Department of Alternative
Energy Development and Efficiency
MINISTRY OF ENERGY

LAM PHRA PHLOENG HYDROPOWER PROJECT

AMPHOE PAK THONG CHAI CHANGWAT NAKORN RATCHASIMA

ELECTRO - MECHANICAL EQUIPMENT

VOLUME 4
DRAWINGS

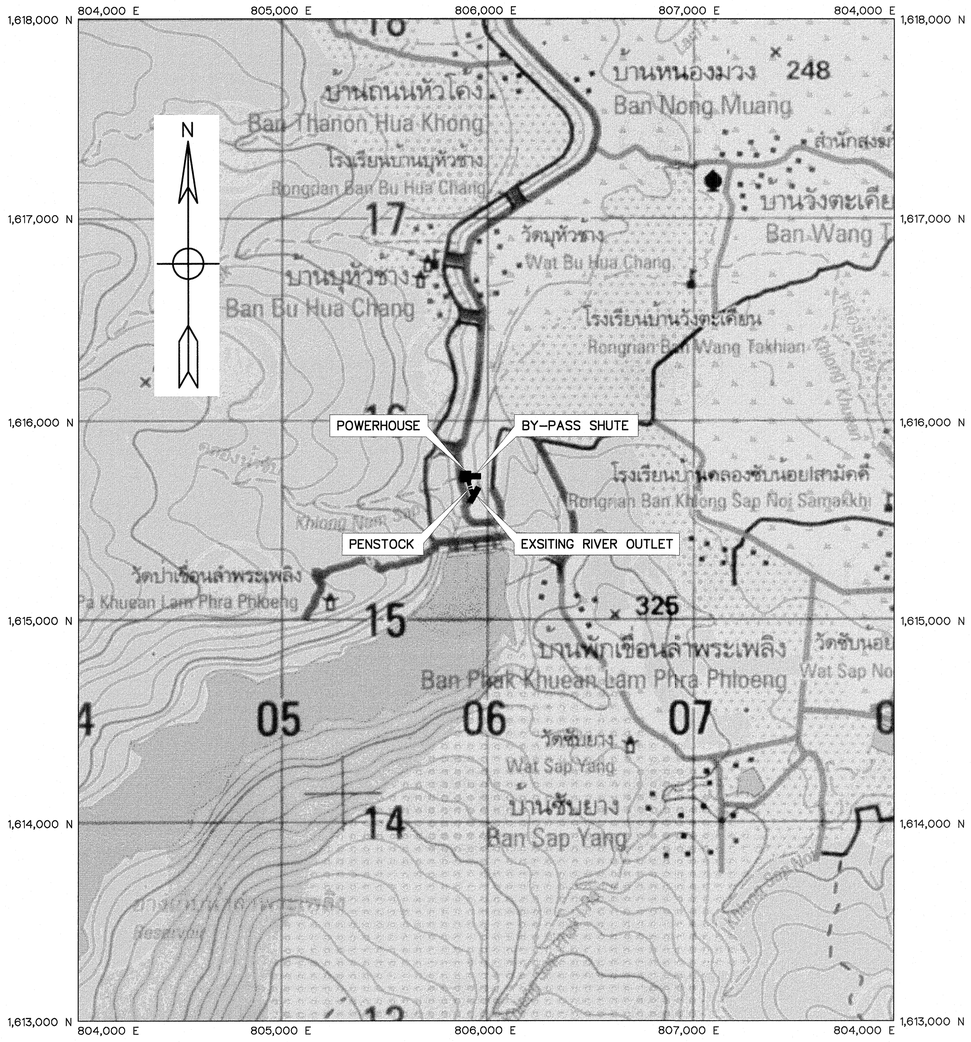
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LAM PHRA PHLOENG HYDROPOWER PROJECT

LIST OF DRAWINGS

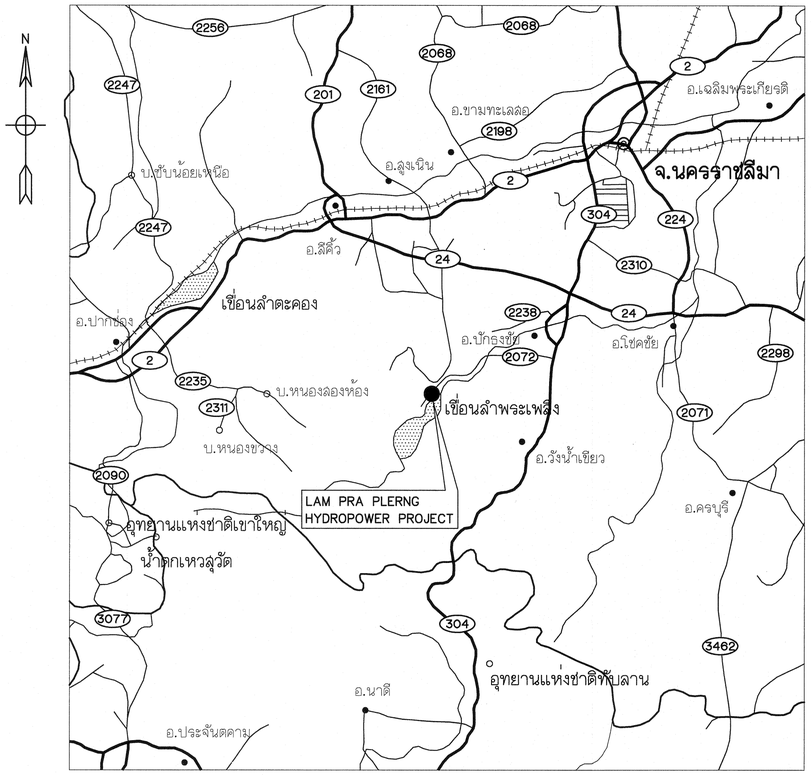
SHEET NO.	DRAWING NO.	DRAWING DETAILS
		GENERAL
1	LPP-GN-01	LOCATION MAP AND PROJECT AREA MAP
2	LPP-GN-02	PROJECT MAP
3	LPP-GN-03	SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES
4	LPP-GN-04	HYDROLOGY DATA
5	LPP-GN-05	HYDRAULIC GRADE LINE
		PENSTOCK
6	LPP-PS-01	PLAN AND PROFILE, STA. 0+000 TO STA. 0+034.000
		POWER HOUSE
7	LPP-PH-01	GENERAL LAY-OUT
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14	LPP-PH-08	TRANSFORMER AND SWITCHYARD, DETAILS

SHEET NO.	DRAWING NO.	DRAWING DETAILS
		TAILRACE
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16	LPP-TR-02	SECTIONS
		BY-PASS CHUTE
17	LPP-BC-01	GENERAL PLAN SECTION
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21	LPP-EM-04	WATER SUPPLY AND DRAINAGE SCHEMATIC DIAGRAM
22	LPP-EM-05	COMPRESS AIR SYSTEM SCHEMATIC DIAGRAM



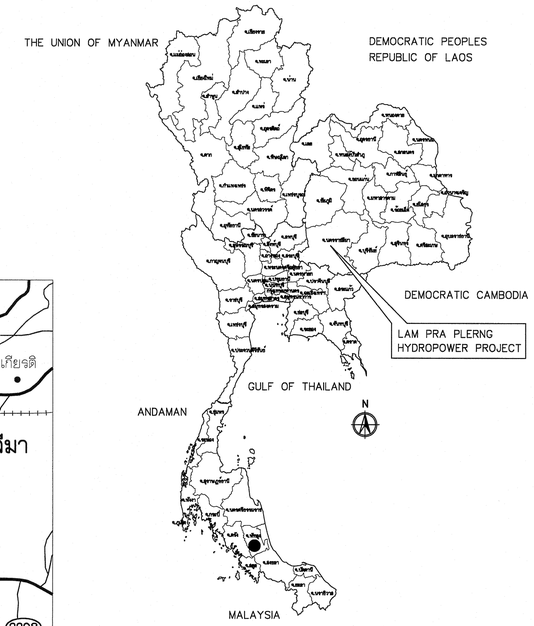
PROJECT AREA MAP

SCALE 1:15,000



LOCATION MAP

NOT TO SCALE



LOCATION MAP

NOT TO SCALE

LEGENDS :

- STREAM
- WEIR
- HEADRACE
- SURGE TANK
- PENSTOCK
- POWERHOUSE

NOTES :

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

0 0.1 0.2 0.4 0.6 0.8 1.0 1.2

SCALE 1:15,000 KILOMETERS

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Department of Alternative Energy Development and Efficiency
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LAM PHRA PHLOENG HYDROPOWER PROJECT

ELECTRO – MECHANICAL EQUIPMENT
GENERAL
LOCATION MAP AND PROJECT AREA MAP

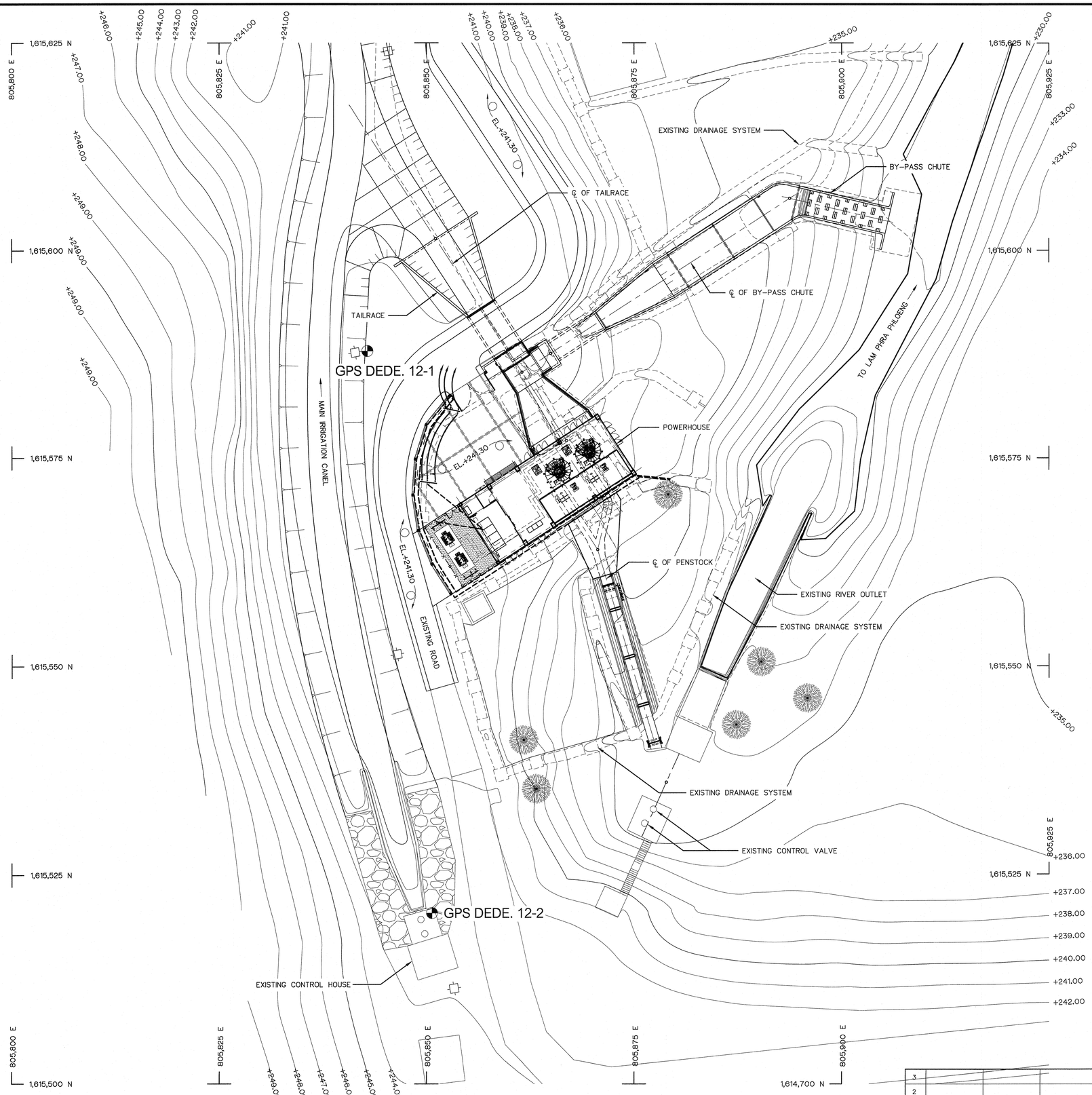
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DESIGNED	สย.6651	REVIEWED	S.KITCHAI
DRAWN		SUBMITTED	
CHECKED	สย.7324	RECOMMENDED	
PROJECT MANAGER	14/01/62 DATE	APPROVED	

DRAWING NO. LPP-GN-01

SHEET NO. 1 OF 22



LAYOUT PLAN

SCALE 1:250

BM. DESCRIPTIONS

BM NO.	COORDINATE		ELEVATION
	N	E	M. (MSL.)
GPS DEDE. 12-1	1,615,587.879	805,842.863	241.873
GPS DEDE. 12-2	1,615,520.362	805,850.623	242.716

NOTES :

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

0 5 10 15 20

SCALE 1:250 METER

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LAM PHRA PHLOENG HYDROPOWER PROJECT

ELECTRO – MECHANICAL EQUIPMENT
GENERAL
PROJECT MAP

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REVIEWED S. KITICHAI

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DRAWN			RECOMMENDED
CHECKED		21.7324	APPROVED
PROJECT MANAGER		14/01/62 DATE	DRAWING NO. LPP-GN-02

SHEET NO. 2 OF 22

ABBREVIATIONS :

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

SYMBOLS :

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

GENERAL NOTES :

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

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

2/ = FILL SHOULD BE AVOIDED

1/ = FOR DOUBTFUL CASES CONSULT FIELD ENGINEER

STRUCTURAL DESIGN NOTES :

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

fc' (ksc)	DESCRIPTION
350	PRESTRESS CONCRETE
210	1. POWERHOUSE
	2. TAILRACE
	3. BY-PASS CHUTE
	4. ANCHOR BLOCK, PIPE SUPPORT
	5. BOX CULVERT
140	LEAN CONCRETE

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

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ELECTRO – MECHANICAL EQUIPMENT
GENERAL
SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

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

DRAWING NO. LPP-GN-03

SHEET NO. 3 OF 22

TABLE 1 CLIMATOLOGICAL DATA FOR THE PERIOD 1980–2009

Station	KASETCHOKCHAI	Elevation of station above M.S.L.	190.34 Meters
Index station	48434		
Latitude	14° 43' 8.0" N		
Longitude	102° 10' 7.0" E		

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Pressure (Hectopascal)													
Mean	1013.3	1011.7	1009.9	1008.3	1007.1	1006.2	1006.1	1006.4	1007.8	1010.5	1012.3	1013.9	1009.5
Ext. max.	1025.9	1024.6	1027.7	1019.9	1015.5	1015.5	1013.0	1012.6	1016.4	1020.5	1022.6	1025.4	1027.7
Ext. min.	1003.5	1002.3	999.7	999.6	998.6	998.3	998.7	998.5	998.9	999.6	1002.1	1002.2	998.3
Mean daily range	5.9	6.1	5.9	5.4	4.6	4.2	4.1	4.2	4.6	4.8	5.1	5.6	5.0
Temperature (Celsius)													
Mean	24.4	26.5	28.6	29.7	29.0	28.8	28.3	28.0	27.4	26.7	25.5	23.8	27.2
Mean max.	31.3	33.5	35.3	36.2	34.8	34.2	33.4	33.0	32.2	31.2	30.7	29.9	33.0
Mean min.	18.1	20.2	23.0	24.6	25.0	25.0	24.6	24.5	24.0	23.1	20.7	18.1	22.6
Ext. max.	37.1	39.0	41.2	42.5	40.7	39.0	37.9	37.0	36.2	35.7	36.1	35.9	42.5
Ext. min.	8.7	11.3	14.0	18.6	21.0	21.6	21.5	21.1	20.2	16.1	13.5	6.5	6.5
Dew Point (Celsius)													
Mean	17.4	18.6	207	22.5	23.7	23.5	23.3	23.4	23.8	22.9	20.2	17.4	21.5
Relative Humidity (%)													
Mean	68	65	65	68	75	75	76	77	82	81	75	70	73
Mean max.	89	86	86	86	90	89	90	91	94	94	91	89	90
Mean min.	43	41	42	46	54	55	57	58	63	62	54	47	52
Ext. min.	22	18	18	21	31	28	33	40	43	37	29	28	18
Visibility (km.)													
07.00 LST	3.5	3.3	4.8	7.0	9.4	10.1	10.1	10.0	9.2	6.7	5.9	5.1	7.1
Cloudiness (0–10)													
Mean	3.4	3.3	4.3	4.8	6.3	7.0	7.5	7.9	7.4	5.8	4.1	3.4	5.4
Wind (knots)													
Mean wind speed	1.4	1.5	1.7	1.7	1.5	2.1	2.2	2.0	1.2	1.4	1.8	1.8	1.7
Max. wind speed	25	35	33	44	40	33	34	34	32	35	25	25	44
Evaporation (mm.)													
Mean–pan	124.1	132.4	167.0	169.5	158.3	147.9	144.3	137.2	118.1	118.3	117.2	122.0	1656.3
Rainfall (mm.)													
Mean	9.3	14.1	41.6	72.7	153.5	113.9	120.7	150.2	204.3	164.2	25.3	3.8	1073.6
Mean rainy day	2	3	6	8	15	14	16	17	19	14	4	1	119
Daily maximum	47.0	35.6	100.3	98.4	147.5	107.9	78.0	86.5	112.8	112.3	74.4	31.8	147.5
Number of days with													
Haze	3	3	1	0	0	0	0	0	1	2	2	1	11
Fog	29	27	27	18	2	0	0	0	1	10	15	22	150
Hail	0	0	0	0	0	0	0	0	0	0	0	0	0
Thunderstorm	0	2	5	8	11	7	6	8	10	5	1	0	63
Squall	0	0	0	0	0	0	0	0	0	0	0	0	1

TABLE 2 FLOOD PEAK DISCHARGE FOR VARIOUS RETURN PERIODS

RETURN PERIOD (YEAR)	FLOOD PEAK DISCHARGE ($M.^3/SEC.$)	
	REGIONAL FLOOD FREQUENCY ANALYSIS	UNIT HYDROGRAPH
10	446.7	414.5
25	578.7	598.0
50	676.6	683.6
100	773.8	773.5
200	870.6	899.4
500	998.3	1,000.0
1,000	1,094.9	1,367.7

FIGURE 1 FLOW DURATION CURVE AT LAM PHRA PHLOENG DAM

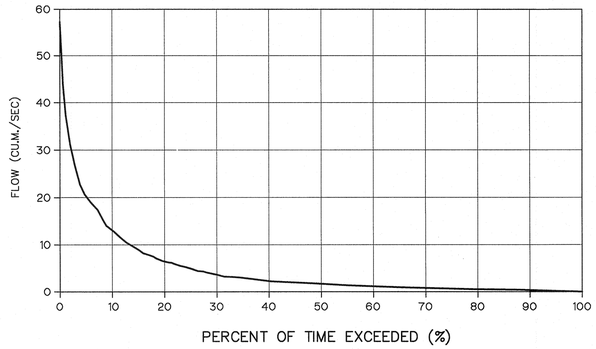


FIGURE 2 FLOW DURATION CURVE AT IRRIGATION OUTLET & RIVER OUTLET OF LAM PHRA PHLOENG DAM

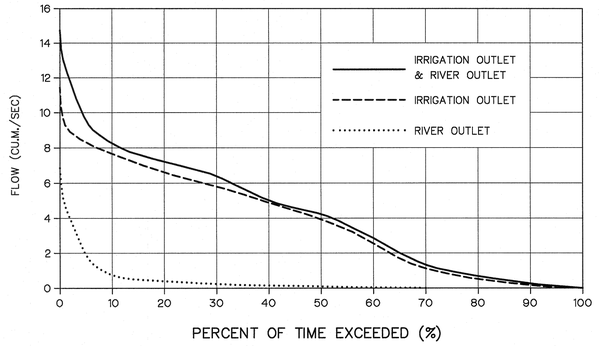
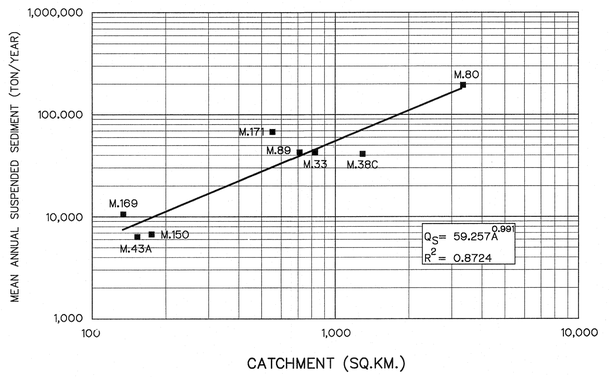


FIGURE 3 RELATIONSHIP BETWEEN ELEVATION AND CATCHMENT AREA



KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
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LAM PHRA PHLOENG HYDROPOWER PROJECT

ELECTRO – MECHANICAL EQUIPMENT
GENERAL
HYDROLOGY DATA

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

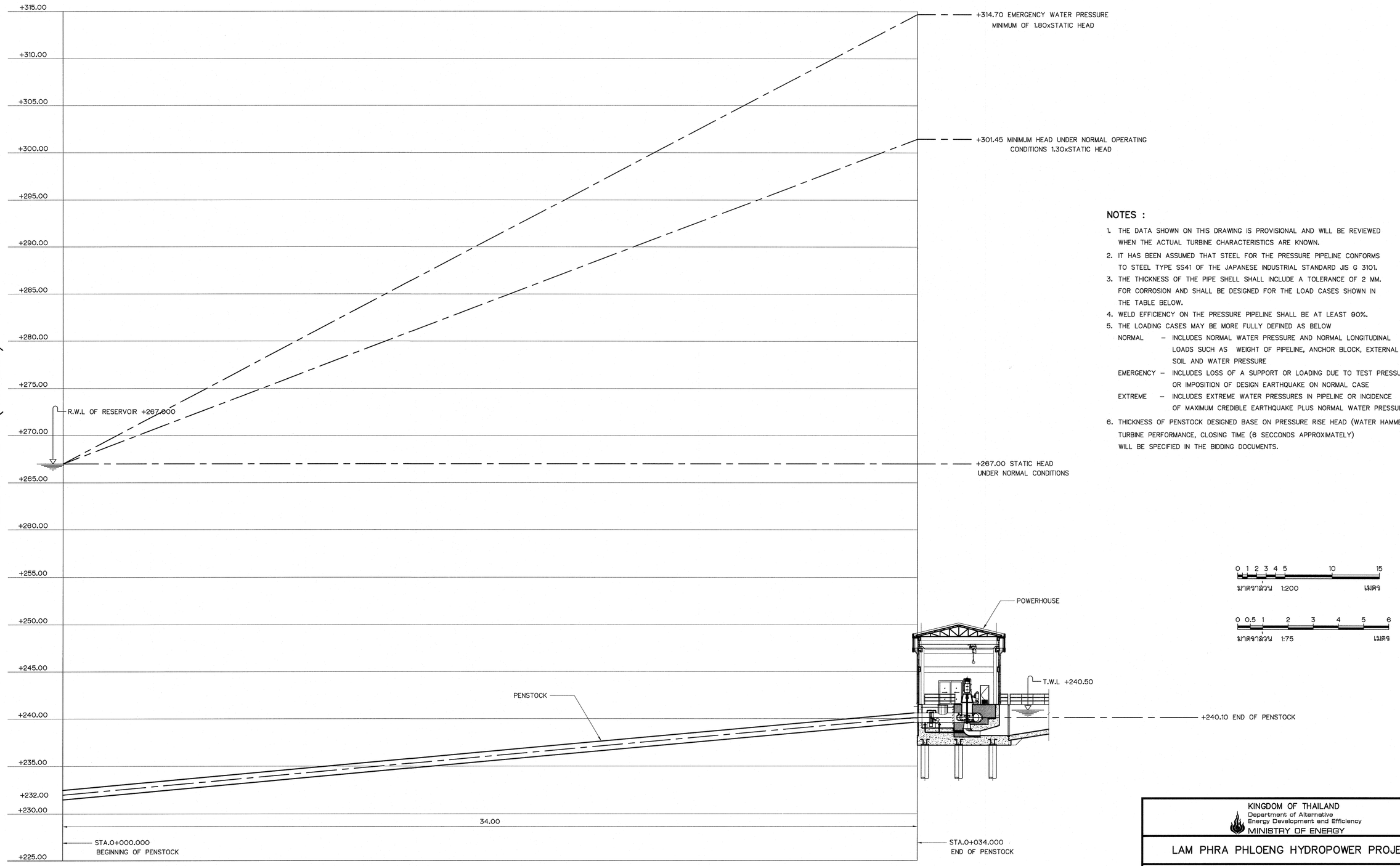
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DESIGNED ส.ต.ท.6651
DRAWN
CHECKED ส.ต.ท.7324
PROJECT MANAGER
14/01/62 DATE

REVIEWED S. KITICHAN
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. LPP–GN–04
SHEET NO. 4 OF 22



NOTES :

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

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

PROFILE ALONG PENSTOCK ℄

SCALE { VERTICAL 1 : 200
HORIZONTAL 1 : 75

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

LAM PHRA PHLOENG HYDROPOWER PROJECT

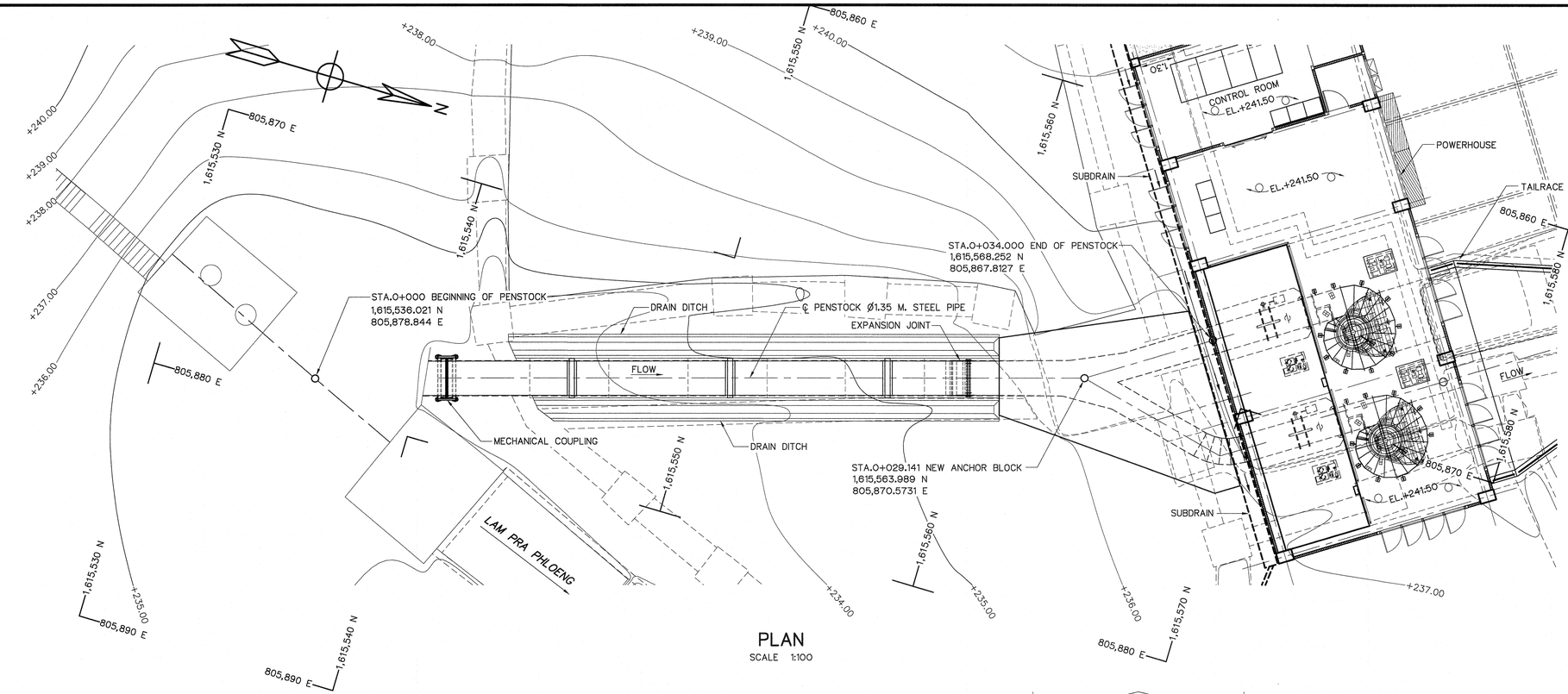
ELECTRO – MECHANICAL EQUIPMENT
GENERAL
HYDRAULIC GRADE LINE

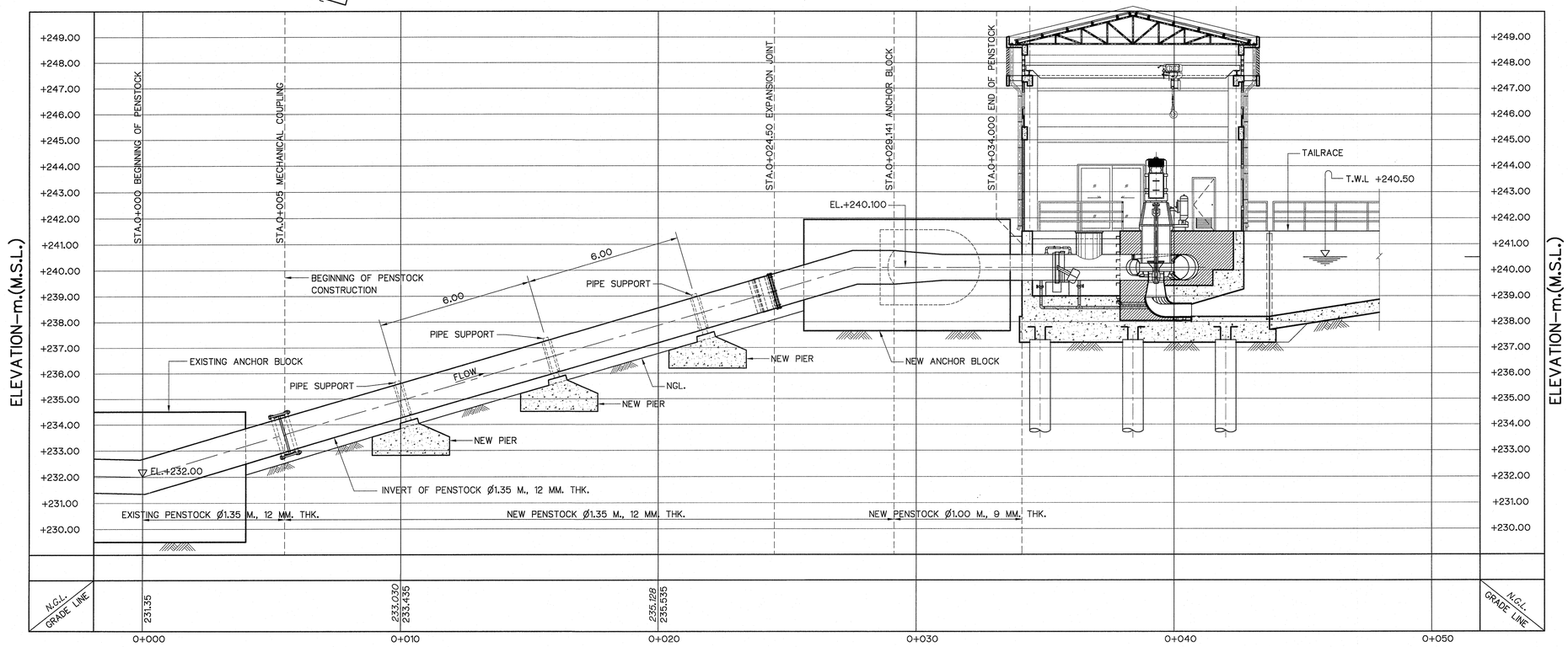
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

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

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED	S.KITICHAI
SUBMITTED	
RECOMMENDED	
APPROVED	
DRAWING NO.	LPP-GN-05
SHEET NO.	5 OF 22





PROFILE

VERTICAL SCALE 1:100

HORIZONTAL SCALE 1:100

NOTES :

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

0 1 2 3 4 5 6 7 8

SCALE 1:100 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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1				
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LAM PHRA PHLOENG HYDROPOWER PROJECT

ELECTRO – MECHANICAL EQUIPMENT

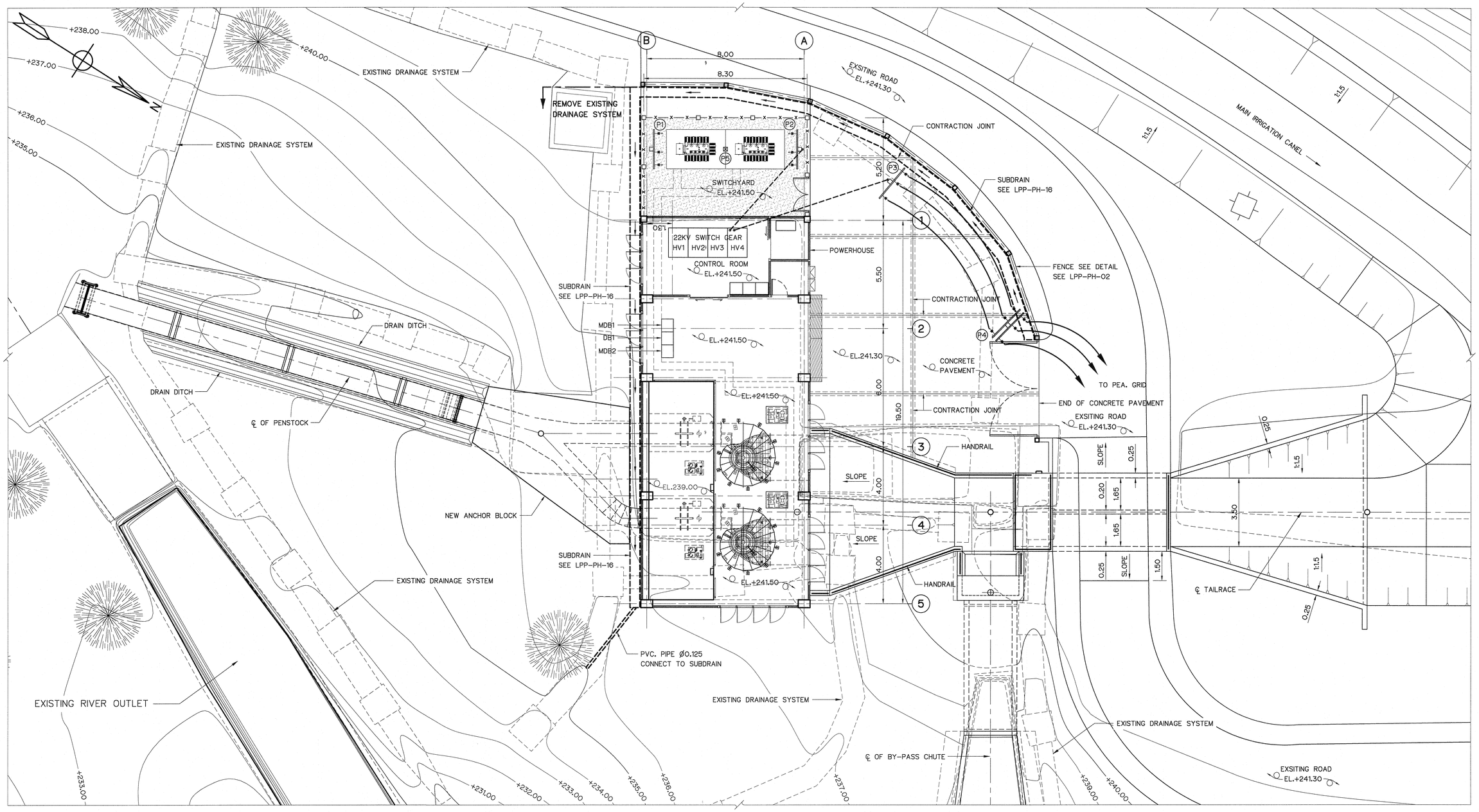
PENSTOCK

PLAN AND PROFILE, STA. 0+000 TO STA. 0+034.000

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MINISTRY OF ENERGY

DESIGNED	วศิ.6651	REVIEWED	S. KITICHAI
DRAWN		SUBMITTED	
CHECKED	วศิ.7324	RECOMMENDED	
PROJECT MANAGER	14/01/62 DATE	APPROVED	
		DRAWING NO.	LPP–PS–01
		SHEET NO.	6 OF 22



GENERAL LAY-OUT

SCALE 1:100

NOTES :

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

REFERENCE DRAWINGS :

1.	POWERHOUSE, GROUND FLOOR PLANS & ROOF PLAN	LPP-PH-02
2.	POWERHOUSE, ELEVATIONS	LPP-PH-03
3.	POWERHOUSE, SECTION A-A	LPP-PH-04
4.	POWERHOUSE, SECTION B-B , C-C	LPP-PH-05

0 1 2 3 4 5 6 7 8

SCALE 1:100 METERS

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

LAM PHRA PHLOENG HYDROPOWER PROJECT

ELECTRO – MECHANICAL EQUIPMENT

POWERHOUSE

GENERAL LAY-OUT

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

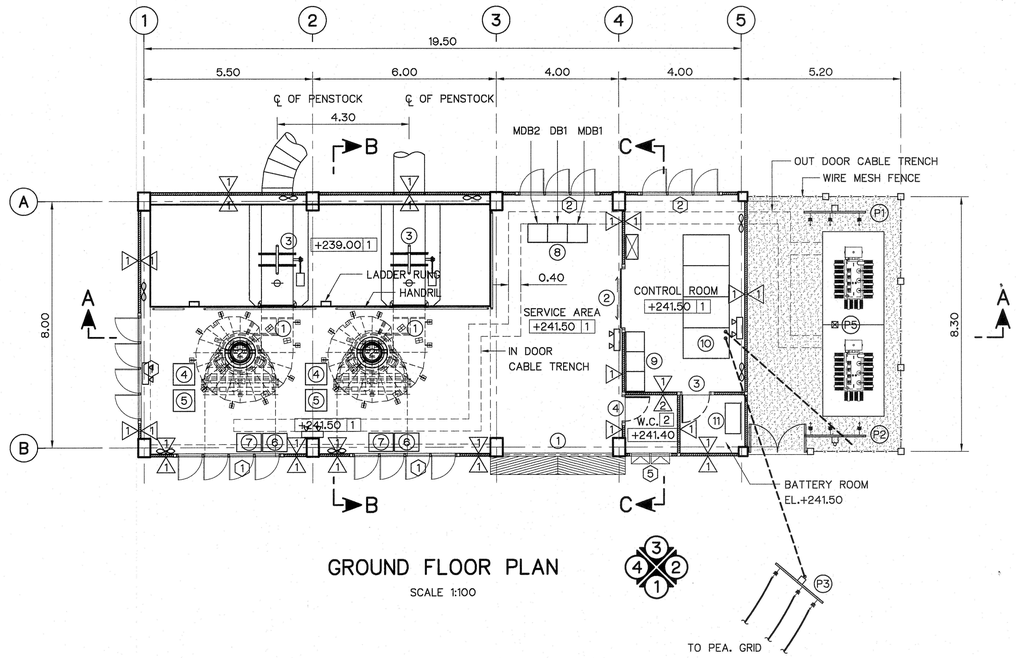
REVIEWED S. KITCHAI

DESIGNED		21.6651	SUBMITTED
DRAWN			RECOMMENDED
CHECKED		21.7324	APPROVED
PROJECT MANAGER		14/01/62 DATE	DRAWING NO. LPP-PH-01

SHEET NO. 7 OF 22

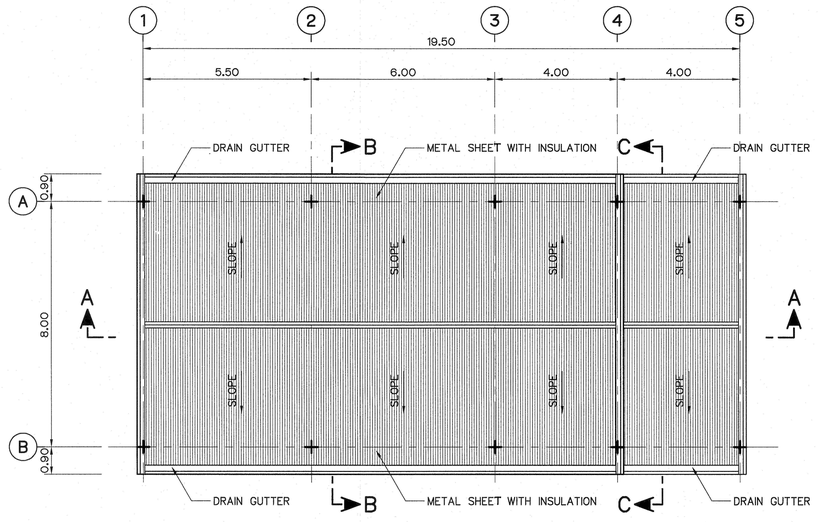
DESCRIPTION :

1. KAPLAN TURBINE
2. SYNCHRONOUSE GENERATOR
3. INLET VALVE AND BYPASS VALVE
4. FILTRATION AGREGATE
5. HYDRAULIC GOVERNOR OF TURBINE REGULATION
6. SWITCHGEAR CUBICLE
7. GOVERNOR AND TURBINE CONTROL PANEL
8. MAIN CONTROL SWITCHBOARD
9. AC & DC SWITCHBOARD AND BATTARY CHARGER CUBICLE
10. HIGH VOLTAGE SWITCHGEAR 22 KV.
11. BATTERY RACK



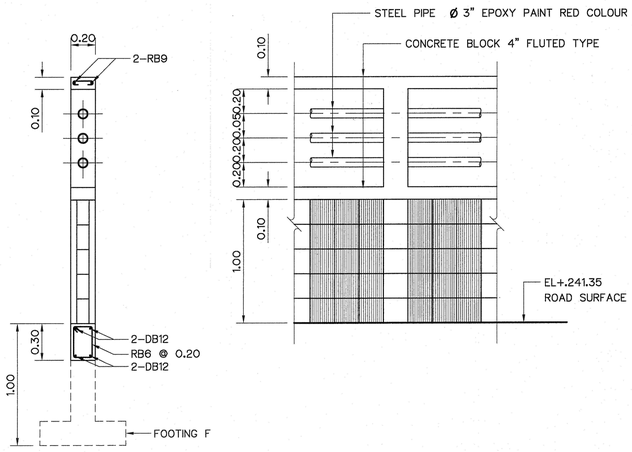
GROUND FLOOR PLAN

SCALE 1:100



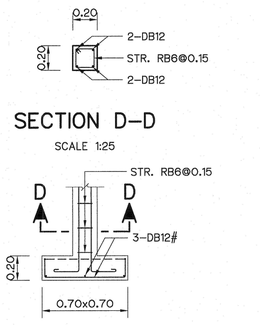
ROOF PLAN

SCALE 1:100



FENCE DETAIL

SCALE 1:25



SECTION D–D

SCALE 1:25

FOOTING F

SCALE 1:25

SYMBOLS :

- EXHAUST FAN Ø10"
- AIR CONDITIONING
- EMERGENCY LAMP

FLOOR FINISH SYMBOLS :

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

WALL FINISH SYMBOLS :

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

NOTES :

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

0 1 2 3 4 5 6 7 8

SCALE 1:100 METERS

REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAY–OUT	LPP–PH–01
2. POWERHOUSE, ELEVATIONS	LPP–PH–03
3. POWERHOUSE, SECTION A–A	LPP–PH–04
4. POWERHOUSE, SECTION B–B , C–C	LPP–PH–05

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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MINISTRY OF ENERGY

LAM PHRA PHLOENG HYDROPOWER PROJECT

ELECTRO – MECHANICAL EQUIPMENT

POWERHOUSE

GROUND FLOOR PLANS & ROOF PLAN

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED S. KITICHAI

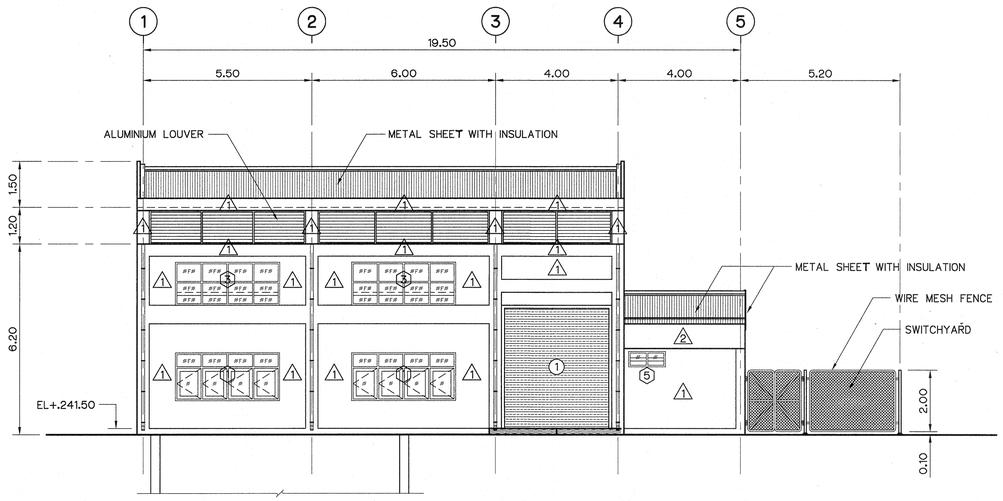
DESIGNED วศ.6651 | SUBMITTED

DRAWN | RECOMMENDED

CHECKED วศ.7324 | APPROVED

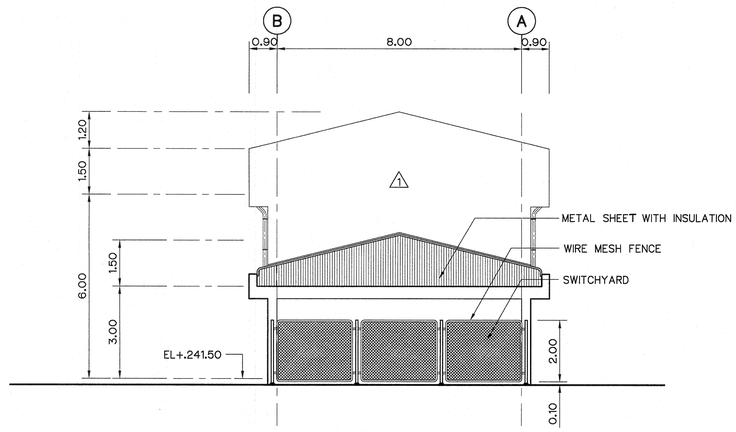
PROJECT MANAGER | 14/01/62 DATE

DRAWING NO. LPP–PH–02 | SHEET NO. 8 OF 22



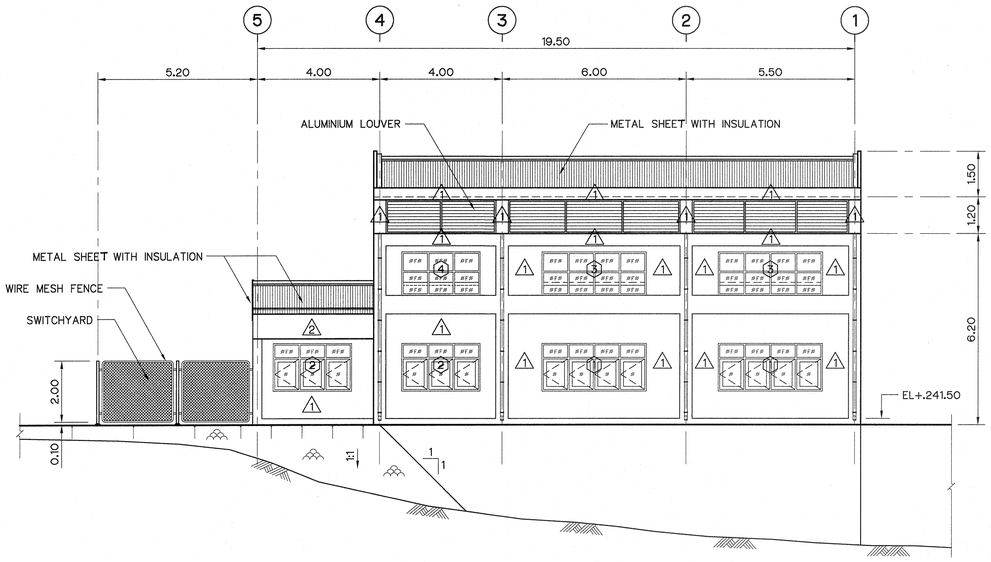
ELEVATION 1

SCALE 1:100



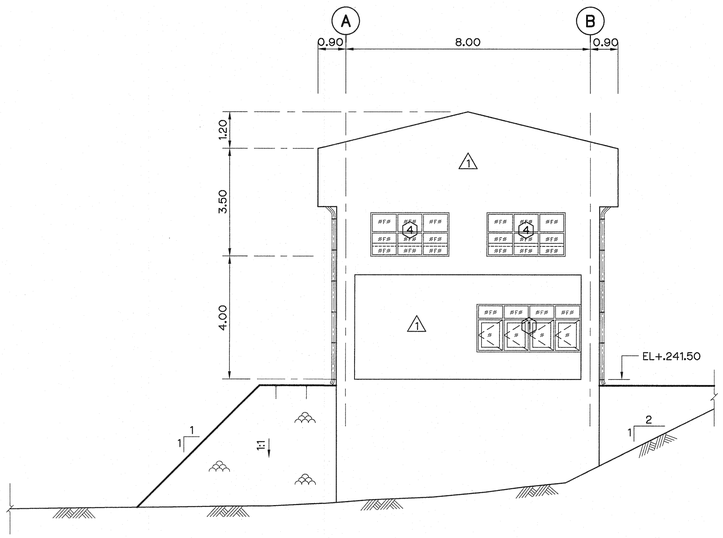
ELEVATION 2

SCALE 1:100



ELEVATION 3

SCALE 1:100



ELEVATION 4

SCALE 1:100

NOTES :

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

REFERENCE DRAWINGS :

1. POWERHOUSE, GROUND FLOOR PLANS & ROOF PLAN	LPP-PH-02
2. POWERHOUSE, SECTION A-A	LPP-PH-04
3. POWERHOUSE, SECTION B-B , C-C	LPP-PH-05

0 1 2 3 4 5 6 7 8

SCALE 1:100 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
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	CONSULTANTS		DEDE	

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

LAM PHRA PHLOENG HYDROPOWER PROJECT

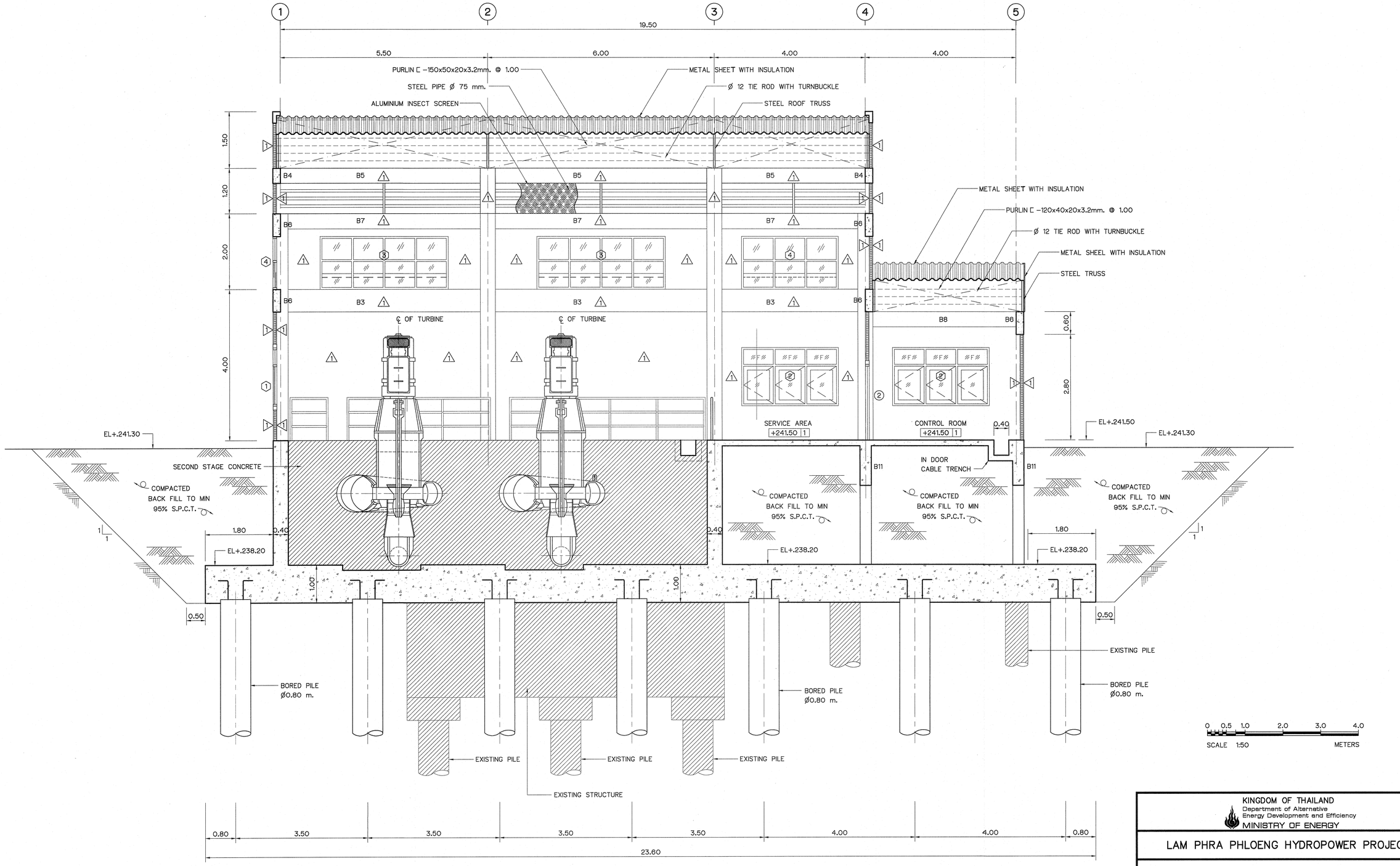
ELECTRO – MECHANICAL EQUIPMENT
POWERHOUSE
ELEVATIONS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED S. KITICHAI

DESIGNED	สุ.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สุ.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO.	LPP-PH-03
		SHEET NO.	9 OF 22



SECTION A–A

SCALE 1:50

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP–GN–03.
3. ALLOWABLE LOAD OF BORED PILE Ø0.80 M. SHALL NOT BE LESS THAN 180 TONS.
4. BORED PILE TIP SHALL BE PLACED ON FIRM ROCK LAYER OR DENSE SAND APPROX. PILE LENGTH 25 M.

REFERENCE DRAWINGS :

1. POWERHOUSE, GROUND FLOOR PLAN & ROOF PLAN	LPP–PH–02
2. POWERHOUSE, ELEVATIONS	LPP–PH–03
3. POWERHOUSE, ROOF TRUSS AND MISSCALLANEOUS DETAILS	LPP–PH–06

NO.	DATE	REVISIONS	CHECKED	APPROVED
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MINISTRY OF ENERGY

LAM PHRA PHLOENG HYDROPOWER PROJECT

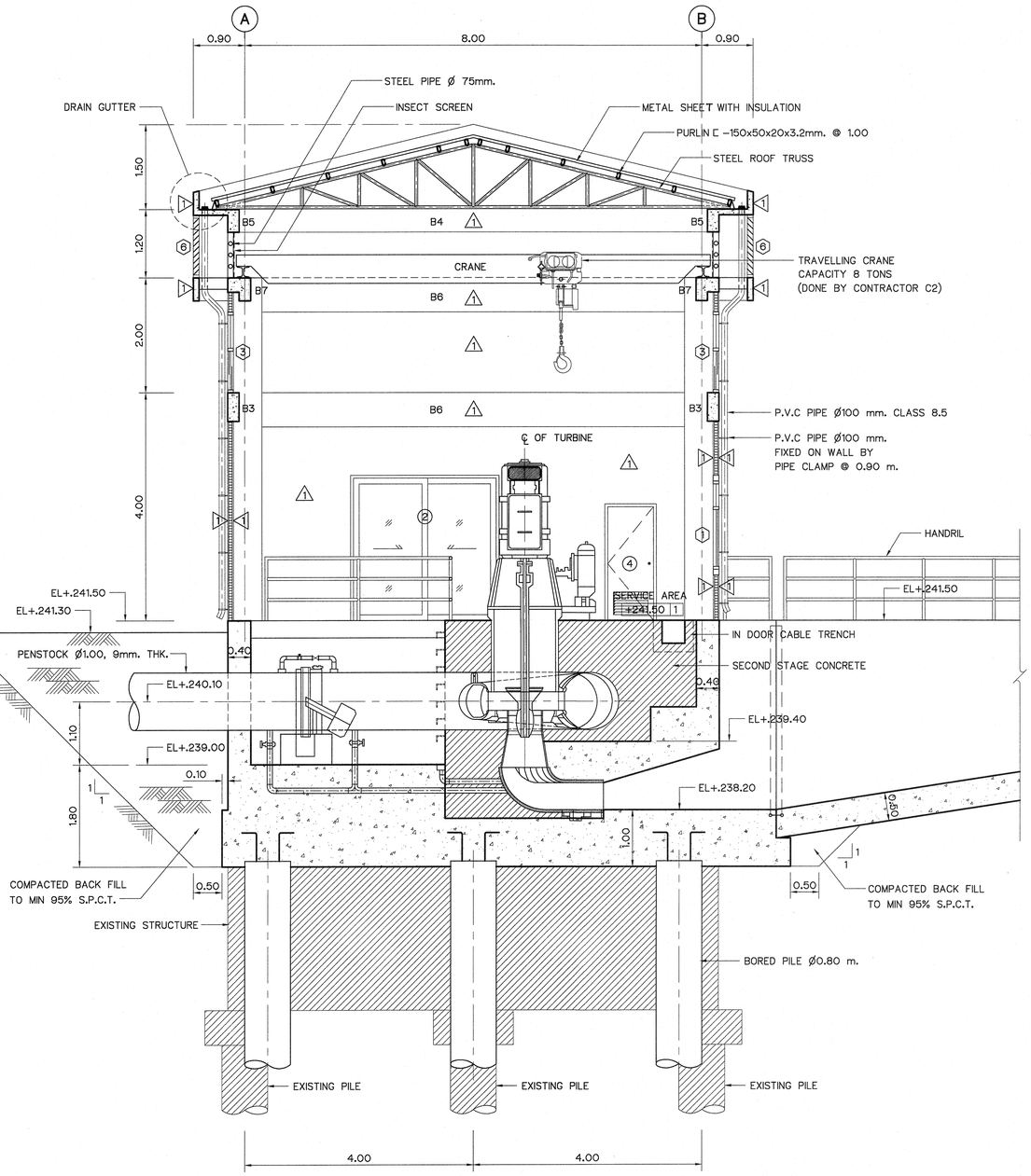
ELECTRO – MECHANICAL EQUIPMENT
POWERHOUSE
SECTION A–A

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Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

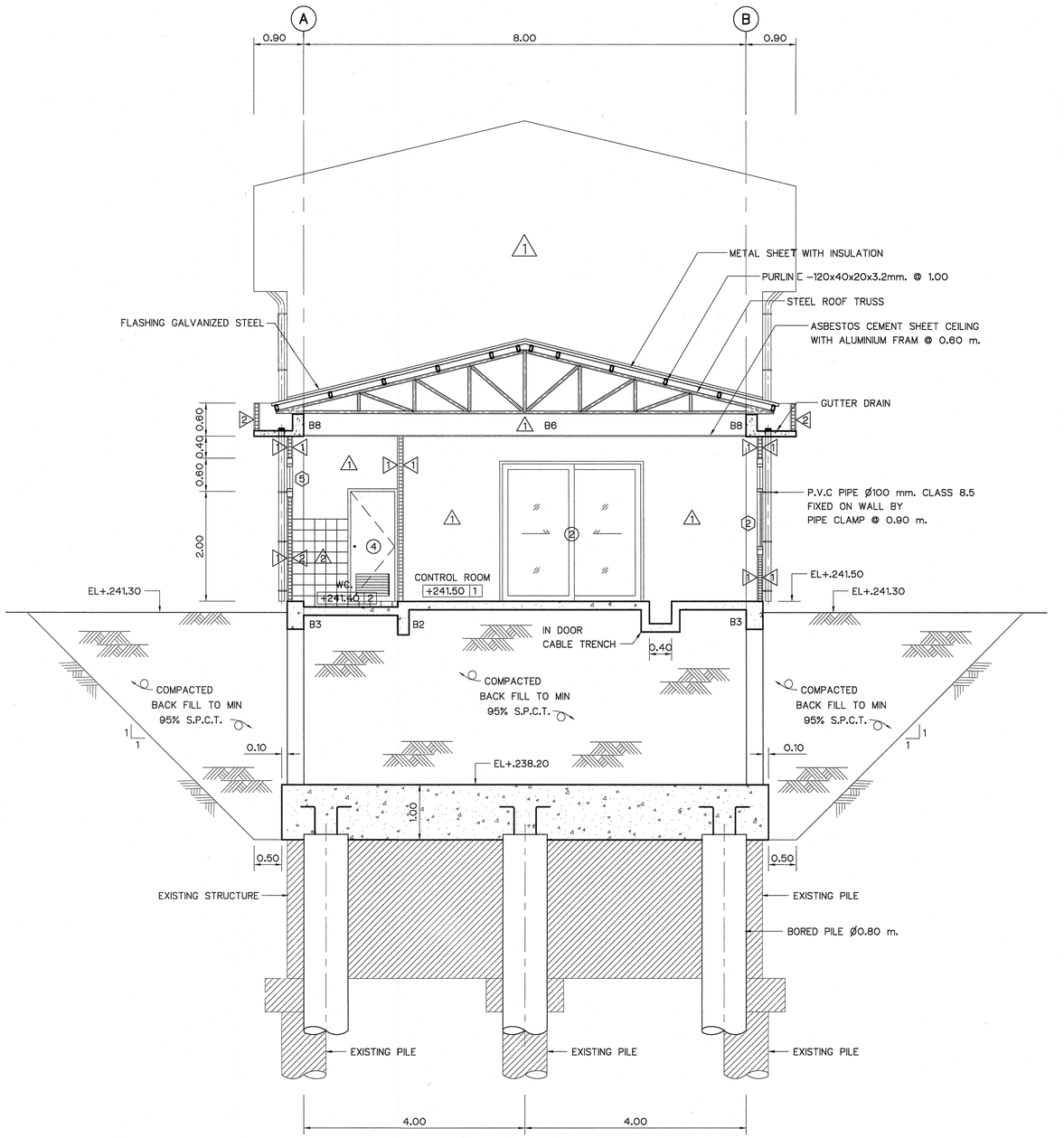
REVIEWED S. KITICHAI

DESIGNED		281.6651	SUBMITTED
DRAWN			RECOMMENDED
CHECKED		281.7324	APPROVED
PROJECT MANAGER		14/01/62 DATE	DRAWING NO. LPP–PH–04
			SHEET NO. 10 OF 22



SECTION B–B

SCALE 1:50



SECTION C–C

SCALE 1:50

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP–GN–03.
3. ALLOWABLE LOAD OF BORED PILE Ø0.80 M. SHALL NOT BE LESS THAN 180 TONS.
4. BORED PILE TIP SHALL BE PLACED ON FIRM ROCK LAYER OR DENSE SAND APPROX. PILE LENGTH 25 M.

REFERENCE DRAWINGS :

1. POWERHOUSE, GROUND FLOOR PLANS & ROOF PLAN	LPP–PH–02
2. POWERHOUSE, ELEVATIONS	LPP–PH–03

0 0.5 1.0 2.0 3.0 4.0

SCALE 1:50 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
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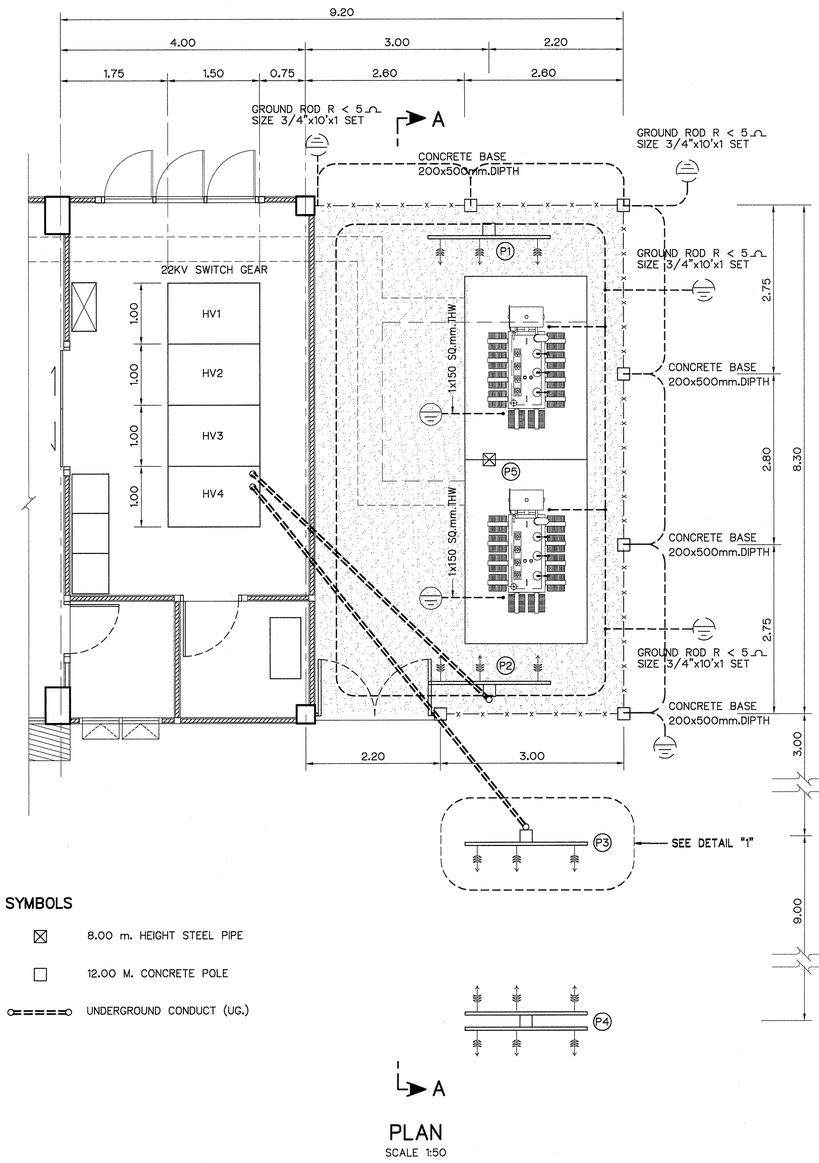
LAM PHRA PHLOENG HYDROPOWER PROJECT

ELECTRO – MECHANICAL EQUIPMENT

POWERHOUSE

SECTION B–B , C–C

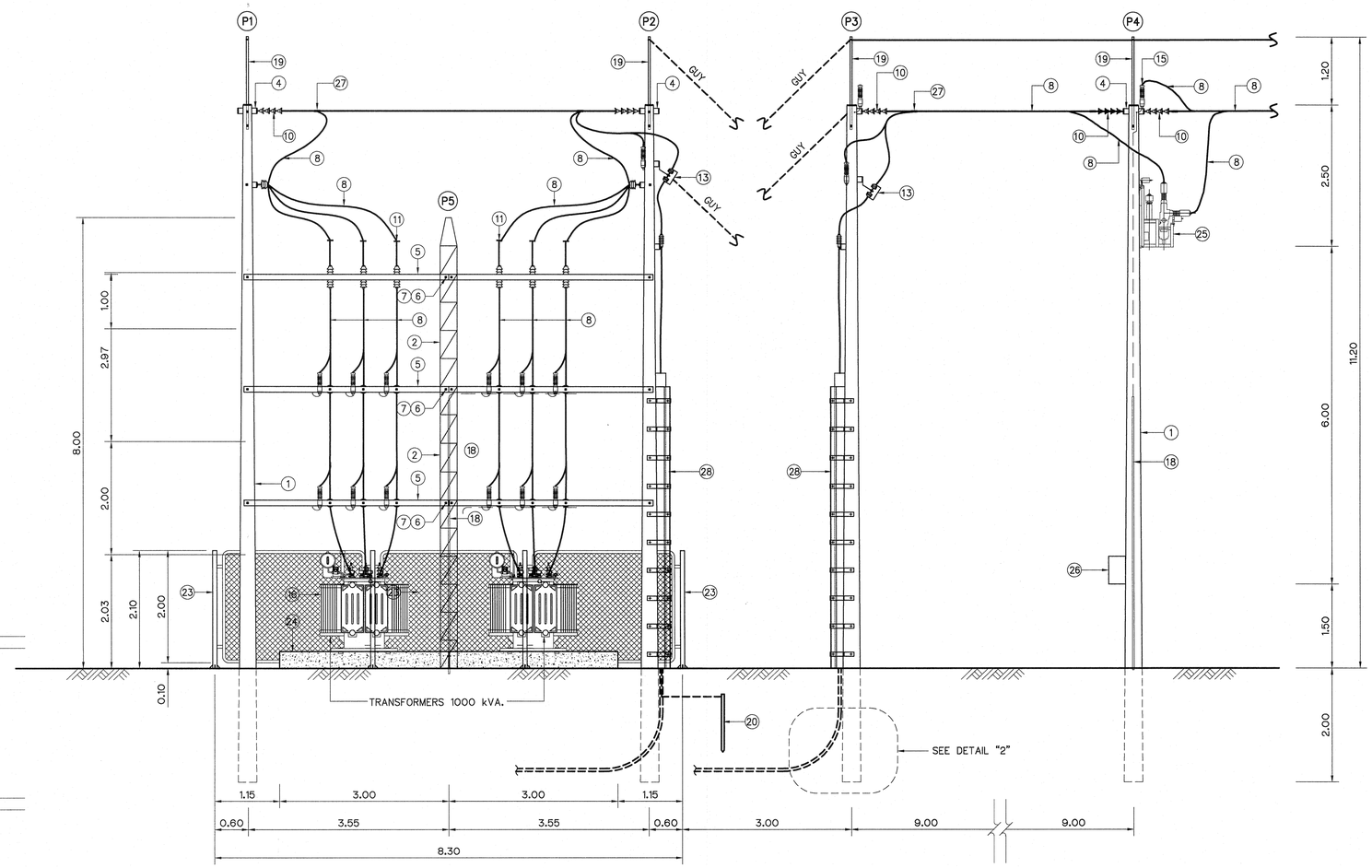
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED S. KITICHAI
DESIGNED	SUBMITTED
DRAWN	RECOMMENDED
CHECKED	APPROVED
PROJECT MANAGER — 14/01/62 DATE	DRAWING NO. LPP–PH–05 — SHEET NO. 11 OF 22



SYMBOLS

- ⊠ 8.00 m. HEIGHT STEEL PIPE
- □ 12.00 M. CONCRETE POLE
- UNDERGROUND CONDUCT (UG.)

PLAN
SCALE 1:50



SECTION A–A
NOT TO SCALE

BILL OF MATERIAL

ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	POLE, CONCRETE 12 M. LONGS	14	FUSE LINK TYPE K 27 kV.
2	POLE, GALVANIZED STEEL 8 M. LONGS.	15	LIGHTNING ARRESTER, 21 kV, 10 kA
3	–	16	TRANSFORMER SIZE 1,000 kVA
4	CROSSARM, CONCRETE, H.T 120x120x2,000 mm. LONGS	17	CLEVIS, THIMBLE DEADEND
5	BEAM, SPUN PRESTRESSED CONCRETE 100x100x3,200 mm.	18	PIPE, S'LON Ø 20x4,000 mm COMPLETE WITH FIXING ACCESSORIES
6	BOLT MACHINE 5/8"x12" mm.	19	ANGLE STEEL SIZE 100x50x5 mm. LONGS 2.25 m.
7	WASHER, SQUARE, FLAT 2 1/2" FOR 5/8" BOLT	20	GROUND ROD.5/8"x10'
8	ALL ALUMINUIM CONDUCTOR 185 SQ.mm. (AAC)	21	OVERHEAD GROUND WIRE 25 SQmm.
9	LINE POST TYPE INSULATOR ANSI STANDARD 57–2L 22kV. (POWER ARC.)	22	DEADEND CLAMP FOR AAC 185 SQmm.
10	INSULATOR SUSPENSION TYPE, EEI–NEMA CLASS 52–1 COMPLETE WITH PIN	23	FENCE
11	SLEEVE COMPRESSION TYPE FOR AERIAL CABLE 185 SQ.mm	24	TRANSFORMER CONCRETE FOUNDATION
12	WIRE, STEEL STRANDED, 50/7 Sqmm.	25	RECLOSER 24 kV.
13	DROPOUT FUSE CUTOUT 27 kV. 100 A. BASE	26	CONTROL CABINET
		27	CLAMP STIRRUP & CLAMP HOT LINE
		28	HDPE 5" CONDUCT

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS–GN–03
3. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, THE CONTRACTOR HAS TO SUBMITTED SHOP DRAWING TO FIELD ENGINEER FOR APPROVAL

REFERENCE DRAWING :

1. POWERHOUSE, TRANSFORMER AND SWITCHYARD, SECTION AND DETAILS LPP–PH–07

NO.	DATE	REVISIONS	CHECKED	APPROVED
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	CONSULTANTS		DEDE	

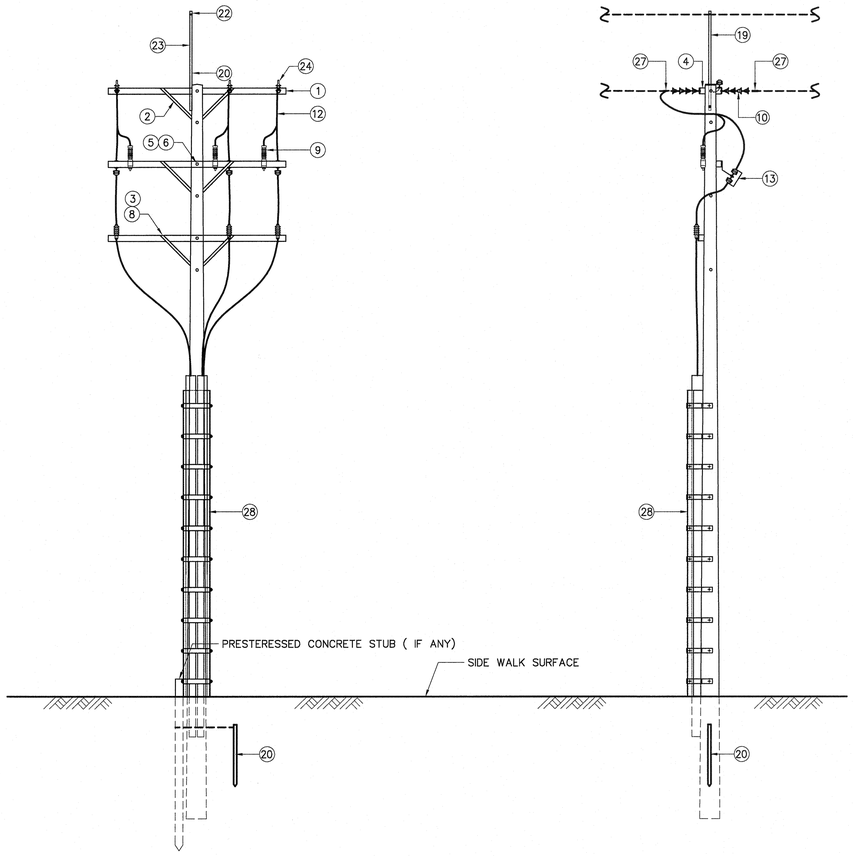
KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

LAM PHRA PHLOENG HYDROPOWER PROJECT

ELECTRO – MECHANICAL EQUIPMENT

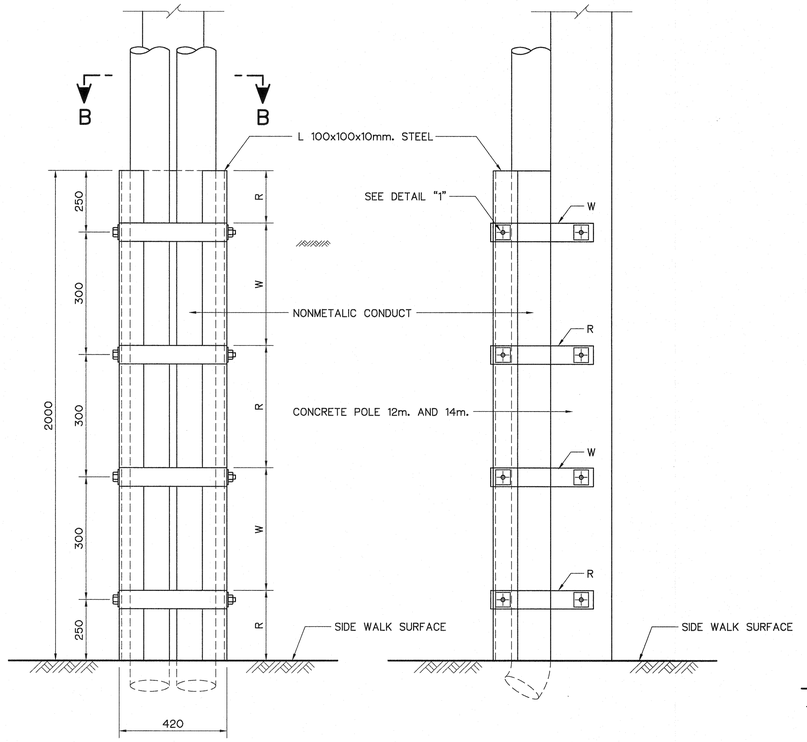
POWERHOUSE
TRANSFORMER, SWITCHYARD PLAN AND SECTION

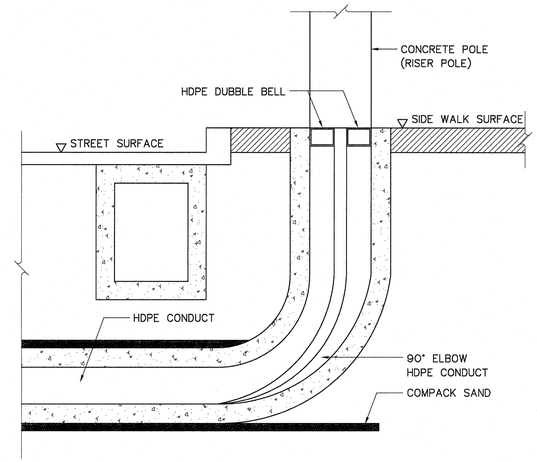
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED S.KITICHAI
DESIGNED	SUBMITTED
DRAWN	RECOMMENDED
CHECKED	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. LPP–PH–06
	SHEET NO. 12 OF 22



STRUCTURE FOR POLE CABLE RISER PEA. ASSEMBLY NO. 2418 (22KV.)

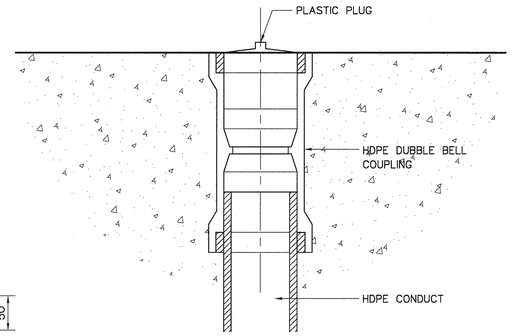
NOT TO SCALE

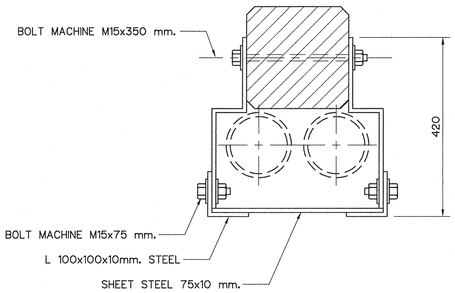




DETAIL "2"

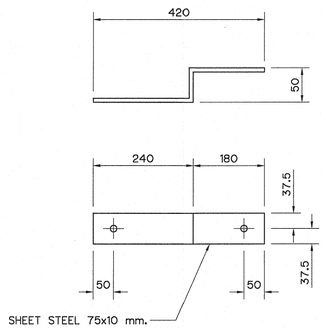
NOT TO SCALE





SECTION B–B

NOT TO SCALE



DETAIL "1"

NOT TO SCALE

STEEL GUARD CONSTRUCTION PEA ASSEMBLY

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS–GN–03
3. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, THE CONTRACTOR HAS TO SUBMITTED SHOP DRAWING TO FIELD ENGINEER FOR APPROVAL

REFERENCE DRAWING :

1. POWERHOUSE, TRANSFORMER, SWITCHYARD PLAN AND SECTION LPP–PH–06

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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	CONSULTANTS		DEDE	

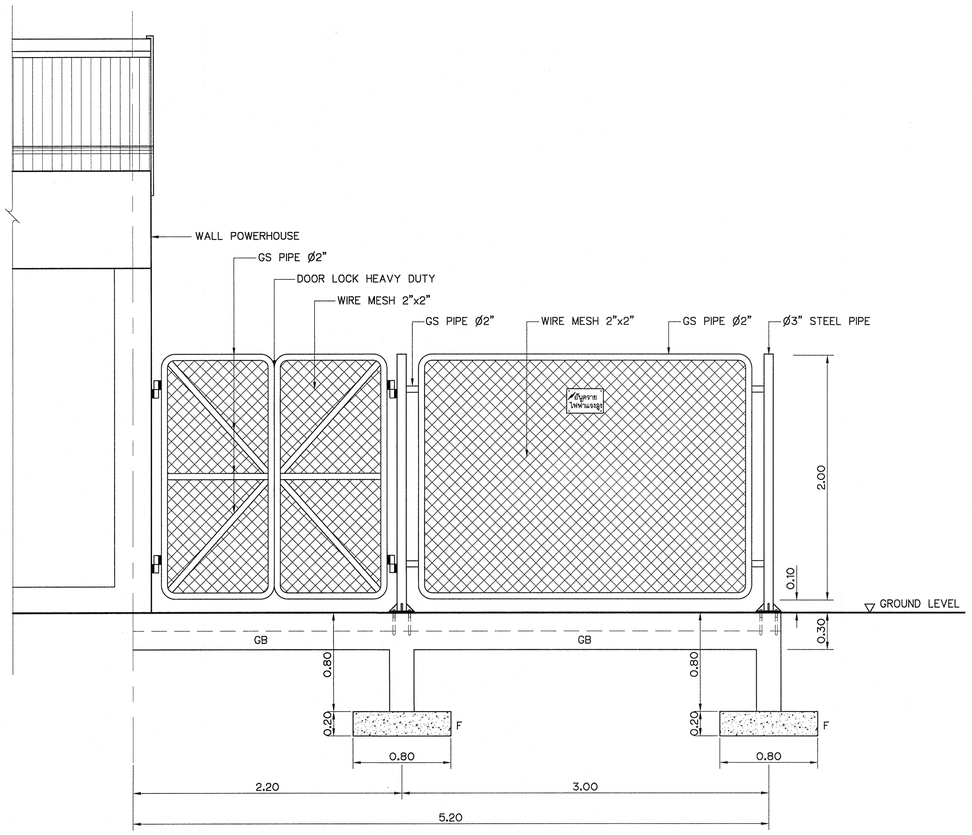
KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

LAM PHRA PHLOENG HYDROPOWER PROJECT

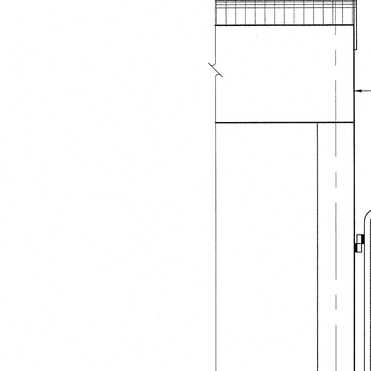
ELECTRO – MECHANICAL EQUIPMENT

POWERHOUSE
TRANSFORMER AND SWITCHYARD, SECTION AND DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED S.KITTICHAI
DESIGNED 29/11.1029	SUBMITTED
DRAWN	RECOMMENDED
CHECKED 29/11.1029	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. LPP–PH–07 / SHEET NO. 13 OF 22

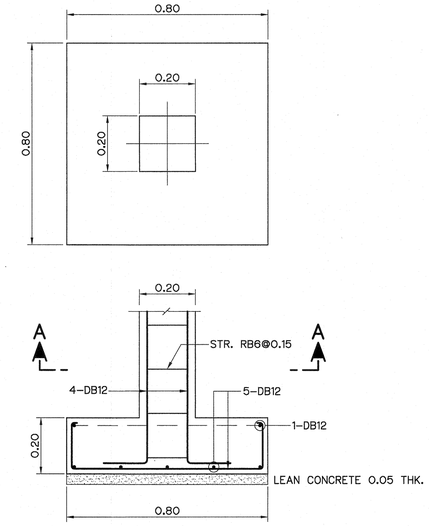


FENCE DETAIL
NOT TO SCALE

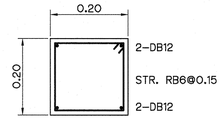


DETAIL OF FOOTING (F)
NOT TO SCALE

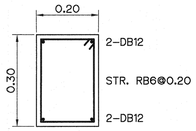
WARNING SIGN
NOT TO SCALE



REINFORCEMENT OF FOOTING (F)
NOT TO SCALE



SECTION A-A
NOT TO SCALE



REINFORCEMENT OF BEAM (GB)
NOT TO SCALE

NOTES :

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP-GN-03
3. THE TRANSFORMER YARD WILL BE ACCORDING TO PEA STANDARD.

REFERENCE DRAWINGS :

1. POWERHOUSE, TRANSFORMER, SWITCHYARD PLAN AND SECTION LPP-PH-06

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
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LAM PHRA PHLOENG HYDROPOWER PROJECT

ELECTRO – MECHANICAL EQUIPMENT

POWERHOUSE
TRANSFORMER AND SWITCHYARD, DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

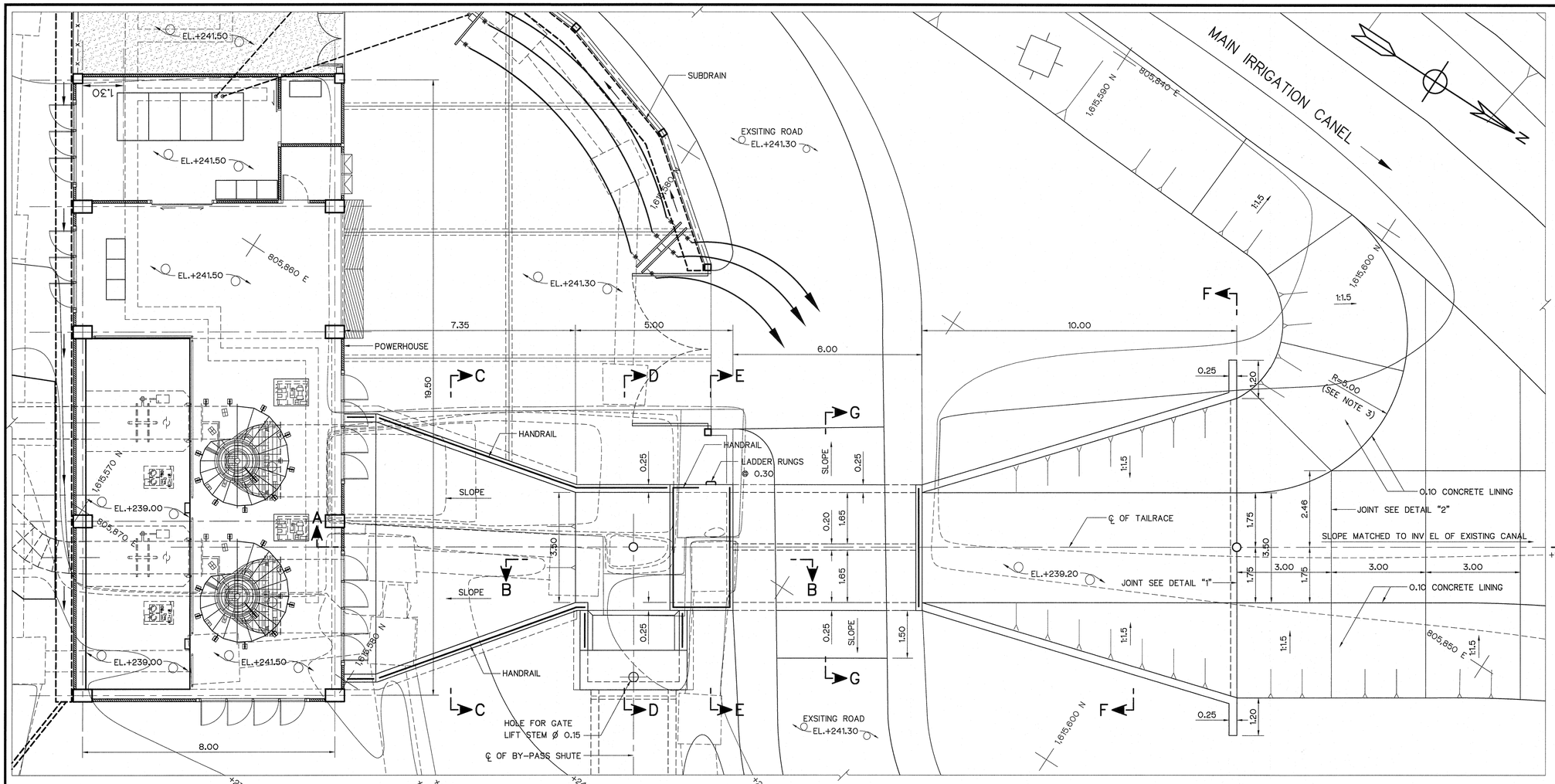
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED S.KITTIKHAI

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

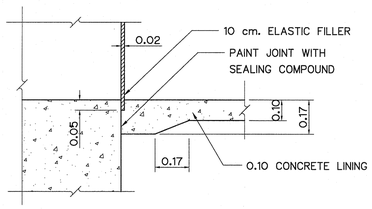
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. LPP-PH-08
SHEET NO. 14 OF 22



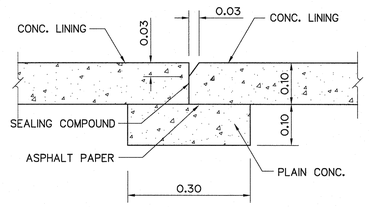
GENERAL PLAN

SCALE 1:75



JOINT DETAIL "1"

SCALE 1:10



JOINT DETAIL "2"

SCALE 1:5

0 0.05 0.1 0.2 0.3 0.4

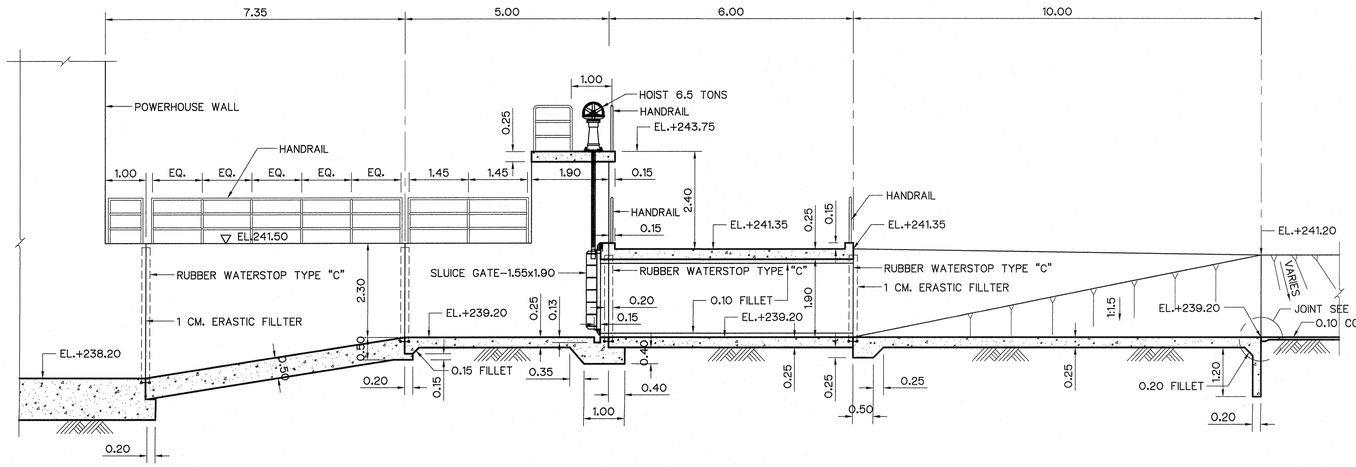
SCALE 1:5 METERS

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8

SCALE 1:10 METERS

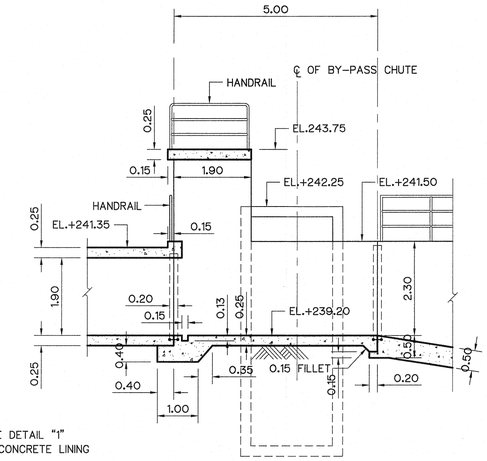
0 0.5 1 2 3 4 5 6

SCALE 1:75 METERS



SECTION A–A

SCALE 1:75



SECTION B–B

SCALE 1:75

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP–GN–03.
3. DIMENSION MY BE CHANGED TO SUIT THE FIELD CONDITION.

REFERENCE DRAWINGS :

1. TAILRACE, SECTIONS LPP–TR–02

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

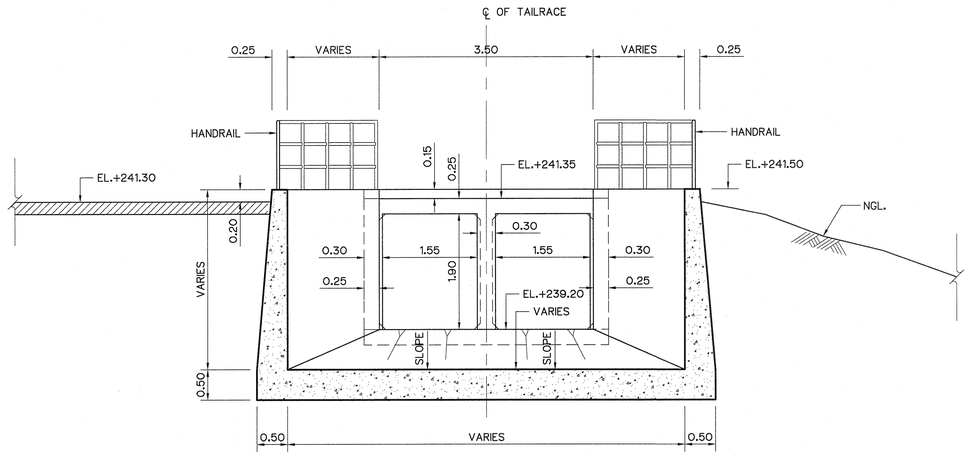
KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

LAM PHRA PHLOENG HYDROPOWER PROJECT

ELECTRO – MECHANICAL EQUIPMENT

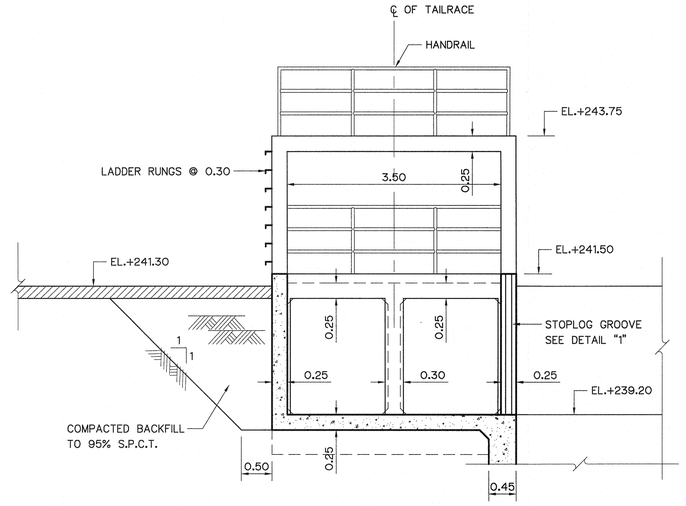
TAILRACE
GENERAL PLAN, SECTION & DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED S.KITICHAI
DESIGNED	SUBMITTED
DRAWN	RECOMMENDED
CHECKED	APPROVED
PROJECT MANAGER	14/01/62 DATE
DRAWING NO. LPP–TR–01	SHEET NO. 15 OF 22



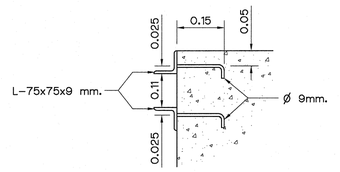
SECTION C–C

SCALE 1:50



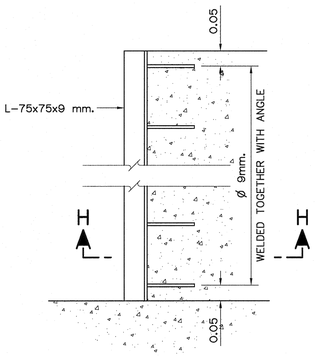
SECTION D–D

SCALE 1:50



SECTION H–H

SCALE 1:10



DETAIL "1"

SCALE 1:10

SECTION E–E

SCALE 1:50

SECTION F–F

SCALE 1:50

SECTION G–G

SCALE 1:50

0 0.5 1.0 2.0 3.0 4.0

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. LPP–GN–03.

REFERENCE DRAWINGS :

1. TAILRACE, GENERAL PLAN, SECTION & DETAILS LPP–TR–01

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
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	CONSULTANTS		DEDE	

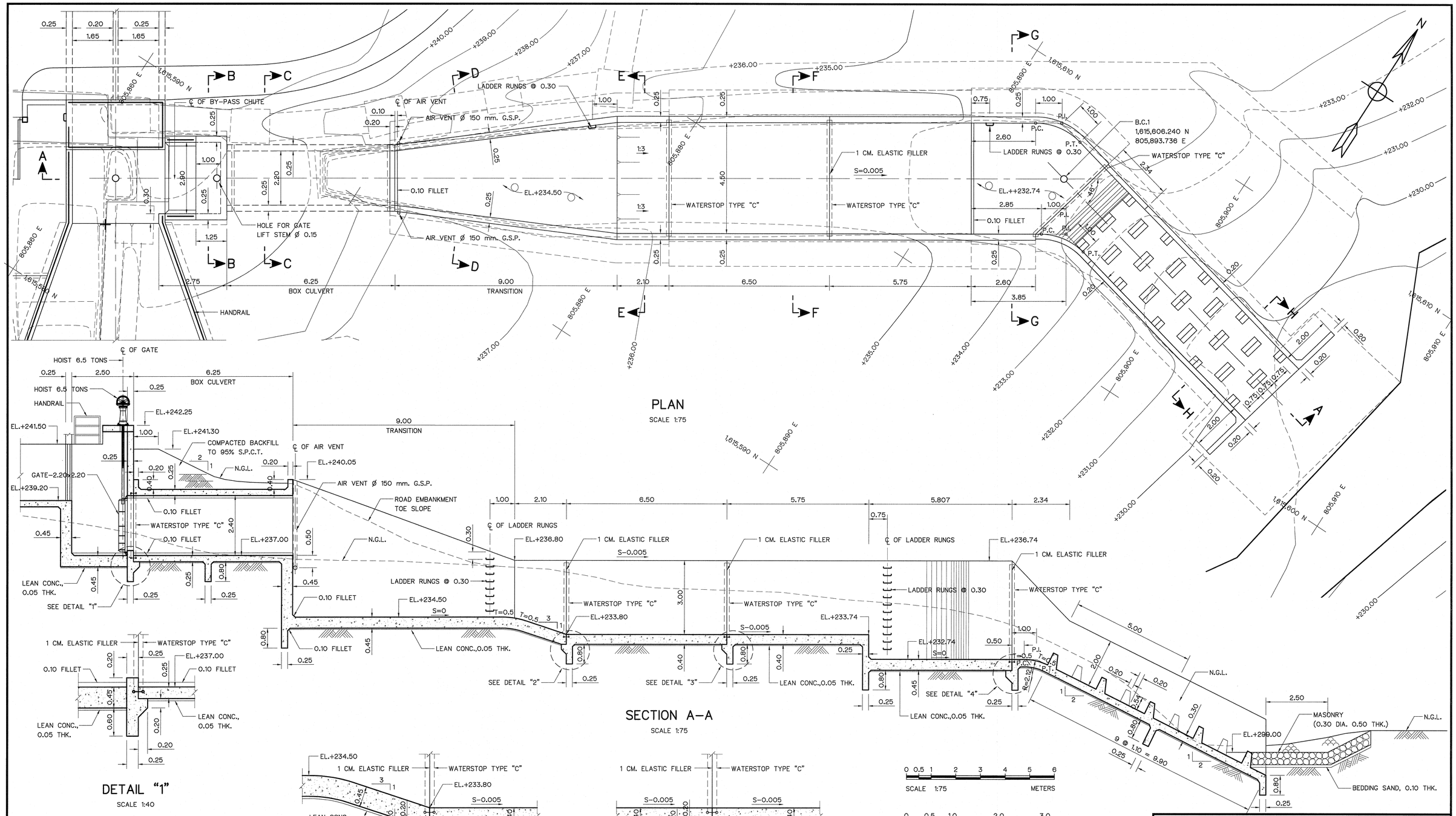
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LAM PHRA PHLOENG HYDROPOWER PROJECT

ELECTRO – MECHANICAL EQUIPMENT

TAILRACE SECTIONS

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	REVIEWED S.RITICHAI
DESIGNED	SUBMITTED
DRAWN	RECOMMENDED
CHECKED	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. LPP–TR–02 / SHEET NO. 16 OF 22



DETAIL "1"
SCALE 1:40

DETAIL "2"
SCALE 1:40

DETAIL "3"
SCALE 1:40

DETAIL "4"
SCALE 1:40

REFERENCE DRAWINGS :

1. BY-PASS CHUTE, SECTIONS — LPP-BC-02

NOTES :

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
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LAM PHRA PHLOENG HYDROPOWER PROJECT

ELECTRO – MECHANICAL EQUIPMENT

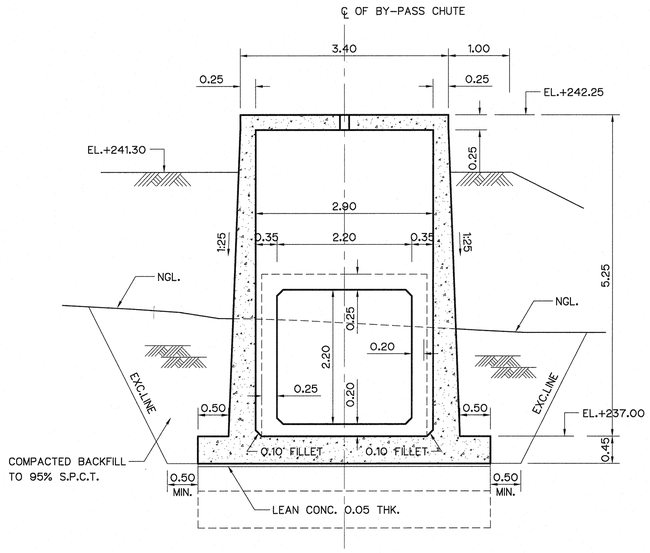
BY-PASS CHUTE
GENERAL PLAN SECTION

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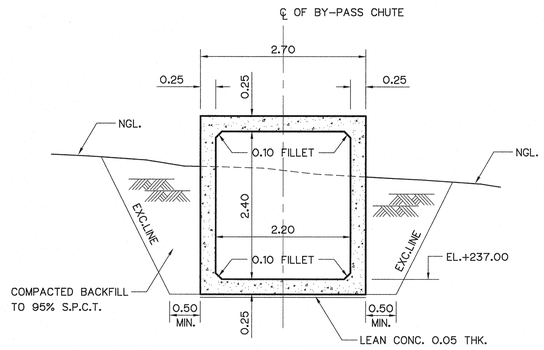
REVIEWED S. KITICHAI

DESIGNED	สย.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สย.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO.	LPP-BC-01
		SHEET NO.	17 OF 22



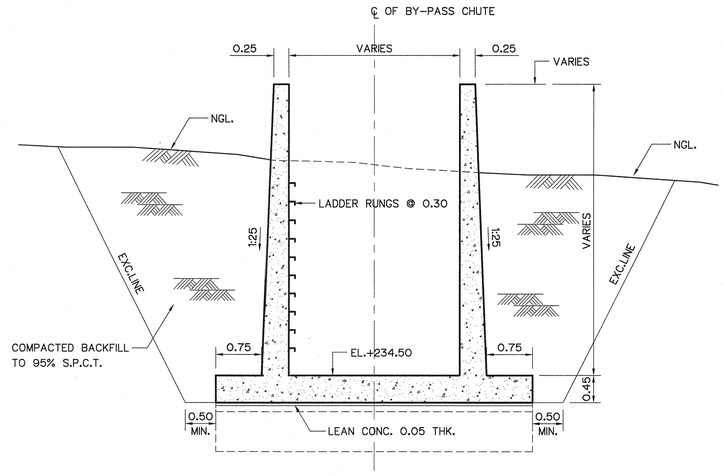
SECTION B–B

SCALE 1:50



SECTION C–C

SCALE 1:50



SECTION D–D

SCALE 1:50

SECTION E–E

SCALE 1:50

SECTION F–F

SCALE 1:50

SECTION G–G

SCALE 1:50

SECTION H–H

SCALE 1:50

0 0.5 1.0 2.0 3.0 4.0

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. LPP–GN–03.

REFERENCE DRAWINGS :

1. BY–PASS CHUTE, GENERAL PLAN & SECTION LPP–BC–01

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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1				
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MINISTRY OF ENERGY

LAM PHRA PHLOENG HYDROPOWER PROJECT

ELECTRO – MECHANICAL EQUIPMENT

BY–PASS CHUTE
SECTIONS

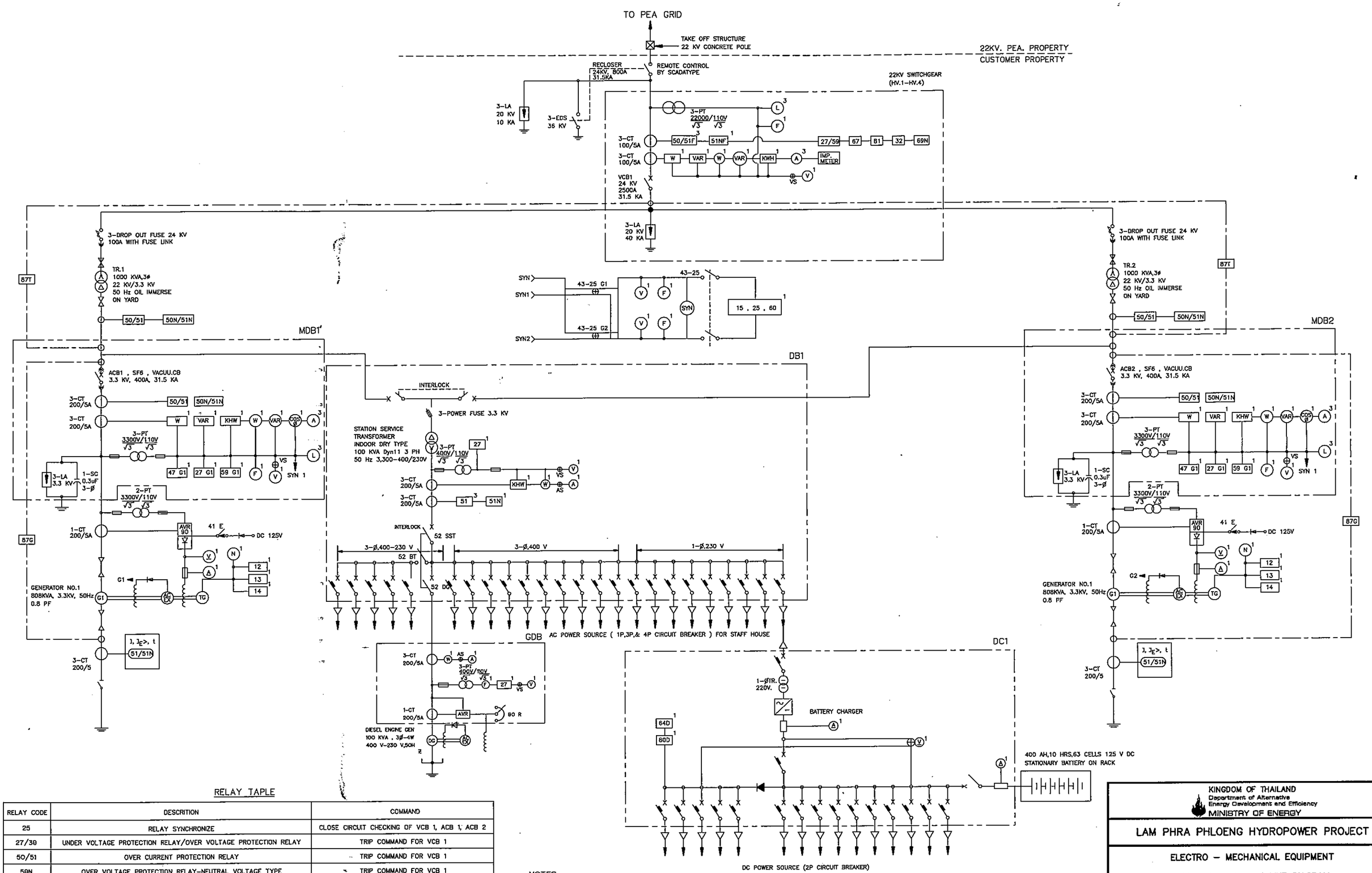
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MINISTRY OF ENERGY

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

DRAWING NO. LPP–BC–02

SHEET NO. 18 OF 22



RELAY TAPLE

RELAY CODE	DESCRITION	COMMAND
25	RELAY SYNCHRONIZE	CLOSE CIRCUIT CHECKING OF VCB 1, ACB 1, ACB 2
27/39	UNDER VOLTAGE PROTECTION RELAY/OVER VOLTAGE PROTECTION RELAY	TRIP COMMAND FOR VCB 1
50/51	OVER CURRENT PROTECTION RELAY	TRIP COMMAND FOR VCB 1
59N	OVER VOLTAGE PROTECTION RELAY-NEUTRAL VOLTAGE TYPE	TRIP COMMAND FOR VCB 1
67	OVER CURRENT PROTECTION RELAY-DIRECTION PHASE TYPE	TRIP COMMAND FOR VCB 1
81	UNDER PREQUENCY PROTECTION RELAY/OVER PREQUENCY PROTECTION RELAY	TRIP COMMAND FOR VCB 1
27R	TRANSIENT UNDER VOLTAGE PROTECTION RELAY	CLOSE CIRCUIT PROTECTION FOR VCB 1
87T	DIFFERENTIAL PROTECTION RELAY FOR TRANSFORMER	TRIP COMMAND FOR VCB 1 AND ACB 1&2
87G	DIFFERENTIAL PROTECTION RELAY FOR GENERATOR	TRIP COMMAND FOR ACB 1&2
78&81R	ISLANDING POWER SUPPLY PROTECTION RELAY	TRIP COMMAND FOR VCB 1
32	POWER PROTECTION RELAY-DIRECTION TYPE	TRIP COMMAND FOR VCB 1

NOTES

1. 22 AND 3.3 KV CIRCUIT BREAKER MUST BE VACUUM TYPE OR AIR TYPE OR SF6 RESPECTIVELY
2. 3.3 KV CURRENT TRANFORMER AND POTENTIAL TRANFORMER MUST BE DRY TYPE
3. 22 KV CURRENT TRANFORMER AND POTENTIAL TRANFORMER MUST BE EPOXY RESIN MOLD
4. ALL POTENTIAL TRANSFORMER : ACCURACY CLASS 0.5
5. ALL CURRENT TRANSFORMER : FOR METERING ACCURACY CLASS 0.5
   : FOR RELAY ACCURACY CLASS 5P 20
6. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, IT SHALL BE DESIGNED AND SPECFIED LATER BY CONTRACTOR AND SUBMITTED TO FIELD ENGINEER FOR APPROVAL

NO.	DATE	REVISIONS	CHECKED	APPROVED
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	CONSULTANTS		DEDE	

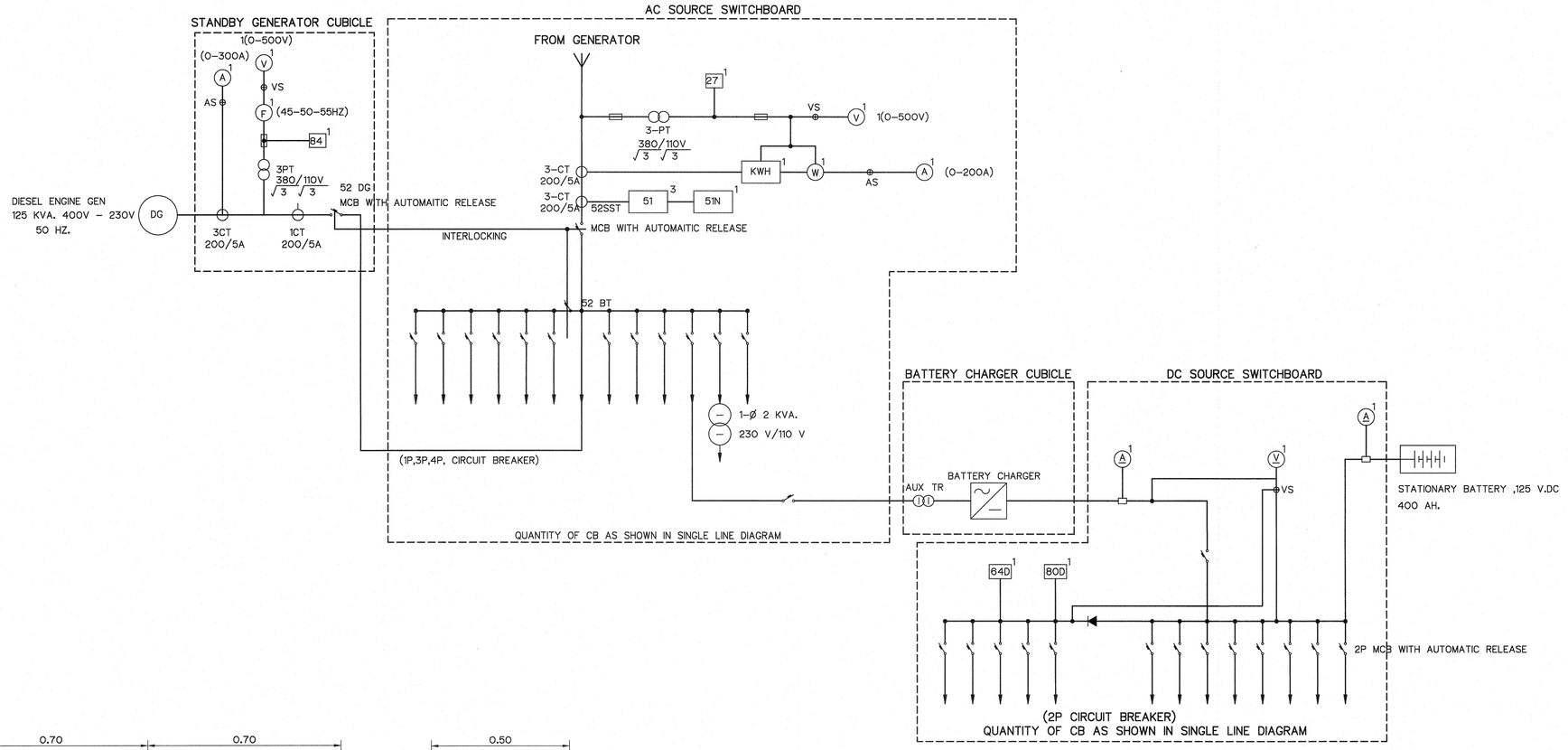
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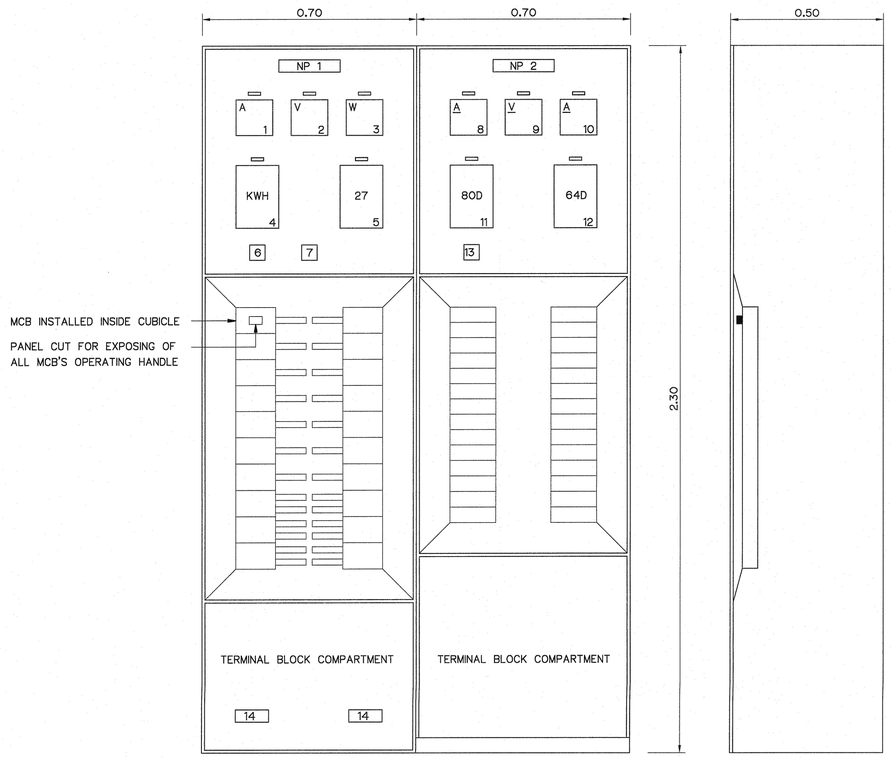
LAM PHRA PHLOENG HYDROPOWER PROJECT

ELECTRO – MECHANICAL EQUIPMENT

MAIN POWER SINGLE LINE DIAGRAM

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED	2Nov.1029	REVIEWED	3, KITTINAI
DRAWN		SUBMITTED	
CHECKED	2Nov.1029	RECOMMENDED	
PROJECT MANAGER	14/01/62 DATE	APPROVED	
		DRAWING NO. LPP-EM-01	SHEET NO. 19 OF 22





AC AND DC SOURCE SWITCHBOARD

LIST OF EQUIPMENT ON CONTROL BOARD

1. AC AMMETER
2. AC VOLTMETER
3. AC WATTMETER
4. WATT HOUR METER
5. UNDER VOLTAGE RELAY
6. AMMETER SELECTOR SWITCH
7. VOLTMETER SELECTOR SWITCH
8. DC AMMETER
9. DC VOLTMETER
10. DC AMMETER
11. DC UNDER VOLTAGE RELAY
12. DC GROUND FAULT RELAY
13. DC VOLTMETER SELECTOR SWITCH
14. TEST TERMINAL
15. MS1 } 3 PHASE MOTOR STARTER , TWO DIRECTIONS , FORWARD AND REVERSE
16. MS2 } WITH FORWARD AND REVERSE PUSH BUTTON , SUITABLE FOR 3 Ø , 380 V. GATE MOTORS.

NOTES :

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SHOWN
2. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, IT SHALL BE DESIGNED AND SPECFIED LATER BY CONTRACTOR AND SUBMITTED TO FIELD ENGINEER FOR APPROVAL

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
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	CONSULTANTS		DEDE	

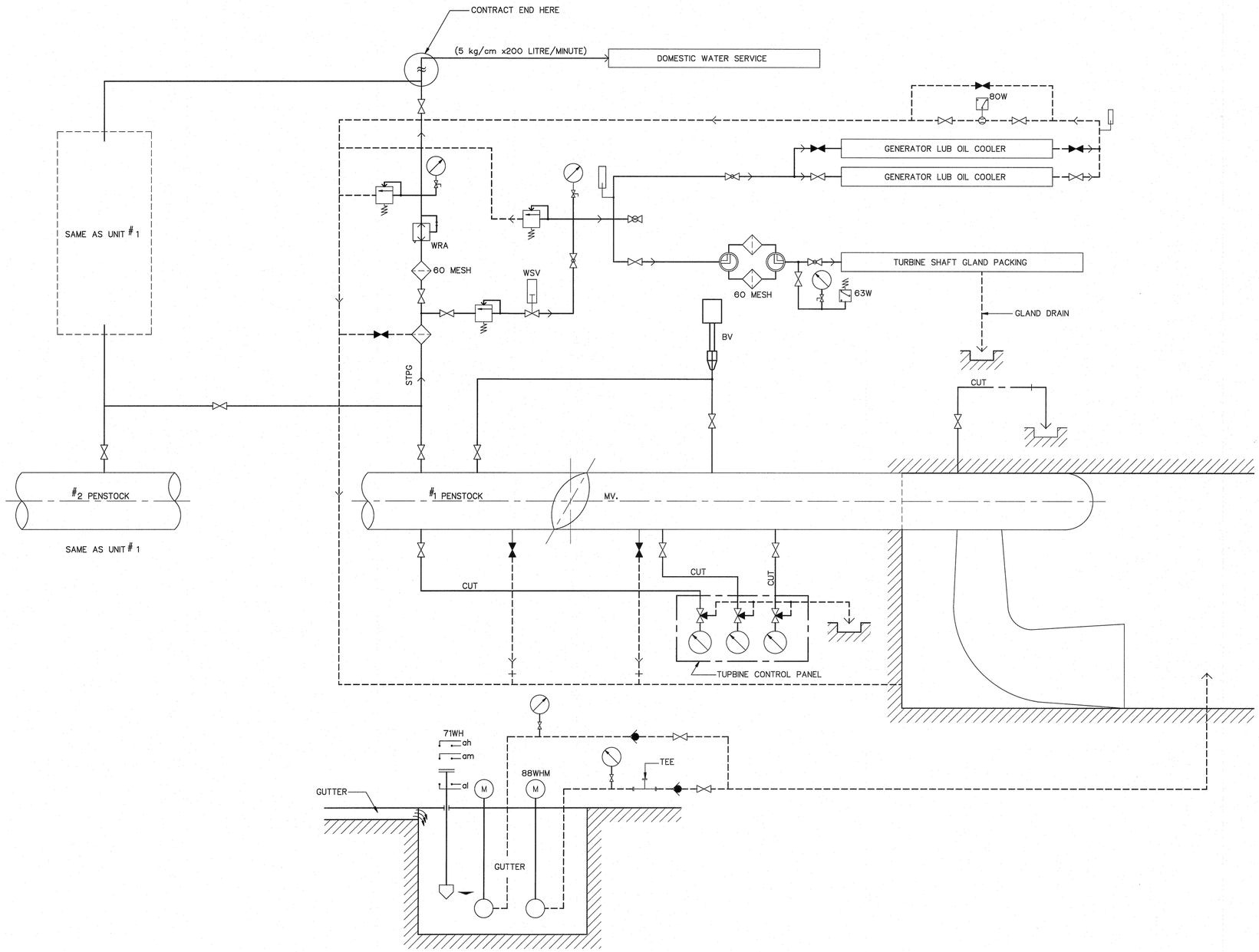
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MINISTRY OF ENERGY

LAM PHRA PHLOENG HYDROPOWER PROJECT

ELECTRO – MECHANICAL EQUIPMENT

MAIN CONTROL SWITCH BOARD

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED S. KITICHAI
DESIGNED	SUBMITTED
DRAWN	RECOMMENDED
CHECKED 3พ.ค.1029	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. LPP–EM–02
	SHEET NO. 20 OF 22



LEGENDS :

———	WATER SUPPLY
- - - - -	WATER DRAINAGE
	THERMOMETER
	STOP VALVE (NORMAL OPEN)
	STOP VALVE (NORMAL CLOSE)
	CHECK VALVE
	FLOW SIGTH
	THREE WAY COCK
	STRAINER
	PRESSURE GAUGE
	PRESSURE RELIEF VALVE
71WH	LEVEL SWITCH FOR SUMP PIT
63W	PRESSURE SWITCH
80W	FLOW RELAY
88WHM	DRAINAGE PUMP MOTOR
WR	REDUCING VALVE
WRA	AUTOMATIC REDUCING VALVE
BV	BY-PASS VALVE
MV	MAIN INLET VALVE
SGP	CARBON STEEL PIPE
STPG	CARBON STEEL PIPE
SUSTP	STAINLESS STEEL PIPE
CUT	COPPER TUBE
WSV	COOLING WATER STOP VALVE
	GLOBE VALVE

NOTE :

1. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, IT SHALL BE DESIGNED AND SPECFIED LATER BY CONTRACTOR AND SUBMITTED TO FIELD ENGINEER FOR APPROVAL

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
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LAM PHRA PHLOENG HYDROPOWER PROJECT

ELECTRO – MECHANICAL EQUIPMENT

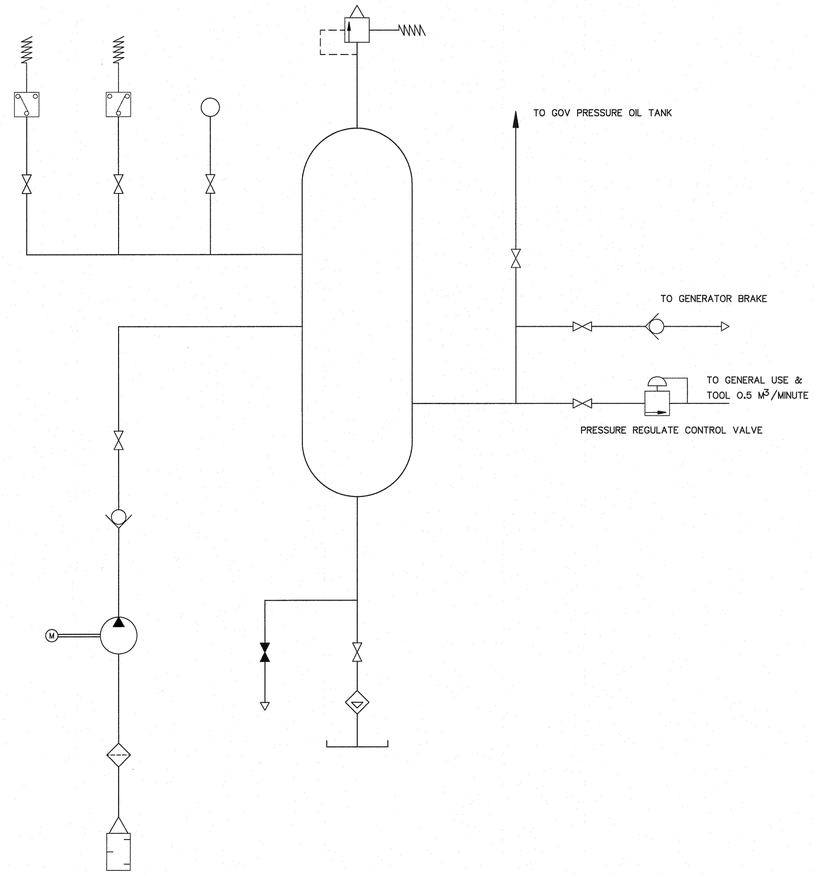
WATER SUPPLY AND DRAINAGE SCHEMATIC DIAGRAM

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

DESIGNED		ส.ค.2197	REVIEWED S. KHUCHAI
DRAWN			SUBMITTED
CHECKED		ส.ค.2197	RECOMMENDED
			APPROVED
PROJECT MANAGER		14/01/62 DATE	DRAWING NO. LPP-EM-03

SHEET NO. 21 OF 22



LEGENDS :

- AUTOMATIC CONDENSATE TRAP
- FILTER OR STRAINER – MANUAL; – AUTOMATIC HAS ADDITIONAL DRAIN LINE AND VALVE
- VALVE–NORMALLY OPEN
- VALVE–NORMALLY CLOSED
- NEEDLE VALVE
- ORIFICE
- VALVE–THERMOSTATICALLY CONTROLLED
- VALVE–PRESSURE REGULATING
- VALVE–PRESSURE RELIEF (WATER)
- VALVE–SOLENOID OPERATED PRESSURE REDUCING
- VALVE–PRESSURE RELIEF (AIR)
- VALVE–SOLENOID OPERATED OIL PRESSURE ACTUATED
- VALVE–NON RETURN
- PRESSURE SWITCH
- AIR VENT
- HEAD EXCHANGER
- FLOW RELAY
- FLOW METER
- PRESSURE GRUGE
- RECEIVER
- PUMP OR COMPRESSOR
- SILENCER
- DIRECTION OF FLOW
- MOTORIZED VALVE

COMPRESSED AIR SYSTEM SCHEMATIC

NOTES :

1. PIPING & FITTING TO WORK SHOP ROOM AND MACHINE HALL FOR UNIT 1 & UNIT 2 SHALL BE PROVIDED BY THE CONTRACTOR
2. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, IT SHALL BE DESIGNED AND SPECFIED LATER BY CONTRACTOR AND SUBMITTED TO FIELD ENGINEER FOR APPROVAL

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

LAM PHRA PHLOENG HYDROPOWER PROJECT

ELECTRO – MECHANICAL EQUIPMENT

COMPRESS AIR SYSTEM SCHEMATIC DIAGRAM

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED	REVIEWED S.KITICHAI
DRAWN	SUBMITTED
CHECKED	RECOMMENDED
PROJECT MANAGER 14/01/62 DATE	APPROVED
DRAWING NO. LPP–EM–04	SHEET NO. 22 OF 22