



Department of Alternative
Energy Development and Efficiency
MINISTRY OF ENERGY

PHLUANG 1 MINI HYDROPOWER PROJECT

AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI

PART 1 : CIVIL WORKS

PART 2 : ELECTRO-MECHANICAL EQUIPMENT

PART 3 : TRANSMISSION LINE

VOLUME 4

DRAWINGS



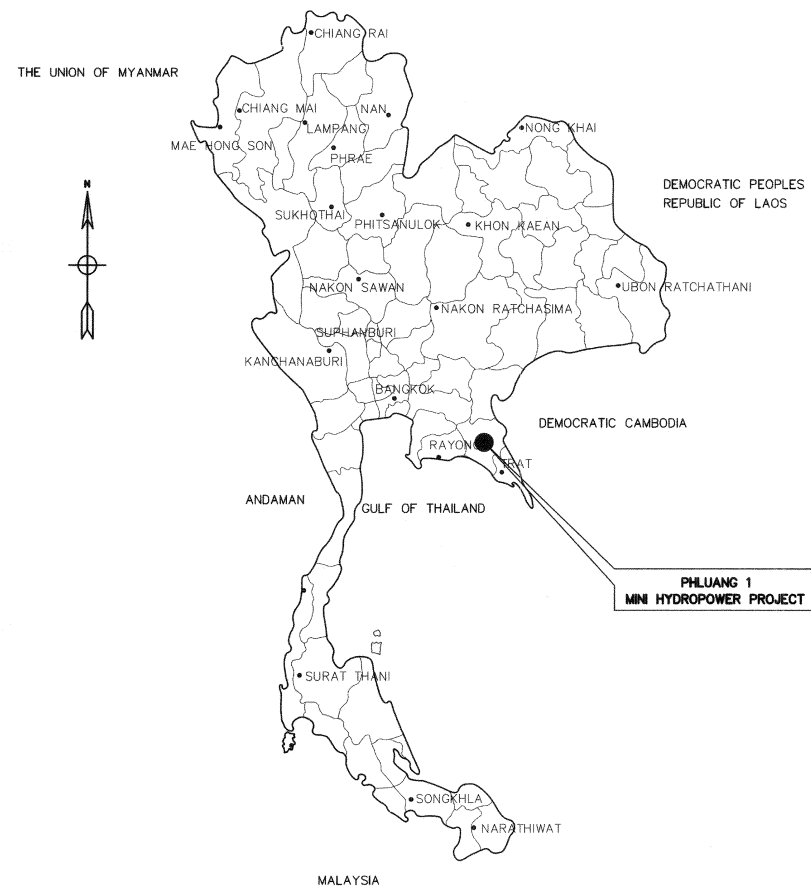
P&C MANAGEMENT CO.,LTD.

PHLUANG 1 MINI HYDROPOWER PROJECT
LIST OF DRAWINGS

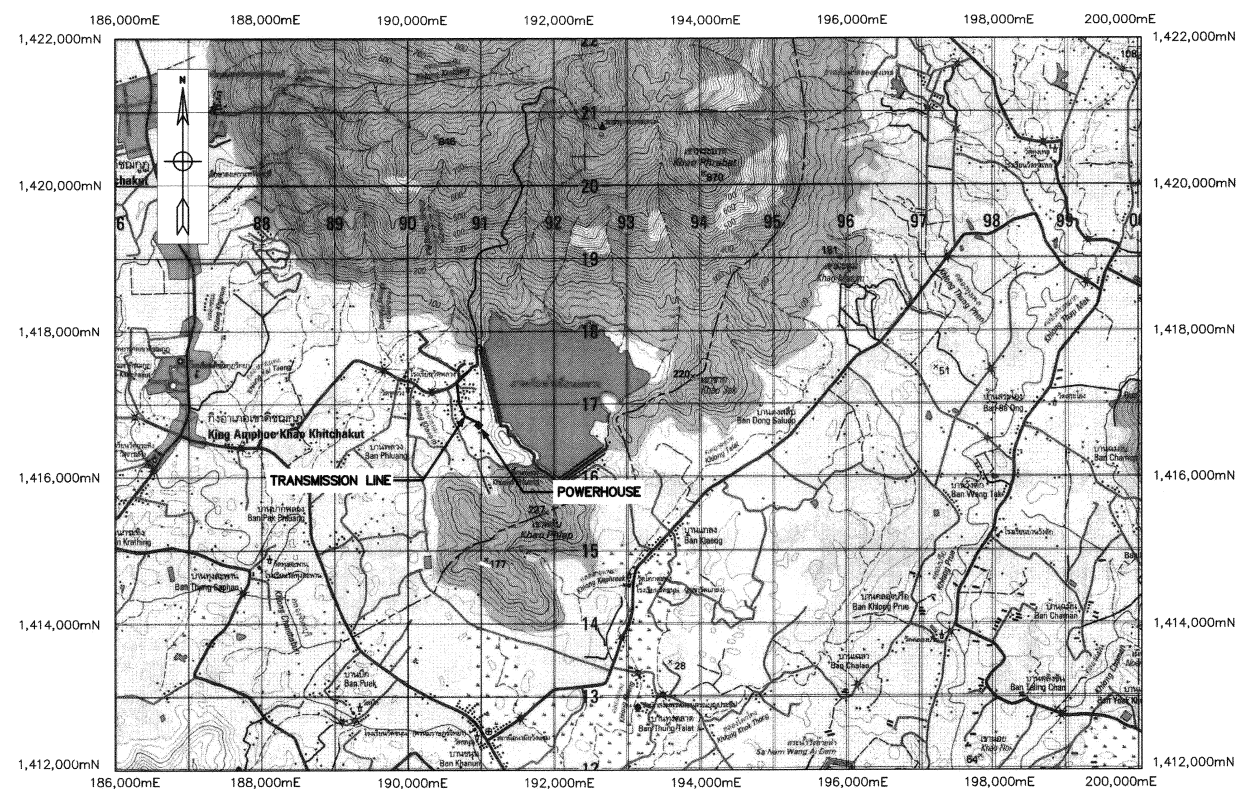
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LIST OF EXISTING STRUCTURE DRAWINGS

SHEET NO.	DRAWING NO.	DRAWING DETAILS
DEDP CAMP		
1	TP-SP-S007	LAYOUT PLAN
ADDITIONAL WORK : OFF TAKE NO.001		
2	AS-TP-PS-092	PLAN AND LOCATION
3	AS-TP-PS-093	ARCHITECTURAL DETAILS



LOCATION MAP
NOT TO SCALE



PROJECT AREA

SCALE 1:50,000



PHLUANG 1 MINI HYDROPOWER PROJECT SITE LOCATION

NOT TO SCALE

LEGEND :

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

NOTES :

- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METRES, DISTANCES ARE IN KILOMETRES, UNLESS OTHERWISE SHOWN.
- SITE LOCATION MAP IS BASED ON THE HIGHWAY MAP 1:1,000,000 SCALE, PUBLISHED BY TOURISM AUTHORITY OF THAILAND.
- THE MAP OF PHLUANG 1 MINI HYDROPOWER PROJECT 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
SCALE 1:50,000 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 1 MINI HYDROPOWER PROJECT AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI	
PART 1 : CIVIL WORKS GENERAL LOCATION MAP AND PROJECT AREA MAP	
PCM P&C MANAGEMENT CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED 28.1957	REVIEWED
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PL1-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 ϕ	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 ($\phi 0.15 \times 0.30$ 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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		17/03/2020	PL1-GN-03
		SHEET NO.	3 OF 14

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

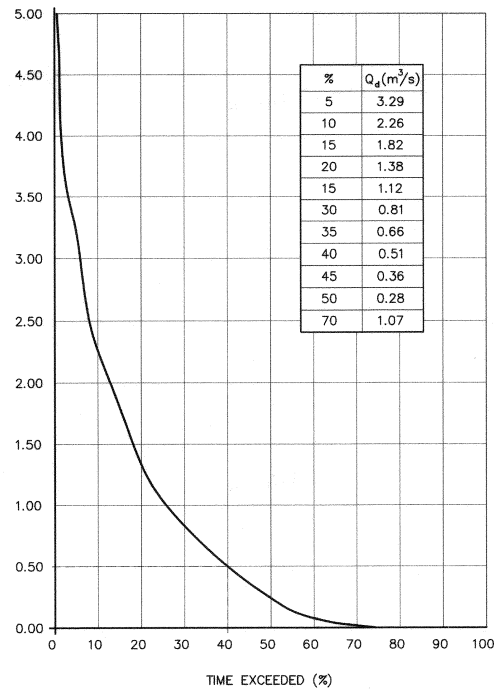


FIGURE 1 FLOW DURATION CURVE AT PHLUANG DAM

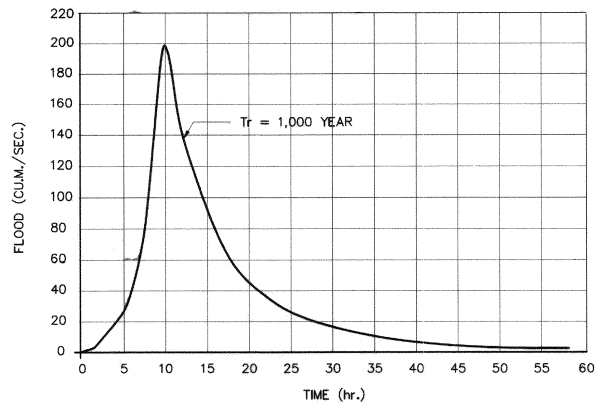


FIGURE 2 RETURN PERIOD 1,000 YEAR AT PHLUANG DAM

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

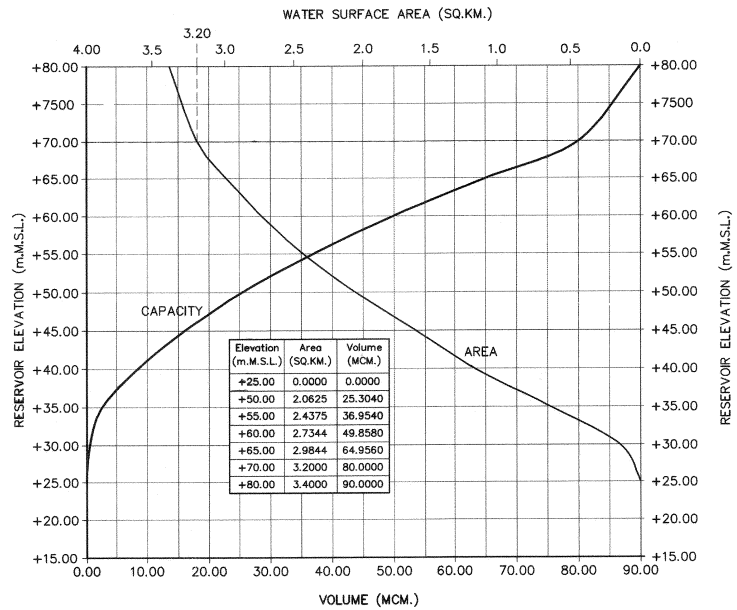
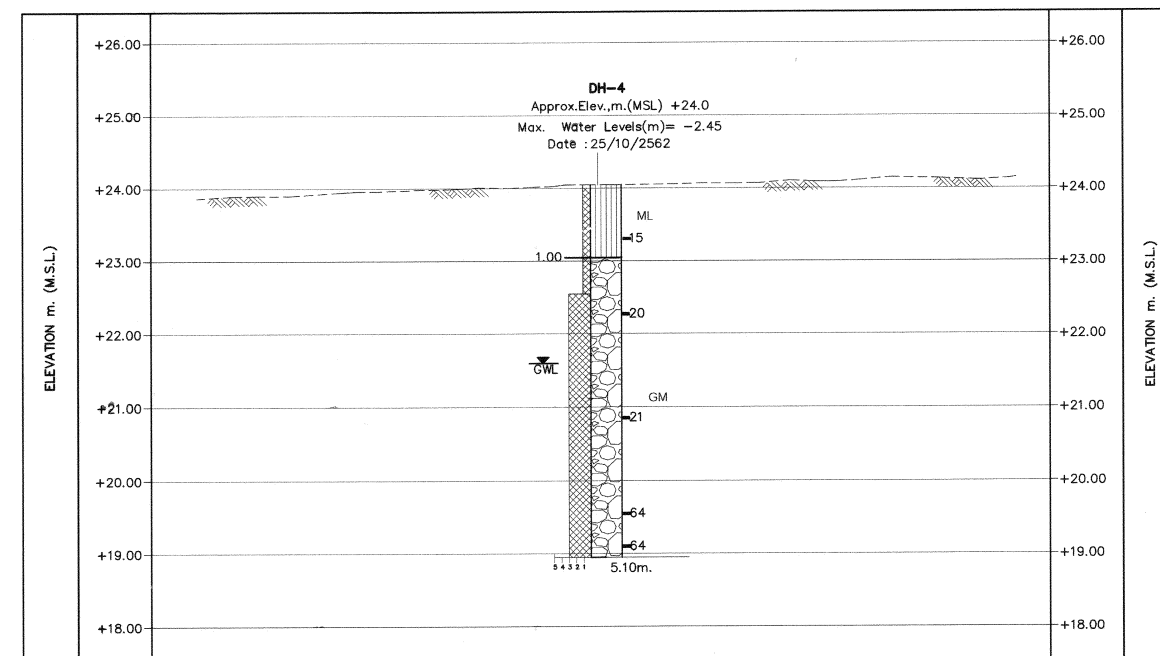
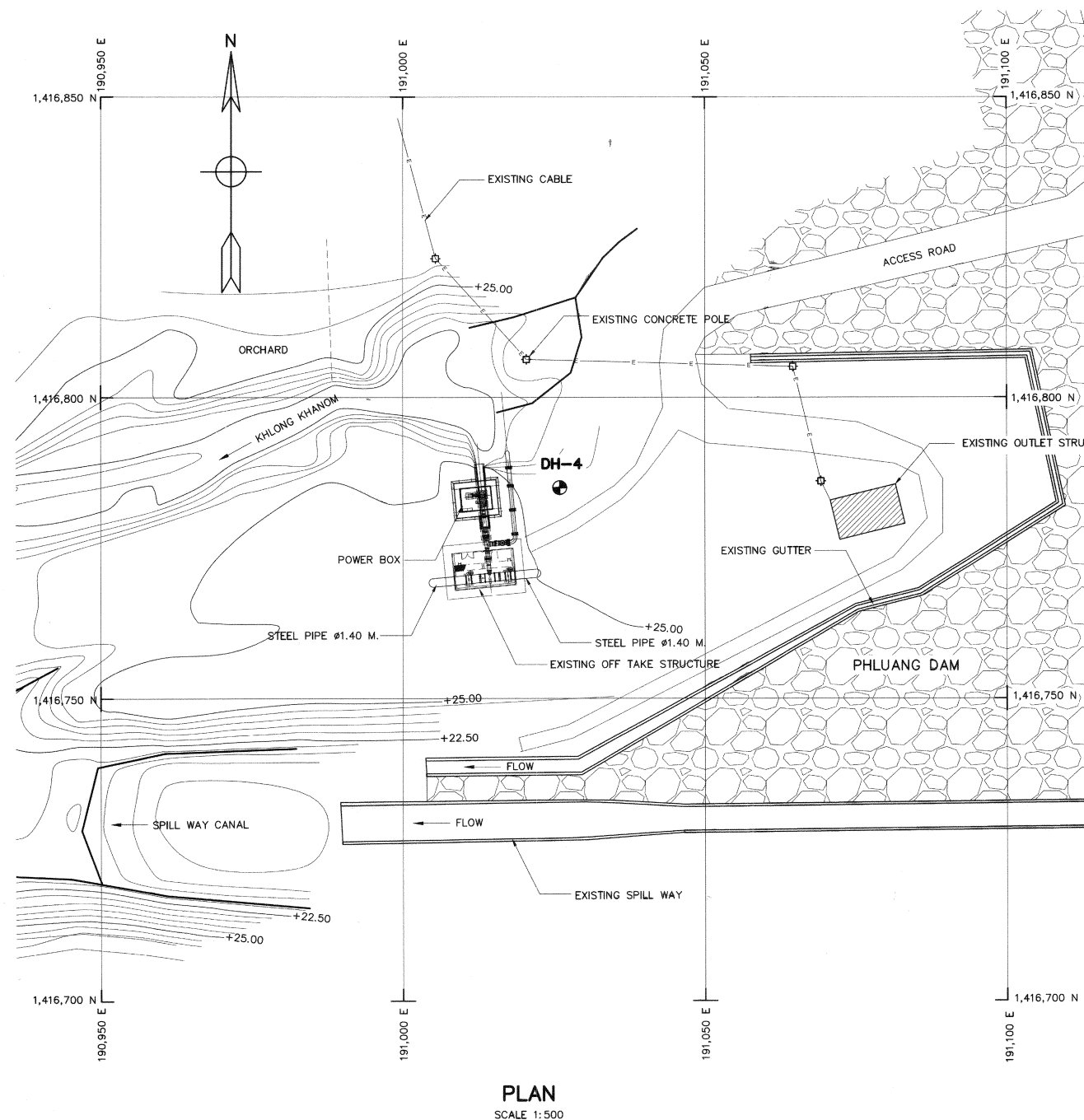


FIGURE 3 RELATIONSHIP BETWEEN AREA AND VOLUME CURVE AT PHLUANG DAM

- 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			
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		PL1-GN-04	4 OF 14



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

NO.	BENCH MARK	DRILL TYPE	WGS 84 GRID CO-ORDINATE		DEPTH
			NORTHING	EASTING	M.
1	DH-4	ROTARY	1,416,785	191,026	5.10

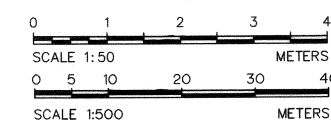
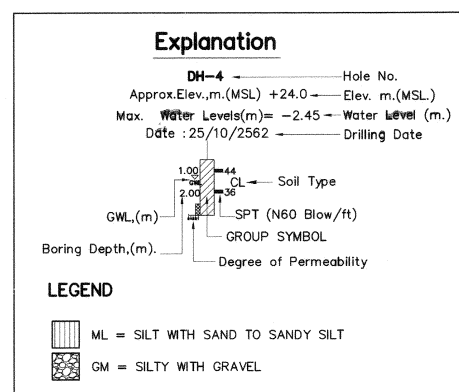
SYMBOL

 DRILL HOLE

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2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. PL1-GN-03

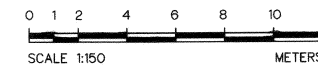


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GENERAL LAYOUT
SCALE 1:150



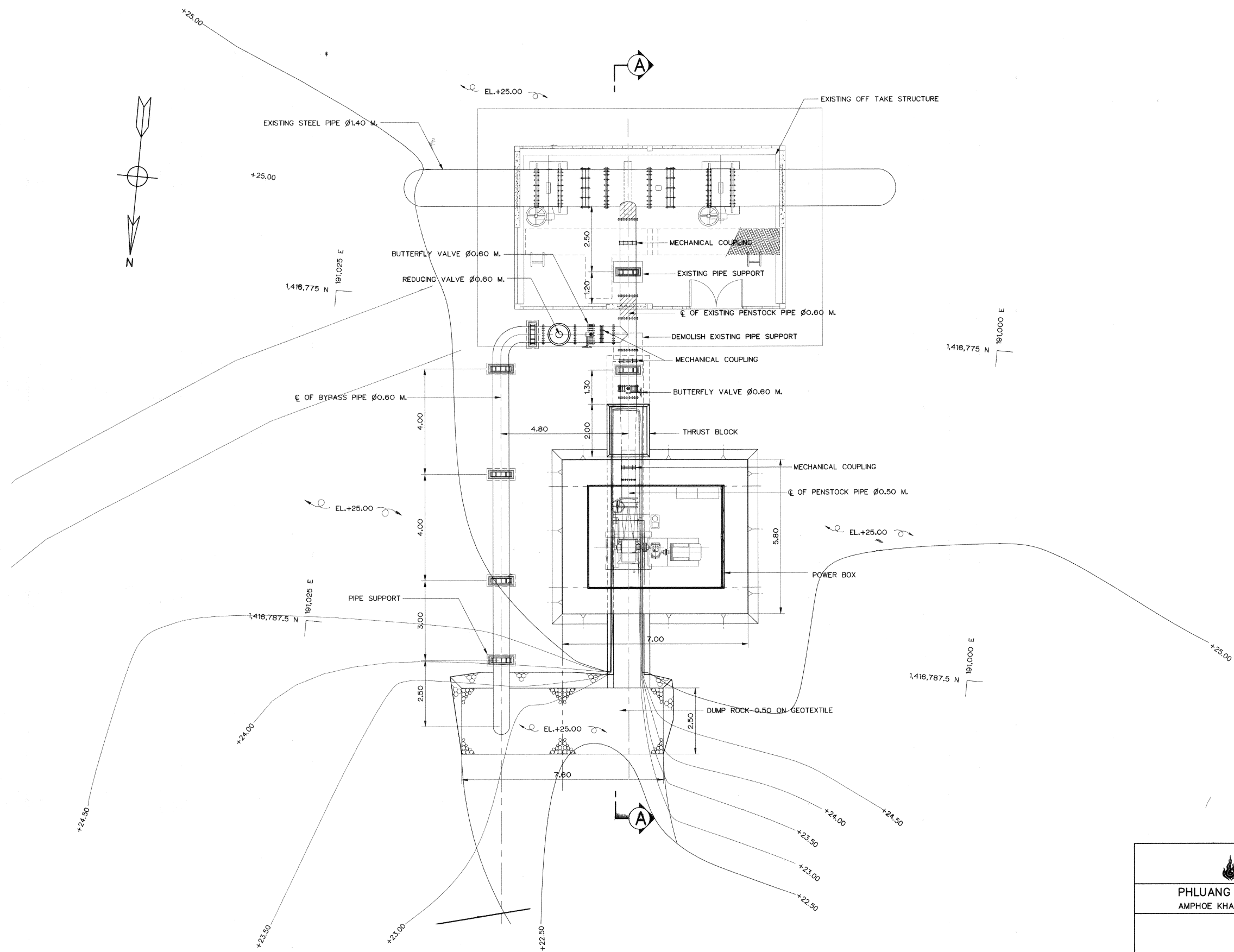
LEGEND :
EXISTING PENSTOCK PIPE

- NOTES :**
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REFERENCE DRAWINGS :
1. POWERHOUSE, LAYOUT PLAN

PL1-PH-02

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PHLUANG 1 MINI HYDROPOWER PROJECT AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI			
PART 1 : CIVIL WORKS POWERHOUSE GENERAL LAYOUT			
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LEGEND :

EXISTING PENSTOCK PIPE

NOTES :

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REFERENCE DRAWINGS :

- POWERHOUSE, GENERAL LAYOUT
- POWERHOUSE, SECTION
- POWERHOUSE, PLAN AND ELEVATION

- PL1-PH-01
PL1-PH-03
PL1-PH-04

LAYOUT PLAN
SCALE 1:75

0 0.5 1.0 2.0 3.0 4.0 6.0
SCALE 1:75 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
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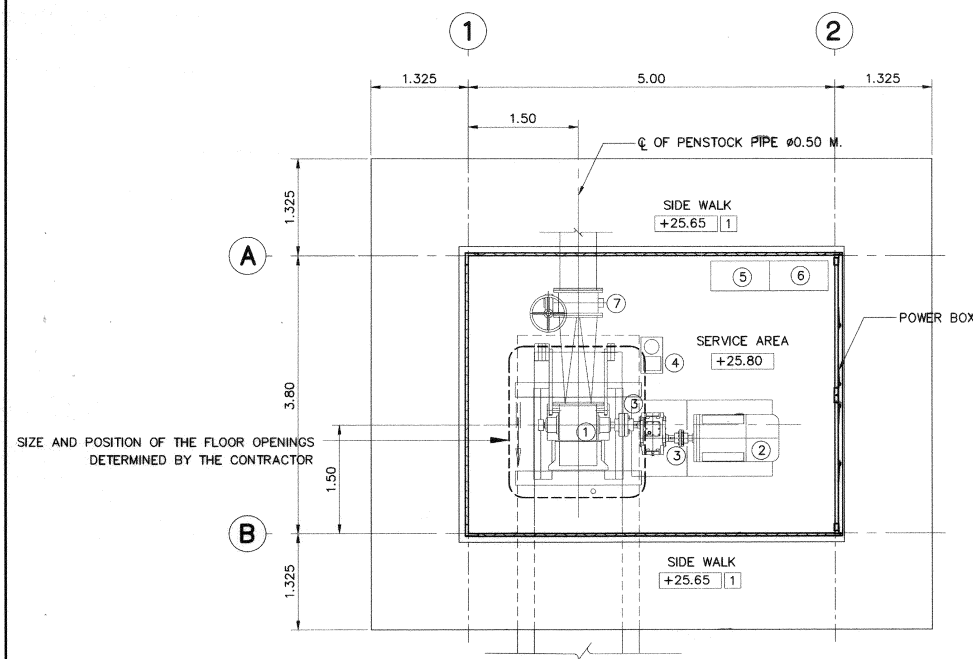


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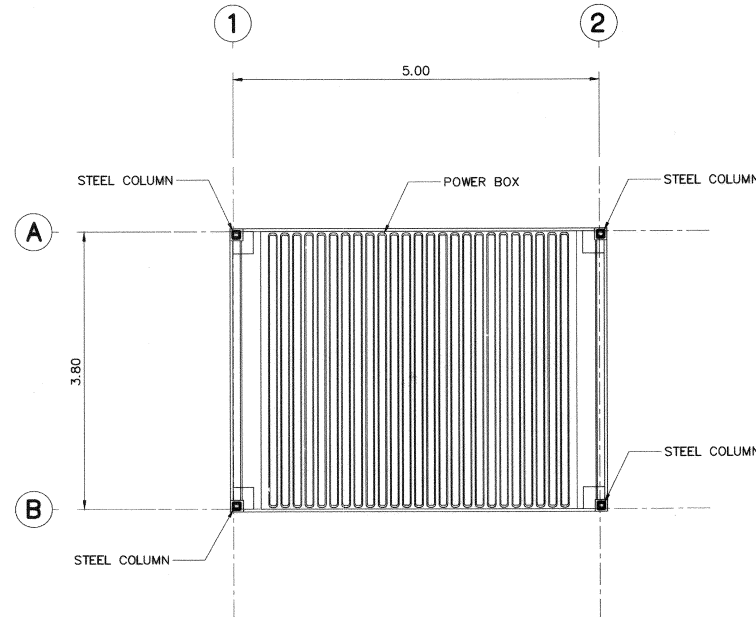
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2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. PL1-GN-03
3. LOCATIONS, DIMENSIONS OF TURBINE, GENERATOR AND TRENCHES FOUNDATION SHOWN
ON THIS DRAWING ARE APPROXIMATELY THE FINAL DESIGN OF FOUNDATIONS SHALL BE
DONE BY THE E&M CONTRACTOR AND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

1. POWERHOUSE, LAYOUT PLAN

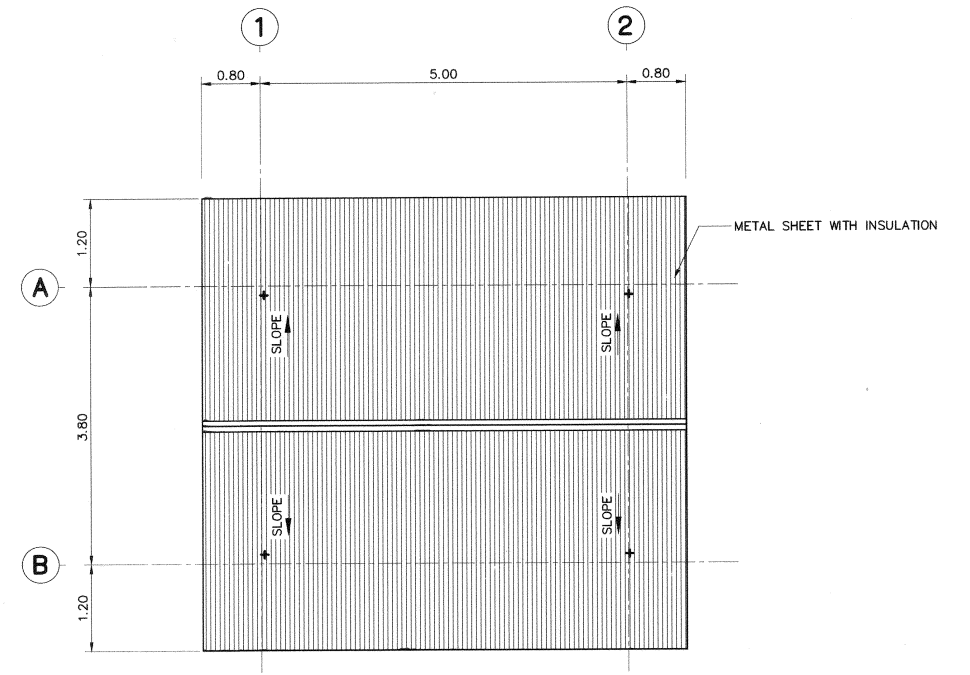
		KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
		PHLUANG 1 MINI HYDROPOWER PROJECT AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI	
PART 1 : CIVIL WORKS POWERHOUSE SECTIONS			
 P&C MANAGEMENT CO.,LTD.		 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED		25.1957	REVIEWED 
DRAWN			SUBMITTED 
CHECKED		25.1957	RECOMMENDED 
	17/03/2020	APPROVED	
PROJECT MANAGER		DRAWING NO.	
DATE		PL1-PH-03	
		SHEET NO.	
		8 OF 14	



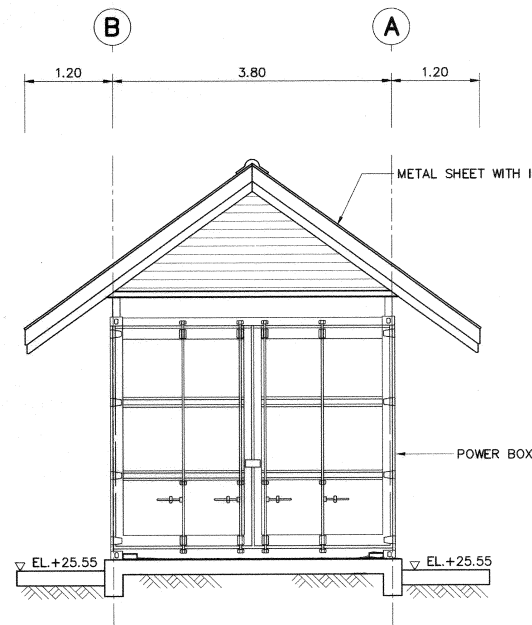
FLOOR PLAN
SCALE 1:50



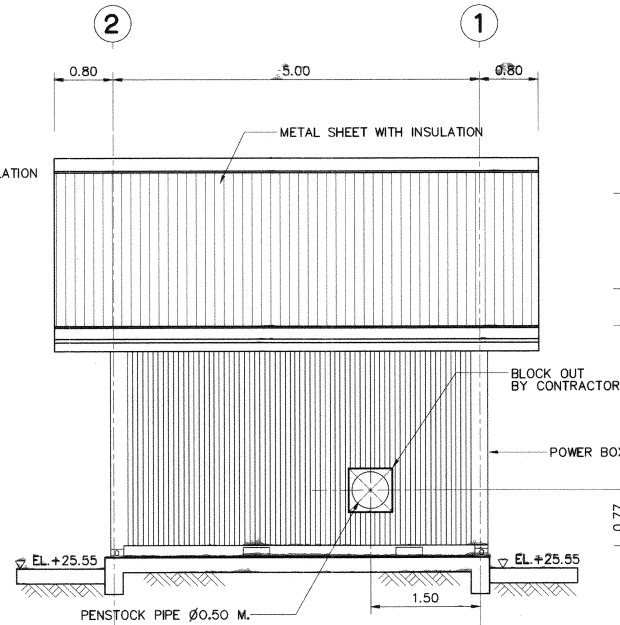
TOP OF POWER BOX PLAN
SCALE 1:50



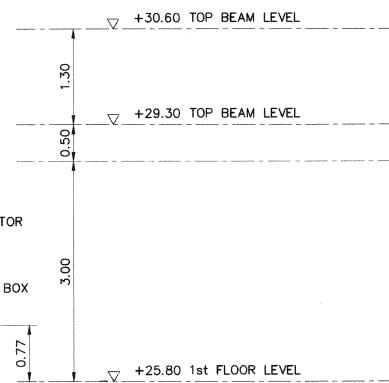
ROOF PLAN
SCALE 1:50



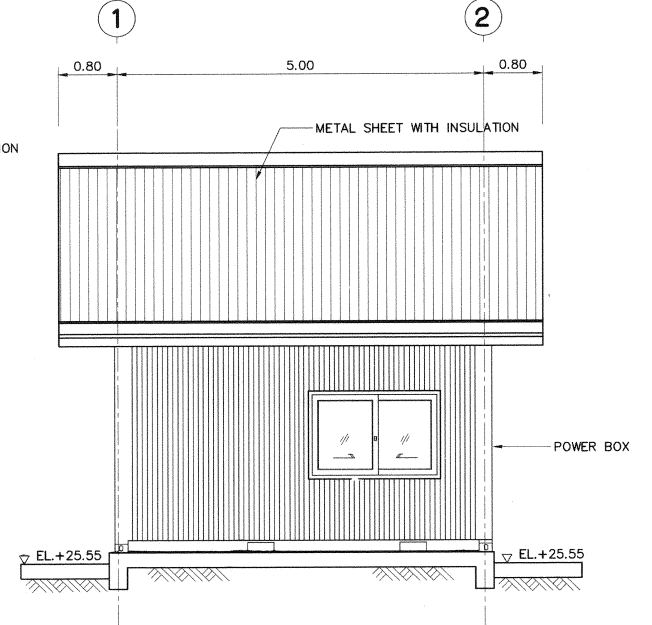
ELEVATION "1"
SCALE 1:50



ELEVATION "2"
SCALE 1:50



ELEVATION "3"
SCALE 1:50



ELEVATION "4"
SCALE 1:50

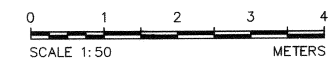
FLOOR FINISH SYMBOLS :
1 COARSE FINISHED

NOTES :
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. PL1-GN-03
3. POWER BOX SHOULD BE DESIGN AND LOCATED BY CONTRACTOR

REFERENCE DRAWINGS :
1. POWERHOUSE, LAYOUT PLAN PL1-PH-02

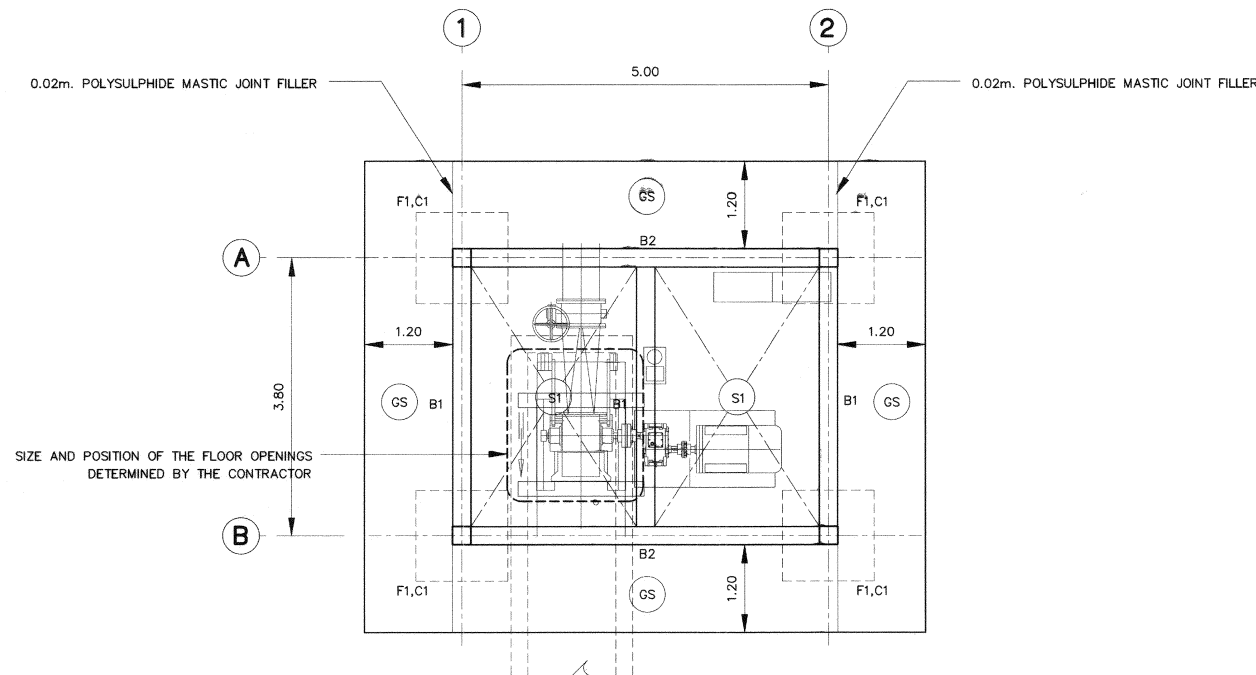
DESCRIPTION :

- 1 TURBINE
- 2 GENERATOR
- 3 GEAR BOX
- 4 GOVERNOR (HYDRAULIC)
- 5 GOVERNOR (ELECTRIC)
- 6 POWER SWITCHBOARD
- 7 BUTTERFLY VALVE

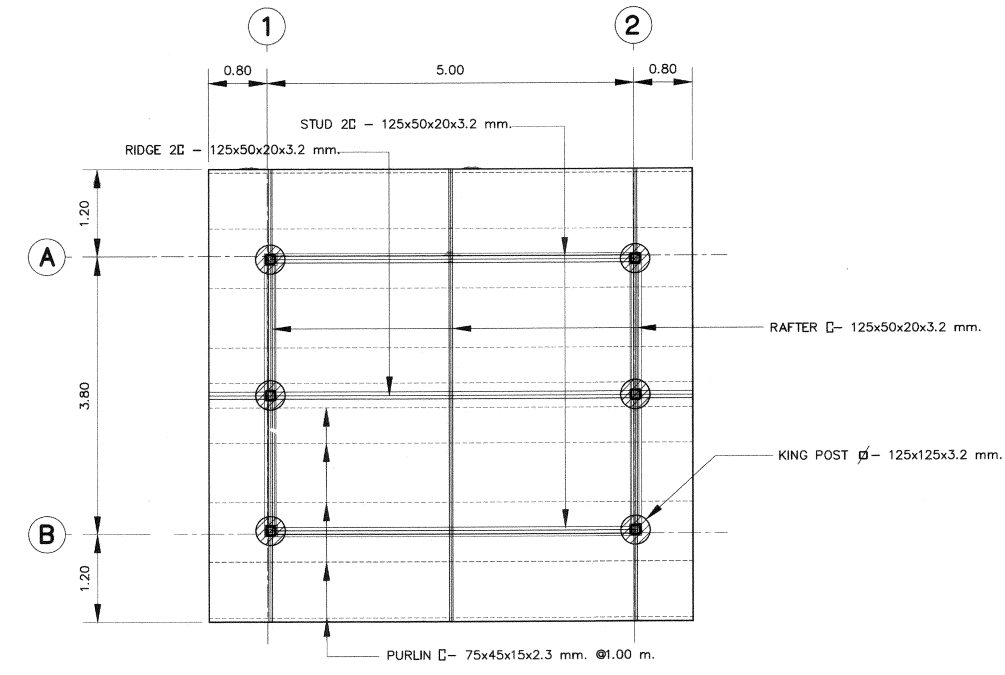


NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
CONSULTANTS		DEDE		

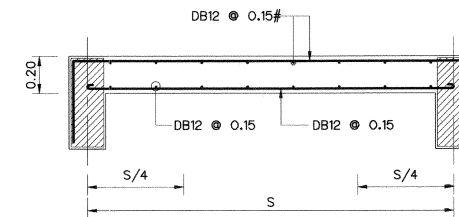
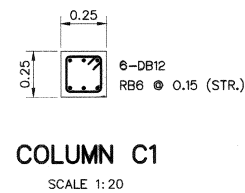
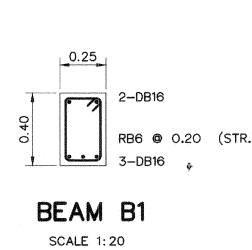
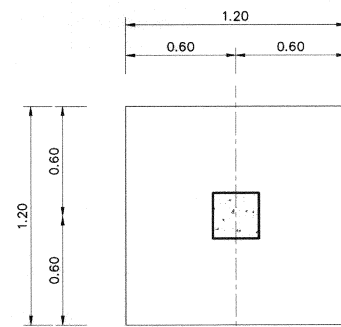
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY PHLUANG 1 MINI HYDROPOWER PROJECT AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI PART 1 : CIVIL WORKS POWERHOUSE PLAN AND ELEVATIONS			
PCM P&C MANAGEMENT CO.,LTD. DESIGNED 28.1957 DRAWN 28.1957 CHECKED 17/03/2020 PROJECT MANAGER	REVIEWED 4 SUBMITTED RECOMMENDED APPROVED	DRAWING NO. PL1-PH-04	SHEET NO. 9 OF 14



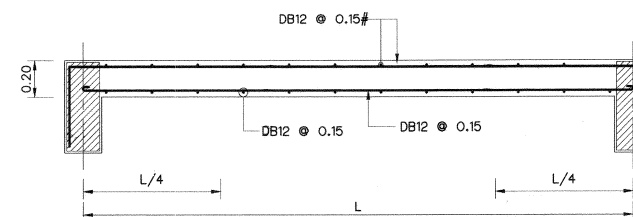
PLAN OF FOOTING, BEAM AND SLAB
SCALE 1:50



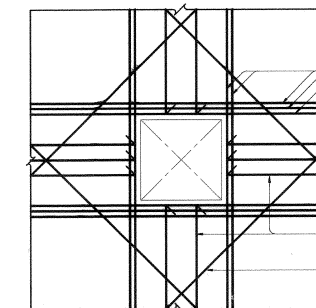
PLAN OF ROOF
SCALE 1:50



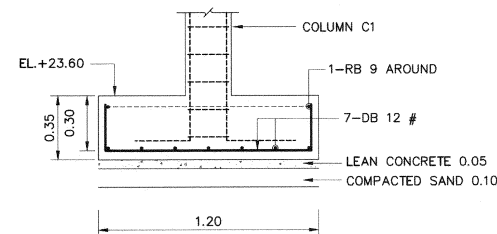
SLAB S1 (SHOT)
SCALE 1:20



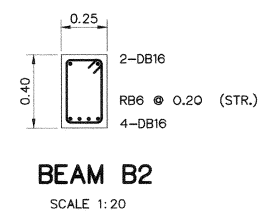
SLAB S1 (LONG)
SCALE 1:20



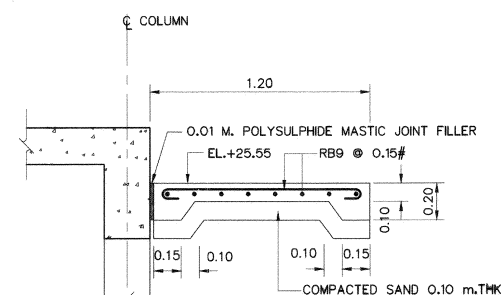
TYPICAL REINFORCING AT SLAB OPENING
SCALE 1:50



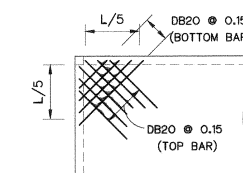
FOOTING (F1)
SCALE 1:20



BEAM B2
SCALE 1:20



SLAB GS
SCALE 1:20



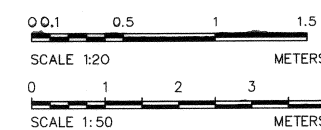
TYP. ALL CORNER
SCALE 1:20

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

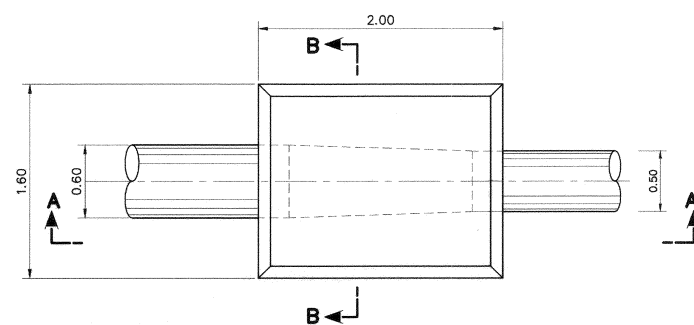
REFERENCE DRAWINGS :

- POWERHOUSE, LAYOUT PLAN PL1-PH-02
- POWERHOUSE, SECTIONS PL1-PH-03

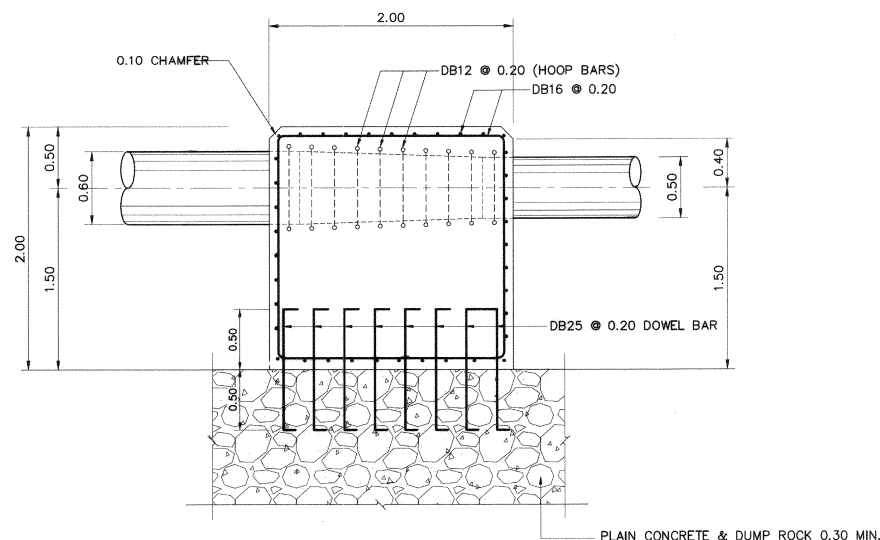


NO.	DATE	REVISIONS	CHECKED	APPROVED
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1				
CONSULTANTS		DEDE		

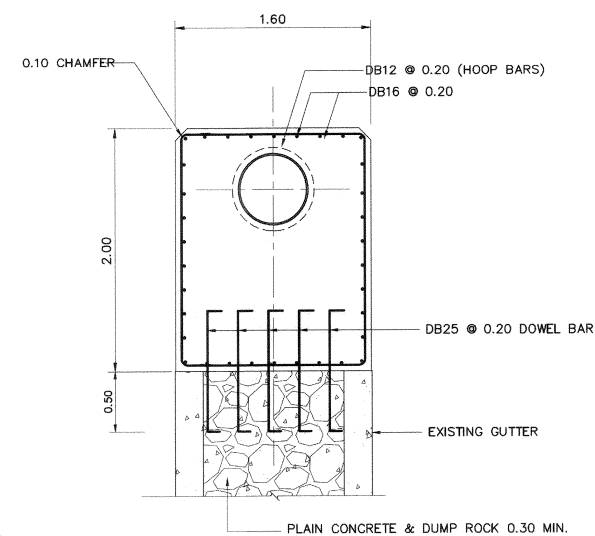
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
PHLUANG 1 MINI HYDROPOWER PROJECT AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI			
PART 1 : CIVIL WORKS POWERHOUSE PLAN OF FOOTING, BEAM, SLAB AND DETAILS			
P&C MANAGEMENT CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED	28.1957	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	28.1957	APPROVED	
PROJECT MANAGER 17/03/2020 DATE		DRAWING NO. PL1-PH-05 SHEET NO. 10 OF 14	



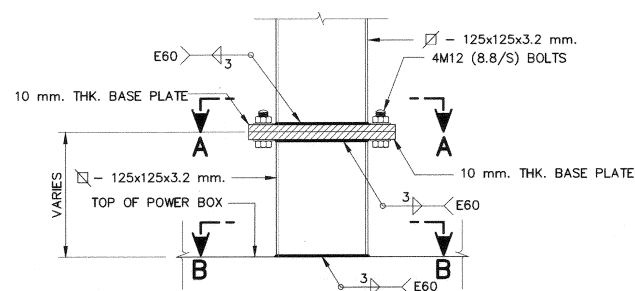
PLAN
ANCHOR BLOCK
SCALE 1:30



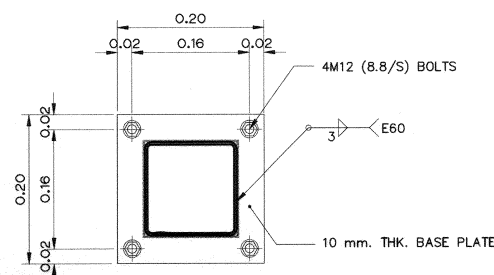
SECTION A-A
ANCHOR BLOCK
SCALE 1:30



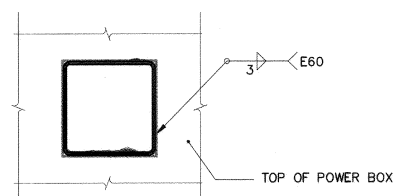
SECTION B-B
ANCHOR BLOCK
SCALE 1:30



DETAIL "A"
SCALE 1:50



SECTION A-A
SCALE 1:50



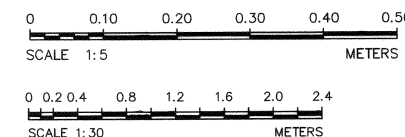
SECTION B-B
SCALE 1:5

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. PL1-GN-03

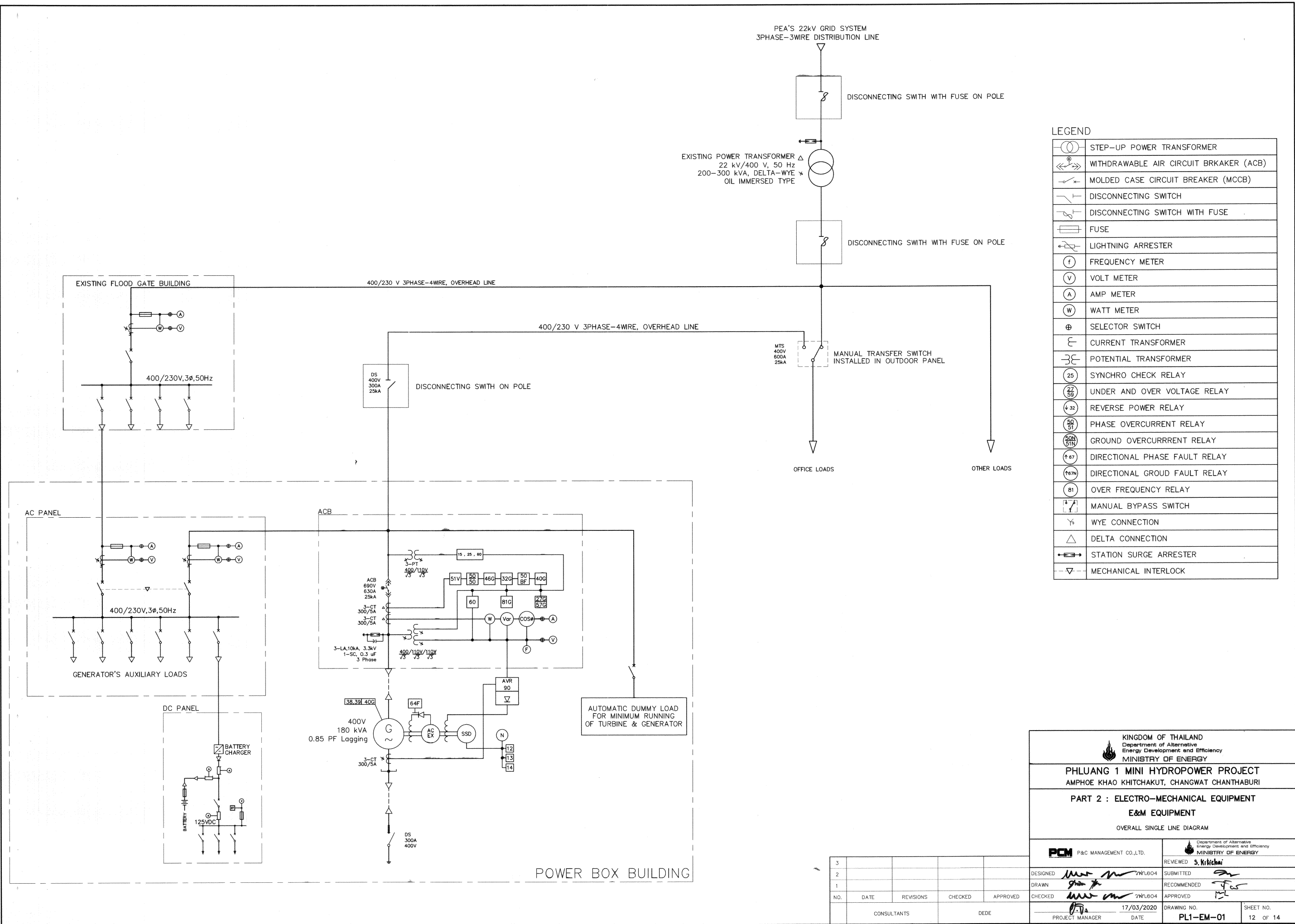
REFERENCE DRAWINGS :

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



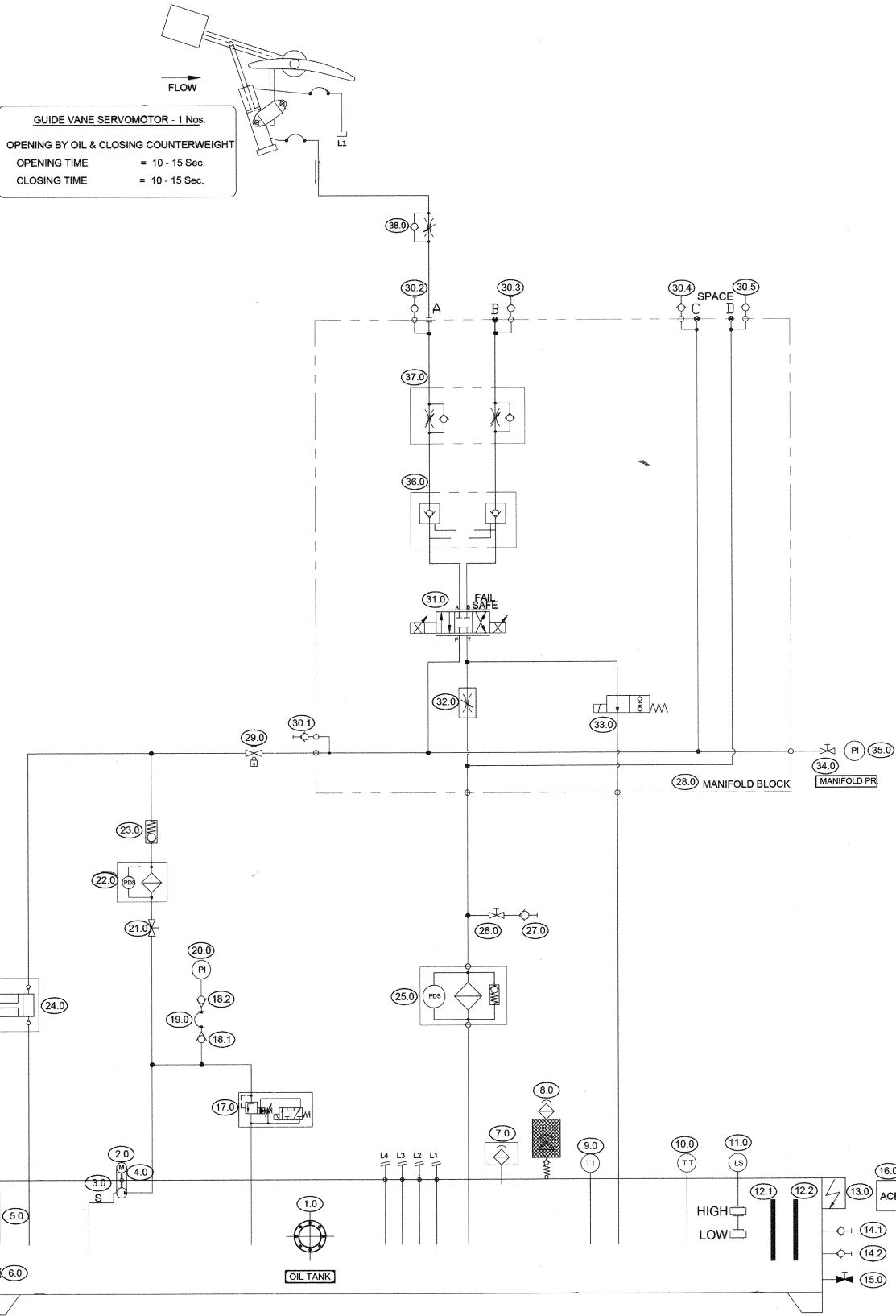
3				
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1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
PHLUANG 1 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	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	28.1957	APPROVED	
PROJECT MANAGER	17/03/2020	DRAWING NO.	PL1-PH-06
		SHEET NO.	11 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	MINIMISS 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	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			
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								



- 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

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.	MINIMISS 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 ELECT & 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.	MINIMISS 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

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

AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI

E&M EQUIPMENT

SCHEMATIC DIAGRAM OF OIL PRESSURE UNIT FOR TURBINE

PCM P&C MANAGEMENT CO.,LTD.

Department of Alternative
Energy Development and Efficiency
MINISTRY OF ENERGY

DESIGNED
DRAWN

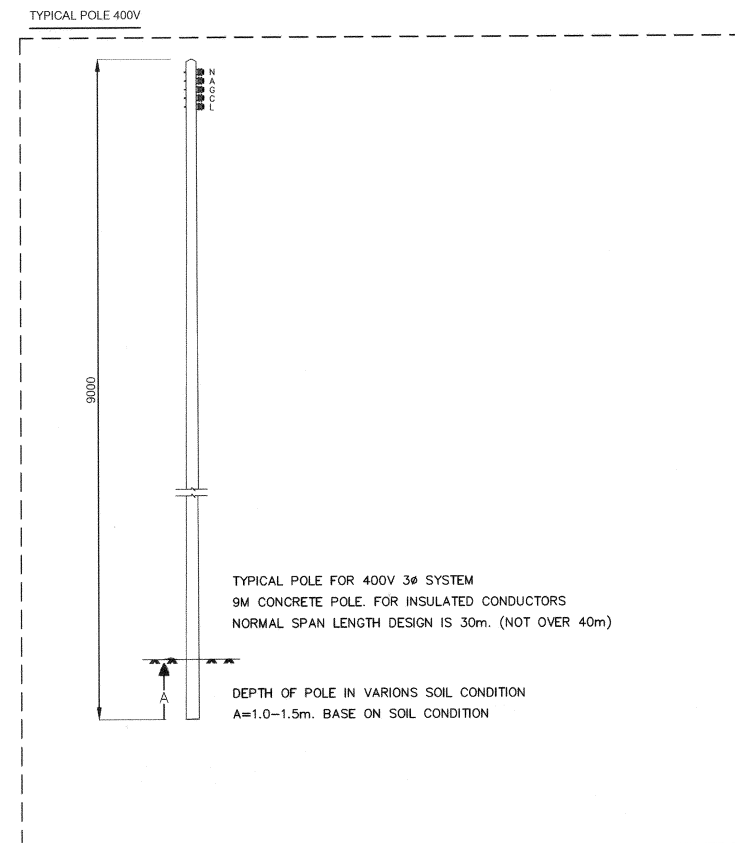
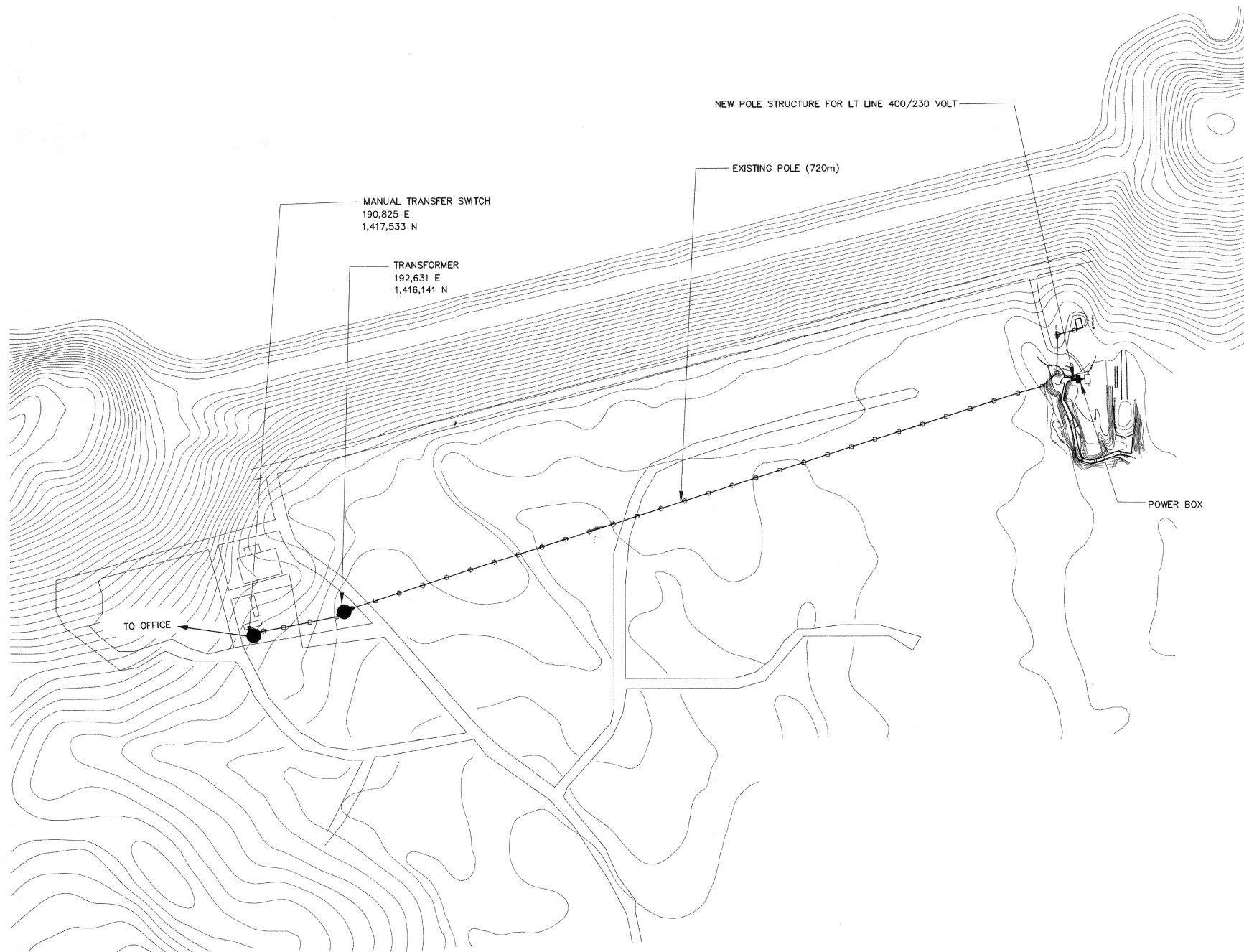
REVIEWED
SUBMITTED

CHECKED

RECOMMENDED

PROJECT MANAGER

APPROVED
DATE
PL1-EM-02
SHEET NO.
13 OF 14



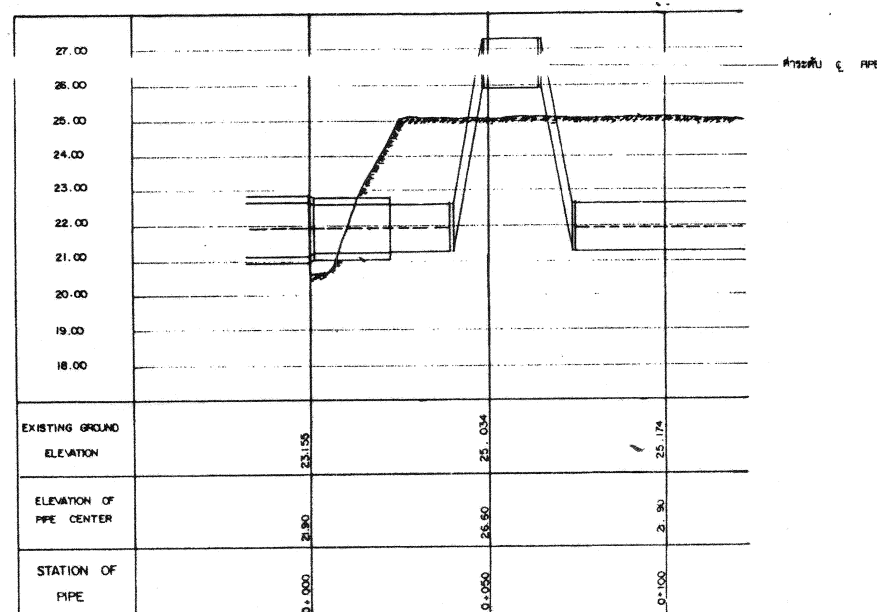
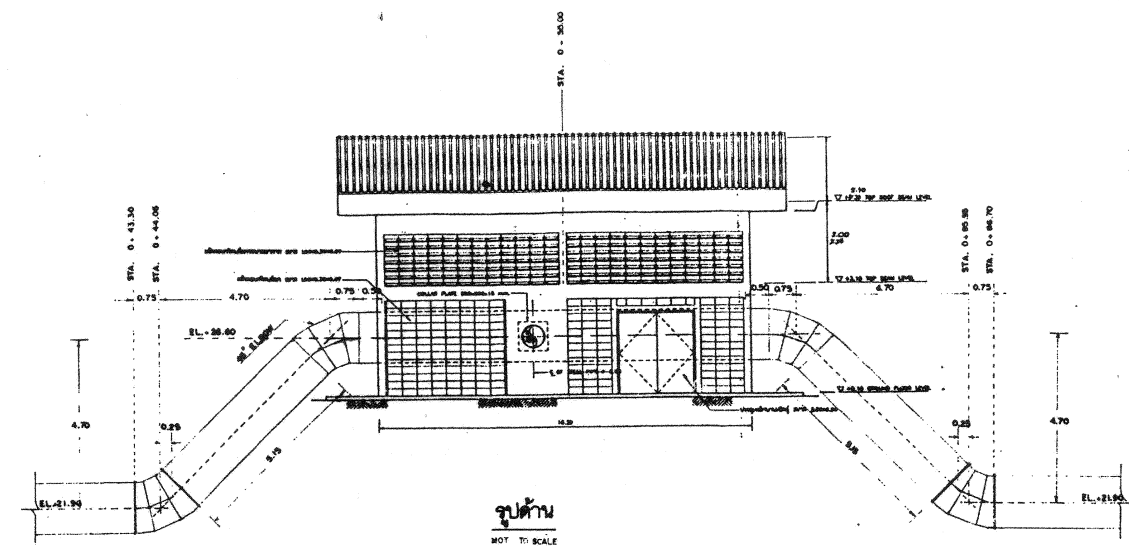
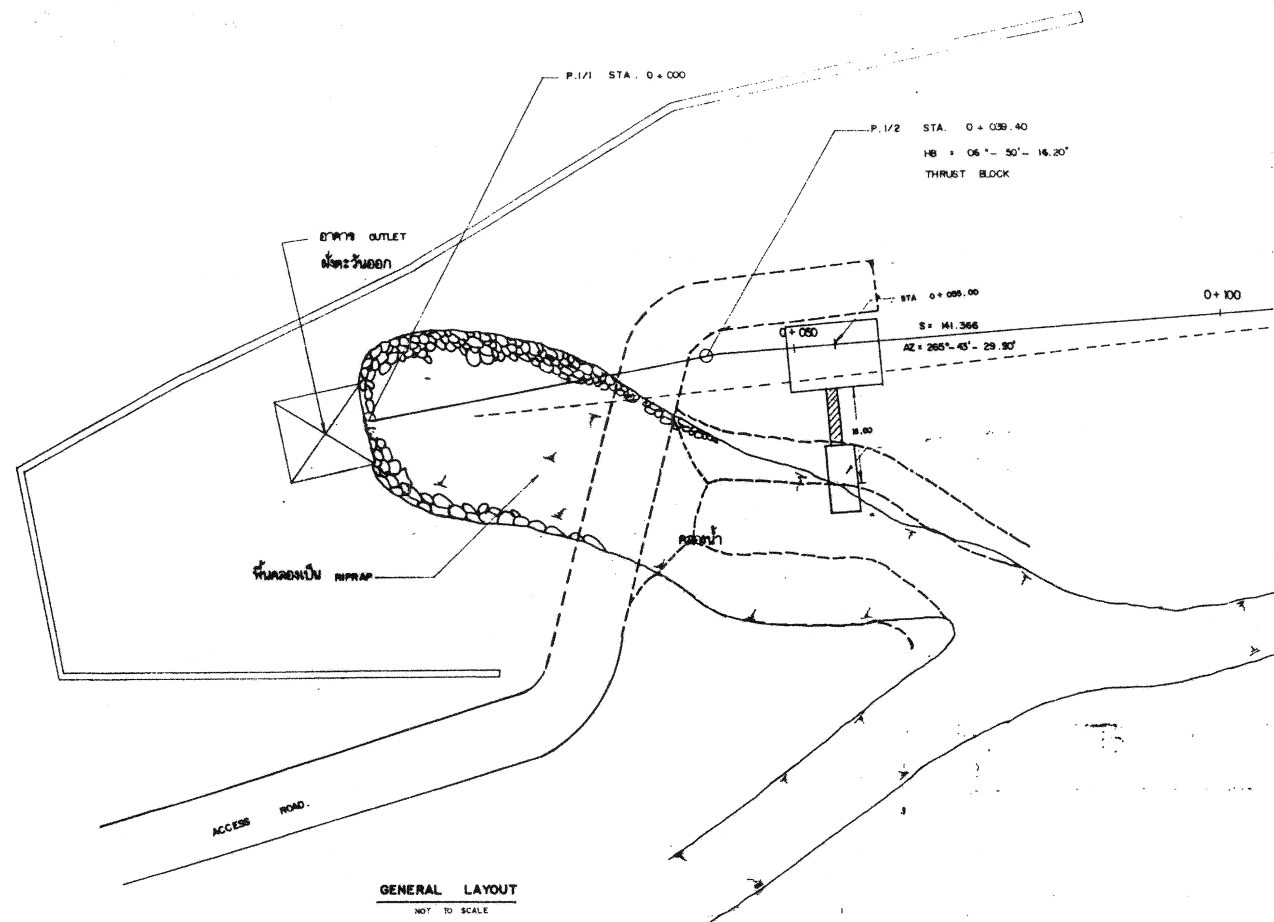
NOTES:

1. THE DRAWING IS DESIGNED FOR GUIDE LINE ONLY,
THE CONSTRUCTION DRAWING SHALL CONFORM TO PEA'S STANDARD AND REGULATION

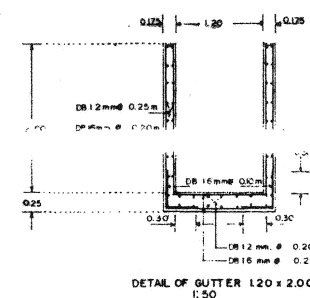
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
PHLUANG 1 MINI HYDROPOWER PROJECT AMPHOE KHAO KHITCHAKUT, CHANGWAT CHANTHABURI	
PART 3 : TRANSMISSION LINE TRANSMISSION LINE 22kV TRANSMISSION LINE LAYOUT PLAN	
PCM P&C MANAGEMENT CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED <i>[Signature]</i> ๒๖/๐๓/๒๐	REVIEWED <i>S. Kitchai</i>
DRAWN <i>[Signature]</i>	SUBMITTED <i>[Signature]</i>
CHECKED <i>[Signature]</i> ๒๖/๐๓/๒๐	RECOMMENDED <i>[Signature]</i>
APPROVED <i>[Signature]</i> 17/03/2020	APPROVED <i>[Signature]</i>
PROJECT MANAGER	DATE
DRAWING NO. PL1-TS-01	SHEET NO. 14 OF 14

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
CONSULTANTS		DEDE		

EXISTING STRUCTURE

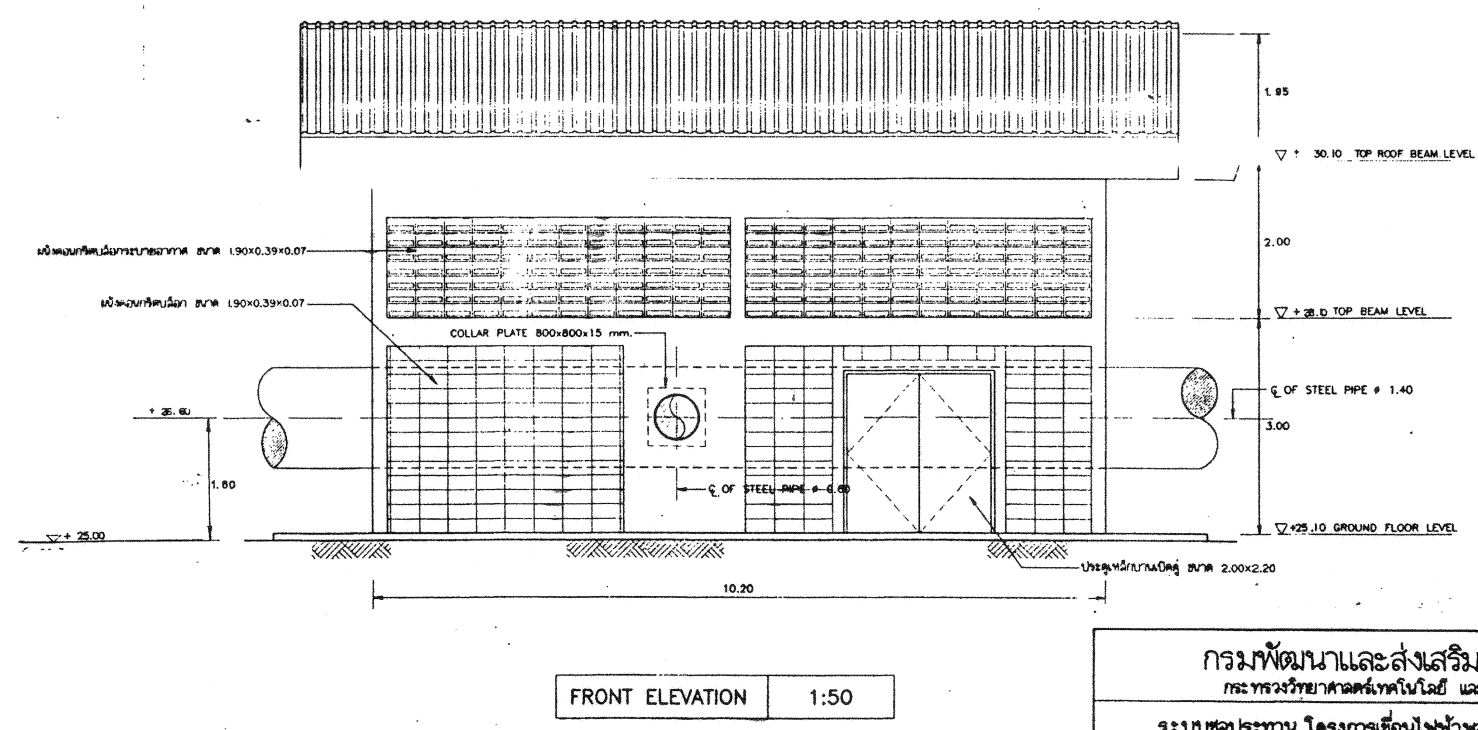
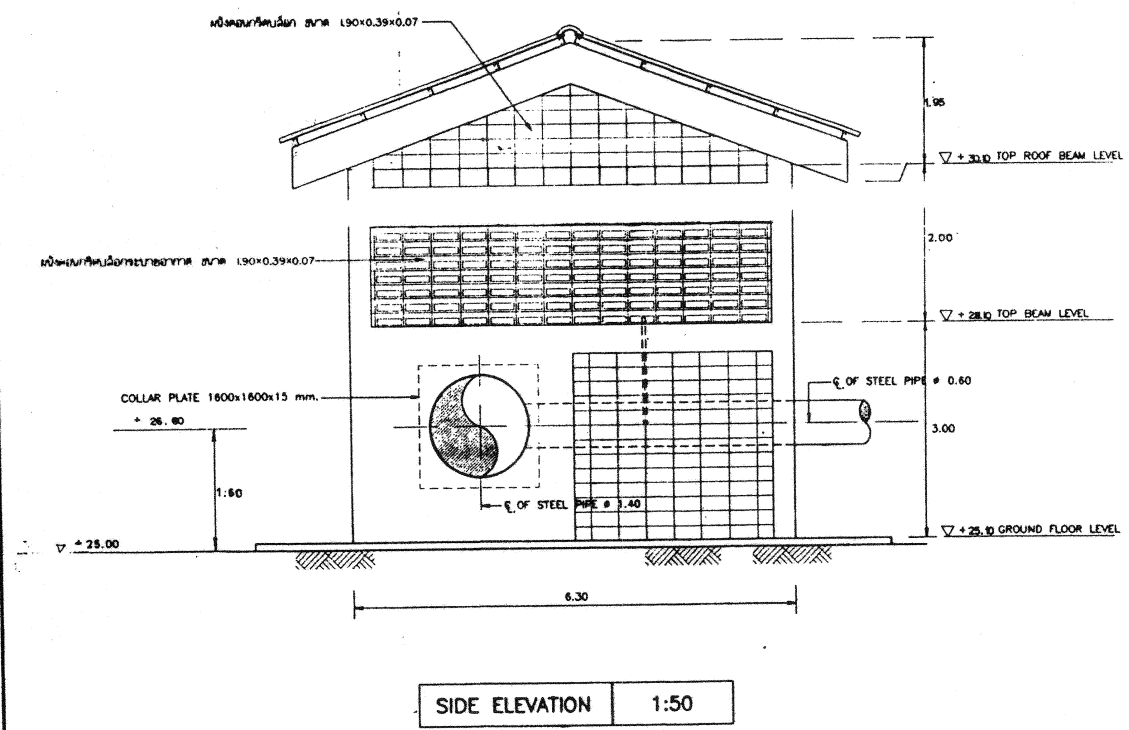
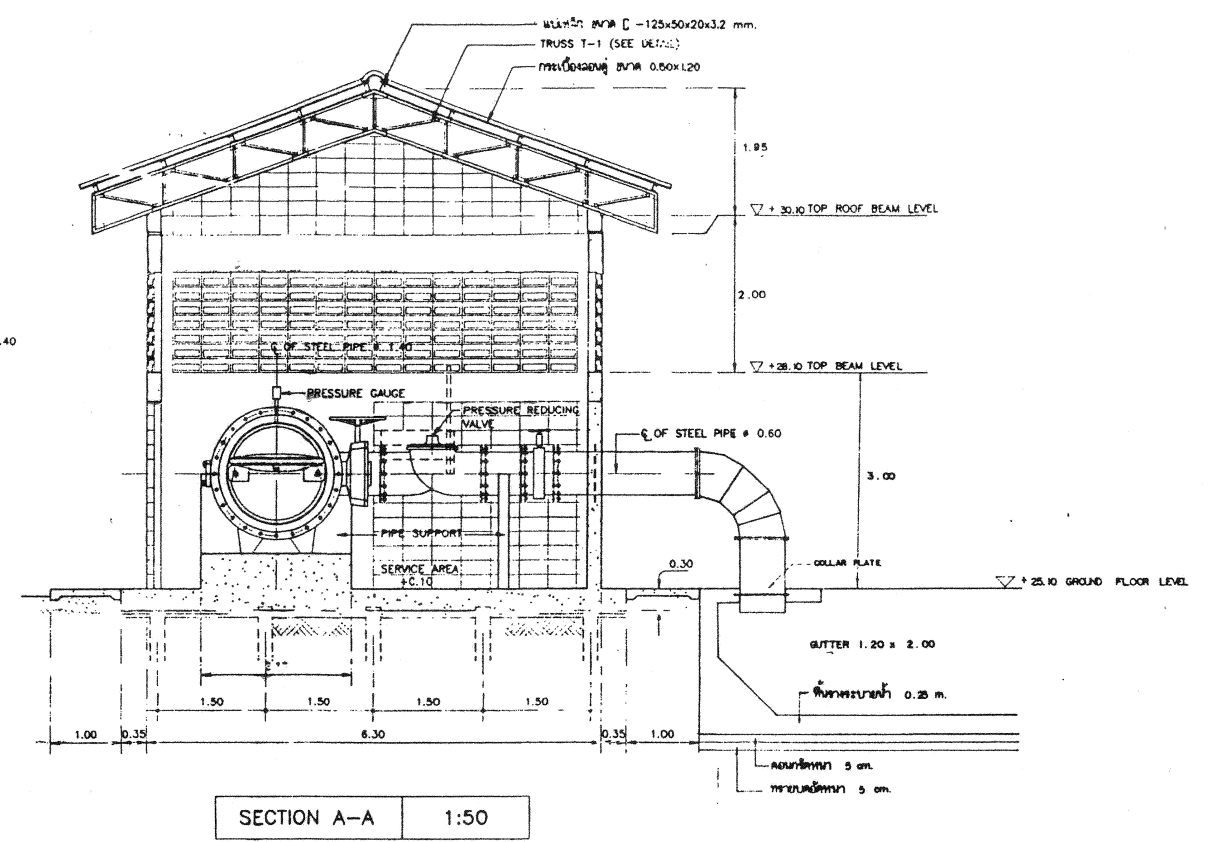
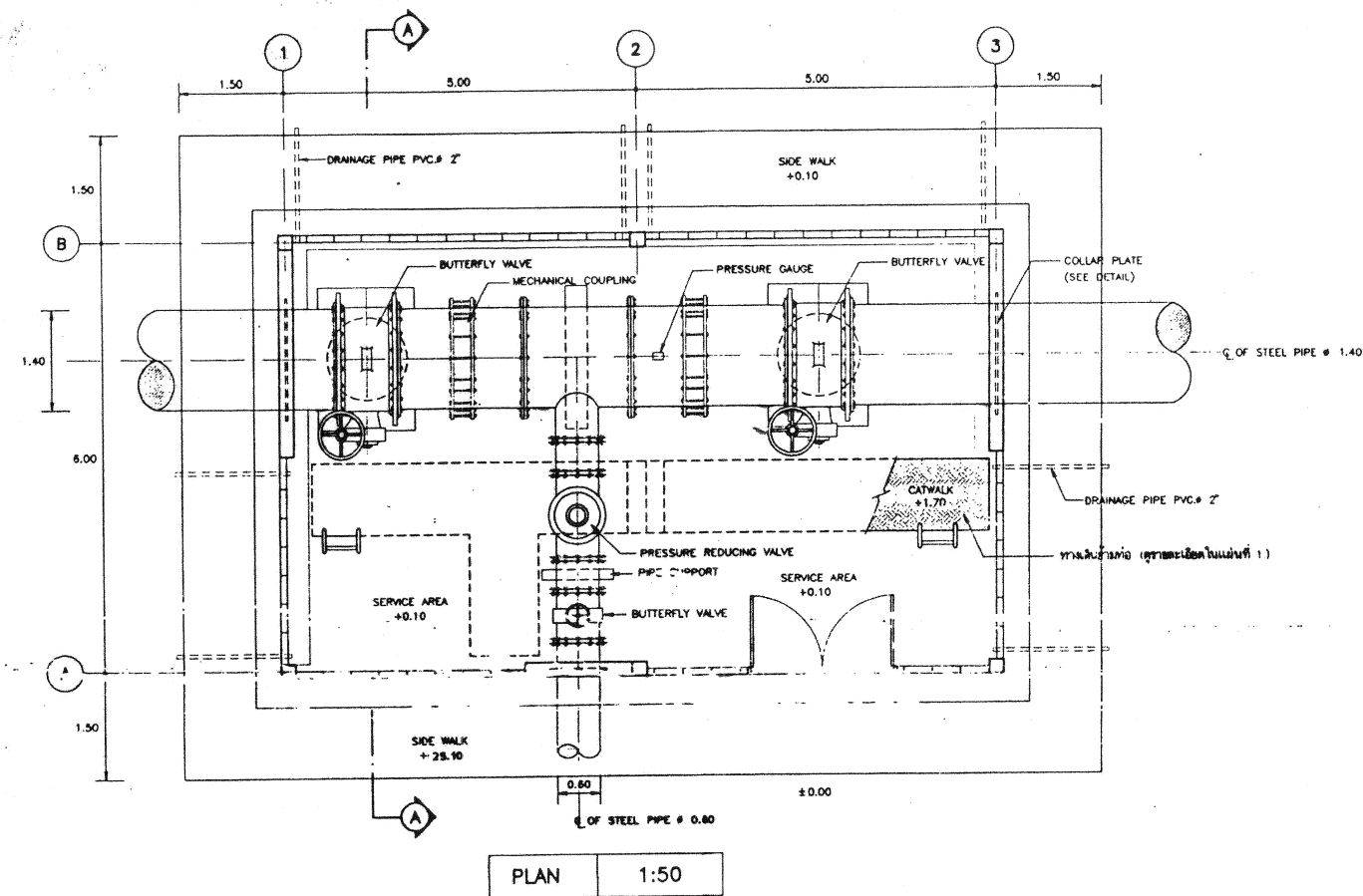


รูปตัดแสดงค่าระดับของท่อจ่ายน้ำ
NOT TO SCALE



AS-NO.11 DRAWING

กรมพัฒนาและส่งเสริมพลังงาน กระทรวงวิทยาศาสตร์และเทคโนโลยี และสิ่งแวดล้อม ระบบชลประทาน โครงการเขื่อนไฟฟ้าพลังน้ำคลองทุ่งเห็ด	
ADDITIONAL WORK OFF TAKE NO. 001 PLAN AND LOCATION	
บริษัทผู้รับจ้าง บริษัทไทยวิศวกรรมฯ จำกัด ออกแบบ เขียน ตรวจ วิศวกรโครงการ	บริษัทที่ปรึกษา บริษัท วิศวกรรม คอนสตรัคชั่น จำกัด บริษัท ที แอนด์ ซี แมเนจเม้นท์ จำกัด อนุมัติ อนุมัติ อนุมัติ
วันที่	วันที่
AS - TP - PS - 002	213 OF 200



กรมพัฒนาและส่งเสริมพลังงาน กระทรวงวิทยาศาสตร์และเทคโนโลยี และสิ่งแวดล้อม ระบบชลประทาน โครงการเขื่อนไฟฟ้าพลังน้ำคลองทุ่งพล		
ADDITIONAL WORK OFF TAKE NO 001 ARCHITECTURAL DETAILS		
บริษัทผู้รับจ้าง บริษัทไทยวิวัฒน์วิศวกรรมฯ จำกัด ออกแบบ เขียน ตรวจสอบ วิศวกร วิศวกร	บริษัท วิศวกรที่ปรึกษา บริษัท ปิณทุภา คอนสตรัคชั่น จำกัด บริษัท พี แอนด์ ซี แมคคานิคส์ จำกัด และ อนุมัติ อนุมัติ	244 OF 255