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

PCM PROJECT AND COMMUNICATION MANAGEMENT P&C MANAGEMENT CO.,LTD.

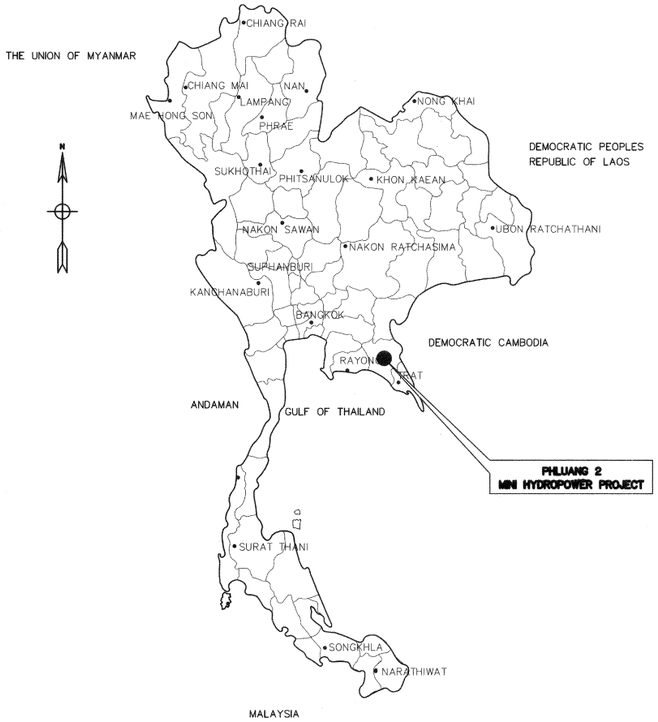
PHLUANG 2 MINI HYDROPOWER PROJECT

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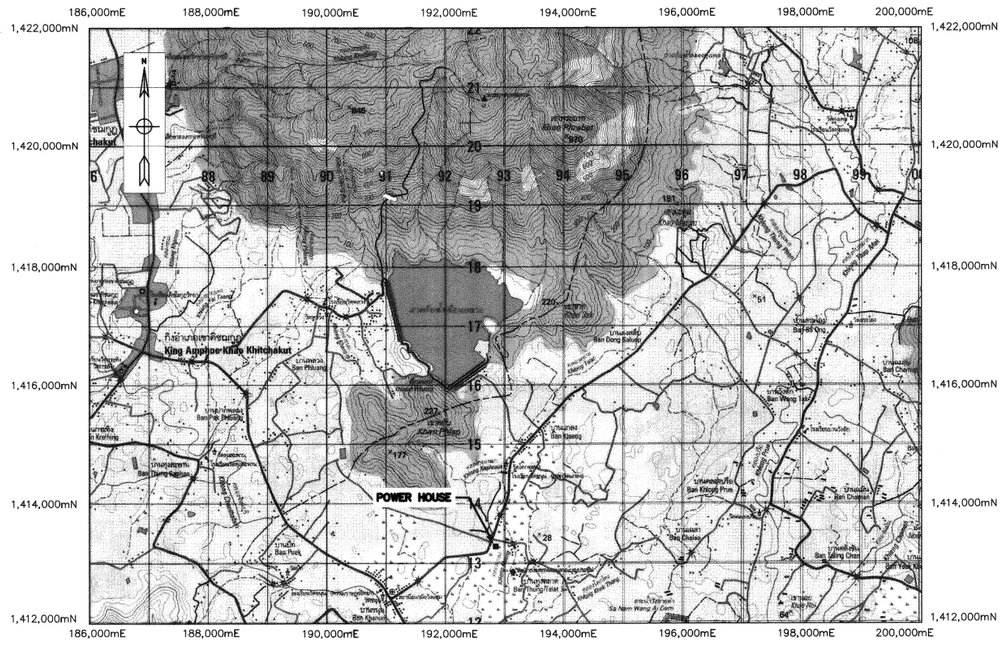
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SHEET NO.	DRAWING NO.	DRAWING DETAILS
		อาคารโรงสูบน้ำ
1	AS-TP-PS-001	LAYOUT PLAN, ประปา
2	AS-TP-PS-003	PLAN บ่อรับน้ำ : พื้นและกำแพง LINE 1-6 และ A-J
3	AS-TP-PS-004	รูปตัดตามยาว รูปตัด ก-ก
4	AS-TP-EE-004	แปลนไฟฟ้าแลงล่าง บริเวณสถานีสูบน้ำ



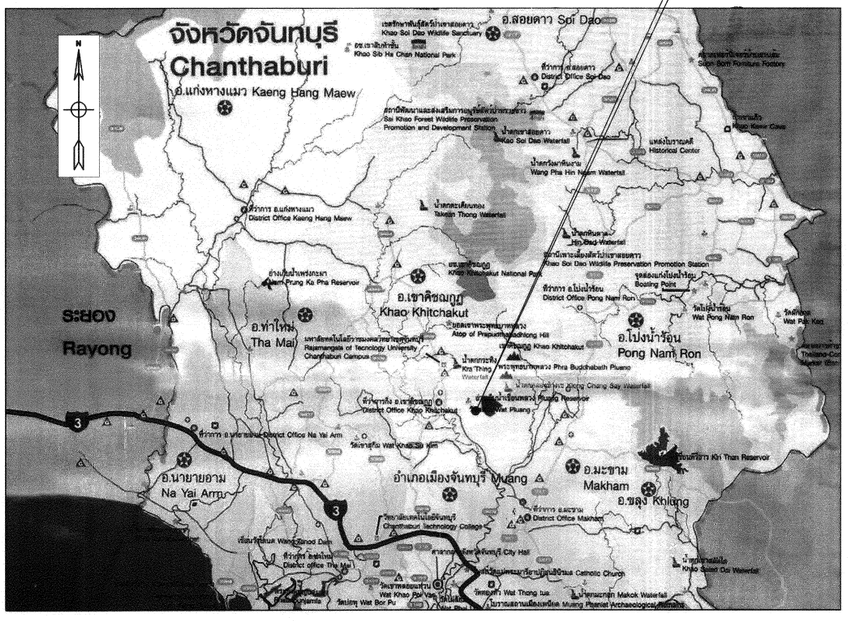
LOCATION MAP

NOT TO SCALE



PROJECT AREA

SCALE 1:50,000



PHLUANG 2 MINI HYDROPOWER PROJECT SITE LOCATION

NOT TO SCALE

LEGEND :

- 3322 — NATIONAL HIGHWAYS
- RIVER, CANAL
- PROVINCE LOCATION
- DISTRICT
- TOURIST ATTRACTION
- GAS STATION

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.

0 1,000 2,000 3,000 4,000 METERS

SCALE 1:50,000

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
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PHLUANG 2 MINI HYDROPOWER PROJECT

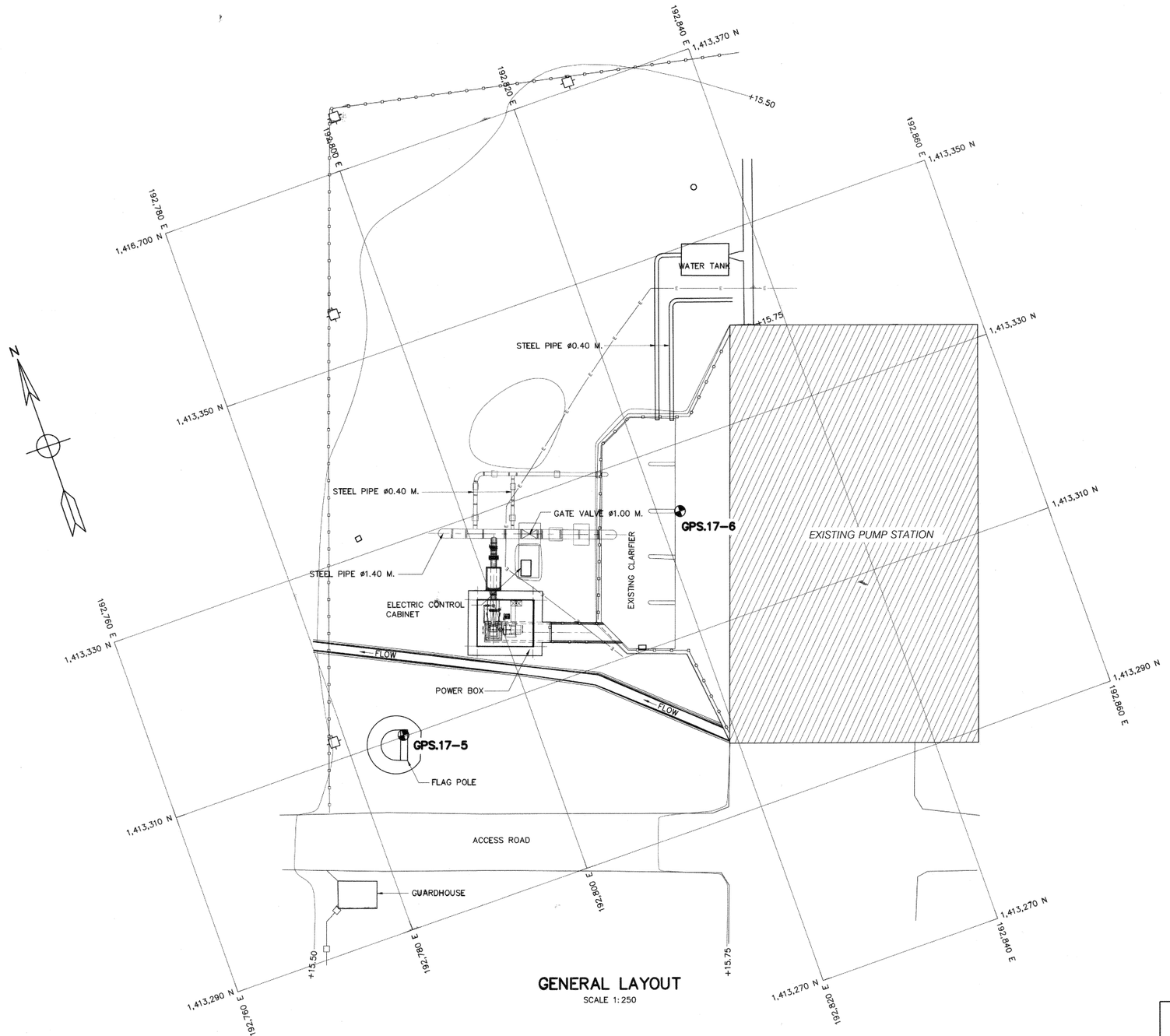
AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI

PART 1 : CIVIL WORKS

GENERAL

LOCATION MAP AND PROJECT AREA MAP

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		PL2-GN-01	1 OF 14



GENERAL LAYOUT

SCALE 1:250

NO.	BENCH MARK	WGS 84 GRID CO-ORDINATE		ELEVATION M. (M.S.L)	AZIMUTH	DISTANCE (M.)	REMARK
		NORTHING	EASTING				
1	GPS 17-5	1,413,310.154	192,786.116	+16.064			IS A MUSHROOM HEAD PINS BURIED AT THE BASE OF THE FLAG POLE OF THE PUMP STATION EAST OF THE PHLUANG DAM
					70° 28' 42.3"	38.491	DISTANCE & AZIMUTH FROM GPS 17-5 TO GPS 17-6
2	GPS 17-6	1,413,323.016	192,822.394	+15.877			IS A MUSHROOM HEAD PINS BURIED AT THE EDGE OF THE RESERVOIR NEAR THE PUMPING BUILDING ON THE EAST SIDE

0 1 2 3 4 5 10 15 20

SCALE 1:250 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 PL2-PH-01

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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Department of Alternative Energy Development and Efficiency
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PHLUANG 2 MINI HYDROPOWER PROJECT
AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI

PART 1 : CIVIL WORKS
GENERAL
GENERAL LAYOUT

PCM P&C MANAGEMENT CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

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CHECKED	28.1957	RECOMMENDED	
PROJECT MANAGER	17/03/2020	APPROVED	
	DATE	DRAWING NO.	PL2-GN-02
		SHEET NO.	2 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 ROUGHINESS 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 HONRIZONTAL CURVATURE
C.B.R.	CALIFORNIA BEARING RATIO	PI.	POINT OF HORIZONTAL INTERSECTION
C/C	CENTER TO CENTER	PL.	PLATE
℄	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 :

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 BOREHOLES
	BOREHOLES
. , "	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
1:2 1:2	ELEVATION OR PLAN OF SLOPE
	NATURAL GROUND LEVEL
25.00	CONTOUR LINE
	RIVER, STREAM OR NATURAL DRAIN
FLOW	FLOW DIRECTION
1:2	SLOPE DIRECTION
1 2	SLOPE RATIO

GENERAL NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS UNLESS OTHERWISE SHOWN.
2. 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.
3. 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 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 CHAMFERED 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. POWERHOUSE
	2. TAILRACE
	3. ANCHOR BLOCK, PIPE SUPPORT
210	SECONDARY CONCRETE
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 :
    - POWERHOUSE & TAILRACE Q_a = 15 T/$M.^2$

NO.	DATE	REVISIONS	CHECKED	APPROVED
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AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI

PART 1 : CIVIL WORKS

GENERAL

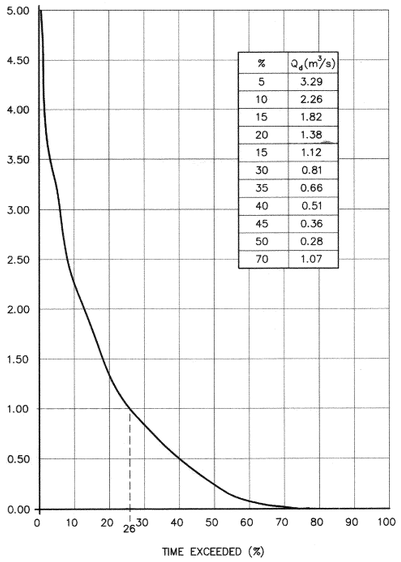
SYMBOLS, ABBREVIATIONS AND GENERAL NOTES

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PROJECT MANAGER	17/03/2020 DATE	DRAWING NO. PL2-GN-03	SHEET NO. 3 OF 14

TABLE 1 CLIMATOLOGICAL DATA FOR THE PERIOD 1988–2017

Station	Amphoe Mueang Changwat Chanthaburi	Elevation 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
Longtitude	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



%	Q_4(m³/s)
5	3.29
10	2.26
15	1.82
20	1.38
15	1.12
30	0.81
35	0.66
40	0.51
45	0.36
50	0.28
70	1.07

FIGURE 1 FLOW DURATION CURVE AT PHLUANG DAM

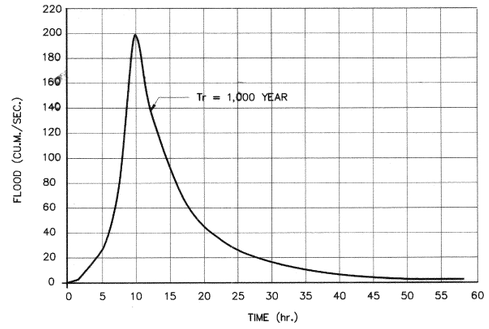
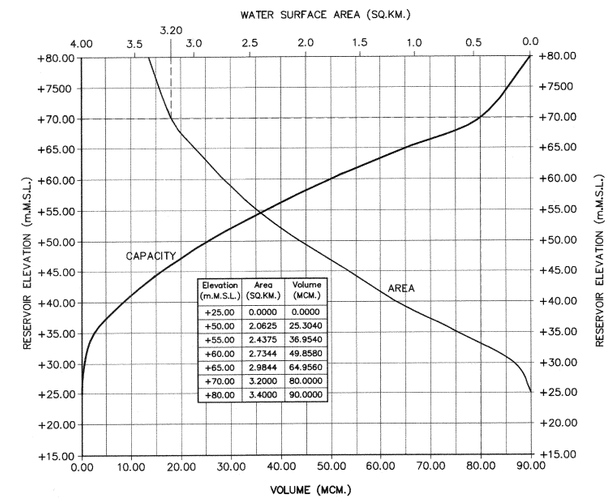


FIGURE 2 RETURN PERIOD 1,000 YEAR AT PHLUANG DAM



Elevation (m.M.S.L.)	Area (SQ.KM.)	Volume (MCM.)
+25.00	0.0000	0.0000
+50.00	2.0625	25.3040
+55.00	2.4375	36.9540
+60.00	2.7344	49.8580
+65.00	2.9844	64.9560
+70.00	3.2000	80.0000
+80.00	3.4000	90.0000

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 :

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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PART 1 : CIVIL WORKS

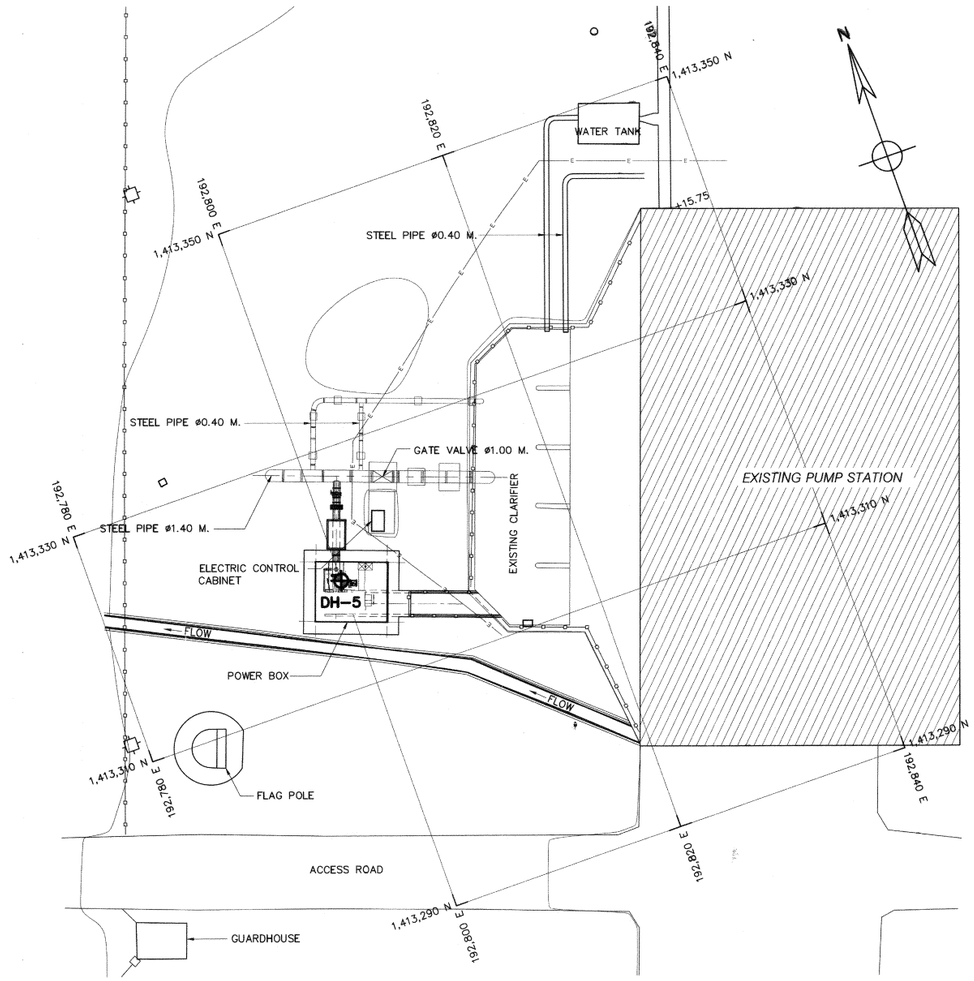
GENERAL

HYDROLOGY DATA

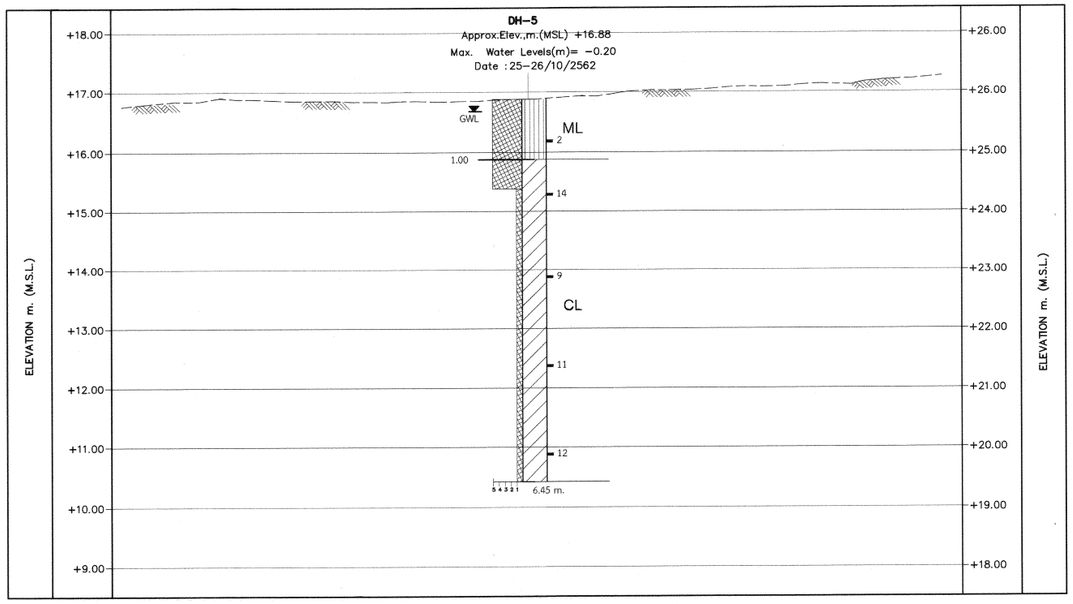
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		DRAWING NO.	PL2–GN–04
		SHEET NO.	4 OF 14



PLAN
SCALE 1:250



PROFILE GEOLOGICAL
SCALE 1:50

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

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

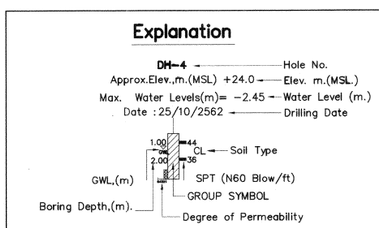
SOIL PROPERTIES AND SPT (N,BLOWS) FOR COHESION LESS SOILS.

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} - $5X10^{-5}$ CM/SEC = SEMI - IMPERVIOUS
3 = 5-10 LUGEON OR $5X10^{-5}$ - 10^{-4} CM/SEC = SEMI - PERVIOUS
4 = 10-50 LUGEON OR 10^{-4} - $5X10^{-4}$ CM/SEC = RATHER - PERVIOUS
5 = > 50 LUGEON OR $>5X10^{-4}$ CM/SEC = PERVIOUS

SYMBOL
DRILL HOLE

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

Explanation


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

0 1 2 3 4
SCALE 1:50 METERS
0 1 2 3 4 5 10 15 20
SCALE 1:250 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

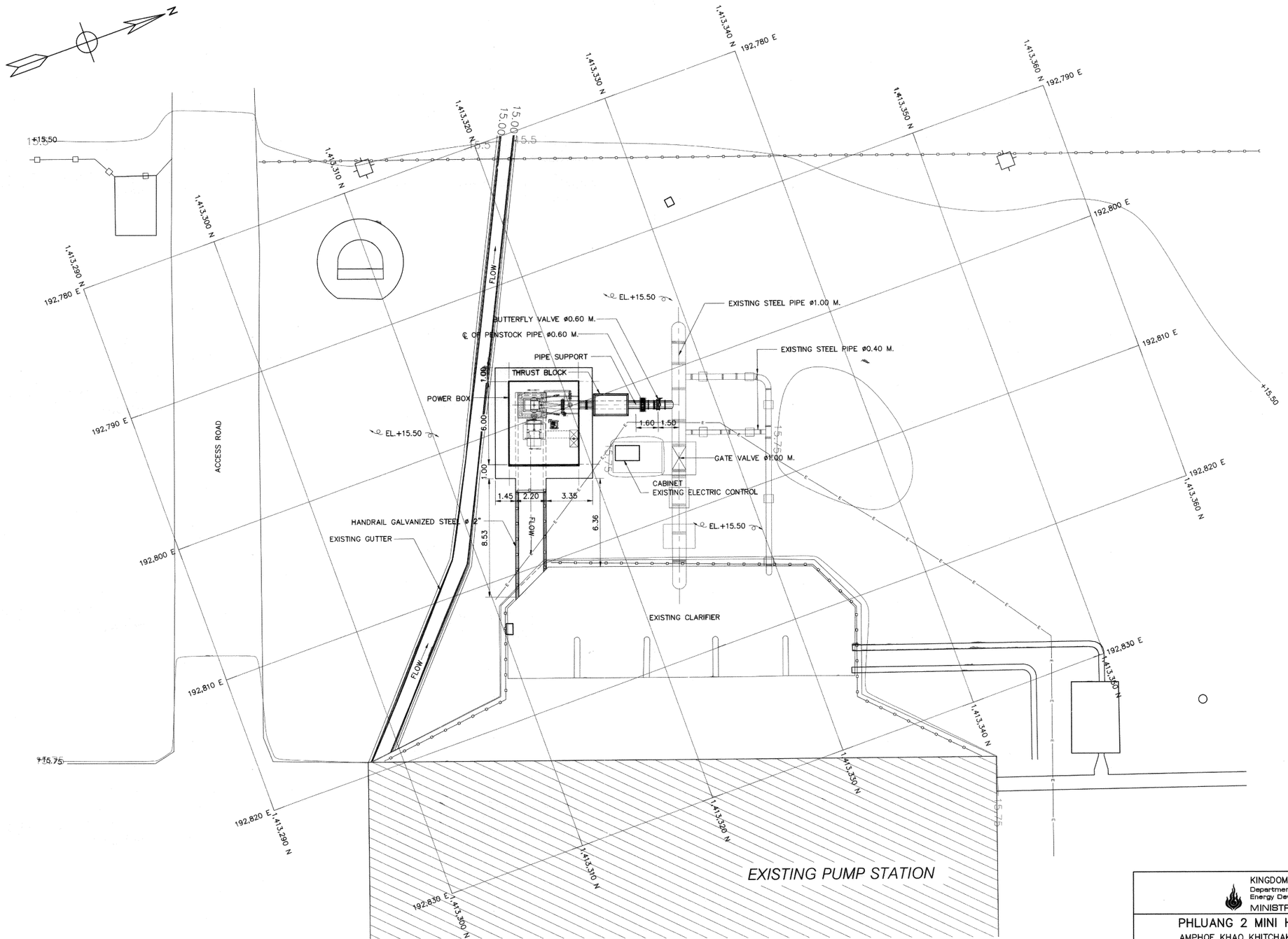
PHLUANG 2 MINI HYDROPOWER PROJECT
AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI

PART 1 : CIVIL WORKS
GENERAL
GEOLOGICAL DATA

PCM P&C MANAGEMENT CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

DESIGNED	28.1.1957	REVIEWED	
DRAWN		SUBMITTED	
CHECKED	28.1.1957	RECOMMENDED	
PROJECT MANAGER	17/03/2020	APPROVED	
	DATE	DRAWING NO.	PL2-GN-05
		SHEET NO.	5 OF 14



GENERAL LAYOUT

SCALE 1:150

0 1 2 4 6 8 10 12

SCALE 1:150 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, LAYOUT PLAN PL2–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

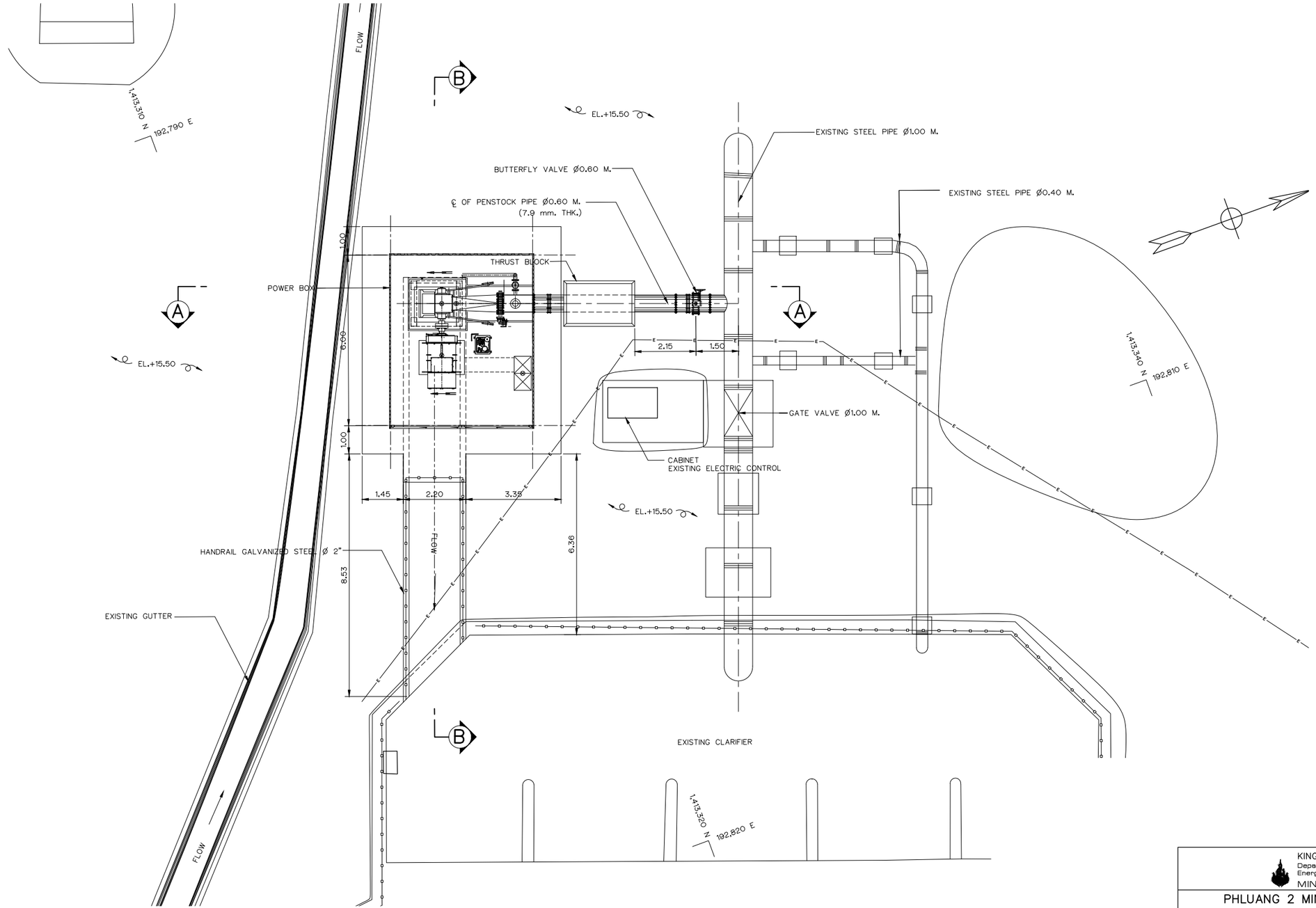
AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI

PART 1 : CIVIL WORKS

POWERHOUSE

GENERAL LAYOUT

PCM P&C MANAGEMENT CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
		REVIEWED	
DESIGNED	28.1957	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	28.1957	APPROVED	
PROJECT MANAGER	17/03/2020 DATE	DRAWING NO.	PL2–PH–01
		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	PL2-PH-01
3. POWERHOUSE, SECTION	PL2-PH-03
3. POWERHOUSE, PLAN AND ELEVATIONS	PL2-PH-04

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

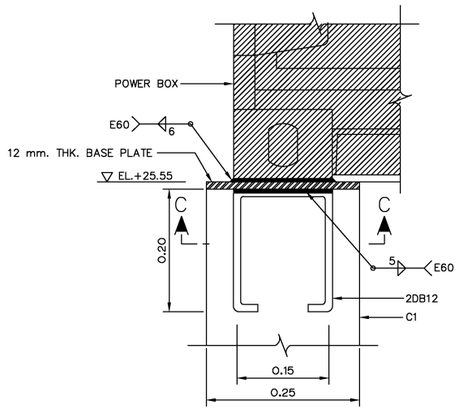
PART 1 : CIVIL WORKS
POWERHOUSE
LAYOUT PLAN

PCM P&C MANAGEMENT CO.,LTD.

DESIGNED	28.1957	
DRAWN		
CHECKED	28.1957	
PROJECT MANAGER	17/03/2020 DATE	

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

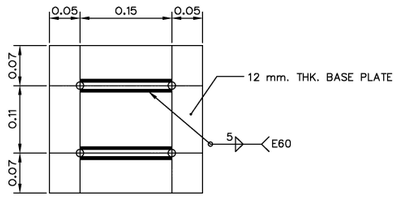
REVIEWED	
SUBMITTED	
RECOMMENDED	
APPROVED	
DRAWING NO.	PL2-PH-02
SHEET NO.	7 OF 14



DETAIL "B"

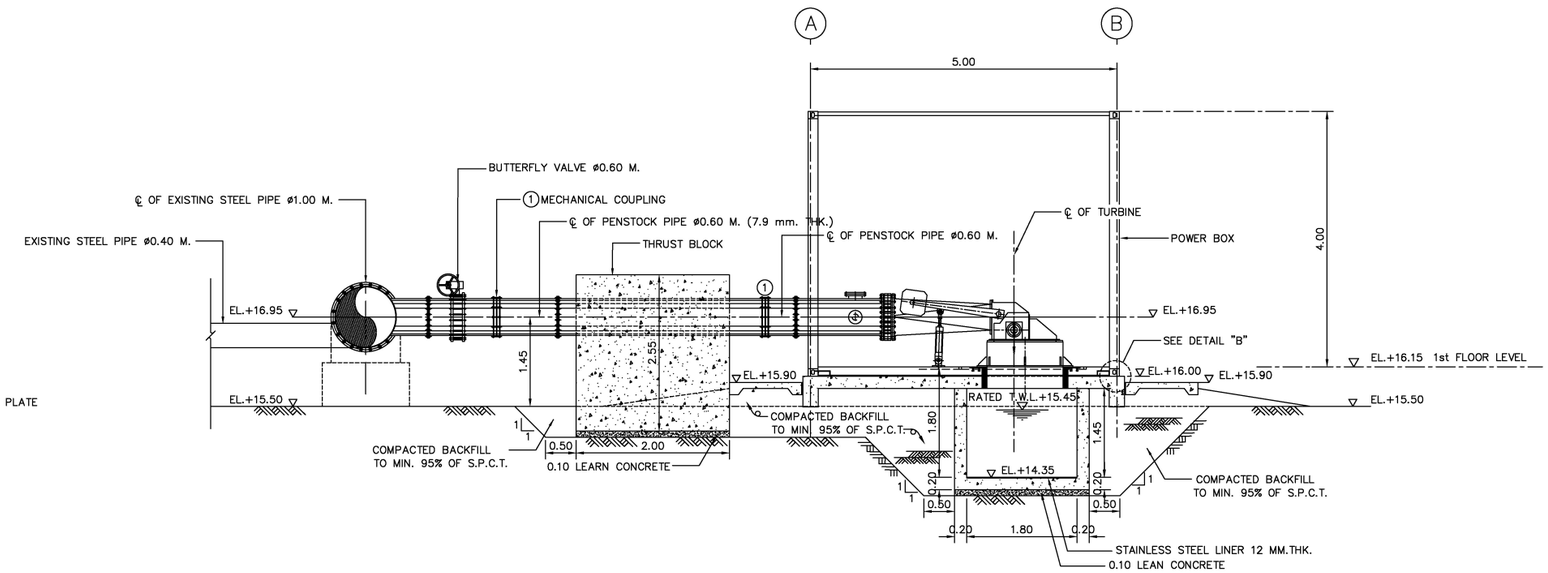
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(PL1-PH-03)



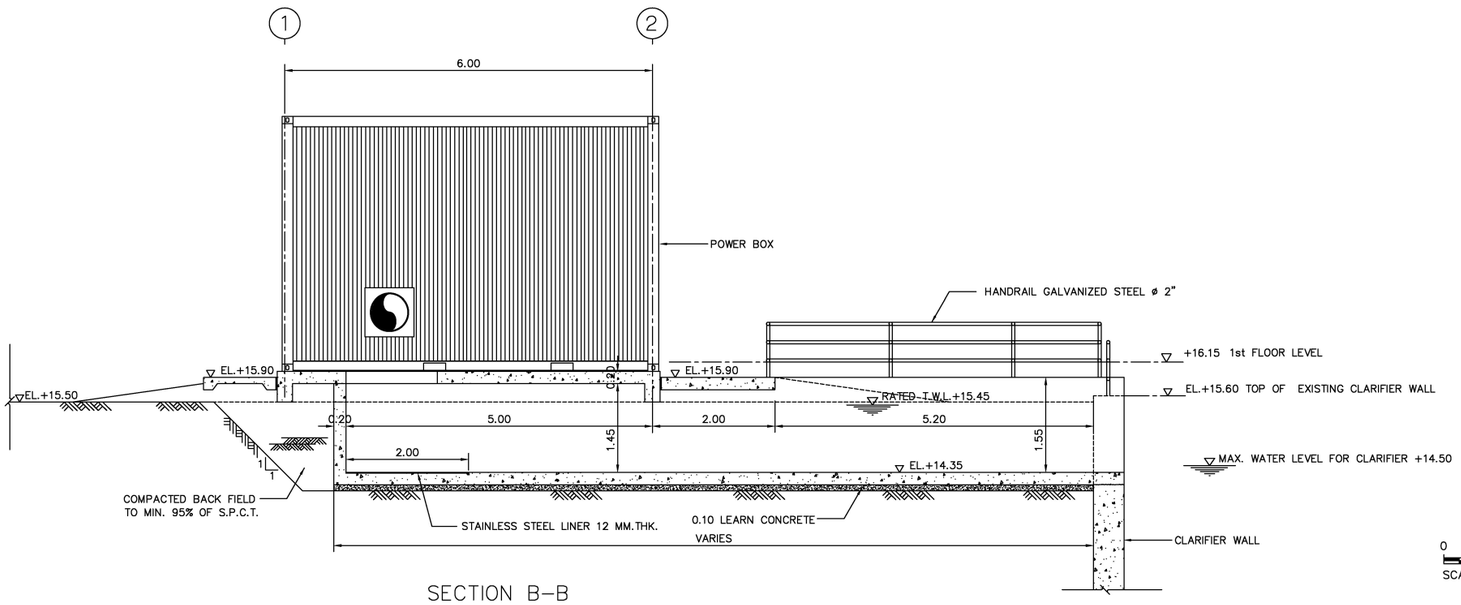
SECTION C-C

SCALE 1:5



SECTION A-A

SCALE 1:50



SECTION B-B

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. PL2-GN-03
3. 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.
4. 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
5. FOUNDATION SHALL HAVE MINIMUM 15 TON/M.^{2} (ULTIMATE CAPACITY)
6. COMPACTED BACKFILL SHALL BE DONE AFTER THE CONCRETE STRUCTURES HAVE BEEN FINISHED AND HAVE THE MINIMUM DESIGN STRENTH TO SUPPORT THE FULL LOAD
7. POWER BOX SHOULD BE DESIGN AND LOCATED BY CONTRACTOR

REFERENCE DRAWINGS :

1. POWERHOUSE, LAYOUT PLAN — PL2-PH-02

0 1 2 3 4

SCALE 1:50 METERS

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

SECTIONS AND DETAIL

PCM P&C MANAGEMENT CO.,LTD.

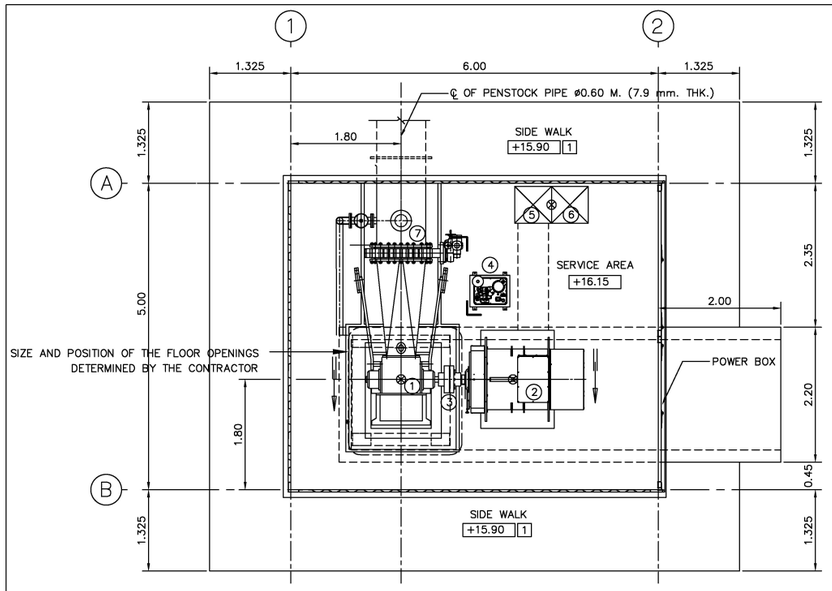
DESIGNED 2ธ.ค.1957
DRAWN
CHECKED 2ธ.ค.1957
PROJECT MANAGER 17/03/2020 DATE

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

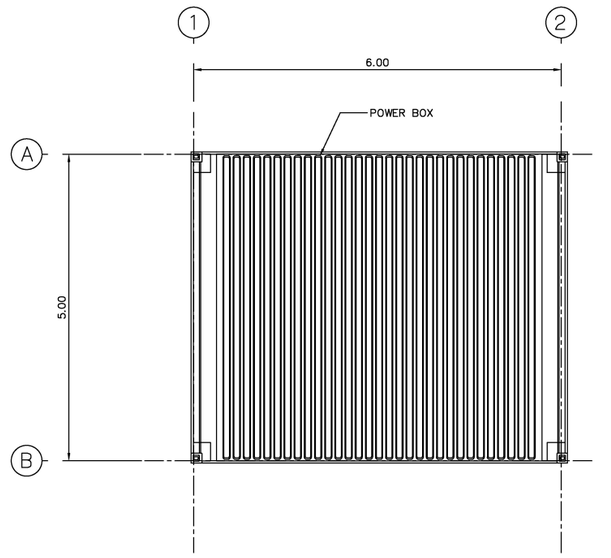
DRAWING NO. PL2-PH-03

SHEET NO. 8 OF 14



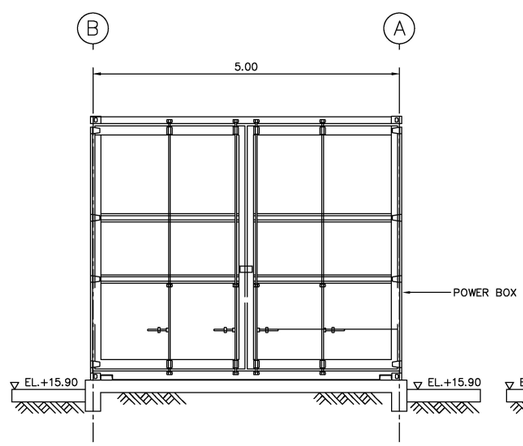
FLOOR PLAN

SCALE 1:50



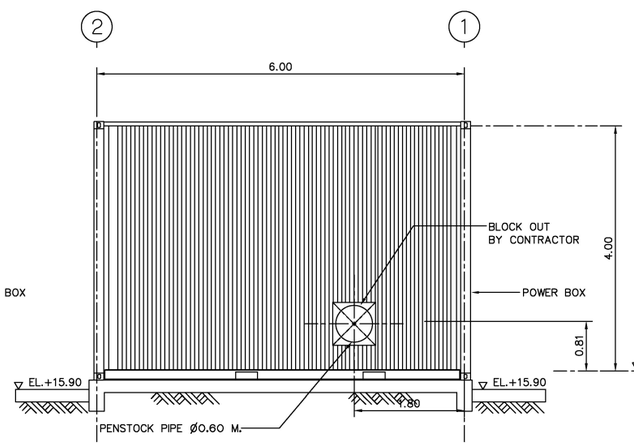
TOP OF POWER BOX PLAN

SCALE 1:50



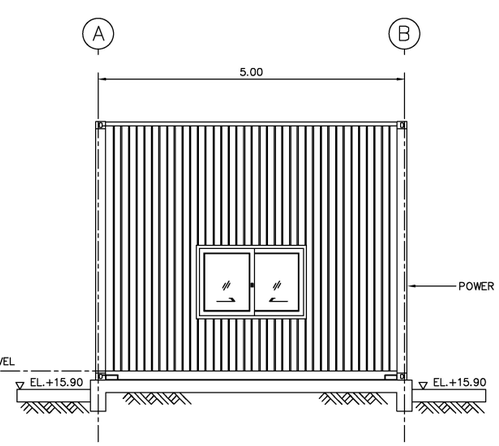
ELEVATION "1"

SCALE 1:50



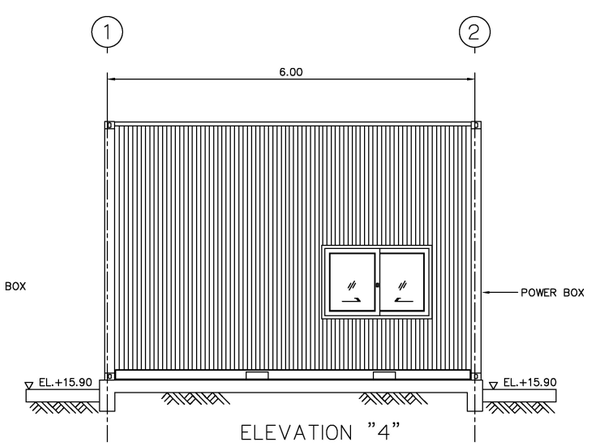
ELEVATION "2"

SCALE 1:50



ELEVATION "3"

SCALE 1:50



ELEVATION "4"

SCALE 1:50

FLOOR FINISH SYMBOLS :

1 COARSE FINISHED

NOTES :

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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

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS

DEDE

PCM P&C MANAGEMENT CO.,LTD.

DESIGNED 28.1.1957

DRAWN

CHECKED 28.1.1957

PROJECT MANAGER 17/03/2020 DATE

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED

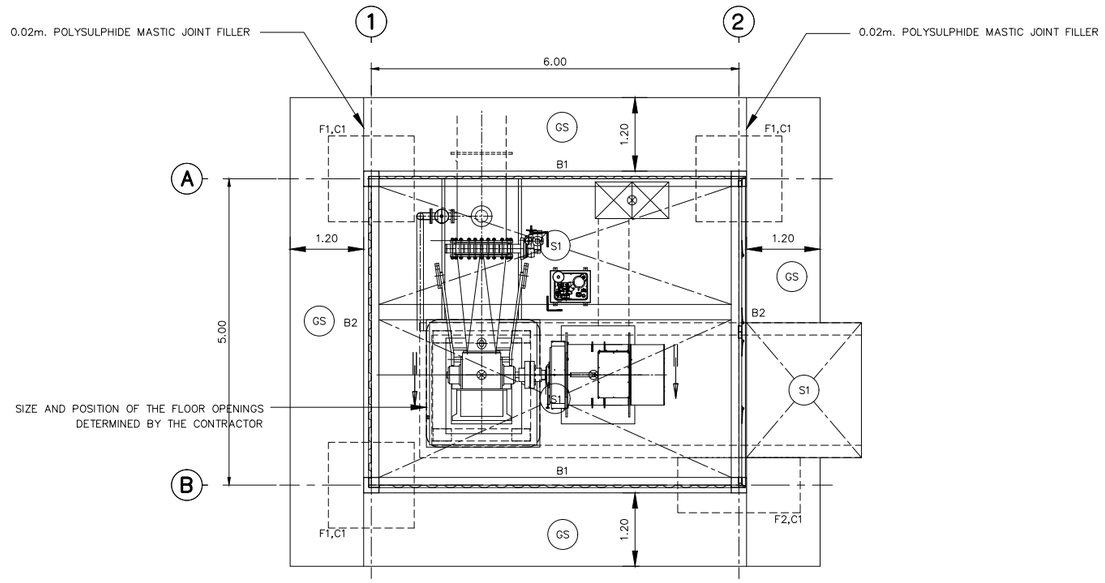
SUBMITTED

RECOMMENDED

APPROVED

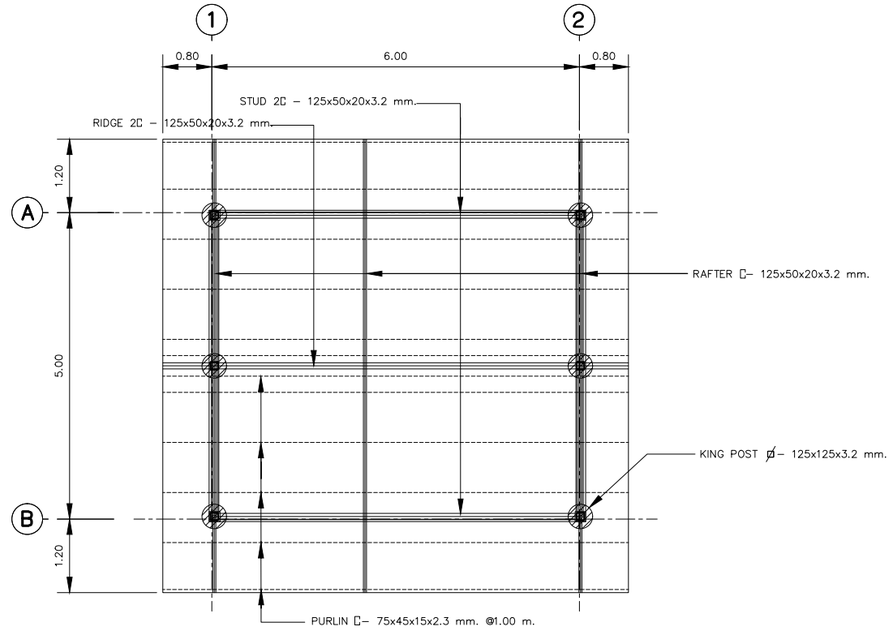
DRAWING NO. PL2-PH-04

SHEET NO. 9 OF 14



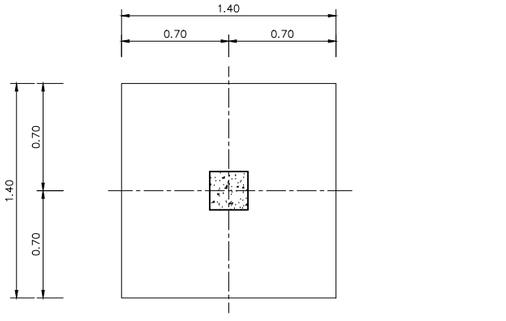
PLAN OF FOOTING, BEAM AND SLAB

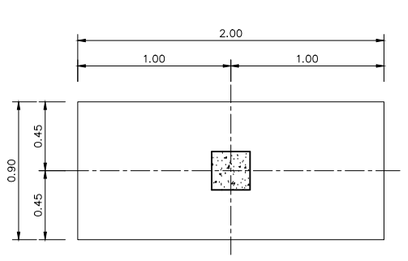
SCALE 1:50



PLAN OF ROOF

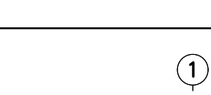
SCALE 1:50





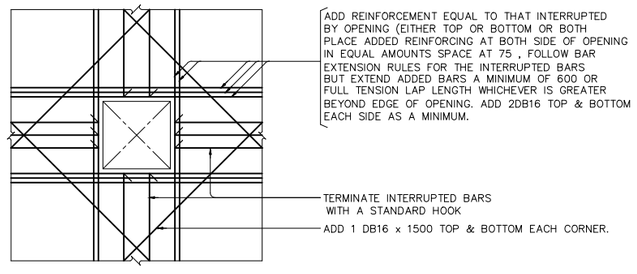
BEAM B1

SCALE 1:20



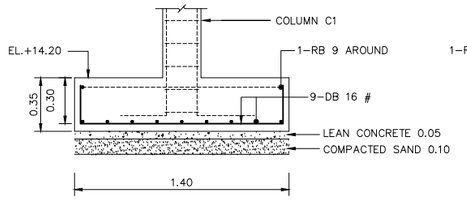
COLUMN C1

SCALE 1:20



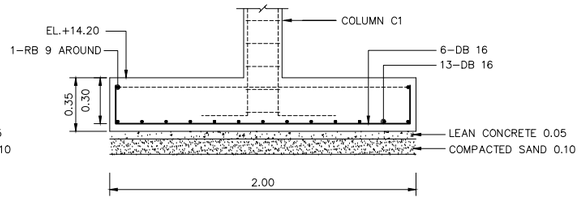
TYPICAL REINFORCING AT SLAB OPENING

SCALE 1:50



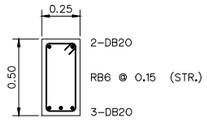
FOOTING (F1)

SCALE 1:20



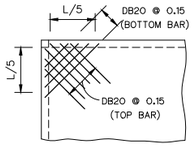
FOOTING (F2)

SCALE 1:20



BEAM B2

SCALE 1:20



TYP. ALL CORNER

SCALE 1:20

0 0.1 0.5 1 1.5
SCALE 1:20 METERS

0 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. PL1-GN-03
3. 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.
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5. FOUNDATION SHALL HAVE MINIMUM 15 TON/M.^{2} (ULTIMATE CAPACITY)
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7. 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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

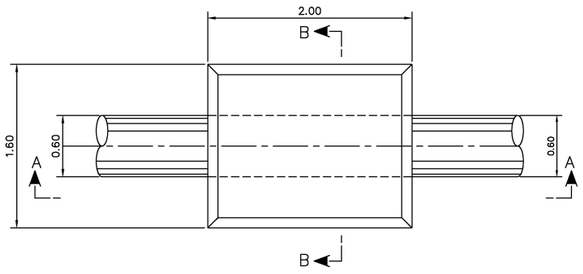
CONSULTANTS | DEDE

PCM P&C MANAGEMENT CO.,LTD.

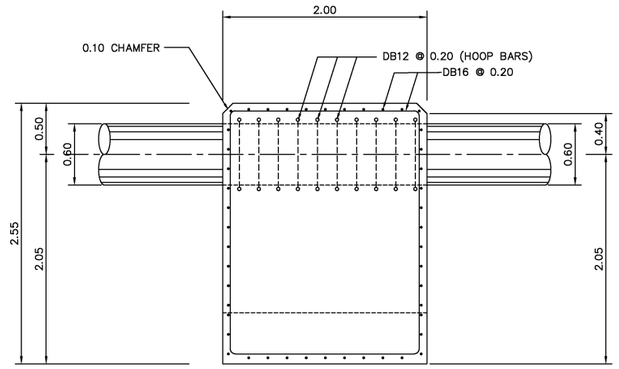
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

DESIGNED	28.1957	REVIEWED	
DRAWN		SUBMITTED	
CHECKED	28.1957	RECOMMENDED	
PROJECT MANAGER	17/03/2020 DATE	APPROVED	

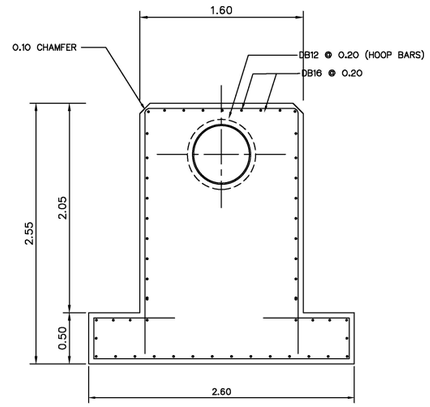
DRAWING NO. PL2-PH-05
SHEET NO. 10 OF 14



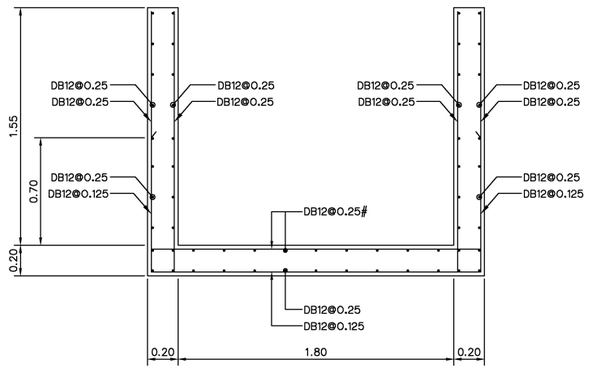
PLAN
ANCHOR BLOCK
SCALE 1:30



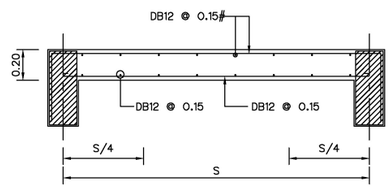
SECTION A–A
ANCHOR BLOCK
SCALE 1:30



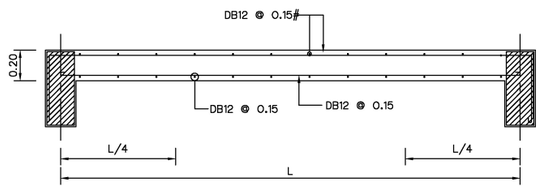
SECTION B–B
ANCHOR BLOCK
SCALE 1:30



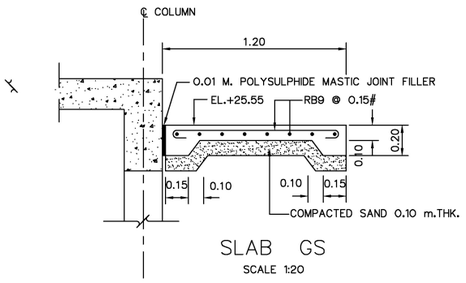
SECTION
TAILRACE
SCALE 1:20



SLAB S1 (SHOT)
SCALE 1:20



SLAB S1 (LONG)
SCALE 1:20



SLAB GS
SCALE 1:20

NOTES :

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3. 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.
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6. COMPACTED BACKFILL SHALL BE DONE AFTER THE CONCRETE STRUCTURES HAVE BEEN FINISHED AND HAVE THE MINIMUM DESIGN STRENTH TO SUPPORT THE FULL LOAD
7. POWER BOX SHOULD BE DESIGN AND LOCATED BY CONTRACTOR

REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAYOUT	PL1–PH–01
2. POWERHOUSE, SECTIONS	PL1–PH–02

0 0.10 0.20 0.30 0.40 0.50
SCALE 1:5 METERS

0 0.1 0.5 1 1.5
SCALE 1:20 METERS

0 0.2 0.4 0.8 1.2 1.6 2.0 2.4
SCALE 1:30 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

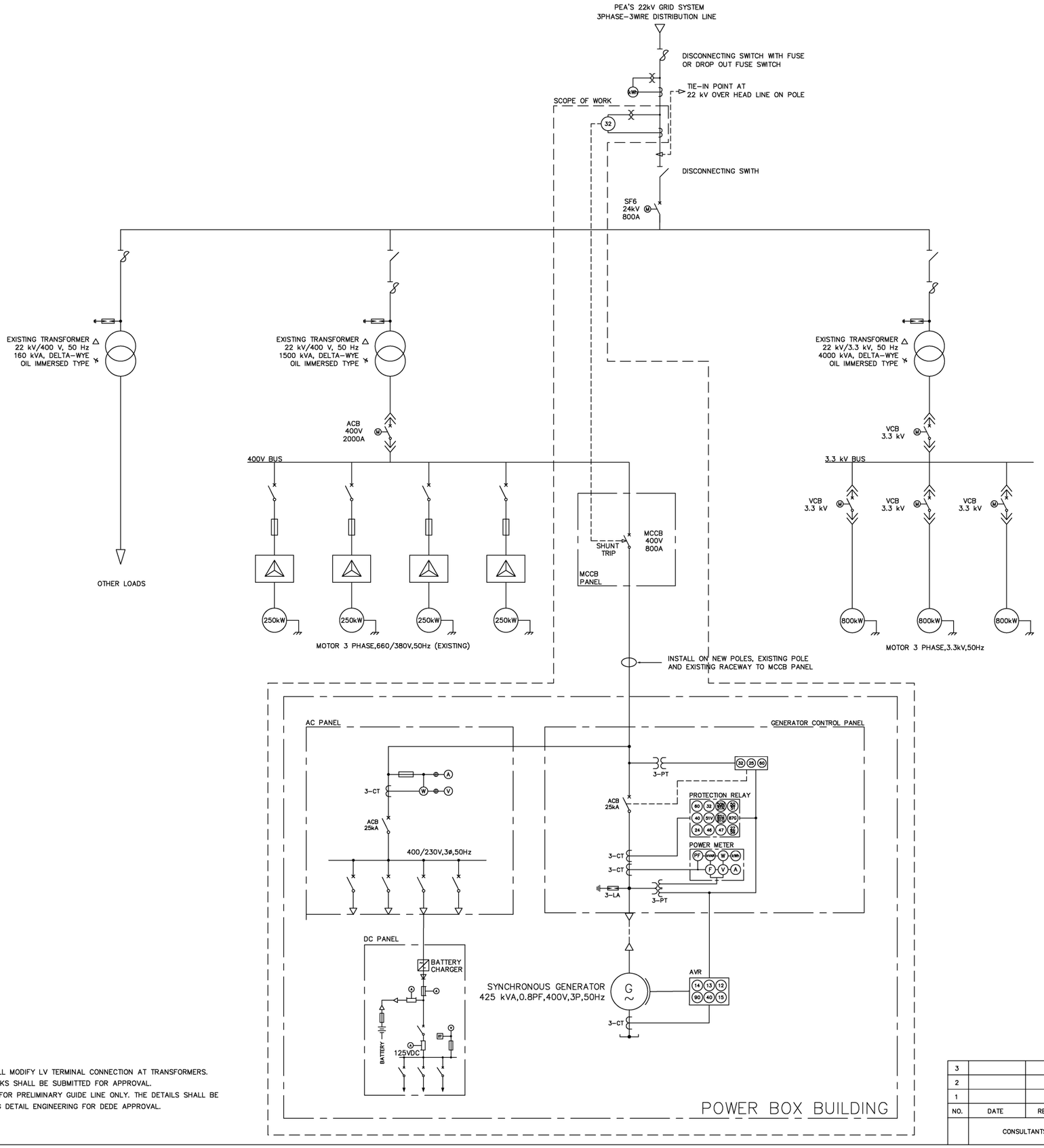
PHLUANG 2 MINI HYDROPOWER PROJECT
AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI

PART 1 : CIVIL WORKS
POWERHOUSE
REINFORCEMENT DETAILS

PCM P&C MANAGEMENT CO.,LTD.

DESIGNED	28.1957	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	28.1957	APPROVED	
PROJECT MANAGER	17/03/2020 DATE	DRAWING NO.	PL2–PH–06
		SHEET NO.	11 OF 14

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY
REVIEWED



LEGEND

	DROP OUT FUSE WITH CUTOUT
	TRANSFORMER
	CIRCUIT BREAKER (CB) MOTOR DRIVE
	CIRCUIT BREAKER (CB)
	LOAD BREAK SWITCH
	FUSE
	LIGHTNING ARRESTER
	MOLD CASE CIRCUIT BREAKER (MCB)
	NEUTRAL GROUNDING RESISTOR (NGR)
	BATTERY
	INVERTER
	BATTERY CHARGER
M	MOTOR OPERATED EQUIPMENT
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
ATS	AUTOMATIC TRANSFER SWITCH
12	OVER SPEED DEVICE
13	SYNCHRONOUS SPEED DEVICE
14	UNDER SPEED DEVICE
15	SPEED OR FREQUENCY MATCHING DEVICE/RELAY
24	VOLT PER HERTZ RELAY
25	SYNCHRO CHECK RELAY
27R	REMANENT UNDER VOLTAGE RELAY
27 59	UNDER AND OVER VOLTAGE RELAY
32	REVERSE POWER RELAY
40	LOSS OF EXCITATION
46	PHASE UNBALANCE CURRENT RELAY
47	PHASE UNBALANCE VOLTAGE RELAY
50BF	BREAKER FAILURE
50 51	PHASE OVERCURRENT RELAY
50N 51N	GROUND OVERCURRRENT RELAY
51V	VOLTAGE RESTRAINED TIME OVERCURRENT
59N	NEUTRAL OVERVOLTAGE RELAY
60	VOLTAGE OR CURRENT UNBALANCE RELAY
64R	ROTOR EARTH FAULT RELAY
64S	STATOR EARTH FAULT RELAY
64	GROUND FAULT PROTECTION RELAY
67	DIRECTIONAL OVERCURRENT RELAY
67N	NEUTRAL DIRECTIONAL OVERCURRENT RELAY
78	PHASE ANGLE MEASURING RELAY
81	OVER FREQUENCY RELAY
81R	RATE OF CHANGE OF FREQUENCY RELAY (RCOF)
DG	STANDBY DIESEL GENERATOR
PF	POWER FACTOR METER
F	FREQUENCY METER
V	VOLT METER
A	AMP METER
W	WATT METER
kWh	KILO WATT HOUR METER
kVar	KILO VAR METER
SYN	SYNCHRONIZING RELAY
G	SYNCHRONOUS AC GENERATOR

NOTE :
1. CONTRACTOR SHALL MODIFY LV TERMINAL CONNECTION AT TRANSFORMERS. MODIFICATION WORKS SHALL BE SUBMITTED FOR APPROVAL.
2. THIS DRAWING IS FOR PRELIMINARY GUIDE LINE ONLY. THE DETAILS SHALL BE SUBMITTED DURING DETAIL ENGINEERING FOR DEDE APPROVAL.

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 2 : ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT
OVERALL SINGLE LINE DIAGRAM

PCM P&C MANAGEMENT CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
		REVIEWED	S. Kitichai
DESIGNED	วิทย์	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	วิทย์	APPROVED	
PROJECT MANAGER	17/03/2020 DATE	DRAWING NO. PL2-EM-01	SHEET NO. 12 OF 14

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	MINIMESS 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	BREATHER WITH SILICA GEL				
SYMBOL								

LINE LEGEND

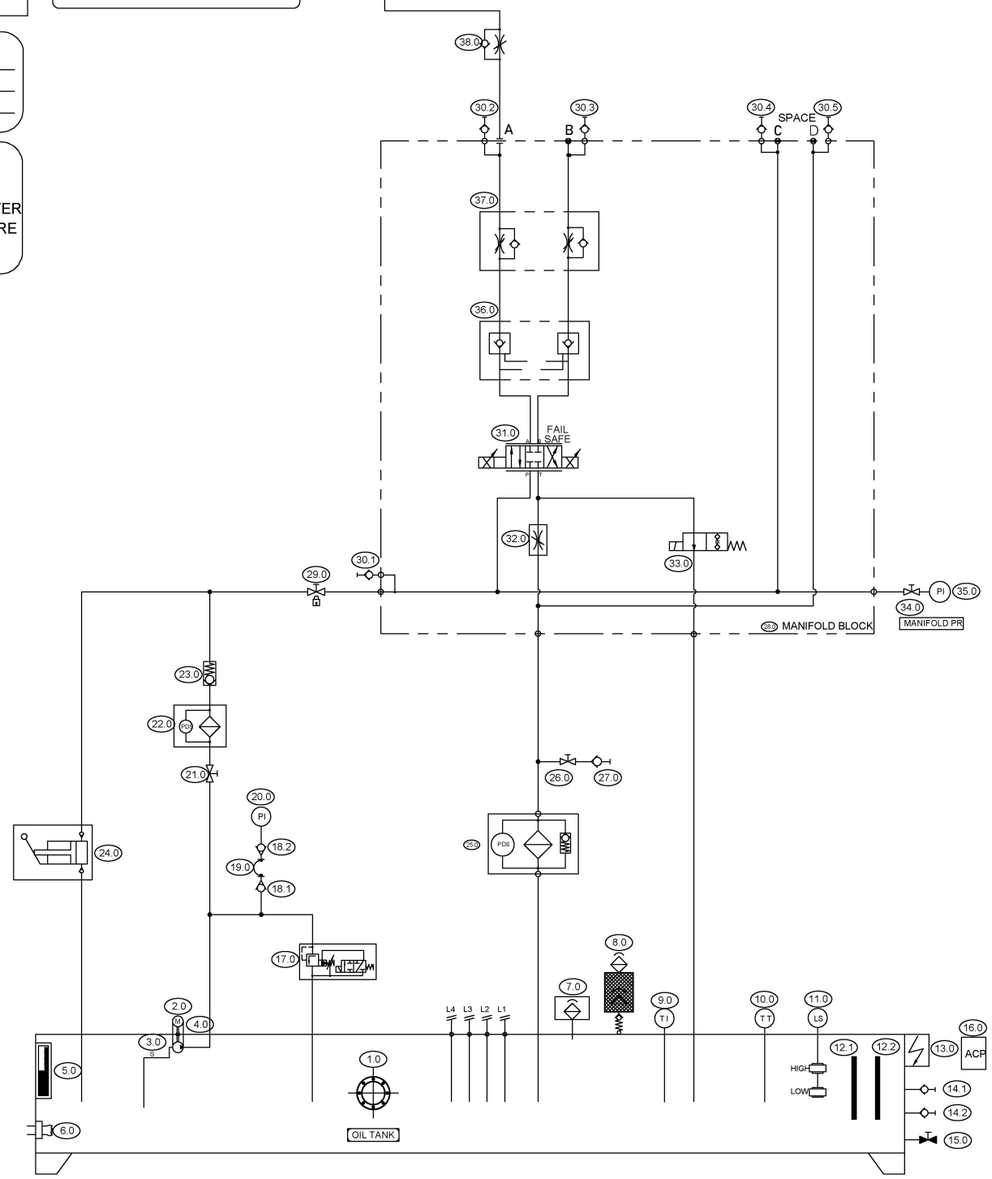
PRESSURE LINE
PILOT LINE
TANK RETURN LINE

ALPHABET LEGEND

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

FLOW

GUIDE VANE SERVOMOTOR - 1 Nos.
OPENING BY OIL & CLOSING COUNTERWEIGHT
OPENING TIME = 10 - 15 Sec.
CLOSING TIME = 10 - 15 Sec.



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.	MINIMESS 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.	MINIMESS 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 : 380 ±10VAC, 50Hz
11. OIL TI BE USED : ISO VG 46/68
12. THIS DRAWING IS FOR PRELIMINARY AND GUIDE LINE ONLY
    CONTRACTOR SHALL SUBMIT THE DETAILS FOR DEDE APPROVAL.

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 2 : ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT

SCHEMATIC DIAGRAM OF OIL PRESSURE UNIT FOR TURBINE

PCM P&C MANAGEMENT CO.,LTD.

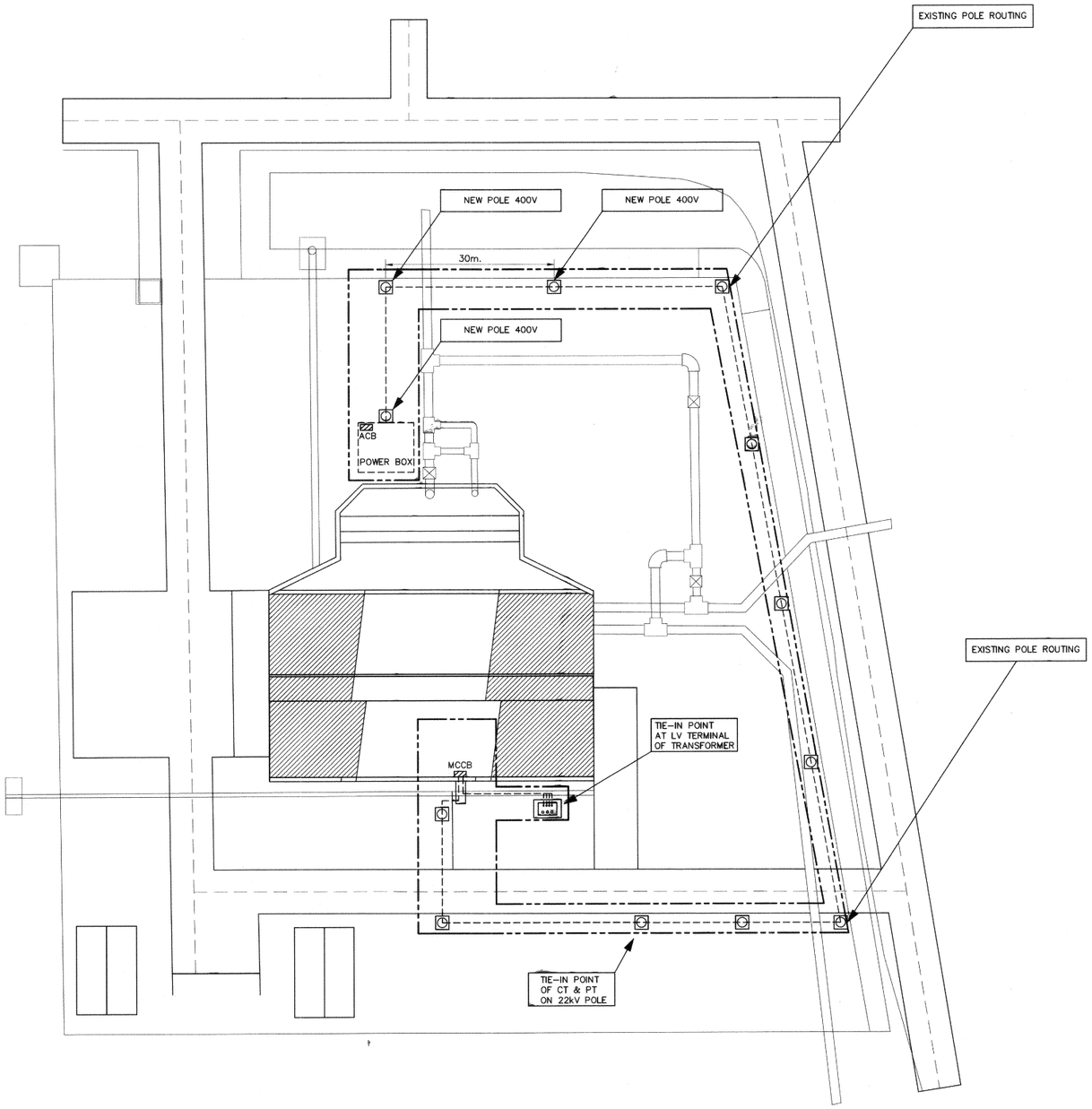
DESIGNED		ส.ค.1950
DRAWN		
CHECKED		ส.ค.1950
PROJECT MANAGER		17/03/2020 DATE

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

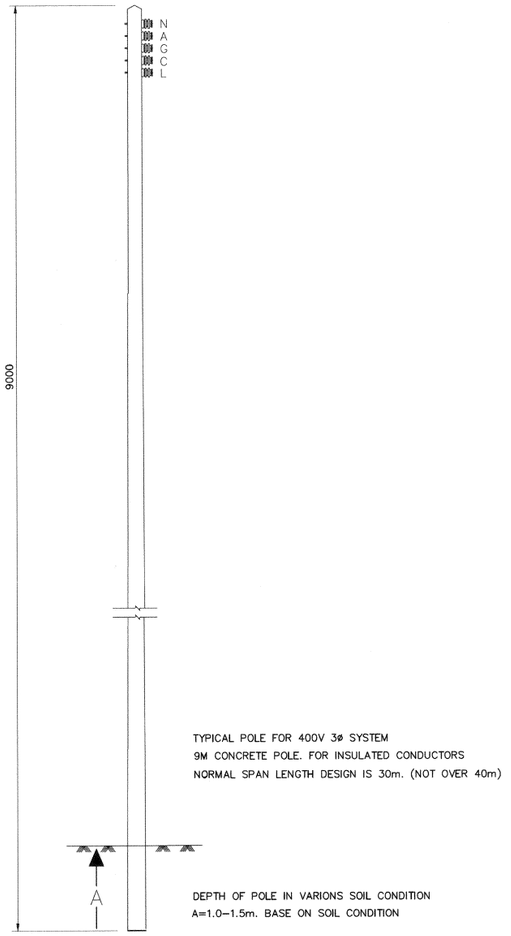
REVIEWED	
SUBMITTED	
RECOMMENDED	
APPROVED	

DRAWING NO. PL2-EM-02
SHEET NO. 13 OF 14

POWER BOX LAYOUT AND 400V DISTRIBUTION LINE ROUTING



TYPICAL POLE 400V



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 VARIONS SOIL CONDITION
A=1.0–1.5m. BASE ON SOIL CONDITION

NOTE

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

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 3 : TRANSMISSION LINE
TRANSMISSION LINE
POWER BOX LAYOUT AND 400V DISTRIBUTION LINE ROUTING

PCM P&C MANAGEMENT CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

DESIGNED	2พ.ค.64	REVIEWED	S.Kitichai
DRAWN		SUBMITTED	
CHECKED	2พ.ค.64	RECOMMENDED	
PROJECT MANAGER	17/03/2020 DATE	APPROVED	

DRAWING NO. PL2–TS–01

SHEET NO. 14 OF 14

EXISTING STRUCTURE

100

~110

x 5.294

DETAIL "A"

DETAIL "B"

DETAIL "C"

GUTTER 1x 1.50 m.

GUTTER 0.40x 0.60 m.

ถังเก็บน้ำ

บ้านพักข้าราชการ

บ้านพักข้าราชการ

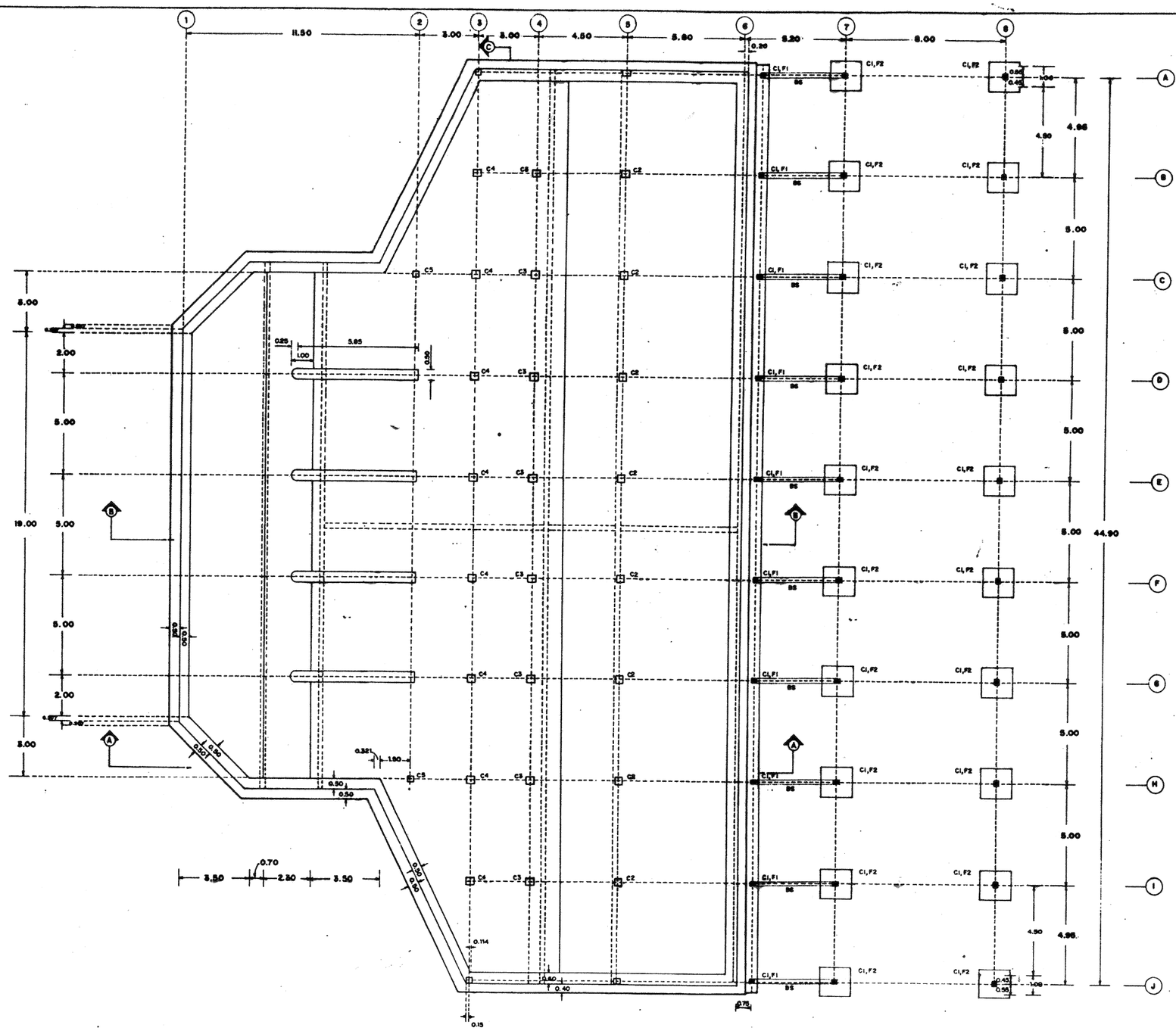
AS-BUILT DRAWINGS

กรมพัฒนาและส่งเสริมพลังงาน
กระทรวงวิทยาศาสตร์เทคโนโลยี และสิ่งแวดล้อม

ระบบชลประทาน โครงการเขื่อนไฟฟ้าผันน้ำคลองตุ่มแหล

อาคารสูบน้ำ EP
LAYOUT PLAN , ประปา EP

บริษัทผู้รับจ้าง บริษัทไทยวัฒน์วิศวการทาง จำกัด	บริษัท วิศวกรที่ปรึกษา
	บริษัท ปัญญา คอนซัลแตนท์ จำกัด
ออกแบบ	บริษัท พี แอนด์ ซี แมนเนจเมนท์ จำกัด
เขียน	แนะนำ
ตรวจ	อนุมัติ
ที่ปรึกษาโครงการ วันที่	แบบรายละเอียด AS - TP - PS - 001 แผ่นที่ 148 OF 385



FOUNDATION AND BASEMENT FRAMING PLAN

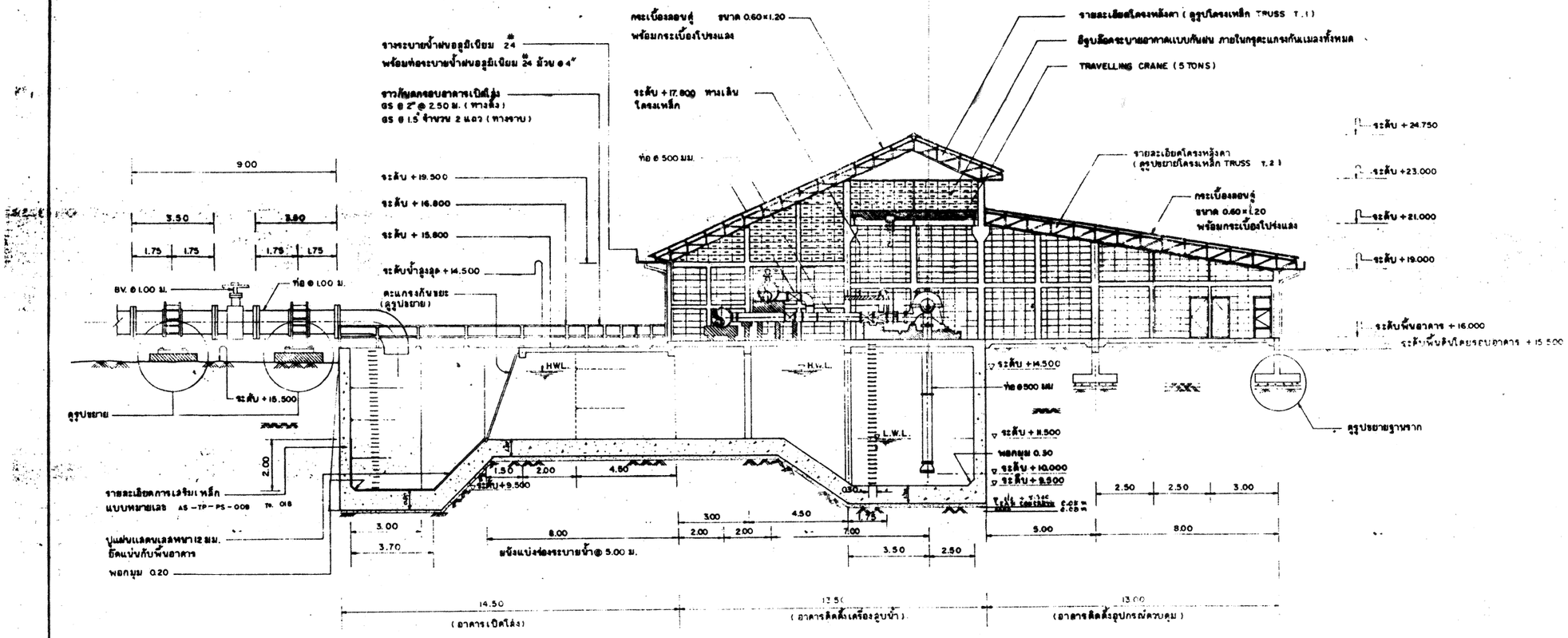
AS-BUILT DRAWINGS

กรมพัฒนาและส่งเสริมพลังงาน
กระทรวงวิทยาศาสตร์เทคโนโลยี และสิ่งแวดล้อม

ระบบผลประทานโครงการเชื่อมไฟฟ้าพลังน้ำ คลองท่งเพล

อาคารโรงสูบน้ำ EP
PLAN บ่อรับน้ำ : พื้น และ กำแพง LINE 1-6 และ A - J
EL.+ 8.300 - EL.+ 16.000

บริษัทผู้รับจ้าง บริษัทไทยวัฒน์วิสาการทาง	บริษัท วิสาหกิจที่ปรึกษา บริษัท บัญญา คอนซัลแตนท์ จำกัด บริษัท พี แอนด์ ซี แมเนจเมนท์ จำกัด
ออกแบบ	แบบนำ
เสียน	
ตรวจ	อนุมัติ
หัวหน้าโครงการ วันที่	แบบหมายเลข AS- TP - PS - 003 แผ่นที่ 150 FO 355



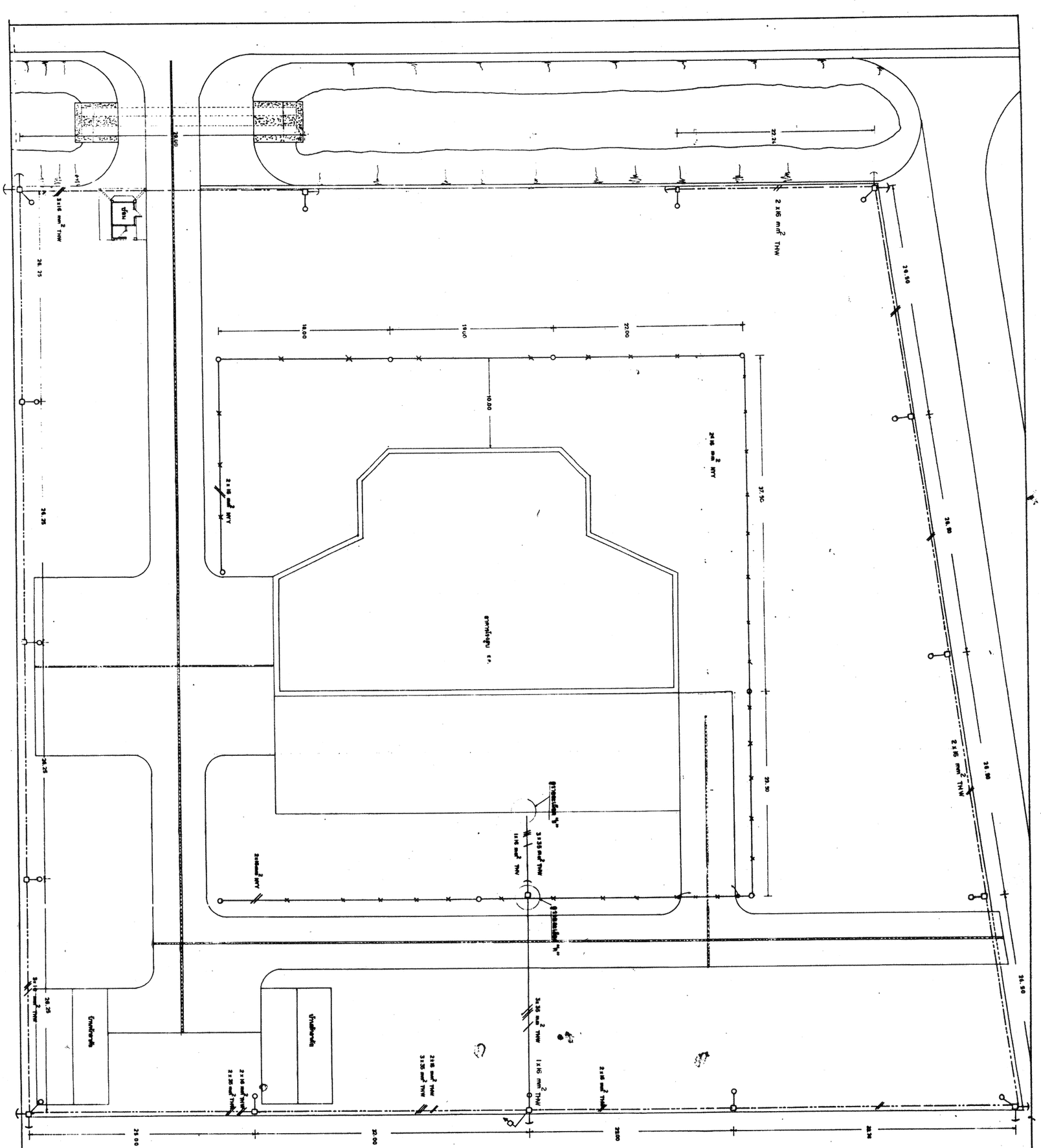
รูปตัด ก–ก
(อาคารสูบน้ำ EP)

มาตราส่วน 1:100

หมายเหตุ : กำหนดให้ติดตั้งบันไดเหล็ก สำหรับขึ้นลงจากพื้นอาคารลงสู่ก้นบ่อสูบ ที่ผนังบ่อสูบทั้ง 2 ด้าน เป็นเหล็ก ø 19 มม. ระยะห่างกัน ø 30 เซนติเมตร ตลอดแนวความลึกบ่อสูบ

AS-BUILT DRAWINGS

กรมพัฒนาและส่งเสริมพลังงาน กระทรวงวิทยาศาสตร์เทคโนโลยี และสิ่งแวดล้อม	
ระบบผลประทาน โครงการผลิตไฟฟ้าพลังน้ำหลายทุ่งเพล	
อาคารโรงสูบน้ำ EP รูปตัดตามยาว (รูปตัด ก-ก)	
บริษัทผู้รับจ้าง บริษัทไทยวัฒน์วิศวการทาง จำกัด	บริษัท วิศวกรที่ปรึกษา บริษัท . นันญา คอนซัลแตนท์ จำกัด บริษัท พี แอนด์ ซี แมเนจเมนท์ จำกัด
ออกแบบ เขียน ตรวจ หัวหน้าโครงการ วันที่	แนะนำ อนุมัติ แบบหมายเลข AS-TP-PS-004 / แผ่นที่ 131 OF 255



AS-BUILT DRAWINGS

กรมพัฒนาและส่งเสริมพลังงาน กระทรวงวิทยาศาสตร์เทคโนโลยี และสิ่งแวดล้อม	
ระบบผลิตประทาน ไดรงการเชื่อมไฟฟ้าพลังน้ำคลองทุ่งเจด	
แปลนไฟฟ้าและสว่าง บริเวณสถานีสูบน้ำ	
บริษัทผู้รับจ้าง บริษัทไทยวัลย์วิศวการทาง จำกัด	บริษัท วิศวกรที่ปรึกษา บริษัท ปัญญา คอนซัลแตนท์ จำกัด บริษัท พี แอนด์ ซี แมเนจเมนท์ จำกัด
ออกแบบ	แนะนำ
เขียน	
ตรวจ	อนุมัติ
หัวหน้าโครงการ วันที่	แบบหมายเลข AS - TP - EE - 004 / แผ่นที่ 208 OF 255

ตัวอย่างสัญลักษณ์

- สายไฟ 2 เส้น ขนาด 35 ตร.มม. ร้อยท่อ 1 นิ้ว ยาว 2 เมตร ฝังดิน และต่อลงดิน
- สาย NYY ขนาด 2 เส้น ร้อยท่อ 0.5 นิ้ว
- สาย NYY ขนาด 3 เส้น ร้อยท่อ 0.5 นิ้ว (ISO)

- กล่องต่อสายแบบกันน้ำ ขนาด 15 ซม.
- กล่องต่อสายแบบกันน้ำ ขนาด 0.5 นิ้ว ติดตั้งบนเสาไฟฟ้า
- โคมไฟส่องสว่างแบบกันน้ำ ขนาด 1x25 วัตต์
- โคมไฟส่องสว่างแบบกันน้ำ ขนาด 1x125 วัตต์
- ชุดกราวด์สำหรับเสา 300 V (GROUND ARRE)
- ชุดกันดิน NEUTRAL เดินลงดิน

หมายเหตุ

1. สายไฟ THW ขนาด
   - สายดิน AWG ขนาด 70 มม.²
   - สายดิน NEUTRAL ขนาด 35 มม.²
   - สายแรงต่ำระบบการจ่ายกำลัง 15 มม.²
2. การติดตั้งต้องการติดตั้งอุปกรณ์ให้ได้มาตรฐานการไฟฟ้าส่วนภูมิภาค