



Department of Alternative
Energy Development and Efficiency
MINISTRY OF ENERGY

PHLUANG 2 MINI HYDROPOWER PROJECT

AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI

PART 1 : CIVIL WORKS

PART 2 : ELECTRO-MECHANICAL EQUIPMENT

PART 3 : TRANSMISSION LINE

VOLUME 4

DRAWINGS



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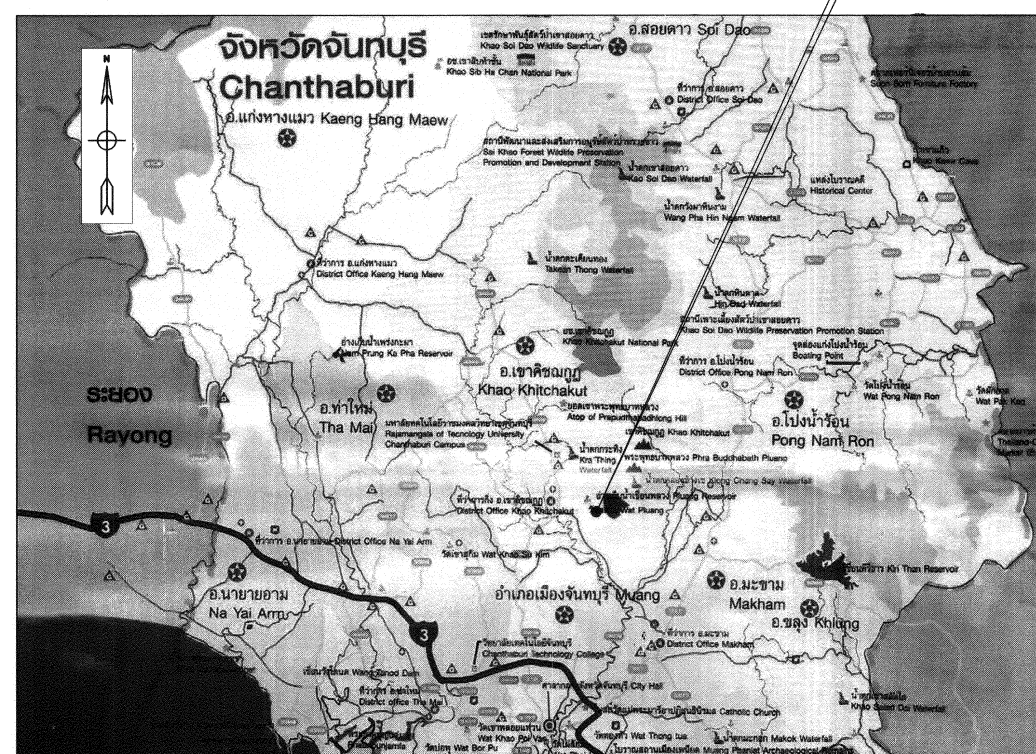
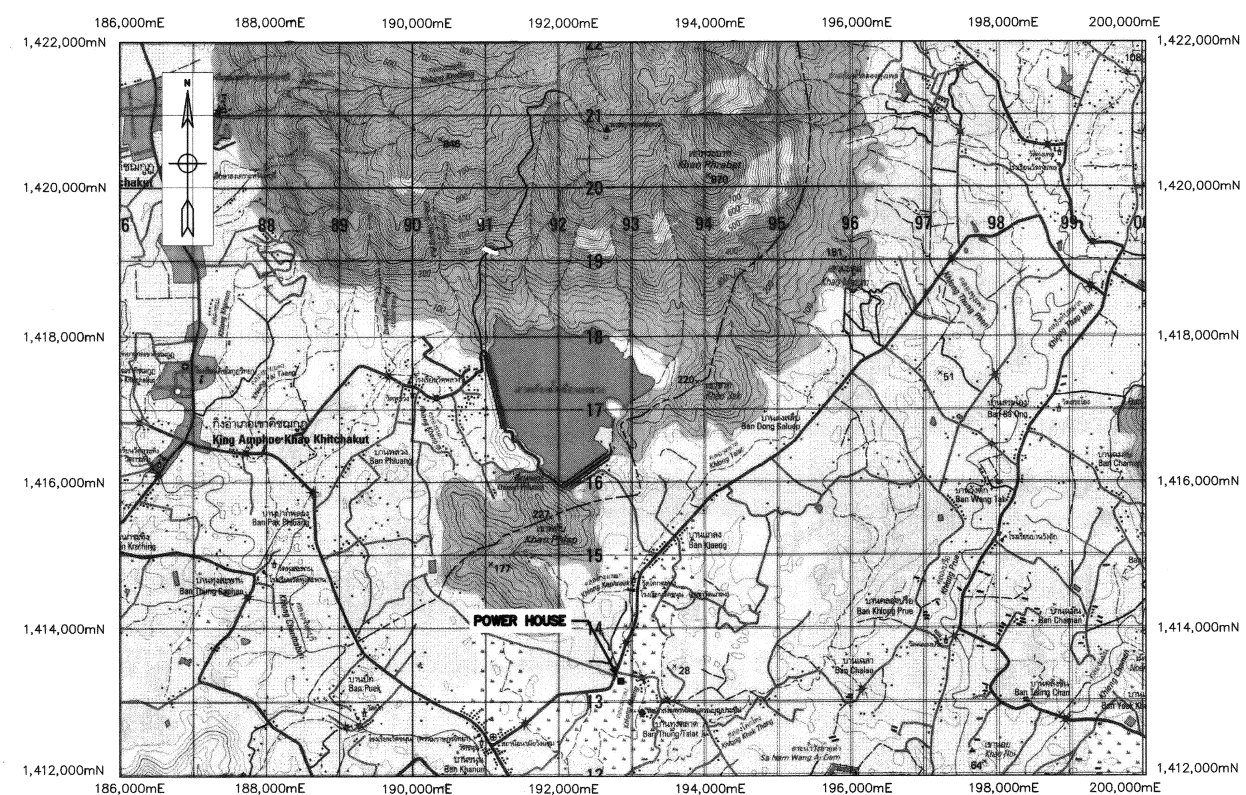
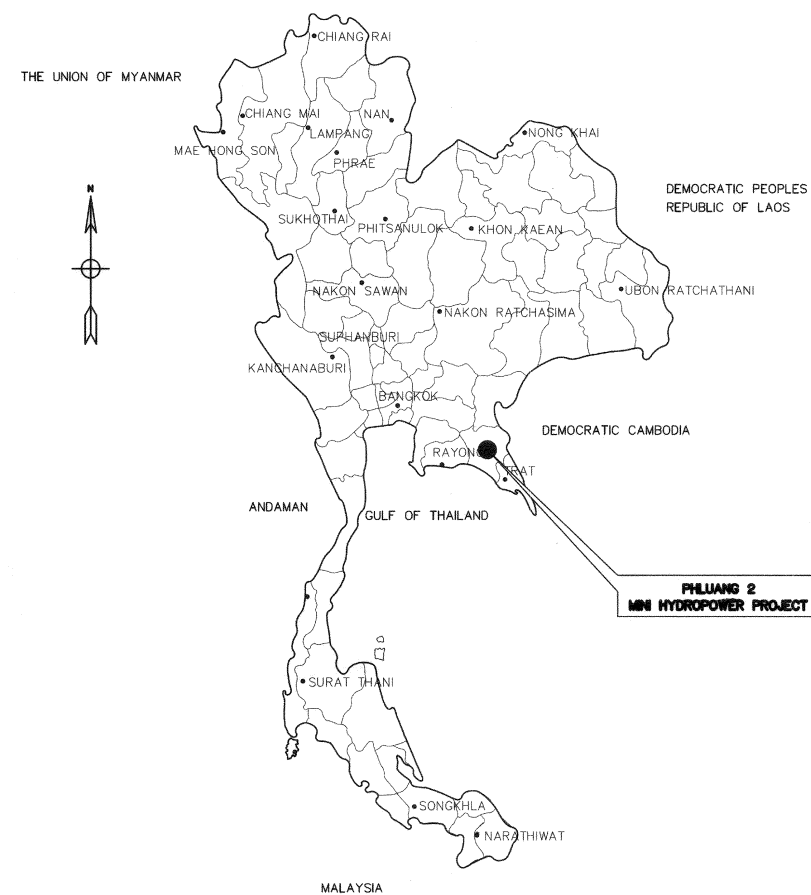
PHLUANG 2 MINI HYDROPOWER PROJECT

LIST OF DRAWINGS

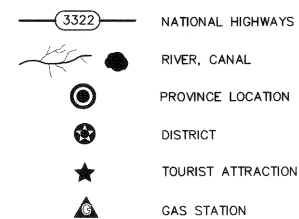
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SHEET NO.	DRAWING NO.	DRAWING DETAILS
อาคารโรงสูบน้ำ		
1	AS-TP-PS-001	LAYOUT PLAN, ประตูน้ำ
2	AS-TP-PS-003	PLAN บ่อรับน้ำ : พื้นและกำแพง LINE 1-6 และ A-J
3	AS-TP-PS-004	รูปตัดตามยาว รูปตัด ก-ก
4	AS-TP-EE-004	แปลนไฟฟ้าแรงสูงวาง บริเวณสถานีสูบน้ำ

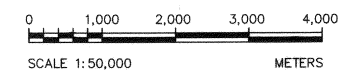


LEGEND :



NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METRES, DISTANCES ARE IN KILOMETRES, UNLESS OTHERWISE SHOWN.
2. SITE LOCATION MAP IS BASED ON THE HIGHWAY MAP 1:1,000,000 SCALE, PUBLISHED BY TOURISM AUTHORITY OF THAILAND.
3. THE MAP OF KLONG THUNG PHEN 2 HYDROPOWER SITE AND RESERVOIR IS BASED ON TOPOGRAPHIC MAPS, SCALE 1:50,000 (SHEET 5434IV WGS 84) PUBLISHED BY THE ROYAL THAI SURVEY DEPARTMENT, 1999.



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 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY		PHLUANG 2 MINI HYDROPOWER PROJECT AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI		
		PART 1 : CIVIL WORKS GENERAL LOCATION MAP AND PROJECT AREA MAP		
 P&C MANAGEMENT CO.,LTD.		 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY		
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DRAWN			SUBMITTED	
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			APPROVED	
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		17/03/2020	PI 2—GN—01	
			SHEET NO.	
			1 OF 14	

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 ROUGHNESS COEFFICIENT
AZ.	AZIMUTH	N.F.	NEAR FACE
B.	BEGINNING OF SURVEY	NGL.	NATURAL GROUND LEVEL
BC.	BEGINNING OF CURVE	NO. OR #	NUMBER
BF.	BOTTOM FACE	N.W.L.	NORMAL WATER LEVEL
B	BEAM	OD.	OUTSIDE DIAMETER
B.M.	BENCH MARK	O.F.	OUTSIDE FACE
BOTT.	BOTTOM	O&M	OPERATION & MAINTENANCE
BRG.	BEARING	PC.	POINT OF HORIZONTAL CURVATURE
C.B.R.	CALIFORNIA BEARING RATIO	PI.	POINT OF HORIZONTAL INTERSECTION
C/C	CENTER TO CENTER	PL.	PLATE
CL	CENTER LINE	P.O.C.	POINT ON CURVE
CL.	CLEARANCE	P.O.T.	POINT ON TANGENT
CM. OR cm.	CENTIMETER	P.O.S.T.	POINT ON SUB-TANGENT
CMS. OR cms.	CUBIC METER PER SECOND	PRC.	POINT OF HORIZONTAL REVERSE CURVE
COL.	COLUMN	PT.	POINT OF TANGENT
CONC.	CONCRETE	PVC.	POLYVINYL CHLORIDE
D	DEGREE OF CURVE	PVC.	POINT OF VERTICAL CURVATURE
DB.	DEFORM BAR	PVI.	POINT OF VERTICAL INTERSECTION
d.	DEPTH OF WATER	PVRC.	POINT OF VERTICAL REVERSE CURVE
DIA. OR Ø	DIAMETER	PVT.	POINT OF VERTICAL TANGENT
DOH.	DEPARTMENT OF HIGHWAY	Q.	DISCHARGE
DWG.	DRAWING	QTY. QUAN.	QUANTITY
DEDE.	DEPARTMENT OF ALTERNATIVE ENERGY	R	RADIUS OF CURVATURE
	DEVELOPMENT AND EFFICIENCY	r	HYDRAULIC RADIUS
E	EAST	RB.	ROUND BAR
E	END OF SURVEY	RC.	REINFORCED CONCRETE
EA.	EACH	RD.	ROAD
E.C.	END OF CURVE	REF.	REFERENCE
E.I.T.	THE ENGINEERING INSTITUTE OF THAILAND	REINF.	REINFORCEMENT
	UNDER H.M. THE KINGS PATRONAGE	REQ'D	REQUIRED
E.F.	END OF FACE	RID.	ROYAL IRRIGATION DEPARTMENT
EL. OR ELEV.	ELEVATION	R.W.L.	RETENTION WATER LEVEL
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
H.W.L.	HIGH WATER LEVEL	T	TON
I.D.	INSIDE DIAMETER	THK.	THICKNESS
I.F.	INSIDE FACE	T.F.	TOP FACE
IN. OR "	INCH	T.I.S.	THAI INDUSTRIAL STANDARD
INT.	INTERIOR	Ts.	SUPERELEVATION TRANSITION LENGTH
INV.	INVERT	TYP.	TYPICAL
Kg.	KILOGRAM	V.	VELOCITY OF FLOW
Km.	KILOMETER	V.C.	VERTICAL CURVE
KPH.	KILOMETER PER HOUR	Vc.	LENGTH OF VERTICAL CURVE
KSC.	KILOGRAM PER SQUARE CENTIMETER	VER.	VERTICAL
L	LENGTH OF CURVE	VOL.	VOLUME
LC.	LENGTH OF HORIZONTAL CURVE	W/	WITH
LONG.	LONGITUDINAL	W.C.	WATER CLOSET
LT.	LEFT	◉	ANGLE
L.W.L.	LOW WATER LEVEL	△	DEFLECTION ANGLE
M. OR m.	METER		
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 :

	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 BOREHOLES
	BOREHOLES
	DEGREE, MINUTE, SECOND
	AT EQUAL DISTANCE BETWEEN CENTER TO CENTER
	B.M.
	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
	ELEVATION OR PLAN OF SLOPE
	NATURAL GROUND LEVEL
	CONTOUR LINE
	RIVER, STREAM OR NATURAL DRAIN
	FLOW DIRECTION
	SLOPE DIRECTION
	SLOPE RATIO

GENERAL NOTES :

- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS UNLESS OTHERWISE SHOWN.
- DURING THE CONSTRUCTION PERIOD, IT IS THE CONTRACTOR'S OBLIGATION TO CHECK THE CORRECTION OF ALL RELEVANT LOCATIONS, DIMENSIONS, ELEVATIONS AND OTHER DATA AS PROVIDED BY THE DRAWINGS AND TECHNICAL SPECIFICATIONS BEFORE IMPLEMENTATION OF THE WORKS.
- IN CASE OF ANY DETAILS NOT MENTIONED OR NOT SHOWN IN THE DRAWINGS OR TECHNICAL SPECIFICATIONS, OR IN CASE OF ANY DISCREPANCY, DEFECTIVE DESCRIPTION, ERROR, DIMENSION OR AMBIGUITY BETWEEN OR IN ANY OF THE DRAWINGS, IT IS THE CONTRACTOR'S RESPONSIBILITY TO CORRECT AND/OR ADJUST THE RELEVANT DRAWINGS TO OBTAIN FIELD ENGINEER APPROVAL.
- ADDITIONAL SYMBOLS, IF REQUIRED, ARE DEFINED IN THE RESPECTIVE DRAWINGS.
- THE SPECIFICATIONS AND THE QUANTITIES OF MATERIALS ARE SPECIFIED IN THE TECHNICAL SPECIFICATIONS.
- ALL PLAIN CONCRETE CORNERS ARE TO BE CHAMFERED 2 cm. UNLESS OTHERWISE SHOWN.
- 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 $\frac{2}{1}$	$\frac{1}{1}$	1:0	$\frac{1}{1}$
1:1 - 1:1.5	1:0.5	1	1:0	$\frac{1}{1}$
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

$\frac{2}{1}$ = FILL SHOULD BE AVOIDED

$\frac{1}{1}$ = FOR DOUBTFUL CASES CONSULT FIELD ENGINEER

STRUCTURAL DESIGN NOTES :

- 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. POWERHOUSE
	2. TAILRACE
	3. ANCHOR BLOCK, PIPE SUPPORT
210	SECONDARY CONCRETE
140	LEAN CONCRETE

- 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.
- THE REINFORCEMENT LAP SPLICES SHALL NOT BE LESS THAN 50 DIAMETERS OF BIGGER THAN BAR WITH HOOKS, UNLESS OTHERWISE SHOWN.
- EMBEDDED METALWORK SHALL BE SECURELY FASTENED IN POSITION BEFORE PLACING CONCRETE.
- ALL CONSTRUCTION JOINT SHOULD BE TREATED AS DIRECTED IN ORDER TO ASSURE THE BEST BOND.
- A 5 cm. (MIN.) LAYER OF LEAN CONCRETE (1:3:5 BY VOLUME) SHOULD BE PLACED BELOW CONCRETE STRUCTURES.
- THE STRUCTURES SHOULD BE PLACED ON UNDISTURBED SOILS OR COMPACTED FILL AND BACKFILL AROUND THE STRUCTURES SHOULD BE COMPACTED.
- THE FOUNDATION ELEVATIONS ARE SUBJECT TO CHANGE AS DIRECTED ACCORDING TO THE SOIL CONDITIONS.
- ALL SIZES OF REINFORCING BARS AND STRUCTURAL STEELS ARE IN MILLIMETERS.
- ALL STRUCTURAL STEELS ARE THOSE OF T.I.S. DESIGNATION Fe24.
- 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
- ALLOWABLE BEARING CAPACITY OF FOUNDATION SHALL NOT BE LESS THAN AS FOLLOW :
 - POWERHOUSE & TAILRACE $Q_0 = 15 \text{ T/M}^2$

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NO.	DATE	REVISIONS	CHECKED	APPROVED	CHECKED	DATE	APPROVED	DRAWING NO.	SHEET NO.
						17/03/2020		PL2-GN-03	3 OF 14
		CONSULTANTS		DEDE		PROJECT MANAGER			

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
PHLUANG 2 MINI HYDROPOWER PROJECT AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI	
PART 1 : CIVIL WORKS GENERAL SYMBOLS, ABBREVIATIONS AND GENERAL NOTES	
PCM P&C MANAGEMENT CO.,LTD. DESIGNED 28.1957 DRAWN 28.1957 CHECKED 17/03/2020 PROJECT MANAGER	REVIEWED SUBMITTED RECOMMENDED APPROVED DATE

TABLE 1 CLIMATOLOGICAL DATA FOR THE PERIOD 1988-2017

Station	Amphoe Mueang Changwat Chanthaburi				Elavation of station above M.S.L.				2.68 Meters					
Index station	48480				Height of barometer above M.S.L.				3.60 Meters					
Latitude	12° 37' 0.0" N				Height of thermometer above ground				1.25 Meters					
Longitude	102° 6' 48.0" E				Height of wind vane above ground				12.00 Meters					
					Height of rain gauge				1.00 Meters					
Elements	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	
Temperature (Celcius)														
Mean	15.0	15.4	17.7	22.2	22.1	21.9	21.4	21.4	22.1	18.7	16.5	13.1	13.1	
Relative Humidity (%)														
Mean	69	74	77	78	83	84	84	84	86	82	72	66	78.4	
Mean Max.	85	89	92	92	94	94	94	94	95	93	85	81	90.7	
Mean Min.	49	55	59	60	67	70	71	71	71	65	56	49	61.8	
Ext.Min.	24	23	33	37	39	51	51	43	41	30	28	19	19	
Pan Evaporation (mm.)														
Mean	138.5	125.0	144.4	140.5	121.9	108.6	108.6	107.1	94.7	118.9	135.4	145.5	1,489.1	

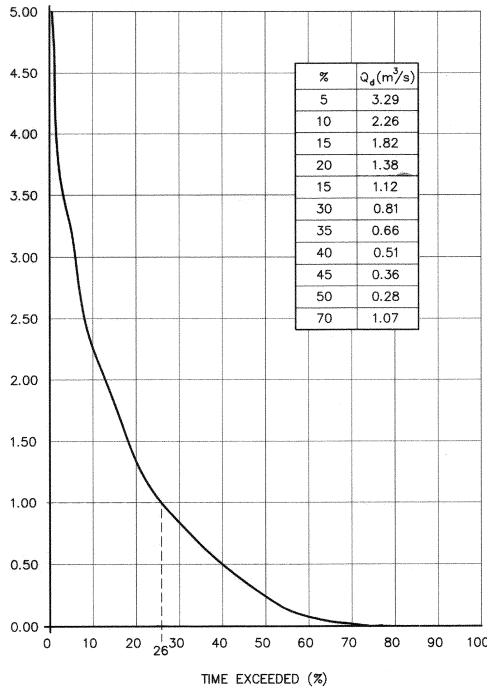


FIGURE 1 FLOW DURATION CURVE AT PHLUANG DAM

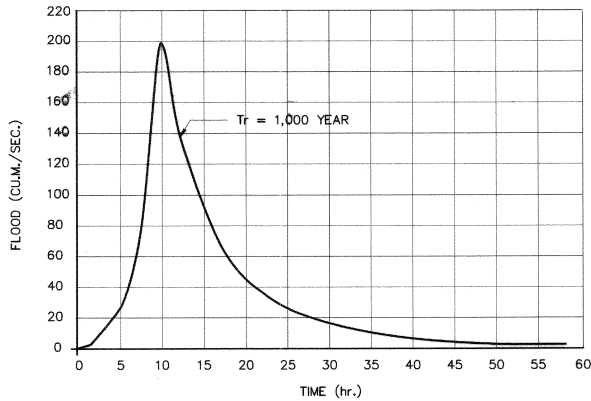


FIGURE 2 RETURN PERIOD 1,000 YEAR AT PHLUANG DAM

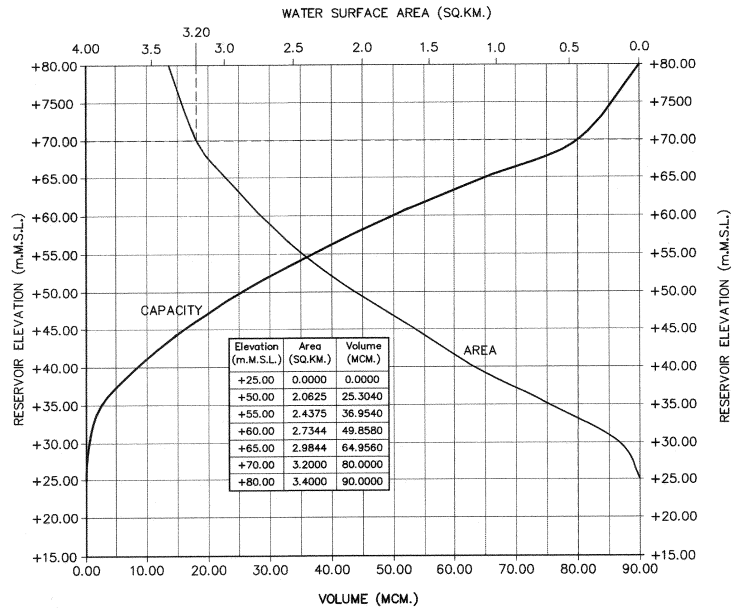


FIGURE 3 RELATIONSHIP BETWEEN AREA AND VOLUME CURVE AT PHLUANG DAM

MONTH	DISCHARGE (CMS.)
APR	0.35
MAY	1.20
JUN	3.38
JUL	5.57
AUG	5.69
SEP	4.21
OCT	1.56
NOV	0.78
DEC	0.79
JAN	0.97
FEB	0.52
MAR	0.72

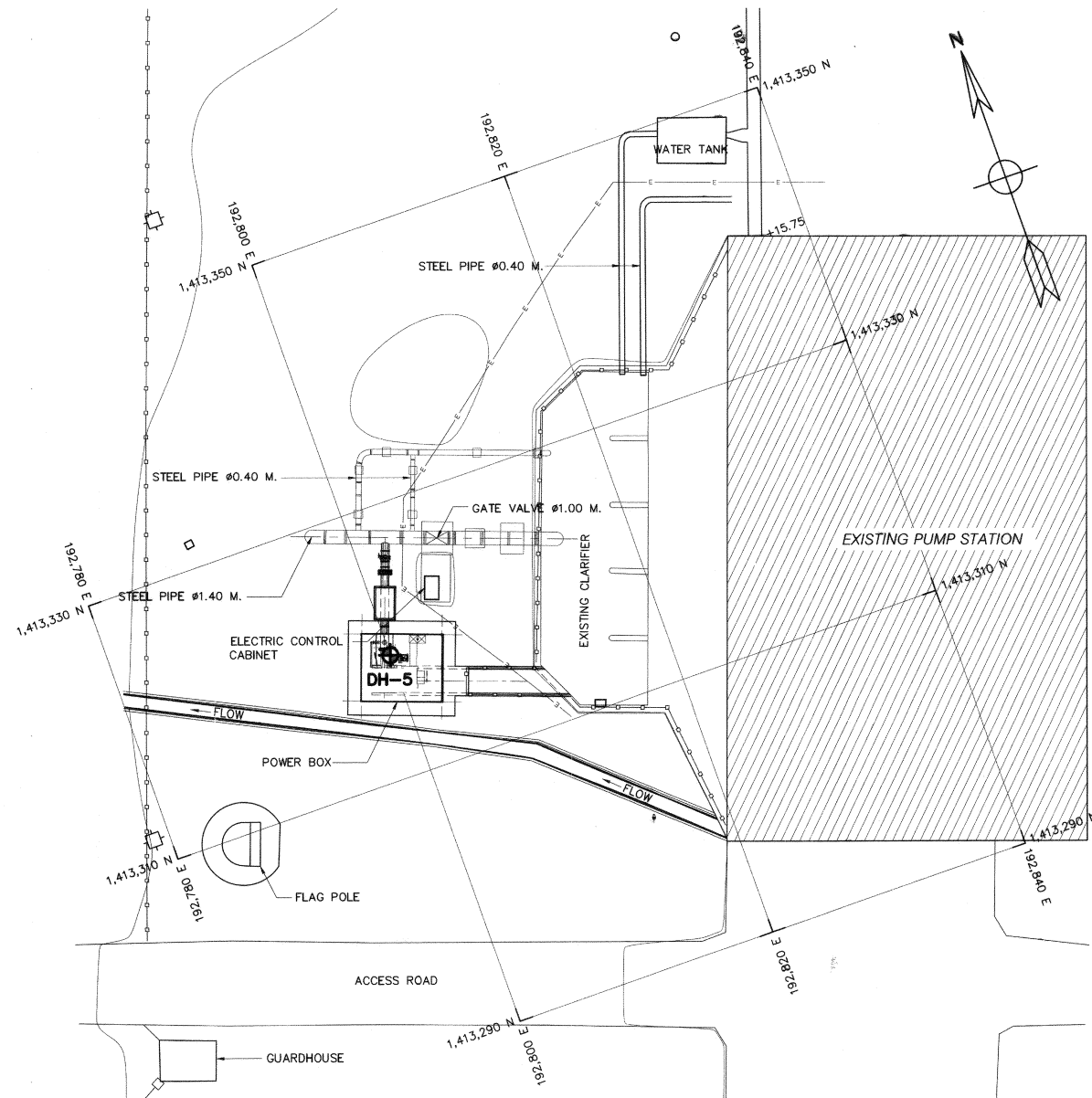
FIGURE 4 AVERAGE MONTHLY DISCHARGE AT PHLUANG DAM

MONTH	RAINFALL (mm.)
APR	123.79
MAY	342.54
JUN	446.94
JUL	508.79
AUG	480.79
SEP	500.38
OCT	289.55
NOV	37.85
DEC	7.02
JAN	22.41
FEB	32.66
MAR	82.31

FIGURE 5 AVERAGE MONTHLY RAINFALL AT PHLUANG DAM

- NOTES :
- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
 - DATA TABLE 1 OBTAINED FROM OUTFLOW RECORDS OF AMPHOE MUEANG CHANGWAT CHANTHABURI BY ROYAL IRRIGATION DEPARTMENT DURING 1988-2017.

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
PHLUANG 2 MINI HYDROPOWER PROJECT AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI			
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PCM P&C MANAGEMENT CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
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		PL2-GN-04	4 OF 14



PLAN
SCALE 1:250

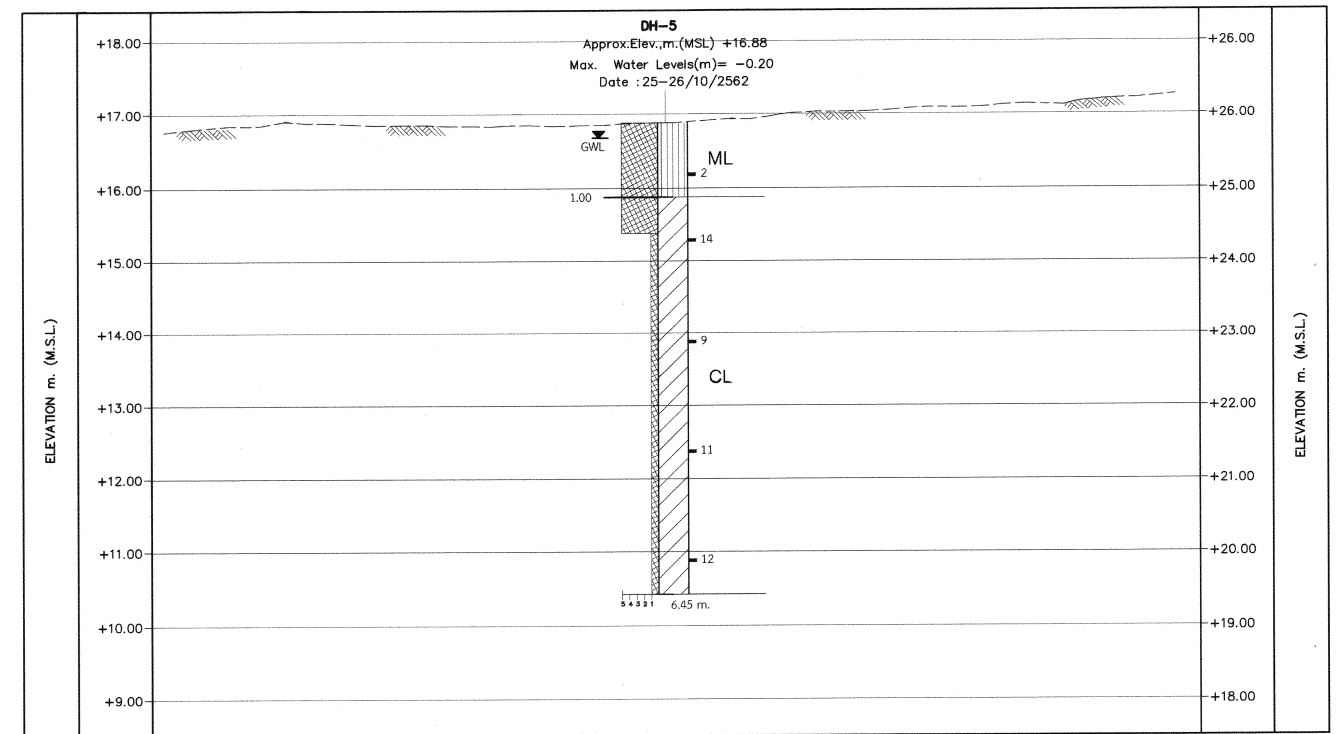
NO.	BENCH MARK	DRILL TYPE	WGS 84 GRID CO-ORDINATE		DEPTH M.
			NORTHING	EASTING	
1	DH-5	ROTARY	1,413,319	192,800	6.45

SYMBOL

◆ DRILL HOLE

NOTES :

- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. PL2-GN-03



PROFILE GEOLOGICAL
SCALE 1:50

**SOIL PROPERTIES AND SPT (N,BLOWS)
RELATIONSHIP FOR COHESIVE SOILS.**

NUMBER BLOW/FOOT (N)	CONSISTENCY
LESS THAN 2	VARY SOFT
2-4	SOFT
4-8	MEDIUM
8-15	STIFF
15-30	VARY STIFF
MORE THAN 30	HARD

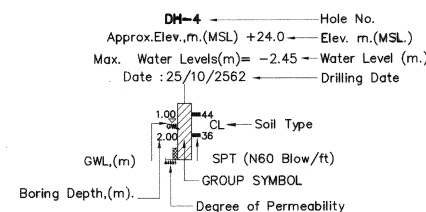
**SOIL PROPERTIES AND SPT (N,BLOWS)
FOR COHESION LESS SOILS.**

NUMBER BLOW/FOOT (N)	CONSISTENCY
0-4	VARY LOOSE
4-10	LOOSE
10-30	MEDIUM DENSE
30-50	DENSE
MORE THAN 50	VERY DENSE

DEGREE OF PERMEABILITY

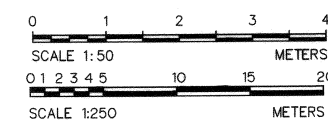
- 1 = < 1 LUGEON OR $< 10^{-5}$ CM/SEC = IMPERVIOUS
- 2 = 1-5 LUGEON OR 10^{-5} - 5×10^{-5} CM/SEC = SEMI - IMPERVIOUS
- 3 = 5-10 LUGEON OR 5×10^{-5} - 10^{-4} CM/SEC = SEMI - PERVIOUS
- 4 = 10-50 LUGEON OR 10^{-4} - 5×10^{-4} CM/SEC = RATHER - PERVIOUS
- 5 = > 50 LUGEON OR $> 5 \times 10^{-4}$ CM/SEC = PERVIOUS

Explanation



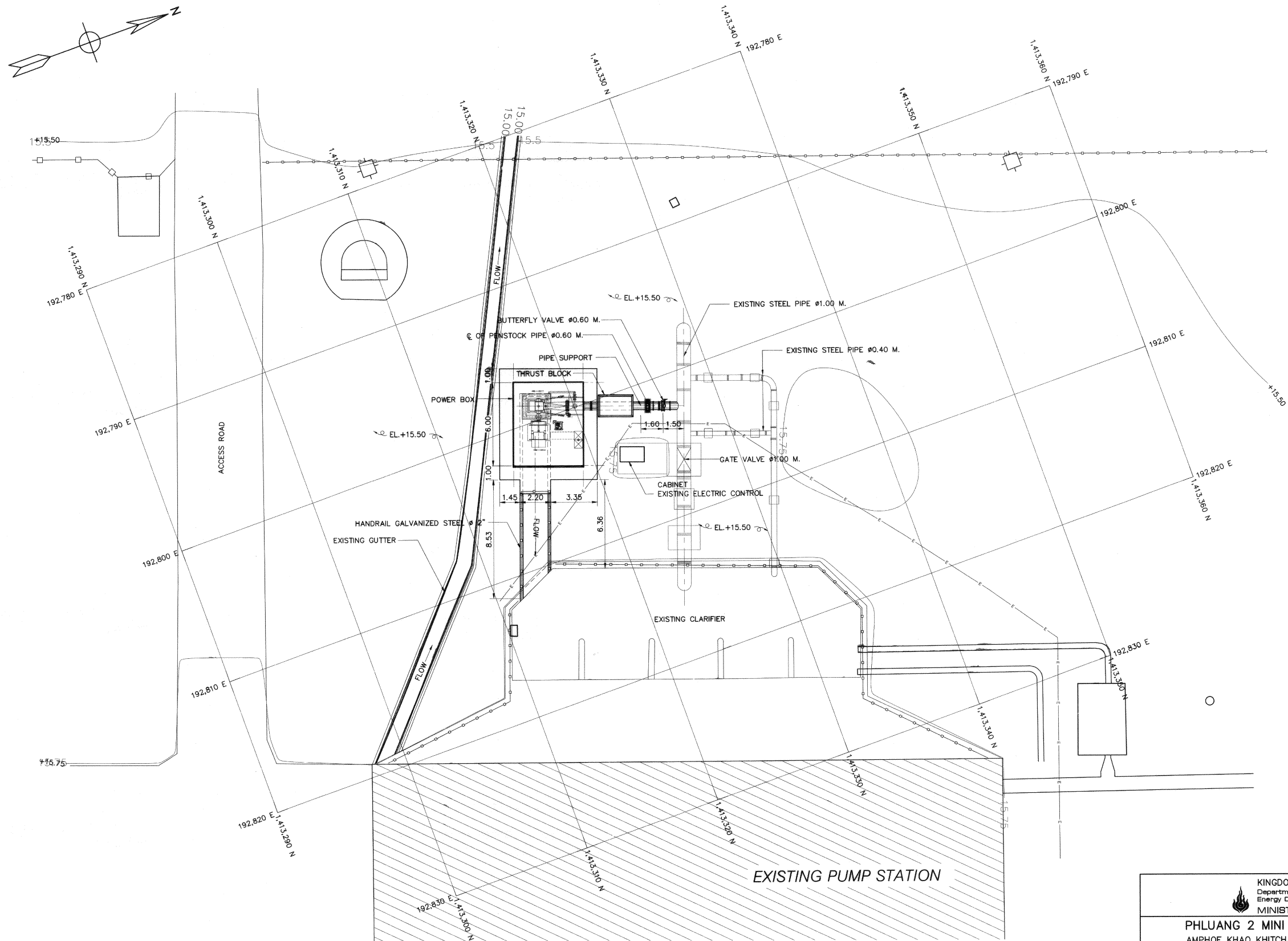
LEGEND

- CL = LEAN CLAY TO SANDY LEAN CLAY
- ML = SILT WITH SAND TO SANDY SILT

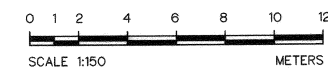


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GENERAL LAYOUT
SCALE 1:150



NOTES :

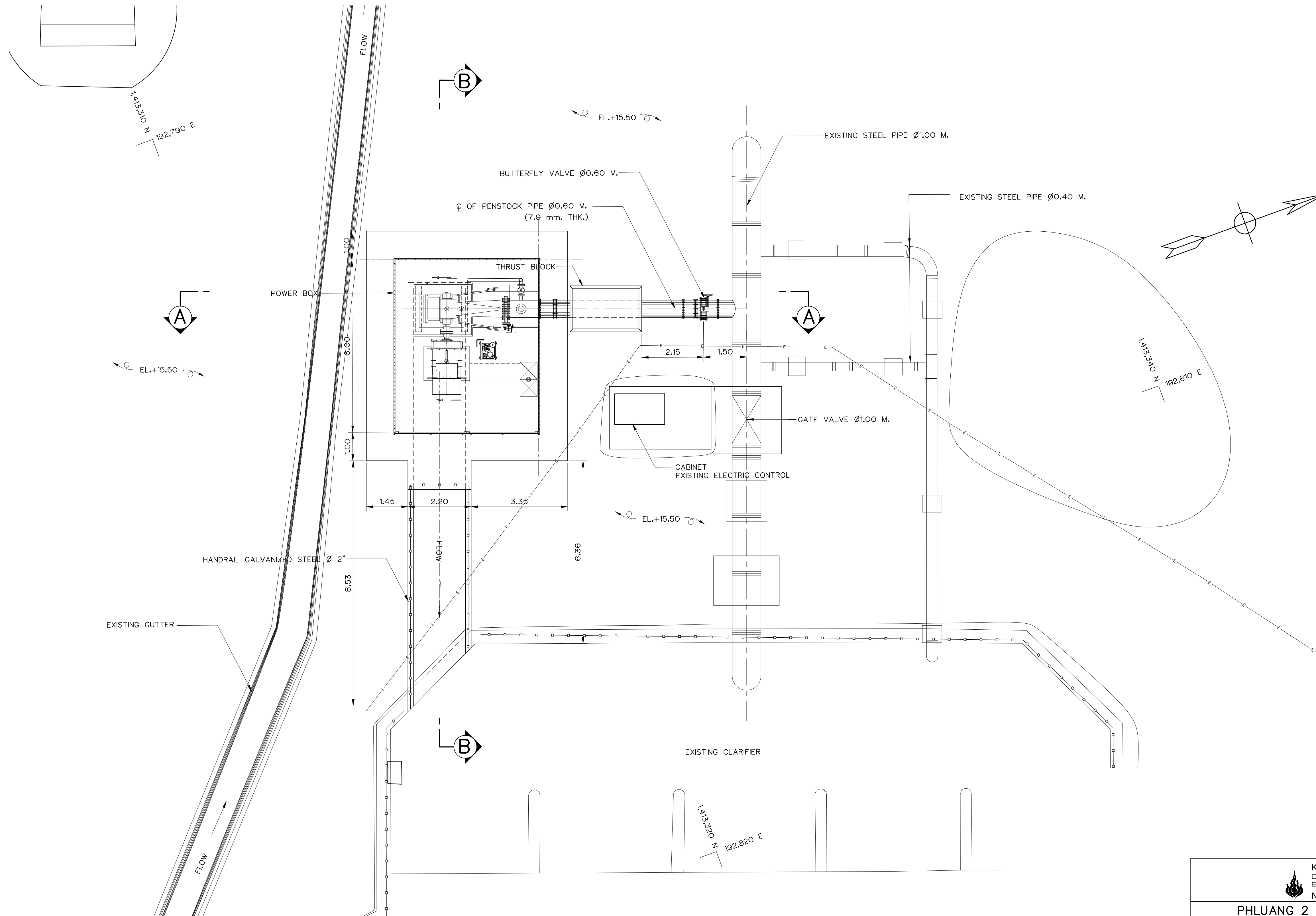
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2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. PL2-GN-03

REFERENCE DRAWINGS :

1. POWERHOUSE, LAYOUT PLAN

PL2-PH-02

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
PHLUANG 2 MINI HYDROPOWER PROJECT AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI			
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CONSULTANTS		DEDE	
		SHEET NO. 6 OF 14	



LAYOUT PLAN
SCALE 1:75

0 0.5 1.0 2.0 3.0 4.0 6.0
SCALE 1:75 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. PL2-GN-03

REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAYOUT
3. POWERHOUSE, SECTION
3. POWERHOUSE, PLAN AND ELEVATIONS

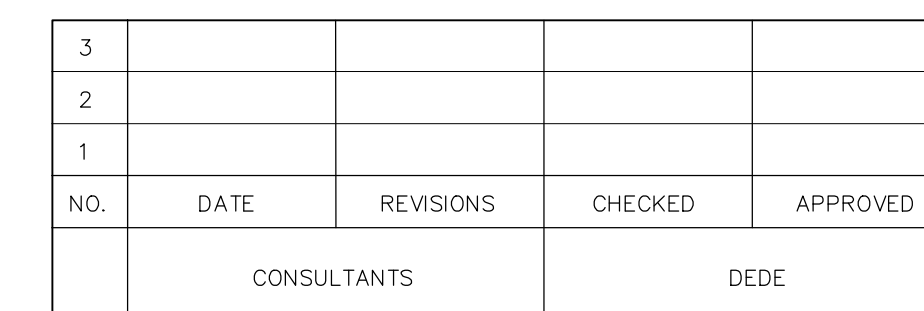
- PL2-PH-01
PL2-PH-03
PL2-PH-04

3				
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NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS			DEDE	

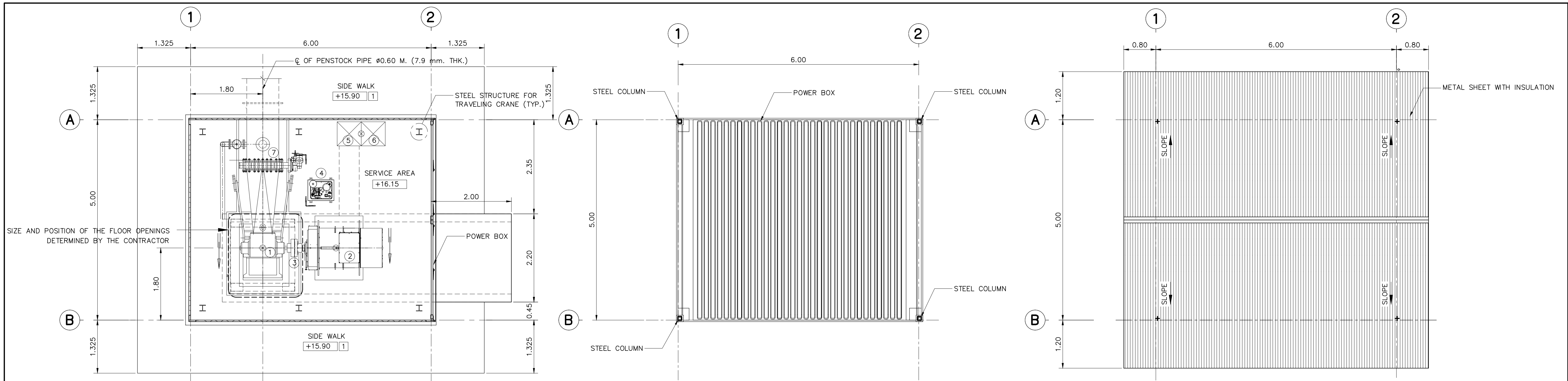
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
PHLUANG 2 MINI HYDROPOWER PROJECT AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI			
PART 1 : CIVIL WORKS POWERHOUSE LAYOUT PLAN			
PCM P&C MANAGEMENT CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED		28.10.57	REVIEWED
DRAWN		28.10.57	SUBMITTED
CHECKED		28.10.57	RECOMMENDED
APPROVED		28.10.57	APPROVED
PROJECT MANAGER		17/03/2020	DRAWING NO.
		DATE	PL2-PH-02
			SHEET NO.
			7 OF 14



- PL2-PH-02



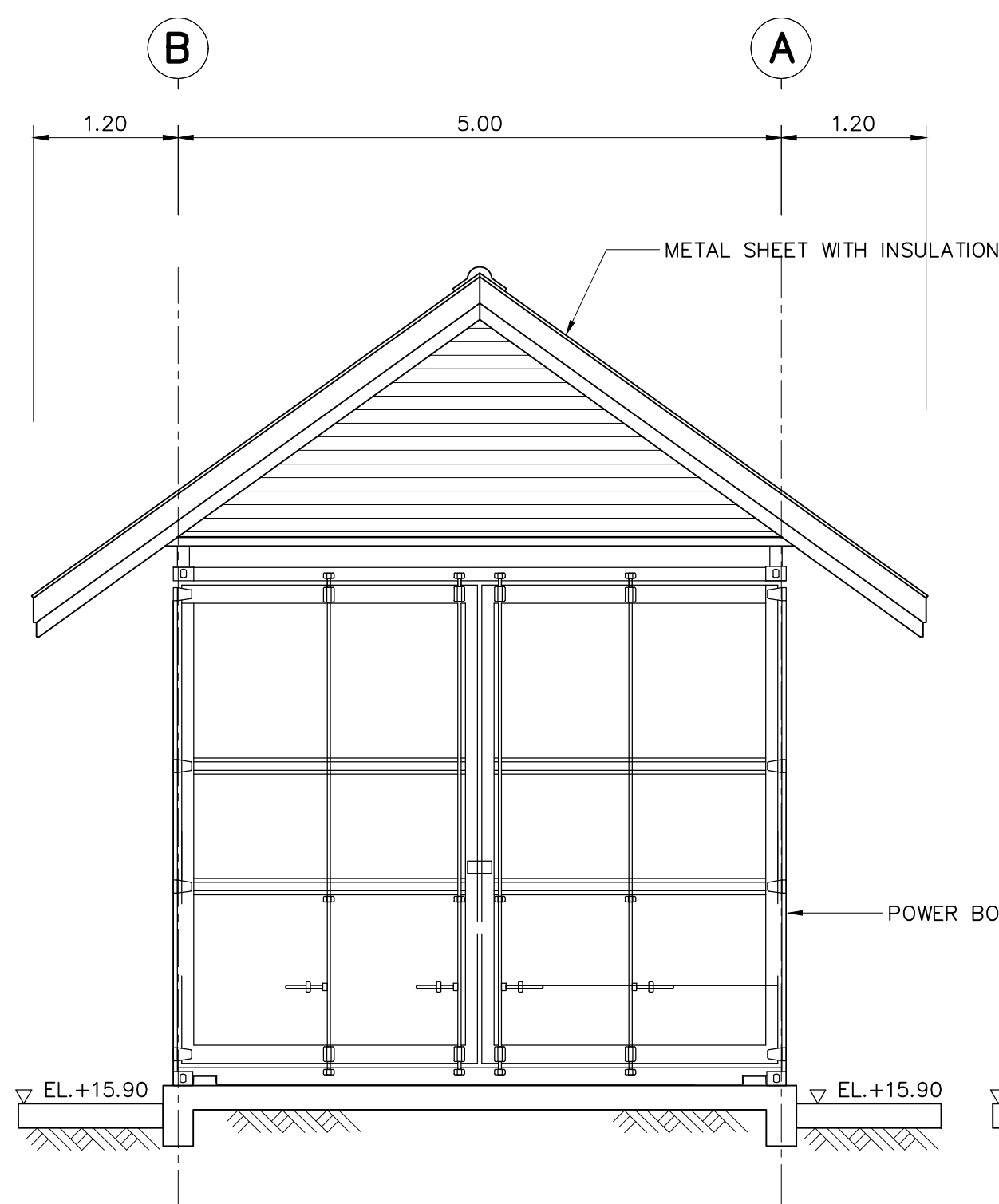
 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
PHLUANG 2 MINI HYDROPOWER PROJECT AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI			
PART 1 : CIVIL WORKS POWERHOUSE SECTIONS AND DETAIL			
 PCM P&C MANAGEMENT CO.,LTD.		 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED		28.1957	REVIEWED 
DRAWN			SUBMITTED 
CHECKED		28.1957	RECOMMENDED 
		17/03/2020	APPROVED 
PROJECT MANAGER		DATE	DRAWING NO. PL2-PH-03 SHEET NO. 8 OF 14



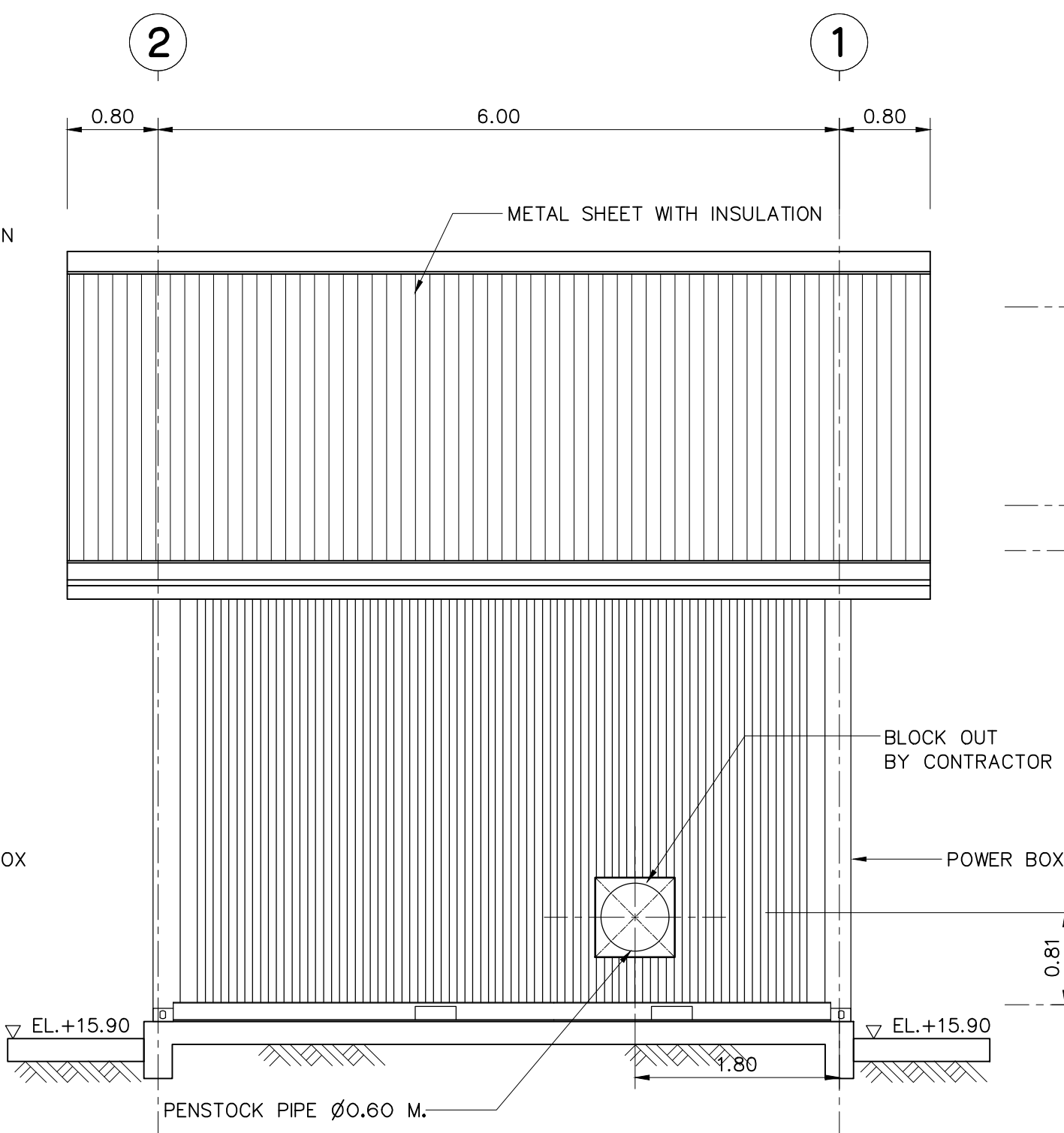
FLOOR PLAN
SCALE 1:50

TOP OF POWER BOX PLAN
SCALE 1:50

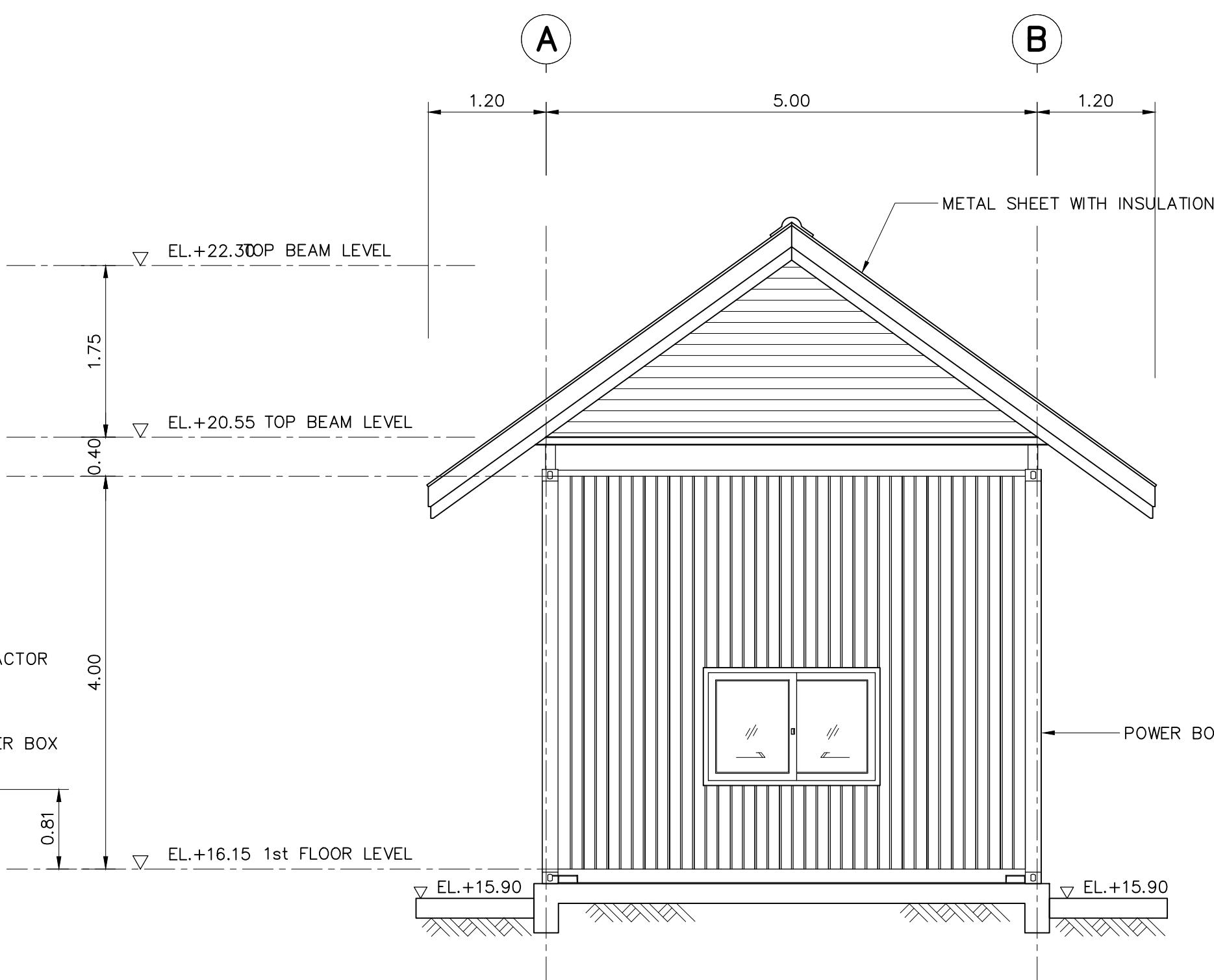
ROOF PLAN
SCALE 1:50



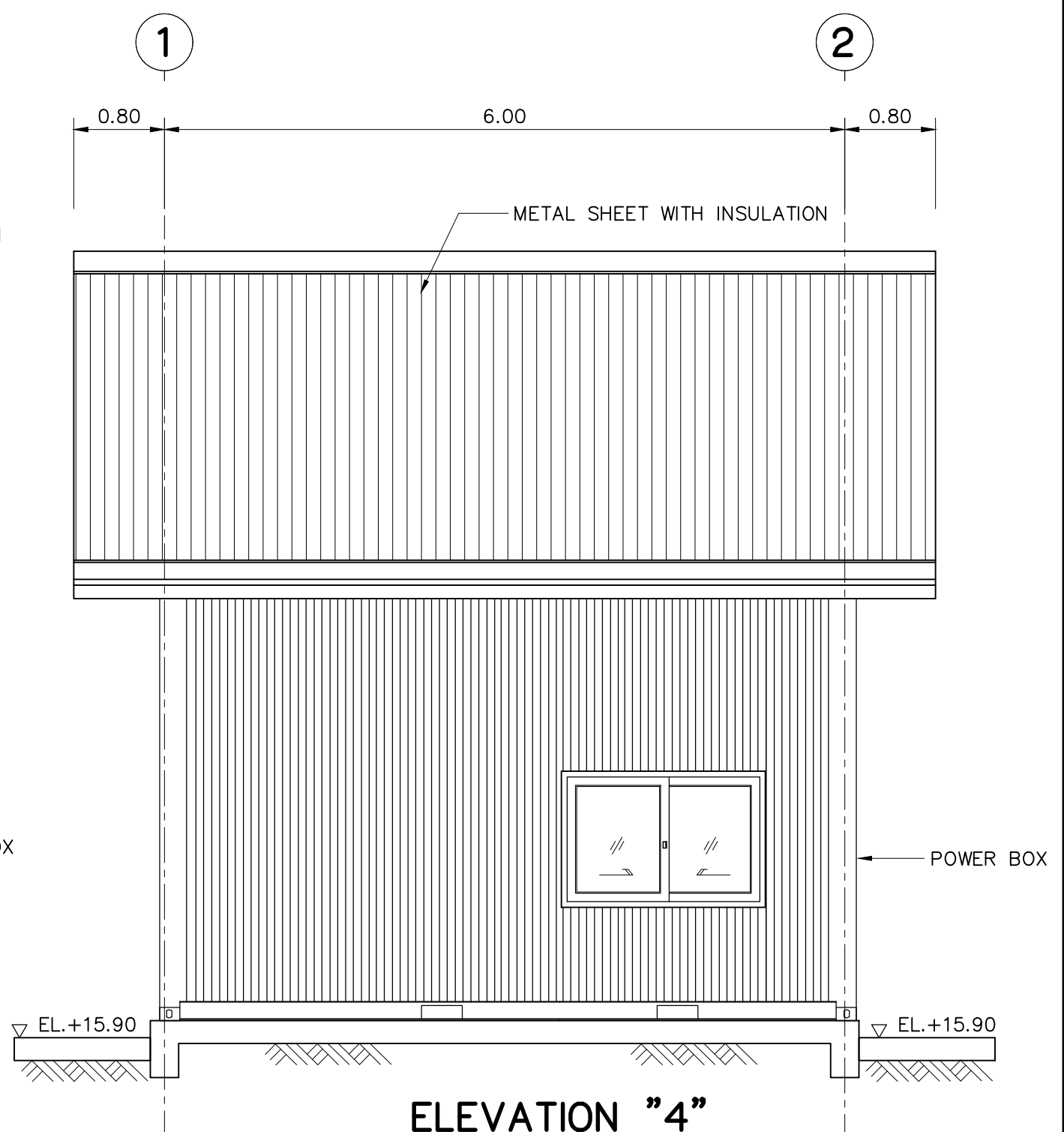
ELEVATION "1"
SCALE 1:50



ELEVATION "2"
SCALE 1:50



ELEVATION "3"
SCALE 1:50



ELEVATION "4"
SCALE 1:50

FLOOR FINISH SYMBOLS :
1 COARSE FINISHED

NOTES :
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. PL2-GN-03
3. POWER BOX SHOULD BE DESIGN AND LOCATED BY E&M CONTRACTOR

REFERENCE DRAWINGS :
1. POWERHOUSE, LAYOUT PLAN

PL2-PH-02

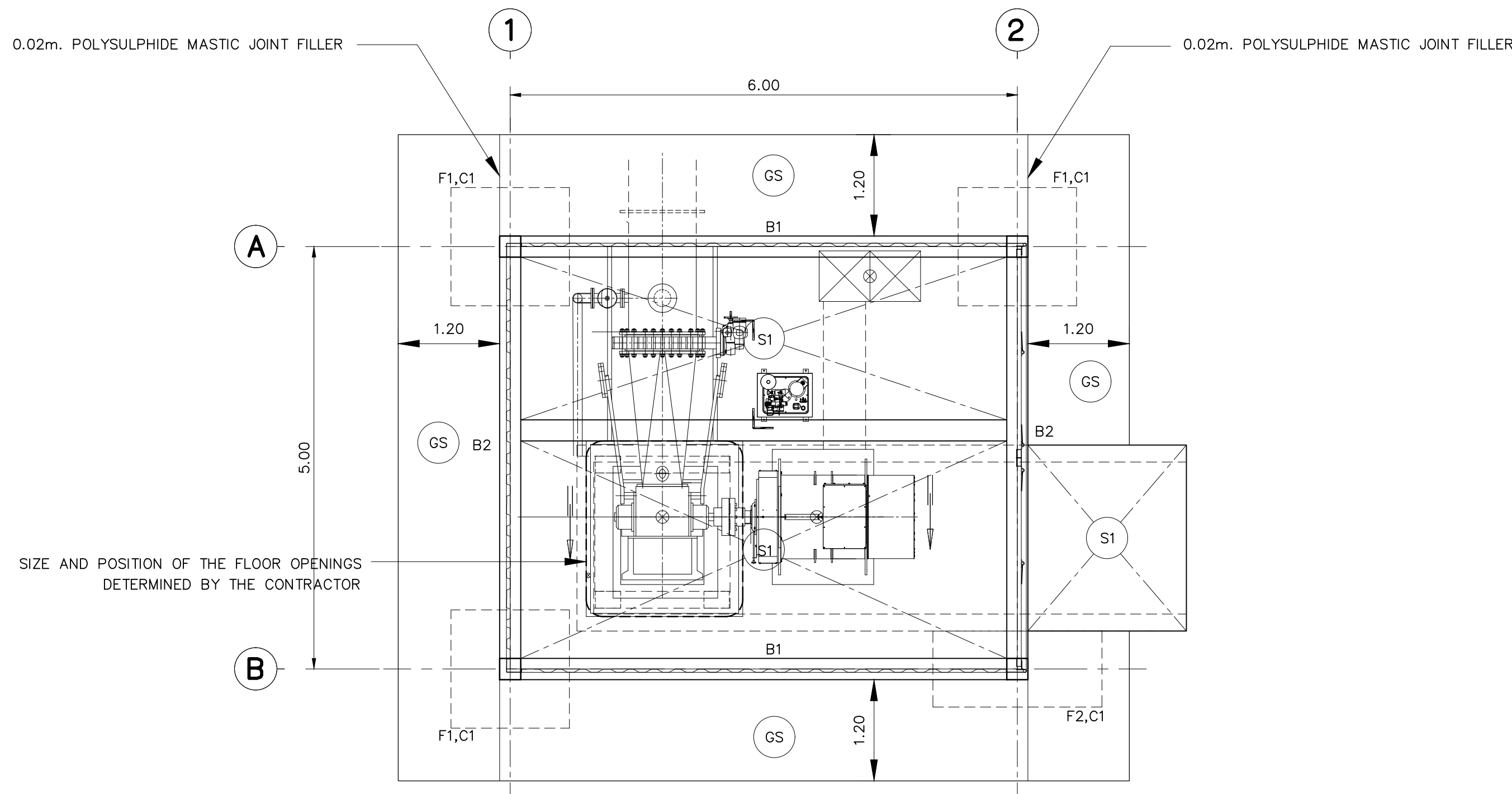
DESCRIPTION OF POWER BOX:

- 1 TURBINE
- 2 GENERATOR
- 3 ELASTIC COUPLING
- 4 GOVERNOR (HYDRAULIC)
- 5 GOVERNOR (ELECTRIC)
- 6 POWER SWITCHBOARD
- 7 SHUT-OFF VALVE

0 1 2 3 4
SCALE 1:50 METERS

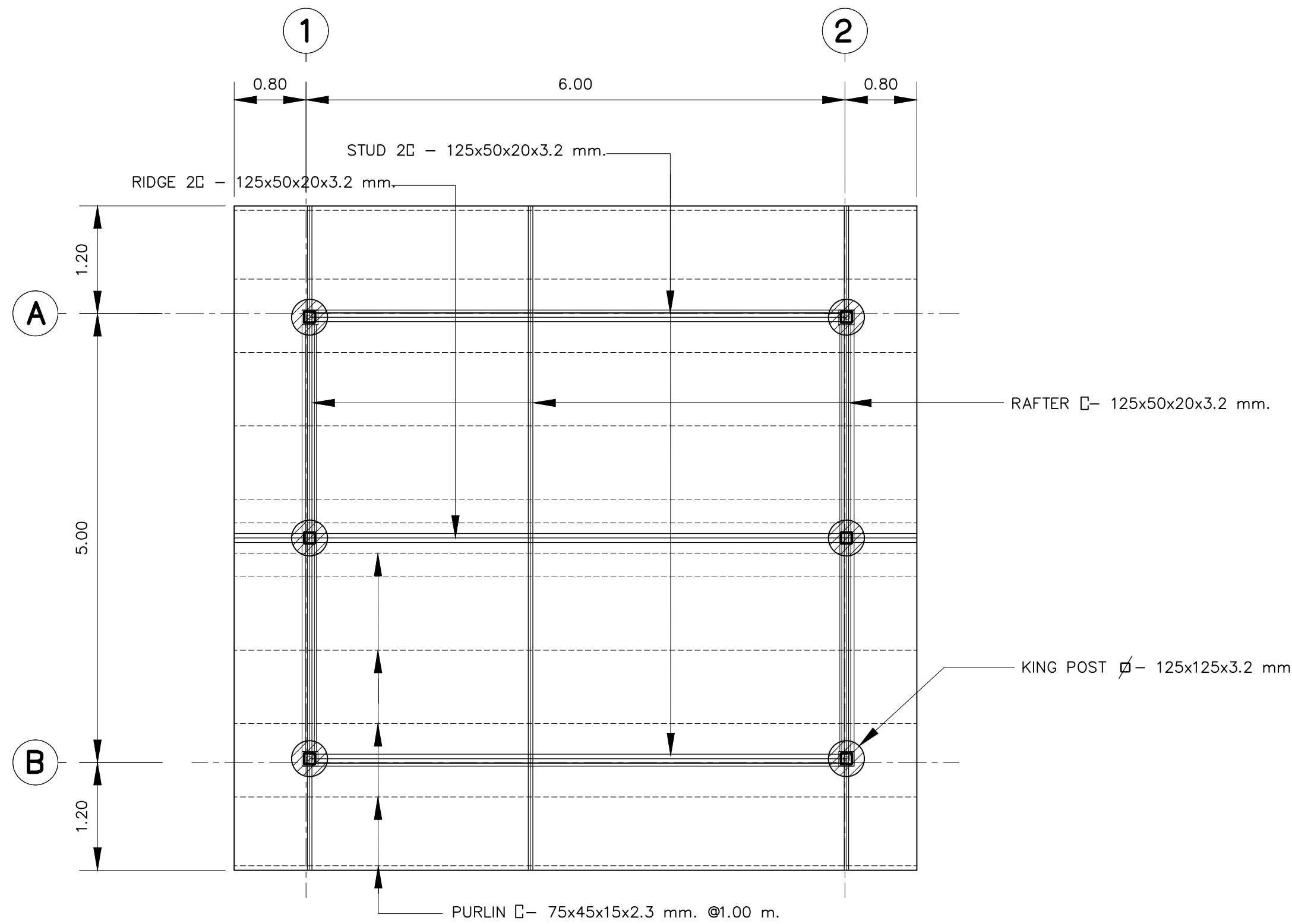
3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
		CONSULTANTS	DEDE	

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
PHLUANG 2 MINI HYDROPOWER PROJECT AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI	
PART 1 : CIVIL WORKS POWERHOUSE PLAN AND ELEVATIONS	
PCM P&C MANAGEMENT CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED 28.1957	REVIEWED
DRAWN	SUBMITTED
CHECKED 28.1957	RECOMMENDED
APPROVED 17/03/2020	APPROVED
PROJECT MANAGER DATE	DRAWING NO. SHEET NO.
	PL2-PH-04 9 OF 14



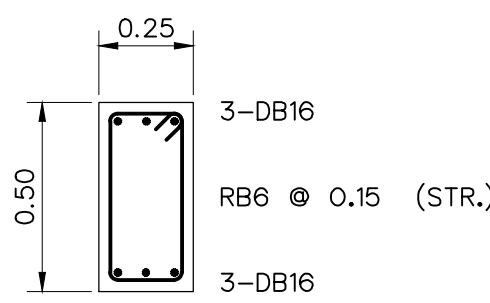
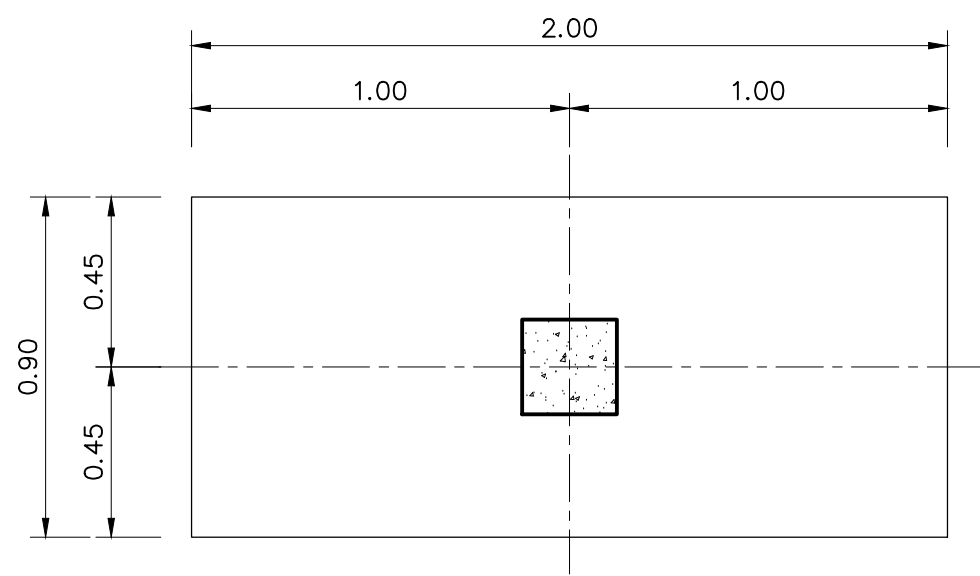
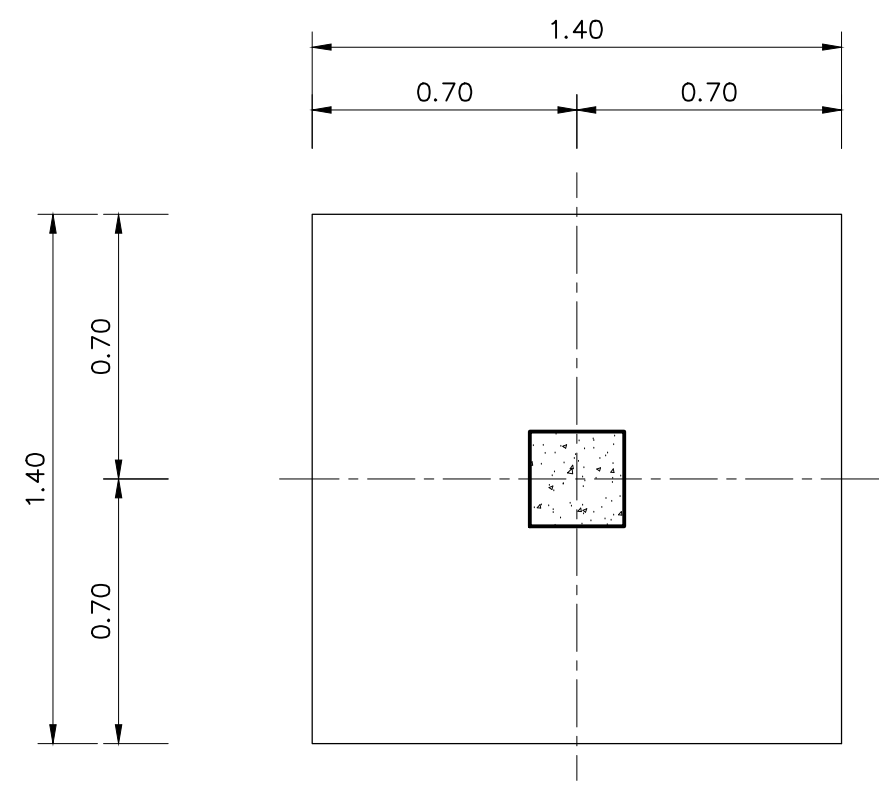
PLAN OF FOOTING, BEAM AND SLAB

SCALE 1: 50



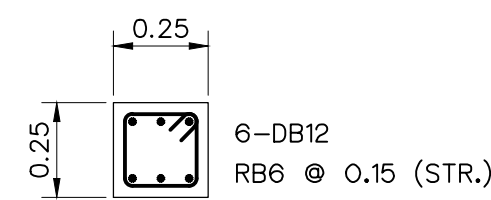
PLAN OF ROOF

SCALE 1: 50



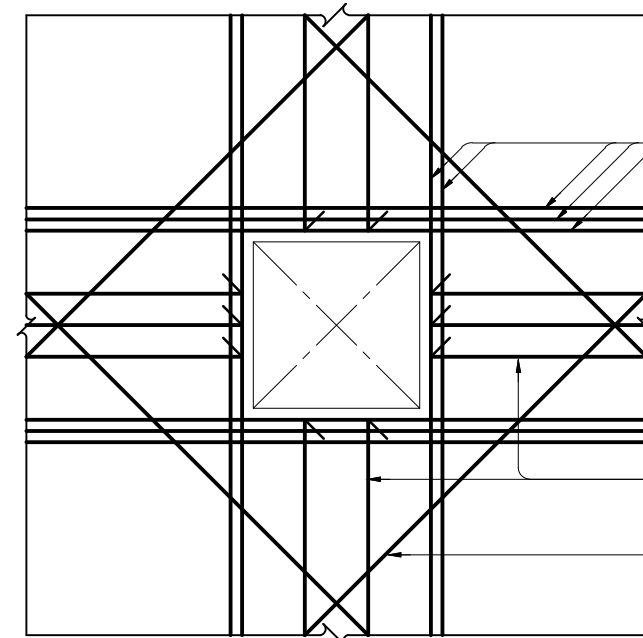
BEAM B1

SCALE 1: 20



COLUMN C1

SCALE 1: 20

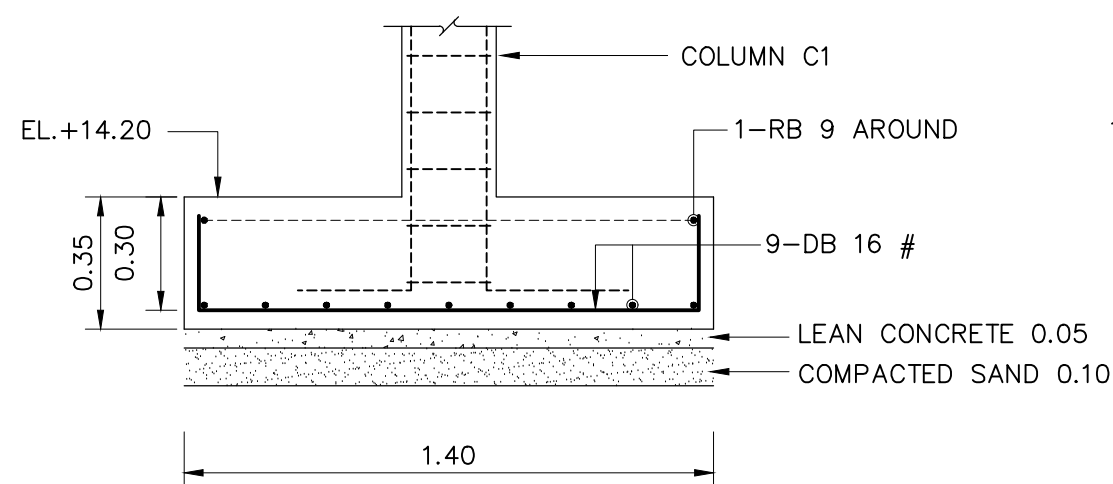


ADD REINFORCEMENT EQUAL TO THAT INTERRUPTED BY OPENING (EITHER TOP OR BOTTOM OR BOTH PLACE ADDED REINFORCING AT BOTH SIDE OF OPENING IN EQUAL AMOUNTS SPACE AT 75 , FOLLOW BAR EXTENSION RULES FOR THE INTERRUPTED BARS BUT EXTEND ADDED BARS A MINIMUM OF 600 OR FULL TENSION LAP LENGTH WHICHEVER IS GREATER BEYOND EDGE OF OPENING. ADD 2DB16 TOP & BOTTOM EACH SIDE AS A MINIMUM.

TERMINATE INTERRUPTED BARS WITH A STANDARD HOOK
ADD 1 DB16 x 1500 TOP & BOTTOM EACH CORNER.

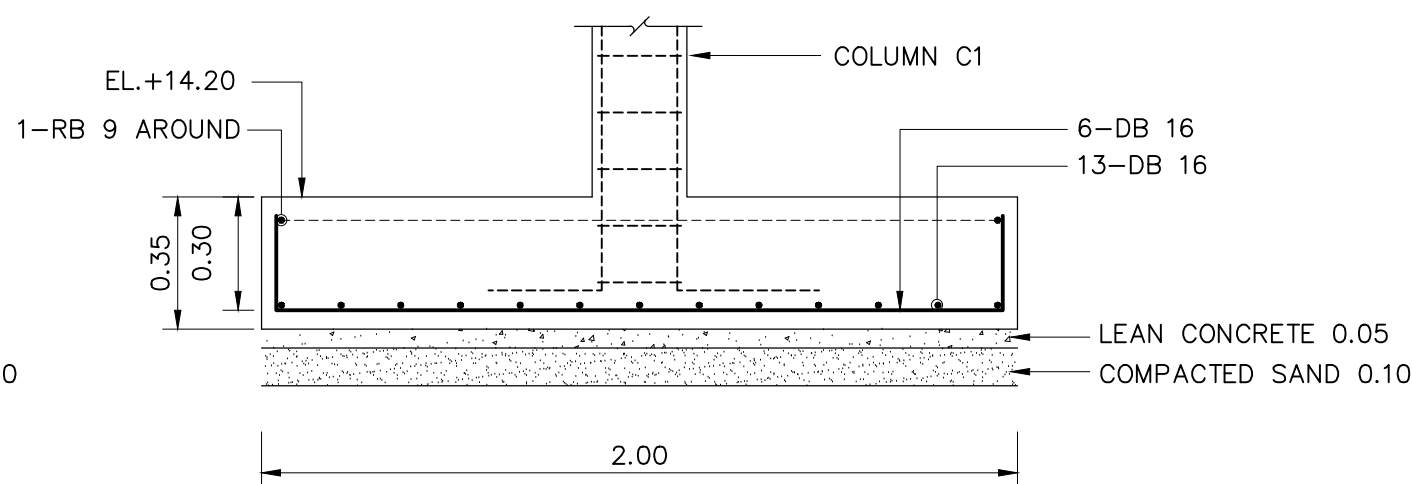
TYPICAL REINFORCING AT SLAB OPENING

SCALE 1: 50



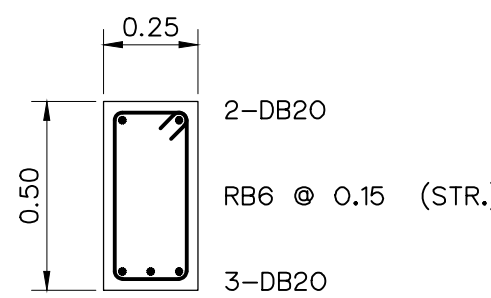
FOOTING (F1)

SCALE 1: 20



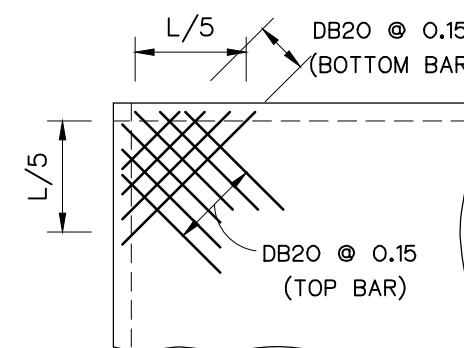
FOOTING (F2)

SCALE 1: 20



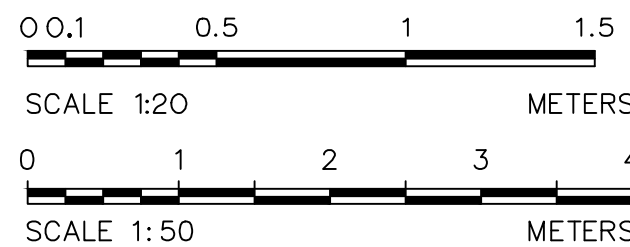
BEAM B2

SCALE 1: 20



TYP. ALL CORNER

SCALE 1: 20



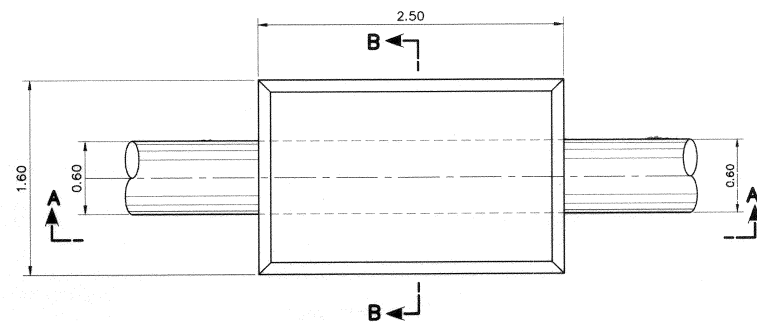
NOTES :

- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. PL1-GN-03
- LOCATIONS, DIMENSIONS OF TURBINE, GENERATOR AND TRENCHES FOUNDATION SHOWN ON THIS DRAWING ARE APPROXIMATELY THE FINAL DESIGN OF FOUNDATIONS SHALL BE DONE BY THE E&M CONTRACTOR AND HAVE TO SUBMITTED TO DEDE. FOR APPROVAL.
- FOOTING SHALL BE PLACED ON BED ROCK FOUNDATION. THE CONTRACTOR SHALL REMOVE UNSUITABLE MATEIAL AND REPLACE OR BACKFILL IT WITH LEAN CONCRETE UPTO THE FOUNDATION ELEVATION
- FOUNDATION SHALL HAVE MINIMUM 15 TON/M² (ULTIMATE CAPACITY)
- COMPACTED BACKFILL SHALL BE DONE AFTER THE CONCRETE STRUCTURES HAVE BEEN FINISHED AND HAVE THE MINIMUM DESIGN STRENGTH TO SUPPORT THE FULL LOAD
- POWER BOX SHOULD BE DESIGN AND LOCATED BY CONTRACTOR

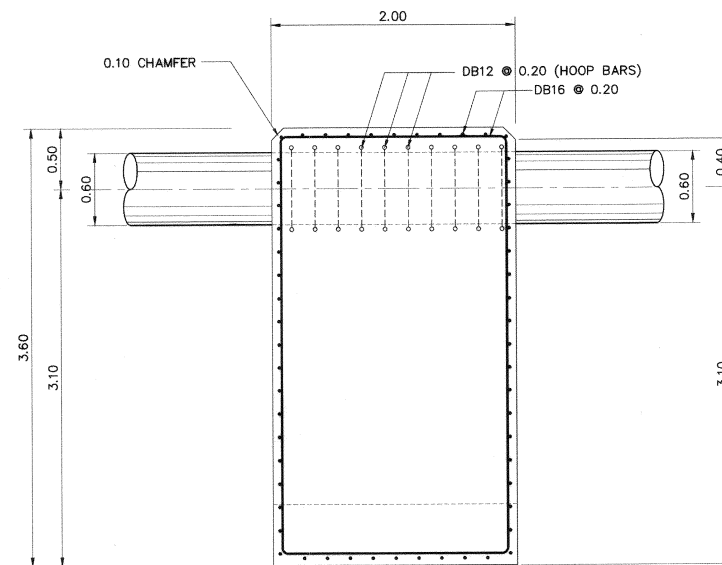
REFERENCE DRAWINGS :

- | | |
|----------------------------|-----------|
| 1. POWERHOUSE, LAYOUT PLAN | PL1-PH-02 |
| 2. POWERHOUSE, SECTIONS | PL1-PH-03 |

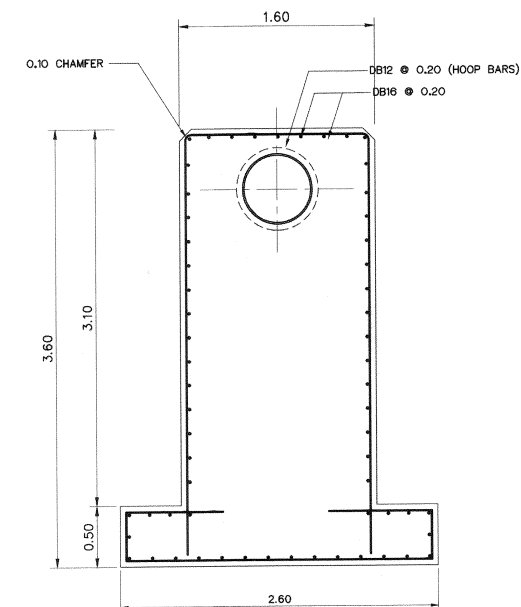
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
PHLUANG 2 MINI HYDROPOWER PROJECT AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI	
PART 1 : CIVIL WORKS POWERHOUSE PLAN OF FOOTING, BEAM, SLAB AND DETAILS	
PCM P&C MANAGEMENT CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED 18/10/17	REVIEWED
DRAWN 18/10/17	SUBMITTED
CHECKED 18/10/17	RECOMMENDED
APPROVED 17/03/2020	APPROVED
PROJECT MANAGER	DRAWING NO. PL2-PH-05
DATE	SHEET NO. 10 OF 14



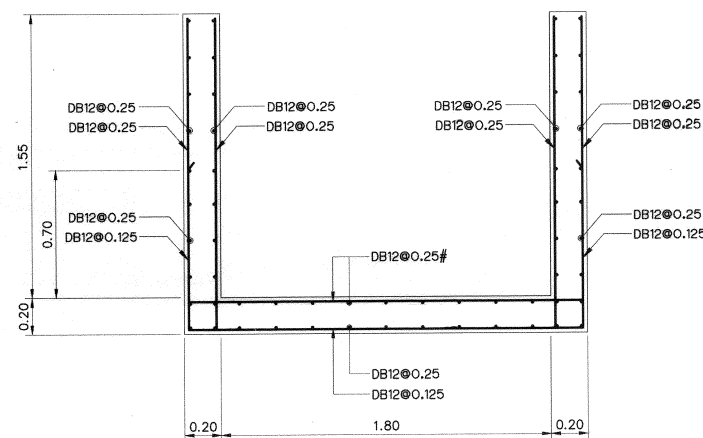
PLAN
ANCHOR BLOCK
SCALE 1:30



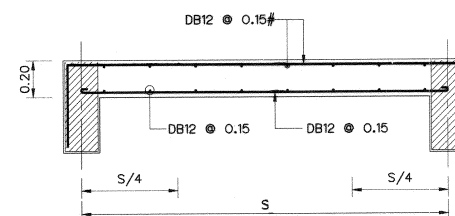
SECTION A-A
ANCHOR BLOCK
SCALE 1:30



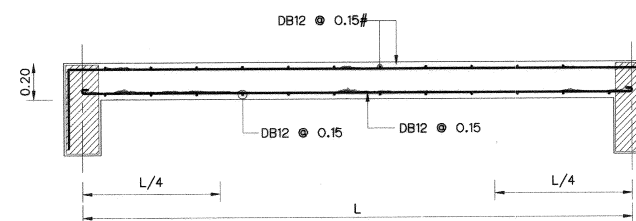
SECTION B-B
ANCHOR BLOCK
SCALE 1:30



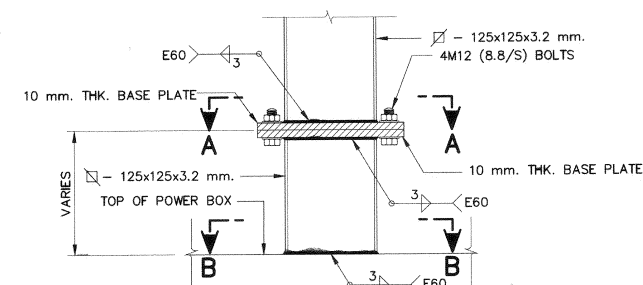
SECTION
TAILRACE
SCALE 1:20



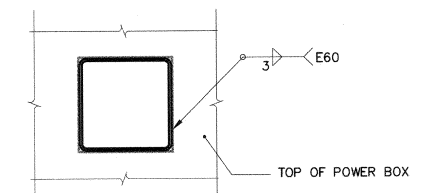
SLAB S2 (SHOT)
SCALE 1:20



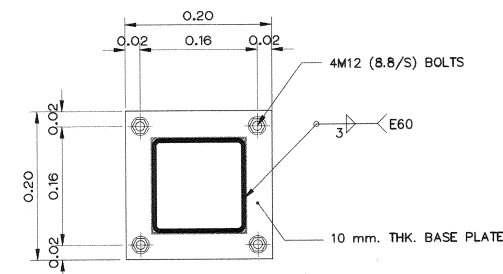
SLAB S2 (LONG)
SCALE 1:20



DETAIL "A"
SCALE 1:5



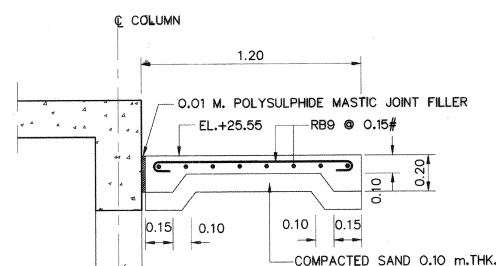
SECTION B-B
SCALE 1:5



SECTION A-A
SCALE 1:5

NOTES :

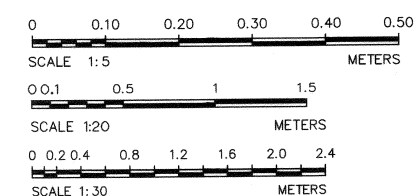
- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. PL1-GN-03
- LOCATIONS, DIMENSIONS OF TURBINE, GENERATOR AND TRENCHES FOUNDATION SHOWN ON THIS DRAWING ARE APPROXIMATELY THE FINAL DESIGN OF FOUNDATIONS SHALL BE DONE BY THE E&M CONTRACTOR AND HAVE TO SUBMITTED TO DEDE. FOR APPROVAL.
- FOOTING SHALL BE PLACED ON BED ROCK FOUNDATION. THE CONTRACTOR SHALL REMOVE UNSUITABLE MATEIAL AND REPLACE OR BACKFILL IT WITH LEAN CONCRETE UP TO THE FOUNDATION ELEVATION
- FOUNDATION SHALL HAVE MINIMUM 15 TON/M² (ULTIMATE CAPACITY)
- COMPACTED BACKFILL SHALL BE DONE AFTER THE CONCRETE STRUCTURES HAVE BEEN FINISHED AND HAVE THE MINIMUM DESIGN STRENGTH TO SUPPORT THE FULL LOAD
- POWER BOX SHOULD BE DESIGN AND LOCATED BY CONTRACTOR



SLAB GS
SCALE 1:20

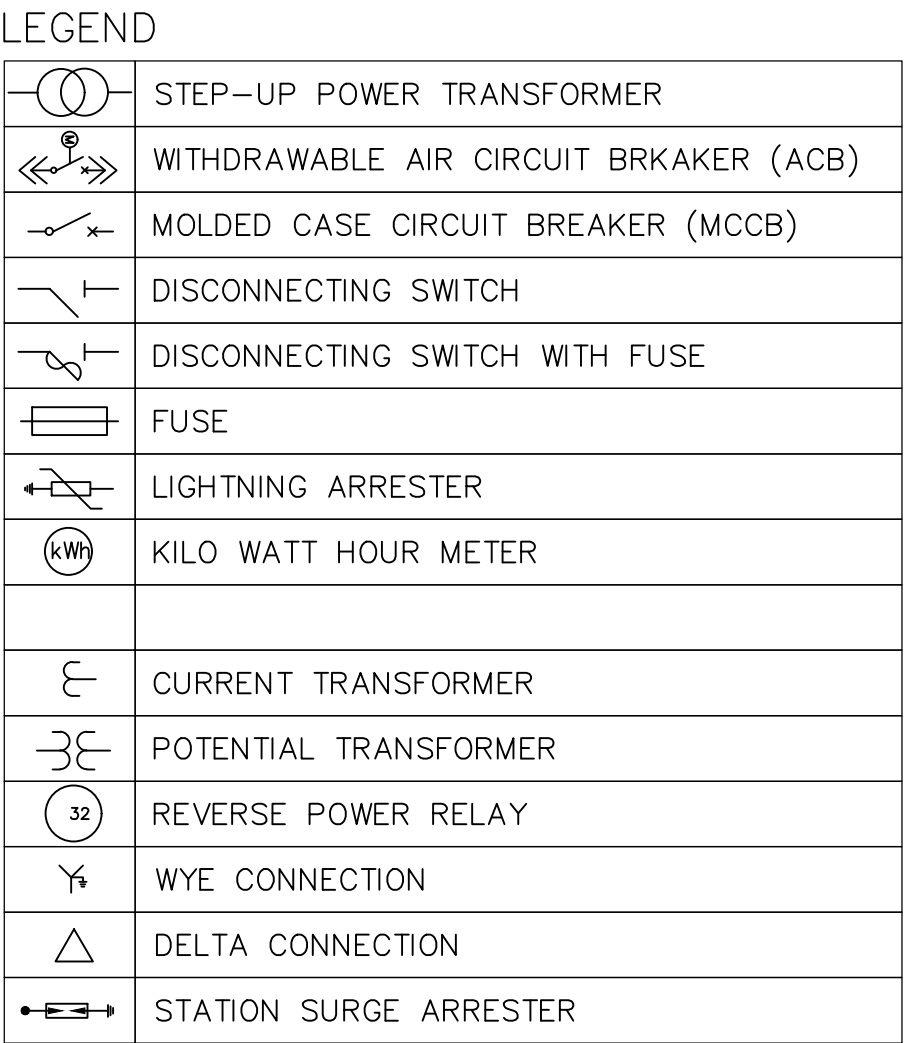
- REFERENCE DRAWINGS :
- POWERHOUSE, GENERAL LAYOUT
 - POWERHOUSE, SECTIONS

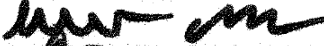
PL1-PH-01
PL1-PH-02



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
CONSULTANTS		DEDE		

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
PHLUANG 2 MINI HYDROPOWER PROJECT AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI			
PART 1 : CIVIL WORKS POWERHOUSE REINFORCEMENT DETAILS			
PCM P&C MANAGEMENT CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED	28.1957	REVIEWED	
DRAWN		SUBMITTED	
CHECKED	28.1957	RECOMMENDED	
APPROVED		APPROVED	
PROJECT MANAGER		17/03/2020 DATE	DRAWING NO. PL2-PH-06
			SHEET NO. 11 OF 14



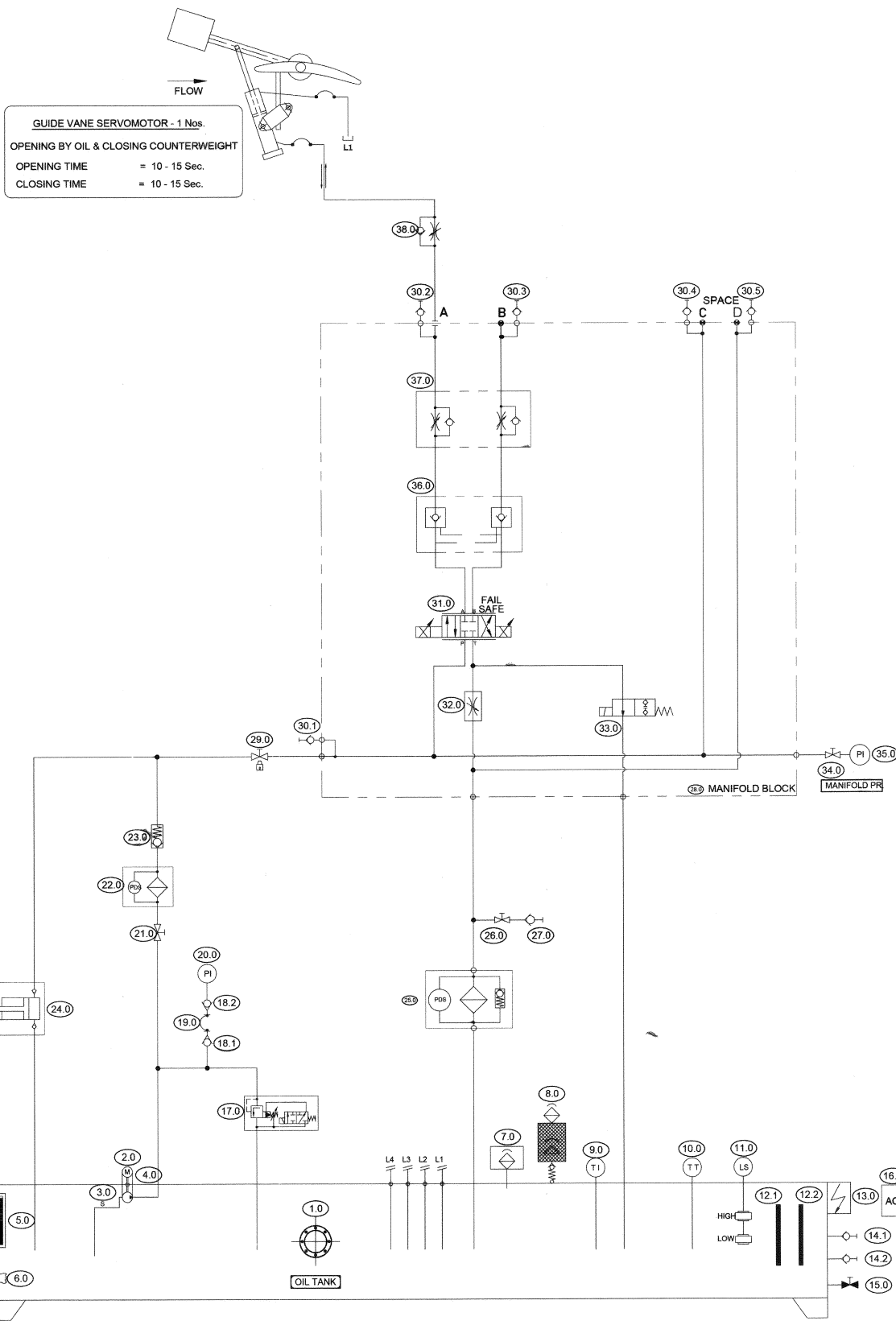
 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
PHLUANG 2 MINI HYDROPOWER PROJECT AMPHOE KHAO KHITCAKUT, CHANGWAT CHANTHABURI	
PART 2 : ELECTRO-MECHANICAL EQUIPMENT E&M EQUIPMENT	
OVERALL SINGLE LINE DIAGRAM	
 P&C MANAGEMENT CO.,LTD.	 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED  ๒๗.๑.๕๐	REVIEWED S. Kitchai
DRAWN  ๒๗.๑.๕๐	SUBMITTED 
CHECKED  ๒๗.๑.๕๐	RECOMMENDED 
	APPROVED 
PROJECT MANAGER _____ DATE	DRAWING NO. PL2-EM-01
	SHEET NO. 12 OF 14

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1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

SYMBOL LEGEND								
NAME	ISOLATION VALVE	ISOLATION VALVE NORMALLY CLOSE	THROTTLE VALVE	PRESSURE RELIEF VALVE	PUMP	ELECTRIC MOTOR	PRESSURE REDUCING VALVE	LOGIC ELEMENT WITH COVERT
SYMBOL								
NAME	3/2 DIRECTIONAL POPPET VALVE	3 WAY HAND OPERATED VALVE	THROTTLE CHECK VALVE	PRESSURE TRANSMITTER	SPACE HEATER	SOLENOID OPERATED	SPRING OPERATED	STROKE LIMITER
SYMBOL								
NAME	SOLENOID VARIABLE OPERATED	MINI-MESS COUPLING	QUICK RELEASE COUPLING	ELECTRIC JUNCTION BOX	FLEXIBLE HOSE PIPE	PRESSURE SWITCH	LEVEL SWITCH	SIMPLEX FILTER
SYMBOL								
NAME	TEMPERATURE INDICATOR	4/2 WAYS DIRECTIONAL CONTROL VALVE	THROTTLE CHECK VALVE	NON-RETURN VALVE				
SYMBOL								
NAME	DETENT TYPE	MANUAL ROTARY OPERATED	MANUAL HAND OPERATED	SPRING VARIABLE OPERATED				
SYMBOL								
NAME	LEVEL INDICATOR SIDE MOUNTED	BLADDER ACCUMULATOR	FILLING FILTER	BREATHING WITH SILICA GEL				
SYMBOL								

LINE LEGEND	
PRESSURE LINE	_____
PILOT LINE	_____
TANK RETURN LINE	_____

ALPHABET LEGEND	
D - DIFFERENTIAL	S - SWITCH
I - INDICATOR	TT - TRANSMITTER
L - LEVEL	T - TEMPERATURE
P - PRESSURE	



BILL OF MATERIAL		
Sr.NO	DESCRIPTION	QTY.
01.	OIL TANK, MATERIAL-M.S	01
02.	ELECTRIC MOTOR, 380 ± 10% AC SUPPLY, 50 Hz	01
03.	GEAR PUMP	01
04.	FLEXIBLE COUPLING TO SUIT PUMP-MOTOR SET.	01
05.	OIL LEVEL INDICATOR	01
06.	HEATER	01
07.	TANK BREATHER FILTER	01
08.	SILICA GEL BREATHER	01
09.	TEMPERATURE CONTROLLER WITH 2 SWITCHING & 1 ANALOGUE	01
10.	TEMPERATURE CONTROLLER WITH 2 SWITCHING & 1 ANALOGUE	01
11.	FLOAT SWITCH, SHREEDAN MAKE	01
12.	MAGNETIC TANK CLEANER	02
13.	JUNCTION BOX	01
14.	QUICK RELEASE COUPLING	02
15.	DRAIN VALVE	01
16.	ANODISED CIRCUIT PLATE (ACP)	01
17.	LOADING/UNLOADING VALVE	01
18.	MINI-MESS COUPLING	02
19.	HYDRAULIC HOSE	01
20.	PRESSURE INDICATOR, 100 MM DIAL	01
21.	ISOLATING VALVE	01
22.	PRESSURE LINE FILTER, 5 MICRONS, WITH ELECT.& VISUAL INDICATION	01
23.	CHECK VALVE	01
24.	MANUAL HYDRAULIC PUMP	01
25.	RETURN LINE FILTER WITH CLECT.&VISUAL IND. 10 MICRON	01
26.	ISOLATING VALVE	01
27.	QUICK RELEASE COUPLING	01
28.	MANIFOLD BLOCK	01
29.	ISOLATING VALVE, LOCKABLE TYPE	01
30.	MINI-MESS COUPLING	05
31.	PROPORTIONAL VALVE	01
32.	THROTTLE VALVE	01
33.	POPPET VALVE	01
34.	SHUT OFF VALVE (NEEDLE TYPE)	01
35.	PRESSURE INDICATOR, 100 MM DIAL	01
36.	HYDRAULIC OPERATED CHECK VALVE	01
37.	ONE WAY THROTTLE VALVE	01
38.	THROTTLE CHECK VALVE	01

- NOTE:-
1. SYSTEM WORKING PRESSURE IS 120 kg/cm²
 2. TEST PRESSURE USING EXTERNAL SOURCE IS 180 kg/cm²
 3. THE MATERIAL OF THE TANK IS AS PER ASTM516/ASME SA516
 4. WELDABLE FITTINGS SHALL BE USED FOR ALL PIPE LINES.
 5. ALL PIPES AND FITTINGS SHALL BE SEAMLESS STAINLESS STEEL AS PER ASTM A312
 6. OIL VELOCITY IN PIPES NOT TO EXCEED 4.5 M/SEC. AT MAXIMUM OIL FLOW.
 7. SERVOMOTORS DETAILS MAY VARY DURING DETAIL ENGINEERING.
 8. CONTROL VOLTAGE : 220 V DC (FOR ALL CONTROL VALVE).
 9. 24 V DC FOR Pr. TRANSMITTER & PROPORTIONAL VALVE.
 10. SUPPLY VOLTAGE : 380VAC, 50Hz
 11. OIL TI BE USED : ISO VG 46/68

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
PHLUANG 2 MINI HYDROPOWER PROJECT AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI	
PART 2 : ELECTRO-MECHANICAL EQUIPMENT E&M EQUIPMENT SCHEMATIC DIAGRAM OF OIL PRESSURE UNIT FOR TURBINE	
PCM P&C MANAGEMENT CO.,LTD.	REVIEWED
DESIGNED	SUBMITTED
DRAWN	RECOMMENDED
CHECKED	APPROVED
PROJECT MANAGER	DATE
PL2-EM-02	SHEET NO.
	13 OF 14

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N
A
G
C
L

TYPICAL POLE FOR 400V 3Ø SYSTEM
9M CONCRETE POLE. FOR INSULATED CONDUCTORS
NORMAL SPAN LENGTH DESIGN IS 30m. (NOT OVER 40m)

DEPTH OF POLE IN VARIOUS SOIL CONDITION
A=1.0-1.5m. BASE ON SOIL CONDITION

400V POWER CABLE FROM POWER BOX TO LV SWITCHGEAR
SHALL BE INSTALLED ON EXISTING POLE.

3					P&C MANAGEMENT CO., LTD.	REVIEWED	S. Kijichimi		
2					DESIGNED	[Signature]	27/06/04	SUBMITTED	[Signature]
1					DRAWN	[Signature]		RECOMMENDED	[Signature]
NO.	DATE	REVISIONS	CHECKED	APPROVED	CHECKED	[Signature]	27/06/04	APPROVED	[Signature]
		CONSULTANTS		DEDE		O.T.V.	17/03/2004	DRAWING NO.	SHEET NO.
					PROJECT MANAGER		DATE	PL2-TS-01	14 OF 14

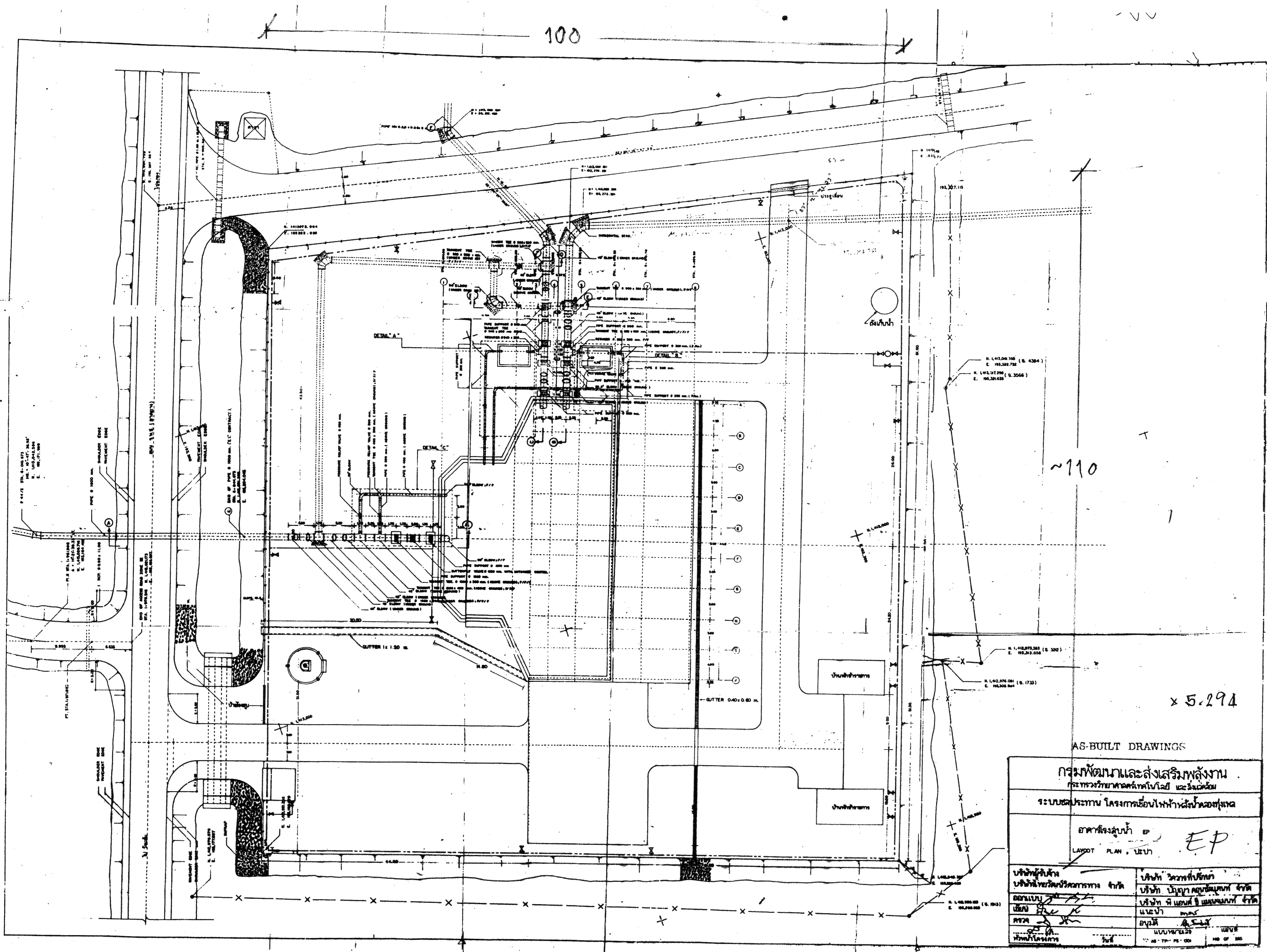
EXISTING STRUCTURE

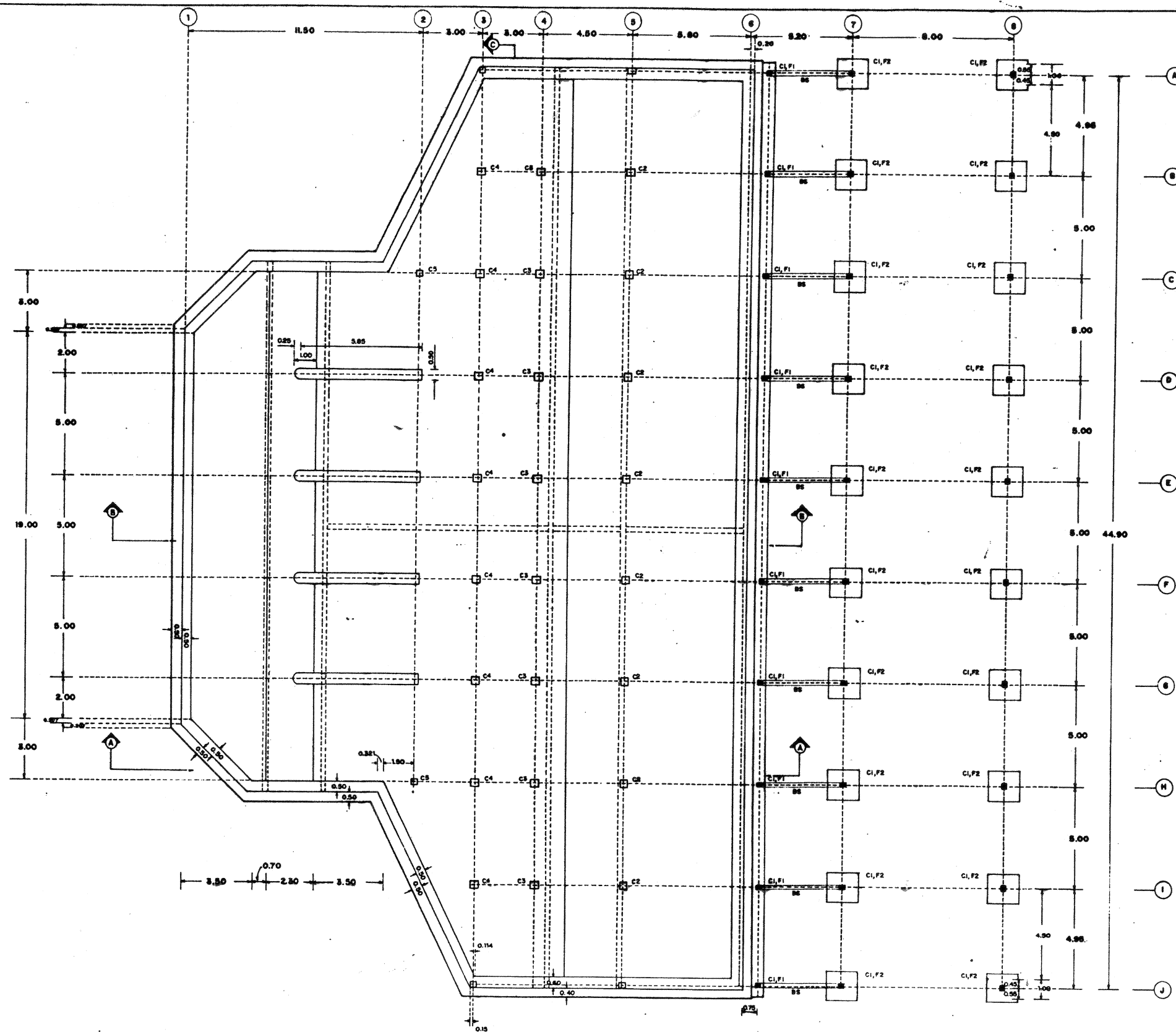
~110

x 5.294

AS-BUILT DRAWINGS

กรมพัฒนาและส่งเสริมพลังงาน กระทรวงวิทยาศาสตร์และเทคโนโลยี	
ระบบชลประทาน โครงการชลประทานไฟฟ้าฝายลัดช่องทุ่งหวะ	
อาคารโรงสูบน้ำ EP	
LAYOUT PLAN, 1:500	
บริษัทผู้รับจ้าง บริษัทไทยวิศวกรรมกรรม จำกัด	บริษัทวิศวกรที่ปรึกษา บริษัท ปิณฑา คอนกรีต จำกัด
ออกแบบ โดย <i>[Signature]</i>	บริษัท วิศวกรที่ปรึกษา นาย <i>[Signature]</i>
ตรวจสอบ โดย <i>[Signature]</i>	นาย <i>[Signature]</i>
หน้า หน้า	หน้า
หน้า	หน้า

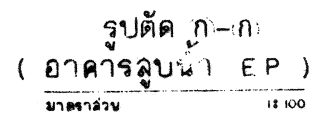




FOUNDATION AND BASEMENT FRAMING PLAN

AS-BUILT DRAWINGS

กรมพัฒนาและส่งเสริมพลังงาน กระทรวงวิทยาศาสตร์และเทคโนโลยี และสิ่งแวดล้อม			
ระบบชลประทานโครงการชลประทานน้ำ คลองทุ่งพล			
อาคารโรงสูบน้ำ EP PLAN ปรังน้ำ : พื้นและ กำแพง LINE 1-6 และ A-J EL. + 8.300 - EL. + 16.000			
บริษัทผู้รับจ้าง	บริษัท วิศวกรที่ปรึกษา		
บริษัทไทยวิวัฒน์วิศวกรรม	บริษัท บัญญา คอนสตรัคชั่น จำกัด		
ออกแบบ	บริษัท ที แอนด์ ซี แมเนจเม้นท์ จำกัด		
เขียน	แนะนำ		
ตรวจ	อนุมัติ		
หัวหน้าโครงการ	วันที่	แบบหมายเลข	แผ่นที่
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AS-BUILT DRAWINGS

กรมพัฒนาและส่งเสริมพลังงาน	
กระทรวงวิทยาศาสตร์และเทคโนโลยี และสิ่งแวดล้อม	
ระบบชลประทาน โครงการชลประทานน้ำผางหลวงทุ่งเฒ่า	
อาคารโรงสูบน้ำ EP	
รูปตัดตามยาว (รูปตัด ก-ก)	
บริษัทผู้รับจ้าง	บริษัท วิศวกรที่ปรึกษา
บริษัท ไบโวมัสวิศวกรรม จำกัด	บริษัท บัญญา สอนัฐเมธา จำกัด
ออกแบบ	บริษัท พี แชนด์ ซี แมเนจเม้นท์ จำกัด
เขียน	และนำ
ตรวจ	อนุมัติ
หัวหน้าโครงการ	แบบขยาย
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