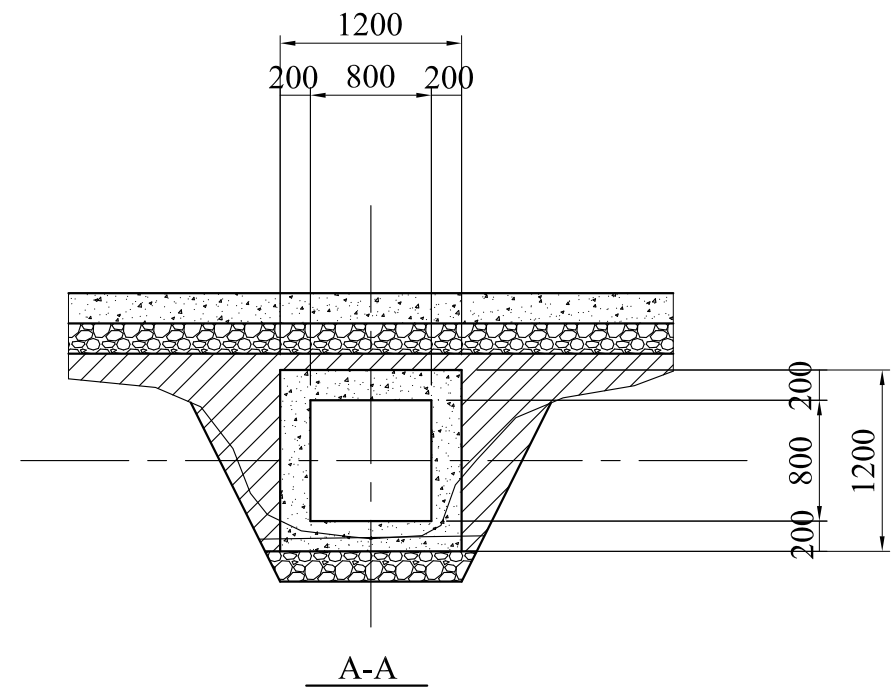
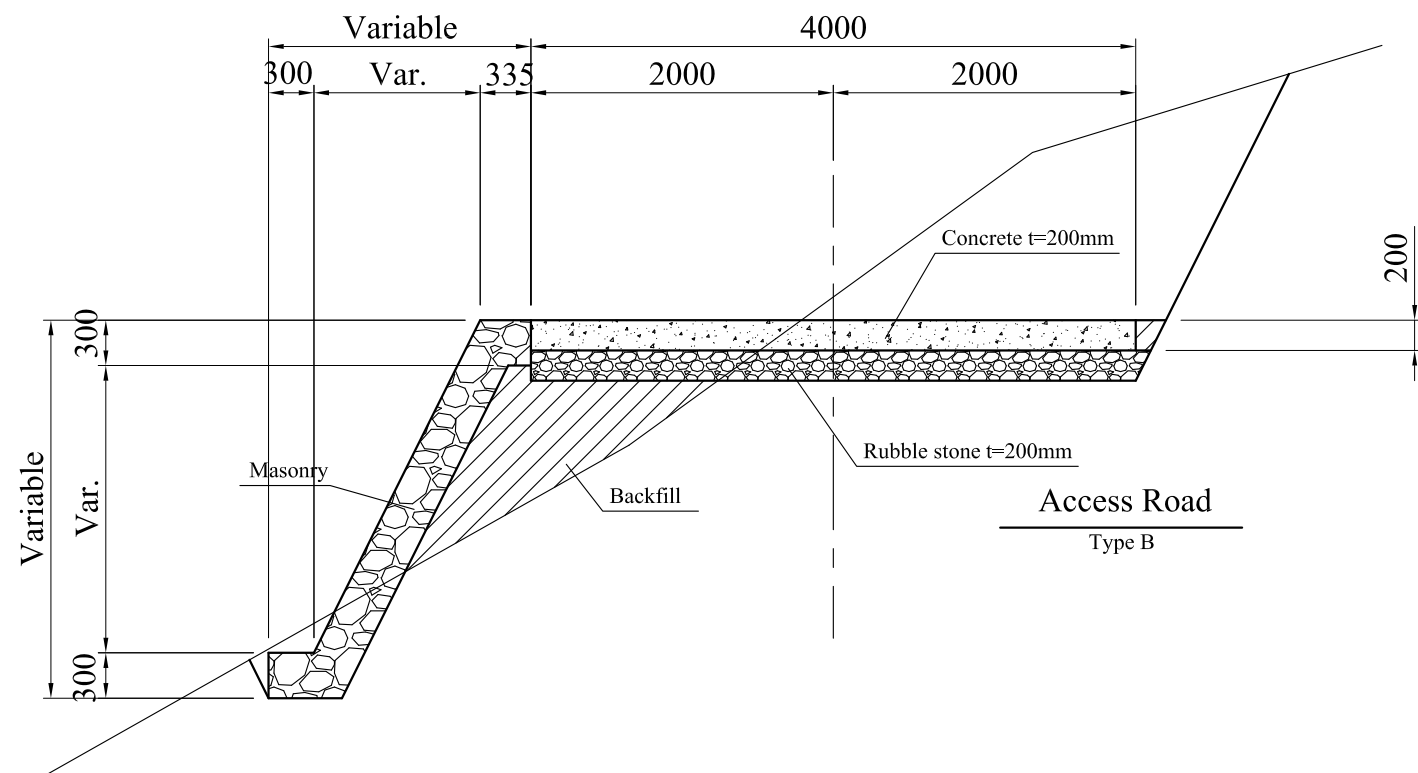
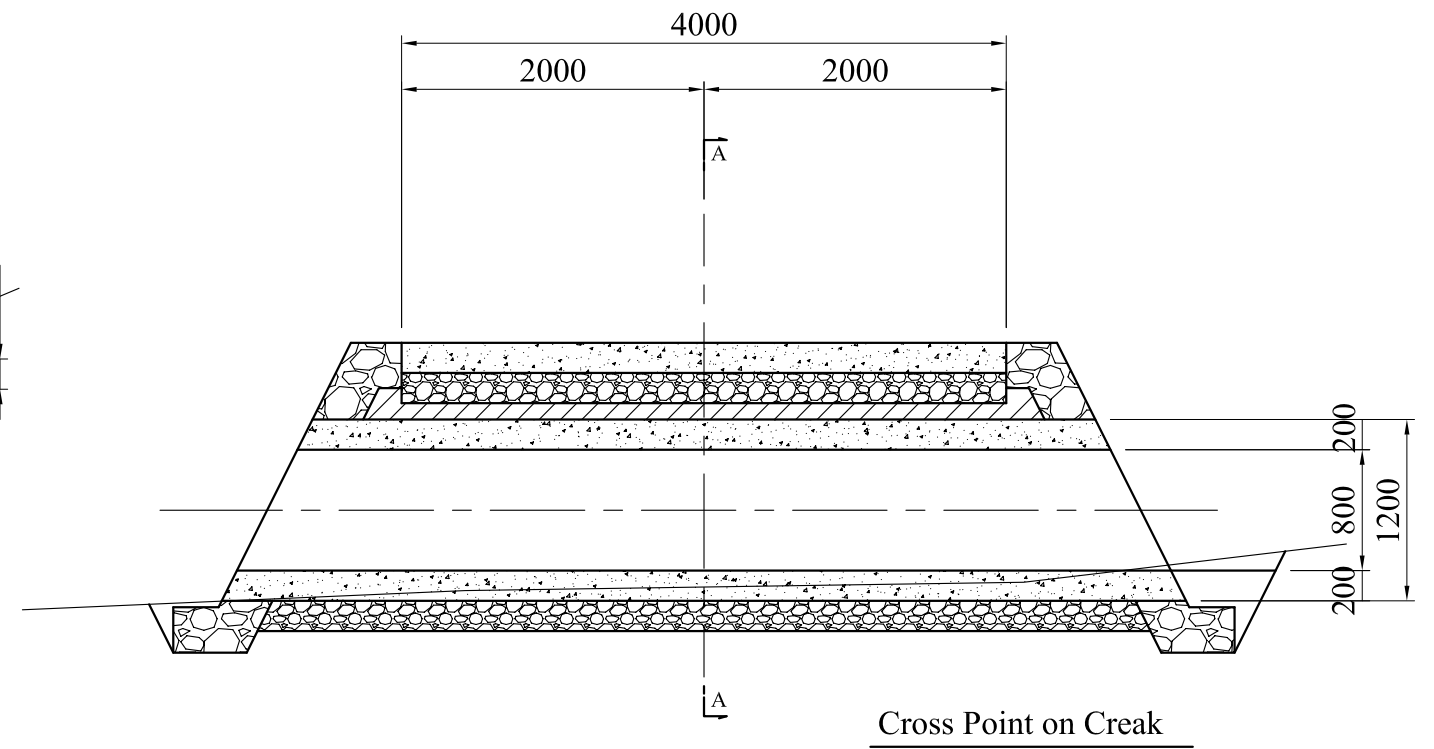
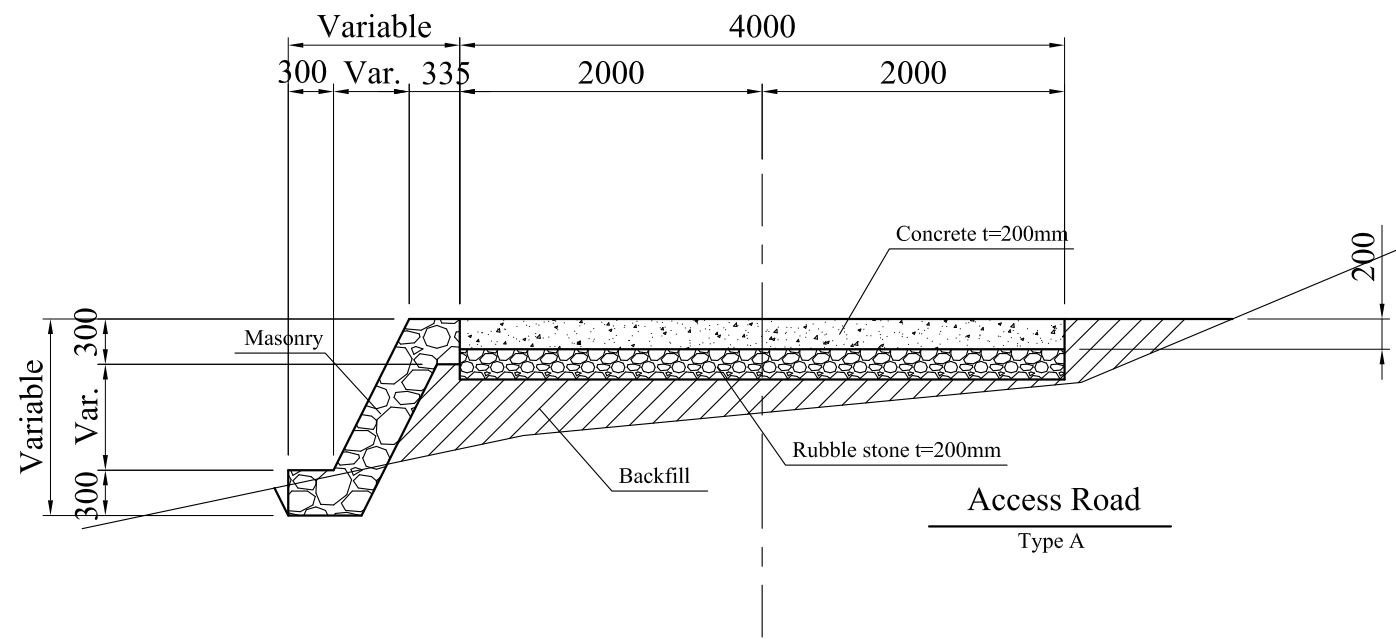


Opposite Bank Protection
L=150m



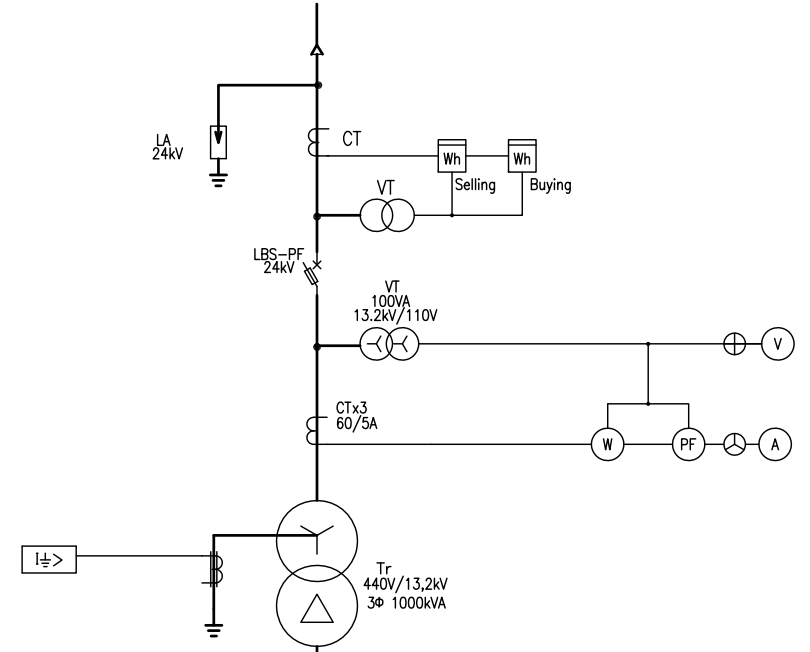
C-C

Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project Cross Section of Powerhouse	
Drawing No.	Scale
26	1/200
JICA	



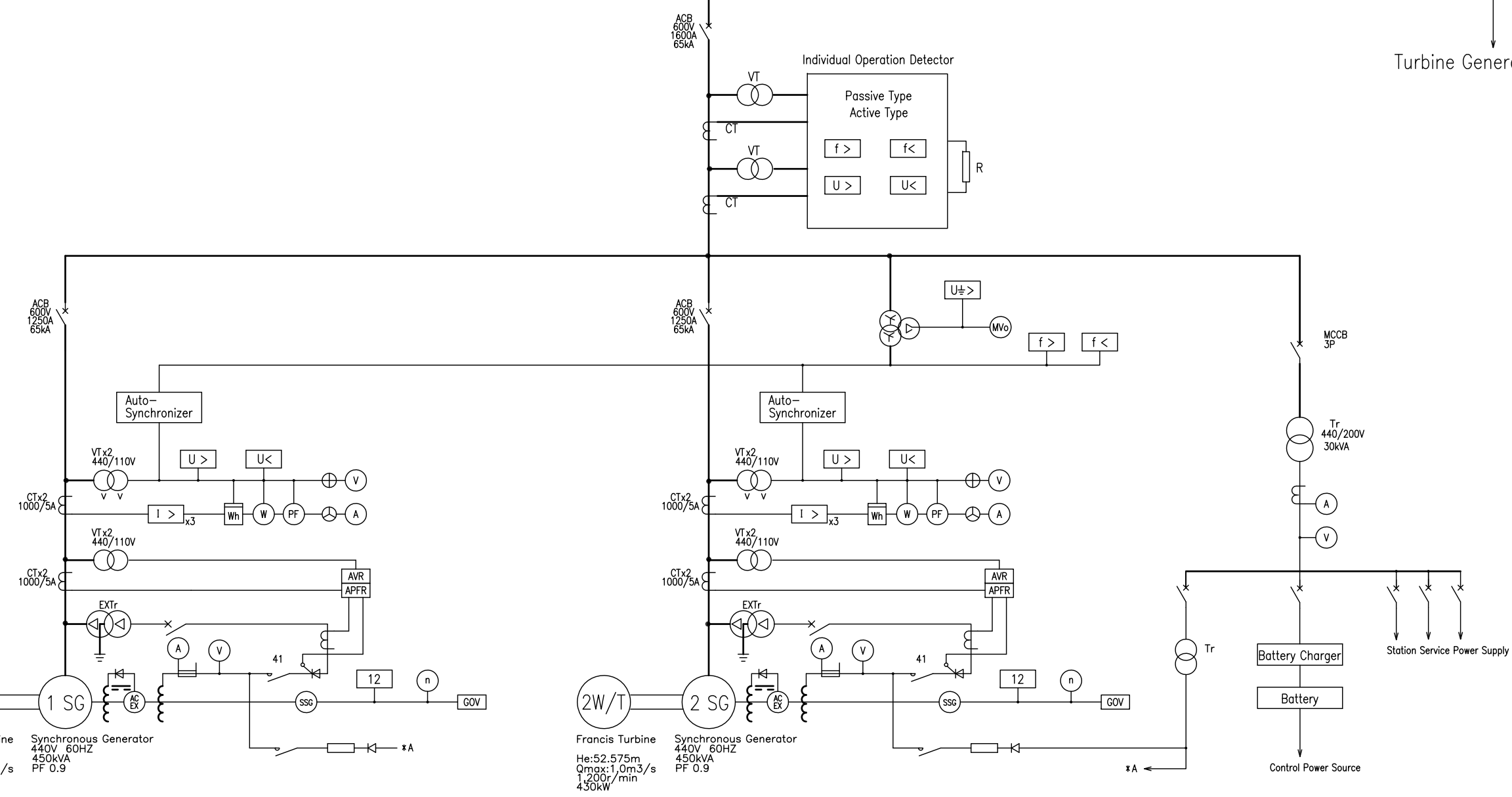
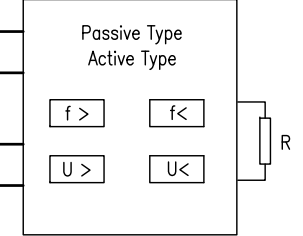
Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-hydropower Project Cross Section of Access Road	
Drawing No.	Scale
27	1/50
JICA	

13.2kV Connection Line



Substation (outdoor)
 ↑
 ↓
 Turbine Generator System

Individual Operation Detector



Francis Turbine
 He:52.575m
 Qmax:1.0m³/s
 1.200r/min
 450kW

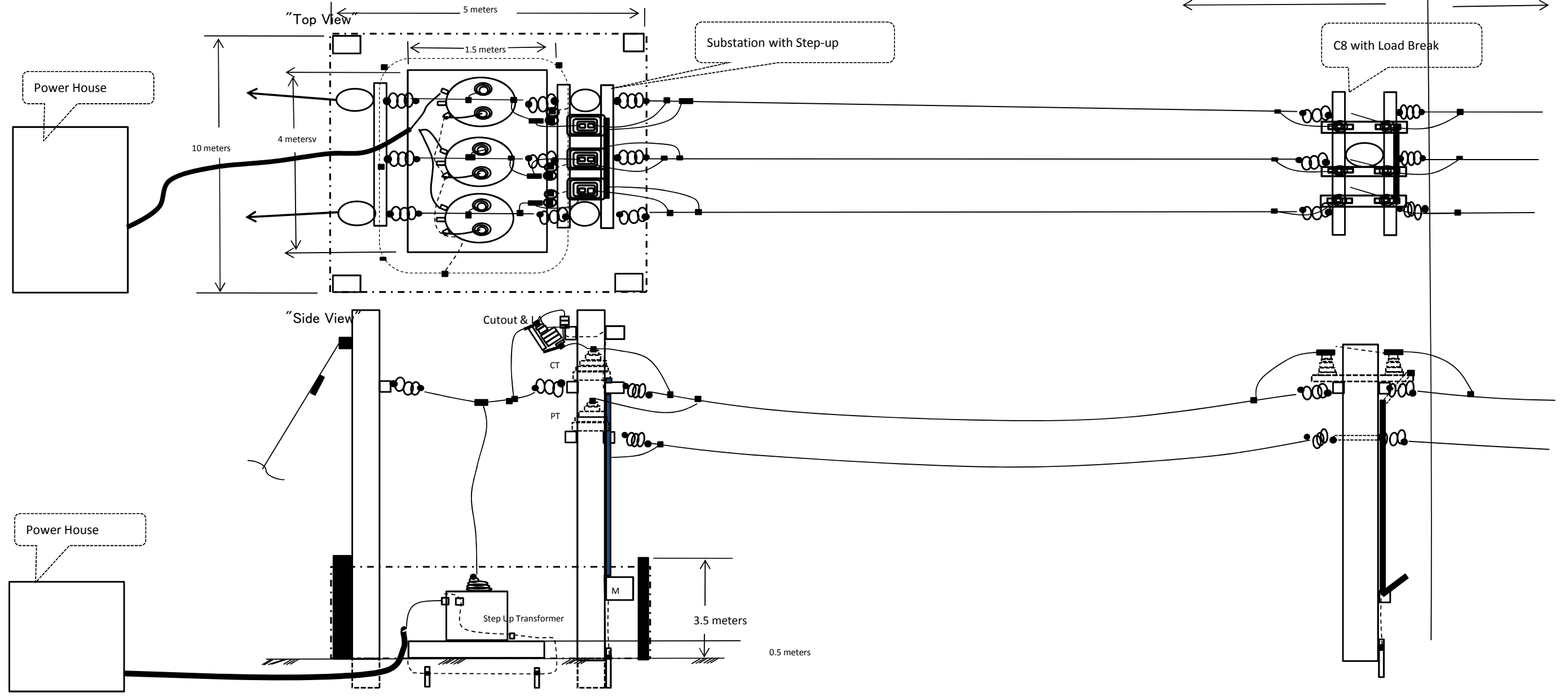
Synchronous Generator
 440V 60HZ
 450kVA
 PF 0.9

Francis Turbine
 He:52.575m
 Qmax:1.0m³/s
 1.200r/min
 450kW

Synchronous Generator
 440V 60HZ
 450kVA
 PF 0.9

Preparatory Suevey for Mini-Hydropower Development Project in the Philoppines	
Likud Mini-hydropower Project Single Diagram	
Drawing No.	Scale
Japan International Cooperation Agency(JICA)	

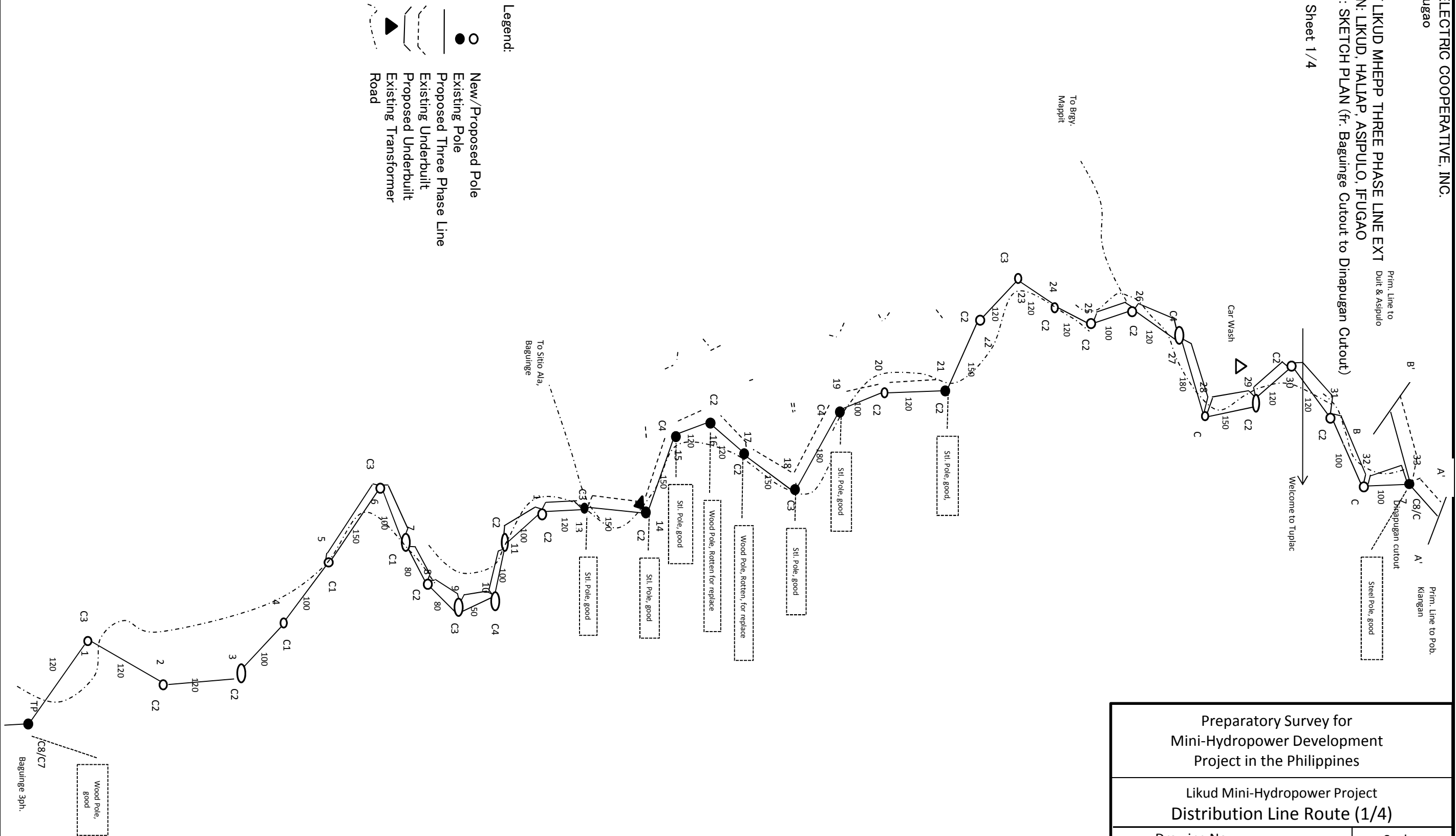
LAYOUT OF LIKUD MHEPP THREE PHASE LINE EXT. SUBSTATION AND DEMARCATION POINT



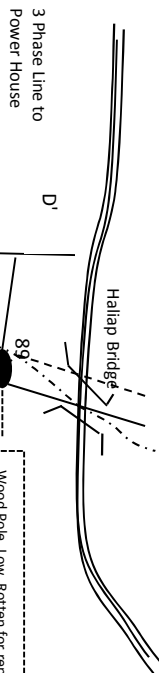
Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-Hydropower Project Sub-Station layout and Plan	
Drawing No.	Scale
Japan International Cooperation Agency (JICA)	

PROJECT LIKUD MHEPP THREE PHASE LINE EXT
LOCATION: LIKUD, HALLAP, ASIPULO, IFUGAO
SUBJECT: SKETCH PLAN (fr. Baguinge Outcut to Dinapungan Outcut)

Sheet 1/4

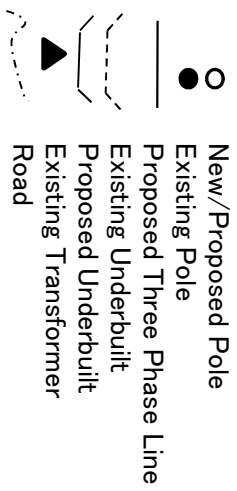
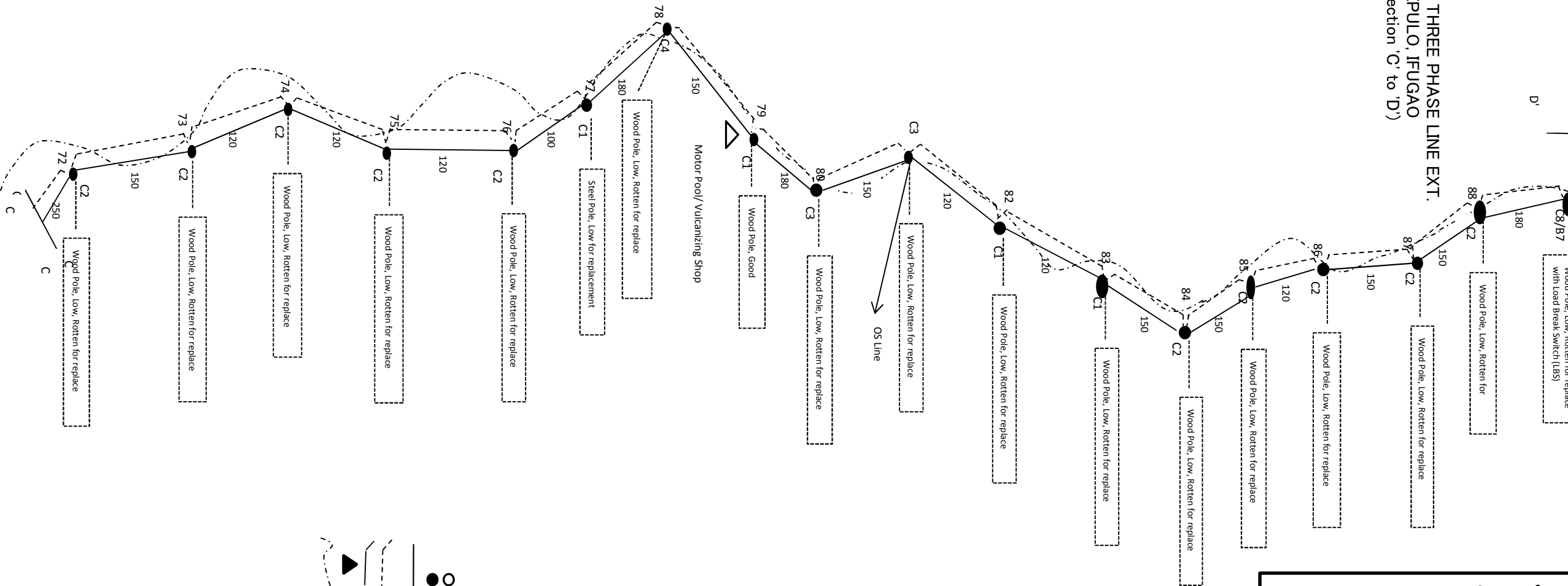


Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-Hydropower Project Distribution Line Route (1/4)	
Drawing No.	Scale
Japan International Cooperation Agency (JICA)	



PROJECT: LIKUD MHEPP THREE PHASE LINE EXT.
LOCATION: LIKUD, HALIAP, ASIPULO, IFUGAO
SUBJECT: SKETCH PLAN (fr. Section 'C' to 'D')

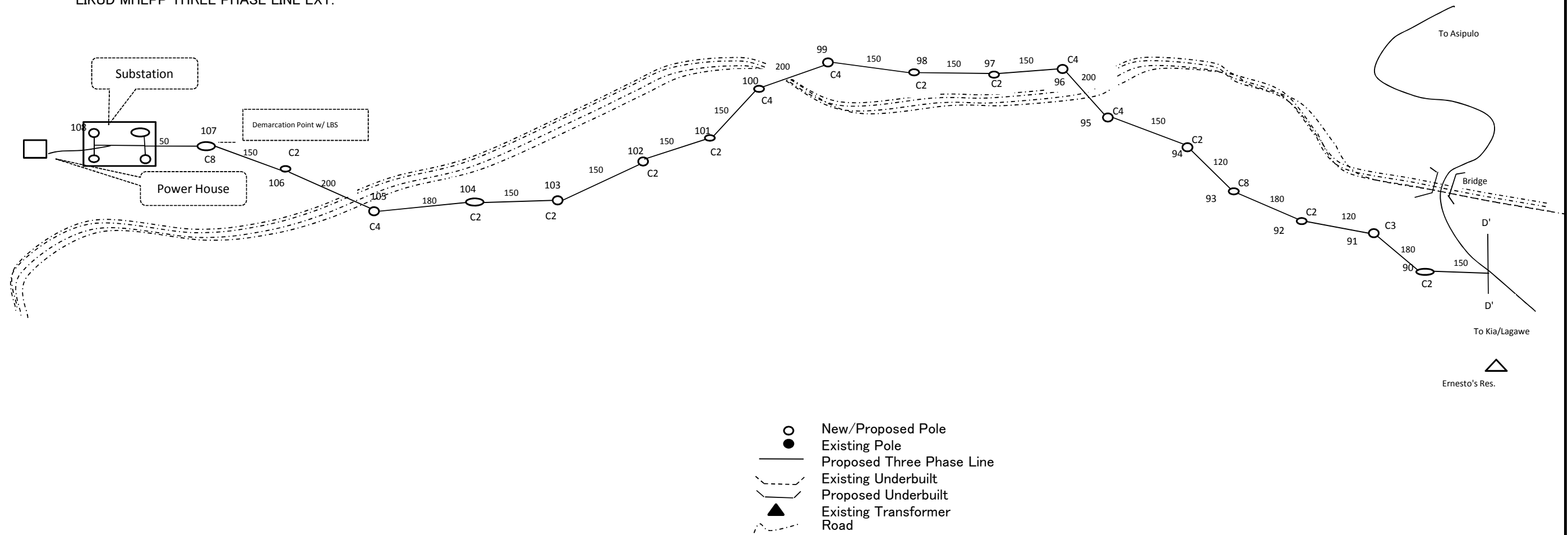
Sheet 3/4



Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-Hydropower Project Distribution Line Route (3/4)	
Drawing No.	Scale
Japan International Cooperation Agency (JICA)	

PROJECT:
LOCATION: LIKUD, HALIAP, ASIPULO, IFUGAO
SUBJECT: SKETCH PLAN (FR. SECTION 'D' TO POWER HOUSE)

LIKUD MHEPP THREE PHASE LINE EXT.



Preparatory Survey for Mini-Hydropower Development Project in the Philippines	
Likud Mini-Hydropower Project Distribution Line Route (4/4)	
Drawing No.	Scale
Japan International Cooperation Agency (JICA)	