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

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

# PART 1 : CIVIL WORKS AND TRANSMISSION LINE

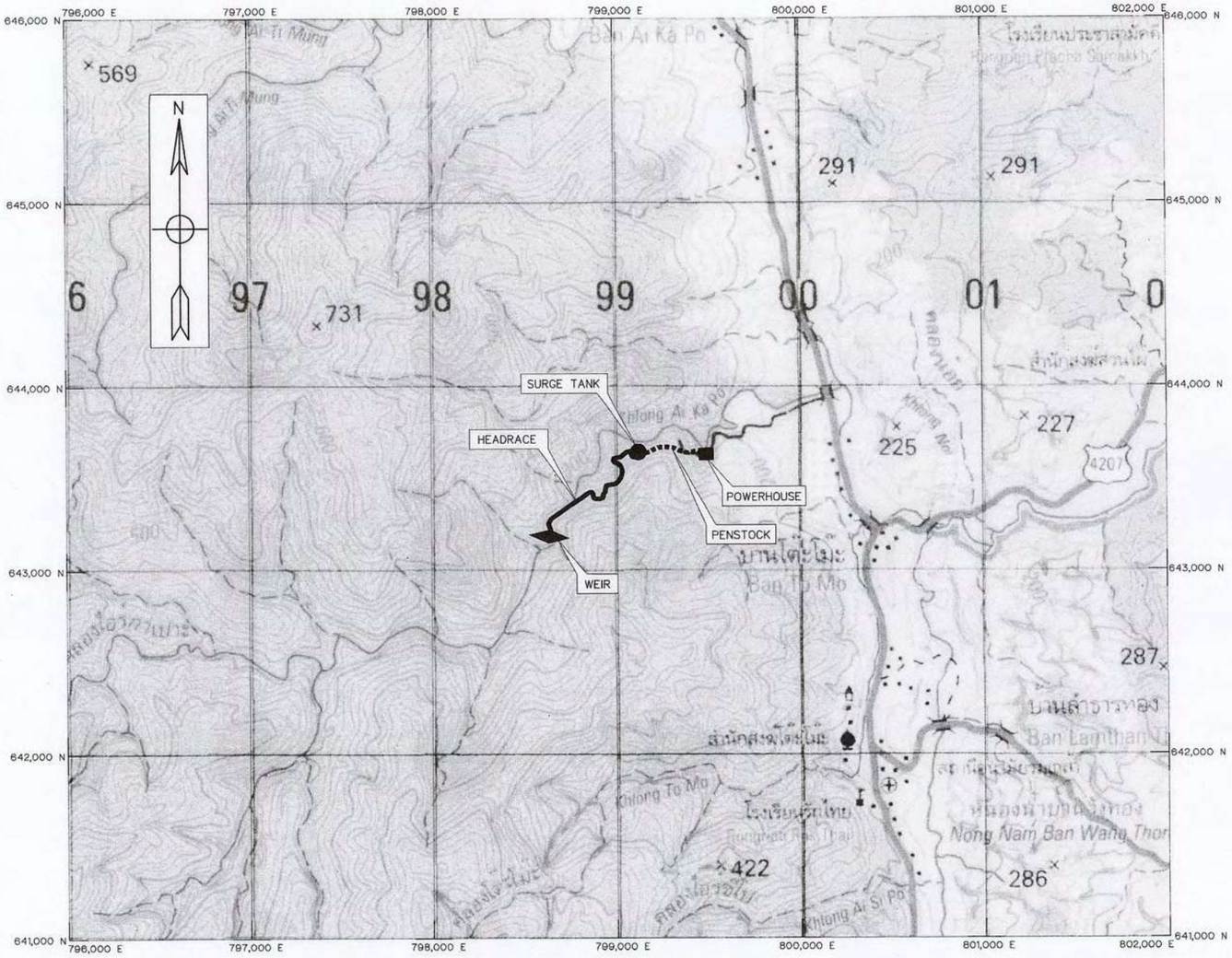
# AI KA PO HYDROPOWER PROJECT

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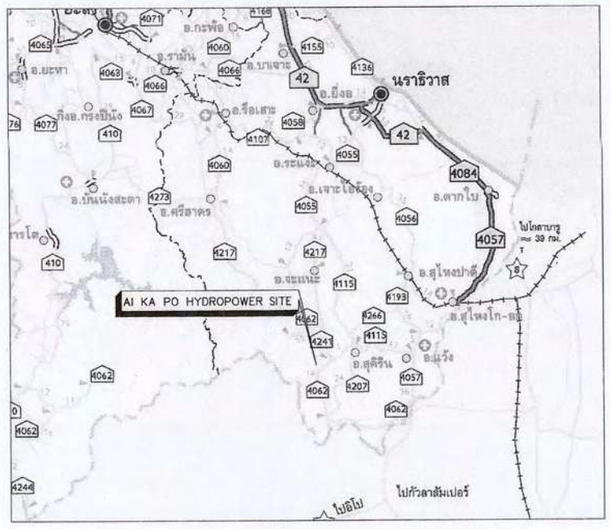

PROJECT AREA MAP

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 | | | | |
| 2 | | | | |
| 1 | | | | |
| | CONSULTANTS | | DEDE | |

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

# AI KA PO HYDROPOWER PROJECT

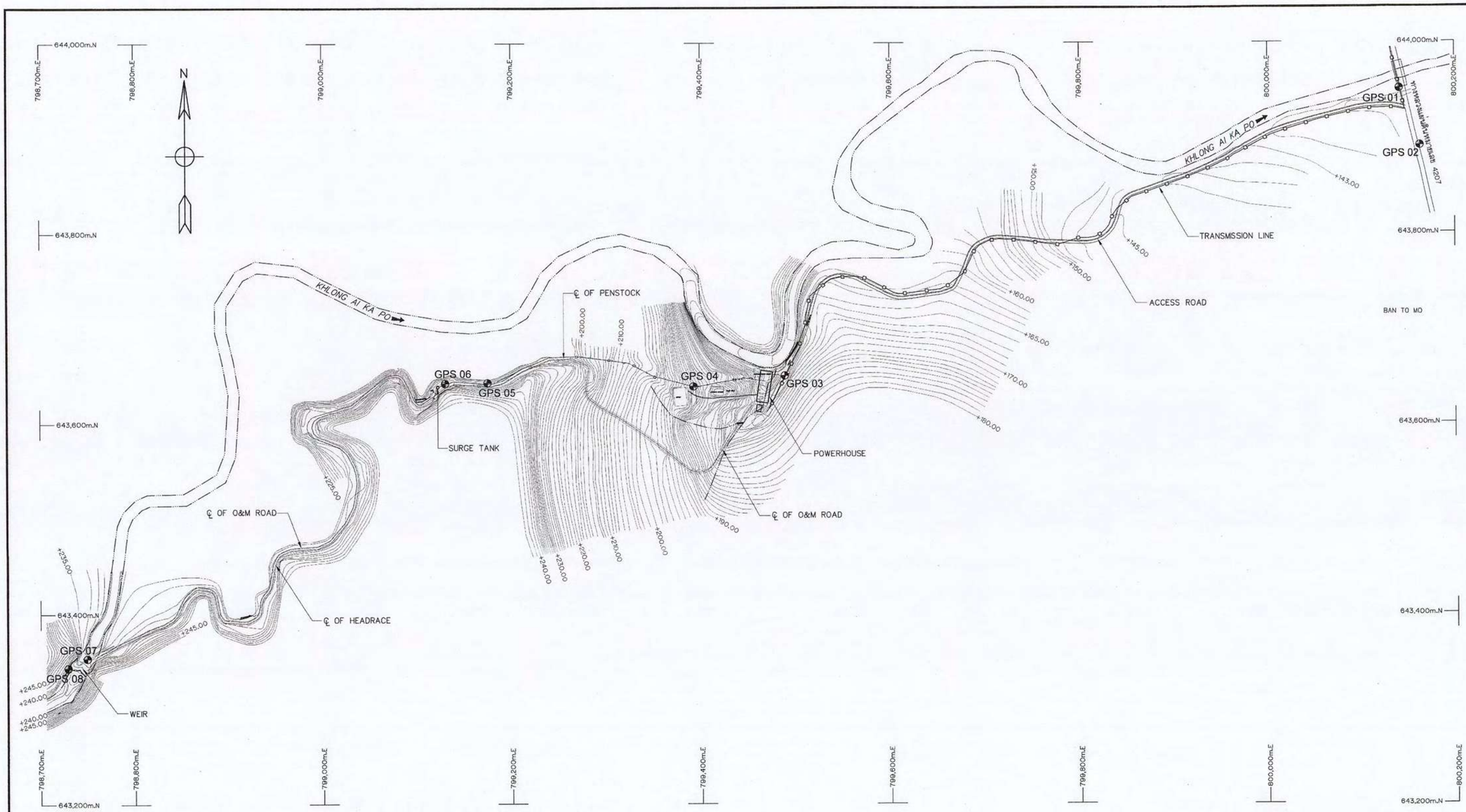
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

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 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED | 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 | | | หมุดสนามเสถียรบริเวณทางเข้าสะพาน |
| | | | | | 159°-29'-23" | 63.712 | Distance & Azimuth from GPS 01 to GPS 02 |
| 2 | GPS 02 | 643,891.078 | 800,163.078 | 141.559 | | | หมุดสนามเสถียรบนฐานคอนกรีตสี่เหลี่ยมบริเวณหน้าป้ายจราจร |
| 3 | GPS 03 | 643,650.377 | 799,488.400 | 162.008 | | | หมุดสนามเสถียรอยู่บริเวณหน้าโรงยาม |
| | | | | | 264°-43'-35" | 96.875 | Distance & Azimuth from GPS 03 to GPS 04 |
| 4 | GPS 04 | 643,639.030 | 799,392.192 | 189.018 | | | หมุดสนามเสถียรอยู่บริเวณจุดรองรับท่อลงน้ำ |
| 5 | GPS 05 | 643,642.955 | 799,174.890 | 229.238 | | | หมุดสนามเสถียรบนฐานคอนกรีตสี่เหลี่ยมบริเวณอาคารลดแรงดัน |
| | | | | | 270°-02'-44" | 44.945 | Distance & Azimuth from GPS 05 to GPS 06 |
| 6 | GPS 06 | 643,642.282 | 799,129.950 | 230.934 | | | หมุดสนามเสถียรบนฐานคอนกรีตสี่เหลี่ยมบริเวณพื้นดิน |
| 7 | GPS 07 | 643,353.531 | 798,749.252 | 234.302 | | | หมุดสนามเสถียรอยู่บนโขดหินบริเวณหน้าน้ำตก |
| | | | | | 116°-20'-29" | 22.375 | Distance & Azimuth from GPS 07 to GPS 08 |
| 8 | GPS 08 | 643,343.603 | 798,729.200 | 238.237 | | | หมุดสนามเสถียรอยู่บริเวณรอบน้ำตกฝั่งซ้ายที่ตะวันตก |

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 | | | | |

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

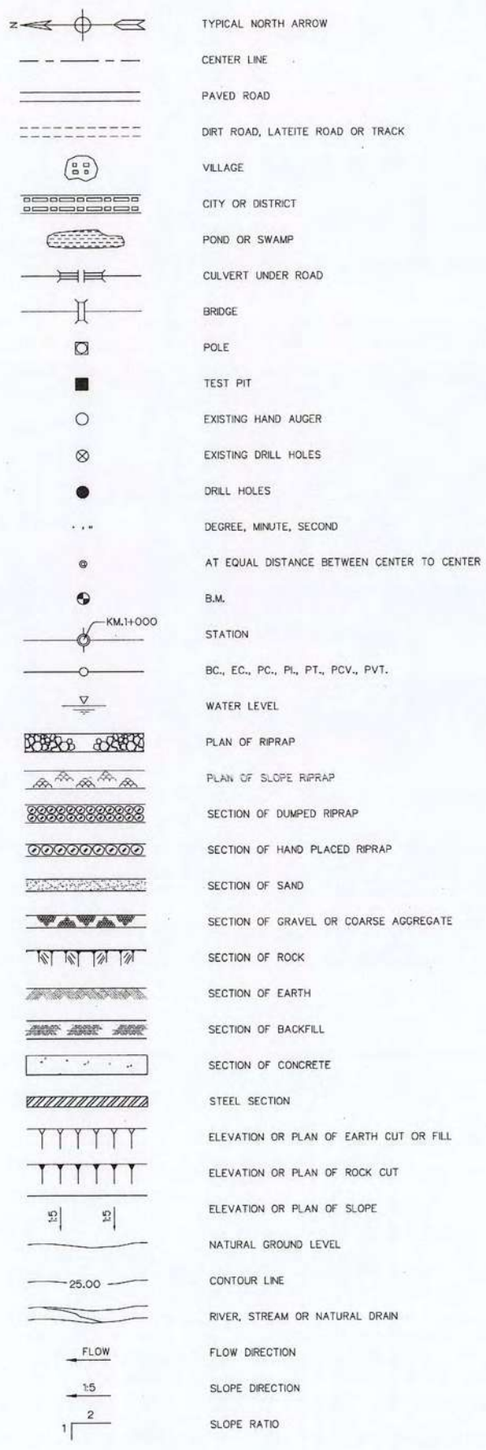
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
GENERAL
PROJECT MAP

| | |
|---|---|
| PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTAN'S 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-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.$^2$

| NO. | DATE | REVISIONS | CHECKED | APPROVED |
|---|---|---|---|---|
| 3 | | | | |
| 2 | | | | |
| 1 | | | | |
| | CONSULTANTS | | DEDE | |

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

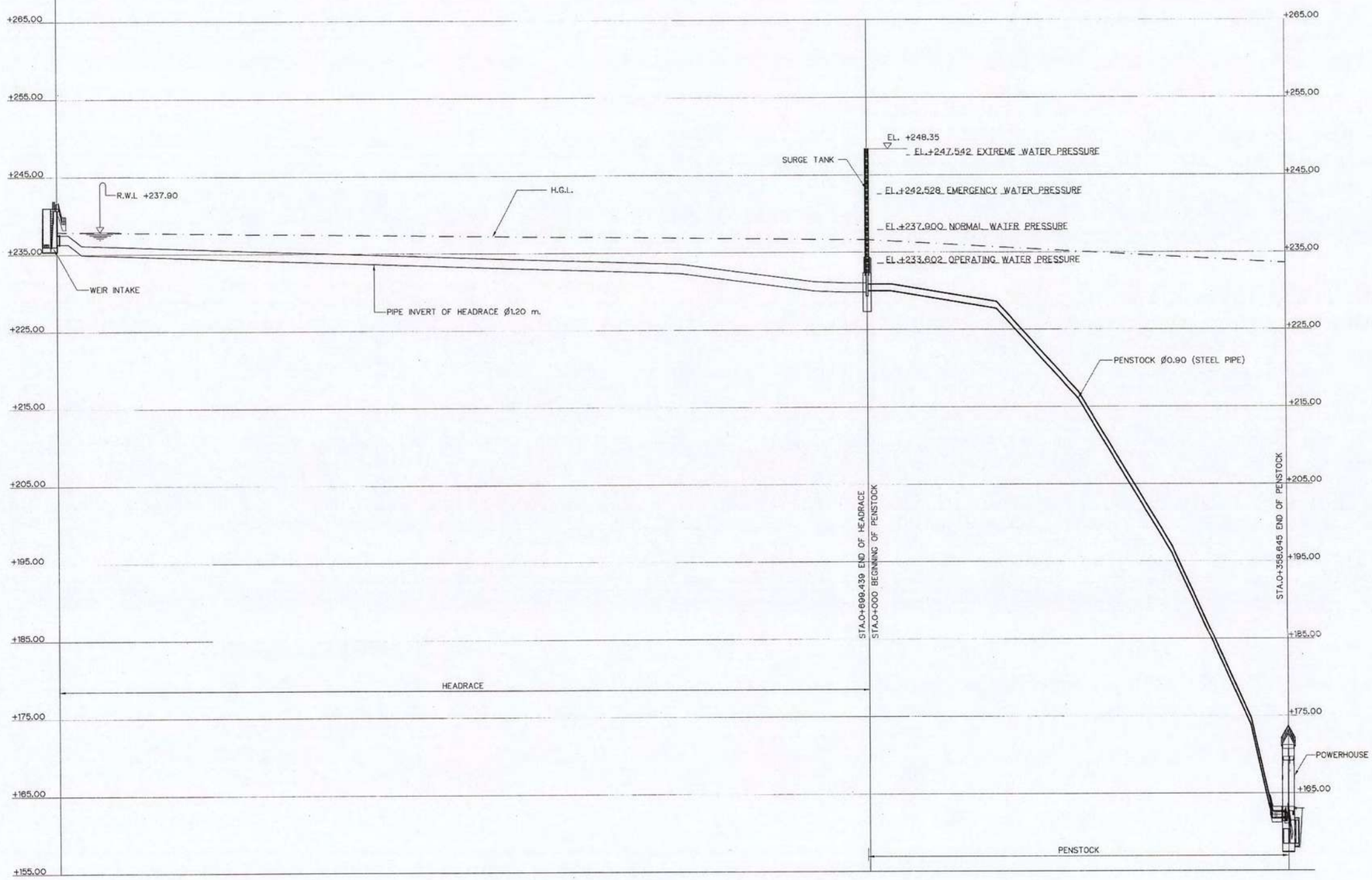
**AI KA PO HYDROPOWER PROJECT**
**TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT**

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

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| | | | |
|---|---|---|---|
| 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 |




## 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.

## PROFILE ALONG WATERWAY ℄

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

| 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 |

0 5 10 15 20 25
SCALE 1:300 METERS

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

| NO. | DATE | REVISIONS | CHECKED | APPROVED |
|---|---|---|---|---|
| 3 | | | | |
| 2 | | | | |
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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

| | |
|---|---|
| PCM P&C MANAGEMENT CO., LTD. / CDD SPT CONSULTANTS CO., LTD. | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY |
| DESIGNED RB.29074 RB.9482 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED RB.8231 | RECOMMENDED |
| PROJECT MANAGER 28/10/2021 DATE | APPROVED |
| DRAWING NO. AKP-GN-04 | SHEET NO. 4 OF 129 |

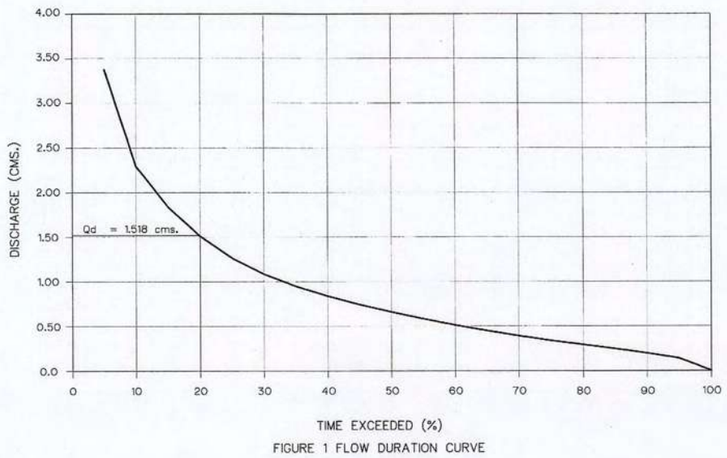



FIGURE 1 FLOW DURATION CURVE

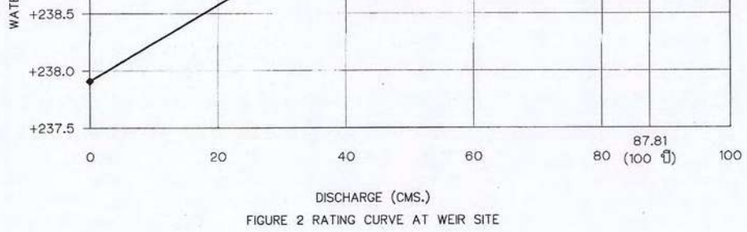



FIGURE 2 RATING CURVE AT WEIR SITE

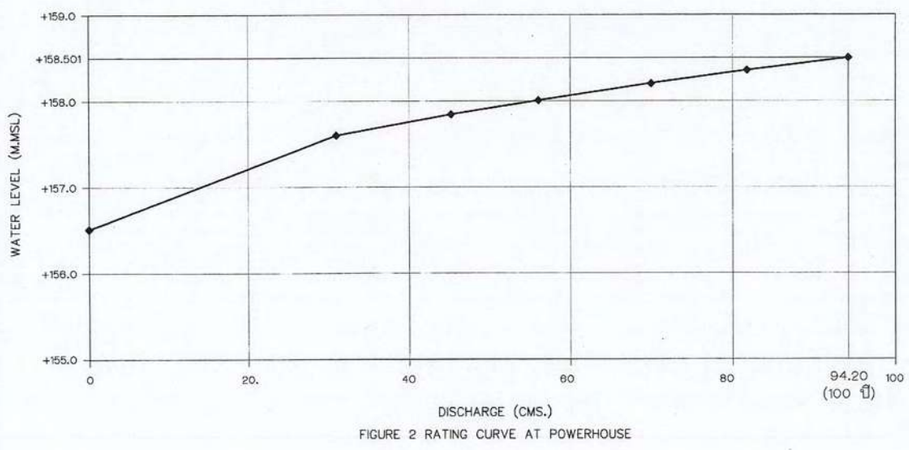
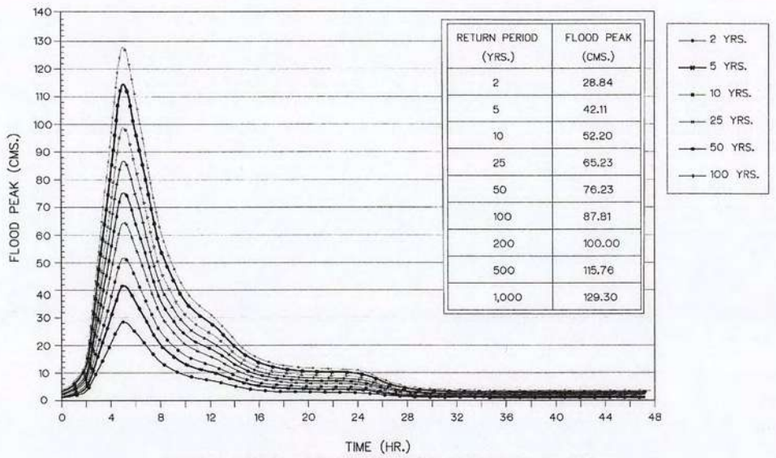
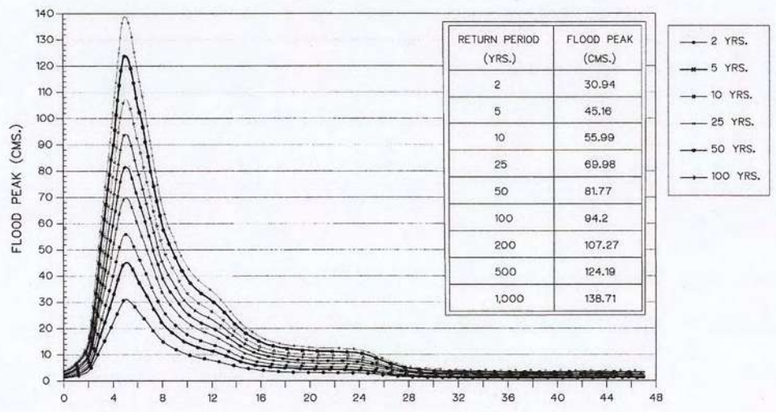



FIGURE 2 RATING CURVE AT POWERHOUSE



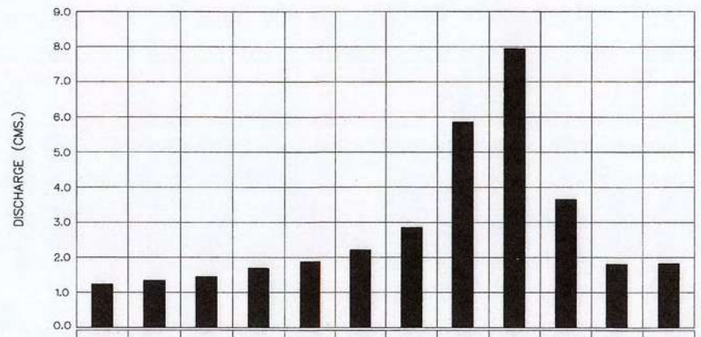

| RETURN PERIOD (YRS.) | FLOOD PEAK (CMS.) |
|---|---|
| 2 | 28.84 |
| 5 | 42.11 |
| 10 | 52.20 |
| 25 | 65.23 |
| 50 | 76.23 |
| 100 | 87.81 |
| 200 | 100.00 |
| 500 | 115.76 |
| 1,000 | 129.30 |

FIGURE 4 VARIOUS FLOOD RETURN PERIOD HYDROGRAPH AT WEIR




| 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




| | 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

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

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

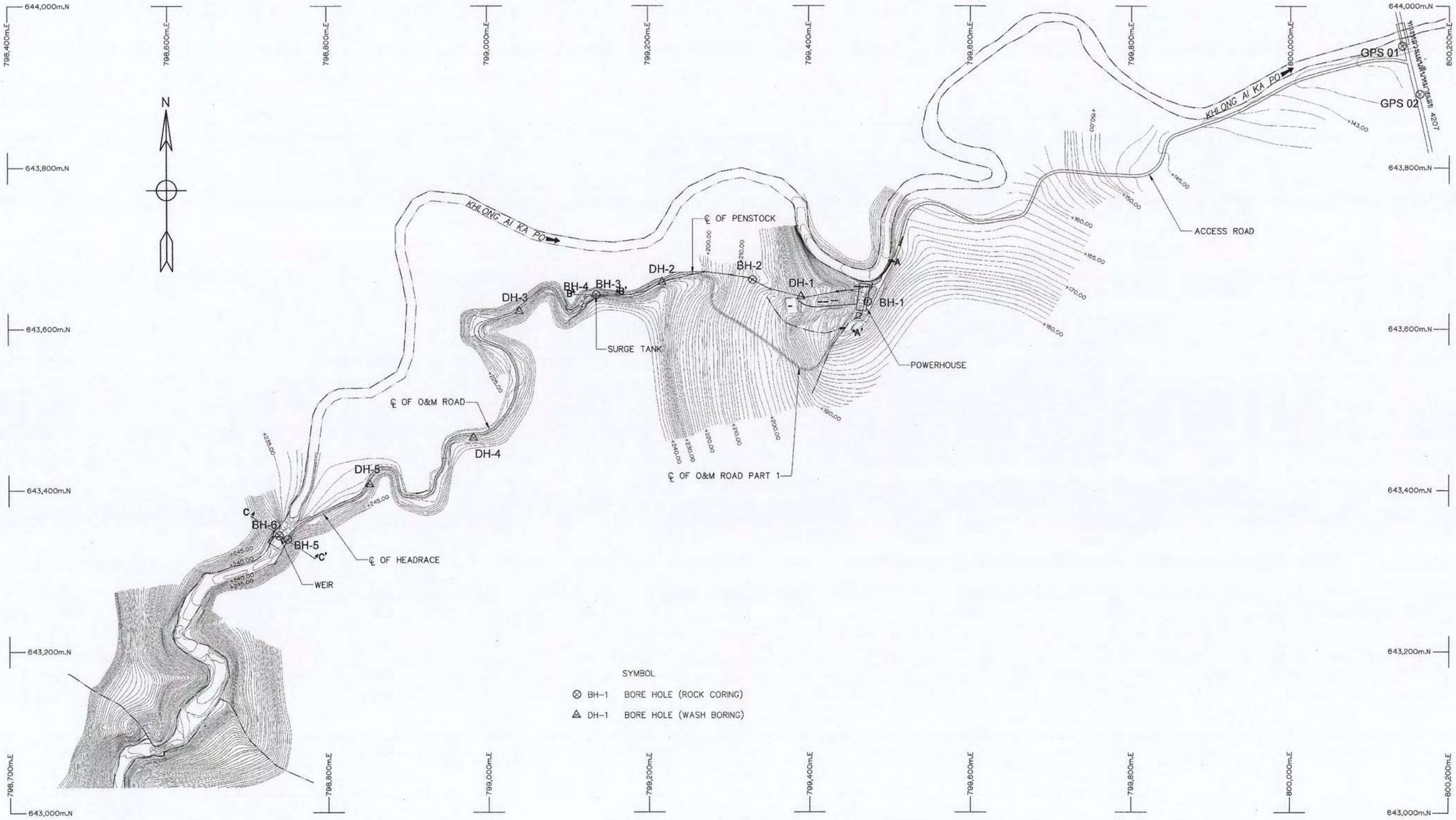
| NO. | DATE | REVISIONS | CHECKED | APPROVED |
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| | CONSULTANTS | | DEDE | |

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SPT CONSULTANTS CO., LTD.

DESIGNED กิตติพงษ์ 28.29074 ศักดิ์ชัย 28.9482
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-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 | บริเวณอาคารรถดแรงดัน (SURGE TANK) |
| 4 | BH-4 | 643,642.286 | 799,128.163 | 10 | บริเวณอาคารรถดแรงดัน (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

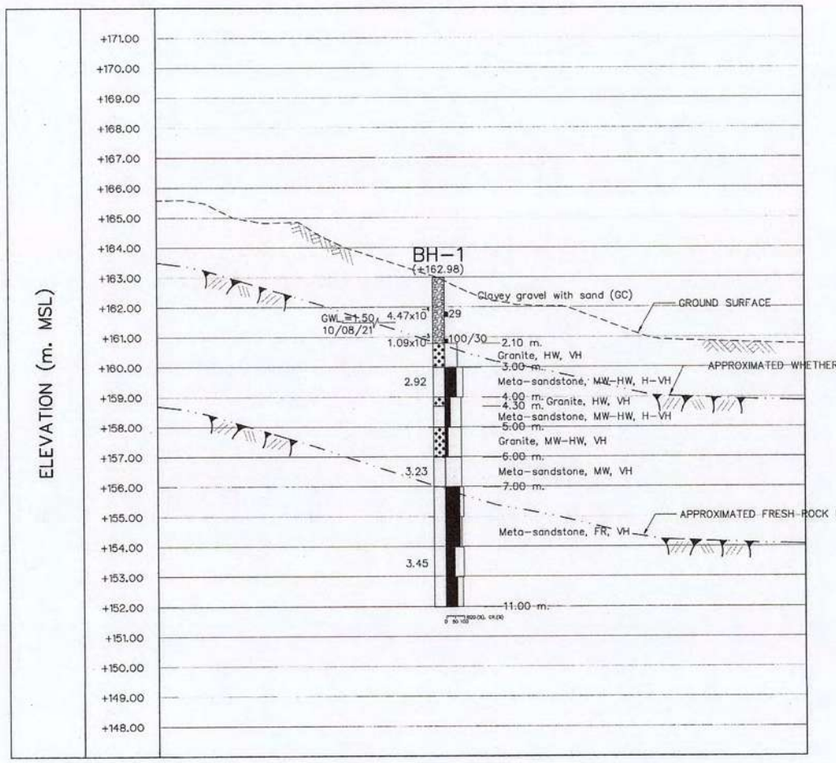
| NO. | DATE | REVISIONS | CHECKED | APPROVED |
|---|---|---|---|---|
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| | CONSULTANTS | | DEDE | |

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

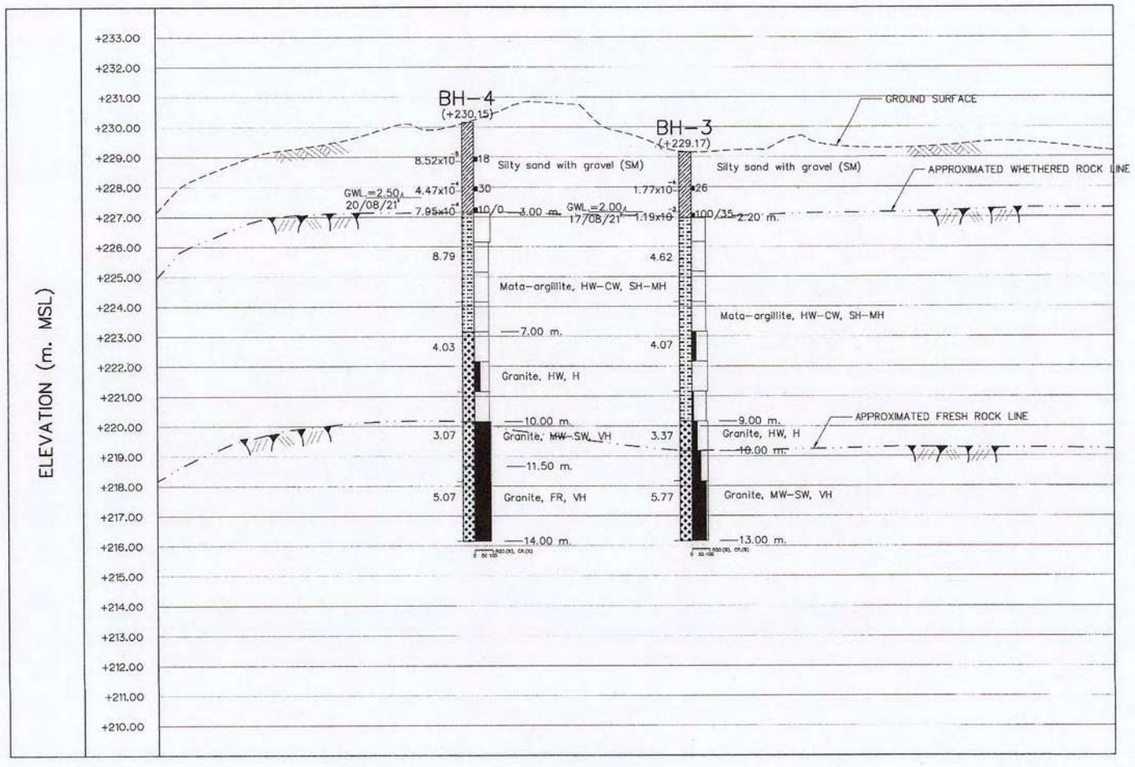
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
GENERAL
GEOTECHNICAL INVESTIGATION PLAN

| | |
|---|---|
| PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY |
| DESIGNED ณัฐพล วิชัยดิษฐ 28.2907 | REVIEWED |
| DRAWN | SUBMITTED 28.8969 |
| CHECKED 28.8231 | RECOMMENDED |
| 28/10/2021 PROJECT MANAGER DATE | APPROVED |
| DRAWING NO. AKP-GN-06 | SHEET NO. 6 OF 129 |




SECTION A-A

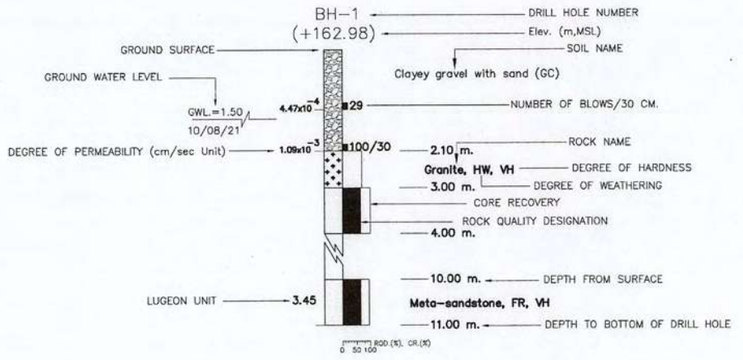
SCALE 1:100




SECTION B-B

SCALE 1:100

## EXPLANATION




0 25 50 75 100 125

SCALE 1:100 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

**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 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 HARDNESS

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

| NO. | DATE | REVISIONS | CHECKED | APPROVED |
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| 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
GENERAL
GEOLOGICAL SECTION A-A AND B-B

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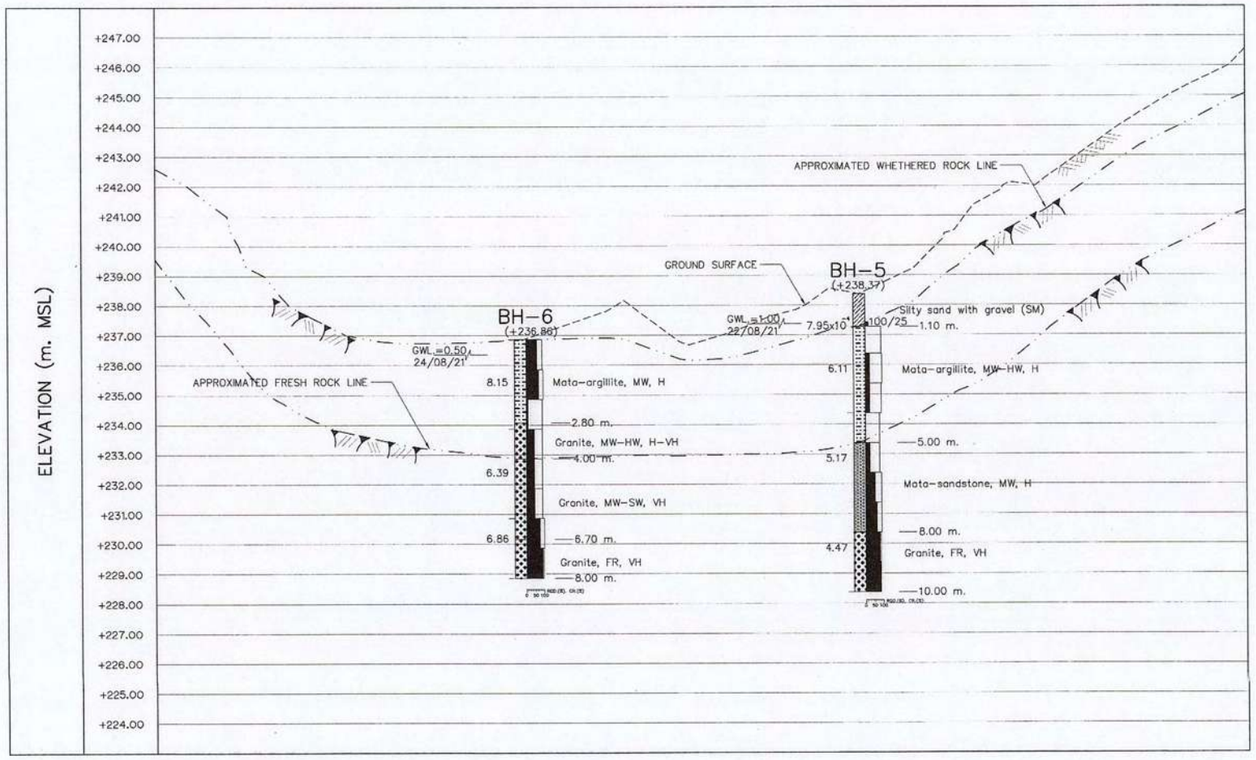
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

| | |
|---|---|
| DESIGNED | 10 มี.ค. พ.ศ.2074 พิชิตชัย ศิริพงษ์ |
| DRAWN | |
| CHECKED | พิชิตชัย ศิริพงษ์ |
| REVIEWED | ดำรงค์ |
| SUBMITTED | |
| RECOMMENDED | |
| APPROVED | เฉลิมชัย |

PROJECT MANAGER 28/10/2021 DATE

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
- 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

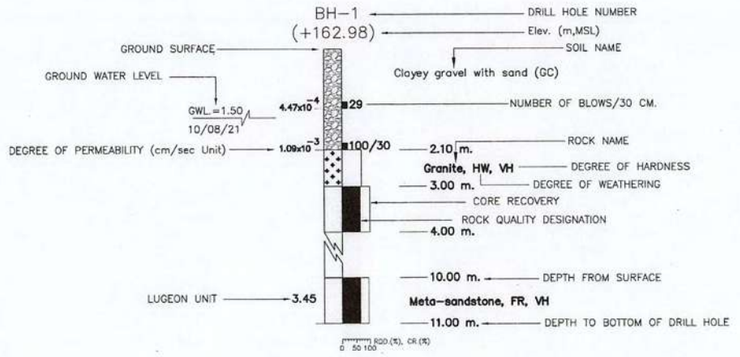
DEGREE OF PERCENTAGE OF RQD.

- < 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

## 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

| NO. | DATE | REVISIONS | CHECKED | APPROVED |
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| 3 | | | | |
| 2 | | | | |
| 1 | | | | |

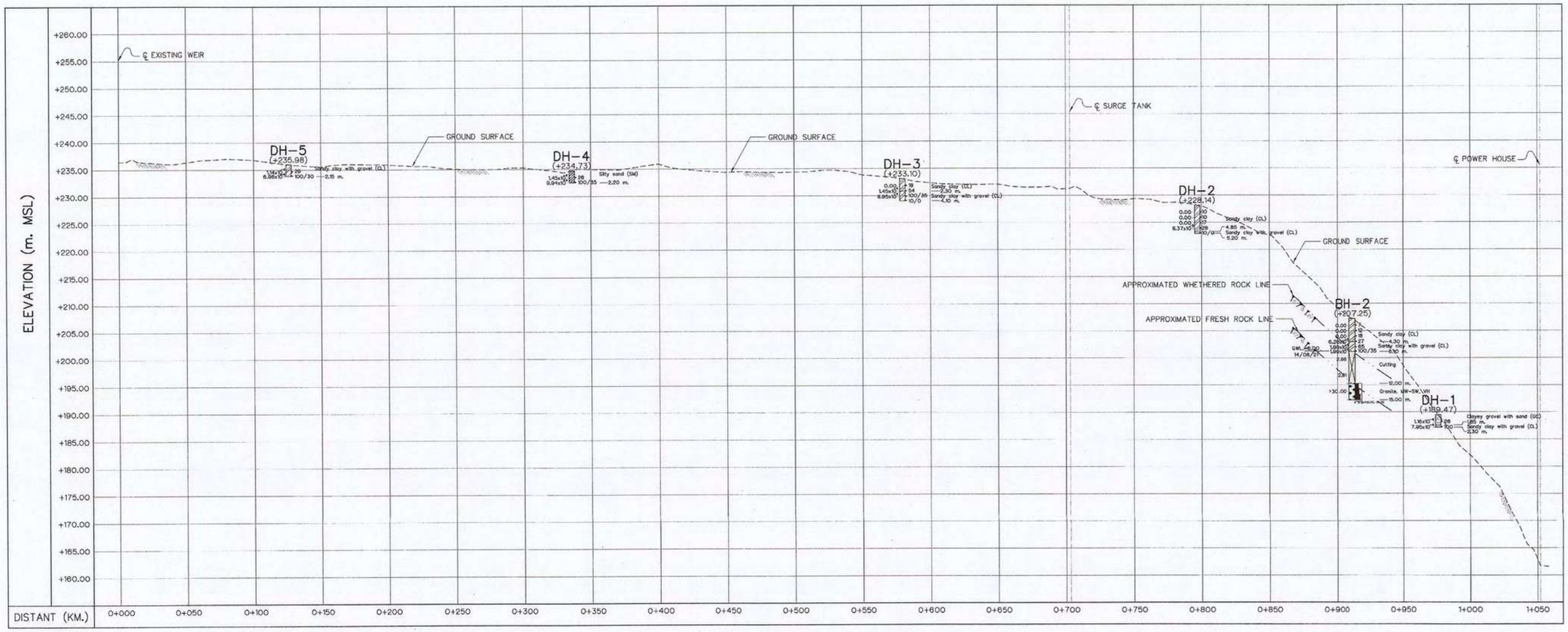
CONSULTANTS | DEDE

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

DESIGNED RE.29074 RE.8969
DRAWN
CHECKED RE.8231
28/10/2021
PROJECT MANAGER DATE

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

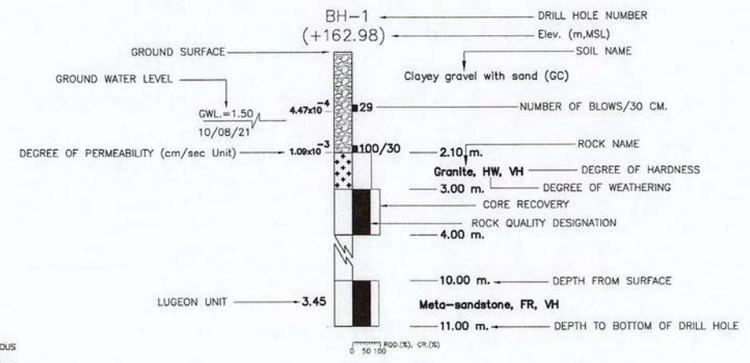
DRAWING NO. AKP-GN-08
SHEET NO. 8 OF 129




## PROFILE

HORIZONTAL SCALE 1:1,800
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

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

0 10 20 30 40 50
SCALE 1:400 METERS
0 50 100 150 200
SCALE 1:1,600 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
GENERAL
GEOLOGICAL OF HEADRACE AND PENSTOCK

| NO. | DATE | REVISIONS | CHECKED | APPROVED |
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| 3 | | | | |
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| | CONSULTANTS | | DEDE | |

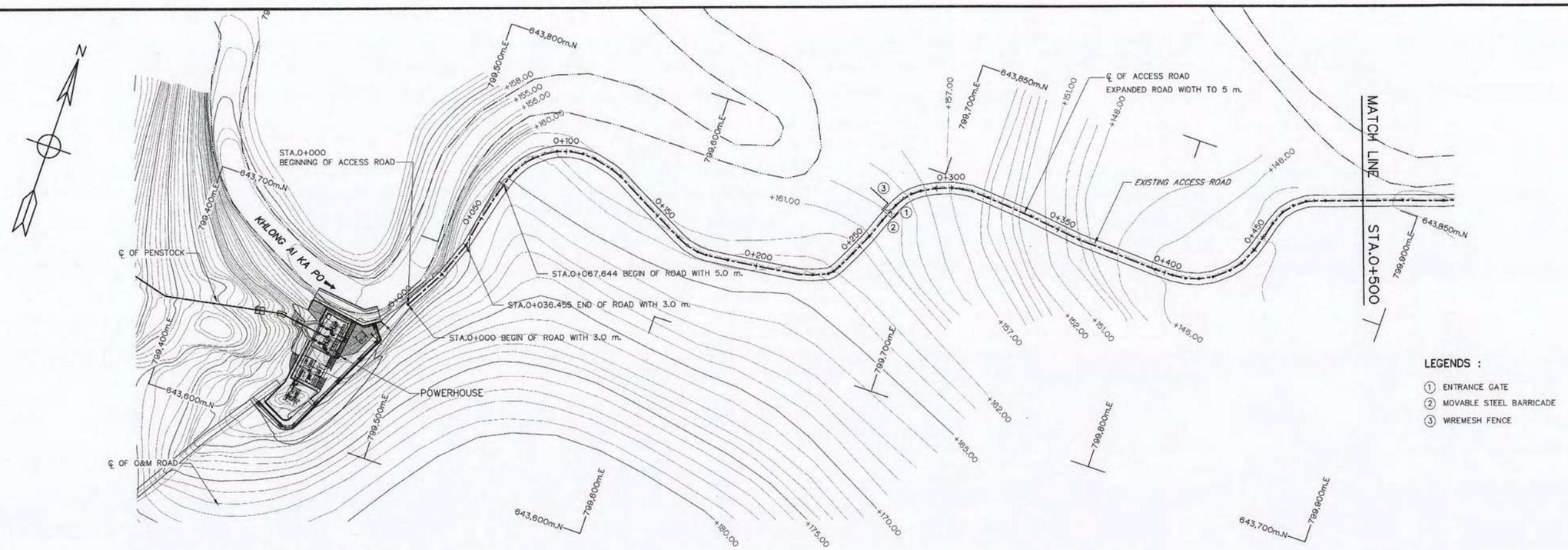
PCM P&C MANAGEMENT CO., LTD.
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MINISTRY OF ENERGY

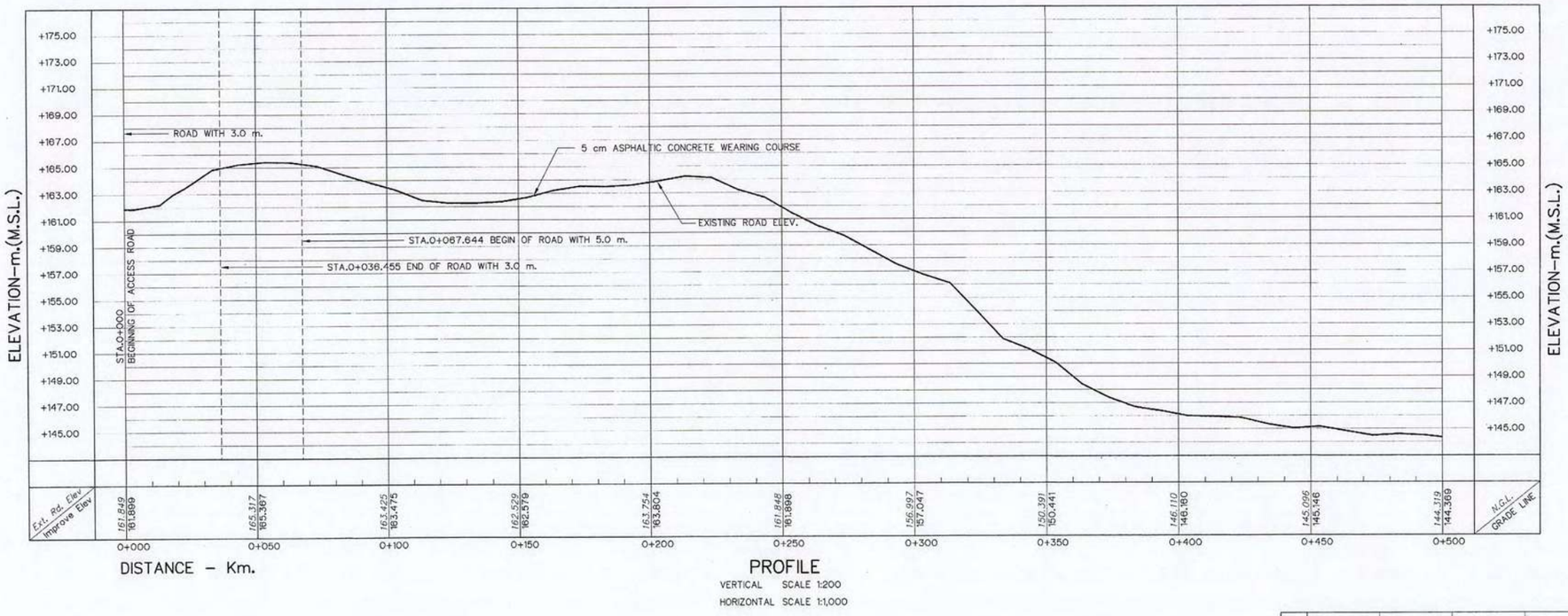
DESIGNED 28/10/2021 281.8969
DRAWN
CHECKED 281.8231
PROJECT MANAGER 28/10/2021 DATE

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

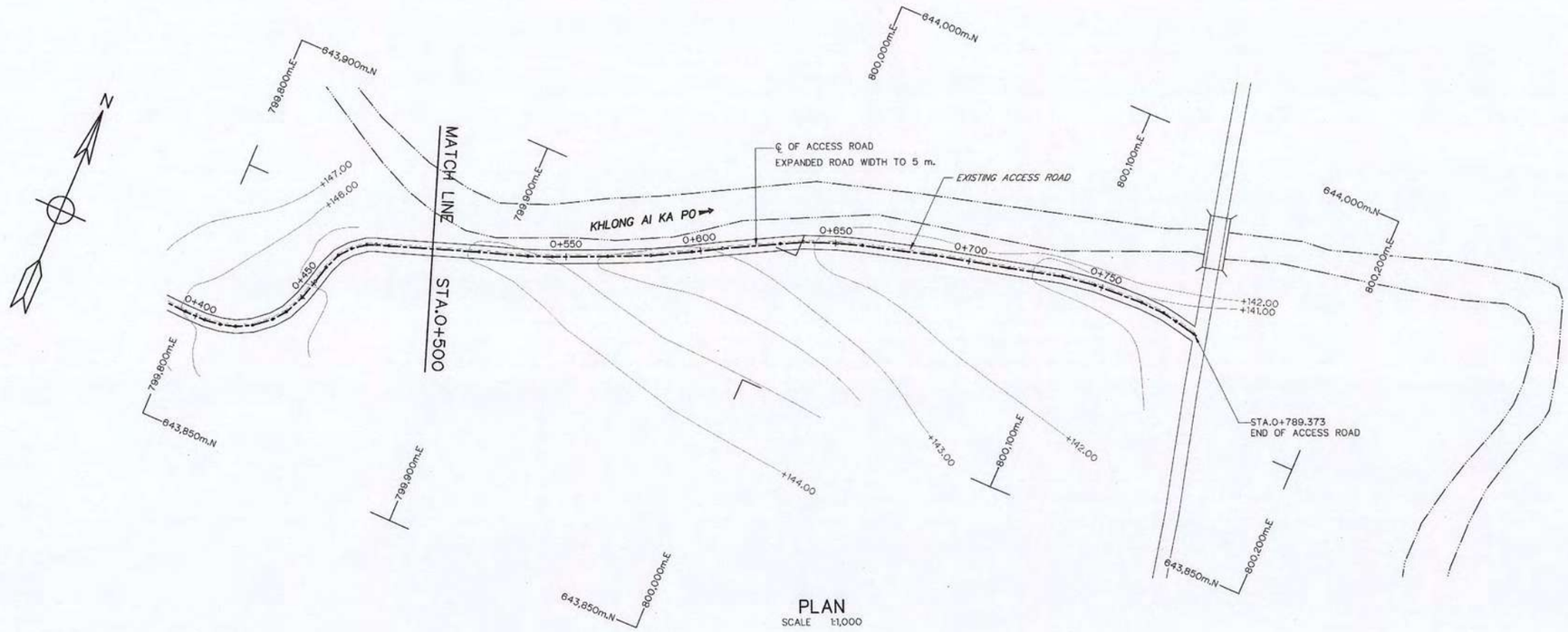
| NO. | DATE | REVISIONS | CHECKED | APPROVED |
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| | CONSULTANTS | | DEDE | |

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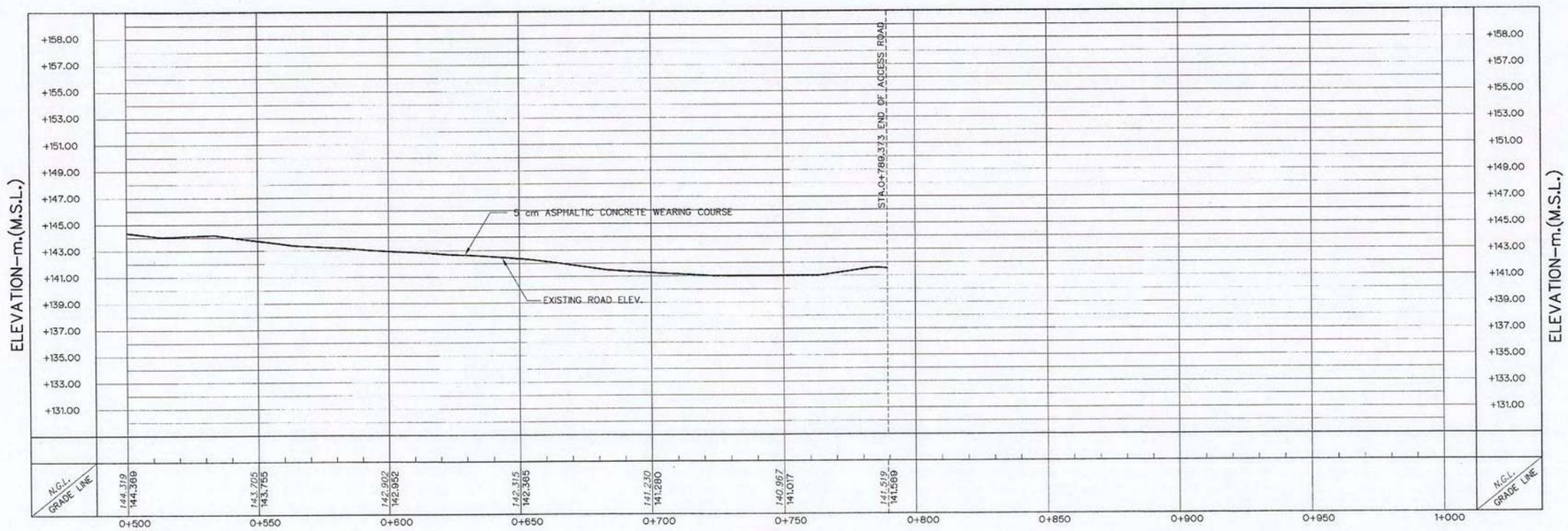
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
ACCESS ROAD
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 | กิตติพงษ์ กิติ.29074 | REVIEWED | |
| DRAWN | | SUBMITTED | |
| CHECKED | กิติ.8231 | RECOMMENDED | |
| 28/10/2021 PROJECT MANAGER DATE | | 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

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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
ACCESS ROAD
PLAN AND PROFILE STA.0+500 TO STA.0+789.373

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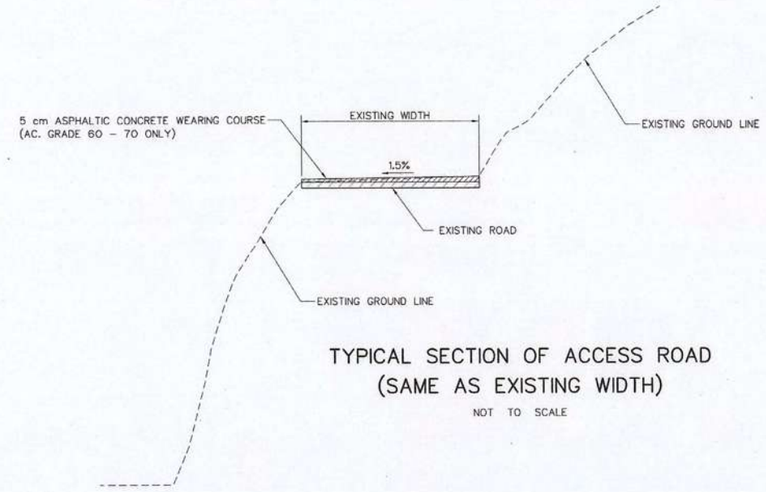
CONSULTANTS: PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.

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

DESIGNED ... REG.29074 ... REG.9402
DRAWN ...
CHECKED ... REG.8231
PROJECT MANAGER ... 28/10/2021 DATE

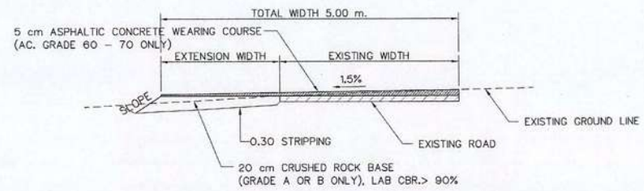
REVIEWED ...
SUBMITTED ...
RECOMMENDED ...
APPROVED ...

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

**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

**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

| NO. | DATE | REVISIONS | CHECKED | APPROVED |
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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

ACCESS ROAD

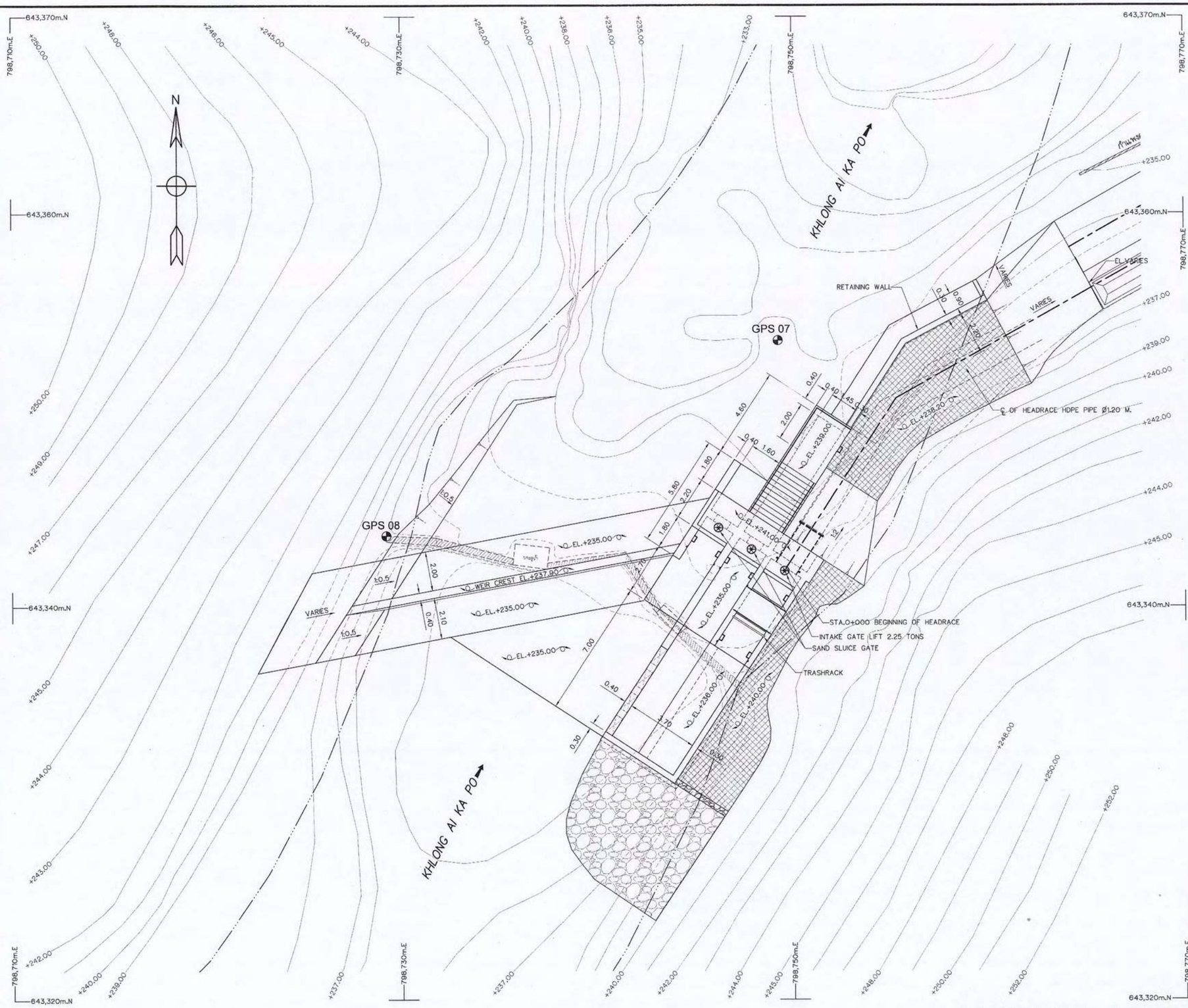
TYPICAL SECTIONS, STOPPING AND PASSING PLACES

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

DESIGNED พ.ย.29074 ส.ค.9462
DRAWN
CHECKED ส.ค.8231
PROJECT MANAGER 28/10/2021 DATE

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

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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
GENERAL LAYOUT

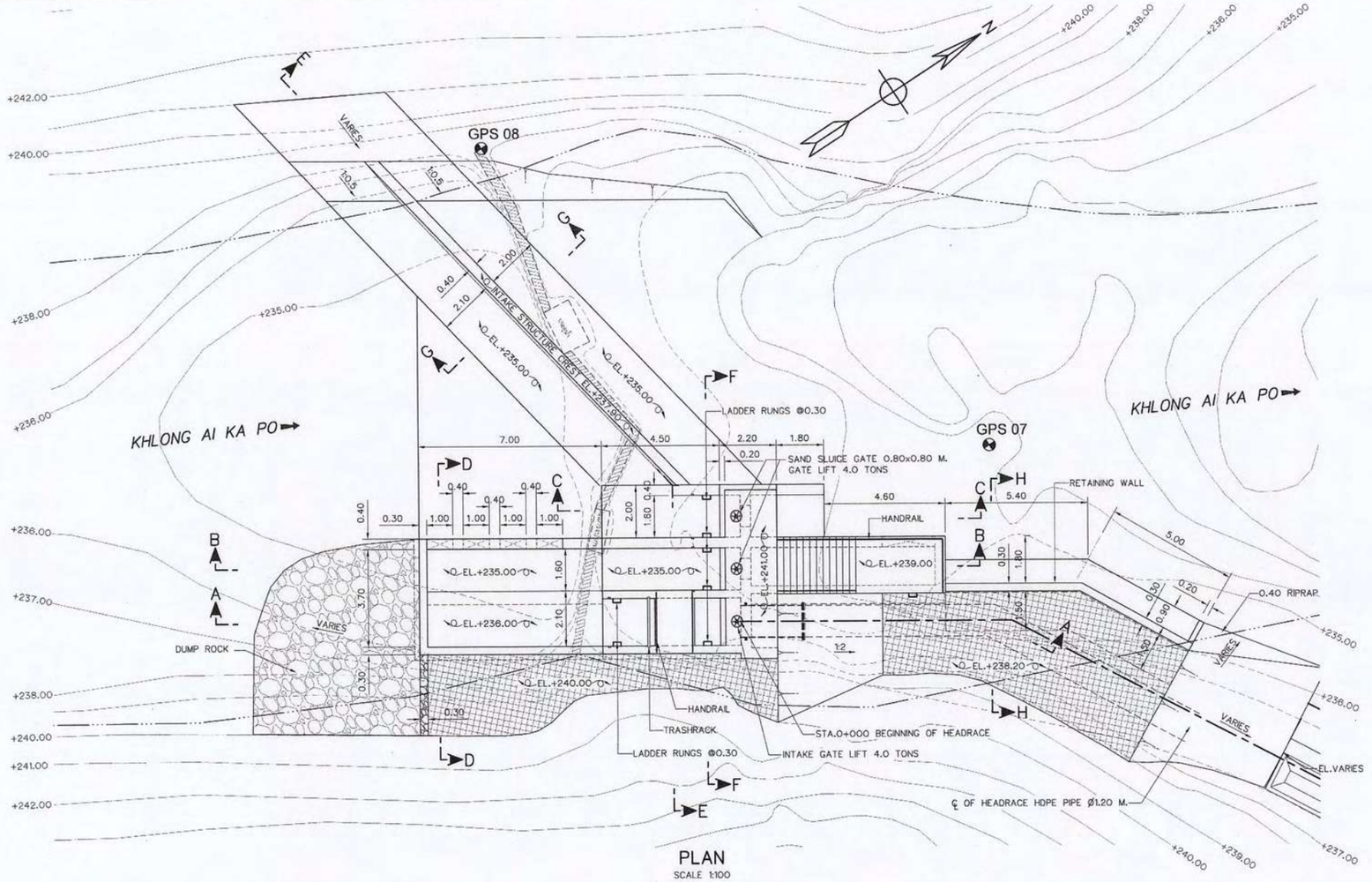
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| | CONSULTANTS | | DEDE | |

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

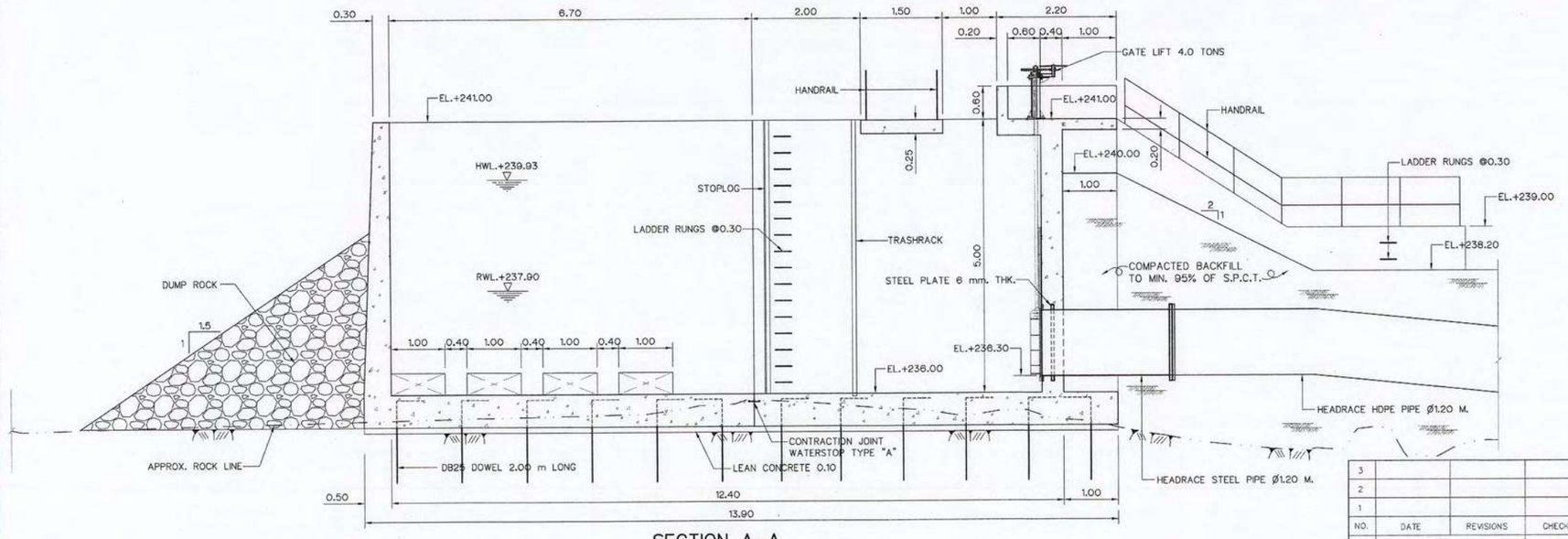
DESIGNED RE.29074 RE.9462
DRAWN
CHECKED RE.8231
28/10/2021
PROJECT MANAGER DATE

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

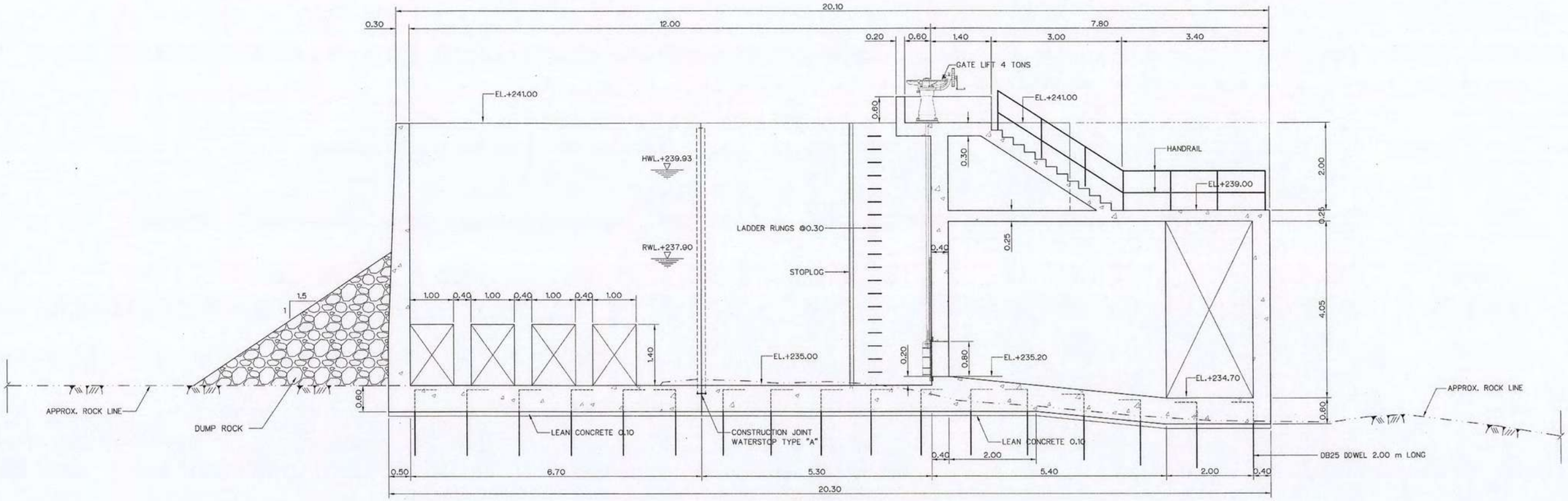
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DESIGNED
DRAWN
CHECKED
PROJECT MANAGER 28/10/2021 DATE

REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

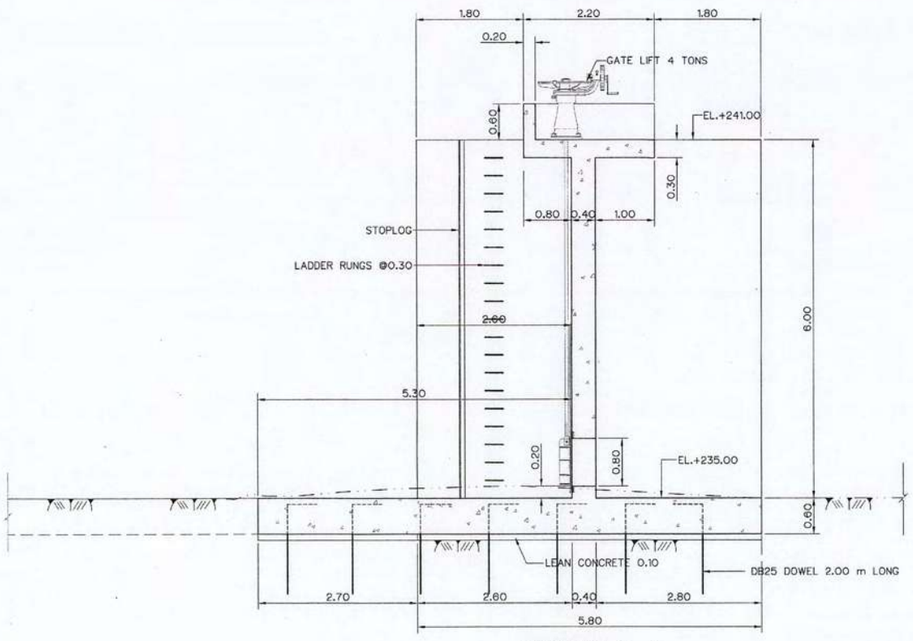
DRAWING NO. AKP–WE–02

SHEET NO. 14 OF 129



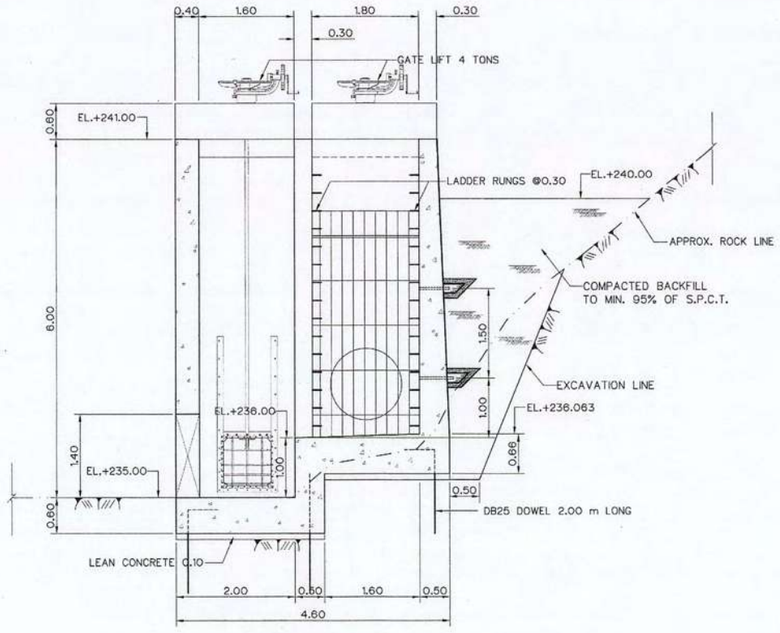

SECTION B–B

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 |
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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 B–B, C–C AND D–D

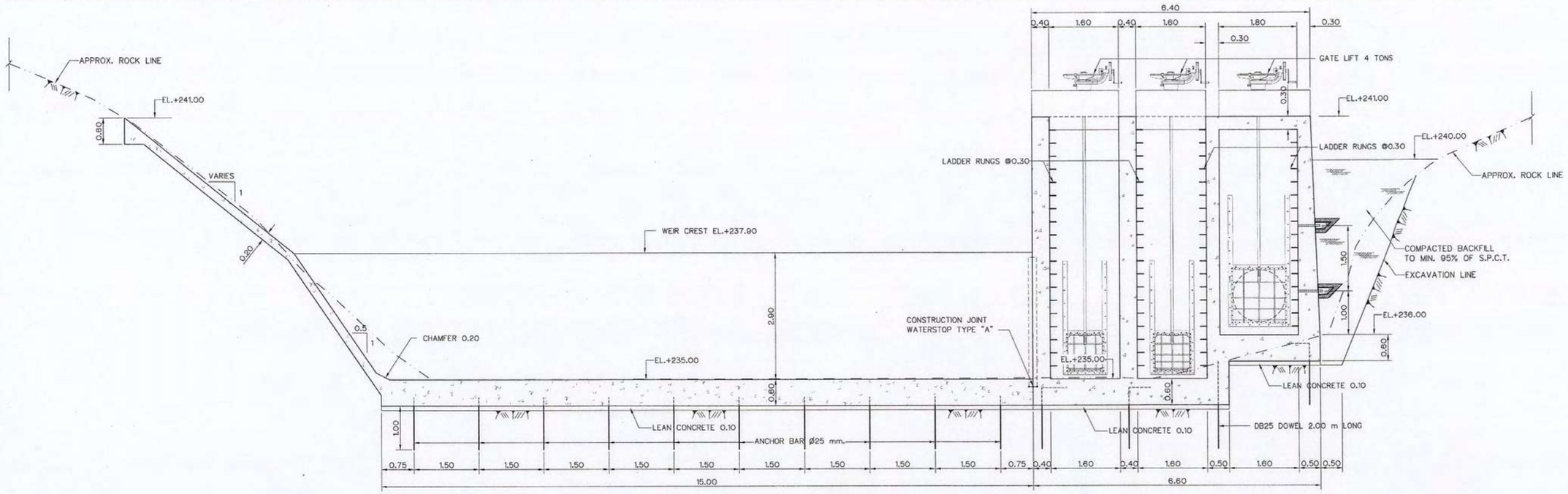
P&C MANAGEMENT CO., LTD.
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MINISTRY OF ENERGY

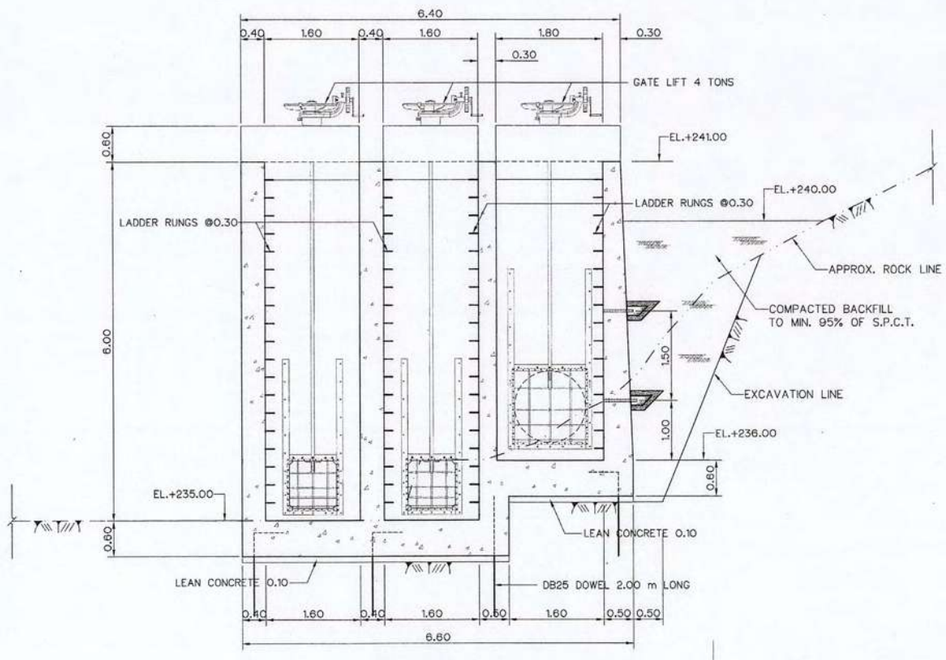
DESIGNED Rs.29074 Rs.9462
DRAWN
CHECKED Rs.8231
PROJECT MANAGER 28/10/2021 DATE

REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

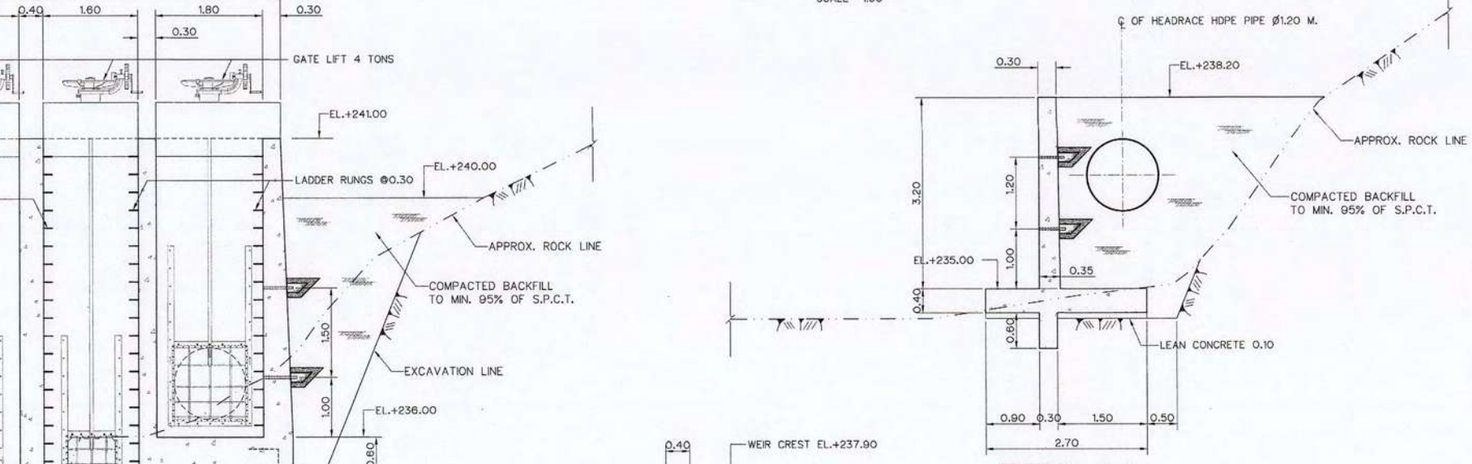
DRAWING NO. AKP-WE-03
SHEET NO. 15 OF 129



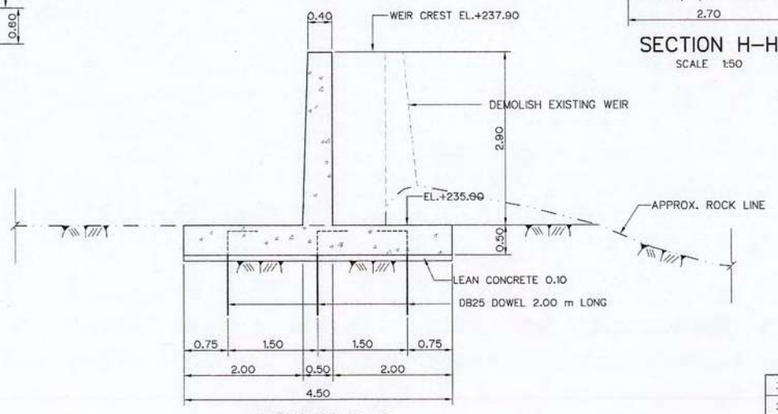

## SECTION E-E
SCALE 1:50




## SECTION F-F
SCALE 1:50




## SECTION H-H
SCALE 1:50




## SECTION G-G
SCALE 1:50

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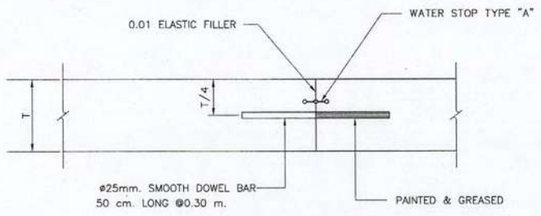
# AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

WEIR

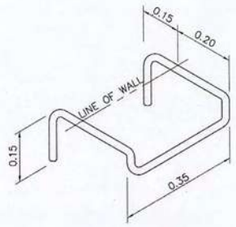
SECTIONS E-E, F-F, G-G AND H-H

| | | | |
|---|---|---|---|
| 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 |

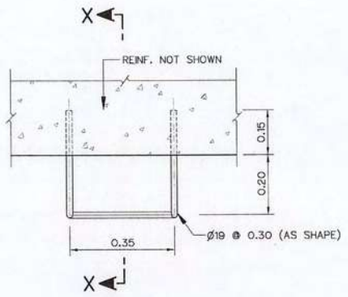



DETAIL OF CONSTRUCTION JOINT

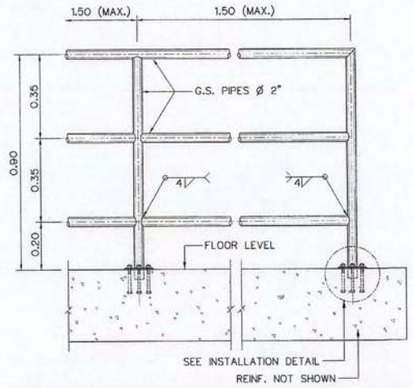
NOT TO SCALE



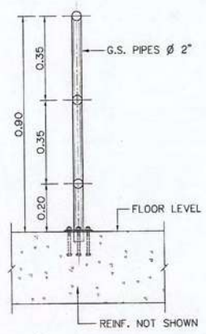

ISOMETRIC VIEW




PLAN



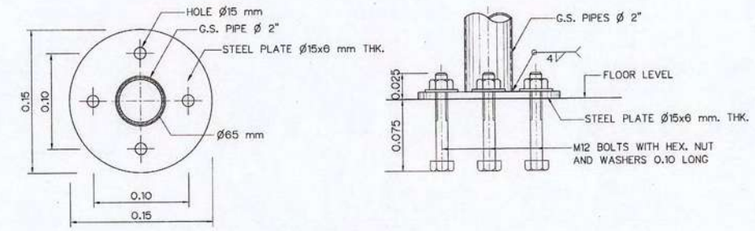

INTERMEDIATE POST




END POST TYPICAL SECTION

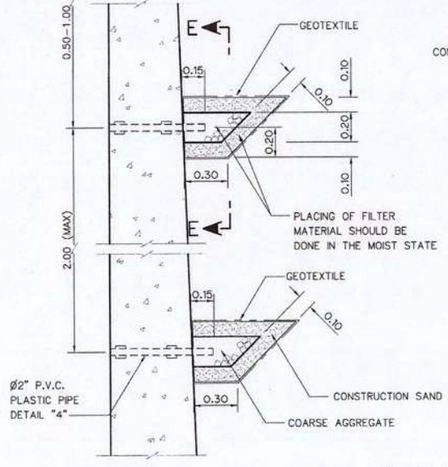
HANDRAIL

NOT TO SCALE



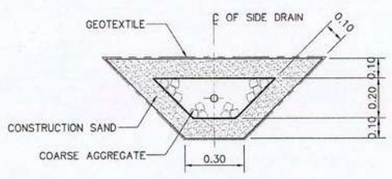

INSTALLATION DETAIL

NOT TO SCALE



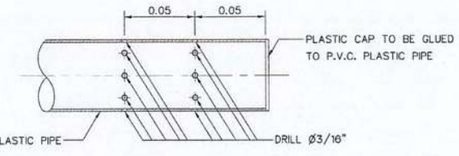

DETAIL OF SIDE DRAIN

NOT TO SCALE



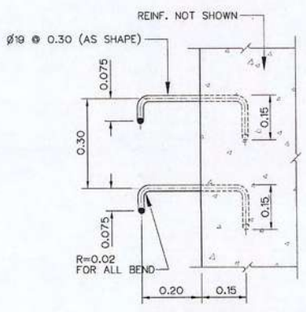

SECTION E – E

SCALE 1:15




DETAIL "4"

NOT TO SCALE



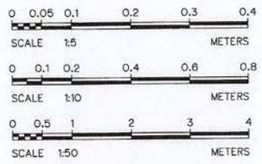

SECTION X–X

DETAIL OF LADDER RUNGS

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




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

MISCELLANEOUS DETAIL

| NO. | DATE | REVISIONS | CHECKED | APPROVED |
|---|---|---|---|---|
| 3 | | | | |
| 2 | | | | |
| 1 | | | | |

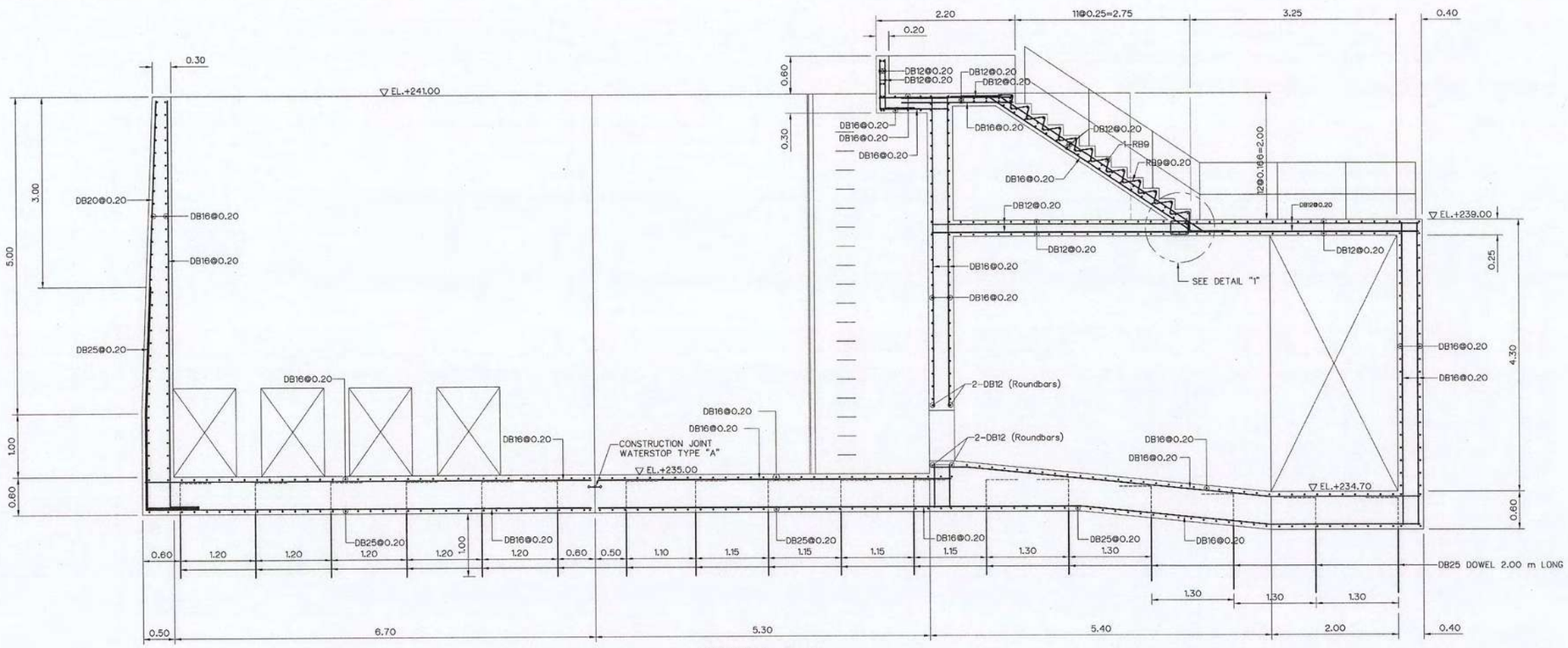
CONSULTANTS: P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.

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

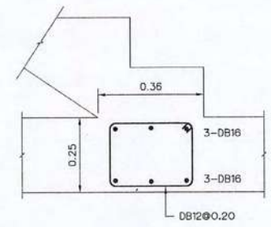
DESIGNED RB.29074 RB.9462 | DRAWN | CHECKED RB.8231 | PROJECT MANAGER 28/10/2021 DATE

REVIEWED | SUBMITTED | RECOMMENDED | APPROVED

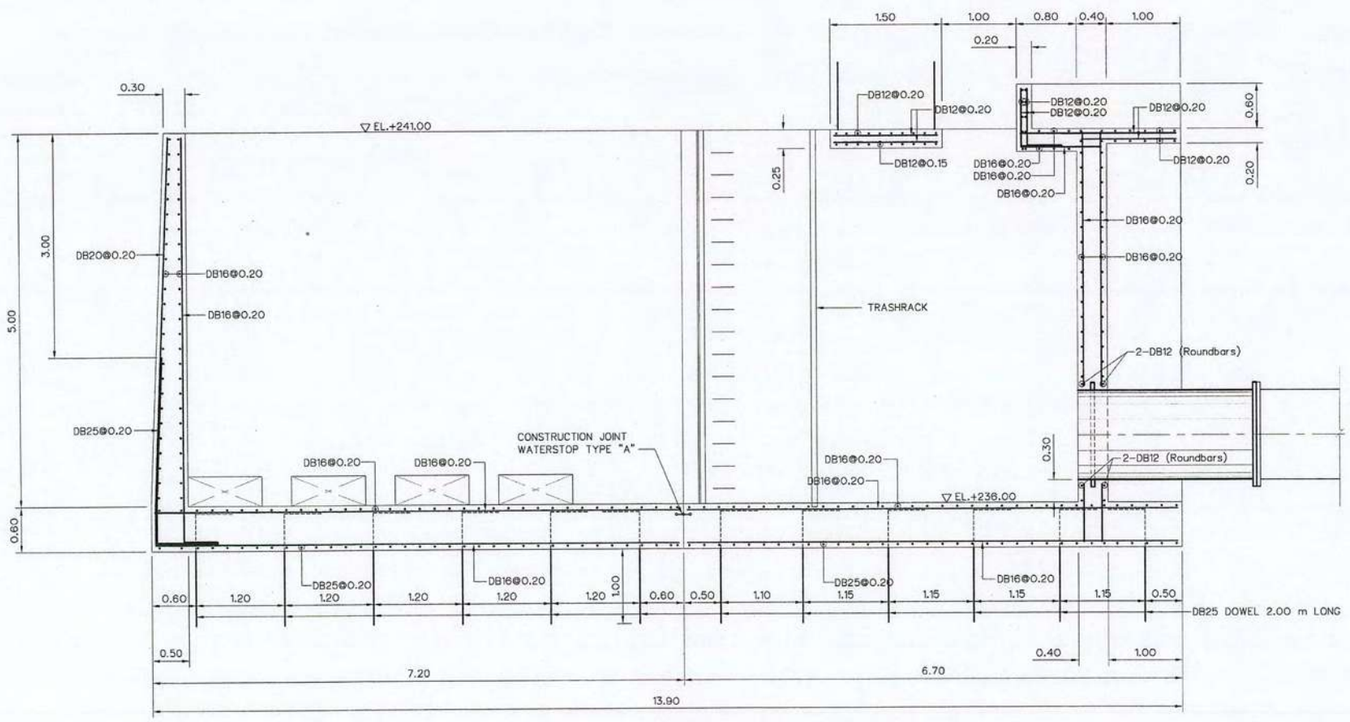
DRAWING NO. AKP-WE-05 | SHEET NO. 17 OF 129




## SECTION B–B
SCALE 1:40




## DETAIL "1"
SCALE 1:10




## SECTION A–A
SCALE 1:40

SCALE 1:40 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. 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 |

| NO. | DATE | REVISIONS | CHECKED | APPROVED |
|---|---|---|---|---|
| 3 | | | | |
| 2 | | | | |
| 1 | | | | |
| | CONSULTANTS | | DEDE | |

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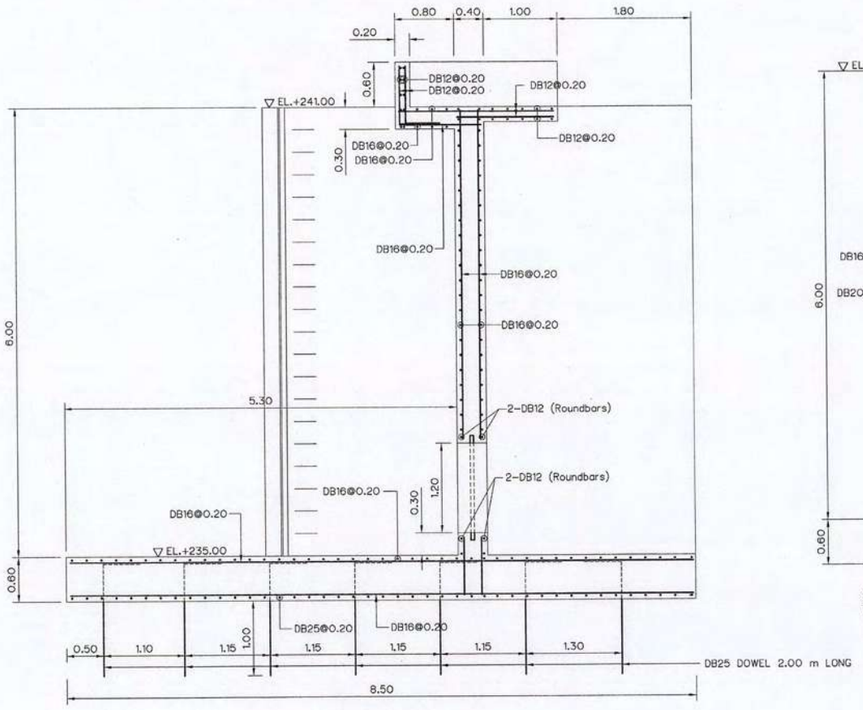
# AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

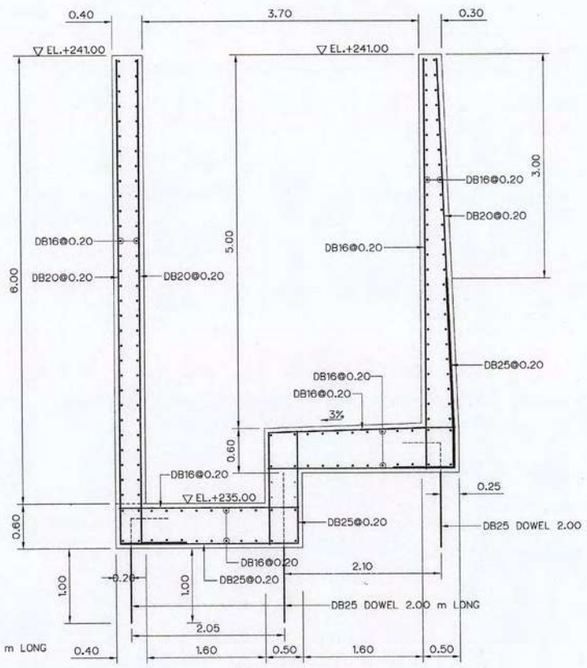
WEIR

REINFORCEMENT (SHEET 1/2)

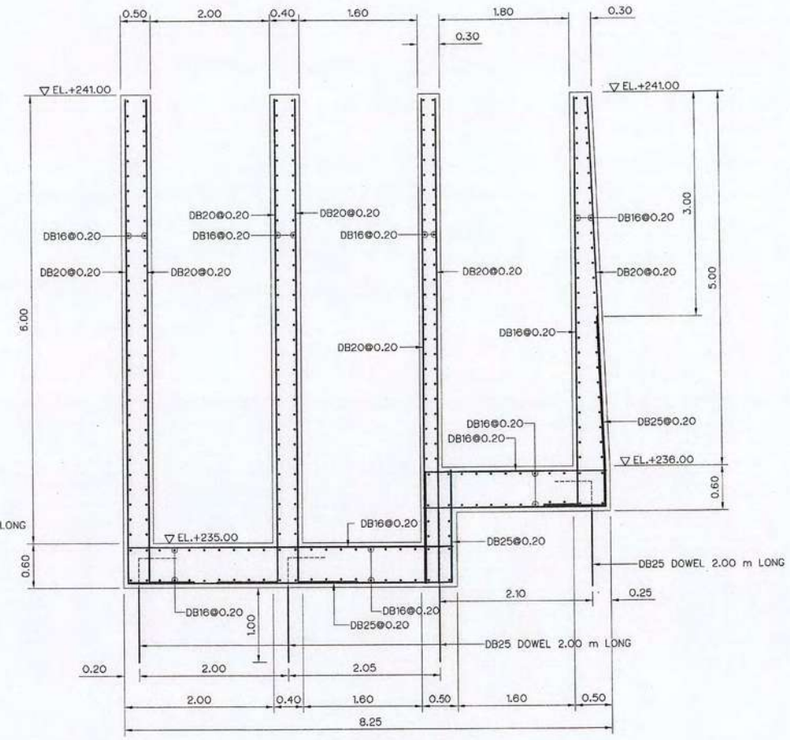
| | |
|---|---|
| PCM P&C MANAGEMENT CO., LTD. / GPD SPT CONSULTANTS CO., LTD. | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY |
| DESIGNED ... ชัย.29074 ... สัย.9462 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED สัย.8231 | RECOMMENDED |
| PROJECT MANAGER 28/10/2021 DATE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



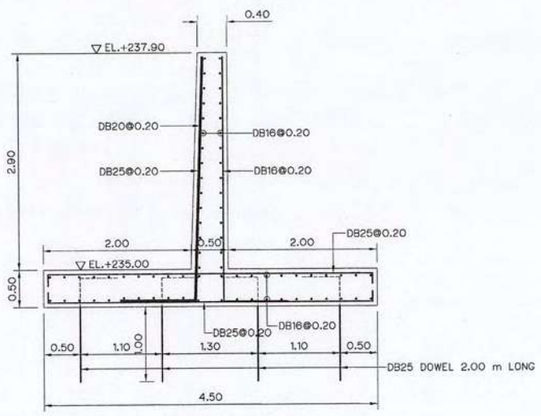

SECTION C–C
SCALE 1:40



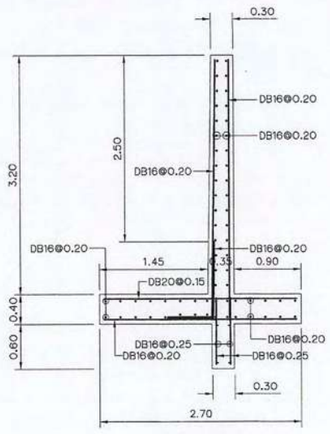

SECTION D–D
SCALE 1:40



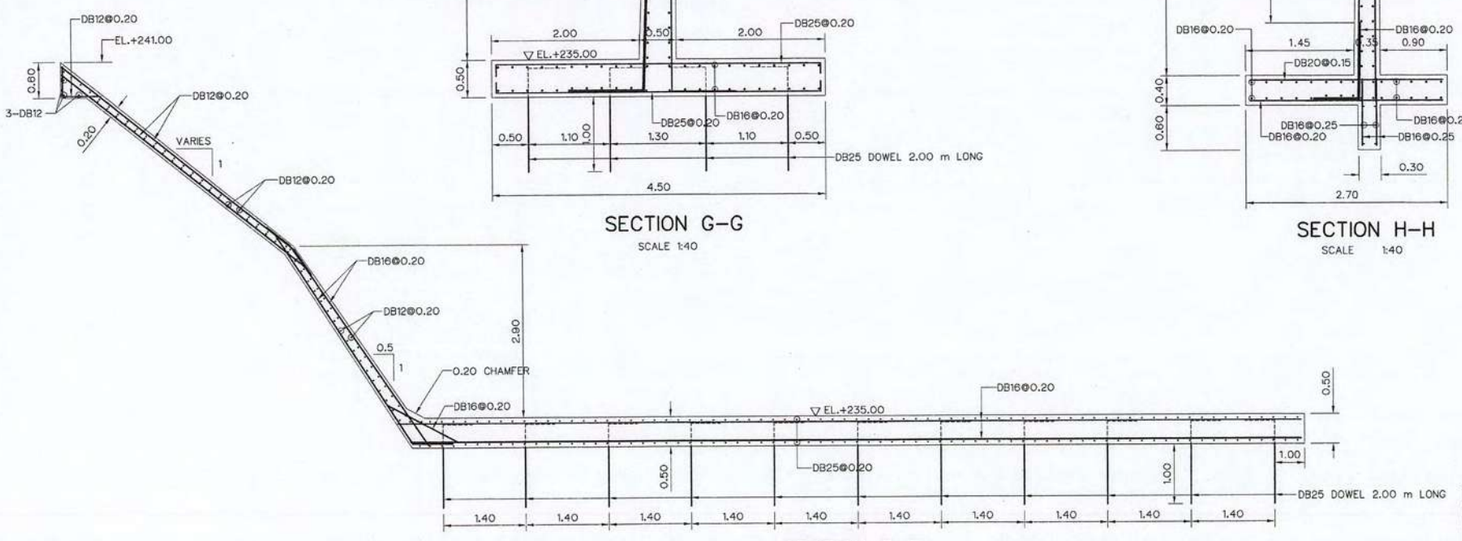

SECTION F–F
SCALE 1:40




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 | |

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

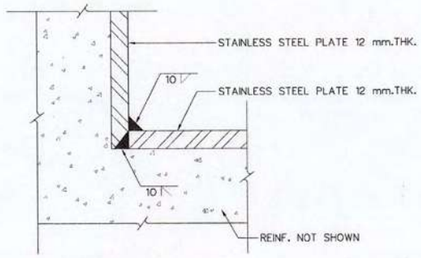
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

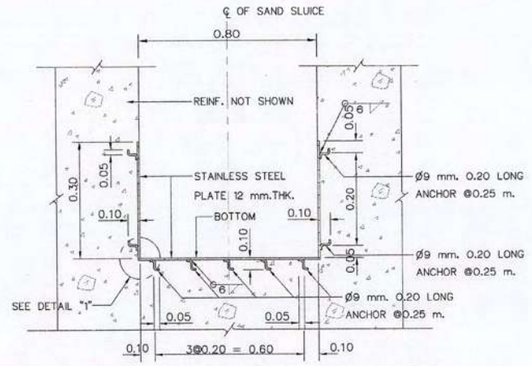
WEIR

REINFORCEMENT (SHEET 2/2)

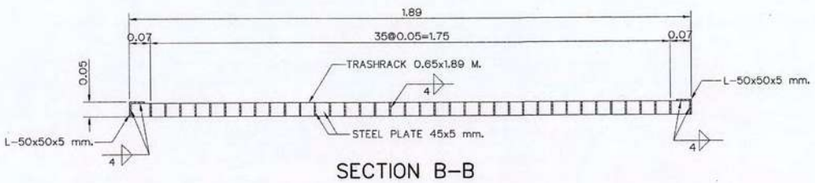
| | |
|---|---|
| PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY |
| DESIGNED [illegible] 28.29074 [illegible] 28.9462 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED 28.8231 | RECOMMENDED |
| PROJECT MANAGER 28/10/2021 DATE | APPROVED |
| DRAWING NO. AKP-WE-07 | SHEET NO. 19 OF 129 |



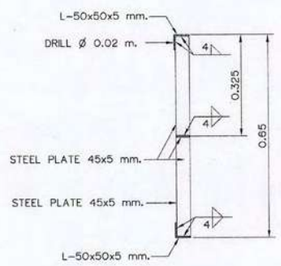

DETAIL "1"
NOT TO SCALE



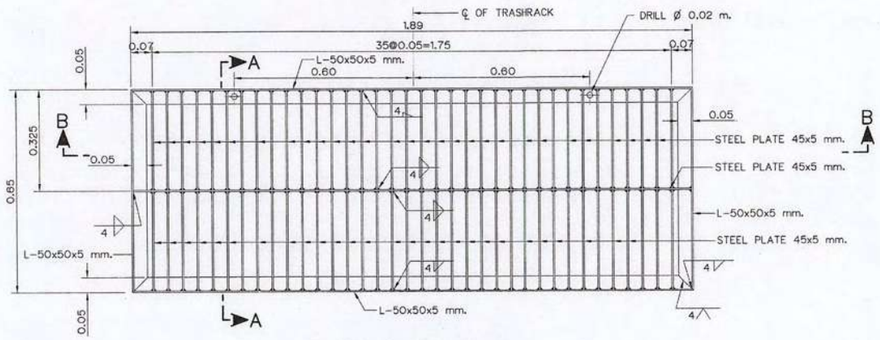

DETAIL OF STEEL LINER AT SAND SLUICE
NOT TO SCALE



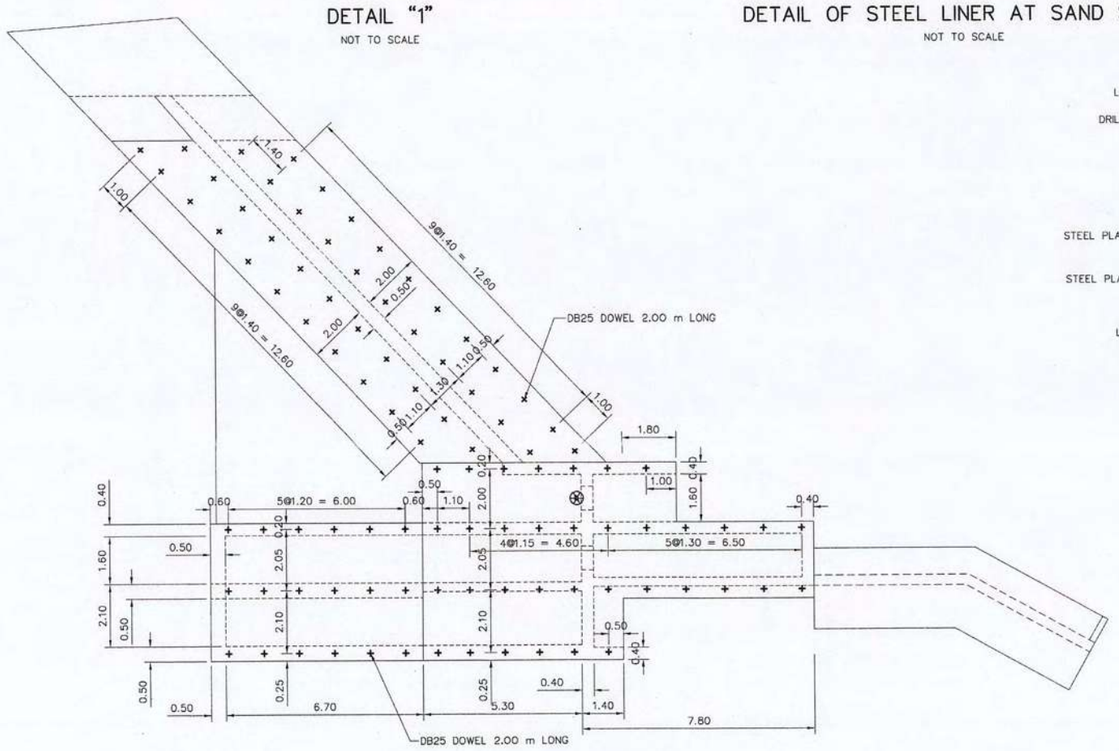

SECTION B-B



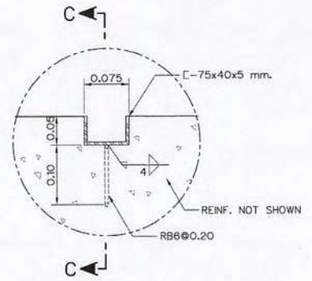

SECTION A-A
SCALE 1:10



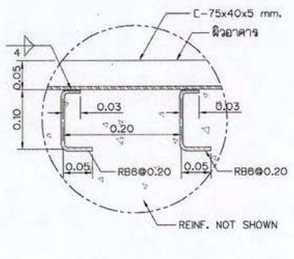

TRASH RACK DETAIL
(REQUIRED 7 PIECES)
SCALE 1:10



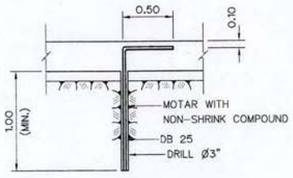

ANCHOR BARS PLAN
SCALE 1:100



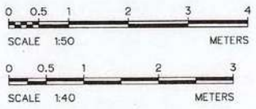

TRASHRACK GROOVE DETAIL
SCALE 1:5




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

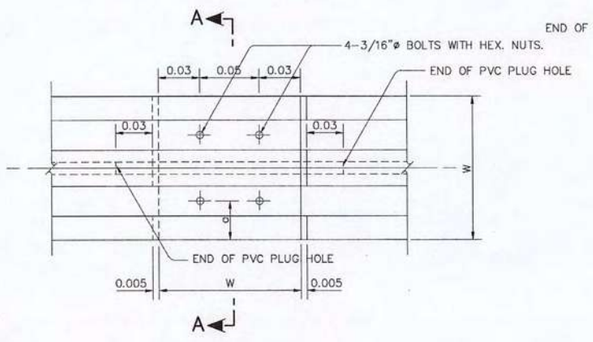
| NO. | DATE | REVISIONS | CHECKED | APPROVED |
|---|---|---|---|---|
| 3 | | | | |
| 2 | | | | |
| 1 | | | | |
| | CONSULTANTS | | DEDE | |

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

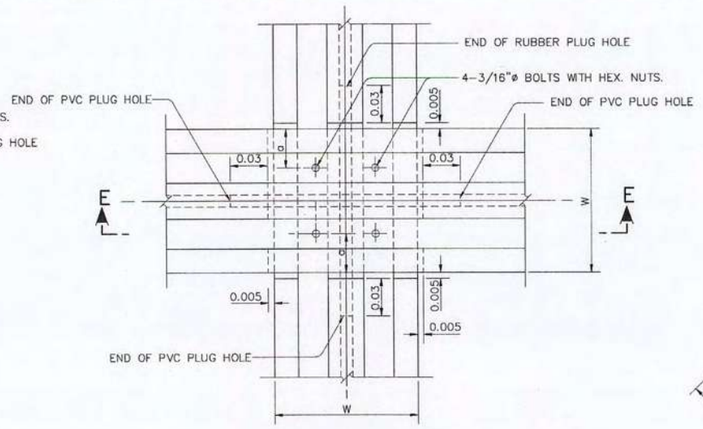
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
WEIR
ANCHOR BARS, TRASH RACK AND STEEL LINER DETAIL

| | |
|---|---|
| PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | 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-08 | SHEET NO. 20 OF 129 |



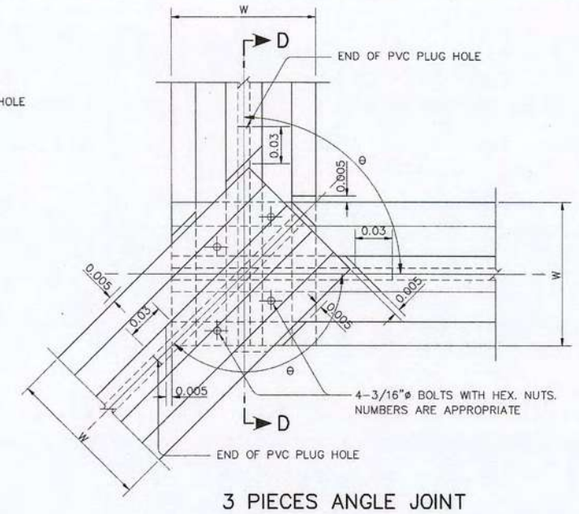

STRAIGHT JOINT

NOT TO SCALE




NORMAL LEAN JOINT

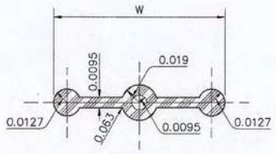
NOT TO SCALE




3 PIECES ANGLE JOINT

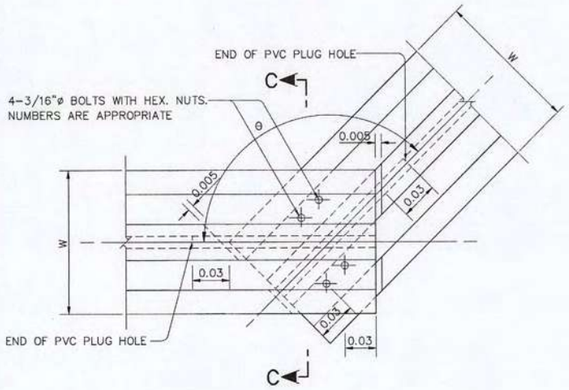
NOT TO SCALE

| 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 |



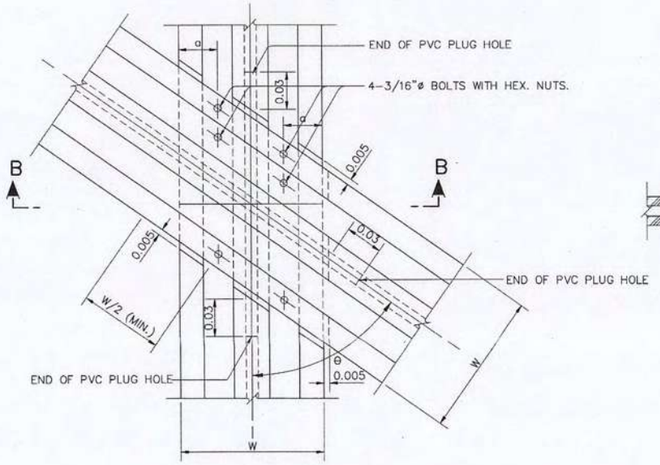

PVC WATERSTOP
(TYPE "A" & TYPE "B" )

NOT TO SCALE



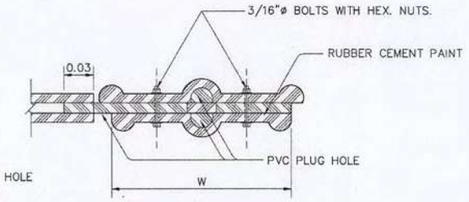

ANGLE JOINT

NOT TO SCALE



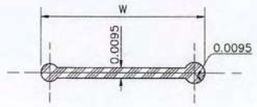

ANGLE LEAN JOINT

NOT TO SCALE



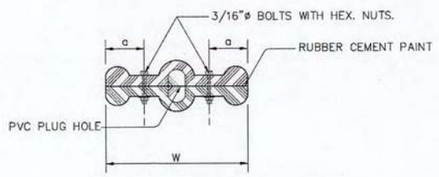

SECTION D–D

NOT TO SCALE



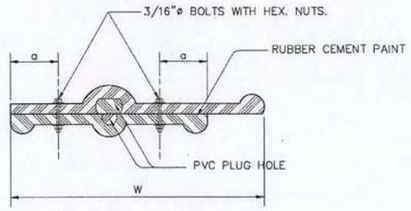

PVC WATERSTOP
(TYPE "C")

NOT TO SCALE



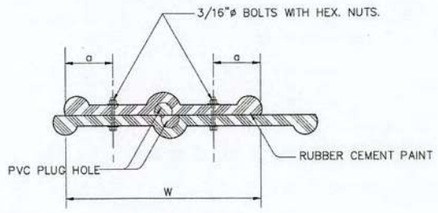

SECTION A–A

NOT TO SCALE



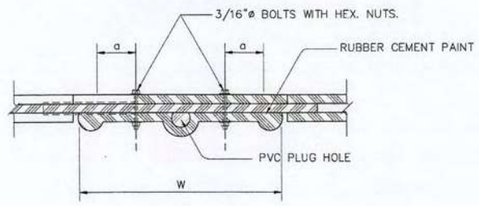

SECTION B–B

NOT TO SCALE



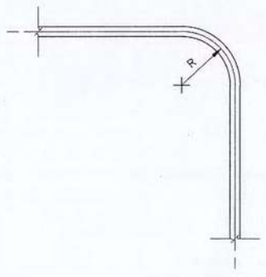

SECTION C–C

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.

| NO. | DATE | REVISIONS | CHECKED | APPROVED |
|---|---|---|---|---|
| 3 | | | | |
| 2 | | | | |
| 1 | | | | |
| | CONSULTANTS | | DEDE | |

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

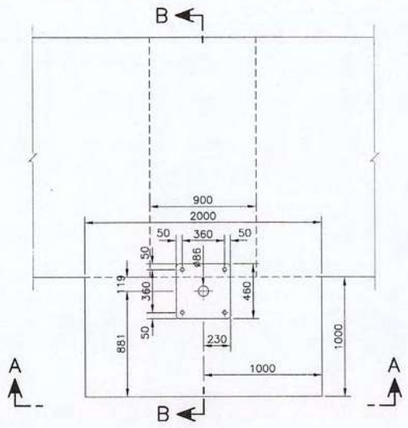
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

WEIR

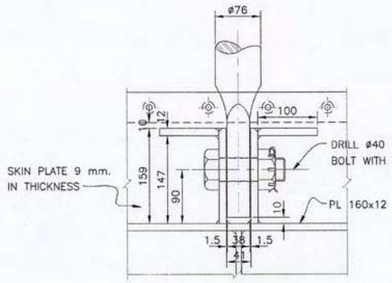
STANDARD PVC WATERSTOP,SECTION AND DETAILS

| | |
|---|---|
| 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 |
| PROJECT MANAGER 28/10/2021 DATE | APPROVED |
| DRAWING NO. AKP-WE-09 | SHEET NO. 21 OF 129 |



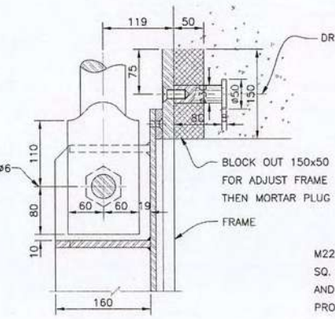

PLAN

SCALE "B"



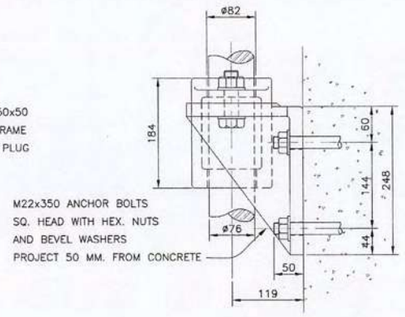

DETAIL "1"

SCALE "A"



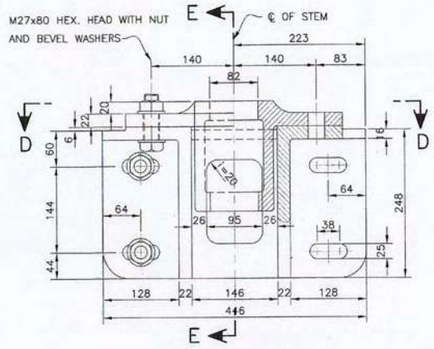

DETAIL "3"

SCALE "A"



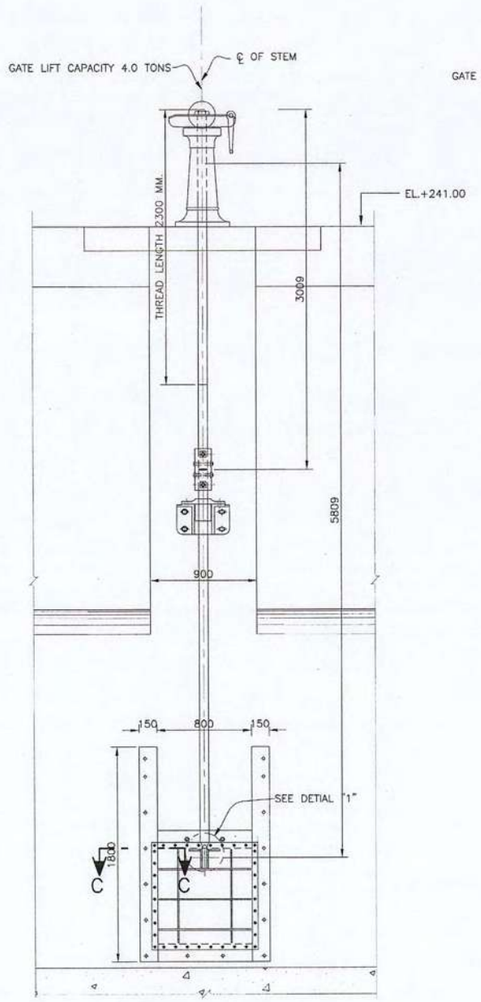

DETAIL "2"

SCALE "A"



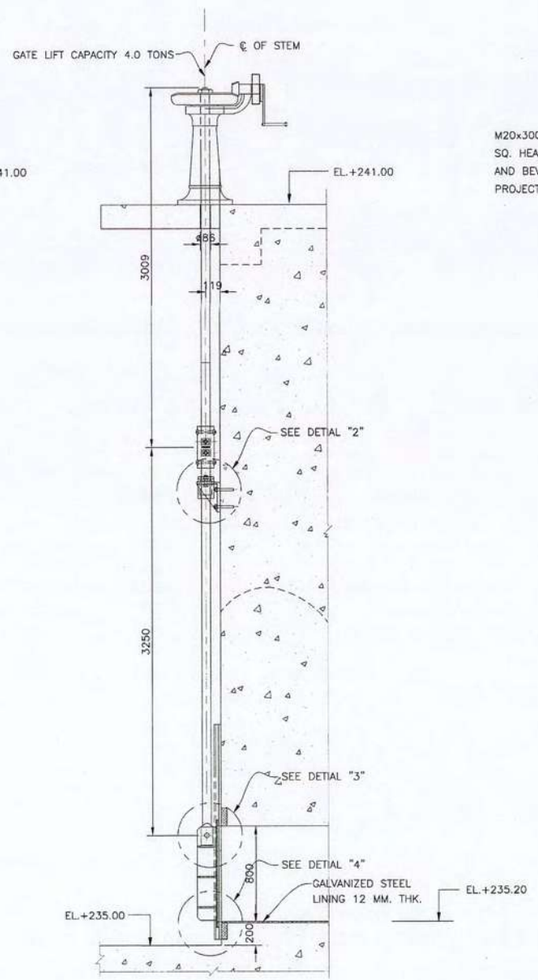

STEM GUIDE

SCALE "A"



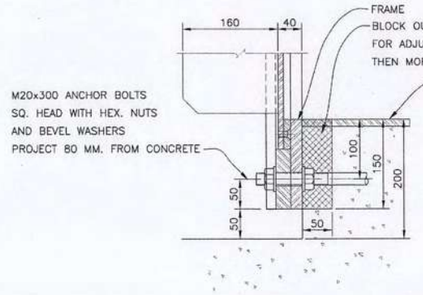

SECTION (A) – (A)

SCALE "B"



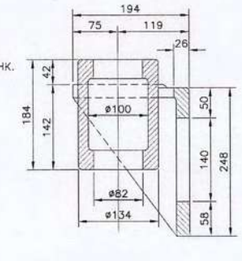

SECTION (B) – (B)

SCALE "B"



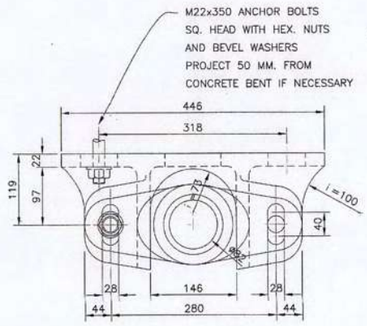

DETAIL "4"

SCALE "A"



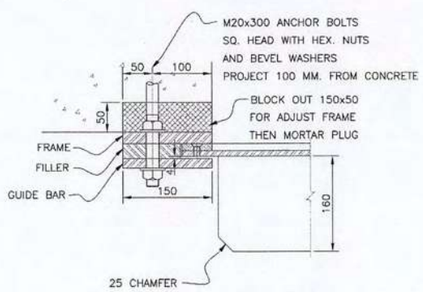

SECTION (E) – (E)

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 | | | | |
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| | CONSULTANTS | | DEDE | |

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MINISTRY OF ENERGY

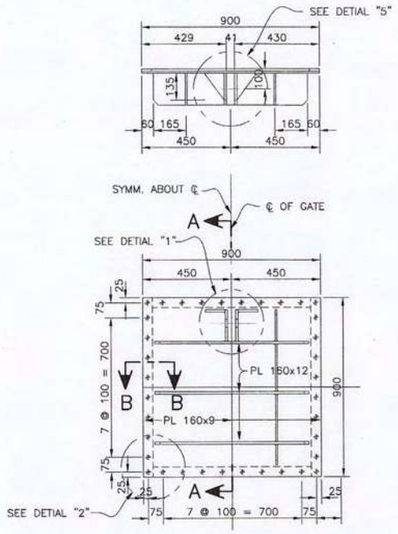
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

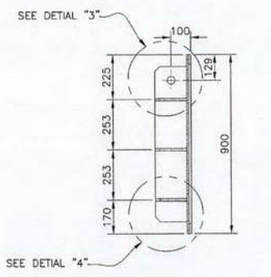
WEIR

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

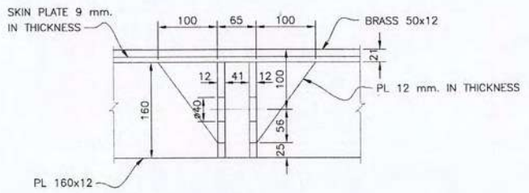
| | |
|---|---|
| PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY |
| DESIGNED RB.29074 RB.9462 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED RB.8231 | RECOMMENDED |
| PROJECT MANAGER 28/10/2021 DATE | APPROVED |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



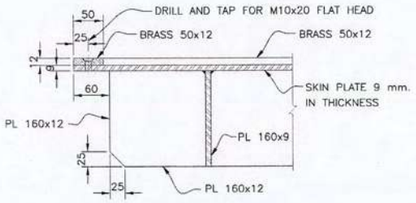

GATE LEAF
SCALE "B"



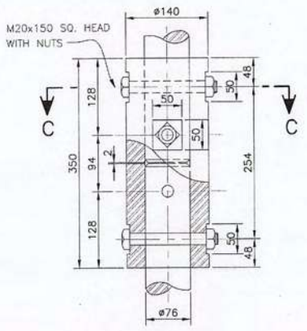

SECTION (A) – (A)
SCALE "B"



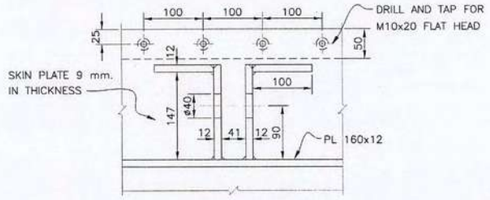

DETAIL "5"
SCALE "A"



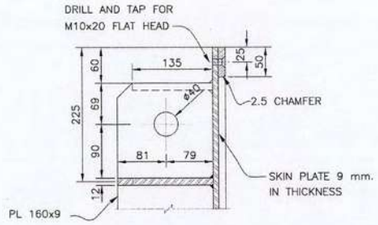

SECTION (B) – (B)
SCALE "A"



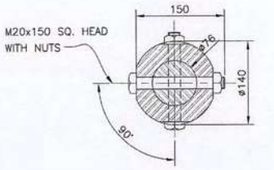

COUPPING
SCALE "A"



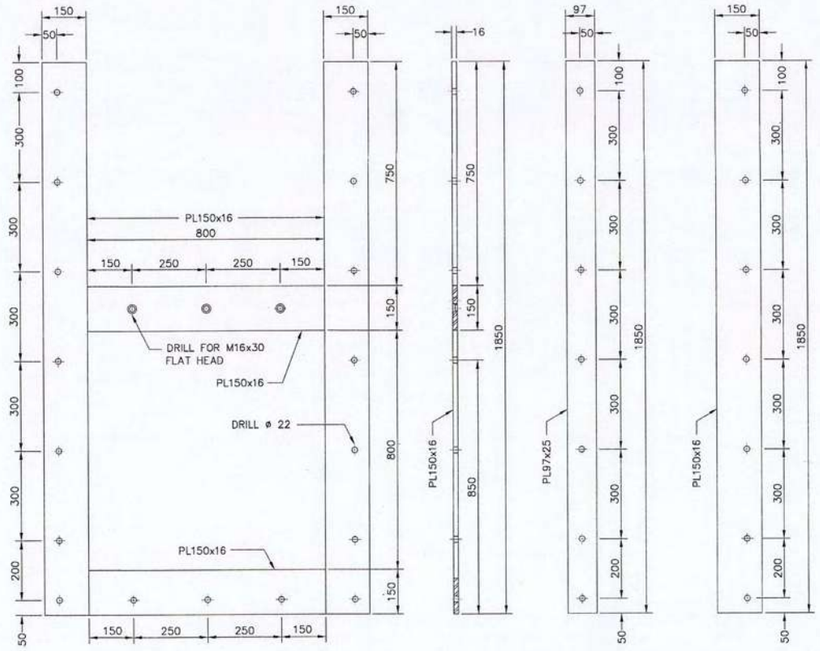

DETAIL "1"
SCALE "A"




DETAIL "3"
SCALE "A"



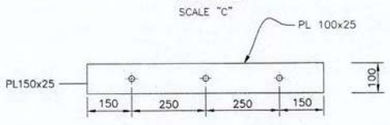

SECTION (C) – (C)
SCALE "A"



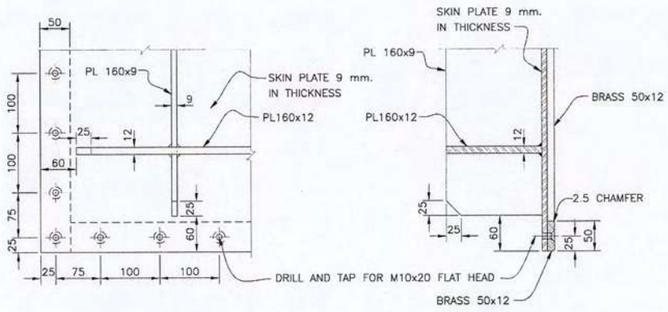

FRAME
SCALE "C"

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.
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, 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 |
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MINISTRY OF ENERGY

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

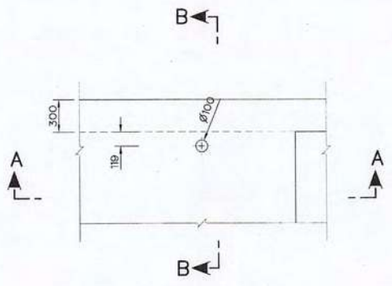
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
WEIR
0.80x0.80 m. SAND SLUICE GATE (GATE DETAIL)

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

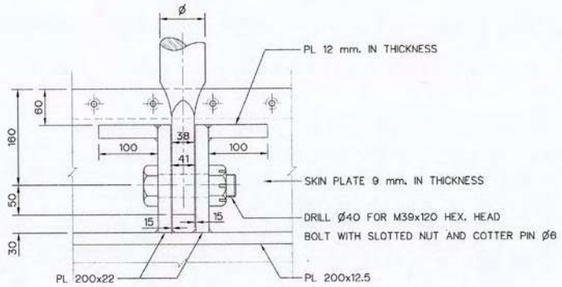
| | | | |
|---|---|---|---|
| DESIGNED | | | |
| DRAWN | | | |
| CHECKED | | | |
| PROJECT MANAGER | | DATE | 28/10/2021 |

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

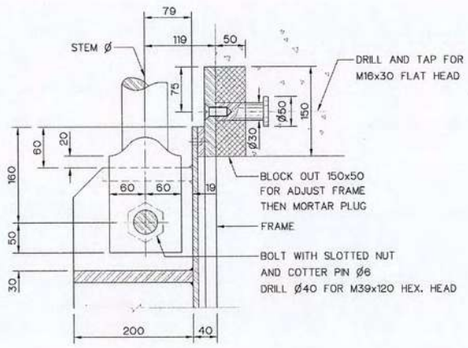
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|---|---|
| REVIEWED | |
| SUBMITTED | |
| RECOMMENDED | |
| APPROVED | |
| DRAWING NO. | AKP-WE-11 |
| SHEET NO. | 23 OF 129 |



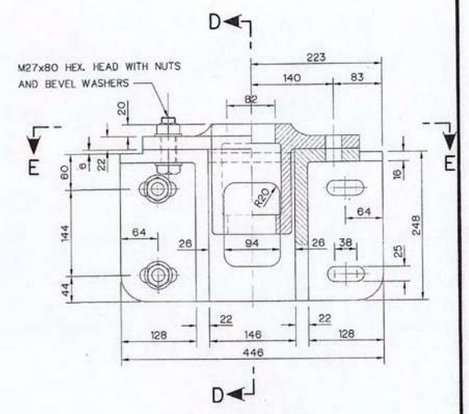

PLAN
NOT TO SCALE



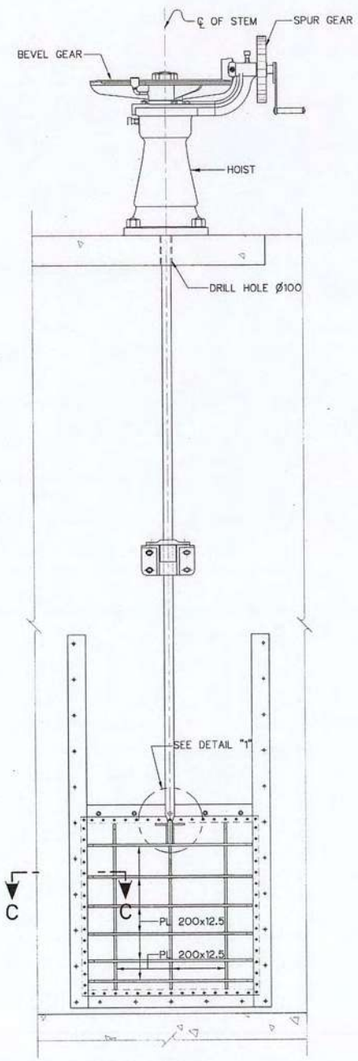

DETAIL "1"
NOT TO SCALE



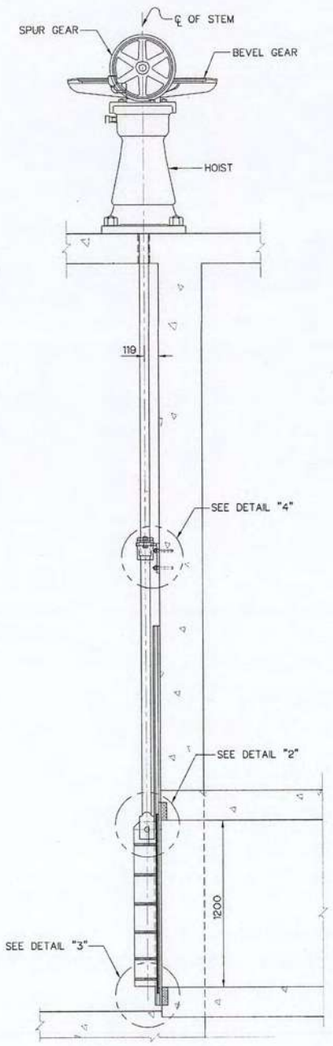

DETAIL "2"
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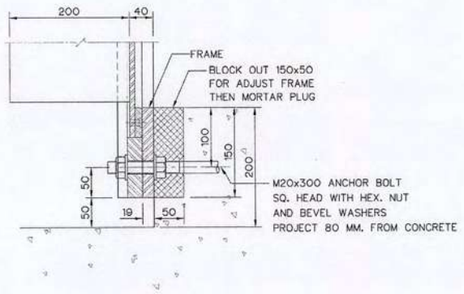

STEM GUIDE
NOT TO SCALE



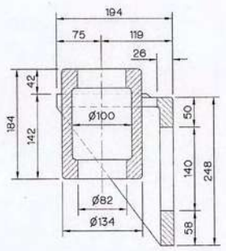

SECTION A-A
NOT TO SCALE



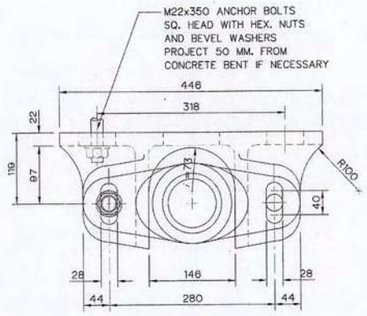

SECTION B-B
NOT TO SCALE



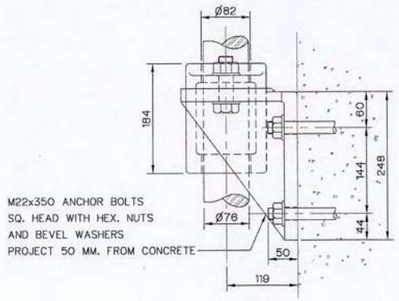

DETAIL "3"
SCALE 1:5



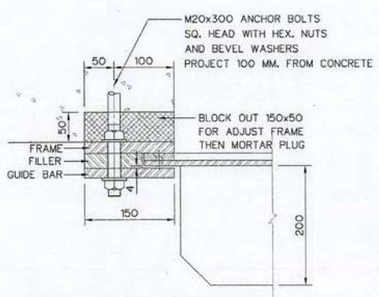

SECTION D-D
SCALE 1:5




SECTION E-E
SCALE 1:5




DETAIL "4"
SCALE 1:5




SECTION C-C
SCALE 1:5

0 0.10 0.20 0.30 0.40 0.50
SCALE 1:5 METERS

**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.
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 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 |

| 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

WEIR

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

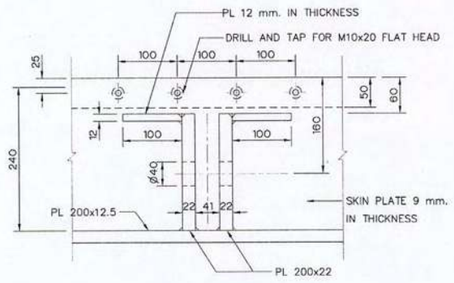
PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

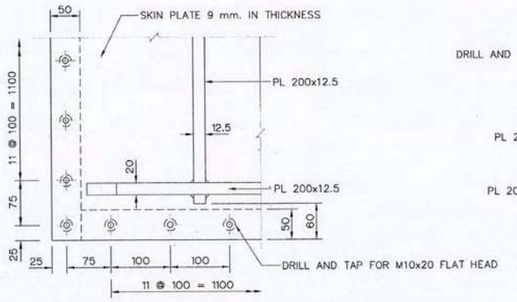
DESIGNED REG.29074 REG.9462
DRAWN
CHECKED REG.8231
PROJECT MANAGER 28/10/2021 DATE

REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

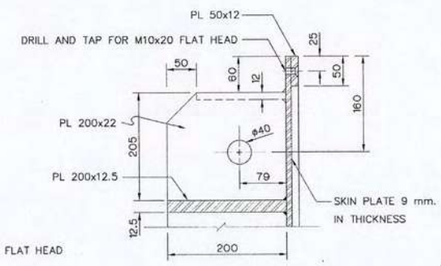
DRAWING NO. AKP-WE-12
SHEET NO. 24 OF 129



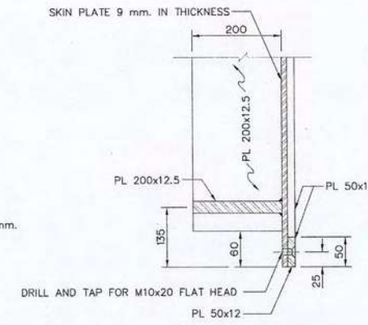

DETAIL "1"
NOT TO SCALE



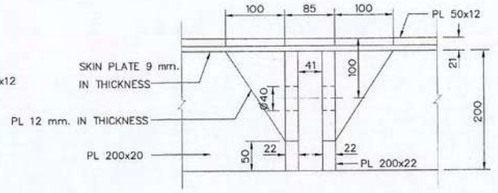

DETAIL "2"
NOT TO SCALE



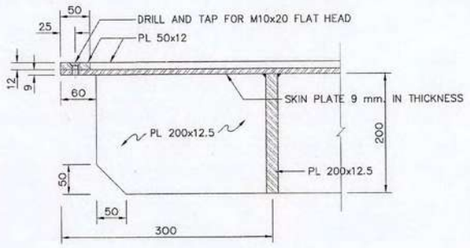

DETAIL "3"
NOT TO SCALE



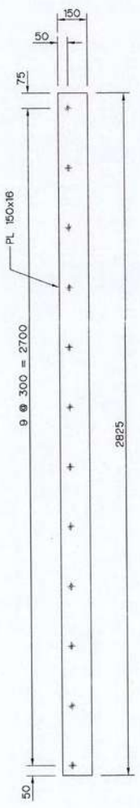

DETAIL "4"
NOT TO SCALE



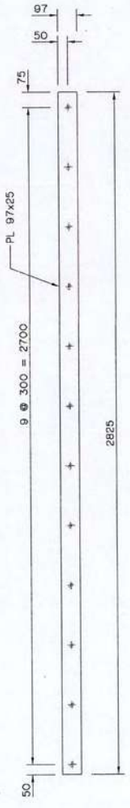

DETAIL "5"
NOT TO SCALE



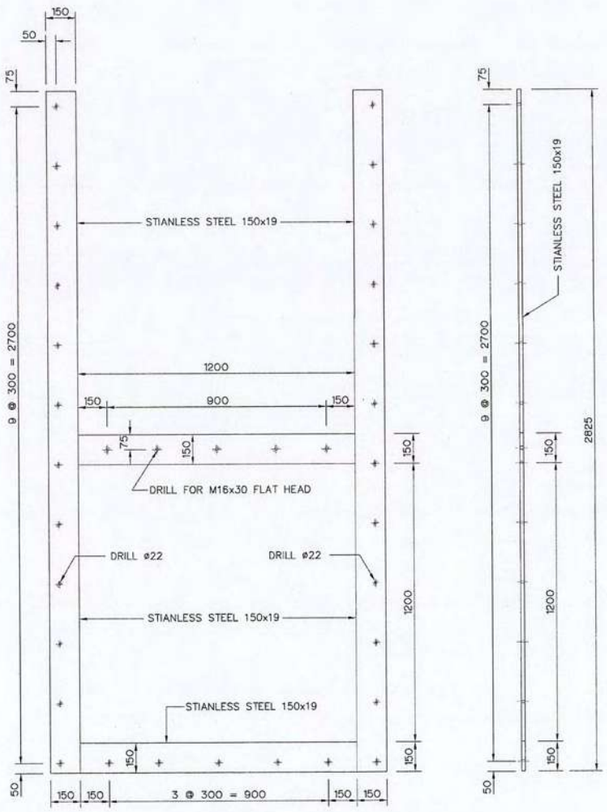

SECTION B–B
NOT TO SCALE




GUIDE BAR
NOT TO SCALE

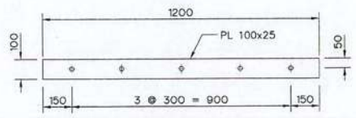



FILLER
NOT TO SCALE

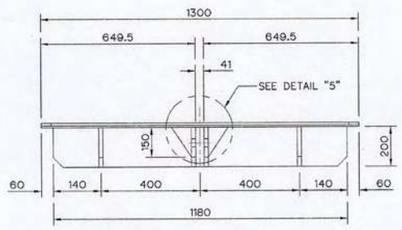


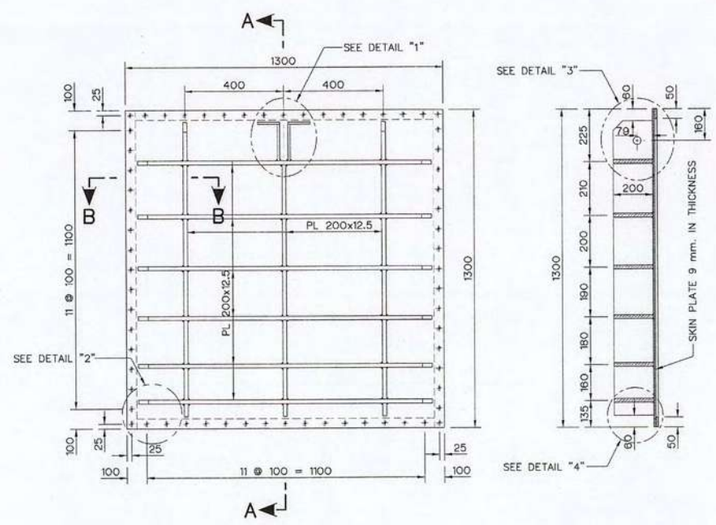

FRAME
NOT TO SCALE




BOTTOM BAR
NOT TO SCALE




GATE LEAF
NOT TO SCALE

SECTION A–A
NOT TO SCALE

NOTES :

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 DRAWINGS :

| | |
|---|---|
| 1. WEIR, PLAN AND SECTION A–A | AKP–WE–02 |
| 2. WIER, 12Ox1.20 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

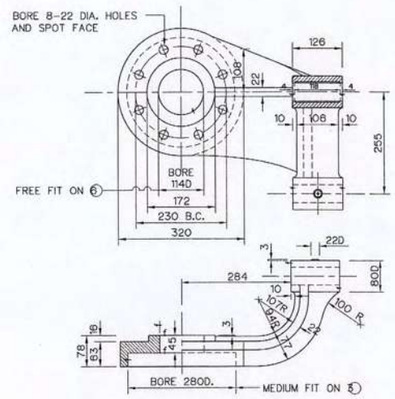
1.20x1.20 M. SLUICE GATE (SHEET 2/2)

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

| | |
|---|---|
| DESIGNED | REG.28074 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–WE–13 |
| SHEET NO. | 25 OF 129 |




1

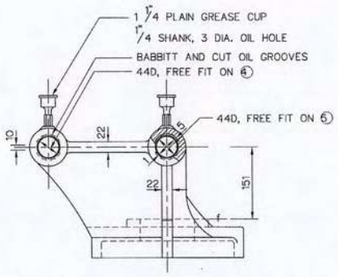
## CAP AND BEARING

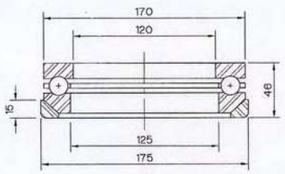
CAST IRON GG-18

ONE REQ'D

SCALE 1:7.5

50 KG.




2

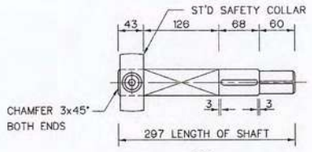
## SINGLE-THRUST BALL BEARING

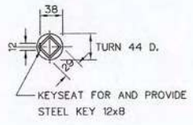
MIN. CAPACITY 9 TONNES @ 10 R.P.M.

TWO REQ'D

SCALE 1:2.5

2.5 KG.




4

## SPUR PINION SHAFT

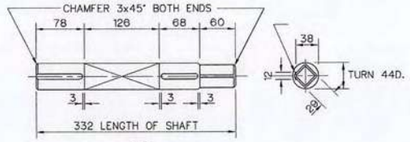
C.F. STEEL, ST 60.11

FINISH ALL OVER

ONE REQ'D

SCALE 1:5

4 KG.







5

## BEVEL PINION SHAFT

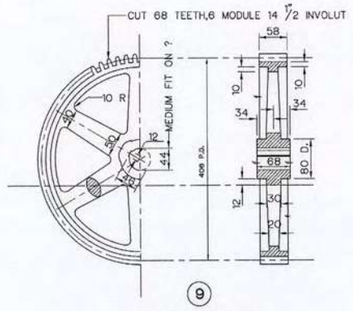
C.F. STEEL, ST 60.11

FINISH ALL OVER

ONE REQ'D

SCALE 1:5

3 1/2 KG.




9

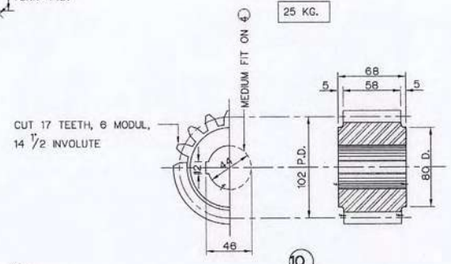
## SPUR GEAR

CAST IRON GG-18

ONE REQ'D

SCALE 1:6

25 KG.




10

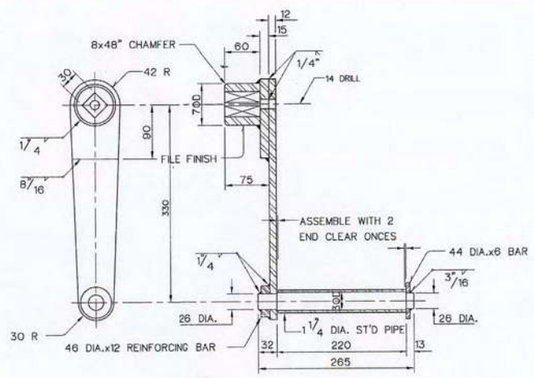
## SPUR PINION

STEEL, ST 60.11

ONE REQ'D

SCALE 1:2

3 KG.




11

## CRANK ARM

STEEL

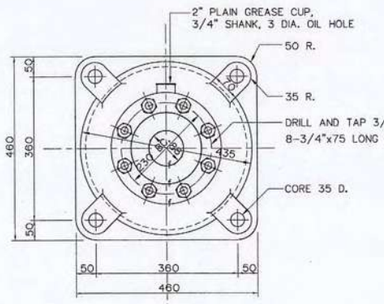
ONE REQ'D

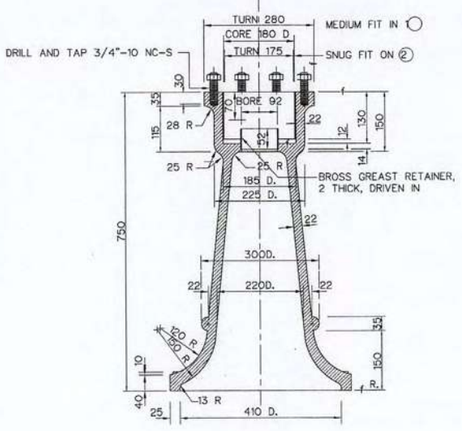
SCALE 1:5

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

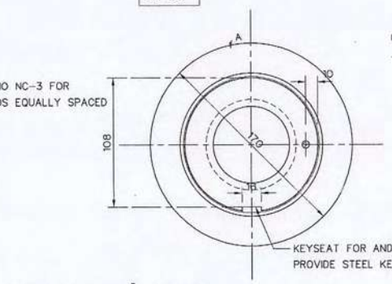
## PEDESTAL

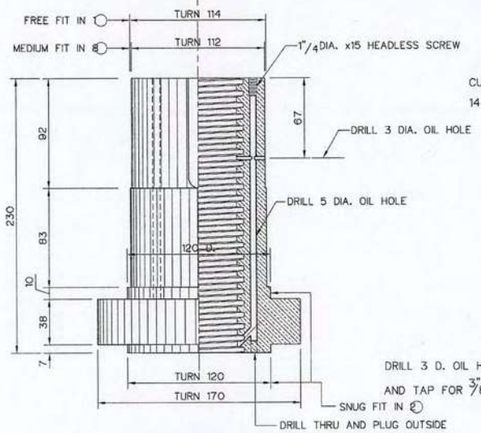
CAST IRON GG-18

ONE REQ'D

SCALE 1:7.5

140 KG.




SMOOTH FINISH ALL OVER EXCEPT AS NOTED

6

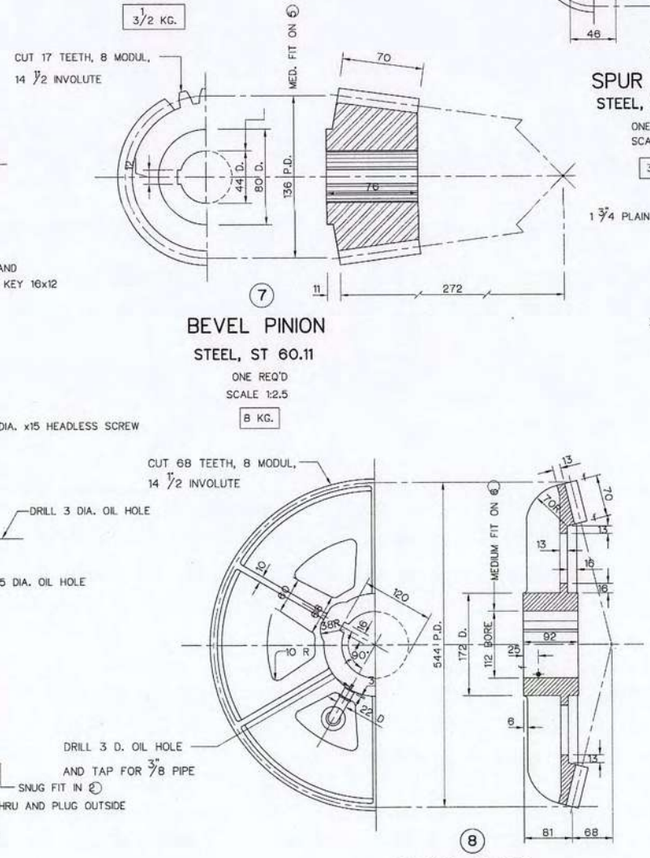
## LIFTING NUT

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

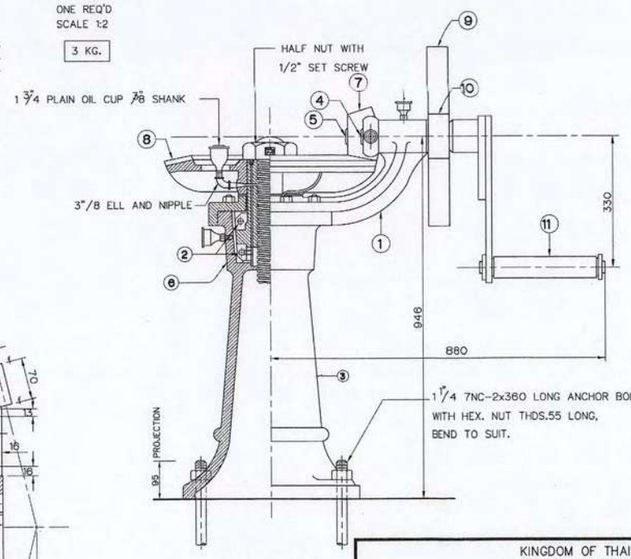
## BEVEL GEAR

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 | | | | |

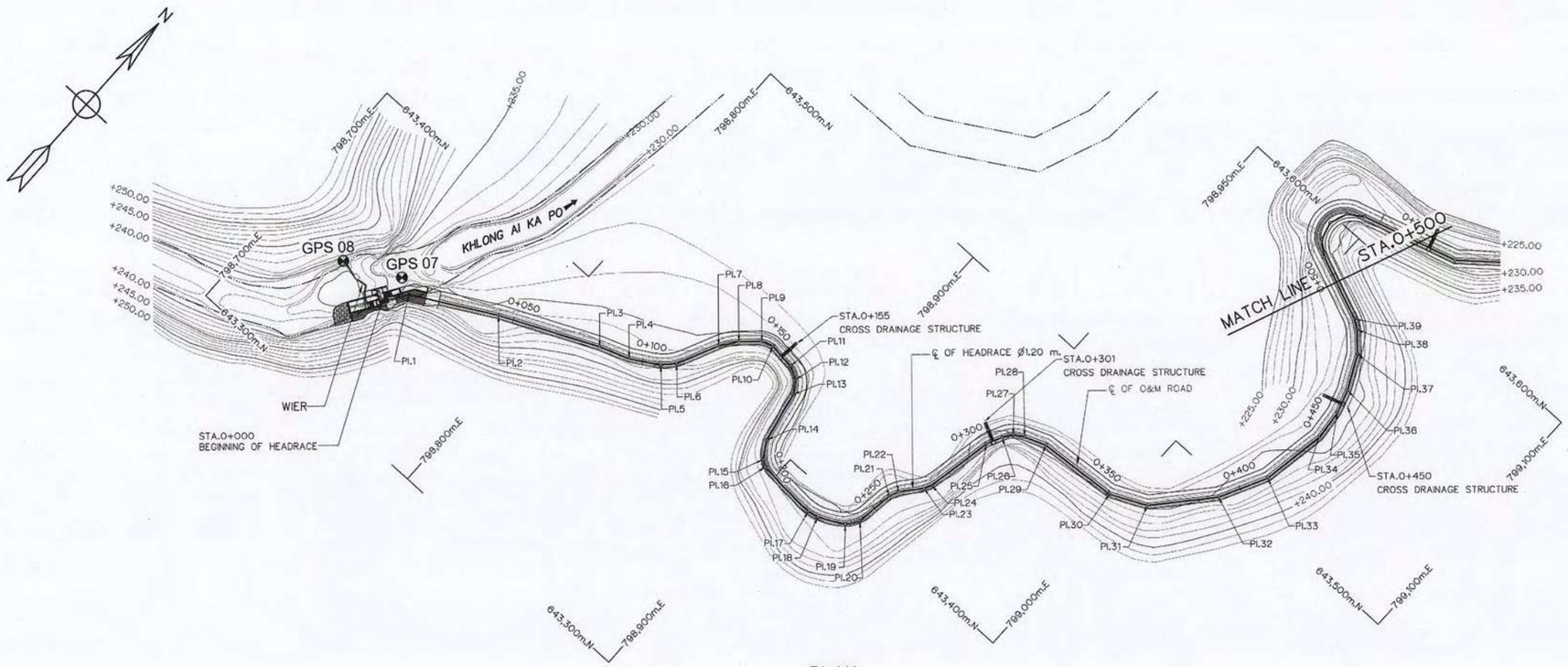
CONSULTANTS: P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.

DEDE

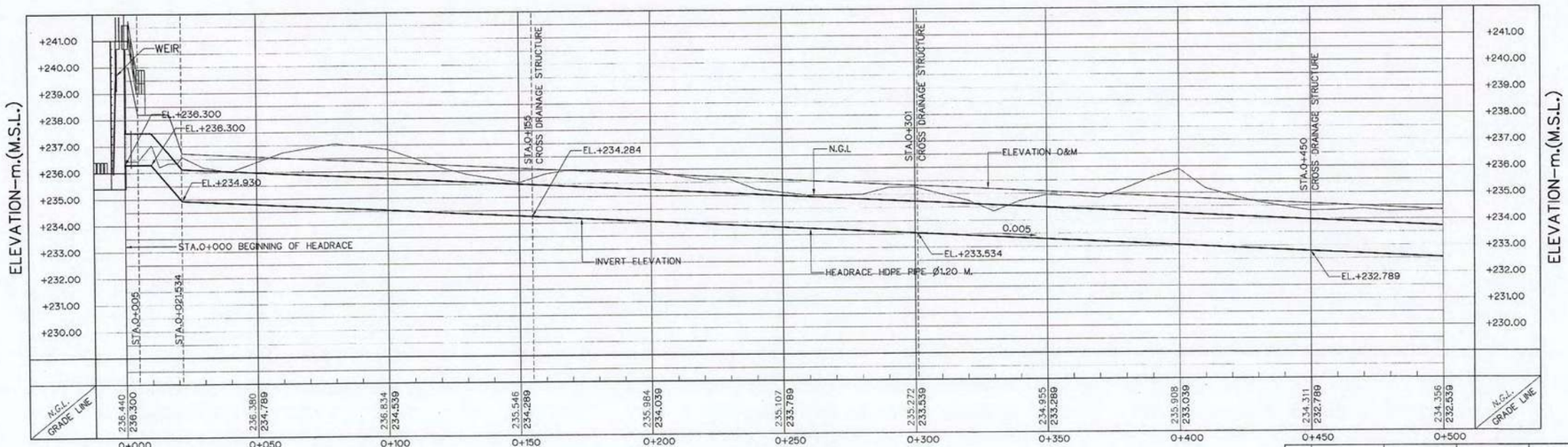
DESIGNED 28.2074 28.9462
DRAWN
CHECKED 28.8231
PROJECT MANAGER 28/10/2021 DATE

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

DRAWING NO. AKP-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

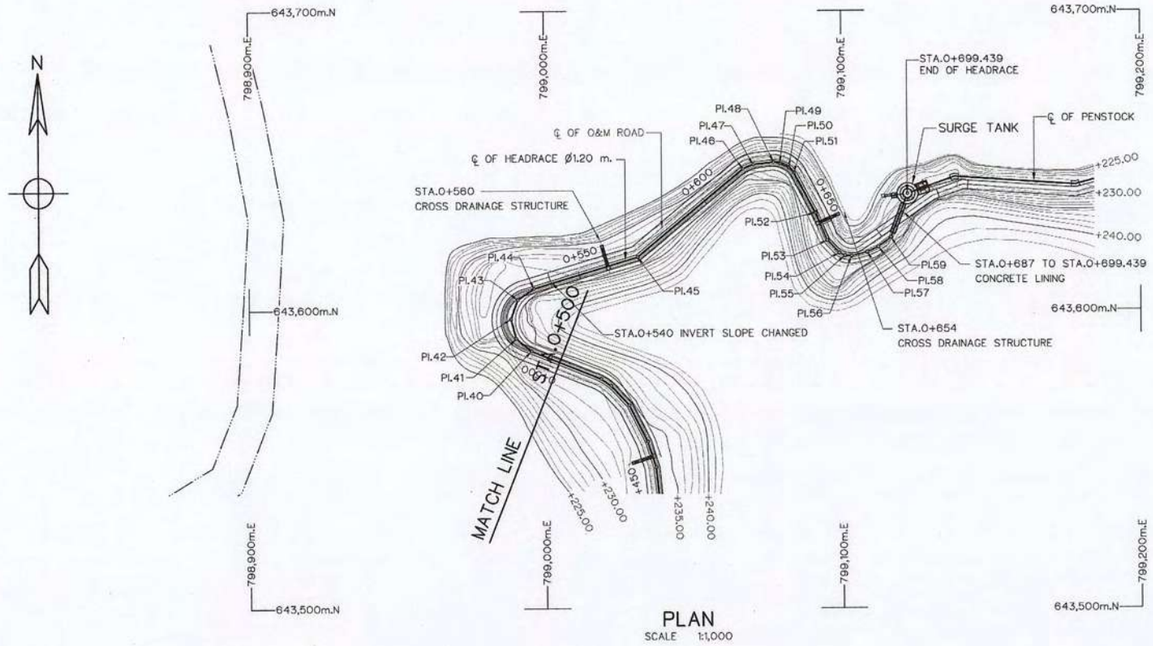
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
HEADRACE
PLAN AND PROFILE, STA.0+000 TO STA.0+500

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

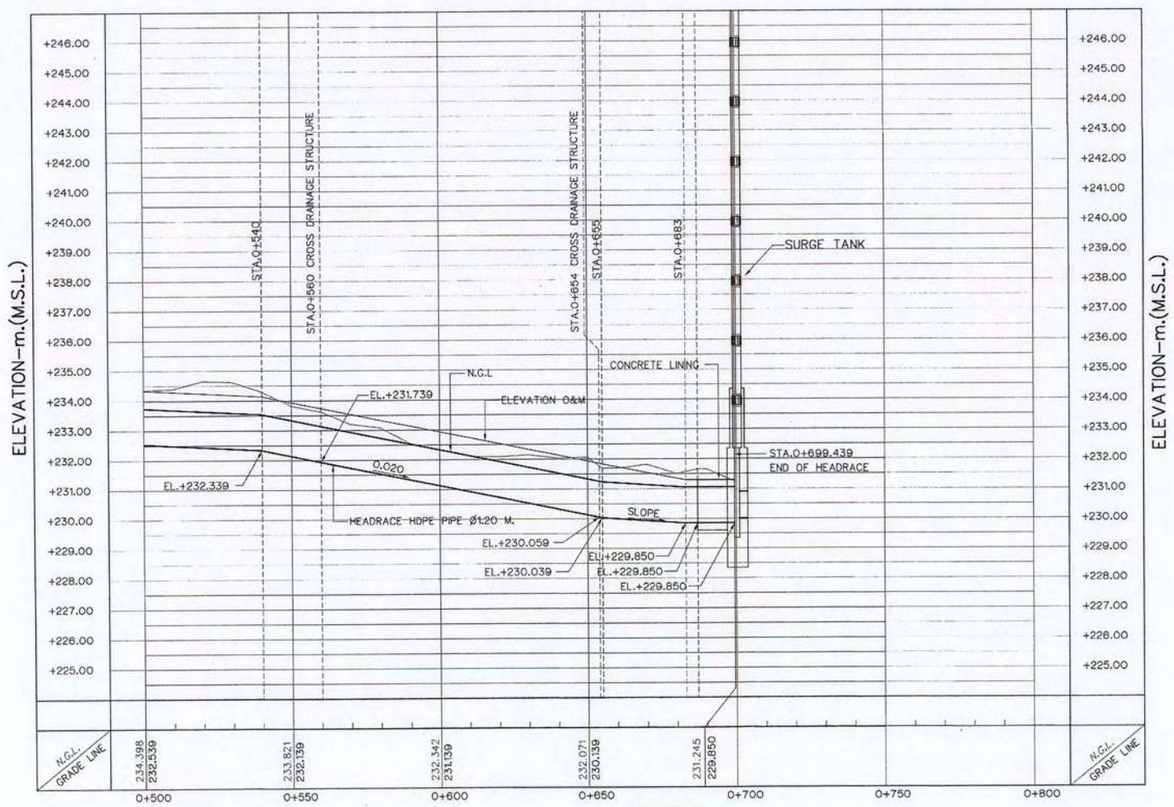
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

| | | | |
|---|---|---|---|
| DESIGNED | REG.29074 | REVIEWED | |
| DRAWN | | SUBMITTED | REG.9462 |
| CHECKED | REG.8231 | 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: PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD.
DEDE: Department of Alternative Energy Development and Efficiency, MINISTRY OF ENERGY

DESIGNED RE.29074 RE.9462
DRAWN
CHECKED RE.8231
28/10/2021
PROJECT MANAGER 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'-48.47" | 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 | 643,619.086 | 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 | 643,619.288 | 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

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 | | | | |
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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
HEADRACE
DATA CURVE OF HEADRACE

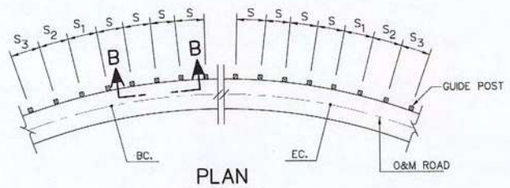
PCM P&C MANAGEMENT CO., LTD.
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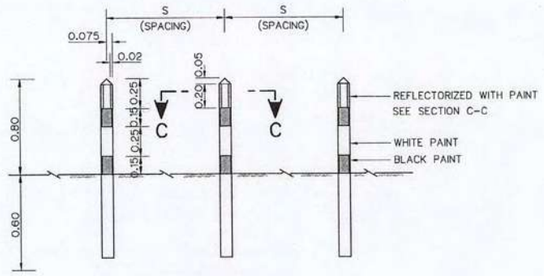
DESIGNED ... RB.29074 ... RB.9462
DRAWN
CHECKED ... RB.8231
28/10/2021
PROJECT MANAGER DATE

REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

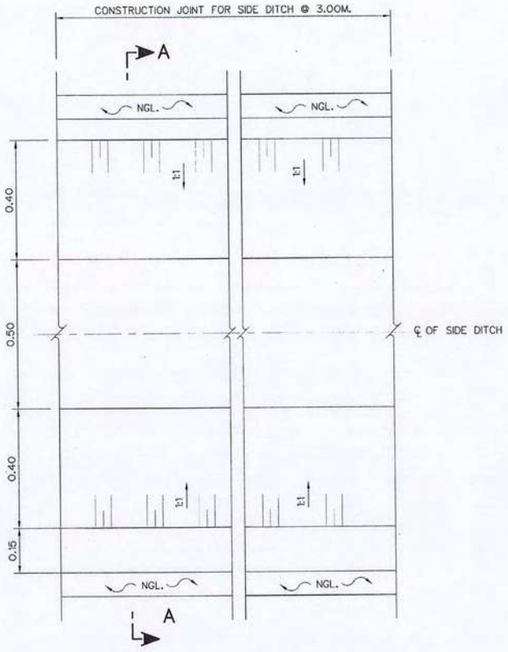
DRAWING NO. AKP-HR-03
SHEET NO. 29 OF 129




PLAN
NOT TO SCALE




SECTION B-B
NOT TO SCALE
GUIDE POSTS



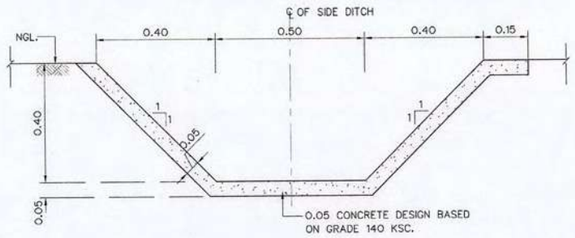

DETAIL OF SIDE DITCH
SCALE 1:10

**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

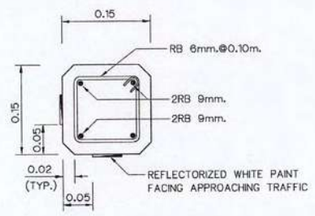
| TYPE OF GROUND | SLOPE 1:H |
|---|---|
| EARTH | 1:1.5 |
| MODERATELY WEATHERED ROCK | 1:1 |
| FRESH ROCK | 1:1 |



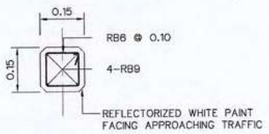

SECTION A-A
SCALE 1:10

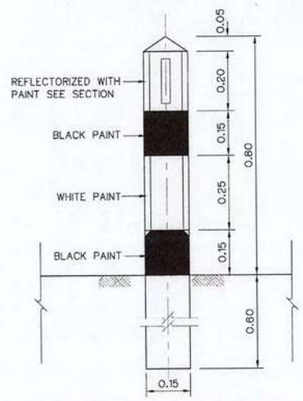
**TABLE 3**

| 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 | | | |

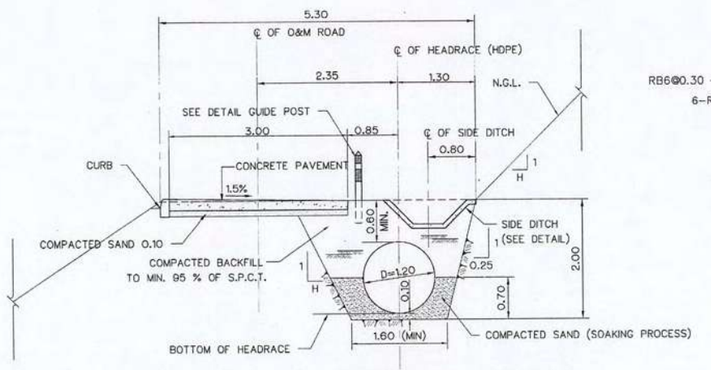



SECTION C-C
NOT TO SCALE

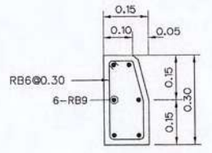



DETAIL OF GUIDE POST
SCALE 1:10




TYPICAL SECTIONS AND DETAIL OF HEADRACE
SCALE 1:50




CURB DETAIL
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. 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 |

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 | | | | |
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| | CONSULTANTS | | DEDE | |

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

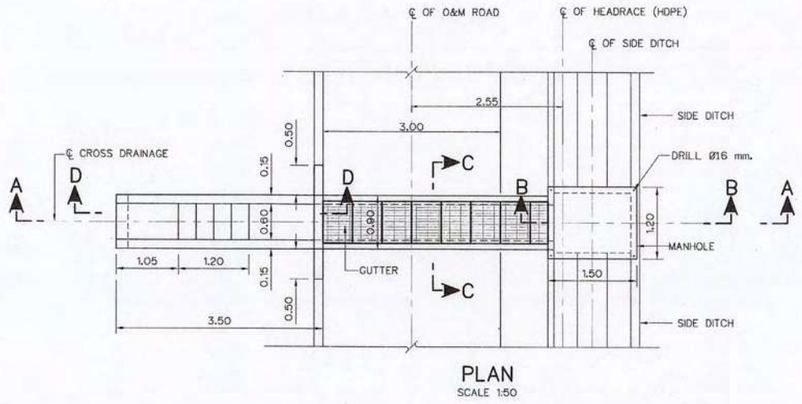
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

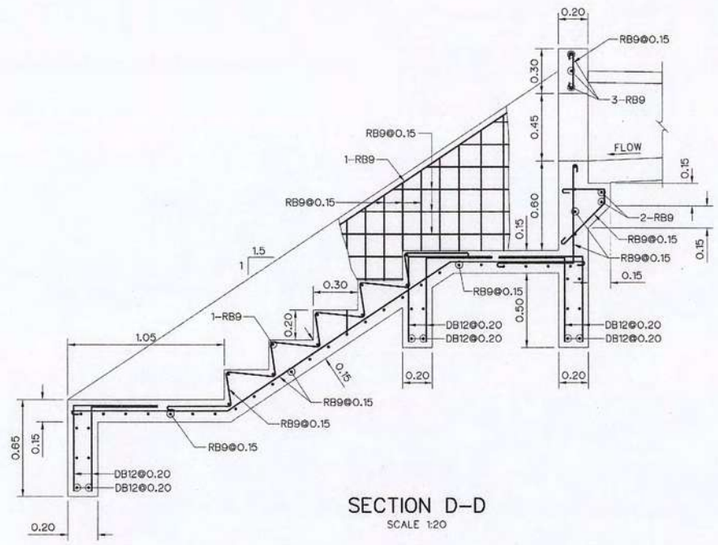
HEADRACE

TYPICAL SECTIONS AND DETAILS

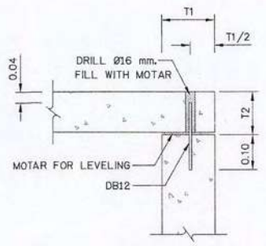
| | |
|---|---|
| PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY |
| DESIGNED RB.29074 RB.9462 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED RB.8231 | RECOMMENDED |
| PROJECT MANAGER 28/10/2021 DATE | APPROVED |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



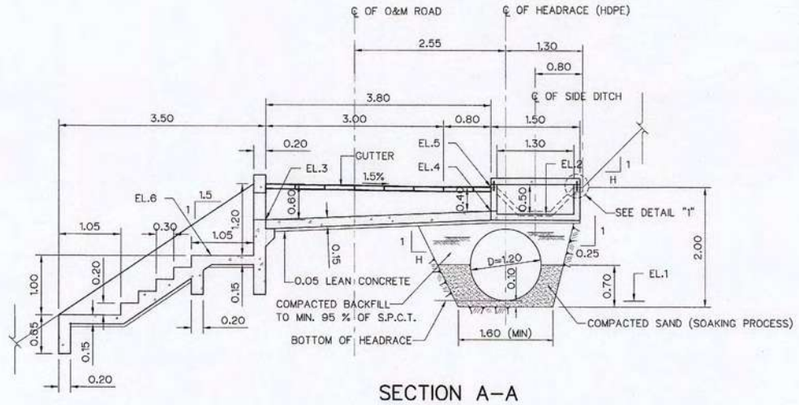

PLAN
SCALE 1:50




SECTION D-D
SCALE 1:20



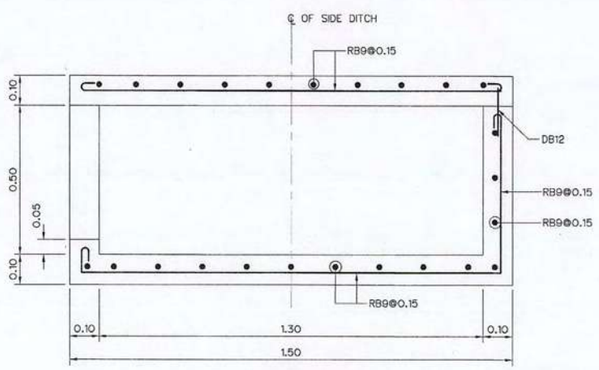

DETAIL "1"
NON TO SCALE



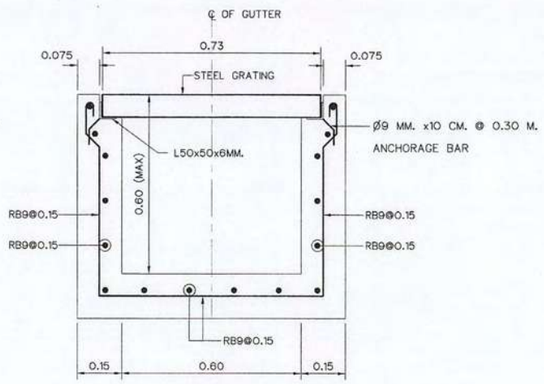

SECTION A-A
SCALE 1:50

INSTALLATION DATA OF CROSS DRAINAGE STRUCTURES

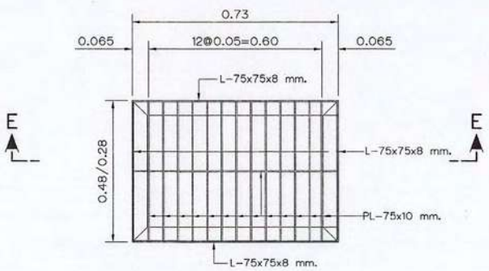
| STA. | FLOW DIRECTION | ELEVATION (m.MSL.) | | | | | |
|---|---|---|---|---|---|---|---|
| | | EL.1 | EL.2 | EL.3 | EL.4 | EL.5 | EL.6 |
| 0+155 | RIGTH TO LEFT | 234.284 | 235.634 | 235.529 | 235.684 | 236.084 | 234.929 |
| 0+301 | RIGTH TO LEFT | 233.534 | 234.884 | 234.779 | 234.934 | 235.334 | 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 |



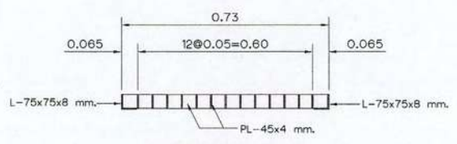

SECTION B-B
SCALE 1:10




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

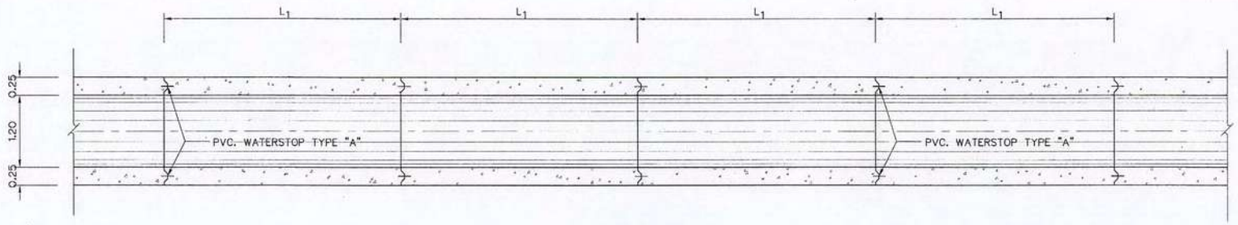
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
HEADRACE
TYPICAL CROSS DRAINAGE AND DETAILS

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

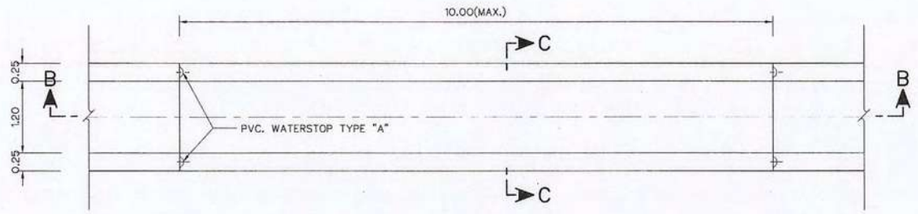
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

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



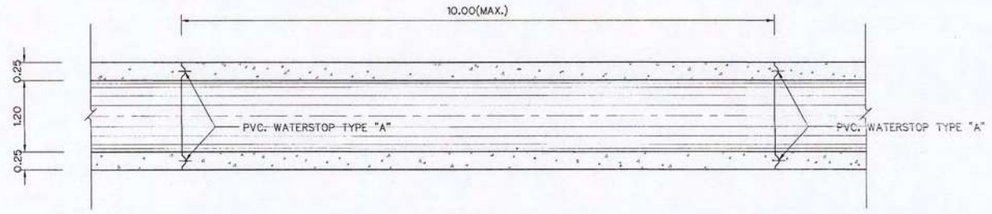

SECTION A–A

NOT TO SCALE



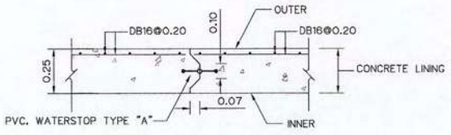

PLAN

NOT TO SCALE



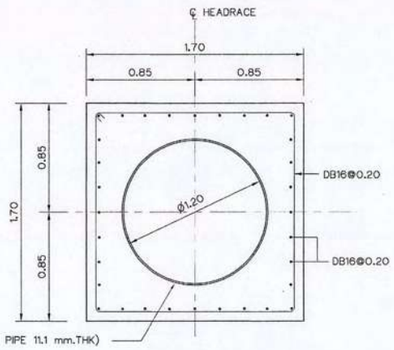

SECTION B–B

NOT TO SCALE



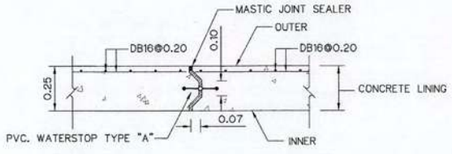

CONTRACTION JOINT @ 10 M. (MAX.)

SCALE 1:20



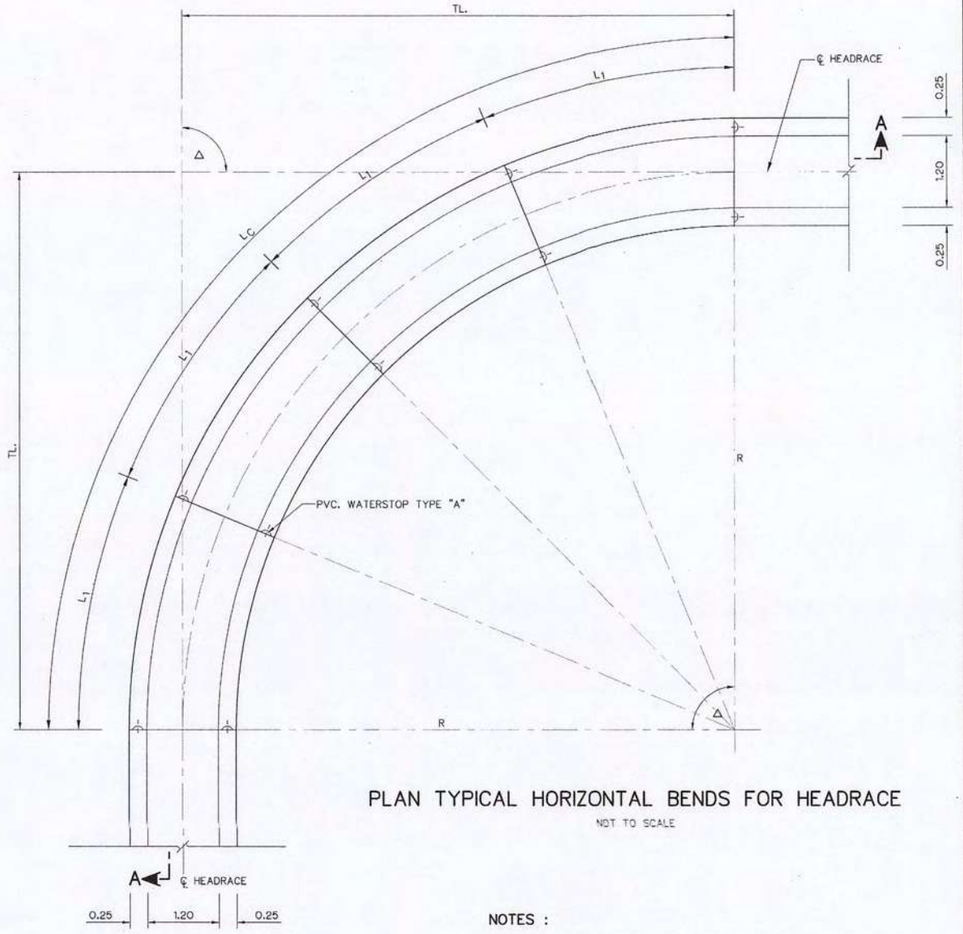

SECTION C–C

NOT TO SCALE




EXPANSION JOINT @ 30 M.

SCALE 1:20




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

| NO. | DATE | REVISIONS | CHECKED | APPROVED |
|---|---|---|---|---|
| 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

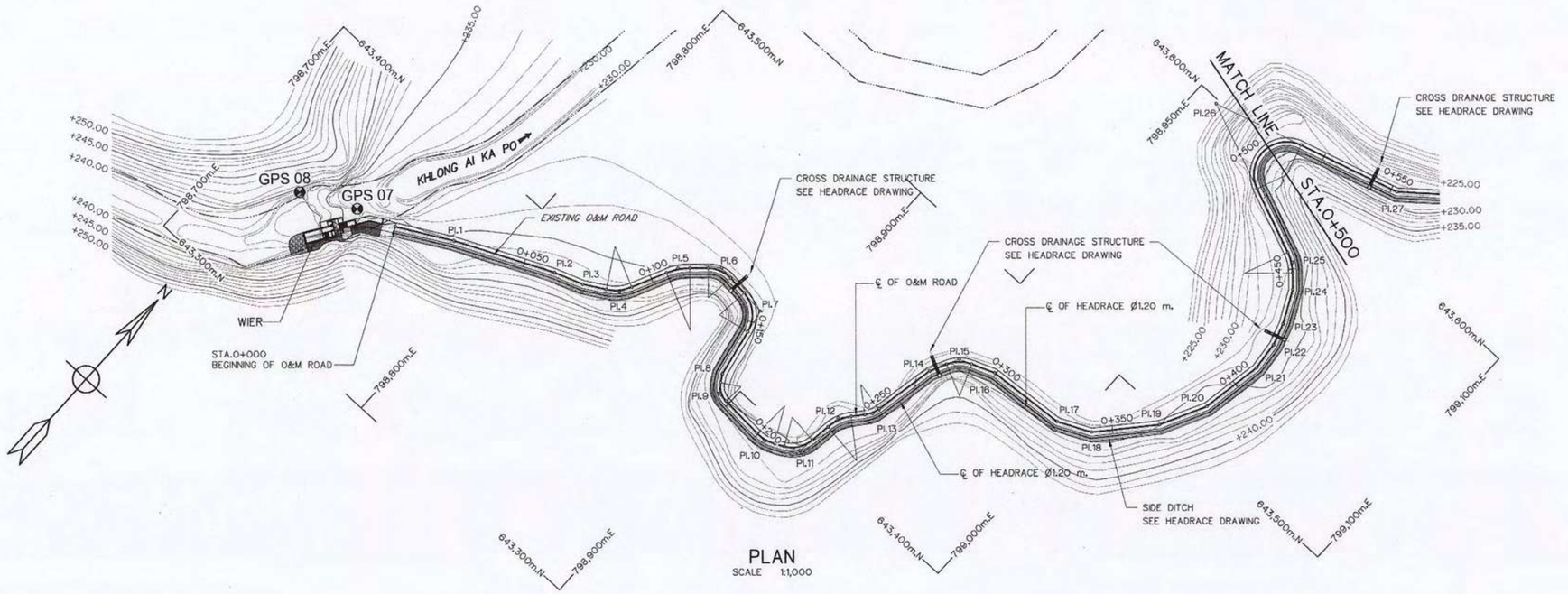
PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

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

REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP–HR–06
SHEET NO. 32 OF 129



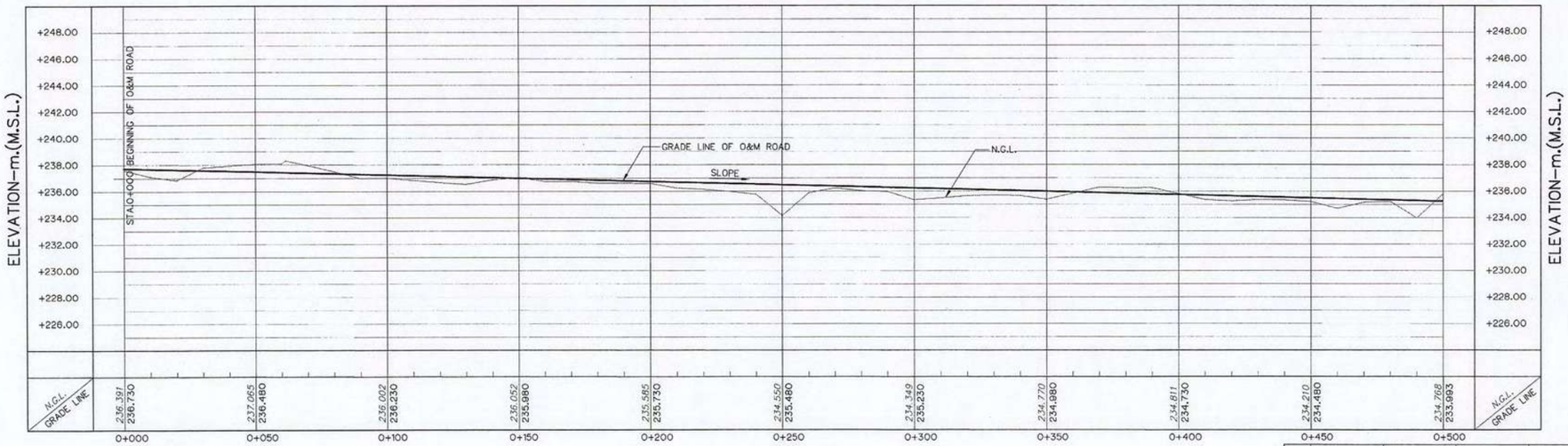

PLAN
SCALE 1:1,000

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

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

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

| NO. | DATE | REVISIONS | CHECKED | APPROVED |
|---|---|---|---|---|
| 3 | | | | |
| 2 | | | | |
| 1 | | | | |

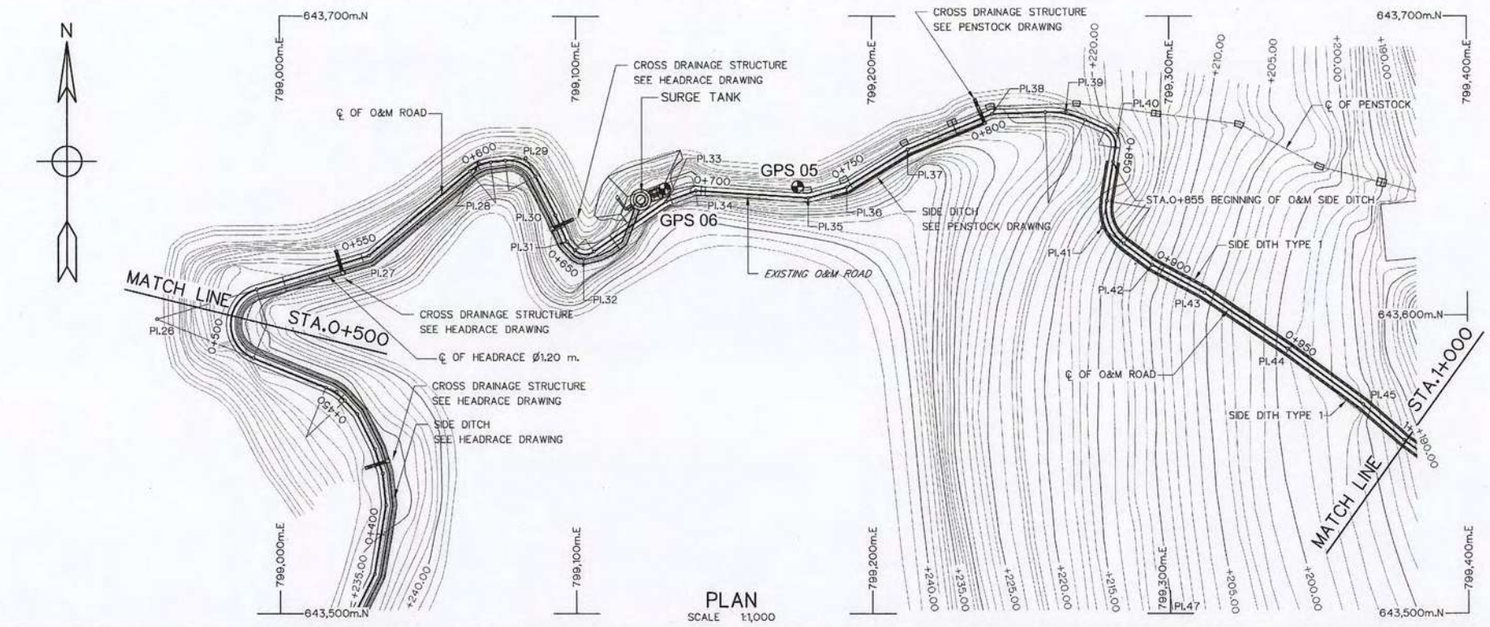
CONSULTANTS | DEDE

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

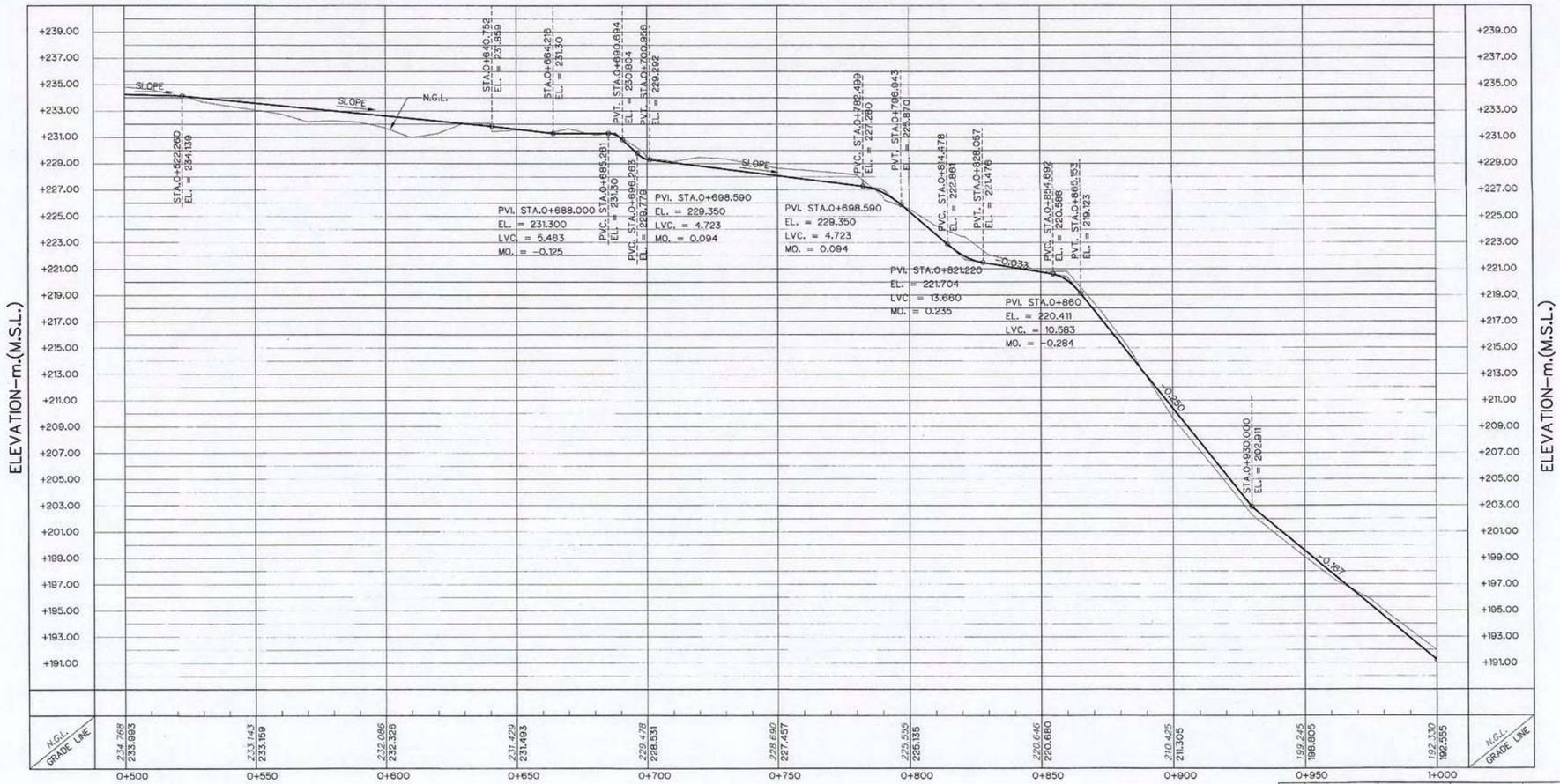
DESIGNED 28.29074 28.9482
DRAWN
CHECKED 28.8231
28/10/2021
PROJECT MANAGER DATE

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

DRAWING NO. AKP-OM-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

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

### PLAN AND PROFILE, STA. 0+500 TO STA. 1+000

| NO. | DATE | REVISIONS | CHECKED | APPROVED |
|---|---|---|---|---|
| 3 | | | | |
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| 1 | | | | |

CONSULTANTS | DEDE

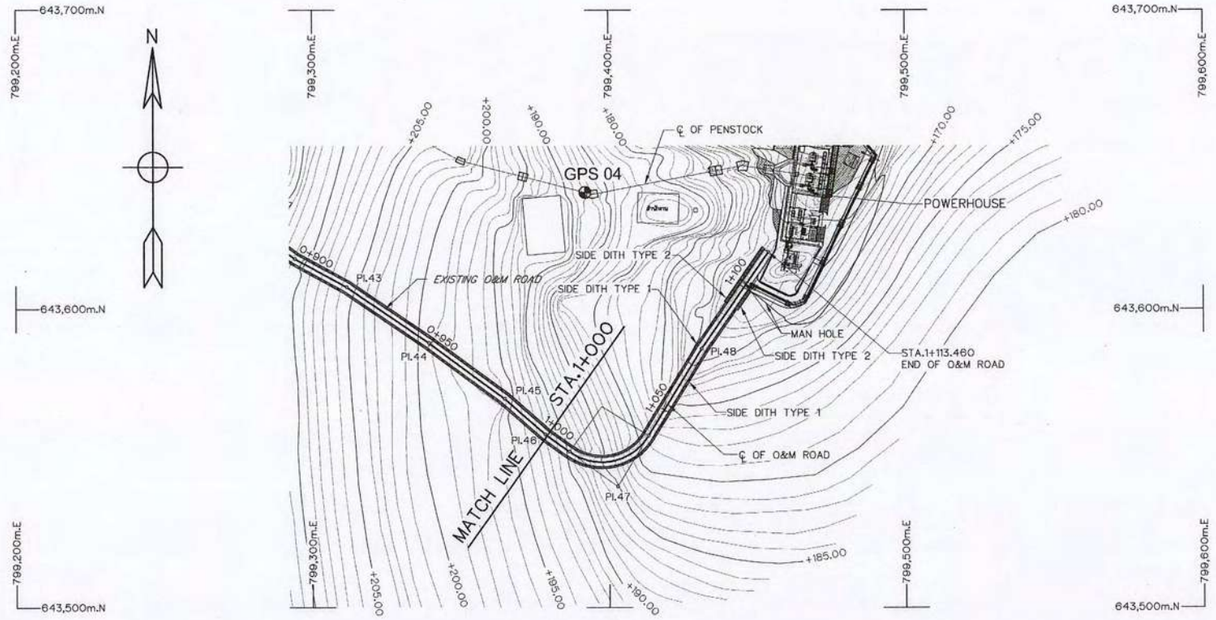
PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

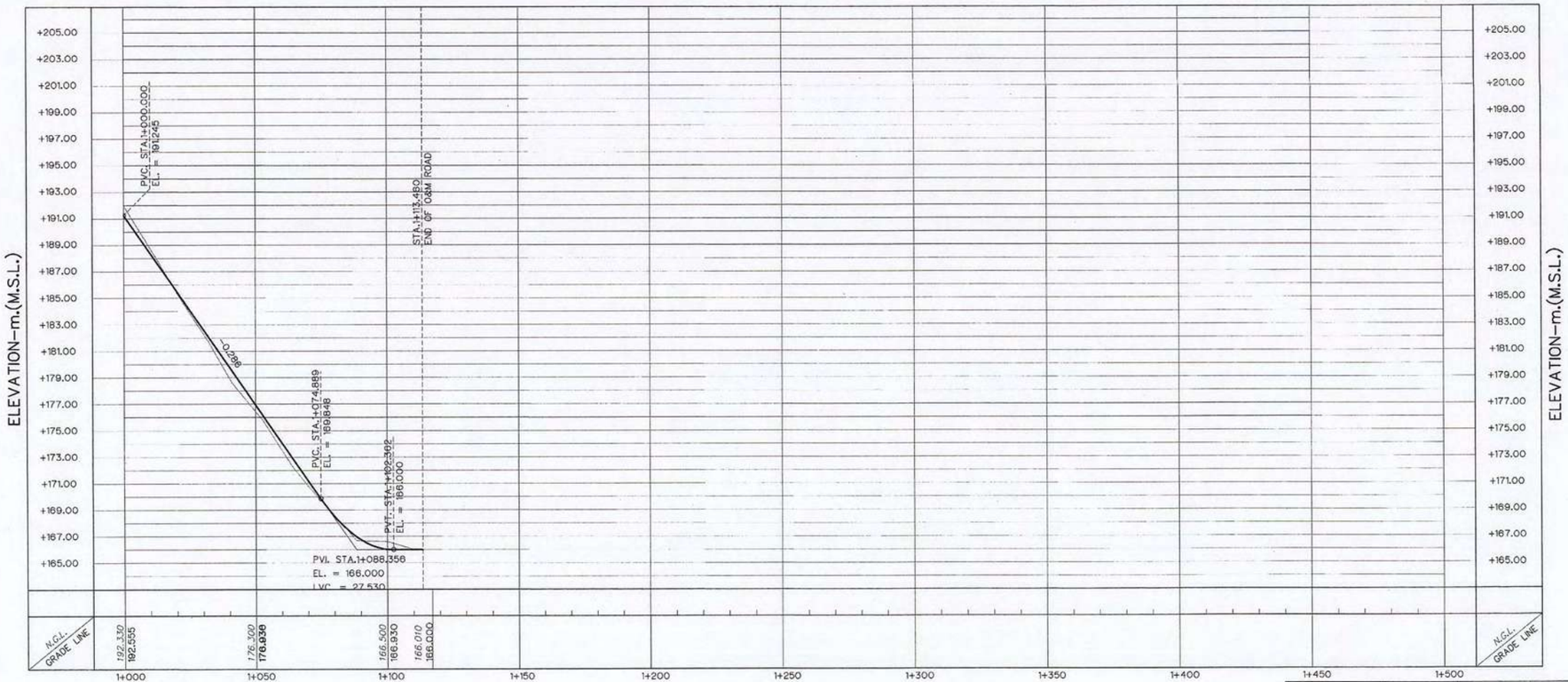
DESIGNED ... REVIEWED
DRAWN ... SUBMITTED
CHECKED ... RECOMMENDED
APPROVED

PROJECT MANAGER 28/10/2021 DATE

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 | | | | |
| | 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
O&M ROAD
PLAN AND PROFILE, STA. 1+000 TO STA. 1+113.460

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

| | | |
|---|---|---|
| DESIGNED | วิบูลย์ 28/9/2074 | สันติ 28/9/2462 |
| DRAWN | | |
| CHECKED | | สันติ 28/9/2231 |
| PROJECT MANAGER | 28/10/2021 DATE | |

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED
SUBMITTED
RECOMMENDED
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'–30.98" 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 | 798,965.374 | 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'–14.48" | – | – | – | – | 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 | | | | |

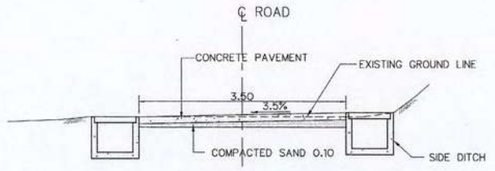
CONSULTANTS: PCM P&C MANAGEMENT CO., LTD. / GPS SPT CONSULTANTS CO., LTD.

DEDE

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

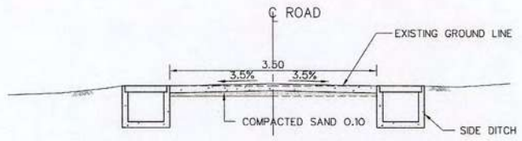
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

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




TYPICAL SECTION FOR HILLSIDE

NOT TO SCALE



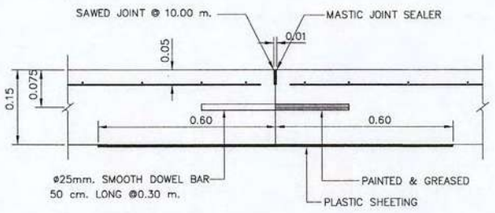

TYPICAL SECTION FOR FLAT AREA

NOT TO SCALE




DETAIL OF EXPANSION JOINT

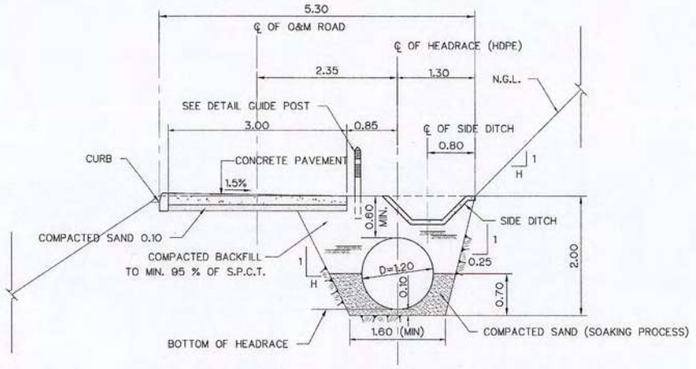
NOT TO SCALE




DETAIL OF CONSTRUCTION JOINT

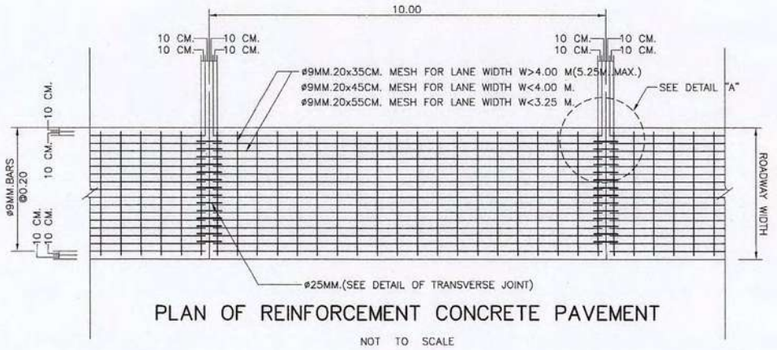
NOT TO SCALE

| 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 |



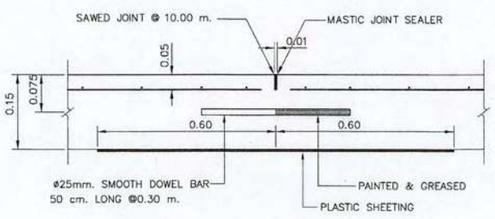

TYPICAL SECTION FOR ALONG WITH HEADRACE

SCALE 1:50



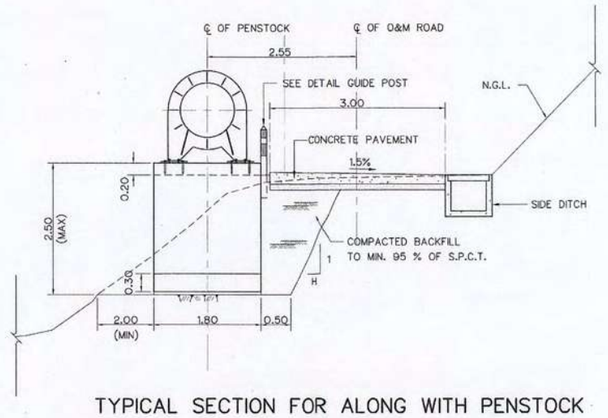

PLAN OF REINFORCEMENT CONCRETE PAVEMENT

NOT TO SCALE



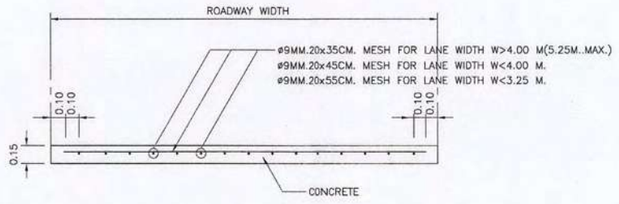

DETAIL OF CONTRACTION JOINT

NOT TO SCALE



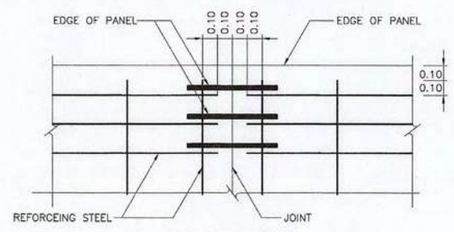

TYPICAL SECTION FOR ALONG WITH PENSTOCK

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.

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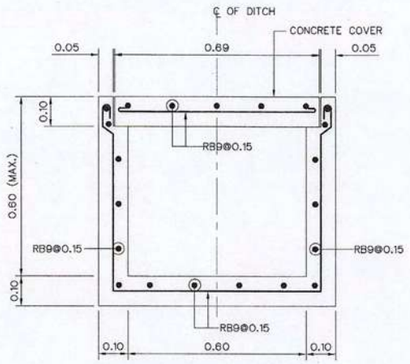
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

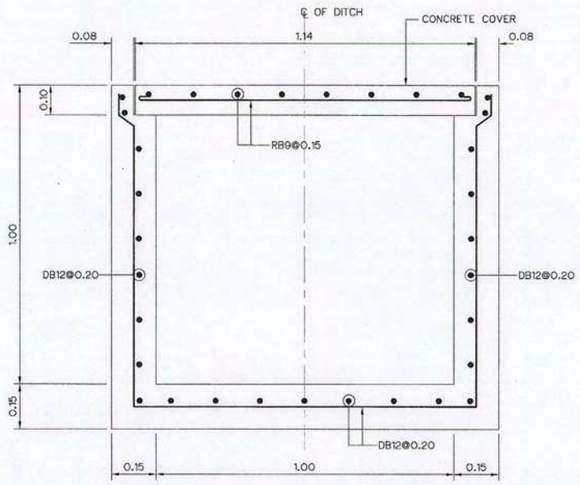
O&M ROAD

TYPICAL SECTIONS AND DETAILS

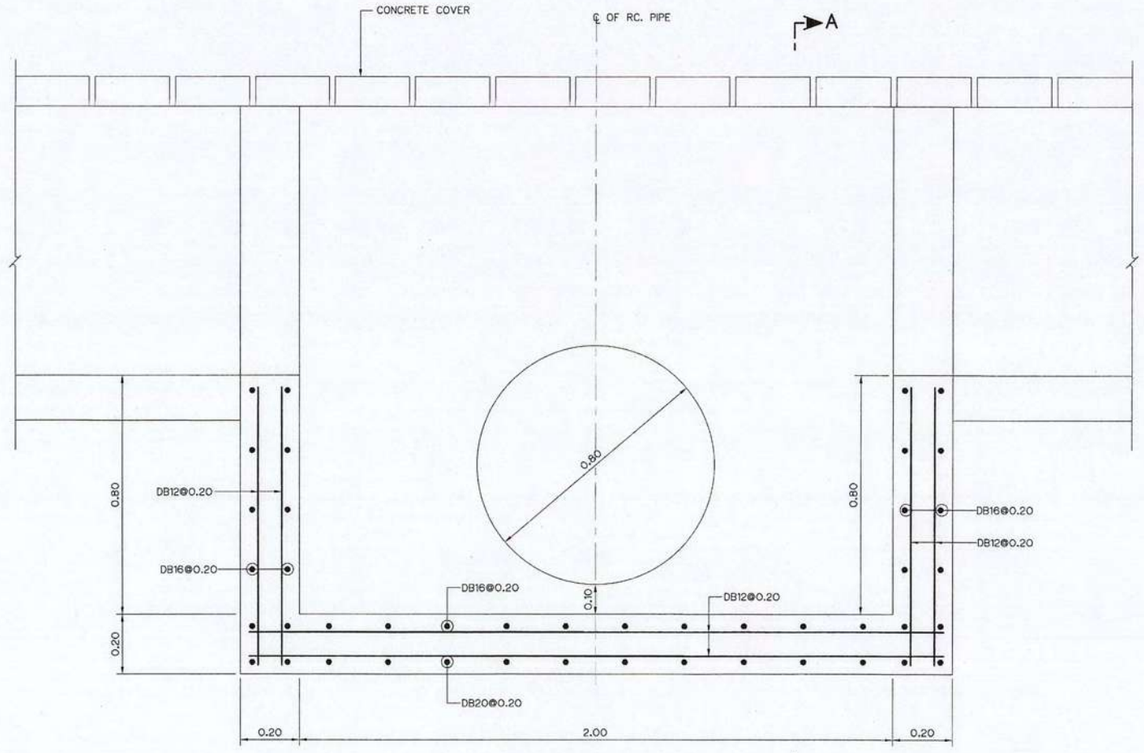
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|---|---|
| P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY |
| DESIGNED ... วิศ.29074 ... วิศ.9462 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED ... วิศ.8231 | RECOMMENDED |
| PROJECT MANAGER 28/10/2021 DATE | APPROVED |
| | DRAWING NO. AKP-OM-05 |
| | SHEET NO. 37 OF 129 |



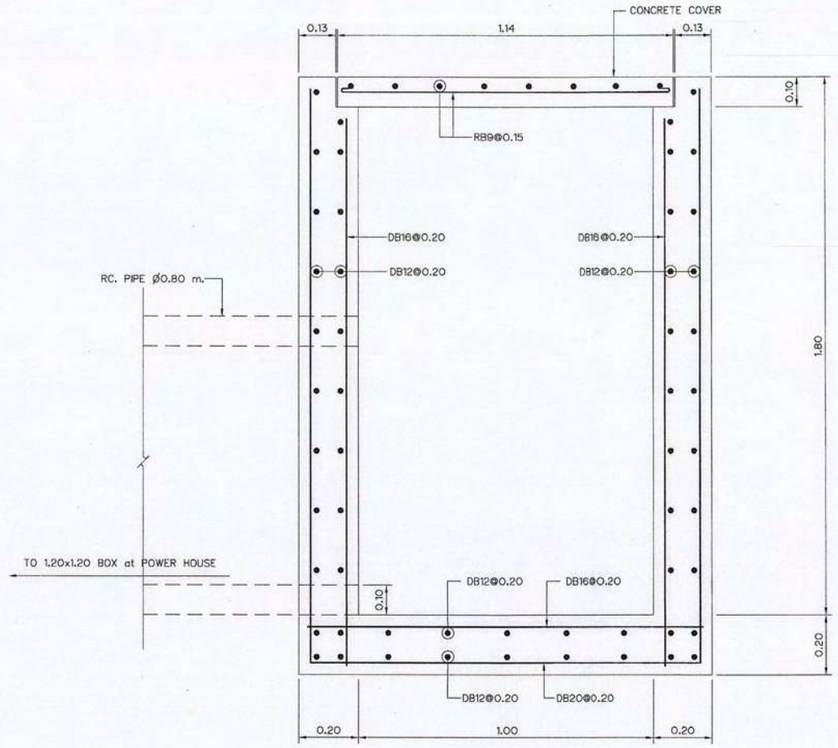

SIDE DITCH TYPE 1
SCALE 1:10




SIDE DITCH TYPE 2
SCALE 1:10




SIDE DITH MANHOLE
SCALE 1:10




SECTION A–A
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 |
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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

O&M ROAD

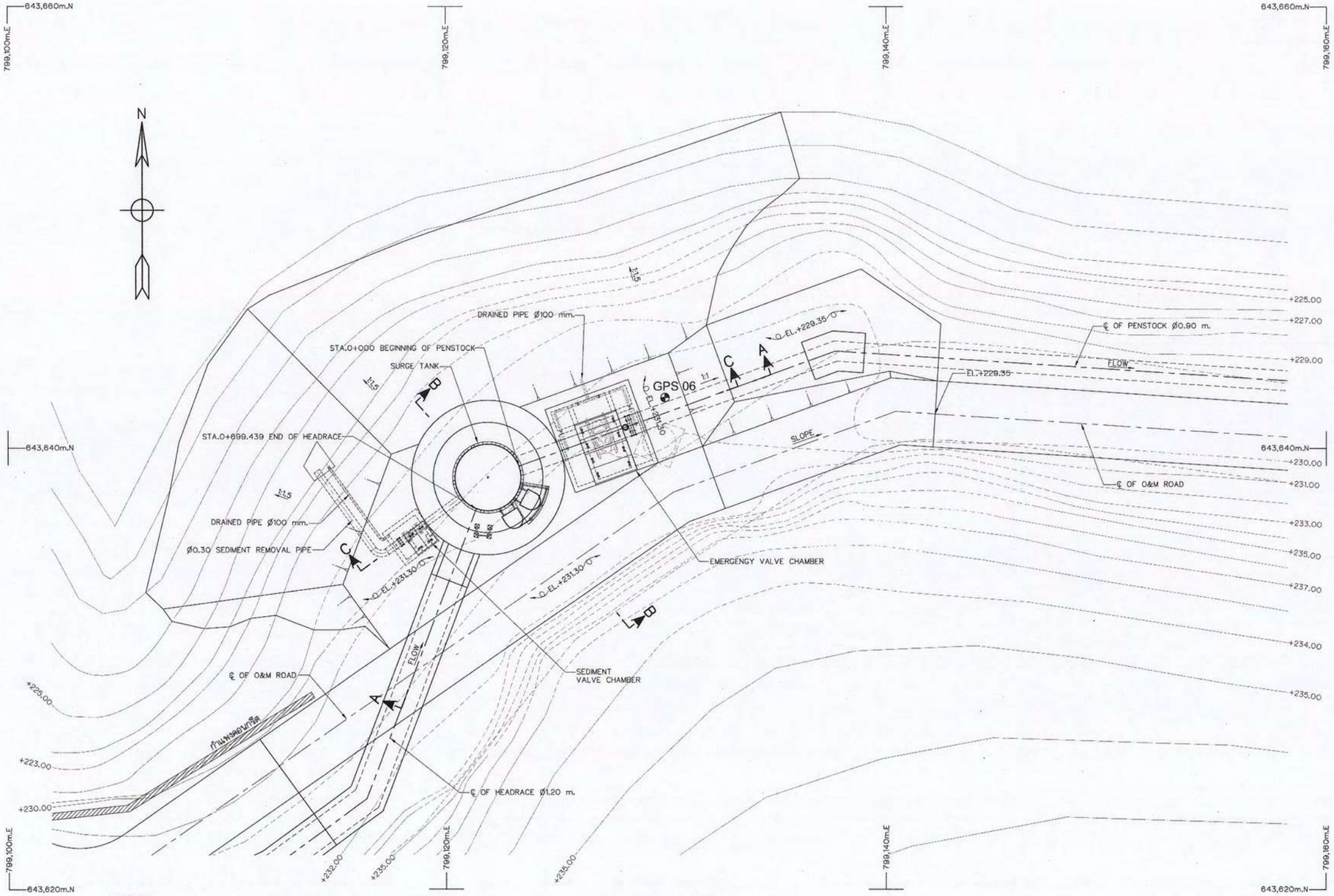
TYPICAL SIDE DITCH TYPE 1 AND SIDE DITCH TYPE 2

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| | | |
|---|---|---|
| DESIGNED | วศ.29074 วศ.9462 | REVIEWED |
| DRAWN | | SUBMITTED |
| CHECKED | วศ.8231 | RECOMMENDED |
| PROJECT MANAGER | 28/10/2021 DATE | 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 |
|---|---|---|---|---|
| 3 | | | | |
| 2 | | | | |
| 1 | | | | |
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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

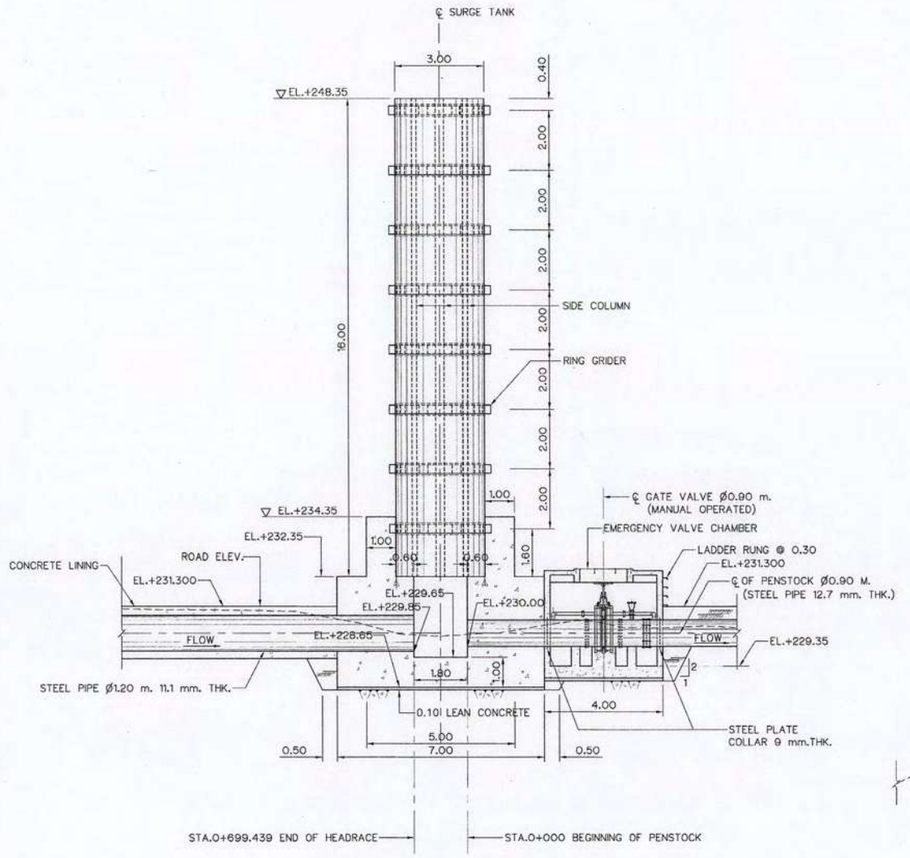
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
SURGE TANK
GENERAL LAYOUT

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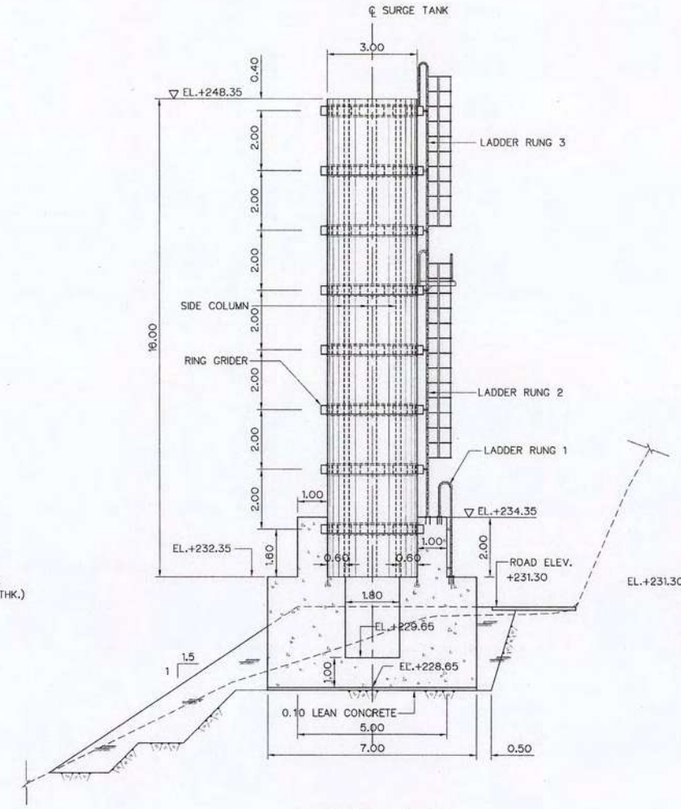
DESIGNED Reg.29074 Reg.9462
DRAWN
CHECKED Reg.8231
28/10/2021
PROJECT MANAGER DATE

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

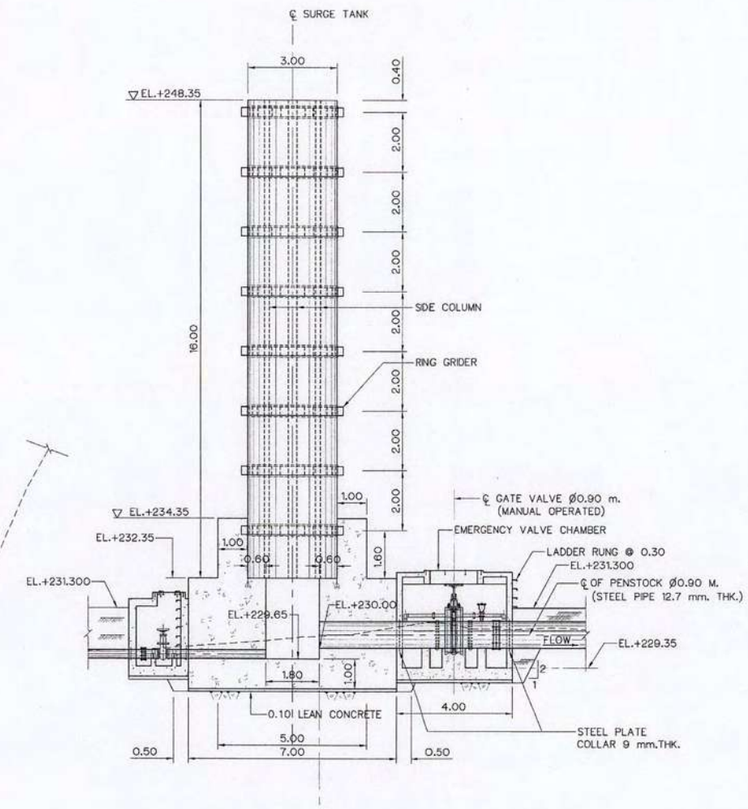
DRAWING NO. AKP-ST-01
SHEET NO. 39 OF 129




SECTION A–A
SCALE 1:100




SECTION B–B
SCALE 1:100



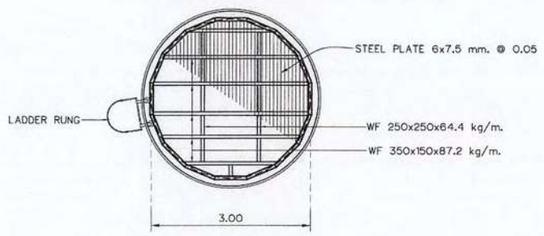

SECTION C–C
SCALE 1:100

## 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

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

0 1 2 3 4 5 6 7 8
SCALE 1:100 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
SURGE TANK
SECTIONS

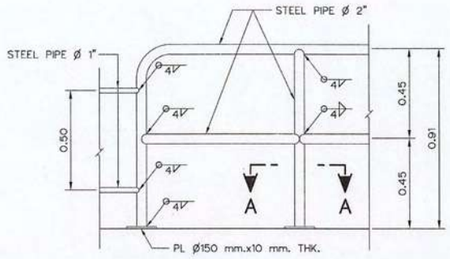
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DESIGNED ณัฐวัฒน์ 29074 สมชาย 9462
DRAWN
CHECKED สมชาย 8231
PROJECT MANAGER 28/10/2021 DATE

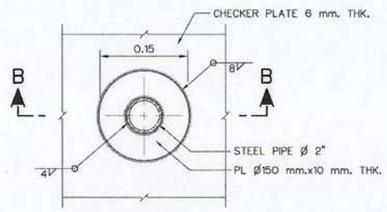
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

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



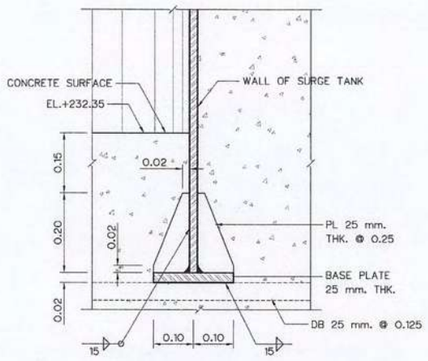

DETAIL OF HANDRAIL

SCALE 1:15



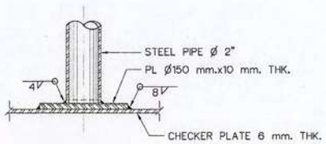

SECTION A–A

SCALE 1:5



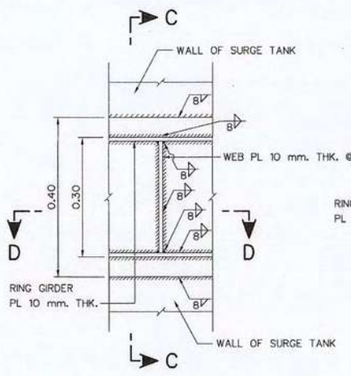

DETAIL "A" (AKP-ST-02)

SCALE 1:10



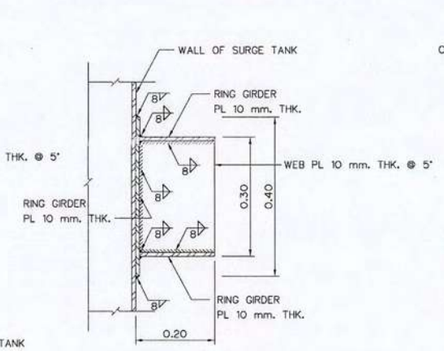

SECTION B–B

SCALE 1:5



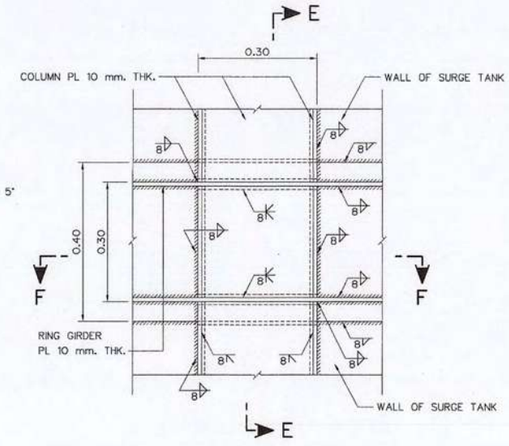

SIDE VIEW OF RING GIRDER

SCALE 1:7.5



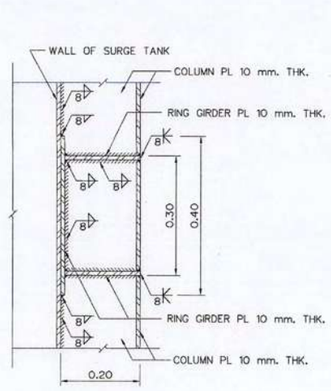

SECTION C–C

SCALE 1:7.5




SIDE VIEW OF COLUMN
AND RING GIRDER

SCALE 1:7.5




SECTION E–E

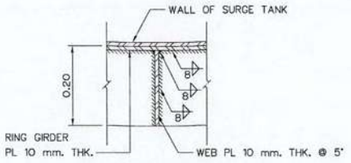
SCALE 1:7.5

## 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.

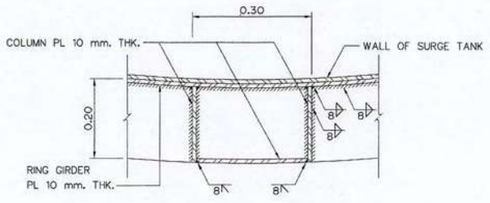
## REFERENCE DRAWINGS :

| | |
|---|---|
| 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 |



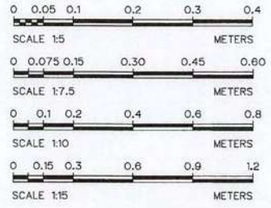

SECTION D–D

SCALE 1:7.5




SECTION F–F

SCALE 1:7.5




| NO. | DATE | REVISIONS | CHECKED | APPROVED |
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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
RING GIRDER AND HANDRAIL DETAILS

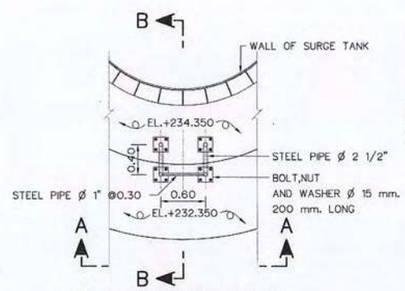
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MINISTRY OF ENERGY

DESIGNED ปฏิรูป วัลลภ 28L29074 28L9482
DRAWN
CHECKED 28L8231
PROJECT MANAGER 28/10/2021 DATE

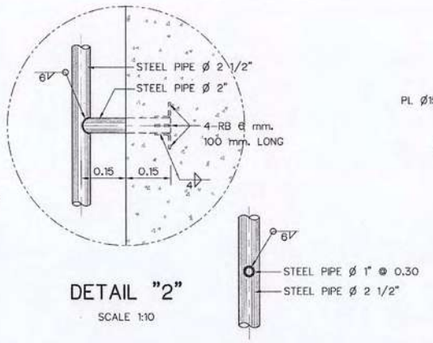
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

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




PLAN LADDER RUNG 1

SCALE 1:40

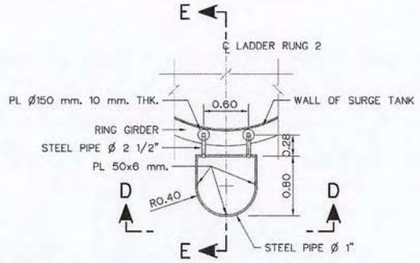



DETAIL "2"

SCALE 1:10

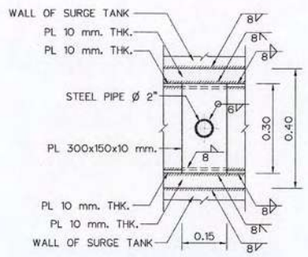
DETAIL "3"

SCALE 1:25



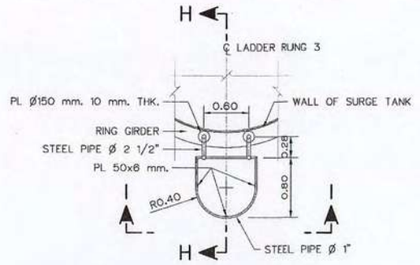

PLAN LADDER RUNG 2

SCALE 1:40



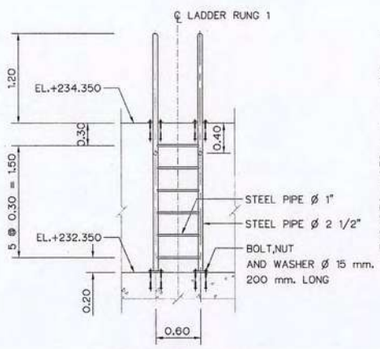

SECTION G-G

SCALE 1:10



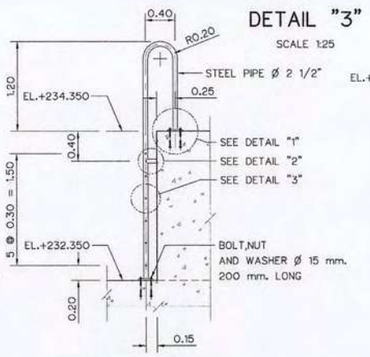

PLAN LADDER RUNG 3

SCALE 1:40



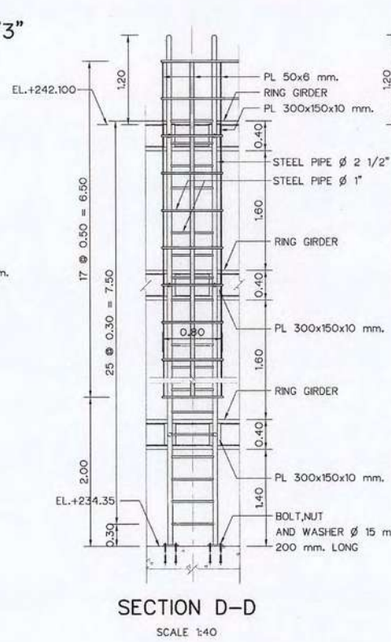

SECTION A-A

SCALE 1:40



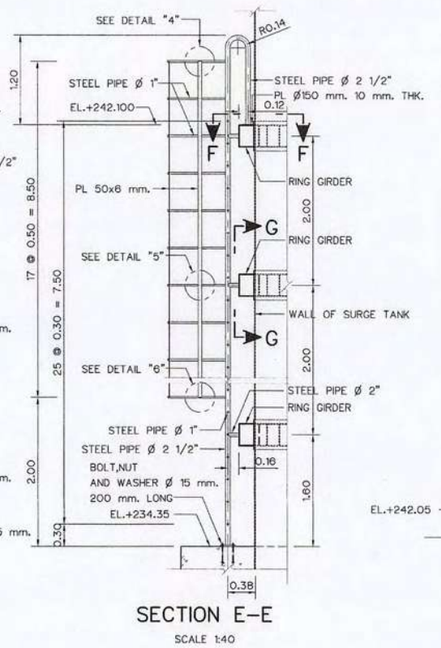

SECTION B-B

SCALE 1:40



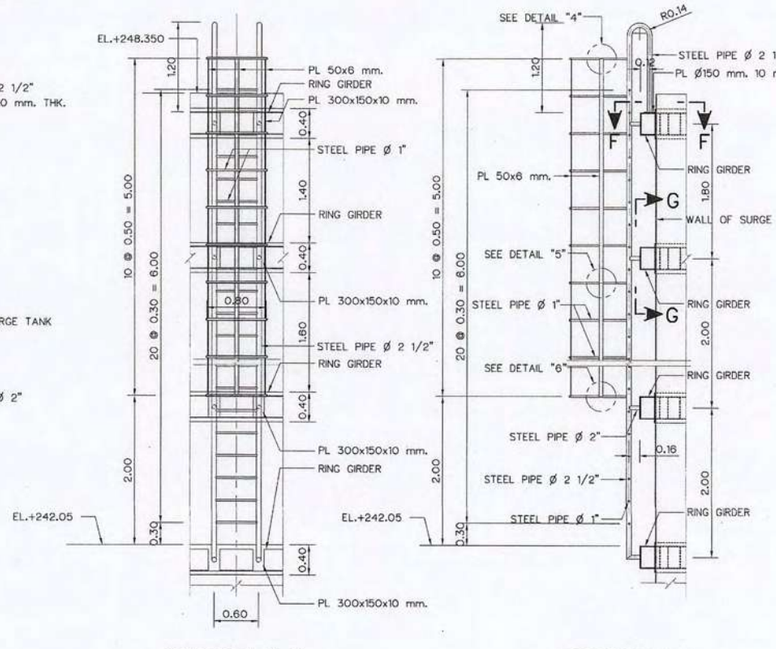

SECTION D-D

SCALE 1:40




SECTION E-E

SCALE 1:40

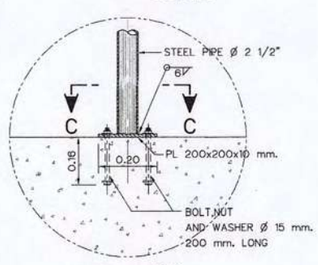



SECTION H-H

SCALE 1:40

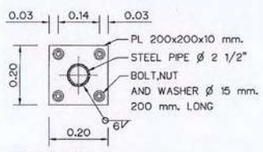
SECTION I-I

SCALE 1:40



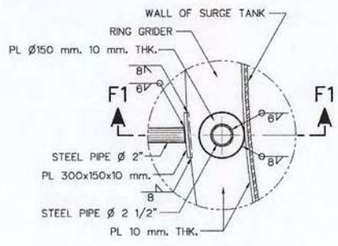

DETAIL "1"

SCALE 1:10



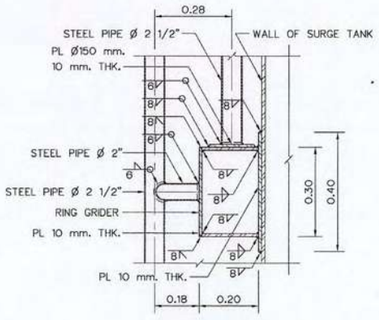

SECTION C-C

SCALE 1:10



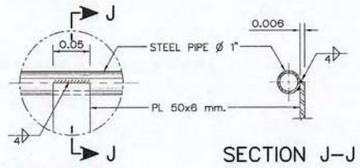

SECTION F-F

SCALE 1:10




SECTION F1-F1

SCALE 1:10

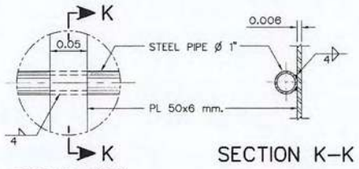



DETAIL "4"

SCALE 1:10

SECTION J-J

SCALE 1:10

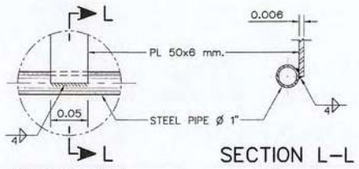



DETAIL "5"

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

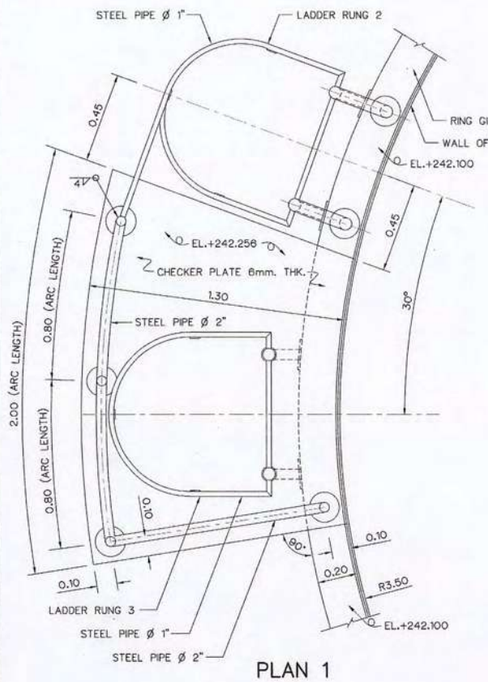
PCM P&C MANAGEMENT CO., LTD.
SPT SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

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

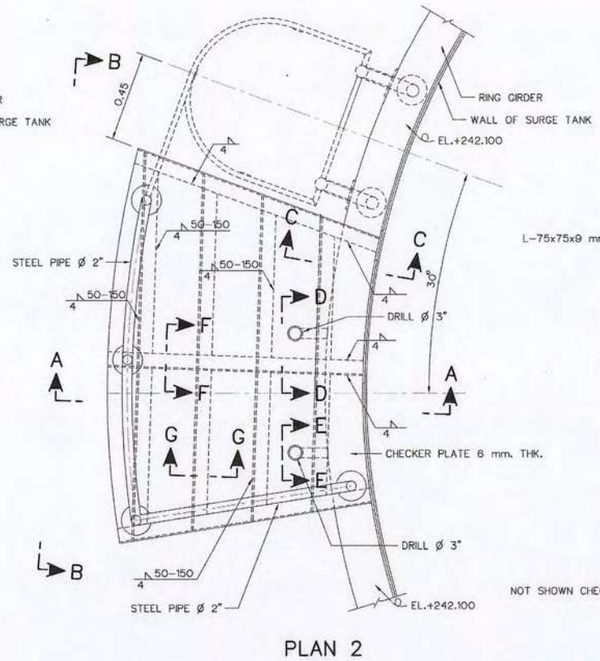
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP-ST-04
SHEET NO. 42 OF 129



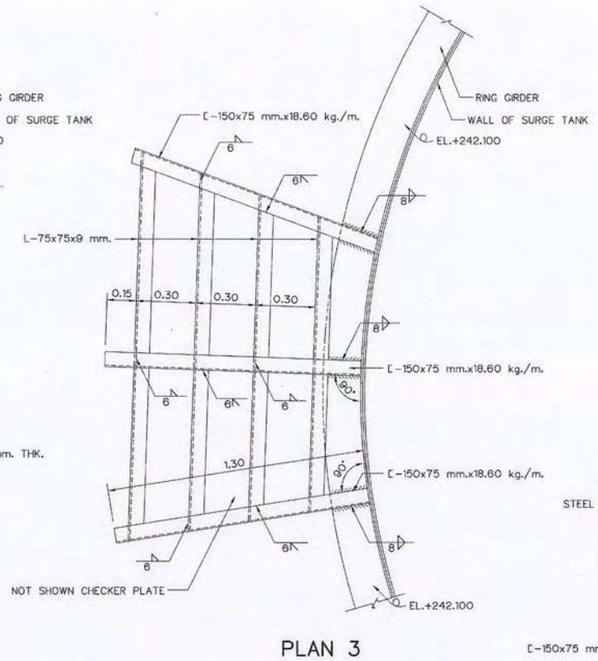

PLAN 1

SCALE 1:15



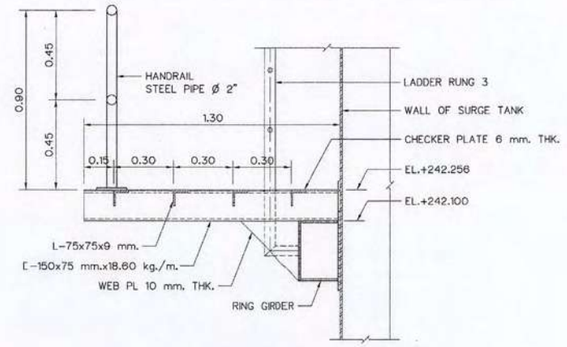

PLAN 2

SCALE 1:15



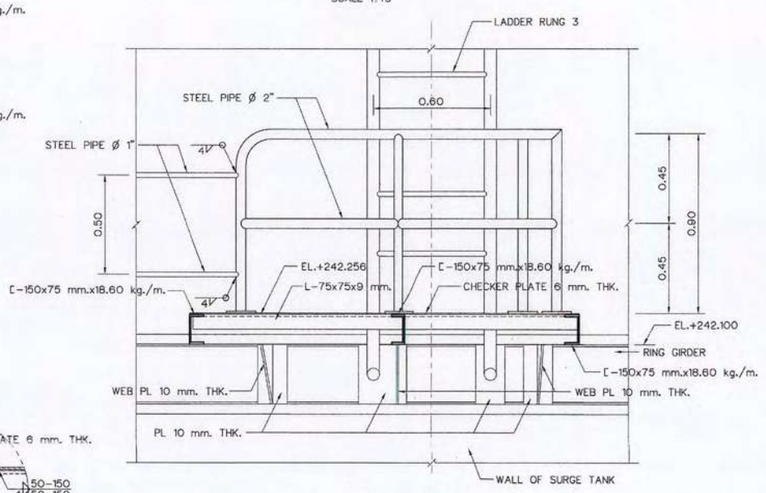

PLAN 3

SCALE 1:15



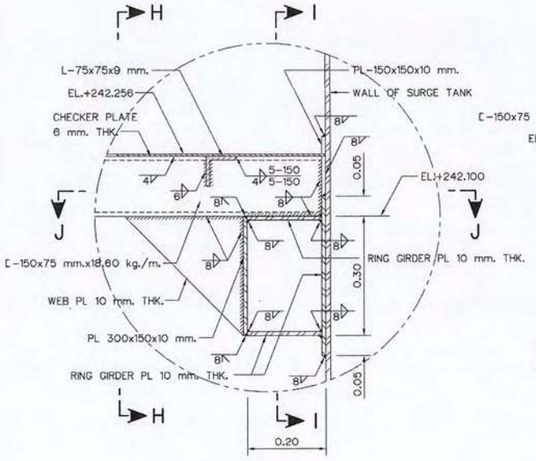

SECTION A–A

SCALE 1:15



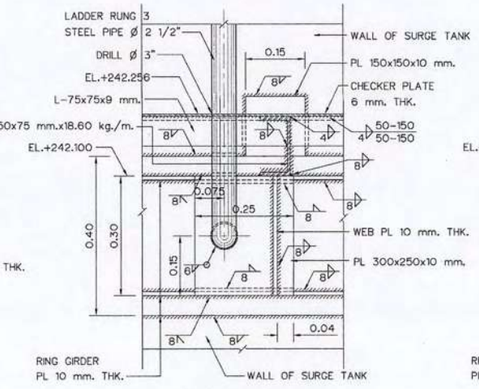

SECTION B–B

SCALE 1:15



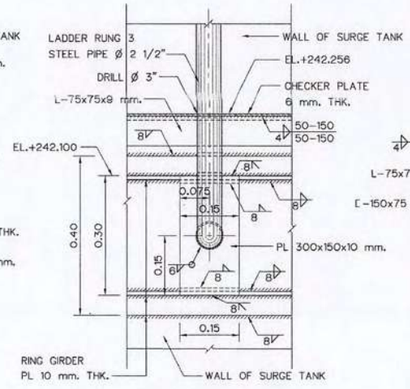

SECTION C–C

SCALE 1:7.5



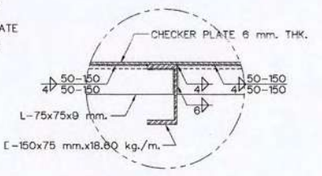

SECTION D–D

SCALE 1:7.5



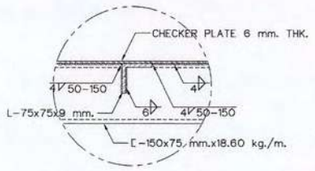

SECTION E–E

SCALE 1:7.5



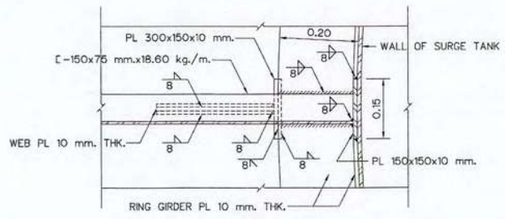

SECTION F–F

SCALE 1:7.5



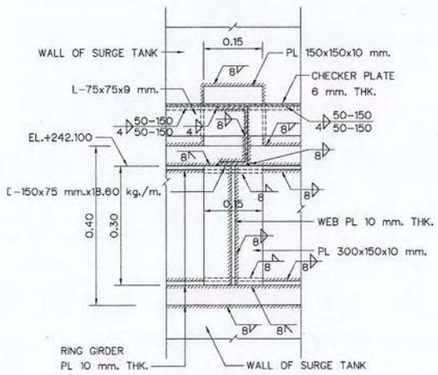

SECTION G–G

SCALE 1:7.5



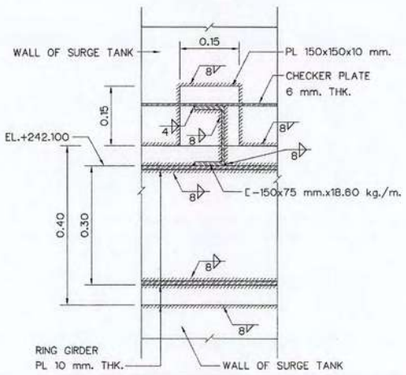

SECTION J–J

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 | | | | |
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| | CONSULTANTS | | DEDE | |

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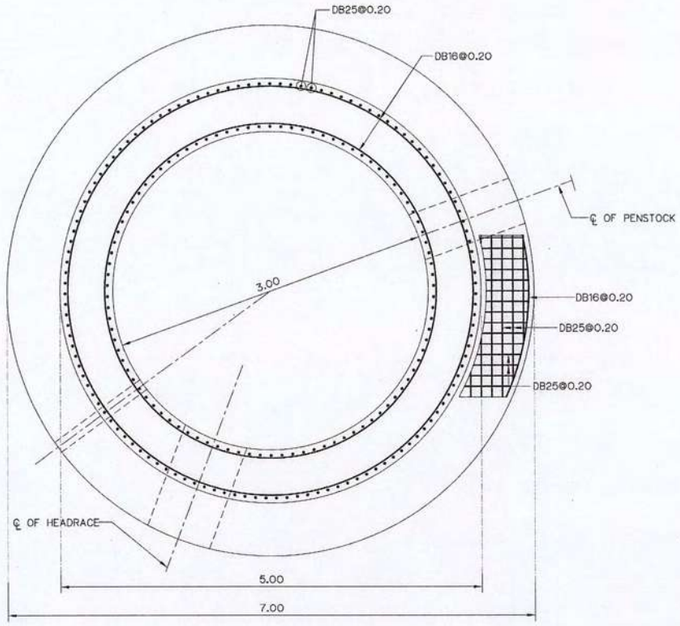
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

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

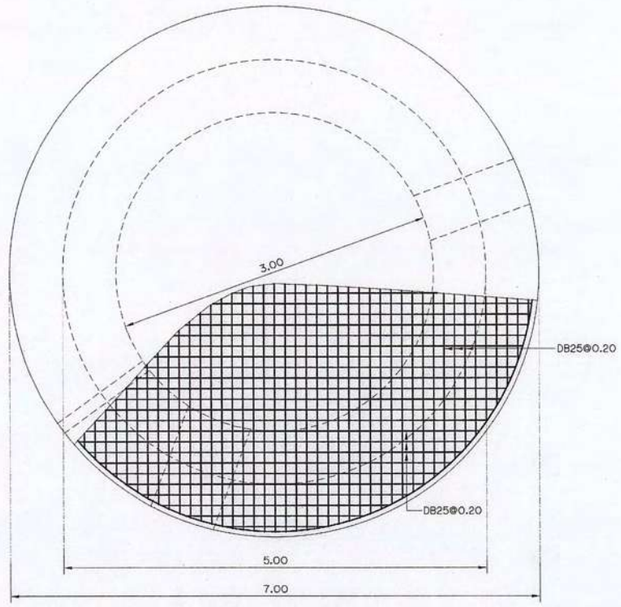
PCM P&C MANAGEMENT CO., LTD.
SPT SPT CONSULTANTS CO., LTD.

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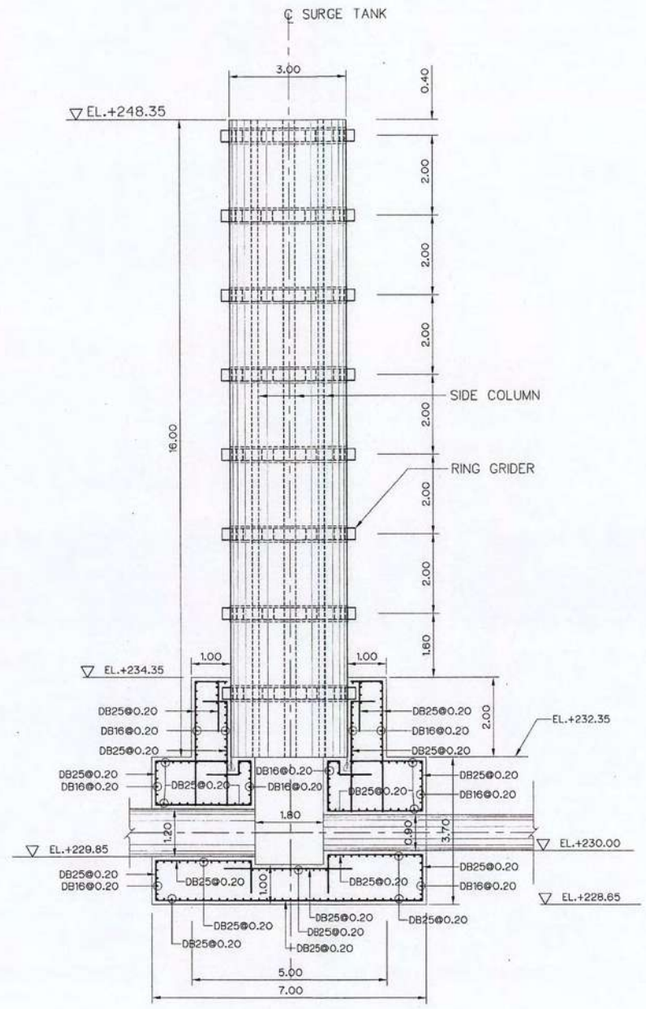
| | | | |
|---|---|---|---|
| DESIGNED | | REVIEWED | |
| DRAWN | | SUBMITTED | |
| CHECKED | | RECOMMENDED | |
| PROJECT MANAGER | 28/10/2021 DATE | APPROVED | |
| DRAWING NO. | AKP-ST-05 | SHEET NO. | 43 OF 129 |




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 |

0 1 2 3 4 5 6
SCALE 1:75 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

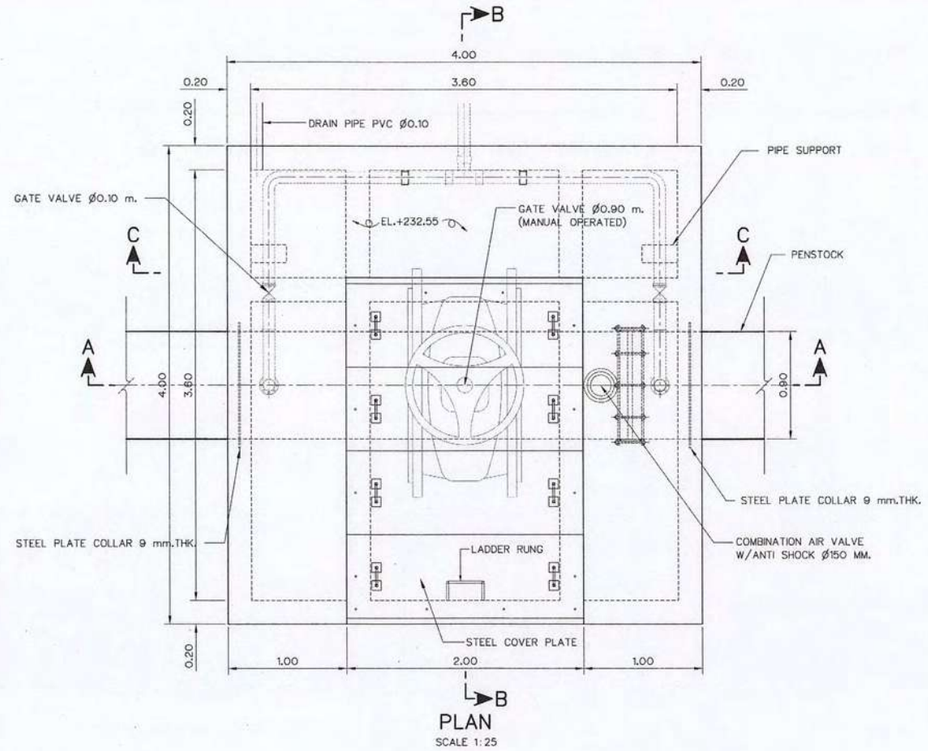
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
SURGE TANK
REINFORCEMENT DETAILS

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

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

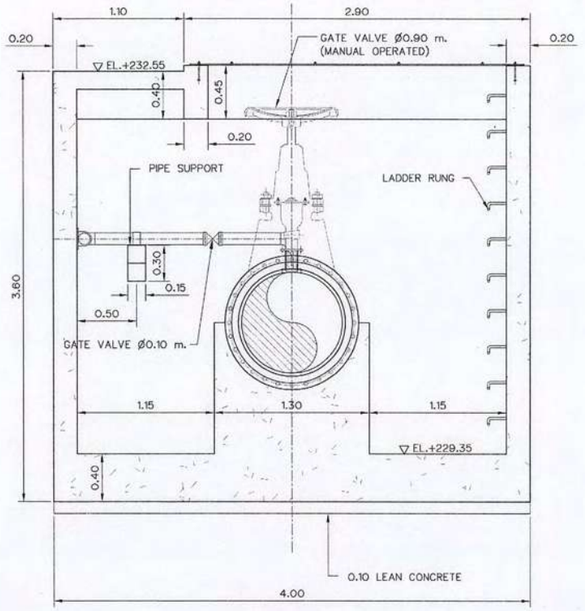
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP–ST–06
SHEET NO. 44 OF 129



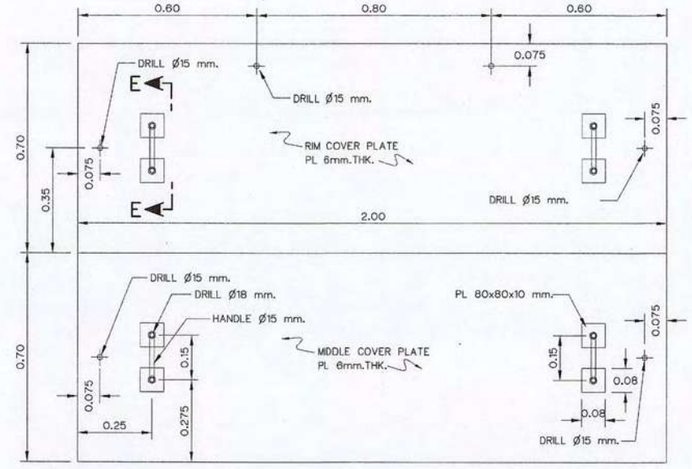

PLAN

SCALE 1:25



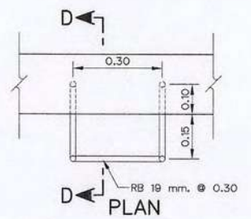

SECTION B–B

SCALE 1:25

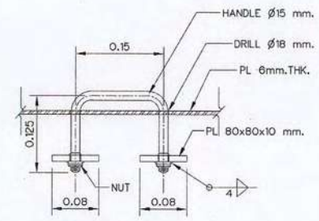



PLAN STEEL COVER PLATE

SCALE 1:10

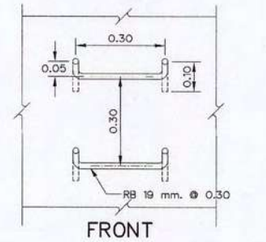



PLAN

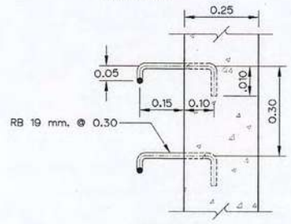



SECTION E–E

SCALE 1:5




FRONT




SECTION D–D

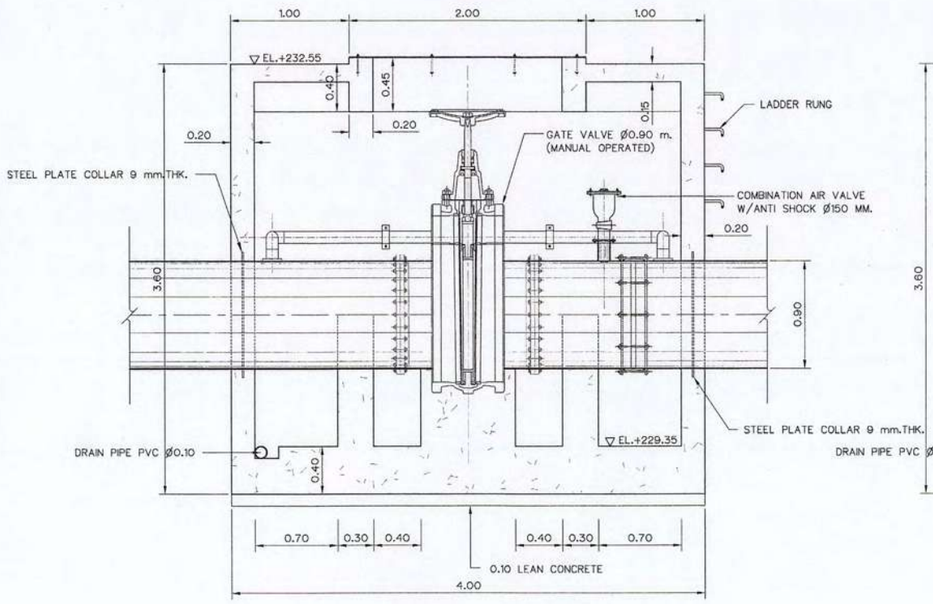
DETAIL OF LADDER RUNG

SCALE 1:10



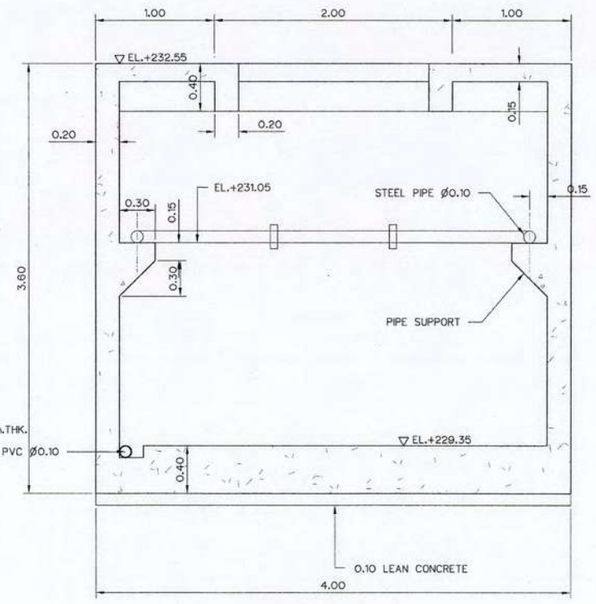







SECTION A–A

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 |
|---|---|---|---|---|
| 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

SURGE TANK

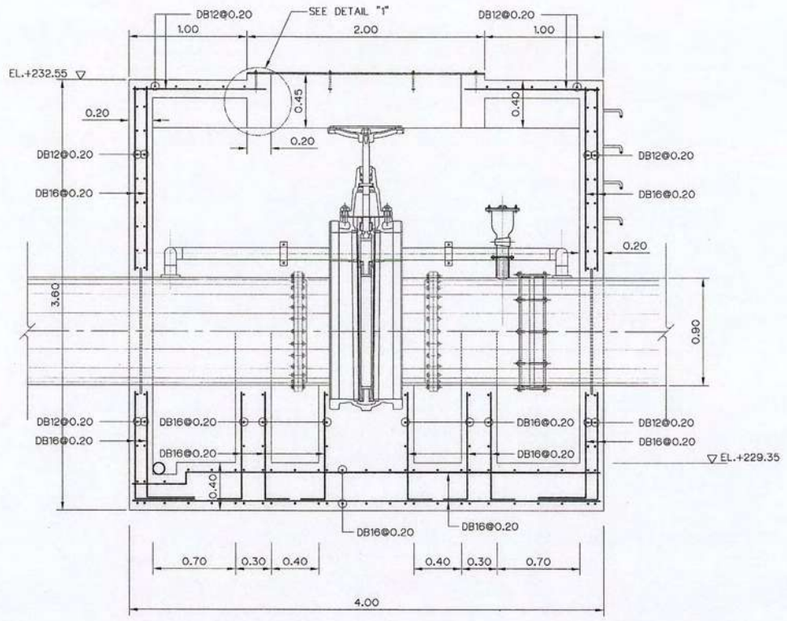
EMERGENCY VALVE CHAMBER PLAN SECTIONS AND DETAILS

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

DESIGNED ... REG.29074 REG.9482
DRAWN
CHECKED REG.8231
28/10/2021
PROJECT MANAGER DATE

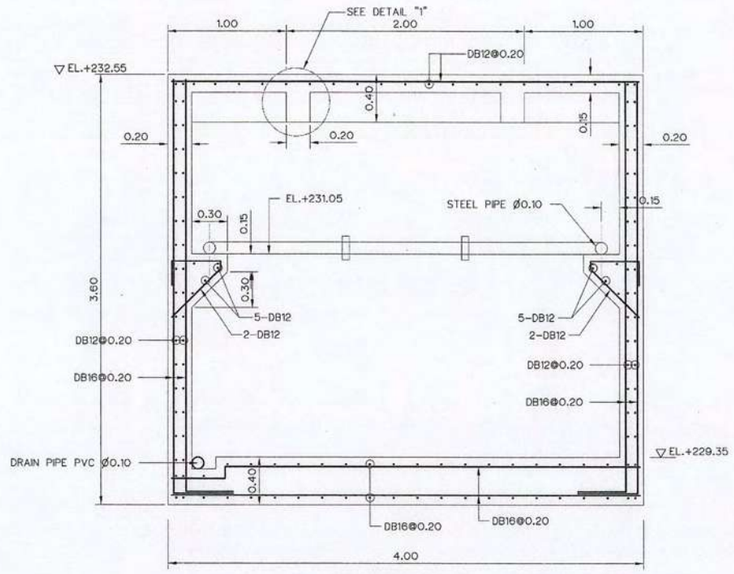
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP–ST–07
SHEET NO. 45 OF 129



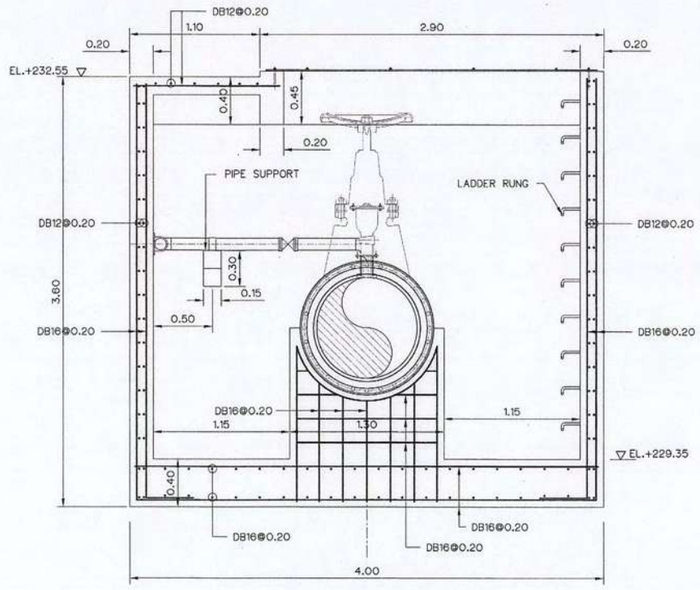

SECTION A–A

SCALE 1:25



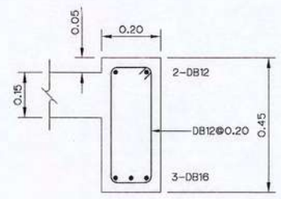

SECTION C–C

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 |
|---|---|---|---|---|
| 3 | | | | |
| 2 | | | | |
| 1 | | | | |
| | CONSULTANTS | | DEDE | |

KINGDOM OF THAILAND
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MINISTRY OF ENERGY

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

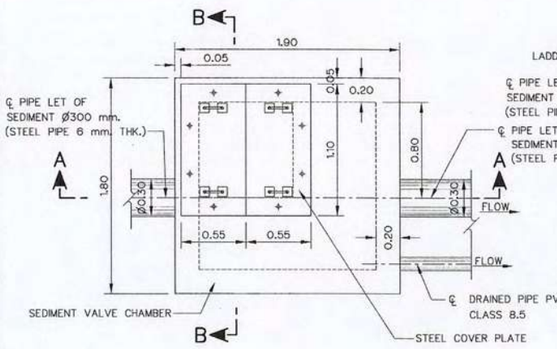
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
SURGE TANK
EMERGENCY VALVE CHAMBER REINFORCEMENT DETAILS

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

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

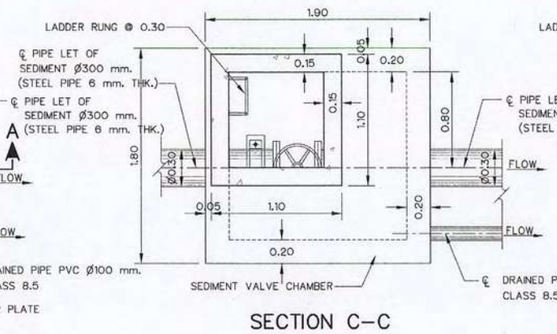
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP–ST–08
SHEET NO. 46 OF 129



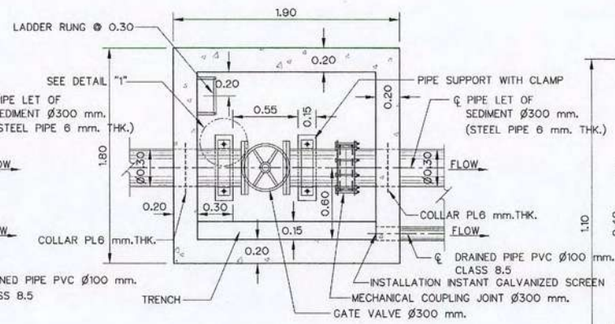

PLAN

SCALE 1:25



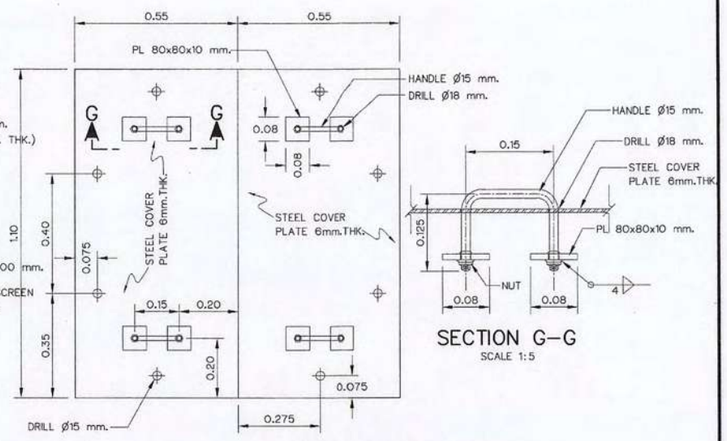

SECTION C–C

SCALE 1:25




SECTION D–D

SCALE 1:25

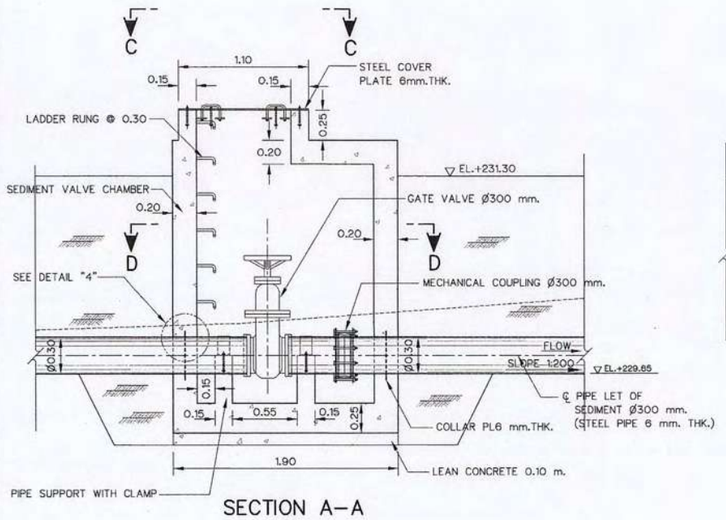



SECTION G–G

SCALE 1:5

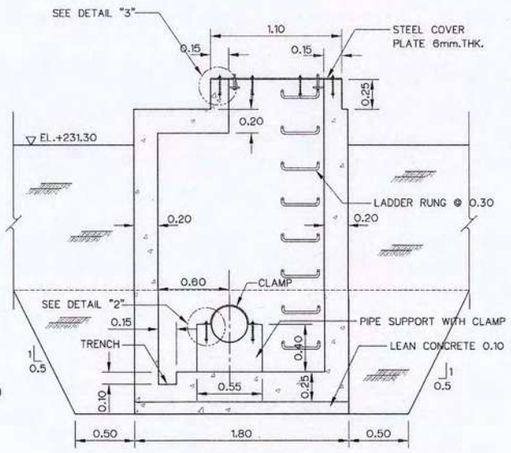
PLAN STEEL COVER PLATE

SCALE 1:10



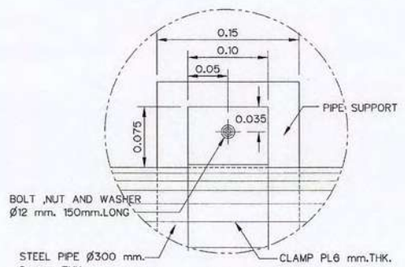

SECTION A–A

SCALE 1:25



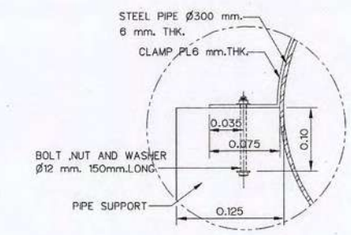

SECTION B–B

SCALE 1:25



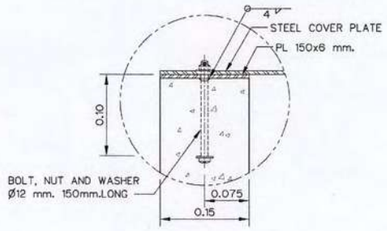

SEE DETAIL "1"

NOT TO SCALE



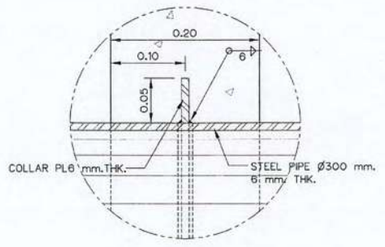

SEE DETAIL "2"

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

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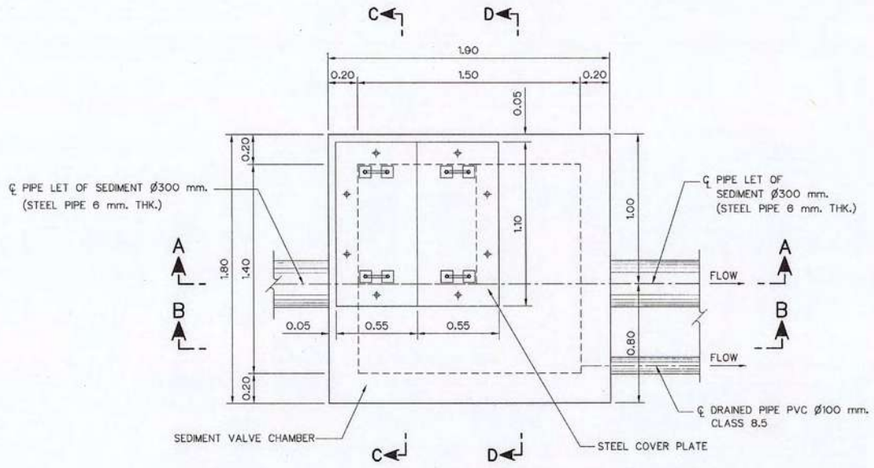
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

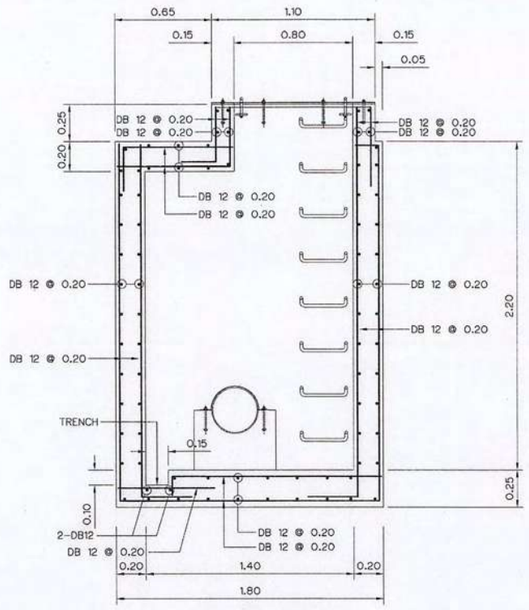
SURGE TANK

SEDIMENT VALVE CHAMBER PLAN SECTIONS AND DETAILS

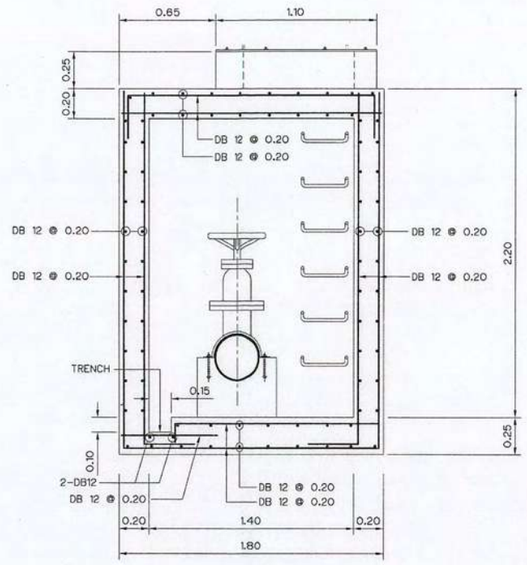
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| DESIGNED Wirom 28.29074 28.9462 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED 28.8231 | RECOMMENDED |
| PROJECT MANAGER 28/10/2021 DATE | APPROVED |
| | DRAWING NO. AKP–ST–09 |
| | SHEET NO. 47 OF 129 |



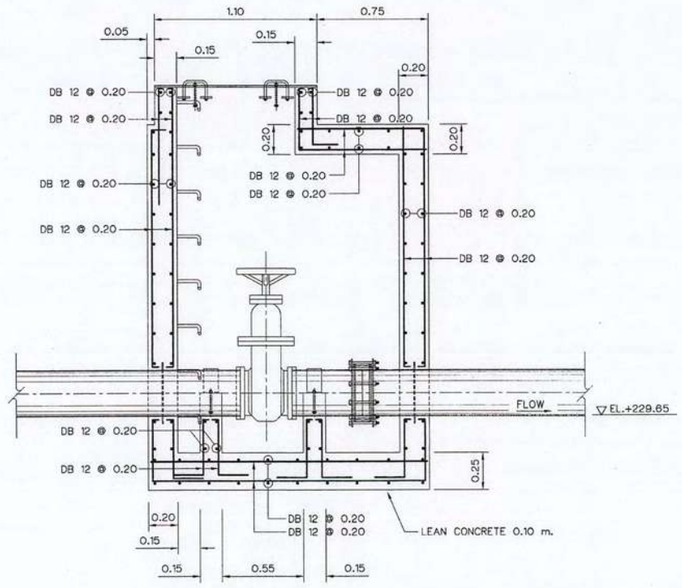

PLAN
SCALE 1:20



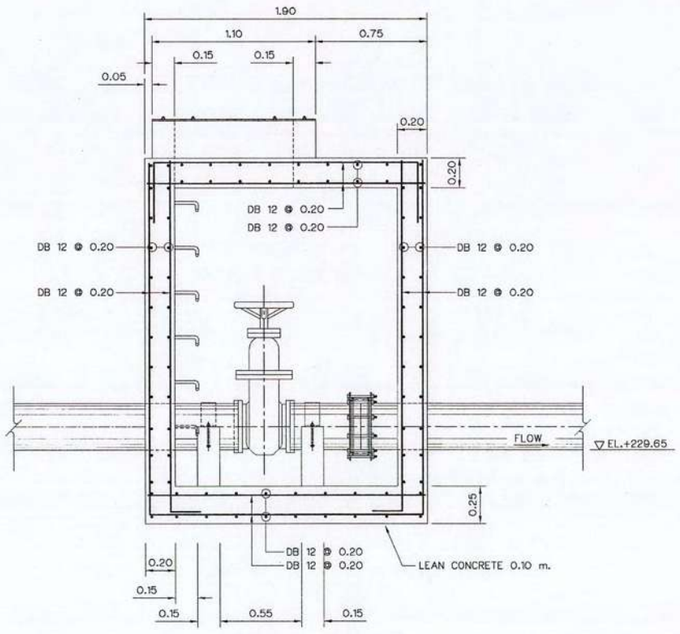

SECTION C–C
SCALE 1:20




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

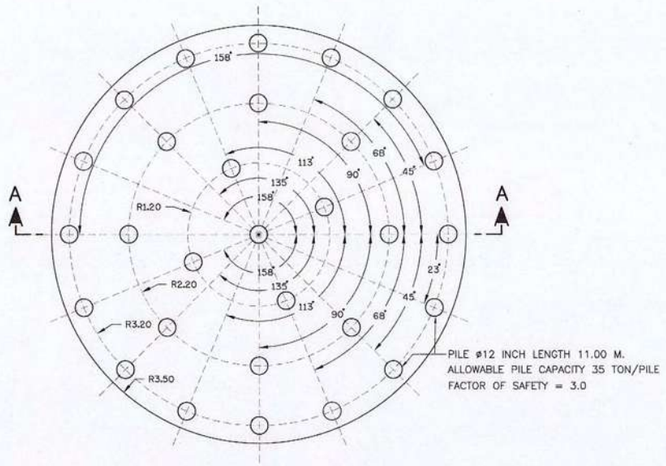
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| | CONSULTANTS | | DEDE | |

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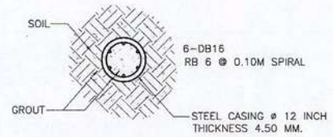
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

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

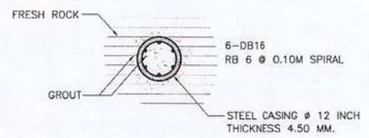
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|---|---|---|---|
| P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY | |
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| DRAWN | | SUBMITTED | |
| CHECKED | REE.8231 | RECOMMENDED | |
| PROJECT MANAGER | 28/10/2021 DATE | APPROVED | |
| | | DRAWING NO. AKP-ST-10 | SHEET NO. 48 OF 129 |



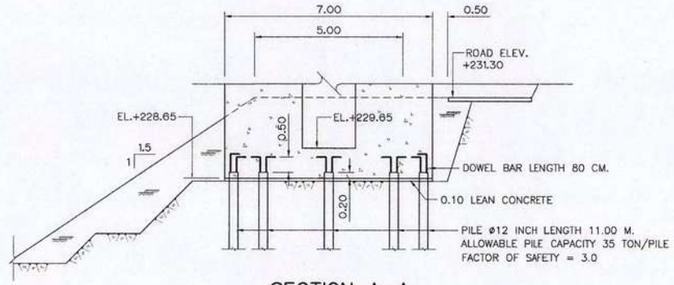

PILE FOOTING PLAN
SCALE 1:50



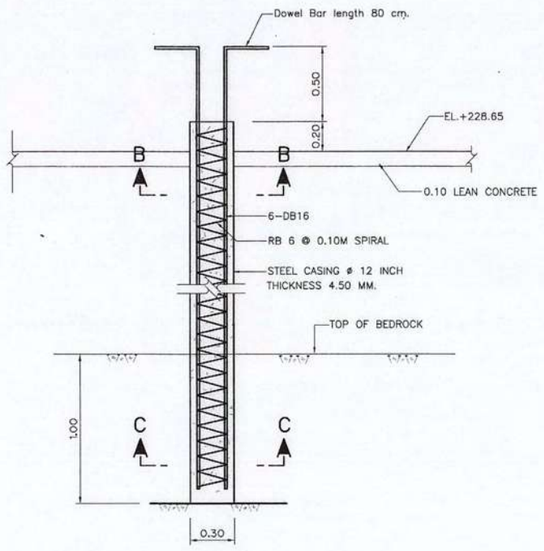

SECTION B–B
SCALE 1:20




SECTION C–C
SCALE 1:20




SECTION A–A
SCALE 1:100




PILE DETAIL
SCALE 1:20

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

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

## 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 มยธ. 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 |
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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

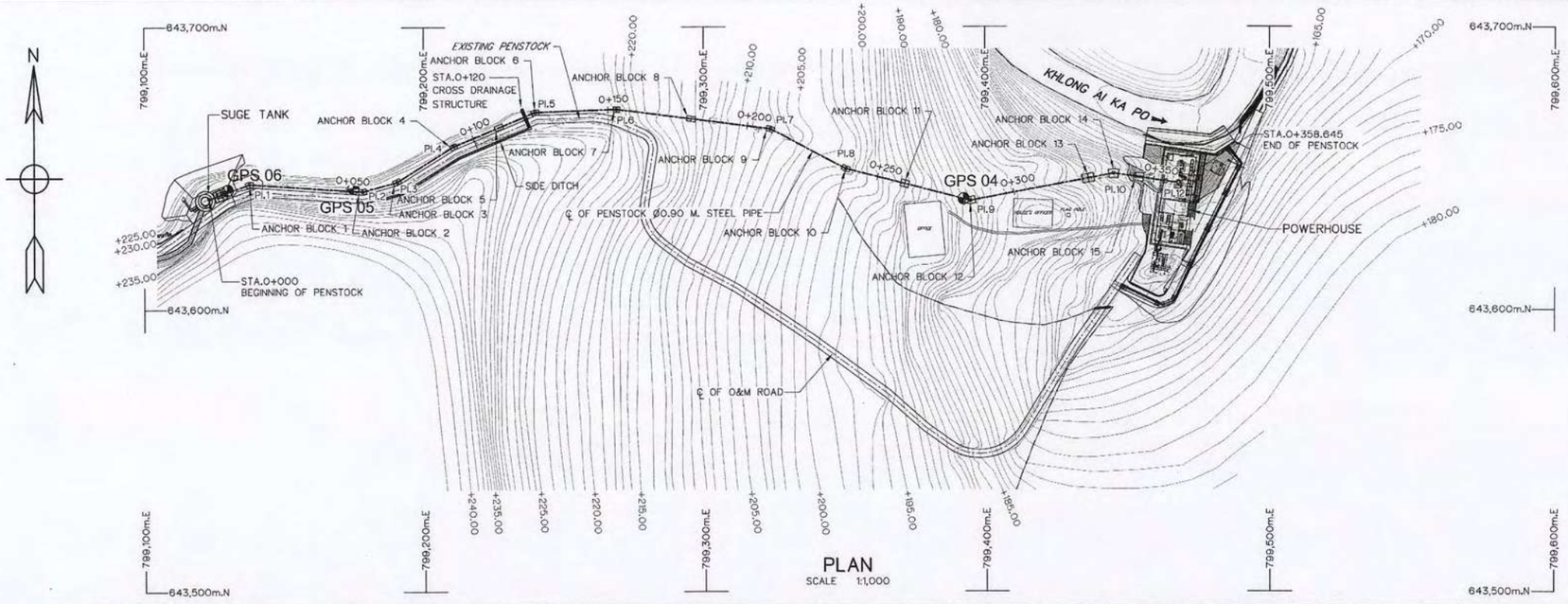
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
SURGE TANK
PILE FOOTING DETAILS

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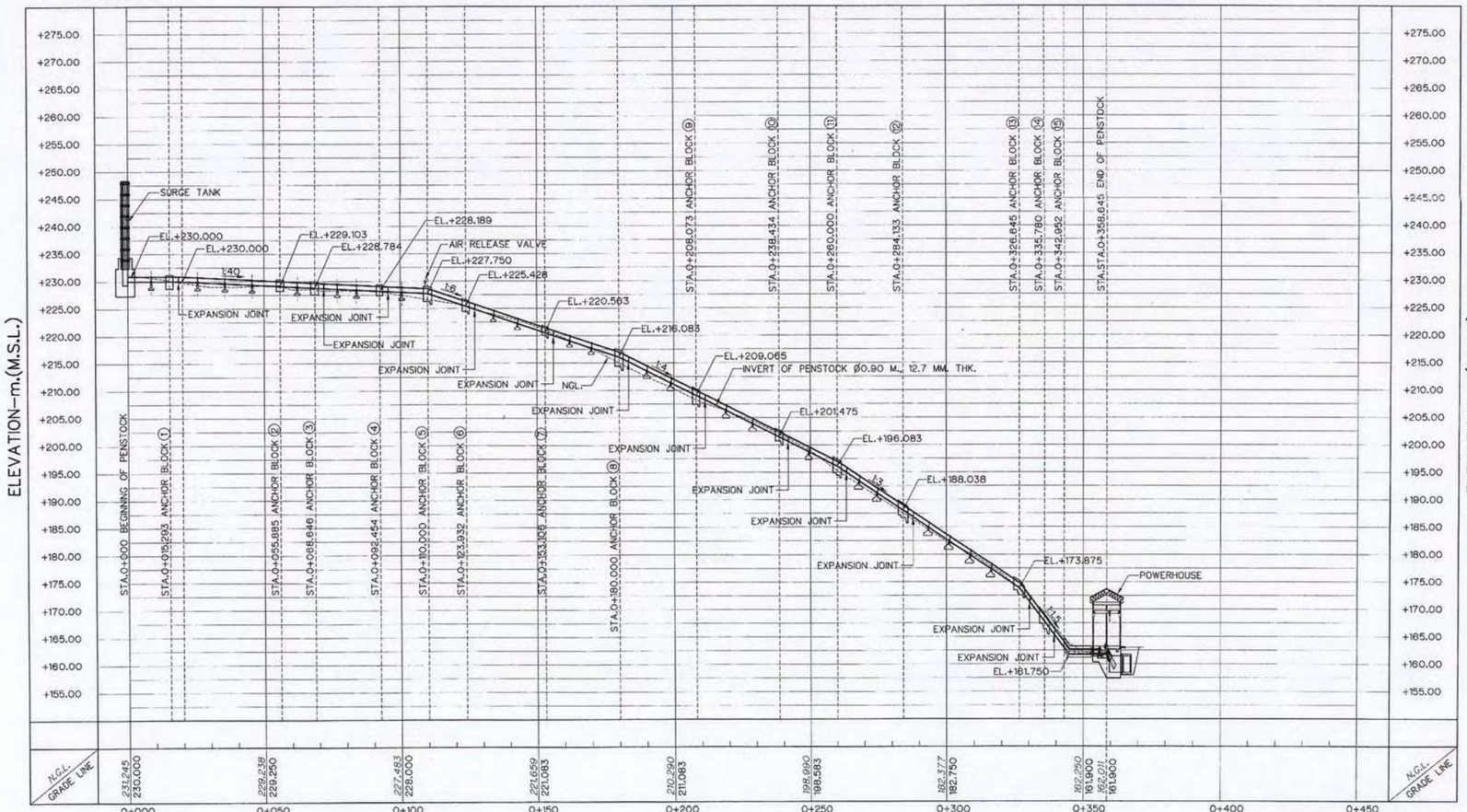
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DESIGNED วิศ.29074 REVIEWED วิศ.8969
DRAWN SUBMITTED
CHECKED วิศ.8231 RECOMMENDED
APPROVED
PROJECT MANAGER 28/10/2021 DATE

DRAWING NO. AKP-ST-11
SHEET NO. 49 OF 129




PLAN
SCALE 1:1,000




PROFILE
VERTICAL SCALE 1:500
HORIZONTAL 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 |

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

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# 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

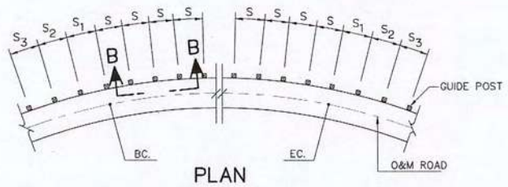
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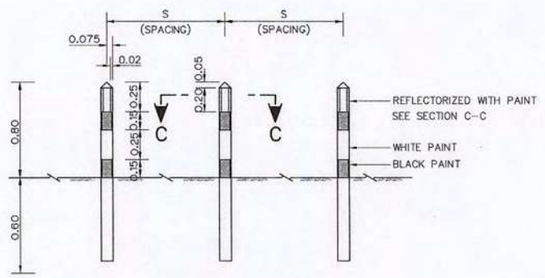
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| DRAWN | | |
| CHECKED | | RB.8231 |
| PROJECT MANAGER | 28/10/2021 | DATE |

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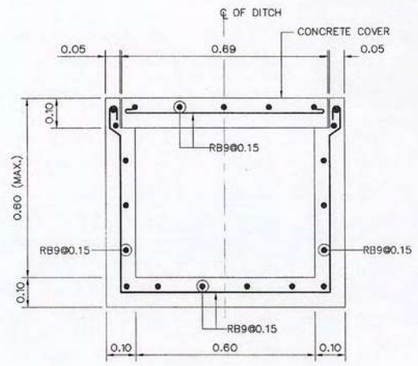
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| APPROVED | |
| DRAWING NO. | AKP-PS-01 |
| SHEET NO. | 50 OF 129 |



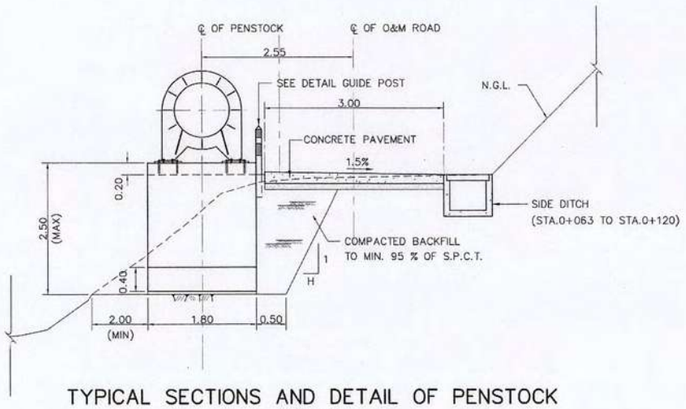

PLAN
NOT TO SCALE



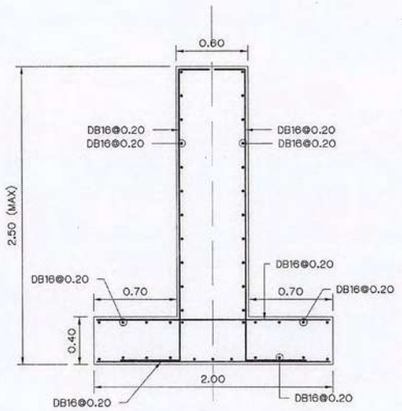

SECTION B-B
NOT TO SCALE
GUIDE POSTS



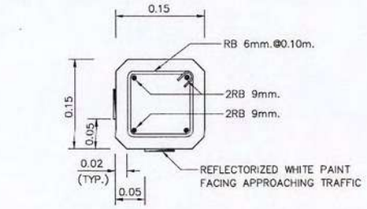

DETAIL OF DITCH
SCALE 1:10



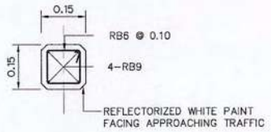

TYPICAL SECTIONS AND DETAIL OF PENSTOCK
SCALE 1:50

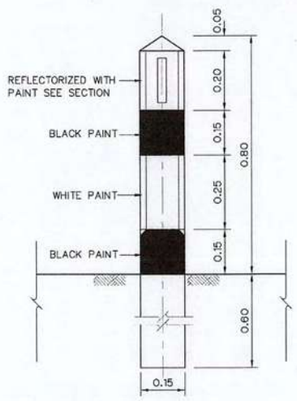



HORIZONTAL PIER
(REINFORCEMENT DETAIL)
NOT TO SCALE

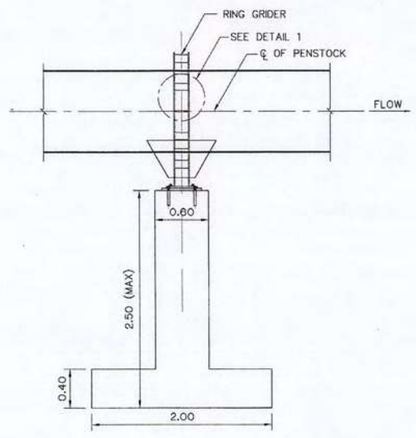


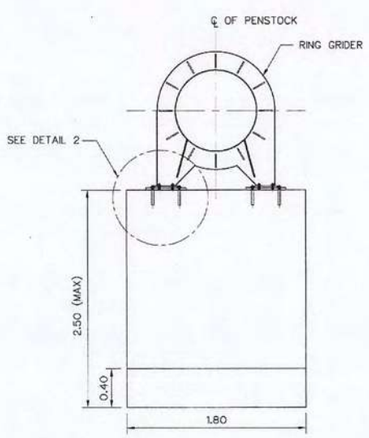

SECTION C-C
NOT TO SCALE




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 | | | |

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

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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
PENSTOCK
TYPICAL SECTIONS AND DETAILS

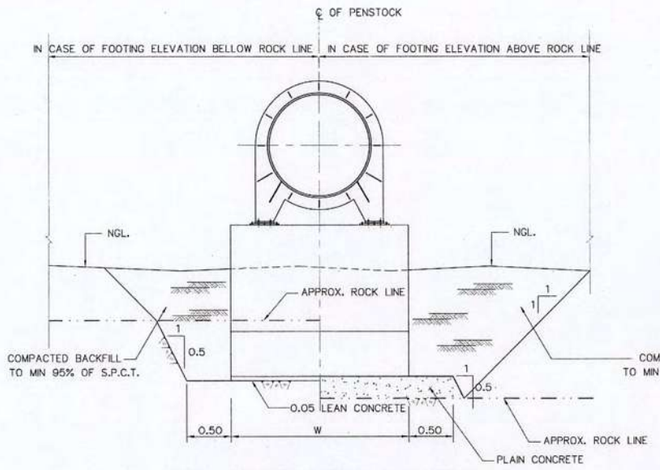
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GPD SPT CONSULTANTS CO., LTD.

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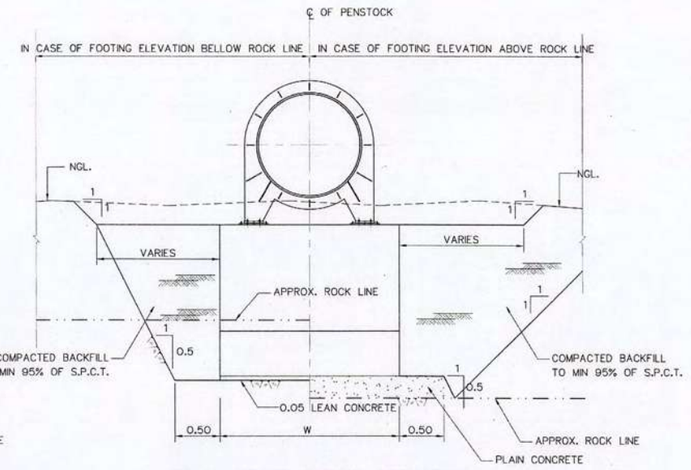
DESIGNED JIB.29074 RB.9462
DRAWN
CHECKED RB.8231
PROJECT MANAGER 28/10/2021 DATE

REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP-PS-02
SHEET NO. 51 OF 129



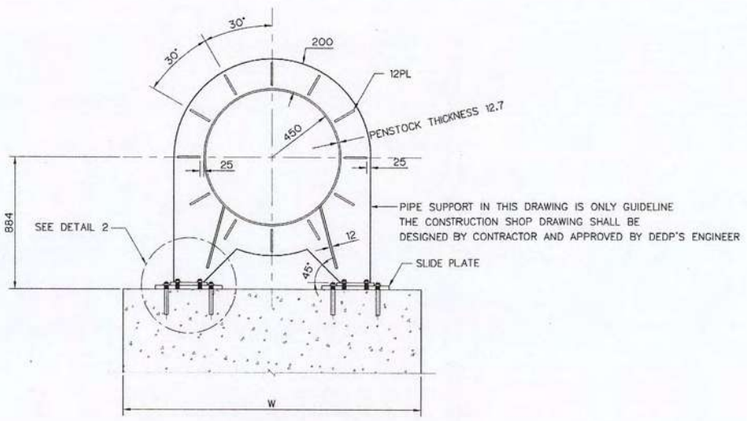

N.G.L. BELLOW INVERT ELEVATION




N.G.L. ABOVE INVERT ELEVATION

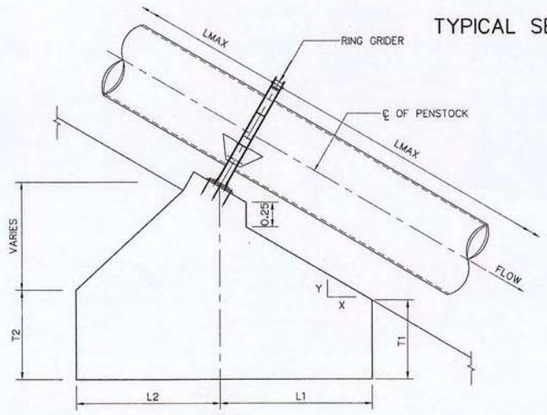
TYPICAL SECTION OF PENSTOCK

NOT TO SCALE



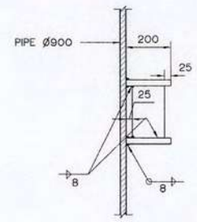

SECTION A – A

SCALE 1:20



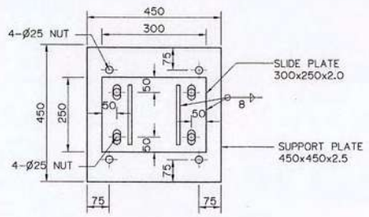

PIER

NOT TO SCALE



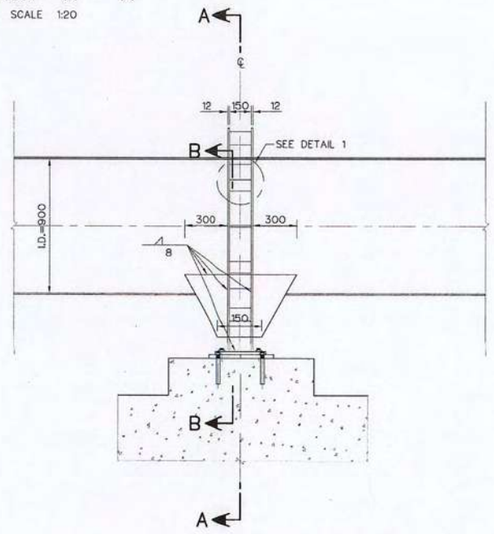

DETAIL "1"

NOT TO SCALE

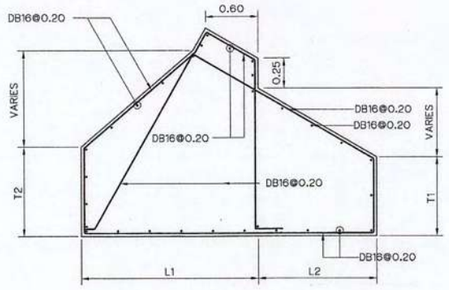



DETAIL "2"

NOT TO SCALE

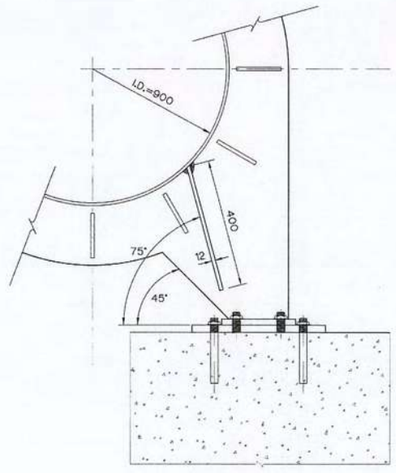



RING GIRDER FOR 900 I.D. PIPE




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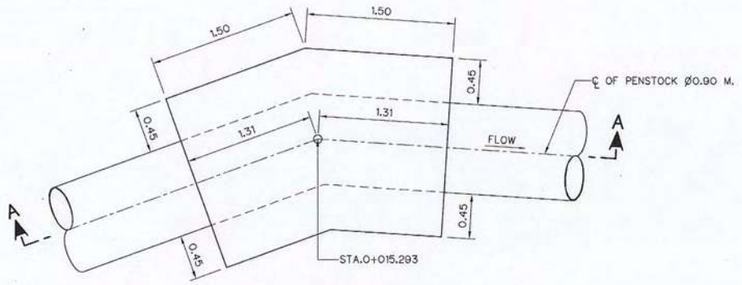
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

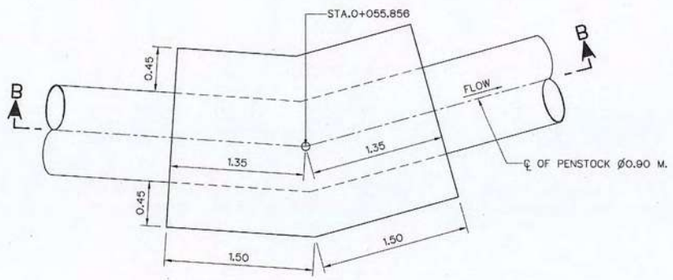
PENSTOCK

TYPICAL OF PENSTOCK, PIER AND RING GIRDER

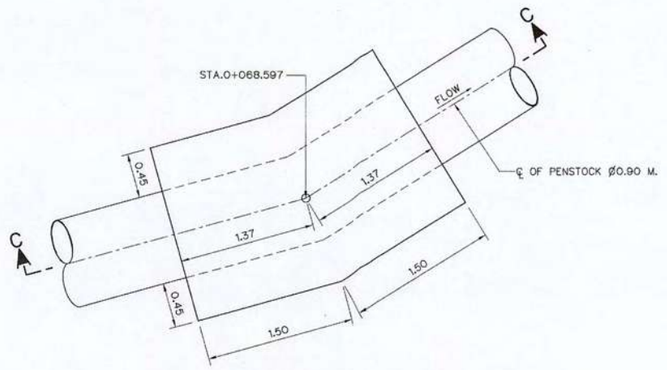
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| P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY |
| DESIGNED REI.29074 REI.9462 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED REI.8231 | RECOMMENDED |
| 28/10/2021 | APPROVED |
| PROJECT MANAGER DATE | DRAWING NO. AKP-PS-03 / SHEET NO. 52 OF 129 |



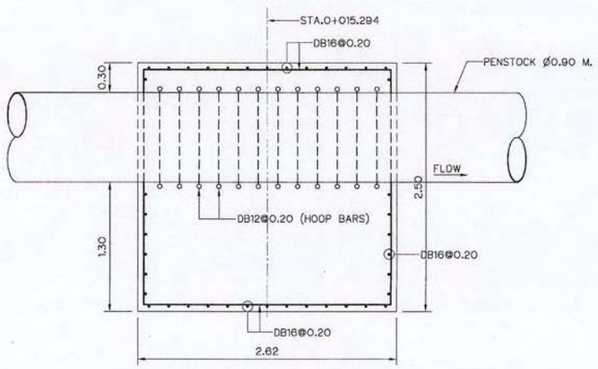

PLAN ANCHOR BLOCK ① (STA.0+015.293)
SCALE 1:30



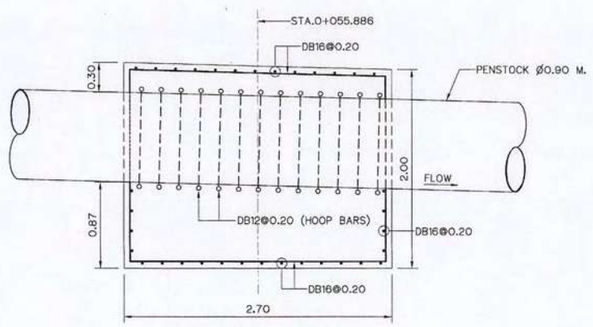

PLAN ANCHOR BLOCK ② (STA.0+055.885)
SCALE 1:30



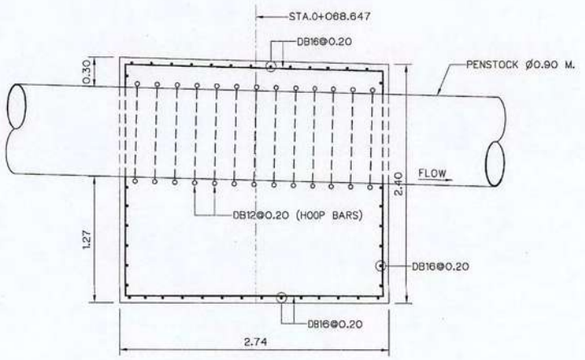

PLAN ANCHOR BLOCK ③ (STA.0+068.646)
SCALE 1:30



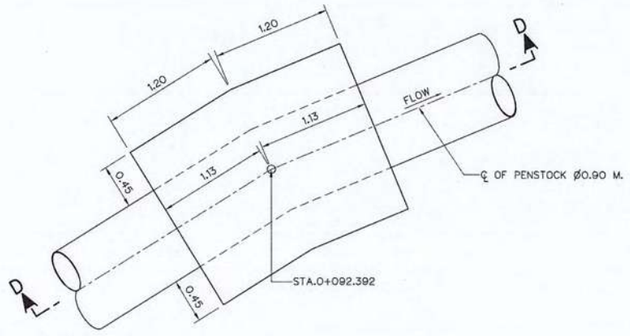

SECTION A–A
SCALE 1:30



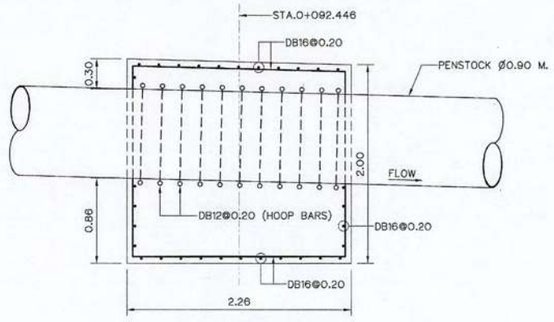

SECTION B–B
SCALE 1:30




SECTION C–C
SCALE 1:30




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




SECTION D–D
SCALE 1:30

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 | | | | |
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| | CONSULTANTS | | DEDE | |

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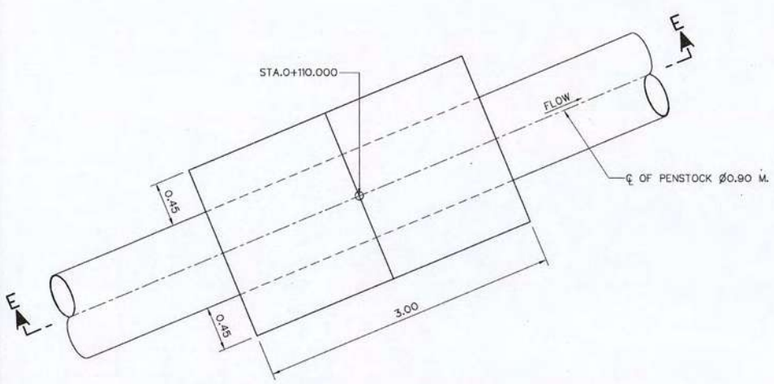
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

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

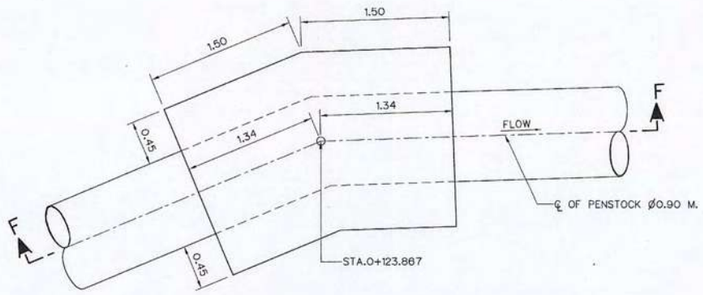
P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

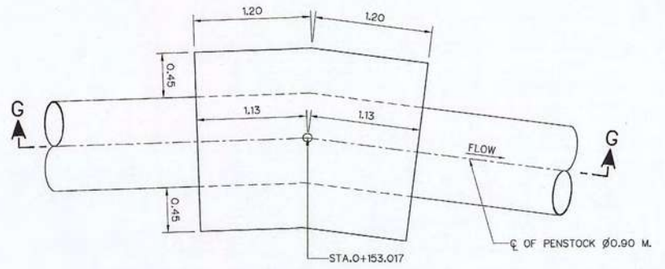
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| DESIGNED | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED | RECOMMENDED |
| PROJECT MANAGER 28/10/2021 | APPROVED |
| DRAWING NO. AKP-PS-04 | SHEET NO. 53 OF 129 |



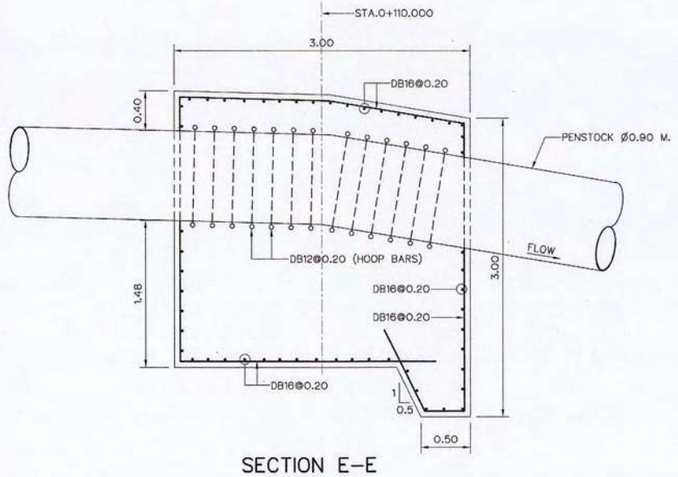

PLAN ANCHOR BLOCK ⑤ (STA.0+110.000)
SCALE 1:30



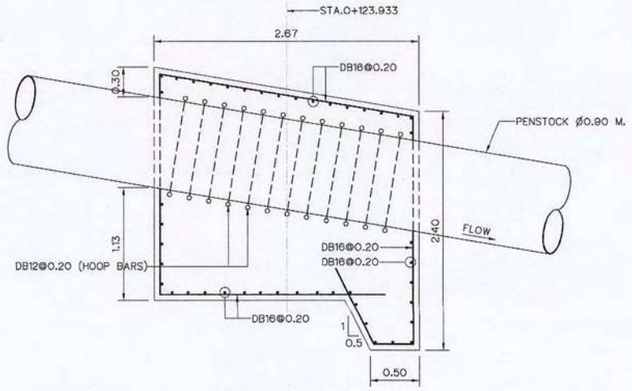

PLAN ANCHOR BLOCK ⑥ (STA.0+123.932)
SCALE 1:30



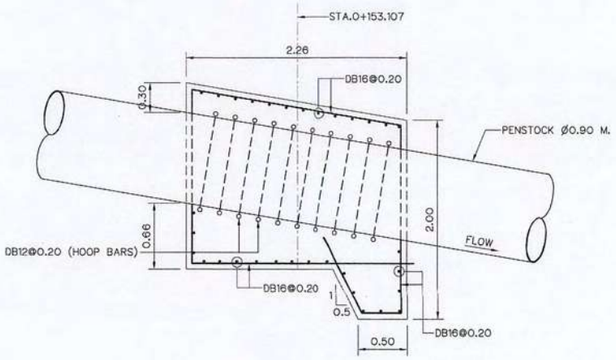

PLAN ANCHOR BLOCK ⑦ (STA.0+153.106)
SCALE 1:30



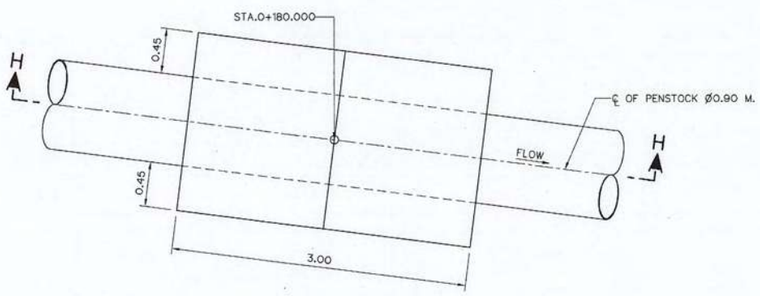

SECTION E–E
SCALE 1:30



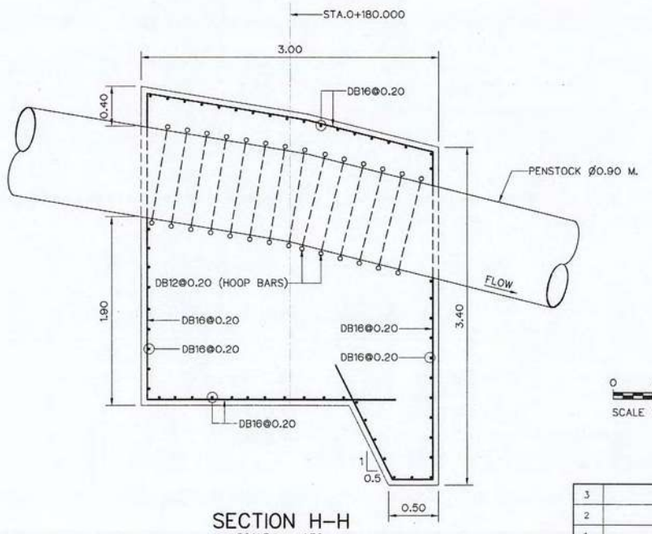

SECTION F–F
SCALE 1:30




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

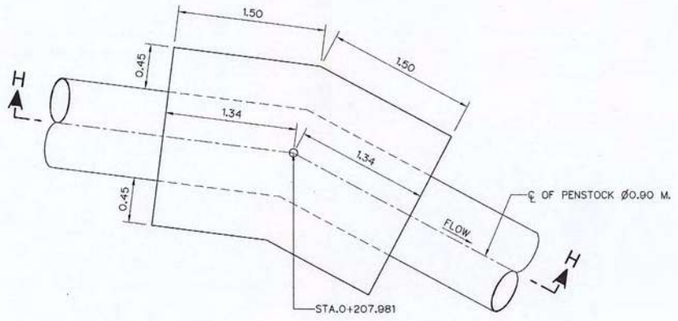
| NO. | DATE | REVISIONS | CHECKED | APPROVED |
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| 3 | | | | |
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| | CONSULTANTS | | DEDE | |

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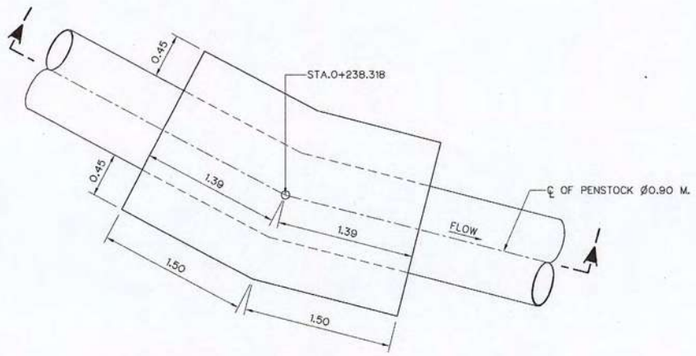
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

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

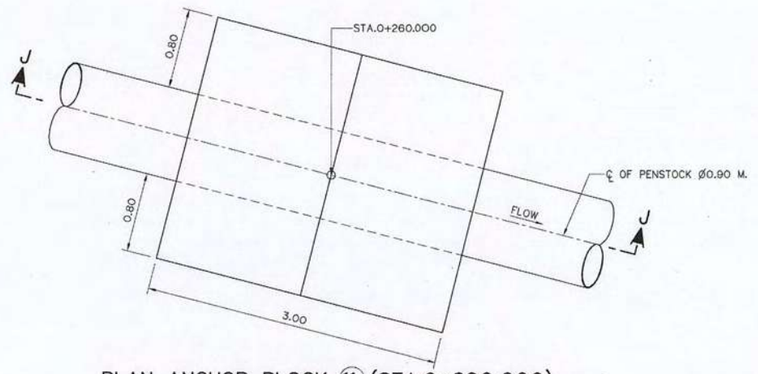
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| P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY | |
| DESIGNED | วิศ.29074 | REVIEWED | |
| DRAWN | | SUBMITTED | |
| CHECKED | วิศ.8231 | RECOMMENDED | |
| PROJECT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



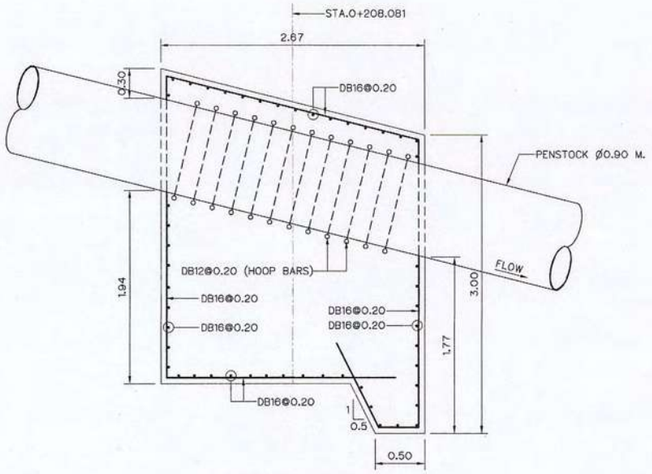

PLAN ANCHOR BLOCK ⑨ (STA.0+208.073)
SCALE 1:30



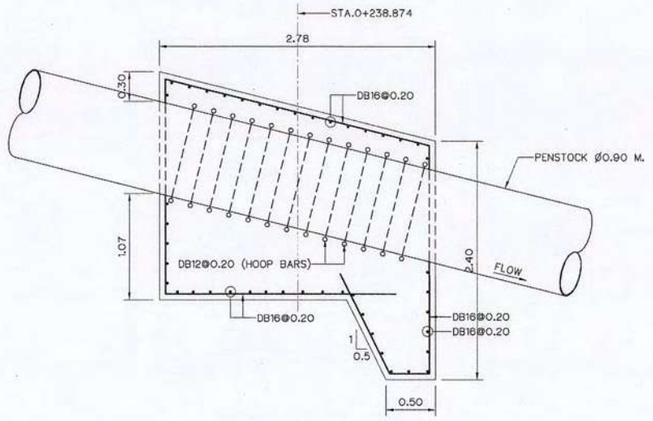

PLAN ANCHOR BLOCK ⑩ (STA.0+238.434)
SCALE 1:30



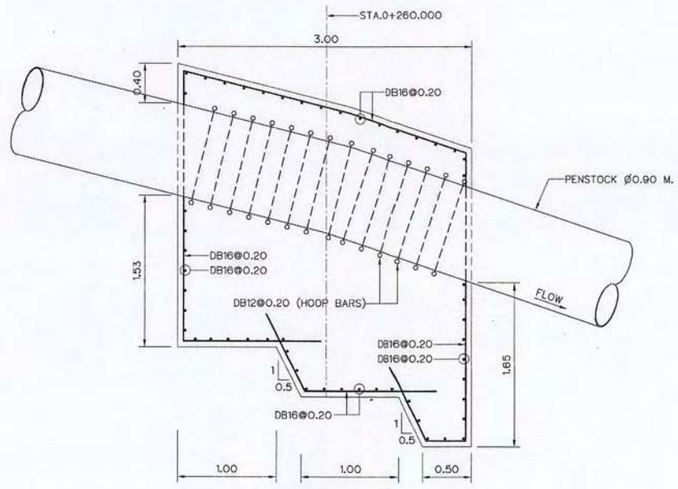

PLAN ANCHOR BLOCK ⑪ (STA.0+260.000)
SCALE 1:30



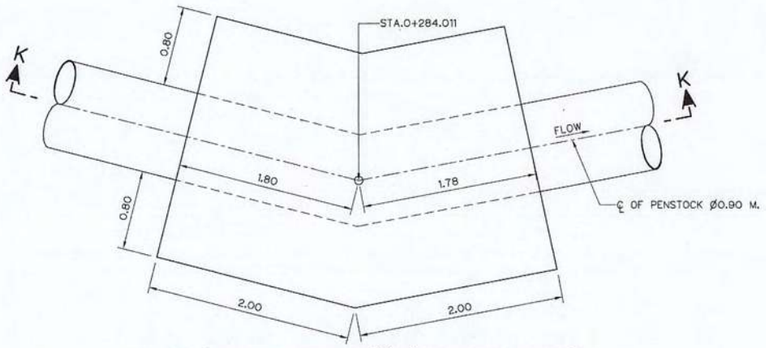

SECTION H–H
SCALE 1:30



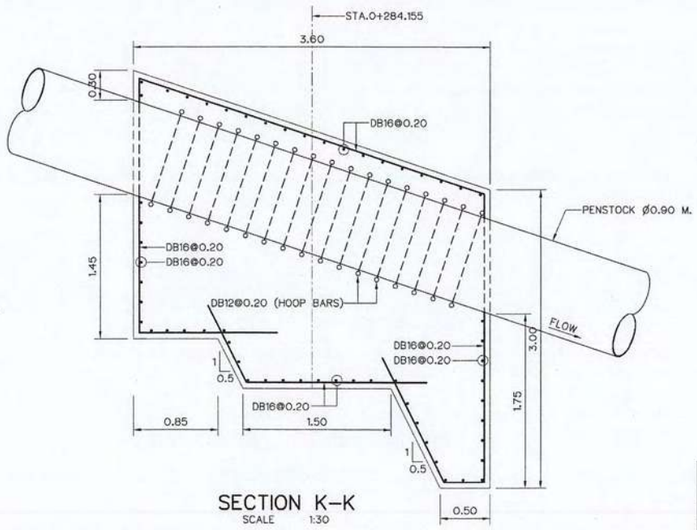

SECTION I–I
SCALE 1:30




SECTION J–J
SCALE 1:30




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




SECTION K–K
SCALE 1:30

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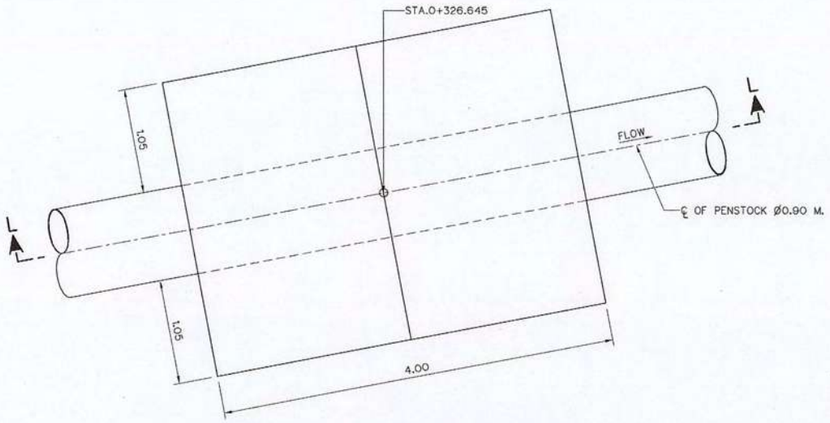
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

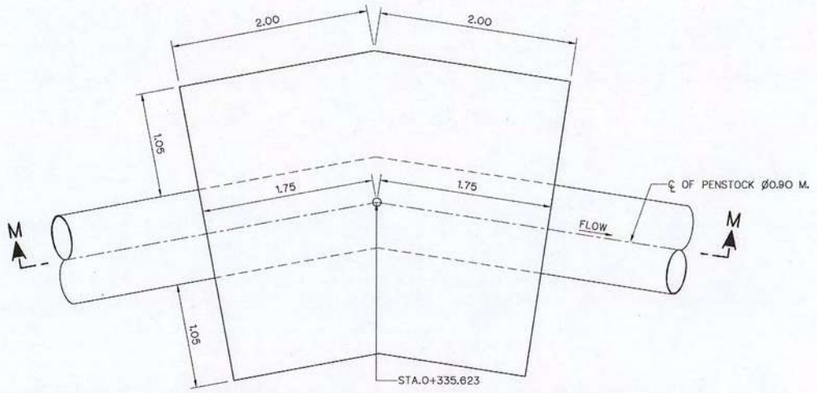
PENSTOCK

ANCHOR BLOCK DETAILS (SHEET 3/5)

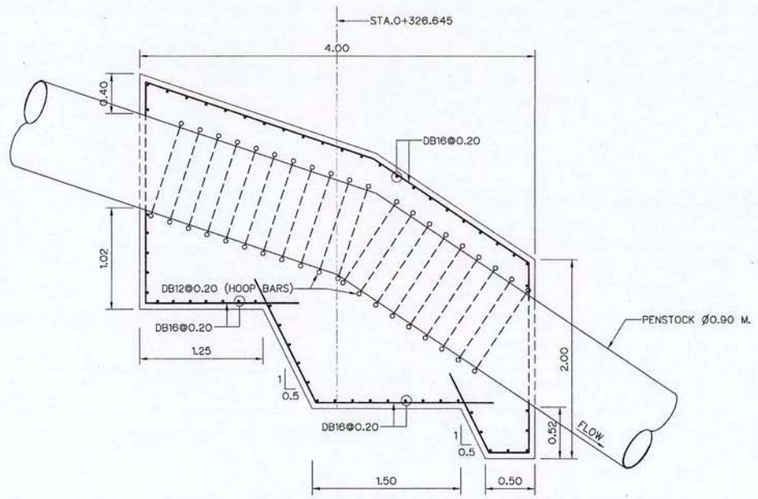
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| PCM P&C MANAGEMENT CO., LTD. / CPT SPT CONSULTANTS CO., LTD. | | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY | |
| DESIGNED | REG.29074 REG.9462 | REVIEWED | |
| DRAWN | | SUBMITTED | |
| CHECKED | REG.8231 | RECOMMENDED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



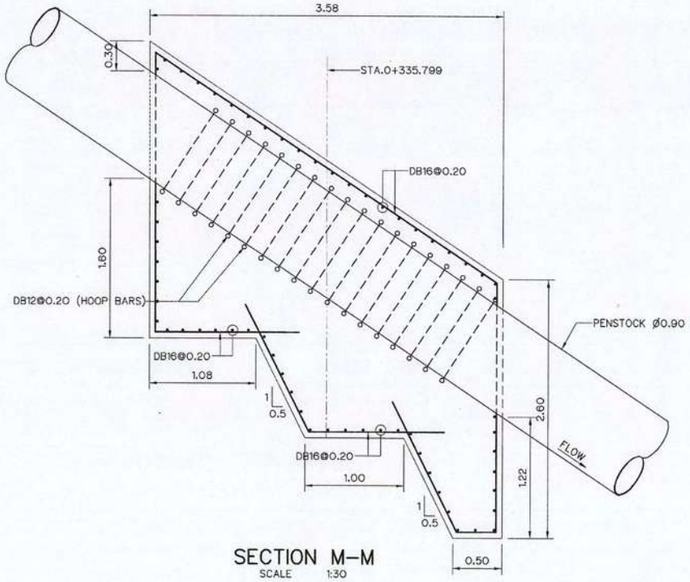

PLAN ANCHOR BLOCK ⑬ (STA.0+326.645)
SCALE 1:30




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

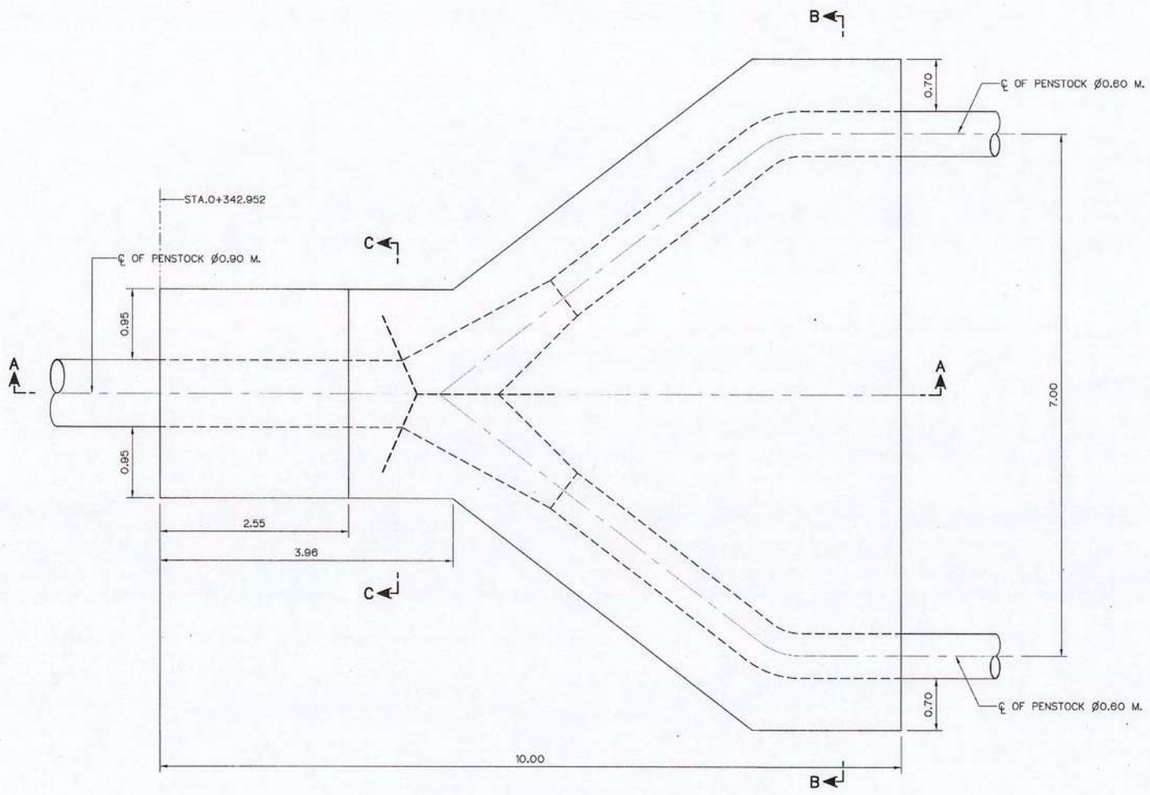
| NO. | DATE | REVISIONS | CHECKED | APPROVED |
|---|---|---|---|---|
| 3 | | | | |
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| | CONSULTANTS | | DEDE | |

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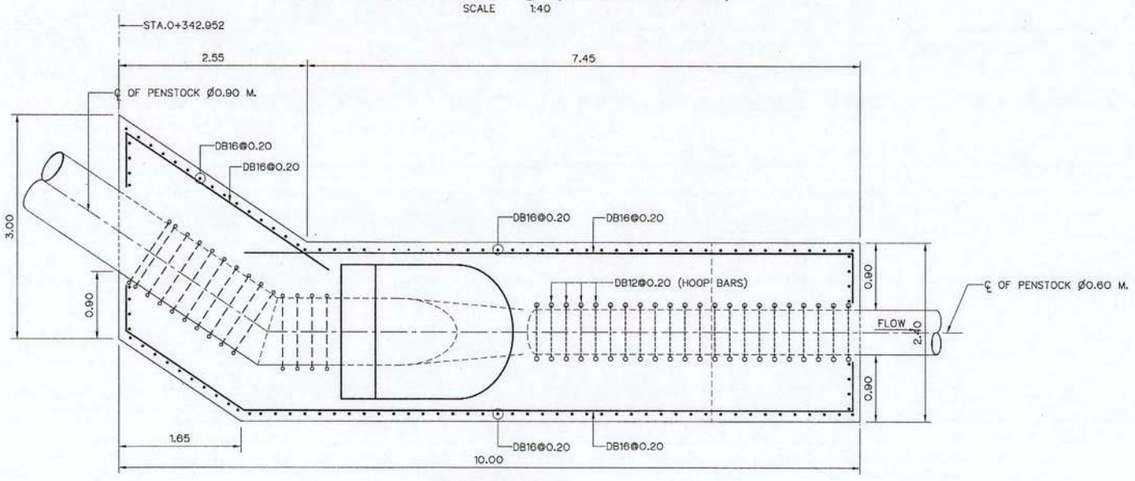
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
PENSTOCK
ANCHOR BLOCK DETAILS (SHEET 4/5)

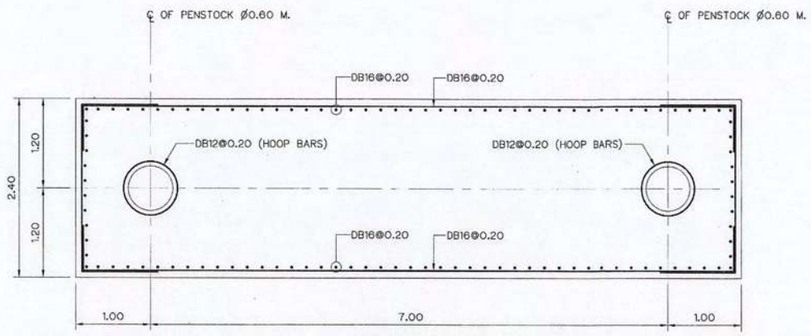
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|---|---|
| PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY |
| DESIGNED Reg.29074 Reg.9462 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED Reg.8231 | RECOMMENDED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



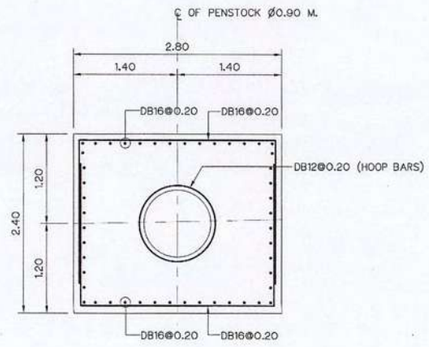

PLAN ANCHOR BLOCK ⑮ (STA.0+342.952)
SCALE 1:40




SECTION A–A
SCALE 1:40




SECTION B–B
SCALE 1:40




SECTION C–C
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

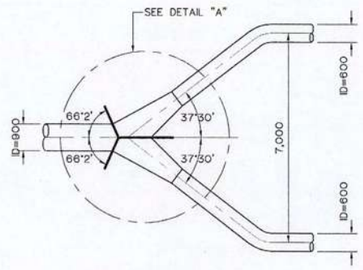
| NO. | DATE | REVISIONS | CHECKED | APPROVED |
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| 3 | | | | |
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| 1 | | | | |
| | CONSULTANTS | | DEDE | |

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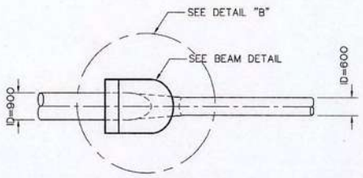
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

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

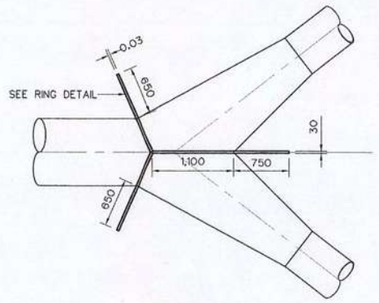
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|---|---|
| PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY |
| DESIGNED RBL29074 RBL9462 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED RBL8231 | RECOMMENDED |
| PROJECT MANAGER 28/10/2021 DATE | APPROVED |
| | DRAWING NO. AKP-PS-08 |
| | SHEET NO. 57 OF 129 |



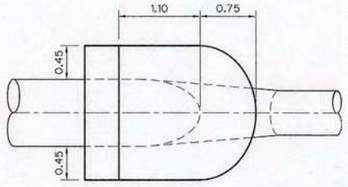

PLAN
NOT TO SCALEO



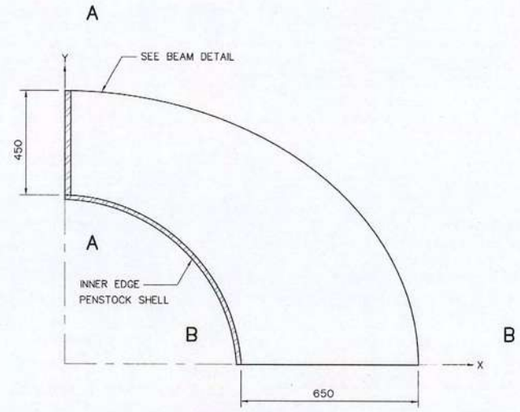

ELEVATION
NOT TO SCALEO



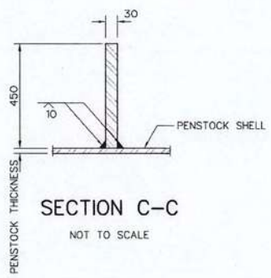

DETAIL "A"
SCALE 1:40



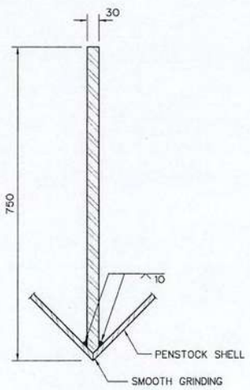

DETAIL "B"
SCALE 1:50



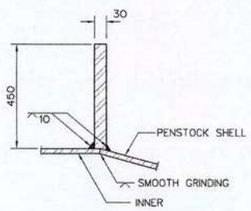

RING DETAIL
NOT TO SCALE



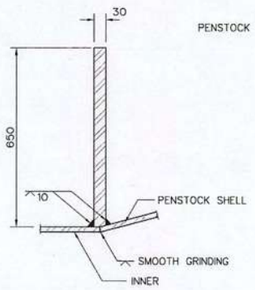

SECTION C–C
NOT TO SCALE



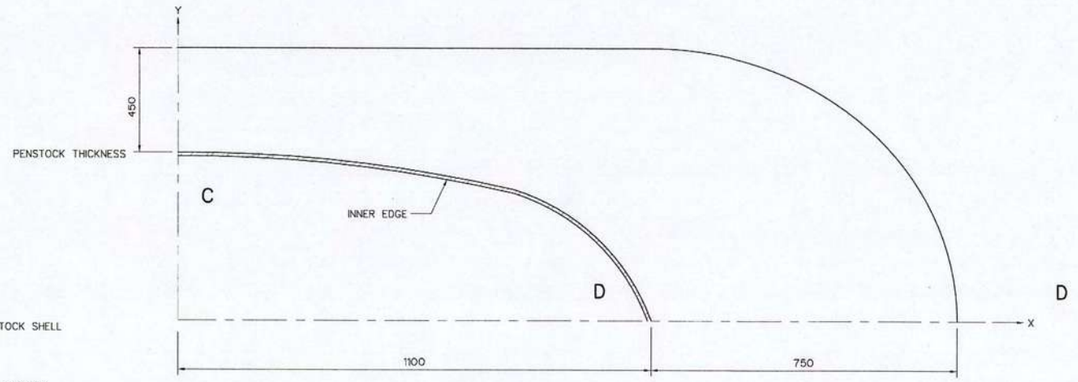

SECTION D–D
NOT TO SCALE




SECTION A–A
NOT TO SCALE




SECTION B–B
NOT TO SCALE




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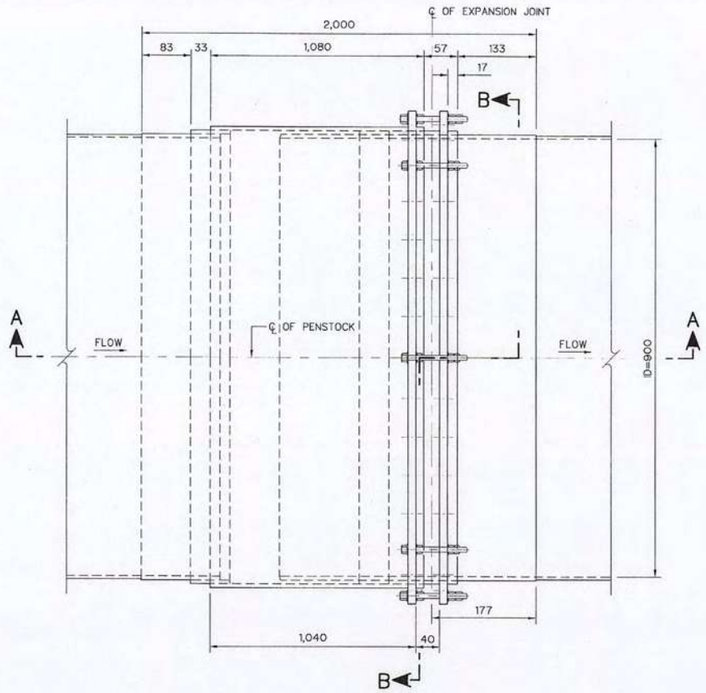
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

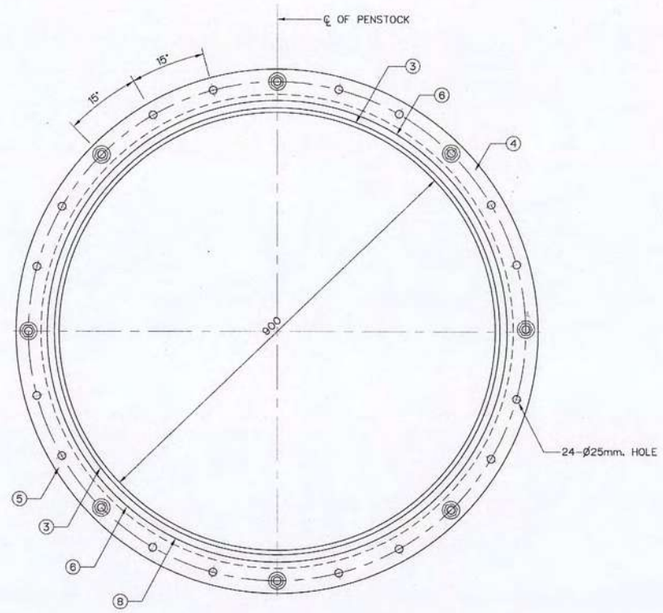
PENSTOCK

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 ... Reg.29074 ... Reg.9462 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED Reg.8231 | RECOMMENDED |
| 28/10/2021 PROJECT MANAGER / 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

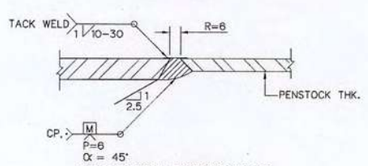
| ITEM | DESCRIPTION | MATERIAL | QUANT. | REMARKS |
|---|---|---|---|---|
| 1 | PENSTOCK | ASTM A-283, GRADE D | - | -- |
| 2 | PENSTOCK | ASTM A-283, GRADE D | 1 | NOTE 2 & 3 |
| 3 | INNER SLEEVE | ASTM A-283, GRADE D | 1 | NOTE 2 & 4 |
| 4 | GRAND RING | ASTM A-283, GRADE D | 1 | SEAMLESS, NOTE 3 |
| 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 :

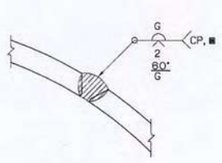
1. LONGITUDINAL SEAMS HAVE TO BE COMPLETE JOINT PENETRATION WELDS BY COMBINING SINGLE-V-GROOVE WITH BACKING WELDS AND GROUND FLUSH WELDING WITH BASE MATAL AS REQUIRED (SEE DETAIL "2")
2. GALVANIZED ALL SURFACES WITH 0.10 mm. THK.
3. NICKEL CLADDING ON OUTER SURFACE WITH 0.50 mm. THK. AND GALVANIZED INNER 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 :

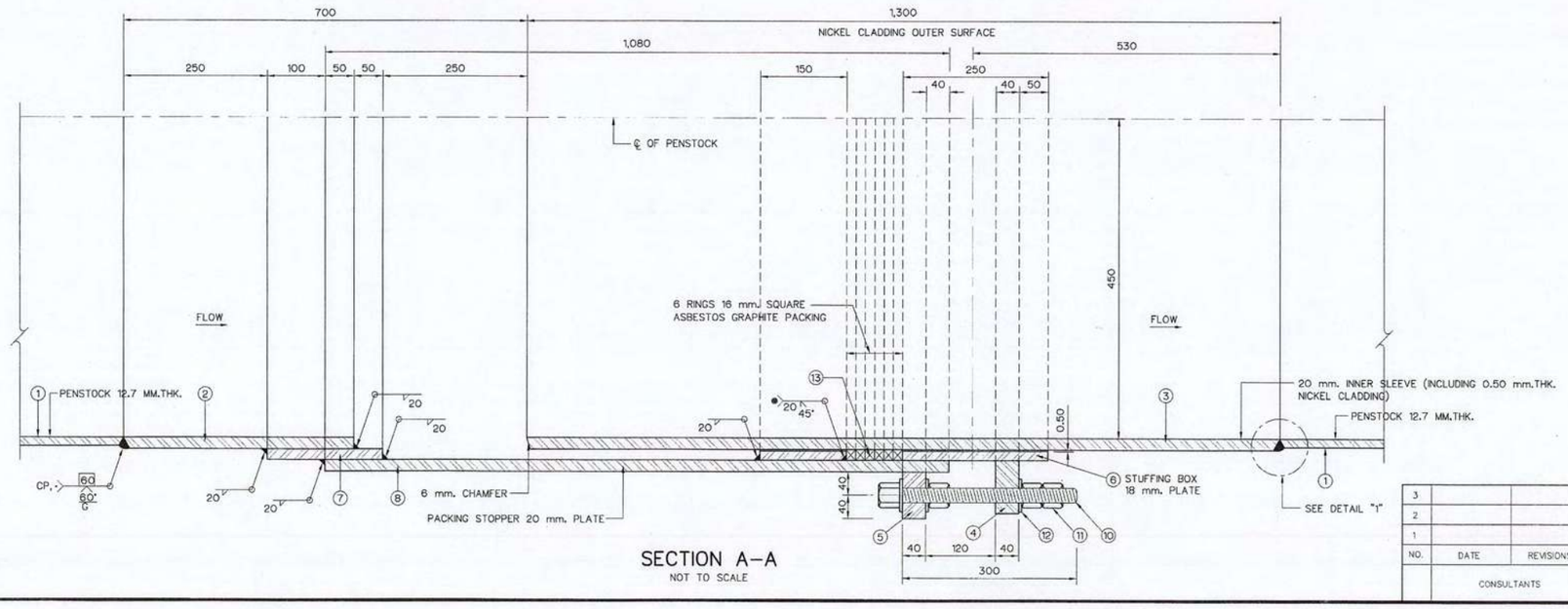
- CP = COMPLETE JOINT PENETRATION GROOVE WELD
- G = GRINDING WELD DEPOSITE FLUSH WITH BASE METAL
- • = BACKING PLATE SIZE 0.10x1.50 mm. AND SAME METERIAL AS PENSTOCK
- ● = BEVEL PLATE 9 mm. BEFORE ROLLING CHIP SQUARE AFTER WELDING
- ▲ = ROOT OPENING R = 2.0 mm.
  ROOT FACE t = 3.0 mm.
  GROOVE ANGLE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

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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
EXPANSION JOINT, PLAN, SECTIONS AND DETAILS

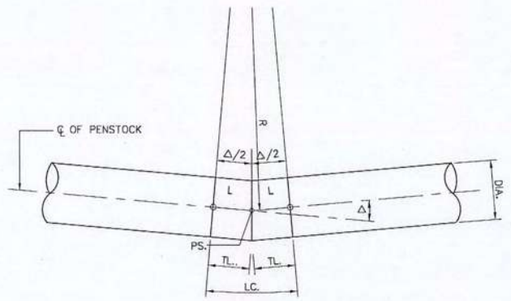
| NO. | DATE | REVISIONS | CHECKED | APPROVED |
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| | CONSULTANTS | | DEDE | |

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

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

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

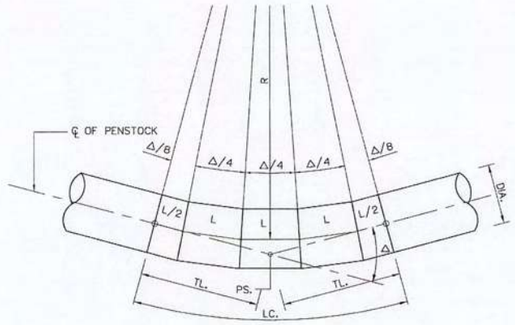
DRAWING NO. AKP-PS-10
SHEET NO. 59 OF 129




BEND TYPE "1"

DELTA(Δ) 0°-5°

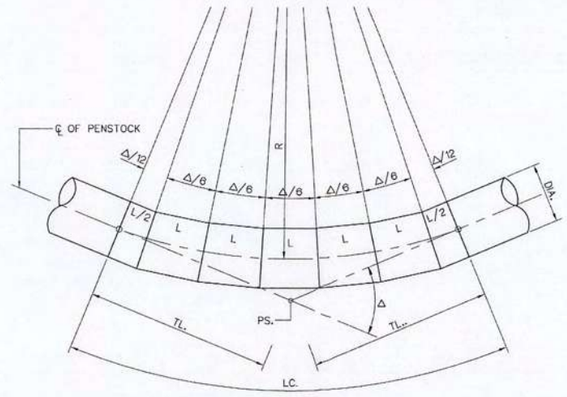
NOT TO SCALE




BEND TYPE "4"

DELTA(Δ) 25°-35°

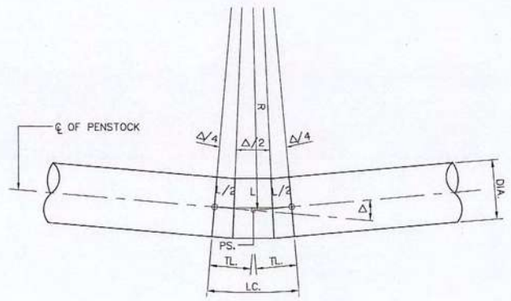
NOT TO SCALE




BEND TYPE "6"

DELTA(Δ) 55°-OVER

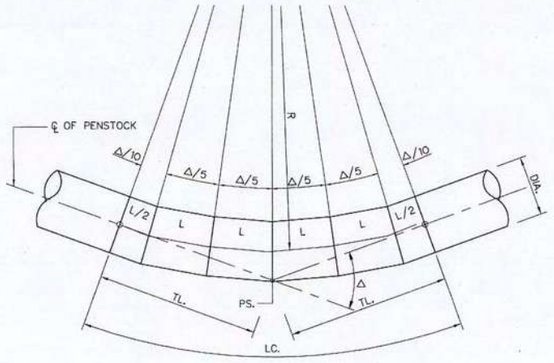
NOT TO SCALE




BEND TYPE "2"

DELTA(Δ) 5°-15°

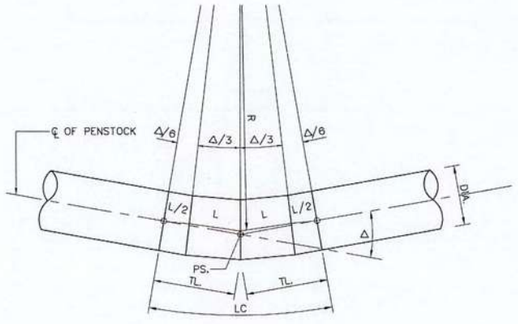
NOT TO SCALE




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.

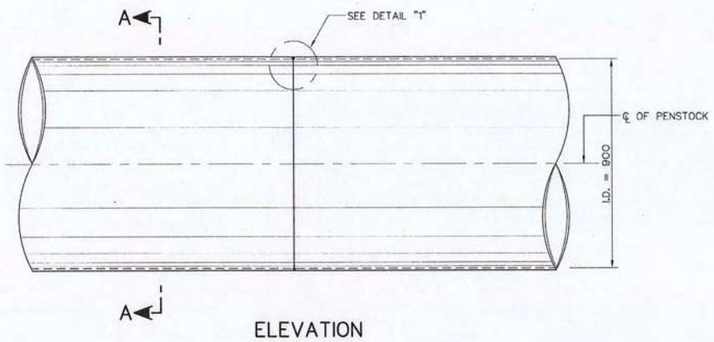
| NO. | DATE | REVISIONS | CHECKED | APPROVED |
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| 3 | | | | |
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| 1 | | | | |
| | CONSULTANTS | | DEDE | |

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

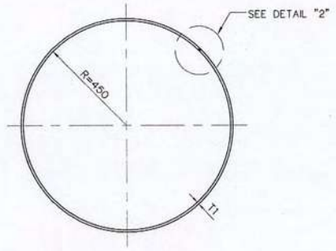
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
PENSTOCK
BEND DETAILS

| | | | |
|---|---|---|---|
| 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 | |
| PROJECT MANAGER | 28/10/2021 DATE | APPROVED | |
| | | DRAWING NO. AKP-PS-11 | SHEET NO. 60 OF 129 |




ELEVATION

SCALE 1:10



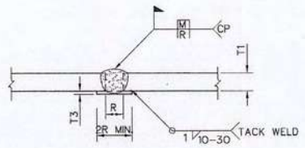

SECTION A–A

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

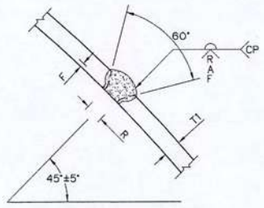



CIRCULAR BUTT JOINT

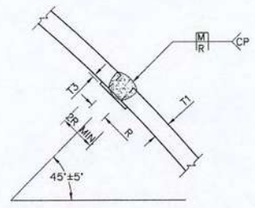
DETAIL "1"

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"

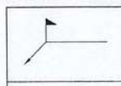
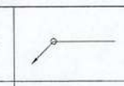
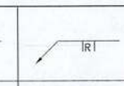
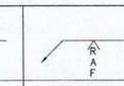
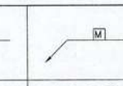
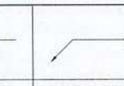
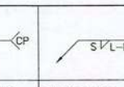
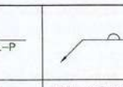
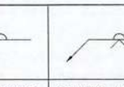
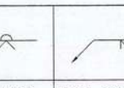
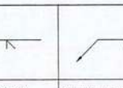
DETAIL "2"

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 |
|---|---|---|---|---|
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| | CONSULTANTS | | DEDE | |

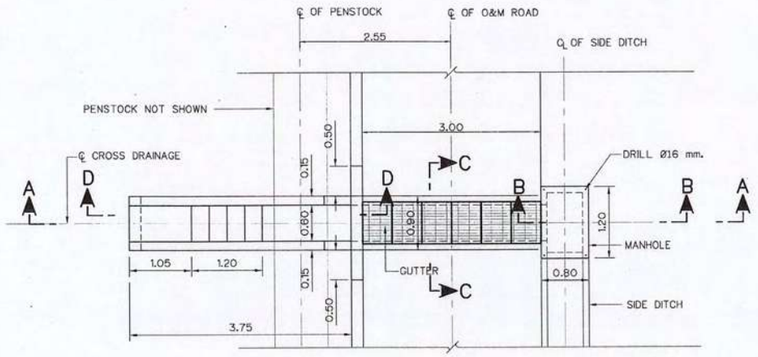
KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

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

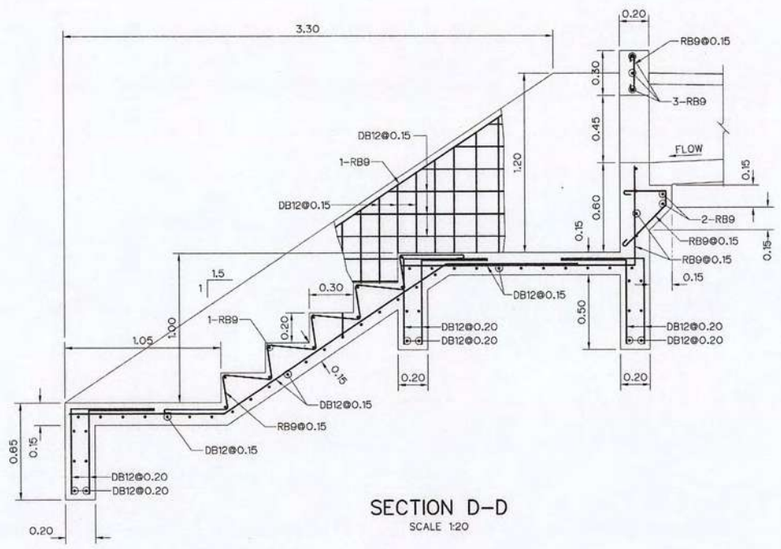
PART : 1 CIVIL WORKS AND TRANSMISSION LINE

PENSTOCK
WELDING DETAILS

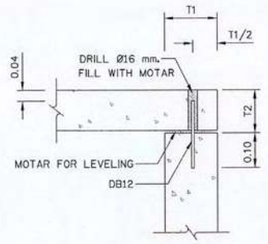
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|---|---|
| PCM F&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY |
| DESIGNED 28.29074 28.9462 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED 28.8231 | RECOMMENDED |
| 28/10/2021 | APPROVED |
| PROJECT MANAGER DATE | DRAWING NO. AKP–PS–12 / SHEET NO. 61 OF 129 |



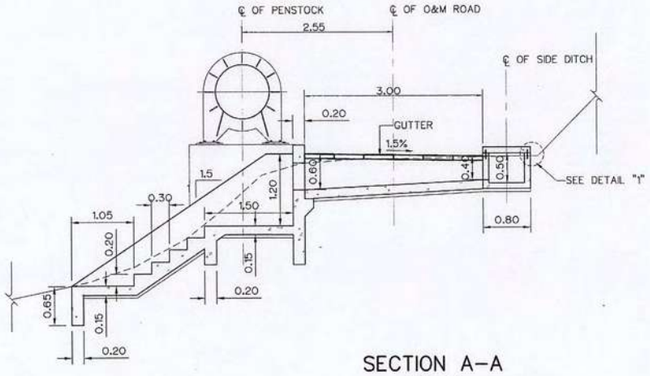

PLAN
SCALE 1:50



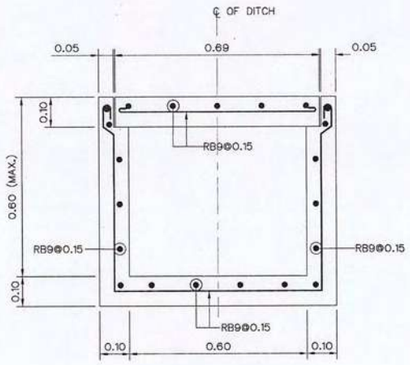

SECTION D-D
SCALE 1:20



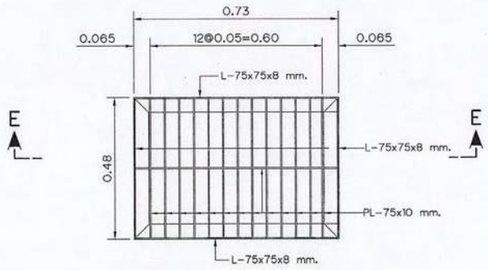

DETAIL "1"
NON TO SCALE



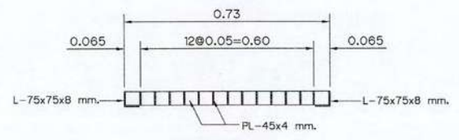

SECTION A-A
SCALE 1:50



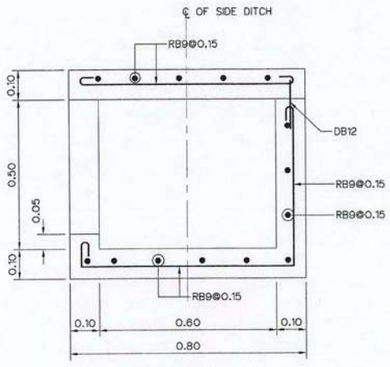

SIDE DITCH
SCALE 1:10



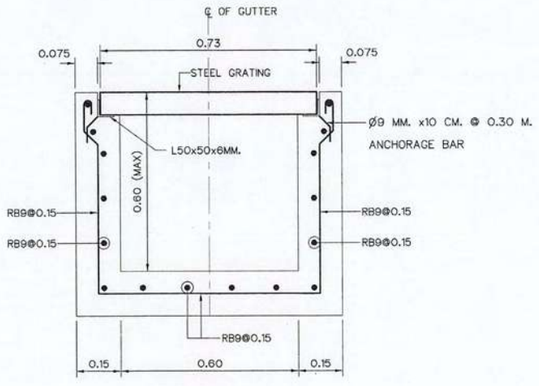

DETAIL OF STEEL GUTTER
SCALE 1:10




SECTION E-E
SCALE 1:10




SECTION B-B
SCALE 1:10




SECTION C-C
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

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
PENSTOCK
TYPICAL CROSS DRAINAGE AND DETAILS

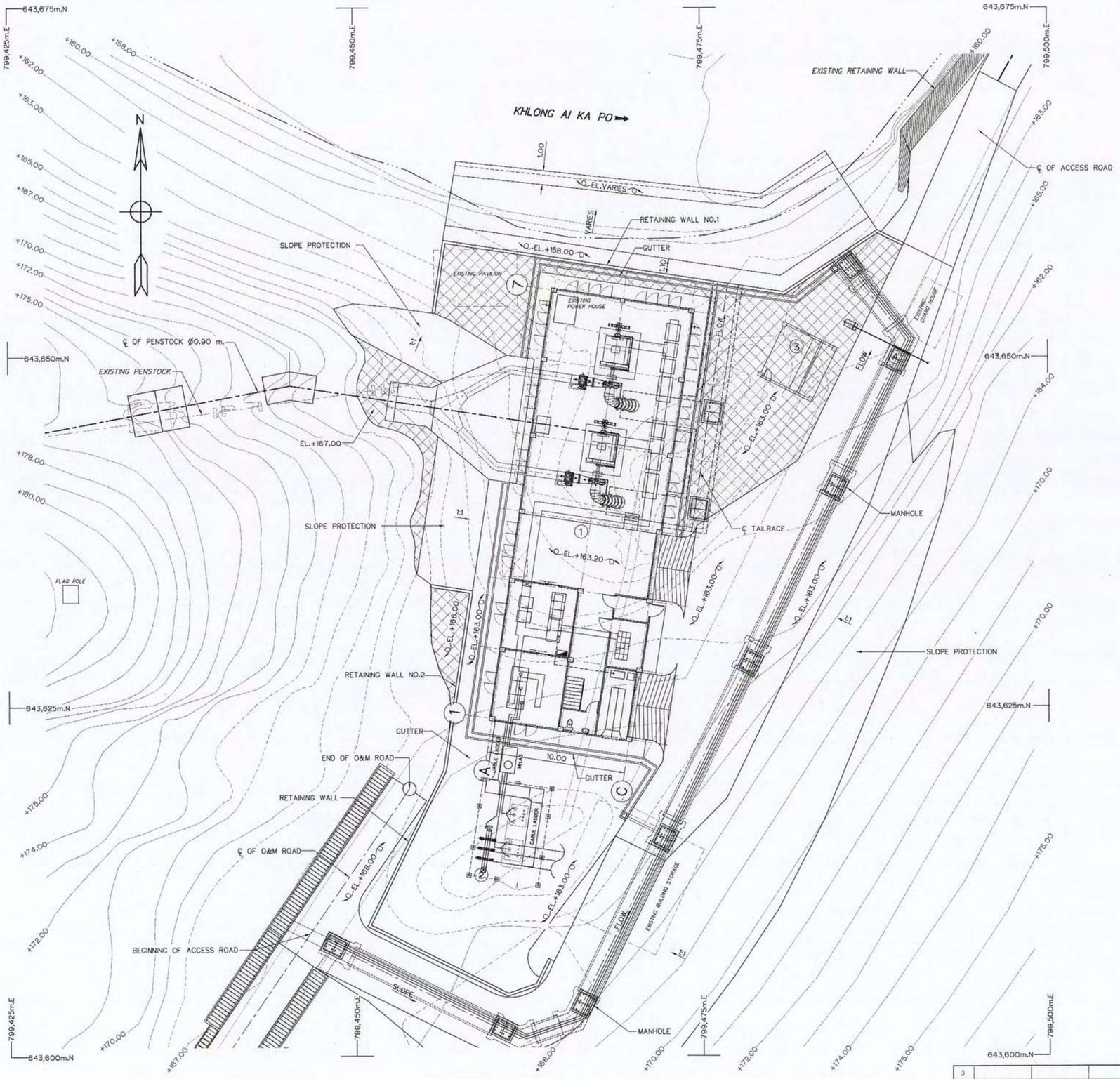
| NO. | DATE | REVISIONS | CHECKED | APPROVED |
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| | CONSULTANTS | | DEDE | |

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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-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 |

0 2 4 6 8 10
SCALE 1:150 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

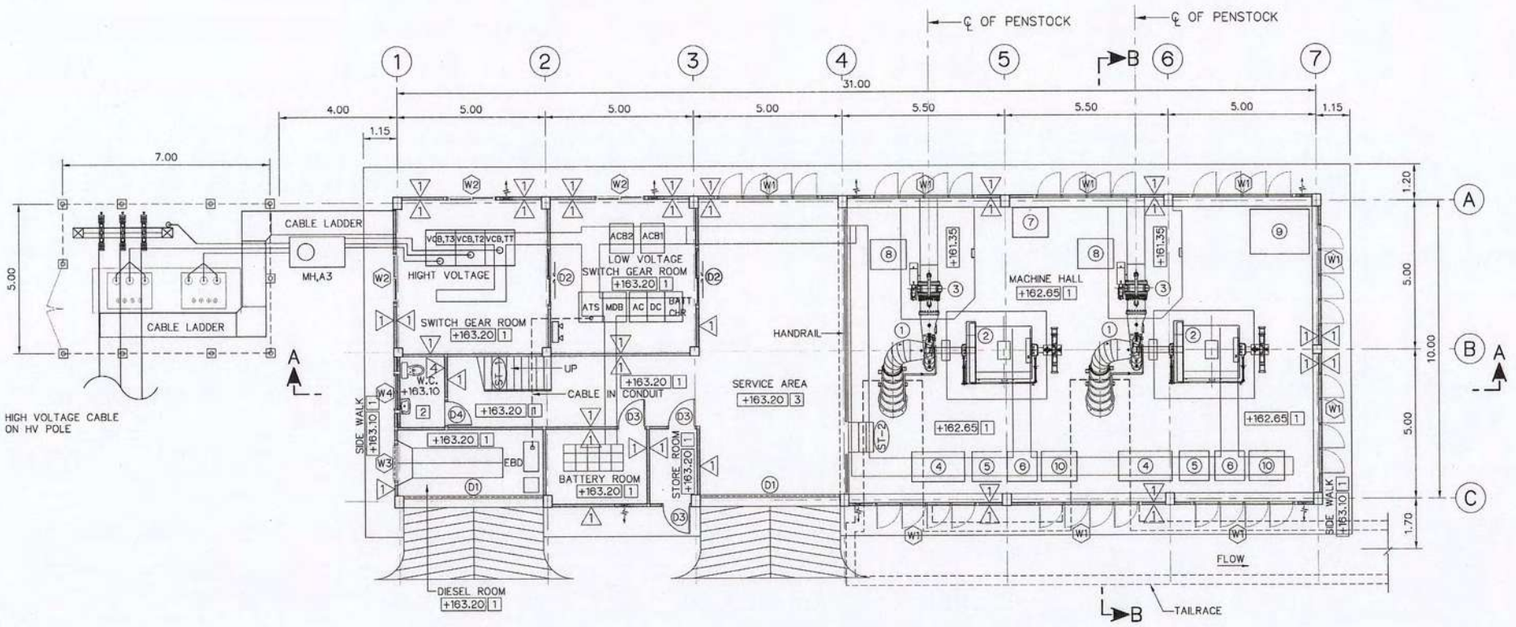
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

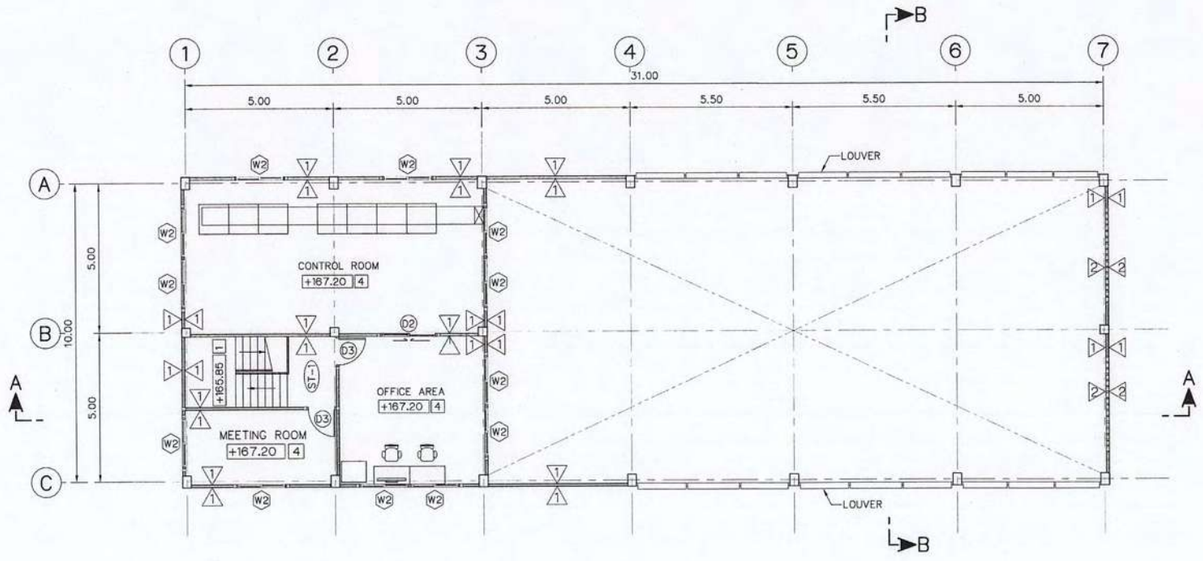
GENERAL LAYOUT

| | |
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| 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-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 |
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| | CONSULTANTS | | DEDE | |

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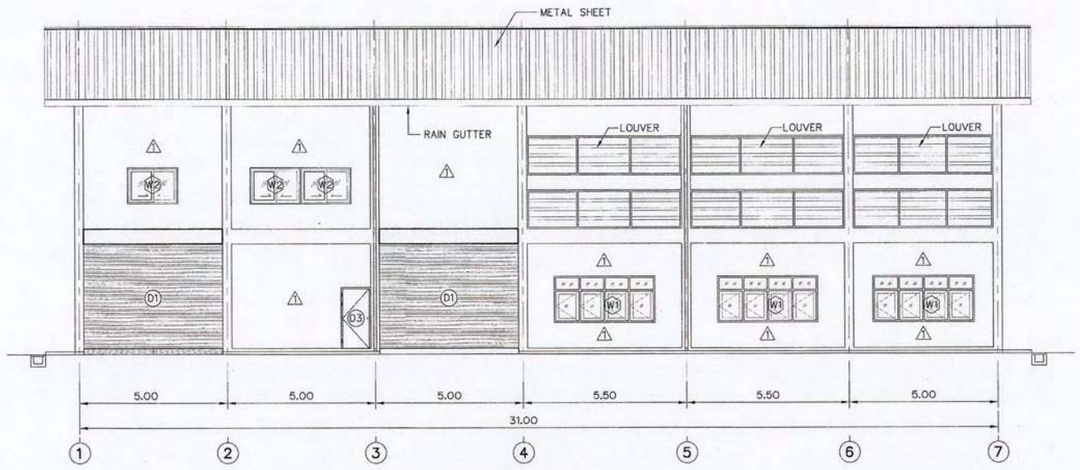
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

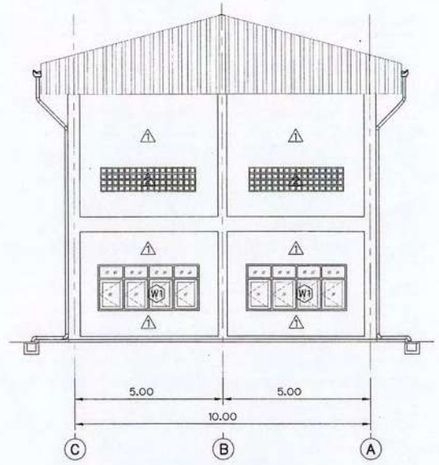
POWERHOUSE

PLANS

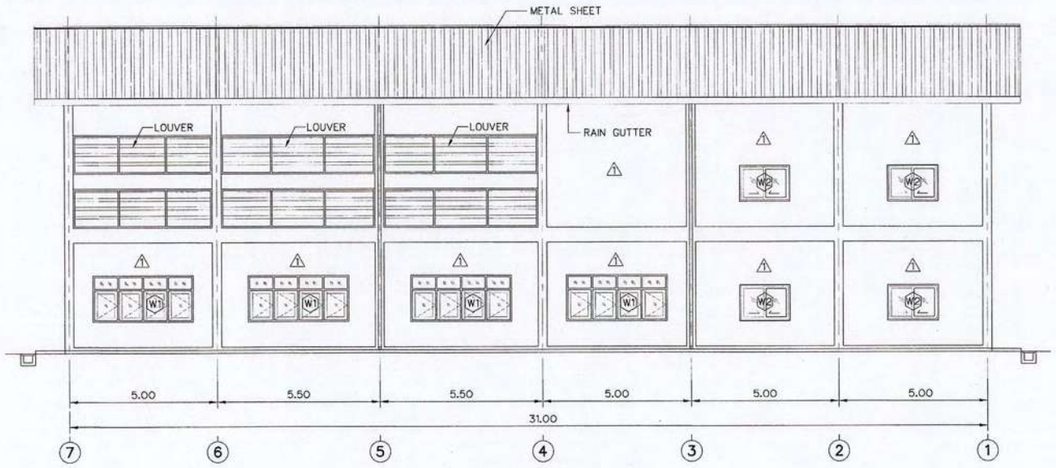
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| P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY |
| DESIGNED Mr.Somyot Rs.29074 Rs.9462 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED Rs.8231 | RECOMMENDED |
| PROJECT MANAGER 28/10/2021 DATE | APPROVED |
| | DRAWING NO. AKP-PH-02 |
| | SHEET NO. 64 OF 129 |



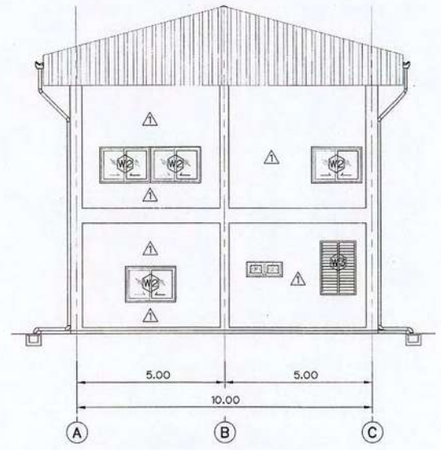

ELEVATION "A"
SCALE 1:100




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 |
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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

ELEVATIONS

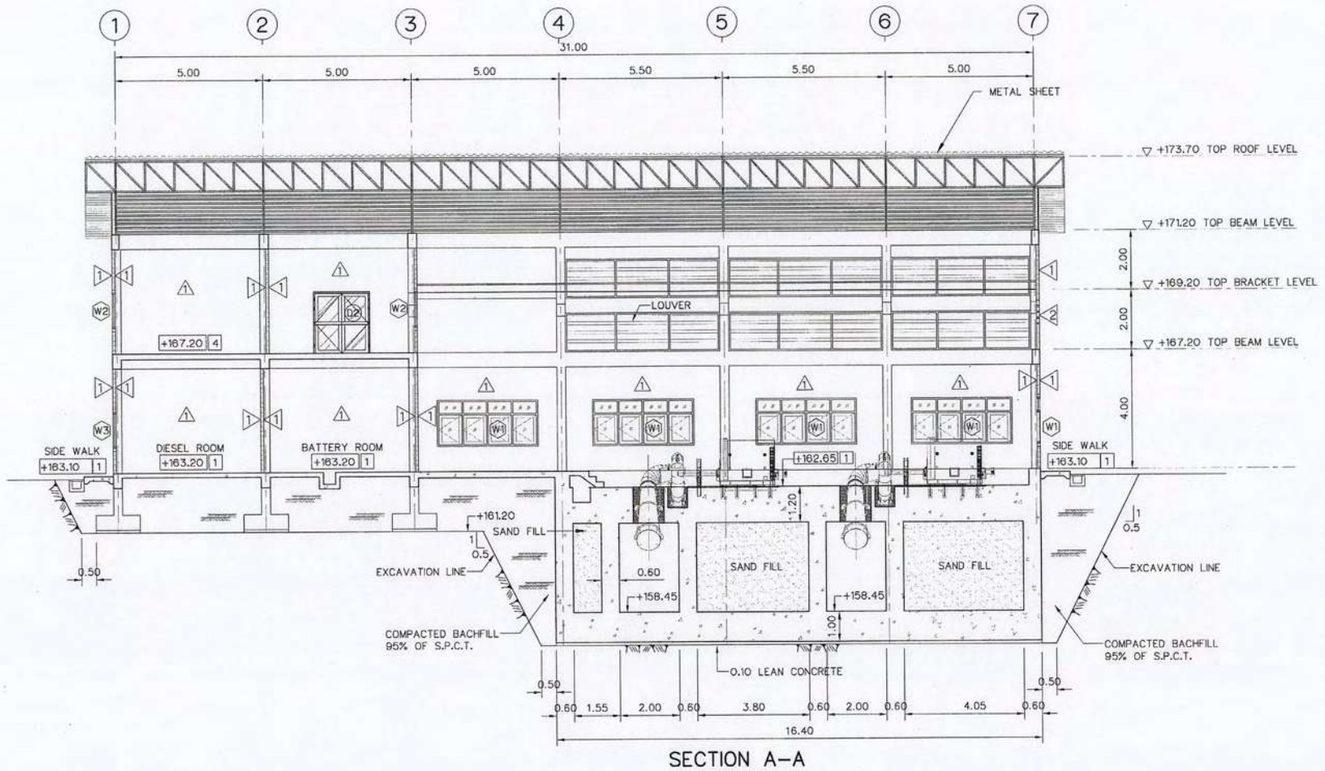
P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

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MINISTRY OF ENERGY

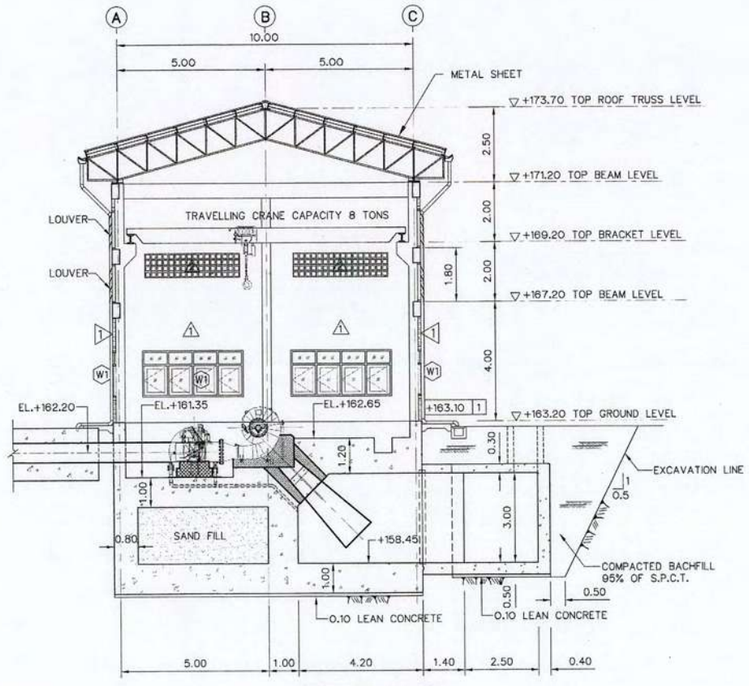
DESIGNED RS.29074 RS.9462
DRAWN
CHECKED RS.8231
PROJECT MANAGER 28/10/2021 DATE

REVIEWED
SUBMITTED
RECOMMENDED
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 |
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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

POWERHOUSE

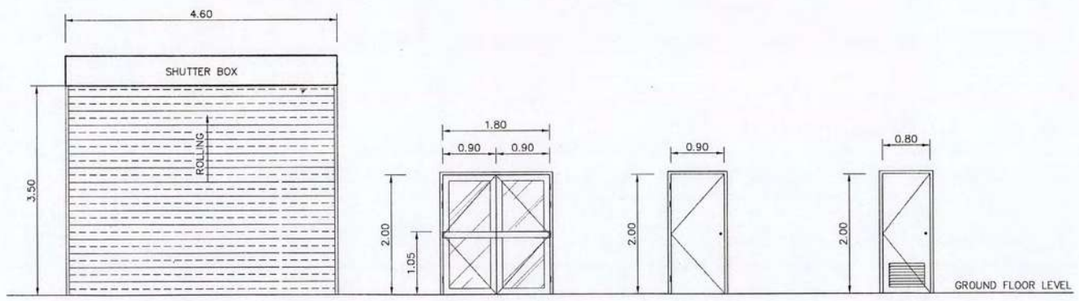
SECTIONS

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Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

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

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



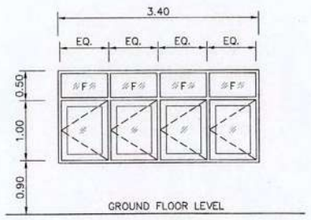

D1 ROLLING SHUTTER
SCALE 1:50

D2 SLIDING DOOR
SCALE 1:50

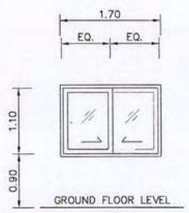
D3 OPENNING DOOR
SCALE 1:50

D4 OPENNING DOOR
SCALE 1:50

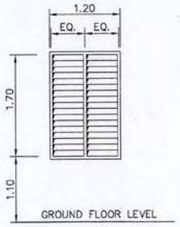
| SYMBOL | DESCRIPTIONS | SIZE | | FRAME | RAIL & STILE | PANEL | HINGE | LOCKSET | HANDLE | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | WIDTH | HEIGHT | | | | | | | |
| D1 | ROLLER SHUTTER DOOR ( STEEL 1.2 mm. THK.) | 4.60 | 3.50 | GALVANIZED STEEL | — | — | — | NORMAL KEY | — | MOTOR 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 | | | | | | | | | |



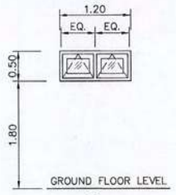

W1 OPENNING WINDOW
SCALE 1:50



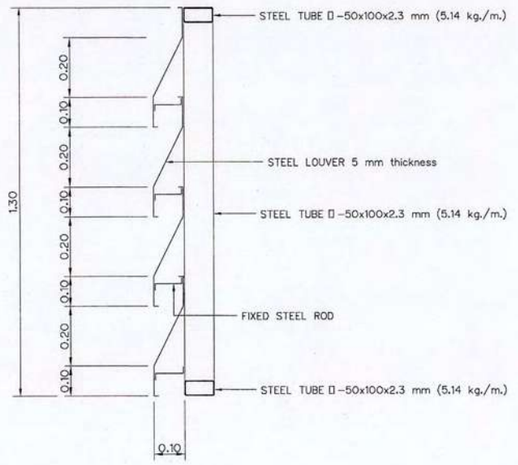

W2 SLIDING WINDOW
SCALE 1:50




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 | | | | |
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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

POWERHOUSE

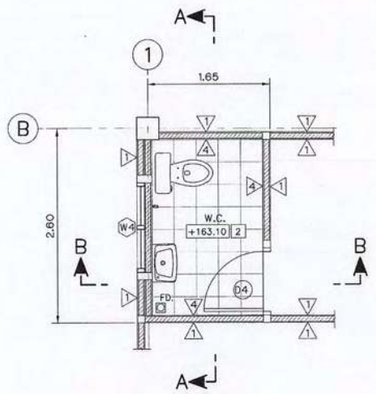
DETAILS OF DOORS, WINDOWS AND SIGNBOARD

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

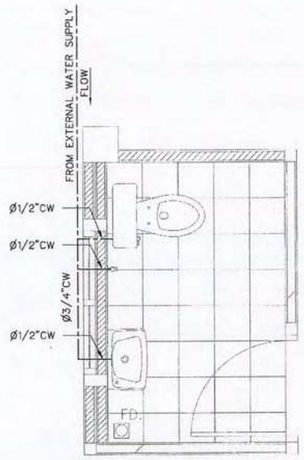
DESIGNED ภ.ป.29074 ส.ป.9462
DRAWN
CHECKED ส.ป.8231
28/10/2021
PROJECT MANAGER DATE

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

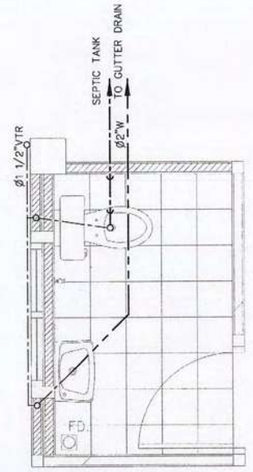
DRAWING NO. AKP-PH-05
SHEET NO. 67 OF 129



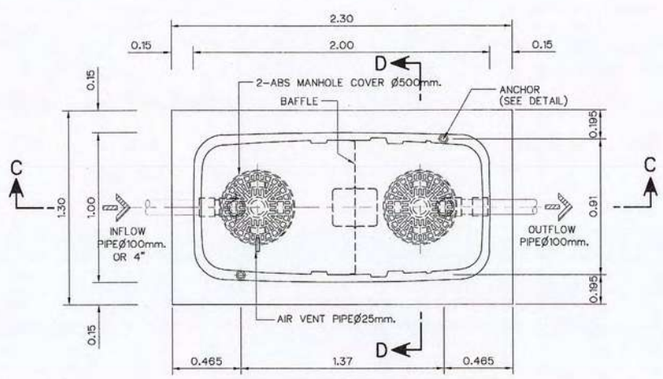

PLAN WC.
SCALE 1:40



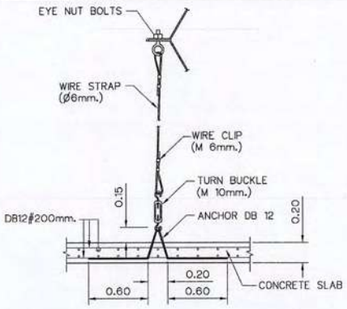

COLD WATER PIPING
SCALE 1:25




SOIL, WASTE AND VENT PIPING
SCALE 1:25

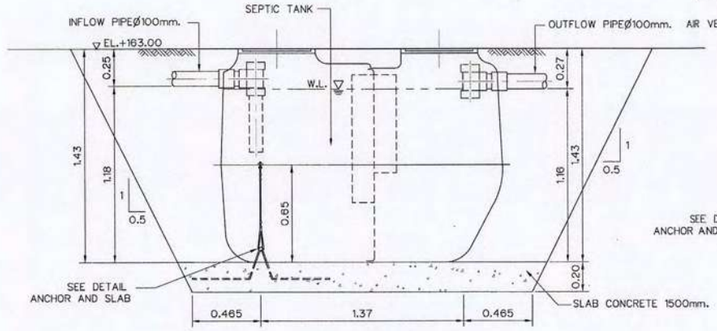



SEPTIC TANK
SCALE 1:20

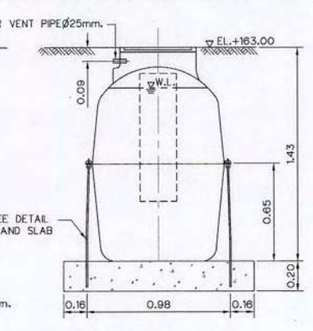



DETAIL ANCHOR AND SLAB
NOT TO SCALE

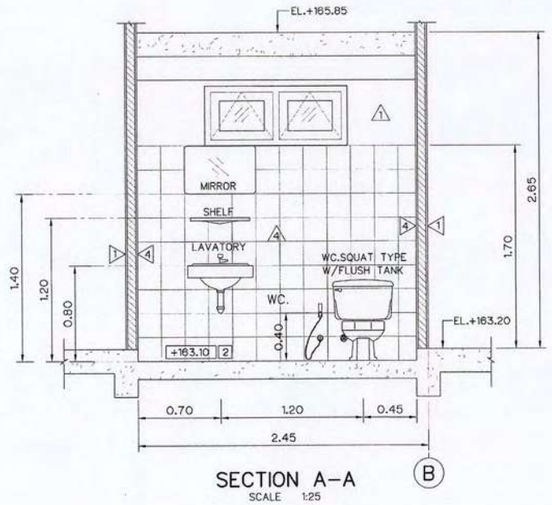
| SPECIFICATION TABLE | | |
|---|---|---|
| No. | ITEM | CONTENT |
| 1 | CAPACITY | |
| 1.1 | SEPTIC TANK | 1.500 $m^3$ |
| 2 | MATERIAL | |
| 2.1 | CHAMBER | FRP |
| 2.2 | SEPARATION PLATE , BAFFLE | FRP |
| 2.3 | MANHOLE COVER | ABS |
| 2.4 | INFLOW , OUTFLOW PIPE | PVC(ø100mm.) |



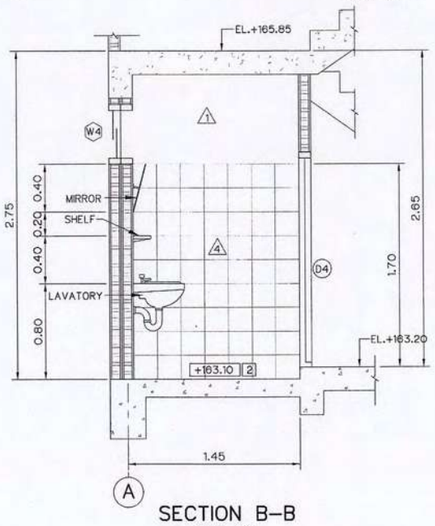

SECTION C–C
SCALE 1:20




SECTION D–D
SCALE 1:20




SECTION A–A
SCALE 1:25




SECTION B–B
SCALE 1:25

NOTES :

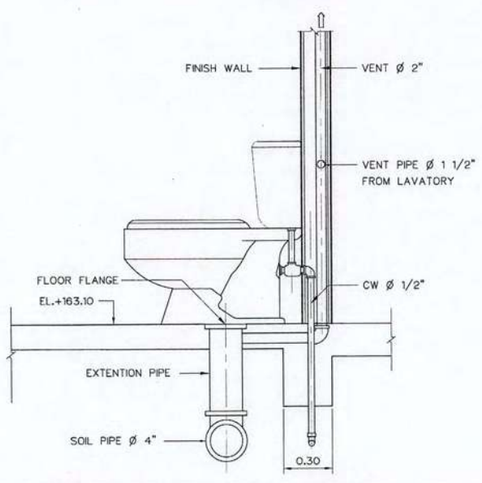
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO.AKP-GN-03

REFERENCE DRAWING :

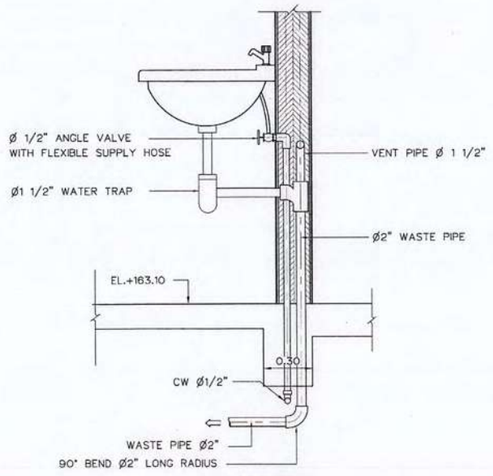
| | |
|---|---|
| 1. POWERHOUSE, GENERAL LAYOUT | AKP-PH-01 |
| 2. POWERHOUSE, PLAN | AKP-PH-02 |
| 3. POWERHOUSE, WATER SUPPLY PIPELINE SYSTEM LAYOUT | AKP-PH-19 |

SYMBOLS :

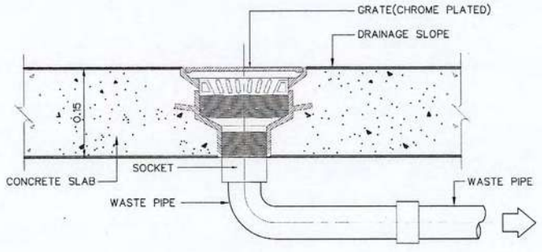
- SOIL PIPE
- WASTE PIPE
- COLD WATER PIPE
- VENT PIPE




WATER CLOSET (FLUSH TANK)
NOT TO SCALE

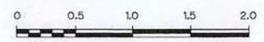



LAVATORY
NOT TO SCALE




FLOOR DRAIN
NOT TO SCALE




| NO. | DATE | REVISIONS | CHECKED | APPROVED |
|---|---|---|---|---|
| 3 | | | | |
| 2 | | | | |
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| | CONSULTANTS | | DEDE | |

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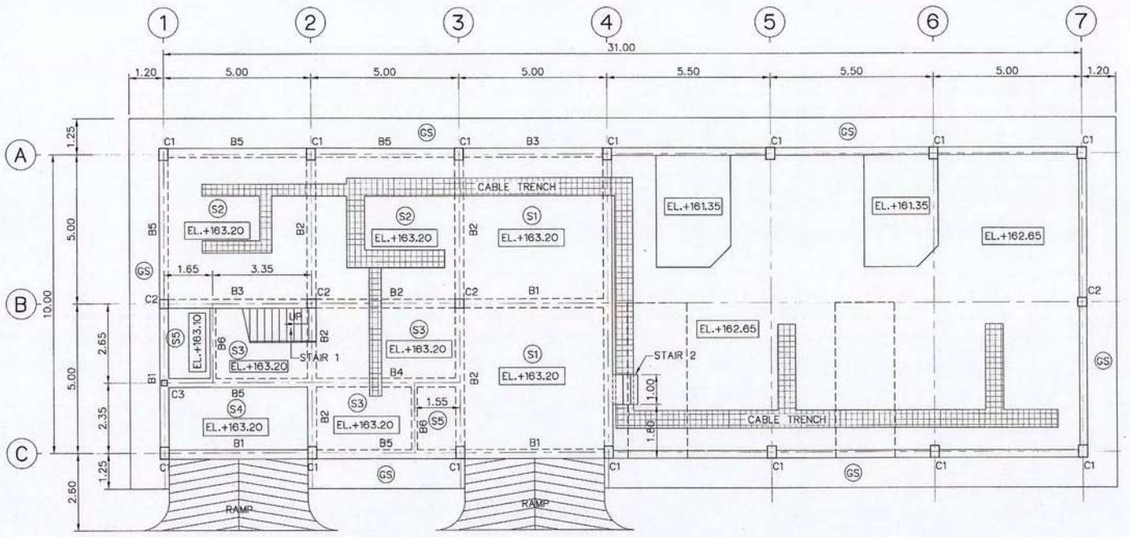
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

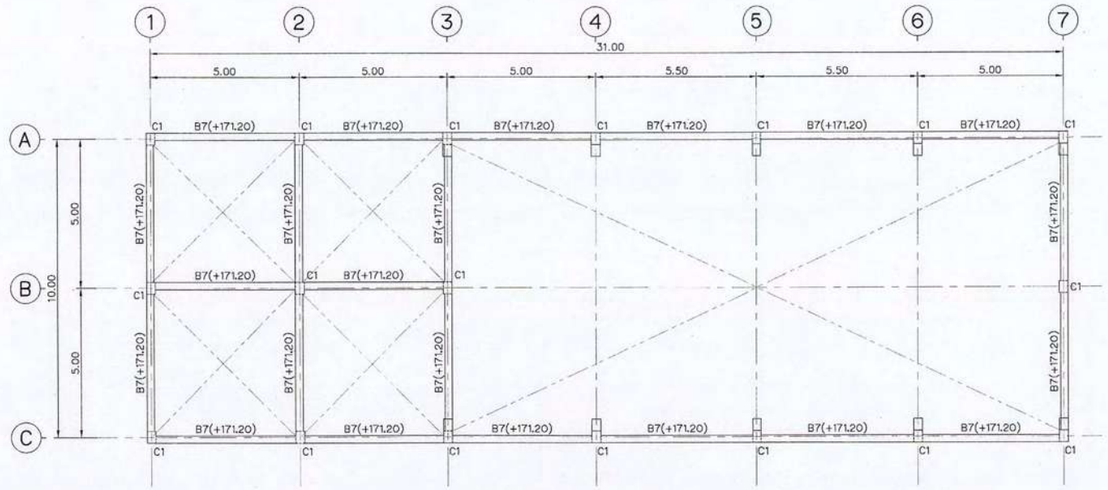
DETAILS OF TOILET, SEPTIC AND SEEPAGE TANK

| | |
|---|---|
| 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-06 |
| | SHEET NO. 68 OF 129 |



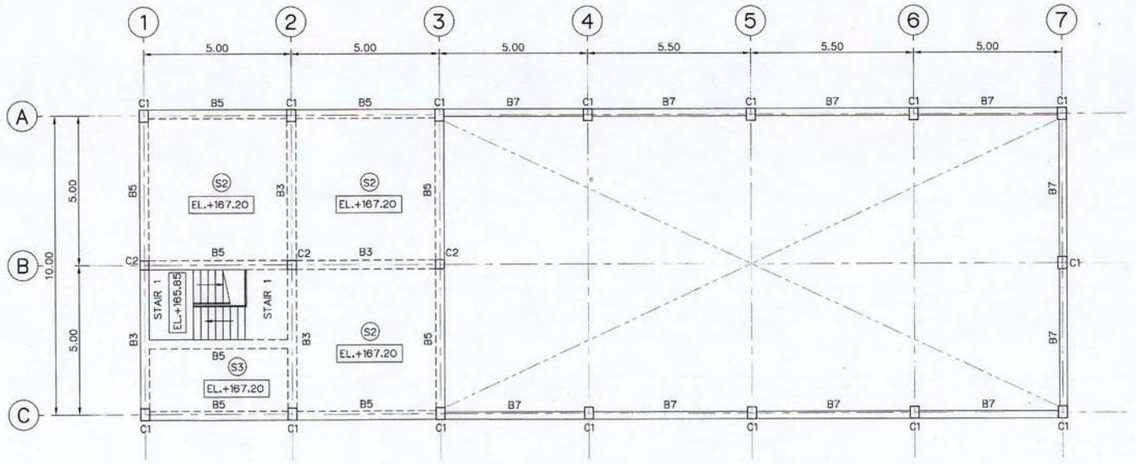

GROUND FLOOR PLAN

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 | | | | |
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| | CONSULTANTS | | DEDE | |

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MINISTRY OF ENERGY

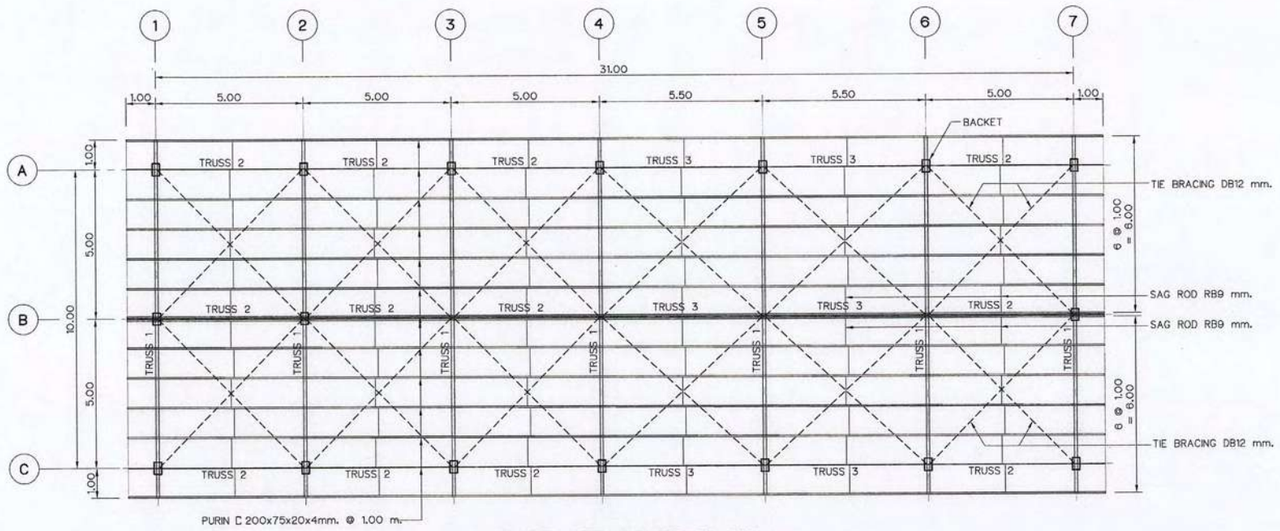
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

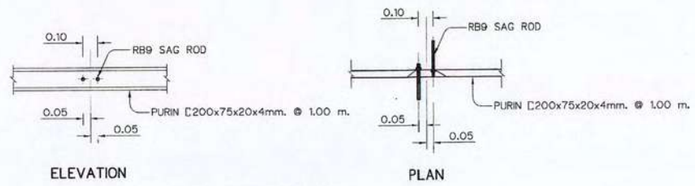
GROUND FLOOR PLAN, PLAN OF BEAM AND SLAB AND ROOF BEAM PLAN

| | |
|---|---|
| P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY |
| DESIGNED 281.29074 281.9462 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED 281.8231 | RECOMMENDED |
| PROJECT MANAGER 28/10/2021 DATE | APPROVED |
| DRAWING NO. AKP-PH-07 | SHEET NO. 69 OF 129 |



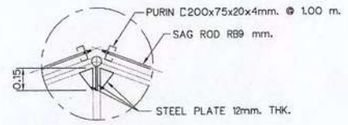

## ROOF STRUCTURE PLAN

SCALE 1:100



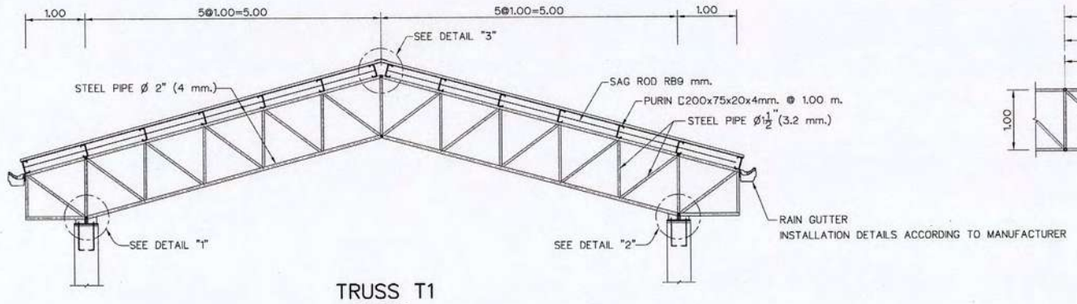

## SAG ROD DETAILS

SCALE 1:20



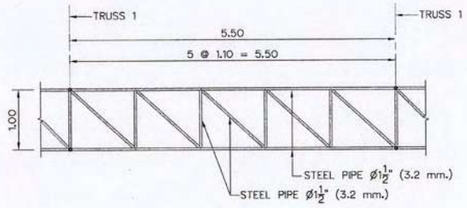

## DETAIL "3"

SCALE 1:20



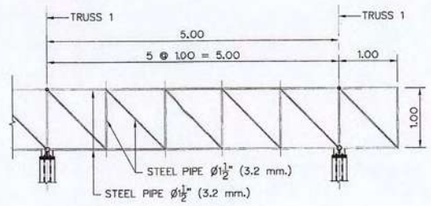

## TRUSS T1

SCALE 1:50



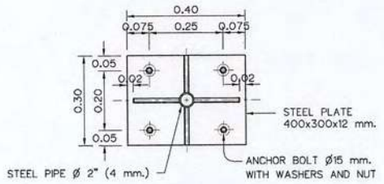

## TRUSS T3

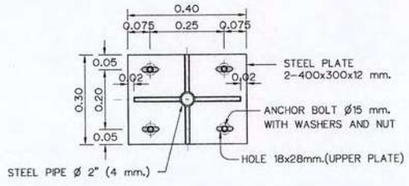
SCALE 1:50

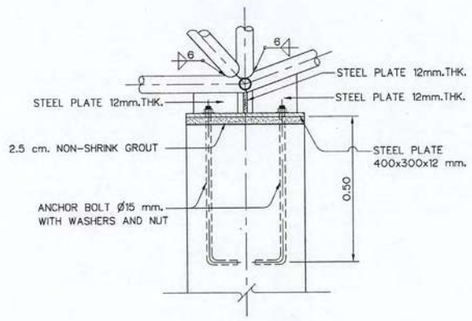



## TRUSS T2

SCALE 1:50



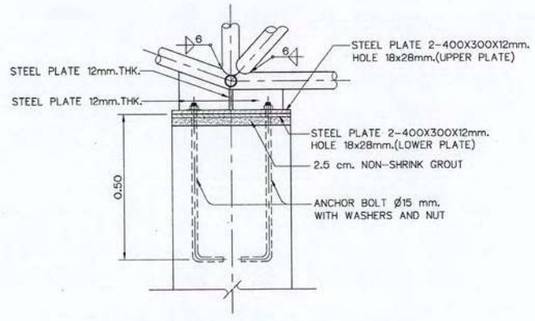




## DETAIL "1"

FIXED END SUPPORT

SCALE 1:10




## DETAIL "2"

FREE END SUPPORT

SCALE 1:10

SCALE 1:100 METERS

SCALE 1:50 METERS

SCALE 1:20 METERS

SCALE 1:10 METERS

### 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

| NO. | DATE | REVISIONS | CHECKED | APPROVED |
|---|---|---|---|---|
| 3 | | | | |
| 2 | | | | |
| 1 | | | | |
| | CONSULTANTS | | DEDE | |

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MINISTRY OF ENERGY

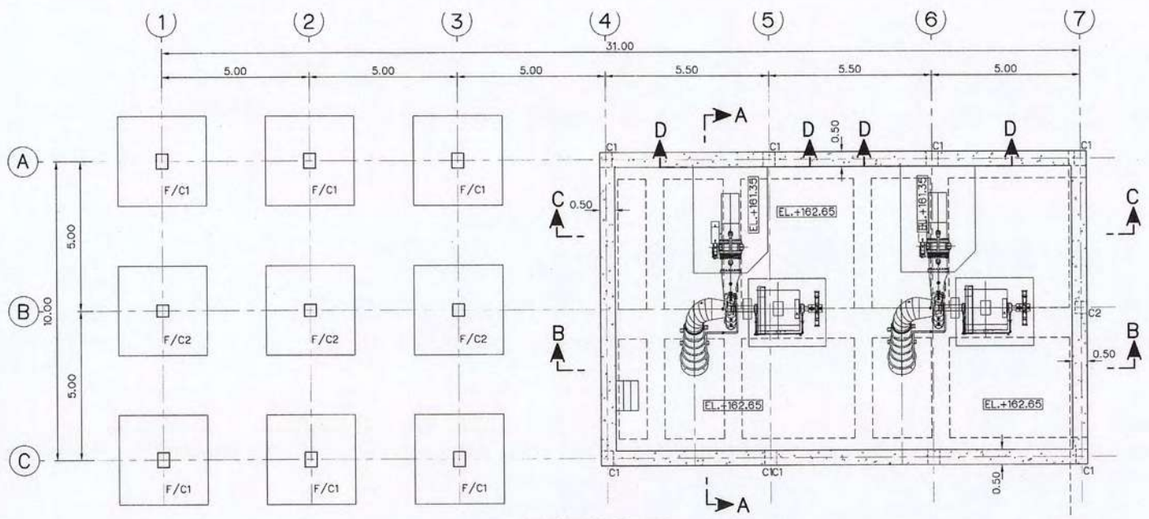
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

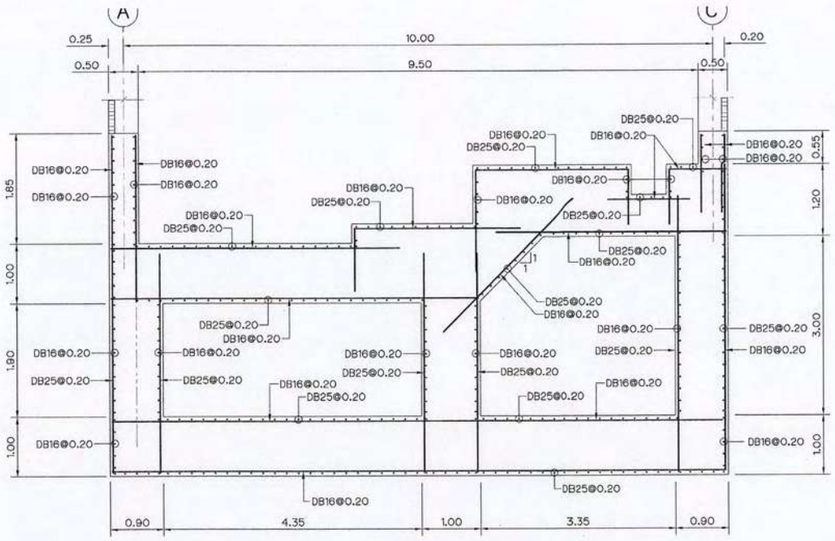
TRUSS SECTIONS AND DETAILS

| | | | |
|---|---|---|---|
| PCM P&C MANAGEMENT CO., LTD. / CPD SPT CONSULTANTS CO., LTD. | | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY | |
| DESIGNED | 281.29074 281.9462 | REVIEWED | |
| DRAWN | | SUBMITTED | |
| CHECKED | 281.8231 | RECOMMENDED | |
| PROJECT MANAGER | 28/10/2021 DATE | APPROVED | |
| | | DRAWING NO. AKP-PH-08 | SHEET NO. 70 OF 129 |



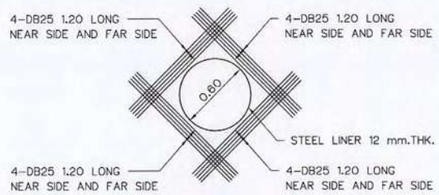

FOOTING PLAN

SCALE 1:100



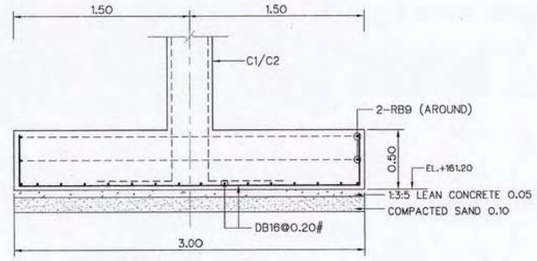

SECTION A-A

SCALE 1:50



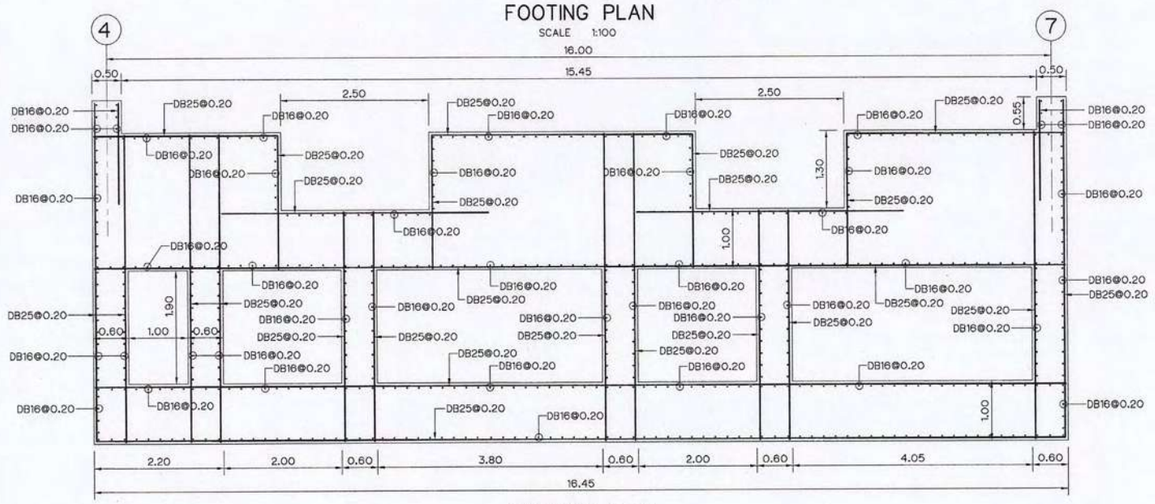

SECTION D-D

SCALE 1:25



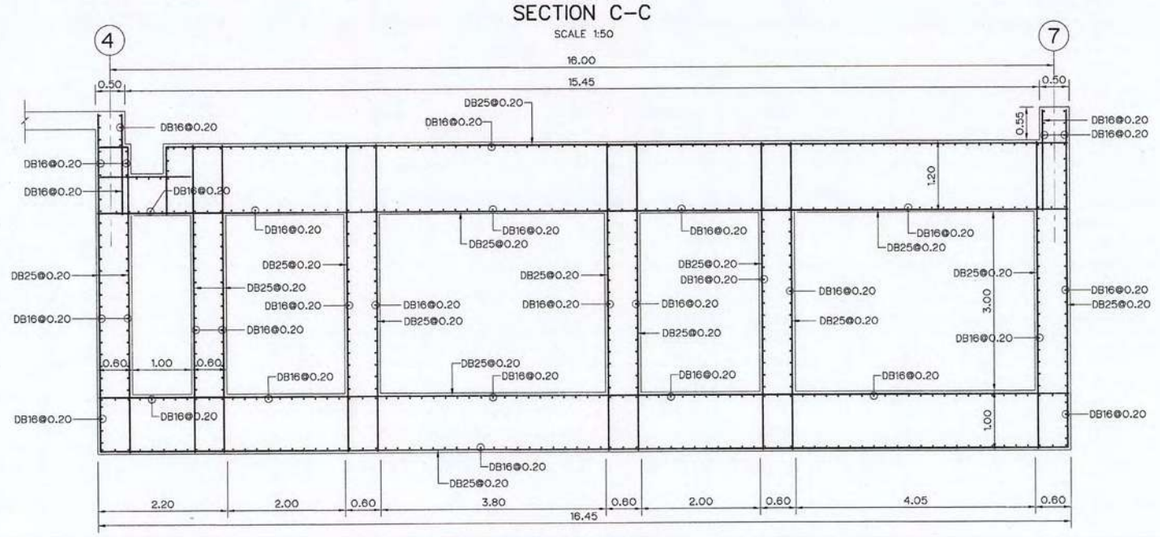

SECTION E-E

SCALE 1:25



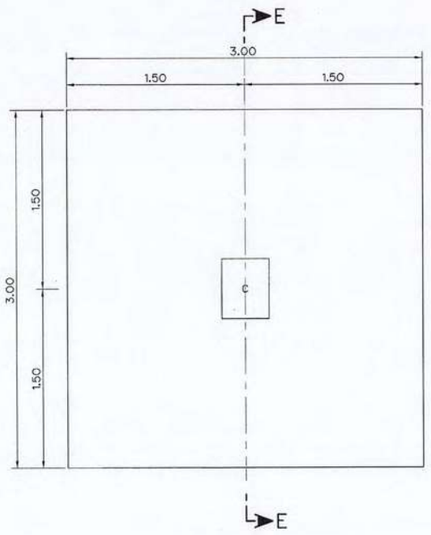

SECTION C-C

SCALE 1:50




SECTION B-B

SCALE 1:50




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 METERS — SCALE 1:20

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

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

| NO. | DATE | REVISIONS | CHECKED | APPROVED |
|---|---|---|---|---|
| 3 | | | | |
| 2 | | | | |
| 1 | | | | |
| | CONSULTANTS | | DEDE | |

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

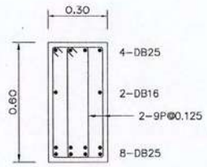
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

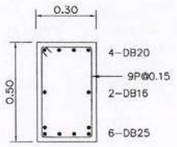
POWERHOUSE

FOOTING PLAN AND SECTIONS

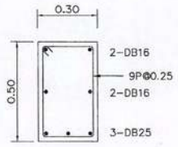
| | |
|---|---|
| PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY |
| DESIGNED Reg.29074 Reg.9462 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED Reg.8231 | RECOMMENDED |
| 28/10/2021 PROJECT MANAGER DATE | APPROVED |
| DRAWING NO. AKP-PH-09 | SHEET NO. 71 OF 129 |



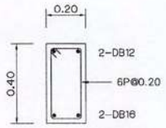

BEAM B1
SCALE 1:15



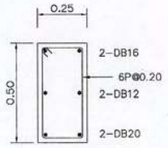

BEAM B3
SCALE 1:15



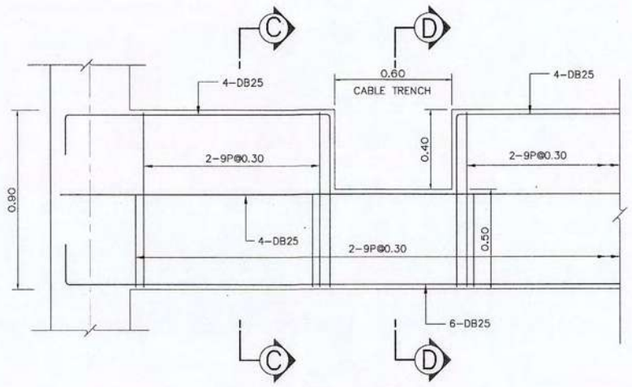

BEAM B5
SCALE 1:15



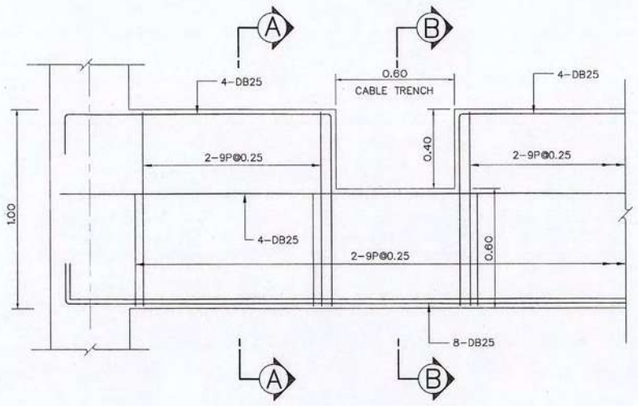

BEAM B6
SCALE 1:15



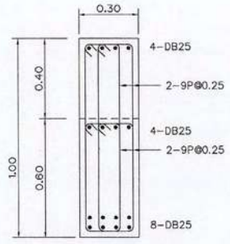

BEAM B7
SCALE 1:15



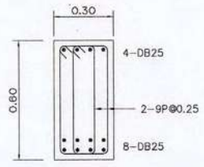

BEAM B4
SCALE 1:15



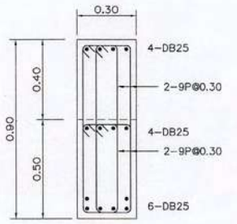

BEAM B2
SCALE 1:15



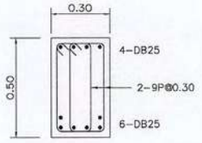

SECTION A–A
SCALE 1:15




SECTION B–B
SCALE 1:15

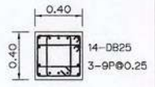
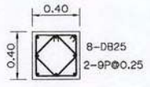
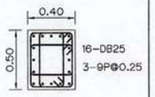
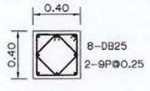
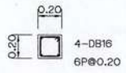
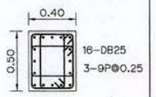
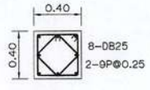


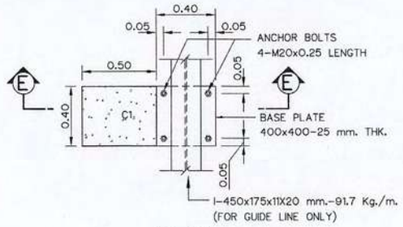

SECTION C–C
SCALE 1:15



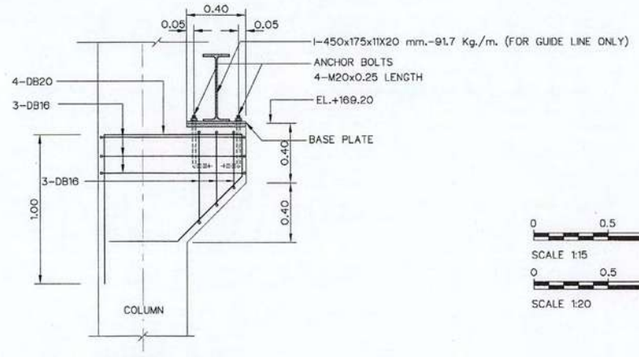

SECTION D–D
SCALE 1:15

## COLUMN SCHEDULE

| COLUMNS / FLOOR | C1 | C2 | C3 |
|---|---|---|---|
| ROOF (EL.+171.20)<br>↑<br>2nd FLOOR (EL.+167.20) |  |  | |
| 2nd FLOOR (EL.+167.20)<br>↑<br>GROUND FLOOR (EL.+163.20) |  |  | LANDING (EL.+165.85)<br>  <br>GROUND FLOOR (EL.+163.10) |
| GROUND FLOOR (EL.+163.20)<br>↑<br>FOOTING (EL.+161.20) |  |  | |




PLAN
SCALE 1:20




SECTION E–E
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
2. POWERHOUSE, FOOTING PLAN AND SECTIONS — AKP-PH-09

0 0.5 1.0 1.5
SCALE 1:15 METERS
0 0.5 1.0 1.5
SCALE 1:20 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

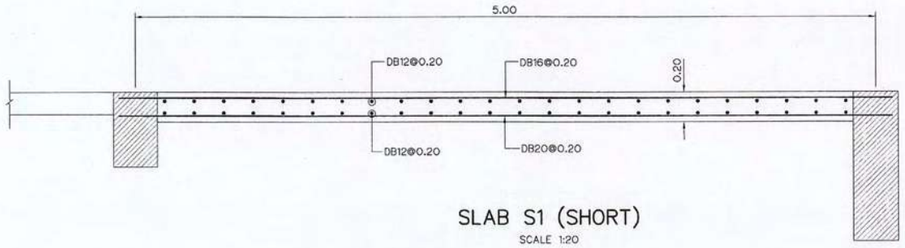
PART : 1 CIVIL WORKS AND TRANSMISSION LINE
POWERHOUSE
BEAM AND COLUMN REINFORCEMENT DETAILS

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

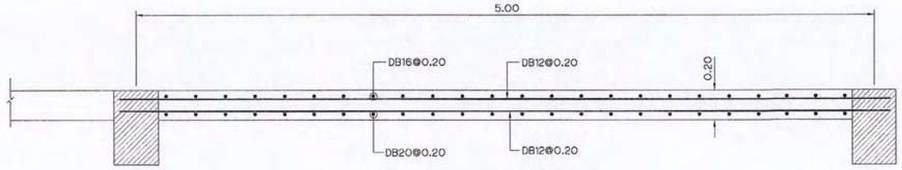
DESIGNED Reg.29074 Reg.9462
DRAWN
CHECKED Reg.8231
28/10/2021
PROJECT MANAGER DATE

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

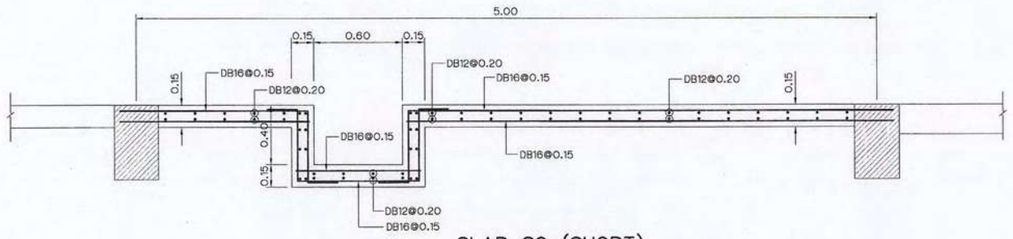
DRAWING NO. AKP-PH-10
SHEET NO. 72 OF 129



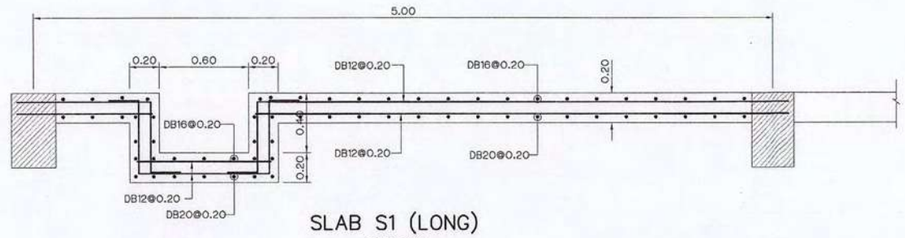

SLAB S1 (SHORT)
SCALE 1:20



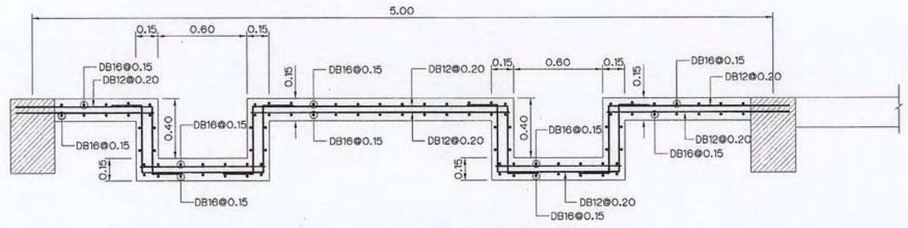

SLAB S1 (LONG)
SCALE 1:20



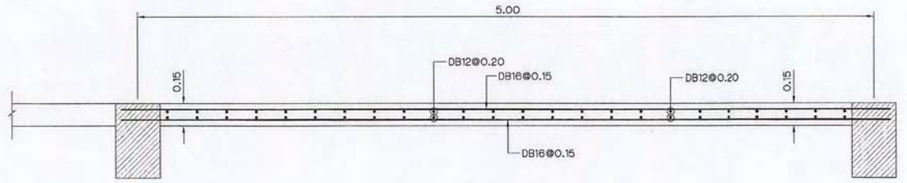

SLAB S2 (SHORT)
SCALE 1:20



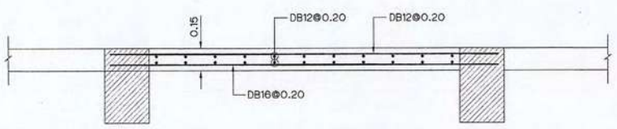

SLAB S1 (LONG)
SCALE 1:20



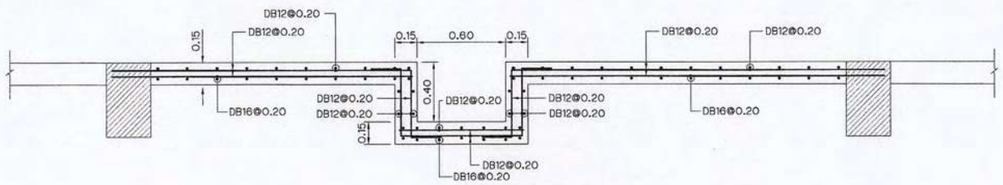

SLAB S2 (LONG)
SCALE 1:20



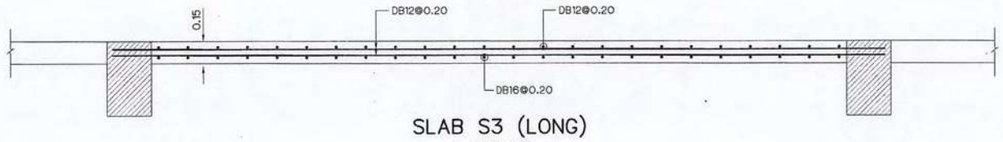

SLAB S2 (SHORT)
SCALE 1:20



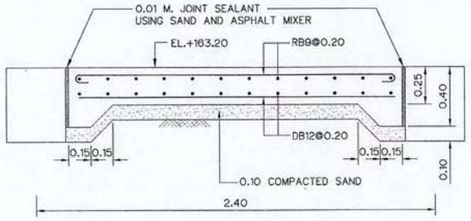

SLAB S3 (SHORT)
SCALE 1:20



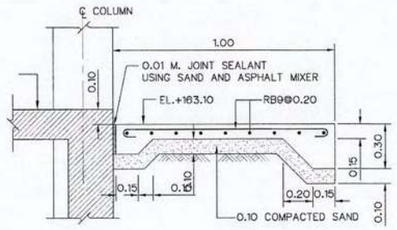

SLAB S3 (LONG)
SCALE 1:20



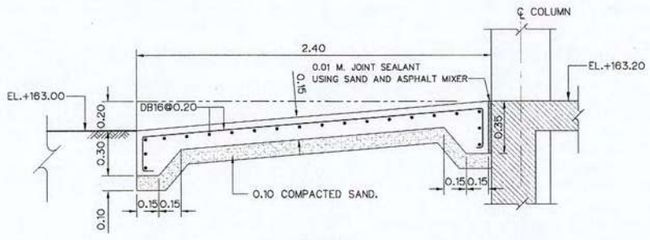

SLAB S3 (LONG)
SCALE 1:20



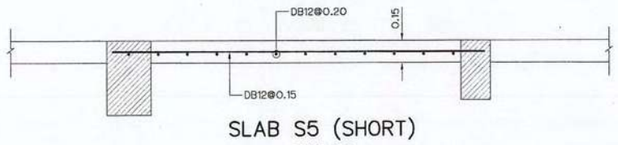

SLAB S4 (SHORT)
SCALE 1:20




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

0 0.5 1.0 1.5
SCALE 1:20 METERS

| 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

POWERHOUSE

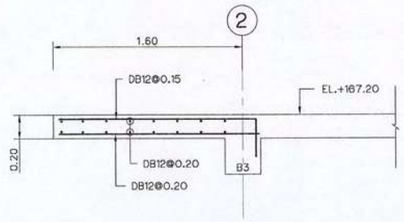
SLAB REINFORCEMENT DETAILS

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

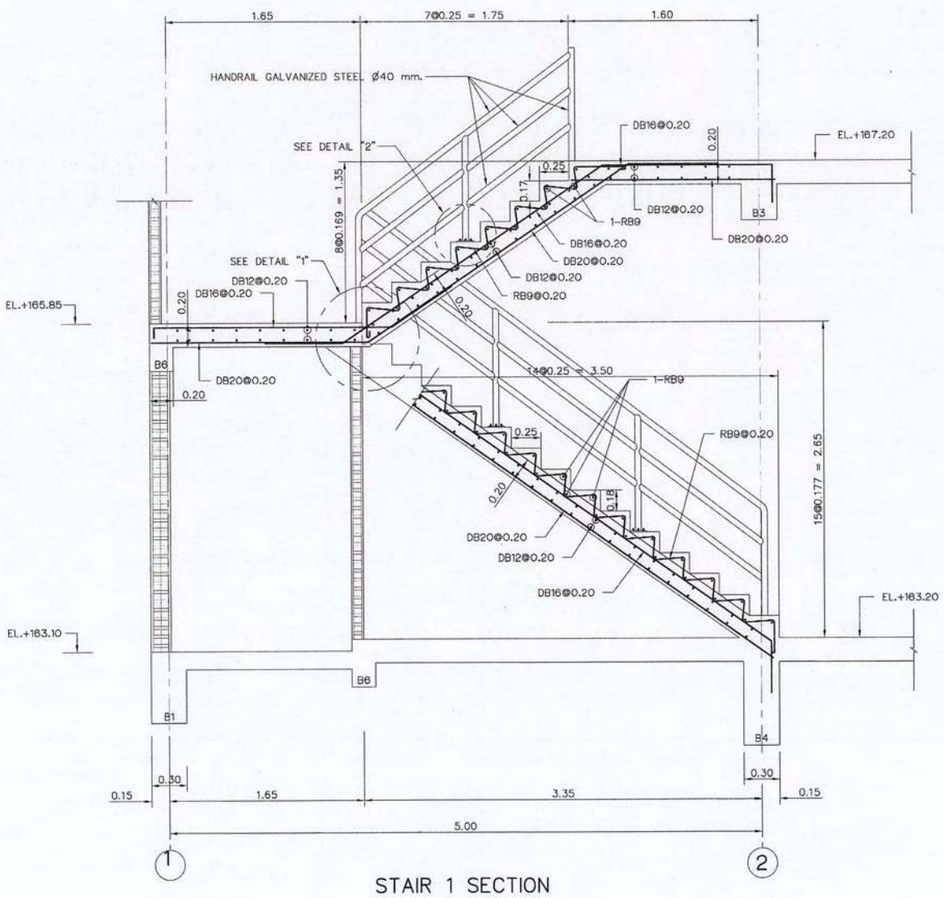
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

| | | | |
|---|---|---|---|
| DESIGNED | [illegible] 28.29074 | 28.9462 | REVIEWED |
| DRAWN | [illegible] | | SUBMITTED |
| CHECKED | [illegible] | 28.8231 | RECOMMENDED |
| PROJECT MANAGER | 28/10/2021 DATE | | APPROVED |

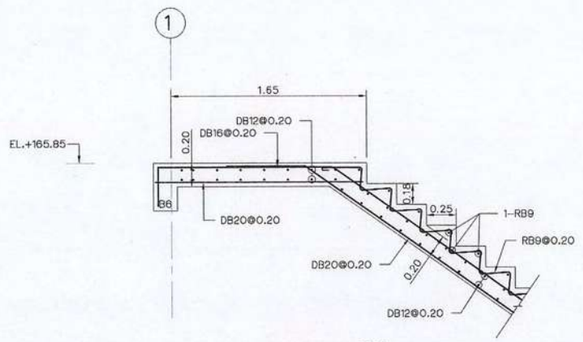
DRAWING NO. AKP-PH-11
SHEET NO. 73 OF 129



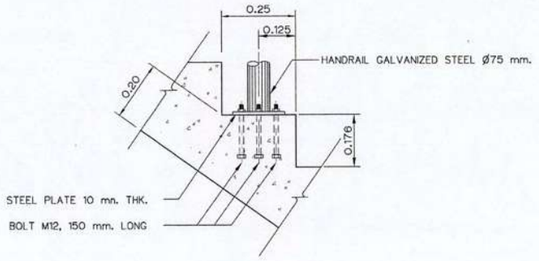

STAIR 1 CANTILEVER SLAB
SCALE 1:25



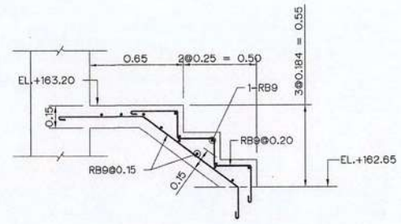

STAIR 1 SECTION
SCALE 1:25




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

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

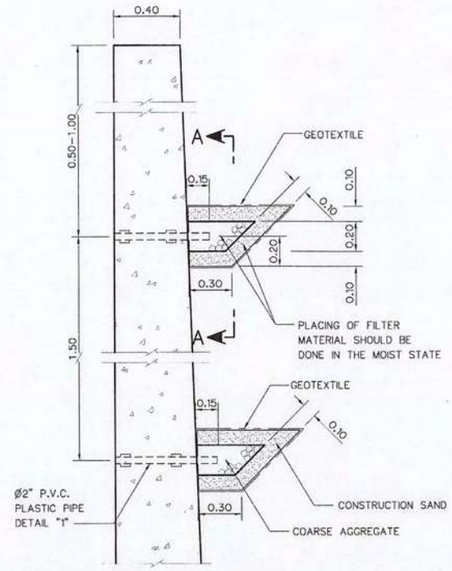
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
POWERHOUSE
STAIR REINFORCEMENT DETAILS

| NO. | DATE | REVISIONS | CHECKED | APPROVED |
|---|---|---|---|---|
| 3 | | | | |
| 2 | | | | |
| 1 | | | | |
| | CONSULTANTS | | DEDE | |

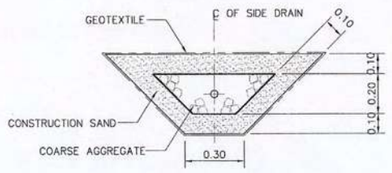
PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.
DESIGNED ณัฐวุฒิ 28.29074 28.9462
DRAWN 28.
CHECKED 28.8231
PROJECT MANAGER 28/10/2021 DATE

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED
DRAWING NO. AKP-PH-12
SHEET NO. 74 OF 129



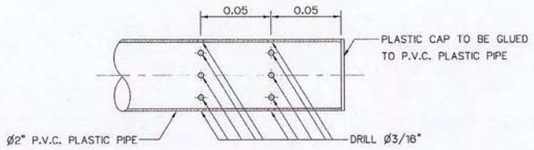

DETAIL OF SIDE DRAIN

NOT TO SCALE



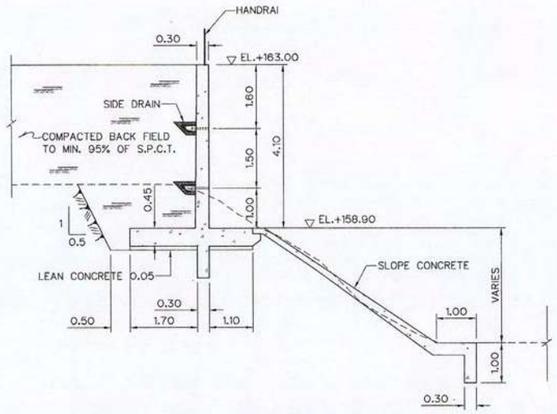

SECTION A–A

SCALE 1:15



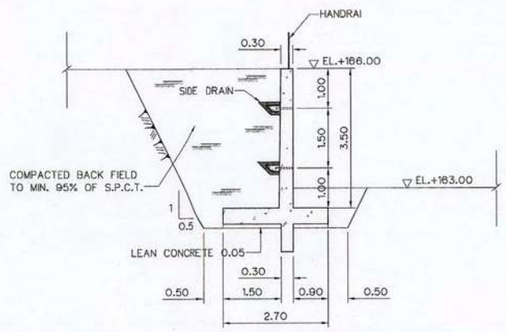

DETAIL "1"

NOT TO SCALE



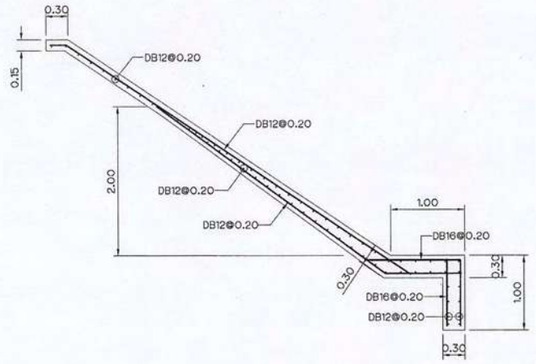

RETAININGWALL NO.1

SCALE 1:75



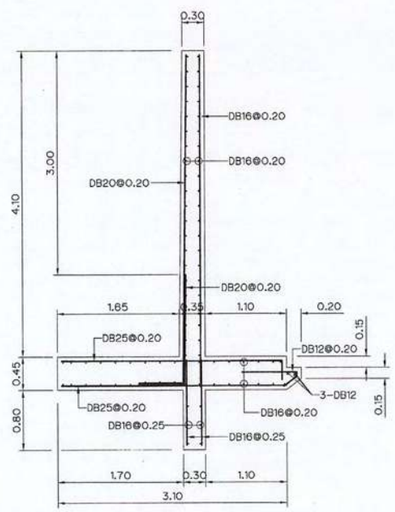

RETAININGWALL NO.2

SCALE 1:75



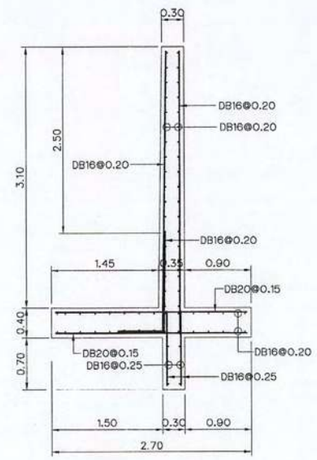

CONCRETE SLOPE REINFORCEMENT

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

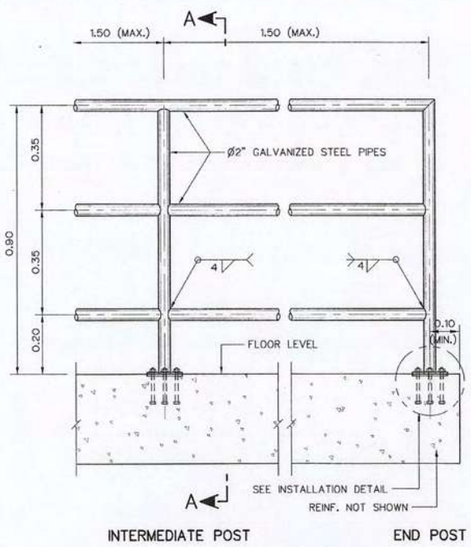
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

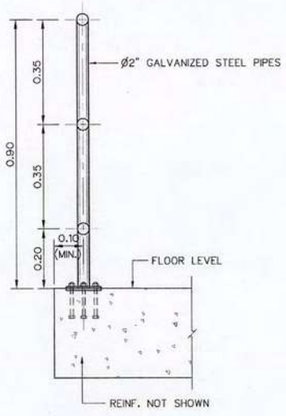
POWERHOUSE

RETAININGWALL REINFORCEMENT DETAILS

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

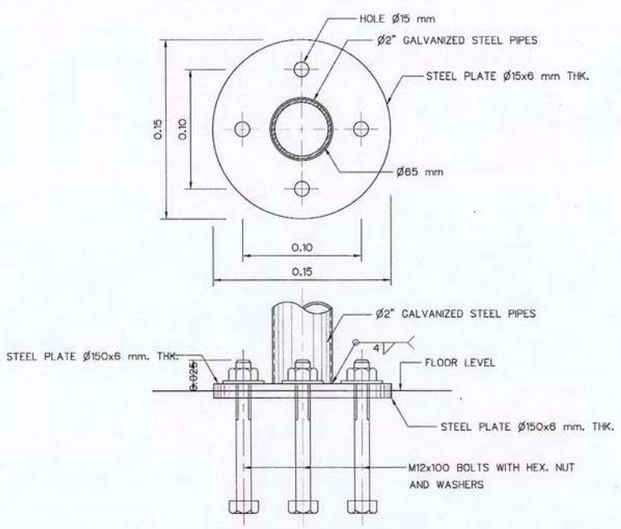



## DETAILS OF HANDRAIL
NOT TO SCALE

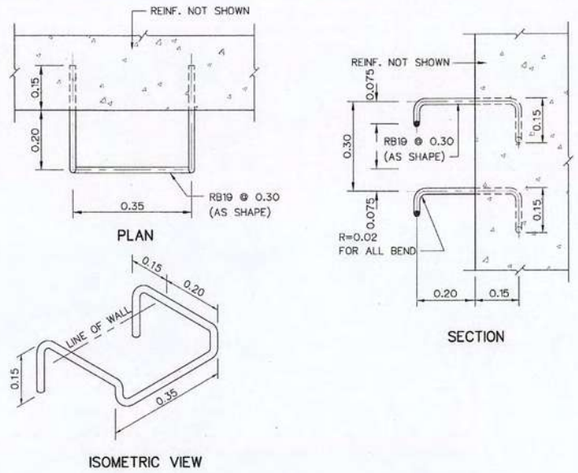



TYPICAL SECTION

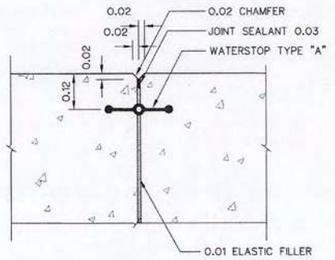
## SECTION A-A
NOT TO SCALE



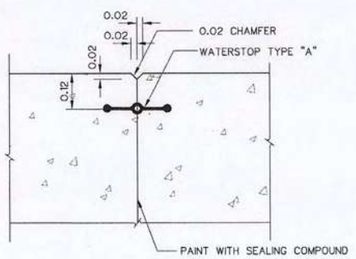

## INSTALLATION DETAIL
NOT TO SCALE



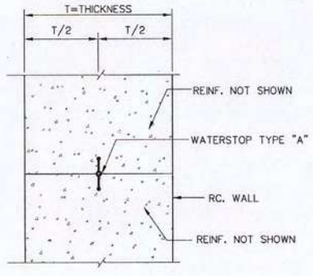

## DETAIL OF LADDER RUNGS
NOT TO SCALE



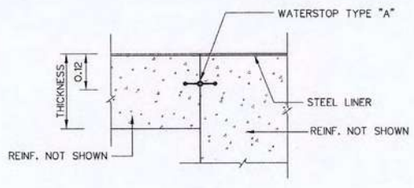

## DETAIL OF EXPANSION JOINT
SCALE 1:10




## DETAIL OF CONTRACTION JOINT
SCALE 1:10



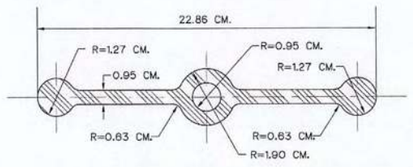

## DETAIL OF CONSTRUCTION JOINT
SCALE 1:20



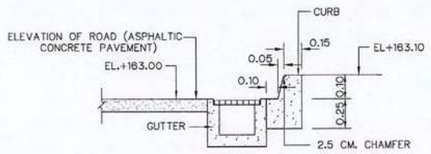

## DETAIL OF CONTROL JOINT
SCALE 1:20

### 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.

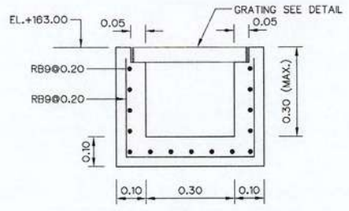
### REFERENCE DRAWINGS :
| | |
|---|---|
| 1. POWERHOUSE, GENERAL LAYOUT | AKP-PH-01 |
| 2. TAILRACE, SECTIONS | AKP-TR-02 |



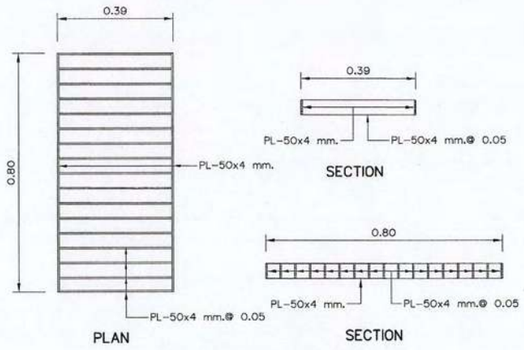

## PVC. WATERSTOP TYPE "A"
NOT TO SCALE




## DETAIL OF CURB
SCALE 1:25




## DETAIL OF GUTTER
SCALE 1:10




## DETAIL OF GRATING
SCALE 1:10

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
MINISTRY OF ENERGY

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

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

MISCELLANEOUS DETAILS

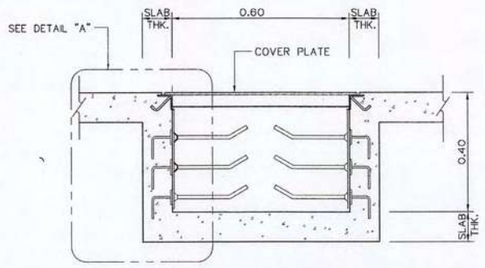
| NO. | DATE | REVISIONS | CHECKED | APPROVED |
|---|---|---|---|---|
| 3 | | | | |
| 2 | | | | |
| 1 | | | | |
| | | CONSULTANTS | DEDE | |

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

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

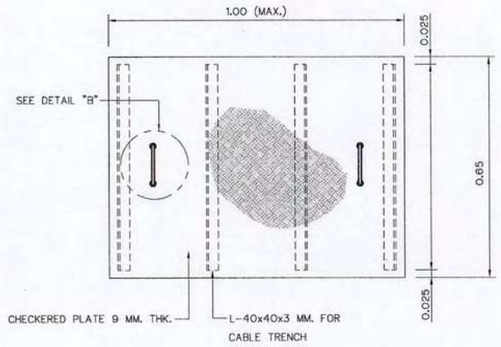
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

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



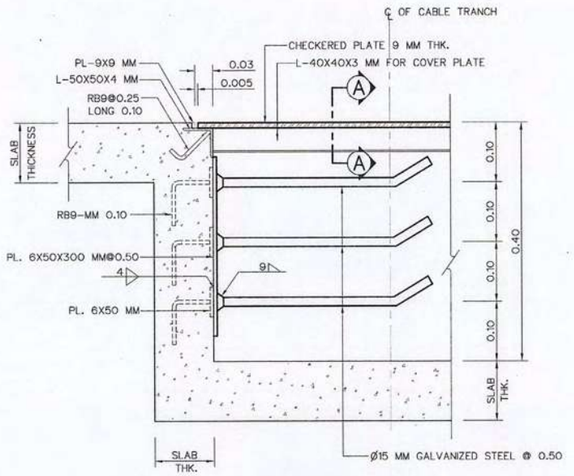

IN DOOR CABLE TRENCH

SCALE 1:10



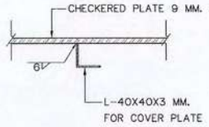

COVER PLATE FOR IN DOOR

SCALE 1:10



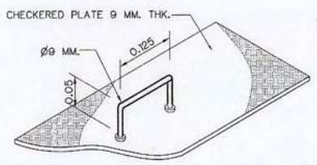

DETAIL "A"

SCALE 1:5



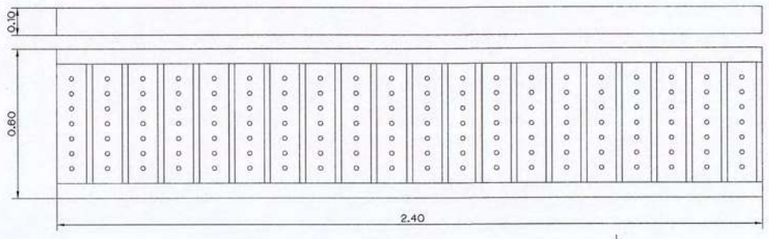

SECTION A-A

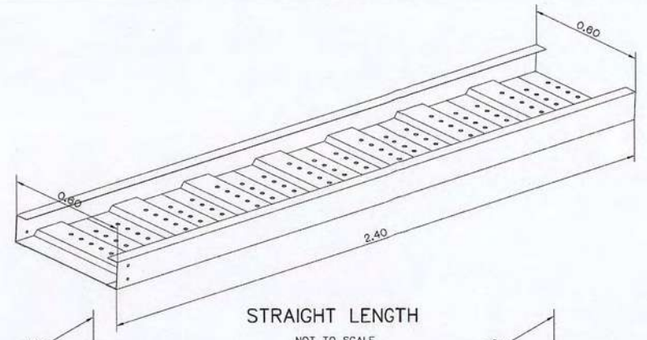
NOT TO SCALE




DETAIL "B"

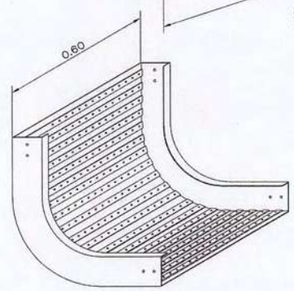
NOT TO SCALE



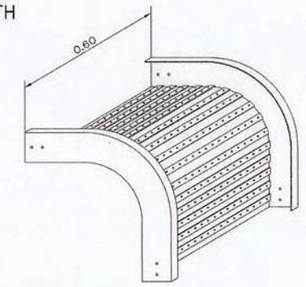

STRAIGHT LENGTH

NOT TO SCALE



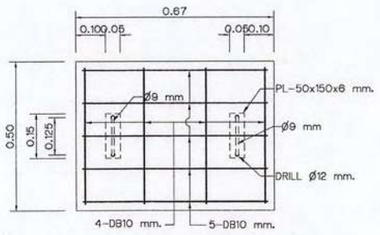

OUTSIDE VERTICAL RISERS

NOT TO SCALE



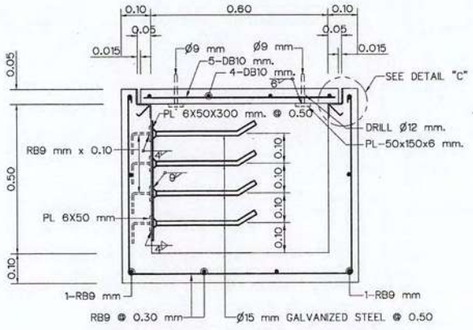

INSIDE VERTICAL RISERS

NOT TO SCALE



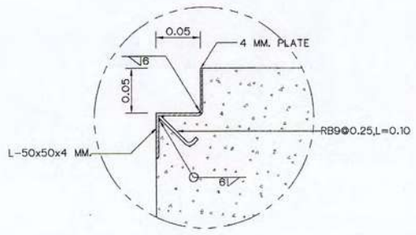

OUT DOOR COVER CABLE TRENCH

SCALE 1:5



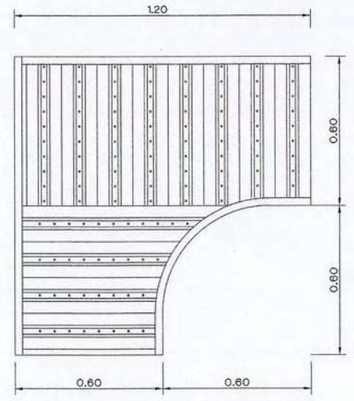

OUT DOOR CABLE TRENCH

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

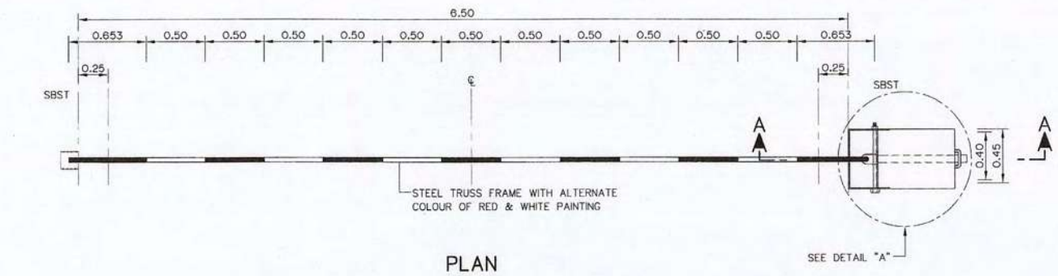
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

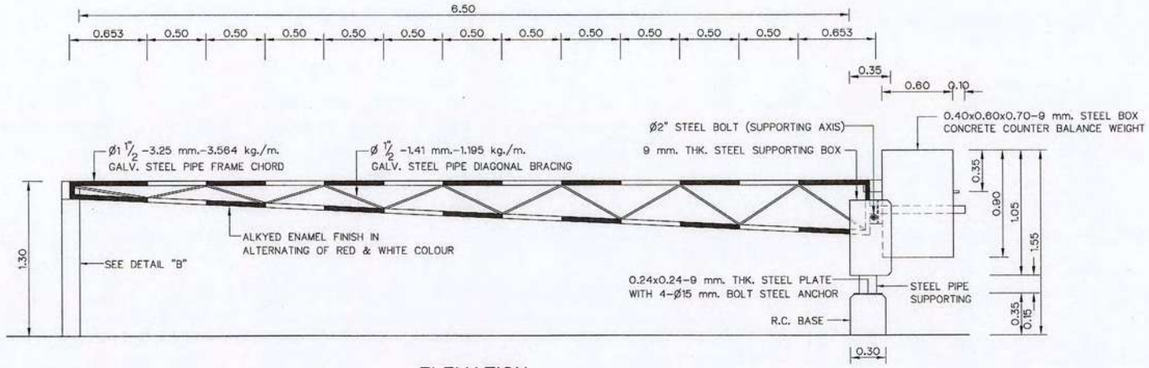
POWERHOUSE

CABLE TRENCH DETAILS

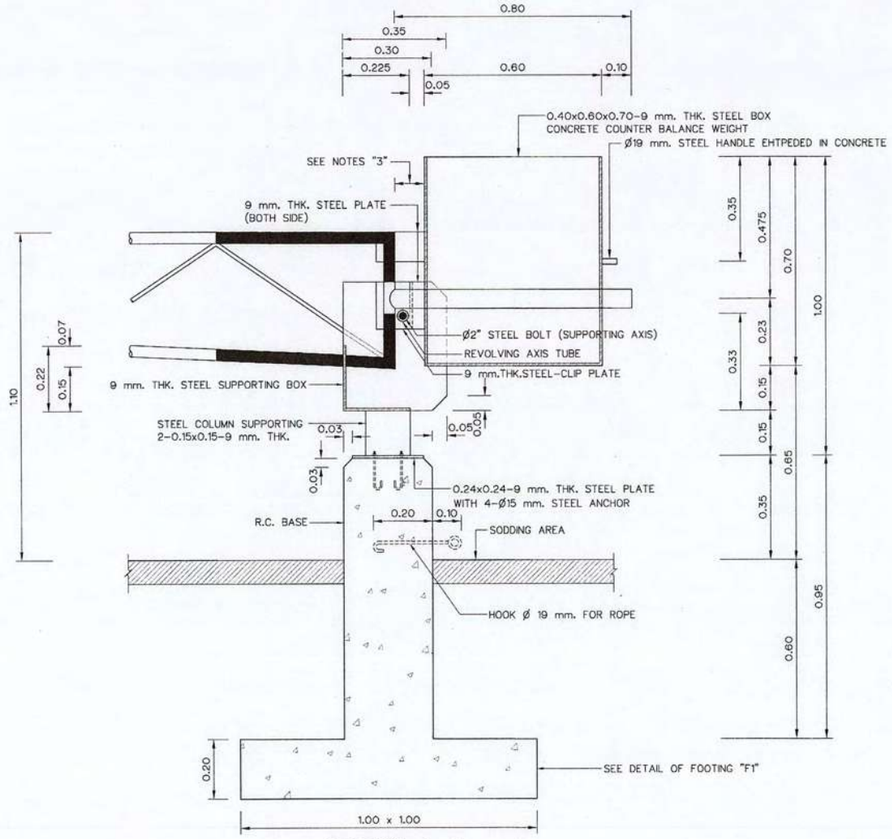
| | | | |
|---|---|---|---|
| PCM P&C MANAGEMENT CO., LTD. / GPD SPT CONSULTANTS CO., LTD. | | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY | |
| DESIGNED | REG.29074 REG.9462 | REVIEWED | |
| DRAWN | | SUBMITTED | |
| CHECKED | REG.8231 | RECOMMENDED | |
| PROJECT MANAGER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



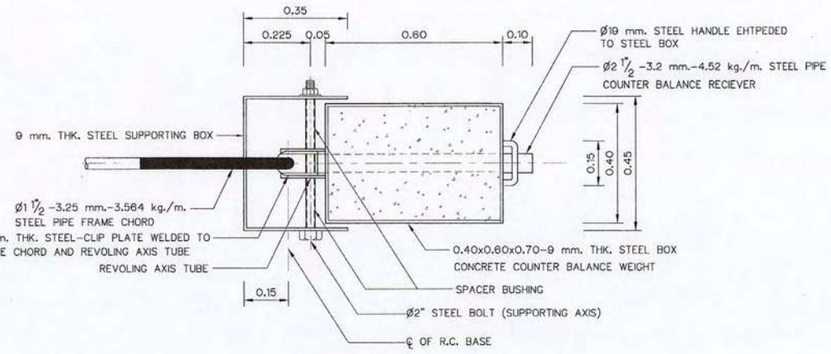

PLAN
SCALE 1:25



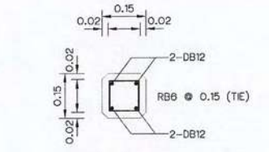

ELEVATION
SCALE 1:25



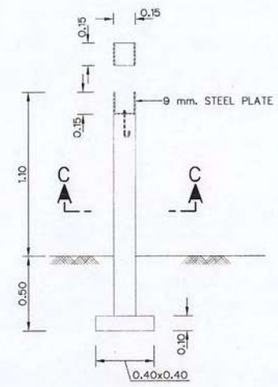

SECTION A-A
SCALE 1:10



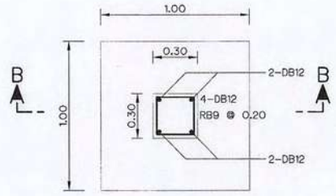

DETAIL "A"
SCALE 1:10



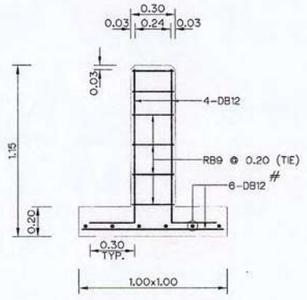

SECTION C-C
SCALE 1:20



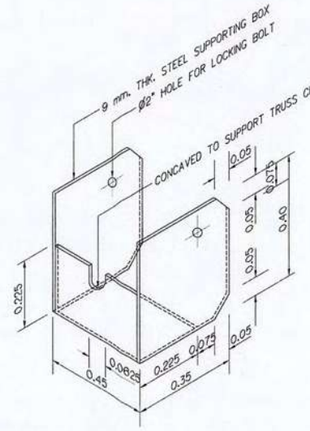

DETAIL "B"
SCALE 1:20




PLAN OF FOOTING "F1"
SCALE 1:20




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 | |

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

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

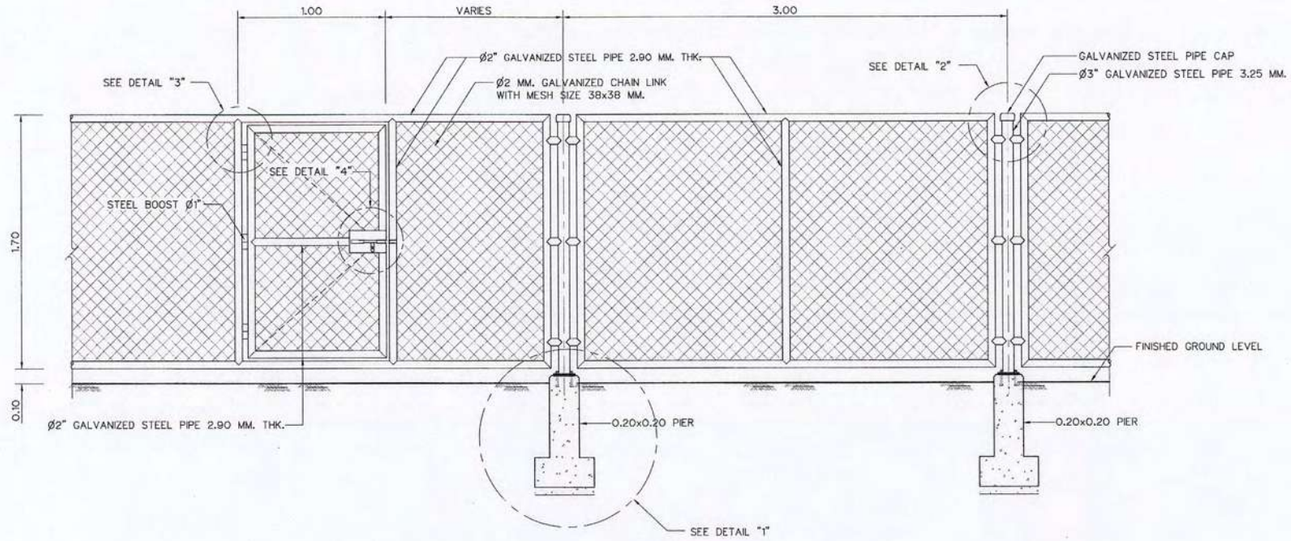
POWERHOUSE

MOVABLE STEEL BARRICADE

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

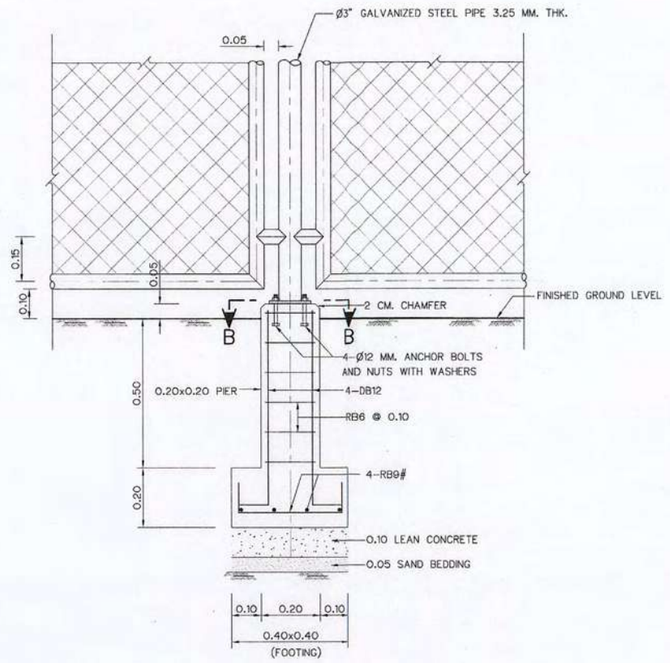
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

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



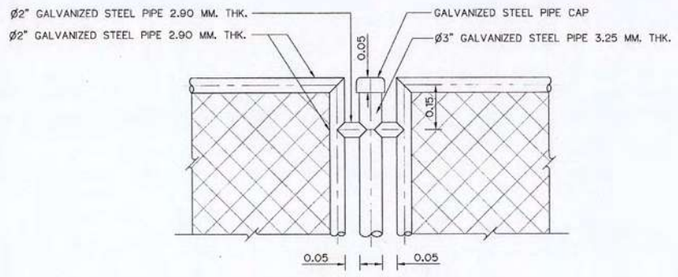

CHAIN LINK FENCE AND GATE WIDTH 1.00 M.

SCALE 1:20



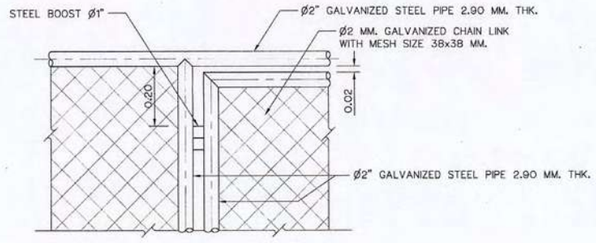

DETAIL "1"

SCALE 1:10



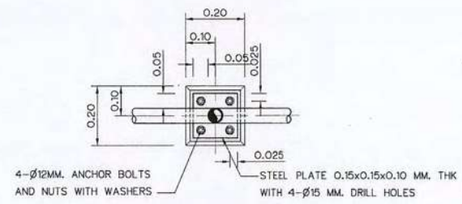

DETAIL "2"

SCALE 1:10



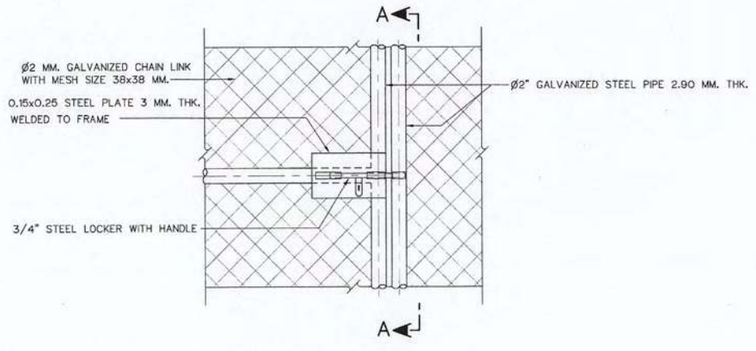

DETAIL "3"

SCALE 1:10



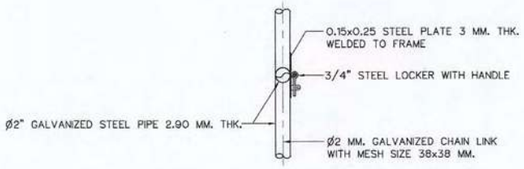

SECTION B-B

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 |
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| 3 | | | | |
| 2 | | | | |
| 1 | | | | |
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AI KA PO HYDROPOWER PROJECT

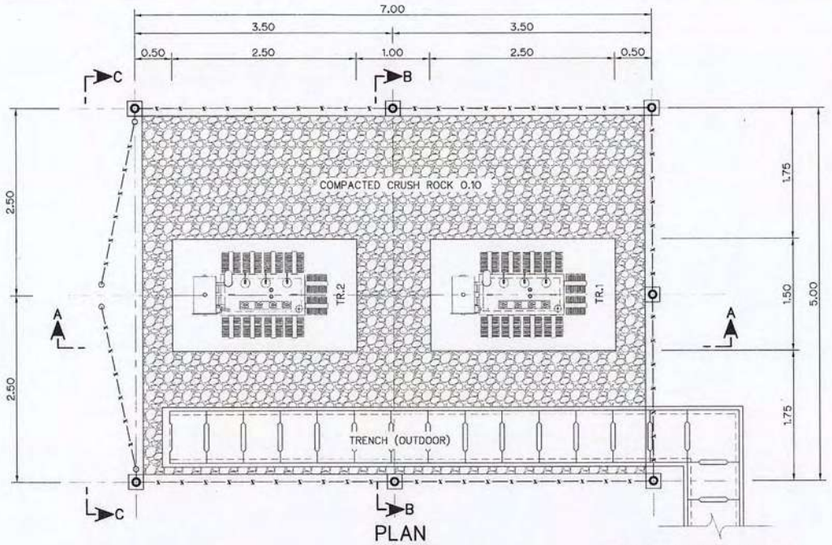
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

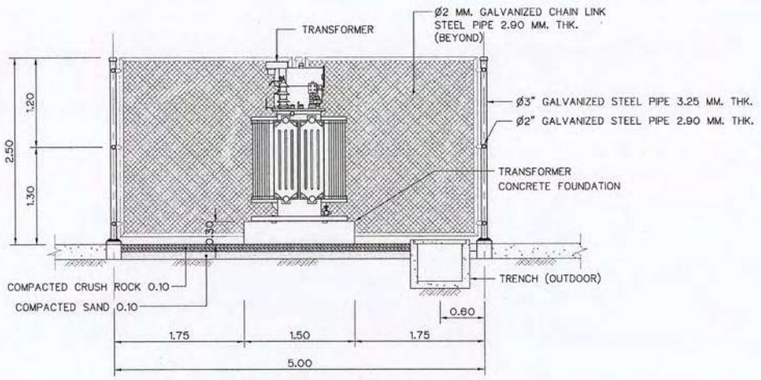
POWERHOUSE

CHAIN LINK FENCE AND GATE WIDTH 1.00 M.

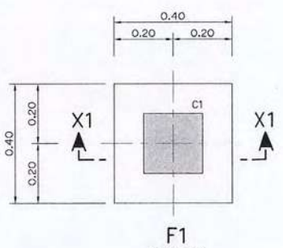
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| PCM P&C MANAGEMENT CO., LTD. / GPP SPT CONSULTANTS CO., LTD. | | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY | |
| DESIGNED | 28L29074 | REVIEWED | |
| DRAWN | | SUBMITTED | |
| CHECKED | 28L8231 | RECOMMENDED | |
| PROJECT MANAGER | 28/10/2021 DATE | APPROVED | |
| | | DRAWING NO. AKP-PH-17 | SHEET NO. 79 OF 129 |



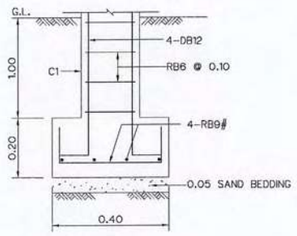

PLAN
SCALE 1:40



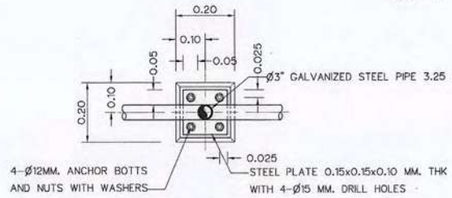

SECTION B–B
SCALE 1:40



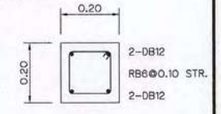

F1
SCALE 1:10



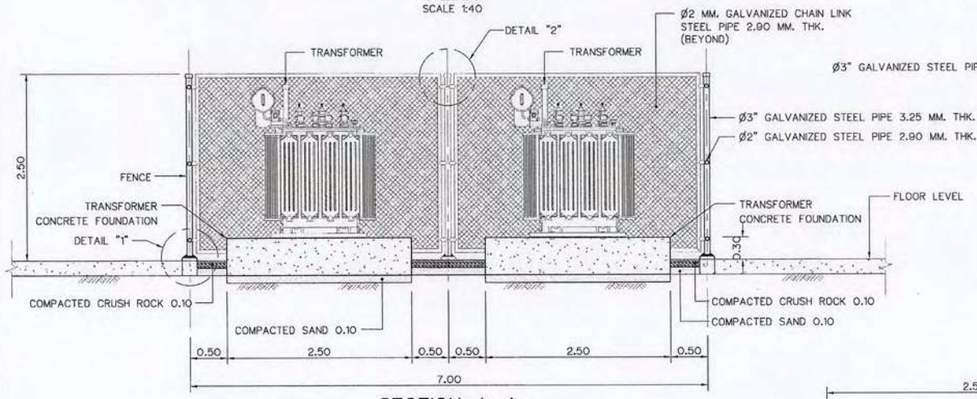

SECTION X1–X1
SCALE 1:10



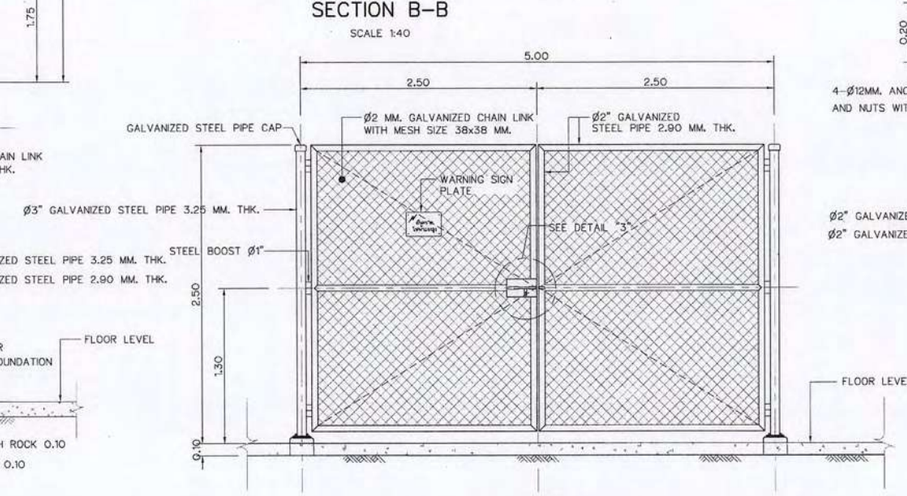

SECTION X2–X2
SCALE 1:10



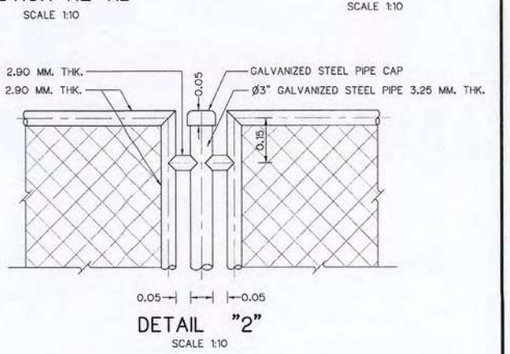

C1
SCALE 1:10



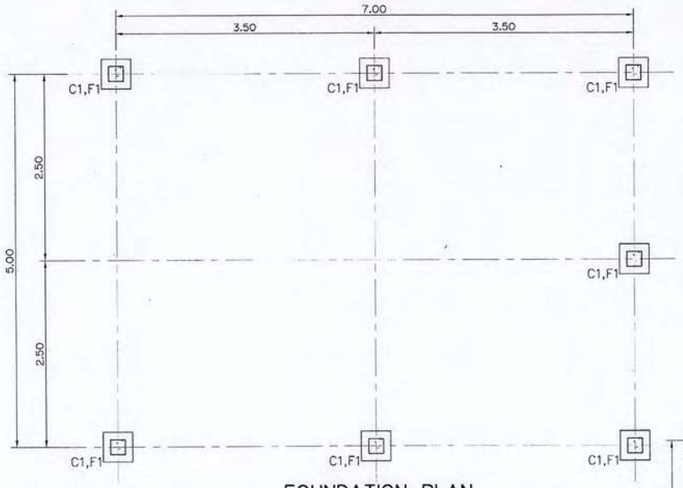

SECTION A–A
SCALE 1:40



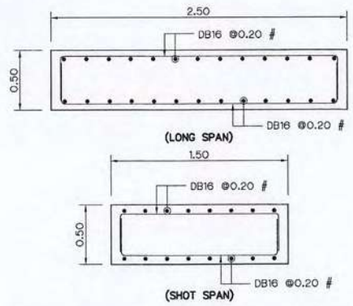

SECTION C–C
CHAIN LINK FENCE AND GATE
SCALE 1:25



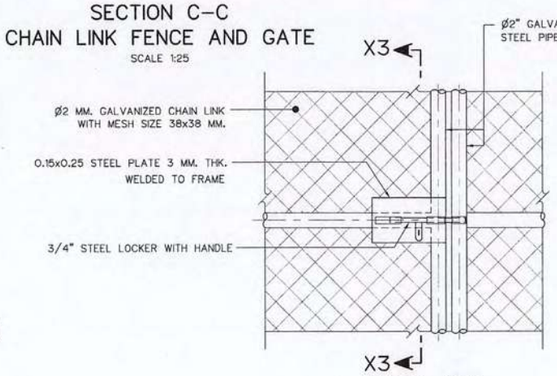

DETAIL "2"
SCALE 1:10



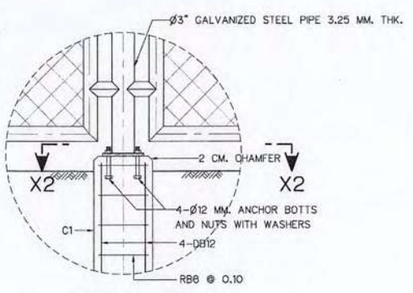

FOUNDATION PLAN
SCALE 1:40




TRANSFORMER CONCRETE FOUNDATION
REINFORCEMENT DETAIL
SCALE 1:25




DETAIL "3"
SCALE 1:10



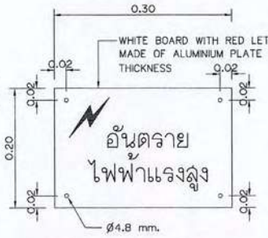

DETAIL "1"
SCALE 1:10

NOTES :

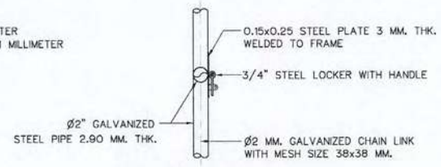
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. AKP-GN-03
3. REINFORCEMENT BARS ARE IN MILLIMETRES, UNLESS OTHERWISE SHOWN.
4. THE TRANSFORMER AREA WILL BE ACCORDING TO PEA STANDARD.

REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAYOUT AKP-PH-01




WARNING SIGN PLATE
SCALE 1:5




SECTION X3–X3
SCALE 1:10

SCALE 1:40 METERS
0 0.10 0.20 0.30 0.40 0.50
SCALE 1:5 METERS
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8
SCALE 1:10 METERS
0 0.5 1.0 1.5 2.0
SCALE 1:25 METERS
0 1 2 3

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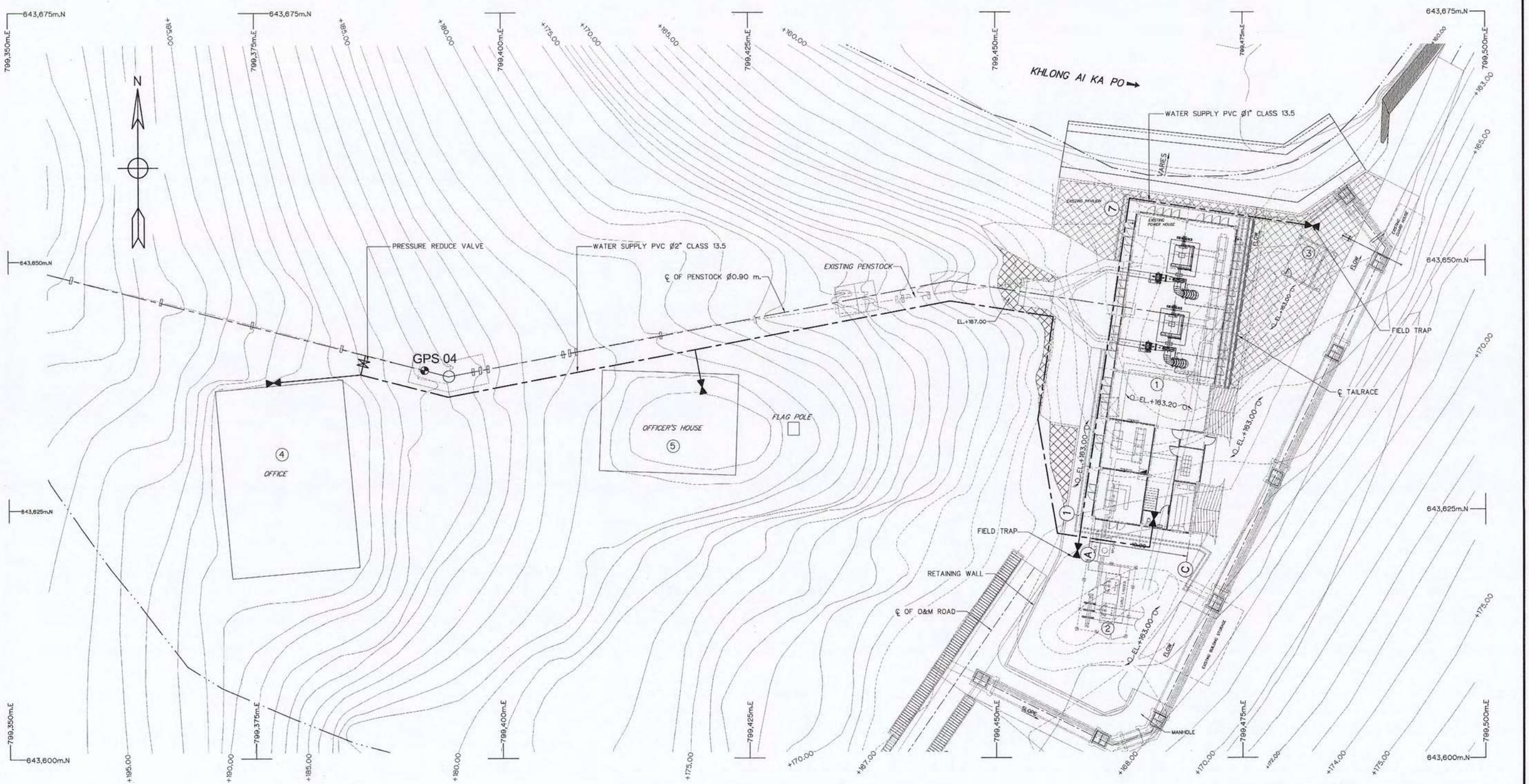
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

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 | RB.29074 RB.9462 | REVIEWED | |
| DRAWN | | SUBMITTED | |
| CHECKED | RB.8231 | 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 | | | | |
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| | CONSULTANTS | | DEDE | |

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

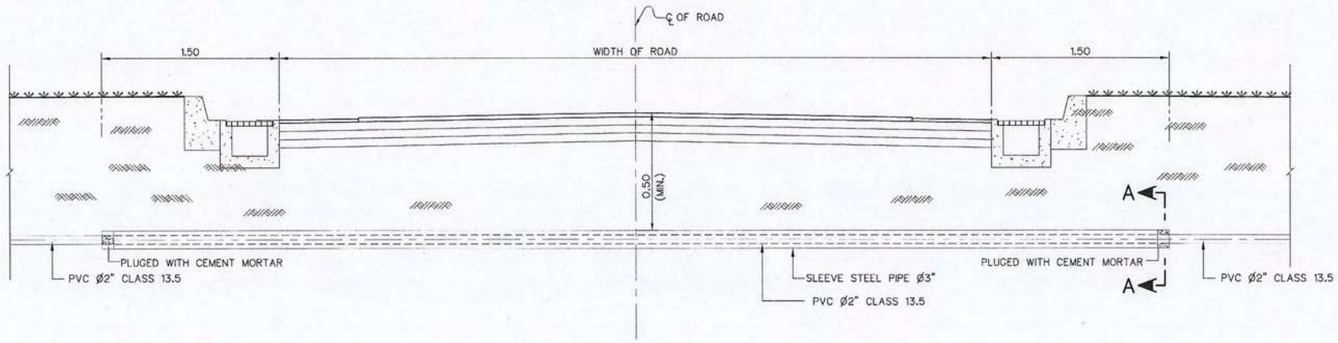
**AI KA PO HYDROPOWER PROJECT**
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

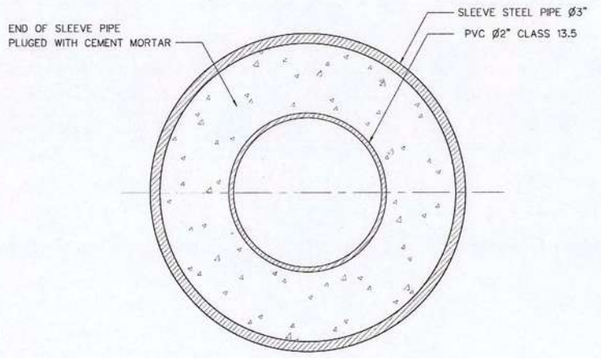
WATER SUPPLY PIPELINE SYSTEM LAYOUT

| | |
|---|---|
| P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY |
| DESIGNED 18.29074 / 18.9462 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED 18.8231 | RECOMMENDED |
| 28/10/2021 PROJECT MANAGER / DATE | APPROVED |
| DRAWING NO. AKP-PH-19 | SHEET NO. 81 OF 129 |



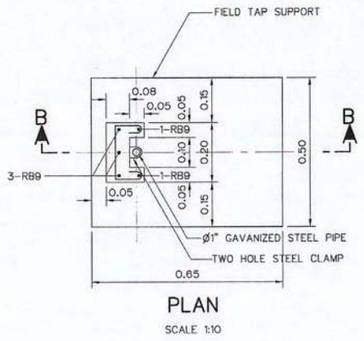

TYPICAL SECTION FOR SLEEVE PIPE INSTALLATION

SCALE 1:25



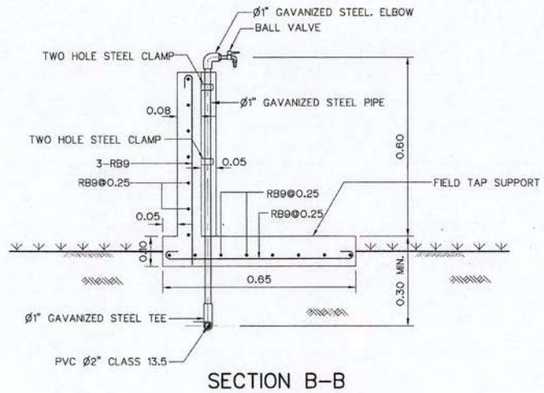

SECTION A–A

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

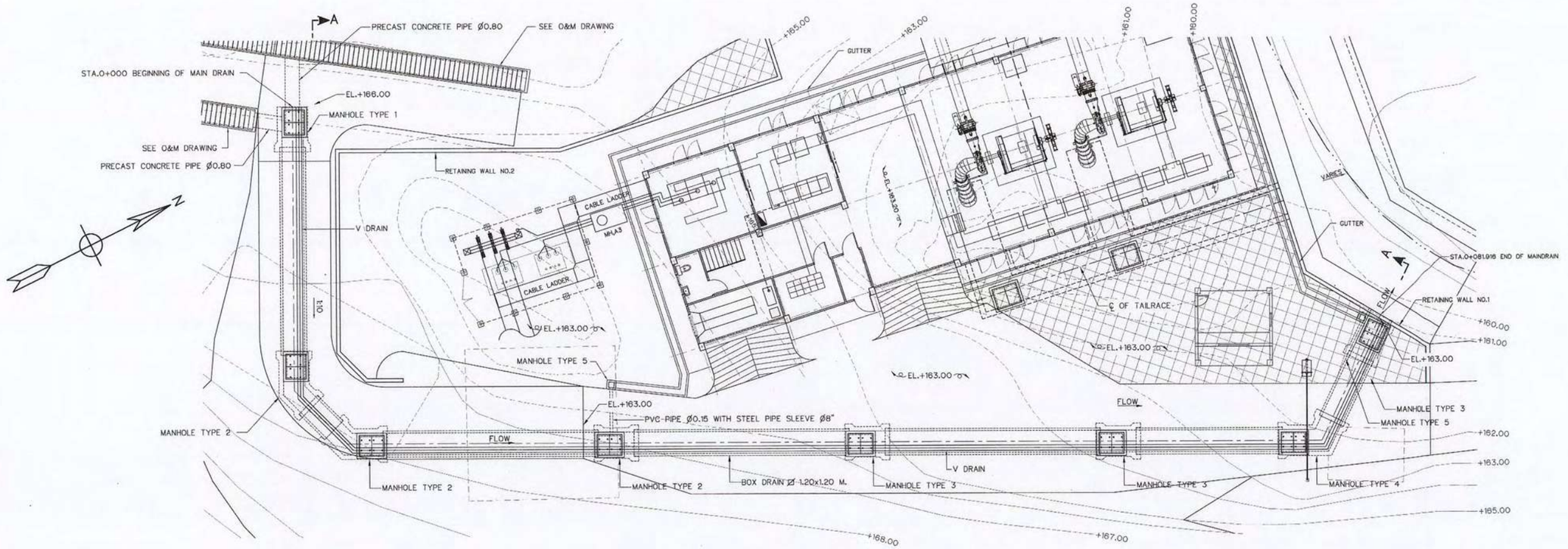
| NO. | DATE | REVISIONS | CHECKED | APPROVED |
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| 3 | | | | |
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| | CONSULTANTS | | DEDE | |

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MINISTRY OF ENERGY

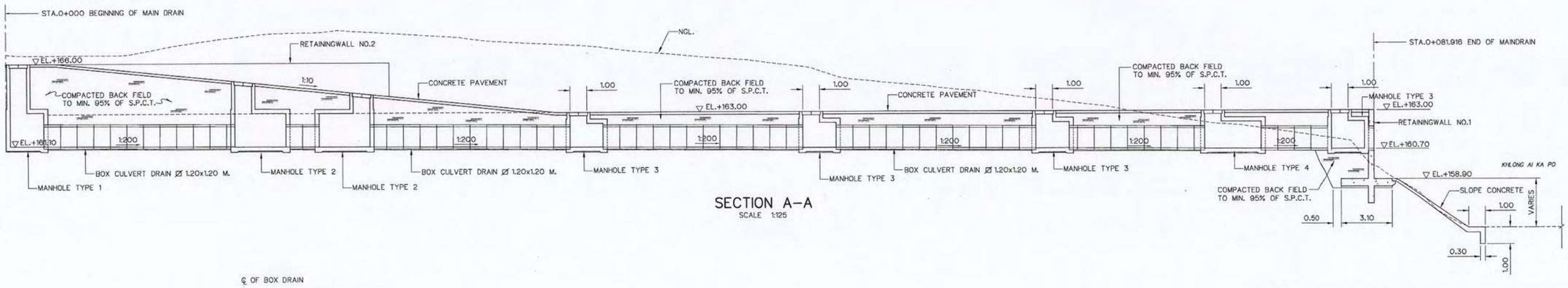
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

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

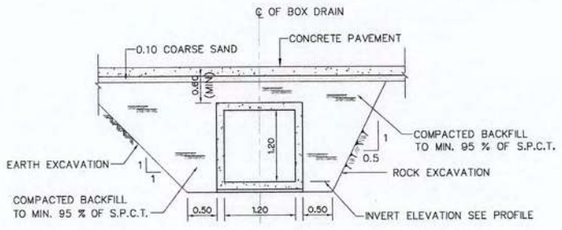
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| PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY |
| DESIGNED RB.29074 RB.9462 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED RB.8231 | RECOMMENDED |
| 28/10/2021 PROJECT MANAGER DATE | 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 | | | | |
| 2 | | | | |
| 1 | | | | |
| | CONSULTANTS | | DEDE | |

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

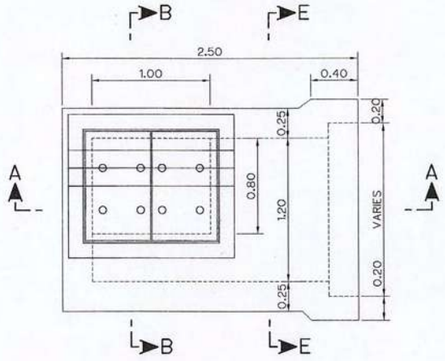
# AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

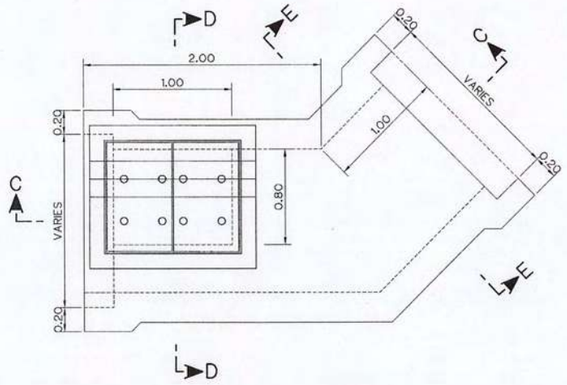
POWERHOUSE

MAIN DRAINAGE SYSTEM

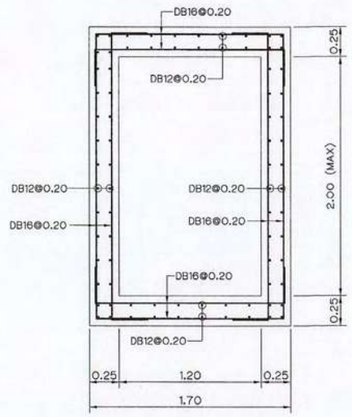
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|---|---|---|---|
| P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY | |
| DESIGNED | RB.29074 RB.9462 | REVIEWED | |
| DRAWN | | SUBMITTED | |
| CHECKED | RB.8231 | RECOMMENDED | |
| PROJECT MANAGER | 28/10/2021 DATE | APPROVED | |
| | | DRAWING NO. AKP-PH-21 | SHEET NO. 83 OF 129 |



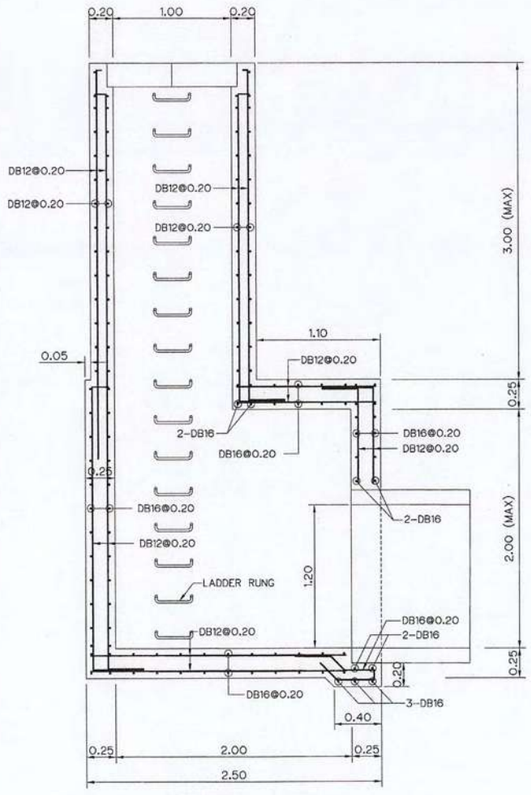

MANHOLE TYPE 1
SCALE 1:25



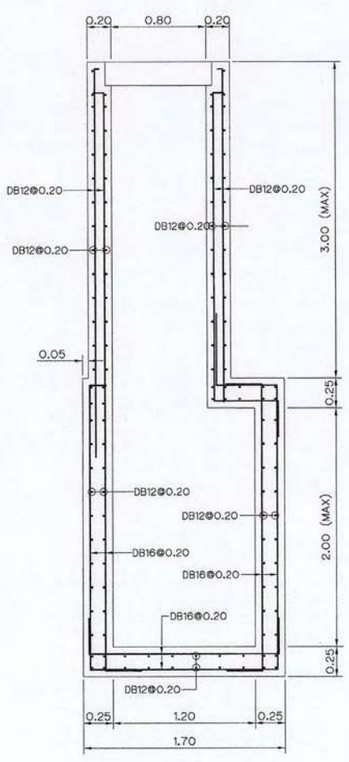

MANHOLE TYPE 2
SCALE 1:25



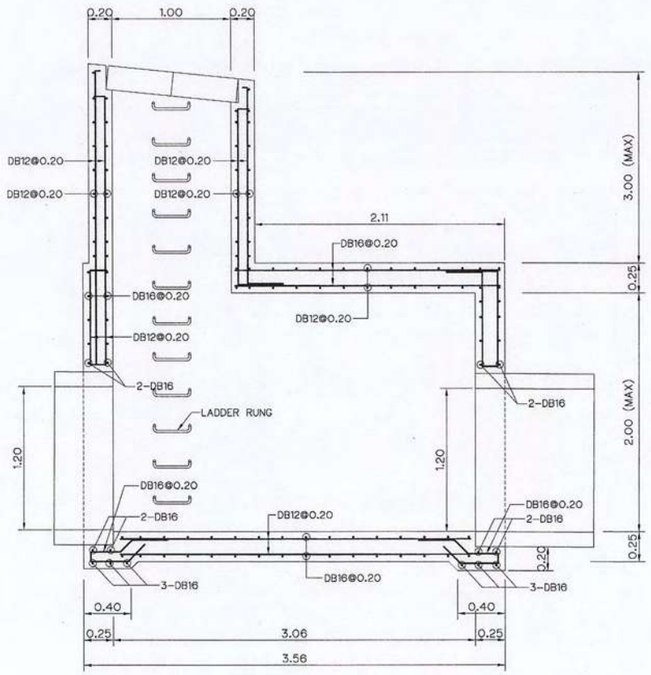

SECTION E–E
SCALE 1:25



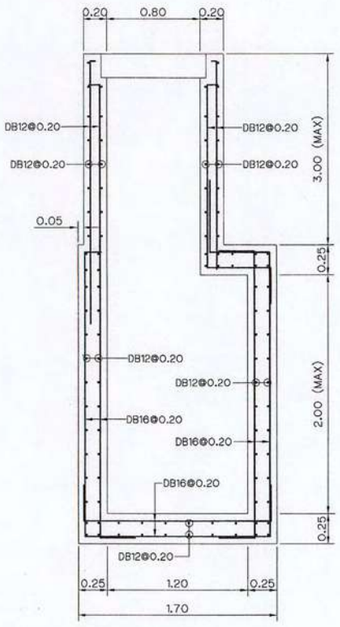

SECTION A–A
SCALE 1:25




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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| 3 | | | | |
| 2 | | | | |
| 1 | | | | |
| | CONSULTANTS | | DEDE | |

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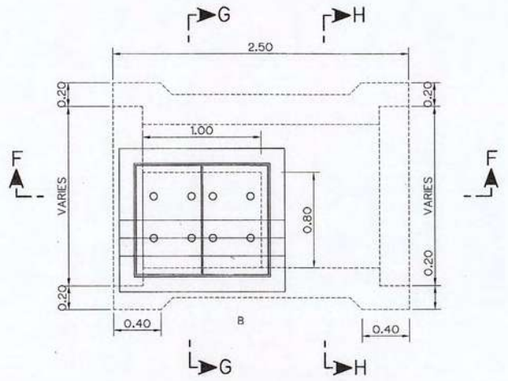
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

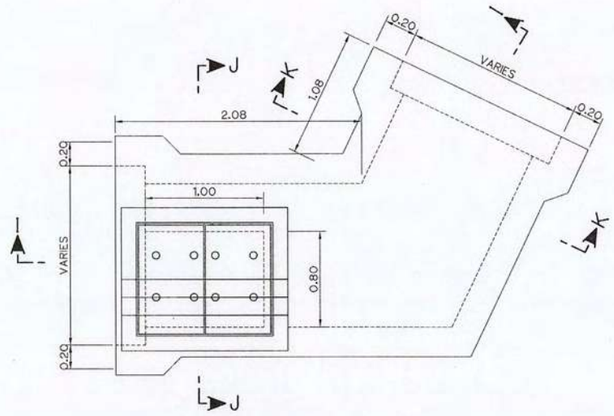
POWERHOUSE

MANHOLE TYPE 1, 2 REINFORCEMENT DETAILS

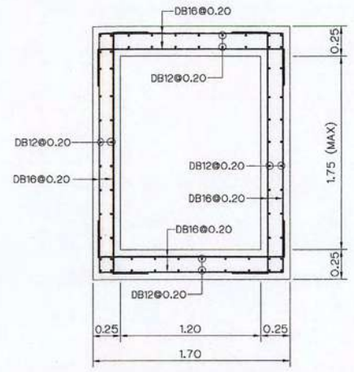
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|---|---|
| PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY |
| DESIGNED ณัฐพงษ์ 28.29074 28.9462 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED 28.8231 | RECOMMENDED |
| 28/10/2021 PROJECT MANAGER DATE | APPROVED |
| DRAWING NO. AKP-PH-22 | SHEET NO. 84 OF 129 |



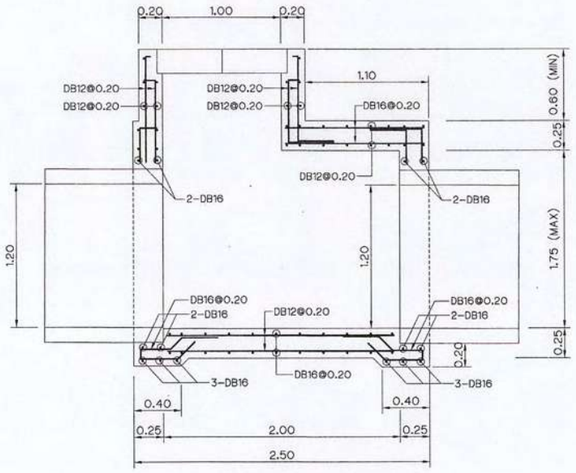

MANHOLE TYPE 3
SCALE 1:25



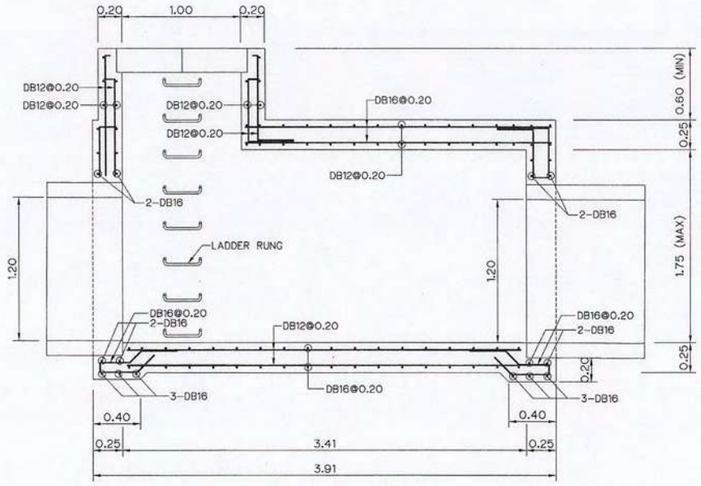

MANHOLE TYPE 4
SCALE 1:25



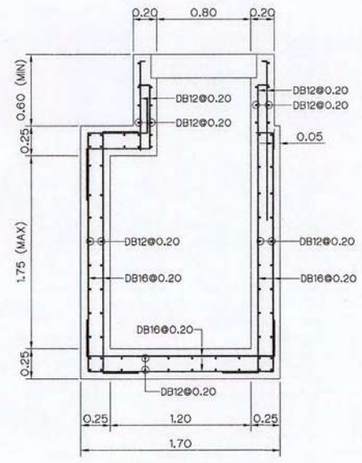

SECTION K-K
SCALE 1:25



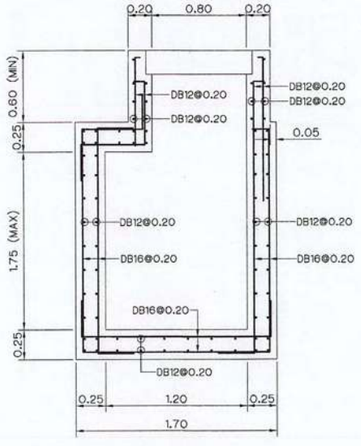

SECTION F-F
SCALE 1:25



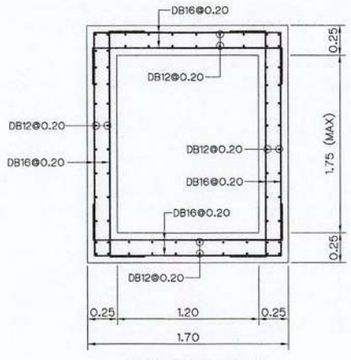

SECTION I-I
SCALE 1:25




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 |
|---|---|---|---|---|
| 3 | | | | |
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MINISTRY OF ENERGY

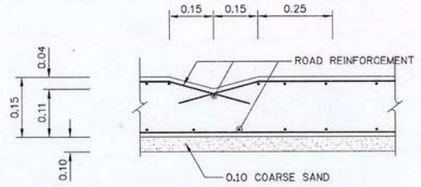
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

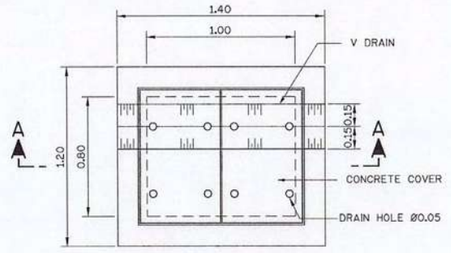
MANHOLE TYPE 3, 4 REINFORCEMENT DETAILS

| | |
|---|---|
| P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY |
| DESIGNED Mr.Ket REE.29074 REE.9462 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED REE.8231 | RECOMMENDED |
| 28/10/2021 PROJECT MANAGER DATE | APPROVED |
| DRAWING NO. AKP-PH-23 | SHEET NO. 85 OF 129 |



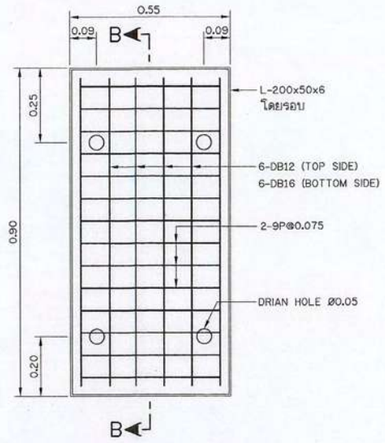

V DRAIN DETAIL

NOT TO SCALE



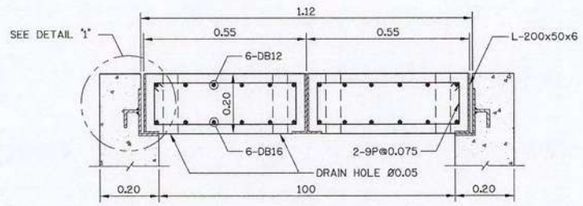

MANHOLE COVER

SCALE 1:20



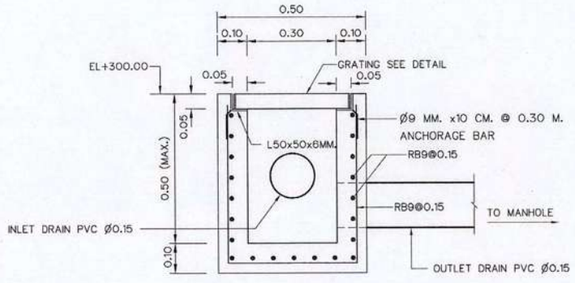

CONCRETE COVER DETAIL

SCALE 1:10



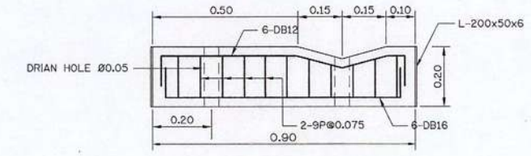

SECTION A-A

SCALE 1:10



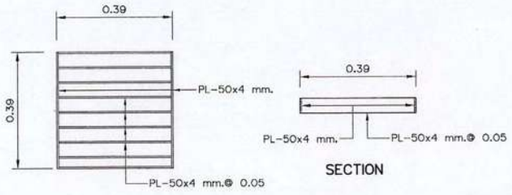

MANHOLE TYPE 5

SCALE 1:10



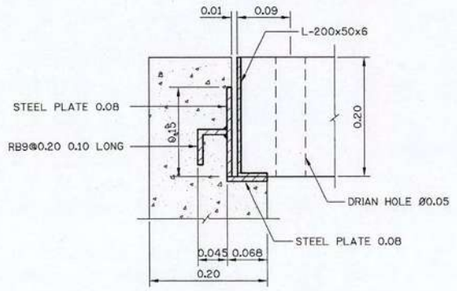

SECTION B-B

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

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

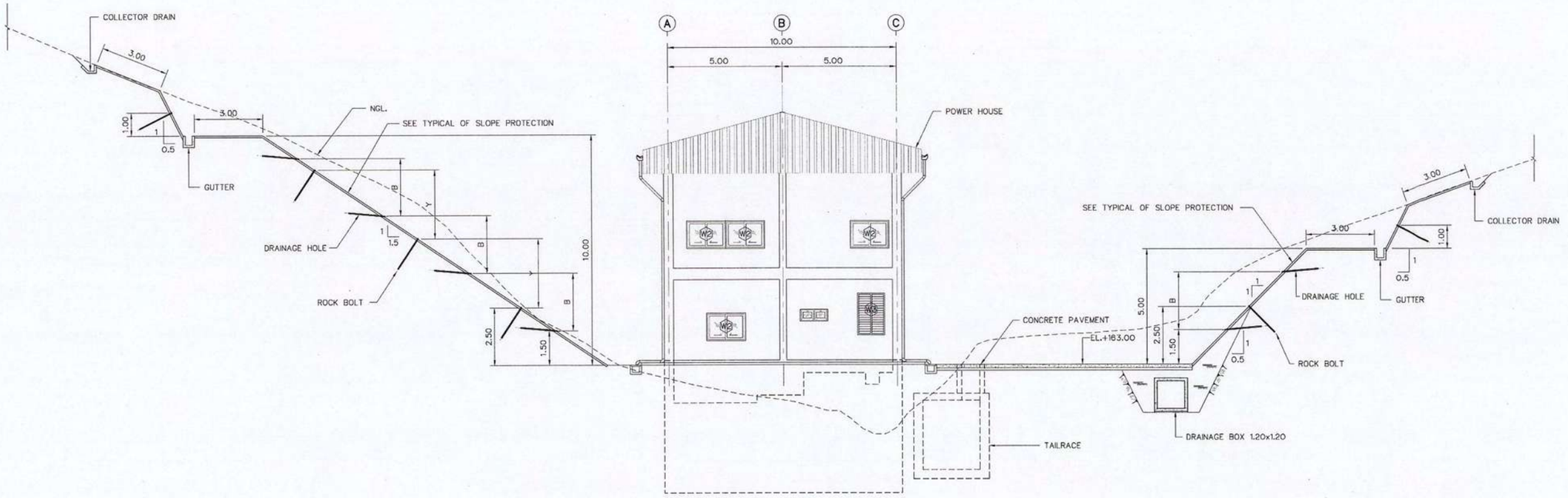
MISCELLANEOUS DETAILS

PCM F&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-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 | | | | |
| 2 | | | | |
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| | CONSULTANTS | | DEDE | |

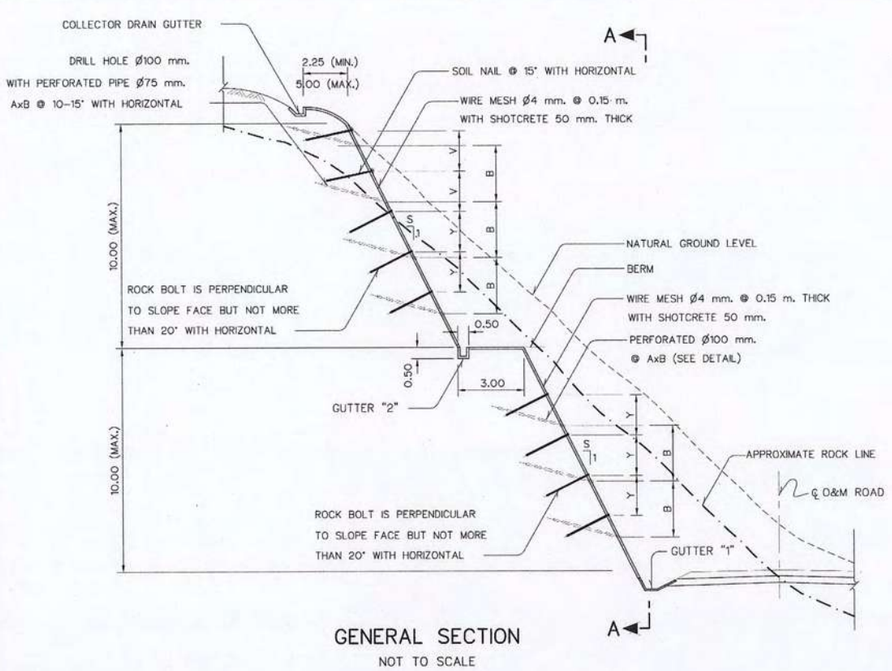
KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

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

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

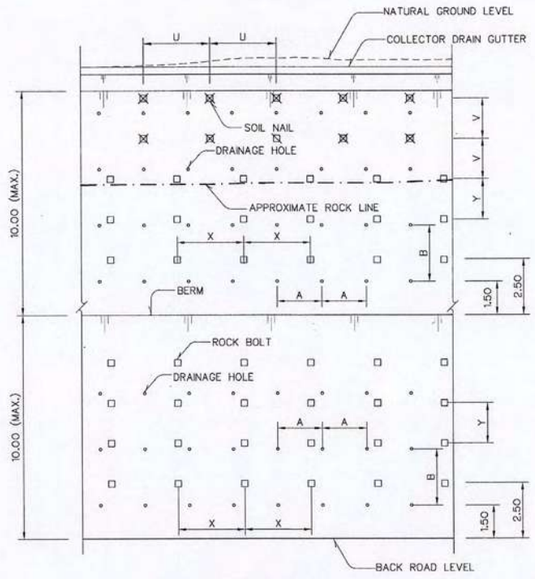
POWERHOUSE
SLOPE PROTECT SECTION

| | |
|---|---|
| PCM 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-PH-25 | SHEET NO. 87 OF 129 |




## GENERAL SECTION

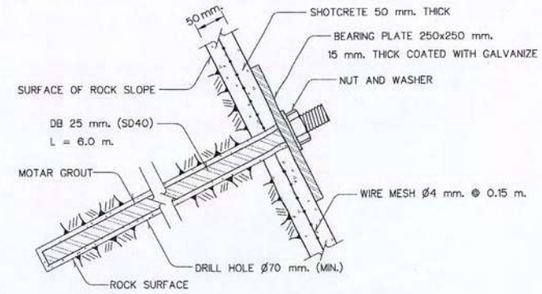
NOT TO SCALE




## SECTION A–A

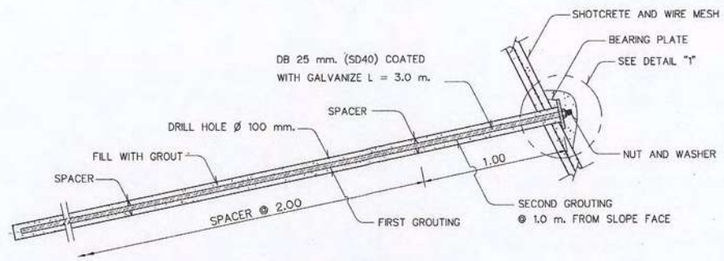
ROCK BOLT, SOIL NAIL AND DRAINAGE HOLE

NOT TO SCALE



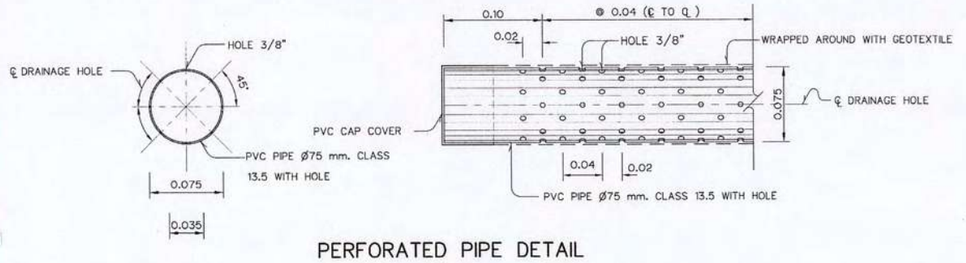

## ROCK BOLT INSTALLATION DETAIL

SCALE 1:5



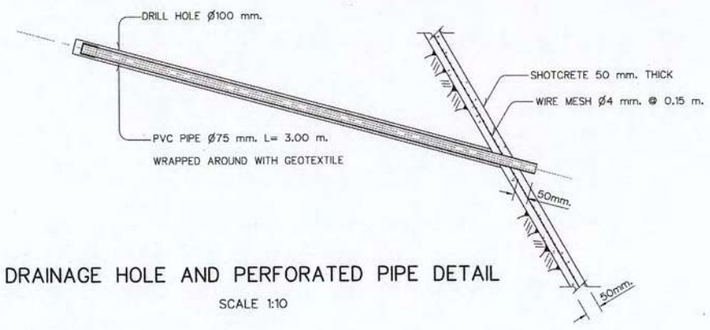

## SOIL NAIL DETAIL

SCALE 1:10



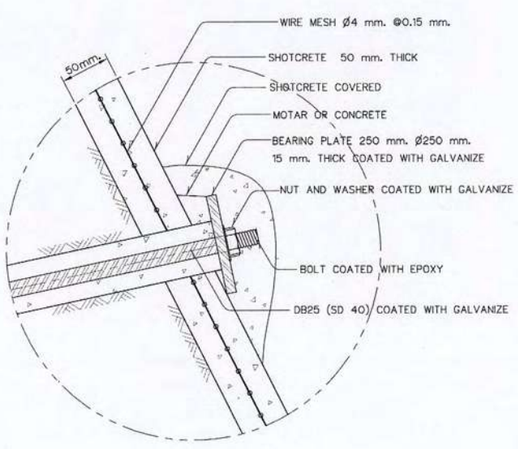

## PERFORATED PIPE DETAIL

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

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

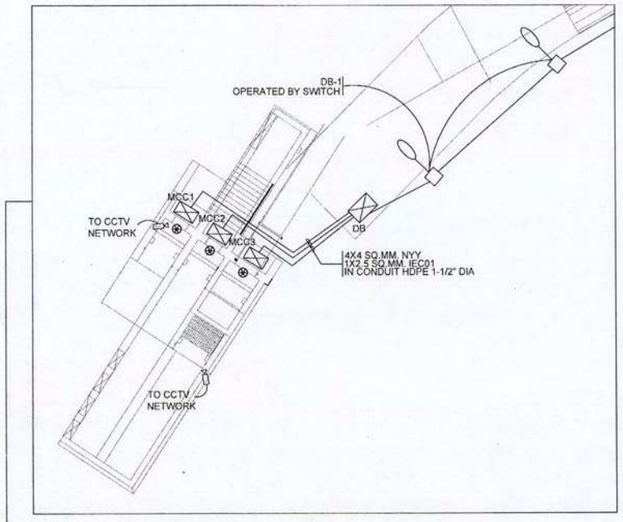
TYPICAL OF SLOPE PROTECTION

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

DESIGNED ณัฐพงษ์ สิริ.29074 SOURCE สิริ.8969
DRAWN
CHECKED สิริ.8231
28/10/2021
PROJECT MANAGER DATE

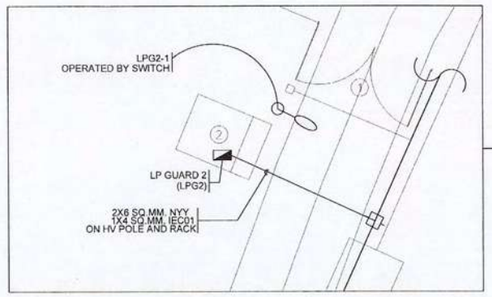
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. AKP-PH-26
SHEET NO. 88 OF 129



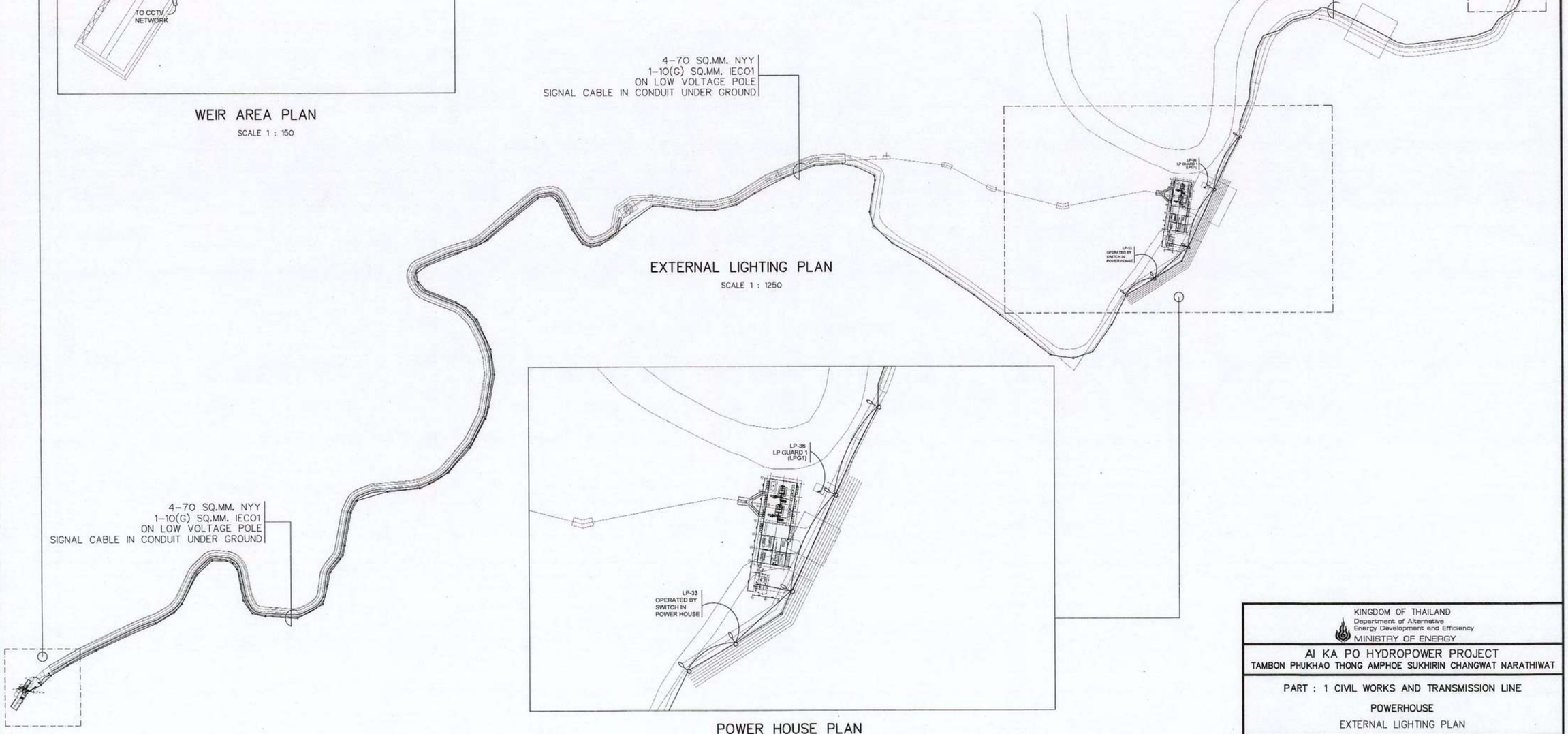

WEIR AREA PLAN

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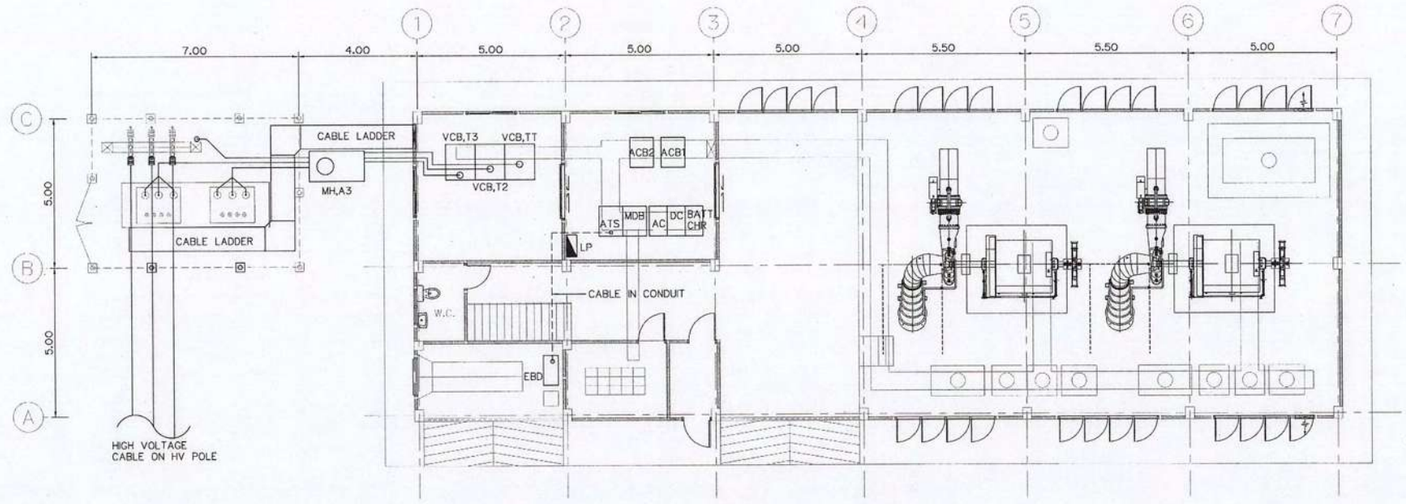
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

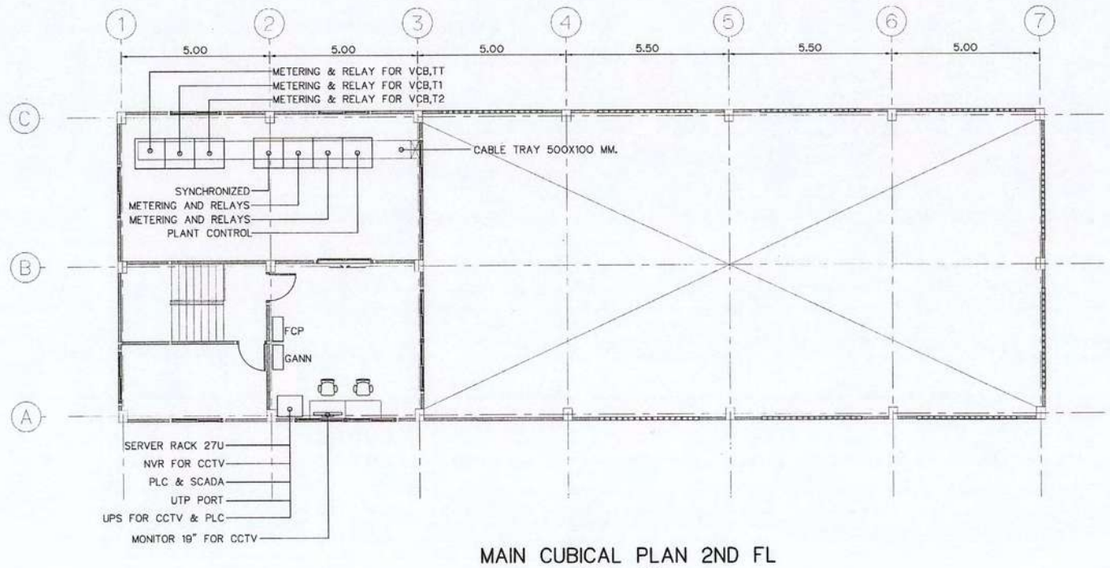
EXTERNAL LIGHTING PLAN

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|---|---|
| P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY |
| DESIGNED ธนพัฒน์ 21764 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED สมชาย 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

| 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

MAIN CUBICLE PLAN

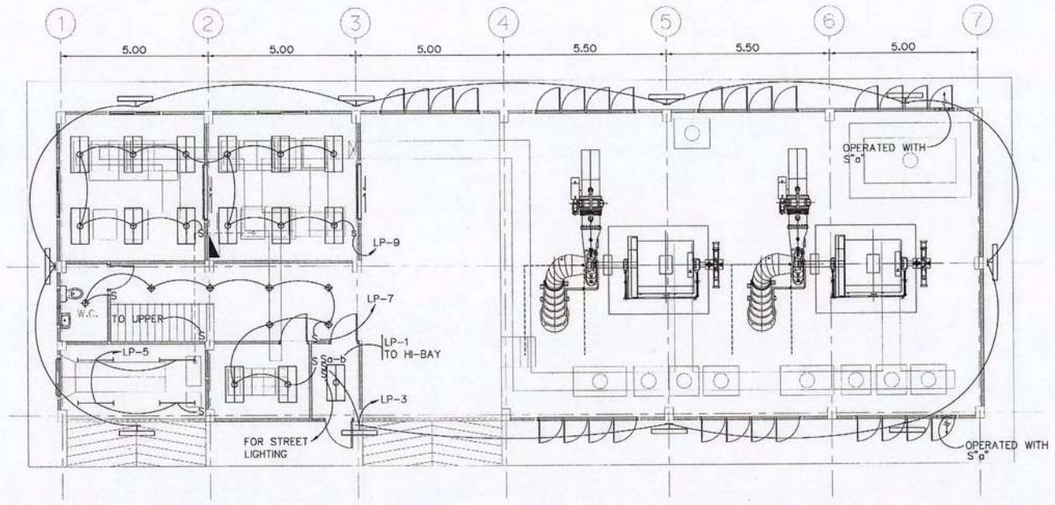
PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

| | | | |
|---|---|---|---|
| DESIGNED | สพล.1764 | REVIEWED | |
| DRAWN | | SUBMITTED | |
| CHECKED | สน.8231 | RECOMMENDED | |
| PROJECT MANAGER | 28/10/2021 DATE | APPROVED | |

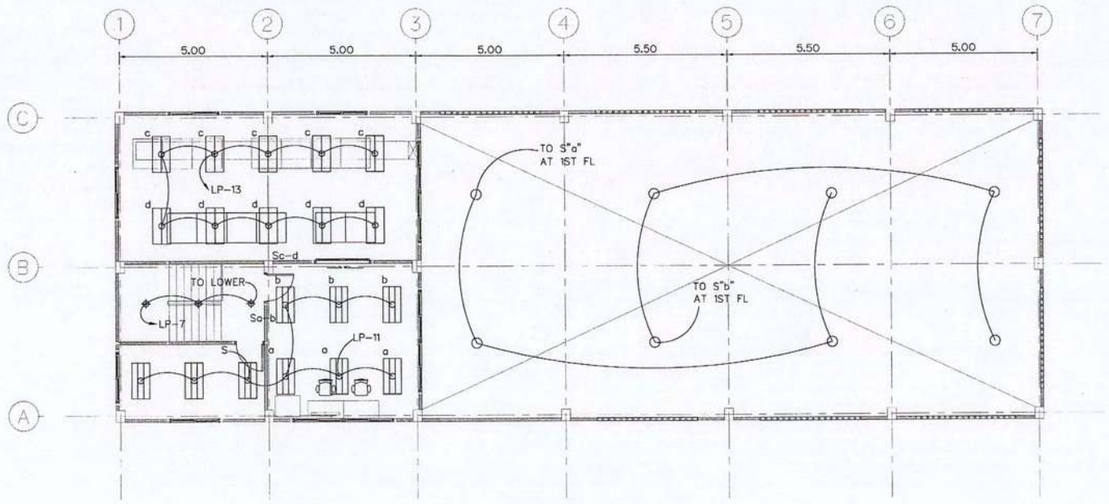
DRAWING NO. AKP-PH-28

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 | | | | |
| 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

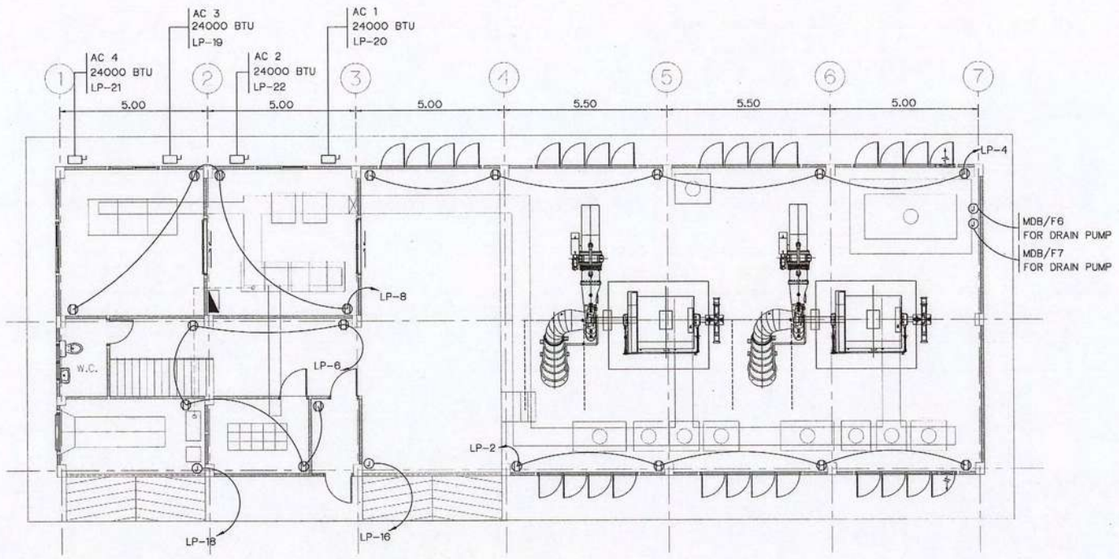
POWERHOUSE

LIGHTING PLAN

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

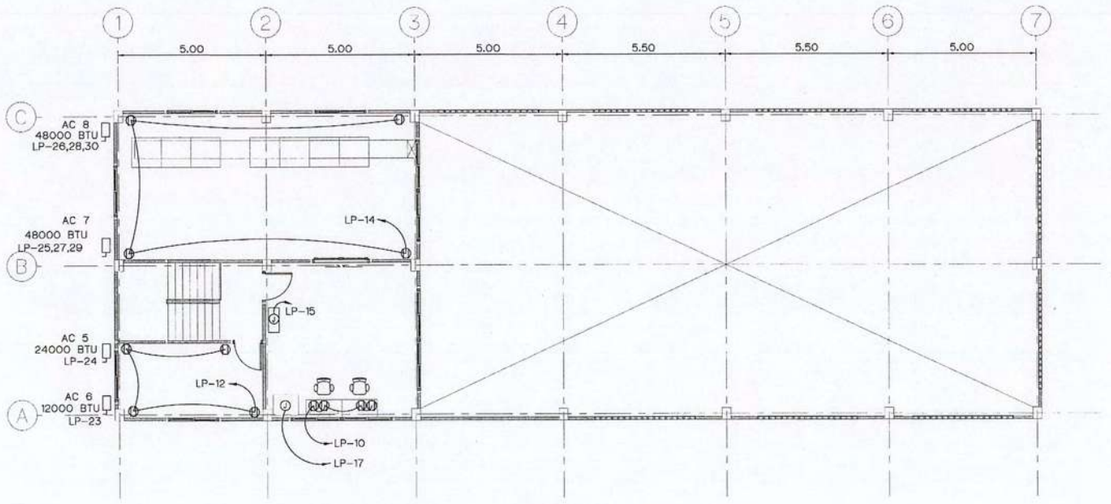
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

| | | | |
|---|---|---|---|
| DESIGNED | RWFL1764 | 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 | | | | |
| 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

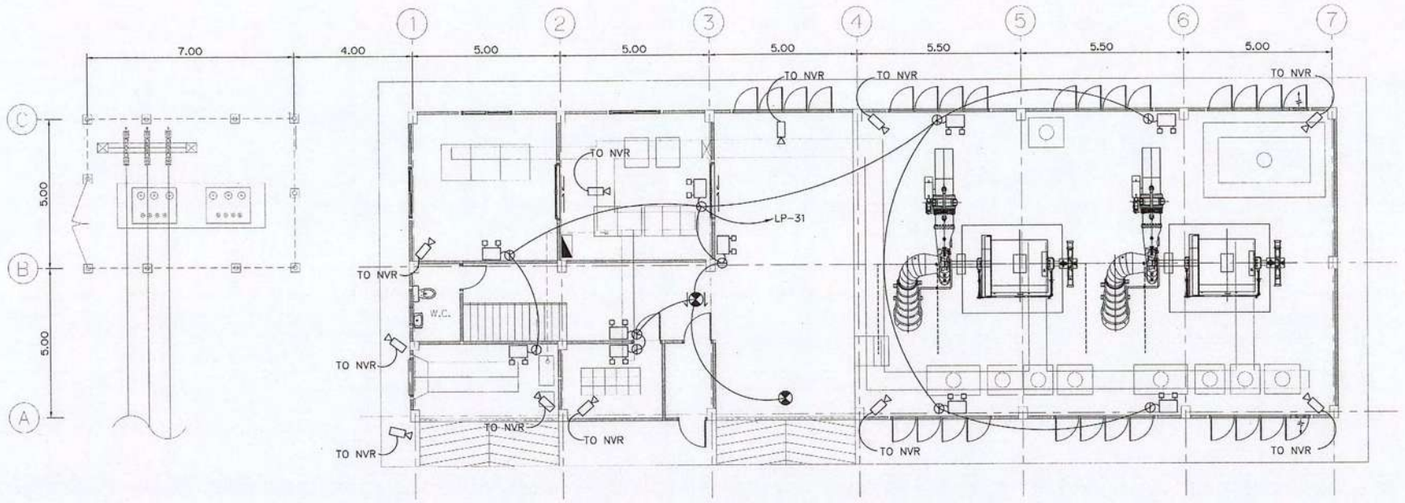
ELECTRICAL POWER PLAN

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

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

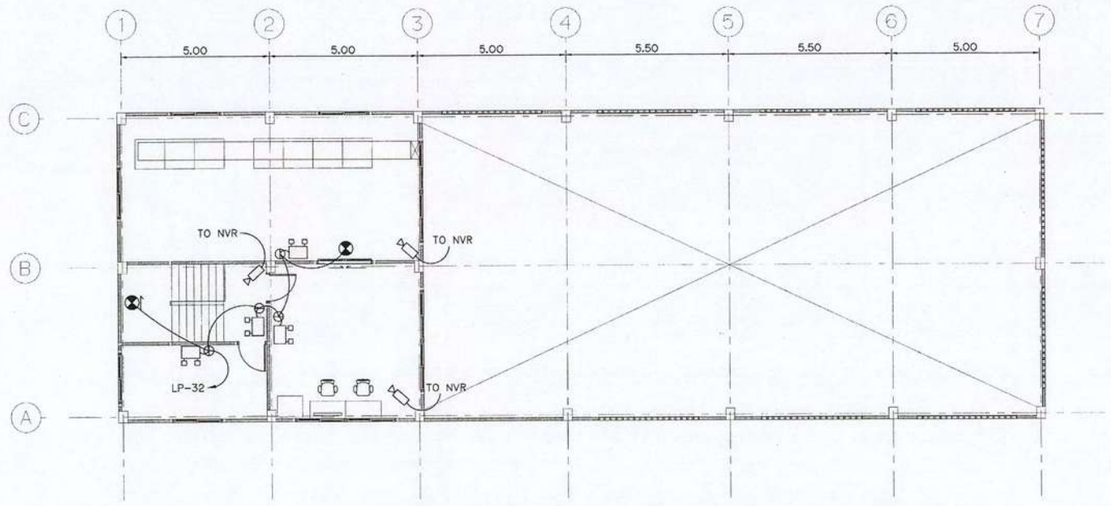
| | | | |
|---|---|---|---|
| DESIGNED | สพัฒน์ | 2พ/1.1764 | SUBMITTED |
| DRAWN | | | RECOMMENDED |
| CHECKED | | 25.8231 | APPROVED |
| PROJECT MANAGER | | 28/10/2021 DATE | DRAWING NO. AKP-PH-30 |

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 | | | | |
| 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

EMERGENCY , FIRE EXIT AND CCTV PLAN

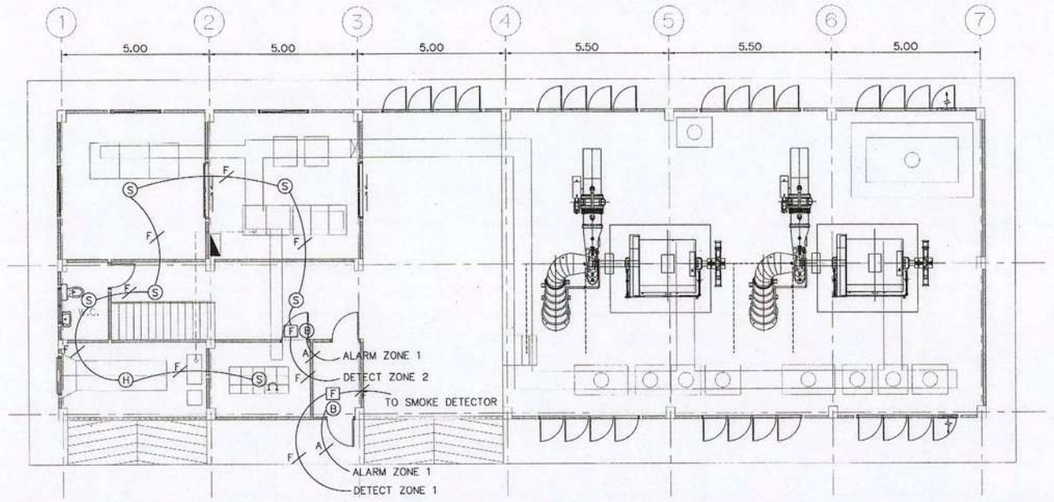
PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

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

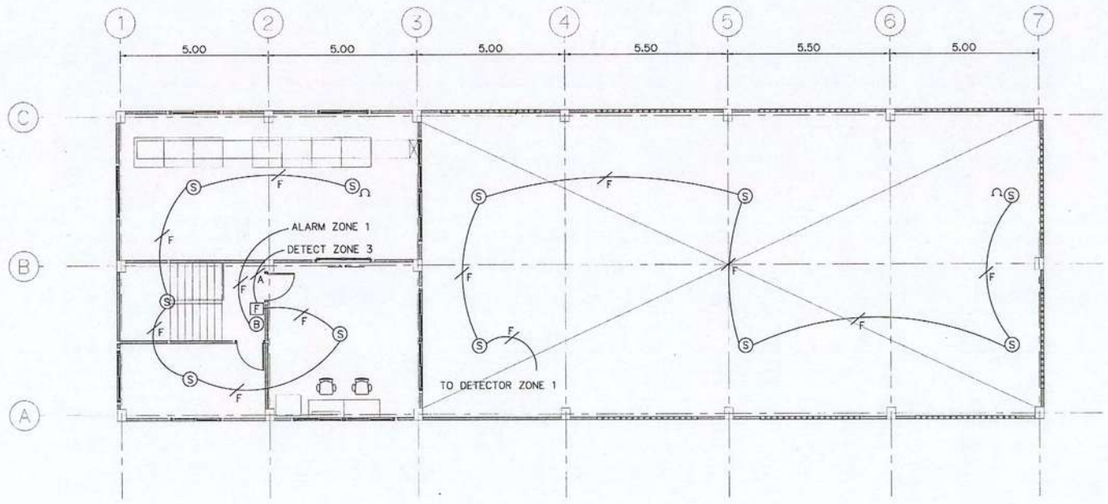
DRAWING NO. AKP-PH-31

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

| 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

FIRE ALARM PLAN

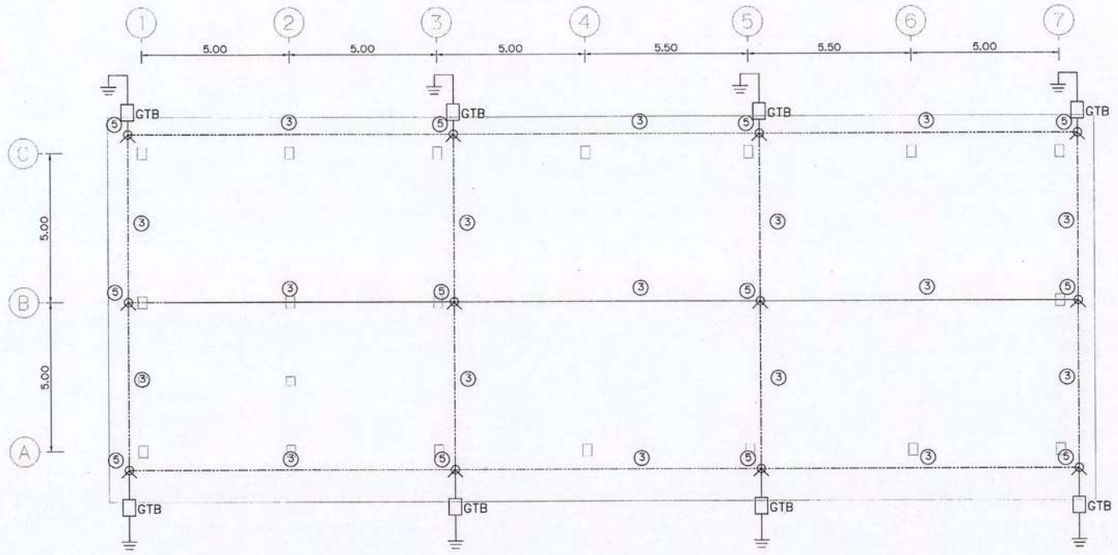
PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

| | | | |
|---|---|---|---|
| DESIGNED | สพ.1704 | REVIEWED | |
| DRAWN | | SUBMITTED | |
| CHECKED | ส.ต.ท.8231 | RECOMMENDED | |
| PROJECT MANAGER | 28/10/2021 DATE | APPROVED | |

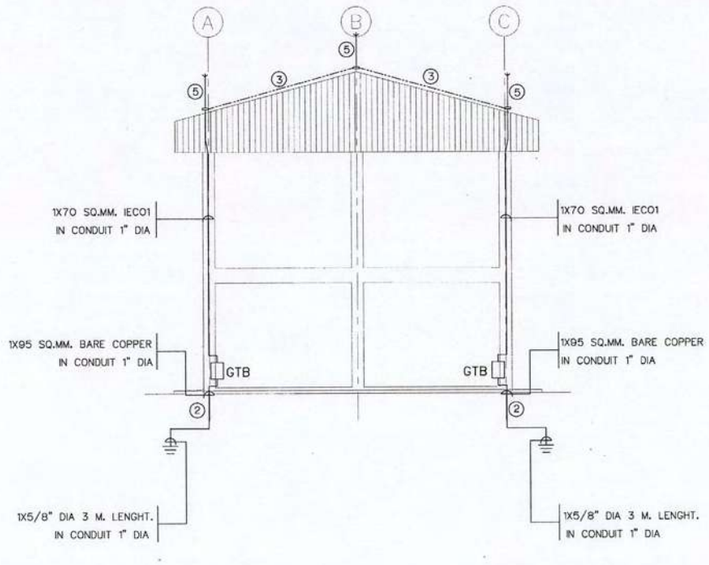
DRAWING NO. AKP-PH-32

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 |
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| 3 | | | | |
| 2 | | | | |
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| | CONSULTANTS | | DEDE | |

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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

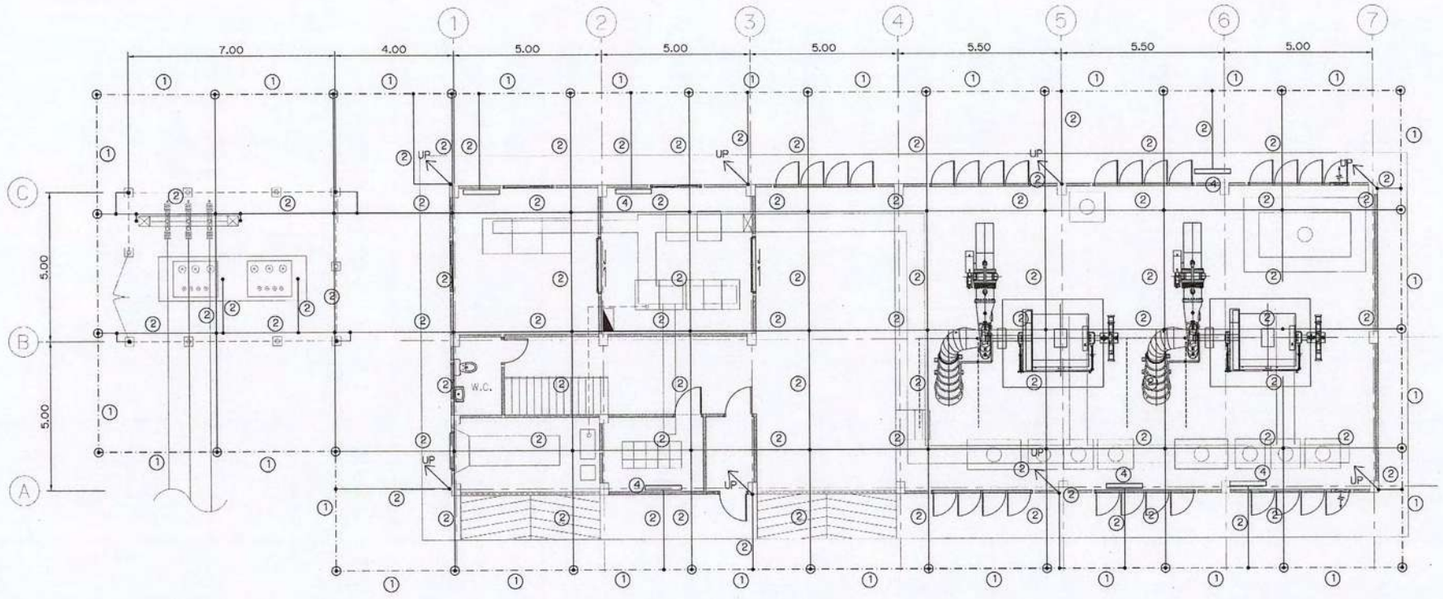
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

POWERHOUSE

LIGHTNING ARRESTER PLAN

| | |
|---|---|
| P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY |
| DESIGNED 2161.1764 | REVIEWED |
| DRAWN | SUBMITTED |
| CHECKED 28.8231 | 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 |
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| 3 | | | | |
| 2 | | | | |
| 1 | | | | |
| | 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

POWERHOUSE

GROUNDING SYSTEM PLAN

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

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

DESIGNED สมพงษ์ 21/11/64
DRAWN
CHECKED สมชาย 21/11/64
PROJECT MANAGER 28/10/2021 DATE

REVIEWED
SUBMITTED
RECOMMENDED
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 | 20660 | 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 | | 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 | | |

IC > 35 kA

## 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 | | | | | | 640 |
| 4 | SPACE | | | | | | | | | |
| 5 | SPACE | | | | | | | | | |
| 6 | SPACE | | | | | | | | | |
| | MAIN BREAKER: ☑ LUG :☐ | 2 | 20 | 50 | | CONDUCTOR : 2x4 sq.mm NYY 1x2.5(G)sq.mm IEC01 | | | | 100% LOAD: 1500 VA |
| | BUS PHASE : 50 A | | | | | | | | | |
| | INCOME LINE : LP-36 | | | | | IN CONDUIT 1-1/4" DIA HDPE | | | | |

6 kA < IC < 10 kA

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 | | | | | | 640 |
| 4 | SPACE | | | | | | | | | |
| 5 | SPACE | | | | | | | | | |
| 6 | SPACE | | | | | | | | | |
| | MAIN BREAKER: ☑ LUG :☐ | 2 | 20 | 50 | | CONDUCTOR : 2x6 sq.mm NYY 1x4(G)sq.mm IEC01 | | | | 100% LOAD: 1500 VA |
| | BUS PHASE : 50 A | | | | | | | | | |
| | INCOME LINE : LP-38 | | | | | IN CONDUIT 1-1/4" DIA HDPE OR ON RACK | | | | |

6 kA < IC < 10 kA

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 | | FDP |
| 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 | ~~EMT~~ 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 | | | | | | | 1500 | | |
| 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 | ~~PVC~~ 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 | | | |

IC > 5 kA

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

| 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

POWERHOUSE

LOAD SCHEDULE

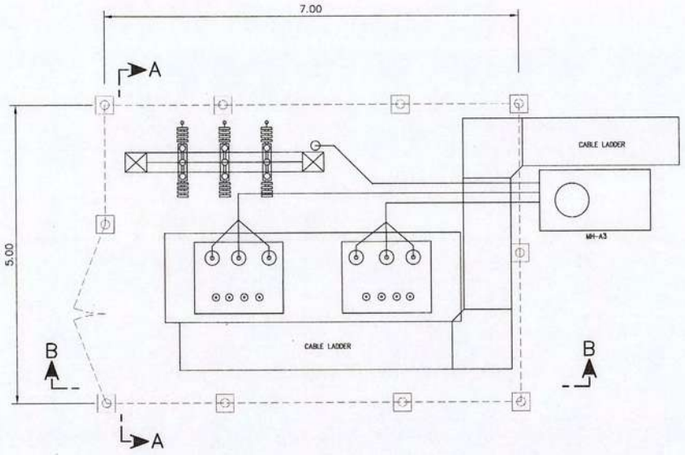
PCM P&C MANAGEMENT CO., LTD.
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Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

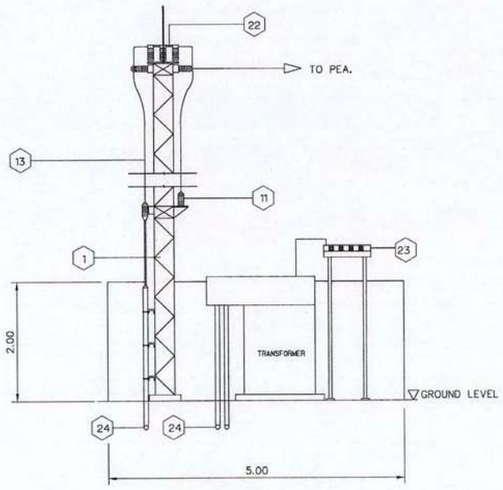
DESIGNED — REVIEWED
DRAWN — SUBMITTED
CHECKED — RECOMMENDED
APPROVED

PROJECT MANAGER — 28/10/2021 DATE

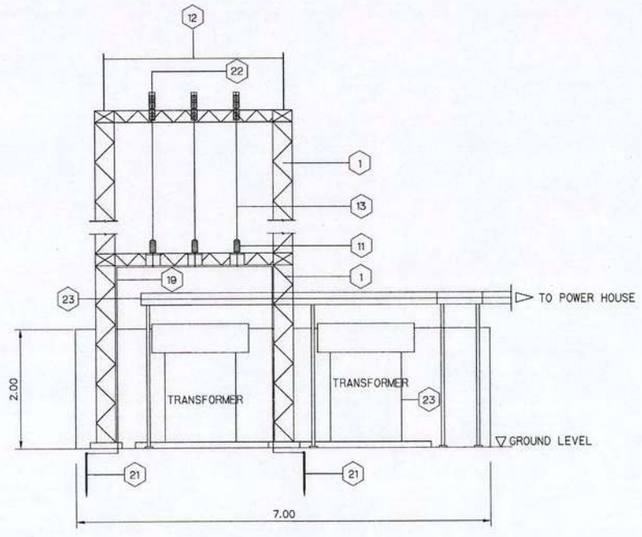
DRAWING NO. AKP-PH-35 — SHEET NO. 97 OF 129




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 |
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| | CONSULTANTS | | DEDE | |

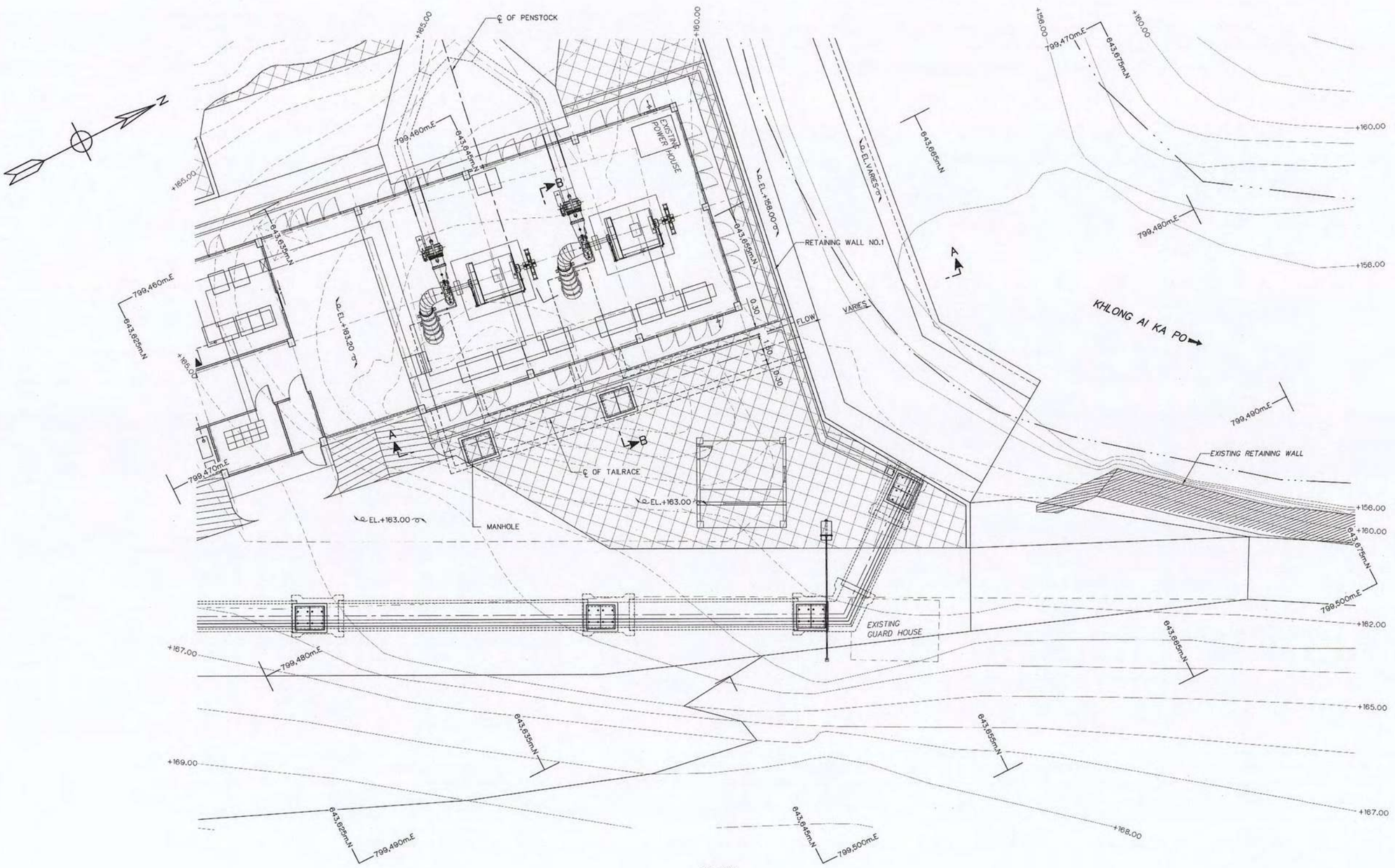
KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

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 สย.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 |
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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

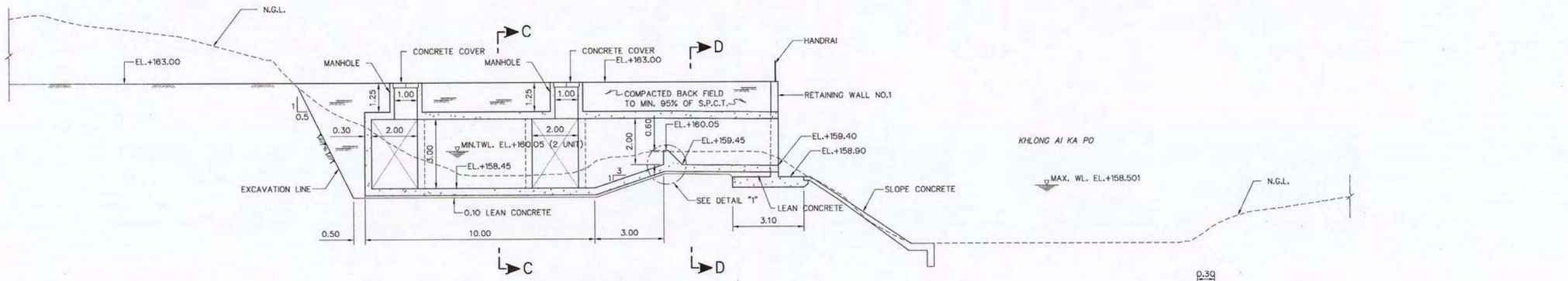
TAILRACE
PLAN

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

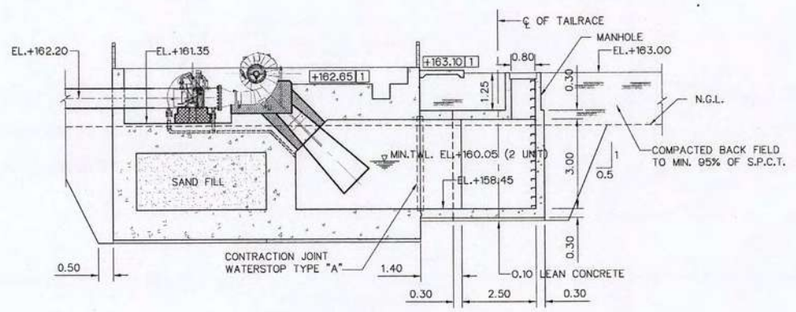
DESIGNED ณัฐพงศ์ สิริ.29074 สิริ.9462
DRAWN
CHECKED สิริ.8231
28/10/2021
PROJECT MANAGER DATE

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

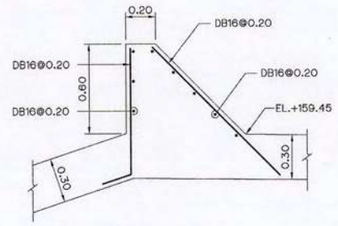
DRAWING NO. AKP-TR-01
SHEET NO. 99 OF 129



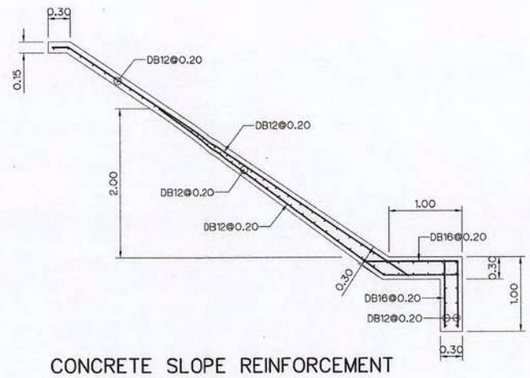

SECTION A-A
SCALE 1:100



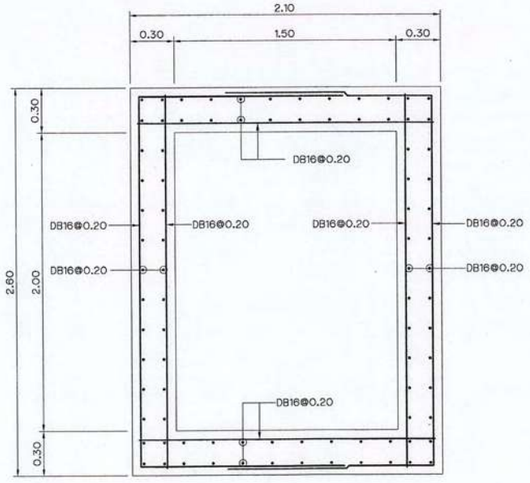

SECTION B-B
SCALE 1:100



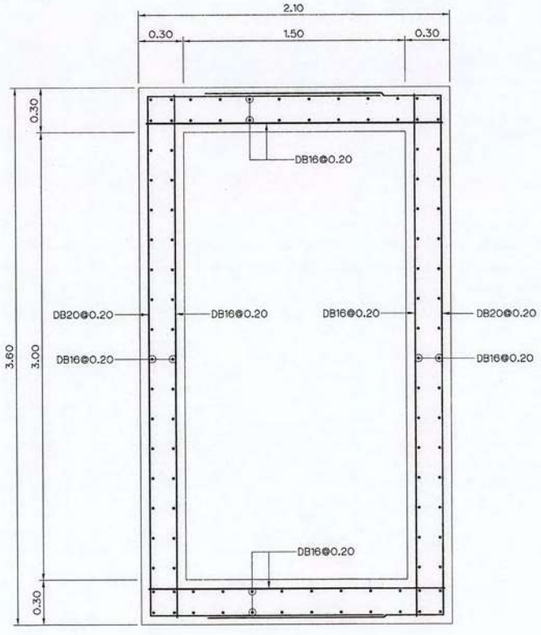

DETAIL "1"
SCALE 1:20



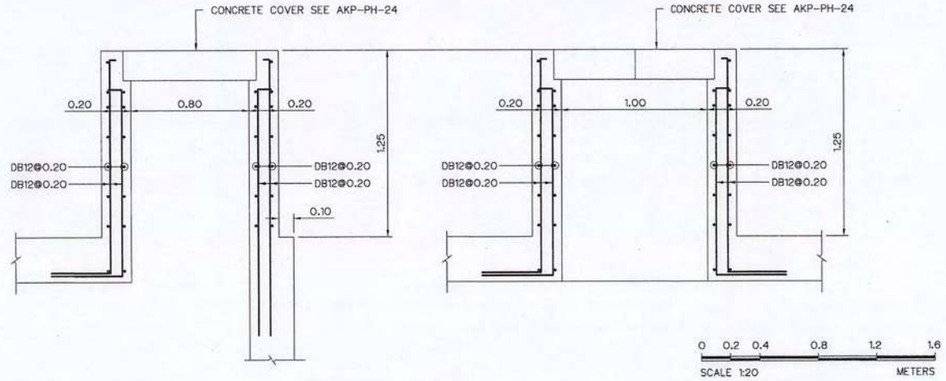

CONCRETE SLOPE REINFORCEMENT
SCALE 1:20




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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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

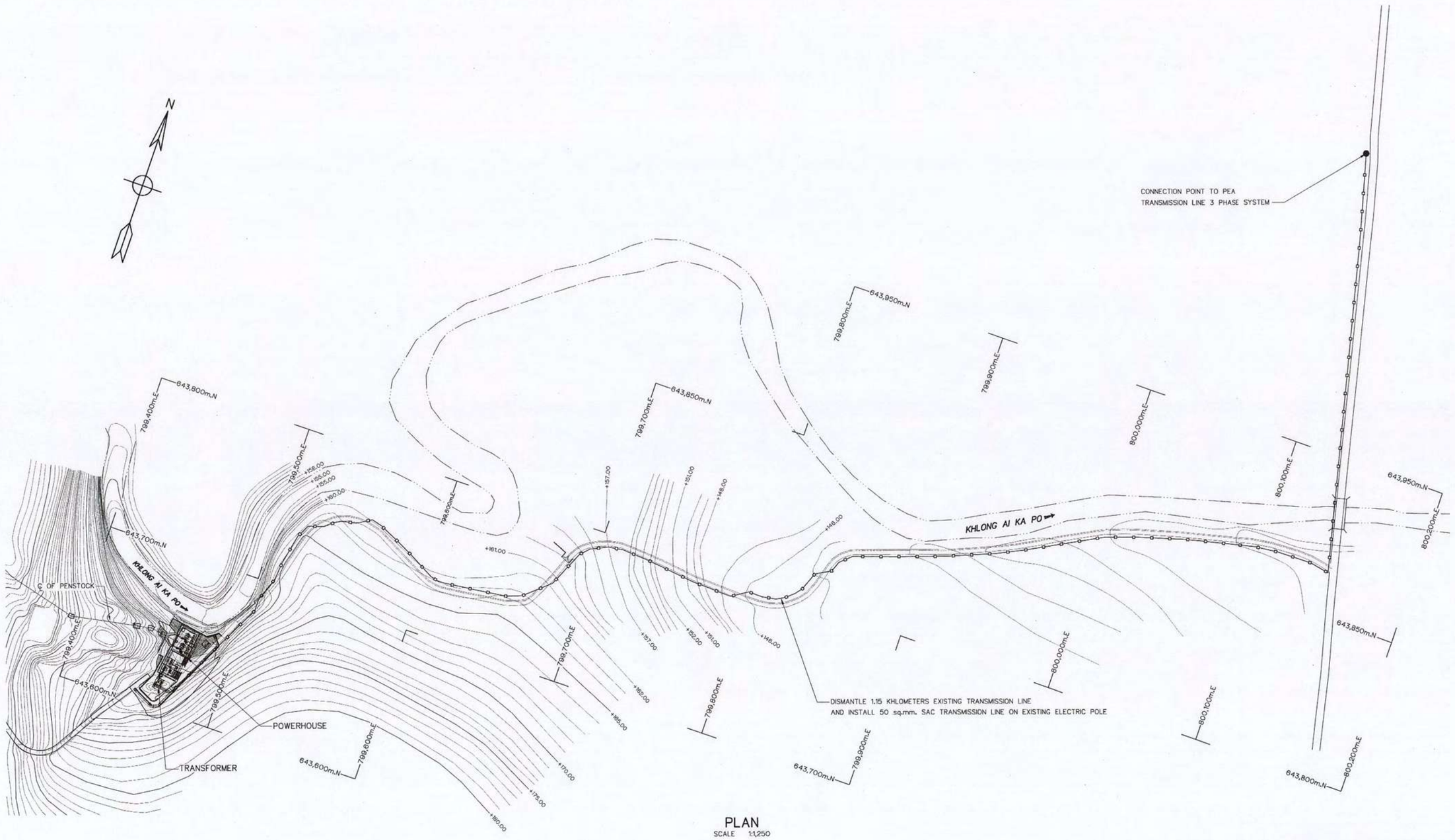
TAILRACE
SECTIONS

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

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-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 |
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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

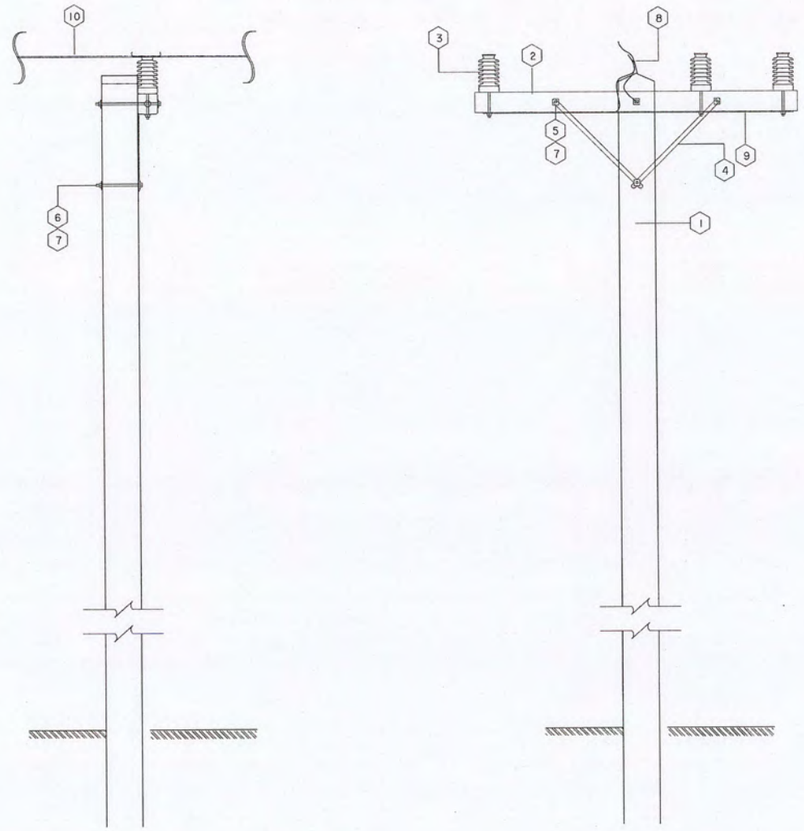
PART : 1 CIVIL WORKS AND TRANSMISSION LINE

TRANSMISSION LINE

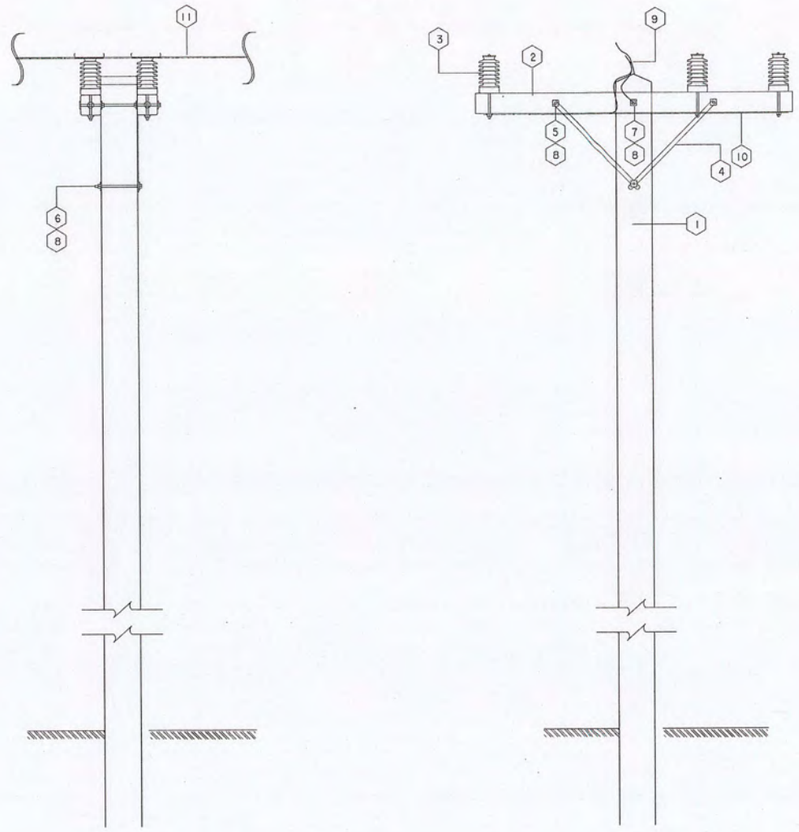
PLAN STA.0+000 TO STA.1+110

| | | | |
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| PCM P&C MANAGEMENT CO., LTD. / SPT CONSULTANTS CO., LTD. | | Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY | |
| DESIGNED | สันติ ทิพย์ | REVIEWED | |
| DRAWN | | SUBMITTED | |
| CHECKED | สันติ ทิพย์ | RECOMMENDED | |
| PROJECT MANAGER | 28/10/2021 DATE | APPROVED | |
| | | 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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MINISTRY OF ENERGY

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

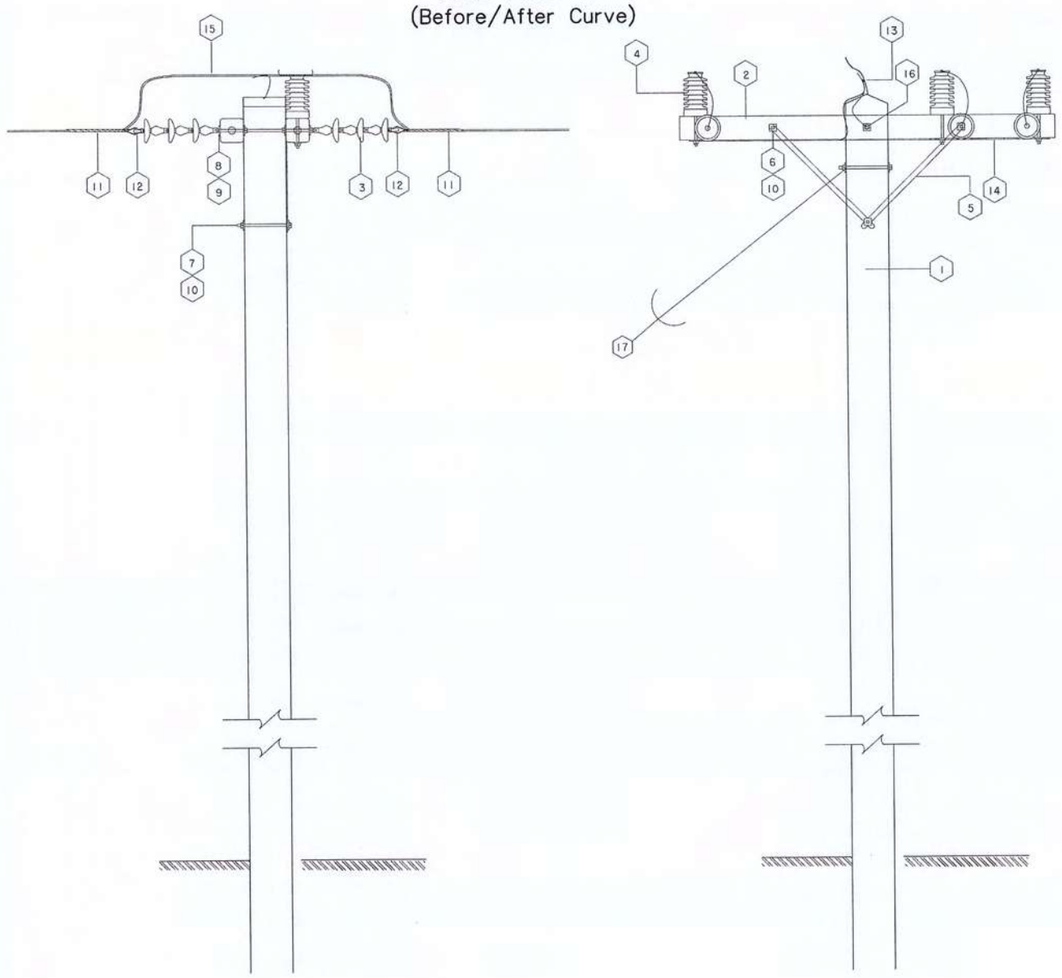
PART : 1 CIVIL WORKS AND TRANSMISSION LINE

TRANSMISSION LINE

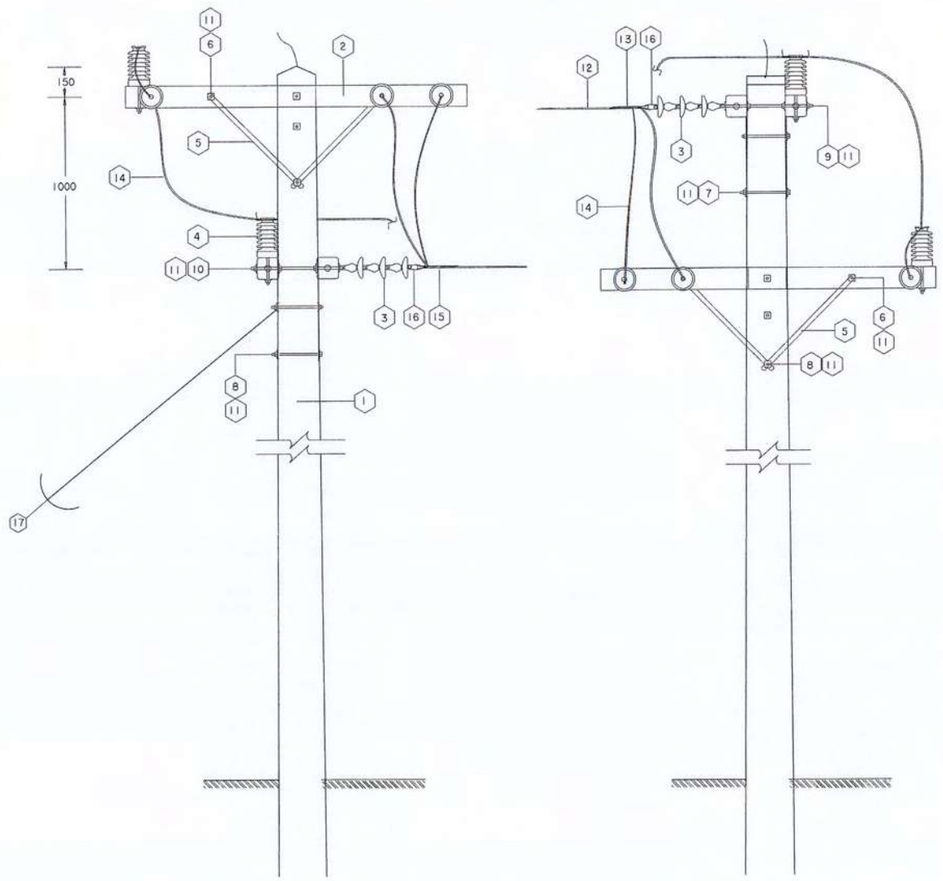
POLE TYPE "A" AND "B"

| | | | |
|---|---|---|---|
| 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 | สย.8231 | RECOMMENDED | |
| | | APPROVED | |
| PROJECT MANAGER | 28/10/2021 DATE | 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 |
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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

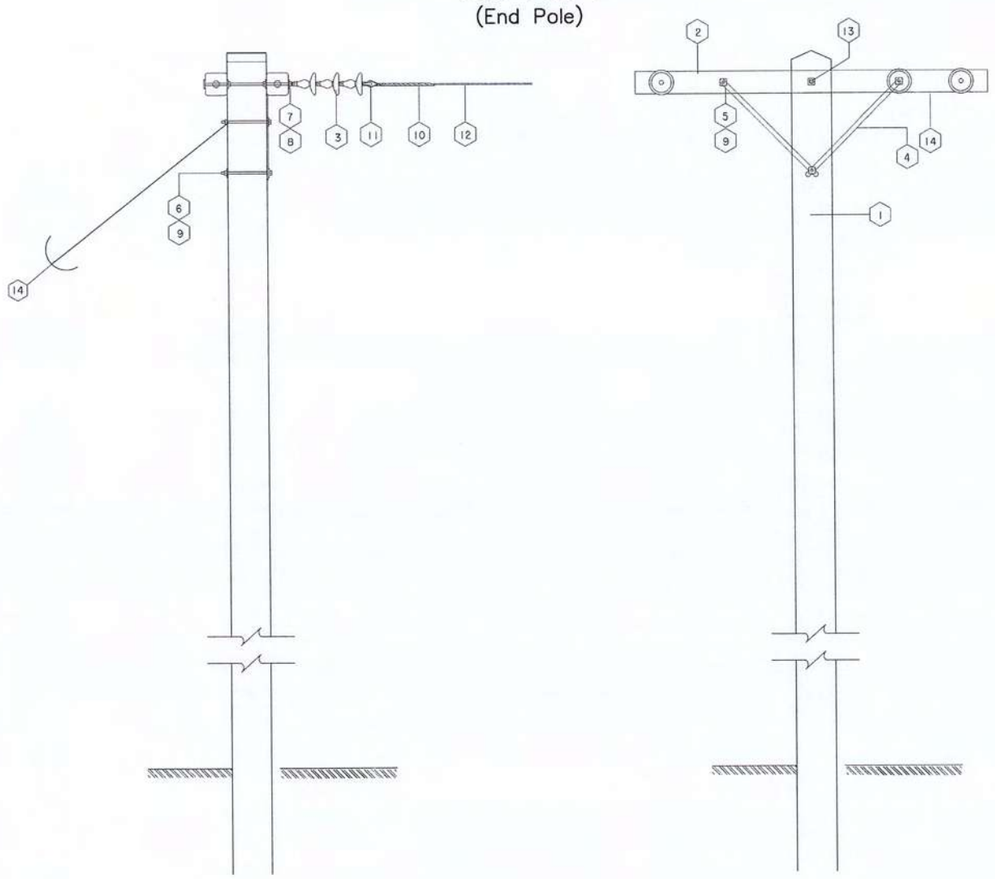
PART : 1 CIVIL WORKS AND TRANSMISSION LINE

TRANSMISSION LINE

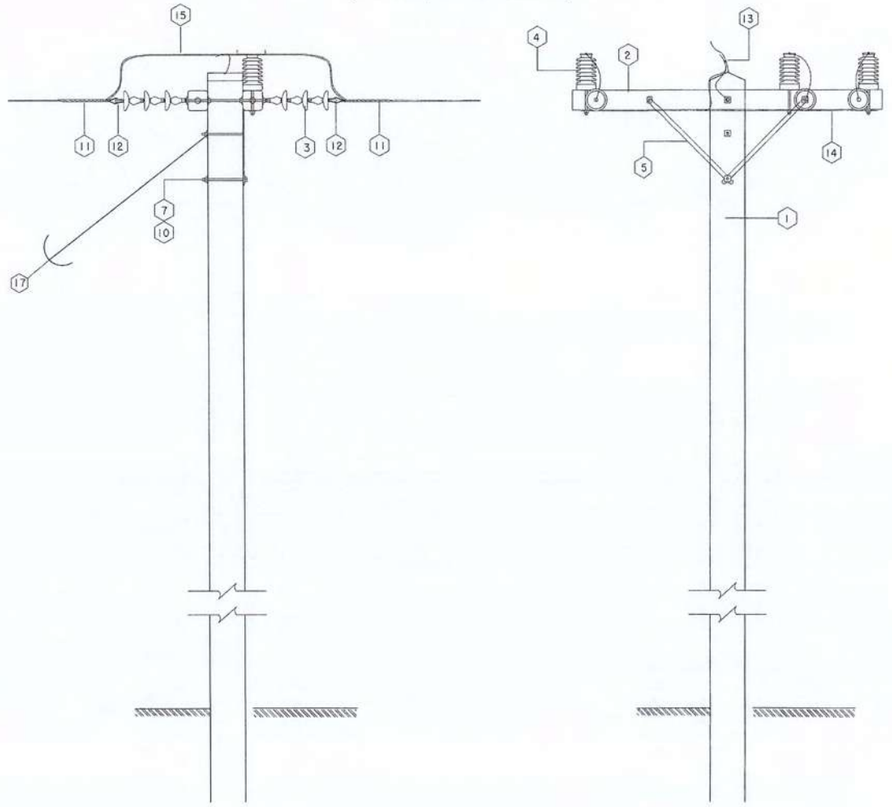
POLE TYPE "C" AND "D"

| | |
|---|---|
| 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 สน.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.

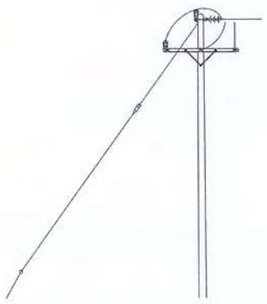
| NO. | DATE | REVISIONS | CHECKED | APPROVED |
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Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

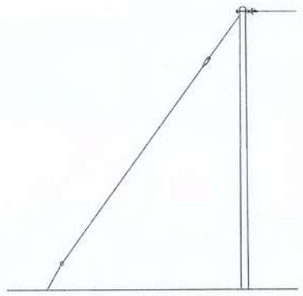
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE
TRANSMISSION LINE
POLE TYPE "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 |



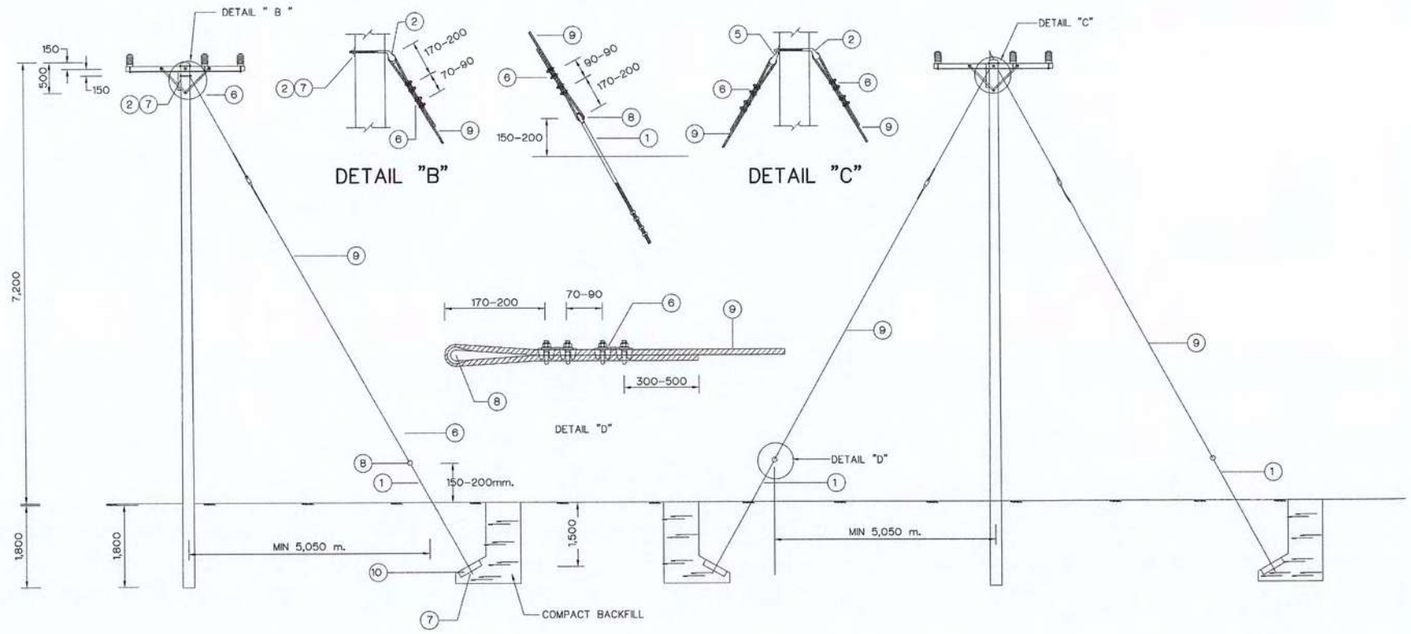
G5
BUCK ARM, 60°– 90°
DEAD END GUY



G4
DEAD END GUY

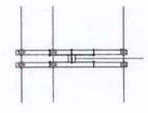
METHOD OF SINGLE ANCHOR GUY

METHOD OF DOUBLE ANCHOR GUY

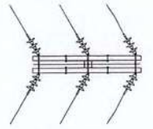



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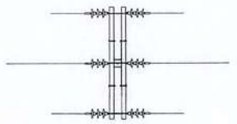
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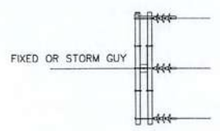
G1
SIDE GUY 5°– 30°



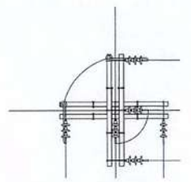
G2
SIDE GUY 30°– 60°



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 | 6 | 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 |

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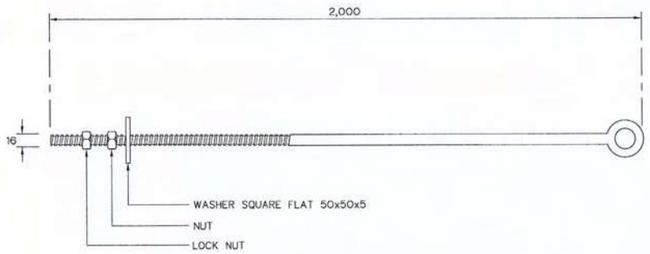
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART : 1 CIVIL WORKS AND TRANSMISSION LINE

TRANSMISSION LINE

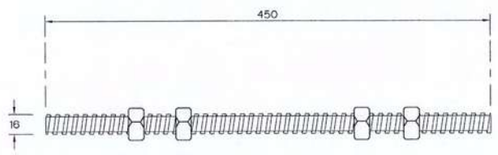
TYPE OF ANCHOR GUY

| | |
|---|---|
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| CHECKED | RECOMMENDED |
| PROJECT MANAGER 28/10/2021 DATE | APPROVED |
| DRAWING NO. AKP-TS-05 | SHEET NO. 105 OF 129 |




DETAIL OF ANCHOR BOLT FOR GUY WIRE

NOT TO SCALE



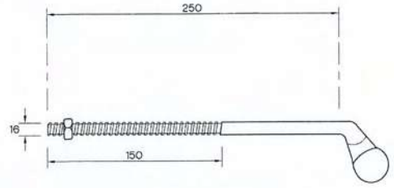

BOLT, DOUBLE ARMING

NOT TO SCALE



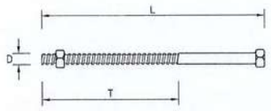
STRAND EYE SINGLE ANGLE 30°

NOT TO SCALE



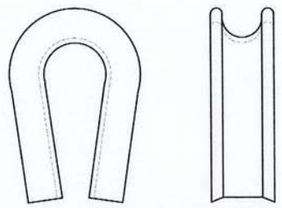

BOLT, SINGLE STRANDED EYE 45°

NOT TO SCALE




NOT TO SCALE

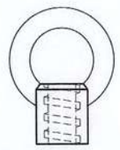
| BOLT, MACHINE ( D x L ) | |
|---|---|
| 1 | M. 16 x 130 mm. ( T = 35 mm. ) |
| 2 | M. 16 x 170 mm. ( T = 50 mm. ) |
| 3 | M. 16 x 200 mm. ( T = 50 mm. ) |
| 4 | M. 16 x 250 mm. ( T = 75 mm. ) |
| 5 | M. 16 x 300 mm. ( T = 75 mm. ) |
| 6 | M. 16 x 400 mm. ( T = 100 mm. ) |



GUY THIMBLE

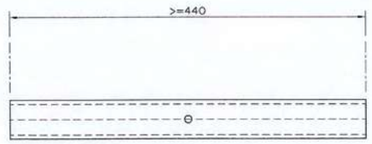
FOR STEEL STRAND GUY WIRE 35Sq.mm.

NOT TO SCALE



NUT EYE

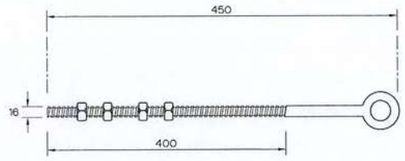
NOT TO SCALE




CONNECTOR, SPLICE, COMPRESSION TYPE

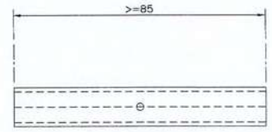
TENSION LOADED FOR PIC(ACSR) 120/8 Sq.mm.

NOT TO SCALE




BOLT, DOUBLE ARMING, ROUND EYE

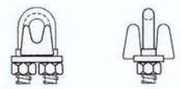
NOT TO SCALE




CONNECTOR, SPLICE, COMPRESSION TYPE

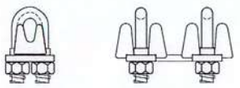
TENSIONLESS LOADED FOR PIC(ACSR) 120/8 Sq.mm.

NOT TO SCALE



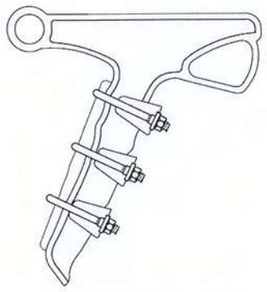
CLAMP, SINGLE U-BOLT M.8

NOT TO SCALE



CLAMP, SINGLE U-BOLT M.16

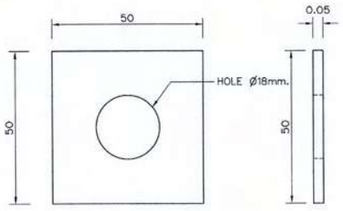
NOT TO SCALE



CLAMP, STRAIN, WITH CLAMPING KEEPER

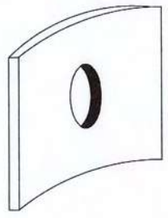
FOR PIC (ACSR) 120/8 Sq.mm.

NOT TO SCALE




WASHER SQUARE FLAT

NOT TO SCALE



WASHER, CURVE, SQUARE 60x60x5mm.

HOLE Ø22 mm.

NOT TO SCALE

NOTE :

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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

POLE ASSEMBLY ACCESSORIES, ANCHOR BOLT FOR GUY

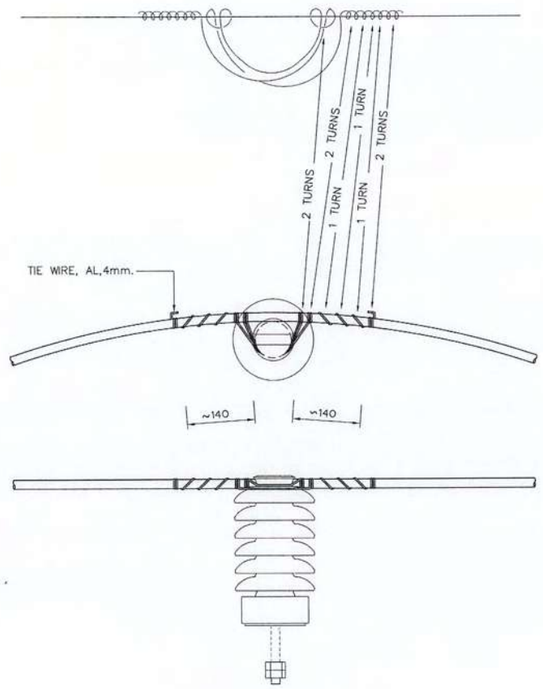
PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

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

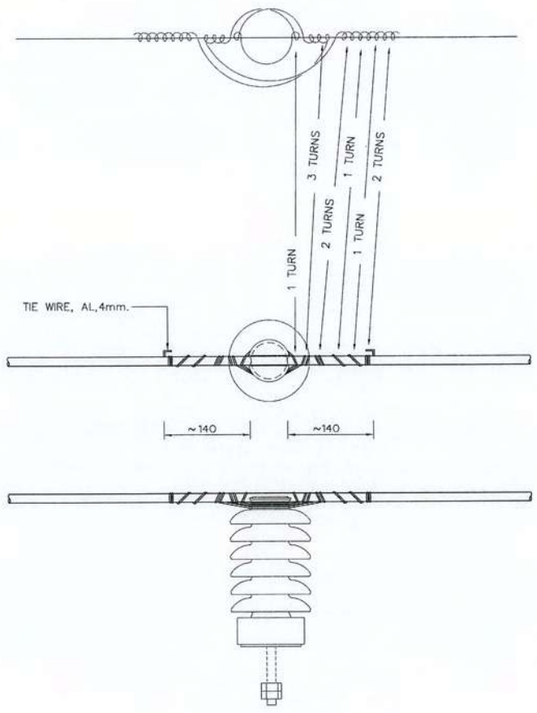
DRAWING NO. AKP-TS-06
SHEET NO. 106 OF 129

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

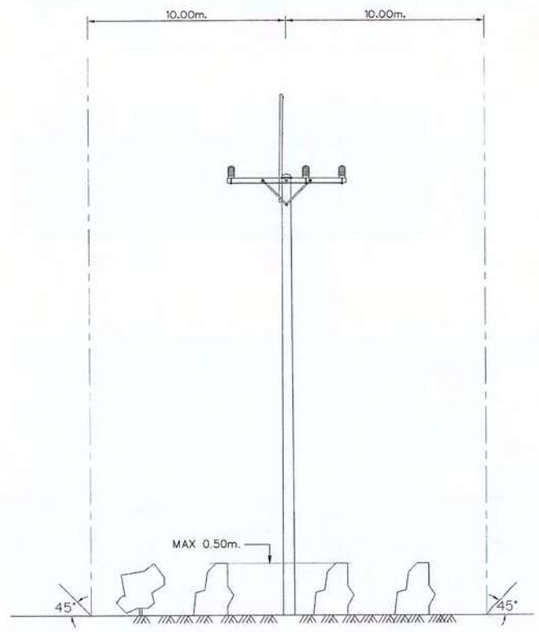



SIDE GROOVE TIE

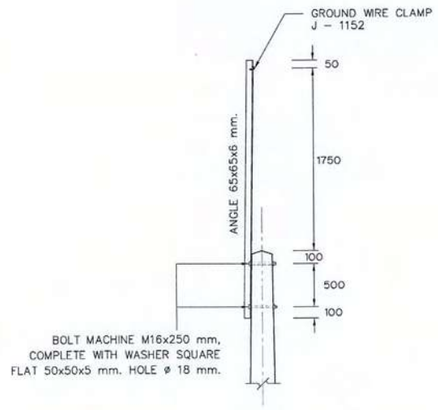
PARTIALLY INSULATED CONDUCTOR TIE,
ON H.T. PIN TYPE INSULATOR
(FOR TOP GROOVE TIE)



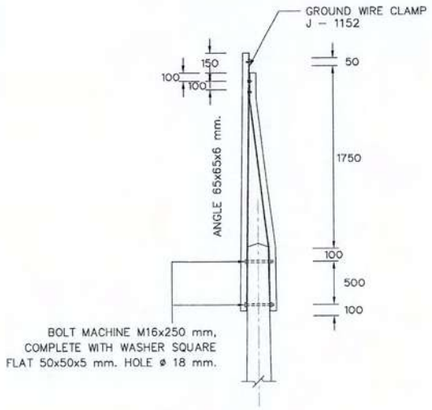

TOP GROOVE TIE




TREE TRIMMING
NOT TO SCALE

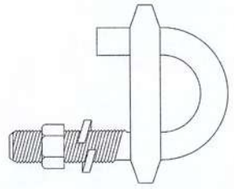



STRAIGHT BAYONET




CORNER BAYONET

OVER HEAD GROUND WIRE BAYONET ASSEMBLY
NOT TO SCALE



GROUND WIRE CLAMP J–1152
NOT TO SCALE

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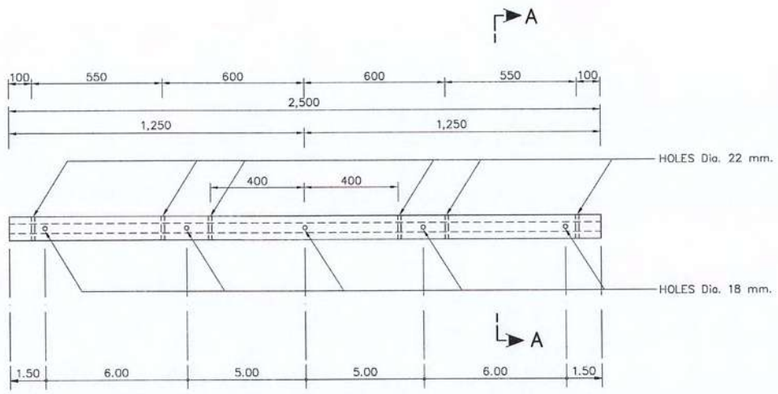
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Department of Alternative Energy Development and Efficiency
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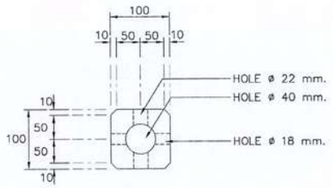
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

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

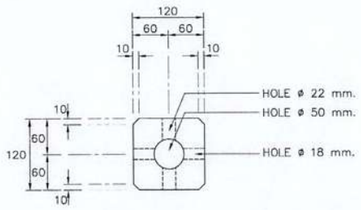
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| DESIGNED | สพัน.1764 | | SUBMITTED |
| DRAWN | | | RECOMMENDED |
| CHECKED | สธ.8231 | | APPROVED |
| PROJECT MANAGER | 28/10/2021 DATE | DRAWING NO. AKP–TS–07 | SHEET NO. 107 OF 129 |



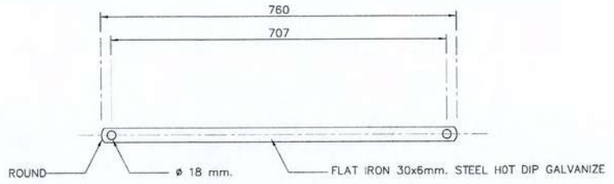

PRESTRESSED CROSS ARM 100x100x2,500mm.



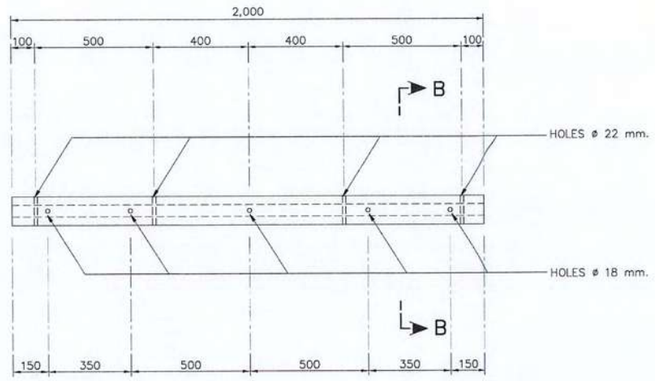

SECTION A–A



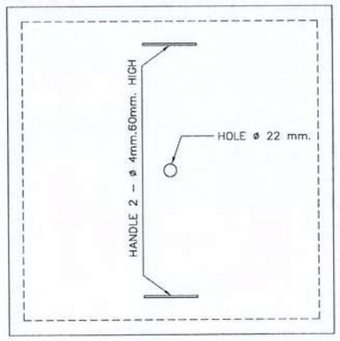

SECTION B–B

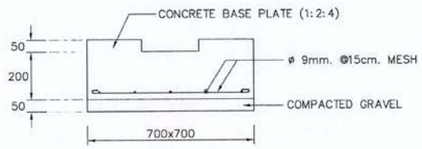



BRECE FLAT FOR CROSS ARM

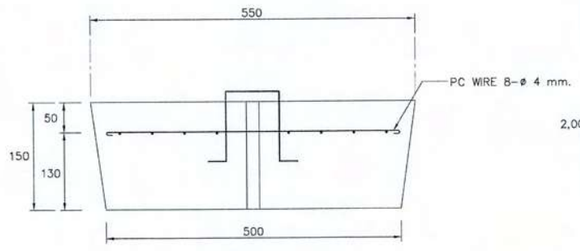



PRESTRESSED CROSS ARM 120X120x2,000mm.

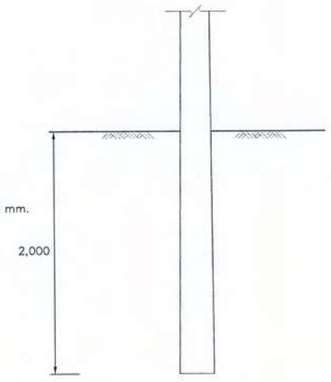


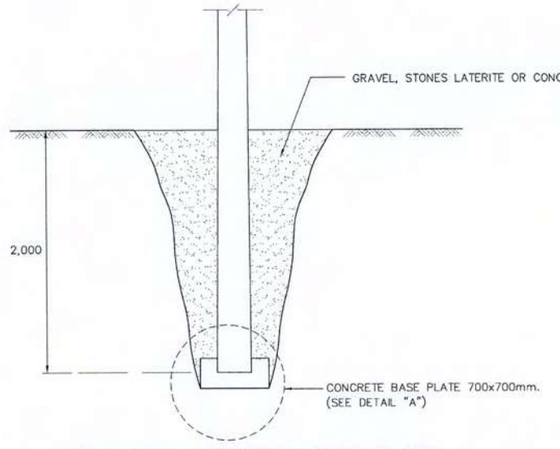

DETAIL "A"




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 |
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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

BURYING DEPTH AND FOUNDATION

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

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

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| 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

L1L2L3 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 | | |
| $\oplus_x$ | HEAT DETECTOR , FIXED TEMPERATURE 135°F ZONE "x" | | |
| $\oplus_x^{200°F}$ | HEAT DETECTOR , FIXED TEMPERATURE 200°F ZONE "x" | | |
| $S_x$ | SMOKE DETECTOR "x" | | |
| $SDB_x^T$ $SDB_x^R$ | BEAM DETECTOR | | |
| $\oplus_x$ | 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. | | |
| IP xx | 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 | | |

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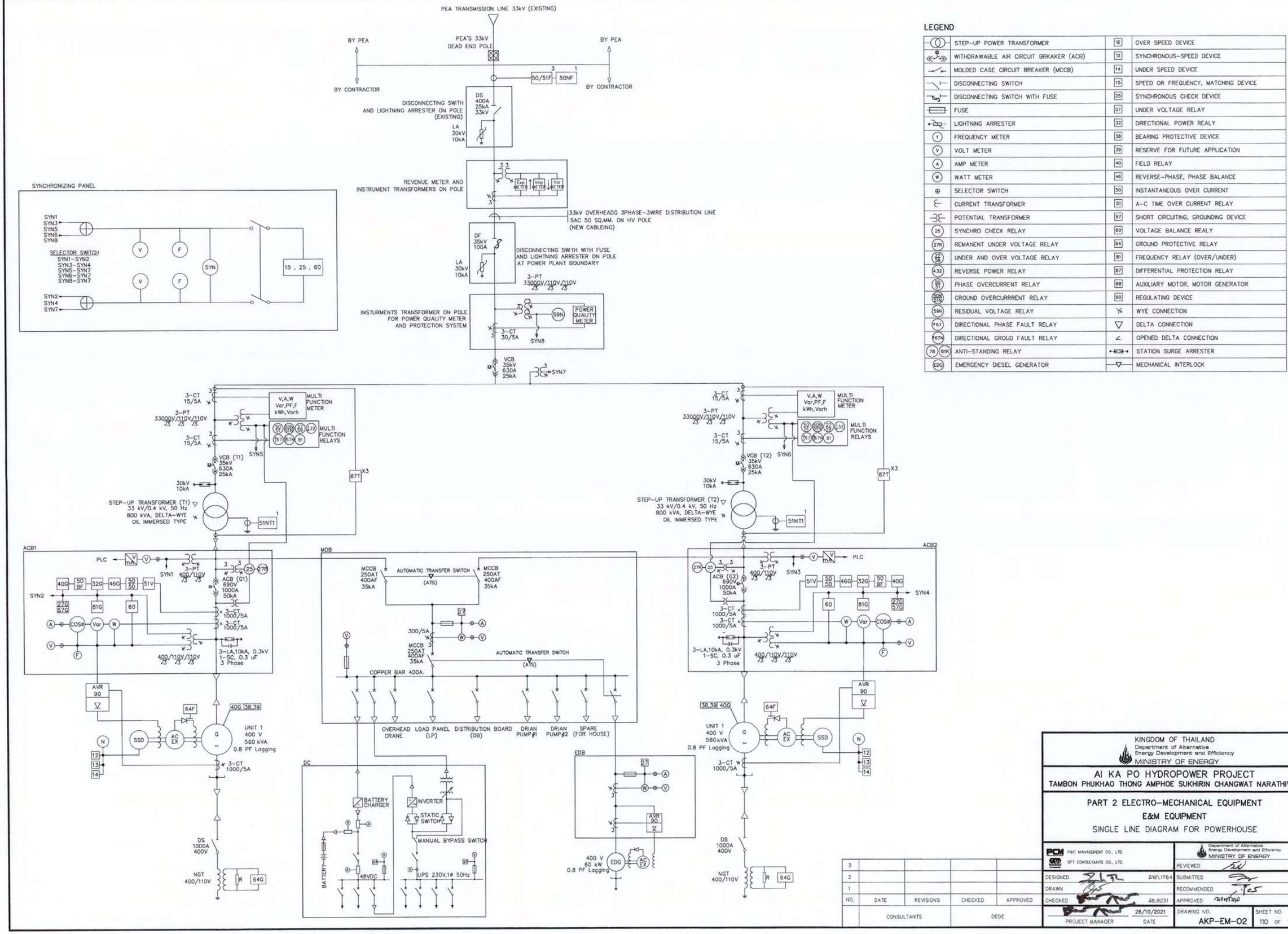
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

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

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| | | | |
|---|---|---|---|
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| DRAWN | | SUBMITTED | |
| CHECKED | ANL6231 | RECOMMENDED | |
| PROJECT MANAGER | 28/10/2021 DATE | APPROVED | |
| | | 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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# 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

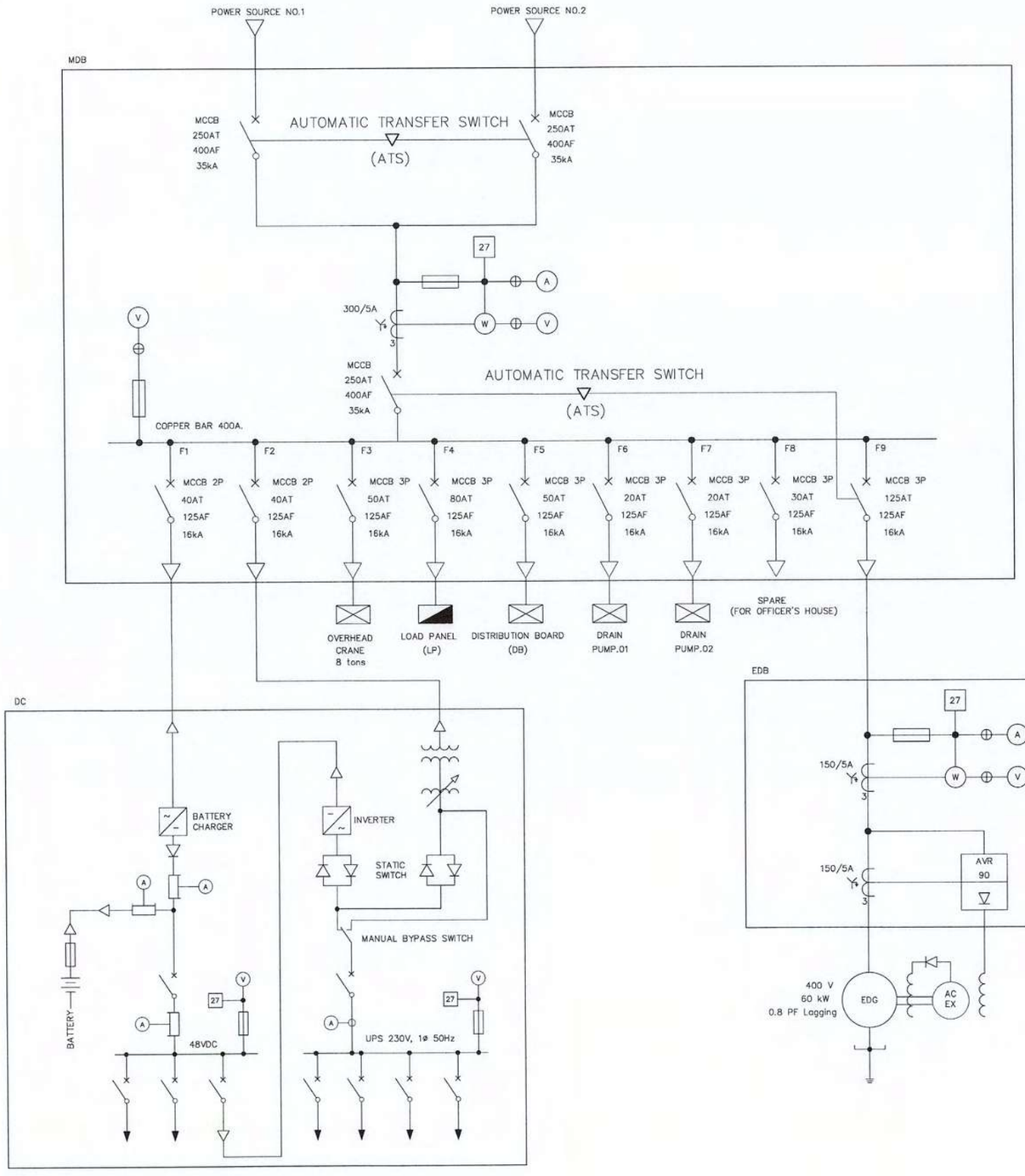
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28/10/2021
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REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

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 |
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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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| DESIGNED | AWO.1764 | REVIEWED | |
| DRAWN | | SUBMITTED | |
| CHECKED | RS.8231 | RECOMMENDED | |
| 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 |
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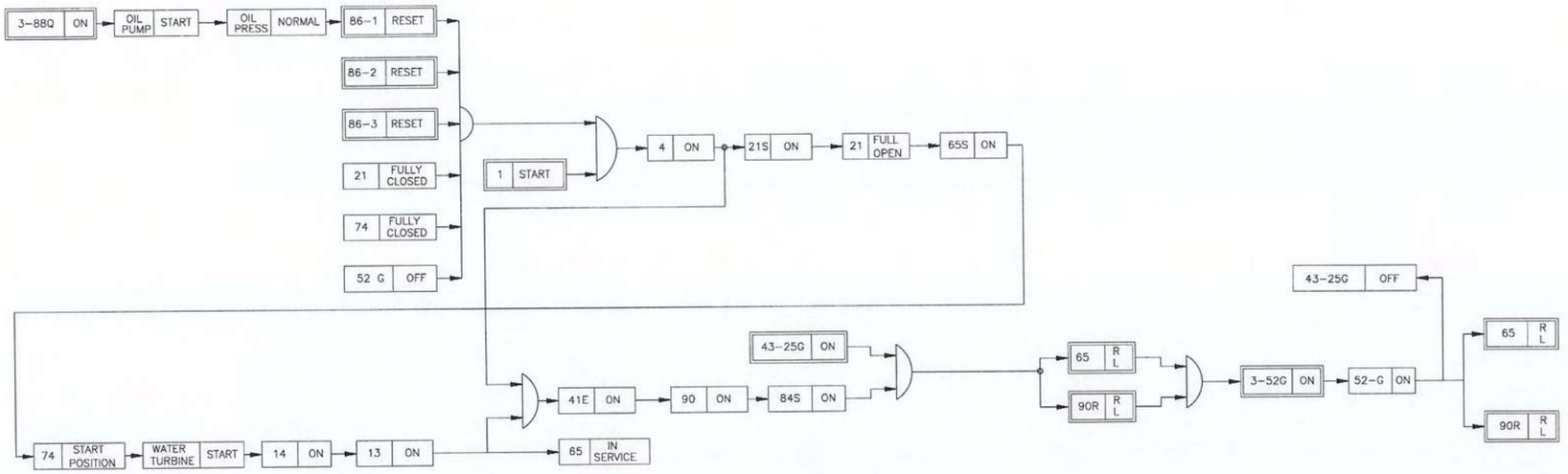
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

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

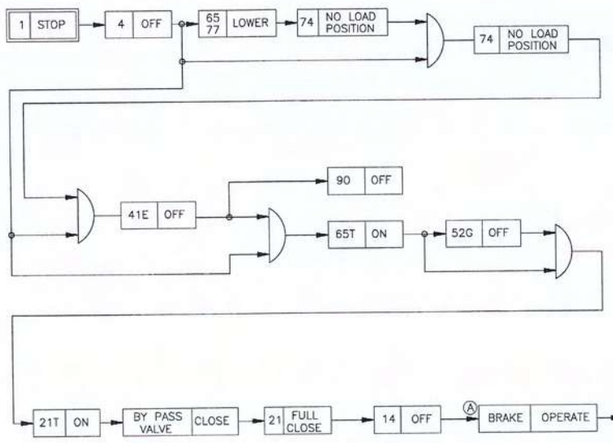
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| PROJECT MANAGER 28/10/2021 DATE | APPROVED |
| DRAWING NO. AKP-EM-04 | SHEET NO. 112 OF 129 |

LEGEND

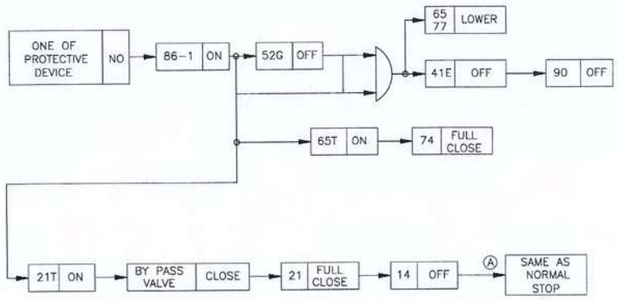
| | |
|---|---|
| | OPERATION AND CONTROL SWITCH |
| | MACHINE STATUS |
| | GROUP INDICATION (ON) |
| | GROUP INDICATION (OFF) |
| | AND |
| | OR |
| T | TIMER |
| Ⓐ | SAME CONTINUTION MARK |



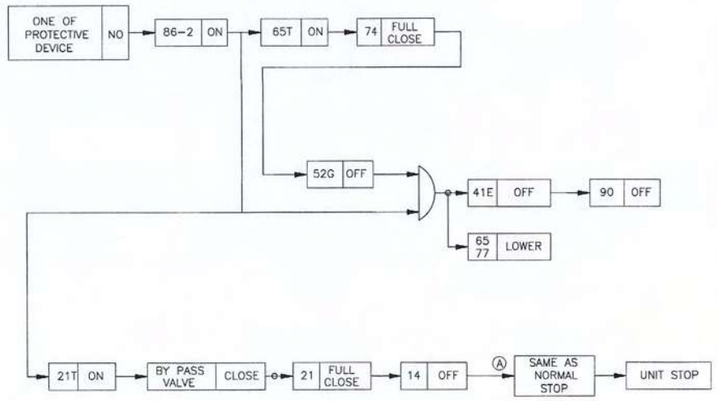

START LOAD




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

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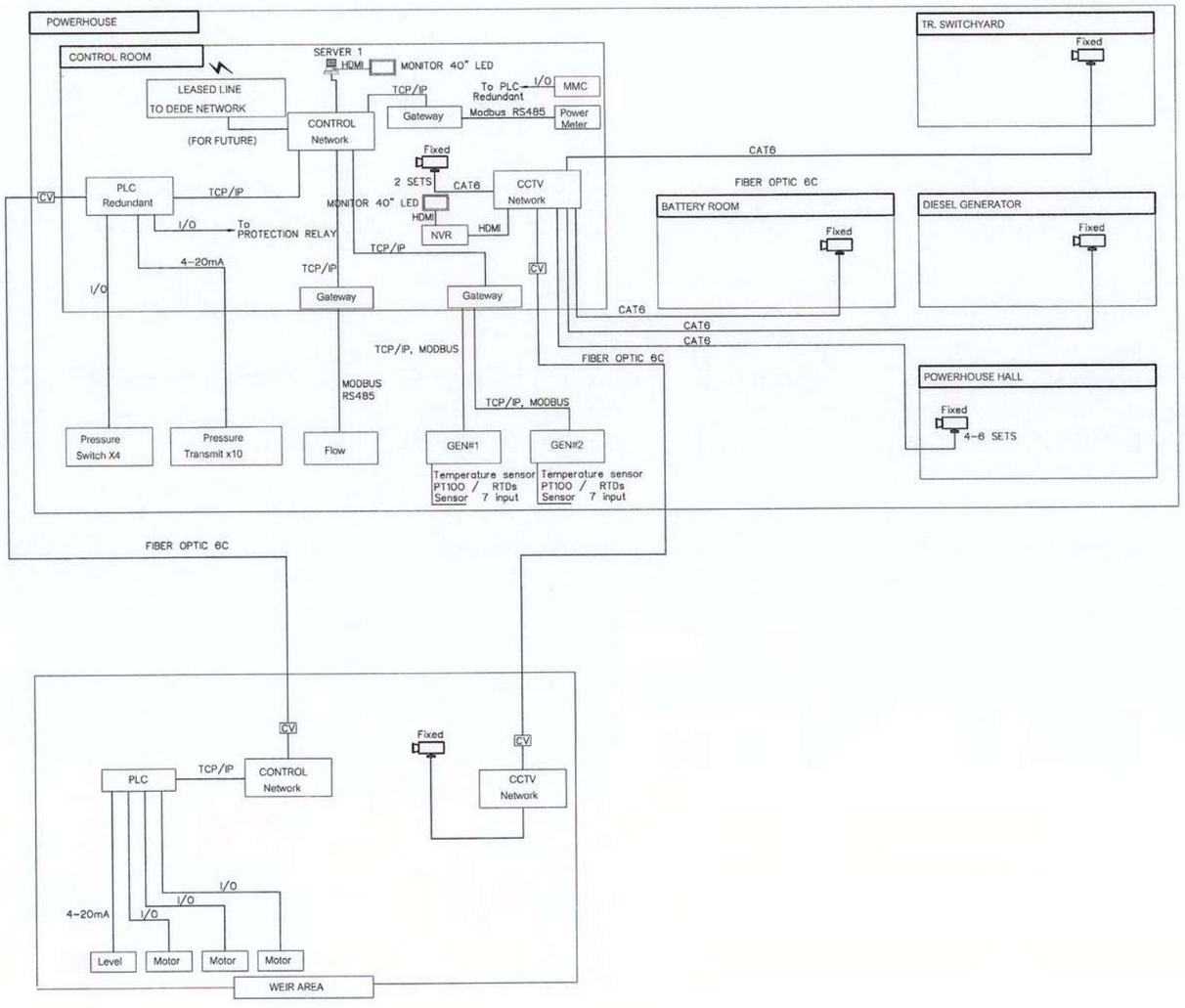
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PROJECT MANAGER 28/10/2021 DATE

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DRAWING NO. AKP-EM-05
SHEET NO. 113 OF 129




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# AI KA PO HYDROPOWER PROJECT

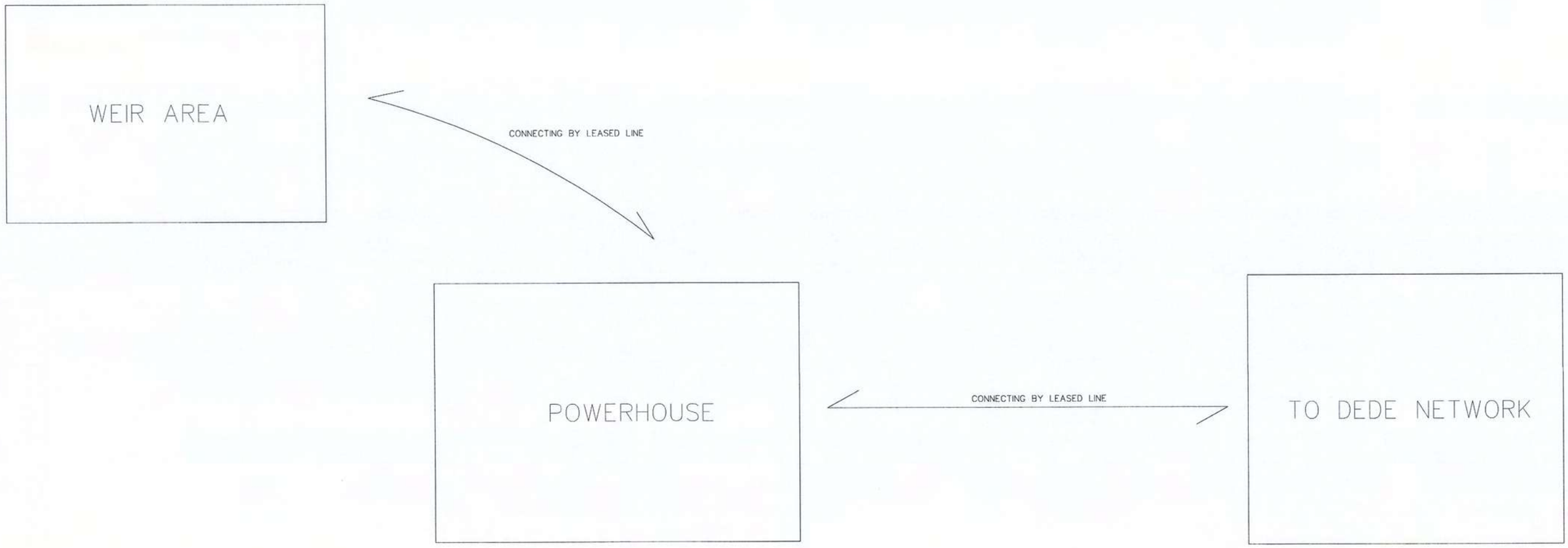
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

## PART 2 ELECTRO-MECHANICAL EQUIPMENT

## E&M EQUIPMENT

## SCADA SYSTEM

| | |
|---|---|
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| DESIGNED สพก.1764 | REVIEWED |
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| CHECKED สธ.8231 | RECOMMENDED |
| PROJECT MANAGER 28/10/2021 DATE | APPROVED |
| DRAWING NO. AKP-EM-06 | SHEET NO. 114 OF 129 |



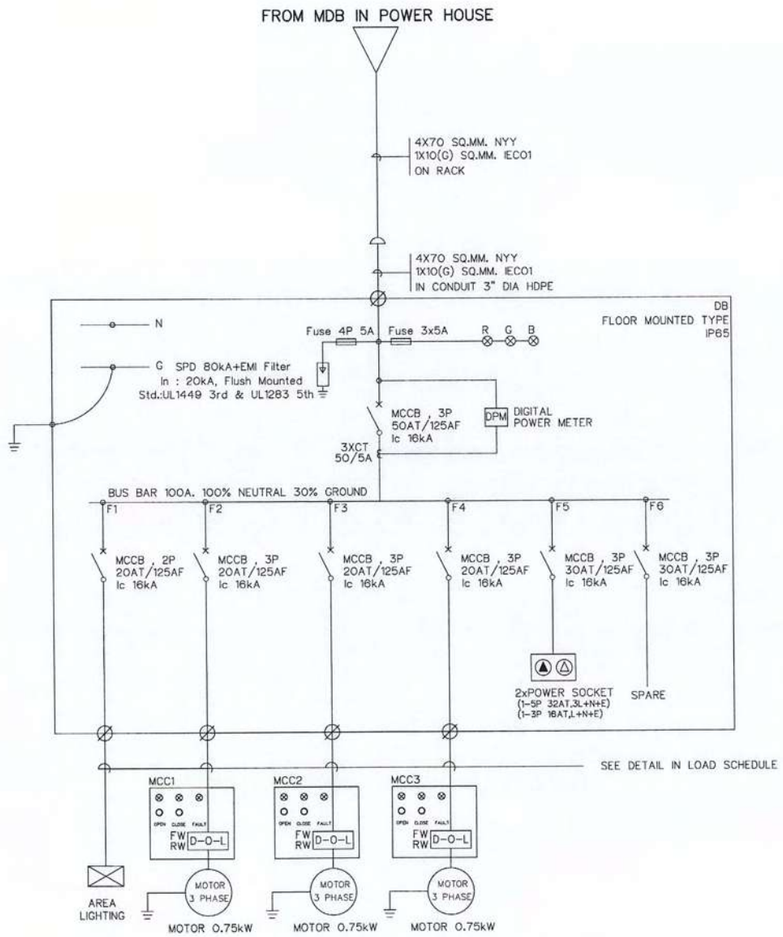

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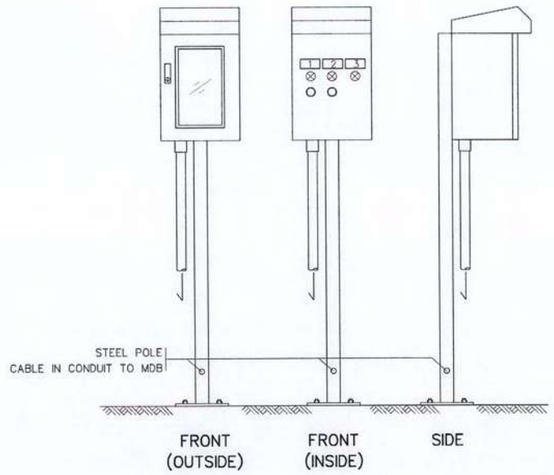
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

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

| | |
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| DRAWN | SUBMITTED |
| CHECKED | RECOMMENDED |
| PROJECT MANAGER 28/10/2021 DATE | APPROVED |
| DRAWING NO. AKP-EM-07 | 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) | TYPE | LOAD CONNECTION(VA) R | S | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | STREET LIGHTING | 2 | 20 | 125 | | 2X4/1X2.5G | NYY | 1-1/4 | HDPE / IMC | 500 | | |
| 2 | MCC1 | 3 | 20 | 125 | | 4X4/1X2.5G | NYY | 1-1/2 | HDPE / IMC | 400 | 400 | 400 |
| 3 | MCC2 | 3 | 20 | 125 | | 4X4/1X2.5G | NYY | 1-1/2 | HDPE / IMC | 400 | 400 | 400 |
| 4 | MCC3 | 3 | 20 | 125 | | 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 | | 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 | | |

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 |
|---|---|---|---|---|
| 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

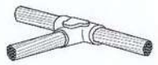
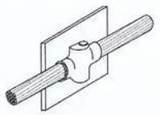
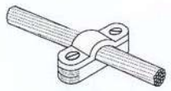
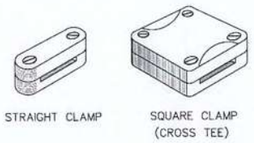
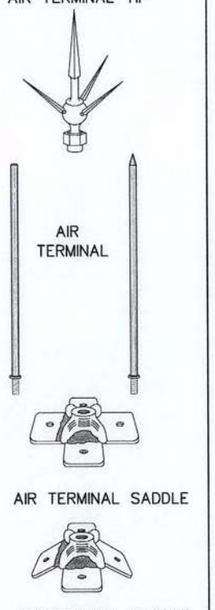
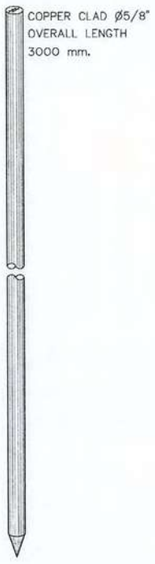
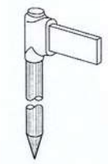
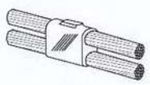
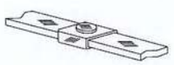
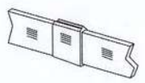
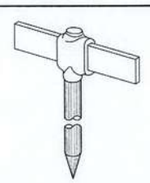
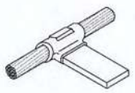
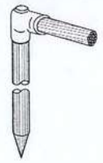
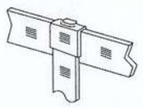
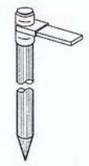
PART 2 ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT
SINGLE LINE DIAGRAM FOR WEIR AREA

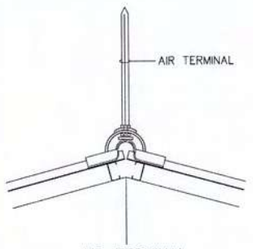
PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

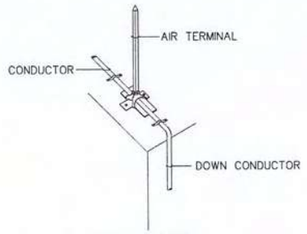
| | | | |
|---|---|---|---|
| DESIGNED | RW.1764 | REVIEWED | |
| DRAWN | | SUBMITTED | |
| CHECKED | RS.8231 | RECOMMENDED | |
| PROJECT MANAGER | 28/10/2021 DATE | APPROVED | |

DRAWING NO. AKP-EM-08
SHEET NO. 116 OF 129

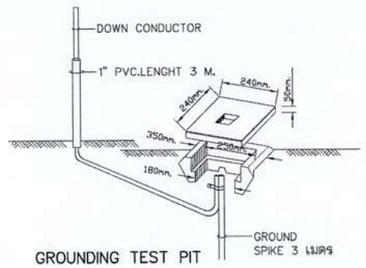
| | | | | | | | |
|---|---|---|---|---|---|---|---|
|  CABLE CONNECTION |  TEE SPLICE |  SHEET METAL BONDING |  HEAVY DUTY CAST CABLE SADDLE DETAIL COPPER STRAP CLAMP |  STRAIGHT CLAMP SQUARE CLAMP (CROSS TEE) COPPER STRAP CLAMP | AIR TERMINAL TIP  AIR TERMINAL AIR TERMINAL SADDLE  AIR TERMINAL SADDLE |  COPPER CLAD Ø5/8" OVERALL LENGTH 3000 mm. GROUND ROD. |  COPPER BAR TO GROUND ROD |
|  CABLE CROSS CONNECTION |  DOUBLE CABLE CONNECTION |  CABLE TO GROUND ROD |  COPPER STRAP CONNECTION, HORIZONTAL |  COPPER STRAP CONNECTION VERTICAL | | |  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 | | |  COPPER BAR TO GROUND ROD |



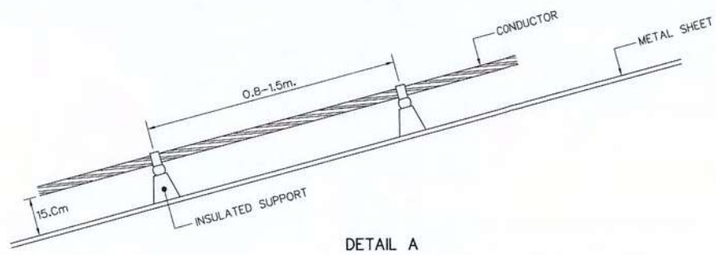
AIR TERMINAL



AIR TERMINAL



GROUNDING TEST PIT



DETAIL A

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 1/3)

| NO. | DATE | REVISIONS | CHECKED | APPROVED |
|---|---|---|---|---|
| 3 | | | | |
| 2 | | | | |
| 1 | | | | |

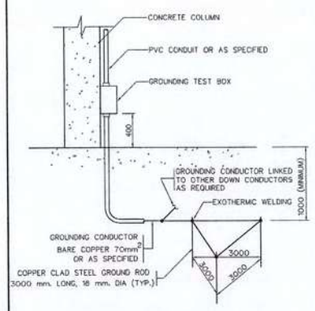
CONSULTANTS | DEDE

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

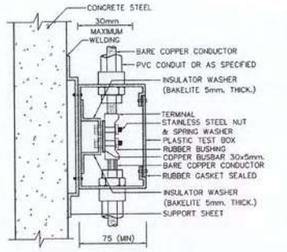
DESIGNED สพท.1764
DRAWN
CHECKED สธ.8231
28/10/2021
PROJECT MANAGER DATE

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

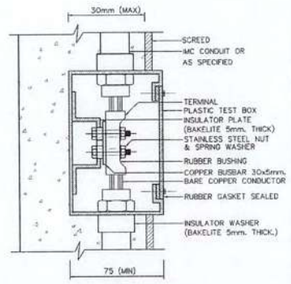
DRAWING NO. AKP-EM-09
SHEET NO. 117 OF 129



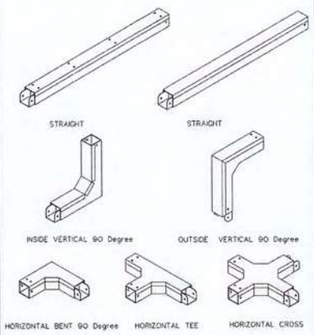

DETAIL–GROUNDING INSTALLATION FOR LIGHTNING PROTECTION WITH SURFACE MOUNTED TEST BOX



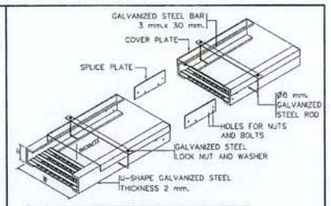

DETAIL–SURFACE MOUNTED GROUND TEST BOX




DETAIL–RECESS MOUNTED GROUND TEST BOX



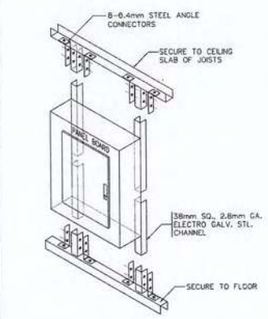

WIREWAY



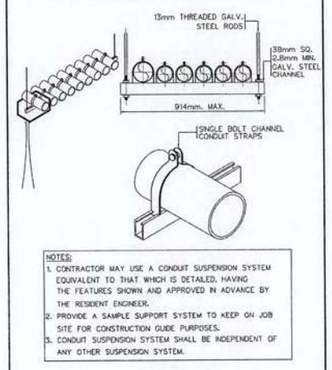

| SIZE OF WIREWAY (mm.) | W (mm.) | H (mm.) | THICKNESS (mm.) |
|---|---|---|---|
| 200 x 100 | 200 | 100 | 2.00 |
| 300 x 100 | 300 | 100 | 2.00 |
| 400 x 100 | 400 | 100 | 2.00 |
| 500 x 100 | 500 | 100 | 2.00 |
| 600 x 100 | 600 | 100 | 2.00 |
| 700 x 100 | 700 | 100 | 2.00 |
| 800 x 100 | 800 | 100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

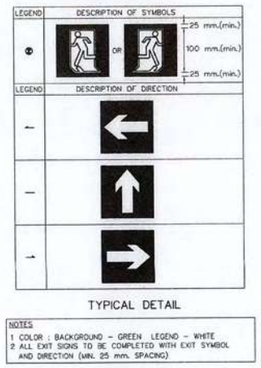



DETAIL–PANEL BOARD INSTALLATION ON DRYWALL




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.

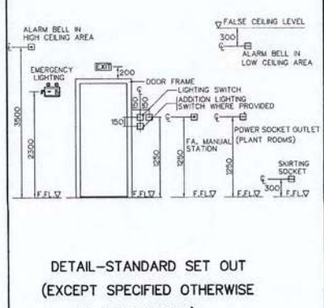
DETAIL–CONDUIT HANGER



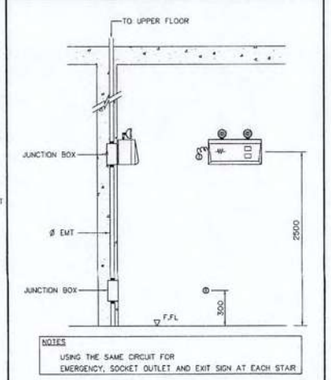

TYPICAL DETAIL

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

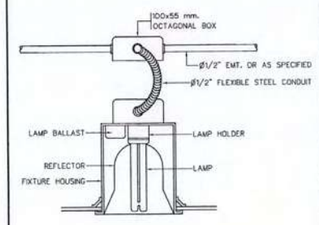



DETAIL–STANDARD SET OUT (EXCEPT SPECIFIED OTHERWISE ON THE LAYOUT)

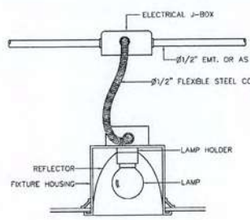



NOTES
USING THE SAME CIRCUIT FOR EMERGENCY, SOCKET OUTLET AND EXIT SIGN AT EACH STAIR

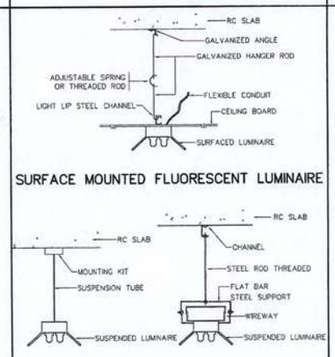
DETAIL–EMERGENCY AND OUTLET AT STAIR



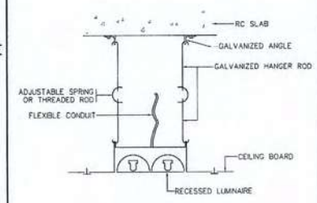

RECESSED MOUNTED DOWNLIGHT



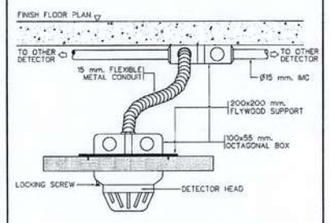

RECESSED MOUNTED DOWNLIGHT




SUSPENSION MOUNTED FLUORESCENT LUMINAIRE




RECESSED MOUNTED FLUORESCENT LUMINAIRE




FLUSH MOUNTED DETECTOR DETAIL

| NO. | DATE | REVISIONS | CHECKED | APPROVED |
|---|---|---|---|---|
| 3 | | | | |
| 2 | | | | |
| 1 | | | | |

CONSULTANTS | DEDE

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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

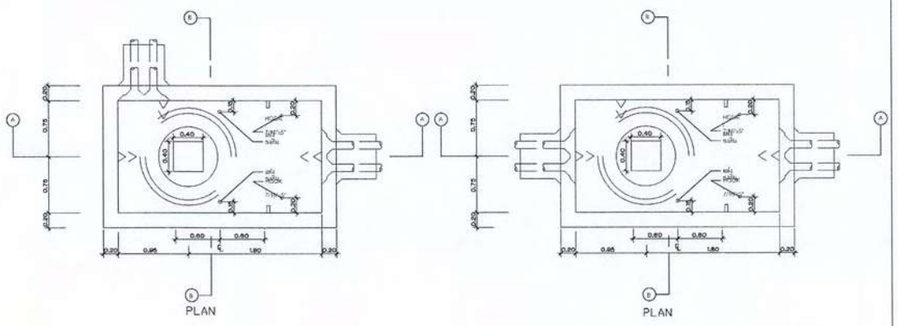
PART 2 ELECTRO–MECHANICAL EQUIPMENT
E&M EQUIPMENT
TYPICAL DETAILS FOR INSTALLATION (SHEET 2/3)

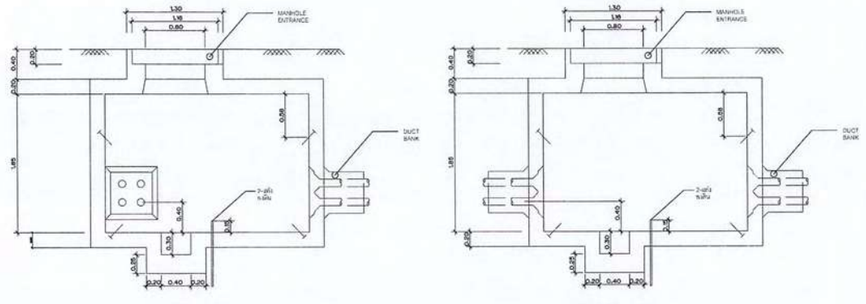
PCM P&C MANAGEMENT CO., LTD.
SPT CONSULTANTS CO., LTD.

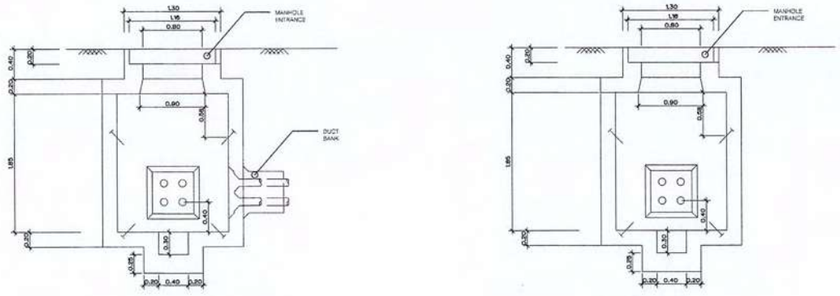
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|---|---|---|---|
| DESIGNED | RWN.1764 | REVIEWED | |
| DRAWN | | SUBMITTED | |
| CHECKED | Rti.8231 | RECOMMENDED | |
| PROJECT MANAGER | 28/10/2021 DATE | APPROVED | |

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

DRAWING NO. AKP–EM–10
SHEET NO. 118 OF 129

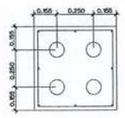


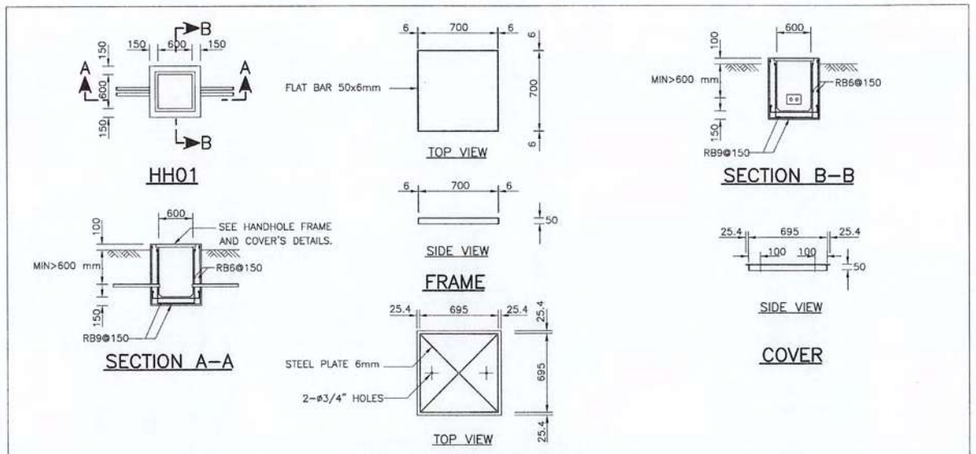




DETAIL OF MH2 (MANHOLE TYPE A-3)2 WAYS , 90 DEGREE)

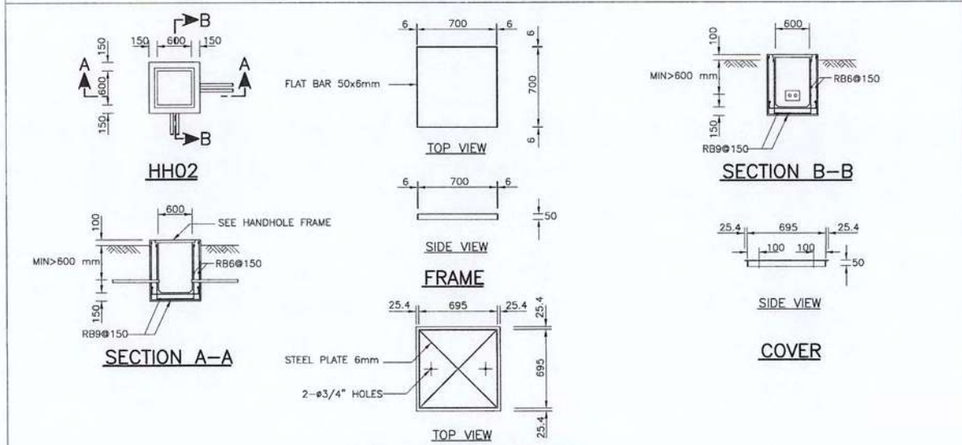
DETAIL OF MH1 (MANHOLE TYPE A-3)(2 WAYS)



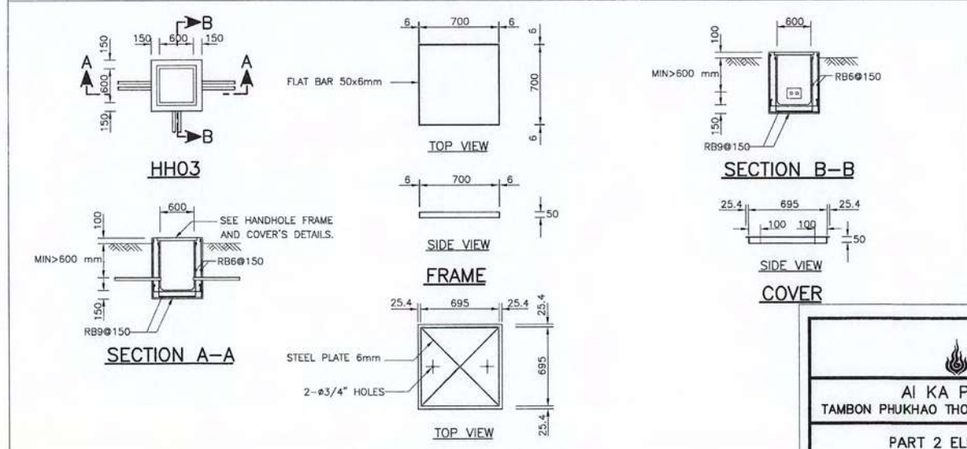

TYPICAL DETAIL FOR HIGH VOLTAGE MANHOLE




DETAIL HANDHOLE TYPE 1




DETAIL HANDHOLE TYPE 2




DETAIL HANDHOLE TYPE 3

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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 3/3)

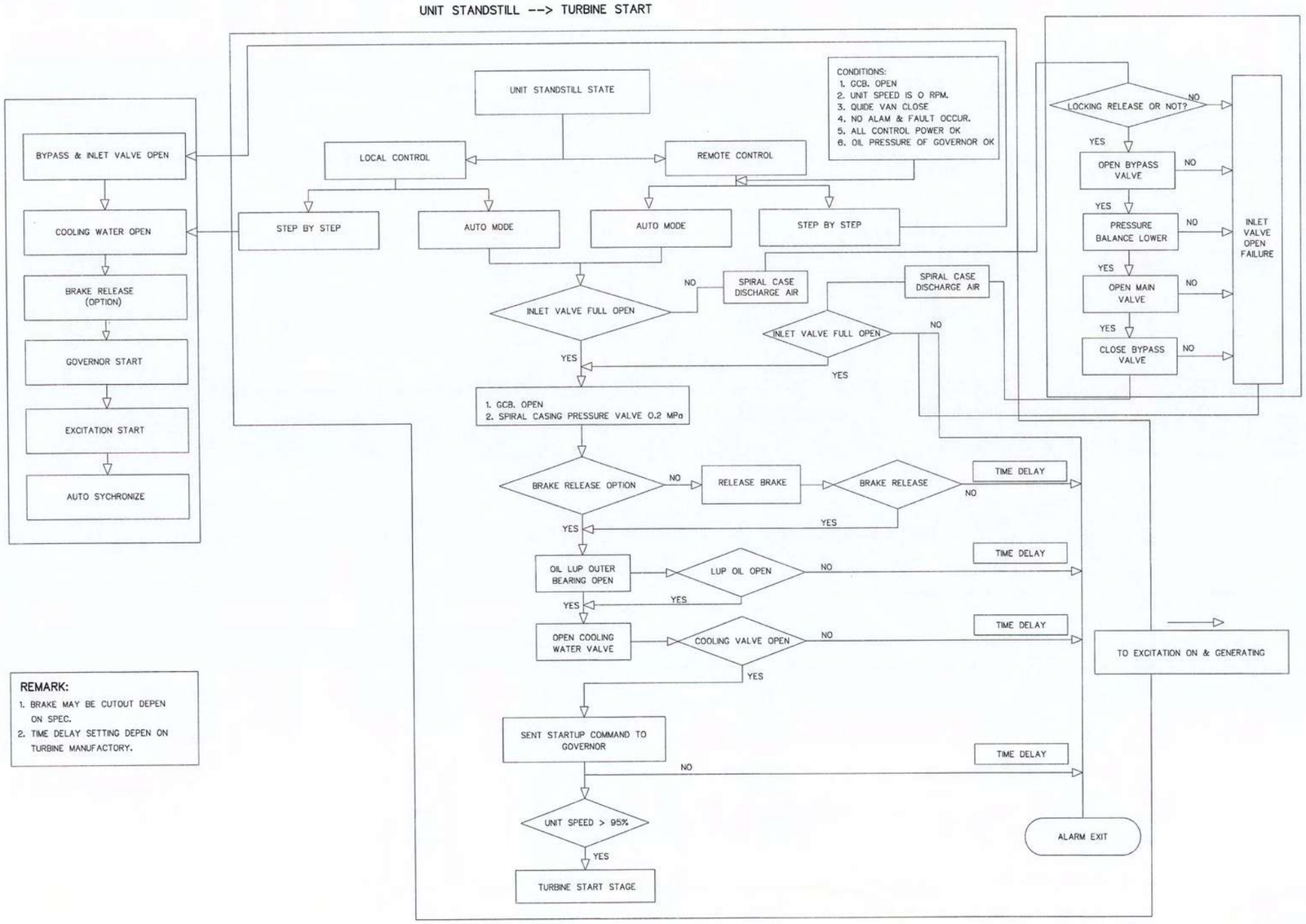
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| DRAWN | |
| CHECKED | สถ.8231 |
| PROJECT MANAGER | 28/10/2021 (DATE) |
| REVIEWED | |
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| RECOMMENDED | |
| APPROVED | |
| DRAWING NO. | AKP-EM-11 |
| SHEET NO. | 119 OF 129 |

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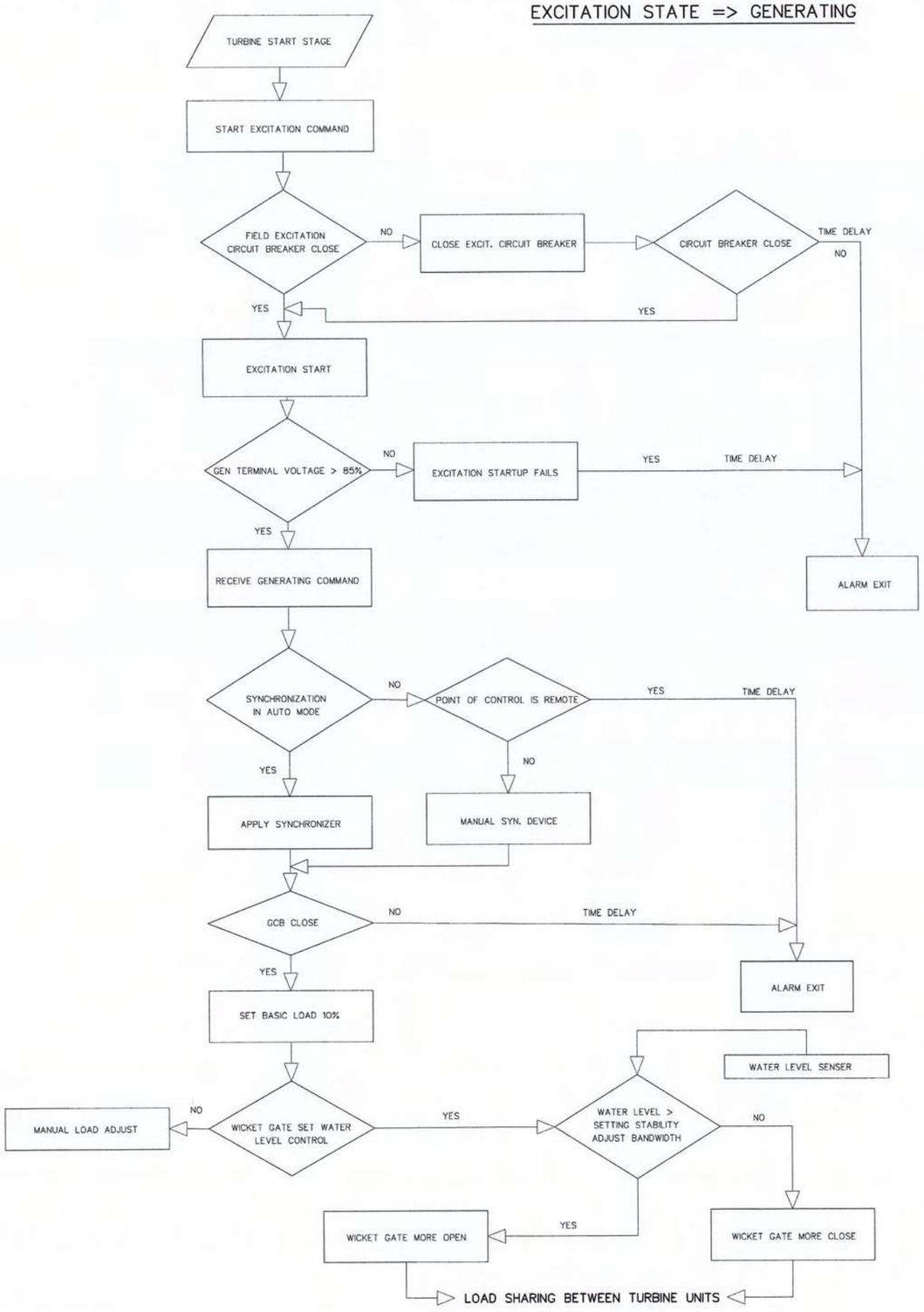
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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

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

| | | | |
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| DESIGNED | 27.1950 | REVIEWED | |
| DRAWN | | SUBMITTED | |
| CHECKED | 28.8231 | 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 |
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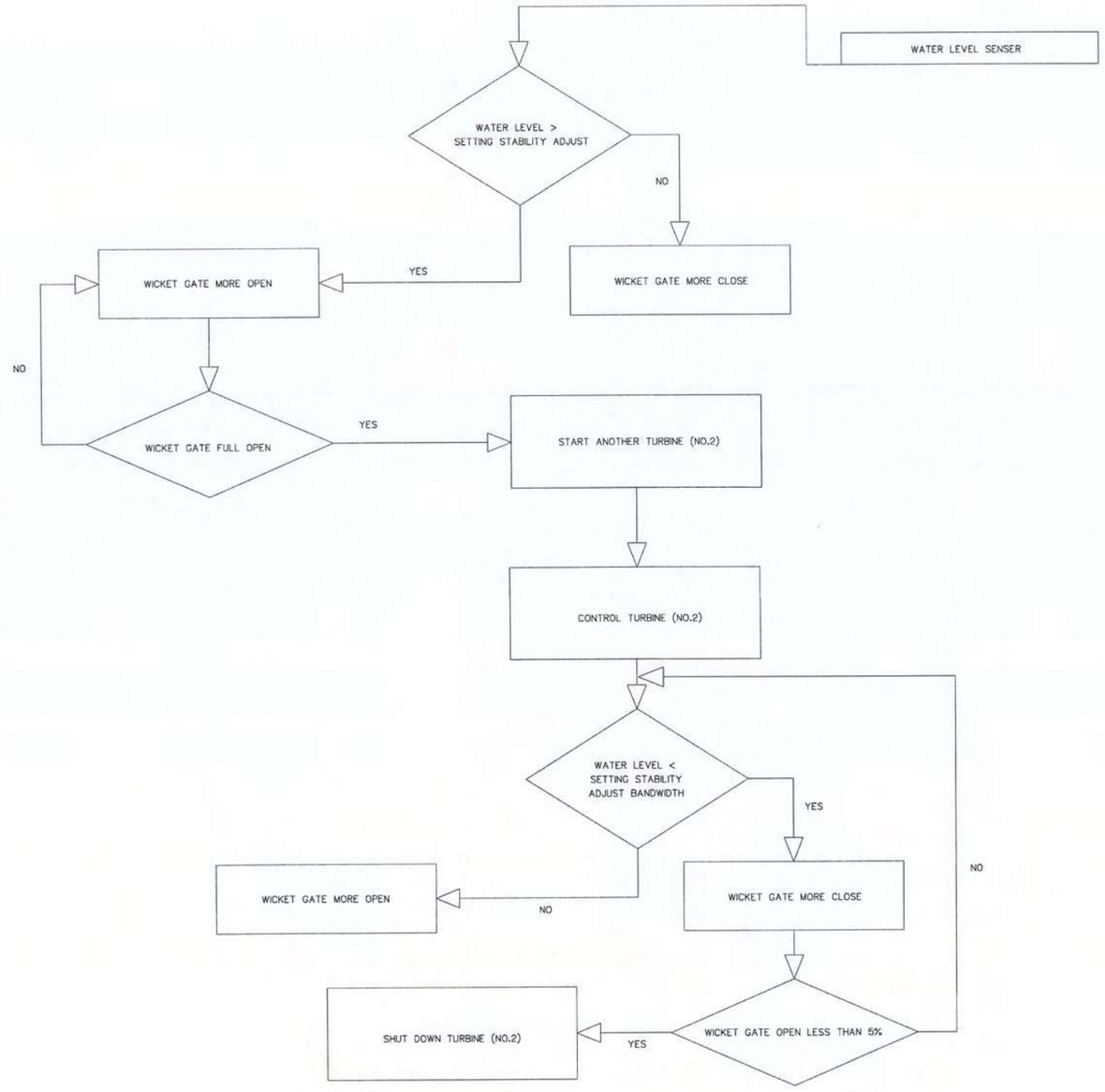
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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

PART 2 ELECTRO-MECHANICAL EQUIPMENT
E&M EQUIPMENT
EXCITATION

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| CHECKED 28.8231 | 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 |
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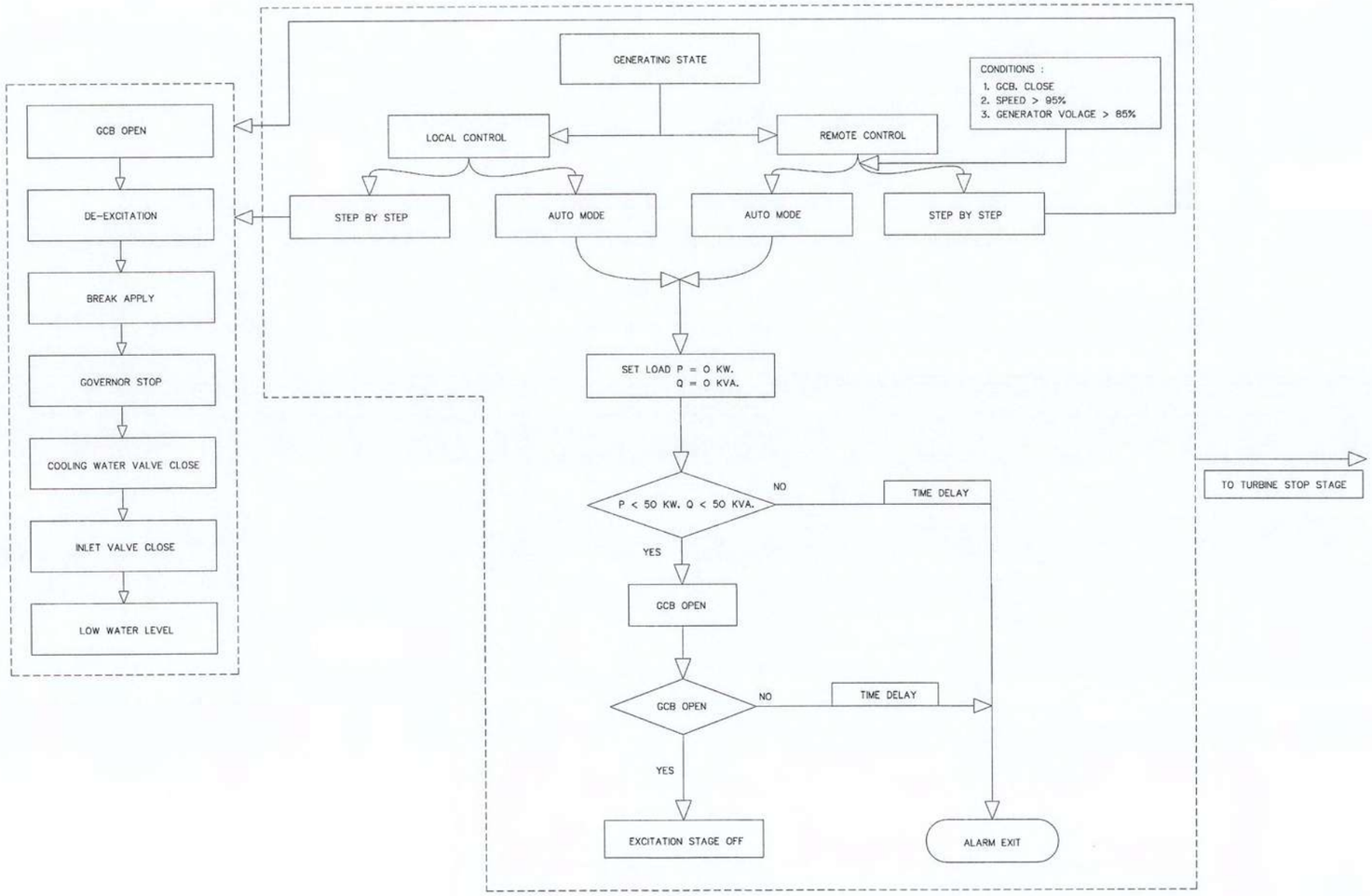
AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

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

| | |
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| PROJECT MANAGER 28/10/2021 DATE | APPROVED |
| DRAWING NO. AKP-EM-14 | SHEET NO. 122 OF 129 |

# GENERATING => EXCITATION OFF

(FRANCIS TURBINE 2 UNITS)




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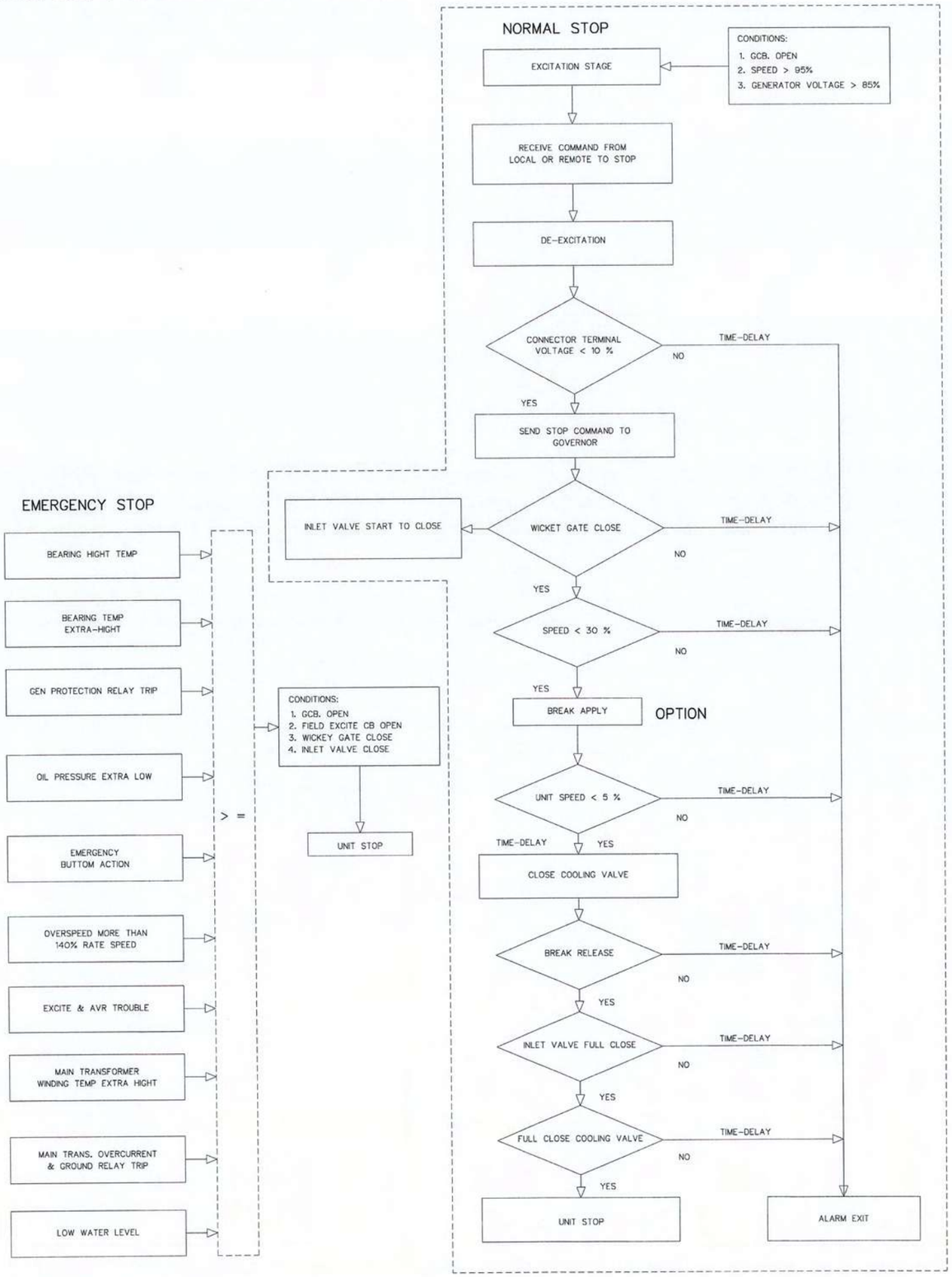
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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

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

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| PROJECT MANAGER 28/10/2021 DATE | APPROVED |
| DRAWING NO. AKP-EM-15 | SHEET NO. 123 OF 129 |

# TURBINE STOP : DE-EXCITATION ==> UNIT STOP




| 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
TURBINE STOP

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| DRAWING NO. AKP-EM-16 | SHEET NO. 124 OF 129 |

## SYMBOL LEGEND

| NAME | ISOLATION VALVE | EQUATION 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 MANU 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 | 5/2 WAYS DIRECTIONAL CONTROL VALVE | THROTTLE CHECK VALVE | NON - RETURN VALVE | | | | |
| SYMBOL | | | | | | | | |
| NAME | MANUAL 3 WAY VALVE | ADJUST SWITCH | MICRO-ADJUST SWITCH | SPRING WARMFILL OPERATED | | | | |
| SYMBOL | | | | | | | | |
| NAME | LEVEL INDICATOR (BUILT MOUNTED) | BLADDER ACCUMULATOR | FILTING 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.

**MIV SERVOMOTOR - 1 Nos.**

OPENING BY OIL & CLOSING COUNTERWEIGHT
OPENING TIME = 60 Sec.
CLOSING TIME = 60 Sec.

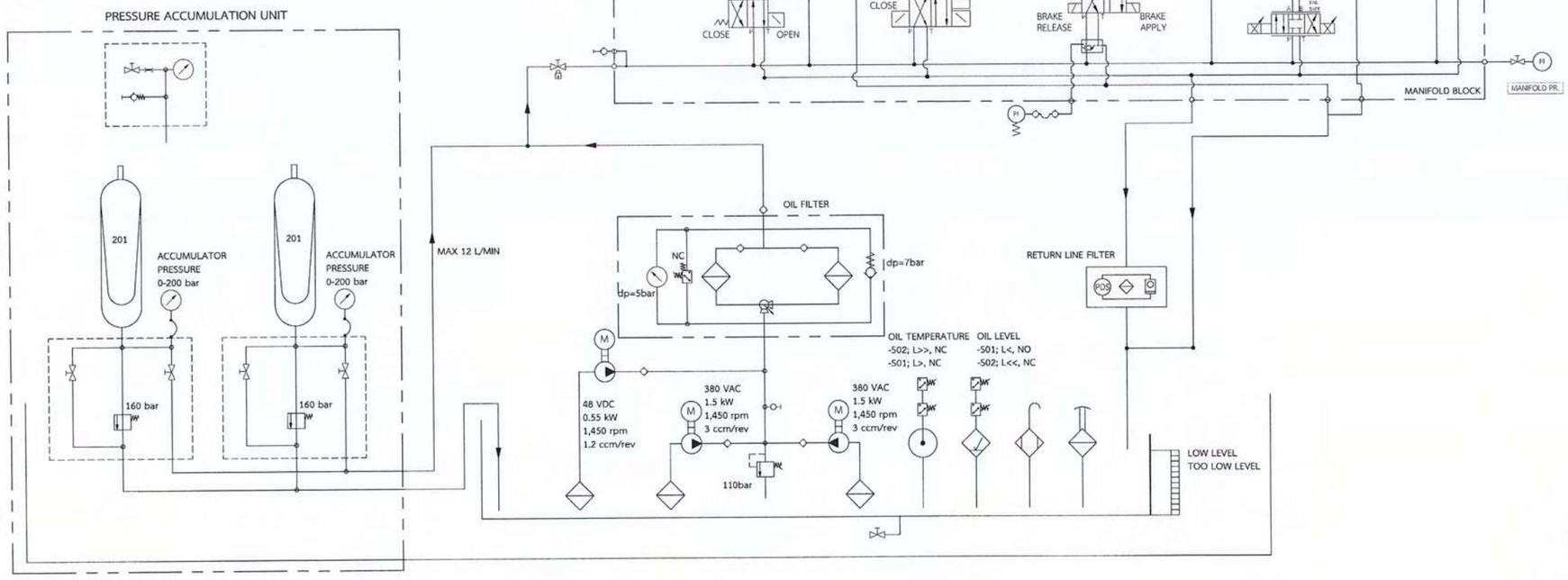
**BRAKING & LIFTING SERVOMOTOR - 3 Nos.**

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




### 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.

| 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

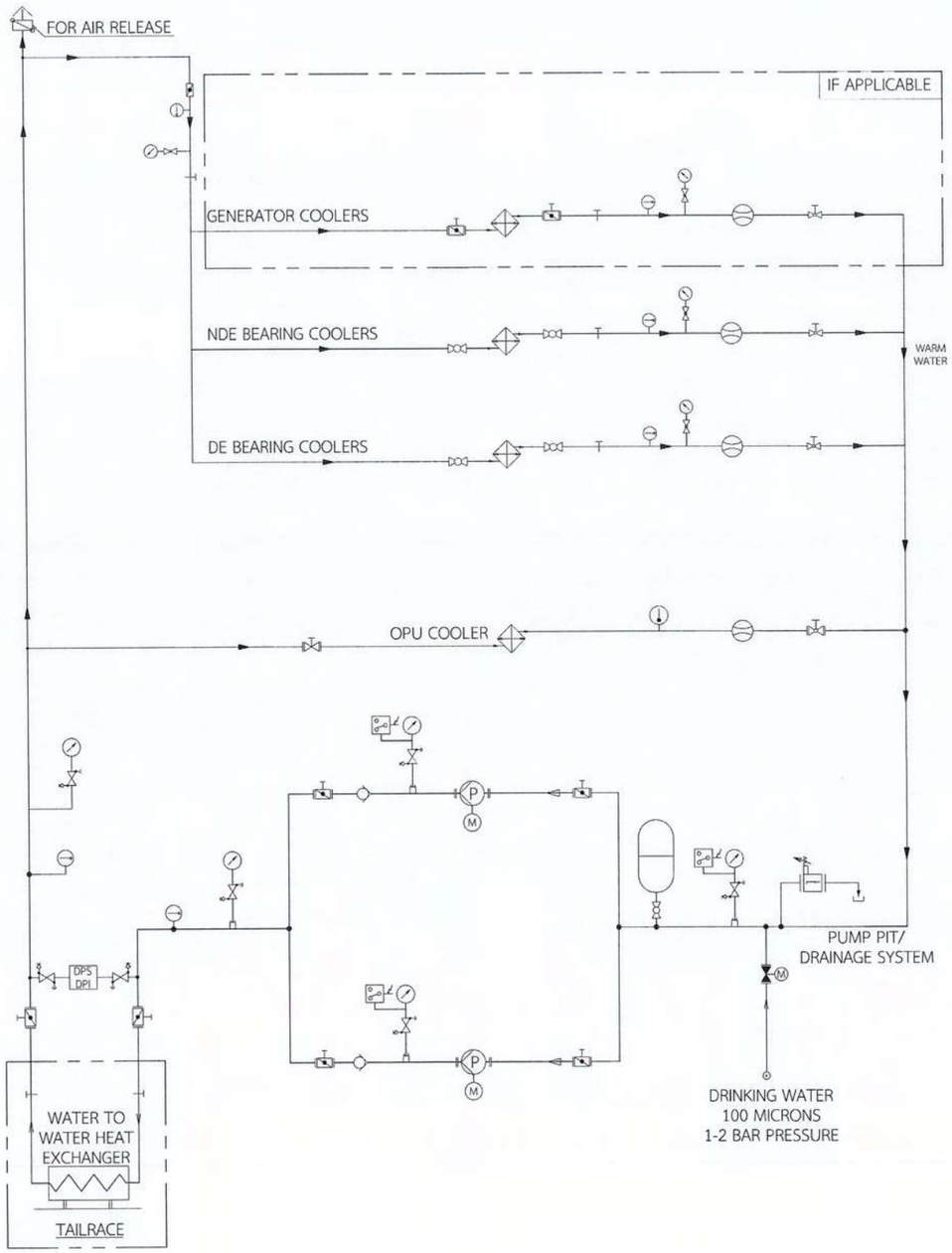
SCHEMATIC DIAGRAM OF OIL PRESSURE UNIT FOR TURBINE, BRAKE AND MIV

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

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| PROJECT MANAGER | 28/10/2021 DATE | APPROVED | |

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.

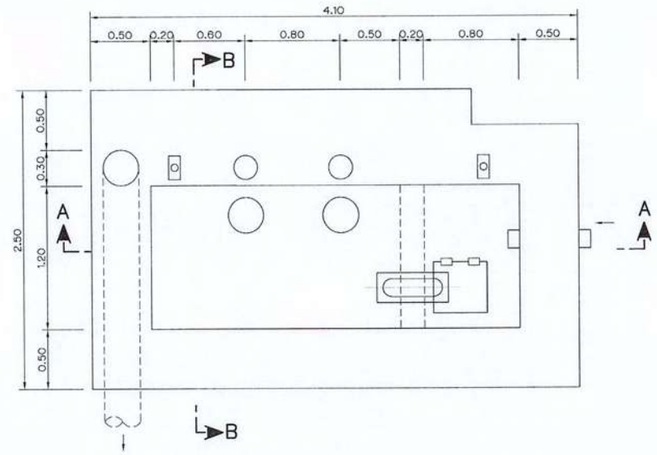
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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

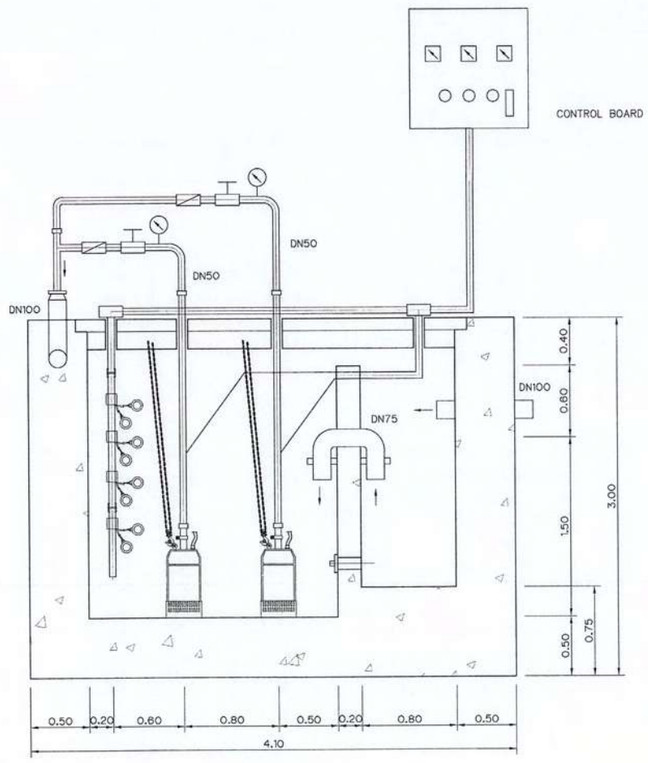
PART 2 ELECTRO−MECHANICAL EQUIPMENT
E&M EQUIPMENT
SCHEMATIC DIAGRAM FOR COOLING WATER SYSTEM

| | |
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| 28/10/2021 PROJECT MANAGER DATE | DRAWING NO. AKP−EM−18 / SHEET NO. 126 OF 129 |

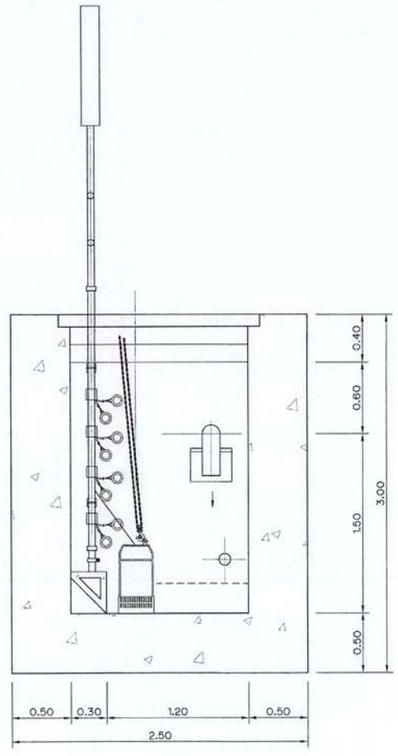



TOP VIEW
SCALE 1:25

| 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

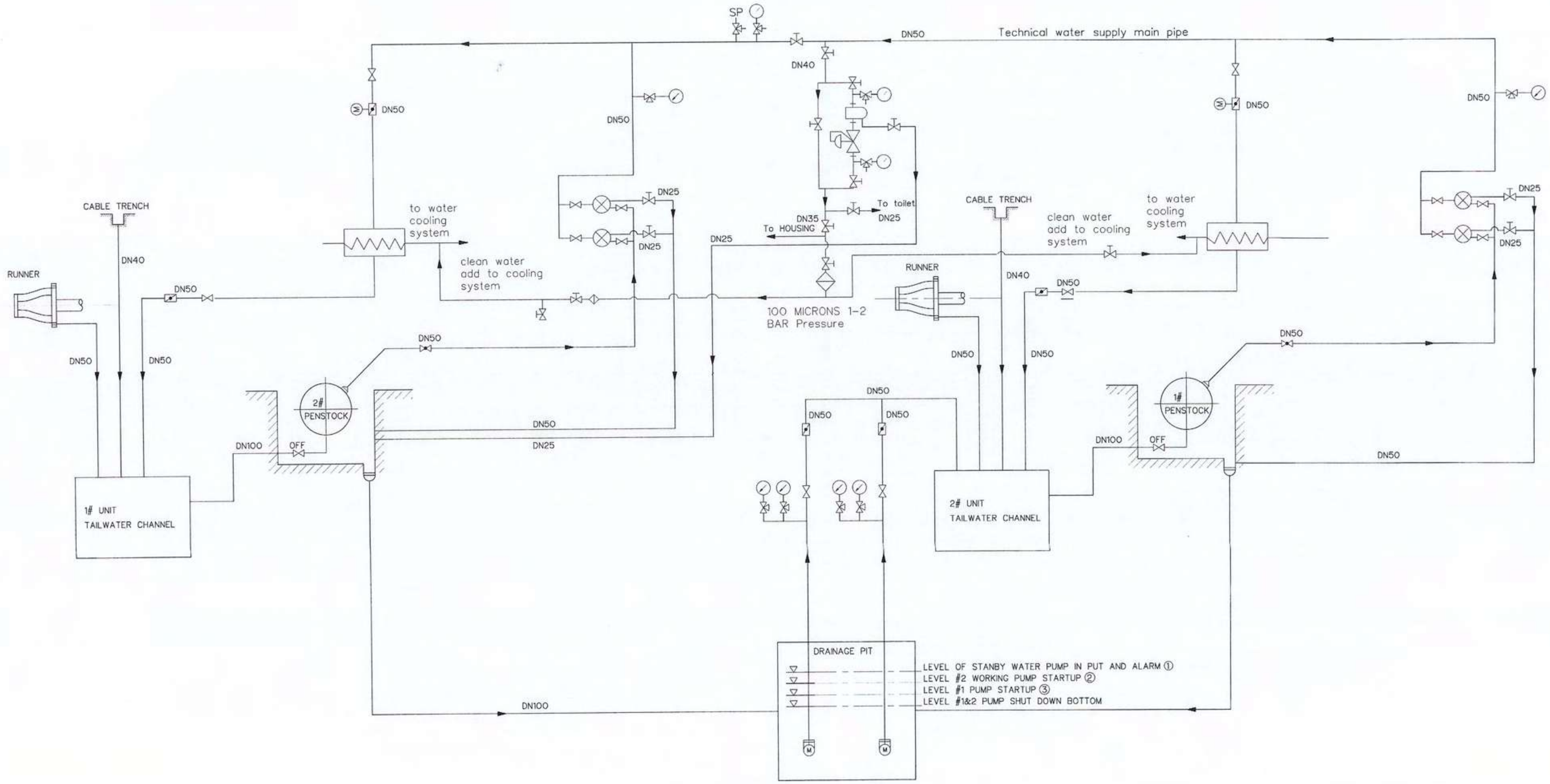
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SUBMITTED
RECOMMENDED
APPROVED

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 | | 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 |

| 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

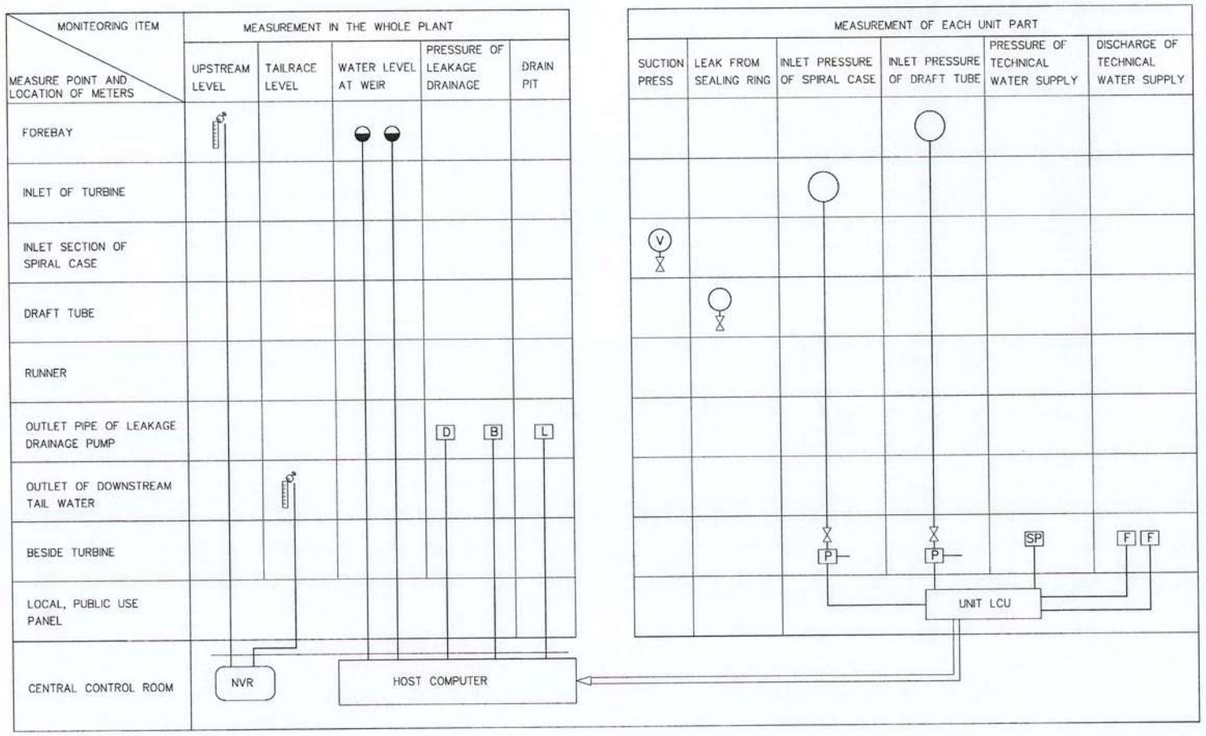
E&M EQUIPMENT

SCHEMATIC DIAGRAM FOR COOLING WATER SUPPLY & DRAINAGE SYSTEM

PCM P&C MANAGEMENT CO., LTD.
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| PROJECT MANAGER | DATE 28/10/2021 | APPROVED | |
| | | 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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AI KA PO HYDROPOWER PROJECT
TAMBON PHUKHAO THONG AMPHOE SUKHIRIN CHANGWAT NARATHIWAT

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