



Department of Alternative
Energy Development Efficiency
MINISTRY OF ENERGY

HUAI MAE SOT HYDROPOWER PROJECT

TAK PROVINCE

CONTRACT C1/2

CIVIL WORKS

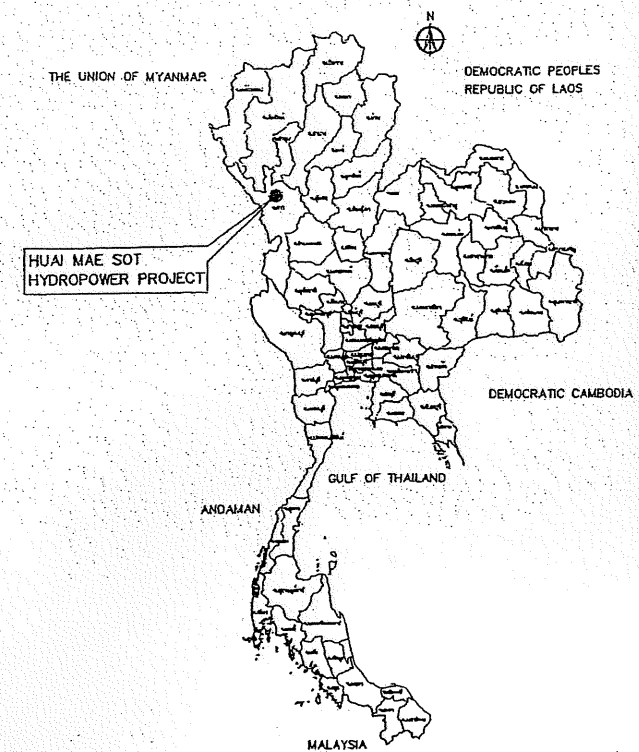
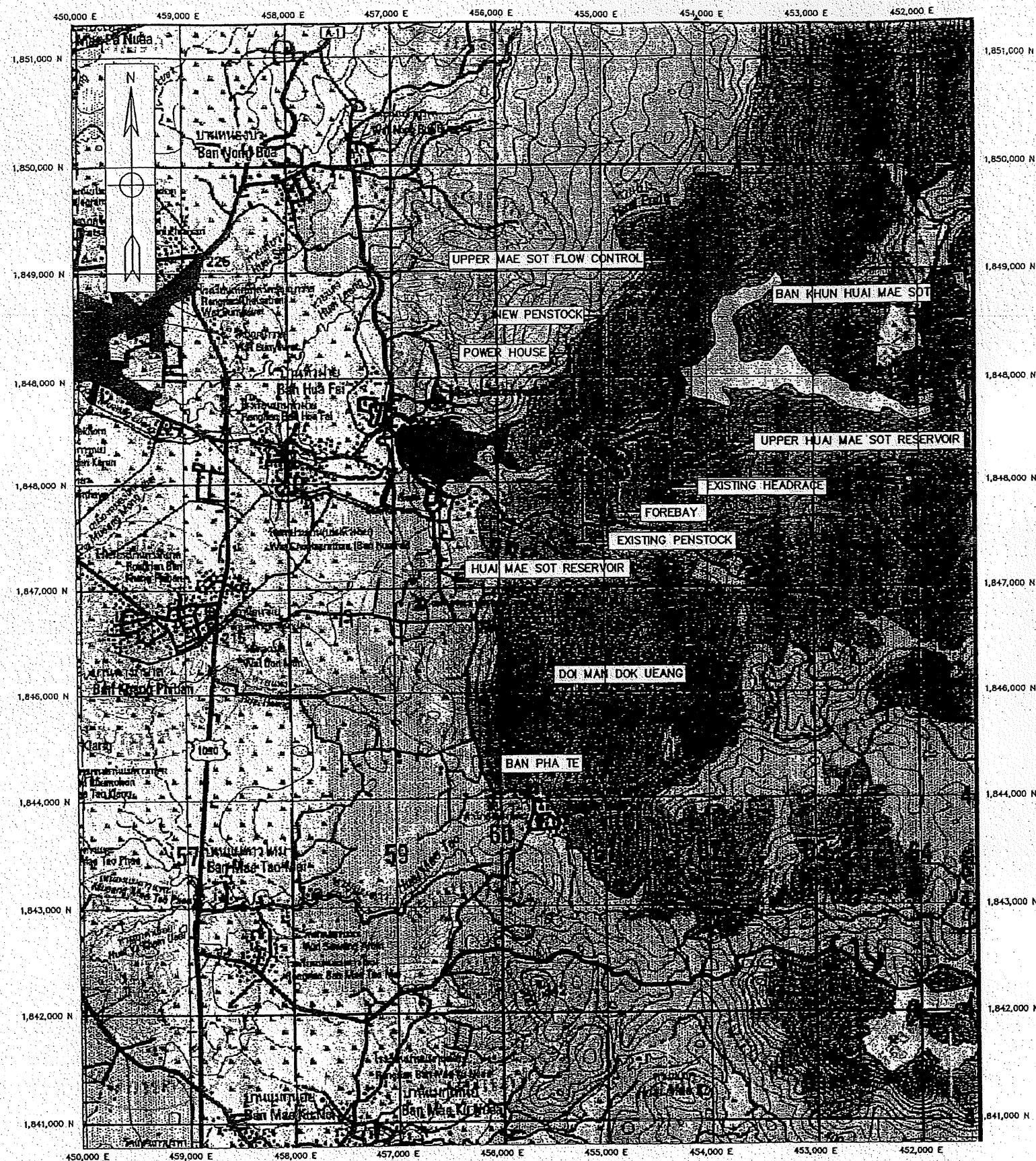
VOLUME 4

DRAWINGS

MAHA NAKORN CONSULTANTS CO.,LTD.

LIST OF DRAWINGS
HUI MAE SOT HYDROPOWER PROJECT
CONTRACT C1/2 : CIVIL WORKS

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5	HMS-PS-02(S)	NO.1 PLAN AND PROFILE, STA.0+500.000 TO STA.1+000.000
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LOCATION MAP
NOT TO SCALE

LEGENDS :

- HIGHWAY
- STREAM
- DAM
- HEADRACE
- FOREBAY
- PENSTOCK
- POWERHOUSE
- EXISTING ROAD
- ACCESS ROAD
- BRIDGE

0 500 1,000 1,500
SCALE 1:20,000 METERS

KINGDOM OF THAILAND MINISTRY OF ENERGY DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY			
HUI MAE SOT HYDROPOWER PROJECT			
CIVIL WORKS GENERAL LOCATION MAP			
MAHA NAKORN CONSULTANTS CO., LTD.		DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY	
DESIGNED BY <i>[Signature]</i> 21.10.04		REVIEWED <i>[Signature]</i> 21.10.04	
DRAWN <i>[Signature]</i> 21.10.04		SUBMITTED <i>[Signature]</i> 21.10.04	
CHECKED <i>[Signature]</i> 21.10.04		RECOMMENDED <i>[Signature]</i> 21.10.04	
PROJECT MANAGER		DATE	DRAWING NO. HMS-GN-01
			SHEET NO. 1 OF 39

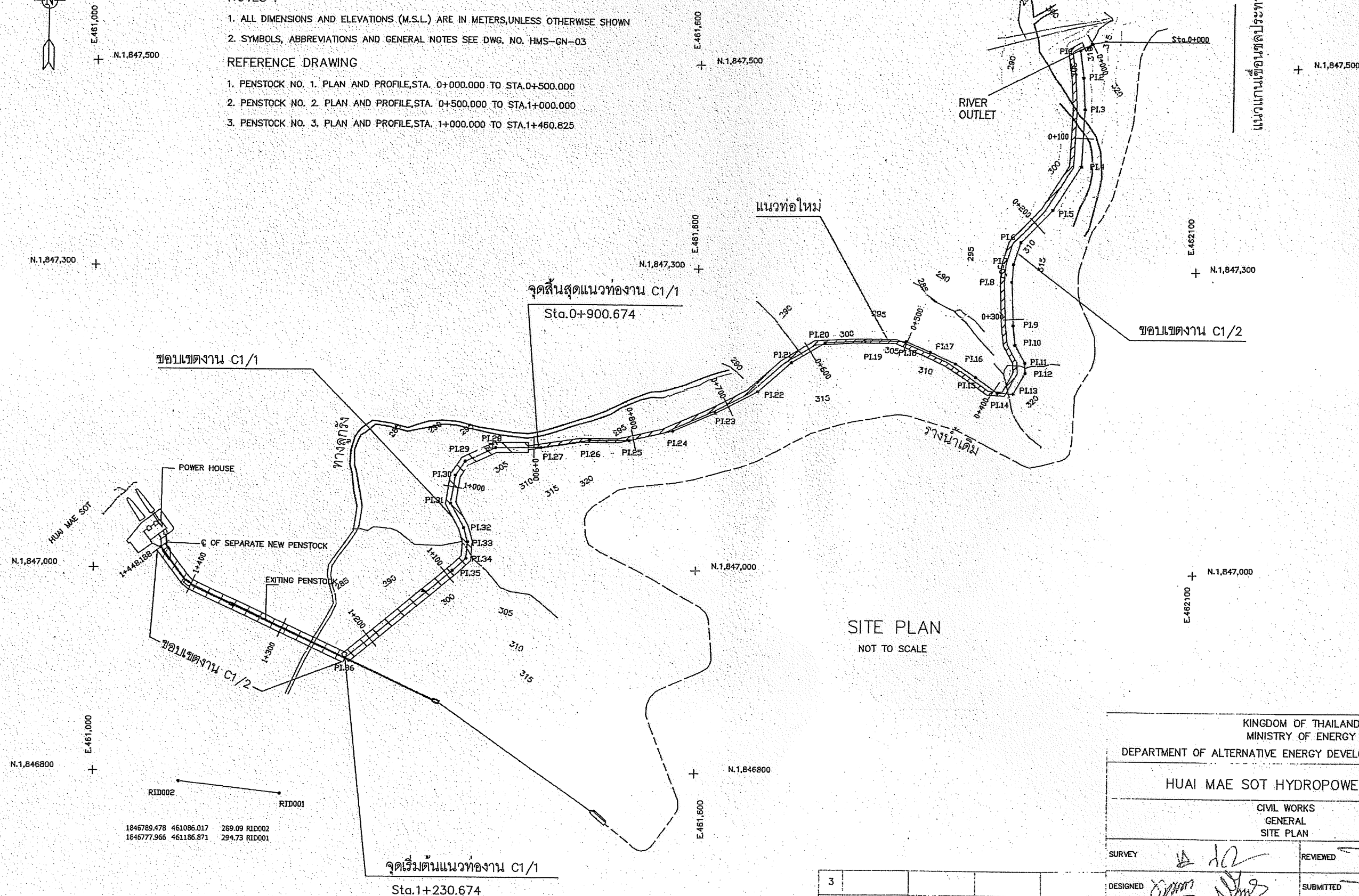


NOTES :

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

REFERENCE DRAWING

1. PENSTOCK NO. 1. PLAN AND PROFILE, STA. 0+000.000 TO STA. 0+500.000
2. PENSTOCK NO. 2. PLAN AND PROFILE, STA. 0+500.000 TO STA. 1+000.000
3. PENSTOCK NO. 3. PLAN AND PROFILE, STA. 1+000.000 TO STA. 1+460.825



SITE PLAN
NOT TO SCALE

KINGDOM OF THAILAND MINISTRY OF ENERGY	
DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY	
HUA MAE SOT HYDROPOWER PROJECT	
CIVIL WORKS GENERAL SITE PLAN	
SURVEY	REVIEWED
DESIGNED	SUBMITTED
DRAWN	RECOMMENDED
CHECKED	APPROVED
CONSULTANTS	DEDE
PROJECT MANAGER	DATE
DRAWING NO. HMS-GN-02(S)	SHEET NO. 2 OF 39

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
C	CENTER LINE
CL	CLEARANCE
CM. OR cm.	CENTIMETER
CM./S OR cm./s	CENTIMETER PER SECOND
CCL	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

SYMBOLS :

	TYPICAL NORTH ARROW
	CENTER LINE
	PAVED ROAD
	DIRT ROAD, LATITE 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, PL, PT, PCV, PVT.
	WATER LEVEL
	PLAN OF RIPRAP
	PLAN OF SLOPE RIPRAP
	SECTION OF DUMPED RIPRAP
	SECTION OF HAND PLACED RIPRAP
	SECTION OF SAND
	SECTION OF GRAVEL OR COARSE AGGREGATE
	SECTION OF ROCK
	SECTION OF EARTH
	SECTION OF BACKFILL
	SECTION OF CONCRETE
	STEEL SECTION
	ELEVATION OR PLAN OF EARTH CUT OR FILL
	ELEVATION OR PLAN OF ROCK CUT
	ELEVATION OR PLAN OF SLOPE
	NATURAL GROUND LEVEL
	CONTOUR LINE
	RIVER, STREAM OR NATURAL DRAIN
	FLOW DIRECTION
	SLOPE DIRECTION
	SLOPE RATIO

GENERAL NOTES :

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

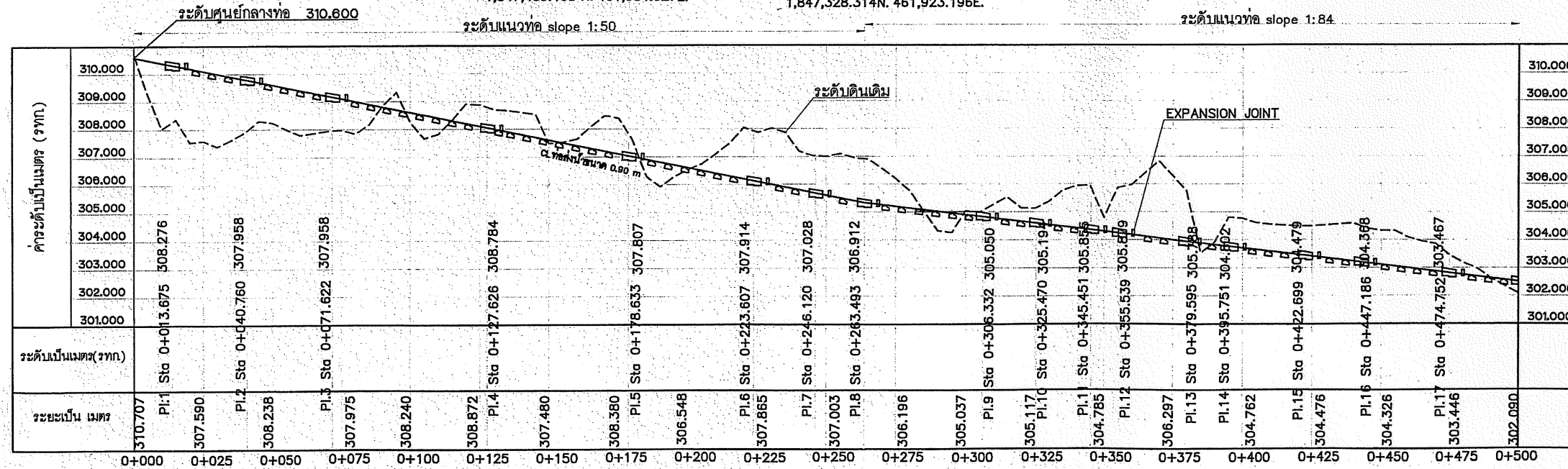
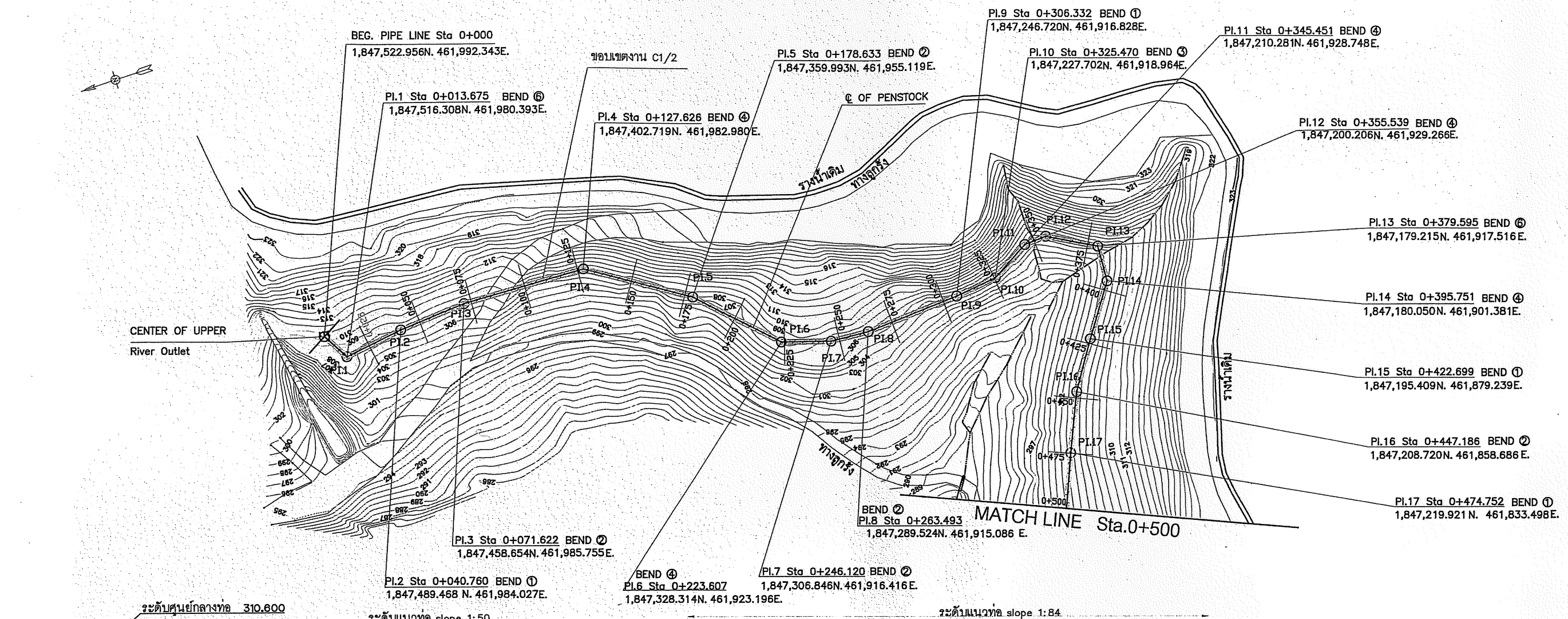
STRUCTURAL DESIGN NOTES :

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

fc' (ksc)	DESCRIPTION
350	PRESTRESS CONCRETE
210	1. POWER HOUSE
	2. TAILRACE
175	1. ANCHOR
140	1. LEAN CONCRETE

- UNLESS OTHERWISE SHOWN, THE FOLLOWING CLEAR COVER OF CONCRETE OVER OF THE REINFORCEMENT SHALL BE USED :
 - FACE EXPOSED TO SCOUR 5.0 cm.
 - FACE EXPOSED TO EARTH OR WEATHER 5.0 cm.
 - FACE UNEXPOSED TO EARTH OR WEATHER 3.0 cm.
- THE REINFORCEMENT LAP SPLICES SHALL NOT BE LESS THAN 50 DIAMETERS OF BIGGER THAN BAR WITH HOOKS, UNLESS OTHERWISE SHOWN.
- EMBEDDED METALWORK SHALL BE SECURELY FASTENED IN POSITION BEFORE PLACING CONCRETE.
- ALL CONSTRUCTION JOINT SHOULD BE TREATED AS DIRECTED IN ORDER TO ASSURE THE BEST BOND.
- A 5 cm. (MIN.) LAYER OF LEAN CONCRETE (1:3:5 BY VOLUME) SHOULD BE PLACED BELOW CONCRETE STRUCTURES.
- THE STRUCTURES SHOULD BE PLACED ON UNDISTURBED SOILS OR COMPACTED FILL AND BACKFILL AROUND THE STRUCTURES SHOULD BE COMPACTED.
- THE FOUNDATION ELEVATIONS ARE SUBJECT TO CHANGE AS DIRECTED ACCORDING TO THE SOIL CONDITIONS.
- ALL SIZES OF REINFORCING BARS AND STRUCTURAL STEELS ARE IN MILLIMETERS.
- ALL STRUCTURAL STEELS ARE THOSE OF T.I.S. DESIGNATION Fe24.
- REINFORCED STEEL BARS SHALL BE CONFORM TO T.I.S. AS FOLLOW :
 - DEFORMED BARS (SD30) - T.I.S. 24-2548
 - ROUND BARS (SR24) - T.I.S. 20-2543
- ALLOWABLE BEARING CAPACITY OF FOUNDATION SHALL NOT BE LESS THAN AS FOLLOW :
 - POWERHOUSE Q_b = 15 T/M²
 - PENSTOCK Q_b = 20 T/M²

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DRAWN	APPROVED	DATE	DATE
CHECKED	DATE	PROJECT MANAGER	DATE
CONSULTANTS	DEDE	HMS-GN-03	SHEET NO. 3 OF 39



หมายเหตุ

การวางท่อทั้งหมดจะต้องสำรวจกำหนดแนวก่อสร้างเพื่อพิจารณาการวางท่อนดิน (pipe support) หรือวางท่อใต้ดิน (Encased steel pipe) โดยอยู่ในดุลยพินิจของผู้ควบคุมงาน

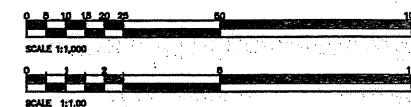
Pipe Support
Provide Pipe Support Spacing <6 m.,length

REFERENCE DRAWINGS :

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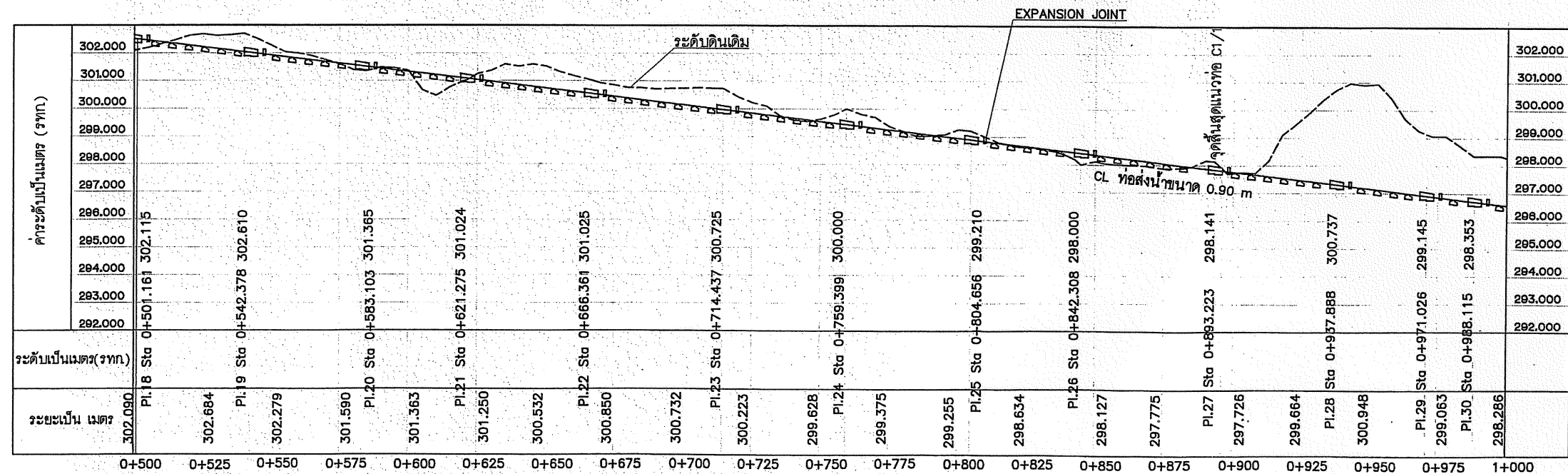
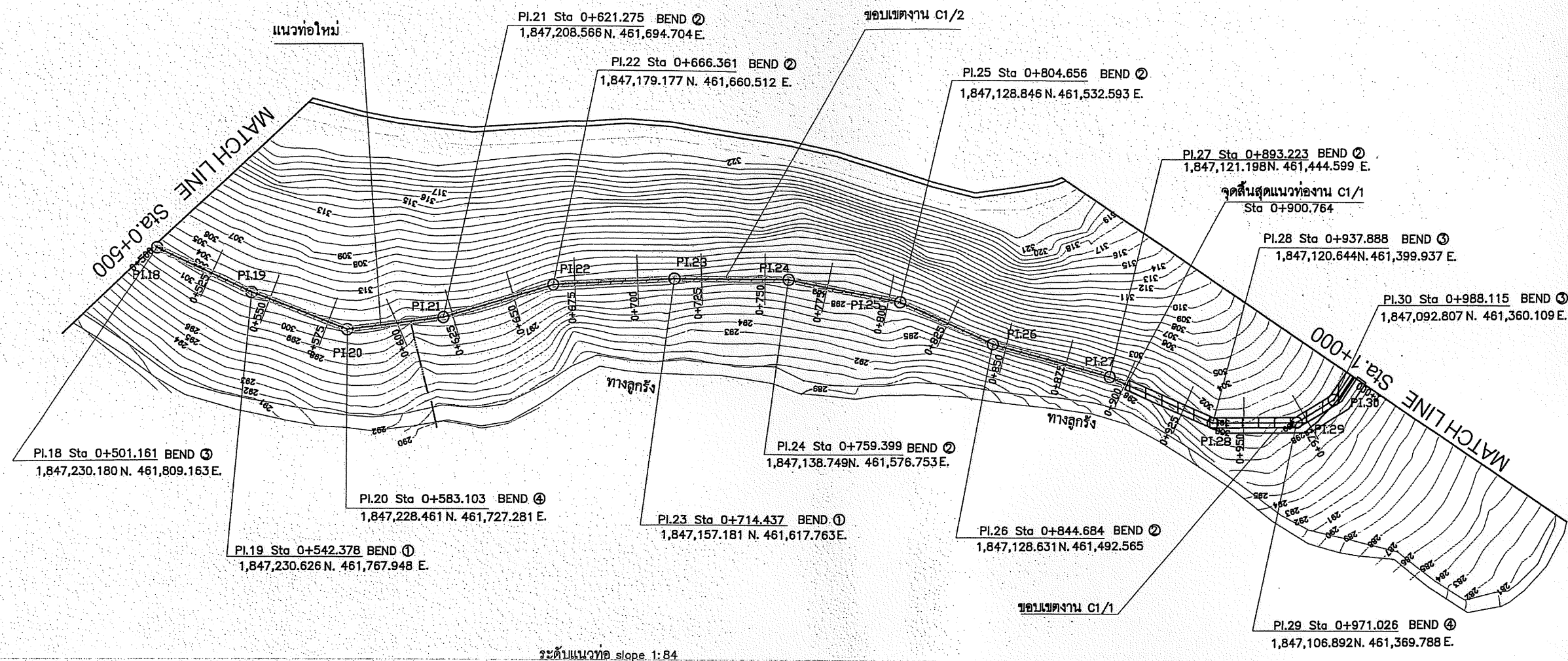
HMS-GN-03
HMS-PS-01
HMS-PS-02
HMS-PS-03

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



04

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SURVEY	DESIGNED	REVIEWED	SUBMITTED
DRAWN	CHECKED	APPROVED	
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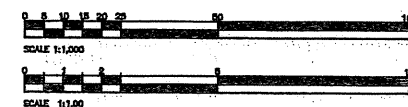
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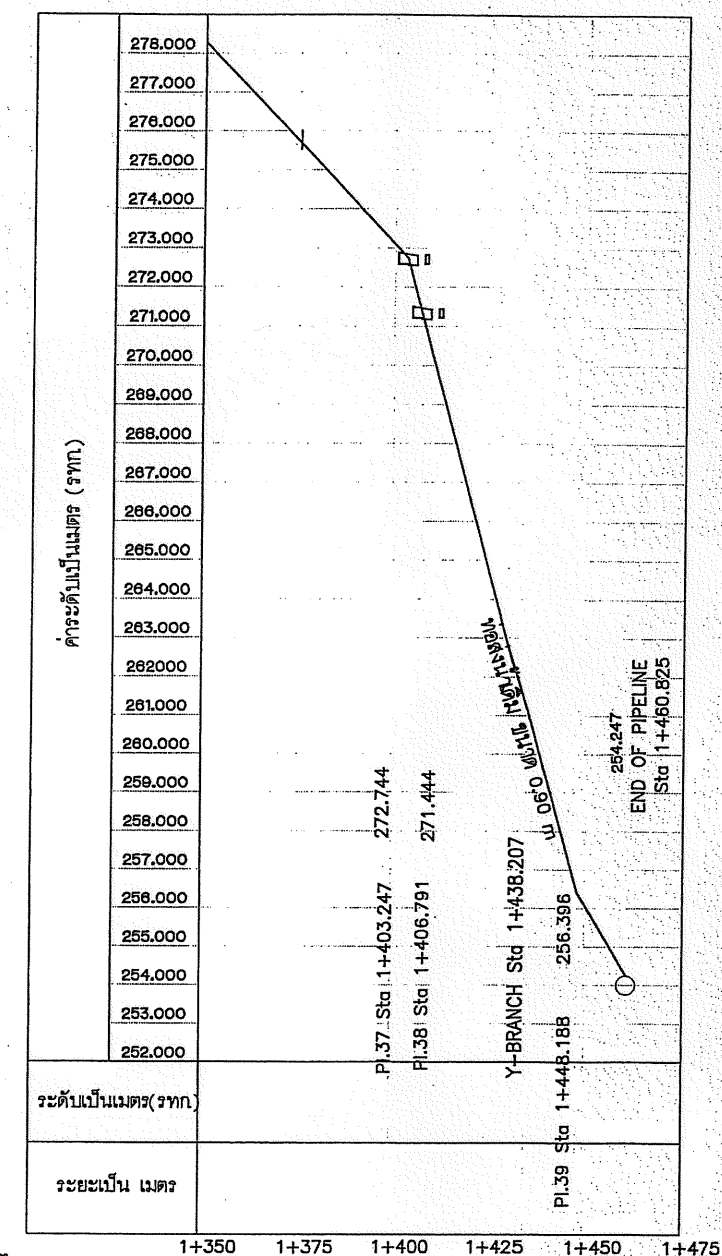
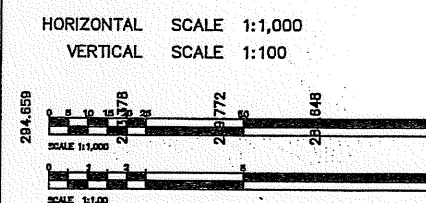
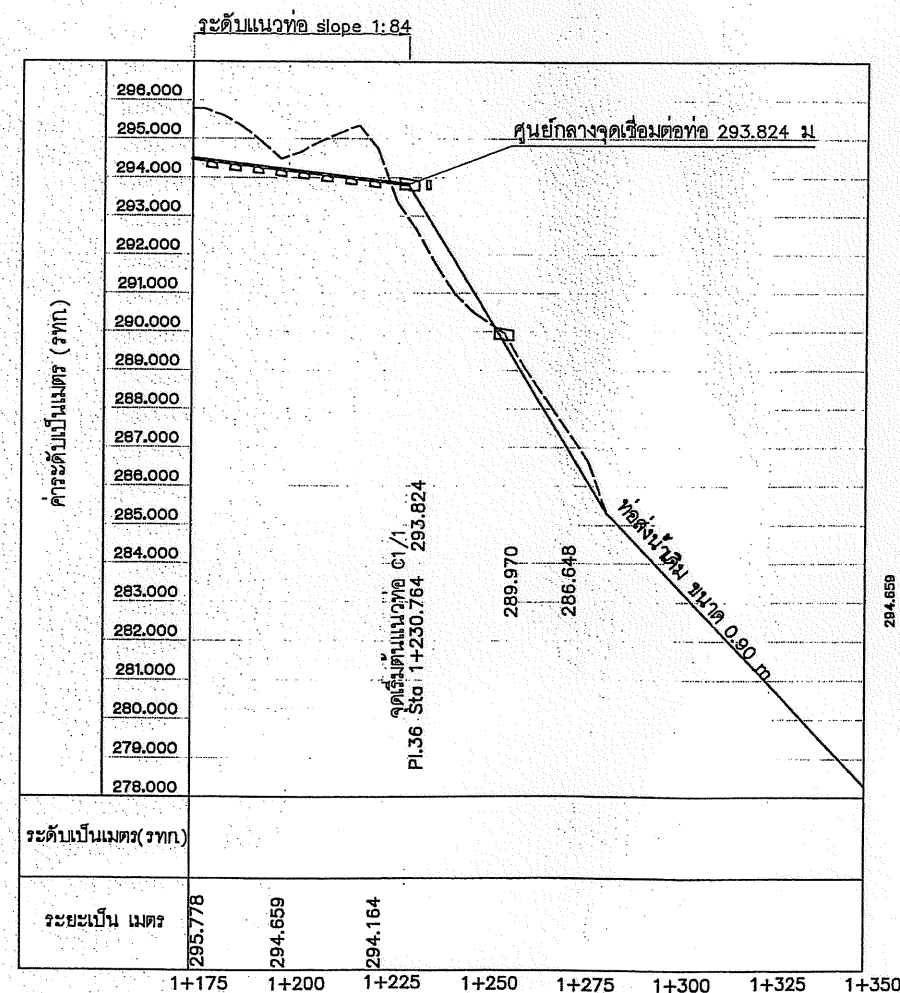
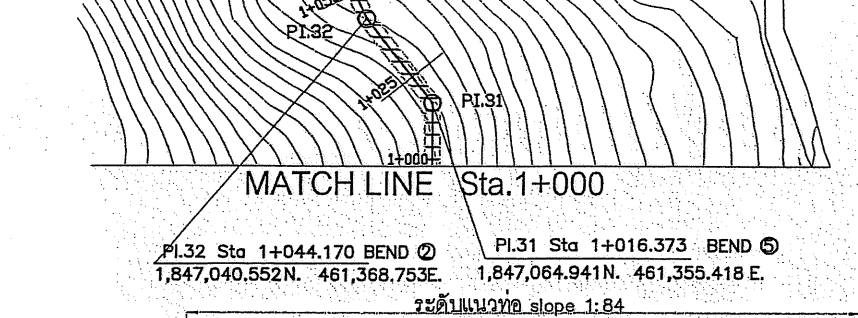
HMS-GN-03
HMS-PS-01
HMS-PS-02
HMS-PS-03

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



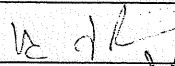
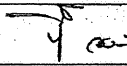
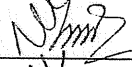
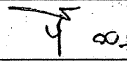
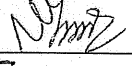
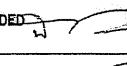
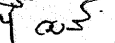
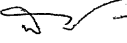
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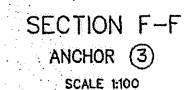
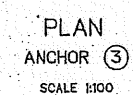
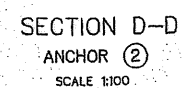
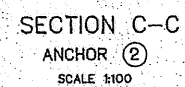
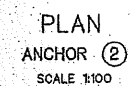
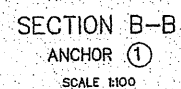
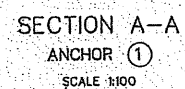
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PENSTOCK CIVIL WORKS			
NO.2, PLAN AND PROFILE, STA.0+500.000 TO STA.1+000.000			
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PROJECT MANAGER		DATE	
DRAWING NO. HMS-PS-02(S)		SHEET NO. 5 OF 39	



HMS-GN-03
HMS-PS-01
HMS-PS-02
HMS-PS-03

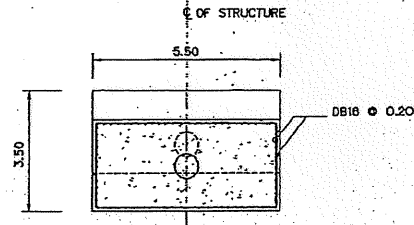
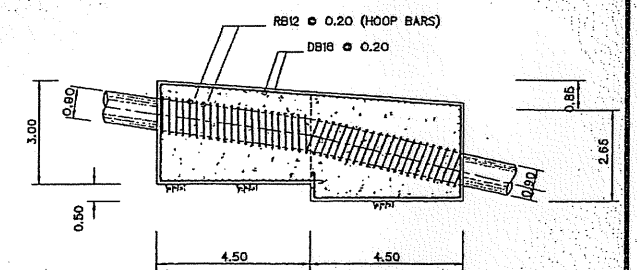
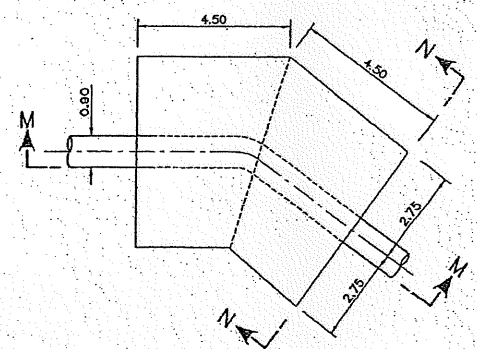
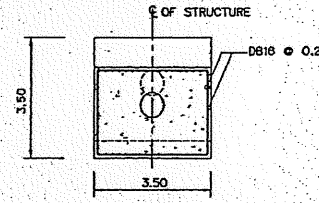
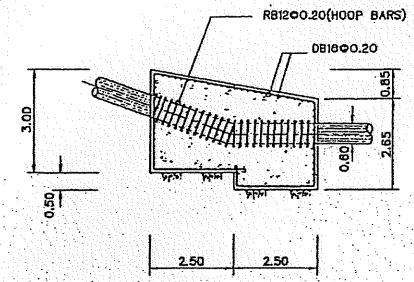
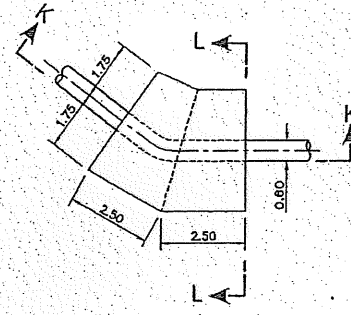
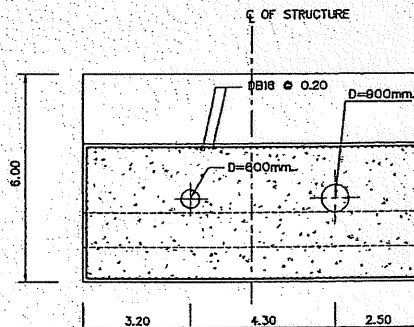
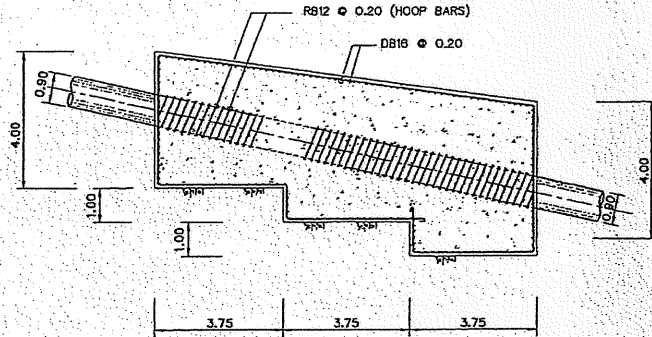
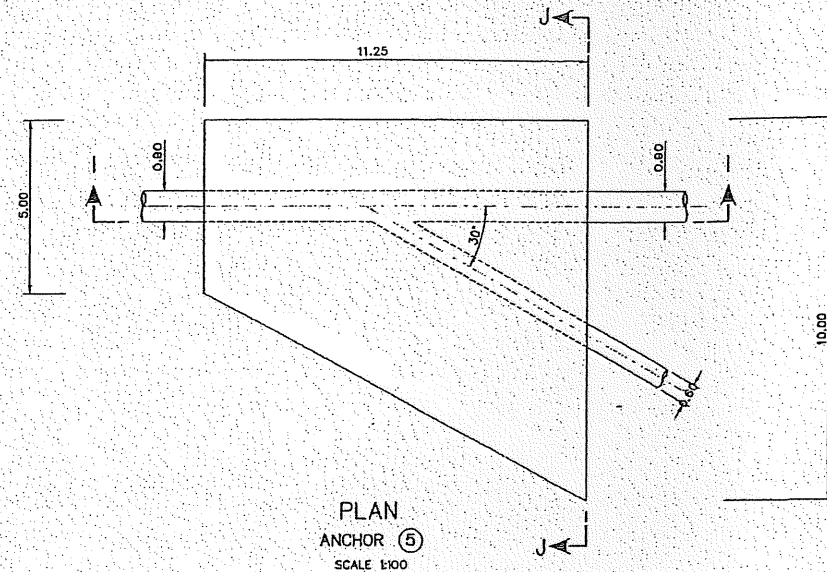
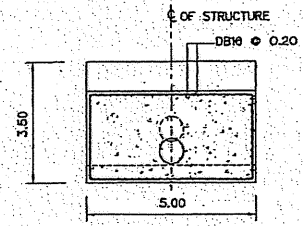
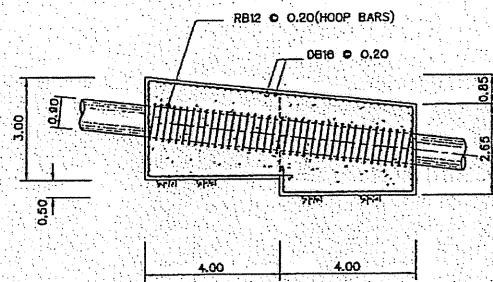
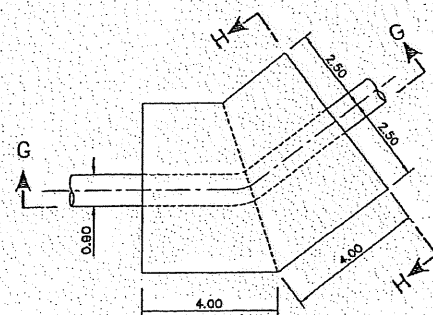
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NO.	DATE	REVISIONS	CHECK	APPROV
	CONSULTANTS		DEDE	

KINGDOM OF THAILAND MINISTRY OF ENERGY DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY		
HUAI MAE SOT HYDROPOWER PROJECT		
PENSTOCK CIVIL WORKS		
NO.3, PLAN AND PROFILE, STA.1+000.000 TO STA.1+460.825		
SURVEY 	REVIEWED  30.10.59	
DESIGNED  	SUBMITTED  30.10.59	
DRAWN  	RECOMMENDED  30.10.59	
CHECKED 	APPROVED  4.11.59	
PROJECT MANAGER _____ DATE _____	DRAWING NO. HMS-PS-03(S)	SHEET NO. 6 OF 39



3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

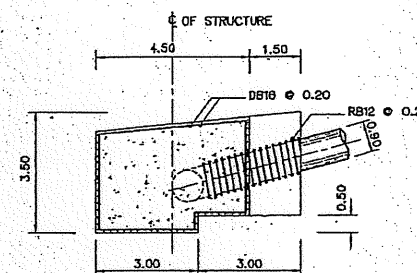
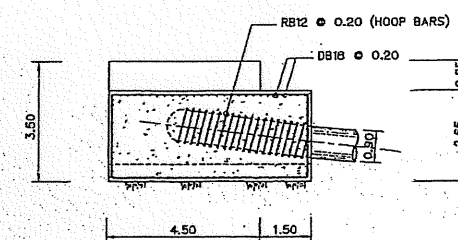
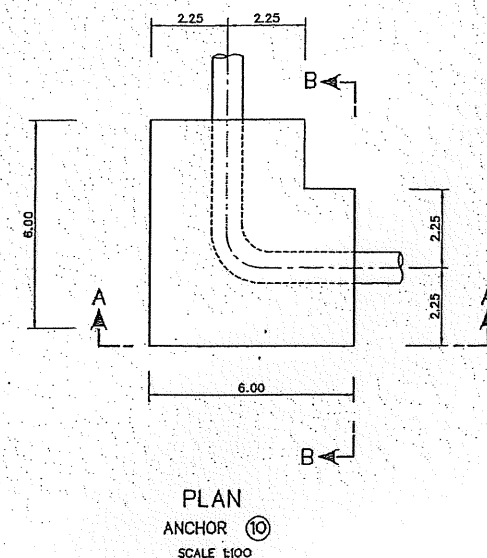
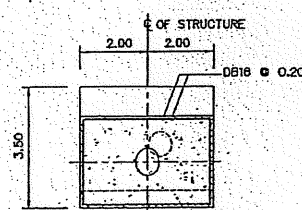
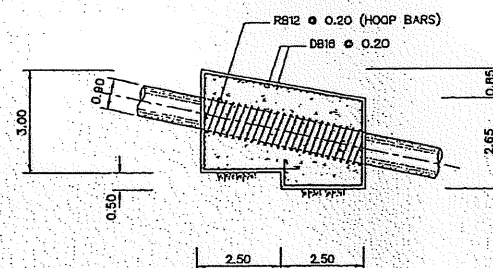
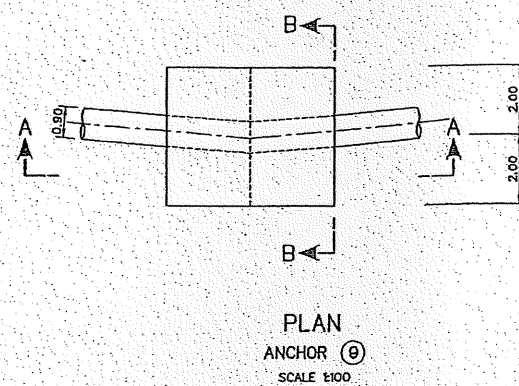
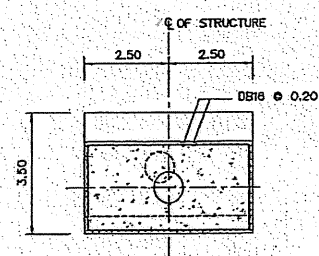
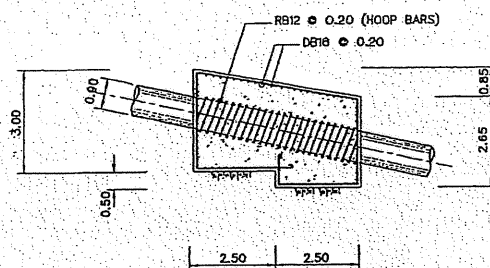
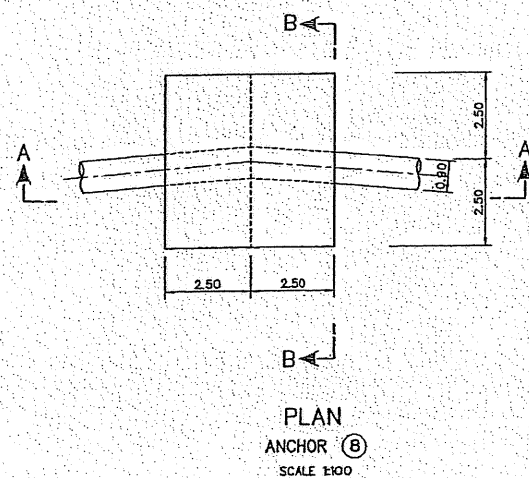
07



NOTES :

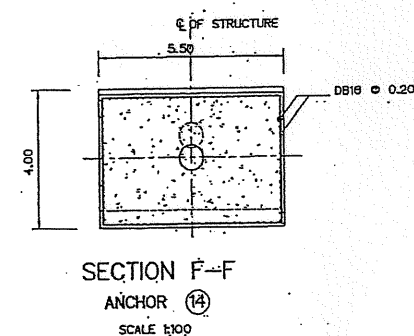
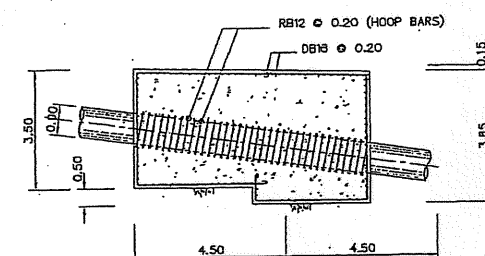
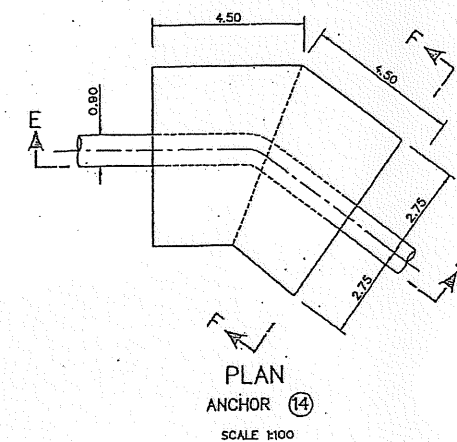
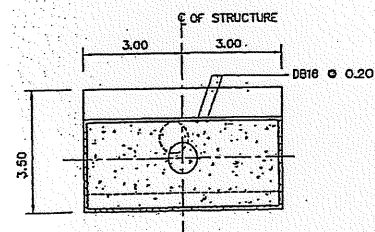
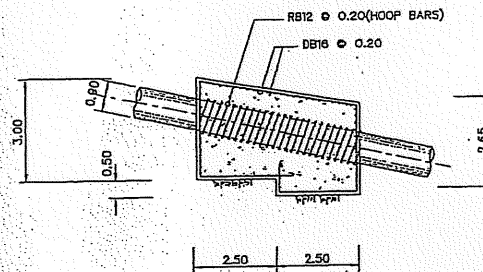
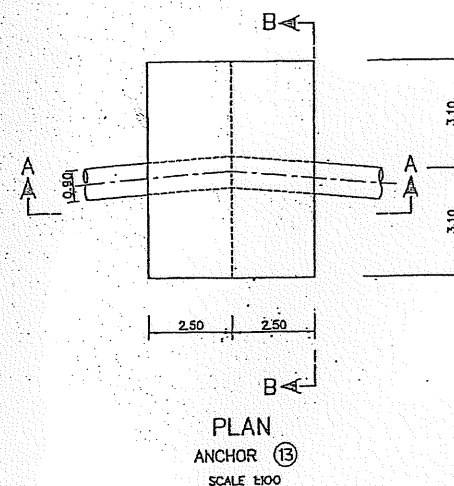
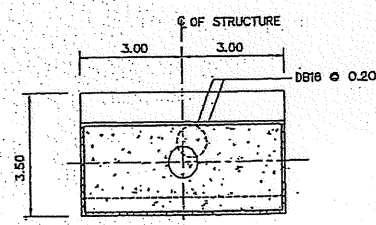
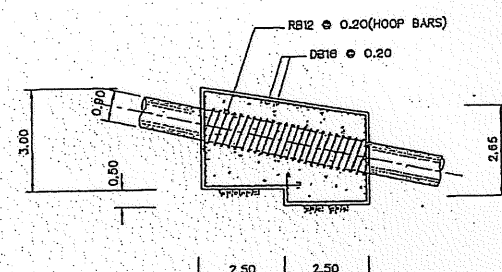
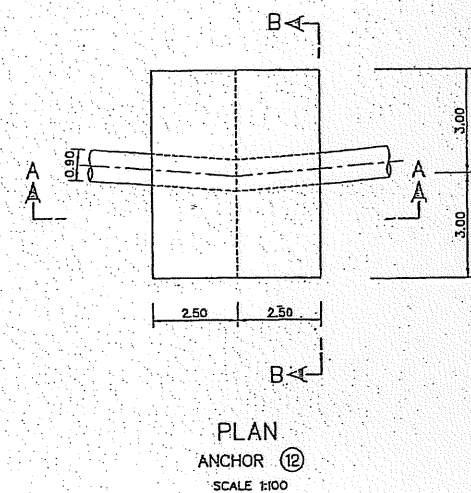
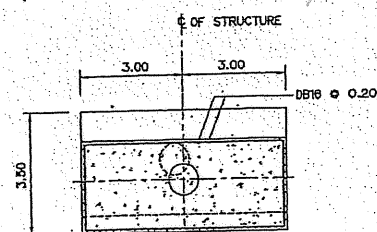
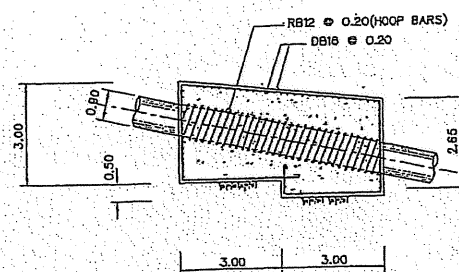
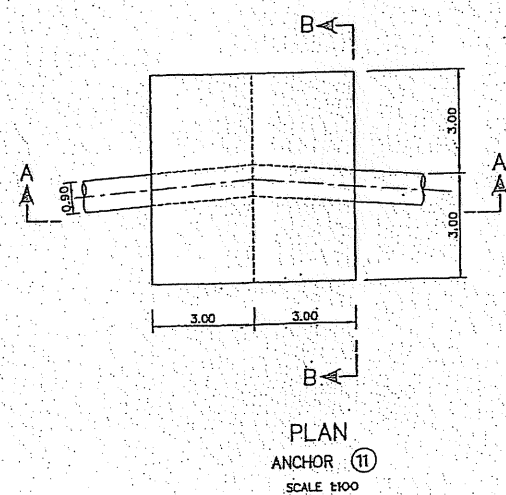
1. ALL DIMENSIONS ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HMS-GN-03
3. CORROSIVE PROTECTION IS WARNED TO STRICTLY FOLLOW PAINTING SPECIFICATION

3						DESIGNED	18.10.2020	REVIEWED	D. Paul
2						DRAWN	09.11.2020	SUBMITTED	6.11.2020
1						CHECKED	25.11.2020	APPROVED	[Signature]
NO.	DATE	REVISIONS	CHECKED	APPROVED	CHECKED	PROJECT MANAGER	DATE	DRAWING NO.	SHEET NO.
		CONSULTANTS		DEDE				HMS-PS-05	8 OF 38



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

KINGDOM OF THAILAND MINISTRY OF ENERGY DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY			
HUAI MAE SOT HYDROPOWER PROJECT			
CIVIL WORKS PENSTOCK ANCHOR BLOCK NO. 8,9,10 PLAN AND SECTION			
MAHA NAKORN CONSULTANTS CO., LTD.		DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY	
DESIGNED	REVISED	REVIEWED	SUBMITTED
DRAWN	CHECKED	RECOMMENDED	APPROVED
DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS	DEDE	PROJECT MANAGER	DATE
HMS-PS-06		SHEET NO. 8 OF 30	

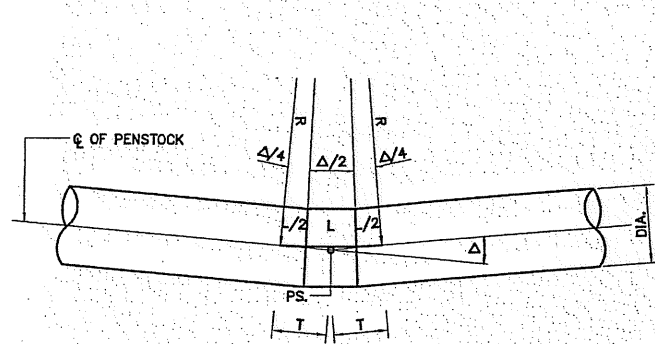


NOTES :

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

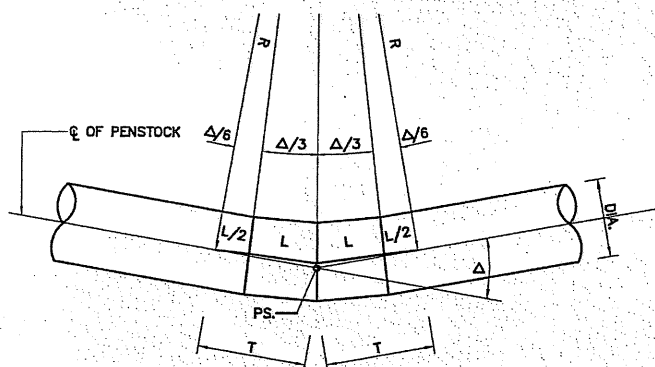
NO.	DATE	REVISIONS	CHECKED	APPROVED
1				
2				
3				

KINGDOM OF THAILAND MINISTRY OF ENERGY DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY			
HUAI MAE SOT HYDROPOWER PROJECT			
CIVIL WORKS PENSTOCK ANCHOR BLOCK NO. 11,12,13,14 PLAN AND SECTION			
MAHA NAKORN CONSULTANTS CO., LTD.			
DESIGNED	28.4.95	28.4.95	28.4.95
DRAWN	28.4.95	28.4.95	28.4.95
CHECKED	28.4.95	28.4.95	28.4.95
PROJECT MANAGER	DATE	HMS-PS-07	SHEET NO. 10 OF 30



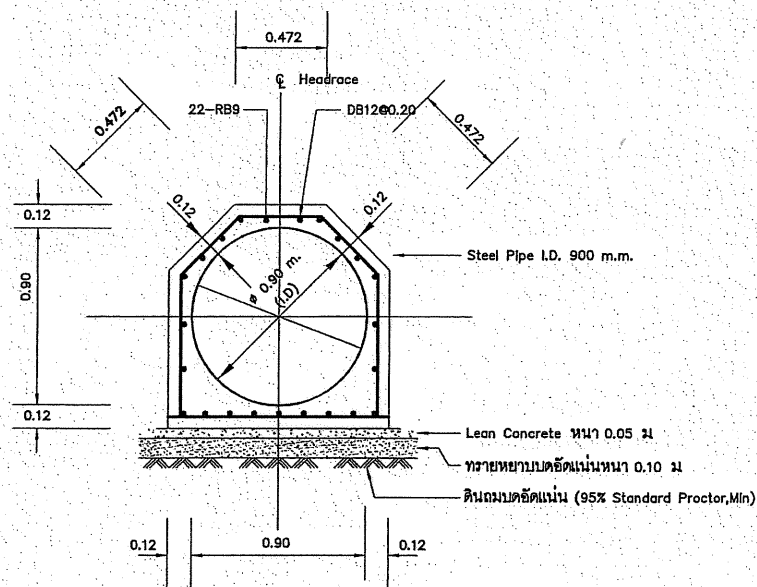
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DELTA(Δ) 5'-15'
SCALE 1:20



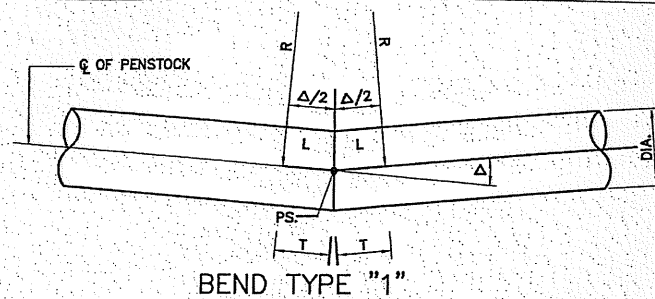
BEND TYPE "3"

DELTA(Δ) 15'-25'
SCALE 1:20



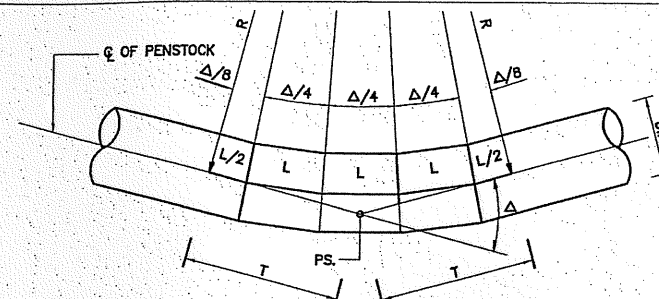
TYPICAL SECTION OF ENCASED STEEL PIPE

(แบบขยายท่อวางใต้ดิน)



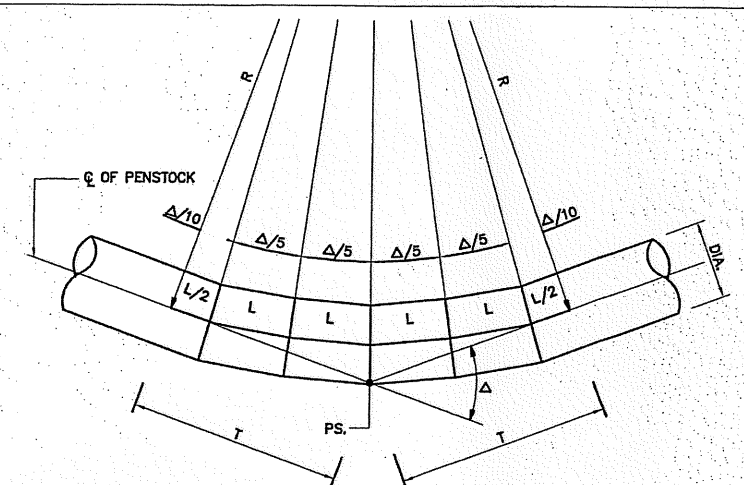
BEND TYPE "1"

DELTA(Δ) 0'-5'
SCALE 1:20



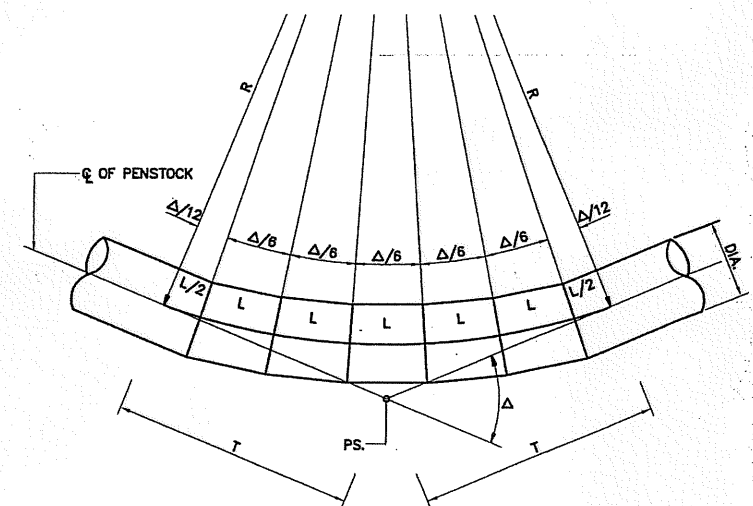
BEND TYPE "4"

DELTA(Δ) 25'-35'
SCALE 1:20



BEND TYPE "5"

DELTA(Δ) 35'-45'
SCALE 1:20



BEND TYPE "6"

DELTA(Δ) 45'-OVER
SCALE 1:20

DIMENSIONS OF BENDS

BEND NO.	PI NO.	KM. OF PI - PS	COORDINATE		Δ (DEGREE)	BEND TYPE	T (m.)	R (m.)	DIA. (m.)	Length Of Curve (m.)	THICKNESS (mm.)
			N	E							
HEAD PIPELINE	PI.0	0+000.000	1,847,522.956	461,992.343	-	-	-	-	0.90	-	7.9
1	PI.1	0+013.675	1,847,516.308	461,980.393	68°-37'-21.7"	6	0.450	0.659	0.90	0.759	7.9
2	PI.2	0+040.760	1,847,489.468	461,984.027	4°-30'-03.5"	1	0.100	2.545	0.90	0.200	7.9
3	PI.3	0+071.622	1,847,458.654	461,985.755	06°-02'-00.0"	2	0.450	8.539	0.90	0.899	7.9
4	PI.4	0+127.626	1,847,402.719	461,982.980	30°-16'-03.4"	4	0.450	1.664	0.90	0.879	7.9
5	PI.5	0+178.633	1,847,359.993	461,955.119	12°-06'-43.3"	2	0.450	4.242	0.90	0.897	7.9
6	PI.6	0+223.607	1,847,328.314	461,923.196	27°-41'-33.7"	4	0.450	1.826	0.90	0.882	7.9
7	PI.7	0+246.120	1,847,306.846	461,916.416	13°-08'-11.4"	2	0.450	3.908	0.90	0.896	7.9
8	PI.8	0+263.493	1,847,289.524	461,915.086	06°-43'-16.0"	2	0.450	7.663	0.90	0.899	7.9
9	PI.9	0+306.332	1,847,246.720	461,916.828	04°-04'-40.1"	1	0.100	2.809	0.90	0.200	7.9
10	PI.10	0+325.470	1,847,227.702	461,918.964	22°-54'-40.3"	3	0.450	2.221	0.90	0.888	7.9
11	PI.11	0+345.451	1,847,210.281	461,928.748	26°-22'-34.5"	4	0.450	1.920	0.90	0.884	7.9
12	PI.12	0+355.539	1,847,200.206	461,929.266	32°-10'-54.3"	4	0.450	1.560	0.90	0.876	7.9
13	PI.13	0+379.595	1,847,179.215	461,917.516	63°-43'-26.2"	6	0.450	0.724	0.90	0.805	7.9
14	PI.14	0+395.751	1,847,180.050	461,901.381	31°-47'-06.0"	4	0.450	1.581	0.90	0.877	7.9
15	PI.15	0+422.699	1,847,195.409	461,879.239	01°-49'-07.1"	1	0.100	6.300	0.90	0.200	7.9
16	PI.16	0+447.186	1,847,208.720	461,858.686	08°-57'-15.5"	2	0.450	5.747	0.90	0.898	7.9
17	PI.17	0+474.752	1,847,219.921	461,833.498	01°-08'-55.8"	1	0.100	10.272	0.90	0.200	7.9
18	PI.18	0+501.161	1,847,230.180	461,809.163	22°-14'-20.5"	3	0.450	2.290	0.90	0.889	7.9
19	PI.19	0+542.378	1,847,230.626	461,767.948	03°-40'-03.0"	1	0.100	3.124	0.90	0.200	7.9
20	PI.20	0+583.103	1,847,228.461	461,727.281	28°-21'-55.1"	4	0.450	1.781	0.90	0.882	7.9
21	PI.21	0+621.275	1,847,208.566	461,694.704	09°-16'-02.3"	2	0.450	5.552	0.90	0.898	7.9
22	PI.22	0+668.361	1,847,179.177	461,680.512	13°-27'-08.8"	2	0.450	3.816	0.90	0.896	7.9
23	PI.23	0+714.437	1,847,157.181	461,617.763	03°-01'-33.5"	1	0.100	3.786	0.90	0.200	7.9
24	PI.24	0+759.399	1,847,138.749	461,576.753	11°-33'-43.1"	2	0.450	4.445	0.90	0.897	7.9
25	PI.25	0+804.656	1,847,128.846	461,532.593	12°-19'-54.8"	2	0.450	4.165	0.90	0.897	7.9
26	PI.26	0+844.684	1,847,128.631	461,492.565	08°-30'-03.5"	2	0.450	6.055	0.90	0.898	7.9
27	PI.27	0+893.223	1,847,121.198	461,444.599	08°-05'-52.9"	2	0.450	6.357	0.90	0.899	7.9
28	PI.28	0+937.888	1,847,120.644	461,399.937	23°-48'-31.3"	3	0.450	2.135	0.90	0.887	7.9
29	PI.29	0+971.026	1,847,106.892	461,369.788	30°-59'-07.7"	4	0.450	1.623	0.90	0.878	7.9
30	PI.30	0+988.115	1,847,092.807	461,360.109	24°-56'-22.2"	3	0.450	2.035	0.90	0.886	7.9
31	PI.31	1+016.373	1,847,064.941	461,355.418	38°-13'-23.3"	5	0.450	1.299	0.90	0.866	7.9
32	PI.32	1+044.170	1,847,040.552	461,368.753	12°-58'-46.9"	2	0.450	3.956	0.90	0.896	7.9
33	PI.33	1+058.560	1,847,026.698	461,372.644	20°-24'-49.7"	3	0.450	2.499	0.90	0.890	7.9
34	PI.34	1+074.994	1,847,010.320	461,371.290	43°-20'-56.6"	5	0.450	1.132	0.90	0.857	7.9
35	PI.35	1+093.052	1,846,998.254	461,357.854	02°-43'-43.5"	1	0.100	4.199	0.90	0.200	7.9
36	PI.36	1+230.764	1,846,911.223	461,251.129	64°-24'-22.6"	6	0.450	0.715	0.90	0.803	7.9
37	PI.37	1+403.247	1,846,984.690	461,095.075	15°-11'-22.4"	3	0.450	3.375	0.90	0.895	7.9
38	PI.38	1+406.791	1,846,986.987	461,092.376	12°-43'-23.8"	2	0.450	4.036	0.90	0.896	7.9
39	PI.39	1+448.188	1,847,020.101	461,067.534	33°-17'-47.4"	4	0.450	1.505	0.90	0.875	7.9
40	END OF PIPELINE	1+460.825	1,847,032.500	461,065.149			0.450		0.90		7.9

0.5 1.0 1.5
SCALE 1:20 METERS

NOTES :

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

KINGDOM OF THAILAND MINISTRY OF ENERGY DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY			
HUAI MAE SOT HYDROPOWER PROJECT			
PENSTOCK CIVIL WORKS BEND DETAILS			
SURVEY		REVIEWED	30.0.59
DESIGNED		SUBMITTED	30.0.59
DRAWN		RECOMMENDED	30.0.59
CHECKED		APPROVED	30.0.59
PROJECT MANAGER		DRAWING NO. HMS-PS-08 (S)	SHEET NO. 11 OF 39

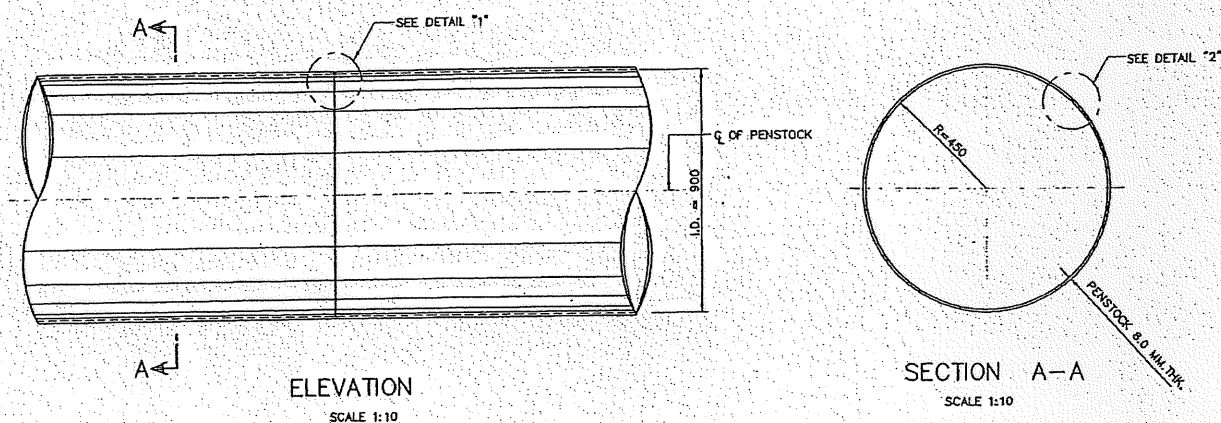
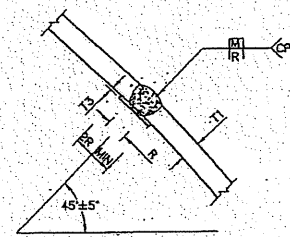
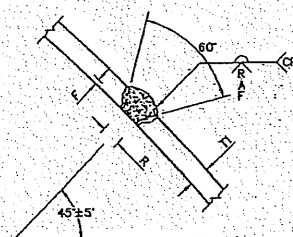
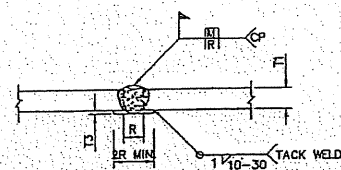


TABLE OF DETAIL "1" SQUARE-GROOVE WELD, BUTT JOINT								
WELDING PROCESS	DESIGNATION	BASE METAL THICKNESS		GROOVE PREPARATION		TOLERANCES		REMARKS
		T1	T3	ROOT OPENING	GROOVE ANGLE	ROOT OPENING	GROOVE ANGLE	
SMAW	B-L1a	8.0	1.0	R = T1	-	+1.0,-0	-	SINGLE-PASS WELD
GMAW FCAW	B-L1a-GF	8.0	1.0	R = T	-	+1.0,-0	-	SINGLE-PASS WELD

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



DETAIL "2"

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	8.0	-	R = 2.0	A = 60°	F = 1.5	+1.0,-0	+5°,-0°	+1.5,-0	SINGLE-PASS WELD
	SMAW	B-U2	8.0	-	R = 2.0	A = 60°	F = 2.0	+1.0,-0	+5°,-0°	+1.5,-0	SINGLE-PASS WELD
B	SMAW	B-L1a-GF	8.0	1.0	R = 6.0	-	-	+1.0,-0	-	-	SINGLE-PASS WELD
	GMAW FCAW	B-L1a-GF	8.0	1.0	R = 9.0	-	-	+1.0,-0	-	-	SINGLE-PASS WELD

NOTES :

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

0 0.1 0.2 0.4 0.6 0.8
SCALE 1:10 METERS

WELDING SYMBOLS

FIELD WELD 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

KINGDOM OF THAILAND MINISTRY OF ENERGY DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY			
HUA MAE SOT HYDROPOWER PROJECT			
CIVIL WORKS PENSTOCK WELDING DETAILS			
MAHA NAKORN CONSULTANTS CO., LTD.		DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY	
DESIGNED	21/11/80	21/11/80	21/11/80
DRAWN	21/11/80	21/11/80	21/11/80
CHECKED	21/11/80	21/11/80	21/11/80
NO.	DATE	REVISIONS	CHECKED
CONSULTANTS		DECE	
PROJECT MANAGER		DATE	DRAWING NO.
		25/11/80	HMS-PS-10
			SHEET NO.
			13 OF 39

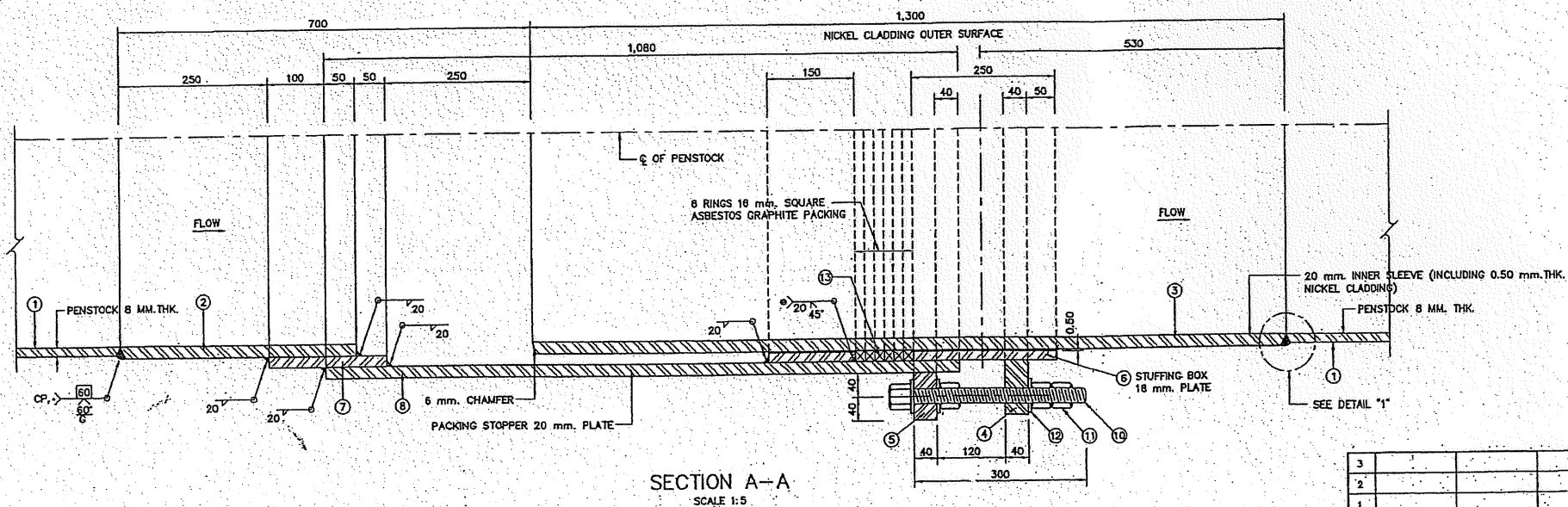
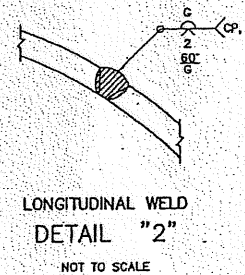
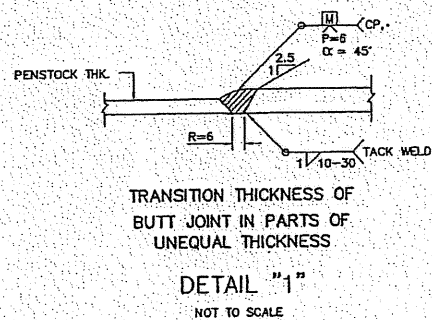
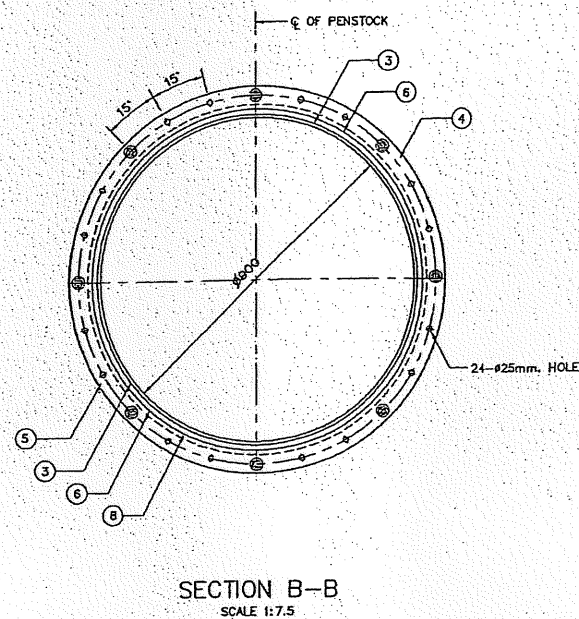
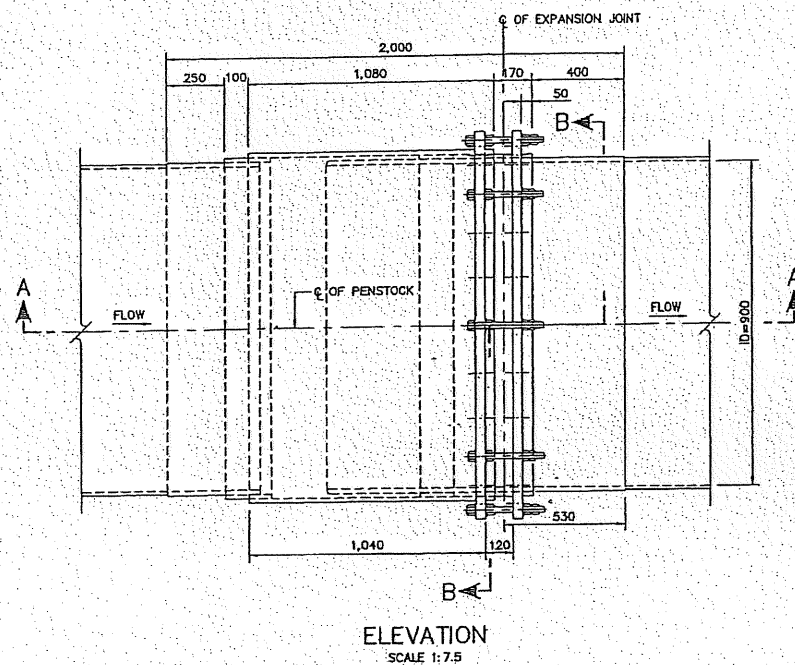


TABLE OF DETAIL 1 SQUARE - GROOVE WELD, BUTT JOINT

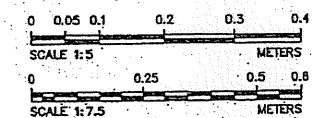
ITEM	DESCRIPTION	MATERIAL	QUANT.	REMARKS
1	PENSTOCK	ASTM A-283, GRADE D	—	—
2	PENSTOCK	ASTM A-283, GRADE D	1	NOTE 2 & 3
3	INNER SLEEVE	ASTM A-283, GRADE D	1	NOTE 2 & 4
4	GRAND RING	ASTM A-283, GRADE D	1	SEAMLESS, NOTE 3
5	OUTER RING	ASTM A-283, GRADE D	1	SEAMLESS, NOTE 3
6	STUFFING BOX	ASTM A-283, GRADE 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	#25 mm. BOLTS	ASTM A-325	24	—
11	#25 mm. NUT	ASTM A-325	72	—
12	#25 mm. WASHER	ASTM A-325	48	—
13	PACKING RINGS (16 mm. S.G. RING)	ASBESTOS-GRAPHITE	5	NOTE 4

NOTES :

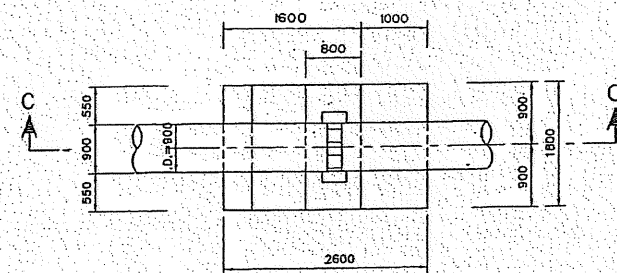
- LONGITUDINAL SEAMS HAVE TO BE COMPLETE JOINT PENETRATION WELDS BY COMBINING SINGLE-V-GROOVE WITH BACKING WELDS AND GROUND FLUSH WELDING WITH BASE METAL AS REQUIRED (SEE DETAIL "2")
- GALVANIZED ALL SURFACES WITH 0.10 mm. THK.
- NICKEL CLADDING ON OUTER SURFACE WITH 0.50 mm. THK. AND GALVANIZED INNER SURFACE WITH 0.10 mm. THK.
- EACH JOINT OF EACH PACKING RING SHALL BE MIN. 25 cm. APART. DO NOT LINE UP JOINTS.
- ALL DIMENSION ARE IN MILLIMETER UNLESS OTHERWISE SHOWN.
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HMS-GN-03.
- MATERIAL GRADE CAN BE CHANGE AS SHOWN IN CHAP 8 OF CONTRACT C1 VOL.2

WELDING NOTATION :

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

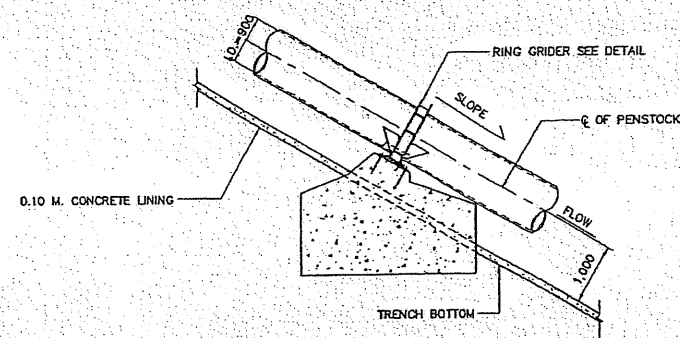


KINGDOM OF THAILAND MINISTRY OF ENERGY DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY			
HUAI MAE SOT HYDROPOWER PROJECT			
CIVIL WORKS PENSTOCK EXPANSION JOINT, PLAN, SECTIONS AND DETAILS			
MAHA NAKORN CONSULTANTS CO., LTD.		DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY	
DESIGNED	18.18.04	SUBMITTED	18.18.04
DRAWN	18.18.04	RECOMMENDED	18.18.04
CHECKED	18.18.04	APPROVED	18.18.04
NO.	DATE	REVISIONS	CHECKED
CONSULTANTS		DEDE	
PROJECT MANAGER		DATE	HMS-PS-11
SHEET NO.		14 OF 39	



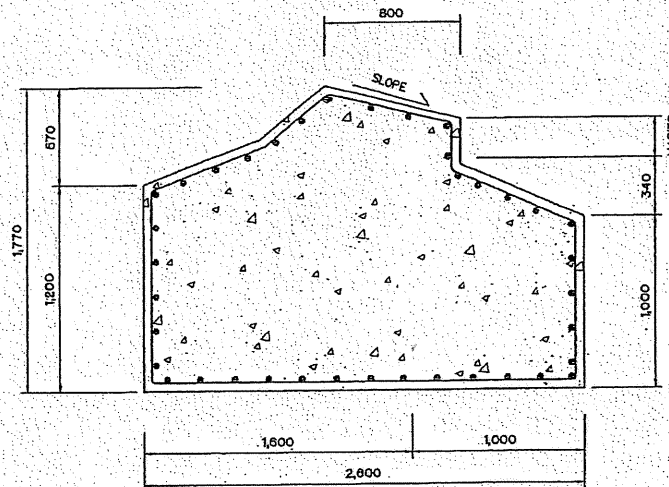
PLAN (PIPE SUPPORT)

SCALE 1:50



ELEVATION

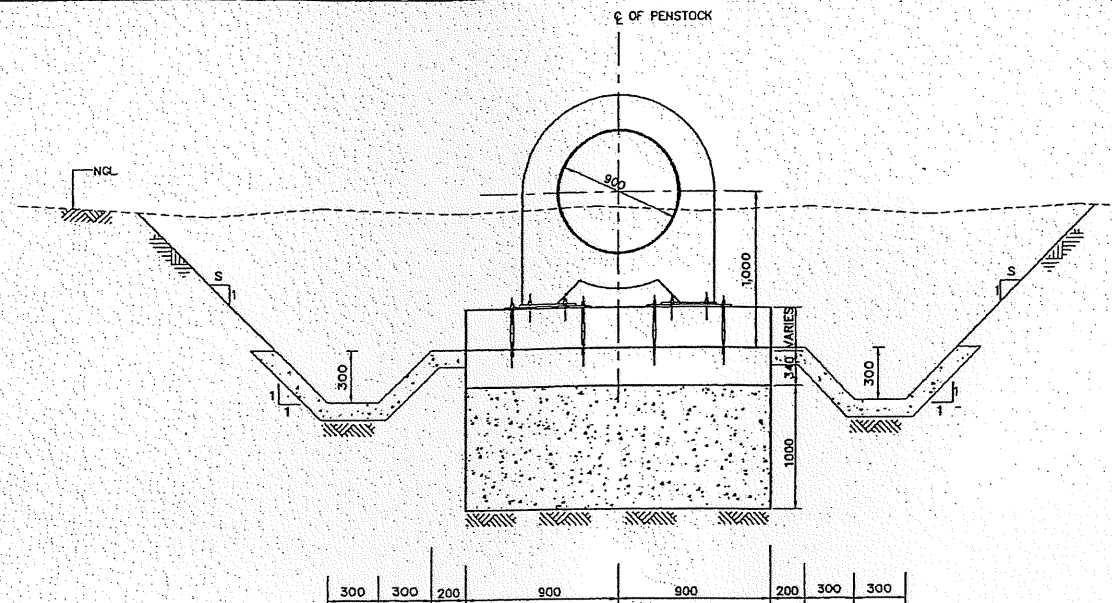
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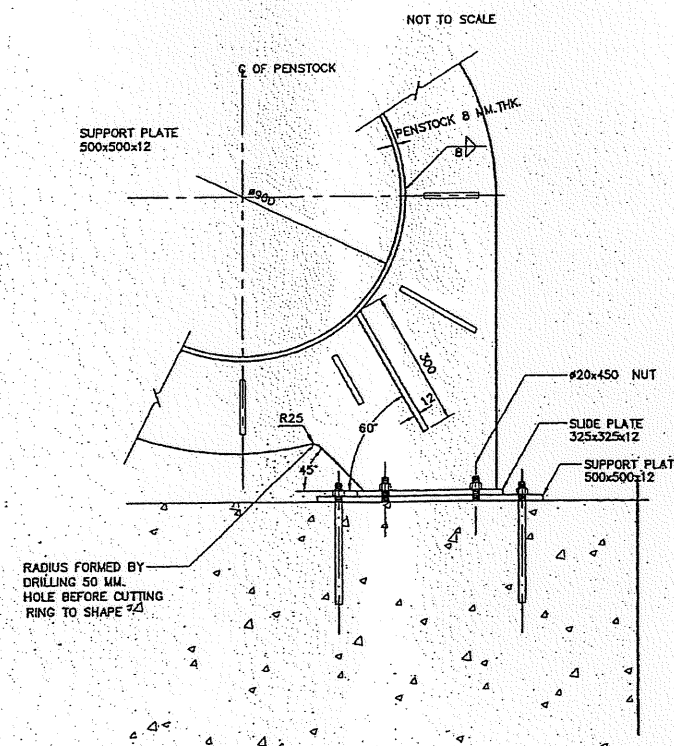
SECTION C-C

SCALE 1:20

STA.	SLOPE
0+000.000 TO 0+440.00	1 : 50
0+440.000 TO 1+356.022	1 : 70
1+571.114 TO 1+599.081	1 : 3.59

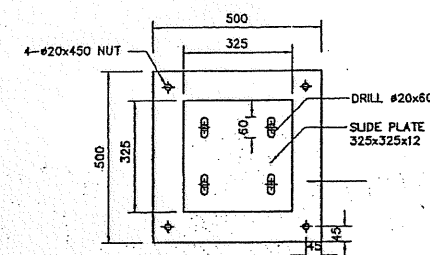


TYPICAL OF PENSTOCK TRENCH



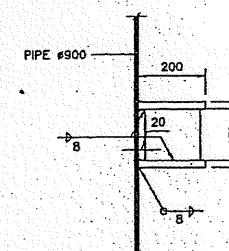
DETAIL "3"

SCALE 1:7.5



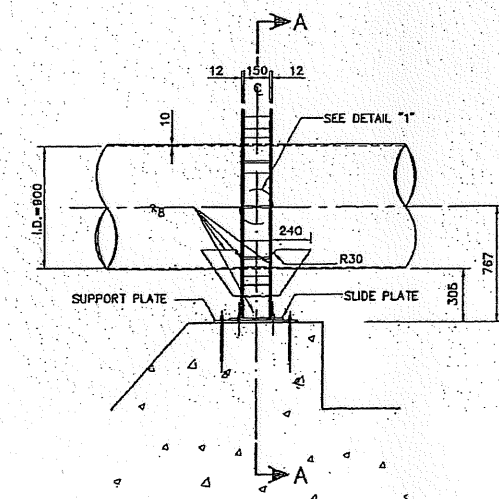
DETAIL "2"

SCALE 1:10



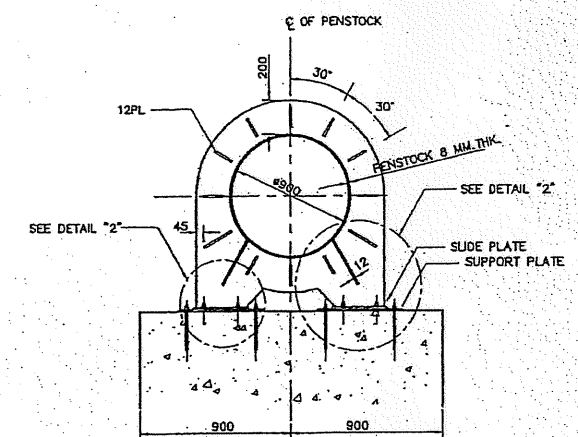
DETAIL "1"

SCALE 1:10



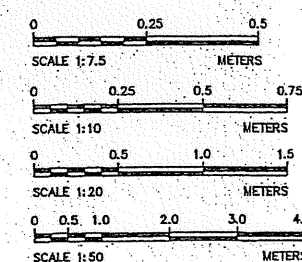
RING GIRDER FOR 900 I.D. PIPE

SCALE 1:20



SECTION A-A

SCALE 1:20

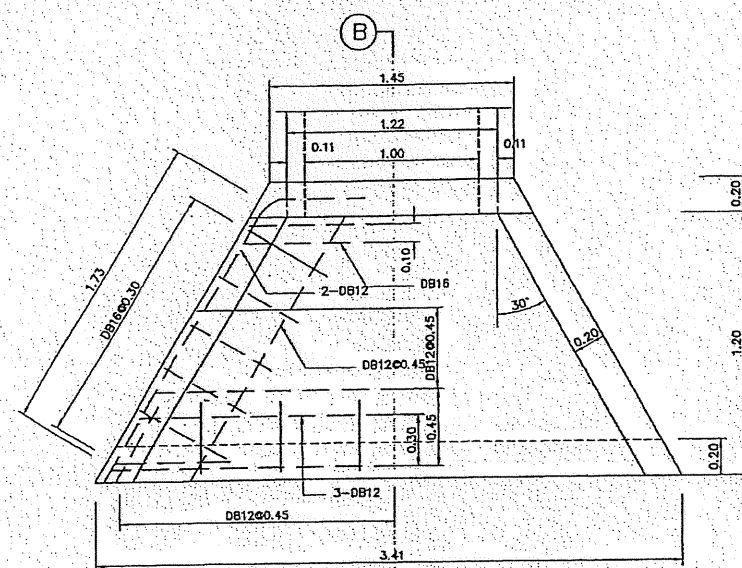


NOTES :

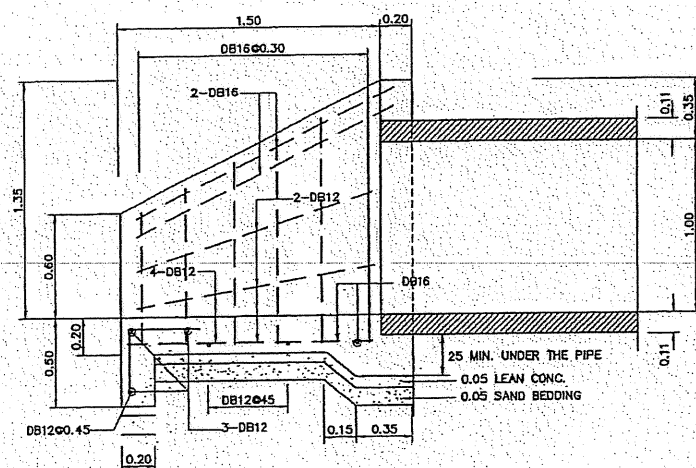
1. ALL DIMENSIONS ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWS. NO. HMS-GY-03
3. CORROSIVE PROTECTION IS WARNED TO STRICTLY FOLLOW PAINTING SPECIFICATION

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

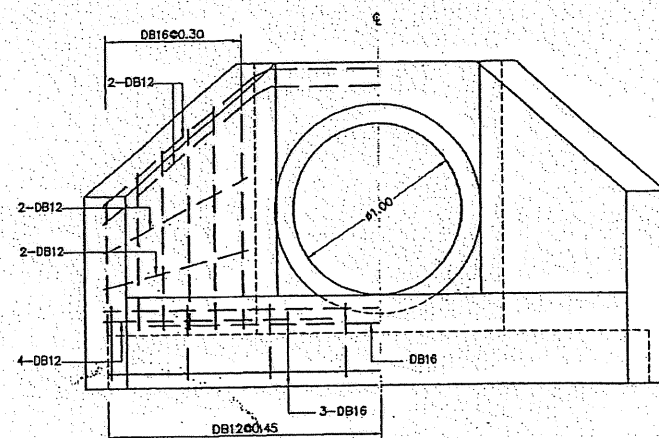
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HUA MAE SOT HYDROPOWER PROJECT			
CIVIL WORKS PENSTOCK PIPE SUPPORT, PLAN, SECTIONS AND DETAILS			
MAHA NAKORN CONSULTANTS CO., LTD.		DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY	
DESIGNED BY: JUL10804	REVIEWED BY: JUL10803	SUBMITTED BY: JUL10803	RECOMMENDED BY: JUL10803
CHECKED BY: JUL10803	APPROVED BY: JUL10803	DRAWING NO: HMS-PS-12	SHEET NO: 15 OF 39
PROJECT MANAGER		DATE	



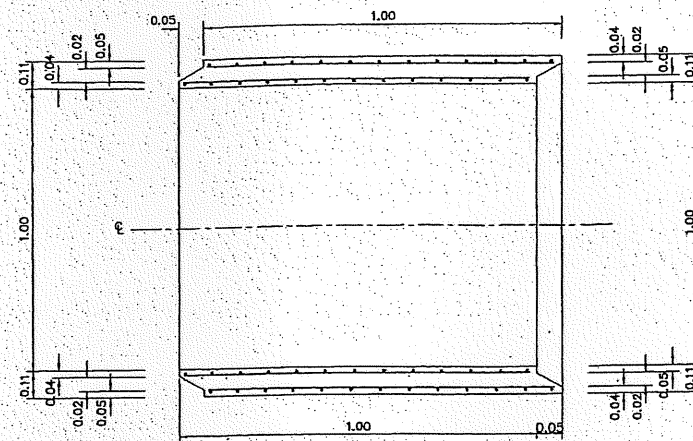
PLAN
NOT TO SCALE



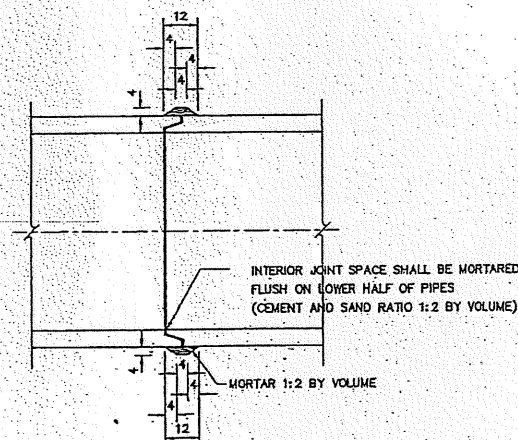
SECTION B-B
NOT TO SCALE



END VIEW
DETAILS FOR R.C. HEAD WALL
NOT TO SCALE



R.C. PIPE DETAIL
NOT TO SCALE



PIPE CONNECTION DETAILS
DIMENSIONS ARE IN CENTIMETERS

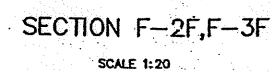
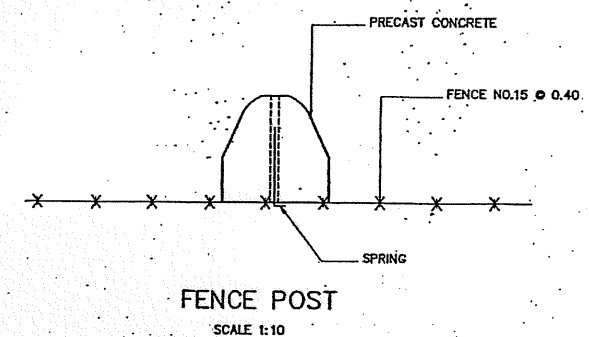
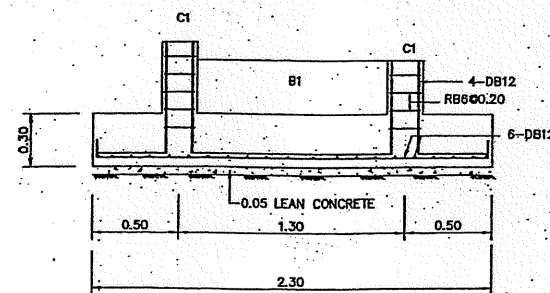
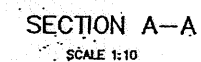
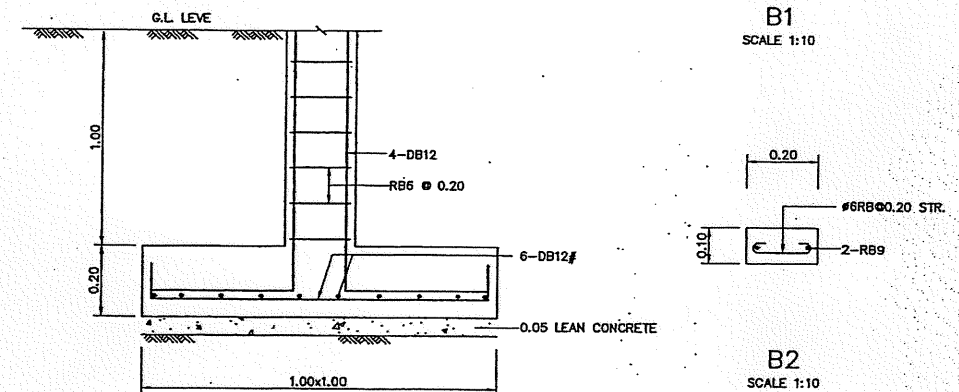
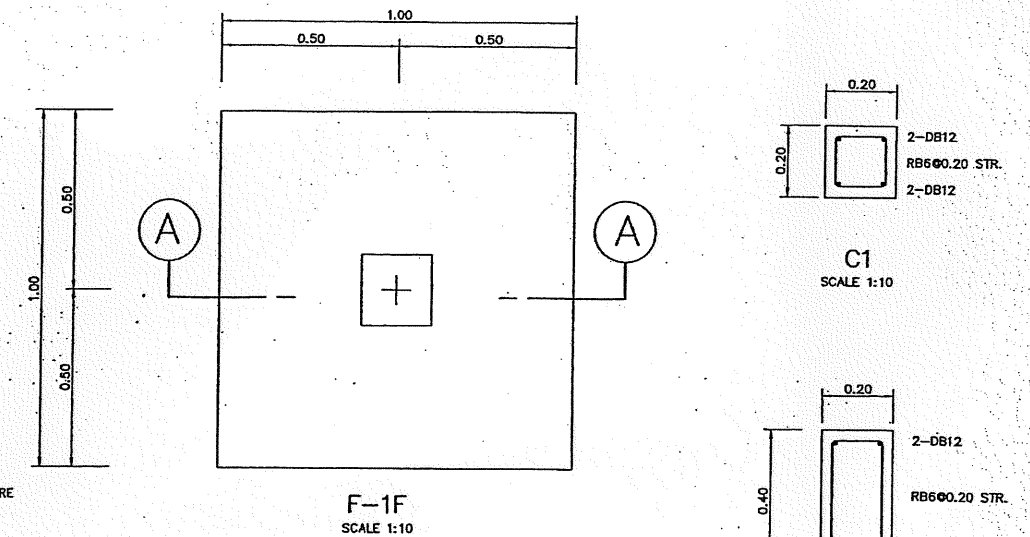
DETAILS FOR R.C. PIPE CULVERT
NOT TO SCALE

NOTES :

- ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
- REINFORCED CONCRETE PIPE CULVERT CLASSES 2 AND 3 SHALL CONFORM TO TIS.128 OR EQUIVALENT.
- CEMENT, STEEL REINFORCEMENT, AGGREGATES AND TEST METHODS USED FOR R.C. PIPE CULVERT SHALL CONFORM TO THE REQUIREMENT OF TIS.128 OR EQUIVALENT.
 - CEMENT CONTENT USED FOR CONCRETE MIX SHALL NOT BE LESS THAN 335 KILOGRAM PER CUBIC METER OF CONCRETE.
 - CONCRETE COVER FOR SINGLE LAYER CIRCULAR REINFORCEMENT SHALL BE 0.35 TO 0.5 TIME OF WALL THICKNESS (MEASURED FROM INNER WALL).
 - CONCRETE COVER FOR DOUBLE LAYERS CIRCULAR REINFORCEMENT SHALL BE 2.5 CM. IN AVERAGE BUT NOT LESS THAN 1.5 CM.
 - LONGITUDINAL REINFORCEMENT SPACING SHALL BE A MINIMUM OF 8-#4 MM. BARS.
 - CIRCULAR REINFORCEMENT SPACING SHALL BE 15 CM. OR LESS BUT NOT MORE THAN WALL THICKNESS.
- THE CULVERT WHICH HAVING TRANSVERSE REINFORCEMENT IN ELLIPTICAL CAGE AS SPECIFIED IN THE TIS. 128 SHALL NOT BE USED.
- CULVERT JOINTS SHALL BE MORTARED AS SHOWN ON THE DRAWING WITH CEMENT MORTAR (1:2 BY VOLUME)
- FOR R.C. HEADWALL
 - CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15x15x15 CM. CUBE AT 28 DAY AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS:

PORTLAND CEMENT TYPE 1	350	KG. (MIN)
SAND	0.43	M ³
CRUSHED ROCK OR GRAVEL	0.86	M ³
CONCRETE SLUMP	10	CM. (MAC.)
 - REINFORCING STEEL SHALL BE DEFROMED BARS CONFORMING TO TIS.24 GRADE SD 30
 - DESIGN WORKING STRESSES :-
 - CONCRETE, $f_c = 70$ KSC.
 - STEEL, $f_s = 1400$ KSC. $n = 10$
- THIS DRAWING IS ADAPTED FROM DOH DWG NO.DS-101,DS-104

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CIVIL WORKS PENSTOCK R.C. PIPE CULVERT			
MAHA NAKORN CONSULTANTS CO.,LTD.		DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY	
DESIGNED BY	REVIEWED BY	DESIGNED BY	REVIEWED BY
DATE	DATE	DATE	DATE
NO.	DATE	REVISIONS	CHECKED
CONSULTANTS		DECE	



KINGDOM OF THAILAND MINISTRY OF ENERGY DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY	
HUA MAE SOT HYDROPOWER PROJECT	
CIVIL WORKS POWER HOUSE DETAIL GATE AND FENCE	
MAHA NAKORN CONSULTANTS CO., LTD.	DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY
DESIGNED <i>[Signature]</i> 2612553 2615093	REVIEWED <i>[Signature]</i>
DRAWN <i>[Signature]</i>	SUBMITTED <i>[Signature]</i>
CHECKED <i>[Signature]</i> 2615220	RECOMMENDED
PROJECT MANAGER <i>[Signature]</i> 25524-52	APPROVED <i>[Signature]</i>
1	DRAWING NO. HMS-PH-22
SHEET NO. 38 OF 39	