Department of Alternative
Energy Development and Efficiency
MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT

TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 1 : CIVIL WORKS AND TRANSMISSION LINE

PART 2 : ELECTRO-MECHANICAL EQUIPMENT

VOLUME 4

DRAWINGS

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SPT CONSULTANTS CO., LTD.

PART 1 : CIVIL WORKS AND TRANSMISSION LINE

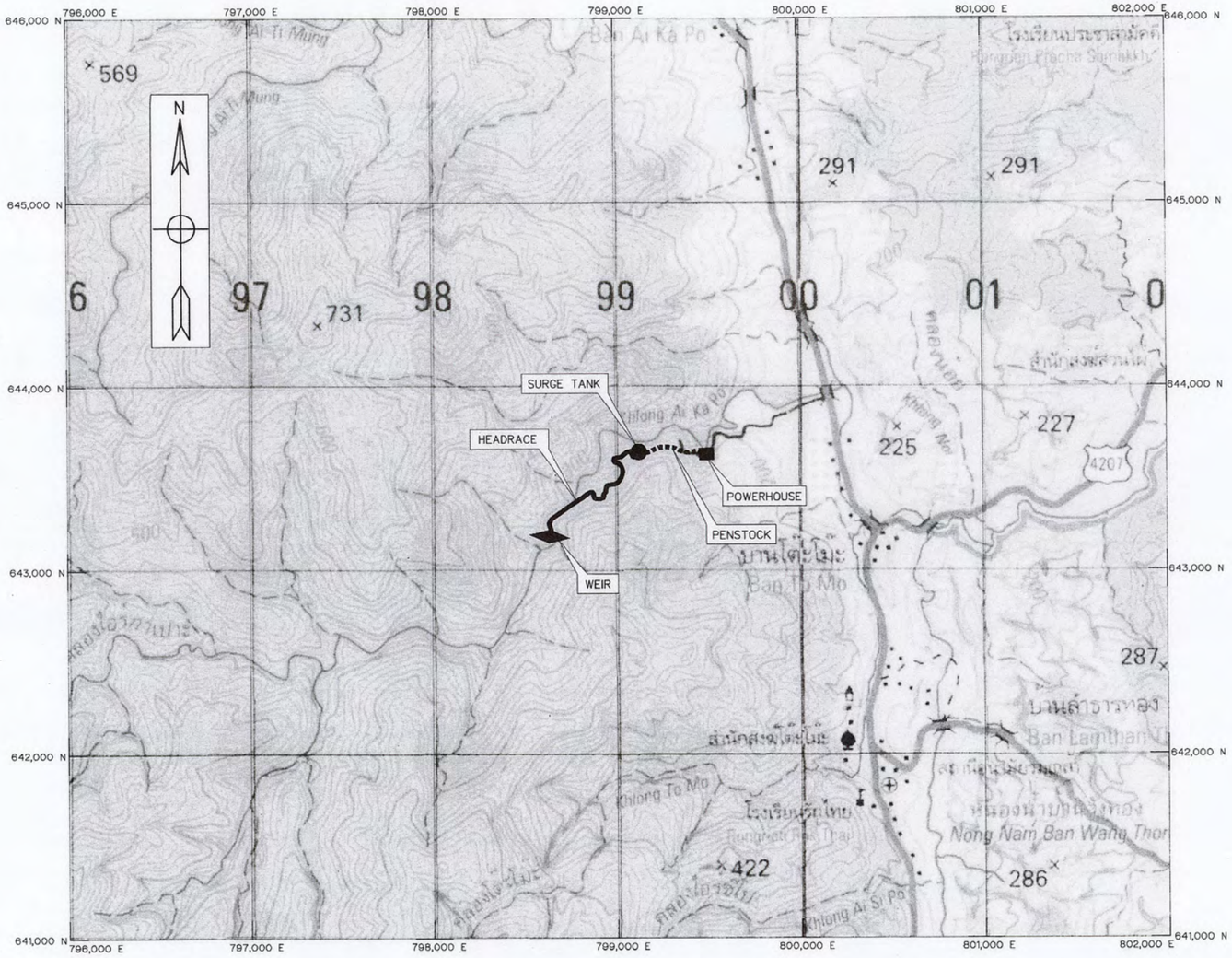
AI KA PO HYDROPOWER PROJECT

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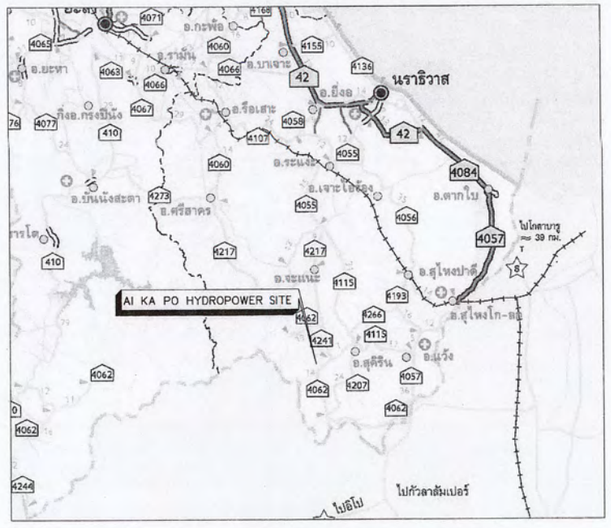
PROJECT AREA MAP

SCALE 1:15,000



LOCATION MAP

NOT TO SCALE



AI KA PO HYDROPOWER SITE LOCATION

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. AKP-GN-03

0 0.1 0.2 0.4 0.6 0.8 1.0 1.2

SCALE 1:15,000 KILOMETERS

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

AI KA PO HYDROPOWER PROJECT

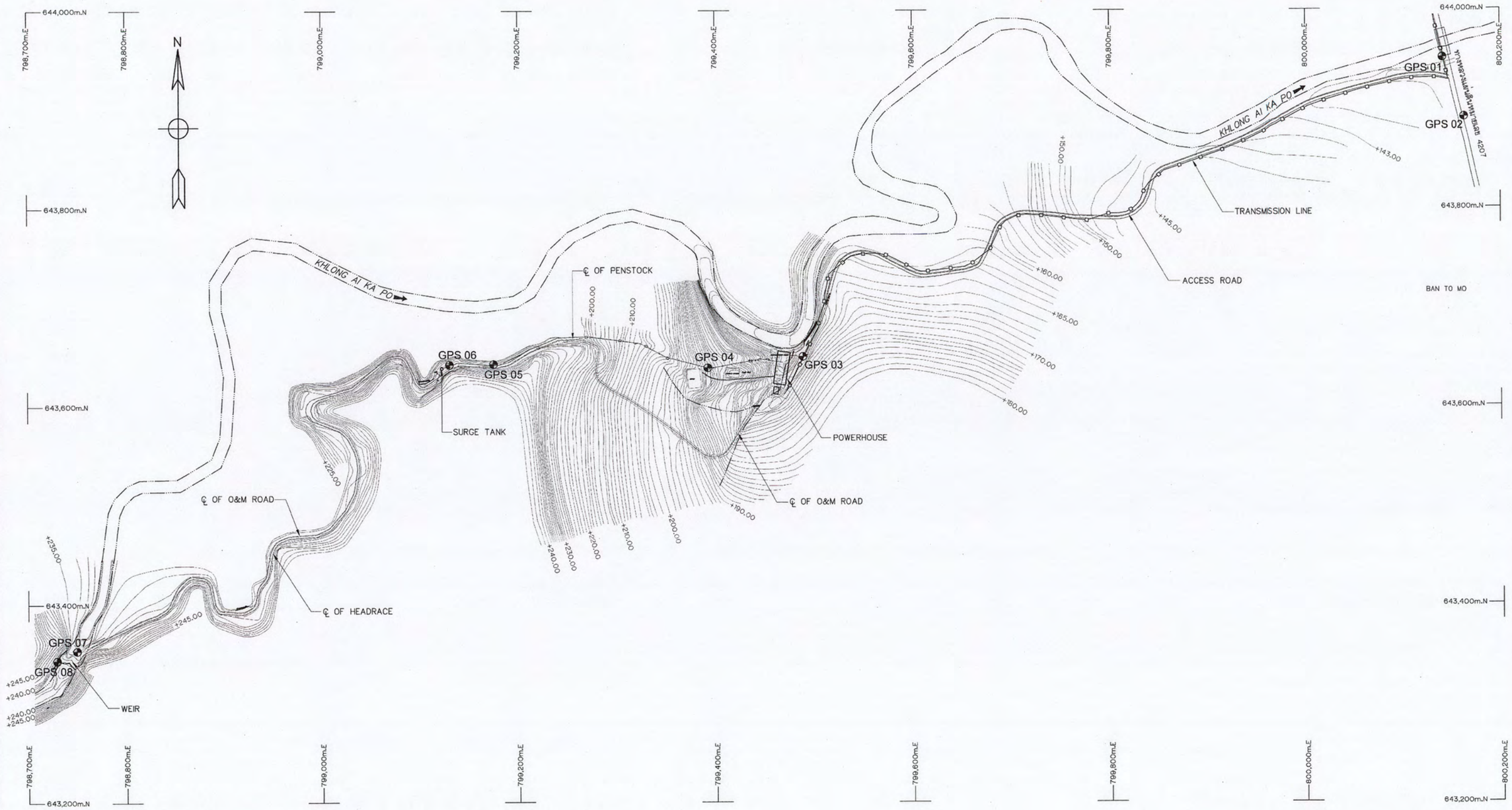
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

GENERAL

LOCATION MAP AND PROJECT AREA MAP

PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED	ศิธ.29074 ศิธ.9462 — REVIEWED
DRAWN	— SUBMITTED
CHECKED	ศิธ.8231 — RECOMMENDED
PROJECT MANAGER	28/10/2021 DATE — APPROVED
DRAWING NO.	AKP-GN-01
SHEET NO.	1 OF 129



NO.	BENCH MARK	WGS 84 GRID CO-ORDINATE		ELEVATION (MSL.)	AZIMUTH	DISTANCE (m.)	REMARK
		NORTHING	EASTING				
1	GPS 01	643,950.751	800,140.755	142.190			หมุดสเตนเลสฝังอยู่บริเวณทางเท้าละพาน
					159°-29'-23"	63.712	Distance & Azimuth from GPS 01 to GPS 02
2	GPS 02	643,891.078	800,163.078	141.559			หมุดสเตนเลสฝังบนฐานคอนกรีตสี่เหลี่ยมบริเวณหน้าป้ายจราจร
3	GPS 03	643,650.377	799,488.400	162.008			หมุดสเตนเลสฝังอยู่บริเวณหน้าโรงสยาม
					264°-43'-35"	96.875	Distance & Azimuth from GPS 03 to GPS 04
4	GPS 04	643,639.030	799,392.192	189.018			หมุดสเตนเลสฝังอยู่บริเวณจุดรอรับท่อลงน้ำ
5	GPS 05	643,642.955	799,174.890	229.238			หมุดสเตนเลสฝังบนฐานคอนกรีตสี่เหลี่ยมบริเวณอาคารลดแรงดัน
					270°-02'-44"	44.945	Distance & Azimuth from GPS 05 to GPS 06
6	GPS 06	643,642.282	799,129.950	230.934			หมุดสเตนเลสฝังบนฐานคอนกรีตสี่เหลี่ยมบริเวณพื้นดิน
7	GPS 07	643,353.531	798,749.252	234.302			หมุดสเตนเลสฝังอยู่บนโขดหินบริเวณหน้าน้ำตก
					116°-20'-29"	22.375	Distance & Azimuth from GPS 07 to GPS 08
8	GPS 08	643,343.603	798,729.200	238.237			หมุดสเตนเลสฝังอยู่บริเวณขอบน้ำตกฝั่งซ้ายที่ตะวันตก

PROJECT MAP
SCALE 1:2,000

NOTES :

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

0 50 100 150
SCALE 1:2,000 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

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

AI KA PO HYDROPOWER PROJECT

TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

GENERAL

PROJECT MAP

PCM P&C MANAGEMENT CO., LTD.
SPT SPT CONSULTAN'S CO., LTD.

DESIGNED ธีรพงษ์ วชิ.29074 DRAWN CHECKED วชิ.9462 วชิ.8231

PROJECT MANAGER 28/10/2021 DATE

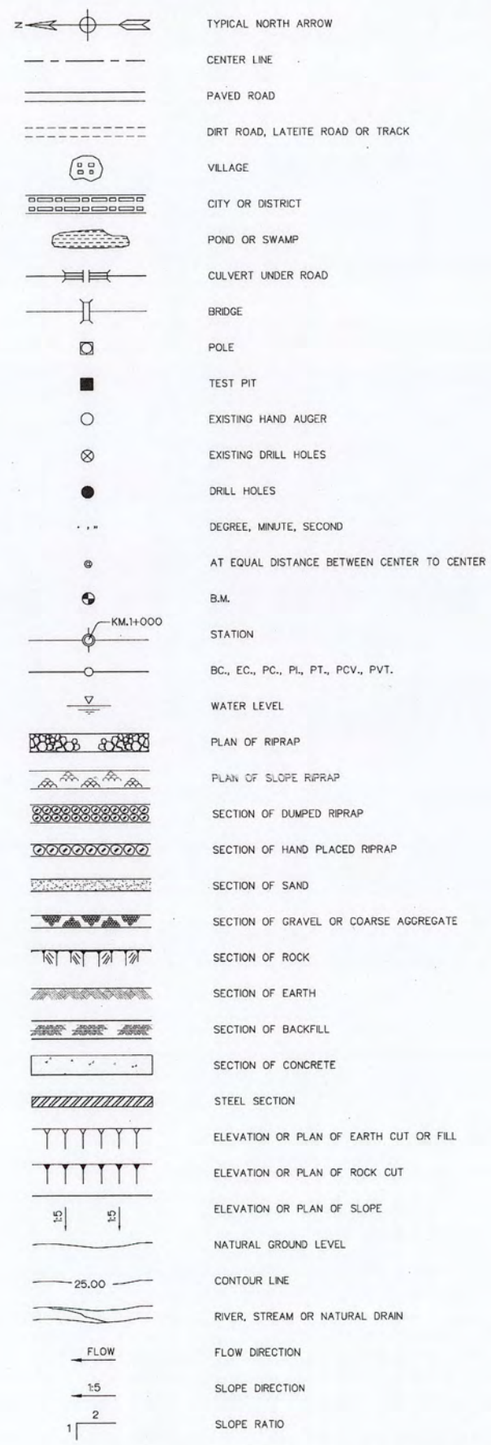
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP-GN-02
SHEET NO. 2 OF 129

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.
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 :

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
240	O&M ROAD
210	1. WEIR, INTAKE STRUCTURE, SEDIMENT TRAP
	2. POWERHOUSE, TAILRACE
	3. CROSS DRAINAGE STRUCTURE
	4. MANHOLE
	5. ANCHOR BLOCK, PIPE SUPPORT
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 :
    - WEIR, INTAKE AND SEDIMENT TRAP Q_a = 10 T/M.^{2}
    - HEADRACE Q_a = 5 T/M.^{2}
    - SURGE TANK Q_a = 20 T/M.^{2}
    - POWERHOUSE Q_a = 20 T/M.^{2}
    - PENSTOCK Q_a = 10 T/M.^{2}
    - RETAINING WALL, TAILRACE Q_a = 10 T/M.^{2}
    - OTHER STRUCTURES Q_a = 5 T/M.^{2}

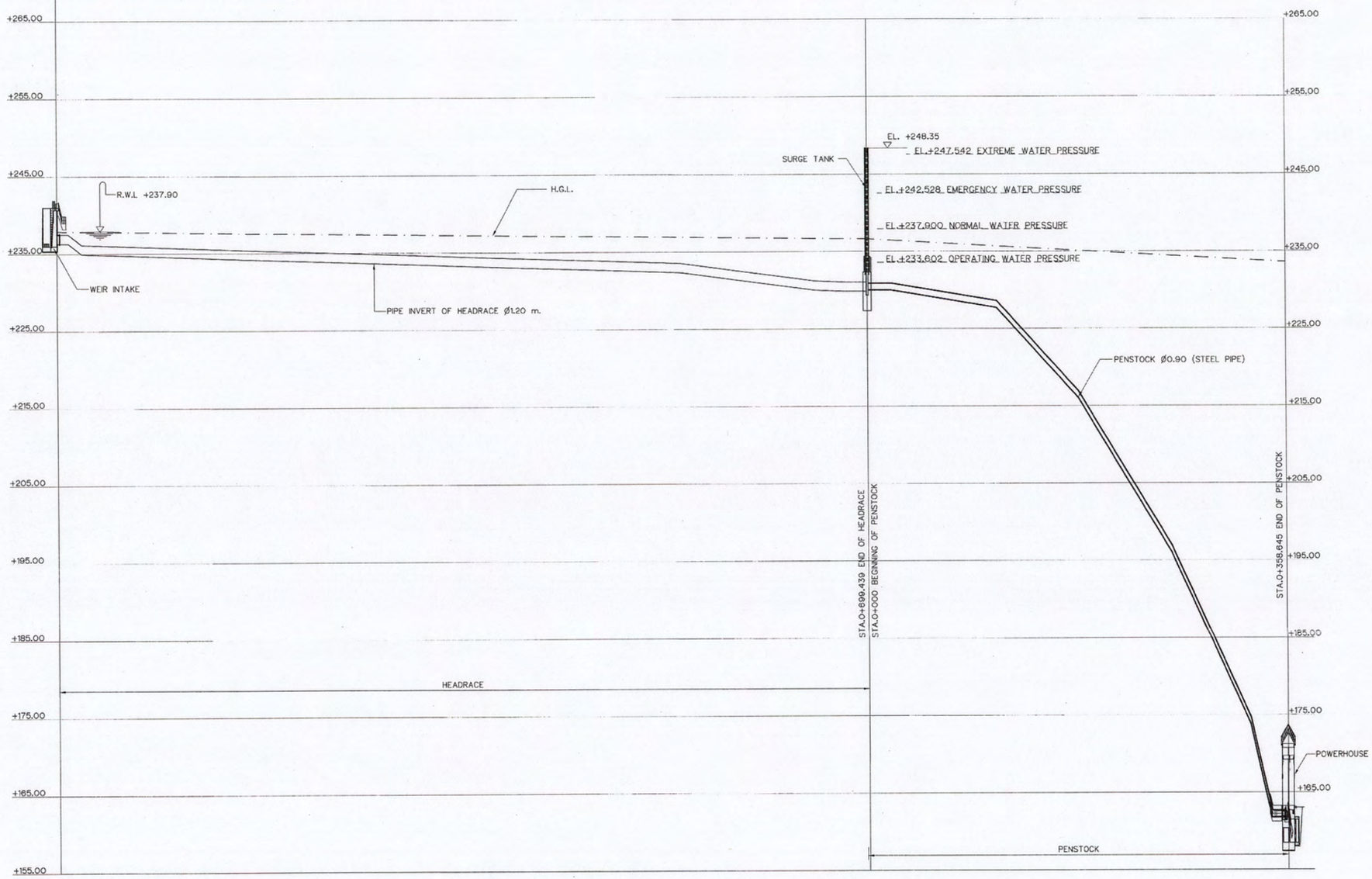
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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
GENERAL
SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES

PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	REVIEWED
DESIGNED	RB.29074	RB.9462	SUBMITTED
DRAWN			RECOMMENDED
CHECKED	RB.8231		APPROVED
PROJECT MANAGER	28/10/2021 DATE	DRAWING NO. AKP-GN-03	SHEET NO. 3 OF 129



PROFILE ALONG WATERWAY ℄

SCALE { VERTICAL 1 : 300 / HORIZONTAL 1 : 2,000

SCALE 1:300 — 0 5 10 15 20 25 METERS

SCALE 1:2,000 — 0 25 50 100 150 METERS

NOTES :

1. THE DATA SHOWN ON THIS DRAWING IS PROVISIONAL AND WILL BE REVIEWED WHEN THE ACTUAL TURBINE CHARACTERISTICS ARE KNOWN.
2. IT HAS BEEN ASSUMED THAT STEEL FOR THE PRESSURE PIPELINE CONFORMS TO STEEL TYPE SS41 OF THE JAPANESE INDUSTRIAL STANDARD JIS G 3101
3. THE THICKNESS OF THE PIPE SHELL SHALL INCLUDE A TOLERANCE OF 2 MM. FOR CORROSION AND SHALL BE DESIGNED FOR THE LOAD CASES SHOWN IN THE TABLE BELOW
4. WELD EFFICIENCY ON THE PRESSURE PIPELINE SHALL BE AT LEAST 90%
5. THE LOADING CASES MAY BE MORE FULLY DEFINED AS BELOW
   - NORMAL – INCLUDES NORMAL WATER PRESSURE AND NORMAL LONGITUDINAL LOADS SUCH AS WEIGHT OF PIPELINE, ANCHOR BLOCK, EXTERNAL SOIL AND WATER PRESSURE
   - EMERGENCY – INCLUDES LOSS OF A SUPPORT OR LOADING DUE TO TEST PRESSURE OR IMPOSITION OF DESIGN EARTHQUAKE ON NORMAL CASE
   - EXTREME – INCLUDES EXTREME WATER PRESSURES IN PIPELINE OR INCIDENCE OF MAXIMUM CREDIBLE EARTHQUAKE PLUS NORMAL WATER PRESSURE
6. THICKNESS OF PENSTOCK DESIGNED BASE ON PRESSURE RISE HEAD (WATER HAMMER) = 1.8 X STATIC HEAD = 43.902 M.
   TURBINE PERFORMANCE, CLOSING TIME (6 SECCONDS APPROXIMATELY) WILL BE SPECIFIED IN THE BIDDING DOCUMENTS.

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

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AI KA PO HYDROPOWER PROJECT

TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

GENERAL

POWER WATERWAY HYDRAULIC GRADE LINE

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PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-GN-04	SHEET NO. 4 OF 129

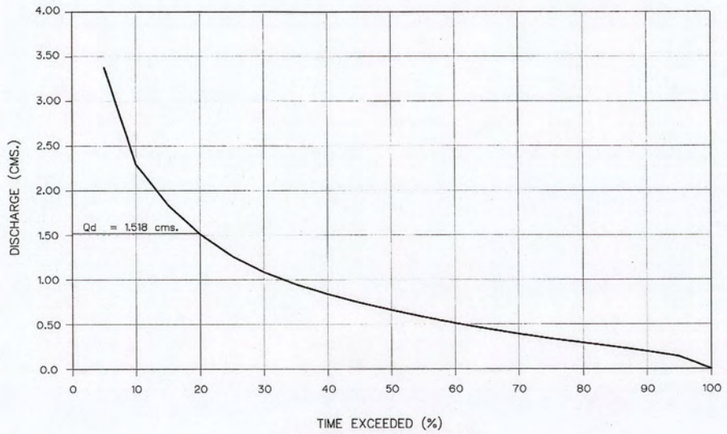
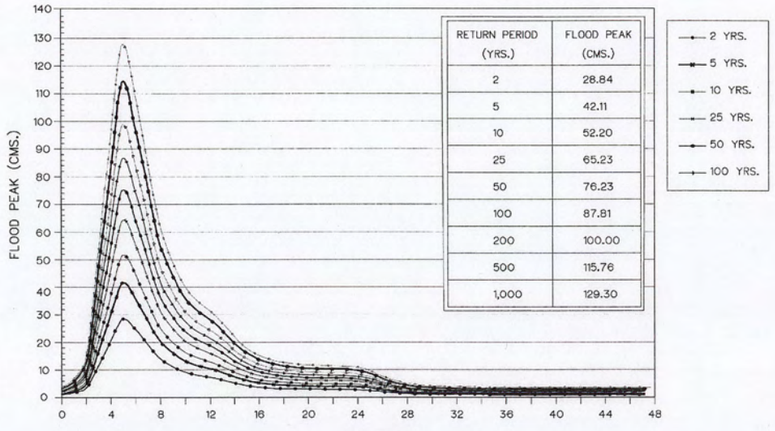
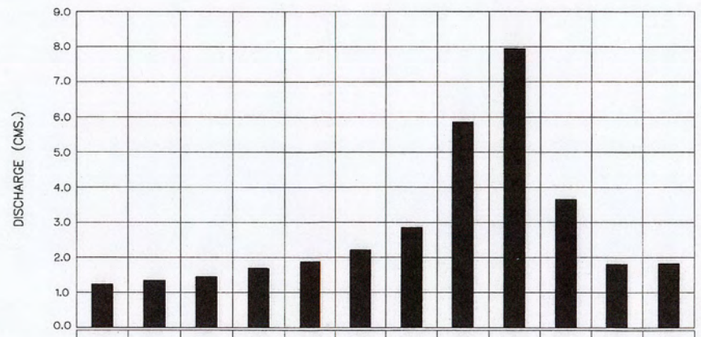


FIGURE 1 FLOW DURATION CURVE



RETURN PERIOD (YRS.)	FLOOD PEAK (CMS.)
2	28.84
5	42.11
10	52.20
25	65.23
50	76.23
100	87.81
200	100.00
500	115.76
1,000	129.30

FIGURE 4 VARIOUS FLOOD RETURN PERIOD HYDROGRAPH AT WEIR



	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
DISCHARGE (CMS.)	1.24	1.35	1.45	1.7	1.88	2.21	2.86	5.84	7.93	3.65	1.82	1.83

FIGURE 6 AVERAGE MONTHLY DISCHARGE AT WEIR

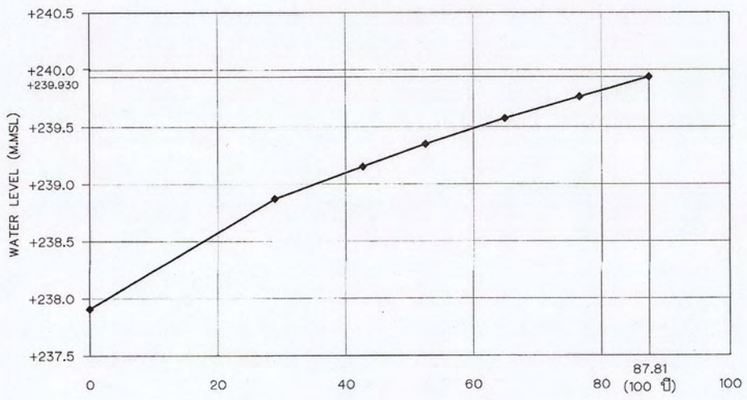
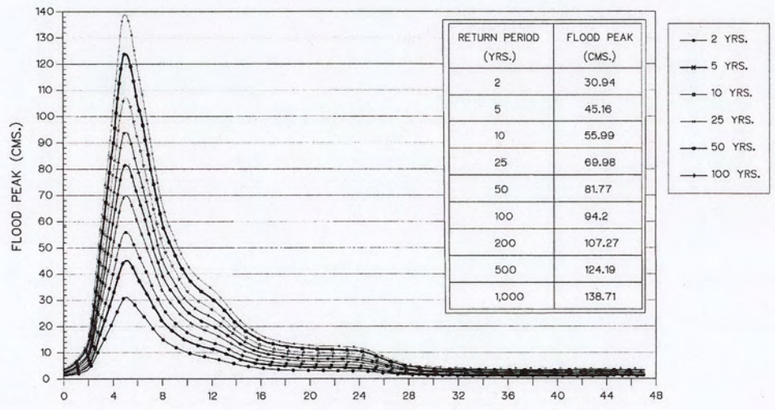


FIGURE 2 RATING CURVE AT WEIR SITE



RETURN PERIOD (YRS.)	FLOOD PEAK (CMS.)
2	30.94
5	45.16
10	55.99
25	69.98
50	81.77
100	94.2
200	107.27
500	124.19
1,000	138.71

FIGURE 5 VARIOUS FLOOD RETURN PERIOD HYDROGRAPH AT POWERHOUSE

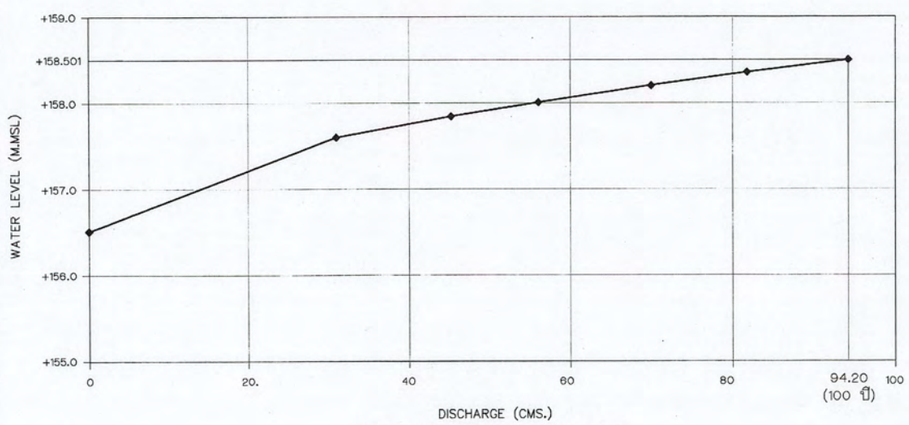


FIGURE 2 RATING CURVE AT POWERHOUSE

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MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
GENERAL DRAWING
HYDROLOGICAL DATA

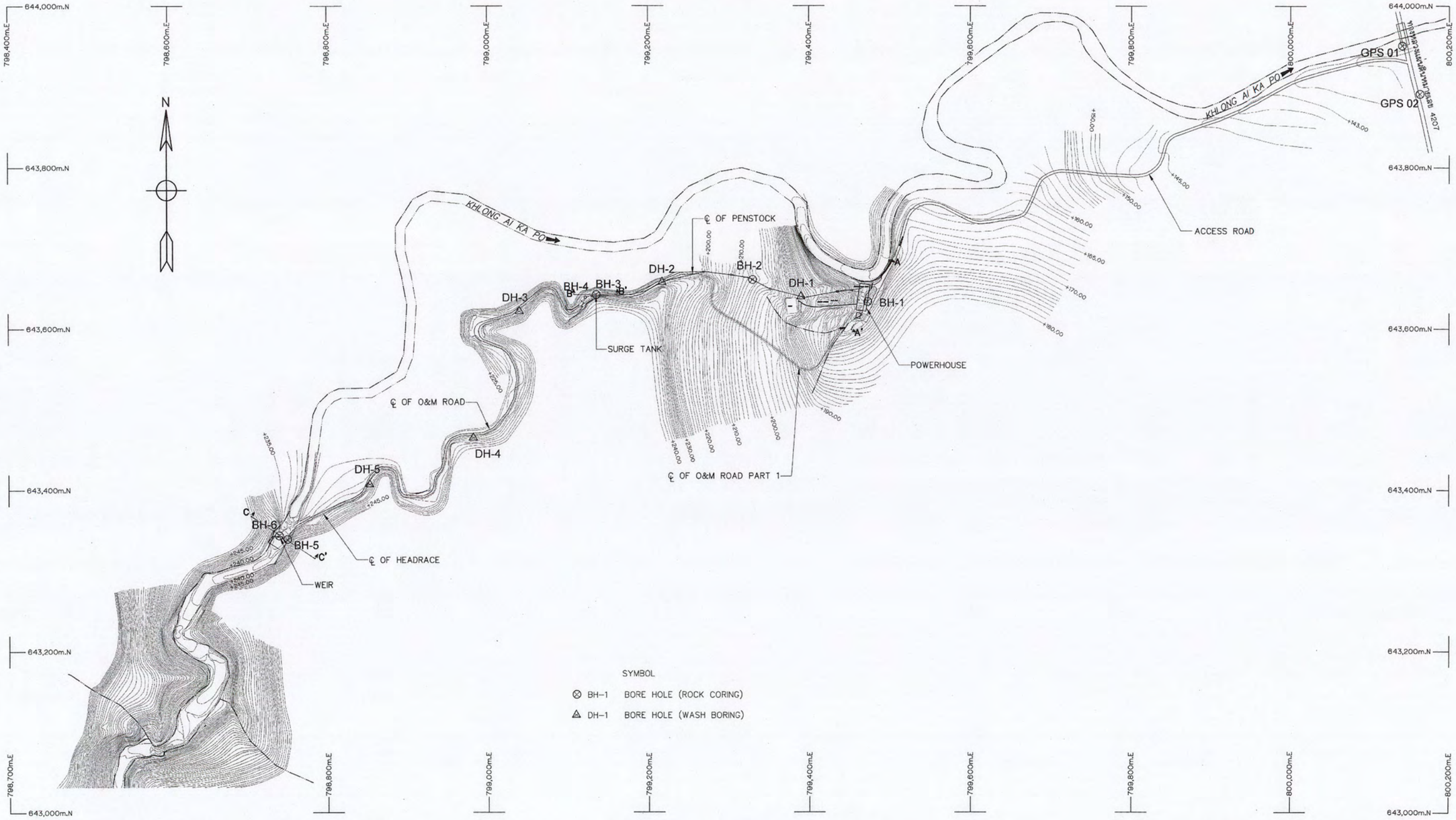
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CHECKED 8231
PROJECT MANAGER
28/10/2021 DATE

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APPROVED

DRAWING NO. AKP-GN-05
SHEET NO. 5 OF 129



SYMBOL

⊗ BH–1 BORE HOLE (ROCK CORING)

△ DH–1 BORE HOLE (WASH BORING)

NO.	NAME	WGS 84 GRID CO-ORDINATE		DEPTH (METER)	REMARK
		NORTHING	EASTING		
1	BH–1	643,633.344	799,472.782	10	บริเวณโรงไฟฟ้า
2	BH–2	643,660.668	799,329.574	6	บริเวณท่อส่งน้ำ
3	BH–3	643,642.071	799,135.406	8	บริเวณอาคารลดแรงดัน (SURGE TANK)
4	BH–4	643,642.286	799,128.163	10	บริเวณอาคารลดแรงดัน (SURGE TANK)
5	BH–5	643,338.985	798,748.890	8	บริเวณฝายเดิม ฐานยันขวา
6	BH–6	643,343.539	798,738.216	8	บริเวณฝายเดิม กลางน้ำ
รวมความลึกงานเจาะสำรวจ				50	
7	DH–1	643,639.635	799,389.932	5	บริเวณท่อส่งน้ำ (PENSTOCK)
8	DH–2	643,657.779	799,217.254	5	บริเวณท่อส่งน้ำ (PENSTOCK)
9	DH–3	643,621.736	799,039.414	5	บริเวณทางเข้าน้ำ (HEADRACE)
10	DH–4	643,464.633	798,981.940	5	บริเวณทางเข้าน้ำ (HEADRACE)
11	DH–5	643,407.030	798,852.119	5	บริเวณทางเข้าน้ำ (HEADRACE)

GEOTECHNICAL INVESTIGATION PLAN

SCALE 1:2,500

NOTES :

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

0 50 100 150 200

SCALE 1:2,500 METERS

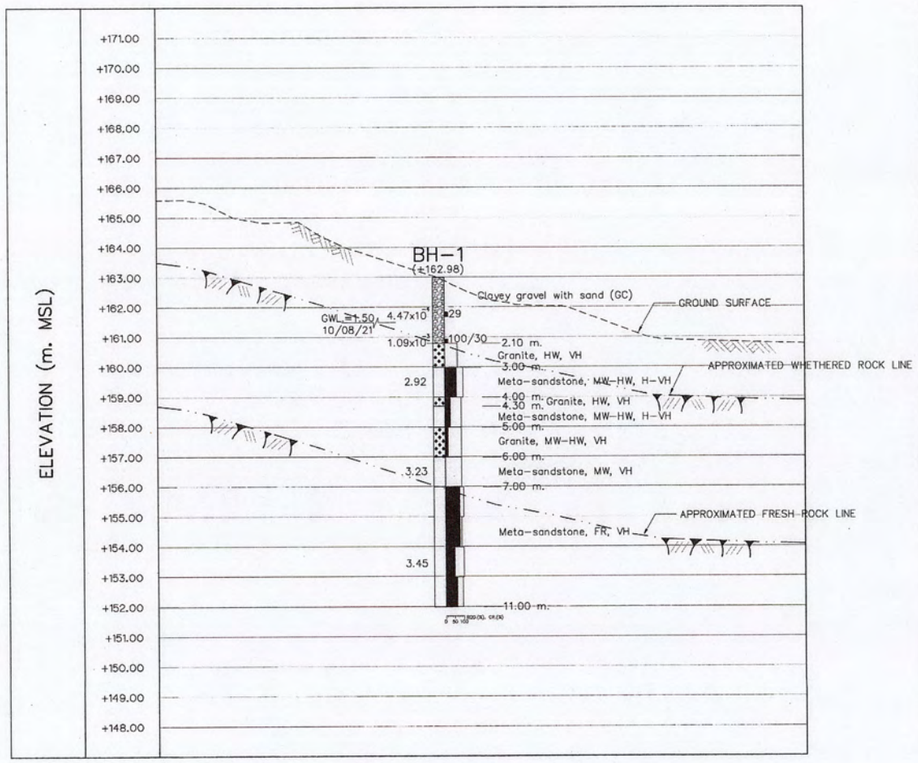
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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

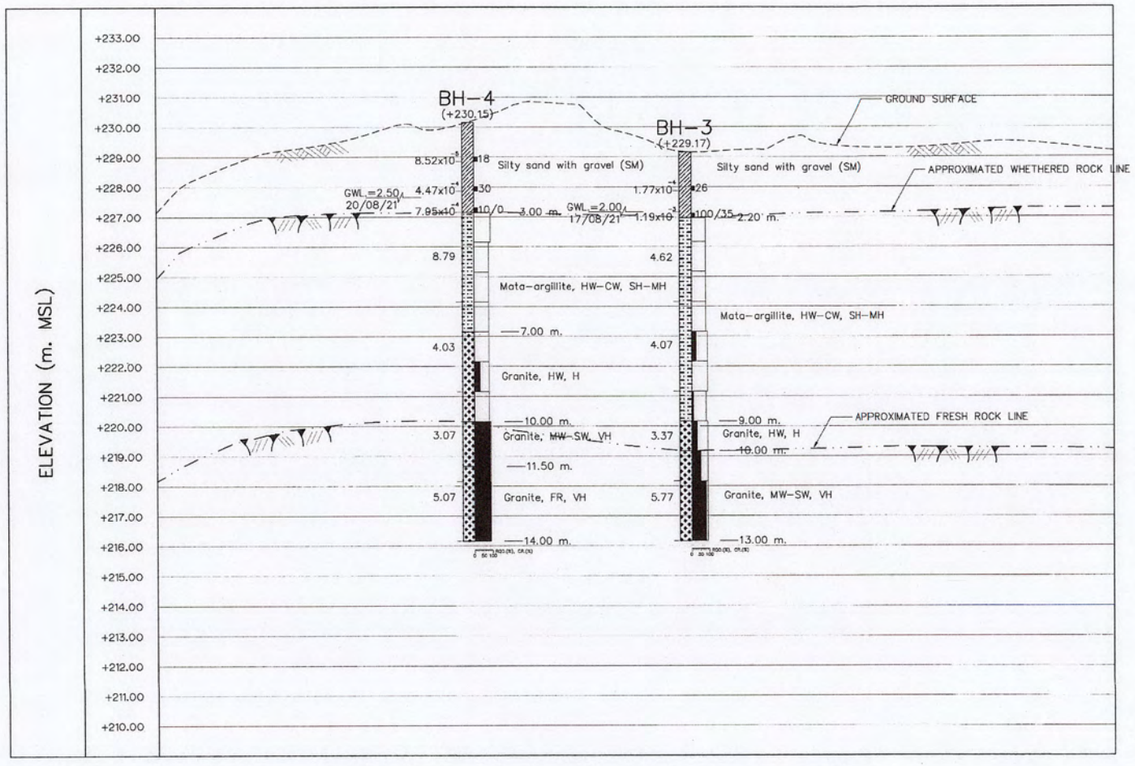
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
GENERAL
GEOTECHNICAL INVESTIGATION PLAN

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PROJECT MANAGER 28/10/2021 DATE	APPROVED
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SECTION A-A

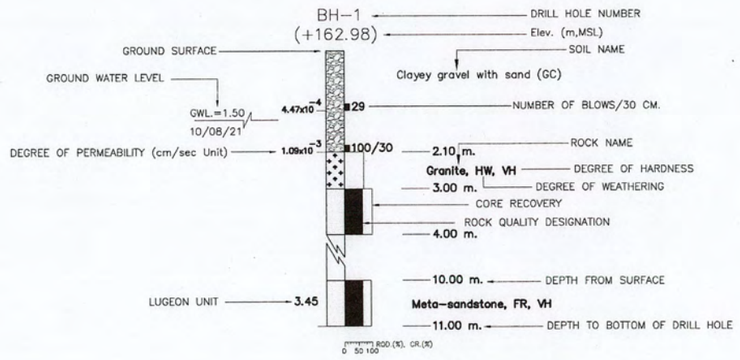
SCALE 1:100

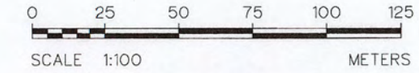


SECTION B-B

SCALE 1:100

EXPLANATION





NOTES :

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

LEGEND

SOIL SYMBOLS

- Clayey gravel with sand
- Sandy clay
- Silty sand

ROCK SYMBOLS

- Granite
- Meta-argillite
- Meta-sandstone
- Meta-sandstone

DEGREE OF WEATHERING

FR.	=	FRESH ROCK
SW	=	SLIGHTLY WEATHERED ROCK
MW	=	MODERATELY WEATHERED ROCK
HW	=	HIGHLY WEATHERED ROCK
CW	=	COMPLETELY WEATHERED ROCK

DEGREE OF HARDNESS

VS	=	VERY SOFT ROCK
S	=	SOFT ROCK
MH	=	MEDIUM HARD ROCK
H	=	HARD ROCK
VH	=	VERY HARD ROCK

DEGREE OF PERCENTAGE OF RQD.

< 25 %	=	VERY POOR ROCK
25-50 %	=	POOR ROCK
50-75 %	=	FAIR ROCK
75-90 %	=	GOOD ROCK
90-100 %	=	VERY GOOD ROCK

DEGREE OF PERMEABILITY

- < 1 LUGEON OR < 10^{-5} CM/SEC = IMPERVIOUS
- 1-5 LUGEON OR 10^{-5} - $5x10^{-5}$ CM/SEC SEMI-IMPERVIOUS
- 5-10 LUGEON OR $5x10^{-5}$ - 10^{-4} CM/SEC SEMI-PERVIOUS
- 10-50 LUGEON OR 10^{-4} - $5x10^{-4}$ CM/SEC RATHER-PERVIOUS
- > 50 LUGEON OR > $5x10^{-4}$ CM/SEC = PERVIOUS

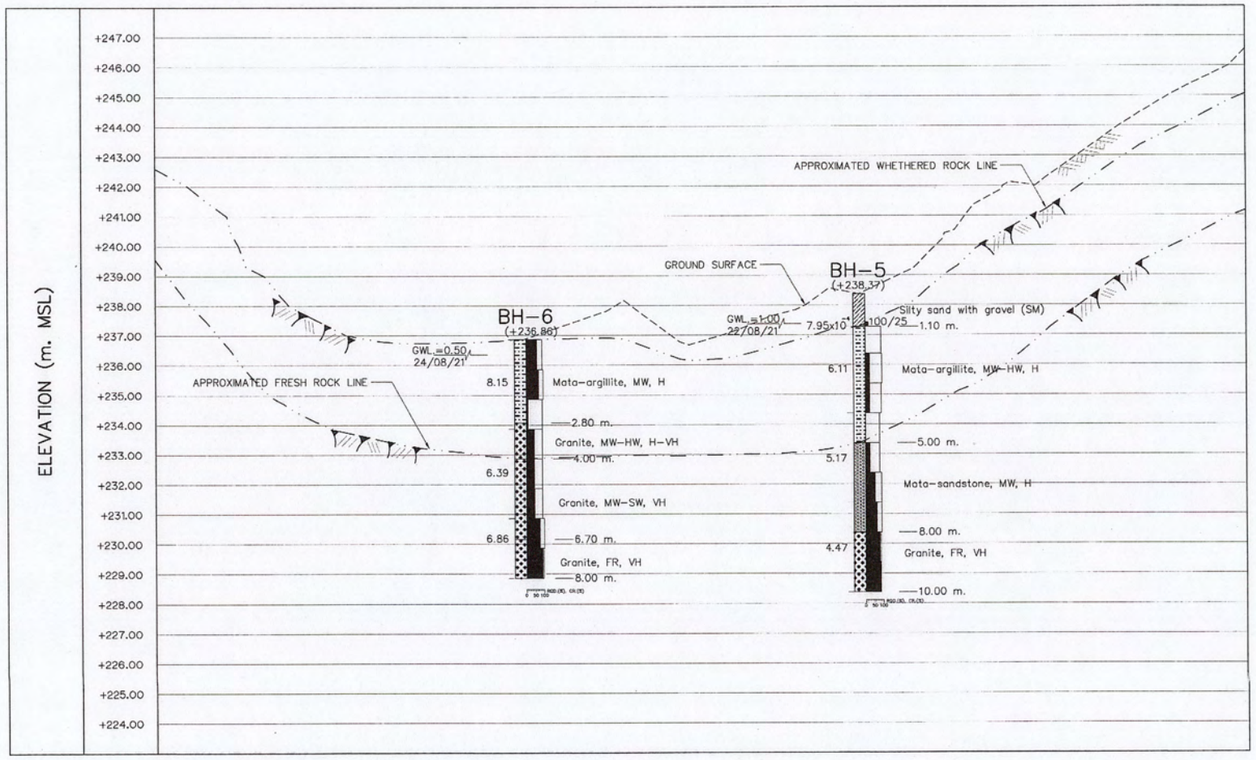
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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
GENERAL
GEOLOGICAL SECTION A-A AND B-B

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PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-GN-07	SHEET NO. 7 OF 129



SECTION C-C

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. AKP-GN-03

LEGEND

SOIL SYMBOLS

- Clayey gravel with sand
- Sandy clay
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ROCK SYMBOLS

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- Meta-sandstone
- Meta-sandstone

DEGREE OF WEATHERING

- FR. = FRESH ROCK
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DEGREE OF HARDNESS

- VS = VERY SOFT ROCK
- S = SOFT ROCK
- MH = MEDIUM HARD ROCK
- H = HARD ROCK
- VH = VERY HARD ROCK

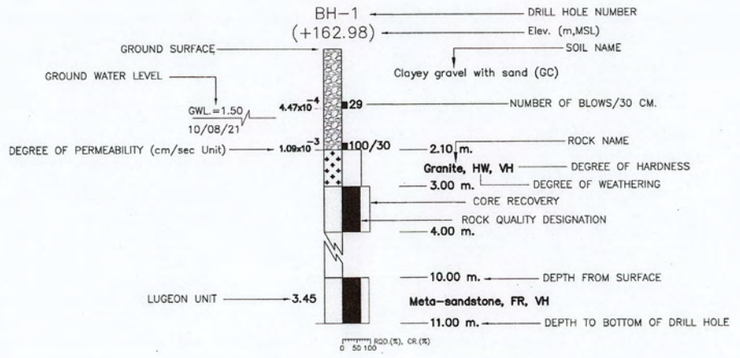
DEGREE OF PERCENTAGE OF RQD.

- < 25 % = VERY POOR ROCK
- 25-50 % = POOR ROCK
- 50-75 % = FAIR ROCK
- 75-90 % = GOOD ROCK
- 90-100 % = VERY GOOD ROCK

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- > 50 LUGEON OR > $5x10^{-4}$ CM/SEC = PERVIOUS

EXPLANATION



0 25 50 75 100 125

SCALE 1:100 METERS

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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
GENERAL
GEOLOGICAL SECTION C-C

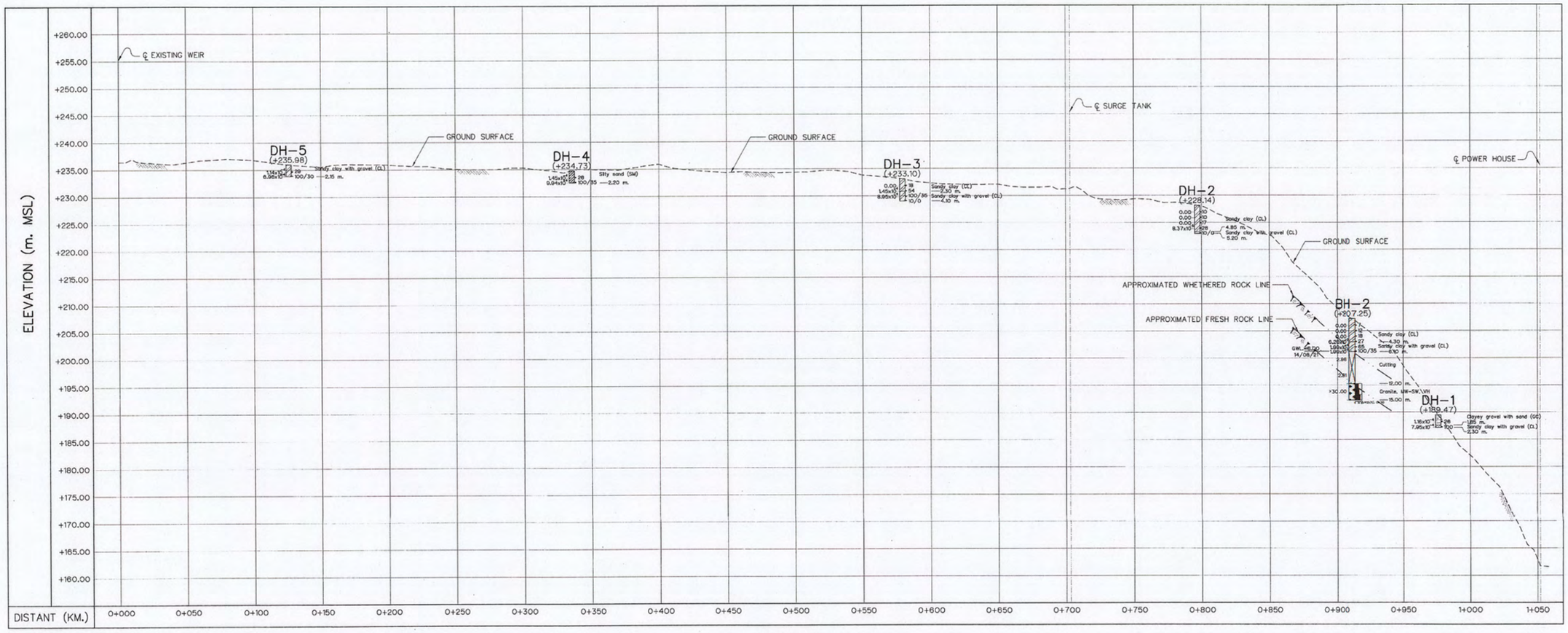
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PROJECT MANAGER 28/10/2021 DATE

REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

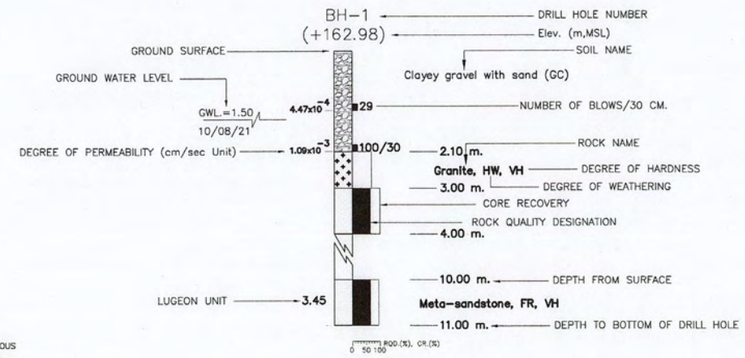
DRAWING NO. AKP-GN-08
SHEET NO. 8 OF 129



PROFILE

HORIZONTAL SCALE 1:1,600
VERTICAL SCALE 1:400

EXPLANATION



NOTES :

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

LEGEND

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- Meta-sandstone
- Meta-sandstone

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- > 50 LUGEON OR > $5x10^{-4}$ CM/SEC = PERVIOUS

0 10 20 30 40 50
SCALE 1:400 METERS
0 50 100 150 200
SCALE 1:1,600 METERS

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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
GENERAL
GEOLOGICAL OF HEADRACE AND PENSTOCK

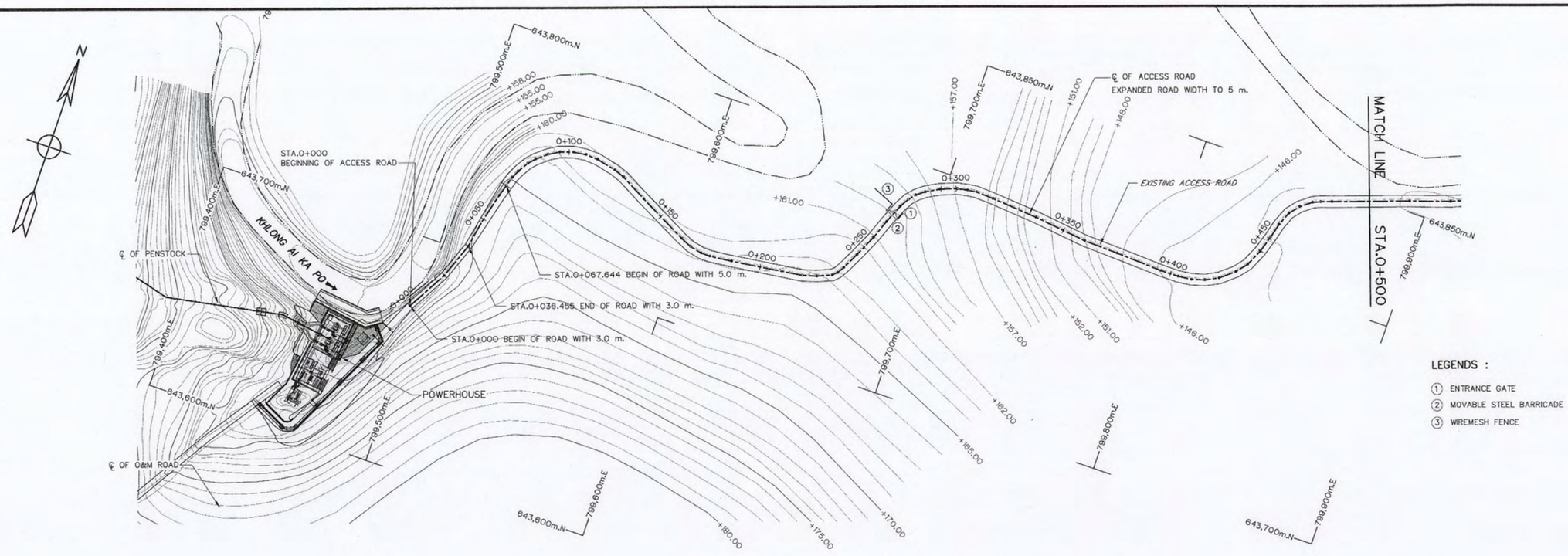
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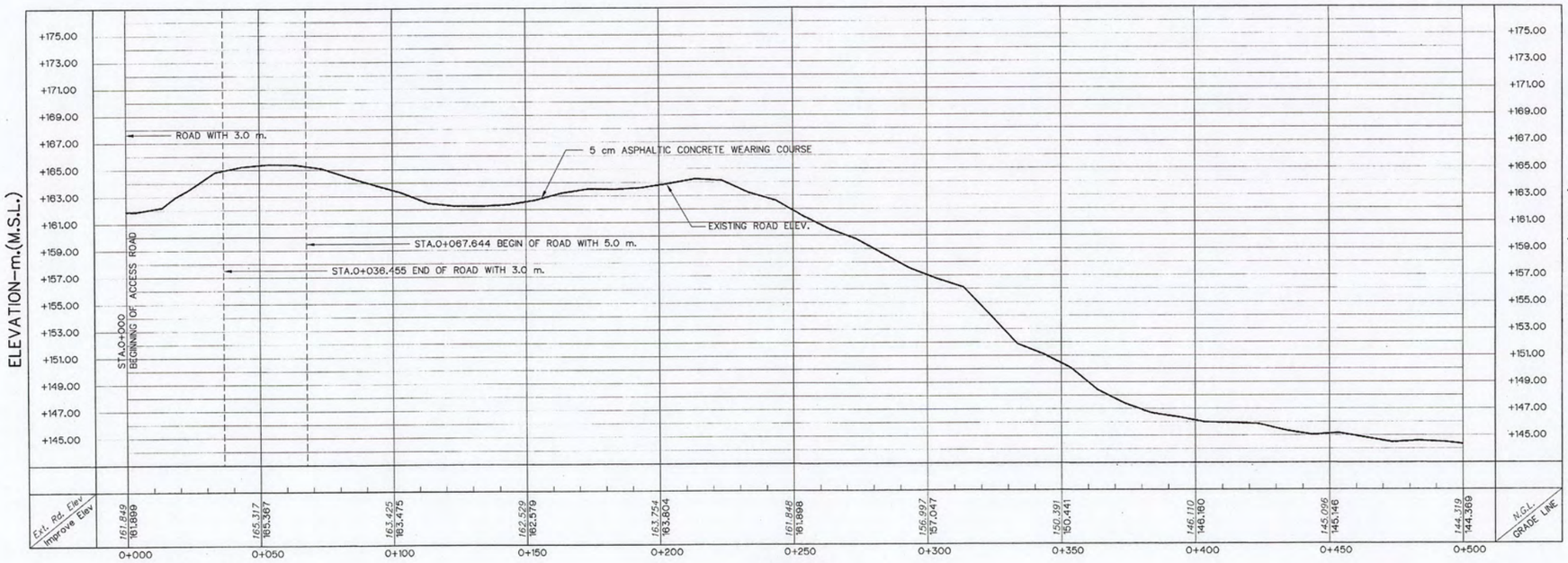
DESIGNED Wipan/Ei.29074 Sathob Ei.8969
DRAWN
CHECKED Ei.8231
28/10/2021
PROJECT MANAGER DATE

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

DRAWING NO. AKP-GN-09
SHEET NO. 9 OF 129



PLAN
SCALE 1:1,000



PROFILE
VERTICAL SCALE 1:200
HORIZONTAL SCALE 1:1,000

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS,UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP-GN-03
3. THE CONTRACTOR HAS TO SUBMITED SURVEYING AND ROAD ALIGNMENT FOR APPROVAL.

REFERENCE DRAWING :

1. ACCESS ROAD, PLAN AND PROFILE STA.0+500 TO STA.0+789.373	AKP-AR-02
2. POWER HOUSE, MOVABLE STEEL BARRICADE	AKP-PH-16
3. POWER HOUSE, CHAIN LINK FENCE AND GATE WIDTH 1.00 M.	AKP-PH-17
4. POWER HOUSE, EXTERNAL LIGHTING PLAN	AKP-PH-27

0 5 10 15
SCALE 1:200 METERS

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

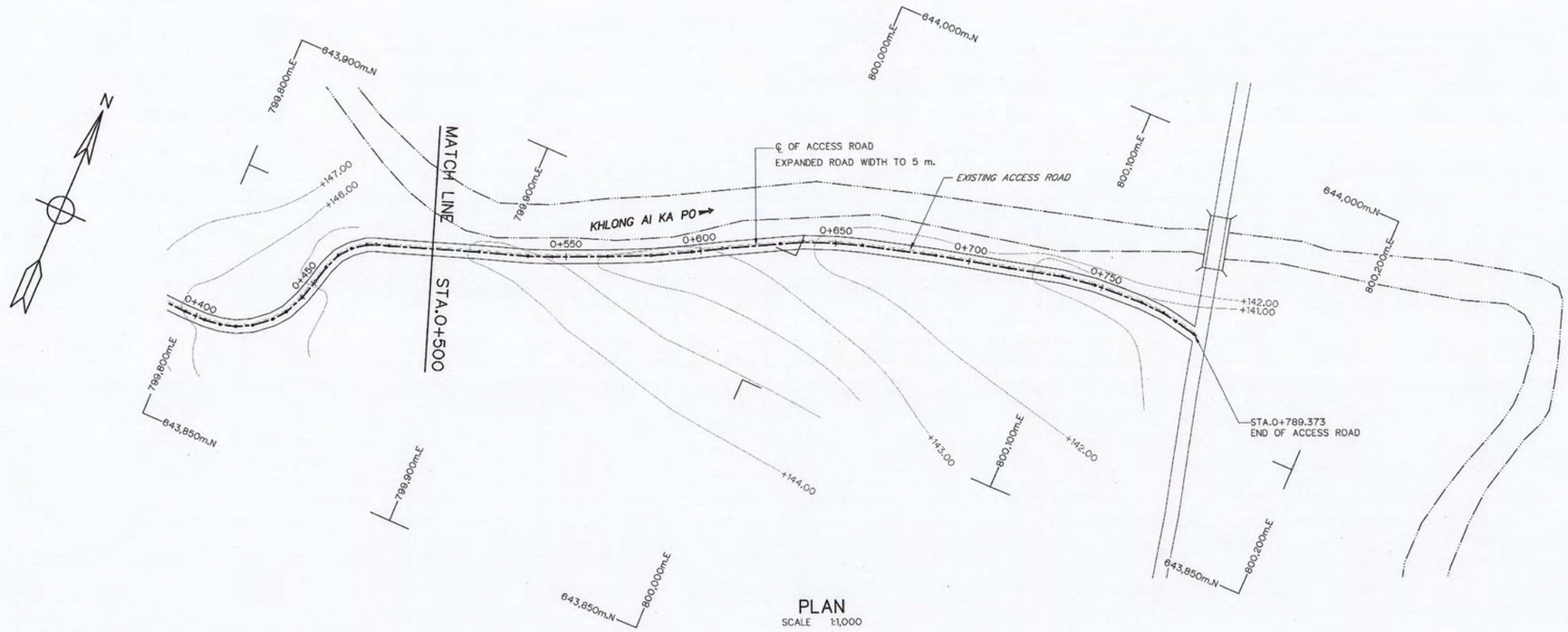
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
ACCESS ROAD
PLAN AND PROFILE STA.0+000 TO STA.0+500

PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

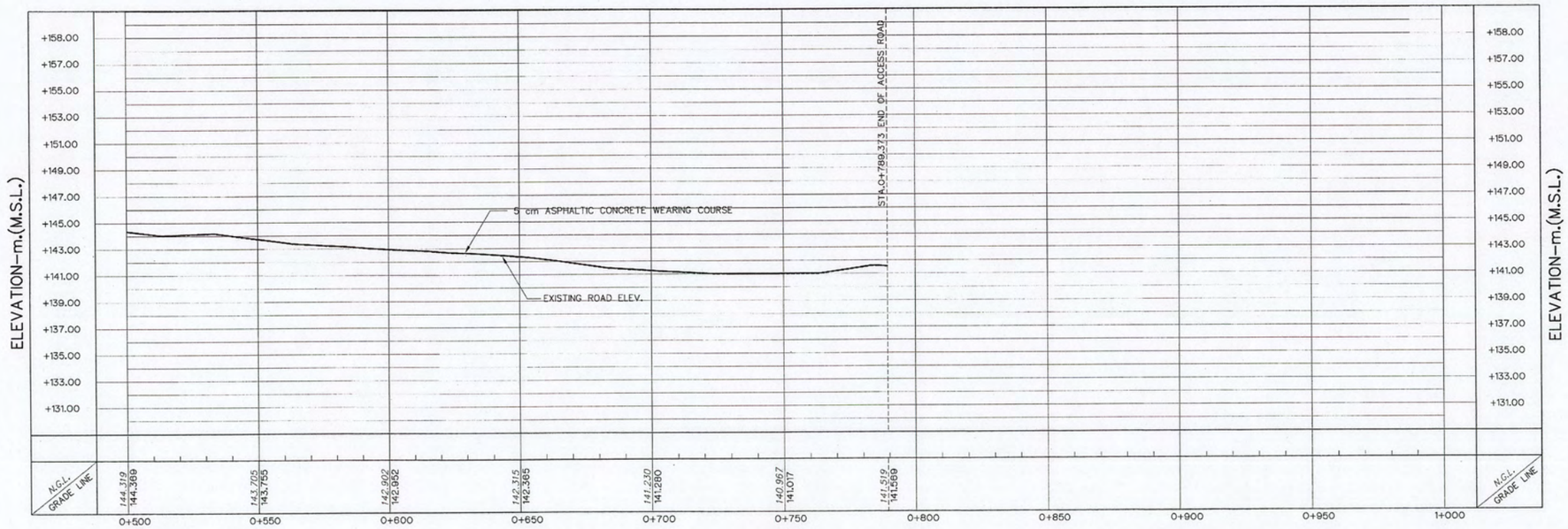
DESIGNED RB.29074 RB.9462
DRAWN
CHECKED RB.8231
28/10/2021
PROJECT MANAGER DATE

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

DRAWING NO. AKP-AR-01
SHEET NO. 10 OF 129



PLAN
SCALE 1:1,000



PROFILE
VERTICAL SCALE 1:200
HORIZONTAL SCALE 1:1,000

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS,UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP-GN-03
3. THE CONTRACTOR HAS TO SUBMITED SURVEYING AND ROAD ALIGNMENT FOR APPROVAL.

REFERENCE DRAWING :

1. ACCESS ROAD,PLAN AND PROFILE STA.0+000 TO STA.0+500 AKP-AR-01

0 5 10 15
SCALE 1:200 METERS

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

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
ACCESS ROAD
PLAN AND PROFILE STA.0+500 TO STA.0+789.373

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

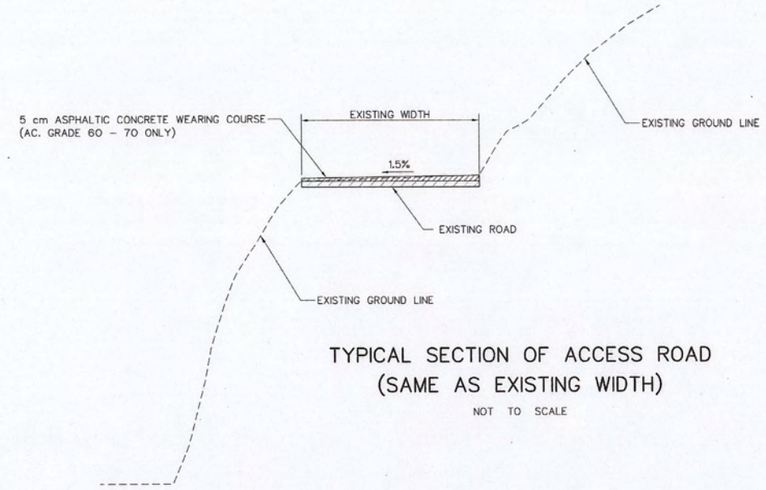
CONSULTANTS: PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.

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

DESIGNED ... REG.29074 ... REG.9462
DRAWN
CHECKED ... REG.8231
PROJECT MANAGER 28/10/2021 DATE

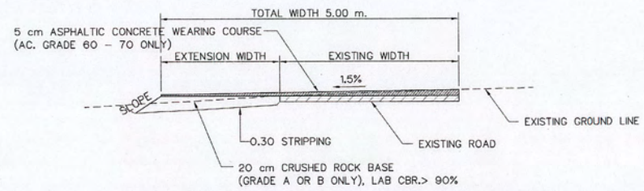
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP-AR-02
SHEET NO. 11 OF 129



TYPICAL SECTION OF ACCESS ROAD
(SAME AS EXISTING WIDTH)

NOT TO SCALE



TYPICAL SECTION OF ACCESS ROAD
(EXTENSION WIDTH)

NOT TO SCALE

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. CLEARING AND GRUBBING METHOD SHALL CONFORM TO THE REQUIREMENTS AS SPECIFILED IN THE TECHNICAL SPECIFICATIONS.
3. ACCESS ROAD ALIGNMENT MAY BE RE-ADJUSTED TO SUIT THE FIELD CONDITIONS, BUT UNDER THE APPROVAL OF FIELD ENGINEERS.
4. THE FIELD ENGINEER MAY ORDER SIDE SLOPE IN DIFFERENCE FROM TYPICALLY SHOWN IN THIS DRAWING.
5. THE MATERIAL FOR LATERITE CRUSHE STONE SHALL HAVE AC. OR VALUE NOT LESS THAN 15% AND ITS PHYSICAL PROPERTIES AS FOLLOWS
   - LIQUID LIMIT (LL) NOT GREATER THAN 34%
   - PLASTIC INDEX (PI) IN RANGE OF 5 TO 11
   - PERCENTAGE OF WEAR NOT GREATER THAN 50%

   AND OTHER PROPERTIES AS SPECIFIED IN THE TECHNICAL SPECIFICATIONS.
6. THE PAVEMENT OF ACCESS ROAD IS ASPHALTIC CONCRETE

SLOPE IN CUT AND FILL SECTIONS

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	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

1/ = FILL SHOULD BE AVOIDED

2/ = FOR DOUBTFUL CASES FIELD ENGINEER

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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

ACCESS ROAD

TYPICAL SECTIONS, STOPPING AND PASSING PLACES

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS: PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.

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

DESIGNED ภัทร 28.9.2021 ศักดิ์ 28.9.62 — REVIEWED

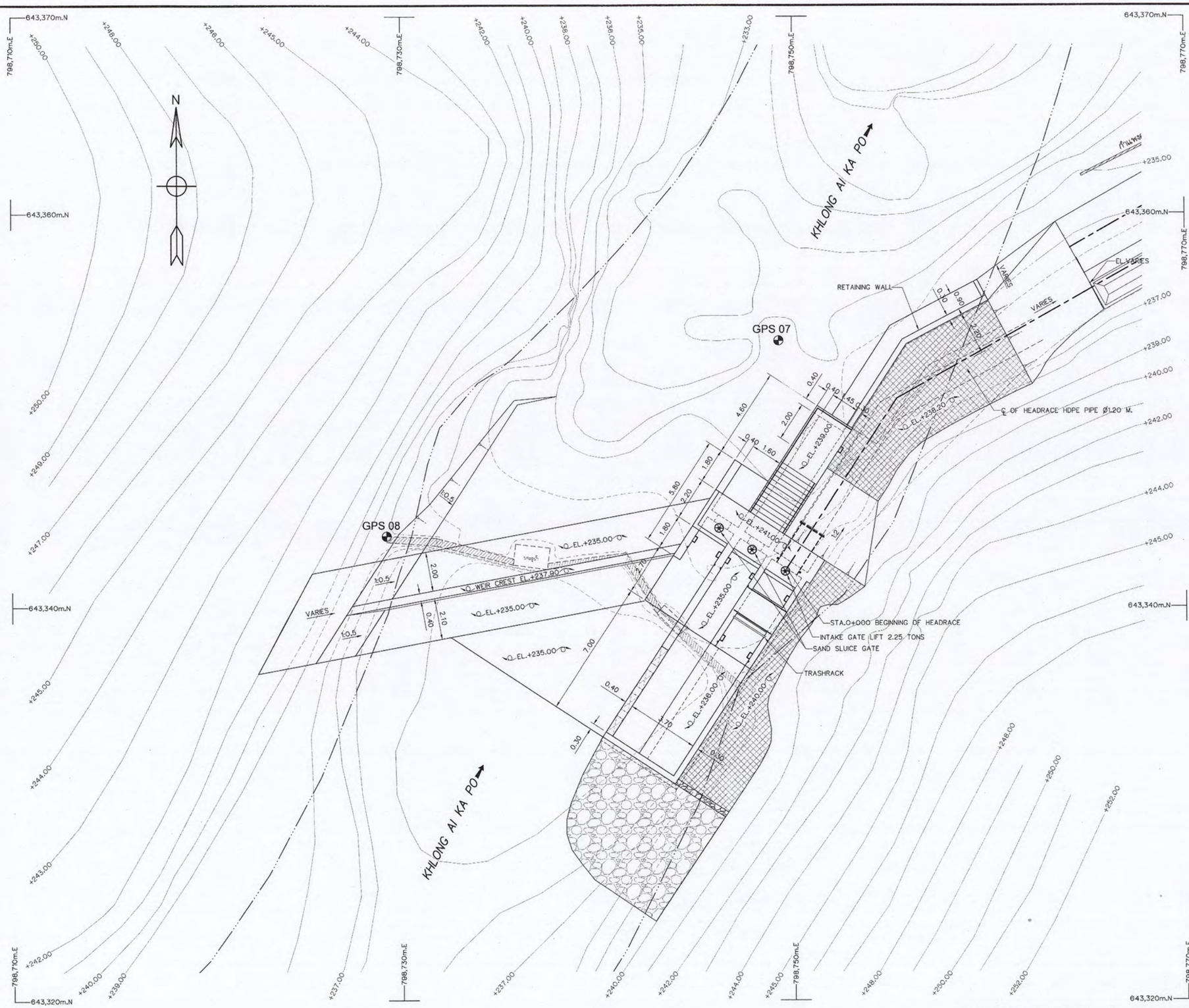
DRAWN — SUBMITTED

CHECKED 28.9.62 — RECOMMENDED

PROJECT MANAGER 28/10/2021 DATE — APPROVED

DRAWING NO. AKP-AR-03

SHEET NO. 12 OF 129



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. AKP-GN-03
3. SPACING OF HANDRAIL CAN BE ADJUSTED IN THE FIELD TO FIT WITH THE STRUCTURE BY CONTRACTOR AND APPROVED BY ENGINEER.
4. WEIR SHALL BE PLACED ON BED ROCK FOUNDATION, OTHER MATERIALS SHALL BE REMOVED AND BACKFILLED WITH LEAN CONCRETE

REFERENCE DRAWINGS :

1.	WEIR, PLAN AND SECTION SECTIONS A-A	AKP-WE-02
2.	WEIR, SECTIONS B-B, C-C AND D-D	AKP-WE-03
3.	WEIR, SECTIONS E-E, F-F, G-G AND H-H	AKP-WE-04

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

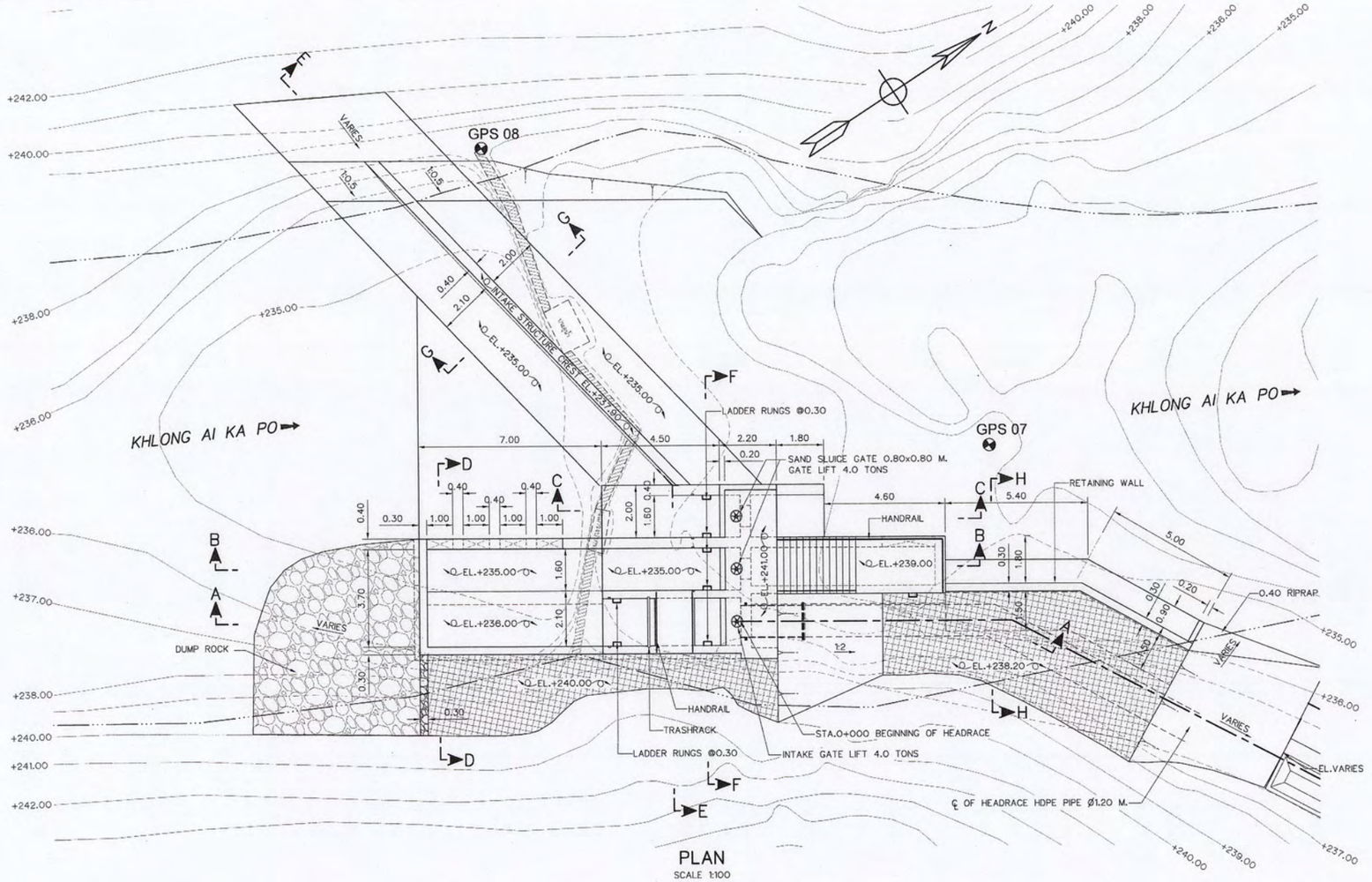
KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

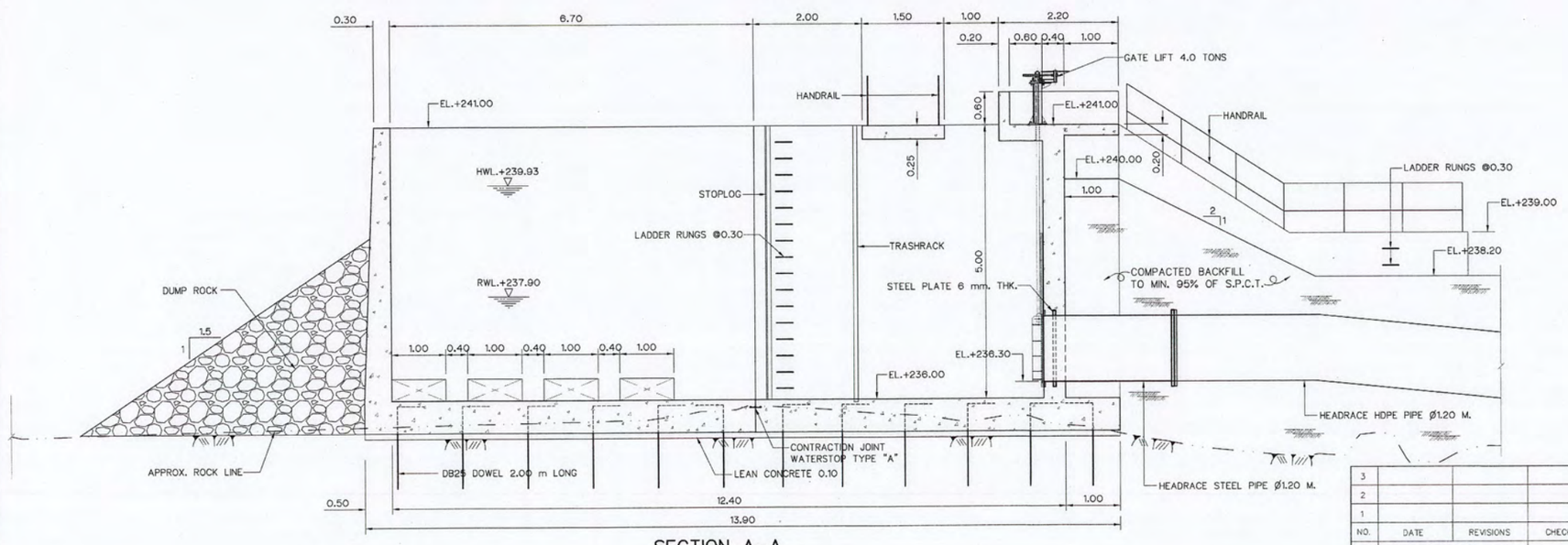
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
WEIR
GENERAL LAYOUT

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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	CONSULTANTS		DEDE	

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DESIGNED Rtl.29074 Rtl.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED Rtl.8231	RECOMMENDED
28/10/2021 PROJECT MANAGER DATE	APPROVED
DRAWING NO. AKP-WE-01	SHEET NO. 13 OF 129



PLAN
SCALE 1:100



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. AKP–GN–03
3. SPACING OF HANDRAIL CAN BE ADJUSTED IN THE FIELD TO FIT WITH THE STRUCTURE BY CONTRACTOR AND APPROVED BY ENGINEER.
4. WEIR SHALL BE PLACED ON BED ROCK FOUNDATION, OTHER MATERIALS SHALL BE REMOVED AND BACKFILLED WITH LEAN CONCRETE

REFERENCE DRAWINGS :

1. WEIR, GENERAL LAYOUT	AKP–WE–01
2. WEIR, SECTIONS B–B, C–C AND D–D	AKP–WE–03
3. WEIR, SECTIONS E–E, F–F, G–G AND H–H	AKP–WE–04
4. WEIR, MISCELLANEOUS DETAIL	AKP–WE–05
5. WEIR, REINFORCEMENT (SHEET 1/2)	AKP–WE–06
5. WEIR, REINFORCEMENT (SHEET 2/2)	AKP–WE–07
6. WEIR, ANCHOR BARS, TRASHRACK AND STEEL LINER DETAIL	AKP–WE–08

SCALE 1:50 METERS

SCALE 1:100 METERS

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
WEIR
PLAN AND SECTION SECTIONS A–A

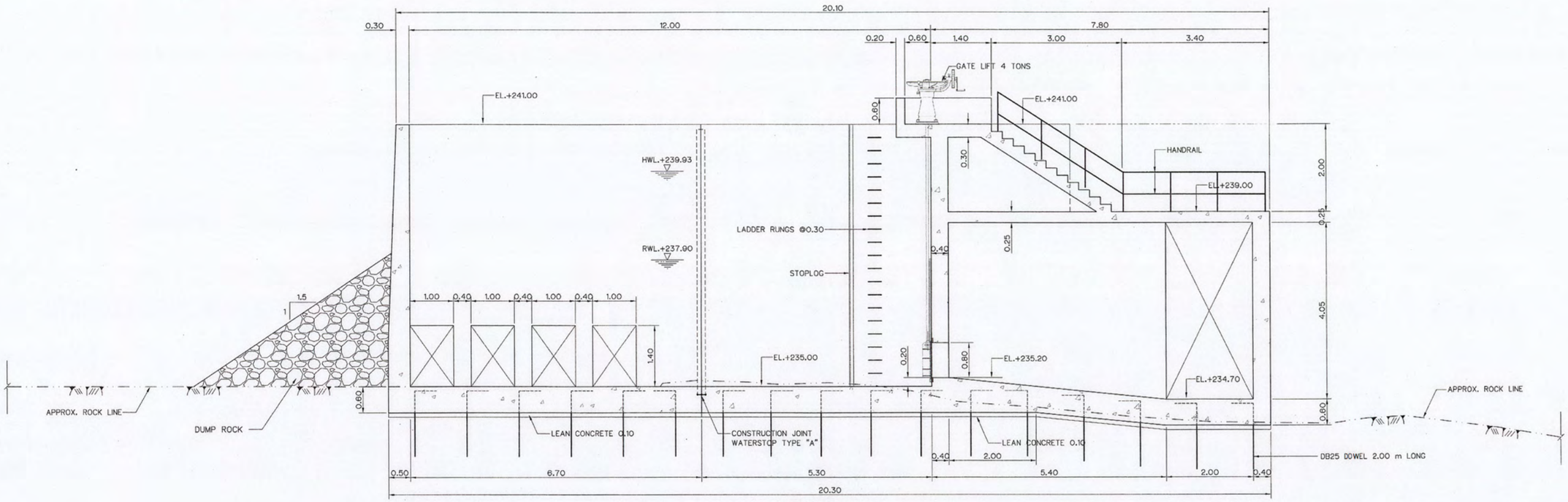
NO.	DATE	REVISIONS	CHECKED	APPROVED
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	CONSULTANTS		DEDE	

PCM P&C MANAGEMENT CO., LTD.
SPT SPT CONSULTANTS CO., LTD.

DESIGNED ณัฐพงษ์ ณัฐ.29074 ณัฐ.9462
DRAWN
CHECKED ณัฐ.8231
28/10/2021
PROJECT MANAGER DATE

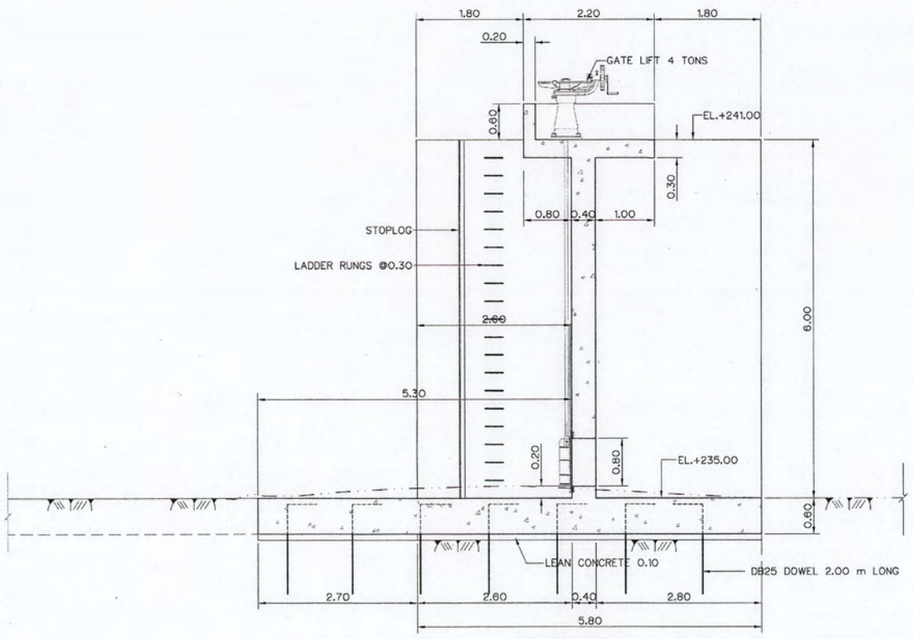
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP–WE–02
SHEET NO. 14 OF 129



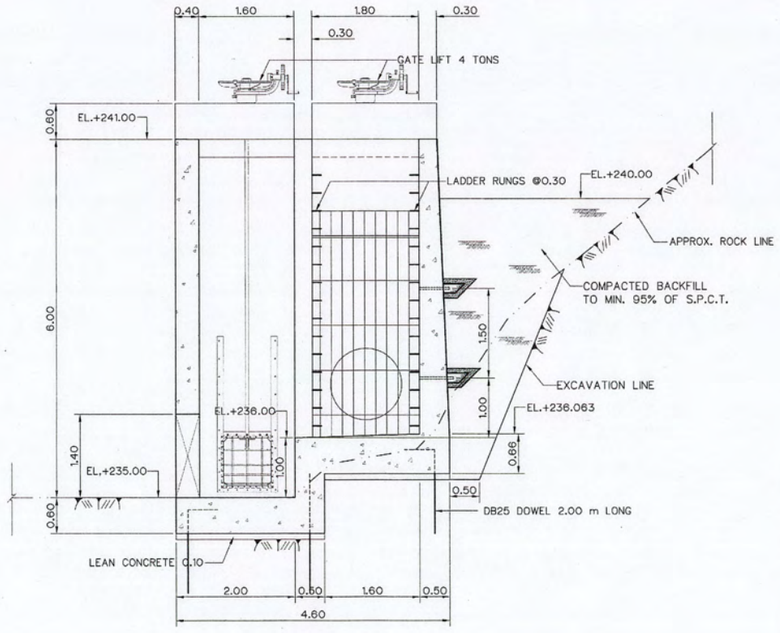
SECTION B–B

SCALE 1:50



SECTION C–C

SCALE 1:50



SECTION D–D

SCALE 1:50

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
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3. SPACING OF HANDRAIL CAN BE ADJUSTED IN THE FIELD TO FIT WITH THE STRUCTURE BY CONTRACTOR AND APPROVED BY ENGINEER.
4. WEIR SHALL BE PLACED ON BED ROCK FOUNDATION, OTHER MATERIALS SHALL BE REMOVED AND BACKFILLED WITH LEAN CONCRETE

REFERENCE DRAWINGS :

1. WEIR, PLAN AND SECTION	AKP-WE-02
2. WEIR, MISCELLANEOUS DETAIL	AKP-WE-05
3. WEIR, REINFORCEMENT (SHEET 1/2)	AKP-WE-06
4. WEIR, REINFORCEMENT (SHEET 2/2)	AKP-WE-07
5. WEIR, ANCHOR BARS, TRASHRACK AND STEEL LINER DETAIL	AKP-WE-08

0 0.5 1 2 3 4
SCALE 1:50 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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1				
	CONSULTANTS		DEDE	

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

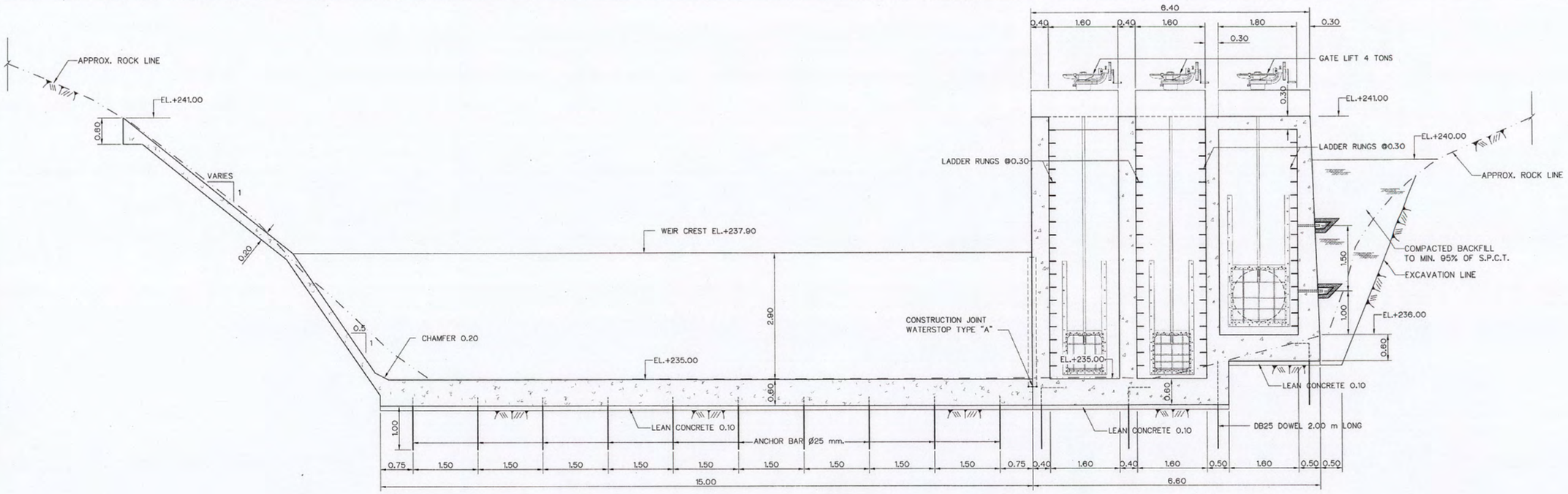
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

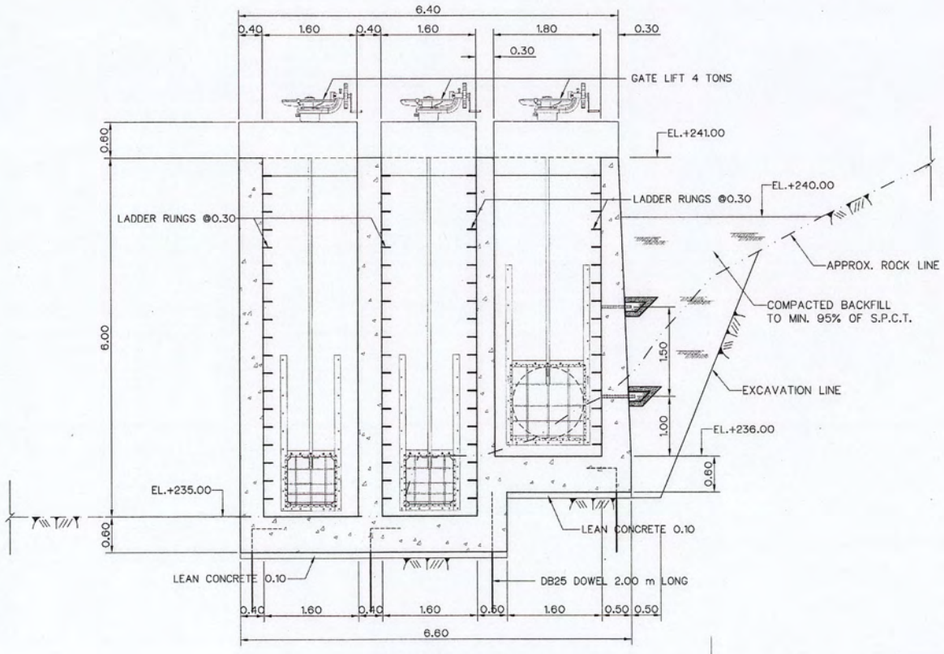
WEIR

SECTIONS B-B, C-C AND D-D

PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED ... RSI.29074 ... RSI.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED ... RSI.8231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-WE-03	SHEET NO. 15 OF 129

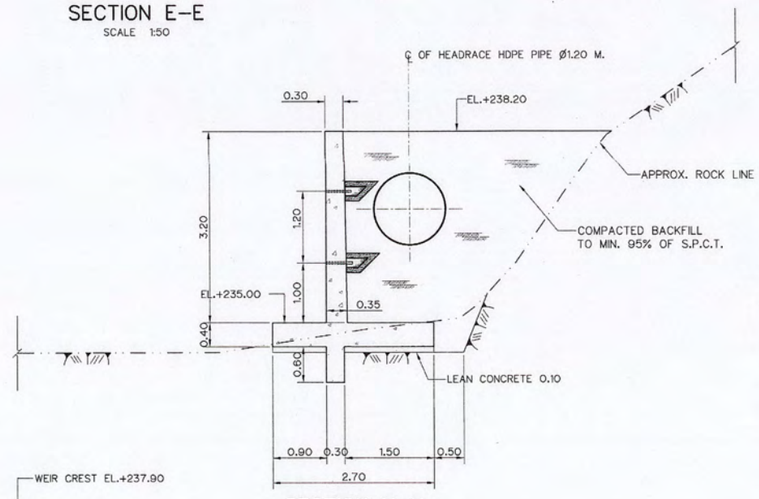


SECTION E–E
SCALE 1:50

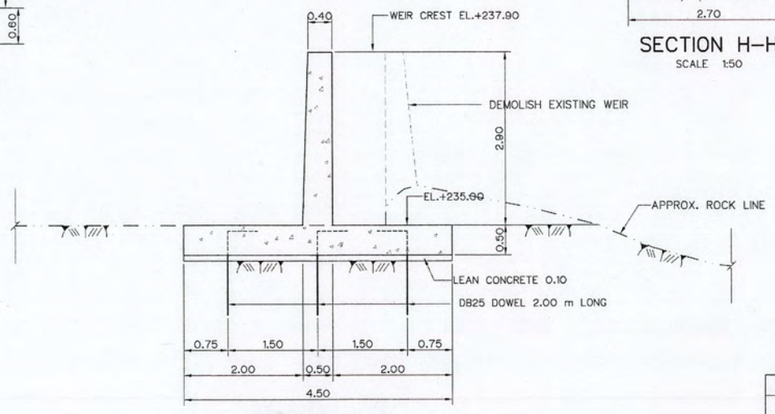


SECTION F–F
SCALE 1:50

0 0.5 1 2 3 4
SCALE 1:50 METERS



SECTION H–H
SCALE 1:50



SECTION G–G
SCALE 1:50

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
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3. SPACING OF HANDRAIL CAN BE ADJUSTED IN THE FIELD TO FIT WITH THE STRUCTURE BY CONTRACTOR AND APPROVED BY ENGINEER.
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REFERENCE DRAWINGS :

1.	WEIR, PLAN AND SECTION SECTIONS A–A	AKP–WE–02
2.	WEIR, MISCELLANEOUS DETAIL	AKP–WE–05
3.	WEIR, REINFORCEMENT (SHEET 1/2)	AKP–WE–06
4.	WEIR, REINFORCEMENT (SHEET 2/2)	AKP–WE–07
5.	WEIR, ANCHOR BARS, TRASHRACK AND STEEL LINER DETAIL	AKP–WE–08

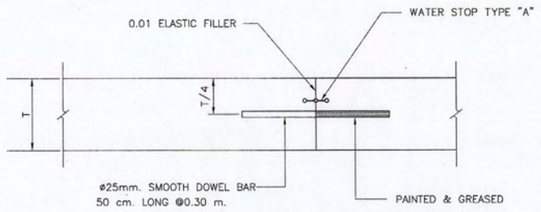
NO.	DATE	REVISIONS	CHECKED	APPROVED
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	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

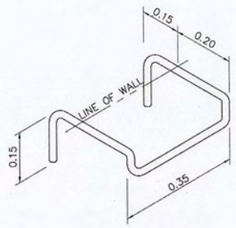
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
WEIR
SECTIONS E–E, F–F, G–G AND H–H

PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED	RE.29074 RE.9462	REVIEWED	
DRAWN		SUBMITTED	
CHECKED	RE.8231	RECOMMENDED	
PROJECT MANAGER	28/10/2021 DATE	APPROVED	
		DRAWING NO. AKP–WE–04	SHEET NO. 16 OF 129

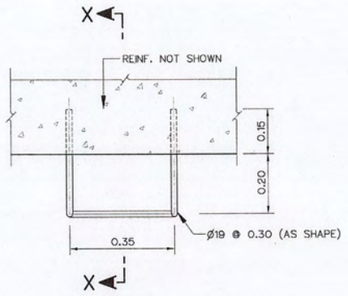


DETAIL OF CONSTRUCTION JOINT

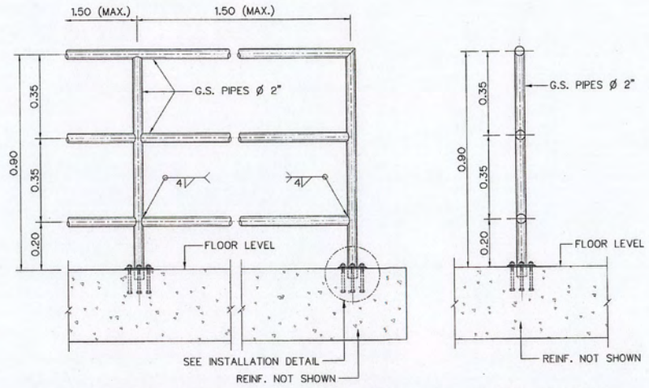
NOT TO SCALE



ISOMETRIC VIEW

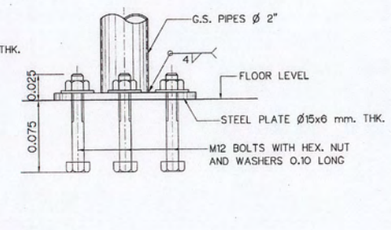


PLAN



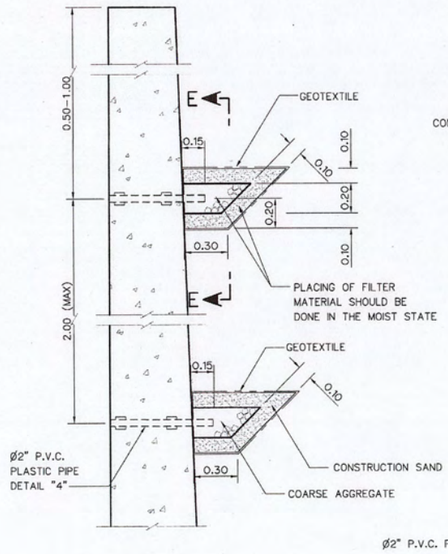
HANDRAIL

NOT TO SCALE



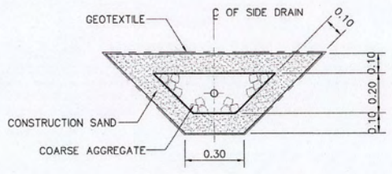
INSTALLATION DETAIL

NOT TO SCALE



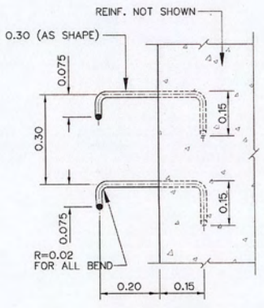
DETAIL OF SIDE DRAIN

NOT TO SCALE



SECTION E – E

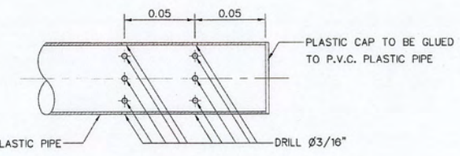
SCALE 1:15



SECTION X–X

DETAIL OF LADDER RUNGS

NOT TO SCALE

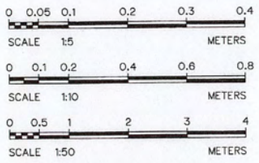


DETAIL "4"

NOT TO SCALE

NOTES :

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



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
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	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
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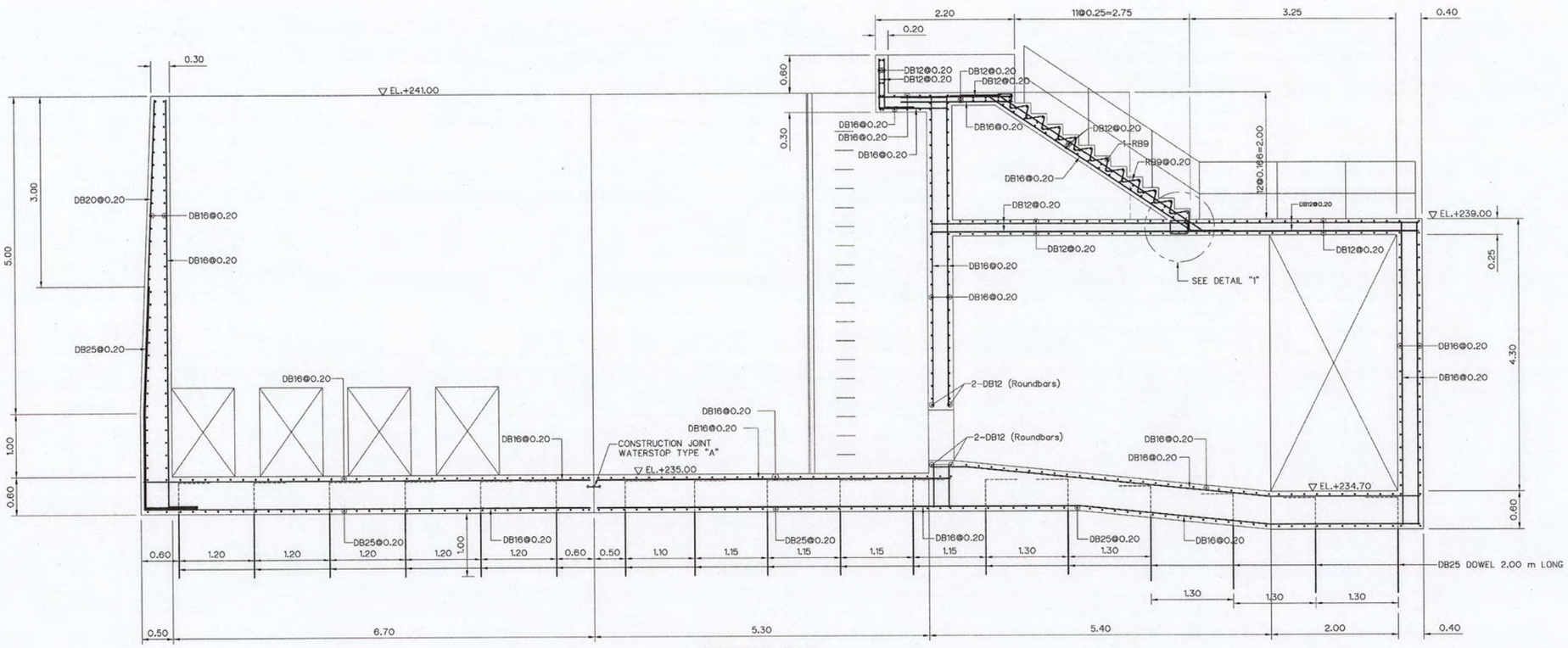
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

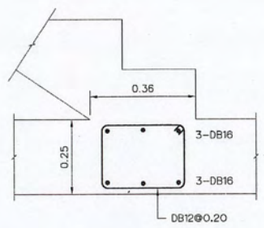
WEIR

MISCELLANEOUS DETAIL

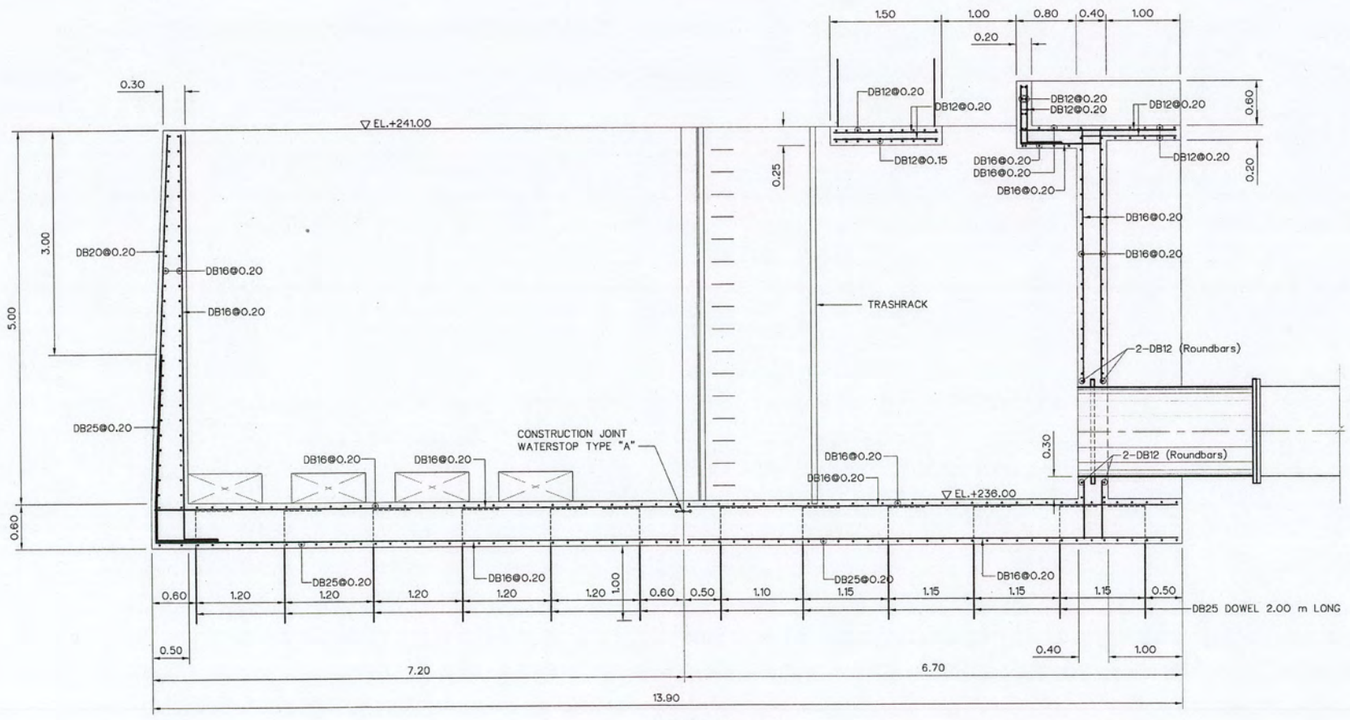
PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED RB.29074 RB.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED RB.8231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-WE-05	SHEET NO. 17 OF 129



SECTION B–B
SCALE 1:40



DETAIL "1"
SCALE 1:10



SECTION A–A
SCALE 1:40

NOTES :

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

REFERENCE DRAWINGS :

1. WEIR, PLAN AND SECTION SECTIONS A–A	AKP-WE-02
2. WEIR, MISCELLANEOUS DETAIL	AKP-WE-05
3. WEIR, REINFORCEMENT (SHEET 2/2)	AKP-WE-07
4. WEIR, ANCHOR BARS, TRASHRACK AND STEEL LINER DETAIL	AKP-WE-08

0 0.5 1 2 3
SCALE 1:40 METERS

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

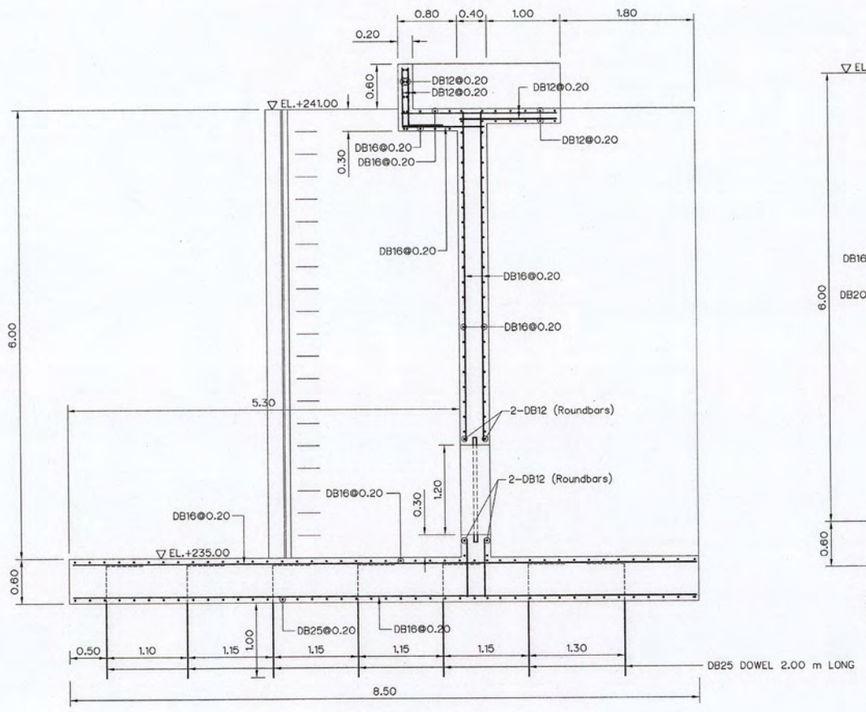
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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MINISTRY OF ENERGY

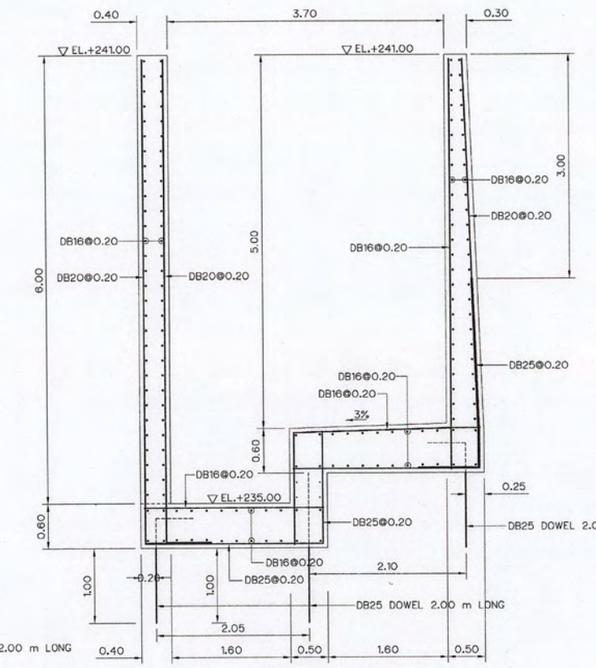
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
WEIR
REINFORCEMENT (SHEET 1/2)

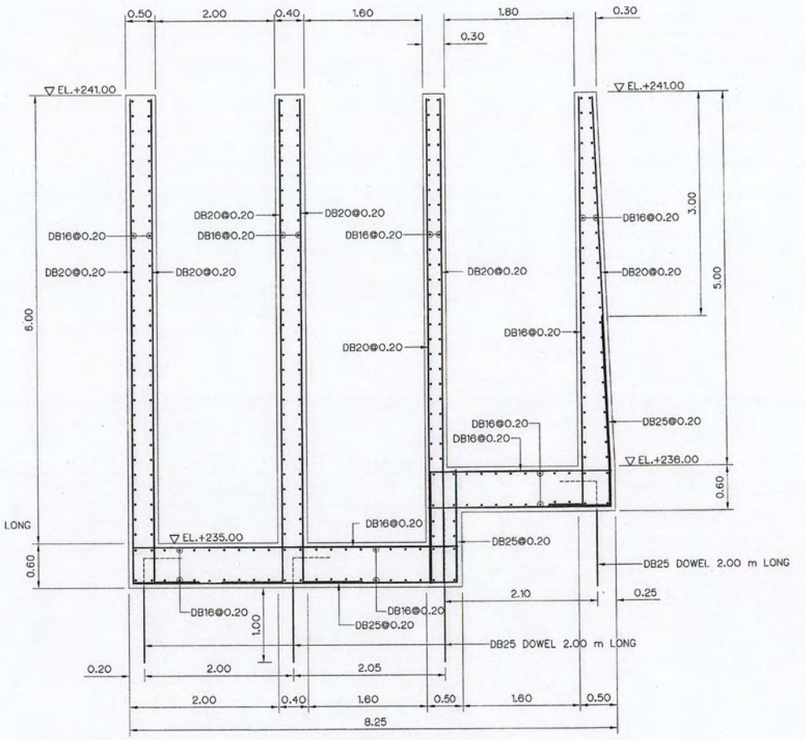
P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED ... REG.29074 ... REG.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED ... REG.8231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-WE-06	SHEET NO. 18 OF 129



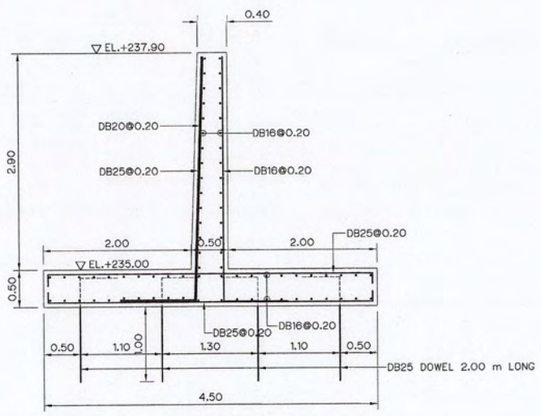
SECTION C–C
SCALE 1:40



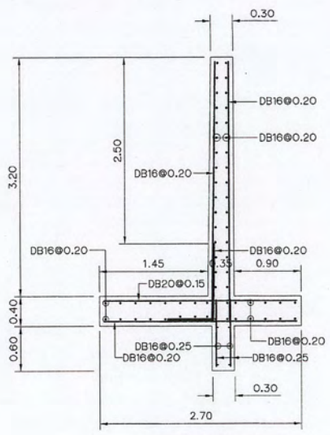
SECTION D–D
SCALE 1:40



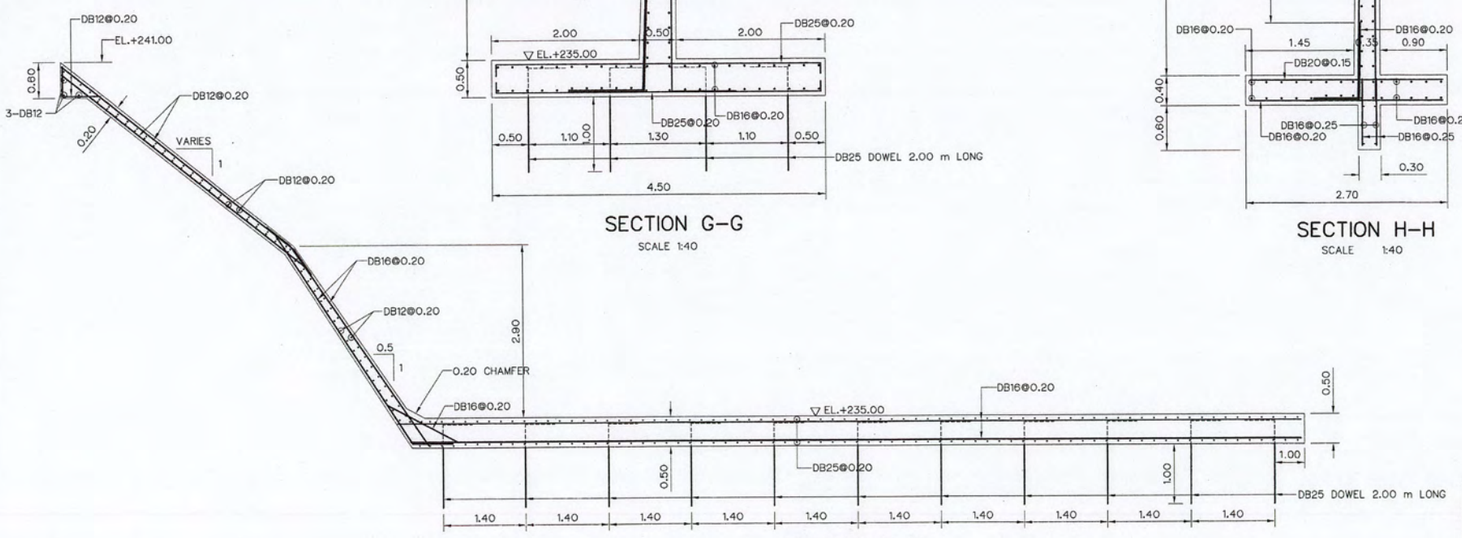
SECTION F–F
SCALE 1:40



SECTION G–G
SCALE 1:40



SECTION H–H
SCALE 1:40



SECTION E–E
SCALE 1:50

0 0.5 1 2 3
SCALE 1:40 METERS

0 0.5 1 2 3 4
SCALE 1:50 METERS

NOTES :

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

REFERENCE DRAWINGS :

1. WEIR, PLAN AND SECTION SECTIONS A–A	AKP-WE-02
2. WEIR, MISCELLANEOUS DETAIL	AKP-WE-05
3. WEIR, REINFORCEMENT (SHEET 1/2)	AKP-WE-06
4. WEIR, ANCHOR BARS, TRASH RACK AND STEEL LINER DETAIL	AKP-WE-08

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT

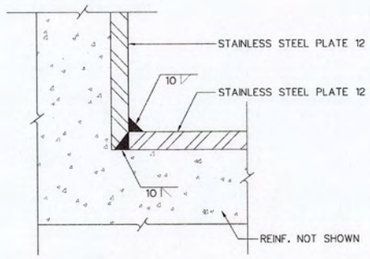
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

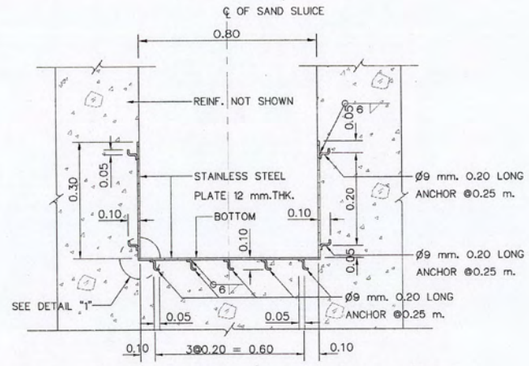
WEIR

REINFORCEMENT (SHEET 2/2)

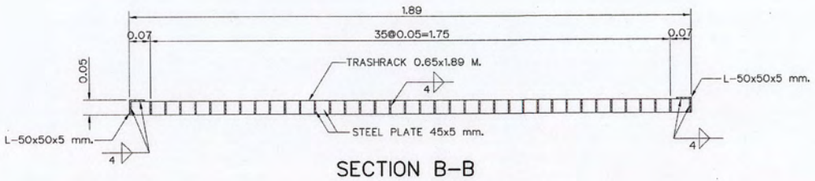
PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED	RE.29074	REVIEWED	
DRAWN		SUBMITTED	RE.9462
CHECKED	RE.8231	RECOMMENDED	
PROJECT MANAGER	28/10/2021 DATE	APPROVED	
		DRAWING NO. AKP-WE-07	SHEET NO. 19 OF 129



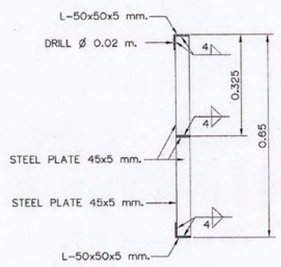
DETAIL "1"
NOT TO SCALE



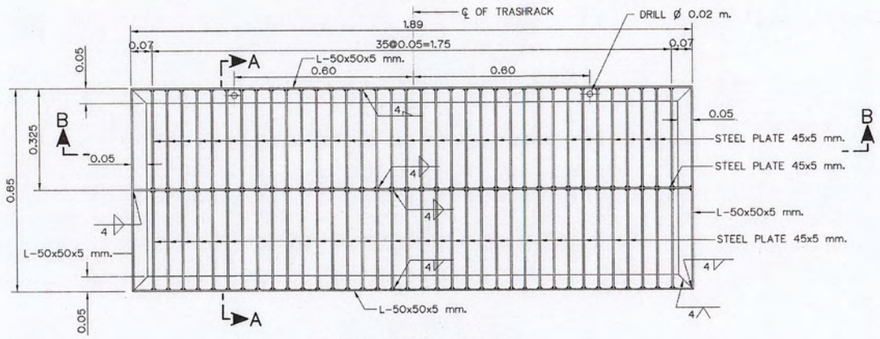
DETAIL OF STEEL LINER AT SAND SLUICE
NOT TO SCALE



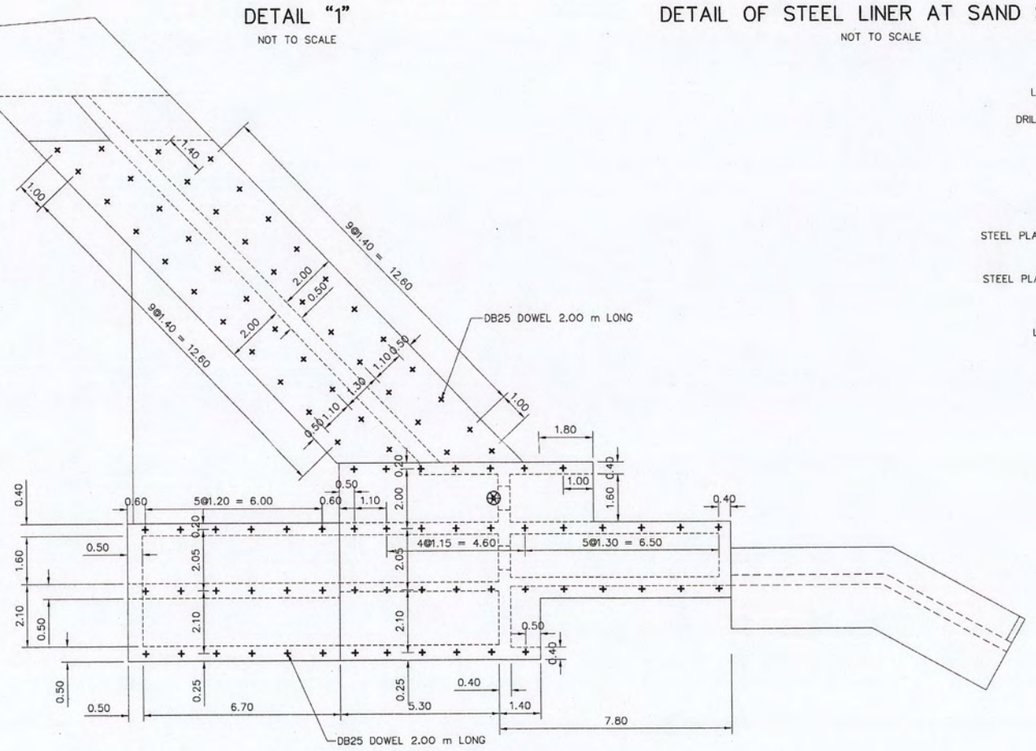
SECTION B-B



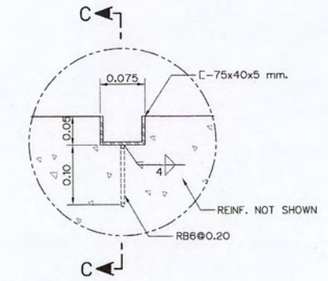
SECTION A-A
SCALE 1:10



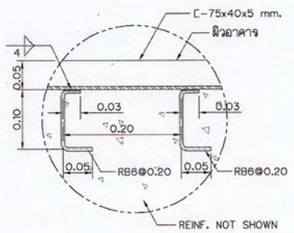
TRASH RACK DETAIL
(REQUIRED 7 PIECES)
SCALE 1:10



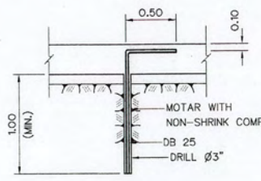
ANCHOR BARS PLAN
SCALE 1:100



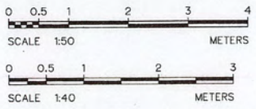
TRASHRACK GROOVE DETAIL
SCALE 1:5



SECTION C-C
SCALE 1:5



ANCHOR BAR
SCALE 1:30



NOTES :

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

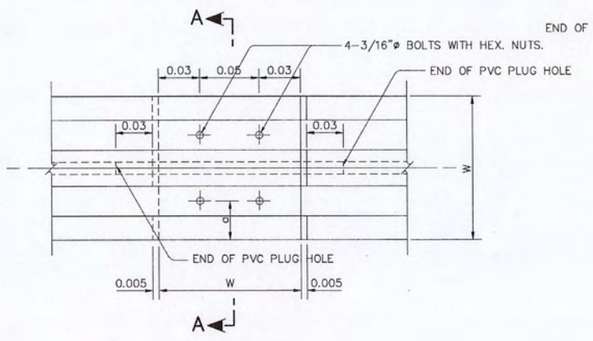
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
WEIR
ANCHOR BARS, TRASH RACK AND STEEL LINER DETAIL

PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

DESIGNED REG.29074 REG.9462
DRAWN
CHECKED REG.8231
28/10/2021
PROJECT MANAGER DATE

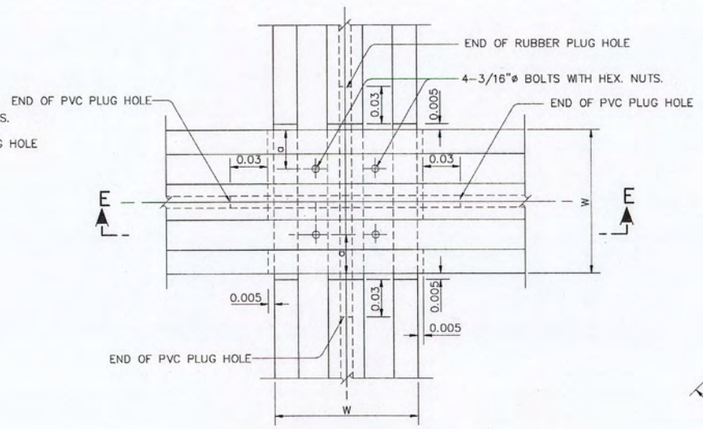
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP-WE-08
SHEET NO. 20 OF 129



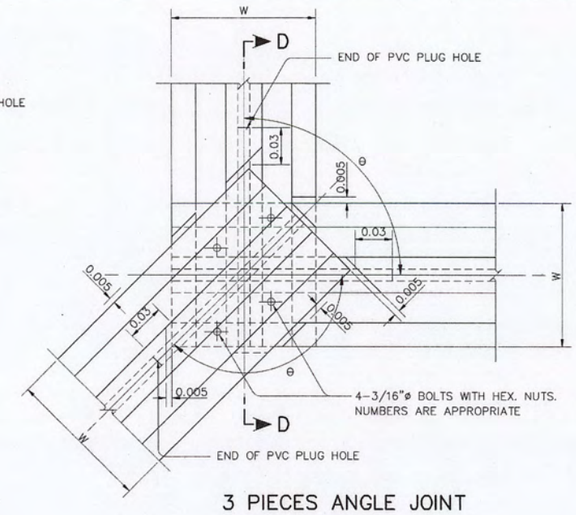
STRAIGHT JOINT

NOT TO SCALE



NORMAL LEAN JOINT

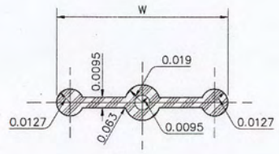
NOT TO SCALE



3 PIECES ANGLE JOINT

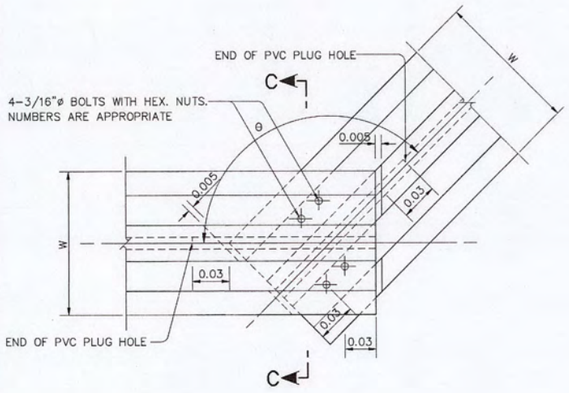
NOT TO SCALE

PVC WATERSTOP (M.)			
TYPE	W	a	R
A	0.2032	0.04	0.20
B	0.1524	0.04	0.15
C	0.1524	0.04	0.10



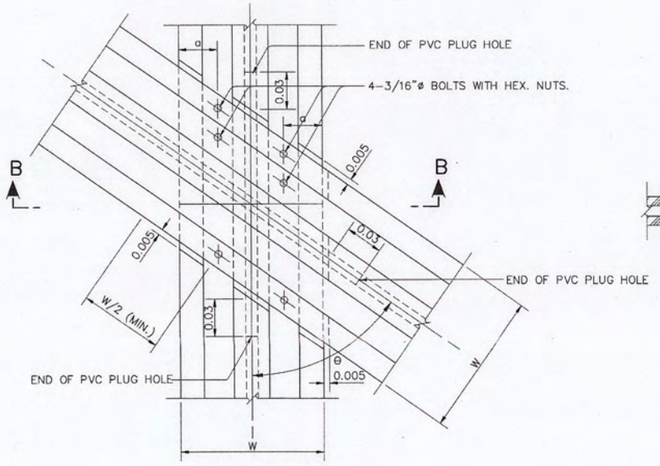
PVC WATERSTOP
(TYPE "A" & TYPE "B")

NOT TO SCALE



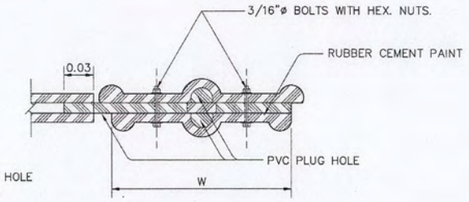
ANGLE JOINT

NOT TO SCALE



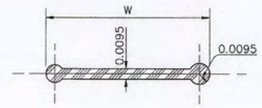
ANGLE LEAN JOINT

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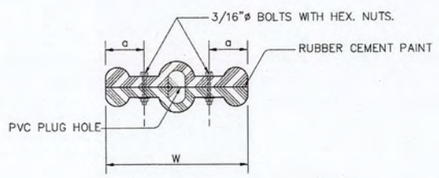
SECTION D-D

NOT TO SCALE



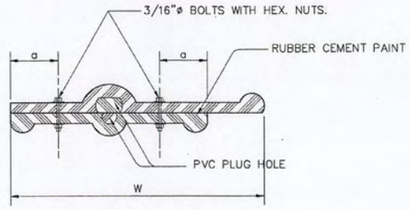
PVC WATERSTOP
(TYPE "C")

NOT TO SCALE



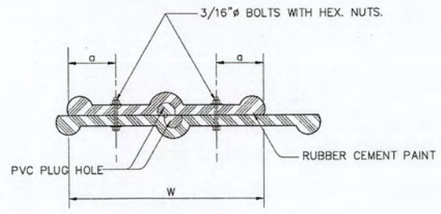
SECTION A-A

NOT TO SCALE



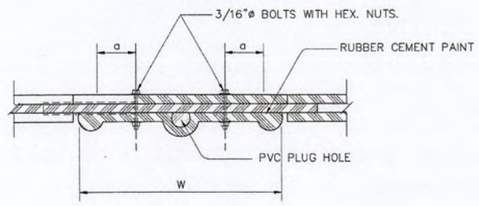
SECTION B-B

NOT TO SCALE



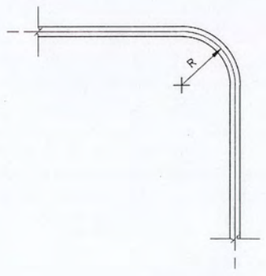
SECTION C-C

NOT TO SCALE



SECTION E-E

NOT TO SCALE



STANDARD CURVE

NOT TO SCALE

NOTES:

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP-GN-03.
3. PVC PLUG HOLES TIGHT AND STICK WITH PVC WATERSTOP.
4. BOLTS WITH HEX. NUTS ARE BRASS OR STAINLESS.

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

WEIR

STANDARD PVC WATERSTOP,SECTION AND DETAILS

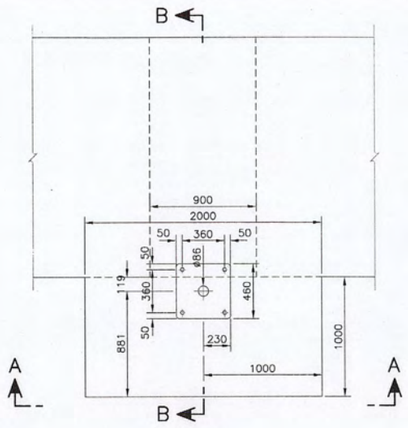
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

DESIGNED RS.29074 RS.9462
DRAWN
CHECKED RS.8231
PROJECT MANAGER 28/10/2021 DATE

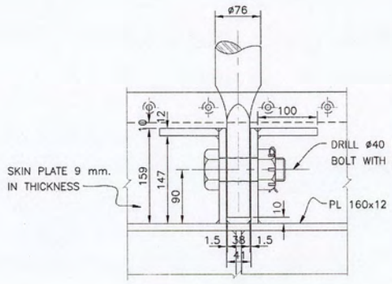
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP-WE-09
SHEET NO. 21 OF 129



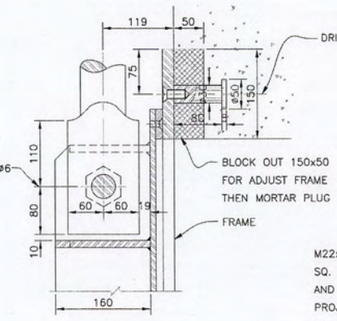
PLAN

SCALE "B"



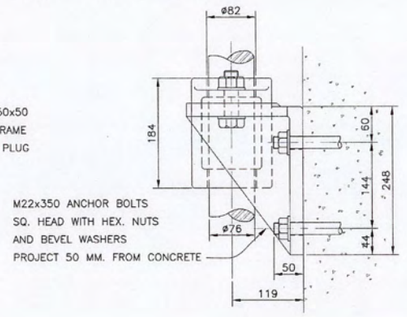
DETAIL "1"

SCALE "A"



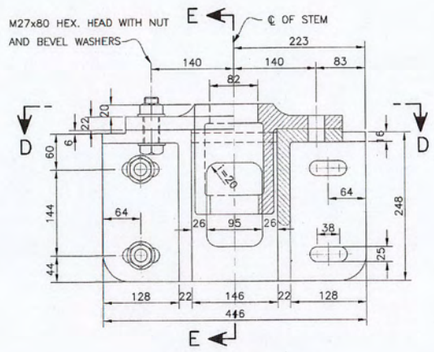
DETAIL "3"

SCALE "A"



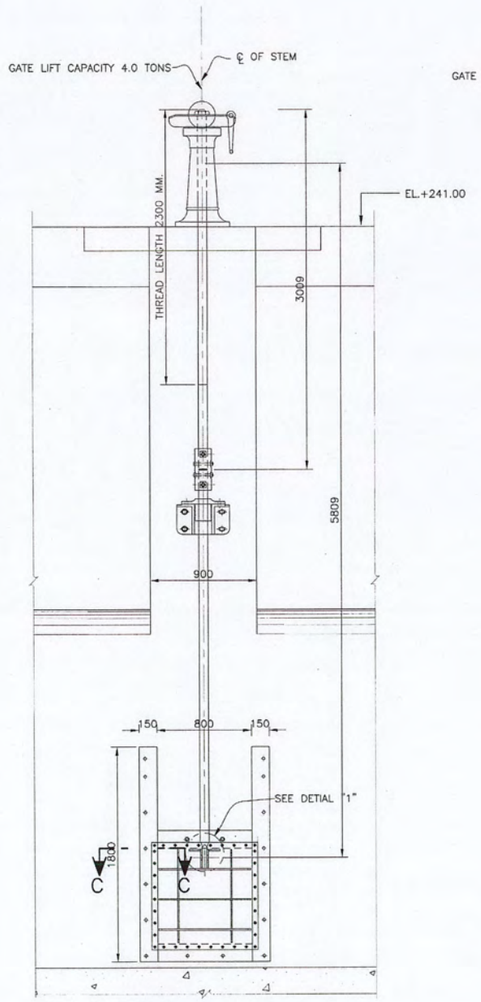
DETAIL "2"

SCALE "A"



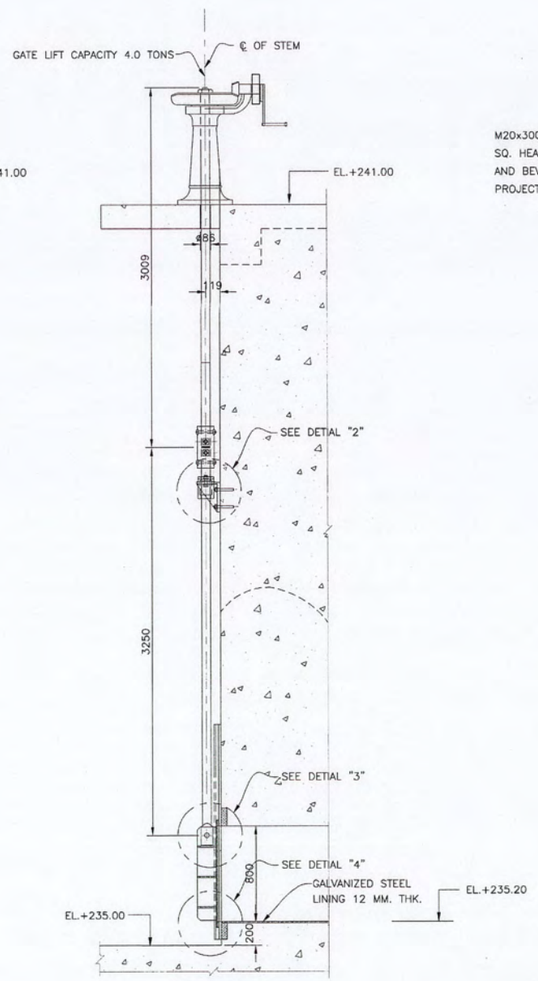
STEM GUIDE

SCALE "A"



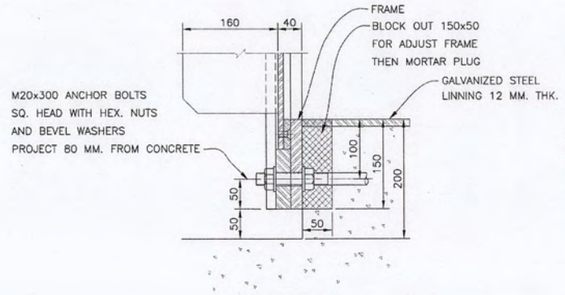
SECTION (A) – (A)

SCALE "B"



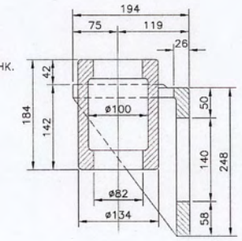
SECTION (B) – (B)

SCALE "B"



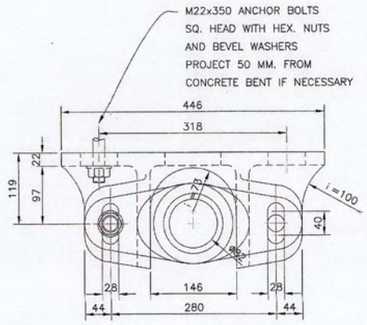
DETAIL "4"

SCALE "A"



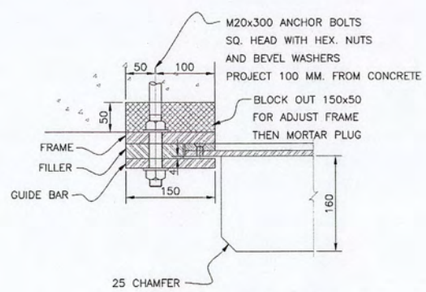
SECTION (E) – (E)

SCALE "A"



SECTION (D) – (D)

SCALE "A"



SECTION (C) – (C)

SCALE "A"

SCALE "A" 0 0.1 0.2 0.3 0.4 0.5 M.

ORIGINAL SCALE 1:5

SCALE "B" 0 0.5 1 1.5 2 2.5 M.

ORIGINAL SCALE 1:25

NOTE :

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

REFERENCE DWGS :

1. WEIR, SECTIONS B–B, C–C AND D–D	AKP–WE–03
2. WEIR, 0.80x0.80 SAND SLUICE GATE (GATE DETAIL)	AKP–WE–11
3. WEIR, GATE LIFT, CAPACITY 4.0 TONS	AKP–WE–14

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

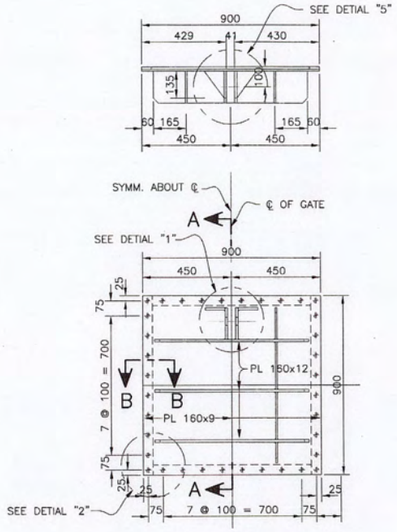
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

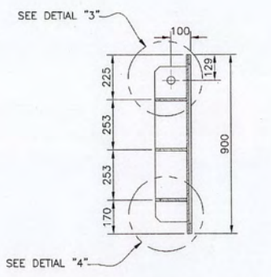
WEIR

0.80x0.80 m. SAND SLUICE GATE (GATE INSTALLATION)

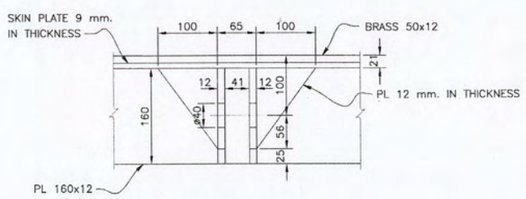
PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED	REG.29074 REG.9462	REVIEWED	
DRAWN		SUBMITTED	
CHECKED	REG.8231	RECOMMENDED	
PROJECT MANAGER	28/10/2021 DATE	APPROVED	
		DRAWING NO. AKP–WE–10	SHEET NO. 22 OF 129



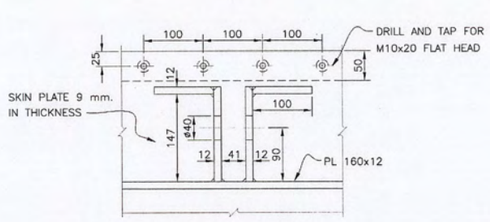
GATE LEAF
SCALE "B"



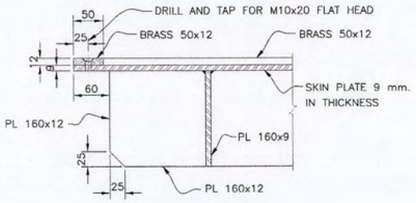
SECTION (A) – (A)
SCALE "B"



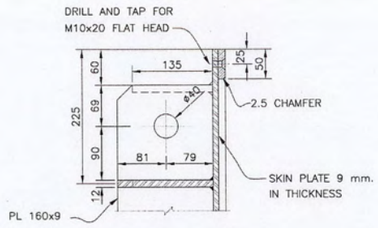
DETAIL "5"
SCALE "A"



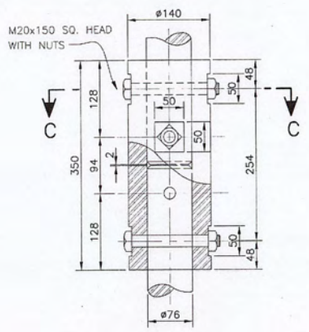
DETAIL "1"
SCALE "A"



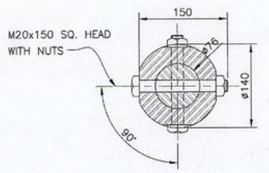
SECTION (B) – (B)
SCALE "A"



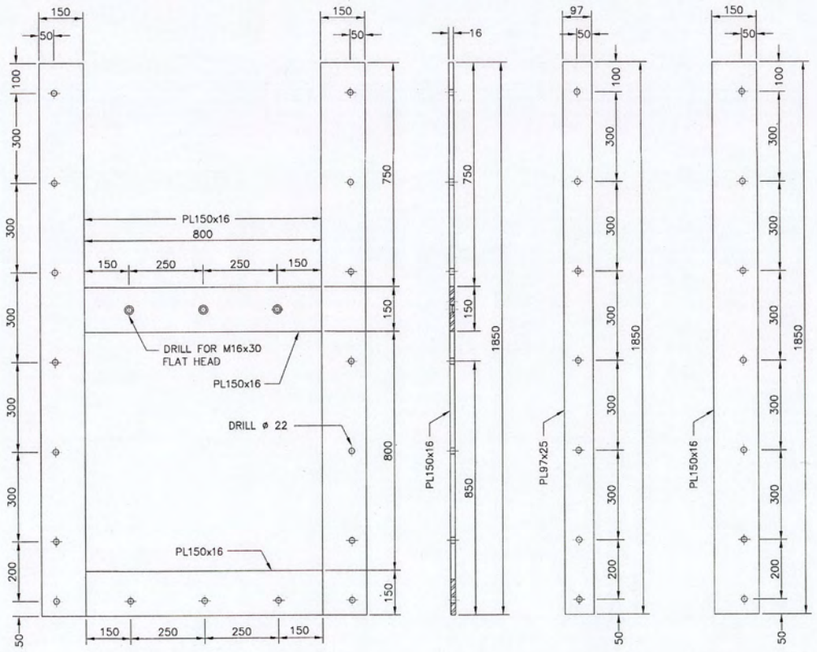
DETAIL "3"
SCALE "A"



COUPPING
SCALE "A"



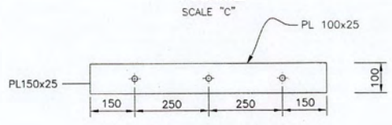
SECTION (C) – (C)
SCALE "A"



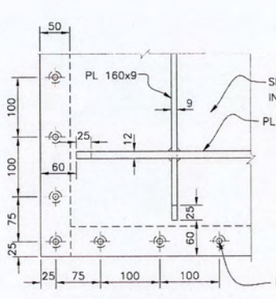
FRAME
SCALE "C"

FILLER
SCALE "C"

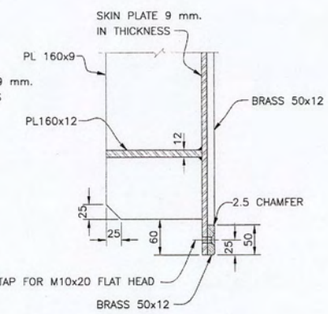
GUIDE BAR
SCALE "C"



BOTTOM BAR
SCALE "C"



DETAIL "2"
SCALE "A"



DETAIL "4"
SCALE "A"

NOTE :

1. ALL DIMENSIONS ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN.
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6. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, THE CONTRACTOR HAS TO SUBMITTED SHOP DRAWING TO FIELD ENGINEER FOR APPROVAL.

REFERENCE DWGS :

1. WEIR, 0.80x0.80 SAND SLUICE GATE (GATE INSTALLATION) AKP-WE-10

SCALE "A" 0 0.1 0.2 0.3 0.4 0.5 M.
ORIGINAL SCALE 1:5

SCALE "B" 0 0.5 1 1.5 M.
ORIGINAL SCALE 1:15

SCALE "C" 0 0.5 1.0 M.
ORIGINAL SCALE 1:10

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

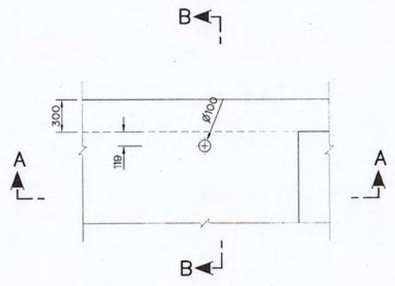
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
WEIR
0.80x0.80 m. SAND SLUICE GATE (GATE DETAIL)

PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

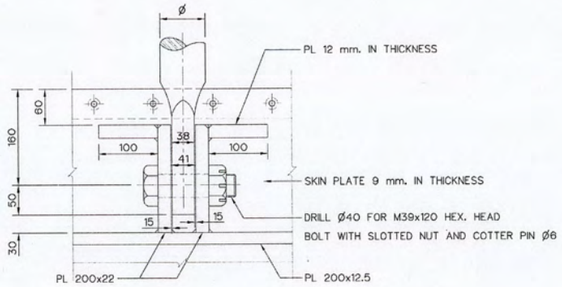
DESIGNED ณัฐวุฒิ 28/10/2021 DRAWN CHECKED 28/10/2021
PROJECT MANAGER DATE

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

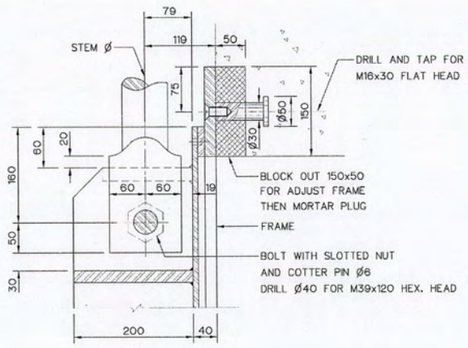
DRAWING NO. AKP-WE-11
SHEET NO. 23 OF 129



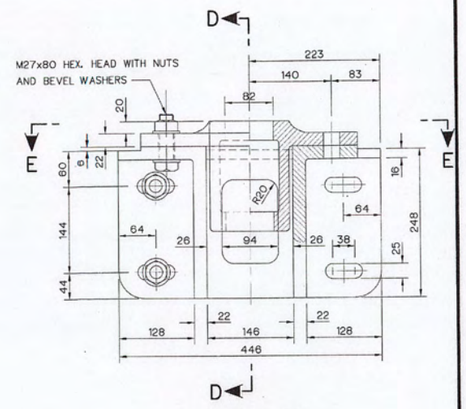
PLAN
NOT TO SCALE



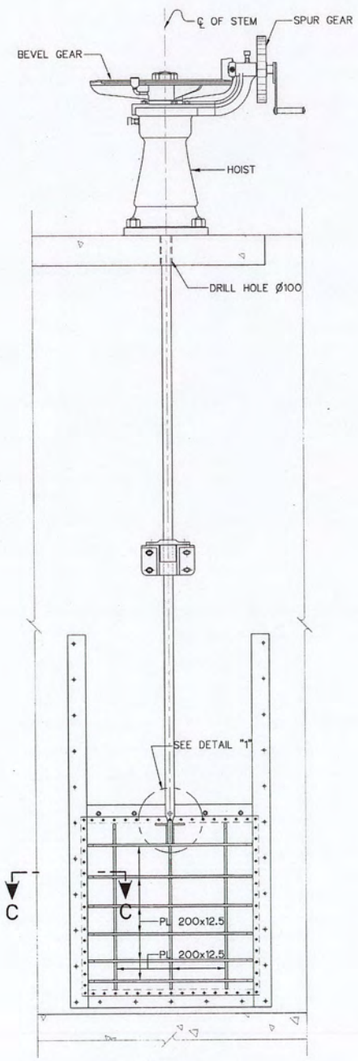
DETAIL "1"
NOT TO SCALE



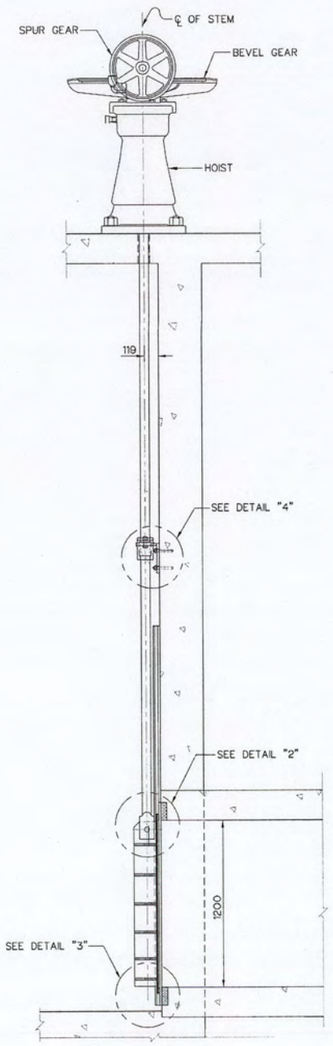
DETAIL "2"
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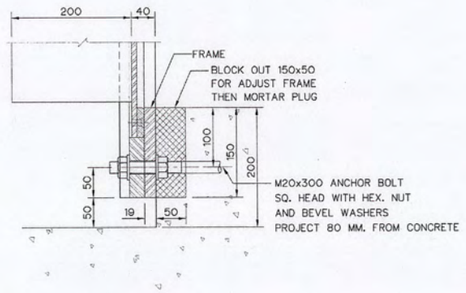
STEM GUIDE
NOT TO SCALE



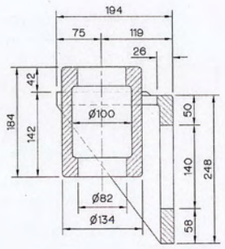
SECTION A–A
NOT TO SCALE



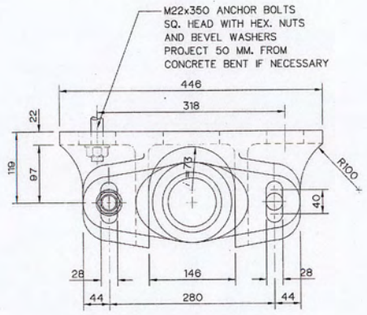
SECTION B–B
NOT TO SCALE



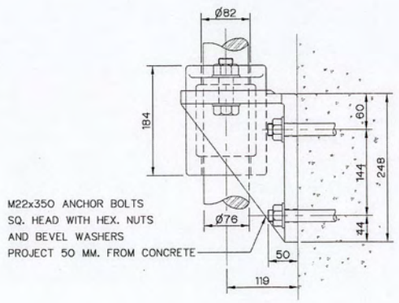
DETAIL "3"
SCALE 1:5



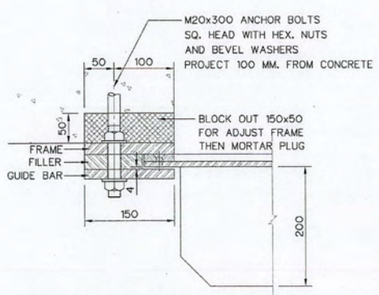
SECTION D–D
SCALE 1:5



SECTION E–E
SCALE 1:5



DETAIL "4"
SCALE 1:5



SECTION C–C
SCALE 1:5

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS, AND ELEVATION ARE IN METERS UNLESS OTHERWISE SHOWN.
2. ALL WELDING WILL BE 6 MILLIMETERS, UNLESS OTHERWISE SHOWN.
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6. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, THE CONTRACTOR HAS TO SUBMITTED SHOP DRAWING TO FIELD ENGINEER FOR APPROVAL.

REFERENCE DRAWINGS :

1. WEIR, PLAN AND SECTION A–A	AKP–WE–02
2. WEIR, 1.20x1.20 M. SLUICE GATE (SHEET 2/2)	AKP–WE–13
3. WEIR, GATE LIFT, CAPACITY 4.0 TONS	AKP–WE–14

0 0.10 0.20 0.30 0.40 0.50
SCALE 1:5 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS | DEDE

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

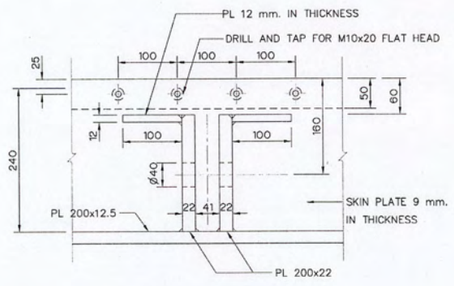
WEIR

1.20x1.20 M. SLUICE GATE (SHEET 1/2)

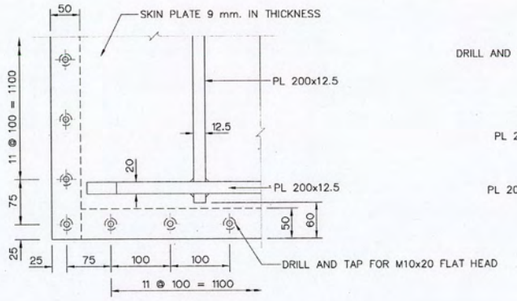
PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

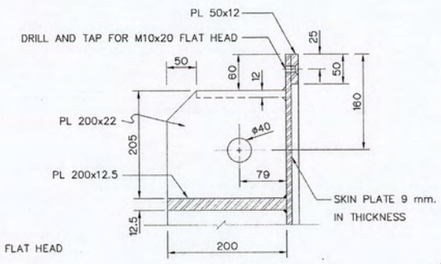
DESIGNED	REG.29074 REG.9462
DRAWN	
CHECKED	REG.8231
PROJECT MANAGER	28/10/2021 DATE
REVIEWED	
SUBMITTED	
RECOMMENDED	
APPROVED	
DRAWING NO.	AKP–WE–12
SHEET NO.	24 OF 129



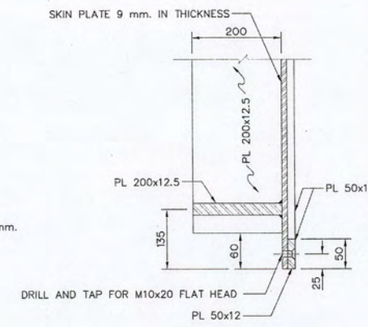
DETAIL "1"
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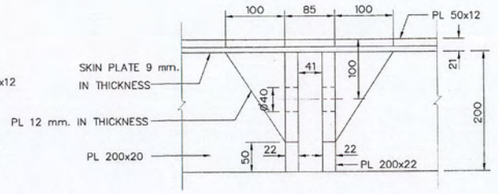
DETAIL "2"
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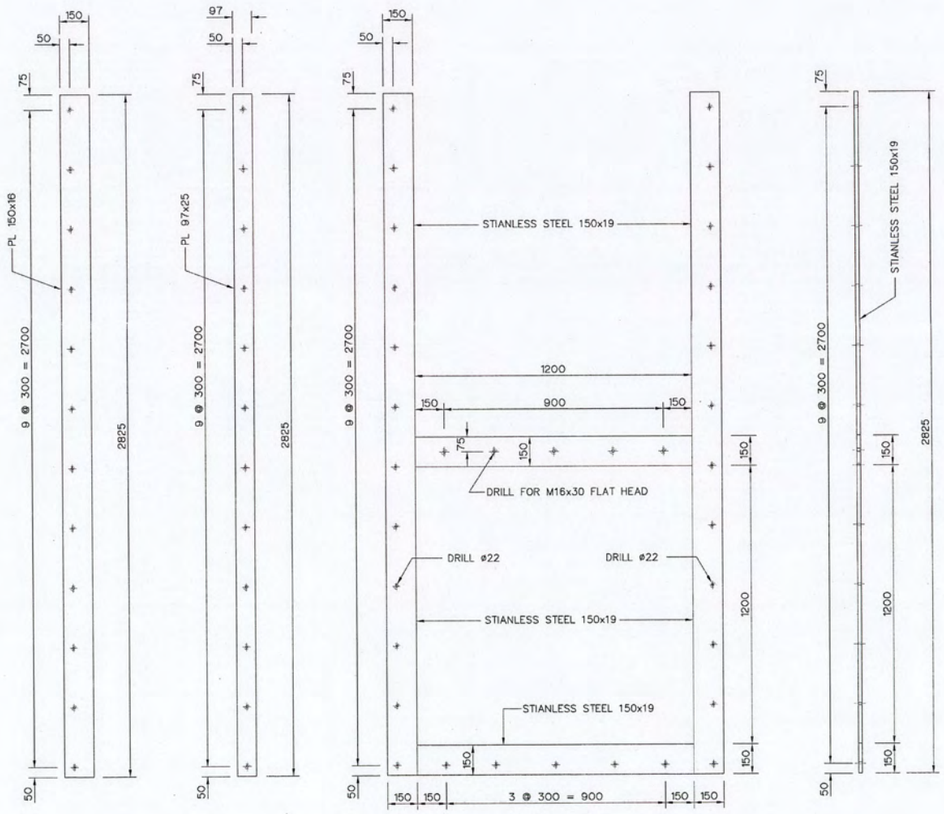
DETAIL "3"
NOT TO SCALE



DETAIL "4"
NOT TO SCALE



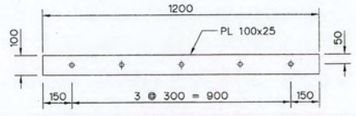
DETAIL "5"
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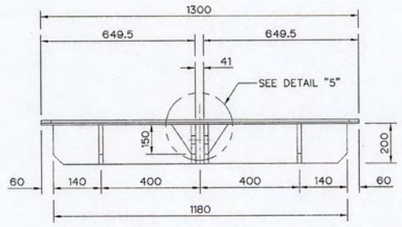
GUIDE BAR
NOT TO SCALE

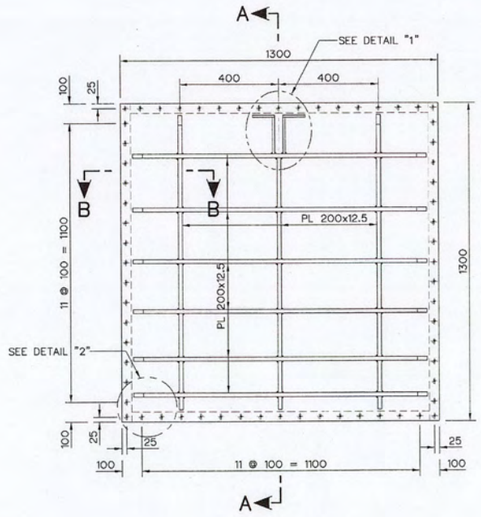
FILLER
NOT TO SCALE

FRAME
NOT TO SCALE

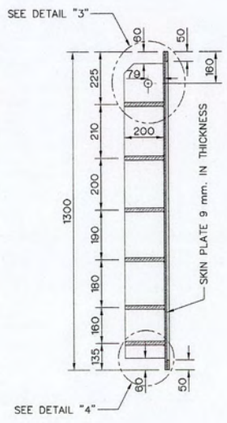


BOTTOM BAR
NOT TO SCALE

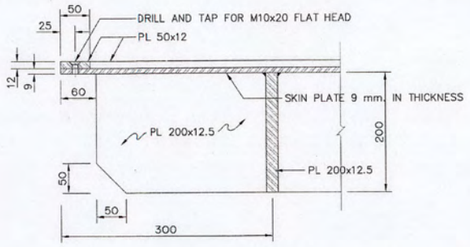




GATE LEAF
NOT TO SCALE



SECTION A-A
NOT TO SCALE



SECTION B-B
NOT TO SCALE

NOTES :

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REFERENCE DRAWINGS :

1. WEIR, PLAN AND SECTION A-A	AKP-WE-02
2. WIER, 120x1.20 M. SLUICE GATE (SHEET 1/2)	AKP-WE-12
3. WEIR, GATE LIFT, CAPACITY 4.0 TONS	AKP-WE-16

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

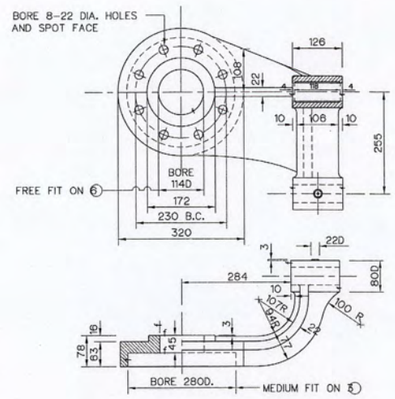
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

WEIR

1.20x1.20 M. SLUICE GATE (SHEET 2/2)

PCM P&C MANAGEMENT CO., LTD. / GPD SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED REE.29074 REE.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED REE.8231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-WE-13	SHEET NO. 25 OF 129



1

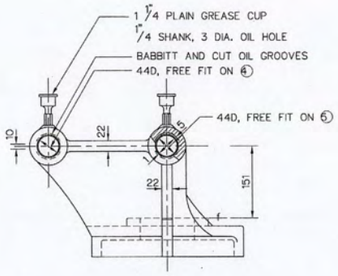
CAP AND BEARING

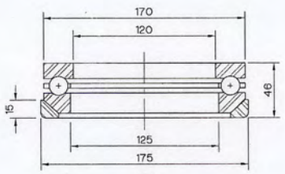
CAST IRON GG-18

ONE REQ'D

SCALE 1:7.5

50 KG.





2

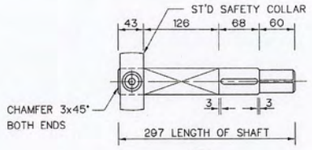
SINGLE-THRUST BALL BEARING

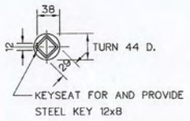
MIN. CAPACITY 9 TONNES @ 10 R.P.M.

TWO REQ'D

SCALE 1:2.5

2.5 KG.





4

SPUR PINION SHAFT

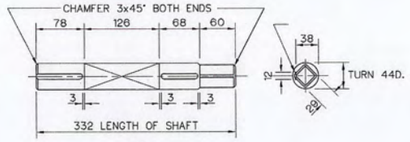
C.F. STEEL, ST 60.11

FINISH ALL OVER

ONE REQ'D

SCALE 1:5

4 KG.



5

BEVEL PINION SHAFT

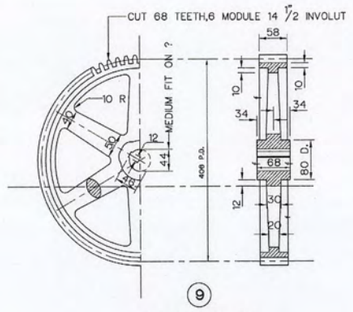
C.F. STEEL, ST 60.11

FINISH ALL OVER

ONE REQ'D

SCALE 1:5

1/2 KG.



9

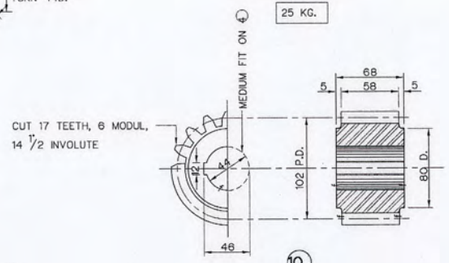
SPUR GEAR

CAST IRON GG-18

ONE REQ'D

SCALE 1:6

25 KG.



10

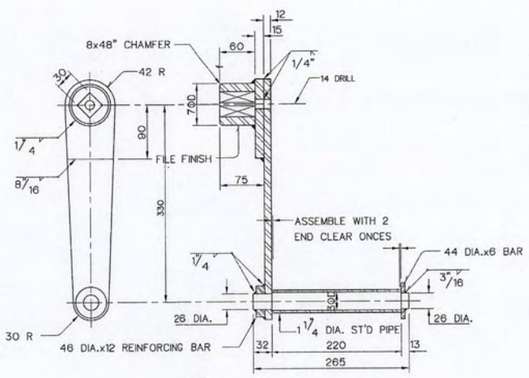
SPUR PINION

STEEL, ST 60.11

ONE REQ'D

SCALE 1:2

3 KG.



11

CRANK ARM

STEEL

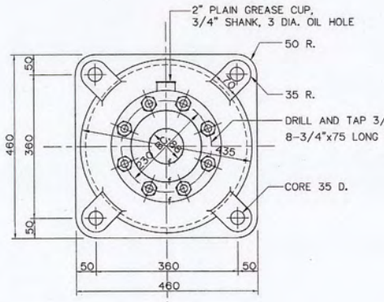
ONE REQ'D

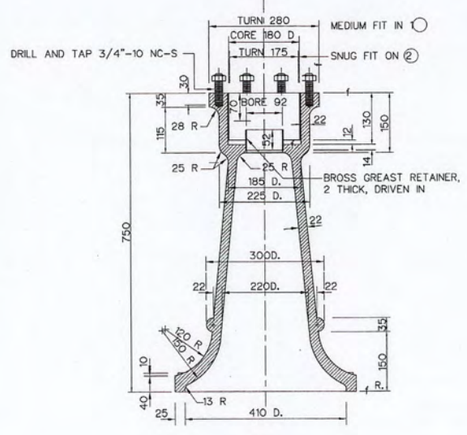
SCALE 1:5

6 KG.

NOTE

1. ALL DIMENSIONS GIVEN IN MILLIMETERS EXCEPT AS NOTED
2. 4-TONNE RATED CAPACITY IS FOR LIFT FURNISHED WITH SINGLE ACME THREADED STEM. TO CUT DOWN THE OPERATING TIME, MULTIPLE THREADS MAY BE ADOPTED AT THE SACRIFICS OF CAPACITY
3. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, THE CONTRACTOR HAS TO SUBMITTED SHOP DRAWING TO FIELD ENGINEER FOR APPROVAL.





3

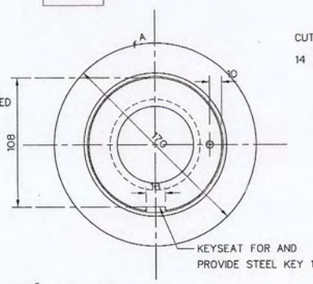
PEDESTAL

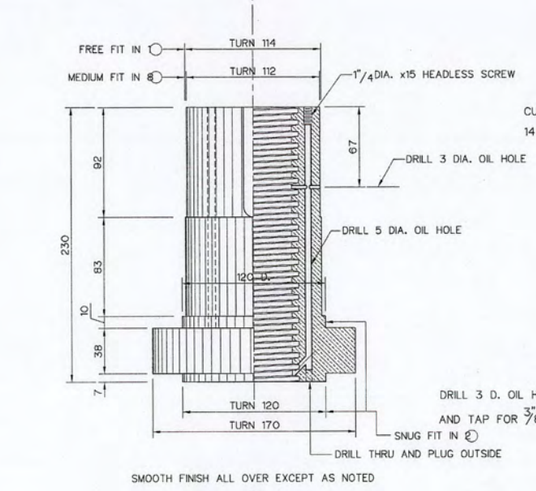
CAST IRON GG-18

ONE REQ'D

SCALE 1:7.5

140 KG.





SMOOTH FINISH ALL OVER EXCEPT AS NOTED

6

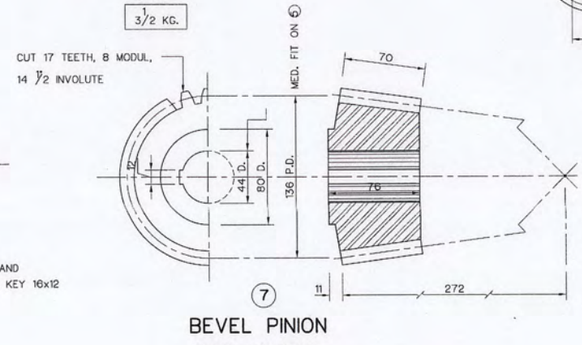
LIFTING NUT

PHOSPHOR BRONZE

ONE REQ'D

SCALE 1:2.5

17 KG.



7

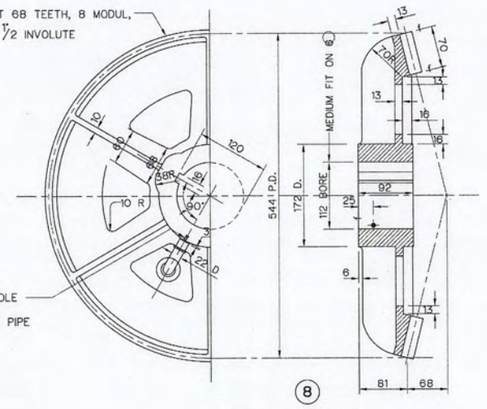
BEVEL PINION

STEEL, ST 60.11

ONE REQ'D

SCALE 1:2.5

8 KG.



8

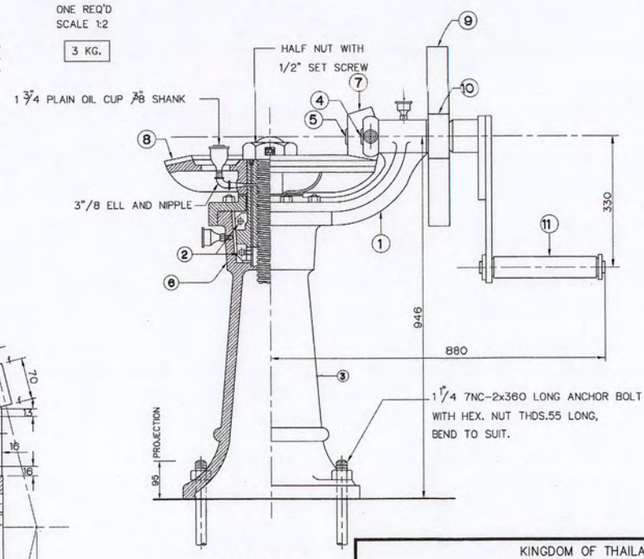
BEVEL GEAR

CAST IRON GG-18

ONE REQ'D

SCALE 1:5

40 KG.



ASSEMBLY

SCALE 1:7.5

310 KG.

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

WEIR

GATE LIFT, CAPACITY 4.0 TONS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS: P&C MANAGEMENT CO., LTD.; SPT CONSULTANTS CO., LTD.

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

DESIGNED [illegible] วิบ.29074 [illegible] วิบ.9462

DRAWN [illegible]

CHECKED [illegible] วิบ.8231

PROJECT MANAGER [illegible] 28/10/2021 DATE

REVIEWED [illegible]

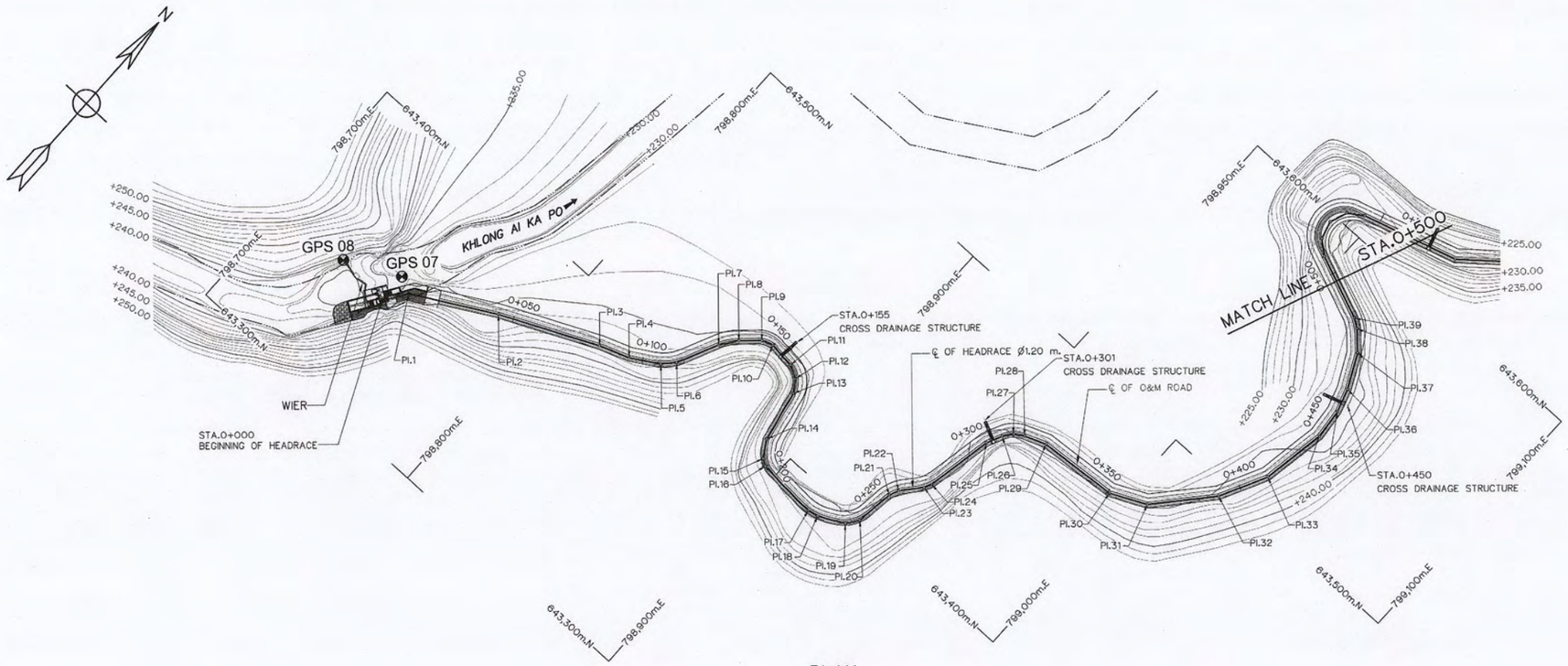
SUBMITTED [illegible]

RECOMMENDED [illegible]

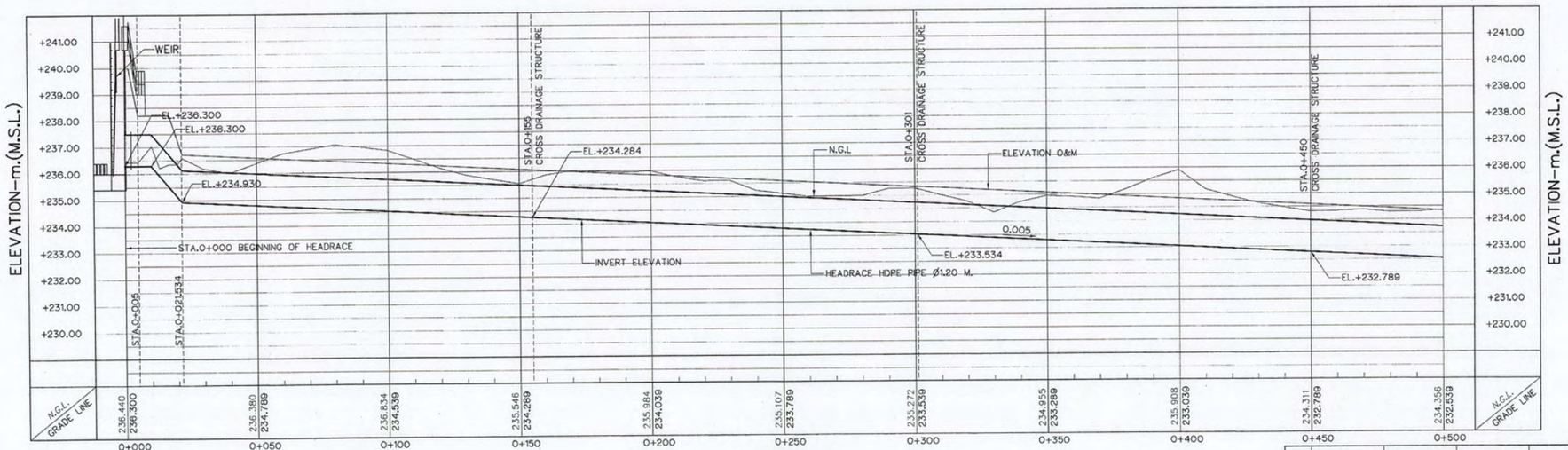
APPROVED [illegible]

DRAWING NO. AKP-WE-14

SHEET NO. 26 OF 129



PLAN
SCALE 1:1,000



PROFILE
VERTICAL SCALE 1:100
HORIZONTAL SCALE 1:1,000

NOTES :

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

REFERENCE DRAWINGS :

1. HEADRACE, PLAN AND PROFILE, STA.0+500 TO STA.0+699.439	AKP-HR-02
2. HEADRACE, DATA CURVE OF HEADRACE	AKP-HR-03
3. HEADRACE, TYPICAL SECTIONS AND DETAILS	AKP-HR-04
4. HEADRACE, TYPICAL CROSS DRAINAGE AND DETAILS	AKP-HR-05
5. HEADRACE, CONCRETE LINING, HORIZONTAL BEND AND JOINT	AKP-HR-06

0 1 2 4 6 8
SCALE 1:100 METERS

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

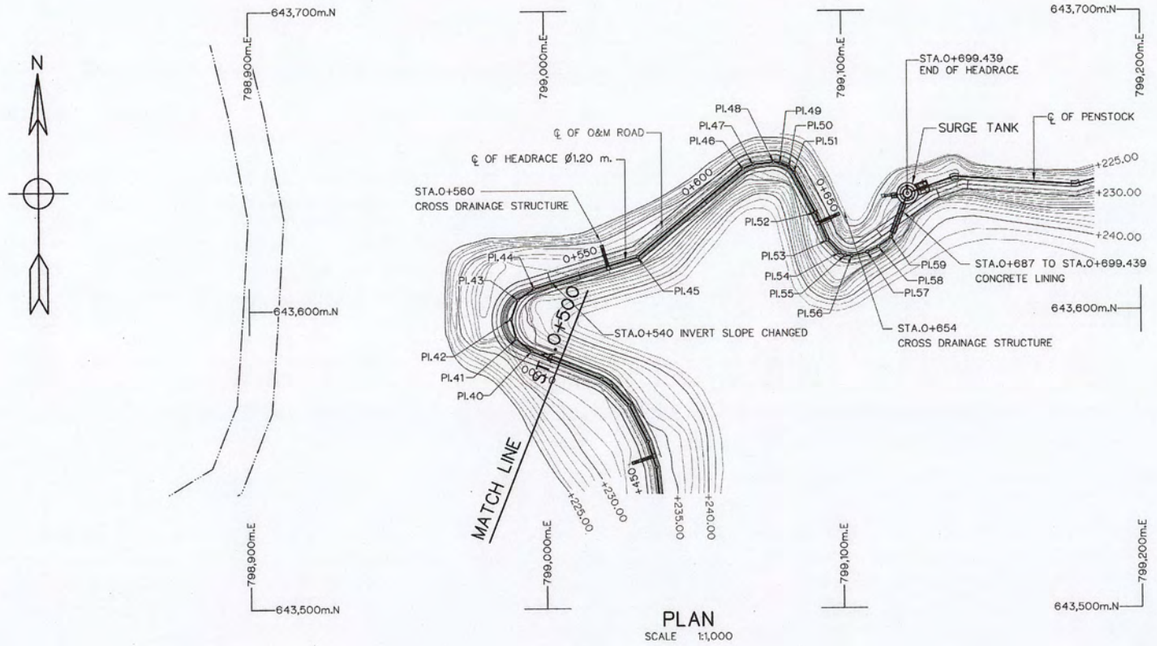
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
		CONSULTANTS	DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

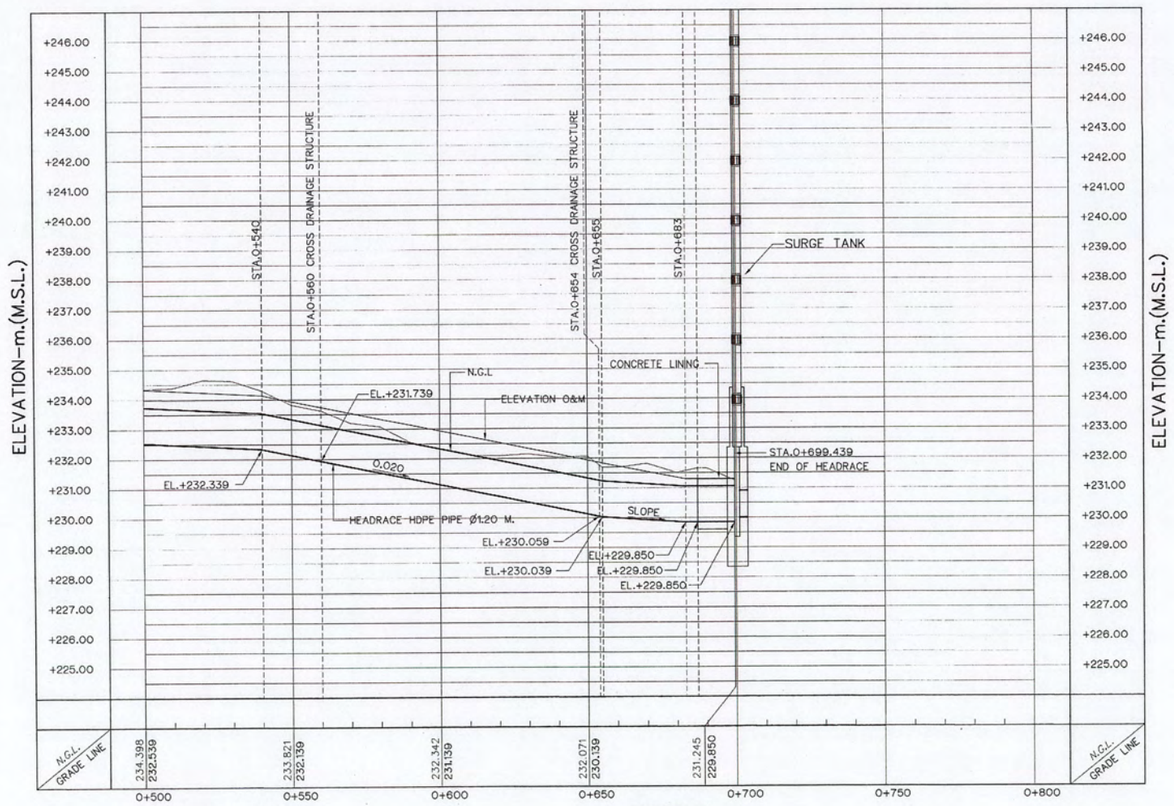
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
HEADRACE
PLAN AND PROFILE, STA.0+000 TO STA.0+500

P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED	REVIEWED
DRAWN	SUBMITTED
CHECKED	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-HR-01	SHEET NO. 27 OF 129



PLAN

SCALE 1:1,000



PROFILE

VERTICAL SCALE 1:100

HORIZONTAL SCALE 1:1,000

NOTES :

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

REFERENCE DRAWINGS :

1. HEADRACE, PLAN AND PROFILE, STA.0+000 TO STA.0+500	AKP-HR-01
2. HEADRACE, DATA CURVE OF HEADRACE	AKP-HR-03
3. HEADRACE, TYPICAL SECTIONS AND DETAILS	AKP-HR-04
4. HEADRACE, TYPICAL CROSS DRAINAGE AND DETAILS	AKP-HR-05
5. HEADRACE, CONCRETE LINING, HORIZONTAL BEND AND JOINT	AKP-HR-06

0 1 2 4 6 8

SCALE 1:100 METERS

0 10 20 40 50 80

SCALE 1:1,000 METERS

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

AI KA PO HYDROPOWER PROJECT

TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

HEADRACE

PLAN AND PROFILE, STA.0+500 TO STA.0+699.439

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS: P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.

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

DESIGNED REG.29074 REG.9462

DRAWN

CHECKED REG.8231

PROJECT MANAGER 28/10/2021 DATE

REVIEWED

SUBMITTED

RECOMMENDED

APPROVED

DRAWING NO. AKP-HR-02

SHEET NO. 28 OF 129

HORIZONTAL ALIGNMENT DATA CURVE OF HEADRACE

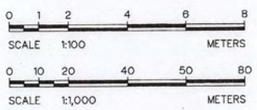
NO. PI.	COORDINATE		PI. – PI.	DEFLECTION ANGLE	PI. STA.	BEARING
	N	E	(m)	(° – ' – ")	(km)	(N/S ° – ' – " E/W)
B	643,341.931	798,749.620	–	–	0+000.000	N 33°-12'-59.48" E
PI.1	643,350.578	798,755.282	10.336	27°-27'-43.25"	0+010.336	N 60°-40'-42.72" E
PI.2	643,367.173	798,784.828	33.887	4°-23'-45.02"	0+044.223	N 65°-04'-27.74" E
PI.3	643,383.636	798,820.253	39.064	4°-44'-11.90"	0+083.287	N 69°-48'-39.65" E
PI.4	643,387.865	798,831.210	11.674	10°-17'-46.47"	0+094.961	N 59°-30'-53.18" E
PI.5	643,393.655	798,841.385	11.807	17°-6'-48.85"	0+106.768	N 42°-24'-04.33" E
PI.6	643,397.985	798,845.339	5.864	17°-6'-20.06"	0+112.632	N 25°-17'-44.27" E
PI.7	643,413.243	798,852.550	16.876	10°-55'-54.70"	0+129.508	N 36°-13'-38.97" E
PI.8	643,419.373	798,857.041	7.599	10°-55'-34.29"	0+137.107	N 47°-09'-13.25" E
PI.9	643,425.131	798,863.249	8.467	24°-17'-29.13"	0+145.574	N 71°-26'-42.39" E
PI.10	643,426.525	798,867.402	4.381	24°-18'-12.10"	0+149.955	S 84°-15'-05.52" E
PI.11	643,425.545	798,877.137	9.784	22°-38'-33.09"	0+159.739	S 61°-36'-32.43" E
PI.12	643,422.989	798,881.866	5.376	27°-43'-36.49"	0+165.115	S 33°-52'-55.94" E
PI.13	643,418.526	798,884.863	5.376	22°-38'-58.78"	0+170.491	S 11°-13'-57.16" E
PI.14	643,399.442	798,888.653	19.457	20°-6'-17.45"	0+189.948	S 31°-20'-14.62" E
PI.15	643,393.175	798,892.469	7.337	27°-28'-55.73"	0+197.285	S 58°-49'-10.35" E
PI.16	643,391.696	798,894.913	2.857	27°-27'-25.03"	0+200.142	S 86°-16'-35.38" E
PI.17	643,390.223	798,917.547	22.682	15°-24'-44.60"	0+222.824	N 78°-18'-40.02" E
PI.18	643,391.028	798,921.438	3.973	15°-24'-10.60"	0+226.797	N 62°-54'-29.42" E
PI.19	643,395.813	798,930.792	10.507	27°-55'-13.52"	0+237.304	N 34°-59'-15.91" E
PI.20	643,400.318	798,933.945	5.499	27°-54'-57.40"	0+242.803	N 07°-04'-18.51" E
PI.21	643,414.368	798,935.688	14.158	16°-37'-48.53"	0+256.960	N 23°-42'-07.04" E
PI.22	643,417.762	798,937.178	3.707	16°-38'-24.38"	0+260.667	N 40°-20'-31.42" E
PI.23	643,425.016	798,943.339	9.517	14°-48'-21.46"	0+270.184	N 25°-32'-09.96" E
PI.24	643,427.735	798,944.638	3.013	14°-47'-41.06"	0+273.198	N 10°-44'-28.90" E
PI.25	643,452.511	798,949.338	25.218	14°-49'-12.17"	0+298.415	N 25°-33'-41.07" E
PI.26	643,458.131	798,952.026	6.230	10°-43'-4.90"	0+304.645	N 36°-16'-45.97" E
PI.27	643,461.526	798,954.518	4.211	21°-28'-32.86"	0+308.857	N 57°-45'-18.83" E
PI.28	643,463.773	798,958.080	4.212	10°-43'-17.24"	0+313.068	N 68°-28'-36.07" E
PI.29	643,466.861	798,965.910	8.417	16°-58'-36.13"	0+321.485	N 85°-27'-12.21" E
PI.30	643,469.195	798,995.261	29.444	21°-0'-36.25"	0+350.929	N 64°-26'-35.96" E
PI.31	643,475.389	799,008.214	14.358	23°-17'-18.49"	0+365.286	N 41°-09'-17.47" E
PI.32	643,495.110	799,025.451	26.192	14°-35'-13.79"	0+391.479	N 26°-34'-03.68" E
PI.33	643,512.490	799,034.142	19.432	16°-55'-58.08"	0+410.910	N 09°-38'-05.60" E
PI.34	643,536.276	799,038.180	24.126	15°-38'-2.36"	0+435.037	N 05°-59'-56.77" W
PI.35	643,547.419	799,037.009	11.204	11°-49'-41.60"	0+446.241	N 17°-49'-38.37" W
PI.36	643,555.992	799,034.252	9.005	8°-54'-54.71"	0+455.247	N 26°-44'-33.09" W
PI.37	643,568.241	799,028.080	13.716	16°-24'-17.73"	0+468.963	N 43°-08'-50.82" W
PI.38	643,574.800	799,021.932	8.990	12°-31'-37.01"	0+477.953	N 55°-40'-27.83" W
PI.39	643,577.056	799,018.628	4.001	12°-30'-52.10"	0+481.953	N 68°-11'-19.94" W
PI.40	643,586.411	798,995.252	25.178	17°-41'-36.11"	0+507.132	N 50°-29'-43.83" W
PI.41	643,590.596	798,990.176	6.579	35°-23'-2.35"	0+513.711	N 15°-06'-41.47" W
PI.42	643,597.184	798,988.397	6.824	35°-23'-50.40"	0+520.534	N 20°-17'-08.92" E
PI.43	643,603.585	798,990.763	6.824	35°-23'-28.81"	0+527.359	N 55°-40'-37.74" E
PI.44	643,607.295	798,996.197	6.580	17°-41'-40.30"	0+533.938	N 73°-22'-18.03" E
PI.45	643,617.769	799,031.268	36.602	22°-53'-22.27"	0+570.540	N 50°-28'-55.77" E
PI.46	643,647.134	798,066.868	46.148	16°-15'-1.52"	0+616.688	N 66°-43'-57.28" E
PI.47	643,648.602	799,070.282	3.716	16°-14'-3.59"	0+620.405	N 82°-58'-00.87" E
PI.48	643,649.435	799,077.034	6.803	17°-21'-32.07"	0+627.208	S 79°-40'-27.05" E
PI.49	643,648.997	799,079.438	2.444	15°-19'-13.56"	0+629.651	S 64°-21'-13.50" E
PI.50	643,647.633	799,082.279	3.151	19°-28'-8.52"	0+632.803	S 44°-53'-04.98" E
PI.51	643,645.890	799,084.015	2.460	17°-21'-30.10"	0+635.263	S 27°-31'-34.88" E
PI.52	643,632.416	799,091.037	15.194	3°-54'-25.74"	0+650.457	S 23°-37'-09.14" E
PI.53	643,623.255	799,095.043	9.999	20°-16'-52.96"	0+660.455	S 43°-54'-02.10" E
PI.54	643,619.088	799,099.055	5.786	19°-12'-52.13"	0+666.241	S 63°-06'-54.23" E
PI.55	643,618.108	799,100.984	2.163	21°-57'-15.08"	0+668.404	S 85°-04'-09.31" E
PI.56	643,617.922	799,103.140	2.164	19°-13'-46.66"	0+670.568	N 75°-42'-04.04" E
PI.57	643,619.268	799,108.421	5.450	10°-50'-53.81"	0+676.018	N 64°-51'-10.22" E
PI.58	643,620.973	799,112.053	4.012	10°-49'-55.52"	0+680.030	N 54°-01'-14.70" E
PI.59	643,624.110	799,116.374	5.340	33°-11'-22.81"	0+685.370	N 20°-49'-51.89" E
E	643,637.259	799,121.377	14.069	–	0+699.439	–

NOTES :

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

REFERENCE DRAWINGS :

1. HEADRACE, PLAN AND PROFILE, STA.0+000 TO STA.0+500 AKP-HR-01
2. HEADRACE, PLAN AND PROFILE, STA.0+500 TO STA.0+699.439 AKP-HR-02



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
HEADRACE
DATA CURVE OF HEADRACE

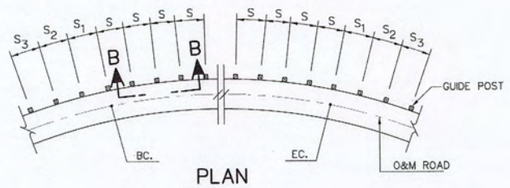
PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

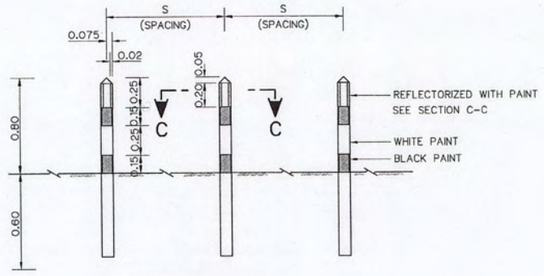
DESIGNED RB.29074 RB.9462
DRAWN
CHECKED RB.8231
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

28/10/2021
PROJECT MANAGER DATE

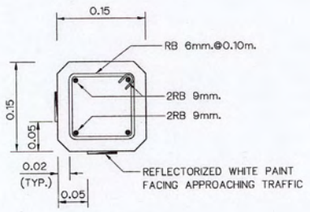
DRAWING NO. AKP-HR-03
SHEET NO. 29 OF 129



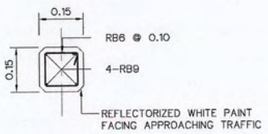
PLAN
NOT TO SCALE

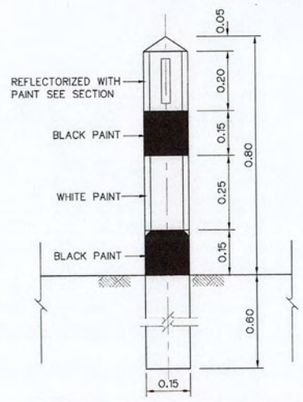


SECTION B-B
NOT TO SCALE
GUIDE POSTS

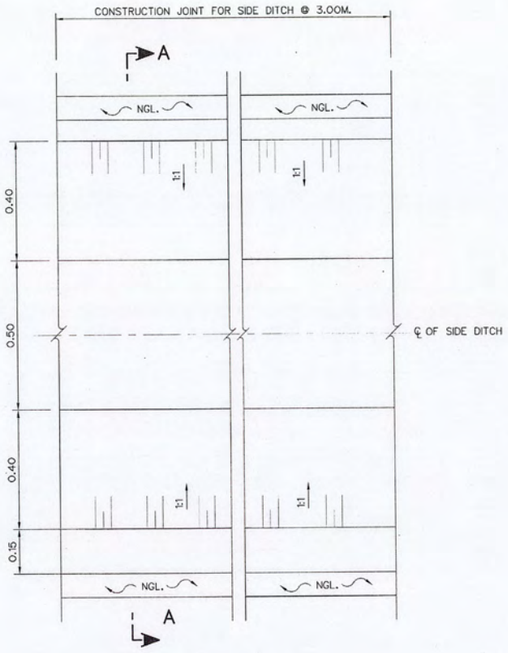


SECTION C-C
NOT TO SCALE





DETAIL OF GUIDE POST
SCALE 1:10



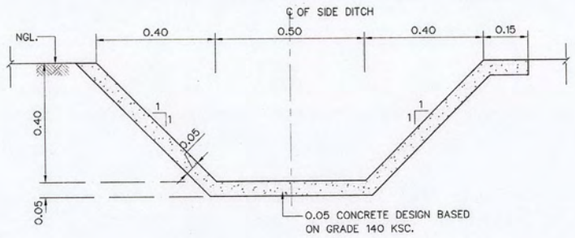
DETAIL OF SIDE DITCH
SCALE 1:10

TABLE 1 TABLE OF CUT SLOPE

TYPE OF GROUND	SLOPE 1:H
EARTH	1:1
MODERATELY WEATHERED ROCK	1:0.5
FRESH ROCK	1:0.25

TABLE 2 TABLE OF FILL SLOPE

TYPE OF GROUND	SLOPE 1:H
EARTH	1:1.5
MODERATELY WEATHERED ROCK	1:1
FRESH ROCK	1:1



SECTION A-A
SCALE 1:10

TABLE 3

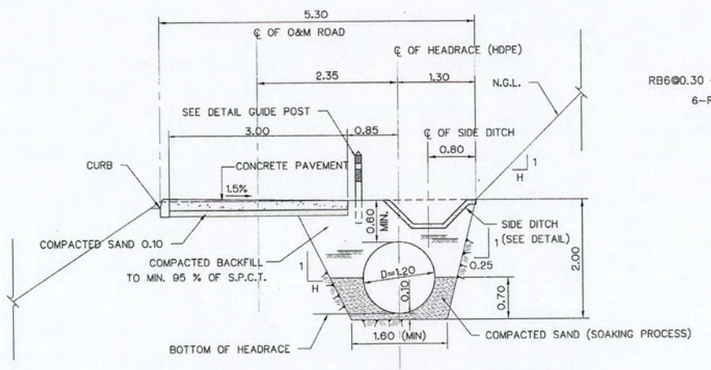
SPACING OF GUIDE POSTS				
RADIUS M.	S M.	S1 M.	S2 M.	S3 M.
15 - 74	4	8	12	24
75 - 99	6	12	18	36
LARGER THAN 100	NO GUIDE POSTS INSTALLED			

NOTES :

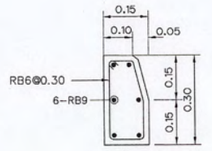
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP-GN-03
3. GUIDE POSTS ARE REQUIRED AT EVERY BENDS AND BETWEEN BENDS WITH MAXIMUM 10.00 M. SPACING.
4. THE SOIL/ROCK TYPE SHALL BE CONSIDERED DIRECT BY FIELD ENGINEER.
5. BEFOR EXCAVATION SHOULD BE EVALUATED AND ANALYSIS BY FIELD GEOTECHNICAL ENGINEER OR ENGINEERING GEOLOGIST.
6. IN CASE OF DEEP CUT/HIGH FILL AT DOUBTFUL AREA, IT IS THE CONTRACTOR'S RESPONSIBILITY TO CORRECT AND/OR ADJUST THE RELEVENT DRAWINGS TO OBTAIN FIELD ENGINEER APPROVAL.
7. BENCHING SHALL BE REQUIRED ON EXISTING GROUND SLOPE IN THE PORTION OF EMBANKMENT. THE NUMBER OF STEPS DEPENDED UPON THE HEIGHT AND STABILITY OF SLOPE CONSIDERED BY FIELD ENGINEER. THE WIDTH SHALL BE PERMITTED FOR COMPACTED EQUIPMENT. DENSITY OF COMPACTED MATERIAL SHALL NOT BE LESS THAN 95% OF STANDARD PROCTOR.

REFERENCE DRAWINGS :

1. HEADRACE, PLAN AND PROFILE, STA.0+000 TO STA.0+500	AKP-HR-01
2. HEADRACE, PLAN AND PROFILE, STA.0+500 TO STA.0+699.439	AKP-HR-02
3. O&M ROAD, PLAN AND PROFILE, STA.0+000 TO STA.0+500	AKP-OM-01
4. O&M ROAD, PLAN AND PROFILE, STA.0+500 TO STA.1+000	AKP-OM-02



TYPICAL SECTIONS AND DETAIL OF HEADRACE
SCALE 1:50



CURB DETAIL
SCALE 1:10

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

0 0.5 1.0 2.0 3.0 4.0
SCALE 1:50 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

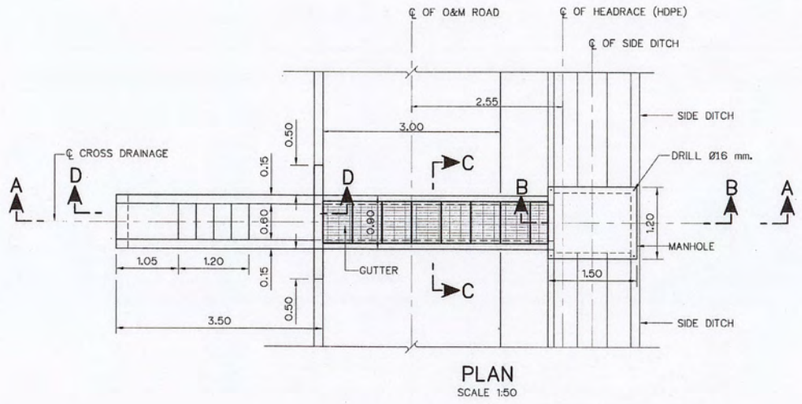
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

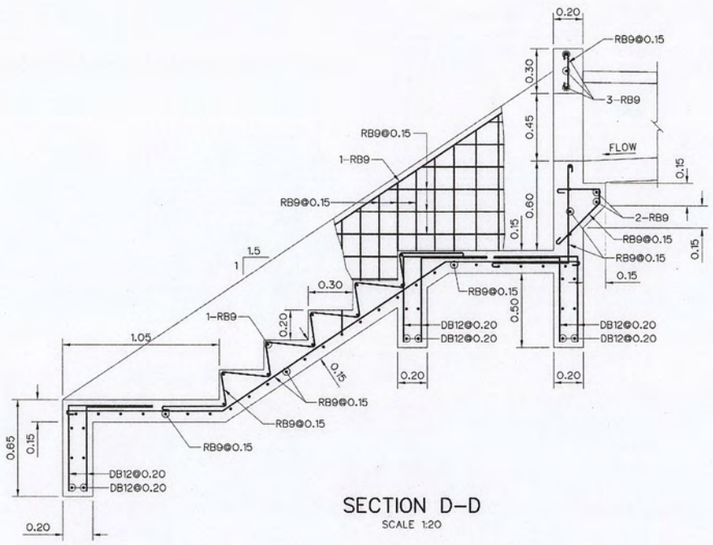
HEADRACE

TYPICAL SECTIONS AND DETAILS

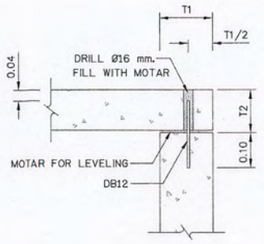
PCM P&C MANAGEMENT CO., LTD. / GPT SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED RB.29074 RB.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED RB.8231	RECOMMENDED
28/10/2021 PROJECT MANAGER DATE	APPROVED
DRAWING NO. AKP-HR-04	SHEET NO. 30 OF 129



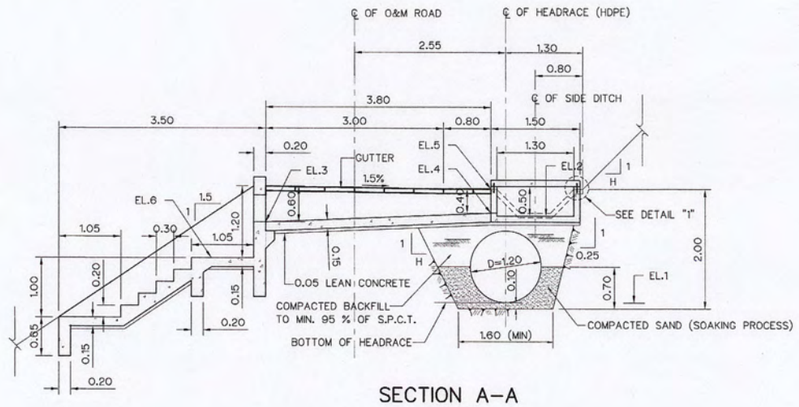
PLAN
SCALE 1:50



SECTION D–D
SCALE 1:20



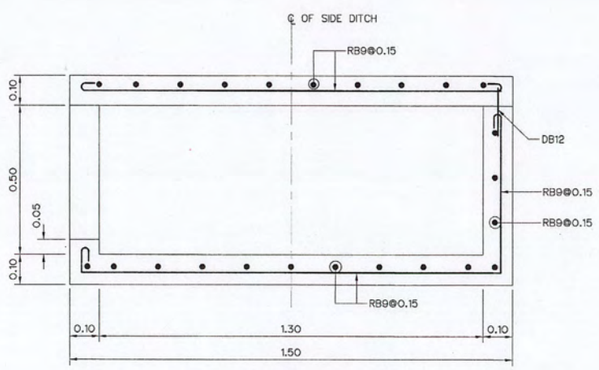
DETAIL "1"
NON TO SCALE



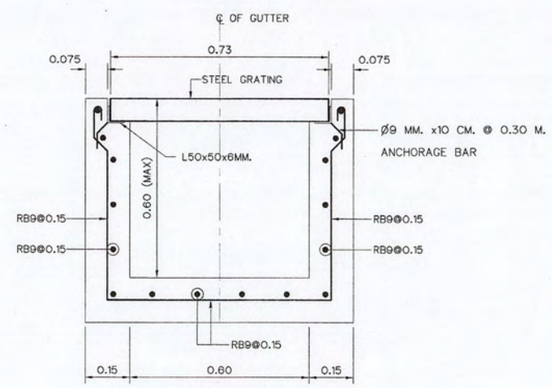
SECTION A–A
SCALE 1:50

INSTALLATION DATA OF CROSS DRAINAGE STRUCTURES

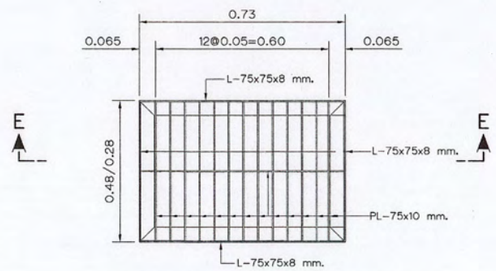
STA.	FLOW DIRECTION	ELEVATION (m.MSL.)					
		EL.1	EL.2	EL.3	EL.4	EL.5	EL.6
0+155	RIGTH TO LEFT	234.284	235.634	235.529	235.684	236.084	234.929
0+301	RIGTH TO LEFT	233.534	234.884	234.779	234.934	235.334	234.179
0+450	RIGTH TO LEFT	232.789	234.139	234.034	234.189	234.589	233.434
0+560	RIGTH TO LEFT	231.739	233.089	232.984	233.139	233.539	232.384
0+654	RIGTH TO LEFT	230.059	231.409	231.304	231.459	231.859	230.704



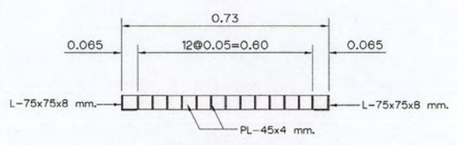
SECTION B–B
SCALE 1:10



SECTION C–C
SCALE 1:10



DETAIL OF STEEL GUTTER
SCALE 1:10



SECTION E–E
SCALE 1:10

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP–GN–03
3. DRESSING OF GROUND TO SUIT THE STRUCTURE TO BE DETERMINED IN THE FIELD.

REFERENCE DRAWINGS :

1. HEADRACE, PLAN AND PROFILE, KM. 0+000 TO KM. 0+500 AKP–HR–01
2. HEADRACE, PLAN AND PROFILE, KM. 0+500 TO KM. 0+699.439 AKP–HR–02

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

0 0.5 1.0 2.0 3.0 4.0
SCALE 1:50 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

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PART : 1 CIVIL WORKS AND TRANSMISSION LINE
HEADRACE
TYPICAL CROSS DRAINAGE AND DETAILS

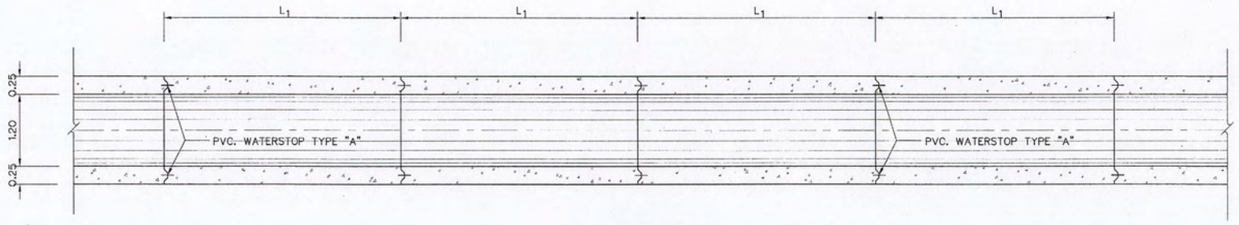
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DESIGNED ส.ต.29074 ส.ต.9462
DRAWN
CHECKED ส.ต.8231
PROJECT MANAGER 28/10/2021 DATE

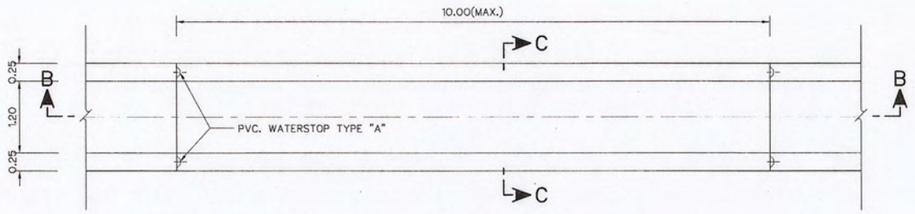
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP–HR–05
SHEET NO. 31 OF 129



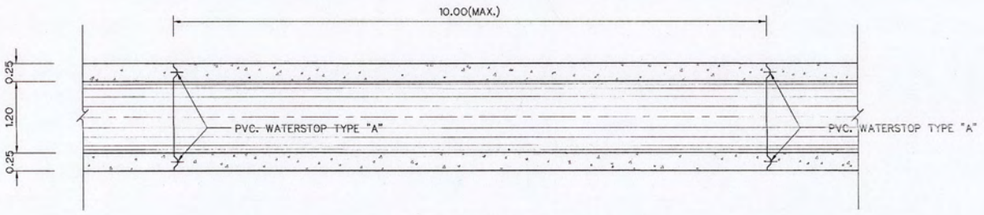
SECTION A–A

NOT TO SCALE



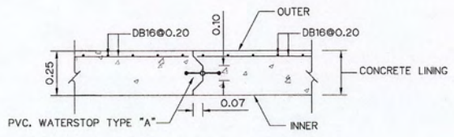
PLAN

NOT TO SCALE



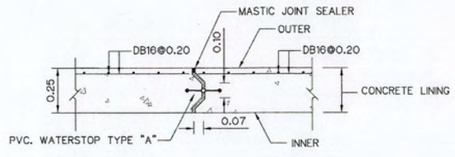
SECTION B–B

NOT TO SCALE



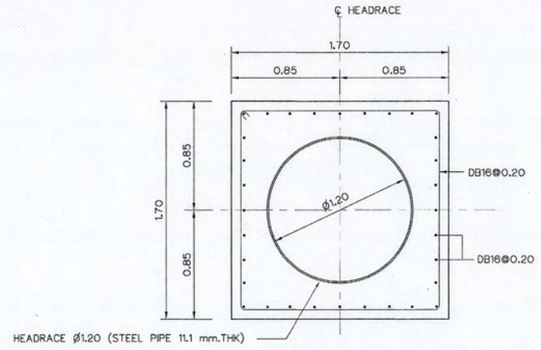
CONTRACTION JOINT @ 10 M. (MAX.)

SCALE 1:20



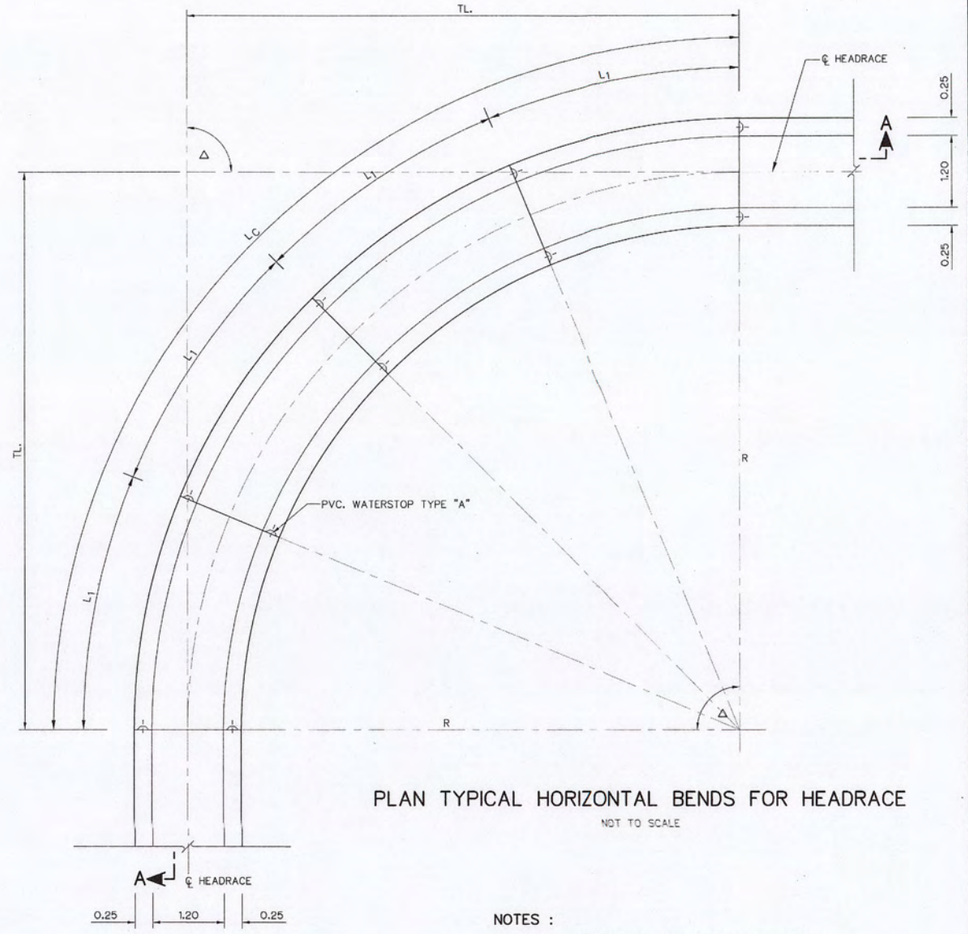
EXPANSION JOINT @ 30 M.

SCALE 1:20



SECTION C–C

NOT TO SCALE



PLAN TYPICAL HORIZONTAL BENDS FOR HEADRACE

NOT TO SCALE

TABLE DETAIL HEADRACE IN HORIZONAL CURVE

CASE	CONDITION	N (UNIT)	L1 (M.)
1	LC ≤ 10.00 M.	1	LC
2	LC > 10.00 M.	1+INT $\left[\frac{LC}{10}\right]$	$\frac{LC}{N}$

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP–GN–03
3. SYMBOL AND ABBREVIATIONS
   - Δ = DEFLECTION ANGLE
   - R = RADIUS
   - TL. = LENGTH OF TANGENT
   - LC. = LENGTH OF CURVE
   - N = NUMBER OF UNIT HEADRACE IN CURVE
   - L1 = LENGTH OF UNIT HEADRACE
   - INT = INTEGER
4. GUIDE POSTS ARE REQURED AT EVERY BENDS AND BETWEEN BENDS WITH MAXIMUM 10.00 M. SPACING.
5. EXPANSION JOINT ARE REQUIRED AT 30 M. SPACING.

0 0.5 1.0 1.5

SCALE 1:20 METERS

REFERENCE DRAWINGS :

1. HEADRACE, PLAN AND PROFILE, STA.0+500 TO STA.0+699.439

AKP–HR–02

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3				
2				
1				
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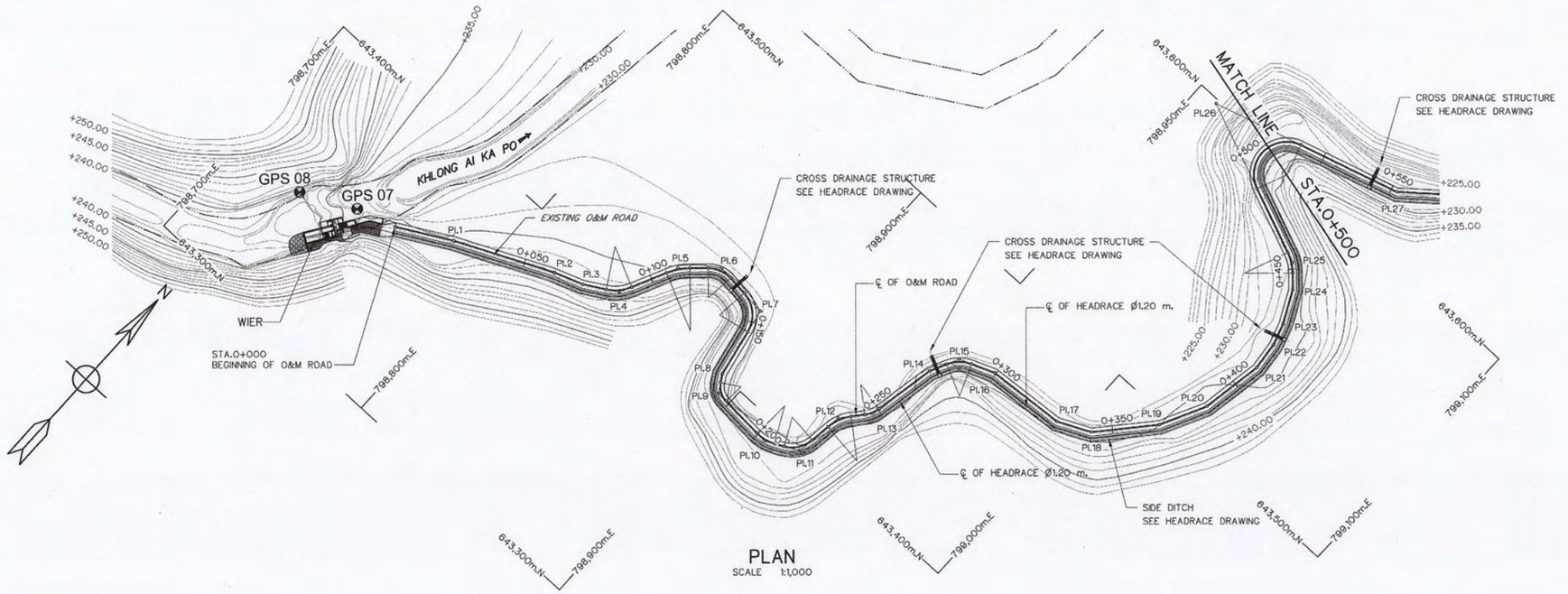
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

HEADRACE

CONCRETE LINING, HORIZONTAL BEND AND JOINT

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DESIGNED RSI.29074 RSI.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED RSI.8231	RECOMMENDED
28/10/2021	APPROVED
PROJECT MANAGER DATE	DRAWING NO. AKP–HR–06 / SHEET NO. 32 OF 129



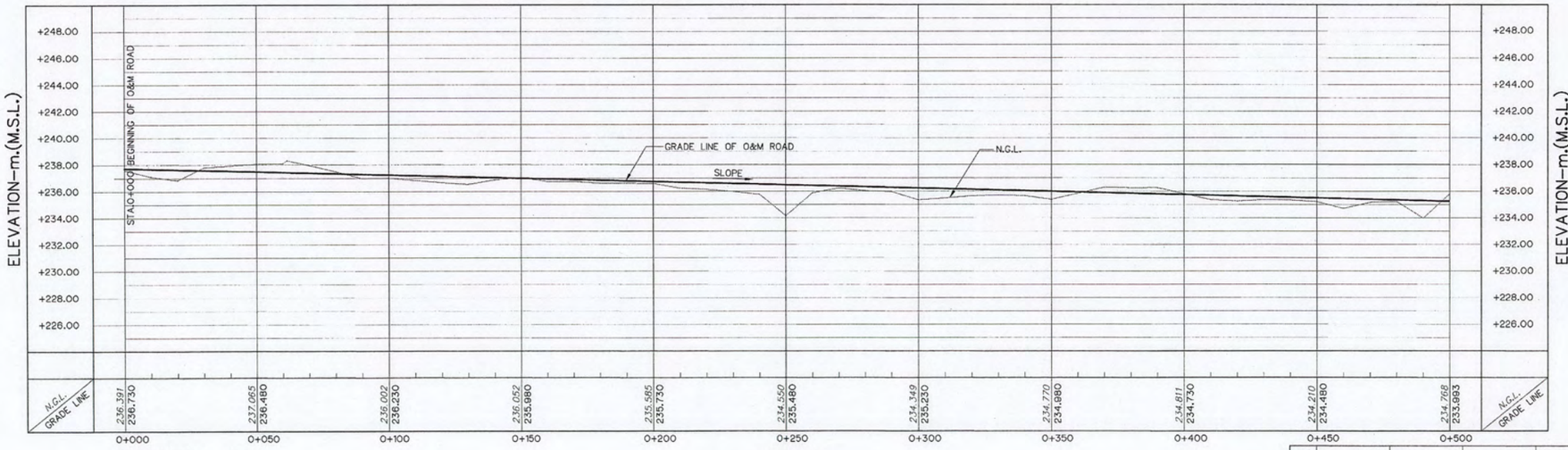
PLAN
SCALE 1:1,000

NOTES :

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

REFERENCE DRAWINGS :

1. O&M ROAD, PLAN AND PROFILE, STA. 0+500 TO STA. 1+000	AKP-OM-02
2. O&M ROAD, TYPICAL SECTIONS AND DETAILS	AKP-OM-05
3. HEADRACE, TYPICAL SECTIONS AND DETAILS	AKP-HR-04



PROFILE
VERTICAL SCALE 1:200
HORIZONTAL SCALE 1:1,000

0 5 10 15
SCALE 1:200 METERS

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

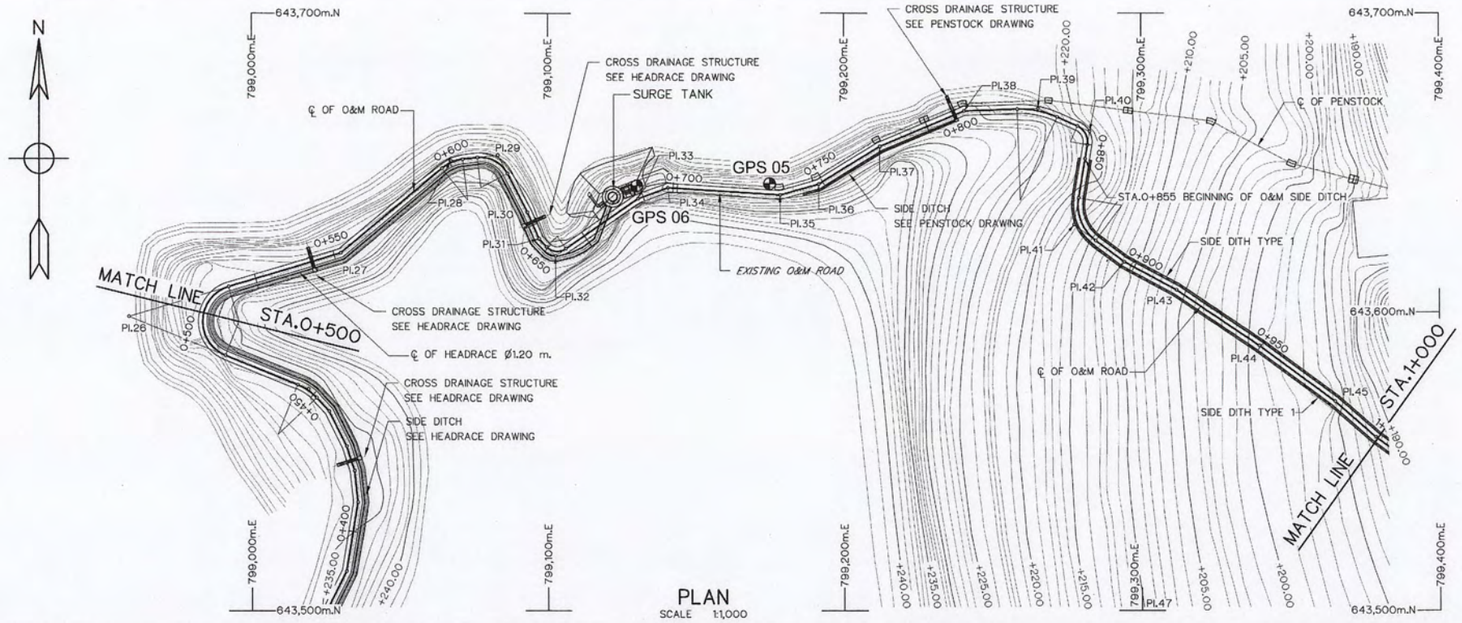
O&M ROAD

PLAN AND PROFILE, STA. 0+000 TO STA. 0+500

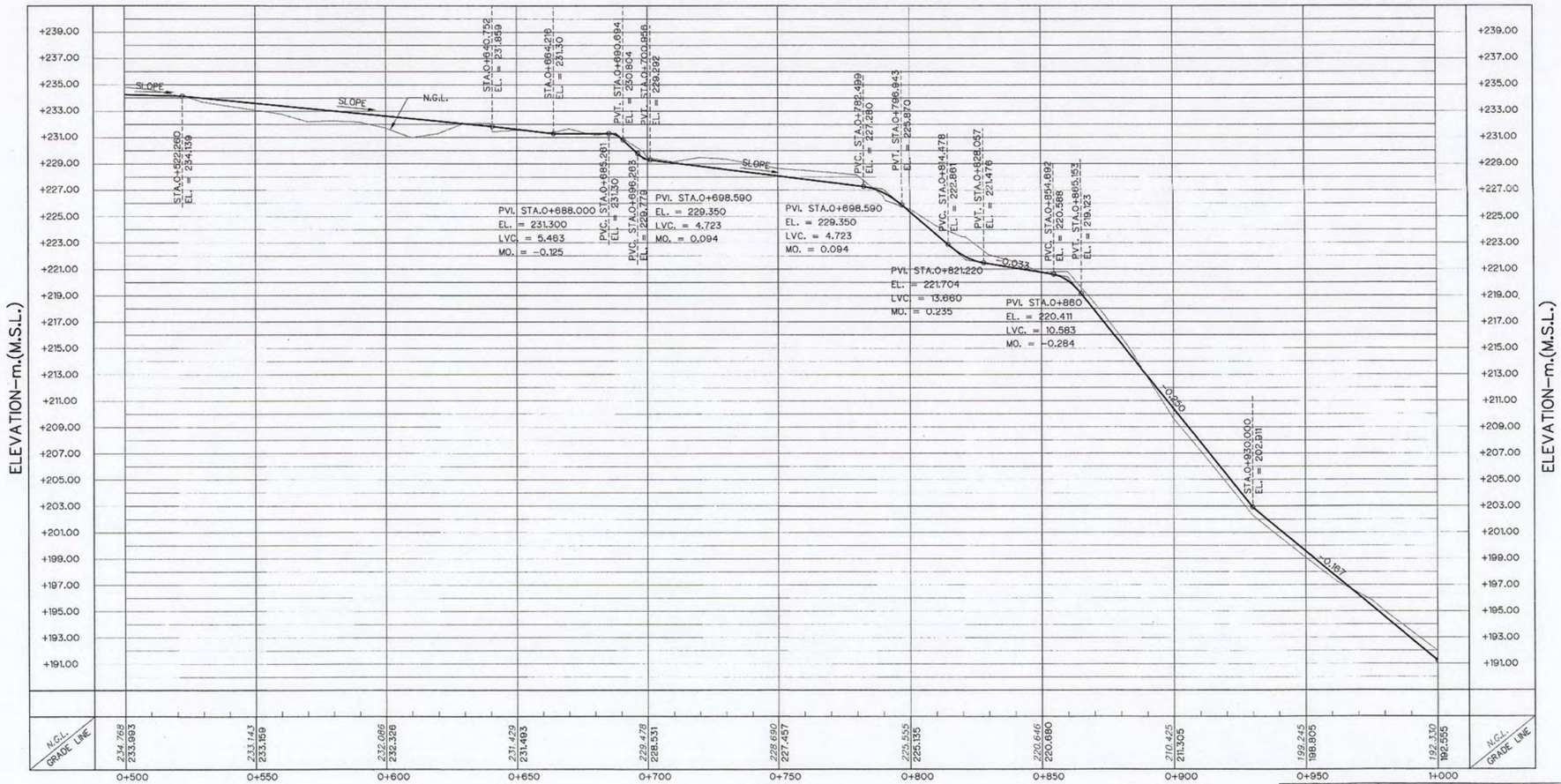
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DESIGNED	281.29074	281.0462	REVIEWED
DRAWN			SUBMITTED
CHECKED	281.8231		RECOMMENDED
			APPROVED
PROJECT MANAGER	28/10/2021 DATE		DRAWING NO. AKP-OM-01
			SHEET NO. 33 OF 129



PLAN
SCALE 1:1,000



PROFILE
VERTICAL SCALE 1:200
HORIZONTAL SCALE 1:1,000

NOTES :

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

REFERENCE DRAWINGS :

1. O&M ROAD, PLAN AND PROFILE, STA. 0+000 TO STA. 0+500	AKP-OM-01
2. O&M ROAD, PLAN AND PROFILE, STA. 0+500 TO STA. 1+113.460	AKP-OM-03
3. O&M ROAD, TYPICAL SECTIONS AND DETAILS	AKP-HR-05
4. O&M ROAD, TYPICAL SIDE DITCH TYPE 1 AND SIDE DITCH TYPE 2	AKP-HR-06
5. PENSTOCK, TYPICAL SECTIONS AND DETAILS	AKP-PS-02

0 5 10 15
SCALE 1:200 METERS

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

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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

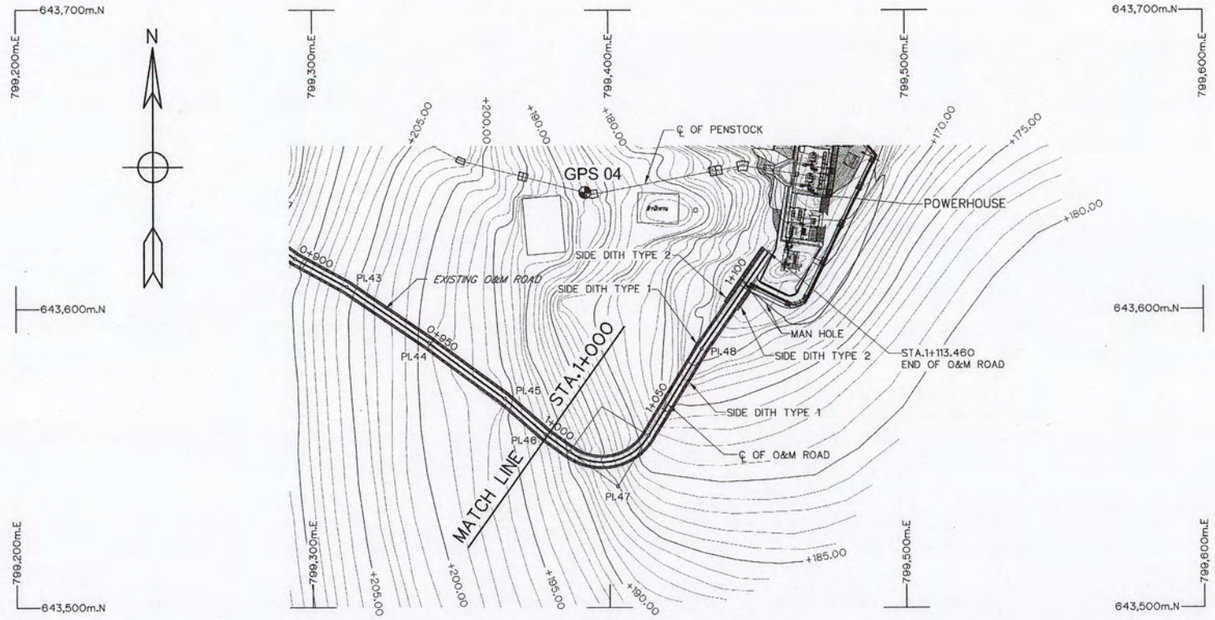
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
O&M ROAD
PLAN AND PROFILE, STA. 0+500 TO STA. 1+000

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
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CHECKED		RECOMMENDED	
PROJECT MANAGER	28/10/2021 DATE	APPROVED	

DRAWING NO. AKP-OM-02
SHEET NO. 34 OF 129



PLAN
SCALE 1:1,000



PROFILE
VERTICAL SCALE 1:200
HORIZONTAL SCALE 1:1,000

NOTES :

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

REFERENCE DRAWINGS :

1.	O&M ROAD, PLAN AND PROFILE, STA. 0+500 TO STA. 1+000	AKP-OM-02
2.	O&M ROAD, TYPICAL SECTIONS AND DETAILS	AKP-OM-05
3.	HEADRACE, TYPICAL SECTIONS AND DETAILS	AKP-HR-04
4.	PENSTOCK, TYPICAL SECTIONS AND DETAILS	AKP-PS-02

0 5 10 15
SCALE 1:200 METERS

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

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MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT

TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

O&M ROAD

PLAN AND PROFILE, STA. 1+000 TO STA. 1+113.460

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SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency
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DESIGNED	วิบ.29074 วิส.9462	REVIEWED	
DRAWN		SUBMITTED	
CHECKED	วิส.8231	RECOMMENDED	
PROJECT MANAGER	28/10/2021 DATE	APPROVED	

DRAWING NO. AKP-OM-03
SHEET NO. 35 OF 129

HORIZONTAL CURVE OF O&M ROAD

NO. PI.	COORDINATE		PI – PI.	DEFLECTION ANGLE	TL	R	LC	BC. STA.	PI. STA.	EC. STA.	BEARING
	N	E	(m)	(° – ' – ")	(m)	(m)	(m)	(km)	(km)	(km)	(N/S ° – ' – " E/W)
B	643,358.243	798,764.131	–	–	–	–	–	–	0+000.000	–	N 60°–40'–40.38" E
PI.1	643,369.266	798,783.756	22.509	4°–23'–47.39"	–	–	–	–	0+022.509	–	N 65°–04'–27.76" E
PI.2	643,385.808	798,819.351	39.251	4°–44'–22.85"	–	–	–	–	0+061.760	–	N 69°–48'–50.62" E
PI.3	643,389.797	798,830.201	11.560	10°–18'–19.62"	–	–	–	–	0+073.320	–	N 59°–30'–30.99" E
PI.4	643,396.869	798,842.211	13.937	34°–12'–33.52"	5.0	16.248	9.701	0+082.257	0+087.257	0+091.959	N 25°–17'–57.48" E
PI.5	643,418.156	798,852.273	23.545	21°–51'–8.07"	4.5	23.311	8.891	0+106.004	0+110.504	0+114.894	N 47°–09'–05.54" E
PI.6	643,429.210	798,864.190	16.254	48°–35'–42.53"	5.0	11.075	9.393	0+121.649	0+126.649	0+131.042	S 84°–15'–11.93" E
PI.7	643,427.059	798,885.564	21.482	73°–1'–12.05"	9.0	12.158	15.495	0+138.524	0+147.524	0+154.019	S 11°–13'–59.88" E
PI.8	643,400.308	798,890.877	27.274	20°–6'–20.10"	–	–	–	–	0+172.293	–	S 31°–20'–19.98" E
PI.9	643,394.066	798,894.678	7.308	54°–56'–15.50"	4.0	7.694	7.377	0+175.601	0+179.601	0+182.978	S 86°–16'–35.48" E
PI.10	643,392.476	798,919.110	24.484	30°–49'–5.72"	4.0	14.513	7.808	0+199.462	0+203.462	0+207.268	N 62°–54'–18.80" E
PI.11	643,398.755	798,931.383	13.786	55°–49'–53.82"	6.0	11.324	11.035	0+211.054	0+217.054	0+222.089	N 07°–04'–24.98" E
PI.12	643,417.274	798,933.681	18.661	33°–15'–59.72"	5.0	16.737	9.717	0+229.750	0+234.750	0+239.468	N 40°–20'–24.69" E
PI.13	643,427.252	798,942.155	13.091	29°–36'–0.57"	3.0	11.354	5.866	0+244.559	0+247.559	0+250.425	N 10°–44'–24.12" E
PI.14	643,453.249	798,947.086	26.461	14°–48'–56.12"	–	–	–	–	0+273.885	–	N 25°–33'–20.25" E
PI.15	643,463.990	798,952.222	11.906	42°–55'–27.95"	5.0	12.718	9.528	0+280.791	0+285.791	0+290.319	N 68°–28'–48.20" E
PI.16	643,469.176	798,985.374	14.138	16°–58'–25.69"	–	–	–	–	0+299.456	–	N 85°–27'–13.89" E
PI.17	643,471.503	798,994.640	29.358	21°–0'–29.90"	–	–	–	–	0+328.815	–	N 64°–26'–43.99" E
PI.18	643,477.300	799,006.764	13.439	23°–17'–29.22"	–	–	–	–	0+342.253	–	N 41°–09'–14.77" E
PI.19	643,496.430	799,023.484	25.407	14°–35'–10.77"	–	–	–	–	0+367.660	–	N 26°–34'–04.01" E
PI.20	643,513.228	799,031.884	18.781	16°–56'–2.28"	–	–	–	–	0+386.441	–	N 09°–38'–01.72" E
PI.21	643,536.351	799,035.809	23.454	15°–37'–42.39"	–	–	–	–	0+409.895	–	N 05°–59'–40.66" W
PI.22	643,546.931	799,034.698	10.638	11°–50'–10.66"	–	–	–	–	0+420.533	–	N 17°–49'–51.33" W
PI.23	643,555.098	799,032.071	8.579	8°–54'–39.07"	–	–	–	–	0+429.112	–	N 26°–44'–30.39" W
PI.24	643,566.881	799,026.134	13.194	16°–24'–25.28"	–	–	–	–	0+442.307	–	N 43°–08'–55.67" W
PI.25	643,574.307	799,019.173	10.178	25°–2'–31.65"	4.0	18.011	7.872	0+448.485	0+452.485	0+456.357	N 68°–11'–27.32" W
PI.26	643,598.530	798,958.639	65.201	141°–33'–44.21"	35.0	12.201	30.146	0+482.558	0+517.558	0+512.704	N 73°–22'–16.89" E
PI.27	643,619.884	799,030.139	74.621	22°–53'–20.65"	–	–	–	–	0+552.324	–	N 50°–28'–56.24" E
PI.28	643,650.614	799,067.394	48.294	32°–29'–11.32"	4.0	13.729	7.785	0+596.618	0+600.618	0+604.402	N 82°–58'–07.55" E
PI.29	643,652.562	799,083.188	15.914	69°–30'–18.89"	7.0	1–89	12.239	0+609.316	0+616.316	0+621.556	S 27°–31'–33.56" E
PI.30	643,633.431	799,093.158	21.573	3°–54'–24.48"	–	–	–	–	0+636.129	–	S 23°–37'–09.08" E
PI.31	643,624.581	799,097.028	9.659	20°–16'–31.44"	–	–	–	–	0+645.788	–	S 43°–53'–40.52" E
PI.32	643,618.823	799,102.568	7.990	80°–43'–50.75"	4.3	5.059	7.128	0+649.478	0+653.778	0+656.606	N 55°–22'–28.73" E
PI.33	643,637.997	799,130.336	33.745	14°–40'–10.58"	–	–	–	–	0+686.051	–	N 70°–02'–39.31" E
PI.34	643,641.661	799,140.427	10.736	23°–38'–53.34"	–	–	–	–	0+696.786	–	S 86°–18'–27.35" E
PI.35	643,639.206	799,178.469	38.121	19°–12'–6.51"	–	–	–	–	0+734.907	–	N 74°–29'–26.14" E
PI.36	643,642.831	799,191.532	13.557	16°–15'–22.57"	–	–	–	–	0+748.464	–	N 58°–14'–03.57" E
PI.37	643,655.449	799,211.910	23.968	9°–10'–46.46"	–	–	–	–	0+772.432	–	N 67°–24'–50.03" E
PI.38	643,667.281	799,240.354	30.807	20°–40'–14.46"	–	–	–	–	0+803.239	–	N 88°–05'–04.50" E
PI.39	643,868.116	799,265.322	24.982	25°–55'–45.36"	7.0	30.406	13.760	0+821.221	0+828.221	0+834.981	S 65°–59'–10.14" E
PI.40	643,660.372	799,282.704	19.029	75°–38'–5.94"	4.5	5.798	7.653	0+842.510	0+847.010	0+850.164	S 09°–38'–55.80" W
PI.41	643,629.304	799,277.422	31.514	63°–4'–55.64"	9.0	14.663	16.144	0+868.178	0+877.178	0+884.321	S 53°–25'–59.84" E
PI.42	643,616.852	799,294.209	20.901	8°–17'–49.28"	–	–	–	–	0+896.223	–	S 61°–43'–49.13" E
PI.43	643,607.446	799,311.700	19.860	5°–42'–36.03"	–	–	–	–	0+916.082	–	S 56°–01'–13.09" E
PI.44	643,588.771	799,339.408	33.414	2°–21'–50.99"	–	–	–	–	0+949.496	–	S 53°–39'–22.10" E
PI.45	643,570.116	799,364.763	31.478	4°–46'–30.18"	–	–	–	–	0+980.974	–	S 48°–52'–51.91" E
PI.46	643,558.162	799,378.457	18.178	5°–30'–6.43"	–	–	–	–	0+999.152	–	S 54°–22'–58.34" E
PI.47	643,540.635	799,402.923	30.096	93°–55'–31.68"	2–	18.675	30.613	1+009.248	1+029.248	1+039.862	N 31°–41'–29.97" E
PI.48	643,586.708	799,431.369	54.147	3°–4'–7.36"	–	–	–	–	1+074.009	–	N 34°–45'–37.33" E
E	643,619.119	799,453.862	39.451	–	–	–	–	–	1+113.460	–	–

NOTES :

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

REFERENCE DRAWINGS :

1. O&M ROAD, PLAN AND PROFILE, STA. 0+000 TO STA. 0+500 AKP–OM–01
2. O&M ROAD, PLAN AND PROFILE, STA. 0+500 TO STA. 1+000 AKP–OM–02
3. O&M ROAD, PLAN AND PROFILE, STA. 1+000 TO STA. 1+113.460 AKP–OM–03

0 5 10 15
SCALE 1:200 METERS

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

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
O&M ROAD
DATA CURVE OF O&M ROAD

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

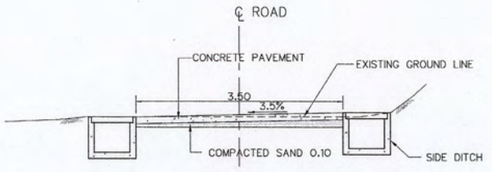
CONSULTANTS: PCM P&C MANAGEMENT CO., LTD. / GPD SPT CONSULTANTS CO., LTD.

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

DESIGNED Mr.Nirun Reg.29074 Reg.9462
DRAWN
CHECKED Reg.8231
PROJECT MANAGER 28/10/2021 DATE

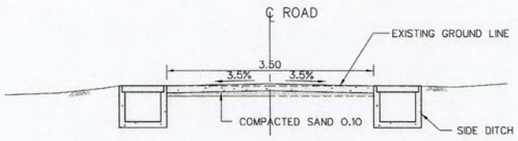
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP–OM–04
SHEET NO. 36 OF 129



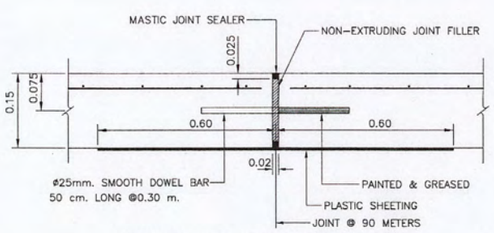
TYPICAL SECTION FOR HILLSIDE

NOT TO SCALE



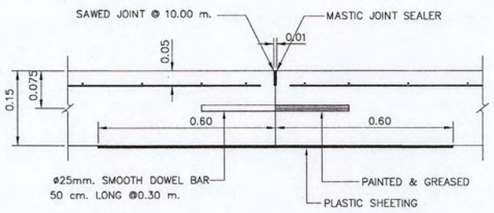
TYPICAL SECTION FOR FLAT AREA

NOT TO SCALE



DETAIL OF EXPANSION JOINT

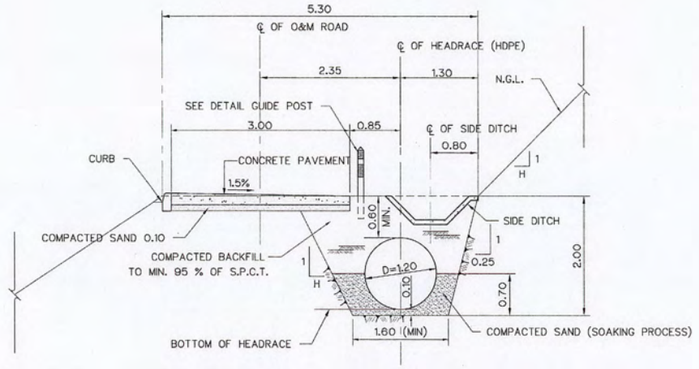
NOT TO SCALE



DETAIL OF CONSTRUCTION JOINT

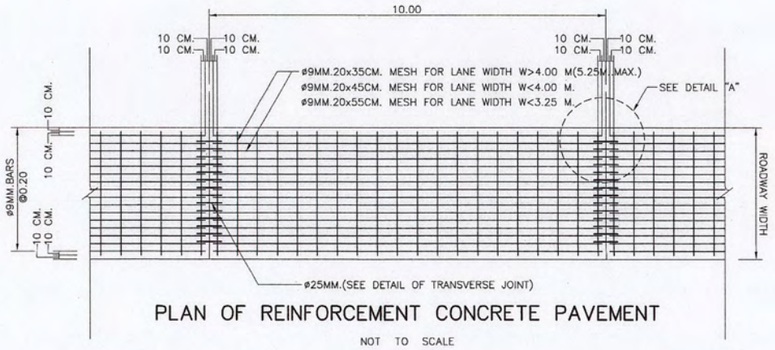
NOT TO SCALE

STA. TO STA.	SIDE DITCH TYPE	DETAIL DRAWWING
0+000.000 – 0+639.752	TRAPEZOIDAL	AKP-HR-04
0+742.454 – 0+799.322	RECTANGULAR	AKP-PS-02
0+855.000 – 1+113.460	RECTANGULAR	AKP-OM-06



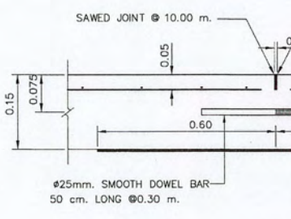
TYPICAL SECTION FOR ALONG WITH HEADRACE

SCALE 1:50



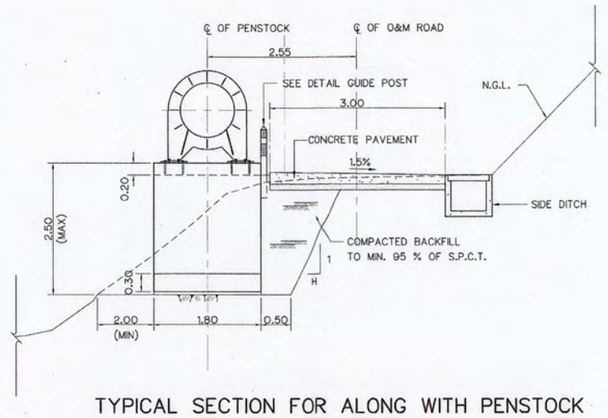
PLAN OF REINFORCEMENT CONCRETE PAVEMENT

NOT TO SCALE



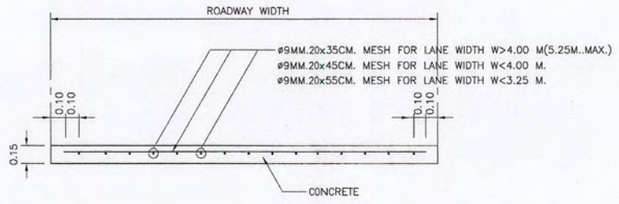
DETAIL OF CONTRACTION JOINT

NOT TO SCALE



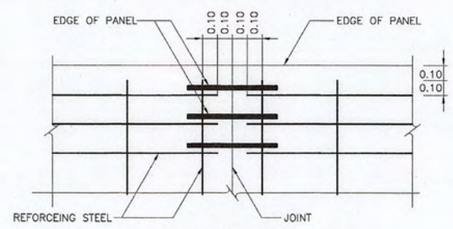
TYPICAL SECTION FOR ALONG WITH PENSTOCK

SCALE 1:50



REINFORCEMENT DETAIL OF CONCRETE PAVEMENT CROSS-SECTION

NOT TO SCALE



DETAIL "A"

NOT TO SCALE

NOTES 1 :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. EXPANSION JOINT SHALL BE CONSTRUCTED AT THE INTERVAL OF 90 METERS.
3. MASTIC JOINT SEALER SHALL BE OF THE HOT POURED ELASTIC TYPE CONFORMING TO TIS.479.
4. JOINT FILLER SHALL CONFORM TO THE AASHTO M.213-74 OR ASTM.D1751-73 SPECIFICATION.
5. REINFORCING STEEL SHALL CONFORM TIS.20 GRADE SR 24 FOR ROUND BARS AND TIS.24 GRADE SD 30 FOR DEFORMED BAR.
6. PLASTIC SHEET USED IN CONSTRUCTION SHALL HAVE THE FOLLOWING REQUIREMENTS :
   - 6.1 THICKNESS OF 0.07 MM. WITH A TOLERANCE OF NOT MORE THAN 7 % SHALL BE REQUIRED.
   - 6.2 WIDTH SHALL NOT BE LESS THAN 1.20 M.
   - 6.3 IT SHALL BE COLOURLESS,TRANSPARENT AND WATERPROOF, FREE FROM POROUS AREA, TURN AREA AND BLISTERING AREA WHICH ARE VISIBLE BY NAKED EYE. EDGE SHALL BE STRAIGHT.
   - 6.4 CONTINUOUS LENGTH SHALL BE REQUIREMENT TO THE WIDTH OF TRAFFIC LANES. CONNECTION ALLOWED AT LONGITUDINAL JOINTS WITH NOT LESS. THAN 20 CM. OVERLAPPING SHALL BE REQUIRED.

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MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

O&M ROAD

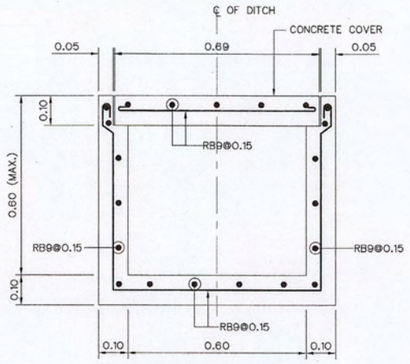
TYPICAL SECTIONS AND DETAILS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

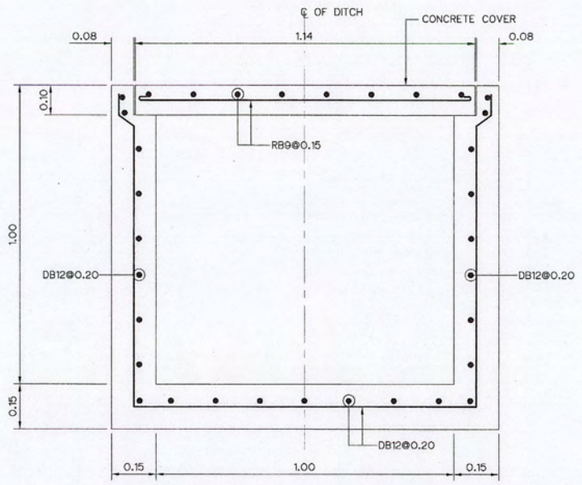
P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.
DESIGNED Reg.No.29074 Reg.9462
DRAWN
CHECKED Reg.8231
PROJECT MANAGER 28/10/2021 DATE

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

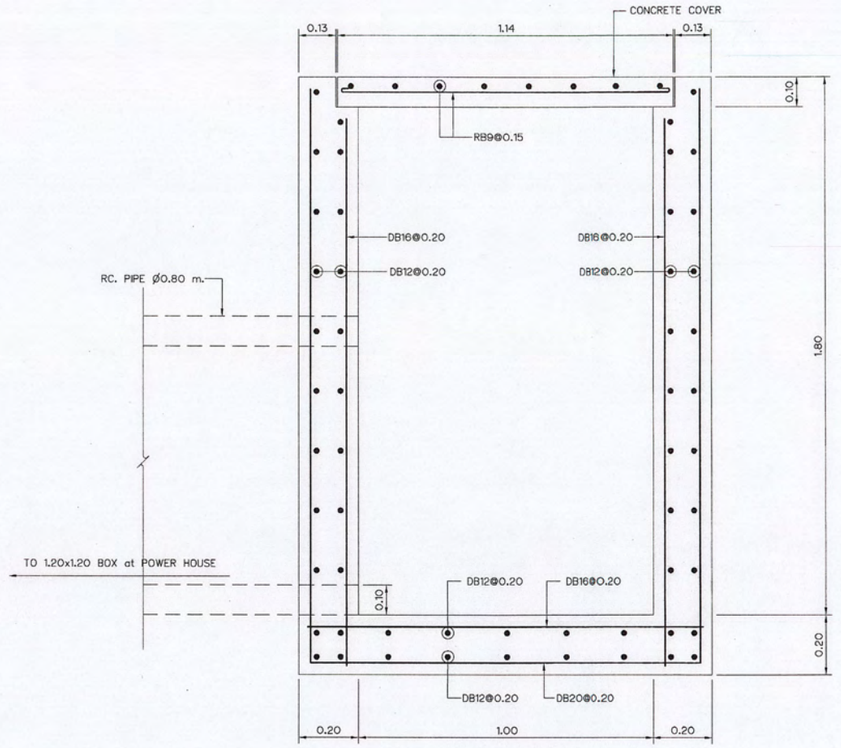
DRAWING NO. AKP-OM-05
SHEET NO. 37 OF 129



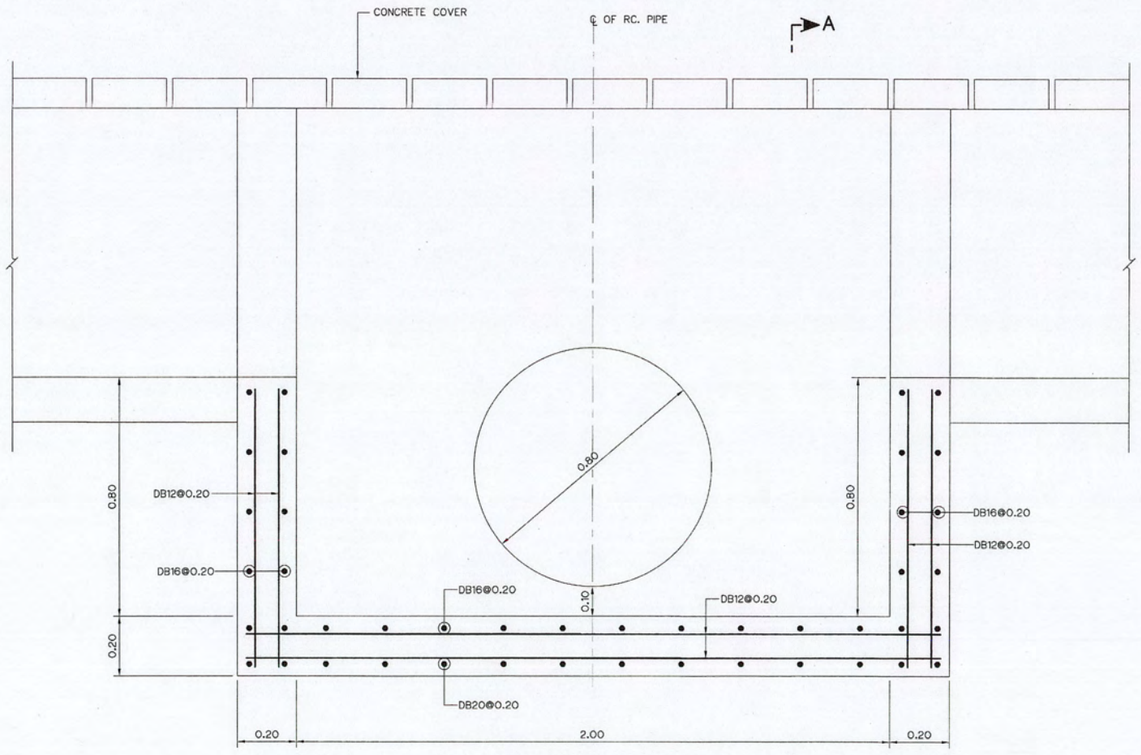
SIDE DITCH TYPE 1
SCALE 1:10



SIDE DITCH TYPE 2
SCALE 1:10



SECTION A-A
SCALE 1:10



SIDE DITH MANHOLE
SCALE 1:10

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. EXPANSION JOINT SHALL BE CONSTRUCTED AT THE INTERVAL OF 90 METERS.

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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Department of Alternative Energy Development and Efficiency
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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

O&M ROAD

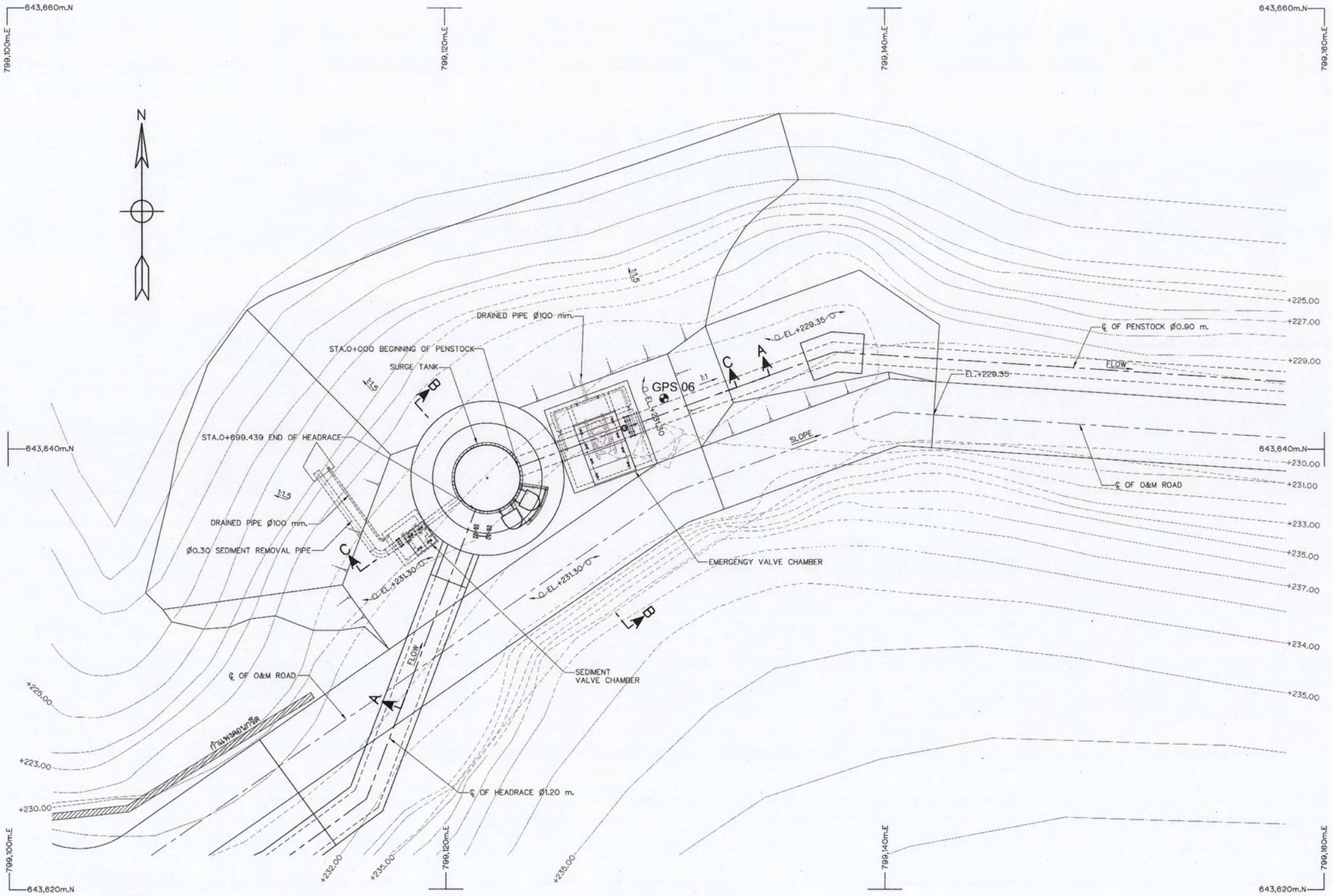
TYPICAL SIDE DITCH TYPE 1 AND SIDE DITCH TYPE 2

PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

DESIGNED 28.29074 28.9462
DRAWN
CHECKED 28.8231
28/10/2021
PROJECT MANAGER DATE

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

DRAWING NO. AKP-OM-06
SHEET NO. 38 OF 129



GENERAL LAYOUT

SCALE 1:100

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METERS, UNLESS OTHERWIRE SHOWN.
2. STEEL PIPE SHELL CONFORM TO JIS G 3101 SS34
3. BEFOR EXCAVATION SHOULD BE EVALUATED AND ANALYSIS BY FIELD GEOTECHNICAL ENGINEER OR ENGINEERING GEOLOGIST.
4. CORROSION PROTECTION OF STEEL PIPE OR GUARDRAIL IS WARNED TO STRICTLY FOLLOW GALVANIZE SPECIFICATION
5. STEEL TANK , GIRDER AND STIFFENER SHALL CONFORM TO JIS G 3101 SS34

REFERENCE DRAWING :

1. SURGE TANK, SECTIONS	AKP-ST-02
2. SURGE TANK, EMERGENCY VALVE CHAMBER PLAN SECTIONS AND DETAILS	AKP-ST-07
3. SURGE TANK, SEDIMENT VALVE CHAMBER PLAN SECTIONS AND DETAILS	AKP-ST-09

0 1 2 3 4 5 6 7 8

SCALE 1:100 METERS

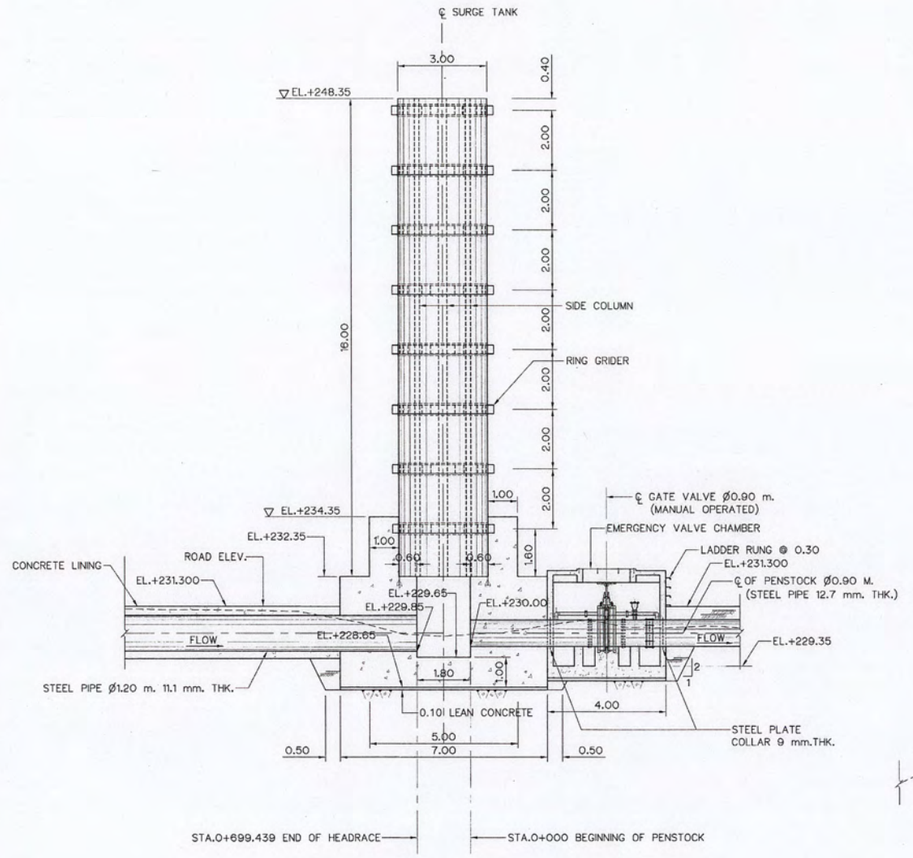
NO.	DATE	REVISIONS	CHECKED	APPROVED
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	CONSULTANTS		DEDE	

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

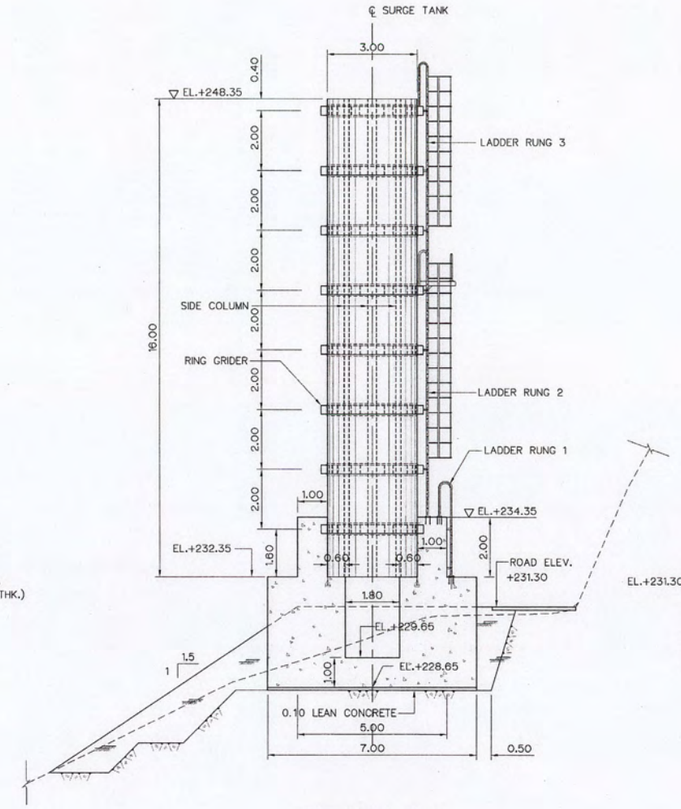
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
SURGE TANK
GENERAL LAYOUT

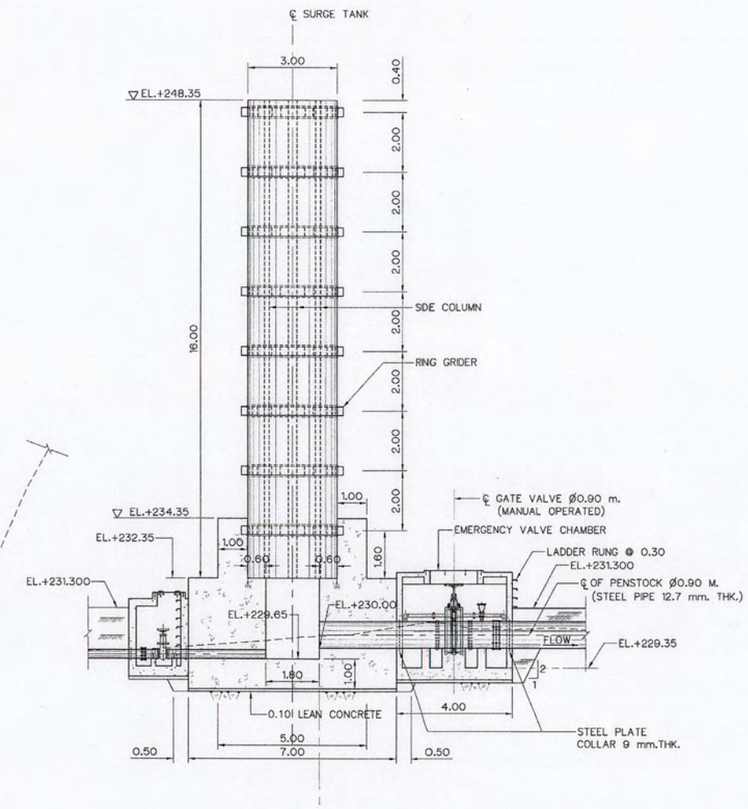
P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED ... Reg.29074 ... Reg.9482	REVIEWED
DRAWN	SUBMITTED
CHECKED Reg.8231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-ST-01	SHEET NO. 39 OF 129



SECTION A–A
SCALE 1:100



SECTION B–B
SCALE 1:100



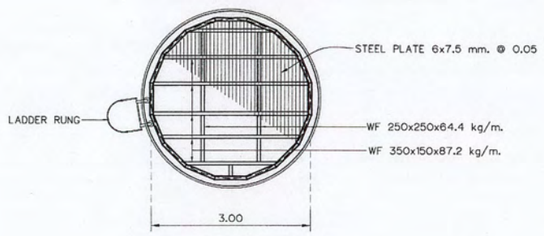
SECTION C–C
SCALE 1:100

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METERS, UNLESS OTHERWIRE SHOWN.
2. STEEL PIPE SHELL CONFORM TO JIS G 3101 SS34
3. BEFOR EXCAVATION SHOULD BE EVALUATED AND ANALYSIS BY FIELD GEOTECHNICAL ENGINEER OR ENGINEERING GEOLOGIST.
4. CORROSION PROTECTION OF STEEL PIPE OR GUARDRAIL IS WARNED TO STRICTLY FOLLOW GALVANIZE SPECIFICATION
5. STEEL TANK , GIRDER AND STIFFENER SHALL CONFORM TO JIS G 3101 SS34

REFERENCE DRAWING :

1. SURGE TANK, GENERAL LAYOUT	AKP–ST–01
2. SURGE TANK, RING GIRDER AND HANDRAIL DETAILS	AKP–ST–03
3. SURGE TANK, LADDER RUNG DETAILS	AKP–ST–04
4. SURGE TANK, PLATFORM DETAILS	AKP–ST–05



PLAN ON TOP LEVEL
SCALE 1:100

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

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

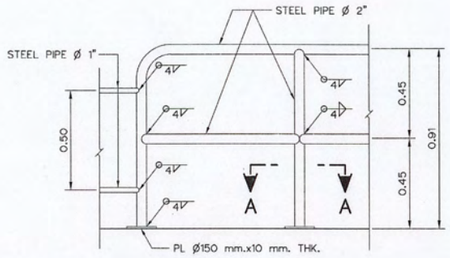
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
SURGE TANK
SECTIONS

P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

DESIGNED ภ.บ.29074 สถ.9462
DRAWN
CHECKED สถ.8231
PROJECT MANAGER 28/10/2021 DATE

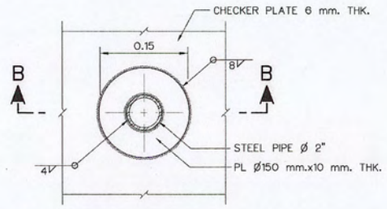
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP–ST–02
SHEET NO. 40 OF 129



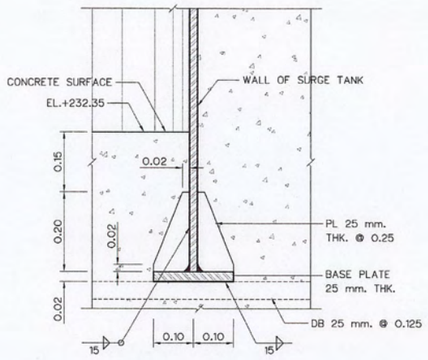
DETAIL OF HANDRAIL

SCALE 1:15



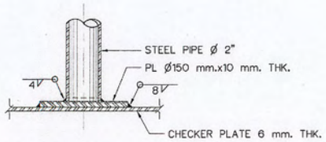
SECTION A–A

SCALE 1:5



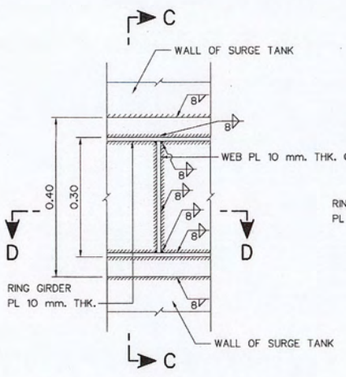
DETAIL "A" (AKP-ST-02)

SCALE 1:10



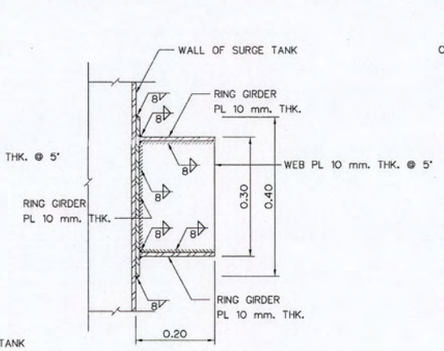
SECTION B–B

SCALE 1:5



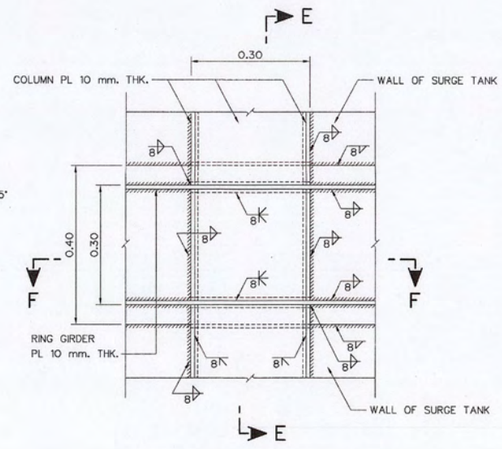
SIDE VIEW OF RING GIRDER

SCALE 1:7.5



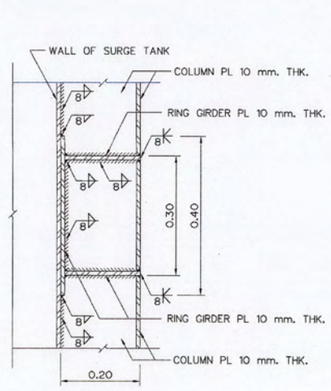
SECTION C–C

SCALE 1:7.5



SIDE VIEW OF COLUMN
AND RING GIRDER

SCALE 1:7.5



SECTION E–E

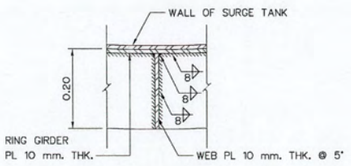
SCALE 1:7.5

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METERS, UNLESS OTHERWISE SHOWN
2. STEEL PIPE CONFORM TO JIS G 3101 SS34
3. CORROSION PROTECTION OF STEEL PIPE OR GUARDRAIL IS WARNED TO STRICTLY FOLLOW GALVANIZE SPECIFICATION
4. STEEL TANK , GIRDER AND STIFFENER SHALL CONFORM TO JIS G 3101 SS34
5. STEEL TANK , WALL OF SURGE TANK 15 mm. THK.

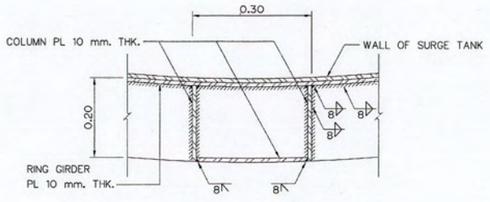
REFERENCE DRAWINGS :

1. SURGE TANK, GENERAL LAYOUT	AKP-ST-01
2. SURGE TANK, SECTIONS	AKP-ST-02
3. SURGE TANK, LADDER RUNG DETAILS	AKP-ST-04
4. SURGE TANK, PLATFORM DETAILS	AKP-ST-05



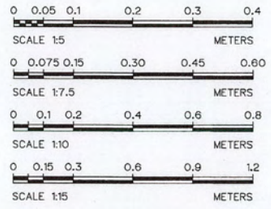
SECTION D–D

SCALE 1:7.5



SECTION F–F

SCALE 1:7.5



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
SURGE TANK
RING GIRDER AND HANDRAIL DETAILS

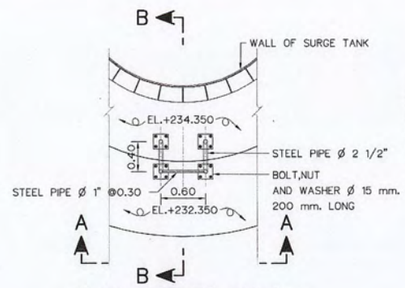
PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

DESIGNED ... 28.29074 ... 28.9482
DRAWN
CHECKED ... 28.8231
PROJECT MANAGER 28/10/2021 DATE

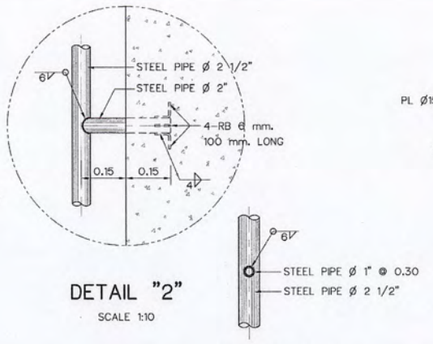
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP-ST-03
SHEET NO. 41 OF 129



PLAN LADDER RUNG 1

SCALE 1:40

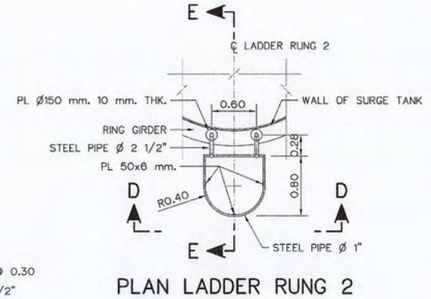


DETAIL "2"

SCALE 1:10

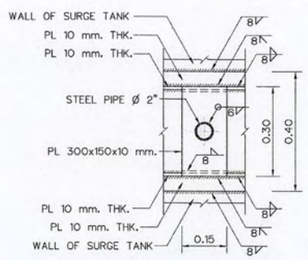
DETAIL "3"

SCALE 1:25



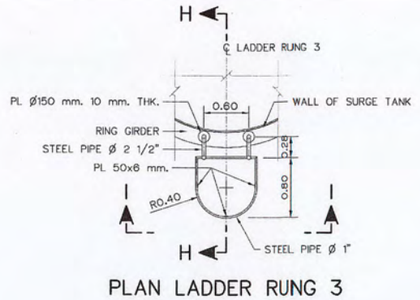
PLAN LADDER RUNG 2

SCALE 1:40



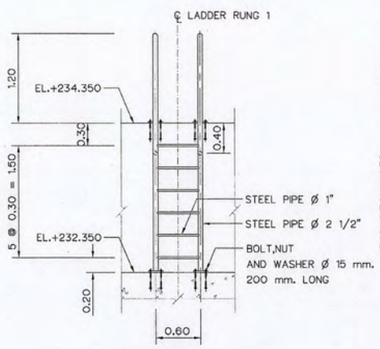
SECTION G-G

SCALE 1:10



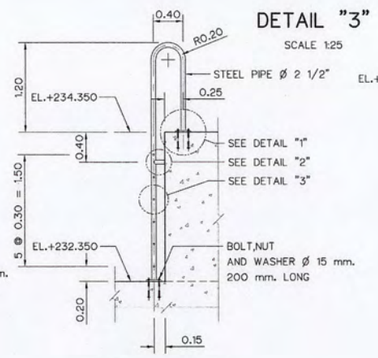
PLAN LADDER RUNG 3

SCALE 1:40



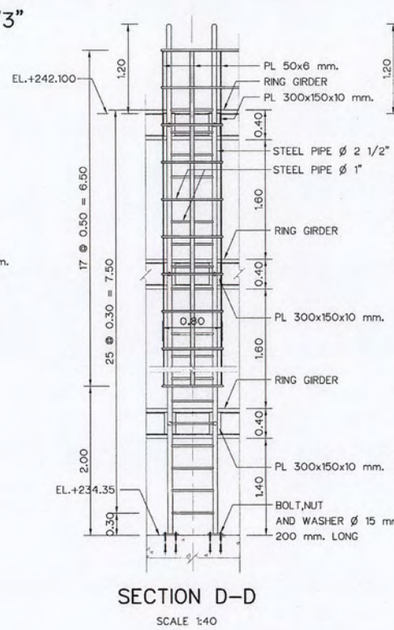
SECTION A-A

SCALE 1:40



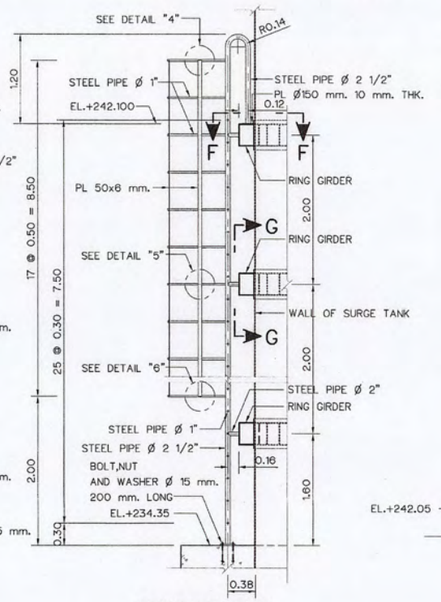
SECTION B-B

SCALE 1:40



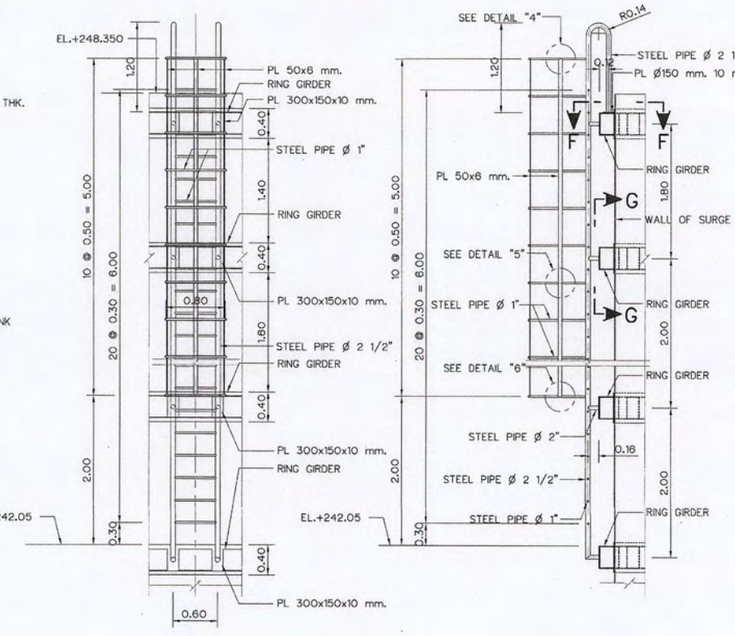
SECTION D-D

SCALE 1:40



SECTION E-E

SCALE 1:40

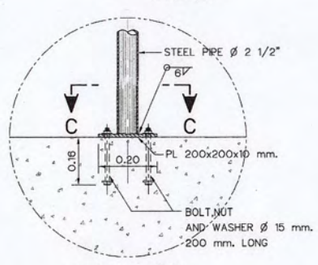


SECTION H-H

SCALE 1:40

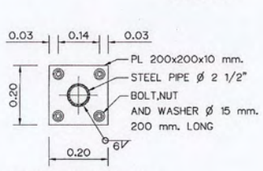
SECTION I-I

SCALE 1:40



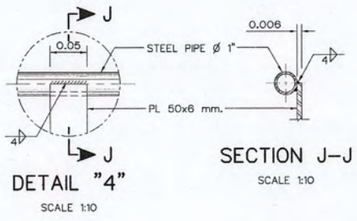
DETAIL "1"

SCALE 1:10



SECTION C-C

SCALE 1:10

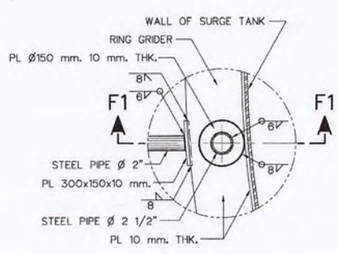


DETAIL "4"

SCALE 1:10

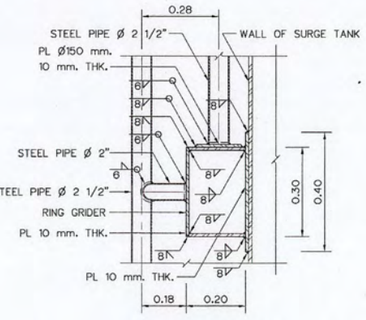
SECTION J-J

SCALE 1:10



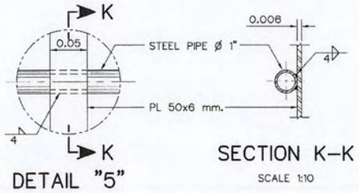
SECTION F-F

SCALE 1:10



SECTION F1-F1

SCALE 1:10

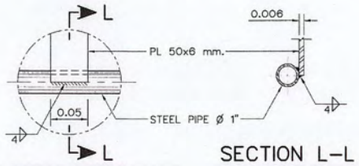


DETAIL "5"

SCALE 1:10

SECTION K-K

SCALE 1:10



DETAIL "6"

SCALE 1:10

SECTION L-L

SCALE 1:10

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METERS, UNLESS OTHERWISE SHOWN
2. STEEL PIPE CONFORM TO JIS G 3101 SS34
3. CORROSION PROTECTION OF STEEL PIPE OR GUARDRAIL IS WARNED TO STRICTLY FOLLOW GALVANIZE SPECIFICATION
4. STEEL TANK , GIRDER AND STIFFENER SHALL CONFORM TO JIS G 3101 SS34
5. STEEL TANK , WALL OF SURGE TANK 15 mm. THK.

REFERENCE DRAWINGS :

1. SURGE TANK, GENERAL LAYOUT	AKP-ST-01
2. SURGE TANK, SECTIONS	AKP-ST-02
3. SURGE TANK, LADDER RUNG 1 DETAILS	AKP-ST-05

0 0.05 0.1 0.15 0.2 0.25 0.30 0.35
SCALE 1:10 METERS

0 0.2 0.4 0.6 0.8
SCALE 1:25 METERS

0 1 2 3
SCALE 1:40 METERS

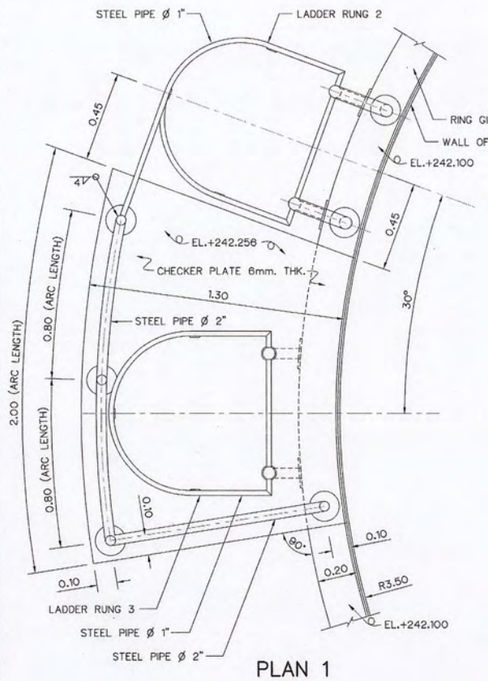
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

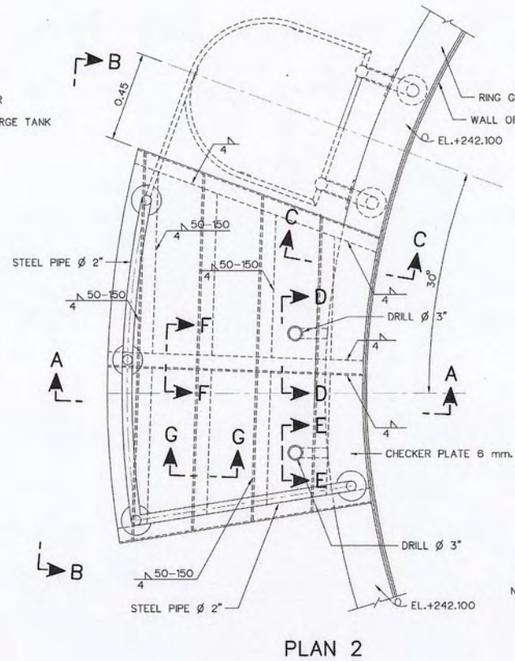
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
SURGE TANK
LADDER RUNG DETAILS

PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED	REI.29074 REI.9462	REVIEWED	
DRAWN		SUBMITTED	
CHECKED	REI.8231	RECOMMENDED	
PROJECT MANAGER	28/10/2021 DATE	APPROVED	
		DRAWING NO. AKP-ST-04	SHEET NO. 42 OF 129



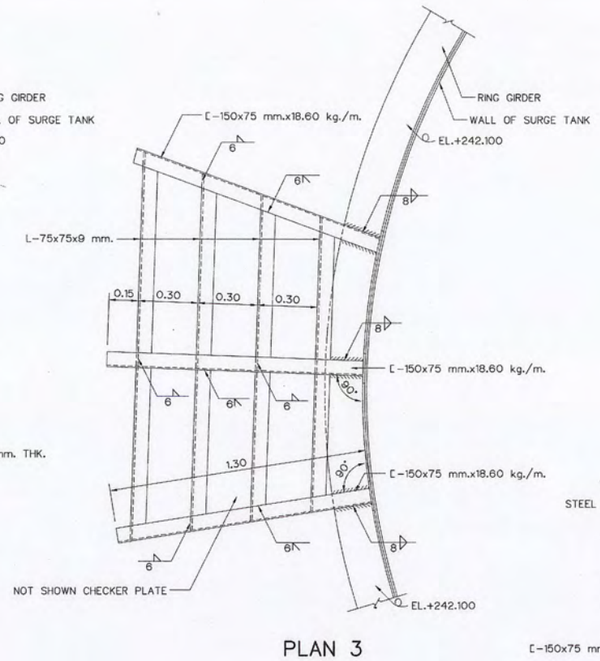
PLAN 1

SCALE 1:15



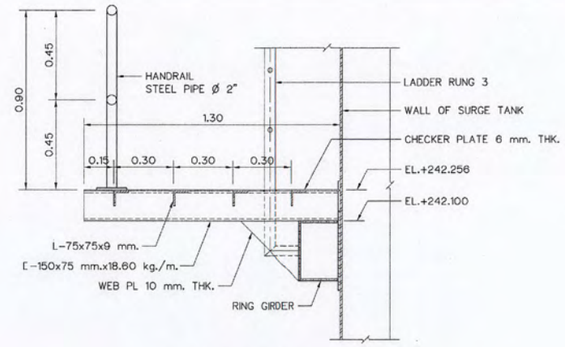
PLAN 2

SCALE 1:15



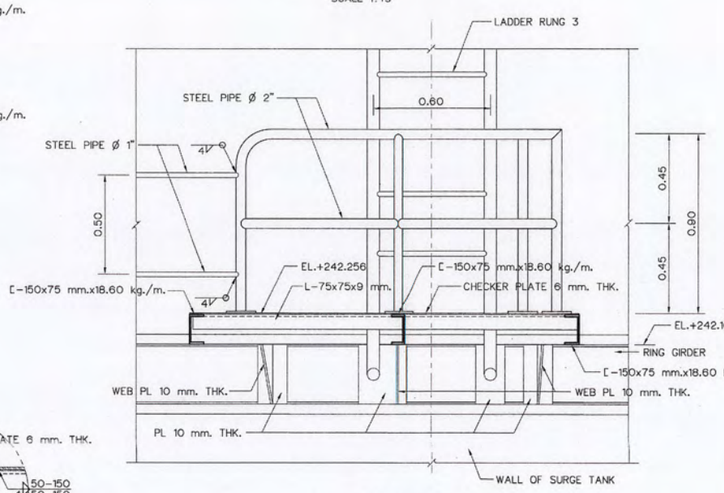
PLAN 3

SCALE 1:15



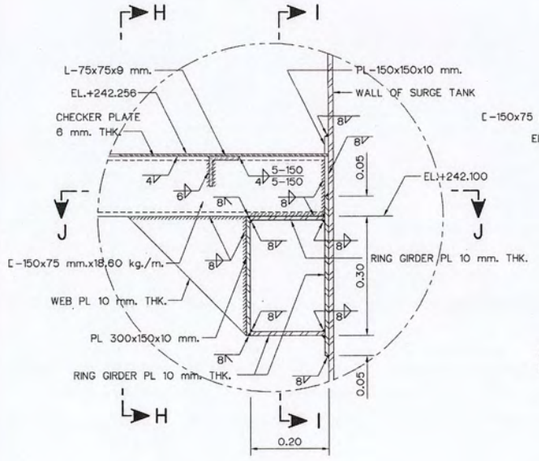
SECTION A–A

SCALE 1:15



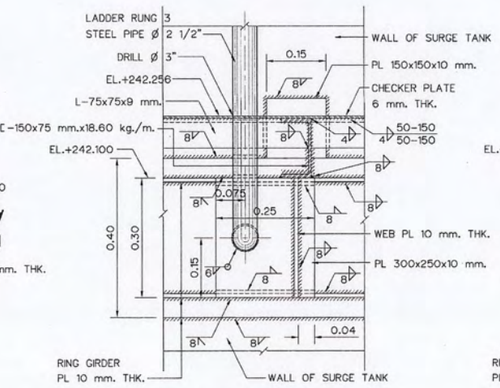
SECTION B–B

SCALE 1:15



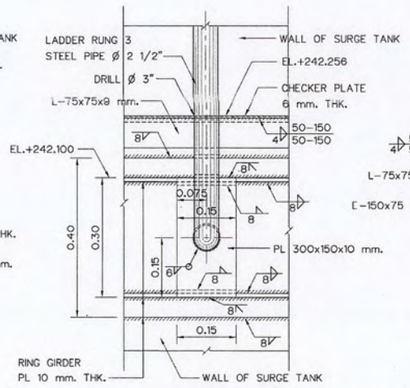
SECTION C–C

SCALE 1:7.5



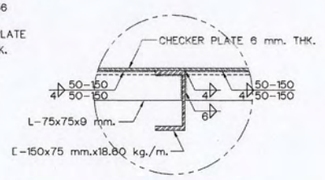
SECTION D–D

SCALE 1:7.5



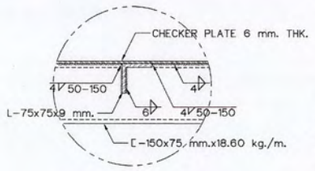
SECTION E–E

SCALE 1:7.5



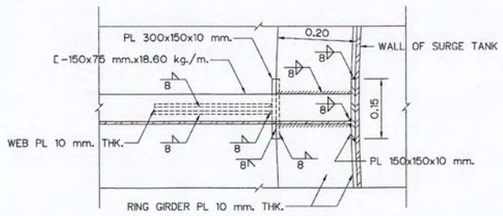
SECTION F–F

SCALE 1:7.5



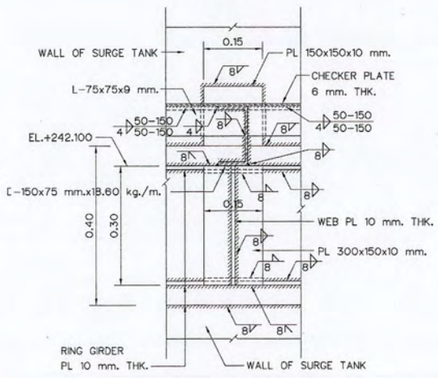
SECTION G–G

SCALE 1:7.5



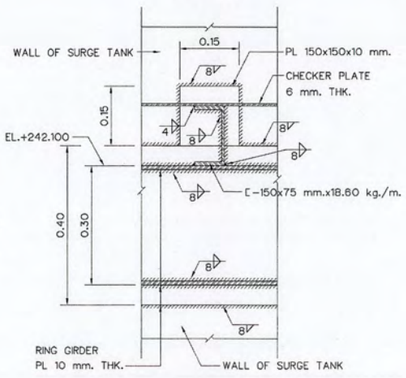
SECTION J–J

SCALE 1:7.5



SECTION H–H

SCALE 1:7.5



SECTION I–I

SCALE 1:7.5

NOTE :

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METERS, UNLESS OTHERWISE SHOWN
2. STEEL PIPE CONFORM TO JIS G 3101 SS34
3. CORROSION PROTECTION OF STEEL PIPE OR GUARDRAIL IS WARNED TO STRICTLY FOLLOW GALVANIZE SPECIFICATION
4. STEEL TANK , GIRDER AND STIFFENEL SHALL CONFORM TO JIS G 3101 SS34

REFERENCE DRAWING :

1. SURGE TANK GENERAL LAY-OUT	AKP-ST-01
2. SURGE TANK SECTIONS	AKP-ST-02
3. SURGE TANK RING GRIDER AND HANDRAIL	AKP-ST-03
4 SURGE TANK LADDER RUNG DETAILS	AKP-ST-04

0 0.075 0.15 0.30 0.45 0.60
SCALE 1:7.5 METERS

0 0.15 0.3 0.6 0.9 1.2
SCALE 1:15 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

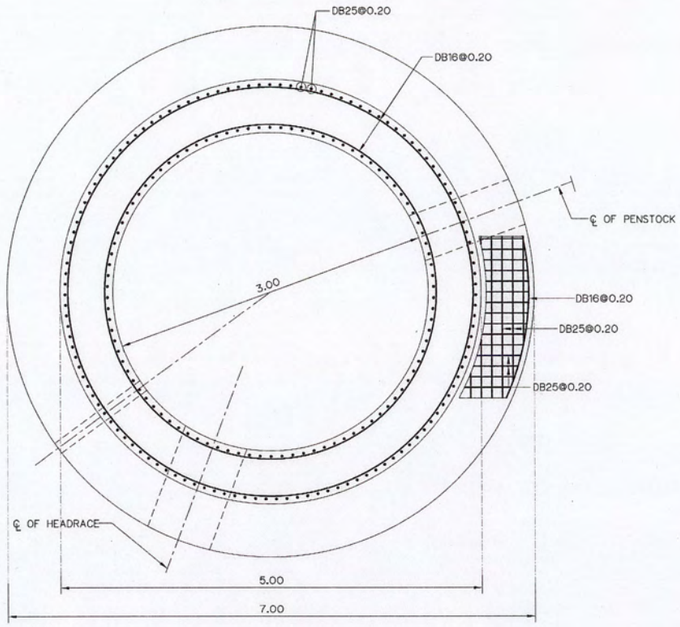
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
SURGE TANK
PLATFORM DETAILS

PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

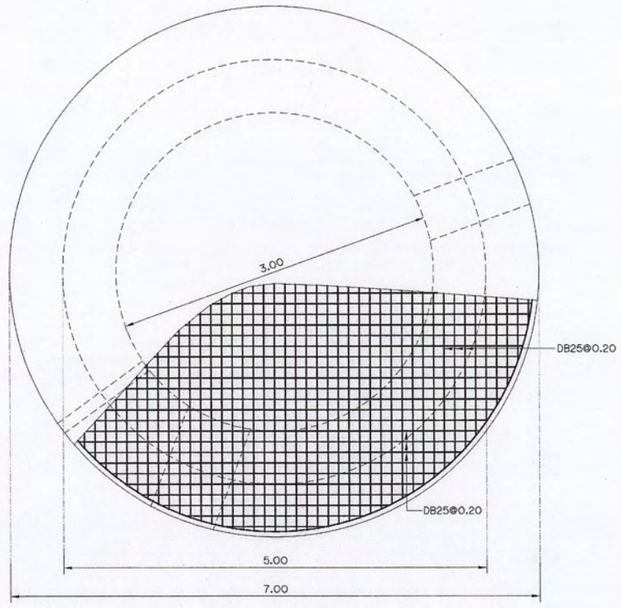
DESIGNED	กิติ.29074	สิน.9482	REVIEWED
DRAWN			SUBMITTED
CHECKED		สิน.8231	RECOMMENDED
PROJECT MANAGER	28/10/2021 DATE		APPROVED

DRAWING NO. AKP-ST-05
SHEET NO. 43 OF 129



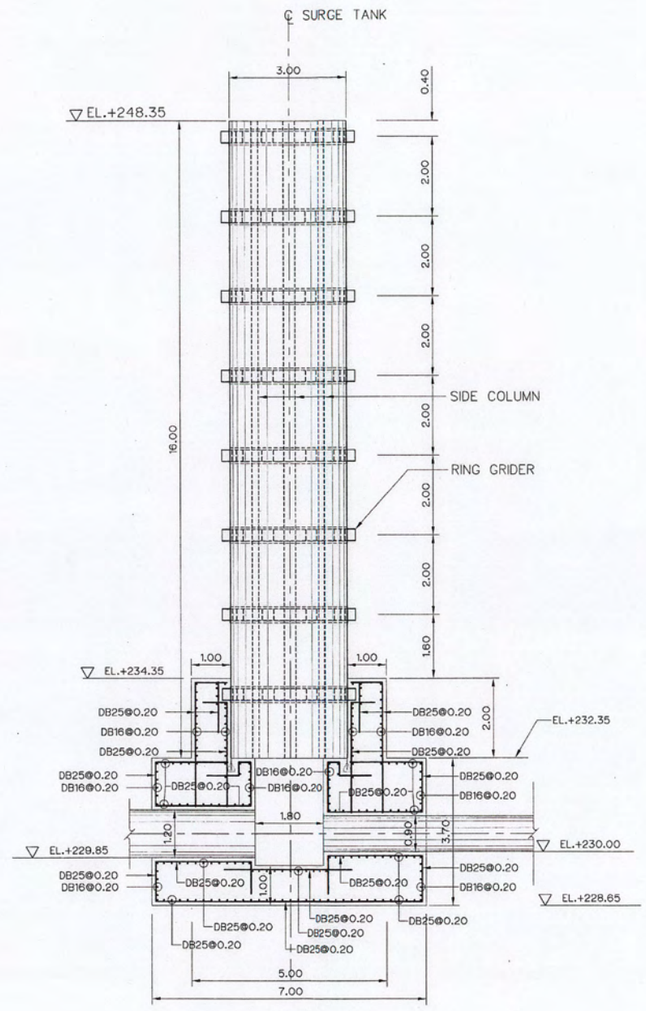
UPPER STEEL PLAN

SCALE 1:75



LOWER STEEL PLAN

SCALE 1:75



SECTION A–A

SCALE 1:100

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METERS, UNLESS OTHERWISE SHOWN
2. STEEL PIPE CONFORM TO JIS G 3101 SS34
3. CORROSION PROTECTION OF STEEL PIPE OR GUARDRAIL IS WARNED TO STRICTLY FOLLOW GALVANIZE SPECIFICATION
5. STEEL TANK , GIRDER AND STIFFENER SHALL CONFORM TO JIS G 3101 SS34

REFERENCE DRAWINGS :

1. SURGE TANK, GENERAL LAYOUT	AKP–ST–01
2. SURGE TANK, SECTIONS	AKP–ST–02



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

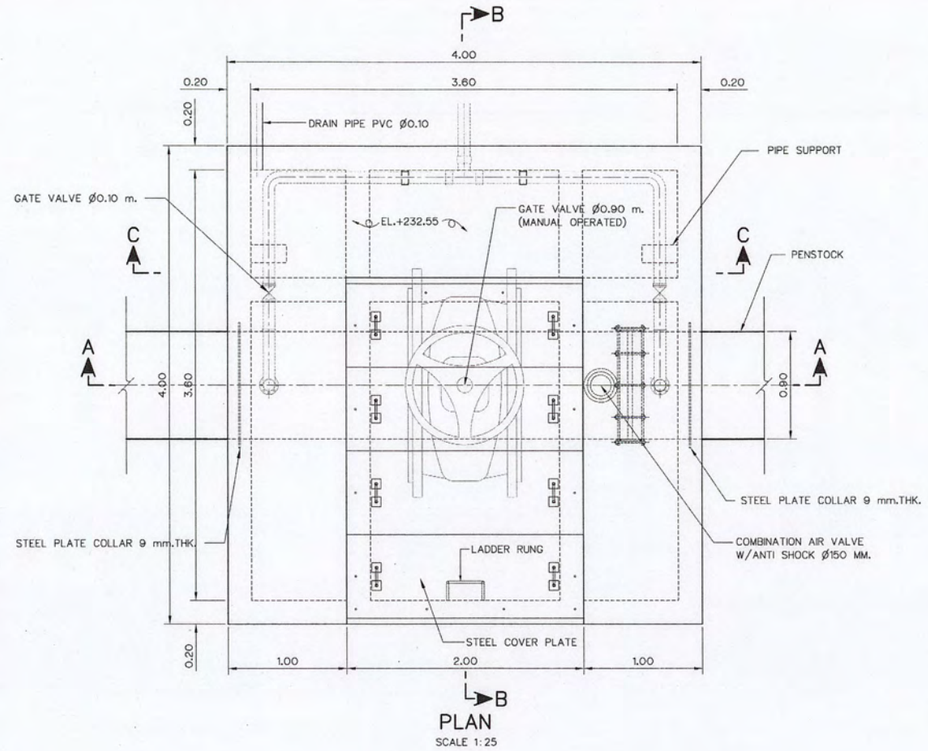
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

SURGE TANK

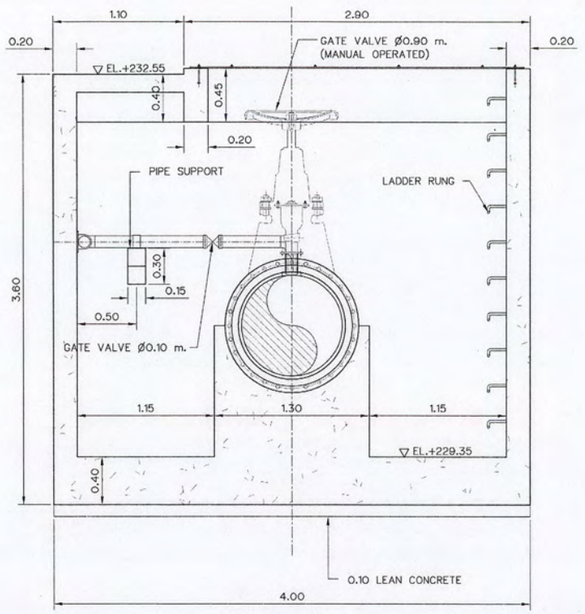
REINFORCEMENT DETAILS

PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED ... 28.29074 ... 28.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED ... 28.8231	RECOMMENDED
28/10/2021 PROJECT MANAGER / DATE	APPROVED
DRAWING NO. AKP–ST–06	SHEET NO. 44 OF 129



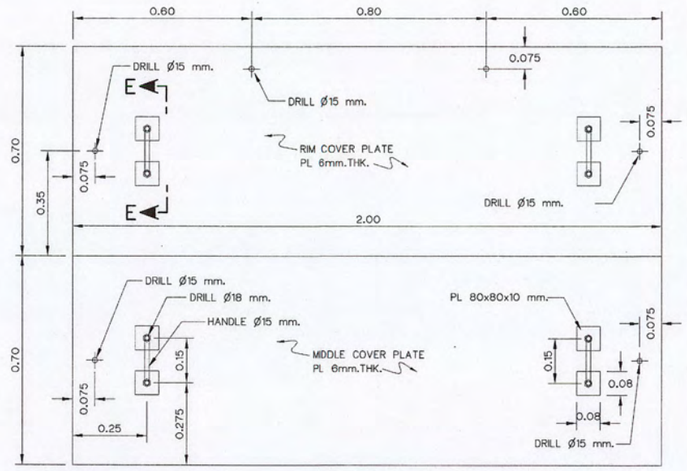
PLAN

SCALE 1:25



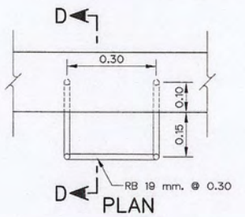
SECTION B–B

SCALE 1:25

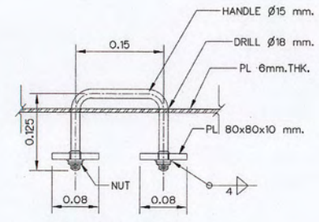


PLAN STEEL COVER PLATE

SCALE 1:10

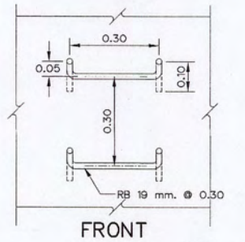


PLAN

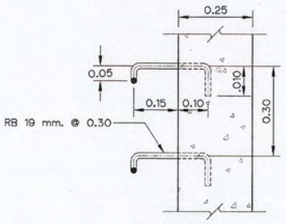


SECTION E–E

SCALE 1:5



FRONT



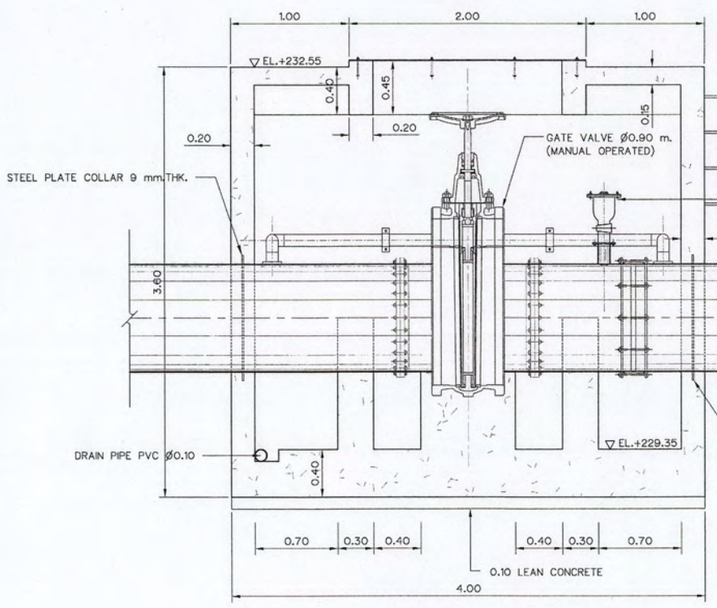
SECTION D–D

DETAIL OF LADDER RUNG

SCALE 1:10

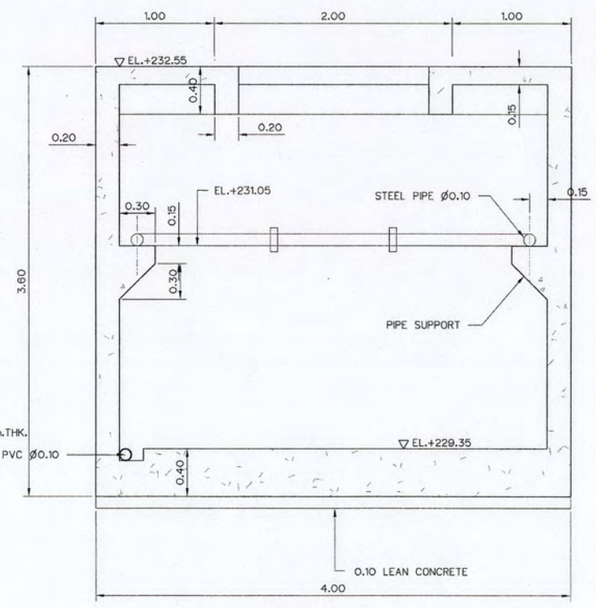






SECTION A–A

SCALE 1:25



SECTION C–C

SCALE 1:25

NOTE :

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

REFERENCE DRAWING :

1. SURGE TANK, GENERAL LAYOUT AKP–ST–01
2. SURGE TANK, EMERGENCY VALVE CHAMBER REINFORCEMENT DETAILS AKP–ST–08

NO.	DATE	REVISIONS	CHECKED	APPROVED
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1				
	CONSULTANTS		DEDE	

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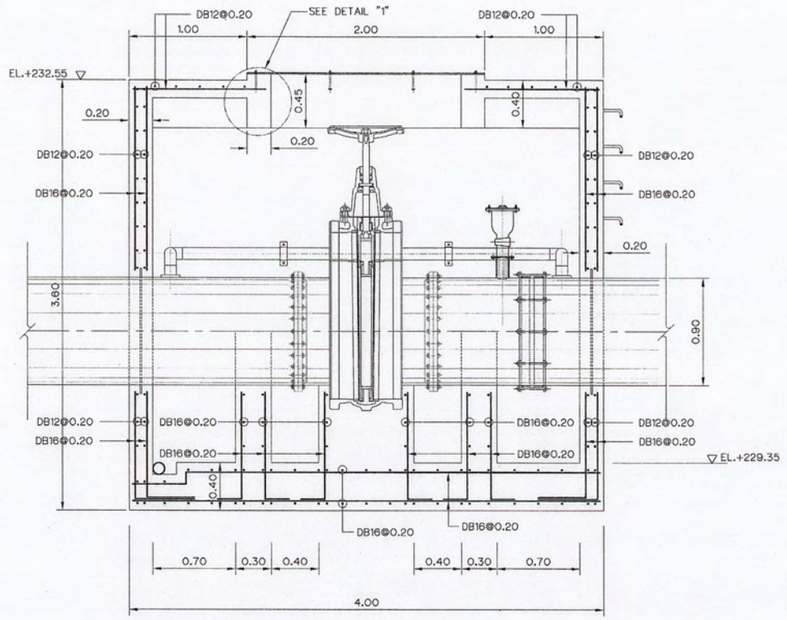
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

SURGE TANK

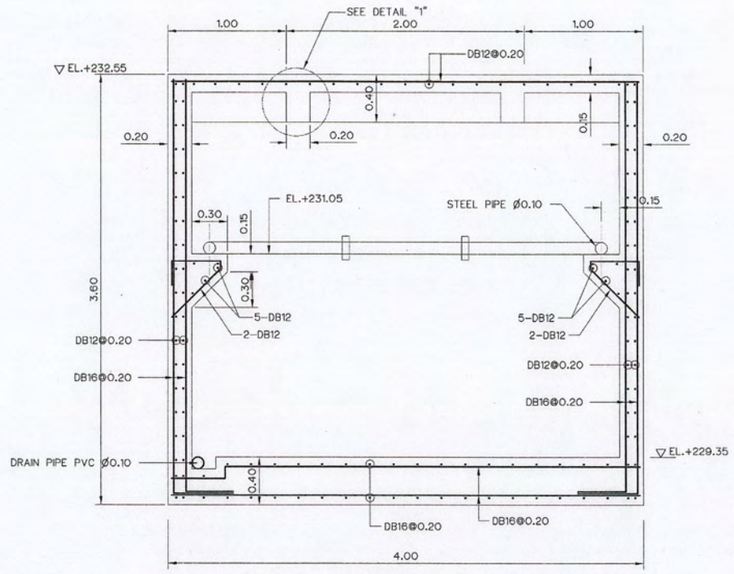
EMERGENCY VALVE CHAMBER PLAN SECTIONS AND DETAILS

P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED REG.29074 REG.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED REG.8231	RECOMMENDED
28/10/2021 PROJECT MANAGER DATE	APPROVED
DRAWING NO. AKP–ST–07	SHEET NO. 45 OF 129



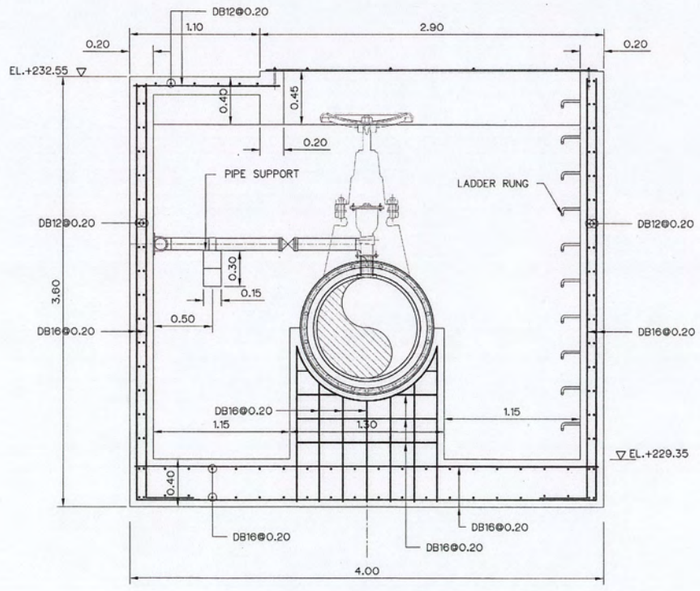
SECTION A–A

SCALE 1:25



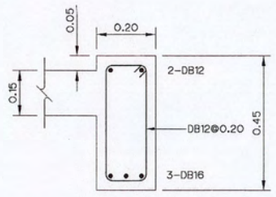
SECTION C–C

SCALE 1:25



SECTION B–B

SCALE 1:25



DETAIL "1"

SCALE 1:10

NOTE :

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

REFERENCE DRAWING :

1. SURGE TANK, GENERAL LAYOUT AKP–ST–01
2. SURGE TANK, EMERGENCY VALVE CHAMBER PLAN SECTIONS AND DETAILS AKP–ST–07

0 0.25 0.5 0.75
SCALE 1:10 METERS

0 0.5 1 1.5 2
SCALE 1:25 METERS

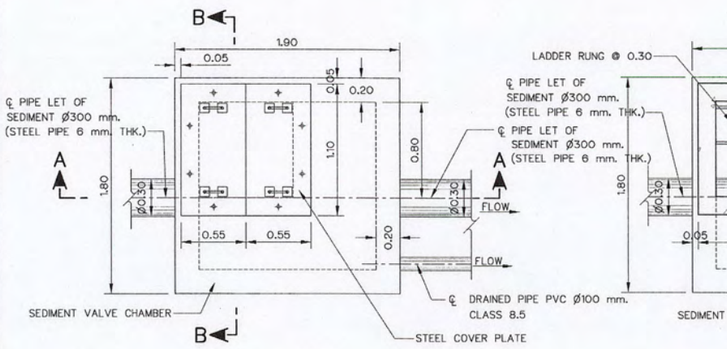
NO.	DATE	REVISIONS	CHECKED	APPROVED
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	CONSULTANTS		DEDE	

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

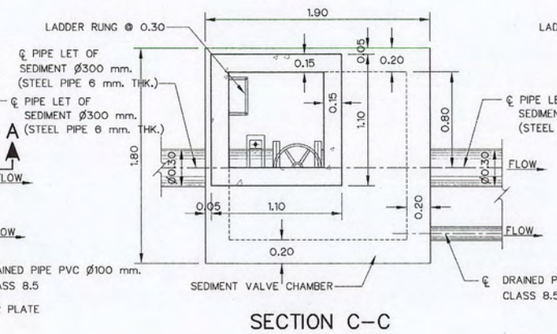
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
SURGE TANK
EMERGENCY VALVE CHAMBER REINFORCEMENT DETAILS

PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED ... REG.29074 ... REG.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED ... REG.8231	RECOMMENDED
28/10/2021 PROJECT MANAGER DATE	APPROVED
DRAWING NO. AKP–ST–08	SHEET NO. 46 OF 129



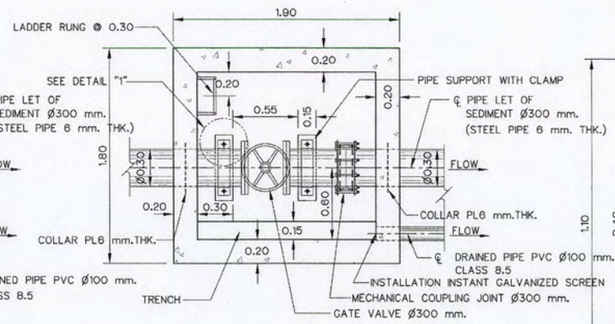
PLAN

SCALE 1:25



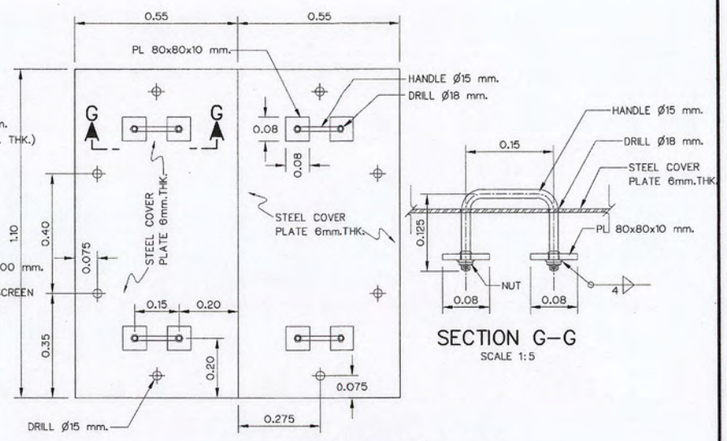
SECTION C–C

SCALE 1:25



SECTION D–D

SCALE 1:25

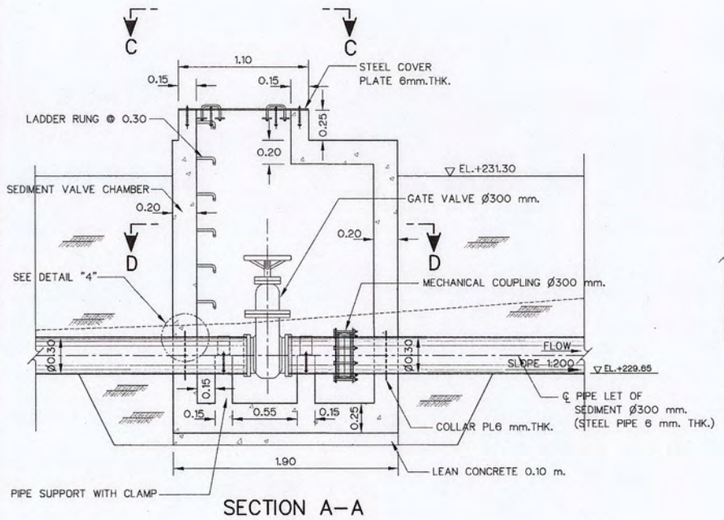


PLAN STEEL COVER PLATE

SCALE 1:10

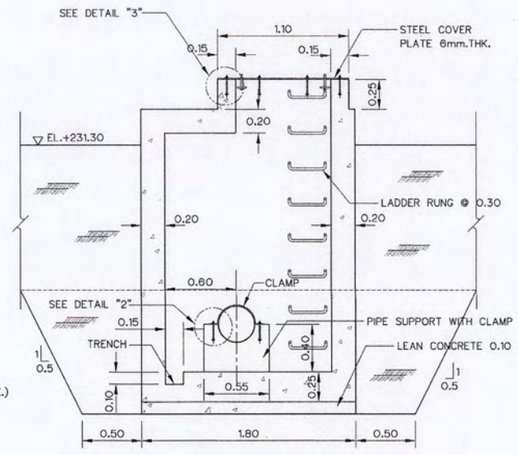
SECTION G–G

SCALE 1:5



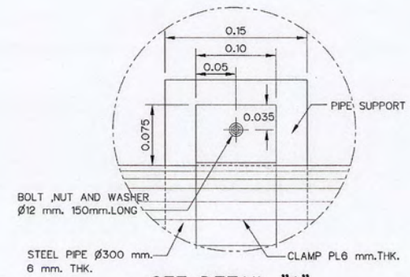
SECTION A–A

SCALE 1:25



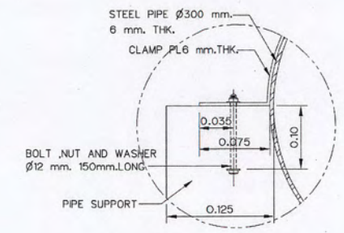
SECTION B–B

SCALE 1:25



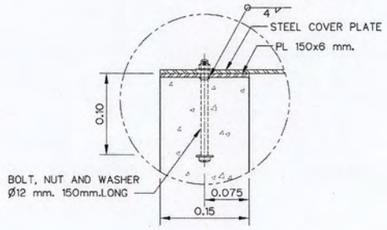
SEE DETAIL "1"

NOT TO SCALE



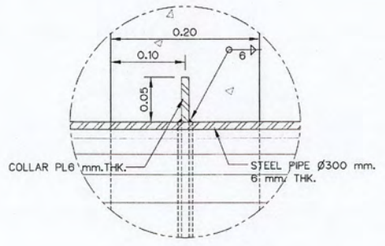
SEE DETAIL "2"

NOT TO SCALE



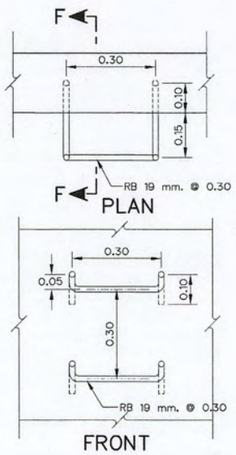
SEE DETAIL "3"

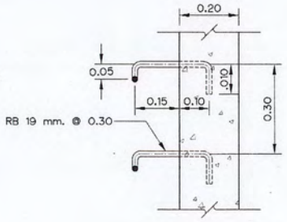
NOT TO SCALE



SEE DETAIL "4"

NOT TO SCALE





SECTION F–F

DETAIL OF LADDER RUNG

SCALE 1:10

NOTE :

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

REFERENCE DRAWING :

1. SURGE TANK, GENERAL LAYOUT AKP–ST–01
2. SURGE TANK, SEDIMENT VALVE CHAMBER REINFORCEMENT DETAILS AKP–ST–10

0 0.0125 0.25 0.375
SCALE 1:5 METERS

0 0.25 0.5 0.75
SCALE 1:10 METERS

0 0.5 1 1.5 2
SCALE 1:25 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
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2				
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	CONSULTANTS		DEDE	

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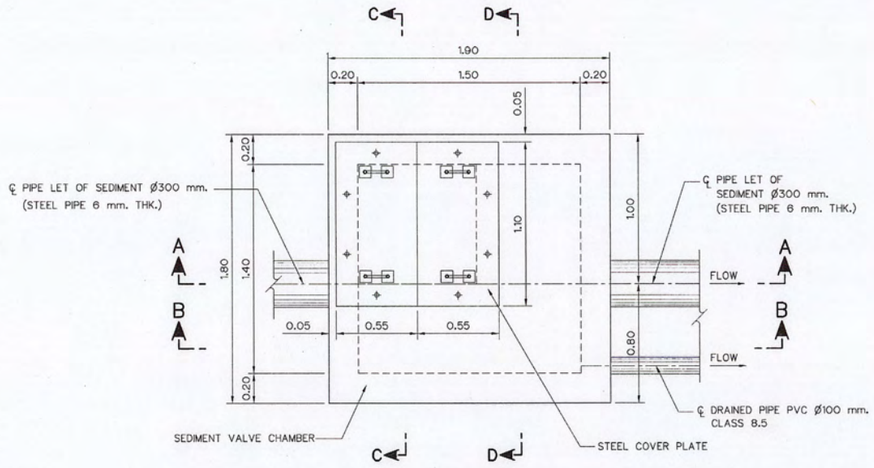
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

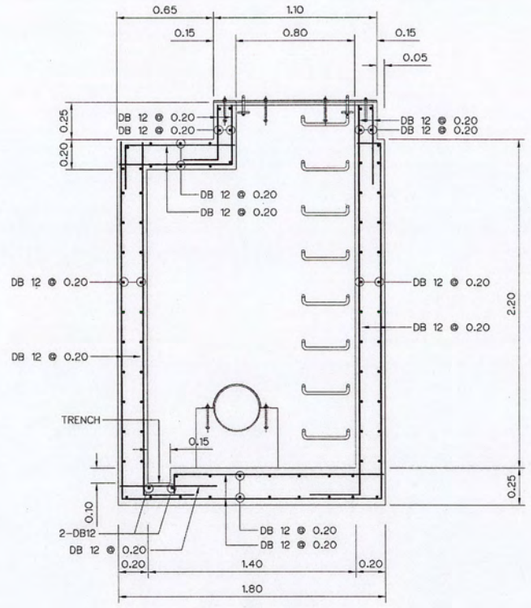
SURGE TANK

SEDIMENT VALVE CHAMBER PLAN SECTIONS AND DETAILS

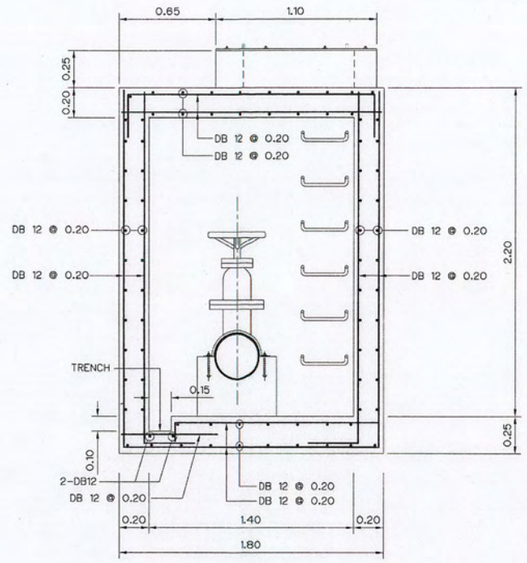
PCM P&C MANAGEMENT CO., LTD. / SPT SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED วิศ.29074 วิศ.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED วิศ.8231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
	DRAWING NO. AKP–ST–09
	SHEET NO. 47 OF 129



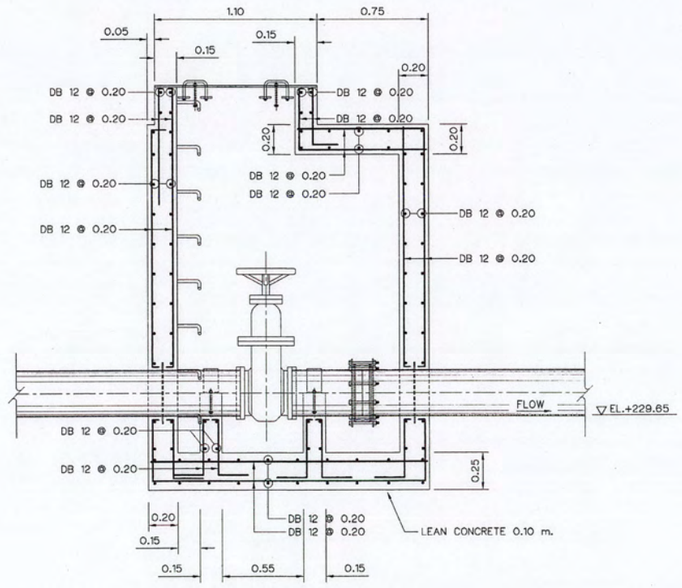
PLAN
SCALE 1:20



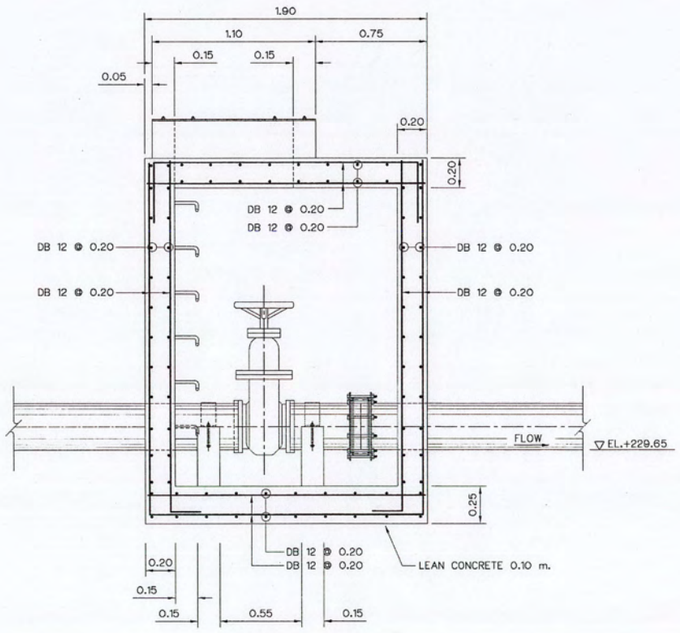
SECTION C–C
SCALE 1:20



SECTION D–D
SCALE 1:20



SECTION A–A
SCALE 1:20



SECTION B–B
SCALE 1:20

NOTE :

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

REFERENCE DRAWING :

1. SURGE TANK, SEDIMENT VALVE CHAMBER PLAN SECTIONS AND DETAILS AKP-ST-09

0 0.5 1 1.5
SCALE 1:20 METERS

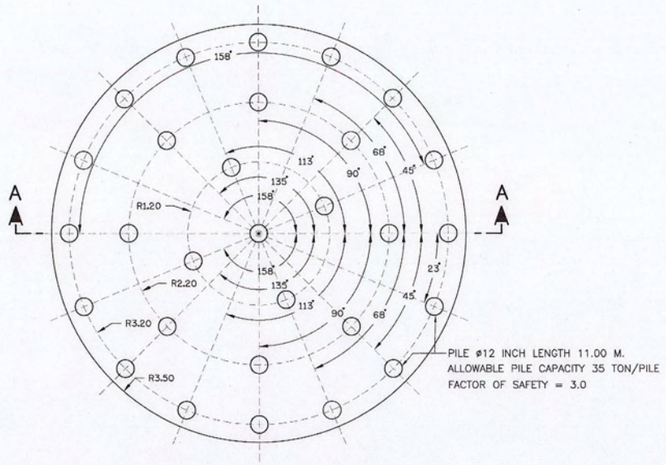
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	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
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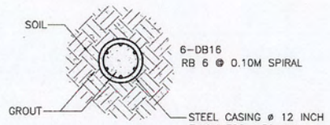
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
SURGE TANK
SEDIMENT VALVE CHAMBER REINFORCEMENT DETAILS

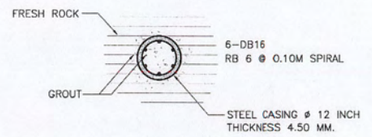
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DESIGNED Wipan REI.29074 REI.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED REI.8231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
	DRAWING NO. AKP-ST-10
	SHEET NO. 48 OF 129



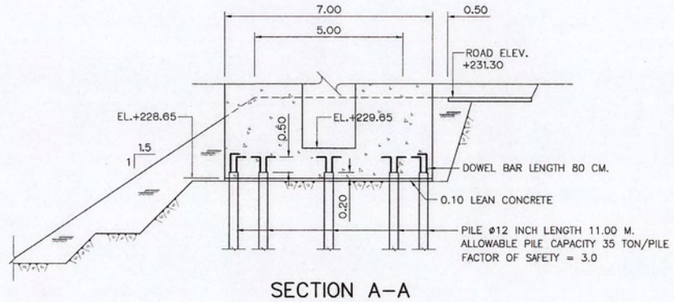
PILE FOOTING PLAN
SCALE 1:50



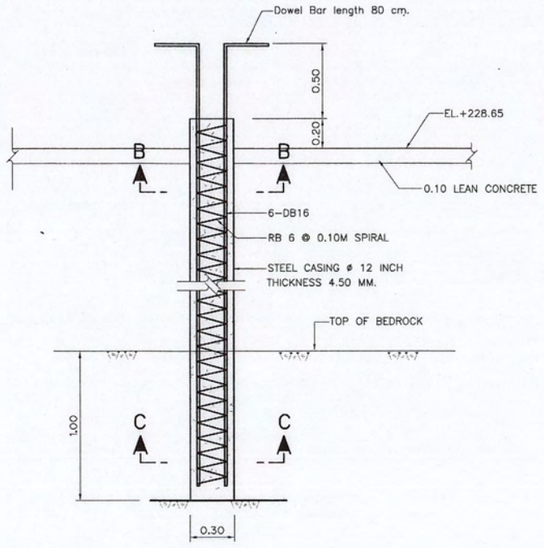
SECTION B–B
SCALE 1:20



SECTION C–C
SCALE 1:20



SECTION A–A
SCALE 1:100

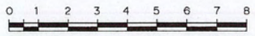


PILE DETAIL
SCALE 1:20

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METERS, UNLESS OTHERWISE SHOWN
2. GROUT STRENGTH SHALL BE 300 KSC (MIN)
3. ONE VERIFICATION PILE LOAD TEST SHALL BE ALLOWABLE PILE CAPACITY = 35 TON , FACTOR OF SAFETY = 3.0
4. REFER TO SPECIFICATION FOR PERMANENT CASING ACCORDANCE WITH มยผ. 107-2533
5. PROJECT INSPECTORS SHALL NOTE ACTUAL BEDROCK ELEVATIONS ON AS–BUILT DRAWING.
6. THE CONTRACTOR MUST SURVEY THE CONDITION OF THE AREA. AND ASSESSING THE STABILITY OF THE AREA. AND ASSESSING THE STABILITY OF THE AREA BEFORE PROCEEDING WITH THE CONSTRUCTION





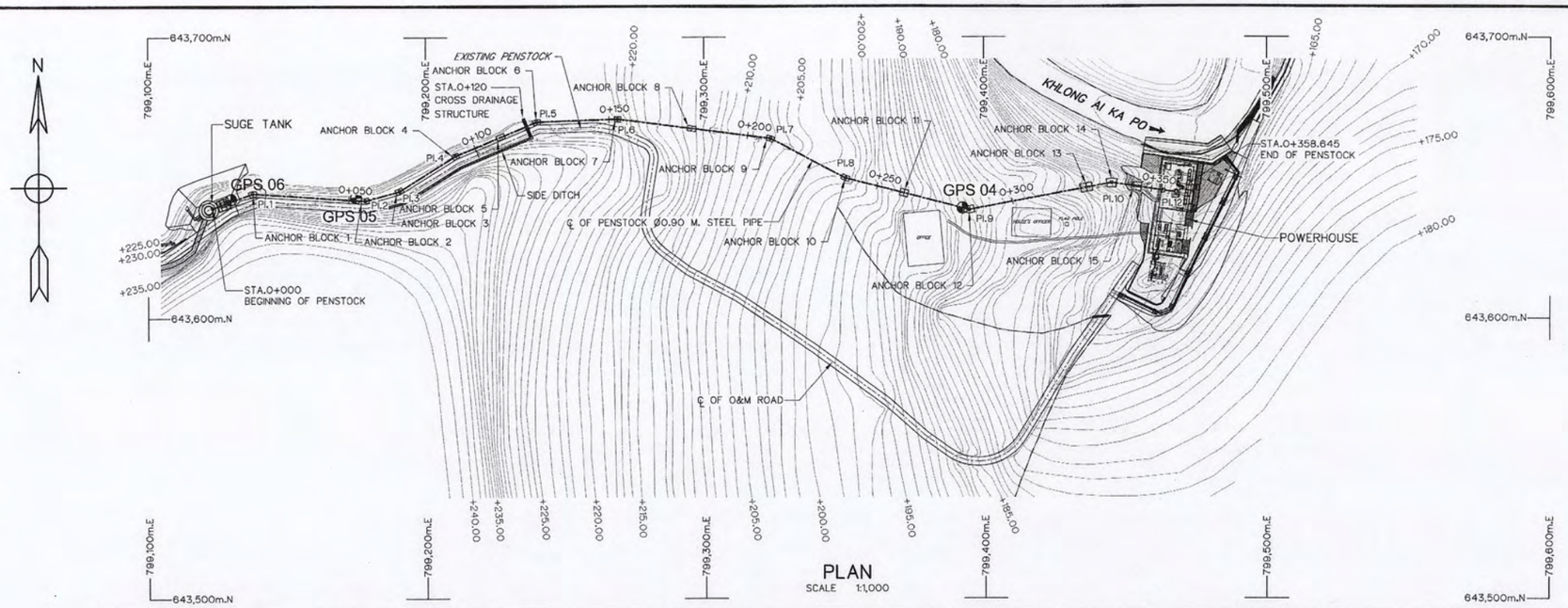
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
SURGE TANK
PILE FOOTING DETAILS

P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED วิศ.29074 วิศ.8969	REVIEWED
DRAWN	SUBMITTED
CHECKED วิศ.8231	RECOMMENDED
28/10/2021 PROJECT MANAGER DATE	APPROVED
	DRAWING NO. AKP-ST-11
	SHEET NO. 49 OF 129

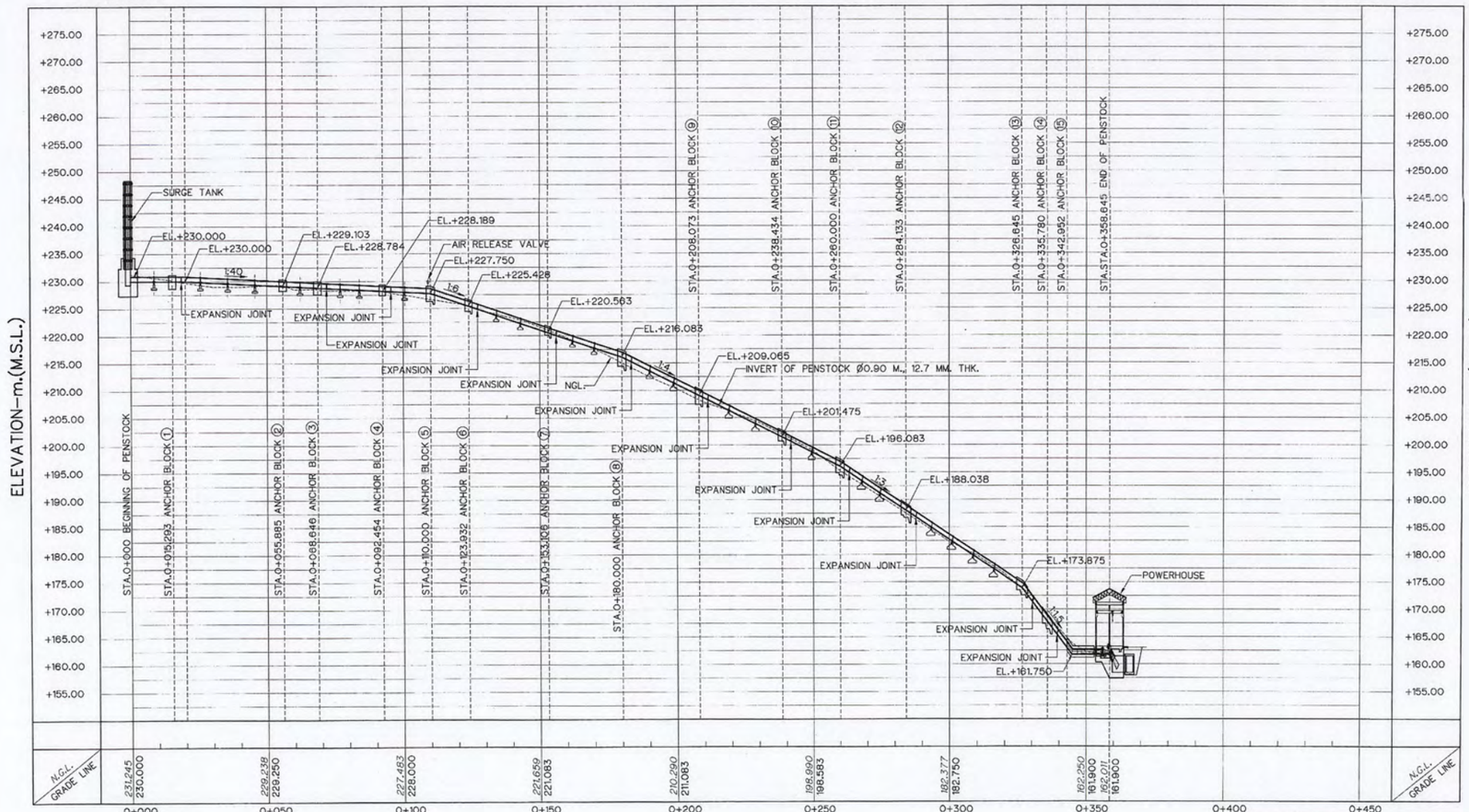


PLAN

SCALE 1:1,000

HORIZONTAL ALINEMENT OF PENSTOCK

NO. PI.	COORDINATE		PI. – PI.	DEFLECTION ANGLE	PI. STA.	BEARING
	N	E	(m)	(° – ' – ")	(km)	(N/S ° – ' – " E/W)
B	643,639.173	799,123.320	–	–	0+000.000	–
PI.1	643,644.392	799,137.695	15.293	23°–38'–46.26"	0+015.293	N 70°–02'–45.68" E
PI.2	643,641.778	799,178.203	40.592	19° –12'–18.93"	0+055.885	S 86° –18'–28.07" E
PI.3	643,645.191	799,190.499	12.761	16° –15'–10.98"	0+068.646	N 74°–29'–13.00" E
PI.4	643,657.725	799,210.741	23.808	09°–10'–50.97"	0+092.454	N 58° –14'–02.02" E
PI.5	643,669.814	799,239.804	31.477	20°–40'–12.39"	0+123.932	N 67°–24'–52.99" E
PI.6	643,670.789	799,268.962	29.174	09°–07' 39.32 "	0+153.106	N 88°–05'–05.38" E
PI.7	643,663.888	799,323.494	54.967	20°–41'–40.80"	0+208.073	S 82°–47'–15.30" E
PI.8	643,649.678	799,350.324	30.361	13°–37'–57.89"	0+238.434	S 62°–05'–34.50" E
PI.9	643,638.410	799,394.613	45.700	24°–56'–46.05"	0+284.133	S 75°–43'–32.39" E
PI.10	643,647.974	799,445.366	51.646	19° –17'–03.15"	0+335.780	N 79° –19'–41.56" E
E	643,644.550	799,467.973	22.865	–	0+358.645	S 81° –23'–15.29" E



PROFILE

VERTICAL SCALE 1:500

HORIZONTAL SCALE 1:1,000

NOTES :

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

REFERENCE DRAWINGS :

1. PENSTOCK, TYPICAL SECTIONS AND DETAILS	AKP–PS–02
2. PENSTOCK, TYPICAL OF PENSTOCK, PIER AND RING GIRDER	AKP–PS–03
3. PENSTOCK, ANCHOR BLOCK DETAILS	AKP–PS–04 TO 08
4. PENSTOCK, WYE, PLAN, SECTIONS AND DETAILS	AKP–PS–09
5. PENSTOCK, EXPANSION JOINT, PLAN, SECTIONS AND DETAILS	AKP–PS–10
6. PENSTOCK, BEND DETAILS	AKP–PS–11
7. PENSTOCK, WELDING DETAILS	AKP–PS–12
8. PENSTOCK, CROSS DRAINAGE STRUCTURE	AKP–PS–13

0 5 10 20 30 40
SCALE 1:500 METERS

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

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

AI KA PO HYDROPOWER PROJECT

TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

PENSTOCK

PLAN AND PROFILE, STA.0+000 TO STA.0+358.645

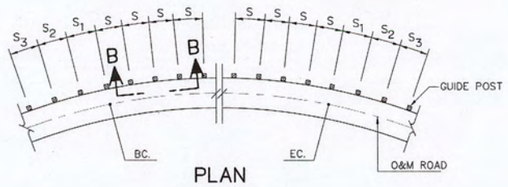
NO.	DATE	REVISIONS	CHECKED	APPROVED
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	CONSULTANTS		DEDE	

PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

DESIGNED ณัฐวุฒิ 28/10/2021 ณัฐวุฒิ 28/9462
DRAWN
CHECKED 28/8231
PROJECT MANAGER 28/10/2021 DATE

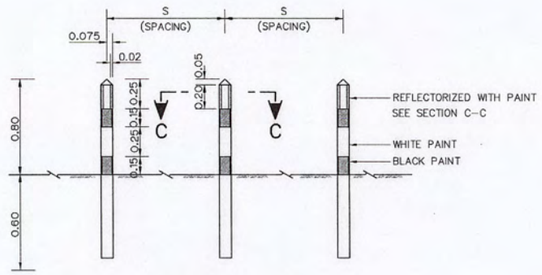
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP–PS–01
SHEET NO. 50 OF 129



PLAN

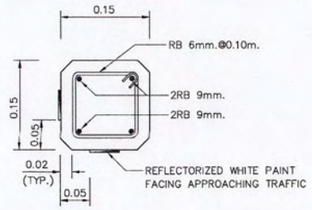
NOT TO SCALE



SECTION B-B

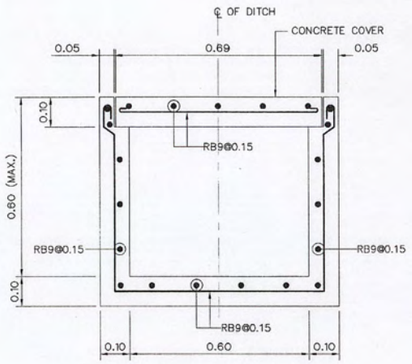
NOT TO SCALE

GUIDE POSTS



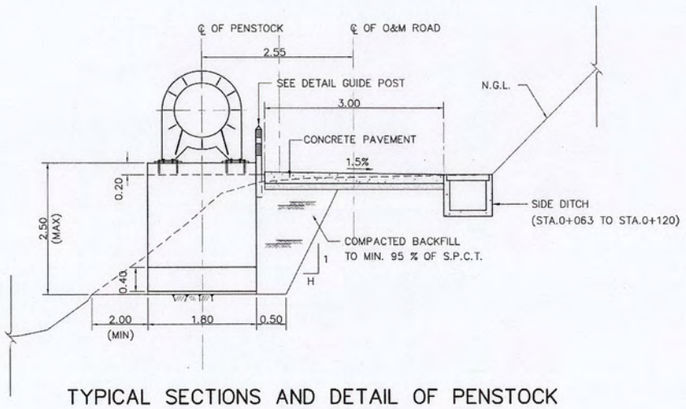
SECTION C-C

NOT TO SCALE



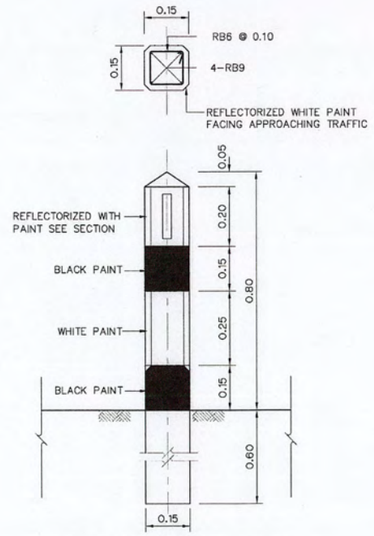
DETAIL OF DITCH

SCALE 1:10



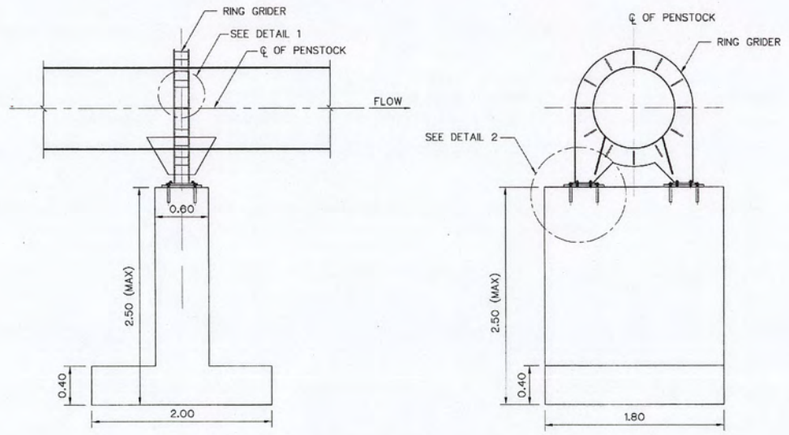
TYPICAL SECTIONS AND DETAIL OF PENSTOCK

SCALE 1:50



DETAIL OF GUIDE POST

SCALE 1:10



HORIZONTAL PIER
(GENERAL SECTION)

NOT TO SCALE

TABLE 1 TABLE OF CUT SLOPE

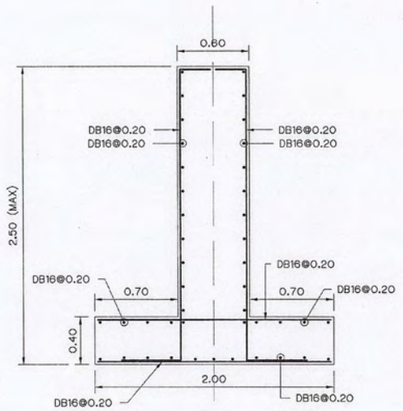
TYPE OF GROUND	SLOPE 1:H
EARTH	1:1
MODERATELY WEATHERED ROCK	1:0.5
FRESH ROCK	1:0.25

TABLE 2 TABLE OF FILL SLOPE

TYPE OF GROUND	SLOPE 1:H
EARTH	1:1.5
MODERATELY WEATHERED ROCK	1:1
FRESH ROCK	1:1

TABLE 3

SPACING OF GUIDE POSTS				
RADIUS M.	S M.	S1 M.	S2 M.	S3 M.
15 – 74	4	8	12	24
75 – 99	6	12	18	36
LARGER THAN 100	NO GUIDE POSTS INSTALLED			



HORIZONTAL PIER
(REINFORCEMENT DETAIL)

NOT TO SCALE

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP-GN-03
3. GUIDE POSTS ARE REQUIRED AT EVERY BENDS AND BETWEEN BENDS WITH MAXIMUM 10.00 M. SPACING.
4. THE SOIL/ROCK TYPE SHALL BE CONSIDERED DIRECT BY FIELD ENGINEER.
5. BEFOR EXCAVATION SHOULD BE EVALUATED AND ANALYSIS BY FIELD GEOTECHNICAL ENGINEER OR ENGINEERING GEOLOGIST.
6. IN THE EVENT THAT THE CONDITION OF FOUNDATION IS POOR, IT IS THE CONTRACTOR'S RESPONSIBILITY TO CORRECT AND/OR ADJUST THE RELEVENT DRAWINGS TO SUIT THE FIELD CONDITIONS. AND SHALL BE SUBMITTED TO DEDE'S FIELD ENGINEER FOR APPROVAL.
7. IN CASE OF DEEP CUT/HIGH FILL AT DOUBTFUL AREA, IT IS THE CONTRACTOR'S RESPONSIBILITY TO CORRECT AND/OR ADJUST THE RELEVENT DRAWINGS TO OBTAIN FIELD ENGINEER APPROVAL.
8. BENCHING SHALL BE REQUIRED ON EXISTING GROUND SLOPE IN THE PORTION OF EMBANKMENT. THE NUMBER OF STEPS DEPENDED UPON THE HEIGHT AND STABILITY OF SLOPE CONSIDERED BY FIELD ENGINEER. THE WIDTH SHALL BE PERMITTED FOR COMPACTED EQUIPMENT. DENSITY OF COMPACTED MATERIAL SHALL NOT BE LESS THAN 95% OF STANDARD PROCTOR.

REFERENCE DRAWINGS :

1. PENSTOCK, PLAN AND PROFILE, KM. 0+000 TO KM. 0+358.645	AKP-PS-01
2. PENSTOCK, RING GIRDER, DETAIL "1" AND DETAIL "2"	AKP-PS-03

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8

SCALE 1:10 METERS

0 0.5 1.0 2.0 3.0 4.0

SCALE 1:50 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

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MINISTRY OF ENERGY

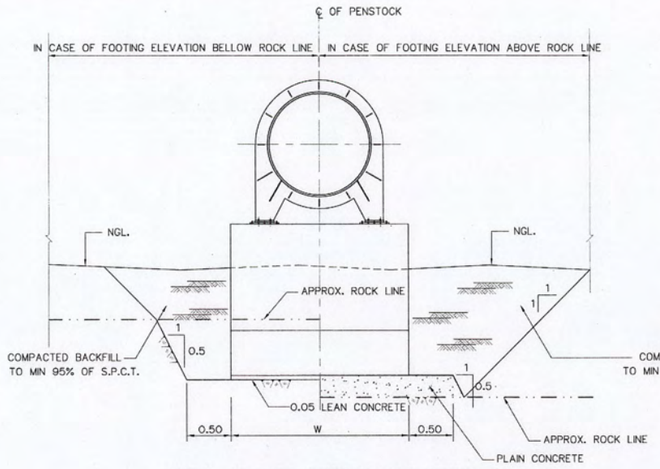
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

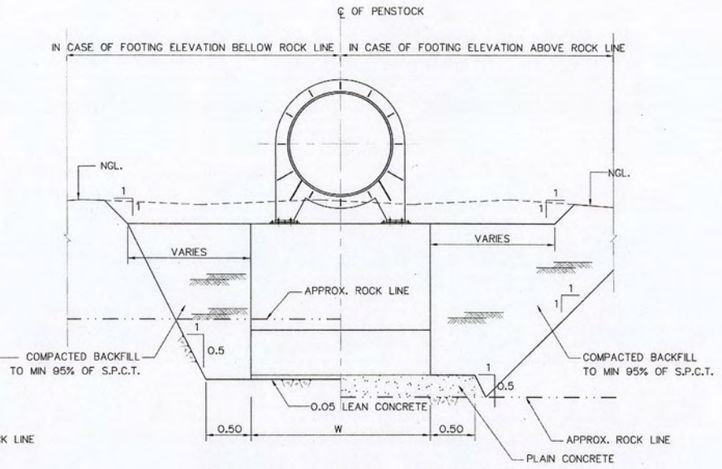
PENSTOCK

TYPICAL SECTIONS AND DETAILS

PCM P&C MANAGEMENT CO., LTD. / GPD SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED วิศ.29074 วิศ.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED วิศ.8231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-PS-02	SHEET NO. 51 OF 129



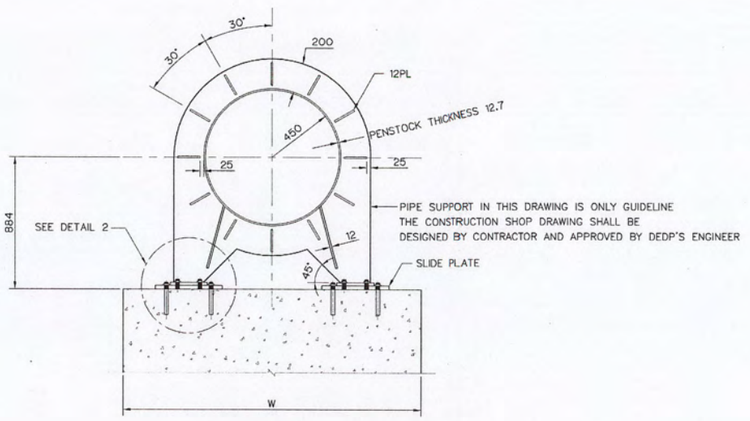
N.G.L. BELLOW INVERT ELEVATION



N.G.L. ABOVE INVERT ELEVATION

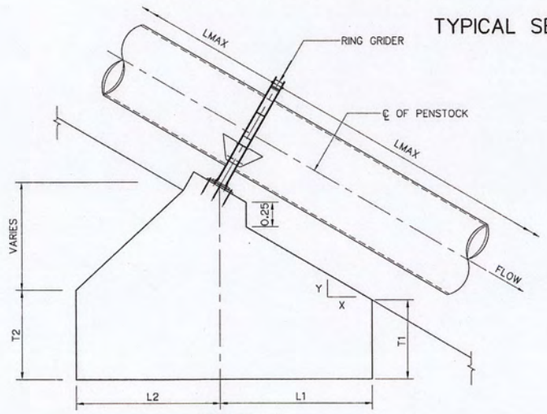
TYPICAL SECTION OF PENSTOCK

NOT TO SCALE



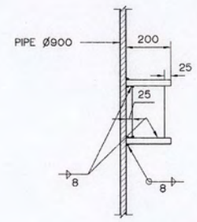
SECTION A – A

SCALE 1:20



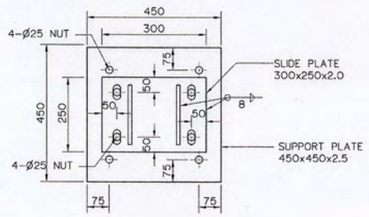
PIER

NOT TO SCALE



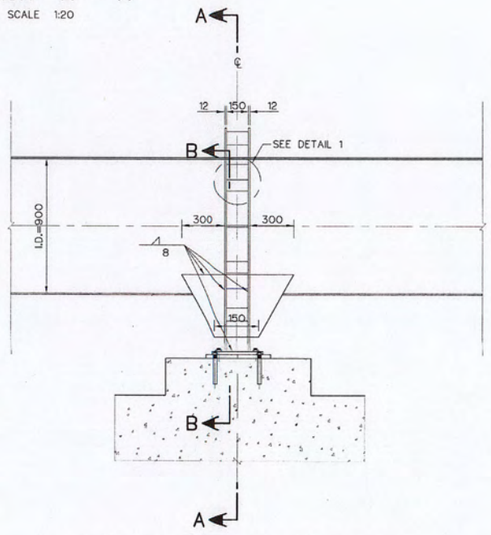
DETAIL "1"

NOT TO SCALE

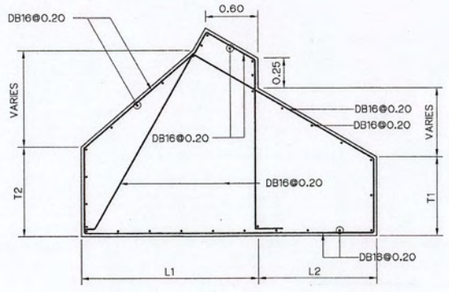


DETAIL "2"

NOT TO SCALE

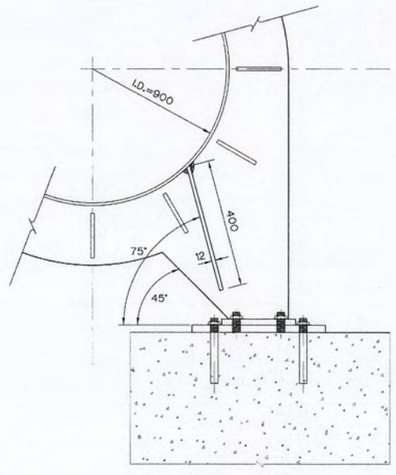


RING GIRDER FOR 900 I.D. PIPE



PIER (REINFORCEMENT DETAIL)

NOT TO SCALE



SECTION B – B

NOT TO SCALE

NOTES :

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP-GN-03
3. CORROSIVE PROTECTION IS WARNED TO STRICTLY FLOW PAINTING SPECIFICATION

DIMENSIONS FOR PIER

PIPE SIOPE Y:X	L1 (m.)	L2 (m.)	T1 (m.)	T2 (m.)	W (m.)	LMAX (m.)
1:6	1.30	0.70	0.30	0.40	1.80	8.00
1:4	1.50	1.00	0.40	0.40	1.80	8.00
1:3	2.00	1.00	0.40	0.40	1.80	8.00
1:1.5	2.00	1.50	0.40	0.50	1.80	8.00

0 0.5 1.0 1.5

SCALE 1:20 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

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MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

PENSTOCK

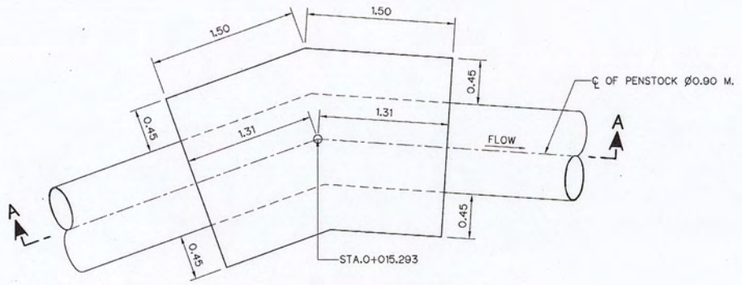
TYPICAL OF PENSTOCK, PIER AND RING GIRDER

PCM F&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

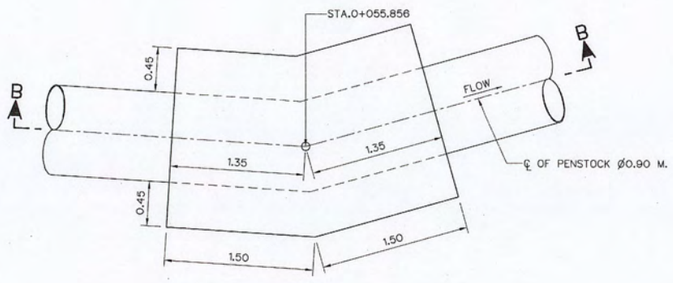
DESIGNED REI.29074 REI.9462
DRAWN
CHECKED REI.8231
PROJECT MANAGER 28/10/2021 DATE

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

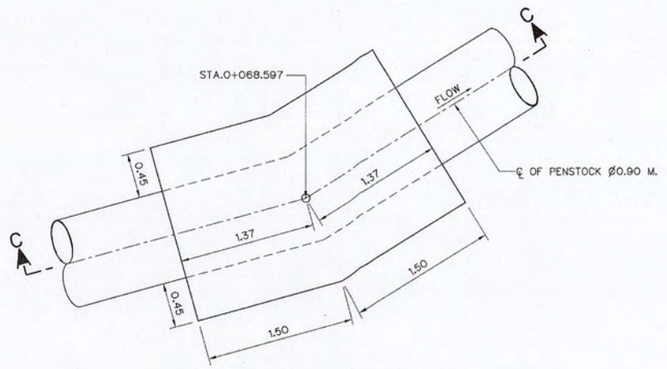
DRAWING NO. AKP-PS-03
SHEET NO. 52 OF 129



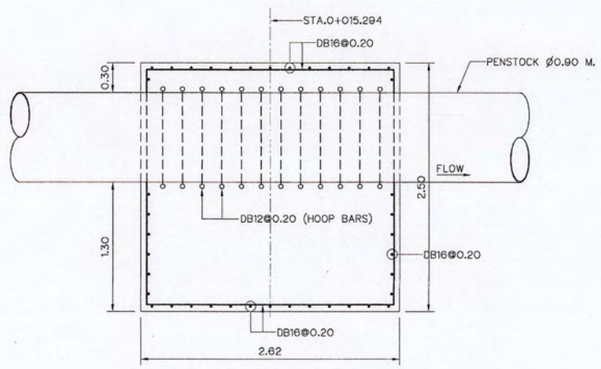
PLAN ANCHOR BLOCK ① (STA.0+015.293)
SCALE 1:30



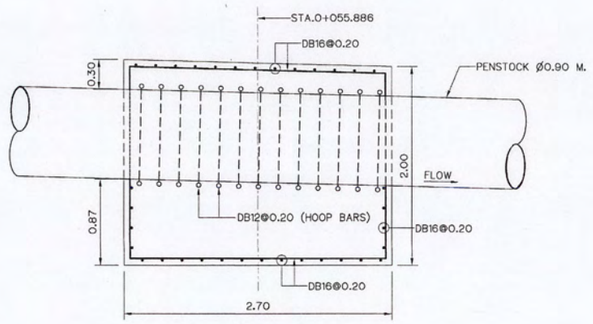
PLAN ANCHOR BLOCK ② (STA.0+055.885)
SCALE 1:30



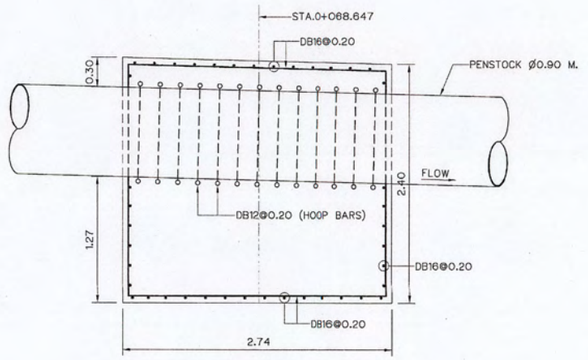
PLAN ANCHOR BLOCK ③ (STA.0+068.646)
SCALE 1:30



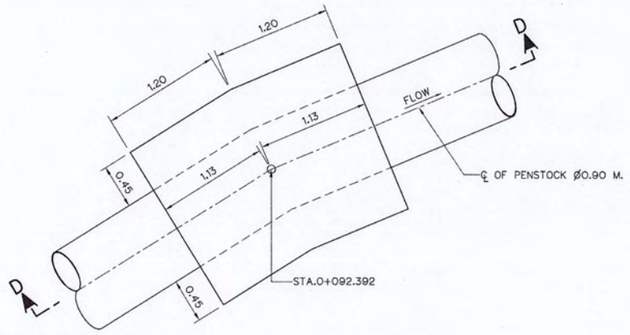
SECTION A–A
SCALE 1:30



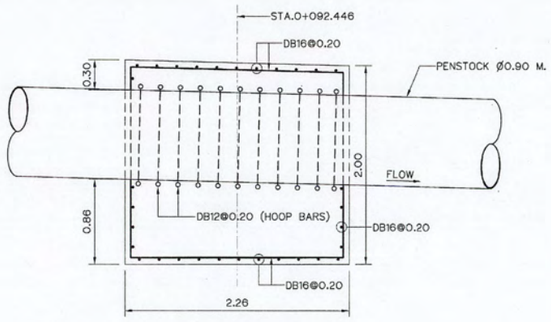
SECTION B–B
SCALE 1:30



SECTION C–C
SCALE 1:30



PLAN ANCHOR BLOCK ④ (STA.0+092.454)
SCALE 1:30



SECTION D–D
SCALE 1:30

SCALE 1:30 0 0.5 1 1.5 2 2.5 METERS

NOTES :

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

REFERENCE DRAWINGS :

1. PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA.0+358.645 AKP-PS-01

NO.	DATE	REVISIONS	CHECKED	APPROVED
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2				
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	CONSULTANTS		DEDE	

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

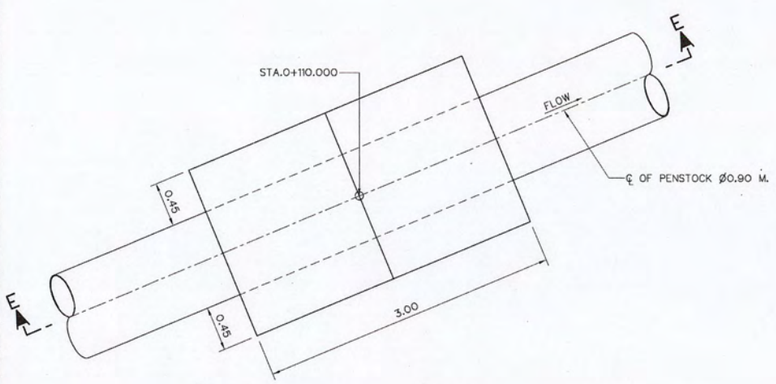
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
PENSTOCK
ANCHOR BLOCK DETAILS (SHEET 1/5)

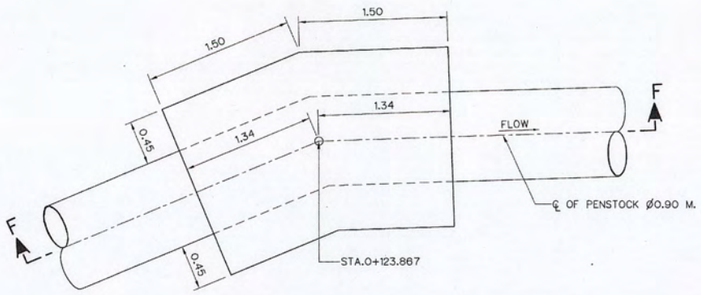
P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

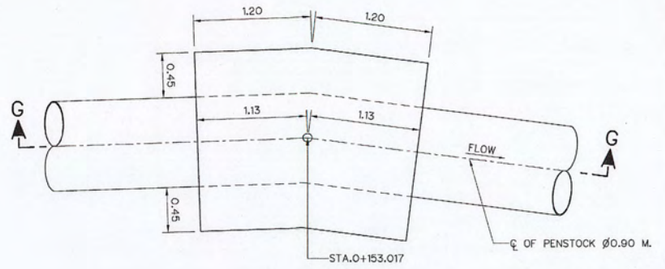
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DRAWN	
CHECKED	REG.8231
PROJECT MANAGER	28/10/2021 DATE
REVIEWED	
SUBMITTED	
RECOMMENDED	
APPROVED	
DRAWING NO.	AKP-PS-04
SHEET NO.	53 OF 129



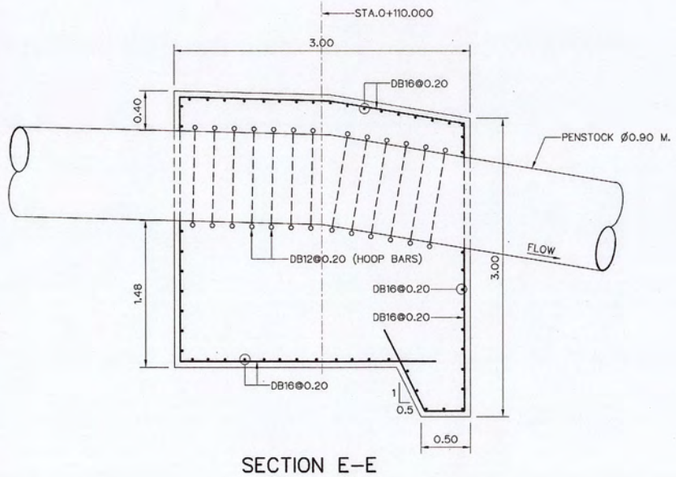
PLAN ANCHOR BLOCK ⑤ (STA.0+110.000)
SCALE 1:30



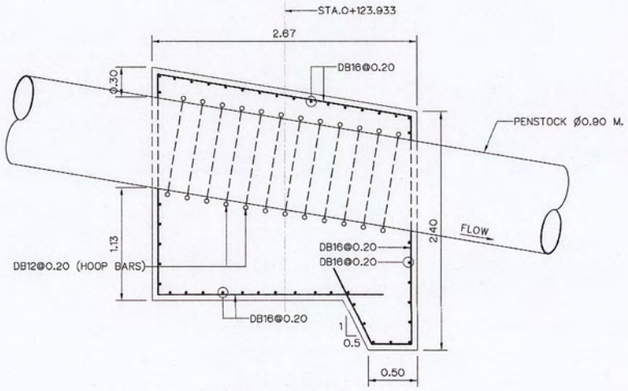
PLAN ANCHOR BLOCK ⑥ (STA.0+123.932)
SCALE 1:30



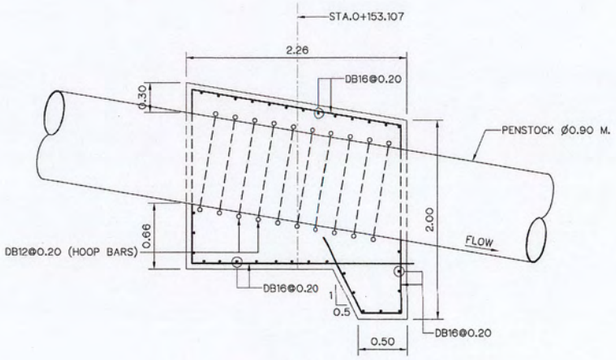
PLAN ANCHOR BLOCK ⑦ (STA.0+153.106)
SCALE 1:30



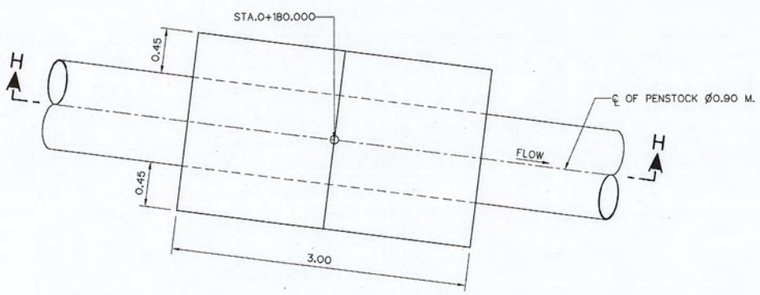
SECTION E–E
SCALE 1:30



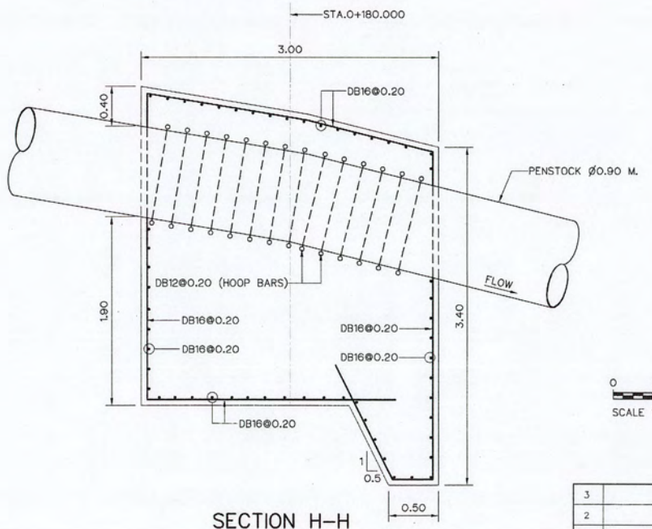
SECTION F–F
SCALE 1:30



SECTION G–G
SCALE 1:30



PLAN ANCHOR BLOCK ⑧ (STA.0+180.000)
SCALE 1:30



SECTION H–H
SCALE 1:30

0 0.5 1 1.5 2 2.5
SCALE 1:30 METERS

NOTES :

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

REFERENCE DRAWINGS :

1. PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA.0+358.645 AKP-PS-01

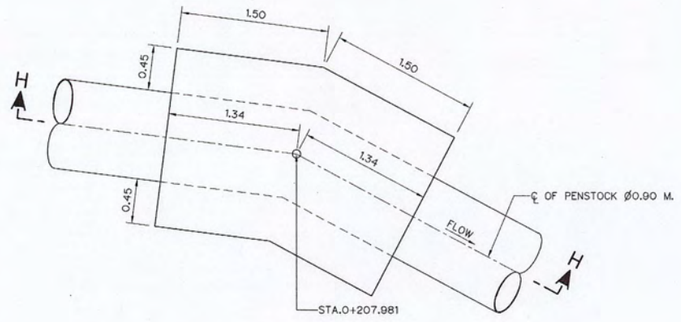
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

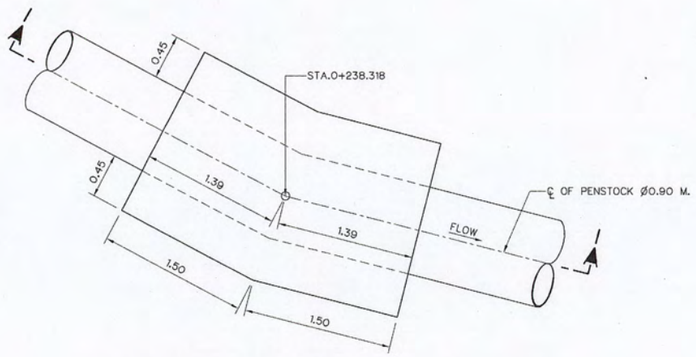
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
PENSTOCK
ANCHOR BLOCK DETAILS (SHEET 2/5)

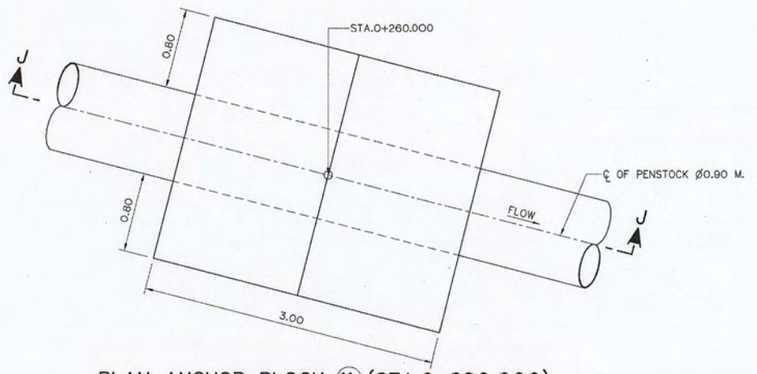
PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED	RL.29074 RL.9462	REVIEWED	
DRAWN		SUBMITTED	
CHECKED	RL.8231	RECOMMENDED	
PROJECT MANAGER	28/10/2021 DATE	APPROVED	
		DRAWING NO. AKP-PS-05	SHEET NO. 54 OF 129



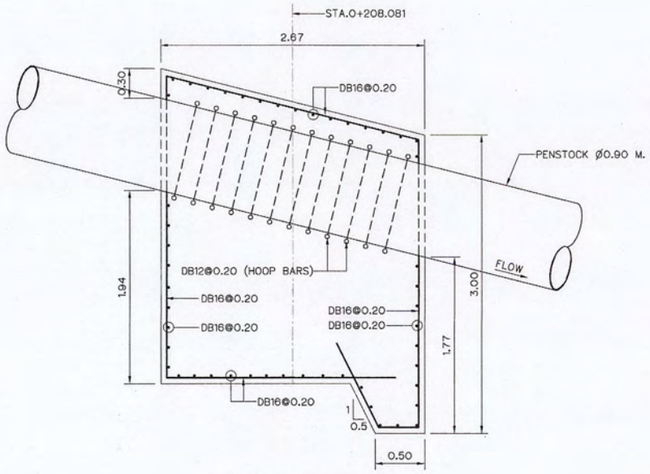
PLAN ANCHOR BLOCK ⑨ (STA.0+208.073)
SCALE 1:30



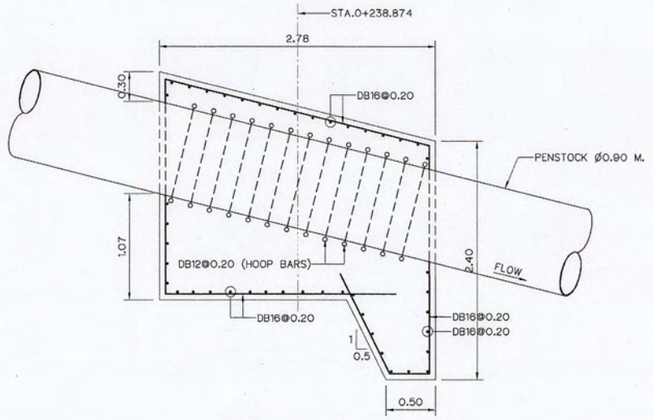
PLAN ANCHOR BLOCK ⑩ (STA.0+238.434)
SCALE 1:30



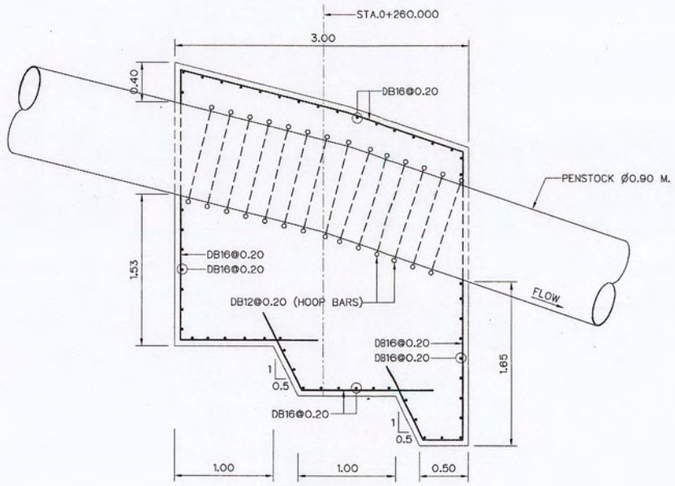
PLAN ANCHOR BLOCK ⑪ (STA.0+260.000)
SCALE 1:30



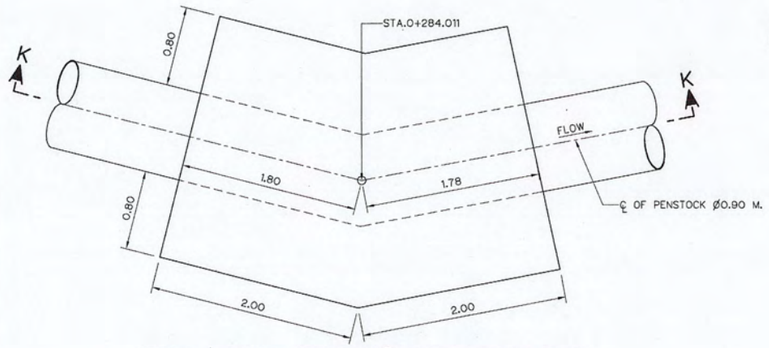
SECTION H–H
SCALE 1:30



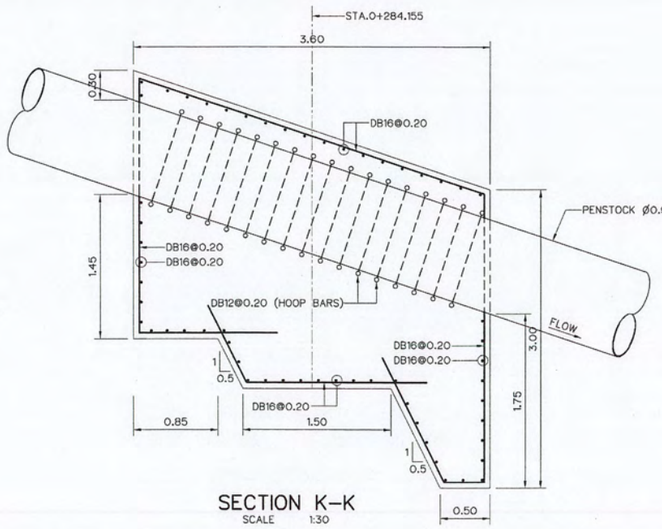
SECTION I–I
SCALE 1:30



SECTION J–J
SCALE 1:30



PLAN ANCHOR BLOCK ⑫ (STA.0+284.133)
SCALE 1:30



SECTION K–K
SCALE 1:30

SCALE 1:30
0 0.5 1 1.5 2 2.5
METERS

NOTES :

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

REFERENCE DRAWINGS :

1. PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA.0+358.645 AKP-PS-01

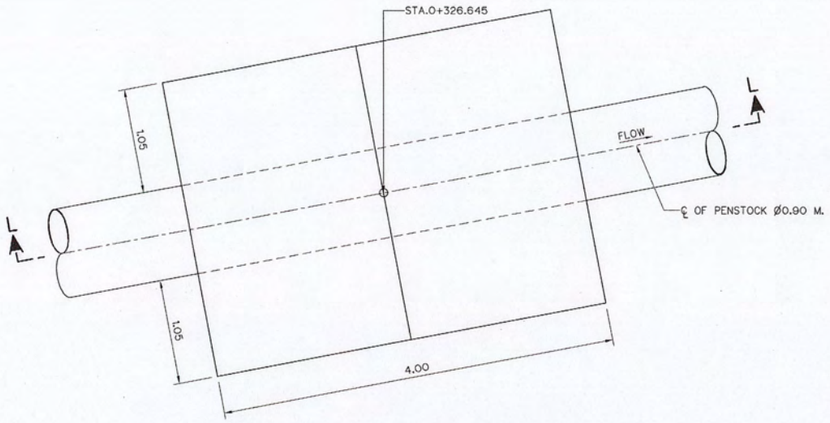
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

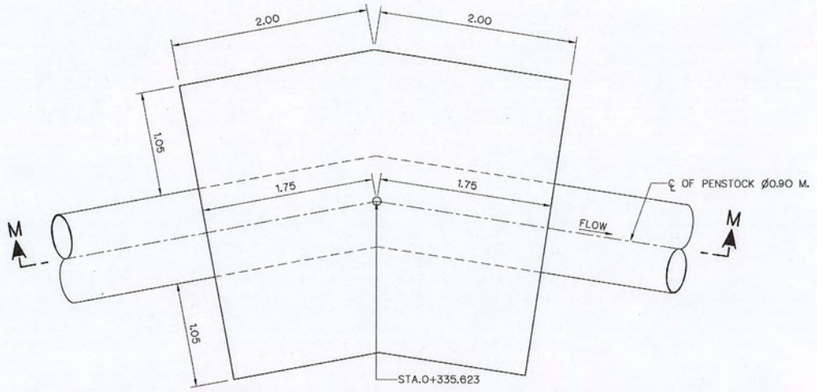
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
PENSTOCK
ANCHOR BLOCK DETAILS (SHEET 3/5)

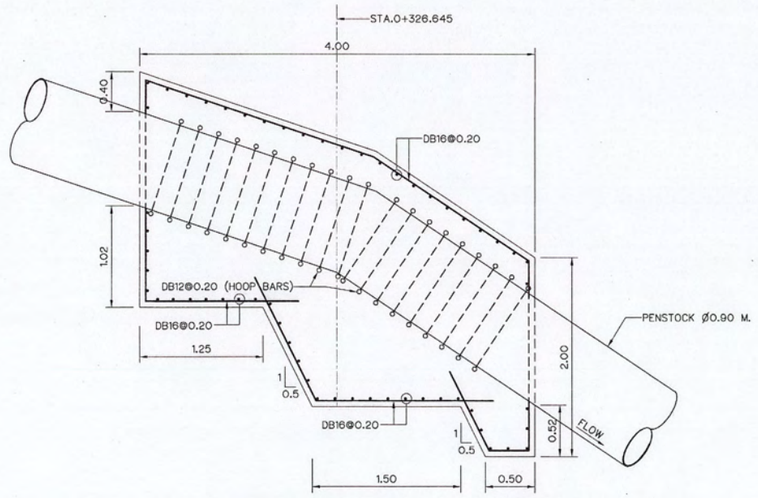
PCM P&C MANAGEMENT CO., LTD. / CPA SPT CONSULTANTS CO., LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED	REG.29074 REG.9462	REVIEWED	
DRAWN		SUBMITTED	
CHECKED	REG.8231	RECOMMENDED	
PROJECT MANAGER	28/10/2021 DATE	APPROVED	
		DRAWING NO. AKP-PS-06	SHEET NO. 55 OF 129



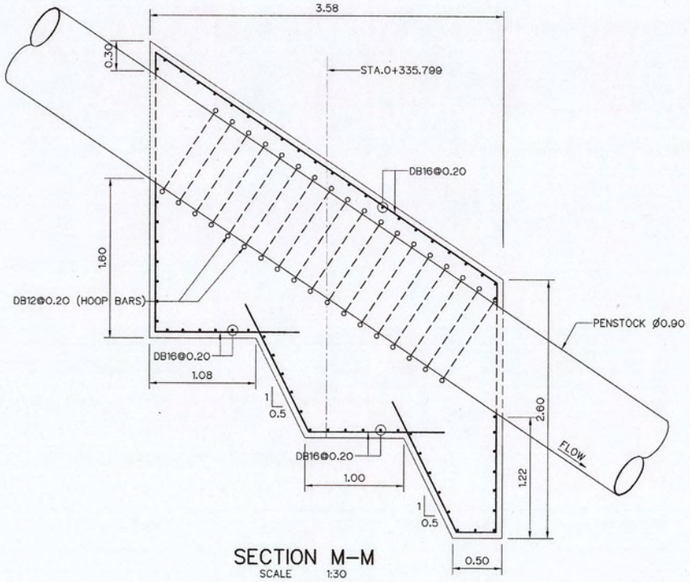
PLAN ANCHOR BLOCK ⑬ (STA.0+326.645)
SCALE 1:30



PLAN ANCHOR BLOCK ⑭ (STA.0+335.780)
SCALE 1:30



SECTION L-L
SCALE 1:30



SECTION M-M
SCALE 1:30

NOTES :

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

REFERENCE DRAWINGS :

1. PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA.0+358.645 AKP-PS-01

0 0.5 1 1.5 2 2.5
SCALE 1:30 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
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2				
1				
	CONSULTANTS		DEDE	

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

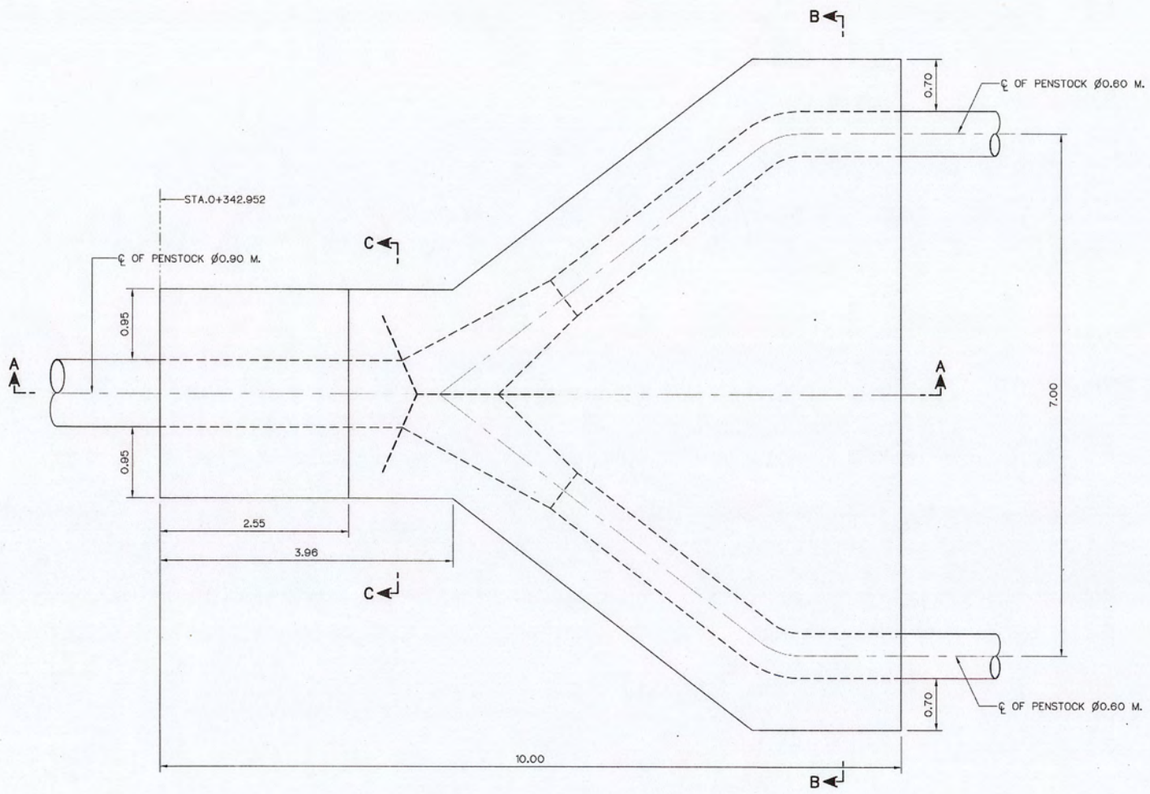
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

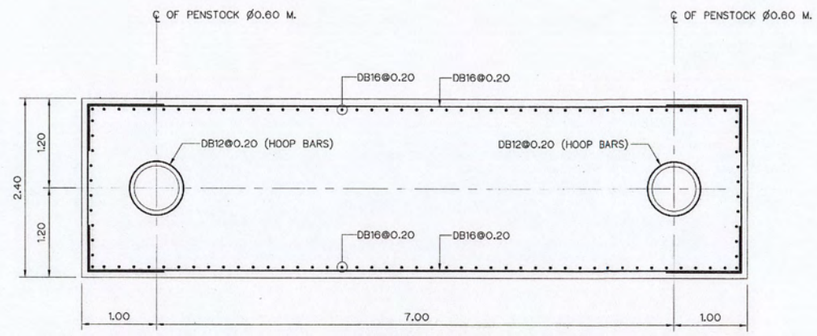
PENSTOCK

ANCHOR BLOCK DETAILS (SHEET 4/5)

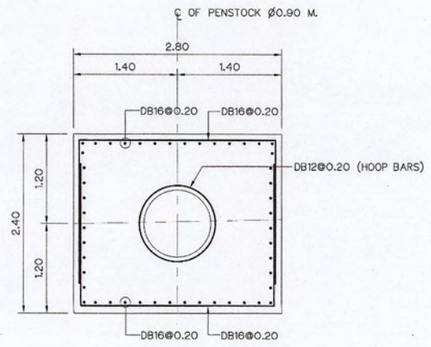
PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED Reg.29074 Reg.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED Reg.8231	RECOMMENDED
28/10/2021 PROJECT MANAGER DATE	APPROVED
DRAWING NO. AKP-PS-07	SHEET NO. 56 OF 129



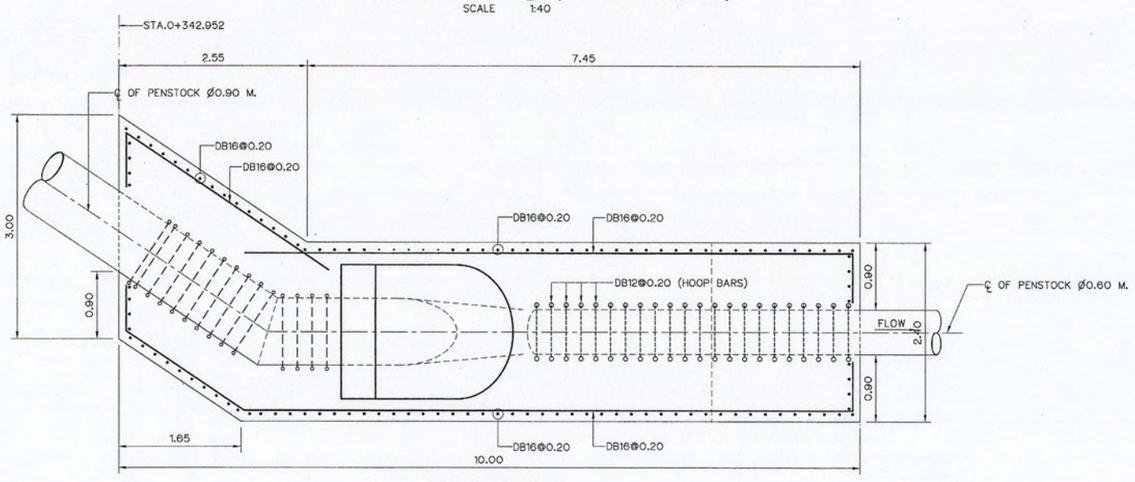
PLAN ANCHOR BLOCK ⑮ (STA.0+342.952)
SCALE 1:40



SECTION B–B
SCALE 1:40



SECTION C–C
SCALE 1:40



SECTION A–A
SCALE 1:40

NOTES :

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

REFERENCE DRAWINGS :

1. PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA.0+358.645 AKP–PS–01

0 0.5 1 2 3
SCALE 1:40 METERS

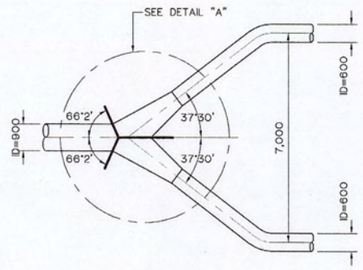
NO.	DATE	REVISIONS	CHECKED	APPROVED
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2				
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	CONSULTANTS		DEDE	

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

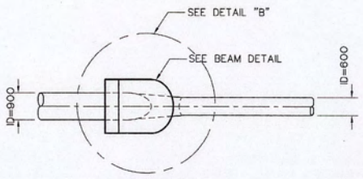
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
PENSTOCK
ANCHOR BLOCK DETAILS (SHEET 5/5)

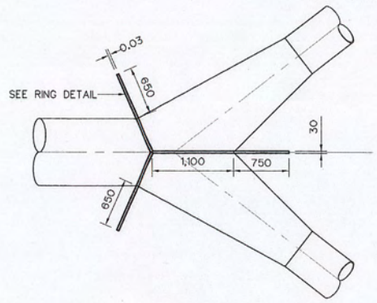
P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED RB.29074 RB.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED RB.8231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP–PS–08	SHEET NO. 57 OF 129



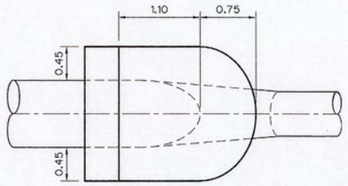
PLAN
NOT TO SCALEO



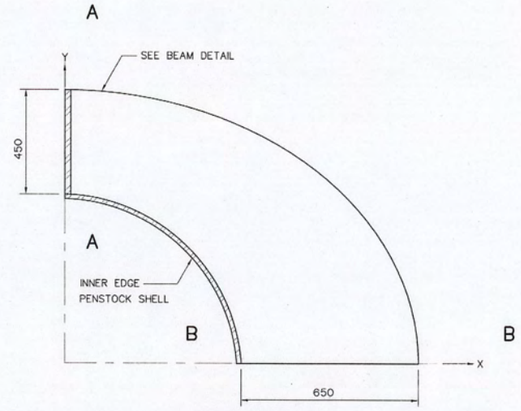
ELEVATION
NOT TO SCALEO



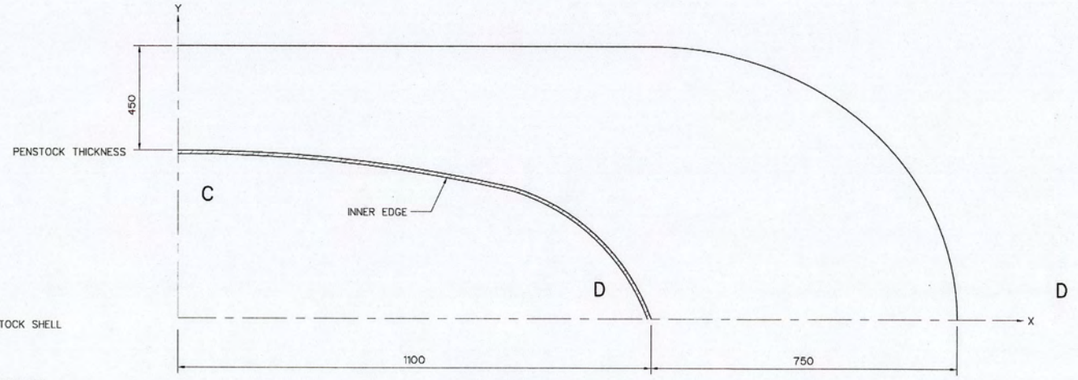
DETAIL "A"
SCALE 1:40



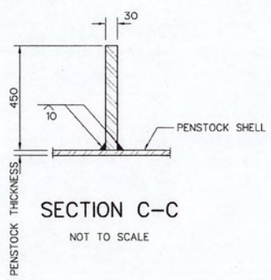
DETAIL "B"
SCALE 1:50



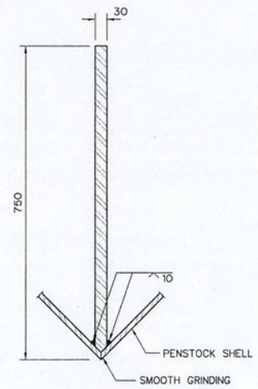
RING DETAIL
NOT TO SCALE



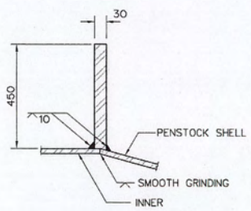
BEAM DETAIL
NOT TO SCALE



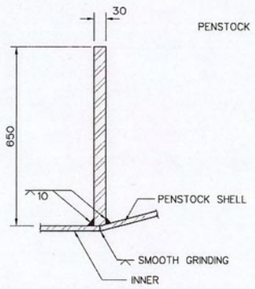
SECTION C–C
NOT TO SCALE



SECTION D–D
NOT TO SCALE



SECTION A–A
NOT TO SCALE



SECTION B–B
NOT TO SCALE

NOTES :

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

0 0.5 1.0 2.0 3.0 4.0
SCALE 1:50 METERS

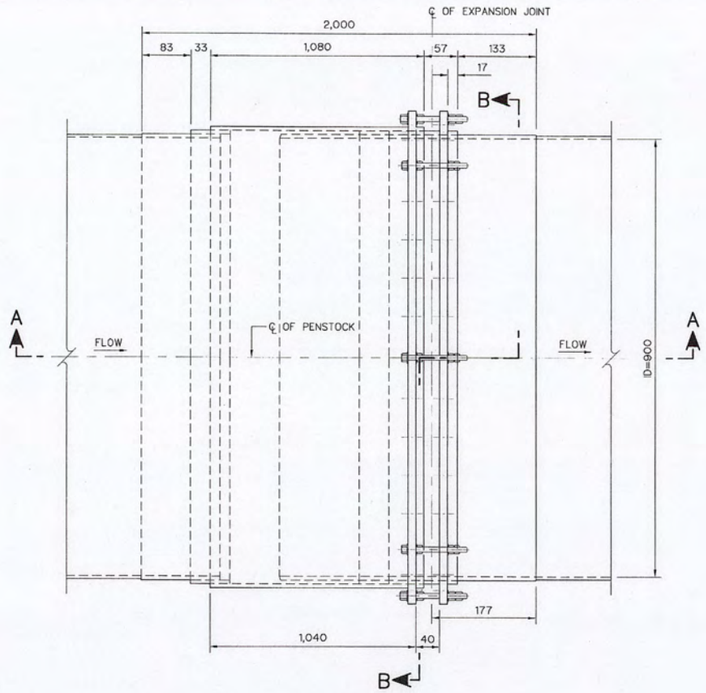
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

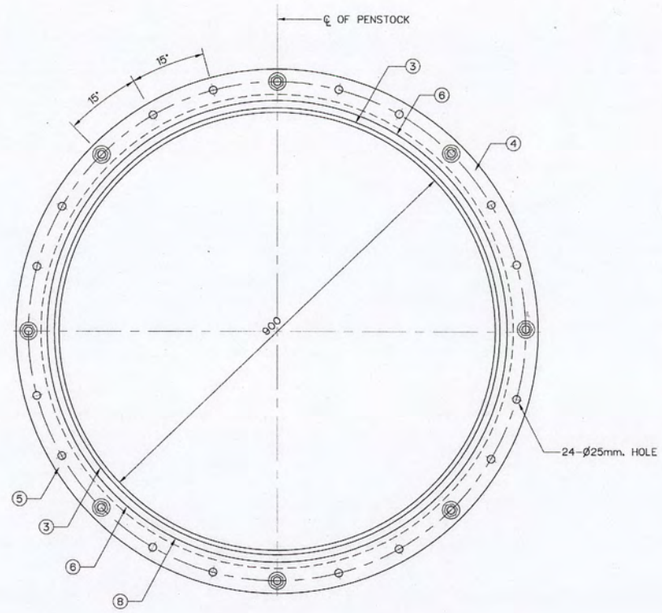
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
PENSTOCK
WYE, PLAN, SECTIONS AND DETAILS

P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED ธนพล วิเชียร 29074 ณัฐ 9462	REVIEWED
DRAWN	SUBMITTED
CHECKED ณัฐ 8231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-PS-09	SHEET NO. 58 OF 129



ELEVATION
NOT TO SCALE



SECTION B–B
NOT TO SCALE

TABLE OF DETAIL 1 SQUARE – GROOVE WELD , BUTT JOINT

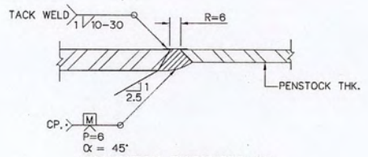
ITEM	DESCRIPTION	MATERIAL	QUANT.	REMARKS
1	PENSTOCK	ASTM A-283, GRADE D	-	--
2	PENSTOCK	ASTM A-283, GRADE D	1	NOTE 2 & 3
3	INNER SLEEVE	ASTM A-283, GRADE D	1	NOTE 2 & 4
4	GRAND RING	ASTM A-283, GRADE D	1	SEAMLESS, NOTE 3
5	OUTER RING	ASTM A-283, GRADE D	1	SEAMLESS, NOTE 3
6	STUFFING BOX	ASTM A-283, GRADE D	1	NOTE 2 & 3
7	DOUBLING PLATE	ASTM A-283, GRADE D	1	NOTE 2 & 3
8	OUTER SLEEVE	ASTM A-283, GRADE D	1	NOTE 2 & 3
9	PACKING STOPPER	ASTM A-283, GRADE D	1	NOTE 2 & 3
10	ø25 mm. BOLTS	ASTM A-325	24	--
11	ø25 mm. NUT	ASTM A-325	72	--
12	ø25 mm. WASHER	ASTM A-325	48	--
13	PACKING RINGS (16 mm. S.Q. RING)	ASBESTOS-GRAPHITE	6	NOTE 5

NOTES :

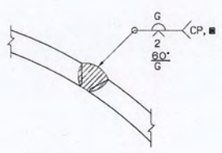
1. LONGITUDINAL SEAMS HAVE TO BE COMPLETE JOINT PENETRATION WELDS BY COMBINING SINGLE-V-GROOVE WITH BACKING WELDS AND GROUND FLUSH WELDING WITH BASE MATAL AS REQUIRED (SEE DETAIL "2")
2. GALVANIZED ALL SURFACES WITH 0.10 mm. THK.
3. NICKEL CLADDING ON OUTER SURFACE WITH 0.50 mm. THK. AND GALVANIZED INNER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

WELDING NOTATION :

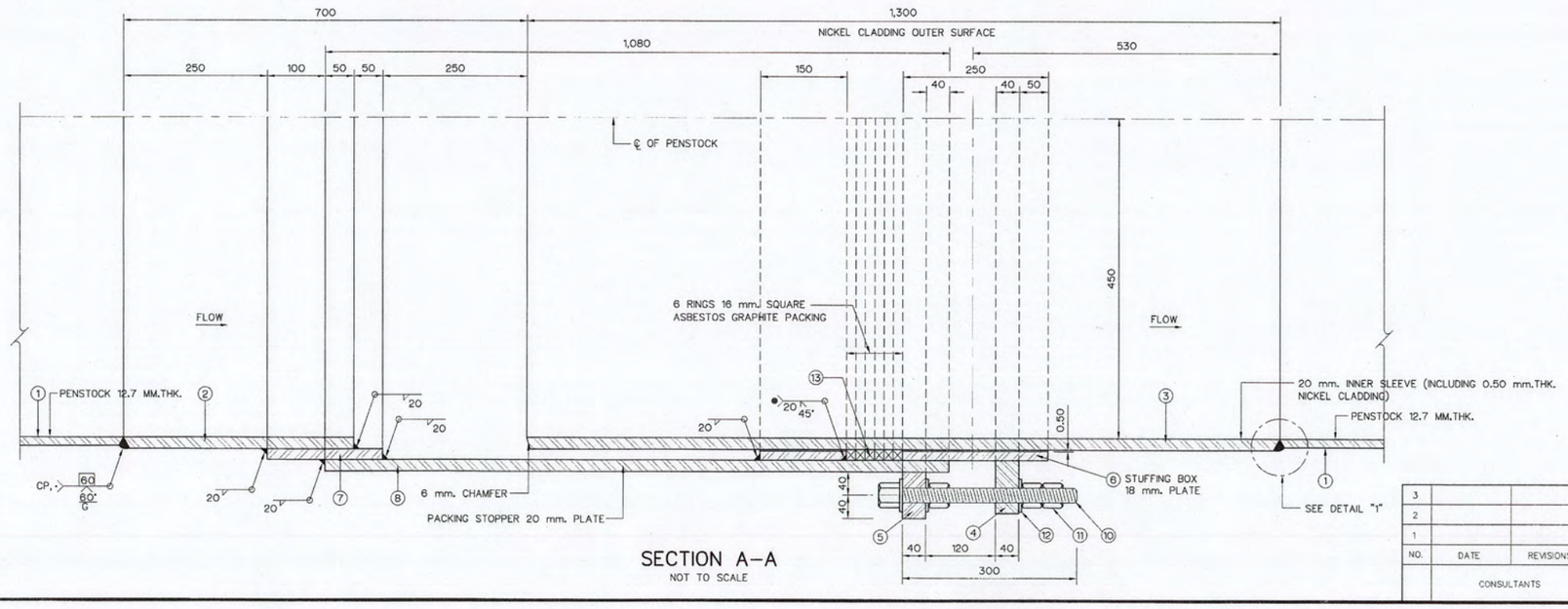
CP = COMPLETE JOINT PENETRATION GROOVE WELD
G = GRINDING WELD DEPOSITE FLUSH WITH BASE METAL
• = BACKING PLATE SIZE 0.10x1.50 mm. AND SAME METERIAL AS PENSTOCK
● = BEVEL PLATE 9 mm. BEFORE ROLLING CHIP SQUARE AFTER WELDING
▲ = ROOT OPENING R = 2.0 mm.
ROOT FACE t = 3.0 mm.
GROOVE ANGLE = 45°
■ = ROOT OPENING R = 2.0 mm.
ROOT FACE t = 2.0 mm.
GROOVE ANGLE = 60°



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



LONGITUDINAL WELD
NOT TO SCALE



SECTION A–A
NOT TO SCALE

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
PENSTOCK
EXPANSION JOINT, PLAN, SECTIONS AND DETAILS

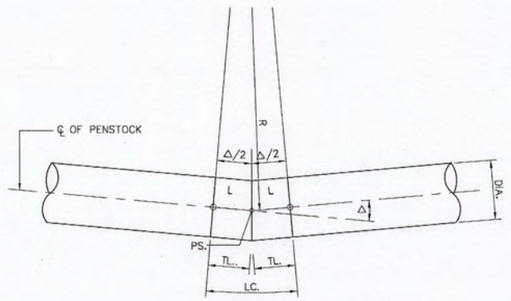
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

PCM P&C MANAGEMENT CO., LTD.
SPT SPT CONSULTANTS CO., LTD.

DESIGNED ณัฐพงษ์ 28.29074 RE.9462
DRAWN
CHECKED RE.8231
28/10/2021
PROJECT MANAGER DATE

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

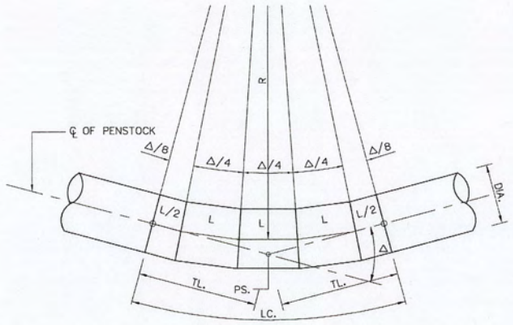
DRAWING NO. AKP-PS-10
SHEET NO. 59 OF 129



BEND TYPE "1"

DELTA(Δ) 0°-5°

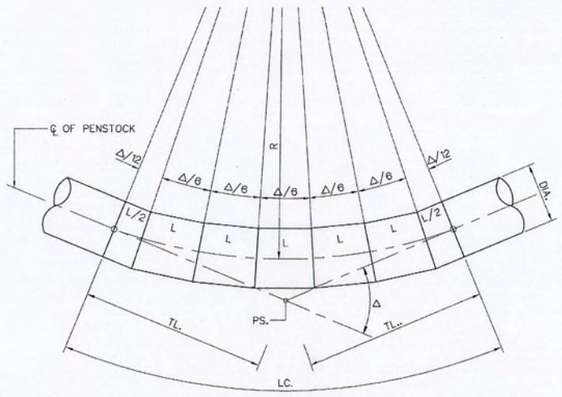
NOT TO SCALE



BEND TYPE "4"

DELTA(Δ) 25°-35°

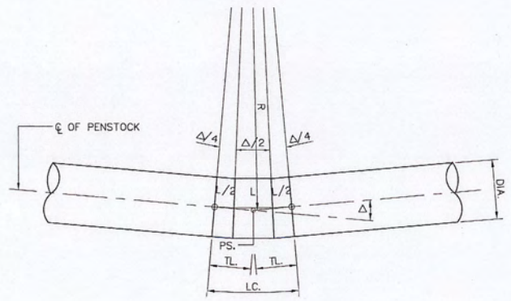
NOT TO SCALE



BEND TYPE "6"

DELTA(Δ) 55°-OVER

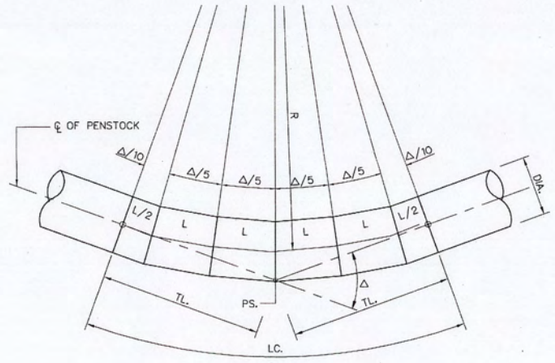
NOT TO SCALE



BEND TYPE "2"

DELTA(Δ) 5°-15°

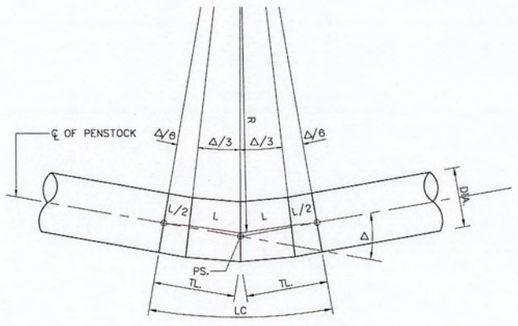
NOT TO SCALE



BEND TYPE "5"

DELTA(Δ) 35°-45°

NOT TO SCALE



BEND TYPE "3"

DELTA(Δ) 15°-25°

NOT TO SCALE

DIMENSIONS OF BENDS

BEND	KM. OF PS.	Δ (DEGREE)	TYPE	DIA. (m.)	THICKNESS (mm.)	CURVE TYPE
1	0+015.293	23°38'46.26"	3	0.90	12.70	HORIZONTAL
2	0+055.885	19°12'18.93"	3	0.90	12.70	HORIZONTAL
3	0+068.646	16°15'10.98"	3	0.90	12.70	HORIZONTAL
4	0+092.454	9°10'50.97"	2	0.90	12.70	HORIZONTAL
5	0+110.000	7°57'42.09"	2	0.90	12.70	VERTICAL
6	0+123.932	20°40'12.39"	3	0.90	12.70	HORIZONTAL
7	0+153.106	9°7'39.32"	2	0.90	12.70	HORIZONTAL
8	0+180.000	4°34'25.16"	1	0.90	12.70	VERTICAL
9	0+208.073	20°41'40.80"	3	0.90	12.70	HORIZONTAL
10	0+238.434	13°37'57.89"	2	0.90	12.70	HORIZONTAL
11	0+260.000	4°23'54.41"	1	0.90	12.70	VERTICAL
12	0+284.133	24°56'46.05"	3	0.90	12.70	HORIZONTAL
13	0+326.645	15°15'19.18"	3	0.90	12.70	VERTICAL
14	0+335.780	19°17'3.15"	3	0.90	12.70	HORIZONTAL
15	0+342.952	33°41'24.24"	4	0.90	12.70	VERTICAL

NOTES :

1. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP-GN-03
2. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, THE CONTRACTOR HAS TO SUBMITTED SHOP DRAWING TO FIELD ENGINEER FOR APPROVAL.

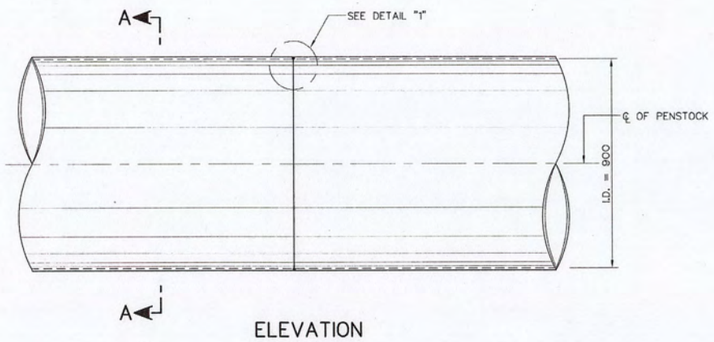
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

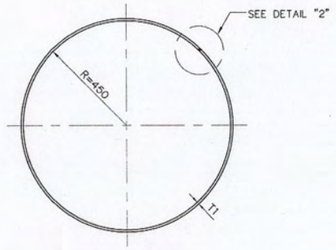
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
PENSTOCK
BEND DETAILS

P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED ... REG.29074 ... REG.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED ... REG.8231	RECOMMENDED
28/10/2021 PROJECT MANAGER / DATE	APPROVED
	DRAWING NO. AKP-PS-11 / SHEET NO. 60 OF 129



ELEVATION

SCALE 1:10



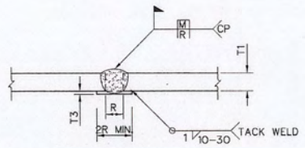
SECTION A–A

SCALE 1:10

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

WELDING PROCESS	DESIGNATION	BASE METAL THICKNESS		GROOVE PREPARATION		TOLERANCES		REMARKS
		T1	T3	ROOT OPENING	GROOVE ANGLE	ROOT OPENING	GROOVE ANGLE	
GMAW FCAW	B–L1a–GF	12.7	1.0	R = T1	–	+1.5,–0	–	SINGLE–PASS WELD
GMAW FCAW	B–L1a–GF	12.7	1.0	R = T1	–	+1.5,–0	–	SINGLE–PASS WELD

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

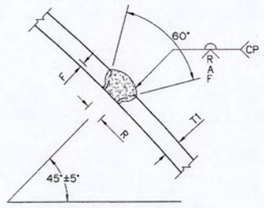


CIRCULAR BUTT JOINT

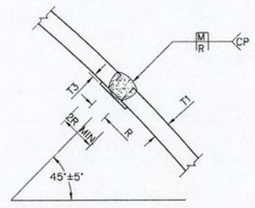
DETAIL "1"

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

TYPE	WELDING PROCESS	DESIGNATION	BASE METAL THICKNESS		GROOVE PREPARATION			TOLERANCES			REMARKS
			T1	T3	ROOT OPENING	GROOVE ANGLE	ROOT FACE	R	A	F	
A	SMAW	B–U2	12.7	–	R = 2.0	A = 60°	F = 2.0	+15,–0	+10°,–0°	+15,–0	SINGLE–PASS WELD
	SMAW	B–U2	12.7	–	R = 2.0	A = 60°	F = 2.0	+15,–0	+10°,–0°	+15,–0	SINGLE–PASS WELD
B	GMAW FCAW	B–L1a–GF	12.7	1.0	R = 9.0	–	–	+15,–0	–	–	SINGLE–PASS WELD
	GMAW FCAW	B–L1a–GF	12.7	1.0	R = 12.0	–	–	+15,–0	–	–	SINGLE–PASS WELD



LONGITUDINAL BUTT JOINT
TYPE "A"



LONGITUDINAL BUTT JOINT (ALTERNATIVE)
TYPE "B"

DETAIL "2"

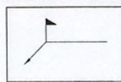
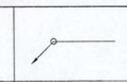
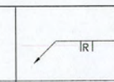
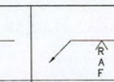
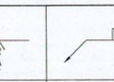
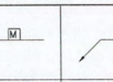
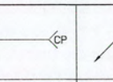
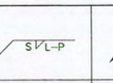
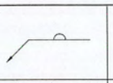
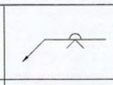
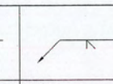
NOTES :

1. ALL DIMENSION ARE IN MILLIMETER, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP–GN–03
3. GROOVE WELD MADE AFTER WELDING OTHER SIDE
4. USE WELDING ELECTRODE TYPE "E" 70XX
5. MATERIAL OF BACKING IS THE SAME AS OF PIPE
6. THIS DRAWING IS DESIGNED FOR GUIDELINE ONLY, SHOP DRAWING SHALL BE DESIGNED BY CONTRACTOR UNDER APPROVAL BY FIELD ENGINEER.

0 0.1 0.2 0.4 0.6 0.8

SCALE 1:10 METERS

WELDING SYMBOLS

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
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	CONSULTANTS		DEDE	

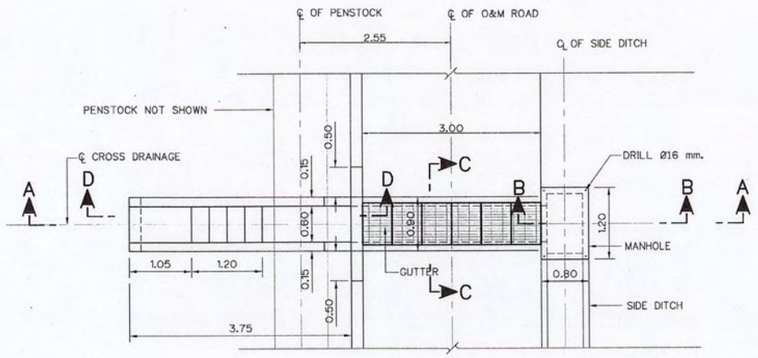
KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

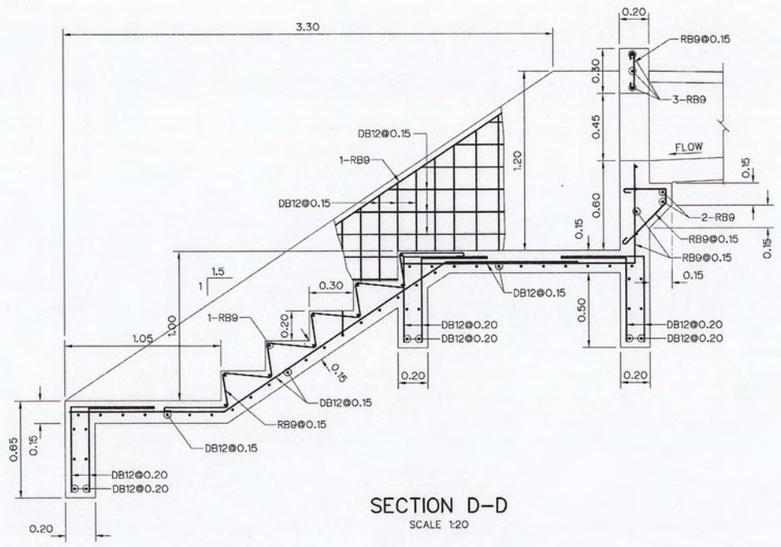
PART : 1 CIVIL WORKS AND TRANSMISSION LINE

PENSTOCK
WELDING DETAILS

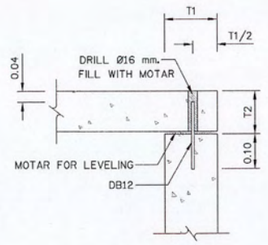
PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED RBI.29074 RBI.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED RBI.8231	RECOMMENDED
28/10/2021 PROJECT MANAGER DATE	APPROVED
DRAWING NO. AKP–PS–12	SHEET NO. 61 OF 129



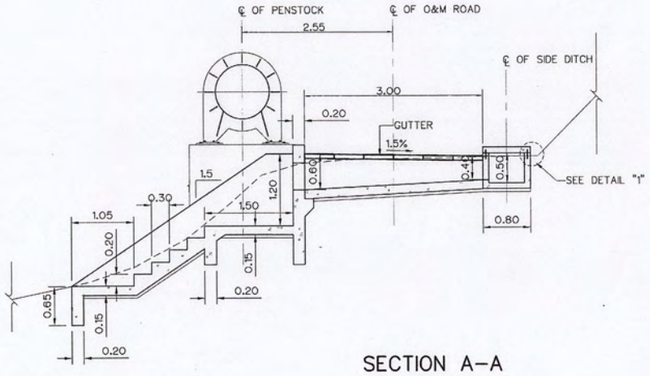
PLAN
SCALE 1:50



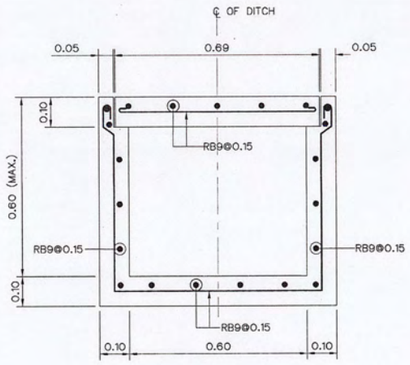
SECTION D–D
SCALE 1:20



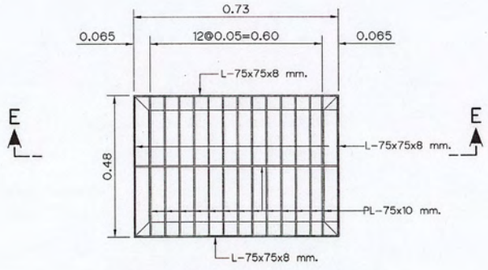
DETAIL "1"
NON TO SCALE



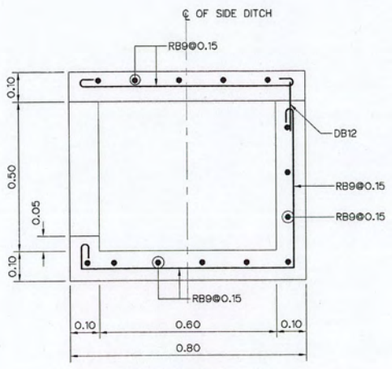
SECTION A–A
SCALE 1:50



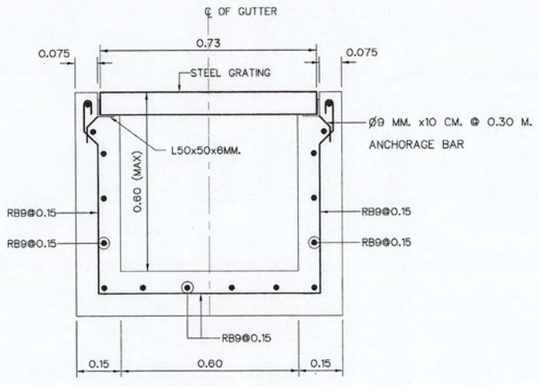
SIDE DITCH
SCALE 1:10



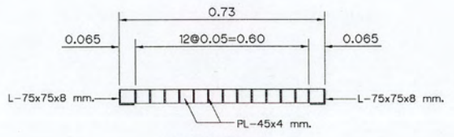
DETAIL OF STEEL GUTTER
SCALE 1:10



SECTION B–B
SCALE 1:10



SECTION C–C
SCALE 1:10



SECTION E–E
SCALE 1:10

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP-GN-03
3. DRESSING OF GROUND TO SUIT THE STRUCTURE TO BE DETERMINED IN THE FIELD.

REFERENCE DRAWINGS :

1. PENSTOCK, PLAN AND PROFILE, KM. 0+000 TO KM. 0+358.645 AKP-PS-01

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

0 0.5 1.0 2.0 3.0 4.0
SCALE 1:50 METERS

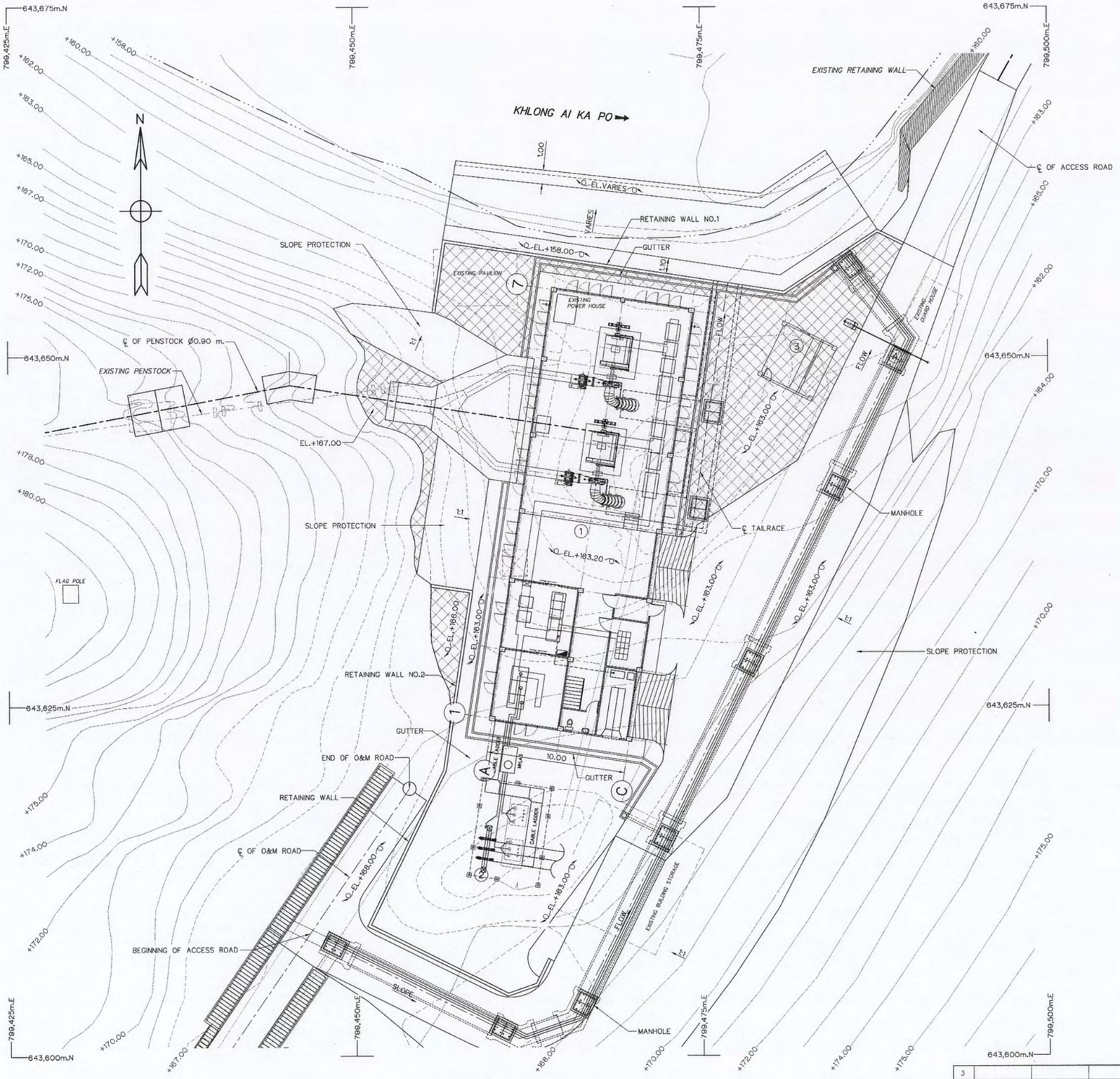
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
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	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
PENSTOCK
TYPICAL CROSS DRAINAGE AND DETAILS

PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED ณัฐวุฒิ 28.29074 ศิริพร 28.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED 28.8231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-PS-13	SHEET NO. 62 OF 129



GENERAL LAY-OUT
SCALE 1:150

LEGENDS :

1. POWER HOUSE
2. SWITCHYARD
3. GUARD HOUSE
4. MOVABLE STEEL BARRICADE

NOTES :

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

REFERENCE DRAWINGS :

1. POWERHOUSE, PLANS	AKP-PH-02
2. POWERHOUSE, RETAININGWALL REINFORCEMENT DETAILS	AKP-PH-13
3. POWERHOUSE, MISCELLANEOUS DETAILS	AKP-PH-14

SCALE 1:150 METERS (0 2 4 6 8 10)

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

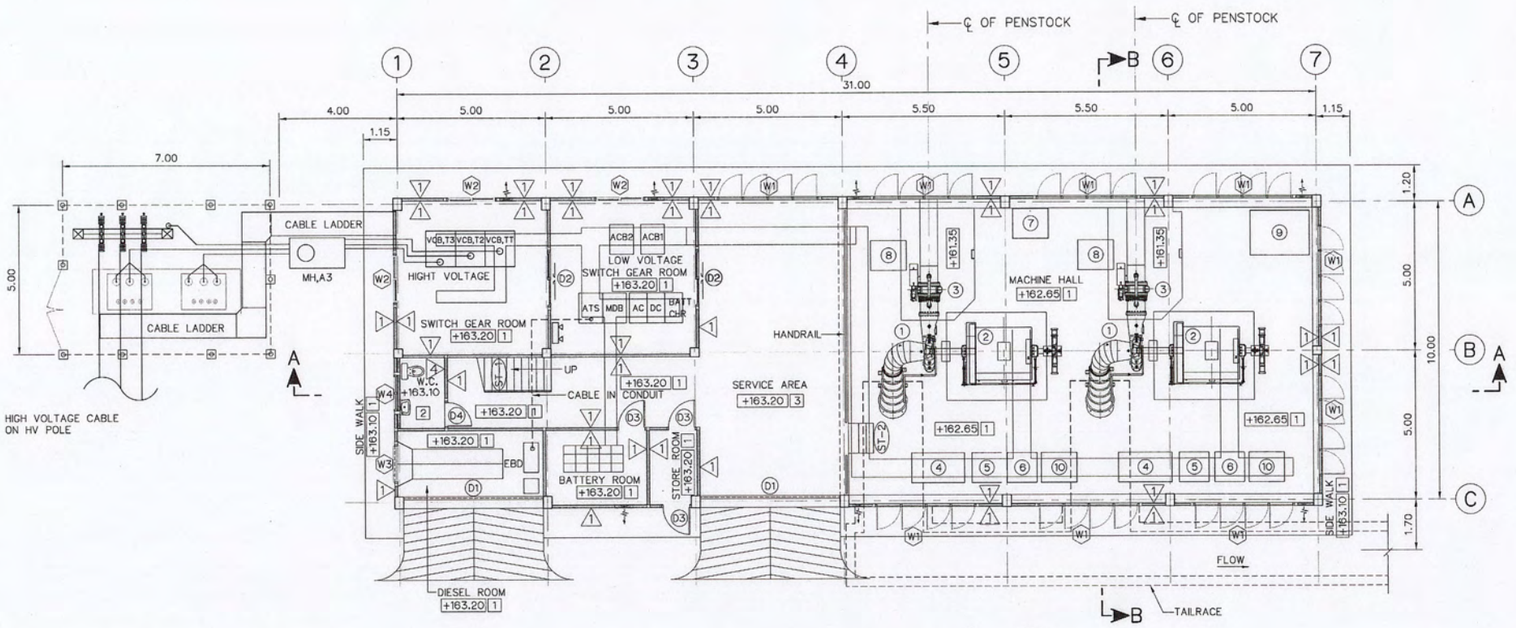
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

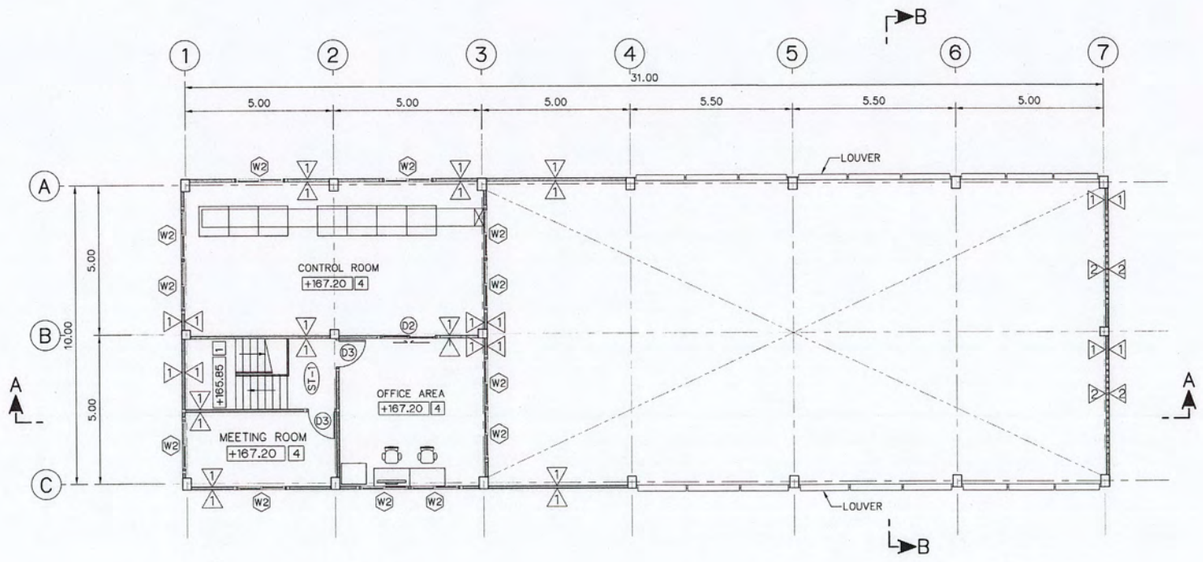
GENERAL LAYOUT

P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED วศ.29074 วศ.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED วศ.8231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-PH-01	SHEET NO. 63 OF 129



GROUND FLOOR PLAN

SCALE 1:125



DESCRIPTION :

1. TURBINE
2. GENERATOR
3. INLET VALVE AND BYPASS VALVE AND MECHANICAL COUPLING
4. LUBRICANT UNIT
5. GOVERNOR AND TURBINE CONTROL PANEL
6. NGR CUBICLE
7. AIR PRESSURE TANK
8. PRESSURE OIL UNIT
9. DRAINAGE & DEWATERING SYSTEM
10. COOLING SYSTEM

FLOOR FINISH SYMBOLS :

1. COARSE FINISHED
2. 12"x12" CERAMIC FLOOR TILES
3. COATED WITH EPOXY RESIN
4. 12"x12" VINYL TILES

WALL FINISH SYMBOLS :

1. CEMENT PLASTER
2. GLASS BOX DIMENSIONS 19x19x9 cm.
3. AC. FLAT SHEET EAVES 6 mm. THK.
4. 8"x8" CERAMIC WALL TILES

SYMBOLS :

- EXHAUST FAN
- EMERGENCY LAMP
- CABLE TRENCH
- BLOCK OUT

NOTES :

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

REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAYOUT	AKP-PH-01
2. POWERHOUSE, ELEVATIONS	AKP-PH-03
3. POWERHOUSE, SECTIONS	AKP-PH-04
4. POWERHOUSE, DETAILS OF DOORS, WINDOWS AND SIGNBOARD	AKP-PH-05
5. POWERHOUSE, DETAILS OF TOILET, SEPTIC AND SEEPAGE TANK	AKP-PH-06

0 1 2 3 4 5 6 7 8

SCALE 1:100 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

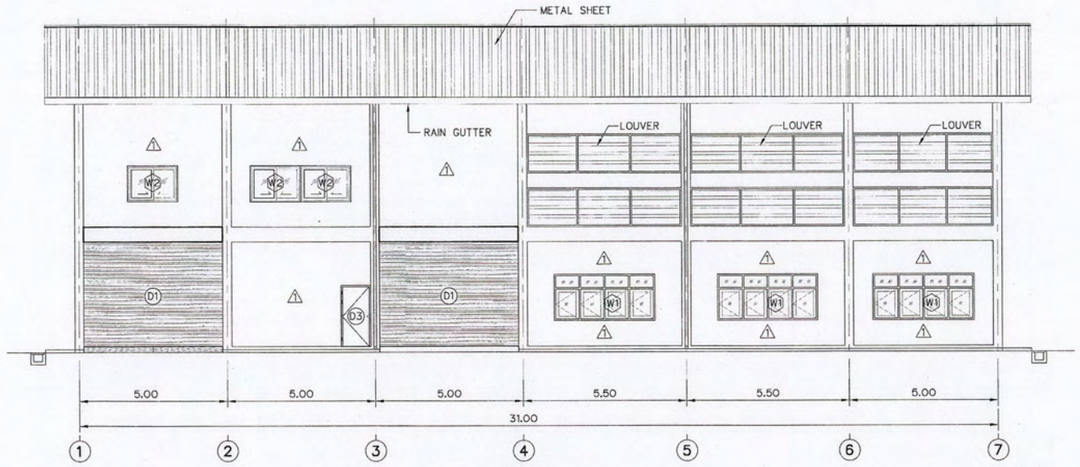
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

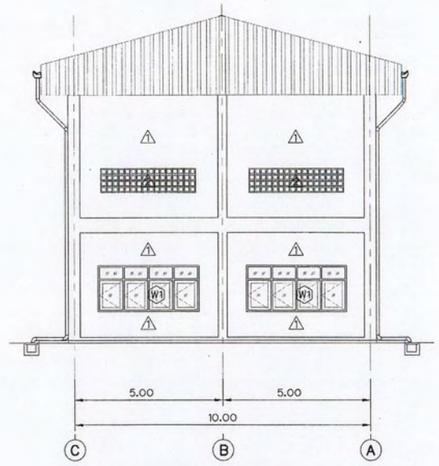
POWERHOUSE

PLANS

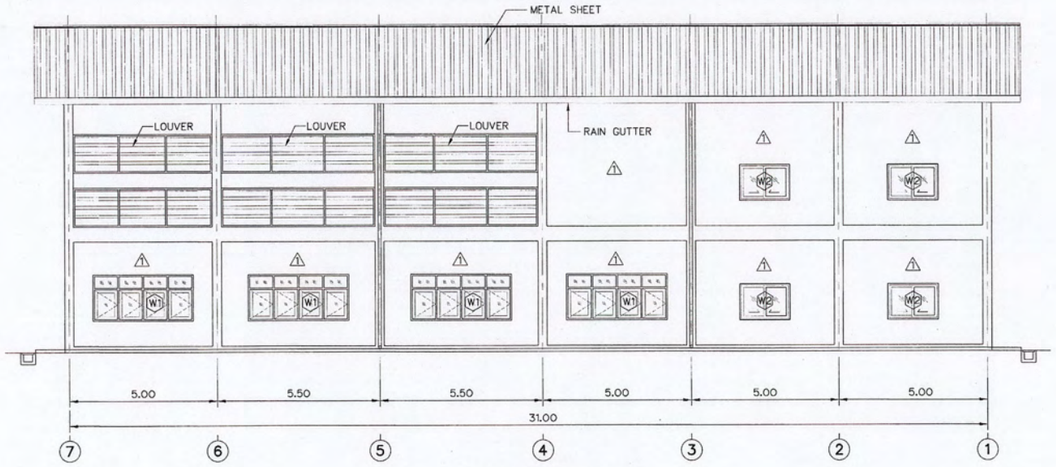
PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED ... 28.29074 ... 28.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED ... 28.8231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-PH-02	SHEET NO. 64 OF 129



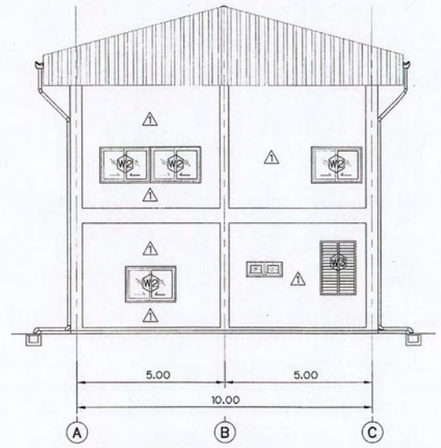
ELEVATION "A"
SCALE 1:100



ELEVATION "B"
SCALE 1:100



ELEVATION "C"
SCALE 1:100



ELEVATION "D"
SCALE 1:100

NOTES :

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

REFERENCE DRAWINGS :

1. POWERHOUSE, PLANS	AKP-PH-02
2. POWERHOUSE, SECTIONS	AKP-PH-04

WALL FINISH SYMBOLS :

1. CEMENT PLASTER
2. GLASS BOX DIMENSIONS 19x19x9 cm.

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

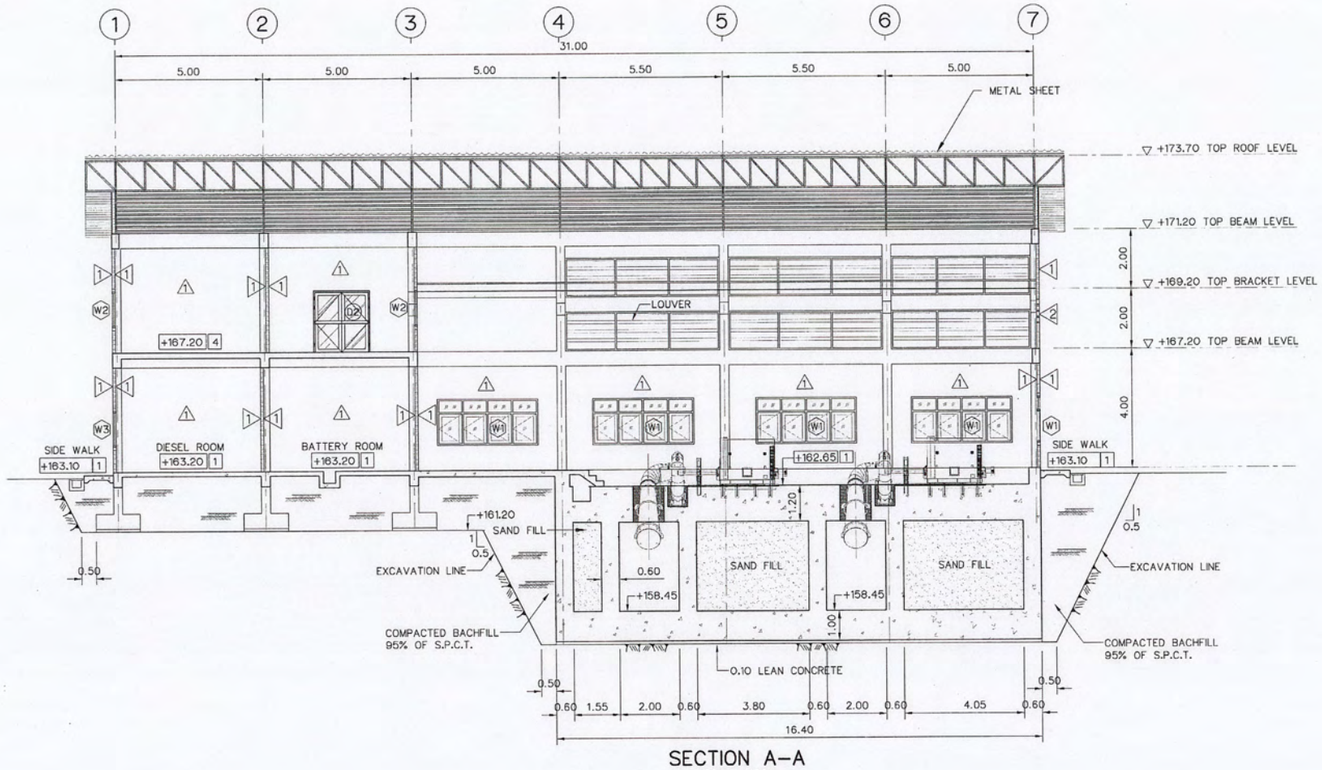
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

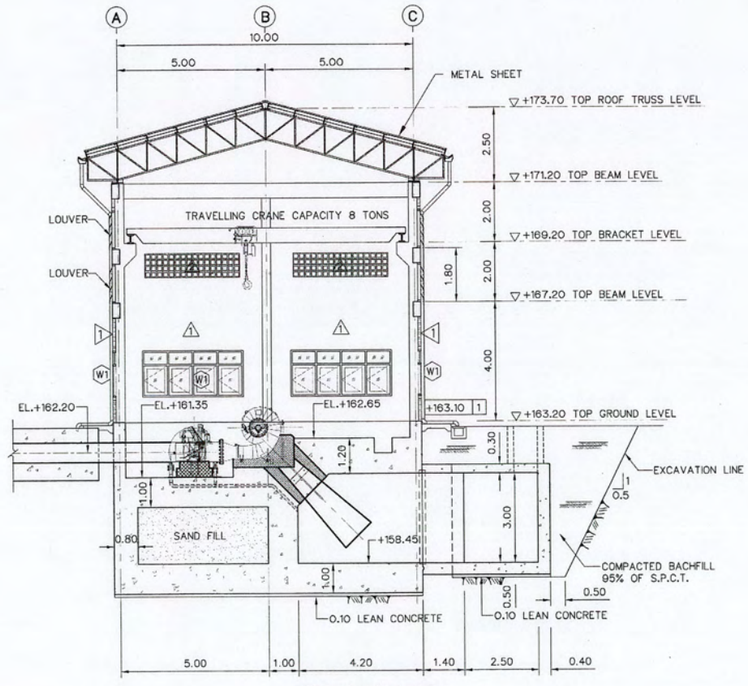
POWERHOUSE

ELEVATIONS

P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED ... Rß.29074 ... Rß.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED Rß.8231	RECOMMENDED
28/10/2021 PROJECT MANAGER / DATE	APPROVED
DRAWING NO. AKP-PH-03	SHEET NO. 65 OF 129



SECTION A–A
SCALE 1:100



SECTION B–B
SCALE 1:100

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP-GN-03
3. BEFOR EXCAVATION SHOULD BE EVALUATED AND ANALYSIS
   BY FIELD GEOTECHNICAL ENGINEER OR ENGINEERING GEOLOGIST.

REFERENCE DRAWINGS :

1. POWERHOUSE, PLANS	AKP-PH-02
2. POWERHOUSE, ELEVATIONS	AKP-PH-03

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

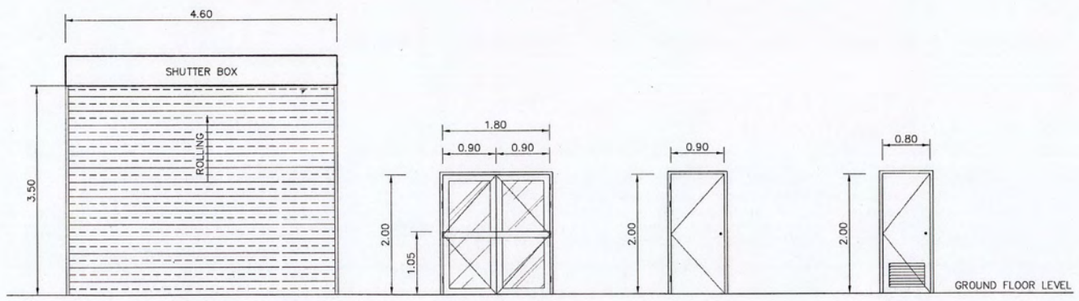
POWERHOUSE
SECTIONS

PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

DESIGNED ณัฐวุฒิ 28.9074 สิน 28.9462
DRAWN
CHECKED 28.8231
PROJECT MANAGER 28/10/2021 DATE

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

DRAWING NO. AKP-PH-04
SHEET NO. 66 OF 129



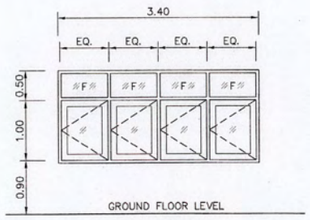
D1 ROLLING SHUTTER
SCALE 1:50

D2 SLIDING DOOR
SCALE 1:50

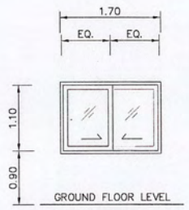
D3 OPENNING DOOR
SCALE 1:50

D4 OPENNING DOOR
SCALE 1:50

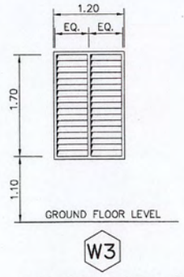
SYMBOL	DESCRIPTIONS	SIZE		FRAME	RAIL & STILE	PANEL	HINGE	LOCKSET	HANDLE	REMARKS
		WIDTH	HEIGHT							
D1	ROLLER SHUTTER DOOR (STEEL 1.2 mm. THK.)	4.60	3.50	GALVANIZED STEEL	—	—	—	NORMAL KEY	—	MOTOR OPERATING
D2	SLIDING DOOR	1.80	2.00	ALUMINIUM 2"x 4"	—	GLASS 6 mm.thk.	●	●	●	FULL SET OF ACCESSORIES FROM MANUFACTURER
D3	OPENNING DOOR	0.90	2.00	STEEL 2"x 4"	—	STEEL 1.6 mm.THK.	●	●	●	FULL SET OF ACCESSORIES FROM MANUFACTURER
D4	OPENNING DOOR	0.80	2.00	P.V.C. 2"x 4"	—	P.V.C.	STAINLESS STEEL 4"x3"x2.5mm.	CYINDER LOCK	—	
W1	OPENNING WINDOW	3.40	1.50	ALUMINIUM 1.5 mm.thk.	GALVANIZED STEEL	GLASS 6 mm.thk.	●	●	●	FULL SET OF ACCESSORIES FROM MANUFACTURER
W2	SLIDING WINDOW	1.70	1.10	ALUMINIUM 1.5 mm.thk.	—	GLASS 6 mm.thk.	—	●	●	FULL SET OF ACCESSORIES FROM MANUFACTURER
W3	LOUVER WINDOW	1.20	1.70	ALUMINIUM 1.5 mm.thk.	—	GLASS 6 mm.thk.	—	—	—	
W4	OPENNING GLASS WINDOW	1.20	0.50	ALUMINIUM 1.5 mm.thk.	—	GLASS 6 mm.thk.	●	●	●	FULL SET OF ACCESSORIES FROM MANUFACTURER
●	SHALL BE USED SPACIFIED ACCESSORIES									



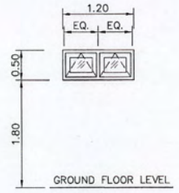
W1 OPENNING WINDOW
SCALE 1:50



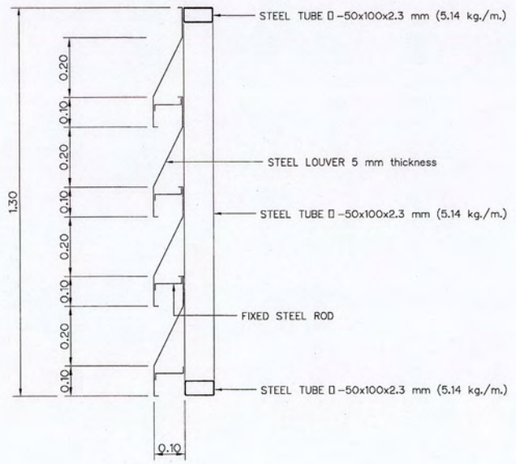
W2 SLIDING WINDOW
SCALE 1:50



W3 LOUVER WINDOW
SCALE 1:50



W4 OPENING GLASS WINDOW
SCALE 1:50



LOUVER DETAILS
SCALE 1:10

NOTES :

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

REFERENCE DRAWINGS :

1. POWERHOUSE, PLANS AKP-PH-02
2. POWERHOUSE, DETAILS OF TOILET, SEPTIC AND SEEPAGE TANK AKP-PH-06

0 0.5 1.0 2.0 3.0 4.0
SCALE 1:50 METERS

0 0.1 0.2 0.4 0.6 0.8
SCALE 1:10 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

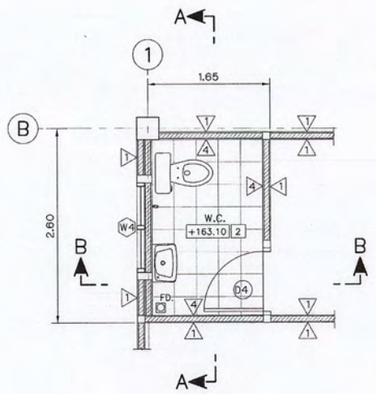
DETAILS OF DOORS, WINDOWS AND SIGNBOARD

PCM P&C MANAGEMENT CO., LTD.
SPT SPT CONSULTANTS CO., LTD.

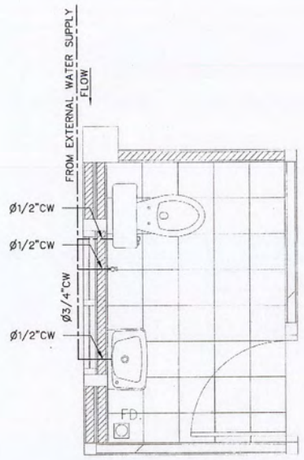
DESIGNED ว.ที่.29074 28.9462
DRAWN
CHECKED 28.8231
28/10/2021
PROJECT MANAGER DATE

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

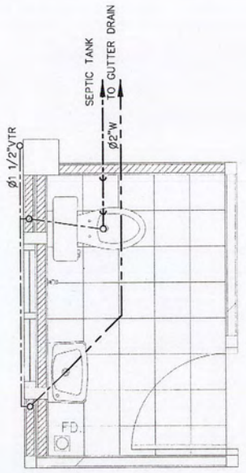
DRAWING NO. AKP-PH-05
SHEET NO. 67 OF 129



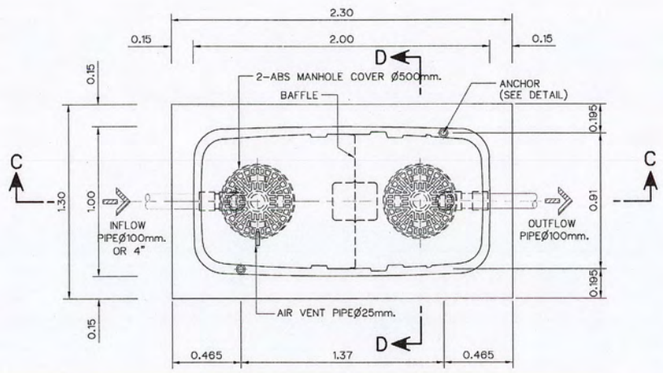
PLAN WC.
SCALE 1:40



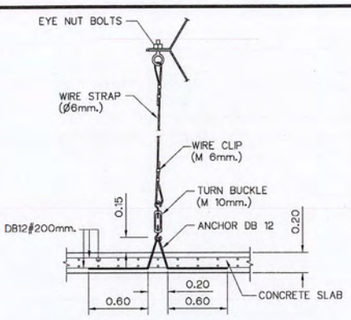
COLD WATER PIPING
SCALE 1:25



SOIL, WASTE AND VENT PIPING
SCALE 1:25

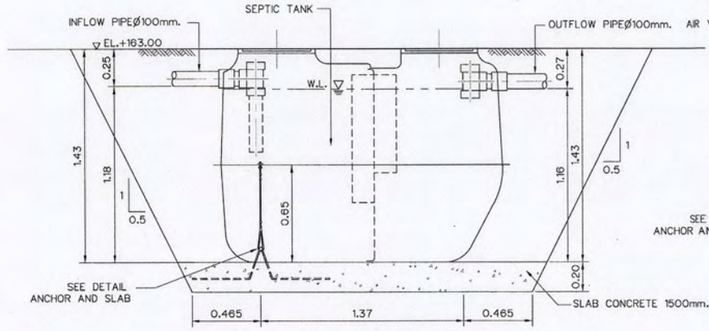


SEPTIC TANK
SCALE 1:20

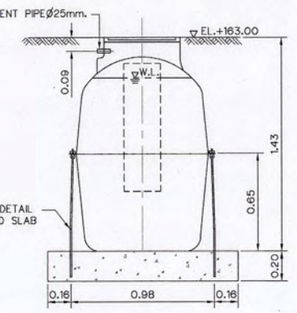


DETAIL ANCHOR AND SLAB
NOT TO SCALE

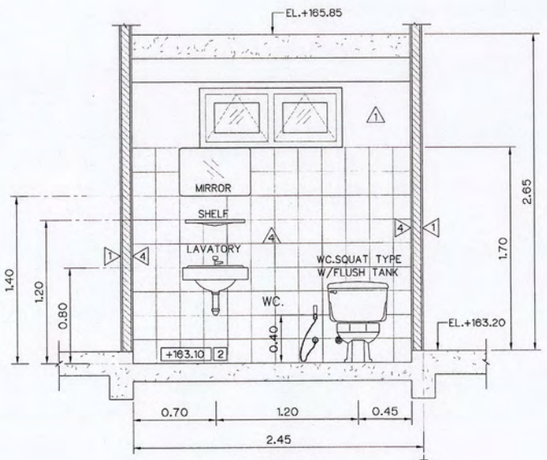
SPECIFICATION TABLE			
No.		ITEM	CONTENT
1		CAPACITY	
	1.1	SEPTIC TANK	1.500 m^3
2		MATERIAL	
	2.1	CHAMBER	FRP
	2.2	SEPARATION PLATE , BAFFLE	FRP
	2.3	MANHOLE COVER	ABS
	2.4	INFLOW , OUTFLOW PIPE	PVC(ø100mm.)



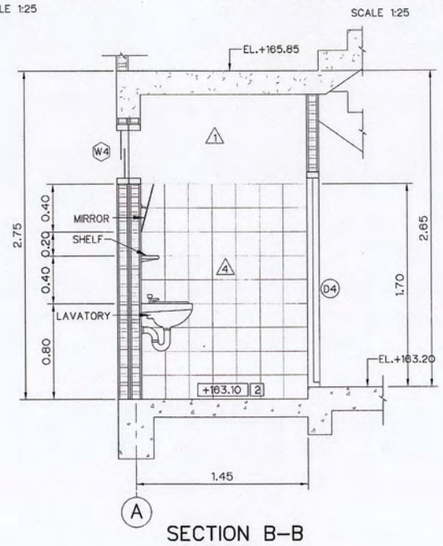
SECTION C–C
SCALE 1:20



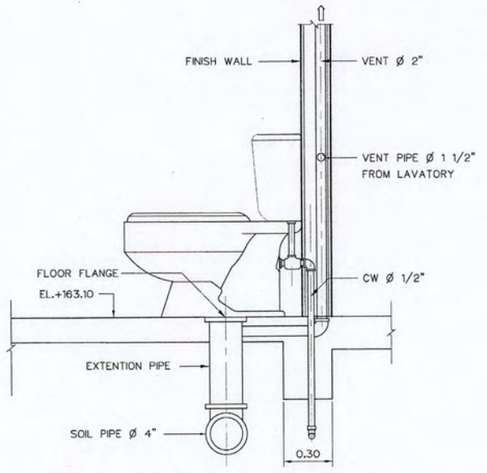
SECTION D–D
SCALE 1:20



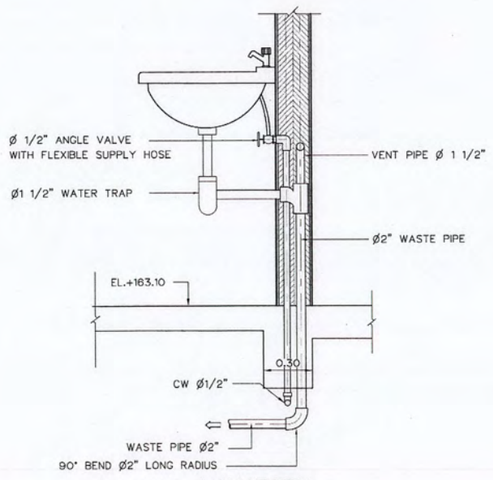
SECTION A–A
SCALE 1:25



SECTION B–B
SCALE 1:25



WATER CLOSET (FLUSH TANK)
NOT TO SCALE



LAVATORY
NOT TO SCALE

SYMBOLS :

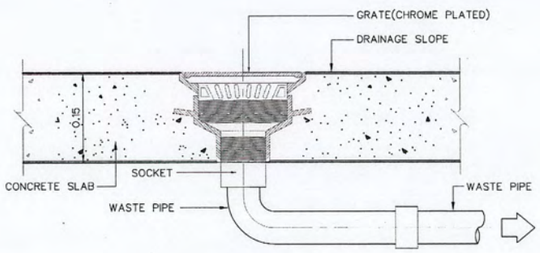
- SOIL PIPE
- WASTE PIPE
- COLD WATER PIPE
- VENT PIPE

NOTES :

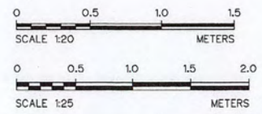
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO.AKP-GN-03

REFERENCE DRAWING :

1. POWERHOUSE, GENERAL LAYOUT	AKP-PH-01
2. POWERHOUSE, PLAN	AKP-PH-02
3. POWERHOUSE, WATER SUPPLY PIPELINE SYSTEM LAYOUT	AKP-PH-19



FLOOR DRAIN
NOT TO SCALE



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MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

DETAILS OF TOILET, SEPTIC AND SEEPAGE TANK

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

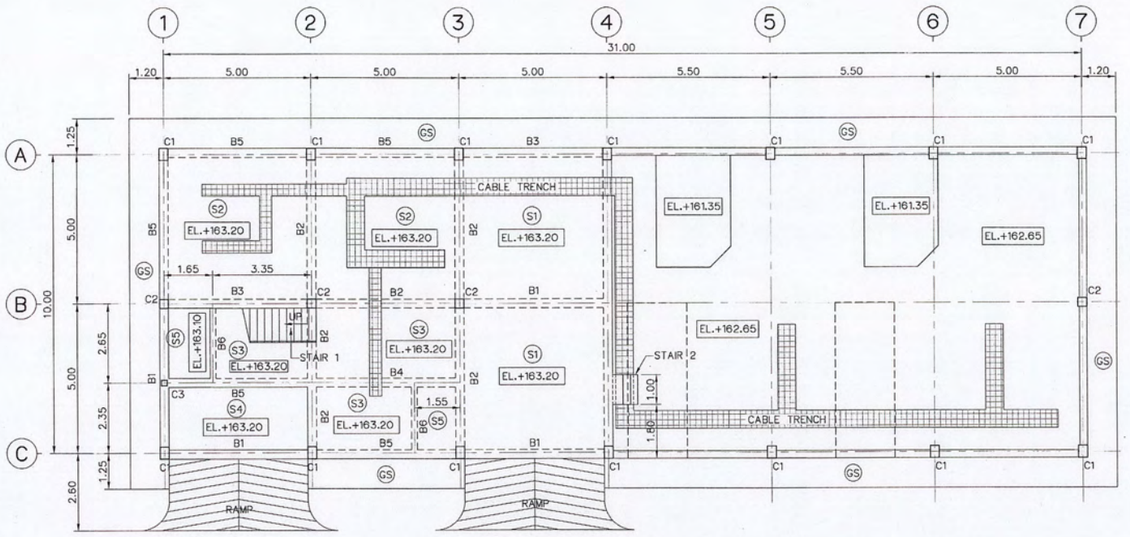
CONSULTANTS: PCM P&C MANAGEMENT CO., LTD. / SPT SPT CONSULTANTS CO., LTD.

DEDE

DESIGNED วศ.29074 วศ.9462
DRAWN
CHECKED วศ.8231
28/10/2021
PROJECT MANAGER DATE

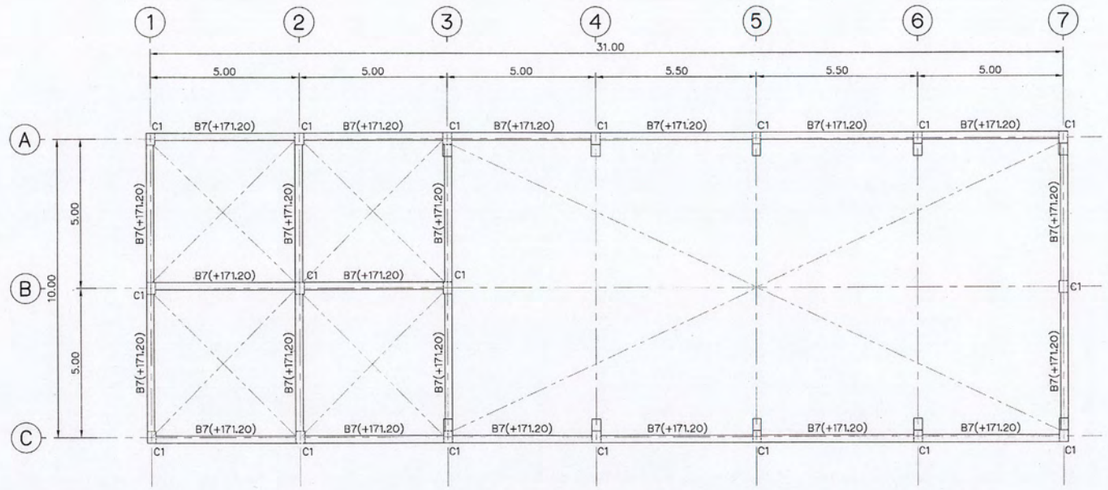
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP-PH-06
SHEET NO. 68 OF 129



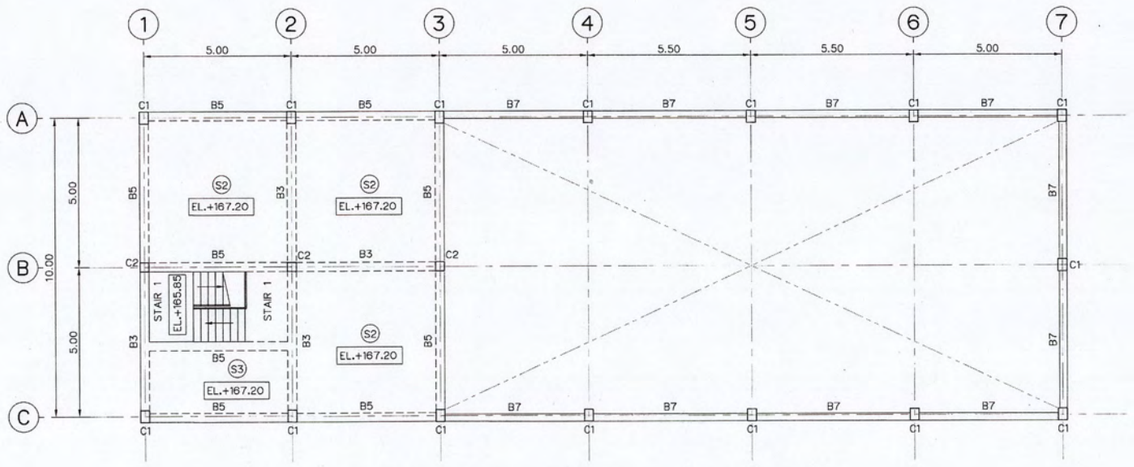
GROUND FLOOR PLAN

SCALE 1:100



ROOF BEAM PLAN

SCALE 1:100



PLAN OF BEAM AND SLAB (SECOND FLOOR)

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. AKP-GN-03

REFERENCE DRAWINGS :

1. POWERHOUSE, PLAN	AKP-PH-02
2. POWERHOUSE, SECTIONS	AKP-PH-04
3. POWERHOUSE, SLAB REINFORCEMENT DETAILS	AKP-PH-11
4. POWERHOUSE, TRUSS SECTIONS AND DETAILS	AKP-PH-08

0 1 2 3 4 5 6 7 8

SCALE 1:100 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

GROUND FLOOR PLAN, PLAN OF BEAM AND SLAB AND ROOF BEAM PLAN

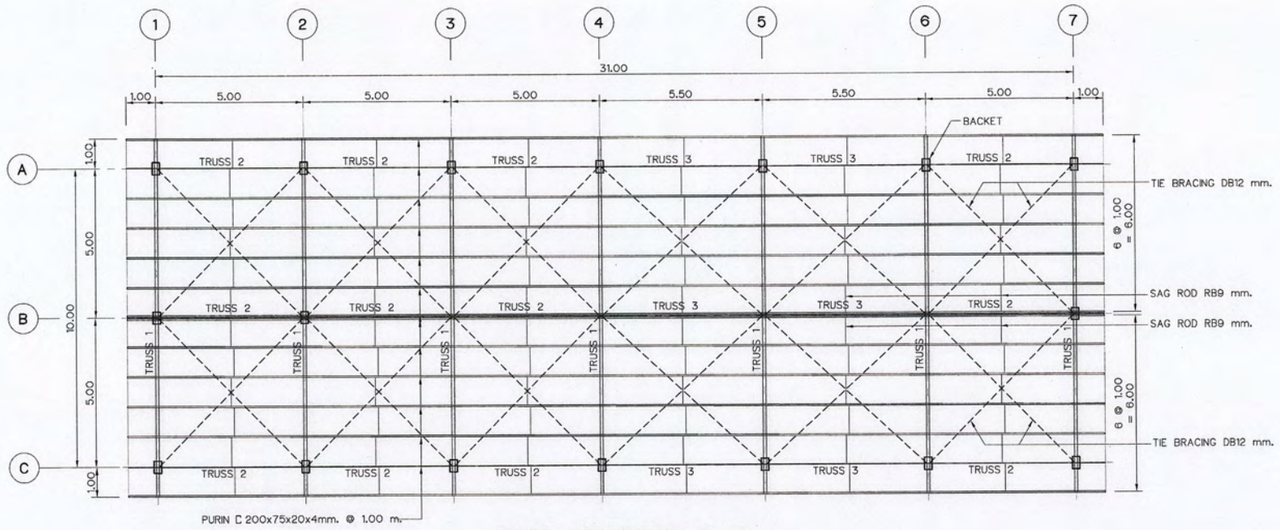
P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

DESIGNED	วิศ.29074	วิศ.9462	REVIEWED
DRAWN			SUBMITTED
CHECKED	วิศ.8231		RECOMMENDED
PROJECT MANAGER	28/10/2021 DATE		APPROVED

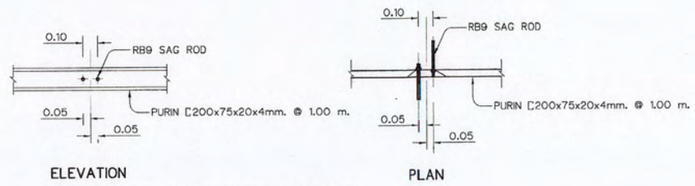
DRAWING NO. AKP-PH-07

SHEET NO. 69 OF 129



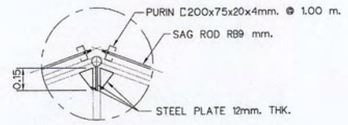
ROOF STRUCTURE PLAN

SCALE 1:100



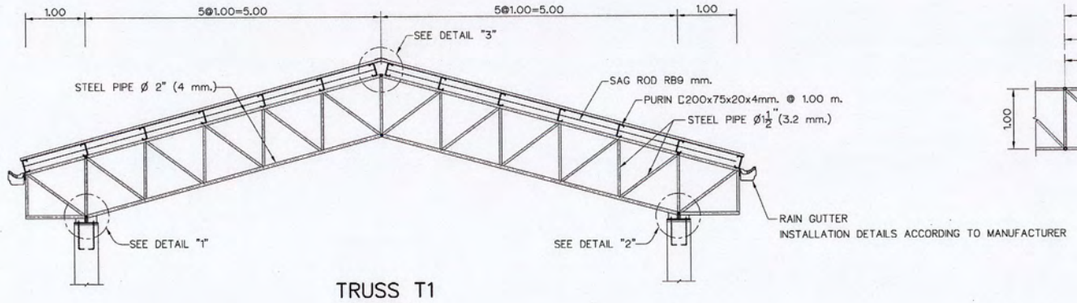
SAG ROD DETAILS

SCALE 1:20



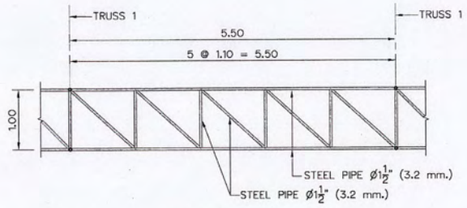
DETAIL "3"

SCALE 1:20



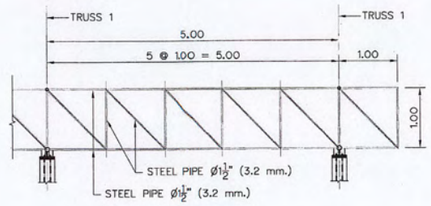
TRUSS T1

SCALE 1:50



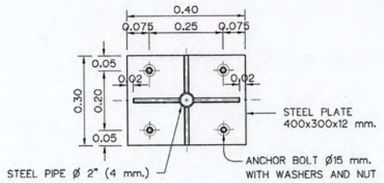
TRUSS T3

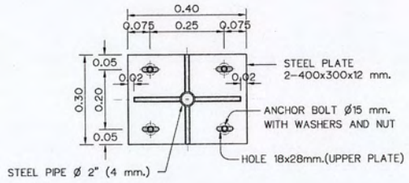
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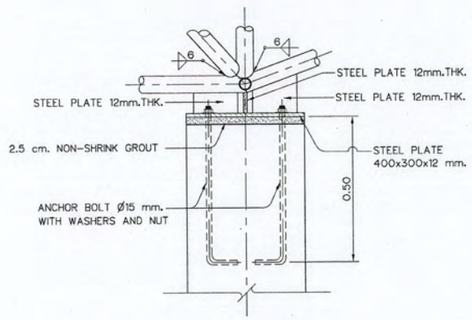


TRUSS T2

SCALE 1:50



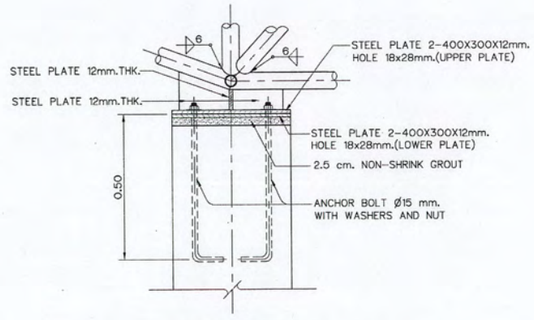




DETAIL "1"

FIXED END SUPPORT

SCALE 1:10



DETAIL "2"

FREE END SUPPORT

SCALE 1:10

NOTES :

1. ALL DIMENSIONS ARE IN METRES
2. REINFORCEMENT BARS ARE IN MILLIMETRES, UNLESS OTHERWISE SHOWN.
3. ALL WELDING CONNECTIONS USE 6 mm. E60
4. STEEL SHALL BE IN ACCORDANCE WITH ASTM A36-81 a. OR TIS. 1227-2539 SS400
5. BOLT AND CONNECTOR SHALL CONFORM TO ASTM 325 OR TIS.171-2530 CLASS 8.8, HEX NUT SHALL CONFORM TO TIS.672-2530 TYPE1 CLASS A OR CLASS B, SPRING WASHER SHALL CONFORM TO TIS.259-2531, ANCHOR BOLT, CONNECTOR, HEX NUT AND SPRING WASHER USED HOT DIP GALVANIZED 305 g/m^2 THK. SHALL CONFORM TO ASTM-A 153

REFERENCES :

1. POWERHOUSE, SECTIONS — AKP-PH-04

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

0 0.5 1 2 3 4
SCALE 1:50 METERS

0 .5 1.0 1.5
SCALE 1:20 METERS

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT

TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

TRUSS SECTIONS AND DETAILS

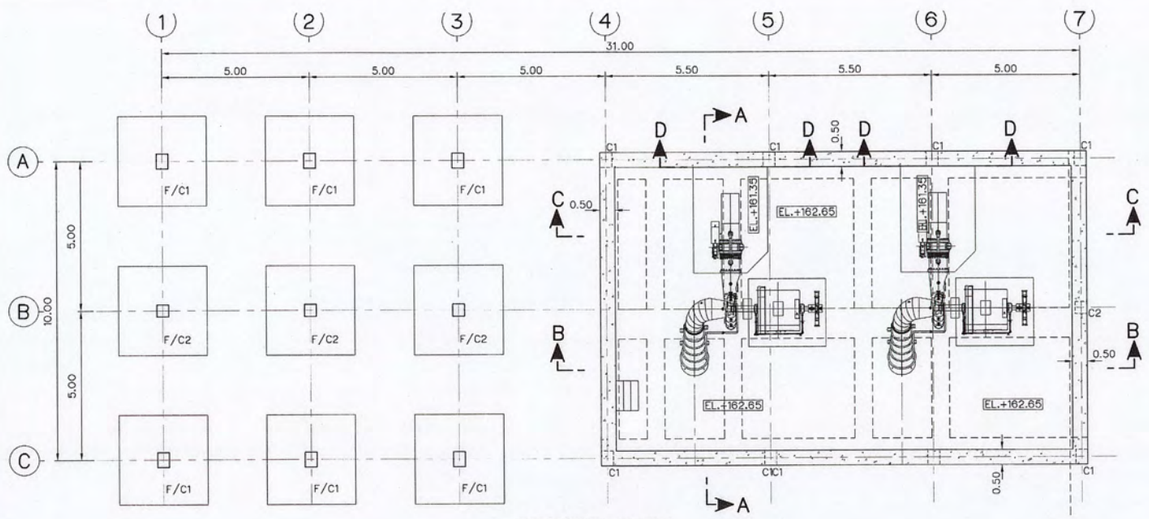
PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED			
DESIGNED		28.9074	28.9462
DRAWN			
CHECKED			28.8231
PROJECT MANAGER	28/10/2021 DATE	SUBMITTED	
		RECOMMENDED	
		APPROVED	

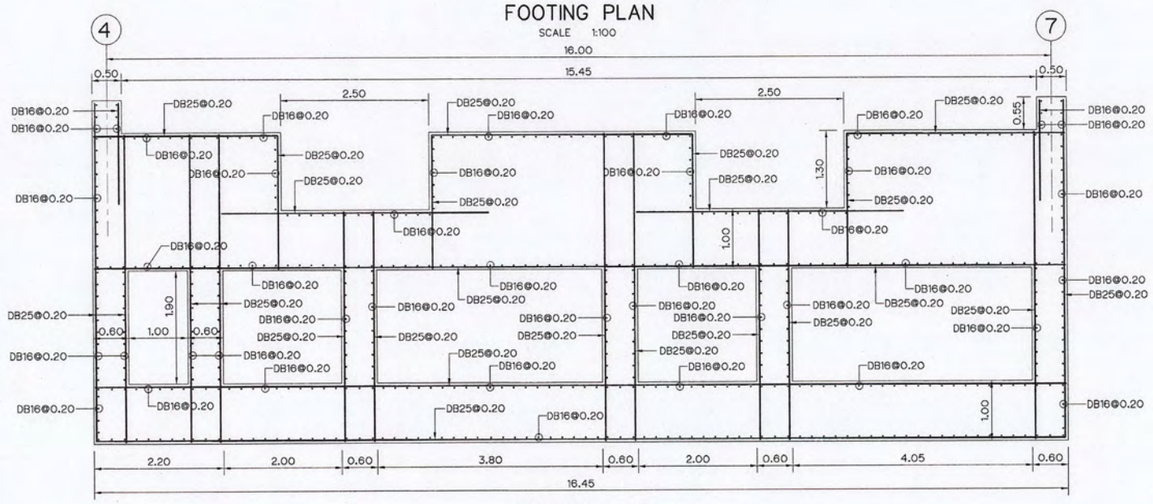
DRAWING NO. AKP-PH-08

SHEET NO. 70 OF 129



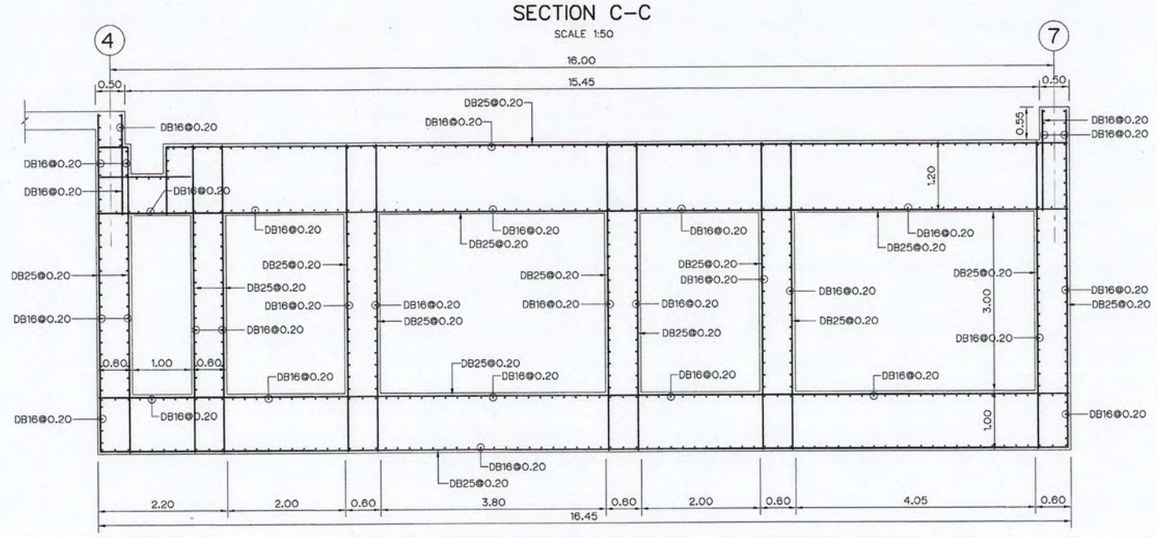
FOOTING PLAN

SCALE 1:100



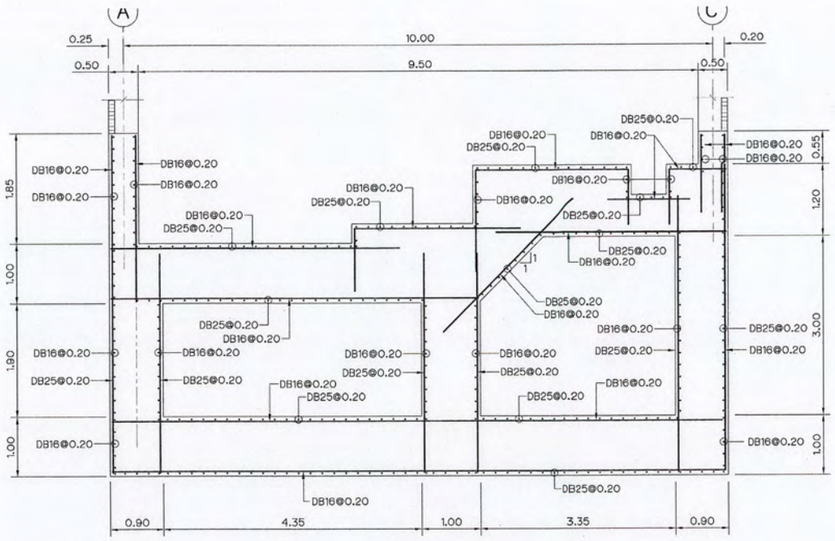
SECTION C–C

SCALE 1:50



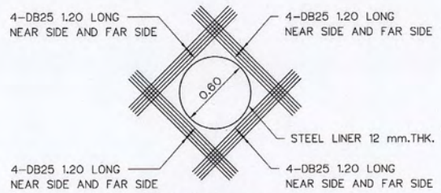
SECTION B–B

SCALE 1:50



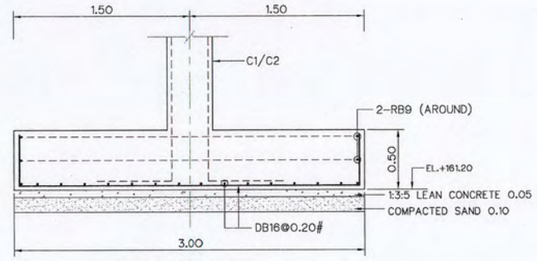
SECTION A–A

SCALE 1:50



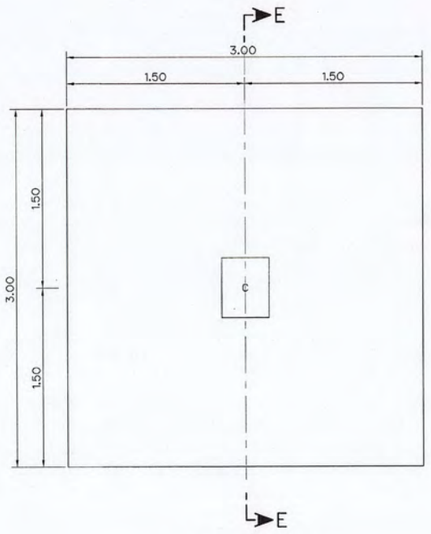
SECTION D–D

SCALE 1:25



SECTION E–E

SCALE 1:25



FOOTING (F)

SCALE 1:25

NOTES :

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

REFERENCE DRAWINGS :

1. POWERHOUSE, PLAN — AKP–PH–02
2. POWERHOUSE, SECTIONS — AKP–PH–04

0 0.5 1.0 1.5 — SCALE 1:20 METERS

0 0.5 1.0 2.0 3.0 2.5 — SCALE 1:50 METERS

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS — DEDE

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

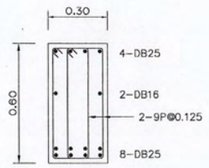
FOOTING PLAN AND SECTIONS

PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

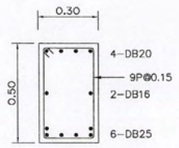
DESIGNED — RE.29074 — RE.9462
DRAWN
CHECKED — RE.8231
28/10/2021 PROJECT MANAGER — DATE

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

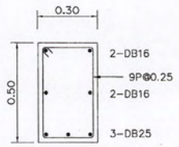
DRAWING NO. AKP–PH–09
SHEET NO. 71 OF 129



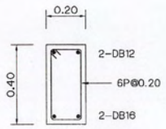
BEAM B1
SCALE 1:15



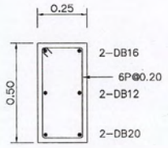
BEAM B3
SCALE 1:15



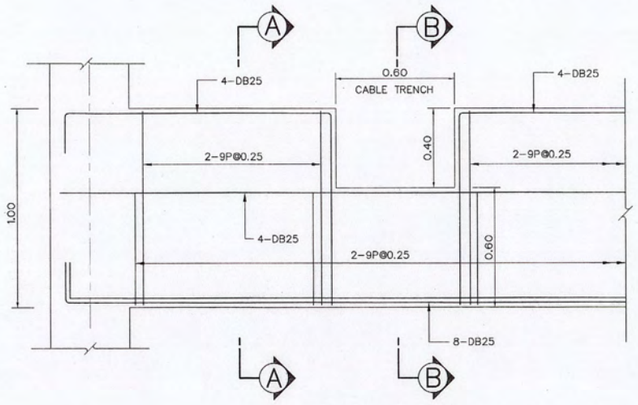
BEAM B5
SCALE 1:15



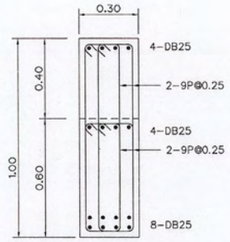
BEAM B6
SCALE 1:15



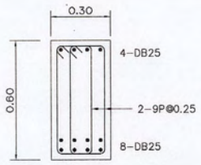
BEAM B7
SCALE 1:15



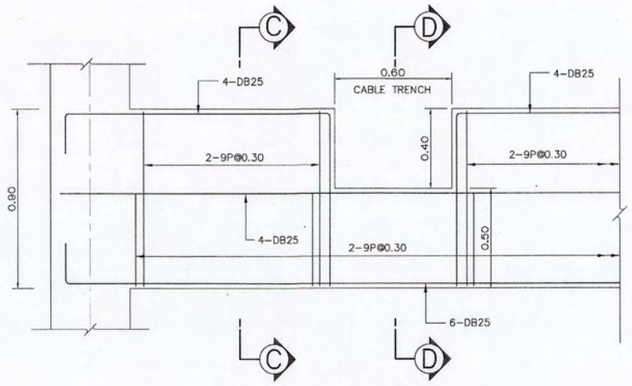
BEAM B2
SCALE 1:15



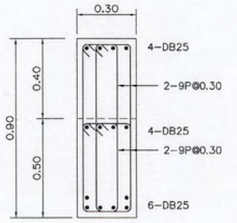
SECTION A–A
SCALE 1:15



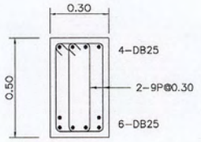
SECTION B–B
SCALE 1:15



BEAM B4
SCALE 1:15



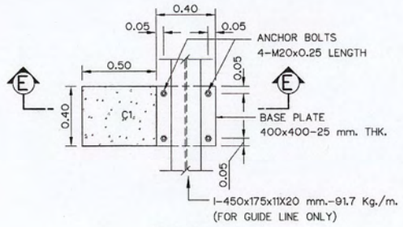
SECTION C–C
SCALE 1:15



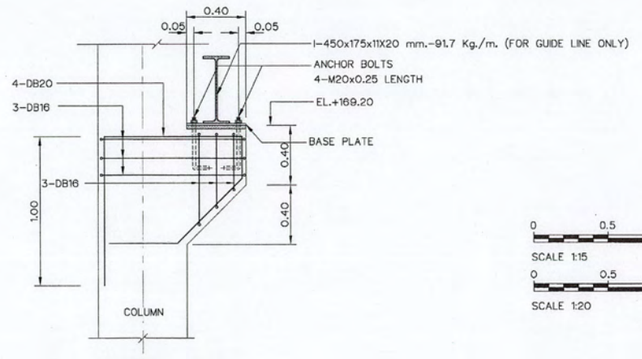
SECTION D–D
SCALE 1:15

COLUMN SCHEDULE

COLUMNS / FLOOR	C1	C2	C3
ROOF (EL.+171.20) ↑ 2nd FLOOR (EL.+167.20)	0.40 × 0.40: 14-DB25, 3-9P@0.25	0.40 × 0.40: 8-DB25, 2-9P@0.25	
2nd FLOOR (EL.+167.20) ↑ GROUND FLOOR (EL.+163.20)	0.40 × 0.50: 16-DB25, 3-9P@0.25	0.40 × 0.40: 8-DB25, 2-9P@0.25	LANDING (EL.+165.85); 0.20 × 0.20: 4-DB16, 6P@0.20; GROUND FLOOR (EL.+163.10)
GROUND FLOOR (EL.+163.20) ↑ FOOTING (EL.+161.20)	0.40 × 0.50: 16-DB25, 3-9P@0.25	0.40 × 0.40: 8-DB25, 2-9P@0.25	



PLAN
SCALE 1:20



SECTION E–E
SCALE 1:20

SCALE 1:15 METERS (0, 0.5, 1.0, 1.5)

SCALE 1:20 METERS (0, 0.5, 1.0, 1.5)

NOTES :
1. ALL DIMENSIONS AND ELEVATIONS ARE IN METERS, REINFORCEMENT BARS ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP-GN-03.

REFERENCE DRAWINGS :
1. POWERHOUSE, GROUND FLOOR PLAN, PLAN OF BEAM AND SLAB AND ROOF BEAM PLAN — AKP-PH-07
2. POWERHOUSE, FOOTING PLAN AND SECTIONS — AKP-PH-09

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

BEAM AND COLUMN REINFORCEMENT DETAILS

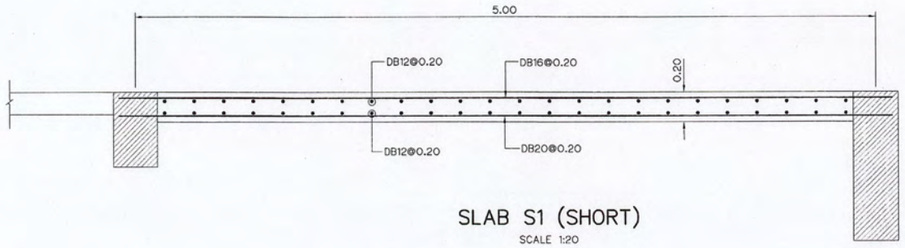
P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

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MINISTRY OF ENERGY

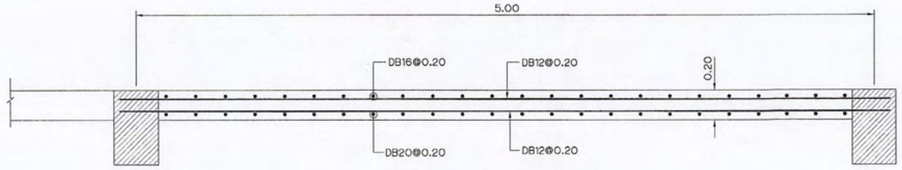
DESIGNED Rtl.29074 Rtl.9462
DRAWN
CHECKED Rtl.8231
28/10/2021
PROJECT MANAGER DATE

REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

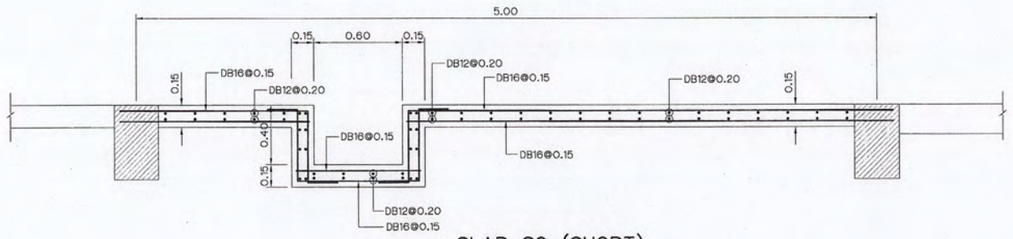
DRAWING NO. AKP-PH-10
SHEET NO. 72 OF 129



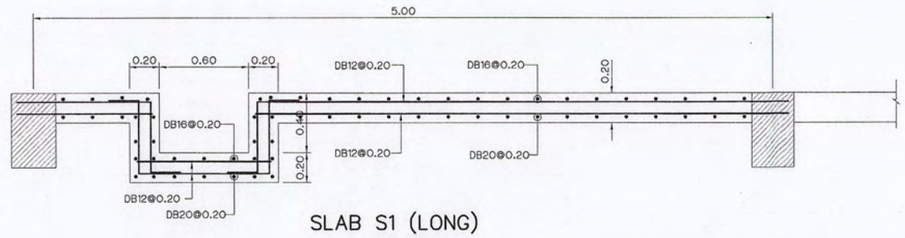
SLAB S1 (SHORT)
SCALE 1:20



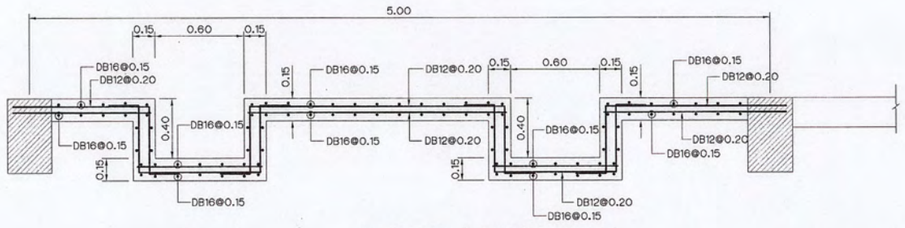
SLAB S1 (LONG)
SCALE 1:20



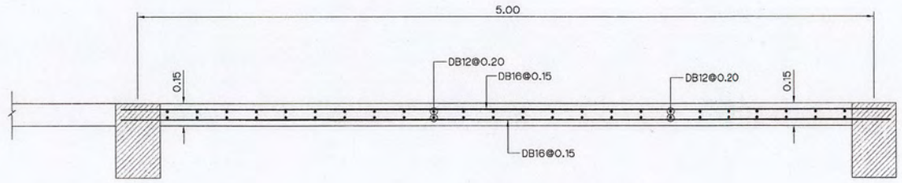
SLAB S2 (SHORT)
SCALE 1:20



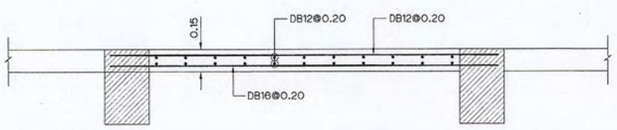
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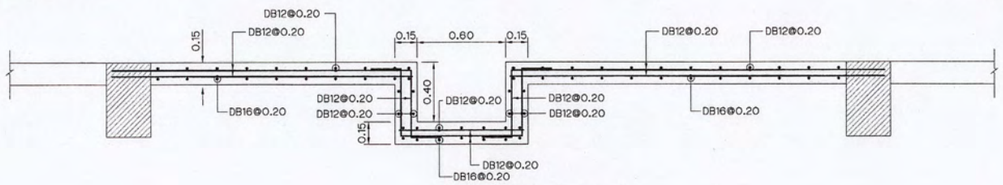
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SCALE 1:20



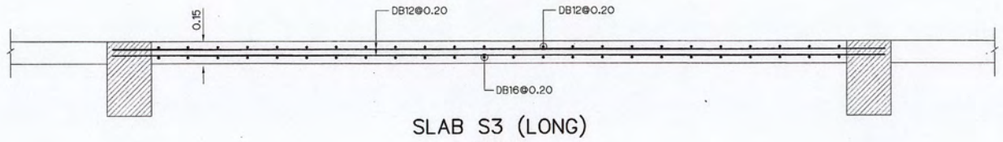
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SCALE 1:20



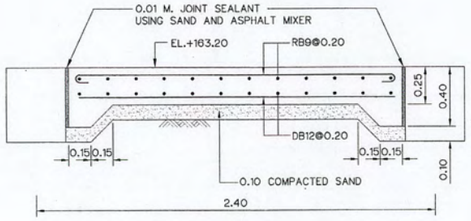
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SCALE 1:20



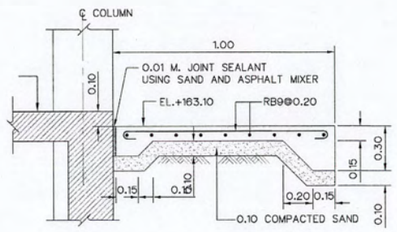
SLAB S3 (LONG)
SCALE 1:20



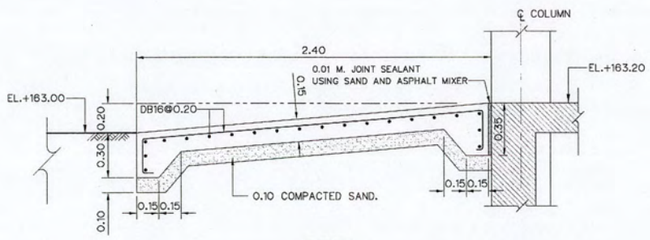
SLAB S3 (LONG)
SCALE 1:20



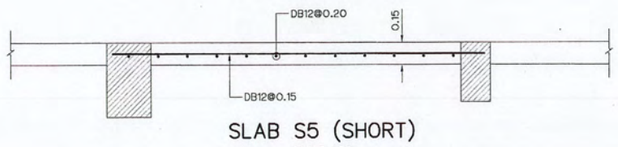
SLAB S4 (SHORT)
SCALE 1:20



SLAB GS
NOT TO SCALE



RAMP
SCALE 1:20



SLAB S5 (SHORT)
SCALE 1:20

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METERS, REINFORCEMENT BARS ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP-GN-03.

REFERENCE DRAWINGS :

1. POWERHOUSE, GROUND FLOOR PLAN, PLAN OF BEAM AND SLAB AND ROOF BEAM PLAN — AKP-PH-07



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

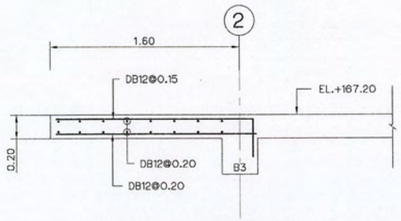
SLAB REINFORCEMENT DETAILS

PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

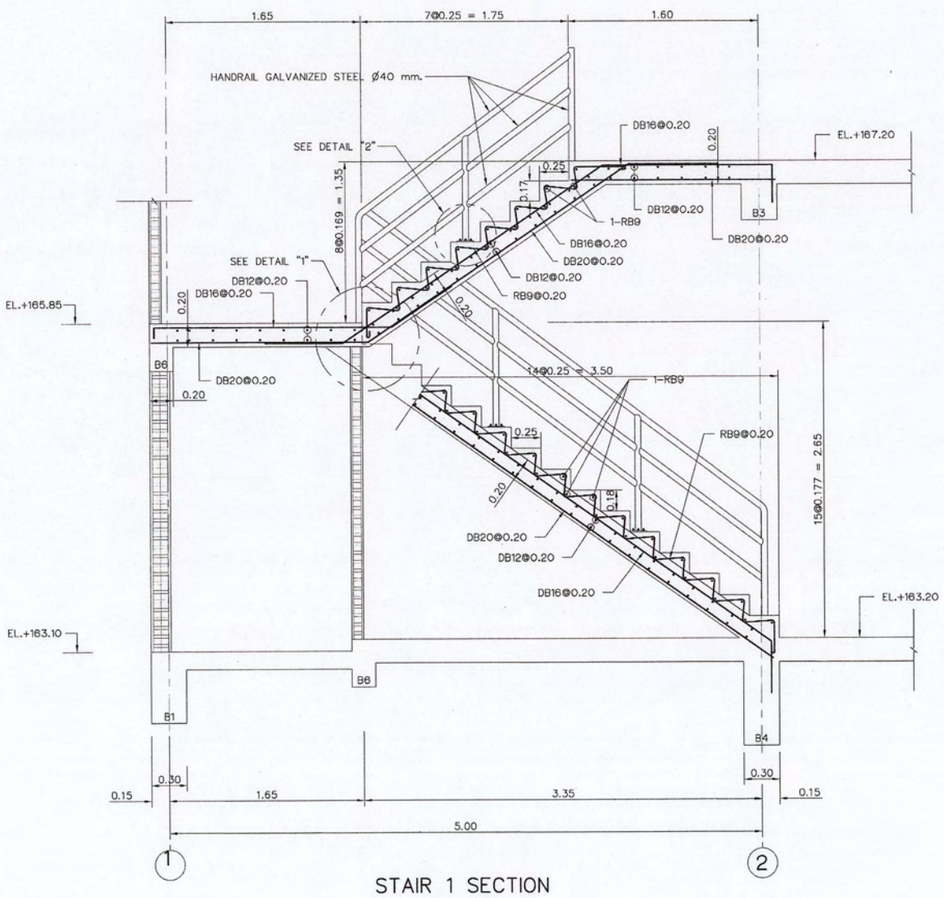
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

DESIGNED	ณัฐพงศ์ ณัฐ.29074	ส.ย.9462	REVIEWED
DRAWN			SUBMITTED
CHECKED		ส.ย.8231	RECOMMENDED
PROJECT MANAGER	28/10/2021 DATE		APPROVED

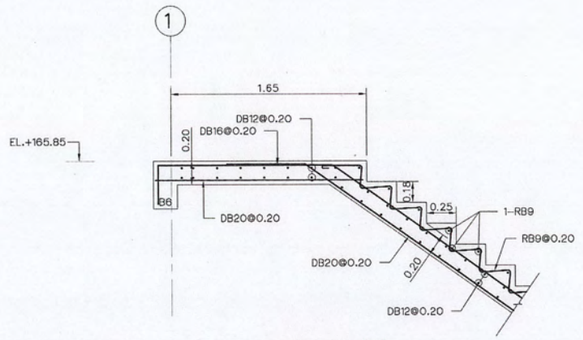
DRAWING NO. AKP-PH-11
SHEET NO. 73 OF 129



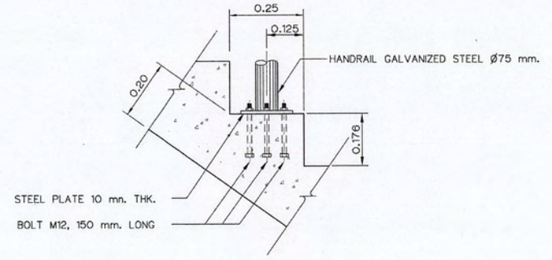
STAIR 1 CANTILEVER SLAB
SCALE 1:25



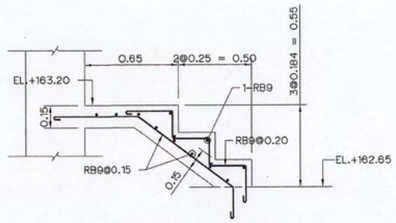
STAIR 1 SECTION
SCALE 1:25



DETAIL "1"
SCALE 1:20



DETAIL "2"
SCALE 1:10



STAIR 2 SECTION
SCALE 1:20

NOTES :
1. ALL DIMENSIONS AND ELEVATIONS ARE IN METERS, REINFORCEMENT BARS ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP-GN-03.

REFERENCE DRAWINGS :
1. POWERHOUSE, PLAN — AKP-PH-02

0 0.5 1.0 1.5 2.0
SCALE 1:25 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

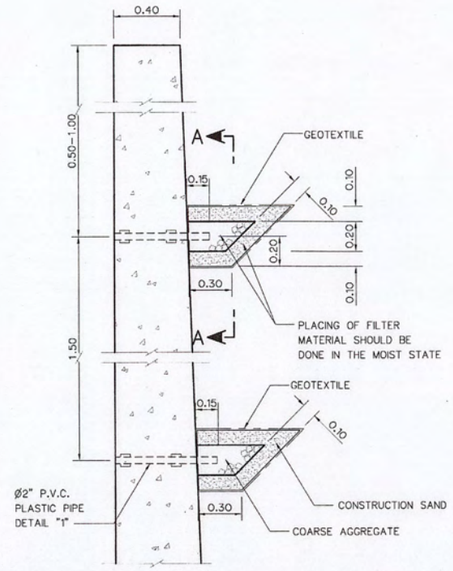
STAIR REINFORCEMENT DETAILS

PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

DESIGNED ณัฐวุฒิ 28.9.2021 — 28.9.62
DRAWN — 28.9.62
CHECKED — 28.8.21
PROJECT MANAGER — 28/10/2021 DATE

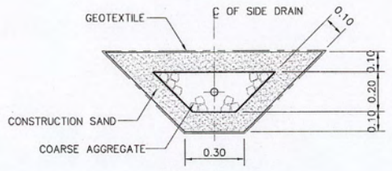
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP-PH-12
SHEET NO. 74 OF 129



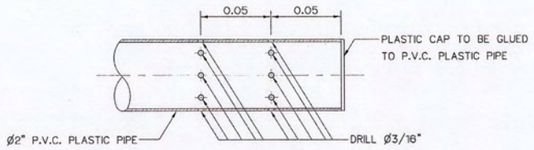
DETAIL OF SIDE DRAIN

NOT TO SCALE



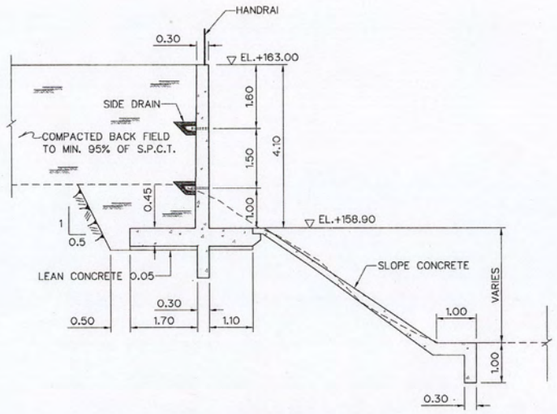
SECTION A–A

SCALE 1:15



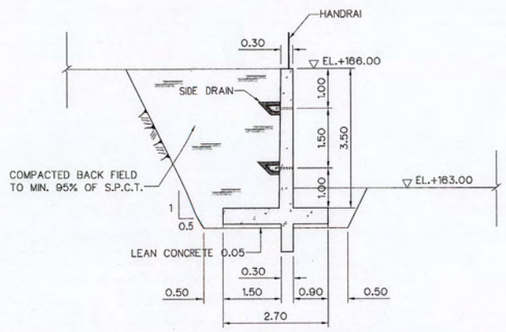
DETAIL "1"

NOT TO SCALE



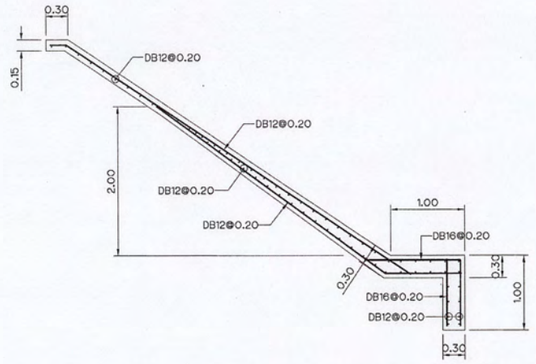
RETAININGWALL NO.1

SCALE 1:75



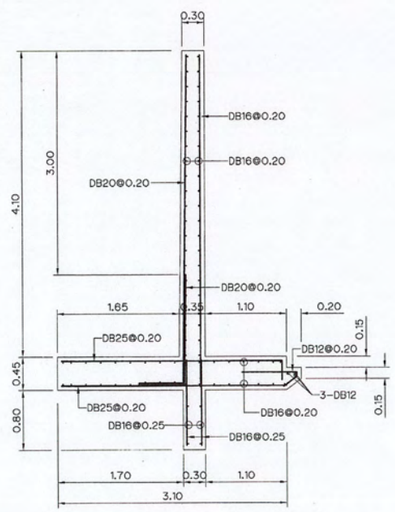
RETAININGWALL NO.2

SCALE 1:75



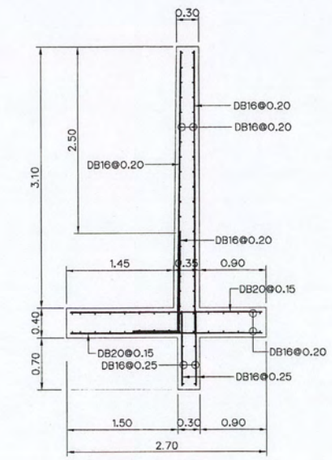
CONCRETE SLOPE REINFORCEMENT

SCALE 1:20



RETAININGWALL NO.1 (Reinforcement)

SCALE 1:40



RETAININGWALL NO.2 (Reinforcement)

SCALE 1:40

NOTES :

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

REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAYOUT AKP-PH-01

0 0.2 0.4 0.8 1.2 1.6
SCALE 1:20 METERS

0 0.5 1 2 3
SCALE 1:40 METERS

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

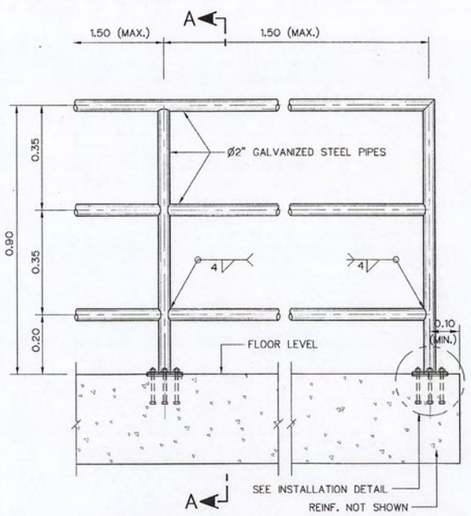
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

RETAININGWALL REINFORCEMENT DETAILS

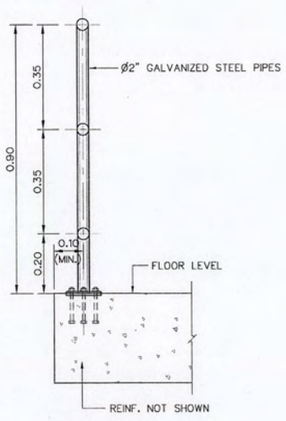
PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED ... ชัย.29074 ... สัญ.9462	REVIEWED ...
DRAWN ...	SUBMITTED ...
CHECKED ... สัญ.8231	RECOMMENDED ...
PROJECT MANAGER 28/10/2021 DATE	APPROVED ...
	DRAWING NO. AKP-PH-13 / SHEET NO. 75 OF 129



INTERMEDIATE POST END POST

DETAILS OF HANDRAIL

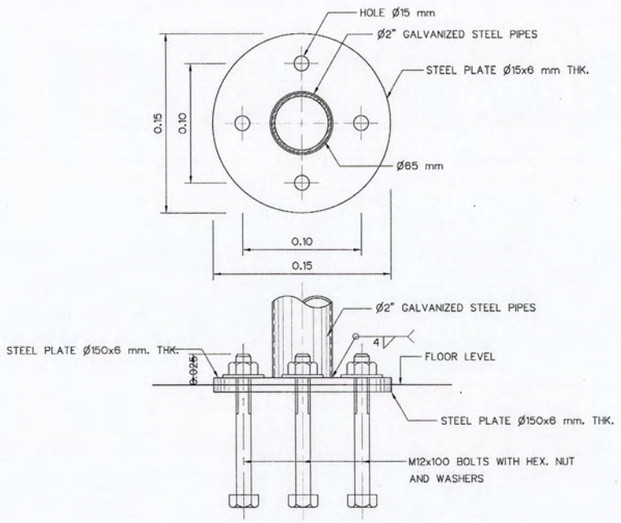
NOT TO SCALE



TYPICAL SECTION

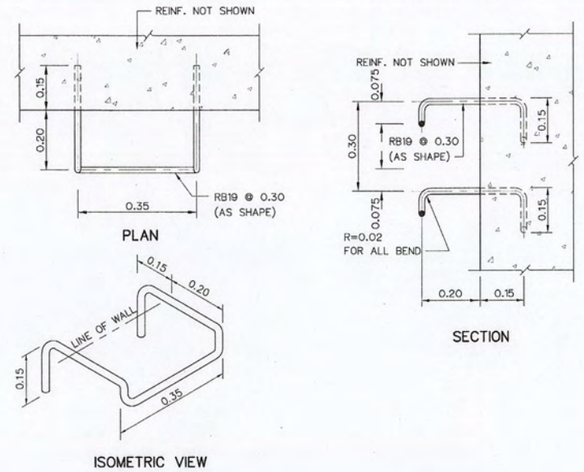
SECTION A–A

NOT TO SCALE



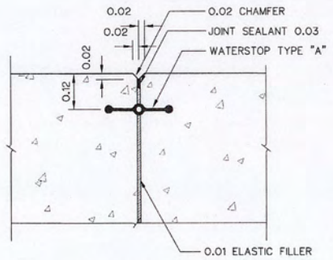
INSTALLATION DETAIL

NOT TO SCALE



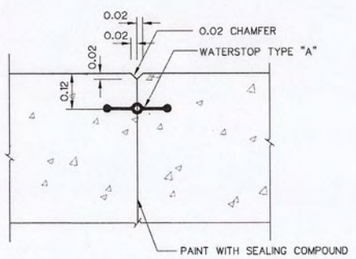
DETAIL OF LADDER RUNGS

NOT TO SCALE



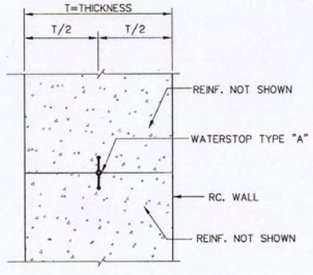
DETAIL OF EXPANSION JOINT

SCALE 1:10



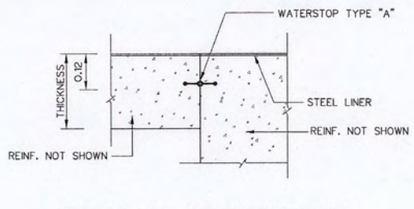
DETAIL OF CONTRACTION JOINT

SCALE 1:10



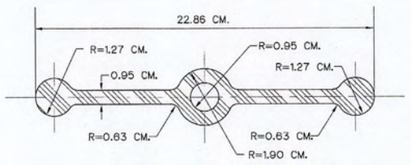
DETAIL OF CONSTRUCTION JOINT

SCALE 1:20



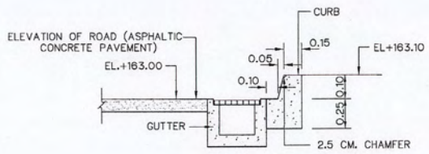
DETAIL OF CONTROL JOINT

SCALE 1:20



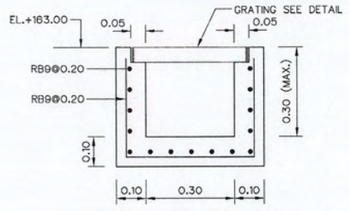
PVC. WATERSTOP TYPE "A"

NOT TO SCALE



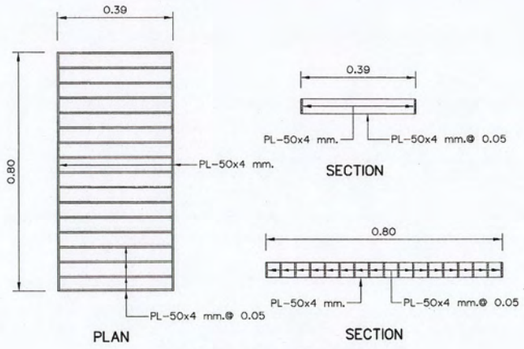
DETAIL OF CURB

SCALE 1:25



DETAIL OF GUTTER

SCALE 1:10



DETAIL OF GRATING

SCALE 1:10

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METERS, REINFORCEMENT BARS ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP-GN-03.
3. WELDING CONNECTION USE 4 MM. UNLESS OTHERWISE SHOWN.

REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAYOUT	AKP-PH-01
2. TAILRACE, SECTIONS	AKP-TR-02

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

0 0.2 0.4 0.8 1.2 1.6
SCALE 1:20 METERS

0 0.5 1.0 1.5 2.0
SCALE 1:25 METERS

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

MISCELLANEOUS DETAILS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

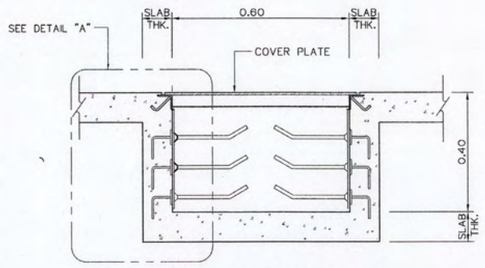
CONSULTANTS DEDE

P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

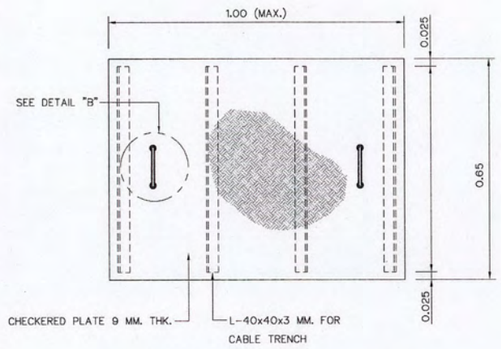
DESIGNED RTN.29074 RTL.9462
DRAWN
CHECKED RTL.8231
28/10/2021
PROJECT MANAGER DATE

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

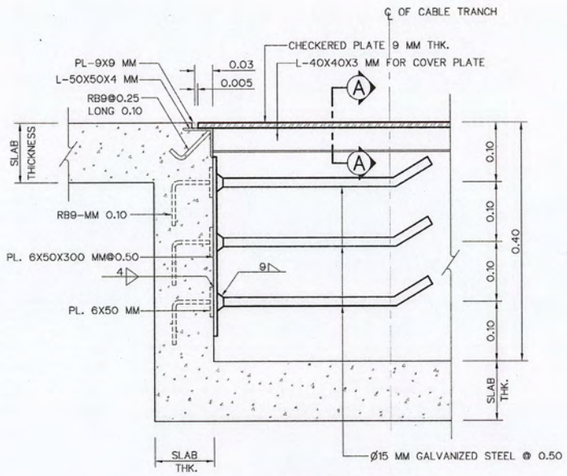
DRAWING NO. AKP-PH-14
SHEET NO. 76 OF 129



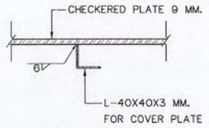
IN DOOR CABLE TRENCH
SCALE 1:10



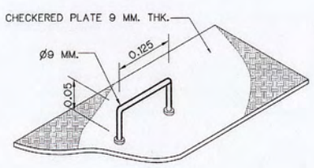
COVER PLATE FOR IN DOOR
SCALE 1:10



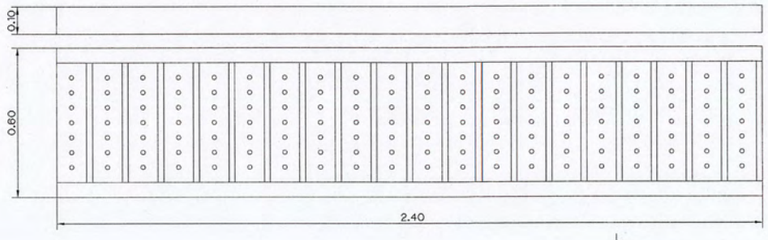
DETAIL "A"
SCALE 1:5

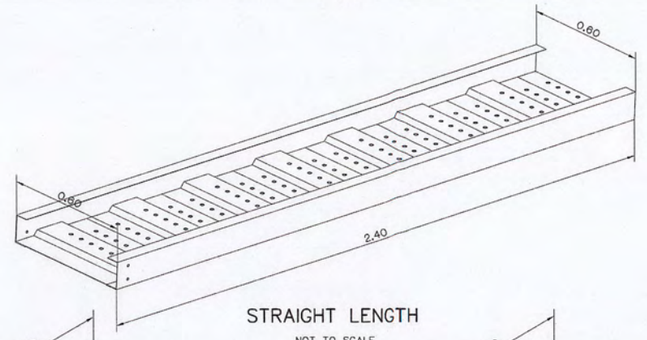


SECTION A-A
NOT TO SCALE

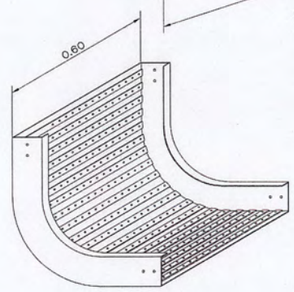


DETAIL "B"
NOT TO SCALE

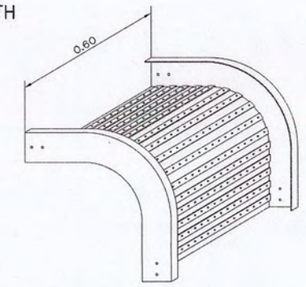




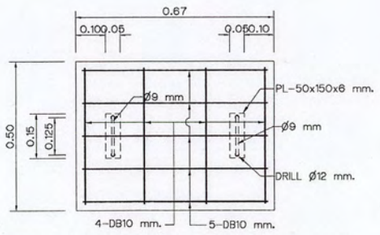
STRAIGHT LENGTH
NOT TO SCALE



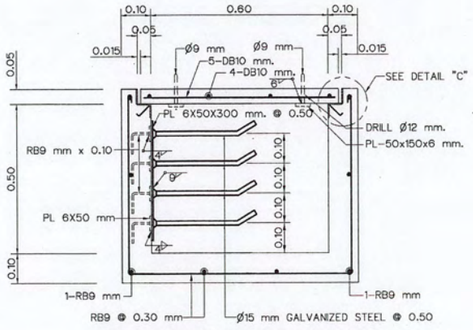
OUTSIDE VERTICAL RISERS
NOT TO SCALE



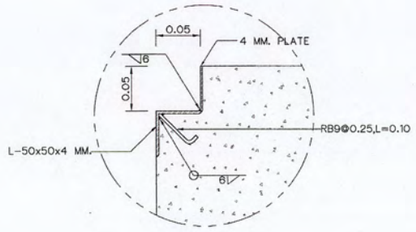
INSIDE VERTICAL RISERS
NOT TO SCALE



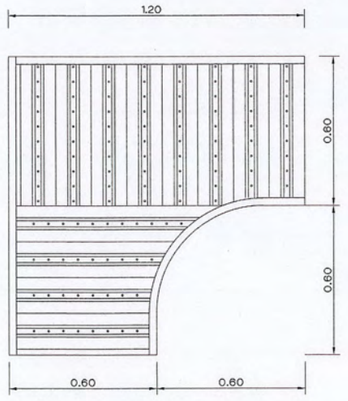
OUT DOOR COVER CABLE TRENCH
SCALE 1:5



OUT DOOR CABLE TRENCH
SCALE 1:10



DETAIL "C"
NOT TO SCALE



HORIZONTAL 90 ELBOWS
NOT TO SCALE

MATERIALS :SHEET STEEL 1.5MM.
SURFACE FINISH :POWDER
COATED IN TEXTURED RAL
7032 OR HOT-DIP GALVANIZED
(UPON YOU REQUIREMENTS)
ASSEMBLY :WELDING METHOD
APPLICATION : USING FOR INDOOR & OUTDOOR INSTALLATION WORK

0 0.05 0.1 0.2 0.3 0.4
SCALE 1:5 METERS

0 0.1 0.2 0.4 0.6 0.8
SCALE 1:10 METERS

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METERS, REINFORCEMENT BARS ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP-GN-03.
3. STEEL COVER FOR IN DOOR TRENCH SHALL BE COATED WITH NON BLEEDING TYPE COAL TAR EPOXY.

REFERENCE DRAWINGS :

1. POWERHOUSE, PLAN AKP-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

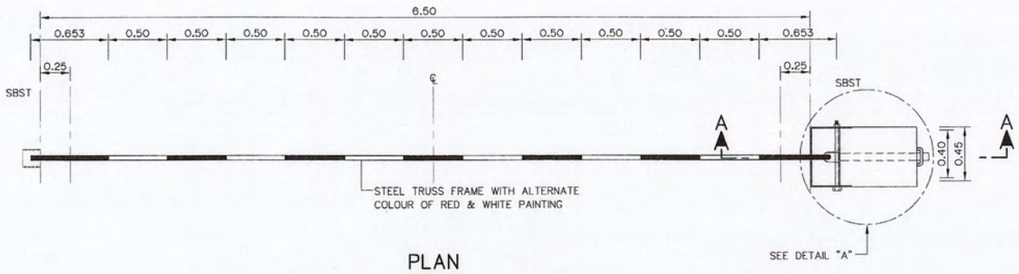
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

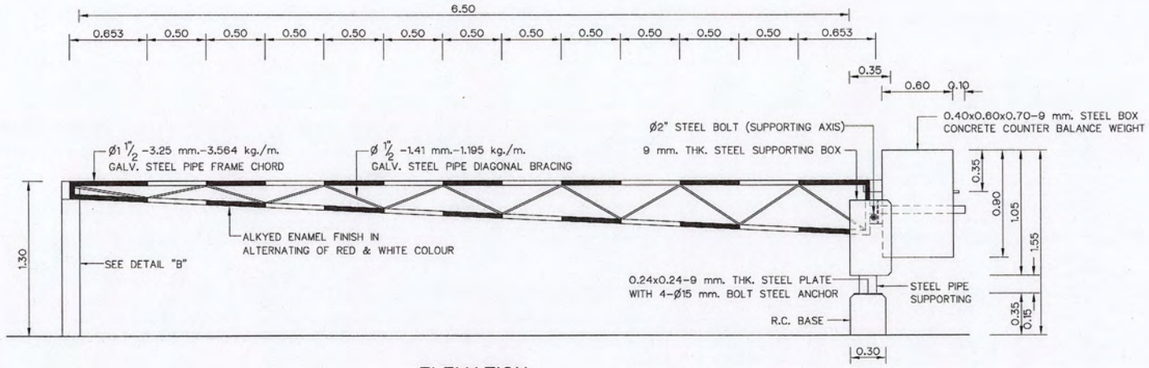
POWERHOUSE

CABLE TRENCH DETAILS

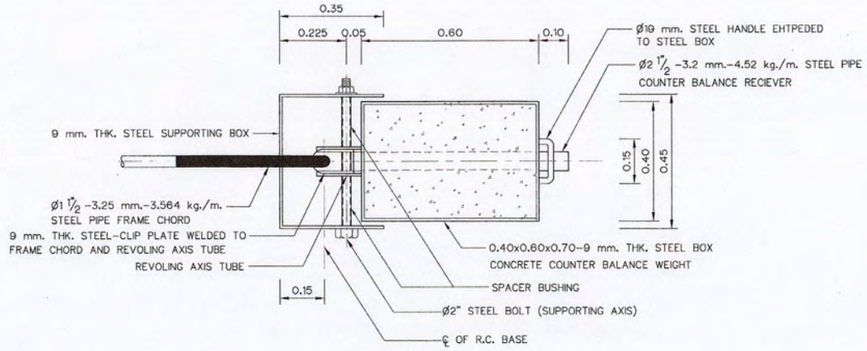
P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED RSL.29074 RSL.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED RSL.8231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-PH-15	SHEET NO. 77 OF 129



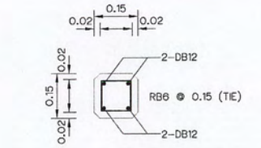
PLAN
SCALE 1:25



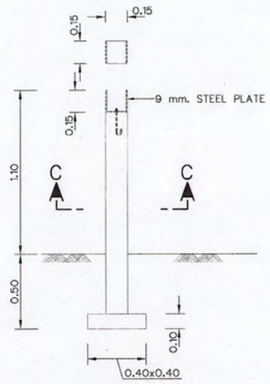
ELEVATION
SCALE 1:25



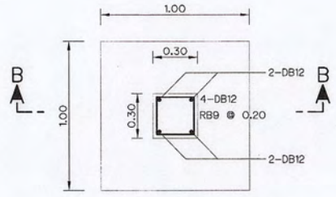
DETAIL "A"
SCALE 1:10



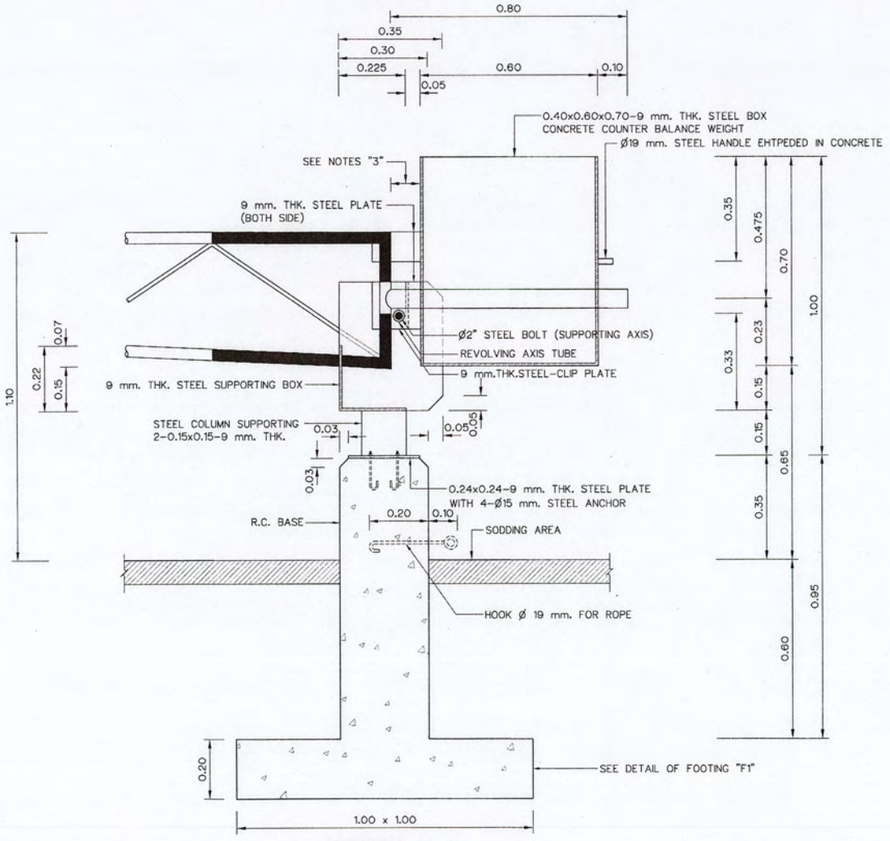
SECTION C-C
SCALE 1:20



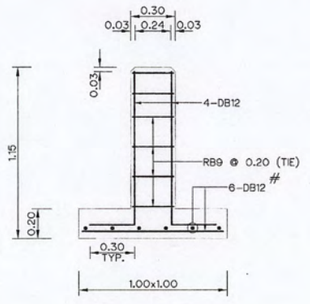
DETAIL "B"
SCALE 1:20



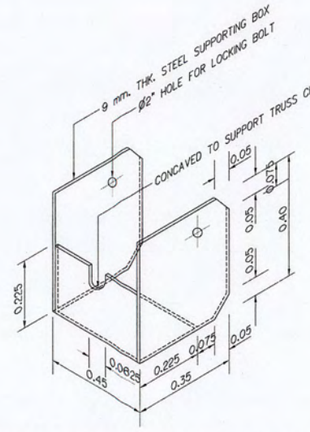
PLAN OF FOOTING "F1"
SCALE 1:20



SECTION A-A
SCALE 1:10



SECTION B-B
SCALE 1:20



ISOMETRIC DETAIL OF SUPPORTING BOX
SCALE 1:10

NOTES :

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. REINFORCING BARS ARE IN MILLIMETERS.
3. DISTANCE BETWEEN CONCRETE COUNTER BALANCE WEIGHT AND FRAME CHORD SHALL BE ADJUSTED BY CONTRACTOR.

REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAYOUT AKP-PH-01

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

0 0.5 1.0 1.5
SCALE 1:20 METERS

0 0.5 1.0 1.5 2.0
SCALE 1:25 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

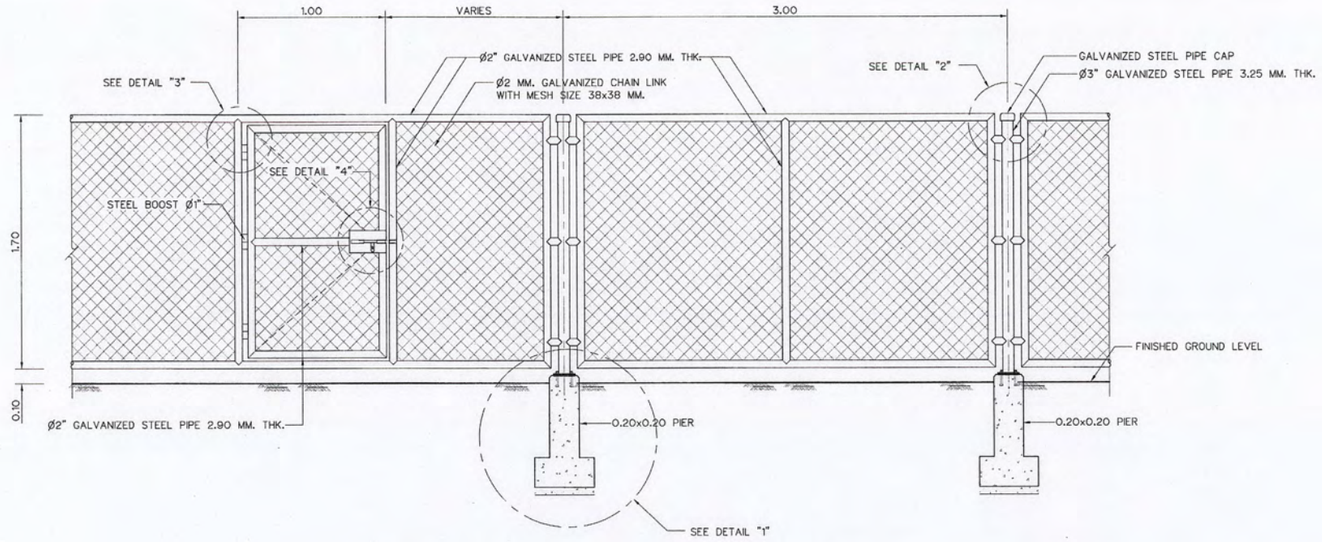
POWERHOUSE

MOVABLE STEEL BARRICADE

PCM P&C MANAGEMENT CO., LTD.
SPT SPT CONSULTANTS CO., LTD.

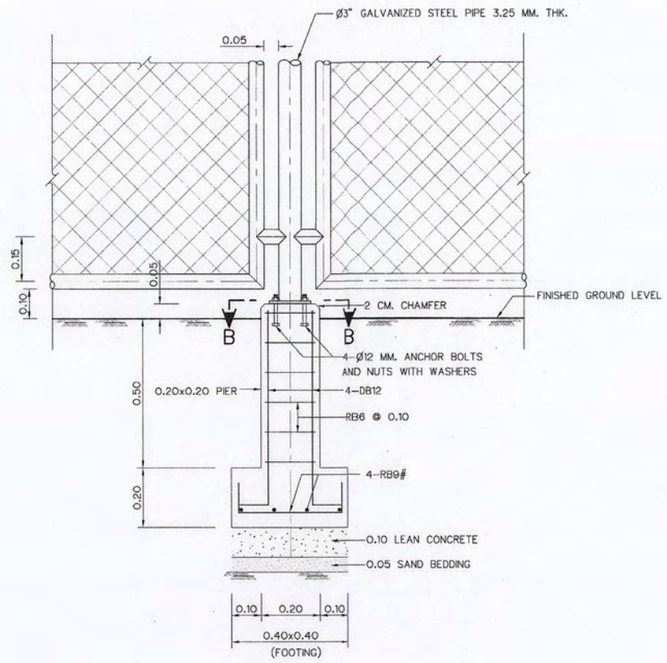
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

DESIGNED	วศ.29074	วศ.9462	REVIEWED
DRAWN			SUBMITTED
CHECKED	วศ.8231		RECOMMENDED
			APPROVED
PROJECT MANAGER	28/10/2021 DATE		DRAWING NO. AKP-PH-16
			SHEET NO. 78 OF 129



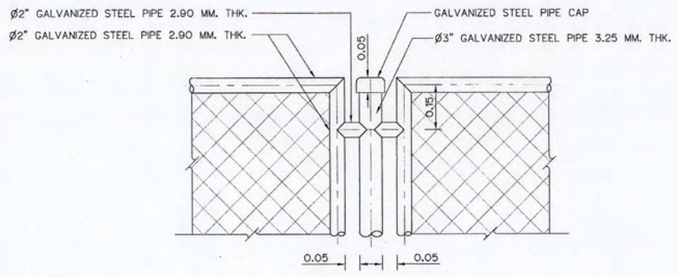
CHAIN LINK FENCE AND GATE WIDTH 1.00 M.

SCALE 1:20



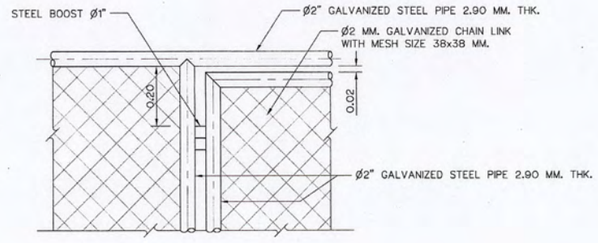
DETAIL "1"

SCALE 1:10



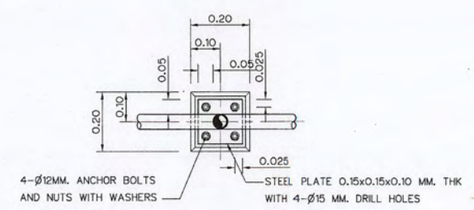
DETAIL "2"

SCALE 1:10



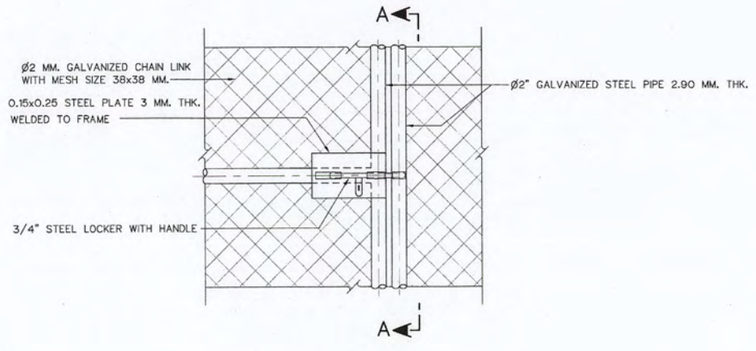
DETAIL "3"

SCALE 1:10



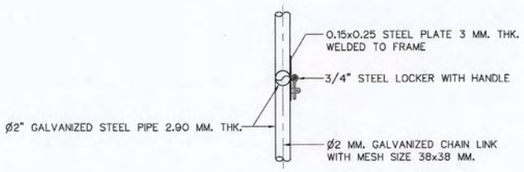
SECTION B-B

SCALE 1:10



DETAIL "4"

SCALE 1:10



SECTION A-A

SCALE 1:10

NOTES :

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. CHAIN LINK SHALL GALVANIZED AS SPECIFIED BY TIS.208-2562.

REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAYOUT AKP-PH-01

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

0 0.5 1.0 1.5
SCALE 1:20 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

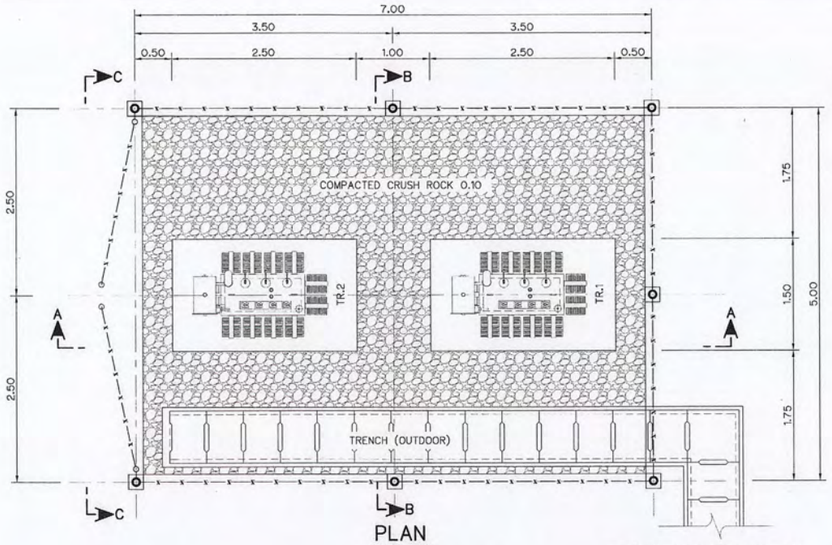
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

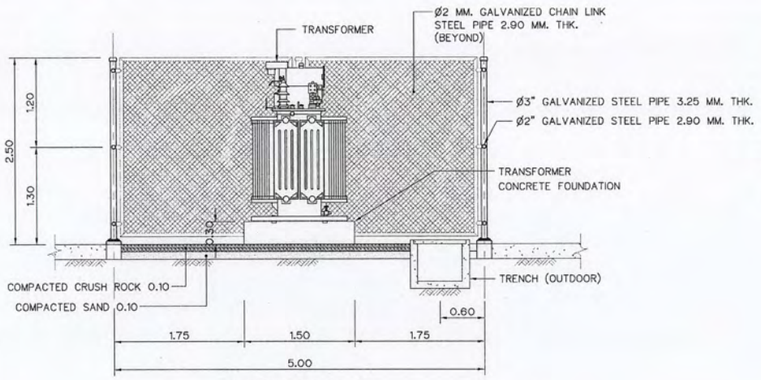
CHAIN LINK FENCE AND GATE WIDTH 1.00 M.

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DESIGNED	REVIEWED
DRAWN	SUBMITTED
CHECKED	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
	DRAWING NO. AKP-PH-17
	SHEET NO. 79 OF 129



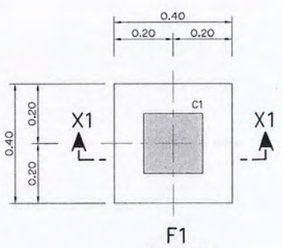
PLAN

SCALE 1:40



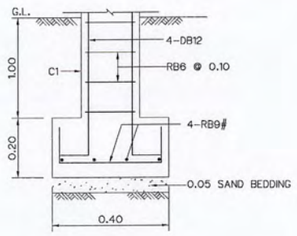
SECTION B–B

SCALE 1:40



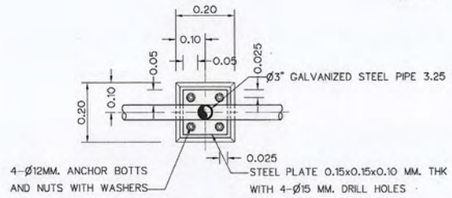
F1

SCALE 1:10



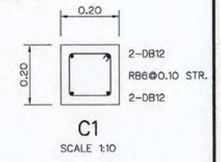
SECTION X1–X1

SCALE 1:10



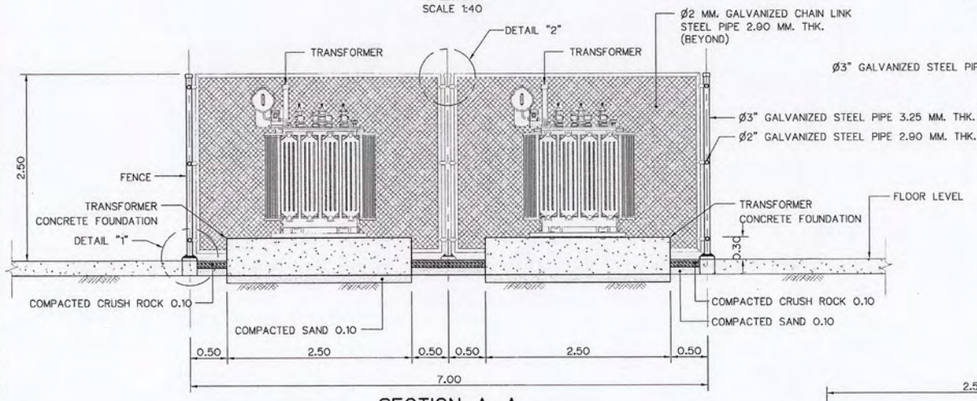
SECTION X2–X2

SCALE 1:10



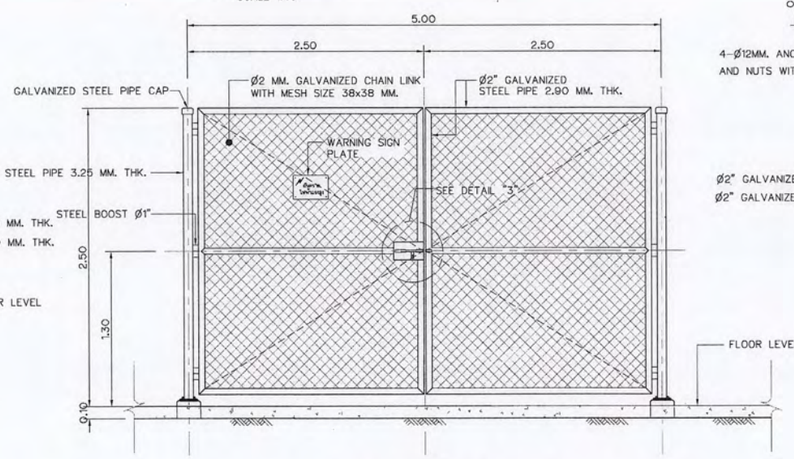
C1

SCALE 1:10



SECTION A–A

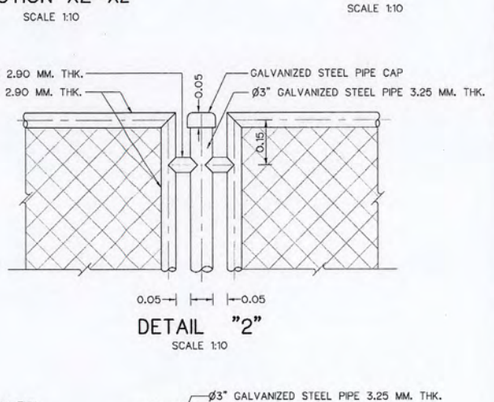
SCALE 1:40



SECTION C–C

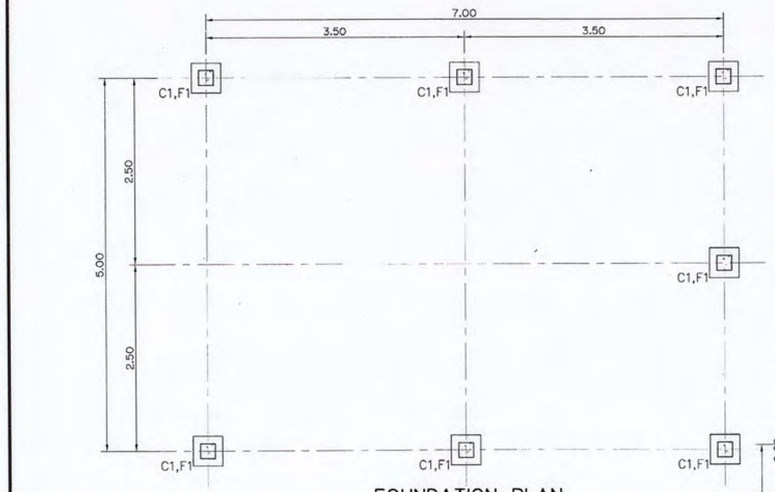
CHAIN LINK FENCE AND GATE

SCALE 1:25



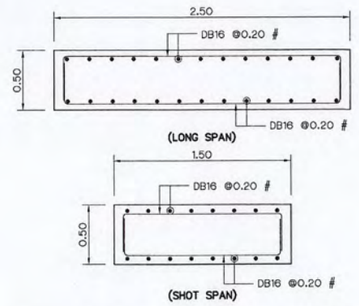
DETAIL "2"

SCALE 1:10



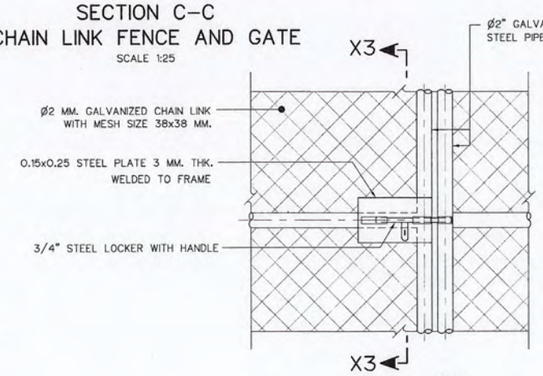
FOUNDATION PLAN

SCALE 1:40



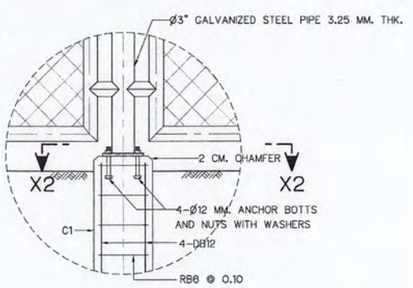
TRANSFORMER CONCRETE FOUNDATION
REINFORCEMENT DETAIL

SCALE 1:25



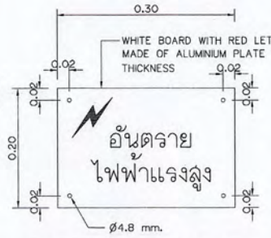
DETAIL "3"

SCALE 1:10



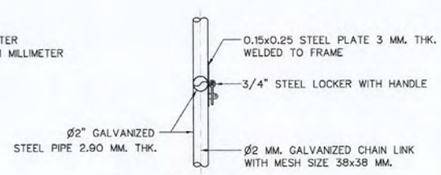
DETAIL "1"

SCALE 1:10



WARNING SIGN PLATE

SCALE 1:5



SECTION X3–X3

SCALE 1:10

SCALE 1:5 METERS
0 0.10 0.20 0.30 0.40 0.50

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

SCALE 1:25 METERS
0 0.5 1.0 1.5 2.0

SCALE 1:40 METERS
0 1 2 3

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP-GN-03
3. REINFORCEMENT BARS ARE IN MILLIMETRES, UNLESS OTHERWISE SHOWN.
4. THE TRANSFORMER AREA WILL BE ACCORDING TO PEA STANDARD.

REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAYOUT AKP-PH-01

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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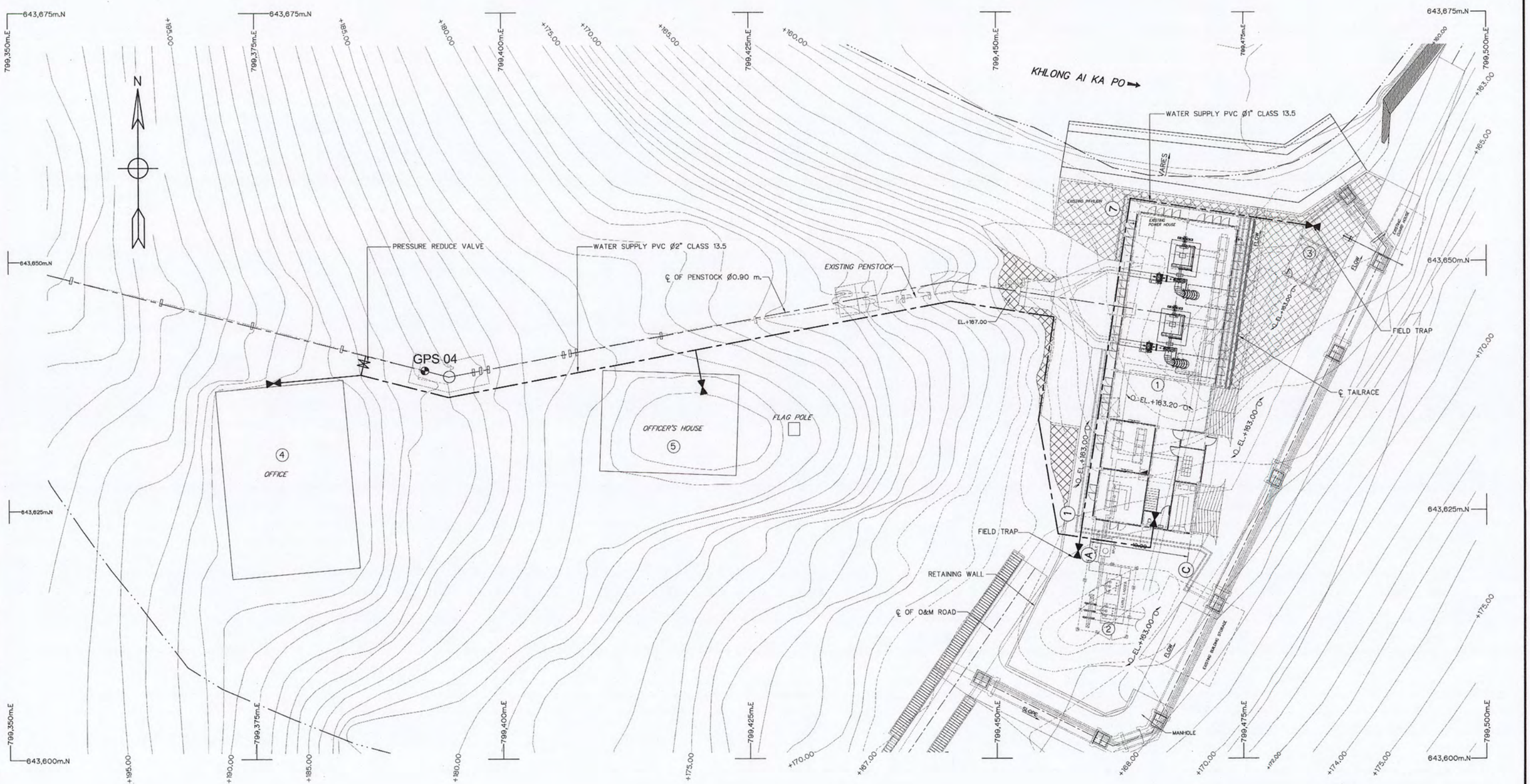
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

TRANSFORMER AREA PLANS, SECTIONS AND DETAILS

PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED	REVIEWED	
DRAWN	SUBMITTED	
CHECKED	RECOMMENDED	
PROJECT MANAGER 28/10/2021 DATE	APPROVED	
	DRAWING NO. AKP-PH-18	SHEET NO. 80 OF 129



WATER SUPPLY PIPELINE SYSTEM LAYOUT

SCALE 1:200

LEGENDS :

1. POWER HOUSE
2. SWITCHYARD
3. GUARD HOUSE
4. OFFICE
5. OFFICER'S HOUSE

NOTES :

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

0 5 10 15

SCALE 1:200 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
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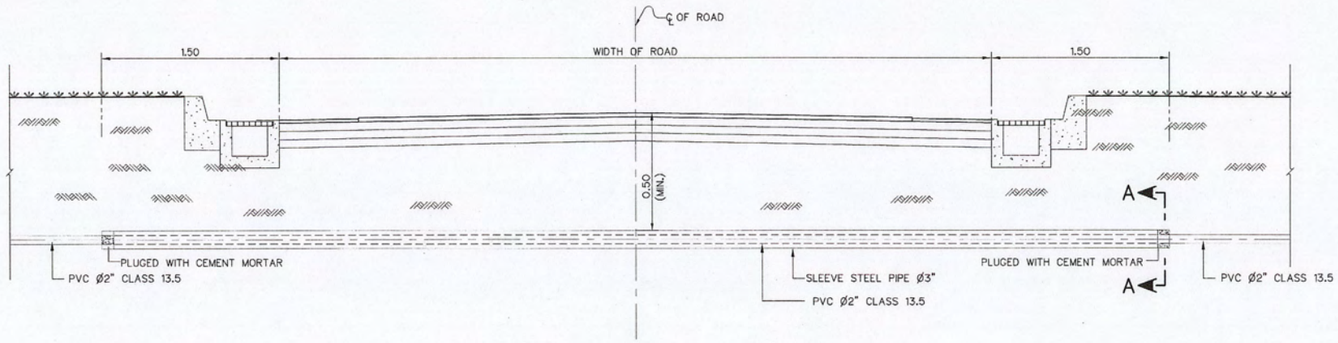
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

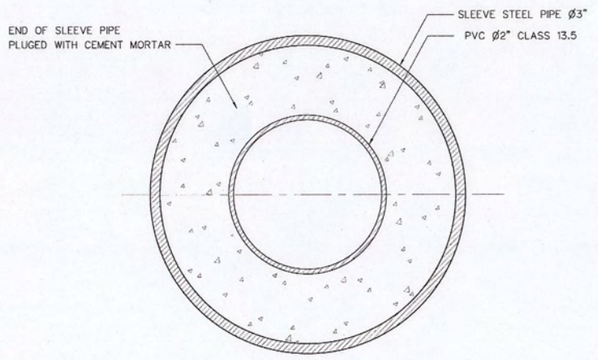
WATER SUPPLY PIPELINE SYSTEM LAYOUT

P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED	REVIEWED
DRAWN	SUBMITTED
CHECKED	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-PH-19	SHEET NO. 81 OF 129



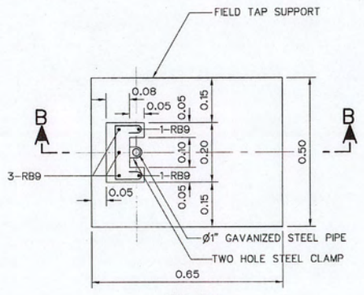
TYPICAL SECTION FOR SLEEVE PIPE INSTALLATION

SCALE 1:25



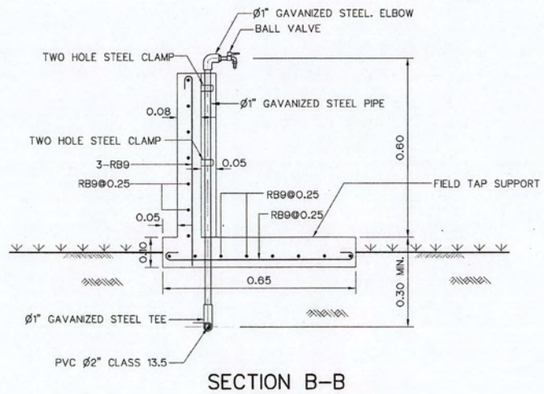
SECTION A–A

SCALE 1:25



PLAN

SCALE 1:10



SECTION B–B

SCALE 1:10

FIELD TAP
TYPICAL INSTALLATION DETAIL

NOTES :

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

REFERENCE DRAWINGS :

1. POWERHOUSE, WATER SUPPLY PIPELINE SYSTEM LAYOUT AKP-PH-19

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

0 0.5 1.0 1.5 2.0
SCALE 1:25 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
POWERHOUSE
FIELD TAP AND SLEEVE PIPE DETAILS

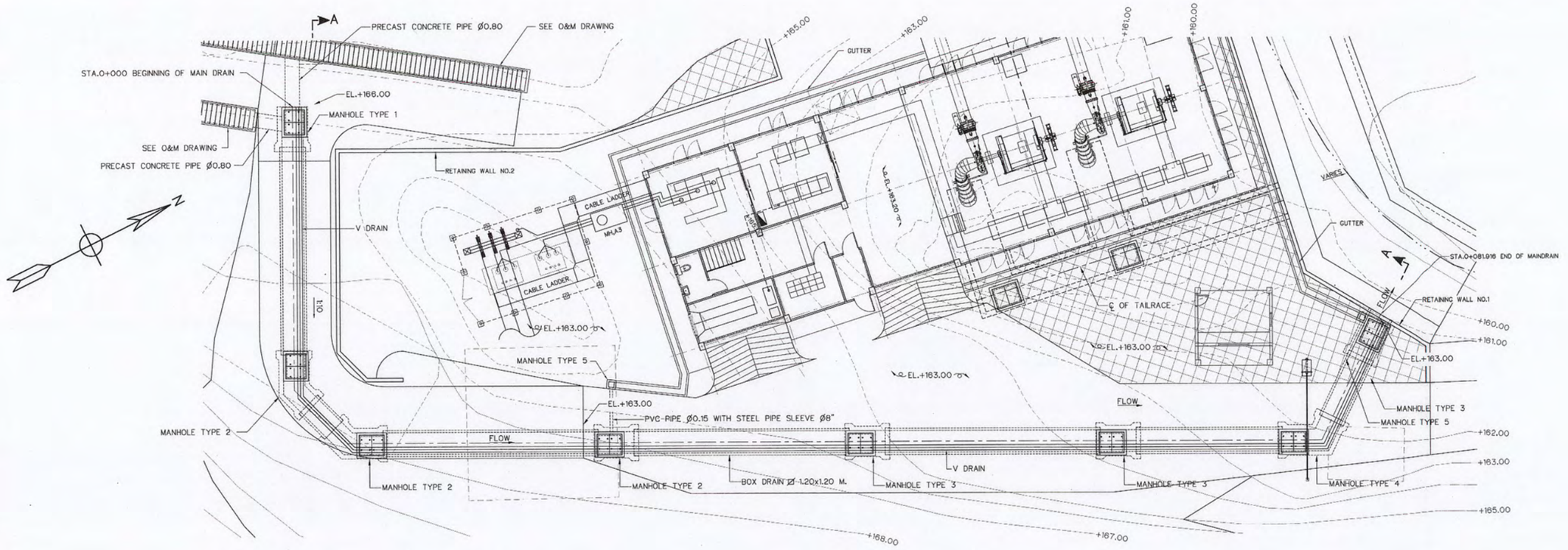
PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

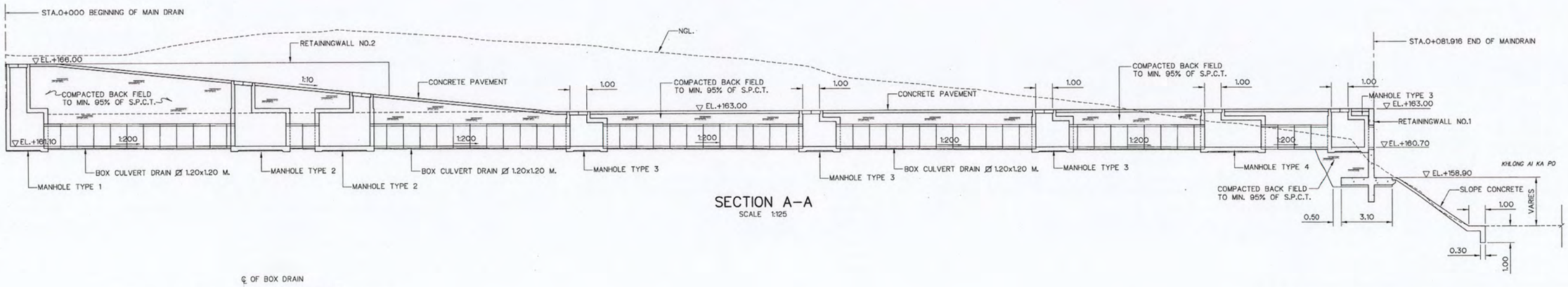
DESIGNED ธิติ.29074 ศิริ.9462
DRAWN
CHECKED ศิริ.8231
28/10/2021
PROJECT MANAGER DATE

REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

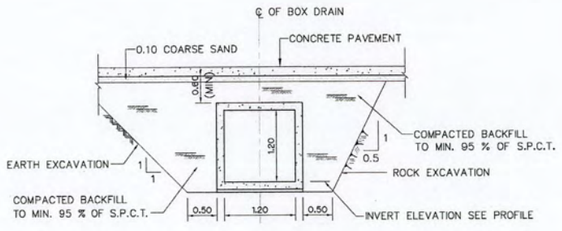
DRAWING NO. AKP-PH-20
SHEET NO. 82 OF 129



PLAN
SCALE 1:125



SECTION A–A
SCALE 1:125



TYPICAL SECTION OF BOX DRAIN
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. AKP-GN-03

REFERENCE DRAWING :

1. POWERHOUSE, GENERAL LAYOUT	AKP-PH-01
2. POWERHOUSE, MANHOLE TYPE 1, 2 REINFORCEMENT DETAILS	AKP-PH-22
2. POWERHOUSE, MANHOLE TYPE 3, 4 REINFORCEMENT DETAILS	AKP-PH-23
2. POWERHOUSE, MISCELLANEOUS DETAILS	AKP-PH-24

0 0.5 1 2 3 4
SCALE 1:50 METERS

0 1 2 4 6 8 10
SCALE 1:125 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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1				

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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

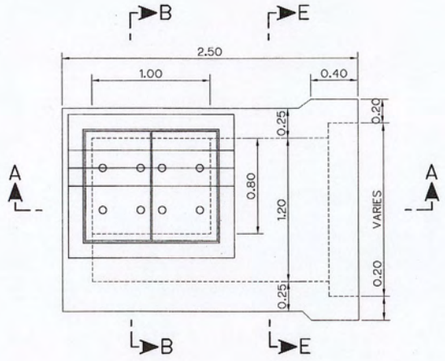
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
POWERHOUSE
MAIN DRAINAGE SYSTEM

P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

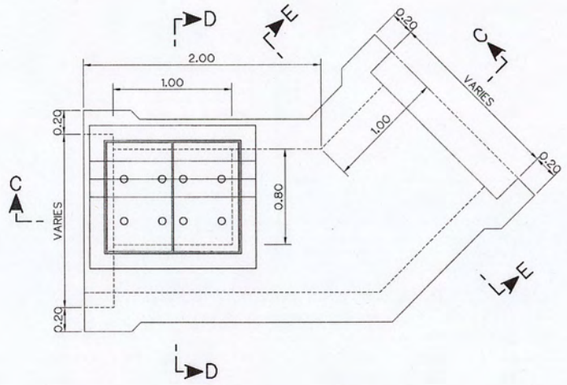
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

DESIGNED	วิศ.29074	วิศ.9462	REVIEWED
DRAWN			SUBMITTED
CHECKED	วิศ.8231		RECOMMENDED
PROJECT MANAGER	28/10/2021 DATE		APPROVED

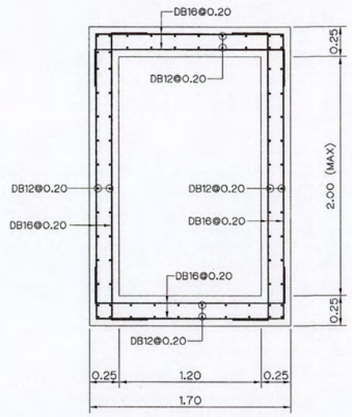
DRAWING NO. AKP-PH-21
SHEET NO. 83 OF 129



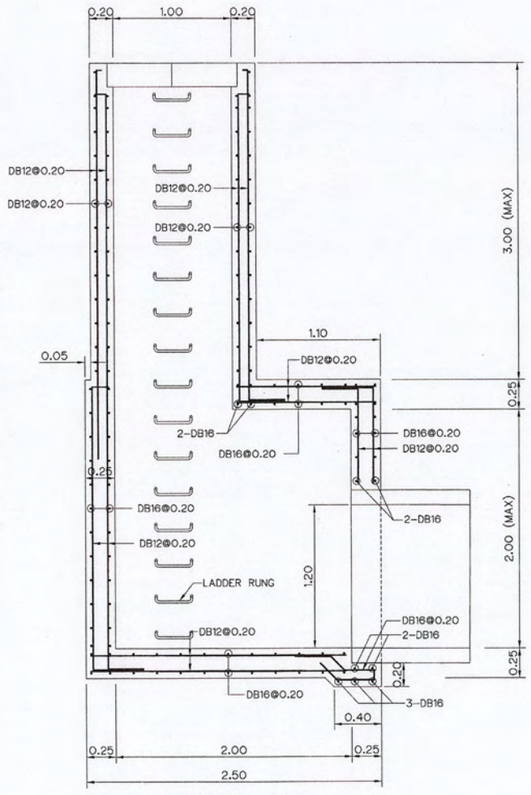
MANHOLE TYPE 1
SCALE 1:25



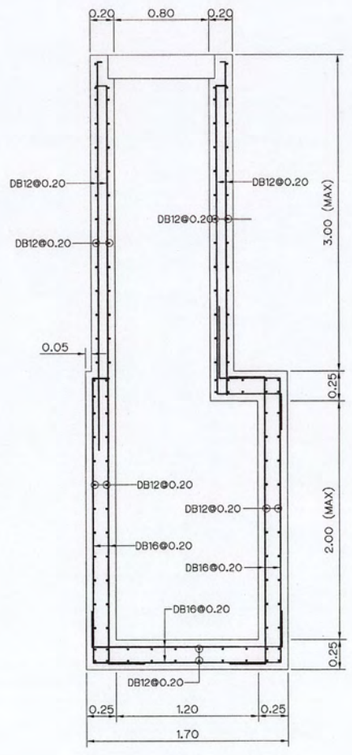
MANHOLE TYPE 2
SCALE 1:25



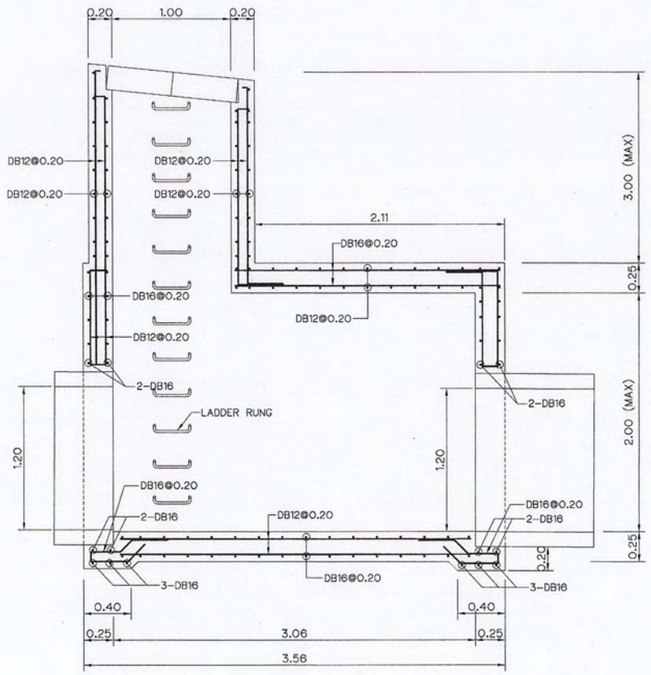
SECTION E–E
SCALE 1:25



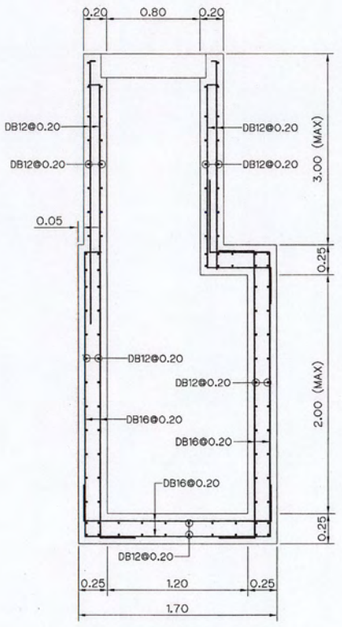
SECTION A–A
SCALE 1:25



SECTION B–B
SCALE 1:25



SECTION C–C
SCALE 1:25



SECTION D–D
SCALE 1:25

NOTES :

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

REFERENCE DRAWING :

1. POWERHOUSE, MANHOLE PLAN AND SECTIONS	AKP-PH-21
2. POWERHOUSE, MISCELLANEOUS DETAILS	AKP-PH-24

0 1 2 4 6 8 10
SCALE 1:25 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
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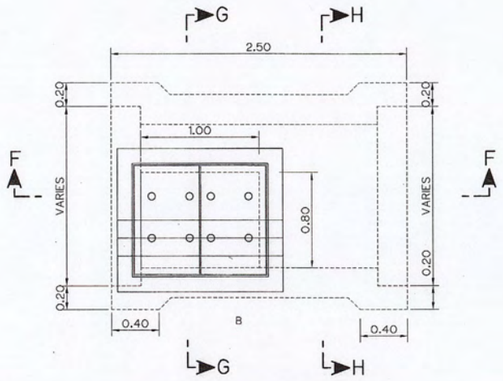
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

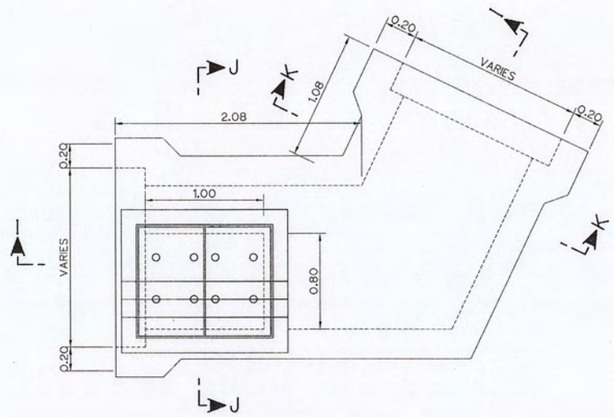
POWERHOUSE

MANHOLE TYPE 1, 2 REINFORCEMENT DETAILS

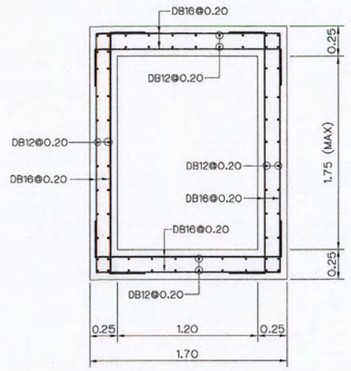
PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED ณัฐพงษ์ 28129074 ณัฐ 28L9462	REVIEWED
DRAWN	SUBMITTED
CHECKED 28L8231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
	DRAWING NO. AKP-PH-22 / SHEET NO. 84 OF 129



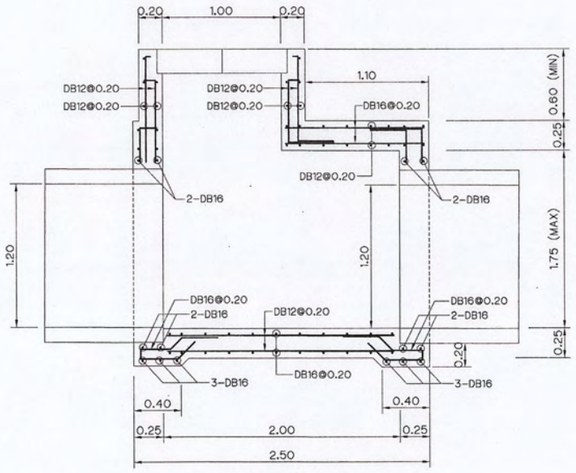
MANHOLE TYPE 3
SCALE 1:25



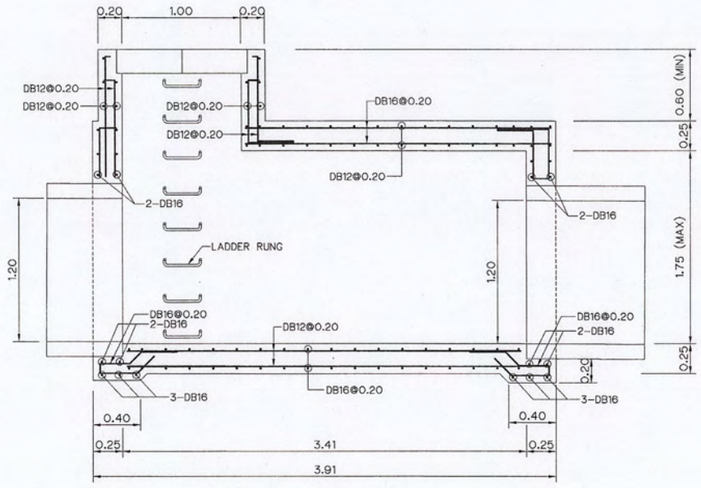
MANHOLE TYPE 4
SCALE 1:25



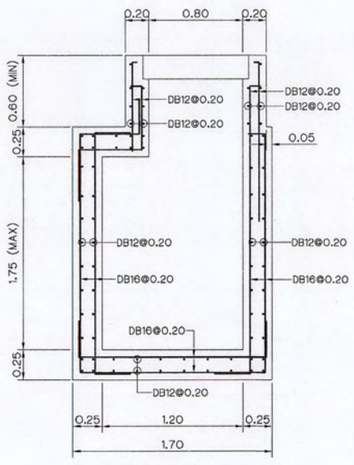
SECTION K–K
SCALE 1:25



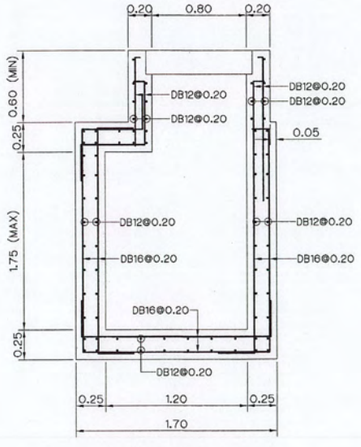
SECTION F–F
SCALE 1:25



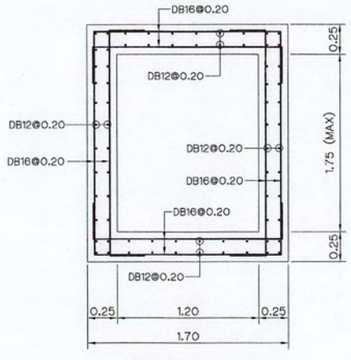
SECTION I–I
SCALE 1:25



SECTION J–J
SCALE 1:25



SECTION G–G
SCALE 1:25



SECTION H–H
SCALE 1:25

0 1 2 4 6 8 10
SCALE 1:25 METERS

NOTES :

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

REFERENCE DRAWING :

1. POWERHOUSE, MANHOLE PLAN AND SECTIONS	AKP-PH-21
2. POWERHOUSE, MISCELLANEOUS DETAILS	AKP-PH-24

NO.	DATE	REVISIONS	CHECKED	APPROVED
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	CONSULTANTS		DEDE	

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MINISTRY OF ENERGY

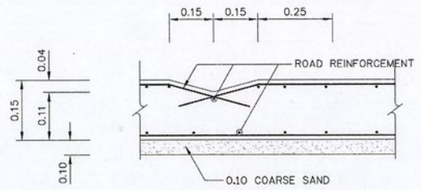
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

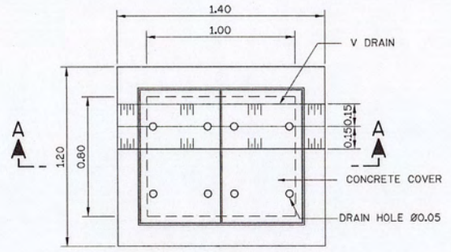
MANHOLE TYPE 3, 4 REINFORCEMENT DETAILS

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DRAWN	SUBMITTED
CHECKED สมิ.8231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
	DRAWING NO. AKP-PH-23
	SHEET NO. 85 OF 129



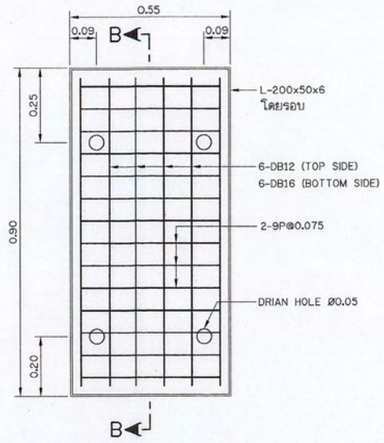
V DRAIN DETAIL

NOT TO SCALE



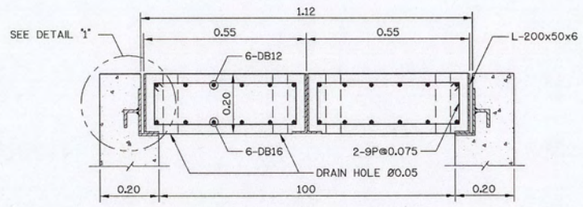
MANHOLE COVER

SCALE 1:20



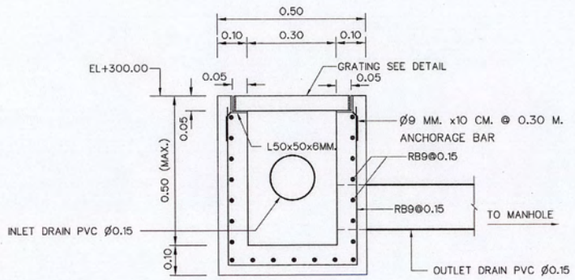
CONCRETE COVER DETAIL

SCALE 1:10



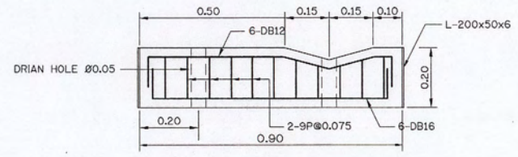
SECTION A-A

SCALE 1:10



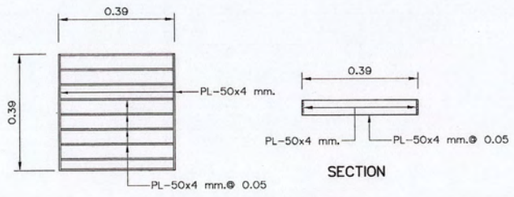
MANHOLE TYPE 5

SCALE 1:10



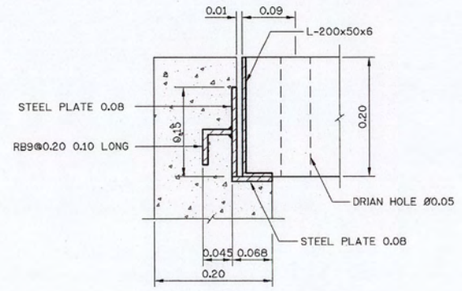
SECTION B-B

SCALE 1:10



DETAIL OF GRATING

SCALE 1:10



DETAIL "1"

SCALE 1:5

0 0.1 0.2 0.4 0.6 0.8

SCALE 1:10 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. AKP-GN-03
3. BEFOR EXCAVATION SHOULD BE EVALUATED AND ANALYSIS BY FIELD GEOTECHNICAL ENGINEER OR ENGINEERING GEOLOGIST.

REFERENCE DRAWING :

1. POWERHOUSE, MAIN DRAINAGE SYSTEM AKP-PH-21

NO.	DATE	REVISIONS	CHECKED	APPROVED
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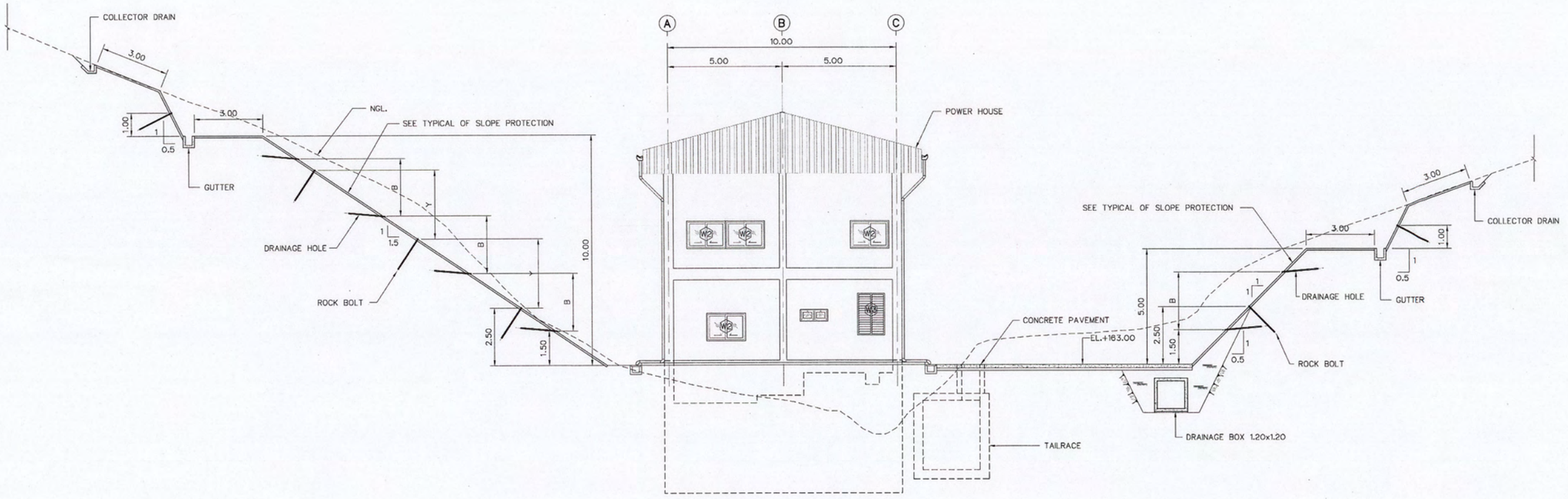
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

MISCELLANEOUS DETAILS

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DRAWN	SUBMITTED
CHECKED ... สย.8231	RECOMMENDED
28/10/2021 PROJECT MANAGER / DATE	APPROVED
DRAWING NO. AKP-PH-24	SHEET NO. 86 OF 129



SLOPE PROTECT SECTION

SCALE 1:100

0 1 2 4 6 8

SCALE 1:100 METERS

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP-GN-03
3. THIS DRAWING PREPARES FOR BOQ ONLY.
   IN CONSTRUCTION STAGE SHALL BE EVALUATED AND ANALYSIS IN THE DETAIL
   AND SHOLUD BE MADE BY FIELD GEOTECHNICAL ENGINEER OR ENGINEERING GEOLOGIST.

REFERENCE DRAWINGS :

1. POWERHOUSE, TYPICAL SLOPE PROTECTION AKP-PH-26

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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	CONSULTANTS		DEDE	

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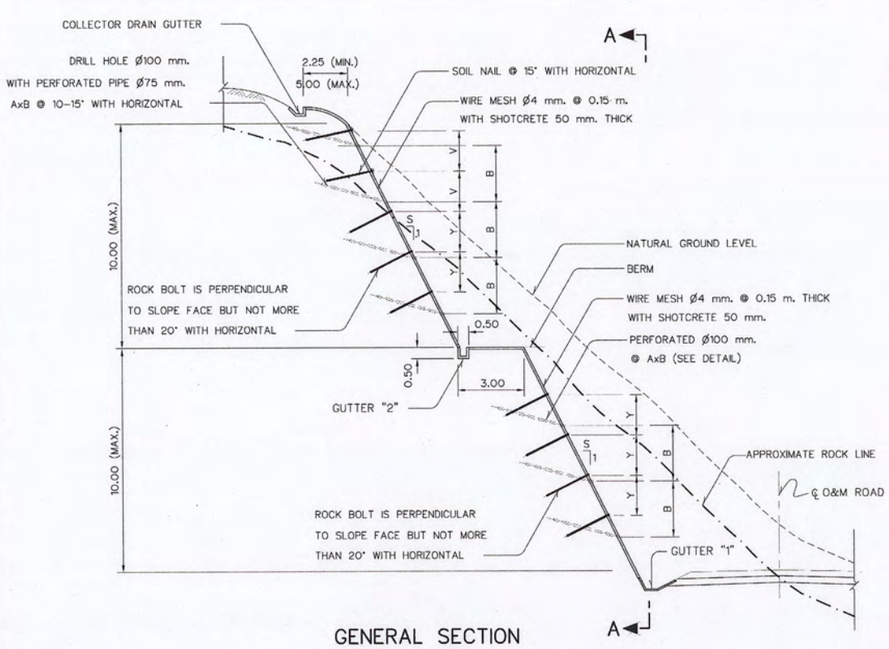
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

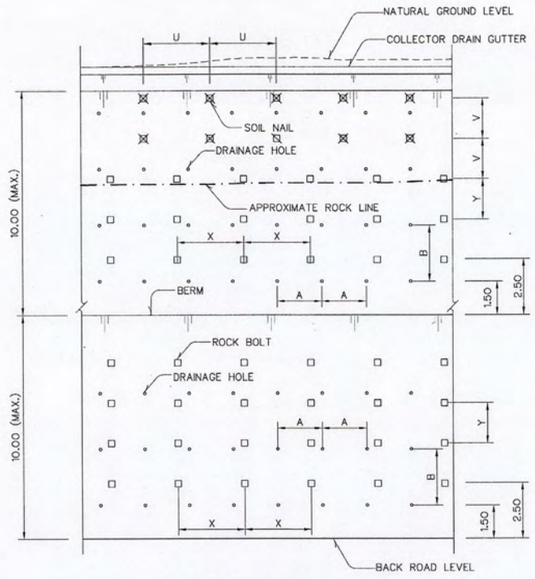
SLOPE PROTECT SECTION

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DRAWN	SUBMITTED
CHECKED วิศ.8231	RECOMMENDED
28/10/2021 PROJECT MANAGER DATE	APPROVED
DRAWING NO. AKP-PH-25	SHEET NO. 87 OF 129



GENERAL SECTION

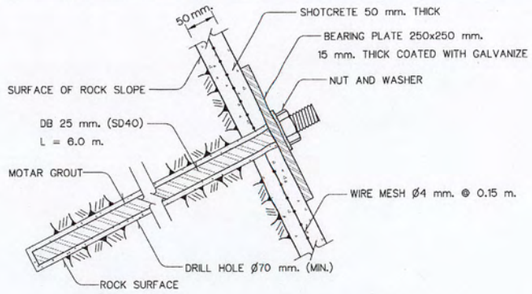
NOT TO SCALE



SECTION A-A

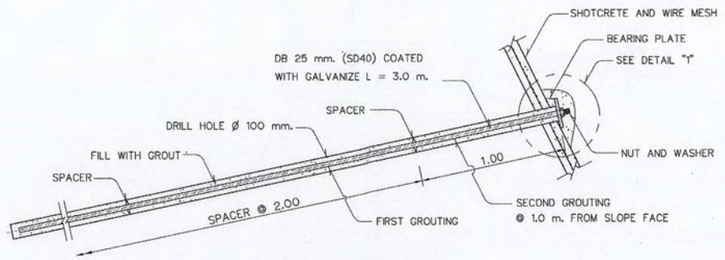
ROCK BOLT, SOIL NAIL AND DRAINAGE HOLE

NOT TO SCALE



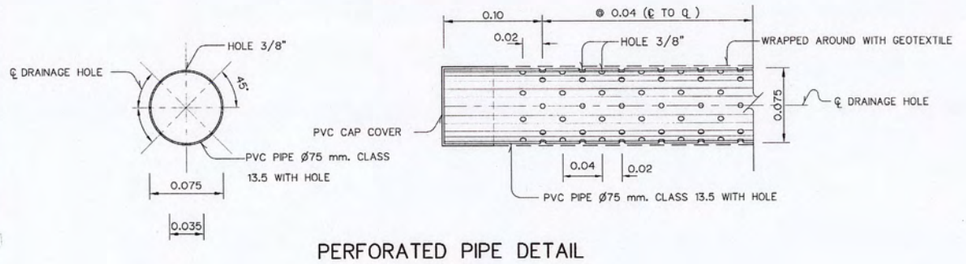
ROCK BOLT INSTALLATION DETAIL

SCALE 1:5



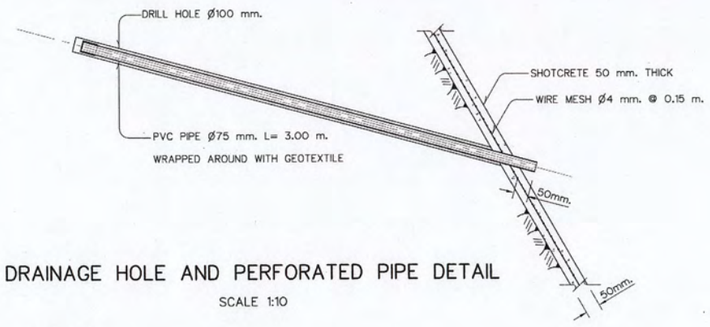
SOIL NAIL DETAIL

SCALE 1:10



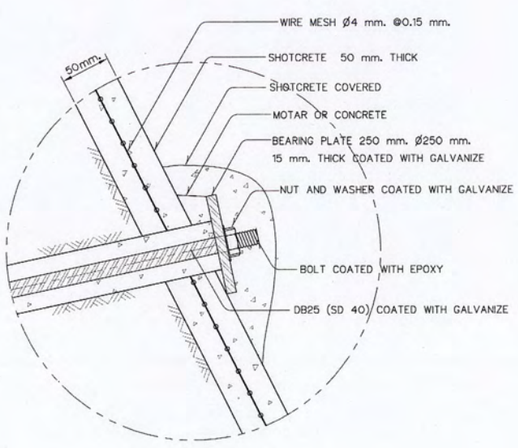
PERFORATED PIPE DETAIL

SCALE 1:3



DRAINAGE HOLE AND PERFORATED PIPE DETAIL

SCALE 1:10



DETAIL "1"

SCALE 1:3

SOIL NAIL ROCK BOLT AND DRAINAGE HOLE DIMENSIONS

ITEM	DIMENSIONS (m.)
A	3.00
B	2.50
U	2.00
V	2.00
X	3.00
Y	3.00

REFERENCE DRAWINGS :

1. POWER HOUSE, SLOPE PROTECTION — AKP-PH-25

NOTES :

1. THE SOIL/ROCK TYPE SHALL BE CONSIDERED DIRECT BY FIELD GEOTECHNICAL ENGINEER OR ENGINEERING GEOLOGIST.
2. THIS DISCONTINUITY ANALYSIS IS THE PRELIMINARY ANALYSIS ONLY. IN CONSTRUCTION STAGE SHALL BE EVALUATED AND ANALYSIS IN THE DETAIL AND SHOLUD BE MADE BY FIELD GEOTECHNICAL ENGINEER OR ENGINEERING GEOLOGIST.
3. PROTECTION CASE IN ROCK CONDITION; CASE#1 IS CONSISTED OF PLANE FAILURE AND LOW SLOPE CUTE, CASE#2 IS CONSISTED OF PLANE FAILURE AND HIGHLY SLOPE CUT, AND CASE#3 IS CONSISTED OF PLANE AND WEDGE FAILURES. IT SHALL BE CONSIDERED DIRECT BY FIELD GEOTECHNICAL ENGINEER OR ENGINEERING GEOLOGIST.
4. IN CASE OF HIGHLY WEATHERED ROCK SHOULD BE QUICKLY PROTECTION.
5. ROCK BOLT IS USED STABILITY FOR ROCK EXCAVATION, SOIL NAIL USED STABILITY FOR SOIL EXCAVATION, WITH INSTALATION FOLLOWED THE TECHNICAL SPECIFICATION.
6. ROCK BOLT INSTALLATION SHOULD BE INSTALLED TO PERPENDICULAR TO PLUNGE OF DISCONTINUITY OF ROCK MASS.

0 0.05 0.1 0.2 0.25
SCALE 1:3 METERS

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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	CONSULTANTS		DEDE	

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MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

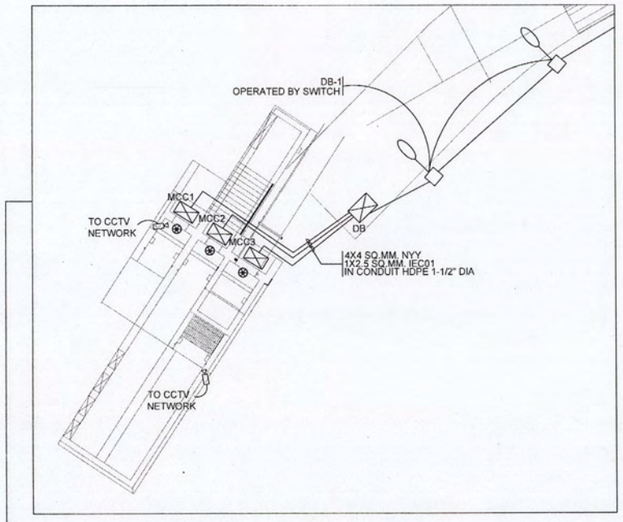
POWERHOUSE

TYPICAL OF SLOPE PROTECTION

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SPT CONSULTANTS CO., LTD.

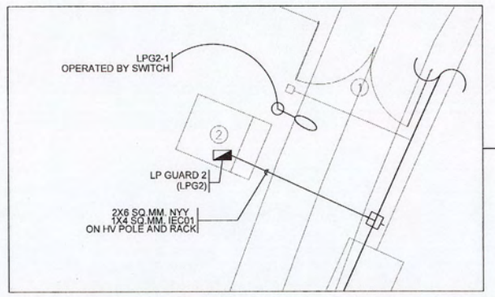
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MINISTRY OF ENERGY

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DRAWN	SUBMITTED
CHECKED	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-PH-26	SHEET NO. 88 OF 129



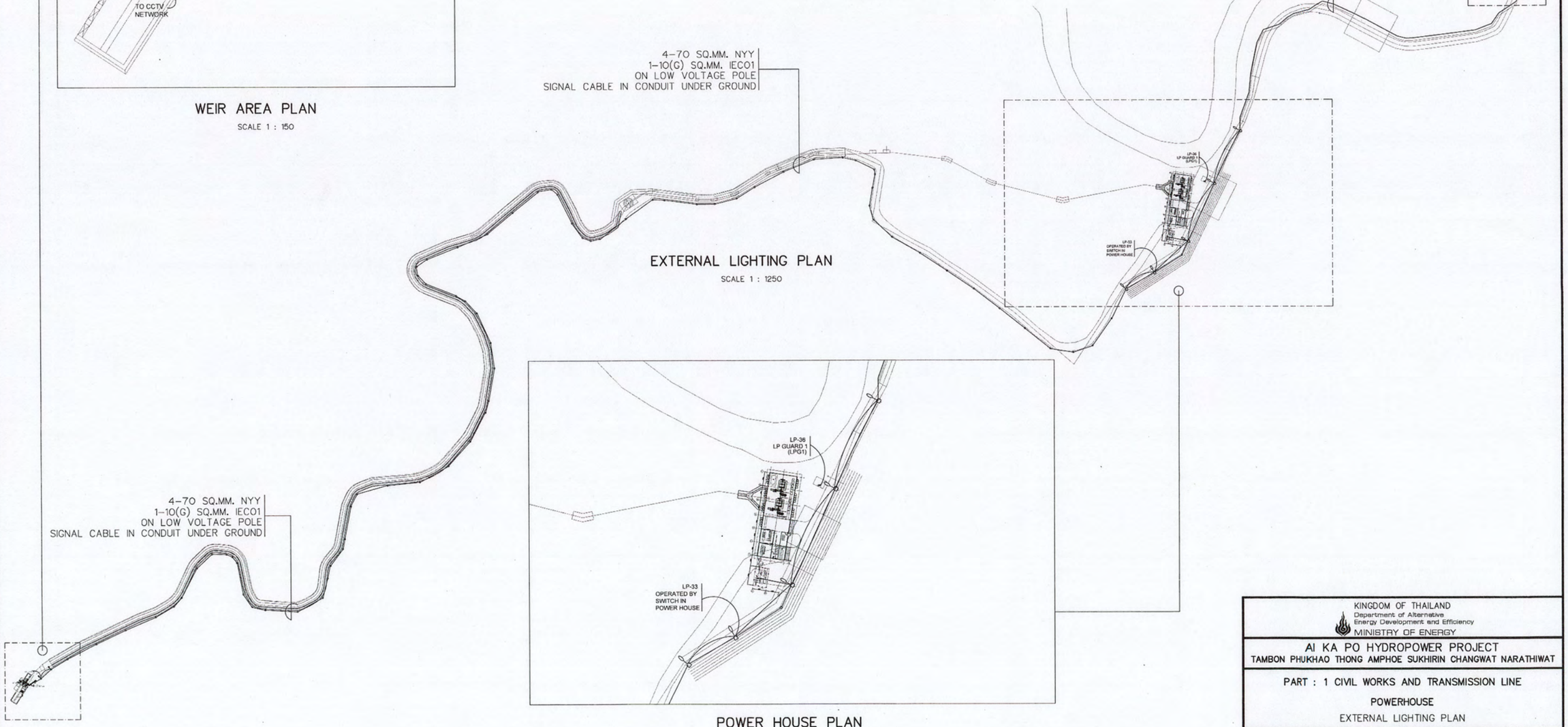
WEIR AREA PLAN

SCALE 1 : 150



GUARD HOUSE 2 AREA PLAN

SCALE 1 : 150



EXTERNAL LIGHTING PLAN

SCALE 1 : 1250

POWER HOUSE PLAN

SCALE 1 : 1250

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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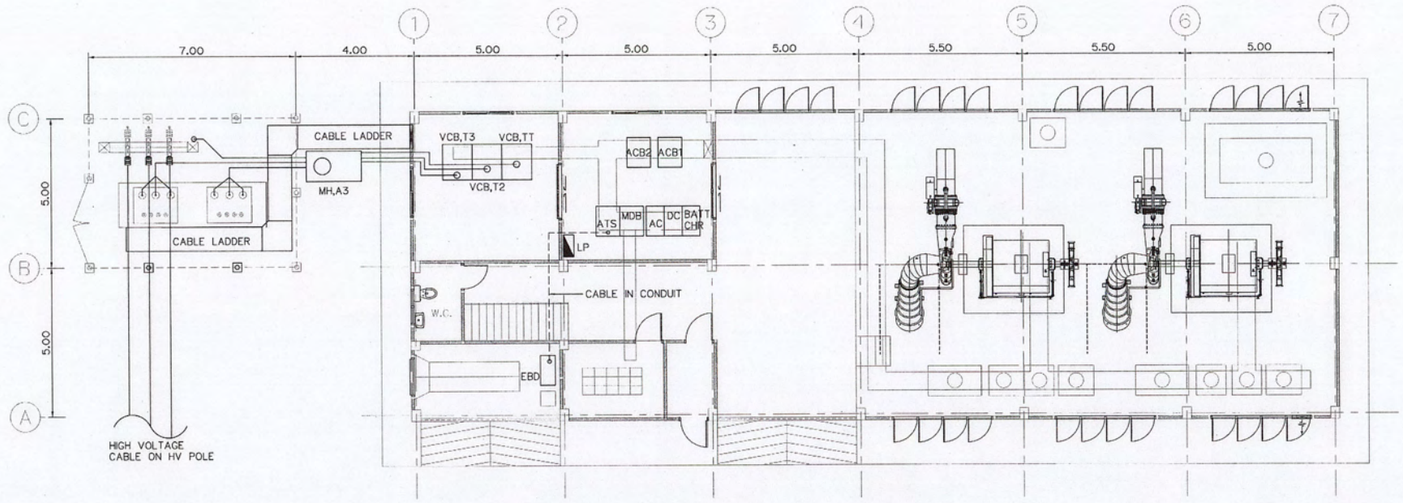
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

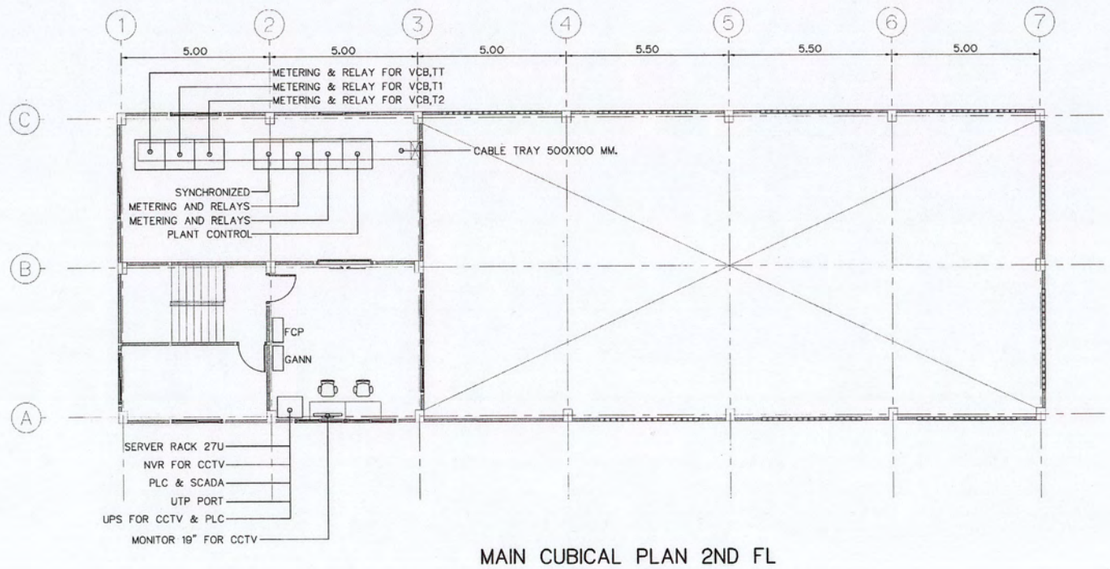
EXTERNAL LIGHTING PLAN

P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED RWN.1764	REVIEWED
DRAWN	SUBMITTED
CHECKED RBL.8231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-PH-27	SHEET NO. 89 OF 129



MAIN CUBICAL PLAN 1ST FL

SCALE 1:100



MAIN CUBICAL PLAN 2ND FL

SCALE 1:100

0 1 2 3 4 5 6 7 8

SCALE 1:100 METERS

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

MAIN CUBICLE PLAN

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

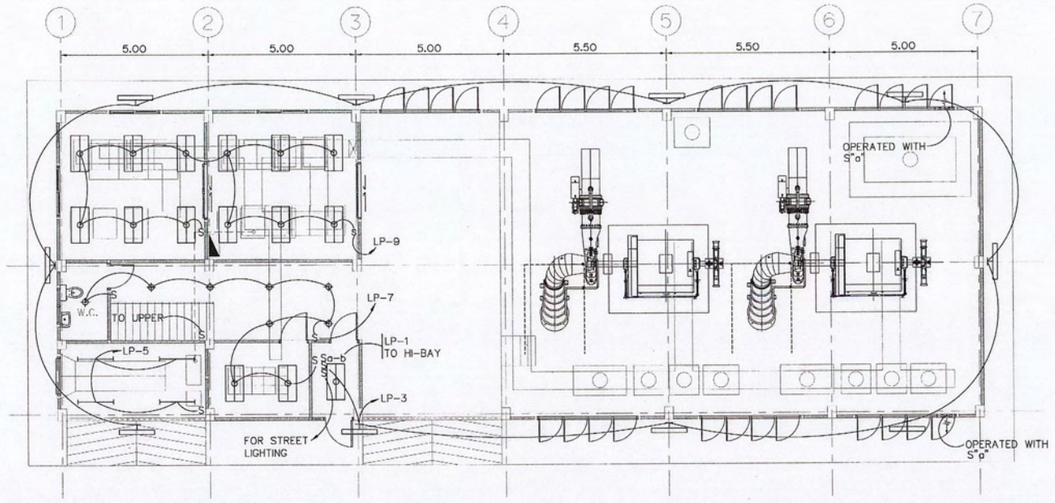
PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

DESIGNED ลพล.1764
DRAWN
CHECKED สม.8231
PROJECT MANAGER 28/10/2021 DATE

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

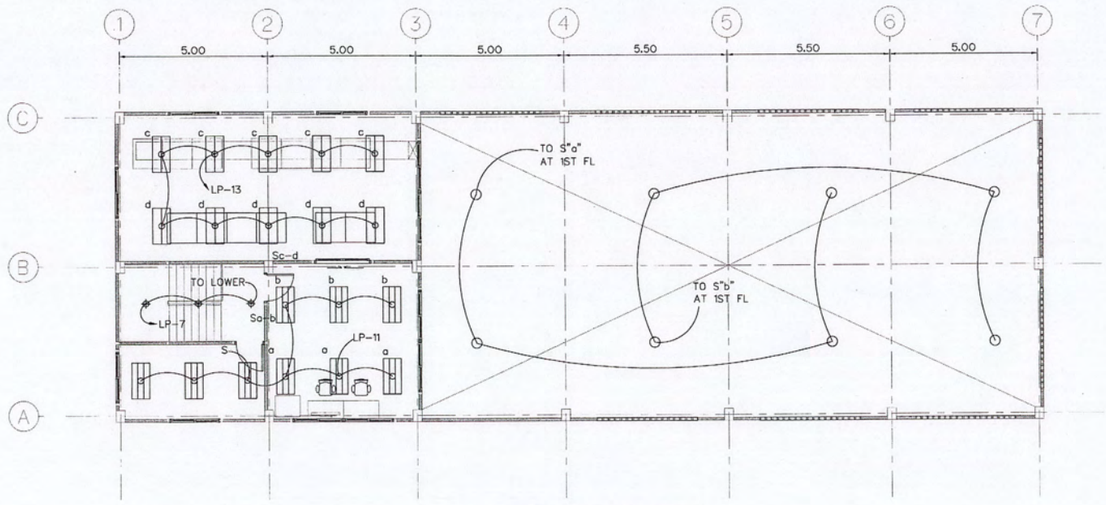
DRAWING NO. AKP-PH-28

SHEET NO. 90 OF 129



LIGHTING PLAN 1ST FL

SCALE 1:100



LIGHTING PLAN 2ND FL

SCALE 1:100

0 1 2 3 4 5 6 7 8

SCALE 1:100 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
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	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

LIGHTING PLAN

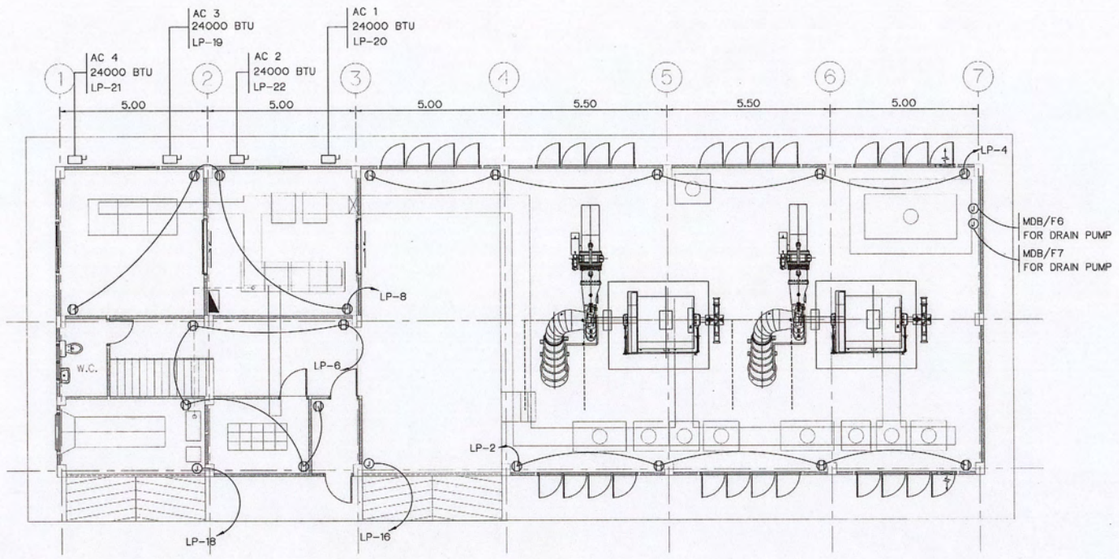
P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

DESIGNED	RWT.1764	REVIEWED	
DRAWN		SUBMITTED	
CHECKED	REL.B231	RECOMMENDED	
PROJECT MANAGER	28/10/2021 DATE	APPROVED	

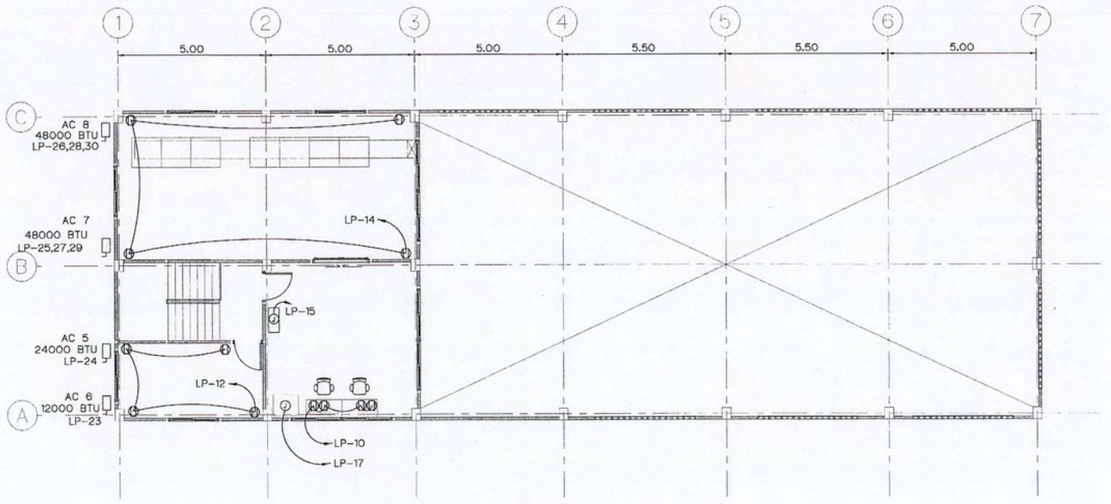
DRAWING NO. AKP-PH-29

SHEET NO. 91 OF 129



ELECTRICAL POWER PLAN 1ST FL

SCALE 1:100



ELECTRICAL POWER PLAN 2ND FL

SCALE 1:100

0 1 2 3 4 5 6 7 8

SCALE 1:100 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
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	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

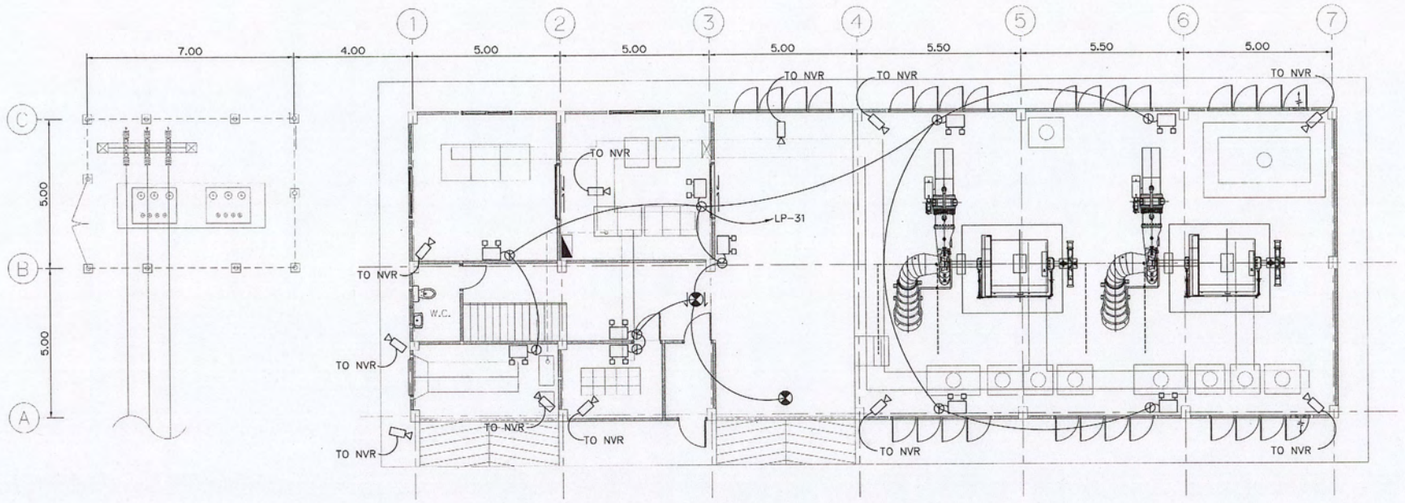
ELECTRICAL POWER PLAN

PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

DESIGNED 2561.1764
DRAWN
CHECKED 25.8231
PROJECT MANAGER 28/10/2021 DATE

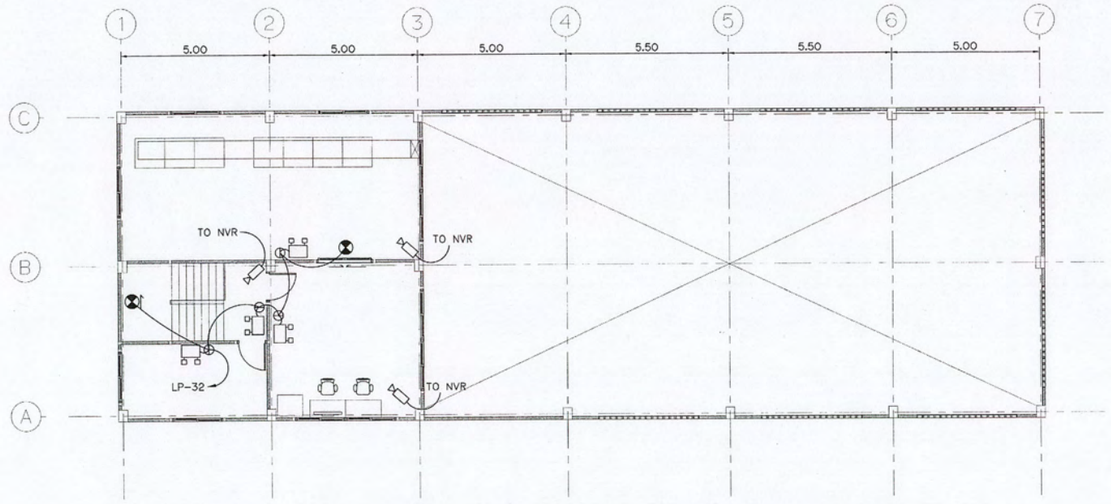
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP-PH-30
SHEET NO. 92 OF 129



EMERGENCY & FIRE EXIT SIGN &CCTV PLAN 1ST FL

SCALE 1:100



EMERGENCY & FIRE EXIT SIGN & CCTV PLAN 2ND FL

SCALE 1:100

0 1 2 3 4 5 6 7 8

SCALE 1:100 METERS

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

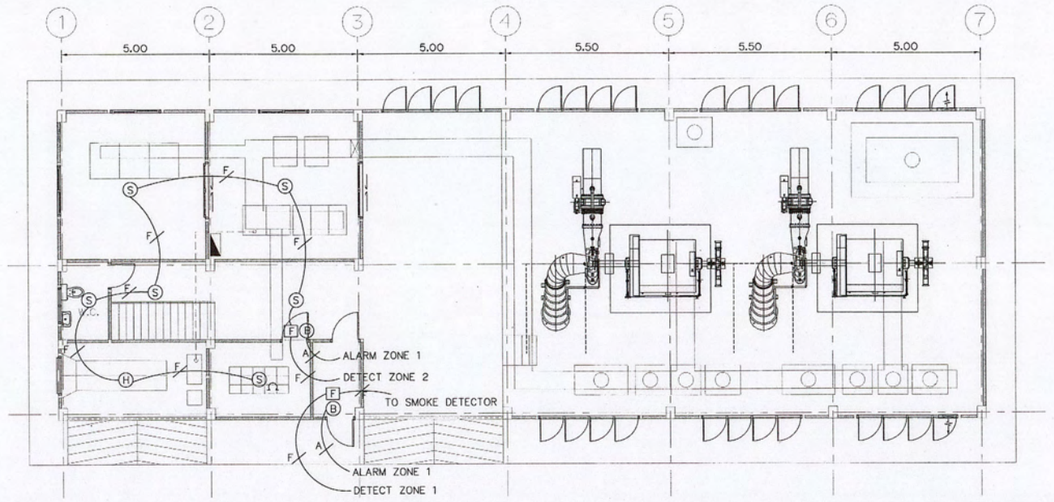
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

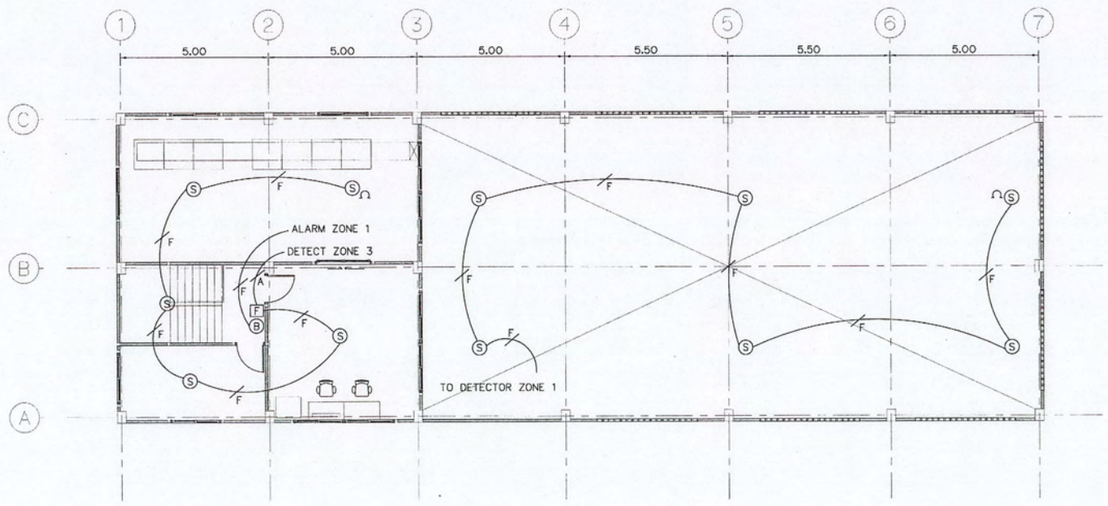
EMERGENCY , FIRE EXIT AND CCTV PLAN

PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED สพัฒ.1764	REVIEWED
DRAWN	SUBMITTED
CHECKED 2ELB231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-PH-31	SHEET NO. 93 OF 129



FIRE ALARM PLAN 1ST FL

SCALE 1:100



FIRE ALARM PLAN 1ST FL

SCALE 1:100

0 1 2 3 4 5 6 7 8

SCALE 1:100 METERS

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

FIRE ALARM PLAN

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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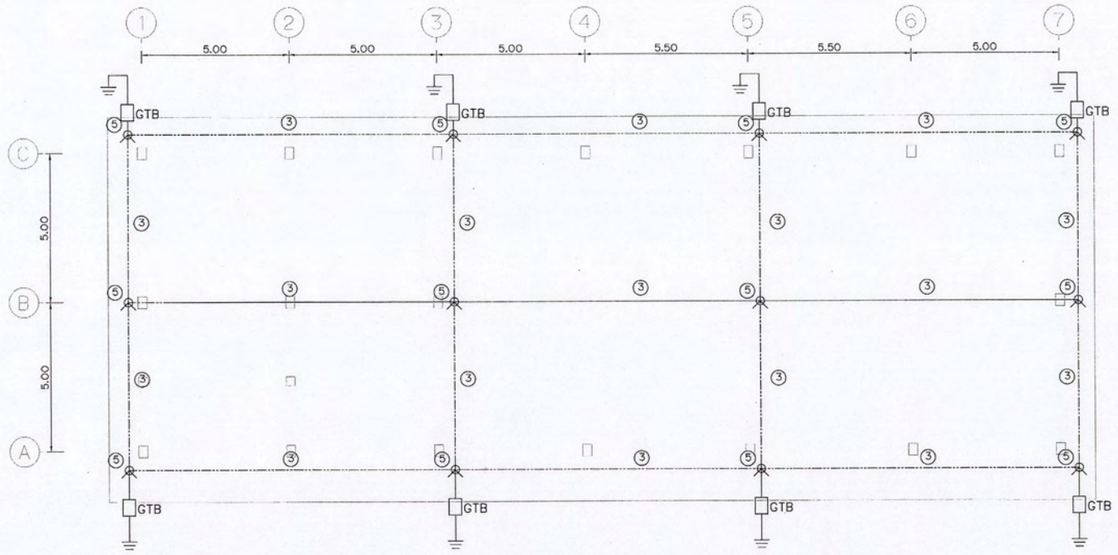
CONSULTANTS: PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.

DEDE

DESIGNED สพัฒ.1764
DRAWN
CHECKED สย.8231
PROJECT MANAGER 28/10/2021 DATE

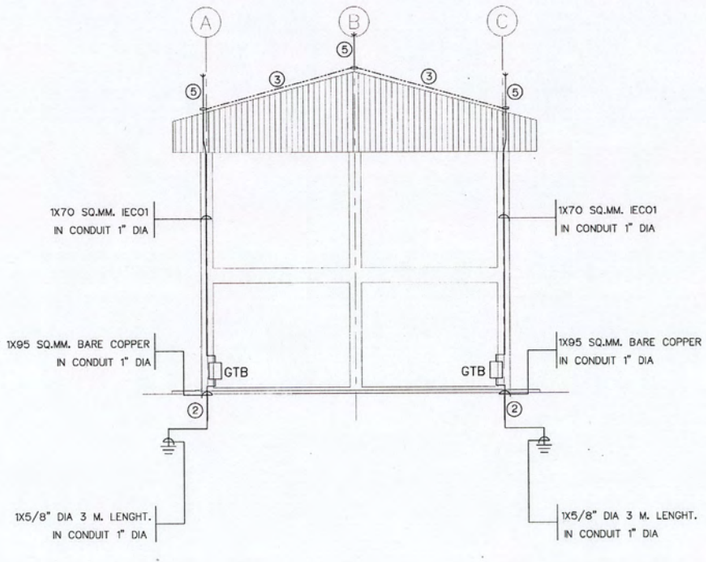
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP-PH-32
SHEET NO. 94 OF 129



LIGHTNING ARRESTER ROOF PLAN

SCALE 1:100



LIGHTNING ARRESTER SECTION PLAN

SCALE 1:100

LEGEND	DESCRIPTION	MATERIAL	PLOTTING
①	POWER HOUSE GROUND GRID (CONNECT TO SUB GROUND) BURIED IN THE SOIL AT LEAST 0.5 m. DEEP	120 sq.mm. BARE COPPER CONDUCTOR	
②	DOWN CONDUCTOR EMBEDDED IN CONCRETE	95 sq.mm. BARE COPPER CONDUCTOR	
③	ROOF CONDUCTOR FOR FORMING FARADAY CAGE	25 mm x 3 mm COPPER BAR	
④	MAIN EARTHING CONDUCTOR	30 x 4 mm COPPER BAR	
⑤	AIR TERMINAL 1.00 m LENGTH	SIZE DIAMETER 16 mm	

PLOTTING

- 120 sq.mm. BARE COPPER
- COPPER COVER GROUND ROD 5/8"x10'
- GROUND CONNECTION, WELD TYPE
- INDICATED TO EQUIPMENTS OR STEEL STRUCTURE
- FALT BAR

NOTES

1. THE EARTHING SYSTEM IS DESIGNED IN ACCORDANCE WITH VDE 0141/7.89 (EARTHING SYSTEM FOR POWER INSTALLATIONS WITH RATED VOLTAGES ABOVE 1 kV.) AND THE PLANNING RULES FOR AVOIDANCE OF UNPERMISSIBLE TRANSIENT OVERVOLTAGES IN SECONDARY CIRCUITS.
2. THE LAYING OF EARTHING CONDUCTORS IS TO BE DETERMINED ON SITE ACCORDING TO ARCHITECTURAL AND TECHNICAL CIRCUMSTANCES.
3. ALL CROSSING CONDUCTORS WITH THE EARTHING GRID SMALL TO BE CONNECTED CONDUCTIVELY WITH THERMITE WELDING.
4. ALL EARTHING CONDUCTOR IN THE CONCRETE SHALL BE ATTACHED WITH REINFORCE STEEL BY WELDING PROCESS EVERY 1 m INTERVAL.
5. ALL EARTHING CONNECTIONS SHALL BE WELDING TYPE. COMPRESSION CONNECTOR OR WRENCH LOCK CONNECTORS ARE NOT ALLOW. EXCEPT IT SHALL BE SUBMITTED FOR APPROVAL BEFORE INSTALLATION.
6. CONTRACTOR SHALL BE LEAVE EARTHING CONDUCTOR FROM FLOOR TO EQUIPMENT ABOUT 1.5 m LENGTH.
7. ALL DIMENSIONS ARE IN METERS, EXCEPT OTHERWISE AS SHOWN.

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

LIGHTNING ARRESTER PLAN

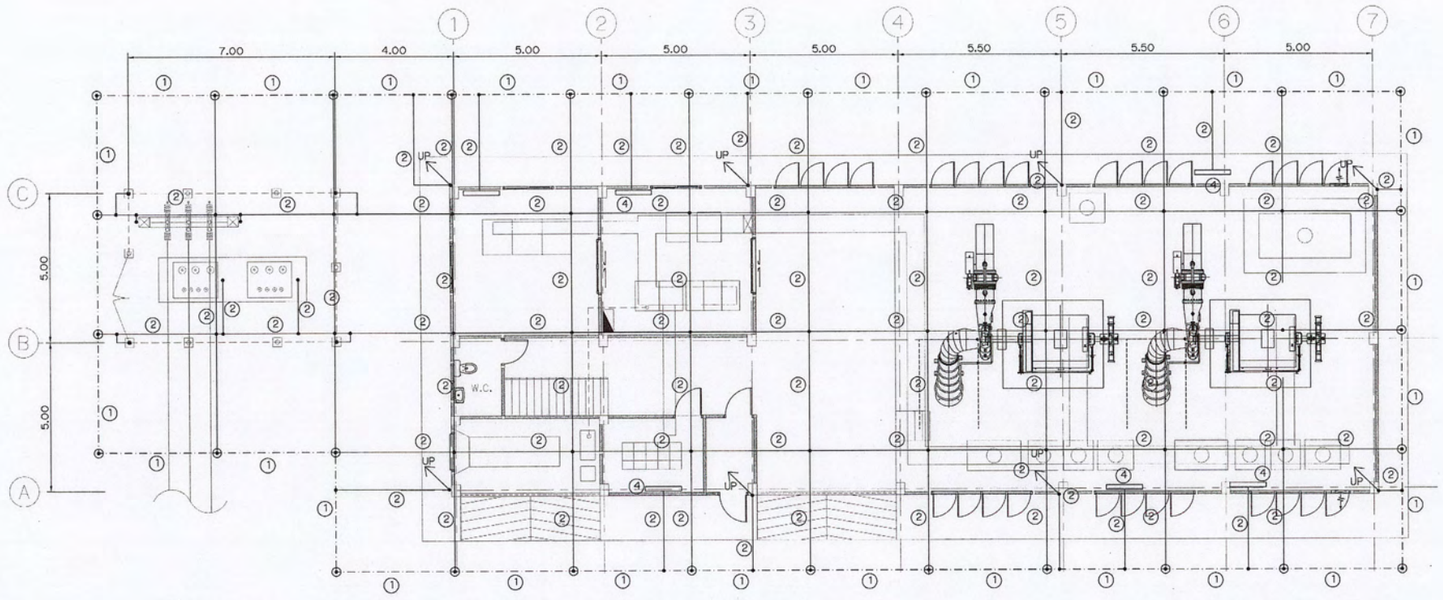
PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

DESIGNED	สม.1764	REVIEWED	
DRAWN		SUBMITTED	
CHECKED	สย.8231	RECOMMENDED	
PROJECT MANAGER	28/10/2021 DATE	APPROVED	

DRAWING NO. AKP-PH-33

SHEET NO. 95 OF 129



LEGEND	DESCRIPTION	MATERIAL	PLOTTING
①	POWER HOUSE GROUND GRID (CONNECT TO SUB GROUND) BURIED IN THE SOIL AT LEAST 0.5 m. DEEP	120 sq.mm. BARE COPPER CONDUCTOR	
②	DOWN CONDUCTOR EMBEDDED IN CONCRETE	95 sq.mm. BARE COPPER CONDUCTOR	
③	ROOF CONDUCTOR FOR FORMING FARADAY CAGE	25 mm x 3 mm COPPER BAR	
④	MAIN EARTHING CONDUCTOR	30 x 4 mm COPPER BAR	
⑤	AIR TERMINAL 1.00 m LENGTH	SIZE DIAMETER 16 mm	

PLOTTING

- 120 sq.mm. BARE COPPER
- COPPER COVER GROUND ROD 5/8"x10'
- GROUND CONNECTION, WELD TYPE
- INDICATED TO EQUIPMENTS OR STEEL STRUCTURE
- FALT BAR

NOTES

1. THE EARTHING SYSTEM IS DESIGNED IN ACCORDANCE WITH VDE 0141/7.89 (EARTHING SYSTEM FOR POWER INSTALLATIONS WITH RATED VOLTAGES ABOVE 1 kV.) AND THE PLANNING RULES FOR AVOIDANCE OF UNPERMISSIBLE TRANSIENT OVERVOLTAGES IN SECONDARY CIRCUITS.
2. THE LAYING OF EARTHING CONDUCTORS IS TO BE DETERMINED ON SITE ACCORDING TO ARCHITECTURAL AND TECHNICAL CIRCUMSTANCES.
3. ALL CROSSING CONDUCTORS WITH THE EARTHING GRID SMALL TO BE CONNECTED CONDUCTIVELY WITH THERMITE WELDING.
4. ALL EARTHING CONDUCTOR IN THE CONCRETE SHALL BE ATTACHED WITH REINFORCE STEEL BY WELDING PROCESS EVERY 1 m INTERVAL.
5. ALL EARTHING CONNECTIONS SHALL BE WELDING TYPE. COMPRESSION CONNECTOR OR WRENCH LOCK CONNECTORS ARE NOT ALLOW. EXCEPT IT SHALL BE SUBMITTED FOR APPROVAL BEFORE INSTALLATION.
6. CONTRACTOR SHALL BE LEAVE EARTHING CONDUCTOR FROM FLOOR TO EQUIPMENT ABOUT 1.5 m LENGTH.
7. ALL DIMENSIONS ARE IN METERS, EXCEPT OTHERWISE AS SHOWN.

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
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	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

GROUNDING SYSTEM PLAN

P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED สพัฒ.1764	REVIEWED
DRAWN	SUBMITTED
CHECKED สิน.8231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-PH-34	SHEET NO. 96 OF 129

LOAD SCHEDULE

DIAGRAM: N R S T, G

PANEL NO : MDB — ELECTRICAL SYSTEM : 3ø, 4w, 400/230 v, 50Hz
MAX CKT : 9 — LOCATION : POWER HOUSE — MOUTED : FLOOR

FEED NO.	DESCRITION	CIRCUIT BREAKER CABLE P	AT	AF	IC	SECTION (sq.mm)	TYPE	CONDUIT DIA (INCH)	CONDUIT TYPE	LOAD CONNECTION(VA) R	S	T
1	DC CHARGER	2	40	160		2X10/1X4G	IEC01	3/4	EMT	7000		
2	AC	2	40	160		2X10/1X4G	IEC01	3/4	EMT		7000	
3	OVERHEAD CRANE 8 tons	3	50	160		4X16/1X4G	IEC01	1-1/4	EMT	2800	2800	2800
4	LP	3	80	160		4X35/1X10G	IEC01	2	EMT	20680	19900	19080
5	DB	3	50	160		4X70/1X10G	NYY	3	HDPE	11700	11200	11200
6	DRAIN PUMP.01	3	20	160		4X4/1X2.5G	IEC01	3/4	EMT	1500	1500	1500
7	DRAIN PUMP.02	3	20	160		4X4/1X2.5G	IEC01	3/4	EMT	1500	1500	1500
8	SPARE	3	30	160						5000	5000	5000
9	FOR DIESEL GENERATOR	3	125	160		4X70/1X16G	IEC01	2-1/2	IMC			
	MAIN BREAKER: ☑ LUG :☐	3	250	400	IC > 35 kA	CONDUCTOR : 4x185sq.mm IEC01, 1x25(G)sq.mm IEC01				50160	48900	41080
	BUS PHASE : 400 A									100% LOAD: 140140 VA		
	INCOME LINE : ACB1 &ACB2					IN CABLE TRENCH				90% LOAD: 126126 VA		

LOAD SCHEDULE

DIAGRAM: N L, G

PANEL NO : LPG1 — ELECTRICAL SYSTEM : 1ø, 3w, 230 v, 50Hz
MAX CKT : 6 — LOCATION : GUARD HOUSE 1 — MOUTED : WALL

FEED NO.	DESCRITION	CIRCUIT BREAKER CABLE P	AT	AF	IC	SECTION (sq.mm)	TYPE	CONDUIT DIA (INCH)	CONDUIT TYPE	LOAD CONNECTION(VA)
1	LIGHTING	1	16	50		2X2.5/1X2.5G	IEC01	1/2	EMT	200
2	RECEPTACLE	1	20	50		2X4/1X2.5G	IEC01	1/2	EMT	660
3	SPARE	1	16	50	IC > 6kA					640
4	SPACE									
5	SPACE									
6	SPACE									
	MAIN BREAKER: ☑ LUG :☐	2	20	50	kA	CONDUCTOR : 2x4 sq.mm NYY 1x2.5(G)sq.mm IEC01				100% LOAD: 1500 VA
	BUS PHASE : 50 A				IC > 10					
	INCOME LINE : LP-36					IN CONDUIT 1-1/4" DIA HDPE				

REMARKS: CB "E" IS EARTH LEAK CIRCUIT BREAKER 30 mA.

LOAD SCHEDULE

DIAGRAM: N L, G

PANEL NO : LPG2 — ELECTRICAL SYSTEM : 1ø, 3w, 230 v, 50Hz
MAX CKT : 6 — LOCATION : GUARD HOUSE 2 — MOUTED : WALL

FEED NO.	DESCRITION	CIRCUIT BREAKER CABLE P	AT	AF	IC	SECTION (sq.mm)	TYPE	CONDUIT DIA (INCH)	CONDUIT TYPE	LOAD CONNECTION(VA)
1	LIGHTING	1	16	50		2X2.5/1X2.5G	IEC01	1/2	EMT	200
2	RECEPTACLE	1	20	50		2X4/1X2.5G	IEC01	1/2	EMT	660
3	SPARE	1	16	50	IC > 6kA					640
4	SPACE									
5	SPACE									
6	SPACE									
	MAIN BREAKER: ☑ LUG :☐	2	20	50	kA	CONDUCTOR : 2x6 sq.mm NYY 1x4(G)sq.mm IEC01				100% LOAD: 1500 VA
	BUS PHASE : 50 A				IC > 10					
	INCOME LINE : LP-38					IN CONDUIT 1-1/4" DIA HDPE OR ON RACK				

REMARKS: CB "E" IS EARTH LEAK CIRCUIT BREAKER 30 mA.

LOAD SCHEDULE

DIAGRAM: N R S T, G

PANEL NO : LP — ELECTRICAL SYSTEM : 3ø, 4w, 400/230 v, 50Hz
MAX CKT : 42 — LOCATION : POWER HOUSE — MOUTED : WALL

CKT NO.	DESCRITION	CIRCUIT BREAKER CABLE P	AT	AF	IC	SECTION (sq.mm)	TYPE	CONDUIT DIA (INCH)	CONDUIT TYPE	LOAD CONNECTION(VA) R	S	T	
1	LIGHTING	1	16	50		2x2.5/1x2.5	IEC01	1/2	EMT	2000			MACHINE BAY
3	LIGHTING	1	16	50		2x2.5/1x2.5	IEC01	1/2	EMT		300		EXTERNAL LIGHTING
5	LIGHTING	1	16	50		2x2.5/1x2.5	IEC01	1/2	EMT			200	DIESEL GEN ROOM
7	LIGHTING	1	16	50		2x2.5/1x2.5	IEC01	1/2	EMT	400			BATT , TOILET , CORRIDOR
9	LIGHTING	1	16	50		2x2.5/1x2.5	IEC01	1/2	EMT		500		SWITCH GEAR ROOM
11	LIGHTING	1	16	50		2x2.5/1x2.5	IEC01	1/2	EMT			600	OFFICE & MEETING ROOM
13	LIGHTING	1	16	50		2x2.5/1x2.5	IEC01	1/2	EMT	400			CONTROL ROOM
15	RECEPTACLE	1	20	50		2x4/1x2.5	IEC01	1/2	EMT		1500		FCP
17	RECEPTACLE	1	20	50		2x4/1x2.5	IEC01	1/2	EMT			1500	SERVER
19	AC3 24000 BTU	1	32	50		2x6/1x2.5	IEC01	3/4	EMT	2500			INTERLOCK WITH AC4
21	AC4 24000 BTU	1	32	50		2x6/1x2.5	IEC01	3/4	EMT		2500		INTERLOCK WITH AC3
23	AC1 12000 BTU	1	20	50		2x4/1x2.5	IEC01	1/2	EMT			1400	MEETING ROOM
25											1700		
27	AC7 48000 BTU	3	20	50		4x4/1x2.5	IEC01	3/4	EMT		1700		INTER LOCK WITH ACB
29												1700	
31	RECEPTACLE	1	20	50		2x4/1x2.5	IEC01	1/2	EMT	2500			EMER & FIRE EXIT LIGHTING
33	STREET LIGHTING	1	20	50		2x4/1x2.5	NYY	1-1/4	DWG HDPE		1500		STREET LIGHTING
35	SPARE	1	20	50								1500	
37	SPARE	1	20	50							1500		
39	SPARE	1	20	50								1500	
41	SPARE	1	20	50	IC > 5 kA								
2	RECEPTACLE	1	20E	50		2x4/1x2.5	IEC01	1/2	EMT	880			MACHINE BAY
4	RECEPTACLE	1	20E	50		2x4/1x2.5	IEC01	1/2	EMT		1100		MACHINE BAY
6	RECEPTACLE	1	20E	50		2x4/1x2.5	IEC01	1/2	EMT			1100	BATT , TOILET , CORRIDOR
8	RECEPTACLE	1	20	50		2x4/1x2.5	IEC01	1/2	EMT	880			SWITCH GEAR
10	RECEPTACLE	1	20	50		2x4/1x2.5	IEC01	1/2	EMT		1100		OFFICE
12	RECEPTACLE	1	20	50		2x4/1x2.5	IEC01	1/2	EMT			880	MEETING ROOM
14	RECEPTACLE	1	20	50		2x4/1x2.5	IEC01	1/2	EMT	880			CONTROL ROOM
16	JUNCTION BOX	1	20	50		2x4/1x2.5	IEC01	1/2	EMT		1500		ROLLER SHUTTER
18	JUNCTION BOX	1	20	50		2x4/1x2.5	IEC01	1/2	EMT			1500	ROLLER SHUTTER
20	AC1 24000 BTU	1	32	50		2x6/1x2.5	IEC01	3/4	EMT	2500			INTER LOCK WITH AC2
22	AC2 24000 BTU	1	32	50		2x6/1x2.5	IEC01	3/4	EMT		2500		INTER LOCK WITH AC1
24	AC5 24000 BTU	1	32	50		2x6/1x2.5	IEC01	3/4	EMT			2500	OFFICE
26											1700		
28	AC8 48000 BTU	3	20	50		4x4/1x2.5	IEC01	3/4	EMT		1700		INTER LOCK WITH AC7
30												1700	
32	RECEPTACLE	1	20	50		2x4/1x2.5	IEC01	1/2	EMT	1320			EMER & FIRE EXIT LIGHTING
34	LIGHTING CONTROL 1	1	20	50							1000		LC1
36	LP GUARD 1 (LPG1)	1	20	50		2x4/1x2.5	NYY	1-1/4	HDPE			1500	FOR LIGHTING AND EE
38	LP GUARD 2 (LPG2)	1	20	50		2x6/1x4	NYY	1-1/4	DWG HDPE	1500			FOR LIGHTING AND EE
40	SPARE	1	20	50							1500		
42	SPARE	1	20	50								1500	
	MAIN BREAKER: ☑ LUG : ☐	3	80	100		CONDUCTOR : 4x35/10G sq.mm IEC01				20660	19900	19080	
	BUS PHASE : 200 A									100% LOAD: 59640 VA			
	INCOME LINE : MDB					WIRING IN CONDUIT 2" DIA EMT				DEMANA FACTOR 80% LOAD: 47712 VA			

REMARKS: CB "E" IS EARTH LEAK CIRCUIT BREAKER 30 mA.

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

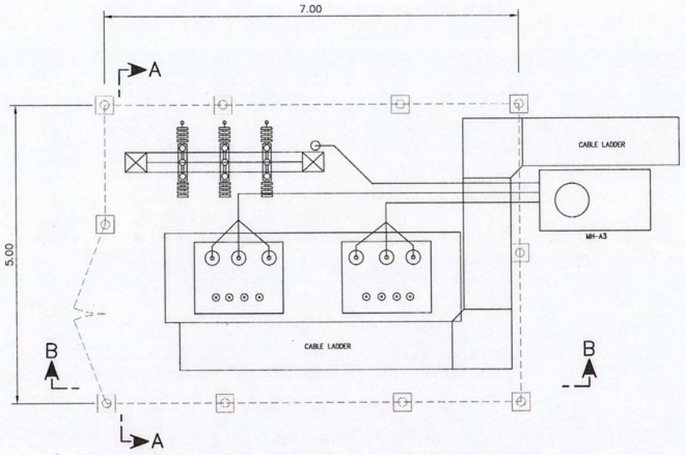
KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

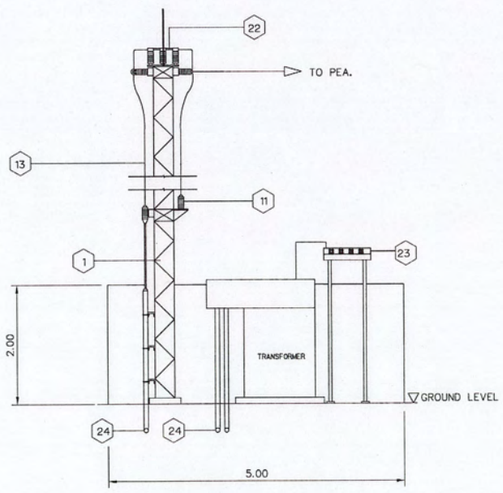
PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE
LOAD SCHEDULE

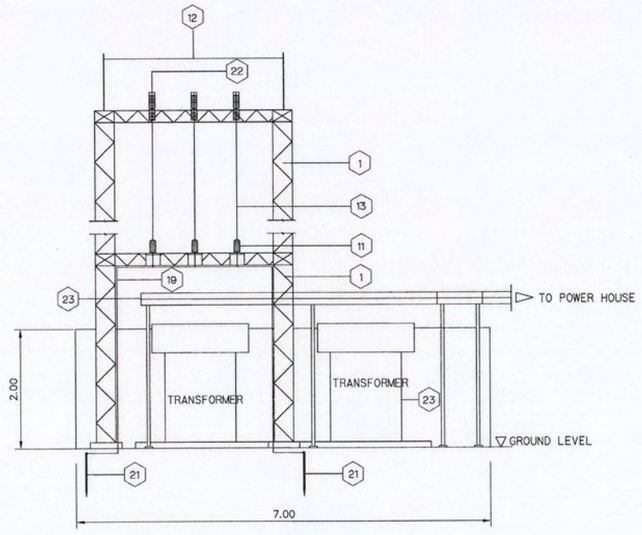
PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED	REVIEWED
DRAWN	SUBMITTED
CHECKED	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-PH-35	SHEET NO. 97 OF 129



TRANSFORMER SWITCH YARD PLAN
NOT TO SCALE



SECTION "A"–"A"
NOT TO SCALE



SECTION "B"–"B"
NOT TO SCALE

BILL OF MATERIAL	
ITEM	DESCRIPTION
1	STEEL POLE 12.0 M.LONG
2	CROSSARM,SPUN PRESTERSSED CONCRETE,100x100x2,500 mm.
3	CROSSARM,SPUN PRESTERSSED CONCRETE,120x120x2,000 mm.
4	BEAM SPUN, PRESTRESSD CONCRETE, 100x100x3,200 mm.
5	CONCRETE BEAM 150x250x3,450 mm.FOR TRANS.PLATFORM
6	BRACE,FLAT,FOR CROSSARM,30x6x760 mm.
7	BOLT,MACHINE HEXAGON M16x550 mm.
8	INSULATOR, SUSPENSION TYPE (CLASS 52-1)
9	INSULATOR, LINE POST TYPE CLASS 57-2L
10	CUT-OUT,FUSE, OPEN TYPE, SINGLE INSULATOR, DROP-OUT 100A.
11	SURGE ARRESTERS 3 kV. 5 kA.
12	OVER HEAD GOUND WIRE (OHGW)
13	ALUMINIUM CONDUCTOR STEEL REINFORCED
14	CLAMP STRAIN FOR Al 35-70 sq.mm.
15	WIRE, STEEL STRANDED, 50/7 DIN 48201
16	CLAMP, SINGLE U-BOLT, M 8
17	WIRE, STEEL, SOLID, DIMETER 4 mm.
18	CONNECTOR, PARALLEL GROOVE, DOUBLE BOLT, Al 25-95 sq.mm.
19	PIPE, RIGID PVC. 20x2,500 mm. COMP. WITH FIXER
20	ROD, GROUND 60x60x5 mm. 2,000 mm. LONG
21	TRANSFORMER 3 PHASE 3,500-400/230 V.
22	LINE SWITCH
23	LOW VOLTAGE CABLE (CV) WIRE ON CABLE TRAY
24	33KV XLPE IN HDPE PIPE

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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	CONSULTANTS		DEDE	

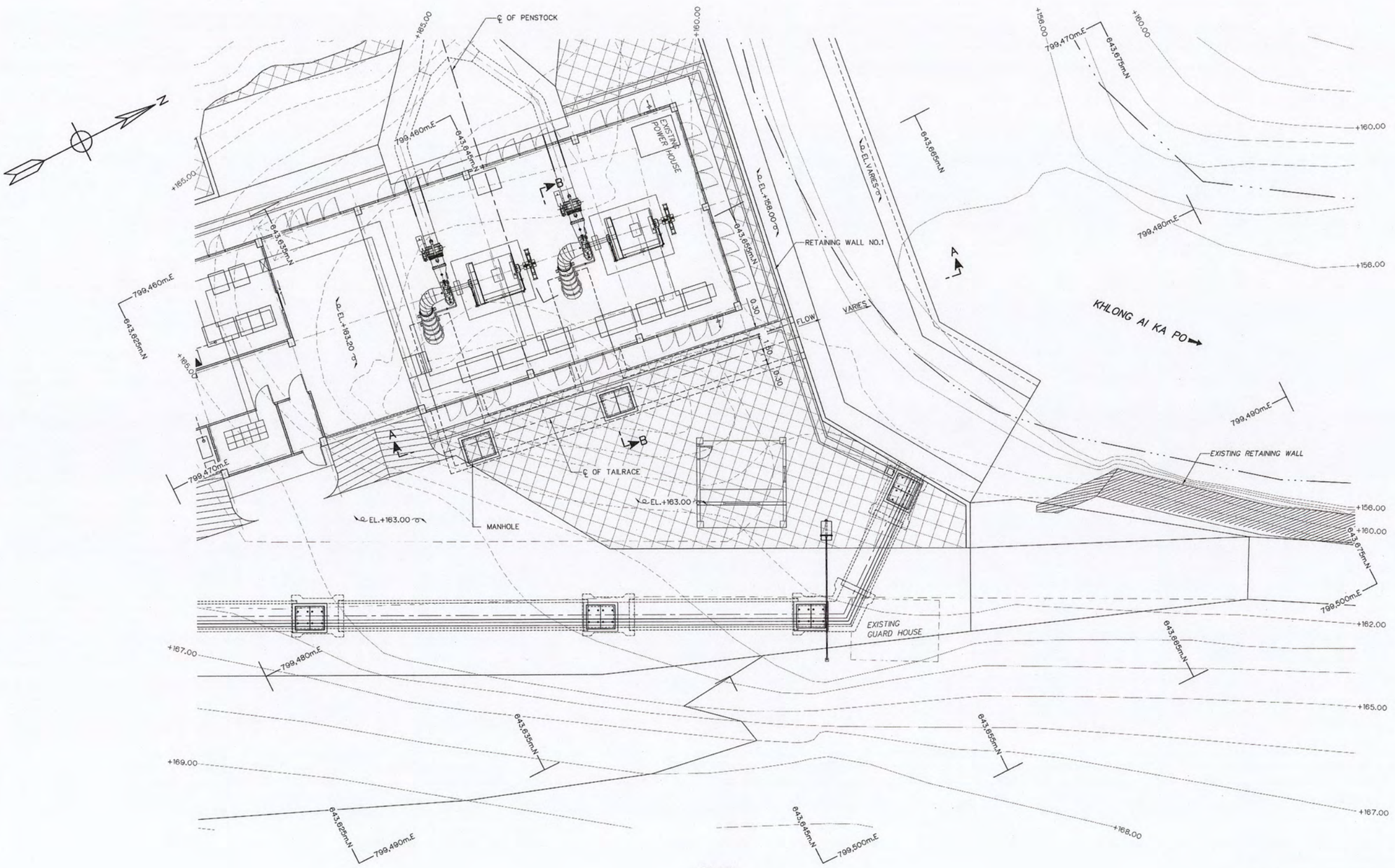
KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE
SWITCH YARD AREA

P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED	สพ.1764	REVIEWED	
DRAWN		SUBMITTED	
CHECKED	สธ.8231	RECOMMENDED	
PROJECT MANAGER	28/10/2021 DATE	APPROVED	
		DRAWING NO. AKP-PH-36	SHEET NO. 98 OF 129



PLAN
SCALE 1:100

NOTES :

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

REFERENCE DRAWING :

1. TAILRACE, SECTIONS AKP-TR-02

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

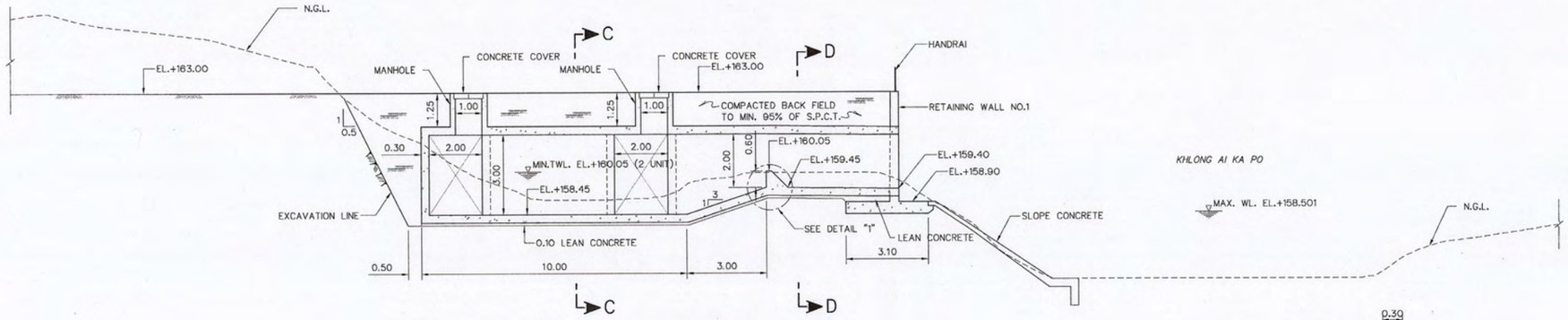
TAILRACE
PLAN

P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

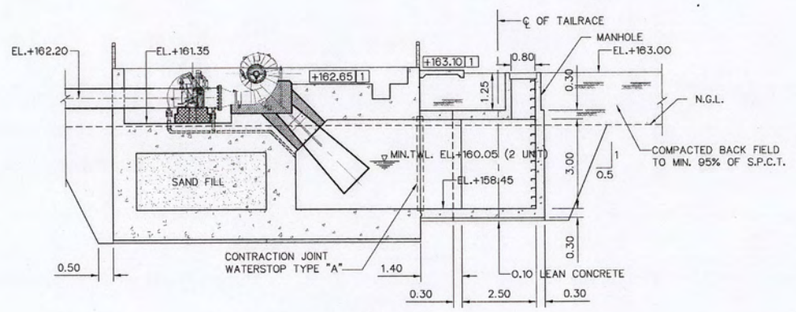
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

DESIGNED ณัฐพงศ์ วิโรจน์ 28.9462 | REVIEWED
DRAWN | SUBMITTED
CHECKED 28.8231 | RECOMMENDED
28/10/2021 PROJECT MANAGER DATE | APPROVED

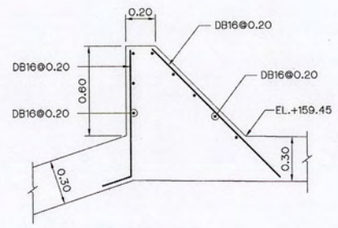
DRAWING NO. AKP-TR-01
SHEET NO. 99 OF 129



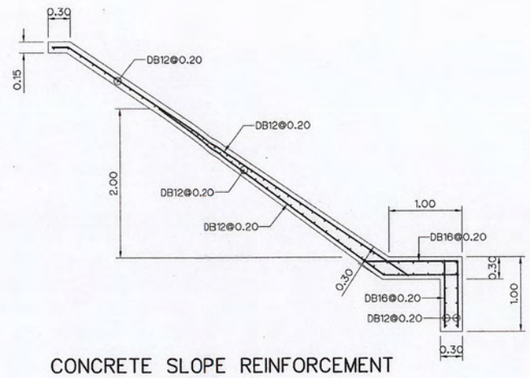
SECTION A–A
SCALE 1:100



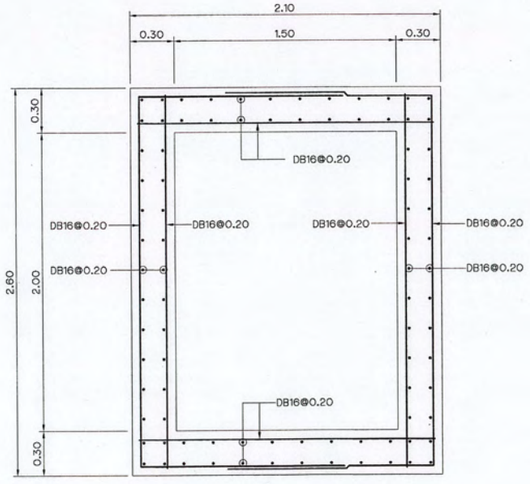
SECTION B–B
SCALE 1:100



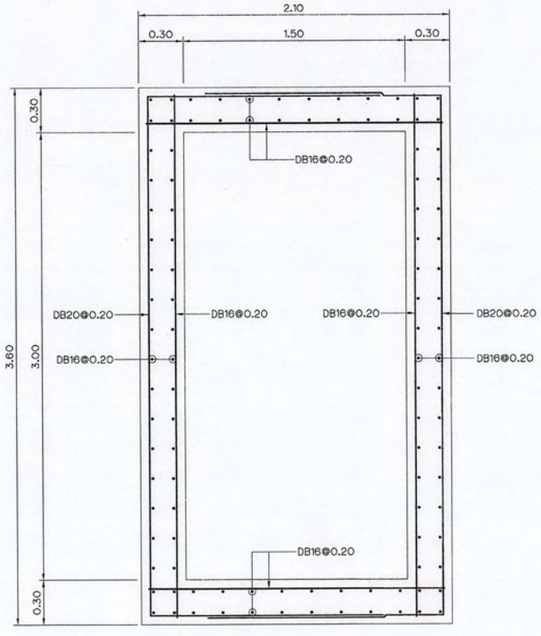
DETAIL "1"
SCALE 1:20



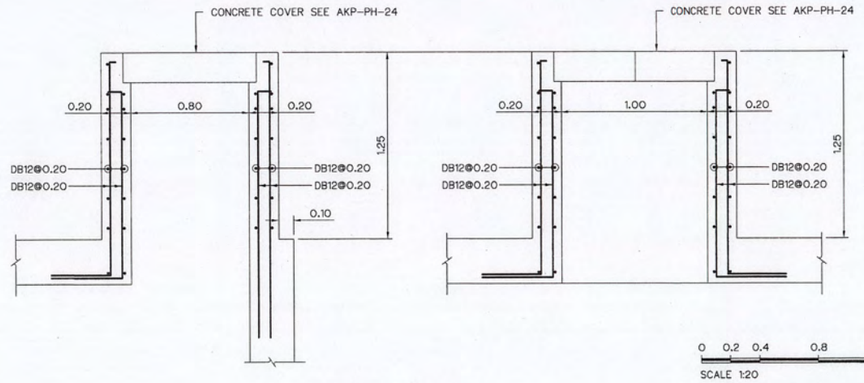
CONCRETE SLOPE REINFORCEMENT
SCALE 1:20



SECTION D–D
SCALE 1:20



SECTION C–C
SCALE 1:20



MANHOLE DETAIL
SCALE 1:20

SCALE 1:20 METERS

SCALE 1:100 METERS

NOTES :

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

REFERENCE DRAWINGS :

1. TAILRACE, PLAN	AKP-TR-01
2. POWERHOUSE, RETAININGWALL REINFORCEMENT DETAILS	AKP-PH-13
3. POWERHOUSE, MISCELLANEOUS DETAILS	AKP-PH-24

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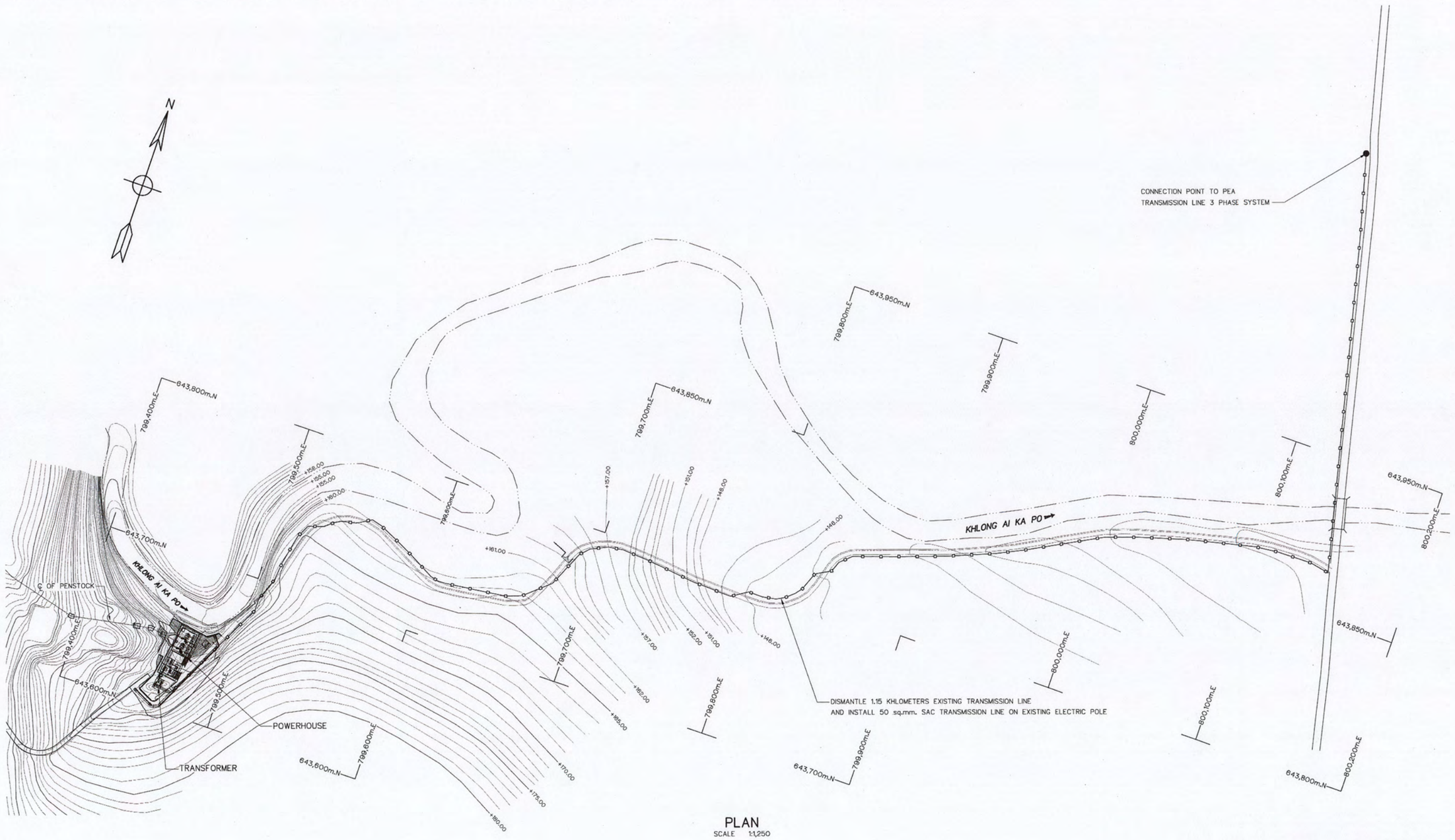
KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

TAILRACE
SECTIONS

PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED ... REG.29074 ... REG.9462	REVIEWED
DRAWN	SUBMITTED
CHECKED ... REG.8231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
	DRAWING NO. AKP-TR-02
	SHEET NO. 100 OF 129



PLAN
SCALE 1:1,250

NOTES:

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP-GN-03
3. IMPROVED BY INSTALL NEW TRANSMISSION LINE ON EXISTING ELECTRIC POLE

0 10 20 40 60 80 100
SCALE 1:1,250 METERS

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

AI KA PO HYDROPOWER PROJECT

TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

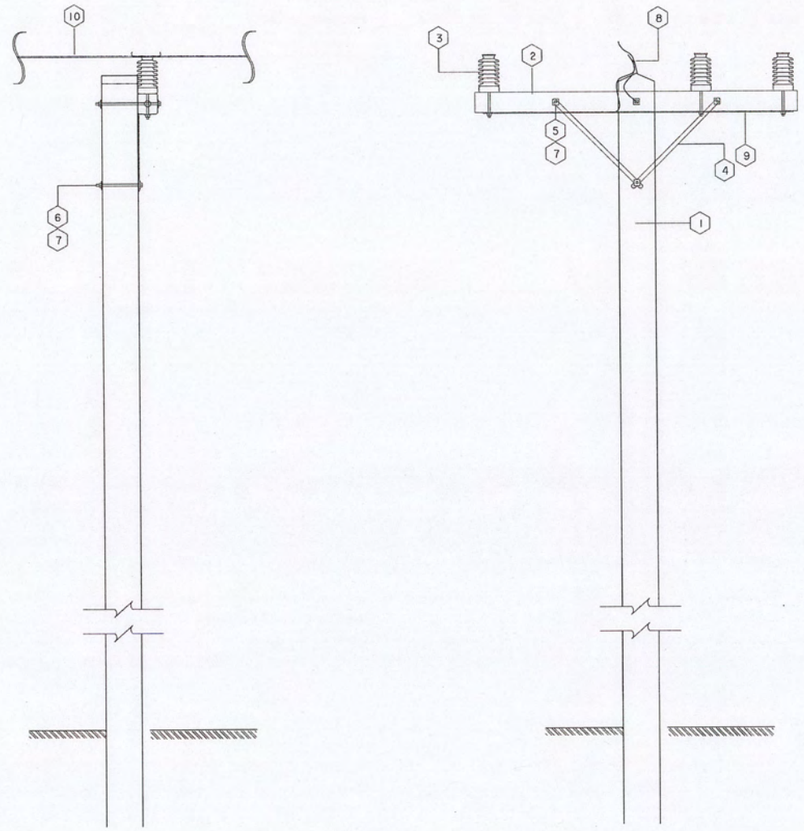
PART : 1 CIVIL WORKS AND TRANSMISSION LINE

TRANSMISSION LINE

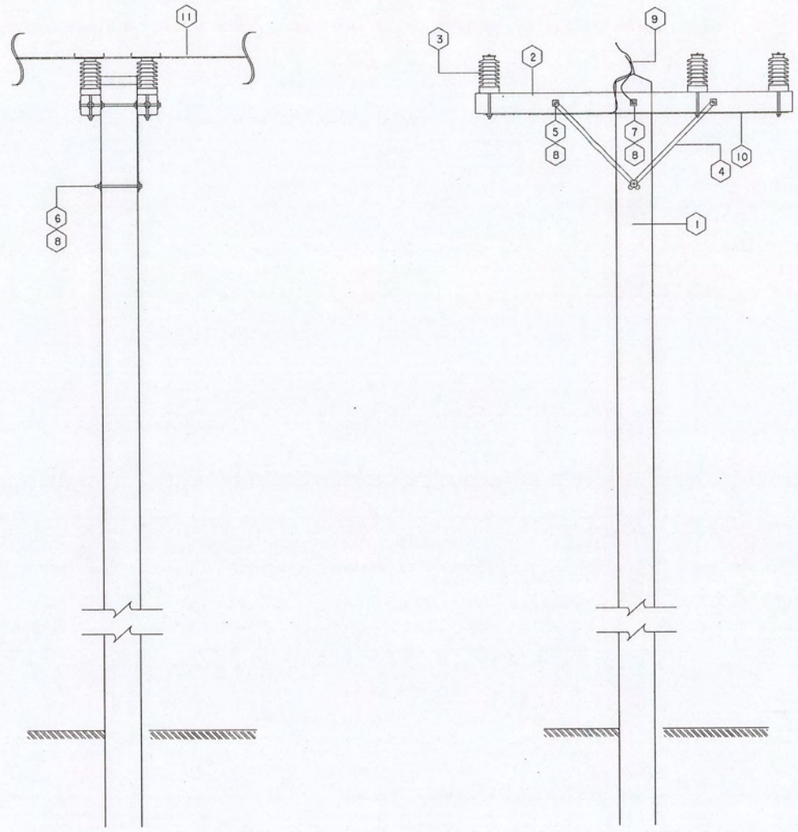
PLAN STA.0+000 TO STA.1+110

P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
		REVIEWED	
DESIGNED	สพ.1764	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สย.8231	APPROVED	
PROJECT MANAGER	28/10/2021 DATE	DRAWING NO. AKP-TS-01	SHEET NO. 101 OF 129

POLE TYPE "A"
(0°–5°)



POLE TYPE "B"
(5°–60°)



BILL OF MATERIAL	
ITEM	DESCRIPTION
1	POLE CONCRETE 12.0 M.LONG
2	CROSSARM,SPUN PRESTERSSED CONCRETE,120x120x2,000 mm.
3	INSULATOR,LINE POST TYPE,ANSI C 29.7 CLASS 57-2L
4	BRACE,FLAT,FOR CROSSARM,30x6x760 mm.
5	BOLT,MACHINE, M16x170 mm.
6	BOLT,MACHINE, M16x200 mm.
7	WASHER,SQUARE,FLAT,52x52x4.5 mm.HOLE Dia. 18 mm.TIS 258
8	CLAMP, SINGLE U-BOLT, M 8
9	WIRE STEEL SOLID Dia. 4 MM.
10	35kV-CC (SAC)

BILL OF MATERIAL	
ITEM	DESCRIPTION
1	POLE CONCRETE 12.0 M.LONG
2	CROSSARM,SPUN PRESTERSSED CONCRETE,120x120x2,000 mm.
3	INSULATOR,LINE POST TYPE,ANSI C 29.7 CLASS 57-2L
4	BRACE,FLAT,FOR CROSSARM,30x6x760 mm.
5	BOLT,MACHINE, M16x170 mm.
6	BOLT,MACHINE, M16x200 mm.
7	BOLT,MACHINE, M16x400 mm.
8	WASHER,SQUARE,FLAT,52x52x4.5 mm.HOLE Dia. 18 mm.TIS 258
9	CLAMP, SINGLE U-BOLT, M 8
10	WIRE STEEL SOLID Dia. 4 MM.
11	35kV-CC (SAC)

NOTE :

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
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Department of Alternative Energy Development and Efficiency
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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

TRANSMISSION LINE

POLE TYPE "A" AND "B"

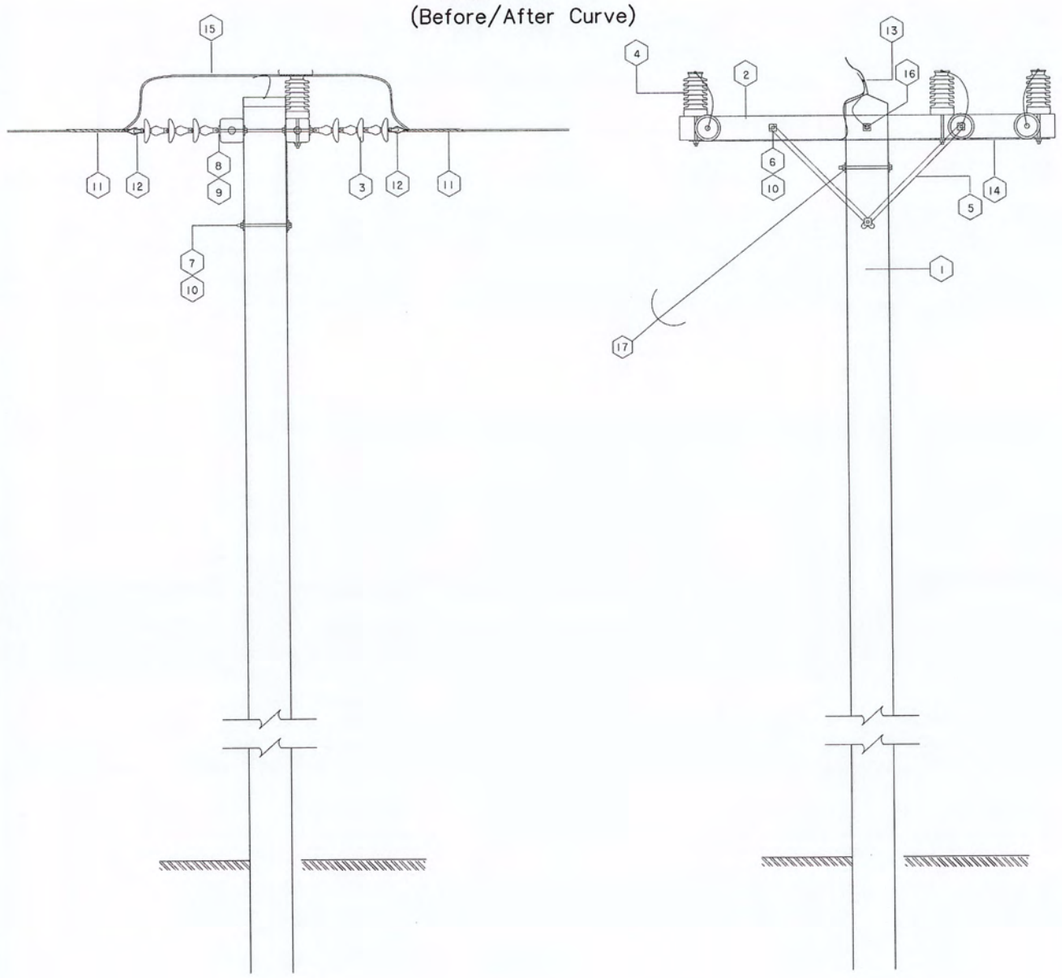
PCM P&C MANAGEMENT CO., LTD.
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DESIGNED สพัก.1764
DRAWN
CHECKED สย.8231
PROJECT MANAGER 28/10/2021 DATE

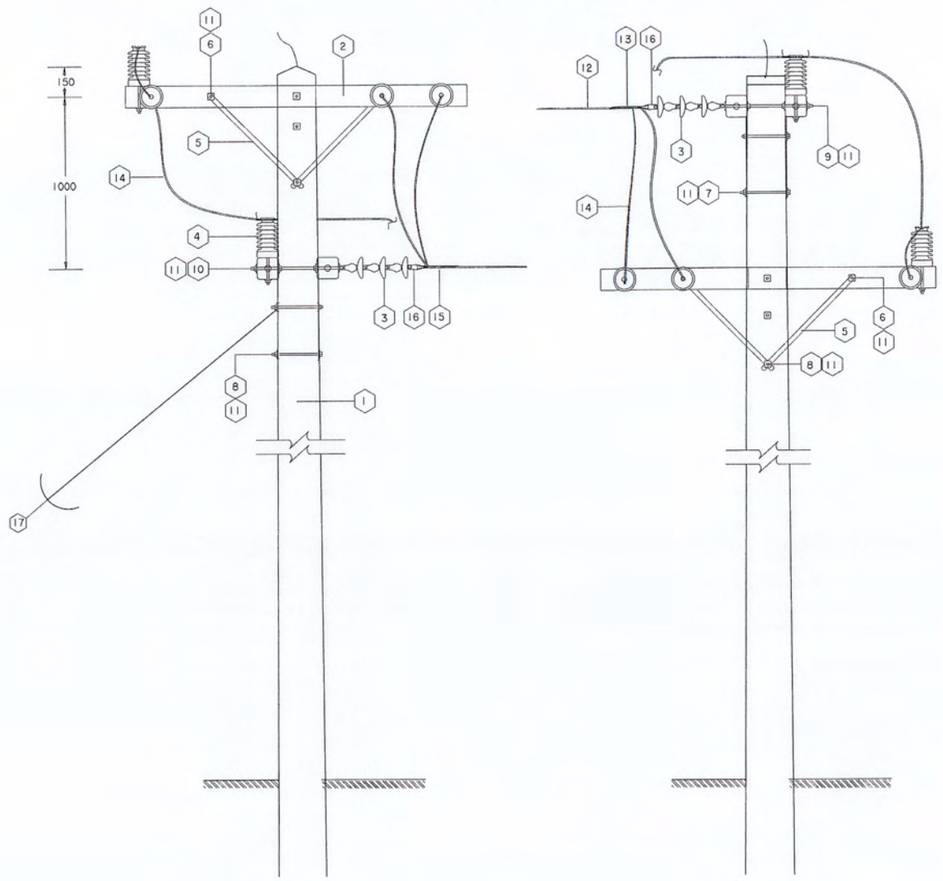
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP-TS-02
SHEET NO. 102 OF 129

POLE TYPE "C"
(Before/After Curve)



POLE TYPE "D"
(60°-90°)



BILL OF MATERIAL	
ITEM	DESCRIPTION
1	POLE CONCRETE 12.0 M.LONG
2	CROSSARM,SPUN PRESTERSSED CONCRETE,120x120x2,000 mm.
3	INSULATOR,SUSPENSION TYPE,TIS 354 , TYPE A (CLASS 52-1)
4	INSULATOR,LINE POST TYPE,ANSI C 29.7 CLASS 57-2L
5	BRACE,FLAT,FOR CROSSARM,30x6x760 mm.
6	BOLT,MACHINE, M16x170 mm.
7	BOLT,MACHINE, M16x200 mm.
8	BOLT,DOUBLE ARMING,ROUND EYE, M16x450 mm.
9	NUT,EYE, M 16 ,DIN 582
10	WASHER,SQUARE,FLAT,52x52x4.5 mm.HOLE Dia. 18 mm.TIS 258
11	PREFORMED DEAD-END FOR SAC 35-95 sq.mm.
12	CLEVIS, THIMBLE, FOR PREFORMED DEAD-END
13	CLAMP, SINGLE U-BOLT, M 8
14	WIRE STEEL SOLID Dia. 4 MM.
15	35kV-CC (SAC)
16	WIRE STEEL STRANDED 50/7 DIN 48201
17	GUY (STEEL STARNDARD WIRE 95 Sq.mm.)

BILL OF MATERIAL	
ITEM	DESCRIPTION
1	POLE CONCRETE 12.0 M.LONG
2	CROSSARM,SPUN PRESTERSSED (FOR DEADENDING),120x120x2,000 mm.
3	INSULATOR,SUSPENSION TYPE,TIS 354 , TYPE A (CLASS 52-1)
4	INSULATOR,LINE POST TYPE, ANSI C 29.7 CLASS 57-2L
5	BRACE,FLAT,FOR CROSSARM,30x6x760 mm.
6	BOLT,MACHINE, M16x170 mm.
7	BOLT,MACHINE, M16x200 mm.
8	BOLT,MACHINE, M16x250 mm.
9	BOLT,DOUBLE ARMING,ROUND EYE, M16x450 mm.
10	BOLT,DOUBLE ARMING,ROUND EYE, M16x500 mm.
11	WASHER,SQUARE,FLAT, 52x52x4.5 mm. HOLE Dia.18 mm. TIS 258
12	ALUMINIUM CONDUCTOR STEEL REINFORCED
13	PERFOR DEAD-END FOR SAC 35-95 sq.mm.
14	35kV-CC (SAC)
15	PERFOR DEAD-END FOR AERIAL CABLE 50 sq.mm.
16	CLEVIS, THIMBLE, FOR PERFORMED DEAD-END
17	GUY (STEEL STARNDARD WIRE 95 Sq.mm.)

NOTE :

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

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

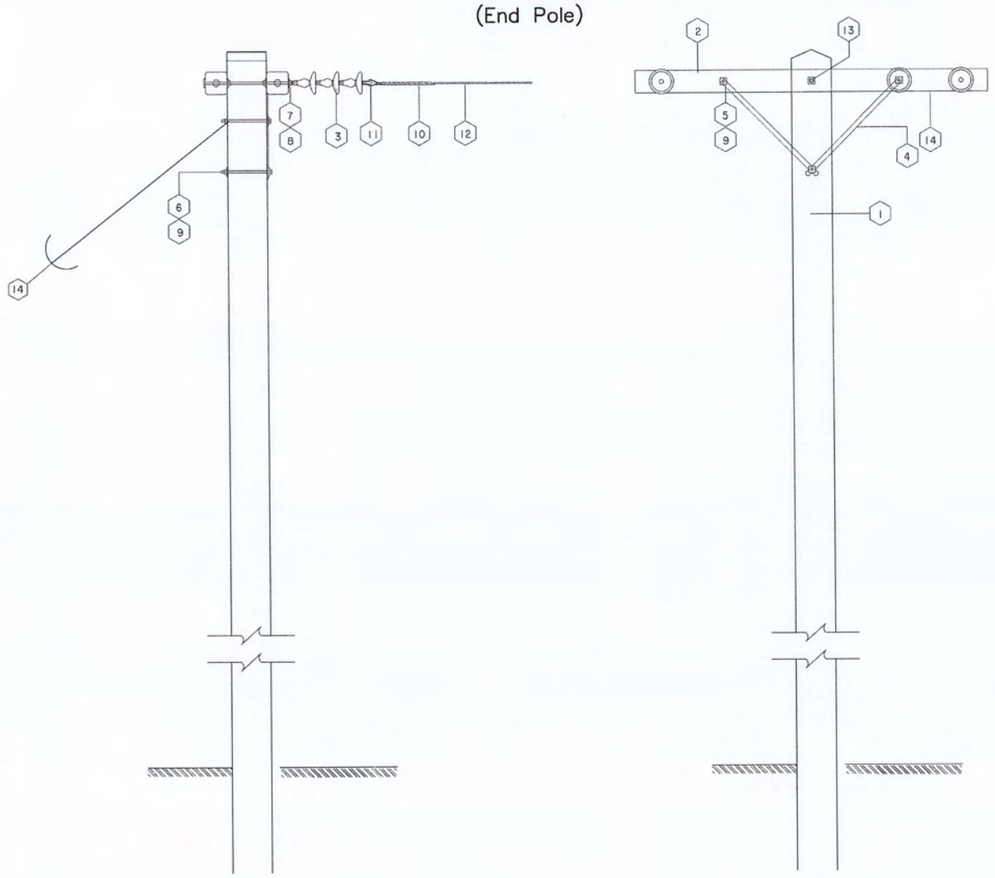
PART : 1 CIVIL WORKS AND TRANSMISSION LINE

TRANSMISSION LINE

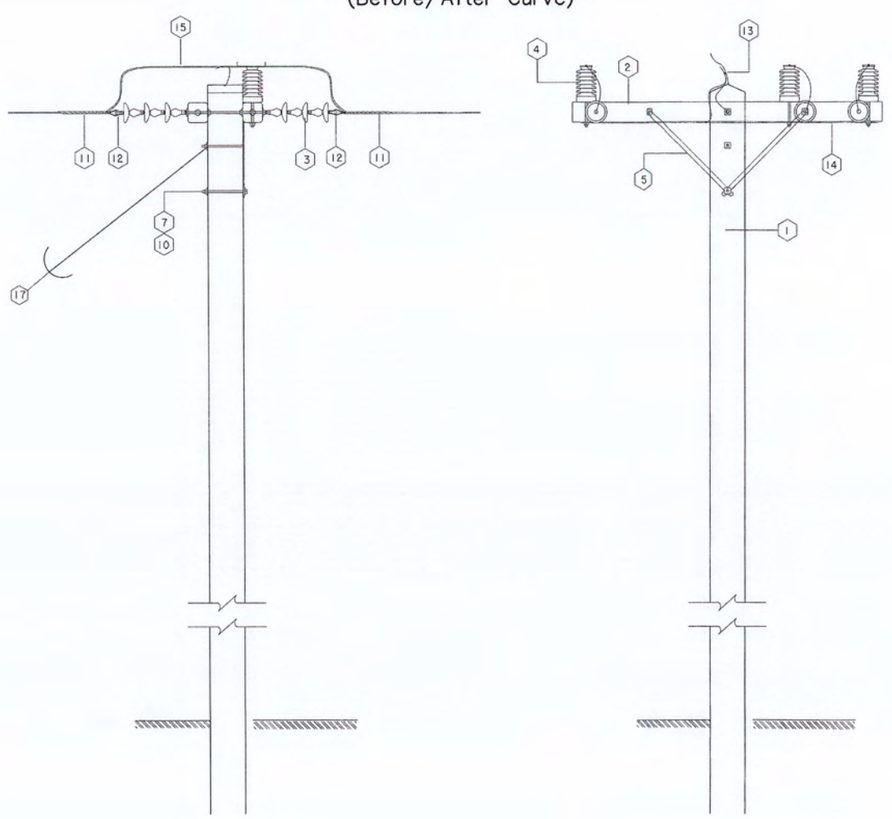
POLE TYPE "C" AND "D"

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DESIGNED	สพัก.1764	REVIEWED	
DRAWN		SUBMITTED	
CHECKED	สธ.8231	RECOMMENDED	
PROJECT MANAGER	28/10/2021 DATE	APPROVED	
		DRAWING NO. AKP-TS-03	SHEET NO. 103 OF 129

POLE TYPE "E"
(End Pole)



POLE TYPE "F"
(Before/After Curve)



BILL OF MATERIAL	
ITEM	DESCRIPTION
1	POLE CONCRETE 12.0 M.LONG
2	CROSSARM,SPUN PRESTERSSED CONCRETE,120x120x2,000 mm.
3	INSULATOR,SUSPENSION TYPE,TIS 354 , TYPE A (CLASS 52-1)
4	BRACE,FLAT,FOR CROSSARM,30x6x760 mm.
5	BOLT,MACHINE, M16x170 mm.
6	BOLT,MACHINE, M16x200 mm.
7	BOLT,DOUBLE ARMING,ROUND EYE, M16x450 mm.
8	NUT,EYE, M 16 ,DIN 582
9	WASHER,SQUARE,FLAT,52x52x4.5 mm. HOLE Dia.18 mm.TIS 258
10	PREFORMED DEAD-END FOR SAC 35-95 sq.mm.
11	CLEVIS, THIMBLE, FOR PREFORMED DEAD-END
12	35kV-CC (SAC)
13	WIRE STEEL STRANDED 50/7 DIN 48201
14	GUY (STEEL STARNDARD WIRE 95 Sq.mm.)

BILL OF MATERIAL	
ITEM	DESCRIPTION
1	POLE CONCRETE 12.0 M.LONG
2	CROSSARM,SPUN PRESTERSSED CONCRETE,120x120x2,000 mm.
3	INSULATOR,SUSPENSION TYPE,TIS 354 , TYPE A (CLASS 52-1)
4	INSULATOR,LINE POST TYPE,ANSI C 29.7 CLASS 57-2L
5	BRACE,FLAT,FOR CROSSARM,30x6x760 mm.
6	BOLT,MACHINE, M16x200 mm.
7	BOLT,DOUBLE ARMING,ROUND EYE, M16x450 mm.
8	NUT,EYE, M 16 ,DIN 582
9	WASHER,SQUARE,FLAT,52x52x4.5 mm.HOLE Dia. 18 mm.TIS 258
10	PREFORMED DEAD-END FOR SAC 35-95 sq.mm.
11	CLEVIS, THIMBLE, FOR PREFORMED DEAD-END
12	CLAMP, SINGLE U-BOLT, M 8
13	WIRE STEEL SOLID Dia. 4 MM.
14	35kV-CC (SAC)
15	WIRE STEEL STRANDED 50/7 DIN 48201
16	GUY (STEEL STARNDARD WIRE 95 Sq.mm.)

NOTE :

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

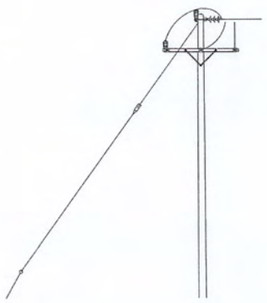
NO.	DATE	REVISIONS	CHECKED	APPROVED
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KINGDOM OF THAILAND
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MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
TRANSMISSION LINE
POLE TYPE "E" AND "F"

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DESIGNED	REVIEWED
DRAWN	SUBMITTED
CHECKED	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-TS-04	SHEET NO. 104 OF 129



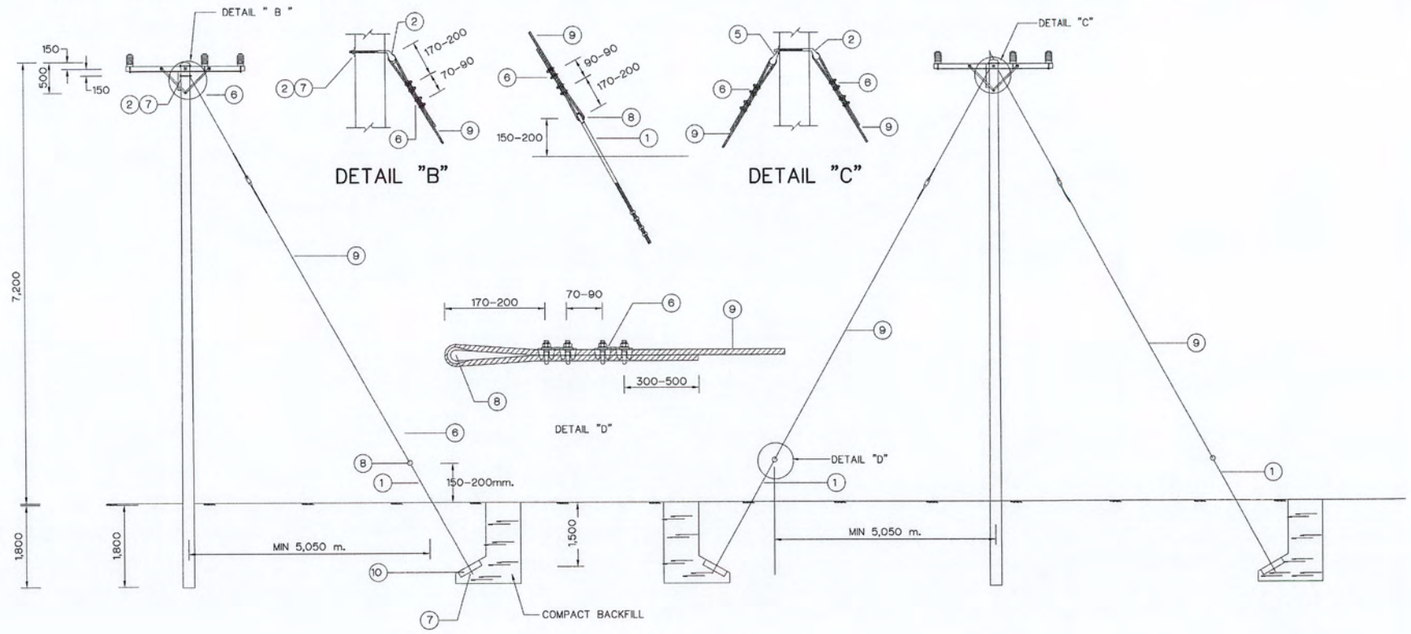
G5
BUCK ARM, 60°– 90°
DEAD END GUY



G4
DEAD END GUY

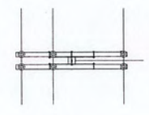
METHOD OF SINGLE ANCHOR GUY

METHOD OF DOUBLE ANCHOR GUY

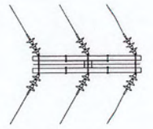


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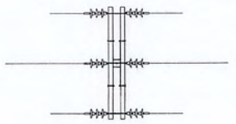
1. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, THE CONSTRUCTION DRAWING SHALL CONFORM TO PEA'S STANDARD AND REGULATIONS.



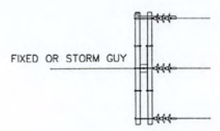
G1
SIDE GUY 5°– 30°



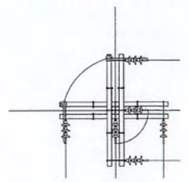
G2
SIDE GUY 30°– 60°



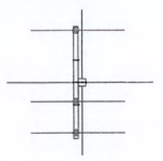
G3
LINE GUY



G4
DEAD END GUY



G5
BUCK ARM, 60°– 90°
DEAD END GUY



G6

BILL OF MATERIAL FOR ANCHOR GUY

ITEM	DESCRIPTION	REQ'D					
		G1	G2	G3	G4	G5	G6
1	ANCHOR ROD, M. 16 x 2,000 mm. COMPLETE WITH SQUARE NUT	1	1	2	1	2	4
2	BOLT, SINGLE STRANDED EYE 45° M. 16 x 250 mm. COMPLETE WITH SQUARE NUT	1	1	1	1	2	2
3	BOLT, SINGLE STRANDED EYE 30° M. 16 x 250 mm. COMPLETE WITH SQUARE NUT	–	1	–	1	2	–
4	BOLT, DOUBLE ARMING, ROUND EYE, M. 16 x 200 mm. COMPLETE WITH SQUARE NUT	–	–	–	–	–	–
5	STRAND EYE SINGLE ANGLE 45°	–	–	1	–	–	2
6	CLAMP, DOUBLE U-BOLT, M. 16 mm.	4	8	8	8	16	16
7	WASHER, SQUARE FLAT 50 x 50 x 5 mm. HOLE Ø18 mm.	2	2	2	4	8	4
8	GUY, THIMBLE, FOR STEEL STRANDED WIRE 50 Sq.mm.	1	2	2	2	4	4
9	STEEL STRANDED WIRE 50 Sq.mm.	15 m.	35 m.	30 m.	35 m.	70	60
10	CONCRETE ANCHOR 550 x 550 x 180 mm.	1	1	2	2	2	4
11	STRAIN INSULATOR CLASS 54-4	1	1	2	2	2	4

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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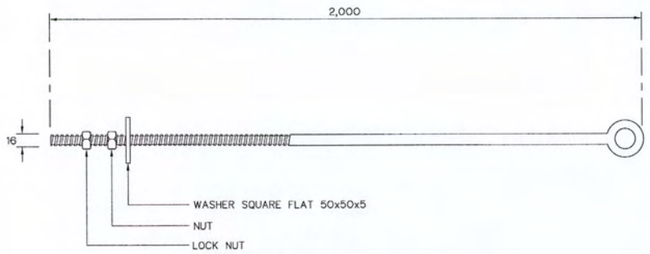
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

TRANSMISSION LINE

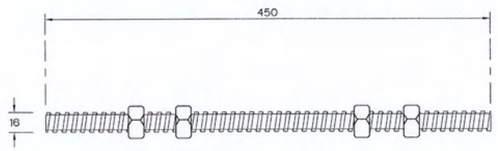
TYPE OF ANCHOR GUY

PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED สพัก.1764	REVIEWED
DRAWN	SUBMITTED
CHECKED สธ.8231	RECOMMENDED
28/10/2021 PROJECT MANAGER DATE	APPROVED
DRAWING NO. AKP–TS–05	SHEET NO. 105 OF 129



DETAIL OF ANCHOR BOLT FOR GUY WIRE

NOT TO SCALE



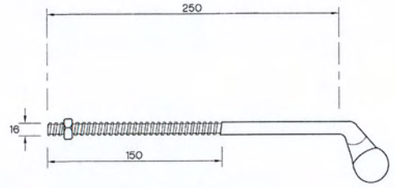
BOLT, DOUBLE ARMING

NOT TO SCALE



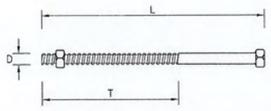
STRAND EYE SINGLE ANGLE 30°

NOT TO SCALE

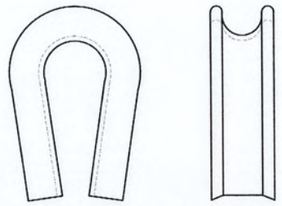


BOLT, SINGLE STRANDED EYE 45°

NOT TO SCALE



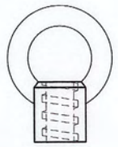
NOT TO SCALE



GUY THIMBLE

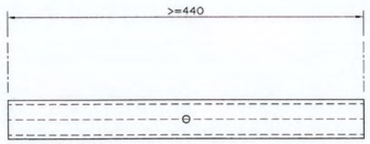
FOR STEEL STRAND GUY WIRE 35Sq.mm.

NOT TO SCALE



NUT EYE

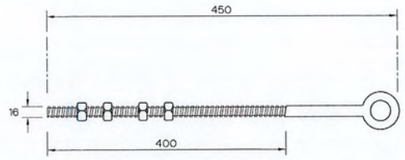
NOT TO SCALE



CONNECTOR, SPLICE, COMPRESSION TYPE

TENSION LOADED FOR PIC(ACSR) 120/8 Sq.mm.

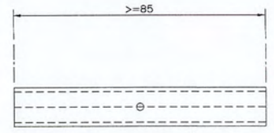
NOT TO SCALE



BOLT, DOUBLE ARMING, ROUND EYE

NOT TO SCALE

BOLT, MACHINE (D x L)	
1	M. 16 x 130 mm. (T = 35 mm.)
2	M. 16 x 170 mm. (T = 50 mm.)
3	M. 16 x 200 mm. (T = 50 mm.)
4	M. 16 x 250 mm. (T = 75 mm.)
5	M. 16 x 300 mm. (T = 75 mm.)
6	M. 16 x 400 mm. (T = 100 mm.)



CONNECTOR, SPLICE, COMPRESSION TYPE

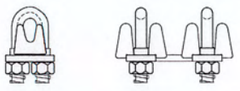
TENSIONLESS LOADED FOR PIC(ACSR) 120/8 Sq.mm.

NOT TO SCALE



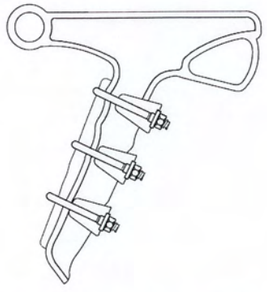
CLAMP, SINGLE U-BOLT M.8

NOT TO SCALE



CLAMP, SINGLE U-BOLT M.16

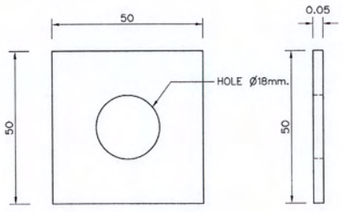
NOT TO SCALE



CLAMP, STRAIN, WITH CLAMPING KEEPER

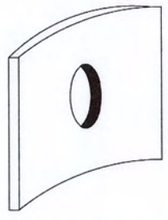
FOR PIC (ACSR) 120/8 Sq.mm.

NOT TO SCALE



WASHER SQUARE FLAT

NOT TO SCALE



WASHER, CURVE, SQUARE 60x60x5mm.

HOLE Ø22 mm.

NOT TO SCALE

NOTE :

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

TRANSMISSION LINE

POLE ASSEMBLY ACCESSORIES, ANCHOR BOLT FOR GUY

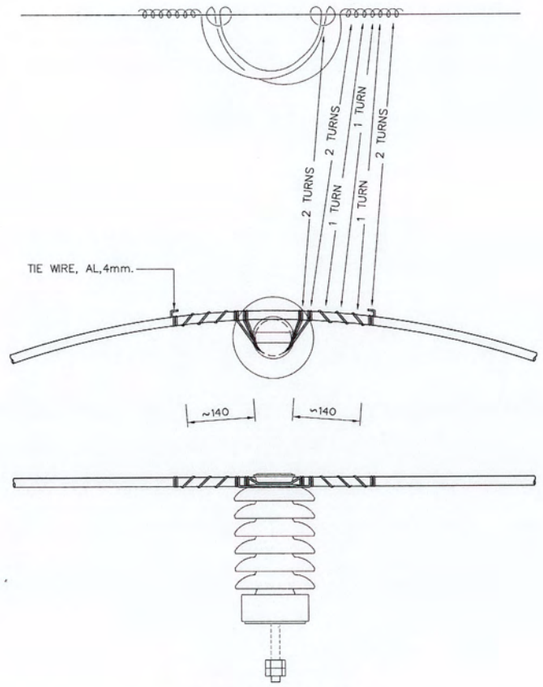
PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

DESIGNED AWL1764
DRAWN
CHECKED RB.8231
PROJECT MANAGER 28/10/2021 DATE

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

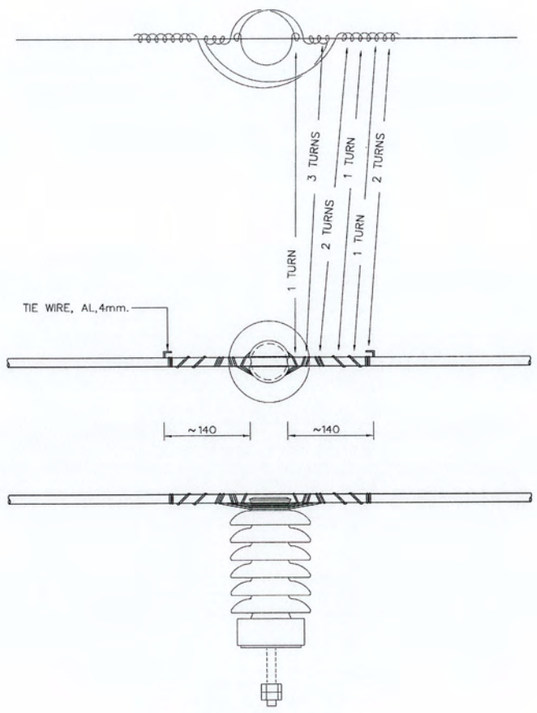
DRAWING NO. AKP-TS-06
SHEET NO. 106 OF 129

PARTIALLY INSULATED CONDUCTOR TIE,
ON H.T. PIN TYPE INSULATOR
(FOR SIDE GROOVE TIE)

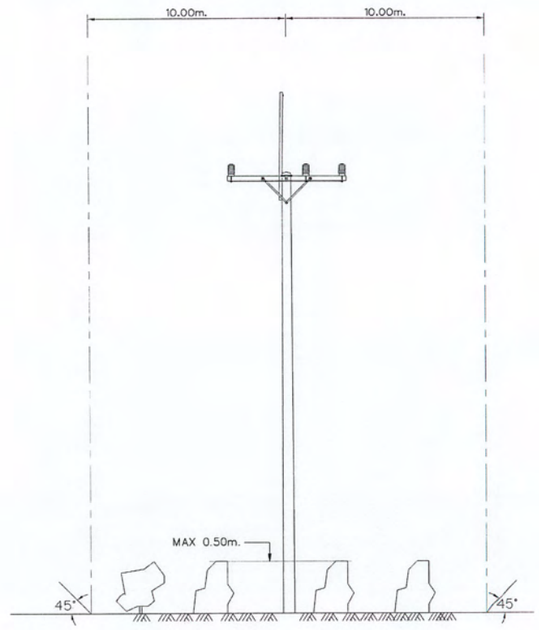


SIDE GROOVE TIE

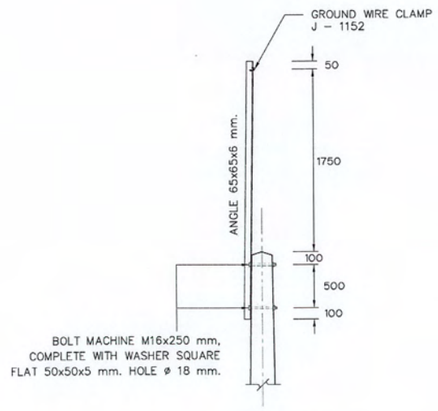
PARTIALLY INSULATED CONDUCTOR TIE,
ON H.T. PIN TYPE INSULATOR
(FOR TOP GROOVE TIE)



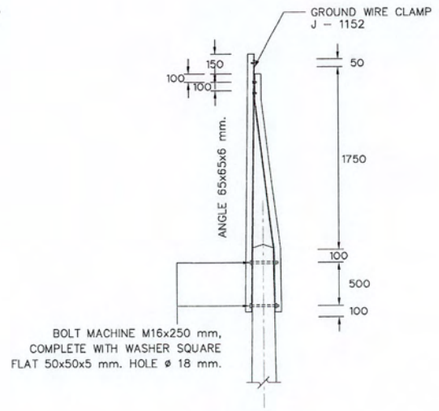
TOP GROOVE TIE



TREE TRIMMING
NOT TO SCALE

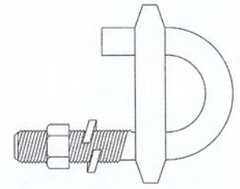


STRAIGHT BAYONET



CORNER BAYONET

OVER HEAD GROUND WIRE BAYONET ASSEMBLY
NOT TO SCALE



GROUND WIRE CLAMP J-1152
NOT TO SCALE

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

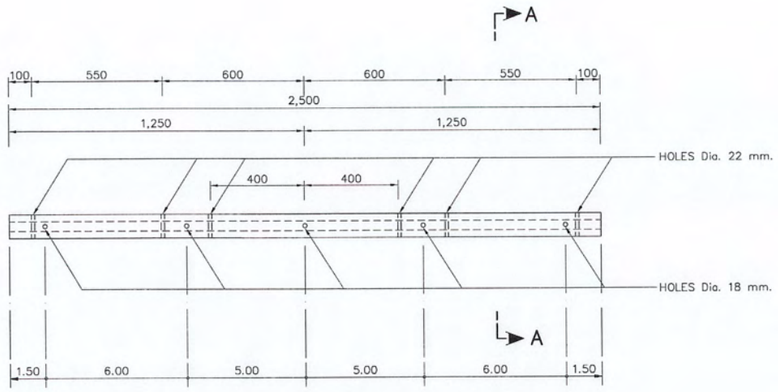
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

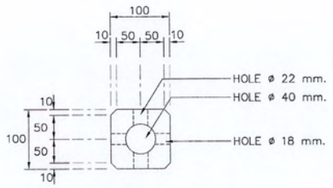
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
TRANSMISSION LINE
OVERHEAD GROUND WIRE BAYONET ASSEMBLY

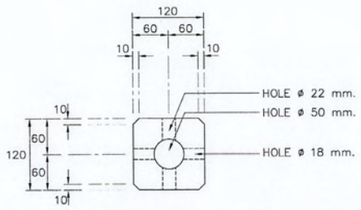
PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED	สพ.1764	REVIEWED	
DRAWN		SUBMITTED	
CHECKED	สย.8231	RECOMMENDED	
PROJECT MANAGER	28/10/2021 DATE	APPROVED	
		DRAWING NO. AKP-TS-07	SHEET NO. 107 OF 129



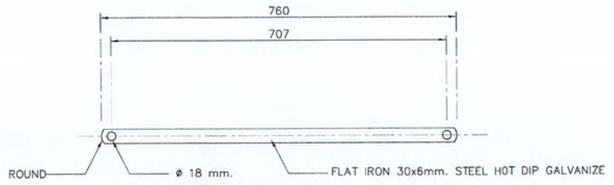
PRESTRESSED CROSS ARM 100x100x2,500mm.



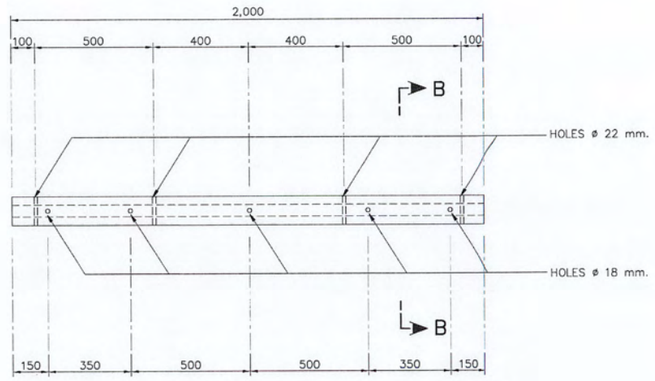
SECTION A–A



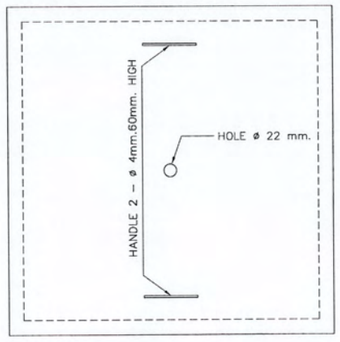
SECTION B–B

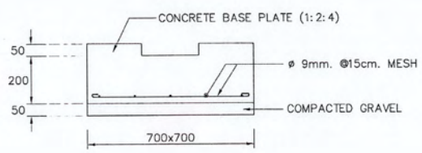


BRECE FLAT FOR CROSS ARM

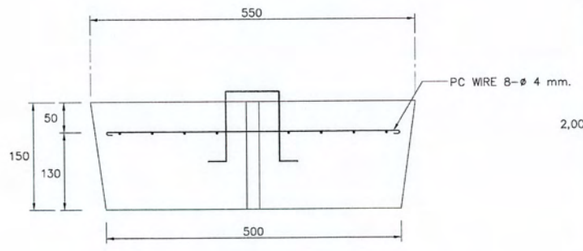


PRESTRESSED CROSS ARM 120X120x2,000mm.

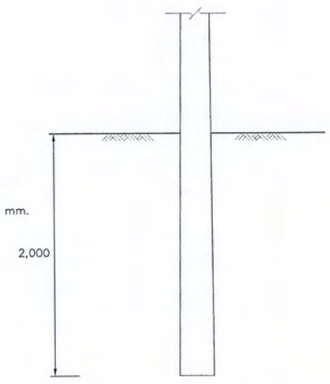




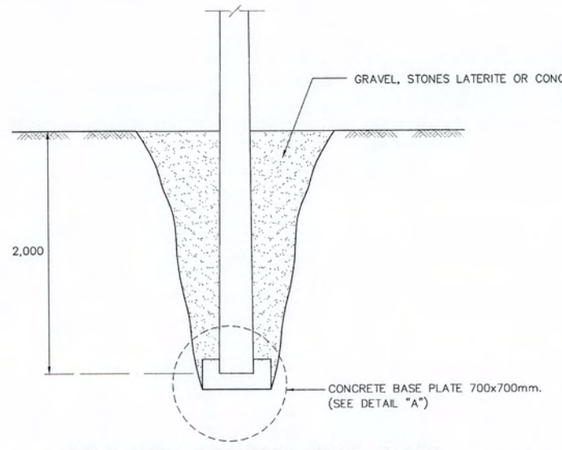
DETAIL "A"



REINFORCED CONCRETE ANCHOR PLATE
550x550x180mm.



FOR NORMAL SOIL CONDITION



POLE WITH CONCRETE BASE PLATE

NOTES :

CONCRETE BASE PLATE WILL BE USE FOR
1. POLES WITH ANCHOR GUY TYPES G5 AND G6
2. POLES CONSTRUCTED ON SOFT SOIL WITH PRESSURE NOT MIN 1 kg/Sq.mm.
3. CONTRACTOR SHALL INVESTIGATE THE SOIL CONDITION FOR EVERY POLES AND VERIFY TO USE CONCRETE BASE PLATE OR NOT. THE INVESTIGATION RESULT SHALL BE SUBMITTED TO FIELD ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

TRANSMISSION LINE

BURYING DEPTH AND FOUNDATION

PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

DESIGNED	AWN.1764	REVIEWED	
DRAWN		SUBMITTED	
CHECKED	ADL.8231	RECOMMENDED	
PROJECT MANAGER	28/10/2021 DATE	APPROVED	

DRAWING NO. AKP–TS–08

SHEET NO. 108 OF 129

PART 2 : ELECTRO-MECHANICAL EQUIPMENT

LEGENDS

115 kV CIRCUIT BREAKER MOTOR OPERATED

LOAD BREAK SWITCH

EARTHING SWITCH

D/S CONNECTING SWITCH WITH EARTHING SWITCH

MOTOR OPERATED DISCONNECTOR

MOTOR OPERATED EARTHING SWITCH

WITHDRAWABLE VACUUM CIRCUIT BREAKER 12 KV MOTOR OPERATED

AUX — AUXILIARY CONTACT OF LOAD BREAK SWITCH/ CIRCUIT BREAKER/CONTACTOR

POWER TRANSFORMER

POTENTIAL TRANSFORMER

CURRENT TRANSFORMER

LIGHTNING ARRESTER OUTDOOR TYPE

VOLTAGE TRANSFORMER

CURRENT TRANSFORMER

STATIC CAPACITOR

SR — SERIES REACTOR

LIGHTNING ARRESTER INDOOR TYPE

LL2L3 — CAPACITIVE VOLTAGE INDICATING

INDICATING LAMP

HIGH VOLTAGE CURRENT LIMITING FUSE LINK

7.2 kV LOAD BREAK SWITCH WITH FUSE

CO — LIGHTNING ARRESTER WITH COUNTER

INTERLOCK

HV. TERMINATION KIT

HRC FUSE

MINIATURE CIRCUIT BREAKER

LAMP.

A — AMMETER, MEASURING RANGE AS INDICATED

V — VOLT-METER

W — WATT METER

PF — POWER FACTOR METER

WH — WATT-HOUR METER

AS — AMP SELECTOR SWITCH

PFC — POWER FACTOR CONTROLER

VS — VOLT SELECTOR SWITCH

27 — PHASE UNDERVOLTAGE RELAY

49 T1 — TRANSFORMER THERMOMETER CONTACT, ALARM/FAN-OPERATION TEMPERATURE

49 T2 — TRANSFORMER THERMOMETER CONTACT, CIRCUIT BREAKER TRIPPING TEMPERATURE

63 — TRANSFORMER SUDDEN PRESSURE RELAY

50/51 — INSTANTANEOUS AND TIME OVERCURRENT RELAY

50N/51N — INSTANTANEOUS AND TIME GROUND OVERCURRENT RELAY

51N — TIME DELAY GROUND OVERCURRENT RELAY

86 — AUXILIARY TRIP AND LOCK OUT RELAY

87T — TRANSFORMER DIFFERENTIAL PROTECTION RELAY

87B — BUS DIFFERENTIAL PROTECTION RELAY

PROTECTION, MONITORING AND CONTROL RELAY

PROTN. RELAY — PROTECTION RELAY (SEE DETAIL SPECIFICATION)

MOTOR PROTN. RELAY — PROTECTION MOTOR (SEE DETAIL SPECIFICATION)

ENERGY METER — MULTIFUNCTION METER (SEE DETAIL SPECIFICATION)

NON-FUSE SEFTY SWITCH ชนิด WEATHER PROOF 220VAC 2P 30A(HEAVY DUTY) AFF +1.00 M.

NON-FUSE SEFTY SWITCH ชนิด WEATHER PROOF 380VAC 3P 30A(HEAVY DUTY) AFF +1.00 M.

STRUCTURE OF LAMP	LAMP			INSTALLATION	SYMBOL
	TYPE	WATT	BRIGHTNESS		
LOVERED LUMINARE COMPOSE OF 0.8 mm THICKNESS STEEL HOUSING WITH WHITE STOVE ENAMELALUMINIUM CROSS PROFILE LOVERS FOR REDUCING GLARE, PURITY ALUMINIUM ANODIZE REFLECTOR AND BUILT IN COMPLETE WIRING OF ROTARY LOCK LAMPHOLDERS,	LED (DAYLIGHT)	3x18	1,800/LAMP	RECESSED CEILING	
LOVERED LUMINARE COMPOSE OF 0.8 mm THICKNESS STEEL HOUSING WITH WHITE STOVE ENAMELALUMINIUM CROSS PROFILE LOVERS FOR REDUCING GLARE, PURITY ALUMINIUM ANODIZE REFLECTOR AND BUILT IN COMPLETE WIRING OF ROTARY LOCK LAMPHOLDERS,	LED (DAYLIGHT)	2x18	1,800/LAMP	RECESSED CEILING	
EMERGENCY LIGHTING COMPOSED OF GALVANIZED STEEL WITH ENAMEL COATING ADJUSTABLE AIMMING BEAM TYPE, ON-OFF LAMP SWITCH, MAINTENANCE FREE SEALED LEAD ACID BATTERY, 3 HOURS EMERGENCY DURATION TIME	LED	2x9	500/LAMP	SURFACE ON WALL 2.2 m HEIGHT ABOVE FLOOR	
LED HIGH BAY LIGHT WITH CREE CHIP (OR EQUAL) AND MAXWELL (OR EQUAL) DRIVER INPUT VOLTAGE : AC85V-265V ,50HZ/60HZ POWER FACTOR 0.95, IP65, DAY LIGHT	LED (DAYLIGHT)	1x200	24,000/LAMP	HANG WITH STRUCTURE, ABOVE FLOOR	
WATER PROOF TYPE WITH COVER CLEAR ACRYLICS.	LED (DAYLIGHT)	1x18	1,800/LAMP	SURFACE ON WALL 2.2 m HEIGHT ABOVE FLOOR	
BARE BATTERN TYPE, RUST PROOF, WHITE POWDER COATING FINISHED, AND REFLEX SHEET	LED (DAYLIGHT)	1x18	1,800/LAMP	ON CEILING	
RECESSED VERTICAL DOWNLIGHT, ANODIZED ALUMINIUM HIGH PURITY REFLECTOR	LED (DAYLIGHT)	1x9	800/LAMP	RECESSED CEILING	
STREET LIGHTING ALUMINIUM ALLOY BODY, LIGHT GRAY POWDER COATING FINISHED POLYCARBONATE BOWL, DIFFUSER, COMPLETE WITH BUILT IN INTEGRAL CONTROL SET, IP65	LED	1x100	12,000/LAMP	ON HIGH VOLTAGE POLE	
STREET LIGHTING ALUMINIUM ALLOY BODY, LIGHT GRAY POWDER COATING FINISHED POLYCARBONATE BOWL, DIFFUSER, COMPLETE WITH BUILT IN INTEGRAL CONTROL SET, IP65	LED	1x100	12,000/LAMP	ON STEEL POLE 6 M. HEIGHT	
STREET LIGHTING ALUMINIUM ALLOY BODY, LIGHT GRAY POWDER COATING FINISHED POLYCARBONATE BOWL, DIFFUSER, COMPLETE WITH BUILT IN INTEGRAL CONTROL SET, IP65	LED	1x100	12,000/LAMP	ON LOW VOLTAGE POLE	

SYMBOL FOR ELECTRICAL AND FIRE ALARM SYSTEM		SYMBOL FOR ELECTRICAL AND FIRE ALARM SYSTEM	
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
S	ONE WAY SWITCH 15A 220VAC WITCH COVER	F	WIRING CABLE 2x1.5 sq.mm. IEC01 IN EMT 1/2" dia FOR FIRE ALARM DETECTOR SYSTEM.
	DUPLEX RECEPTACLE WITH GROUND2P+N+G 15A. 250VAC. WITH COVER	A	WIRING CABLE 2x2.5 sq.mm. FRC IN EMT 1/2" dia FOR FIRE ALARM SYSTEM
TC	MDF OR TC	GANN	GRAPHIC ANNUNCIATOR PANEL
	TELEPHONE OUTLET 4 P MODULAR JACK(RJ11)		
FCP	(FIRE ALARM CONTROL PANEL		
H_x	HEAT DETECTOR , FIXED TEMPERATURE 135°F ZONE "x"		
$H_x^{200°F}$	HEAT DETECTOR , FIXED TEMPERATURE 200°F ZONE "x"		
S_x	SMOKE DETECTOR "x"		
SDB_x^T SDB_x^R	BEAM DETECTOR		
B_x	ALARM BELL 6" Dia		
F_x	MANUAL STATION WITH KEY RESET		
	FIRE EXIT SIGN 1 SIDE OR 2 SIDES WITH LED , STAND BY 2 HRS.		
IPxx	IP CAMERA , INDOOR/OUTDOOR TYPE WIRING BY CAT6 CABLE TO NVR		
NVR	NETWORK VIDEO RECORDER WITH HDD 2 TB , 32 CHANNEL WITH POE 32 CHANNEL		

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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 2 ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT
ELECTRICAL SYMBOLS

NO.	DATE	REVISIONS	CHECKED	APPROVED
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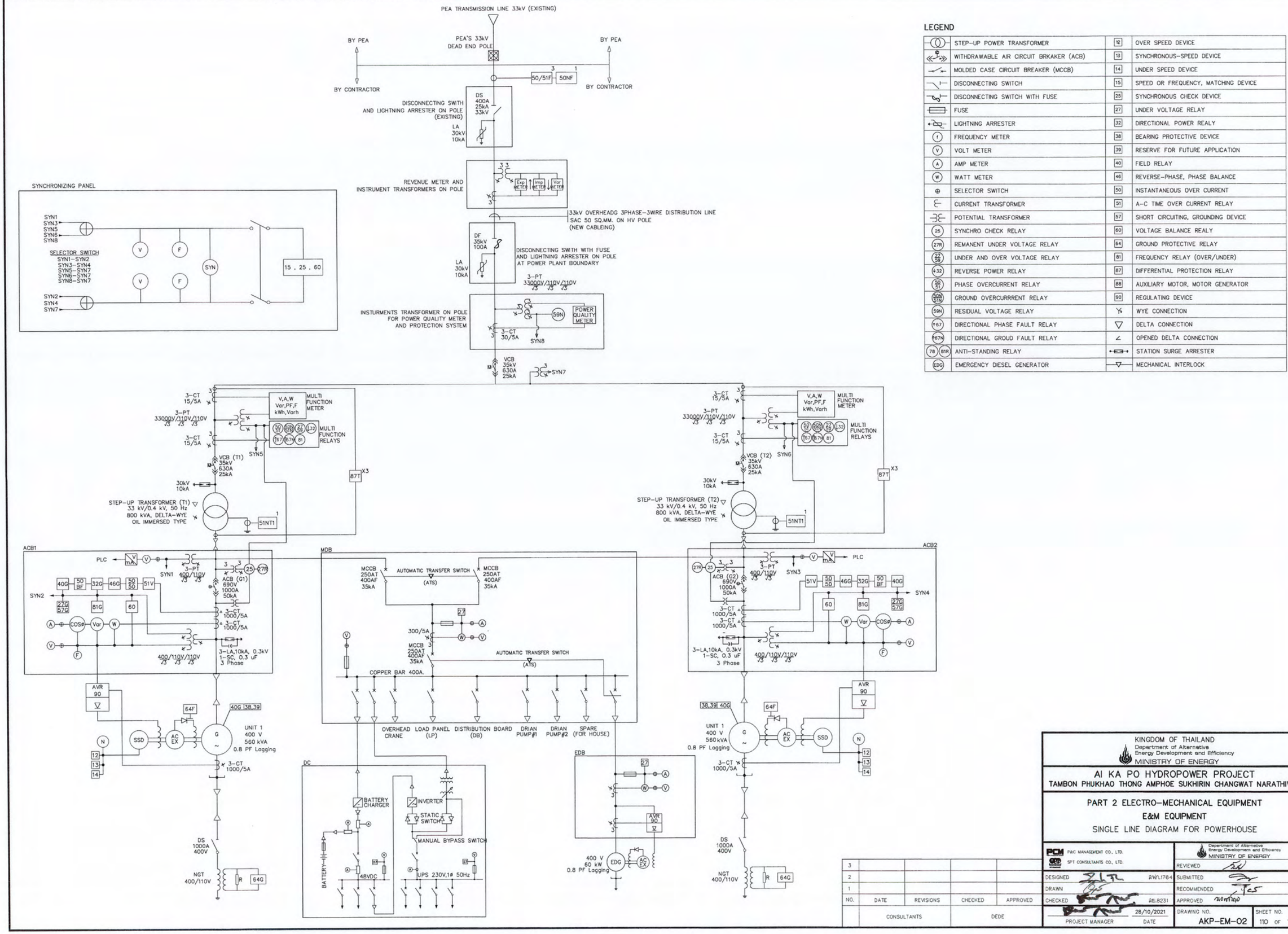
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PROJECT MANAGER — 28/10/2021 DATE

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DRAWING NO. AKP-EM-01
SHEET NO. 109 OF 129



LEGEND

	STEP-UP POWER TRANSFORMER	12	OVER SPEED DEVICE
	WITHDRAWABLE AIR CIRCUIT BRKAKER (ACB)	13	SYNCHRONOUS-SPEED DEVICE
	MOLDED CASE CIRCUIT BREAKER (MCCB)	14	UNDER SPEED DEVICE
	DISCONNECTING SWITCH	15	SPEED OR FREQUENCY, MATCHING DEVICE
	DISCONNECTING SWITCH WITH FUSE	25	SYNCHRONOUS CHECK DEVICE
	FUSE	27	UNDER VOLTAGE RELAY
	LIGHTNING ARRESTER	32	DIRECTIONAL POWER REALY
f	FREQUENCY METER	38	BEARING PROTECTIVE DEVICE
V	VOLT METER	39	RESERVE FOR FUTURE APPLICATION
A	AMP METER	40	FIELD RELAY
W	WATT METER	46	REVERSE-PHASE, PHASE BALANCE
	SELECTOR SWITCH	50	INSTANTANEOUS OVER CURRENT
	CURRENT TRANSFORMER	51	A-C TIME OVER CURRENT RELAY
	POTENTIAL TRANSFORMER	57	SHORT CIRCUITING, GROUNDING DEVICE
25	SYNCHRO CHECK RELAY	60	VOLTAGE BALANCE REALY
27R	REMANENT UNDER VOLTAGE RELAY	64	GROUND PROTECTIVE RELAY
27/59	UNDER AND OVER VOLTAGE RELAY	81	FREQUENCY RELAY (OVER/UNDER)
32	REVERSE POWER RELAY	87	DIFFERENTIAL PROTECTION RELAY
50/51	PHASE OVERCURRENT RELAY	88	AUXILIARY MOTOR, MOTOR GENERATOR
50N/51N	GROUND OVERCURRRENT RELAY	90	REGULATING DEVICE
59N	RESIDUAL VOLTAGE RELAY	Y	WYE CONNECTION
67	DIRECTIONAL PHASE FAULT RELAY		DELTA CONNECTION
67N	DIRECTIONAL GROUD FAULT RELAY		OPENED DELTA CONNECTION
78 81R	ANTI-STANDING RELAY		STATION SURGE ARRESTER
EDG	EMERGENCY DIESEL GENERATOR		MECHANICAL INTERLOCK

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Department of Alternative Energy Development and Efficiency
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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 2 ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT
SINGLE LINE DIAGRAM FOR POWERHOUSE

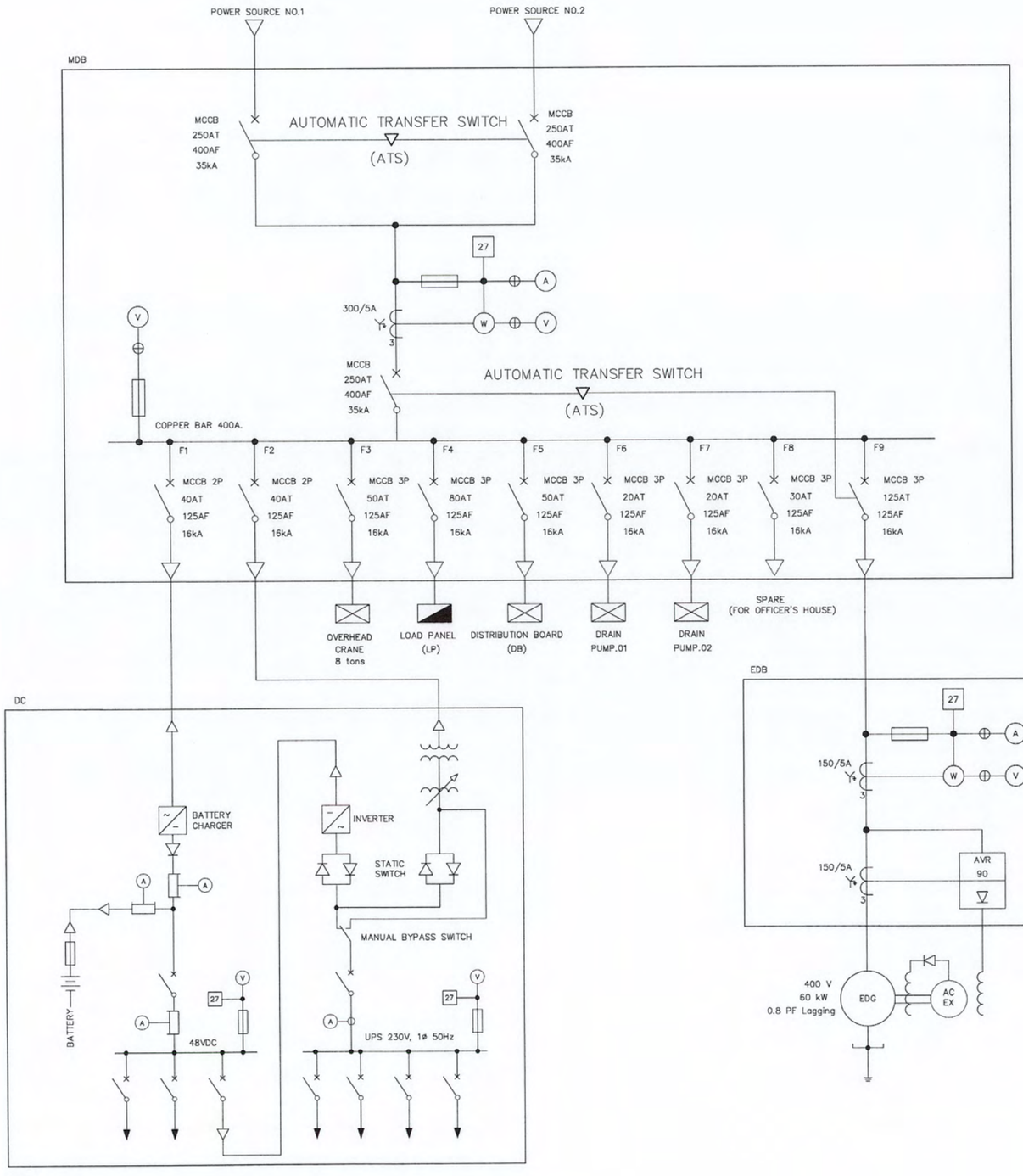
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APPROVED

DRAWING NO. AKP-EM-02
SHEET NO. 110 OF 129



LEGEND

	STEP-UP POWER TRANSFORMER	12	OVER SPEED DEVICE
	WITHDRAWABLE AIR CIRCUIT BRKAKER (ACB)	13	SYNCHRONOUS-SPEED DEVICE
	MOLDED CASE CIRCUIT BREAKER (MCCB)	14	UNDER SPEED DEVICE
	DISCONNECTING OR ISOLATING SWITCH	15	SPEED OR FREQUENCY , MATCHING DEVICE
	FUSE	25	SYNCHRONOUS CHECK DEVICE
	LIGHTNING ARRESTER	27	UNDER VOLTAGE RELAY
(f)	FREQUENCY METER	32	DIRECTIONAL POWER REALY
(V)	VOLT METER	38	BEARING PROTECTIVE DEVICE
(A)	AMP METER	39	RESERVE FOR FUTURE APPLICATION
(W)	WATT METER	40	FIELD RELAY
⊕	SELECTOR SWITCH	46	REVERSE-PHASE , PHASE BALANCE
	CURRENT TRANSFORMER	50	INSTANTANEOUS OVER CURRENT
	POTENTIAL TRANSFORMER	51	A-C TIME OVER CURRENT RELAY
(25)	SYNCHRO CHECK RELAY	57	SHORT CIRCUITING , GROUNDING DEVICE
(27R)	REMANENT UNDER VOLTAGE RELAY	60	VOLTAGE BALANCE REALY
(27/59)	UNDER AND OVER VOLTAGE RELAY	64	GROUND PROTECTIVE RELAY
(32)	REVERSE POWER RELAY	81	FREQUENCY RELAY (OVER/UNDER)
(50/51)	PHASE OVERCURRENT RELAY	87	DIFFERENTIAL PROTECTION RELAY
(50N/51N)	GROUND OVERCURRRENT RELAY	88	AUXILIARY MOTOR , MOTOR GENERATOR
(59N)	RESIDUAL VOLTAGE RELAY	90	REGULATING DEVICE
(67)	DIRECTIONAL PHASE FAULT RELAY		
(67N)	DIRECTIONAL GROUD FAULT RELAY		
(81)	OVER FREQUENCY RELAY		
(EDG)	EMERGENCY DIESEL GENERATOR		
	WYE CONNECTION		
	DELTA CONNECTION		
	OPENED DELTA CONNECTION		
	BATTERY CHARGER		
	INVERTER		
	ISOLATION TRANSFORMER		
	VOLTAGE REGURATOR		
	STATIC SWITCH		
	DIODE		
	BATTERY BANK		
(A)	SHUNT AMP METER		
	MANUAL BYPASS SWITCH		
	MECHANICAL INTERLOCK		

NOTE :

MECHANICAL INTERLOCK SHALL BE PROVIDED BETWEEN POWER SOURCE NO.1'S MCCB AND POWER SOURCE NO.2'S MCCB
POWER SOURCE NO.1'S MCCB "CLOSED", POWER SOURCE NO.2'S MCCB CAN NOT BE CLOSED AND VICE VERSA.
MECHANICAL INTERLOCK SHALL BE PROVIDED BETWEEN INCOMING'S MCCB AND EDG'S MCCB
INCOMING'S MCCB "CLOSED", EDG'S MCCB CAN NOT BE CLOSED AND VICE VERSA.

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 2 ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT
SINGLE LINE DIAGRAM BATTERY CHARGER , DC , EDG

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PROJECT MANAGER	28/10/2021 DATE	APPROVED	
		DRAWING NO. AKP-EM-03	SHEET NO. 111 OF 129

FUNCTION OF PROTECTIVE RELAY FOR UNIT AND ALARMS

LINE NO.	PROTECTION RELAY	DEVICE NO.	KIND OF THE LOCKOUT RELAY		TRIP CB		
			86-1	86-2	52 G	52 T	52 F
1	GENERATOR DIFFERENTIAL RELAY	87 G	O		O		
2	GENERATOR OVERCURRENT GROUND RELAY	51 NG	O		O		
3	EMERGENCY STOP SWITCH	5 E	O		O		
4	GENERATOR PHASE UNBALANCE CURRENT RELAY	46 G	O		O		
5	GENERATOR DIRECTIONAL OVERCURRENT RELAY	67 G	O		O		
6	GENERATOR OVER-VOLTAGE RELAY	59 G	O		O		
7	MAIN TRANSFORMER OVER-CURRENT GROUND RELAY	51 NT	O		O		O
8	GENERATOR OVERCURRENT RELAY	51 G			O		

FUNCTION OF PROTECTIVE RELAY FOR UNIT SHUT DOWN

LINE NO.	PROTECTION RELAY	DEVICE NO.
1	OVER SPEED RELAY (1 ST STAGE)	12-1

FUNCTION OF PROTECTIVE RELAY FOR 22 KV LINE AND ALARMS

LINE NO.	PROTECTION RELAY	DEVICE NO.	KIND OF LOCK OUT RELAY		TRIP CB	
			86 F		52 F	
1	LINE OVERCURRENT AND SHORT CIRCUIT RELAY	50/51 F	O		O	
2	LINE OVERCURRENT GROUND RELAY	51 NF	O		O	

LINE NO.	PROTECTION RELAY	DEVICE NO.
1	BREAKER LINE TROUBLE	86 CB1
2	RELAY METERING UNDERVOLTAGE	27 XM

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 2 ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT
FUNCTION OF PROTECTIVE RELAY

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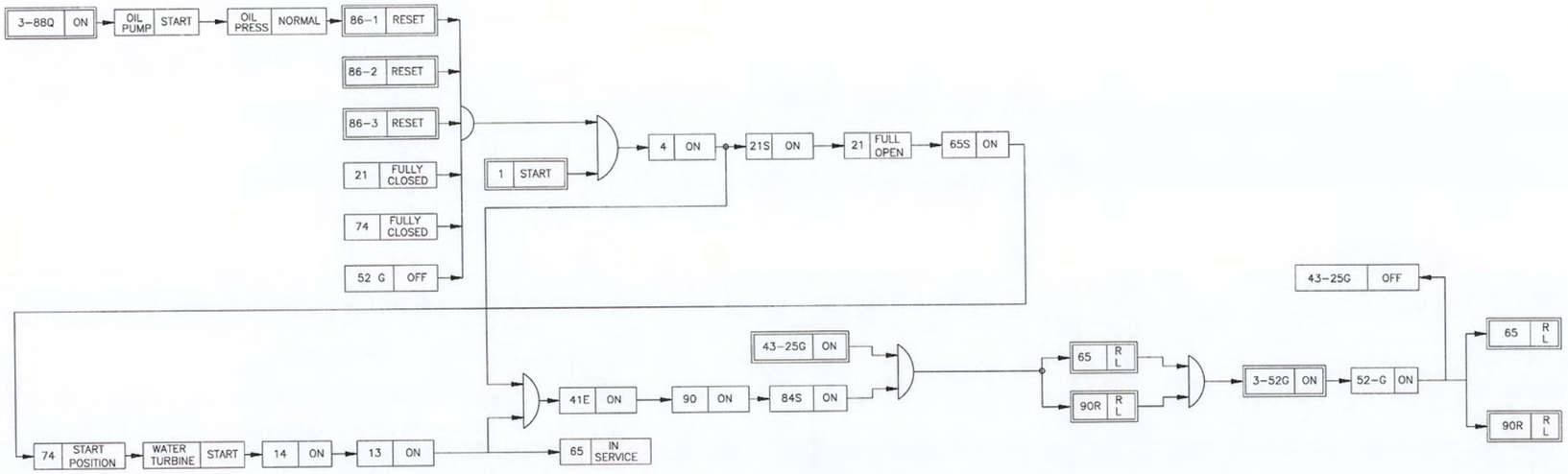
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PROJECT MANAGER 28/10/2021 DATE

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RECOMMENDED
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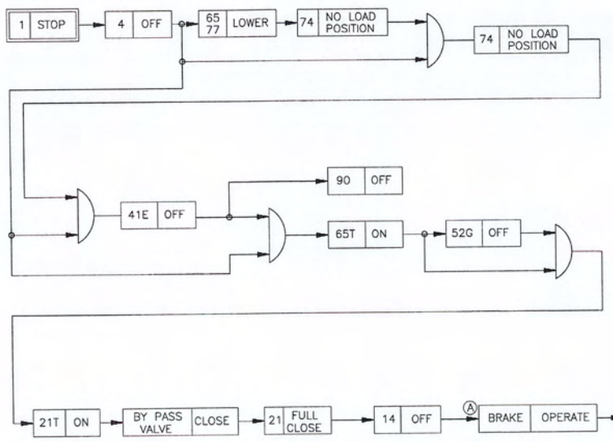
DRAWING NO. AKP-EM-04
SHEET NO. 112 OF 129

LEGEND

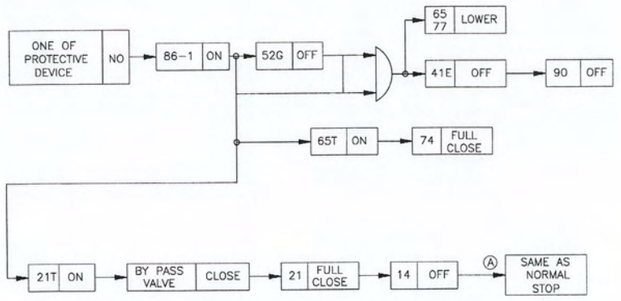
	OPERATION AND CONTROL SWITCH
	MACHINE STATUS
	GROUP INDICATION (ON)
	GROUP INDICATION (OFF)
	AND
	OR
T	TIMER
Ⓐ	SAME CONTINUTION MARK



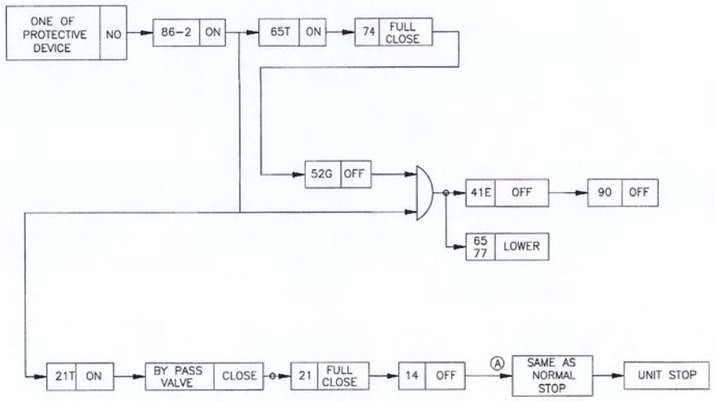
START LOAD



NORMAL STOP



EMERGENCY STOP



QUICK STOP

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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 2 ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT
OPERATION AND CONTROL SEQUENCE DIAGRAM

NO.	DATE	REVISIONS	CHECKED	APPROVED
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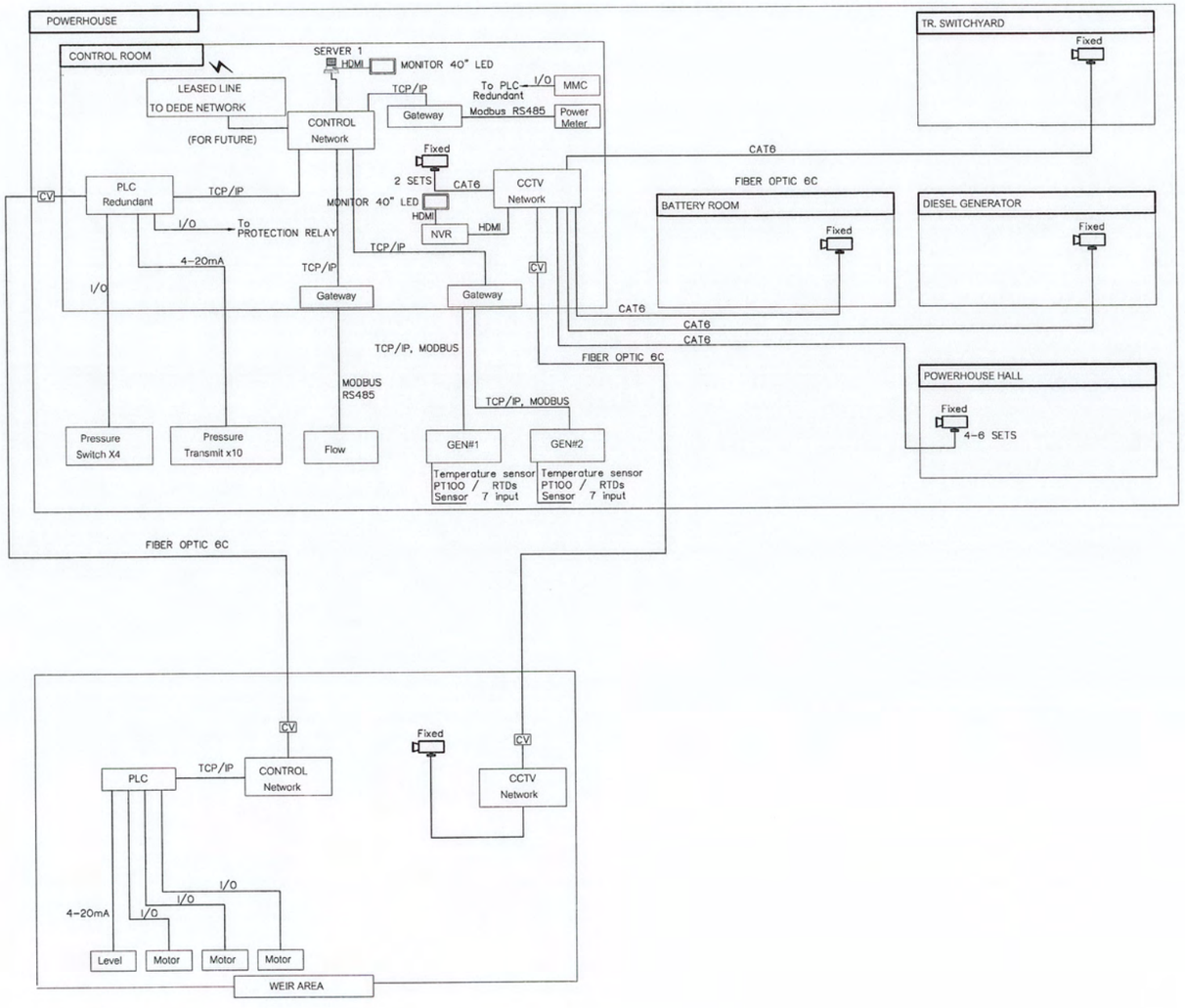
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AI KA PO HYDROPOWER PROJECT

TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 2 ELECTRO-MECHANICAL EQUIPMENT

E&M EQUIPMENT

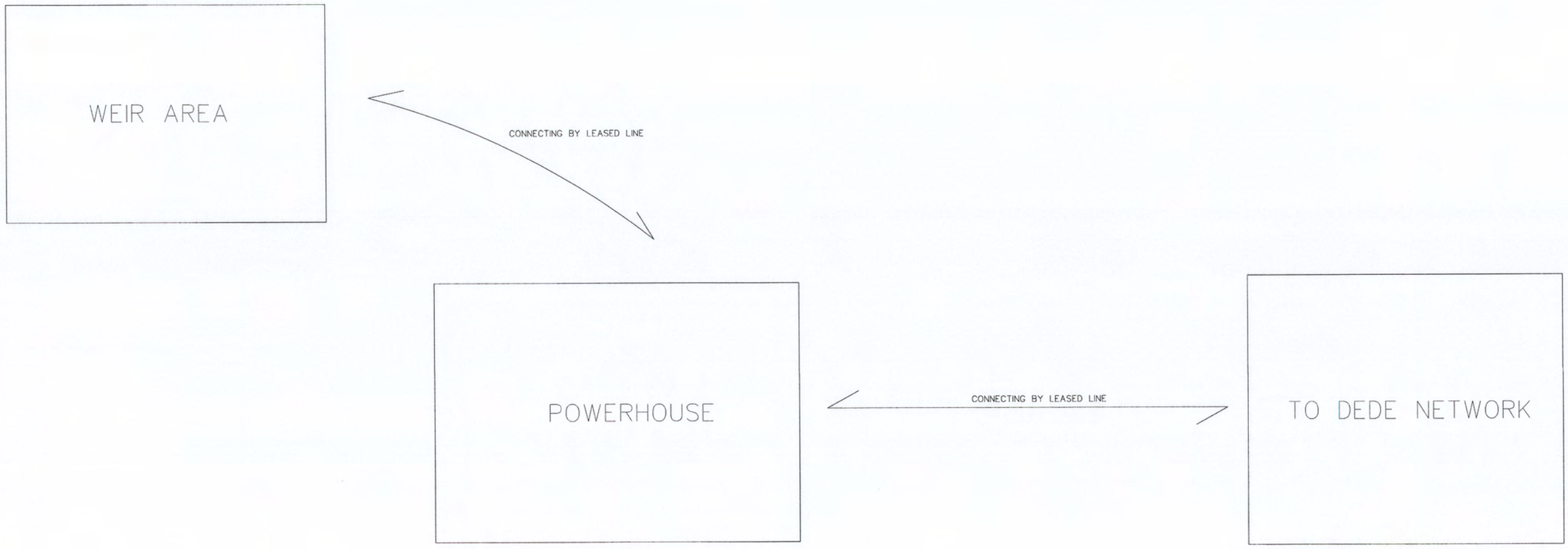
SCADA SYSTEM

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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1				

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SHEET NO.	114 OF 129



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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 2 ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT
BLOCK DIAGRAM FOR SCADA SYSTEM

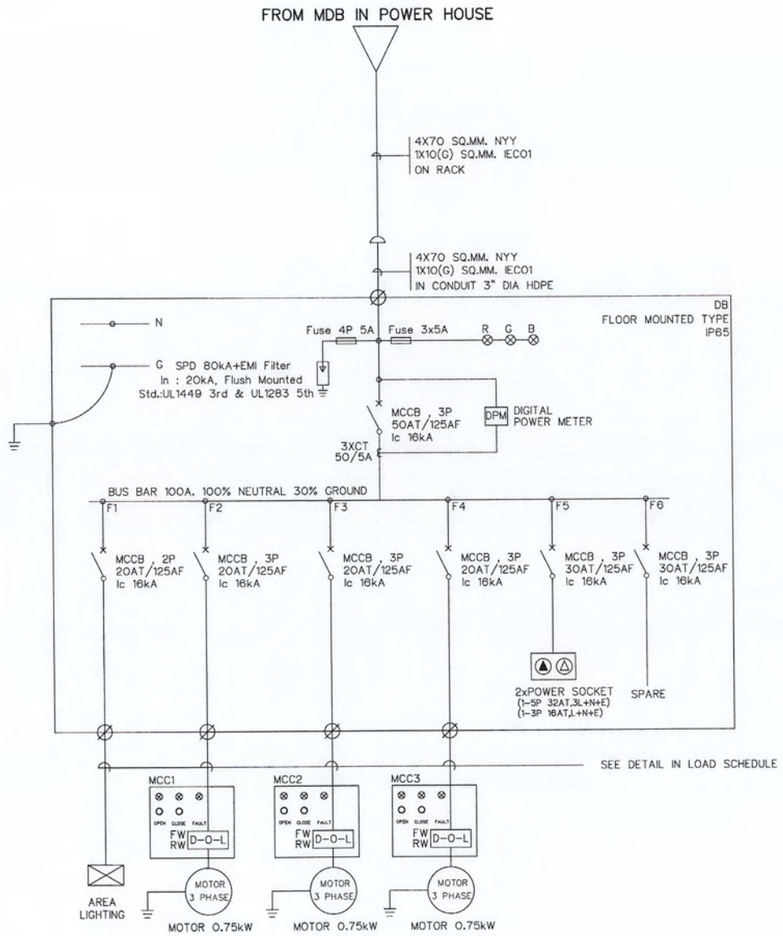
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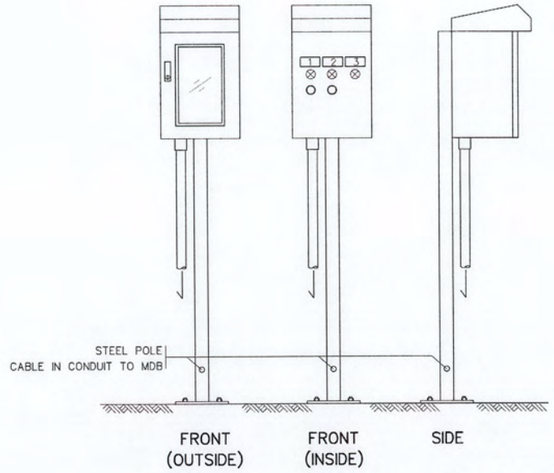
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SHEET NO. 115 OF 129



SINGLE LINE DIAGRAM



NO.	DESCRIPTION
1	OPEN
2	CLOSE
3	FAULT

MOTOR CONTROL CUBICAL 1 – 3
(MCC1–MCC3)

LOAD SCHEDULE

PANEL NO : DB — ELECTRICAL SYSTEM : 3ø, 4w, 400/230 v, 50Hz
MAX CKT : 6 — LOCATION : AREA — MOUTED : FLOOR

CKT NO.	DESCRIPTION	CIRCUIT BREAKER CABLE P	AT	AF	IC	SECTION (sq.mm)	TYPE	CONDUIT DIA (INCH)	CONDUIT TYPE	LOAD CONNECTION(VA) R	S	T
1	STREET LIGHTING	2	20	125	10 kA	2X4/1X2.5G	NYY	1-1/4	HDPE / IMC	500		
2	MCC1	3	20	125	10 kA	4X4/1X2.5G	NYY	1-1/2	HDPE / IMC	400	400	400
3	MCC2	3	20	125	10 kA	4X4/1X2.5G	NYY	1-1/2	HDPE / IMC	400	400	400
4	MCC3	3	20	125	10 kA	4X4/1X2.5G	NYY	1-1/2	HDPE / IMC	400	400	400
5	POWER SOCKET PANEL	3	30	125		4X6/1X4G	IEC01	1	EMT	5000	5000	5000
6	SPARE	3	30	125						5000	5000	5000
	MAIN BREAKER: ☑ LUG : ☐	3	50	125	10 kA	CONDUCTOR : 4x70q.mm NYY 1x10(G)q.mm IEC01				11700	11200	11200
	BUS PHASE : 100 A									100% LOAD: 34100 VA		
	INCOME LINE : POWER HOUSE					WIRING ON RACK AND IN CONDUIT 3" DIA IMC/HDPE				80% LOAD: 27280 VA		

N R S T — G

NOTE :

1. FULLY OPEN AND FULLY CLOSE MUST BE OPERATED BY LIMITED SWITCH. LIMITED SWITCH 'S LEVEL WILL BE CONFIRMED BY OWNER.
2. DIMENSION AND LOCATION OF MAIN EQUIPMENT , CONTRACTOR MUST BE SENT TO OWNER FOR APPROVE AGAIN BEFORE PRODUCTION AND INSTALLATION.

NO.	DATE	REVISIONS	CHECKED	APPROVED
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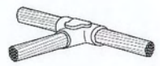
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 2 ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT
SINGLE LINE DIAGRAM FOR WEIR AREA

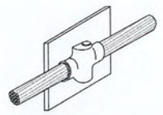
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DRAWN		SUBMITTED	
CHECKED	RSI.8231	RECOMMENDED	
PROJECT MANAGER	28/10/2021 DATE	APPROVED	
		DRAWING NO. AKP-EM-08	SHEET NO. 116 OF 129



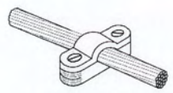
CABLE CONNECTION



TEE SPLICE

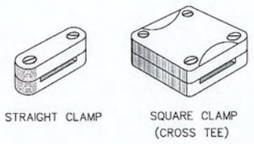


SHEET METAL BONDING



HEAVY DUTY CAST
CABLE SADDLE

DETAIL
COPPER STRAP CLAMP

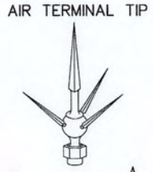


STRAIGHT CLAMP

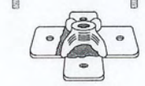
SQUARE CLAMP
(CROSS TEE)

COPPER STRAP CLAMP

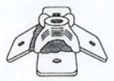
AIR TERMINAL TIP



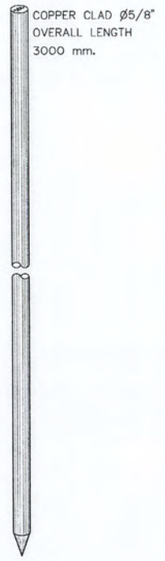
AIR
TERMINAL



AIR TERMINAL SADDLE

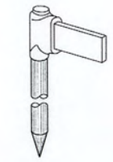


AIR TERMINAL SADDLE

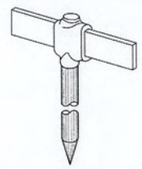


COPPER CLAD Ø5/8"
OVERALL LENGTH
3000 mm.

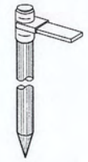
GROUND ROD.



COPPER BAR TO GROUND ROD



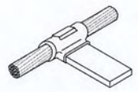
COPPER BAR TO GROUND ROD



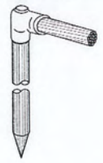
COPPER BAR TO GROUND ROD



COPPER STRAP TO CABLE



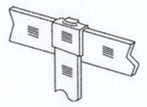
CABLE TO COPPER STRAP



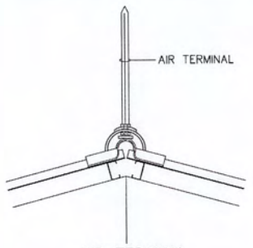
CABLE TO GROUND ROD



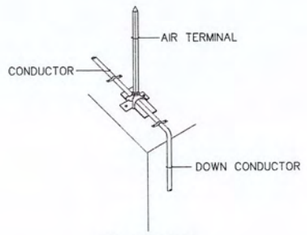
COPPER STRAP
TEE SPLICE HORIZONTAL



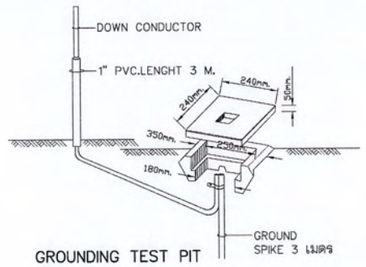
COPPER STRAP
TEE SPLICE VERTICAL



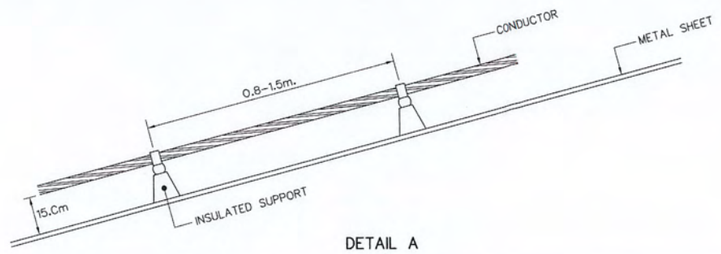
AIR TERMINAL



AIR TERMINAL



GROUNDING TEST PIT



DETAIL A

KINGDOM OF THAILAND
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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 2 ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT
TYPICAL DETAILS FOR INSTALLATION (SHEET 1/3)

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

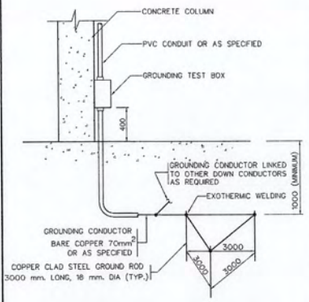
PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

DESIGNED สพท.1764
DRAWN
CHECKED สย.8231
28/10/2021
PROJECT MANAGER DATE

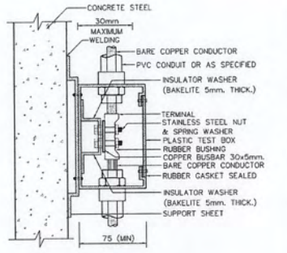
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

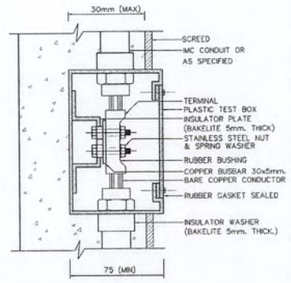
DRAWING NO. AKP-EM-09
SHEET NO. 117 OF 129



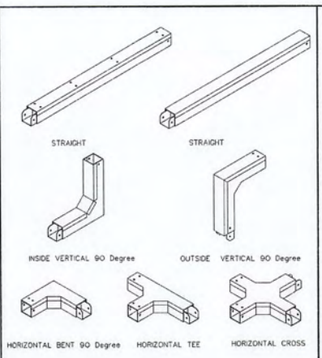
DETAIL–GROUNDING INSTALLATION FOR LIGHTNING PROTECTION WITH SURFACE MOUNTED TEST BOX



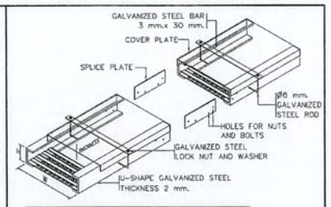
DETAIL–SURFACE MOUNTED GROUND TEST BOX



DETAIL–RECESS MOUNTED GROUND TEST BOX



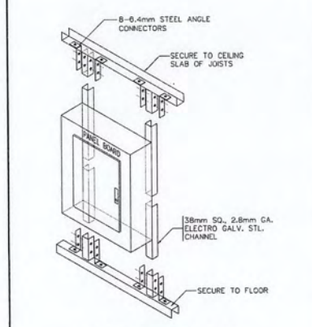
WIREWAY



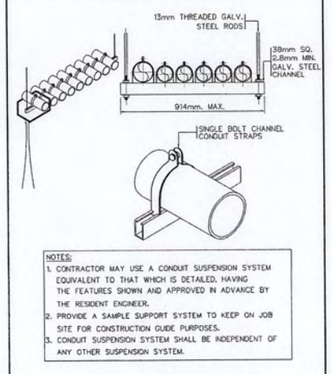
SIZE OF WIREWAY (mm.)	W (mm.)	H (mm.)	THICKNESS (mm.)
200 x 100	200	100	2.00
300 x 100	300	100	2.00
400 x 100	400	100	2.00
500 x 100	500	100	2.00
600 x 100	600	100	2.00
700 x 100	700	100	2.00
800 x 100	800	100	2.00
900 x 100	900	100	2.00
1000 x 100	1000	100	2.00

NOTE:
-WIREWAY AND COVER PLATE SHALL BE ALUZING STEEL WITHOUT PAINTING
-THE LENGTH OF EACH COVER PLATE OF WIREWAY SHALL NOT MORE THAN 1200 mm.

WIREWAY FOR SIZE 300x100 mm. OR LARGER

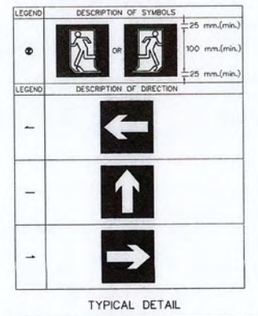


DETAIL–PANEL BOARD INSTALLATION ON DRYWALL



NOTES:
1. CONTRACTOR MAY USE A CONDUIT SUSPENSION SYSTEM EQUIVALENT TO THAT WHICH IS DETAILED, HAVING THE FEATURES SHOWN AND APPROVED IN ADVANCE BY THE RESIDENT ENGINEER.
2. PROVIDE A SAMPLE SUPPORT SYSTEM TO KEEP ON JOB SITE FOR CONSTRUCTION GUIDE PURPOSES.
3. CONDUIT SUSPENSION SYSTEM SHALL BE INDEPENDENT OF ANY OTHER SUSPENSION SYSTEM.

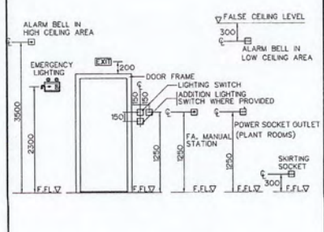
DETAIL–CONDUIT HANGER



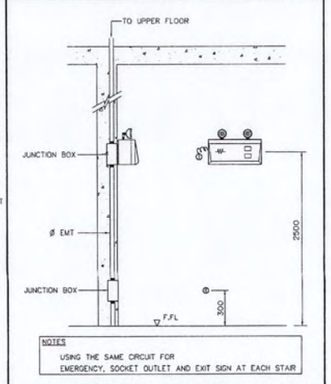
TYPICAL DETAIL

NOTES
1 COLOR : BACKGROUND – GREEN LEGEND – WHITE
2 ALL EXIT SIGNS TO BE COMPLETED WITH EXIT SYMBOL AND DIRECTION (MIN. 25 mm. SPACING)

EXIT SIGN DETAIL

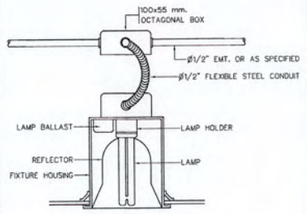


DETAIL–STANDARD SET OUT (EXCEPT SPECIFIED OTHERWISE ON THE LAYOUT)

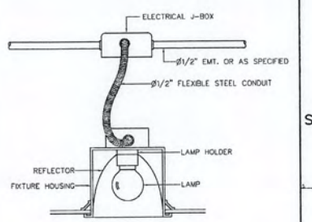


NOTES
USING THE SAME CIRCUIT FOR EMERGENCY, SOCKET OUTLET AND EXIT SIGN AT EACH STAIR

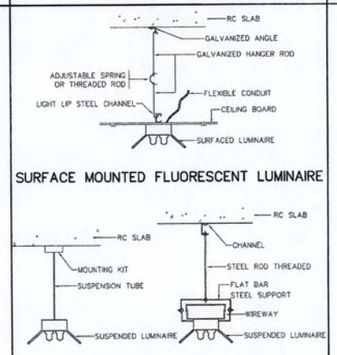
DETAIL–EMERGENCY AND OUTLET AT STAIR



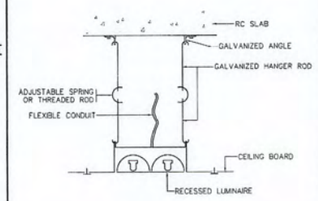
RECESSED MOUNTED DOWNLIGHT



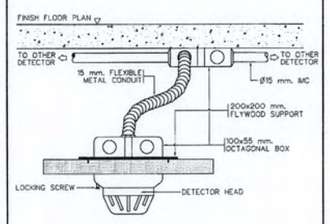
RECESSED MOUNTED DOWNLIGHT



SUSPENSION MOUNTED FLUORESCENT LUMINAIRE



RECESSED MOUNTED FLUORESCENT LUMINAIRE



FLUSH MOUNTED DETECTOR DETAIL

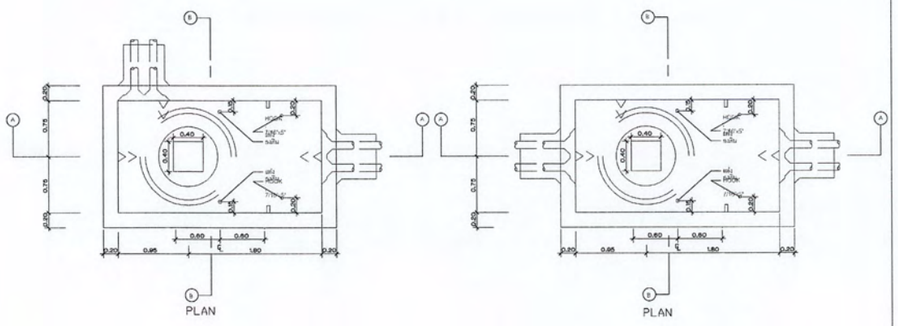
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

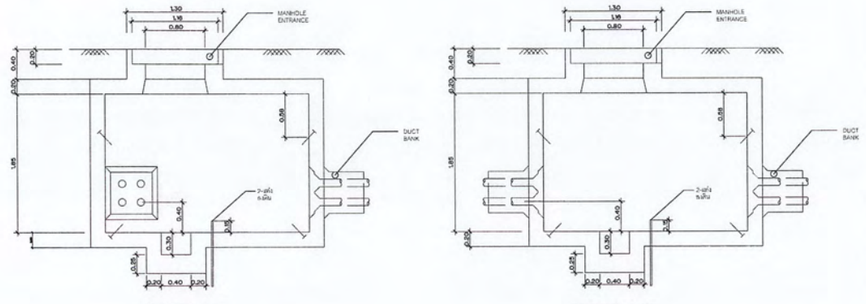
KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

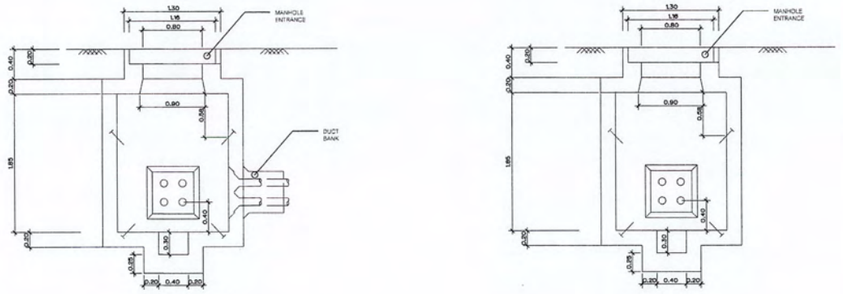
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 2 ELECTRO–MECHANICAL EQUIPMENT
E&M EQUIPMENT
TYPICAL DETAILS FOR INSTALLATION (SHEET 2/3)

PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED	RWN.1764	REVIEWED	
DRAWN		SUBMITTED	
CHECKED	RS.8231	RECOMMENDED	
PROJECT MANAGER	28/10/2021 DATE	APPROVED	
		DRAWING NO. AKP–EM–10	SHEET NO. 118 OF 129

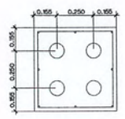




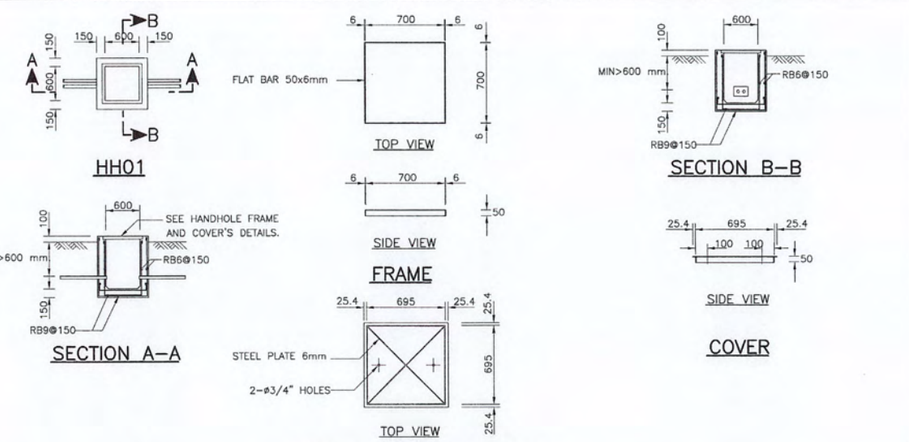


DETAIL OF MH2 (MANHOLE TYPE A-3)2 WAYS , 90 DEGREE)

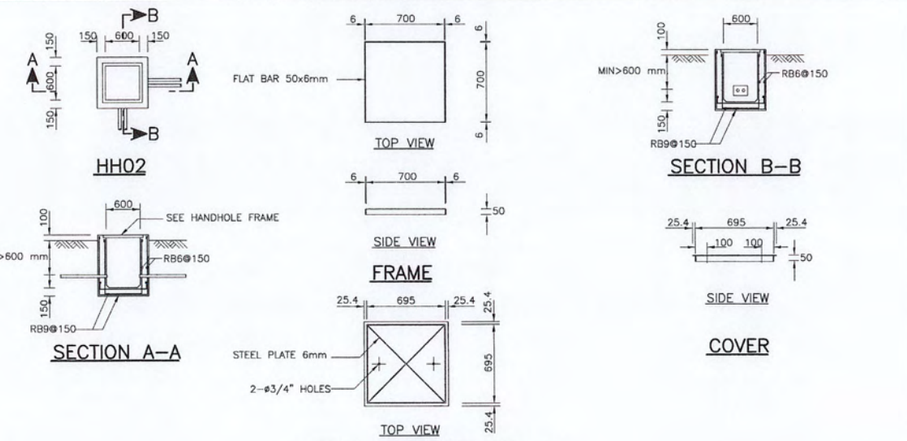
DETAIL OF MH1 (MANHOLE TYPE A-3)(2 WAYS)



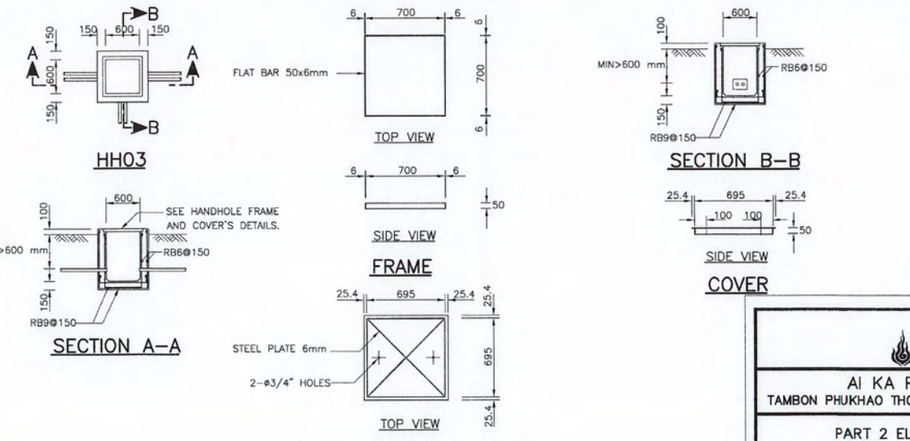
TYPICAL DETAIL FOR HIGH VOLTAGE MANHOLE



DETAIL HANDHOLE TYPE 1



DETAIL HANDHOLE TYPE 2



DETAIL HANDHOLE TYPE 3

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 2 ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT
TYPICAL DETAILS FOR INSTALLATION (SHEET 3/3)

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS | DEDE

PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

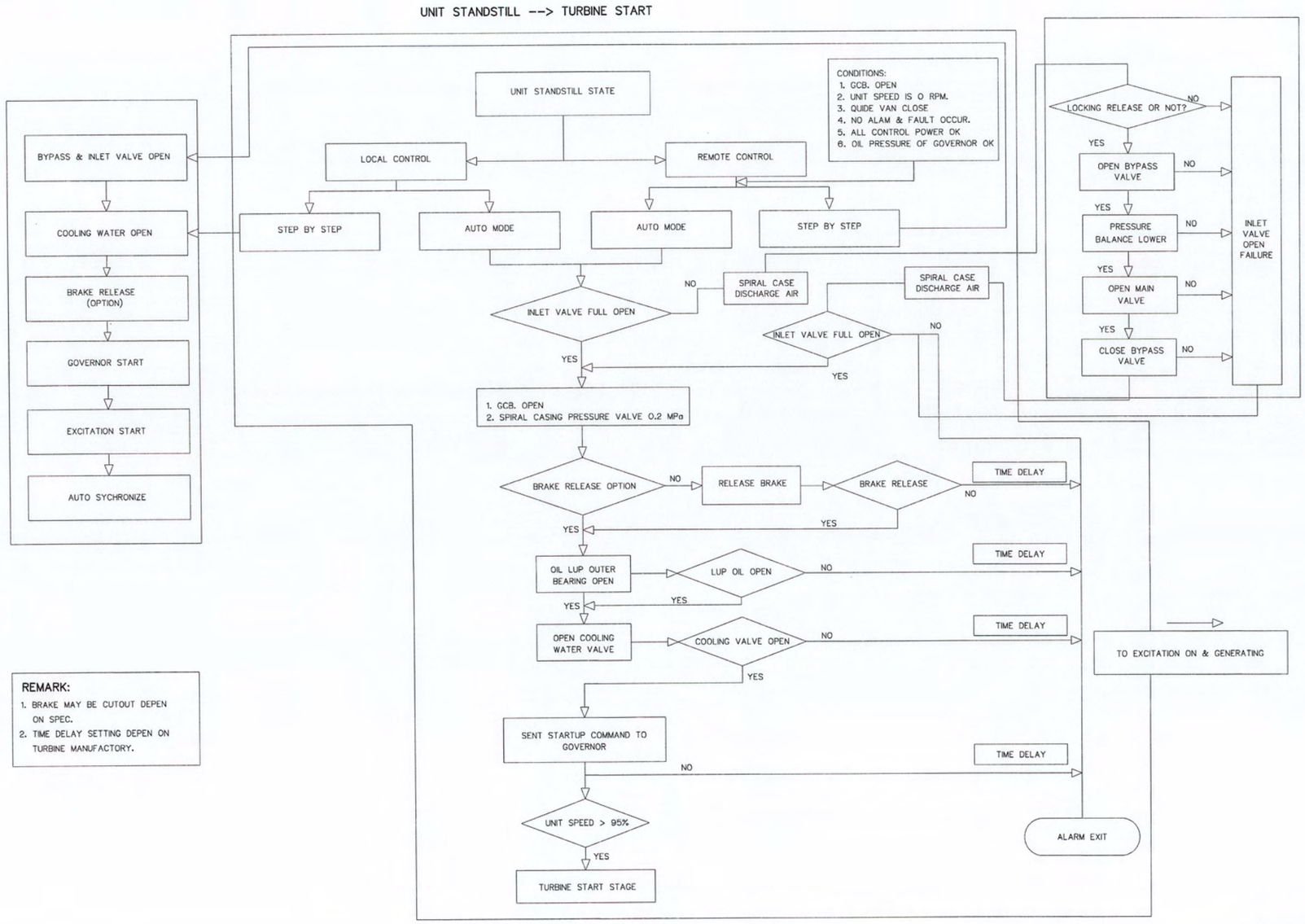
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

DESIGNED	สพท.1764	REVIEWED	
DRAWN		SUBMITTED	
CHECKED	สถ.8231	RECOMMENDED	
PROJECT MANAGER	28/10/2021 DATE	APPROVED	

DRAWING NO. AKP-EM-11
SHEET NO. 119 OF 129

AI KA PO HYDROPOWER PROJECT FRANCIS TURBINE 2 UNITS

UNIT STANDSTILL --> TURBINE START



REMARK:

1. BRAKE MAY BE CUTOUT DEPEN ON SPEC.
2. TIME DELAY SETTING DEPEN ON TURBINE MANUFACTORY.

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

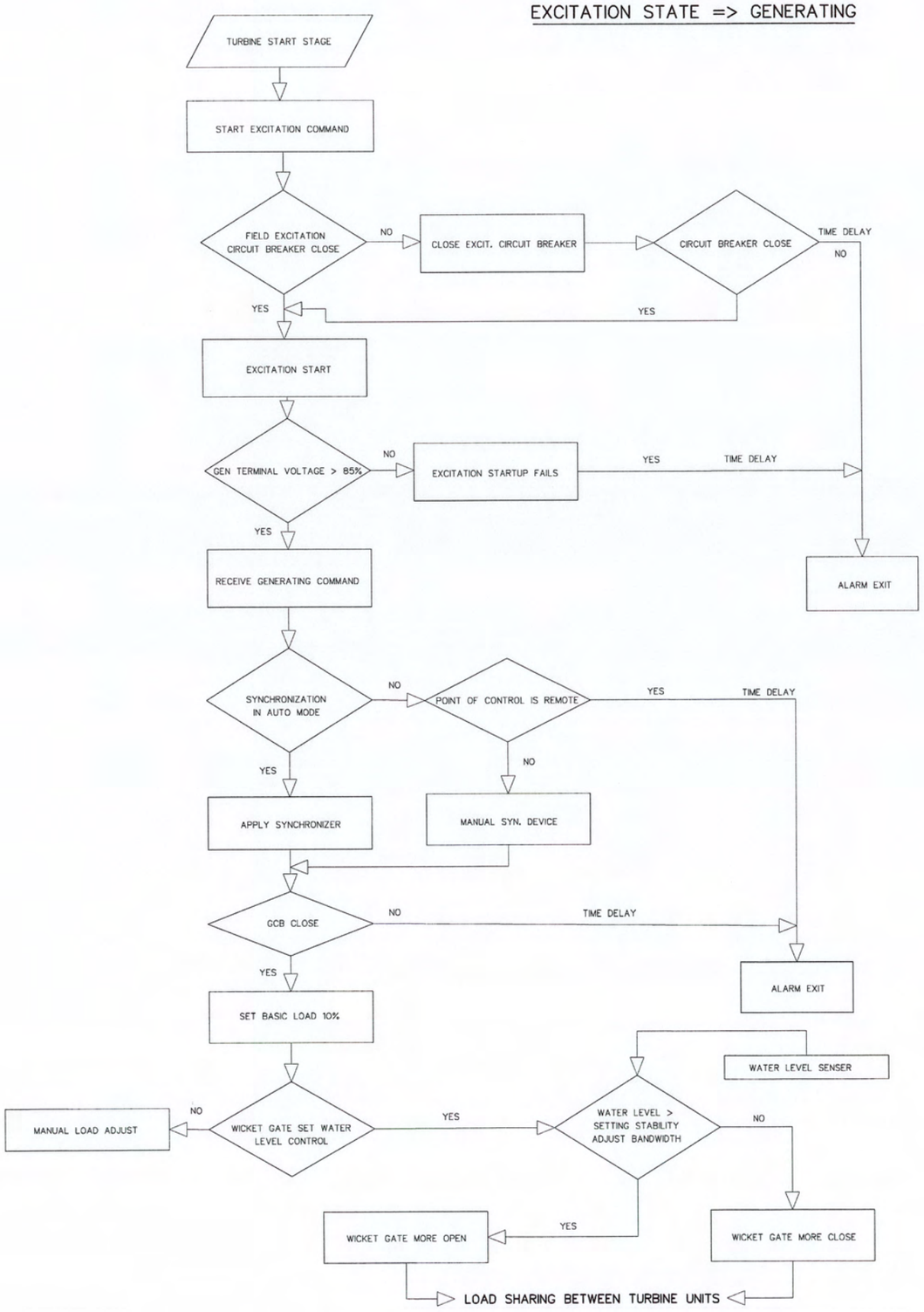
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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 2 ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT
TURBINE START

P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED	REVIEWED
DRAWN	SUBMITTED
CHECKED	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-EM-12	SHEET NO. 120 OF 129

EXCITATION STATE => GENERATING



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 2 ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT
EXCITATION

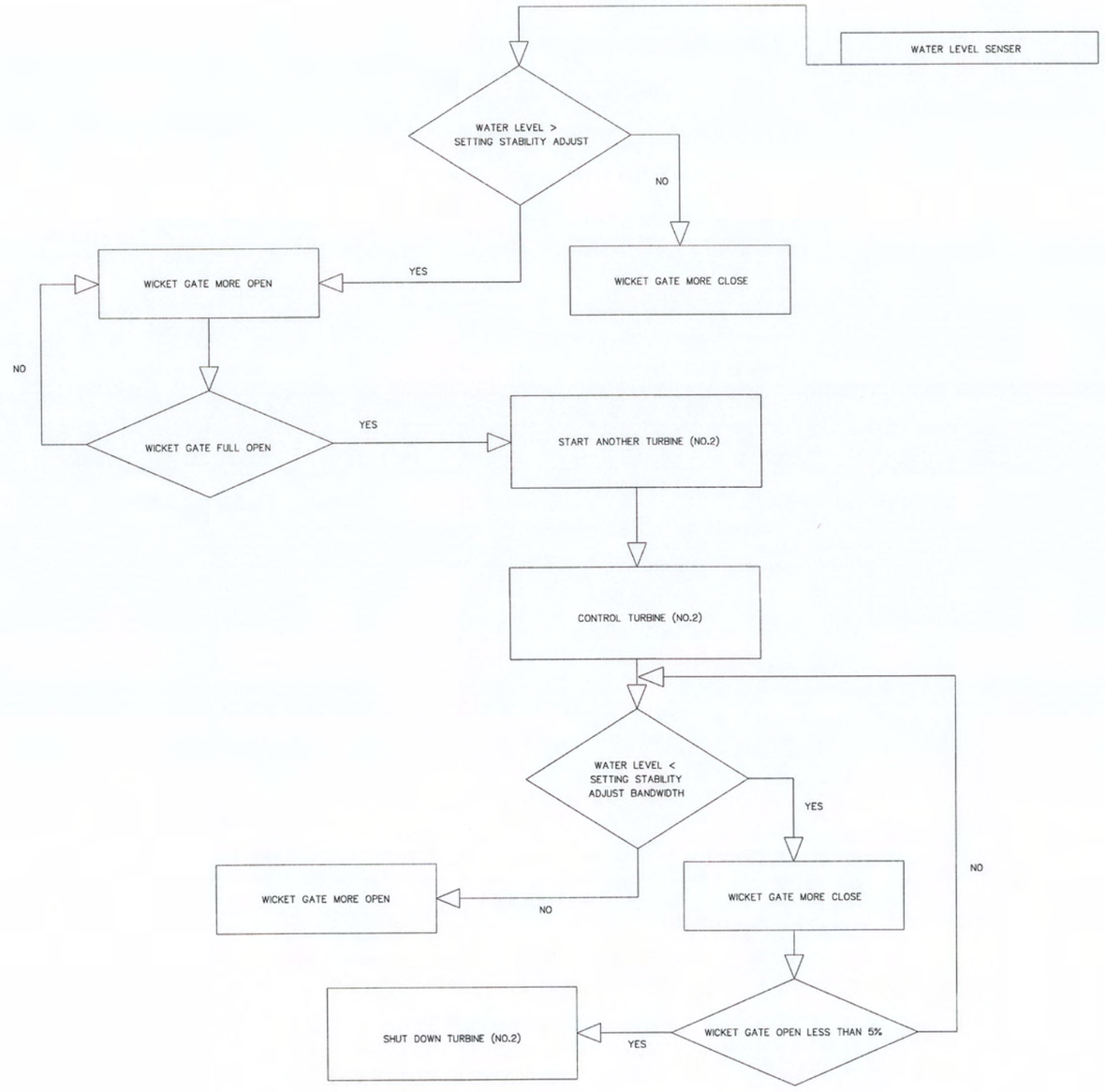
P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

DESIGNED	ก.ค.1950	REVIEWED	
DRAWN		SUBMITTED	
CHECKED	ส.ค.8231	RECOMMENDED	
PROJECT MANAGER	28/10/2021 DATE	APPROVED	

DRAWING NO. AKP-EM-13
SHEET NO. 121 OF 129

LOAD SHARING BETWEEN TURBINE UNITS



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

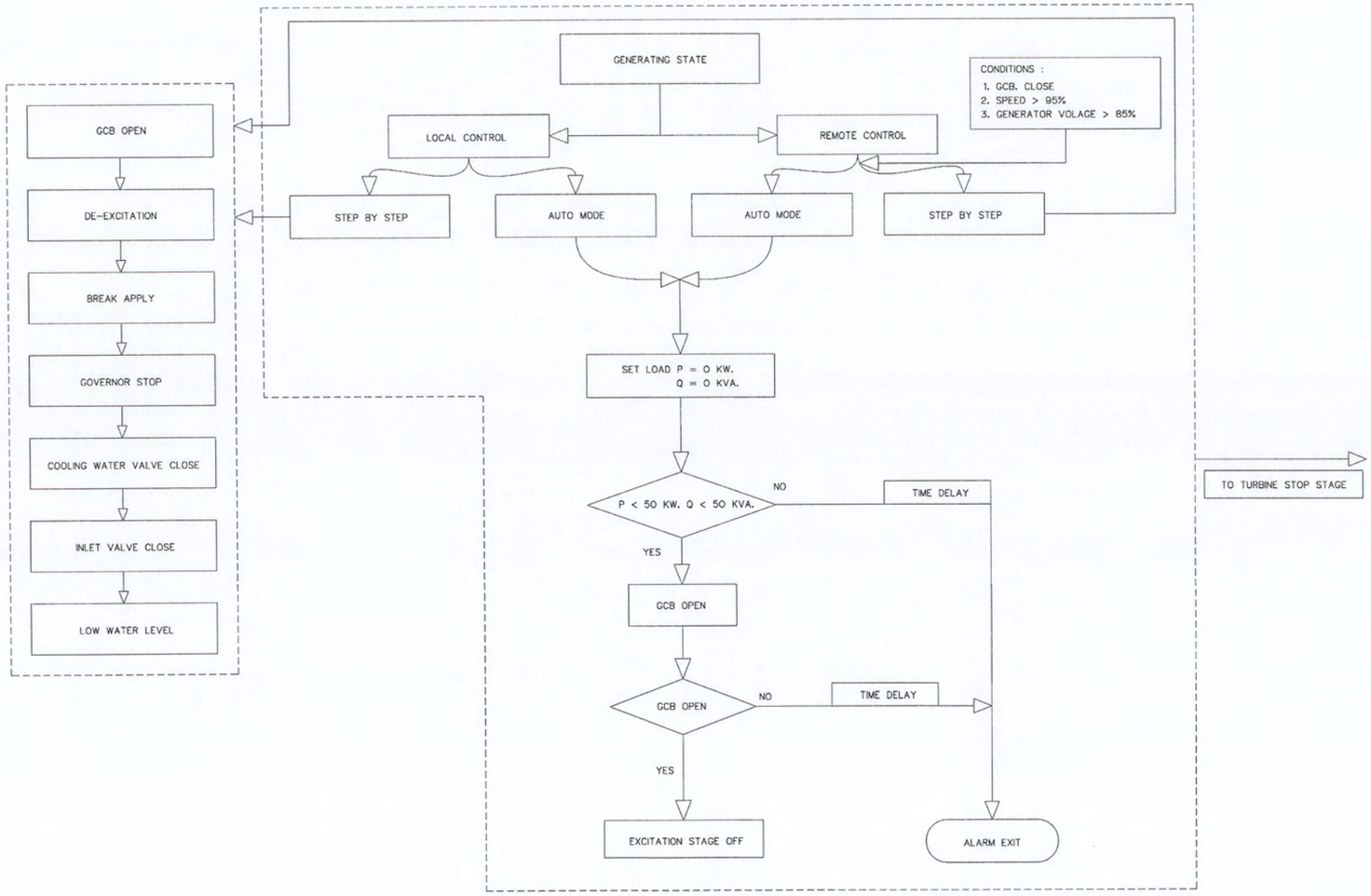
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 2 ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT
LOAD CONTROL

P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED	REVIEWED
DRAWN	SUBMITTED
CHECKED	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-EM-14	SHEET NO. 122 OF 129

GENERATING => EXCITATION OFF

(FRANCIS TURBINE 2 UNITS)



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

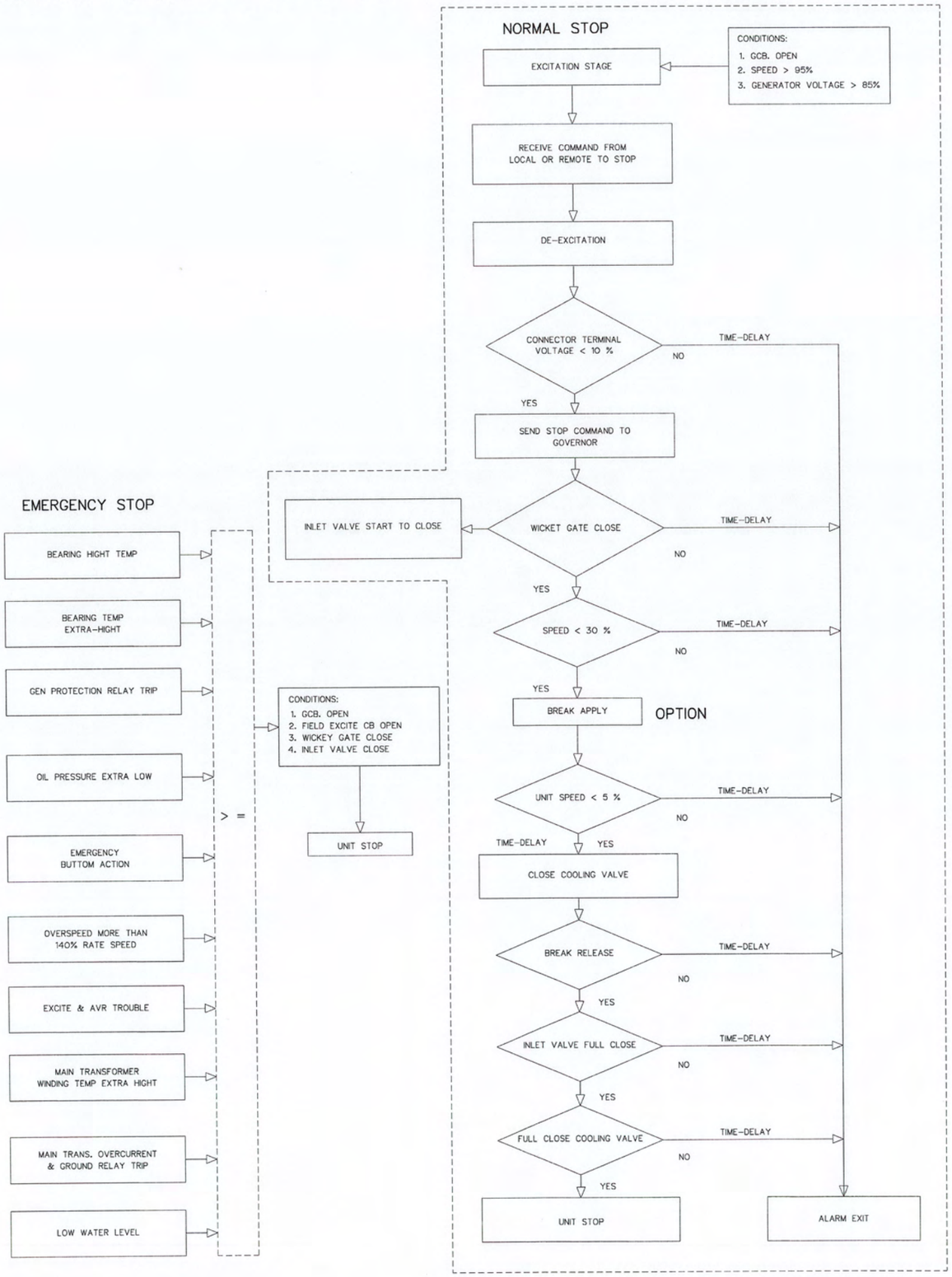
KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 2 ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT
GENERATING LOAD

PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED วิ.1950	REVIEWED
DRAWN	SUBMITTED
CHECKED สิน.8231	RECOMMENDED
PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-EM-15	SHEET NO. 123 OF 129

TURBINE STOP : DE-EXCITATION ==> UNIT STOP



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KINGDOM OF THAILAND
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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 2 ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT
TURBINE STOP

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PROJECT MANAGER 28/10/2021 DATE	APPROVED
DRAWING NO. AKP-EM-16	SHEET NO. 124 OF 129

SYMBOL LEGEND

NAME	ISOLATION VALVE	ISOLATION VALVE NORMALLY CLOSE	THROTTLE VALVE	PRESSURE RELIEF VALVE	PUMP	ELECTRIC MOTOR	PRESSURE REDUCING VALVE	LOGIC ELEMENT WITH CONVERT
SYMBOL								
NAME	3/2 DIRECTIONAL POPPET VALVE	3 WAY HAND OPERATED VALVE	THROTTLE CHECK VALVE	PRESSURE TRANSMITTER	FLOAT	SOLENOID OPERATED	SPRING OPERATED	STROKE LIMITER
SYMBOL								
NAME	SOLENOID VARIABLE OPERATED	MINIMESS COUPLING	QUICK RELEASE COUPLING	ELECTRIC JUNCTION BOX	FLEXIBLE HOSE PIPE	PRESSURE SWITCH	THERMOMETER	SIMPLEX FILTER
SYMBOL								
NAME	TEMPERATURE INDICATOR	4/2 WAYS DIRECTIONAL CONTROL VALVE	THROTTLE CHECK VALVE	NON - RETURN VALVE				
SYMBOL								
NAME	MANUAL 3 WAY VALVE	ADJUST SWITCH	NON-ADJUST SWITCH	SPRING VARIABLE OPERATED				
SYMBOL								
NAME	LEVEL INDICATOR (BLUE MOUNTED)	BLADDER ACCUMULATOR	FILLING FILTER	AIR DRY FILTER				
SYMBOL								

LINE LEGEND

PRESSURE LINE
PILOT LINE
TANK RETURN LINE

ALPHABET LEGEND

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

BY-PASS VALVE SERVOMOTOR - 1 Nos.

OPENING AND CLOSING BY OIL
OPENING TIME = 10 Sec.
CLOSING TIME = 10 Sec.

BRAKING & LIFTING SERVOMOTOR - 3 Nos.

APPLY BY OIL PRESSURE
RELEASE BY SPRING FORCE

GUIDE VANE VALVE SERVOMOTOR - 1 Nos.

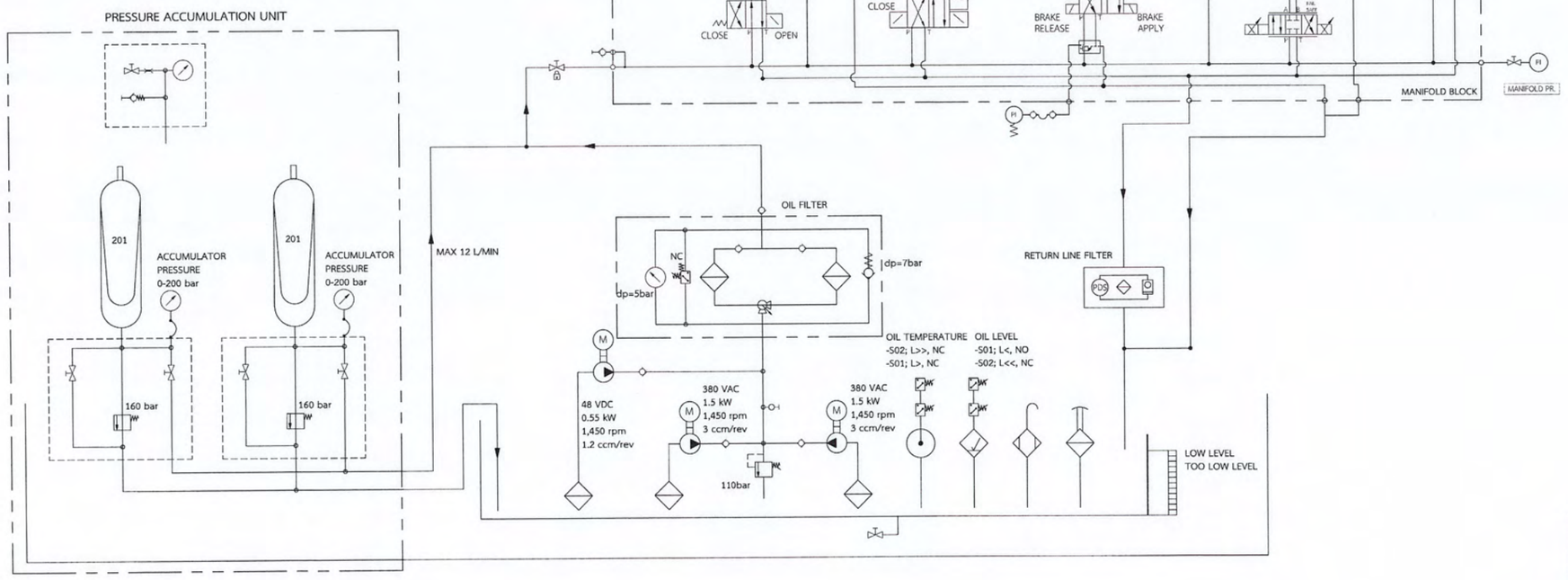
OPENING BY = OIL PRESSURE
CLOSING BY = OIL PRESSURE
OPENING TIME = 8 - 10 Sec.
CLOSING TIME = 10 Sec.

THE SIGNAL TO THE PLC

GUIDE APPRATUS

MIV SERVOMOTOR - 1 Nos.

OPENING BY OIL & CLOSING COUNTERWEIGHT
OPENING TIME = 60 Sec.
CLOSING TIME = 60 Sec.



PUMPS, MOTORS, HEATERS TECHNICAL DATA

oil pump (AC motor) capacity/ type	2x3ccm/rev (2x4 /min) / gear
AC electromotor for pump	2x1.5kW (400VAC 50HZ)
oil pump (DC motor) capacity / type:	1x1.2 ccm/rev (1x1.6 /min)/ gear
DC electromotor for pump:	1x0.55kW (48VDC)
electrical heater	NA

TECHNICAL DATA:

minimum sump tank capacity	150 L
minimum oil pressure	120 Bar
operating pressure	140 Bar
maximum pressure	170 Bar
nitrogen pre-charge presure	160 Bar
bladder accumulator capacity	
DC voltage	48 Volt
DC coils	48 V.+-10%
oil filtration (ISO 4406-1999)	ISO V46/68

NOTE :

1. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY.

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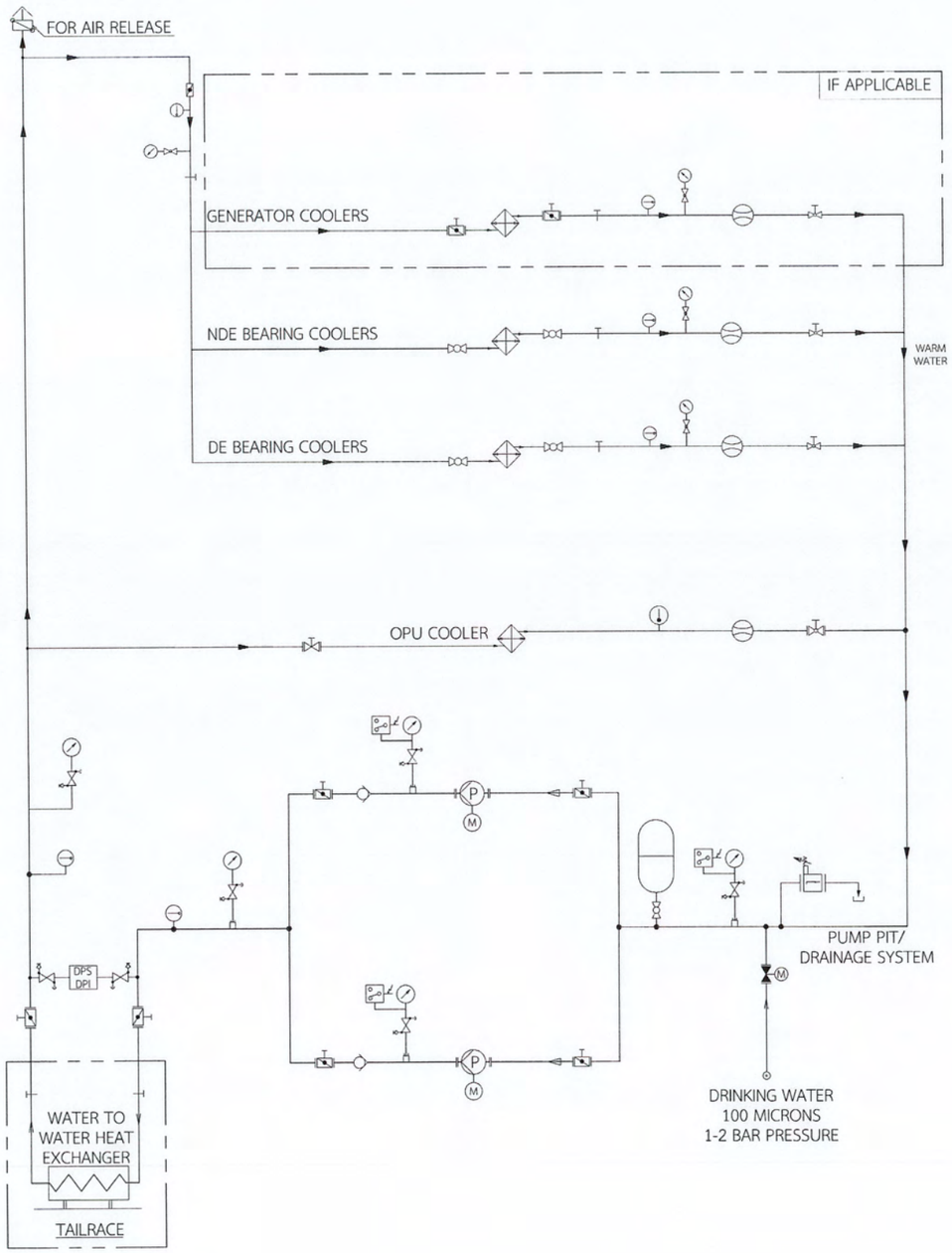
KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 2 ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT
SCHEMATIC DIAGRAM OF OIL PRESSURE UNIT FOR TURBINE, BRAKE AND MIV

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DRAWING NO. AKP-EM-17	SHEET NO. 125 OF 129

SYMBOL LEGEND					
NAME	CENTRIFUGAL PUMP MOTOR SET	ISOLATION VALVE (GATE TYPE)	CHECK VALVE	INSTRUMENT ISOLATION VALVE	WATER TO WATER HEAT EXCHANGER
SYMBOL					
NAME	CONTROL VALVE (GLOBE TYPE)	ISOLATION VALVE (BALL TYPE)	PRESSURE SWITCH	PRESSURE GAUGE	FLOW INDICATOR
SYMBOL					
NAME	DIFFERENTIAL PRESSURE SWITCH	TEMPERATURE GAUGE	MOTORIZED GATE VALVE	PRESSURE RELIEF VALVE	RTD
SYMBOL	DPS / DPI				



NOTE:

- ALL ELEVATIONS ARE IN METER.
- SUPPLY VOLTAGE: 400 VAC ±10% 3PH, 50 HZ −3% TO +5%.
- MATERIAL OF CONSTRUCTION OF PIPES SHALL BE SEAMLESS STAINLESS STEEL AS PER ASTM A 312 OR ISO 1127.
- ALL FITTINGS SHALL BE OF SS AS PER ASME B 16.9, ASME A403, ASME M 16.5, ASTM A182.
- MOC FOR ALL VALVES SHALL BE BODY−CAST STEEL & INTERNAL−SS.
- TURBINE SHAFT SEAL SYSTEM SHALL BE DESIGNED AS FOLLOW THE MANUFACTURER STANDARD.

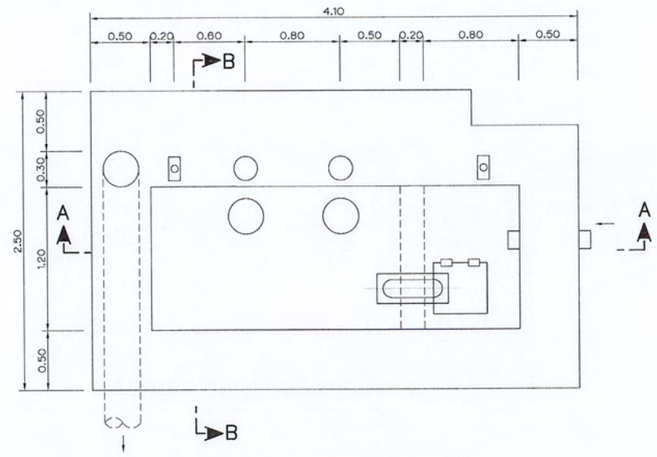
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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

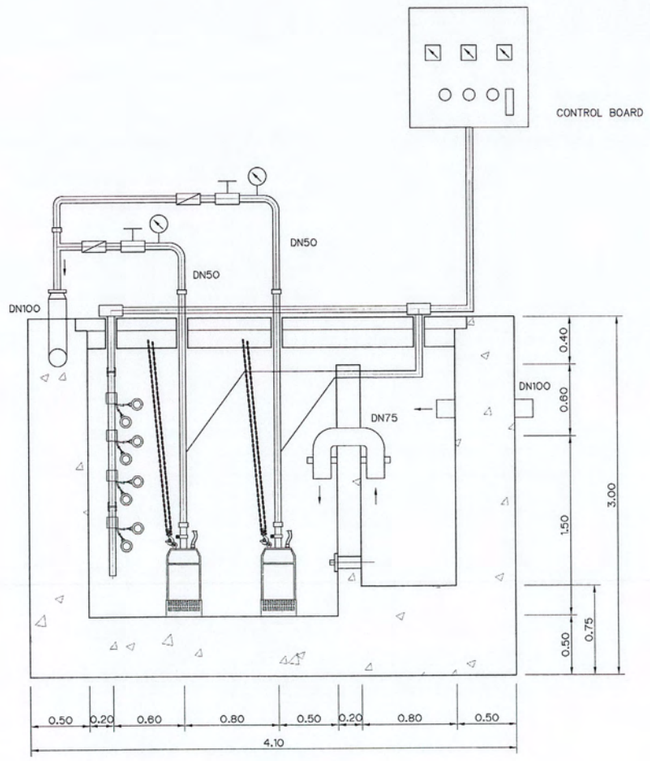
PART 2 ELECTRO−MECHANICAL EQUIPMENT
E&M EQUIPMENT
SCHEMATIC DIAGRAM FOR COOLING WATER SYSTEM

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DRAWING NO. AKP−EM−18	SHEET NO. 126 OF 129

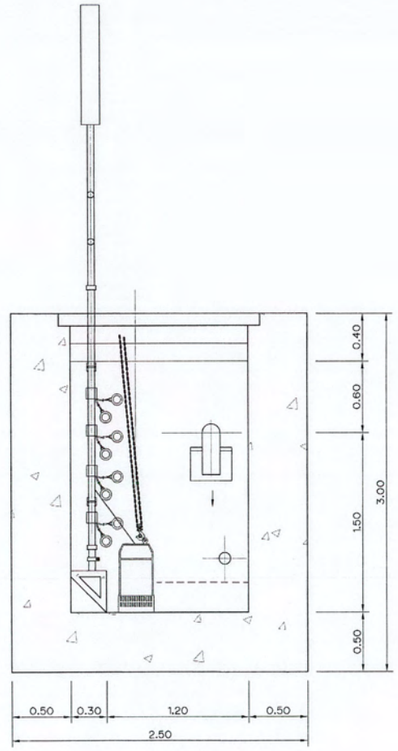


TOP VIEW
SCALE 1:25

SYMBOL LEGEND			
NAME	CENTRIFUGAL PUMP	VALVE	CHECK VALVE
SYMBOL			
NAME	PRESSURE GAUGE	LEVEL SWITCH	FOOT VALVE
SYMBOL			



SECTION A–A
SCALE 1:25



SECTION B–B
SCALE 1:25

0 0.1 0.5 1 1.5 2
SCALE 1:25 METERS

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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 2 ELECTRO–MECHANICAL EQUIPMENT
E&M EQUIPMENT
SCHEMATIC DIAGRAM FOR DRAINAGE & DEWATERING SYSTEM

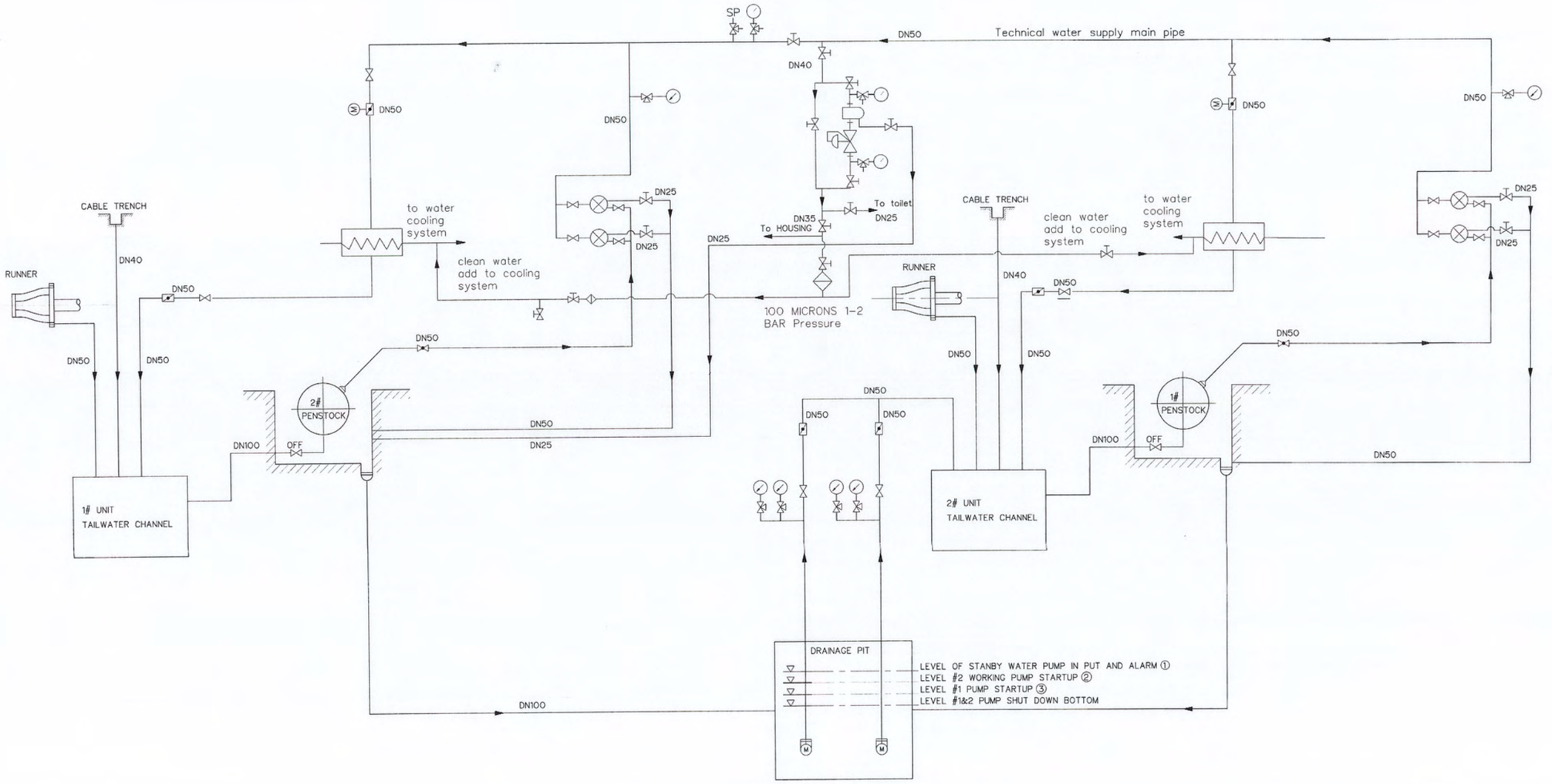
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CHECKED	25.8231	RECOMMENDED	
PROJECT MANAGER	28/10/2021 DATE	APPROVED	

DRAWING NO. AKP–EM–19
SHEET NO. 127 OF 129



LEGEND

SYMBOL	ITEM	SYMBOL	ITEM	SYMBOL	ITEM	SYMBOL	ITEM
	SUBMERSIBLE SEWAGE PUMPS	L	FLOAT TYPE LEVEL ANNUNCIATOR		SCREEN		FLUSH VALVE
	PIPELINE		GATE VALVE		BUTTERFLY VALVE	M	DRAINAGE PUMP
	CHECK VALVE		AUTOMATIC BACKWASH STRAINER	F	FLOW ANNUNCIATOR		REDUCING VALVE
	COOLER		PRESSURE GAUGE		THREE-WAY COCK		HANDLE WHEEL WASHING BASKET STRAINER
SP	INTELLIGENCE DIGITAL PRESSURE GAUGE		ELECTRIC ELEMENT		STRAINER	SP	INTELLIGENCE DIGITAL PRESSURE GAUGE

FLOTING SET

①	FLOOD ALARM
②	PUMP # 2 START
③	PUMP # 1 START
④	ALL PUMP STOP

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TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 2 ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT
SCHEMATIC DIAGRAM FOR COOLING WATER SUPPLY & DRAINAGE SYSTEM

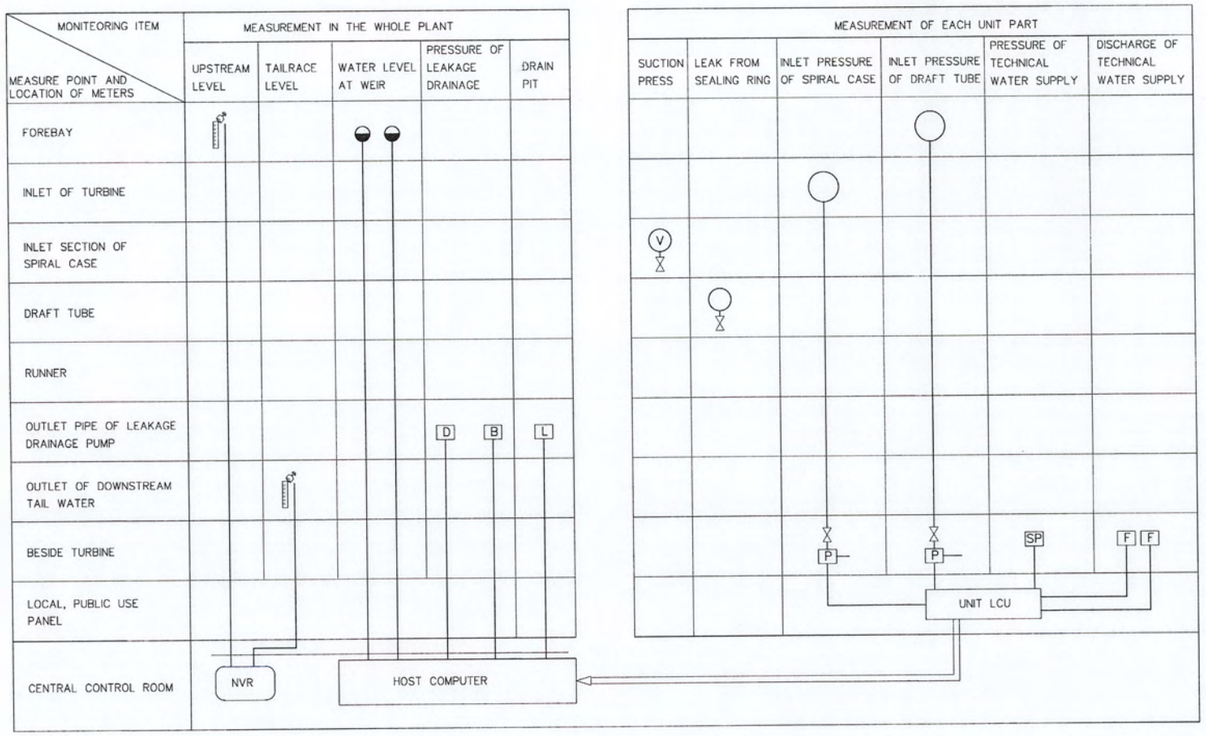
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DRAWING NO. AKP-EM-20
SHEET NO. 128 OF 129



MAIN EQUIPMENTS LIST

No.	ITEM	SPECIFICATION	UNIT	QTY	REMARKS
1	THROW-IN TYPE WATER LEVEL TRANSMITTER	0__5 m	PC	2	LEAKAGE COLLECT WELL MONITORING
2	PRESSURE TRANSMITTER	0__1 MPa	PC	4	-
3	FLOATING WATER LEVEL ANNUNCIATOR	4 LEVEL STEP	PC	1	-
4	FLOW ANNUNCIATOR		PC	4	2/UNIT
5	PRESSURE GAUGE	Y-100 0-1.4 MPa	PC	8	4/UNIT
6	PRESSURE ANNUNSIATOR	0-1 MPa	PC	2	-
7	INTELLIGENT DIGITAL PRESSURE GAUGE	Y-100 0-1.4 MPa	PC	2	-
8	VACUUM GAUGE	0__-0.1 MPa	PC	2	1/UNIT

LEGEND

SYMBOL	NAME	SYMBOL	NAME	SYMBOL	NAME	SYMBOL	NAME
	CABLE	L	FLOATING LIQUID LEVEL ANNUNCIATOR		WATER LEVEL METER	V	VACUUM GAUGE
	PIPELINE	P	PRESSURE ANNUNCIATOR		GATE VALVE		
	THROW-IN TYPE LIQUID LEVEL GAUGE	P	PRESSURE TRANSMITTER	F	FLOW ANNUNCIATOR		
SP	INTELLIGENT DIGITAL PRESSURE GAUGE		FIBER OPTIC CABLE		PRESSURE GAUGE		

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PART 2 ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT
SCHEMATIC DIAGRAM FOR WATER LEVEL MONITERING SYSTEM

NO.	DATE	REVISIONS	CHECKED	APPROVED
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DRAWING NO. AKP-EM-21
SHEET NO. 129 OF 129