Department of Alternative
Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI PA PU HYDROPOWER PROJECT

CHANGWAT TAK

CONTRACT C1

CIVIL WORKS AND TRANSMISSION LINE

VOLUME 4

DRAWINGS

MAHA NAKORN CO.,LTD.

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HUAI PA PU HYDROPOWER PROJECT

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ACCESS ROAD		
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17	HPP-AR-11	R.C. PIPE CULVERT
18	HPP-AR-12	NO.2, BOX CULVERT STA.1+456.600, PLAN AND SECTIONS
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WEIR		
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48	HPP-FB-06	DETAIL OF TRASHRACK AND JOINT
49	HPP-FB-07	0.70 X 0.70 M. SAND SLUICE GATE, GATE INSTALLATION
50	HPP-FB-08	0.70 X 0.70 M. SAND SLUICE GATE, DETAILS
51	HPP-FB-09	0.70 M. DAI. SLUICE GATE, GATE INSTALLATION
52	HPP-FB-10	0.70 M. DAI. SLUICE GATE, GATE DETAILS
53	HPP-FB-11	GATE LIFT, CAPACITY 3.0 TONS

SHEET NO.	DRAWING NO.	DRAWING DETAILS
O&M ROAD		
54	HPP-OM-01	PLAN AND PROFILE, STA. 0+000.000 TO STA. 0+137.376
55	HPP-OM-02	TYPICAL SECTIONS AND DETAILS
56	HPP-OM-03	PIPE CULVERT STA. 0+081.091, PLAN AND SECTIONS
57	HPP-OM-04	PIPE CULVERT STA. 0+081.091, REINFORCEMENT DETAILS
PENSTOCK		
58	HPP-PS-01	PLAN AND PROFILE, STA. 0+000.000 TO STA. 0+200.000
59	HPP-PS-02	PLAN AND PROFILE, STA. 0+200.000 TO STA. 0+373.556
60	HPP-PS-03	ANCHOR BLOCK NO.1, 2, 3, 4, 5 PLAN AND SECTIONS
61	HPP-PS-04	EXPANSION JOINT, PLAN, SECTIONS AND DETAILS
62	HPP-PS-05	PIPE SUPPORT, PLAN, SECTIONS AND DETAILS
63	HPP-PS-06	BEND DETAILS
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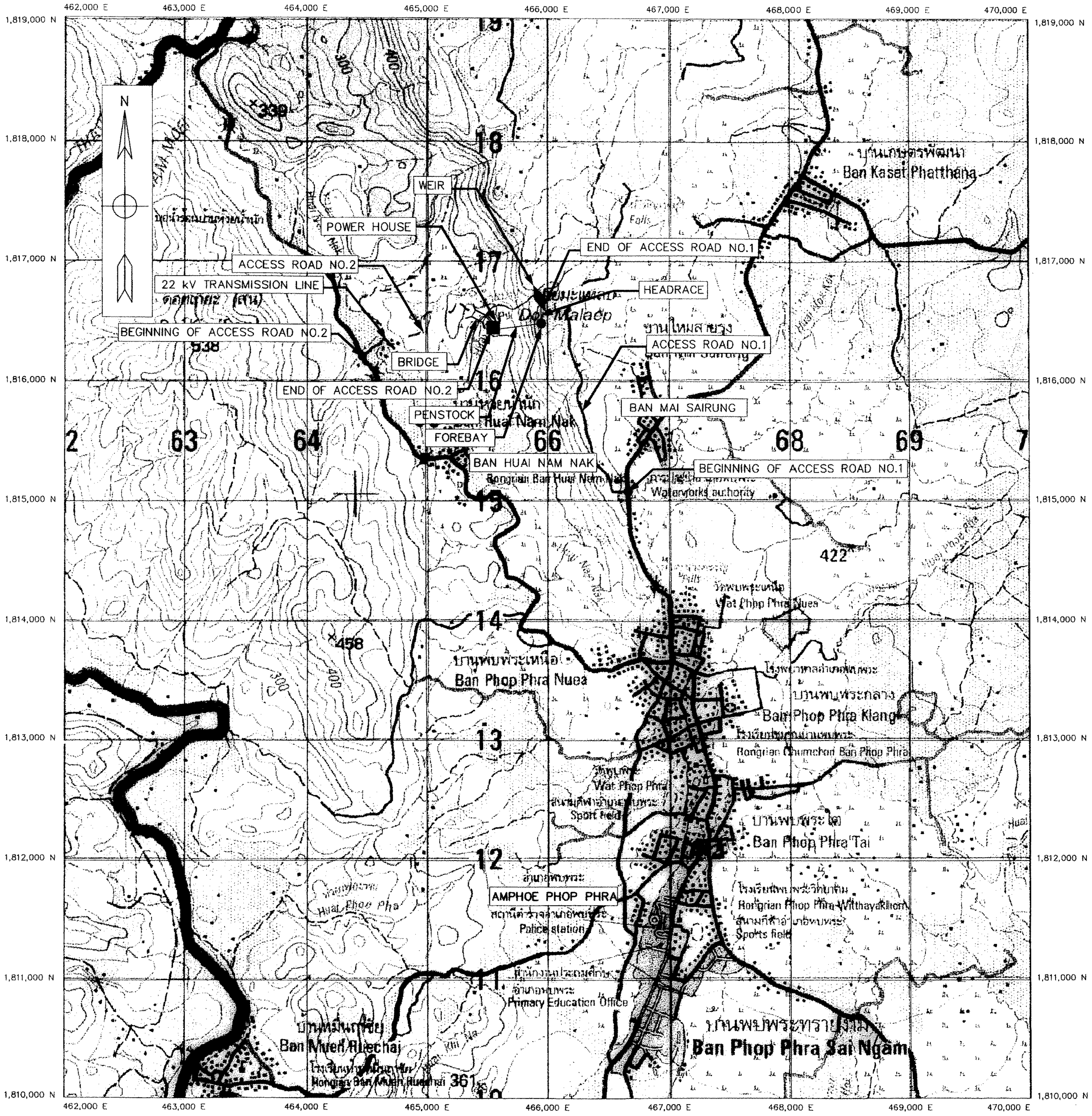
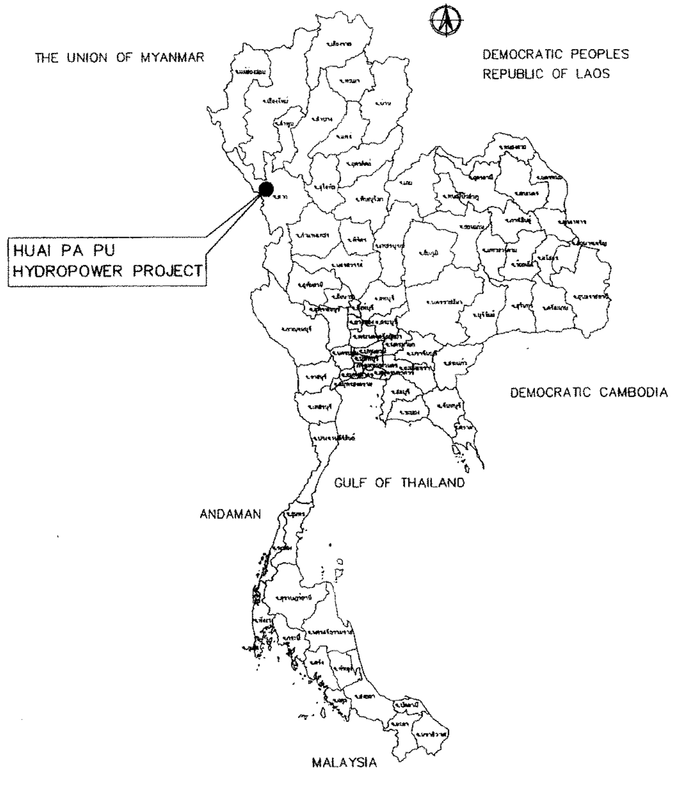
69	HPP-PH-04	ELEVATIONS
70	HPP-PH-05	DETAILS OF TOILET, SEPTIC AND SEEPAGE TANK
71	HPP-PH-06	DETAIL OF DOORS, WINDOWS AND NAME PLATE
72	HPP-PH-07	GROUND FLOOR FRAMING PLAN AND DETAILS
73	HPP-PH-08	ROOF BEAM AND TRUSS PLANS
74	HPP-PH-09	BEAM REINFORCEMENT DETAILS
75	HPP-PH-10	TRUSS T-1, T-2 AND T-3
76	HPP-PH-11	DETAILS TRUSS T-1, T-2 AND T-3
77	HPP-PH-12	COLUMN DETAILS
78	HPP-PH-13	CABLE TRENCH DETAILS
79	HPP-PH-14	ELECTRICAL LIGHTING PLAN EXHAUST AND OUTLET PLAN
80	HPP-PH-15	EXTERIOR LIGHTING PLAN
81	HPP-PH-16	WATER SUPPLY PIPELINE SYSTEM LAY-OUT
82	HPP-PH-17	PIT VALVE, FIELD TAP, DITCH AND SLOPE PROTECTION DETAILS
83	HPP-PH-18	WIRE MESH FENCE AND GATE WIDTH 1.00 M.
84	HPP-PH-19	MOVABLE STEEL BARRICADE
TAILRACE		
85	HPP-TR-01	PLAN
86	HPP-TR-02	SECTIONS AND DETAILS
87	HPP-TR-03	REINFORCEMENT DETAILS 1
88	HPP-TR-04	REINFORCEMENT DETAILS 2
TRANSMISSION LINE		
89	HPP-TS-01	GENERAL PLAN
90	HPP-TS-02	PLAN AND PROFILE STA. 0+000.000 TO STA. 0+600.000
91	HPP-TS-03	PLAN AND PROFILE STA. 0+600.000 TO STA. 1+200.000
92	HPP-TS-04	PLAN AND PROFILE STA. 1+200.000 TO STA. 1+725.000
93	HPP-TS-05	22 kV TRANSMISSION LINE TO WIER, PLAN
94	HPP-TS-06	POLE TYPE "A", "B" AND "C"
95	HPP-TS-07	POLE TYPE "D", "E" AND "F"
96	HPP-TS-08	POLE TYPE "G", "H" AND "I"
97	HPP-TS-09	TYPE OF ANCHOR GUY
98	HPP-TS-10	POLE ASSEMBLY ACCESSORIES, ANCHOR BOLT FOR GUY
99	HPP-TS-11	OVERHEAD GROUND WIRE BAYONET ASSEMBLY
100	HPP-TS-12	BURYING DEPTH, FOUNDATION AND UNDERGROUND CABLE LAYING



PROJECT AREA MAP

SCALE 1:20,000



LOCATION MAP

NOT TO SCALE

LEGENDS :

—(1206)—	HIGHWAY
〰	STREAM
◆	WEIR
— · —	HEADRACE
●	FOREBAY
— · —	PENSTOCK
■	POWERHOUSE
- - - -	EXISTING ROAD
— · · —	ACCESS ROAD
· · · ·	O&M ROAD
⌘	BRIDGE
——	PROPOSEED TRANSMISSION LINE

0 500 1,000 1,500

SCALE 1:20,000 METERS

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
GENERAL
LOCATION MAP AND PROJECT AREA MAP

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

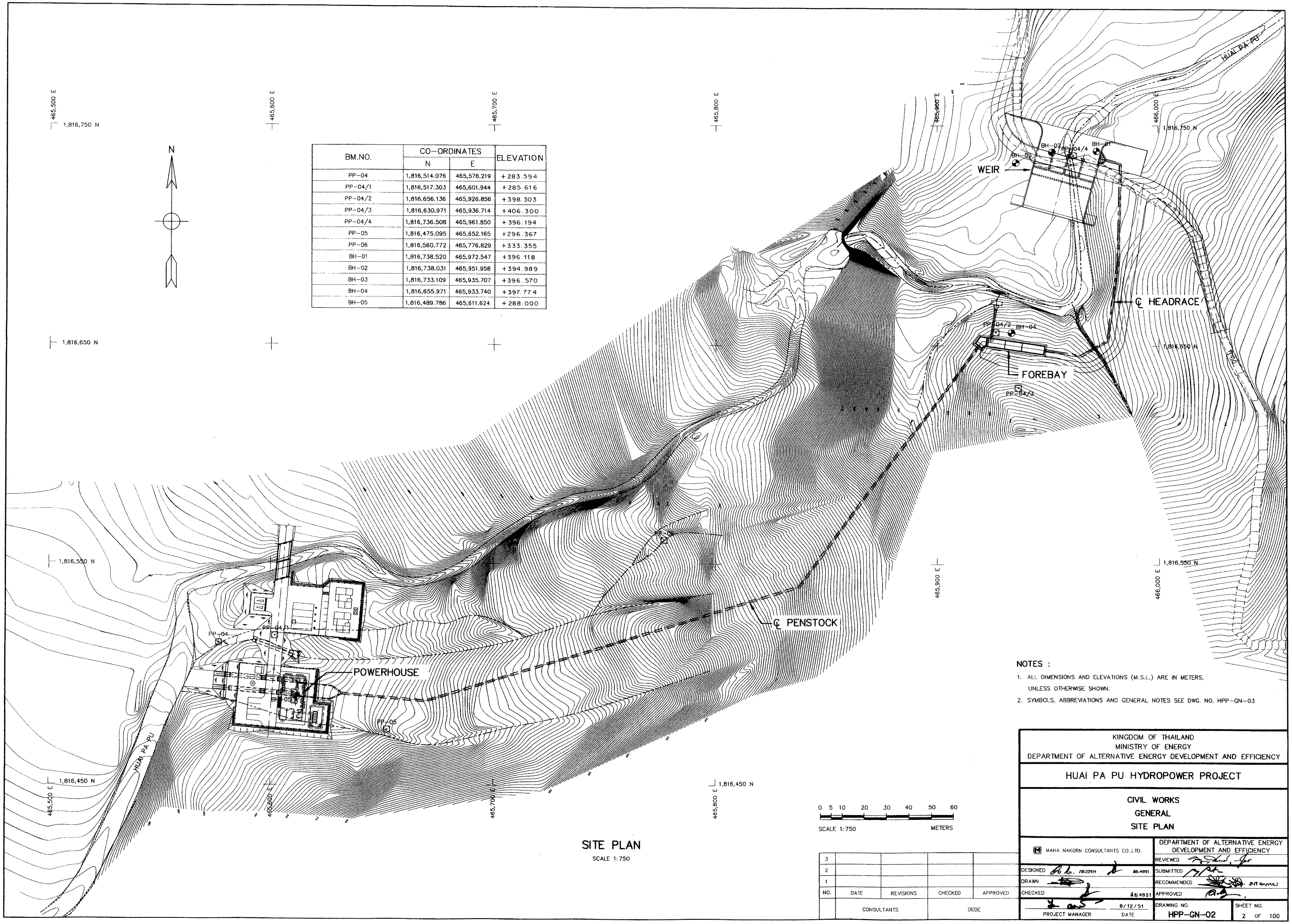
MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED ภย.22514 วย.4651
DRAWN
CHECKED วย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-GN-01

SHEET NO. 1 OF 100



BM.NO.	CO-ORDINATES		ELEVATION
	N	E	
PP-04	1,816,514.076	465,576.219	+283.594
PP-04/1	1,816,517.303	465,601.944	+285.616
PP-04/2	1,816,656.136	465,926.856	+398.303
PP-04/3	1,816,630.971	465,936.714	+406.300
PP-04/4	1,816,736.508	465,961.850	+396.194
PP-05	1,816,475.095	465,652.165	+296.367
PP-06	1,816,560.772	465,776.829	+333.355
BH-01	1,816,738.520	465,972.547	+396.118
BH-02	1,816,738.031	465,951.958	+394.989
BH-03	1,816,733.109	465,935.707	+396.570
BH-04	1,816,655.971	465,933.740	+397.774
BH-05	1,816,489.786	465,611.624	+288.000

SITE PLAN
SCALE 1:750

NOTES :

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

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
GENERAL
SITE PLAN

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

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภย.22514 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

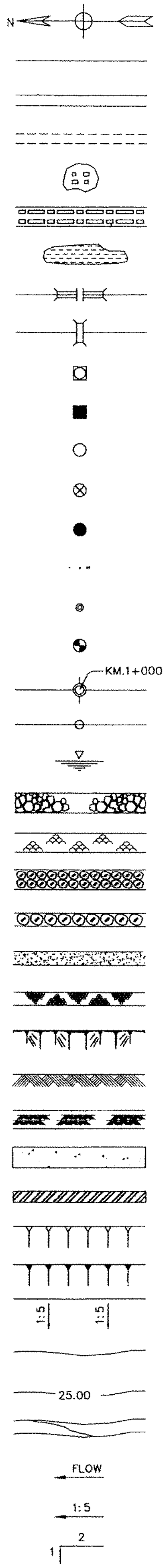
DRAWING NO. HPP-GN-02
SHEET NO. 2 OF 100

ABBREVIATIONS :

A	CROSS-SECTION AREA OF FLOW
AC.	ASBESTOS CEMENT PIPE
AGG.	AGGREGATE
ALT.	ALTERNATIVE
APPROX.	APPROXIMATE
AZ.	AZIMUTH
B.	BEGINNING OF SURVEY
BC.	BEGINNING OF CURVE
BF.	BOTTOM FACE
B	BEAM
B.M.	BENCH MARK
BOTT.	BOTTOM
BRG.	BEARING
C.B.R.	CALIFORNIA BEARING RATIO
C/C	CENTER TO CENTER
℄	CENTER LINE
CL.	CLEARANCE
CM. OR cm.	CENTIMETER
CM./S OR cm./s	CENTIMETER PER SECOND
COL.	COLUMN
CONC.	CONCRETE
D	DEGREE OF CURVE
DB.	DEFORM BAR
d.	DEPTH OF WATER
DIA. OR ø	DIAMETER
DOH.	DEPARTMENT OF HIGHWAY
DWG.	DRAWING
DEDE.	DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
E	EAST
E	END OF SURVEY
EA.	EACH
E.C.	END OF CURVE
E.F.	END OF FACE
EL. OR ELEV.	ELEVATION
EXIST.	EXISTING
EXP.	EXPANSION
EXT.	EXTERIOR
EX.	EXTERNAL DISTANCE OF CURVE
f	FREE BOARD , FINISH
F.F.	FAR FACE
F.S.L.	FULL SUPPLY LEVEL
FTG.	FOOTING
HD.	HEAD
HEX.	HEXAGONAL
HOR.	HORIZONTAL
I.D.	INSIDE DIAMETER
I.F.	INSIDE FACE
IN. OR "	INCH
INT.	INTERIOR
INV.	INVERT
Kg.	KILOGRAM
Km.	KILOMETER
KPH.	KILOMETER PER HOUR
KSC.	KILOGRAM PER SQUARE CENTIMETER
L	LENGTH OF CURVE
LC.	LENGTH OF HORIZONTAL CURVE
LONG.	LONGITUDINAL
LT.	LEFT
L.W.L.	LOW WATER LEVEL
M. OR m.	METER
$M.^2$ OR $m.^2$	SQUARE METER
$M.^3$ OR $m.^3$	CUBIC METER
MM. OR mm.	MILLIMETER
M./S OR m./s	METER PER SECOND
MIN.	MINIMUM

MAX.	MAXIMUM
M.S.L.	MEAN SEA LEVEL
MISC.	MISCELLANEOUS
N.	NORTH
n.	MANNING'S ROUGHINESS COEFFICIENT
N.F.	NEAR FACE
NGL.	NATURAL GROUND LEVEL
NO. OR #	NUMBER
N.W.L.	NORMAL WATER LEVEL
OD.	OUTSIDE DIAMETER
O.F.	OUTSIDE FACE
O&M	OPERATION & MAINTENANCE
PC.	POINT OF HONRIZONTAL CURVATURE
PI.	POINT OF HORIZONTAL INTERSECTION
PL.	PLATE
P.O.C.	POINT ON CURVE
P.O.T.	POINT ON TANGENT
P.O.S.T.	POINT ON SUB-TANGENT
PRC.	POINT OF HORIZONTAL REVERSE CURVE
PT.	POINT OF TANGENT
PVC.	POLYVINYL CHLORIDE
PVC.	POINT OF VERTICAL CURVATURE
PVI.	POINT OF VERTICAL INTERSECTION
PVRC.	POINT OF VERTICAL REVERSE CURVE
PVT.	POINT OF VERTICAL TANGENT
Q.	DISCHARGE
QTY. QUAN.	QUANTITY
R	RADIUS OF CURVATURE
r	HYDRAULIC RADIUS
Rø , ø	ROUND BAR
RC.	REINFORCED CONCRETE
RD.	ROAD
REF.	REFERENCE
REINF.	REINFORCEMENT
REQ'D	REQUIRED
RID.	ROYAL IRRIGATION DEPARTMENT
SCH.	SCHEDULE
SE.	SUPERELEVATION
SETC.	SECTION
S.P.C.T.	STANDARD PROCTOR COMPACTION TEST
S.S.	SIDE SLOPE
STIR.	STIRRUP
STA.	STATION
STD.	STANDARD
STR.	STRUCTURE
SYMM.	SYMMETRICAL
T.	TANGENT LENGTH , THICKNESS
T	TON
THK.	THICKNESS
T.F.	TOP FACE
T.I.S.	THAI INDUSTRIAL STANDARD
Ts.	SUPERELEVATION TRANSITION LENGTH
TYP.	TYPICAL
V.	VELOCITY OF FLOW
V.C.	VERTICAL CURVE
Vc.	LENGTH OF VERTICAL CURVE
VER.	VERTICAL
VOL.	VOLUME
W/	WITH
W.C.	WATER CLOSET
°	ANGLE
△	DEFLECTION ANGLE

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 OBLIGATION TO CHECK THE CORRECTION OF ALL RELEVANT LOCATIONS, DIMENSIONS, ELEVATIONS AND OTHER DATA AS PROVIDED BY THE DRAWINGS AND TECHNICAL SPECIFICATIONS BEFORE IMPLEMENTATION OF THE WORKS.
3. IN CASE OF ANY DETAILS NOT MENTIONED OR NOT SHOWN IN THE DRAWINGS OR TECHNICAL SPECIFICATIONS, OR IN CASE OF ANY DISCREPANCY, DEFECTIVE DESCRIPTION, ERROR, DIMENSION OR 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 CONFORM TO THE FOLLOWING TABLE OR AS DIRECTED BY FIELD ENGINEER.

EXISTING GROUND SLOPE 1:S	EARTH		HARD ROCK	
	1:S	1:S	1:S	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.

DESCRIPTION	fc' (ksc)
PRESTRESS CONCRETE	350
1. CONCRETE FOR SLAB IN BRIDGE 2. WEIR 3. FOREBAY 4. POWER HOUSE 5. TAILRACE	210
1. MANHOLE 2. ANCHOR	175
LEAN CONCRETE	140

2. UNLESS OTHERWISE SHOWN, THE FOLLOWING CLEAR COVERING OF CONCRETE OVER REINFORCEMENT SHALL BE USED :
   - FACE EXPOSED TO SCOUR 5.0 cm.
   - FACE EXPOSED TO EARTH OR WEATHER 7.5 cm.
   - FACE UNEXPOSED TO EARTH OR WEATHER 4.0 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 SHALL BE TREATED AS DIRECTED IN ORDER TO ASSURE THE BEST BOND.
6. A 5 cm. (MIN.) LAYER OF LEAN CONCRETE SHALL BE PLACED BELOW CONCRETE STRUCTURES.
7. THE STRUCTURES SHALL BE PLACED ON UNDISTURBED SOILS OR COMPACTED FILL AND BACKFILL AROUND THE STRUCTURES SHALL BE WELL 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. 24-2548
    - ROUND BARS (SR24) - T.I.S. 20-2543
12. ALLOWABLE BEARING CAPACITY OF FOUNDATION SHALL NOT BE LESS THAN AS FOLLOW :
    - WEIR Q_a = 25 $T/M.^2$
    - FOREBAY Q_a = 15 $T/M.^2$
    - HEADRACE Q_a = 10 $T/M.^2$
    - POWERHOUSE Q_a = 20 $T/M.^2$
    - PENSTOCK Q_a = 20 $T/M.^2$
    - BRIDGE Q_a = 20 $T/M.^2$

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
GENERAL
SYMBOLS, ABBREVIATIONS AND GENERAL NOTES

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED ภย.22514 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-GN-03
SHEET NO. 3 OF 100

TABLE 1 CLIMATOLOGICAL DATA FOR THE PERIOD 1971–2000

Station	MAE SOT	Elevation of station above M.S.L.	196	Meters
Index station	48375	Height of barometer above M.S.L.	197	Meters
Latitude	16 40 N	Height of thermometer above ground	1.50	Meters
Longitude	98 33 E	Height of wind vane above ground	11.50	Meters
		Height of rain gauge	0.86	Meters

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Pressure (Hectopascal)													
Mean	1012.3	1010.7	1009.1	1007.5	1006.2	1005.5	1005.8	1006.0	1007.3	1009.3	1011.5	1013.2	1008.7
Ext. max.	1023.1	1021.1	1021.4	1016.2	1014.0	1012.8	1012.1	1012.4	1014.9	1017.1	1021.2	1024.0	1024.0
Ext. min.	1002.6	1001.7	1000.2	999.0	997.4	997.1	997.0	997.3	998.6	999.9	1001.8	1003.4	997.0
Mean daily range	6.3	6.4	6.4	6.0	4.9	3.6	3.6	3.8	4.9	5.3	5.3	5.9	5.2
Temperature (Celsius)													
Mean	21.9	24.2	27.1	29.0	27.8	26.2	25.6	25.4	26.0	25.9	24.1	21.7	25.4
Mean max.	31.0	33.4	35.6	36.5	33.9	31.1	30.1	29.8	31.2	31.8	30.9	30.0	32.1
Mean min.	14.6	16.2	19.6	22.9	23.9	23.5	23.1	23.0	23.1	22.2	19.0	15.1	20.5
Ext. max.	35.4	37.5	39.4	40.6	41.6	36.4	35.6	35.4	35.8	36.2	36.5	35.0	41.6
Ext. min.	5.5	9.4	11.8	17.6	19.5	21.1	20.9	21.0	19.3	14.2	8.4	4.5	4.5
Relative Humidity (%)													
Mean	72	64	60	63	76	84	86	87	85	82	78	75	76
Mean max.	94	90	85	84	90	95	95	96	96	95	95	95	93
Mean min.	40	34	34	40	56	69	73	67	62	62	52	45	54
Ext. min.	72	64	60	63	76	84	86	87	85	82	78	75	76
Ext. min.	72	64	60	63	76	84	86	87	85	82	78	75	76
Dew Point (Celsius)													
Mean	15.7	15.8	17.7	20.3	22.6	23.1	22.9	22.9	23.1	22.4	19.4	16.2	20.2
Evaporation (mm.)													
Mean–pan	119.8	144.8	196.9	212.0	164.9	103.6	95.0	88.1	103.8	122.3	121.4	118.3	1590.9
Cloudiness (0–10)													
Mean	2.6	2.4	2.8	4.1	6.9	8.6	8.9	9.1	8.1	6.2	4.2	2.8	5.6
Sunshine Duration (hr.)						NO OBSERVATION							
Visibility (km.)													
0700 L.S.T.	2.0	2.8	3.0	4.9	7.2	8.0	7.7	7.4	6.8	4.9	4.0	2.4	5.1
Mean	6.1	5.6	5.0	7.1	10.0	10.0	9.6	9.2	9.9	9.1	8.5	7.3	8.1
Wind (Knots)													
Mean wind speed	1.4	2.0	2.8	3.6	2.8	2.3	2.2	2.0	1.5	1.7	2.2	1.9	2.2
Prevailing wind	W	W	W	W	W	W	W	W	W	E	E	E	–
Max. wind speed	21	38	58	42	38	33	25	28	33	35	25	27	58
Rainfall (mm.)													
Mean	2.3	8.0	8.7	38.9	168.8	235.3	312.4	333.3	159.9	98.8	24.7	4.2	1395.3
Mean rainy day	0.7	0.8	1.7	4.8	16.6	24.8	26.4	26.9	20.3	12.3	3.6	0.8	139.7
Daily maximum	14.4	73.0	22.6	58.7	96.2	89.3	207.4	118.8	79.0	67.9	51.0	61.7	207.4
Number of days with													
Haze	24.0	26.6	29.9	22.6	3.8	0.0	0.1	0.0	0.7	3.6	7.0	13.6	131.9
Fog	15.9	5.6	1.8	0.2	0.1	0.1	0.1	0.3	1.4	4.9	7.8	16.4	54.6
Hail	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Thunderstorm	0.1	0.9	1.8	5.5	10.2	2.8	2.2	1.6	6.0	5.5	0.8	0.1	37.5
Squall	0.0	0.1	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.6

FIGURE 1 DESIGN FLOOD HYDROGRAPH FOR VARIOUS RETURN PERIODS

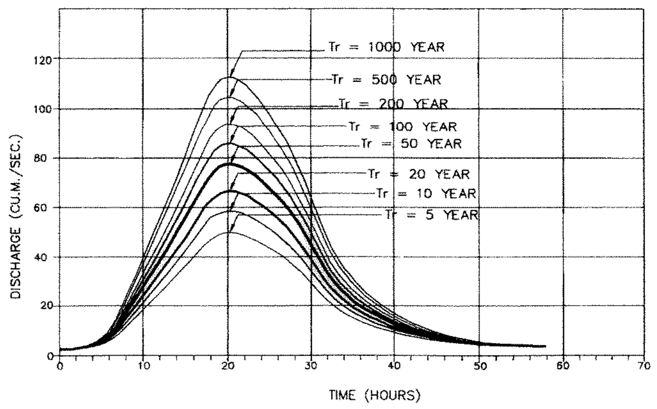


FIGURE 2 FLOW DURATION CURVE AT WEIR SITE

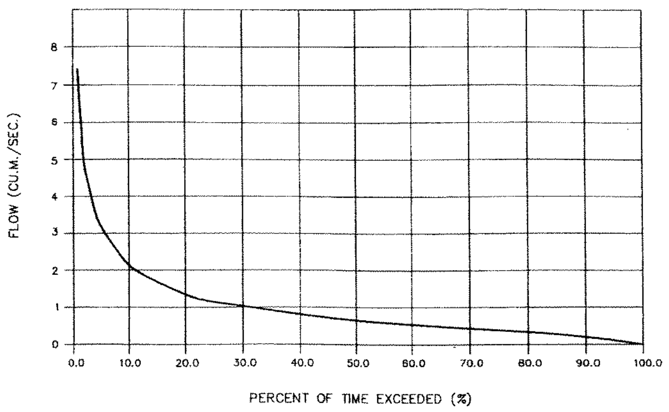


FIGURE 3 RELATIONSHIP BETWEEN ELEVATION
AND DISCHARGE AT WEIR SITE

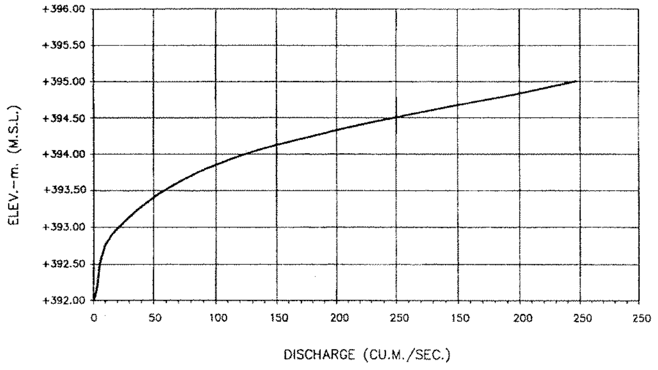


FIGURE 4 RELATIONSHIP BETWEEN ELEVATION
AND DISCHARGE AT POWERHOUSE

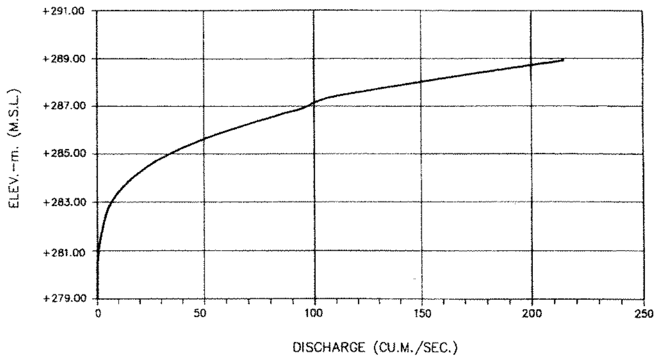


FIGURE 5 RELATIONSHIP BETWEEN ELEVATION
AND DISCHARGE AT BRIDGE

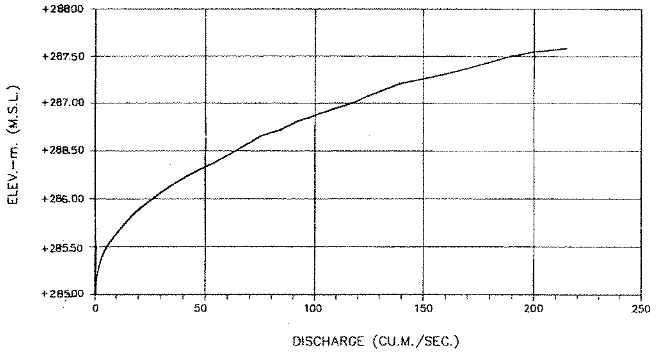


FIGURE 6 RELATIONSHIP BETWEEN MEAN ANNUAL SUSPENDED SIDIMENT
AND CATCHMENT AREA.

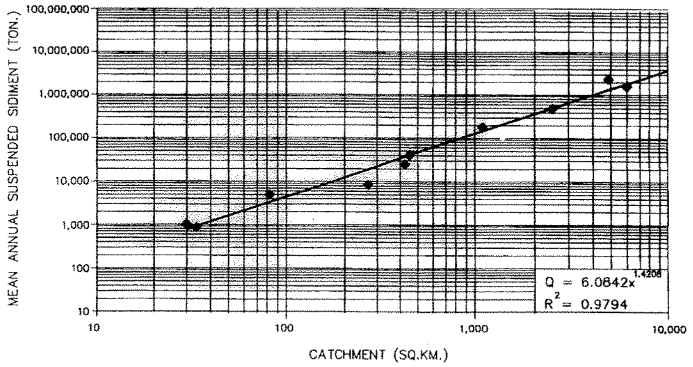
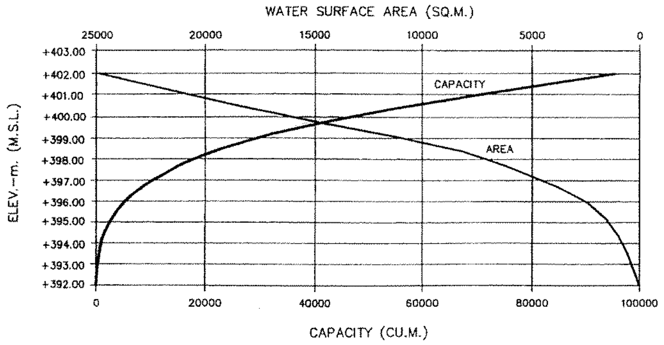


FIGURE 7 RELATIONSHIP BETWEEN CAPACITY–AREA
AND ELEVATION AT WEIR SITE



KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT.

CIVIL WORKS
GENERAL
HYDROLOGY DATA

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED สย.22514 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–GN–04
SHEET NO. 4 OF 100

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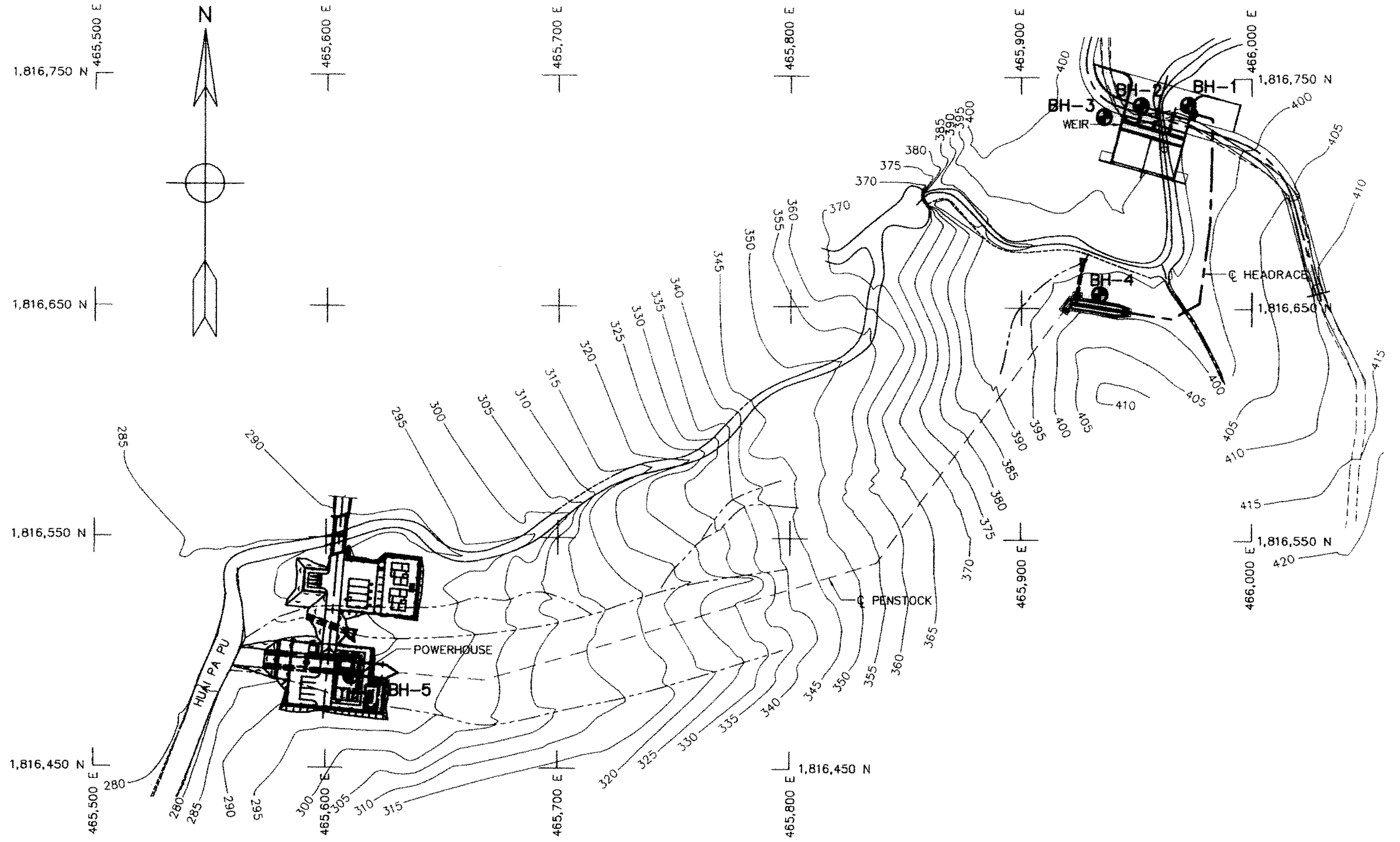
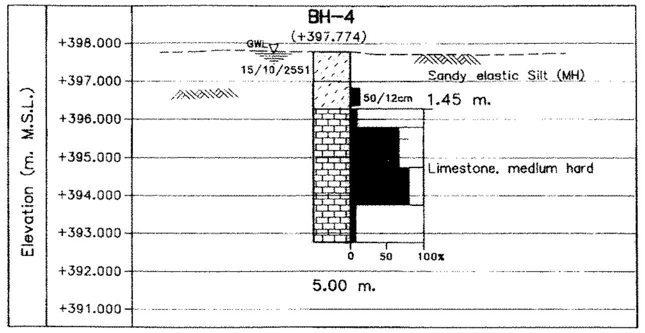


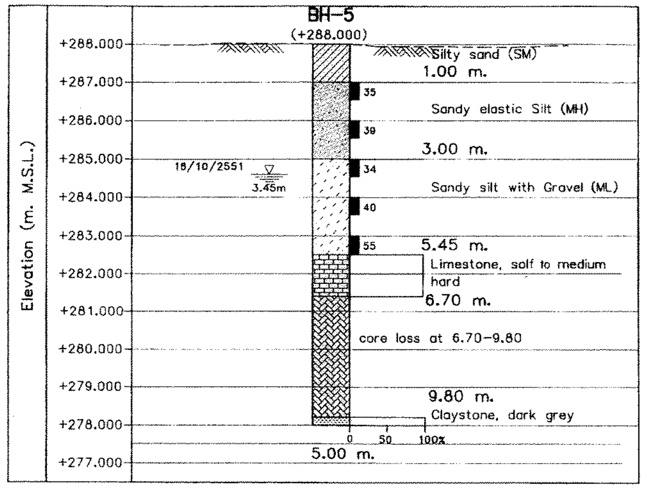
SITE PLAN

SCALE 1:750



GEOLOGICAL PROFILE ALONG CENTERLINE OF FORBAY

SCALE 1:100



GEOLOGICAL PROFILE ALONG CENTERLINE OF POWERHOUSE

SCALE 1:100

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

% R.Q.D.

< 25% VERY POOR ROCK

25 – 50% POOR ROCK

50 – 75% FAIR ROCK

75 – 90% GOOD ROCK

90 – 100% VERY GOOD ROCK

DEGREE OF HARDNESS

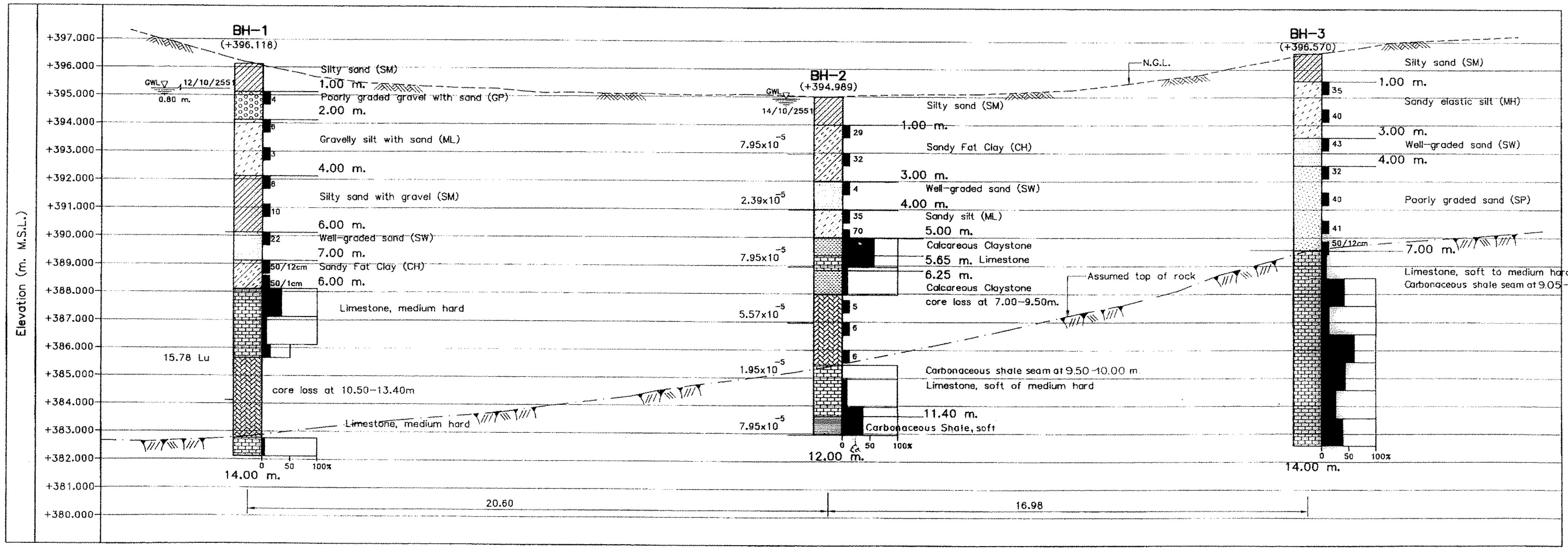
VH	VERY HARD ROCK
H	HARD ROCK
MH	MEDIUM HARD ROCK
S	SOFT ROCK
VS	VERY SOFT ROCK

DEGREE OF WEATHERING

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

LEGEND

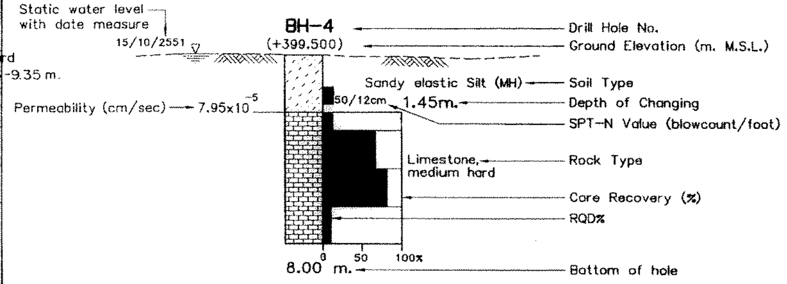
- ☐ Well-graded sand (SW)
- ▨ Poorly graded gravel (GP)
- ▨ Silty sand/Silty Sand with Gravel (SM)
- ▨ Sandy silt/Gravelly silt with sand (ML)
- ▨ Sandy elastic Silt (MH)
- ▨ Sandy Fat Clay (CH)
- ▨ Limestone
- ▨ Carbonaceous Shale
- ▨ Calcareous Claystone/Claystone



GEOLOGICAL PROFILE ALONG CENTERLINE OF WEIR CREST

SCALE 1:100

EXPLANATION



NOTES :

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

0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0
SCALE 1:100 METERS

0 5 10 20 30 40 50 60
SCALE 1:750 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
GENERAL
GEOLOGICAL DATA

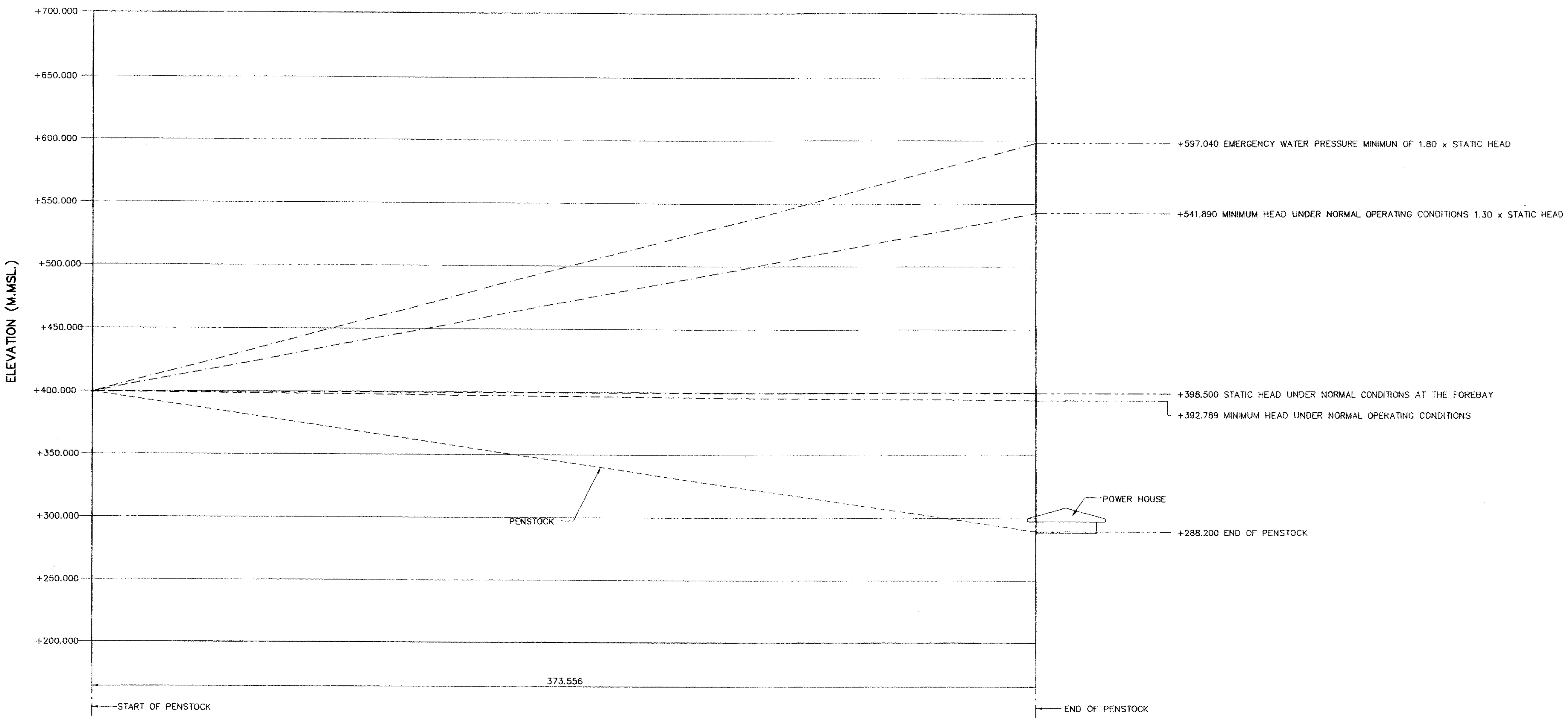
MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED สย.22514 สธ.4051
DRAWN
CHECKED สธ.4051
PROJECT MANAGER
8/12/51 DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-GN-05
SHEET NO. 5 OF 100

D:\0783\HPP-GN-05.DWG\18-NOV-2008\SMP



DISTANCE (M.)

LONGITUDINAL SECTION

SCALE { VERT. 1:2,000
HOR. 1:1,000

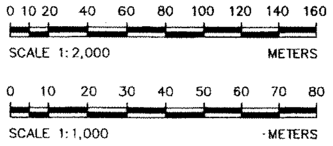
NOTES :

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 = 198.540 M.
7. TURBINE PERFORMANCE, CLOSING TIME (6 SECCONDS APPROXIMATELY) WILL BE SPECIFIED IN THE BIDDING DOCUMENTS.

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



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

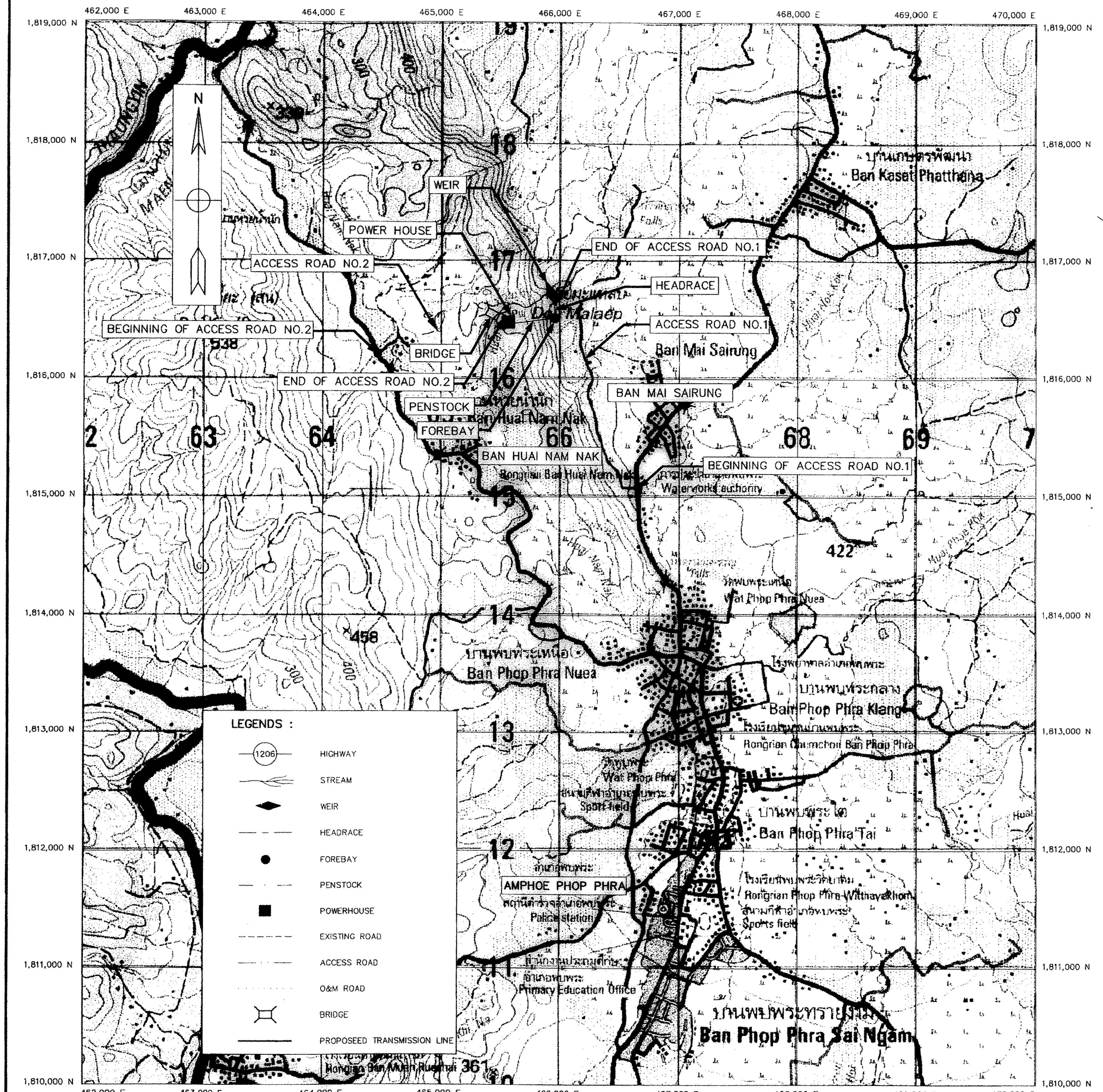
HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
GENERAL
POWER WATERWAY HYDAULIC GRADE LINE

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED
DRAWN
CHECKED
PROJECT MANAGER
DATE 8/12/51

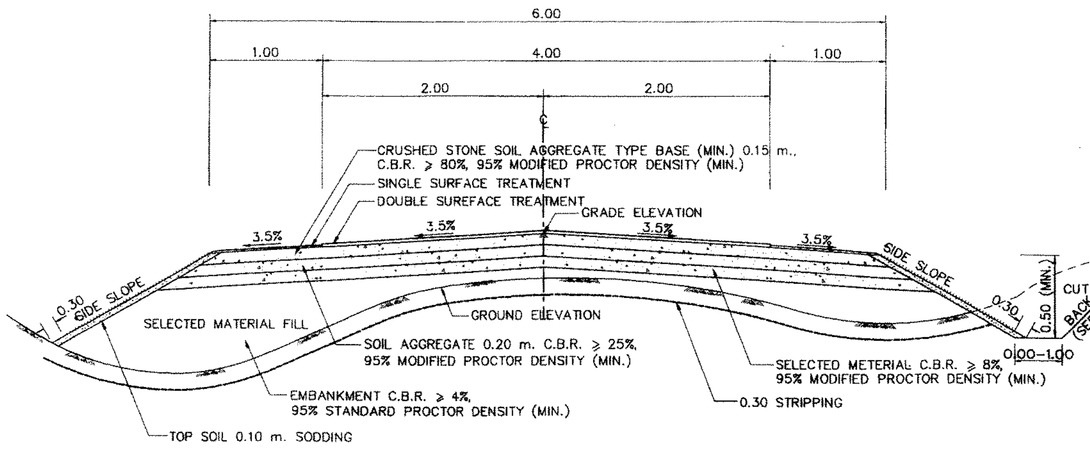
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-GN-06
SHEET NO. 6 OF 100



GENERAL PLAN

SCALE 1:20,000


6.00
1.00
4.00
1.00
2.00
2.00
CRUSHED STONE SOIL AGGREGATE TYPE BASE (MIN.) 0.15 m., C.B.R. ≥ 80%, 95% MODIFIED PROCTOR DENSITY (MIN.)
SINGLE SURFACE TREATMENT
DOUBLE SUREFACE TREATMENT
GRADE ELEVATION
3.5%
3.5%
3.5%
3.5%
SIDE SLOPE
SIDE SLOPE
0.30
0.30
0.50 (MIN.)
CUT BACK SLOPE (SEE TABLE 2)
0.00–1.00
SELECTED MATERIAL FILL
GROUND ELEVATION
SOIL AGGREGATE 0.20 m. C.B.R. ≥ 25%, 95% MODIFIED PROCTOR DENSITY (MIN.)
SELECTED METERIAL C.B.R. ≥ 8%, 95% MODIFIED PROCTOR DENSITY (MIN.)
EMBANKMENT C.B.R. ≥ 4%, 95% STANDARD PROCTOR DENSITY (MIN.)
0.30 STRIPPING
TOP SOIL 0.10 m. SODDING

TYPICAL SECTION OF ACCESS ROAD

NOT TO SCALE

TABLE 1 PAVEMENT AND SHOLDER OF ACCESS ROAD

NO.	KM. TO KM.	PAVEMENT	SHOLDER		MIN. CBR.	REMARKS
			L	R		
1	0+000.000–2+184.723 (NO.1)	4.00	1	1	6%	SELECT MATERIAL
2	0+000.000–1+709.000 (NO.2)	4.00	1	1	80%	LATERITE
					85%	CRUSHE STONE

TABLE 2 SIDE SLOPE AND BACK SLOPE

HIGH OF CUT AND FILL (m.)	EARTH		WEATHER ROCK		ROCK	
	CUT	FILL	CUT	FILL	CUT	FILL
0.00 – 3.00 m.	2:1	2:1	1:1	1.5:1	0.25:1	1:1
> 3.00 m.	1.5:1	1.5:1	0.5:1	1:1	0.25:1	1:1

NOTES :

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

REFERENCE DRAWINGS :

1. ACCESS ROAD, NO.1, PLAN AND PROFILE	HPP-AR-02 TO HPP-AR-05
2. ACCESS ROAD, NO.2, PLAN AND PROFILE	HPP-AR-06 TO HPP-AR-08
3. ACCESS ROAD, TYPICAL SECTIONS, STOPPING AND PASSING PLACES	HPP-AR-09

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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1				
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KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

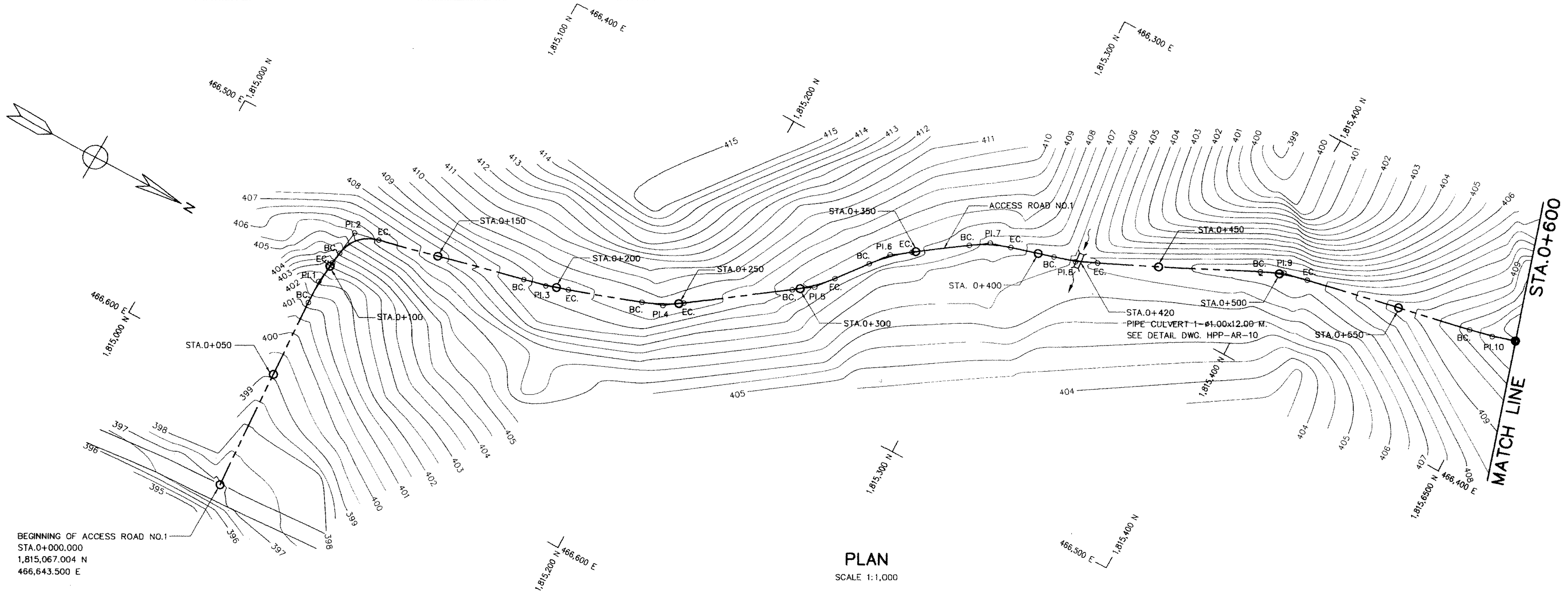
CIVIL WORKS
ACCESS ROAD
GENERAL PLAN

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED สย.22514 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER 8/12/51 DATE

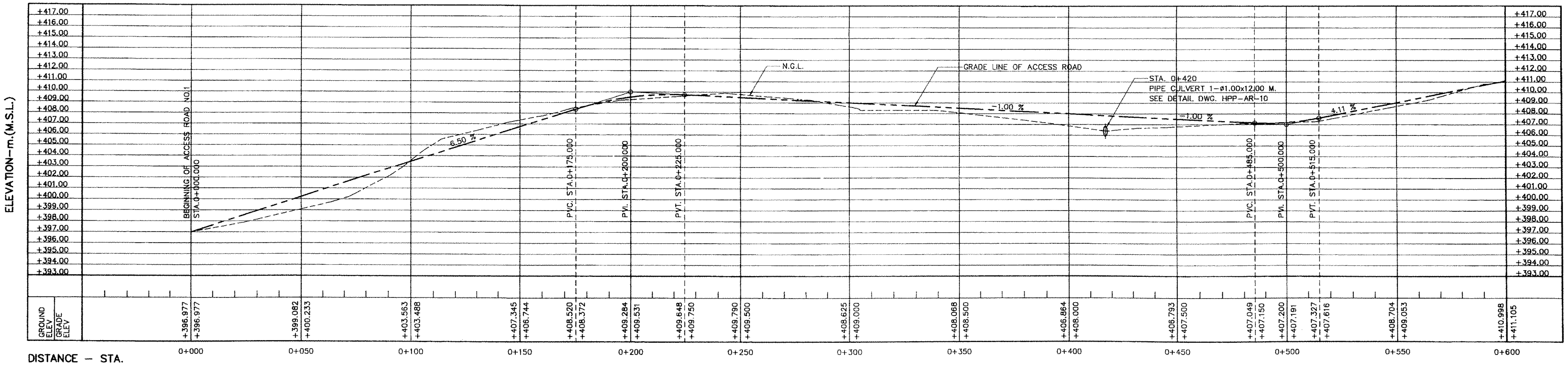
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-AR-01
SHEET NO. 7 OF 100



PLAN

SCALE 1:1,000



PROFILE

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

HORIZONTAL CURVE

NO. OF CURVE	PI. Sta.	PI. TO PI. m.	COORDINATE OF PI. N	COORDINATE OF PI. E	ANGLE I	T m.	R m.	L m.	BC. Sta.	EC. Sta.	BEARING
BEGIN	0+000.000		1,815,067.004	466,643.500							
1	0+092.155	92.155	1,815,062.210	466,551.471	10°-02'-37"	9.666	110.000	19.282	0+082.489	0+101.771	S 87°-01'-04" W
2	0+117.286	25.181	1,815,065.306	466,526.481	70°-00'-30"	10.505	15.000	18.328	0+106.781	0+125.109	N 82°-56'-19" W
3	0+195.476	80.871	1,815,144.126	466,508.385	6°-25'-41"	9.546	170.000	19.073	0+185.929	0+205.002	N 12°-55'-49" W
4	0+243.618	48.162	1,815,189.564	466,492.421	16°-19'-12"	8.603	60.000	17.090	0+235.015	0+252.105	N 19°-21'-30" W
5	0+305.767	62.266	1,815,240.143	466,456.105	17°-01'-07"	8.977	59.999	17.822	0+296.790	0+314.612	N 35°-40'-42" W
6	0+339.270	33.636	1,815,260.528	466,429.349	17°-32'-16"	9.255	60.000	18.365	0+330.016	0+348.381	N 52°-41'-49" W
7	0+380.376	41.252	1,815,294.253	466,405.594	19°-18'-08"	8.503	50.000	16.844	0+371.876	0+388.720	N 35°-09'-34" W
8	0+415.999	35.782	1,815,328.674	466,395.817	9°-43'-28"	9.357	110.000	18.669	0+406.642	0+425.311	N 15°-51'-26" W
9	0+501.913	85.959	1,815,406.207	466,358.700	14°-06'-40"	9.901	80.000	19.703	0+492.011	0+511.714	N 25°-34'-54" W
10	0+590.489	88.872	1,815,493.304	466,341.027	6°-11'-03"	9.724	180.000	19.428	0+580.961	0+600.389	N 11°-28'-14" W
11	0+659.255	68.589	1,815,558.663	466,320.225	14°-15'-07"	18.752	150.000	37.311	0+640.502	0+677.813	N 17°-39'-17" W

NOTES:

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP-GN-03
3. ALIGNMENT OF ACCESS ROAD SHALL BE JUSTIFIED BY FIELD ENGINEER IN THE FIELD TO SUIT THE TOPOGRAPHY

REFERENCE DRAWINGS :

1. ACCESS ROAD NO.1, PLAN AND PROFILE, STA.0+600.000 TO STA.1+200.000	HPP-AR-03
2. ACCESS ROAD, TYPICAL SECTIONS, STOPPING AND PASSING PLACES	HPP-AR-09
3. ACCESS ROAD, TYPICAL RC. PIPE, INSTALLATION AND REINFORCEMENT	HPP-AR-10

0 5 10 15 20
SCALE 1:200 METERS

0 5 10 15 20 25 50 100
SCALE 1:1,000 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

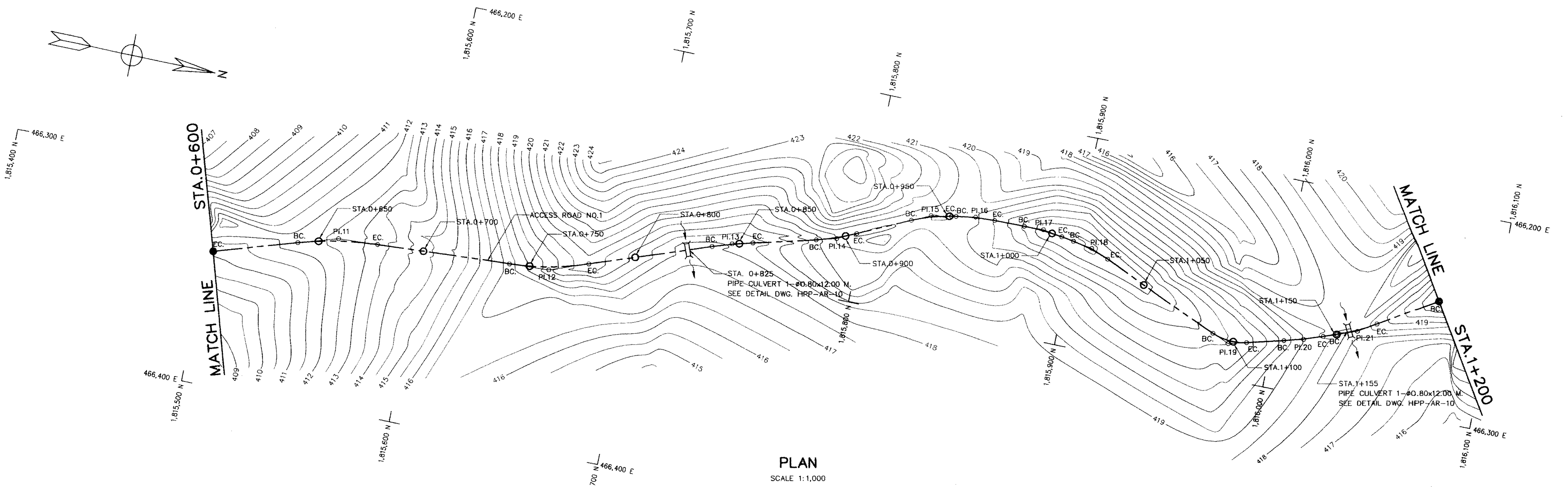
CIVIL WORKS
ACCESS ROAD
NO.1, PLAN AND PROFILE, STA.0+000.000 TO STA.0+600.000

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED กย.22514 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

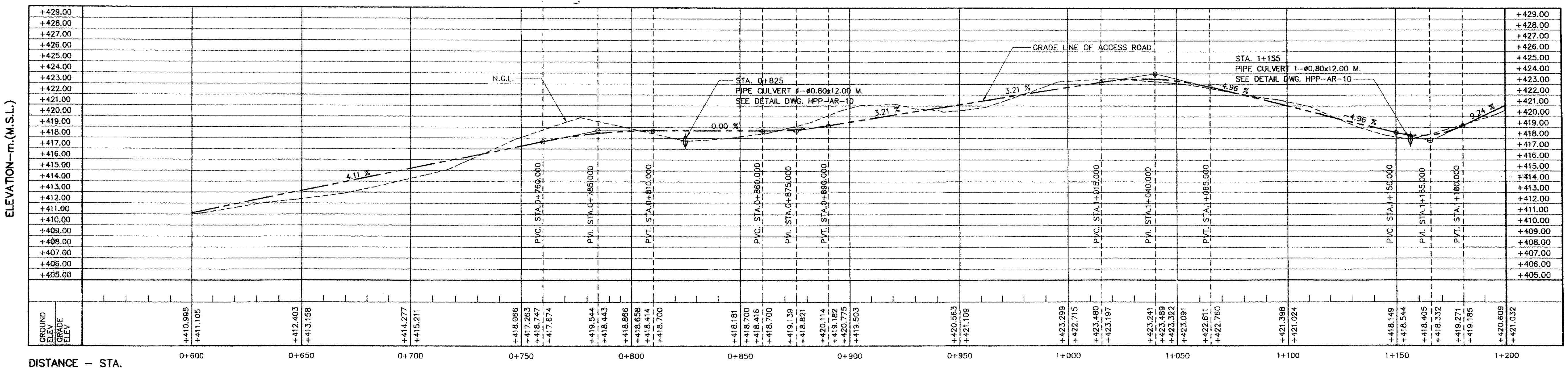
DRAWING NO. HPP-AR-02
SHEET NO. 8 OF 100

D\0783\HPP-AR-02.DWG\28-OCT-2008/SMP.



PLAN

SCALE 1:1,000



PROFILE

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

HORIZONTAL CURVE

NO. OF CURVE	PI. Sta.	PI. TO PI. m.	COORDINATE OF PI. N	COORDINATE OF PI. E	ANGLE I	T m.	R m.	L m.	BC. Sta.	EC. Sta.	BEARING
10	0+590.685	68.589	1,815,493.304	466,341.027	6°-11'-03"	9.724	180.000	19.428	0+580.961	0+600.389	N 17°-39'-17" W
11	0+659.255	100.295	1,815,558.663	466,320.225	14°-15'-07"	18.752	150.000	37.311	0+640.502	0+677.813	N 3°-24'-10" W
12	0+759.356	87.562	1,815,658.781	466,314.272	16°-38'-57"	19.022	130.000	37.775	0+740.334	0+778.109	N 20°-03'-07" W
13	0+846.649	48.943	1,815,741.035	466,284.249	5°-16'-40"	9.679	210.000	19.344	0+836.971	0+856.315	N 14°-46'-27" W
14	0+895.579	46.137	1,815,788.360	466,271.768	10°-22'-57"	9.994	110.001	19.933	0+885.585	0+905.518	N 25°-09'-24" W
15	0+941.661	20.977	1,815,830.121	466,252.155	15°-24'-43"	9.472	70.000	18.829	0+932.189	0+951.018	N 9°-44'-41" W
16	0+962.524	33.252	1,815,850.796	466,248.605	8°-16'-10"	9.398	130.000	18.763	0+953.126	0+971.889	N 1°-28'-31" W
17	0+995.743	24.040	1,815,884.037	466,247.749	11°-37'-41"	9.164	90.000	18.265	0+986.579	1+004.844	N 10°-09'-10" E
18	1+019.720	78.630	1,815,907.700	466,251.986	12°-58'-10"	9.093	80.000	18.109	1+010.627	1+028.736	N 23°-07'-20" E
19	1+098.273	36.139	1,815,980.014	466,282.863	37°-44'-12"	8.544	25.000	16.466	1+089.729	1+106.195	N 14°-36'-52" W
20	1+133.790	25.942	1,816,014.983	466,273.745	5°-33'-33"	9.710	200.000	19.405	1+124.080	1+143.485	N 20°-10'-25" W
21	1+159.717	44.613	1,816,039.333	466,264.799	12°-15'-07"	9.659	90.000	19.245	1+150.057	1+169.302	N 32°-25'-32" W
22	1+204.256		1,816,076.991	466,240.877	7°-25'-09"	9.725	150.000	19.423	1+194.531	1+213.954	

NOTES:

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP-GN-03
3. ALIGNMENT OF ACCESS ROAD SHALL BE JUSTIFIED BY FIELD ENGINEER IN THE FIELD TO SUIT THE TOPOGRAPHY

REFERENCE DRAWINGS :

1. ACCESS ROAD NO.1, PLAN AND PROFILE, STA.0+000.000 TO STA.0+600.000	HPP-AR-02
2. ACCESS ROAD NO.1, PLAN AND PROFILE, STA.1+200.000 TO STA.1+800.000	HPP-AR-04
3. ACCESS ROAD, TYPICAL SECTIONS, STOPPING AND PASSING PLACES	HPP-AR-09
4. ACCESS ROAD, TYPICAL RC. PIPE, INSTALLATION AND REINFORCEMENT	HPP-AR-10

0 5 10 15 20
SCALE 1:200 METERS

0 5 10 15 20 25 50 100
SCALE 1:1,000 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

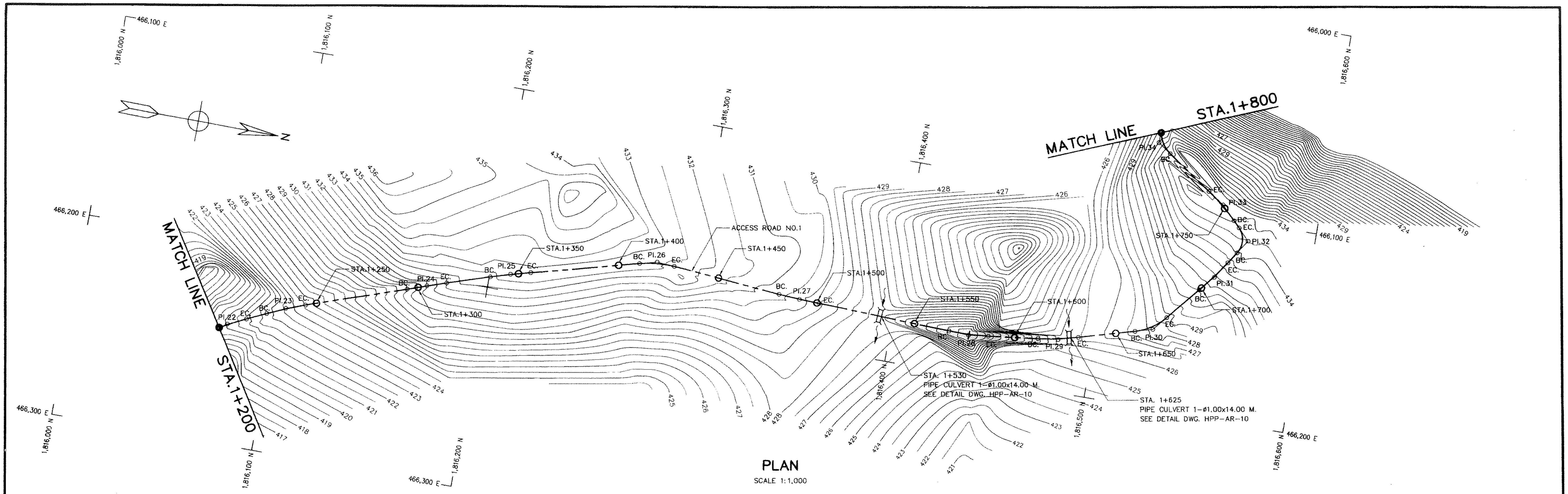
KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
ACCESS ROAD
NO.1, PLAN AND PROFILE, STA.0+600.000 TO STA.1+200.000

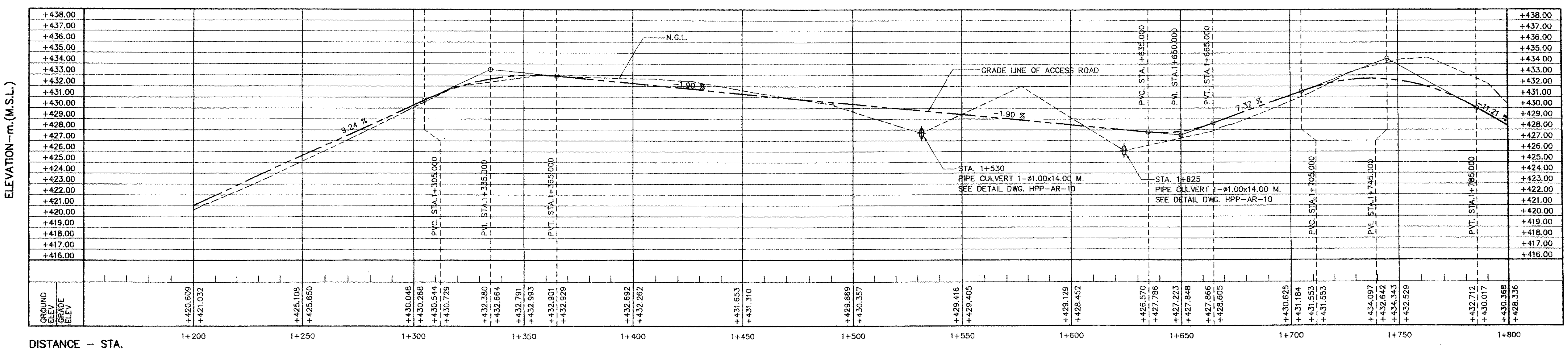
MAHA NAKORN CONSULTANTS CO.,LTD.	DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
	REVIEWED
DESIGNED ภย.22514	SUBMITTED
DRAWN	RECOMMENDED
CHECKED สข.4651	APPROVED
PROJECT MANAGER	DATE 8/12/51
DRAWING NO. HPP-AR-03	SHEET NO. 9 OF 100

D:\0783\HPP-AR-03.DWG\29-OCT-2008/SMP.



PLAN

SCALE 1:1,000



PROFILE

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

HORIZONTAL CURVE

NO. OF CURVE	PI. Sta.	PI. TO PI. m.	COORDINATE OF PI. N	COORDINATE OF PI. E	ANGLE I	T m.	R m.	L m.	BC. Sta.	EC. Sta.	BEARING
21	1+159.717		1,816,039.333	466,264.799	12°-15'-07"	9.659	90.000	19.245	1+150.057	1+169.302	
		44.613									N 32°-25'-32" W
22	1+204.256		1,816,076.991	466,240.877	7°-25'-09"	9.725	150.000	19.423	1+194.531	1+213.954	
		30.259									N 25°-00'-23" W
23	1+234.487		1,816,104.414	466,228.086	5°-26'-48"	9.969	210.000	19.963	1+224.498	1+244.461	
		70.011									N 19°-33'-34" W
24	1+304.483		1,816,170.385	466,204.647	1°-06'-44"	9.998	1030.000	19.995	1+294.485	1+314.480	
		41.638									N 18°-26'-50" W
25	1+346.120		1,816,209.884	466,191.471	3°-14'-10"	9.887	350.000	19.769	1+336.233	1+356.002	
		72.617									N 15°-12'-40 W"
26	1+418.732		1,816,279.956	466,172.419	19°-24'-19"	8.549	50.000	16.934	1+410.183	1+427.117	
		72.686									N 4°-11'-40" E
27	1+491.254		1,816,352.448	466,177.735	2°-25'-14"	9.929	470.000	19.855	1+481.325	1+501.180	
		85.551									N 1°-46'-26" E
28	1+576.802		1,816,437.957	466,180.383	9°-19'-06"	9.780	120.000	19.516	1+567.022	1+586.538	
		44.853									N 7°-32'-40" W
29	1+621.611		1,816,482.422	466,174.494	8°-47'-13"	9.988	130.000	19.937	1+611.623	1+631.560	
		47.177									N 16°-19'-53" W
30	1+668.749		1,816,527.695	466,161.228	33°-36'-53"	9.062	30.000	17.601	1+659.687	1+677.288	
		40.038									N 49°-56'-46" W
31	1+708.265		1,816,553.460	466,130.582	7°-24'-15"	9.706	150.000	19.384	1+698.559	1+717.943	
		24.228									N 57°-21'-01" W
32	1+732.466		1,816,566.531	466,110.182	76°-28'-33"	7.880	10.000	13.347	1+724.586	1+737.933	
		21.823									S 46°-10'-26" W
33	1+751.876		1,816,551.419	466,094.438	12°-07'-59"	9.565	90.000	19.058	1+742.311	1+761.369	
		44.442									S 34°-02'-28" W
34	1+796.246		1,816,514.593	466,069.560	55°-28'-12"	7.887	15.000	14.522	1+788.359	1+802.881	
		35.835									S 89°-30'-40" W
35	1+830.829		1,816,514.287	466,033.726	101°-43'-37"	12.289	10.000	17.755	1+818.540	1+836.295	

NOTES:

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP-GN-03
3. ALIGNMENT OF ACCESS ROAD SHALL BE JUSTIFIED BY FIELD ENGINEER IN THE FIELD TO SUIT THE TOPOGRAPHY

REFERENCE DRAWINGS :

1. ACCESS ROAD NO.1, PLAN AND PROFILE, STA.0+600.000 TO STA.1+200.000	HPP-AR-03
2. ACCESS ROAD NO.1, PLAN AND PROFILE, STA.1+800.000 TO STA.2+184.723	HPP-AR-05
3. ACCESS ROAD, TYPICAL SECTIONS, STOPPING AND PASSING PLACES	HPP-AR-09
4. ACCESS ROAD, TYPICAL RC. PIPE, INSTALLATION AND REINFORCEMENT	HPP-AR-10

0 5 10 15 20
SCALE 1:200 METERS

0 5 10 15 20 25 50 100
SCALE 1:1,000 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
ACCESS ROAD
NO.1, PLAN AND PROFILE, STA.1+200.000 TO STA.1+800.000

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED ทย.-22514 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-AR-04
SHEET NO. 10 OF 100

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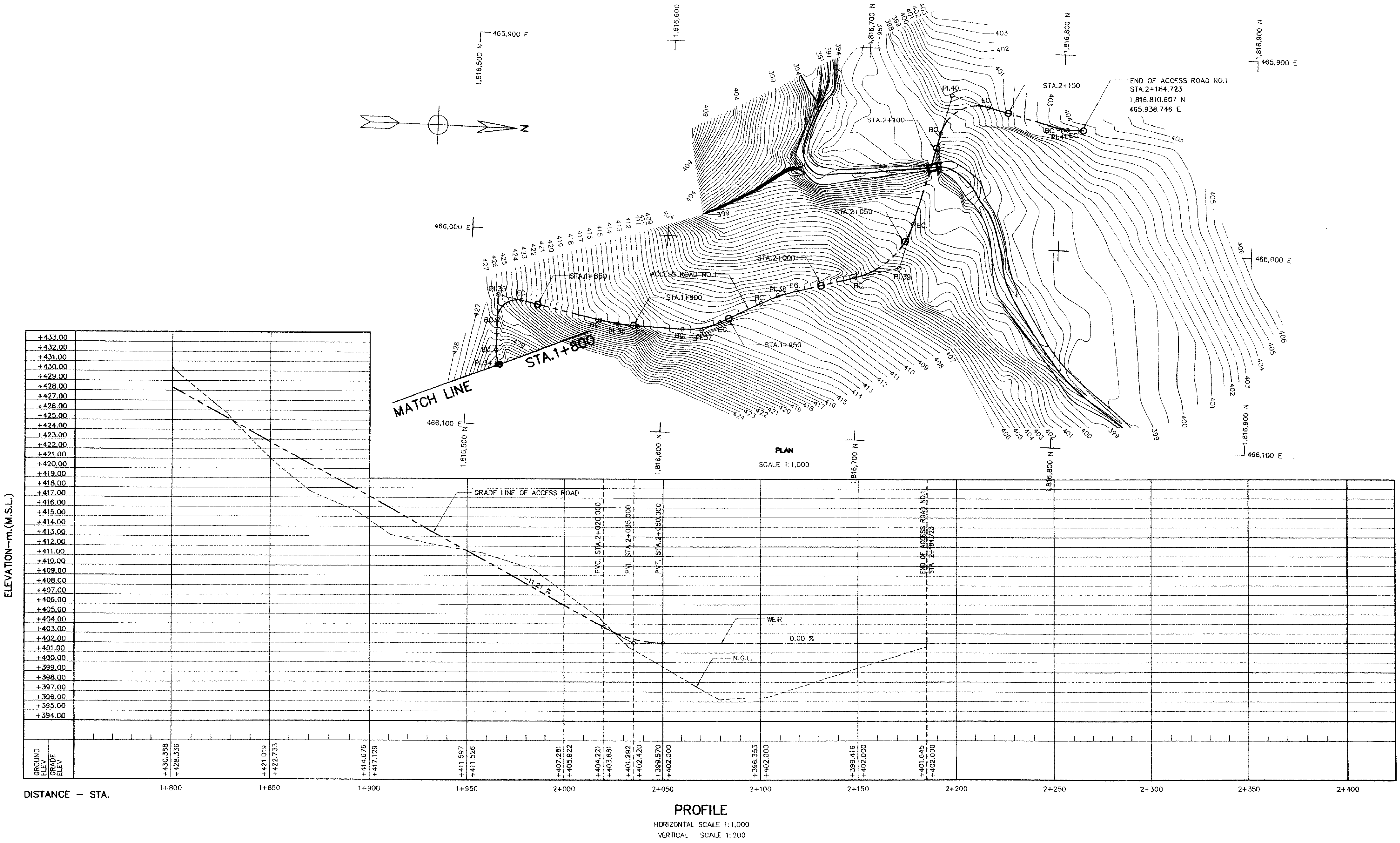

PLAN

SCALE 1:1,000

PROFILE

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

HORIZONTAL CURVE

NO. OF CURVE	PI. Sta.	PI. TO PI. m.	COORDINATE OF PI. N	COORDINATE OF PI. E	ANGLE I	T m.	R m.	L m.	BC. Sta.	EC. Sta.	BEARING
34	1+796.246	35.835	1,816,514.593	466,069.560	55°-28'-12"	7.887	15.000	14.522	1+788.359	1+802.881	S 89°-30'-40" W
35	1+830.829	63.588	1,816,514.287	466,033.726	101°-43'-37"	12.289	10.000	17.755	1+818.540	1+836.295	N 11°-14'-17" E
36	1+887.594	43.047	1,816,576.656	466,046.119	9°-46'-41"	9.409	110.000	18.772	1+878.185	1+896.957	N 1°-27'-36" E
37	1+930.595	42.461	1,816,619.689	466,047.216	28°-14'-05"	10.060	40.000	19.712	1+920.535	1+940.247	N 26°-46'-29" W
38	1+972.648	63.330	1,816,657.597	466,028.088	11°-59'-53"	9.458	90.000	18.847	1+963.190	1+982.037	N 14°-46'-36" W
39	2+035.909	91.712	1,816,718.833	466,011.935	60°-13'-23"	23.198	40.000	42.044	2+012.711	2+054.755	N 75°-00'-00" W
40	2+123.269	59.492	1,816,742.570	465,923.348	90°-00'-01"	20.000	20.000	31.416	2+103.269	2+134.685	N 15°-00'-01" E
41	2+174.177	10.572	1,816,800.035	465,938.746	15°-00'-01"	2.370	18.000	4.712	2+171.807	2+176.519	N 0°-00'-00" E
END	2+184.721		1,816,810.607	465,938.746							

NOTES:

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP-GN-03
3. ALIGNMENT OF ACCESS ROAD SHALL BE JUSTIFIED BY FIELD ENGINEER IN THE FIELD TO SUIT THE TOPOGRAPHY

REFERENCE DRAWINGS :

1. ACCESS ROAD NO.1, PLAN AND PROFILE, STA.1+200.000 TO STA.1+800.000 HPP-AR-04
2. ACCESS ROAD, TYPICAL SECTIONS, STOPPING AND PASSING PLACES HPP-AR-09

0 5 10 15 20
SCALE 1:200 METERS

0 5 10 15 20 25 50 100
SCALE 1:1,000 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
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2				
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CONSULTANTS DEDE

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
ACCESS ROAD
NO.1, PLAN AND PROFILE, STA.1+800.000 TO STA.2+184.723

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ก.22514 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-AR-05
SHEET NO. 11 OF 100

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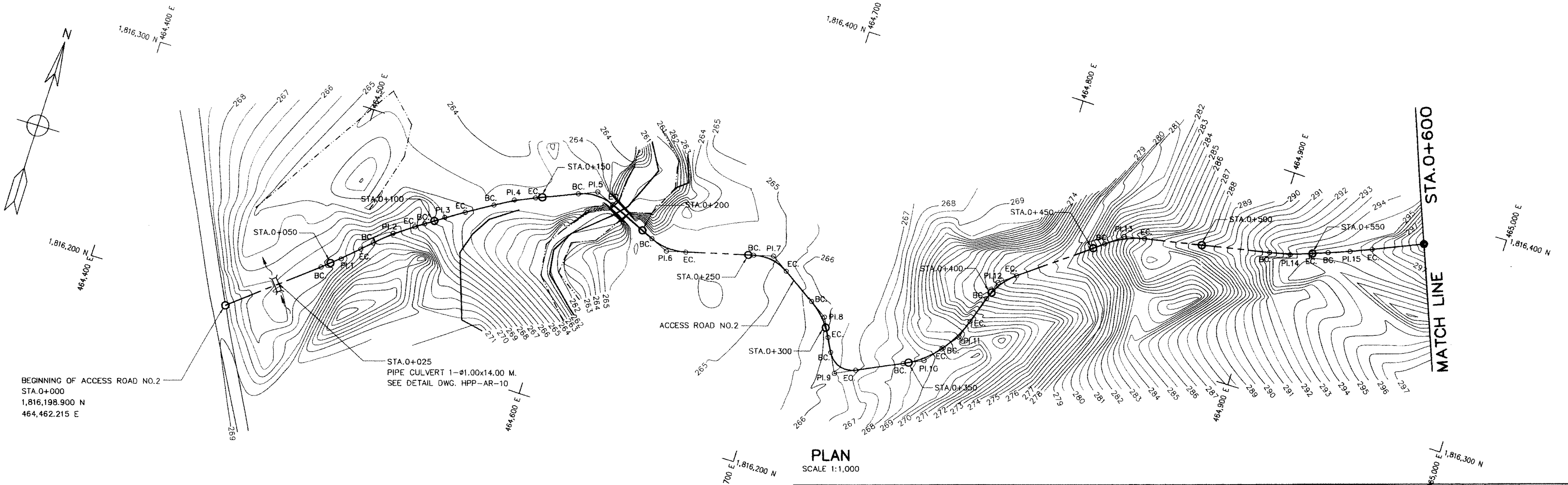
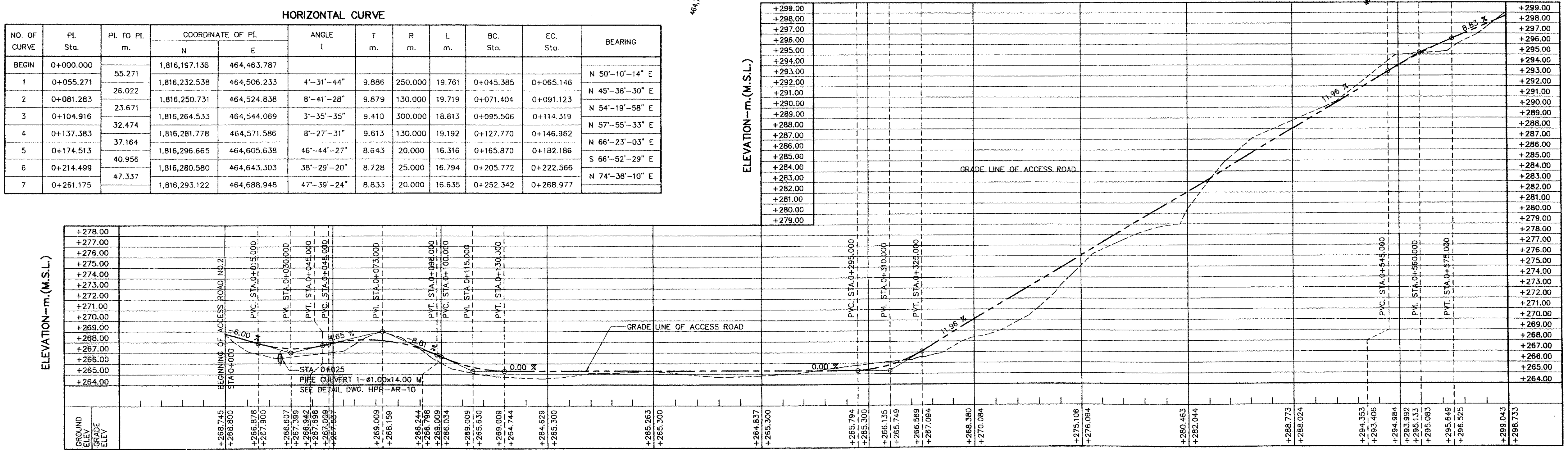


PLAN

SCALE 1:1,000

HORIZONTAL CURVE

NO. OF CURVE	PI. Sta.	PI. TO PI. m.	COORDINATE OF PI. N	COORDINATE OF PI. E	ANGLE I	T m.	R m.	L m.	BC. Sta.	EC. Sta.	BEARING
BEGIN	0+000.000	55.271	1,816,197.136	464,463.787							N 50°-10'-14" E
1	0+055.271	26.022	1,816,232.538	464,506.233	4°-31'-44"	9.886	250.000	19.761	0+045.385	0+065.146	N 45°-38'-30" E
2	0+081.283	23.671	1,816,250.731	464,524.838	8°-41'-28"	9.879	130.000	19.719	0+071.404	0+091.123	N 54°-19'-58" E
3	0+104.916	32.474	1,816,264.533	464,544.069	3°-35'-35"	9.410	300.000	18.813	0+095.506	0+114.319	N 57°-55'-33" E
4	0+137.383	37.164	1,816,281.778	464,571.586	8°-27'-31"	9.613	130.000	19.192	0+127.770	0+146.962	N 66°-23'-03" E
5	0+174.513	40.956	1,816,296.665	464,605.638	46°-44'-27"	8.643	20.000	16.316	0+165.870	0+182.186	S 66°-52'-29" E
6	0+214.499	47.337	1,816,280.580	464,643.303	38°-29'-20"	8.728	25.000	16.794	0+205.772	0+222.566	N 74°-38'-10" E
7	0+261.175		1,816,293.122	464,688.948	47°-39'-24"	8.833	20.000	16.635	0+252.342	0+268.977	



PROFILE

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

HORIZONTAL CURVE

NO. OF CURVE	PI. Sta.	PI. TO PI. m.	COORDINATE OF PI. N	COORDINATE OF PI. E	ANGLE I	T m.	R m.	L m.	BC. Sta.	EC. Sta.	BEARING
7	0+261.175	35.563	1,816,293.122	464,688.948	47°-39'-24"	8.833	20.000	16.635	0+252.342	0+268.977	S 57°-42'-26" E
8	0+295.707	25.546	1,816,274.123	464,719.010	29°-34'-12"	9.238	35.000	18.063	0+286.470	0+304.533	S 28°-08'-13" E
9	0+320.841	39.865	1,816,251.596	464,731.057	87°-29'-22"	9.571	10.000	15.270	0+311.270	0+326.540	N 64°-22'-25" E
10	0+356.834	18.741	1,816,268.838	464,767.001	26°-04'-33"	9.263	40.000	18.204	0+347.571	0+365.775	N 38°-17'-52" E
11	0+375.254	30.308	1,816,283.546	464,778.616	19°-33'-13"	8.616	50.000	17.064	0+366.638	0+383.702	N 18°-44'-39" E
12	0+405.394	60.073	1,816,312.246	464,788.355	33°-11'-21"	8.940	30.000	17.378	0+396.454	0+413.832	N 51°-56'-00" E
13	0+464.965	75.138	1,816,349.285	464,835.650	26°-42'-28"	9.495	40.000	18.646	0+455.469	0+474.115	N 78°-38'-28" E
14	0+539.758	27.214	1,816,364.084	464,909.316	9°-35'-39"	9.651	115.000	19.257	0+530.107	0+549.364	N 69°-02'-49" E
15	0+566.927	58.099	1,816,373.816	464,934.730	2°-29'-32"	9.788	450.000	19.573	0+557.139	0+576.712	N 66°-33'-18" E
16	0+625.023		1,816,396.931	464,988.032	70°-37'-18"	10.625	15.000	18.489	0+614.398	0+632.887	

NOTES:

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP-GN-03
3. ALIGNMENT OF ACCESS ROAD SHALL BE JUSTIFIED BY FIELD ENGINEER IN THE FIELD TO SUIT THE TOPOGRAPHY

REFERENCE DRAWINGS :

1.	ACCESS ROAD NO.2, PLAN & PROFILE, STA.0+600.000 TO STA.1+200.000	HPP-AR-07
2.	ACCESS ROAD, TYPICAL SECTIONS, STOPPING AND PASSING PLACES	HPP-AR-09
3.	ACCESS ROAD, TYPICAL RC. PIPE, INSTALLATION AND REINFORCEMENT	HPP-AR-10

0 5 10 15 20
SCALE 1:200 METERS

0 5 10 15 20 25 50 100
SCALE 1:1,000 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
ACCESS ROAD
NO.2, PLAN AND PROFILE, STA.0+000.000 TO STA.0+600.000

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED ภย.22514 วย.4651
DRAWN
CHECKED วย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-AR-06
SHEET NO. 12 OF 100

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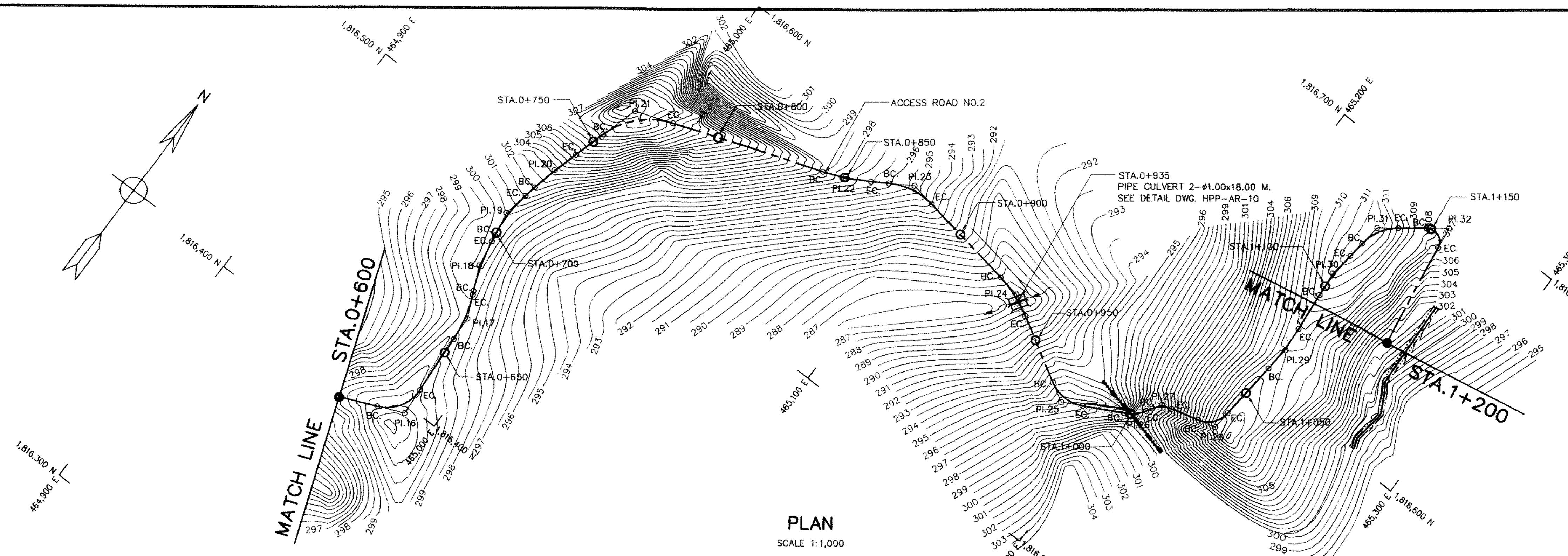
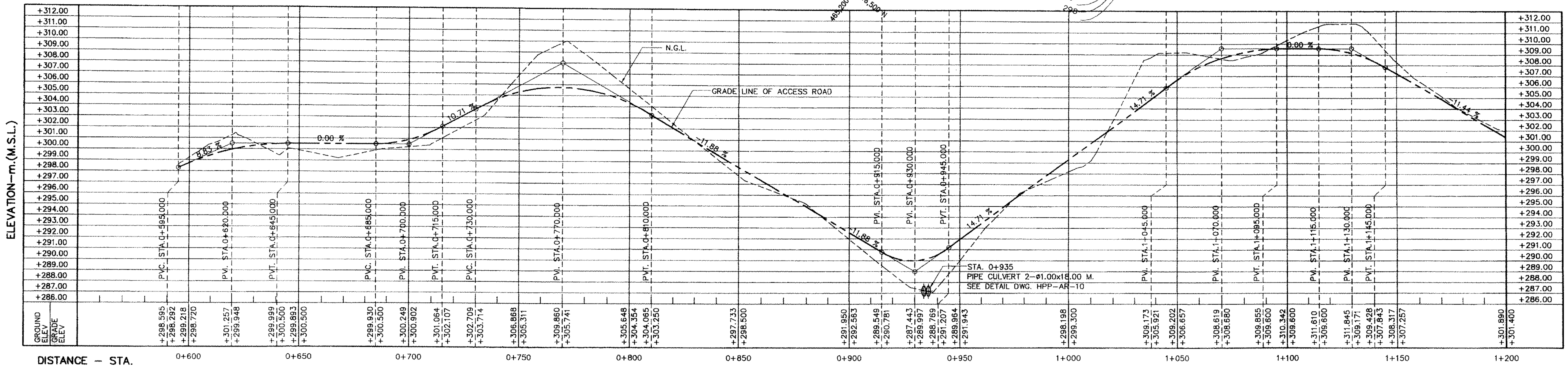


PLAN

SCALE 1:1,000



HORIZONTAL CURVE

NO. OF CURVE	PI. Sta.	PI. TO PI. m.	COORDINATE OF PI. N	COORDINATE OF PI. E	ANGLE I	T m.	R m.	L m.	BC. Sta.	EC. Sta.	BEARING
15	0+566.927	58.099	1,816,373.816	464,934.730	2°-29'-32"	9.788	450.000	19.573	0+557.139	0+576.712	N 66°-33'-18" E
16	0+625.023	43.163	1,816,396.931	464,988.032	70°-37'-18"	10.625	15.000	18.489	0+614.398	0+632.887	N 4°-04'-00" W
17	0+665.425	20.937	1,816,439.986	464,984.971	21°-08'-02"	9.327	50.000	18.443	0+656.098	0+674.541	N 25°-12'-02" W
18	0+686.150	22.098	1,816,458.930	464,976.056	14°-29'-08"	10.167	80.000	20.226	0+675.983	0+696.209	N 10°-42'-54" W
19	0+708.140	24.030	1,816,480.642	464,971.948	21°-20'-41"	9.423	50.000	18.627	0+698.717	0+717.344	N 10°-37'-47" E
20	0+731.952	37.713	1,816,504.260	464,976.381	6°-15'-18"	9.835	180.000	19.650	0+722.117	0+741.767	N 16°-53'-05" E
21	0+769.645	83.353	1,816,540.347	464,987.334	53°-10'-06"	15.013	30.000	27.839	0+754.633	0+782.472	N 70°-03'-11" E
22	0+850.812	25.376	1,816,568.783	465,065.686	11°-47'-53"	9.299	90.000	18.532	0+841.513	0+860.045	N 58°-15'-18" E
23	0+876.122	56.163	1,816,582.134	465,087.266	41°-23'-31"	9.445	25.000	18.061	0+866.677	0+884.738	S 80°-21'-12" E
24	0+931.456	44.254	1,816,572.723	465,142.635	20°-09'-34"	8.888	50.000	17.592	0+922.568	0+940.160	S 60°-11'-38" E
25	0+975.526	27.842	1,816,550.726	465,181.035	56°-41'-44"	8.093	15.000	14.843	0+967.434	0+982.277	N 63°-06'-38" E
26	1+002.026	10.762	1,816,563.318	465,205.867	31°-41'-49"	4.258	15.000	8.298	0+997.767	1+006.065	N 31°-24'-49" E
27	1+012.569	22.178	1,816,572.502	465,211.476	43°-05'-37"	3.949	10.000	7.521	1+008.621	1+016.142	N 74°-30'-27" E
28	1+034.371	39.292	1,816,578.426	465,232.848	69°-56'-57"	6.995	10.000	12.208	1+027.376	1+039.584	N 4°-33'-29" E
29	1+071.880	33.824	1,816,617.594	465,235.971	10°-38'-51"	9.318	100.000	18.583	1+062.562	1+081.145	N 6°-05'-21" W
30	1+105.650	24.421	1,816,651.227	465,232.383	13°-37'-10"	9.553	80.000	19.016	1+096.097	1+115.113	N 7°-31'-49" E
31	1+129.981	27.461	1,816,675.437	465,235.583	45°-27'-04"	8.377	20.000	15.865	1+121.604	1+137.469	N 52°-58'-53" E
32	1+156.554	67.078	1,816,691.970	465,257.509	118°-09'-49"	8.348	5.000	10.312	1+148.205	1+158.517	S 8°-51'-19" E
33	1+217.247		1,816,625.692	465,267.835	48°-36'-07"	9.031	20.000	16.965	1+208.216	1+225.181	

PROFILE

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

NOTES:

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP-GN-03
3. ALIGNMENT OF ACCESS ROAD SHALL BE JUSTIFIED BY FIELD ENGINEER IN THE FIELD TO SUIT THE TOPOGRAPHY

REFERENCE DRAWINGS :

1.	ACCESS ROAD NO.2, PLAN AND PROFILE, STA.0+000.000 TO STA.0+600.000	HPP-AR-06
2.	ACCESS ROAD NO.2, PLAN AND PROFILE, STA.1+200.000 TO STA.1+709.000	HPP-AR-08
3.	ACCESS ROAD, TYPICAL SECTIONS, STOPPING AND PASSING PLACES	HPP-AR-09
4.	ACCESS ROAD, TYPICAL RC. PIPE, INSTALLATION AND REINFORCEMENT	HPP-AR-10

0 5 10 15 20
SCALE 1:200 METERS

0 5 10 15 20 25 50 100
SCALE 1:1,000 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

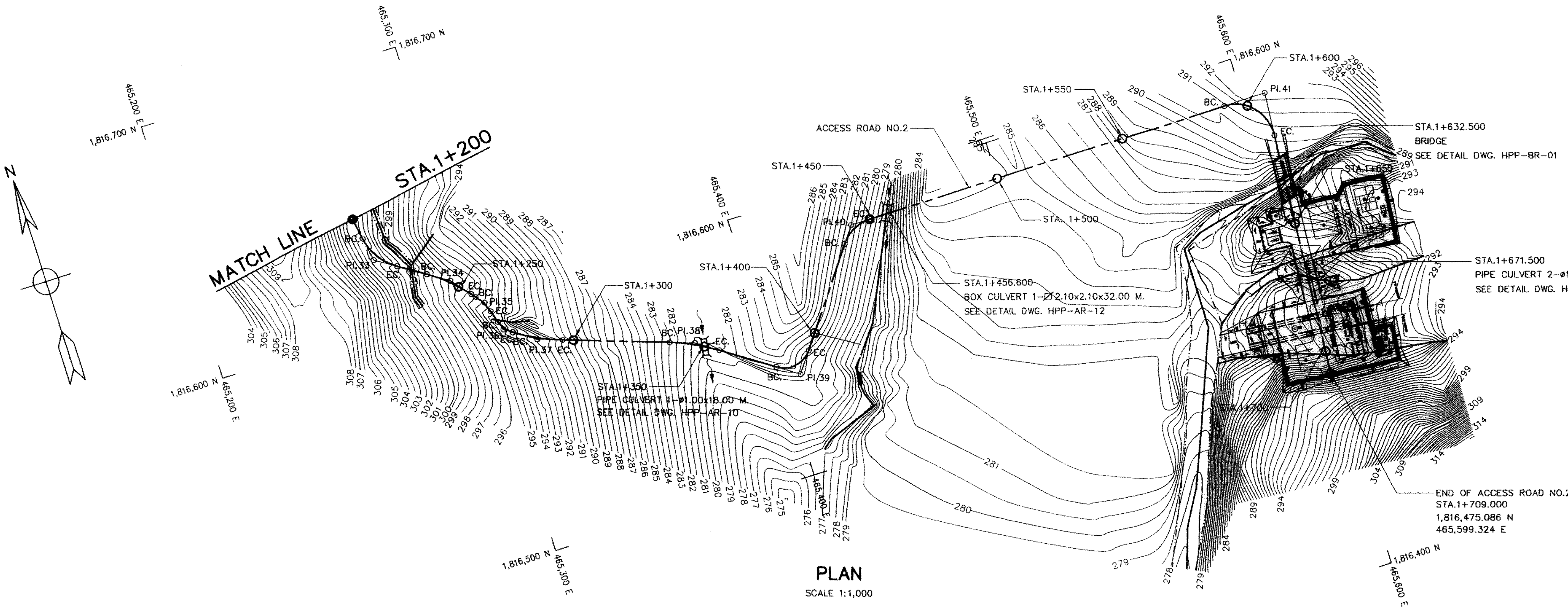
KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
ACCESS ROAD
NO.2, PLAN AND PROFILE, STA.0+600.000 TO STA.1+200.000

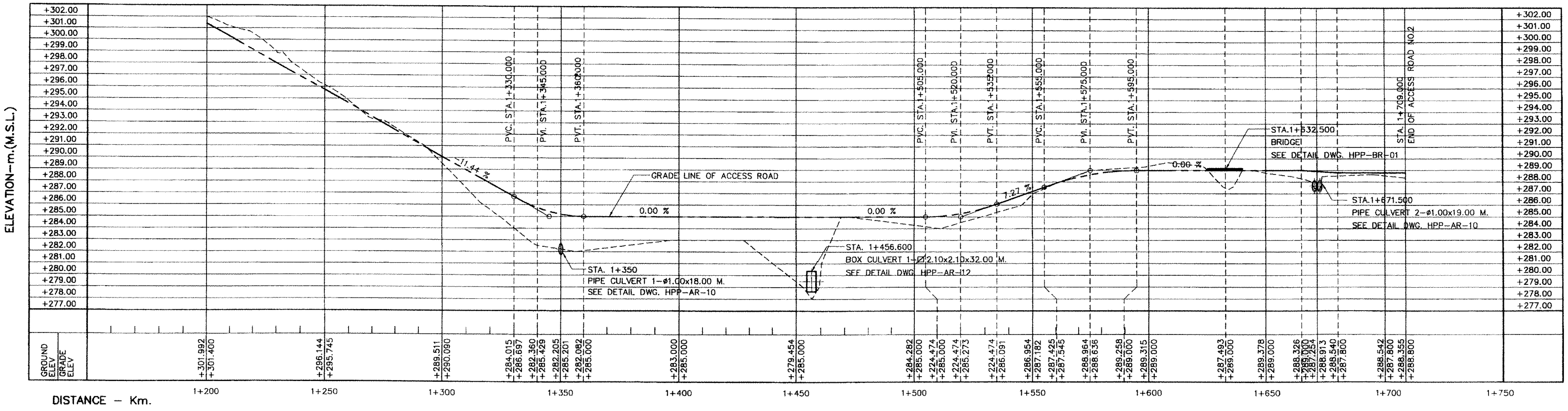
MAHA NAKORN CONSULTANTS CO.,LTD.	DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
	REVIEWED
DESIGNED ภย.22514 สย.4651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED สย.4651	APPROVED
PROJECT MANAGER — DATE 8/12/51	DRAWING NO. HPP-AR-07 — SHEET NO. 13 OF 100

D:\0783\HPP-AR-07.DWG\29-OCT-2008/SMP



PLAN

SCALE 1:1,000



PROFILE

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

HORIZONTAL CURVE

NO. OF CURVE	PI. Sta.	PI. TO PI.	COORDINATE OF PI. N	COORDINATE OF PI. E	ANGLE I	T m.	R m.	L m.	BC. Sta.	EC. Sta.	BEARING
32	1+156.554	67.078	1,816,691.970	465,257.509	118°-09'-49"	8.348	5.000	10.312	1+148.205	1+158.517	S 8°-51'-19" E
33	1+217.247	30.141	1,816,625.692	465,267.835	48°-36'-07"	9.031	20.000	16.965	1+208.216	1+225.181	S 57°-27'-26" E
34	1+246.291	15.390	1,816,609.478	465,293.244	17°-48'-37"	9.401	60.000	18.651	1+236.890	1+255.541	S 39°-38'-49" E
35	1+261.530	12.406	1,816,597.628	465,303.063	22°-40'-19"	4.009	20.000	7.914	1+257.520	1+265.434	S 16°-58'-29" E
36	1+273.831	13.048	1,816,585.762	465,306.685	38°-51'-50"	3.528	10.000	6.783	1+270.303	1+277.086	S 55°-50'-19" E
37	1+286.606	59.725	1,816,578.436	465,317.481	15°-21'-44"	9.441	70.000	18.768	1+277.165	1+295.933	S 71°-12'-03" E
38	1+346.217	41.220	1,816,559.189	465,374.021	15°-36'-00"	9.589	70.000	19.059	1+336.628	1+355.687	S 55°-36'-00" E
39	1+387.319	60.217	1,816,535.902	465,408.032	87°-49'-41"	9.628	10.000	15.329	1+377.691	1+393.020	N 36°-34'-15" E
40	1+443.609	164.734	1,816,584.263	465,443.911	53°-35'-21"	7.575	15.000	14.030	1+436.034	1+450.064	S 89°-50'-23" E
41	1+607.222	101.778	1,816,583.803	465,608.644	94°-44'-18"	16.295	15.000	24.802	1+590.927	1+615.729	S 4°-53'-55" W
END	1+709.000		1,816,475.086	465,599.324							

NOTES:

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP-GN-03
3. ALIGNMENT OF ACCESS ROAD SHALL BE JUSTIFIED BY FIELD ENGINEER IN THE FIELD TO SUIT THE TOPOGRAPHY

REFERENCE DRAWINGS :

1.	ACCESS ROAD NO.2, PLAN AND PROFILE, STA.0+600.000 TO STA.1+200.000	HPP-AR-07
2.	ACCESS ROAD, TYPICAL SECTIONS, STOPPING AND PASSING PLACES	HPP-AR-09
3.	ACCESS ROAD, TYPICAL RC. PIPE, INSTALLATION AND REINFORCEMENT	HPP-AR-10
4.	ACCESS ROAD NO.2, BOX CULVERT, STA.1+456.600, PLAN AND SECTIONS	HPP-AR-12

0 5 10 15 20
SCALE 1:200 METERS

0 5 10 15 20 25 50 100
SCALE 1:1,000 METERS

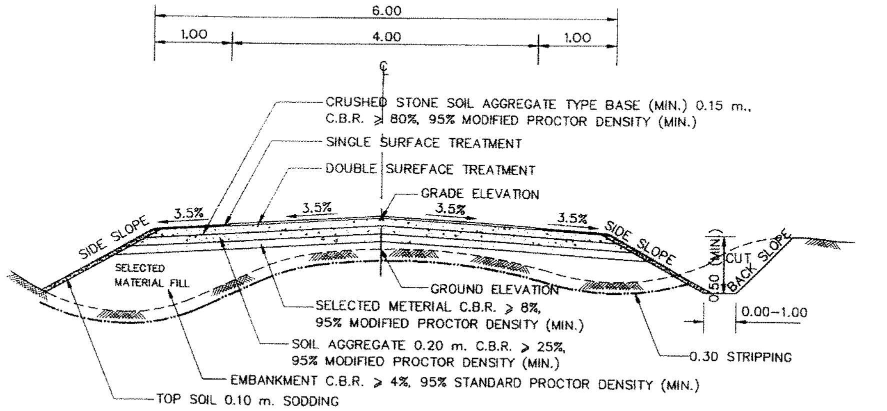
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

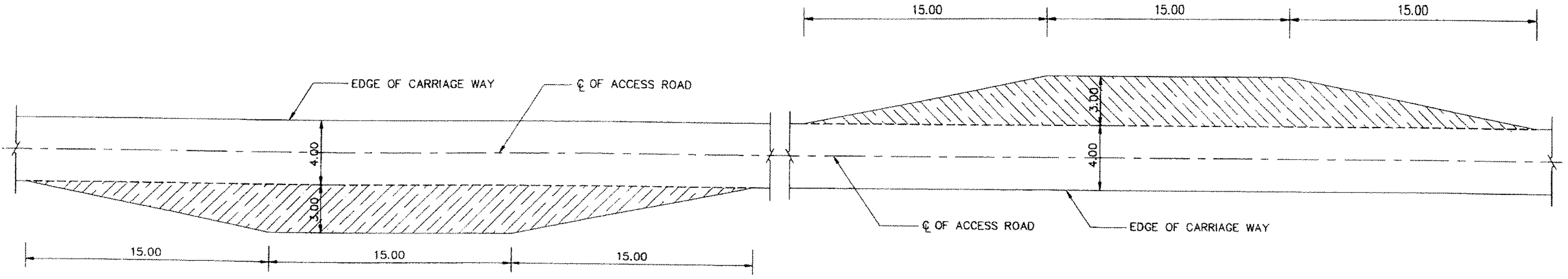
CIVIL WORKS
ACCESS ROAD
NO.2, PLAN AND PROFILE, STA.1+200.000 TO STA.1+709.000

MAHA NAKORN CONSULTANTS CO.,LTD.	DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
	REVIEWED
DESIGNED สย.22514 สย.4651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED สย.4651	APPROVED
PROJECT MANAGER DATE 8/12/51	DRAWING NO. HPP-AR-08 SHEET NO. 14 OF 100


6.00
1.00
4.00
1.00
℄
CRUSHED STONE SOIL AGGREGATE TYPE BASE (MIN.) 0.15 m., C.B.R. ≥ 80%, 95% MODIFIED PROCTOR DENSITY (MIN.)
SINGLE SURFACE TREATMENT
DOUBLE SUREFACE TREATMENT
GRADE ELEVATION
3.5%
SIDE SLOPE
SELECTED MATERIAL FILL
GROUND ELEVATION
SELECTED METERIAL C.B.R. ≥ 8%, 95% MODIFIED PROCTOR DENSITY (MIN.)
SOIL AGGREGATE 0.20 m. C.B.R. ≥ 25%, 95% MODIFIED PROCTOR DENSITY (MIN.)
EMBANKMENT C.B.R. ≥ 4%, 95% STANDARD PROCTOR DENSITY (MIN.)
TOP SOIL 0.10 m. SODDING
0.50 (MIN)
CUT BACK SLOPE
0.00–1.00
0.30 STRIPPING

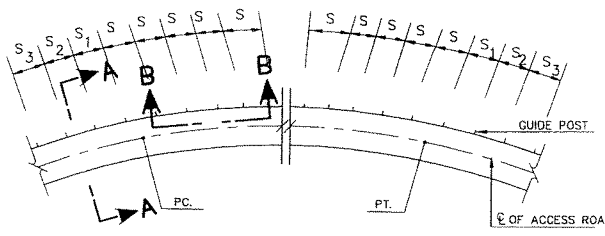
TYPICAL SECTION OF ACCESS ROAD

NOT TO SCALE



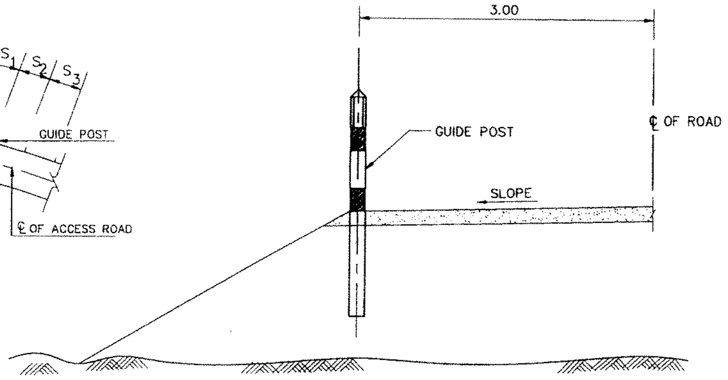
PLAN SHOWING DETAIL OF STOPPING AND PASSING PLACES IN GENERAL

NOT TO SCALE



PLAN

NOT TO SCALE

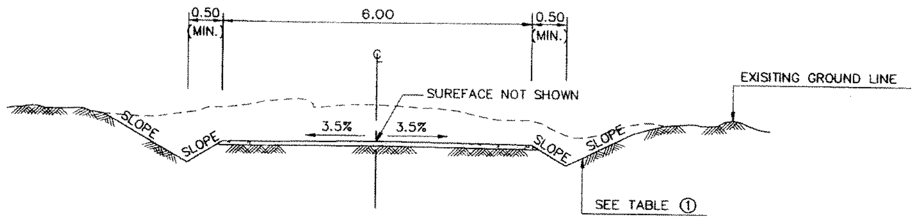


SECTION A–A

NOT TO SCALE

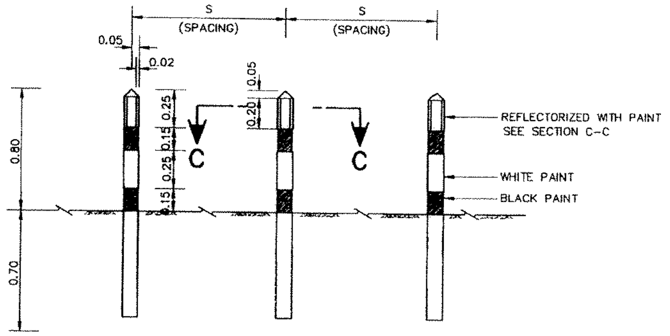
NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. THE PROPERTIES OF MATERIALS NOT INDICATED IN THE DRAWING AND ROAD CONSTRUCTION METHODS SHALL CONFORM TO CONSTRUCTION STANDARD OF มทช.201 – มทช.217 AND มทช.218 – มทช.231 (ONLY IN RELATED PART)
3. CLEARING AND GRUBBING METHODE SHALL CONFORM TO THE REQUIREMENTS AS SPECIFILED IN THE TECHNICAL SPECIFICATIONS
4. SIDE DITCH SHALL BE PROVIDES FOR ROAD IN CUT SECTION AND IN FILL SECTION WHERE HEIGHT OF FILL FROM CARRIAGE WAY EDGE TO EXISTING GROUND LINE IS LESS THAN 0.50 METERS
5. ACCESS ROAD ALIGNMENT MAY BE RE–ADJUSTED TO SUIT THE FIELD CONDITIONS, BUT UNDER THE APPROVAL OF FIELD ENGINEERS
6. THE FIELD ENGINEER MAY ORDER SIDE SLOPE IN DIFFERENCE FROM TYPICALLY SHOWN IN THIS DRAWING
7. RC. PIPES ARE GROOVE AND TONGUE TYPE WHICH SPECIFIED IN THE TECHNICAL SPECIFICATIONS LOCATION AND SIZE OF RC. PIPE CULVERTS AS SHOWN IN PLAN AND PROFILE, MAY BE RE–ADJUSTED BY FIELD ENGINEER TO FIT WITH THE TERRAIN.
8. ALL RC. PIPE CULVERTS SHALL BE INSTALLED IN MANUFACTURED LENGTH WITHOUT FIELD CUTTINGS.
9. INVERT ELEVATIONS OF RC. PIPE CULVERTS WILL BE SET ON SITE, THE LENGTH SHOWN IN PLAN AND PROFILE SHEETS MAY BE VARIED TO SUIT FIELD CONDITIONS
10. LOCATION OF STOPPING AND PASSING PLACES SHALL BE INDICATED ON PLAN AND PROFILE DRAWING OR AS DIRECTED BY FIELD ENGINEER
11. THE PAVEMENT OF ACCESS ROAD IS DOUBLE SUREFACE THEATMENT. PLAN AND PROFILE DRAWING OR AS DIRECTED BY THE CONTRACTOR AND APPROVED BY FIELD ENGINEER



CUT SECTION

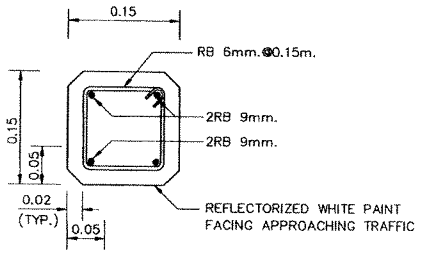
NOT TO SCALE



SECTION B–B

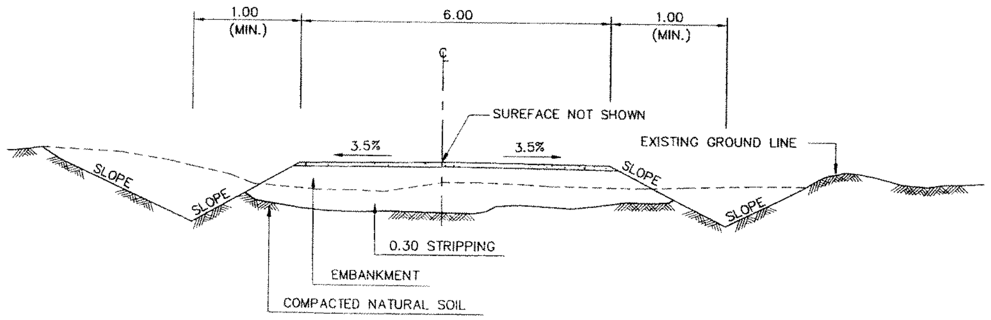
NOT TO SCALE

GUIDE POSTS



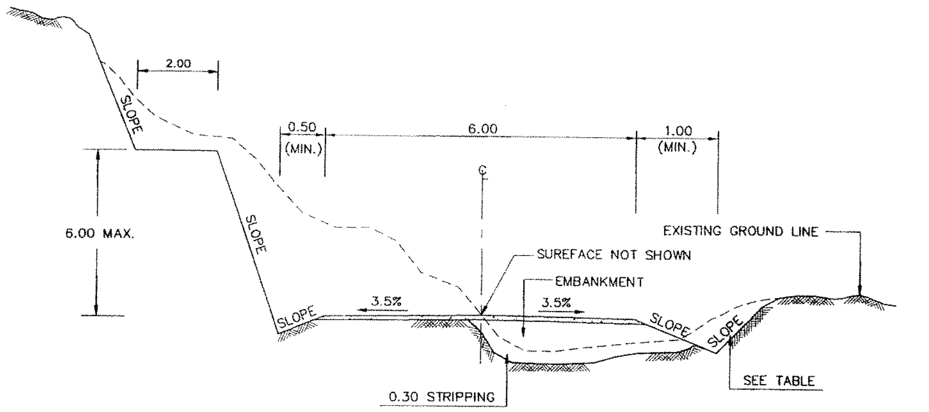
SECTION C–C

NOT TO SCALE



FILL SECTION

NOT TO SCALE



CUT & FILL SECTION

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 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

1/ = FILL SHOULD BE AVOIDED

2/ = FOR DOUBTFUL CASES FIELD ENGINEER

TABLE

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			

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

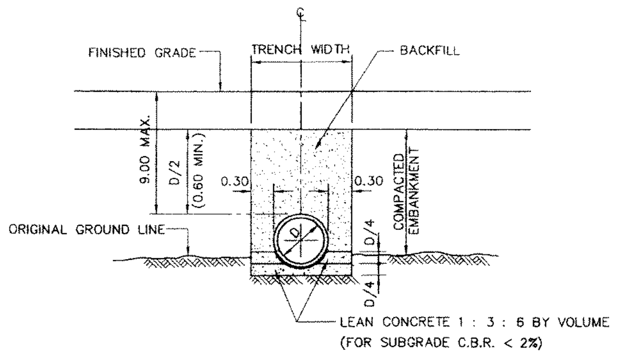
HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
ACCESS ROAD
TYPICAL SECTIONS, STOPPING AND PASSING PLACES

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภย.22614 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

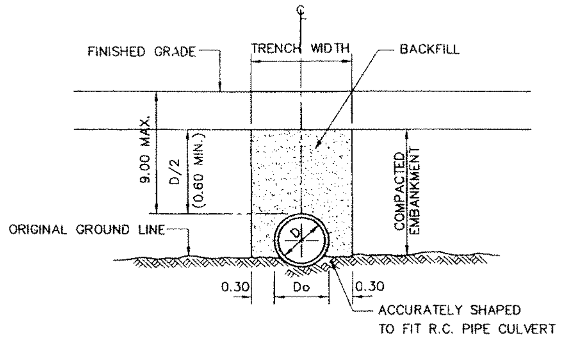
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–AR–09
SHEET NO. 15 OF 100

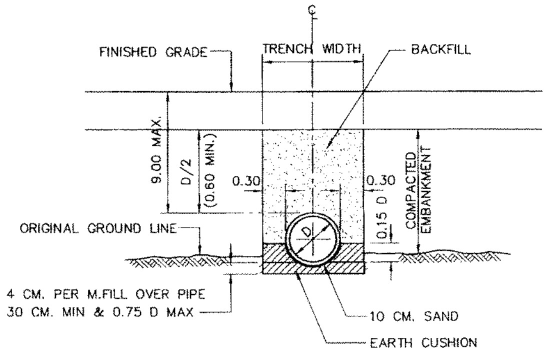


D = INSIDE DIAMETER

(A) CONCRETE CRADLE BEDDING



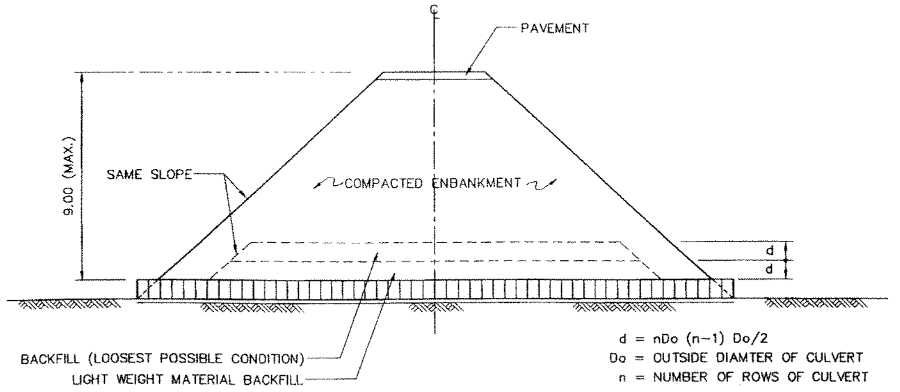
(B) ORDINARY BEDDING



(C) BEDDING FOR ROCK OR UNYIELDING FOUNDATION

R.C. PIPE CULVERTS INSTALLATION BY TRENCH METHOD

NOT TO SCALE

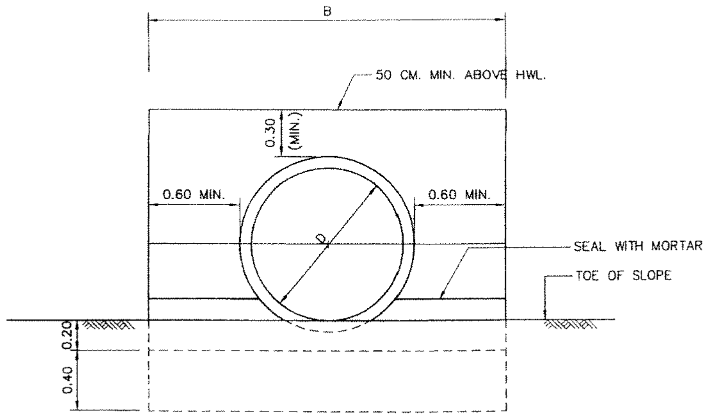


℄
PAVEMENT
9.00 (MAX.)
SAME SLOPE
COMPACTED ENBANKMENT
d
d
BACKFILL (LOOSEST POSSIBLE CONDITION)
LIGHT WEIGHT MATERIAL BACKFILL

d = nDo (n-1) Do/2
Do = OUTSIDE DIAMTER OF CULVERT
n = NUMBER OF ROWS OF CULVERT

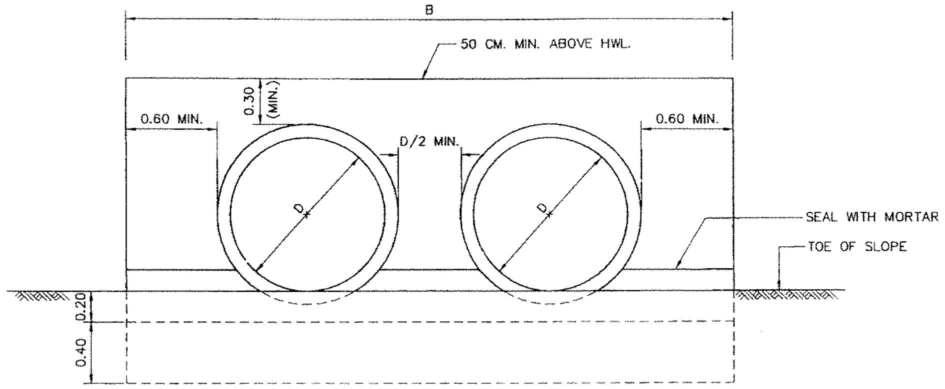
LONGITUDINAL SECTION

NOT TO SCALE



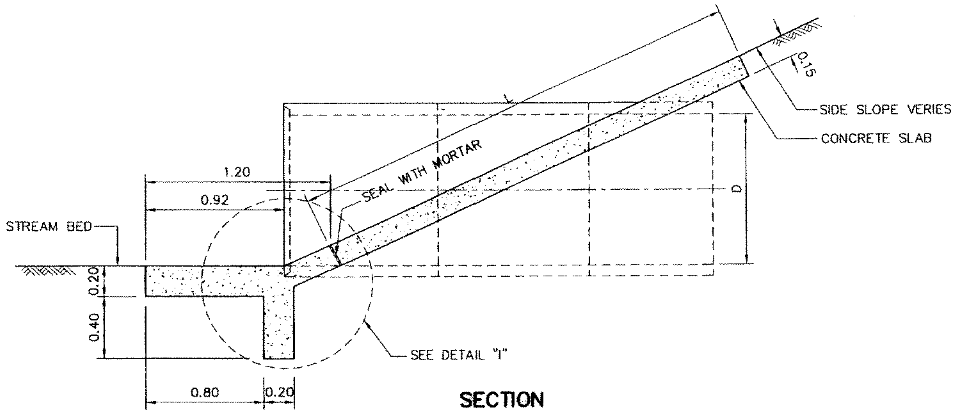
SINGLE PIPE

SCALE 1:25



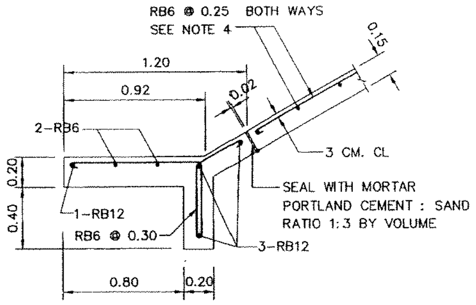
MULITIPLE PIPES

SCALE 1:20



SECTION

SCALE 1:20



DETAIL "1"

SCALE 1:20

REINFORCED CONCRETE CULVERT PIPE INSTALLATION
(MAX. FILL HEIGHT 9.00 M.)

A.) CONSTRUCTION METHODS WHEN FILL HEIGHT IS LESS THAN 1.20 M.

1. THE PROJECTION METHODS SHALL BE USED FOR PIPE INSTALLATION.
2. THE PIPE LINE LAYOUT SHALL BE SUITABLE FOR THE TERRAIN.THE EXISTING GROUND ALONG THE LINE OF CULVERT SHALL BE PREPARED TO THE SPECIFIED SLOPE.
3. PIPE BEDDING SHALL BE TYPE (A) , (B) OR (C) AS SHOWN ON THE DRAWING AND SHALL DEPEND UPON PREVAILING SOIL CONDITION AND THE JUDGEMENT OF THE ENGINEER.
4. AFTER THE PIPE HAS BEEN PLACED , THE SUBGRADE AND / OR PORTION OF PAVEMENT SECTION WHICH ARE TO BE LAID ALONG BOTH SIDES OF THE LINE WITH IN A DISTANCE OF 4 PIPE DIAMETERS BUT NOT LESS THAN 5.00 M. FROM CENTERLINE OF THE PIPE SHALL BE CONSTRUCTED LIGHT WEIGHT CONSTRUCTION EQUIPMENT USED FOR COMPACTION SHALL OPERATE IN A DIRECTION PERPENDICULAR TO CENTERLINE OF ROADWAY (OR PARALLEL TO PIPE LINE UNTIL THE BACKFILL HAS REACHED AN ELEVATION OF AT LEAST 30 CM. ABOVE THE TOP OF PIPE.

B.) CONSTRUCTION METHODS WHEN FILL HEIGHT EXCEEDS 1.20 M.

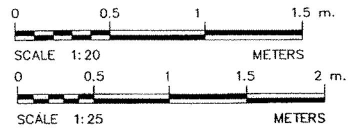
1. PIPE INSTALLATION SHALL BE BY TRENCH METHOD.SUBGRADE SHALL BE FIRST CONSTRUCTED TO AN ELEVATION D/2 OR AT LEAST 60 CM. OVER TOP OF PROPOSED PIPE A TRENCH SHALL THEN BE EXCAVATED ALONG THE PROPOSED LINE AS SHOWN ON THE DRAWING TRENCH WALLS SHALL HAVE A SMOOTH SURFACE AND SHALL BE CONSTRUCTED VERTICALLY.
2. THE TRENCH BED SHALL BE PREPARED TO THE SPECIFIED SLOPE BEDDING TYPE SHALL BE (A), (B) OR (C) DEPENDING ON FOUNDATION SOIL AND AS DIRECTED BY THE ENGINEER.
3. PIPE SHALL BE INSTALLED ACCORDING TO SIZES SHOWN ON THE DRAWINGS. BACKFILLING OF PIPE CULVERTS SHALL NOT BE PERMITTED UNTIL AT LEAST 48 HOURS HAVE ELAPSED AFTER JOINT HAVE BEEN COMPLETED.
4. BACKFILL SHALL BE PLACED TO THE SUBGRADE ELEVATION AS DESCRIBED IN NOTE I. BACKFILL SHALL BE A SELECT MATERIAL AND SHALL REQUIRE THE APPROVAL OF THE ENGINEER METHOD OF COMPACTION OF BACKFILL SHALL BE THE SAME AS REQUIRED FOR SUBGRADE COMPACTION EQUIPMENT SHALL BE APPROVED BY THE ENGINEER.

NOTES :

1. ALL DIMENSION ARE IN METERS, REINFORCEMENT BARS IN MILLIMETERS, UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 175 KSC. FOR 15X15X15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS

PORTLAND CEMENT TYPE 1	320	KG. (MIN.)
SAND	0.43	$M.^3$
CRUSHED ROCK OR GRAVEL	0.85	$M.^3$
CONCRETE SLUMP	10	CM. (MAX.)

3. REINFORCING STEEL SHALL CONFROM TO TIS.20 GRADE SR. 24 OR EQUIVALENT.
4. STEEL REINFORCED IN CONCRETE SLAB SHALL BE REQUIRED ONLY WHEN (B X L) IS MORE THAN 9.00 SQ.M.
5. FOR ROLLING AND MOUNTAINOUS TERRAINS,THESE HEADWALLS SHALL BE USED AS NECESSARY
6. THIS DRAWING IS ADAPTED FROM DOH DWG NO.DS-102 AND DWG NO.DS-103



KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
ACCESS ROAD
TYPICAL RC. PIPE INSTALLATION AND REINFORCEMENT

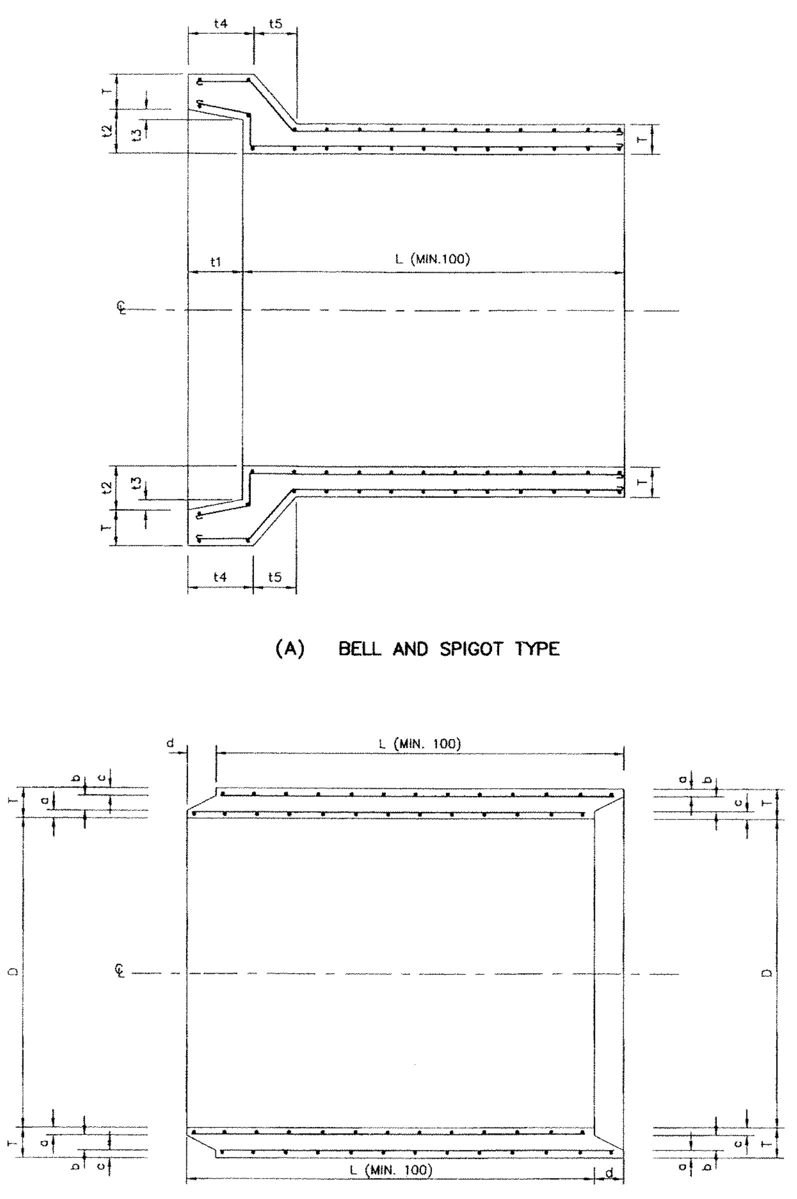
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED 22514 4651
DRAWN
CHECKED 4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-AR-10
SHEET NO. 16 OF 100

D:\0783\HPP-AR-10.DWG\27-OCT-2008/SMP.

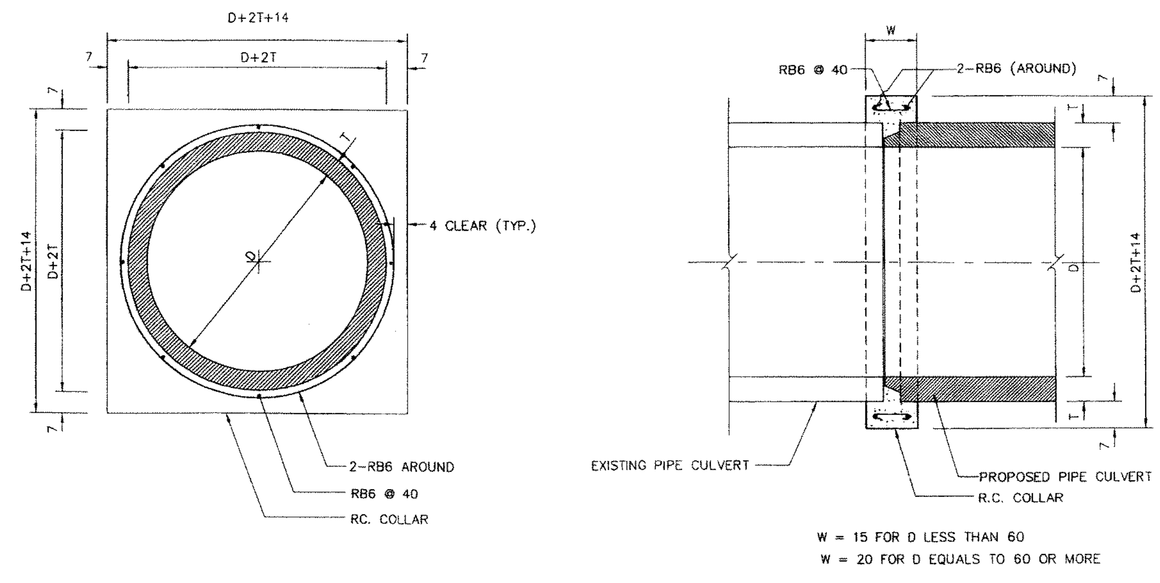


(A) BELL AND SPIGOT TYPE

(B) TONGUE AND GROOVE TYPE

DETAIL OF RC. PIPE CULVERT

NOT TO SCALE



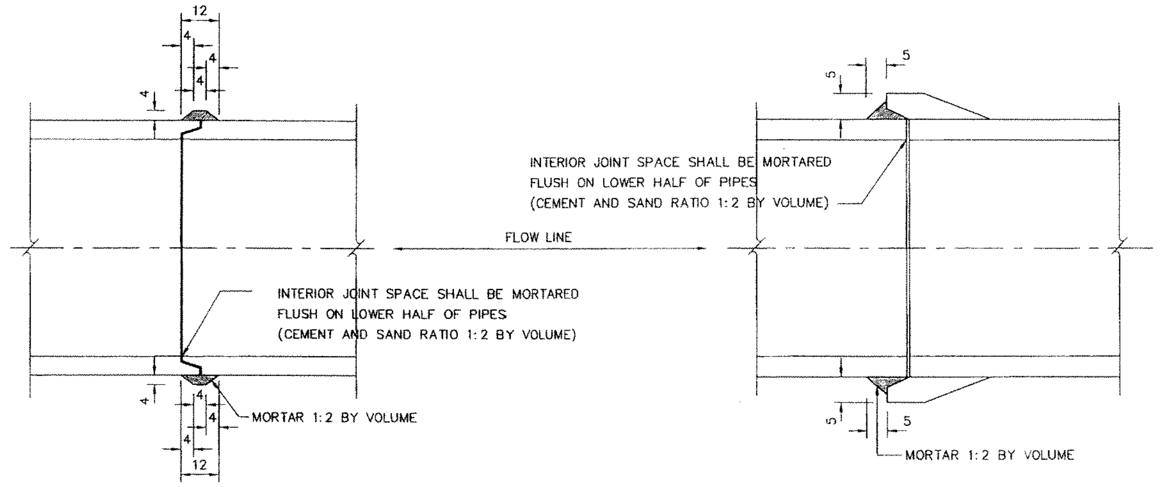
W = 15 FOR D LESS THAN 60
W = 20 FOR D EQUALS TO 60 OR MORE

(A) TRANSVERSE SECTION

(B) LONGITUDINAL SECTION

PIPE EXTENSION

NOT TO SCALE


12
4
INTERIOR JOINT SPACE SHALL BE MORTARED
FLUSH ON LOWER HALF OF PIPES
(CEMENT AND SAND RATIO 1:2 BY VOLUME)
FLOW LINE
MORTAR 1:2 BY VOLUME
5

(A) SINGLE AND GROOVE TYPE

(B) BELL AND SPIGOT TYPE

PIPE CONNECTION DETAILS

NOT TO SCALE

NOTES :

1. ALL DIMENSIONS ARE IN CENTIMETERS, REINFORCEMENT BARS IN MILLIMETERS, UNLESS OTHERWISE INDICATED.
2. REINFORCED CONCRETE PIPE CULVERT CLASSES 2 AND 3 SHALL CONFORM TO TIS.128 OR EQUIVALENT.
3. CEMENT , STEEL REINFORCEMENT , AGGREGATES AND TEST METHODS USED FOR R.C.PIPE CULVERT SHALL CONFORM TO THE REQUIREMENT OF TIS.128 OR EQUIVALENT.
   - 3.1 CEMENT CONTENT USED FOR CONCRETE MIX SHALL NOT BE LESS THAN 335 KILOGRAM PER CUBIC METER OF CONCRETE
   - 3.2 CONCRETE COVER FOR SINGLE LAYER CIRCULAR REINFORCEMENT SHALL BE 0.35 TO 0.5 TIME OF WALL THICKNESS (MEASURED FROM INNER WALL)
   - 3.3 CONCRETE COVER FOR DOUBLE LAYERS CIRCULAR REINFORCEMENT SHALL BE 2.5 CM. IN AVERAGE BUT NOT LESS THAN 1.5 CM.
   - 3.4 LONGITUDINAL REINFORCEMENT SPACING FOR PIPE SIZE ø50 CM. OR SMALLER SHALL BE A MINIMUM OF 4-ø4 MM. BARS AND 8-ø4 MM. BARS FOR PIPE ø60 CM. OR LARGER.
   - 3.5 CIRCULAR REINFORCEMENT SPACING FOR PIPE SIZE ø30 CM. TO ø80 CM. SHALL BE 10 CM. OR LESS AND FOR PIPE SIZE ø100 CM. TO ø150 CM. SHALL BE 15 CM. OR LESS BUT NOT MORE THAN THEIR WALL THICKNESS.
4. THE CULVERT WHICH HAVING TRANSVERSE REINFORCEMENT IN ELLIPTICAL CAGE AS SPECIFIED IN THE TIS. 128 SHALL NOT BE USED.
5. PIPE MAY BE EITHER BELL AND SPIGOT TYPE OR TONGUE AND GROOVE TYPE AS DIRECTED BY THE ENGINEER.
6. CULVERT JOINTS SHALL BE MORTARED AS SHOWN ON THE DRAWING WITH CEMENT MORTAR (1:2 BY VOLUME)
7. CULVERT LENGTH (L) SHALL BE 100 CM. UNLESS OTHERWISE SPECIFIED.
8. REINFORCED CONCRETE PIPE CULVERT CLASS 2 SHALL BE USED UNDER PAVEMENT.
9. REINFORCED CONCRETE PIPE CULVERT CLASS 3 SHALL BE USED UNDER SIDEWALK.
10. THIS DRAWING IS ADAPTED FROM DOH DWG NO.DS-101

TABLE 1

R.C. PIPE CULVERT CLASS	INSIDE DIAMETER (D) (C.M.)	WALL THICKNESS (T) (C.M.)	MIN. CIRCULAR REINFORCEMENT ($CM^2/M.$)		CRUSHING LOAD TO PRODUCE 0.03 CM. CRACK WIDTH AND 30 CM. CRACK LENGTH (KG./M.)	MAXIMUM CRUSHING LOAD (KG./M.)	ULTIMATE COMPRESSIVE STRENGTH FOR ø15 x 30 CM. CONCRETE CYLINDER AT 28 DAYS AGE ($KG./CM.^2$)	OVER FILL ON R.C. PIPE CULVERT NOT MORE THAN (METERS)
			INNER CAGE	OUTER CAGE				
2	30	5.0	1.5	–	3,060	4,590	280(350)	10.0
	40	6.0	2.5	–	4,080	6,120		
	50	7.0	3.8	–	5,100	7,650		
	60	7.5	5.7	–	6,120	9,180		
	80	9.5	5.8	4.1	8,160	12,240		
	100	11.0	7.0	5.2	10,200	15,300		
	120	12.5	8.9	6.8	12,240	18,360		
	150	15.0	12.5	9.5	15,300	22,950	350(440)	11.0
3	30	5.0	1.5	–	1,990	3,060	280(350)	8.0
	40	6.0	1.5	–	2,650	4,080		
	50	7.0	1.5	–	3,320	5,100		
	60	7.5	1.5	–	3,980	6,120		
	80	9.5	4.0	–	5,300	8,160		
	100	11.0	4.2	3.2	6,630	10,200		
	120	12.5	5.1	3.8	7,960	12,240		
	150	15.0	7.2	5.5	9,950	15,300		

FIGUERS IN PARENTHESES ARE ULTIMATE COMPRESSIVE STRENGTH FOR 15x15x15 CM. CONCRETE CUBE AT 28 DAYS AGE

TABLE 2

R.C. PIPE CULVERT CLASS	INSIDE DIAMETER (D) (CM.)	WALL THICKNESS (T) (CM.)	PIPE END DETAILS (CM.)								
			BELL & SPIGOT TYPE					TONGUE & GROOVE TYPE			
			t1	t2	t3	t4	t5 (MIN.)	a	b	c	d
2 & 3	30	5.0	6.0	6.6	0.4	8.5	15.0	1.9	0.8	2.3	3.0
	40	6.0	6.7	7.6	0.4	9.7	18.0	2.3	1.0	2.7	3.0
	50	7.0	7.0	8.6	0.4	10.5	21.0	2.8	1.0	3.2	4.0
	60	7.5	7.6	9.1	0.4	11.4	22.5	2.8	1.5	3.2	4.0
	80	9.5	8.9	11.1	0.4	13.7	28.5	3.8	1.5	4.2	4.5
	100	11.0	9.5	12.6	0.4	15.0	33.0	4.3	2.0	4.7	4.5
	120	12.5	10.0	14.1	0.4	16.5	37.5	4.8	2.5	5.2	5.0
	150	15.0	10.0	16.6	0.4	17.7	45.0	5.7	3.0	6.3	6.0

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
ACCESS ROAD
R.C. PIPE CULVERT

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED ภย.22514 สย.4651
DRAWN
CHECKED สย.4651
8/12/51
PROJECT MANAGER DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-AR-11
SHEET NO. 17 OF 100

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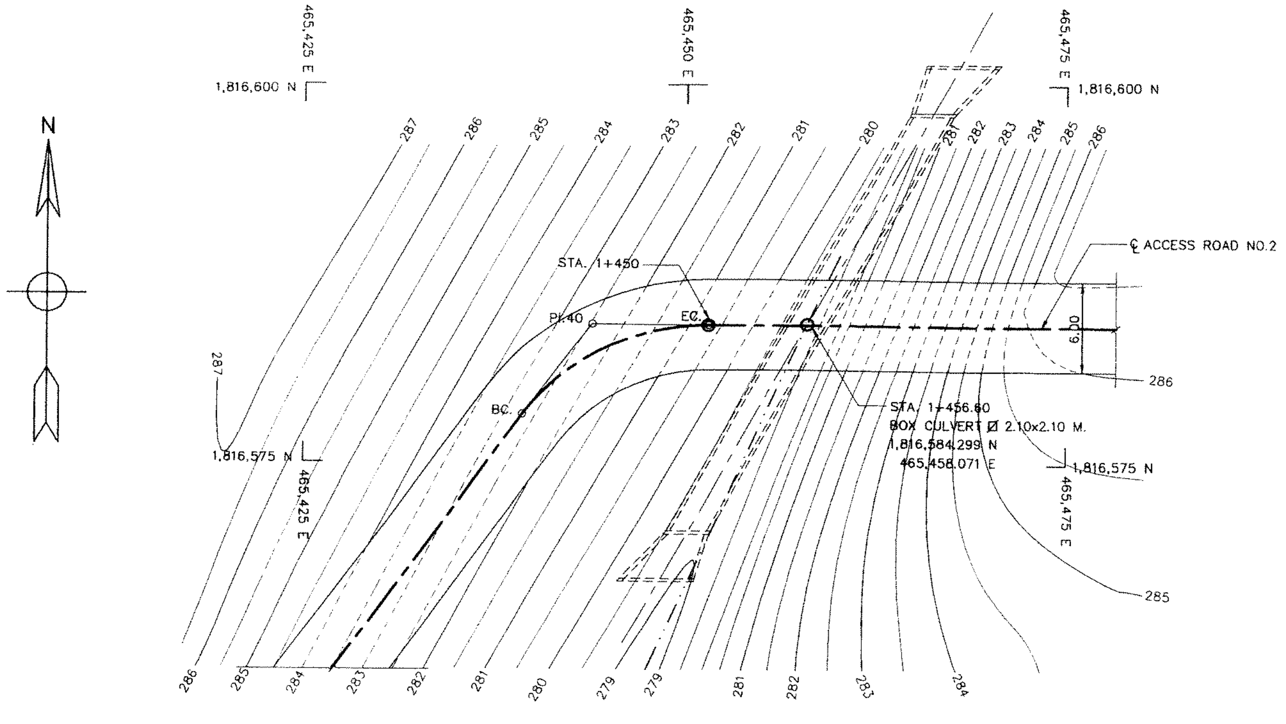
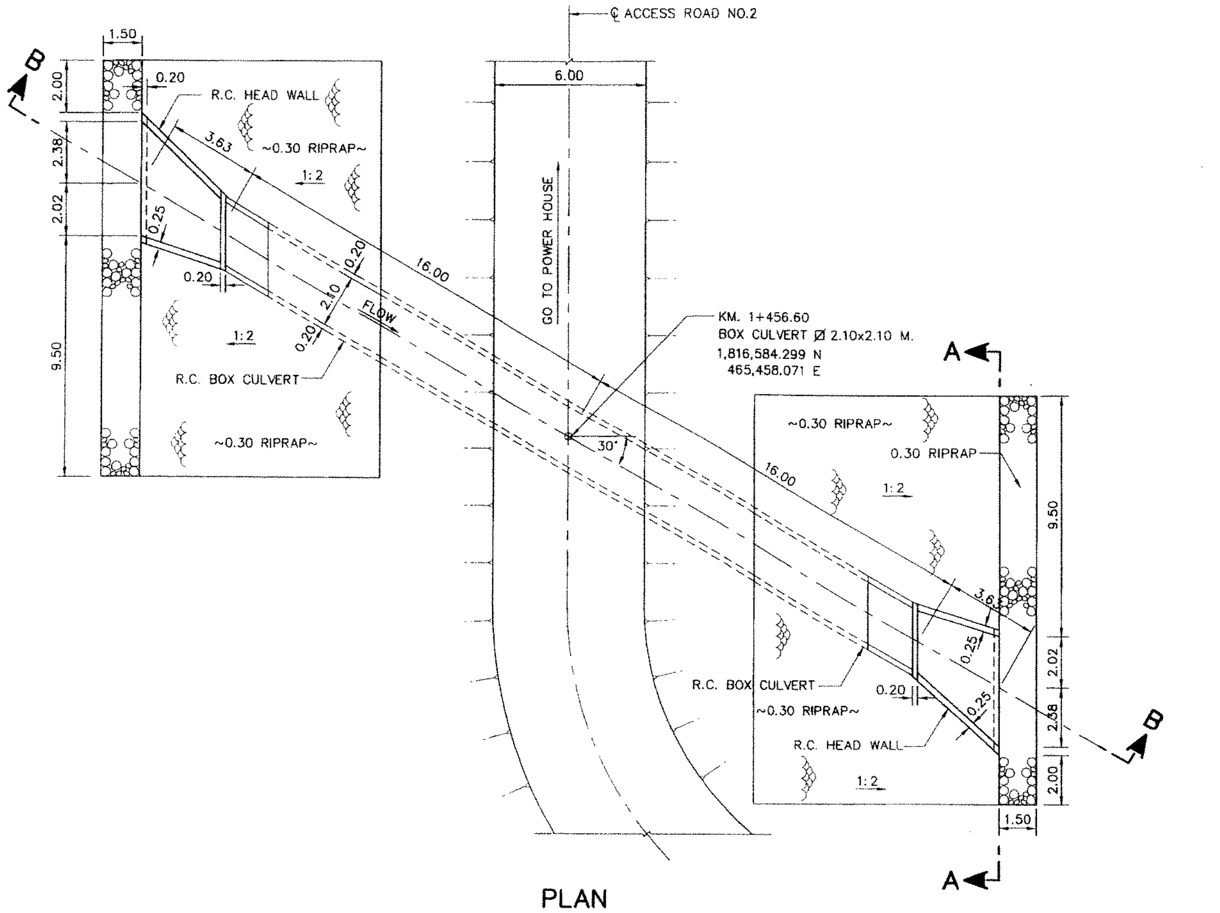


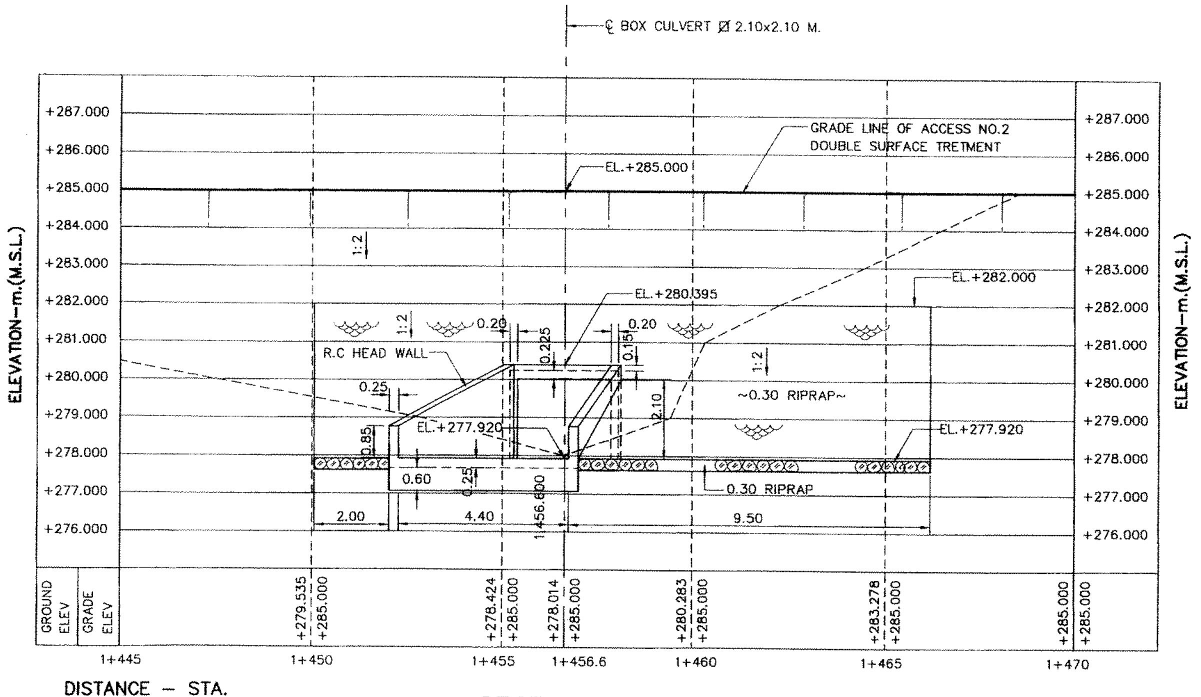
LAYOUT

SCALE 1:250



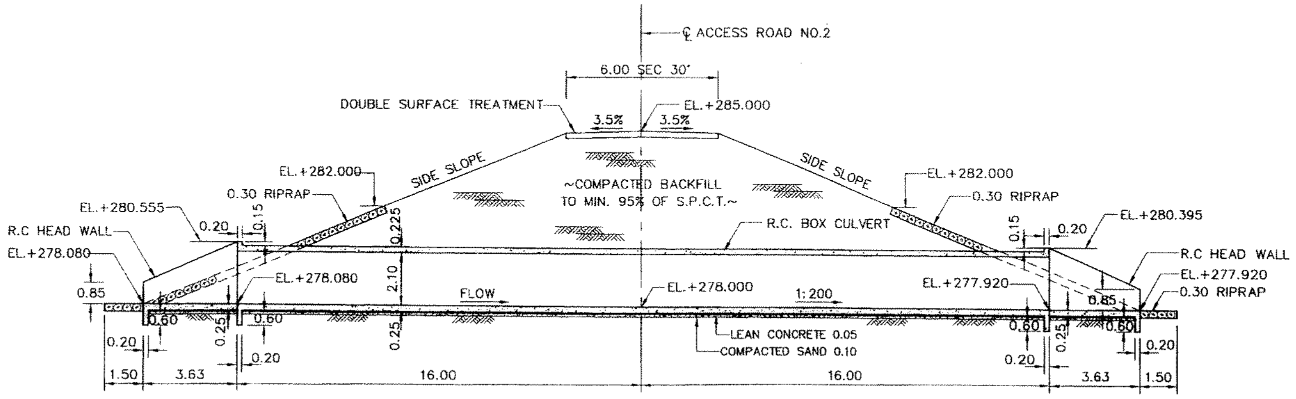
PLAN

SCALE 1:150



SECTION A–A

SCALE 1:100



SECTION B–B

SCALE 1:150

NOTES :

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

REFERENCE DRAWINGS :

1. ACCESS ROAD NO. 2, PLAN AND PROFILE, STA.1+200.000 TO STA.1+709.000	HPP–AR–08
2. ACCESS ROAD NO. 2, BOX CULVERT STA.1+456.600, REINFORCEMENT AND DETAILS	HPP–AR–13

0 1 2 3 4 5 6 7 8 9 10 11 12
SCALE 1:150 METERS

0 5 10 15 20
SCALE 1:250 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

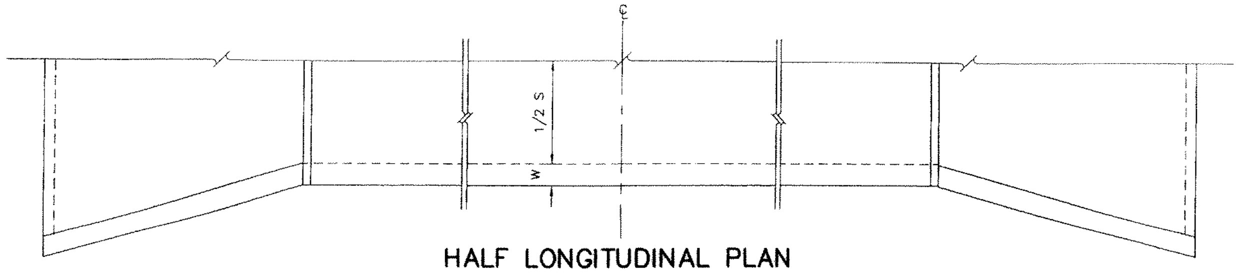
KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
ACCESS ROAD NO. 2
BOX CULVERT STA.1+456.600, PLAN AND SECTIONS

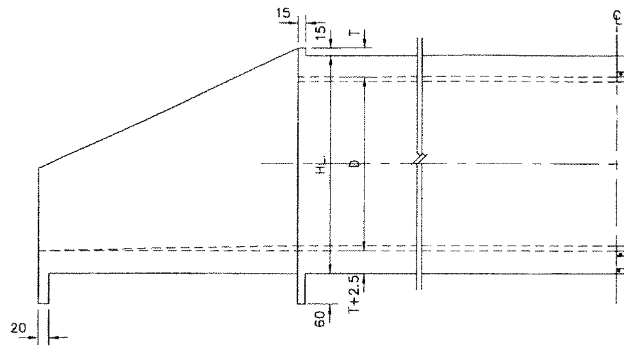
MAHA NAKORN CONSULTANTS CO.,LTD.	DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
	REVIEWED
DESIGNED ภย.22514 สย.4651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED สย.4651	APPROVED
PROJECT MANAGER 8/12/51 DATE	DRAWING NO. HPP–AR–12
	SHEET NO. 18 OF 100

D:\0783\HPP-AR-12.DWG\29-OCT-2008/SMP.



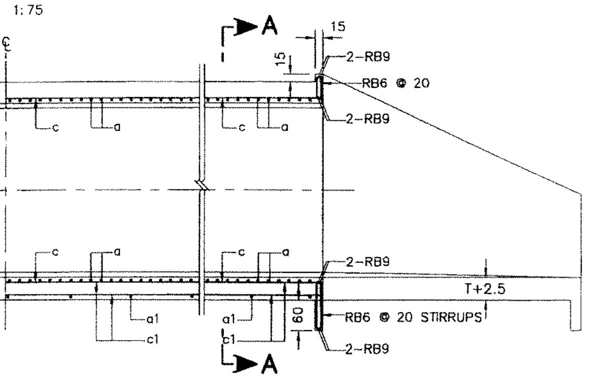
HALF LONGITUDINAL PLAN

SCALE 1:75



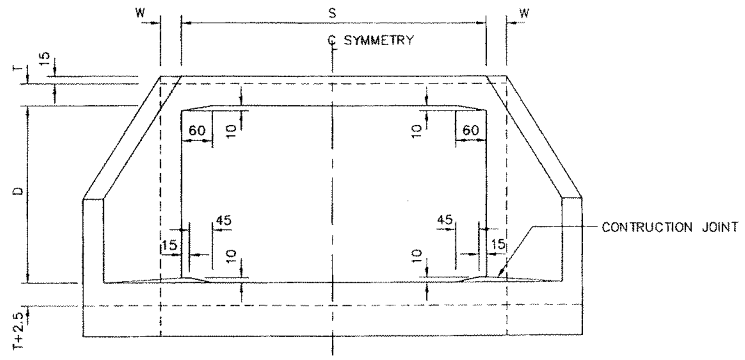
HALF LONGITUDINAL ELEVATION

SCALE 1:75



HALF LONGITUDINAL SECTION

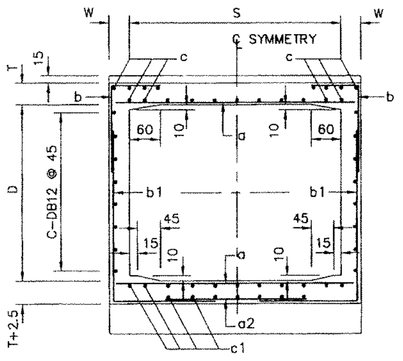
SCALE 1:75



SINGLE BOX

TRANSVERSE ELEVATION

SCALE 1:75



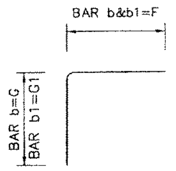
SINGLE BOX

SECTION A-A

SCALE 1:75

REINFORCEMENT FOR BOXCULVERT

S	D	T	W	SCREW ANGLE	BAR MARK a			BAR MARK a2			BAR MARK b&b1			BAR MARK b		BAR MARK b1		BAR MARK c			BAR MARK c1			BAR MARK v			BAR MARK v1			BAR MARK b2		
					SIZE	@ CM.	L CM.	SIZE	@ CM.	L CM.	SIZE	@ CM.	F CM.	G CM.	L CM.	G1 CM.	L CM.	SIZE	@ CM.	NO	SIZE	@ CM.	NO	SIZE	@ CM.	L CM.	SIZE	@ CM.	L CM.	SIZE	@ CM.	L CM.
210	210	22.5	20	30°	DB20	15	270	DB12	±120	190	DB16	12.5	102.5	102.5	220	212.5	330	DB12	45	19	DB16	30	15	–	–	–	DB12	30	260	DB16	12.5	195

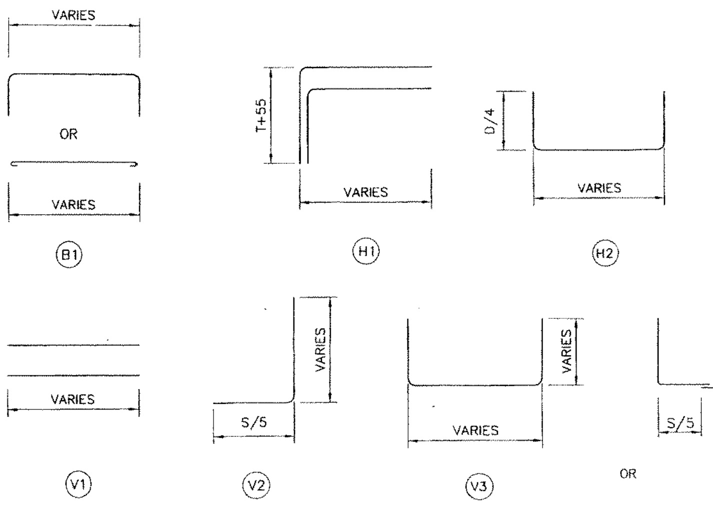


BENDING DETAILS FOR BARS b&b1

NOT TO SCALE

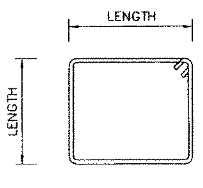
TABLE OF REINFORCEMENT FOR HEADWALL OF SINGLE BOX CULVERT

L	h1	t1	CULVERTS			V1		V2		V3		H1		H2		B1	
			L1	S1	S2	SIZE	@	SIZE	@	SIZE	@	SIZE	@	SIZE	@	SIZE	No.
320	85	25	363	202	238	RB9	30	DB12	16	DB12	16	DB12	30	DB12	16	DB12	4

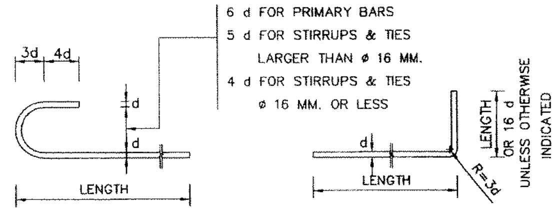


BAR BENDING DIAGRAMS

NOT TO SCALE



PLAIN BAR



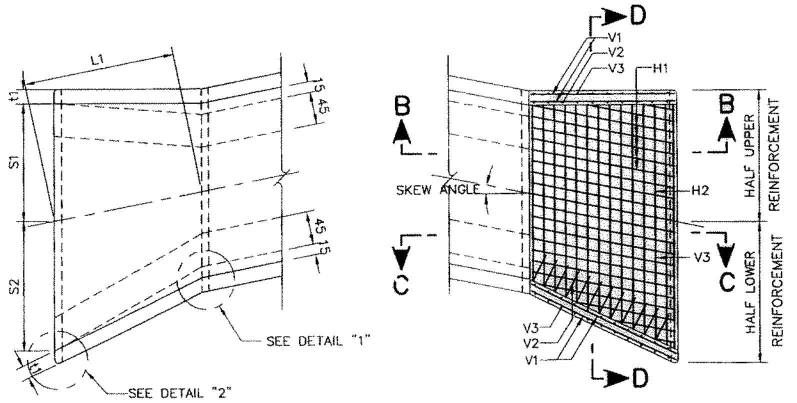
DEFORMED BAR

NOTES :

1. CONCRETE SHALL HAVE THE 28–DAY MINIMUM ULTIMATE COMPRESSIVE STRENGTH BASED ON 15x15x15 CM. CUBE SAMPLES , OF 175 KG./CM.^{2} AND SHALL HAVE A MINIMUM CEMENT CONTENT OF 320 KG./M.^{3}
   THE FOLLOWING IS THE SUGGESTED CONCRETE MIX PROPORTIONS PER CUBIC METER :

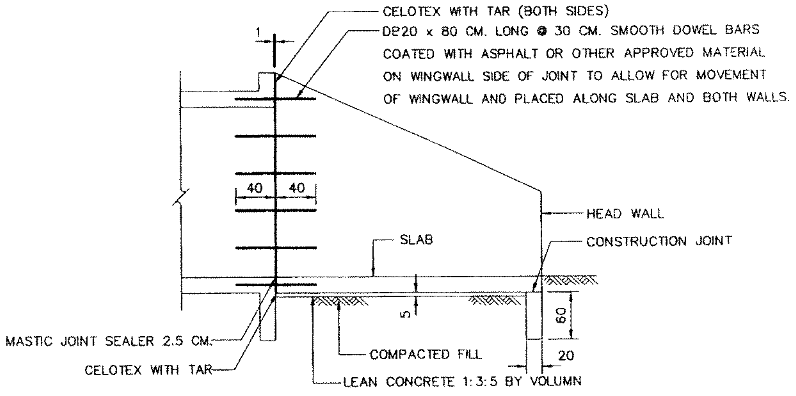
TYPE I PORTLAND CEMENT	320 KG.
SAND	0.43 M.^{3}
CRUSHED ROCK OR GRAVEL	0.86 M.^{3}
WITH THE MAXIMUM SLUMP OF	10 CM.

2. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE BOTTOM OF BOTTOM SLABS OR WALLS AT WHICH CLEAR COVER OF 7.5 CM. SHALL BE PROVIDED.
3. ALL DIMENTIONS SHOWN ARE IN CENTIMETERS, REINFORCEMENT BARS IN MILLIMETERS, UNLESS OTHERWISE INDICATED.
4. REBARS 12 MM. DIAMETER OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFROMED BARS OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS OR EQUIVALENT.
5. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
6. LAP LENGTH SHALL NOT BE LESS THAN 40 DIMETERS OF BIGGER BAR FOR PLAN BARS AND 24 DIMETERS OF BIGGER BAR FOR DEFROMED BARS.
7. THIS DRAWING IS ADAPTED FROM DOH DWG NO.BC–01, NO.BC–02, NO.BC–04



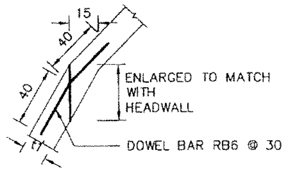
DETAILS FOR SKEWED SINGLE BOX

NOT TO SCALE


CELOTEX WITH TAR (BOTH SIDES)
DB20 x 80 CM. LONG @ 30 CM. SMOOTH DOWEL BARS COATED WITH ASPHALT OR OTHER APPROVED MATERIAL ON WINGWALL SIDE OF JOINT TO ALLOW FOR MOVEMENT OF WINGWALL AND PLACED ALONG SLAB AND BOTH WALLS.
1
40
40
HEAD WALL
SLAB
CONSTRUCTION JOINT
5
60
20
MASTIC JOINT SEALER 2.5 CM.
CELOTEX WITH TAR
COMPACTED FILL
LEAN CONCRETE 1:3:5 BY VOLUMN

EXPANSION JOINT DETAIL

SCALE 1:25



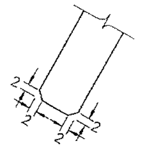
DETAIL "1"

SCALE 1:20

0 0.5 1 1.5 m.
SCALE 1:20 METERS

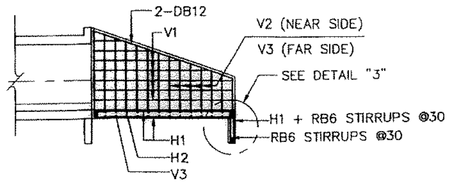
0 0.5 1 1.5 2 m.
SCALE 1:25 METERS

0 0.5 1 2 3 4 5 6 m.
SCALE 1:75 METERS



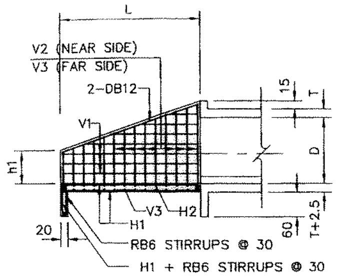
DETAIL "2"

NOT TO SCALE



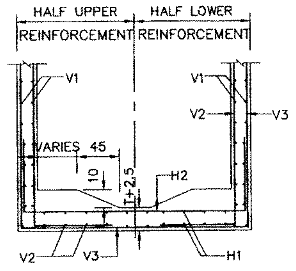
SECTION B–B

NOT TO SCALE



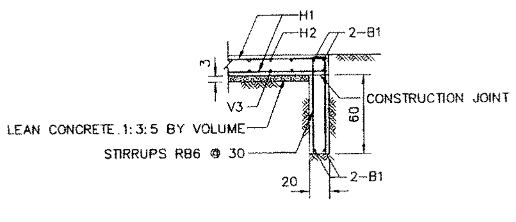
SECTION C–C

NOT TO SCALE



SECTION D–D

NOT TO SCALE



DETAIL "3"

SCALE 1:20

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
ACCESS ROAD NO.2
BOX CULVERT, STA.1+456.600, REINFORCEMENT AND DETAILS

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED ภย.22514 วย.4651
DRAWN
CHECKED วย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–AR–13
SHEET NO. 19 OF 100

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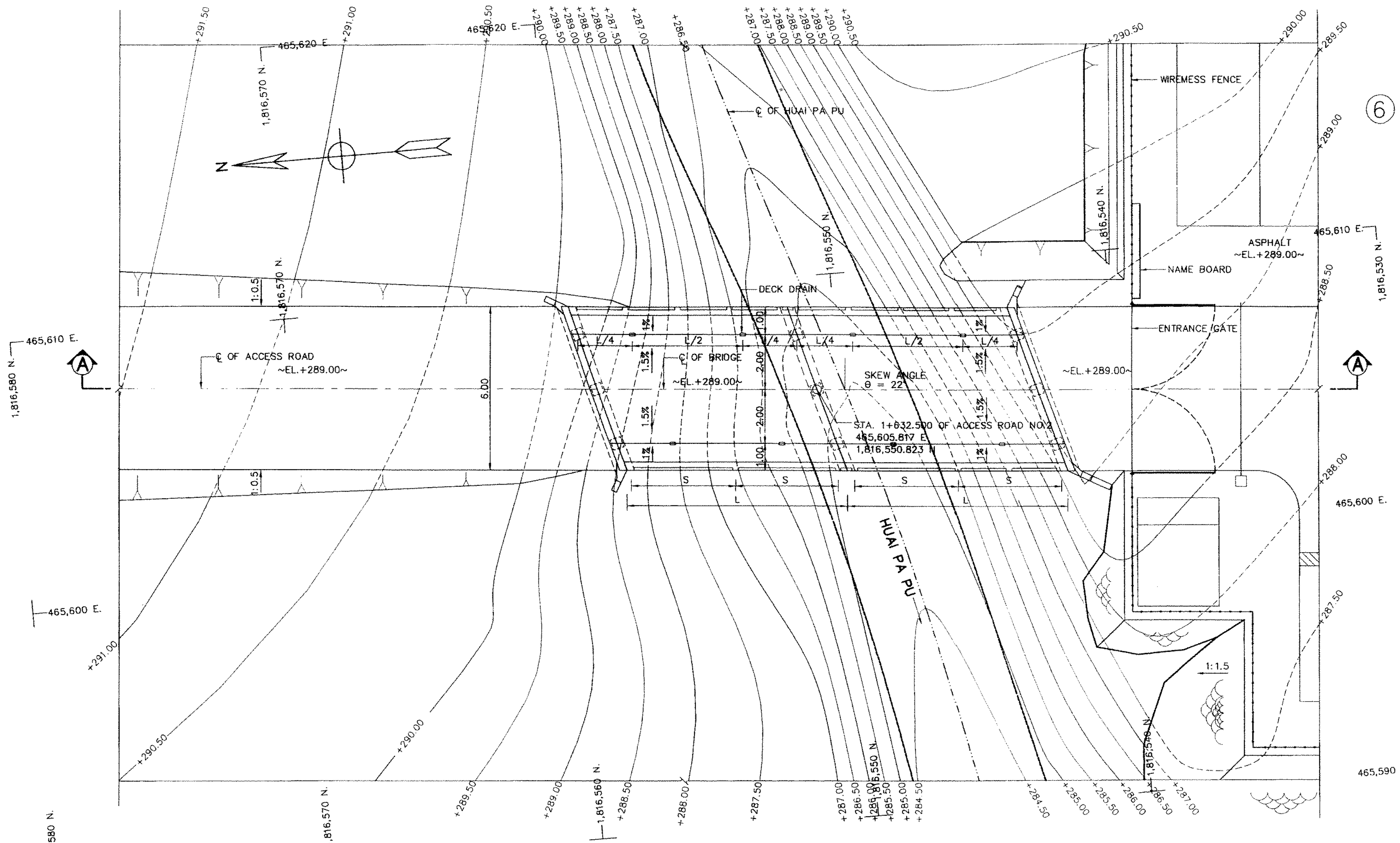
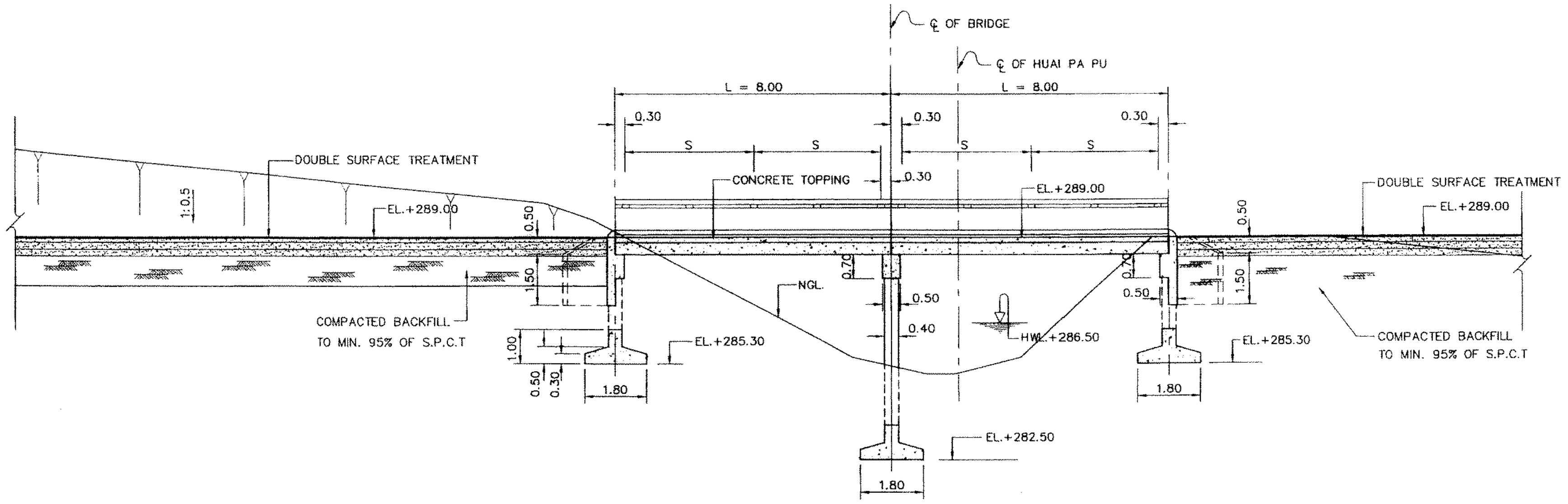


PLAN

SCALE 1:100



SECTION A–A

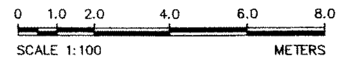
SCALE 1:100

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP-GN-03
3. THE MINIMUM ALLOWABLE BEARING CAPACITY OF SOIL SHALL BE 20 TON/M^2

REFERENCE DRAWINGS :

1.	BRIDGE, REINFORCEMENT, PLAN, SECTIONS AND DETAILS	HPP-BR-02
2.	BRIDGE, REINFORCEMENT, SPREAD FOUNDATION ABUTMENT DETAILS	HPP-BR-03
3.	BRIDGE, REINFORCEMENT, SPREAD FOUNDATION PIER DETAILS	HPP-BR-04



KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
BRIDGE
PLAN AND SECTIONS

MAHA NAKORN CONSULTANTS CO.,LTD.

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

DESIGNED สย.46109 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-BR-01
SHEET NO. 20 OF 100

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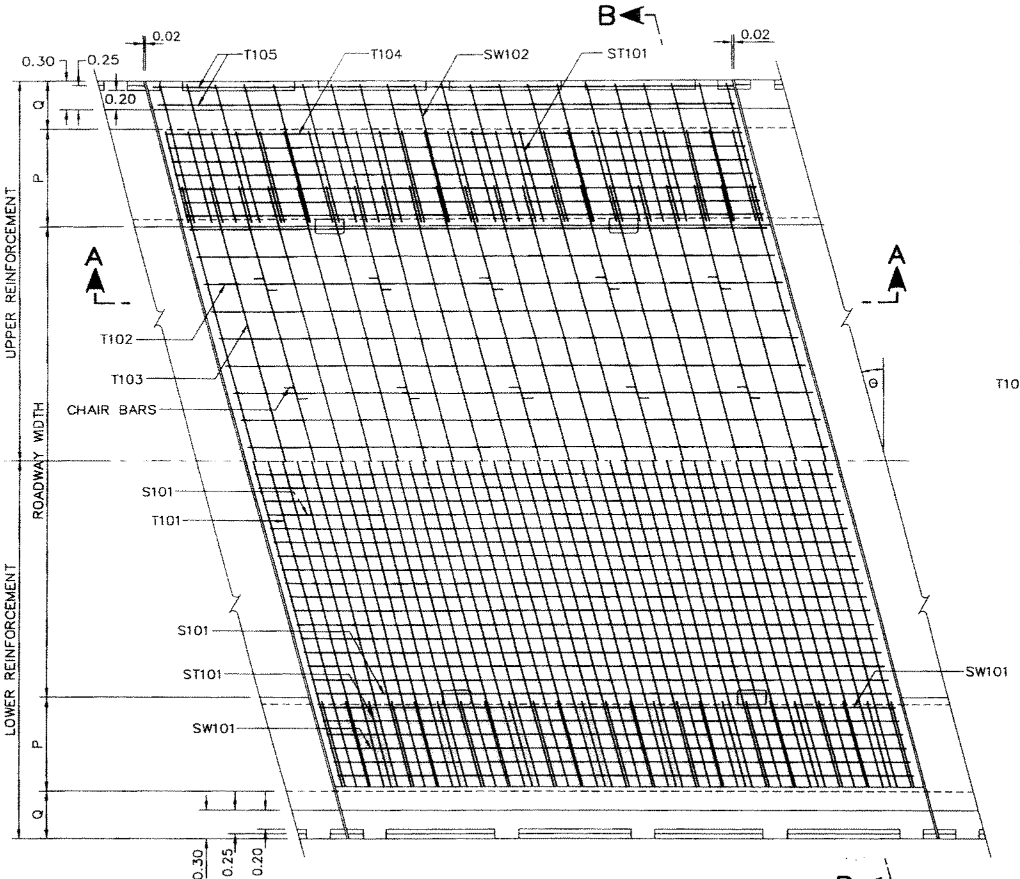
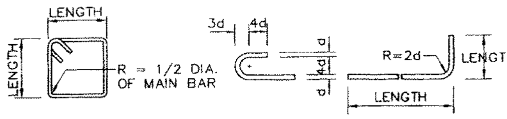


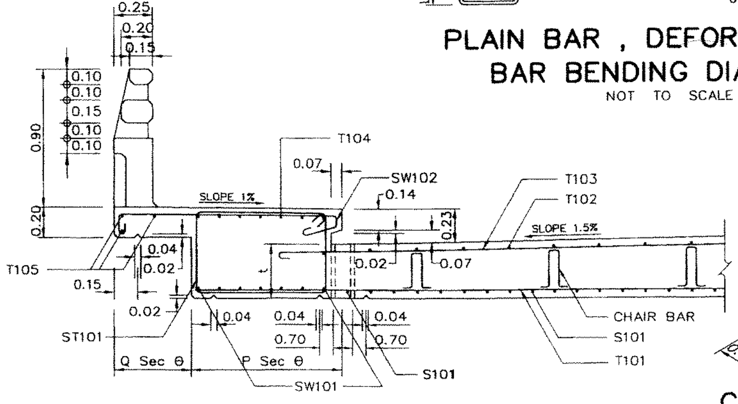
REINFORCEMENT PLAN

SCALE 1:40



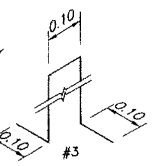
PLAIN BAR , DEFORMED BAR BAR BENDING DIAGRAMS

NOT TO SCALE



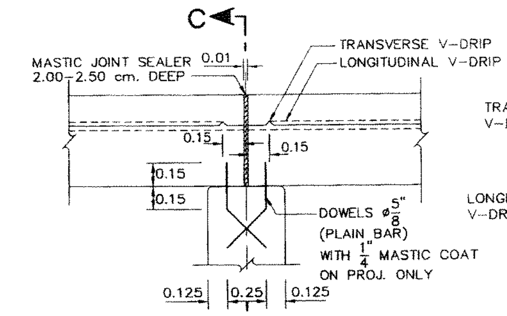
SECTION B – B

SCALE 1:25



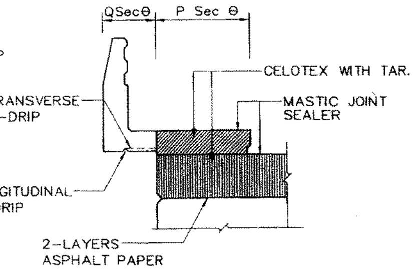
CHAIR BAR

NOT TO SCALE



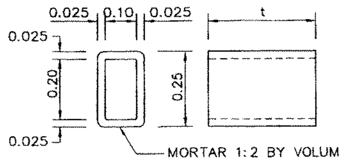
EXPANSION JOINT DETAILS

SCALE 1:25



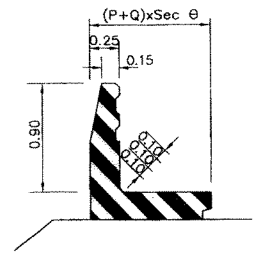
SECTION C – C

SCALE 1:25



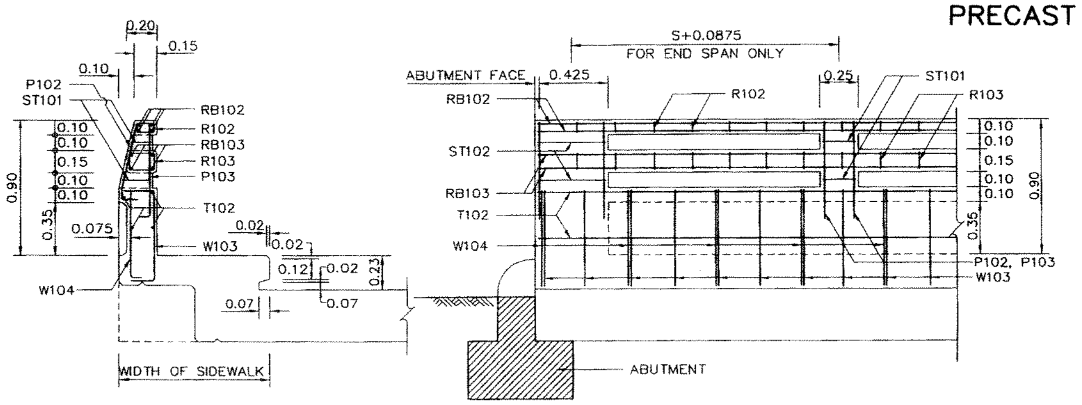
PRECAST MORTAR DRAIN PIPE

SCALE 1:25



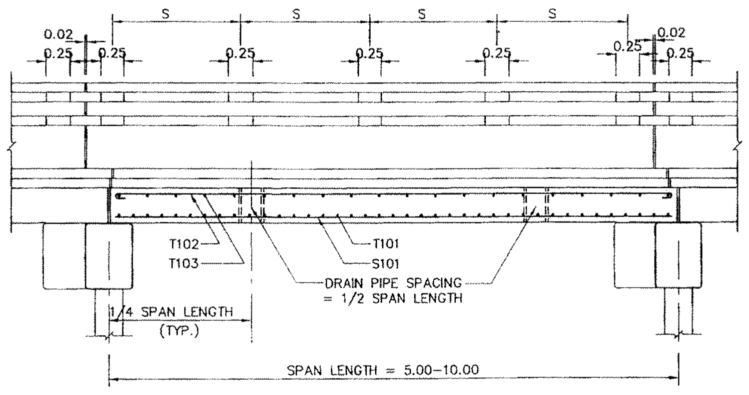
PAINTING AT BRIDGE END

SCALE 1:25



TYPE 3 COMBINATION RAILING

SCALE 1:25



SECTION A – A

SCALE 1:40

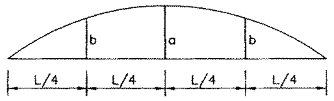


TABLE OF DEAD LOAD CAMBER		
SPAN	CAMBER	
	a	b
5.00	0.0022	0.0016
6.00	0.0034	0.0025
7.00	0.0054	0.0040
8.00	0.0076	0.0054
9.00	0.0103	0.0074
10.00	0.0122	0.0088

TABLE OF SLAB THICKNESS

SPAN	5.00	6.00	7.00	8.00	9.00	10.00
SLAB THICKNESS	0.32	0.36	0.39	0.43	0.47	0.53

TABLE OF Sec θ

θ DEGREE	0	5	10	15	20	25	30
Sec θ	1.0000	1.0038	1.0154	1.0353	1.0642	1.1034	1.1547

TABLE OF RAILING REINFORCEMENT

TYPE	TYPE OF RAILING	BAR BENDING DIAGRAMS	BAR MARK	#	⊘	NO.	L	REMARK
3	COMBINATION	0.435 0.075 0.10	P102	4	–	2*	0.61	L = TOTAL LENGTH OF EACH BAR NO. = TOTAL AMOUNT OF BARS * = AMOUNT OF REINFORCEMENT IN ONE POST #2 = ø1/4" OR 6 mm. #3 = ø3/8" OR 9 mm. #4 = ø1/2" OR 12 mm. #5 = ø5/8" OR 16 mm.
		0.60 0.10	P103	4	–	2*	0.70	
		VARIES 0.05 0.20	ST101	2	–	2*	–	
		VARIES 0.05 0.375	ST102	2	–	2*	–	
		0.075 VARIES 0.075	RB102	3	–	4	–	
		0.10 0.05 0.05	R102	2	20	–	0.40	
		VARIES	RB103	4	–	4	–	
		0.15 0.10 0.10	R103	2	20	–	0.60	
		0.075 VARIES 0.075	T102	3	–	4	–	
		0.225 0.60 0.225	W103	5	20	–	1.05	
		0.55 0.10	W104	4	40	–	0.65	

TABLE OF RAILING POST SPACING

SPAN (m)	5.00	6.00	7.00	8.00	9.00	10.00
SPACING, S (m)	1.46	1.80	1.60	1.85	1.68	1.88

TABLE OF SLAB REINFORCEMENT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 m				SPAN 6.00 m				SPAN 7.00 m				SPAN 8.00 m				SPAN 9.00 m				SPAN 10.00 m				REMARK
		#	⊘	NO.	L	#	⊘	NO.	L	#	⊘	NO.	L	#	⊘	NO.	L	#	⊘	NO.	L	#	⊘	NO.	L	
VARIES	S101	8	0.16	–	4.95	8	0.15	–	5.95	8	0.13	–	6.95	8	0.12	–	7.95	8	0.10	–	8.95	8	0.09	–	9.95	NO. = TOTAL AMOUNT OF BARS. L = TOTAL LENGTH OF EACH BAR.
VARIES VARIES 0.075	ST101	3	0.25	42	–	3	0.25	50	–	3	0.25	58	–	3	0.25	66	–	3	0.25	74	–	3	0.25	82	–	
VARIES 0.10 0.075 0.20 0.09	SW102	4	0.20	51	–	4	0.20	63	–	4	0.20	72	–	4	020	81	–	4	0.20	93	–	4	0.20	102	–	
VARIES	T101	4	0.15	34	–	4	0.15	41	–	4	0.14	51	–	4	0.14	58	–	4	0.13	70	–	4	0.11	92	–	
0.075 0.075 VARIES	T102	3	0.30	–	5.10	3	0.30	–	6.10	3	0.30	–	7.10	3	0.30	–	8.10	3	0.30	–	9.10	3	0.30	–	10.10	
0.075 0.075 VARIES	T103	3	0.30	17	–	3	0.30	21	–	3	0.30	24	–	3	0.30	27	–	3	0.30	31	–	3	0.30	34	–	
	#3 = ø3/8" OR 9 mm., #4 = ø1/2" OR 12 mm, #8 = ø1" OR 25 mm																									

TABLE OFSIDEWALK AND EDGE BEAM REINFORCEMENT

WIDTH OF SIDEWALK m	P m	Q m	R m	BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 m				SPAN 6.00 m				SPAN 7.00 m				SPAN 8.00 m				SPAN 9.00 m				SPAN 10.00 m				REMARK
						#	⊘	NO.	L	#	⊘	NO.	L	#	⊘	NO.	L	#	⊘	NO.	L	#	⊘	NO.	L	#	⊘	NO.	L	
1.00	0.50	0.50	0.50	VARIES	SW101	8	–	6	4.95	8	–	8	5.95	8	–	10	6.95	8	–	12	7.95	8	–	14	8.95	8	–	16	9.95	NO. = TOTAL AMOUNT OF BARS L = TOTAL LENGTH OF EACH BAR #4 = ø1/2" OR 12 mm #8 = ø1" OR 25 mm
				VARIES	T104	4	–	6	4.95	4	–	8	5.95	4	–	10	6.95	4	–	12	7.95	4	–	12	8.95	4	–	12	9.95	
				VARIES	T105	4	–	6	4.95	4	–	6	5.95	4	–	6	6.95	4	–	6	7.95	4	–	6	8.95	4	–	6	9.95	
1.50	1.00	0.50	1.00	VARIES	SW101	8	–	8	4.95	8	–	10	5.95	8	–	12	6.95	8	–	16	7.95	8	–	18	8.95	8	–	20	9.95	
				VARIES	T104	4	–	8	4.95	4	–	10	5.95	4	–	12	6.95	4	–	12	7.95	4	–	12	8.95	4	–	12	9.95	
				VARIES	T105	4	–	6	4.95	4	–	6	5.95	4	–	6	6.95	4	–	6	7.95	4	–	6	8.95	4	–	6	9.95	

NOTES :–

1. DESIGN STRESSES :
   a) CONCRETE , fc = 70 kg/cm^2
   b) STEEL , fs = 1,400 kg/cm^2 (INTERMEDIATE GRADE)
   fs = 1,200 kg/cm^2 (STRUCTURAL GRADE)
2. CONCRETE SHALL HAVE MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 kg/cm.^{2} FOR 0.15x0.15x0.15 m CUBE AT 28 DAYS AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :
   PORTLAND CEMENT, MIN. 350 kg
   SAND 0.43 m^3
   CRUSHED ROCK OR GRAVEL 0.86 m^3
   CONCRETE SLUMP, MAX. 10 cm.
3. CLEAR CONCRETE COVER FOR TOP REINFORCEMENT IN SLAB BRIDGE SHALL BE 3.50 cm ELSEWHERE OF SLAB BRIDGE AND SIDEWALK SHALL BE 2.50 cm
4. ALL CONCRETE EXPOSED CORNERS SHALL HAVE 2 cm. CHAMFER UNLESS OTHERWISE INDICATED.
5. REBARS # 4 OR LARGER SHALL BE INTERMEDIATE GRADE DEFORMED BARS, OTHERS SHALL BE STRUCTURAL GRADE PLAIN BARS UNLESS OTHERWISE INDICATED.
6. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
7. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR IN CASE OF PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
8. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMED TO AASHO SPECIFICATIONS SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.50 cm FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED WITHOUT ALTERING THE LOCATIONS OF REBARS.
9. ALL MATERIALS SHALL BE USED UNDER THE APPROVAL OF THE ENGINEER.
10. PAINTING SHALL BE PROVIDED ON ALL SURFACES AT BRIDGE ENDS WHICH EXPOSED TO TRAFFIC. WHITE AND BLACK COLOUR SHALL BE PAINTED ALTERNATELY. WHITE COLOUR SHALL BE LIGTH REFLECTED TYPE.
11. ALL DIMENSIONS SHOWN ARE IN METER UNLESS OTHERWISE INDICATED.
12. BAR MARK S 101 MAY BE TAKEN OUT ONE BAR ON EACH SIDE OF THE BRIDGE WHEREVER THEY PASS THROUGH DRAIN PIPES IF THE LOCATIONS OF THESE BARS ARE NEAR V-DRIP SUCH THAT CONCRETE COVER IS NOT ADEQUATE, THEY SHALL BE PLACED ON TOP OF ST 101 OTHER BARS WHICH PASS THROUGH DRAIN PIPES SHALL BE BENT ALONG THE PIPES.
13. THE SKEW ANGLE (θ) IS THE ANGLE IN DEGREE BETWEEN THE DIRECTION OF THE CANAL AND A LINE PERPENDICULAR TO THE ROADWAY AND VARIES BETWEEN 0°–30°.
14. RAILING POST SPACINGS OF TYPE 3 FOR BRIDGE WITH 0.50 m SIDE WALKS OR WIDER IN GENARAL ARE AS SHOWN IN THE TABLE ABOVE.
15. THIS DRAWING IS ADAPTED FROM DOH. DWG. NO.3BD5–106–14/1A, AND DWG. NO.3AD5–106–14/26 IN CASE OF ANY DISCRIPANCY BETWEEN SUCH DRAWINGS ARISES, THE DOH. STANDARD DRAWING WILL PREVAIL BUT UNDER THE APPROVAL OF THE ENGINEER.

REFERENCE DRAWINGS :

1. BRIDGES, PLAN AND SECTIONS HPP–BR–01

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
BRIDGE
REINFORCEMENT, PLAN, SECTIONS AND DETAILS

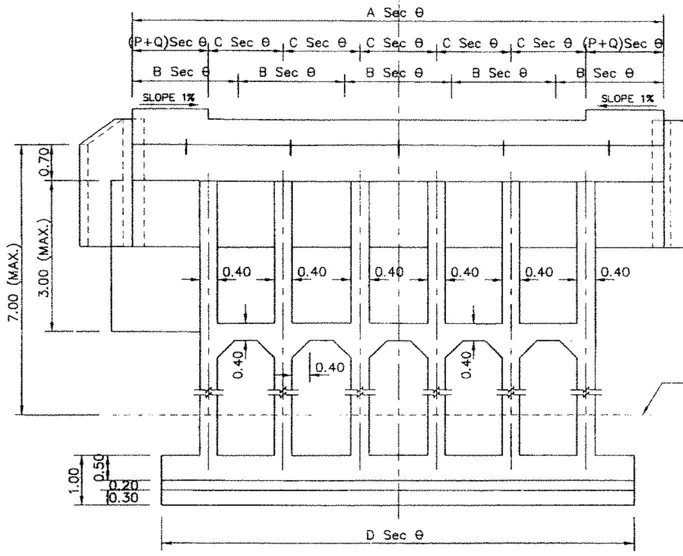
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED
DRAWN
CHECKED
PROJECT MANAGER
DATE 8/12/51

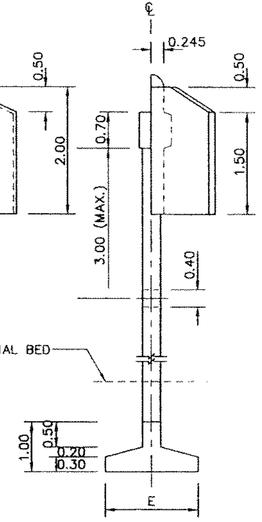
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–BR–02
SHEET NO. 21 OF 100

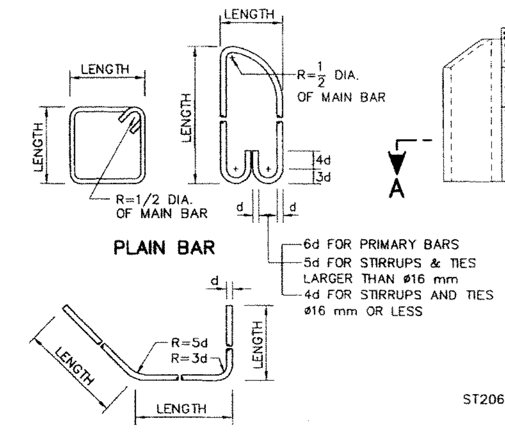
D\0783\HPP–BR–02.DWG\11–NOV–2008/SMP.



TRANSVERSE ELEVATION

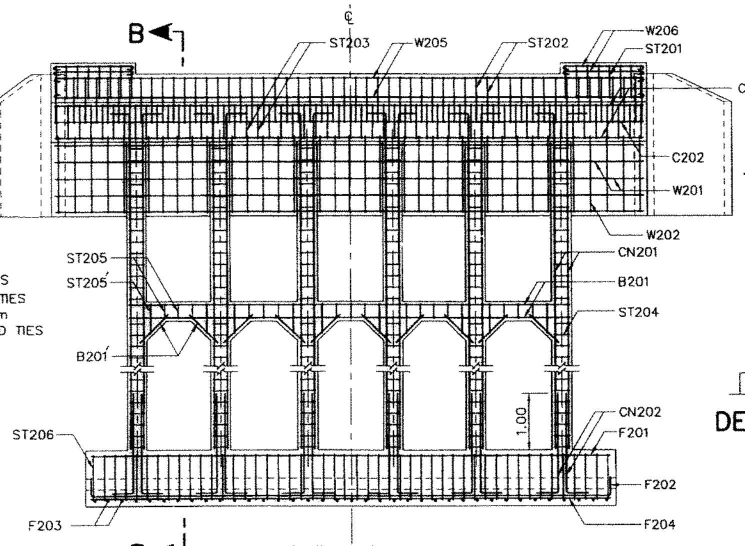


LONGITUDINAL ELEVATION

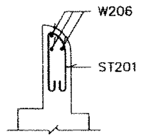


BAR BENDING DETAILS

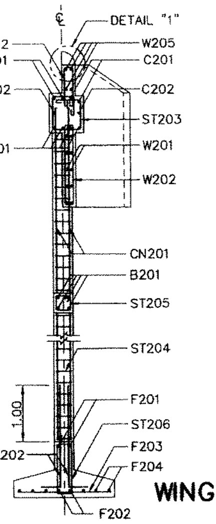
NOT TO SCALE



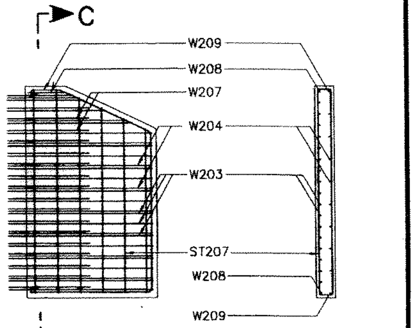
ELEVATION



DETAIL "1"



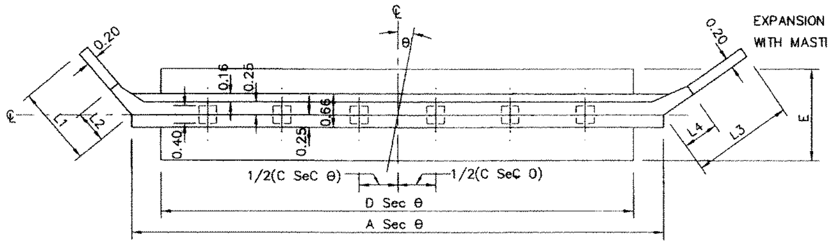
SECTION B–B



SECTION C–C

WINGWALL REINFORCEMENT DETAIL

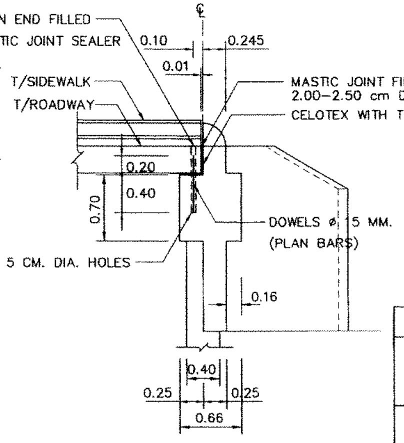
NOT TO SCALE



PLAN

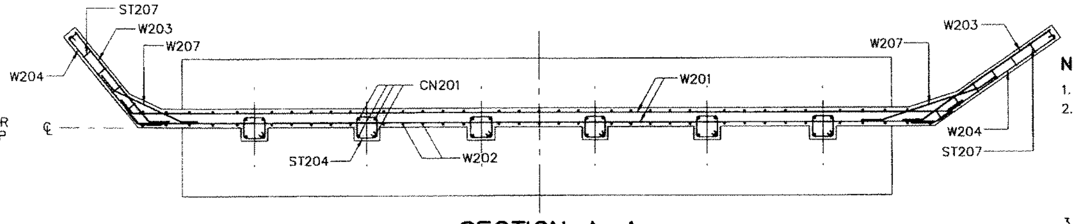
ABUTMENT DETAILS

NOT TO SCALE


EXPANSION END FILLED WITH MASTIC JOINT SEALER
℄
0.10
0.245
0.01
T/SIDEWALK
T/ROADWAY
MASTIC JOINT FILLER 2.00–2.50 cm DEEP
CELOTEX WITH TAR.
0.20
0.40
0.70
DOWELS ø 15 MM. (PLAN BARS)
5 CM. DIA. HOLES
0.16
0.40
0.25
0.25
0.66

ABUTMENT HEAD DETAIL

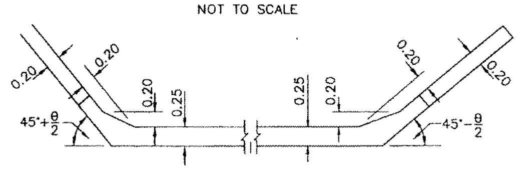
SCALE 1:50



SECTION A–A

REINFORCEMENT DETAILS

NOT TO SCALE



WINGWALL DETAILS

NOT TO SCALE

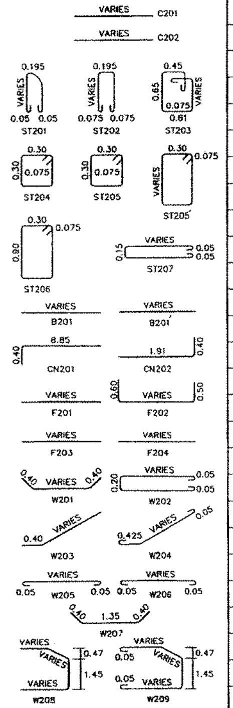
NOTES :–

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE INDICATED.
2. THE BOTTOM OF A FOOTING SHALL BE EMBEDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT ITS CAPACITY BUT NOT LESS THAN 2.50 m AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED, 10 cm THICK OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 cm WIDER THAN THE FOOTING ALL AROUND COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 BY VOLUME.
3. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON/m^2.
4. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES :
   a) IF THE DISTANCE FROM CANAL BED TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 m, A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.00 m, AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE CANAL BED EXCEEDS 3.00 m, ADDITIONAL BRACING SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.00 m.
5. CLEAR CONCRETE COVER SHALL BE 2.5 cm EXCEPT THE BOTTOM OF FOOTING AT WHICH CLEAR COVER OF 5 cm SHALL BE PROVIDED.
6. CONCRETE SHALL HAVE A MINIMUM CEMENT OF 350 KG/m^3 AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG/cm^2 FOR 0.15x0.15x0.15 m CUBE AT 28 DAYS AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT, (MIN.)	350	kg
SAND	0.43	m^3
CRUSHED ROCK OR GRAVEL	0.86	m^3
CONCRETE SLUMP, (MAX.)	10	cm

7. REBARS #4 OR LARGER SHALL BE INTERMEDIATE GRADE DEFORMED BARS, OTHERS SHALL BE STRUCTURAL GRADE PLAIN ROUND BARS UNLESS OTHERWISE INDICATED.
8. LOCATIONS OF LAP SPICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
9. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR IN CASE OF PLAIN ROUND BARS AND 24 DIAMETERS OF BIGGER BARS FOR DEFORMED BARS.
10. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMED TO AASHO SPECIFICATIONS SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.50 cm FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED WITHOUT ALTERING LOCATIONS OF REBARS.
11. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING CANAL BED TO THE TOP OF CAP BEAM SHALL BE 7.0 m. PIERS HIGHER THAN 7.0 m. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
12. THE SKEW ANGLE (θ) IS THE ANGLE IN DEGREE BETWEEN THE DIRECTION OF THE CANAL AND A LINE PERPENDICULAR TO THE ROADWAY AND VARIES BETWEEN 0°–30°.
13. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 10 m.
14. THIS DRAWING IS ADAPTED FROM DOH. DWG. NO. 3BD5–106–14/2a IN CASE OF ANY DISCRIPANCY BETWEEN SUCH DRAWING ARISES, THE DOH. STANDARD DRAWING WILL PREVAIL BUT UNDER THE APPROVAL OF THE ENGINEER.

TABLE OF REINFORCEMENT

BAN BENDING DIAGRAMS	BAR MARK	SPAN 5.00 m				SPAN 6.00 m				SPAN 7.00 m				SPAN 8.00 m				SPAN 9.00 m				SPAN 10.00 m			
		#	●	NO.	L_g	#	●	NO.	L_g	#	●	NO.	L_g	#	●	NO.	L_g	#	●	NO.	L_g	#	●	NO.	L_g
	C201	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
	C202	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	ST201	2	0.20	–	1.215	2	0.20	–	1.295	2	0.20	–	1.355	2	0.20	–	1.435	2	0.20	–	1.515	2	0.20	–	1.635
	ST202	3	0.20	–	1.745	3	0.20	–	1.795	3	0.20	–	1.848	3	0.20	–	1.895	3	0.20	–	1.945	3	0.20	–	1.995
	ST203	3	0.20	–	3.155	3	0.20	–	3.195	3	0.20	–	3.225	3	0.20	–	3.265	3	0.20	–	3.305	3	0.20	–	3.365
	ST204	3	0.20	–	1.35	3	0.20	–	1.35	3	0.20	–	1.35	3	0.20	–	1.35	3	0.20	–	1.35	3	0.20	–	1.35
	ST205	3	0.25	–	1.35	3	0.25	–	1.35	3	0.25	–	1.35	3	0.25	–	1.35	3	0.25	–	1.35	3	0.25	–	1.35
	ST205'	3	–	–	–	3	–	–	–	3	–	–	–	3	–	–	–	3	–	–	–	3	–	–	–
	ST206	3	0.20	–	2.55	3	0.20	–	2.55	3	0.20	–	2.55	3	0.20	–	2.55	3	0.20	–	2.55	3	0.20	–	2.55
	ST207	2	0.30	–	–	2	0.30	–	–	2	0.30	–	–	2	0.30	–	–	2	0.30	–	–	2	0.30	–	–
	B201	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
	B201'	6	–	–	–	6	–	–	–	6	–	–	–	6	–	–	–	6	–	–	–	6	–	–	–
	CN201	8	–	–	9.25	8	–	–	9.25	8	–	–	9.25	8	–	–	9.25	8	–	–	9.25	8	–	–	9.25
	CN202	8	–	–	2.31	8	–	–	2.31	8	–	–	2.31	8	–	–	2.31	8	–	–	2.31	8	–	–	2.31
	F201	8	–	2	–	8	–	2	–	8	–	2	–	8	–	2	–	8	–	2	–	8	–	2	–
	F202	8	–	2	–	8	–	2	–	8	–	2	–	8	–	2	–	8	–	2	–	8	–	2	–
	F203	4	0.25	–	1.55	4	0.25	–	1.55	4	0.20	–	1.75	4	0.20	–	1.75	4	0.125	–	1.95	4	0.125	–	1.95
	F204	4	–	6	–	4	–	6	–	4	–	6	–	4	–	6	–	4	–	6	–	4	–	6	–
	W201	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–
	W202	2	0.30	–	2.70	2	0.30	–	2.60	2	0.30	–	2.60	2	0.30	–	2.50	2	0.30	–	2.40	2	0.30	–	2.30
	W203	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–
	W204	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
	W205	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–
	W206	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–
	W207	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15
	W208	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	W209	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–

#2 = ø1/4" OR 6 mm, #3 = ø3/8" OR 9 mm, #4 = ø1/2" OR 12 mm, #6 = ø3/4" OR 20 mm, #8 = ø1" OR 25 mm, NO. = TOTAL AMOUNT OF BARS, L_g = TOTAL LENGTH OF EACH BAR

TABLE OF ABUTMENT DIMENSIONS

ROADWAY WIDTH m	LENGTH OF ABUTMENT HEAD A Sec θ m	DOWEL SPACING B Sec θ m	SPAN 5.00 m		SPAN 6.00 m		SPAN 7.00 m		SPAN 8.00 m		SPAN 9.00 m		SPAN 10.00 m	
			COL. SPG. C Sec θ m	NO. OF COL.	COL. SPG. C Sec θ m	NO. OF COL.	COL. SPG. C Sec θ m	NO. OF COL.	COL. SPG. C Sec θ m	NO. OF COL.	COL. SPG. C Sec θ m	NO. OF COL.	COL. SPG. C Sec θ m	NO. OF COL.
4.00	[4.00+2(P+Q)] Sec θ	1.00 Sec θ	2.00 Sec θ	3	2.00 Sec θ	3	2.00 Sec θ	3	2.00 Sec θ	3	1.30 Sec θ & 1.40 Sec θ	4	1.30 Sec O & 1.40 Sec θ	4
6.00	[6.00+2(P+Q)] Sec θ	1.00 Sec θ	2.00 Sec θ	4	2.00 Sec θ	4	1.50 Sec θ	5	1.50 Sec θ	5	1.20 Sec θ	6	1.20 Sec θ	6
7.00	[7.00+2(P+Q)] Sec θ	1.00 Sec θ	2.30 Sec θ & 2.40 Sec θ	4	2.30 Sec θ & 2.40 Sec θ	4	1.75 Sec θ	5	1.75 Sec θ	5	1.40 Sec θ	6	1.40 Sec θ	6
8.00	[8.00+2(P+Q)] Sec θ	1.00 Sec θ	2.65 Sec θ & 2.70 Sec θ	4	2.65 Sec θ & 2.70 Sec θ	4	2.00 Sec θ	5	2.00 Sec θ	5	1.60 Sec θ	6	1.60 Sec θ	6
9.00	[9.00+2(P+Q)] Sec θ	1.00 Sec θ	3.00 Sec θ	4	3.00 Sec θ	4	2.25 Sec θ	5	2.25 Sec θ	5	1.50 Sec θ	7	1.50 Sec θ	7
10.00	[10.00+2(P+Q)] Sec θ	1.00 Sec θ	2.50 Sec θ	5	2.50 Sec θ	5	2.00 Sec θ	6	2.00 Sec θ	6	1.40 Sec θ	8	1.40 Sec θ	8
11.00	[11.00+2(P+Q)] Sec θ	1.00 Sec θ	2.75 Sec θ	5	2.75 Sec θ	5	1.80 Sec θ & 1.85 Sec θ	7	1.80 Sec θ & 1.85 Sec θ	7	1.50 Sec θ & 1.60 Sec θ	8	1.30 Sec θ & 1.40 Sec θ	9
12.00	[12.00+2(P+Q)] Sec θ	1.00 Sec θ	2.40 Sec θ	6	2.40 Sec θ	6	2.00 Sec θ	7	2.00 Sec θ	7	1.70 Sec θ & 1.80 Sec θ	8	1.50 Sec θ	9
13.00	[13.00+2(P+Q)] Sec θ	1.00 Sec θ	2.60 Sec θ	6	2.60 Sec θ	6	1.85 Sec θ & 1.90 Sec θ	8	1.85 Sec θ & 1.90 Sec θ	8	1.55 Sec θ & 1.65 Sec θ	9	1.40 Sec θ & 1.45 Sec θ	10
14.00	[14.00+2(P+Q)] Sec θ	1.00 Sec θ	2.30 Sec θ & 2.40 Sec θ	7	2.30 Sec θ & 2.40 Sec θ	7	2.00 Sec θ	8	2.00 Sec θ	8	1.75 Sec θ	9	1.55 Sec θ 1.60 Sec θ	10

LENGTH OF WING WALL

$L_1 = 1.414\ \mathrm{Sec}\ (45° - \frac{\theta}{2})$	$L_3 = 1.414\ \mathrm{Sec}\ (45° + \frac{\theta}{2})$
$L_2 = 0.50\ \mathrm{Sec}\ (45° - \frac{\theta}{2})$	$L_4 = 0.50\ \mathrm{Sec}\ (45° + \frac{\theta}{2})$

TABLE OF Sec θ ($45° \pm \frac{\theta}{2}$)

θ	0	5	10	15	20	25	30
Sec θ ($45° + \frac{\theta}{2}$)	1.4142	1.4802	1.5557	1.6427	1.7434	1.8612	2.0000
Sec θ ($45° - \frac{\theta}{2}$)	1.4142	1.3563	1.3054	1.2605	1.2208	1.1857	1.1547

TABLE OF FOOTING DIMENSIONS

ROADWAY WIDTH m	LENGTH OF FOOTING D Sec θ, m	WIDTH OF FOOTING, E		
		SPAN 5.00–6.00 m	SPAN 7.00–8.00 m	SPAN 9.00–10.00 m
4.00	5.80 Sec θ	1.60	1.80	2.00
6.00	7.80 Sec θ	1.60	1.80	2.00
7.00	8.80 Sec θ	1.60	1.80	2.00
8.00	9.80 Sec θ	1.60	1.80	2.00
9.00	10.80 Sec θ	1.60	1.80	2.00
10.00	11.80 Sec θ	1.60	1.80	2.00
11.00	12.80 Sec θ	1.60	1.80	2.00
12.00	13.80 Sec θ	1.60	1.80	2.00
13.00	14.80 Sec θ	1.60	1.80	2.00
14.00	15.80 Sec θ	1.60	1.80	2.00

REFERENCE DRAWINGS :

1. BRIDGE, PLAN AND SECTIONS HPP–BR–01

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

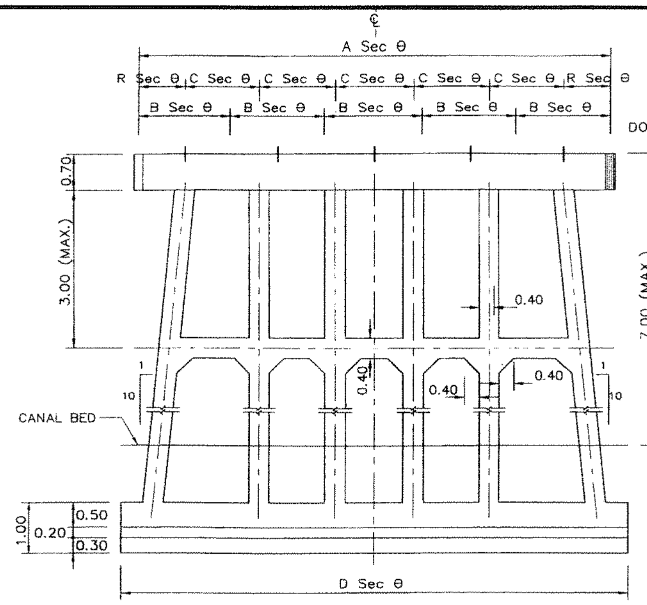
KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

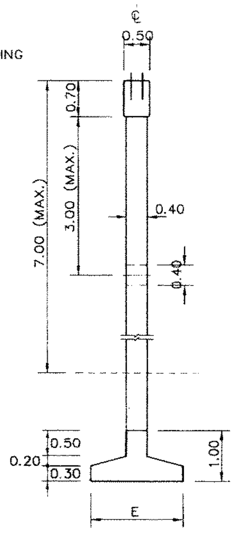
CIVIL WORKS
BRIDGE
REINFORCEMENT, SPREAD FOUNDATION ABUTMENT DETAILS

MAHA NAKORN CONSULTANTS CO.,LTD.	DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
	REVIEWED
DESIGNED สย.46159 สย.4651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED สย.4651	APPROVED
PROJECT MANAGER — DATE 8/12/51	DRAWING NO. HPP–BR–03 — SHEET NO. 22 OF 100

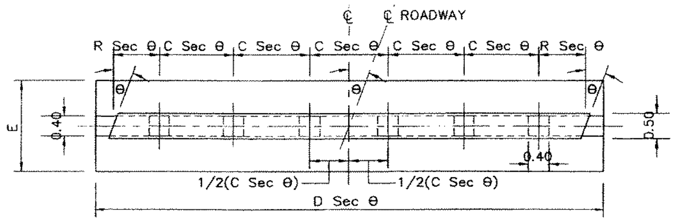
D:\0783\HPP-BR-03.DWG\11-NOV-2008/SMP



TRANSVERSE ELEVATION



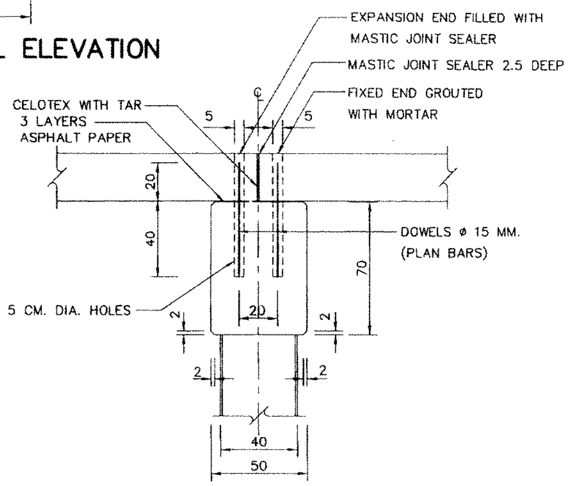
LONGITUDINAL ELEVATION



PLAN

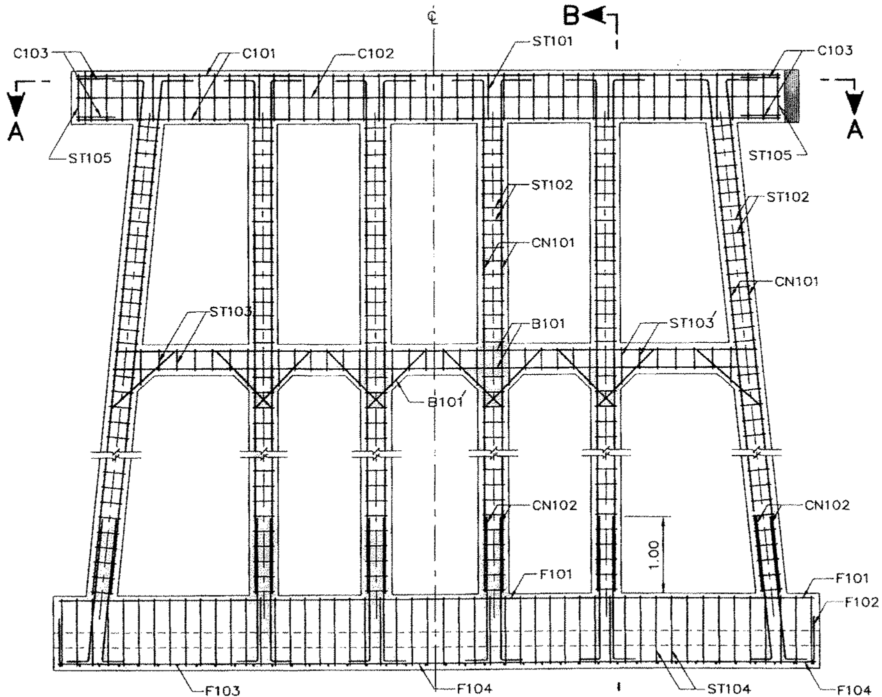
PIER DETAILS

NOT TO SCALE

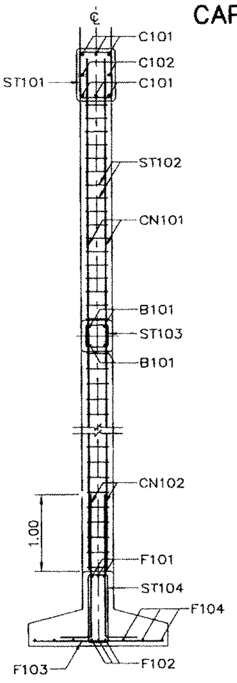

EXPANSION END FILLED WITH MASTIC JOINT SEALER
MASTIC JOINT SEALER 2.5 DEEP
FIXED END GROUTED WITH MORTAR
CELOTEX WITH TAR 3 LAYERS ASPHALT PAPER
℄
5
5
20
40
70
DOWELS ø 15 MM. (PLAN BARS)
5 CM. DIA. HOLES
20
2
2
2
2
40
50

CAP BEAM DETAIL

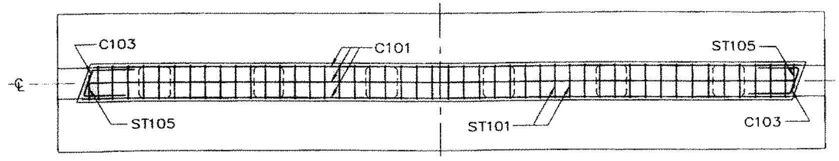
NOT TO SCALE



ELEVATION



SECTION B–B



SECTION A–A

REINFORCEMENT DETAILS

NOT TO SCALE

TABLE OF PIER DIMENSIONS

ROADWAY WIDTH (m)	LENGTH OF CAP BEAM A Sec Θ (m)	DOWEL SPACING B Sec Θ (m)	SPAN 5.00 m		SPAN 6.00 m		SPAN 7.00 m		SPAN 8.00 m		SPAN 9.00 m		SPAN 10.00 m	
			COL. SPG. C Sec Θ (m)	NO. OF COLUMN	COL. SPG. C Sec Θ (m)	NO. OF COLUMN	COL. SPG. C Sec Θ (m)	NO. OF COLUMN	COL. SPG. C Sec Θ (m)	NO. OF COLUMN	COL. SPG. C Sec Θ (m)	NO. OF COLUMN	COL. SPG. C Sec Θ (m)	NO. OF COLUMN
4.00	(4.0+2R) Sec Θ	1.00 Sec Θ	2.00 Sec Θ	3	2.00 Sec Θ	3	2.00Sec Θ	3	2.00Sec Θ	3	1.30 Sec Θ & 1.40 Sec Θ	4	1.30 Sec Θ & 1.40 Sec Θ	4
6.00	(6.0+2R) Sec Θ	1.00 Sec Θ	2.00 Sec Θ	4	2.00 Sec Θ	4	1.50 Sec Θ	5	1.50 Sec Θ	5	1.20 Sec Θ	6	1.20 Sec Θ	6
7.00	(7.0+2R) Sec Θ	1.00 Sec Θ	2.30 Sec Θ & 2.40 Sec Θ	4	2.30 Sec Θ & 2.40 Sec Θ	4	1.75 Sec Θ	5	1.75 Sec Θ	5	1.40 Sec Θ	6	1.40 Sec Θ	6
8.00	(8.0+2R) Sec Θ	1.00 Sec Θ	2.65 Sec Θ & 2.70 Sec Θ	4	2.65 Sec Θ & 2.70 Sec Θ	4	2.00 Sec Θ	5	2.00 Sec Θ	5	1.60 Sec Θ	6	1.60 Sec Θ	6
9.00	(9.0+2R) Sec Θ	1.00 Sec Θ	3.00 Sec Θ	4	3.00 Sec Θ	4	2.25 Sec Θ	5	2.25 Sec Θ	5	1.50 Sec Θ	7	1.50 Sec Θ	7
10.00	(10.0+2R) Sec Θ	1.00 Sec Θ	2.50 Sec Θ	5	2.50 Sec Θ	5	2.00 Sec Θ	6	2.00 Sec Θ	6	1.40 Sec Θ & 1.45 Sec Θ	8	1.40 Sec Θ & 1.45 Sec Θ	8
11.00	(11.0+2R) Sec Θ	1.00 Sec Θ	2.75 Sec Θ	5	2.75 Sec Θ	5	1.80 Sec Θ & 1.85 Sec Θ	7	1.80 Sec Θ & 1.85 Sec Θ	7	1.50 Sec Θ & 1.60 Sec Θ	8	1.30 Sec Θ & 1.40 Sec Θ	9
12.00	(12.0+2R) Sec Θ	1.00 Sec Θ	2.40 Sec Θ	6	2.40 Sec Θ	6	2.00 Sec Θ	7	2.00 Sec Θ	7	1.70 Sec Θ & 1.80 Sec Θ	8	1.50 Sec Θ	9
13.00	(13.0+2R) Sec Θ	1.00 Sec Θ	2.60 Sec Θ	6	2.60 Sec Θ	6	1.85 Sec Θ & 1.90 Sec Θ	8	1.85 Sec Θ & 1.90 Sec Θ	8	1.55 Sec Θ & 1.65 Sec Θ	9	1.40 Sec Θ & 1.45 Sec Θ	10
14.00	(14.0+2R) Sec Θ	1.00 Sec Θ	2.30 Sec Θ & 2.40 Sec Θ	7	2.30 Sec Θ & 2.40 Sec Θ	7	2.00 Sec Θ	8	2.00 Sec Θ	8	1.75 Sec Θ	9	1.55 Sec Θ & 1.60 Sec Θ	10

TABLE OF Sec Θ

Θ , DEGREE	0	5	10	15	20	25	30
Sec Θ	1.0000	1.0038	1.0154	1.0353	1.0642	1.1034	1.1547

TABLE OF FOOTING DIMENSIONS

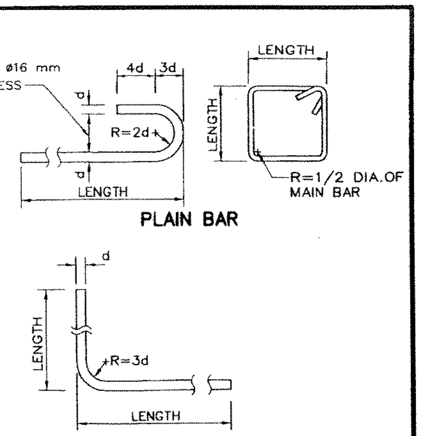
ROADWAY WIDTH (m)	LENGTH OF FOOTING D Sec Θ (m)	WIDTH OF FOOTING, E		
		SPAN 5.00 – 6.00 m	SPAN 7.00 – 8.00 m	SPAN 9.00 – 10.00 m
4.00	6.80 Sec Θ	1.60	1.80	2.00
6.00	8.80 Sec Θ	1.60	1.80	2.00
7.00	9.80 Sec Θ	1.60	1.80	2.00
8.00	10.80 Sec Θ	1.60	1.80	2.00
9.00	11.80 Sec Θ	1.60	1.80	2.00
10.00	12.80 Sec Θ	1.60	1.80	2.00
11.00	13.80 Sec Θ	1.60	1.80	2.00
12.00	14.80 Sec Θ	1.60	1.80	2.00
13.00	15.80 Sec Θ	1.60	1.80	2.00
14.00	16.80 Sec Θ	1.60	1.80	2.00

TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 m				SPAN 6.00 m				SPAN 7.00 m				SPAN 8.00 m				SPAN 9.00 m				SPAN 10.00 m			
		#	Φ	NO.	Ls	#	Φ	NO.	Ls	#	Φ	NO.	Ls	#	Φ	NO.	Ls	#	Φ	NO.	Ls	#	Φ	NO.	Ls
VARIES	C101	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–
VARIES	C102	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
0.50 0.50 0.35	C103	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–
0.40 VARIES	CN101	8	–	–	–	8	–	–	–	8	–	–	–	8	–	–	–	8	–	–	–	8	–	–	–
0.40 1.91	CN102	8	–	–	2.31	8	–	–	2.31	8	–	–	2.31	8	–	–	2.31	8	–	–	2.31	8	–	–	2.31
0.65 0.075 0.075 0.45	ST101	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35
0.30 0.30 0.075 0.075	ST102	3	0.20	–	1.35	3	0.20	–	1.35	3	0.20	–	1.35	3	0.20	–	1.35	3	0.20	–	1.35	3	0.20	–	1.35
0.30 0.30 0.075 0.075	ST103	3	0.25	–	1.35	3	0.25	–	1.35	3	0.25	–	1.35	3	0.25	–	1.35	3	0.25	–	1.35	3	0.25	–	1.35
0.30 VARIES 0.075 0.075	ST103'	3	0.25	–	–	3	0.25	–	–	3	0.25	–	–	3	0.25	–	–	3	0.25	–	–	3	0.25	–	–
0.90 0.075 0.075 0.30	ST104	3	0.20	–	2.55	3	0.20	–	2.55	3	0.20	–	2.55	3	0.20	–	2.55	3	0.20	–	2.55	3	0.20	–	2.55
0.65 0.075 0.075 0.25	ST105	3	–	2	1.95	3	–	2	1.95	3	–	2	1.95	3	–	2	1.95	3	–	2	1.95	3	–	2	1.95
VARIES	B101	8	–	12	–	8	–	12	–	8	–	12	–	8	–	12	–	8	–	12	–	8	–	12	–
VARIES	B101'	6	–	–	–	6	–	–	–	6	–	–	–	6	–	–	–	6	–	–	–	6	–	–	–
VARIES	F101	8	–	3	–	8	–	3	–	8	–	3	–	8	–	3	–	8	–	3	–	8	–	3	–
0.60 VARIES 0.60	F102	8	–	3	–	8	–	3	–	8	–	3	–	8	–	3	–	8	–	3	–	8	–	3	–
VARIES	F103	4	0.25	–	1.55	4	0.25	–	1.55	4	0.20	–	1.75	4	0.20	–	1.75	4	0.125	–	1.95	4	0.125	–	1.95
VARIES	F104	4	–	6	–	4	–	6	–	4	–	6	–	4	–	6	–	4	–	6	–	4	–	6	–

#3 = ø3/8" OR 9 mm, #4 = ø1/2" OR 12 mm, #6 = ø3/4" OR 20 mm, #8 = ø1" OR 25 mm, NO. = TOTAL AMOUNT OF BARS, L_s= TOTAL LENGTH OF EACH BAR

6d FOR PRIMARY BARS
5d FOR STIRRUPS AND TIES LARGER THAN ø16 mm
4d FOR STRRUPS AND TIES ø16 mm OR LESS



PLAIN BAR

PLAIN BAR

BAR BENDING DETAILS

NOT TO SCALE

NOTES :–

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE INDICATED.
2. THE BOTTOM OF A FOOTING SHALL BE EMBEDDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT ITS CAPACITY BUT NOT LESS THAN 2.5 m AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED, 10 cm THICK OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 cm WIDER THAN THE FOOTING ALL AROUND. COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 BY VOLUME.
3. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TONS/M^2
4. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES:
   - a) IF THE DISTANCE FROM CANAL BED TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 m, A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 m. AND
   - b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE CANAL BED EXCEEDS 3.0 m, ADDITONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 m.
5. CLEAR CONCRETE COVER SHALL BE 2.5 cm EXCEPT THE BOTTOM OF FOOTING AT WHICH CLEAR COVER OF 5 cm SHALL BE PROVIDED.
6. PROPERTIES OF CONCRETE SHALL BE THE SAME AS SLAB BRIDGE.
7. REBARS # 4 OR LARGER SHALL BE INTERMEDIATE GRADE DEFORMED BARS, OTHERS SHALL BE STRUCTURE GRADE PLAIN ROUND BARS UNLESS OTHERWISE INDICATED.
8. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
9. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR IN CASE OF PLAIN ROUND BARS AND 24 DIAMETERS OF BIGGER BARS FOR DEFORMED BARS.
10. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMED TO AASHO SPECIFICATIONS SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.50 cm FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM WITHOUT ALTERING THE LOCATIONS OF REBARS.
11. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING CANAL BED TO THE TOP OF CAP BEAM SHALL BE 7.0 m. PIERS HIGHGER THAN 7.0 m. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
12. THE SKEW ANGLE (Θ) IS THE ANGLE IN DEGREE BETWEEN THE DIRECTION OF THE CANAL AND A LINE PERPENDICULAR TO THE ROADWAY AND VARIES BETWEEN 0°–30°.
13. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 12.0 m.
14. THIS DRAWING IS ADAPTED FROM DOH. DWG. NO.3BD5–106–14/2 IN CASE OF ANY DISCRIPANCY BETWEEN SUCH DRAWING ARISES, THE DOH. STANDARD DRAWING WILL PREVAIL BUT UNDER THE APPROVAL BUT UNDER THE APPROVAL OF THE ENGINEER.

REFERENCE DRAWINGS :–

1. BRIDGE, PLAN AND SECTIONS	HPP–BR–01

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS
DEDE

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

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CIVIL WORKS
BRIDGE
REINFORCEMENT, SPREAD FOUNDATION PIER DETAILS

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DESIGNED
DRAWN
CHECKED
PROJECT MANAGER
8/12/51
DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–BR–04
SHEET NO. 23 OF 100

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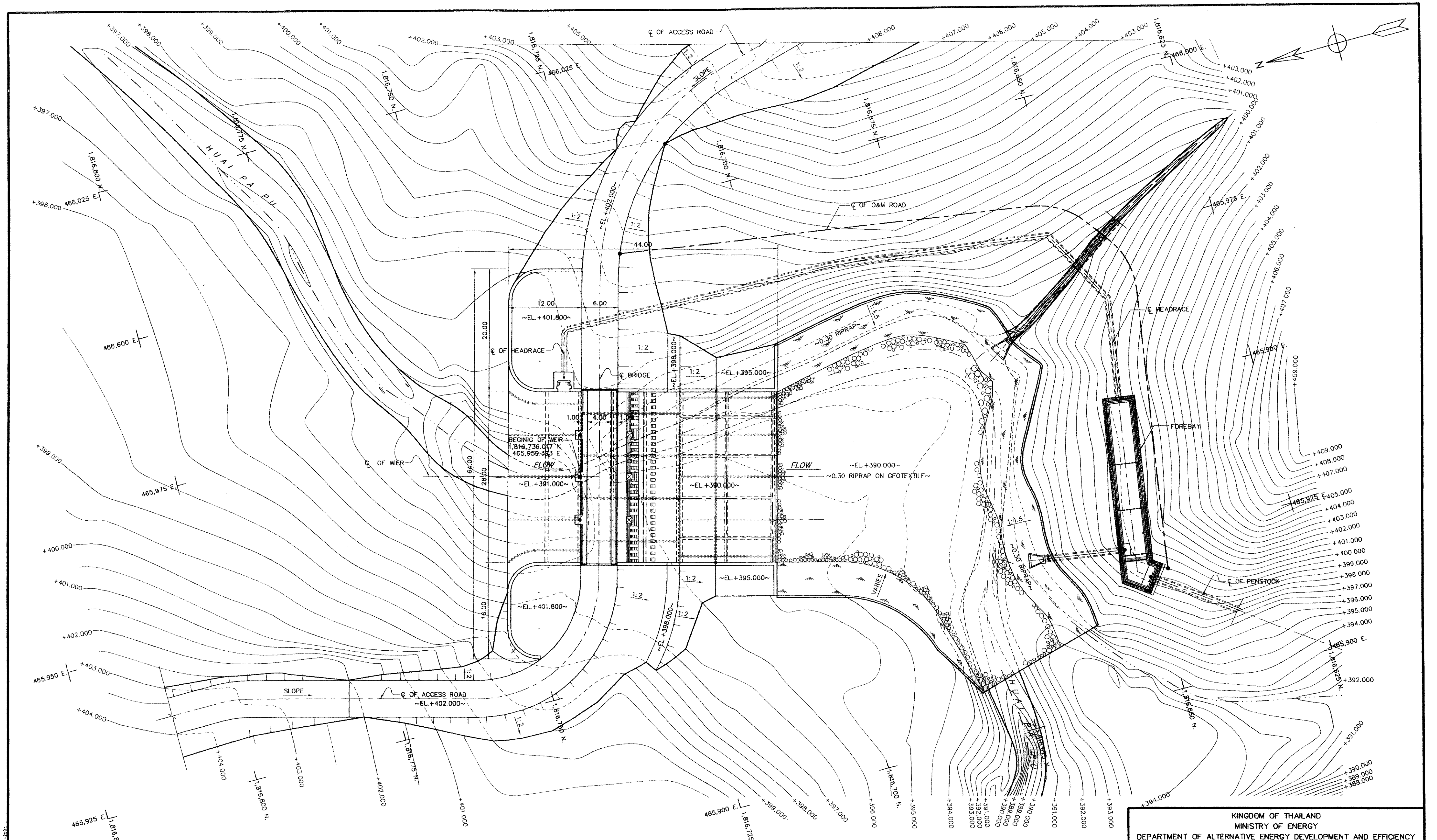


GENERAL LAYOUT

SCALE 1:300

NOTES :

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

REFERENCE DRAWINGS :

1. WEIR, GENERAL PLAN	HPP-WE-02
2. WEIR, SECTIONS A-A	HPP-WE-03
3. WEIR, SECTIONS B-B, C-C	HPP-WE-04
4. WEIR, SECTIONS D-D, E-E	HPP-WE-05

0 5 10 15 20 25

SCALE 1:300 METERS

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

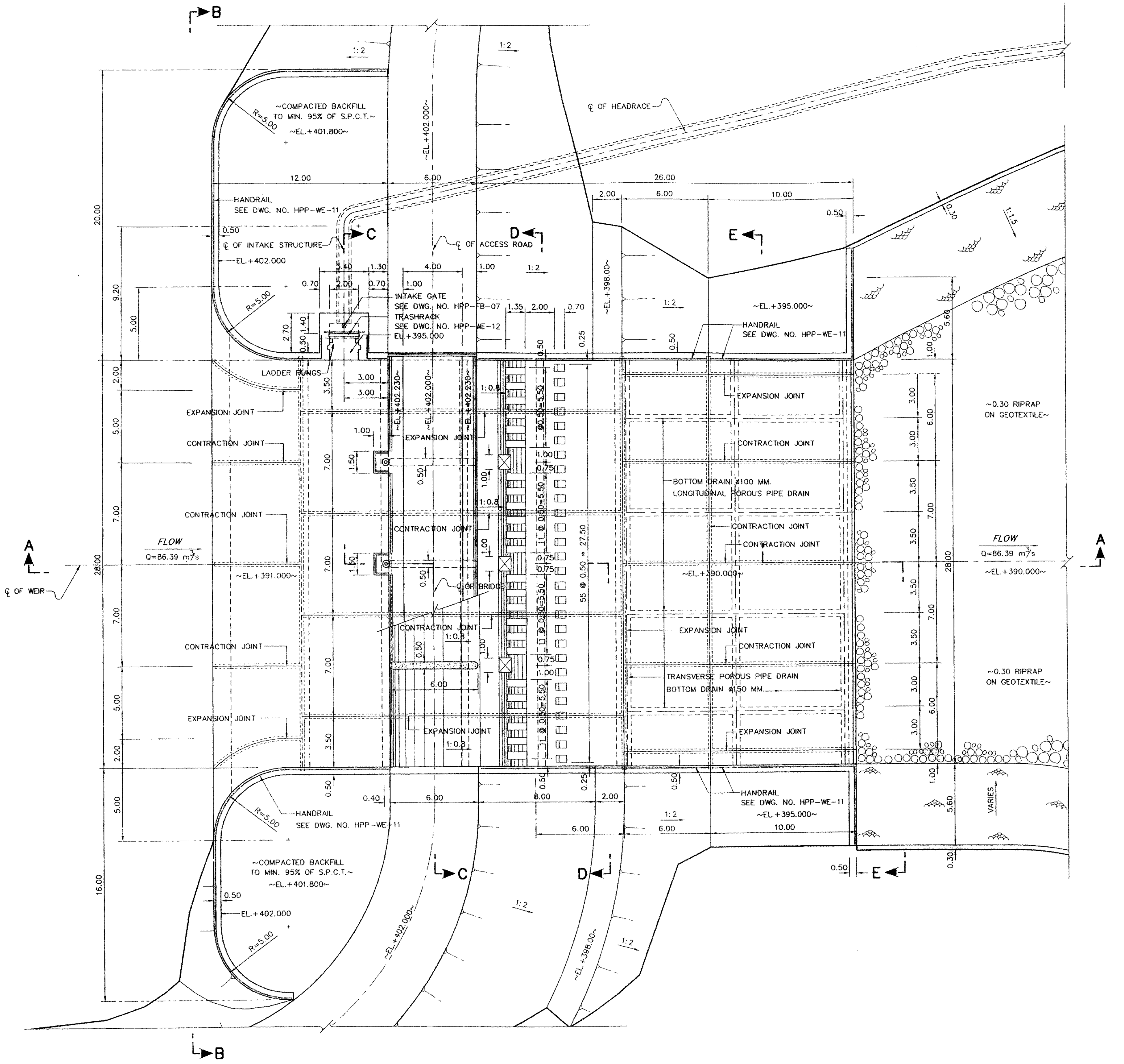
CIVIL WORKS
WEIR
GENERAL LAYOUT

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED ภย.22514 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-WE-01
SHEET NO. 24 OF 100



GENERAL PLAN

SCALE 1:150

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP-GN-03
3. ALLOWABLE BEARING CAPACITY NOT LESS THAN 25 TON/M.^{2}
4. SLUICE GATES WITH OUTSIDE-SCREW RISING STEM SHALL BE MOTOR AND HAND OPERATED, MIN. CAPACITY 6.5 TONS.
5. WEIR HAS A MAXIMUM DISCHARGE 86.39 m^3/s AT WATER LEVEL +398.50 (M.S.L.)

REFERENCE DRAWINGS :

1.	WEIR, GENERAL LAYOUT	HPP-WE-01
2.	WEIR, SECTIONS A-A	HPP-WE-03
3.	WEIR, SECTIONS B-B, C-C	HPP-WE-04
4.	WEIR, SECTIONS D-D, E-E	HPP-WE-05
5.	WEIR, REINFORCEMENT PLAN	HPP-WE-06
6.	WEIR, MISCELLANEOUS DETAILS	HPP-WE-11 AND HPP-WE-12
7.	WEIR, ELECTRICAL AND LIGHTING PLAN	HPP-WE-16
8.	FOREBAY, 0.70x0.70 M. SAND SLUICE GATE, GATE INSTALLATION	HPP-FB-07

0 1 2 3 4 5 6 9 12
SCALE 1:150 METERS

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
WEIR
GENERAL PLAN

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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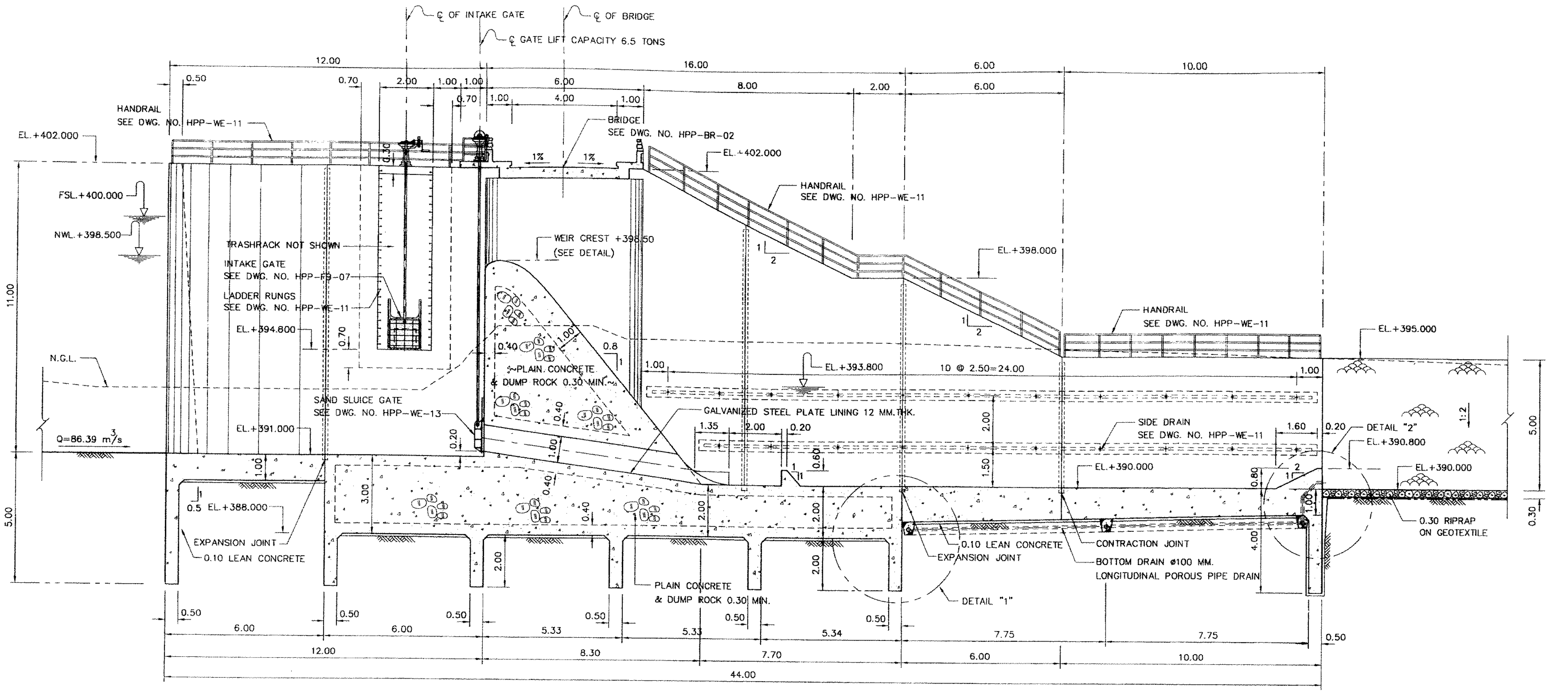
DESIGNED ภย.22514 สย.4651
DRAWN
CHECKED สย.4651
8/12/51
PROJECT MANAGER DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-WE-02
SHEET NO. 25 OF 100

:2008-PRO\0783\DRAFT FINAL\WEIR\HPP-WE-02 .DWG\TKK\19-11-2008

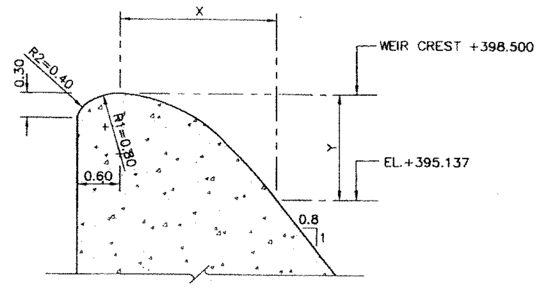

℄ OF INTAKE GATE
℄ OF BRIDGE
℄ GATE LIFT CAPACITY 6.5 TONS
HANDRAIL SEE DWG. NO. HPP-WE-11
EL.+402.000
BRIDGE SEE DWG. NO. HPP-BR-02
FSL.+400.000
NWL.+398.500
TRASHRACK NOT SHOWN
INTAKE GATE SEE DWG. NO. HPP-FD-07
LADDER RUNGS SEE DWG. NO. HPP-WE-11
WEIR CREST +398.50 (SEE DETAIL)
EL.+394.800
N.G.L.
PLAIN CONCRETE & DUMP ROCK 0.30 MIN.
SAND SLUICE GATE SEE DWG. NO. HPP-WE-13
EL.+391.000
Q=86.39 m³/s
GALVANIZED STEEL PLATE LINING 12 MM.THK.
EL.+398.000
EL.+393.800
10 @ 2.50=24.00
HANDRAIL SEE DWG. NO. HPP-WE-11
EL.+395.000
SIDE DRAIN SEE DWG. NO. HPP-WE-11
DETAIL "2"
EL.+390.800
EL.+390.000
0.30 RIPRAP ON GEOTEXTILE
EL.+388.000
EXPANSION JOINT
0.10 LEAN CONCRETE
CONTRACTION JOINT
BOTTOM DRAIN ø100 MM. LONGITUDINAL POROUS PIPE DRAIN
PLAIN CONCRETE & DUMP ROCK 0.30 MIN.
DETAIL "1"
12.00
16.00
6.00
10.00
44.00

SECTION A-A

SCALE 1:100

WEIR CREST

X (M.) (M.)	Y (M.) (M.)	ELEVATION M. (MSL.)
0.00	0.000	+398.50
0.25	0.026	+398.474
0.50	0.096	+398.377
0.75	0.206	+398.172
1.00	0.352	+397.820
1.25	0.534	+397.285
1.50	0.752	+396.534
2.089	1.397	+395.137



DETAIL OF WEIR CREST

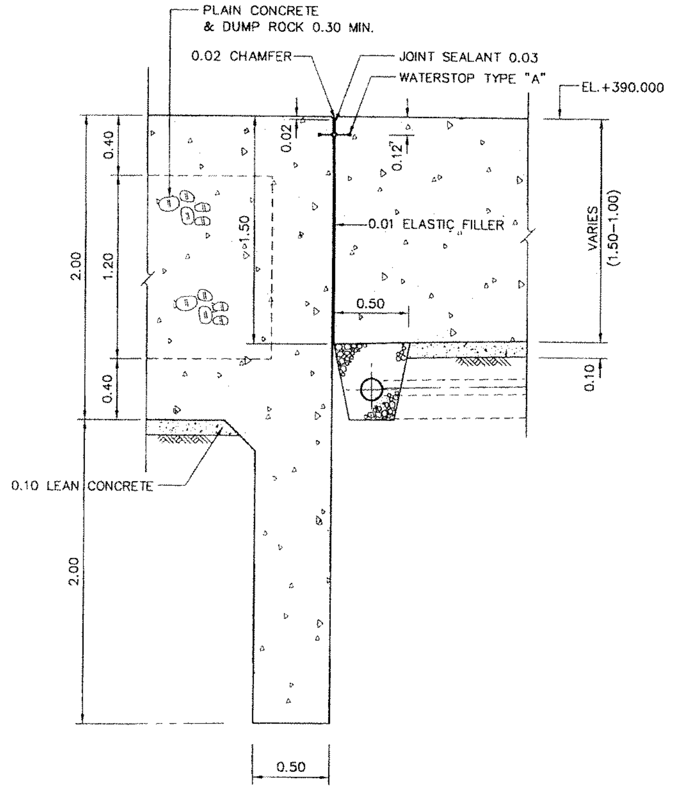
SCALE 1:50

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP-GN-03
3. ALLOWABLE BEARING CAPACITY NOT LESS THAN 25 TON/M.^{2}
4. SLUICE GATES WITH OUTSIDE-SCREW RISING STEM SHALL BE MOTOR AND HAND OPERATED, MIN. CAPACITY 6.5 TONS.
5. WEIR HAS A MAXIMUM DISCHARGE 86.39 m^3/s AT WATER LEVEL +398.50 (M.S.L.)

REFERENCE DRAWINGS :

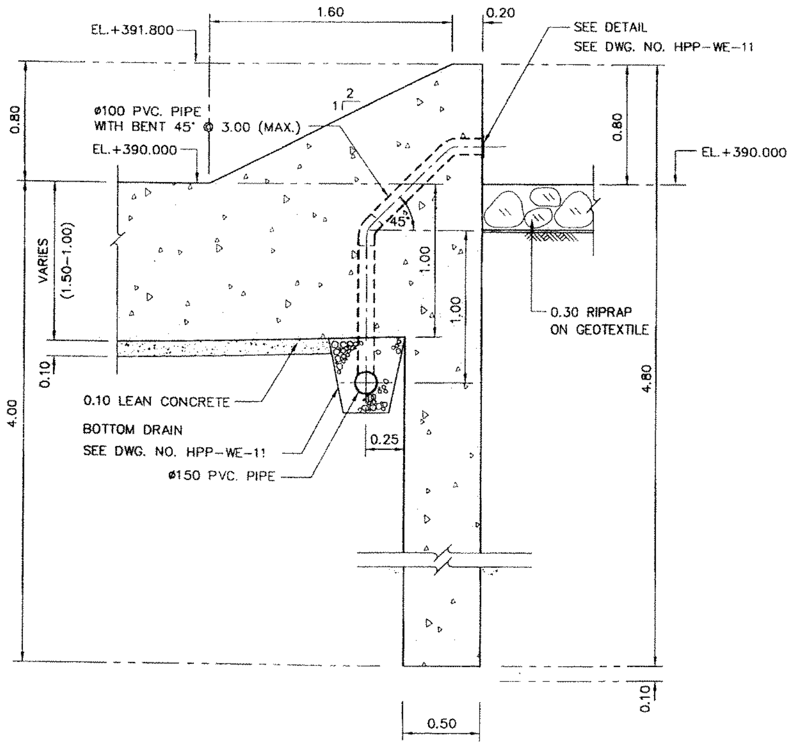
1.	WEIR, GENERAL LAYOUT	HPP-WE-01
2.	WEIR, GENERAL PLAN	HPP-WE-02



DETAIL "1"

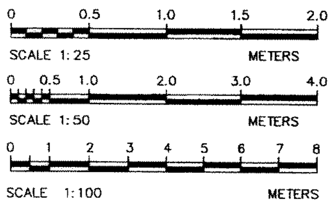
(EXPANSION JOINT)

SCALE 1:25


EL.+391.800
1.60
0.20
SEE DETAIL SEE DWG. NO. HPP-WE-11
ø100 PVC. PIPE WITH BENT 45° @ 3.00 (MAX.)
EL.+390.000
EL.+390.000
VARIES (1.50-1.00)
0.30 RIPRAP ON GEOTEXTILE
0.10 LEAN CONCRETE
BOTTOM DRAIN SEE DWG. NO. HPP-WE-11
ø150 PVC. PIPE
0.25
4.80
0.50

DETAIL "2"

SCALE 1:25



KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

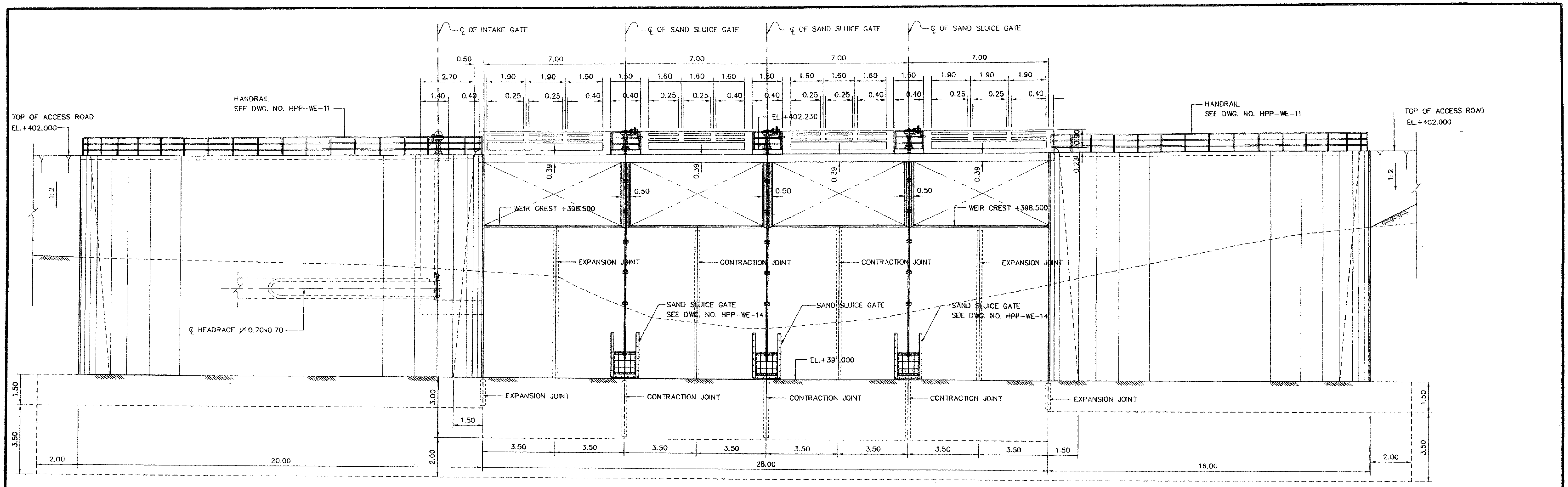
CIVIL WORKS
WEIR
SECTION A-A

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS | DEDE

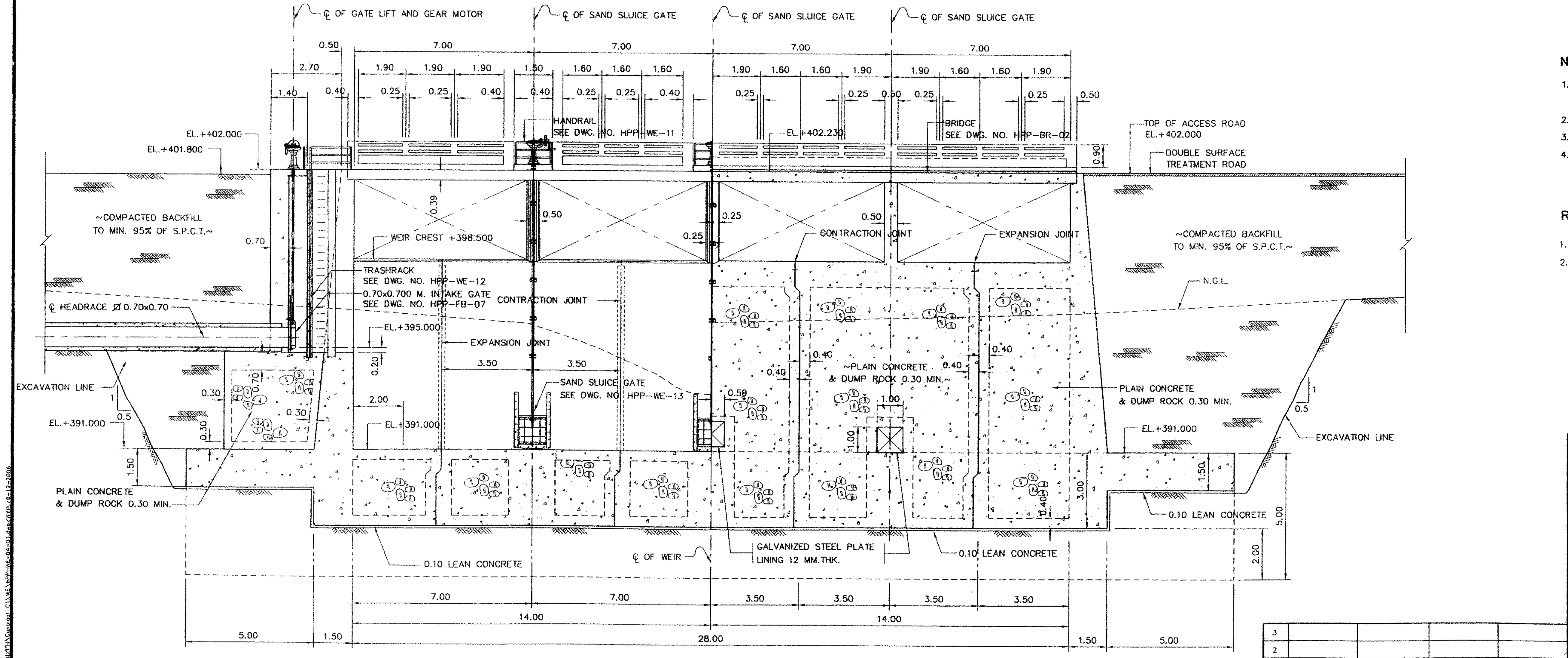
MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภย.22514 ภย.4651
DRAWN
CHECKED ภย.4651
PROJECT MANAGER 8/12/51 DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED
DRAWING NO. HPP-WE-03
SHEET NO. 26 OF 100



SECTION B-B

SCALE 1:100



SECTION C-C

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. HPP-GN-03
3. ALLOWABLE BEARING CAPACITY NOT LESS THAN 25 TON/M.^{2}
4. SLUICE GATES WITH OUTSIDE-SCREW RISING STEM SHALL BE MOTOR AND HAND OPERATED, MIN. CAPACITY 6.5 TONS.

REFERENCE DRAWINGS :

1.	WEIR, GENERAL LAYOUT	HPP-WE-01
2.	WEIR, GENERAL PLAN	HPP-WE-02

SCALE 1:100 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
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	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

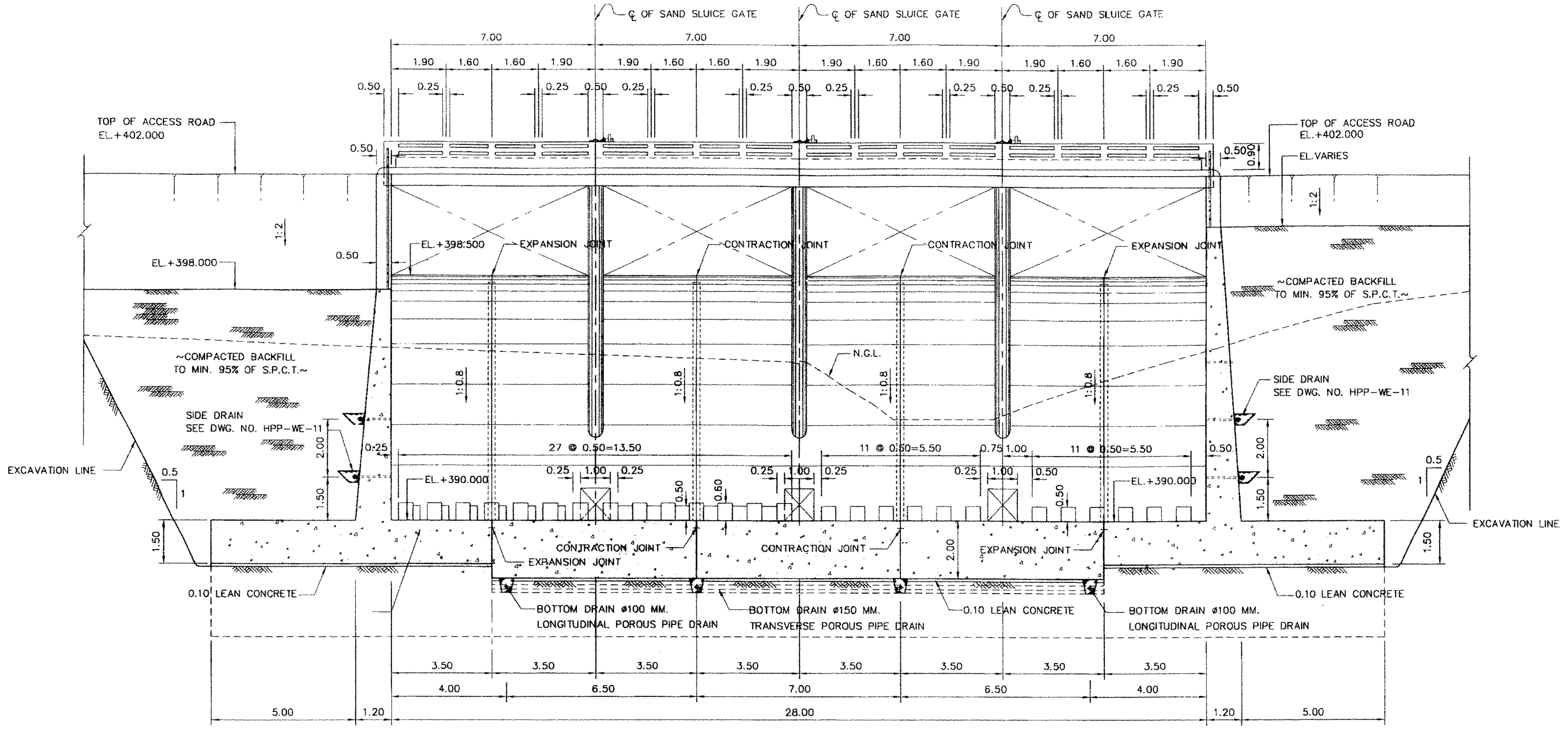
CIVIL WORKS
WEIR
SECTION B-B, C-C

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED สย.22514 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

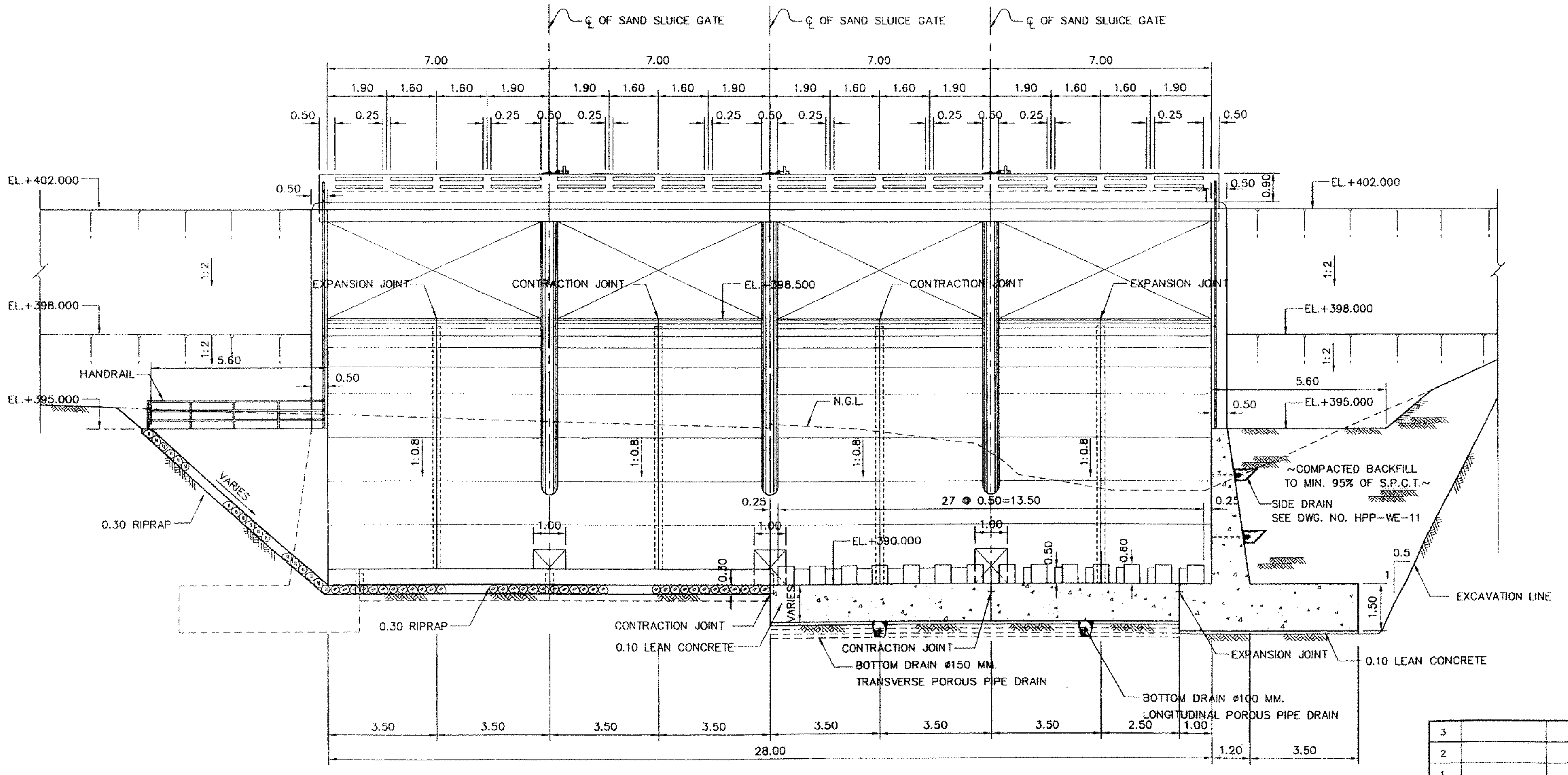
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-WE-04
SHEET NO. 27 OF 100



SECTION D–D

SCALE 1:100



SECTION E–E

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. HPP-GN-03
3. ALLOWABLE BEARING CAPACITY NOT LESS THAN 25 TON/M.^{2}
4. SLUICE GATES WITH OUTSIDE-SCREW RISING STEM SHALL BE MOTOR AND HAND OPERATED, MIN. CAPACITY 6.5 TONS.

REFERENCE DRAWINGS :

1.	WEIR, GENERAL LAYOUT	HPP-WE-01
2.	WEIR, GENERAL PLAN	HPP-WE-02

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
WEIR
SECTION D–D AND E–E

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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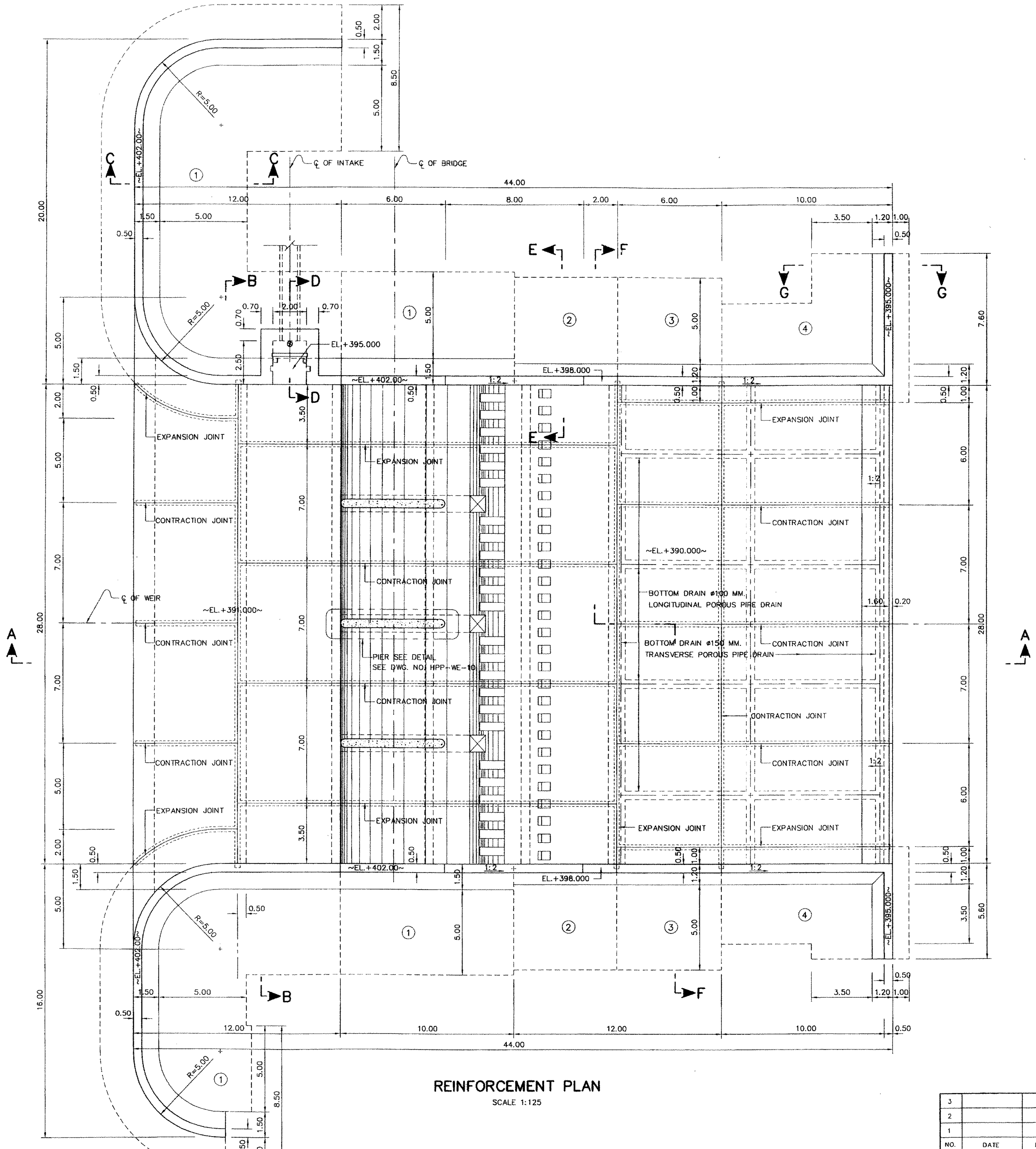
CONSULTANTS	DEDE

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภย.22514 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–WE–05
SHEET NO. 28 OF 100



REINFORCEMENT PLAN

SCALE 1:125

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP-GN-03
3. ALL REINFORCEMENT BARS ARE DEFORMED BARS, UNLESS OTHERWISW SHOWN.
4. ① = RETAINING WALL No.1

REFERENCE DRAWINGS :

1. WEIR, GENERAL LAYOUT	HPP-WE-01
2. WEIR, GENERAL PLAN	HPP-WE-02
3. WEIR, REINFORCEMENT DETAIL	HPP-WE-07 TO HPP-WE-10

0 1 2 3 4 5 6 7 8 9 10

SCALE 1:125 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

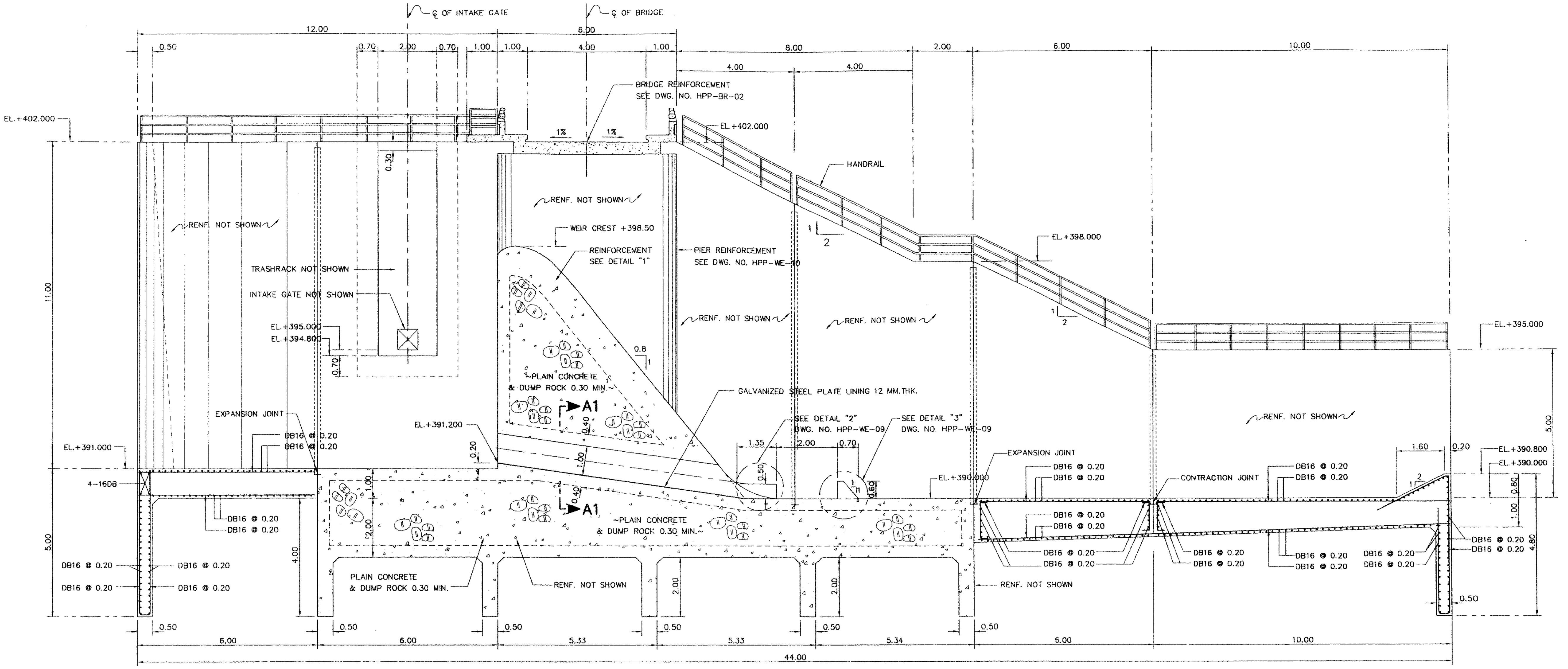
CIVIL WORKS
WEIR
REINFORCEMENT PLAN

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED ภย.22514 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

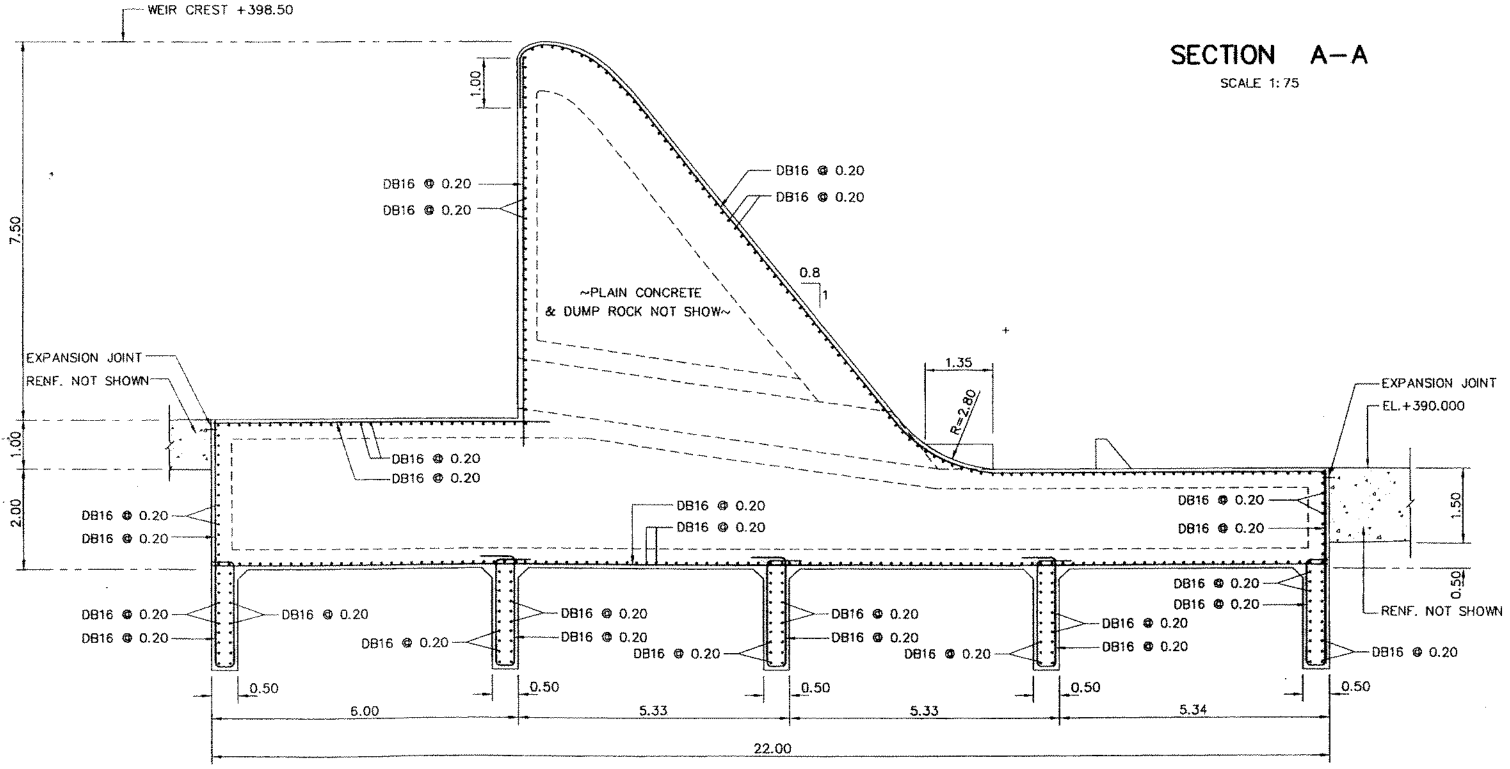
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-WE-06
SHEET NO. 29 OF 100



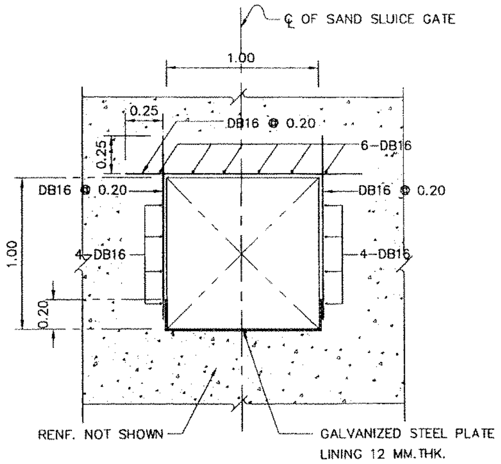
SECTION A–A

SCALE 1: 75



DETAIL "1"

SCALE 1: 75



SECTION A1–A1

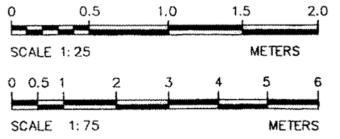
SCALE 1: 25

NOTES :

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

REFERENCE DRAWINGS :

1.	WEIR, GENERAL LAYOUT	HPP-WE-01
2.	WEIR, GENERAL PLAN	HPP-WE-02
3.	WEIR, REINFORCEMENT PLAN	HPP-WE-06



KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
WEIR
REINFORCEMENT DETAILS 1

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED	ภย.22514	สย.4651
DRAWN		
CHECKED		สย.4651
PROJECT MANAGER	8/12/51 DATE	

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO.	SHEET NO.
HPP-WE-07	30 OF 100

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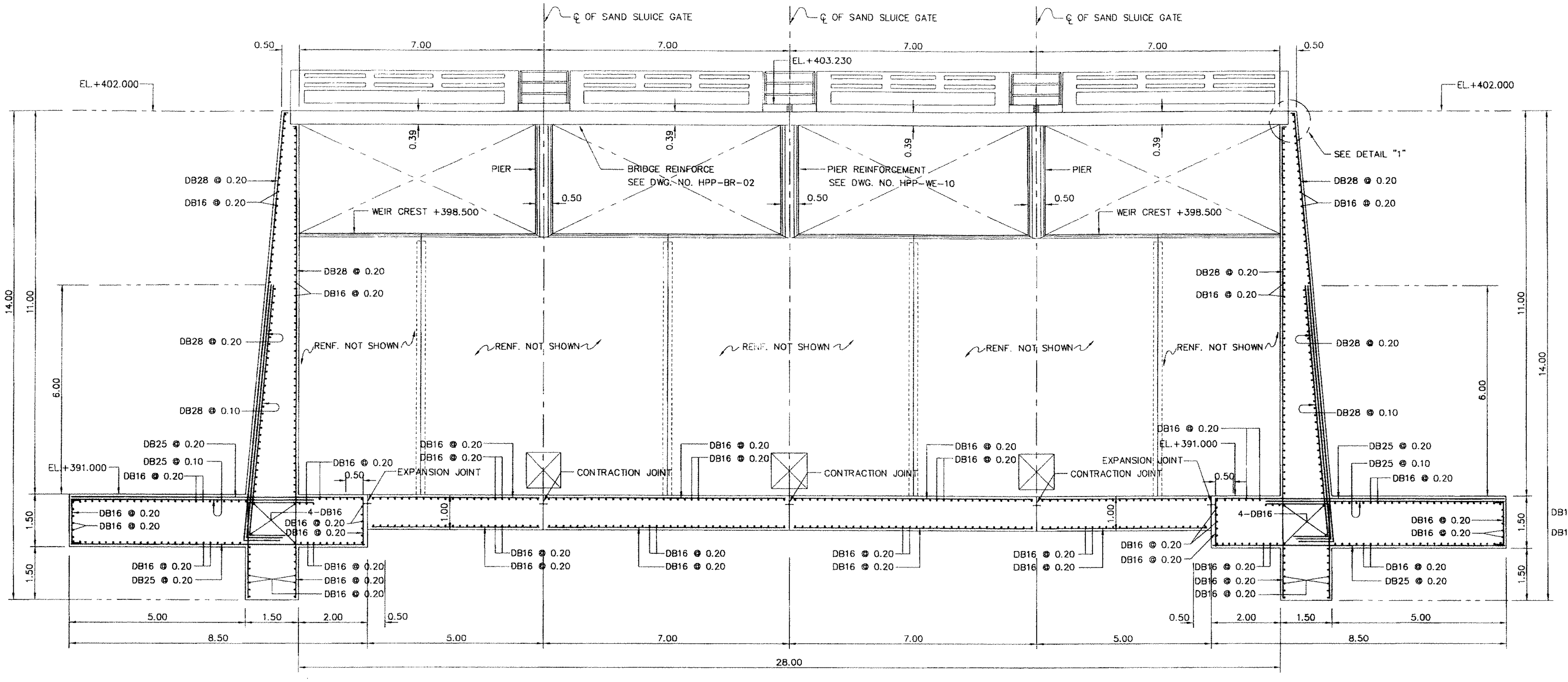
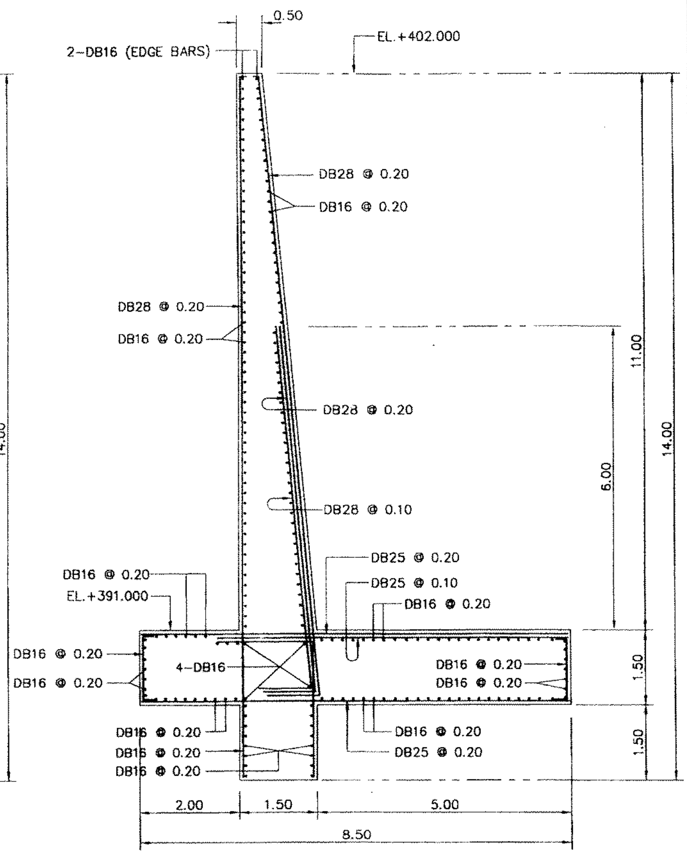


SECTION B-B

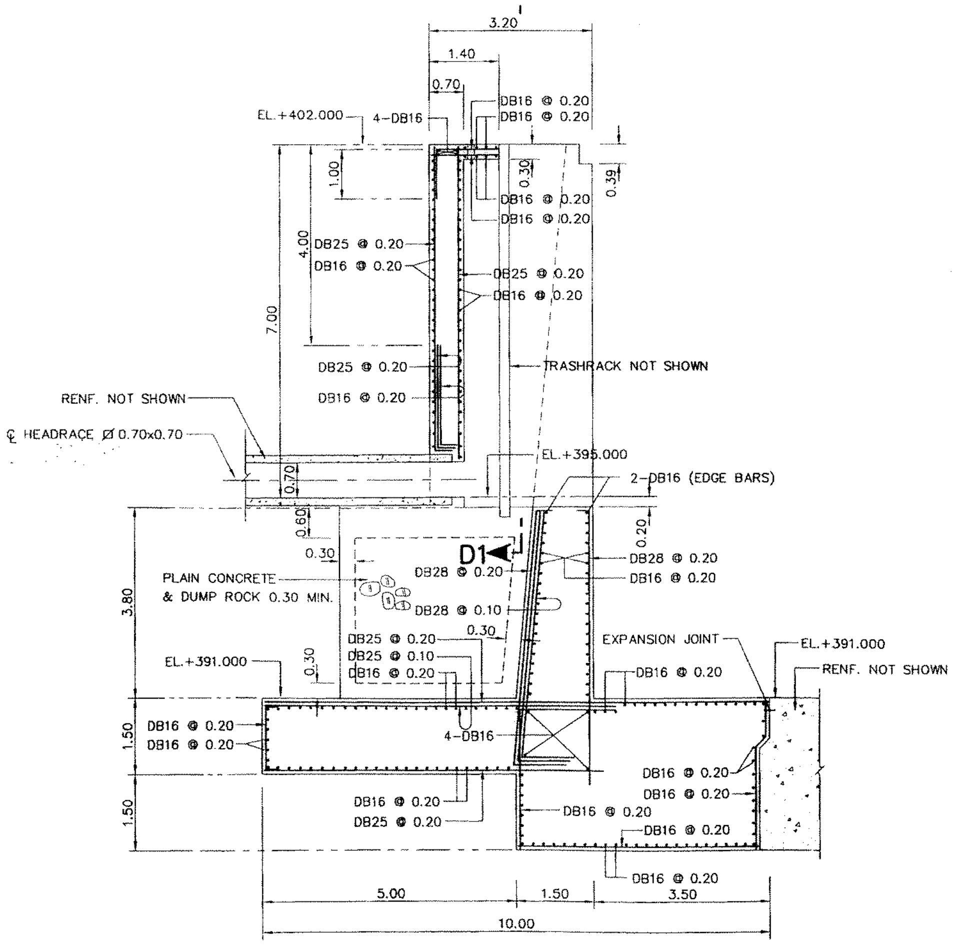
SCALE 1: 75



SECTION C-C

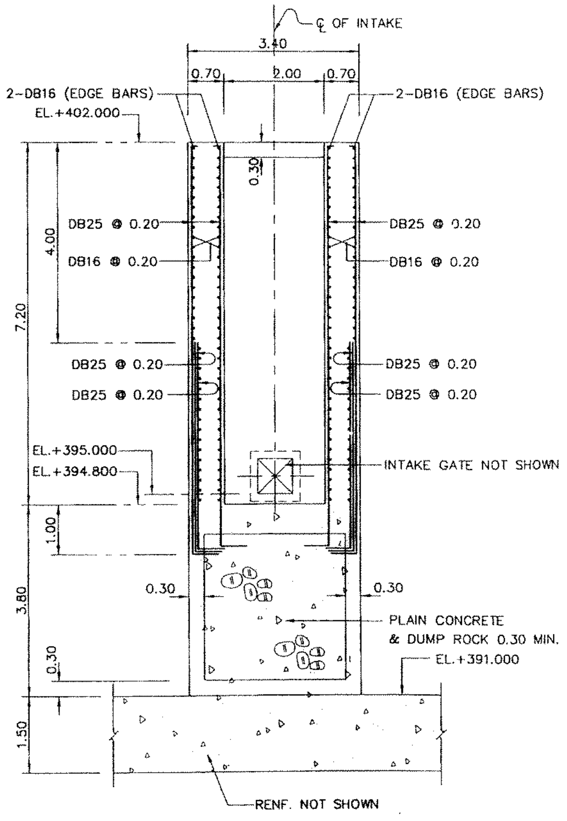
(RETAINING WALL No.1)

SCALE 1: 75



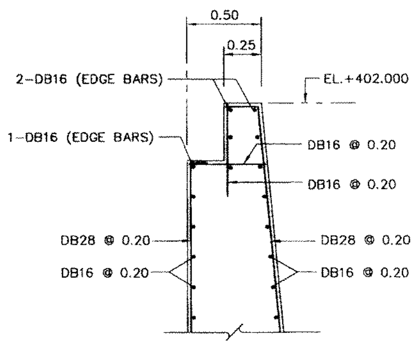
SECTION D-D

SCALE 1: 75



SECTION D1-D1

SCALE 1: 75



DETAIL "1"

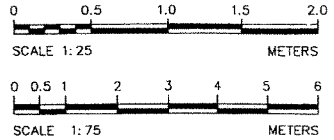
SCALE 1: 25

NOTES :

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

REFERENCE DRAWINGS :

1.	WEIR, GENERAL LAYOUT	HPP-WE-01
2.	WEIR, GENERAL PLAN	HPP-WE-02
3.	WEIR, REINFORCEMENT PLAN	HPP-WE-07



KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
WEIR
REINFORCEMENT DETAILS 2

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED	ภย.22514	สย.4651
DRAWN		
CHECKED		สย.4651

PROJECT MANAGER 8/12/51 DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-WE-08
SHEET NO. 31 OF 100

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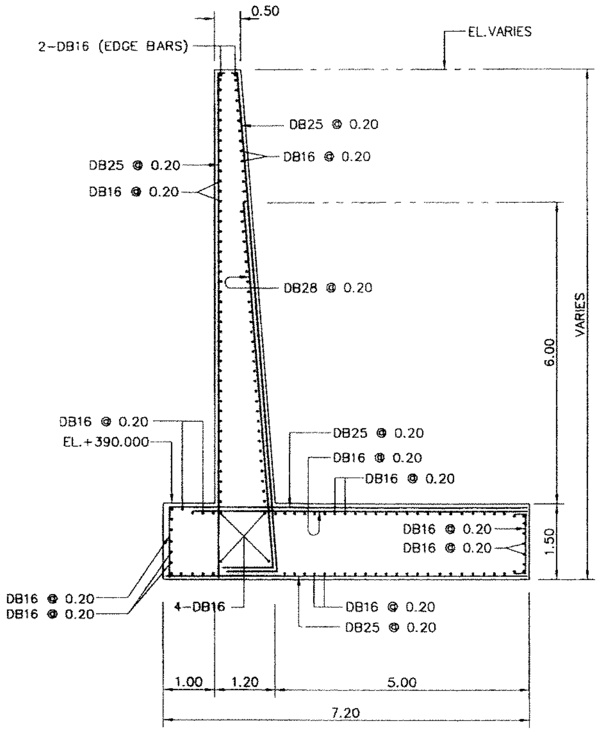
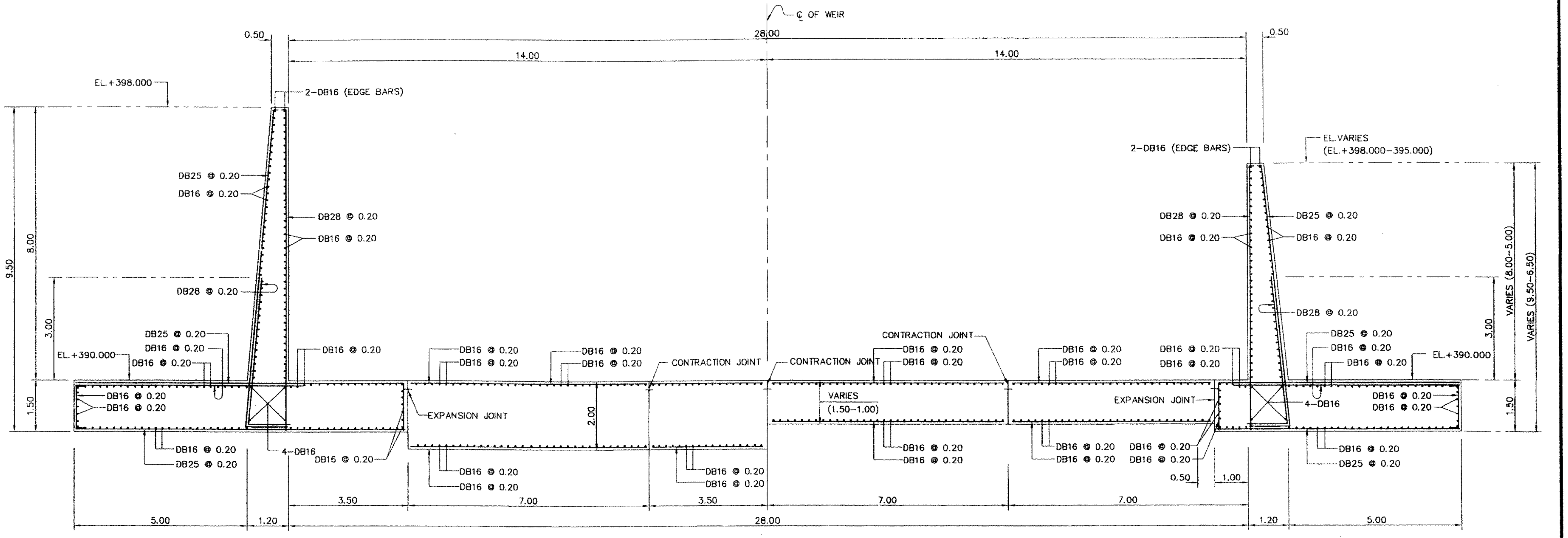
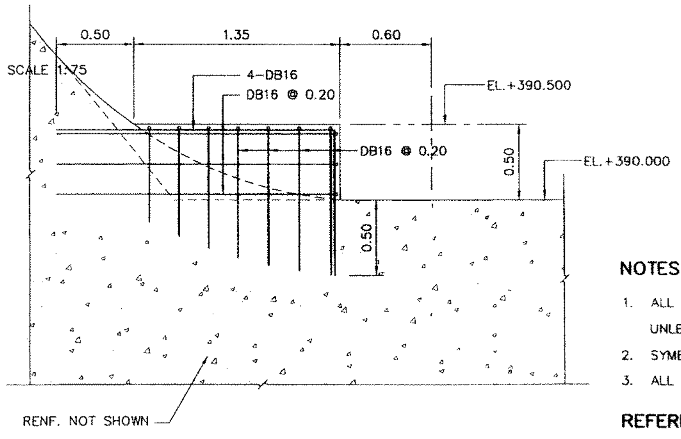


RETAINING WALL No.3

SCALE 1: 75



SECTION F-F



DETAIL "2" (HPP-WE-07)

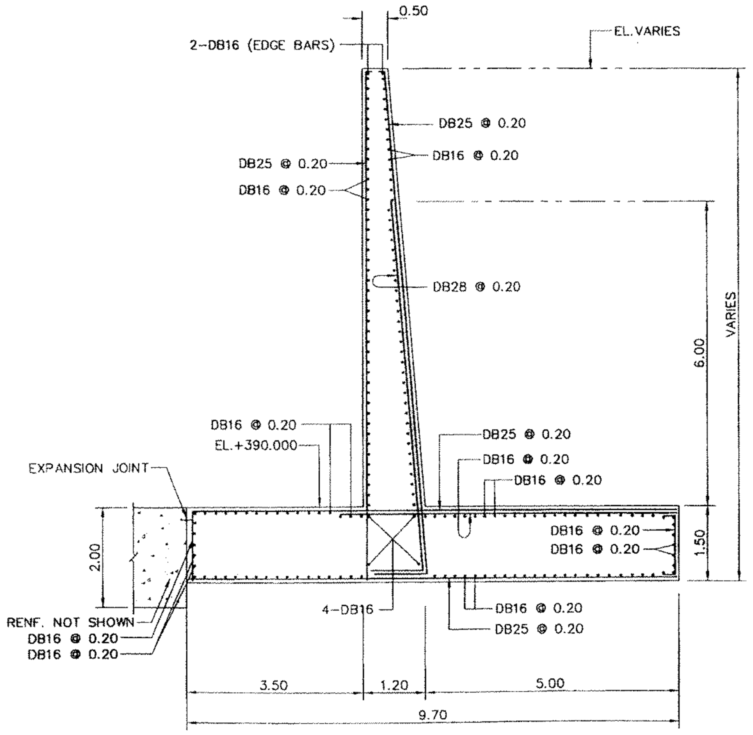
SCALE 1: 25

NOTES :

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

REFERENCE DRAWINGS :

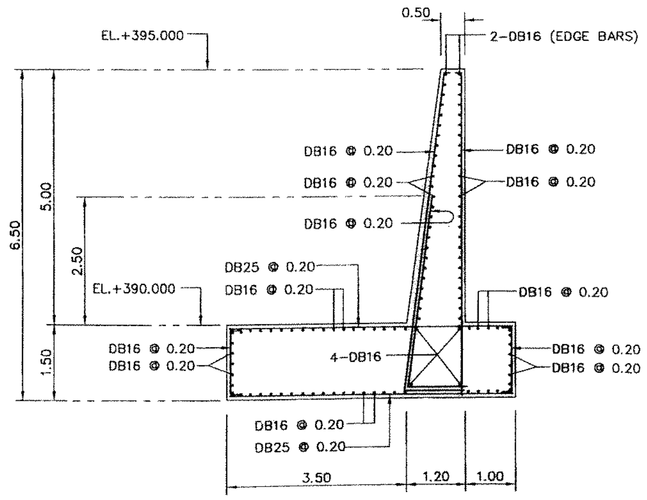
1.	WEIR, GENERAL LAYOUT	HPP-WE-01
2.	WEIR, GENERAL PLAN	HPP-WE-02
3.	WEIR, REINFORCEMENT PLAN	HPP-WE-06



SECTION E-E

(RETAINING WALL No.2)

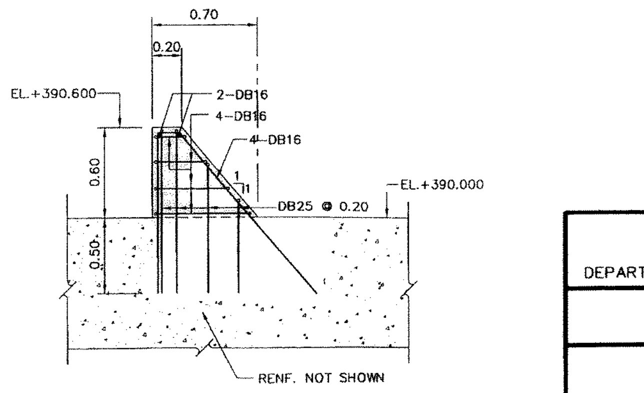
SCALE 1: 75



SECTION G-G

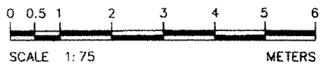
(RETAINING WALL No.4)

SCALE 1: 75



DETAIL "3" (HPP-WE-07)

SCALE 1: 25



KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
WEIR
REINFORCEMENT DETAILS 3

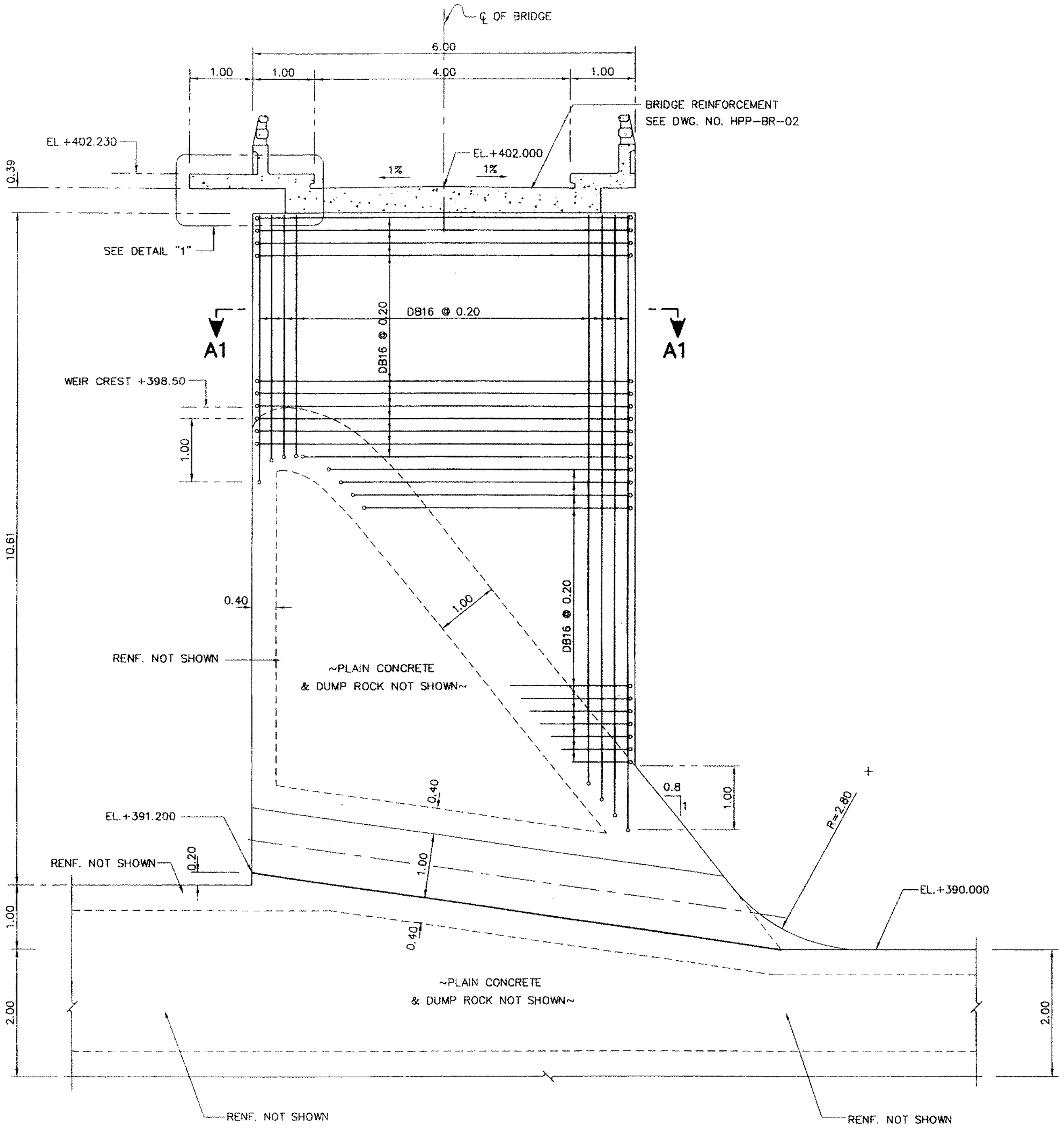
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภย.22514 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

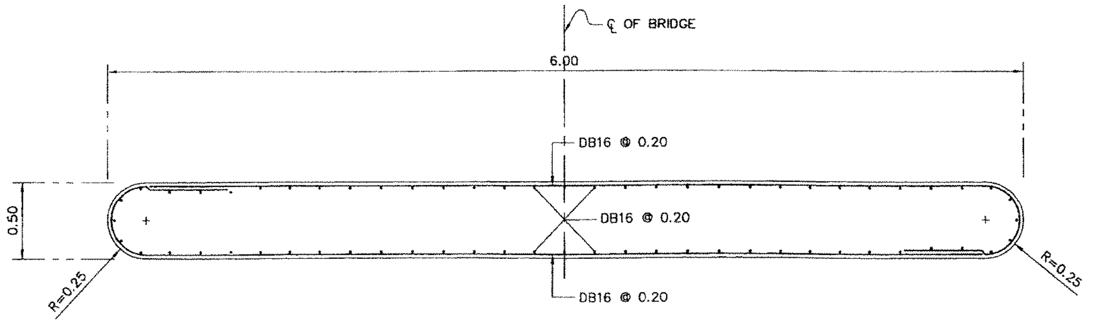
DRAWING NO. HPP-WE-09
SHEET NO. 32 OF 100

D:2008-PRO\0783\DRAFT FINAL\WEIR\HPP-WE-09 .DWG\TKK\19-11-2008



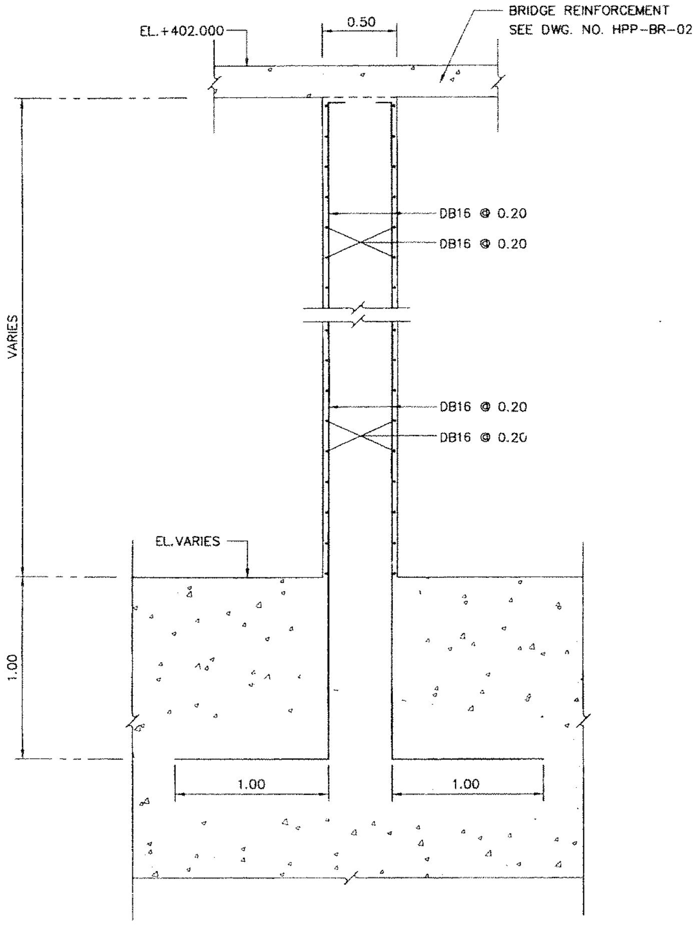
SECTION A–A

SCALE 1:50



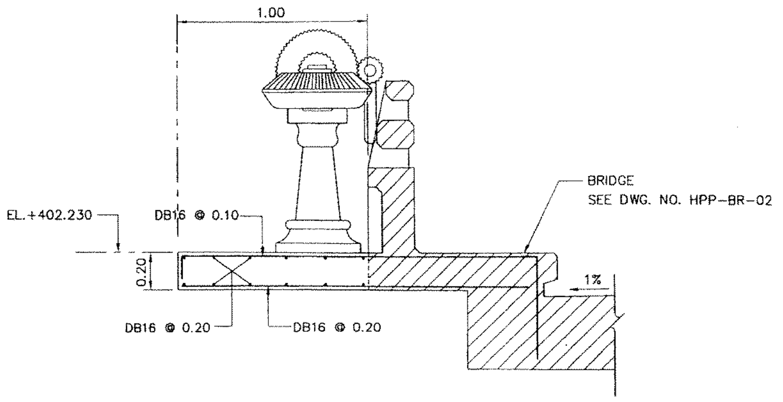
SECTION A1–A1

SCALE 1:25



SECTION B–B

SCALE 1:25



DETAIL "1"

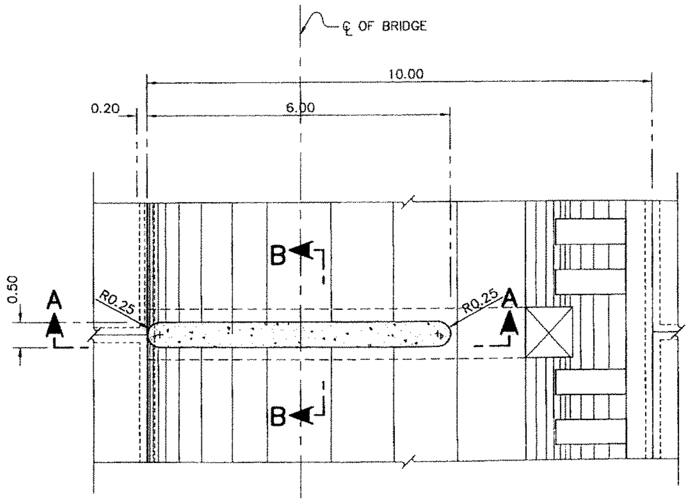
SCALE 1:20

NOTES :

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

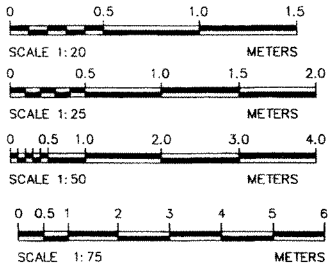
REFERENCE DRAWINGS :

1.	WEIR, GENERAL LAYOUT	HPP-WE-01
2.	WEIR, GENERAL PLAN	HPP-WE-02
3.	WEIR, REINFORCEMENT PLAN	HPP-WE-06
4.	BRIDGE REINFORCEMENT, PLAN SECTIONS AND DETAILS	HPP-BR-02



DETAIL OF PIER (HPP–WE–06)

SCALE 1:75



KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

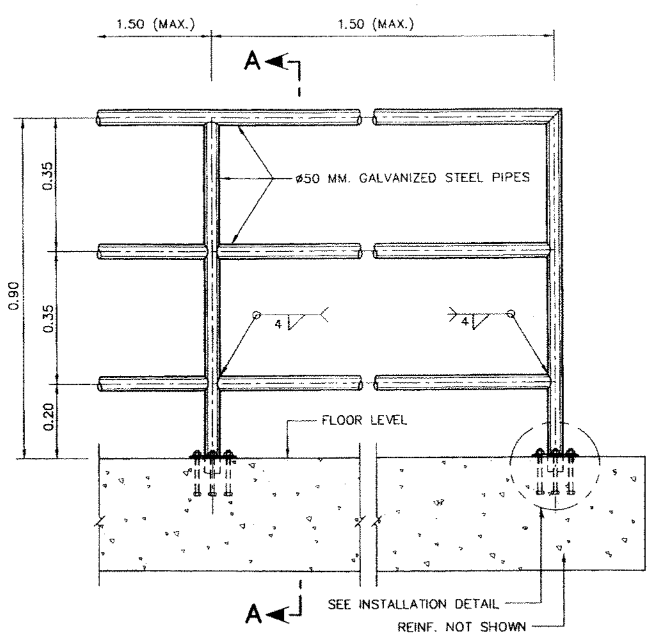
CIVIL WORKS
WEIR
REINFORCEMENT DETAILS 4

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภย.22514 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER 8/12/51 DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED
DRAWING NO. HPP–WE–10
SHEET NO. 33 OF 100

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

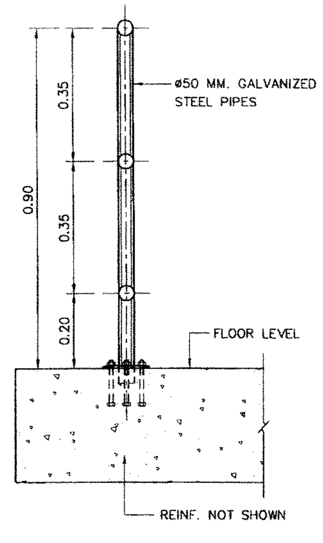
\2008-PRO\078J\DRAFT FINAL\WEIR\HPP-WE-10 .DWG\TKK\19-11-2008



INTERMEDIATE POST **END POST**

DETAILS OF HANDRAIL

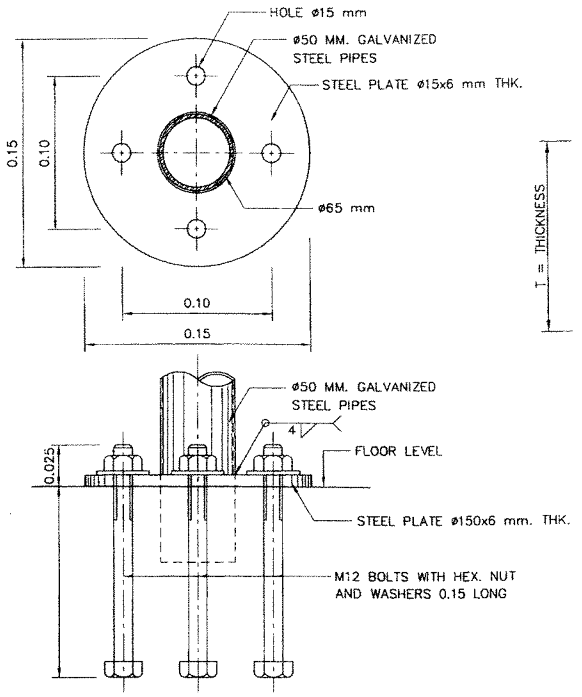
NOT TO SCALE



TYPICAL SECTION

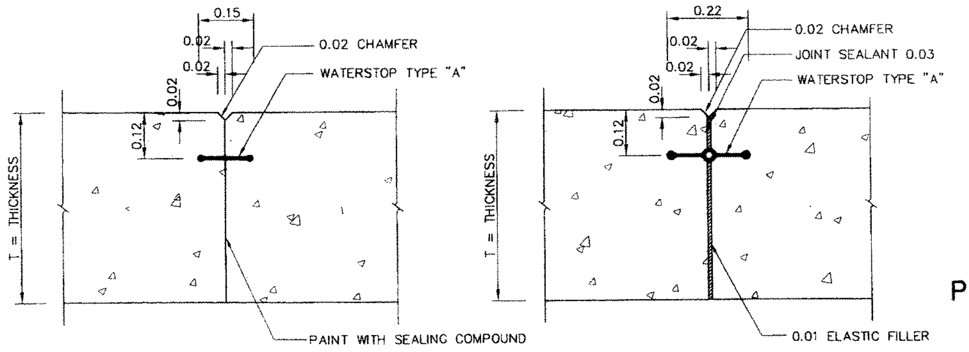
SECTION A–A

NOT TO SCALE


HOLE ø15 mm
ø50 MM. GALVANIZED STEEL PIPES
STEEL PLATE ø15x6 mm THK.
ø65 mm
0.15
0.10
0.10
0.15
ø50 MM. GALVANIZED STEEL PIPES
4
FLOOR LEVEL
0.025
STEEL PLATE ø150x6 mm. THK.
M12 BOLTS WITH HEX. NUT AND WASHERS 0.15 LONG

INSTALLATION DETAIL

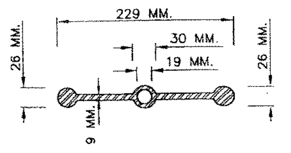
NOT TO SCALE



CONTRACTION JOINT **EXPANSION JOINT**

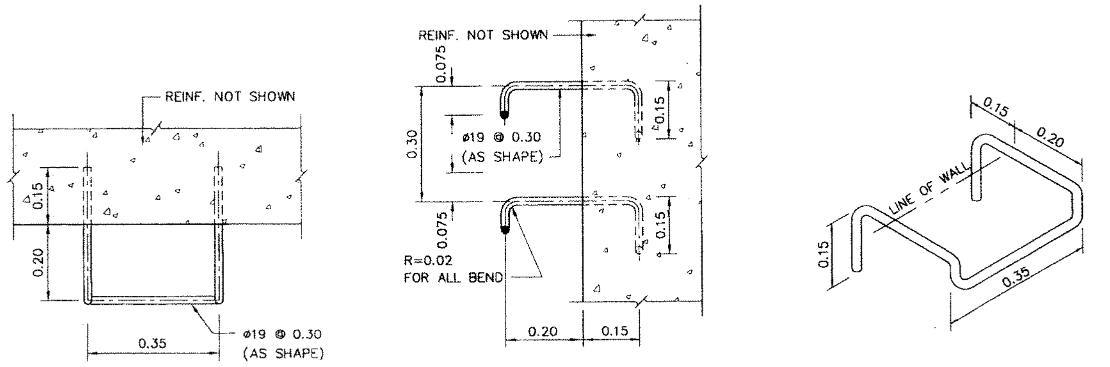
DETAILS OF JOINTS

SCALE 1:10



PVC. WATERSTOP TYPE "A"

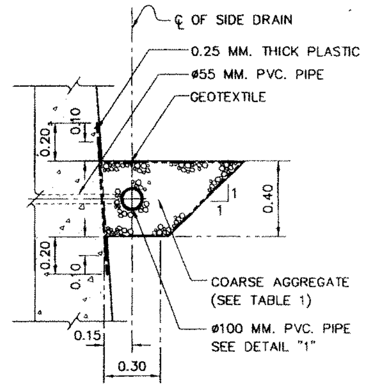
NOT TO SCALE



PLAN **SECTION** **ISOMETRIC VIEW**

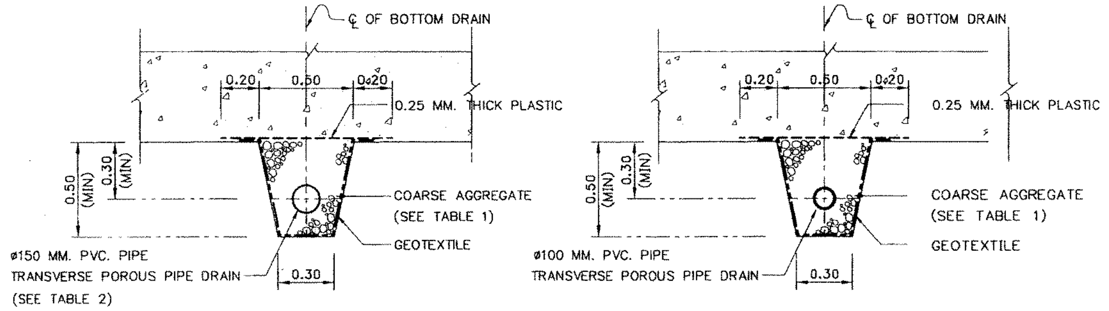
DETAIL OF LADDER RUNGS (HPP-WE-03)

NOT TO SCALE



DETAIL OF SIDE DRAIN

SCALE 1:20



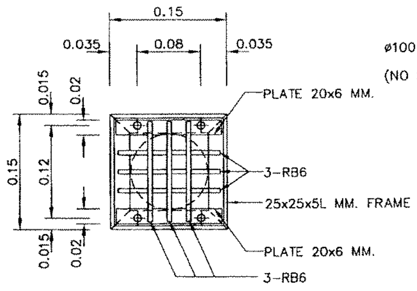
TRANSVERSE POROUS PIPE DRAIN **LONGITUDINAL POROUS PIPE DRAIN**

DETAILS OF BOTTOM DRAIN

SCALE 1:20

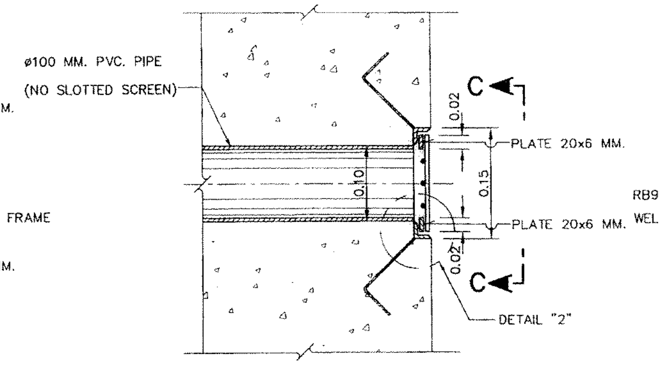
TABLE 1 GRADATION OF FILTER MATERIALS

FILTER MATERIALS	PERCENT BY WEIGHT RETAINED ON STANDARD SIEVE										
	1 1/2"	3/4"	3/6"	3/8"	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200
COARSE AGGREGATE	0	20–35	40–60	0	60–80	75–90	95–100	–	–	–	–



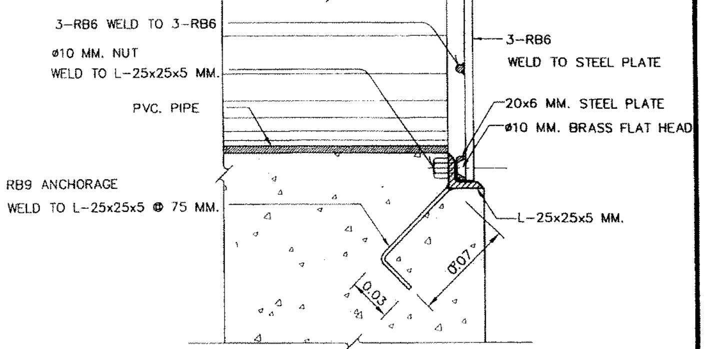
SECTION C–C

SCALE 1:5



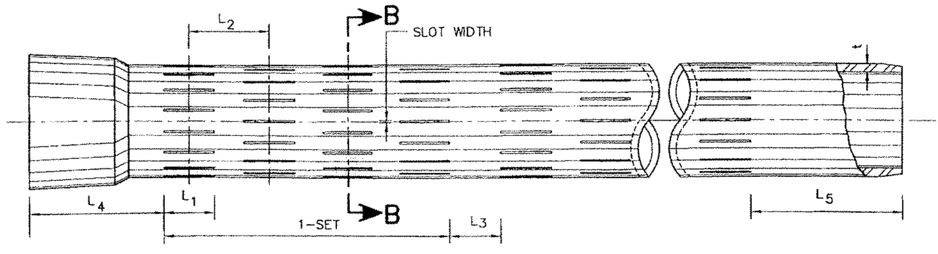
DETAILS OF ø100 MM. PVC. PIPE (HPP-WE-03)

SCALE 1:5

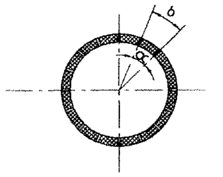

3-RB6 WELD TO 3-RB6
ø10 MM. NUT WELD TO L-25x25x5 MM.
PVC. PIPE
RB9 ANCHORAGE WELD TO L-25x25x5 @ 75 MM.
3-RB6 WELD TO STEEL PLATE
20x6 MM. STEEL PLATE
ø10 MM. BRASS FLAT HEAD
L-25x25x5 MM.
0.03
0.07

DETAILS "2"

NOT TO SCALE



ELEVATION



SECTION B–B

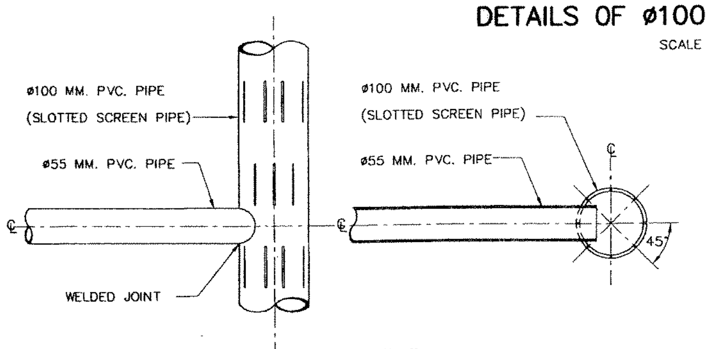
NOT TO SCALE

SLOTTED uPVC SCREEN PIPE OF BOTTOM DRAIN AND SIDE DRAIN DETAILS

NOT TO SCALE

TABLE 2 SIZE OF SLOTTED uPVC SCREEN PIPE

NOMINAL SIZE (MM.)	L_1 (MM.)	L_2 (MM.)	L_3 (MM.)	L_4 (MM.)	L_5 (MM.)	SLOT WIDTH (MM.)	α (MM.)	b (MM.)	No. OF SLOT ON THE SAME CIRCUMFERENCE	No. OF SET PER LENGTH (4.00 M)	APPROX OPENING AREA
55	80±10	120±10	80±10	215	220	2.4±0.2	45°	23.5	8	7	5.7 %
100	80±10	120±10	80±10	210	220	2.4±0.2	22.5°	22.4	16	7	6.0 %
150	80±10	120±10	80±10	200	220	2.4±0.2	18°	25.9	20	7	5.2 %

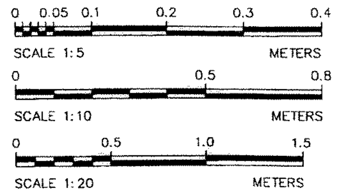

ø100 MM. PVC. PIPE (SLOTTED SCREEN PIPE)
ø55 MM. PVC. PIPE
℄
WELDED JOINT
ø100 MM. PVC. PIPE (SLOTTED SCREEN PIPE)
ø55 MM. PVC. PIPE
℄
℄
45°

DETAIL "1"

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. HPP-GN-03



KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

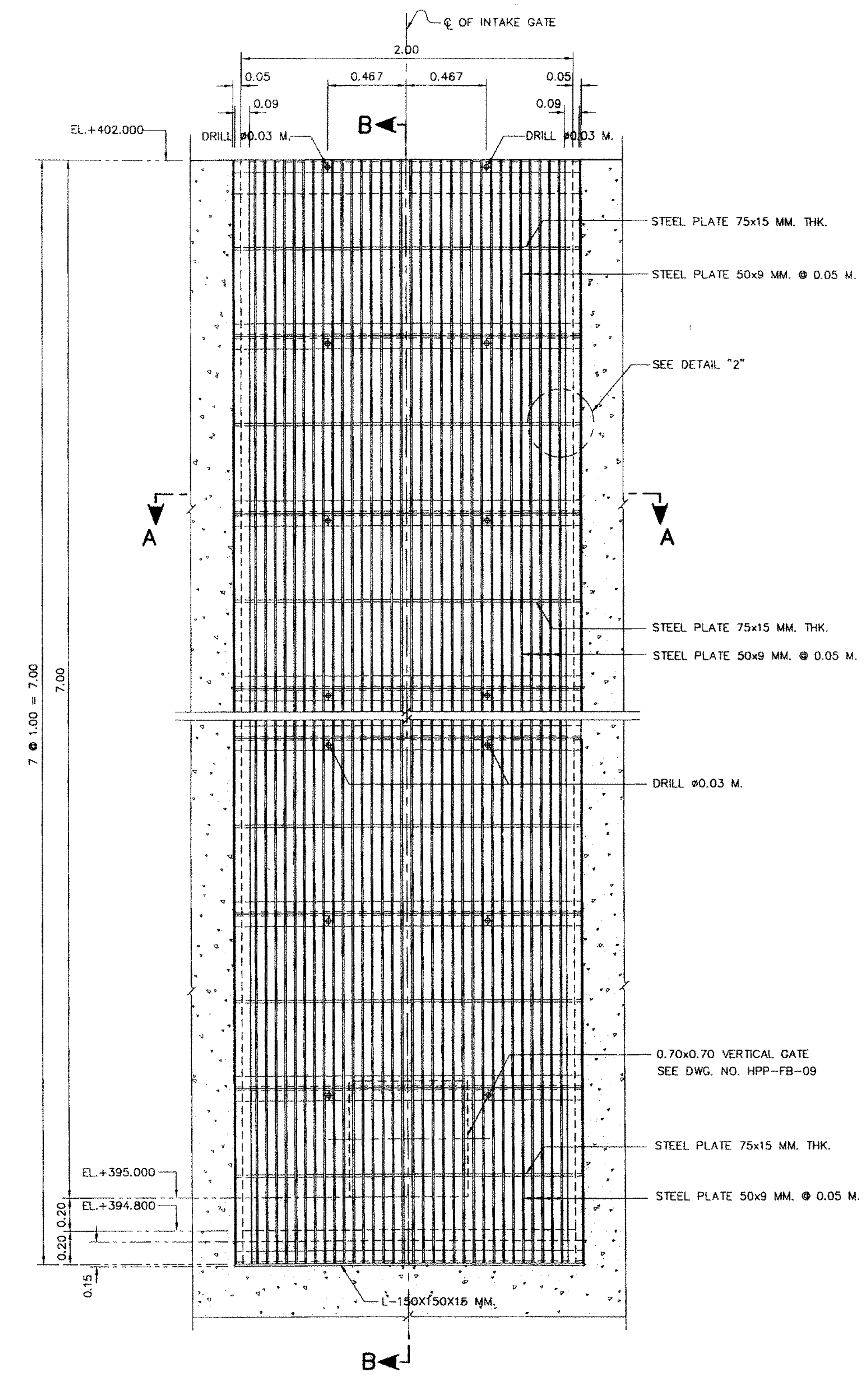
CIVIL WORKS
WEIR
MISCELLANEOUS DETAILS 1

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภย.22514 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER DATE 8/12/51

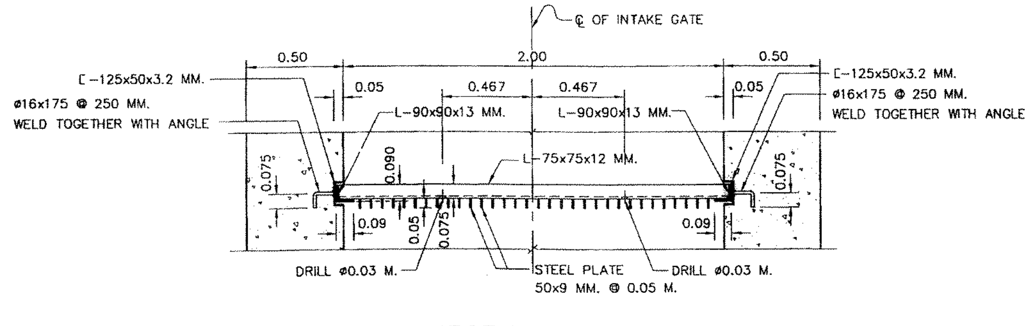
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED
DRAWING NO. HPP–WE–11
SHEET NO. 34 OF 100

D:2008-PRO\0783\DRAFT FINAL\WEIR\HPP-WE-11 .DWG\TKK\ 19-11-2008



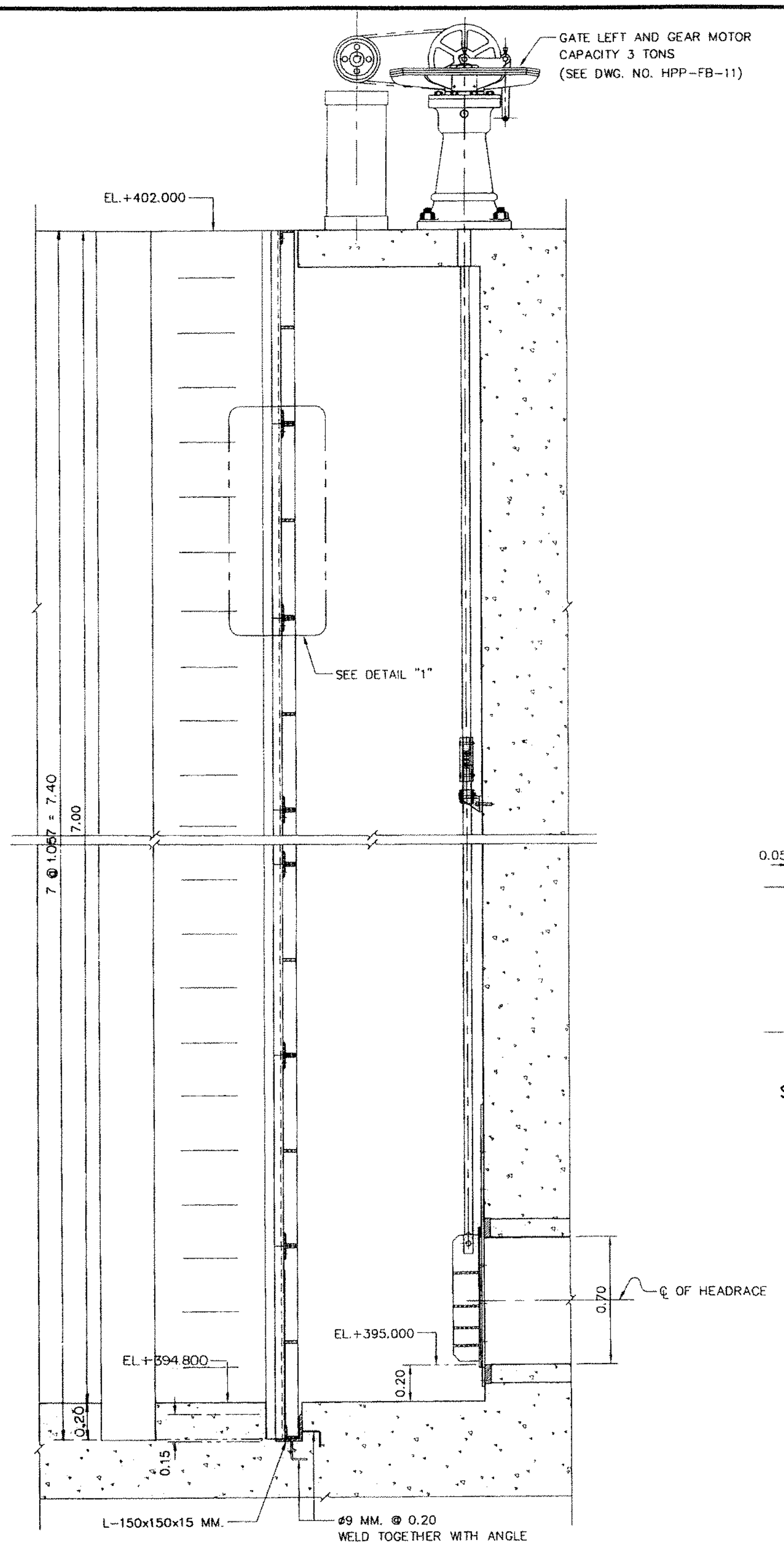
DETAIL OF TRASHRACK

SCALE 1:20



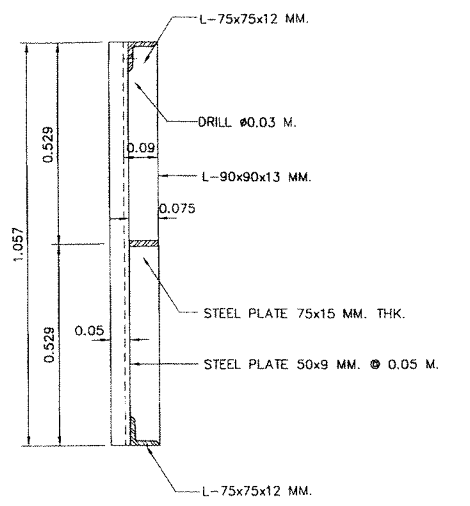
SECTION A-A

SCALE 1:20



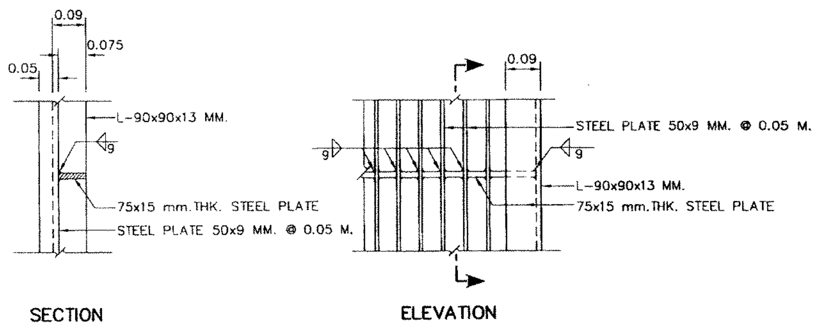
SECTION B-B

SCALE 1:20



DETAIL "1"

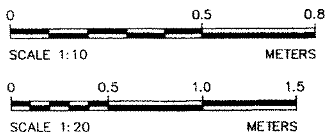
SCALE 1:10



0.09
0.075
0.05
L-90x90x13 MM.
9
75x15 mm.THK. STEEL PLATE
STEEL PLATE 50x9 MM. @ 0.05 M.
0.09
STEEL PLATE 50x9 MM. @ 0.05 M.
9
9
L-90x90x13 MM.
75x15 mm.THK. STEEL PLATE
SECTION
ELEVATION

DETAIL "2"

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. HPP-GN-03

REFERENCE DRAWINGS :

1. WEIR, GENERAL PLAN	HPP-WE-02
2. WEIR, SECTIONS A-A	HPP-WE-03
3. FOREBAY, 0.70x0.70 VERTICAL GATE, GATE DETAILS	HPP-FB-09
4. FOREBAY, GATE LIFT, CAPACITY 3.0 TONS	HPP-FB-11

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS
DEDE

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
WEIR
MISCELLANEOUS DETAILS 2

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED กส.22514 สน.4851
DRAWN
CHECKED สน.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-WE-12
SHEET NO. 35 OF 100

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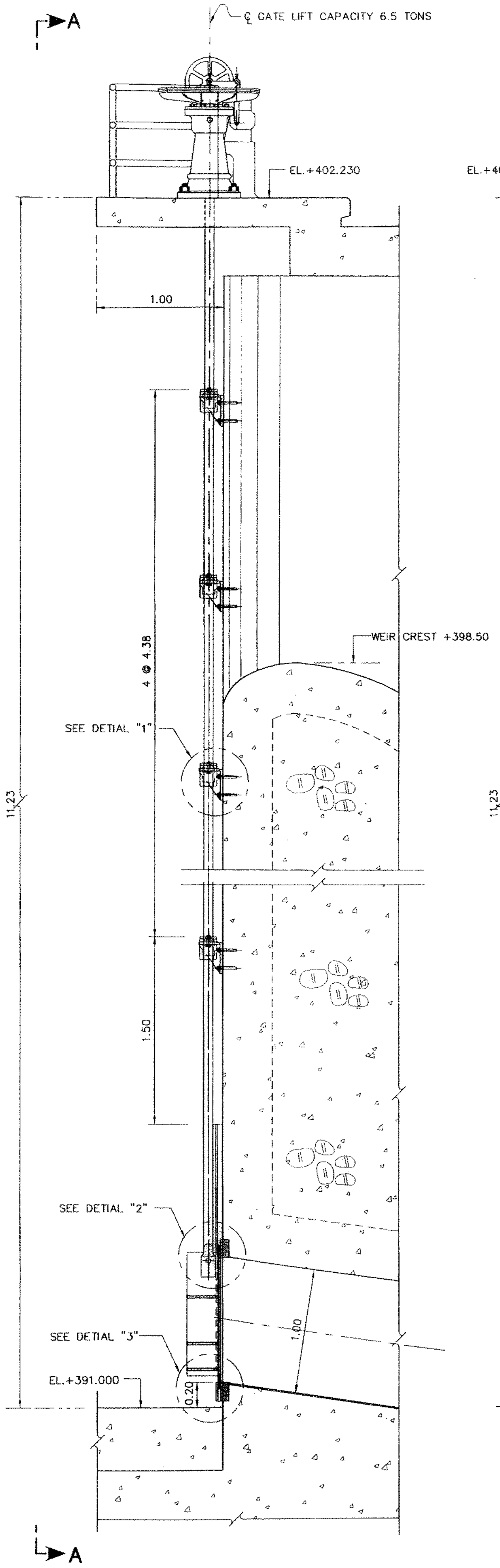
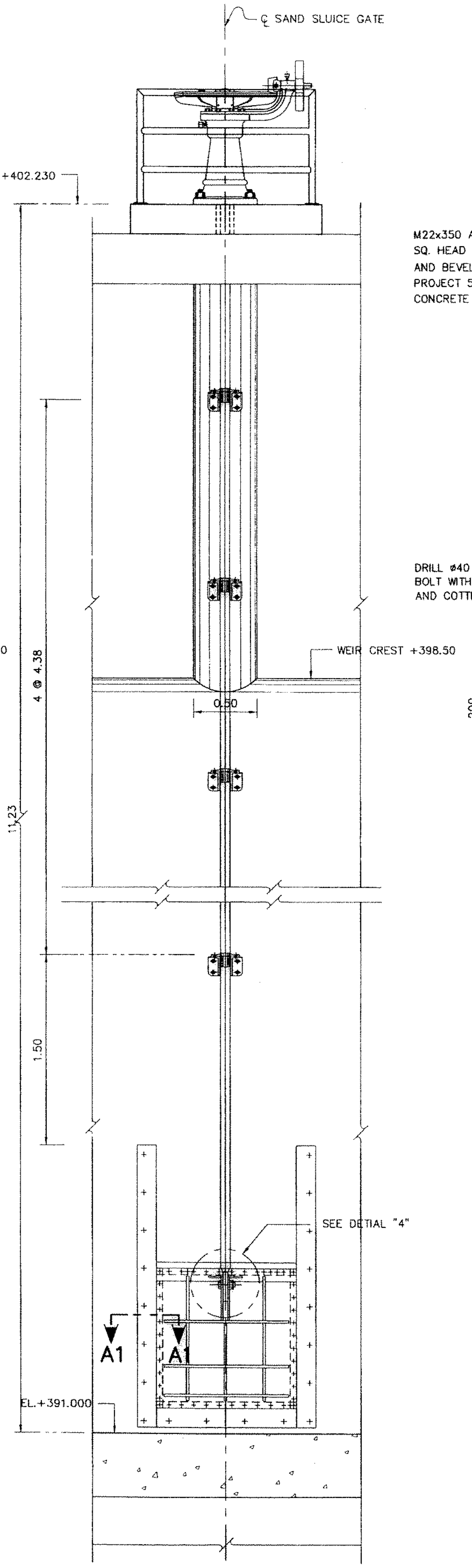


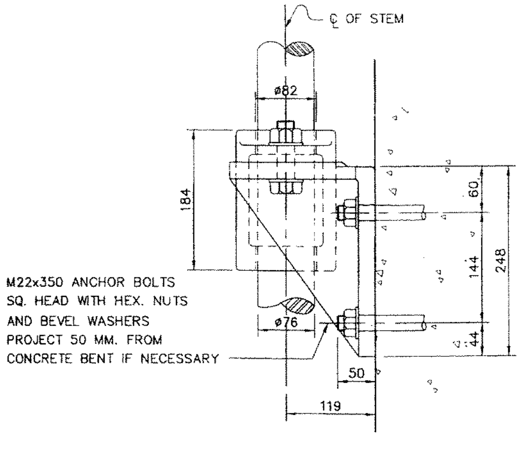
DETAIL OF SAND SLUICE GATE (HPP-WE-03)

SCALE 1:25



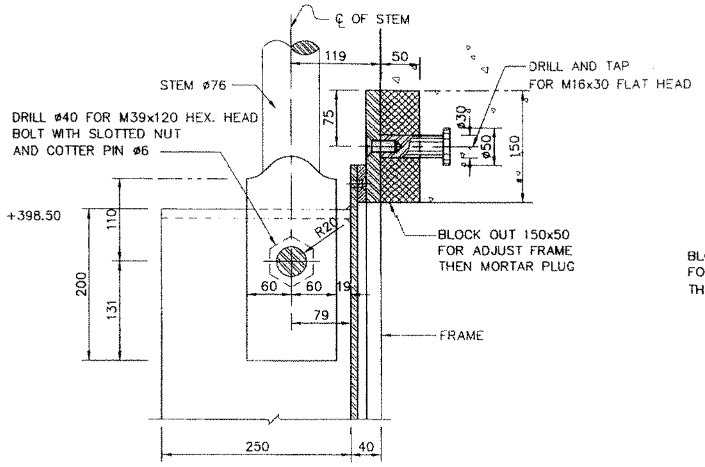
SECTION A–A

SCALE 1:25



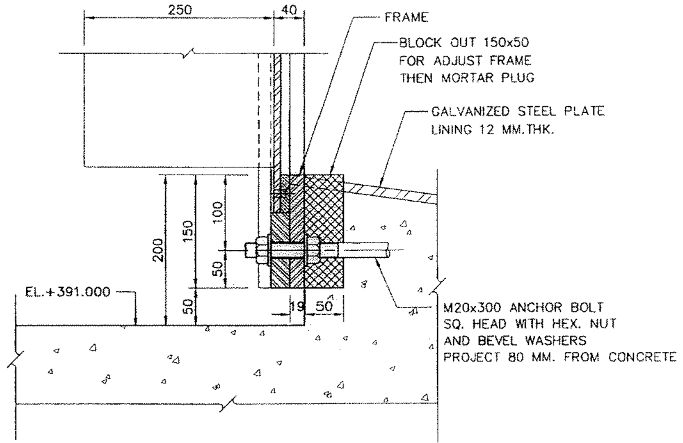
DETAIL "1"

SCALE 1:5



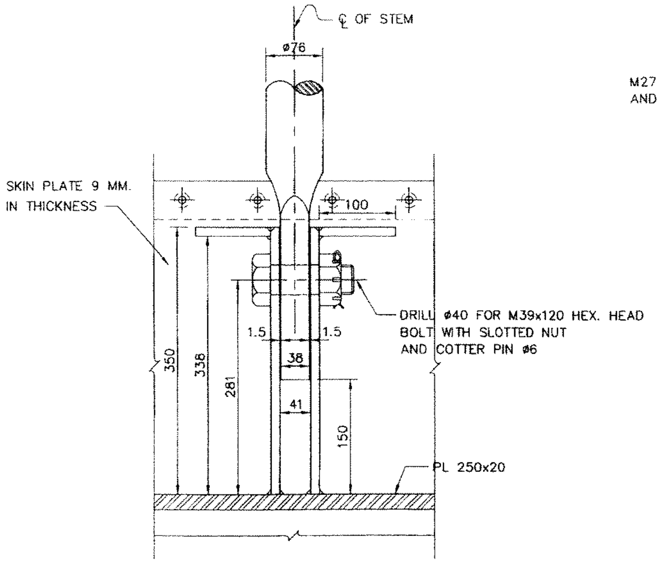
DETAIL "2"

SCALE 1:5



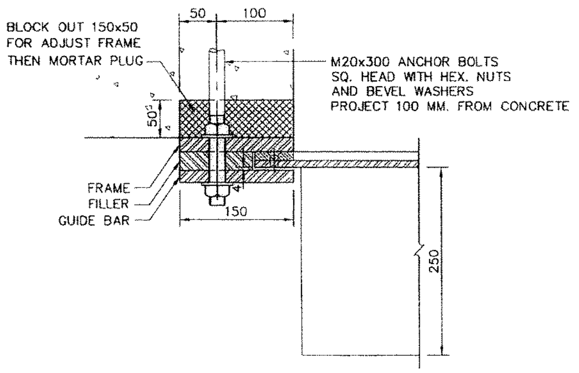
DETAIL "3"

SCALE 1:5



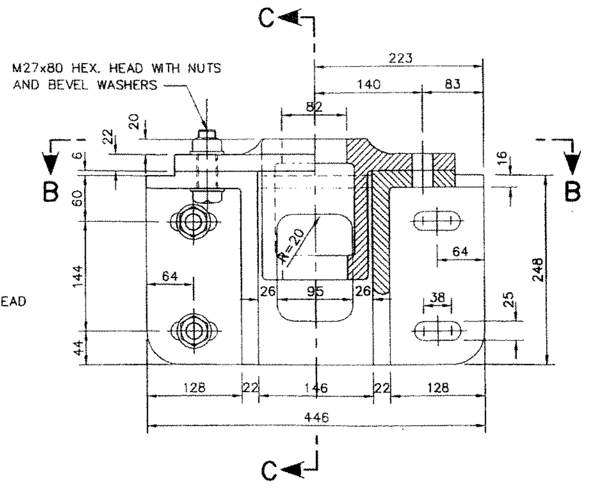
DETAIL "4"

SCALE 1:5



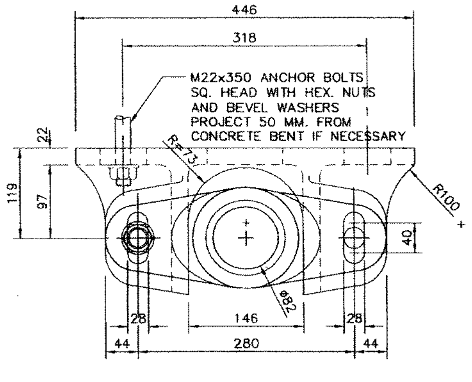
SECTION A1–A1

SCALE 1:5



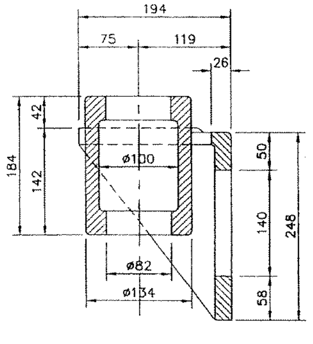
STEM GUIDE

SCALE 1:5



SECTION B–B

SCALE 1:5



SECTION C–C

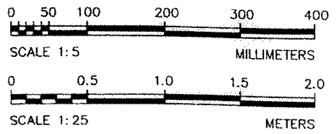
SCALE 1:5

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN.
2. ALL WELDING WILL BE 6 MILLIMETERS, USLESS OTHERWISE SHOWN.
3. ALL BOLTS AND NUTS USE ASTM A325.
4. ALL STRUCTURAL STEELS ARE JIS G 3101 SS400
5. ALL STAINLESS STEEL PLATES ARE JIS G 4304 SUS 304.

REFERENCE DRAWINGS :

1.	WEIR, GENERAL LAYOUT	HPP-WE-01
2.	WEIR, GENERAL PLAN	HPP-WE-02
3.	WEIR, 1.00x1.00 M. SAND SLUICE GATE, GATE DETAILS	HPP-WE-14
4.	WEIR, GATE LIFT, CAPACITY 6.5 TONS	HPP-WE-15



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORK
WEIR
1.00x1.00 M. SAND SLUICE GATE, GATE INSTALLATION

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED ภย.22514 สย.4651
DRAWN
CHECKED สย.4651

PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-WE-13
SHEET NO. 36 OF 100

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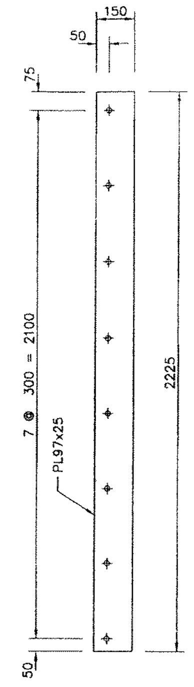
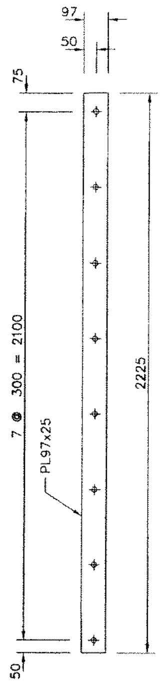


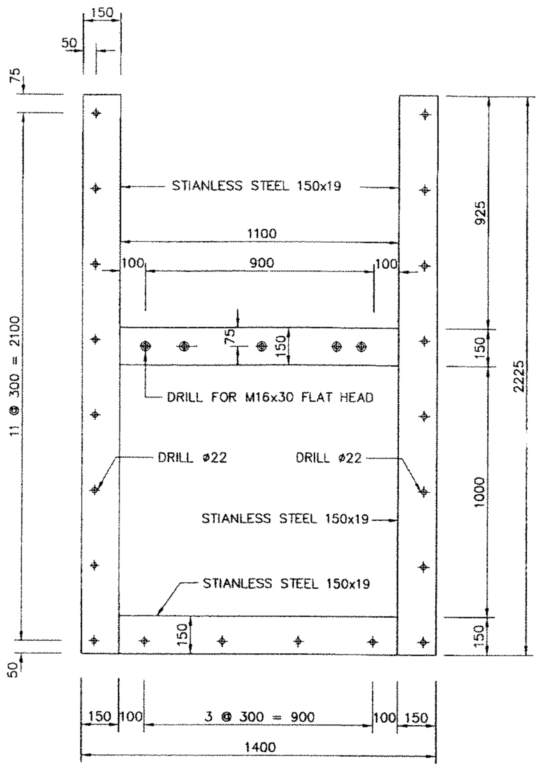
GUIDE BAR

SCALE 1:15



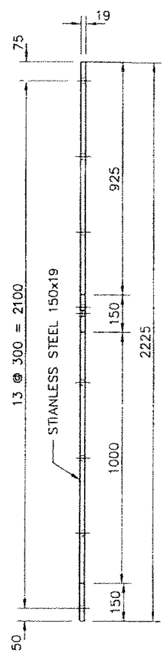
FILLER

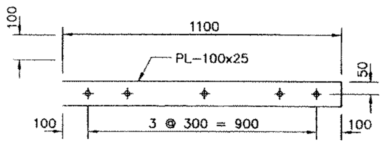
SCALE 1:15



FRAME

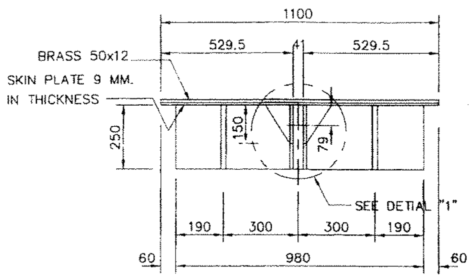
SCALE 1:15





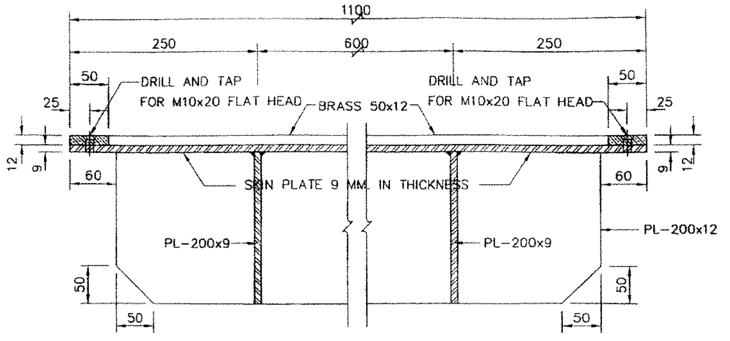
BOTTOM BAR

SCALE 1:15



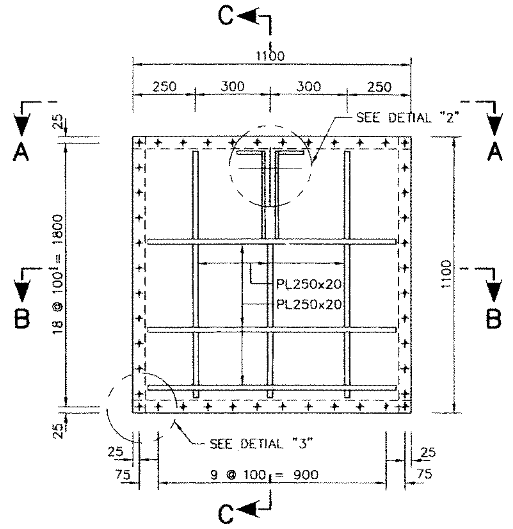
SECTION A–A

SCALE 1:15



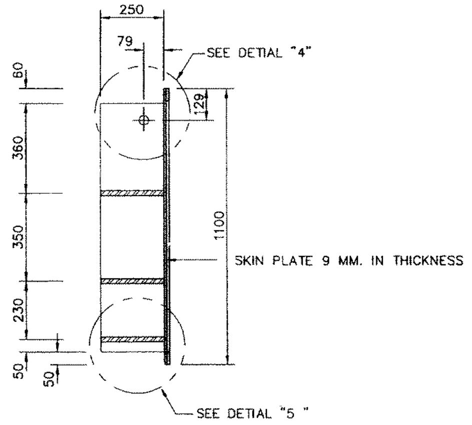
SECTION B–B

SCALE 1:5



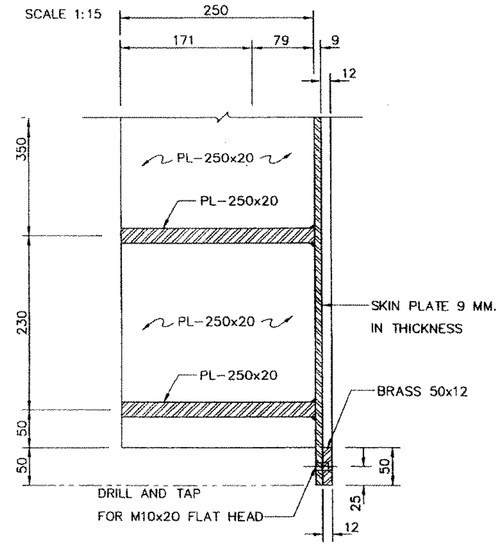
GATE LEAF

SCALE 1:15



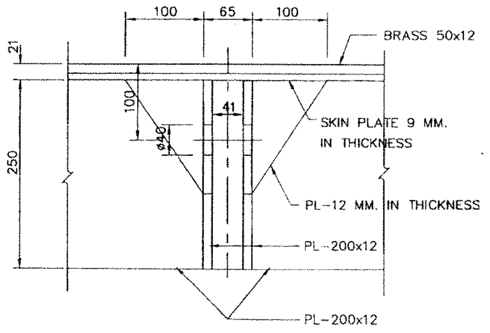
SECTION C–C

SCALE 1:15



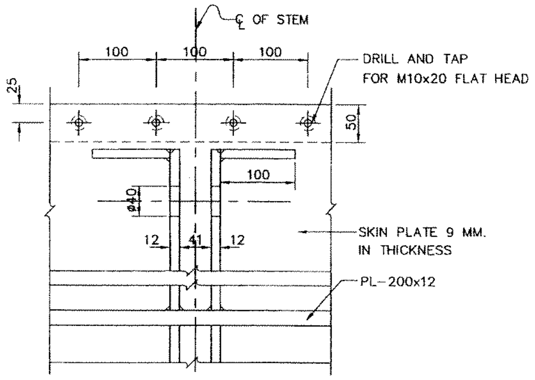
DETAIL "5"

SCALE 1:5



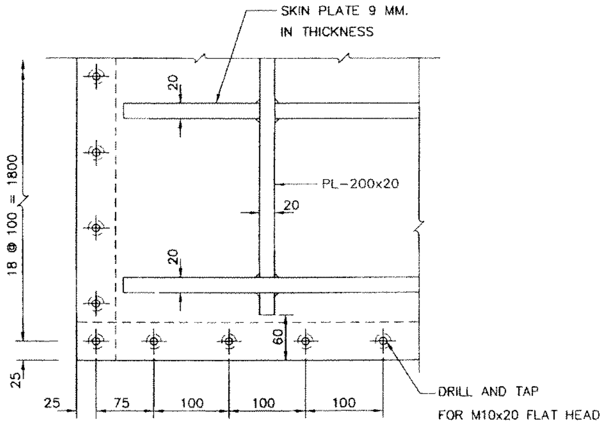
DETAIL "1"

SCALE 1:5



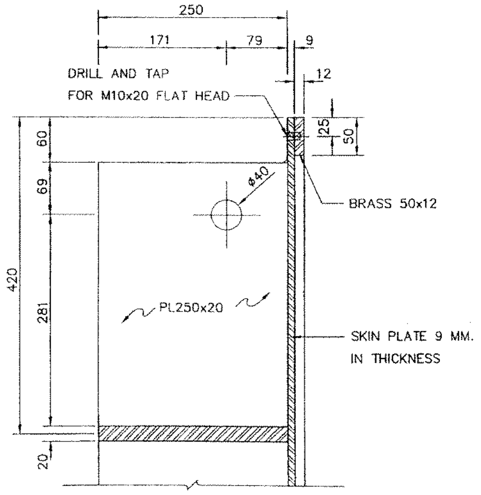
DETAIL "2"

SCALE 1:5



DETAIL "3"

SCALE 1:5



DETAIL "4"

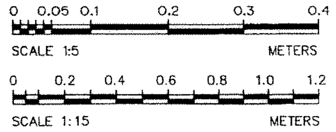
SCALE 1:5

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN.
2. ALL WELDING WILL BE 6 MILLIMETERS, USLESS OTHERWISE SHOWN.
3. ALL BOLTS AND NUTS USE ASTM A325
4. ALL STRUCTURAL STEELS ARE JIS G 3101 SS400
5. ALL STAINLESS STEEL PLATES ARE JIS G 4304 SUS 304

REFERENCE DRAWINGS :

1.	WEIR, GENERAL LAYOUT	HPP–WE–01
2.	WEIR, GENERAL PLAN	HPP–WE–02
3.	WEIR, 1.00x1.00 M. SAND SLUICE GATE, GATE INSTALLATION	HPP–WE–13



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORK
WEIR
1.00x1.00 M. SAND SLUICE GATE, GATE DETAIL

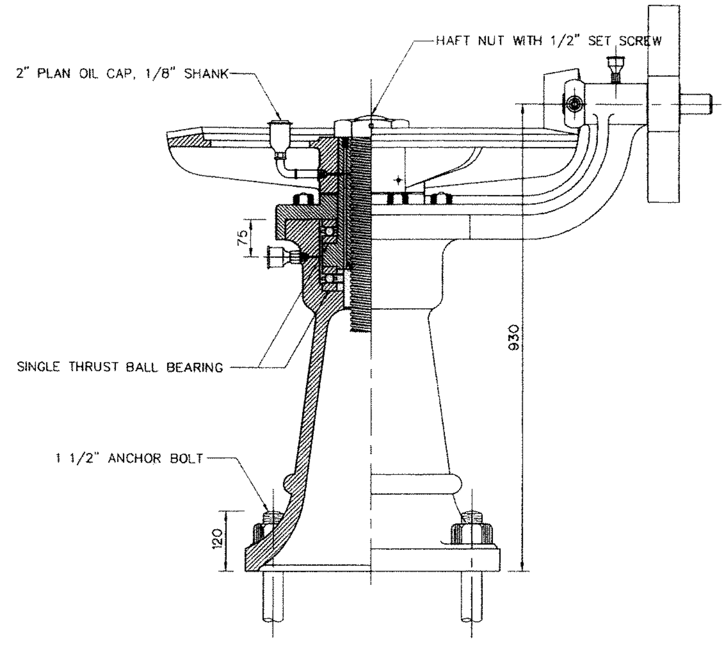
MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED สย.22514 สย.4661
DRAWN
CHECKED สย.4651
PROJECT MANAGER — DATE 9/12/51

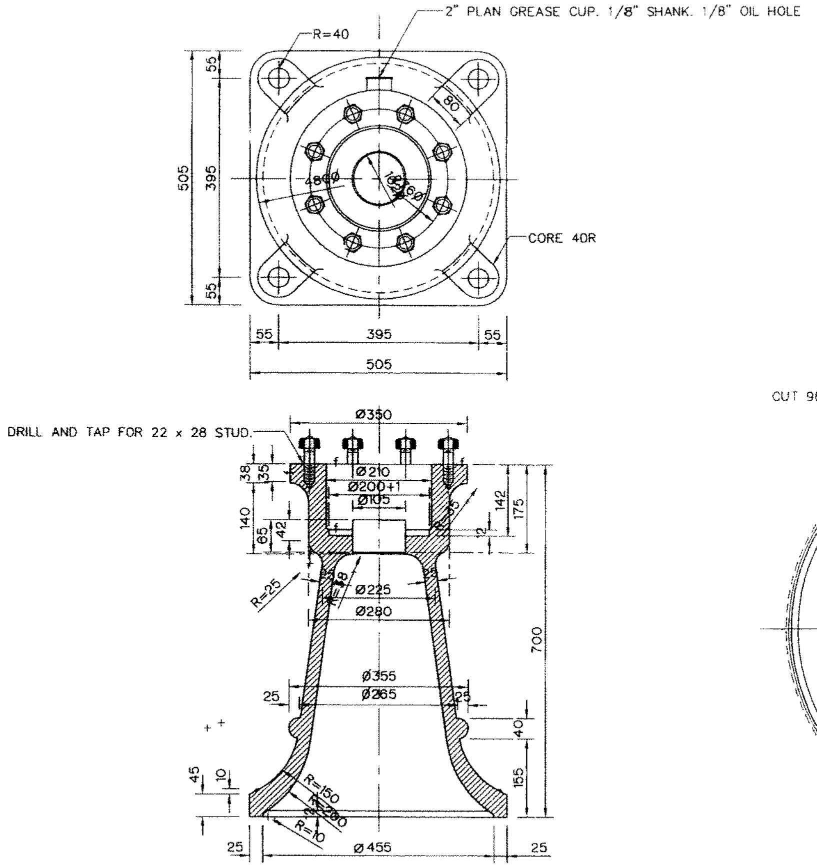
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–WE–14
SHEET NO. 37 OF 100

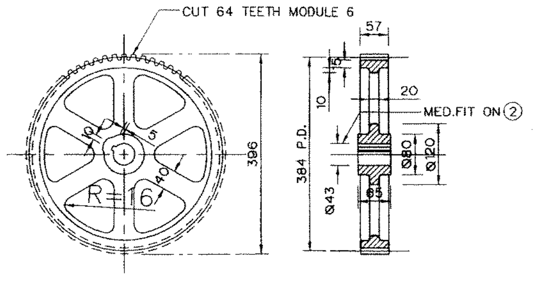
Q:2008-PRO\0783\DRAFT FINAL\WEIR\HPP-WE-14.DWG\TKK\19-11-2008


2" PLAN OIL CAP, 1/8" SHANK
HAFT NUT WITH 1/2" SET SCREW
SINGLE THRUST BALL BEARING
1 1/2" ANCHOR BOLT
75
930
120

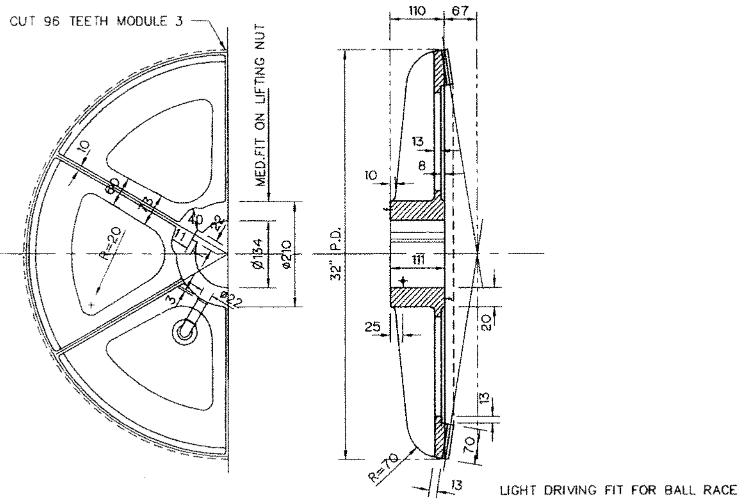
ASSEMBLY
SCALE 1:7.5



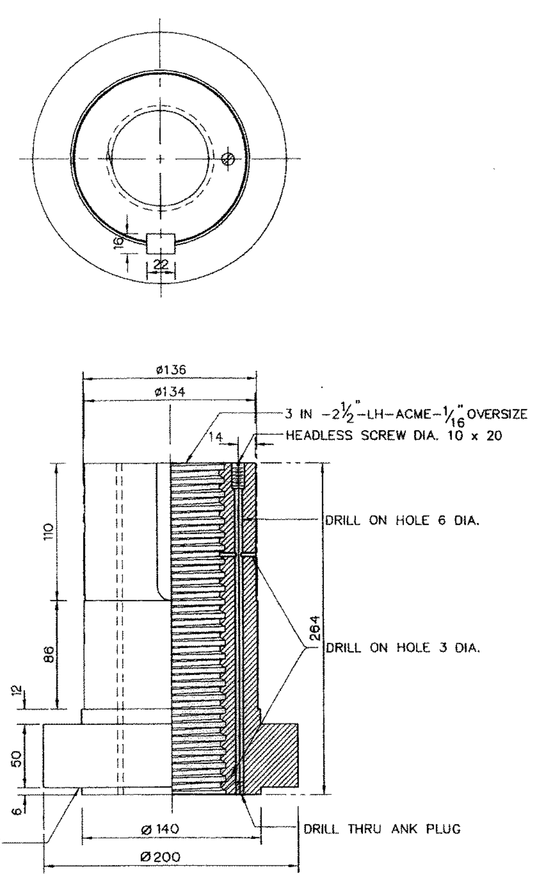
PEDESTAL
CAST IRON
SCALE 1:7.5



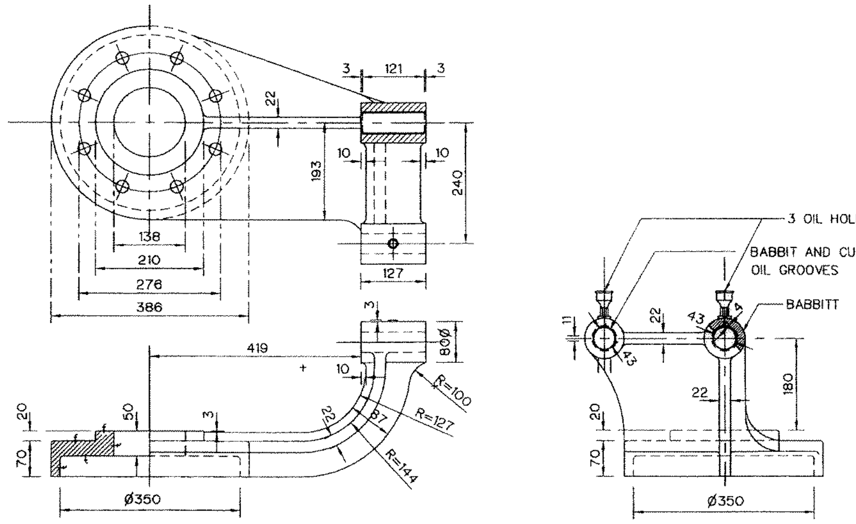
SPUR GEAR
SCALE 1 : 7.5



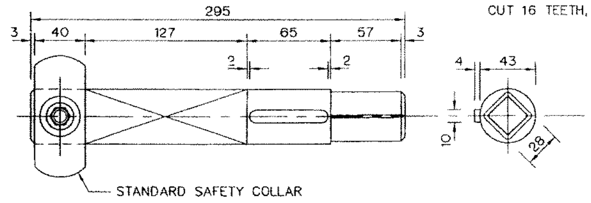
BEVEL GEAR
CAST IRON
SCALE 1:7.5



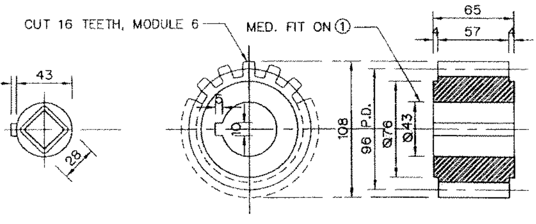
LIFTING NUT
PHOSPHOR BRONZE
SCALE 1:3



GAP AND BEARING
CAST IRON
SCALE 1:7.5



BEVEL PINION SHAFT
COLD ROLLED STEEL
SCALE 1:3



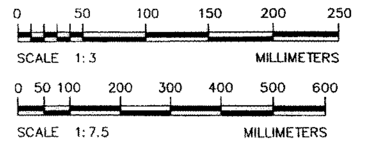
SPUR PINION
CAST IRON
SCALE 1:3

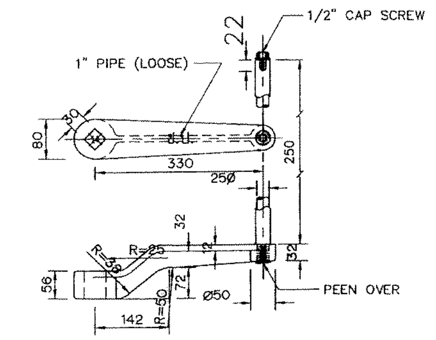
NOTE

1. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE SHOWN.

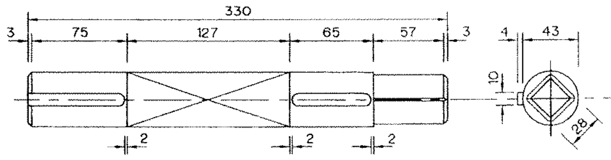
REFERENCE DRAWINGS :

1. WEIR, GENERAL LAYOUT	HPP-WE-01
2. WEIR, GENERAL PLAN	HPP-WE-02

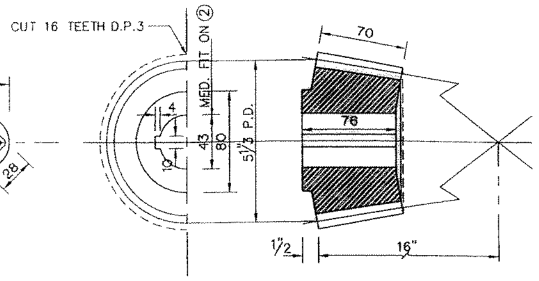




CRANK ARM
CAST IRON
SCALE 1 : 7.5



BEVEL GEAR SHAFT
COLD ROLLED STEEL
SCALE 1:3



BEVEL PINION
CAST IRON
SCALE 1:3

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

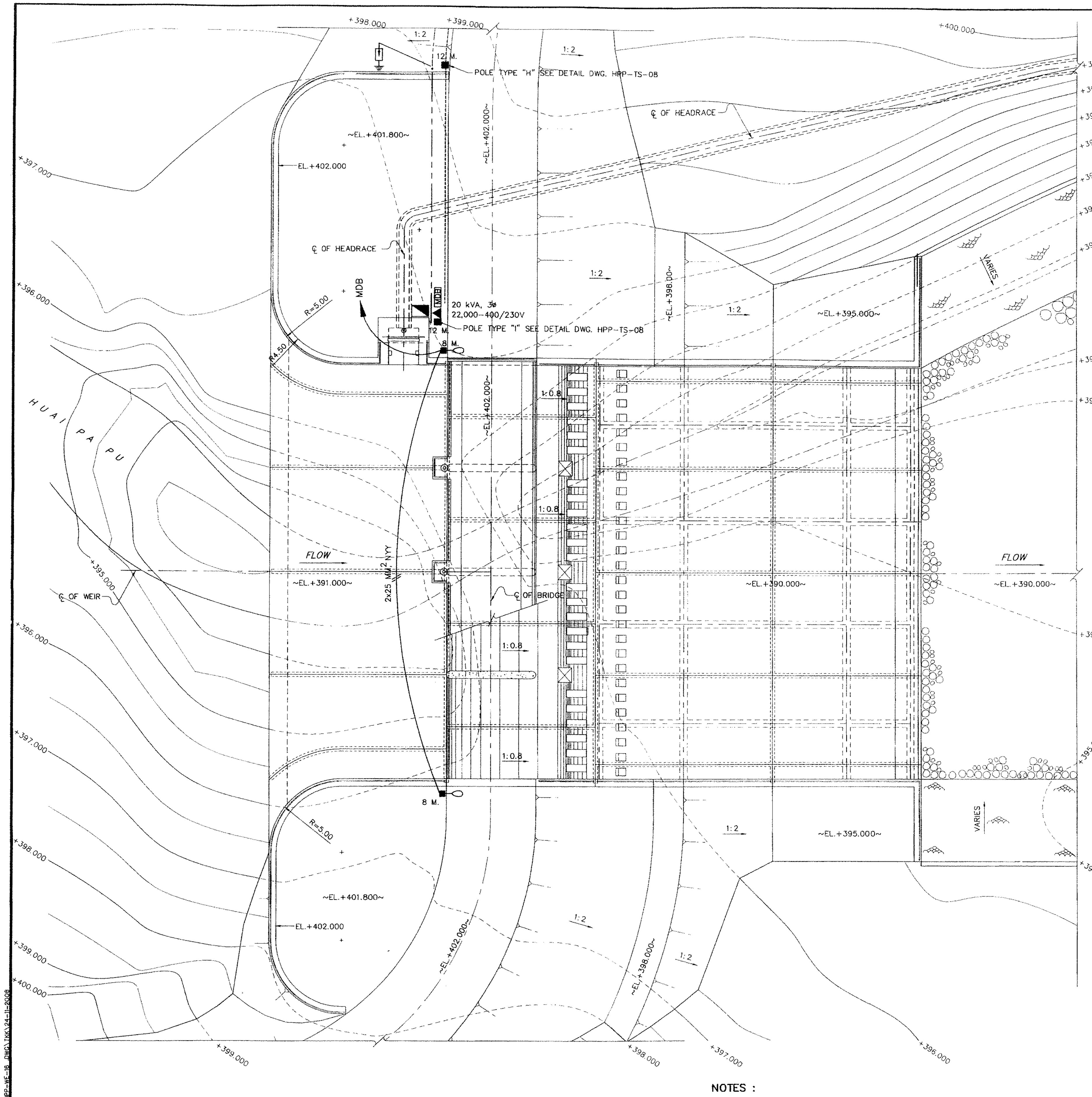
CIVIL WORK
WEIR
GATE LIFT, CAPACITY 6.5 TONS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภย.22514 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER 8/12/51 DATE

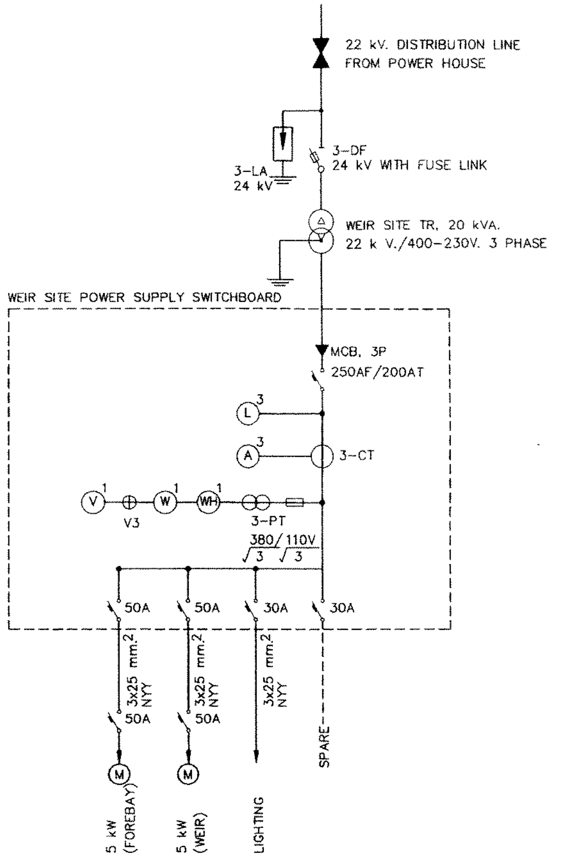
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED
DRAWING NO. HPP-WE-15
SHEET NO. 38 OF 100

J:\2008-PRO\0783\DRAFT FINAL\WEIR\HPP-WE-15.DWG\TKK\19-11-2008



ELECTRICAL AND LIGHTING PLAN

SCALE 1:150



SINGLE LINE DIAGRAM

LEGENDS :

■-○	STREET LIGHTING FIXTURE, 1x125 W MERCURY LAMP ON CONCRETE POLE
■	CONCRETE POLE , SUFFIX INDICATES HEIGHT OF POLE
▲	TRANSFORMER ON CONCRETE POLE
- - - - -	UNDERGROUND CABLE, NYY, 400/230 V.
◩	MOTOR CONTROL PANEL
— - —	UNDERGROUND CABLE, XLPE 22 kV.

NOTES AT WEIR SITE :

- : POWER CABLE FROM WEIR SITE TRANSFORMER TO WEIR SITE POWER SUPPLY SWITCHBOARD, 24 kV. LIGHTNING ARRESTOR, WEIR TRANSFORMER AND 24 kV. DROP OUT FUSE MUST BE SUPPLIED AND INSTALLED BY CIVIL CONTRACTOR C1
- : CONNECTION AND WIRING BETWEEN GATE MOTORS AND WEIR SITE POWER SUPPLY SWITCHBOARD SHALL BE DONE BY CIVIL CONTRACTOR C1 (GATE MOTORS SHALL BE SUPPLIED BY CIVIL CONTRACTOR C1)

NOTES :

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

REFERENCE DRAWING :

1. TRANSMISSION LINE, POLE TYPE "G", "H" AND "I" HPP-TS-08

0 1 2 3 4 5 6 9 12

SCALE 1:150 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

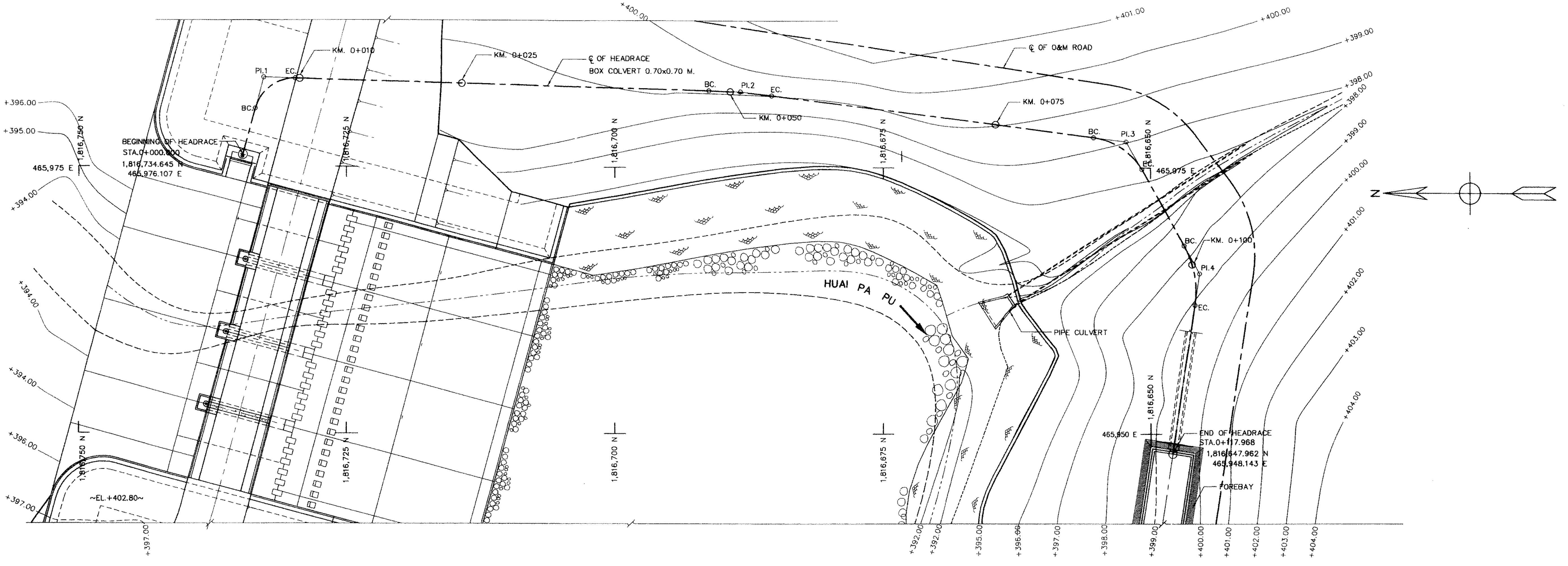
CIVIL WORKS
WEIR
ELECTRICAL AND LIGHTING PLAN

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED วฟก.741
DRAWN
CHECKED วฟก.741
PROJECT MANAGER DATE 8/12/51

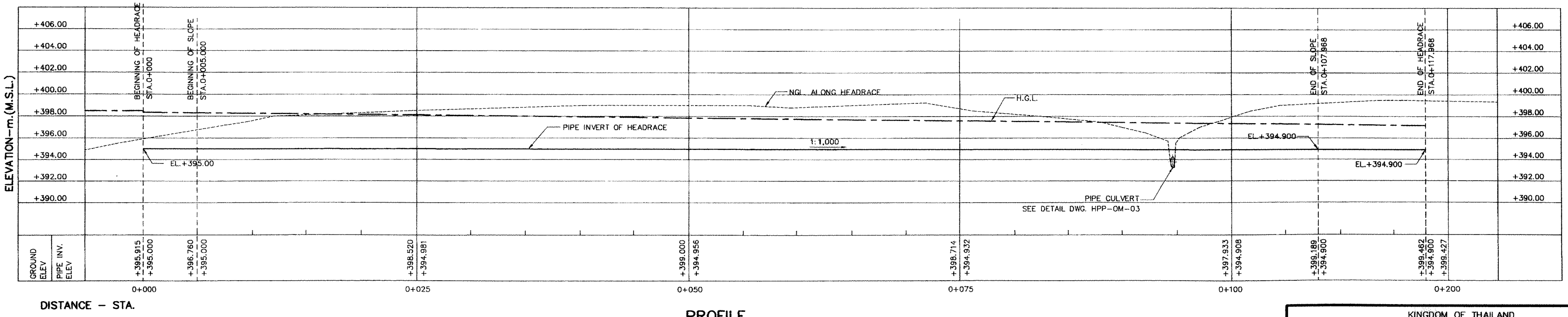
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-WE-16
SHEET NO. 39 OF 100



PLAN

SCALE 1:200



PROFILE

HORIZONTAL SCALE 1:200
VERTICAL SCALE 1:200

ALIGNMENT DATA CURVE

NO. OF CURVE	PI. Sta.	PI. TO PI. m.	COORDINATE OF PI. N	COORDINATE OF PI. E	ANGLE I	T m.	R m.	L m.	BC. Sta.	EC. Sta.	BEARING
BEGIN	0+000.000		1,816,734.645	465,976.107							
1	0+007.500	7.500	1,816,732.704	465,983.351	76°–30'–52"	3	3.805	5.081	0+004.500	0+009.581	S 74°–59'–59" E
2	0+050.974	44.390	1,816,688.330	465,982.178	5°–56'–25"	3	57.819	5.995	0+047.970	0+053.965	S 1°–30'–52" W
3	0+087.344	36.379	1,816,652.258	465,977.458	53°–34'–17"	3	5.943	5.556	0+084.344	0+089.900	S 7°–27'–18" W
4	0+101.083	14.182	1,816,645.388	465,965.051	37°–37'–50"	3	8.805	5.783	0+098.083	0+103.865	S 61°–01'–35" W
END	0+117.968	16.885	1,816,647.962	465,948.143							N 81°–20'–36" W

NOTES:

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP-GN-03
3. ALIGNMENT OF HEADRACE SHALL BE JUSTIFIED BY FIELD ENGINEER IN THE FIELD TO SUIT THE TOPOGRAPHY

REFERENCE DRAWING :

1. HEADRACE, TYPICAL SECTION, CONDUIT HORIZONTAL BEND AND JOINT HPP-HR-02

SCALE 1:200 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
HEADRACE
PLAN AND PROFILE, STA. 0+000.000 TO STA. 0+117.968

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED สย.46159 สย.4651
DRAWN
CHECKED สย.4651
8/12/51
PROJECT MANAGER DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-HR-01
SHEET NO. 40 OF 100

TABLE I

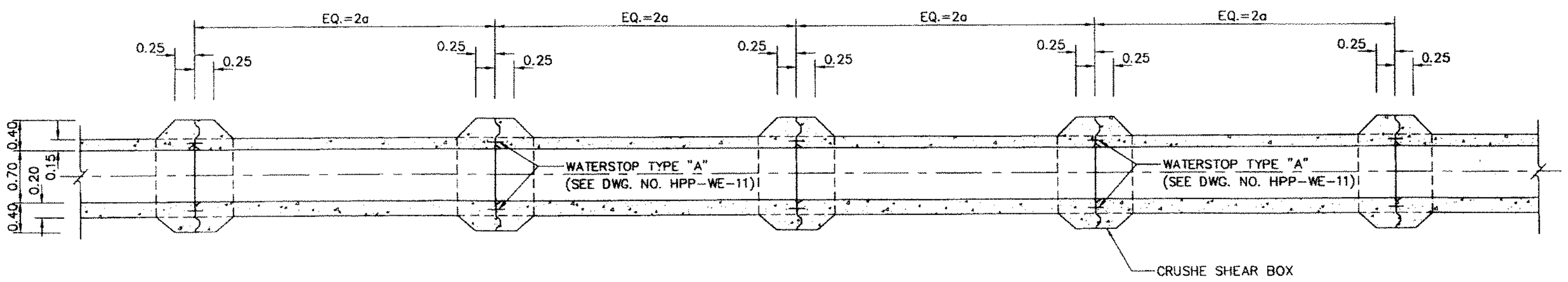
SLOPE OF EXCAVATION

TYPE OF GROUND	SLOPE VER. TO HOR.
EARTH	1:1
MODERATELY WEATHERED ROCK	1:0.5
FRESH ROCK	1:0.25

TABLE II

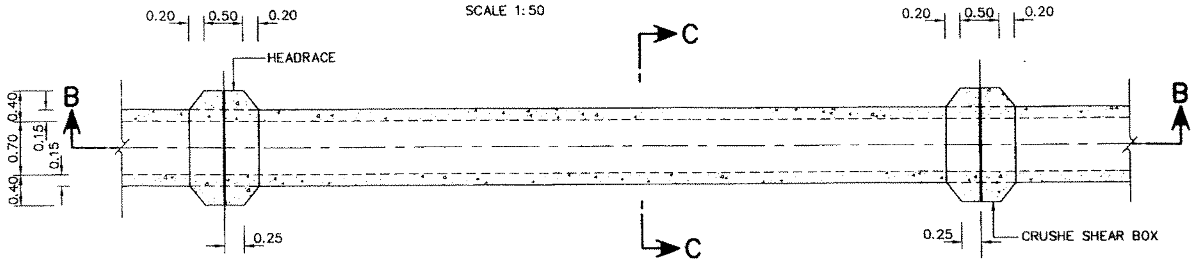
SLOPE OF EXCAVATION FOR INTAKE PIPE

TYPE OF GROUND	SLOPE VER. TO HOR.
EARTH	1:0.5
MODERATELY WEATHERED ROCK	1:0.5
FRESH ROCK	1:0.25



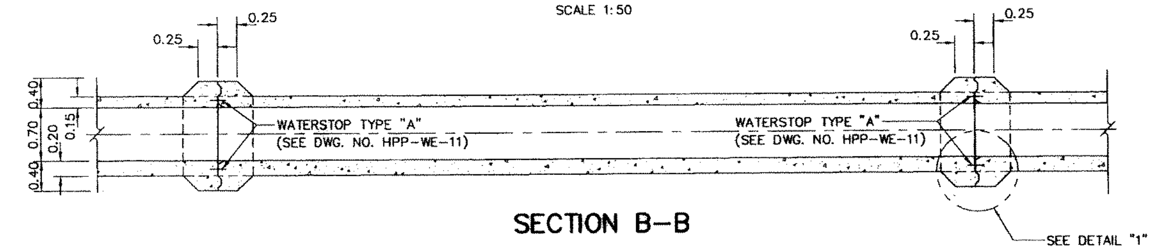
SECTION A–A

SCALE 1:50



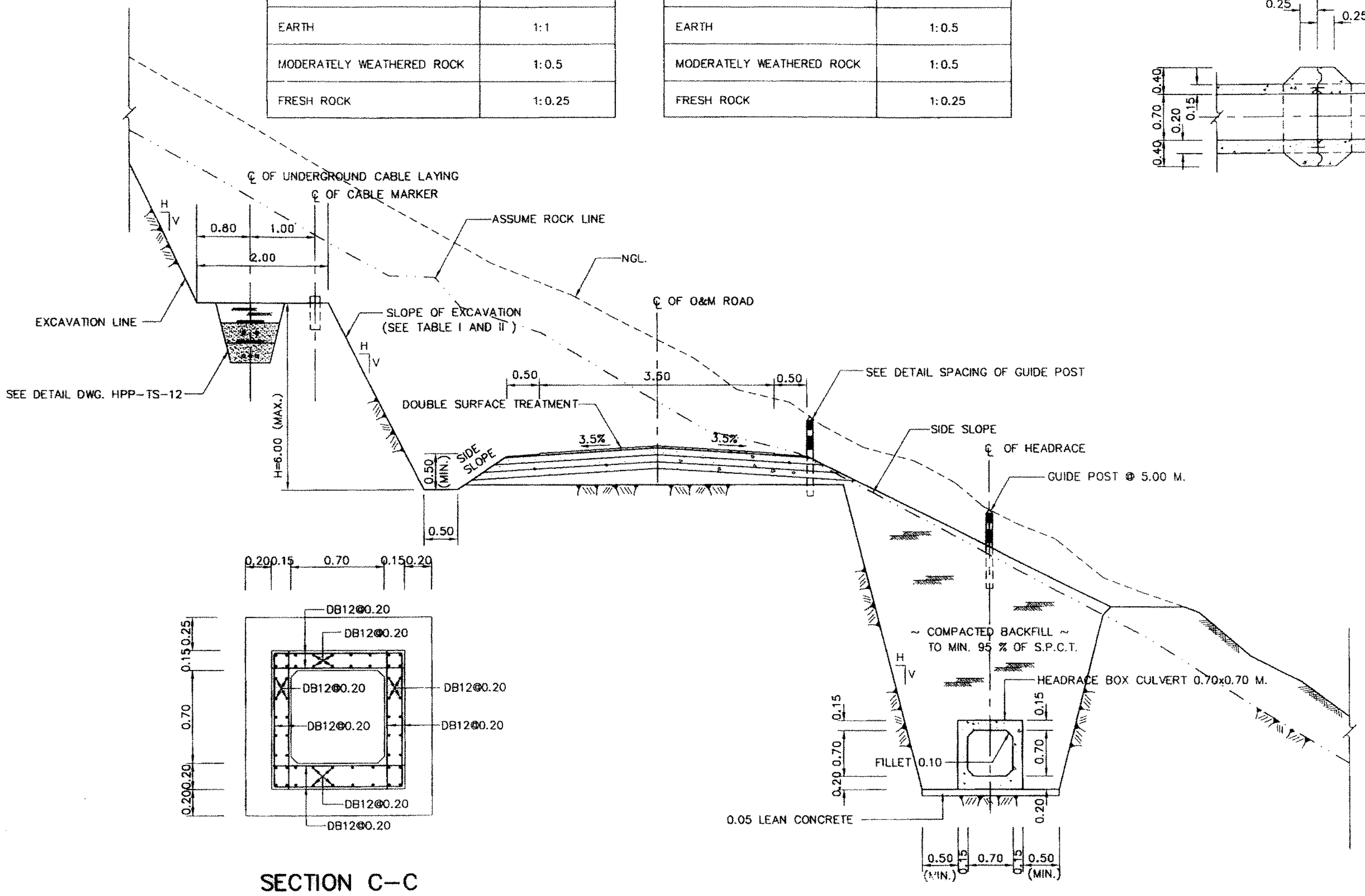
PLAN

SCALE 1:50



SECTION B–B

SCALE 1:50

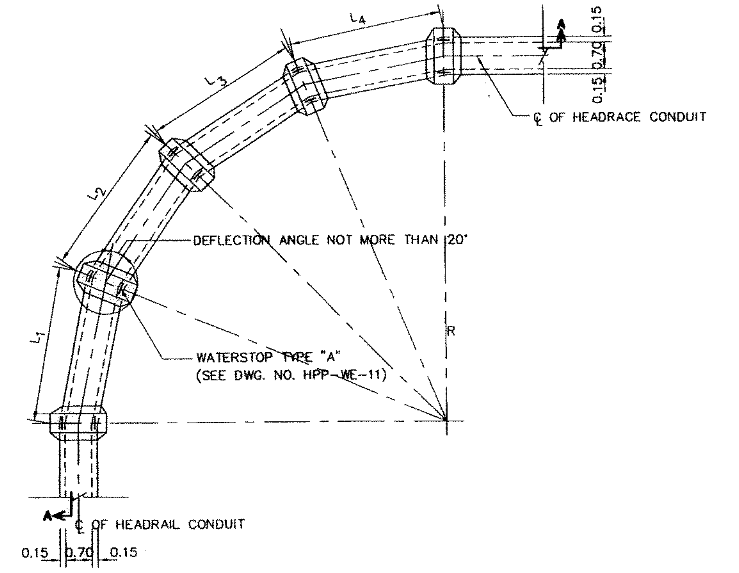


SECTION C–C

SCALE 1:25

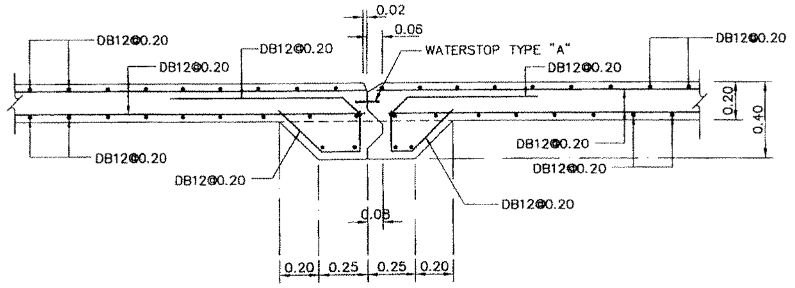
TYPICAL SECTIONS OF HEADRACE AND O&M ROAD

SCALE 1:50


L1
L2
L3
L4
℄ OF HEADRACE CONDUIT
DEFLECTION ANGLE NOT MORE THAN 20°
R
WATERSTOP TYPE "A" (SEE DWG. NO. HPP-WE-11)
A
℄ OF HEADRAIL CONDUIT
0.15
0.70

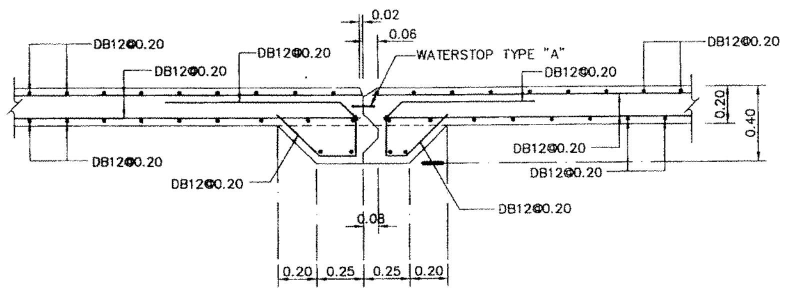
PLAN TYPICAL HORIZONTAL BENDS FOR HEADRACE

SCALE 1:100



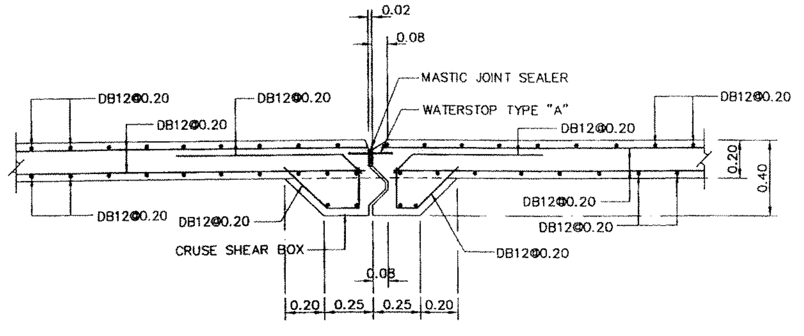
CONTRACTION JOINT

SCALE 1:20



DETAIL "1"

SCALE 1:20



EXPANSION JOINT @ 50 M.

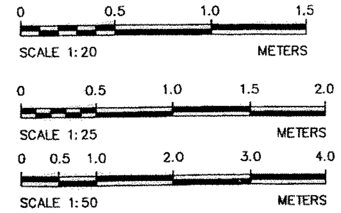
SCALE 1:20

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP-GN-03
3. GUIDE POSTS ARE REQUIRED AT EVERY BENDS AND BETWEEN BENDS WITH MAXIMUM 10.00 M. SPACING.
4. CORROSION PROTECTION OF STEEL PIPE SHALL STRICTLLY FOLOW THE CONTRACT SPECIFICATION

REFERENCE DRAWING :

1. HEADRACE, PLAN AND PROFILE, STA. 0+000.000 TO STA. 0+117.968 HPP–HR–01



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS DEDE

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

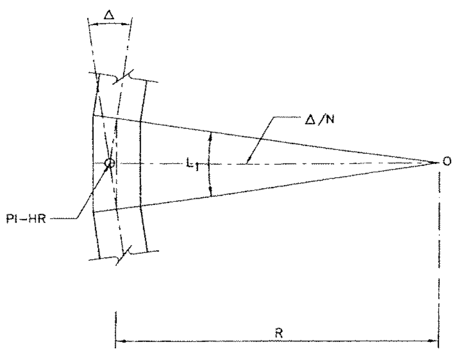
CIVIL WORKS
HEADRACE
TYPICAL SECTION, CONDUIT HORIZONTAL BEND AND JOINT

MAHA NAKORN CONSULTANTS CO.,LTD.

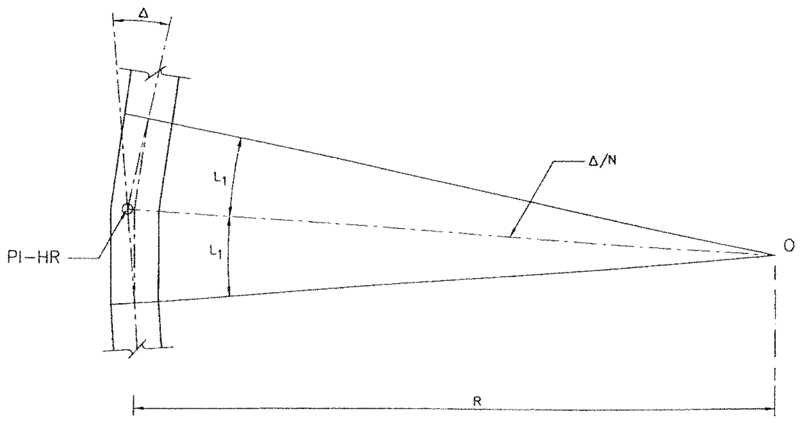
DESIGNED ภส.46159 สข.4651
DRAWN
CHECKED สข.4651
PROJECT MANAGER 8/12/51 DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

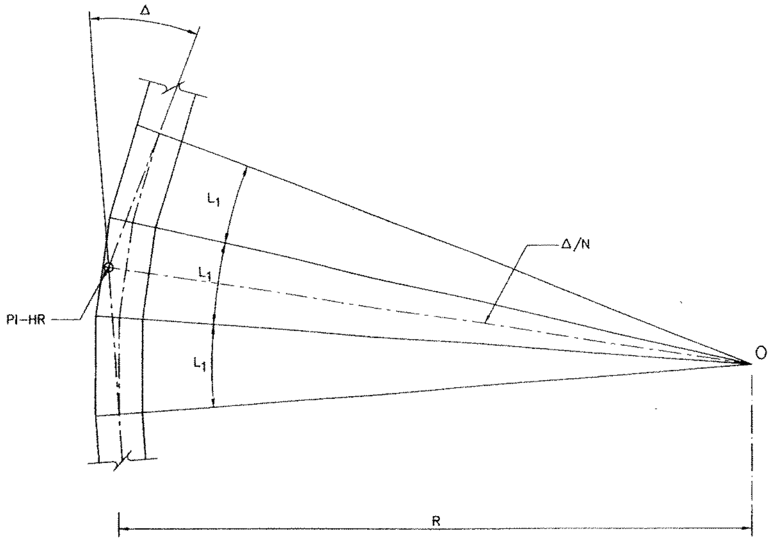
DRAWING NO. HPP–HR–02
SHEET NO. 41 OF 100



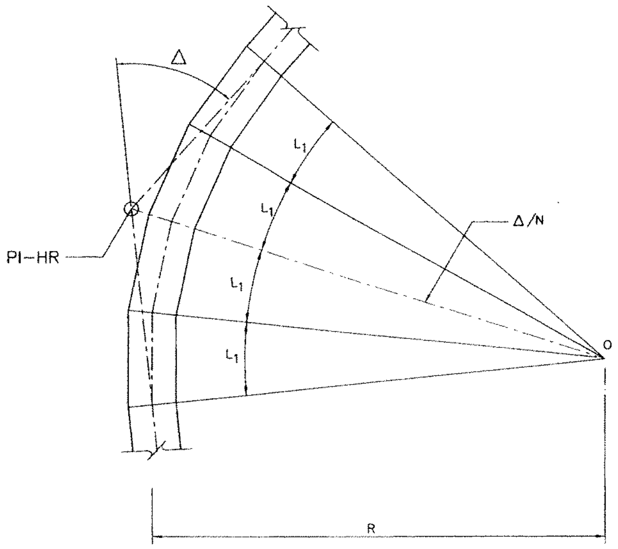
TYPICAL BEND TYPE 1



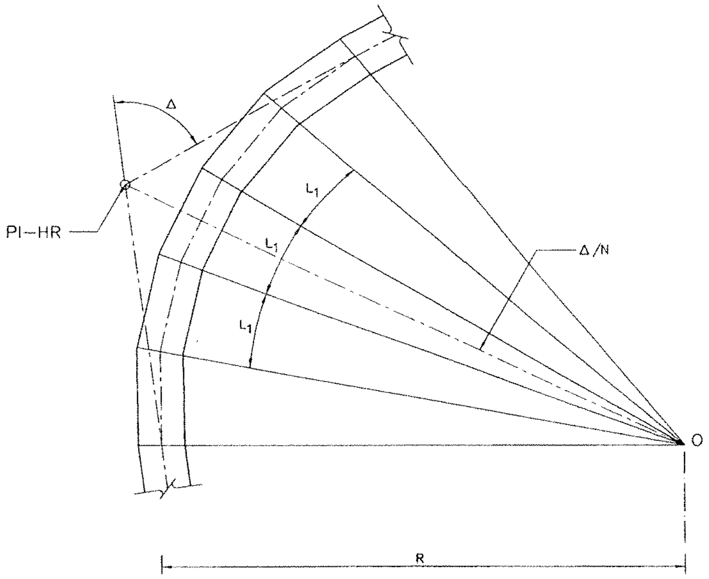
TYPICAL BEND TYPE 2



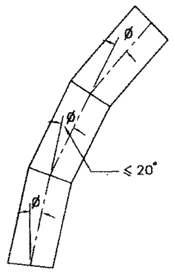
TYPICAL BEND TYPE 3



TYPICAL BEND TYPE 4



TYPICAL BEND TYPE 5



TYPICAL OF DEFLECTION ANGLE

HORIZONTAL CURVE

NO. OF CURVE	PI. Sta.	PI. TO PI. m.	COORDINATE OF PI.		ANGLE I	T m.	R m.	L m.	BC. Sta.	EC. Sta.	TYPE	BEARING
			N	E								
BEGIN	0+000.000	7.500	1,816,734.645	465,976.107								S 74°-59'-59" E
1	0+007.500	44.390	1,816,732.704	465,983.351	76°-30'-52"	3	3.805	5.081	0+004.500	0+009.581	5	S 1°-30'-52" W
2	0+050.974	36.379	1,816,688.330	465,982.178	5°-56'-25"	3	57.819	5.995	0+047.970	0+053.965	1	S 7°-27'-18" W
3	0+087.344	14.182	1,816,652.258	465,977.458	53°-34'-17"	3	5.943	5.556	0+084.344	0+089.900	4	S 61°-01'-35" W
4	0+101.083	16.885	1,816,645.388	465,965.051	37°-37'-50"	3	8.805	5.783	0+098.083	0+103.865	3	N 81°-20'-36" W
END	0+117.968		1,816,647.962	465,948.143								

NOTES :

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
HEADRACE
POINT AND BEND DATA

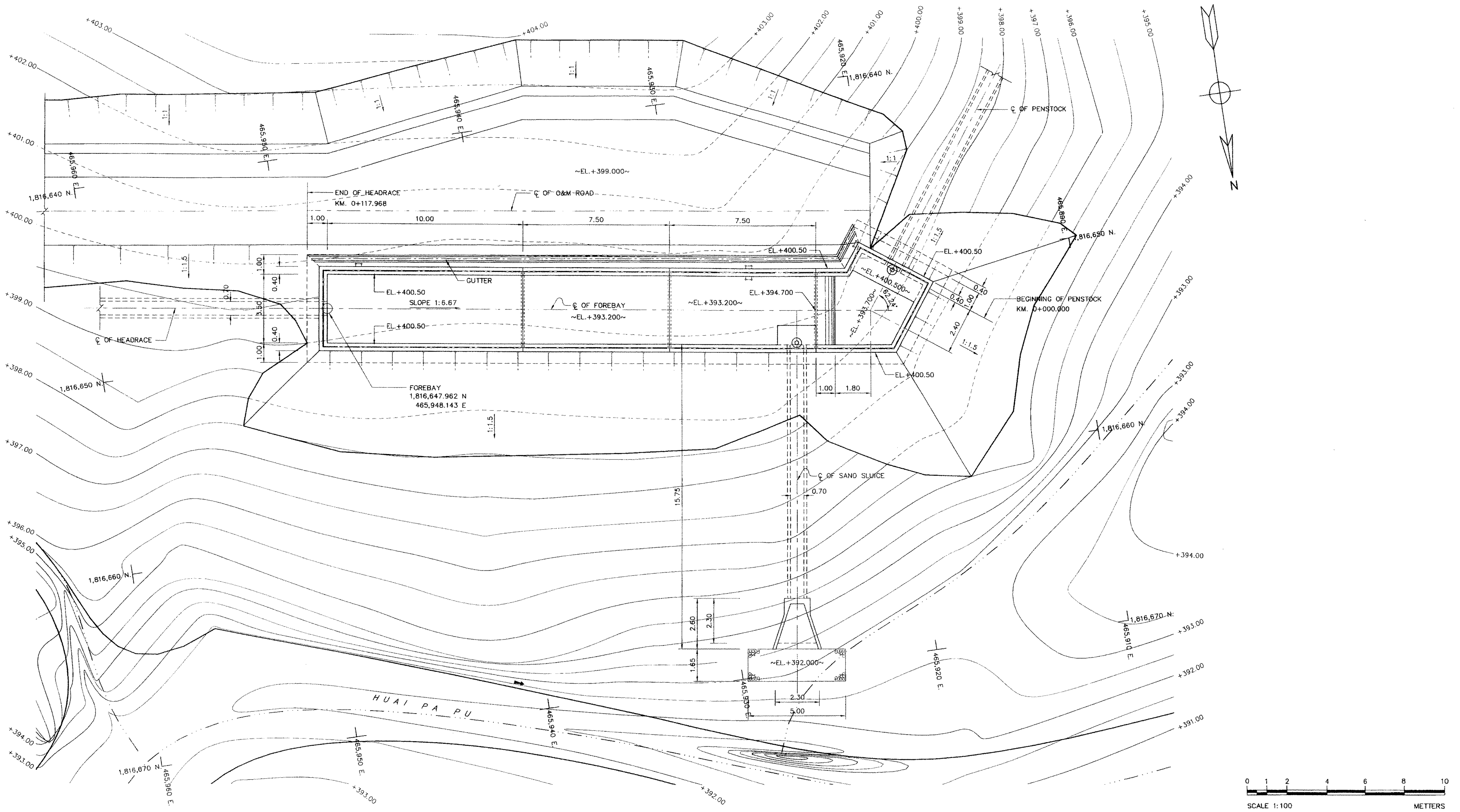
MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED
DRAWN
CHECKED
PROJECT MANAGER
8/12/51
DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO.
HPP-HR-03

SHEET NO.
42 OF 100

Z:\[illegible]\HPP-HR-03.dwg



GENERAL LAYOUT

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. HPP-GN-03

REFERENCE DRAWINGS :

1. FOREBAY, PLAN AND SECTIONS A-A, B-B	HPP-FB-02
2. FOREBAY, SECTIONS C-C, D-D, E-E, F-F, G-G	HPP-FB-03

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

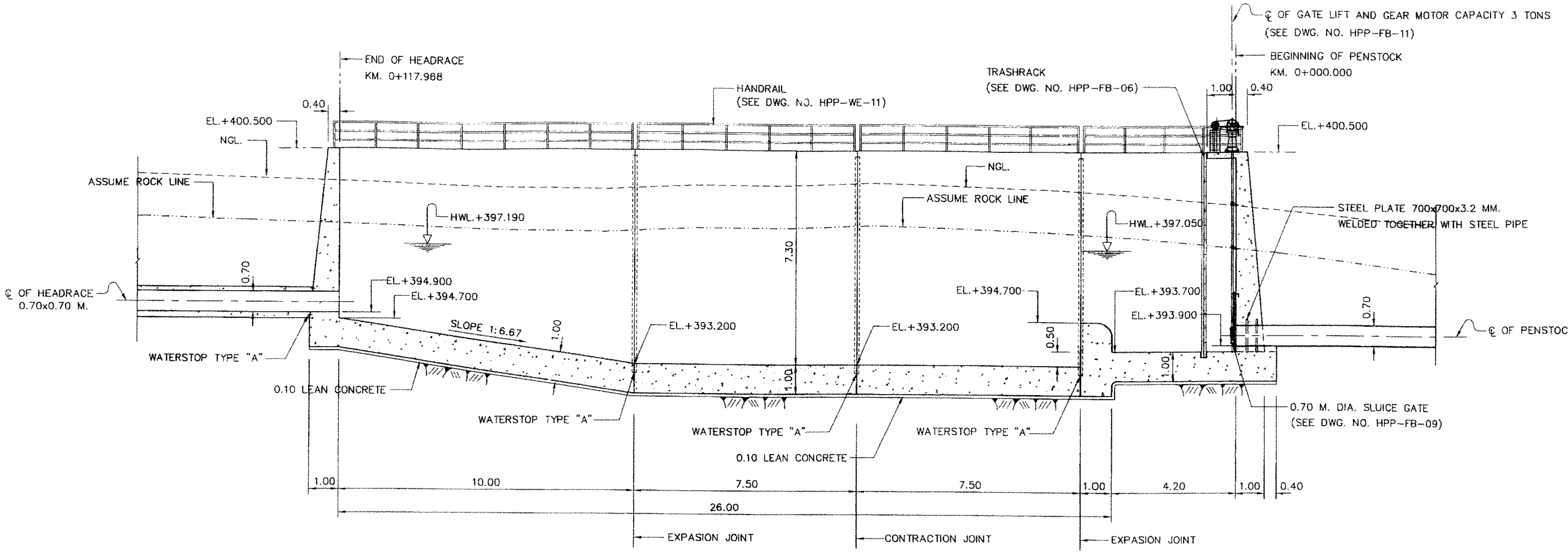
HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
FOREBAY
GENERAL LAYOUT

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED
DRAWN
CHECKED
PROJECT MANAGER
DATE 8/12/51

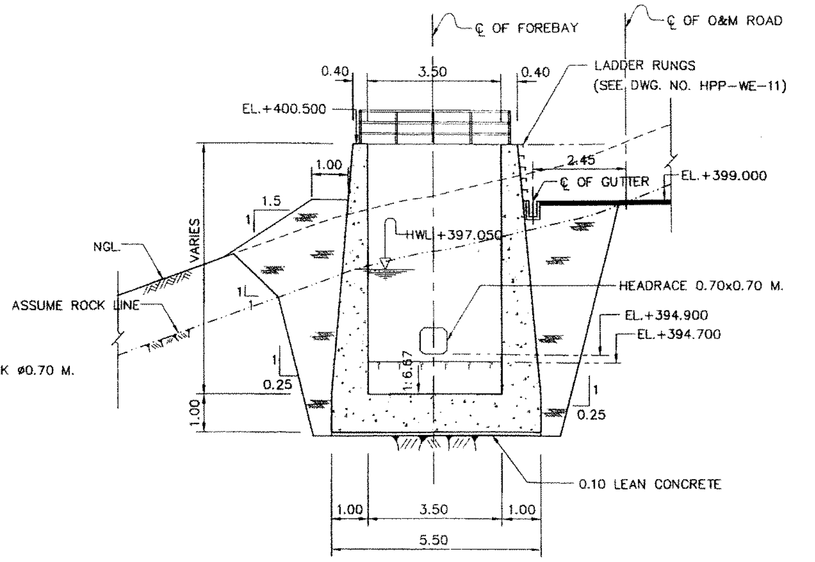
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-FB-01
SHEET NO. 43 OF 100



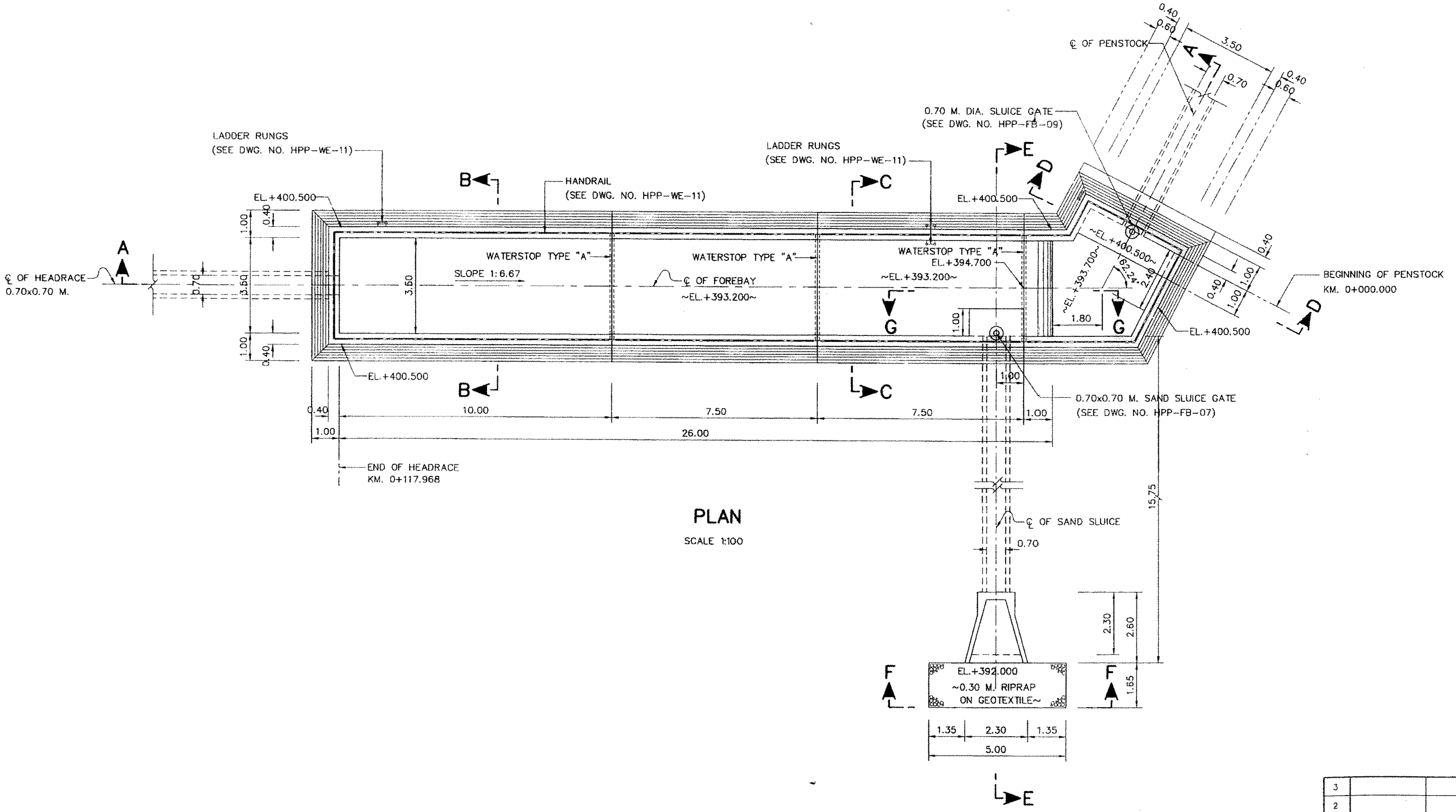
SECTION A-A

SCALE 1:100



SECTION B-B

SCALE 1:100



PLAN

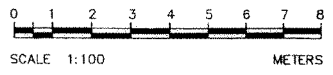
SCALE 1:100

NOTES :

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

REFERENCE DRAWINGS :

1. WEIR, MISCELLANEOUS DETAIL 1	HPP-WE-11
2. FOREBAY, GENERAL LAY-OUT	HPP-FB-01
3. FOREBAY, SECTIONS C-C, D-D, E-E, F-F, G-G	HPP-FB-03
4. FOREBAY, DETAILS OF TRASHRACK AND JOINT	HPP-FB-06
5. FOREBAY, 0.70x0.70 M. SAND SLUICE GATE, GATE INSTALLATION	HPP-FB-07
6. FOREBAY, 0.70 M. DIA. SLUICE GATE, GATE INSTALLATION	HPP-FB-09
7. FOREBAY, GATE LIFT, CAPACITY 3.0 TONS	HPP-FB-11



KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
FOREBAY
PLAN AND SECTIONS A-A, B-B

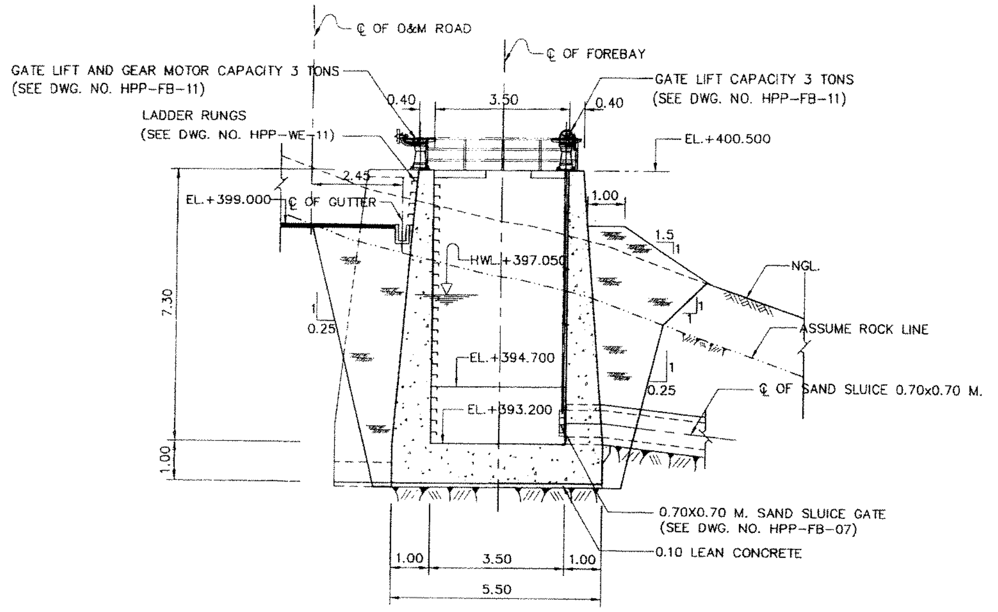
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED สย.46159 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER 8/12/51 DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

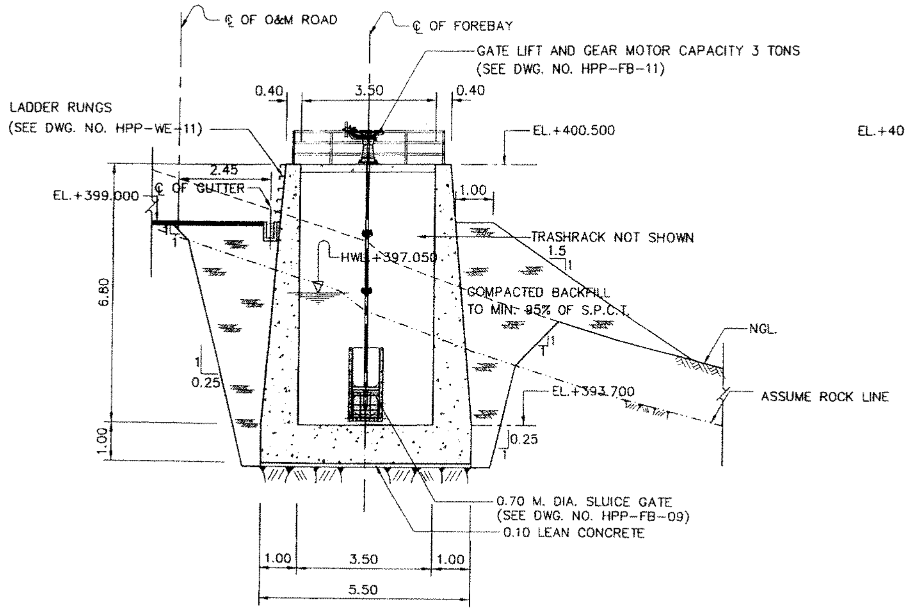
DRAWING NO. HPP-FB-02
SHEET NO. 44 OF 100

D:\0783\HPP-FB-02.DWG\13-NOV-2008



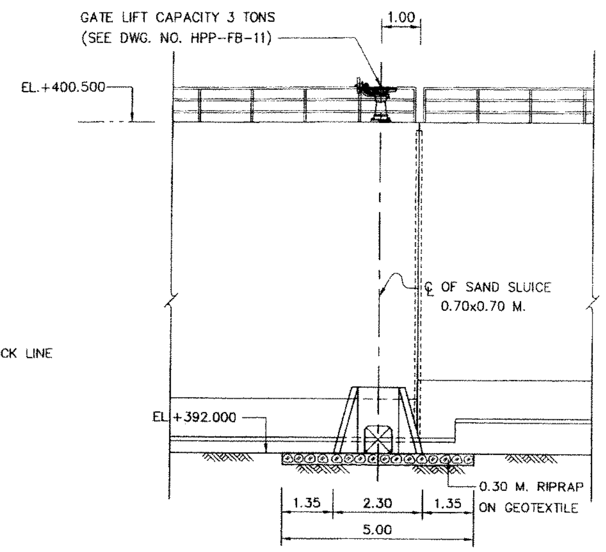
SECTION C-C

SCALE 1:100



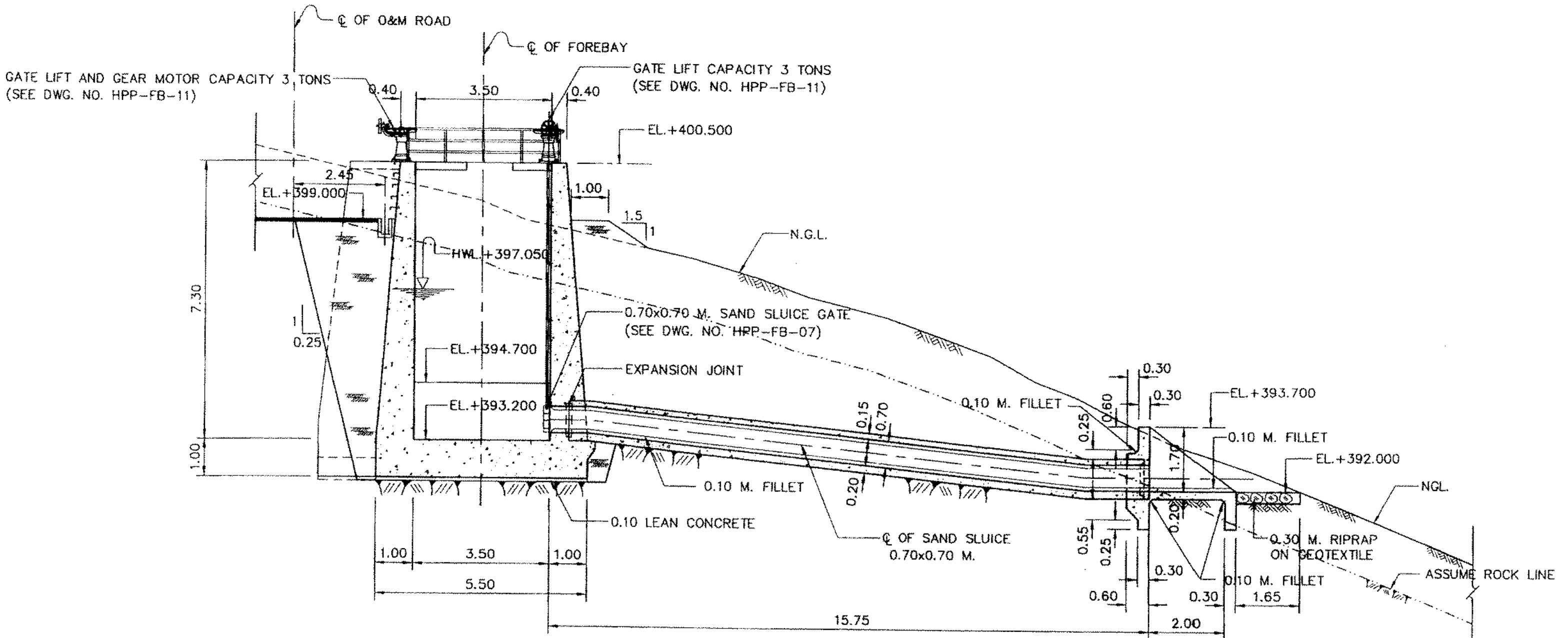
SECTION D-D

SCALE 1:100



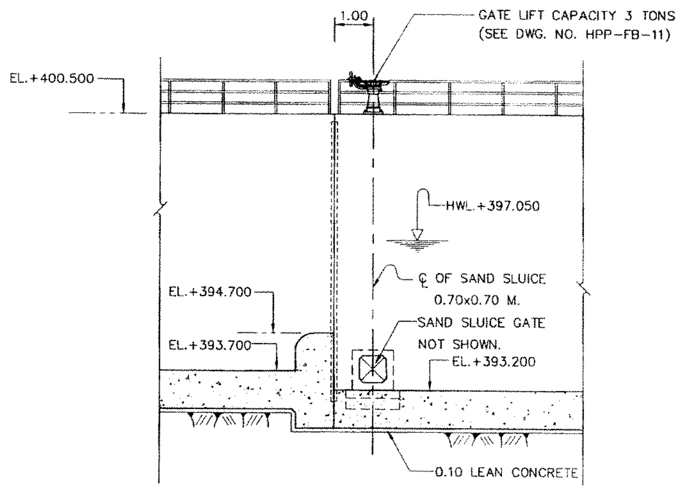
SECTION F-F

SCALE 1:100



SECTION E-E

SCALE 1:100



SECTION G-G

SCALE 1:100

0 1 2 3 4 5 6 7 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. HPP-GN-03

REFERENCE DRAWINGS :

1. WEIR, MISCELLANEOUS DETAIL 1	HPP-WE-11
2. FOREBAY, GENERAL LAY-OUT	HPP-FB-01
3. FOREBAY, PLAN AND SECTIONS A-A, B-B	HPP-FB-02
4. FOREBAY, DETAILS OF TRASHRACK AND JOINT	HPP-FB-06
5. FOREBAY, 0.70x0.70 M. SAND SLUICE GATE, GATE INSTALLATION	HPP-FB-07
6. FOREBAY, 0.70 M. DIA. SLUICE GATE, GATE INSTALLATION	HPP-FB-09
7. FOREBAY, GATE LIFT, CAPACITY 3.0 TONS	HPP-FB-11

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
FOREBAY
SECTIONS C-C, D-D, E-E, F-F, G-G

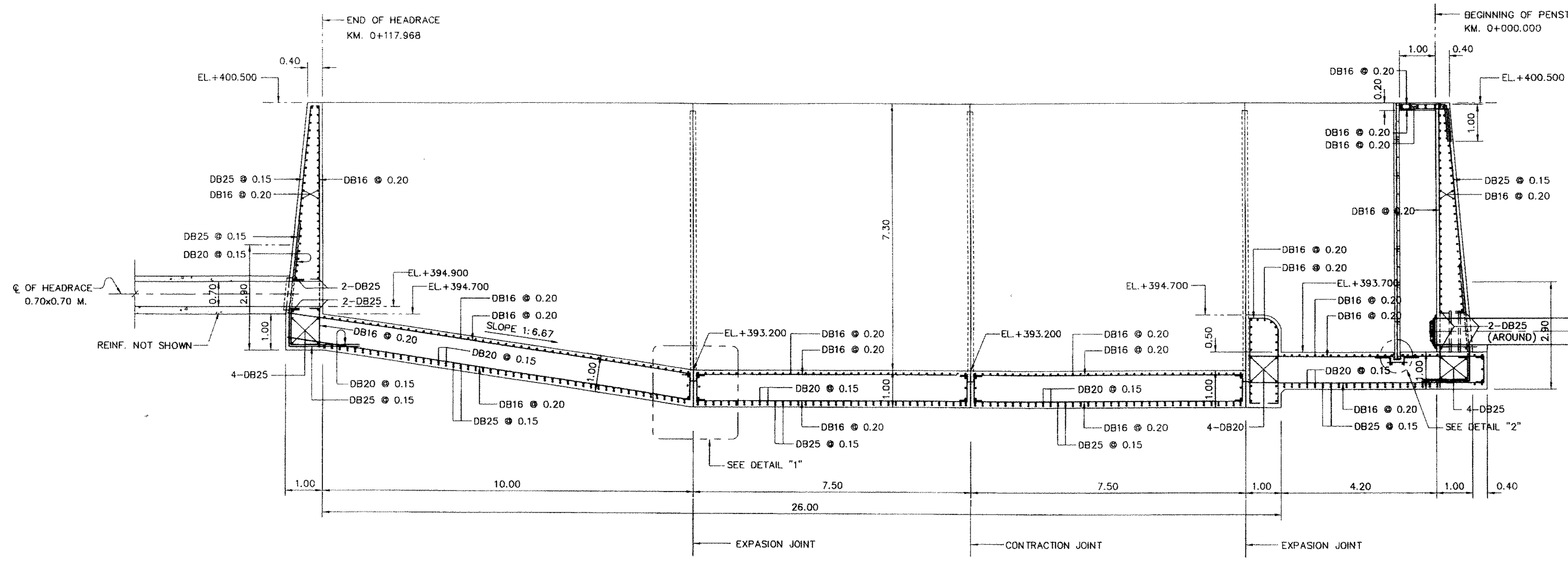
MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED กย.46159 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

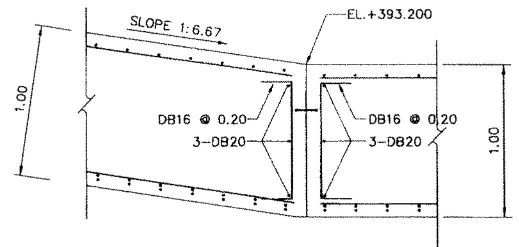
DRAWING NO. HPP-FB-03
SHEET NO. 45 OF 100

D:\0783\HPP-FB-03-REV02.DWG\13-NOV-2008/SMP.



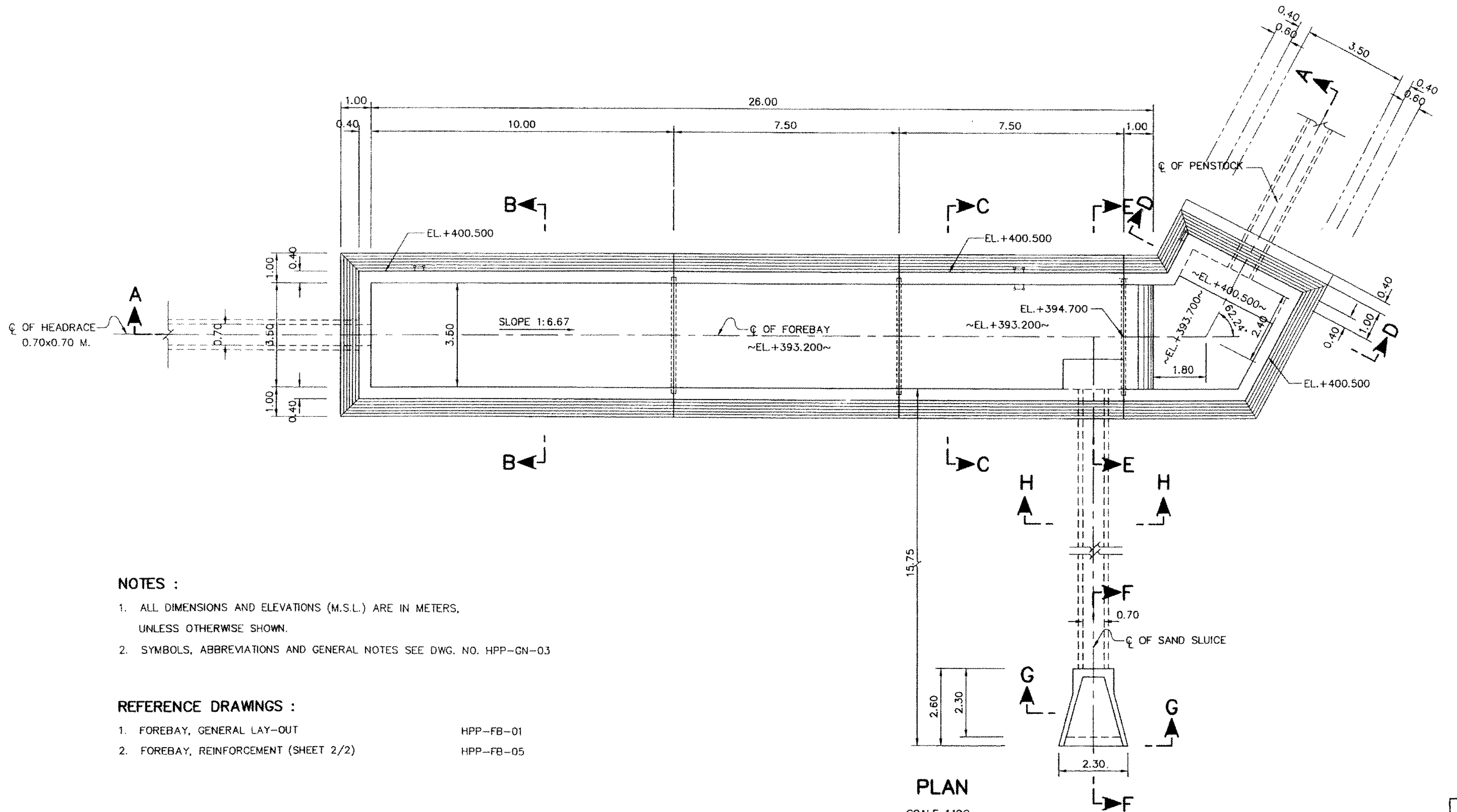
SECTION A–A

SCALE 1:75



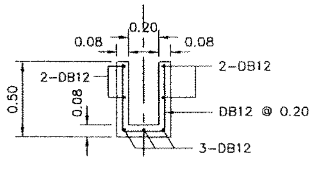
DETAIL "1"

SCALE 1:25



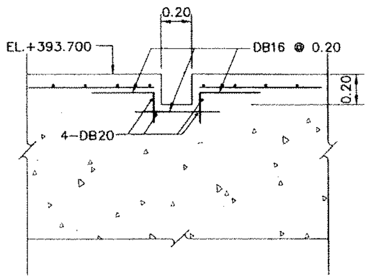
PLAN

SCALE 1:100



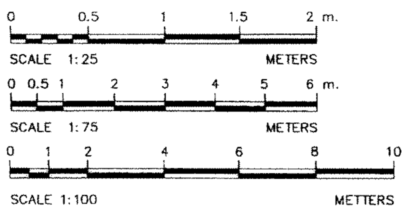
GUTTER

SCALE 1:25



DETAIL "2"

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. HPP-GN-03

REFERENCE DRAWINGS :

1. FOREBAY, GENERAL LAY-OUT	HPP-FB-01
2. FOREBAY, REINFORCEMENT (SHEET 2/2)	HPP-FB-05

D:2008-PROJ.0783\DRAFT FINAL\FOREBAY\HPP-FB-04.DWG\13-11-2008

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

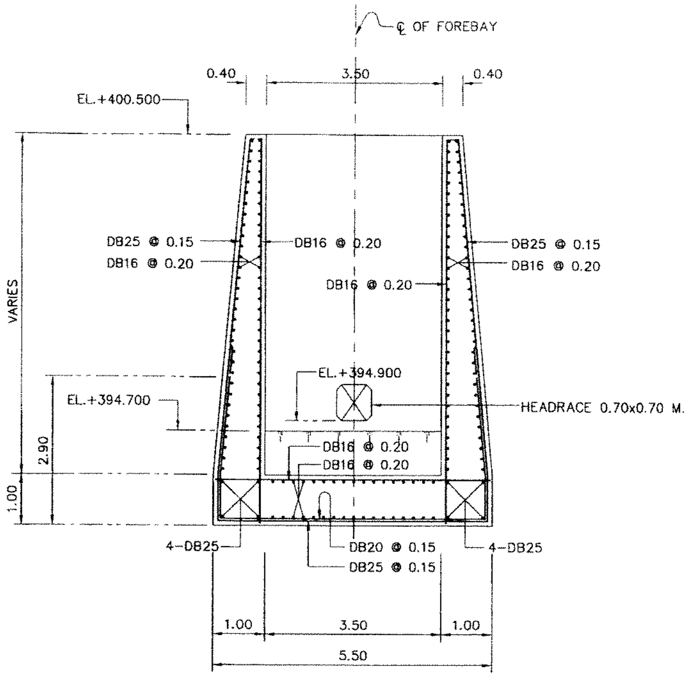
HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
FOREBAY
REINFORCEMENT (SHEET 1/2)

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED
DRAWN
CHECKED
PROJECT MANAGER
DATE 8/12/51

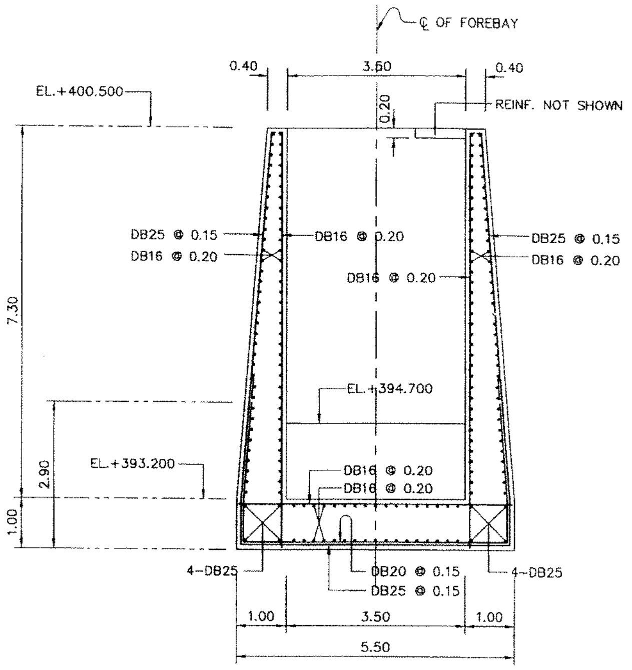
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–FB–04
SHEET NO. 46 OF 100



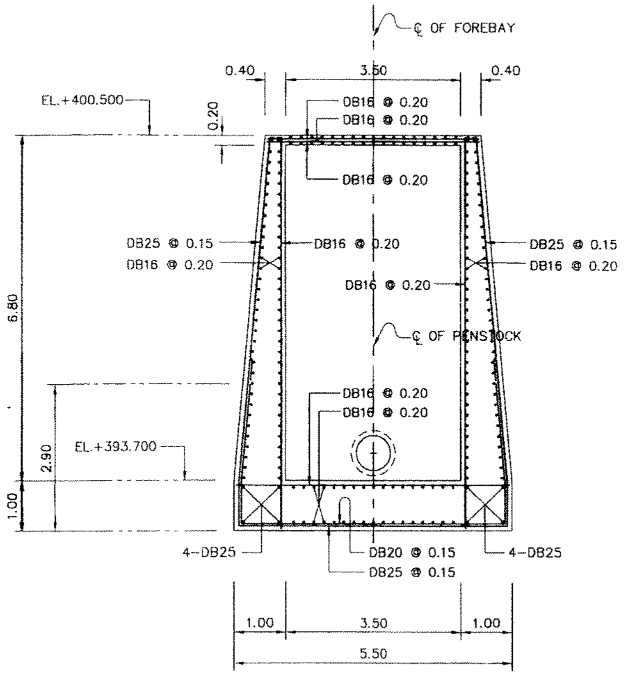
SECTION B–B

SCALE 1:75



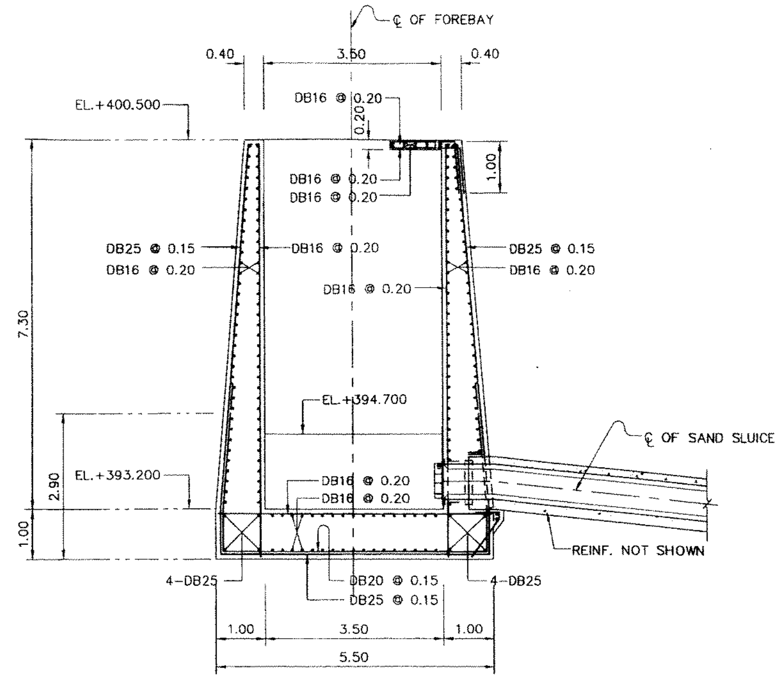
SECTION C–C

SCALE 1:75



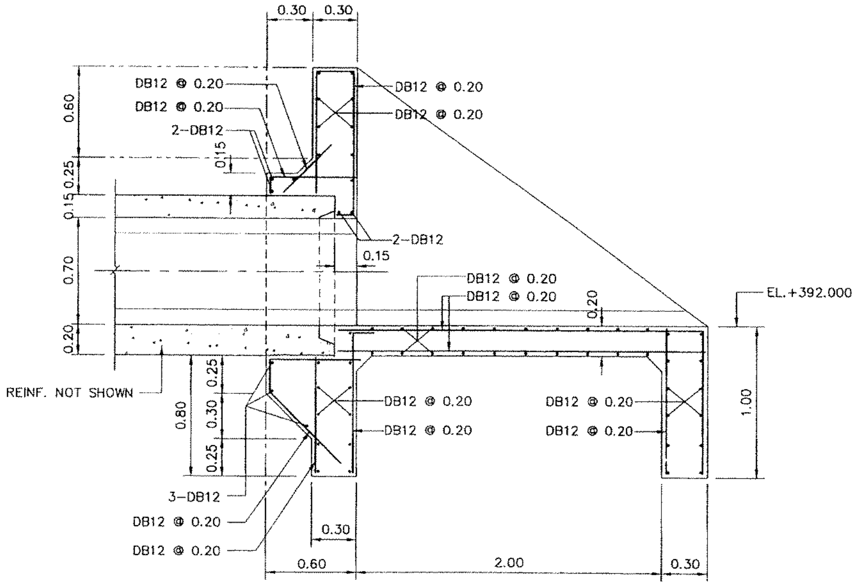
SECTION D–D

SCALE 1:75



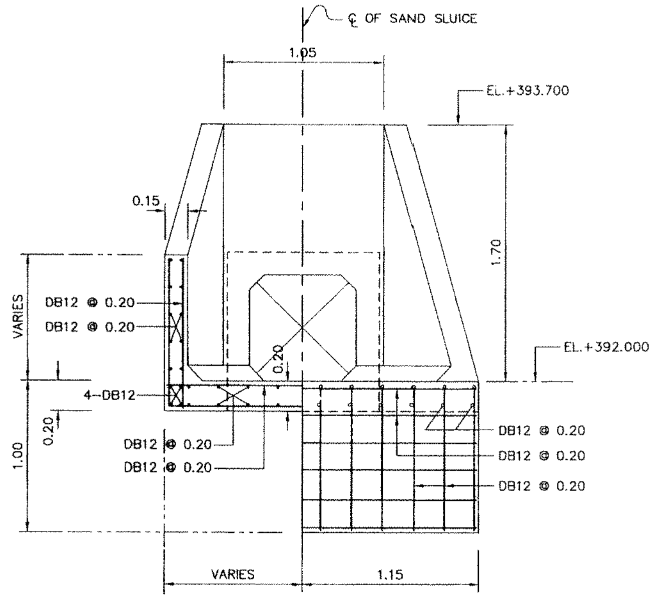
SECTION E–E

SCALE 1:75



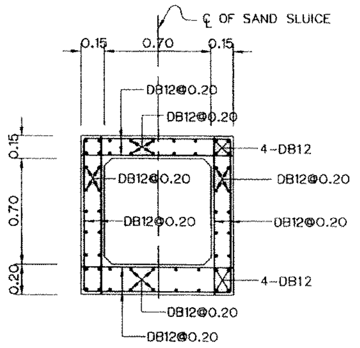
SECTION F–F

SCALE 1:25



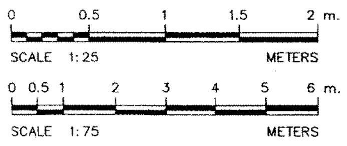
SECTION G–G

SCALE 1:25



SECTION H–H

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. HPP-GN-03

REFERENCE DRAWINGS :

1. FOREBAY, GENERAL LAY-OUT	HPP-FB-01
2. FOREBAY, REINFORCEMENT (SHEET 1/2)	HPP-FB-04

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
FOREBAY
REINFORCEMENT (SHEET 2/2)

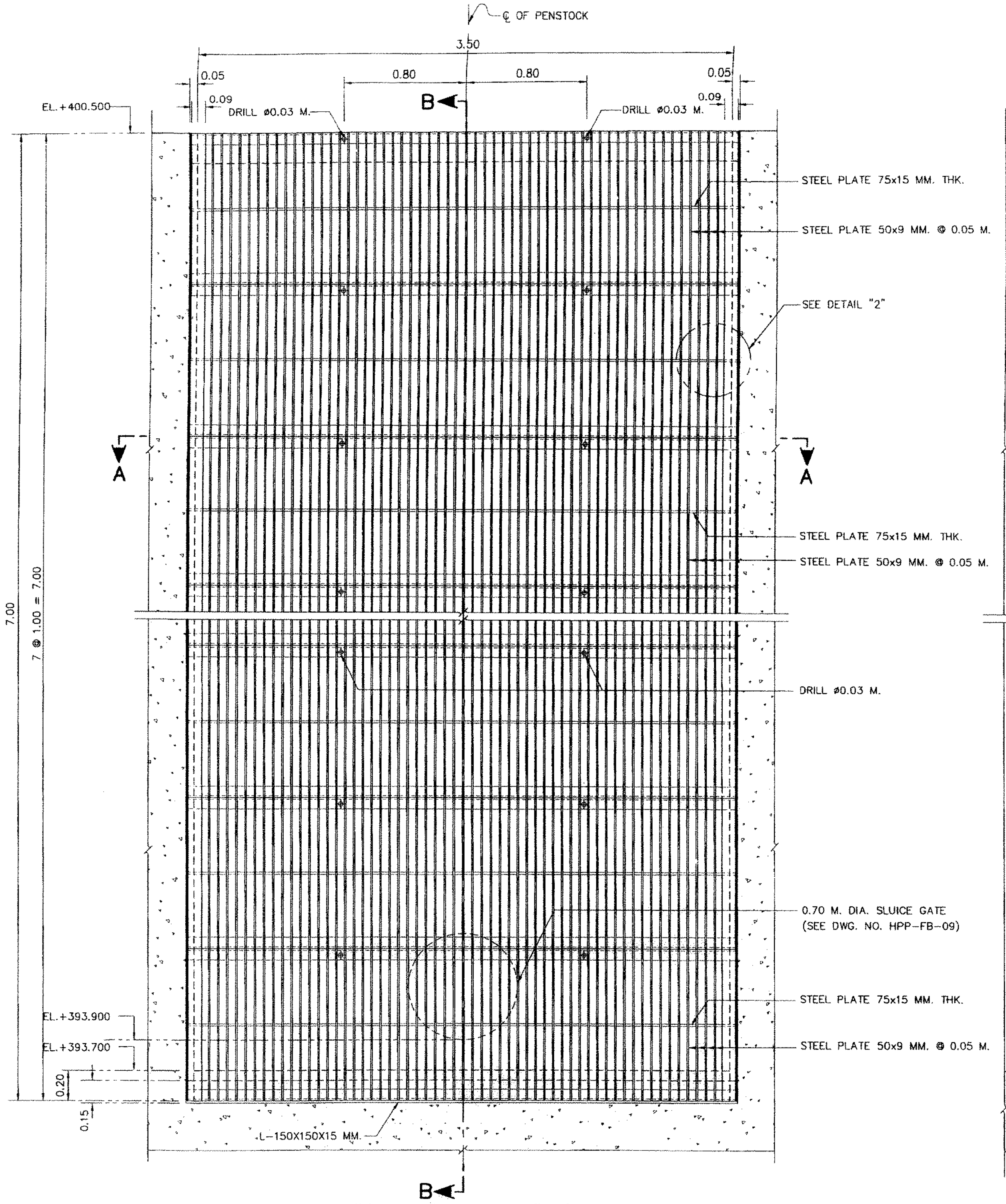
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED กส.46159 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

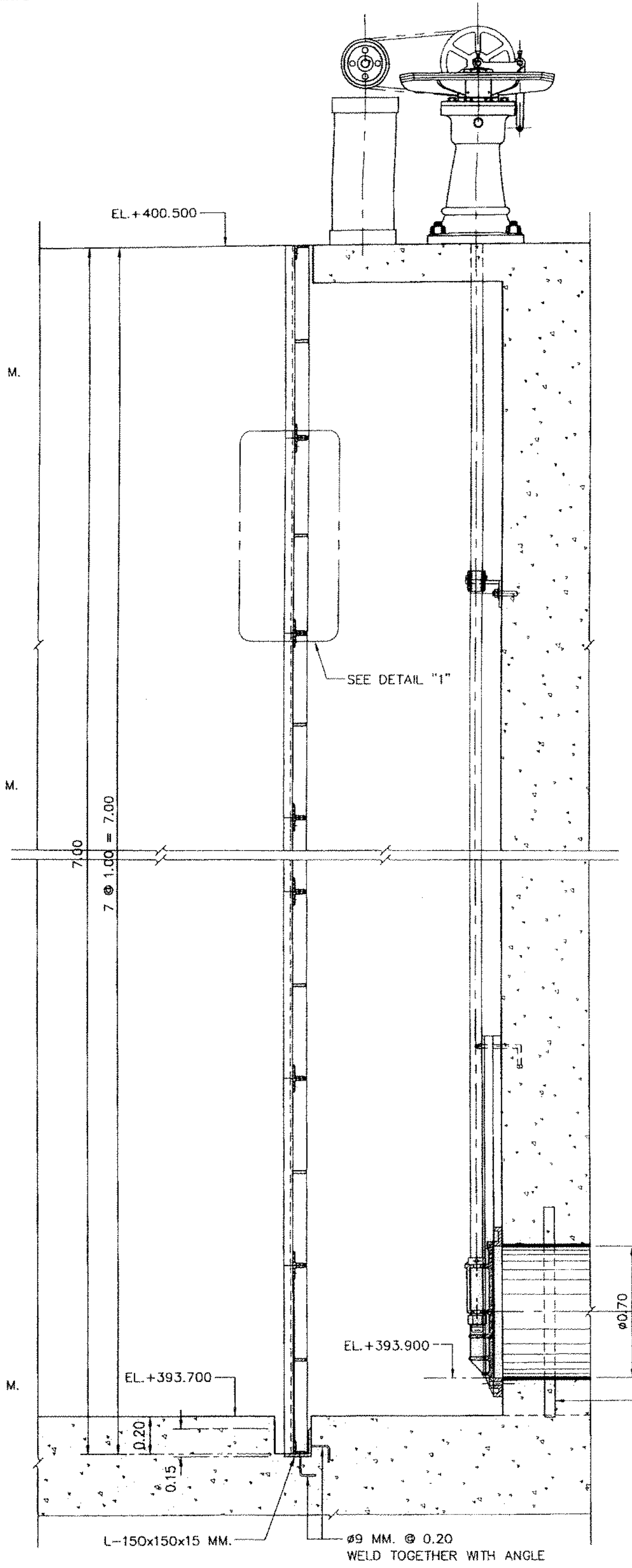
DRAWING NO. HPP-FB-05
SHEET NO. 47 OF 100

D:2008-PRO\0783\DRAFT FINAL\FOREBAY\HPP-FB-08 .DWG\13-11-2008



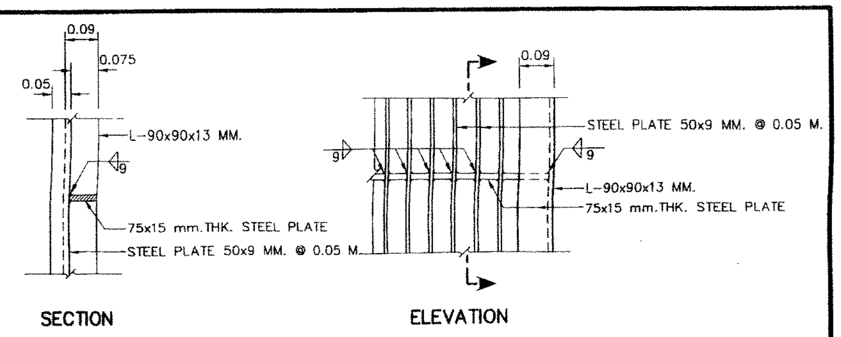
DETAIL OF TRASHRACK

SCALE 1:20



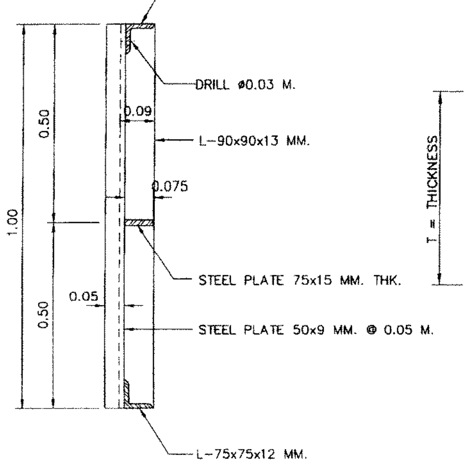
SECTION B–B

SCALE 1:20


0.09
0.075
0.05
L-90x90x13 MM.
9
75x15 mm.THK. STEEL PLATE
STEEL PLATE 50x9 MM. @ 0.05 M.
SECTION
0.09
9
9
STEEL PLATE 50x9 MM. @ 0.05 M.
L-90x90x13 MM.
75x15 mm.THK. STEEL PLATE
ELEVATION

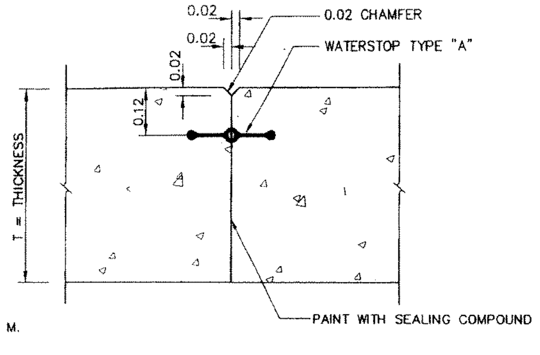
DETAIL "2"

SCALE 1:10



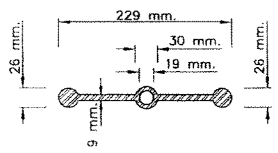
DETAIL "1"

SCALE 1:10



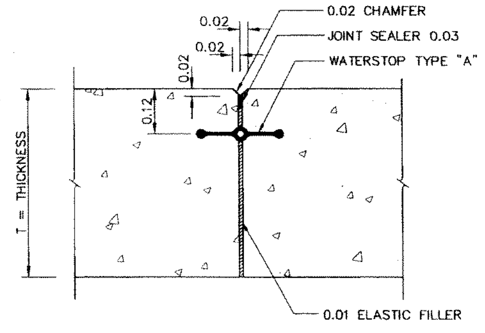
CONTRACTION JOINT

NOT TO SCALE



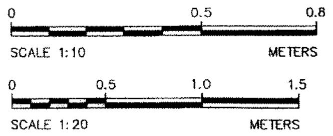
WATERSTOP TYPE "A"

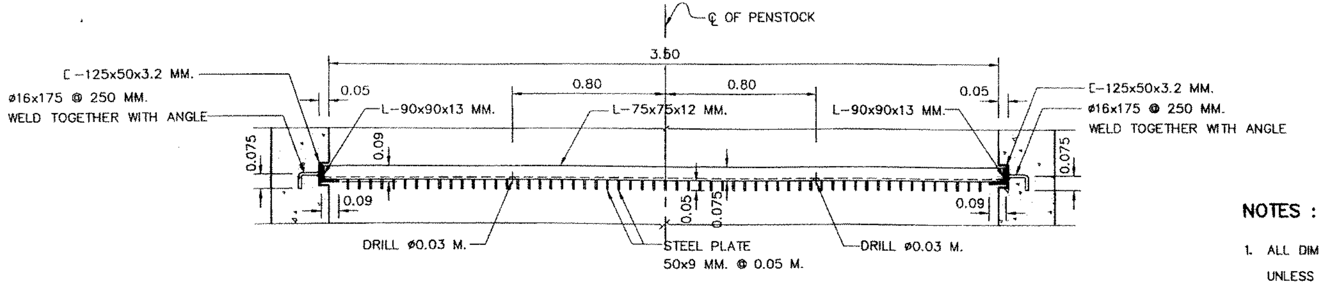
NOT TO SCALE



EXPANSION JOINT

NOT TO SCALE





SECTION A–A

SCALE 1:20

NOTES :

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

REFERENCE DRAWINGS :

1.	FOREBAY, PLAN AND SECTION A–A, B–B	HPP-FB-02
2.	FOREBAY, C–C, D–D, E–E, F–F, G–G	HPP-FB-03

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
CONSULTANTS			DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

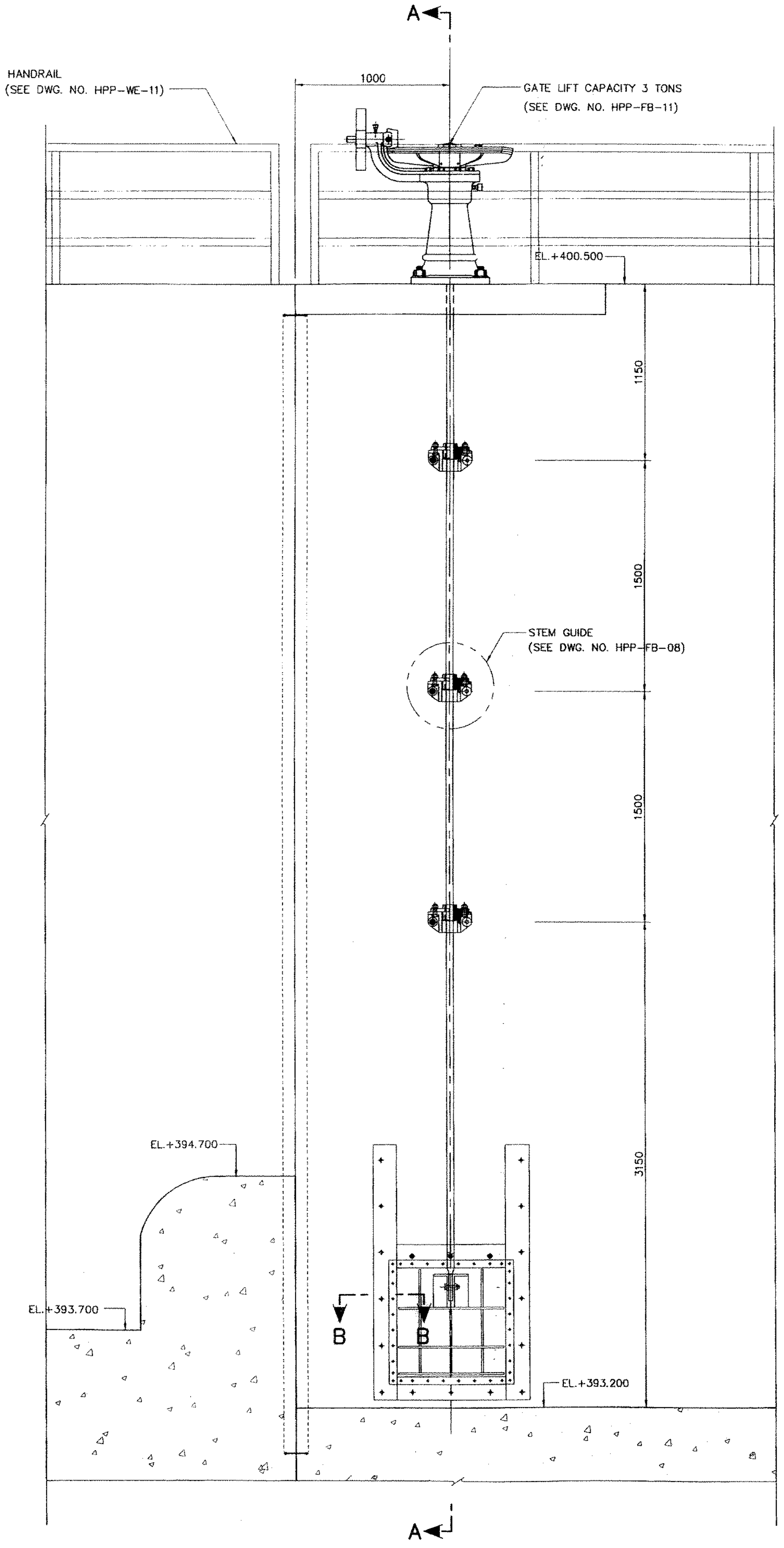
HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
FOREBAY
DETAIL OF TRASHRACK AND JOINT

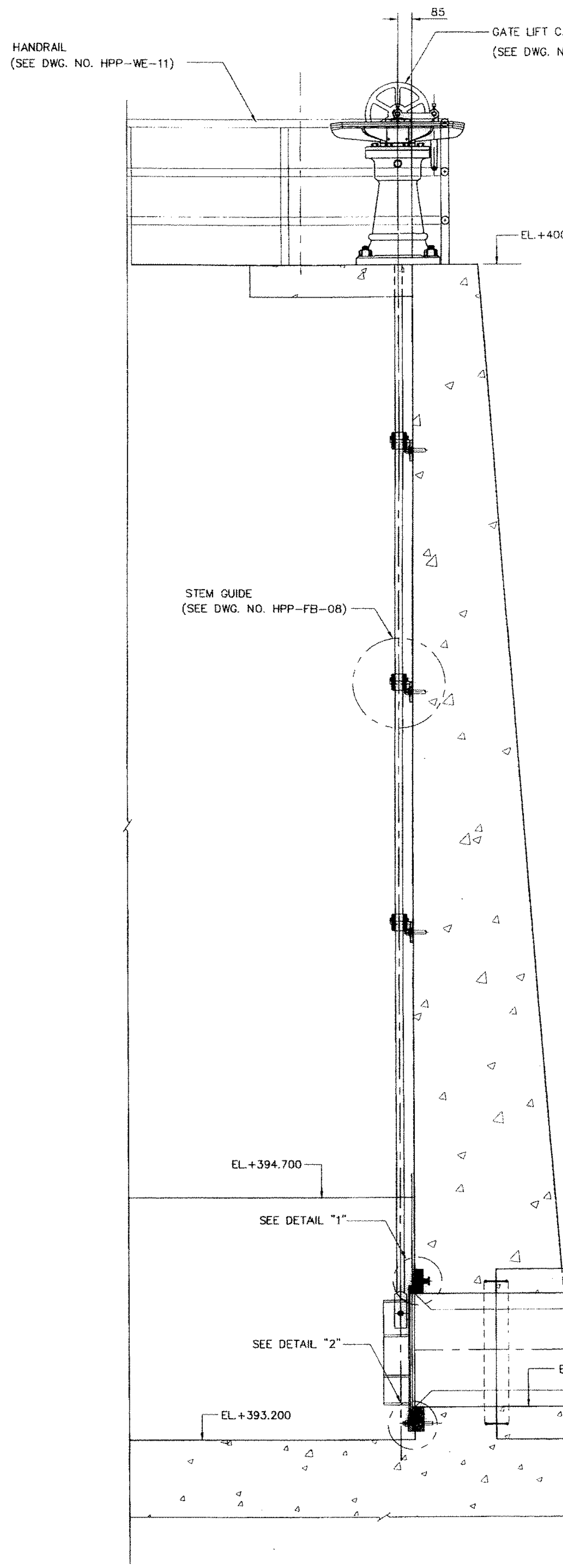
MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED
DRAWN
CHECKED
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED
DRAWING NO. HPP-FB-06
SHEET NO. 48 OF 100

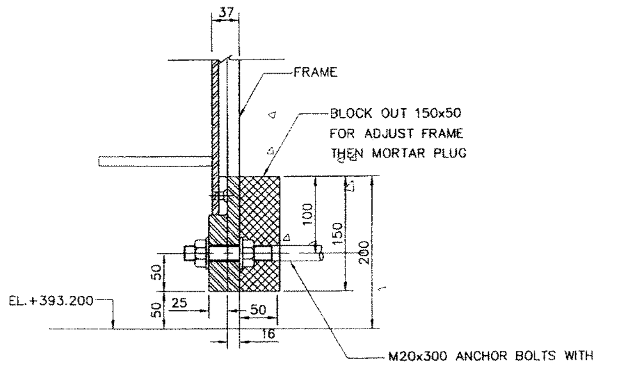
D:2008-PRO\0783\DRAFT FINAL\FOREBAY\HPP-FB-06 .DWG\TKK\04-11-2008



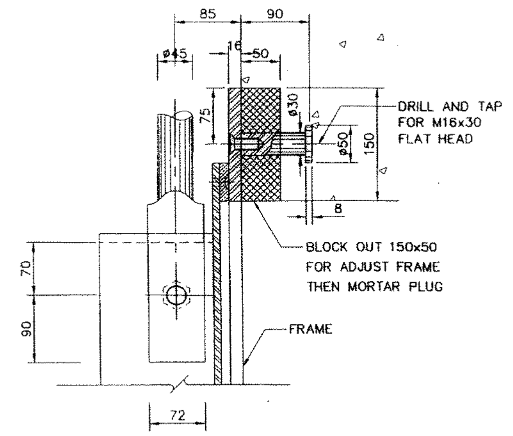
ASSEMBLY
SCALE 1:20



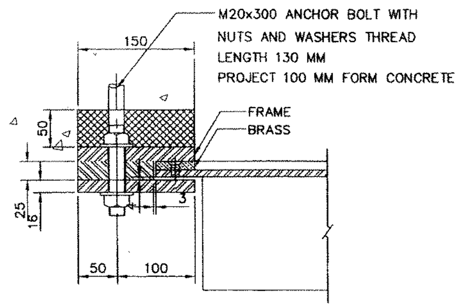
SECTION A–A
SCALE 1:20



DETAIL "2"
SCALE 1:5



DETAIL "1"
SCALE 1:5



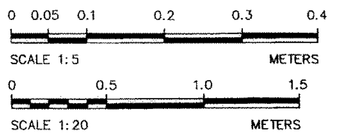
SECTION B–B
SCALE 1:5

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN.
2. ALL WELDING WILL BE 6 MILLIMETERS, USLESS OTHERWISE SHOWN.
3. ALL BOLTS AND NUTS USE ASTM A325.
4. ALL STRUCTURAL STEELS ARE JIS G 3101 SS400
5. ALL STAINLESS STEEL PLATES ARE JIS G 4304 SUS 304.

REFERENCE DRAWINGS :

1. FOREBAY, SECTIONS C–C, D–D, E–E, F–F, G–G	HPP–FB–03
2. FOREBAY, 0.70x0.70 M. SAND SLUICE GATE, GATE DETAILS	HPP–FB–08
3. FOREBAY, GATE LIFT, CAPACITY 3.0 TONS	HPP–FB–11



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS
DEDE

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

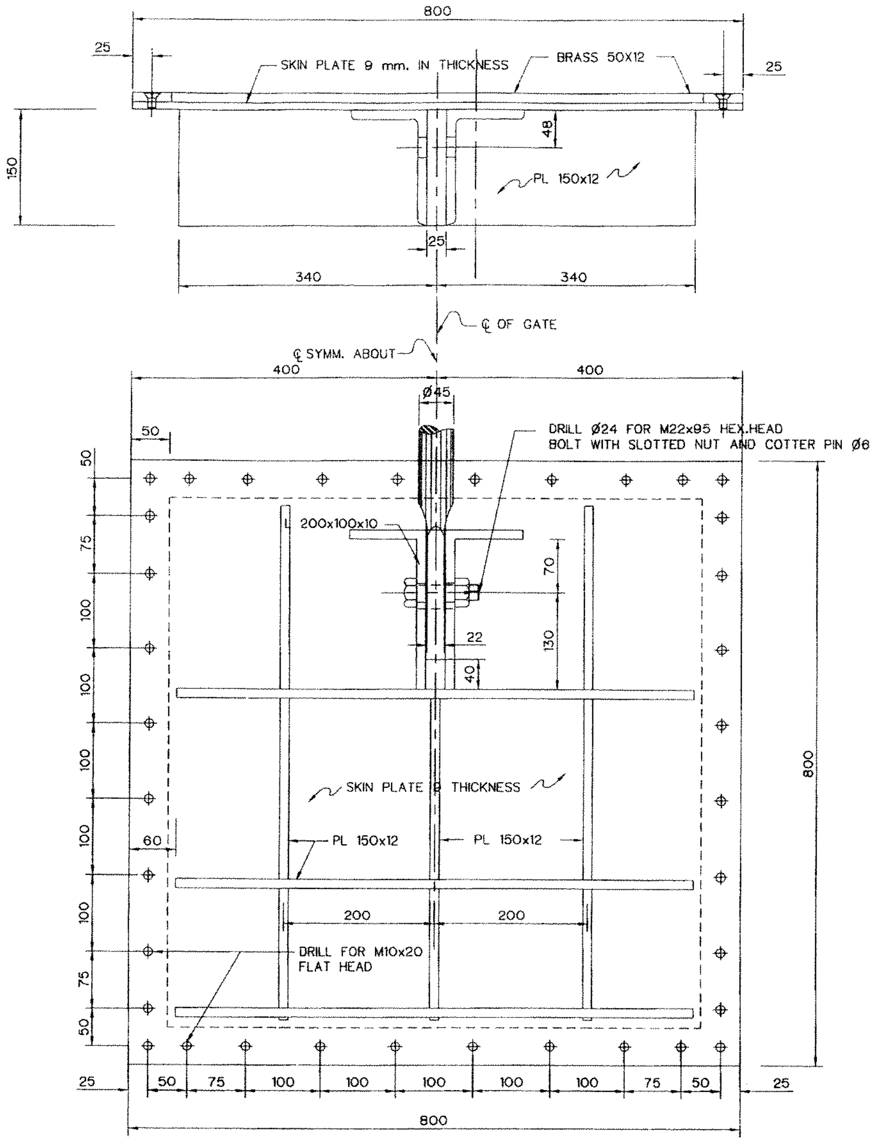
CIVIL WORKS
FOREBAY
0.70x0.70 M. SAND SLUICE GATE, GATE INSTALLATION

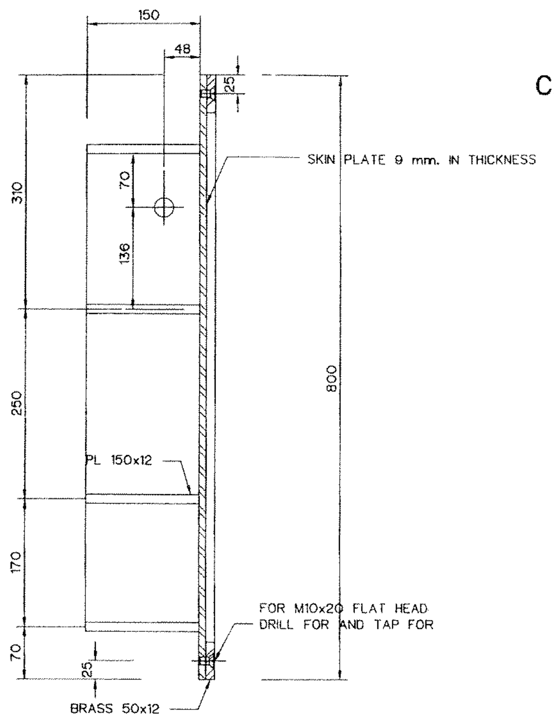
MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภย.46159 สย.4651
DRAWN
CHECKED สย.4651
8/12/51
PROJECT MANAGER DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–FB–07
SHEET NO. 49 OF 100

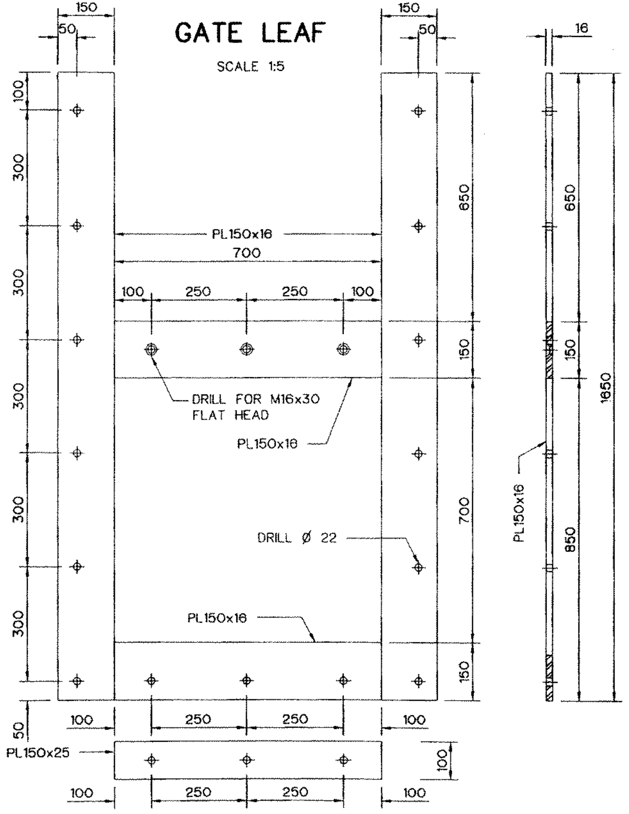
D:\0783\HPP-FB-08\13-NOV-2008/SMP.





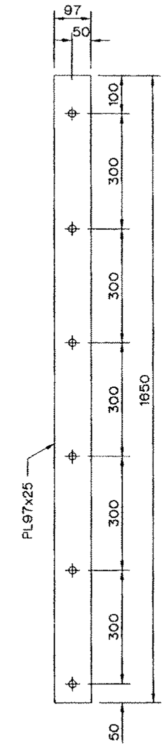
GATE LEAF

SCALE 1:5



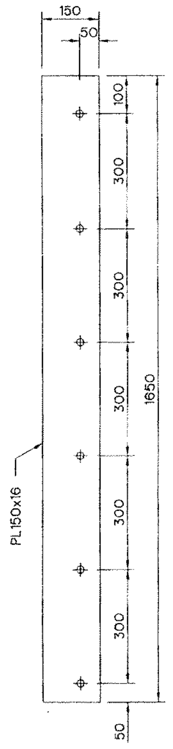
FRAME

SCALE 1:10



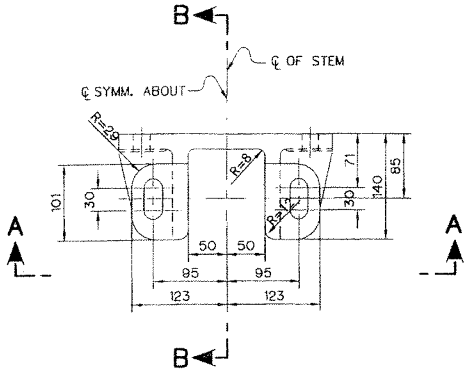
FILLER

SCALE 1:10



GUIDE BAR

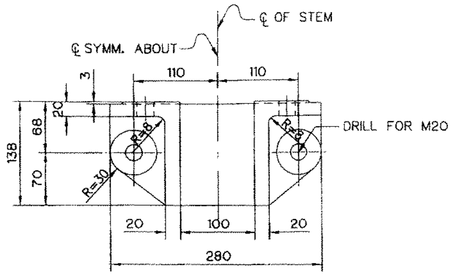
SCALE 1:10



①

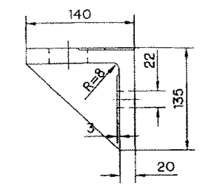
CAST IRON

SCALE 1:5



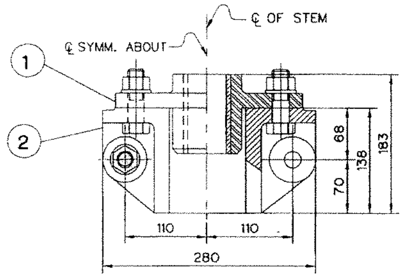
SECTION A–A

SCALE 1:5



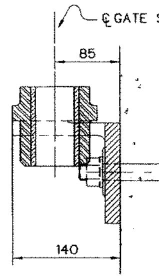
SECTION B–B

SCALE 1:5



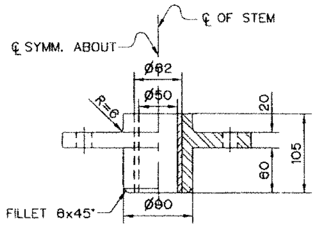
STEM GUIDE (CAST IRON)

SCALE 1:5



DETAIL "1"

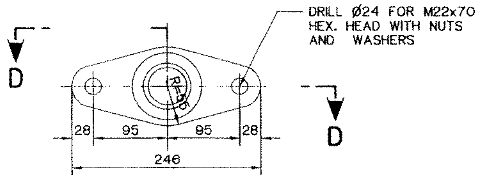
SCALE 1:5



SECTION D–D

(STEEL & PHOSPHOR BRONZE)

SCALE 1:5



②

CAST IRON

SCALE 1:5

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN.
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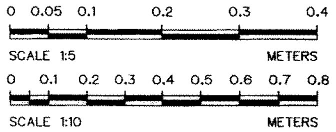
5. ALL STAINLESS STEEL PLATES ARE JIS G 4304 SUS 304.

REFERENCE DRAWINGS :

1. FOREBAY, 0.70x0.70 M. SAND SLUICE GATE, GATE INSTALLATION HPP-FB-07



KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
FOREBAY
0.70x0.70 M. SAND SLUICE GATE, GATE DETAILS

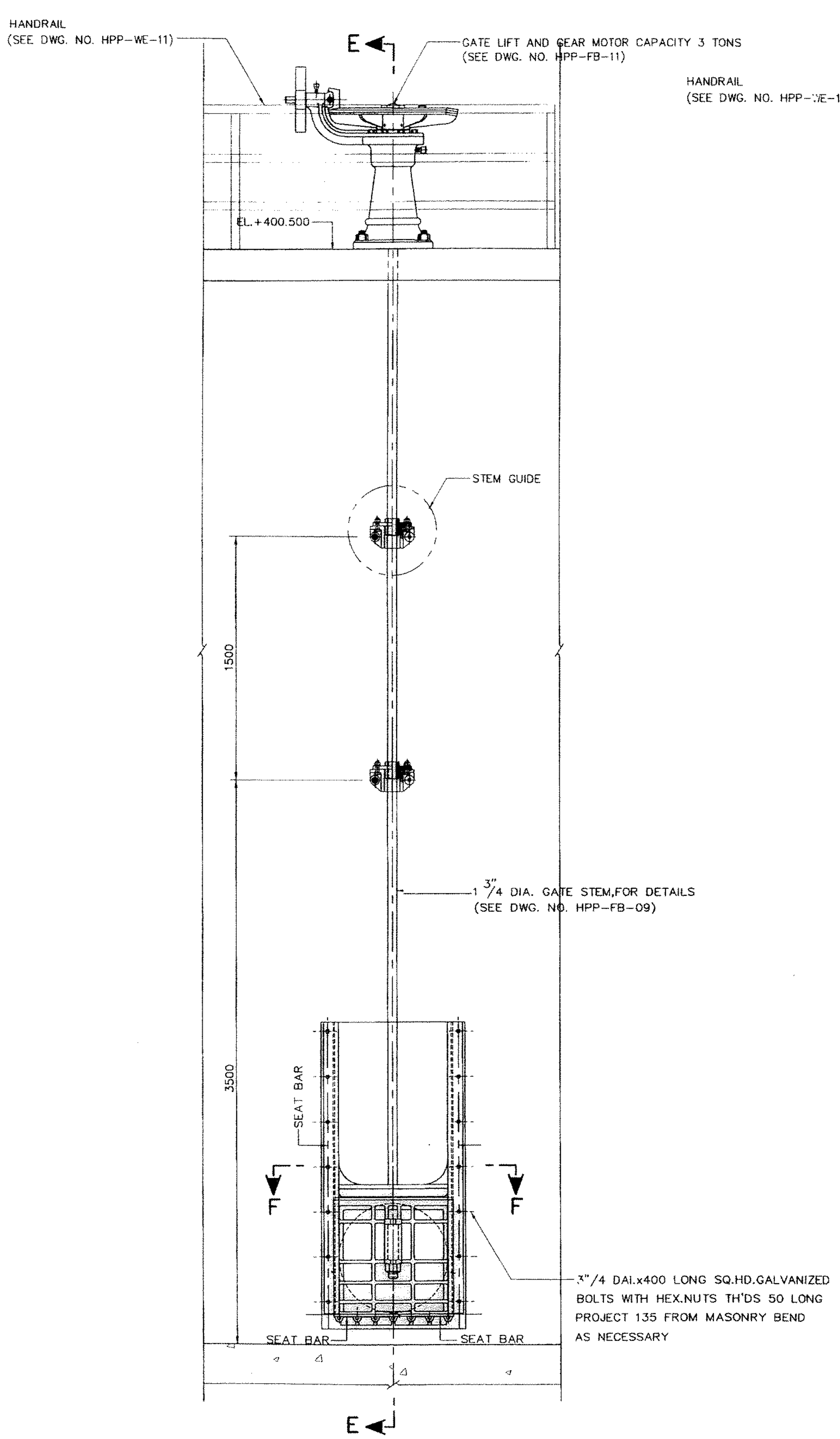
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
CONSULTANTS			DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.

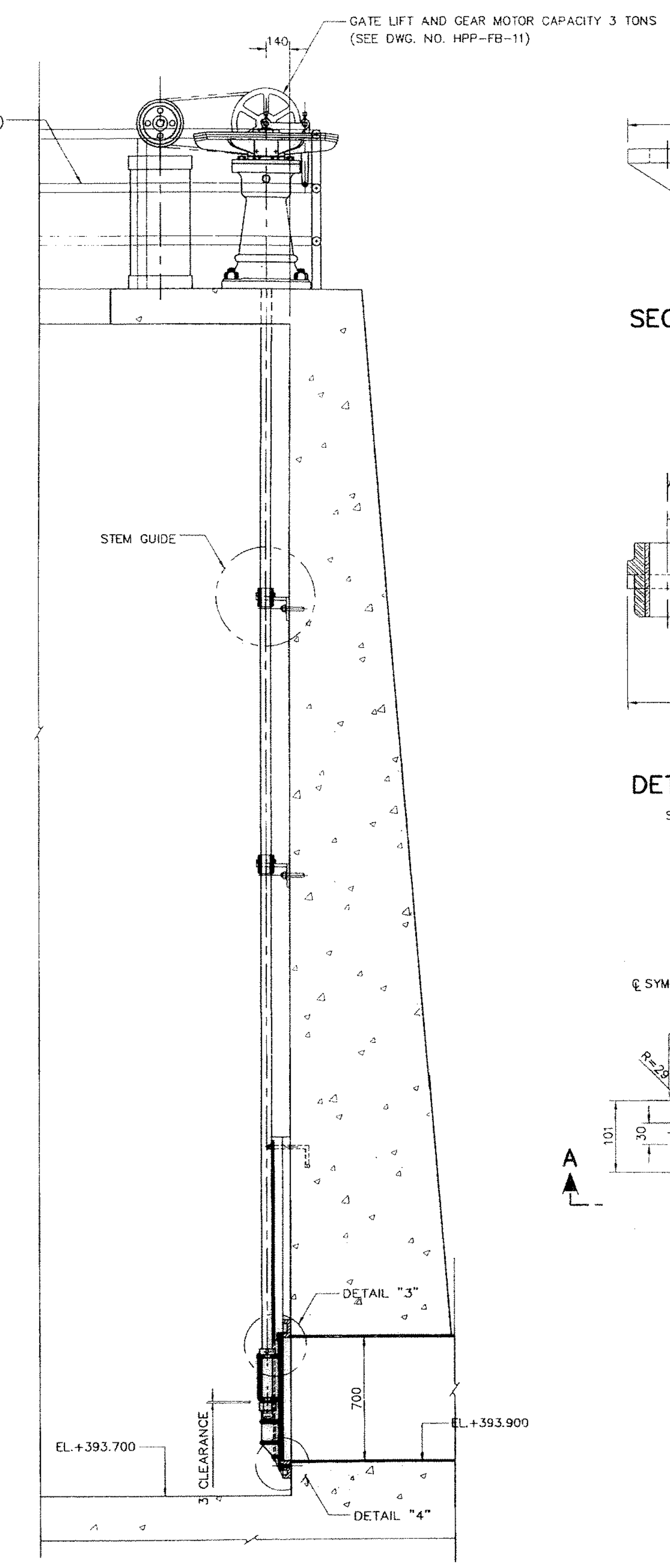
DESIGNED สย.46150 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

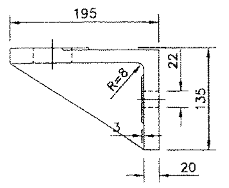
DRAWING NO. HPP-FB-08
SHEET NO. 50 OF 100


HANDRAIL
(SEE DWG. NO. HPP-WE-11)
E
GATE LIFT AND GEAR MOTOR CAPACITY 3 TONS
(SEE DWG. NO. HPP-FB-11)
EL.+400.500
STEM GUIDE
1500
1 3/4 DIA. GATE STEM,FOR DETAILS
(SEE DWG. NO. HPP-FB-09)
3500
SEAT BAR
F
F
3"/4 DAI.x400 LONG SQ.HD.GALVANIZED
BOLTS WITH HEX.NUTS TH'DS 50 LONG
PROJECT 135 FROM MASONRY BEND
AS NECESSARY
SEAT BAR
SEAT BAR
E

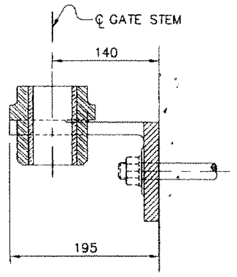
ASSEMBLY
SCALE 1:20



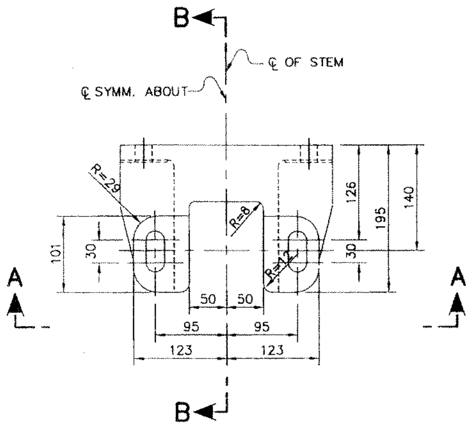
SECTION E–E
SCALE 1:20



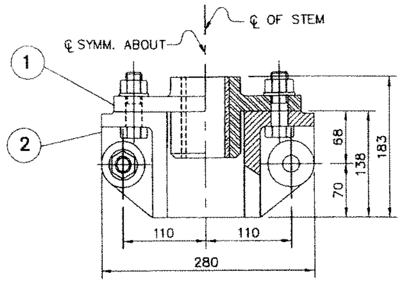
SECTION B–B
SCALE 1:5



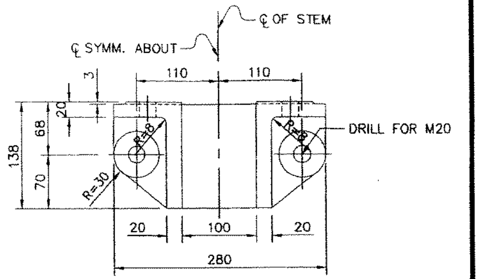
DETAIL "1"
SCALE 1:5



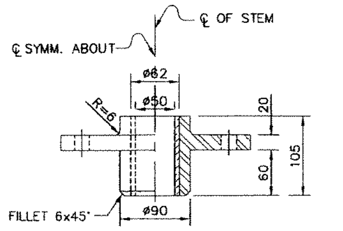
①
CAST IRON
SCALE 1:5



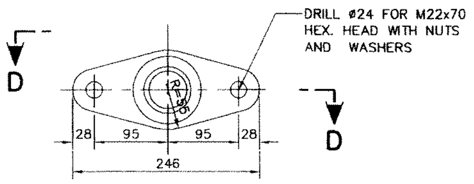
STEM GUIDE (CAST IRON)
SCALE 1:5



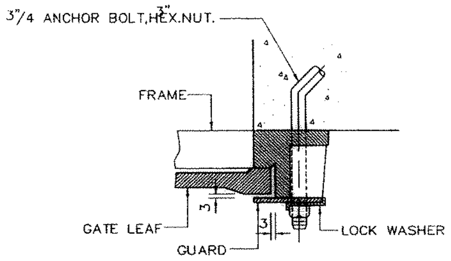
SECTION A–A
SCALE 1:5



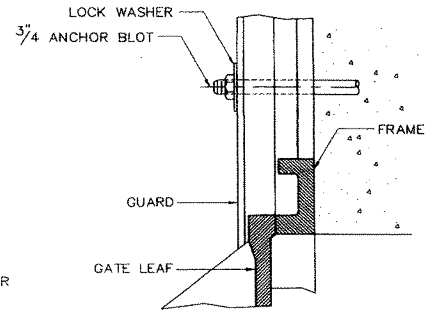
SECTION D–D
(STEEL & PHOSPHOR BRONZE)
SCALE 1:5



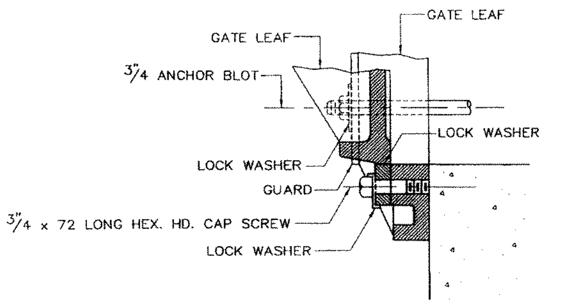
②
CAST IRON
SCALE 1:5



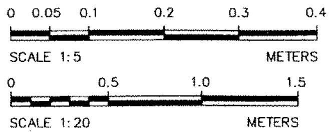
PART SECTION F–F
SCALE 1:5



DETAIL "3"
SCALE 1:5



DETAIL "4"
SCALE 1:5



NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN.
2. ALL WELDING WILL BE 6 MILLIMETERS, USLESS OTHERWISE SHOWN.
3. ALL BOLTS AND NUTS USE ASTM A325.
4. ALL STRUCTURAL STEELS ARE JIS G 3101 SS400
5. ALL STAINLESS STEEL PLATES ARE JIS G 4304 SUS 304.

REFERENCE DRAWINGS :

1. FOREBAY, SECTIONS C-C, D-D, E-E, F-F, G-G	HPP-FB-03
2. FOREBAY, 0.70 M. DIA. SLUICE GATE, GATE DETAILS	HPP-FB-10
3. FOREBAY, GATE LIFT, CAPACITY 3 TONS	HPP-FB-11

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

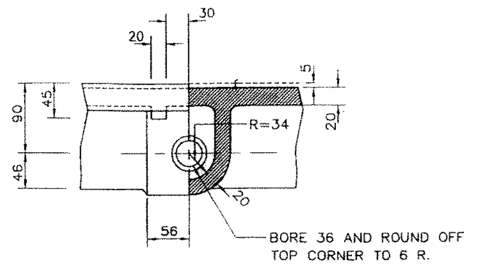
CIVIL WORKS
FOREBAY
0.70 M. DAI. SLUICE GATE, GATE INSTALLATION

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED
DRAWN
CHECKED
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

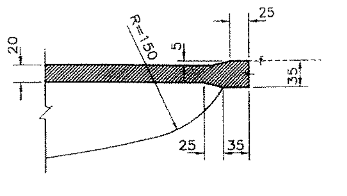
DRAWING NO. HPP–FB–09
SHEET NO. 51 OF 100

D:\0783\HPP-FB-11.DWG\13-NOV-2008/SMP



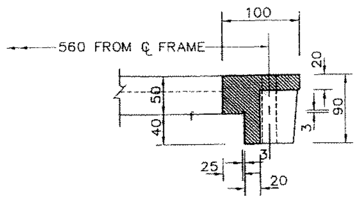
DETAIL "B"

SCALE 1:5



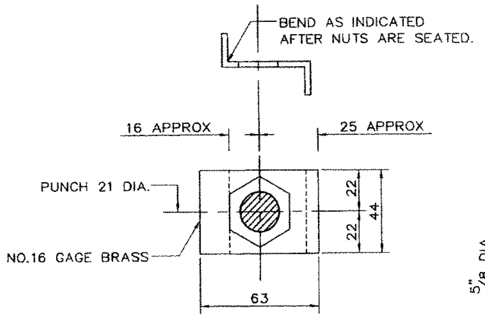
DETAIL "C"

SCALE 1:5



SECTION F–F

SCALE 1:5

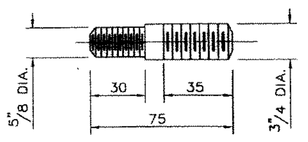


LOCK WASHER

BRASS

21 REQ'D

SCALE 1:2

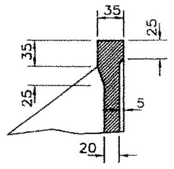


STUP

BOLT STEEL

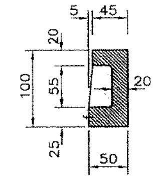
6 REQ'D

SCALE 1:2



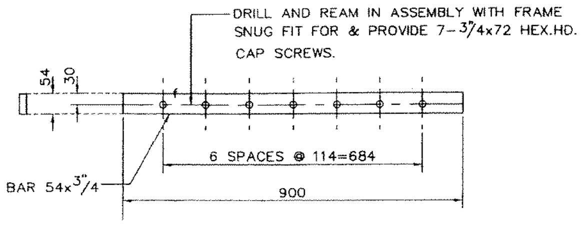
DETAIL "D"

SCALE 1:5



SECTION G–G

SCALE 1:5

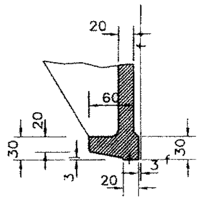

DRILL AND REAM IN ASSEMBLY WITH FRAME SNUG FIT FOR & PROVIDE 7–3/4x72 HEX.HD. CAP SCREWS.
54
30
6 SPACES @ 114=684
BAR 54x3/4"
900

SEAT BAR

STEEL

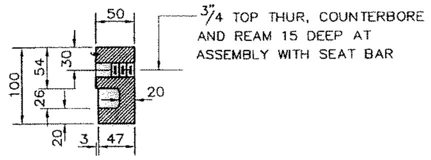
ONE REQ'D

SCALE 1:10



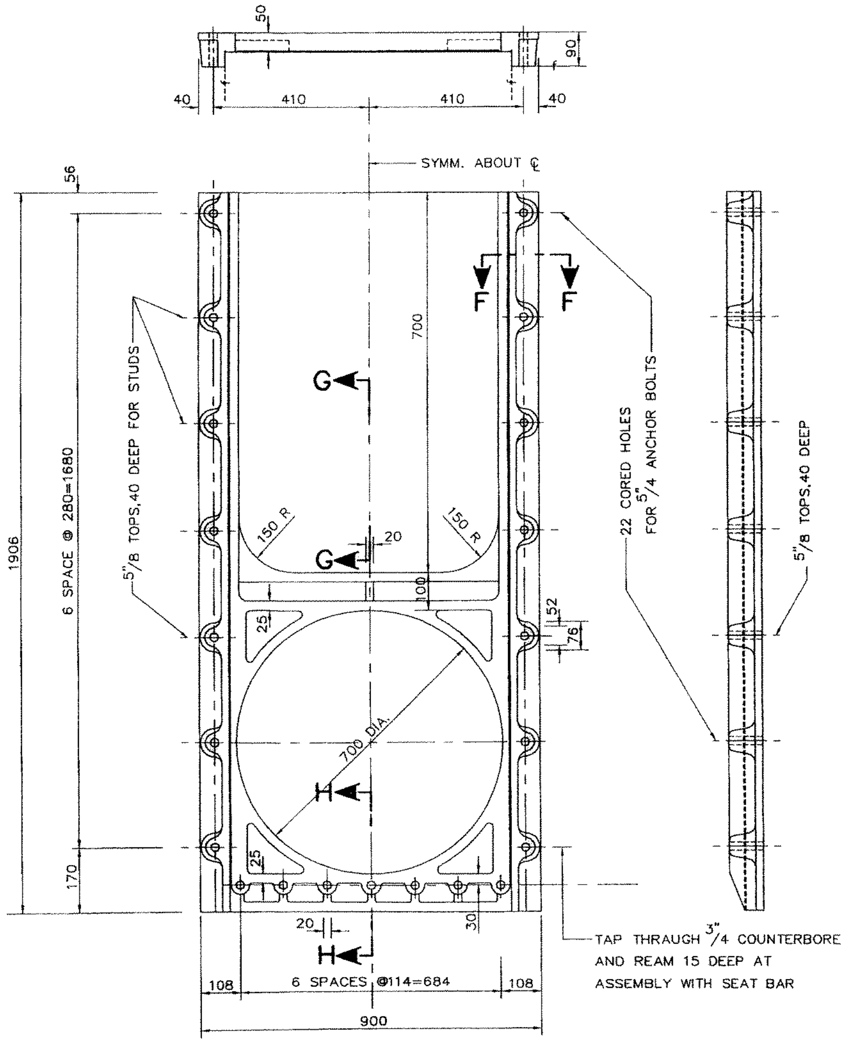
DETAIL "E"

SCALE 1:5


50
3/4" TOP THUR. COUNTERBORE AND REAM 15 DEEP AT ASSEMBLY WITH SEAT BAR
100
54
30
26
20
20
3
47

SECTION H–H

SCALE 1:5

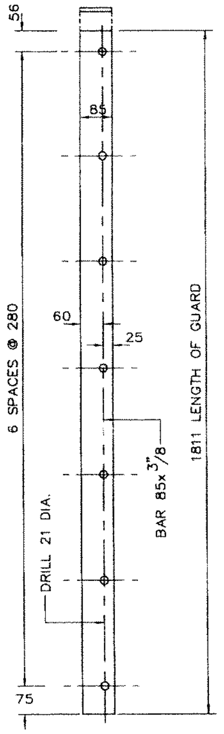


FRAME

CAST IRON

ONE REQ'D

SCALE 1:10



GUARD

STEEL

TWO REQ'D

SCALE 1:10

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN.
2. ALL WELDING WILL BE 6 MILLIMETERS, USLESS OTHERWISE SHOWN.
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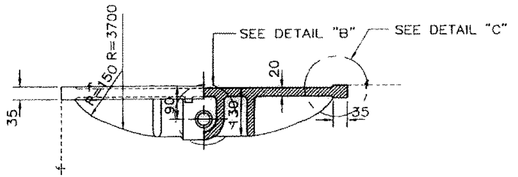
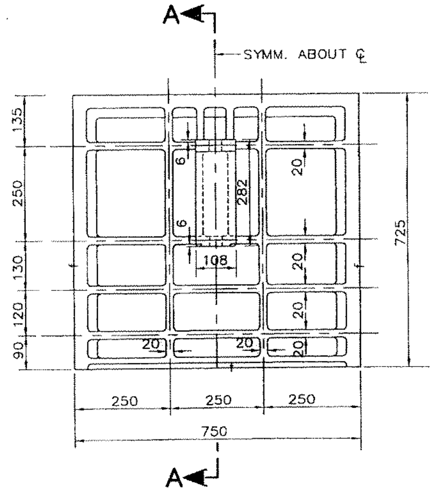
REFERENCE DRAWINGS :

1. FOREBAY, 0.70 M. DIA. SLUICE GATE, GATE INSTALLATION HPP–FB–09



SECTIONAL PLAN

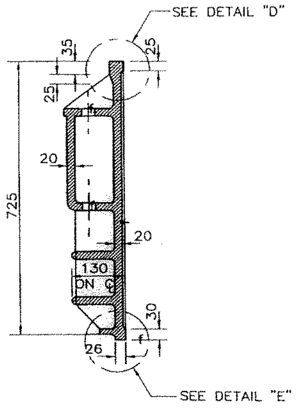


GATE LEAF

CAST IRON

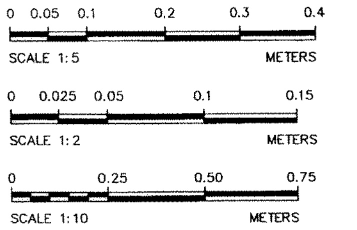
ONE REQ'D

SCALE 1:10



SECTION A–A

SCALE 1:10



KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
FOREBAY
0.70 M. DAI. SLUICE GATE, GATE DETAILS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

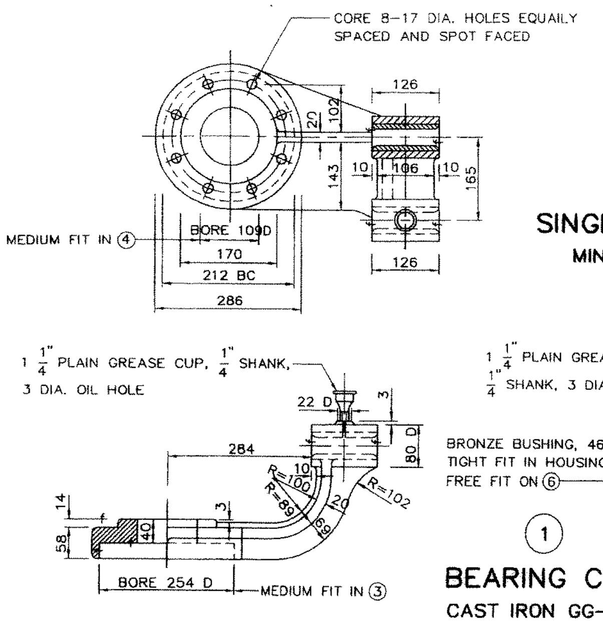
MAHA NAKORN CONSULTANTS CO.,LTD.

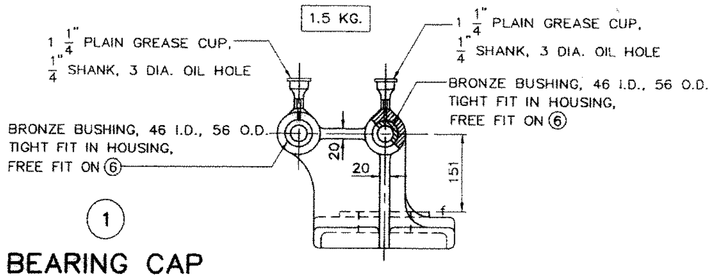
DESIGNED
DRAWN
CHECKED
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–FB–10
SHEET NO. 52 OF 100

G:\0783\HPP-FB-10.DWG\14-NOV-2008/SMP


CORE 8-17 DIA. HOLES EQUALLY SPACED AND SPOT FACED
MEDIUM FIT IN ④
BORE 109D
170
212 BC
286
126
106
$1\frac{1}{4}$" PLAIN GREASE CUP, $\frac{1}{4}$" SHANK, 3 DIA. OIL HOLE
22 D
284
BORE 254 D
MEDIUM FIT IN ③
R=102


$1\frac{1}{4}$" PLAIN GREASE CUP, $\frac{1}{4}$" SHANK, 3 DIA. OIL HOLE
BRONZE BUSHING, 46 I.D., 56 O.D. TIGHT FIT IN HOUSING, FREE FIT ON ⑥
151
20

①

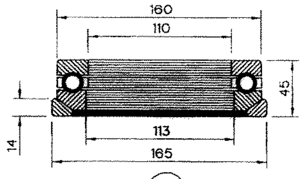
BEARING CAP

CAST IRON GG-18

ONE REQ"D

SCALE 1:7.5

40 KG.



②

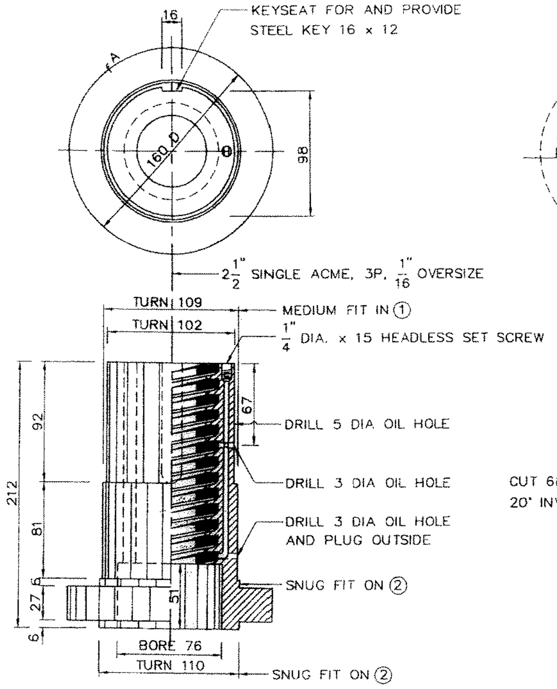
SINGLE THRUUST BALL BEARING

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

TWO REQ"D

SCALE 1:3

1.5 KG.


KEYSEAT FOR AND PROVIDE STEEL KEY 16 x 12
16
160 D
98
$2\frac{1}{2}$" SINGLE ACME, 3P, $\frac{1}{16}$" OVERSIZE
TURN 109
TURN 102
MEDIUM FIT IN ①
$\frac{1}{4}$" DIA. x 15 HEADLESS SET SCREW
DRILL 5 DIA OIL HOLE
DRILL 3 DIA OIL HOLE
DRILL 3 DIA OIL HOLE AND PLUG OUTSIDE
SNUG FIT ON ②
BORE 76
TURN 110
SNUG FIT ON ②
212
92
81
27.5
6

④

LIFTING NUT

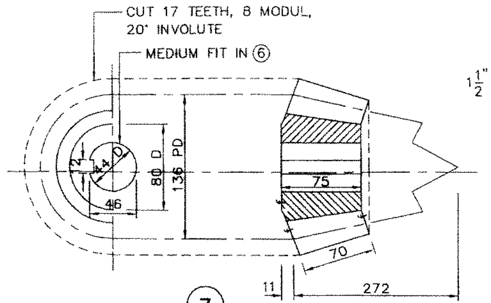
PHOSPHOR BRONZE

ONE REQ"D

SCALE 1:3

17 KG.

SMOOTH FINISH ALL OVER EXCEPT AS NOTED



⑦

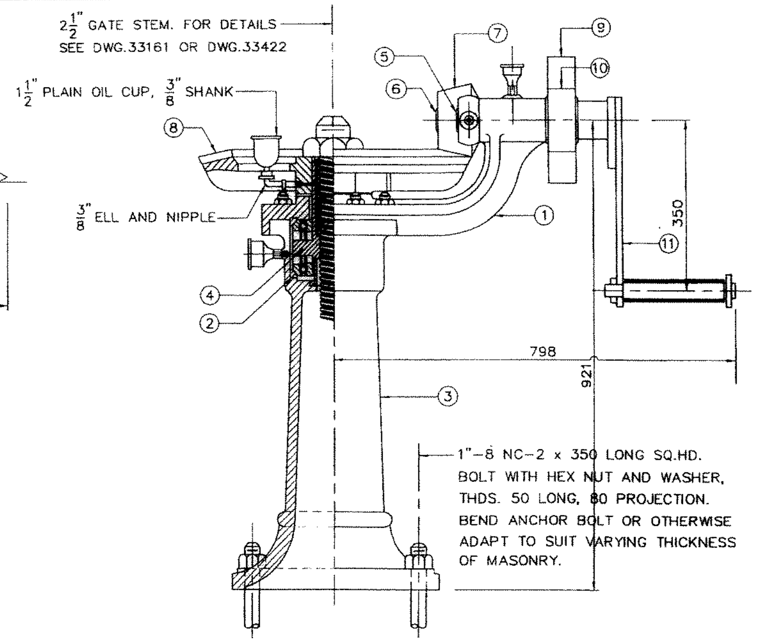
BEVEL PINION

STEEL, ST 6011

ONE REQ"D

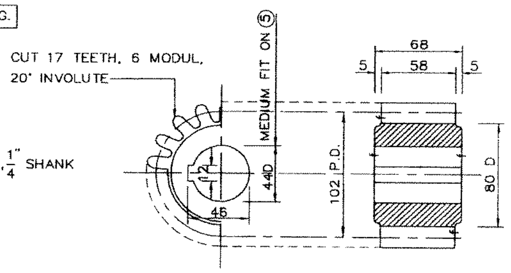
SCALE 1:3

5 KG.


$2\frac{1}{2}$" GATE STEM. FOR DETAILS SEE DWG.33161 OR DWG.33422
$1\frac{1}{2}$" PLAIN OIL CUP, $\frac{3}{8}$" SHANK
$\frac{3}{8}$" ELL AND NIPPLE
⑤
⑥
⑦
⑧
⑨
⑩
①
④
②
③
⑪
350
798
921
1"-8 NC-2 x 350 LONG SQ.HD. BOLT WITH HEX NUT AND WASHER, THDS. 50 LONG, 80 PROJECTION. BEND ANCHOR BOLT OR OTHERWISE ADAPT TO SUIT VARYING THICKNESS OF MASONRY.

ASSEMBLY

SCALE 1:7.5



⑩

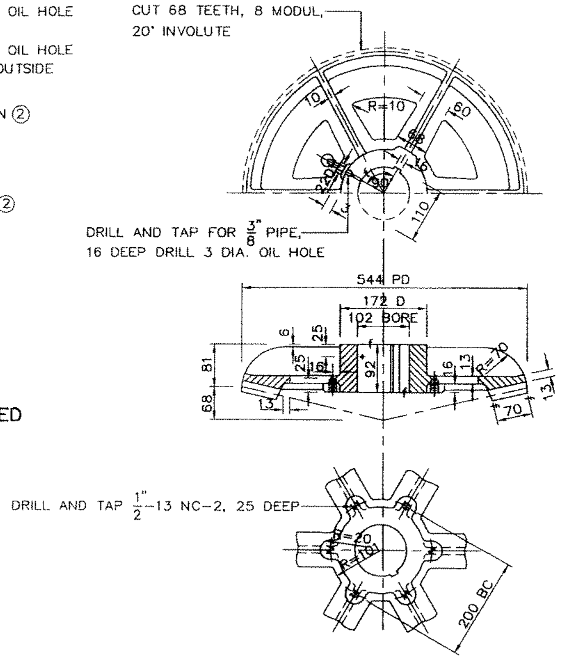
SPUR PINION

STEEL, ST 60.11

ONE REQ"D

SCALE 1:3

3 KG.


CUT 68 TEETH, 8 MODUL, 20° INVOLUTE
R=10
DRILL AND TAP FOR $\frac{3}{8}$" PIPE, 16 DEEP DRILL 3 DIA. OIL HOLE
544 PD
172 D
102 BORE
81
68
70
DRILL AND TAP $\frac{1}{2}$"-13 NC-2, 25 DEEP
200 BC

⑧

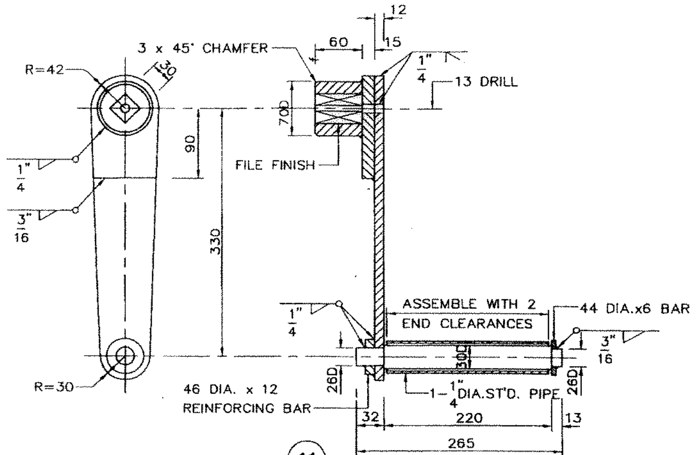
BEVEL GEAR

CAST IRON G.G-18

ONE REQ"D

SCALE 1:7.5

40 KG.



⑪

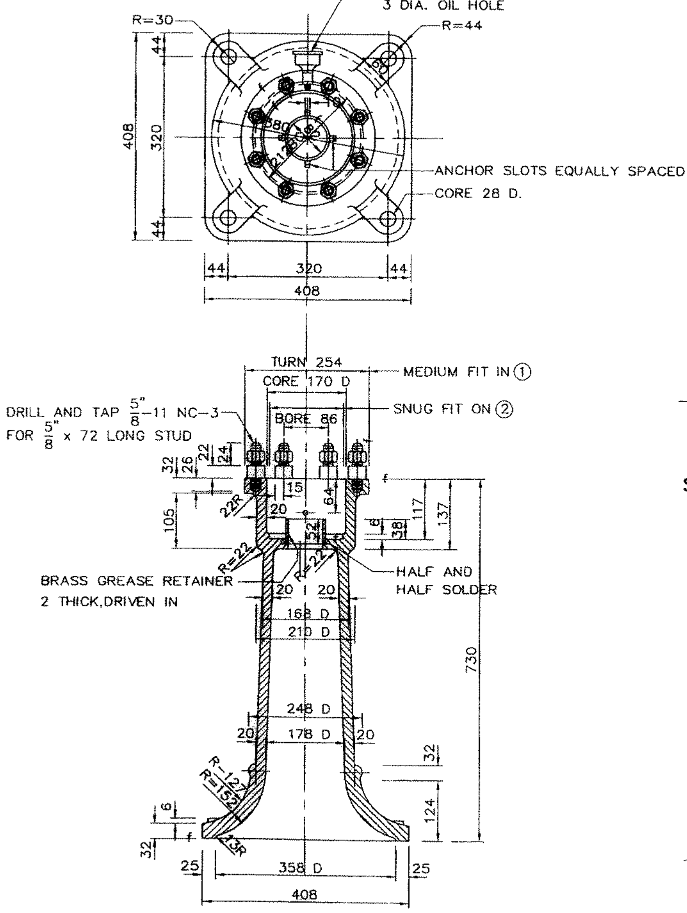
HAND CRANK

STEEL

ONE REQ"D

SCALE 1:5

6 KG.


$1\frac{1}{2}$" PLAIN GREASE CUP, $\frac{1}{4}$" SHANK 3 DIA. OIL HOLE
R=30
R=44
ANCHOR SLOTS EQUALLY SPACED
CORE 28 D.
408
320
44
TURN 254
CORE 170 D
BORE 86
MEDIUM FIT IN ①
SNUG FIT ON ②
DRILL AND TAP $\frac{5}{8}$"-11 NC-3 FOR $\frac{5}{8}$" x 72 LONG STUD
BRASS GREASE RETAINER 2 THICK,DRIVEN IN
HALF AND HALF SOLDER
168 D
210 D
248 D
178 D
730
358 D
408

③

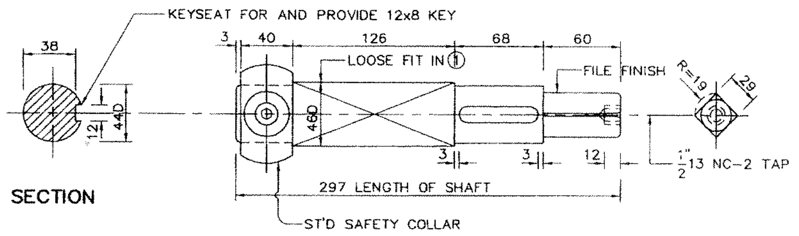
PEDESTAL

CAST IRON GG-18

ONE REQ"D

SCALE 1:7.5

140 KG.



⑤

SPUR PINION SHAFT

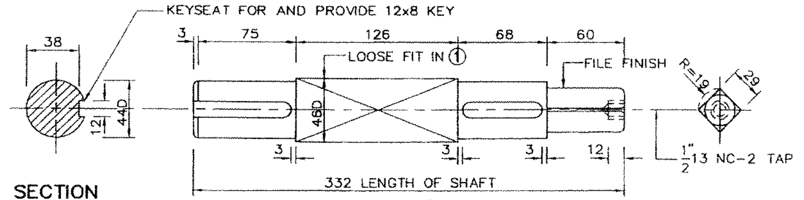
C.F.STEEL,ST 60.11

ONE REQ"D

SCALE 1:3

4 KG.

FINISH ALL OVER



⑥

BEVEL PINION SHAFT

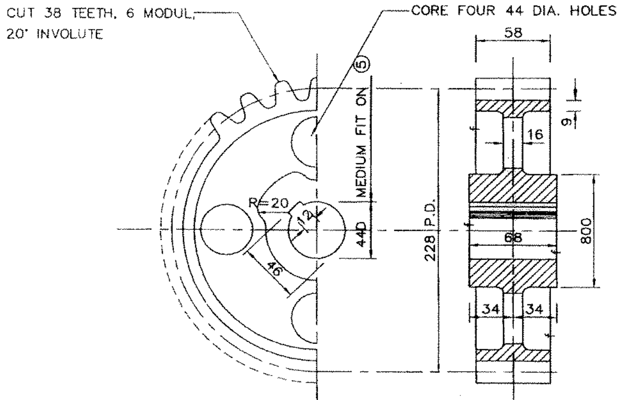
C.F.STEEL,ST 60.11

ONE REQ"D

SCALE 1:3

4 KG.

FINISH ALL OVER



⑨

SPUR GEAR

CAST IRON GG-18

ONE REQ"D

SCALE 1:3

16 KG.

NOTES :

1. DIMENSIONS TO BE READ IN MILLIMETERS EXCEPT WHERE DIMENSIONAL UNITS ARE NOTED.
2. LIFTING NUT MAY BE TAPPED FOR EITHER SINGLE ACME THREADS OR MULTIPLE THREADS TO SECURE AS DESIRED THE TRAVELING SPEED OF GATE STEM.

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
FOREBAY
GATE LIFT, CAPACITY 3 TONS

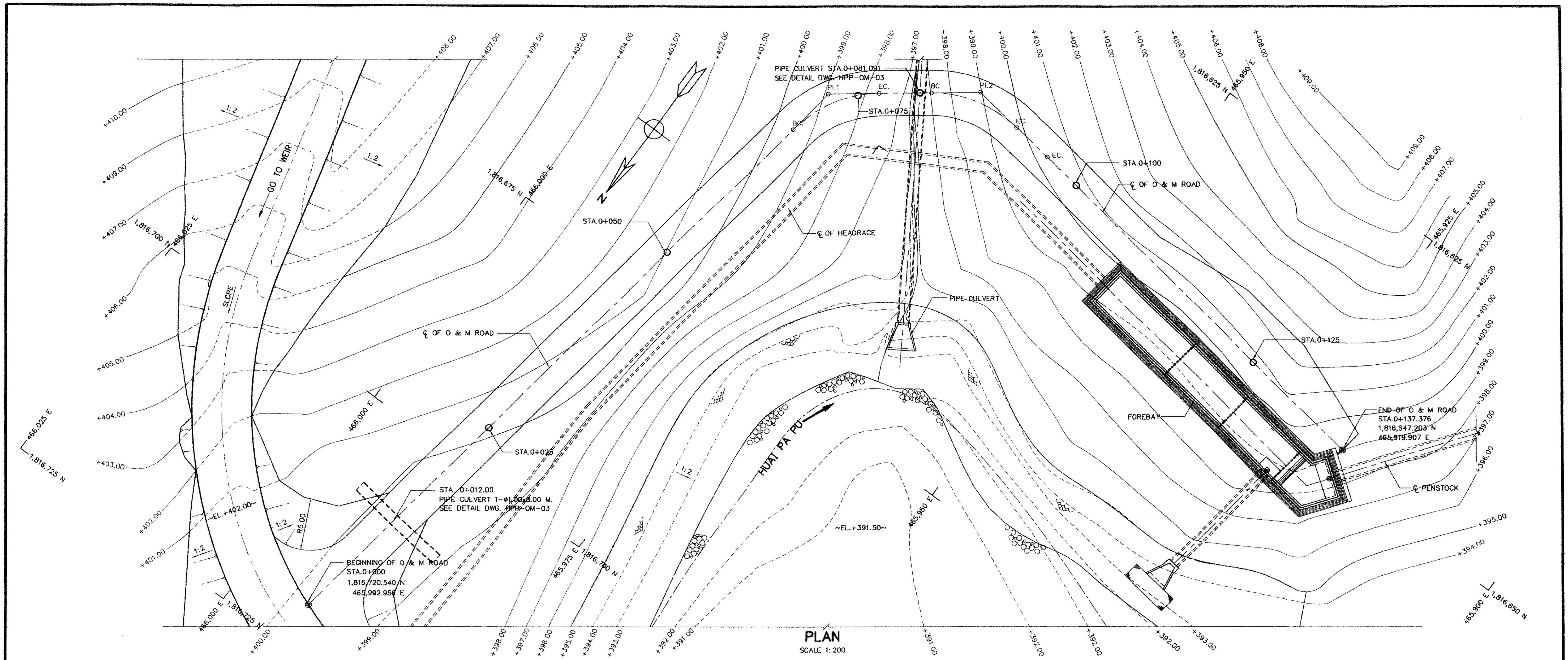
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED
DRAWN
CHECKED
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

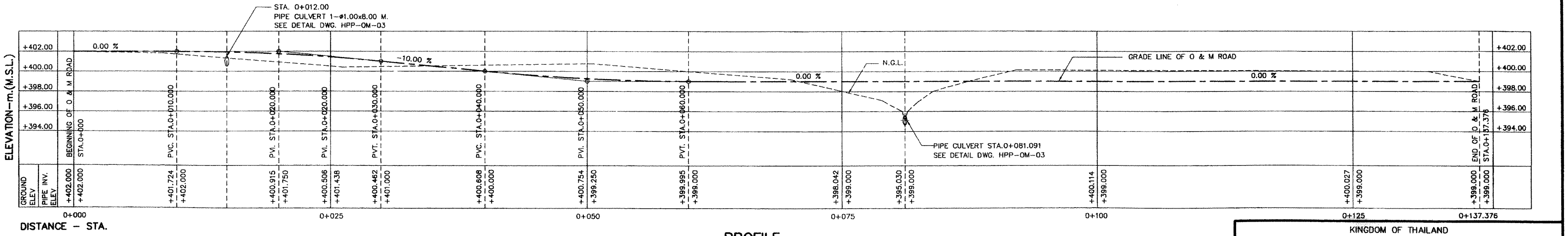
DRAWING NO. HPP-FB-11
SHEET NO. 53 OF 100

D:\0783\HPP-FB-11.DWG\14-NOV-2008\SMP.



PLAN

SCALE 1:200



PROFILE

HORIZONTAL SCALE 1:200
VERTICAL SCALE 1:200

ALIGNMENT DATA CURVE

NO. OF CURVE	PI. Sta.	PI. TO PI. m.	COORDINATE OF PI.		ANGLE I	T m.	R m.	Lc m	BC. Sta.	EC. Sta.	BEARING
			N	E							
BEGIN	0+000.000		1,816,720.540	465,992.956							
		72.590									S 8°-37'-47" E
1	0+072.590		1,816,648.771	465,982.064	44°-10'-36"	5.00	12.321	9.500	0+067.590	0+077.090	
		15.199									S 52°-48'-23" W
2	0+087.289		1,816,639.583	465,969.956	45°-51'-01"	5.00	11.822	9.461	0+082.289	0+091.750	
		50.626									N 81°-20'-36" W
END	0+137.376		1,816,647.203	465,919.907							

NOTES:

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP-GN-03
3. ALIGNMENT OF O& M ROAD SHALL BE JUSTIFIED BY FIELD ENGINEER IN THE FIELD TO SUIT THE TOPOGRAPHY

REFERENCE DRAWING :

1. O & M ROAD, TYPICAL SECTIONS AND DETAILS	HPP-OM-02
2. O & M ROAD, PIPE CULVERT STA.0+081.091, PLAN AND SECTIONS	HPP-OM-03
3. ACCESS ROAD, TYPICAL RC. PIPE, INSTALLATION AND REINFORCEMENT	HPP-AR-10

0 5 10 15 20
SCALE 1:200 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

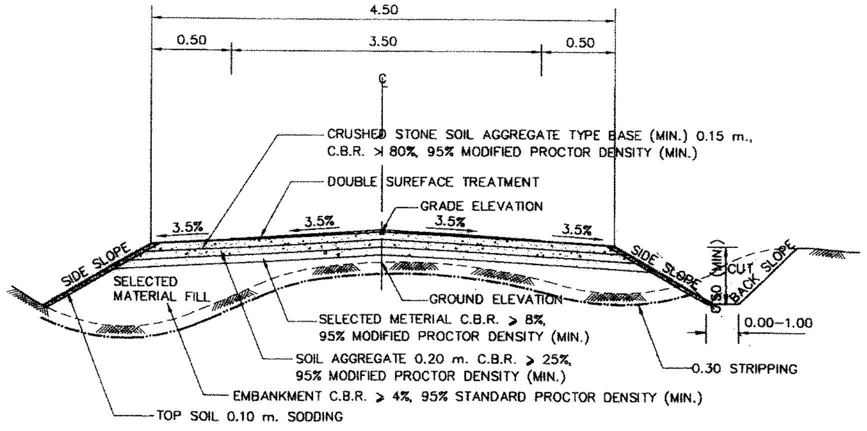
KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
O & M ROAD
PLAN AND PROFILE, STA. 0+000.000 TO STA. 0+137.376

MAHA NAKORN CONSULTANTS CO.,LTD.	DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
DESIGNED สย.46159 สย.4651	REVIEWED
DRAWN	SUBMITTED
CHECKED สย.4651	RECOMMENDED
PROJECT MANAGER — DATE 8/12/51	APPROVED
	DRAWING NO. HPP-OM-01 — SHEET NO. 54 OF 100

D:\0783\แบบก่อสร้าง HPP-O&M-01.DWG\29-OCT-2008/SMF


4.50
0.50
3.50
0.50
℄
CRUSHED STONE SOIL AGGREGATE TYPE BASE (MIN.) 0.15 m., C.B.R. > 80%, 95% MODIFIED PROCTOR DENSITY (MIN.)
DOUBLE SUREFACE TREATMENT
GRADE ELEVATION
3.5%
3.5%
3.5%
3.5%
SIDE SLOPE
SIDE SLOPE
SELECTED MATERIAL FILL
GROUND ELEVATION
0.50 (MIN)
CUT
BACK SLOPE
0.00–1.00
SELECTED METERIAL C.B.R. > 8%, 95% MODIFIED PROCTOR DENSITY (MIN.)
SOIL AGGREGATE 0.20 m. C.B.R. > 25%, 95% MODIFIED PROCTOR DENSITY (MIN.)
EMBANKMENT C.B.R. > 4%, 95% STANDARD PROCTOR DENSITY (MIN.)
0.30 STRIPPING
TOP SOIL 0.10 m. SODDING

TYPICAL SECTION OF O&M ROAD

NOT TO SCALE

TABLE I

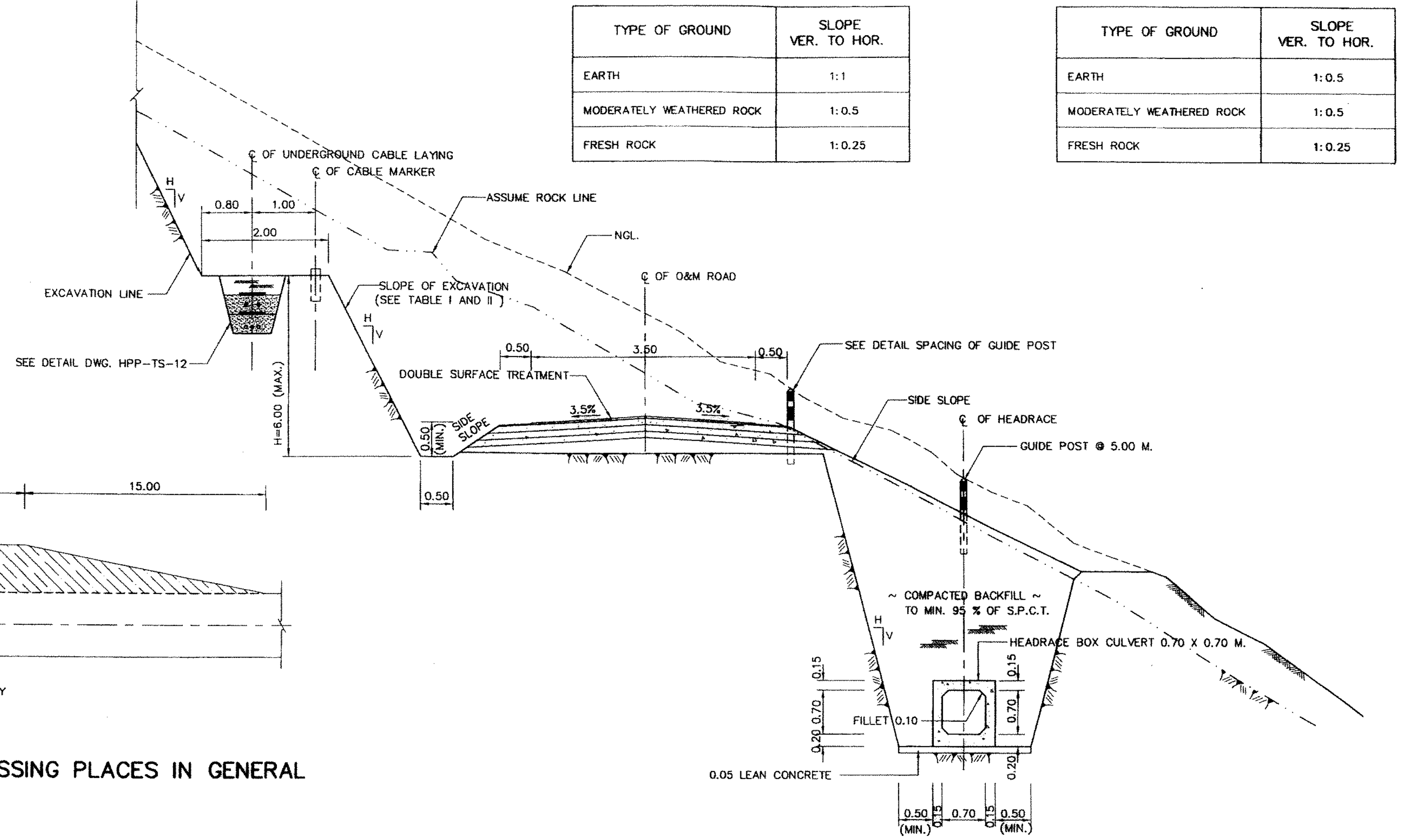
SLOPE OF EXCAVATION

TYPE OF GROUND	SLOPE VER. TO HOR.
EARTH	1:1
MODERATELY WEATHERED ROCK	1:0.5
FRESH ROCK	1:0.25

TABLE II

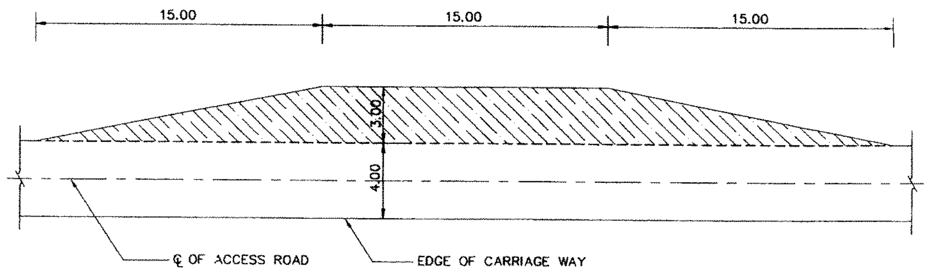
SLOPE OF EXCAVATION FOR INTAKE PIPE

TYPE OF GROUND	SLOPE VER. TO HOR.
EARTH	1:0.5
MODERATELY WEATHERED ROCK	1:0.5
FRESH ROCK	1:0.25



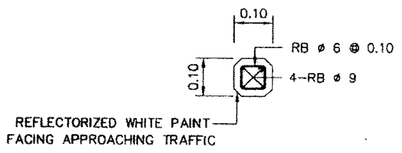
TYPICAL SECTIONS OF HEADRACE AND O&M ROAD

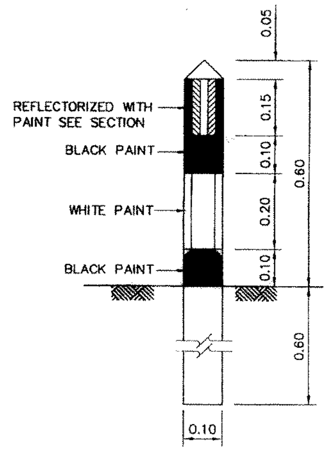
SCALE 1:50



PLAN SHOWING DETAIL OF STOPPING AND PASSING PLACES IN GENERAL

NOT TO SCALE



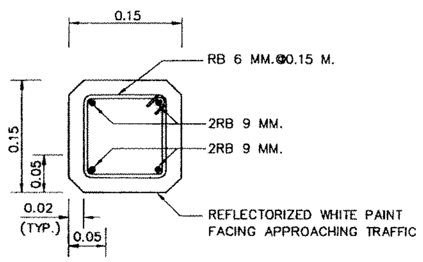


DETAIL OF GUIDE POST

SCALE 1:10

TABLE

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

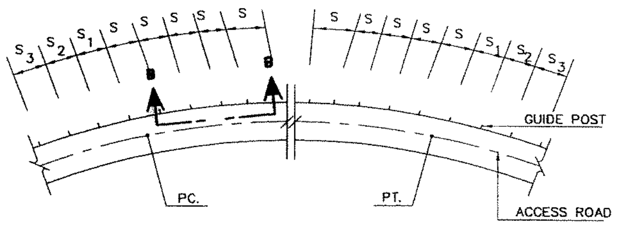
NOT TO SCALE

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP-GN-03
3. GUIDE POSTS ARE REQUIRED AT EVERY BENDS AND BETWEEN BENDS WITH MAXIMUM 10.00 M. SPACING.
4. LOCATION OF STOPPING AND PASSING PLACES SHALL BE INDICATED ON PLAN AND PROFILE DRAWING OR AS DIRECTED BY FIELD ENGINEER

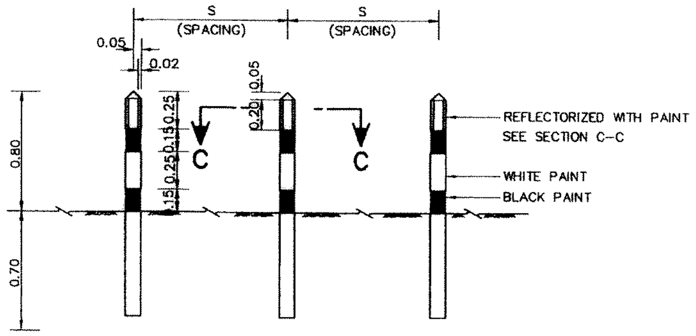
REFERENCE DRAWINGS :

1. O&M ROAD, PLAN AND PROFILE, STA.0+000.000 TO STA.0+137.376 HPP-OM-01



PLAN

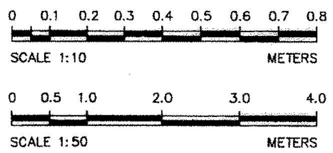
NOT TO SCALE



SECTION B–B

NOT TO SCALE

GUIDE POSTS



3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
O&M ROAD
TYPICAL SECTIONS AND DETAILS

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED วก.48159 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-OM-02
SHEET NO. 55 OF 100

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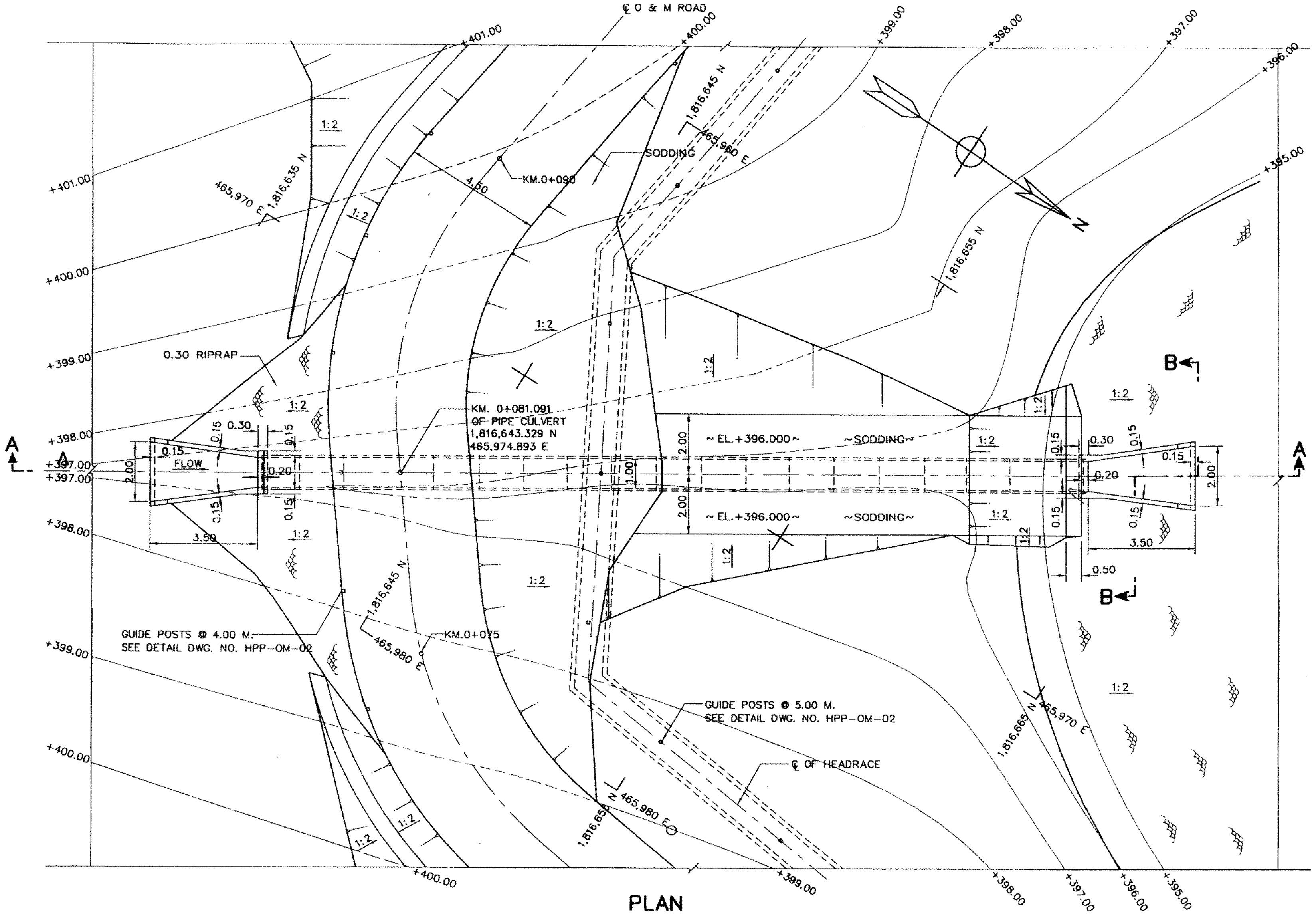
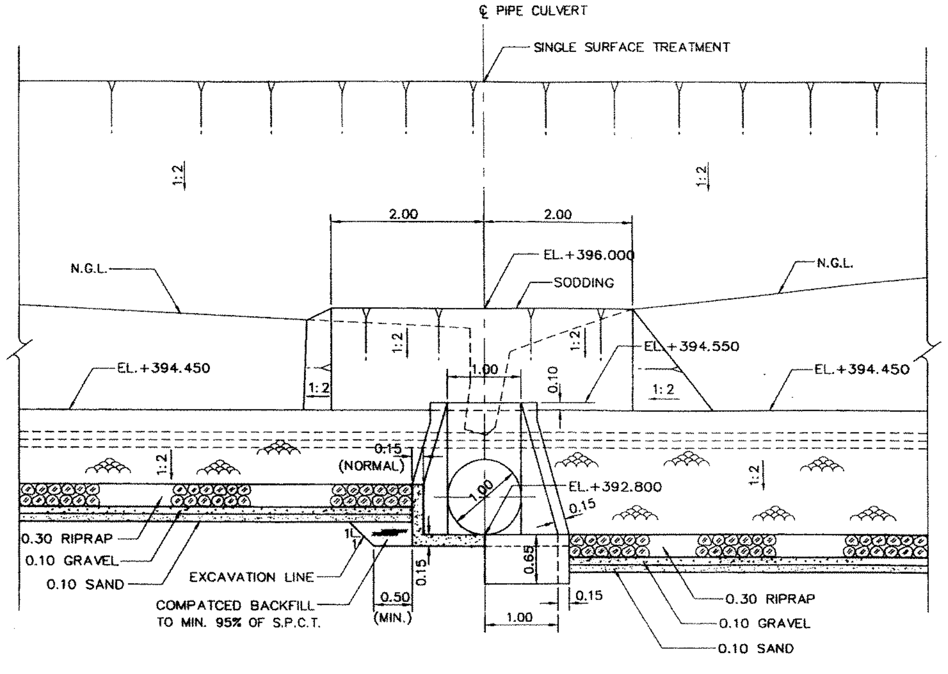


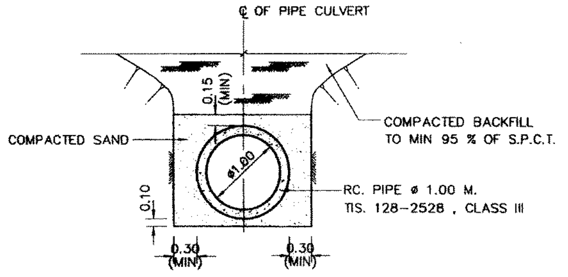
PLAN

SCALE 1:100



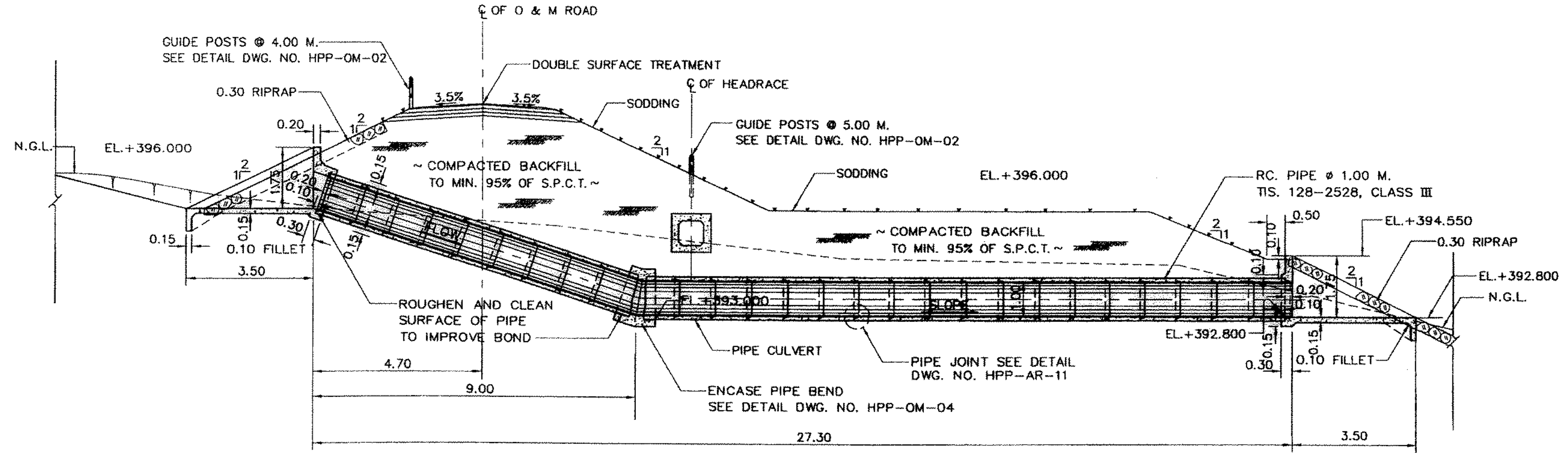
SECTION B – B

SCALE 1:50



PIPE INSTALLATION

SCALE 1:50



SECTION A – A

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. HPP-GN-03

REFERENCE DRAWINGS :

1.	O&M ROAD, PLAN AND PROFILE, STA. 0+000.000 TO STA. 0+137.376	HPP-OM-01
2.	O&M ROAD, PIPE CULVERT, STA. 0+081.091, REINFORCEMENT DETAILS	HPP-OM-04
3.	ACCESS ROAD, RC. PIPE CULVERT	HPP-AR-11

KINGDOM OF THAILAND
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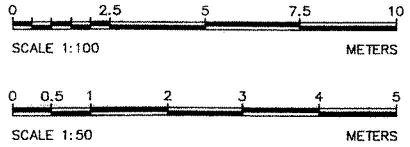
HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
O & M ROAD
PIPE CULVERT STA.0+081.091, PLAN AND SECTIONS



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED ภย.46159 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-OM-03
SHEET NO. 56 OF 100

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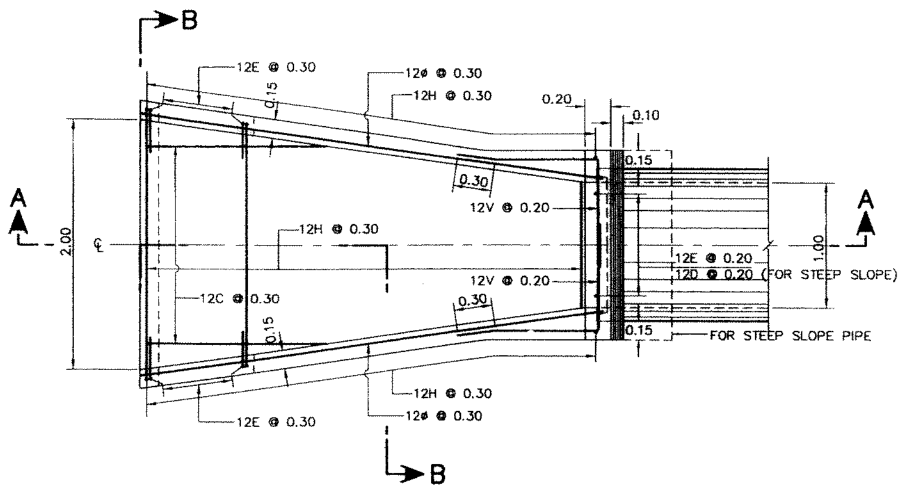
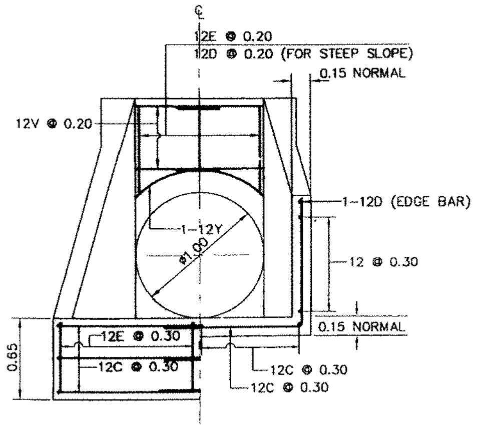


PLAN

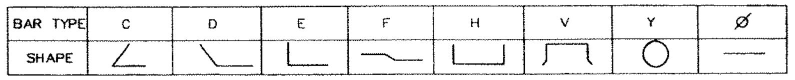
SCALE 1:30



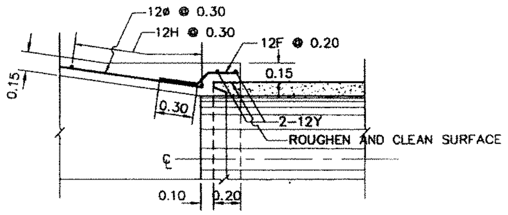
SECTION B – B

SCALE 1:30

TABLE OF BAR TYPE

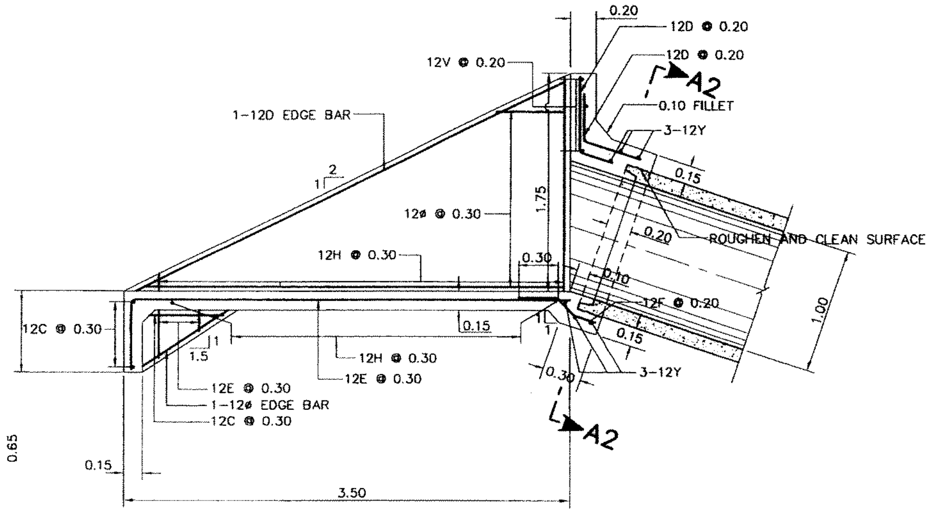


BAR TYPE	C	D	E	F	H	V	Y	Ø
SHAPE								



SECTION A1 –A1

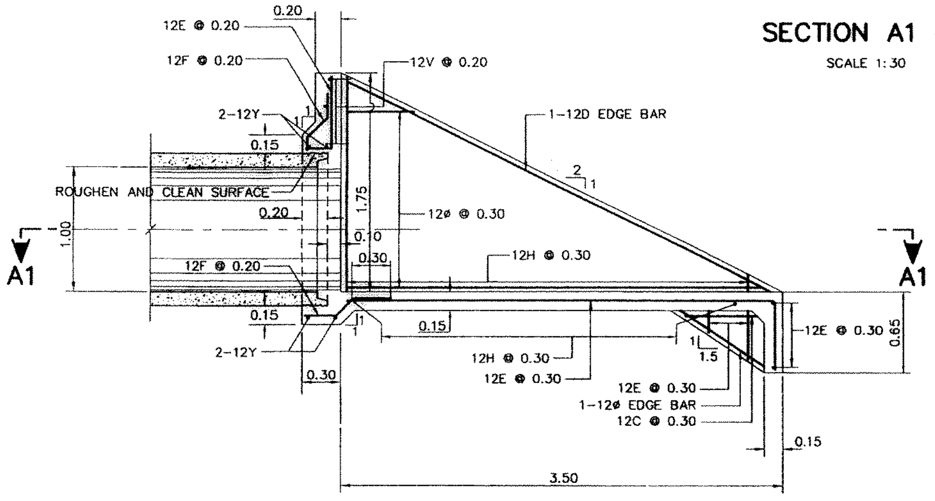
SCALE 1:30



SECTION A – A

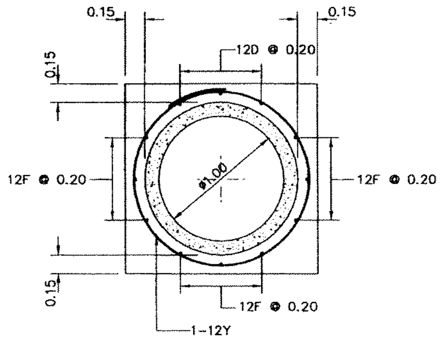
FOR STEEP SLOPE PIPE

SCALE 1:30



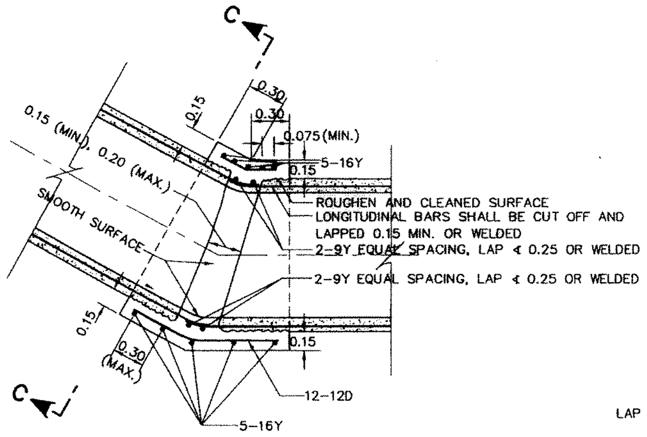
SECTION A – A

SCALE 1:30



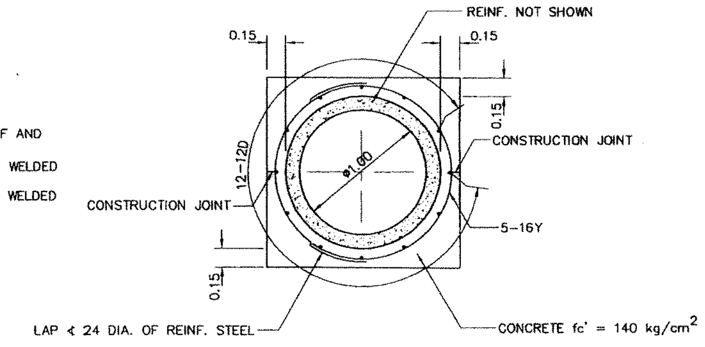
SECTION A2–A2

SCALE 1:30


C
0.30
0.30
0.15
0.075(MIN.)
5-16Y
0.15 (MIN.)
0.20 (MAX.)
0.15
SMOOTH SURFACE
ROUGHEN AND CLEANED SURFACE
LONGITUDINAL BARS SHALL BE CUT OFF AND LAPPED 0.15 MIN. OR WELDED
2-9Y EQUAL SPACING, LAP ≮ 0.25 OR WELDED
2-9Y EQUAL SPACING, LAP ≮ 0.25 OR WELDED
0.15
0.30 (MAX.)
0.15
12-12D
5-16Y
C

ENCASED MITERED PIPE BEND

SCALE 1:30



SECTION C – C

SCALE 1:30

NOTES :

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

REFERENCE DRAWINGS :

1.	O&M ROAD, PLAN AND PROFILE, STA. 0+000.000 TO STA. 0+137.376	HPP-OM-01
2.	O&M ROAD, PIPE CULVERT STA. 0+081.091, PLAN AND SECTIONS	HPP-OM-03

SCALE 1:30 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

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MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

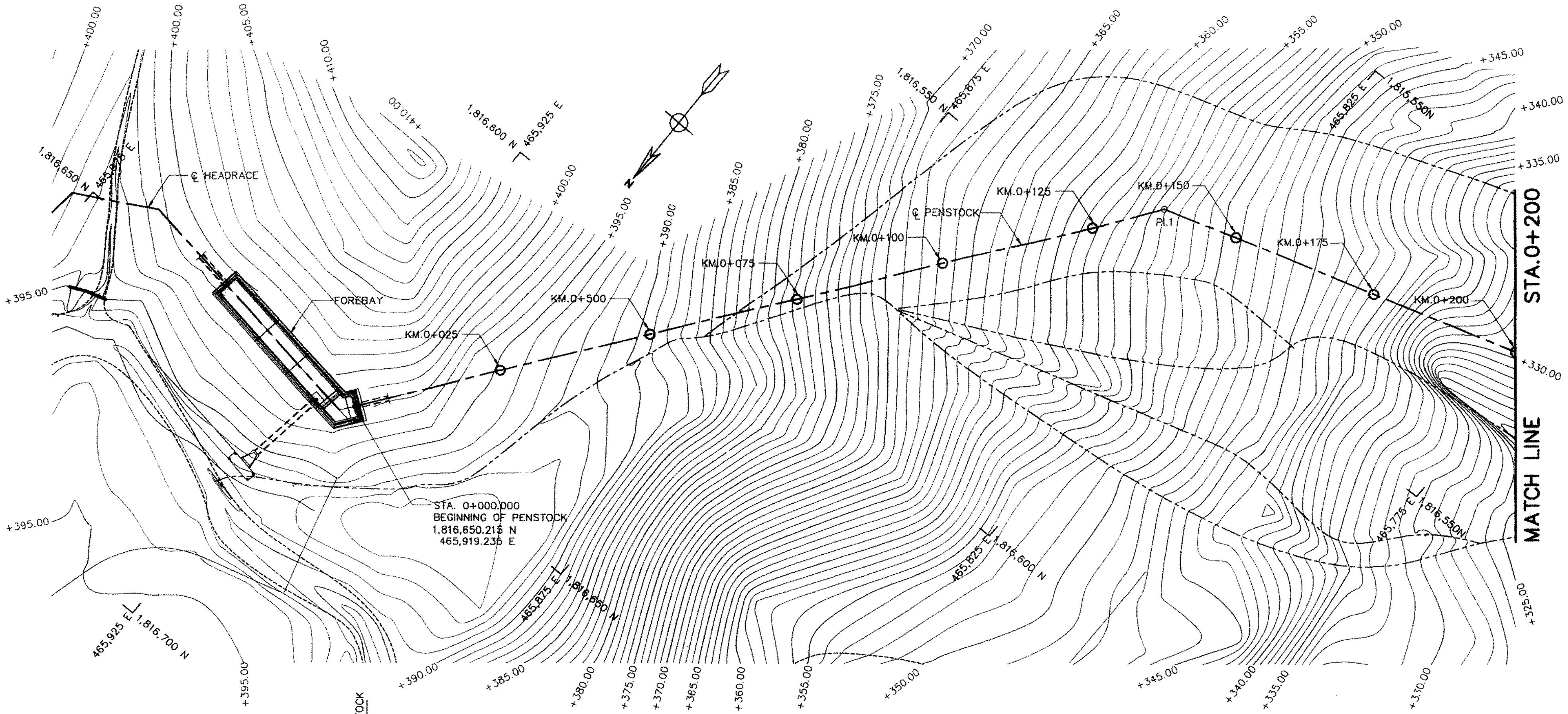
HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
O & M ROAD
PIPE CULVERT STA.0+081.091, REINFORCEMENT DETAILS

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภย.46150 ภย.4651
DRAWN
CHECKED ภย.4651
PROJECT MANAGER 8/12/51 DATE

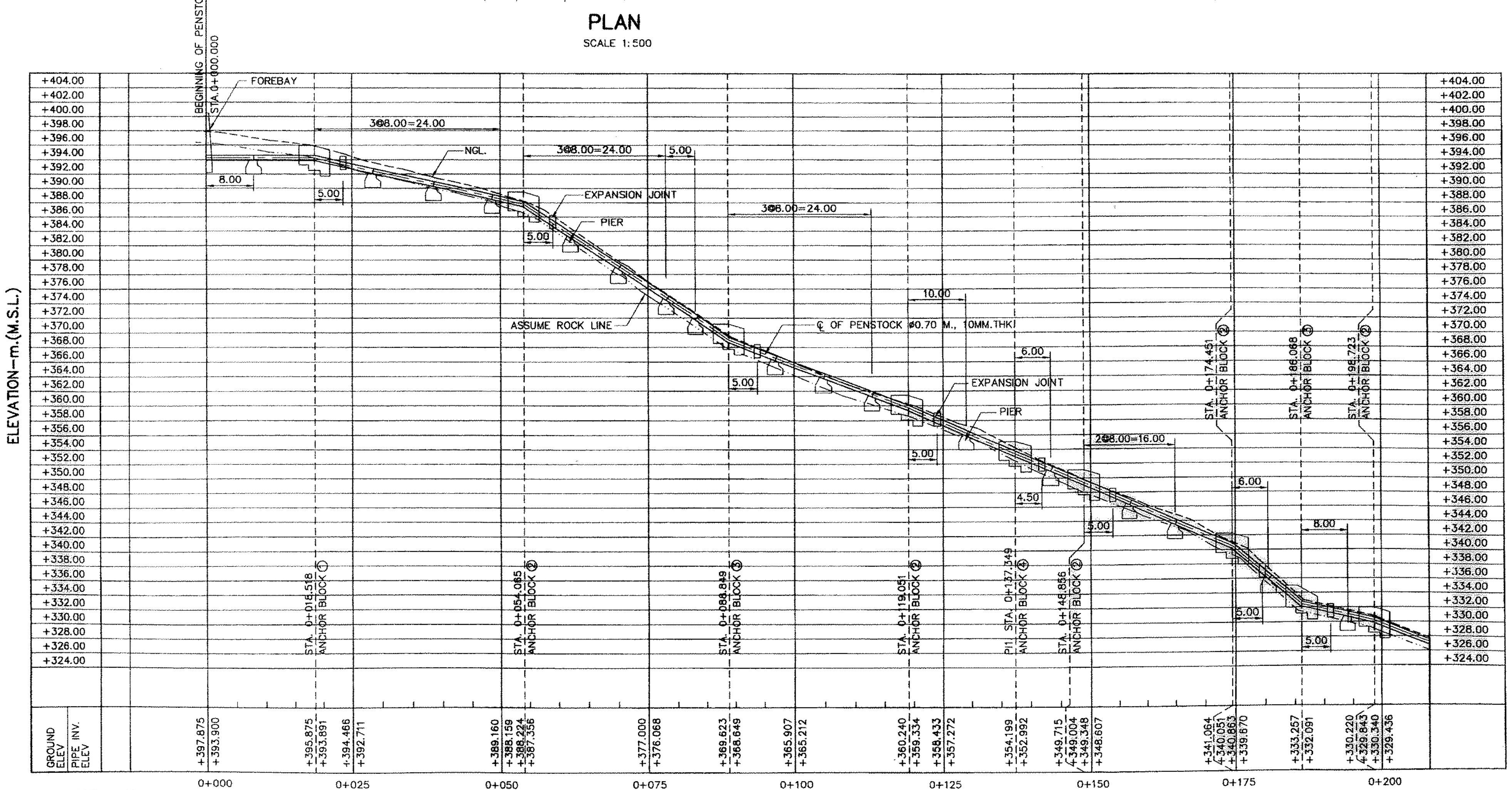
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-OM-04
SHEET NO. 57 OF 100



PLAN

SCALE 1:500



PROFILE

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:400

HORIZONTAL CURVE

NO. OF CURVE	PI. Sta.	PI. TO PI. m.	COORDINATE OF PI. N	COORDINATE OF PI. E	ANGLE I	BEARING
BEGIN	0+000.000		1,816,650.215	465,919.235		
		137.349				S 36°–25'–15" W
PI.1	0+137.349		1,816,539.694	465,837.690	36°–27'–30"	
		176.120				S 72°–52'–45" W
PI.2	0+313.469		1,816,487.846	465,669.374	22°–01'–16"	
		60.087				N 85°–05'–59" W
END	0+373.556		1,816,495.901	465,610.543		

NOTES:

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP–GN–03
3. ALIGNMENT OF PENSTOCK SHALL BE JUSTIFIED BY FIELD ENGINEER IN THE FIELD TO SUIT THE TOPOGRAPHY

REFERENCE DRAWINGS :

1. PENSTOCK, PLAN AND PROFILE, STA 0+200.000 TO 0+373.556	HPP–PS–02
2. PENSTOCK, ANCHOR BLOCK NO. 1, 2, 3, 4, 5 PLAN AND SECTIONS	HPP–PS–03
3. PENSTOCK, EXPANSION JOINT, PLAN, SECTIONS AND DETAILS	HPP–PS–04

0 5.0 10.0 20.0 30.0
SCALE 1:400 METERS

0 5.0 10.0 20.0 30.0 40.0
SCALE 1:500 METERS

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

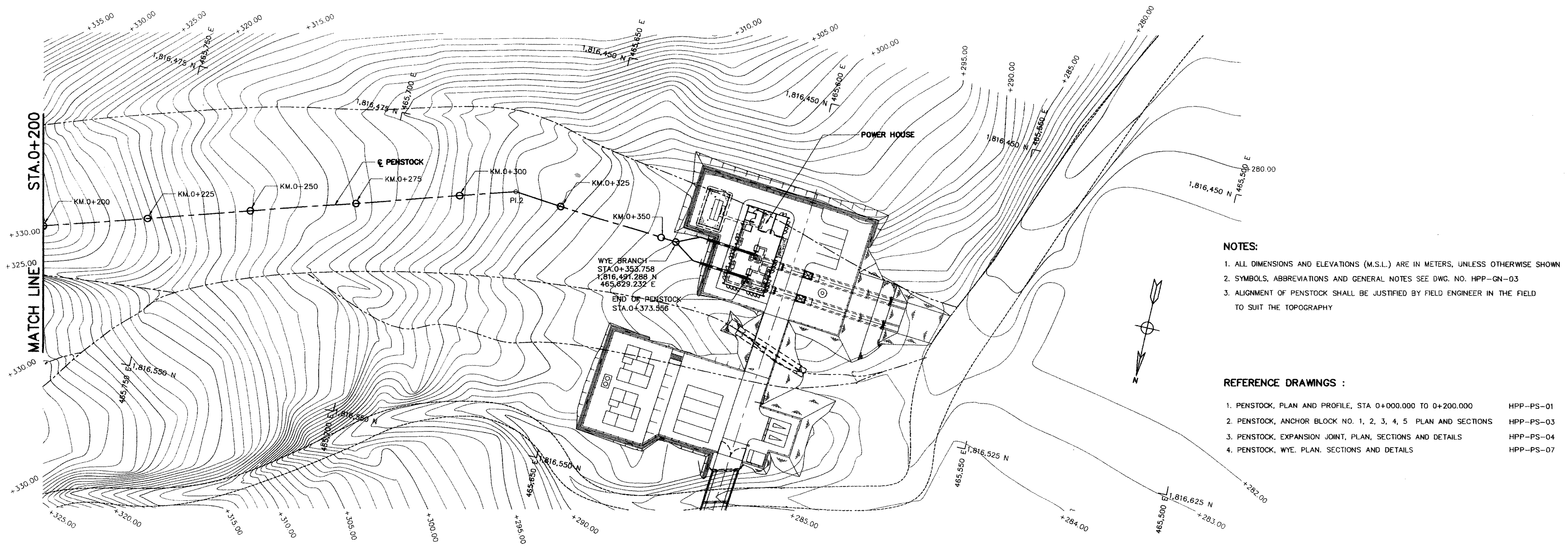
CIVIL WORKS
PENSTOCK
PLAN AND PROFILE, STA. 0+000.000 TO STA. 0+200.000

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED
DRAWN
CHECKED
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–PS–01
SHEET NO. 58 OF 100



PLAN

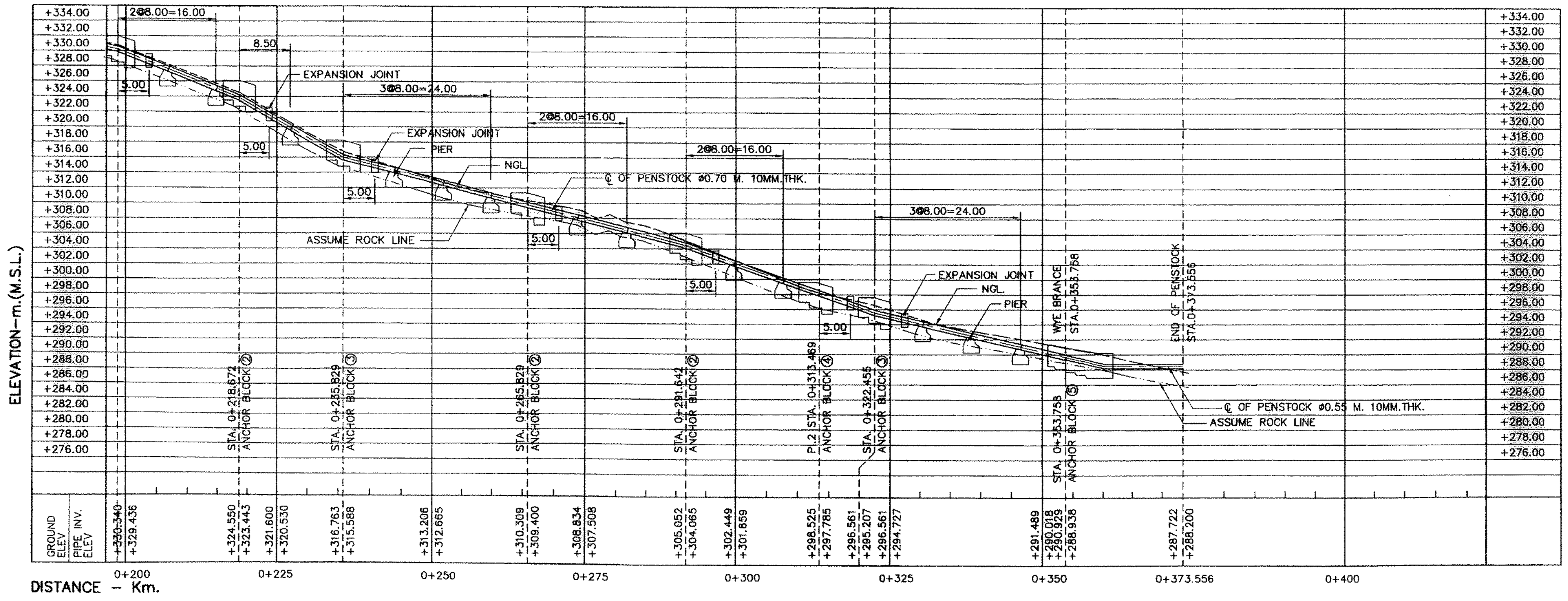
SCALE 1:500

NOTES:

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP-GN-03
3. ALIGNMENT OF PENSTOCK SHALL BE JUSTIFIED BY FIELD ENGINEER IN THE FIELD TO SUIT THE TOPOGRAPHY

REFERENCE DRAWINGS :

1. PENSTOCK, PLAN AND PROFILE, STA 0+000.000 TO 0+200.000	HPP-PS-01
2. PENSTOCK, ANCHOR BLOCK NO. 1, 2, 3, 4, 5 PLAN AND SECTIONS	HPP-PS-03
3. PENSTOCK, EXPANSION JOINT, PLAN, SECTIONS AND DETAILS	HPP-PS-04
4. PENSTOCK, WYE. PLAN. SECTIONS AND DETAILS	HPP-PS-07

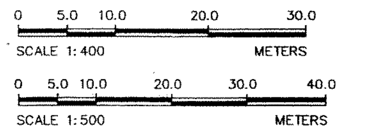


PROFILE

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:400

HORIZONTAL CURVE

NO. OF CURVE	PI. Sta.	PI. TO PI. m.	COORDINATE OF PI.		ANGLE I	BEARING
			N	E		
BEGIN	0+000.000	137.349	1,816,650.215	465,919.235		S 36°–25'–15" W
PI.1	0+137.349	176.120	1,816,539.694	465,837.690	36°–27'–30"	S 72°–52'–45" W
PI.2	0+313.469	60.087	1,816,487.846	465,669.374	22°–01'–16"	N 85°–05'–59" W
END	0+373.556		1,816,495.901	465,610.543		



KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

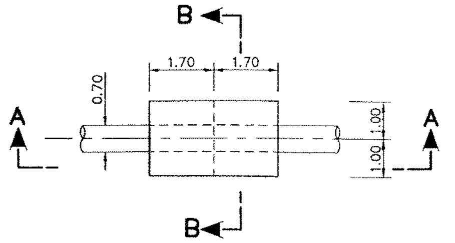
CIVIL WORKS
PENSTOCK
PLAN AND PROFILE, STA. 0+200.000 TO STA. 0+373.556

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

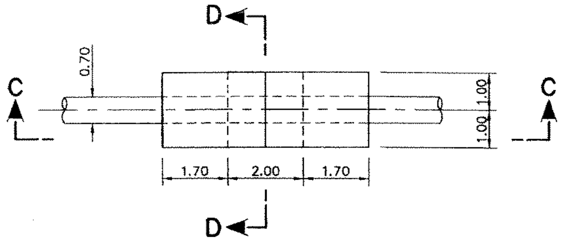
MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED
DRAWN
CHECKED
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

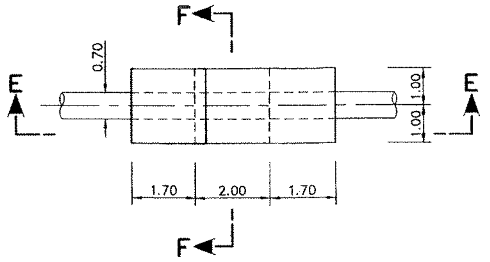
DRAWING NO. HPP-PS-02
SHEET NO. 59 OF 100



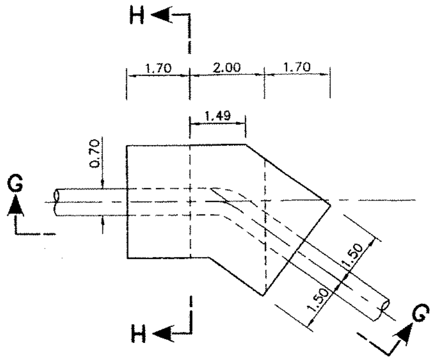
PLAN
ANCHOR ①
SCALE 1:100



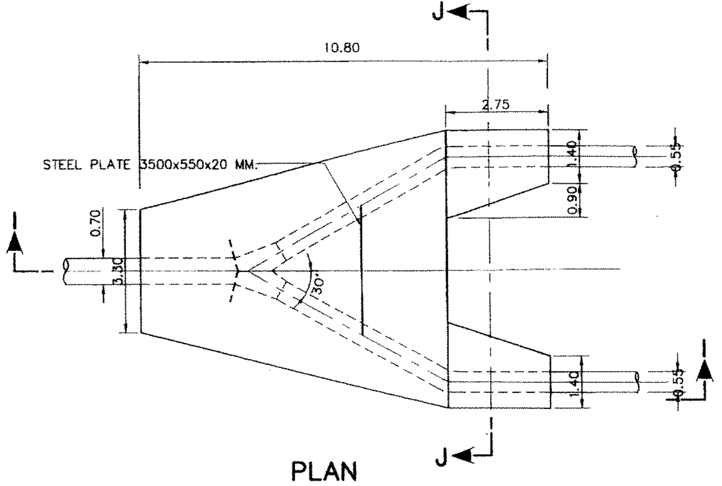
PLAN
ANCHOR ②
SCALE 1:100



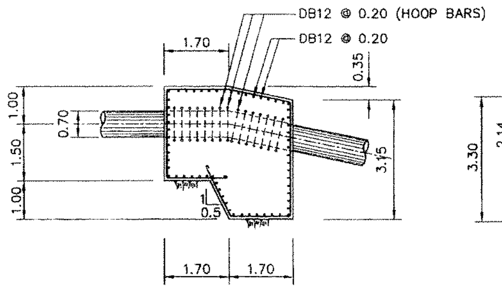
PLAN
ANCHOR ③
SCALE 1:100



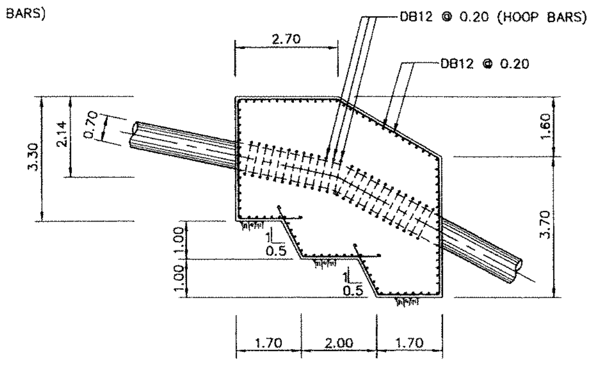
PLAN
ANCHOR ④
SCALE 1:100



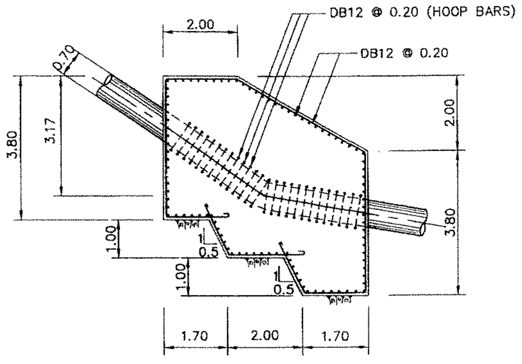
PLAN
ANCHOR ⑤
SCALE 1:100



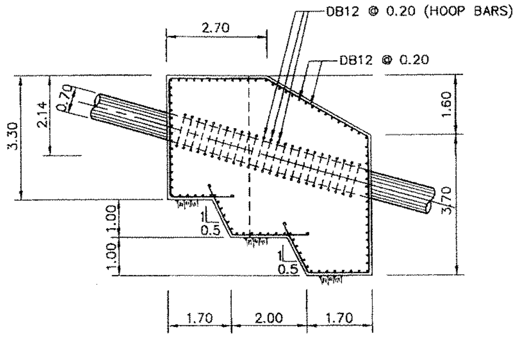
SECTION A–A
ANCHOR ①
SCALE 1:100



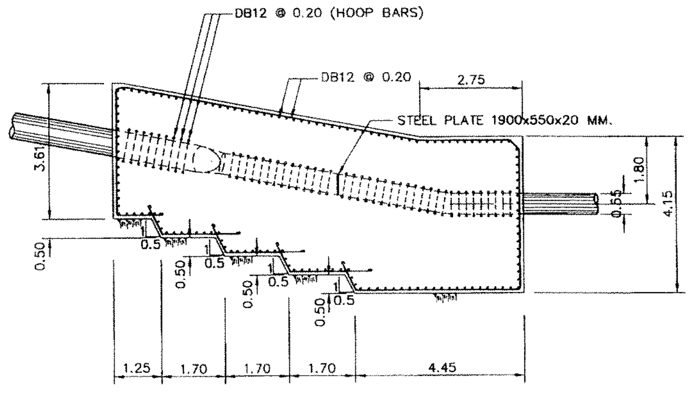
SECTION C–C
ANCHOR ②
SCALE 1:100



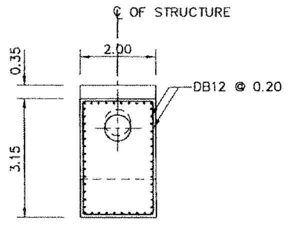
SECTION E–E
ANCHOR ③
SCALE 1:100



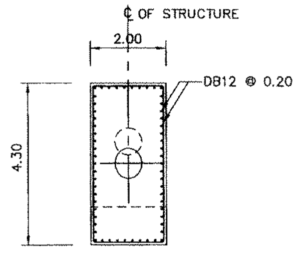
SECTION G–G
ANCHOR ④
SCALE 1:100



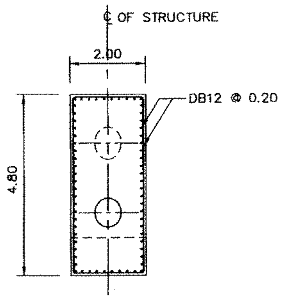
SECTION I–I
ANCHOR ⑤



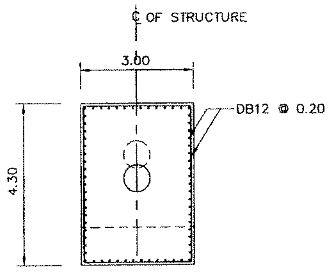
SECTION B–B
ANCHOR ①
SCALE 1:100



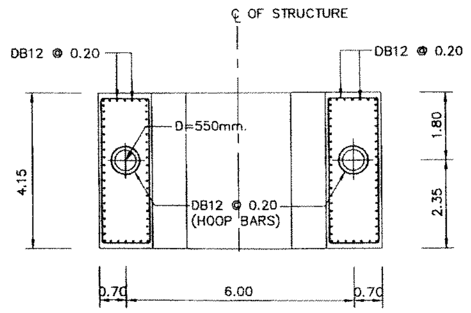
SECTION D–D
ANCHOR ②
SCALE 1:100



SECTION F–F
ANCHOR ③
SCALE 1:100



SECTION H–H
ANCHOR ④
SCALE 1:100



SECTION J–J
ANCHOR ⑤
SCALE 1:100

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

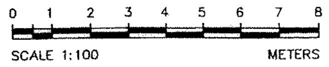
CIVIL WORKS
PENSTOCK
ANCHOR BLOCK NO. 1, 2, 3, 4, 5, PLAN AND SECTIONS

NOTES :

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP–GN–03
3. CONCRETE COVER OF STEEL BARS 8.0 CM.
4. REINFORCED CONCRETE IS PLAIN CONCRETE WITH 40% DUMPED ROCK
5. CORROSIVE PROTECTION IS WARNED TO STRICTLY FOLLOW PAINTING SPECIFICATION

REFERENCE DRAWING :

1. PENSTOCK, PLAN AND PROFILE, STA 0+000.000 TO 0+200.000	HPP–PS–01
2. PENSTOCK, PLAN AND PROFILE, STA 0+200.000 TO 0+373.556	HPP–PS–02



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–PS–03
SHEET NO. 60 OF 100

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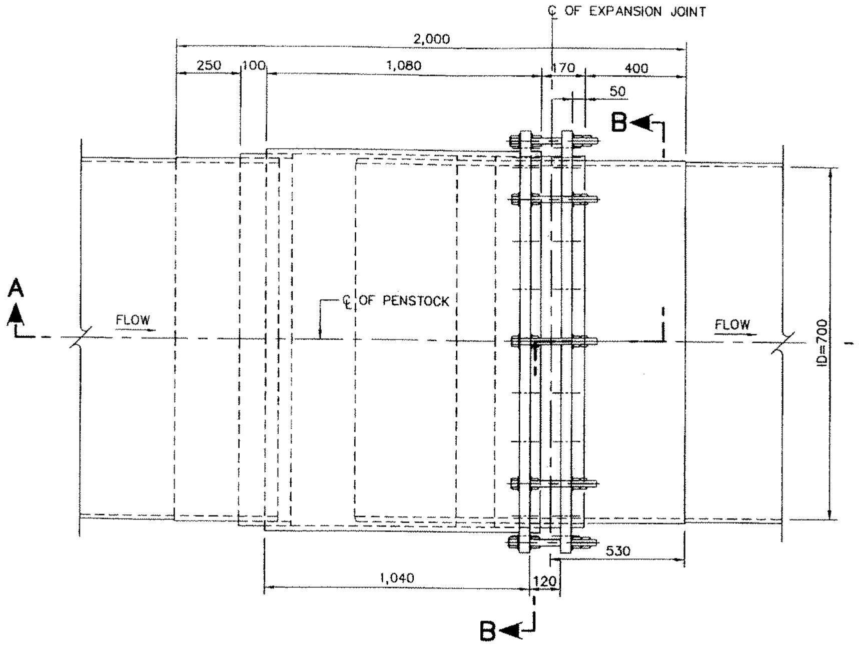
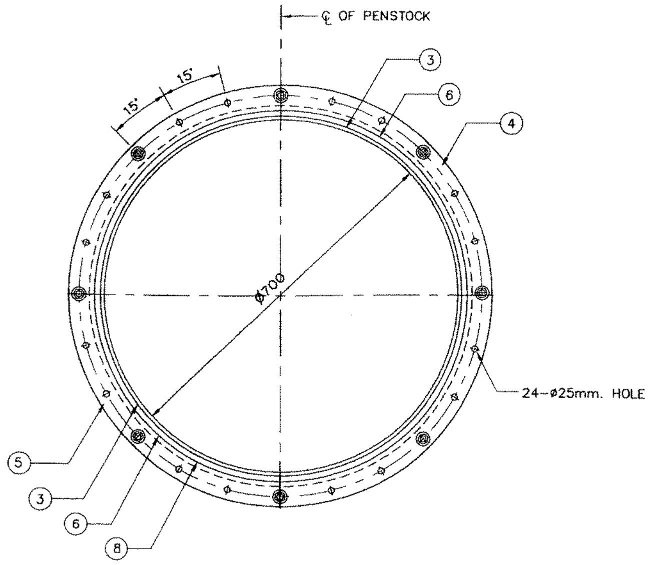


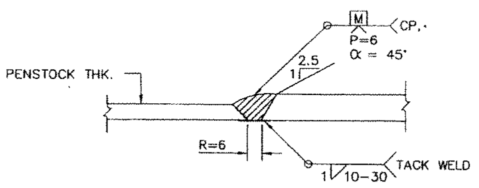
ELEVATION

SCALE 1:7.5



SECTION B–B

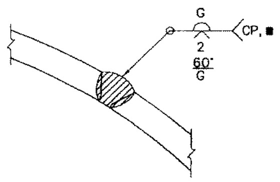
SCALE 1:7.5



TRANSITION THICKNESS OF
BUTT JOINT IN PARTS OF
UNEQUAL THICKNESS

DETAIL "1"

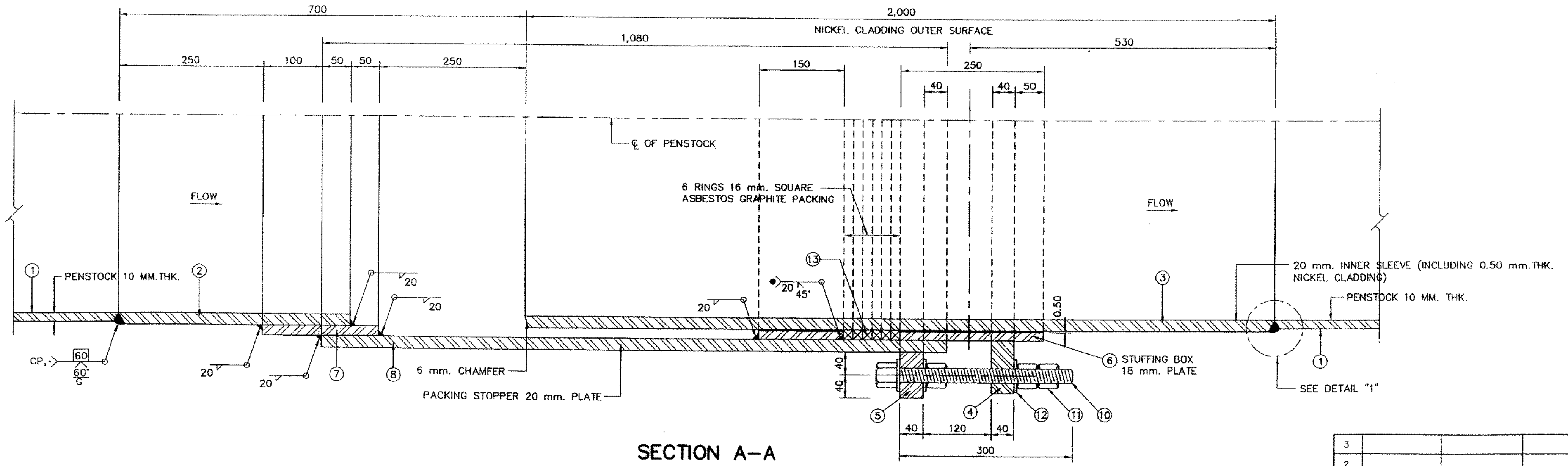
NOT TO SCALE



LONGITUDINAL WELD

DETAIL "2"

NOT TO SCALE



SECTION A–A

SCALE 1:5

TABLE OF DETAIL 1 SQUARE – GROOVE WELD , BUTT JOINT

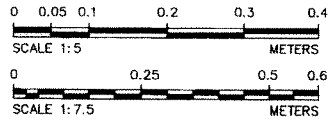
ITEM	DESCRIPTION	MATERIAL	QUANT.	REMARKS
1	PENSTOCK	ASTM A–283, GRADE D	–	––
2	PENSTOCK	ASTM A–283, GRADE D	1	NOTE 2 & 3
3	INNER SLEEVE	ASTM A–283, GRADE D	1	NOTE 2 & 4
4	GRAND RING	ASTM A–283, GRADE D	1	SEAMLESS, NOTE 3
5	OUTER RING	ASTM A–283, GRADE D	1	SEAMLESS, NOTE 3
6	STUFFING BOX	ASTM A–283, GRADE 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. HPP–GN–03

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°



KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
EXPANSION JOINT, PLAN, SECTIONS AND DETAILS

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED สย.46159 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER 8/12/51 DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED
DRAWING NO. HPP–PS–04
SHEET NO. 61 OF 100

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS | DEDE

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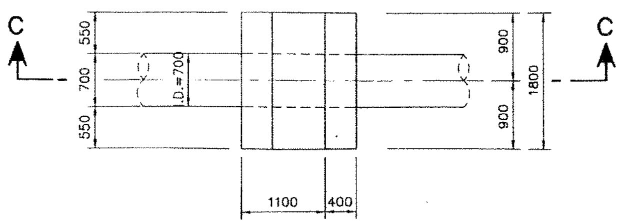
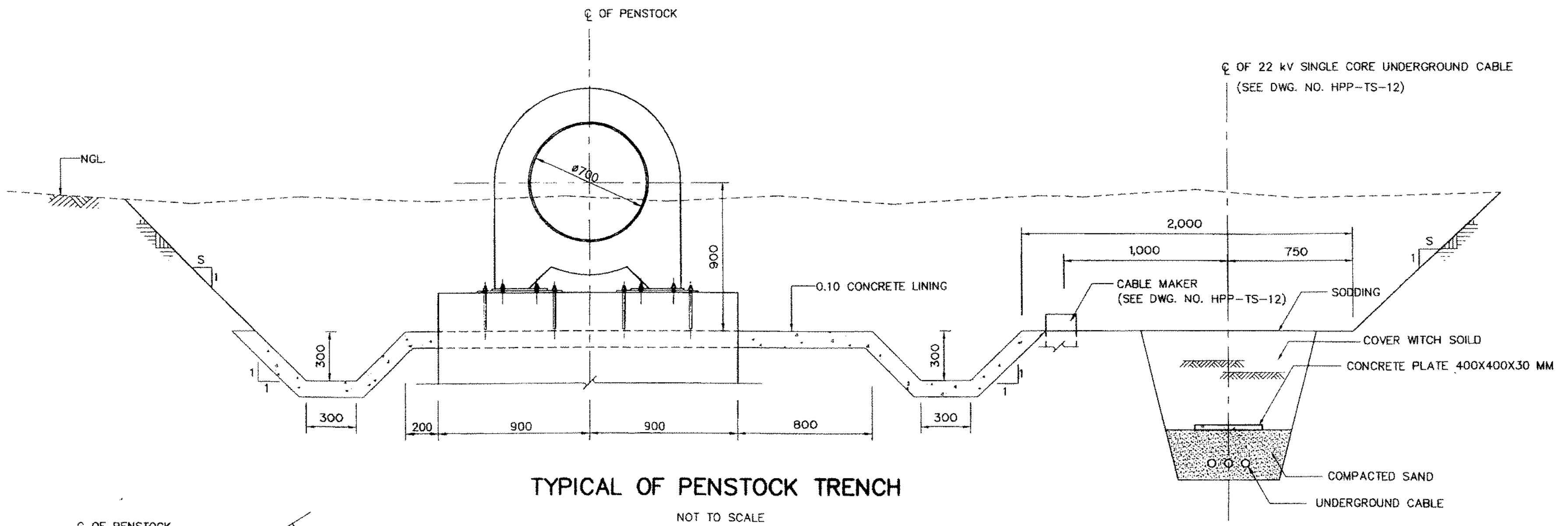


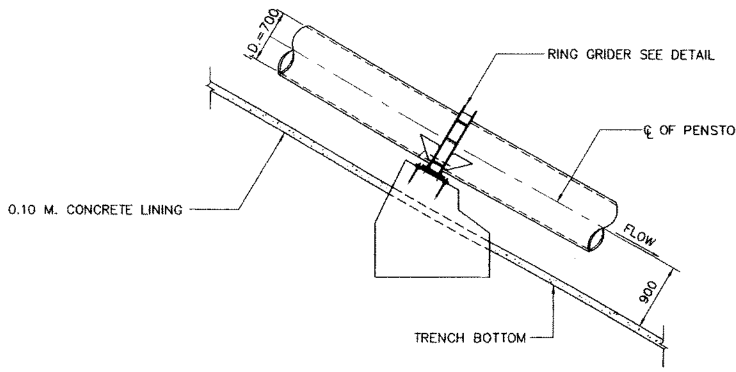
PLAN (PIPE SUPPORT)

SCALE 1:50



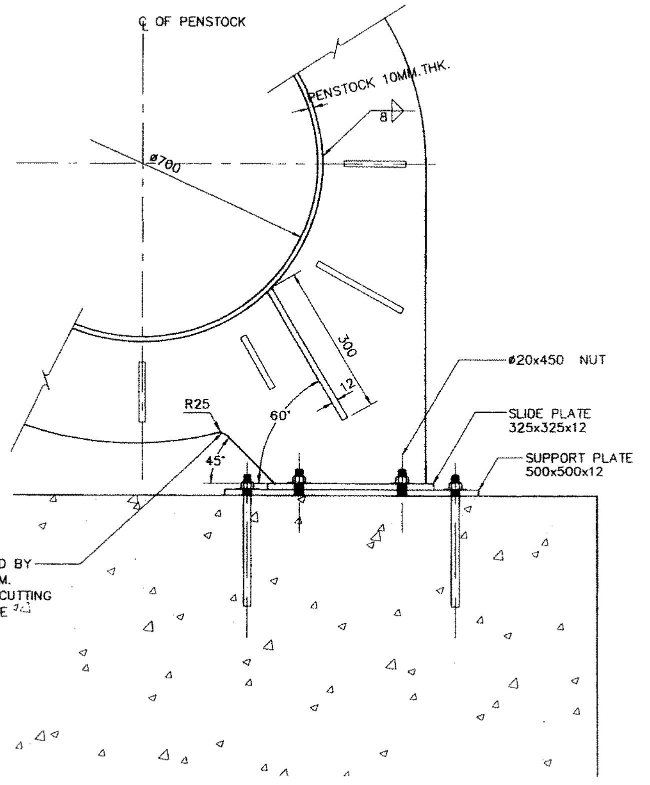
TYPICAL OF PENSTOCK TRENCH

NOT TO SCALE



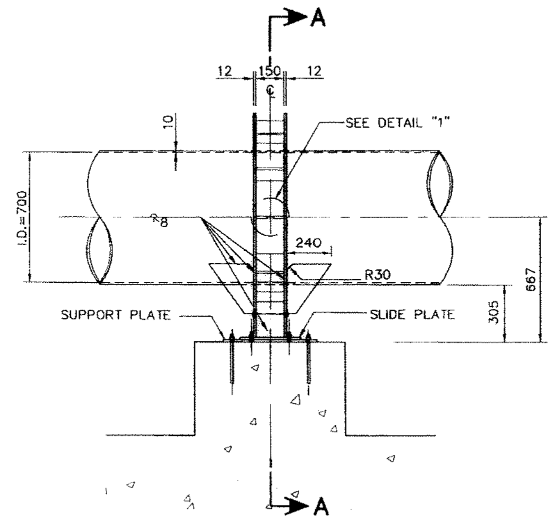
ELEVATION

SCALE 1:50



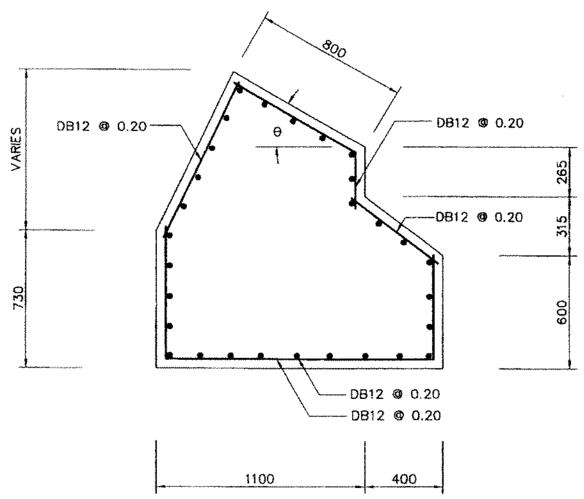
DETAIL "3"

SCALE 1:7.5



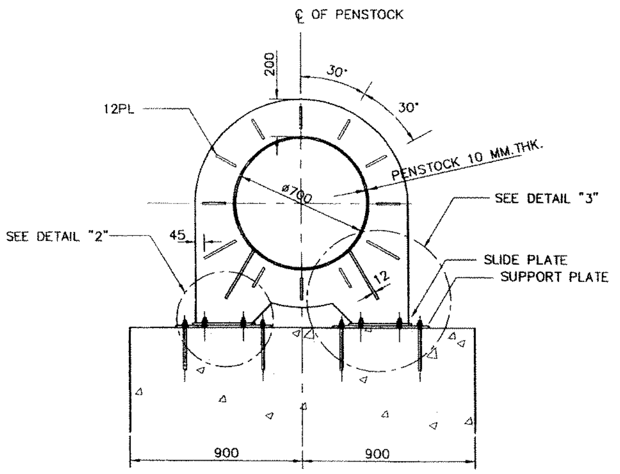
RING GIRDER FOR 700I.D. PIPE

SCALE 1:20



SECTION C-C

SCALE 1:20

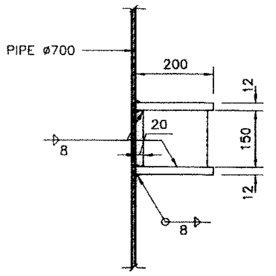


SECTION A-A

SCALE 1:20

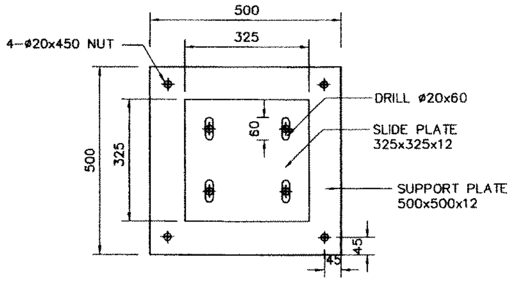
PIER DIMENSIONS

KM.		SLOPE (θ)
FROM	TO	DEGREE
0+000.000	0+018.518	00°-00'-00"
0+018.518	0+054.065	10°-19'-09"
0+054.065	0+088.849	28°-19'-59"
0+088.849	0+119.051	17°-07'-29"
0+119.051	0+174.451	19°-06'-58"
0+174.451	0+186.068	34°-46'-07"
0+186.068	0+198.723	9°-59'-24"
0+198.723	0+218.672	17°-43'-11"
0+218.672	0+235.829	24°-42'-56"
0+235.829	0+291.642	11°-39'-16"
0+291.642	0+322.455	16°-03'-39"
0+322.455	0+353.758	10°-40'-03"



DETAIL "1"

SCALE 1:10

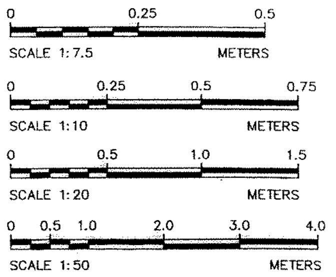


DETAIL "2"

SCALE 1:10

NOTES :

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



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
PIPE SUPPORT, PLAN, SECTIONS AND DETAILS

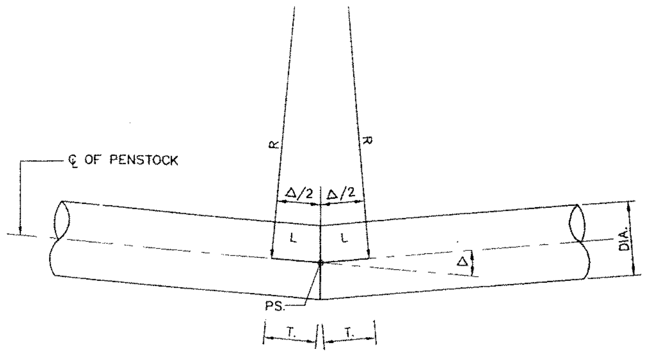
MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-PS-05
SHEET NO. 62 OF 100

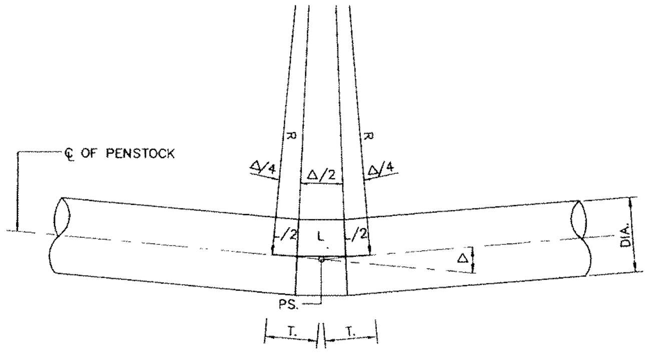
D:\0783\HPP-PS-05.dwg /14-11-2008/ SNP



BEND TYPE "1"

DELTA(Δ) 0°-5°

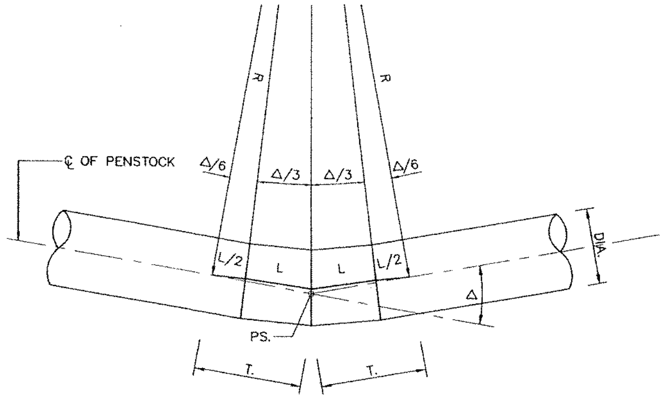
SCALE 1:20



BEND TYPE "2"

DELTA(Δ) 5°-15°

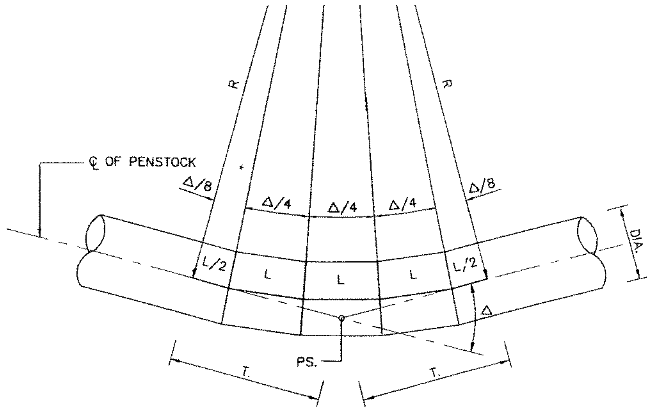
SCALE 1:20



BEND TYPE "3"

DELTA(Δ) 15°-25°

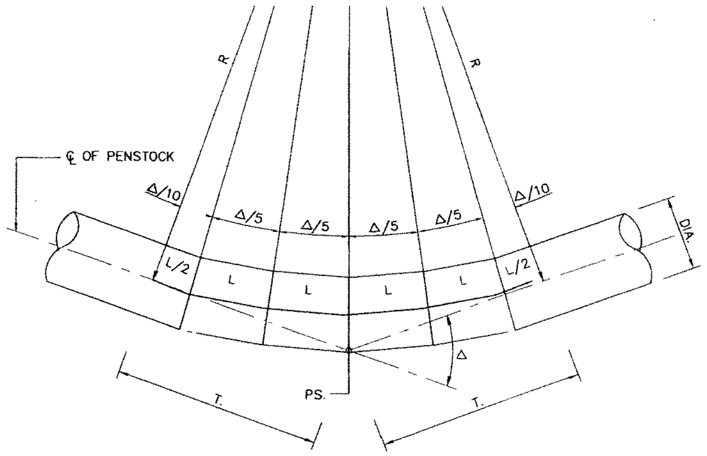
SCALE 1:20



BEND TYPE "4"

DELTA(Δ) 25°-35°

SCALE 1:20



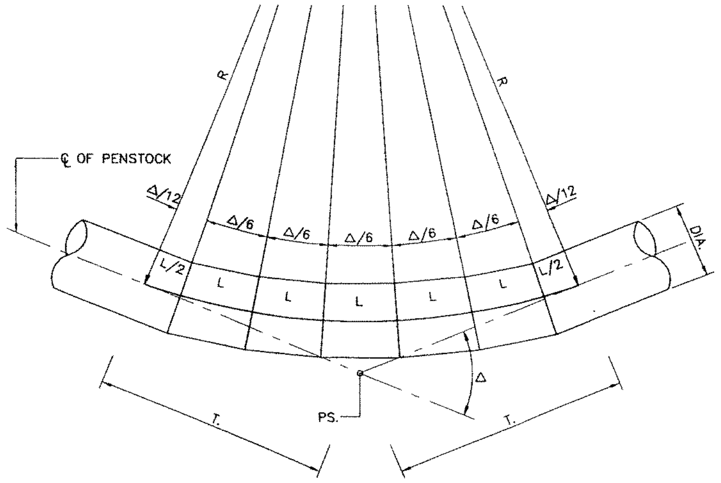
BEND TYPE "5"

DELTA(Δ) 35°-45°

SCALE 1:20

NOTES :

1. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP-GN-03



BEND TYPE "6"

DELTA(Δ) 55°-OVER

SCALE 1:20

DIMENSIONS OF BENDS

BEND	KM. OF PS.	PS. NO.	Δ (DEGREE)	TYPE	T. (M.) (m.)	R (m.)	DIA. (m.)	L (m.)	THICKNESS (mm.)
1	0+018.518	1	10°-19'-09"	2	0.225	2.492	0.70	0.449	10
2	0+054.065	2	18°-00'-50"	3	0.225	1.419	0.70	0.446	10
3	0+088.849	3	11°-12'-19"	2	0.225	2.294	0.70	0.449	10
4	0+119.051	4	01°-59'-18"	1	0.225	12.965	0.70	0.450	10
5	0+137.349	PI.1	36°-27'-30"	5	0.450	1.366	0.70	0.869	10
6	0+174.451	5	15°-39'-08"	3	0.225	1.637	0.70	0.447	10
7	0+186.068	6	24°-46'-43"	3	0.450	2.049	0.70	0.886	10
8	0+198.723	7	07°-43'-49"	2	0.225	3.330	0.70	0.449	10
9	0+218.672	8	06°-59'-45"	2	0.225	3.681	0.70	0.449	10
10	0+235.829	9	13°-03'-40"	2	0.225	1.965	0.70	0.448	10
11	0+291.642	10	04°-24'-23"	1	0.225	5.848	0.70	0.450	10
12	0+313.469	PI.2	22°-01'-16"	3	0.225	1.156	0.70	0.444	10
13	0+322.455	11	05°-23'-36"	2	0.225	4.777	0.70	0.450	10
14	0+356.258	12	10°-40'-03"	2	0.225	4.777	0.55	0.449	10

0 0.5 1.0 1.5

SCALE 1:20 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
BEND DETAILS

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED สย.4651
DRAWN
CHECKED สย.4651
8/12/51
PROJECT MANAGER DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-PS-06

SHEET NO. 63 OF 100

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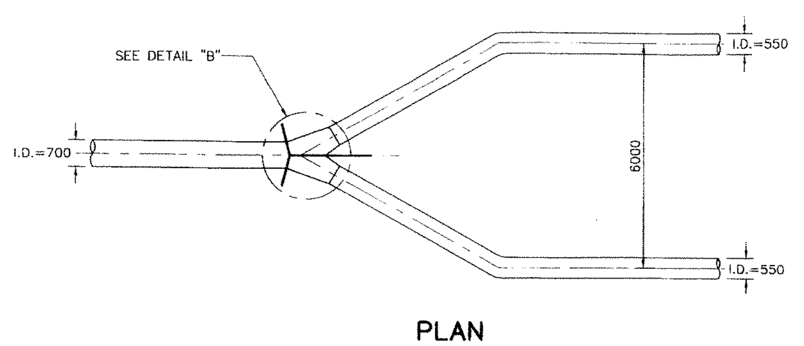
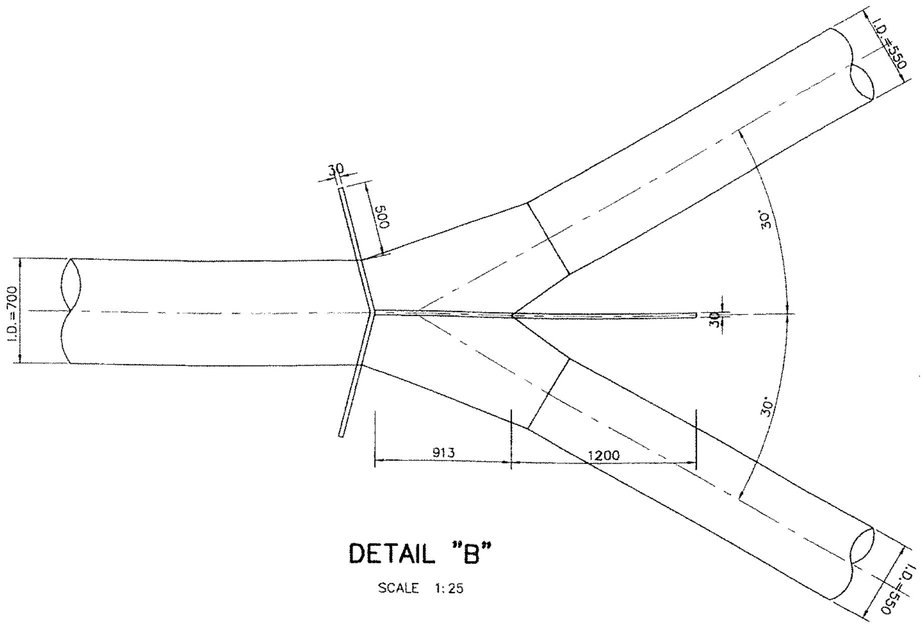
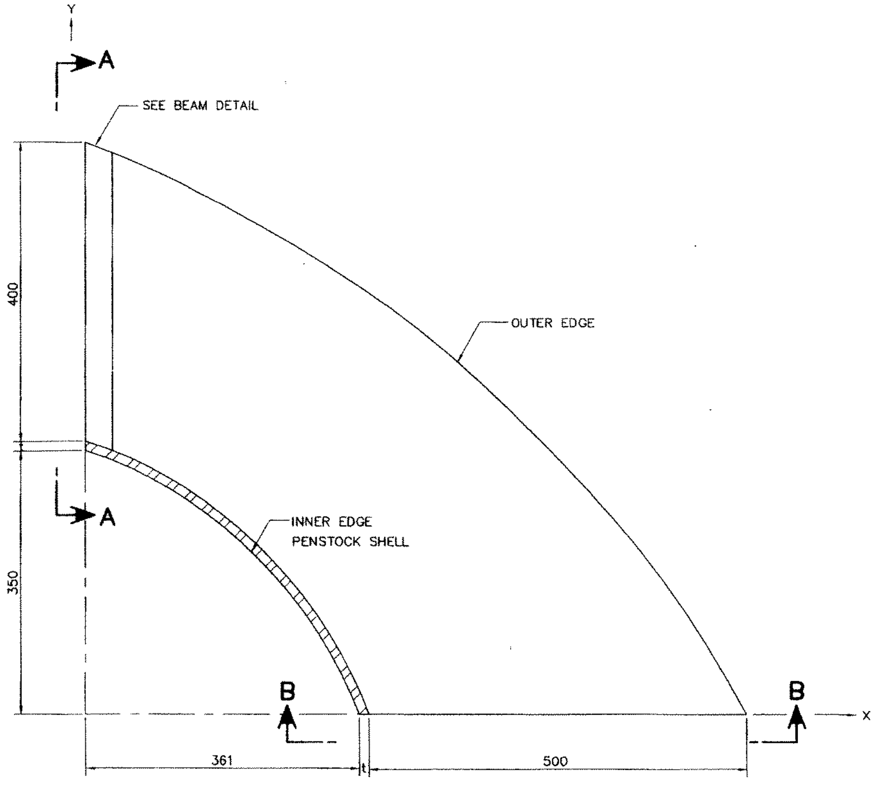


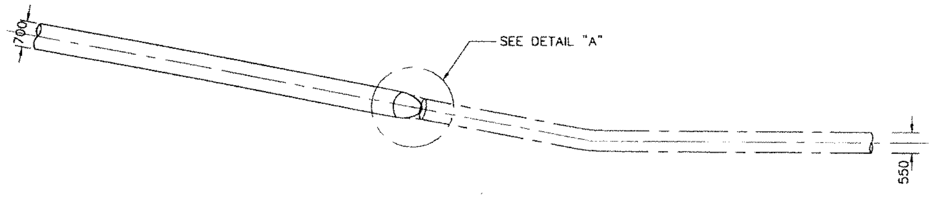
PLAN
SCALE 1:100



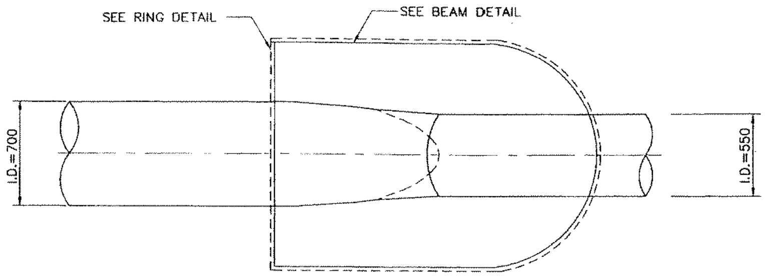
DETAIL "B"
SCALE 1:25



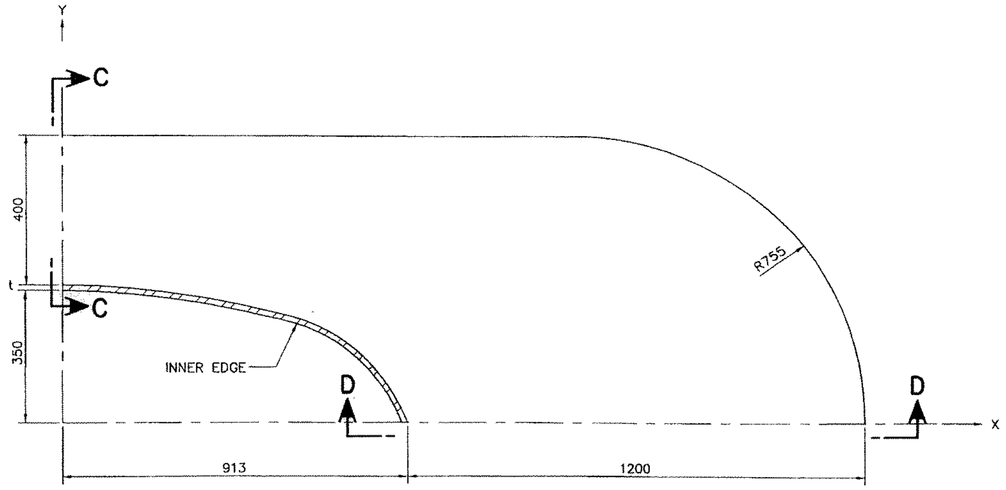
RING DETAIL
SCALE 1:5



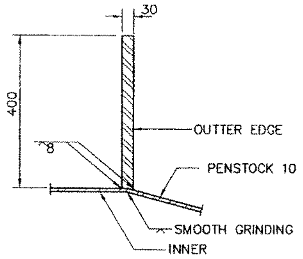
ELEVATION
SCALE 1:100



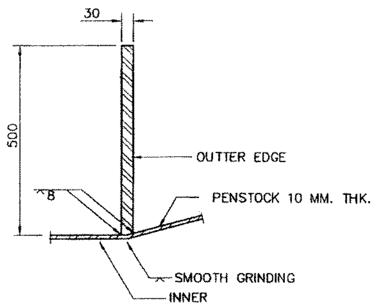
DETAIL "A"
SCALE 1:25



BEAM DETAIL
SCALE 1:10



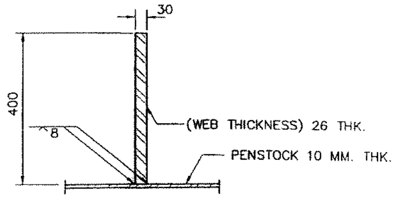
SECTION A–A
SCALE 1:10



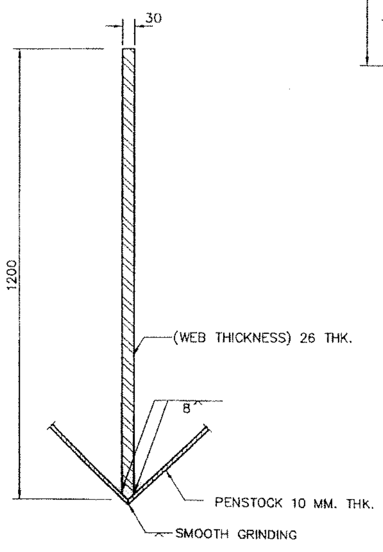
SECTION B–B
SCALE 1:10

NOTES :

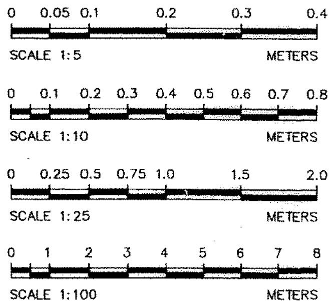
1. ALL DIMENSIONS ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP–GN–03



SECTION C–C
SCALE 1:10



SECTION D–D
SCALE 1:10



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
WYE, PLAN, SECTIONS AND DETAILS

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED ก.ย.46159 ธ.ย.4651
DRAWN
CHECKED ธ.ย.4651
PROJECT MANAGER 8/12/51 DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–PS–07
SHEET NO. 64 OF 100

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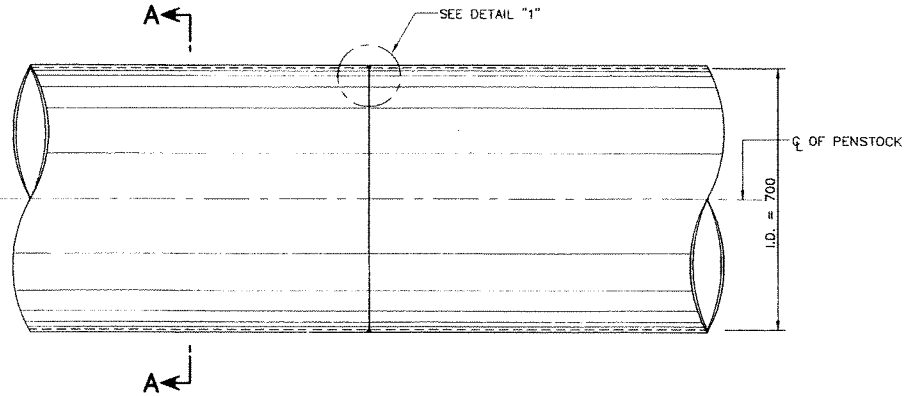
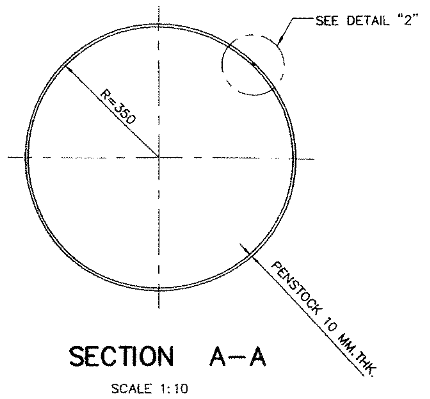


ELEVATION

SCALE 1:10



SECTION A–A

SCALE 1:10

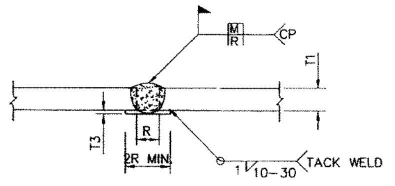
TABLE OF DETAIL "1" SQUARE–GROOVE WELD, BUTT JOINT

WELDING PROCESS	DESIGNATION	BASE METAL THICKNESS		GROOVE PREPARATION		TOLERANCES		REMARKS
		T1	T3	ROOT OPENING	GROOVE ANGLE	ROOT OPENING	GROOVE ANGLE	
SMAW	B–L1a	10	1.0	R = T1	–	+1.5,–0	–	SINGLE–PASS WELD
GMAW FCAW	B–L1a–GF	10	1.0	R = T	–	+1.5,–0	–	SINGLE–PASS WELD

SMAW = SHIELD METAL ARC WELDING

GMAW = GAS METAL ARC WELDING

FCAW = FLUX CORED ARC WELDING

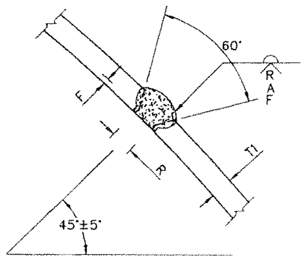


CIRCULAR BUTT JOINT

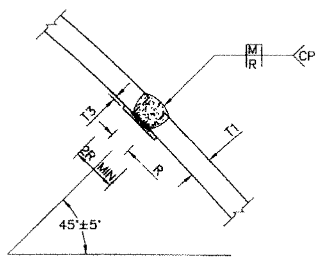
DETAIL "1"

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	10	–	R = 2.0	A = 60°	F = 1.5	+15,–0	+10°,–0°	+15,–0	SINGLE–PASS WELD
	SMAW	B–U2	10	–	R = 2.0	A = 60°	F = 2.0	+15,–0	+10°,–0°	+15,–0	SINGLE–PASS WELD
B	SMAW	B–L1a–GF	10	1.0	R = 6.0	–	–	+15,–0	–	–	SINGLE–PASS WELD
	GMAW FCAW	B–L1a–GF	10	1.0	R = 9.0	–	–	+15,–0	–	–	SINGLE–PASS WELD



LONGITUDINAL BUTT JOINT
TYPE "A"



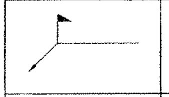
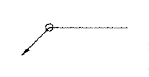
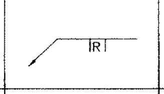
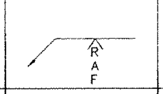
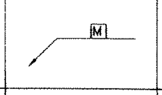
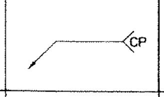
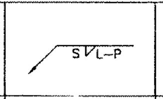
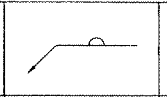
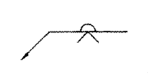
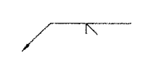
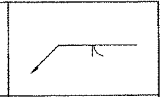
LONGITUDINAL BUTT JOINT (ALTERNATIVE)
TYPE "B"

DETAIL "2"

NOTES :

1. ALL DIMENSION ARE IN MILLIMETER, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP–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

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

0 0.1 0.2 0.4 0.6 0.8
SCALE 1:10 METERS

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
WELDING DETAILS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED วส.46156 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER 8/12/51
DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–PS–08
SHEET NO. 65 OF 100

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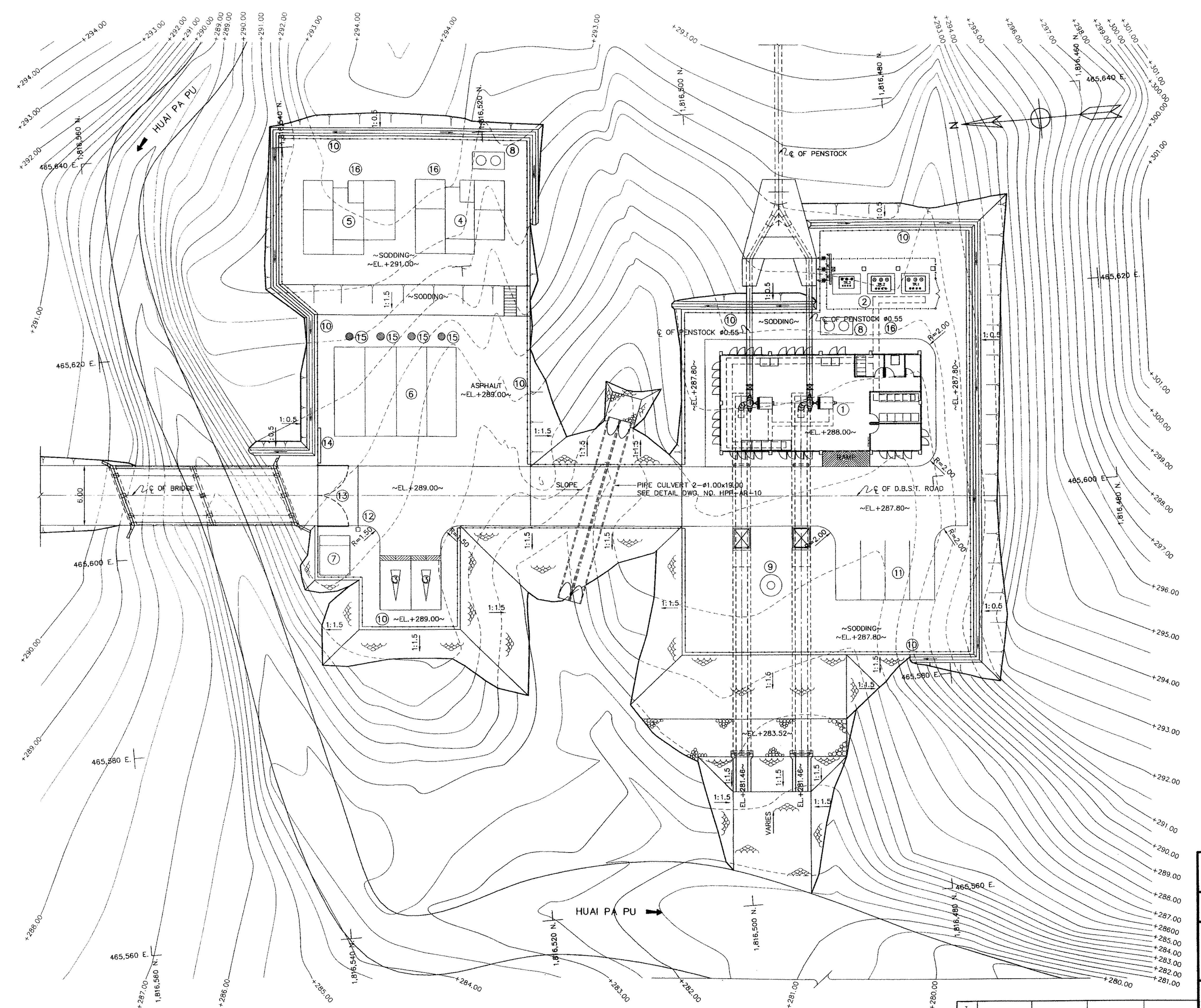


GENERAL LAYOUT

SCALE 1:200

LEGENDS :

1. POWERHOUSE
2. SWITCHYARD
3. GARAGE
4. HOUSING GRADE 5-6 FOR 1 FAMILY
5. HOUSING GRADE 3-4 FOR 1 FAMILY
6. LABOUR HOUSING FOR 4 FAMILY
7. GUARD HOUSE
8. ELEVATED TANK
9. FLAG POLE
10. WIREMESH FENCE
11. PARKING AREA
12. MOVABLE STEEL BARRICADE
13. ENTRANCE GATE
14. NAME BOARD
15. STAINLESS STEEL WATER TANK 3.00 CU.M.
16. SEPTIC TANK

NOTES :

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

REFERENCE DRAWINGS :

1. POWERHOUSE, PLAN AND SECTIONS	HPP-PH-03
2. POWERHOUSE, ELEVATIONS	HPP-PH-04

0 1 2 3 4 5 10 15
SCALE 1:200 METERS

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

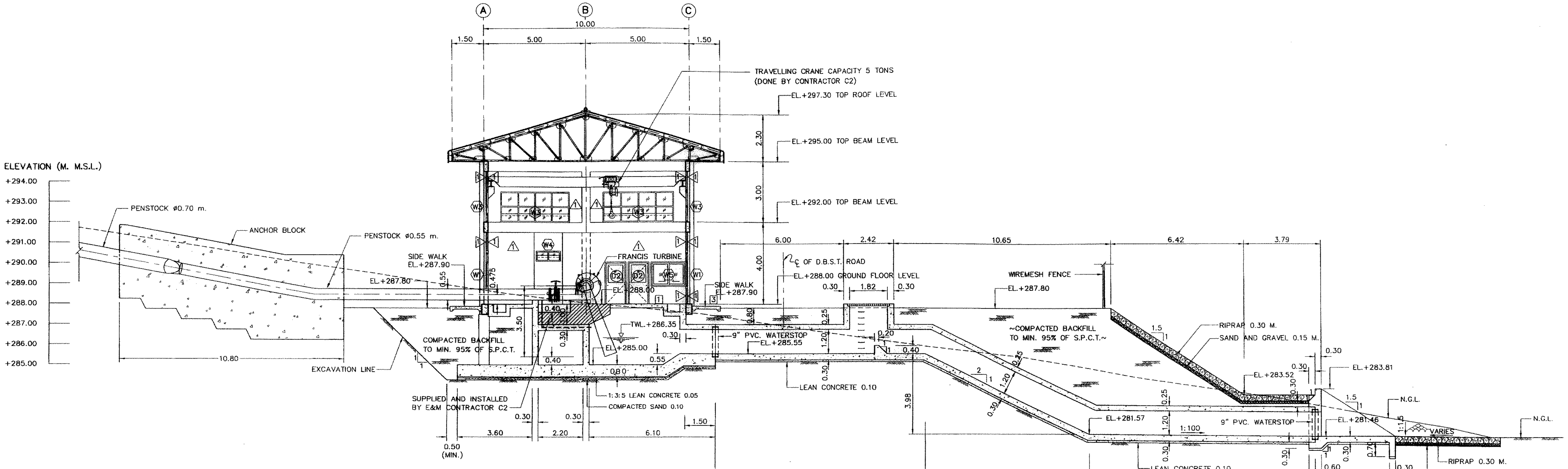
CIVIL WORKS
POWERHOUSE
GENERAL LAYOUT

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภย.37953 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER 8/12/51 DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-PH-01
SHEET NO. 66 OF 100



CROSS SECTION

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. HPP-GN-03
3. TURBINE & GENERATOR FOUNDATIONS, TRENCH AND BLOCKOUT SIZES AND LOCATIONS ARE ONLY APPROXIMATE. THE ELECTRO-MECHANICAL CONTRACTOR IS REQUIRED TO SUBMIT THE SHOP DRAWINGS INDICATED ALL FINAL SIZES AND LOCATIONS TO FIELD ENGINEER.

0 1.0 2.0 4.0 6.0 8.0
SCALE 1:100 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
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	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
CROSS SECTION

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED กย.37953 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-PH-02
SHEET NO. 67 OF 100

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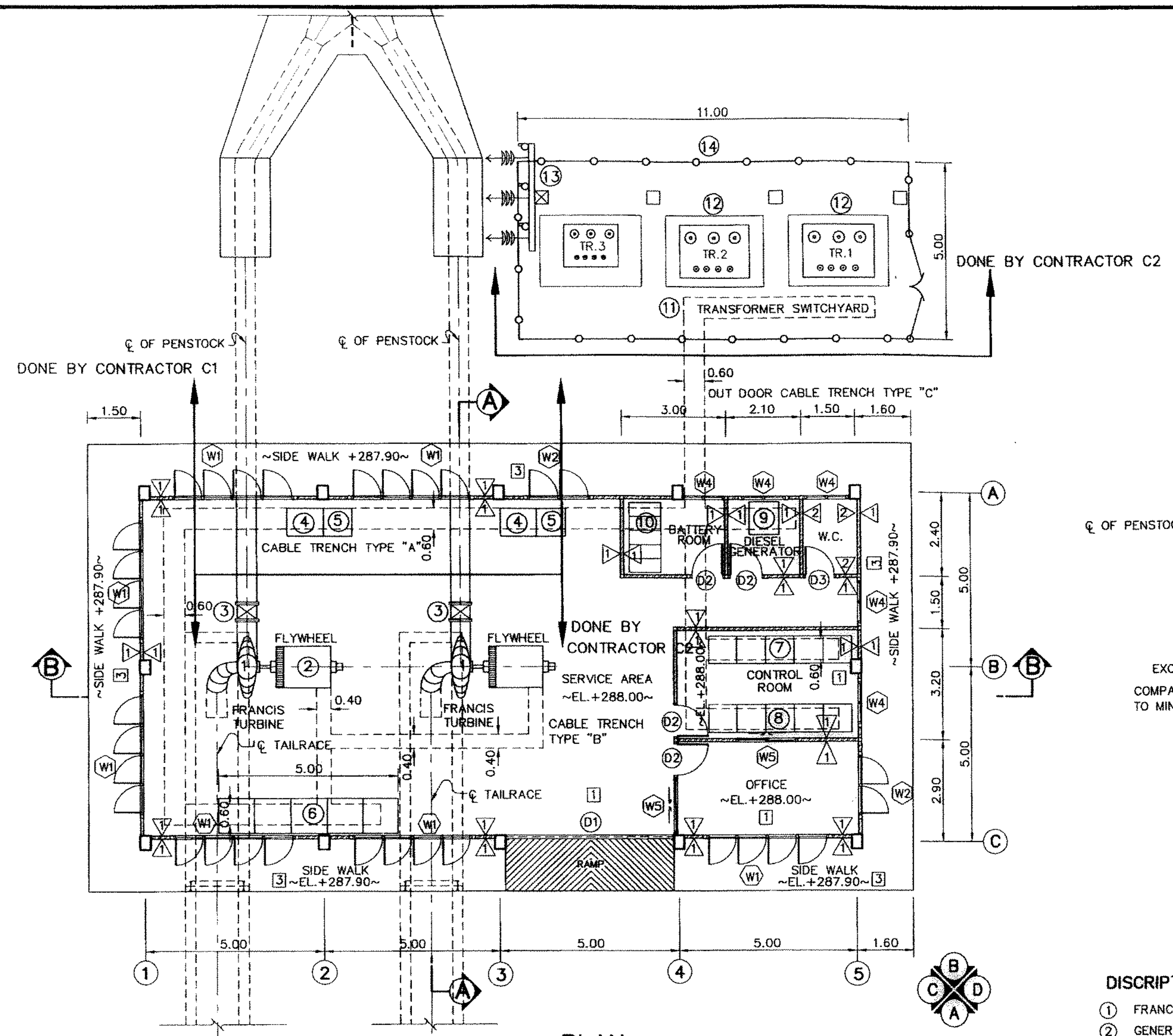
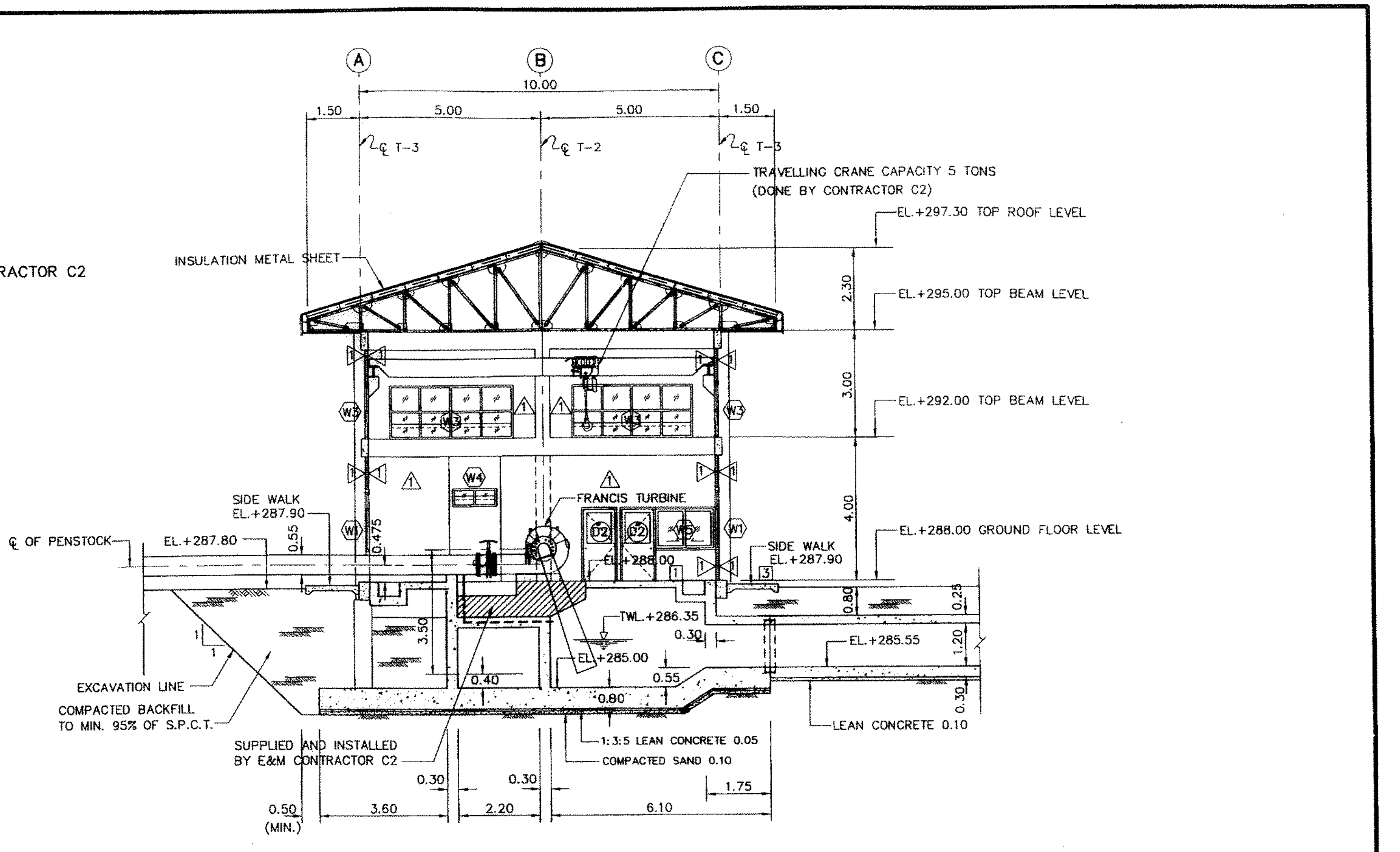


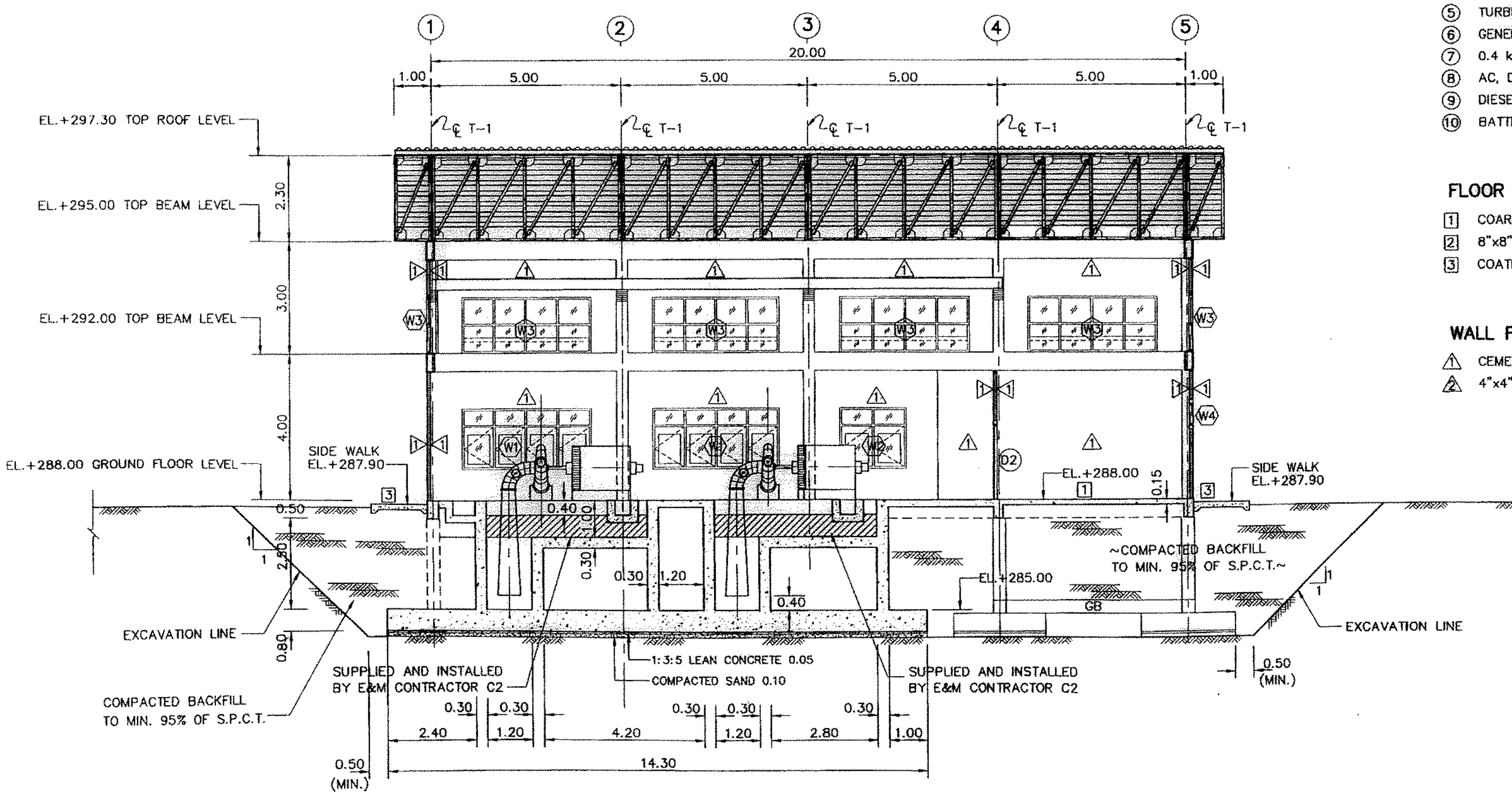
PLAN

SCALE 1:100



SECTION A–A

SCALE 1:100



SECTION B–B

SCALE 1:100

DISCRIPTION :

①	FRANCIS TURBINE
②	GENERATOR
③	INLET VALVE AND BYPASS VALVE
④	HYDRAULIC UNIT
⑤	TURBINE–GOVERNOR BOARD
⑥	GENERATOR CONTROL & LV ELECTRICAL PANELS
⑦	0.4 kV SWITCH GEAR CUBICLES
⑧	AC, DC BOARD AND BATTERY CHARGER
⑨	DIESEL ENGINE GENERATOR SET
⑩	BATTERY AND RACK
⑪	SWITCHYARD
⑫	MAIN TRANSFORMER
⑬	TAKE OFF STRUCTURE
⑭	TRANSFORMER FENCE SWICTHYARD

FLOOR FINISH SYMBOLS :

1	COARSE FINISHED
2	8"x8" CERAMIC FLOOR TILES
3	COATED WITH EPOXY RESIN

WALL FINISH SYMBOLS :

⚠1	CEMENT PLASTER
⚠2	4"x4" CERAMIC FLOOR TILES

NOTES :

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

REFERENCE DRAWINGS :

1.	POWERHOUSE, GENERAL LAYOUT	HPP-PH-01
2.	POWERHOUSE, ELEVATIONS	HPP-PH-04

0 1.0 2.0 4.0 6.0 8.0
SCALE 1:100 METERS

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
PLAN AND SECTIONS

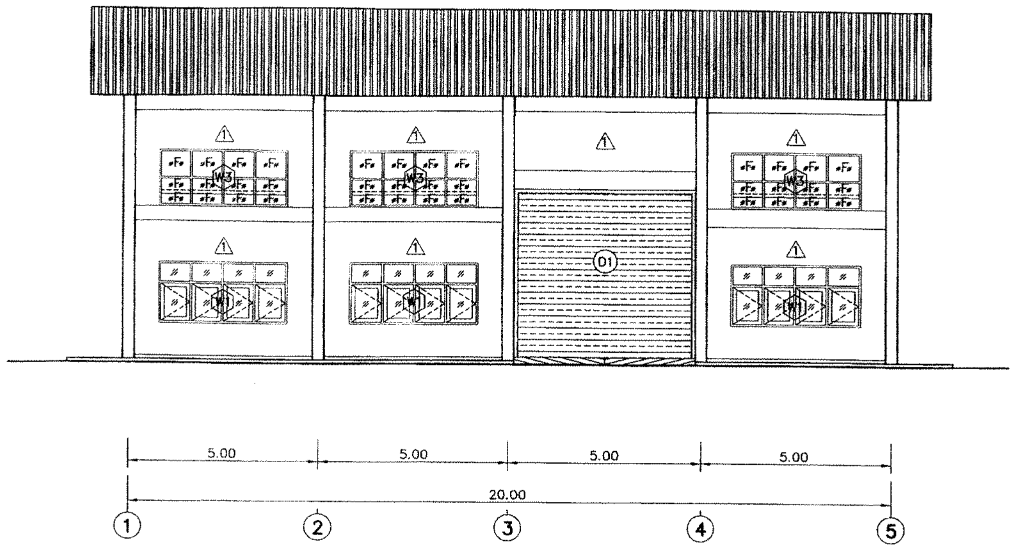
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS
DEDE

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภย.37953 วย.4651
DRAWN
CHECKED วย.4651
PROJECT MANAGER
DATE 8/12/51

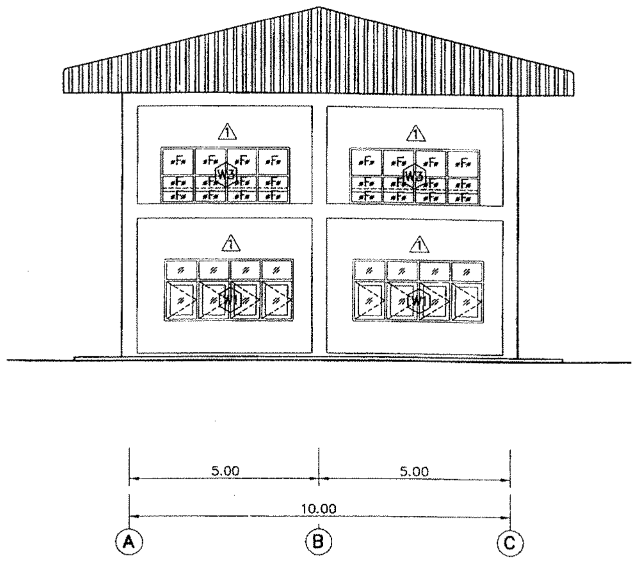
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–PH–03
SHEET NO. 68 OF 100



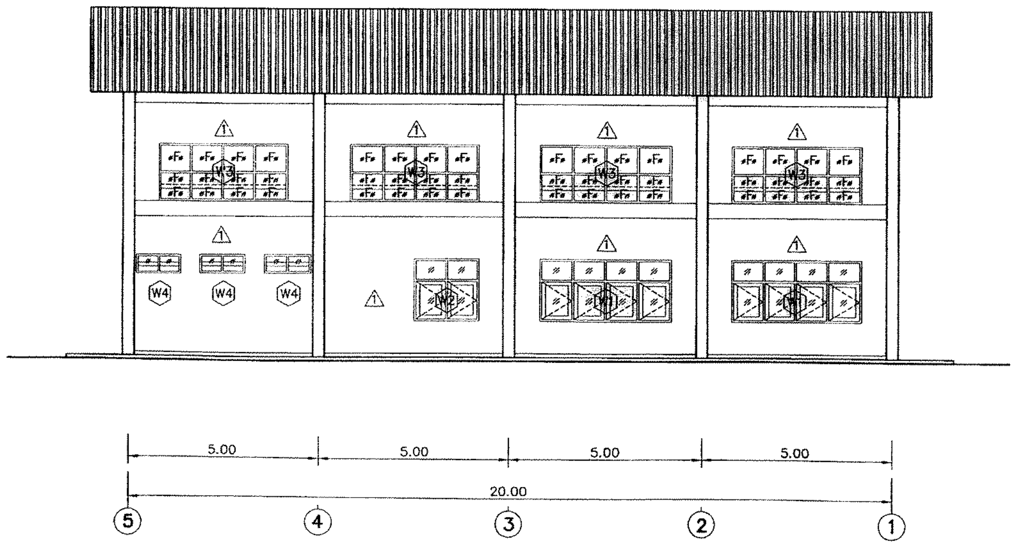
ELEVATION "A"

SCALE 1:100



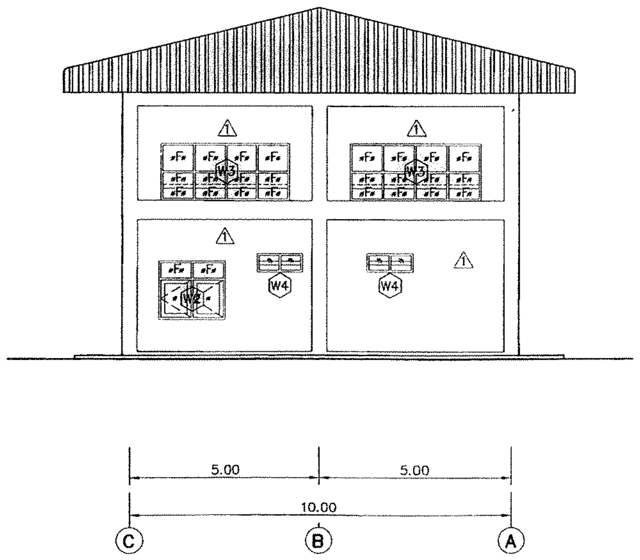
ELEVATION "C"

SCALE 1:100



ELEVATION "B"

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. HPP-GN-03

REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAY-OUT	HPP-PH-01
2. POWERHOUSE, PLAN AND SECTIONS	HPP-PH-03

0 1.0 2.0 4.0 6.0 8.0

SCALE 1:100 METERS

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
ELEVATIONS

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED ภย.37953 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-PH-04
SHEET NO. 69 OF 100

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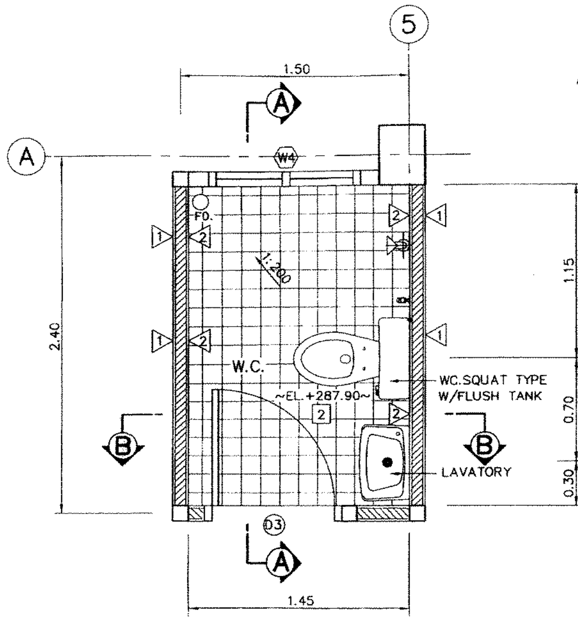
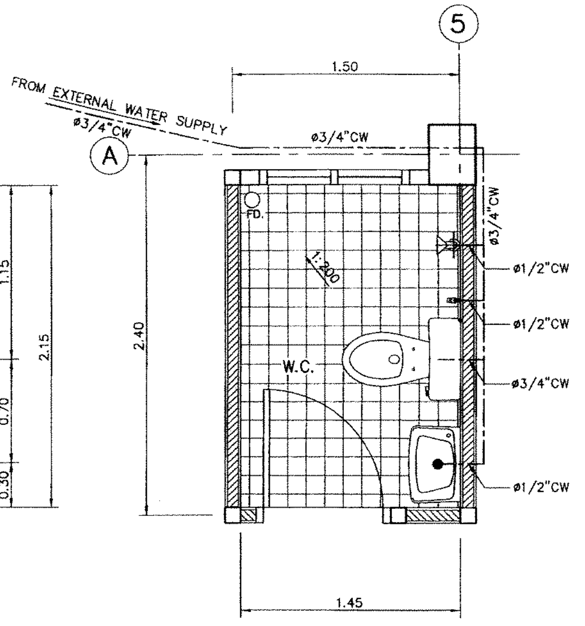


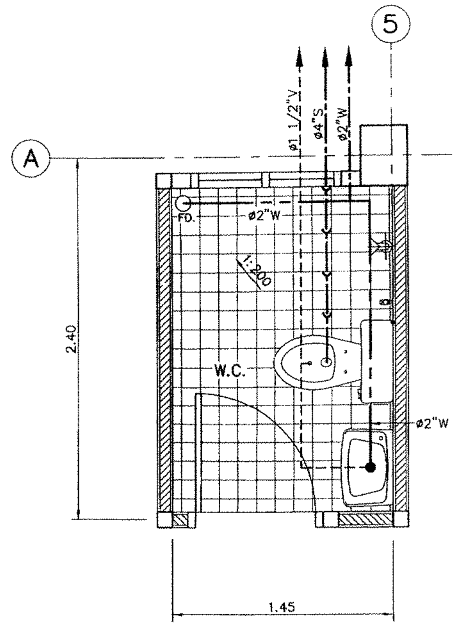
PLAN W.C.

SCALE 1:25



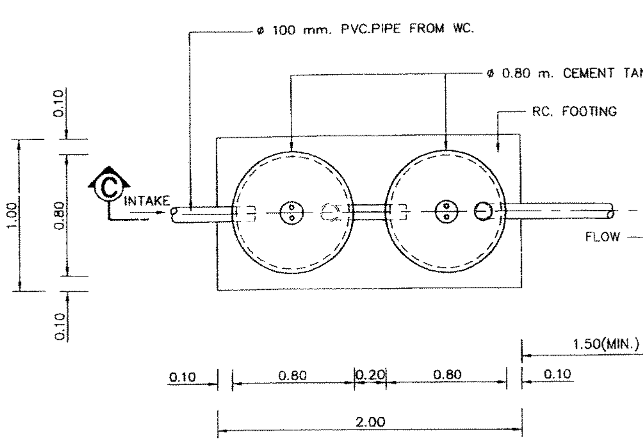
COLD WATER PIPING

SCALE 1:25



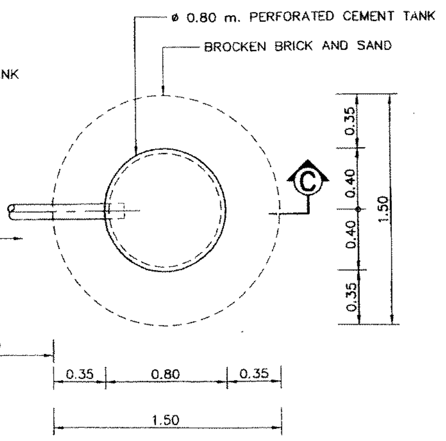
SOIL, WASTE AND VENT PIPING

SCALE 1:25



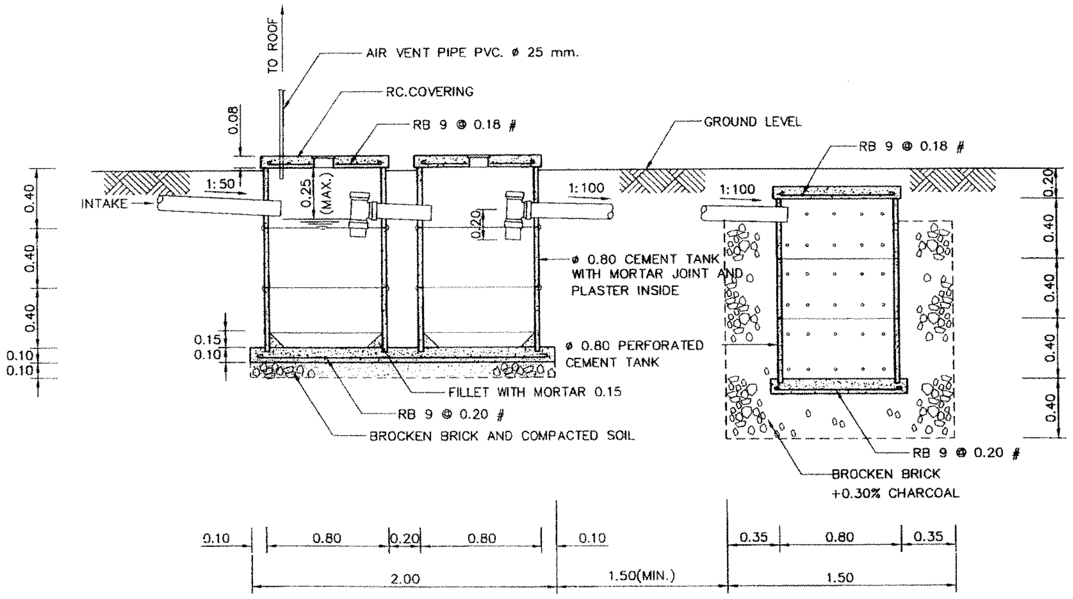
SEPTIC TANK

SCALE 1:25



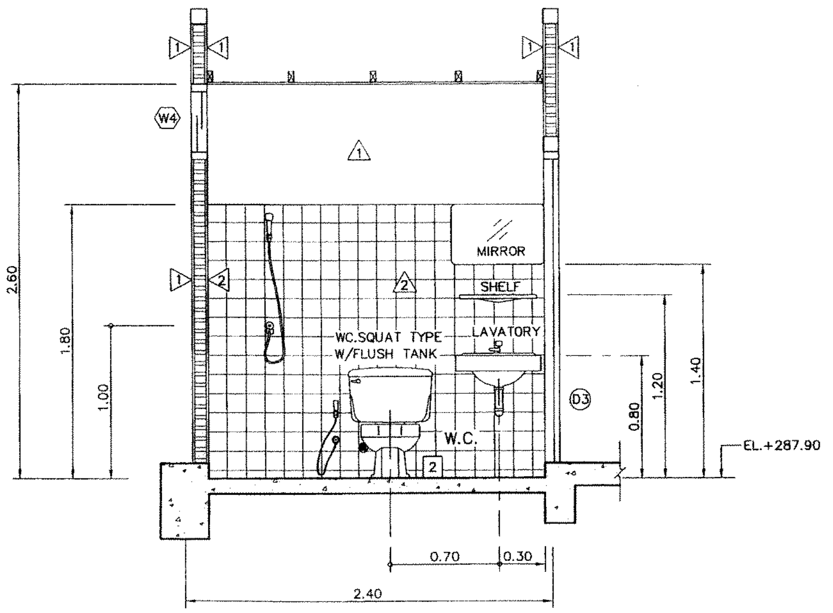
SEEPAGE TANK

SCALE 1:25



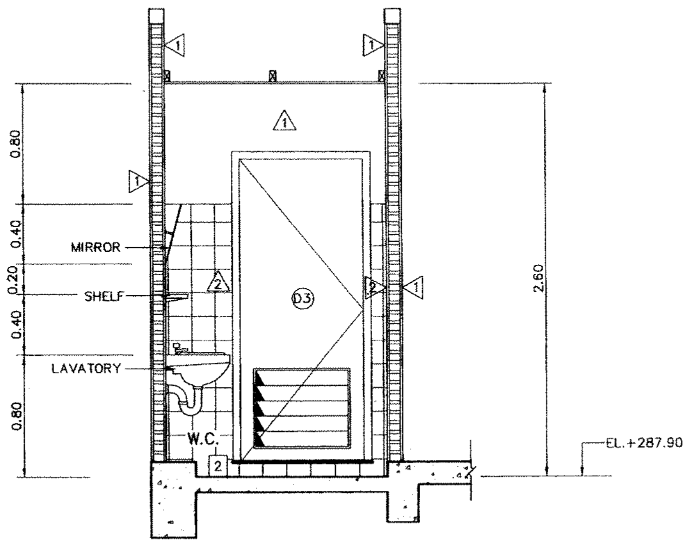
SECTION C–C

SCALE 1:25



SECTION A–A

SCALE 1:25



SECTION B–B

SCALE 1:25

SYMBOLS :

——ε——ε——	SOIL PIPE
—— — — ——	WASTE PIPE
——·——·——	COLD WATER PIPE
- - - - - - - -	VENT PIPE

NOTES :

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

REFERENCE DRAWING :

1. POWERHOUSE, PLAN AND SECTIONS HPP-PH-03

0 0.5 1.0 1.5 2.0
SCALE 1:25 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

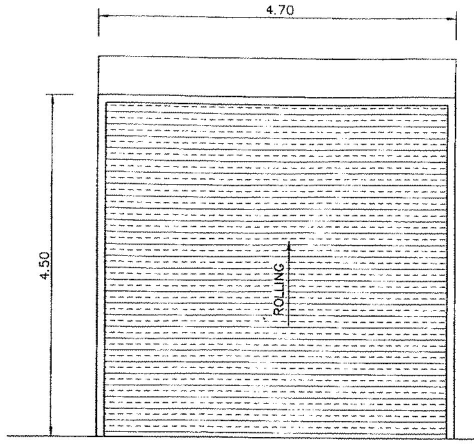
HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
DETAILS OF TOILET, SEPTIC AND SEEPAGE TANK

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภย.37953 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER 8/12/51 DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

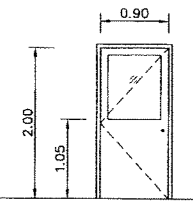
DRAWING NO. HPP-PH-05
SHEET NO. 70 OF 100



(D1)

ROLLING DOOR

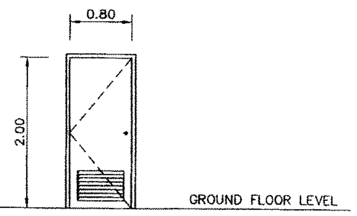
SCALE 1:50



(D2)

OPENNING DOOR

SCALE 1:50

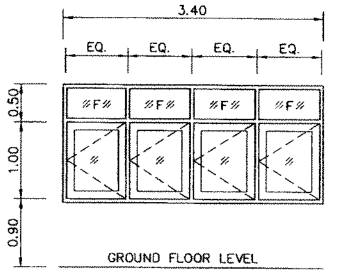


(D3)

OPENNING DOOR

SCALE 1:50

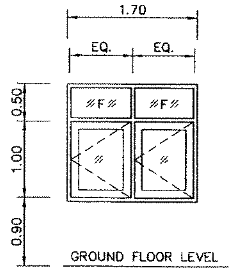
SYMBOL	DESCRIPTIONS	SIZE		FRAME	RAIL & STILE	PANEL	HINGE	LOCKSET	HANDLE	REMARKS
		WIDTH	HEIGHT							
D1	ROLLING DOOR (STEEL NO.18,1.2 mm. Thk.)	4.70	4.50	GALVANIZED STEEL	—	—	—	NORMAL KEY	—	MOTOR OPERATING
D2	OPENNING DOOR	0.90	2.00	HARDWOOD 2"x 4"	—	TEAK PLYWOOD & TEAK LOUVER	STAINLESS STEEL 4"x3"x2.5mm.	CYLINDER LOCK	—	
D3	OPENNING DOOR	0.80	2.00	P.V.C. 2"x 4"	—	P.V.C.	STAINLESS STEEL 4"x3"x2.5mm.	CYLINDER LOCK	—	
W1	OPENNING WINDOW	3.40	1.50	ALUMINIUM(NA) 2"x 4"	GALVANIZED STEEL	GLASS 5 mm.thk.	●	●	●	FULL SET OF ACCESSORIES FROM MANUFACTURER
W2	OPENNING WINDOW	1.70	1.50	ALUMINIUM(NA) 2"x 4"	GALVANIZED STEEL	GLASS 5 mm.thk.	—	—	—	
W3	FIXED GLASS WINDOW	3.40	1.50	ALUMINIUM(NA) 2"x 4"	—	GLASS 5 mm.thk.	—	—	—	
W4	FIXED GLASS WINDOW	1.20	0.50	ALUMINIUM(NA) 2"x 4"	—	GLASS 5 mm.thk.	—	—	—	
W5	SLIDING WINDOW	1.70	1.10	ALUMINIUM(NA) 2"x 4"	—	GLASS 5 mm.thk.	—	—	—	
●	SHALL BE USED SPACIFIED ACCESSORIES									



(W1)

OPENNING WINDOW

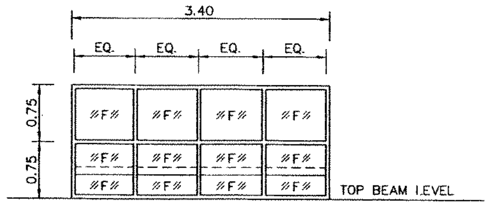
SCALE 1:50



(W2)

OPENNING WINDOW

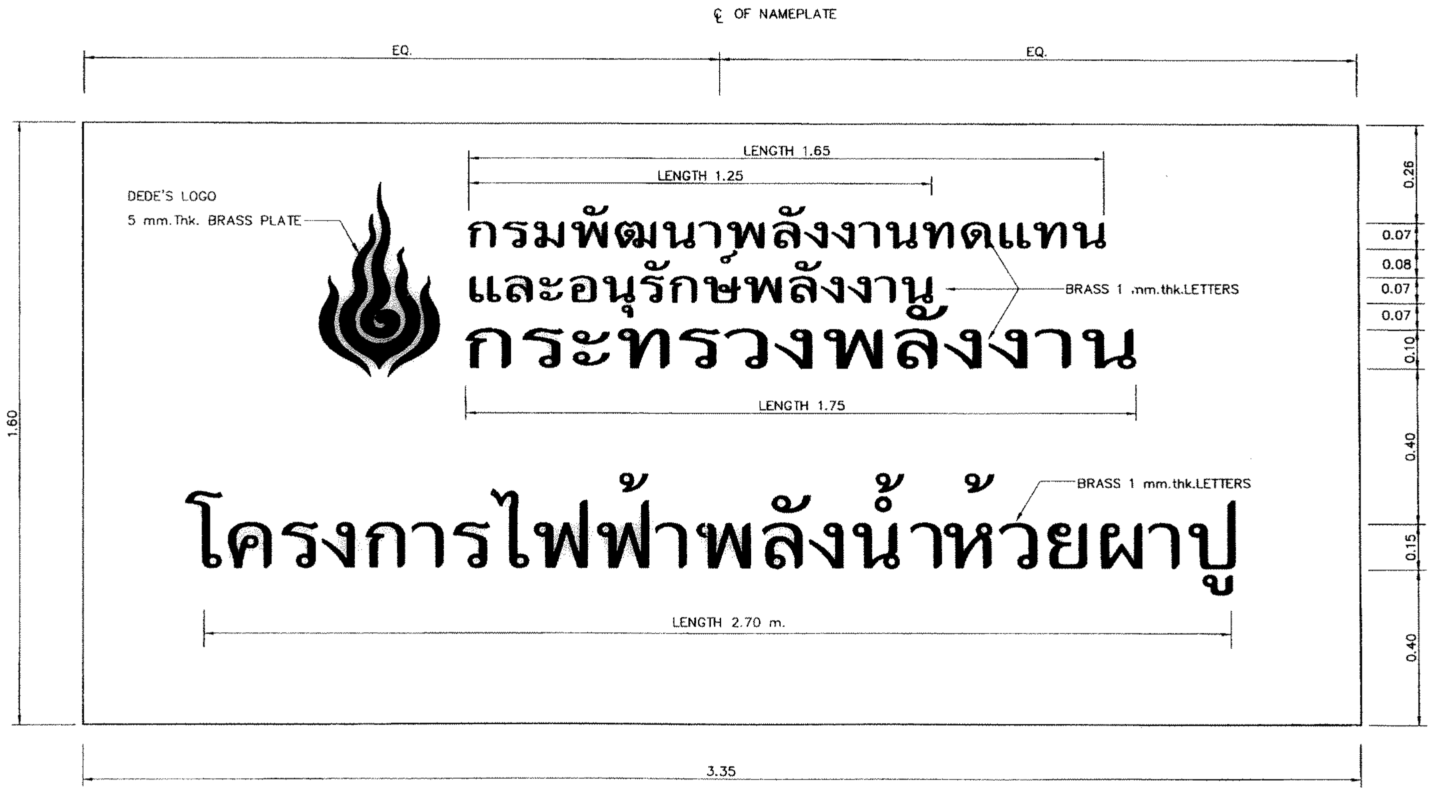
SCALE 1:50



(W3)

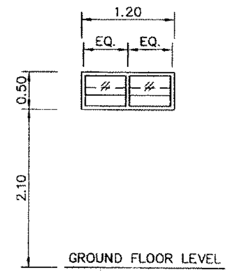
OPENNING WINDOW

SCALE 1:50



FRONT VIEW OF NAMEPLATE

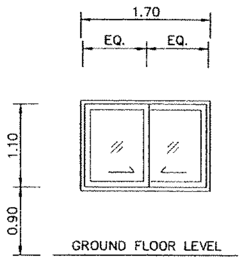
SCALE 1:10



(W4)

FIX GRASS WINDOW

SCALE 1:50



(W5)

FIX GRASS WINDOW

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. HPP-GN-03

REFERENCE DRAWINGS :

1. POWERHOUSE, PLAN AND SECTIONS	HPP-PH-03
2. POWERHOUSE, ELEVATIONS	HPP-PH-04

0 0.5 1.0 2.0 3.0 4.0
SCALE 1:50 METERS

0 0.1 0.2 0.4 0.6 0.8
SCALE 1:10 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

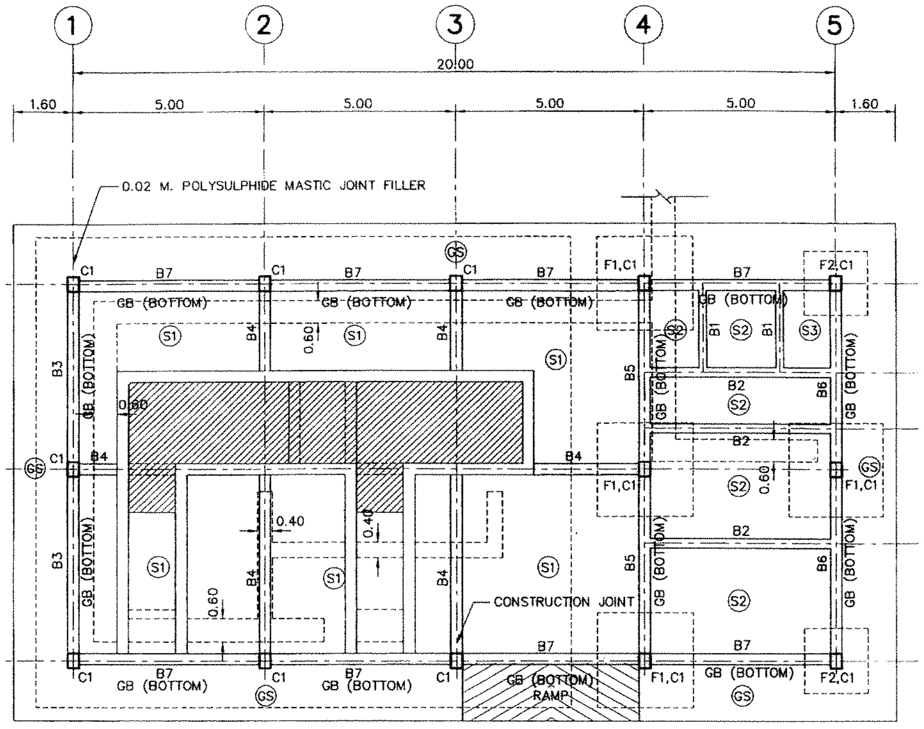
CIVIL WORKS
POWERHOUSE
DETAILS OF DOORS, WINDOWS AND NAME PLATE

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED ภย.37953 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER DATE 8/12/51

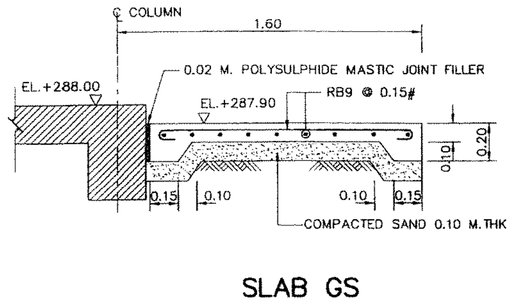
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-PH-06
SHEET NO. 71 OF 100



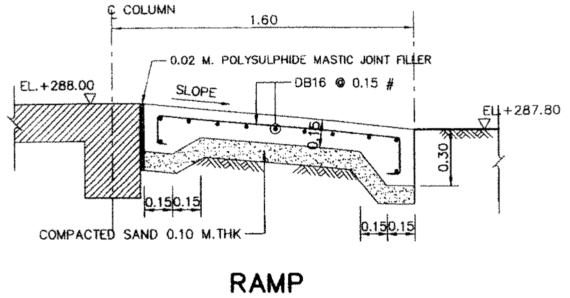
GROUND FLOOR FRAMING PLAN

SCALE 1:100



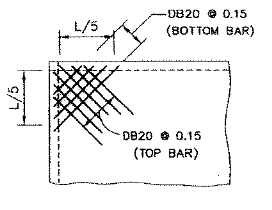
SLAB GS

SCALE 1:20



RAMP

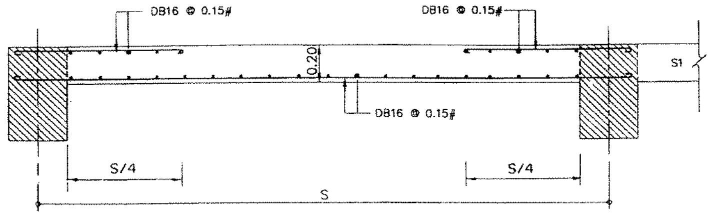
SCALE 1:20



TYP. DETAIL OF SLAB

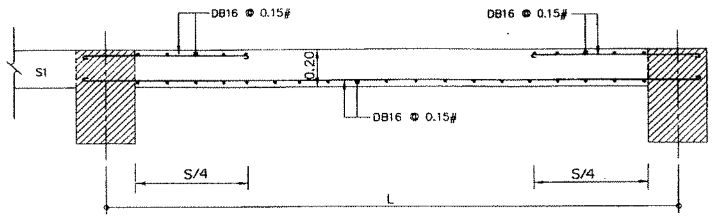
(ALL CORNER)

SCALE 1:20



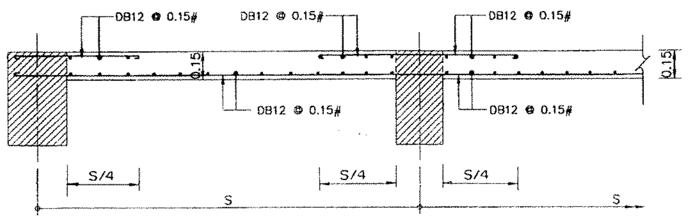
SLAB S1 (SHORT)

SCALE 1:20



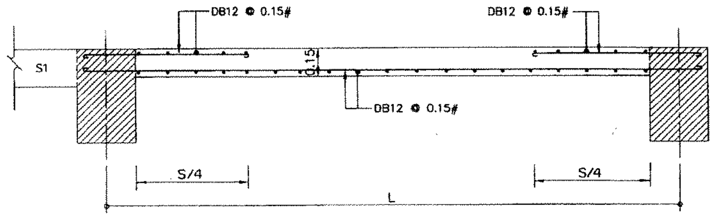
SLAB S1 (LONG)

SCALE 1:20



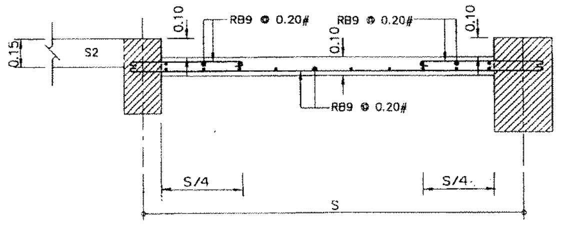
SLAB S2 (SHORT)

SCALE 1:20



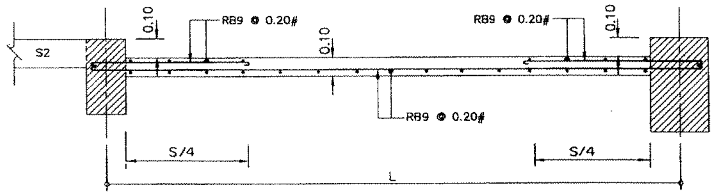
SLAB S2 (LONG)

SCALE 1:20



SLAB S3 (SHORT)

SCALE 1:20



SLAB S3 (LONG)

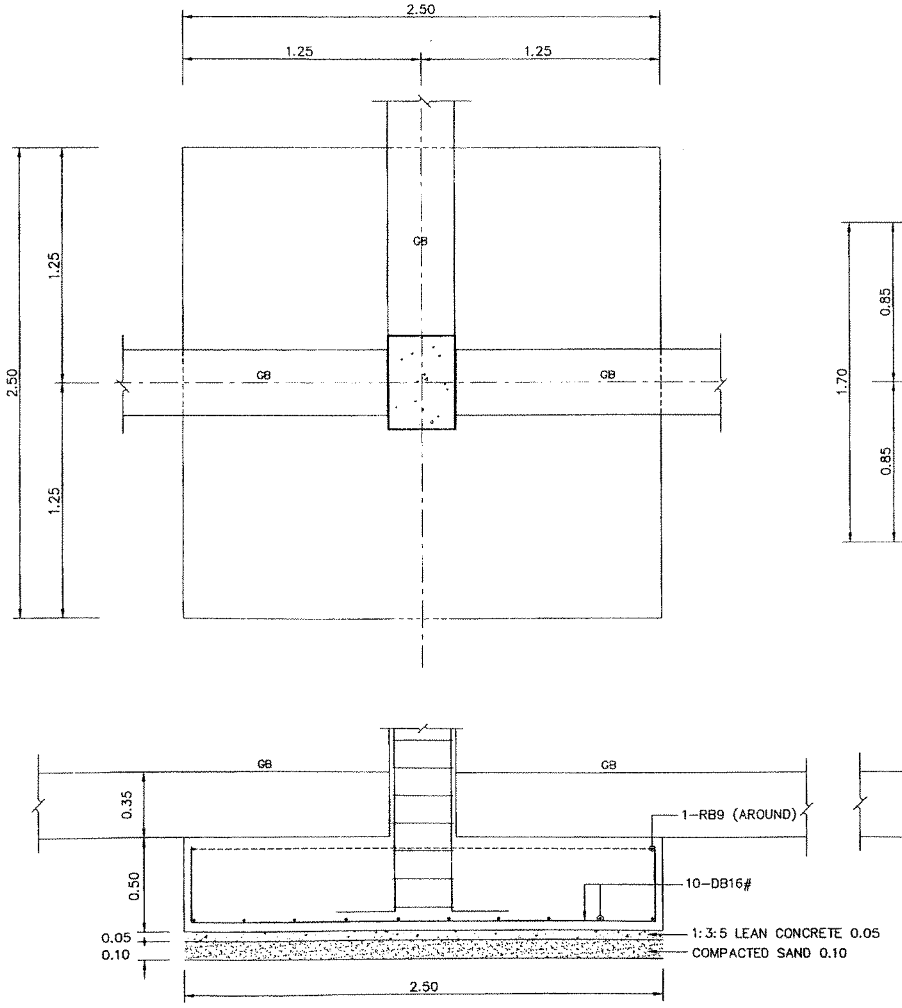
SCALE 1:20

NOTES :

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

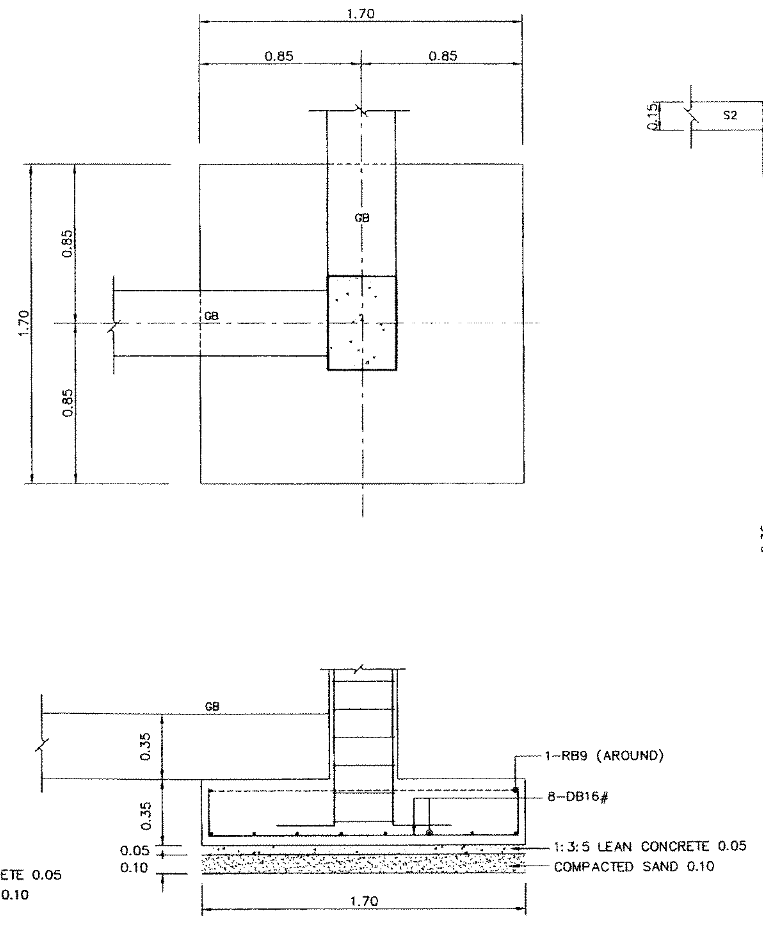
REFERENCE DRAWINGS :

1.	POWERHOUSE, PLAN AND SECTIONS	HPP-PH-03
2.	POWERHOUSE, BEAM REINFORCEMENT DETAILS	HPP-PH-09
3.	POWERHOUSE, COLUMN DETAILS	HPP-PH-12



FOOTING (F1)

SCALE 1:20



FOOTING (F2)

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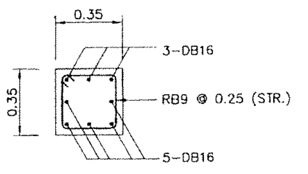
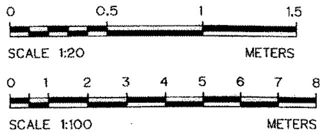


BEAM GB

SCALE 1:20



3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

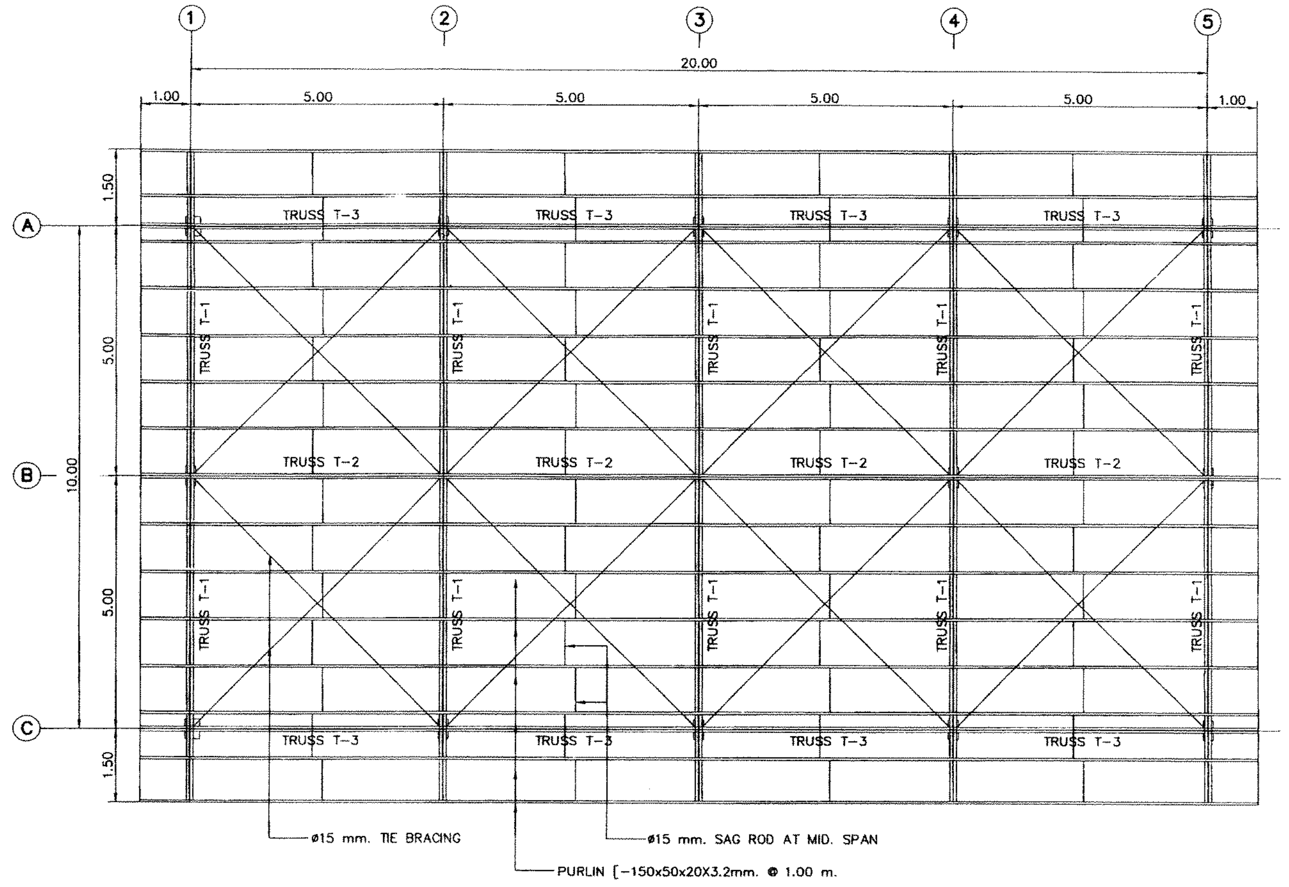
HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
GROUND FLOOR FRAMING PLAN AND DETAILS

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภย.37953 สย.4651
DRAWN
CHECKED สย.4651
8/12/51
PROJECT MANAGER DATE

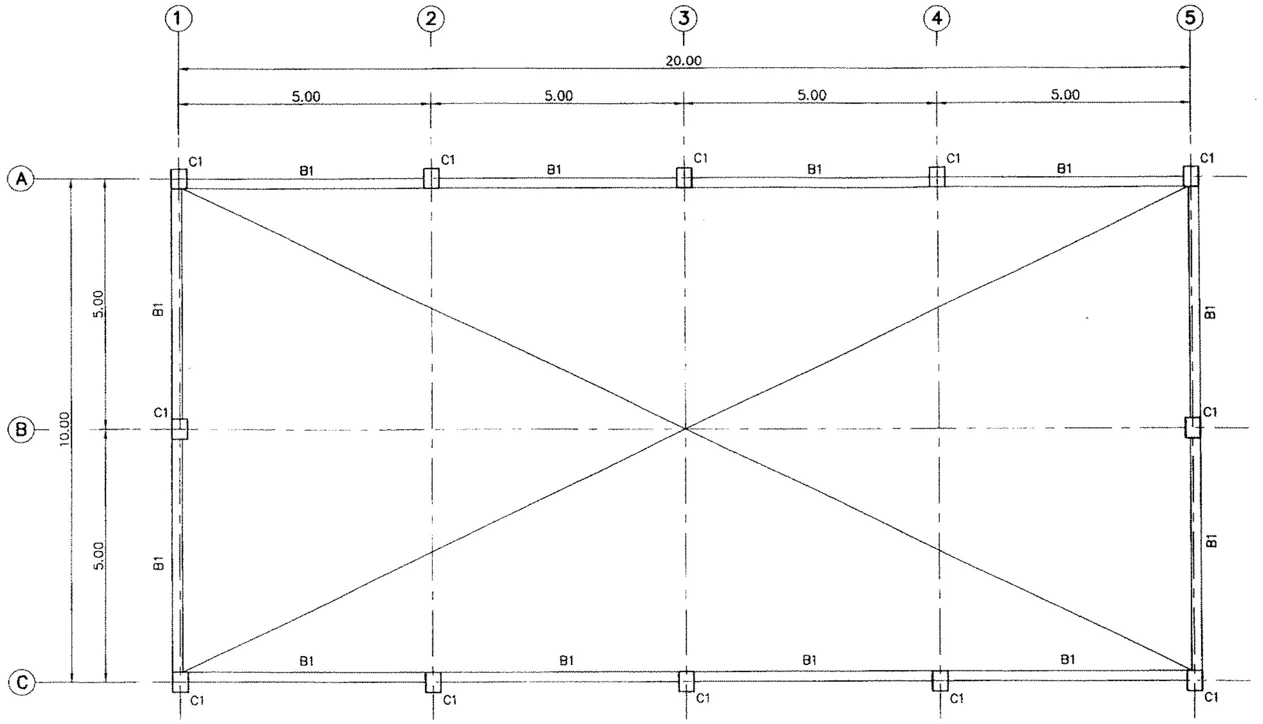
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-PH-07
SHEET NO. 72 OF 100



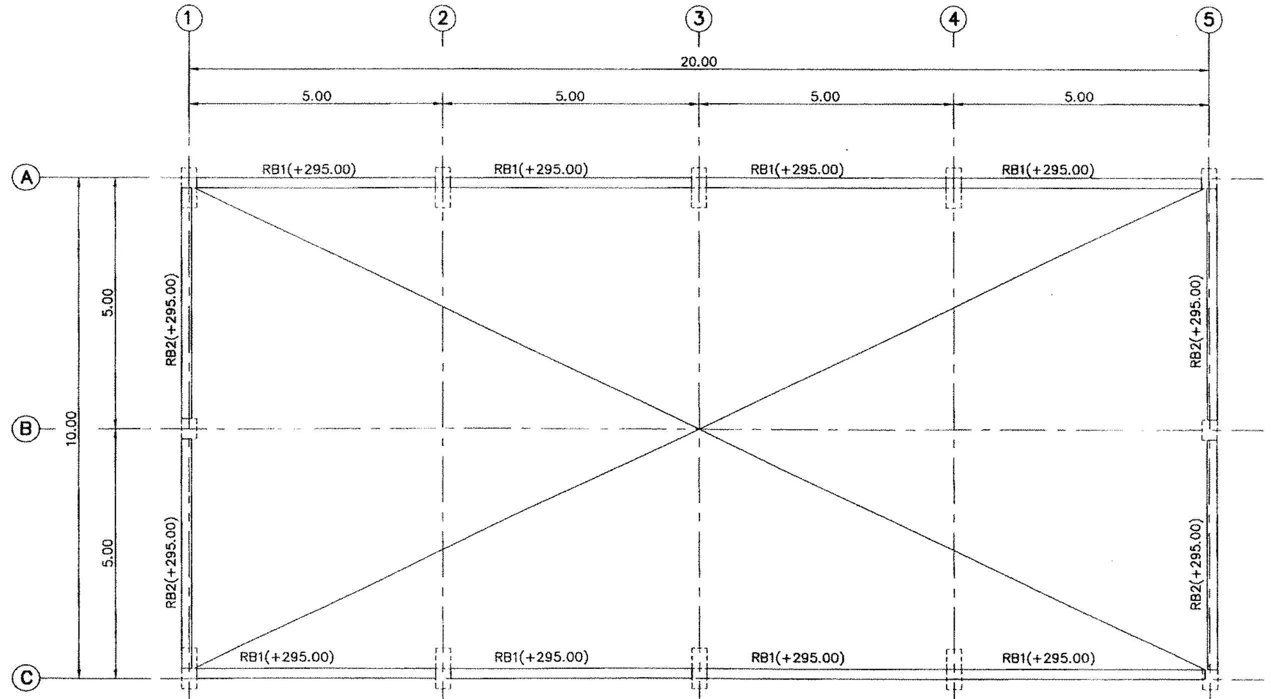
TRUSS PLAN

SCALE 1: 75



BEAM PLAN (AT EL.+292.00)

SCALE 1: 75



ROOF BEAM PLAN

SCALE 1: 75

NOTES :

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

REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAY-OUT	HPP-PH-01
2. POWERHOUSE, PLAN AND SECTIONS	HPP-PH-03
3. POWERHOUSE, BEAM REINFORCEMENT DETAILS	HPP-PH-09
4. POWERHOUSE, TRUSS T-1, T-2 AND T-3	HPP-PH-10

0 1.0 2.0 3.0 4.0 5.0 6.0
SCALE 1: 75 METERS

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
ROOF BEAM AND TRUSS PLANS

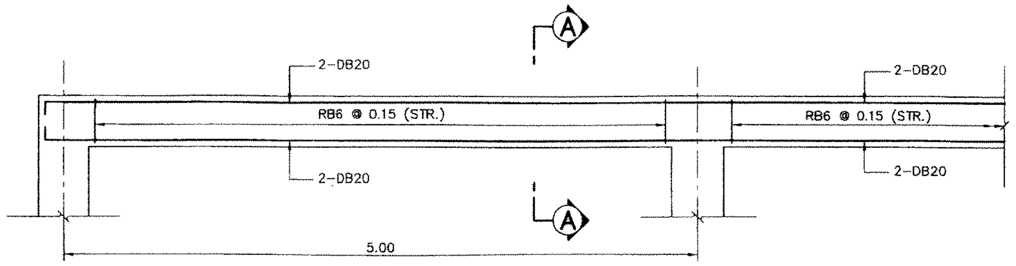
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภย.37953 ธ.ค.4651
DRAWN
CHECKED ธ.ค.4651
8/12/51
PROJECT MANAGER DATE

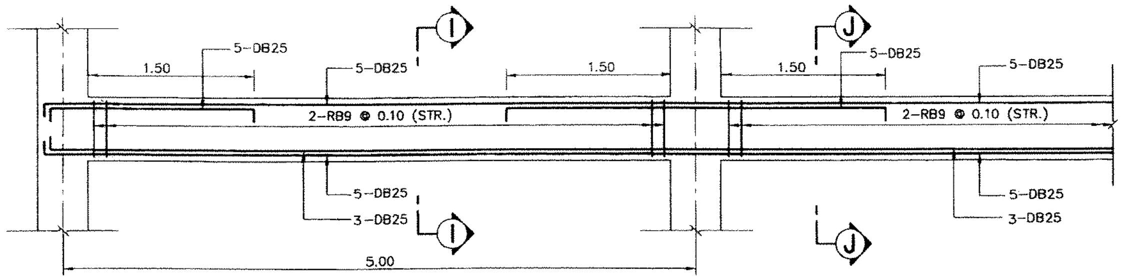
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-PH-08
SHEET NO. 73 OF 100

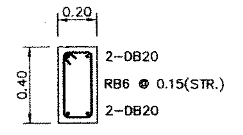
\\FILES-SERVER\0007B3\FINAL\CI\PH\HPP-PH-08\7-12-2008



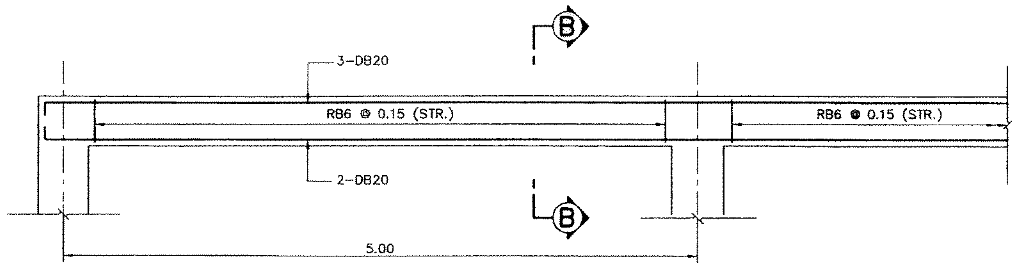
BEAM RB1
SCALE 1:30



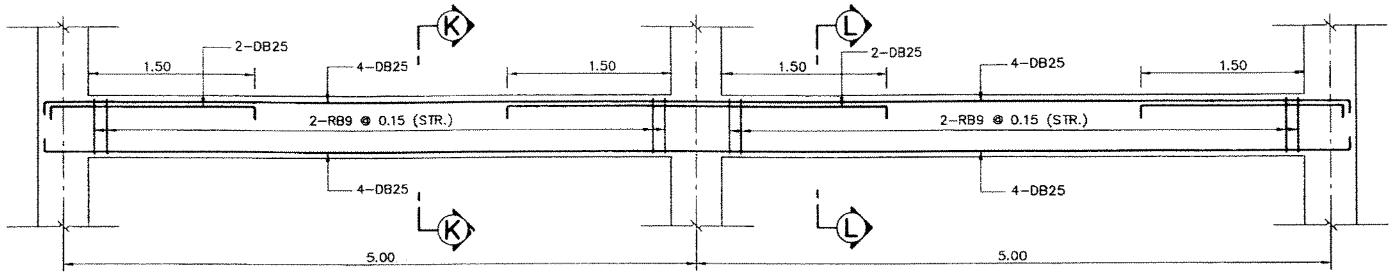
BEAM B5
SCALE 1:30



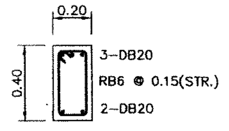
SECTION A-A
SCALE 1:20



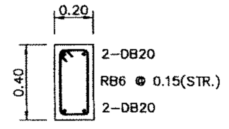
BEAM RB2
SCALE 1:30



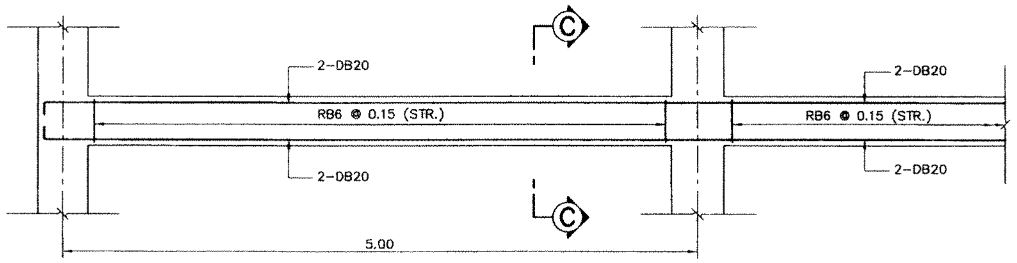
BEAM B6
SCALE 1:30



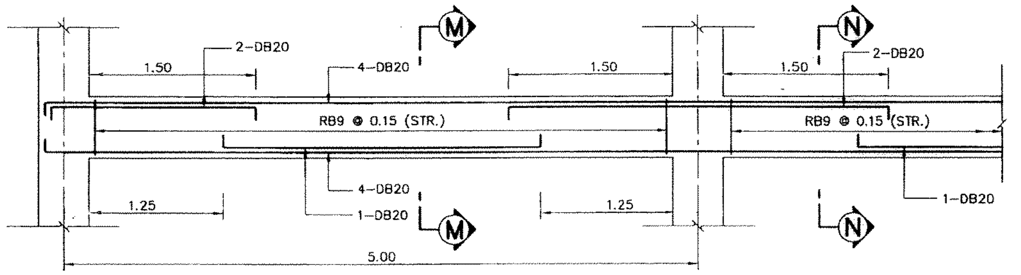
SECTION B-B
SCALE 1:20



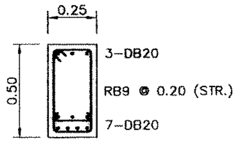
SECTION C-C
SCALE 1:20



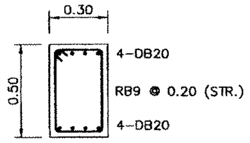
BEAM B1
SCALE 1:30



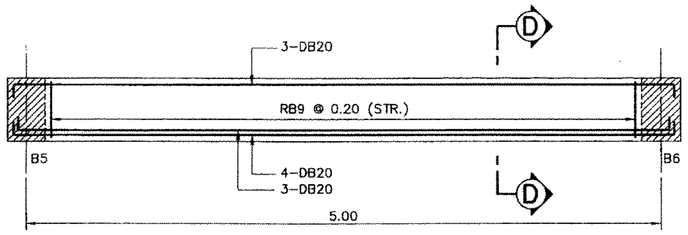
BEAM B7
SCALE 1:30



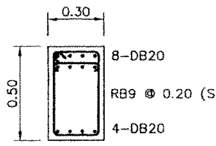
SECTION D-D
SCALE 1:20



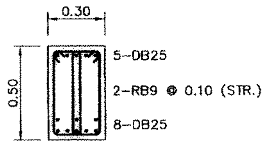
SECTION E-E
SCALE 1:20



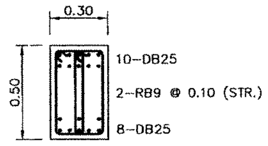
BEAM B2
SCALE 1:30



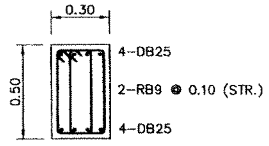
SECTION F-F
SCALE 1:20



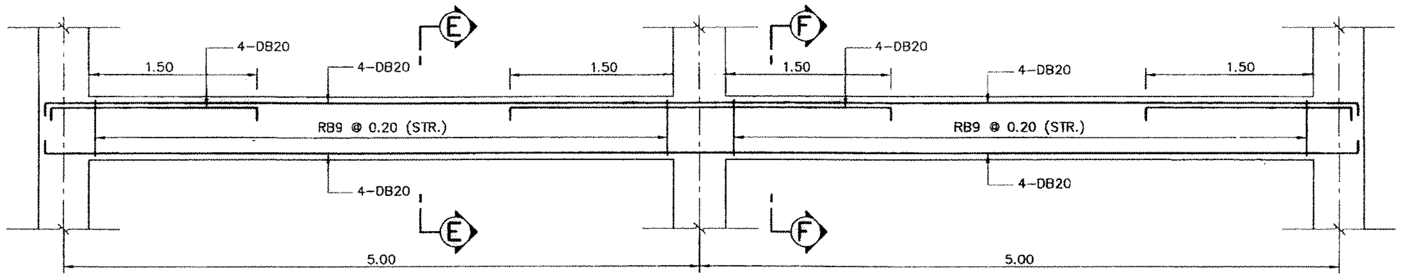
SECTION I-I
SCALE 1:20



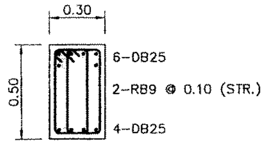
SECTION J-J
SCALE 1:20



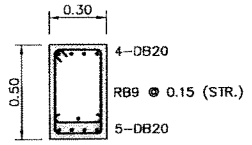
SECTION K-K
SCALE 1:20



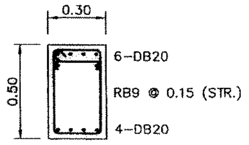
BEAM B3
SCALE 1:30



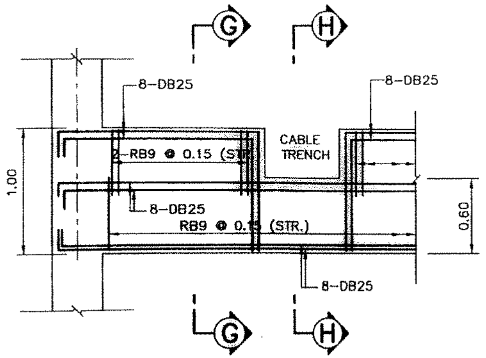
SECTION L-L
SCALE 1:20



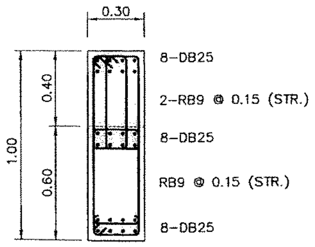
SECTION M-M
SCALE 1:20



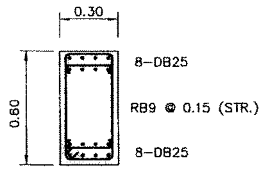
SECTION N-N
SCALE 1:20



BEAM B4
SCALE 1:30



SECTION G-G
SCALE 1:20



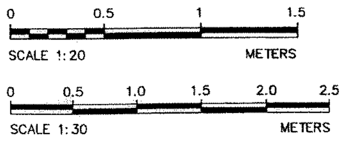
SECTION H-H
SCALE 1:20

NOTES :

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

REFERENCE DRAWINGS :

1. POWERHOUSE, GROUND FLOOR FRAMING PLAN AND DETAILS	HPP-PH-07
2. POWERHOUSE, ROOF BEAM AND TRUSS PLANS	HPP-PH-08



3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

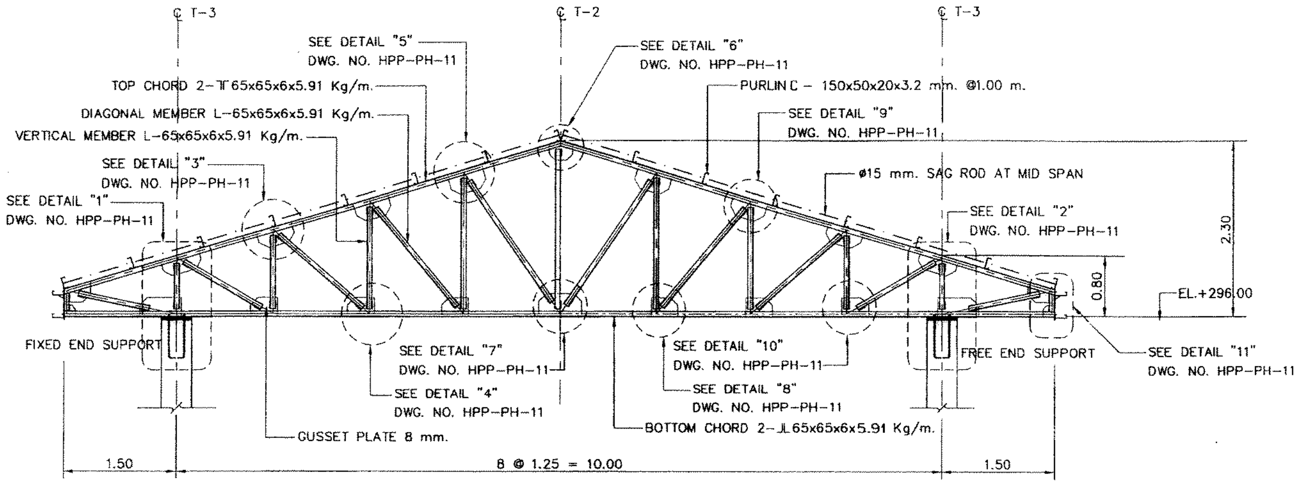
CIVIL WORKS
POWERHOUSE
BEAM REINFORCEMENT DETAILS

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED ภย.37963 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER 8/12/51 DATE

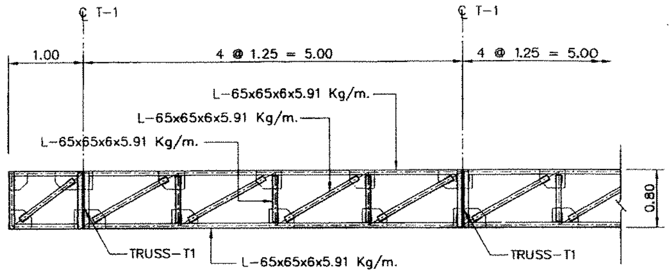
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-PH-09
SHEET NO. 74 OF 100



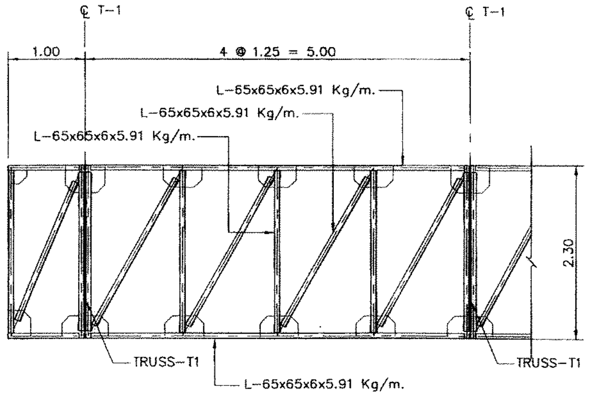
TRUSS T-1

SCALE 1:50



TRUSS T-3

SCALE 1:50



TRUSS T-2

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. HPP-GN-03

REFERENCE DRAWINGS :

1. POWERHOUSE, PLAN AND SECTIONS	HPP-PH-03
2. POWERHOUSE, ROOF BEAM AND TRUSS PLAN	HPP-PH-08

SCALE 1:50 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

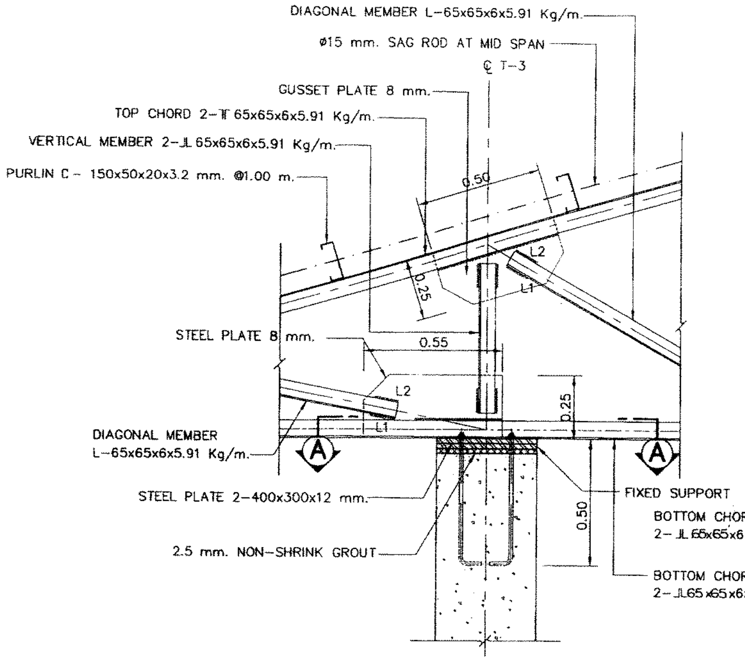
KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
TRUSS T-1, T-2 AND T-3

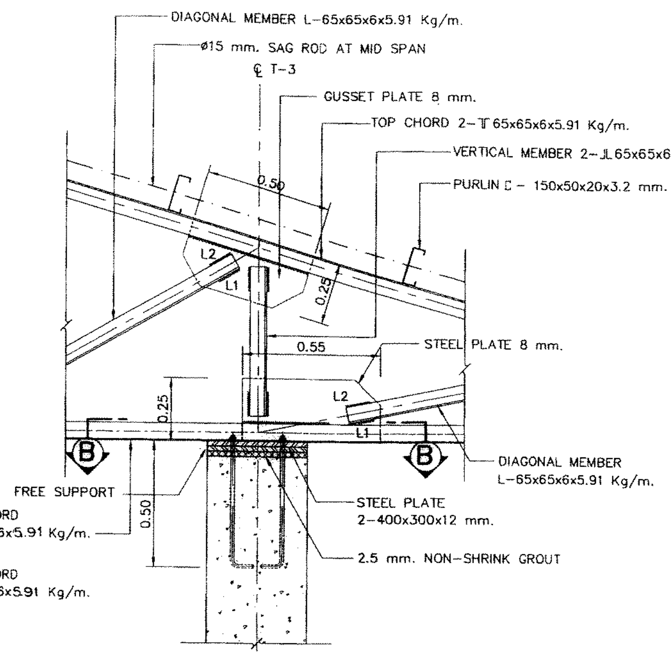
MAHA NAKORN CONSULTANTS CO.,LTD.	DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
	REVIEWED
DESIGNED ภย.37953 สย.4651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED สย.4651	APPROVED
PROJECT MANAGER 8/12/51 DATE	DRAWING NO. HPP-PH-10
	SHEET NO. 75 OF 100

\\FILES-SERVER\D00783\FINAL\CI\PH\HPP-PH-10\7-12-2008


DIAGONAL MEMBER L-65x65x6x5.91 Kg/m.
ø15 mm. SAG ROD AT MID SPAN
℄ T-3
GUSSET PLATE 8 mm.
TOP CHORD 2-⫪ 65x65x6x5.91 Kg/m.
VERTICAL MEMBER 2-⫫ 65x65x6x5.91 Kg/m.
PURLIN ⊏ - 150x50x20x3.2 mm. @1.00 m.
0.50
0.25
L2
L1
STEEL PLATE 8 mm.
0.55
0.25
DIAGONAL MEMBER L-65x65x6x5.91 Kg/m.
A
A
STEEL PLATE 2-400x300x12 mm.
FIXED SUPPORT
BOTTOM CHORD 2-⫫ 65x65x6x5.91 Kg/m.
0.50
2.5 mm. NON-SHRINK GROUT
BOTTOM CHORD 2-⫫ 65x65x6x5.91 Kg/m.

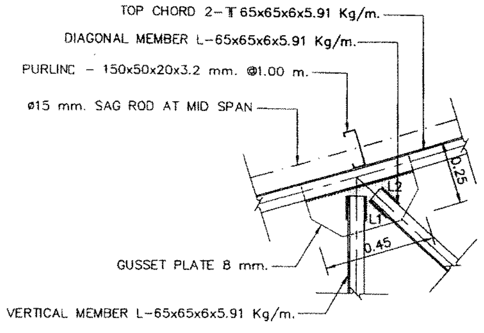
DETAILS "1"

SCALE 1:15


DIAGONAL MEMBER L-65x65x6x5.91 Kg/m.
ø15 mm. SAG ROD AT MID SPAN
℄ T-3
GUSSET PLATE 8 mm.
TOP CHORD 2-⫪ 65x65x6x5.91 Kg/m.
VERTICAL MEMBER 2-⫫ 65x65x6x5.91 Kg/m.
PURLIN ⊏ - 150x50x20x3.2 mm. @1.00 m.
0.50
0.25
L2
L1
0.55
STEEL PLATE 8 mm.
FREE SUPPORT
B
B
0.25
0.50
DIAGONAL MEMBER L-65x65x6x5.91 Kg/m.
STEEL PLATE 2-400x300x12 mm.
2.5 mm. NON-SHRINK GROUT

DETAILS "2"

SCALE 1:15

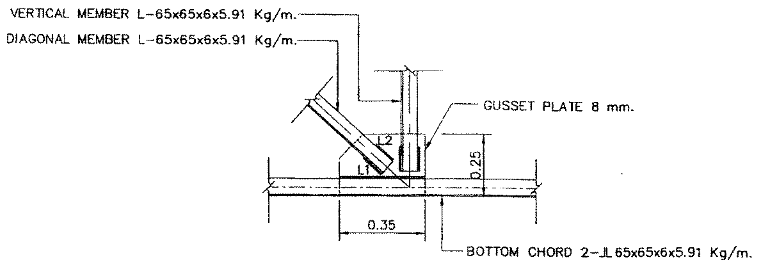

TOP CHORD 2-⫪ 65x65x6x5.91 Kg/m.
DIAGONAL MEMBER L-65x65x6x5.91 Kg/m.
PURLIN⊏ - 150x50x20x3.2 mm. @1.00 m.
ø15 mm. SAG ROD AT MID SPAN
0.25
L2
L1
0.45
GUSSET PLATE 8 mm.
VERTICAL MEMBER L-65x65x6x5.91 Kg/m.

DETAILS "3"

SCALE 1:15

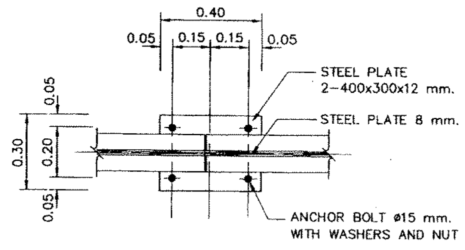
TABLE OF MEMBERS

TRUSS TYPE	MEMBER	FILLET WELD SIZE (mm)		
		L1	L2	t
TRUSS T-1	2-⫫65x65x6x5.91 Kg/m.	100	100	6
TRUSS T-2 TRUSS T-3	2-⫫65x65x6x5.91 Kg/m.	100	100	6


VERTICAL MEMBER L-65x65x6x5.91 Kg/m.
DIAGONAL MEMBER L-65x65x6x5.91 Kg/m.
GUSSET PLATE 8 mm.
L2
L1
0.25
0.35
BOTTOM CHORD 2-⫫ 65x65x6x5.91 Kg/m.

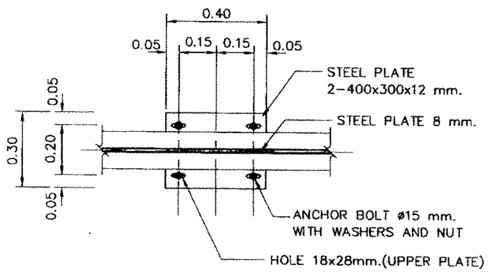
DETAILS "4"

SCALE 1:15


0.40
0.05
0.15
0.15
0.05
STEEL PLATE 2-400x300x12 mm.
STEEL PLATE 8 mm.
0.05
0.30
0.20
0.05
ANCHOR BOLT ø15 mm. WITH WASHERS AND NUT

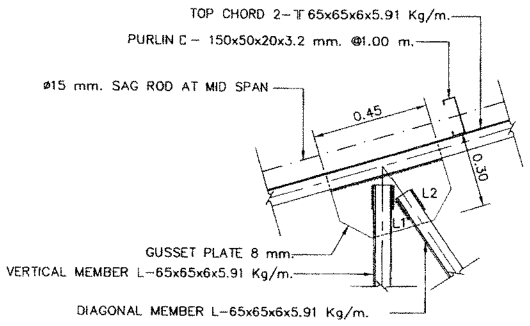
SECTION A–A (FIXED SUPPORT)

SCALE 1:15


0.40
0.05
0.15
0.15
0.05
STEEL PLATE 2-400x300x12 mm.
STEEL PLATE 8 mm.
0.05
0.30
0.20
0.05
ANCHOR BOLT ø15 mm. WITH WASHERS AND NUT
HOLE 18x28mm.(UPPER PLATE)

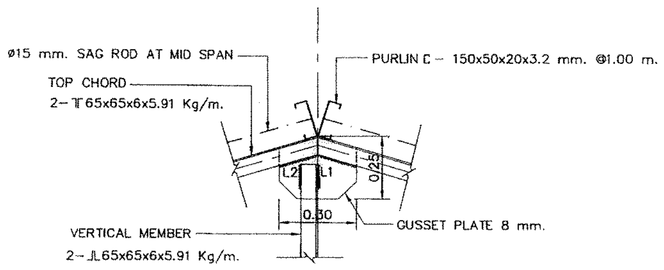
SECTION B–B (FREE SUPPORT)

SCALE 1:15


TOP CHORD 2-⫪ 65x65x6x5.91 Kg/m.
PURLIN ⊏ - 150x50x20x3.2 mm. @1.00 m.
ø15 mm. SAG ROD AT MID SPAN
0.45
0.30
L2
L1
GUSSET PLATE 8 mm.
VERTICAL MEMBER L-65x65x6x5.91 Kg/m.
DIAGONAL MEMBER L-65x65x6x5.91 Kg/m.

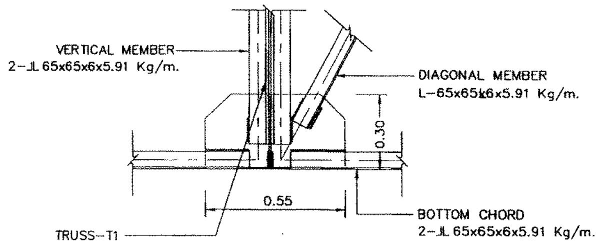
DETAILS "5"

SCALE 1:15


ø15 mm. SAG ROD AT MID SPAN
PURLIN ⊏ - 150x50x20x3.2 mm. @1.00 m.
TOP CHORD 2-⫪ 65x65x6x5.91 Kg/m.
L2
L1
0.25
0.30
GUSSET PLATE 8 mm.
VERTICAL MEMBER 2-⫫65x65x6x5.91 Kg/m.

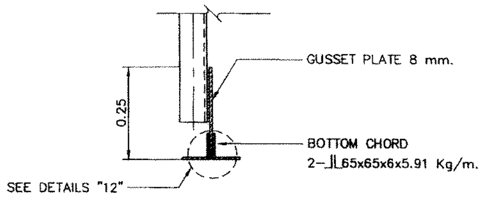
DETAILS "6"

SCALE 1:15


VERTICAL MEMBER 2-⫫ 65x65x6x5.91 Kg/m.
DIAGONAL MEMBER L-65x65x6x5.91 Kg/m.
0.30
0.55
BOTTOM CHORD 2-⫫ 65x65x6x5.91 Kg/m.
TRUSS-T1

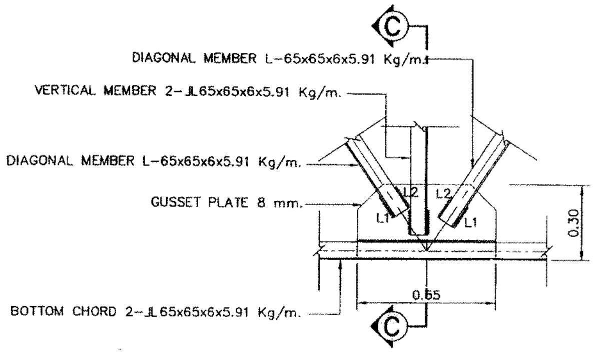
SECTION C–C

SCALE 1:15



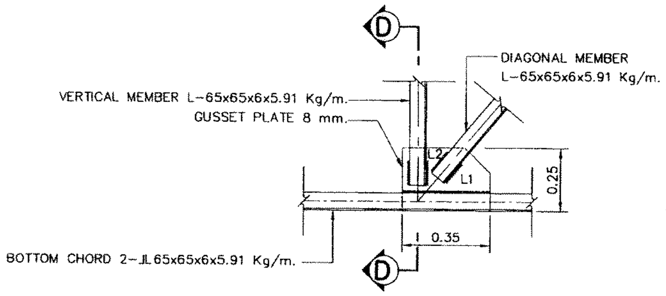
SECTION D–D

SCALE 1:10


C
DIAGONAL MEMBER L-65x65x6x5.91 Kg/m.
VERTICAL MEMBER 2-⫫65x65x6x5.91 Kg/m.
DIAGONAL MEMBER L-65x65x6x5.91 Kg/m.
GUSSET PLATE 8 mm.
L2
L2
L1
L1
0.30
0.65
BOTTOM CHORD 2-⫫65x65x6x5.91 Kg/m.
C

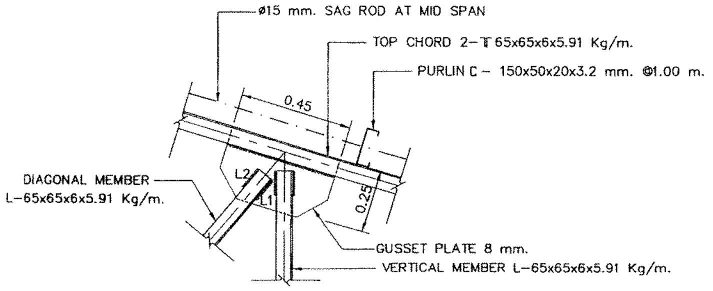
DETAILS "7"

SCALE 1:15


D
DIAGONAL MEMBER L-65x65x6x5.91 Kg/m.
VERTICAL MEMBER L-65x65x6x5.91 Kg/m.
GUSSET PLATE 8 mm.
L2
L1
0.25
0.35
BOTTOM CHORD 2-⫫65x65x6x5.91 Kg/m.
D

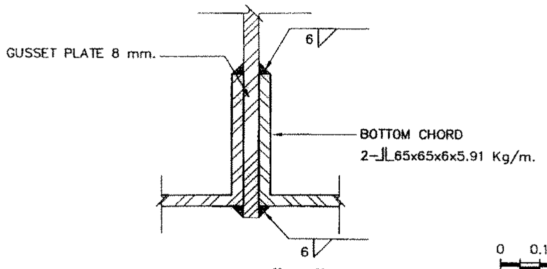
DETAILS "8"

SCALE 1:15


ø15 mm. SAG ROD AT MID SPAN
TOP CHORD 2-⫪ 65x65x6x5.91 Kg/m.
PURLIN ⊏ - 150x50x20x3.2 mm. @1.00 m.
0.45
DIAGONAL MEMBER L-65x65x6x5.91 Kg/m.
L2
L1
0.25
GUSSET PLATE 8 mm.
VERTICAL MEMBER L-65x65x6x5.91 Kg/m.

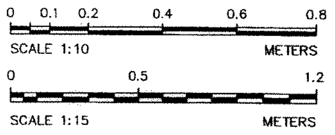
DETAILS "9"

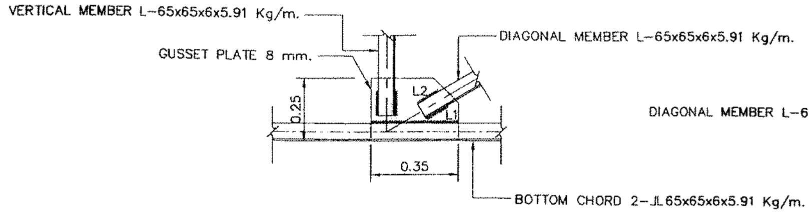
SCALE 1:15



DETAILS "12"

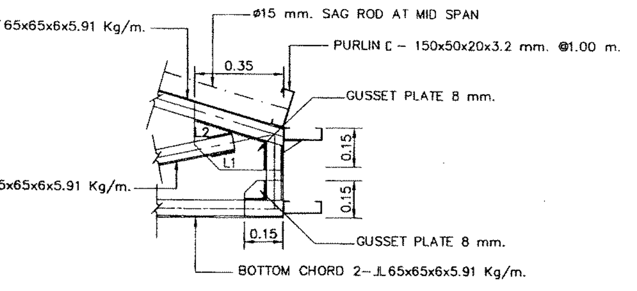
NOT TO SCALE




VERTICAL MEMBER L-65x65x6x5.91 Kg/m.
GUSSET PLATE 8 mm.
DIAGONAL MEMBER L-65x65x6x5.91 Kg/m.
L2
L1
0.25
0.35
BOTTOM CHORD 2-⫫65x65x6x5.91 Kg/m.

DETAILS "10"

SCALE 1:15


TOP CHORD 2-⫪ 65x65x6x5.91 Kg/m.
ø15 mm. SAG ROD AT MID SPAN
PURLIN ⊏ - 150x50x20x3.2 mm. @1.00 m.
0.35
GUSSET PLATE 8 mm.
L2
L1
0.15
0.15
DIAGONAL MEMBER L-65x65x6x5.91 Kg/m.
0.15
GUSSET PLATE 8 mm.
BOTTOM CHORD 2-⫫65x65x6x5.91 Kg/m.

DETAILS "11"

SCALE 1:15

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP-GN-03
3. WELDING CONNECTION USE 6 MM.,UNLESS OTHERWISE SHOWN

REFERENCE DRAWINGS :

1. POWERHOUSE, ROOF BEAM AND TRUSS PLANS	HPP-PH-08
2. POWERHOUSE, TRUSS T-1, T-2 AND T-3	HPP-PH-10

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

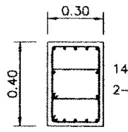
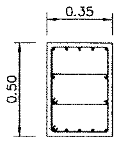
CIVIL WORKS
POWERHOUSE
DETAILS TRUSS T-1, T-2 AND T-3

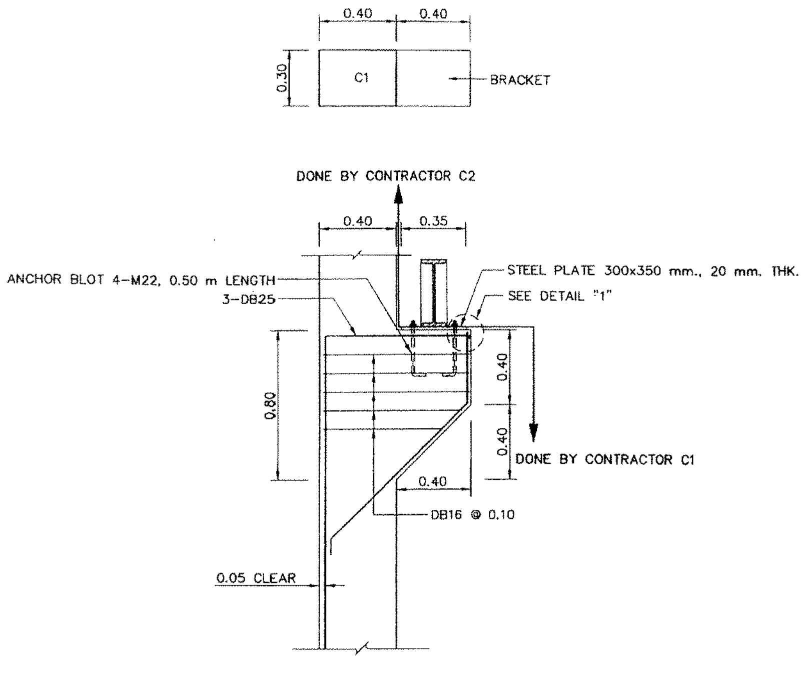
MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภย.37853 วย.4651
DRAWN
CHECKED วย.4651
8/12/51
PROJECT MANAGER DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

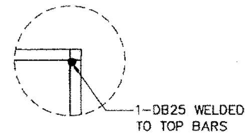
DRAWING NO. HPP-PH-11
SHEET NO. 76 OF 100

COLUMN SCHEDULE

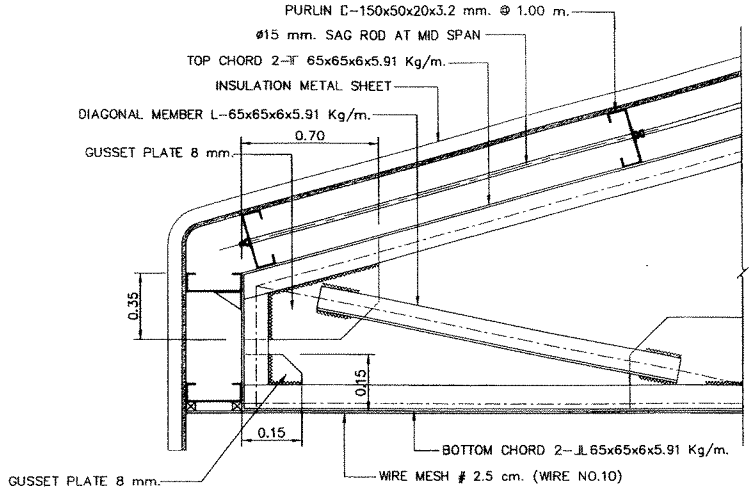
COLUMN FLOOR	C1
ROOF BEAM ↑ 1ST FLOOR	 0.30 0.40 14-DB25 2-RB9 @ 0.25 (STR.)
1ST FLOOR ↑ FOOTING	 0.35 0.50 14-DB25 2-RB9 @ 0.25 (STR.)



BRACKET
SCALE 1:20



DETAIL "1"
SCALE 1:10


PURLIN C-150x50x20x3.2 mm. @ 1.00 m.
ø15 mm. SAG ROD AT MID SPAN
TOP CHORD 2-ᒣᒥ 65x65x6x5.91 Kg/m.
INSULATION METAL SHEET
DIAGONAL MEMBER L-65x65x6x5.91 Kg/m.
0.70
GUSSET PLATE 8 mm.
0.35
0.15
0.15
BOTTOM CHORD 2-ᒧᒪ 65x65x6x5.91 Kg/m.
WIRE MESH # 2.5 cm. (WIRE NO.10)
GUSSET PLATE 8 mm.

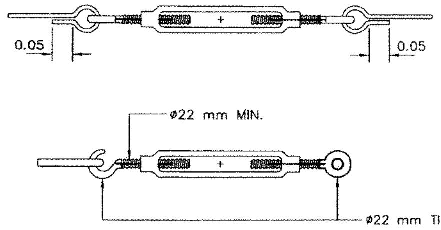
EAVES DETAIL
SCALE 1:10

NOTES :

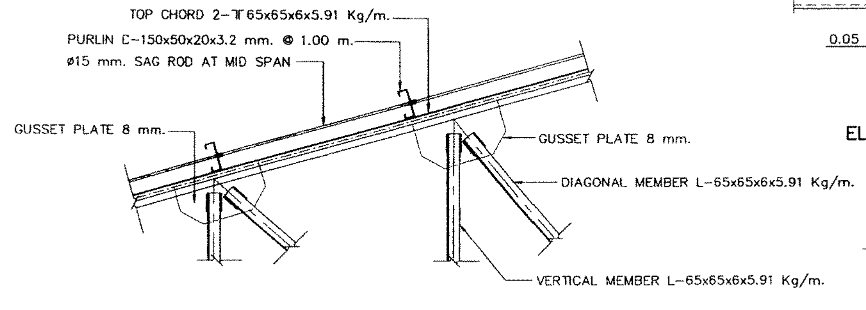
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HPP-GN-03

REFERENCE DRAWINGS :

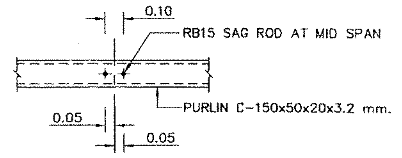
1.	POWERHOUSE, GROUND FLOOR FRAMING PLAN AND DETAILS	HPP-PH-07
2.	POWERHOUSE, ROOF BEAM AND TRUSS PLANS	HPP-PH-08
3.	POWERHOUSE, TRUSS T-1, T-2 AND T-3	HPP-PH-10
4.	POWERHOUSE, DETAILS TRUSS T-1, T-2 AND T-3	HPP-PH-11



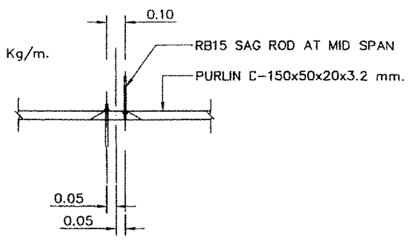
TURNBUCKLE
NOT TO SCALE


TOP CHORD 2-ᒣᒥ 65x65x6x5.91 Kg/m.
PURLIN C-150x50x20x3.2 mm. @ 1.00 m.
ø15 mm. SAG ROD AT MID SPAN
GUSSET PLATE 8 mm.
GUSSET PLATE 8 mm.
DIAGONAL MEMBER L-65x65x6x5.91 Kg/m.
VERTICAL MEMBER L-65x65x6x5.91 Kg/m.

SECTION

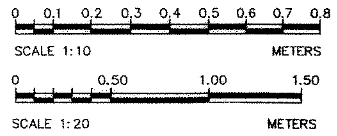


ELEVATION



PLAN

SAG ROD DETAILS
SCALE 1:20



KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
COLUMN DETAILS

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

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภย.37953 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER 8/12/51 DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED
DRAWING NO. HPP-PH-12
SHEET NO. 77 OF 100

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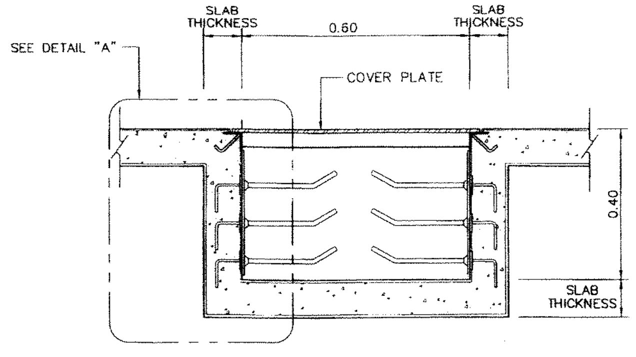
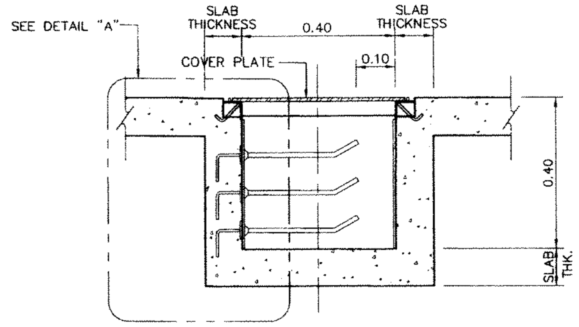


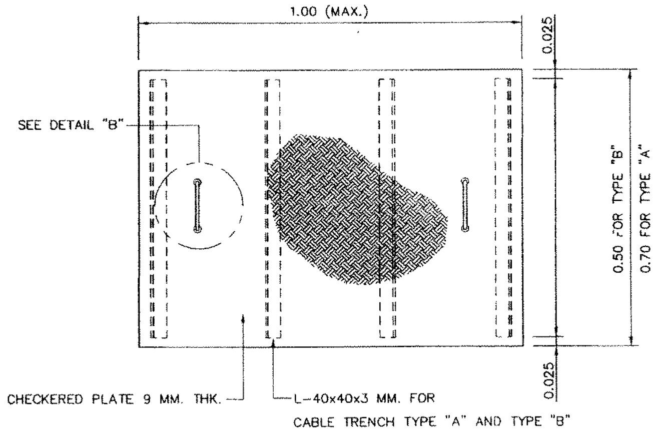
IN DOOR CABLE TRENCH TYPE "A"

SCALE 1:10



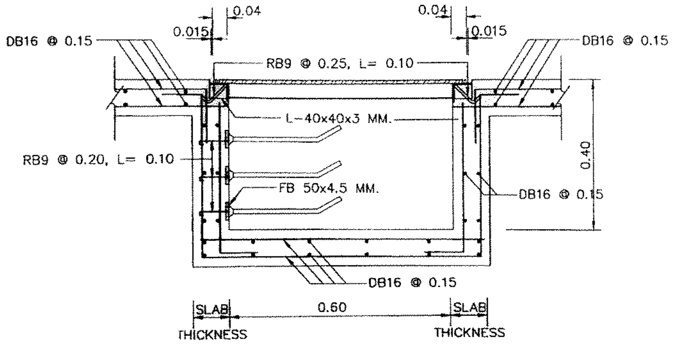
IN DOOR CABLE TRENCH TYPE "B"

SCALE 1:10


1.00 (MAX.)
0.025
SEE DETAIL "B"
0.50 FOR TYPE "B"
0.70 FOR TYPE "A"
0.025
CHECKERED PLATE 9 MM. THK.
L-40x40x3 MM. FOR CABLE TRENCH TYPE "A" AND TYPE "B"

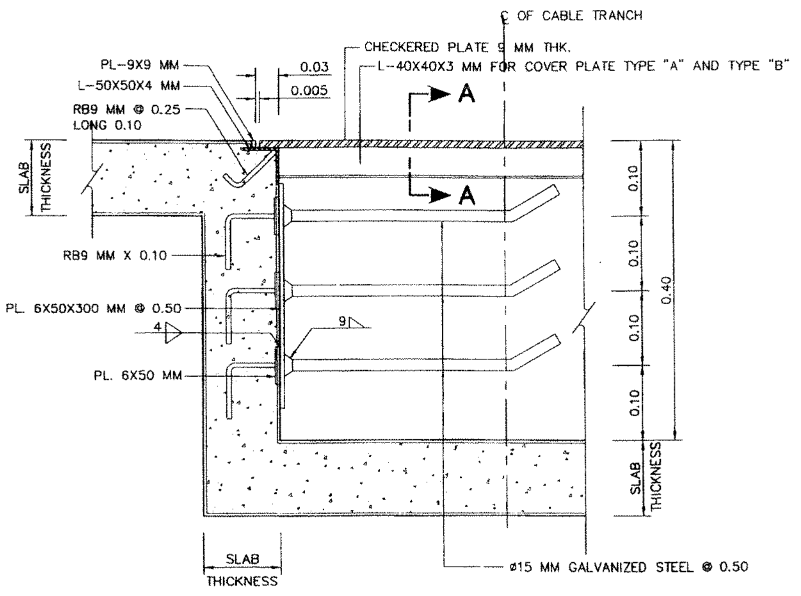
COVER PLATE FOR IN DOOR

SCALE 1:10



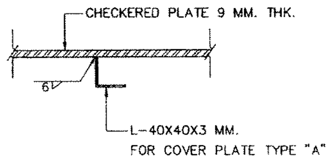
DETAIL OF IN DOOR CABLE TRENCH TYPE "A", "B"

SCALE 1:10



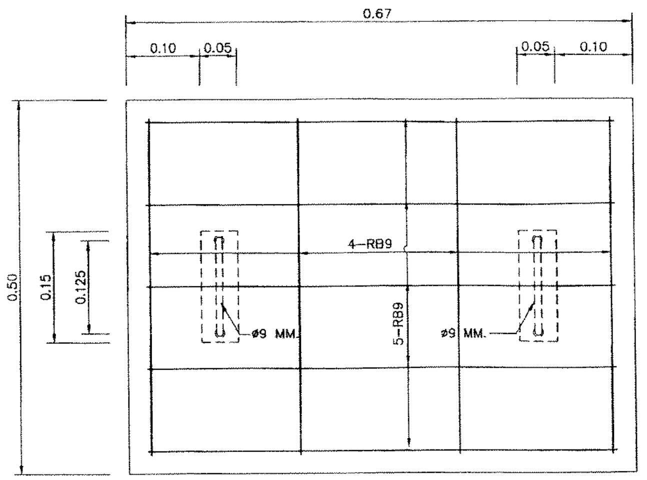
DETAIL "A"

SCALE 1:5


CHECKERED PLATE 9 MM. THK.
6
L-40X40X3 MM. FOR COVER PLATE TYPE "A"

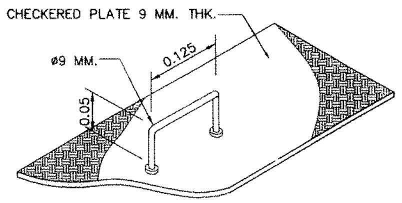
SECTION A-A

NOT TO SCALE



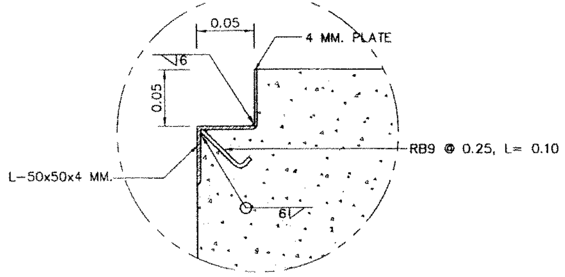
OUT DOOR COVER CABLE TRENCH

SCALE 1:5



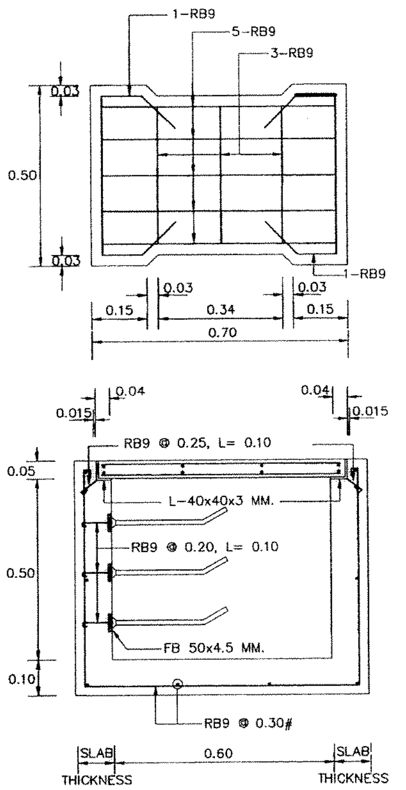
DETAIL "B"

NOT TO SCALE



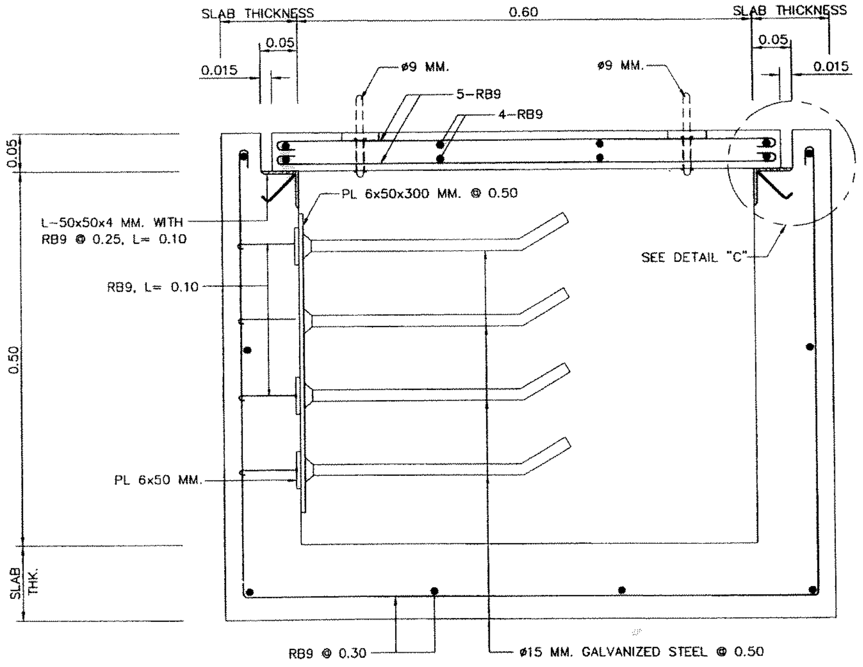
DETAIL "C"

NOT TO SCALE



DETAIL CABLE TRENCH IN SWITCHYARD

SCALE 1:20



OUT DOOR CABLE TRENCH TYPE "C"

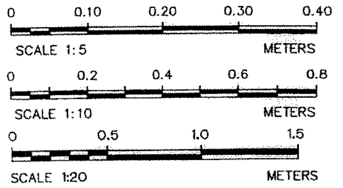
SCALE 1:5

NOTES :

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATION AND GENERAL NOTES SEE DWG. No. HPP-GN-03
3. STEEL COVER FOR IN DOOR TRENCH SHALL BE COATED WITH NON BLEEDING TYPE COAL TAR EPOXY.

REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAY OUT	HPP-PH-01
2. POWERHOUSE, PLAN AND SECTIONS	HPP-PH-03



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

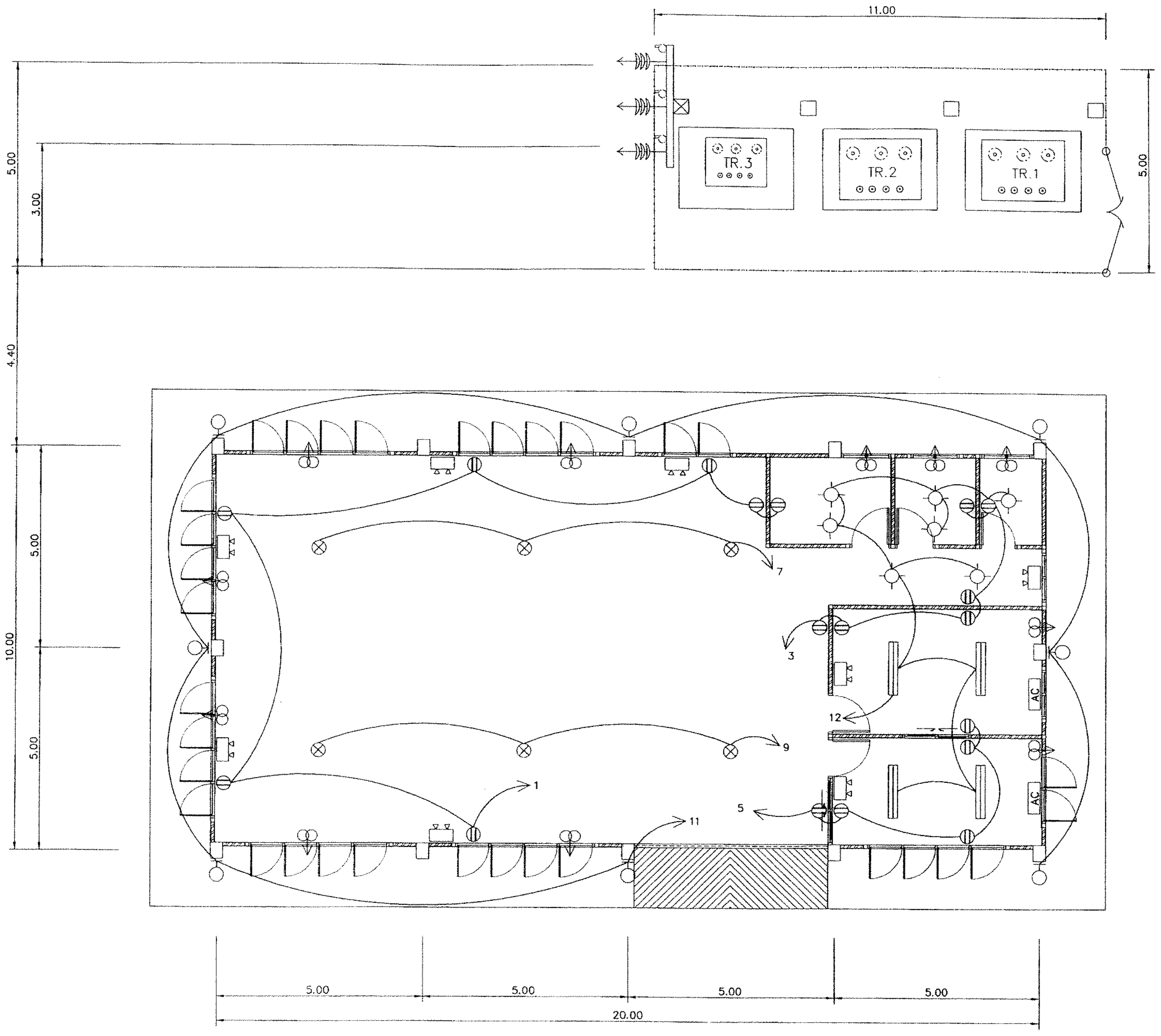
CIVIL WORKS
POWERHOUSE
CABLE TRENCH DETAILS

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED ภย.37053 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 6/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-PH-13
SHEET NO. 78 OF 100



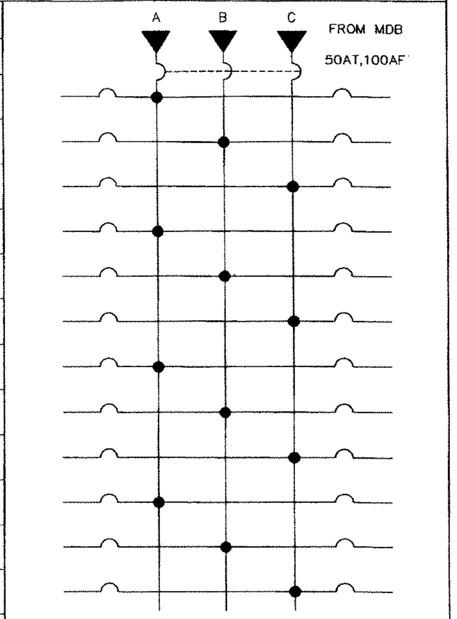
LIGHTING PLAN

SCALE 1:75

DIAGRAM

LOCATION : MACHINE HALL "PB" LOAD CENTER 3ø 4W WITH MCCB. 3P 50AT 100AF
(24 CKTS,BRANCH MCB 5 KAIC) IC > 10 KA AT 380 VOLT

CKT NO	DESCRIPTION	LOAD (VA)			MCB		CONDUCTOR	
		A	B	C	POLE	AT	SIZE(MM)^2	TYPE
1	RECEPTACLES	1540			1	15	2.5/1.5	VAF–G
3	RECEPTACLES		1320		1	15	2.5/1.5	VAF–G
5	RECEPTACLES			1100	1	15	2.5/1.5	VAF–G
7	LIGHTING	1200			1	10	2.5	VAF
9	LIGHTING		1200		1	10	2.5	VAF
11	LIGHTING			480	1	10	2.5	VAF
13	A/C 18,000 BTU/Hr	3000			1	30	6/6	THW 3/4" EMT
15	A/C 18,000 BTU/Hr		3000		1	30	6/6	THW 3/4" EMT
17	LIGHTING			1060	1	10	2.5	VAF
19	A/C 24,000 BTU/Hr	3300			1	30	6/6	THW 3/4" EMT
21	A/C 24,000 BTU/Hr		3300		1	30	6/6	THW 3/4" EMT
23	A/C 24,000 BTU/Hr			3300	1	30	6/6	THW 3/4" EMT
2	EXHAUST FAN	1400			1	10	2.5	VAF
4	EXHAUST FAN		1400		1	10	2.5	VAF
6	EXHAUST FAN			1400	1	10	2.5	VAF
8	SPARE				1	10	2.5	VAF
10	SPARE				1	10	2.5	VAF
12	SPARE				1	10	2.5	VAF
14	SPARE							
16	SPARE							
18	SPARE							
		10440	10220	7340				



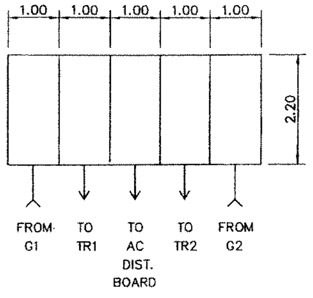
TOTAL CONNECTED LOAD	28,000	VA
DEMAND FACTOR	75%	
CALCULATED LOAD	21,000	VA

NOTE :

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

⊗	1 x 400 W MERCURY VAPOUR LAMP
▭	2 x 36 W FLUORESCENT WITH ALUMINIUM ANODIZED REFLECTOR
▭	1 x 36 W FLUORESCENT LUMINAIRE
▭	1 x 18 W FLUORESCENT LUMINAIRE
▷	250 W HIGH PRESSURE SODIUM FLOODLIGHT
8→	EXHAUST FAN ø 10 inch.
▯	2 x 25 W EMERGENCY LIGHT WITH BATTERY OPERATE RECEPTACLE
AC	AIR CONDITION , CEILING TYPE
◩ PB	LOAD CENTER PANEL
⊖	DUPLEX RECEPTACLE
Ⓢ	ONE WAY SWITCH, 15A ,1ø , 250V
○	1 x 60 W INCANDESCENT, OUTDOOR
⌖	1 x 60 W INCANDESCENT, INDOOR
⊓	EMERGENCY LAMP 3x35W, 12V, 32A

0.4 Kv SW.GEAR CUBICLES



0 0.5 1 2 3 4 5 6 m.
SCALE 1:75 METERS

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
ELECTRICAL LIGHTING PLAN EXHAUST AND OUTLET PLAN

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED วฟก.741
DRAWN
CHECKED วฟก.741
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–PH–14
SHEET NO. 79 OF 100

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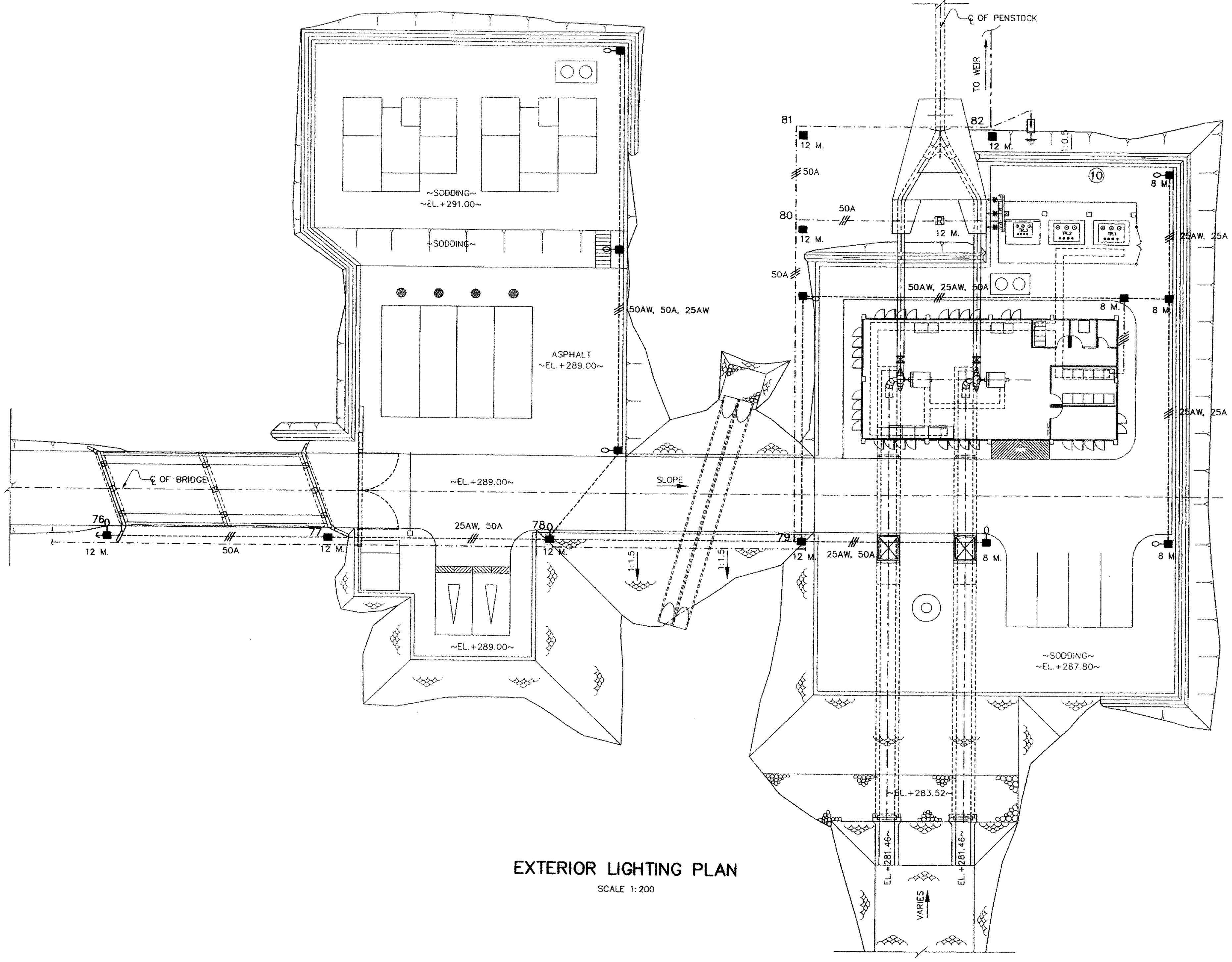
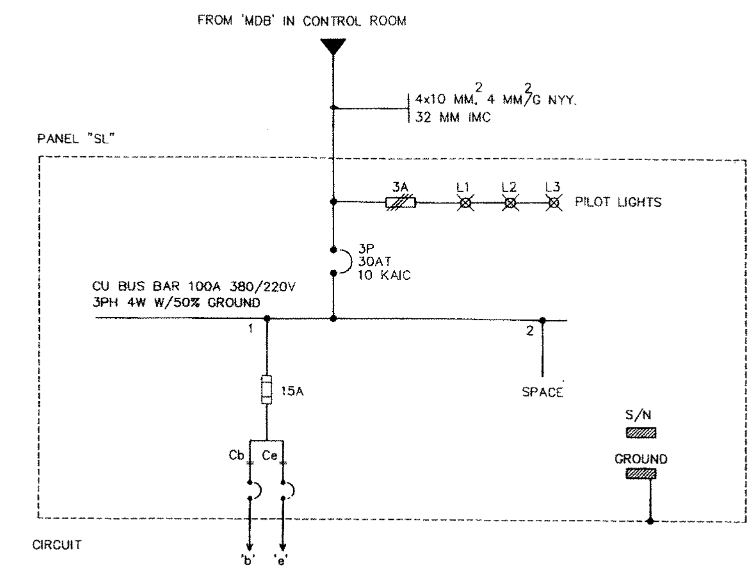


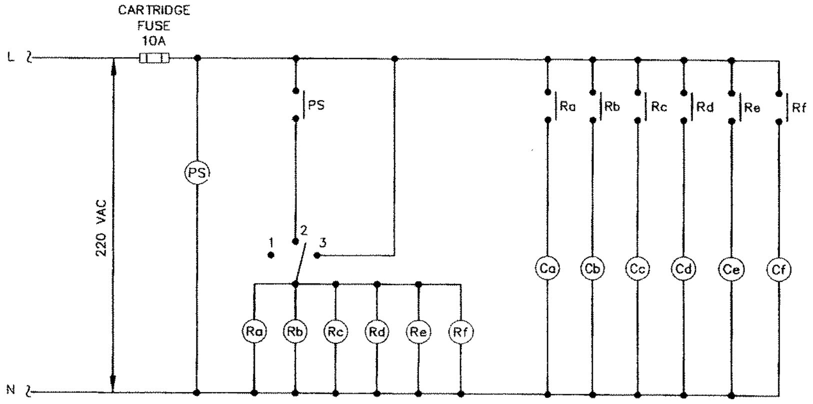
EXTERIOR LIGHTING PLAN

SCALE 1:200



SINGLE DIAGRAM OF PANEL "SL"

NOT TO SCALE



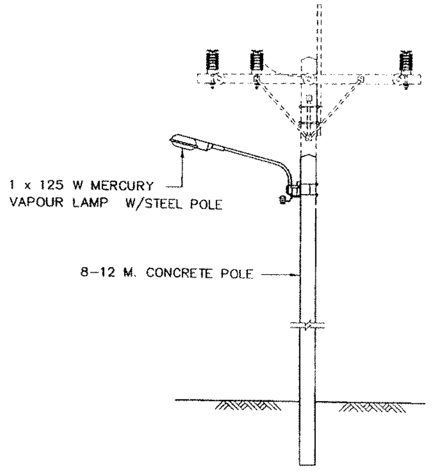
STREET LIGHTING CONTROL DIAGRAM

NOT TO SCALE

NOTES :

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. ALL CONCRETE POLES, HARDWARES, TRANSFORMER, AND INSTALLATION SHALL STRICTLY CONFORM TO PEA'S STANDARD AND REGULATIONS.
3. SPLICING OF CABLES IS NOT ALLOWED IN CONDUITS OR HAND HOLES EXCEPT AT JUNCTION BOXES OR PULL BOXES ABOVE GROUND LEVEL WITH APPROVED SPLICING FITTINGS.

0 5 10 15 20
SCALE 1:200 METTERS



DETAIL OF STREET LIGHTING

NOT TO SCALE

LEGENDS :

■ 8, 12m	CONCRETE POLE, SUFFIX INDICATES HEIGHT OF POLE
■-○	STREET LIGHTING FIXTURE, 1x125 W MERCURY LAMP, ON CONCRETE POLE
■→	CONCRETE POLE WITH GUY WIRE
▬	MAIN DISTRIBUTION PANEL
Ⓙ	JUNCTION BOX
PB	WEATHERPROOF (WP) GALVANIZED STEEL PULL BOX
▭	SAFETY SWITCH OR DISCONNECT SWITCH, NEMA 3R ON CONCRETE POLE
— · — · —	PRIMARY LINES, 22 KV OVERHEAD BARE CONDUCTORS
- - - - - -	SECONDARY LINES, 380/220 V 50 MM² THW OVERHEAD INSULATED CABLES, 3ø 4 WIRE
— - — - —	UNDERGROUND WIRING IN CONDUIT
— — - — —	UNDERGROUND CABLE, XLPE 22 kV. IN HDPE CONDUIT

LEGENDS :

(PS)	PHOTO SWITCH
•|	CONTACT
1 2 3	SELECTOR SWITCH : 3 POSITIONS, OFF-AUTO MANUAL
(Ra),b	CONTROL RELAY, CIRCUIT 'a', 'b'
(Rc),d	CONTROL RELAY, CIRCUIT 'c', 'd'
(Re),f	CONTROL RELAY, CIRCUIT 'e', 'f'
(Ca),b	MAGNETIC CONTACTOR 30A, CIRCUIT 'a', 'b'
(Cc),d	MAGNETIC CONTACTOR 30A, CIRCUIT 'c', 'd'
(Ce),f	MAGNETIC CONTACTOR 30A, CIRCUIT 'e', 'f'

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
EXTERIOR LIGHTING PLAN

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED ววท.741
DRAWN
CHECKED ววท.741
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-PH-15
SHEET NO. 80 OF 100

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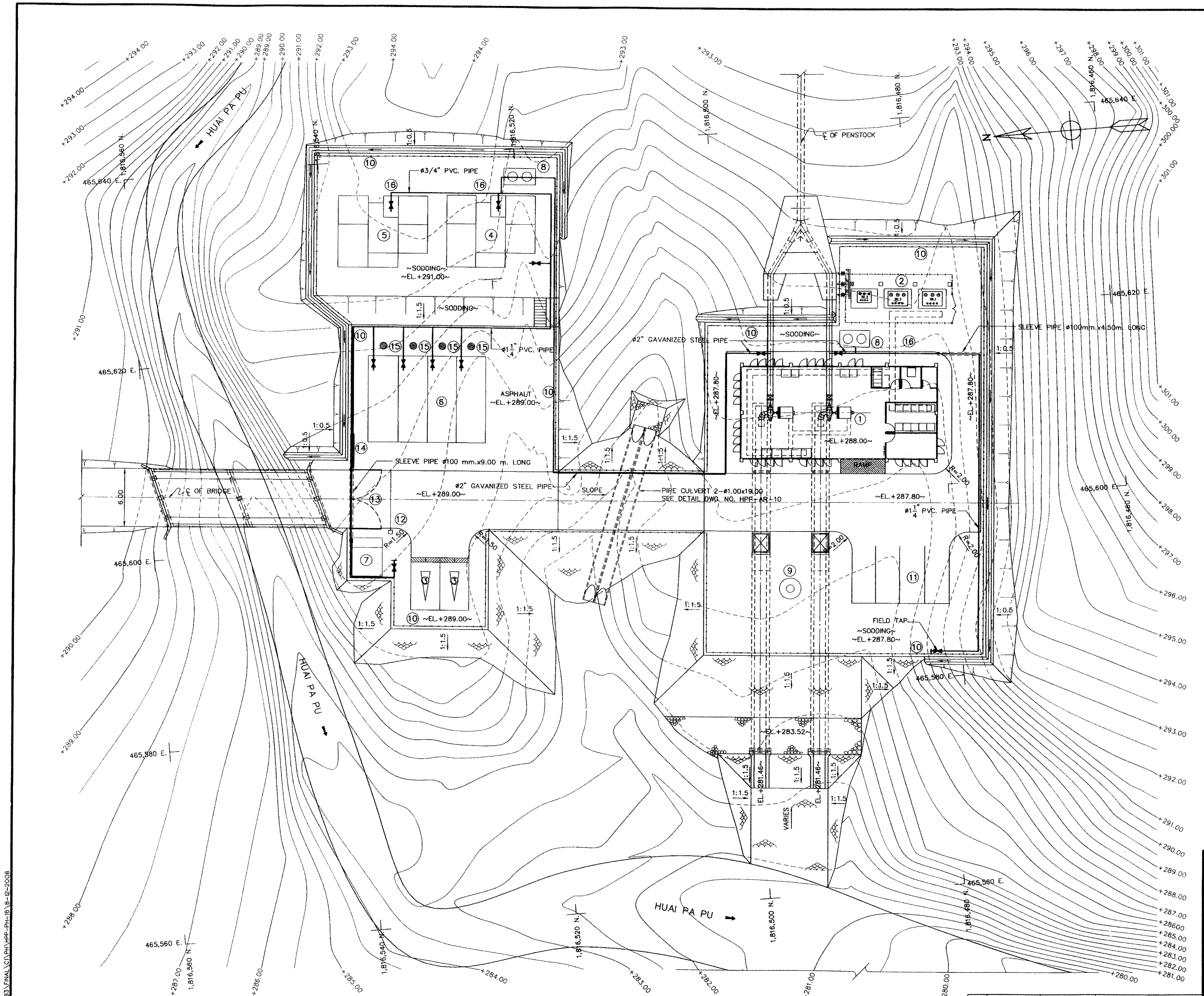

WATER SUPPLY PIPELINE SYSTEM LAYOUT

SCALE 1:200

LEGENDS :

- ① POWERHOUSE
- ② SWITCHYARD
- ③ GARAGE
- ④ HOUSING GRADE 5–6 FOR 1 FAMILY
- ⑤ HOUSING GRADE 3–4 FOR 1 FAMILY
- ⑥ LABOUR HOUSING FOR 4 FAMILY
- ⑦ GUARD HOUSE
- ⑧ ELEVATED TANK
- ⑨ FLAG POLE
- ⑩ WIREMESH FENCE
- ⑪ PARKING AREA
- ⑫ MOVABLE STEEL BARRICADE
- ⑬ ENTRANCE GATE
- ⑭ NAME BOARD
- ⑮ STAINLESS STEEL WATER TANK 3.00 CU.M.
- ⑯ SEPTIC TANK

NOTES :

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

REFERENCE DRAWINGS :

1. PIT VALVE, FIELD TAP, DITCH AND SLOPE PROTECTION DETAILS HPP–PH–17

0 1 2 3 4 5 10 15

SCALE 1:200 METERS

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
WATER SUPPLY PIPELINE SYSTEM LAYOUT

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภส.37953 สน.4651
DRAWN
CHECKED สน.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–PH–16
SHEET NO. 81 OF 100

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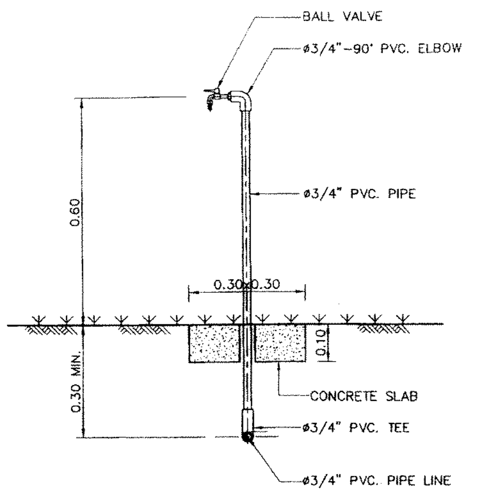
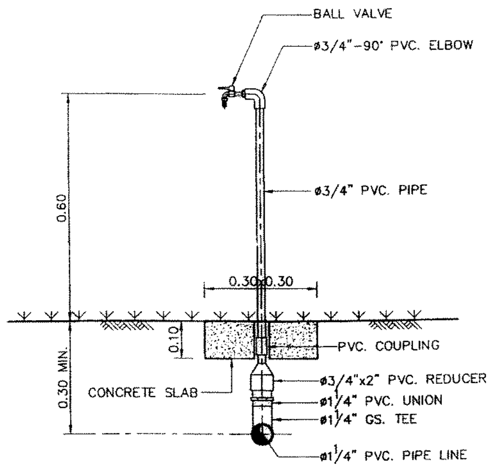


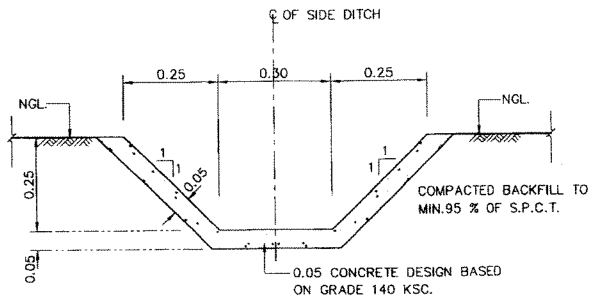
FIELD TAP TYPICAL INSTALLATION DETAIL "1"

SCALE 1:10



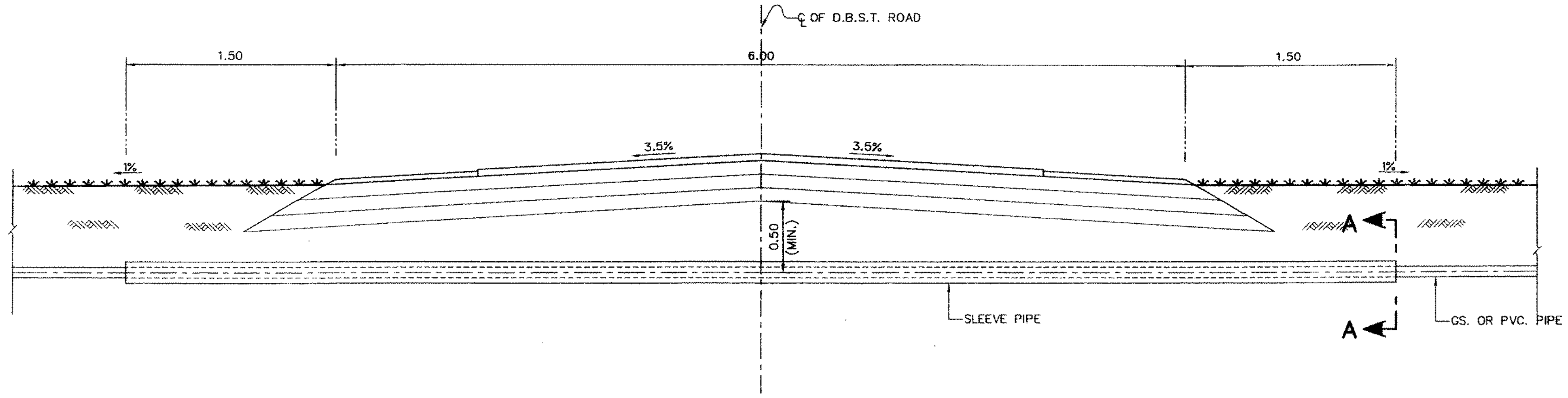
FIELD TAP TYPICAL INSTALLATION DETAIL "2"

SCALE 1:10


℄ OF SIDE DITCH
0.25
0.30
0.25
NGL.
NGL.
1
1
1
1
0.05
0.25
0.05
COMPACTED BACKFILL TO MIN.95 % OF S.P.C.T.
0.05 CONCRETE DESIGN BASED ON GRADE 140 KSC.

DETAIL OF DITCH

SCALE 1:10



TYPICAL SECTION FOR SLEEVE PIPE INSTALLATION

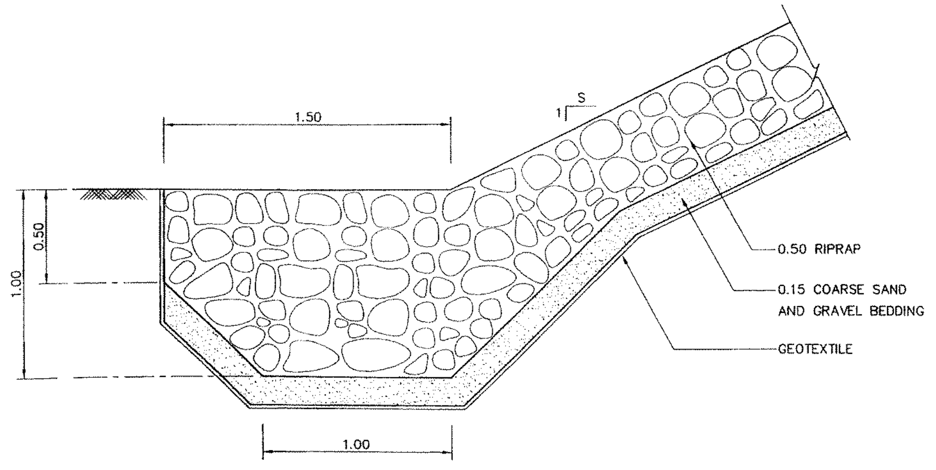
SCALE 1:25

NOTES :

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. REINFORCING BARS ARE IN MILLIMETERS
3. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 175 KSC. FOR STANDARD CYLINDER AT 28 DAYS
4. REINFORCING STEEL SHALL CONFORM TO SR24, TIS 20-2543
5. MORTAR RIPRAP DITCH SHALL BE SPECIFIED AS FOLLOWS
   5.1 THE STONES USED FOR MORTAR RIPRAP DITCH SHALL WEIGH 20-45 KG. EACH AND AT LEAST 50 % SHALL WEIGH MORE THAN 35 KG. STONES SHALL HAVE SUCH SHAPE AND DIMENSIONS AS TO MINIMIZE THE INTERSPLICES AFTER PLACING THE THICKNESS OF THE STONES SHALL BE APPROXIMATELY 15 CM.
   5.2 THE LARGER STONES SHALL BE PLACED FIRST AND THE INTERSPLICES SHALL BE FILLED WITH SPELLS OR SMALL STONES UNTIL A SMOOTH SURFACE IS OBTAINED FRESH MORTAR SHALL THEN BE APPLIED TO SEAL ALL JOINTS
6. RIPRAP SLOPE PROTECTION SHALL BE SPECIFIED AS FOLLOWS :
   6.1 THE STONES USED FOR RIPRAP SLOPE PROTECTION SHALL WEIGH BETWEEN 25-70 KG. EACH AND AT LEAST 75 % SHALL WEIGH MORE THAN 45 KG.
   6.2 THE LARGER STONES SHALL BE PLACED FIRST AND THE INTERSPLICES SHALL BE FILLED WITH SMALL STONES THE THICKNEES OF RIPRAP SHALL BE APPROXIMATELY 0.50 M.

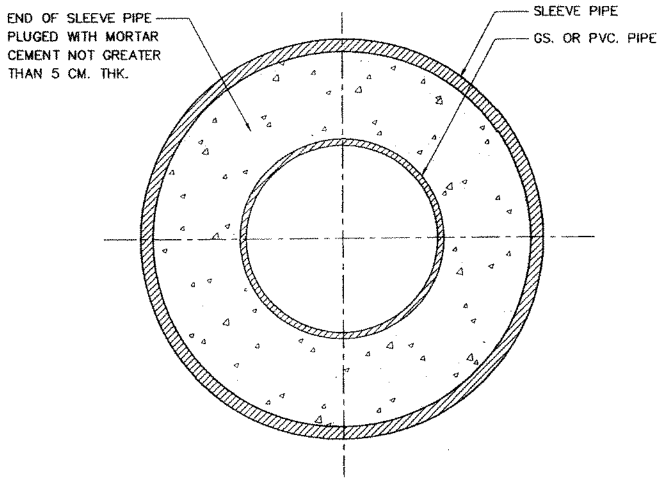
REFERENCE DRAWING :

1. POWERHOUSE, WATERSUPPLY PIPELINE SYSTEM LAYOUT HPP-PH-16



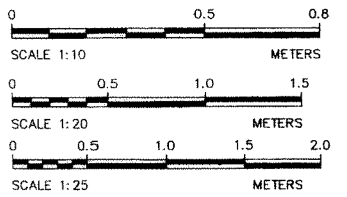
RIPRAP SLOPE PROTECTION DETAIL

SCALE 1:20


END OF SLEEVE PIPE PLUGED WITH MORTAR CEMENT NOT GREATER THAN 5 CM. THK.
SLEEVE PIPE
GS. OR PVC. PIPE

SECTION A-A

SCALE 1:25



KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
PIT VALVE, FIELD TAP, DITCH AND SLOPE PROTECTION DETAILS

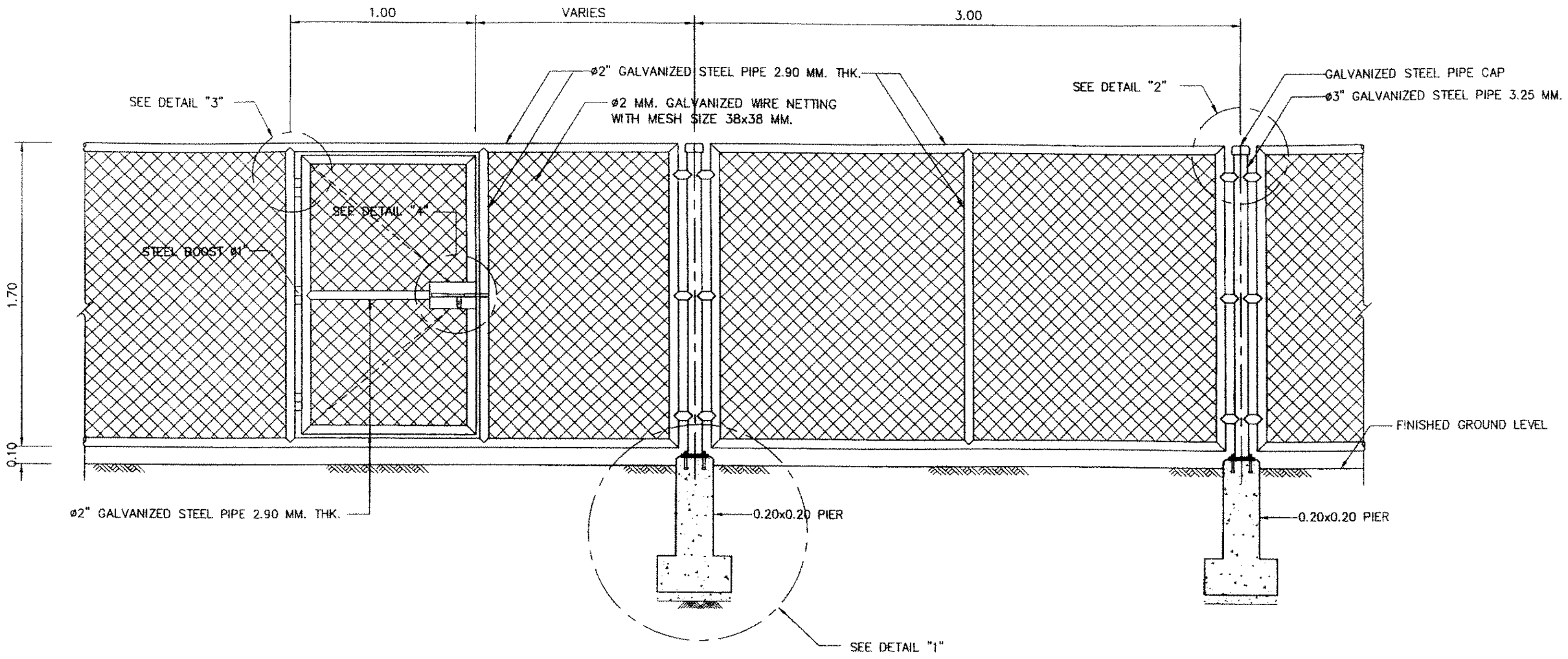
3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภย.37953 สย.4651
DRAWN
CHECKED สย.4651
8/12/51
PROJECT MANAGER DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

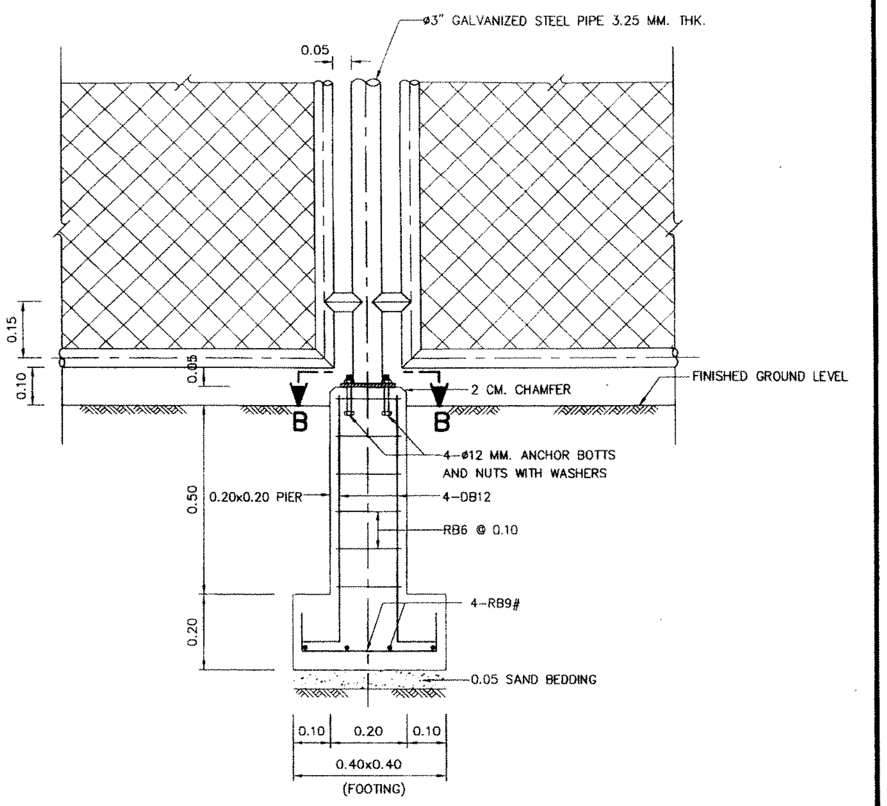
DRAWING NO. HPP-PH-17
SHEET NO. 82 OF 100

\FILES-SERVER\D00783\FINAL\CI\PH\HPP-PH-17\7-12-2008


1.00
VARIES
3.00
SEE DETAIL "3"
ø2" GALVANIZED STEEL PIPE 2.90 MM. THK.
ø2 MM. GALVANIZED WIRE NETTING WITH MESH SIZE 38x38 MM.
SEE DETAIL "2"
GALVANIZED STEEL PIPE CAP
ø3" GALVANIZED STEEL PIPE 3.25 MM. THK.
SEE DETAIL "4"
STEEL BOOST ø1"
1.70
0.10
FINISHED GROUND LEVEL
ø2" GALVANIZED STEEL PIPE 2.90 MM. THK.
0.20x0.20 PIER
0.20x0.20 PIER
SEE DETAIL "1"

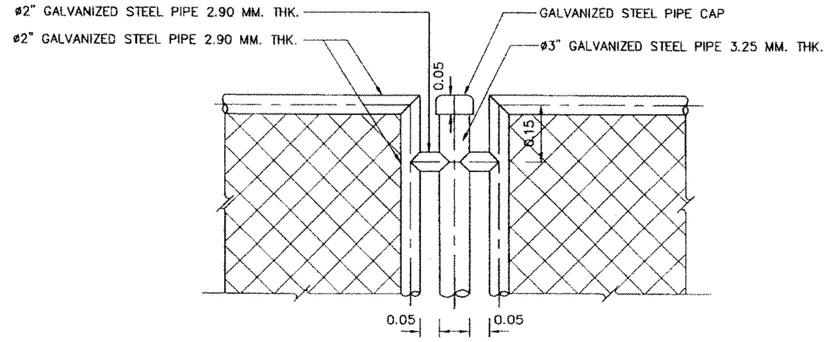
WIRE MESH FENCE AND GATE WIDTH 1.00 M.

SCALE 1:20



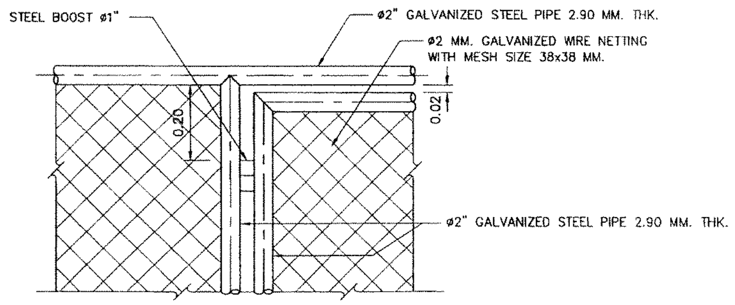
DETAIL "1"

SCALE 1:10


ø2" GALVANIZED STEEL PIPE 2.90 MM. THK.
ø2" GALVANIZED STEEL PIPE 2.90 MM. THK.
GALVANIZED STEEL PIPE CAP
ø3" GALVANIZED STEEL PIPE 3.25 MM. THK.
0.05
0.15
0.05
0.05

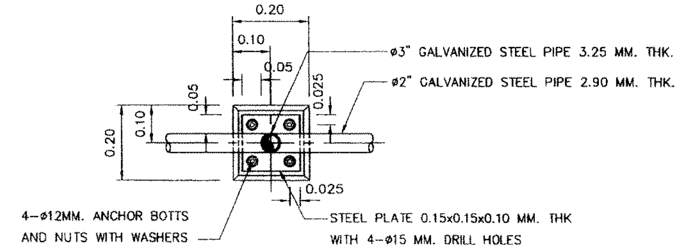
DETAIL "2"

SCALE 1:10


STEEL BOOST ø1"
ø2" GALVANIZED STEEL PIPE 2.90 MM. THK.
ø2 MM. GALVANIZED WIRE NETTING WITH MESH SIZE 38x38 MM.
0.20
0.02
ø2" GALVANIZED STEEL PIPE 2.90 MM. THK.

DETAIL "3"

SCALE 1:10

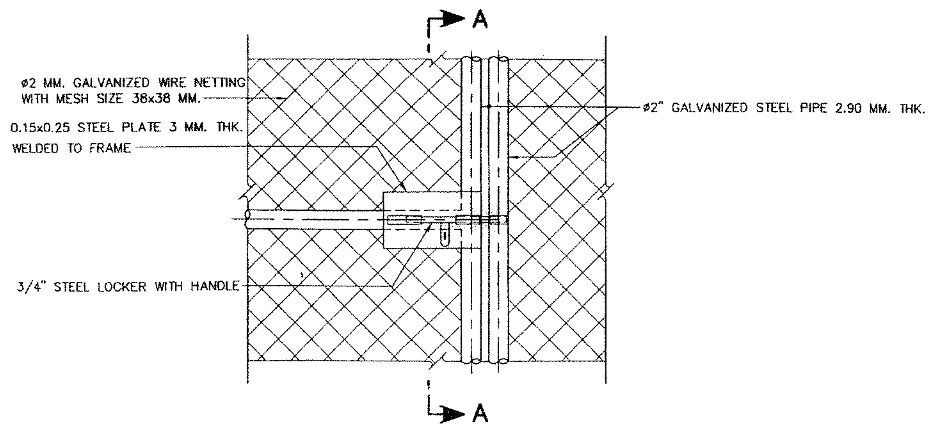

0.20
0.10
0.05
0.025
ø3" GALVANIZED STEEL PIPE 3.25 MM. THK.
ø2" GALVANIZED STEEL PIPE 2.90 MM. THK.
0.05
0.10
0.20
0.025
4-ø12MM. ANCHOR BOTTS AND NUTS WITH WASHERS
STEEL PLATE 0.15x0.15x0.10 MM. THK WITH 4-ø15 MM. DRILL HOLES

SECTION B-B

SCALE 1:10

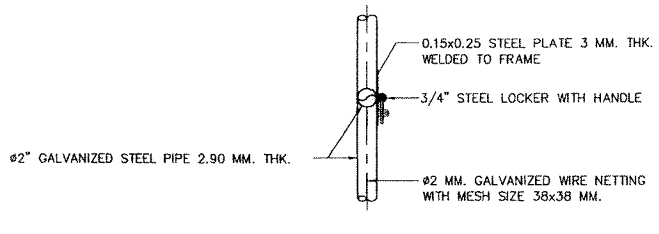
NOTES :

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. WIRE MESH SHALL GALVANIZED AS SPECIFIED BY TIS 208


A
ø2 MM. GALVANIZED WIRE NETTING WITH MESH SIZE 38x38 MM.
0.15x0.25 STEEL PLATE 3 MM. THK. WELDED TO FRAME
ø2" GALVANIZED STEEL PIPE 2.90 MM. THK.
3/4" STEEL LOCKER WITH HANDLE
A

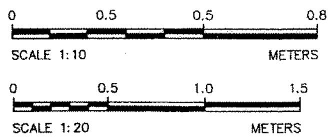
DETAIL "4"

SCALE 1:10


0.15x0.25 STEEL PLATE 3 MM. THK. WELDED TO FRAME
3/4" STEEL LOCKER WITH HANDLE
ø2" GALVANIZED STEEL PIPE 2.90 MM. THK.
ø2 MM. GALVANIZED WIRE NETTING WITH MESH SIZE 38x38 MM.

SECTION A-A

SCALE 1:10



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
WIRE MESH FENCE AND GATE WIDTH 1.00 M.

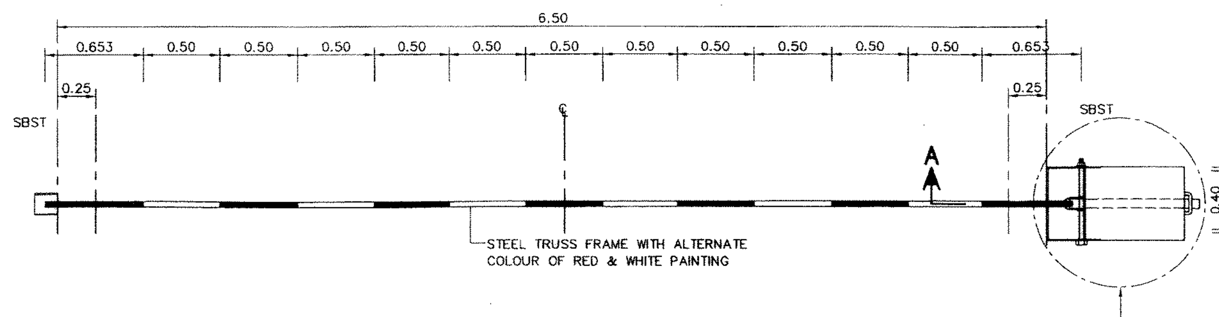
MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED ภย.37953 สย.4661
DRAWN
CHECKED สย.4651
8/12/51
PROJECT MANAGER DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

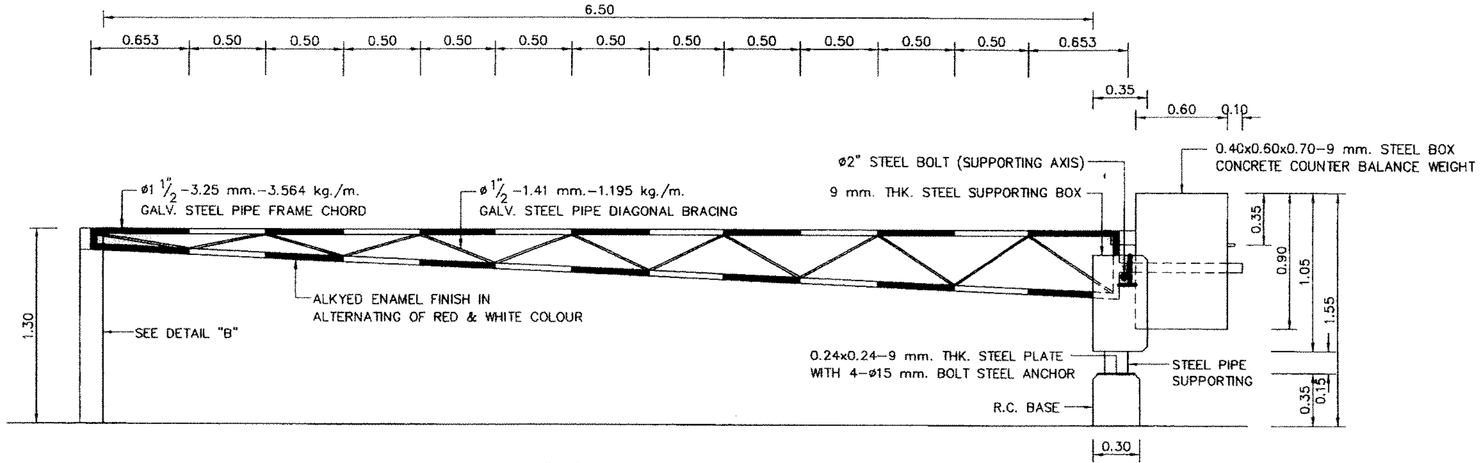
DRAWING NO. HPP-PH-18
SHEET NO. 83 OF 100

\\FILES-SERVER\000783\FINAL\C1\PH\HPP-PH-18\7-12-2008


6.50
0.653
0.50
0.653
0.25
SBST
℄
A
A
STEEL TRUSS FRAME WITH ALTERNATE COLOUR OF RED & WHITE PAINTING
0.40
0.45
SEE DETAIL "A"

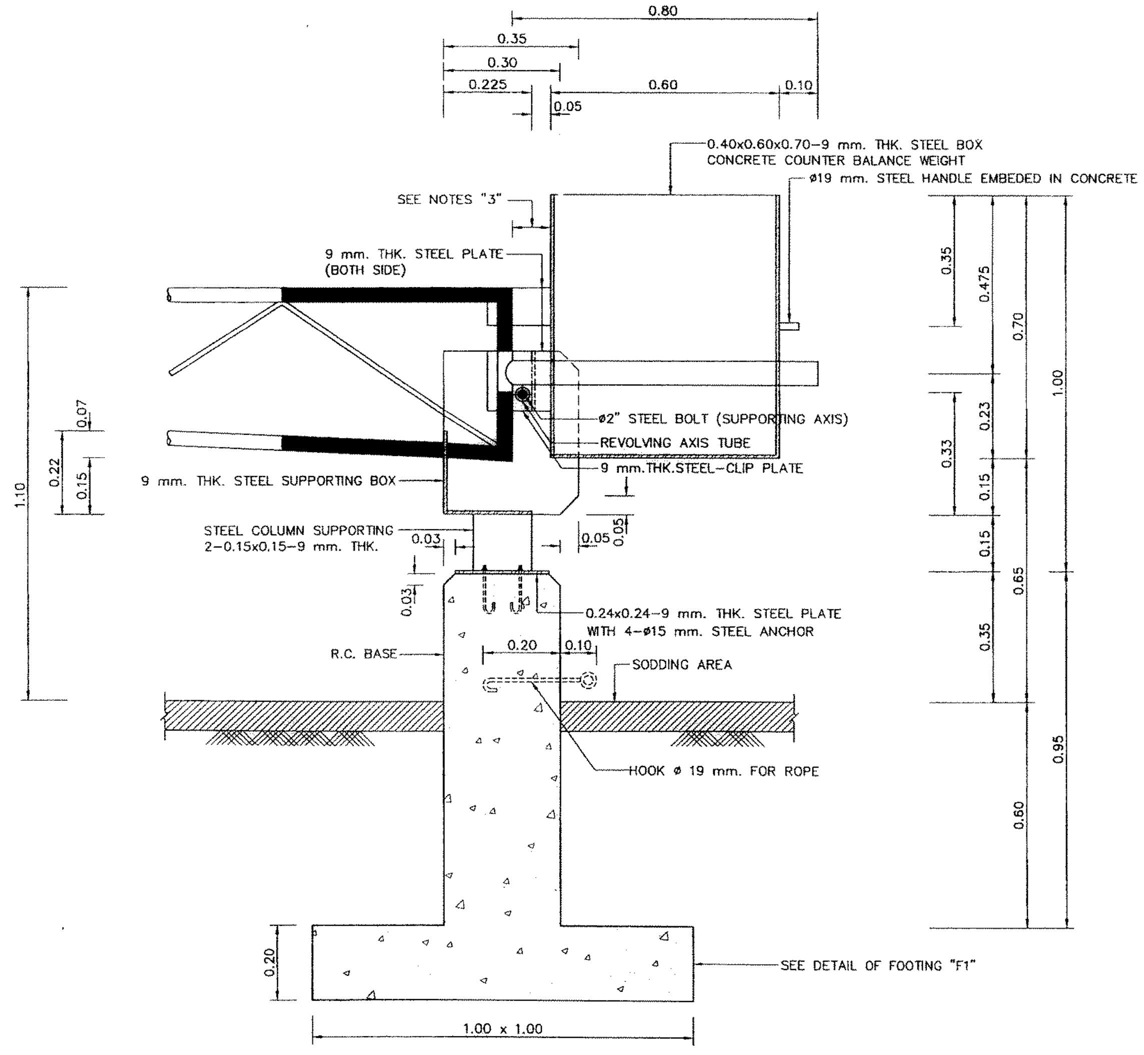
PLAN

SCALE 1:25


6.50
0.653
0.50
0.653
0.35
0.60
0.10
ø2" STEEL BOLT (SUPPORTING AXIS)
0.40x0.60x0.70–9 mm. STEEL BOX CONCRETE COUNTER BALANCE WEIGHT
9 mm. THK. STEEL SUPPORTING BOX
ø1 1/2 –3.25 mm.–3.564 kg./m. GALV. STEEL PIPE FRAME CHORD
ø1 1/2 –1.41 mm.–1.195 kg./m. GALV. STEEL PIPE DIAGONAL BRACING
ALKYED ENAMEL FINISH IN ALTERNATING OF RED & WHITE COLOUR
SEE DETAIL "B"
1.30
0.24x0.24–9 mm. THK. STEEL PLATE WITH 4–ø15 mm. BOLT STEEL ANCHOR
STEEL PIPE SUPPORTING
R.C. BASE
0.35
0.90
1.05
1.55
0.35
0.15
0.30

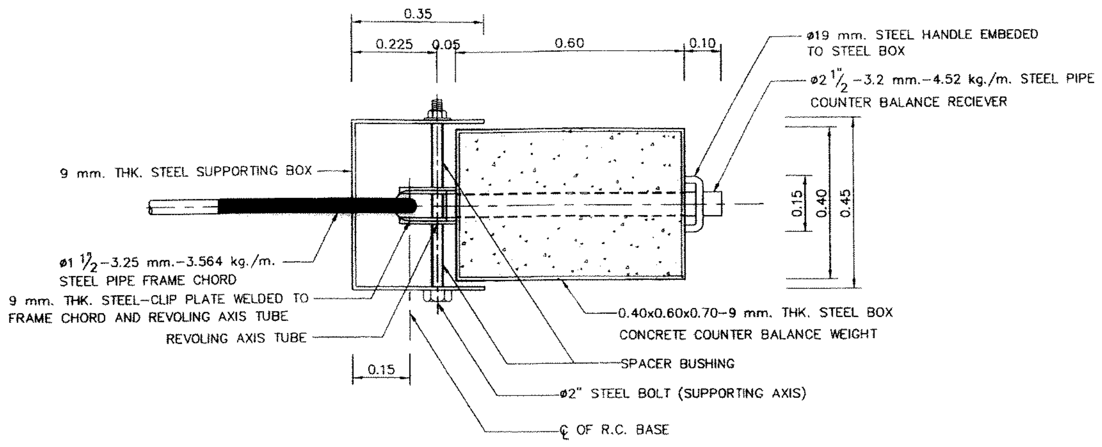
ELEVATION

SCALE 1:25


0.80
0.35
0.30
0.225
0.60
0.10
0.05
0.40x0.60x0.70–9 mm. THK. STEEL BOX CONCRETE COUNTER BALANCE WEIGHT
ø19 mm. STEEL HANDLE EMBEDED IN CONCRETE
SEE NOTES "3"
9 mm. THK. STEEL PLATE (BOTH SIDE)
ø2" STEEL BOLT (SUPPORTING AXIS)
REVOLVING AXIS TUBE
9 mm.THK.STEEL-CLIP PLATE
9 mm. THK. STEEL SUPPORTING BOX
STEEL COLUMN SUPPORTING 2–0.15x0.15–9 mm. THK.
0.03
0.05
0.24x0.24–9 mm. THK. STEEL PLATE WITH 4–ø15 mm. STEEL ANCHOR
R.C. BASE
0.20
0.10
SODDING AREA
HOOK ø 19 mm. FOR ROPE
SEE DETAIL OF FOOTING "F1"
1.00 x 1.00
1.10
0.07
0.22
0.15
0.35
0.475
0.70
1.00
0.33
0.23
0.15
0.15
0.65
0.35
0.95
0.60
0.20

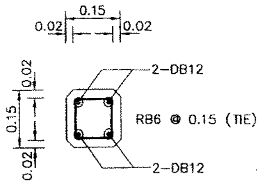
SECTION A–A

SCALE 1:10


0.35
0.225
0.05
0.60
0.10
ø19 mm. STEEL HANDLE EMBEDED TO STEEL BOX
ø2 1/2 –3.2 mm.–4.52 kg./m. STEEL PIPE COUNTER BALANCE RECIEVER
9 mm. THK. STEEL SUPPORTING BOX
ø1 1/2 –3.25 mm.–3.564 kg./m. STEEL PIPE FRAME CHORD
9 mm. THK. STEEL-CLIP PLATE WELDED TO FRAME CHORD AND REVOLING AXIS TUBE
REVOLING AXIS TUBE
0.40x0.60x0.70–9 mm. THK. STEEL BOX CONCRETE COUNTER BALANCE WEIGHT
SPACER BUSHING
ø2" STEEL BOLT (SUPPORTING AXIS)
℄ OF R.C. BASE
0.15
0.15
0.40
0.45

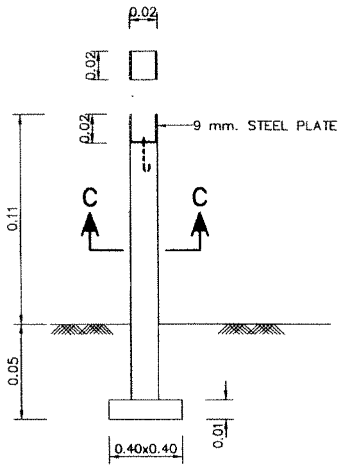
DETAIL "A"

SCALE 1:10



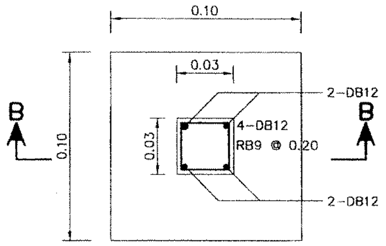
SECTION C–C

SCALE 1:20



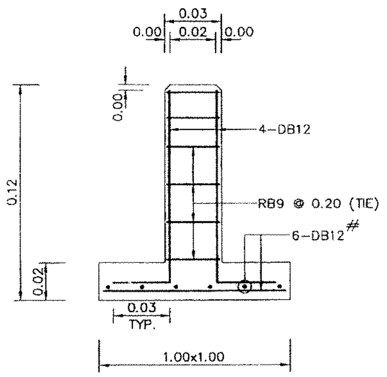
DETAIL "B"

SCALE 1:20



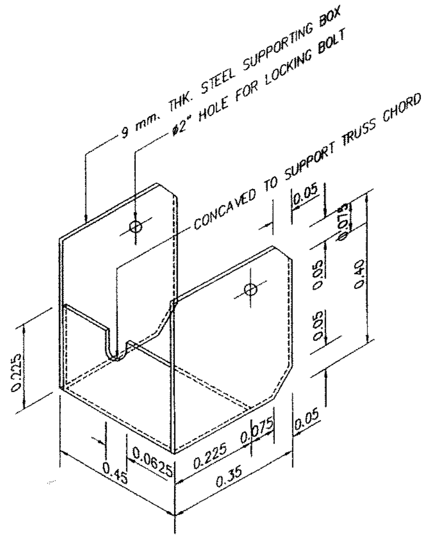
PLAN OF FOOTING "F1"

SCALE 1:20



SECTION B–B

SCALE 1:20


9 mm. THK. STEEL SUPPORTING BOX
ø2" HOLE FOR LOCKING BOLT
CONCAVED TO SUPPORT TRUSS CHORD
0.05
0.075
0.05
0.40
0.05
0.225
0.45
0.0625
0.225
0.35
0.075
0.05

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

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
MOVABLE STEEL BARRICADE

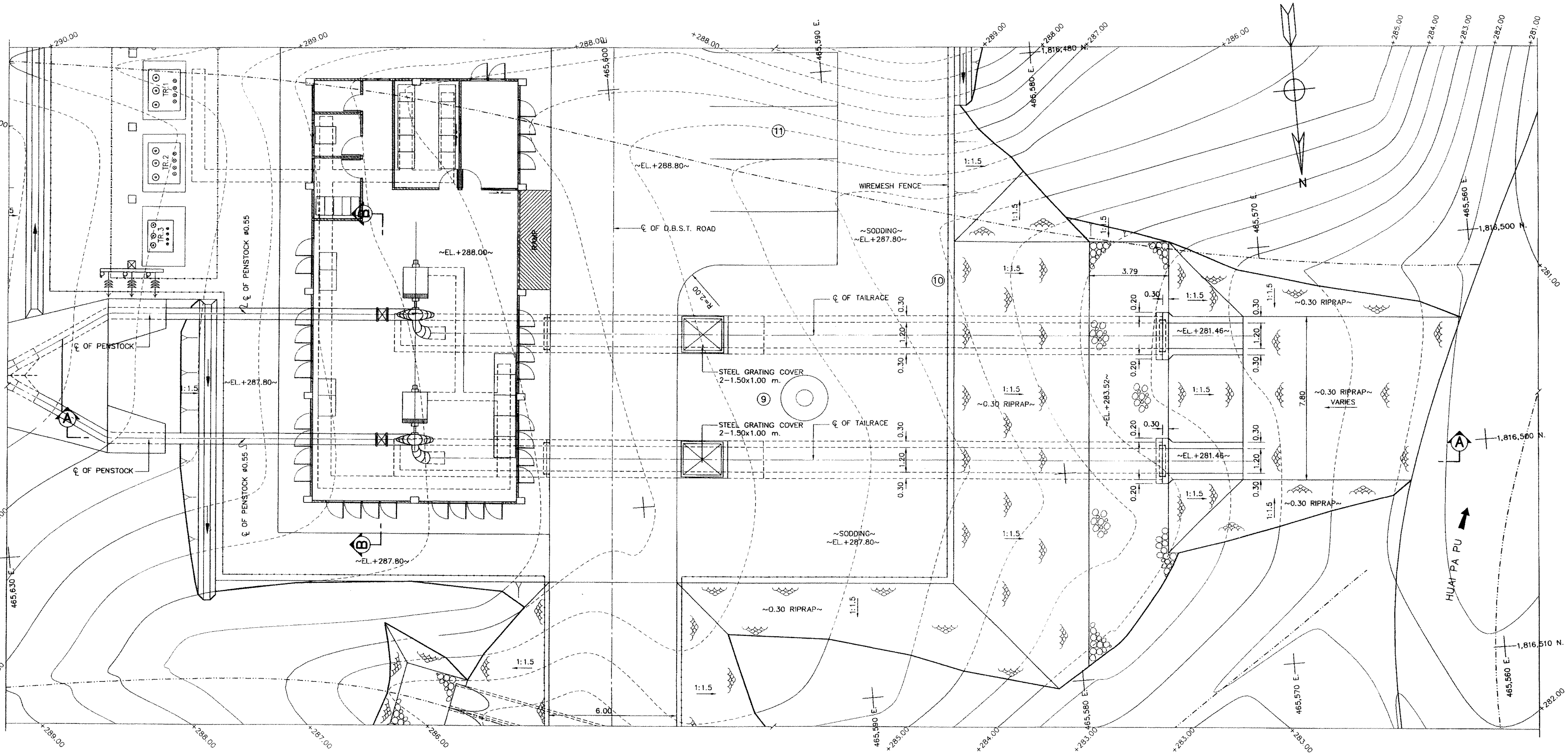
3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED ภย.37053 วย.4651
DRAWN
CHECKED วย.4651
PROJECT MANAGER 8/12/51 DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–PH–19
SHEET NO. 84 OF 100



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. HPP-GN-03

REFERENCE DRAWING :

1. TAILRACE, SECTIONS AND DETAIL HPP-TR-02

0 1.0 2.0 4.0 6.0 8.0
SCALE 1:100 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

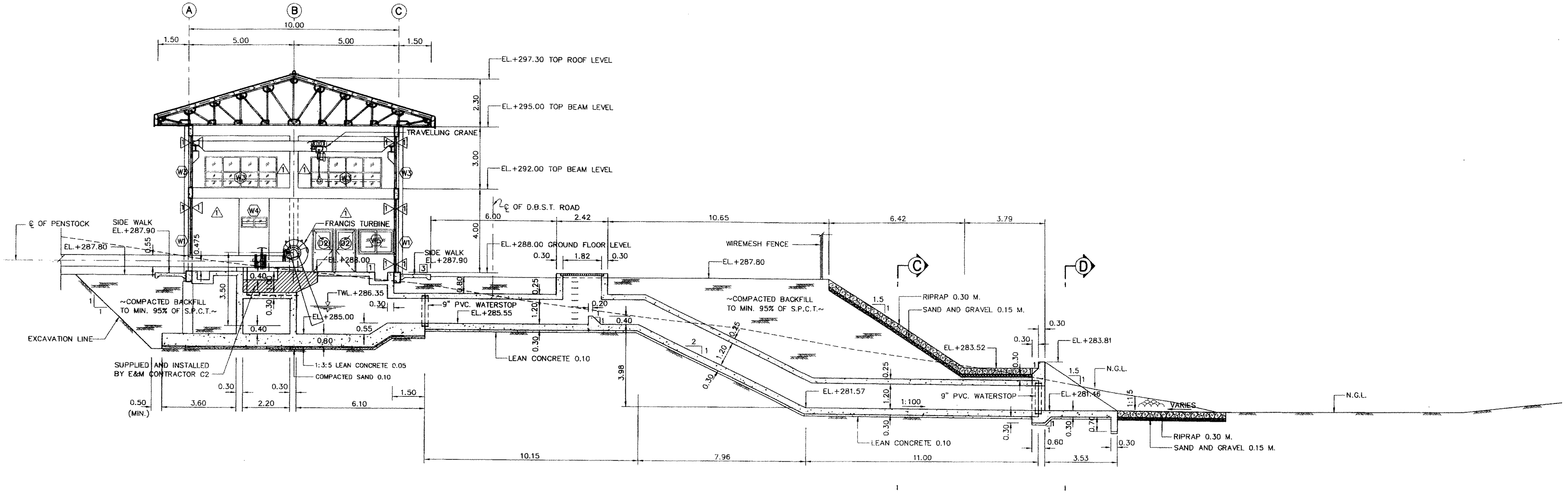
CIVIL WORKS
TAILRACE
PLAN

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภย.37953 สย.4651
DRAWN
CHECKED สย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-TR-01
SHEET NO. 85 OF 100

\\FILES-SERVER\DD0783\FINAL\C1\TR\HPP-TR-01\7-12-2008



SECTION A–A

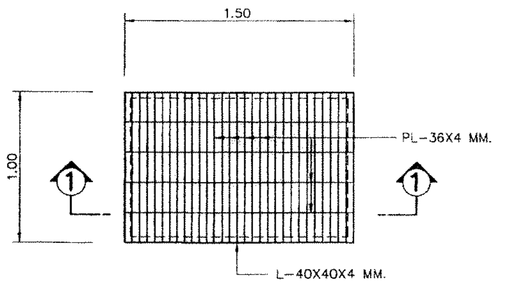
SCALE 1:100

NOTES :

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

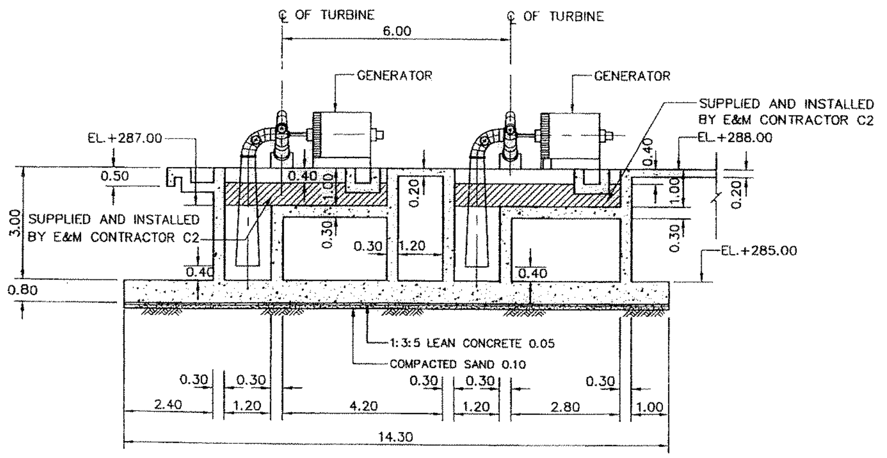
REFERENCE DRAWING :

1. TAILRACE, PLAN HPP-TR-01



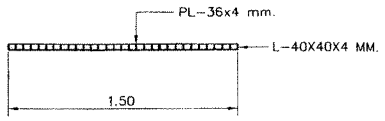
DETAIL OF GRATING

SCALE 1:25



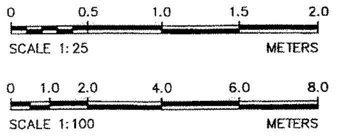
SECTION B–B

SCALE 1:100



SECTION 1–1

SCALE 1:25



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS DEDE

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

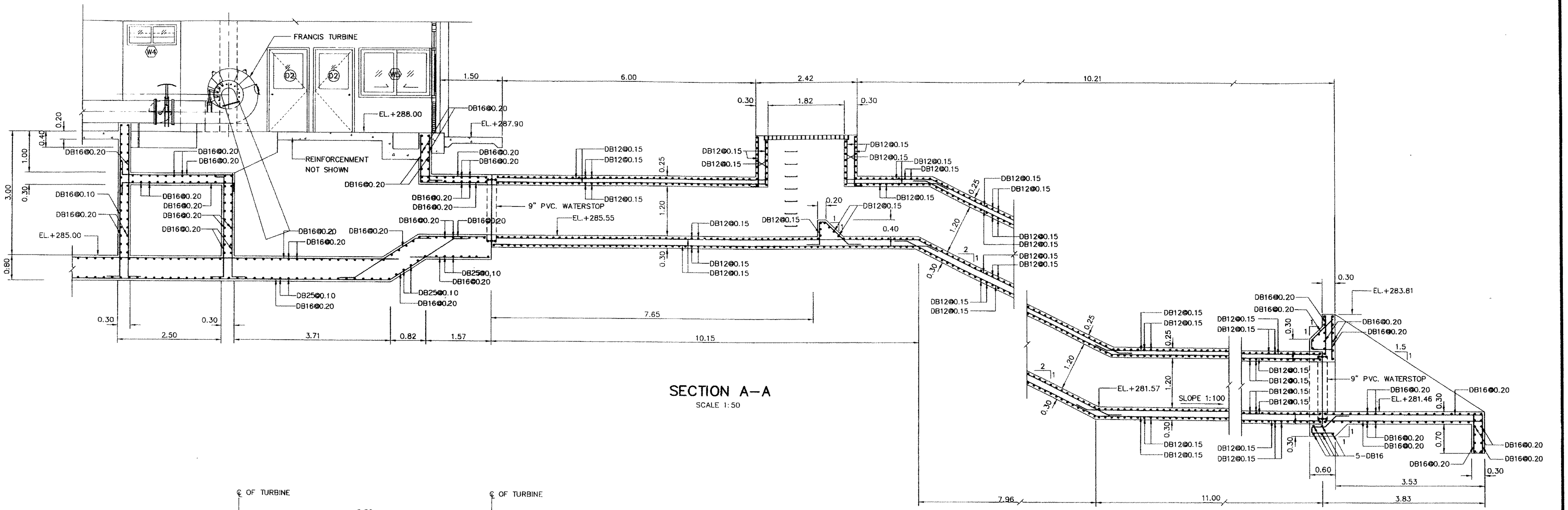
CIVIL WORKS
TAILRACE
SECTIONS AND DETAIL

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED
DRAWN
CHECKED
PROJECT MANAGER 8/12/51
DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

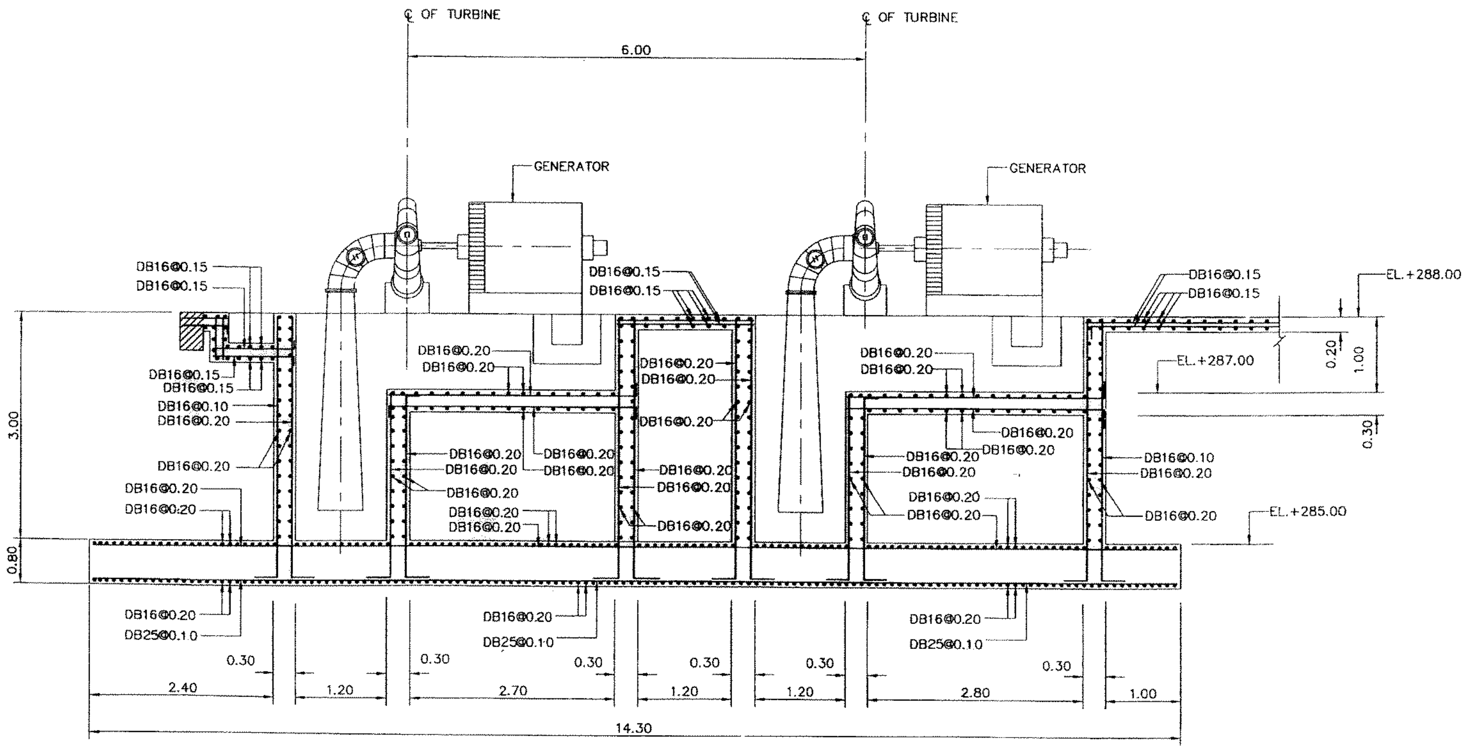
DRAWING NO. HPP–TR–02
SHEET NO. 86 OF 100

\\FILES-SERVER\000783\FINAL\CIV\TR\HPP-TR-02\17-12-2008



SECTION A–A

SCALE 1:50



SECTION B–B

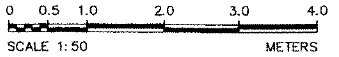
SCALE 1:50

NOTES :

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

REFERENCE DRAWINGS :

1. TAILRACE, PLAN	HPP–TR–01



SCALE 1:50

NO.	DATE	REVISIONS	CHECKED	APPROVED
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	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
TAILRACE
REINFORCEMENT DETAILS 1

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED 37953 4651
DRAWN
CHECKED 4651
PROJECT MANAGER 8/12/51 DATE

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–TR–03
SHEET NO. 87 OF 100

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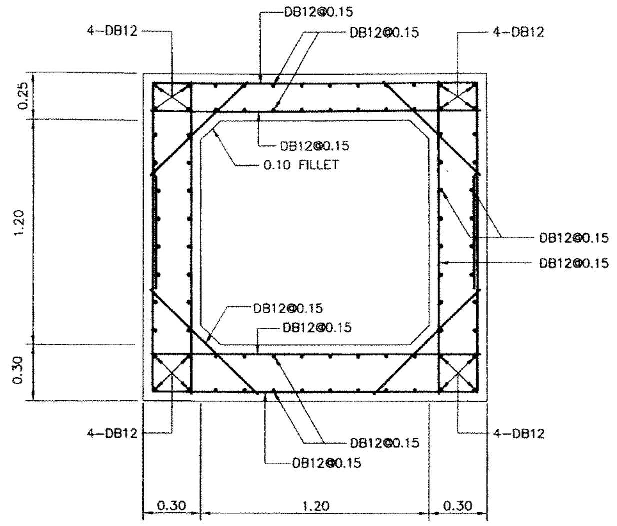
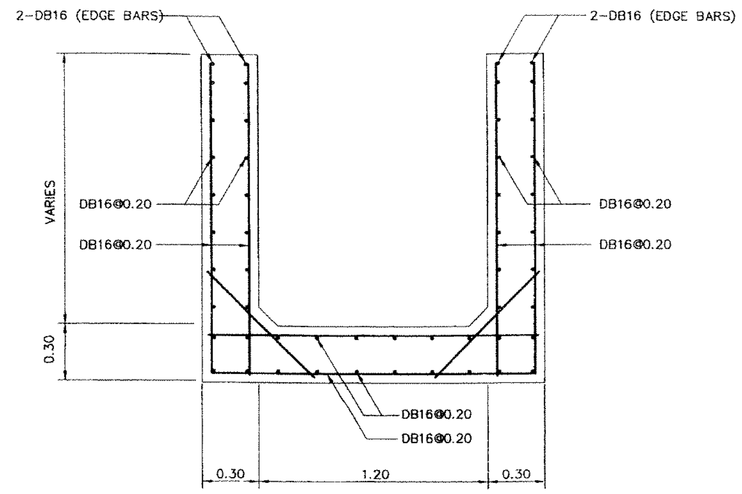


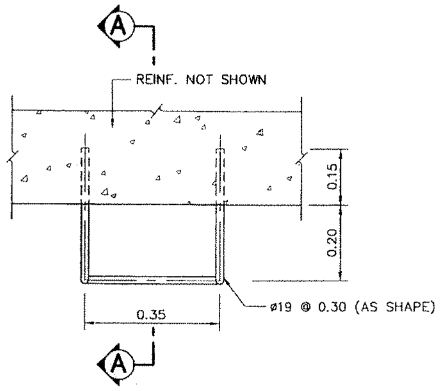
SECTION C-C

SCALE 1:20

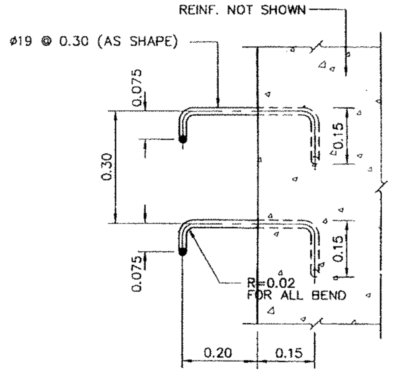


SECTION D-D

SCALE 1:20



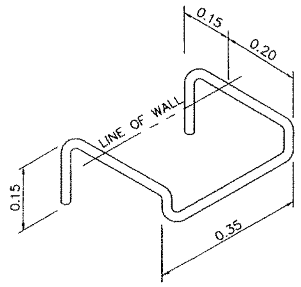
PLAN



SECTION A-A

DETAIL OF LADDER RUNGS

NOT TO SCALE



ISOMETRIC VIEW

NOTES :

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

REFERENCE DRAWING :

1. TAILRACE, PLAN	HPP-TR-01

0 0.5 1.0 1.5
SCALE 1:20 METERS

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

CIVIL WORKS
TAILRACE
REINFORCEMENT DETAILS 2

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED กย.37953 วย.4651
DRAWN
CHECKED วย.4651
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-TR-04
SHEET NO. 88 OF 100

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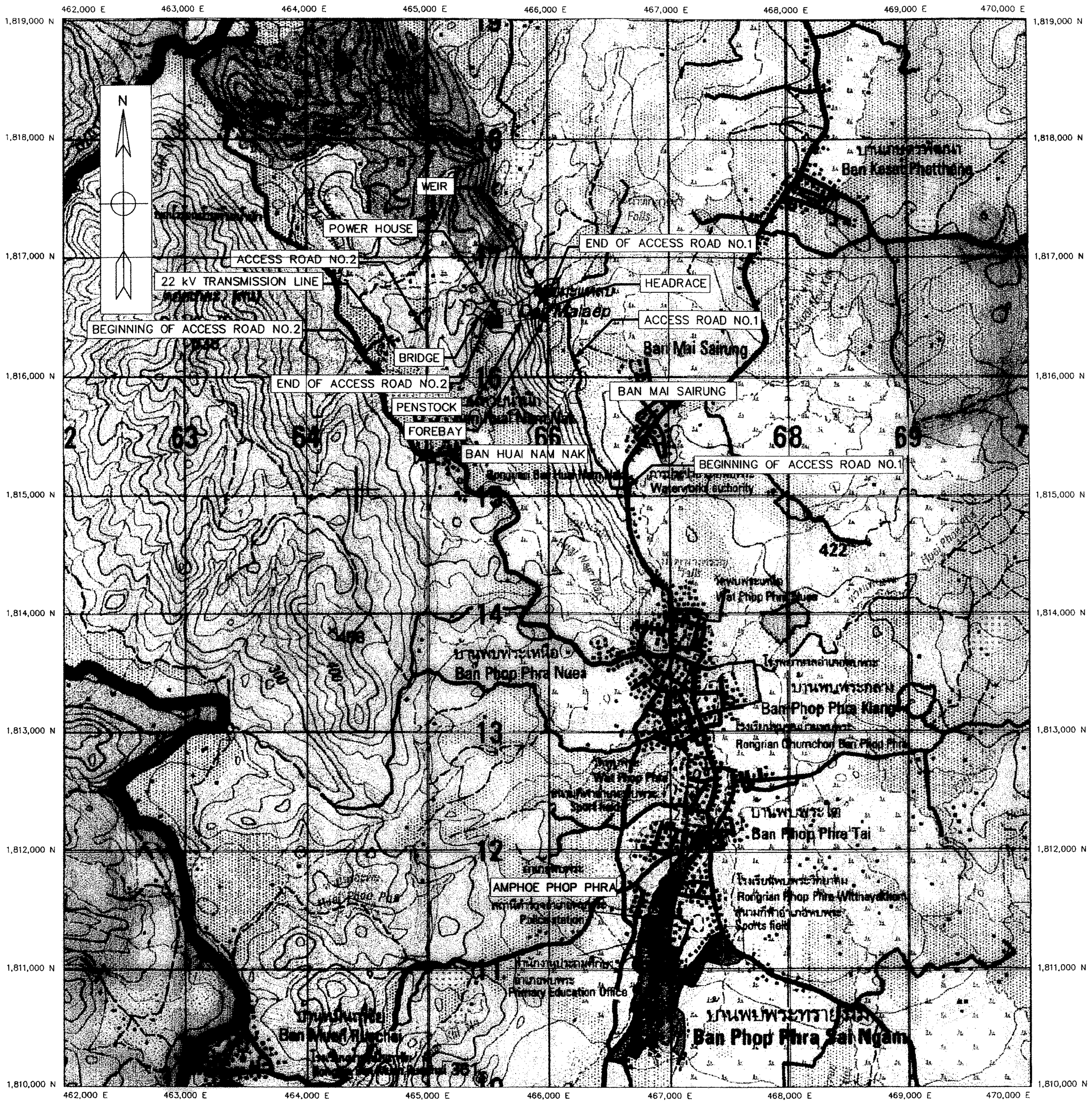

GENERAL PLAN

SCALE 1:20,000

0 500 1,000 1,500

SCALE 1:20,000 METERS

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. THE POLE OF TRANSMISSION LINE IS PRESTRESSED CONCRETE WITH 12.00 METERS HIGH.

LEGENDS :

—(1206)—	HIGHWAY
～～～	STREAM
◆	WEIR
— — —	HEADRACE
●	FOREBAY
—·—	PENSTOCK
■	POWERHOUSE
- - - - -	EXISTING ROAD
—·—·—	ACCESS ROAD
········	O&M ROAD
⌑	BRIDGE
———	PROPOSEED TRANSMISSION LINE

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

TRANSMISSION LINE
GENERAL PLAN

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED วศก.741

DRAWN

CHECKED วศก.741

PROJECT MANAGER

DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

REVIEWED

SUBMITTED

RECOMMENDED

APPROVED

DRAWING NO. HPP-TS-01

SHEET NO. 89 OF 100

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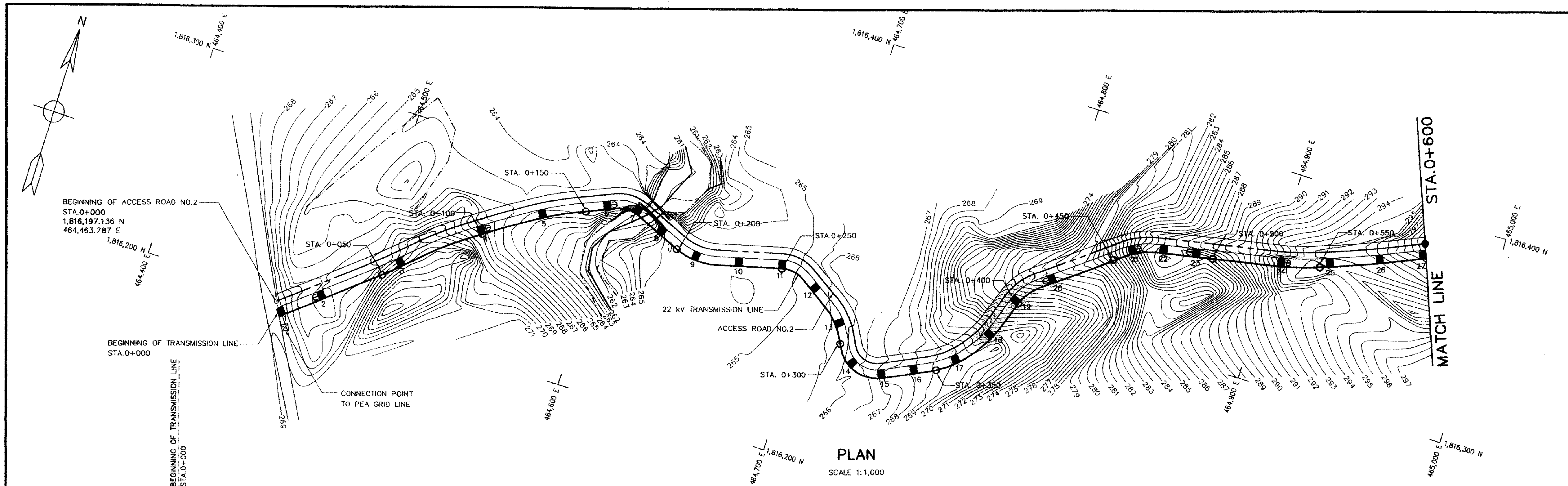
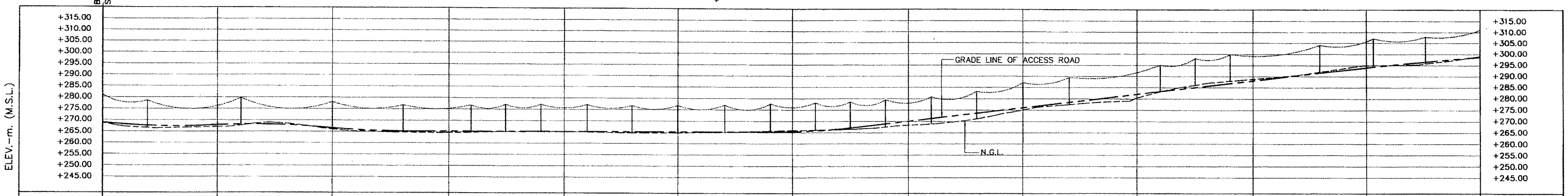


PLAN

SCALE 1:1,000



DISTANCE (KM.)	0+000	0+050	0+100	0+150	0+200	0+250	0+300	0+350	0+400	0+450	0+500	0+550	0+600	DISTANCE (KM.)
ELEV.-m. (M.S.L.)	+268.745	+267.054	+266.034	+264.629	+265.263	+264.837	+265.909	+268.380	+275.106	+280.463	+288.773	+294.984	+299.043	ELEV.-m. (M.S.L.)

POLE NO.	STRUCTURE TYPE	DEVIATION ANGLE	TYPE OF GUY	SPAN (m.)
1	A	0	–	20
2	F	1	G4	40
3	A	0	–	40
4	F	8	–	30
5	B	7	–	30
6	F	16	G4	15
7	C	32	–	15
8	A	4	–	20
9	B	29	–	20
10	B	5	–	20
11	C	32	–	20
12	B	20	–	20
13	B	18	–	20
14	C	51	–	15
15	C	30	–	15
16	B	6	–	20
17	B	23	–	20
18	B	16	–	20
19	B	21	–	20
20	F	11	G4	40
21	F	19	G4	15
22	B	7	–	15
23	F	0	G4	40
24	F	6	G4	23
25	A	4	–	23
26	A	1	–	24
27	A		–	

PROFILE

HORIZONTAL SCALE 1:1,000
VERTICAL 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. HPP-GN-03

REFERENCE DRAWINGS :

1. TRANSMISSION LINE, GENERAL PLAN	HPP-TS-01
2. TRANSMISSION LINE, PLAN AND PROFILE STA. 0+600 TO STA. 1+200	HPP-TS-03

0 5 10 15 20 25 50 100
SCALE 1:1,000 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

TRANSMISSION LINE
PLAN AND PROFILE
STA. 0+000 TO STA. 0+600

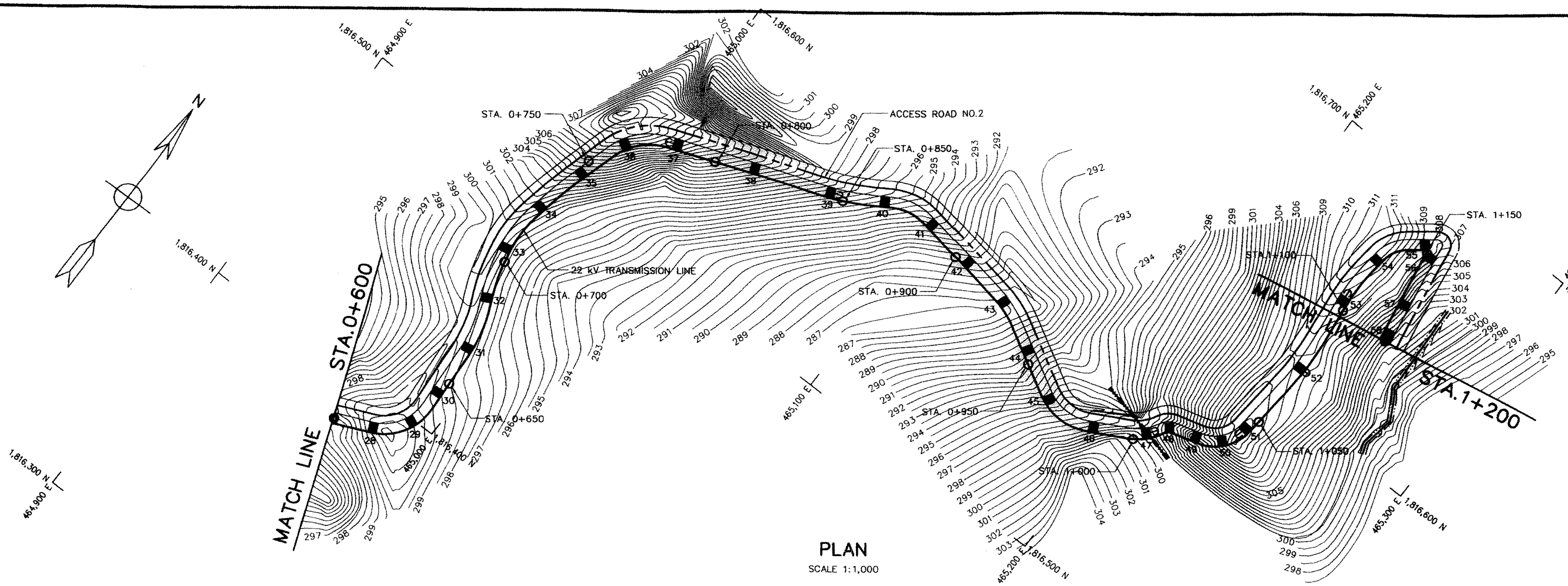
MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED วฟก.741
DRAWN
CHECKED วฟก.741
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

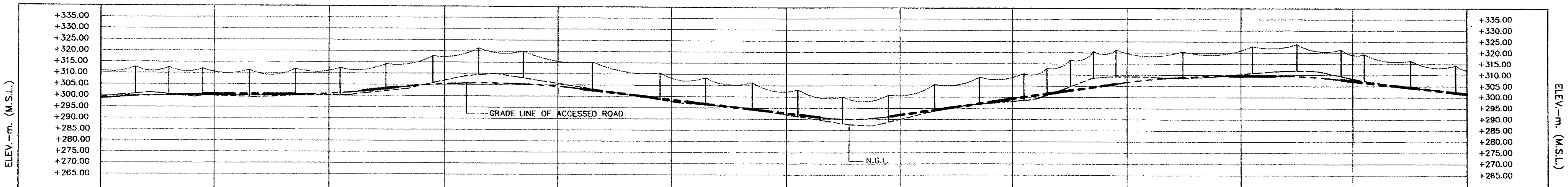
DRAWING NO. HPP-TS-02
SHEET NO. 90 OF 100

\0783\HPP-TS-02.DWG\1-DEC-2008/SMP.



PLAN

SCALE 1:1,000



DISTANCE (KM.)	0+600	0+650	0+700	0+750	0+800	0+850	0+900	0+950	1+000	1+050	1+100	1+150	1+200	DISTANCE (KM.)
ELEV.–m. (M.S.L.)	+299.218	+299.893	+300.249	+306.868	+305.648	+297.733	+291.950	+289.964	+298.198	+309.202	+310.342	+308.317	+301.890	ELEV.–m. (M.S.L.)

POLE NO.	28 29 30	31 32	33 34 35	36 37	38 39	40 41	42 43 44	45 46	47 48 49 50 51	52	53 54 55	56	57 58	POLE NO.
STRUCTURE TYPE	B C B	B A	B B B	C F	A F	B B	A B B	C B	A C F C B	B	B C D	C	A B	STRUCTURE TYPE
DEVIATION ANGLE	19 40 8	13 0	18 12 6	34 17	0 8	18 20	0 12 8	34 25	4 5 38 20	9	8 32 88	48	0 8	DEVIATION ANGLE
TYPE OF GUY	– – –	– –	– – –	– G4	– G4	– –	– – –	– –	G4 – – G4	G1	G4 – –	–	– G4	TYPE OF GUY
SPAN (m.)	15 15 15	20 20 20	20 20	20 20	30 30	20 20 20	20 20	20 20 20	10 10 10 10	30 30	20 20 10	20	20 5	SPAN (m.)

PROFILE

HORIZONTAL SCALE 1:1,000
VERTICAL 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. HPP-GN-03

REFERENCE DRAWINGS :

1.	TRANSMISSION LINE, PLAN AND PROFILE STA. 0+000 TO STA. 0+600	HPP-TS-02
2.	TRANSMISSION LINE, PLAN AND PROFILE STA. 1+200 TO STA. 1+725	HPP-TS-04

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

TRANSMISSION LINE
PLAN AND PROFILE
STA. 0+600 TO STA. 1+200

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED ภวท.741
DRAWN
CHECKED ภวท.741
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–TS–03
SHEET NO. 91 OF 100

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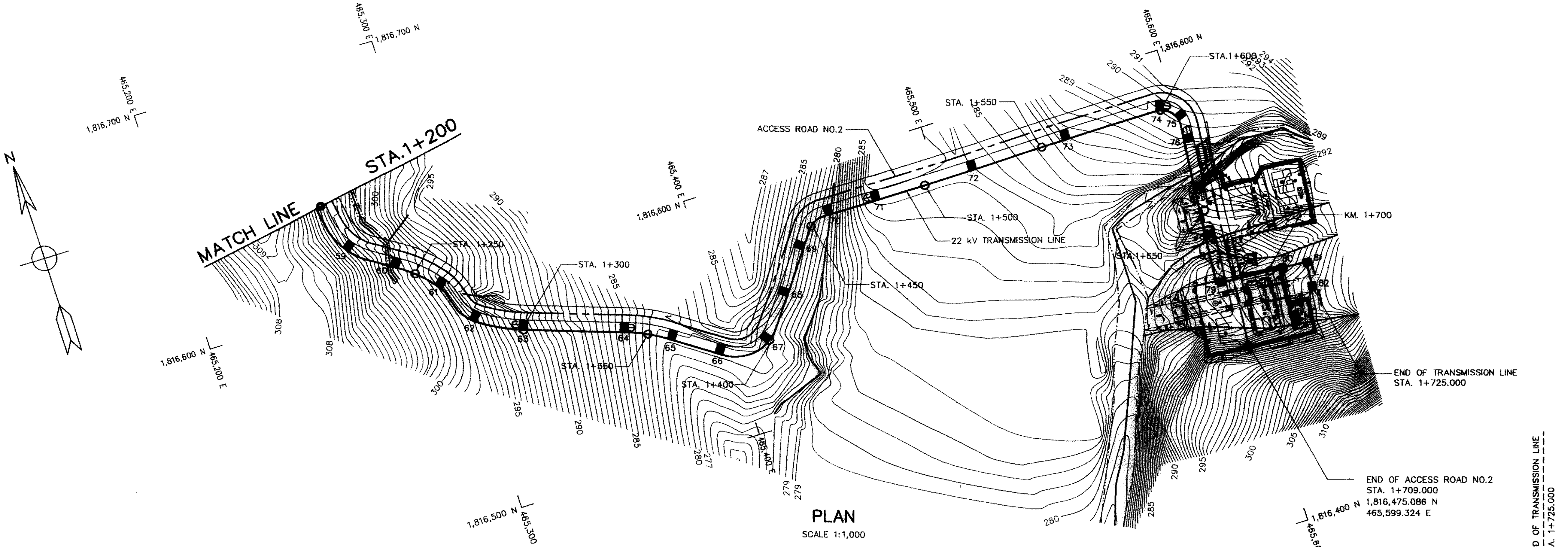
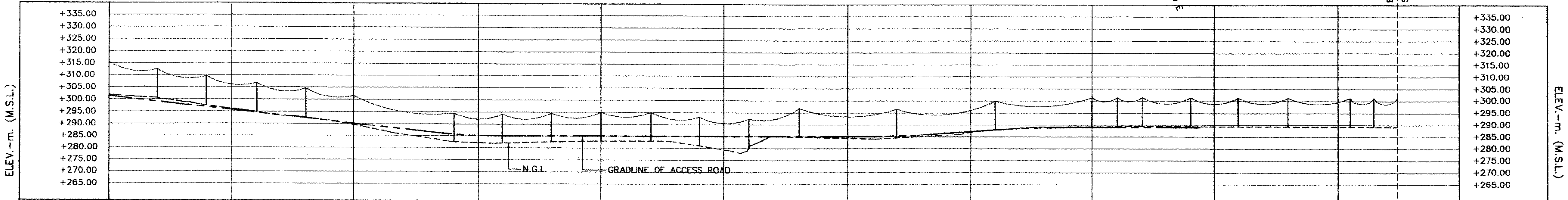


PLAN

SCALE 1:1,000



DISTANCE (KM.)	1+200	1+250	1+300	1+350	1+400	1+450	1+500	1+550	1+600	1+650	1+700	1+725	DISTANCE (KM.)
ELEV.-m. (M.S.L.)	+301.992	+296.144	+289.511	+282.205	+283.000	+279.454	+284.282	+286.954	+289.315	+289.315	+289.236	+289.236	ELEV.-m. (M.S.L.)

POLE NO.	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	POLE NO.
STRUCTURE TYPE	C	A	B	C	F	F	B	C	C	A	B	C	F	A	A	F	C	F	A	F	D	G	H	I	STRUCTURE TYPE
DEVIATION ANGLE	36	4	20	34	9	7	9	32	54	2	20	34	0	0	0	40	50	4	0	0	90	0	90	0	DEVIATION ANGLE
TYPE OF GUY	–	–	–	–	G4	G4	–	–	–	–	–	–	G4	–	–	G4		G4	–	–	–	–	–	–	TYPE OF GUY
SPAN (m.)	20	20	20	20	20	40	20	20	20	20	20	20	20	40	40	40	10	10	20	20	20	25	10	10	SPAN (m.)

PROFILE

HORIZONTAL SCALE 1:1,000
VERTICAL SCALE 1:1,000

0 5 10 15 20 25 50 100
SCALE 1:1,000 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. HPP-GN-03

REFERENCE DRAWINGS :

1. TRANSMISSION LINE, PLAN AND PROFILE STA. 0+600 TO STA. 1+200 HPP-TS-03

NO.	DATE	REVISIONS	CHECKED	APPROVED
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	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

TRANSMISSION LINE
PLAN AND PROFILE
STA. 1+200 TO STA. 1+725

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED วฟก.741
DRAWN
CHECKED วฟก.741
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-TS-04
SHEET NO. 92 OF 100

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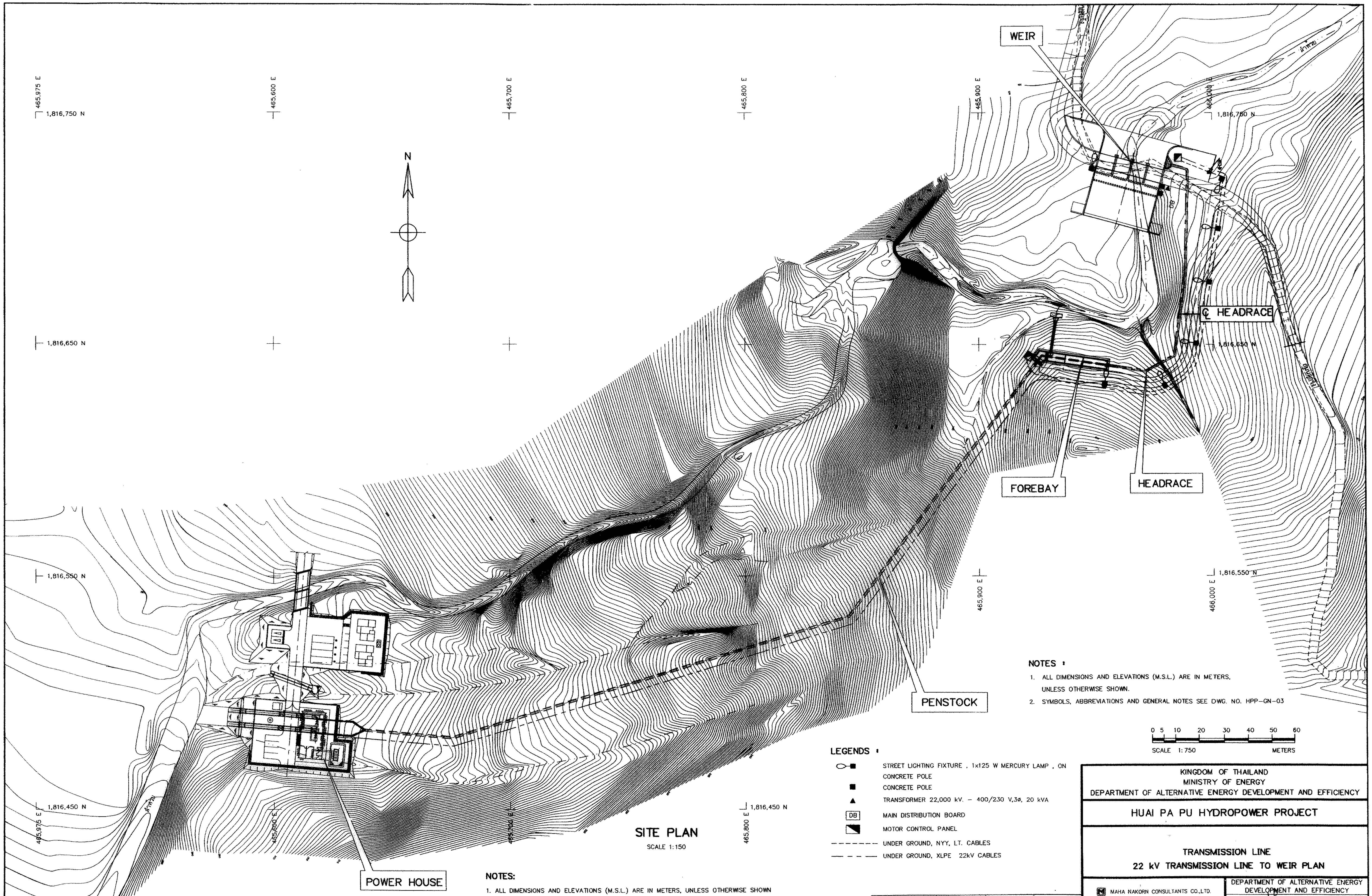

SITE PLAN

SCALE 1:150

NOTES :

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

0 5 10 20 30 40 50 60

SCALE 1:750 METERS

LEGENDS :

○-■	STREET LIGHTING FIXTURE , 1x125 W MERCURY LAMP , ON CONCRETE POLE
■	CONCRETE POLE
▲	TRANSFORMER 22,000 kV. – 400/230 V,3ø, 20 kVA
DB	MAIN DISTRIBUTION BOARD
◪	MOTOR CONTROL PANEL
--------	UNDER GROUND, NYY, LT. CABLES
— – – —	UNDER GROUND, XLPE 22kV CABLES

NOTES:

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

REFERENCE DRAWINGS :

1. TRANSMISSION LINE, BURYING DEPTH, FOUNDATION AND UNDERGROUND CABLE LAYING HPP-TS-12

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

TRANSMISSION LINE
22 kV TRANSMISSION LINE TO WEIR PLAN

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED วฟก.741
DRAWN
CHECKED วฟก.741
PROJECT MANAGER
DATE 8/12/51

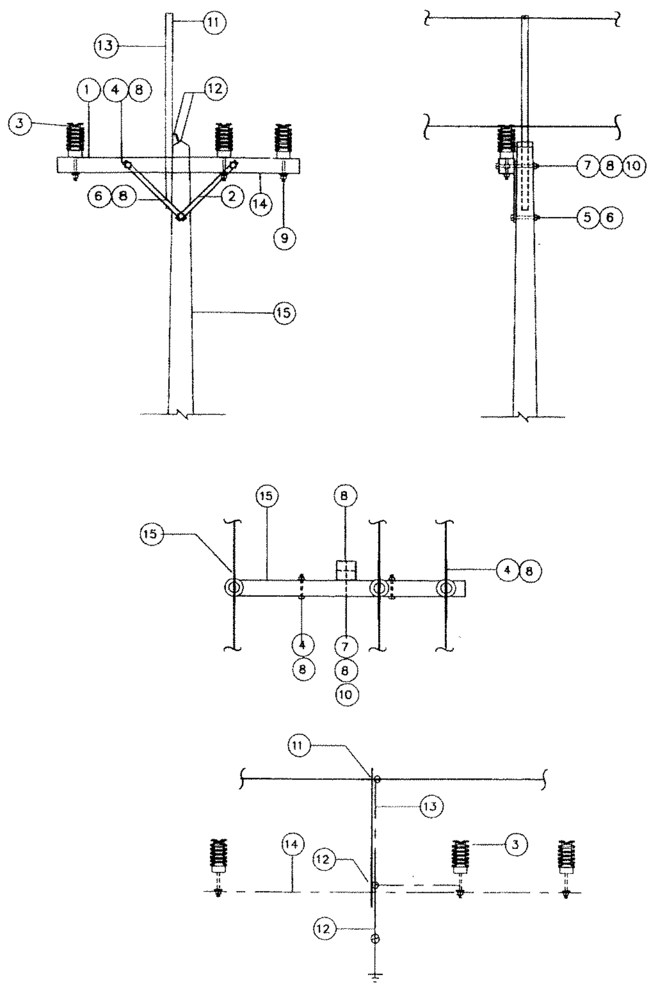
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-TS-05

SHEET NO. 93 OF 100

POLE TYPE "A"

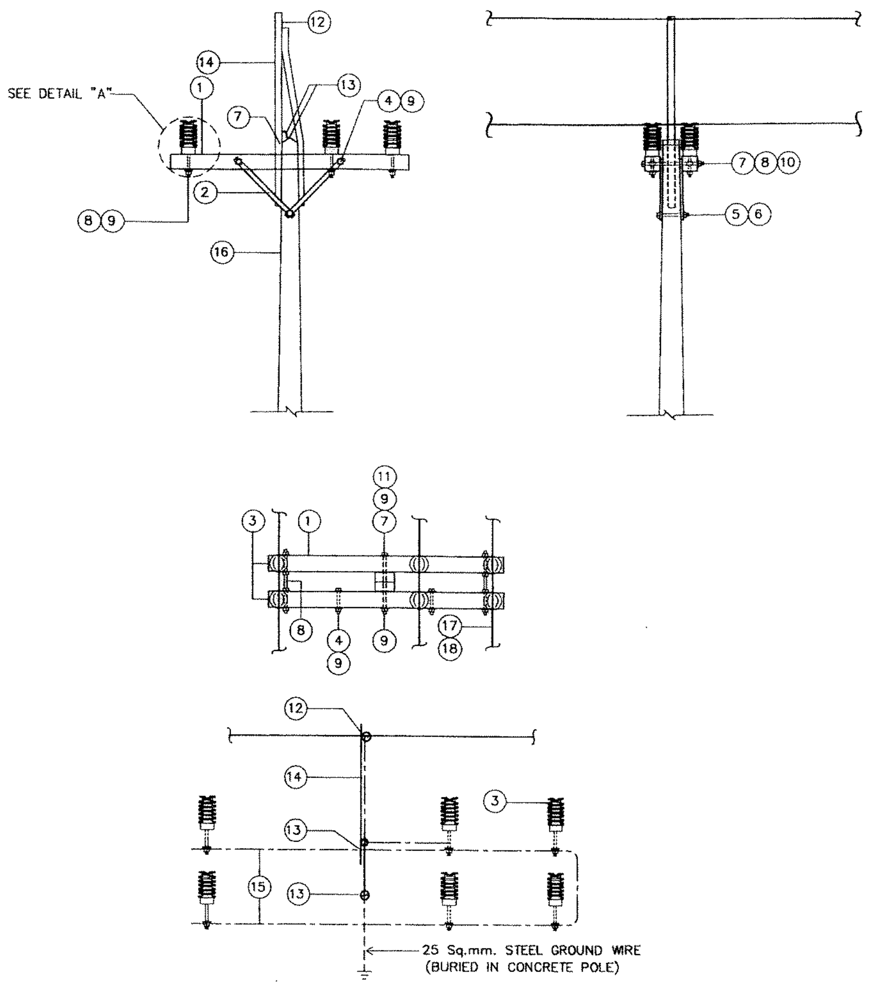
(TANGENT STRUCTURE 0 – 5 Deg.)



EARTHING DIAGRAM

POLE TYPE "B"

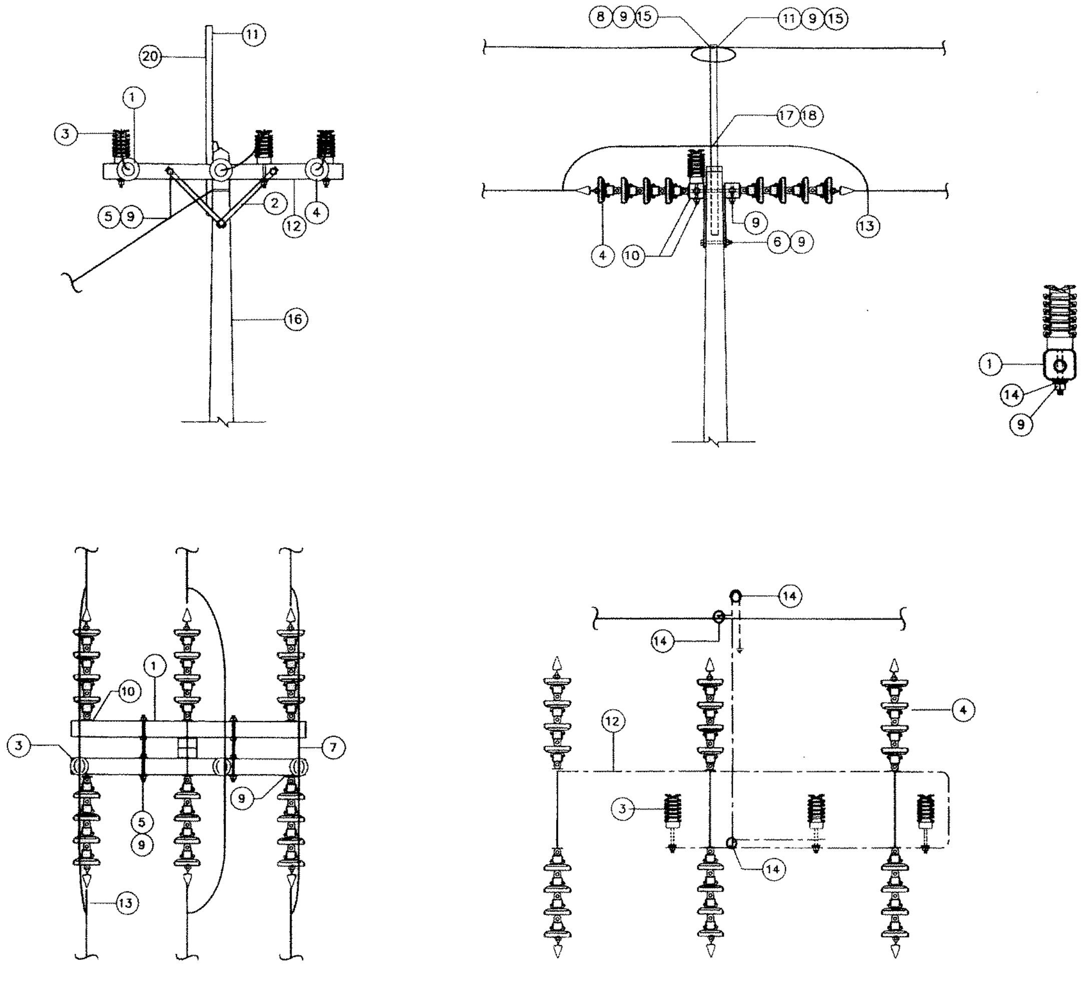
(TANGENT STRUCTURE 5 – 30 Deg.)



EARTHING DIAGRAM

POLE TYPE "C"

(TANGENT STRUCTURE 30 – 60 Deg.)



EARTHING DIAGRAM

BILL OF MATERIAL POLE TYPE "A"

ITEM	DESCRIPTION	REQ
1	CROSSARM SPUN PRESTRESS CONCRETE 100 x 100 x 2500 mm.	1
2	BRACE FOR CROSS ARM 30 x 6 x 760 mm.	2
3	INSULATOR LINE POST TYPE CL 52–7	3
4	BOLT MACHINE M 16 x 130 mm.	2
5	BOLT MACHINE M 16 x 200 mm.	1
6	BOLT MACHINE M 16 x 250 mm.	2
7	BOLT MACHINE M 16 x 300 mm.	1
8	WASHER SQUARE FLAT 50 x 50 x 5 mm. HOLE DIA. 16 mm.	7
9	WASHER SQUARE CURVED 60 x 60 x 5 mm. HOLE DIA. 22 mm.	5
10	WASHER LOCK M 16 DIN 127	1
11	GROUND WIRE CLAMP J.1152	1
12	CLAMP SINGLE U–BOLT M.8 (WIRE ROPE CLIP)	4
13	OVER HEAD GROUND WIRE BAYONET 60 x 60 x 6 x 2,500 mm.	1
14	WIRE STEEL SOLID Dia. 4 mm. (TIS 71–2517)	4.00 m.
15	PRE – STRESED CONCRETE POLE 12 m.	1
16	TIE WIRE AL. Dia. 4 mm.	5.55 m.
17	PREFORMED LINE GUARD 580 mm. LONG	3

BILL OF MATERIAL POLE TYPE "B"

ITEM	DESCRIPTION	REQ
1	CROSSARM SPUN PRESTRESS CONCRETE 100 x 100 x 2500 mm.	2
2	BRACE FOR CROSS ARM 30 x 6 x 760 mm.	2
3	INSULATOR LINE POST TYPE CL 52–7	6
4	BOLT MACHINE M 16 x 130 mm.	2
5	BOLT MACHINE M 16 x 200 mm.	1
6	BOLT MACHINE M 16 x 250 mm.	2
7	BOLT MACHINE M 16 x 450 mm.	1
8	BOLT DOUBLE ARMING M 16 x 400 mm.	2
9	WASHER SQUARE FLAT 50 x 50 x 5 mm. HOLE DIA. 16 mm.	15
10	WASHER SQUARE CURVED 60 x 60 x 5 mm. HOLE DIA. 22 mm.	6
11	WASHER LOCK M 16 DIN 127	1
12	GROUND WIRE CLAMP J.1152	1
13	CLAMP SINGLE U–BOLT M.8 (WIRE ROPE CLIP)	2
14	OVER HEAD GROUND WIRE CORNER BAYONET 60 x 60 x 6 x 2,500 mm.	1
15	WIRE STEEL SOLID Dia. 4 mm. (TIS 71–2517)	7.00 m.
16	PRE – STRESED CONCRETE POLE 12 m.	1
17	TIE WIRE AL. Dia. 4 mm.	11.1 m.
18	PREFORMED ARMOR ROD 1,250 mm. LONG	3

BILL OF MATERIAL POLE TYPE "C"

ITEM	DESCRIPTION	REQ
1	CROSSARM SPUN PRESTRESS CONCRETE 120 x 120 x 2000 mm.	2
2	BRACE FOR CROSS ARM 30 x 6 x 760 mm.	2
3	INSULATOR LINE POST TYPE CL 52–7	3
4	INSULATOR SUSPENSION TYPE D TIS.354 CL 52–4	24
5	BOLT MACHINE M 16 x 170 mm.	2
6	BOLT MACHINE M 16 x 250 mm.	1
7	BOLT DOUBLE ARMING ROUND EYE M 16 x 500 mm.	3
8	BOLT ROUND EYE M 16 x 250 mm.	1
9	WASHER SQUARE FLAT 50 x 50 x 5 mm. HOLE DIA. 16 mm.	12
10	WASHER SQUARE CURVED 60 x 60 x 5 mm. HOLE DIA. 22 mm.	6
11	NUT EYE M 16 DIN 127	1
12	WIRE STEEL SOLID Dia. 4 mm. (TIS 71–2517)	6.00 m.
13	CLAMP STRAIN FOR AAC 185 Sq.mm.	6
14	CLAMP SINGLE U–BOLT M.8 (WIRE ROPE CLIP)	2
15	THIMBLE GUY FOR STEEL WIRE 50–95 Sq.mm.	2
16	PRE ? STRESED CONCRETE POLE 12 m.	1
17	TIE WIRE AL. Dia. 4 mm.	6.00 m.
18	PREFORMED ARMOR ROD 580 mm. LONG	3
19	OVER HEAD GROUND WIRE DEAD–END BAYONET 100 x 50 x 5 x 2,250 mm.	1

NOTE :

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
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1				
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

TRANSMISSION LINE
POLE TYPE "A", "B" AND "C"

MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED ภวก.741
DRAWN
CHECKED ภวก.741
PROJECT MANAGER
DATE 8/12/51

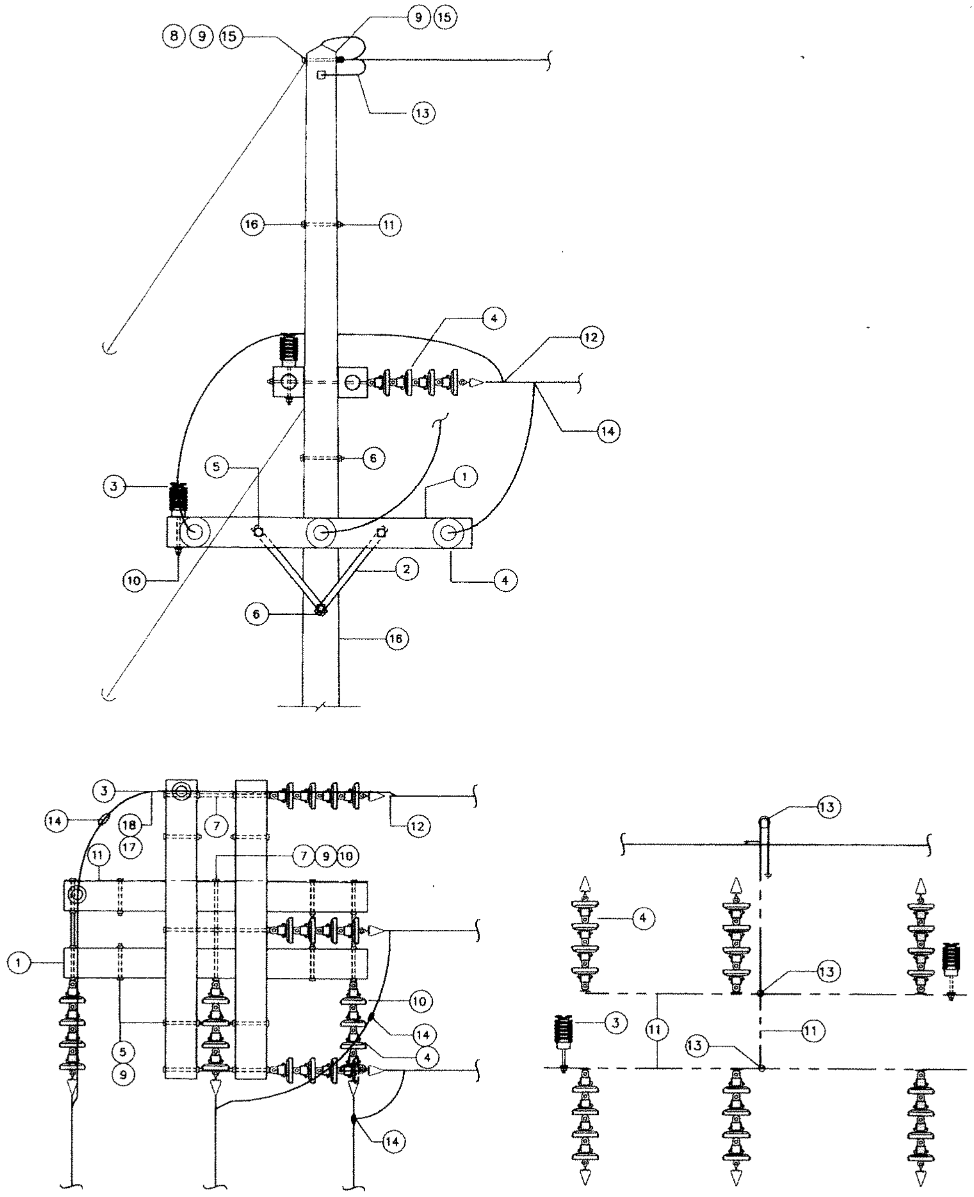
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–TS–06
SHEET NO. 94 OF 100

D:\0783\HPP-TS-07.dwg/MYP./7-11-2008/SMP

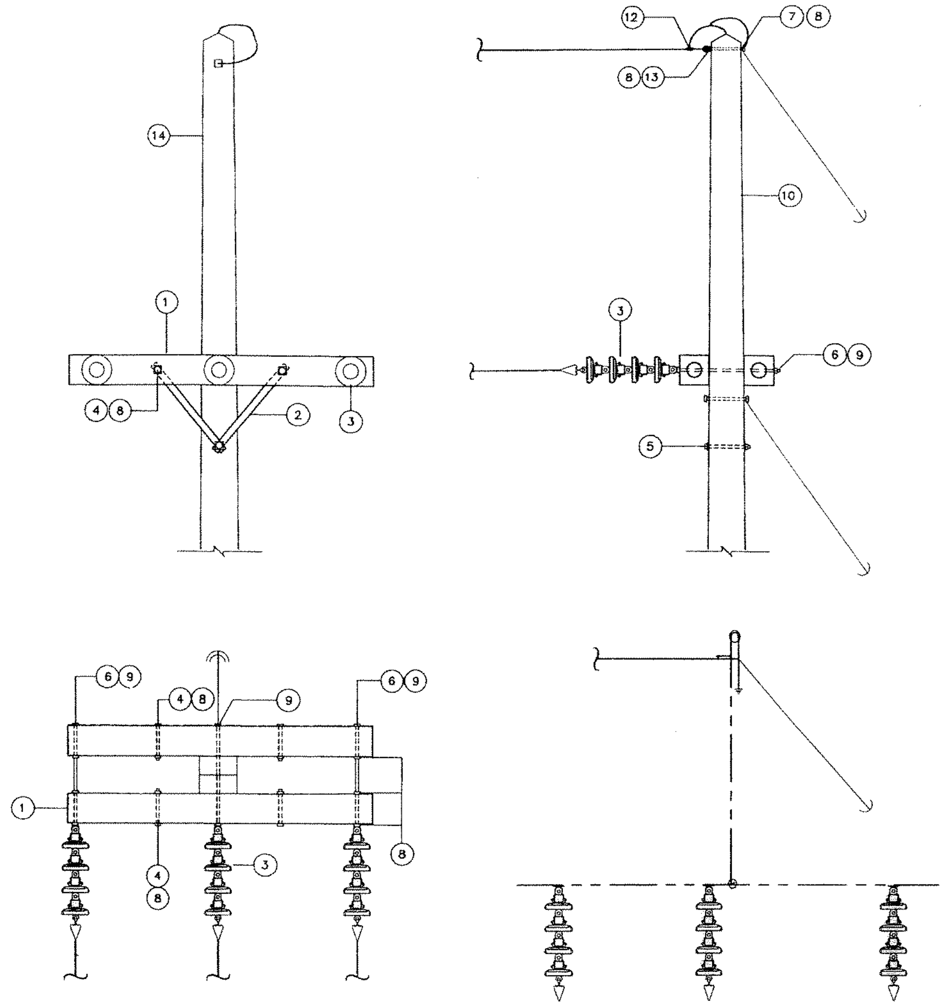
POLE TYPE "D"

(BUCK ARM STRUCTURE 60 - 90 Deg.)



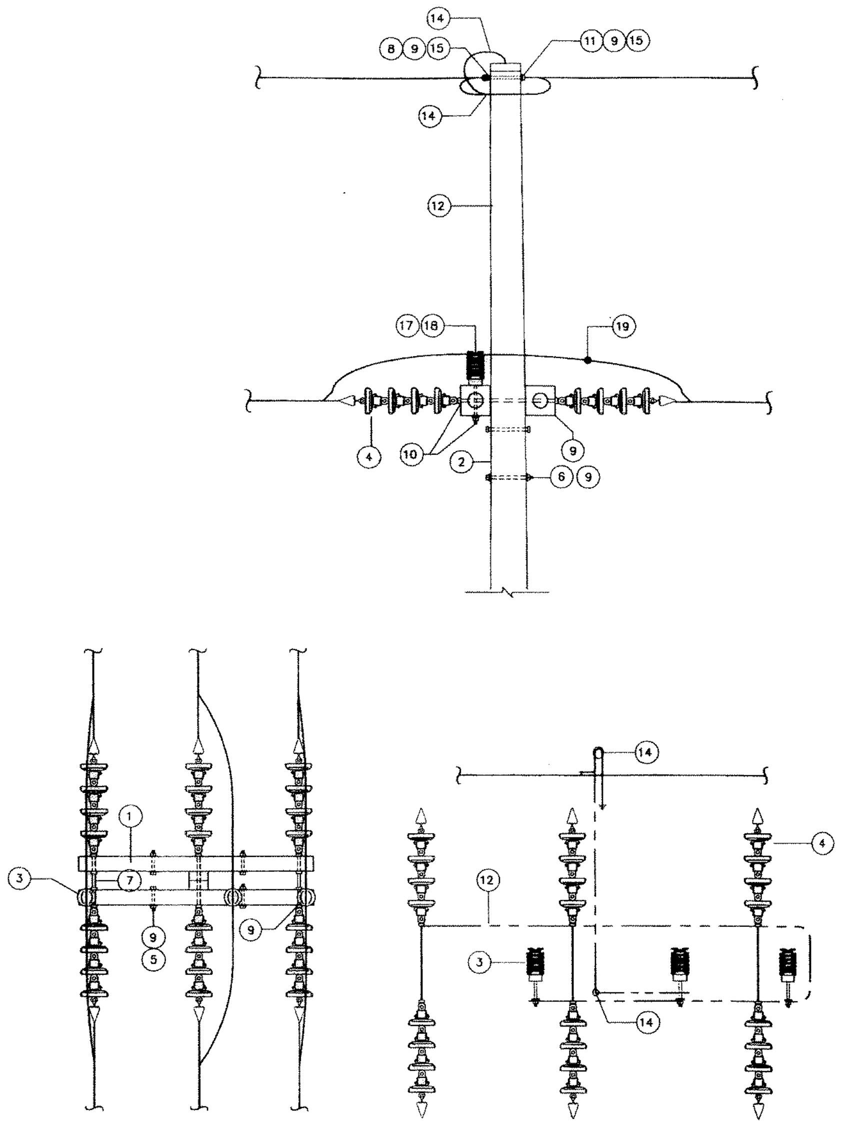
POLE TYPE "E"

(DEAD END STRUCTURE)



POLE TYPE "F"

(DOUBLE DEAD END STRUCTURE)



EARTHING DIAGRAM

BILL OF MATERIAL POLE TYPE "D"		
ITEM	DESCRIPTION	REQ
1	CROSSARM SPUN PRESTRESS CONCRETE 120 x 120 x 2000 mm.	4
2	BRACE FOR CROSS ARM 30 x 6 x 760 mm.	8
3	INSULATOR LINE POST TYPE CL 52-7	2
4	INSULATOR SUSPENSION TYPE D TIS.354 CL 52-4	24
5	BOLT MACHINE M 16 x 170 mm.	8
6	BOLT MACHINE M 16 x 250 mm.	2
7	BOLT DOUBLE ARMING ROUND EYE M 16 x 500 mm.	6
8	BOLT ROUND EYE M 16 x 250 mm.	2
9	WASHER SQUARE FLAT 50 x 50 x 5 mm. HOLE DIA. 16 mm.	30
10	WASHER SQUARE CURVED 60 x 60 x 5 mm. HOLE DIA. 22 mm.	6
11	WIRE STEEL SOLID Dia. 4 mm. (TIS 71-2517)	6.00 m.
12	CLAMP STRAIN FOR AAC 185 Sq.mm.	6
13	CLAMP SINGLE U-BOLT M.8 (WIRE ROPE CLIP)	8
14	CONNECTOR PARALEL GROOVE CLAMP	4
15	THIMBLE GUY FOR STEEL WIRE 50-95 Sq.mm.	2
16	PRE - STRESED CONCRETE POLE 14 m.	1
17	TIE WIRE AL. Dia. 4 mm.	6.00 m.
18	PREFORMED ARMOR ROD 580 mm. LONG	2

BILL OF MATERIAL POLE TYPE "E"		
ITEM	DESCRIPTION	REQ
1	CROSSARM SPUN PRESTRESS CONCRETE 120 x 120 x 2000 mm.	2
2	BRACE FOR CROSS ARM 30 x 6 x 760 mm.	4
3	INSULATOR SUSPENSION TYPE D TIS.354 CL 52-4	12
4	BOLT MACHINE M 16 x 170 mm.	4
5	BOLT MACHINE M 16 x 250 mm.	1
6	BOLT DOUBLE ARMING ROUND EYE M 16 x 500 mm.	3
7	BOLT ROUND EYE M 16 x 300 mm.	1
8	WASHER SQUARE FLAT 50 x 50 x 5 mm. HOLE DIA. 16 mm.	14
9	WASHER SQUARE CURVED 60 x 60 x 5 mm. HOLE DIA. 22 mm.	3
10	WIRE STEEL SOLID Dia. 4 mm. (TIS 71-2517)	6.00 m.
11	CLAMP STRAIN FOR AAC 185 Sq.mm.	3
12	CLAMP SINGLE U-BOLT M.8 (WIRE ROPE CLIP)	9
13	THIMBLE GUY FOR STEEL WIRE 50-95 Sq.mm.	1
14	PRE - STRESED CONCRETE POLE 14 m.	1

BILL OF MATERIAL POLE TYPE "F"		
ITEM	DESCRIPTION	REQ
1	CROSSARM SPUN PRESTRESS CONCRETE 120 x 120 x 2000 mm.	2
2	BRACE FOR CROSS ARM 30 x 6 x 760 mm.	2
3	INSULATOR LINE POST TYPE CL 52-7	3
4	INSULATOR SUSPENSION TYPE D TIS.354 CL 52-4	24
5	BOLT MACHINE M 16 x 170 mm.	2
6	BOLT MACHINE M 16 x 250 mm.	1
7	BOLT DOUBLE ARMING ROUND EYE M 16 x 500 mm.	6
8	BOLT ROUND EYE M 16 x 250 mm.	1
9	WASHER SQUARE FLAT 50 x 50 x 5 mm. HOLE DIA. 16 mm.	12
10	WASHER SQUARE CURVED 60 x 60 x 5 mm. HOLE DIA. 22 mm.	6
11	NUT EYE M.16	2
12	WIRE STEEL SOLID Dia. 4 mm. (TIS 71-2517)	6.00 m.
13	CLAMP STRAIN FOR AAC 185 Sq.mm.	6
14	CLAMP SINGLE U-BOLT M.8 (WIRE ROPE CLIP)	8
15	THIMBLE GUY FOR STEEL WIRE 50-95 Sq.mm.	2
16	PRE - STRESED CONCRETE POLE 14 m.	1
17	TIE WIRE AL. Dia. 4 mm.	6 m.
18	PREFORMED ARMOR ROD 580 mm. LONG	3
19	CONNECTOR SPLICE COMPRESSION TYPE TENSIONLESS FOR AAC 185 Sq.mm.	3

NOTE :

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

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

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

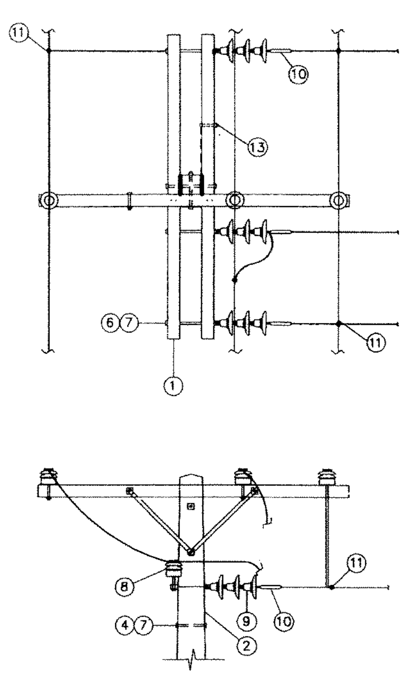
HUAI PA PU HYDROPOWER PROJECT

TRANSMISSION LINE
POLE TYPE "D", "E" AND "F"

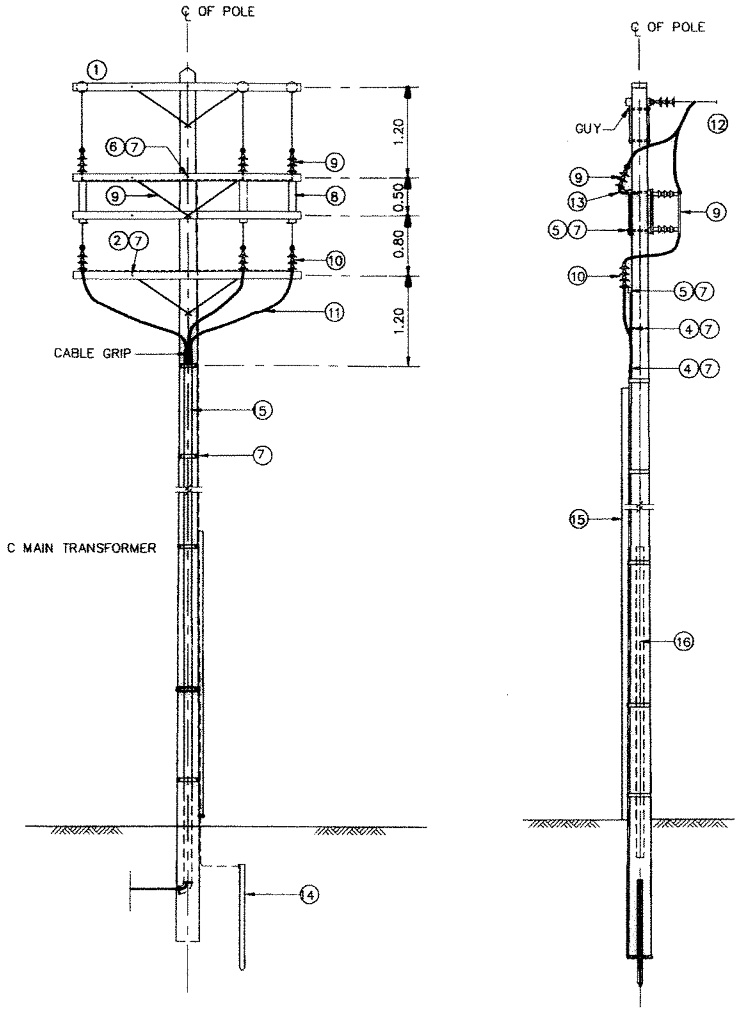
MAHA NAKORN CONSULTANTS CO.,LTD.	DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
	REVIEWED
DESIGNED วฟก.741	SUBMITTED
DRAWN	RECOMMENDED
CHECKED วฟก.741	APPROVED
PROJECT MANAGER 8/12/51 DATE	DRAWING NO. HPP-TS-07
	SHEET NO. 95 OF 100

D\0783\HPP-TS-07.dwg/7-11-2008

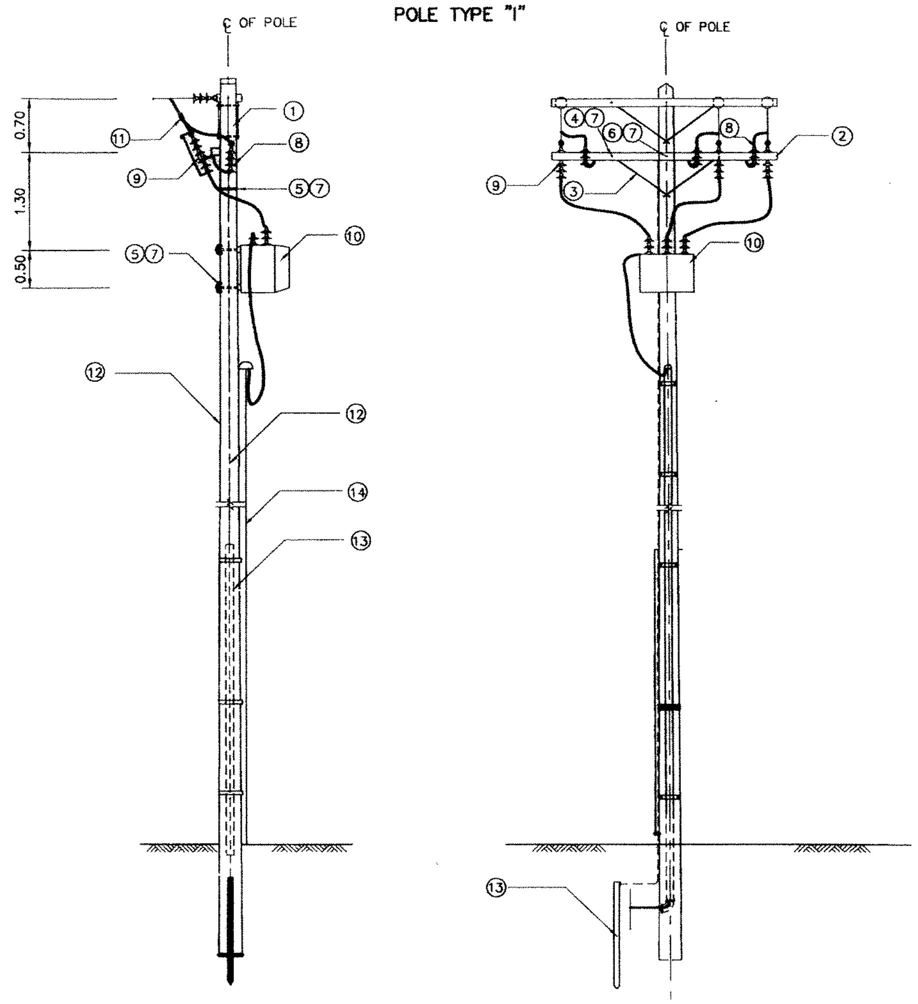
POLE TYPE "G"



POLE TYPE "H"



POLE TYPE "I"



BILL OF MATERIAL		
ITEM	DESCRIPTION	REQ'D
1	CROSSARM WOOD, HT. 100 x 100 x 2,500 mm.	2
2	BRACE,FLAT, FOR CROSSARM, 30 x 6 x 760 mm.	2
3	BOLT, MACHINE, M 16 x 130 mm.	1
4	BOLT, MACHINE, M 16 x 250 mm.	1
5	BOLT, MACHINE, M 16 x 250 mm.	1
6	BOLT, DOUBLE, ARMING, ROUND EYE, M 16 x450 mm.	3
7	WASHER, SQUARE, FLAT 52 x 52 x 4.5 mm. HOLE ø 18 mm. DIN 258	15
8	INSULATOR, PIN TYPE, 22 kV, TIS 279 YYPE B (CLASS 56-2) COMP. WITH PIN	1
9	INSULATOR, SUPENSION TYPE, TIS 354 TYPE A (CLASS 52-1)	9
10	CLAMP, STRAIN, FOR Al CONDUCTOR, SIZE AS REQUIRED	3
11	CONDUCTOR, PARALLEL GROOVE, 2 OR 3 BOLT, FOR Al SIZE AS REQUIRED	4

BILL OF MATERIAL		
ITEM	DESCRIPTION	REQ'D
1	CROSSARM (H.T.)	6
2	BRACE,FLAT, FOR CROSSARM 0.03x0.006x0.76 m.	4
3	BOLT, MACHINE, M 16 x 130 mm.	4
4	BOLT, MACHINE, M 16 x 250 mm.	2
5	BOLT, MACHINE, M 16 x 300 mm. (M 16 x 350 mm. FOR 14 m. POLE)	2
6	BOLT, MACHINE, M 16 x 400 mm. (M 16 x 450 mm. FOR 14 m. POLE)	1
7	WASHER, SQUARE, FLAT 50 x 50 x 5 mm. HOLE ø 18 mm. DIN 436	10
8	DROP OUT FUSE , 33 KV. 3 PHASE WITH FUSE LINK	3
9	LIGHTNING ARRESTER, 33 kV. , 3 PHASE	3
10	POT HEAD FOR XLPE. CABLE 33 kV. , 3 PHASE	3
11	CABLE, UNDERGROUND XLPE, 33 kV. FOR 3 PHASE	1 LOT
12	CONECTOR, PARALLEL GROOVE, DOUBLE OR TRIPLE BOLTS SIZE AS REQ'D	6
13	WIRE, STEEL STRANDED 50/7 DIN. 48201 ST II.	26m.
14	GROUND ROD 60 x 60 x 5 mm. 2000 mm. LONG	1
15	STEEL PIPE GALVANIZED, SIZE AND LENGTH AS REQ,D	1
16	PIPE,S' LON SIZE 0.20 x 2.50 m.	1
17	PERFORATED TAPE 30 x 1.5 mm. HOLE ø10 mm.	12m
18	BOLT, MACHINE M. 8 x 25 mm.	8

BILL OF MATERIAL		
ITEM	DESCRIPTION	REQ'D
1	POLE, CONCRETE, 12 m LONG FOR II AND 22 kV	–
2	CROSSARM, WOOD, H.T. 100x100x2500 mm	2
3	BRACE, FLAT, FOR CROSSARM 30x6x760 mm	4
4	BOLT, MACHINE M 11x130 mm	4
5	BOLT, MACHINE M 11x250 mm	6
6	BOLT, MACHINE M 11x350 mm	2
7	WASHER, SQUARE, FLAT 52x52x4.5 mm HOLE ø 18 m TIS 258	14
8	LIGHTNING ARRESTER, 22 kV, 5 kV	3
9	CUT-OUT, FUSE, OPEN TYPE, SINGLE INSULATOR, DROP-OUT 22 kV, 100 A	3
10	TRANSFORMER, 20 kVa, 3-PHASE 22/04 kV	1
11	CONNECTOR, PARALLEL GROOVE, DOUBLE BOLTS, Al 25-95 mm^2	3
12	GROUND CONDUCTOR, STEEL WIRE 50 mm^2 AND FIXED ACCESSSORIES	22
13	ROD, GROUND 60x60x5 mm 2,000 mm LONG	1
14	STEEL PIPE GALVANIZED, SIZE AND LENGTH AS REQ,D	1

NOTE

1. A FOR 11 kV SYSTEM AND b FOR 22 kV SYSTEM
2. BILL OF MATERIAL FOR BUCKARM INSTALLATION ONLY

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

TRANSMISSION LINE
POLE TYPE "G", "H" AND "I"

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED วฟก.741
DRAWN
CHECKED วฟก.741
PROJECT MANAGER
DATE 6/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-TS-08
SHEET NO. 96 OF 100

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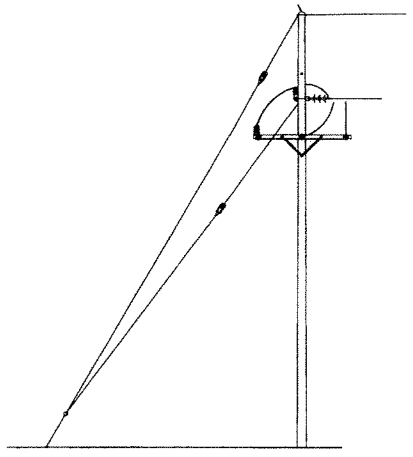
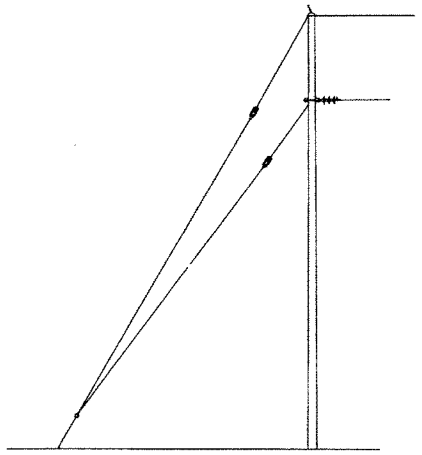


G5

BUCK ARM, 60° – 90°

DEAD END GUY

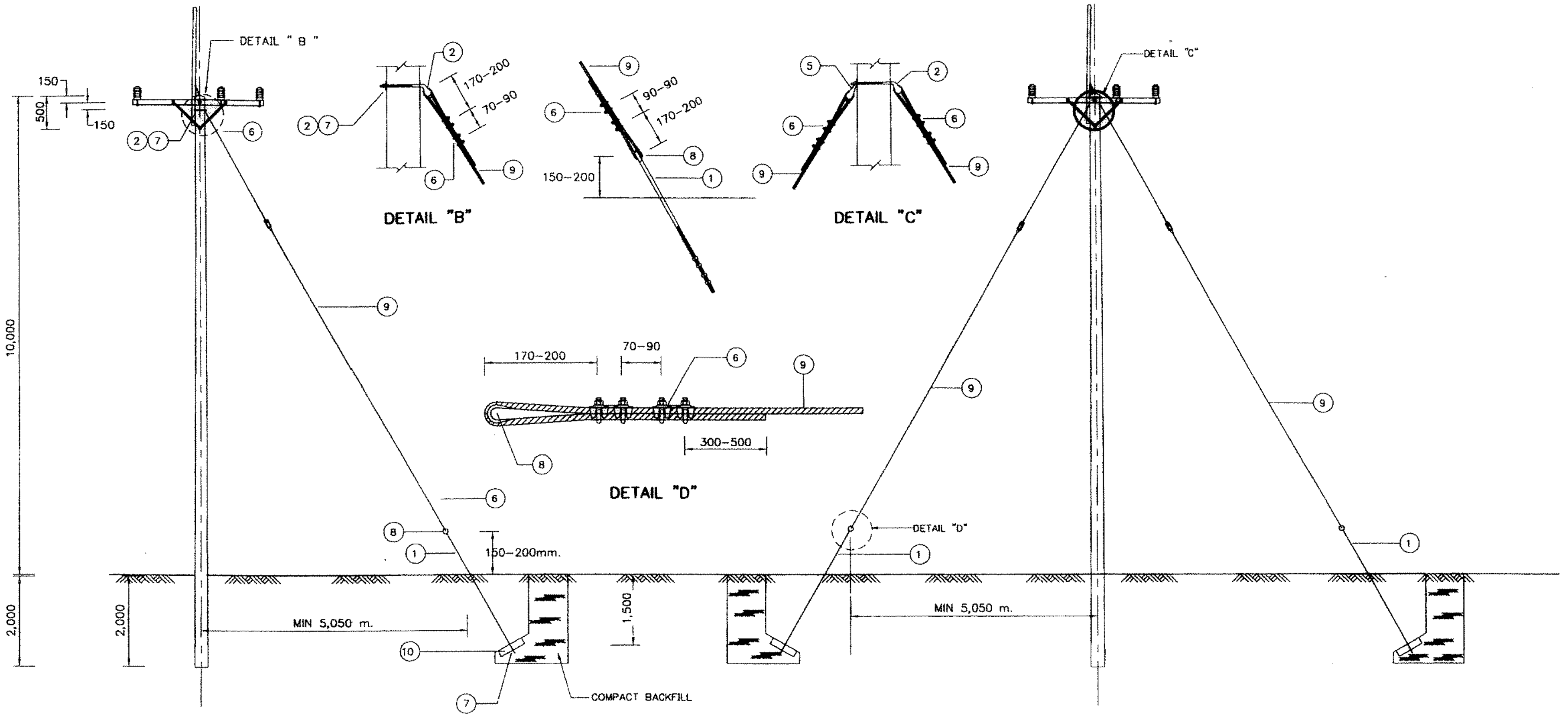


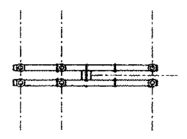
G4

DEAD END GUY

METHOD OF SINGLE ANCHOR GUY

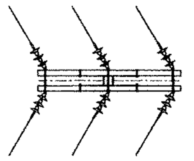
METHOD OF DOUBLE ANCHOR GUY





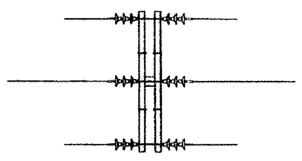
G1

SIDE GUY 5° – 30°



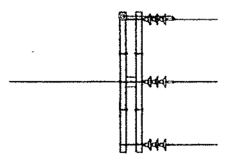
G2

SIDE GUY 30° – 60°



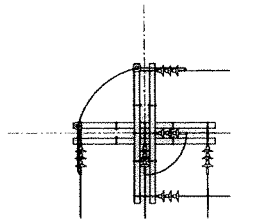
G3

LINE GUY



G4

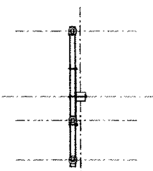
DEAD END GUY



G5

BUCK ARM, 60° – 90°

DEAD END GUY



G6

FIXED OR STORM GUY

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 ø 18 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

NOTE :

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS	DEDE

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

TRANSMISSION LINE
TYPE OF ANCHOR GUY

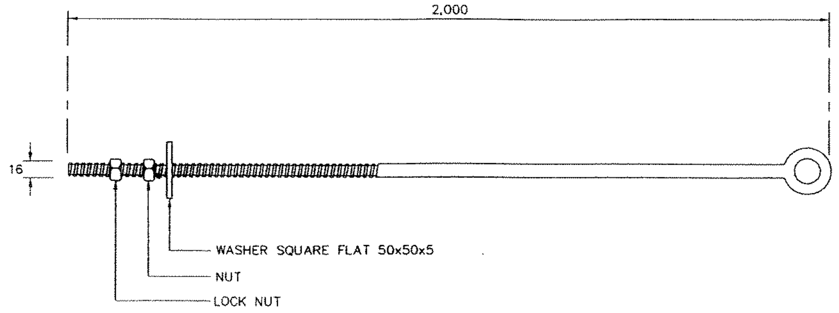
MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED วฟก.741
DRAWN
CHECKED วฟก.741
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

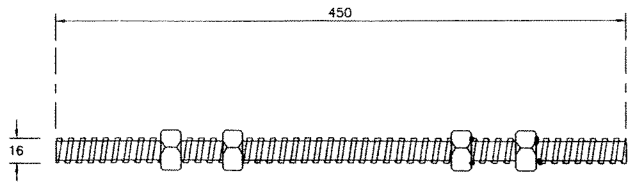
DRAWING NO. HPP–TS–09
SHEET NO. 97 OF 100

D\0783\HPP–TS–09.DWG\07–NOV–2008/SMP.



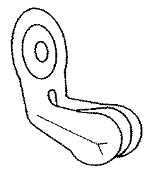
DETAIL OF ANCHOR BOLT FOR GUY WIRE

NOT TO SCALE



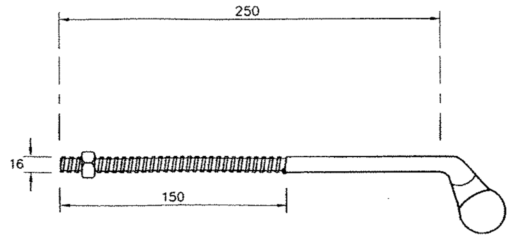
BOLT, DOUBLE ARMING

NOT TO SCALE



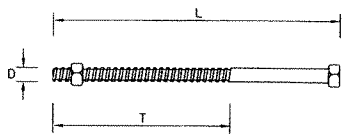
STRAND EYE SINGLE ANGLE 30°

NOT TO SCALE



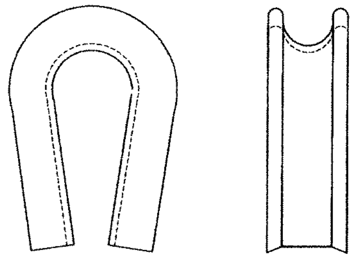
BOLT, SINGLE STRANDED EYE 45°

NOT TO SCALE



NOT TO SCALE

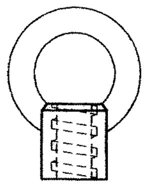
BOLT, MACHINE (D x L)	
1	M. 16 x 130 mm. (T = 35 mm.)
2	M. 16 x 170 mm. (T = 50 mm.)
3	M. 16 x 200 mm. (T = 50 mm.)
4	M. 16 x 250 mm. (T = 75 mm.)
5	M. 16 x 300 mm. (T = 75 mm.)
6	M. 16 x 400 mm. (T = 100 mm.)



GUY THIMBLE

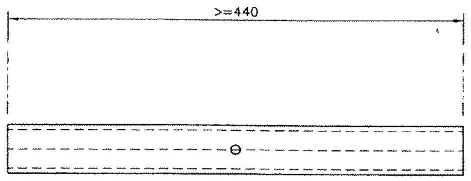
FOR STEEL STRAND GUY WIRE 35Sq.mm.

NOT TO SCALE



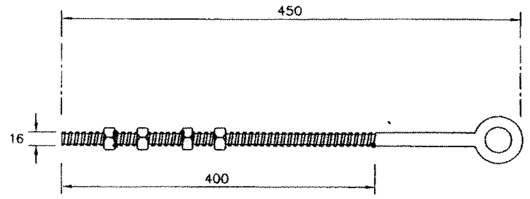
NUT EYE

NOT TO SCALE

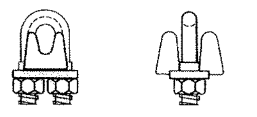


CONNECTOR, SPLICE, COMPRESSION TYPE
TENSION LOADED FOR PIC(ACSR) 120/8 Sq.mm.

NOT TO SCALE

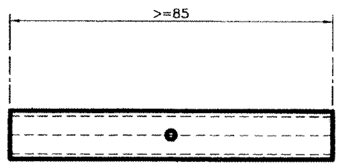


BOLT, DOUBLE ARMING, ROUND EYE



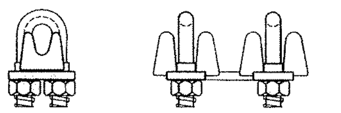
CLAMP, SINGLE U-BOLT M.8

NOT TO SCALE



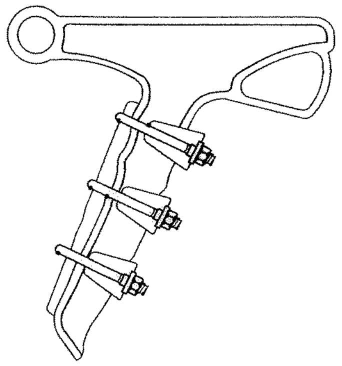
CONNECTOR, SPLICE, COMPRESSION TYPE
TENSIONLESS LOADED FOR PIC(ACSR) 120/8 Sq.mm.

NOT TO SCALE



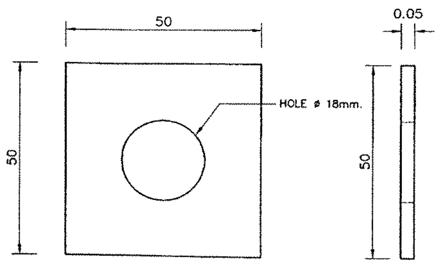
CLAMP, SINGLE U-BOLT M.16

NOT TO SCALE



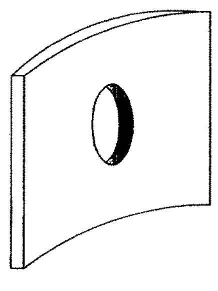
CLAMP, STRAIN, WITH CLAMPING KEEPER
FOR PIC(ACSR) 120/8 Sq.mm.

NOT TO SCALE



WASHER SQUARE FLAT

NOT TO SCALE



WASHER, CURVE, SQUARE 60x60x5mm.
HOLE ø22 mm.

NOT TO SCALE

NOTE :

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

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

TRANSMISSION LINE
POLE ASSEMBLY ACCESSORIES, ANCHOR BOLT FOR GUY

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.

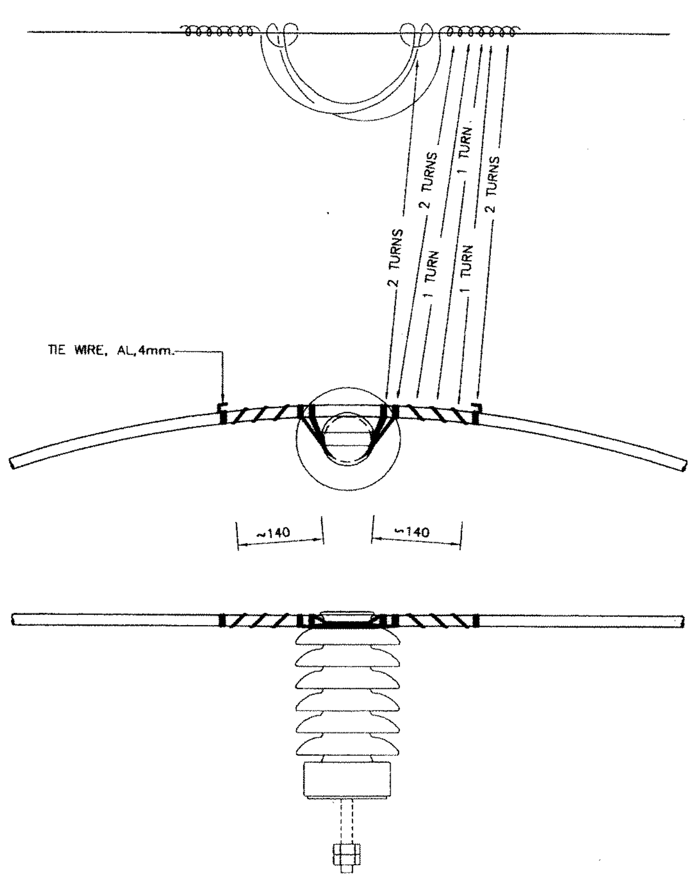
DESIGNED วฟก.741
DRAWN
CHECKED วฟก.741
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP-TS-10
SHEET NO. 98 OF 100

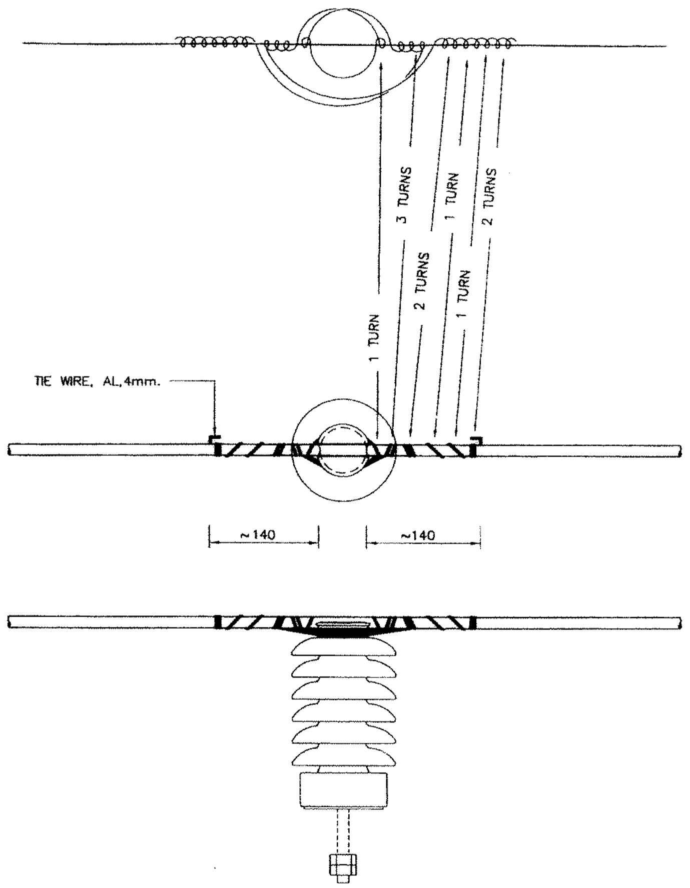
D:\0783\HPP-TS-10.DWG\07-NOV-2008/SMP.

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

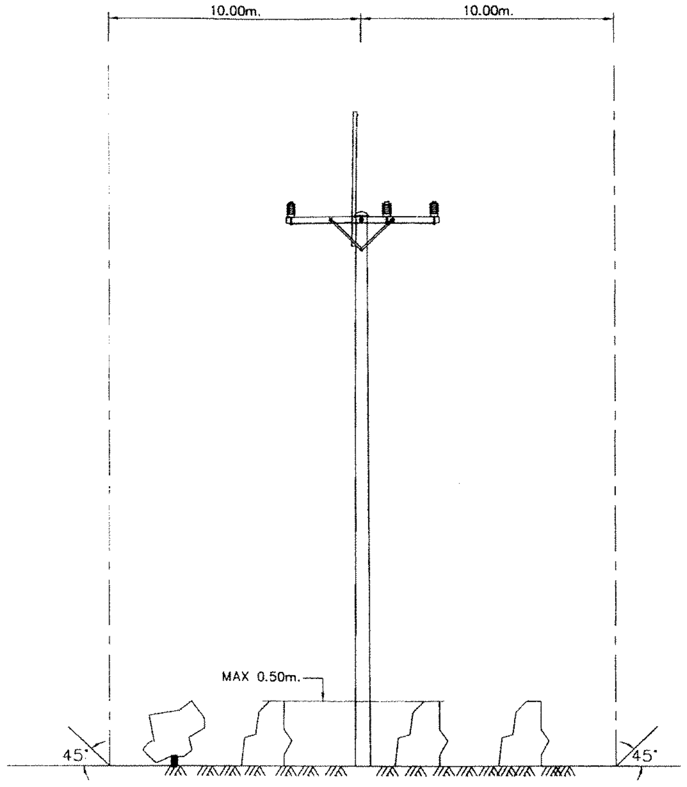


SIDE GROOVE TIE

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

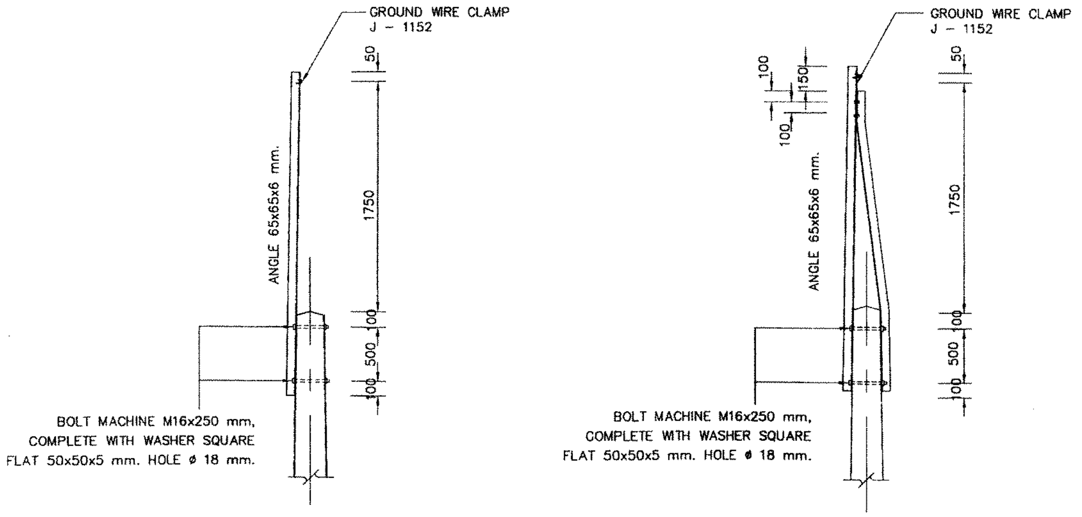


TOP GROOVE TIE



TREE TRIMMING

NOT TO SCALE

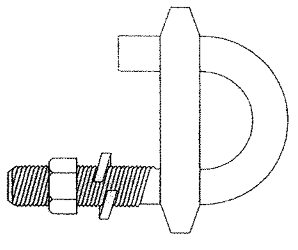


STRAIGHT BAYONET

CORNER BAYONET

OVER HEAD GROUND WIRE BAYONET ASSEMBLY

NOT TO SCALE



GROUND WIRE CLAMP J–1152

NOT TO SCALE

NOTE :

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

KINGDOM OF THAILAND
MINISTRY OF ENERGY
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY

HUAI PA PU HYDROPOWER PROJECT

TRANSMISSION LINE
OVER HEAD GROUND WIRE BAYONET ASSEMBLY

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

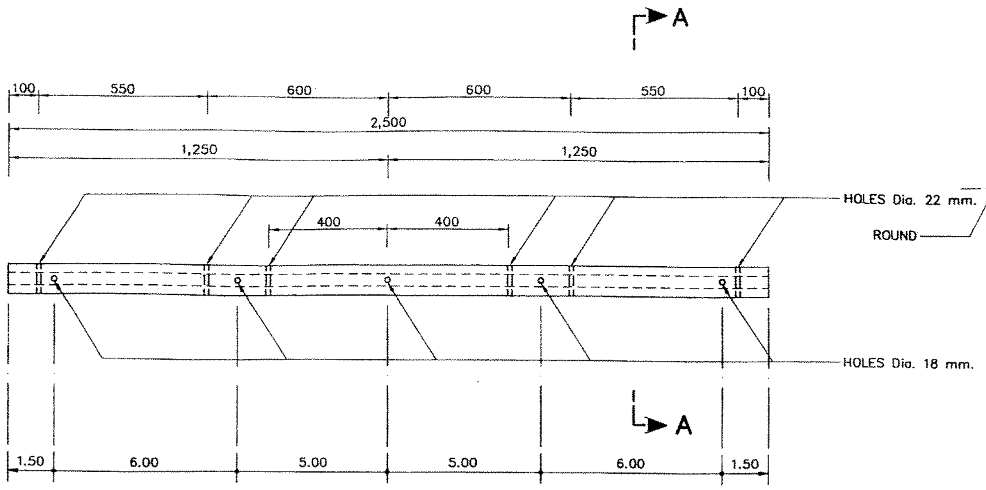
MAHA NAKORN CONSULTANTS CO.,LTD.

DESIGNED วศก.741
DRAWN
CHECKED วศก.741
PROJECT MANAGER
DATE 8/12/51

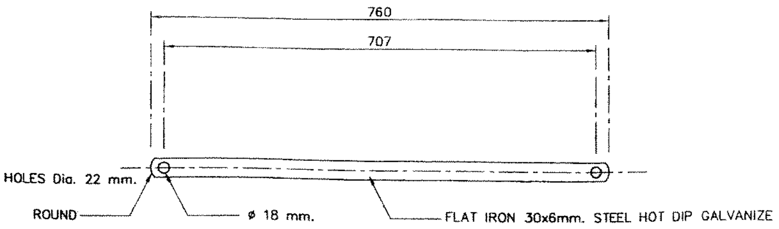
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–TS–11
SHEET NO. 99 OF 100

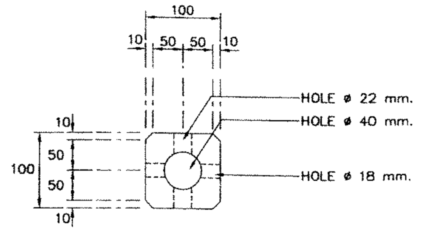
D:\0783\HPP-TS-11.DWG\07-NOV-2008\SHP.



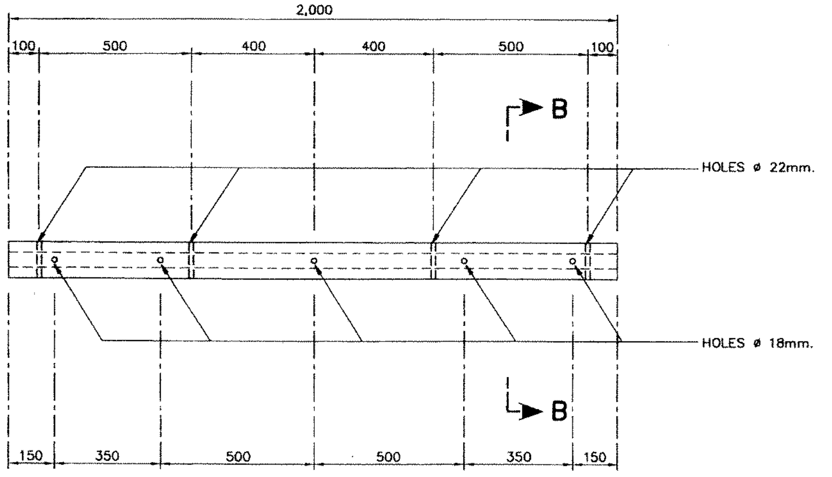
PRESTRESSED CROSS ARM 100x100x2,500mm.



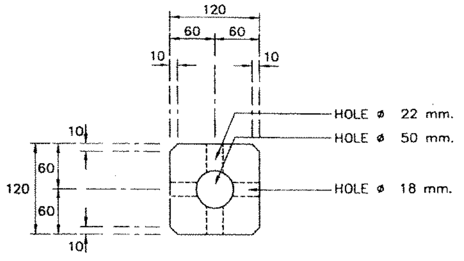
BRECE FLAT FOR CROSS ARM



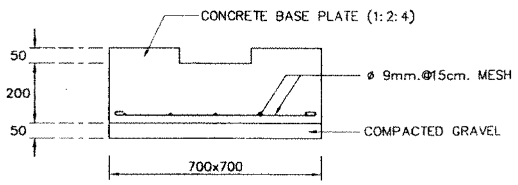
SECTION A–A



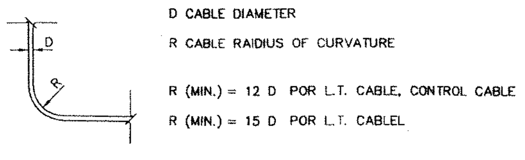
PRESTRESSED CROSS ARM 120X120x2,000mm.



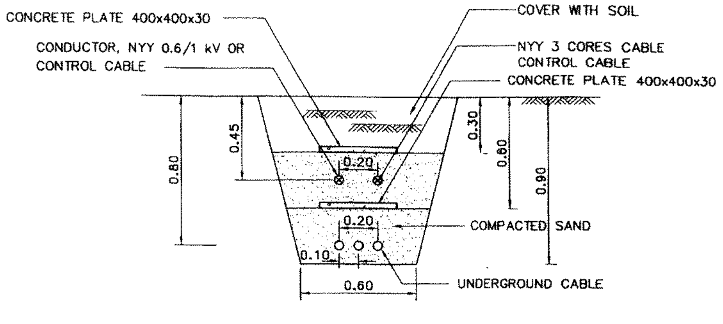
SECTION B–B



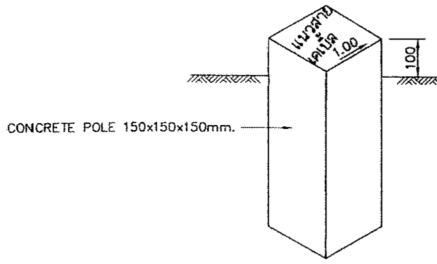
DETAIL "A"


D
R
D CABLE DIAMETER
R CABLE RAIDIUS OF CURVATURE
R (MIN.) = 12 D POR L.T. CABLE, CONTROL CABLE
R (MIN.) = 15 D POR L.T. CABLEL

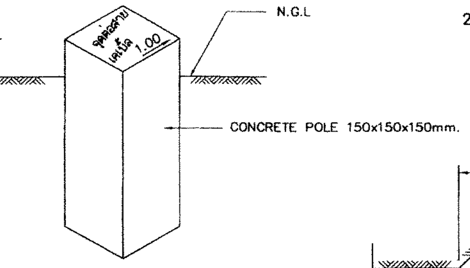
CABLE BENDING


CONCRETE PLATE 400x400x30
CONDUCTOR, NYY 0.6/1 kV OR CONTROL CABLE
COVER WITH SOIL
NYY 3 CORES CABLE CONTROL CABLE
CONCRETE PLATE 400x400x30
0.80
0.45
0.30
0.80
0.90
0.20
0.20
COMPACTED SAND
0.10
0.60
UNDERGROUND CABLE

22 kV SINGLE CORE UNDERGROUND CABLE LAYING

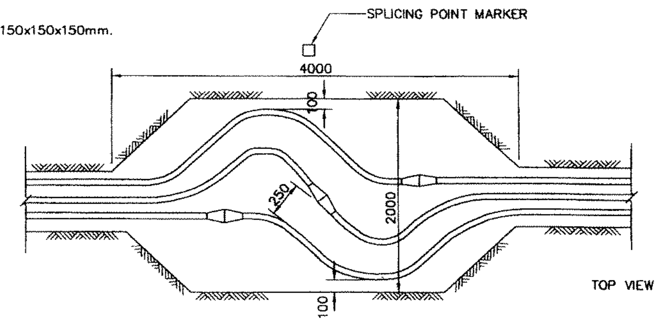


CABLE MARKER



SPLCING POINT MARKER

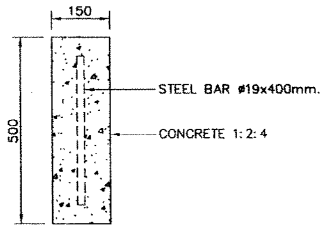
NOTE : INSTALL ONE MARKER EVERY 50m. INSTALL AT SPLICING POINT ALONG CABLE LINE OFFSET 150m.



SPLICING AREA

CONCRETE POLE 150x150x150mm.

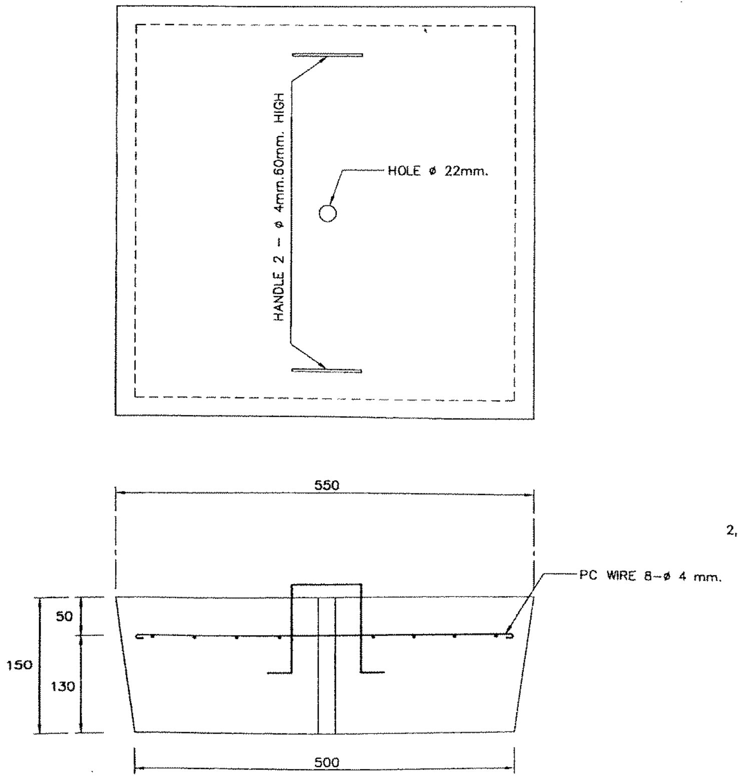
ITEM	BILL OF MATERIAL	REQ'D
1	STONE	0.0064 m^3
2	SAND	0.0032 m^3
3	CEMENT	0.0016 m^3
4	STEEL BAR ø19x400 mm.	1 pc.



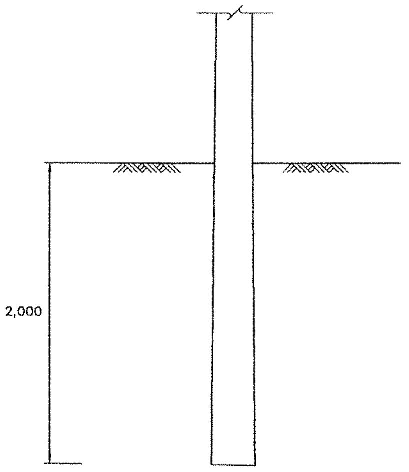
NOTES :

CONCRETE BASE PLATE WILL BE USE FOR

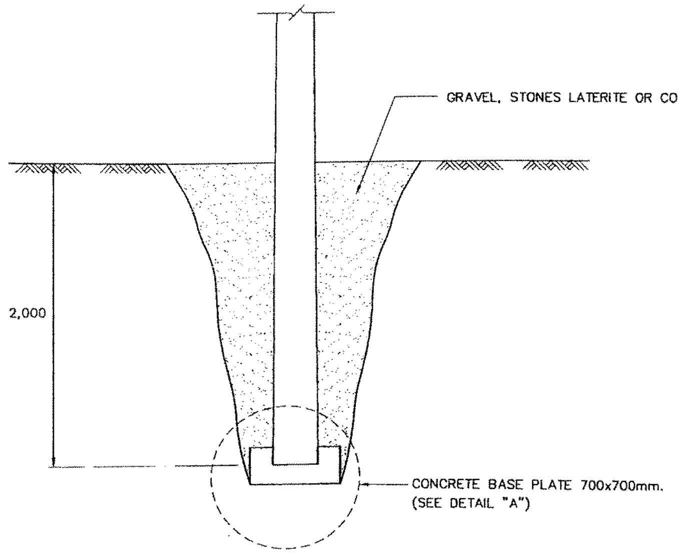
1. POLES WITH ANCHOR GUY TYPES G5 AND G6
2. POLES CONSTRUCTED ON SOFT SOIL WITH PRESSURE NOT MIN 1 kg/Sq.mm.
3. CONTRACTOR SHALL INVESTIGATE THE SOIL CONDITION FOR EVERY POLES AND VERIFY TO USE CONCRETE BASE PLATE OR NOT. THE INVESTIGATION RESULT SHALL BE SUBMITTED TO FIELD ENGINEER FOR APPROVAL PRIOR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



REINFORCED CONCRETE ANCHOR PLATE
550x550x180mm.



FOR NORMAL SOIL CONDITION


GRAVEL, STONES LATERITE OR CONCRETE
2,000
CONCRETE BASE PLATE 700x700mm.
(SEE DETAIL "A")

POLE WITH CONCRETE BASE PLATE

KINGDOM OF THAILAND
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HUAI PA PU HYDROPOWER PROJECT

TRANSMISSION LINE
BURYING DEPTH, FOUNDATION AND
UNDERGROUND CABLE LAYING

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

MAHA NAKORN CONSULTANTS CO.,LTD.
DESIGNED วฟก.741
DRAWN
CHECKED วฟก.741
PROJECT MANAGER
DATE 8/12/51

DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
REVIEWED
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HPP–TS–12
SHEET NO. 100 OF 100

D:\0783\HPP-TS-12.DWG\07-NOV-2008\SMP.