บริษัท ฟรอนเทียร์ เอ็นจิเนียริ่ง คอนซัลแทนท์ส จำกัด
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

ที่ DB.033/66

7 เมษายน 2566

เรื่อง ขอแจ้งรายละเอียดผลการศึกษาเพิ่มเติม
งานศึกษาและออกแบบรายละเอียดการปรับปรุงเพิ่มประสิทธิภาพและเพิ่มกำลังผลิต
โครงการไฟฟ้าพลังน้ำห้วยลำสินธุ์ จังหวัดพัทลุง

เรียน ผู้อำนวยการกองพัฒนาพลังงานทดแทน

อ้างถึง หนังสือที่ พน 0506(กพพ.)/2 ลงวันที่ 5 เมษายน 2566

ตามหนังสือที่อ้างถึง ซึ่งท่านได้แจ้งขอความอนุเคราะห์บริษัท ฟรอนเทียร์ เอ็นจิเนียริ่ง คอนซัลแทนท์ส จำกัด ซึ่งเป็นบริษัทที่ปรึกษาผู้ออกแบบรายละเอียดงานปรับปรุงเพิ่มประสิทธิภาพโครงการไฟฟ้าพลังน้ำห้วยลำสินธุ์ จังหวัดพัทลุง ให้ศึกษารายละเอียดการปรับปรุงเพิ่มประสิทธิภาพและเพิ่มกำลังผลิตของโครงการเพิ่มเติมนั้น

บัดนี้ บริษัทฯ ได้ดำเนินการศึกษารายละเอียดเพิ่มเติมแล้วเสร็จใน 2 ประเด็นหลักตามที่กองพัฒนาพลังงานทดแทน (กพพ.) ได้ขอให้ทางบริษัทฯ ดำเนินการศึกษา จึงขอรายงานสรุปผลการศึกษา ดังนี้

1. ระบบท่อส่งน้ำขนาดเส้นผ่านศูนย์กลาง 60 เซนติเมตร ซึ่งติดตั้งในระบบไฟฟ้าพลังน้ำของโครงการมีศักยภาพในการพัฒนากำลังผลิตติดตั้งสูงสุดได้ 1,888 กิโลวัตต์ พลังงานไฟฟ้าที่ผลิตได้เฉลี่ยต่อปีประมาณ 14.73 ล้านหน่วย โดยจะต้องเพิ่มความหนาท่อช่วง กม.0+000 ถึง กม.0+555 จากเดิม 9 มิลลิเมตร เป็น 12 มิลลิเมตร และช่วง กม.0+555 ถึง กม.1+171 จากเดิม 12 มิลลิเมตร เป็น 15 มิลลิเมตร ทั้งนี้เพื่อรองรับ Water Hammer ที่เพิ่มขึ้นเนื่องจากความเร็วน้ำในท่อสูงขึ้น

2. ระบบไฟฟ้าพลังน้ำของโครงการตามข้อ 1. เมื่อพัฒนาโครงการร่วมกับระบบไฟฟ้าพลังงานแสงอาทิตย์ ซึ่ง กพพ.จะดำเนินการติดตั้งบริเวณพื้นที่ของโครงการ ขนาด 650 กิโลวัตต์ แล้ว พบว่ามีความคุ้มค่าในการลงทุนเชิงเศรษฐศาสตร์ กล่าวคือ เมื่อพิจารณาที่อัตราส่วนลดร้อยละ 8 จะให้ผลประโยชน์ต่อทุน (B/C) เท่ากับ 2.83 และให้อัตราผลตอบแทนทางเศรษฐศาสตร์ (EIRR) ร้อยละ 33.89

จึงเรียนมาเพื่อโปรดทราบและพิจารณา

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

ขอแสดงความนับถือ

(นายวสุ ลิขิตวรรณการ)
กรรมการผู้จัดการ
บริษัท ฟรอนเทียร์ เอ็นจิเนียริ่ง คอนซัลแทนท์ส จำกัด

45ซอยประชาราษฎร์ 3ตำบลตลาดขวัญ อำเภอเมืองนนทบุรี จังหวัดนนทบุรี 11000 โทร 02-968-4461-2แฟกซ์ 02-968-4464
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Department of Alternative
Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

AMPHOE KONGRA CHANGWAT PHATTHALUNG

CONTRACT C1

CIVIL WORKS

VOLUME 4
DRAWINGS

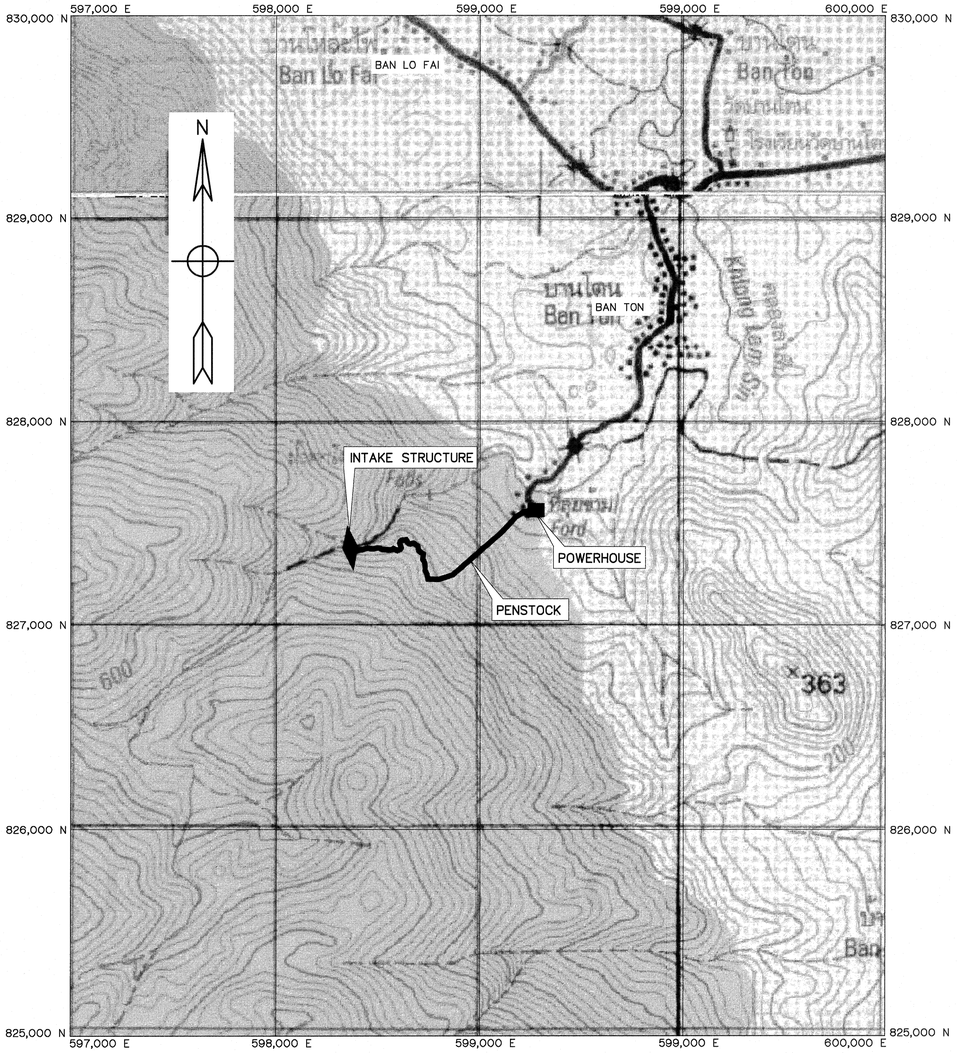
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

HUAI LAM SIN HYDROPOWER PROJECT

CONTRACT C1 : LIST OF DRAWINGS

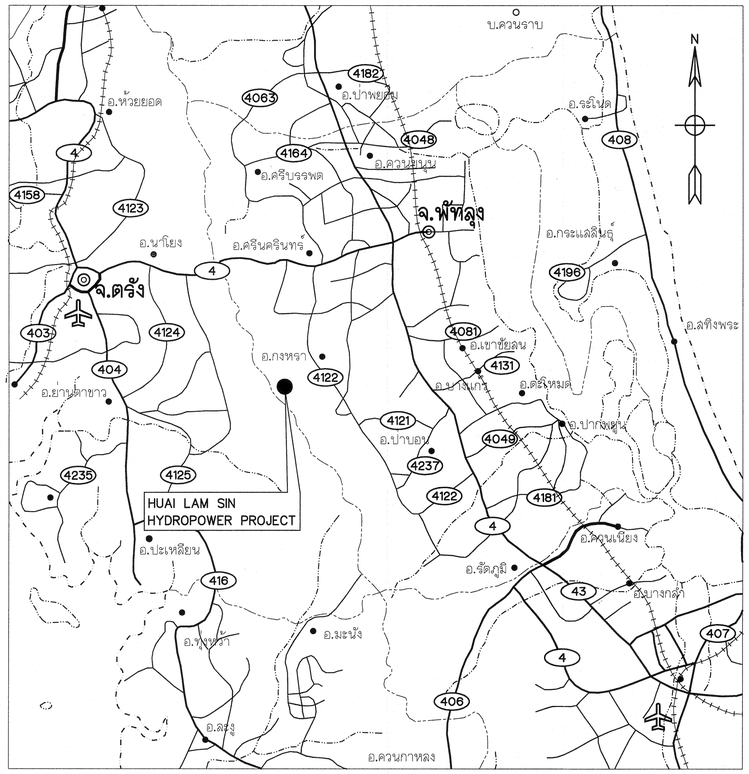
SHEET NO.	DRAWING NO.	DRAWING DETAILS
		GENERAL
1	HLS-GN-01	LOCATION MAP AND PROJECT AREA MAP
2	HLS-GN-02	PROJECT MAP
3	HLS-GN-03	SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES
4	HLS-GN-04	HYDROLOGY DATA
5	HLS-GN-05	HYDRAULIC GRADE LINE
6	HLS-GN-06	BORING LOCATION PLAN
7	HLS-GN-07	GEOLOGICAL PROFILE 1/4
8	HLS-GN-08	GEOLOGICAL PROFILE 2/4
9	HLS-GN-09	GEOLOGICAL PROFILE 3/4
10	HLS-GN-10	GEOLOGICAL PROFILE 4/4
		INTAKE STRUCTURE
11	HLS-IS-01	GENERAL LAY-OUT
12	HLS-IS-02	PLAN AND SECTION A-A
13	HLS-IS-03	SECTION B-B, C-C, D-D, E-E AND DETAILS
14	HLS-IS-04	MISCELLANEOUS DETAILS
15	HLS-IS-05	REINFORCEMENT DETAILS (SHEET 1/2)
16	HLS-IS-06	REINFORCEMENT DETAILS (SHEET 2/2)
17	HLS-IS-07	0.60 M. DIA. VERTICAL GATE
18	HLS-IS-08	1.00x1.00 m. VERTICAL GATE (GATE INSTALLATION)
19	HLS-IS-09	1.00x1.00 m. VERTICAL GATE (GATE DETAIL)
20	HLS-IS-10	PEDESTAL SCREW LIFT CAPACITY 750 KG.
21	HLS-IS-11	GATE-LIFT PEDESTALS 2.25 TONS
22	HLS-IS-12	PEDESTAL SCREW LIFT CAPACITY 2.25 TONS
		PENSTOCK
23	HLS-PS-01	PLAN AND PROFILE, STA. 0+000 TO STA. 0+400
24	HLS-PS-02	PLAN AND PROFILE, STA. 0+400 TO STA. 0+800
25	HLS-PS-03	PLAN AND PROFILE, STA. 0+800 TO STA. 1+000
26	HLS-PS-04	PLAN AND PROFILE, STA. 1+000 TO STA. 1+171.00
27	HLS-PS-05	DETAILS OF WALKWAY
28	HLS-PS-06	REINFORCEMENT DETAILS WALKWAY
29	HLS-PS-07	PIER TYPE 1 DETAILS
30	HLS-PS-08	PIER TYPE 2 DETAILS
31	HLS-PS-09	SUPPORT ELEVATION, SECTIONS AND DETAILS
32	HLS-PS-10	ANCHOR BLOCK ①, ② & ③ PLANS AND REINFORCEMENT DETAILS
33	HLS-PS-11	ANCHOR BLOCK ④, ⑤ & ⑥ PLANS AND REINFORCEMENT DETAILS
34	HLS-PS-12	ANCHOR BLOCK ⑦, ⑧ & ⑨ PLANS AND REINFORCEMENT DETAILS
35	HLS-PS-13	ANCHOR BLOCK ⑩ & ⑪ PLANS AND REINFORCEMENT DETAILS
36	HLS-PS-14	ANCHOR BLOCK ⑫, ⑬ & ⑭ PLANS AND REINFORCEMENT DETAILS
37	HLS-PS-15	ANCHOR BLOCK ⑮ PLAN, SECTIONS, AND REINFORCEMENT DETAILS
38	HLS-PS-16	EXPANSION JOINT, PLAN, SECTIONS AND DETAILS
39	HLS-PS-17	BEND DETAILS
40	HLS-PS-18	WELDING DETAILS
41	HLS-PS-19	WYE, PLAN, SECTIONS AND DETAILS
42	HLS-PS-20	EMERGENCY VALVE CHAMBER GENERAL LAY-OUT AND SECTION
43	HLS-PS-21	EMERGENCY VALVE CHAMBER PLAN SECTIONS AND DETAILS
44	HLS-PS-22	EMERGENCY VALVE CHAMBER REINFORCEMENT DETAILS

SHEET NO.	DRAWING NO.	DRAWING DETAILS
		POWER HOUSE
45	HLS-PH-01	GENERAL LAY-OUT
46	HLS-PH-02	PLAN AND ROOF PLAN
47	HLS-PH-03	ELEVATIONS
48	HLS-PH-04	SECTIONS
49	HLS-PH-05	DETAILS OF TOILET AND SEPTIC TANK
50	HLS-PH-06	DETAILS OF DOORS, WINDOWS AND NAME PLATE
51	HLS-PH-07	FOOTING, BEAM, SLAB ROOF BEAM AND TRUSS PLANS
52	HLS-PH-08	PLAN AND DETAILS OF FOOTING, COLUMN ,CORBEL AND BRACKET
53	HLS-PH-09	BEAM AND DRAIN DITCH REINFORCEMENT DETAILS
54	HLS-PH-10	SLAB REINFORCEMENT DETAILS
55	HLS-PH-11	DETAILS TRUSS T-1 AND T-2 (1/2)
56	HLS-PH-12	DETAILS TRUSS T-1 AND T-2 (2/2)
57	HLS-PH-13	CABLE TRENCH DETAILS
58	HLS-PH-14	CONCRETE PAVEMENT
59	HLS-PH-15	DITCH PLAN
60	HLS-PH-16	DITCH SECTIONS AND DETAILS
61	HLS-PH-17	MANHOLE AND DITCH REINFORCEMENT DETAILS
62	HLS-PH-18	ELECTRICAL LIGHTING, EXHAUST AND OUTLET PLAN
63	HLS-PH-19	EXTERIOR LIGHTING PLAN
64	HLS-PH-20	WATER SUPPLY PIPELINE SYSTEM LAY-OUT
65	HLS-PH-21	PIT VALVE, FIELD TAP AND SLEEVE PIPE DETAILS
66	HLS-PH-22	GROUNDING SYSTEM
		TAILRACE
67	HLS-TR-01	PLAN AND SECTION A-A
68	HLS-TR-02	SECTIONS B-B, C-C AND D-D
69	HLS-TR-03	GRATING COVER AND LADDER RUNGS DETAILS
70	HLS-TR-04	REINFORCEMENT DETAILS (SHEET 1/2)
71	HLS-TR-05	REINFORCEMENT DETAILS (SHEET 2/2)



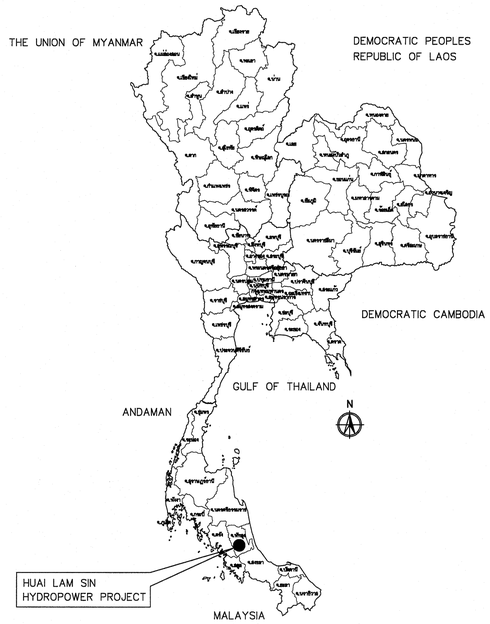
PROJECT AREA MAP

SCALE 1:15,000



LOCATION MAP

NOT TO SCALE



LOCATION MAP

NOT TO SCALE

LEGENDS :

- STREAM
- INTAKE STRUCTURE
- PENSTOCK
- POWERHOUSE

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

0 0.1 0.2 0.4 0.6 0.8 1.0 1.2

SCALE 1:15,000 KILOMETERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

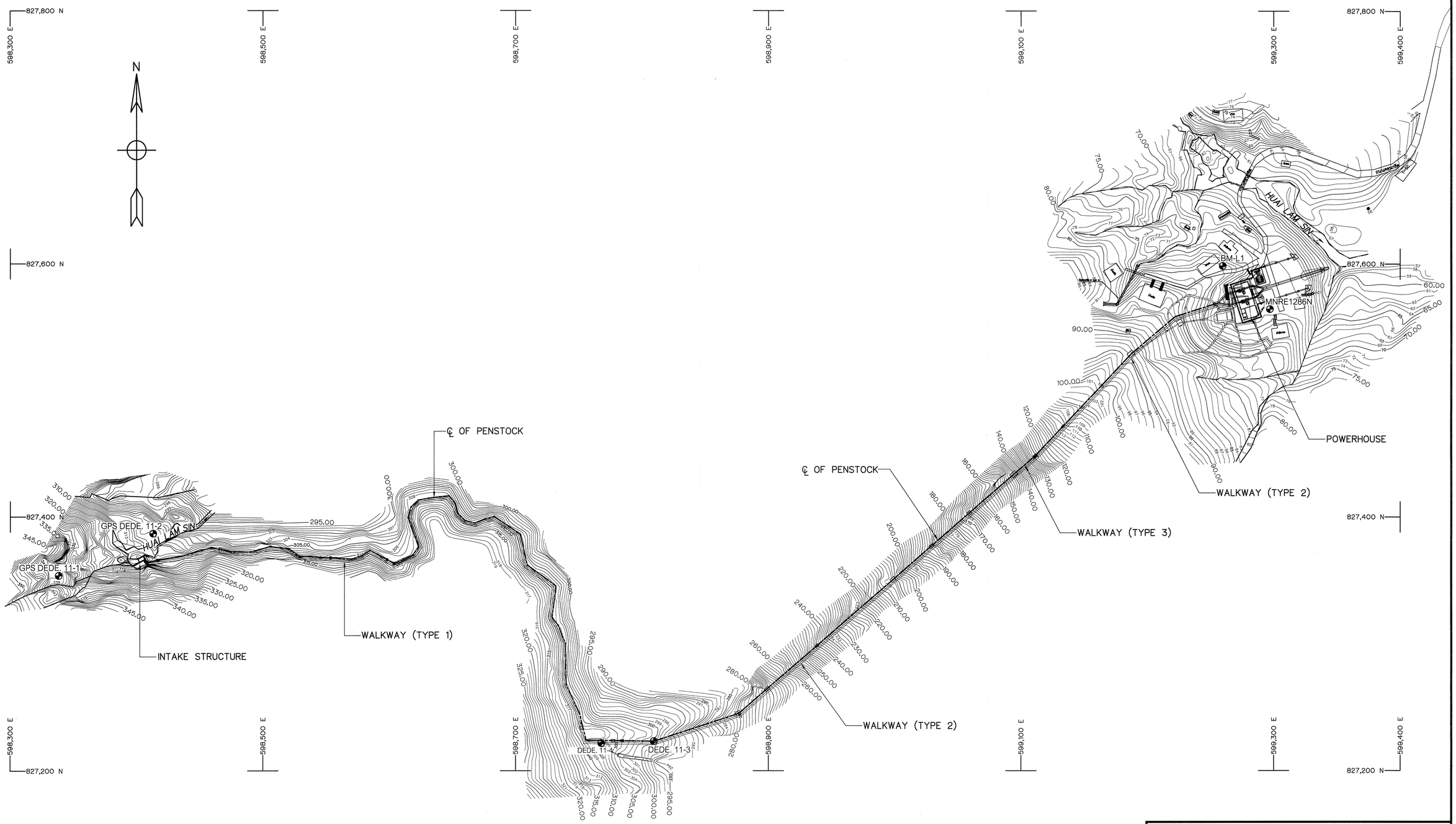
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS

GENERAL

LOCATION MAP AND PROJECT AREA MAP

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED S.KITTIGNAI
DESIGNED สย.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED สย.7324	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS-GN-01
	SHEET NO. 1 OF 71



PROJECT MAP

SCALE 1:1,500

0 10 30 60 90 120

SCALE 1:1,500 METERS

BM. DESCRIPTIONS

BM NO.	COORDINATE		ELEVATION
	N	E	M. (MSL.)
GPS DEDE. 11-1	827,354.129	598,338.669	+339.199
GPS DEDE. 11-2	827,387.233	598,413.286	+308.463
DEDE. 11-3	827,223.464	598,809.441	+301.019
DEDE. 11-4	827,221.905	598,767.983	+307.643
BM-L1	827,598.487	599,259.619	+73.947
MNRE1286N	827,564.329	599,296.961	+68.789

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS. UNLESS OTHERWISE SHOWN.
2. SYMBOLE, ABBREVIATIONS AND CENERAL NOTES SEE DWG. NO. HLS-GN-03

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
GENERAL
PROJECT MAP

FEC FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

DESIGNED		วศ.6651	REVIEWED S.KITCHAI
DRAWN			SUBMITTED
CHECKED		วศ.7324	RECOMMENDED
PROJECT MANAGER	14/01/62 DATE		APPROVED

DRAWING NO. HLS-GN-02

SHEET NO. 2 OF 71

ABBREVIATIONS :

A	CROSS-SECTION AREA OF FLOW	MAX.	MAXIMUM
AC.	ASBESTOS CEMENT PIPE	M.S.L.	MEAN SEA LEVEL
AGG.	AGGREGATE	MISC.	MISCELLANEOUS
ALT.	ALTERNATIVE	N.	NORTH
APPROX.	APPROXIMATE	n.	MANNING'S ROUGHINESS COEFFICIENT
AZ.	AZIMUTH	N.F.	NEAR FACE
B.	BEGINNING OF SURVEY	NGL.	NATURAL GROUND LEVEL
BC.	BEGINNING OF CURVE	NO. OR #	NUMBER
BEG.	BEGINNING	N.W.L.	NORMAL WATER LEVEL
BF.	BOTTOM FACE	OD.	OUTSIDE DIAMETER
B	BEAM	O.F.	OUTSIDE FACE
B.M.	BENCH MARK	O&M	OPERATION & MAINTENANCE
BOTT.	BOTTOM	PC.	POINT OF HONRIZONTAL CURVATURE
BRG.	BEARING	PI.	POINT OF HORIZONTAL INTERSECTION
C.B.R.	CALIFORNIA BEARING RATIO	PL.	PLATE
C/C	CENTER TO CENTER	P.O.C.	POINT ON CURVE
℄	CENTER LINE	P.O.T.	POINT ON TANGENT
CL.	CLEARANCE	P.O.S.T.	POINT ON SUB-TANGENT
CM. OR cm.	CENTIMETER	PRC.	POINT OF HORIZONTAL REVERSE CURVE
CM./S OR cm./s	CENTIMETER PER SECOND	PT.	POINT OF TANGENT
COL.	COLUMN	PVC.	POLYVINYL CHLORIDE
CONC.	CONCRETE	PVC.	POINT OF VERTICAL CURVATURE
D	DEGREE OF CURVE	PVI.	POINT OF VERTICAL INTERSECTION
DB.	DEFORM BAR	PVRC.	POINT OF VERTICAL REVERSE CURVE
d.	DEPTH OF WATER	PVT.	POINT OF VERTICAL TANGENT
DIA. OR Ø	DIAMETER	Q.	DISCHARGE
DOH.	DEPARTMENT OF HIGHWAY	QTY. QUAN.	QUANTITY
DWG.	DRAWING	R	RADIUS OF CURVATURE
DEDE.	DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY	r	HYDRAULIC RADIUS
		RØ , Ø	ROUND BAR
E	EAST	RC.	REINFORCED CONCRETE
E	END OF SURVEY	RD.	ROAD
EA.	EACH	REF.	REFERENCE
E.C.	END OF CURVE	REINF.	REINFORCEMENT
E.F.	END OF FACE	REQ'D	REQUIRED
EL. OR ELEV.	ELEVATION	RID.	ROYAL IRRIGATION DEPARTMENT
EXIST.	EXISTING	SCH.	SCHEDULE
EXP.	EXPANSION	SE.	SUPERELEVATION
EXT.	EXTERIOR	SETC.	SECTION
EX.	EXTERNAL DISTANCE OF CURVE	S.P.C.T.	STANDARD PROCTOR COMPACTION TEST
f	FREE BOARD , FINISH	S.S.	SIDE SLOPE
F.F.	FAR FACE	STIR.	STIRRUP
F.S.L.	FULL SUPPLY LEVEL	STA.	STATION
FTG.	FOOTING	STD.	STANDARD
HD.	HEAD	STR.	STRUCTURE
HEX.	HEXAGONAL	SYMM.	SYMMETRICAL
HOR.	HORIZONTAL	T.	TANGENT LENGTH , THICKNESS
I.D.	INSIDE DIAMETER	T	TON
I.F.	INSIDE FACE	THK.	THICKNESS
IN. OR "	INCH	T.F.	TOP FACE
INT.	INTERIOR	T.I.S.	THAI INDUSTRIAL STANDARD
INV.	INVERT	Ts.	SUPERELEVATION TRANSITION LENGTH
Kg.	KILOGRAM	TYP.	TYPICAL
Km.	KILOMETER	V.	VELOCITY OF FLOW
KPH.	KILOMETER PER HOUR	V.C.	VERTICAL CURVE
KSC.	KILOGRAM PER SQUARE CENTIMETER	Vc.	LENGTH OF VERTICAL CURVE
L	LENGTH OF CURVE	VER.	VERTICAL
LC.	LENGTH OF HORIZONTAL CURVE	VOL.	VOLUME
LONG.	LONGITUDINAL	W/	WITH
LT.	LEFT	W.C.	WATER CLOSET
L.W.L.	LOW WATER LEVEL	◎	ANGLE
M. OR m.	METER	△	DEFLECTION ANGLE
$M.^2$ OR $m.^2$	SQUARE METER		
$M.^3$ OR $m.^3$	CUBIC METER		
MM. OR mm.	MILLIMETER		
M./S OR m./s	METER PER SECOND		
MIN.	MINIMUM		

SYMBOLS :

N	TYPICAL NORTH ARROW
	CENTER LINE
	PAVED ROAD
	DIRT ROAD, LATEITE ROAD OR TRACK
	VILLAGE
	CITY OR DISTRICT
	POND OR SWAMP
	CULVERT UNDER ROAD
	BRIDGE
	POLE
	TEST PIT
	EXISTING HAND AUGER
	EXISTING DRILL HOLES
	DRILL HOLES
° ′ ″	DEGREE, MINUTE, SECOND
@	AT EQUAL DISTANCE BETWEEN CENTER TO CENTER
	B.M.
KM.1+000	STATION
	BC., EC., PC., PI., PT., PCV., PVT.
	WATER LEVEL
	PLAN OF RIPRAP
	PLAN OF SLOPE RIPRAP
	SECTION OF DUMPED RIPRAP
	SECTION OF HAND PLACED RIPRAP
	SECTION OF SAND
	SECTION OF GRAVEL OR COARSE AGGREGATE
	SECTION OF ROCK
	SECTION OF EARTH
	SECTION OF BACKFILL
	SECTION OF CONCRETE
	STEEL SECTION
	ELEVATION OR PLAN OF EARTH CUT OR FILL
	ELEVATION OR PLAN OF ROCK CUT
1:5 1:5	ELEVATION OR PLAN OF SLOPE
	NATURAL GROUND LEVEL
25.00	CONTOUR LINE
	RIVER, STREAM OR NATURAL DRAIN
FLOW	FLOW DIRECTION
1:5	SLOPE DIRECTION
2 / 1	SLOPE RATIO

GENERAL NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS UNLESS OTHERWISE SHOWN.
2. DURING THE CONTRUCTION PERIOD, IT IS THE CONTRACTOR'S DUTY TO CHECK THE CORRECTION OF ALL RELEVANT LOCATIONS, DIMENSIONS, ELEVATIONS AND OTHER DATA AS PROVIDED BY THE DRAWING AND TECHNICAL SPECIFICATIONS BEFORE THE IMPLEMENTATION OF THE WORKS.
3. IN CASE OF ANY DETAILS BEING NOT MENTIONED OR NOT SHOWN IN THE DRAWING OR TECHNICAL SPECIFICATIONS, OR IN CASE OF ANY DISCREPANCY, DEFECTIVE DESCRIPTION, ERROR, DIMENSION OR AMBIGUTY BETWEEN OR IN ANY OF THE DRAWINGS, IT IS THE CONTRACTOR'S RESPONSIBILITY TO CORRECT AND/OR ADJUST THE RELEVENT DRAWINGS TO OBTAIN FIELD ENGINEER APPROVAL
4. ADDITIONAL SYMBOLS, IF REQUIRED, ARE DEFINED IN THE RESPECTIVE DRAWINGS.
5. THE SPECIFICATIONS AND THE QUANTITIES OF MATERIALS ARE SPECIFIED IN THE TECHNICAL SPECIFICATIONS.
6. ALL PLAIN CONCRETE CORNERS ARE TO BE CHEMFERED 2 cm. UNLESS OTHERWISE SHOWN.
7. SLOPE IN CUT AND FILL SECTIONS, UNLESS OTHERWISE SHOWN, SHALL BE CONFORMED TO THE FOLLOWING TABLE OR AS DIRECTED BY FIELD ENGINEER.

EXISTING GROUND SLOPE 1:S	EARTH		HARD ROCK	
	CUT 1:S	FILL 1:S	CUT 1:S	FILL 1:S
OVER 1:1	OVER 1:0.5 2/	1/	1:0	1/
1:1 – 1:1.5	1:0.5	1	1:0	1/
1:1.5 – 1:2	1:1	1:1	1:0	1:1
1:2 – 1:3	1:1	1:1.5	1:0	1:1.5
LOWER 1:3	1:1	1:2	1:0	1:2

2/ = FILL SHOULD BE AVOIDED

1/ = FOR DOUBTFUL CASES CONSULT FIELD ENGINEER

STRUCTURAL DESIGN NOTES :

1. THE ULTIMATE COMPRESSIVE STRENGTH OF CONCRETE OF STANDARD CYLINDER (Ø0.15x0.30 m.) TEST AT AGE 28 DAYS SHALL BE AS THE FOLLOWING, UNLESS OTHERWISE SHOWN.

fc' (ksc)	DESCRIPTION
350	PRESTRESS CONCRETE
210	1. WEIR / INTAKE STRUCTURE
	2. POWERHOUSE, TAILRACE
	3. TAILRACE
	4. MANHOLE
	5. ANCHOR BLOCK, PIPE SUPPORT
	6. BOX CULVERT
140	LEAN CONCRETE

2. UNLESS OTHERWISE SHOWN, THE FOLLOWING CLEAR COVER OF CONCRETE OVER OF THE REINFORCEMENT SHALL BE USED :
   - FACE EXPOSED TO SCOUR 5.0 cm.
   - FACE EXPOSED TO EARTH OR WEATHER 5.0 cm.
   - FACE UNEXPOSED TO EARTH OR WEATHER 3.0 cm.
3. THE REINFORCEMENT LAP SPLICES SHALL NOT BE LESS THAN 50 DIAMETERS OF BIGGER THAN BAR WITH HOOKS, UNLESS OTHERWISE SHOWN.
4. EMBEDDED METALWORK SHALL BE SECURELY FASTENED IN POSITION BEFORE PLACING CONCRETE.
5. ALL CONSTRUCTION JOINT SHOULD BE TREATED AS DIRECTED IN ORDER TO ASSURE THE BEST BOND.
6. A 5 cm. (MIN.) LAYER OF LEAN CONCRETE (1:3:5 BY VOLUME) SHOULD BE PLACED BELOW CONCRETE STRUCTURES.
7. THE STRUCTURES SHOULD BE PLACED ON UNDISTURBED SOILS OR COMPACTED FILL AND BACKFILL AROUND THE STRUCTURES SHOULD BE COMPACTED.
8. THE FOUNDATION ELEVATIONS ARE SUBJECT TO CHANGE AS DIRECTED ACCORDING TO THE SOIL CONDITIONS.
9. ALL SIZES OF REINFORCING BARS AND STRUCTURAL STEELS ARE IN MILLIMETERS.
10. ALL STRUCTURAL STEELS ARE THOSE OF T.I.S. DESIGNATION Fe24.
11. REINFORCED STEEL BARS SHALL BE CONFORM TO T.I.S. AS FOLLOW :
    - DEFORMED BARS (SD30) – T.I.S. 24-2559
    - ROUND BARS (SR24) – T.I.S. 20-2559
12. ALLOWABLE BEARING CAPACITY OF FOUNDATION SHALL NOT BE LESS THAN AS FOLLOW :
    - INTAKE STRUCTURE Q_a = 25 T/M.^{2}
    - POWERHOUSE Q_a = 10 T/M.^{2}
    - PENSTOCK Q_a = 15 T/M.^{2}
    - WALKWAY Q_a = 10 T/M.^{2}

NO.	DATE	REVISIONS	CHECKED	APPROVED
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MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS

GENERAL

SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED & KITICHAI

DESIGNED		28.6651	SUBMITTED
DRAWN			RECOMMENDED
CHECKED		28.7324	APPROVED
PROJECT MANAGER		14/01/62 DATE	DRAWING NO. HLS-GN-03

SHEET NO. 3 OF 71

TABLE 1 CLIMATOLOGICAL DATA FOR THE PERIOD 1980–2009

Station	KASETPHATTHALUNG					Elevation of station above M.S.L.						2.00 Meters	
Index station	48560												
Latitude	7° 35' 0.0" N												
Longitude	100° 10' 0.0" E												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Pressure (Hectopascal)													
Mean	1011.5	1010.9	1010.1	1009.1	1008.4	1008.0	1008.4	1008.7	1009.3	1009.8	1009.6	1010.4	1009.5
Ext. max.	1019.3	1018.6	1016.5	1015.6	1013.7	1015.1	1013.8	1013.7	1014.9	1015.9	1015.7	1017.1	1019.3
Ext. min.	1003.9	1004.4	1003.4	1002.8	1002.6	1002.3	1003.2	1003.6	1004.1	1003.4	1001.6	1004.0	1001.6
Mean daily range	3.6	3.8	4.2	4.2	3.8	3.4	3.4	3.7	4.0	4.1	3.9	3.7	3.8
Temperature (Celsius)													
Mean	26.8	27.4	28.1	28.7	28.5	28.3	27.9	27.9	27.6	27.2	26.8	26.6	27.7
Mean max.	30.4	31.6	32.6	33.6	33.9	33.5	33.3	33.3	32.9	31.9	30.3	29.8	32.3
Mean min.	23.7	23.6	24.2	25.0	25.0	24.6	24.4	24.3	24.3	24.2	24.4	24.2	24.3
Ext. max.	32.6	34.5	35.6	37.0	37.3	36.5	36.7	37.7	36.6	36.1	34.4	32.8	37.7
Ext. min.	20.3	18.5	20.3	23.0	23.0	22.5	22.0	21.9	22.5	21.2	19.8	21.8	18.5
Dew Point (Celsius)													
Mean	23.7	23.5	24.2	24.8	24.7	24.2	23.8	23.7	23.8	24.1	24.4	24.2	24.1
Relative Humidity (%)													
Mean	84	80	80	81	81	80	80	80	81	84	88	87	82
Mean max.	94	93	93	94	94	94	94	94	94	95	96	95	94
Mean min.	72	66	65	65	63	62	61	60	63	68	76	77	66
Ext. min.	55	47	49	47	44	42	38	34	40	43	52	61	34
Visibility (km.)													
07.00 LST	8.5	9.0	9.2	9.2	9.1	9.0	8.9	9.1	8.8	8.5	7.9	8.1	8.8
Cloudiness (0–10)													
Mean	6.3	4.7	5.1	5.7	6.6	6.8	7.2	6.8	7.2	7.4	7.3	7.1	6.5
Wind (knots)													
Mean wind speed	1.9	2.1	2.0	1.9	1.8	2.1	2.3	2.4	2.5	1.9	1.4	1.7	2.0
Max. wind speed	21	20	25	25	30	25	30	30	32	31	40	22	40
Evaporation (mm.)													
Mean–pan	87.6	105.0	120.1	120.3	122.7	116.0	121.9	125.2	108.5	93.6	69.3	71.2	1261.4
Rainfall (mm.)													
Mean	119.6	70.5	118.7	113.0	103.7	80.6	80.4	98.5	115.7	250.5	549.3	448.2	2148.7
Mean rainy day	12	5	7	10	13	10	12	13	14	20	22	21	158
Daily maximum	176.1	312.8	199.1	128.2	120.3	68.2	76.2	134.4	84.5	111.6	312.7	253.8	312.8
Number of days with													
Haze	1	0	0	0	0	0	0	0	0	1	0	0	3
Fog	1	3	3	4	4	7	6	5	6	2	1	0	41
Hail	0	0	0	0	0	0	0	0	0	0	0	0	0
Thunderstorm	1	1	4	7	10	6	5	6	6	8	8	3	66
Squall	0	0	0	1	1	1	1	1	1	0	0	0	5

TABLE 2 FLOOD PEAK DISCHARGE FOR VARIOUS RETURN PERIODS

RETURN PERIOD (YEAR)	FLOOD PEAK DISCHARGE ($M.^3/SEC.$)	
	REGIONAL FLOOD FREQUENCY ANALYSIS	UNIT HYDROGRAPH
10	70.6	58.8
25	90.5	81.5
50	105.3	100.6
100	119.9	121.6
200	134.5	144.4
500	153.8	177.5
1,000	168.3	204.6

FIGURE 1 FLOW DURATION CURVE AT INTAKE STRUCTURE SITE

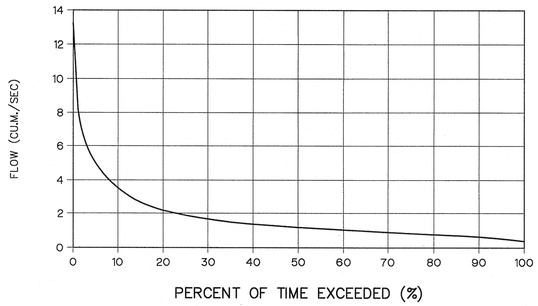
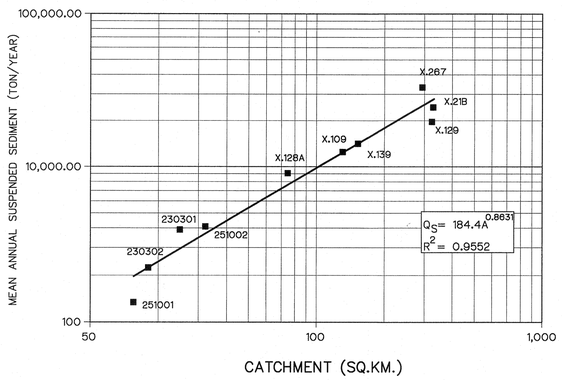


FIGURE 2 RELATIONSHIP BETWEEN ELEVATION AND CATCHMENT AREA



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HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
GENERAL
HYDROLOGY DATA

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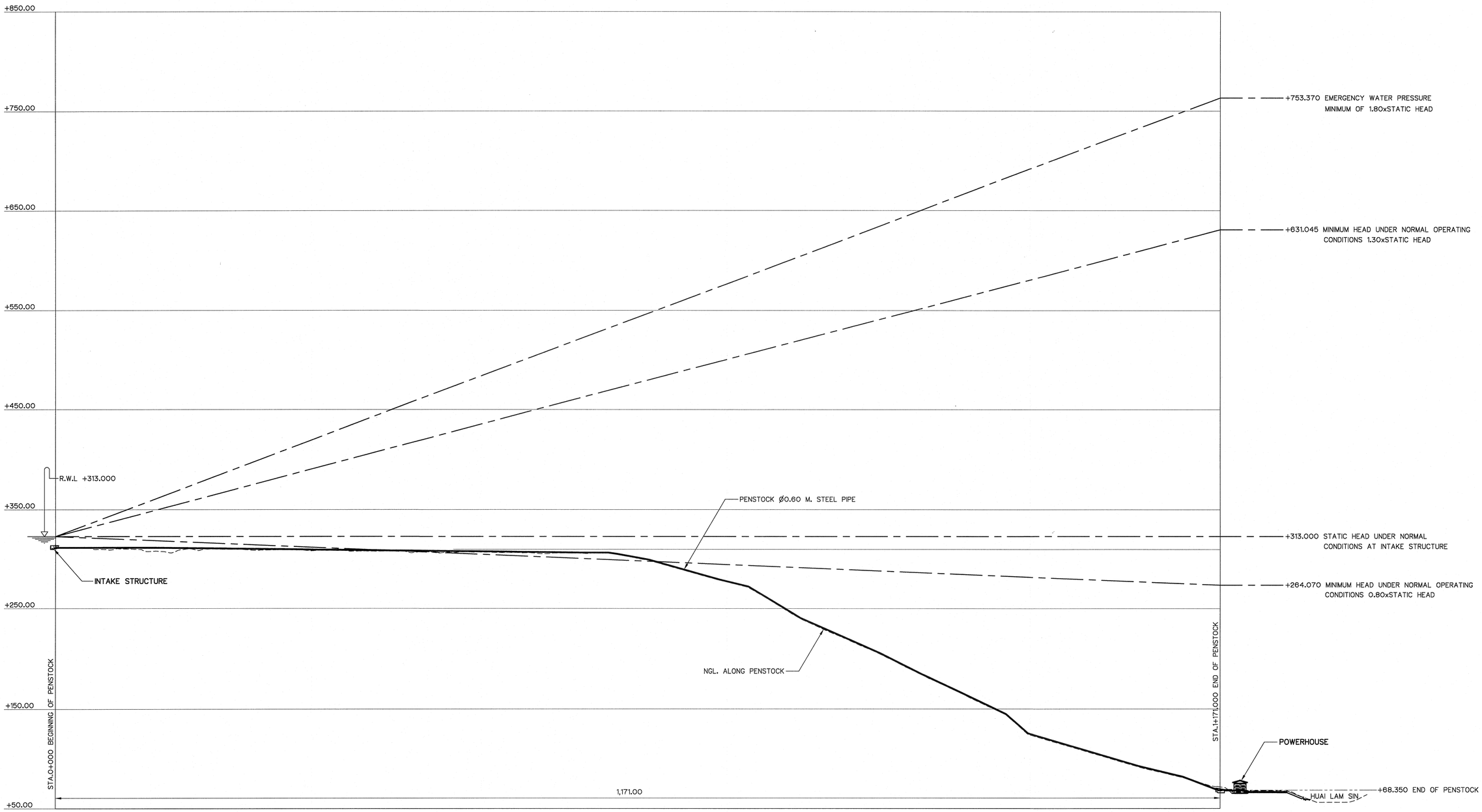
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PROJECT MANAGER 14/01/62 DATE

DRAWING NO. HLS–GN–04

SHEET NO. 4 OF 71



PROFILE ALONG PENSTOCK ℄

SCALE { VERTICAL 1 : 2,000
HORIZONTAL 1 : 2,000

0 50 100 150
SCALE 1:2,000 METERS

NOTES :

1. THE DATA SHOWN ON THIS DRAWING IS PROVISIONAL AND WILL BE REVIEWED WHEN THE ACTUAL TURBINE CHARACTERISTICS ARE KNOWN.
2. IT HAS BEEN ASSUMED THAT STEEL FOR THE PRESSURE PIPELINE CONFORMS TO STEEL TYPE SS41 OF THE JAPANESE INDUSTRIAL STANDARD JIS G 3101
3. THE THICKNESS OF THE PIPE SHELL SHALL INCLUDE A TOLERANCE OF 2 MM. FOR CORROSION AND SHALL BE DESIGNED FOR THE LOAD CASES SHOWN IN THE TABLE BELOW
4. WELD EFFICIENCY ON THE PRESSURE PIPELINE SHALL BE AT LEAST 90%
5. THE LOADING CASES MAY BE MORE FULLY DEFINED AS BELOW
   - NORMAL – INCLUDES NORMAL WATER PRESSURE AND NORMAL LONGITUDINAL LOADS SUCH AS WEIGHT OF PIPELINE, ANCHOR BLOCK, EXTERNAL SOIL AND WATER PRESSURE
   - EMERGENCY – INCLUDES LOSS OF A SUPPORT OR LOADING DUE TO TEST PRESSURE OR IMPOSITION OF DESIGN EARTHQUAKE ON NORMAL CASE
   - EXTREME – INCLUDES EXTREME WATER PRESSURES IN PIPELINE OR INCIDENCE OF MAXIMUM CREDIBLE EARTHQUAKE PLUS NORMAL WATER PRESSURE
6. THICKNESS OF PENSTOCK DESIGNED BASE ON PRESSURE RISE HEAD (WATER HAMMER) TURBINE PERFORMANCE, CLOSING TIME (6 SECCONDS APPROXIMATELY) WILL BE SPECIFIED IN THE BIDDING DOCUMENTS.

LOAD CASES	ALLOWABLE TENSILE STRESS
EXTREME WATER PRESSURE RESULTING FROM SLOWDEN CLOSURE OF THE TABLE VALVE	1.00 x MINIMUM YIELD STRESS
EMERGENCY WATER PRESSURE AND ALL OTHER NORMAL LONGITUDINAL LOADS	0.75 x MINIMUM YIELD STRESS
NORMAL WATER PRESSURE AND ALL OTHER NORMAL LONGITUDINAL LOADS	0.60 x MINIMUM YIELD STRESS

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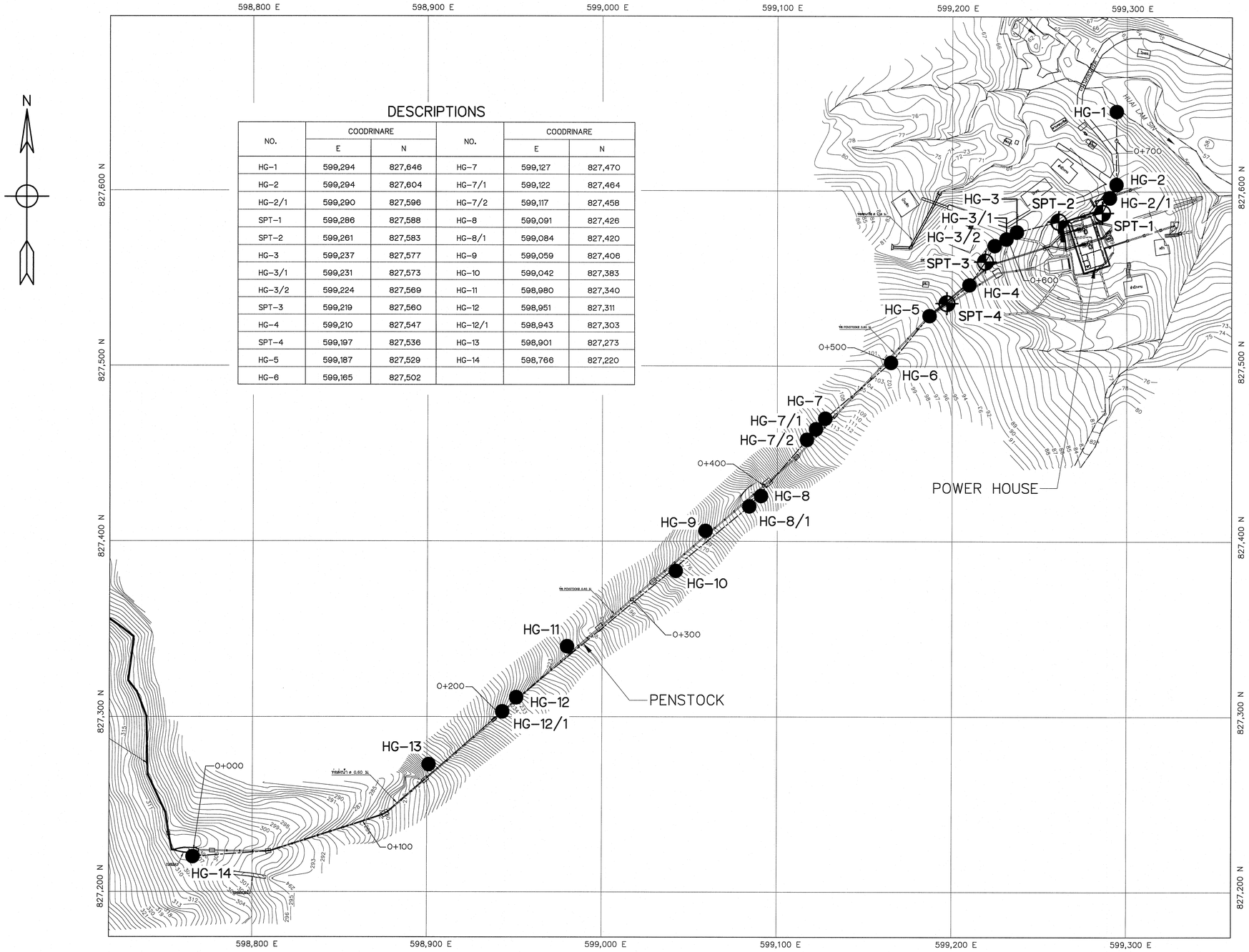
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
GENERAL
HYDRAULIC GRADE LINE

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PROJECT MANAGER 14/01/62	APPROVED
DATE	DRAWING NO. HLS-GN-05
	SHEET NO. 5 OF 71

DESCRIPTIONS

NO.	COODRINARE		NO.	COODRINARE	
	E	N		E	N
HG-1	599,294	827,646	HG-7	599,127	827,470
HG-2	599,294	827,604	HG-7/1	599,122	827,464
HG-2/1	599,290	827,596	HG-7/2	599,117	827,458
SPT-1	599,286	827,588	HG-8	599,091	827,426
SPT-2	599,261	827,583	HG-8/1	599,084	827,420
HG-3	599,237	827,577	HG-9	599,059	827,406
HG-3/1	599,231	827,573	HG-10	599,042	827,383
HG-3/2	599,224	827,569	HG-11	598,980	827,340
SPT-3	599,219	827,560	HG-12	598,951	827,311
HG-4	599,210	827,547	HG-12/1	598,943	827,303
SPT-4	599,197	827,536	HG-13	598,901	827,273
HG-5	599,187	827,529	HG-14	598,766	827,220
HG-6	599,165	827,502			



BORING LOCATION PLAN

SCALE 1:1,250

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

SYMBOL

SPT BORE HOLE

HAND AUGER BORE HOLE

0 10 20 40 60 80 100

SCALE 1:1,250 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
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HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS

GENERAL

BORING LOCATION PLAN

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REVIEWED S. KITICHAN

DESIGNED วิ.6651

SUBMITTED

DRAWN

RECOMMENDED

CHECKED วิ.7324

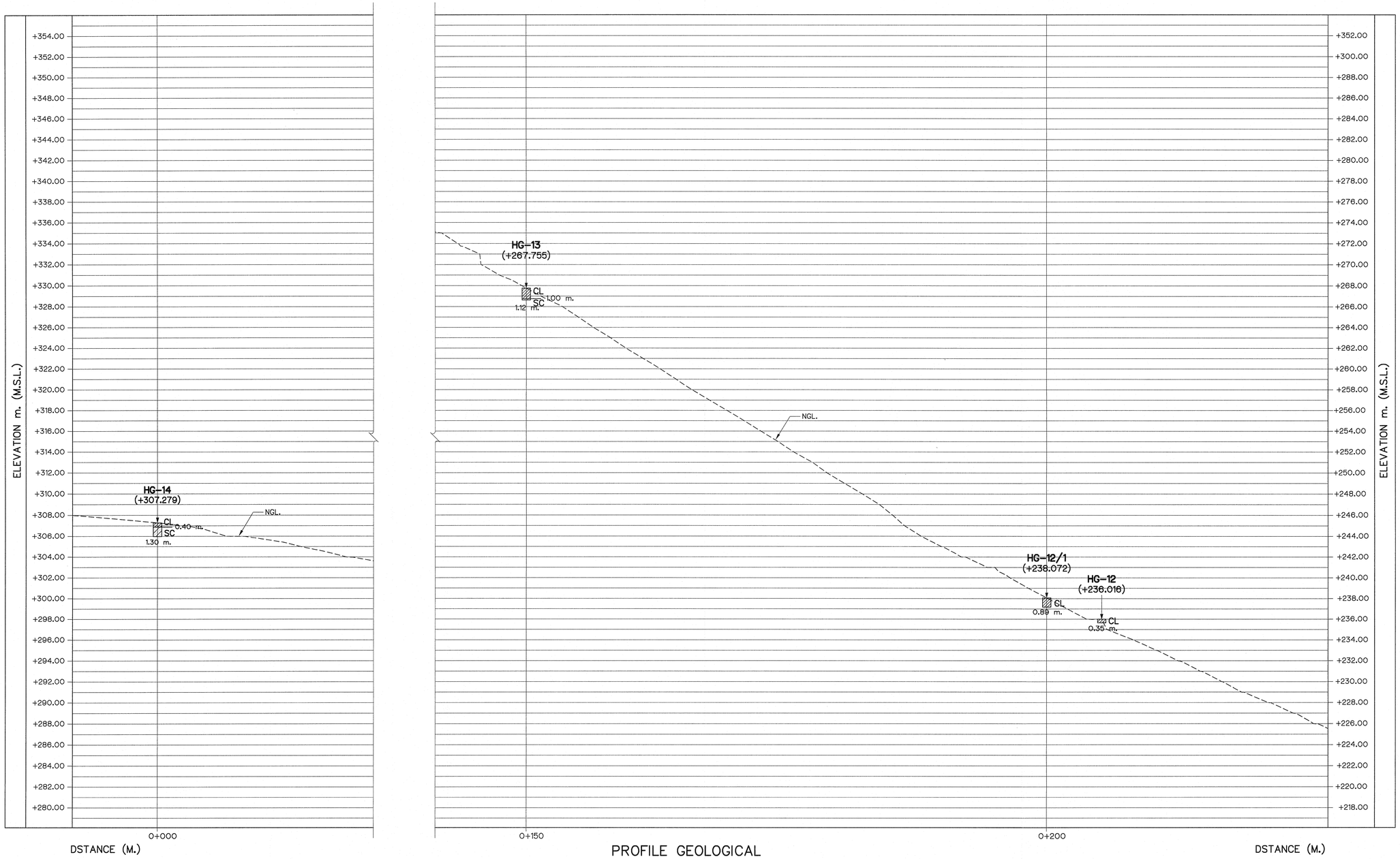
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PROJECT MANAGER

14/01/62
DATE

DRAWING NO. HLS-GN-06

SHEET NO. 6 OF 71



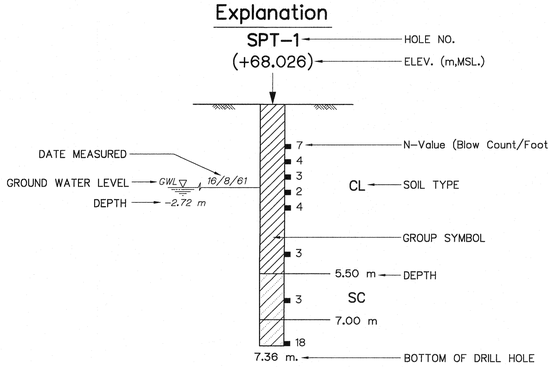
PROFILE GEOLOGICAL

SCALE 1:200

LEGEND

- CL = Lean Clay with Sand
- SC = Clayey Sand

Explanation



NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

0 5 10 15

SCALE 1:200 METERS

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GEOLOGICAL PROFILE 1/4

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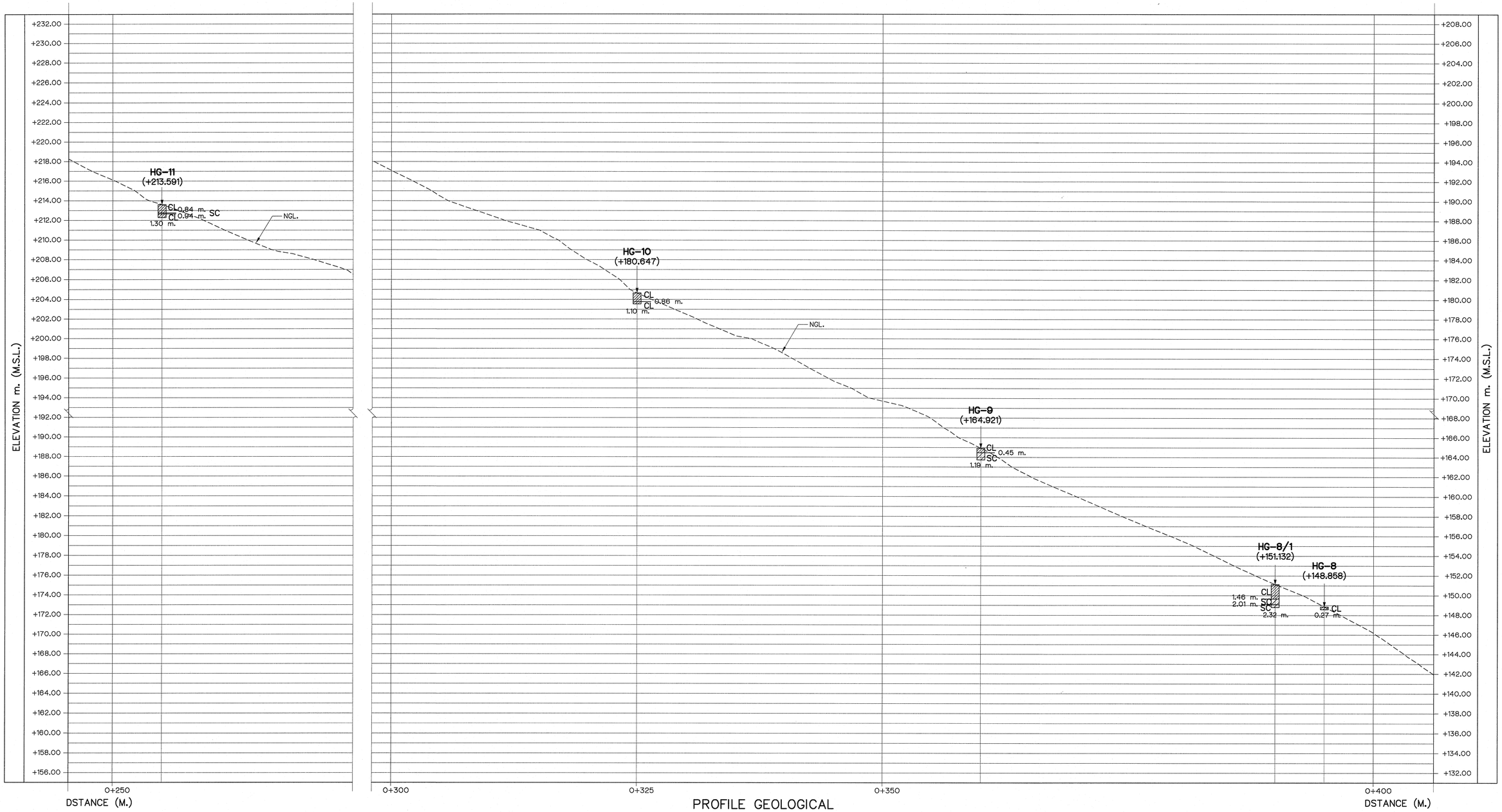
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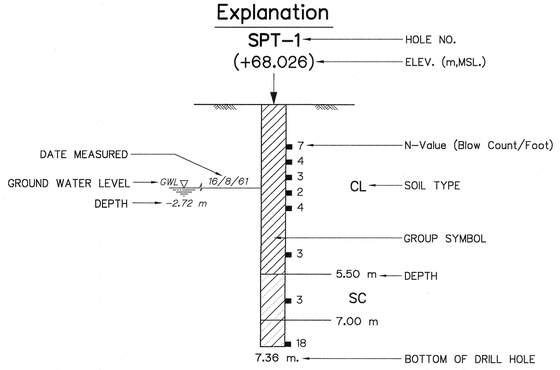
PROFILE GEOLOGICAL

SCALE 1:200

LEGEND

- CL = Lean Clay with Sand
- SC = Clayey Sand

Explanation



NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
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0 5 10 15

SCALE 1:200 METERS

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HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
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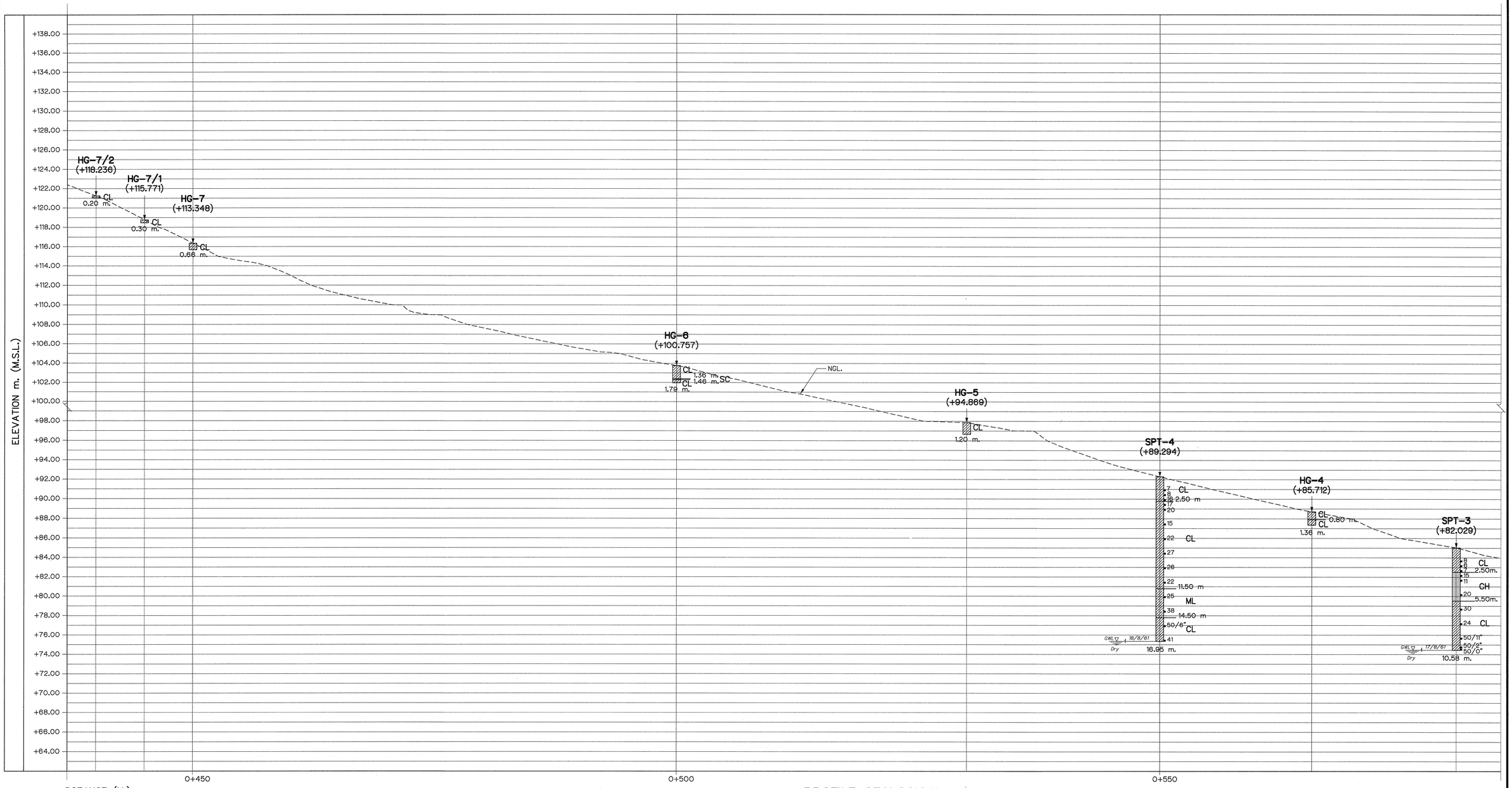
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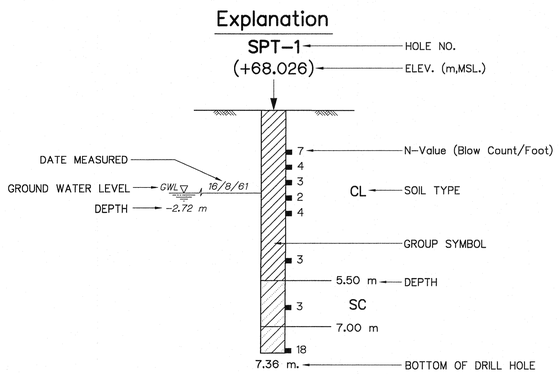
PROFILE GEOLOGICAL

SCALE 1:200

LEGEND

- CL = Lean Clay with Sand
- SC = Clayey Sand

Explanation



NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
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0 5 10 15
SCALE 1:200 METERS

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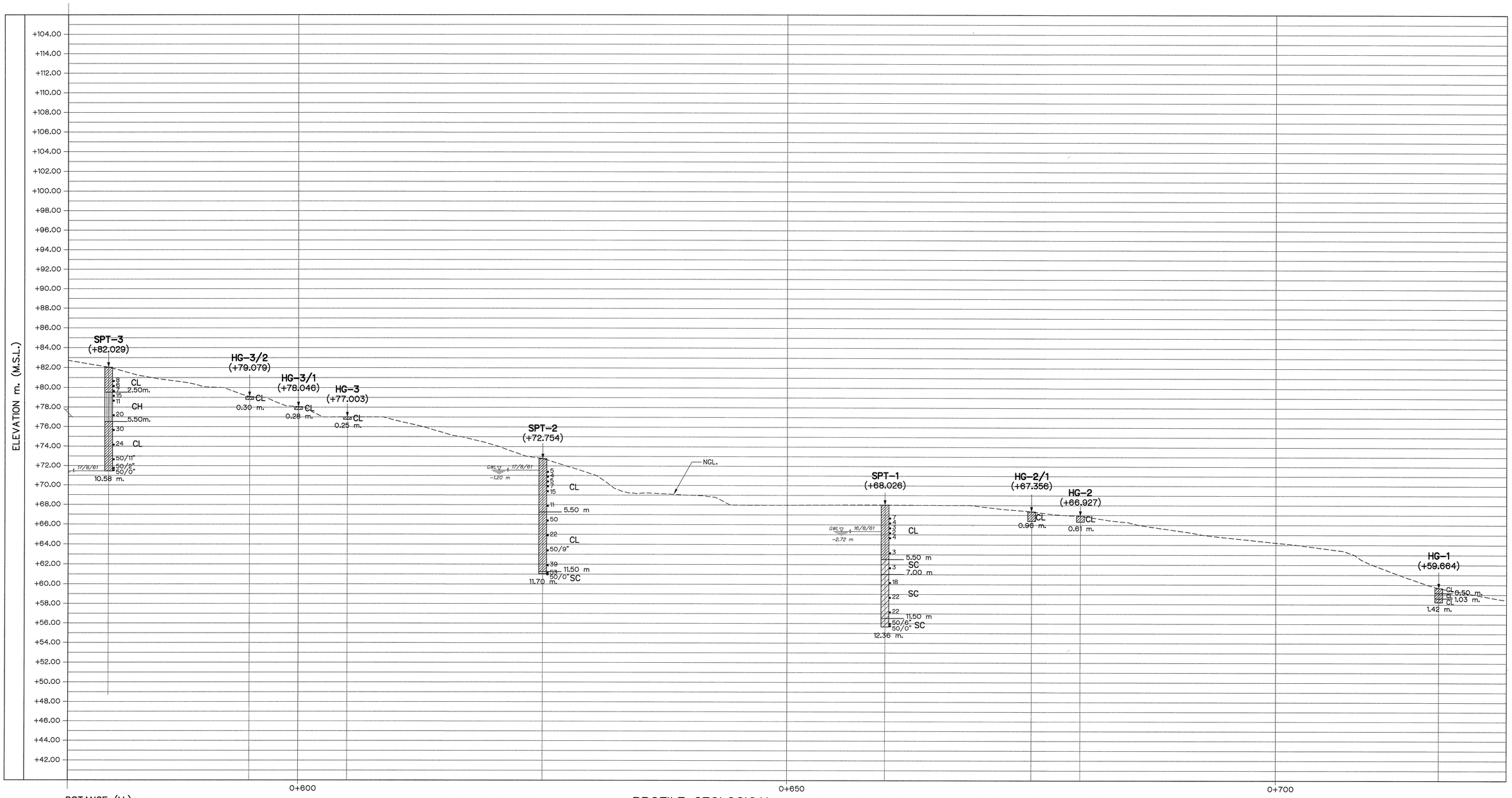
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GEOLOGICAL PROFILE 3/4

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PROJECT MANAGER	14/01/62 DATE	APPROVED	

DRAWING NO. HLS-GN-09
SHEET NO. 9 OF 71



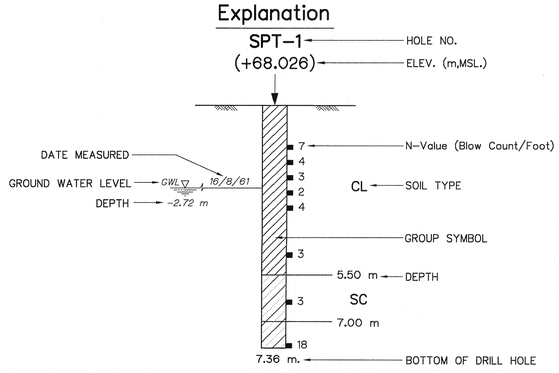
PROFILE GEOLOGICAL

SCALE 1:200

LEGEND

- CL = Lean Clay with Sand
- SC = Clayey Sand

Explanation





NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

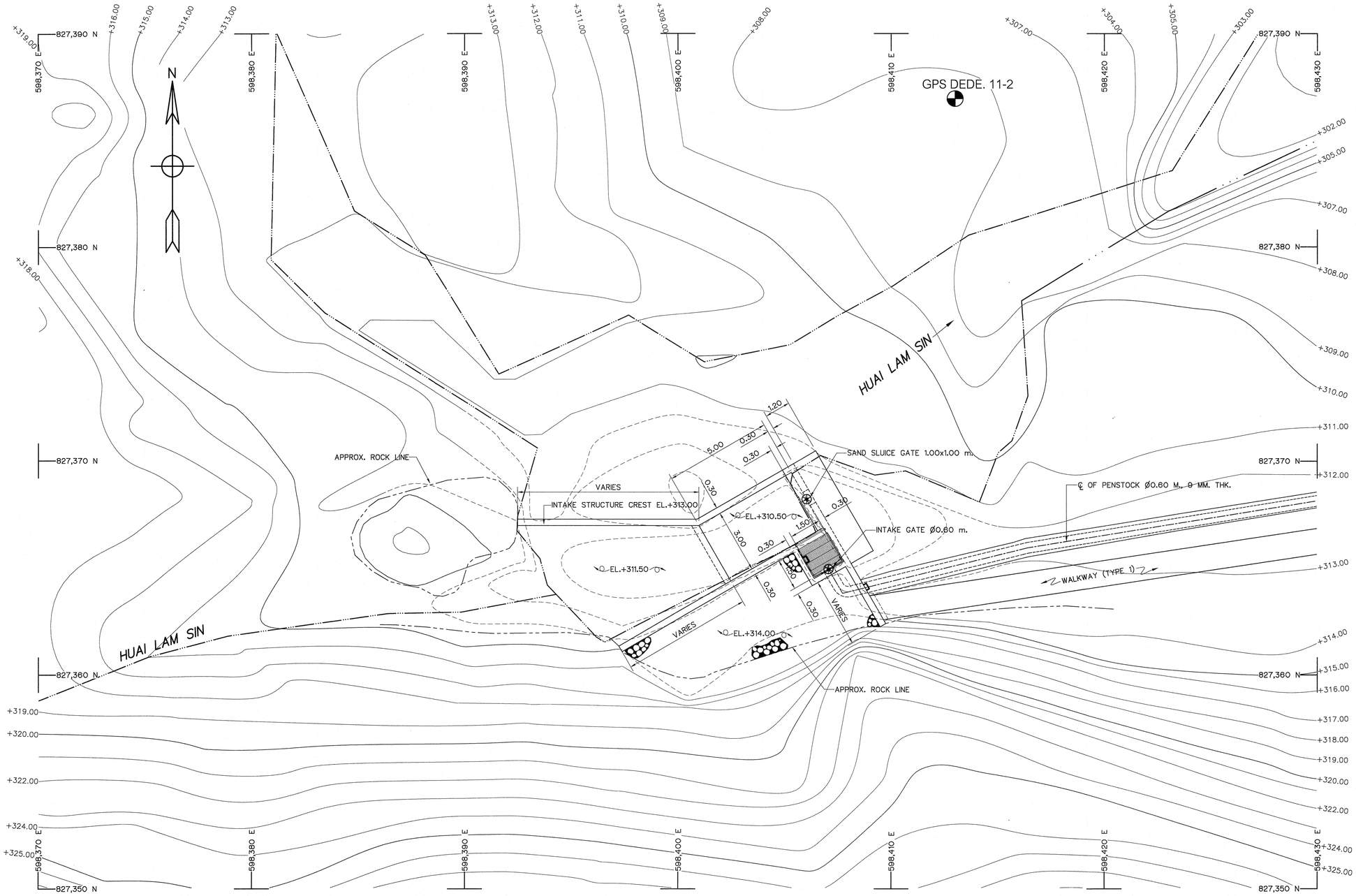
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GENERAL LAY-OUT

SCALE 1:100

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

REFERENCE DRAWINGS :

1. INTAKE STRUCTURE, PLAN AND SECTION A-A HLS-IS-02

0 1 2 4 6 8

SCALE 1:100 METERS

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HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
INTAKE STRUCTURE
GENERAL LAY-OUT

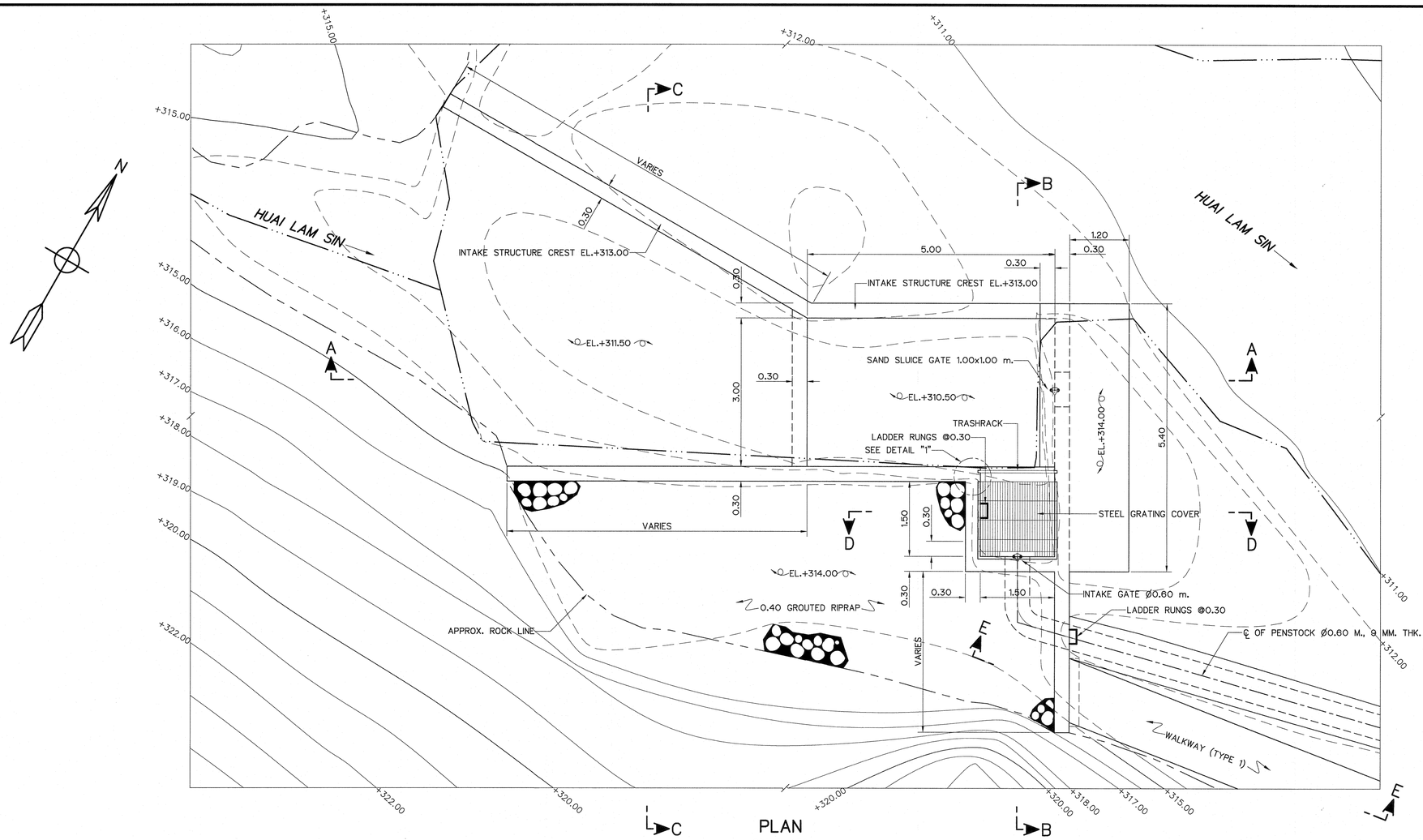
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PROJECT MANAGER	14/01/62 DATE	APPROVED	

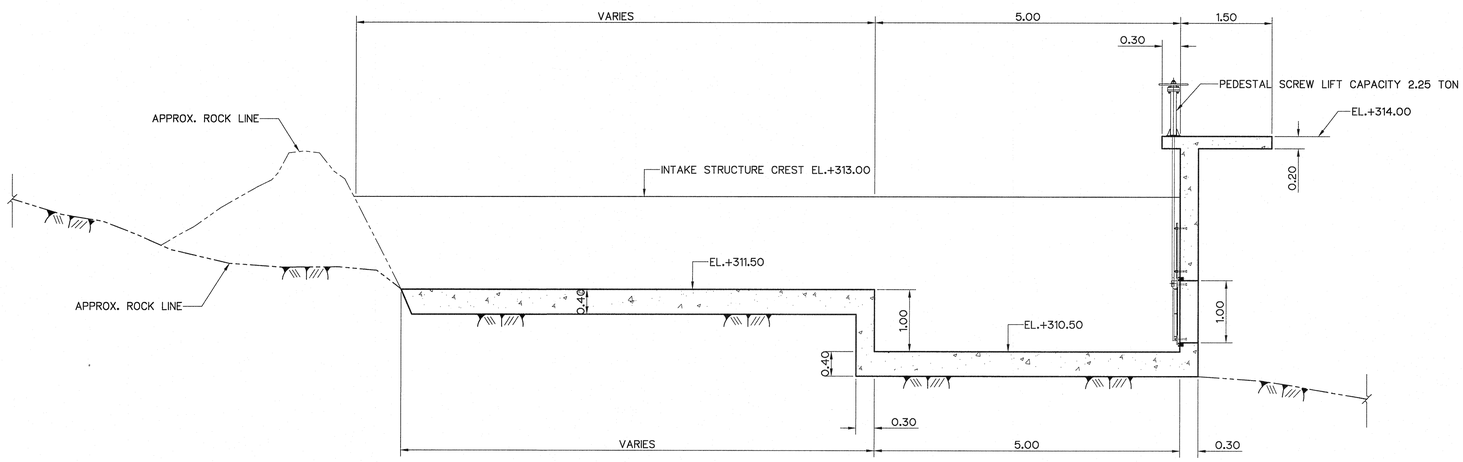
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SHEET NO. 11 OF 71



PLAN

SCALE 1:50



SECTION A–A

SCALE 1:50

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS–GN–03

REFERENCE DRAWINGS :

1. INTAKE STRUCTURE, GENERAL LAY–OUT	HLS–IS–01
2. INTAKE STRUCTURE, SECTION B–B, C–C, D–D AND E–E	HLS–IS–03
3. INTAKE STRUCTURE, MSCELLANEOUS DETAILS	HLS–IS–04

0 0.5 1 2 3 4

SCALE 1:50 METERS

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
INTAKE STRUCTURE
PLAN AND SECTION A–A

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

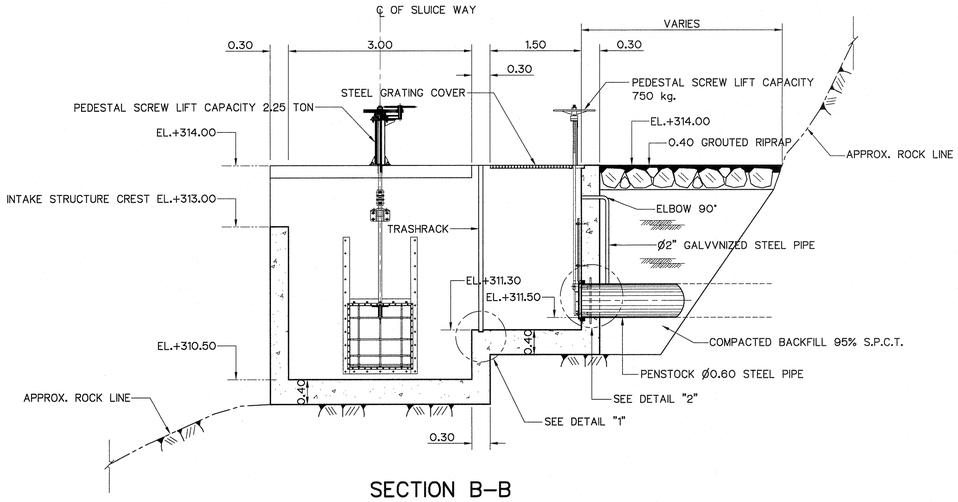
CONSULTANTS: FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

DEDE: Department of Alternative Energy Development and Efficiency, MINISTRY OF ENERGY

DESIGNED	สุชิน. 2561.6651	REVIEWED	S. KITTICHAI
DRAWN		SUBMITTED	
CHECKED	สุชิน. 2561.7324	RECOMMENDED	
PROJECT MANAGER	14/01/62 DATE	APPROVED	

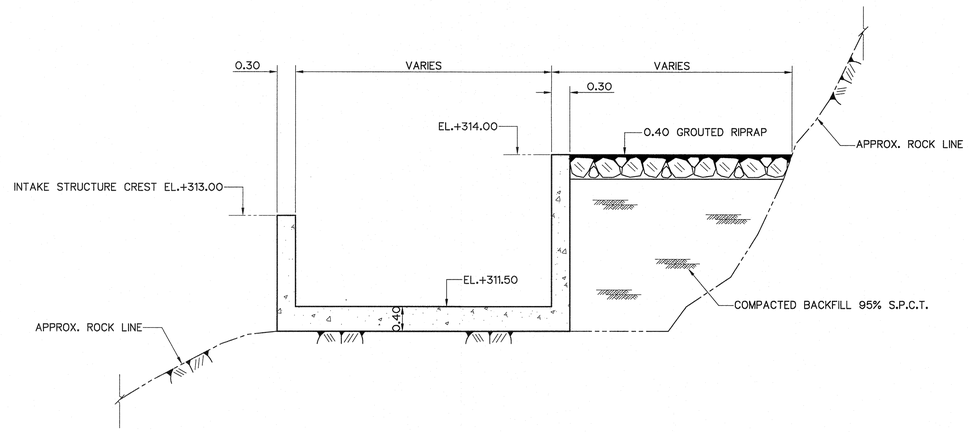
DRAWING NO. HLS–IS–02

SHEET NO. 12 OF 71



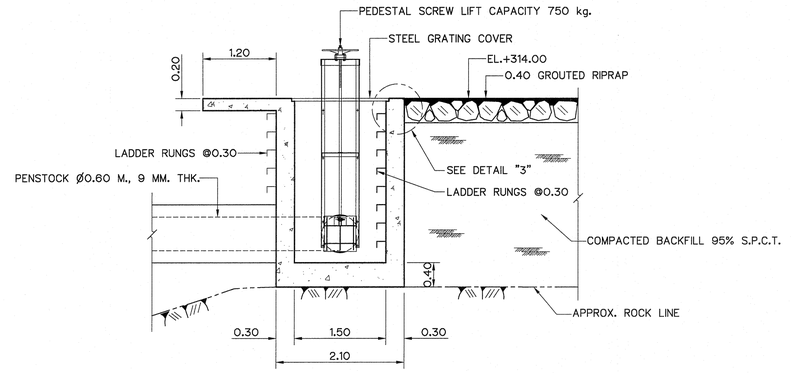
SECTION B–B

SCALE 1:50



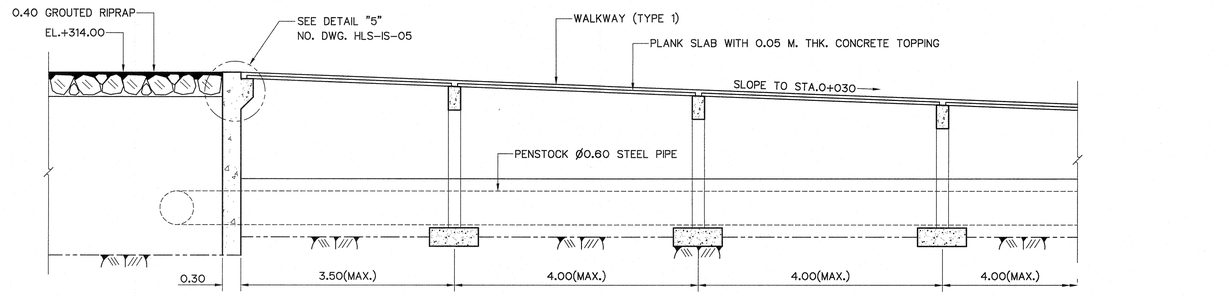
SECTION C–C

SCALE 1:50



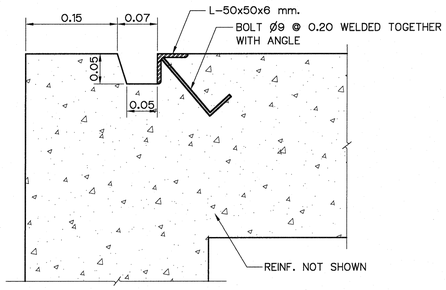
SECTION D–D

SCALE 1:50



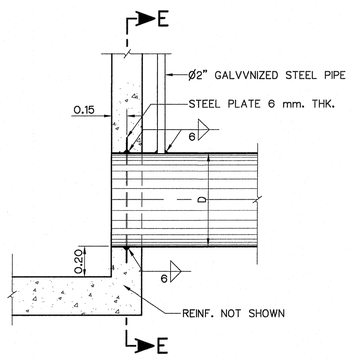
SECTION E–E

SCALE 1:50



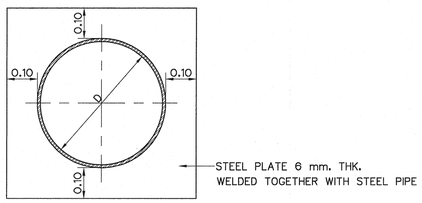
DETAIL "1"

SCALE 1:5



DETAIL "2"

SCALE 1:20



SECTION E–E

SCALE 1:10

0 0.05 0.1 0.2 0.3 0.4
SCALE 1:5 METERS

0 0.1 0.2 0.4 0.6 0.8
SCALE 1:10 METERS

0 0.5 1 1.5
SCALE 1:20 METERS

0 0.5 1 2 3 4
SCALE 1:50 METERS

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS–GN–03

REFERENCE DRAWINGS :

1. INTAKE STRUCTURE, PLAN AND SECTION A–A	HLS–IS–02
2. INTAKE STRUCTURE, MSCELLANEOUS DETAILS	HLS–IS–04

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

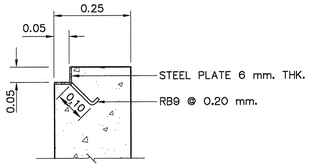
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
INTAKE STRUCTURE
SECTION B–B, C–C, D–D, E–E AND DETAILS

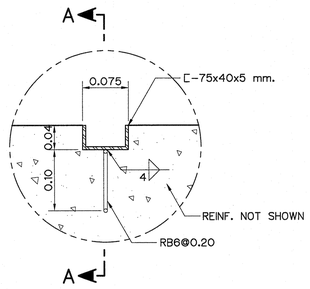
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS: FRONTIER ENGINEERING CONSULTANTS CO.,LTD.
DEDE: Department of Alternative Energy Development and Efficiency, MINISTRY OF ENERGY

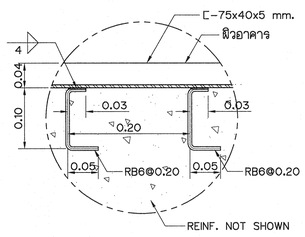
DESIGNED	สย.6651
DRAWN	
CHECKED	สย.7324
PROJECT MANAGER	14/01/62 (DATE)
REVIEWED	S. KITICHAI
SUBMITTED	
RECOMMENDED	
APPROVED	
DRAWING NO.	HLS–IS–03
SHEET NO.	13 OF 71



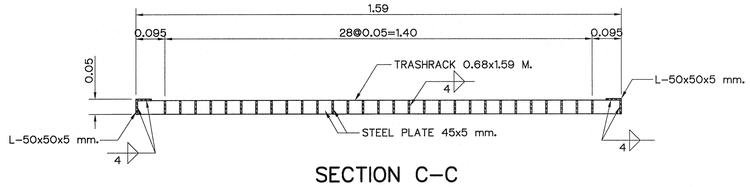
DETAIL "3"
SCALE 1:10



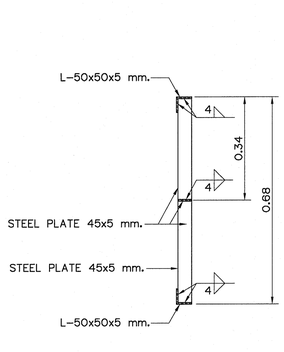
DETAIL "4"
SCALE 1:5



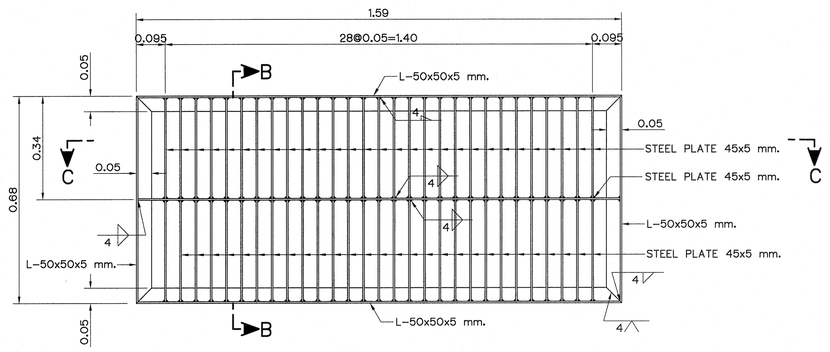
SECTION A-A
SCALE 1:5



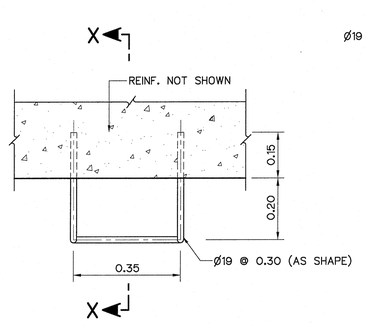
SECTION C-C
SCALE 1:10



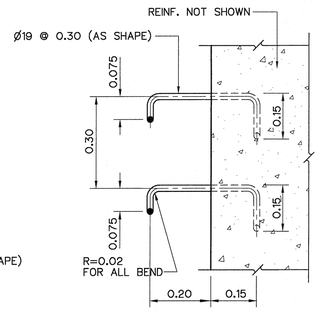
SECTION B-B
SCALE 1:10



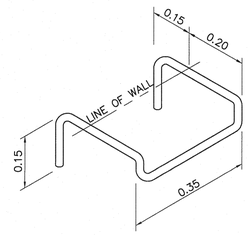
TRASHRACK DETAIL
(REQUIRED 4 PIECES)
SCALE 1:10



PLAN

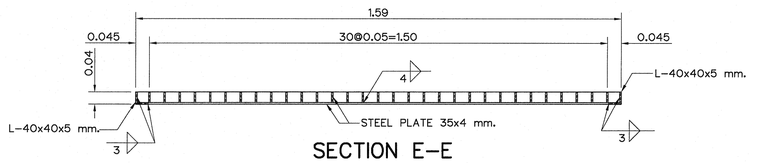


SECTION X-X

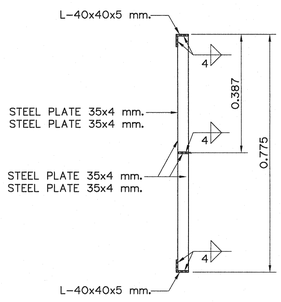


ISOMETRIC VIEW

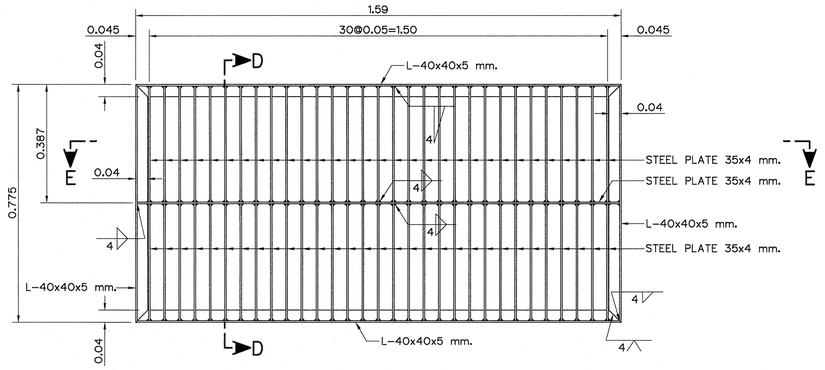
DETAIL OF LADDER RUNGS
NOT TO SCALE



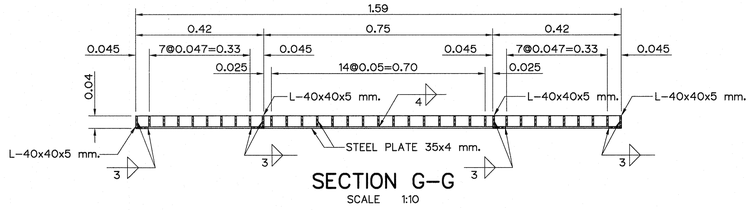
SECTION E-E
SCALE 1:10



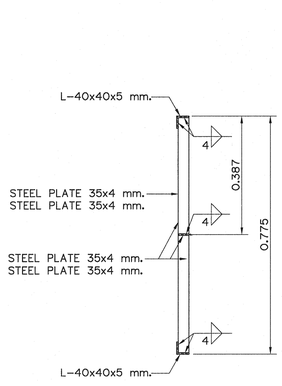
SECTION D-D
SCALE 1:10



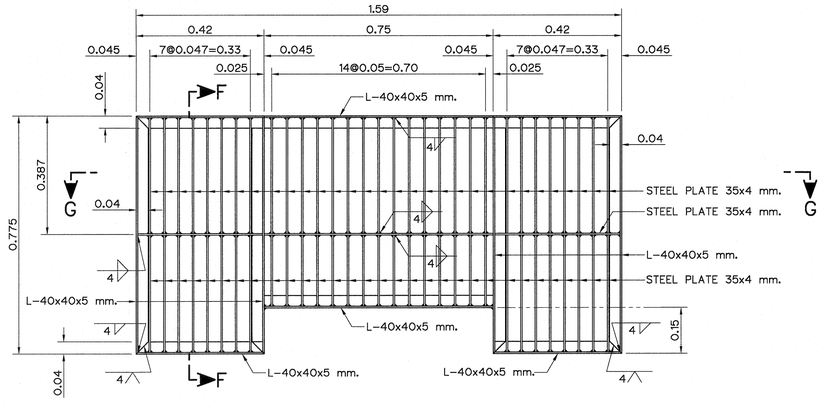
DETAIL OF STEEL GRATING COVER
(REQUIRED 1 PIECES)
SCALE 1:10



SECTION G-G
SCALE 1:10



SECTION F-F
SCALE 1:10



DETAIL OF STEEL GRATING COVER
(REQUIRED 1 PIECES)
SCALE 1:10

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

REFERENCE DRAWINGS :

1. INTAKE STRUCTURE, PLAN AND SECTION A-A	HLS-IS-02
2. INTAKE STRUCTURE, SECTION B-B, C-C, D-D AND E-E	HLS-IS-03

0 0.05 0.1 0.2 0.3 0.4
SCALE 1:5 METERS

0 0.1 0.2 0.4 0.6 0.8
SCALE 1:10 METERS

0 0.5 1 1.5
SCALE 1:20 METERS

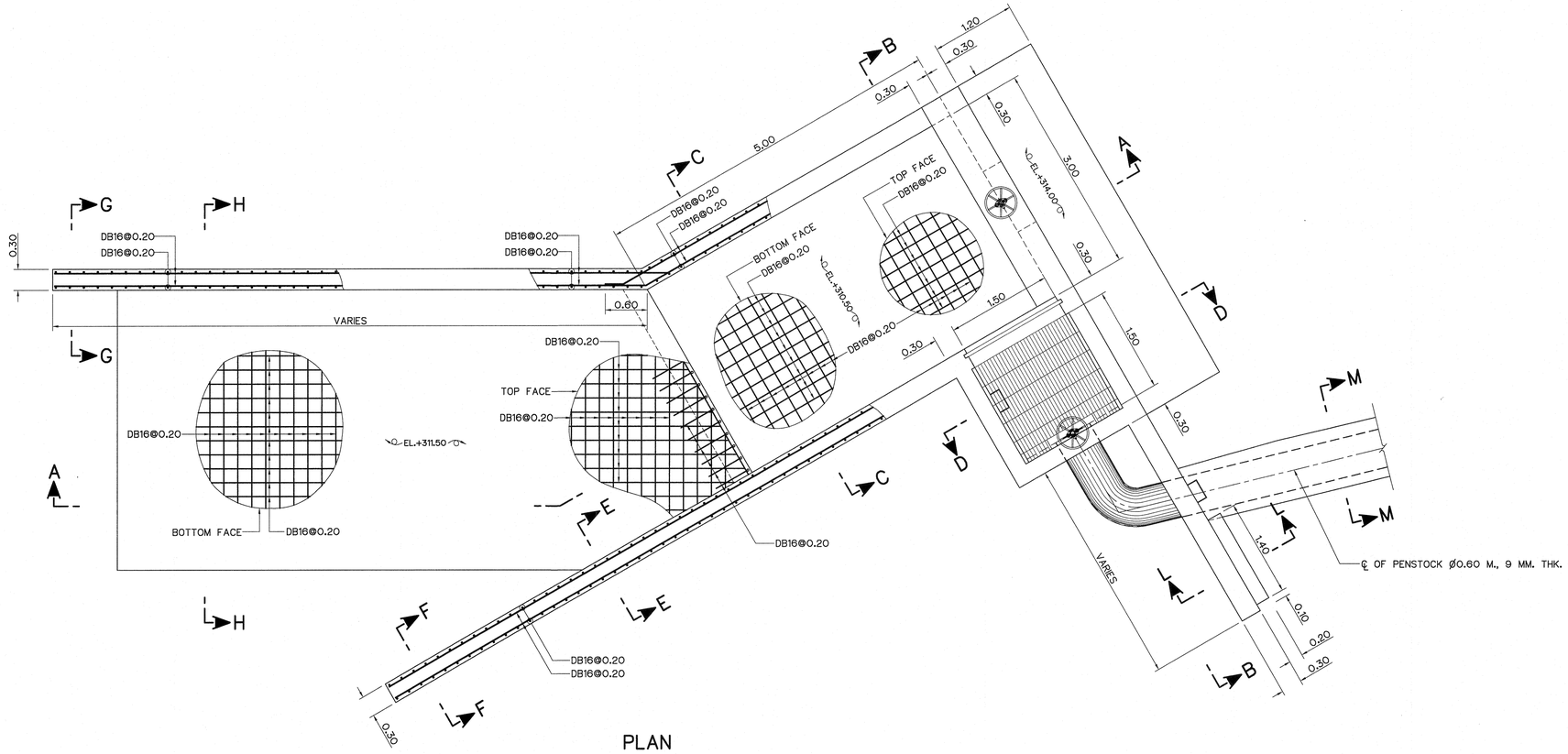
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

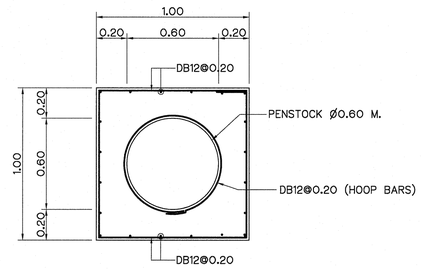
CIVIL WORKS
INTAKE STRUCTURE
MISCELLANEOUS DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED S. KITICHAI
DESIGNED 22.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED 22.7324	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS-IS-04
	SHEET NO. 14 OF 71



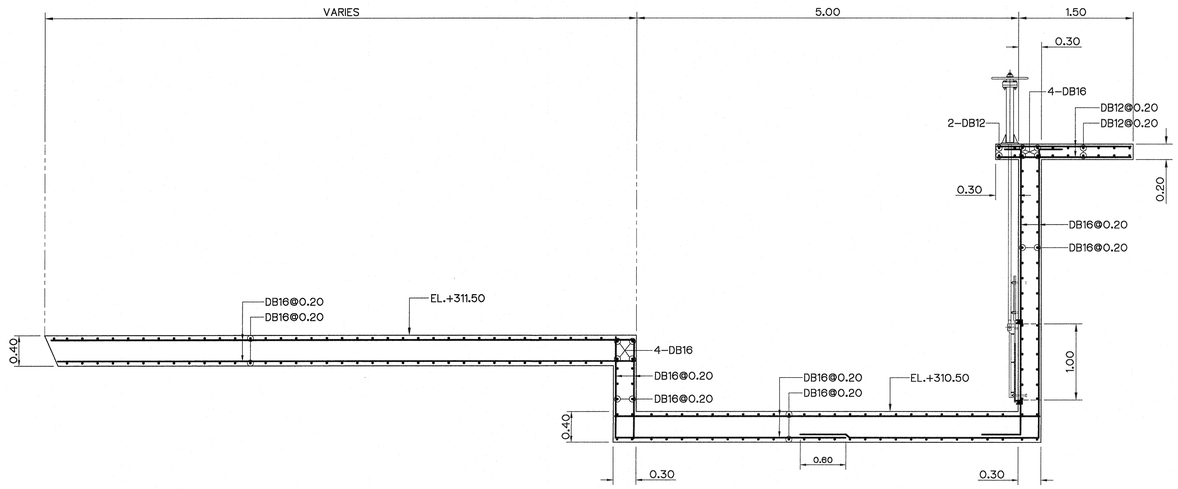
PLAN

SCALE 1:40



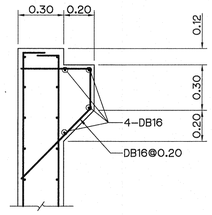
SECTION M–M

SCALE 1:20



SECTION A–A

SCALE 1:40



DETAIL "5"

SCALE 1:20

0 0.5 1 1.5

SCALE 1:20 METERS

0 0.5 1 2 3

SCALE 1:40 METERS

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS–GN–03

REFERENCE DRAWINGS :

1. INTAKE STRUCTURE, GENERAL LAY–OUT	HLS–IS–01
2. INTAKE STRUCTURE, PLAN AND SECTION A–A	HLS–IS–02
3. INTAKE STRUCTURE, REINFORCEMENT DETAILS (SHEET 2/2)	HLS–IS–06

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

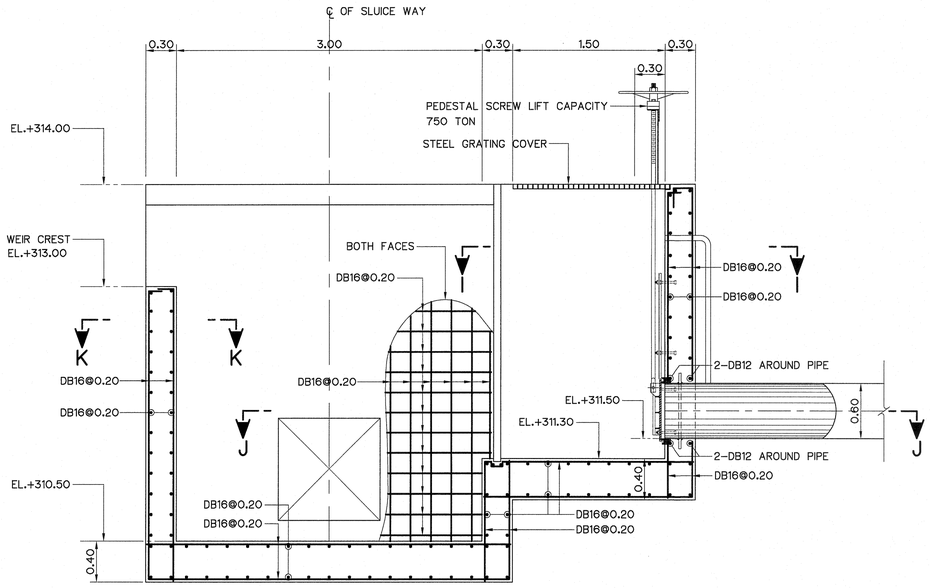
CIVIL WORKS
INTAKE STRUCTURE
REINFORCEMENT DETAILS (SHEET 1/2)

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

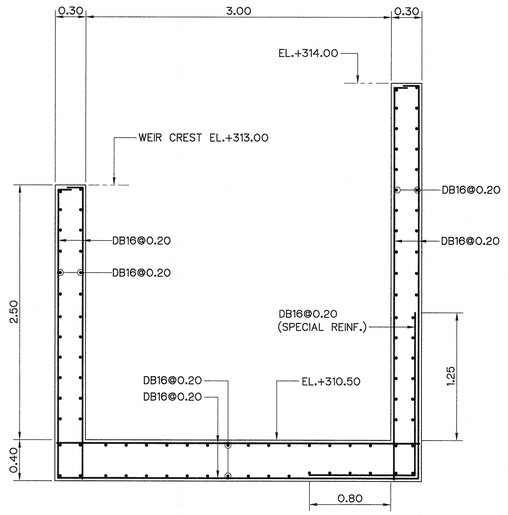
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED S.KITTIGHAM

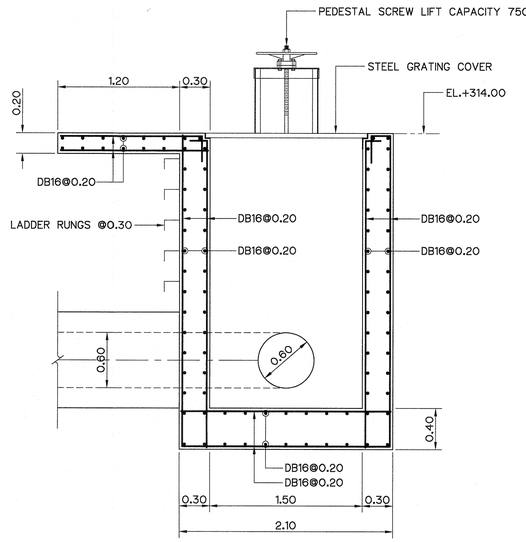
DESIGNED	สม.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สม.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO.	HLS–IS–05
		SHEET NO.	15 OF 71



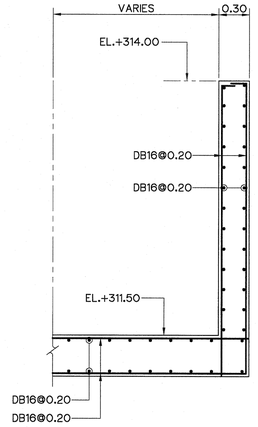
SECTION B–B
SCALE 1:30



SECTION C–C
SCALE 1:30



SECTION D–D
SCALE 1:30



SECTION E–E
SCALE 1:30

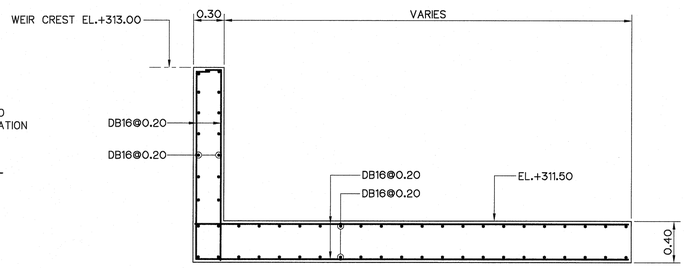
SECTION I–I
SCALE 1:30

SECTION J–J
SCALE 1:30

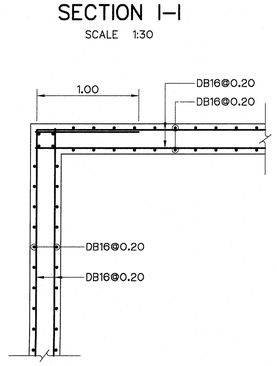
SECTION F–F
SCALE 1:30

SECTION G–G
SCALE 1:30

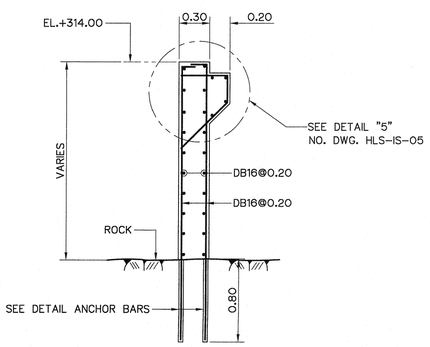
ANCHOR BARS
SCALE 1:12.5



SECTION H–H
SCALE 1:30



SECTION K–K
SCALE 1:30



SECTION L–L
SCALE 1:30

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

REFERENCE DRAWINGS :

1. INTAKE STRUCTURE, REINFORCEMENT DETAILS (SHEET 2/2) HLS-IS-05

0 0.5 1 1.5 2 2.5
SCALE 1:30 METERS

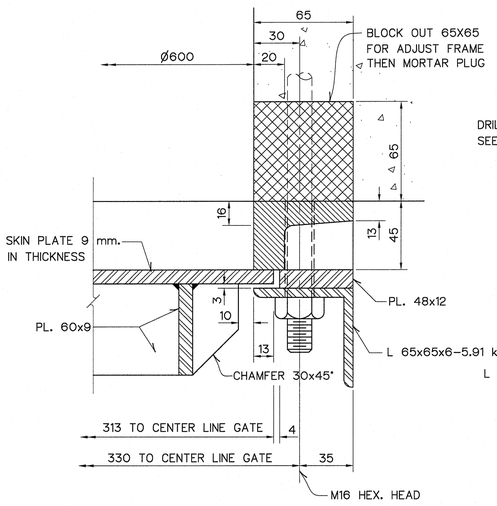
NO.	DATE	REVISIONS	CHECKED	APPROVED
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2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

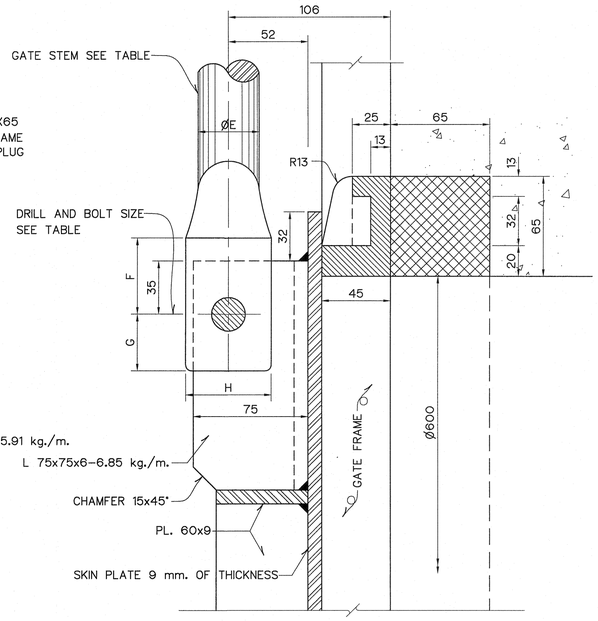
CIVIL WORKS
INTAKE STRUCTURE
REINFORCEMENT DETAILS (SHEET 2/2)

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency, MINISTRY OF ENERGY
	REVIEWED S. KITICHAI
DESIGNED ส.ต.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED ส.ต.7324	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS-IS-06 / SHEET NO. 16 OF 71



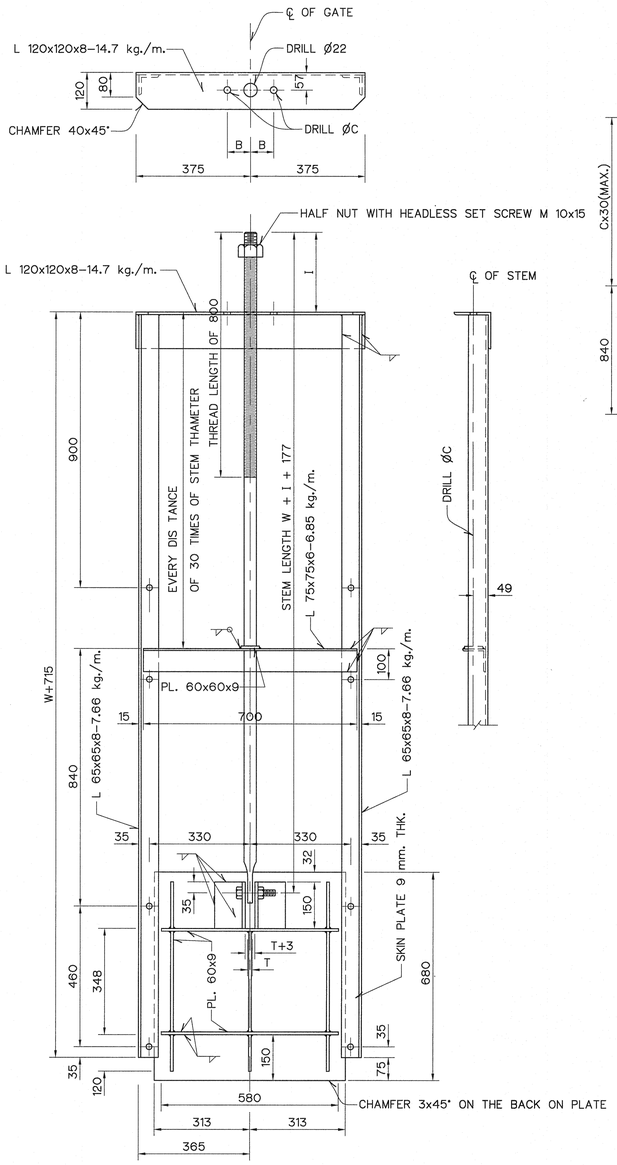
SECTION A–A

NOT TO SCALE



SECTION B–B

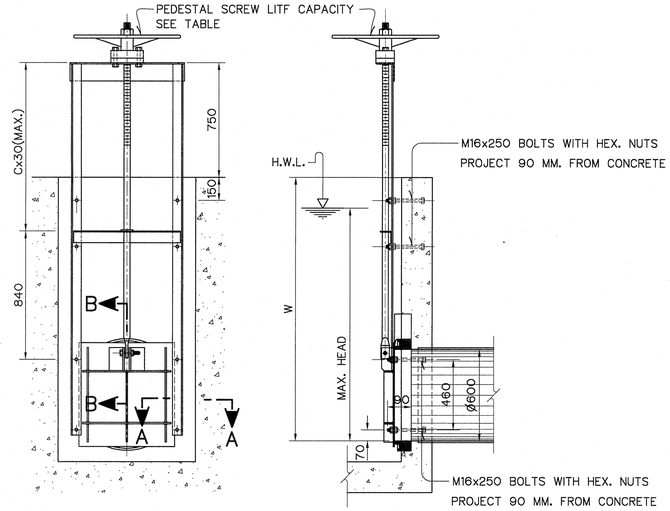
NOT TO SCALE



GATE, STEM AND FRAM

MILD STEEL

NOT TO SCALE



INSTALLATION DETAILS

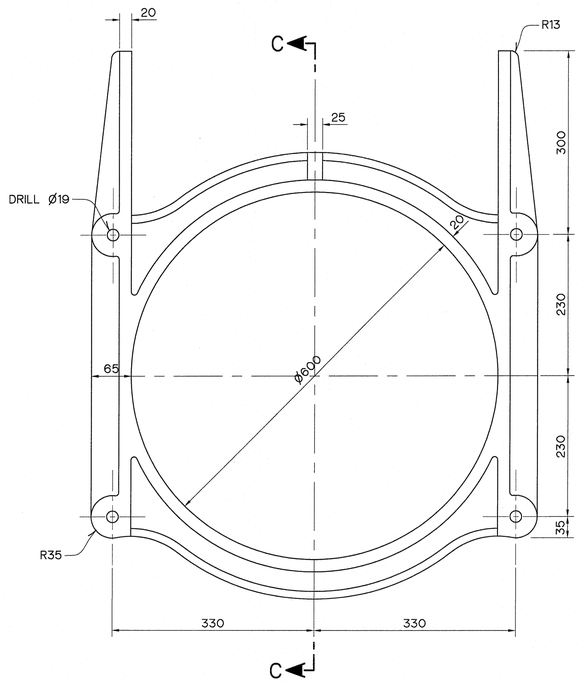
NOT TO SCALE

NOTE :

1. ALL DIMENSIONS ARE IN MILLIMETERS, AND ELEVATION ARE IN METERS UNLESS OTHERWISE SHOWN.
2. ALL WELDING WILL BE 6 MILLIMETERS, UNLESS OTHERWISE SHOWN.
3. ALL STRUCTURAL STEELS ARE JIS G 3101 SS400
4. ALL CAST IRON SHALL BE JIS G 5501 FC200
5. ALL BOLTS AND NUTS USE ASTM A325.
6. WELDING ELECTRODE SHALL BE TIS.731–2530
7. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY,
   SHOP DRAWING SHALL BE DESIGNED BY CONTRACTOR
   UNDER APPROVAL OF FIELD ENGINEER.

REFERENCE DWGS :

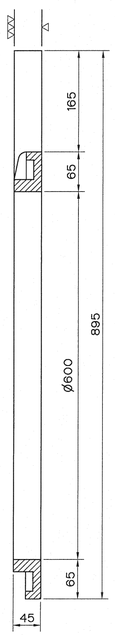
1. INTAKE STRUCTURE PEDESTAL SCREW LIFT CAPACITY 750 kg. HLS–IS–10



GATE FRAME

CAST IRON

NOT TO SCALE



SECTION C–C

NOT TO SCALE

STEM SIZE AND PEDESTAL LIFT CAPACITY

ALLOWABLE HEAD (mm.)	PEDESTAL SCREW LIFT		DRILL SIZE		STEM SIZE							
	CAPACITY (kg.)	DWG. NO.	B	C	I	E	F	G	H	T	BOLT FOR LIFT STEM	STEM THREAD
≤3.00	750	HLS–IS–10	76	36	170	34	55	35	56	18	M 18x70, DRILL Ø21	ACME. 4P

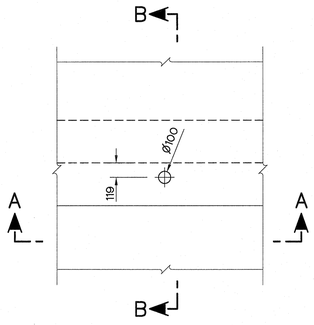
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

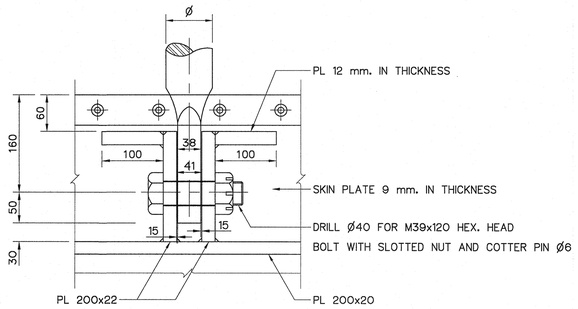
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
INTAKE STRUCTURE
0.60 M. DIA. VERTICAL GATE

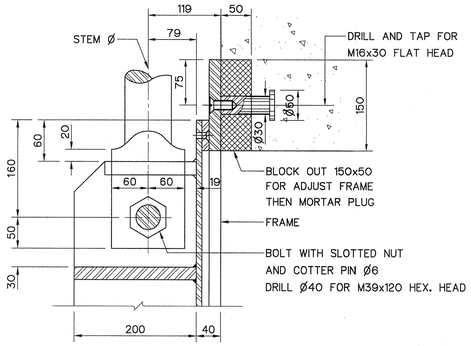
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED S.KITICHAI
DESIGNED ณัฐ.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED ณัฐ.7324	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS–IS–07 / SHEET NO. 17 OF 71



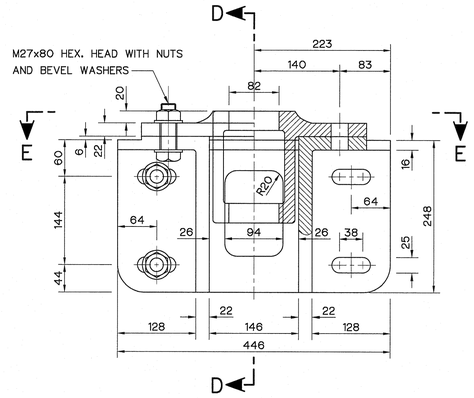
PLAN
NOT TO SCALE



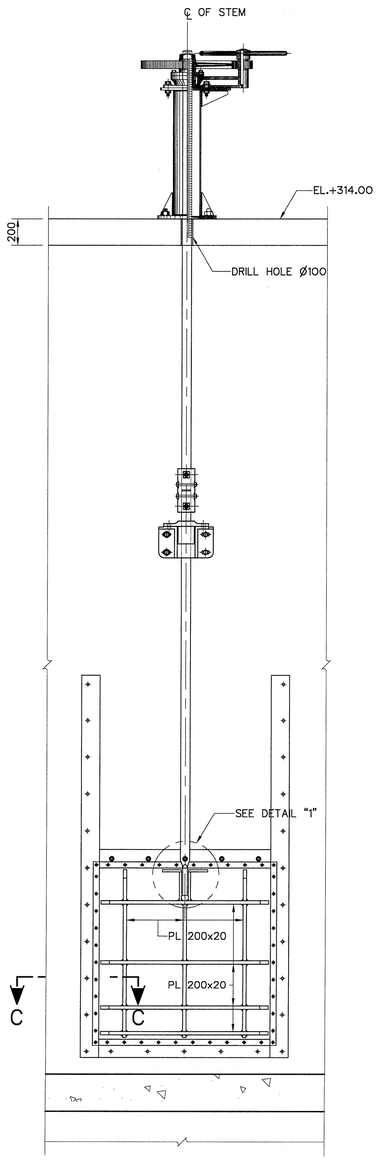
DETAIL "1"
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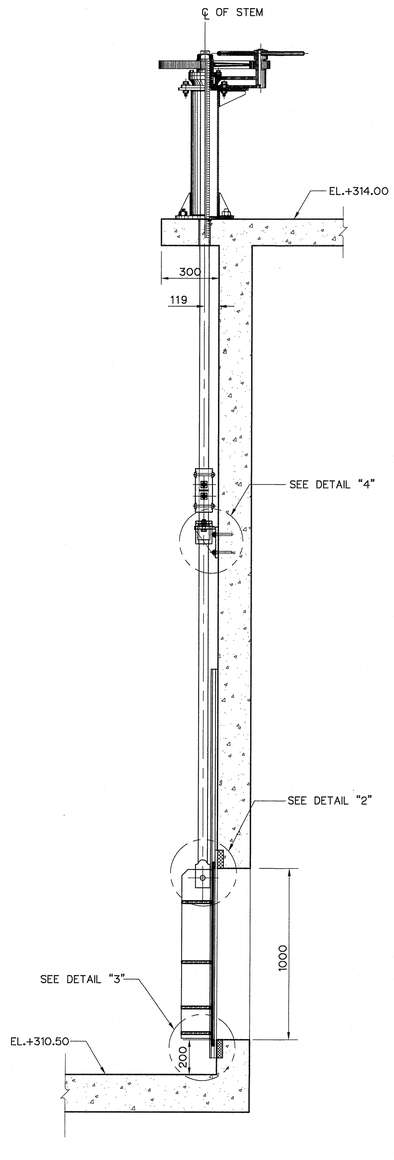
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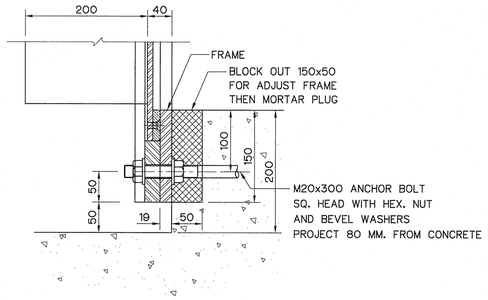
STEM GUIDE
NOT TO SCALE



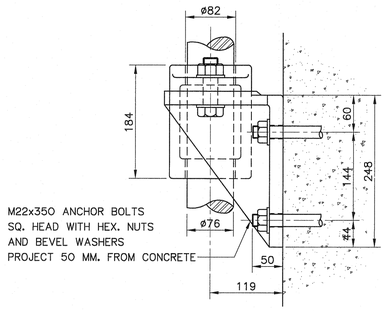
SECTION A–A
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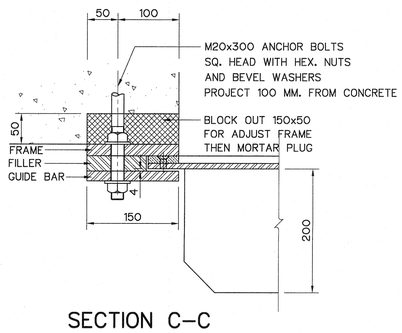
SECTION B–B
NOT TO SCALE



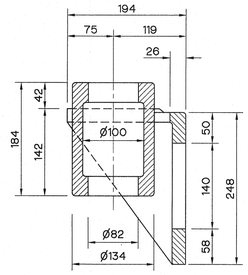
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SCALE 1:5



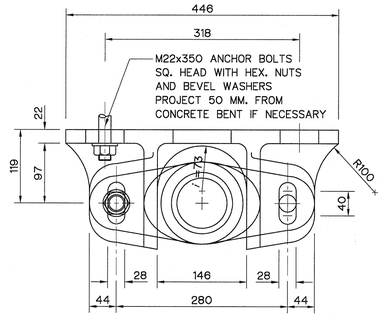
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SCALE 1:5



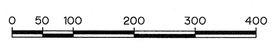
SECTION C–C
SCALE 1:5



SECTION D–D
SCALE 1:5



SECTION E–E
SCALE 1:5



NOTE :

1. ALL DIMENSIONS ARE IN MILLIMETERS, AND ELEVATION ARE IN METERS UNLESS OTHERWISE SHOWN.
2. ALL WELDING WILL BE 6 MILLIMETERS, UNLESS OTHERWISE SHOWN.
3. ALL BOLTS AND NUTS USE ASTM A325.
4. ALL STRUCTURAL STEELS ARE JIS G 3101 SS400
5. ALL STAINLESS STEELS PLATES ARE JIS G 4304 SUS 304.
6. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, SHOP DRAWING SHALL BE DESIGNED BY CONTRACTOR UNDER APPROVAL OF FIELD ENGINEER.

REFERENCE DWGS :

1. INTAKE STRUCTURE, PLAN AND SECTION A–A	HLS–IS–02
2. INTAKE STRUCTURE, 1.00x1.00 m. VERTICAL GATE (GATE DATAIL)	HLS–IS–09
3. INTAKE STRUCTURE, PEDESTAL SCREW LIFT CAPACITY 2.25 TONS	HLS–IS–12

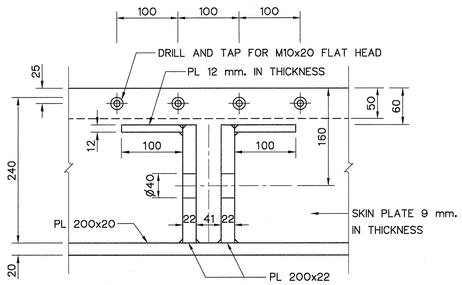
NO.	DATE	REVISIONS	CHECKED	APPROVED
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2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

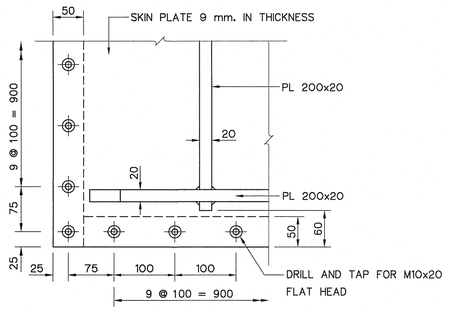
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
INTAKE STRUCTURE
1.00x1.00 m. VERTICAL GATE (GATE INSTALLATION)

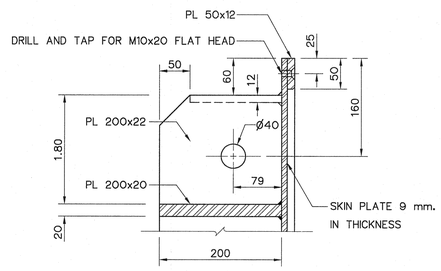
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
		REVIEWED	S.KITIGHM
DESIGNED	สย.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สย.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO.	HLS–IS–08
		SHEET NO.	18 OF 71



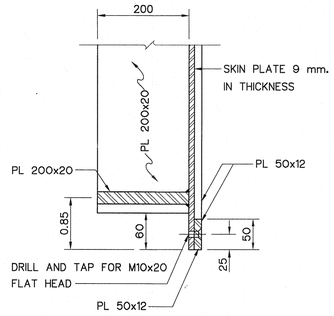
DETAIL "1"
NOT TO SCALE



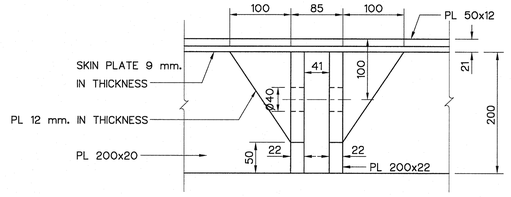
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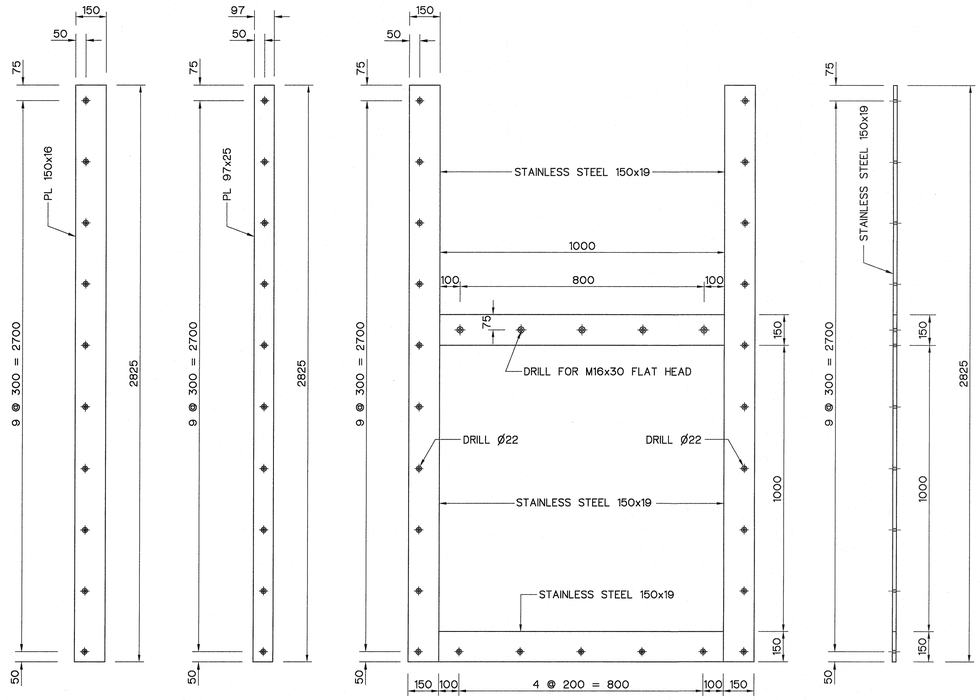
DETAIL "3"
NOT TO SCALE



DETAIL "4"
NOT TO SCALE



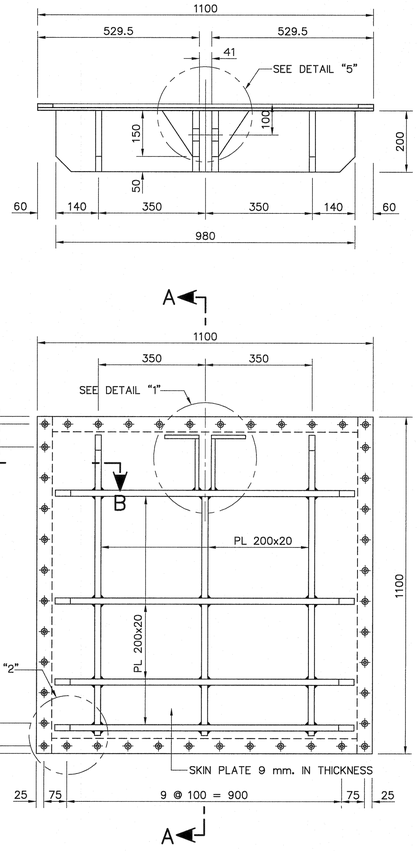
DETAIL "5"
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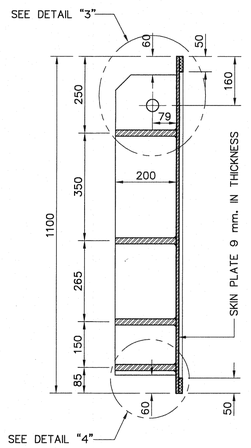
GUIDE BAR
NOT TO SCALE

FILLER
NOT TO SCALE

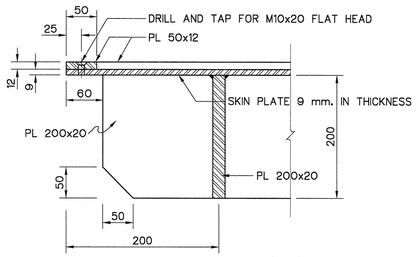
FRAME
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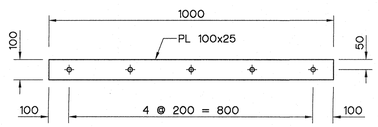
GATE LEAF
NOT TO SCALE



SECTION A–A
NOT TO SCALE



SECTION B–B
NOT TO SCALE



BOTTOM BAR
NOT TO SCALE

NOTE :

1. ALL DIMENSIONS ARE IN MILLIMETERS, AND ELEVATION ARE IN METERS UNLESS OTHERWISE SHOWN.
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5. ALL STAINLESS STEELS PLATES ARE JIS G 4304 SUS 304.
6. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, SHOP DRAWING SHALL BE DESIGNED BY CONTRACTOR UNDER APPROVAL OF FIELD ENGINEER.

REFERENCE DWGS :

1. INTAKE STRUCTURE, PLAN AND SECTION A–A	HLS–IS–02
2. INTAKE STRUCTURE, 1.00x1.00 m. VERTICAL GATE (GATE INSTALLATION)	HLS–IS–09
3. INTAKE STRUCTURE, PEDESTAL SCREW LIFT CAPACITY 2.25 TONS	HLS–IS–12

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

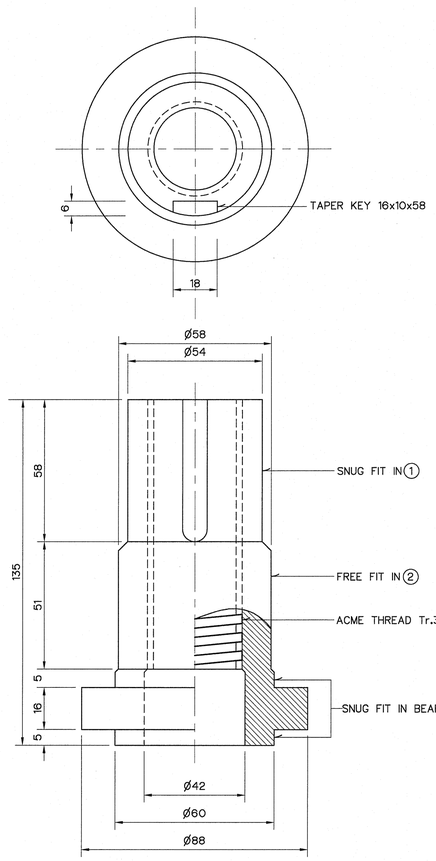
CIVIL WORKS
INTAKE STRUCTURE
1.00x1.00 m. VERTICAL GATE (GATE DETAIL)

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS: FRONTIER ENGINEERING CONSULTANTS CO.,LTD.
DEDE: Department of Alternative Energy Development and Efficiency, MINISTRY OF ENERGY

DESIGNED ส.ต.6651 | REVIEWED S. KITICHAI
DRAWN | SUBMITTED
CHECKED ส.ต.7324 | RECOMMENDED
PROJECT MANAGER 14/01/62 (DATE) | APPROVED

DRAWING NO. HLS–IS–09
SHEET NO. 19 OF 71

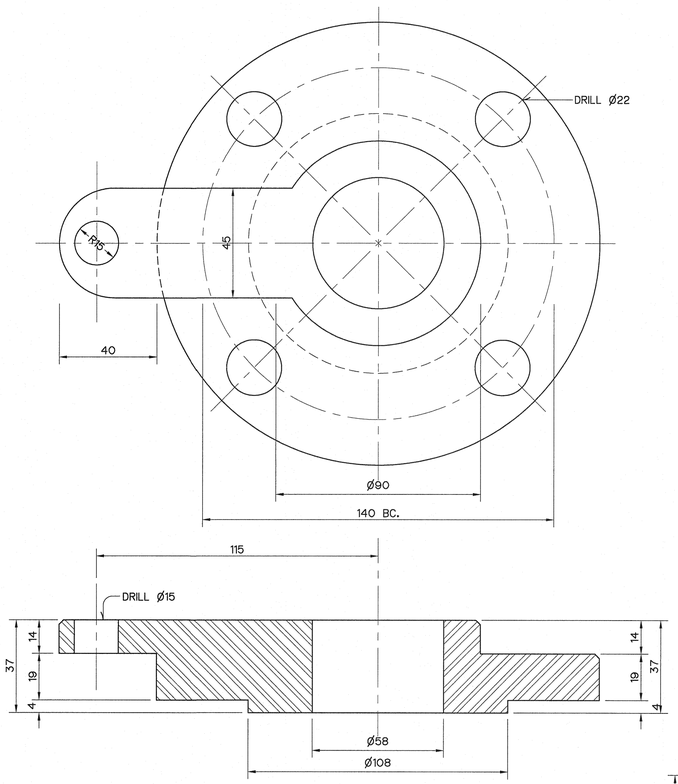


(1)

LIFTING NUT

BRONZE

NOT TO SCALE

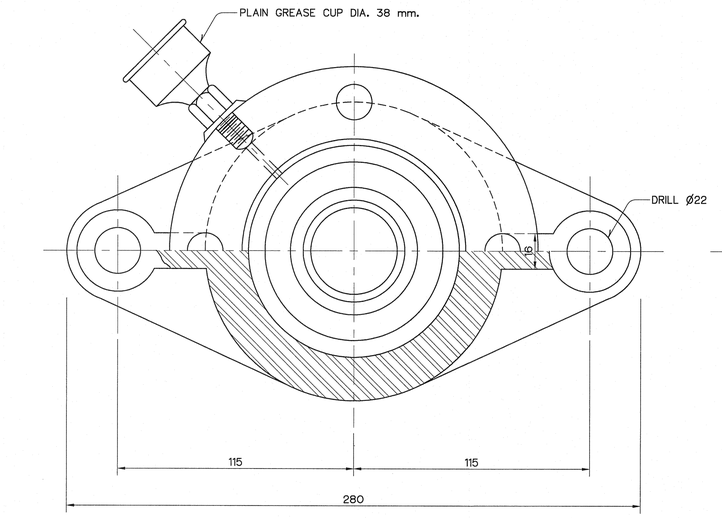


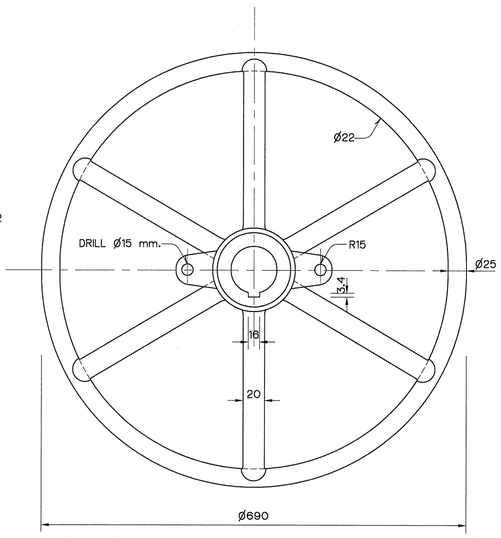
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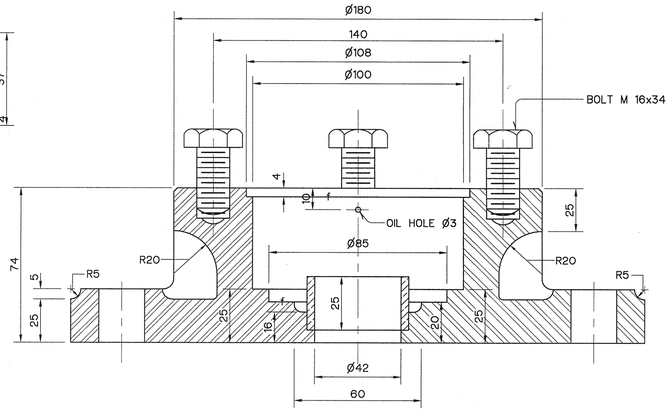
COVER PLATE

JIS G4051 SC 49

NOT TO SCALE





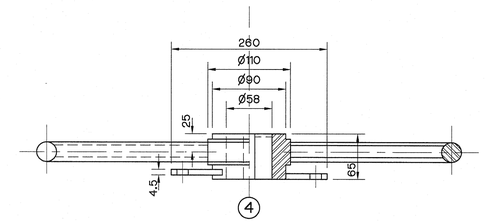


(3)

BASE

JIS G5501 FC 200

NOT TO SCALE

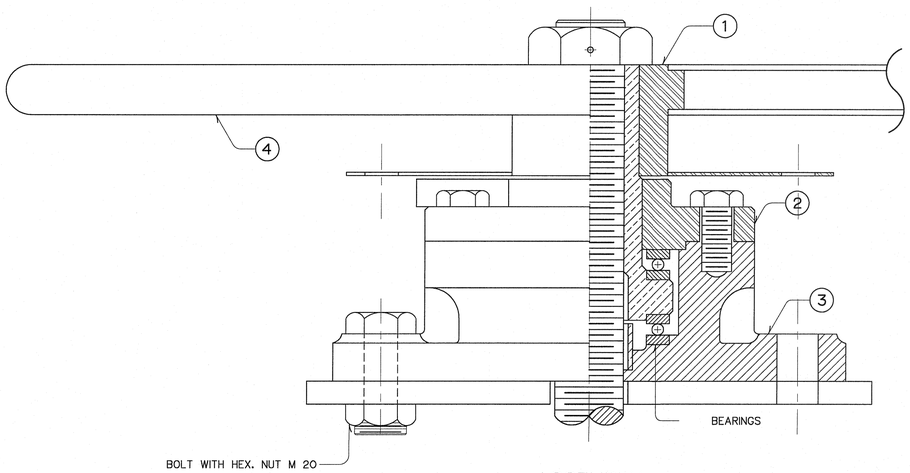


(4)

HAND WHEEL

MILD STEEL

NOT TO SCALE



ASSEMBLY

NOT TO SCALE

NOTE :

1. ALL DIMENSIONS ARE IN MILLIMETERS, AND ELEVATION ARE IN METERS UNLESS OTHERWISE SHOWN.
2. ALL WELDING WILL BE 6 MILLIMETERS, UNLESS OTHERWISE SHOWN.
3. ALL BOLTS AND NUTS USE ASTM A325.
4. ALL STRUCTURAL STEELS ARE JIS G 3101 SS400
5. ALL STAINLESS STEELS PLATES ARE JIS G 4304 SUS 304.
6. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, SHOP DRAWING SHALL BE DESIGNED BY CONTRACTOR UNDER APPROVAL OF FIELD ENGINEER.

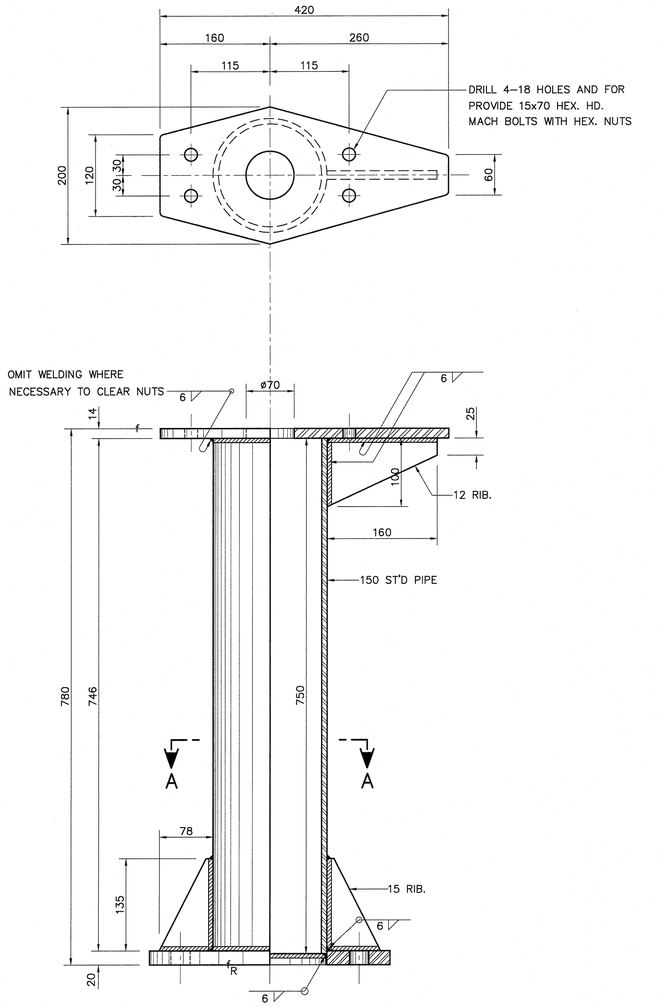
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

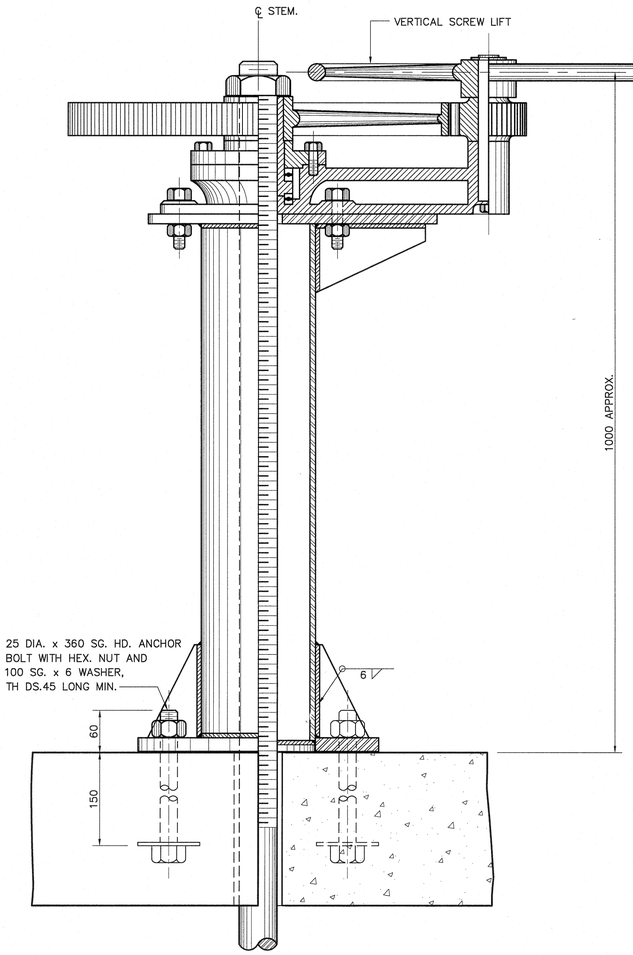
CIVIL WORKS
INTAKE STRUCTURE
PEDESTAL SCREW LIFT CAPACITY 750 kg.

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED S. KITCHAI
DESIGNED สุเทพ แก่นเงิน สก.2197	SUBMITTED
DRAWN	RECOMMENDED
CHECKED สุเทพ แก่นเงิน สก.2197	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS-IS-10 / SHEET NO. 20 OF 71



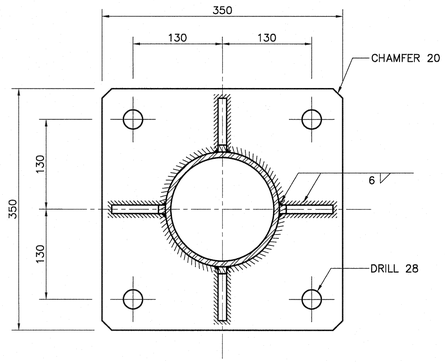
PEDESTAL

NOT TO SCALE



INSTALLATION (CAPACITY 2.25 TON)

NOT TO SCALE



SECTION A–A

NOT TO SCALE

NOTE :

1. ALL DIMENSIONS ARE IN MILLIMETERS, AND ELEVATION ARE IN METERS UNLESS OTHERWISE SHOWN.
2. ALL WELDING WILL BE 6 MILLIMETERS, UNLESS OTHERWISE SHOWN.
3. ALL BOLTS AND NUTS USE ASTM A325.
4. ALL STRUCTURAL STEELS ARE JIS G 3101 SS400
5. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, SHOP DRAWING SHALL BE DESIGNED BY CONTRACTOR UNDER APPROVAL OF FIELD ENGINEER.

REFERENCE DWGS :

1. PEDESTAL SCREW LIFT CAPACITY 2.25 TONS HLS–IS–12

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
INTAKE STRUCTURE
GATE–LIFT PEDESTALS 2.25 TONS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED S.KITICHAI

DESIGNED สุรพล แก้วหนู ส.ค.2197

SUBMITTED

DRAWN

RECOMMENDED

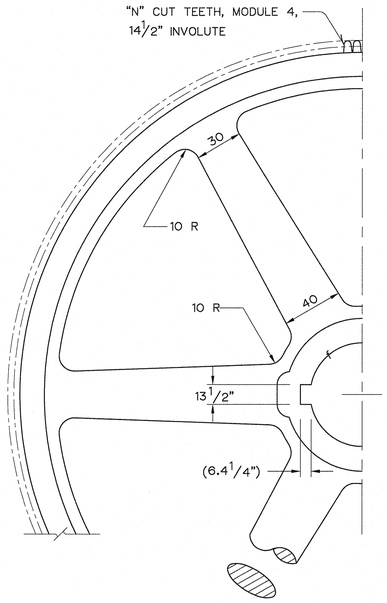
CHECKED สุรพล แก้วหนู ส.ค.2197

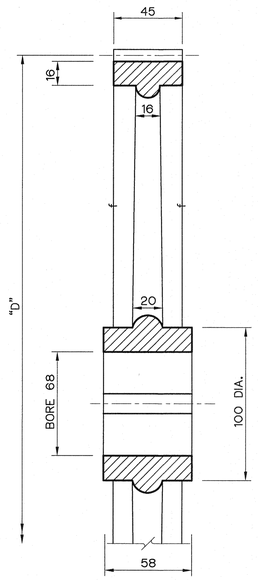
APPROVED

PROJECT MANAGER 14/01/62 DATE

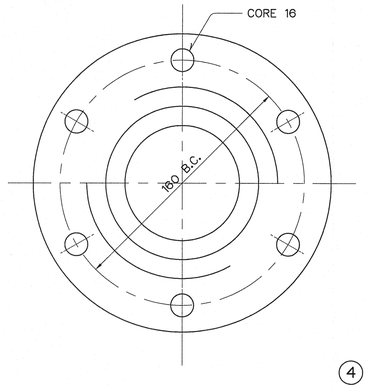
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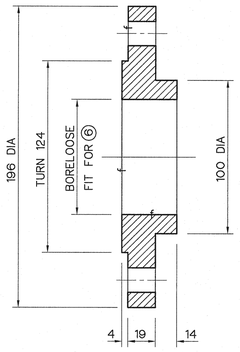
SHEET NO. 21 OF 71



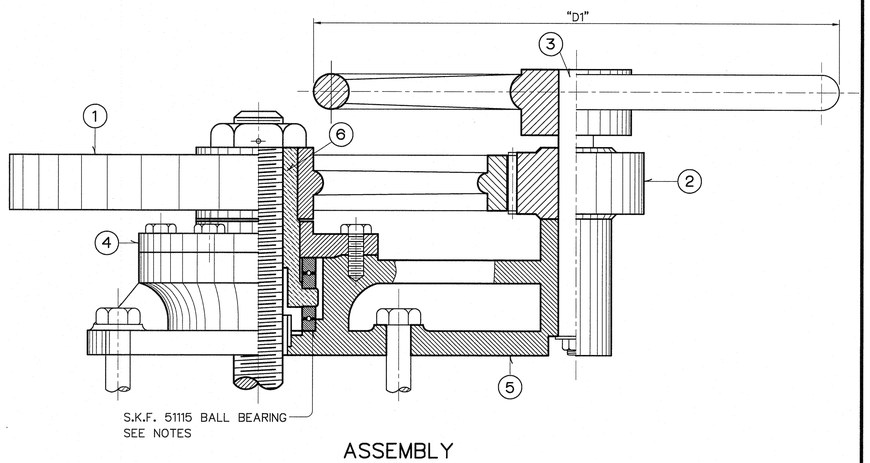


① SPUR GEAR CAST IRON
NOT TO SCALE

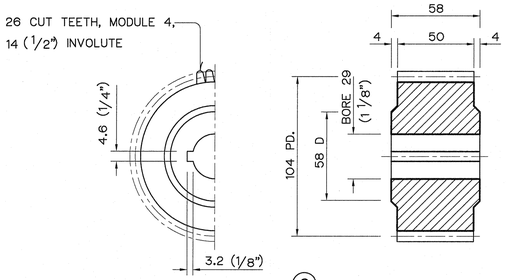




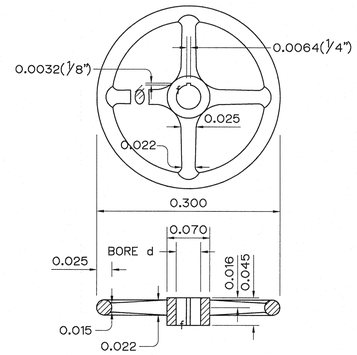
④ COVER PLATE CAST IRON
NOT TO SCALE



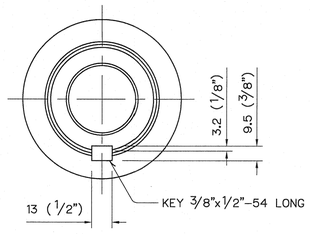
ASSEMBLY
NOT TO SCALE



② PINION CAST IRON
NOT TO SCALE



HAND WHEEL DIA. Ø30 CM.
NOT TO SCALE



CAPACITY (kg.)	"N"	"D"	"S"	"O"	"D1"
1,000	104	416	260	429	300
1,250	104	416	260	429	380
1,750	130	520	312	481	450
2,250	143	572	338	502	530

COMPUTATION NO. SCREW LIFT I

CAPACITY IS BASED ON A HANDWHEEL PULL OF 9 kg. (4.5 kg.PER HAND)

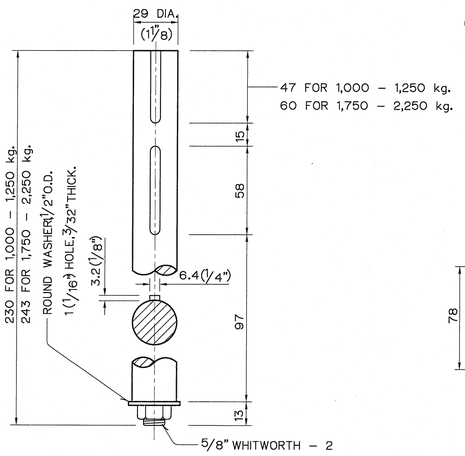
LOAD IS EQUAL TO 0.35xWATER PRESSUREON GATE LEAL + WEIGHT OF GATE AND STEM.

NOTE :

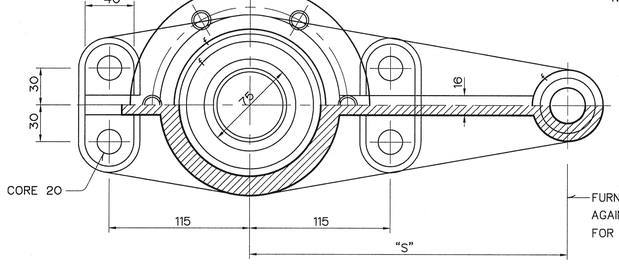
1. ALL DIMENSIONS ARE IN MILLIMETERS, AND ELEVATION ARE IN METERS UNLESS OTHERWISE SHOWN.
2. SINGLE – THRUST BALL BEARING S.K.F. 51115
   DYNAMIC CAPACITY = 8150 LBS. (3,700 kg.)
   BORE = 75
   OUTSIDE DIAMETER = 100
   HEIGHT = 19
3. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, SHOP DRAWING SHALL BE DESIGNED BY CONTRACTOR UNDER APPROVAL OF FIELD ENGINEER.

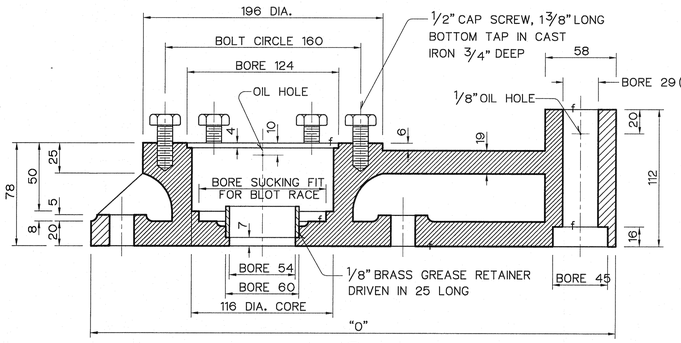
REFERENCE DWGS :

1. GATE–LIFT PEDESTALS 2.25 TONS HLS–IS–11

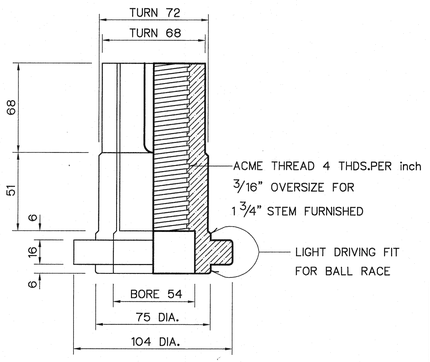


③ PINION SHAFT MILD STEEL
NOT TO SCALE





⑤ BASE CAST IRON
NOT TO SCALE



⑥ LIFTING NUT BRONZE
NOT TO SCALE

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
INTAKE STRUCTURE
PEDESTAL SCREW LIFT CAPACITY 2.25 TONS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED S.KITCHAN

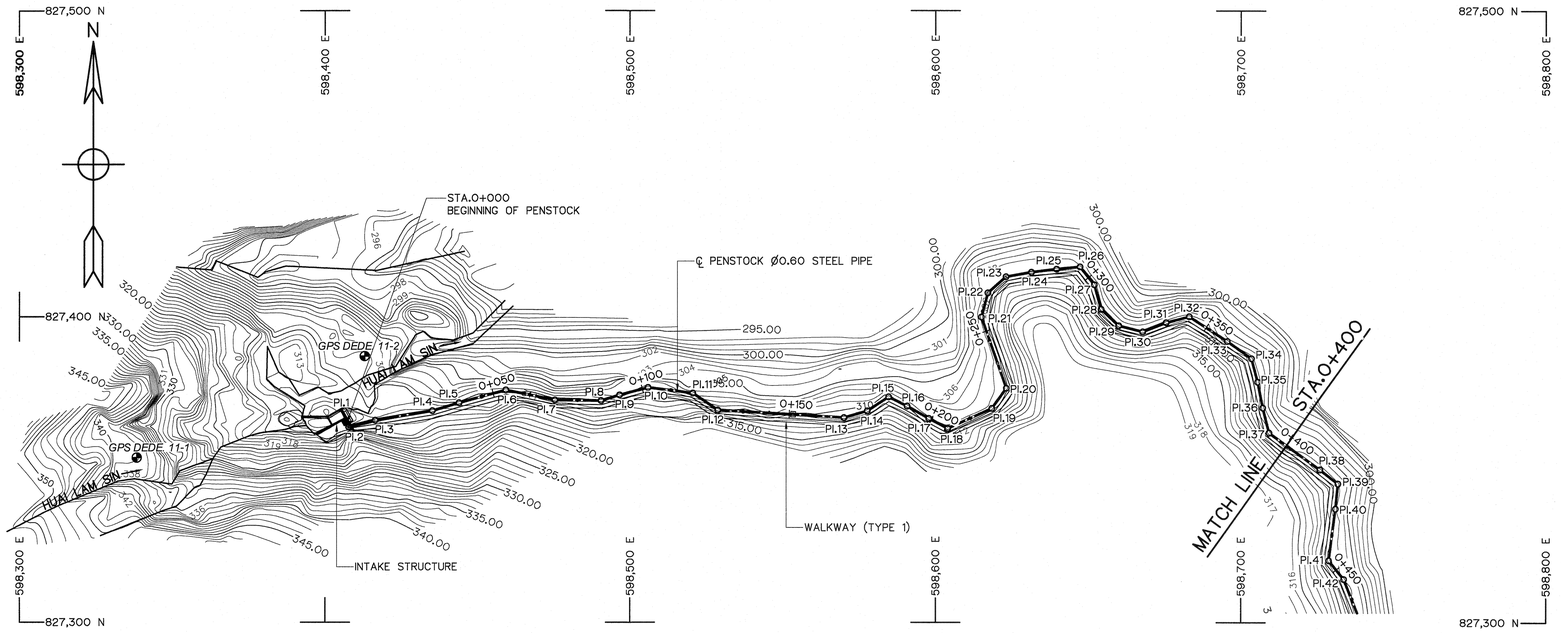
DESIGNED สุรพล แก้วพ่อ ส.ก.2197
DRAWN
CHECKED สุรพล แก้วพ่อ ส.ก.2197

SUBMITTED
RECOMMENDED
APPROVED

PROJECT MANAGER 14/01/62 DATE

DRAWING NO. HLS–IS–12

SHEET NO. 22 OF 71

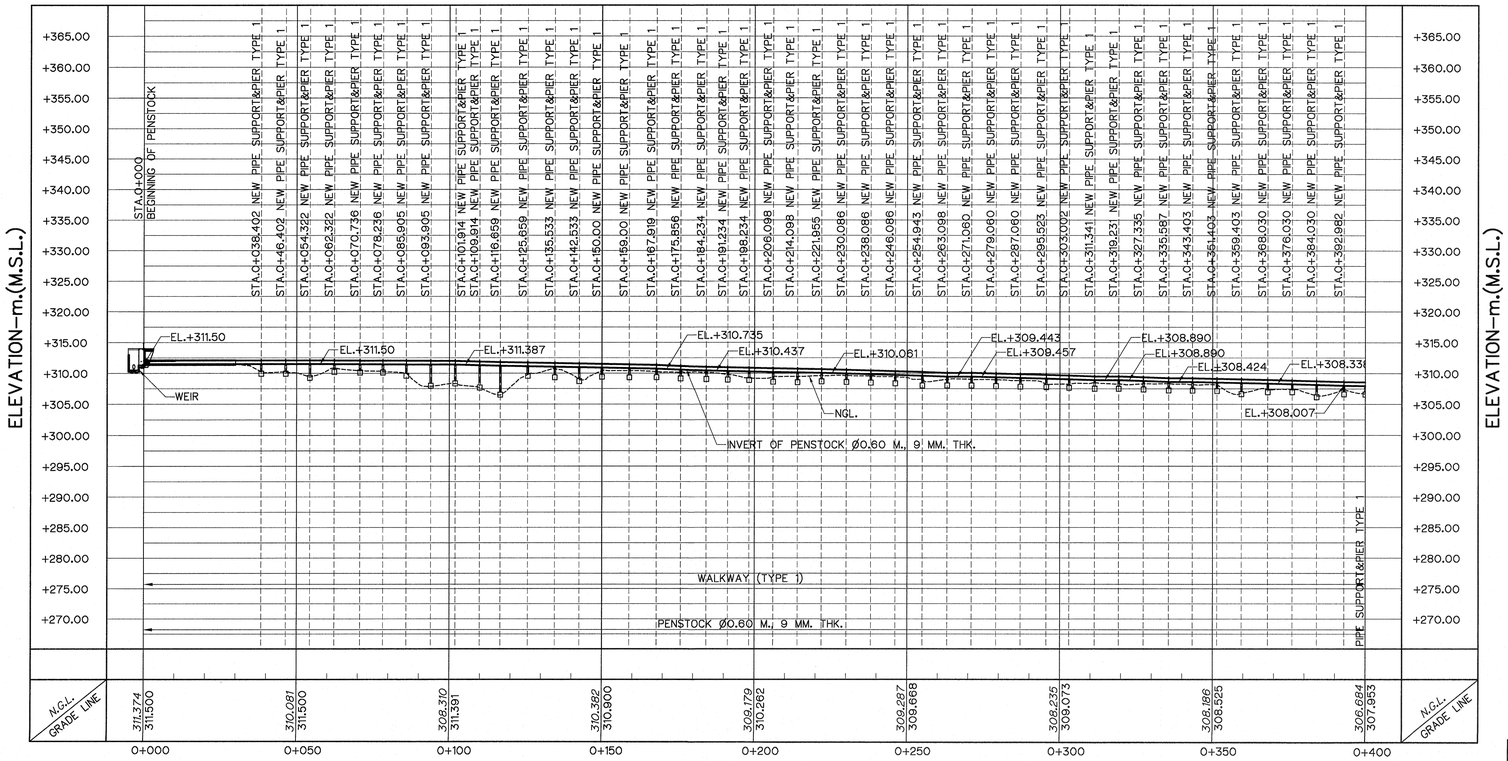


PLAN

SCALE 1:1,000

HORIZONTAL ALINEMENT OF HEADRACE

NO. PI.	COORDINATE N	COORDINATE E	PI. – PI. (m)	DEFLECTION ANGLE (° – ' – ")	PI. STA. (km)	BEARING (N/S ° – ' – " E/W)
PI.1	827,364.921	598,407.056	–	–	0+000.000	–
PI.2	827,363.779	598,407.716	1.319	73°-50'-36.53"	0+001.319	S 30°-01'-30.19" E
PI.3	827,365.924	598,416.404	8.949	04°-36'-56.57"	0+010.268	N 76°-07'-53.27" E
PI.4	827,368.982	598,435.175	19.018	07°-21'-54.54"	0+029.286	N 80°-44'-49.85" E
PI.5	827,371.589	598,443.910	9.116	01°-21'-56.49"	0+038.402	N 73°-22'-55.31" E
PI.6	827,375.777	598,459.269	15.920	26°-49'-05.66"	0+054.322	N 74°-44'-51.80" E
PI.7	827,372.486	598,475.350	16.414	10°-50'-26.65"	0+070.736	S 78°-26'-02.54"E
PI.8	827,372.294	598,490.518	15.169	17°-26'-27.05"	0+085.905	S 89°-16'-29.19" E
PI.9	827,374.125	598,496.615	6.366	01°-56'-08.77"	0+092.271	N 73°-17'-03.76"E
PI.10	827,376.585	598,505.939	9.643	21°-59'-29.86"	0+101.914	N 75°-13'-12.53" E
PI.11	827,374.734	598,520.567	14.745	26°-48'-52.82"	0+116.659	S 82°-47'-17.62" E
PI.12	827,369.209	598,528.750	9.874	30°-37'-32.44"	0+126.533	S 55°-58'-24.80"E
PI.13	827,366.754	598,570.063	41.386	19°-15'-35.63"	0+167.919	S 86°-35'-57.24"E
PI.14	827,368.923	598,577.698	7.937	17°-13'-19.48"	0+175.856	N 74°-08'-27.13" E
PI.15	827,373.496	598,584.718	8.378	59°-23'-15.56"	0+184.234	N 56°-55'-07.66"E
PI.16	827,370.510	598,590.758	6.738	03°-01'-30.56"	0+190.972	S 63°-41'-36.78"E
PI.17	827,366.534	598,597.834	8.117	01°-33'-36.43"	0+199.089	S 60°-40'-06.22"E
PI.18	827,363.268	598,604.036	7.009	51°-58'-30.04"	0+206.098	S 62°-13'-42.66"E
PI.19	827,369.769	598,618.499	15.857	29°-59'-56.85"	0+221.955	N 65°-47'-47.30"E
PI.20	827,376.364	598,623.255	8.131	54°-59'-35.88"	0+230.086	N 35°-47'-50.45"E
PI.21	827,399.839	598,615.082	24.857	34°-12'-43.18"	0+254.943	N 19°-11'-45.42"W
PI.22	827,407.716	598,617.195	8.155	33°-09'-39.47"	0+263.098	N 15°-00'-57.76"E
PI.23	827,413.025	598,623.128	7.962	31°-40'-04.90"	0+271.060	N 48°-10'-37.23"E
PI.24	827,414.514	598,631.441	8.445	03°-10'-09.96"	0+279.505	N 79°-50'-42.13" E
PI.25	827,415.524	598,639.684	8.305	01°-17'-36.30"	0+287.810	N 83°-00'-52.09"E
PI.26	827,416.289	598,647.359	7.713	57°-09'-07.01"	0+295.523	N 84°-18'-28.39"E
PI.27	827,410.439	598,652.019	7.479	22°-53'-14.41"	0+303.002	S 38°-32'-24.60"E
PI.28	827,402.409	598,654.269	8.339	31°-18'-32.43"	0+311.341	S 15°-39'-10.20" E
PI.29	827,397.024	598,660.036	7.890	28°-44'-10.09"	0+319.231	S 46°-57'-42.62"E
PI.30	827,395.022	598,667.889	8.104	35°-40'-17.48"	0+327.335	S 75°-41'-52.71" E
PI.31	827,398.029	598,675.574	8.252	06°-50'-20.35"	0+335.587	N 68°-37'-49.81" E
PI.32	827,399.990	598,683.140	7.816	47°-38'-41.80"	0+343.403	N 75°-28'-10.15" E
PI.33	827,391.876	598,695.580	14.852	02°-36'-23.54"	0+358.255	S 56°-53'-08.04"E
PI.34	827,386.169	598,703.516	9.775	39°-38'-12.15"	0+368.030	S 54°-16'-44.51" E
PI.35	827,378.449	598,705.533	7.979	03°-27'-21.96"	0+376.009	S 14°-38'-32.36"E
PI.36	827,369.984	598,707.207	8.629	03°-02'-35.55"	0+384.638	S 11°-11'-10.40"E
PI.37	827,361.896	598,709.258	8.344	40°-12'-02.48"	0+392.982	S 14°-13'-45.96"E
PI.38	827,349.984	598,725.915	20.478	01°-52'-20.66"	0+413.460	S 54°-25'-48.44"E



PROFILE

VERTICAL SCALE 1:500

HORIZONTAL SCALE 1:1,000

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS. UNLESS OTHERWISE SHOWN.
2. SYMBOLE, ABBREVIATIONS AND CENERAL NOTES SEE DWG. NO. HLS–GN–03
3. THE ALIGNMENT OF THE PENSTOCK AND RELATED STRUCTURES SHALL BE CHECK AND CORRECTED BY THE CONTRACTOR TO SUIT THE FIELD CONDITIONS AND SHALL BE SUBMITTED TO DEDE'S FIELD ENGINEER FOR APPROVAL

REFERENCE DRAWINGS :

1. PENSTOCK, PIER TYPE 1 DETAILS HLS–PS–07

0 5 10 20 30 40
SCALE 1:500 METERS

0 10 20 40 50 80
SCALE 1:1,000 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS DEDE

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS

PENSTOCK

PLAN AND PROFILE, STA. 0+000 TO STA. 0+400

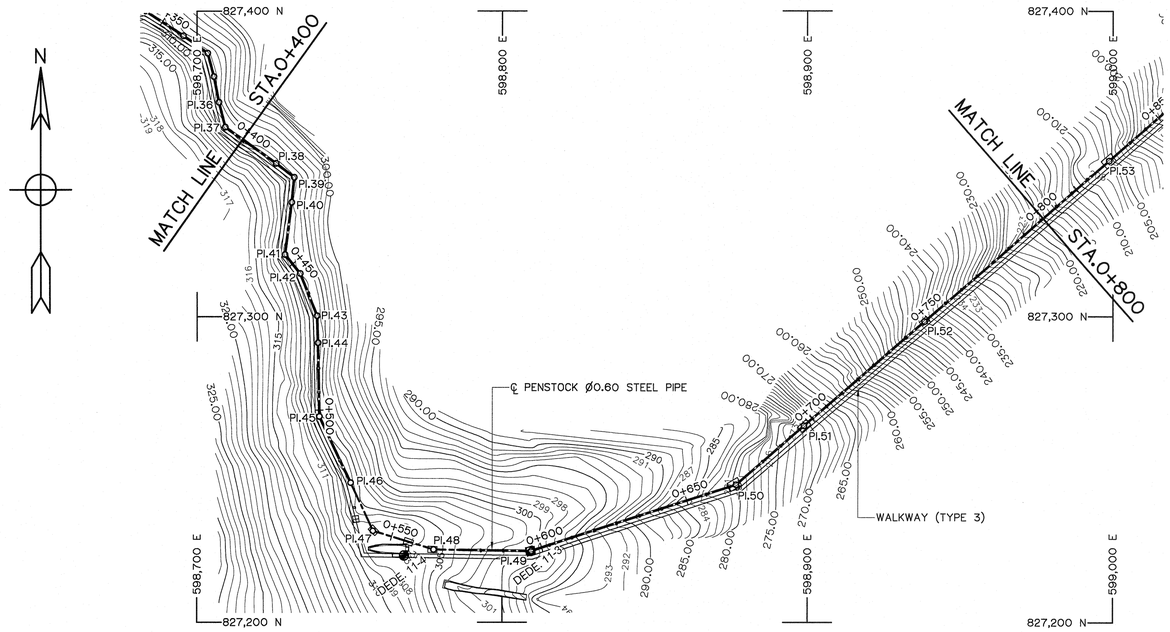
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

DESIGNED	สม. 28.6651	REVIEWED	S.RITICHAI
DRAWN		SUBMITTED	
CHECKED	สม. 28.7324	RECOMMENDED	
PROJECT MANAGER	14/01/62 DATE	APPROVED	

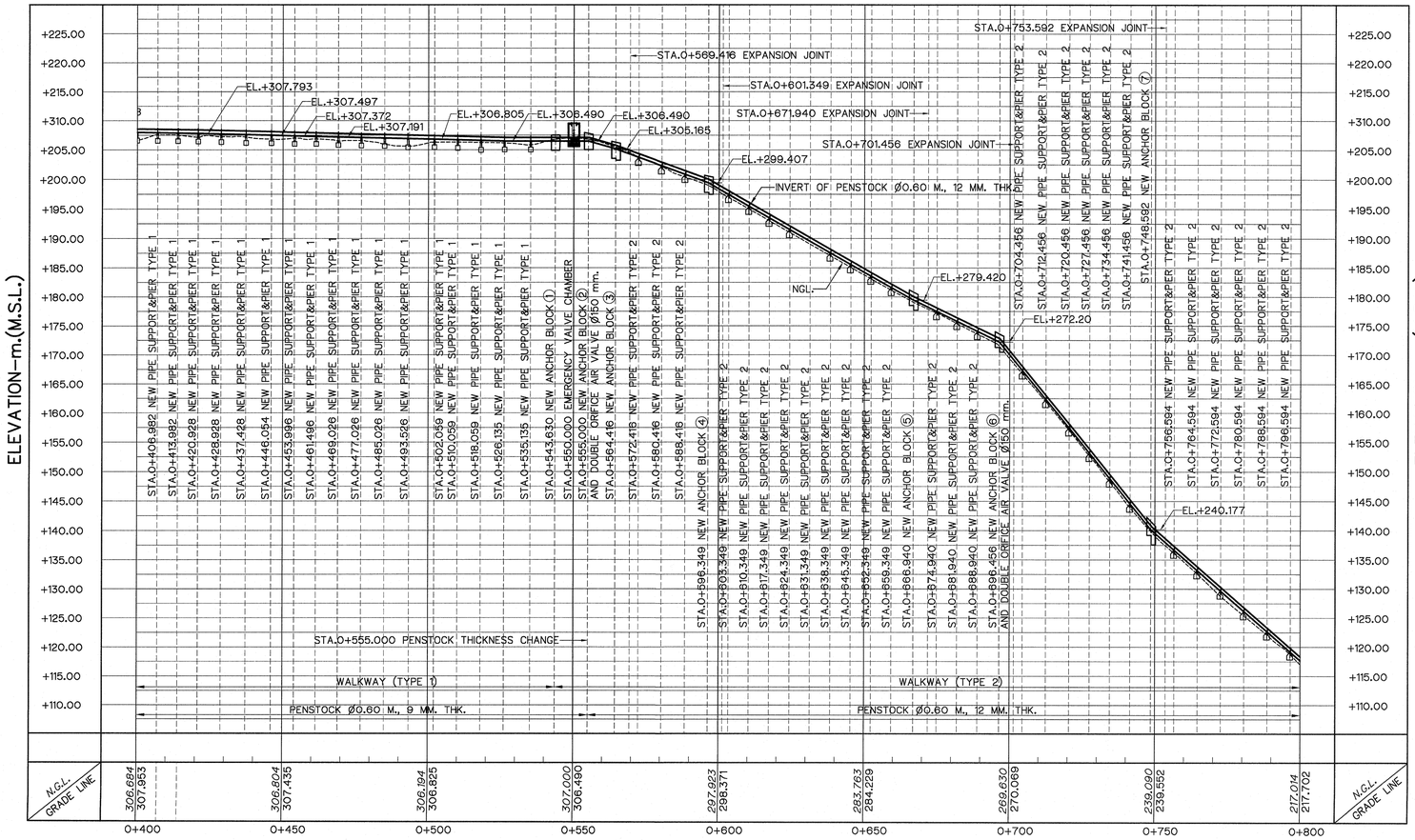
DRAWING NO. HLS–PS–01

SHEET NO. 23 OF 71



PLAN

SCALE 1:1,000



PROFILE

VERTICAL SCALE 1:500

HORIZONTAL SCALE 1:1,000

HORIZONTAL ALINEMENT OF PENSTOCK

NO. PI.	COORDINATE		PI. – PI.	DEFLECTION ANGLE	PI. STA.	BEARING
	N	E	(m)	(° – ' – ")	(km)	(N/S ° – ' – " E/W)
PI.37	827,361.896	598,709.258	8.344	40°–12'–02.48"	0+392.982	S 14°–13'–45.96"E
PI.38	827,349.984	598,725.915	20.478	01°–52'–20.66"	0+413.460	S 54°–25'–48.44"E
PI.39	827,345.444	598,731.844	7.468	58°–24'–15.16"	0+420.928	S52°–33'–27.78"E
PI.40	827,337.348	598,731.015	8.138	01°–39'–19.56"	0+429.066	S 5°–50'–47.39"W
PI.41	827,320.505	598,728.797	16.988	46°–05'–46.99"	0+446.054	S 7°–30'–06.95"W
PI.42	827,314.298	598,733.751	7.942	17°–04'–06.28"	0+453.996	S38°–35'–40.05"E
PI.43	827,300.316	598,739.266	15.030	19°–34'–47.91"	0+469.026	S 21°–31'–33.77"E
PI.44	827,291.428	598,739.568	8.893	00°–50'–58.11"	0+477.919	S 1°–56'–45.85"E
PI.45	827,267.292	598,740.030	24.140	24°–10'–00.20"	0+502.059	S 1°–05'–47.74"E
PI.46	827,245.519	598,750.305	24.076	10°–56'–35.31"	0+526.135	S25°–15'–47.94"E
PI.47	827,229.638	598,757.645	17.495	48°–21'–22.88"	0+543.630	S24°–48'–20.85"E
PI.48	827,223.617	598,777.540	20.786	15°–59'–07.95"	0+564.416	S73°–09'–43.72"E
PI.47	827,229.638	598,757.645	17.495	48°–21'–22.88"	0+543.630	S 24°–48'–20.85"E
PI.48	827,223.617	598,777.540	20.786	15°–59'–07.95"	0+564.416	S 73°–09'–43.72"E
PI.49	827,223.142	598,809.469	31.933	18°–45'–26.90"	0+596.349	S 89°–08'–51.67" E
PI.50	827,244.844	598,876.639	70.589	23°–14'–41.26"	0+666.938	N 72°–05'–41.42" E
PI.51	827,264.268	598,898.866	29.518	00°–19'–38.72"	0+696.456	N 48°–51'–00.17" E
PI.52	827,298.350	598,938.319	52.136	00°–06'–01.70"	0+748.592	N 49°–10'–38.89" E
PI.53	827,350.775	598,998.791	80.033	00°–15'–03.29"	0+828.625	N 49°–04'–37.19" E

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS. UNLESS OTHERWISE SHOWN.
2. SYMBOLE, ABBREVIATIONS AND CENERAL NOTES SEE DWG. NO. HLS-GN-03
3. THE ALIGNMENT OF THE PENSTOCK AND RELATED STRUCTURES SHALL BE CHECK AND CORRECTED BY THE CONTRACTOR TO SUIT THE FIELD CONDITIONS AND SHALL BE SUBMITTED TO DEDE'S FIELD ENGINEER FOR APPROVAL

REFERENCE DRAWINGS :

1. PENSTOCK, PIER TYPE 1 DETAILS	HLS-PS-07
2. PENSTOCK, PIER TYPE 2 DETAILS	HLS-PS-08

0 5 10 20 30 40
SCALE 1:500 METERS

0 10 20 40 50 80
SCALE 1:1,000 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
PLAN AND PROFILE, STA. 0+400 TO STA. 0+800

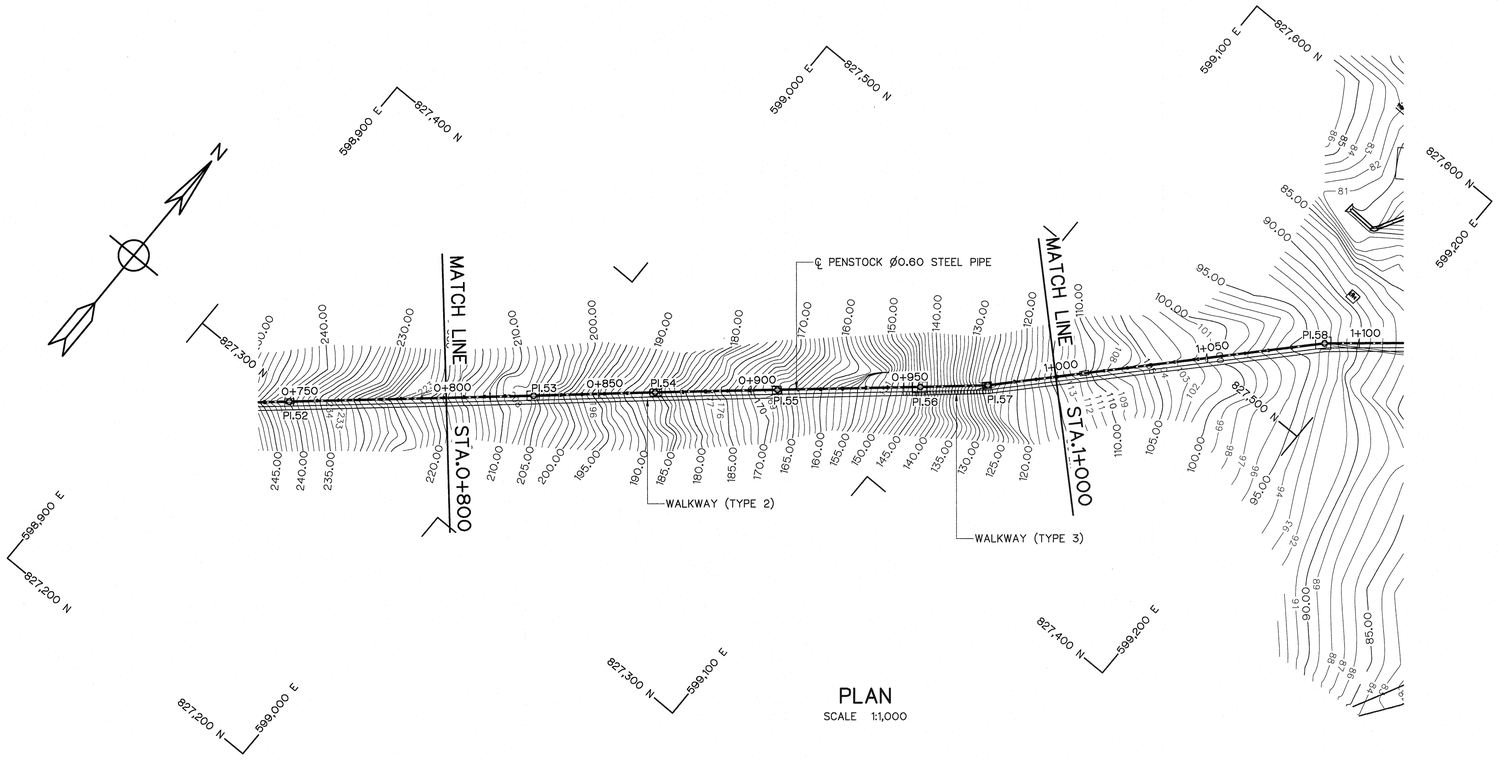
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

DESIGNED	วิ.6651	REVIEWED	S. KITICHAI
DRAWN		SUBMITTED	
CHECKED	วิ.7324	RECOMMENDED	
PROJECT MANAGER	14/01/62 DATE	APPROVED	

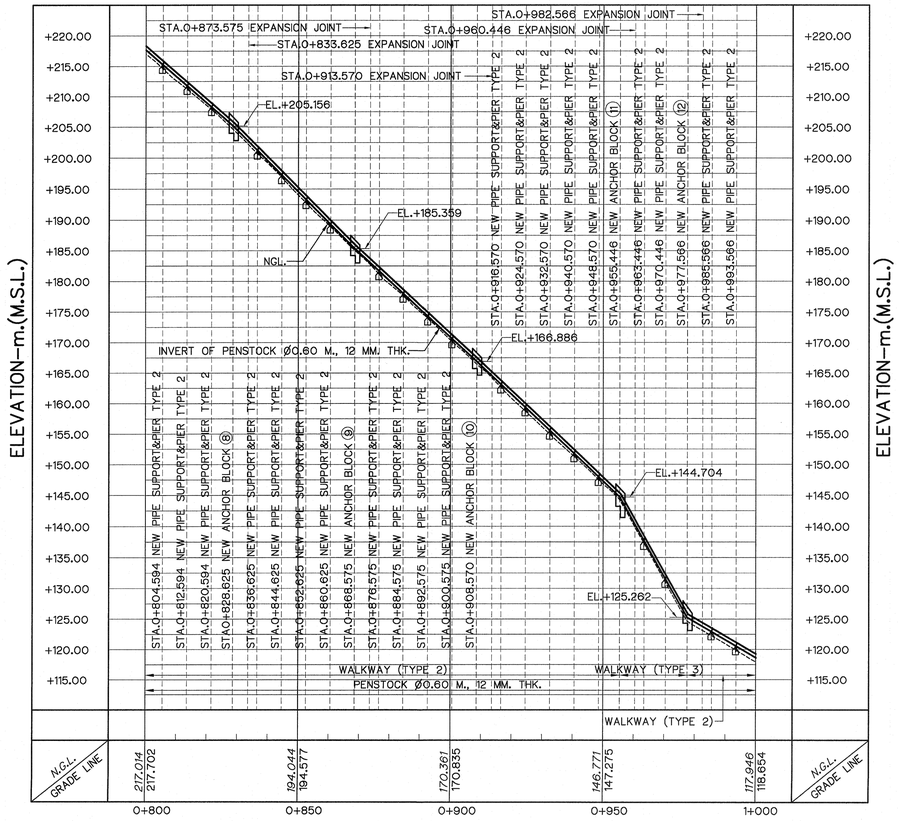
DRAWING NO. HLS-PS-02

SHEET NO. 24 OF 71



PLAN

SCALE 1:1,000



PROFILE

VERTICAL SCALE 1:500

HORIZONTAL SCALE 1:1,000

HORIZONTAL ALINEMENT OF PENSTOCK

NO. PI.	COORDINATE		PI. – PI.	DEFLECTION ANGLE	PI. STA.	BEARING
	N	E	(m)	(° – ' – ")	(km)	(N/S ° – ' – " E/W)
PI.52	827,298.350	598,938.319	52.136	00°-06'-01.70"	0+564.416	N 49°-10'-38.89" E
PI.53	827,350.775	598,998.791	80.033	00°-15'-03.29"	0+828.625	N 49°-04'-37.19" E
PI.54	827,377.076	599,028.862	39.950	00°-23'-19.14"	0+868.575	N 48°-49'-33.90" E
PI.55	827,403.202	599,059.145	39.995	00°-00'-09.70"	0+908.570	N 49°-12'-53.03" E
PI.56	827,433.824	599,094.636	46.876	00° -11'-25.30"	0+955.446	N 49°-12'-43.33" E
PI.57	827,448.330	599,111.336	22.120	05°-48'-44.46"	0+977.566	N 49°-01'-18.03" E
PI.58	827,529.328	599,187.423	111.130	06° -51'-24.99"	1+088.696	N 43°-12'-33.58" E
PI.59	827,558.281	599,222.009	45.105	22° -14'-02.16"	1+133.801	N 50°-03'-58.56" E

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS. UNLESS OTHERWISE SHOWN.
2. SYMBOLE, ABBREVIATIONS AND CENERAL NOTES SEE DWG. NO. HLS-GN-03
3. THE ALIGNMENT OF THE PENSTOCK AND RELATED STRUCTURES SHALL BE CHECK AND CORRECTED BY THE CONTRACTOR TO SUIT THE FIELD CONDITIONS AND SHALL BE SUBMITTED TO DEDE'S FIELD ENGINEER FOR APPROVAL

REFERENCE DRAWINGS :

1. PENSTOCK, PIER TYPE 2 DETAILS HLS-PS-08

0 5 10 20 30 40

SCALE 1:500 METERS

0 10 20 40 50 80

SCALE 1:1,000 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS

PENSTOCK

PLAN AND PROFILE, STA. 0+800 TO STA. 1+000

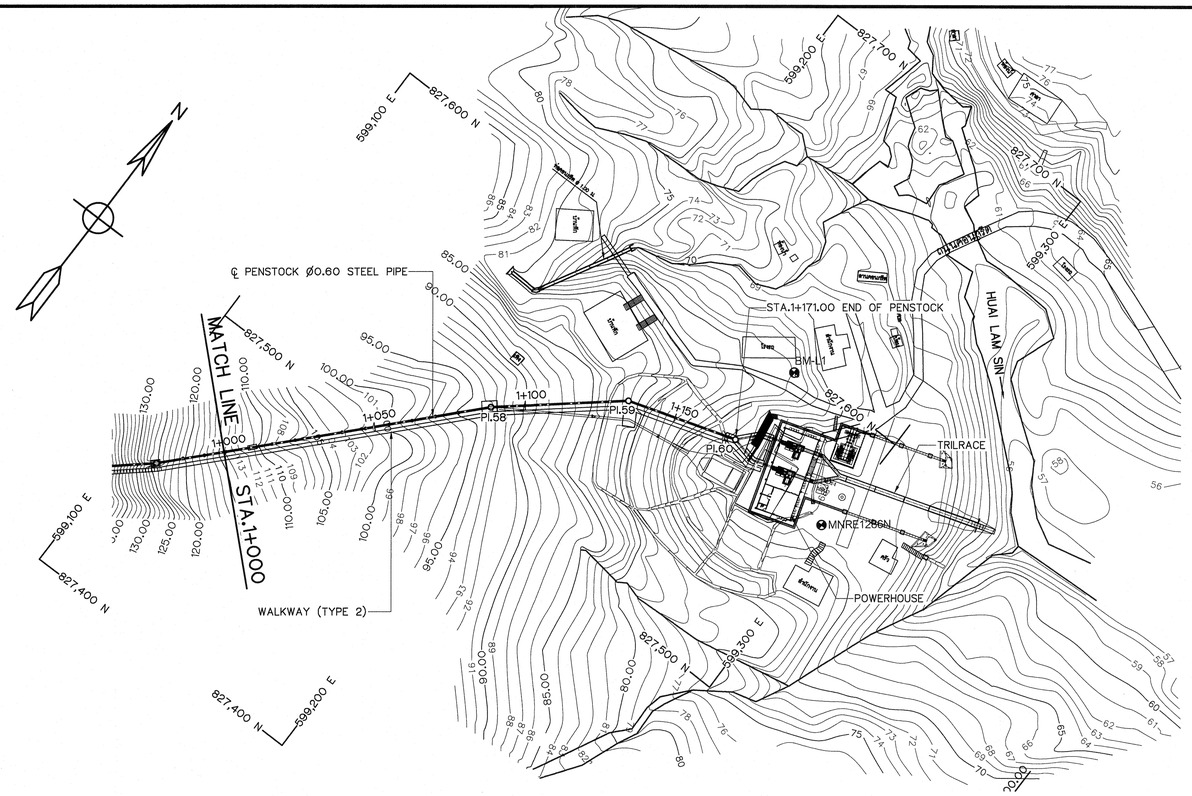
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

DESIGNED	สิ.6651	REVIEWED	S. KITICHAI
DRAWN		SUBMITTED	
CHECKED	สิ.7324	RECOMMENDED	
PROJECT MANAGER	14/01/62 DATE	APPROVED	

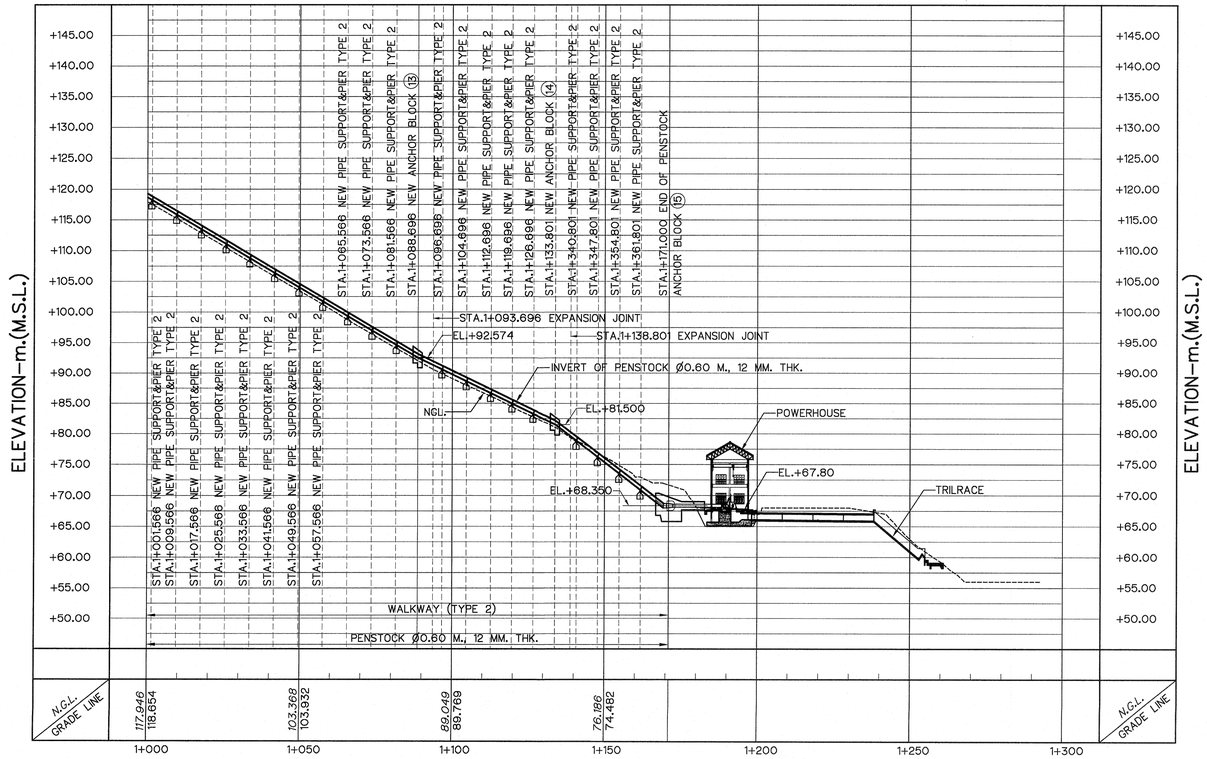
DRAWING NO. HLS-PS-03

SHEET NO. 25 OF 71



PLAN

SCALE 1:1,000



PROFILE

VERTICAL SCALE 1:500

HORIZONTAL SCALE 1:1,000

HORIZONTAL ALINEMENT OF PENSTOCK

NO. PI.	COORDINATE		PI. – PI.	DEFLECTION ANGLE	PI. STA.	BEARING
	N	E	(m)	(° – ' – ")	(km)	(N/S ° – ' – " E/W)
PI.57	827,448.330	599,111.336	22.120	05°–48'–44.46"	0+977.566	N 49°–01'–18.03" E
PI.58	827,529.328	599,187.423	111.130	06°–51'–24.99"	1+088.696	N 43°–12'–33.58" E
PI.59	827,558.281	599,222.009	45.105	22°–14'–02.16"	1+133.801	N 50°–03'–58.56" E
PI.60	827,569.591	599,257.447	37.199	–	1+171.000	N 72°–17'–58.46" E

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS. UNLESS OTHERWISE SHOWN.
2. SYMBOLE, ABBREVIATIONS AND CENERAL NOTES SEE DWG. NO. HLS–GN–03
3. THE ALIGNMENT OF THE PENSTOCK AND RELATED STRUCTURES SHALL BE CHECK AND CORRECTED BY THE CONTRACTOR TO SUIT THE FIELD CONDITIONS AND SHALL BE SUBMITTED TO DEDE'S FIELD ENGINEER FOR APPROVAL

REFERENCE DRAWINGS :

1. PENSTOCK, PIER TYPE 2 DETAILS HLS–PS–08

0 5 10 20 30 40 METERS

SCALE 1:500

0 10 20 40 50 80 METERS

SCALE 1:1,000

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS

PENSTOCK

PLAN AND PROFILE, STA. 1+000 TO STA. 1+171.00

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED S. KITTIGHAM

DESIGNED สย.6651

DRAWN

CHECKED สย.7324

PROJECT MANAGER 14/01/62 DATE

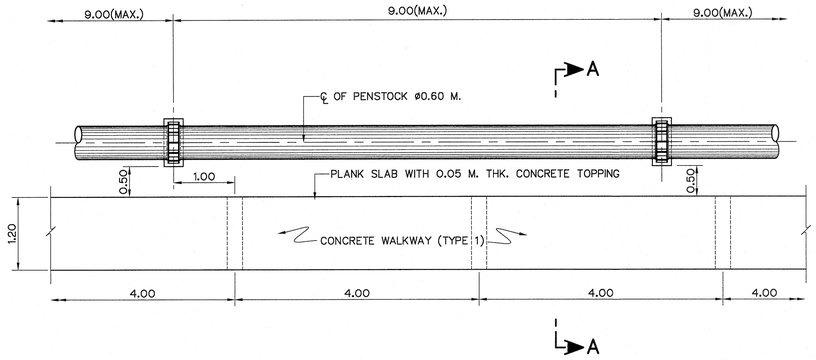
SUBMITTED

RECOMMENDED

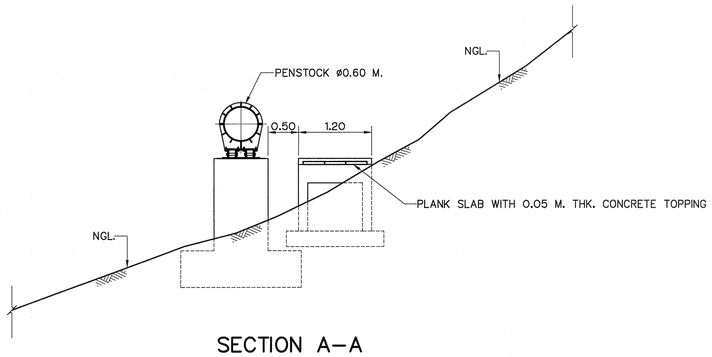
APPROVED

DRAWING NO. HLS–PS–04

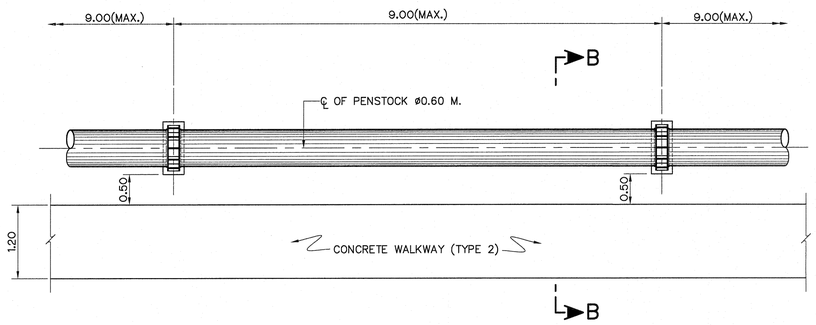
SHEET NO. 26 OF 71



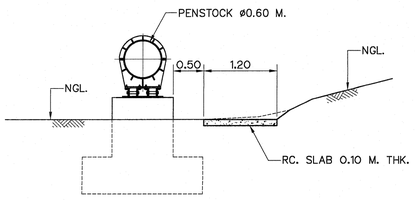
WALKWAY PLAN (TYPE 1)
SCALE 1:50



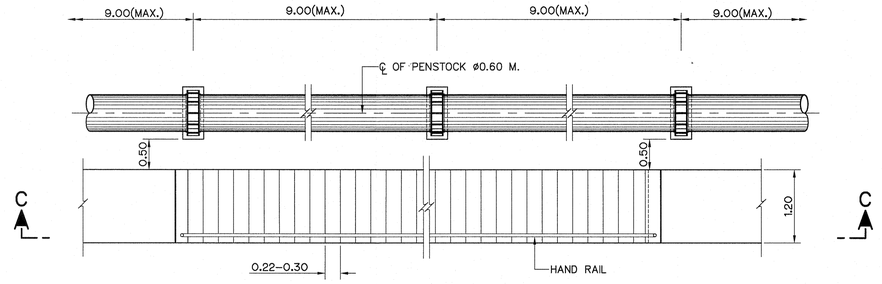
SECTION A–A
SCALE 1:50



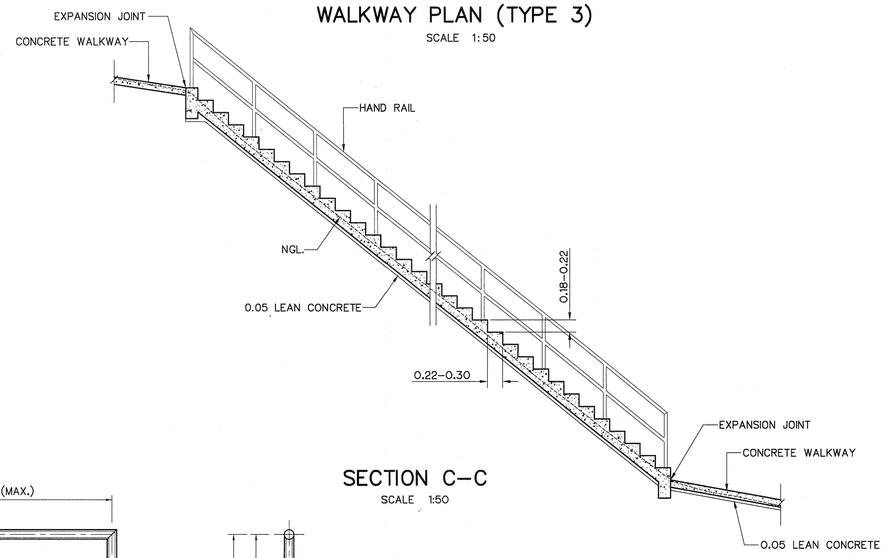
WALKWAY PLAN (TYPE 2)
SCALE 1:50



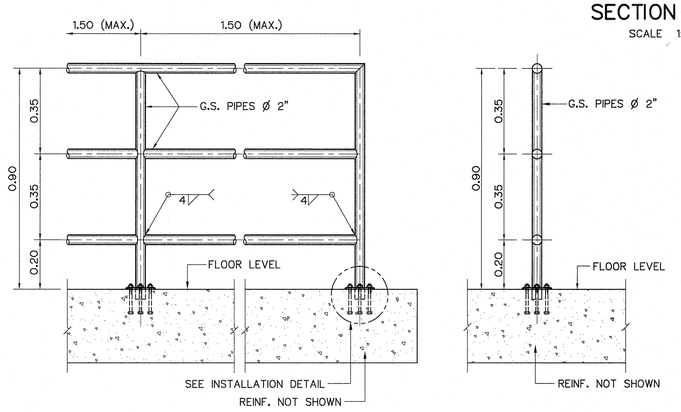
SECTION B–B
SCALE 1:50



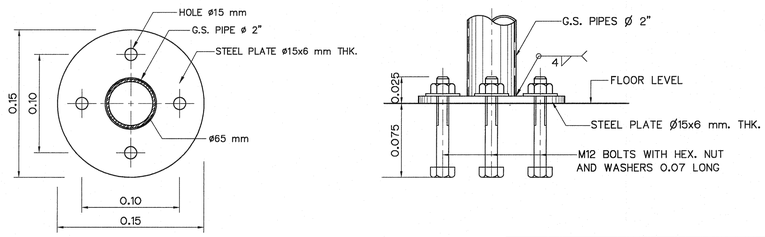
WALKWAY PLAN (TYPE 3)
SCALE 1:50



SECTION C–C
SCALE 1:50



HANDRAIL
NOT TO SCALE



INSTALLATION DETAIL
NOT TO SCALE

NOTES :
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

REFERENCE DRAWINGS :
1. PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA. 1+171.00 HLS-PS-01 TO HLS-PS-04

0 0.5 1 2 3 4
SCALE 1:50 METERS

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

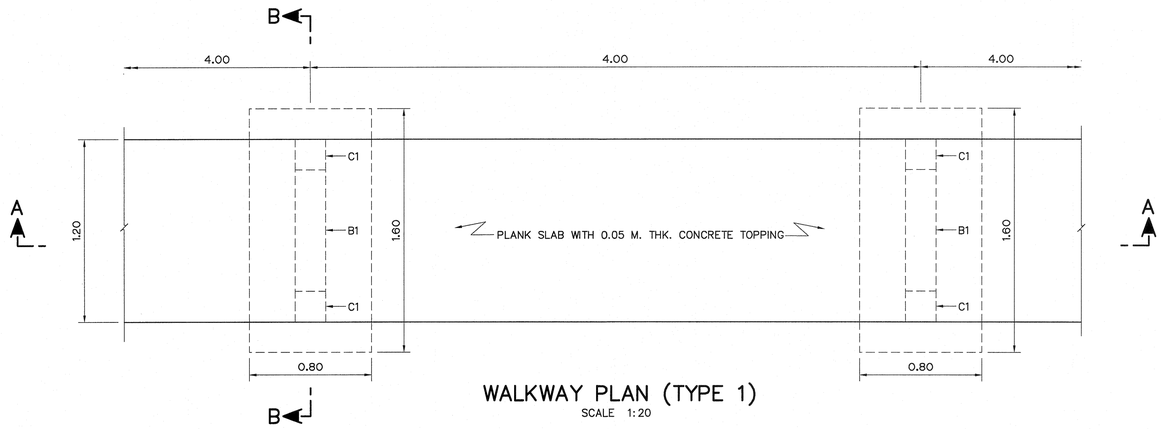
CIVIL WORKS
PENSTOCK
DETAILS OF WALKWAY

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

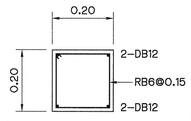
CONSULTANTS: FRONTIER ENGINEERING CONSULTANTS CO.,LTD.
DEDE: Department of Alternative Energy Development and Efficiency, MINISTRY OF ENERGY

DESIGNED	สุชิ.6651	REVIEWED S.RITICHAI
DRAWN		SUBMITTED
CHECKED	สุชิ.7324	RECOMMENDED
PROJECT MANAGER	14/01/62 DATE	APPROVED

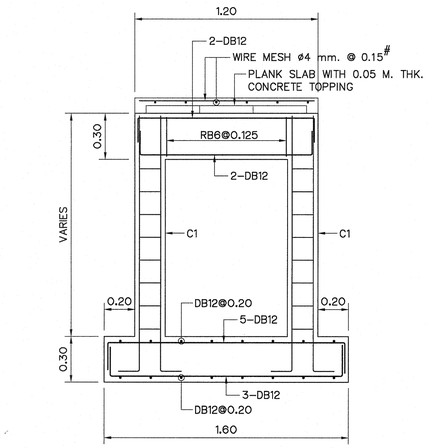
DRAWING NO. HLS-PS-05
SHEET NO. 27 OF 71



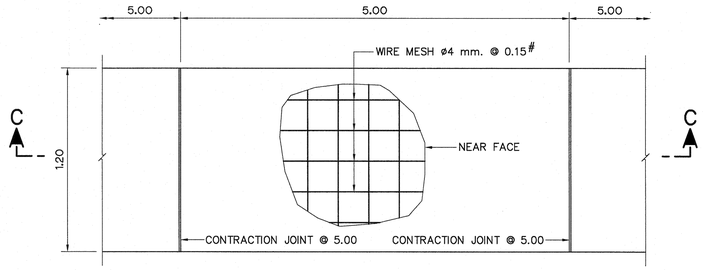
WALKWAY PLAN (TYPE 1)
SCALE 1:20



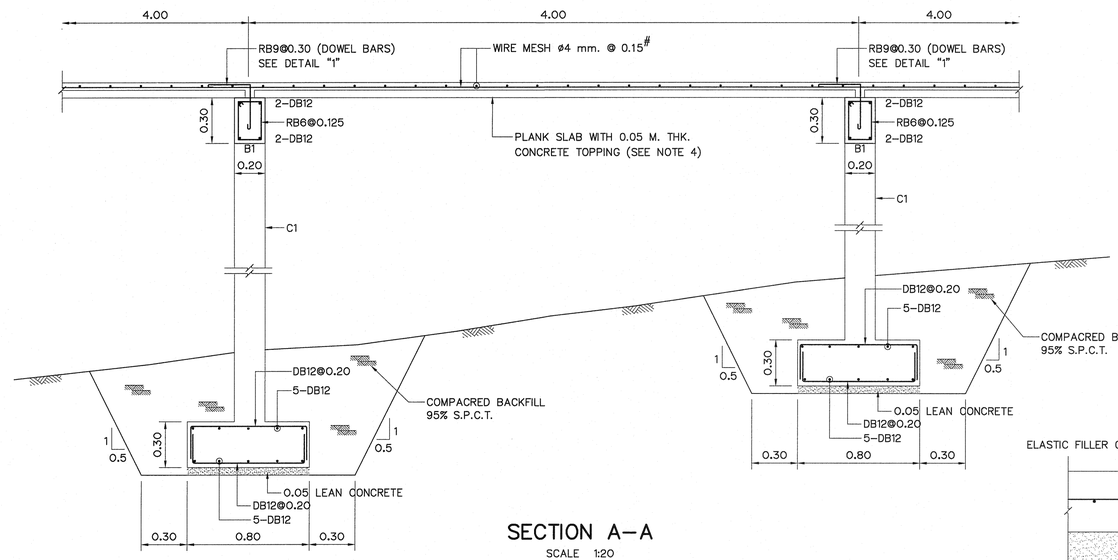
C1
SCALE 1:10



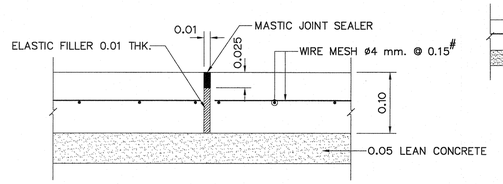
SECTION B-B
SCALE 1:20



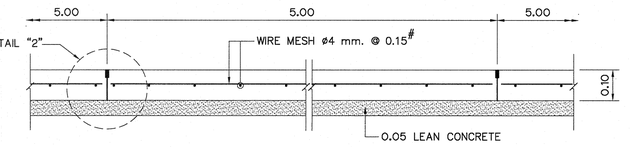
WALKWAY PLAN (TYPE 2)
SCALE 1:20



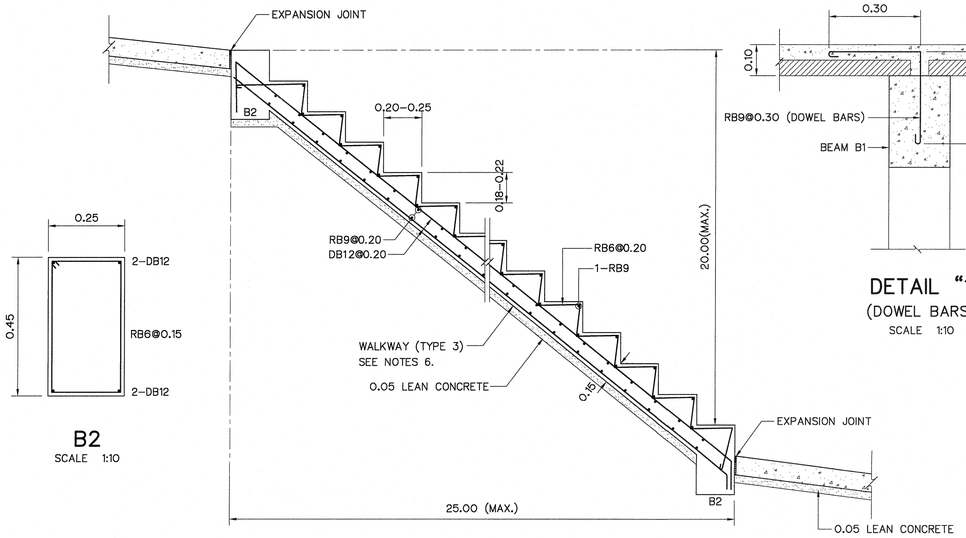
SECTION A-A
SCALE 1:20



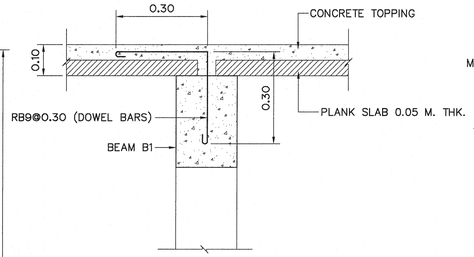
EXPANSION JOINT DETAIL
(SEE NOTES 5.)
SCALE 1:5



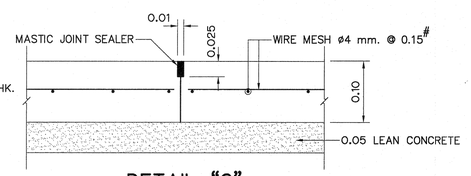
SECTION C-C
SCALE 1:20



WALKWAY SECTION (TYPE 3)
SCALE 1:20



DETAIL "1"
(DOWEL BARS)
SCALE 1:10



DETAIL "2"
(CONTRACTION JOINT)
SCALE 1:5

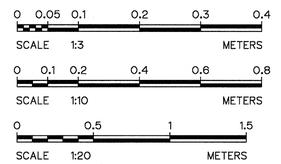
B2
SCALE 1:10

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
3. ALLOWABLE BEARING CAPACITY OF FOUNDATION SHALL NOT BE LESS THAN 10 T/M.^{2}
4. SAFE SUPERIMPOSED SERVICE LOAD OF PLANK SLAB SHALL NOT BE LESS THAN 400 KG./M.^{2}
5. EXPANSION JOINT SHALL BE PROVIDED AT THE INTEVAL OF 100 METERS OR LESS THAN.
6. THE RISERS AND THREADS SHALL BE DETERMINED BY THE CONTRACTOR. TO SUIT THE FIELD CONDITIONS AND SHALL BE SUBMITED TO FIELD ENGINEER FOR APPROVAL.

REFERENCE DRAWINGS :

1. PENSTOCK DETAILS OF WALKWAY HLS-PS-05



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
		CONSULTANTS	DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
REINFORCEMENT DETAILS WALKWAY

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

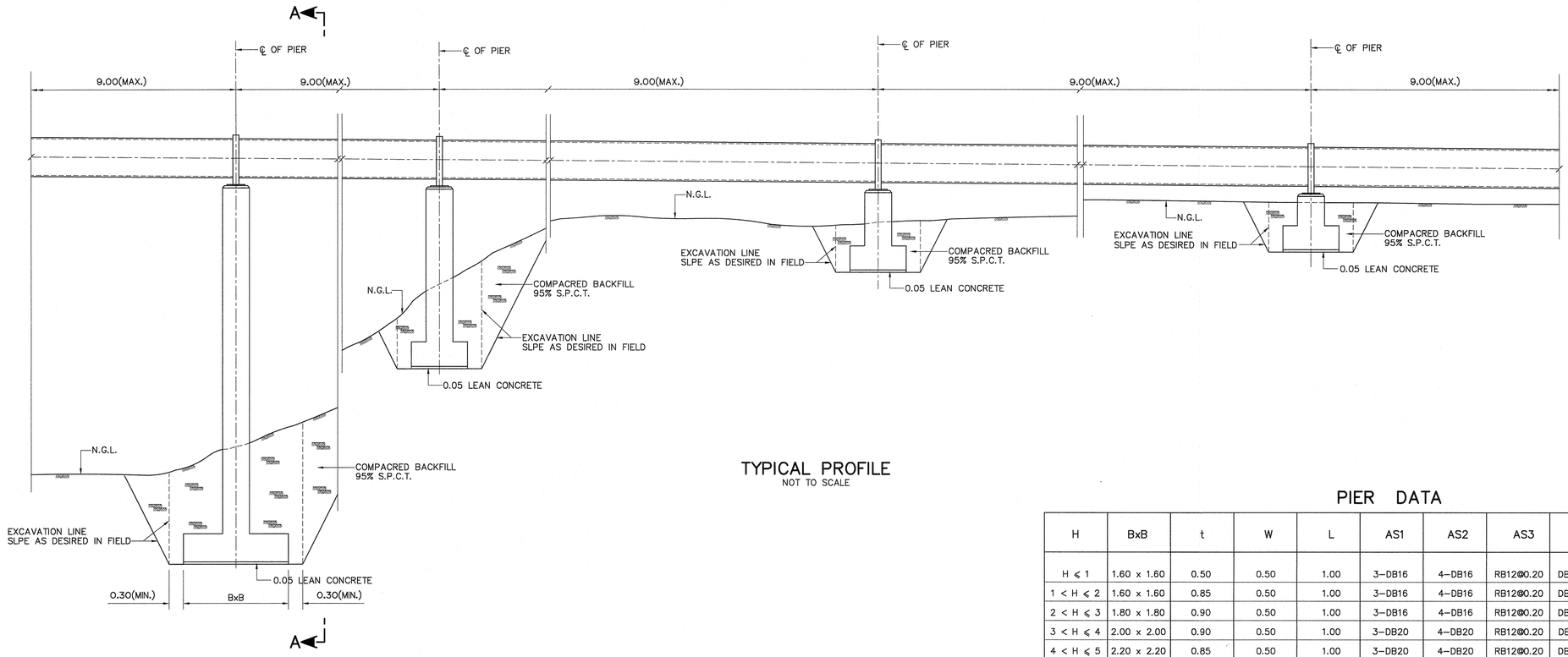
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED S. KITCHAM

DESIGNED ฉลิ.6651
DRAWN
CHECKED ฉลิ.7324
PROJECT MANAGER 14/01/62 DATE

SUBMITTED
RECOMMENDED
APPROVED

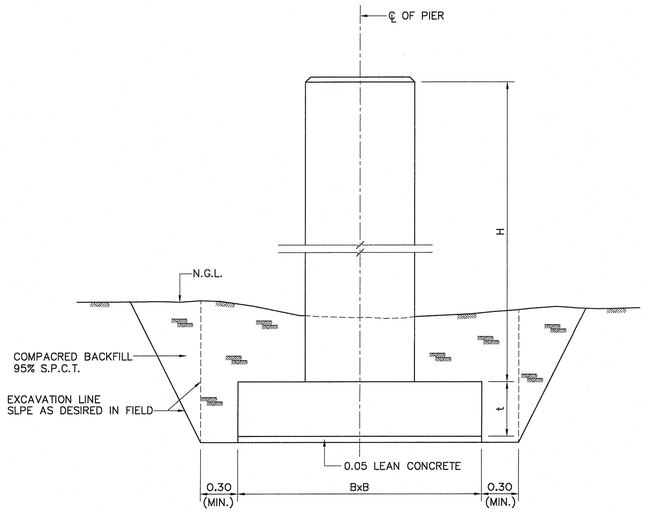
DRAWING NO. HLS-PS-06
SHEET NO. 28 OF 71



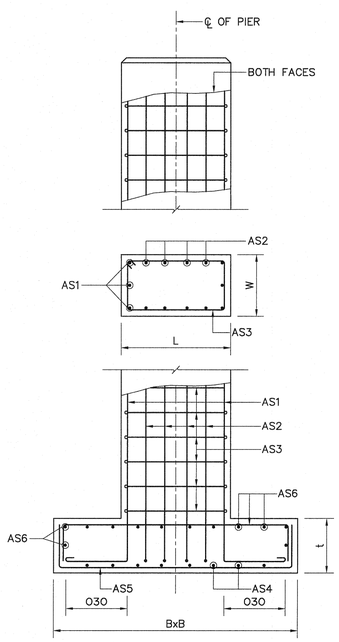
TYPICAL PROFILE
NOT TO SCALE

PIER DATA

H	BxB	t	W	L	AS1	AS2	AS3	AS4	AS5	AS6
H ⩽ 1	1.60 x 1.60	0.50	0.50	1.00	3–DB16	4–DB16	RB12@0.20	DB12@0.20	DB12@0.20	RB12@0.20
1 < H ⩽ 2	1.60 x 1.60	0.85	0.50	1.00	3–DB16	4–DB16	RB12@0.20	DB12@0.20	DB12@0.20	RB12@0.20
2 < H ⩽ 3	1.80 x 1.80	0.90	0.50	1.00	3–DB16	4–DB16	RB12@0.20	DB12@0.20	DB12@0.20	RB12@0.20
3 < H ⩽ 4	2.00 x 2.00	0.90	0.50	1.00	3–DB20	4–DB20	RB12@0.20	DB12@0.15	DB12@0.15	RB12@0.20
4 < H ⩽ 5	2.20 x 2.20	0.85	0.50	1.00	3–DB20	4–DB20	RB12@0.20	DB16@0.25	DB16@0.25	RB12@0.20
5 < H ⩽ 6	2.65 x 2.65	1.00	0.50	1.00	3–DB20	5–DB20	RB12@0.20	DB16@0.20	DB16@0.20	RB12@0.20



SECTION A–A
PIER
NOT TO SCALE



REINFORCEMENT DETAIL
PIER
NOT TO SCALE

NOTES :
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS. UNLESS OTHERWISE SHOWN.
2. BASE OF FOOTINGS SHOULD BE DETEMNED IN BY EMBEDED INTO STABLE EARTH OR ROCK FOUNDATION WHICH THE MINIMUM ALLOWABLE BEARING CAPACITY NOT LESS THAN 15 T./M.^{2} OR APPROVED BY FIELD ENCINEER

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
PIER TYPE 1 DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

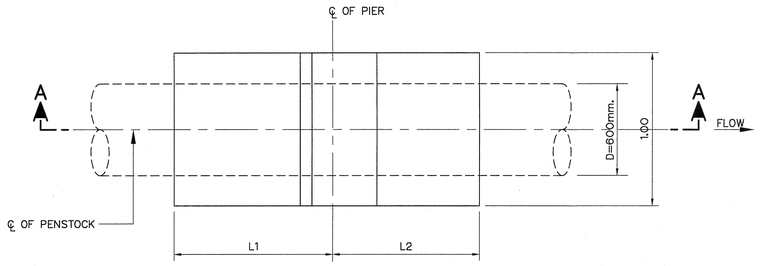
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED S. KITICHAI

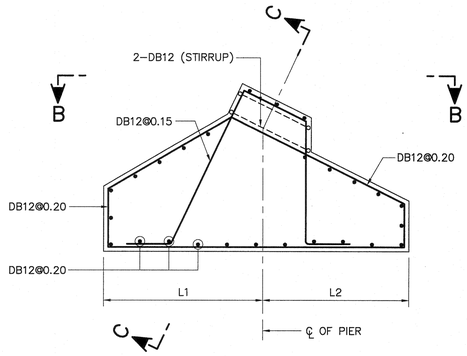
DESIGNED ส.ย.6651
DRAWN
CHECKED ส.ย.7324
PROJECT MANAGER 14/01/62 DATE

SUBMITTED
RECOMMENDED
APPROVED

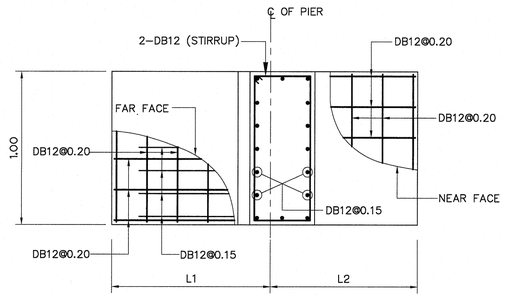
DRAWING NO. HLS–PS–07
SHEET NO. 29 OF 71



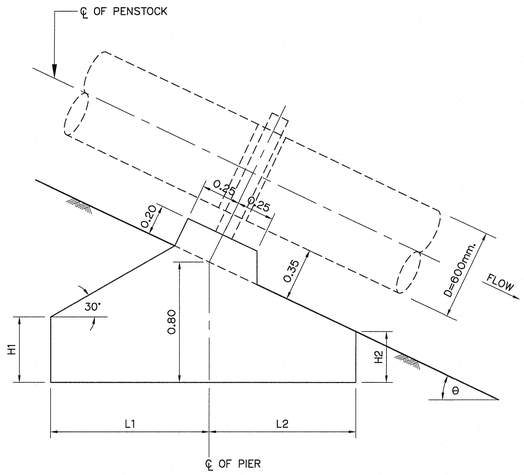
PLAN
SCALE 1:20



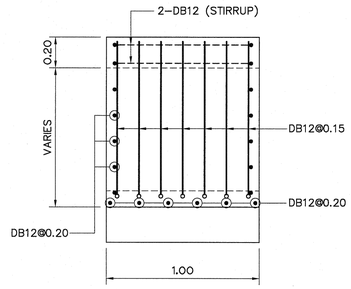
SECTION A–A
SCALE 1:20



SECTION B–B
SCALE 1:20



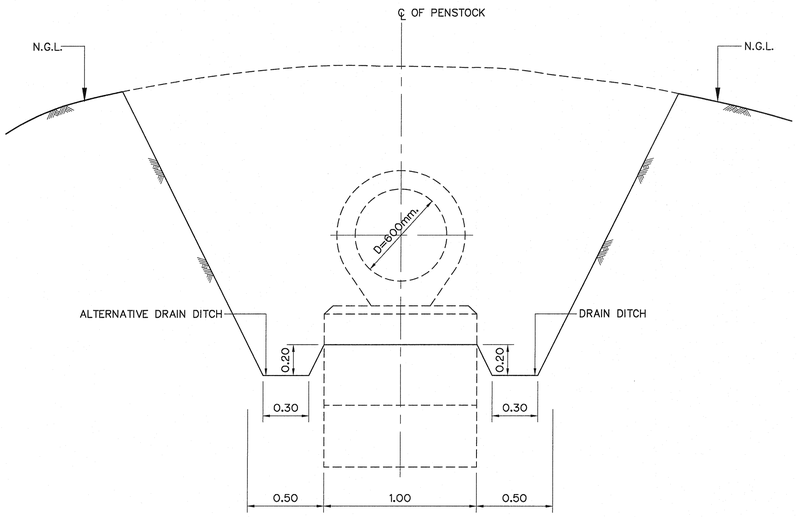
ELEVATION
SCALE 1:20



SECTION C–C
SCALE "A"

PIER DIMENSIONS

KM		SLOPE (θ)	L1	L2	H1	H2
FROM	TO	(DEGREE)	(m.)	(m.)	(m.)	(m.)
0+572.416	0+588.416	10°–13'–05"	1.00	1.00	0.41	0.62
0+605.341	0+658.349	15°–48'–34"	1.00	1.00	0.43	0.52
0+676.940	0+686.940	13°–44'–49"	1.00	1.00	0.42	0.56
0+705.456	0+740.456	31°–33'–23"	1.10	0.90	0.42	0.25
0+756.594	0+828.625	23°–38'–00"	1.10	0.90	0.40	0.41
0+836.625	0+860.625	26°–21'–39"	1.10	0.90	0.41	0.35
0+876.575	0+900.575	24°–47'–26"	1.10	0.90	0.40	0.38
0+916.570	0+948.570	25°–19'–29"	1.10	0.90	0.40	0.37
0+963.446	0+970.446	41°–18'–48"	1.35	0.65	0.29	0.23
0+985.566	1+081.566	16°–24'–51"	1.00	1.00	0.43	0.51
1+096.696	1+120.696	13°–44'–53"	1.00	1.00	0.42	0.56
1+339.801	1+355.801	20°–52'–19"	1.10	0.90	0.39	0.46



TYPICAL SECTION OF PENSTOCK TRENCH
SCALE 1:20

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS. UNLESS OTHERWISE SHOWN.
2. SIDE SLOPE CAN BE ADJUSTED IN FIELD FOR APPROPRIATE SOIL TYPES
3. BASE OF FOOTINGS SHOULD BE DETEMNED IN BY EMBEDED INTO STABLE EARTH OR ROCK FOUNDATION WHICH THE MINIMUM ALLOWABLE BEARING CAPACITY NOT LESS THAN 15 T./M^2 OR APPROVED BY FIELD ENCINEER

0 0.5 1 1.5
SCALE 1:20 METERS

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
PIER TYPE 2 DETAILS

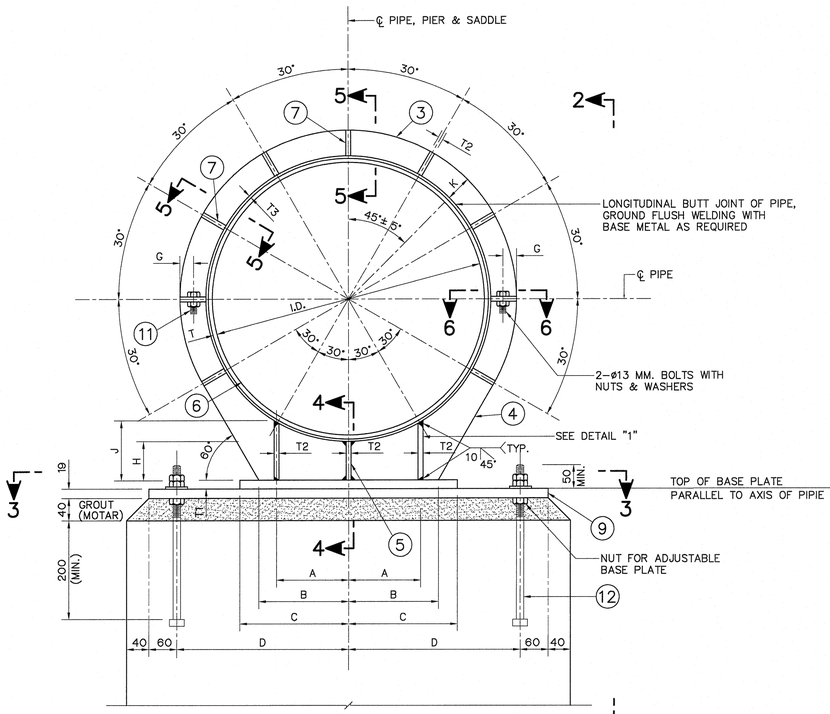
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

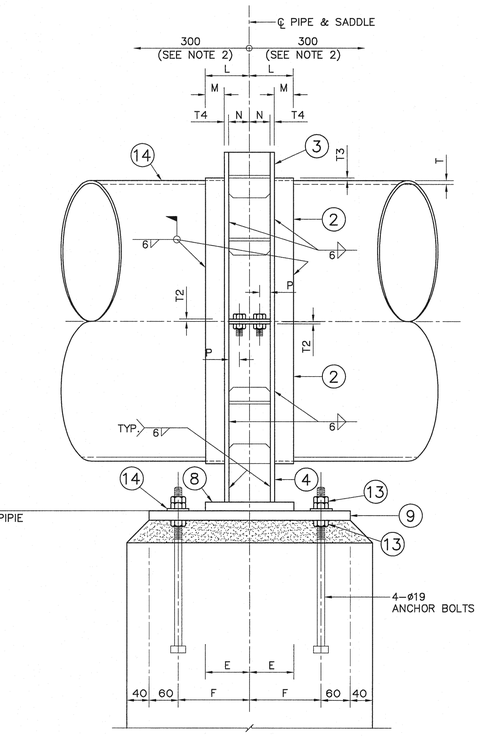
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED S. KITICHAI
DESIGNED EI.6651
SUBMITTED
DRAWN
RECOMMENDED
CHECKED EI.7324
APPROVED
PROJECT MANAGER 14/01/62 DATE

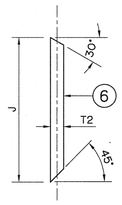
DRAWING NO. HLS–PS–08
SHEET NO. 30 OF 71



ELEVATION
NOT TO SCALE



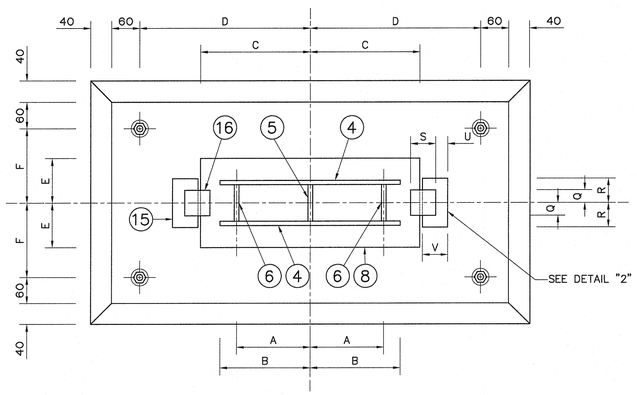
SECTION 2–2
NOT TO SCALE



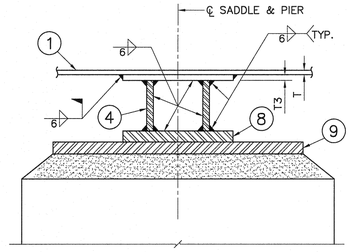
DETAIL "1"
NOT TO SCALE

BILL OF MATERIALS
(PER ONE SET OF SUPPORT)

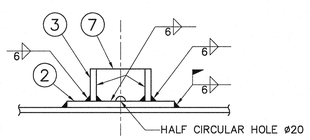
ITEMS	DESCRIPTION	MATERRIAL	QUAN.	REMARKS
1	PENSTOCK STEEL PIPE	ASTM – A 283 , GRADE D	–	
2	REINFORCINC PADS	ASTM – A 283 , GRADE D	2	
3	UPPER RINGS	ASTM – A 283 , GRADE D	2	
4	LOWER RINGS	ASTM – A 283 , GRADE D	2	
5	STIFFENER PLATES 10x80x80	ASTM – A 283 , GRADE D	1	
6	STIFFENER PLATES 10x80x116	ASTM – A 283 , GRADE D	2	
7	STIFFENER PLATES 10x80x50	ASTM – A 283 , GRADE D	7	
8	SADDLE PLATE 19x180x440	ASTM – A 36	1	SEE NOTE 3
9	BASE PLATE 19x400x800	ASTM – A 36	1	GALVANIZED
10	BOLTING PLATES 10x80x50	ASTM – A 283 , GRADE D	4	
11	BOLTS ø13x40 W/NUT & WASHER	ASTM – A 325	4	GALVANIZED
12	ANCHOR BOLTS ø19x350	ASTM – A 307 , GRADE B	4	SEE NOTE 4
13	NUTS ø19	ASTM – A 307 , GRADE B	12	GALVANIZED
14	WASHER ø19	ASTM – A 307 , GRADE B	4	GALVANIZED
15	GUIDE PLATE 22x50x90	ASTM – A 36	2	
16	UPLIFT PLATE 19x50x50	ASTM – A 36	2	



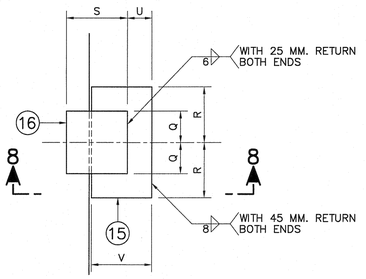
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NOT TO SCALE



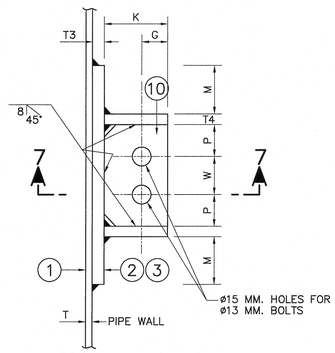
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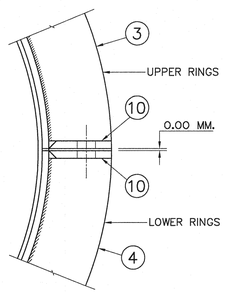
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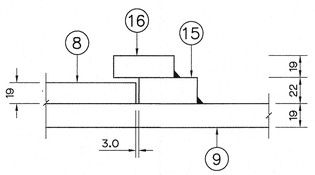
DETAIL "2"
NOT TO SCALE



SECTION 6–6
NOT TO SCALE



SECTION 7–7
NOT TO SCALE



SECTION 8–8
NOT TO SCALE

NOTES :
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS. UNLESS OTHERWISE SHOWN.
2. NO SPIRAL WELDED OF PIPE IN THESE REGION
3. GALVANIZED ONLY PORTION EXPOSED TO WEATHER
4. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, SHOP DRAWING SHALL BE DESIGNED BY CONTRACTOR UNDER APPROVAL OF FIELD ENGINEER.

SUPPORT DIMENSIONS

SUPPORT TYPE	PIPE (MM.)		FABRICATION DIMENSION, UNIT IN MM.																			PLATES THICKNESS (MM.)				REMARKS
	I.D.	T	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	U	V	W	T1	T2	T3	T4	
1	600	9	158	195	250	400	90	150	20	80	122	50	90	40	40	25	25	45	50	20	50	30	19	10	8	10	
2	600	12	159	196	250	400	90	150	20	80	123	80	90	40	40	25	25	45	50	20	50	30	19	10	8	10	

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
SUPPORT ELEVATION, SECTIONS AND DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

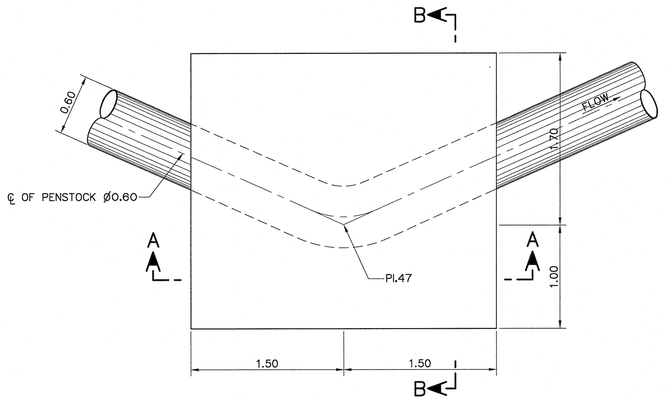
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED S. KITICHAM

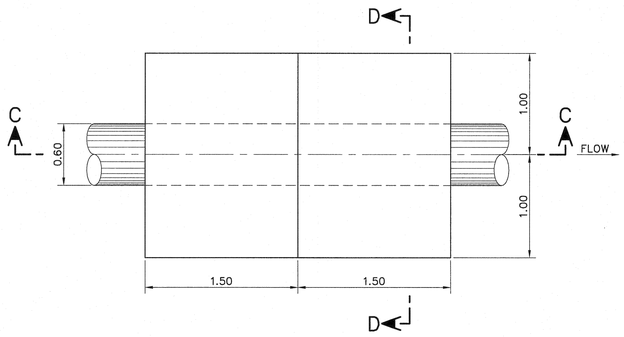
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DRAWN
CHECKED ส.7324
PROJECT MANAGER 14/01/62 DATE

SUBMITTED
RECOMMENDED
APPROVED

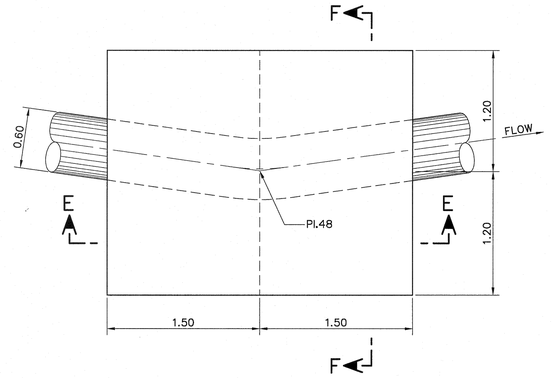
DRAWING NO. HLS–PS–09
SHEET NO. 31 OF 71



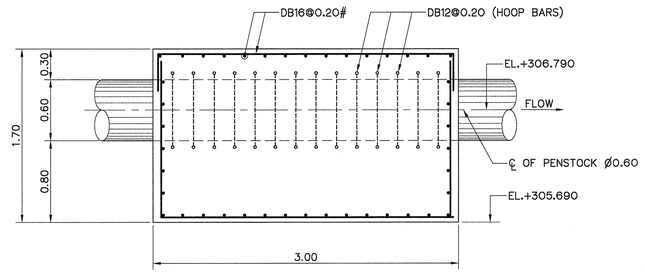
PLAN
ANCHOR (1)
SCALE 1:30



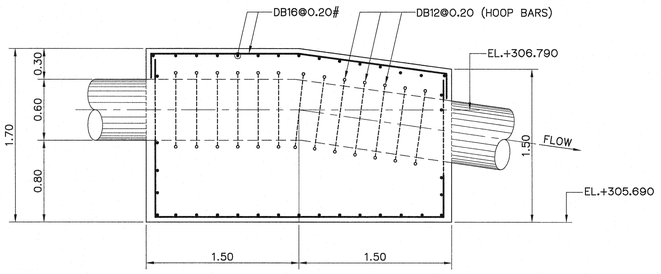
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SCALE 1:30



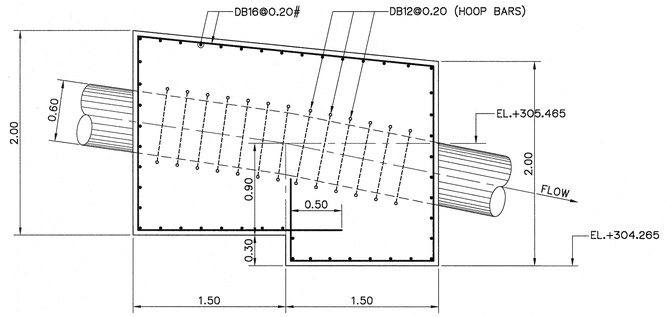
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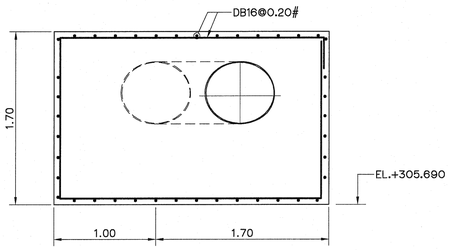
SECTION A–A
ANCHOR (1)
SCALE 1:30



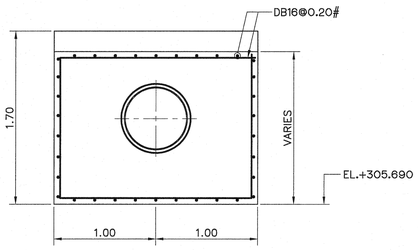
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ANCHOR (2)
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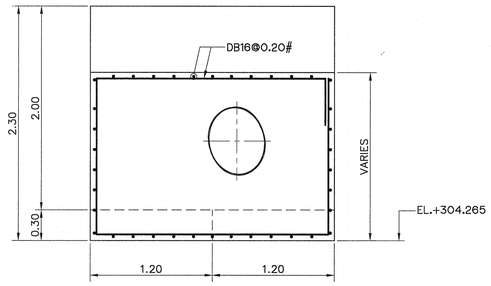
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ANCHOR (3)
SCALE 1:30



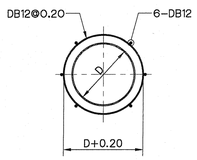
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ANCHOR (1)
SCALE 1:30



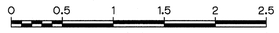
SECTION D–D
ANCHOR (2)
SCALE 1:30



SECTION F–F
ANCHOR (2)
SCALE 1:30



TYPICAL HOOP BAR
SCALE 1:30



NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS. UNLESS OTHERWISE SHOWN.
2. SYMBOLE, ABBREVIATIONS AND CENERAL NOTES SEE DWG. NO. HLS–GN–03
3. THE ALIGNMENT OF THE PENSTOCK AND RELATED STRUCTURES SHALL BE CHECK AND CORRECTED BY THE CONTRACTOR TO SUIT THE FIELD CONDITIONS AND SHALL BE SUBMITTED TO DEDE'S FIELD ENGINEER FOR APPROVAL

REFERENCE DRAWINGS :

1. PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA. 1+171.00 HLS–PS–01, 04

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
ANCHOR BLOCK (1), (2) & (3)
PLANS AND REINFORCEMENT DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

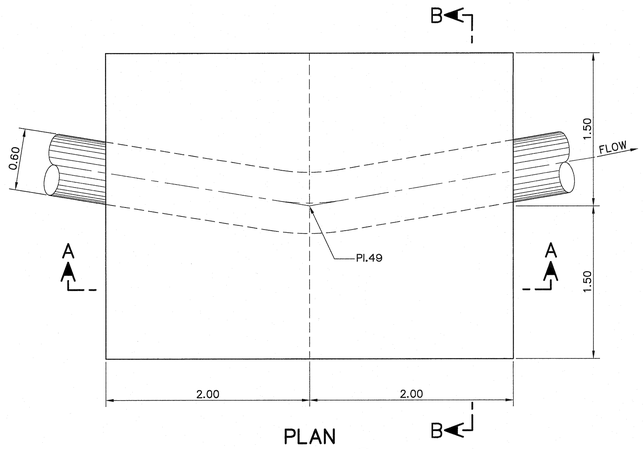
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DESIGNED ส.6651
DRAWN
CHECKED ส.7324
PROJECT MANAGER
14/01/62
DATE

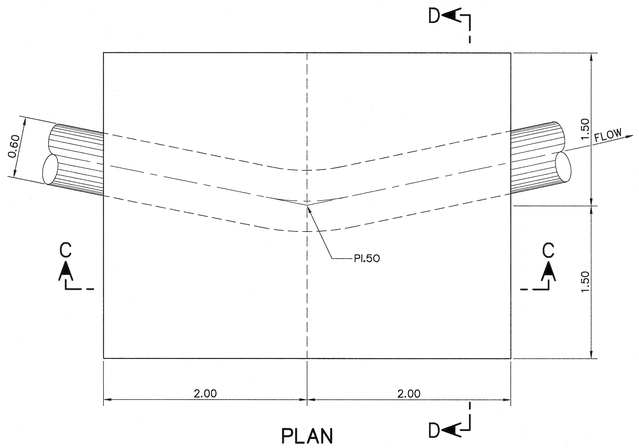
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APPROVED

DRAWING NO. HLS–PS–10

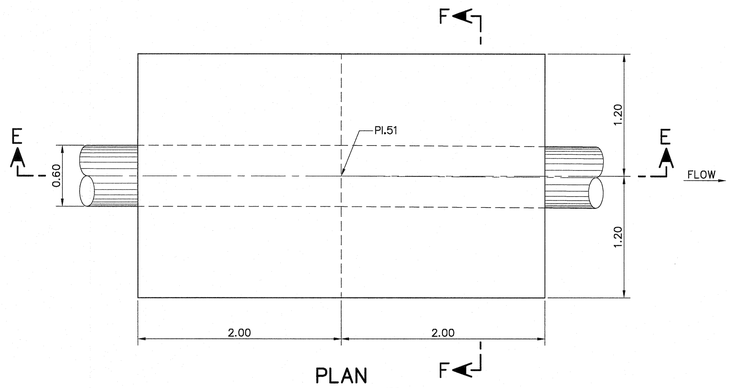
SHEET NO. 32 OF 71



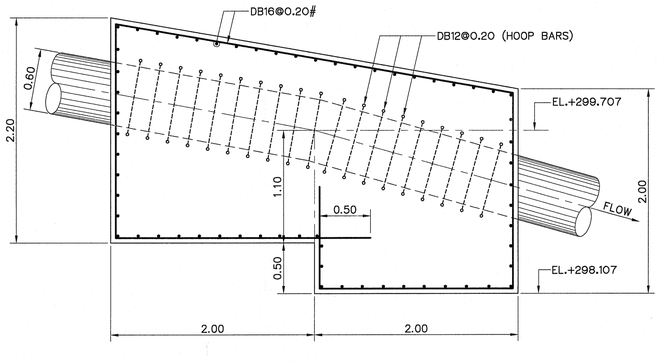
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ANCHOR (4)
SCALE 1:30



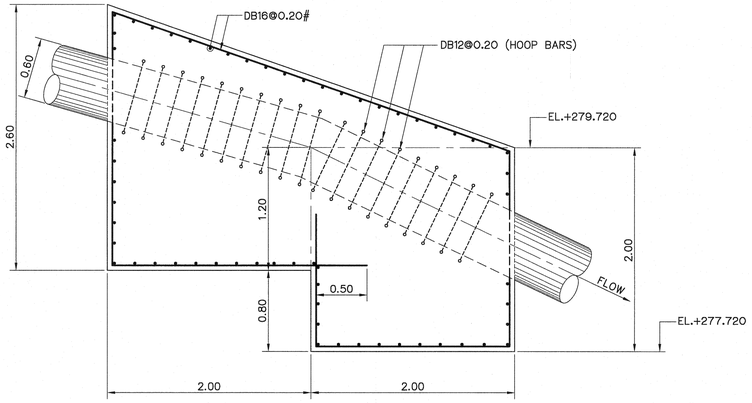
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SCALE 1:30



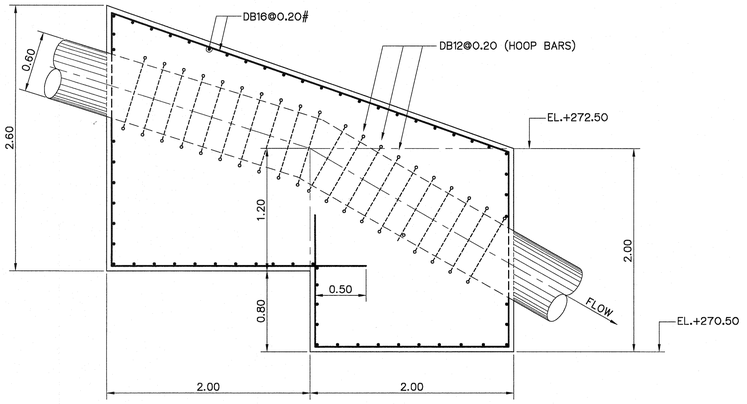
PLAN
ANCHOR (6)
SCALE 1:30



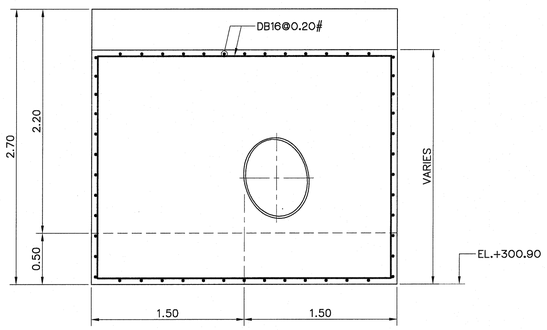
SECTION A–A
ANCHOR (4)
SCALE 1:30



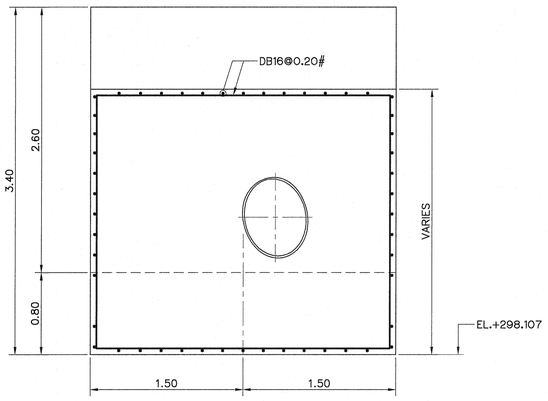
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ANCHOR (5)
SCALE 1:30



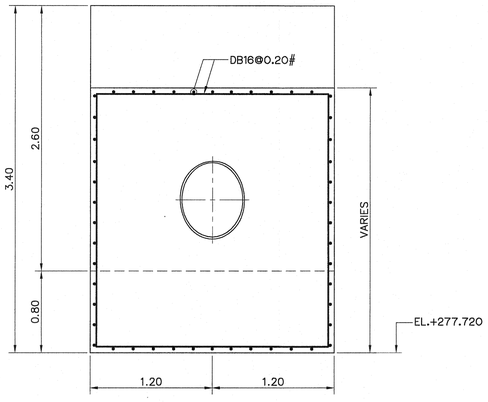
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ANCHOR (6)
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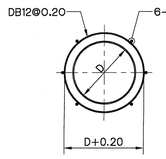
SECTION B–B
ANCHOR (4)
SCALE 1:30



SECTION D–D
ANCHOR (5)
SCALE 1:30



SECTION F–F
ANCHOR (6)
SCALE 1:30



TYPICAL HOOP BAR
SCALE 1:30

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS. UNLESS OTHERWISE SHOWN.
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REFERENCE DRAWINGS :

1. PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA. 1+171.00 HLS–PS–01, 04

0 0.5 1 1.5 2 2.5
SCALE 1:30 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
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2				
1				

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MINISTRY OF ENERGY

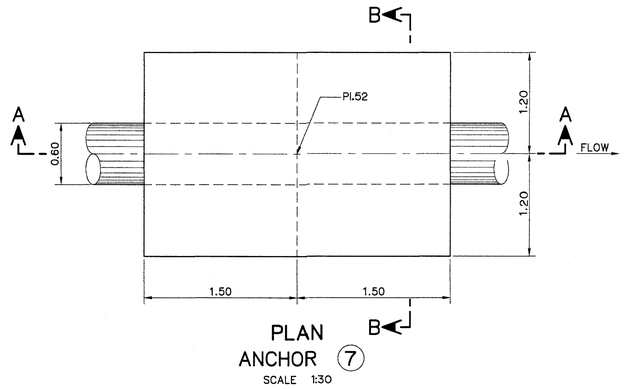
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
ANCHOR BLOCK (4), (5) & (6)
PLANS AND REINFORCEMENT DETAILS

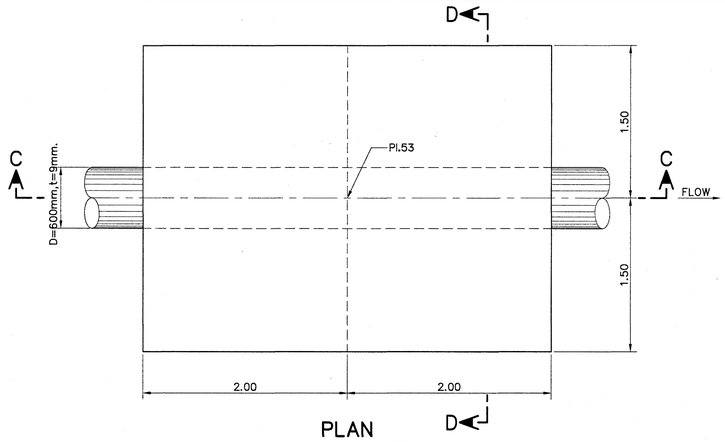
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

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MINISTRY OF ENERGY

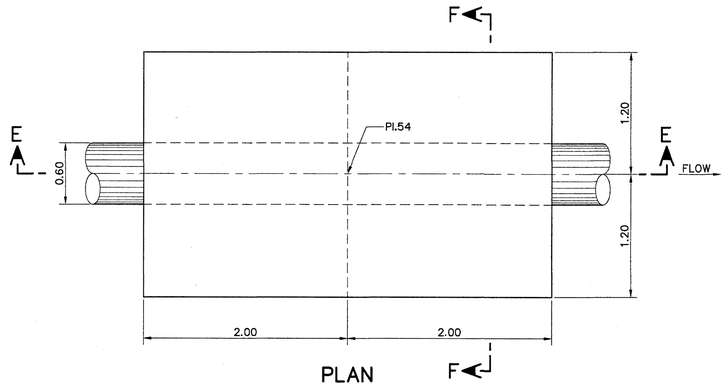
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DRAWN		SUBMITTED	
CHECKED	วศ.7324	RECOMMENDED	
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	DATE	DRAWING NO.	HLS–PS–11
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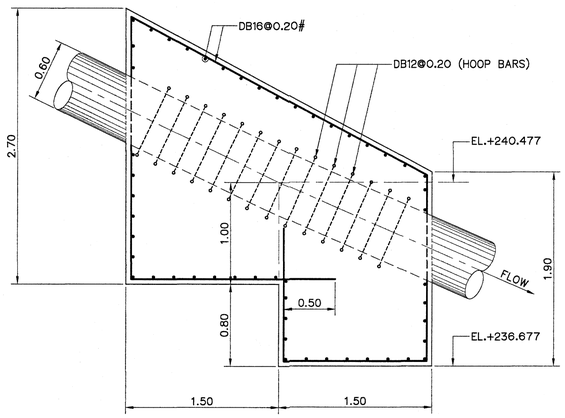
PLAN
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SCALE 1:30



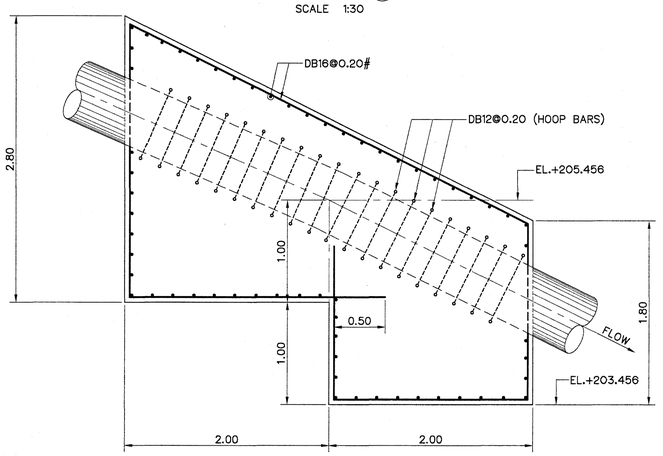
PLAN
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SCALE 1:30



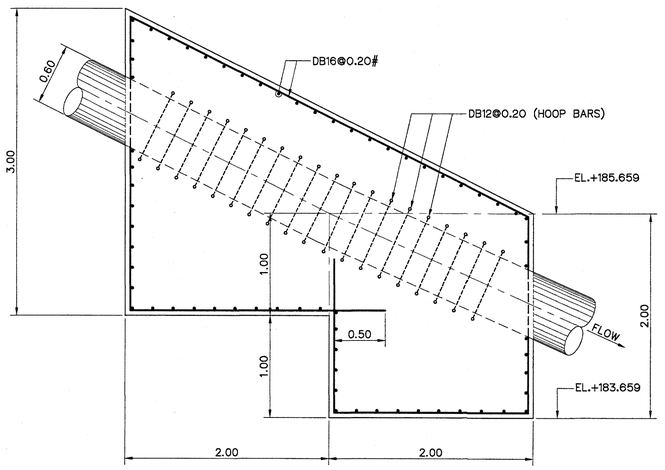
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ANCHOR (9)
SCALE 1:30



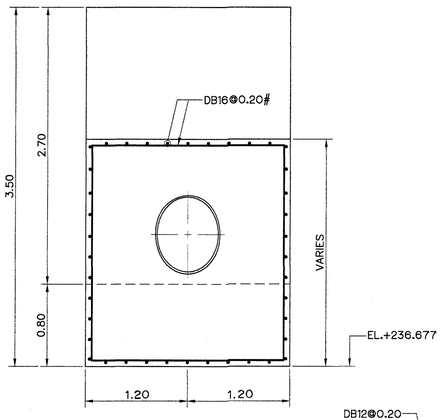
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ANCHOR (7)
SCALE 1:30



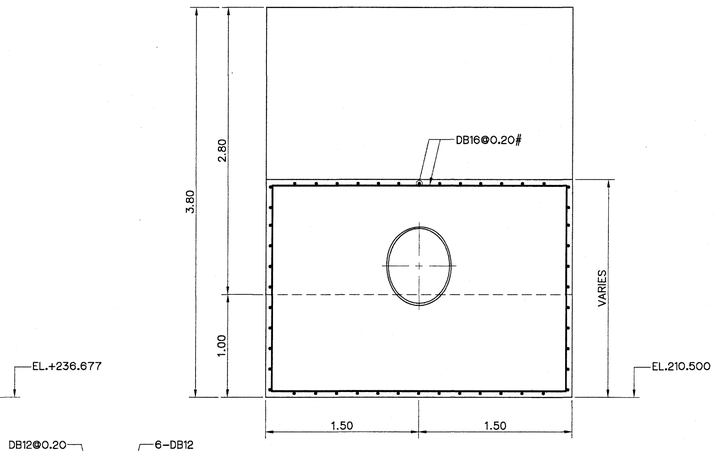
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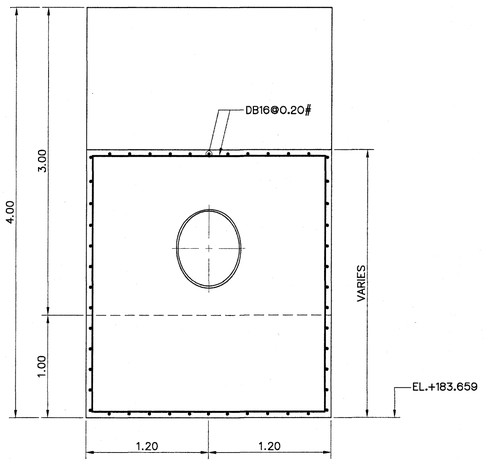
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ANCHOR (9)
SCALE 1:30



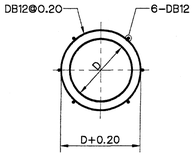
SECTION B–B
ANCHOR (7)
SCALE 1:30



SECTION D–D
ANCHOR (8)
SCALE 1:30



SECTION F–F
ANCHOR (9)
SCALE 1:30



TYPICAL HOOP BAR
SCALE 1:30

0 0.5 1 1.5 2 2.5
SCALE 1:30 METERS

NOTES :

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1. PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA. 1+171.00 HLS-PS-01, 04

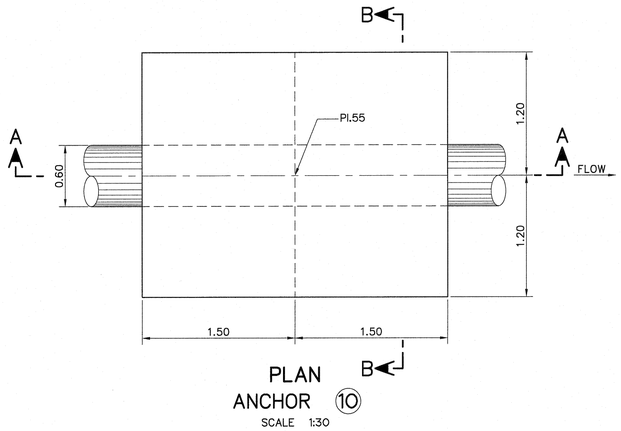
NO.	DATE	REVISIONS	CHECKED	APPROVED
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2				
1				
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KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

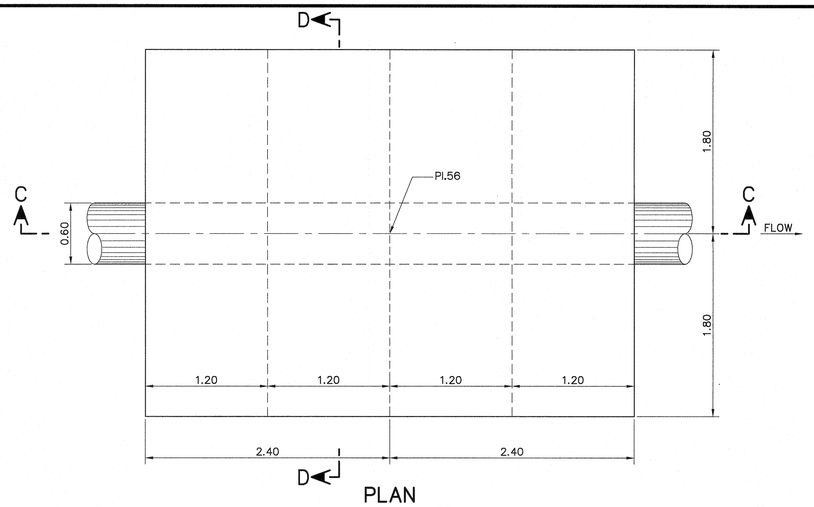
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
ANCHOR BLOCK (7), (8) & (9)
PLANS AND REINFORCEMENT DETAILS

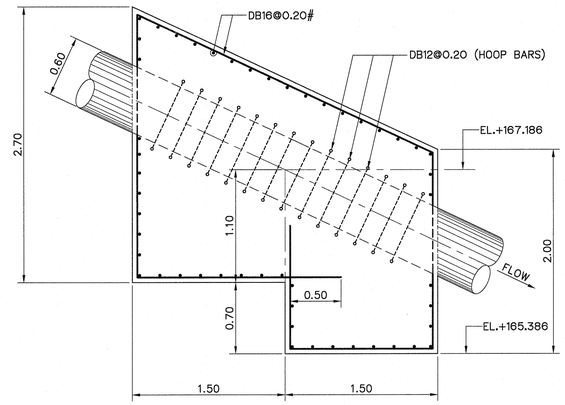
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED ส.ย.6651	REVIEWED S. WITCHAI
DRAWN	SUBMITTED
CHECKED ส.ย.7324	RECOMMENDED
PROJECT MANAGER 14/01/62 DATE	APPROVED
DRAWING NO. HLS-PS-12	SHEET NO. 34 OF 71



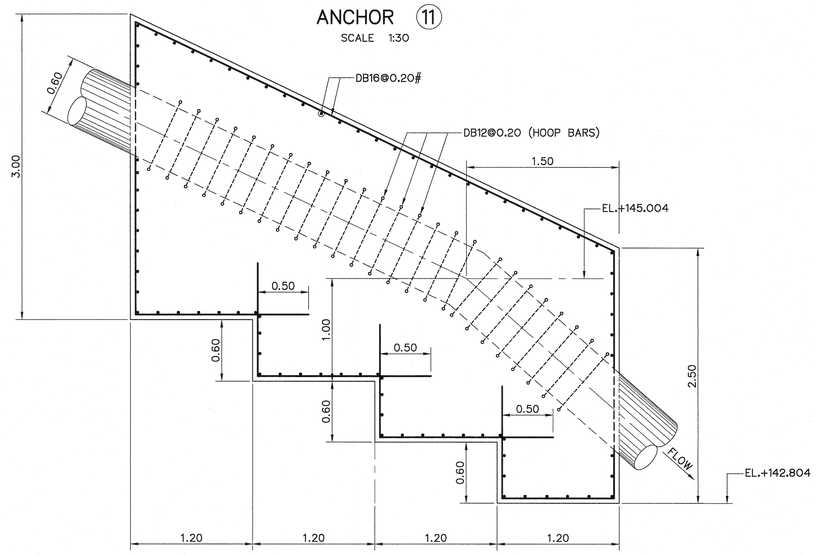
PLAN
ANCHOR (10)
SCALE 1:30



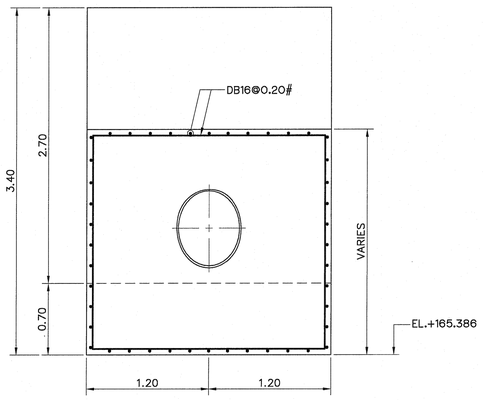
PLAN
ANCHOR (11)
SCALE 1:30



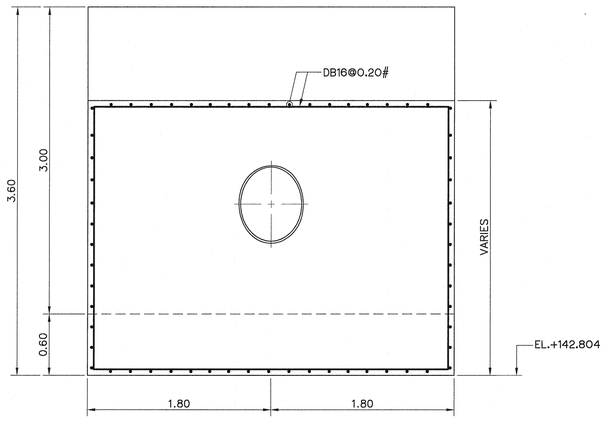
SECTION A–A
ANCHOR (10)
SCALE 1:30



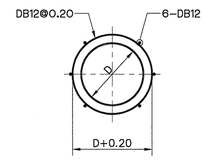
SECTION C–C
ANCHOR (11)
SCALE 1:30



SECTION B–B
ANCHOR (10)
SCALE 1:30



SECTION D–D
ANCHOR (11)
SCALE 1:30



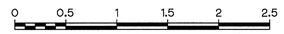
TYPICAL HOOP BAR
SCALE 1:30

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS. UNLESS OTHERWISE SHOWN.
2. SYMBOLE, ABBREVIATIONS AND CENERAL NOTES SEE DWG. NO. HLS–GN–03
3. THE ALIGNMENT OF THE PENSTOCK AND RELATED STRUCTURES SHALL BE CHECK AND CORRECTED BY THE CONTRACTOR TO SUIT THE FIELD CONDITIONS AND SHALL BE SUBMITTED TO DEDE'S FIELD ENGINEER FOR APPROVAL

REFERENCE DRAWINGS :

1. PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA. 1+171.00 HLS–PS–01, 04



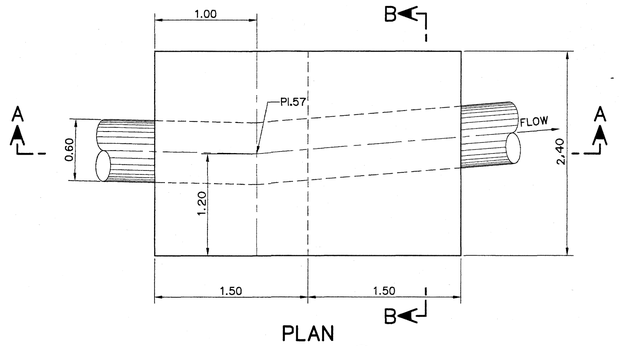
NO.	DATE	REVISIONS	CHECKED	APPROVED
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2				
1				
	CONSULTANTS		DEDE	

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

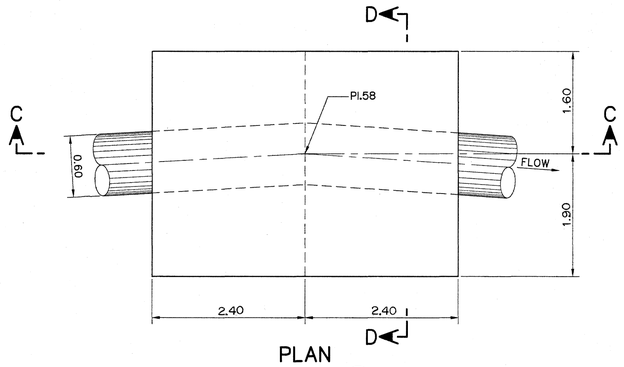
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
ANCHOR BLOCK (10) & (11)
PLANS AND REINFORCEMENT DETAILS

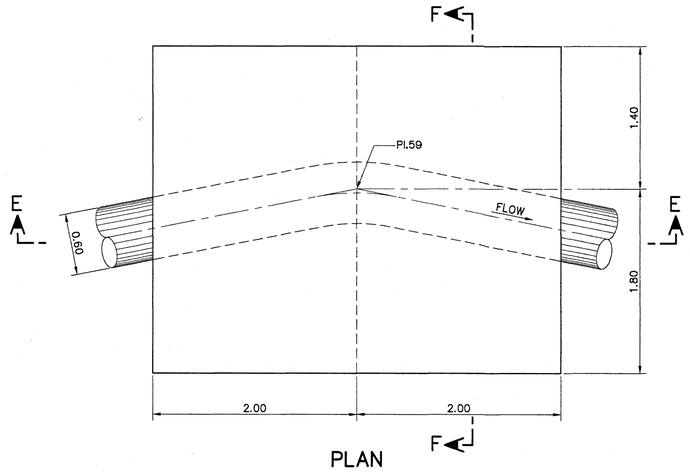
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED S. KITICHAI
DESIGNED ณ.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED ณ.7324	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS–PS–13 / SHEET NO. 35 OF 71



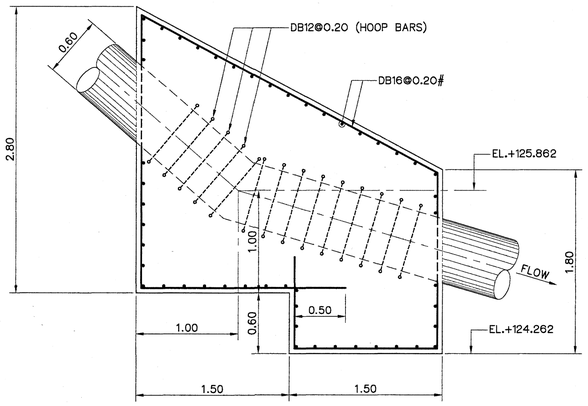
PLAN
ANCHOR (12)
SCALE 1:30



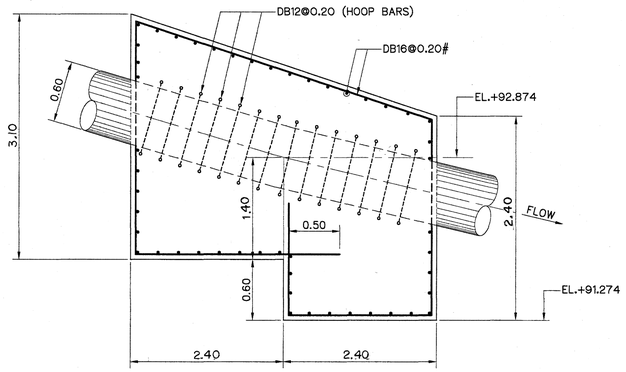
PLAN
ANCHOR (13)
SCALE 1:30



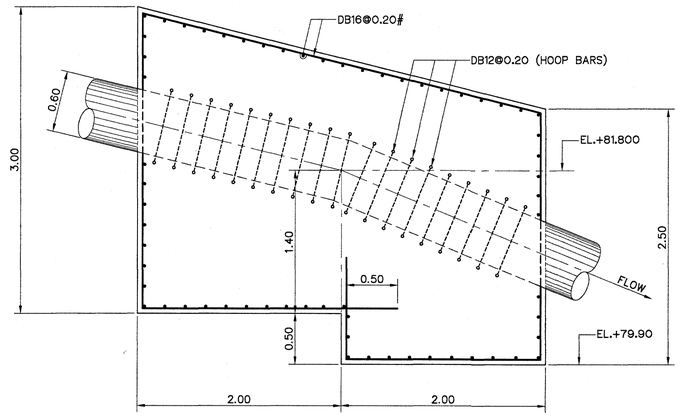
PLAN
ANCHOR (14)
SCALE 1:30



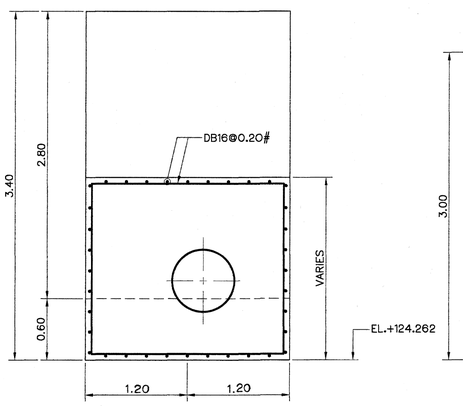
SECTION A–A
ANCHOR (12)
SCALE 1:30



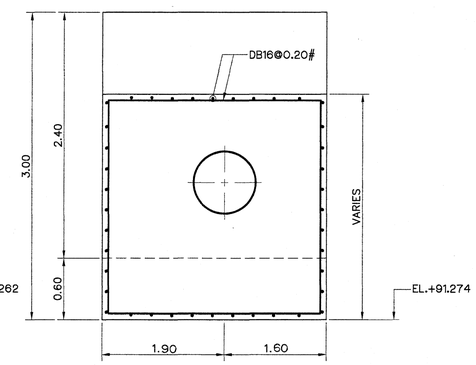
SECTION C–C
ANCHOR (13)
SCALE 1:30



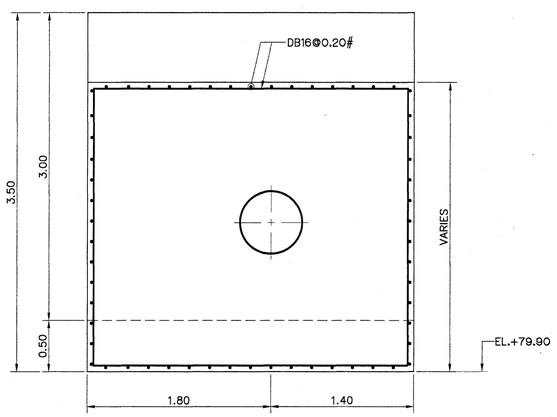
SECTION E–E
ANCHOR (14)
SCALE 1:30



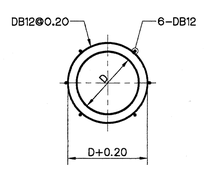
SECTION B–B
ANCHOR (12)
SCALE 1:30



SECTION D–D
ANCHOR (13)
SCALE 1:30



SECTION F–F
ANCHOR (14)
SCALE 1:30



TYPICAL HOOP BAR
SCALE 1:30

0 0.5 1 1.5 2 2.5
SCALE 1:30 METERS

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS. UNLESS OTHERWISE SHOWN.
2. SYMBOLE, ABBREVIATIONS AND CENERAL NOTES SEE DWG. NO. HLS–GN–03
3. THE ALIGNMENT OF THE PENSTOCK AND RELATED STRUCTURES SHALL BE CHECK AND CORRECTED BY THE CONTRACTOR TO SUIT THE FIELD CONDITIONS AND SHALL BE SUBMITTED TO DEDE'S FIELD ENGINEER FOR APPROVAL

REFERENCE DRAWINGS :

1. PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA. 1+171.00 HLS–PS–01, 04

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
ANCHOR BLOCK (12), (13) & (14)
PLANS AND REINFORCEMENT DETAILS

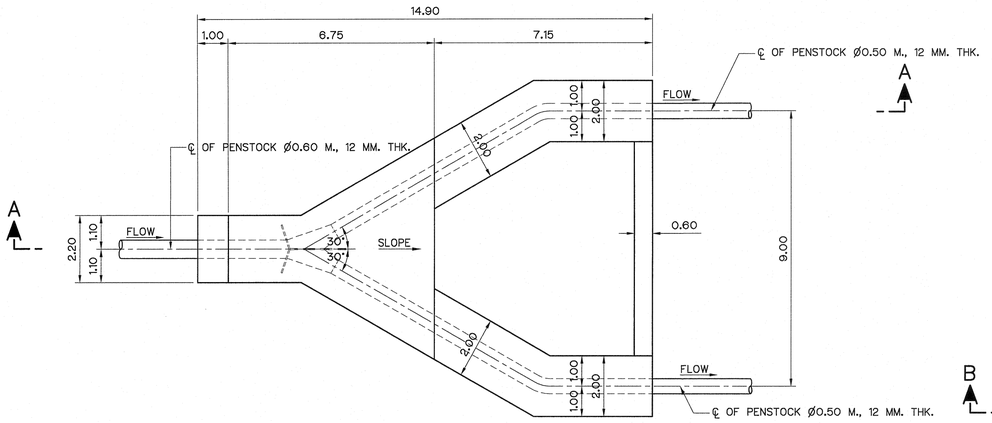
NO.	DATE	REVISIONS	CHECKED	APPROVED
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	CONSULTANTS		DEDE	

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

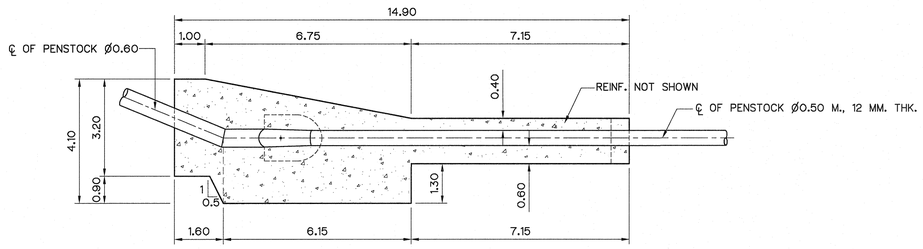
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED S. KITICHAI

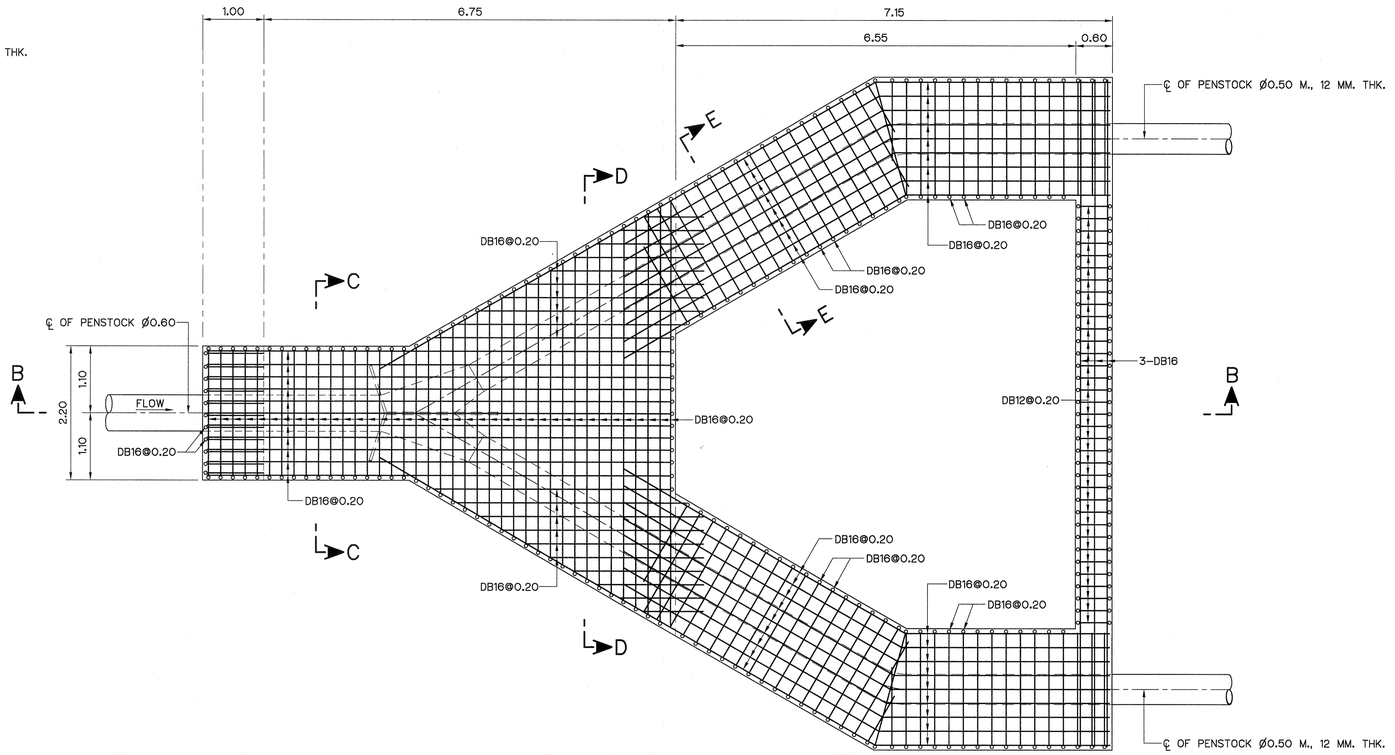
DESIGNED	สิ.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สิ.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO. HLS–PS–14	SHEET NO. 36 OF 71

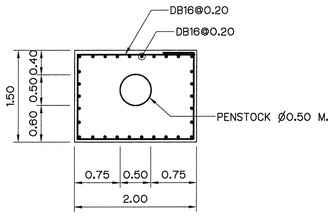


PLAN (ANCHOR BLOCK ⑮)
SCALE 1:100

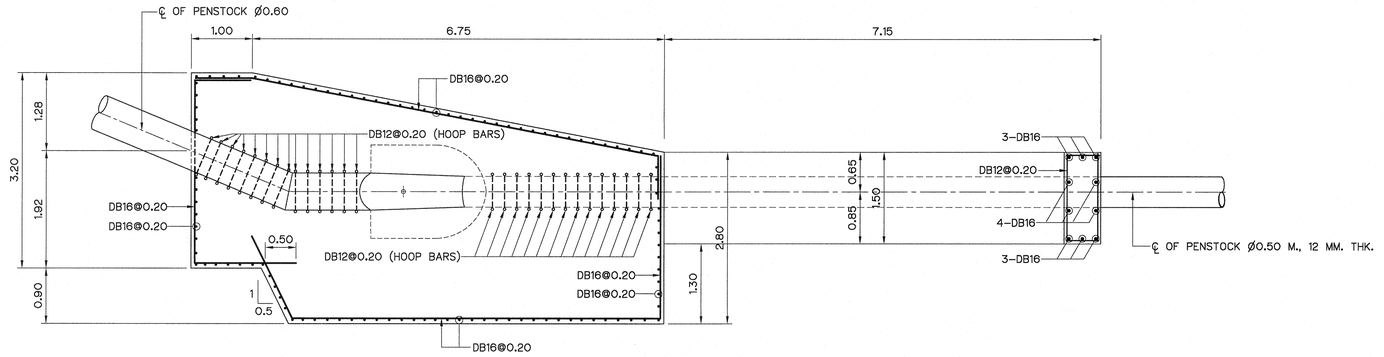


SECTION A – A
SCALE 1:100

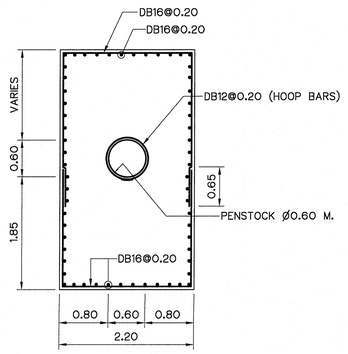




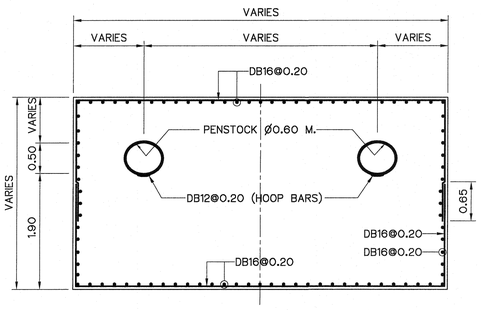
SECTION E – E
SCALE 1:50



SECTION B – B
SCALE 1:50



SECTION C – C
SCALE 1:50



SECTION D – D
SCALE 1:50

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS. UNLESS OTHERWISE SHOWN.
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REFERENCE DRAWINGS :

1. PENSTOCK PLAN AND PROFILE, STA. 1+000 TO STA. 1+171.00 HLS-PS-04

0 0.5 1.0 2.0 3.0 4.0
SCALE 1:50 METERS

0 1 2 3 4 5 6 7 8
SCALE 1:100 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
ANCHOR BLOCK ⑮
PLAN ,SECTIONS, AND REINFORCEMENT DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED S. KITICHAI

DESIGNED ณ.6651 SUBMITTED

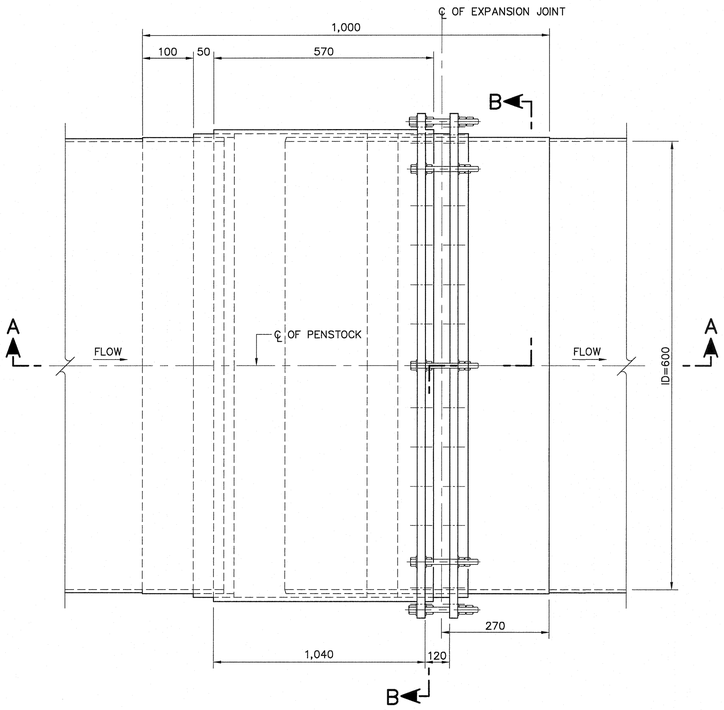
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CHECKED ณ.7324 APPROVED

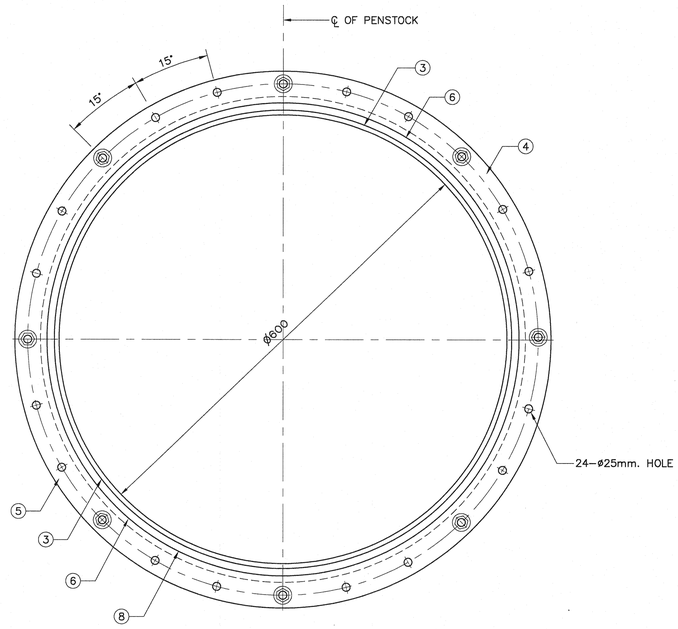
PROJECT MANAGER 14/01/62 DATE

DRAWING NO. HLS-PS-15

SHEET NO. 37 OF 71



ELEVATION
NOT TO SCALE



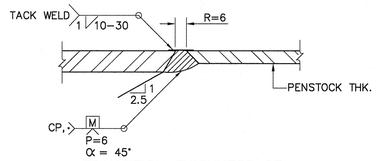
SECTION B–B
NOT TO SCALE

TABLE OF DETAIL 1 SQUARE – GROOVE WELD , BUTT JOINT

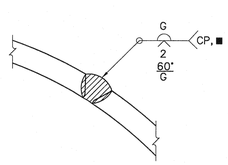
ITEM	DESCRIPTION	MATERIAL	QUANT.	REMARKS
1	PENSTOCK	ASTM A–283, GRADE D	–	––
2	PENSTOCK	ASTM A–283, GRADE D	1	NOTE 1 & 2
3	INNER SLEEVE	ASTM A–283, GRADE D	1	NOTE 1 & 3
4	GRAND RING	ASTM A–283, GRADE D	1	SEAMLESS, NOTE 2
5	OUTER RING	ASTM A–283, GRADE D	1	SEAMLESS, NOTE 2
6	STUFFING BOX	ASTM A–283, GRADE D	1	NOTE 1 & 2
7	DOUBLING PLATE	ASTM A–283, GRADE D	1	NOTE 1 & 2
8	OUTER SLEEVE	ASTM A–283, GRADE D	1	NOTE 1 & 2
9	PACKING STOPPER	ASTM A–283, GRADE D	1	NOTE 1 & 2
10	ø5/8" BOLTS (MIN. THREAD LENGTH = 125)	ASTM A–325	12	NOTE 2
11	ø5/8" NUTS	ASTM A–325	24	NOTE 2
12	ø5/8" WASHER	ASTM A–325	24	NOTE 2
13	PACKING RINGS (16 mm. S.Q. RING)	ASBESTOS–GRAPHITE	6	NOTE 4

NOTES :

1. LONGITUDINAL SEAMS HAVE TO BE COMPLETE JOINT PENETRATION WELDS BY COMBINING SINGLE–V–GROOVE WITH BACKING WELDS AND GROUND FLUSH WELDING WITH BASE MATAL AS REQUIRED (SEE DETAIL "2")
2. GALVANIZED ALL SURFACES WITH 0.10 mm. THK.
3. NICKEL CLADDING ON OUTER SURFACE WITH 0.50 mm. THK. AND GALVANIZED INNER SURFACE WITH 0.10 mm. THK.
4. EACH JOINT OF EACH PACKING RING SHALL BE MIN. 25 cm. APART DO NOT LINE UP JOINTS
5. ALL DIMENSION ARE IN MILIMETER UNLESS OTHERWISE SHOWN
6. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS–GN–03
7. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, SHOP DRAWING SHALL BE DESIGNED BY CONTRACTOR UNDER APPROVAL OF FIELD ENGINEER.



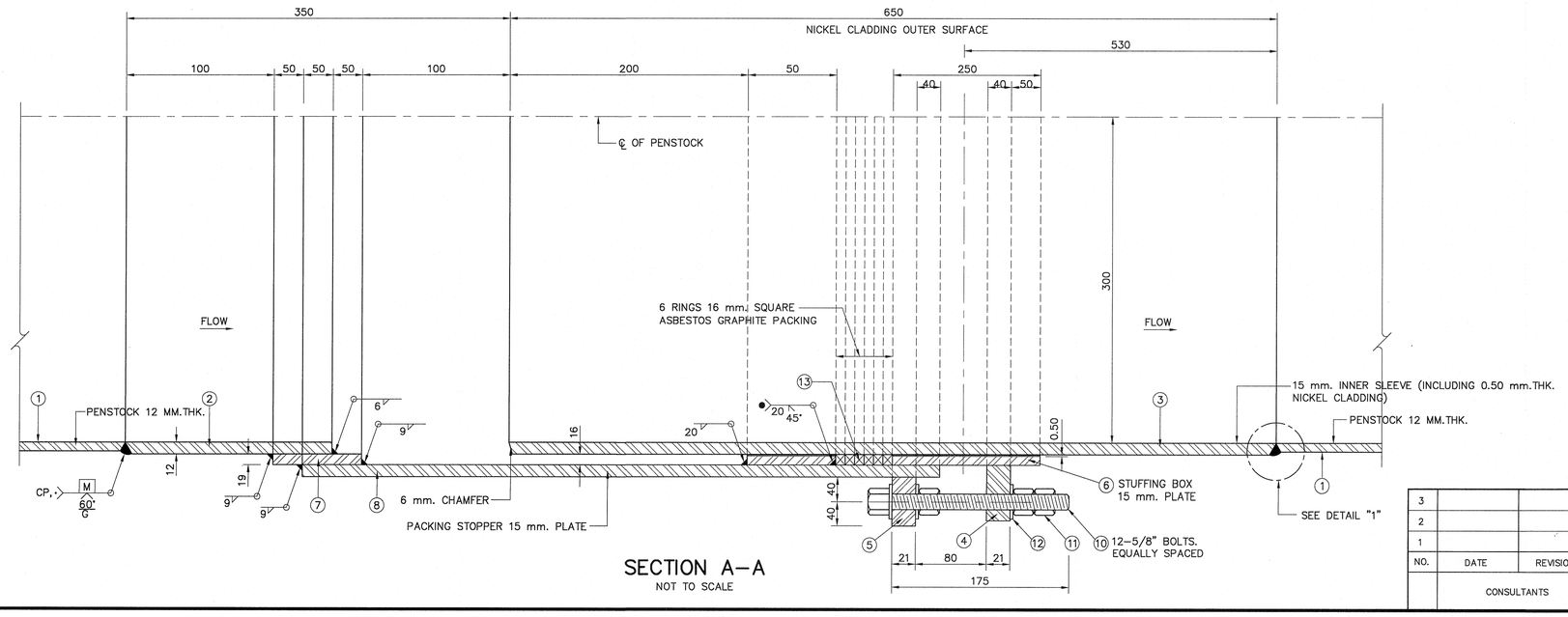
TRANSITION THICKNESS OF BUTT JOINT IN PARTS OF UNEQUAL THICKNESS
DETAIL "1"
NOT TO SCALE



LONGITUDINAL WELD
NOT TO SCALE

WELDING NOTATION :

CP = COMPLETE JOINT PENETRATION GROOVE WELD
G = GRINDING WELD DEPOSITE FLUSH WITH BASE METAL
• = BACKING PLATE SIZE 1.0x1.50 mm. AND SAME METERIAL AS PENSTOCK
● = BEVEL PLATE 9 mm. BEFORE ROLLING CHIP SQUARE AFTER WELDING
▲ = ROOT OPENING R = 0 mm.
ROOT FACE t = 3.0 mm.
GROOVE ANGLE = 45°
■ = ROOT OPENING R = 2.0 mm.
ROOT FACE t = 2.0 mm.
GROOVE ANGLE = 60°



SECTION A–A
NOT TO SCALE

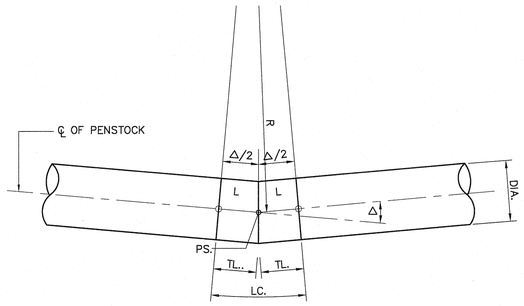
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
EXPANSION JOINT, PLAN, SECTIONS AND DETAILS

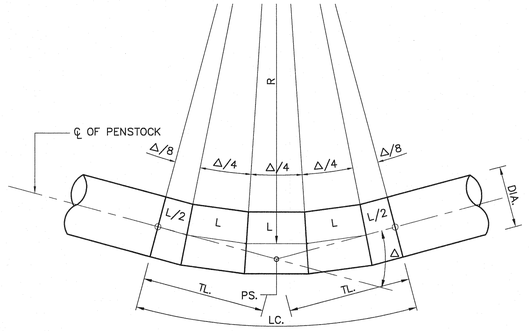
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
		REVIEWED S. KITICHAI	
DESIGNED	ส.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	ส.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO. HLS–PS–16	SHEET NO. 38 OF 71



BEND TYPE "1"

DELTA(Δ) 0°–5°

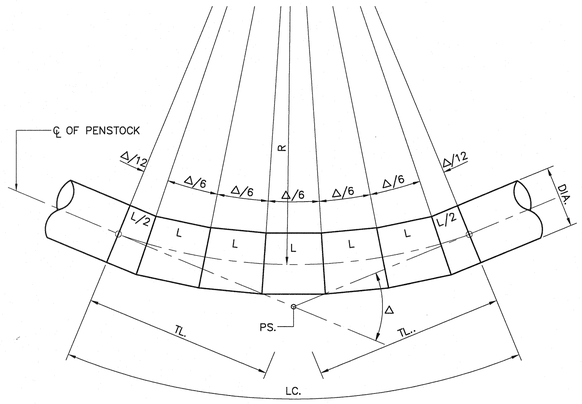
NOT TO SCALE



BEND TYPE "4"

DELTA(Δ) 25°–35°

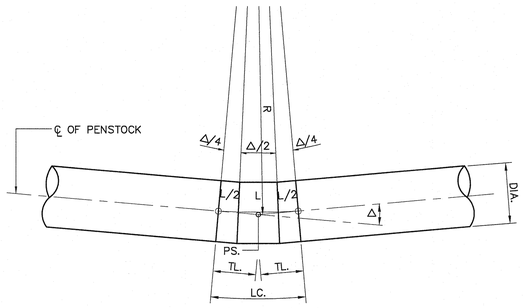
NOT TO SCALE



BEND TYPE "6"

DELTA(Δ) 55°–OVER

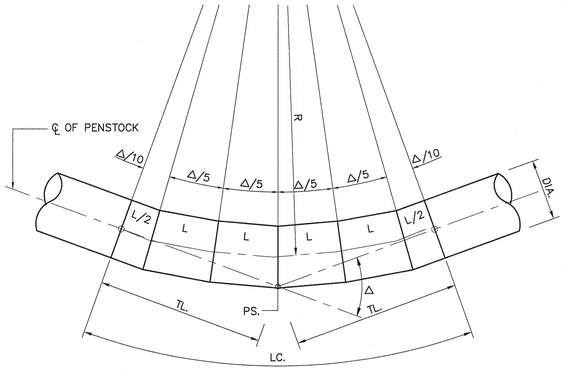
NOT TO SCALE



BEND TYPE "2"

DELTA(Δ) 5°–15°

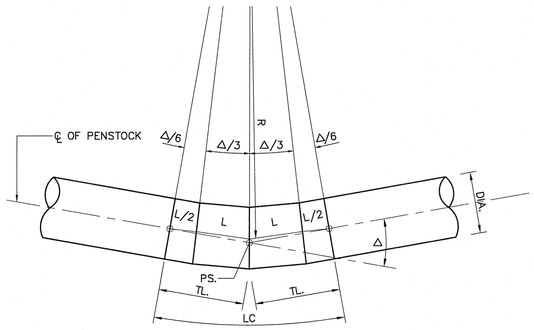
NOT TO SCALE



BEND TYPE "5"

DELTA(Δ) 35°–45°

NOT TO SCALE



BEND TYPE "3"

DELTA(Δ) 15°–25°

NOT TO SCALE

NOTES :

1. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS–GN–03

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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MINISTRY OF ENERGY

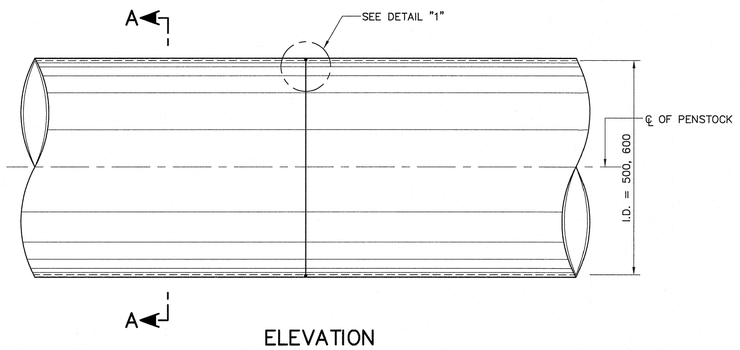
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
BEND DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

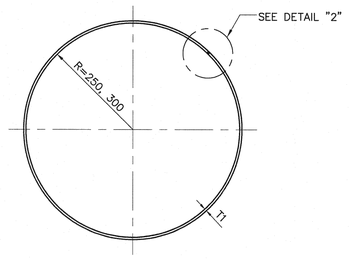
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

DESIGNED	สุชิ.6651	REVIEWED	S. KITIONM
DRAWN		SUBMITTED	
CHECKED	สุชิ.7324	RECOMMENDED	
PROJECT MANAGER	14/01/62	APPROVED	
	DATE	DRAWING NO.	HLS–PS–17
		SHEET NO.	39 OF 71



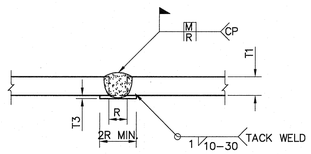
ELEVATION

SCALE 1:10



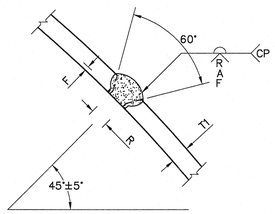
SECTION A–A

SCALE 1:10

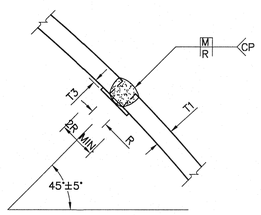


CIRCULAR BUTT JOINT

DETAIL "1"



LONGITUDINAL BUTT JOINT
TYPE "A"



LONGITUDINAL BUTT JOINT (ALTERNATIVE)
TYPE "B"

DETAIL "2"

TABLE OF DETAIL "1" SQUARE–GROOVE WELD, BUTT JOINT

WELDING PROCESS	DESIGNATION	BASE METAL THICKNESS		GROOVE PREPARATION		TOLERANCES		REMARKS
		T1	T3	ROOT OPENING	GROOVE ANGLE	ROOT OPENING	GROOVE ANGLE	
GMAW FCAW	B–L1a–GF	9	1.0	R = T1	–	+1.5,–0	–	SINGLE–PASS WELD
GMAW FCAW	B–L1a–GF	12	1.0	R = T1	–	+1.5,–0	–	SINGLE–PASS WELD

SMAW = SHIELD METAL ARC WELDING
GMAW = GAS METAL ARC WELDING
FCAW = FLUX CORED ARC WELDING

TABLE OF DETAIL "2" SINGLE–V–GROOVE WELD, BUTT JOINT

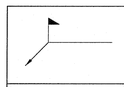
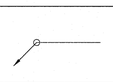
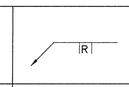
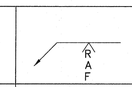
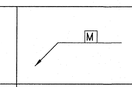
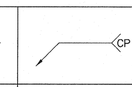
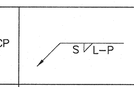
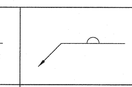
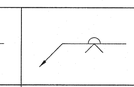
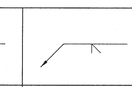
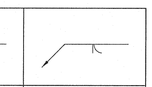
TYPE	WELDING PROCESS	DESIGNATION	BASE METAL THICKNESS		GROOVE PREPARATION			TOLERANCES			REMARKS
			T1	T3	ROOT OPENING	GROOVE ANGLE	ROOT FACE	R	A	F	
A	SMAW	B–U2	9	–	R = 2.0	A = 60°	F = 2.0	+15,–0	+10°,–0°	+15,–0	SINGLE–PASS WELD
	SMAW	B–U2	12	–	R = 2.0	A = 60°	F = 2.0	+15,–0	+10°,–0°	+15,–0	SINGLE–PASS WELD
B	GMAW FCAW	B–L1a–GF	9	1.0	R = 9.0	–	–	+15,–0	–	–	SINGLE–PASS WELD
	GMAW FCAW	B–L1a–GF	12	1.0	R = 12.0	–	–	+15,–0	–	–	SINGLE–PASS WELD

NOTES :

1. ALL DIMENSION ARE IN MILLIMETER, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS–GN–03
3. GROOVE WELD MADE AFTER WELDING OTHER SIDE
4. USE WELDING ELECTRODE TYPE "E" 70XX
5. MATERIAL OF BACKING IS THE SAME AS OF PIPE

0 0.1 0.2 0.4 0.6 0.8
SCALE 1:10 METERS

WELDING SYMBOLS

										
FIELDWELD SYMBOL	WELD – ALL – AROUND SYMBOL	SQUARE GROOVE WELDING SYMBOL R=ROOT OPENING	V–GROOVE WELDING SYMBOL R=ROOT OPENING A=GROOVE ANGLE F=ROOT FACE	BACKING SYMBOL (MATERIAL OF BACKING THE SAME AS OF PIPE)	COMPLETE JOINT PENETRATION WELD	FILLET WELD S=WELDING SIZE L=LENGTH OF WELD P=PITCH (CENTER TO CENTER OF WELD)	BACK OR BACKING WELD SYMBOL	COMBINED WELDS. BACKING WELD ON FAR SIDE AND V–GROOVE WELD ON NEAR SIDE	BEVEL GROOVE WELDING SYMBOL	FLARE–BEVEL GROOVE WELDING SYMBOL

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

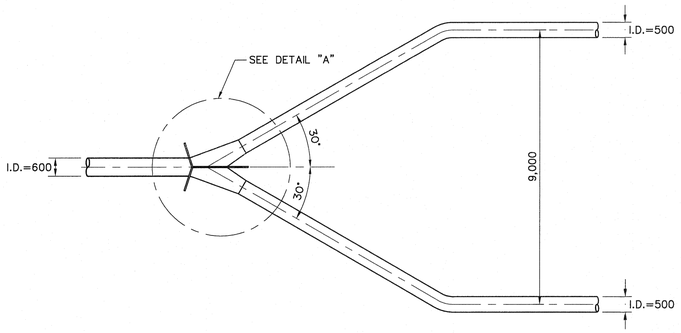
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
WELDING DETAILS

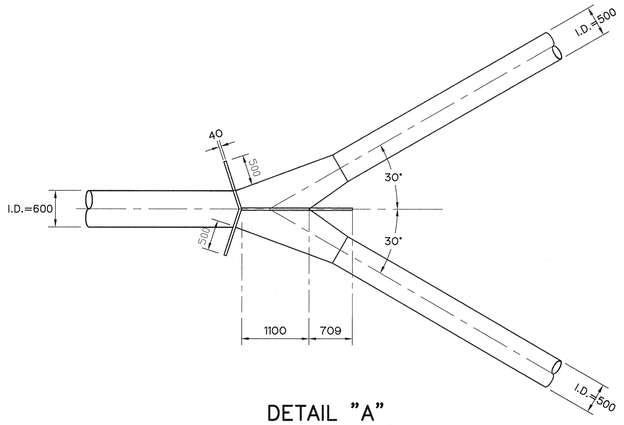
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

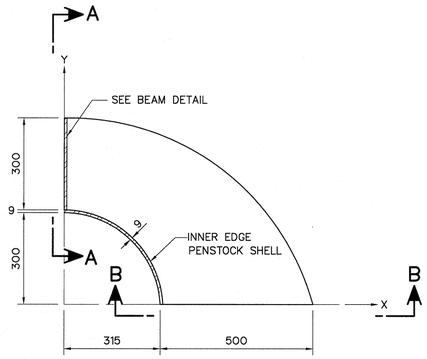
		REVIEWED	S. KITCHM
DESIGNED	สม.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สม.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO.	HLS–PS–18
		SHEET NO.	40 OF 71



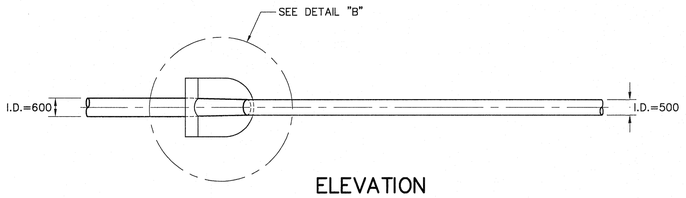
PLAN
SCALE 1:100



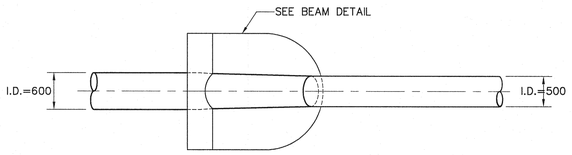
DETAIL "A"
SCALE 1:50



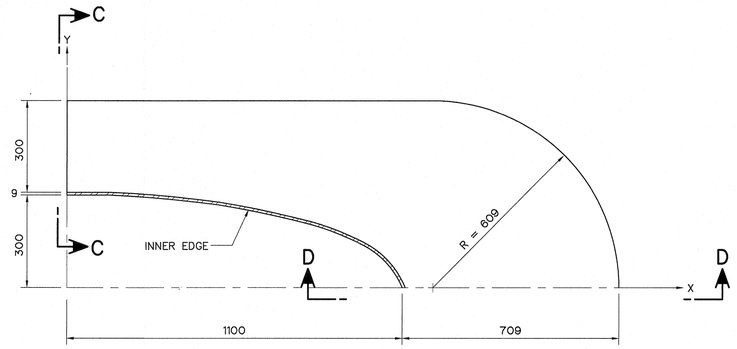
RING DETAIL
SCALE 1:10



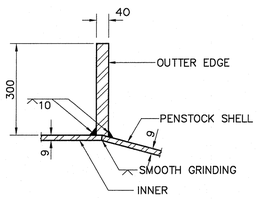
ELEVATION
SCALE 1:100



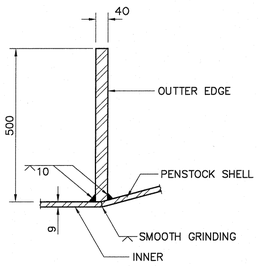
DETAIL "B"
SCALE 1:50



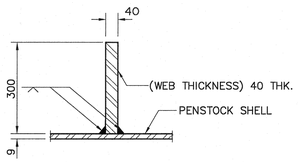
BEAM DETAIL
SCALE 1:10



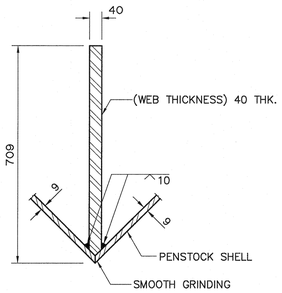
SECTION A–A
SCALE 1:10



SECTION B–B
SCALE 1:10



SECTION C–C
SCALE 1:10



SECTION D–D
SCALE 1:10

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8
SCALE 1:10 METERS

0 0.5 1.0 2.0 3.0 4.0
SCALE 1:50 METERS

0 1 2 3 4 5 6 7 8
SCALE 1:100 METERS

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS–GN–03
3. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY,
   SHOP DRAWING SHALL BE DESIGNED BY CONTRACTOR
   UNDER APPROVAL OF FIELD ENGINEER.

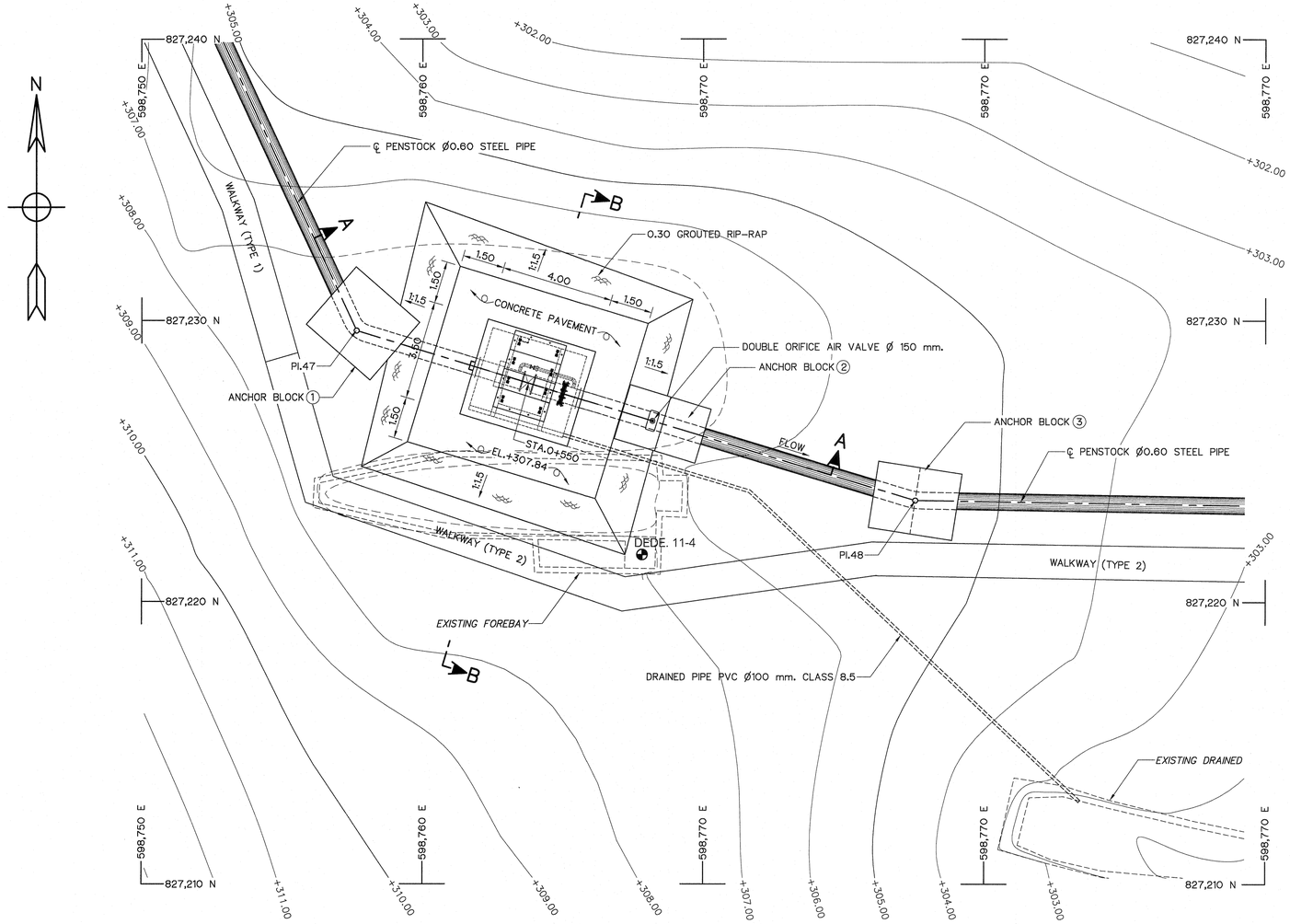
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

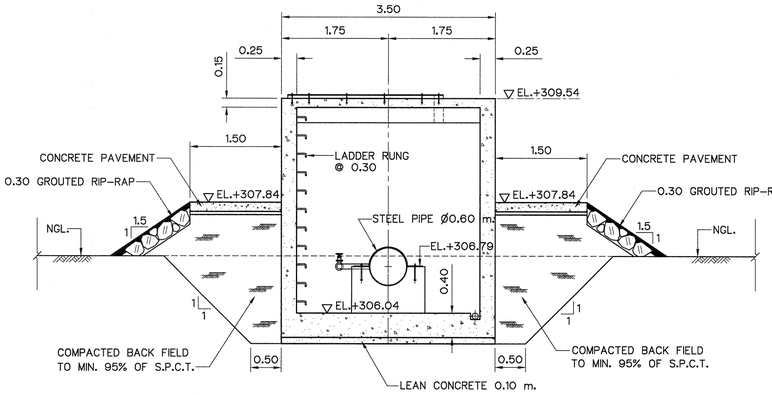
CIVIL WORKS
PENSTOCK
WYE, PLAN, SECTIONS AND DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED S. KITICHAI
DESIGNED 28.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED 28.7324	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS–PS–19
	SHEET NO. 41 OF 71



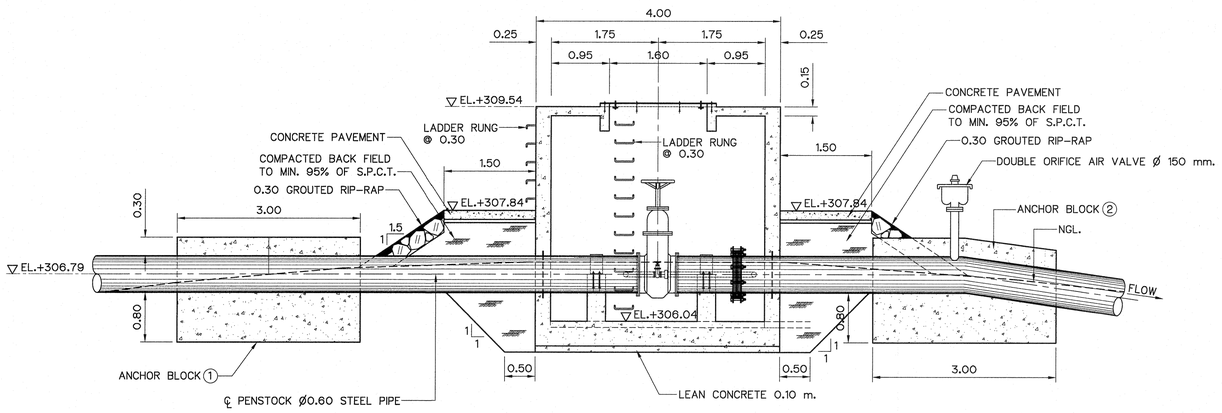
GENERAL LAY-OUT

SCALE 1:100



SECTION B-B

SCALE 1:50



SECTION A-A

SCALE 1:50

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

REFERENCE DRAWINGS :

1. PENSTOCK, EMERGENCY VALVE CHAMBER PLAN SECTIONS AND DETAILS — HLS-PS-21
2. PENSTOCK, EMERGENCY VALVE CHAMBER REINFORCEMENT DETAILS — HLS-PS-22

SCALE 1:50 — 0 0.5 1 2 3 4 METERS

SCALE 1:100 — 0 1 2 4 6 8 METERS

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
EMERGENCY VALVE CHAMBER GENERAL LAY-OUT AND SECTION

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

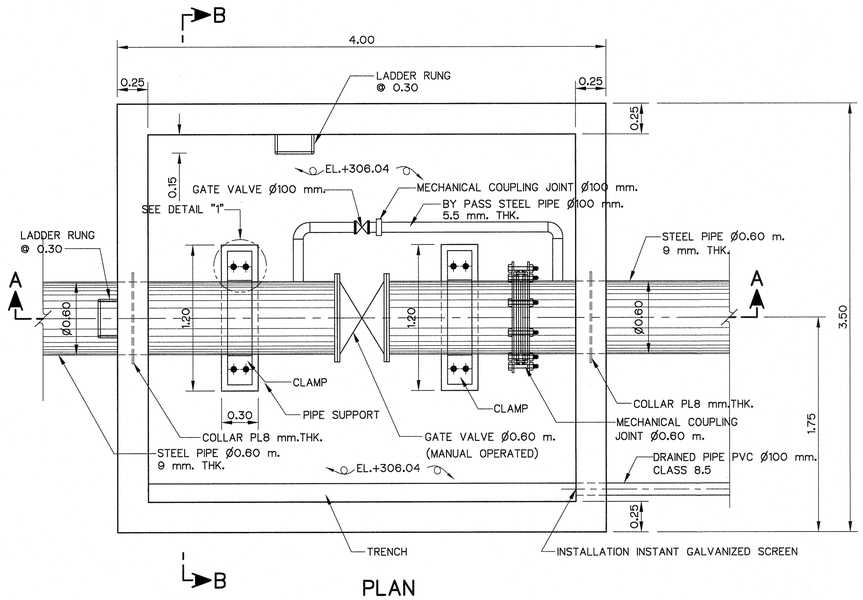
CONSULTANTS: FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

DEDE

DESIGNED ชัย.6651 | DRAWN | CHECKED ชัย.7324 | PROJECT MANAGER 14/01/62 (DATE)

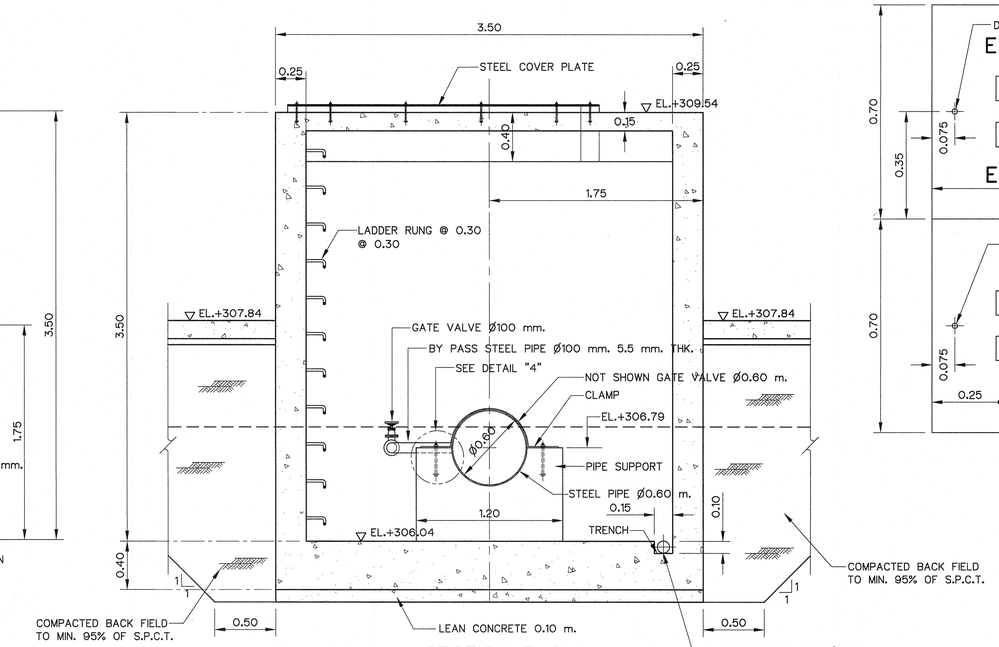
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED S. KITCHAN
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HLS-PS-20
SHEET NO. 42 OF 71



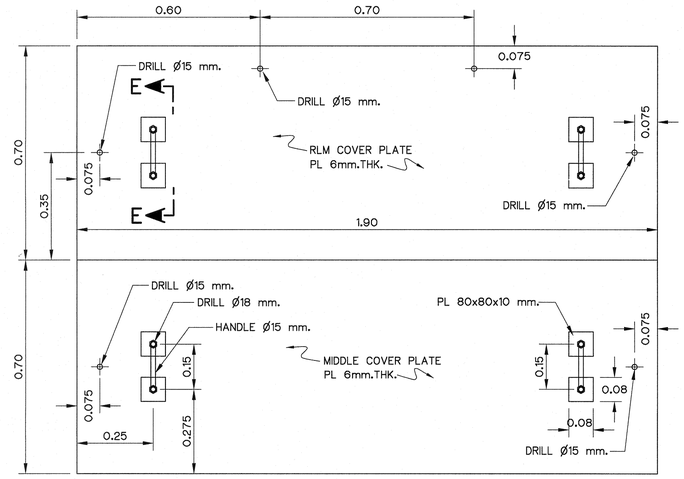
PLAN

SCALE 1:25



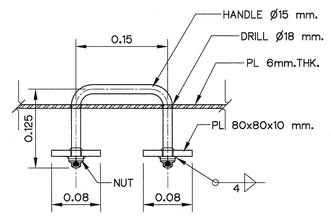
SECTION B–B

SCALE 1:25



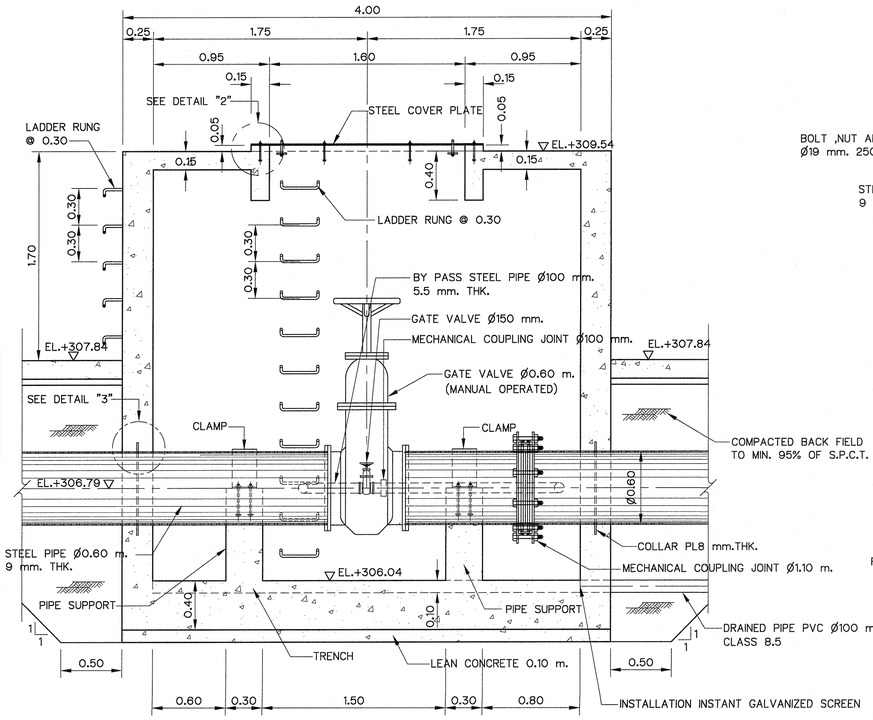
PLAN STEEL COVER PLATE

SCALE 1:10



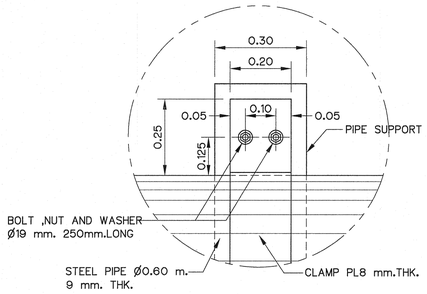
SECTION E–E

SCALE 1:5



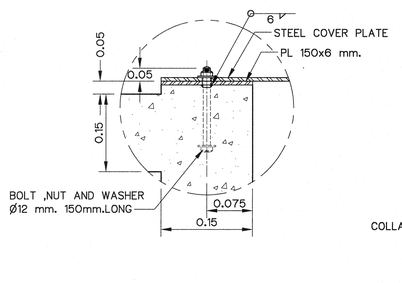
SECTION A–A

SCALE 1:25



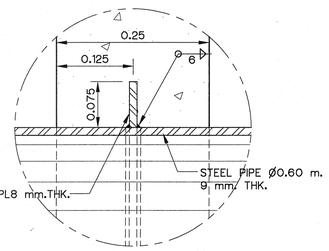
DETAIL "1"

SCALE 1:10



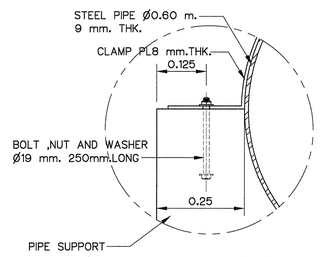
DETAIL "2"

SCALE 1:5



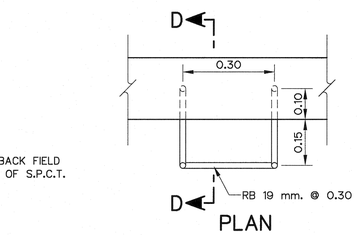
DETAIL "3"

SCALE 1:10

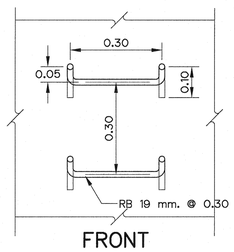


DETAIL "4"

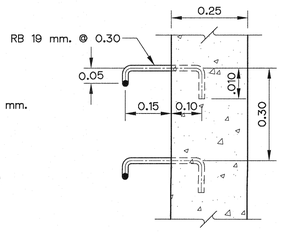
SCALE 1:10



PLAN



FRONT



SECTION D–D

DETAIL OF LADDER RUNG

SCALE 1:10

NOTE :

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METERS, UNLESS OTHERWISE SHOWN
2. ALLOWABLE BEARING CAPACITY OF FOUNDATION SHALL NOT BE LESS THAN 15 T./M.^{2}

REFERENCE DRAWING :

1. PENSTOCK, EMERGENCY VALVE CHAMBER LAY–OUT AND SECTION — HLS–PS–20
2. PENSTOCK, EMERGENCY VALVE CHAMBER REINFORCEMENT DETAILS — HLS–PS–22

0 0.0125 0.25 0.375
SCALE 1:5 METERS

0 0.25 0.5 0.75
SCALE 1:10 METERS

0 0.5 1 1.5 2
SCALE 1:25 METERS

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
EMERGENCY VALVE CHAMBER PLAN SECTIONS AND DETAILS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
		CONSULTANTS	DEDE	

FEC FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED S. KITICHAI

DESIGNED — SEI.6651 — SUBMITTED

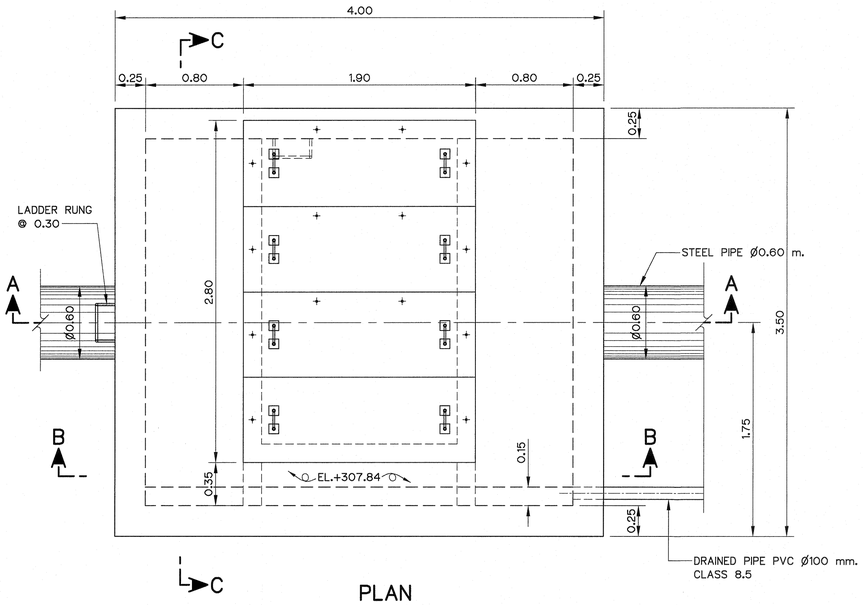
DRAWN — RECOMMENDED

CHECKED — SEI.7324 — APPROVED

PROJECT MANAGER — 14/01/62 DATE

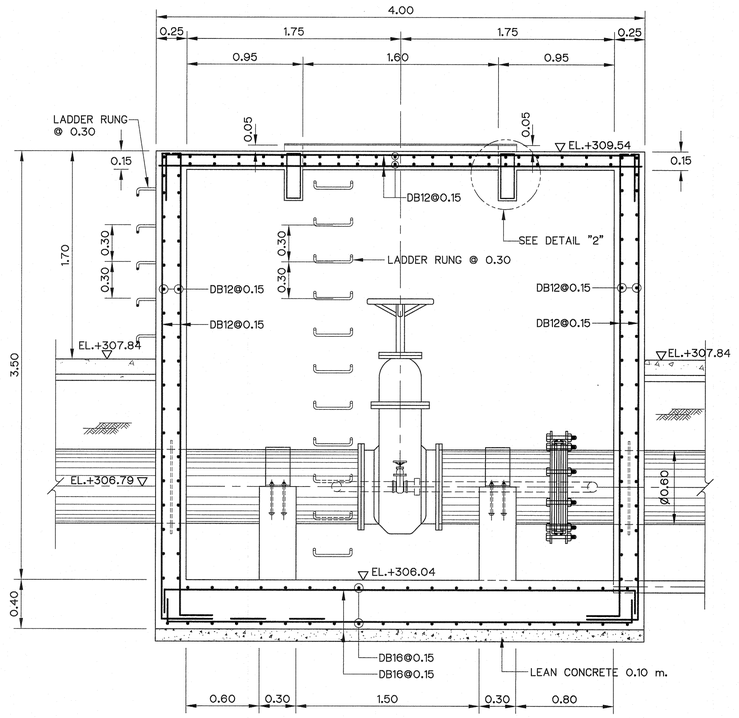
DRAWING NO. HLS–PS–21

SHEET NO. 43 OF 71



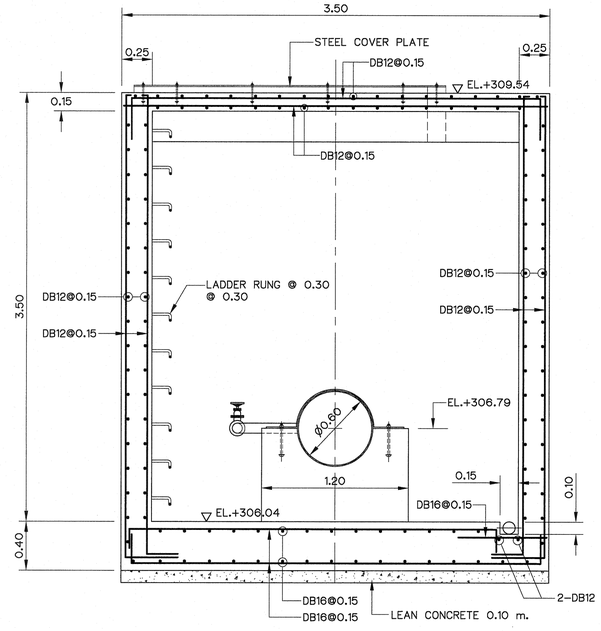
PLAN

SCALE 1:25



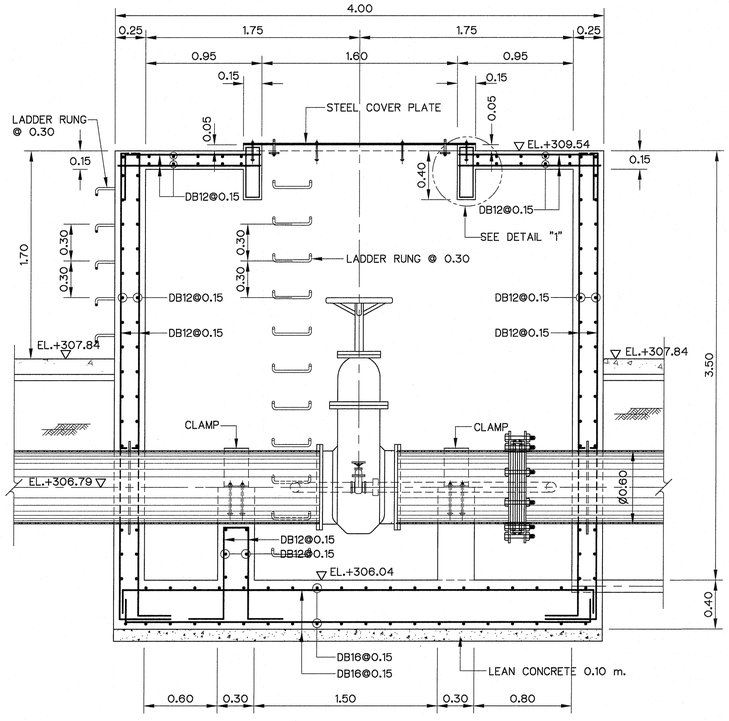
SECTION B–B

SCALE 1:25



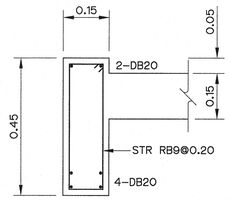
SECTION C–C

SCALE 1:25



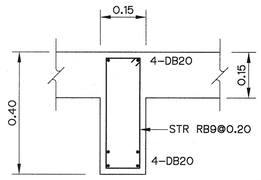
SECTION A–A

SCALE 1:25



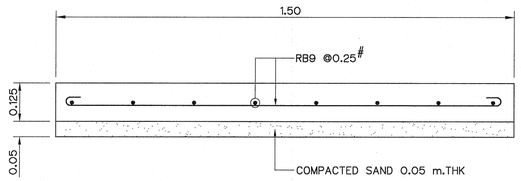
DETAIL "1"

SCALE 1:10



DETAIL "2"

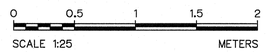
SCALE 1:10



REINFORCEMENT DETAIL OF CONCRETE PAVEMENT

SCALE 1:10





NOTE :

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METERS, UNLESS OTHERWISE SHOWN

REFERENCE DRAWING :

1. PENSTOCK, EMERGENCY VALVE CHAMBER GENERAL LAY-OUT AND SECTION HLS-PS-20
2. PENSTOCK, EMERGENCY VALVE CHAMBER PLAN SECTIONS AND DETAILS HLS-PS-21

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
EMERGENCY VALVE CHAMBER REINFORCEMENT DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

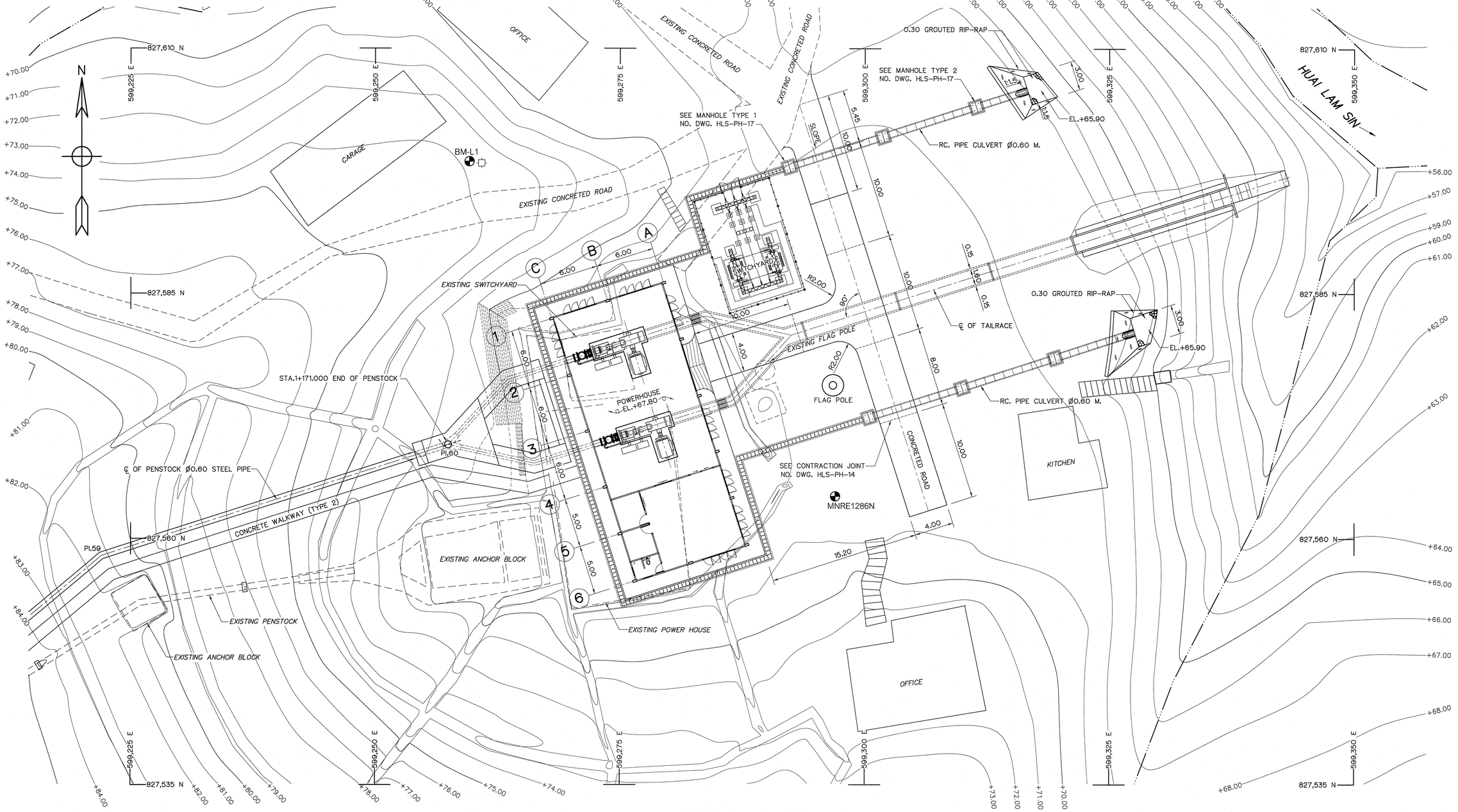
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED S.KITICHAI

DESIGNED ณ.6651
DRAWN
CHECKED ณ.7324
PROJECT MANAGER 14/01/62 DATE

SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HLS-PS-22
SHEET NO. 44 OF 71



GENERAL LAY-OUT

SCALE 1:200

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
3. THE CONTRACTOR SHALL CHECK THE STABILITY OF THE EXCAVATION LINE.IF IT IS NOT SUFFICIENTLY STABLE, THE CONTRACTOR SHALL SUBMIT A REPORT TO THE PROJECT ENGINEER FOR CONSIDERING THE WAY TO IMPROVE ITS STABILITY.
4. FOR THE DETAILS OF THE STABILITY OF THE EXCAVATION LINE, SEE DWG. NO. HLS-PH-02

REFERENCE DRAWINGS :

1. POWERHOUSE, PLAN AND ROOF PLAN	HLS-PH-02
2. POWERHOUSE, ELEVATIONS	HLS-PH-03
3. POWERHOUSE, SECTIONS	HLS-PH-04
4. POWERHOUSE, CONCRETE PAVEMENT	HLS-PH-14

0 5 10 15
SCALE 1:200 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

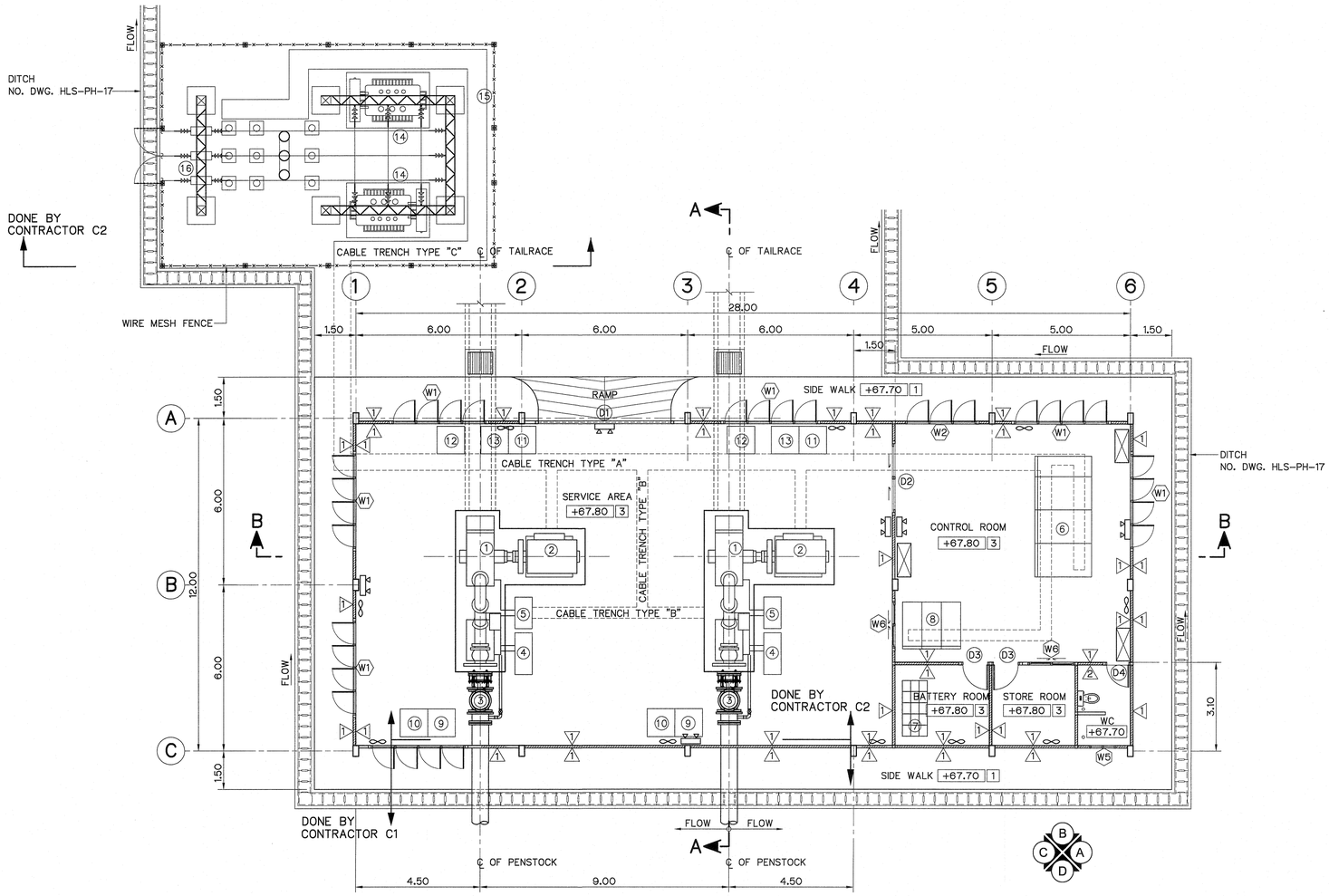
CIVIL WORKS
POWERHOUSE
GENERAL LAY-OUT

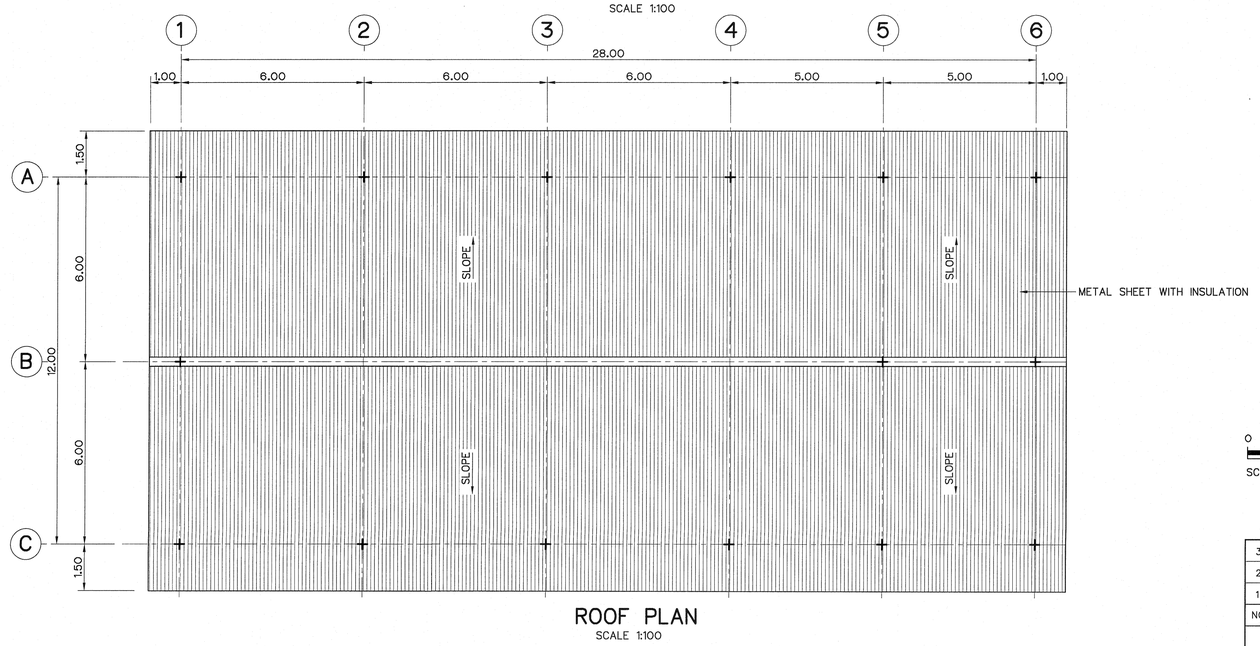
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED S. KITICHAI

DESIGNED	ลิ.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	ลิ.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO. HLS-PH-01	SHEET NO. 45 OF 71





DESCRIPTION :

1. PELTON TURBINE
2. SYNCHRONOUSE GENERATOR
3. INLET VALVE AND BYBASS VALVE
4. PRESSURE OIL EQUIPMENT
5. GOVERNOR AND TURBINE CONTROL PANEL
6. MAIN CONTROL SWITCHBOARD
7. BATTERRIES AND RACKS
8. AC AND DC SWITCHBOARD AND BATTERY CHARGER CUBICLE
9. OIL PRESSURE TANK
10. OIL SUMP TANK WITH OIL PUMP SETS
11. NGR CUBICLE
12. AVR CUBICLE
13. GENERATOR DISCONNECTING SWITCH CUBICLE
14. MAIN TRANSFORMER
15. SWICTHYARD FENCE
16. TAKE OFF STRUCTURE

SYMBOLS :

- EXHAUST FAN Ø10"
- AIR CONDITIONING
- EMERGENCY LAMP

FLOOR FINISH SYMBOLS :

1. COARSE FINISHED
2. 12"x12" CERAMIC FLOOR TILES
3. COATED WITH EPOXY RESIN

WALL FINISH SYMBOLS :

1. CEMENT PLASTER
2. 8"x8" CERAMIC WALL TILES

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
3. CONTRACT C1 OF INCLUDE PENSTOCK BEYOND POWERHOUSE WALL 1.00 M. (INCLUDE FLANGE)
4. ALL OF CABLE TRENCH TYPE "C" (INCLUDE INSIDE SWITCHYARD FENCE) SHALL BE DONE BY CONTRACT C1.

REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAY-OUT	HLS-PH-01
2. POWERHOUSE, ELEVATIONS	HLS-PH-03
3. POWERHOUSE, SECTIONS	HLS-PH-04
4. POWERHOUSE, DETAILS OF TOILET, SEPTIC AND SEEPAGE TANK	HLS-PH-05
5. POWERHOUSE, DETAIL OF DOORS, WINDOWS AND NAMEPLATE	HLS-PH-06

0 1 2 3 4 5 6 7 8
SCALE 1:100 METERS

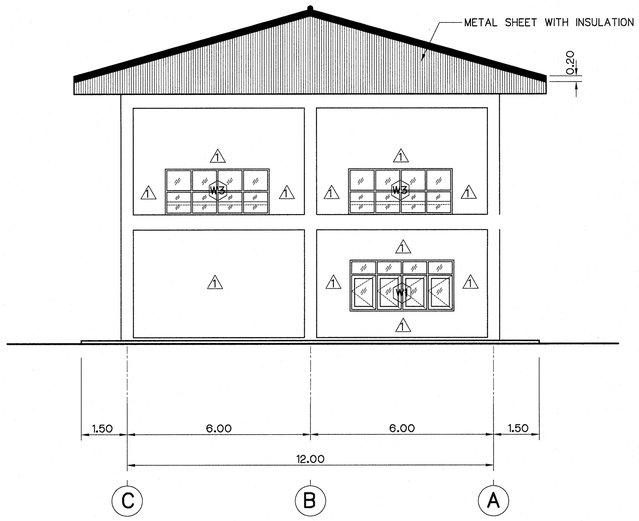
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

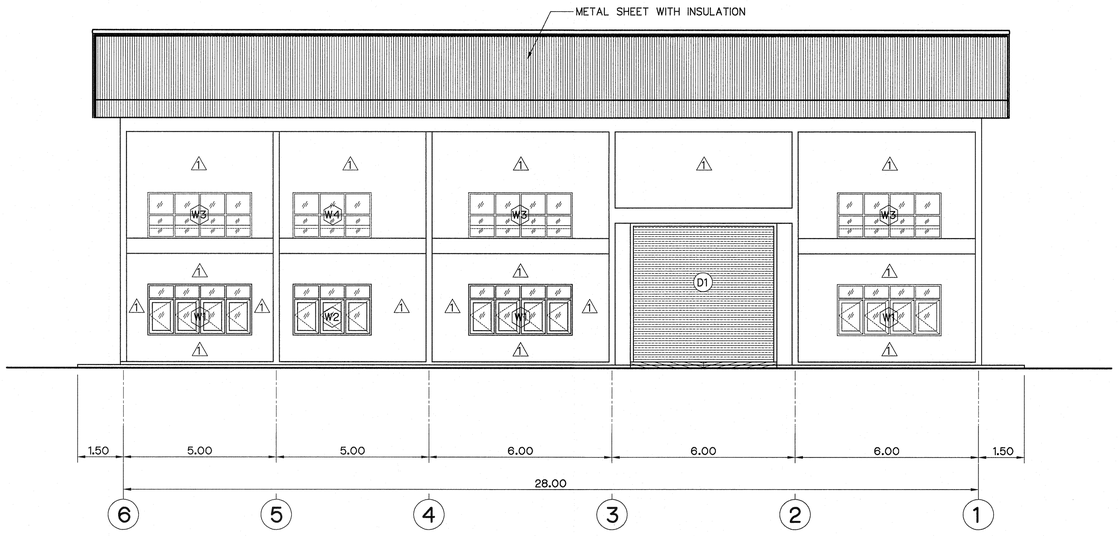
CIVIL WORKS
POWERHOUSE
PLAN AND ROOF PLAN

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED S. KITICHAI
DESIGNED	SUBMITTED
DRAWN	RECOMMENDED
CHECKED	APPROVED
PROJECT MANAGER / 14/01/62 DATE	DRAWING NO. HLS-PH-02 / SHEET NO. 46 OF 71



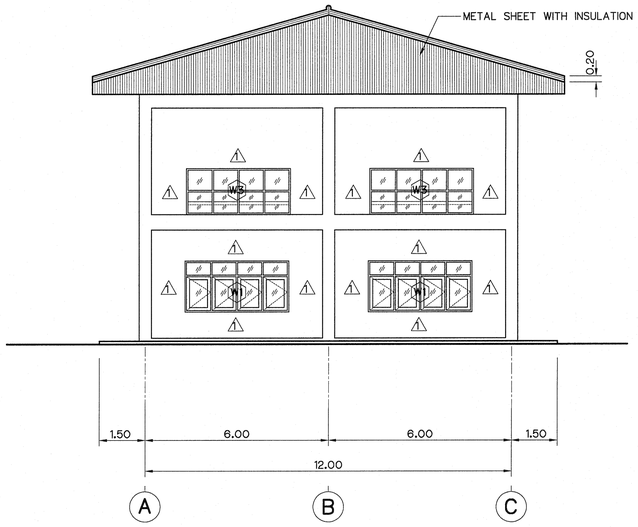
ELEVATION "A"

SCALE 1:100



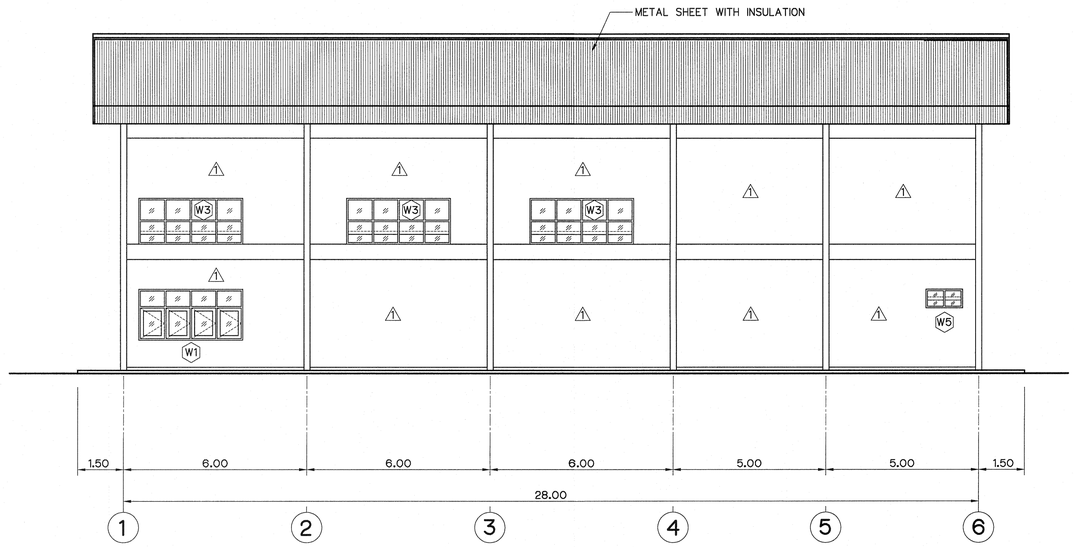
ELEVATION "B"

SCALE 1:100



ELEVATION "C"

SCALE 1:100



ELEVATION "D"

SCALE 1:100

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

REFERENCE DRAWINGS :

1. POWERHOUSE, PLAN ANG ROOF PLAN	HLS-PH-02
2. POWERHOUSE, SECTIONS	HLS-PH-04
3. POWERHOUSE, DETAIL OF DOORS, WINDOWS AND NAME PLATE	HLS-PH-06

0 1 2 3 4 5 6 7 8

SCALE 1:100 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
ELEVATIONS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED S.KITICHAI

DESIGNED 28.6651 SUBMITTED

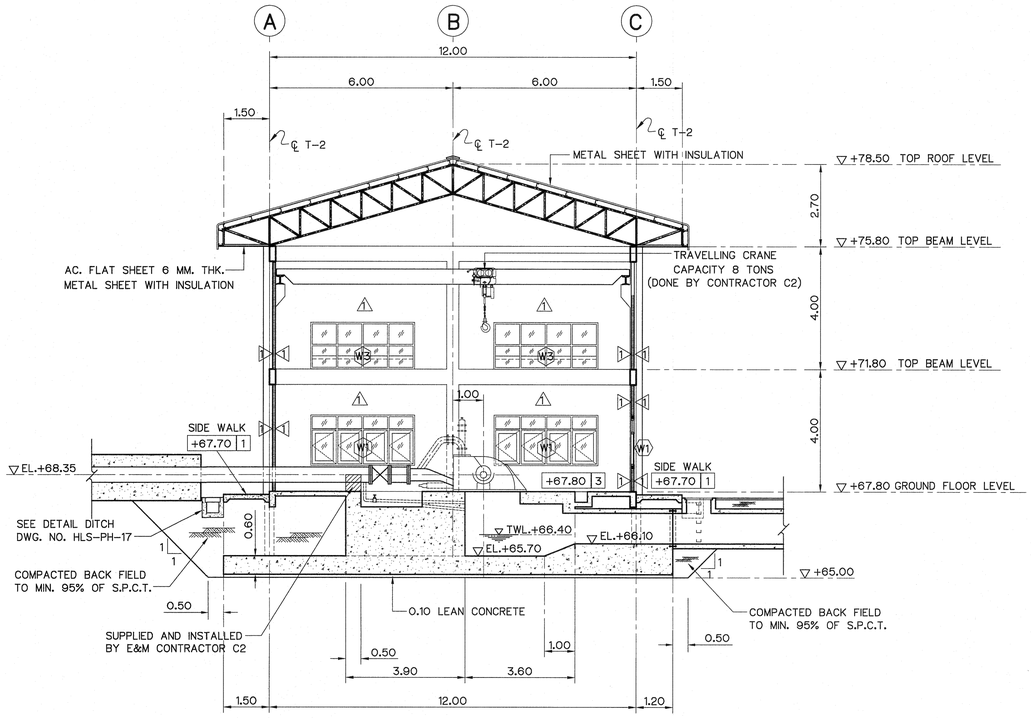
DRAWN RECOMMENDED

CHECKED 28.7324 APPROVED

PROJECT MANAGER 14/01/62 DATE

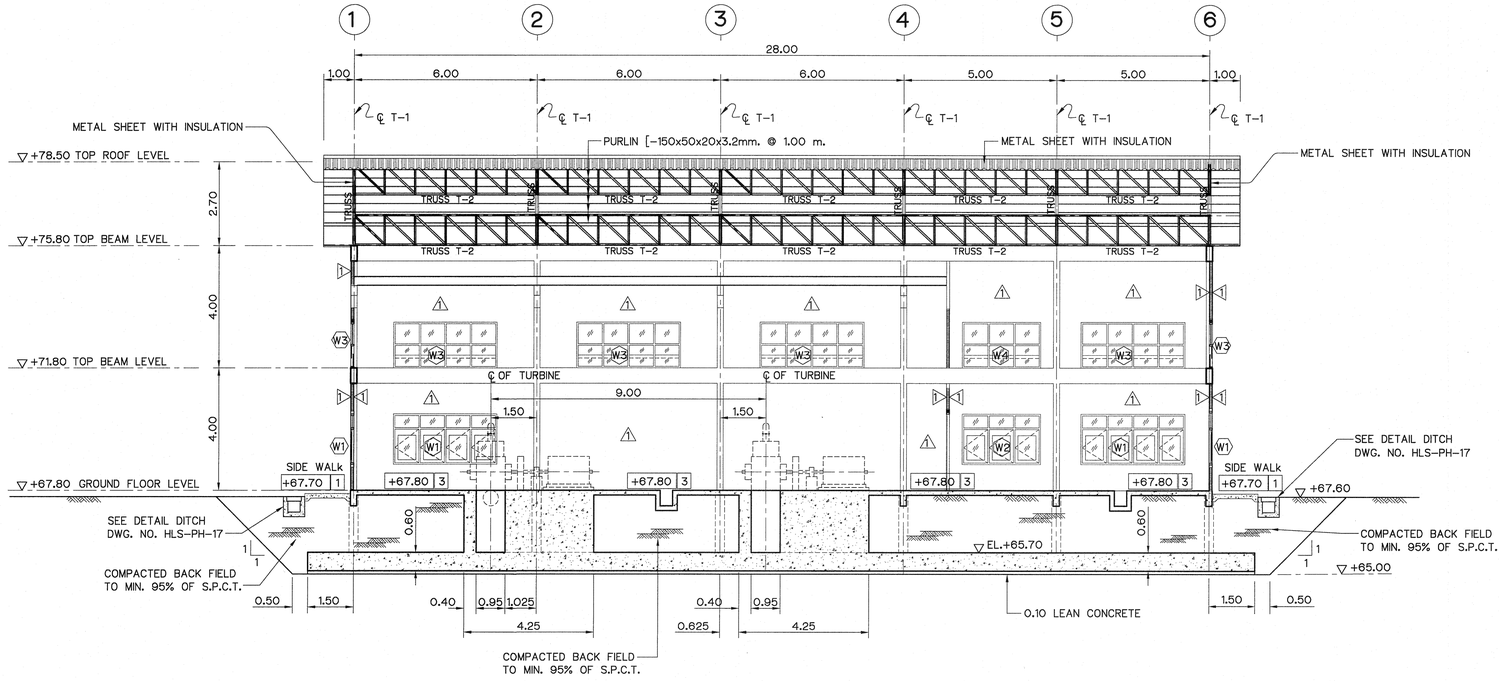
DRAWING NO. HLS-PH-03

SHEET NO. 47 OF 71



SECTION A–A

SCALE 1:100



SECTION B–B

SCALE 1:100

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

REFERENCE DRAWINGS :

1. POWERHOUSE, PLAN AND ROOF PLAN	HLS-PH-02
2. POWERHOUSE, ELEVATIONS	HLS-PH-03

0 1 2 3 4 5 6 7 8

SCALE 1:100 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
SECTIONS

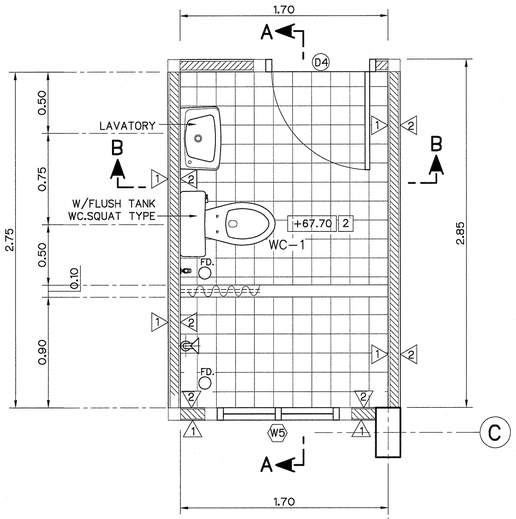
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

DESIGNED	สย.6651	REVIEWED	K KITICHAI
DRAWN		SUBMITTED	
CHECKED	สย.7324	RECOMMENDED	
PROJECT MANAGER	14/01/62 DATE	APPROVED	

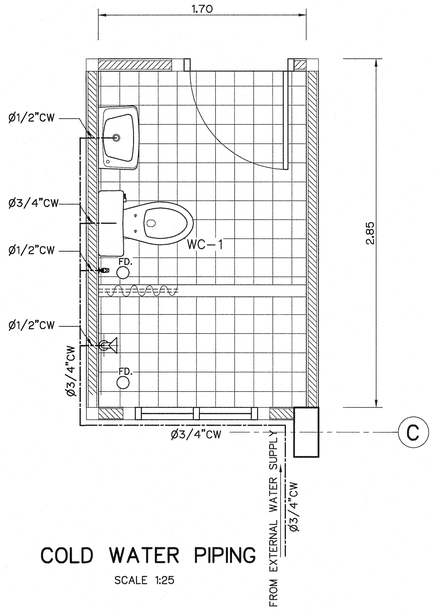
DRAWING NO. HLS-PH-04

SHEET NO. 48 OF 71



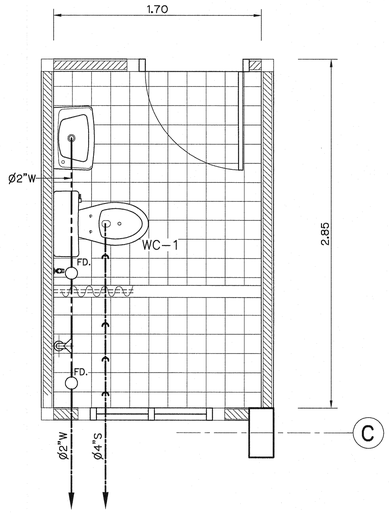
PLAN WC-1

SCALE 1:25



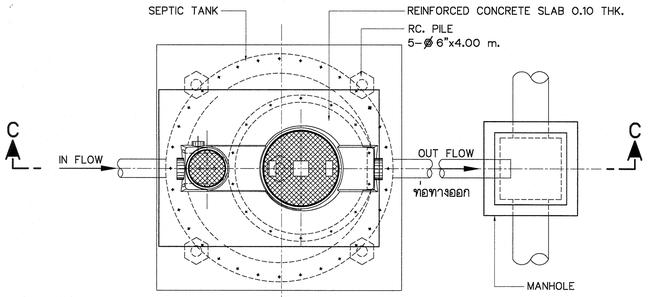
COLD WATER PIPING

SCALE 1:25



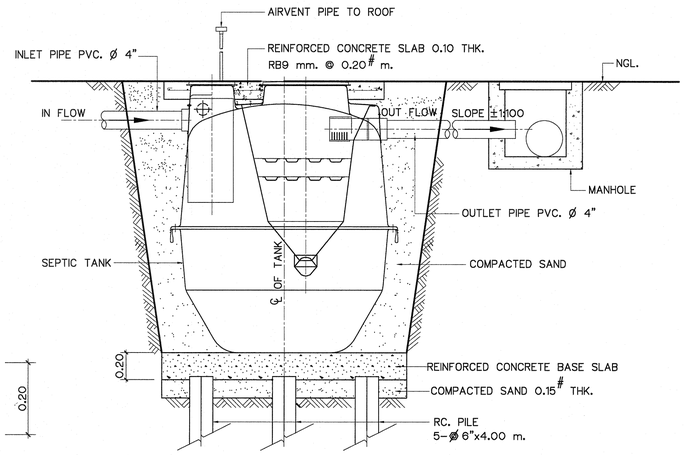
SOIL, WASTE AND VENT PIPING

SCALE 1:25



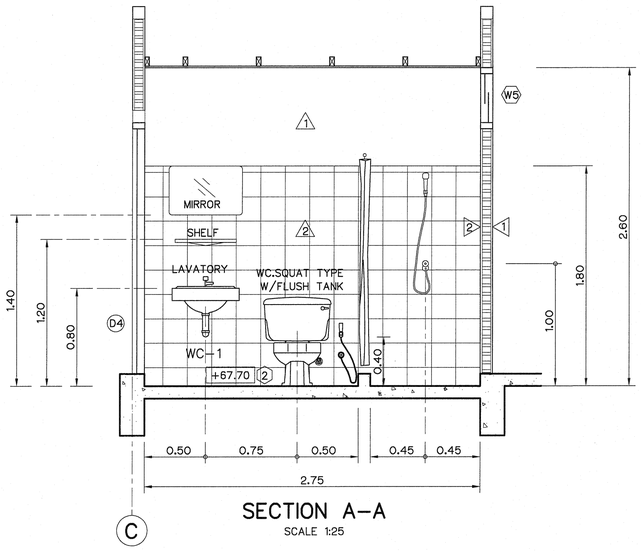
PLAN OF SEPTIC TANK

NOT TO SCALE



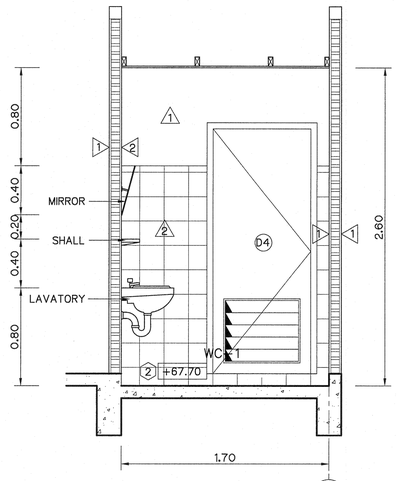
SECTION C-C

NOT TO SCALE



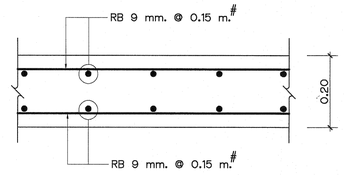
SECTION A-A

SCALE 1:25



SECTION B-B

SCALE 1:25



REINFORCEMENT OF BASE SLAB

NOT TO SCALE

APPLICATION AND DIMENSION OF SEPTIC TANK					
	VOLUMN		CONDITION		
NO. OF USER	RESIDENTIAL	SOIL ONLY 60 LPCD TOTAL WASTE 200 LPCD	16 5	20 6	23 7
DIMENSION	DIAMETER (MM.)		1430	1390	1460
	HIGHT (MM.)		1490	1570	1670
	INLET,OUTLET PIPE (MM.)		100	100	100
	VENT (MM.)		50	50	50
VOLUMNS	TOTAL VOLUMN (LITER)		1600	1800	2230
	SEPTIC ZONE (LITER)		1060	1200	1530
	FILTER ZONE (LITER)		540	600	700
REMARK:LPCD = LITER PER CAPITAL PER DAY					

SELECTED CONDITION

MATERIAL AND APPLICATION OF SEPTIC TANK	
COMPONENTS	MATERIAL
1. TANK BODY	LLDEL (LINER LOW TYPE MEDIUM DENSITY)
2. MANHOLE COVER	ABS (ACRYLONITRILE-BUTADIENCE-STYRENE), IRON CAST
3. INLET, OUTLET PIPES	POLYETHYLENE
4. FLEX	FLEXIBLE FITTING ABS Ø 100 MM.
5. MEDIA	HDPE

SYMBOLS :

- SOIL PIPE
- WASTE PIPE
- COLD WATER PIPE
- VENT PIPE

0 0.5 1.0 1.5 2.0

SCALE 1:25 METERS

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

REFERENCE DRAWING :

1. POWERHOUSE, PLAN AND ROOF PLAN HLS-PH-02

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS

POWERHOUSE

DETAILS OF TOILET AND SEPTIC TANK

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED S.KITICHAI

DESIGNED วิ.6651 SUBMITTED

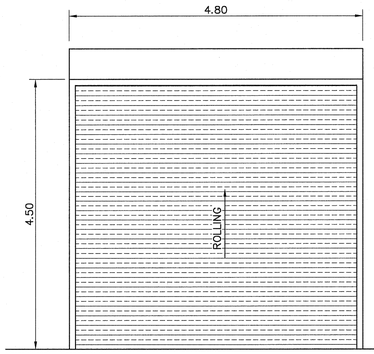
DRAWN RECOMMENDED

CHECKED วิ.7324 APPROVED

PROJECT MANAGER 14/01/62 DATE

DRAWING NO. HLS-PH-05

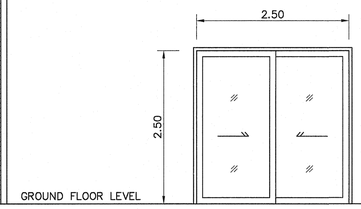
SHEET NO. 49 OF 71



D1

ROLLING DOOR

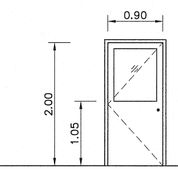
SCALE 1:50



D2

SLIDE DOOR

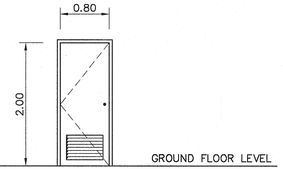
SCALE 1:50



D3

OPENING DOOR

SCALE 1:50

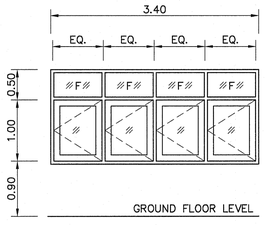


D4

OPENING DOOR

SCALE 1:50

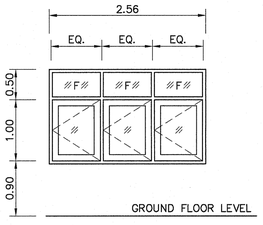
SYMBOL	DESCRIPTIONS	SIZE		FRAME	PANEL	HINGE	LOCKSET	HANDLE	REMARKS
		WIDTH	HEIGHT						
D1	ROLLING DOOR (STEEL NO.18,1.2 mm. Thk.)	4.80	4.50	GALVANIZED STEEL	—	—	NORMAL KEY	—	MOTOR OPERATING
D2	SLIDE DOOR	2.50	2.50	ALUMINIUM(NA) 2"x 4"	GLASS 5 mm.thk.	—	CYINDER LOCK	—	
D3	OPENING DOOR	0.90	2.00	HARDWOOD 2"x 4"	TEAK PLYWOOD & GLASS 5 mm.thk.	STAINLESS STEEL 4"x3"x2.5mm.	CYINDER LOCK	—	
D4	OPENING DOOR	0.80	2.00	P.V.C. 2"x 4"	P.V.C.	STAINLESS STEEL 4"x3"x2.5mm.	CYINDER LOCK	—	
W1	OPENING WINDOW	3.40	1.50	ALUMINIUM(NA) 2"x 4"	GLASS 5 mm.thk.	●	●	●	FULL SET OF ACCESSORIES FROM MANUFACTURER
W2	OPENING WINDOW	2.56	1.50	ALUMINIUM(NA) 2"x 4"	GLASS 5 mm.thk.	●	●	●	FULL SET OF ACCESSORIES FROM MANUFACTURER
W3	FIXED GLASS WINDOW	3.40	1.50	ALUMINIUM(NA) 2"x 4"	GLASS 5 mm.thk.	—	—	—	
W4	FIXED GLASS WINDOW	2.56	1.50	ALUMINIUM(NA) 2"x 4"	GLASS 5 mm.thk.	—	—	—	
W5	FIXED GLASS WINDOW	1.20	0.50	ALUMINIUM(NA) 2"x 4"	GLASS 5 mm.thk.	—	—	—	
W6	SLIDING WINDOW	1.70	1.00	ALUMINIUM(NA) 2"x 4"	GLASS 5 mm.thk.	—	—	—	
●	SHALL BE USED SPACIFIED ACCESSORIES								



W1

OPENING WINDOW

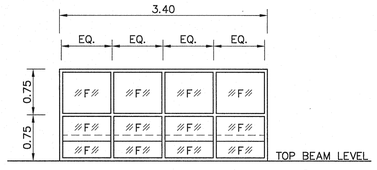
SCALE 1:50



W2

OPENING WINDOW

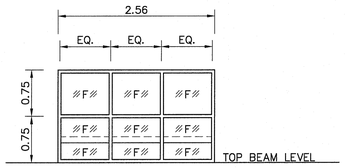
SCALE 1:50



W3

FIX GRASS WINDOW

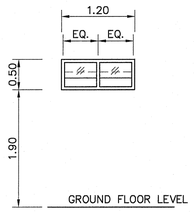
SCALE 1:50



W4

FIX GRASS WINDOW

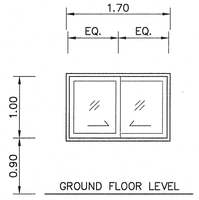
SCALE 1:50



W5

FIX GRASS WINDOW

SCALE 1:50



W6

SLIDING WINDOW

SCALE 1:50



FRONT VIEW OF NAMEPLATE

SCALE 1:10

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
3. FOR PAINTING WORKS SEE TECHNICAL SPECIFICATION

REFERENCE DRAWINGS :

1. POWERHOUSE, PLAN AND ROOF PLAN	HLS-PH-02
2. POWERHOUSE, ELEVATIONS	HLS-PH-03
3. POWERHOUSE, SECTIONS	HLS-PH-04

0 0.5 1.0 2.0 3.0 4.0
SCALE 1:50 METERS

0 0.1 0.2 0.4 0.6 0.8
SCALE 1:10 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS

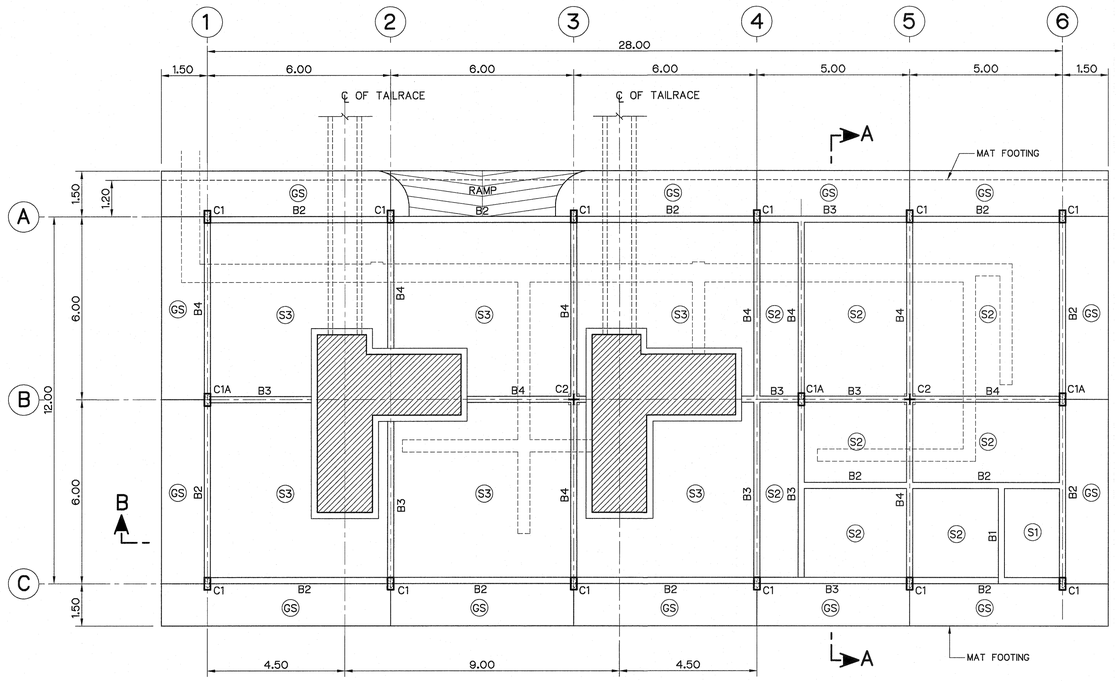
POWERHOUSE

DETAILS OF DOORS, WINDOWS AND NAMEPLATE

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

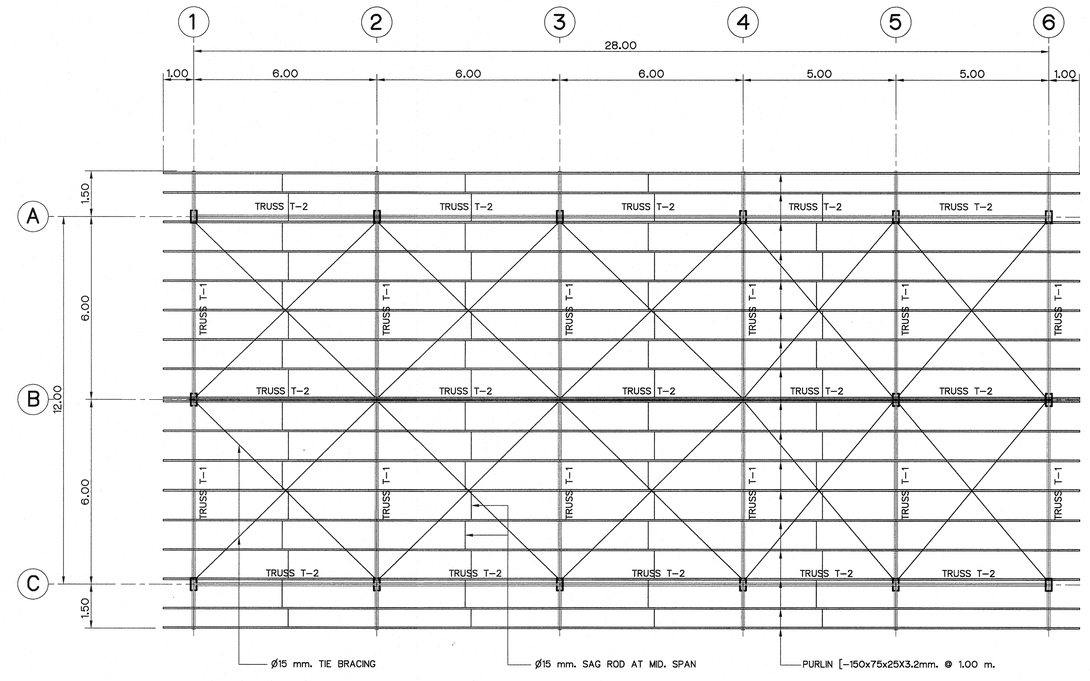
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

DESIGNED	REVIEWED S. KITTICHAI
DRAWN	SUBMITTED
CHECKED 28.7324	RECOMMENDED
PROJECT MANAGER 14/01/62 DATE	APPROVED
	DRAWING NO. HLS-PH-06
	SHEET NO. 50 OF 71



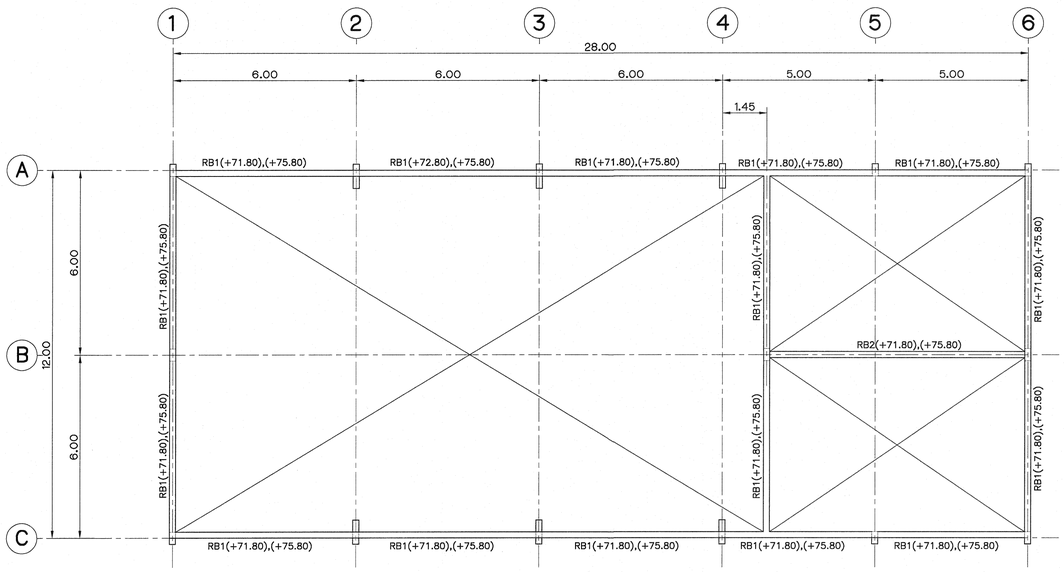
PLAN OF FOOTING, BEAM AND SLAB

SCALE 1:100



PLAN OF BEAM AND ROOF TRUSSES (TOP ROOF LEVEL+75.80)

SCALE 1:100



ROOF BEAM PLAN

SCALE 1:100

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAY-OUT	HLS-PH-01
2. POWERHOUSE, ELEVATIONS	HLS-PH-03
3. POWERHOUSE, SECTIONS	HLS-PH-04
4. POWERHOUSE, DETAILS TRUSS T-1 AND T-2 (1/2)	HLS-PH-11

0 1 2 3 4 5 6 7 8

SCALE 1:100 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

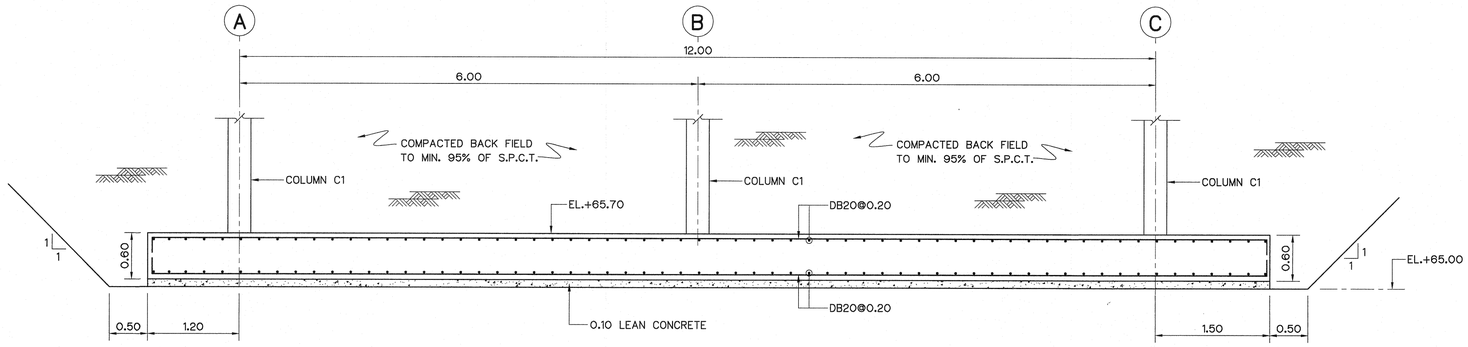
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS

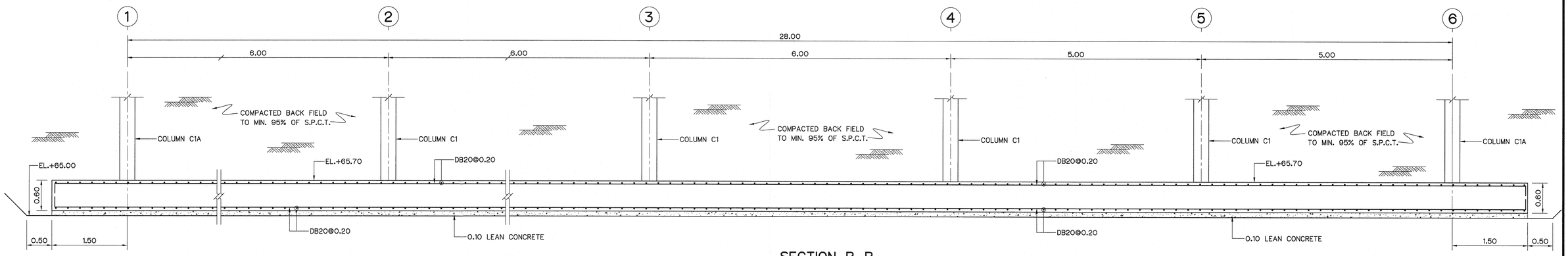
POWERHOUSE

FOOTING, BEAM, SLAB ROOF BEAM AND TRUSS PLANS

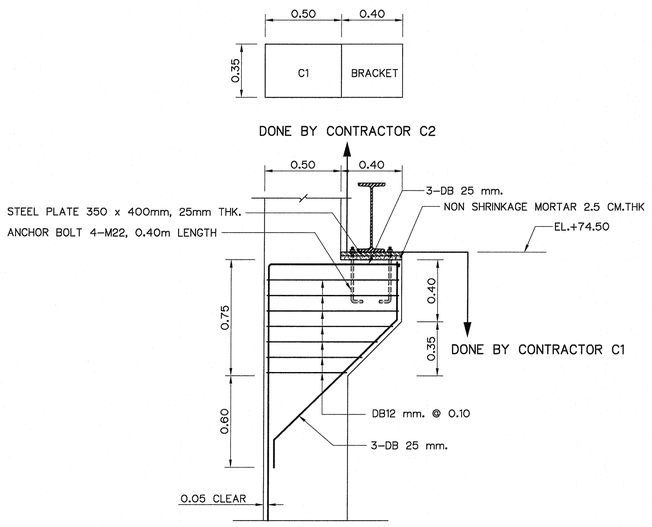
FEC FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED S. KITICHAI
DESIGNED ณัฐ.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED ณัฐ.7324	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS-PH-07 / SHEET NO. 51 OF 71



SECTION A–A
SCALE 1:40



SECTION B–B
SCALE 1:40



BRACKET
SCALE 1:20

COLUMN DETAIL

	C1	C1A	C2
ROOF BEAM ↑ 1ST FLOOR	0.35 / 0.50: 14–DB28, 3 STR RB9 @ 0.25	0.35 / 0.50: 8–DB20, 2 STR RB9 @ 0.25	–
1ST FLOOR ↑ FOOTING	0.35 / 0.50: 14–DB28, 3 STR RB9 @ 0.25	0.35 / 0.50: 8–DB25, 2 STR RB9 @ 0.25	0.35 / 0.50: 8–DB20, 2 STR RB9 @ 0.25

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS–GN–03
3. ALLOWABLE BEARING CAPACITY OF POWERHOUSE FOUNDATION SHALL NOT BE LESS THAN 10 T/M.^{2}

REFERENCE DRAWINGS :

1. POWERHOUSE, PLAN AND ROOF PLAN	HLS–PH–02
2. POWERHOUSE, ELEVATIONS	HLS–PH–03
3. POWERHOUSE, SECTIONS	HLS–PH–04

0 0.5 1 1.5
SCALE 1:20 METERS

0 0.5 1 2 3
SCALE 1:40 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

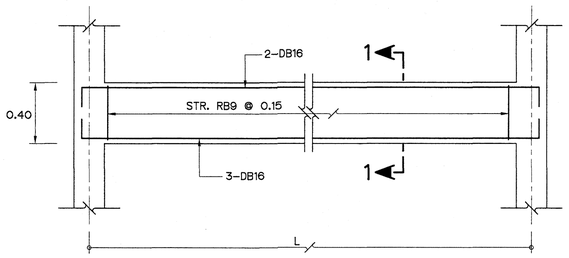
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS

POWERHOUSE

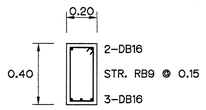
PLAN AND DETAILS OF FOOTING, COLUMN ,CORBEL AND BRACKET

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED S. KITICHAI
DESIGNED วิ.ศ.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED วิ.ศ.7324	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS–PH–08
	SHEET NO. 52 OF 71



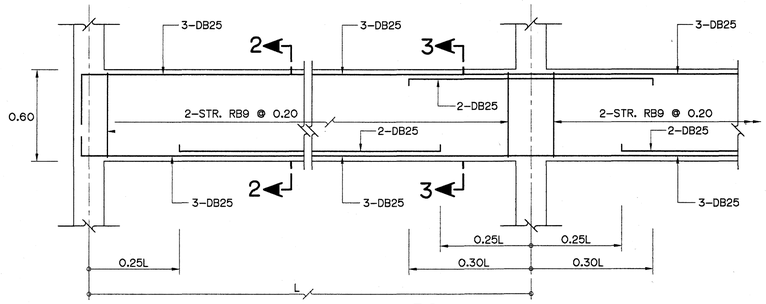
B1

SCALE 1:20



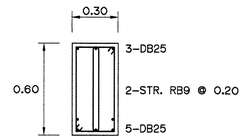
SECTION 1-1

SCALE 1:20



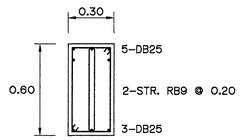
B2

SCALE 1:20



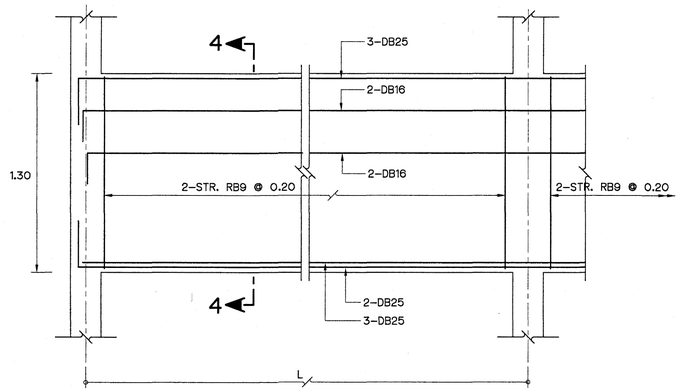
SECTION 2-2

SCALE 1:20



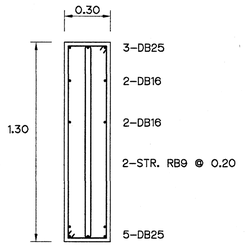
SECTION 3-3

SCALE 1:20



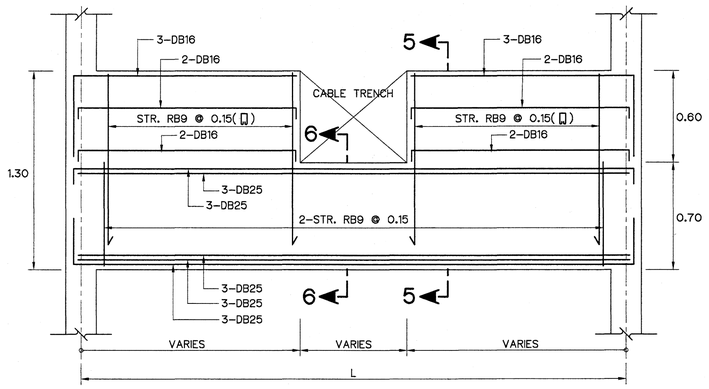
B3

SCALE 1:20



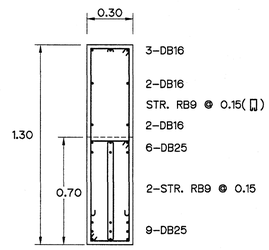
SECTION 4-4

SCALE 1:20



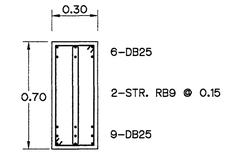
B4

SCALE 1:20



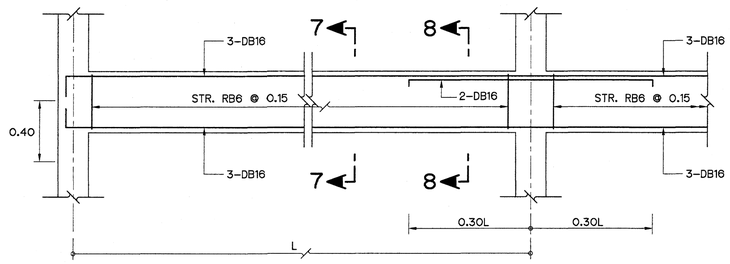
SECTION 5-5

SCALE 1:20



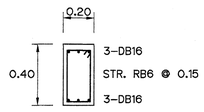
SECTION 6-6

SCALE 1:20



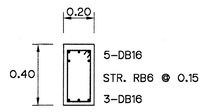
RB1

SCALE 1:20



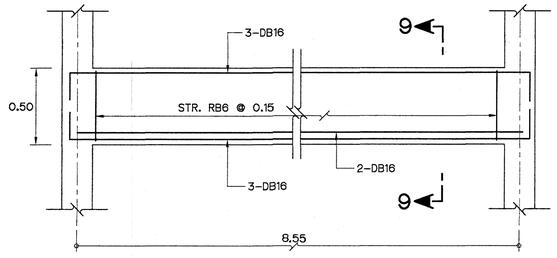
SECTION 7-7

SCALE 1:20



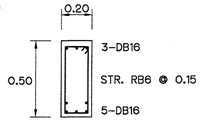
SECTION 8-8

SCALE 1:20



RB2

SCALE 1:20



SECTION 9-9

SCALE 1:20

NOTE :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.

REFERENCE DRAWING :

1. POWERHOUSE, PLAN AND DETAILS OF FOOTING, COLUMN ,CORBEL AND BRACKET HLS-PH-07



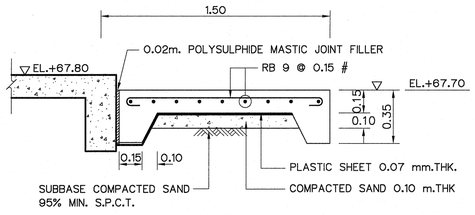
NO.	DATE	REVISIONS	CHECKED	APPROVED
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2				
1				
	CONSULTANTS		DEDE	

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

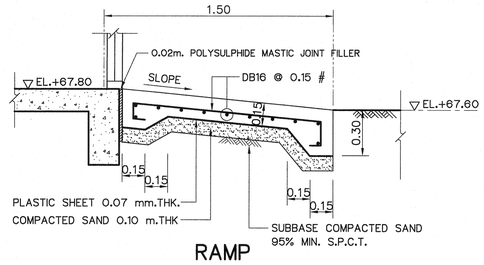
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
BEAM REINFORCEMENT DETAILS

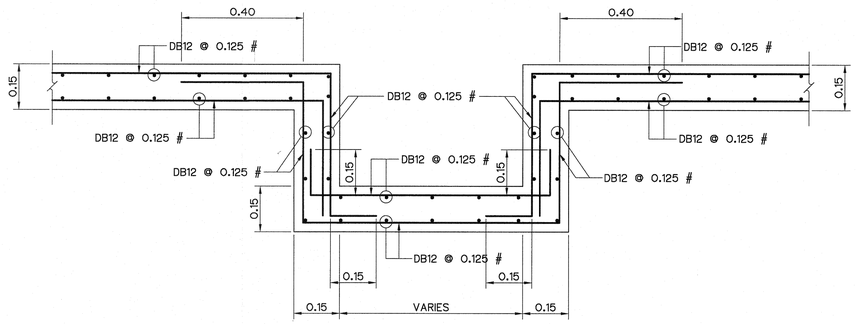
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED S. KITICHAI
DESIGNED ส.ย.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED ส.ย.7324	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS-PH-09 / SHEET NO. 53 OF 71



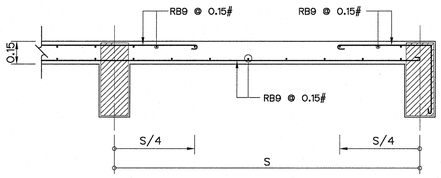
GS
SCALE 1:20



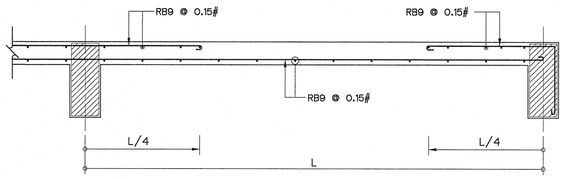
RAMP
SCALE 1:20



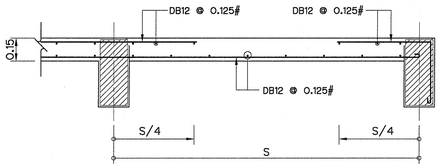
REINFORCEMENT DETAILS OF CABLE TRENCH AT SLAB S2
SCALE 1:10



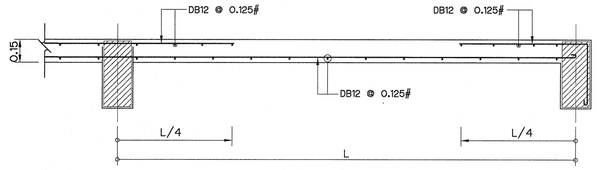
S1 (SHOT)
SCALE 1:20



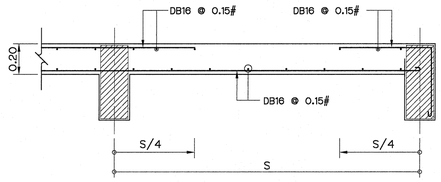
S1 (LONG)
SCALE 1:20



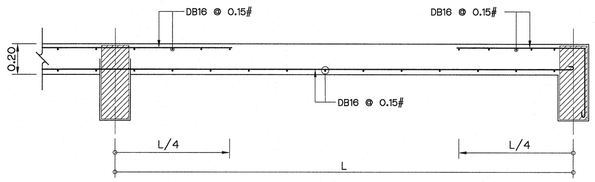
S2 (SHOT)
SCALE 1:20



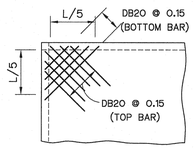
S2 (LONG)
SCALE 1:20



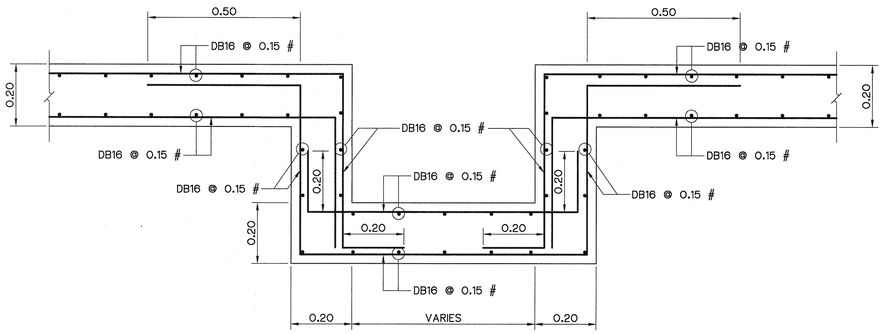
S3 (SHOT)
SCALE 1:20



S3 (LONG)
SCALE 1:20



TYP. ALL CORNER
SCALE 1:20



REINFORCEMENT DETAILS OF CABLE TRENCH AT SLAB S3
SCALE 1:10

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8
SCALE 1:10 METERS

0 0.50 1.00 1.50
SCALE 1:20 METERS

NOTES :
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

REFERENCE DRAWINGS :
1. POWERHOUSE, PLAN AND DETAILS OF FOOTING, COLUMN ,CORBEL AND BRACKET HLS-PH-07

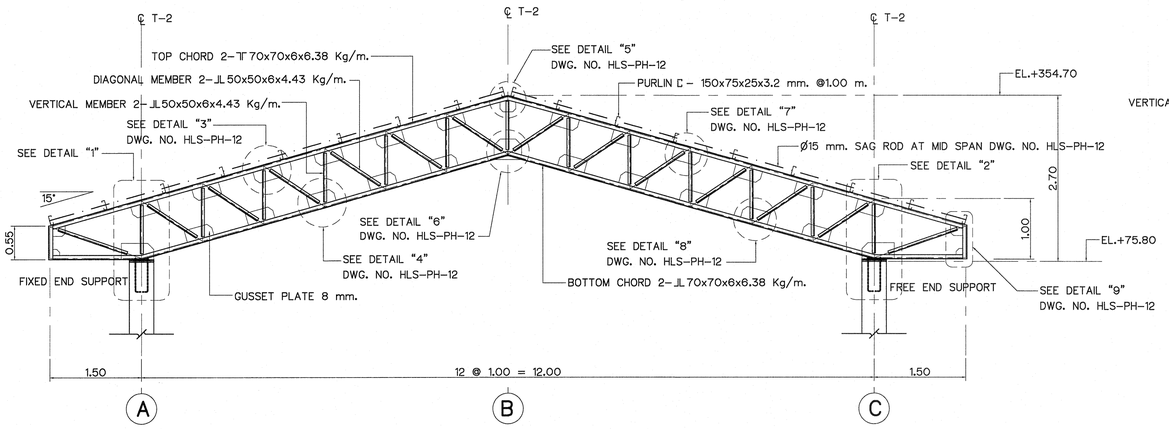
NO.	DATE	REVISIONS	CHECKED	APPROVED
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MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

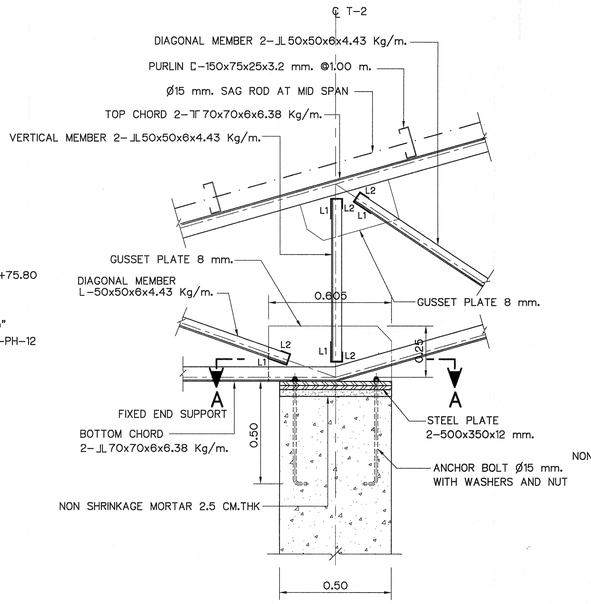
CIVIL WORKS
POWERHOUSE
SLAB REINFORCEMENT DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED S. KITICHAI
DESIGNED สม.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED สม.7324	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS-PH-10
	SHEET NO. 54 OF 71



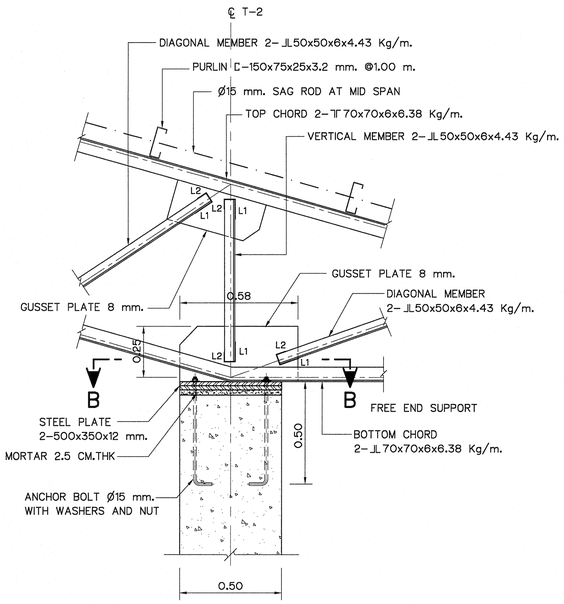
TRUSS T-1

SCALE 1:50



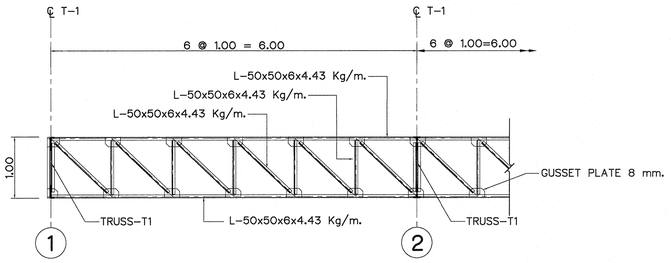
DETAILS "1"

SCALE 1:15



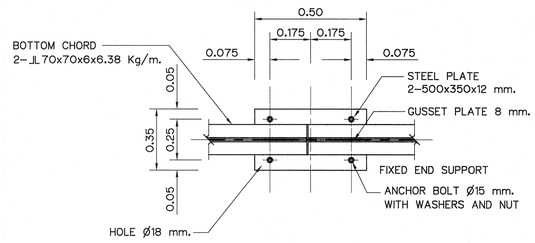
DETAILS "2"

SCALE 1:15



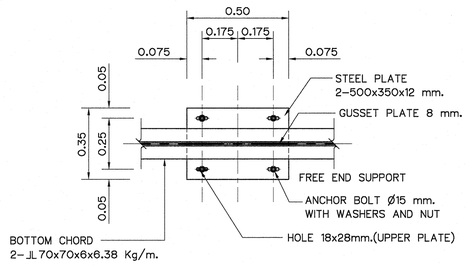
TRUSS T-2 (SPAN 6.00m.)

SCALE 1:50



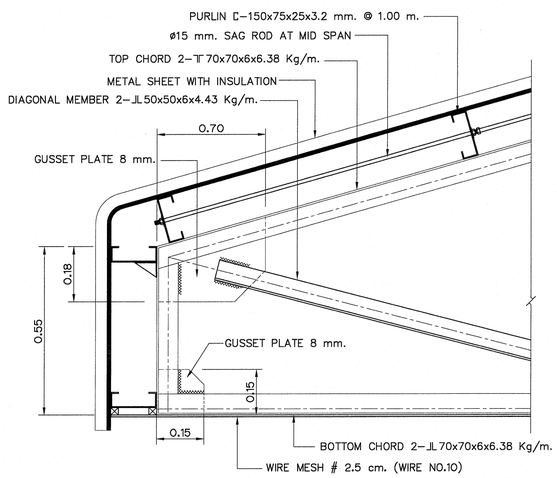
SECTION A-A

SCALE 1:15



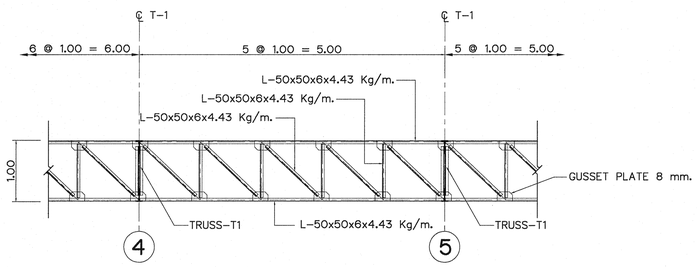
SECTION B-B

SCALE 1:15



EAVES DETAIL

SCALE 1:10



TRUSS T-2 (SPAN 5.00m.)

SCALE 1:50

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8
SCALE 1:10 METERS

0 0.5 1.2
SCALE 1:15 METERS

0 0.5 1.0 2.0 3.0 2.5
SCALE 1:50 METERS

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

REFERENCE DRAWINGS :

1. POWERHOUSE, SECTIONS	HLS-PH-04
2. POWERHOUSE, FOOTING, BEAM, SLAB ROOF BEAM AND TRUSS PLANS	HLS-PH-07
3. POWERHOUSE, DETAILS TRUSS T-1 AND T-2 (2/2)	HLS-PH-12

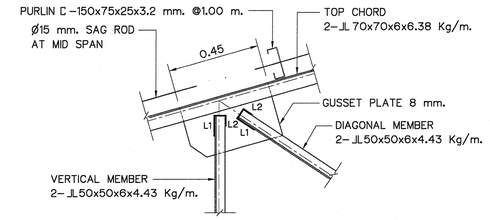
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HUAI LAM SIN HYDROPOWER PROJECT

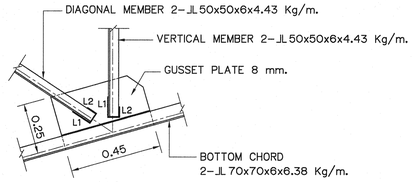
CIVIL WORKS
POWERHOUSE
DETAILS TRUSS T-1 AND T-2 (1/2)

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	REVIEWED S. KITICHAI
DESIGNED สม.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED สม.7324	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS-PH-11
	SHEET NO. 55 OF 71



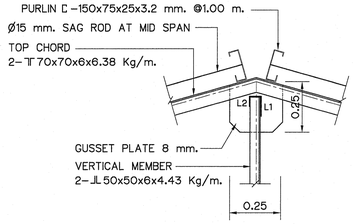
DETAILS "3"

SCALE 1:15



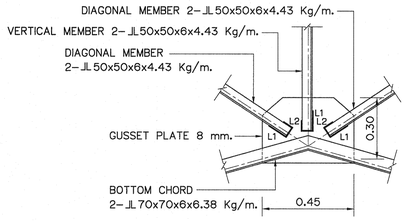
DETAILS "4"

SCALE 1:15



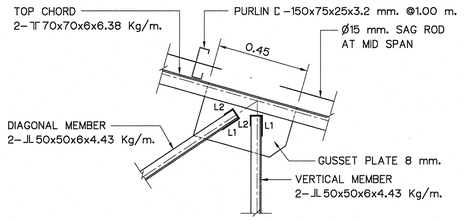
DETAILS "5"

SCALE 1:15



DETAILS "6"

SCALE 1:15

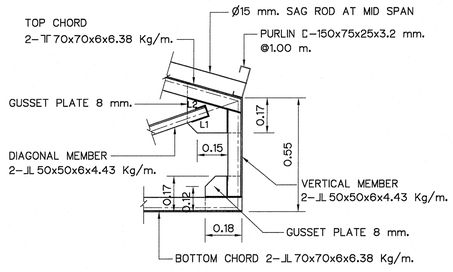


DETAILS "7"

SCALE 1:15

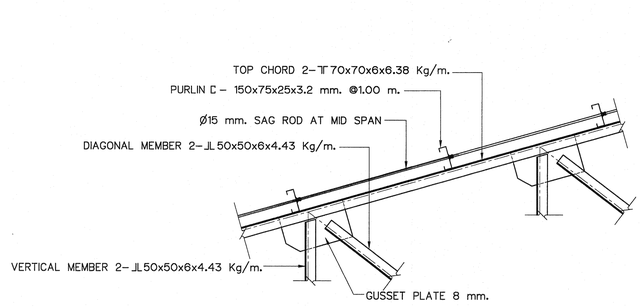
DETAILS "8"

SCALE 1:15

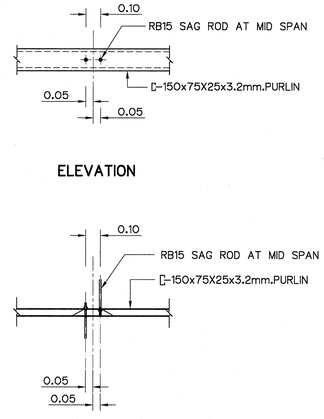


DETAILS "9"

SCALE 1:15

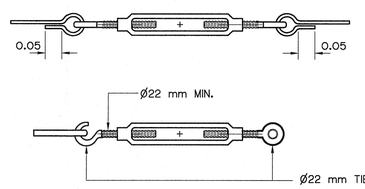


SECTION



SAG ROD DETAILS

SCALE 1:20



TURNBUCKLE

NOT TO SCALE

MEMBER SCHEDULE TABLE

TRUSS TYPE	MEMBER	FILLET WELD SIZE (mm)		
		L1	L2	t
TRUSS T-1	2-JL 70x70x6x6.38 Kg/m.	125	75	5
TRUSS T-2	1-L 70x70x6x6.38 Kg/m.	125	75	5

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

REFERENCE DRAWINGS :

1. POWERHOUSE, DETAILS TRUSS T-1, T-2, T-3 AND T-4 (1/2) HLS-PH-11

0 0.50 1.00 1.50
SCALE 1:20 METERS

0 0.5 1.2
SCALE 1:15 METERS

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HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
DETAILS TRUSS T-1 AND T-2 (2/2)

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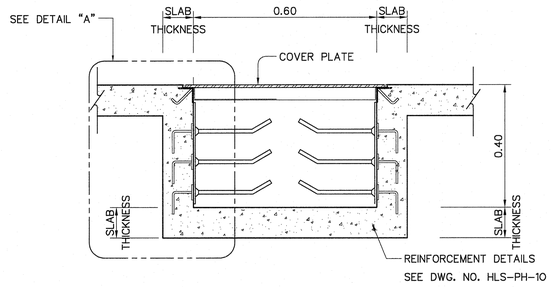
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED S. KITICHAI

DESIGNED ณัฐ.6651
DRAWN
CHECKED ณัฐ.7324
PROJECT MANAGER 14/01/62 DATE

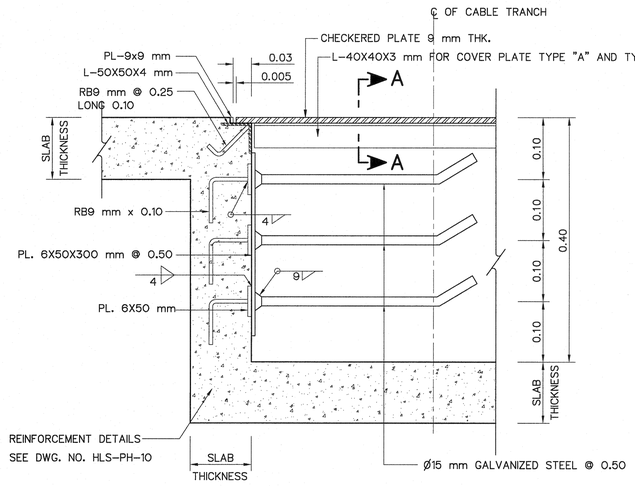
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HLS-PH-12
SHEET NO. 56 OF 71



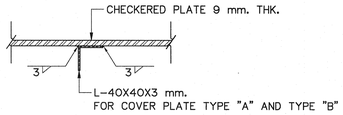
IN DOOR CABLE TRENCH TYPE "A"

SCALE 1:10



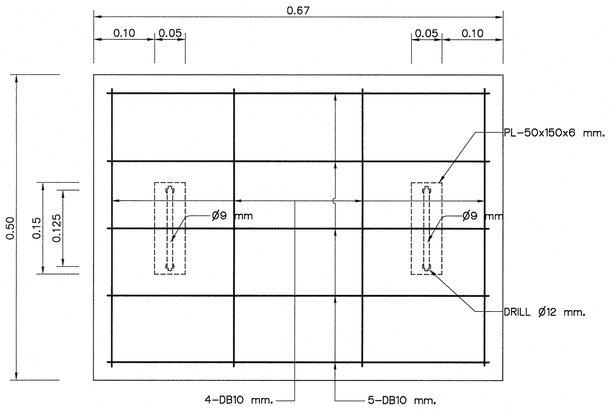
DETAIL "A"

SCALE 1:5



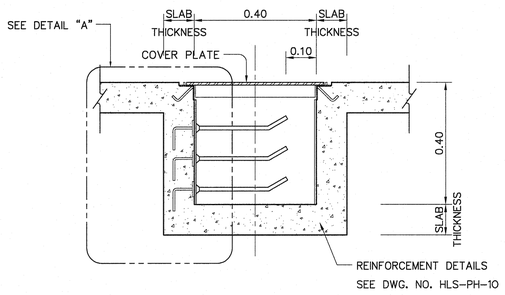
SECTION A-A

SCALE 1:5



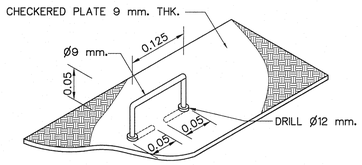
OUT DOOR COVER CABLE TRENCH

SCALE 1:5



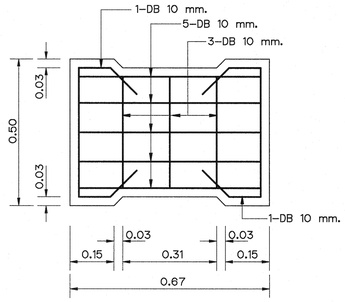
IN DOOR CABLE TRENCH TYPE "B"

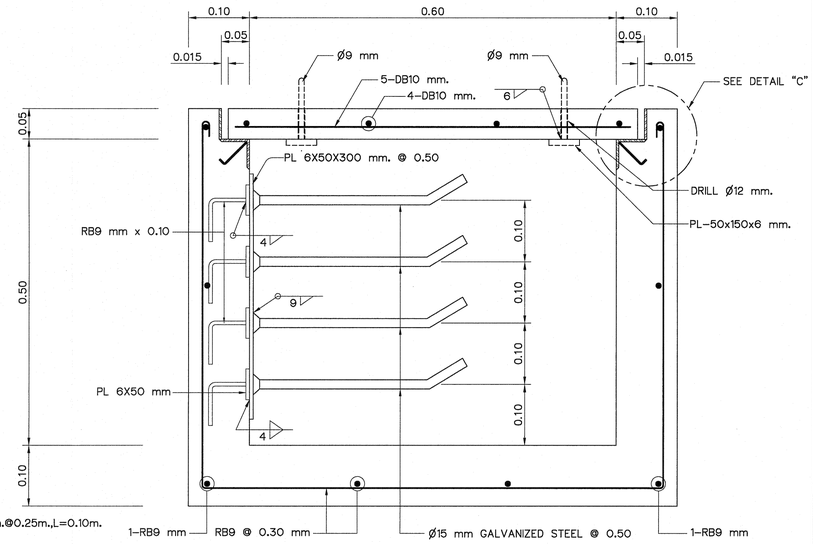
SCALE 1:10



DETAIL "B"

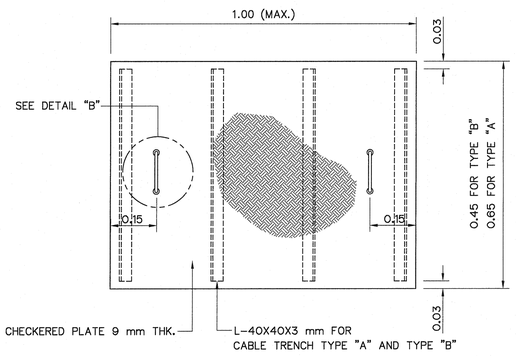
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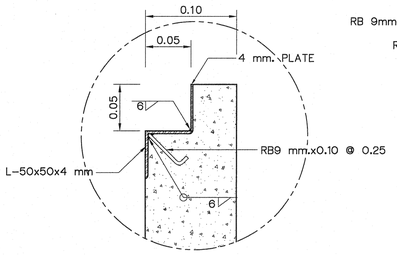
OUT DOOR CABLE TRENCH TYPE "C"

SCALE 1:5



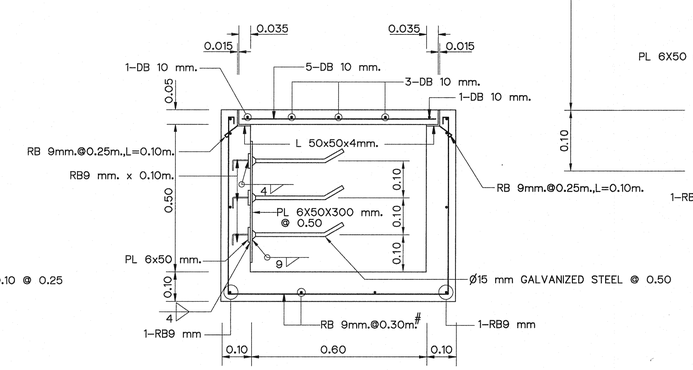
COVER PLATE FOR IN DOOR

SCALE 1:10



DETAIL "C"

NOT TO SCALE



DETAIL CABLE TRENCH IN SWITCHYARD

SCALE 1:20

NOTES :

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATION AND GENERAL NOTES SEE DWG. No. HLS-GN-03
3. STEEL COVER FOR IN DOOR TRENCH SHALL BE COATED WITH NON BLEEDING TYPE COAL TAR EPOXY

REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAY-OUT	HLS-PH-01
2. POWERHOUSE, PLAN AND ROOF PLAN	HLS-PH-02

0 0.10 0.20 0.30 0.40
SCALE 1:5 METERS

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8
SCALE 1:10 METERS

0 0.5 1.0 1.5
SCALE 1:20 METERS

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HUAI LAM SIN HYDROPOWER PROJECT

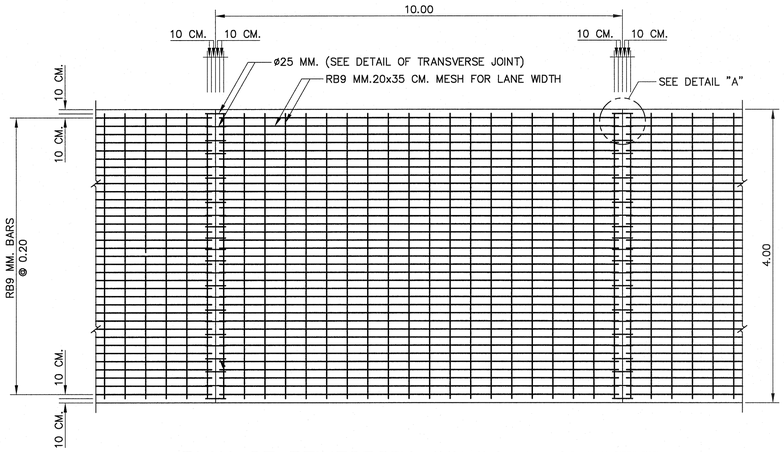
CIVIL WORKS
POWERHOUSE
CABLE TRENCH DETAILS

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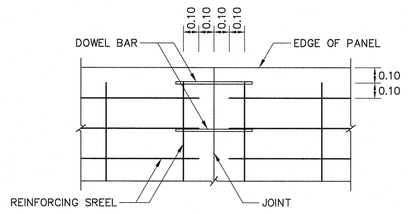
REVIEWED S. KITICHAI

DESIGNED	สย.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สย.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO. HLS-PH-13	SHEET NO. 57 OF 71



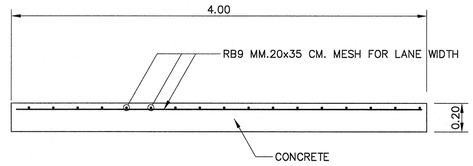
PLAN OF REINFORCED CONCRETE PAVEMENT

SCALE 1 : 75



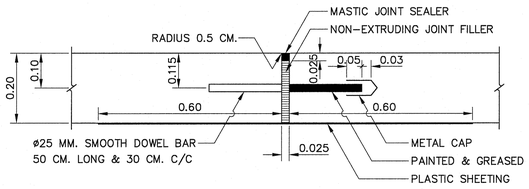
DETAIL "1"

SCALE 1 : 20

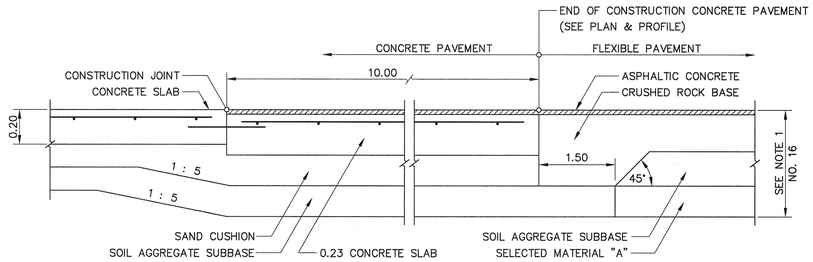


REINFORCEMENT DETAIL OF CONCRETE PAVEMENT CROSS-SECTION

SCALE 1 : 25

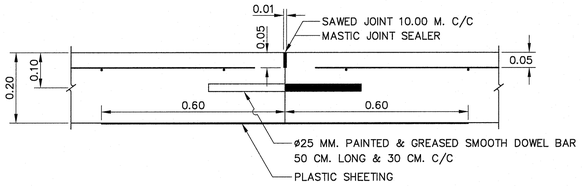


DETAIL OF EXPANSION JOINT

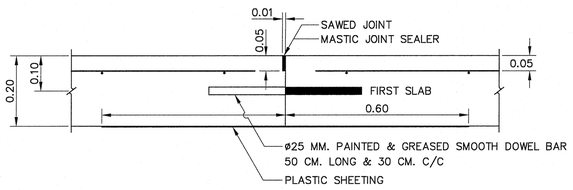


DETAIL OF JOINT BETWEEN CONCRETE PAVEMENT AND FLEXIBLE PAVEMENT

NOT TO SCALE



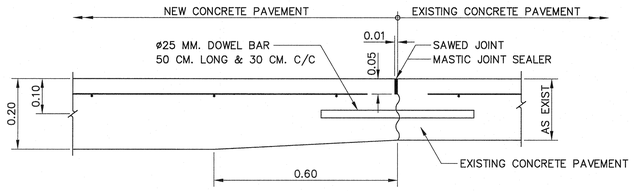
DETAIL OF CONTRACTION JOINT



DETAIL OF CONSTRUCTION JOINT

DETAIL OF TRANSVERSE JOINT

SCALE 1 : 10



DETAIL OF TRANSVERSE JOINT BETWEEN NEW AND EXISTING CONCRETE PAVEMENT

SCALE 1 : 10

NOTES 1 :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
3. EXPANSION JOINT SHALL BE CONSTRUCTED AT THE INTERVAL OF 350 METERS. IF THE LAST INTERVAL IS LESS THAN 350 METERS , THE INTERVALS SHALL BE AVERAGED BUT BETWEEN 300 AND 350 METERS.
4. EXPANSION JOINT SHALL BE PROVIDED AT THE OUTER EDGE OF BOTH SIDES OF THE BOX CULVERT CROSSING.
5. MASTIC JOINT SEALER SHALL BE OF THE HOT POURED ELASTIC TYPE CONFORMING TO TIS.479
6. JOINT FILLER SHALL CONFORM TO THE AASHTO M.213-74 OR ASTM. D1751-73 SPECIFICATION.
7. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR STANDARD CYLINDER (ø0.15x0.50 m.) AT 28 DAYS.
8. WELDED WIRE CAN BE USED IN PLACE OF BAR MESH.
9. ALL JOINTS EXCEPT EXPANSION JOINT SHALL BE MADE BY SLOT CUTTING MACHINE ONLY FOAM SHEET, PLYWOOD, TIMBER OR MATERIAL OF THE SAME TYPE SHALL NOT BE ALLOWED.
10. PLASTIC SHEET USED IN CONSTRUCTION SHALL HAVE THE FOLLOWING REQUIREMENTS :
    - 10.1 THICKNESS OF 0.07 MM. WITH A TOLERANCE OF NOT MORE THAN 7% SHALL BE REQUIRED.
    - 10.2 WIDTH SHALL NOT BE LESS THAN 1.20 M.
    - 10.3 IT SHALL BE COLOURLESS , TRANSPARENT AND WATERPROOF , FREE FROM POROUS AREA , TURN AREA AND BLISTERING AREA WHICH ARE VISIBLE BY NAKED EYE. EDGE SHALL BE STRAIGHT.
    - 10.4 CONTINUOUS LENGTH SHALL BE REQUIREMENT TO THE WIDTH OF TRAFFIC LANES. CONNECTION ALLOWED AT LONGITUDINAL JOINTS WITH NOT LESS THAN 20 CM. OVERLAPPING SHALL BE REQUIRED.

NO.	DATE	REVISIONS	CHECKED	APPROVED
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HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
CONCRETE PAVEMENT

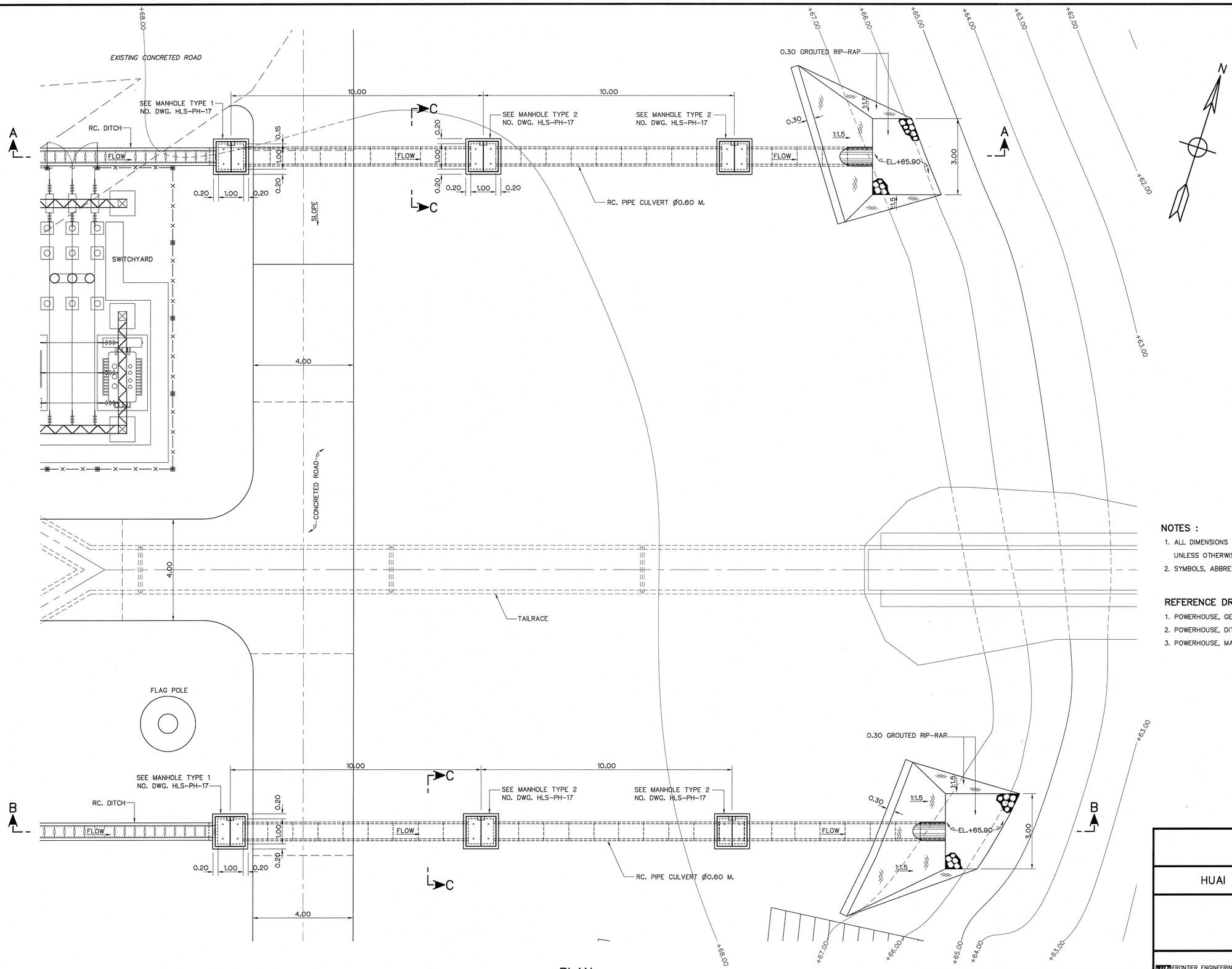
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

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MINISTRY OF ENERGY

DESIGNED	ส.ต.ท.6651	REVIEWED	S. KITICHAI
DRAWN		SUBMITTED	
CHECKED	ส.ต.ท.7324	RECOMMENDED	
PROJECT MANAGER	14/01/62 DATE	APPROVED	

DRAWING NO. HLS-PH-14

SHEET NO. 58 OF 71



PLAN
SCALE 1:75

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAY-OUT	HLS-PH-01
2. POWERHOUSE, DITCH SECTIONS AND DETAILS	HLS-PH-16
3. POWERHOUSE, MANHOLE AND DITCH REINFORCEMENT DETAILS	HLS-PH-17

0 1 2 3 4 5 6
SCALE 1:75 METERS

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
DITCH PLAN

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS | DEDE

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

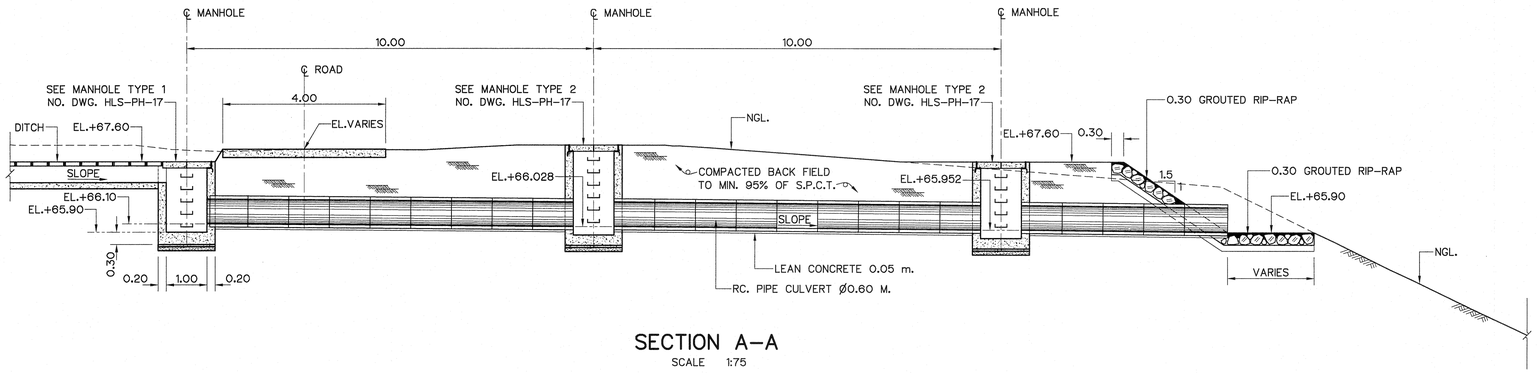
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED S. KITICHAI

DESIGNED ชย.6651
DRAWN
CHECKED ชย.7324
PROJECT MANAGER 14/01/62 DATE

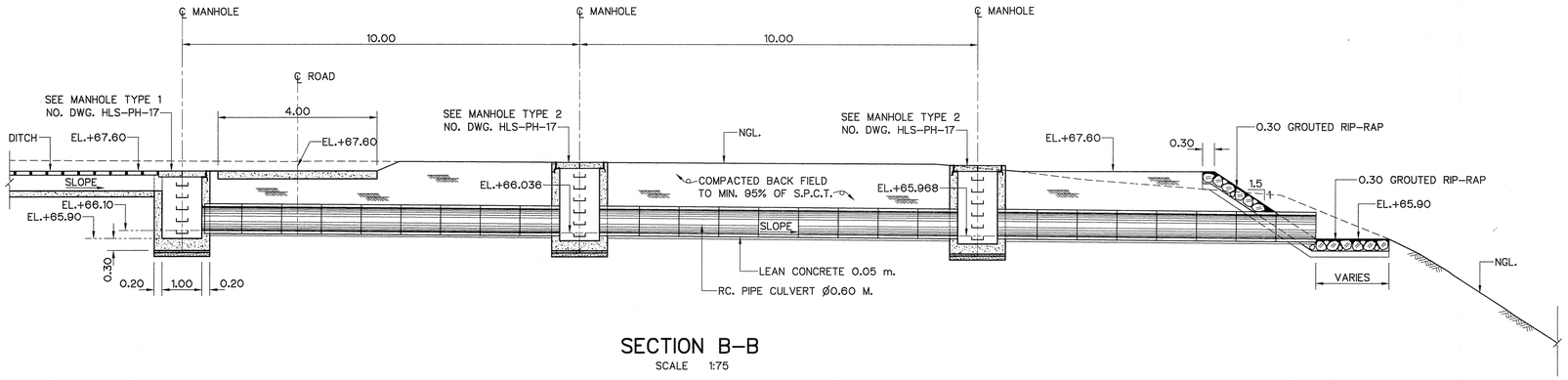
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HLS-PH-15
SHEET NO. 59 OF 71



SECTION A-A

SCALE 1:75



SECTION B-B

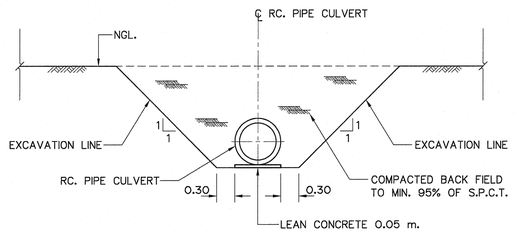
SCALE 1:75

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

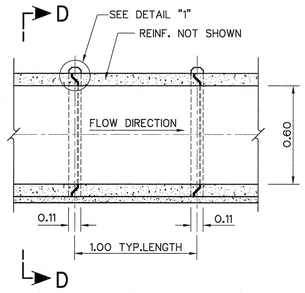
REFERENCE DRAWINGS :

1. POWERHOUSE, DITCH PLAN	HLS-PH-01
2. POWERHOUSE, MANHOLE AND DITCH REINFORCEMENT DETAILS	HLS-PH-17



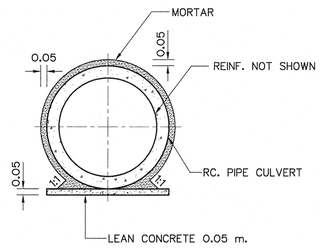
SECTION C-C

SCALE 1:50



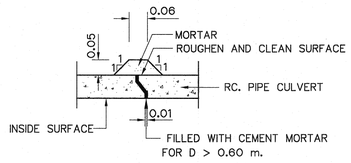
PIPE JOIT DETAIL

SCALE 1:25



SECTION D-D

SCALE 1:25



DETAIL "1"

SCALE 1:10

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8
SCALE 1:10 METERS

0 0.5 1.0 1.5 2.0
SCALE 1:25 METERS

0 0.5 1 2 3 4
SCALE 1:50 METERS

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

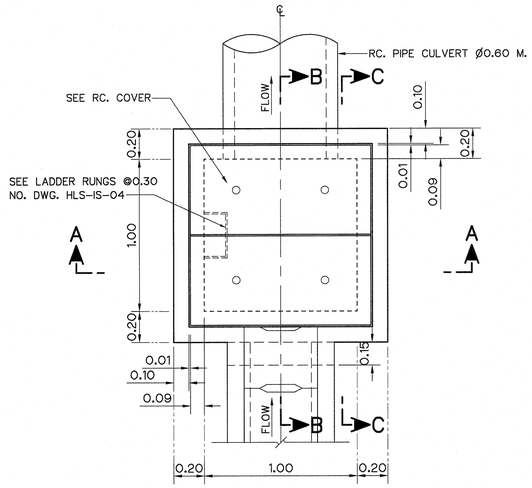
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
DITCH SECTIONS AND DETAILS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

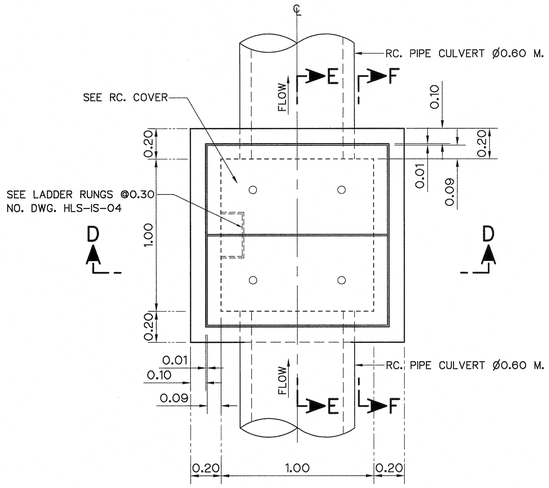
CONSULTANTS: FRONTIER ENGINEERING CONSULTANTS CO.,LTD.
DEDE: Department of Alternative Energy Development and Efficiency, MINISTRY OF ENERGY

DESIGNED	REI.6651
DRAWN	
CHECKED	REI.7324
PROJECT MANAGER	14/01/62 (DATE)
REVIEWED	S. KITICHAI
SUBMITTED	
RECOMMENDED	
APPROVED	
DRAWING NO.	HLS-PH-16
SHEET NO.	60 OF 71



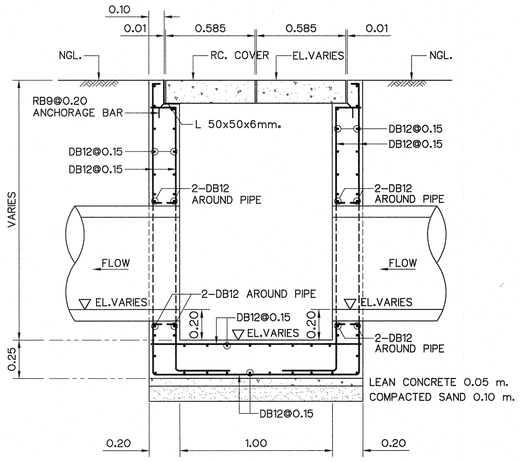
PLAN MANHOLE TYPE 1

SCALE 1:20



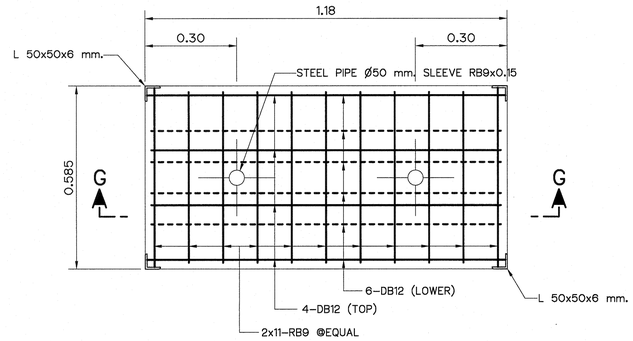
PLAN MANHOLE TYPE 2

SCALE 1:20



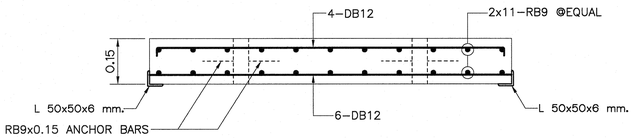
SECTION E-E

SCALE 1:20



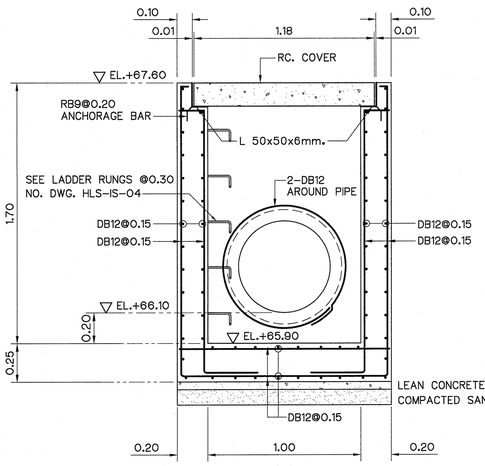
CONCRETE COVER DETAILS

SCALE 1:10



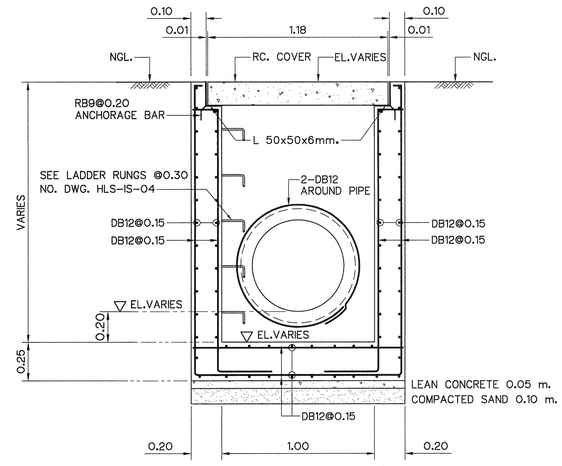
SECTION G-G

SCALE 1:10



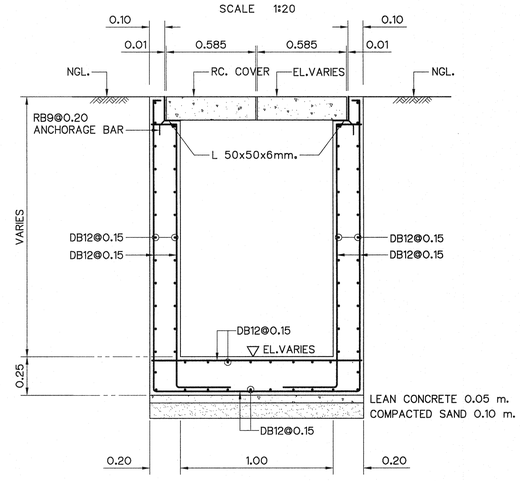
SECTION A-A

SCALE 1:20



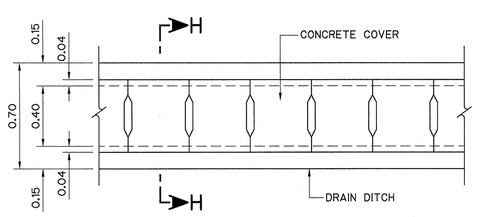
SECTION D-D

SCALE 1:20



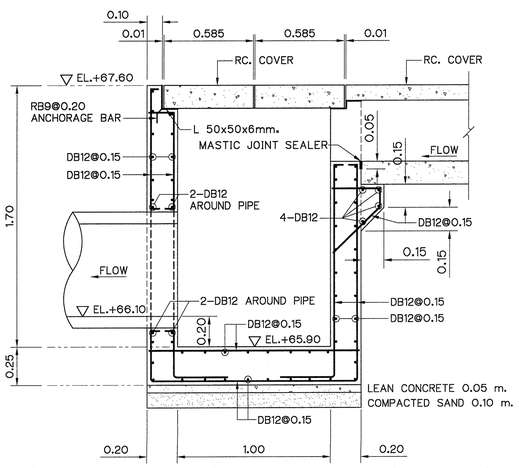
SECTION F-F

SCALE 1:20



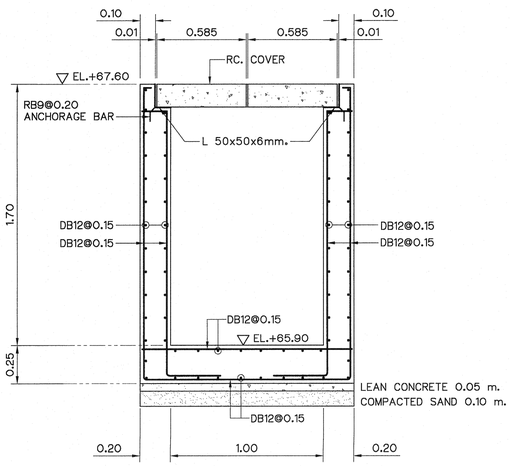
PLAN DITCH

SCALE 1:20



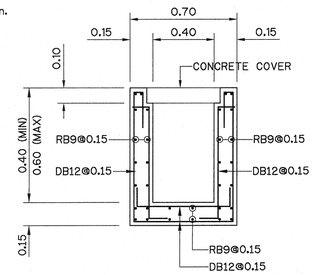
SECTION B-B

SCALE 1:20



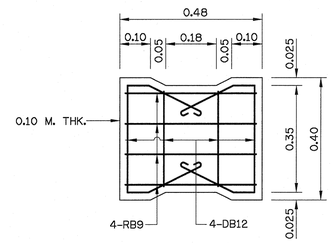
SECTION C-C

SCALE 1:20



SECTION H-H

SCALE 1:20



CONCRETE COVER

SCALE 1:10

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
3. ALLOWABLE BEARING CAPACITY OF POWERHOUSE FOUNDATION SHALL NOT BE LESS THAN 10 T/M.^{2}

REFERENCE DRAWINGS :

1. POWERHOUSE, PLAN AND ROOF PLAN	HLS-PH-02
2. POWERHOUSE, DITCH PLAN	HLS-PH-15
3. POWERHOUSE, DITCH SECTIONS AND DETAILS	HLS-PH-16

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8

SCALE 1:10 METERS

0 0.5 1 1.5

SCALE 1:20 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

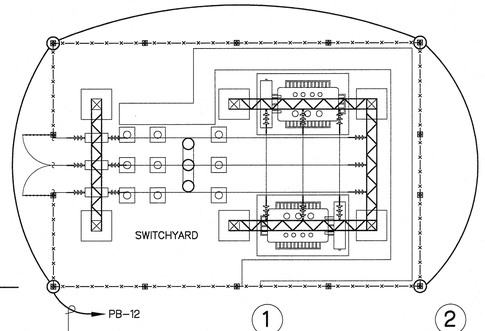
CIVIL WORKS
POWERHOUSE
MANHOLE AND DITCH REINFORCEMENT DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

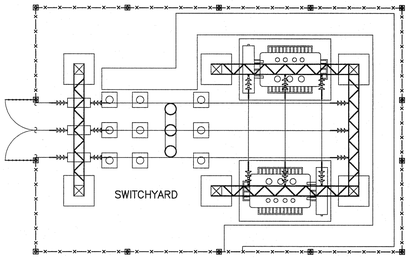
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

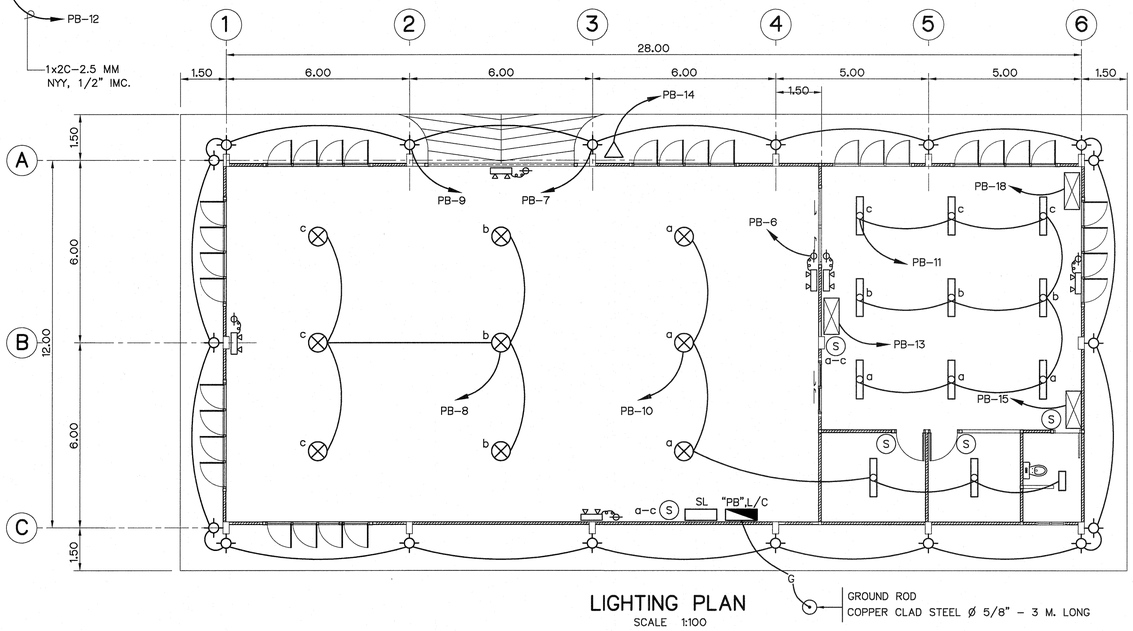
REVIEWED S. KITICHAI

DESIGNED	วิ.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	วิ.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO. HLS-PH-17	SHEET NO. 61 OF 71

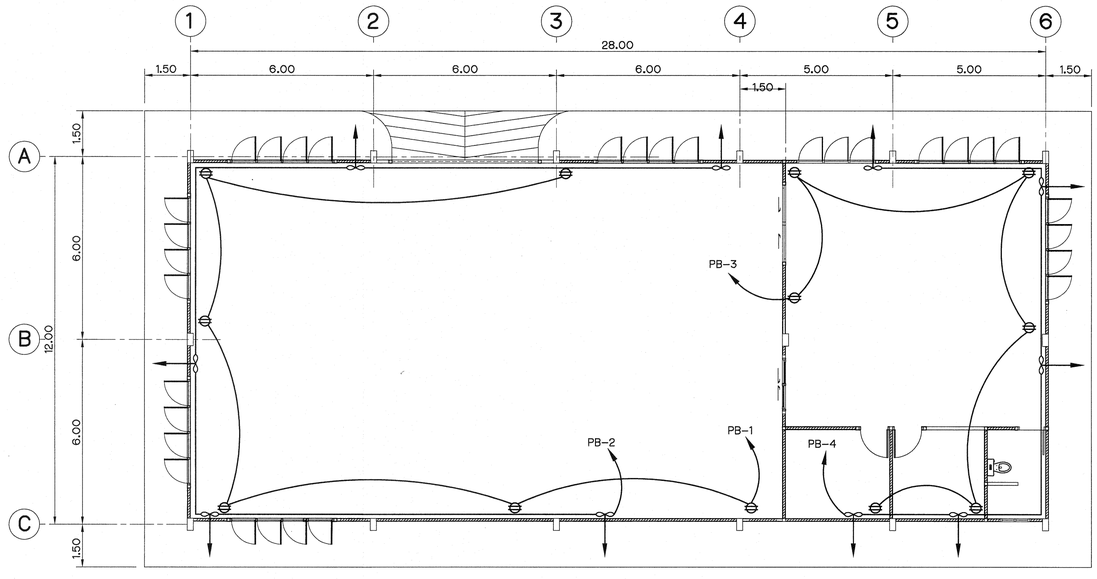


DONE BY
CONTRACTOR C2





LIGHTING PLAN
SCALE 1:100

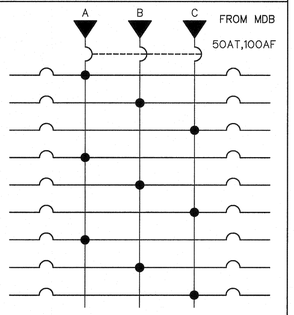


EXHAUST AND OUTLET PLAN
SCALE 1:100

DIAGRAM

LOCATION : MACHINE HALL — "PB" LOAD CENTER 3Ø 4W WITH MCCB. 3P 50AT 100AF (24 CKTS,BRANCH MCB 5 KAIC) IC > 10 KA AT 380 VOLT

CKT NO	DESCRIPTION	LOAD (VA) A	LOAD (VA) B	LOAD (VA) C	MCB POLE	MCB AT	CONDUCTOR SIZE(MM)^2	CONDUCTOR TYPE
1	RECEPTACLES	1080			1	15	2.5/1.5	THW 1C 1/2" PVC
3	RECEPTACLES		1080		1	15	2.5/1.5	THW 1C 1/2" PVC
5	SPARE				1	15	–	–
7	LIGHTING	540			1	10	2.5	THW 1C 1/2" PVC
9	LIGHTING		540		1	10	2.5	THW 1C 1/2" PVC
11	LIGHTING			1800	1	20	2.5	THW 1C 1/2" PVC
13	A/C 16,000 BTU/Hr	2000			1	20	4/4	THW 3/4" PVC
15	A/C 24,000 BTU/Hr		3300		1	30	6/6	THW 3/4" PVC
17	SPARE				1	30	–	–
2	EXHAUST FAN	600			1	10	2.5	THW 1C 1/2" PVC
4	EXHAUST FAN		600		1	10	2.5	THW 1C 1/2" PVC
6	EMERGENCY LIGHT			300	1	10	2.5	THW 1C 1/2" PVC
8	LIGHTING	840			1	10	2.5	THW 1C 1/2" PVC
10	LIGHTING		870		1	10	2.5	THW 1C 1/2" PVC
12	LIGHTING			240	1	10	2.5	THW 1C 1/2" PVC
14	LIGHTING	350			1	10	2.5	THW 1C 1/2" PVC
16	SPARE				1	10	–	–
18	A/C 24,000 BTU/Hr			3300	1	30	6/6	THW 3/4" PVC
		5,410	6,390	5,640				



TOTAL CONNECTED LOAD 17,440 VA
DEMAND FACTOR 75%
CALCULATED LOAD 13,080 VA

LEGENDS :

- 1 x 125 W MERCURY VAPOUR LAMP
- 2 x 36 W FLUORESCENT WITH ALUMINIUM ANODIZED REFLECTOR
- 1 x 36 W FLUORESCENT LUMINAIRE
- 1 x 18 W FLUORESCENT LUMINAIRE
- 250 W HIGH PRESSURE SODIUM FLOODLIGHT
- EXHAUST FAN Ø 10 inch.
- 2 x 25 W EMERGENCY LIGHT WITH BATTERY OPERATE RECEPTACLE
- AIR CONDITION , CEILING TYPE
- LOAD CENTER PANEL (PB)
- DUPLEX RECEPTACLE
- SIMPLEX RECEPTACLE
- POWER RECEPTACLE , 3Ø
- ONE WAY SWITCH, 15A ,1Ø , 250V
- 1 x 60 W INCANDESCENT, OUTDOOR LUMINAIRE

NOTE :

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. THE CONTRACTOR HAS TO SUBMIT THE SHOP DRAWING OF GROUNDING SYSTEM FOR APPROVAL.

0 1 2 3 4 5 6 7 8
SCALE 1:100 METERS

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
ELECTRICAL LIGHTING, EXHAUST AND OUTLET PLAN

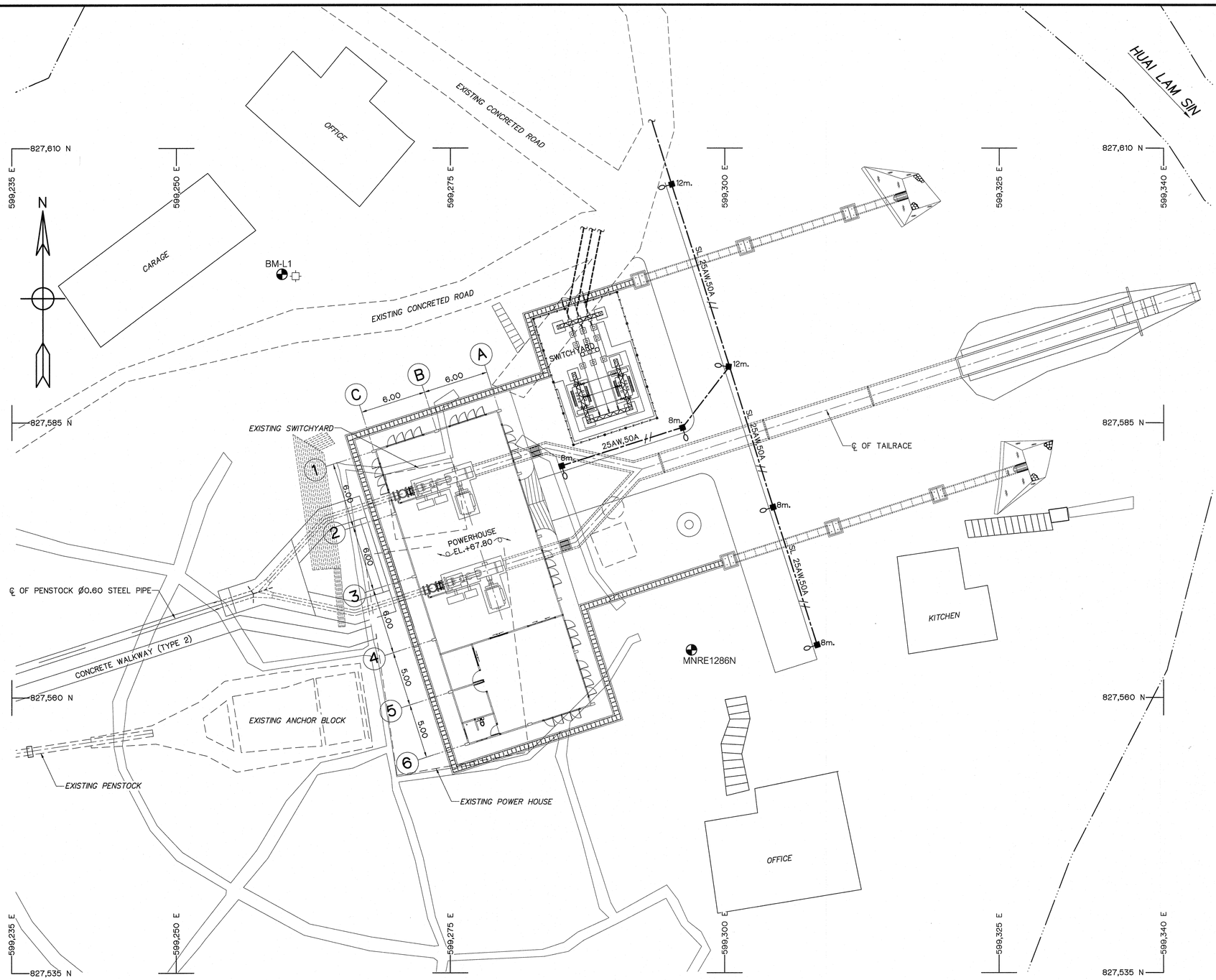
NO.	DATE	REVISIONS	CHECKED	APPROVED
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CONSULTANTS: FRONTIER ENGINEERING CONSULTANTS CO.,LTD.
DEDE: Department of Alternative Energy Development and Efficiency, MINISTRY OF ENERGY

REVIEWED S. KITICHAI
DESIGNED 23/1.1029
DRAWN
CHECKED 23/1.1029
SUBMITTED
RECOMMENDED
APPROVED

PROJECT MANAGER 14/01/62 DATE

DRAWING NO. HLS-PH-18
SHEET NO. 62 OF 71



EXTERIOR LIGHTING PLAN

SCALE 1:200

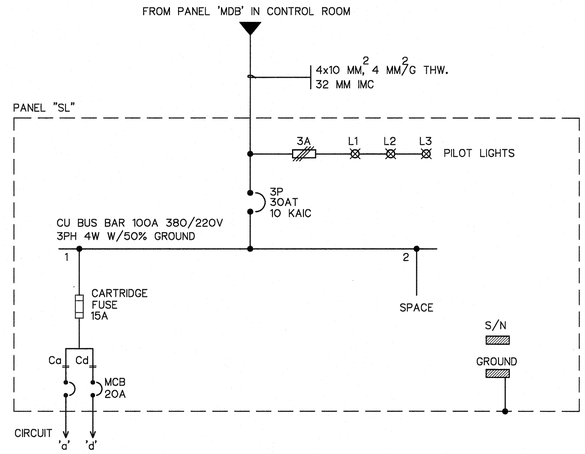
LEGENDS :

- 8, 12m — CONCRETE POLE, SUFFIX INDICATES HEIGHT OF POLE
- STREET LIGHTING FIXTURE, 1x125 W MERCURY LAMP, ON CONCRETE POLE
- CONCRETE POLE WITH GUY WIRE
- MAIN DISTRIBUTION PANEL
- (J) — JUNCTION BOX
- PB — WEATHERPROOF (WP) GALVANIZED STEEL PULL BOX
- SAFETY SWITCH OR DISCONNECT SWITCH, NEMA 3R ON CONCRETE POLE
- ----P---- PRIMARY LINES, 22 KV OVERHEAD BARE CONDUCTORS
- ///S—— SECONDARY LINES, 380/220 V 50 MM THW OVERHEAD INSULATED CABLES, 3Ø 4 WIRE
- —SL— STREET LIGHTING LINES
- CONCEALED WIRING IN CONDUIT IN CONCRETE STRUCTURE OR CABLE TRENCH
- POWER CABLE DROP FOR ELECTRICAL SUPPLY TO BUILDING 3Ø OR 1Ø
- UNDERGROUND WIRING IN CONDUIT
- LV. CABLE, ABOVE GROUND
- SPACE AERIAL CABLE 50 mm.
- GUY
- TRANSFORMER 500 kVA.
- CIRCUIT BREAKER 22 kV.

NOTES :

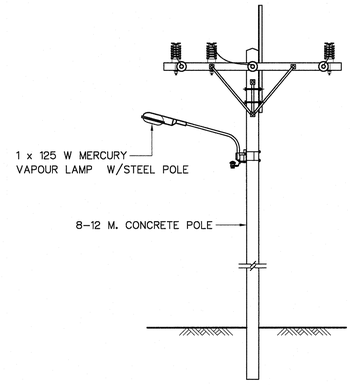
1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. ALL CONCRETE POLES, HARDWARES, TRANSFORMER, AND INSTALLATION SHALL STRICTLY CONFORM TO PEA'S STANDARD AND REGULATIONS.
3. SPLICING OF CABLES IS NOT ALLOWED IN CONDUITS OR HAND HOLES EXCEPT AT JUNCTION BOXES OR PULL BOXES ABOVE GROUND LEVEL WITH APPROVED SPLICING FITTINGS.

0 5 10 15
SCALE 1:200 METERS



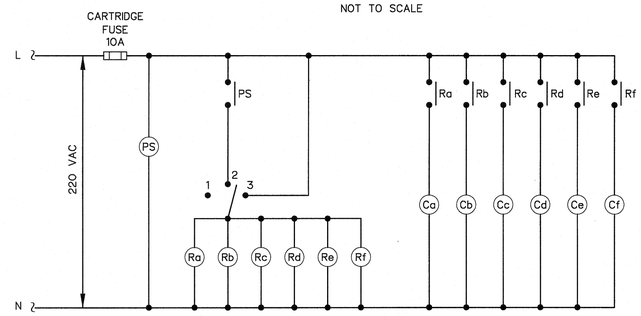
SINGLE LINE DIAGRAM OF PANEL "SL"

NOT TO SCALE



DETAIL OF STREET LIGHTING

NOT TO SCALE



STREET LIGHTING CONTROL DIAGRAM

NOT TO SCALE

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
EXTERIOR LIGHTING PLAN

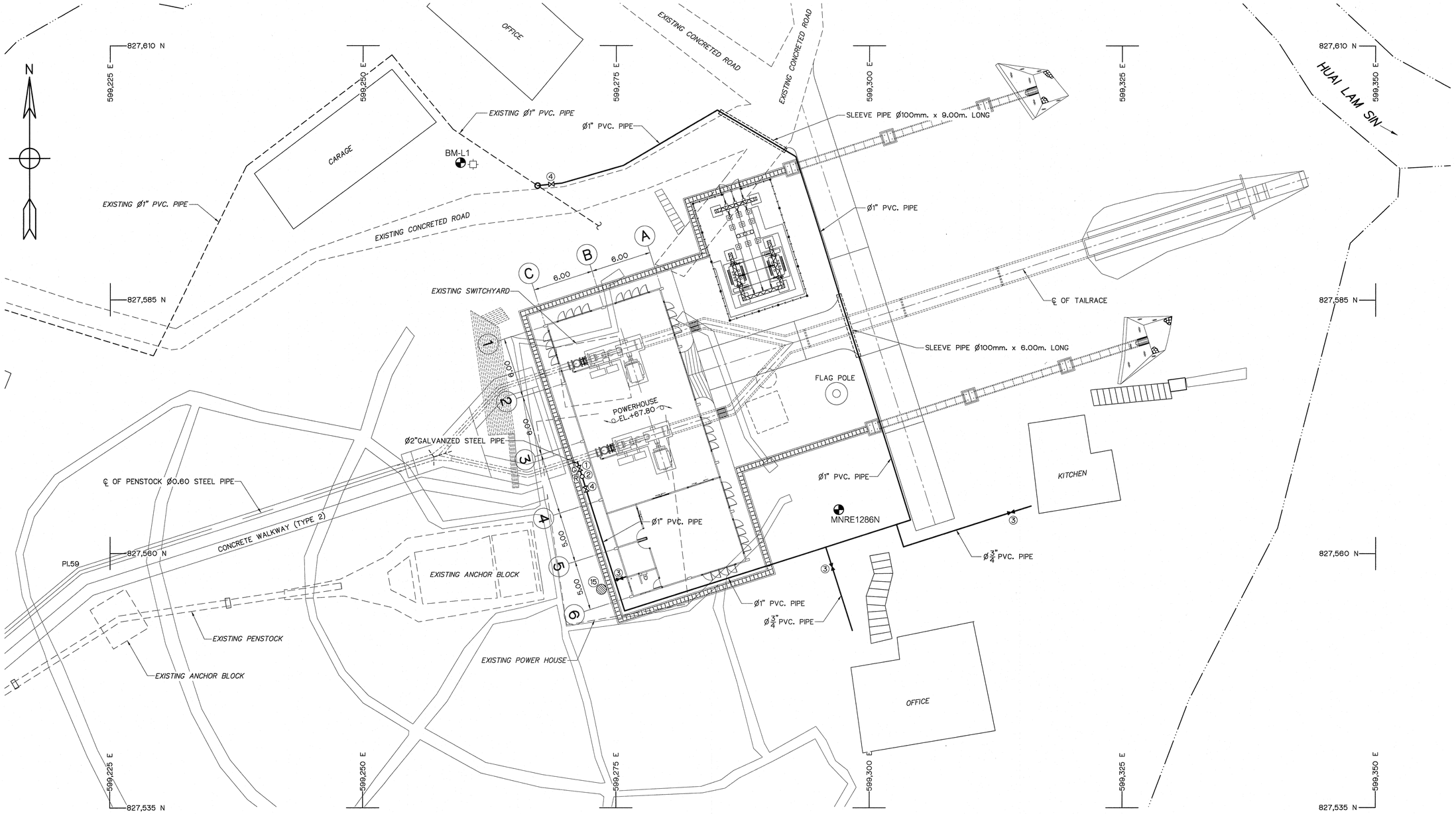
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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1				

CONSULTANTS: FRONTIER ENGINEERING CONSULTANTS CO.,LTD.
DEDE: Department of Alternative Energy Development and Efficiency, MINISTRY OF ENERGY

DESIGNED ฉพก.1029
DRAWN
CHECKED ฉพก.1029
PROJECT MANAGER 14/01/62 DATE

REVIEWED S. KITICHAI
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HLS-PH-19
SHEET NO. 63 OF 71



WATER SUPPLY PIPELINE SYSTEM LAY OUT

SCALE 1:200

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

REFERENCE DRAWINGS :

1. POWERHOUSE, PIT VALVE, FIELD TAP AND SLOPE PROTECTION DETAILS — HLS-PH-21

LEGENDS :

1. GATE VALVE Ø100mm.
2. PRESSURE REDUCING VALVE Ø100mm.
3. GATE VALVE Ø3/4"
4. GATE VALVE Ø1"
5. STAINLESS STEEL WATER TANK ⩾ 1.00 CU.M.

0 5 10 15
SCALE 1:200 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
WATER SUPPLY PIPELINE SYSTEM LAY-OUT

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED S.KITICHAI

DESIGNED ศิริ.6651 — SUBMITTED

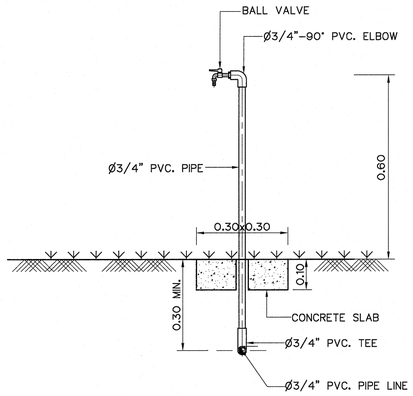
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CHECKED ศิริ.7324 — APPROVED

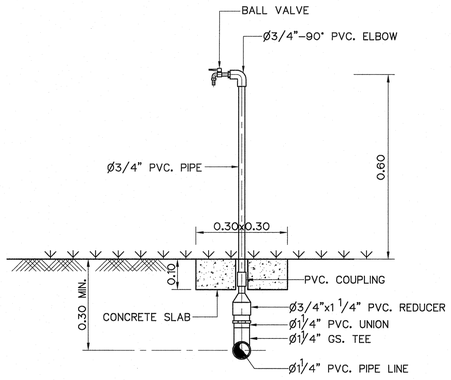
PROJECT MANAGER — 14/01/62 DATE

DRAWING NO. HLS-PH-20

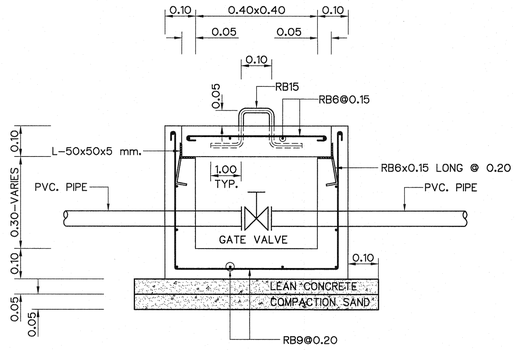
SHEET NO. 64 OF 71



FIELD TAP TYPICAL INSTALLATION DETAIL "1"
SCALE 1:10



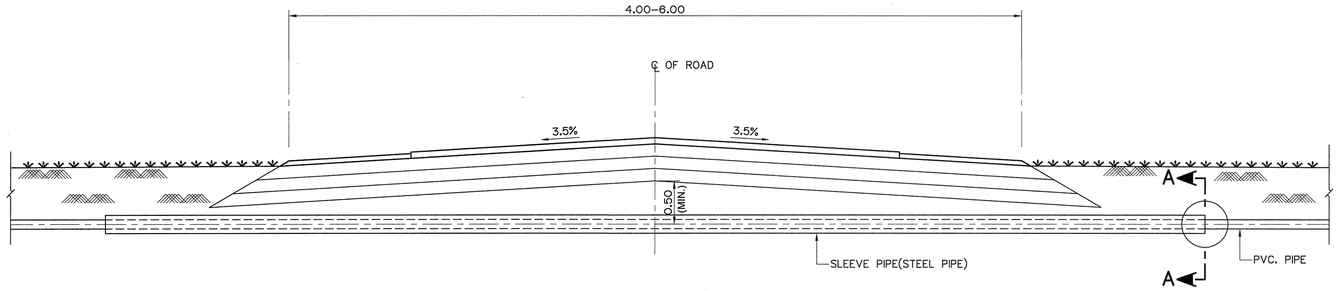
FIELD TAP TYPICAL INSTALLATION DETAIL "2"
SCALE 1:10



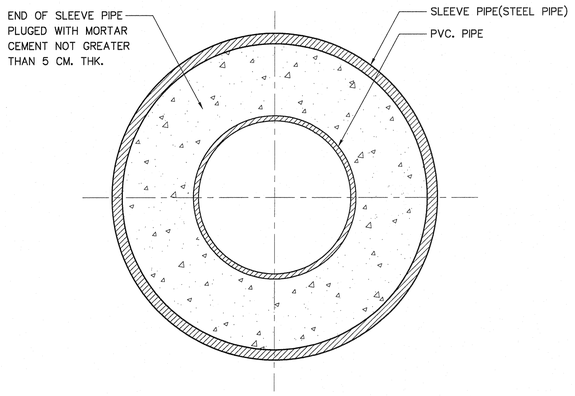
PIT VALVE DETAIL
SCALE 1:10

DIMENSIONS OF SLEEVE PIPE (STEEL PIPE)

SIZE OF WATER SUPPLY PIPE (MM.)	SIZE OF SLEEVE PIPE (MM.)	THICKNESS (MM.)
20 (3/4")	100	2.65
25 (1")	100	2.65
35 (1 1/4")	100	2.65
40 (1 1/2")	100	2.65
55 (2")	100	2.65
60 (2 1/2")	150	3.45
80 (3")	150	3.45



TYPICAL SECTION FOR SLEEVE PIPE INSTALLATION
SCALE 1:25



SECTION A-A
SCALE 1:25

NOTES :

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. REINFORCING BARS ARE IN MILLIMETERS
3. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 175 KSC. FOR STANDARD CYLINDER AT 28 DAYS
4. REINFORCING STEEL SHALL CONFORM TO SR24, TIS 20-2559

REFERENCE DRAWINGS :

1. POWERHOUSE, WATER SUPPLY PIPELINE SYSTEM LAY-OUT HLS-PH-20

0 0.5 0.8
SCALE 1:10 METERS

0 0.5 1.0 1.5 2.0
SCALE 1:25 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
PIT VALVE, FIELD TAP
AND SLEEVE PIPE DETAILS

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MINISTRY OF ENERGY

REVIEWED S.KITICHAI

DESIGNED 21.6651 SUBMITTED

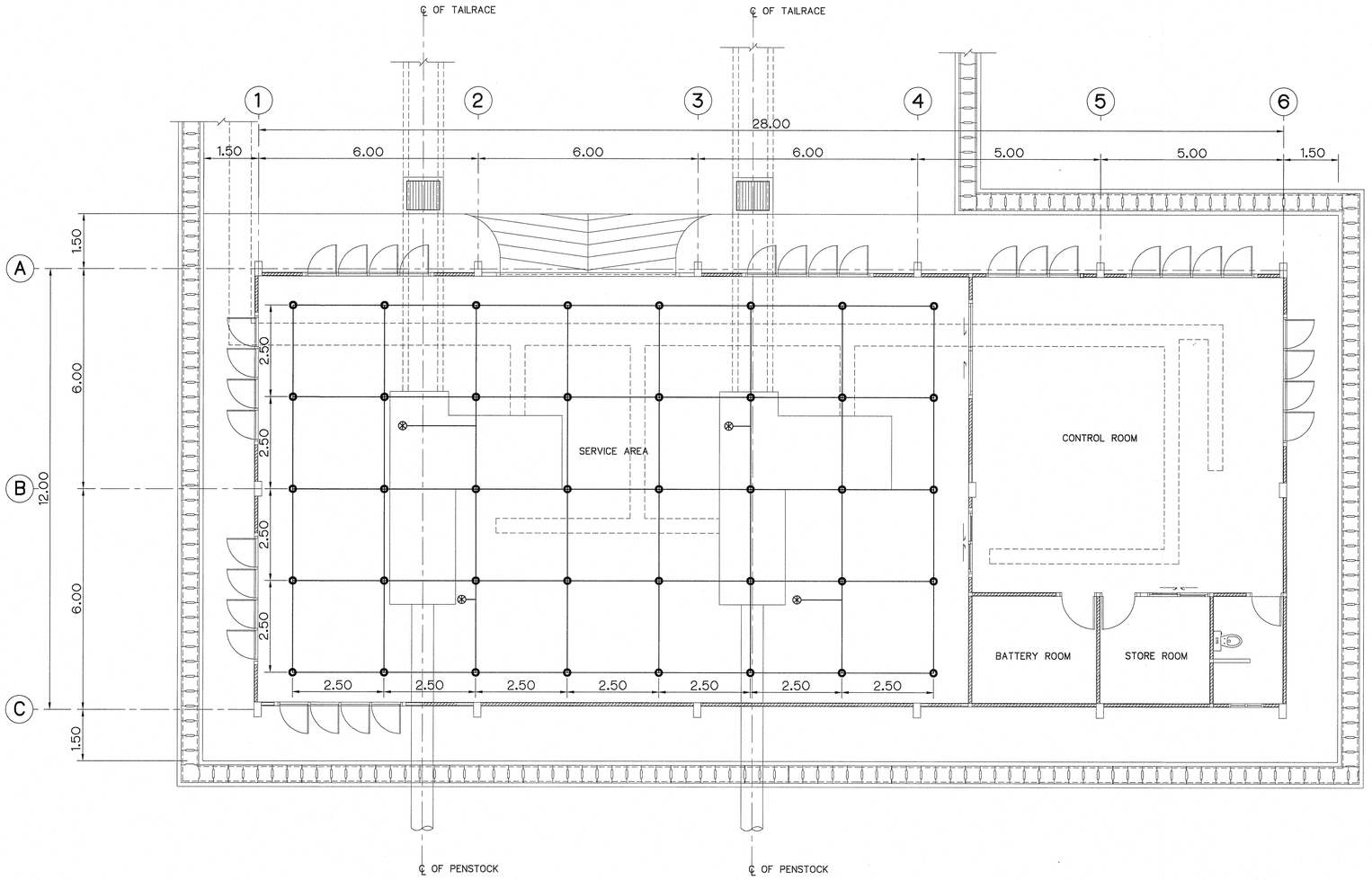
DRAWN RECOMMENDED

CHECKED 21.7324 APPROVED

PROJECT MANAGER 14/01/62 DATE

DRAWING NO. HLS-PH-21

SHEET NO. 65 OF 71



GROUNDING SYSTEM PLAN

SCALE 1:75

LEGENDS :

- GROUND ROD
- GROUND POINT FOR POWER PLANT EQUIPMENT GROUNDING
- BARE CUPPER CONDUCTOR

NOTES :

1. GROUNDING CONDUCTOR, TAP AND RISER FROM GROUNDING NETWORK TO POWER EQUIPMENT SHALL BE FORMED BY BARE COPPER CONDUCTOR NOT LESS THAN 95 SQ.MM.
2. GROUNDING SYSTEM RESISTANCE WILL NOT EXCEED 5 OHM.
3. CONNECTOR TO WITH IN & BETWEEN THE GROUNDING NETWORK TO POWER PLANT EQUIPMENT WILL BE MADE BY THERMAL CADWELD
4. GROUND ROD WILL BE COPPER COVER STEEL DIAMETER 15.87 MM. 2,400 MM. LONG
5. THIS DRAWING USE FOR GUIDE ONLY

0 0.5 1.0 2.0 3.0 4.0 6.0

SCALE 1:75 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

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MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
GROUNDING SYSTEM

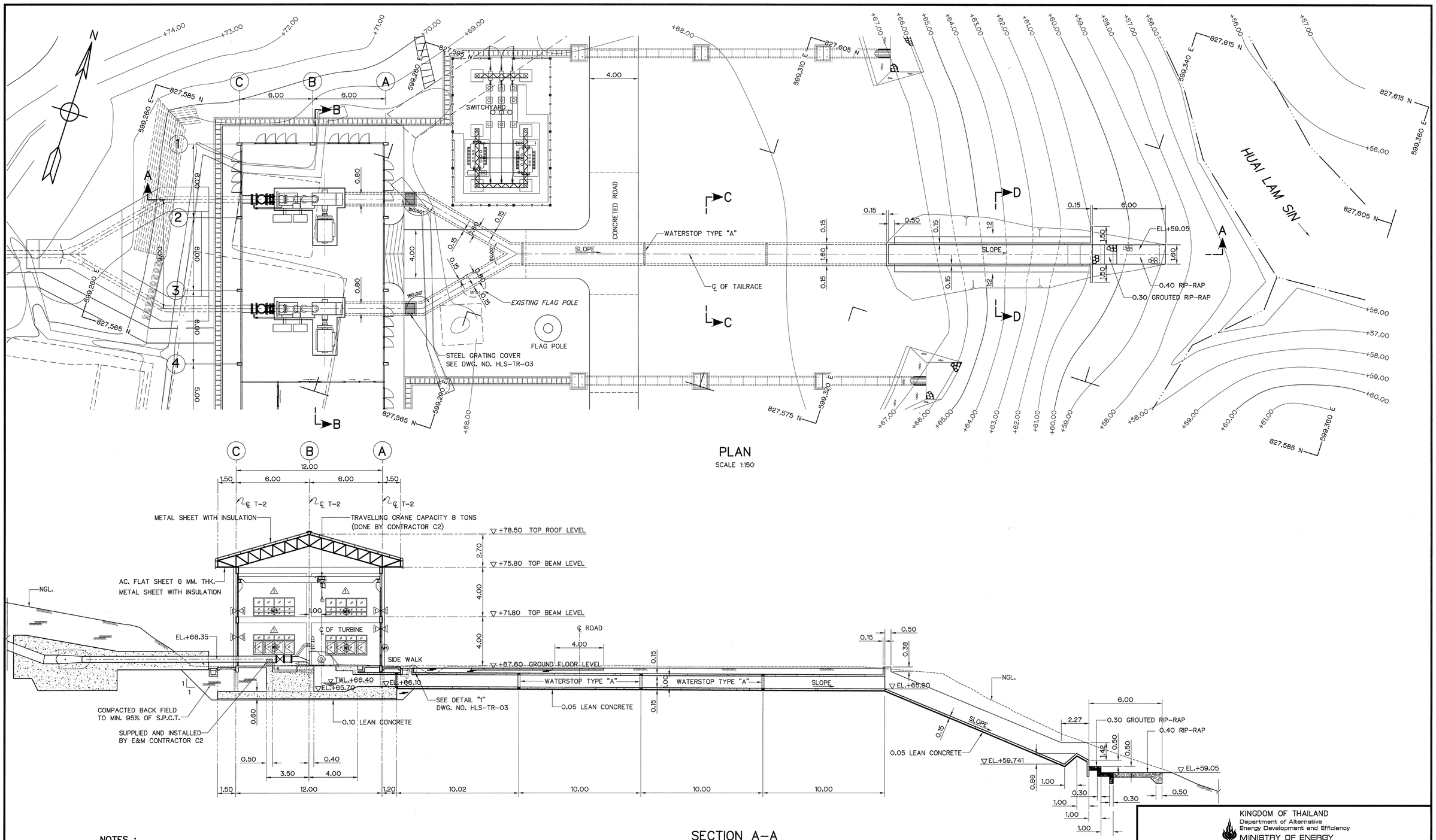
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Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

DESIGNED	๗พ.1029	REVIEWED	S. KITICHAI
DRAWN		SUBMITTED	
CHECKED	๗พ.1029	RECOMMENDED	
PROJECT MANAGER	14/01/62 DATE	APPROVED	

DRAWING NO. HLS-PH-22

SHEET NO. 66 OF 71



PLAN

SCALE 1:150

SECTION A-A

SCALE 1:150

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
3. TURBINE & GENERATOR FOUNDATIONS, TRENCH AND BLOCKOUT SIZES AND LOCATIONS ARE ONLY APPROXIMATE. THE ELECTRO-MECHANICAL CONTRACTOR IS REQUIRED TO SUBMIT THE SHOP DRAWINGS INDICATED ALL FINAL SIZES AND LOCATIONS TO FIELD ENGINEER

REFERENCE DRAWINGS :

1. TAILRACE, SECTIONS B-B, C-C AND D-D HLS-TR-02

SCALE 1:150 METERS

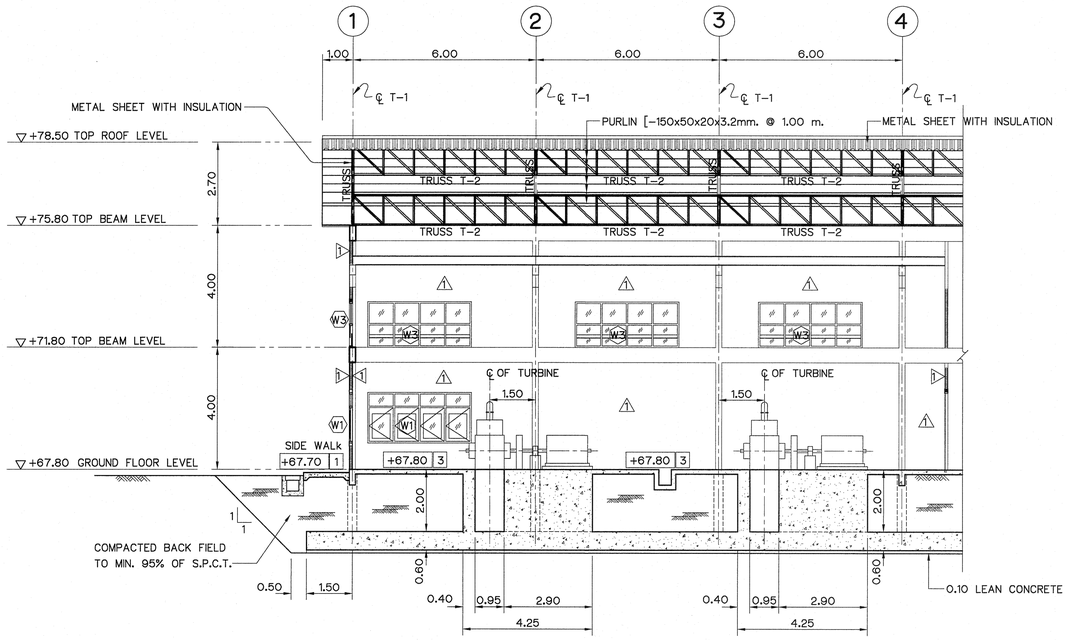
NO.	DATE	REVISIONS	CHECKED	APPROVED
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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

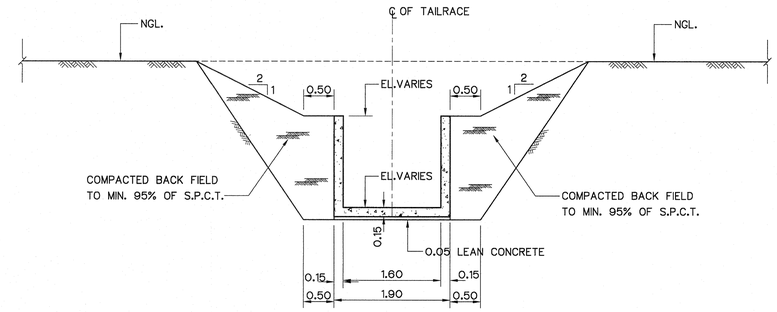
CIVIL WORKS
TAILRACE
PLAN AND SECTION A-A

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED S. KITICHAI
DESIGNED	SUBMITTED
DRAWN	RECOMMENDED
CHECKED 2อ.7324	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS-TR-01 / SHEET NO. 67 OF 71



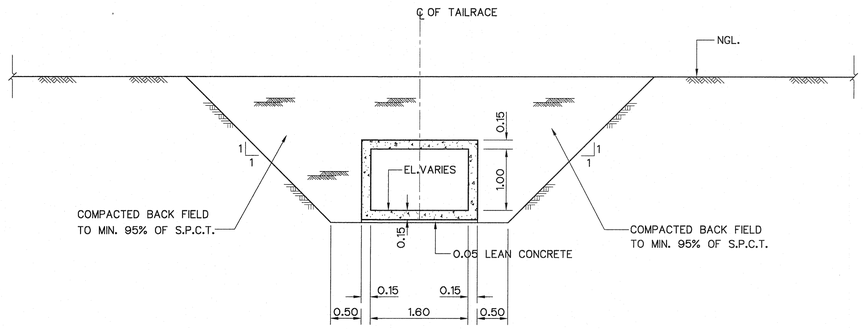
SECTION B–B

SCALE 1:100



SECTION D–D

SCALE 1:50



SECTION C–C

SCALE 1:50

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
3. TURBINE & GENERATOR FOUNDATIONS, TRENCH AND BLOCKOUT SIZES AND LOCATIONS ARE ONLY APPROXIMATE. THE ELECTRO-MECHANICAL CONTRACTOR IS REQUIRED TO SUBMIT THE SHOP DRAWINGS INDICATED ALL FINAL SIZES AND LOCATIONS TO FIELD ENGINEER

REFERENCE DRAWINGS :

1. TAILRACE, PLAN AND SECTION — HLS-TR-01

0 1 2 4 6 8
SCALE 1:100 METERS

0 0.5 1 2 3 4
SCALE 1:50 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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	CONSULTANTS		DEDE	

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
TAILRACE
SECTIONS B–B, C–C AND D–D

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED S.KITICHAI

DESIGNED ส.ย.6651 — SUBMITTED

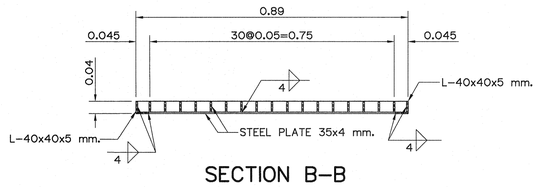
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CHECKED ส.ย.7324 — APPROVED

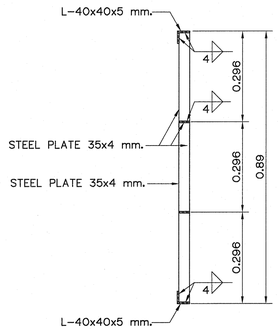
PROJECT MANAGER — 14/01/62 DATE

DRAWING NO. HLS-TR-02

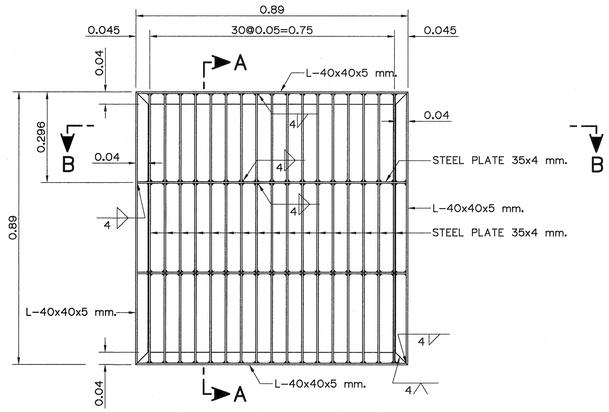
SHEET NO. 68 OF 71



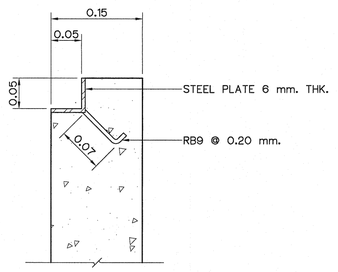
SECTION B-B
SCALE 1:10



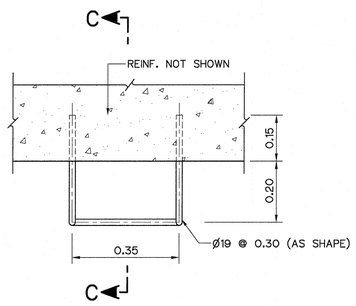
SECTION A-A
SCALE 1:10



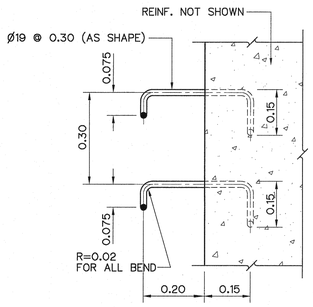
DETAIL OF STEEL GRATING COVER
SCALE 1:10



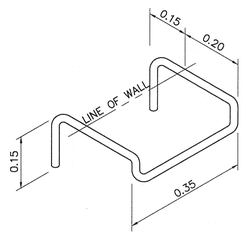
DETAIL "1"
SCALE 1:5



PLAN



SECTION C-C



ISOMETRIC VIEW

DETAIL OF LADDER RUNGS
NOT TO SCALE

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

0 0.05 0.1 0.2 0.3 0.4
SCALE 1:5 METERS

0 0.1 0.2 0.4 0.6 0.8
SCALE 1:10 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
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MINISTRY OF ENERGY

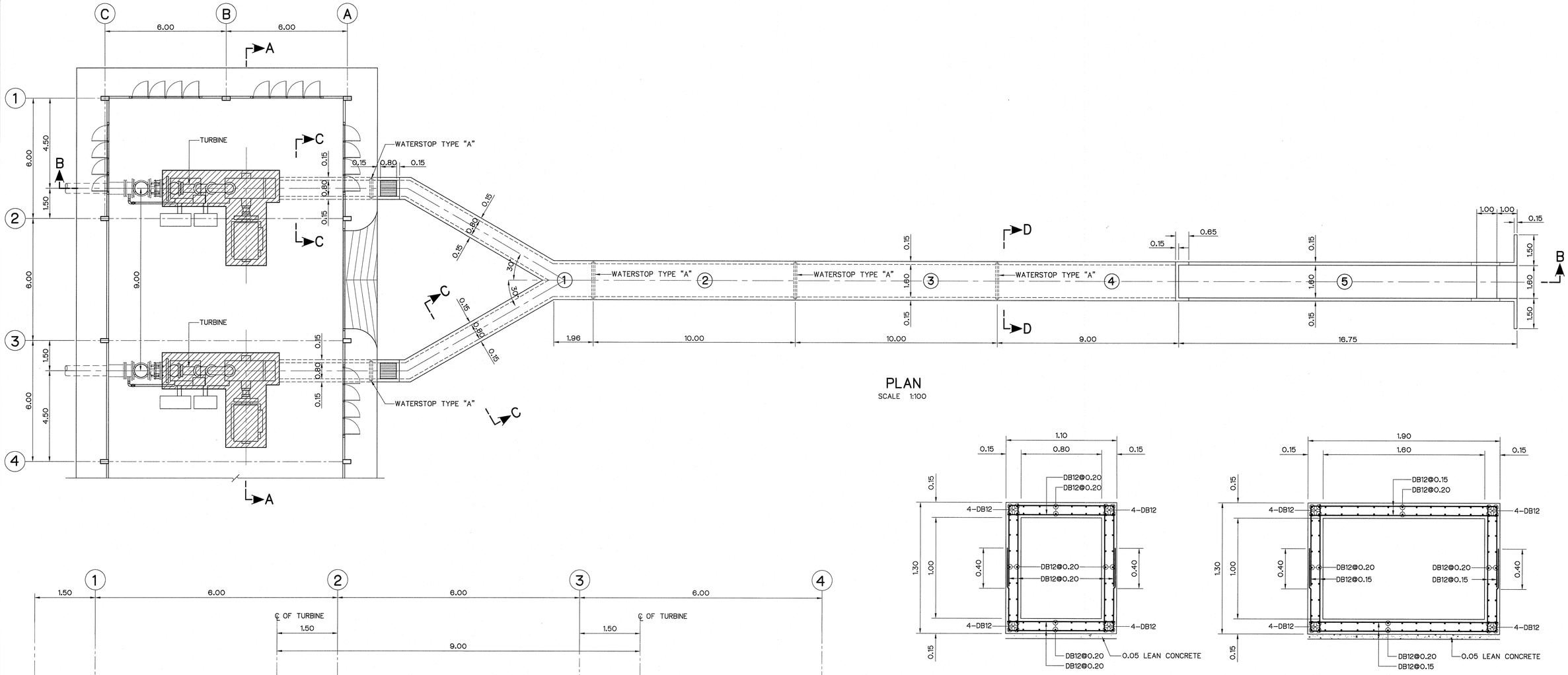
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
TAILRACE
GRATING COVER AND LADDER RUNGS DETAILS

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

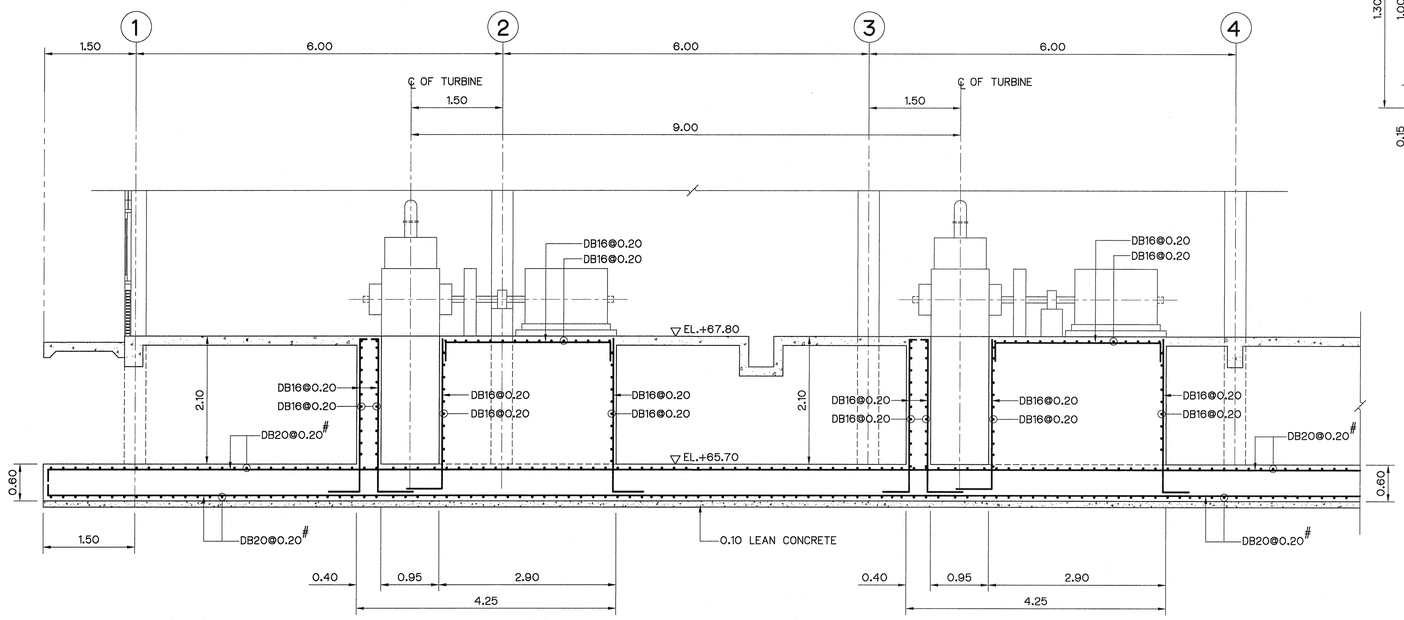
REVIEWED S. KITICHAI
DESIGNED วิ.6651
DRAWN
CHECKED วิ.7324
PROJECT MANAGER 14/01/62 DATE
SUBMITTED
RECOMMENDED
APPROVED
DRAWING NO. HLS-TR-03
SHEET NO. 69 OF 71



PLAN
SCALE 1:100

SECTION C–C
SCALE 1:20

SECTION D–D
SCALE 1:20



SECTION A–A
SCALE 1:50

SCALE 1:20 METERS

SCALE 1:50 METERS

SCALE 1:100 METERS

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

REFERENCE DRAWINGS :

1. TAILRACE, PLAN	HLS-TR-01
2. TAILRACE, REINFORCEMENT DETAILS (SHEET 2/2)	HLS-TR-05
3. POWERHOUSE, CABLE TRENCH DETAILS	HLS-PH-13

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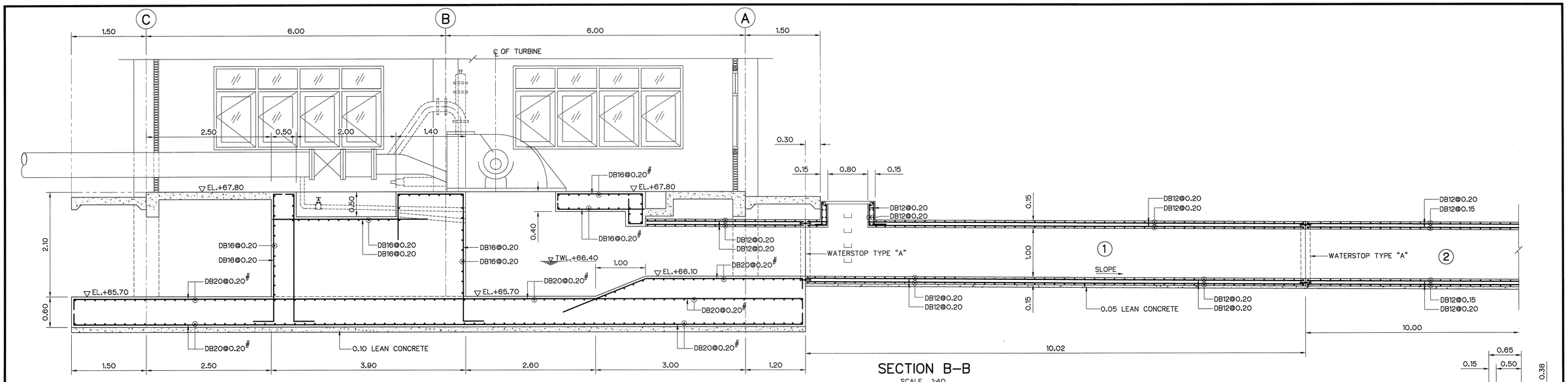
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
TAILRACE
REINFORCEMENT DETAILS (SHEET 1/2)

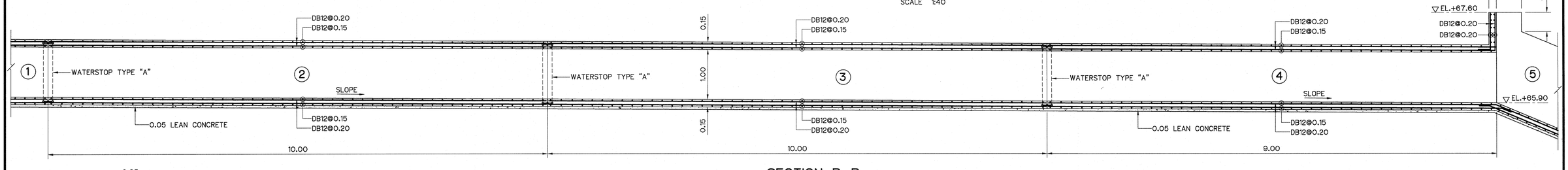
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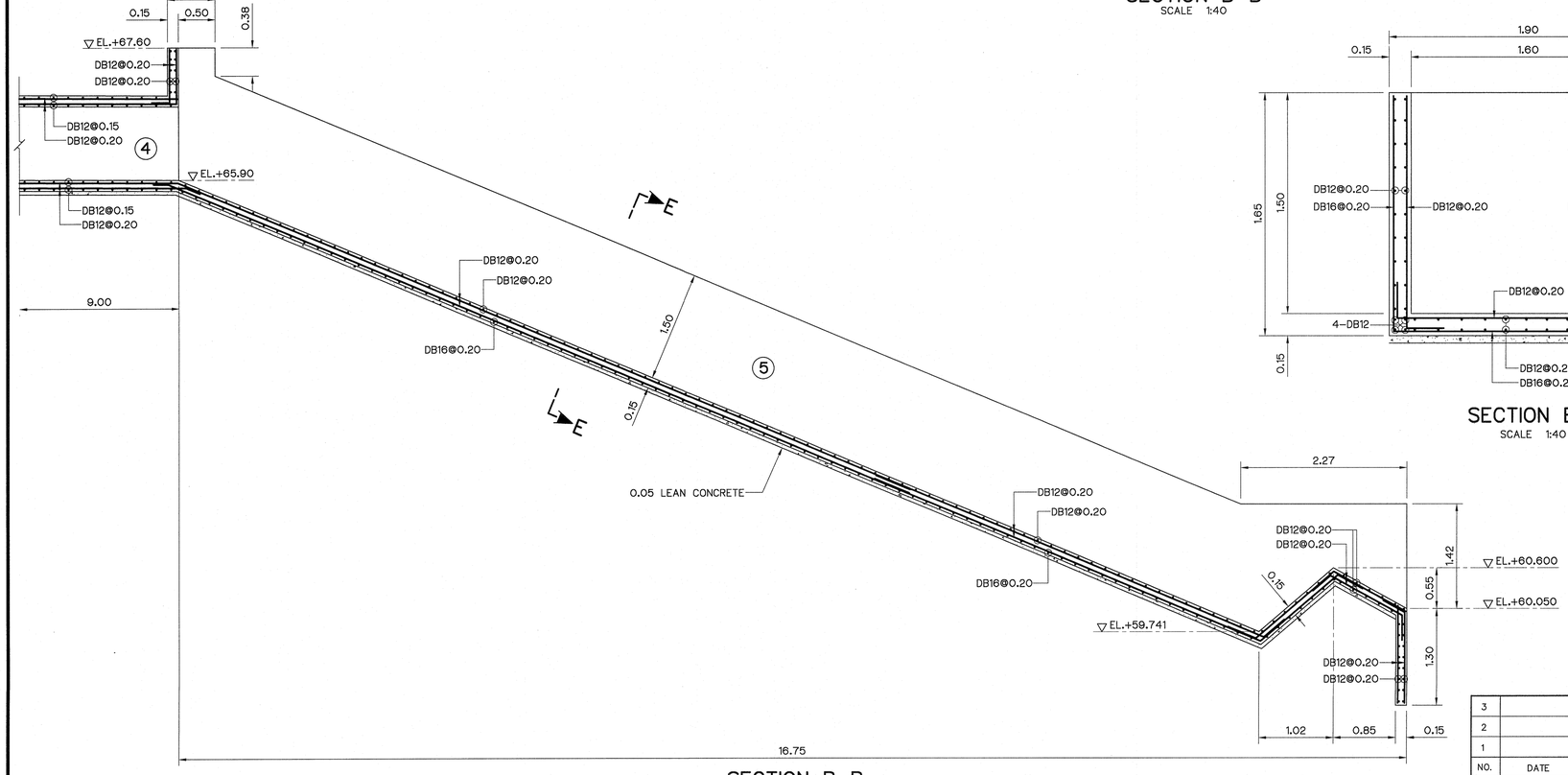
REVIEWED	S.KITICHAI		
DESIGNED	สม.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สม.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO.	HLS-TR-04
		SHEET NO.	70 OF 71



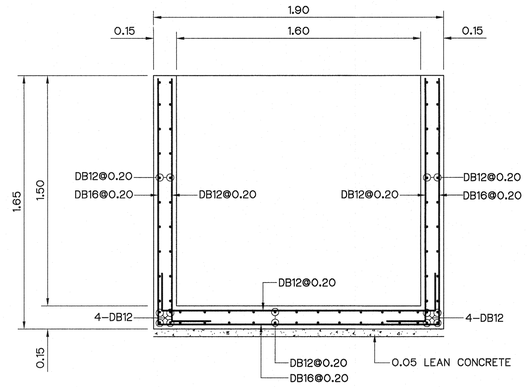
SECTION B–B
SCALE 1:40



SECTION B–B
SCALE 1:40



SECTION B–B
SCALE 1:40



SECTION E–E
SCALE 1:40

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS–GN–03

REFERENCE DRAWINGS :

1. TAILRACE, PLAN — HLS–TR–01
2. TAILRACE, REINFORCEMENT DETAILS (SHEET 1/2) — HLS–TR–04

0 0.5 1 1.5
SCALE 1:20 METERS

0 0.5 1 2 3
SCALE 1:40 METERS

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MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
TAILRACE
REINFORCEMENT DETAILS (SHEET 2/2)

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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DESIGNED	สย.6651	REVIEWED	S.KITTICHAI
DRAWN		SUBMITTED	
CHECKED	สย.7324	RECOMMENDED	
PROJECT MANAGER	14/01/62	APPROVED	
	DATE	DRAWING NO.	HLS–TR–05
		SHEET NO.	71 OF 71