Department of Alternative
Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

AMPHOE KONGRA CHANGWAT PHATTHALUNG

CONTRACT C1

CIVIL WORKS

VOLUME 4
DRAWINGS

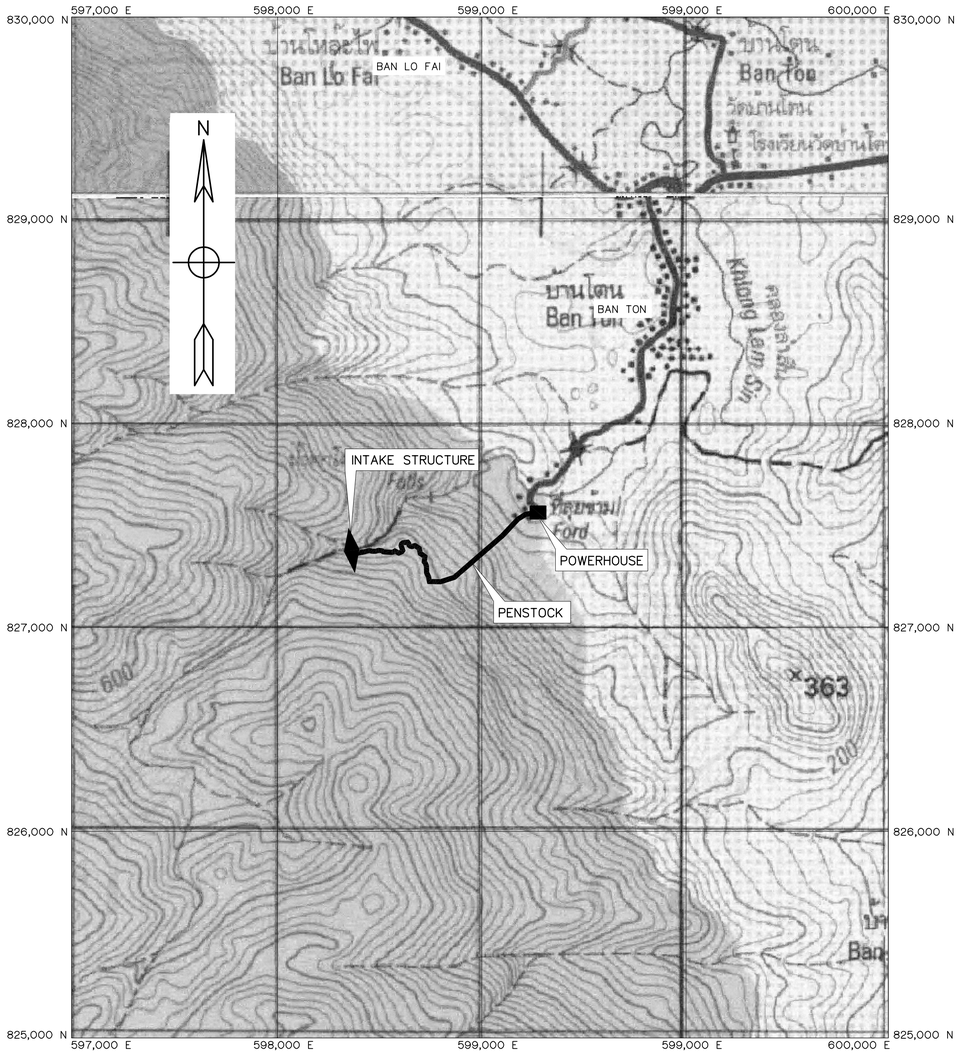
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

HUAI LAM SIN HYDROPOWER PROJECT

CONTRACT C1 : LIST OF DRAWINGS

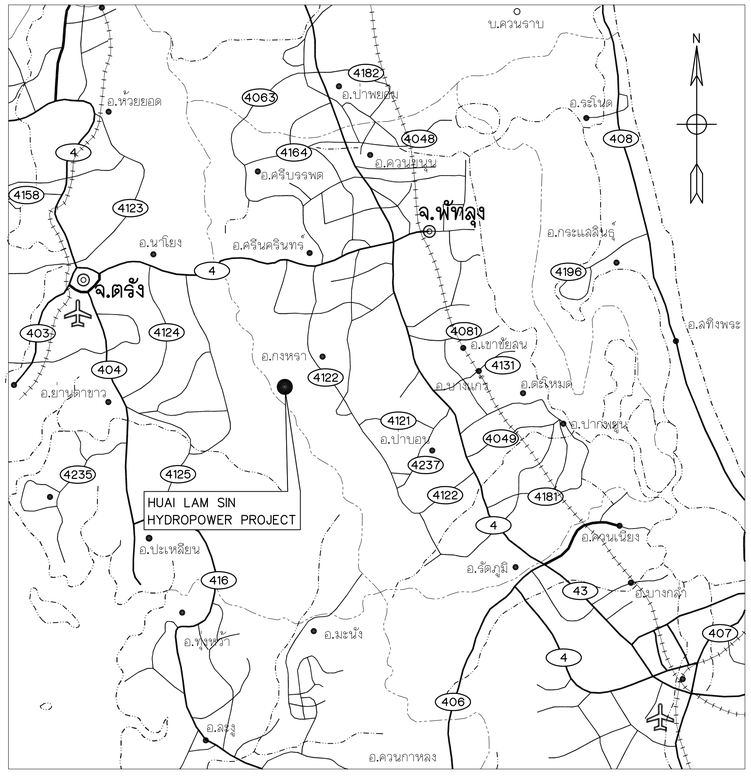
SHEET NO.	DRAWING NO.	DRAWING DETAILS
		GENERAL
1	HLS-GN-01	LOCATION MAP AND PROJECT AREA MAP
2	HLS-GN-02	PROJECT MAP
3	HLS-GN-03	SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES
4	HLS-GN-04	HYDROLOGY DATA
5	HLS-GN-05	HYDRAULIC GRADE LINE
6	HLS-GN-06	BORING LOCATION PLAN
7	HLS-GN-07	GEOLOGICAL PROFILE 1/4
8	HLS-GN-08	GEOLOGICAL PROFILE 2/4
9	HLS-GN-09	GEOLOGICAL PROFILE 3/4
10	HLS-GN-10	GEOLOGICAL PROFILE 4/4
		INTAKE STRUCTURE
11	HLS-IS-01	GENERAL LAY-OUT
12	HLS-IS-02	PLAN AND SECTION A-A
13	HLS-IS-03	SECTION B-B, C-C, D-D, E-E AND DETAILS
14	HLS-IS-04	MISCELLANEOUS DETAILS
15	HLS-IS-05	REINFORCEMENT DETAILS (SHEET 1/2)
16	HLS-IS-06	REINFORCEMENT DETAILS (SHEET 2/2)
17	HLS-IS-07	1.00x1.00 m. VERTICAL GATE (GATE INSTALLATION)
18	HLS-IS-08	1.00x1.00 m. VERTICAL GATE (GATE DETAIL)
19	HLS-IS-09	GATE-LIFT PEDESTALS 2.25 TONS
20	HLS-IS-10	PEDESTAL SCREW LIFT CAPACITY 2.25 TONS
21	HLS-IS-11	GATE LIFT, CAPACITY 4.0 TONS
		PENSTOCK
22	HLS-PS-01	PLAN AND PROFILE, STA. 0+000 TO STA. 0+400
23	HLS-PS-02	PLAN AND PROFILE, STA. 0+400 TO STA. 0+800
24	HLS-PS-03	PLAN AND PROFILE, STA. 0+800 TO STA. 1+000
25	HLS-PS-04	PLAN AND PROFILE, STA. 1+000 TO STA. 1+171.00
26	HLS-PS-05	DETAILS OF WALKWAY
27	HLS-PS-06	REINFORCEMENT DETAILS WALKWAY
28	HLS-PS-07	PIER TYPE 1 DETAILS
29	HLS-PS-08	PIER TYPE 2 DETAILS
30	HLS-PS-09	SUPPORT ELEVATION, SECTIONS AND DETAILS
31	HLS-PS-10	ANCHOR BLOCK ①, ② & ③ PLANS AND REINFORCEMENT DETAILS
32	HLS-PS-11	ANCHOR BLOCK ④, ⑤ & ⑥ PLANS AND REINFORCEMENT DETAILS
33	HLS-PS-12	ANCHOR BLOCK ⑦, ⑧ & ⑨ PLANS AND REINFORCEMENT DETAILS
34	HLS-PS-13	ANCHOR BLOCK ⑩ & ⑪ PLANS AND REINFORCEMENT DETAILS
35	HLS-PS-14	ANCHOR BLOCK ⑫, ⑬ & ⑭ PLANS AND REINFORCEMENT DETAILS
36	HLS-PS-15	ANCHOR BLOCK ⑮ PLAN, SECTIONS, AND REINFORCEMENT DETAILS
37	HLS-PS-16	EXPANSION JOINT, PLAN, SECTIONS AND DETAILS
38	HLS-PS-17	BEND DETAILS
39	HLS-PS-18	WELDING DETAILS
40	HLS-PS-19	WYE, PLAN, SECTIONS AND DETAILS
41	HLS-PS-20	EMERGENCY VALVE CHAMBER GENERAL LAY-OUT AND SECTION
42	HLS-PS-21	EMERGENCY VALVE CHAMBER PLAN SECTIONS AND DETAILS
43	HLS-PS-22	EMERGENCY VALVE CHAMBER REINFORCEMENT DETAILS

SHEET NO.	DRAWING NO.	DRAWING DETAILS
		POWER HOUSE
44	HLS-PH-01	GENERAL LAY-OUT
45	HLS-PH-02	PLAN AND ROOF PLAN
46	HLS-PH-03	ELEVATIONS
47	HLS-PH-04	SECTIONS
48	HLS-PH-05	DETAILS OF TOILET AND SEPTIC TANK
49	HLS-PH-06	DETAILS OF DOORS, WINDOWS AND NAME PLATE
50	HLS-PH-07	FOOTING, BEAM, SLAB ROOF BEAM AND TRUSS PLANS
51	HLS-PH-08	PLAN AND DETAILS OF FOOTING, COLUMN ,CORBEL AND BRACKET
52	HLS-PH-09	BEAM AND DRAIN DITCH REINFORCEMENT DETAILS
53	HLS-PH-10	SLAB REINFORCEMENT DETAILS
54	HLS-PH-11	DETAILS TRUSS T-1 AND T-2 (1/2)
55	HLS-PH-12	DETAILS TRUSS T-1 AND T-2 (2/2)
56	HLS-PH-13	CABLE TRENCH DETAILS
57	HLS-PH-14	CONCRETE PAVEMENT
58	HLS-PH-15	DITCH PLAN
59	HLS-PH-16	DITCH SECTIONS AND DETAILS
60	HLS-PH-17	MANHOLE AND DITCH REINFORCEMENT DETAILS
61	HLS-PH-18	ELECTRICAL LIGHTING, EXHAUST AND OUTLET PLAN
62	HLS-PH-19	EXTERIOR LIGHTING PLAN
63	HLS-PH-20	WATER SUPPLY PIPELINE SYSTEM LAY-OUT
64	HLS-PH-21	PIT VALVE, FIELD TAP, SLEEVE PIPE AND METAL SHEET FENCE DETAILS
65	HLS-PH-22	GROUNDING SYSTEM
		TAILRACE
66	HLS-TR-01	PLAN AND SECTION A-A
67	HLS-TR-02	SECTIONS B-B, C-C AND D-D
68	HLS-TR-03	GRATING COVER AND LADDER RUNGS DETAILS
69	HLS-TR-04	REINFORCEMENT DETAILS (SHEET 1/2)
70	HLS-TR-05	REINFORCEMENT DETAILS (SHEET 2/2)
		BRIDGE
71	HLS-TR-01	GENERAL LAY-OUT
72	HLS-TR-02	PLAN AND SECTIONS
73	HLS-TR-03	DETAILS (1/2)
74	HLS-TR-04	DETAILS (2/2)
75	HLS-TR-05	HANDRAIL AND DETAILS
76	HLS-TR-06	SLAB REINFORCEMENT DETAILS
77	HLS-TR-07	ABUTMENT REINFORCEMENT DETAILS



PROJECT AREA MAP

SCALE 1:15,000



LOCATION MAP

NOT TO SCALE

LOCATION MAP

NOT TO SCALE

LEGENDS :

- STREAM
- INTAKE STRUCTURE
- PENSTOCK
- POWERHOUSE

NOTES :

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

0 0.1 0.2 0.4 0.6 0.8 1.0 1.2

SCALE 1:15,000 KILOMETERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS

GENERAL

LOCATION MAP AND PROJECT AREA MAP

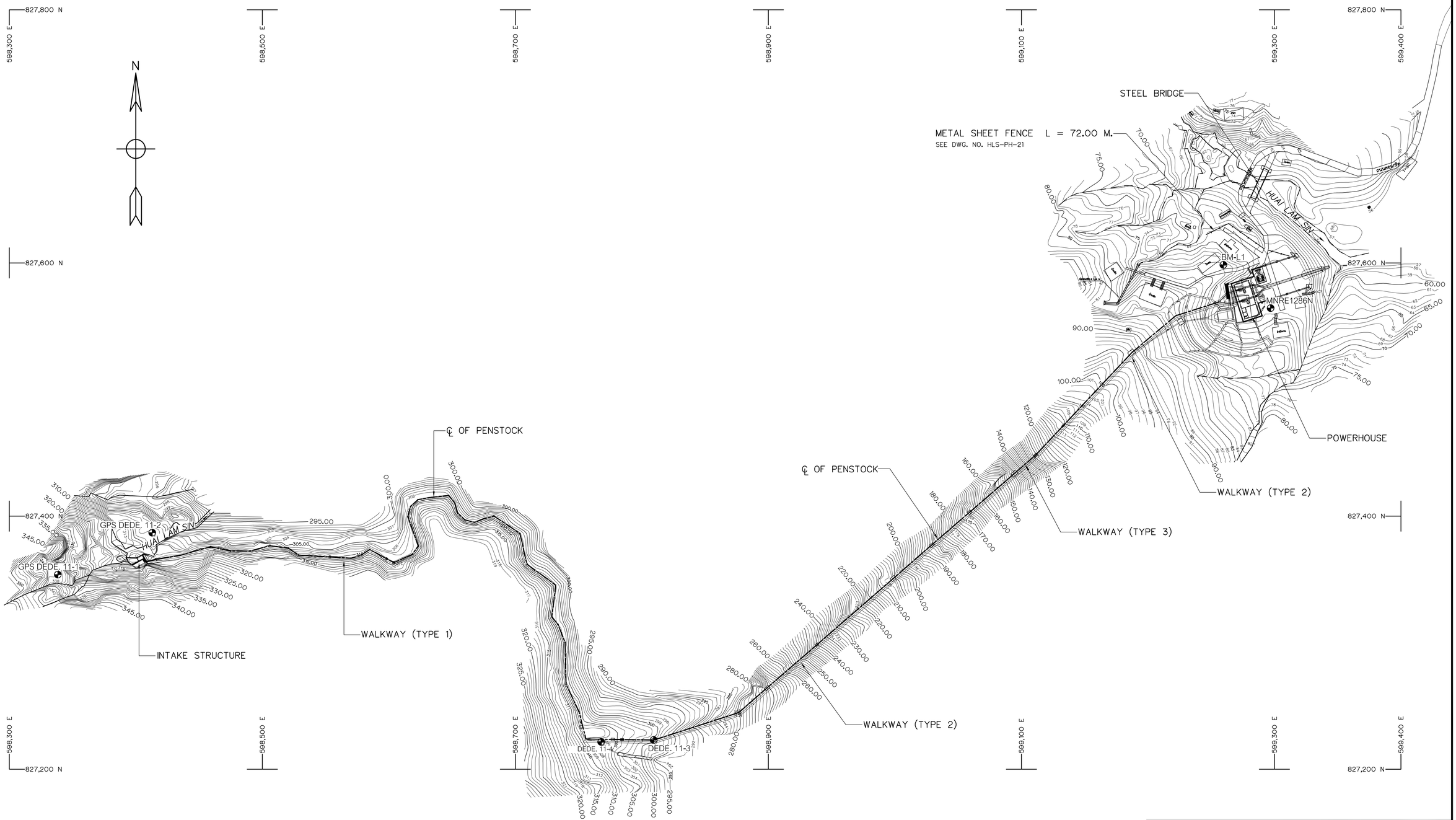
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

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

DRAWING NO. HLS-GN-01

SHEET NO. 1 OF 77



PROJECT MAP

SCALE 1:1,500

0 10 30 60 90 120

SCALE 1:1,500 METERS

BM. DESCRIPTIONS

BM NO.	COORDINATE		ELEVATION
	N	E	M. (MSL.)
GPS DEDE. 11-1	827,354.129	598,338.669	+339.199
GPS DEDE. 11-2	827,387.233	598,413.286	+308.463
DEDE. 11-3	827,223.464	598,809.441	+301.019
DEDE. 11-4	827,221.905	598,767.983	+307.643
BM-L1	827,598.487	599,259.619	+73.947
MNRE1286N	827,564.329	599,296.961	+68.789

NOTES :

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
GENERAL
PROJECT MAP

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

DESIGNED		ลย.6651	SUBMITTED
DRAWN			RECOMMENDED
CHECKED		ลย.7324	APPROVED
PROJECT MANAGER		14/01/62 DATE	DRAWING NO. HLS-GN-02

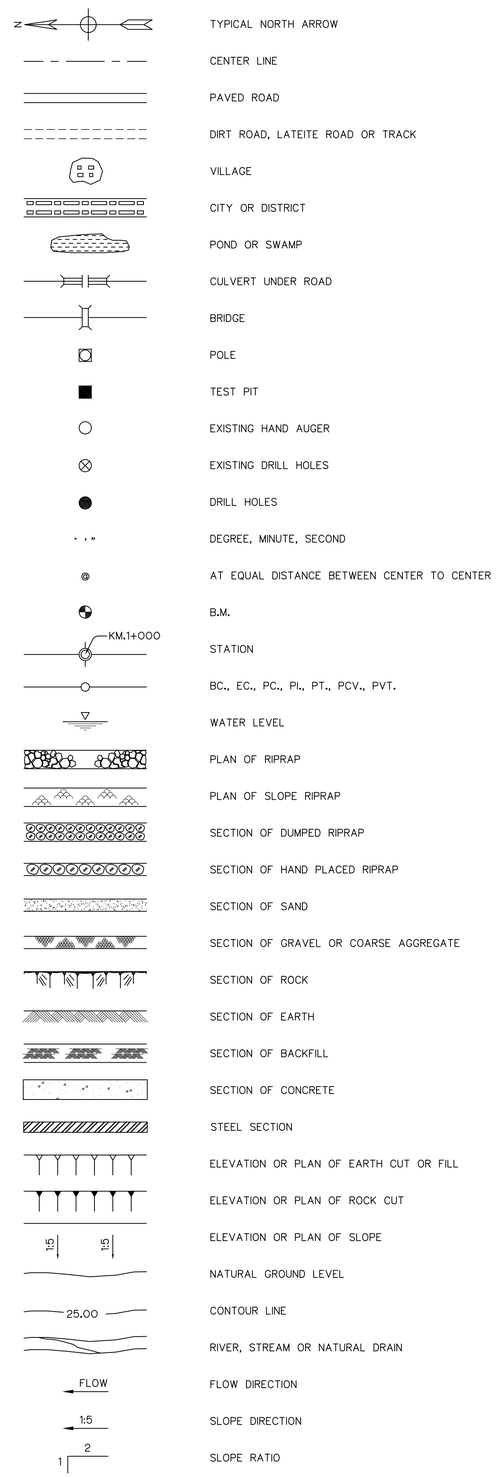
REVIEWED ว.ก.ก.(ก.ล.)

SHEET NO. 2 OF 77

ABBREVIATIONS :

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

SYMBOLS :



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

GENERAL NOTES :

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

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

2/ = FILL SHOULD BE AVOIDED
1/ = FOR DOUBTFUL CASES CONSULT FIELD ENGINEER

STRUCTURAL DESIGN NOTES :

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

fc' (ksc)	DESCRIPTION
350	PRESTRESS CONCRETE
210	1. WEIR / INTAKE STRUCTURE
	2. POWERHOUSE, TAILRACE
	3. TAILRACE
	4. MANHOLE
	5. ANCHOR BLOCK, PIPE SUPPORT
	6. BOX CULVERT
240	BRIDGE
140	LEAN CONCRETE

2. UNLESS OTHERWISE SHOWN, THE FOLLOWING CLEAR COVER OF CONCRETE OVER OF THE REINFORCEMENT SHALL BE USED :
   - FACE EXPOSED TO SCOUR 5.0 cm.
   - FACE EXPOSED TO EARTH OR WEATHER 5.0 cm.
   - FACE UNEXPOSED TO EARTH OR WEATHER 3.0 cm.
3. THE REINFORCEMENT LAP SPLICES SHALL NOT BE LESS THAN 50 DIAMETERS OF BIGGER THAN BAR WITH HOOKS, UNLESS OTHERWISE SHOWN.
4. EMBEDDED METALWORK SHALL BE SECURELY FASTENED IN POSITION BEFORE PLACING CONCRETE.
5. ALL CONSTRUCTION JOINT SHOULD BE TREATED AS DIRECTED IN ORDER TO ASSURE THE BEST BOND.
6. A 5 cm. (MIN.) LAYER OF LEAN CONCRETE (1:3:5 BY VOLUME) SHOULD BE PLACED BELOW CONCRETE STRUCTURES.
7. THE STRUCTURES SHOULD BE PLACED ON UNDISTURBED SOILS OR COMPACTED FILL AND BACKFILL AROUND THE STRUCTURES SHOULD BE COMPACTED.
8. THE FOUNDATION ELEVATIONS ARE SUBJECT TO CHANGE AS DIRECTED ACCORDING TO THE SOIL CONDITIONS.
9. ALL SIZES OF REINFORCING BARS AND STRUCTURAL STEELS ARE IN MILLIMETERS.
10. ALL STRUCTURAL STEELS ARE THOSE OF T.I.S. DESIGNATION Fe24.
11. REINFORCED STEEL BARS SHALL BE CONFORM TO T.I.S. AS FOLLOW :
    - DEFORMED BARS (SD30) – T.I.S. 24-2559
    - ROUND BARS (SR24) – T.I.S. 20-2559
12. ALLOWABLE BEARING CAPACITY OF FOUNDATION SHALL NOT BE LESS THAN AS FOLLOW :
    - INTAKE STRUCTURE Q_a = 25 T/M.^{2}
    - POWERHOUSE Q_a = 10 T/M.^{2}
    - PENSTOCK Q_a = 15 T/M.^{2}
    - WALKWAY Q_a = 10 T/M.^{2}
    - BRIDGE Q_a = 15 T/M.^{2}

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
GENERAL
SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY
REVIEWED ร.ท.ปิติชัย

DESIGNED	สม.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สม.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO.	HLS-GN-03
		SHEET NO.	3 OF 77

TABLE 1 CLIMATOLOGICAL DATA FOR THE PERIOD 1980–2009

Station	KASETPHATTHALUNG					Elevation of station above M.S.L.				2.00 Meters			
Index station	48560												
Latitude	7° 35' 0.0" N												
Longitude	100° 10' 0.0" E												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Pressure (Hectopascal)													
Mean	1011.5	1010.9	1010.1	1009.1	1008.4	1008.0	1008.4	1008.7	1009.3	1009.8	1009.6	1010.4	1009.5
Ext. max.	1019.3	1018.6	1016.5	1015.6	1013.7	1015.1	1013.8	1013.7	1014.9	1015.9	1015.7	1017.1	1019.3
Ext. min.	1003.9	1004.4	1003.4	1002.8	1002.6	1002.3	1003.2	1003.6	1004.1	1003.4	1001.6	1004.0	1001.6
Mean daily range	3.6	3.8	4.2	4.2	3.8	3.4	3.4	3.7	4.0	4.1	3.9	3.7	3.8
Temperature (Celsius)													
Mean	26.8	27.4	28.1	28.7	28.5	28.3	27.9	27.9	27.6	27.2	26.8	26.6	27.7
Mean max.	30.4	31.6	32.6	33.6	33.9	33.5	33.3	33.3	32.9	31.9	30.3	29.8	32.3
Mean min.	23.7	23.6	24.2	25.0	25.0	24.6	24.4	24.3	24.3	24.2	24.4	24.2	24.3
Ext. max.	32.6	34.5	35.6	37.0	37.3	36.5	36.7	37.7	36.6	36.1	34.4	32.8	37.7
Ext. min.	20.3	18.5	20.3	23.0	23.0	22.5	22.0	21.9	22.5	21.2	19.8	21.8	18.5
Dew Point (Celsius)													
Mean	23.7	23.5	24.2	24.8	24.7	24.2	23.8	23.7	23.8	24.1	24.4	24.2	24.1
Relative Humidity (%)													
Mean	84	80	80	81	81	80	80	80	81	84	88	87	82
Mean max.	94	93	93	94	94	94	94	94	94	95	96	95	94
Mean min.	72	66	65	65	63	62	61	60	63	68	76	77	66
Ext. min.	55	47	49	47	44	42	38	34	40	43	52	61	34
Visibility (km.)													
07.00 LST	8.5	9.0	9.2	9.2	9.1	9.0	8.9	9.1	8.8	8.5	7.9	8.1	8.8
Cloudiness (0–10)													
Mean	6.3	4.7	5.1	5.7	6.6	6.8	7.2	6.8	7.2	7.4	7.3	7.1	6.5
Wind (knots)													
Mean wind speed	1.9	2.1	2.0	1.9	1.8	2.1	2.3	2.4	2.5	1.9	1.4	1.7	2.0
Max. wind speed	21	20	25	25	30	25	30	30	32	31	40	22	40
Evaporation (mm.)													
Mean–pan	87.6	105.0	120.1	120.3	122.7	116.0	121.9	125.2	108.5	93.6	69.3	71.2	1261.4
Rainfall (mm.)													
Mean	119.6	70.5	118.7	113.0	103.7	80.6	80.4	98.5	115.7	250.5	549.3	448.2	2148.7
Mean rainy day	12	5	7	10	13	10	12	13	14	20	22	21	158
Daily maximum	176.1	312.8	199.1	128.2	120.3	68.2	76.2	134.4	84.5	111.6	312.7	253.8	312.8
Number of days with													
Haze	1	0	0	0	0	0	0	0	0	1	0	0	3
Fog	1	3	3	4	4	7	6	5	6	2	1	0	41
Hail	0	0	0	0	0	0	0	0	0	0	0	0	0
Thunderstorm	1	1	4	7	10	6	5	6	6	8	8	3	66
Squall	0	0	0	1	1	1	1	1	1	0	0	0	5

TABLE 2 FLOOD PEAK DISCHARGE FOR VARIOUS RETURN PERIODS

RETURN PERIOD (YEAR)	FLOOD PEAK DISCHARGE ($M.^3/SEC.$)	
	REGIONAL FLOOD FREQUENCY ANALYSIS	UNIT HYDROGRAPH
10	70.6	58.8
25	90.5	81.5
50	105.3	100.6
100	119.9	121.6
200	134.5	144.4
500	153.8	177.5
1,000	168.3	204.6

FIGURE 1 FLOW DURATION CURVE AT INTAKE STRUCTURE SITE

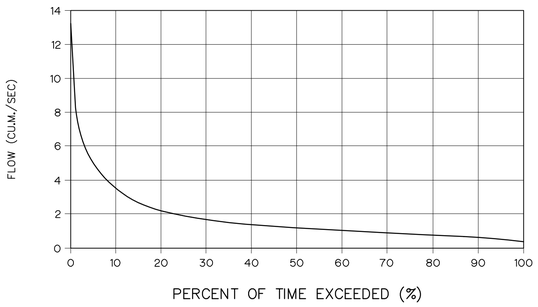
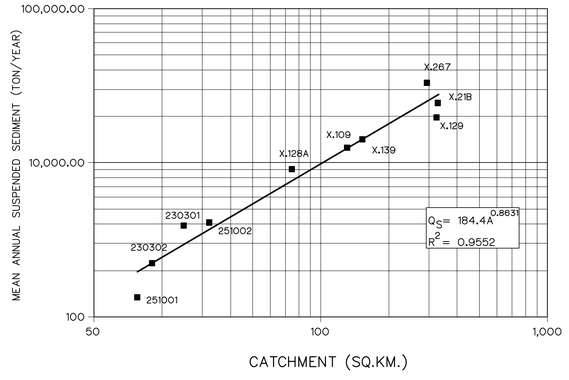


FIGURE 2 RELATIONSHIP BETWEEN ELEVATION AND CATCHMENT AREA



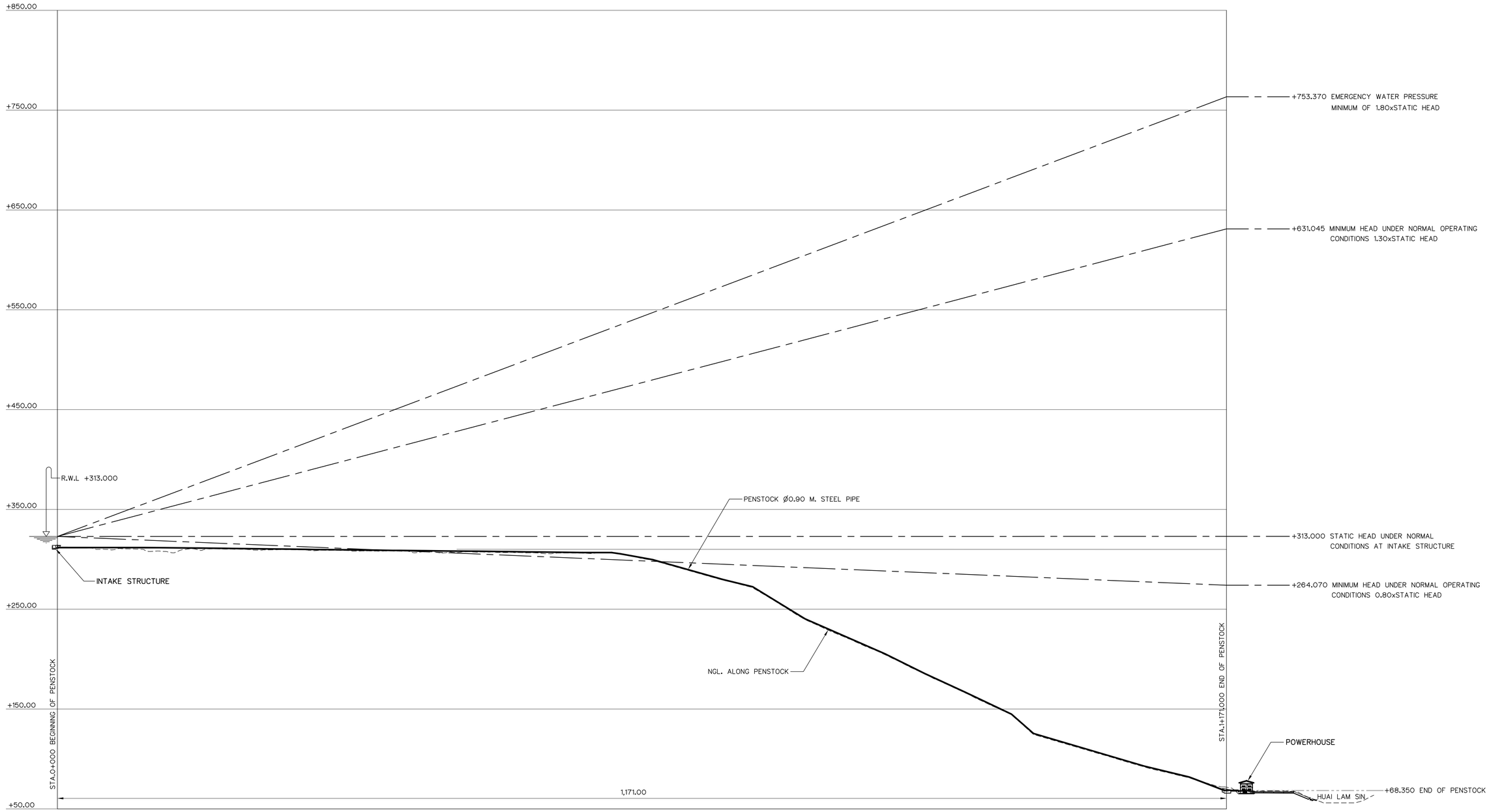
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
GENERAL
HYDROLOGY DATA

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED ว.ภาคิไชย
DESIGNED	SUBMITTED
DRAWN	RECOMMENDED
CHECKED	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS–GN–04 / SHEET NO. 4 OF 77



NOTES :

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

PROFILE ALONG PENSTOCK ℄

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

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

0 50 100 150
SCALE 1:2,000 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
GENERAL
HYDRAULIC GRADE LINE

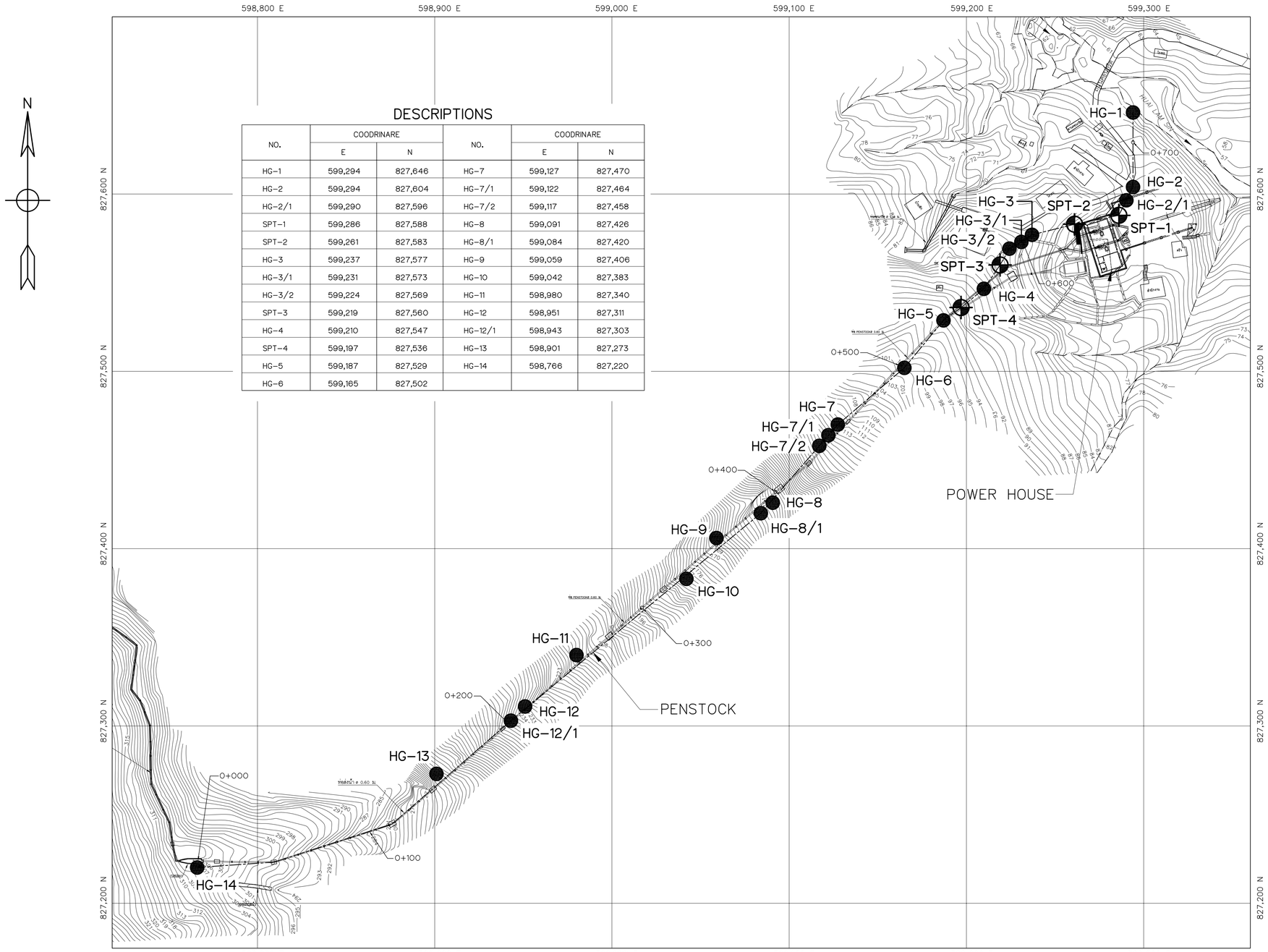
FEC FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

DESIGNED	สิ.ค.6651	REVIEWED	ว.ก.ก.(ช.ล.)
DRAWN		SUBMITTED	
CHECKED	สิ.ค.7324	RECOMMENDED	
PROJECT MANAGER	14/01/62 DATE	APPROVED	

DRAWING NO. HLS-GN-05
SHEET NO. 5 OF 77

DESCRIPTIONS

NO.	COODRINARE		NO.	COODRINARE	
	E	N		E	N
HG-1	599,294	827,646	HG-7	599,127	827,470
HG-2	599,294	827,604	HG-7/1	599,122	827,464
HG-2/1	599,290	827,596	HG-7/2	599,117	827,458
SPT-1	599,286	827,588	HG-8	599,091	827,426
SPT-2	599,261	827,583	HG-8/1	599,084	827,420
HG-3	599,237	827,577	HG-9	599,059	827,406
HG-3/1	599,231	827,573	HG-10	599,042	827,383
HG-3/2	599,224	827,569	HG-11	598,980	827,340
SPT-3	599,219	827,560	HG-12	598,951	827,311
HG-4	599,210	827,547	HG-12/1	598,943	827,303
SPT-4	599,197	827,536	HG-13	598,901	827,273
HG-5	599,187	827,529	HG-14	598,766	827,220
HG-6	599,165	827,502			



BORING LOCATION PLAN

SCALE 1:1,250

NOTES :

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

SYMBOL

SPT BORE HOLE

HAND AUGER BORE HOLE

0 10 20 40 60 80 100

SCALE 1:1,250 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS

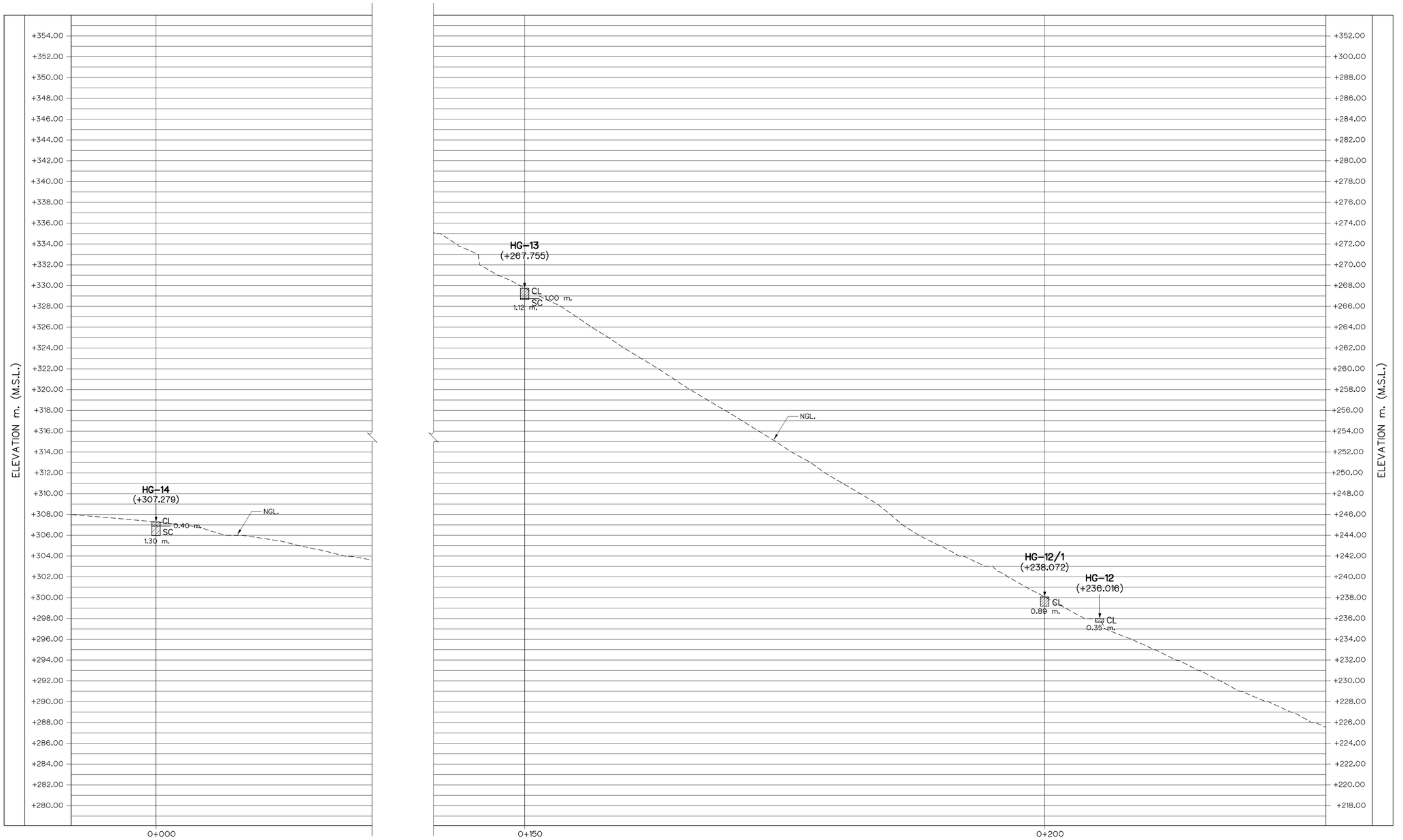
GENERAL

BORING LOCATION PLAN

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

DESIGNED	สย.6651	REVIEWED	
DRAWN		SUBMITTED	
CHECKED	สย.7324	RECOMMENDED	
PROJECT MANAGER	14/01/62 DATE	APPROVED	
		DRAWING NO.	HLS-GN-06
		SHEET NO.	6 OF 77



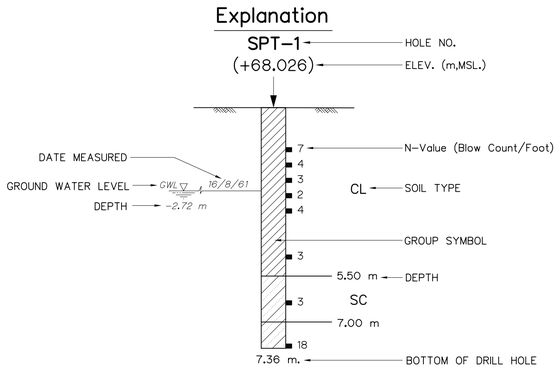
PROFILE GEOLOGICAL

SCALE 1:200

LEGEND

- CL = Lean Clay with Sand
- SC = Clayey Sand

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. HLS-GN-03

0 5 10 15
SCALE 1:200 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

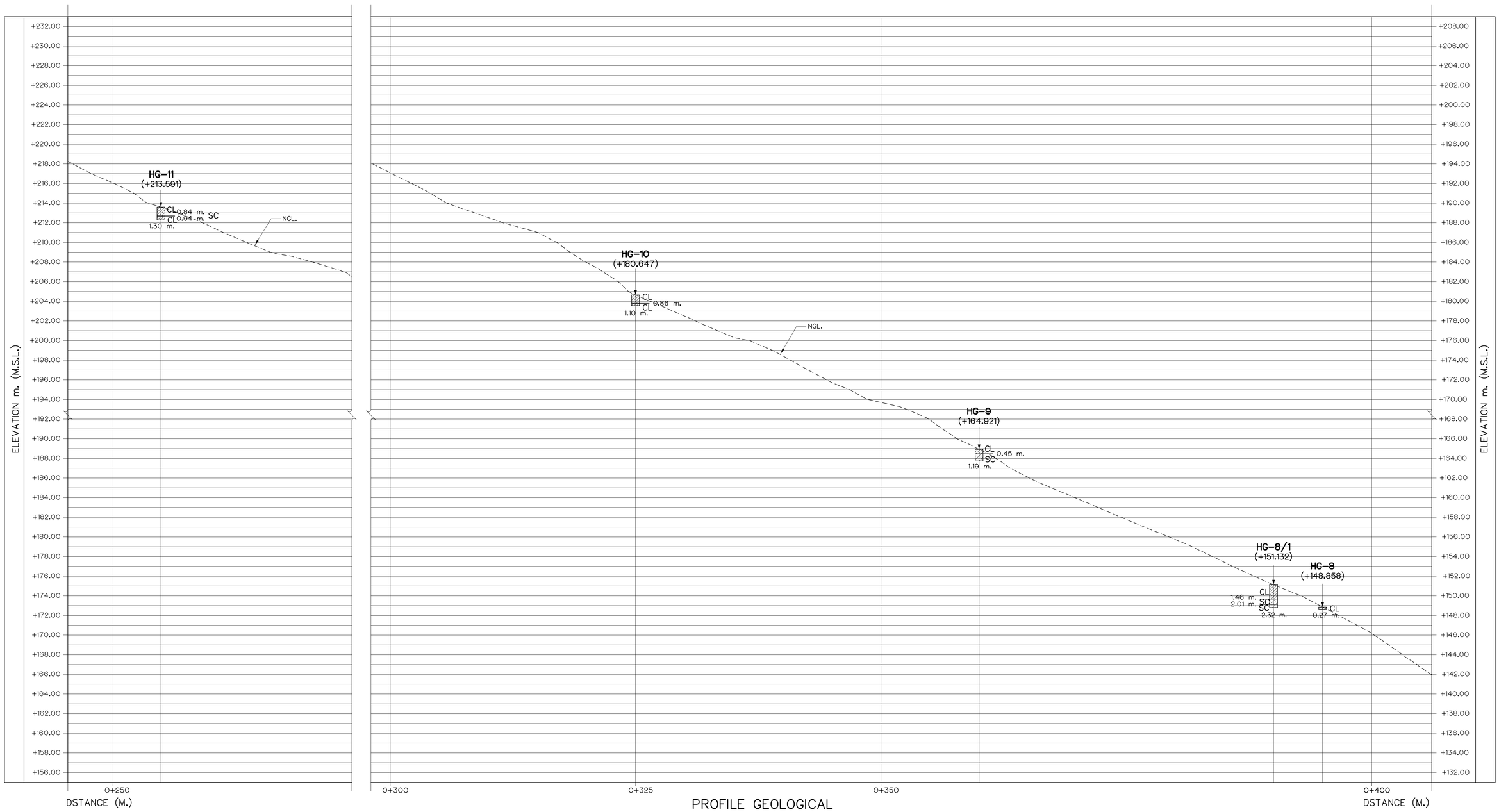
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
GENERAL
GEOLOGICAL PROFILE 1/4

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED	ว.ภาคิเชษฐ์		
DESIGNED	สย.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สย.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO.	HLS-GN-07
		SHEET NO.	7 OF 77



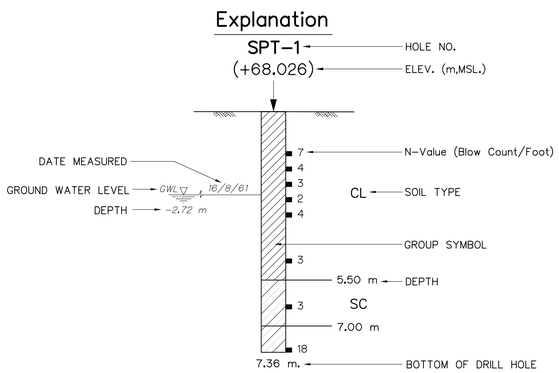
PROFILE GEOLOGICAL

SCALE 1:200

LEGEND

- CL = Lean Clay with Sand
- SC = Clayey Sand

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. HLS-GN-03

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

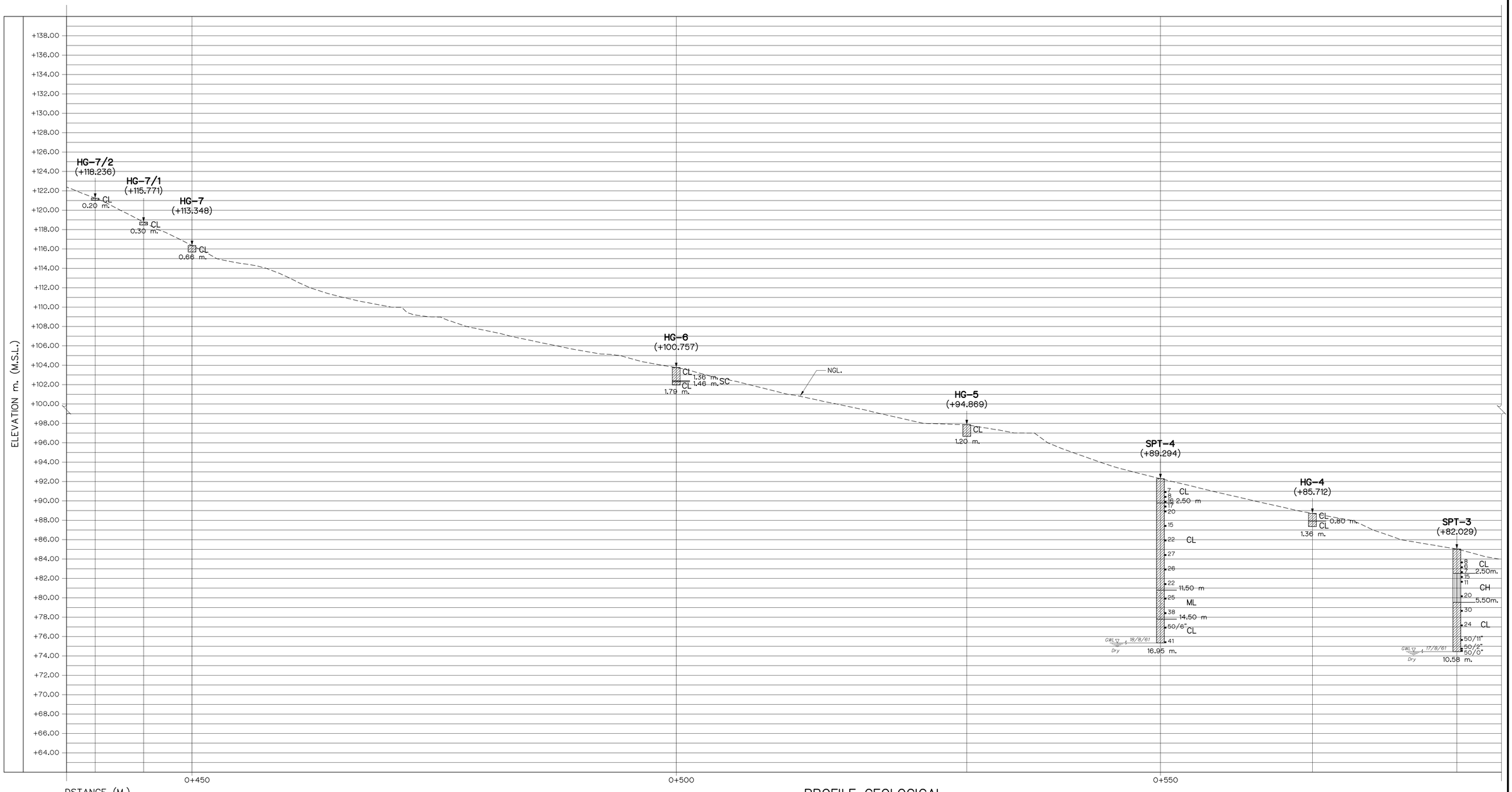
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
GENERAL
GEOLOGICAL PROFILE 2/4

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED S.KITICHAI

DESIGNED	สิ.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สิ.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO. HLS-GN-08	SHEET NO. 8 OF 77



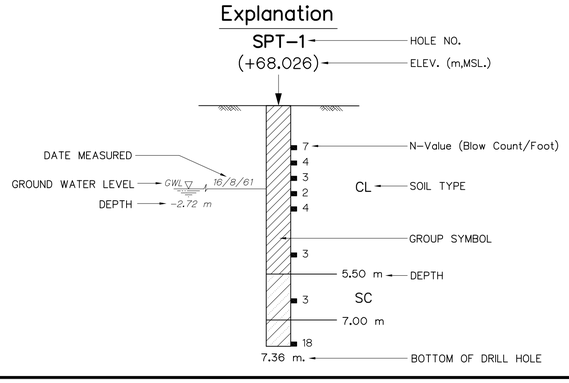
PROFILE GEOLOGICAL

SCALE 1:200

LEGEND

- CL = Lean Clay with Sand
- SC = Clayey Sand

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. HLS-GN-03

0 5 10 15
SCALE 1:200 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

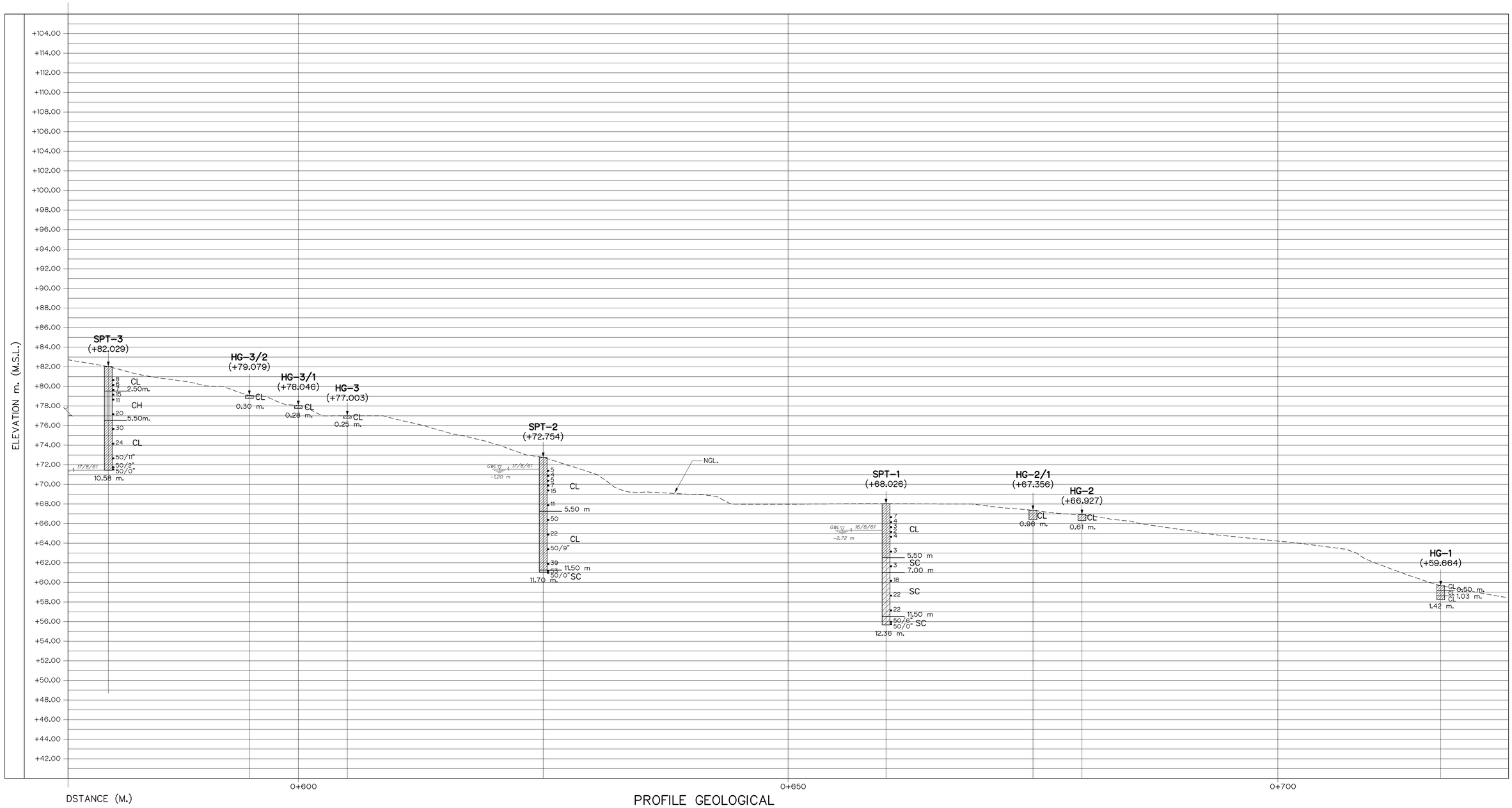
CIVIL WORKS
GENERAL
GEOLOGICAL PROFILE 3/4

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

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

DRAWING NO. HLS-GN-09
SHEET NO. 9 OF 77



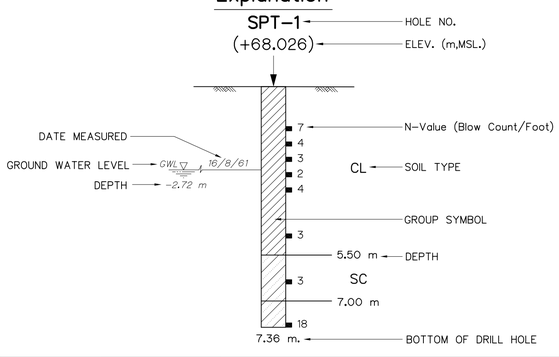
PROFILE GEOLOGICAL

SCALE 1:200

LEGEND

- CL = Lean Clay with Sand
- SC = Clayey Sand

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. HLS-GN-03

0 5 10 15
SCALE 1:200 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
GENERAL
GEOLOGICAL PROFILE 4/4

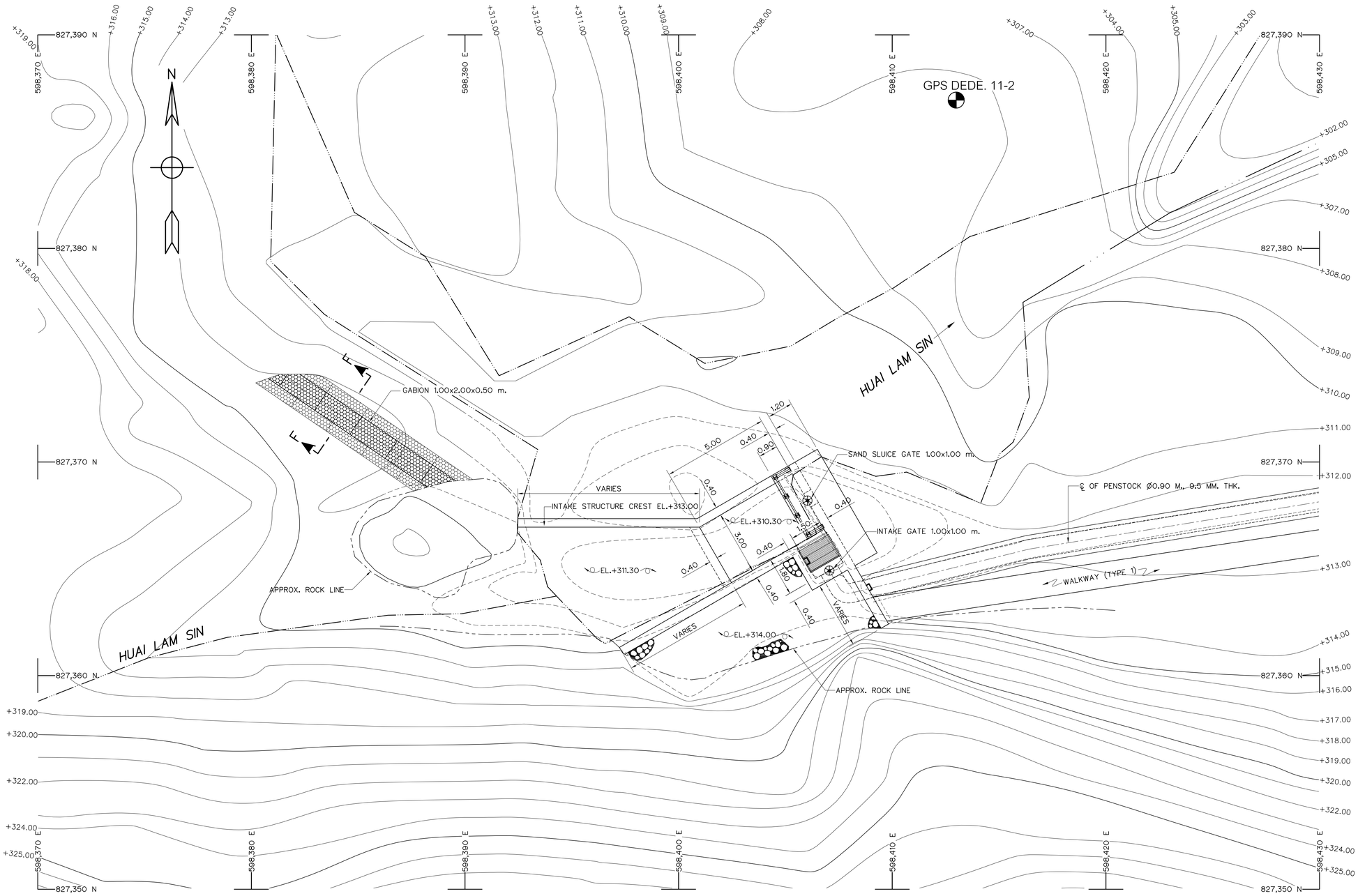
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED ว.ภัทรชัย

DESIGNED		ส.ย.6651	SUBMITTED
DRAWN			RECOMMENDED
CHECKED		ส.ย.7324	APPROVED
PROJECT MANAGER		14/01/62 DATE	DRAWING NO. HLS-GN-10

SHEET NO. 10 OF 77



GENERAL LAY-OUT

SCALE 1:100

NOTES :

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

REFERENCE DRAWINGS :

1. INTAKE STRUCTURE, PLAN AND SECTION A-A HLS-IS-02

0 1 2 4 6 8

SCALE 1:100 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

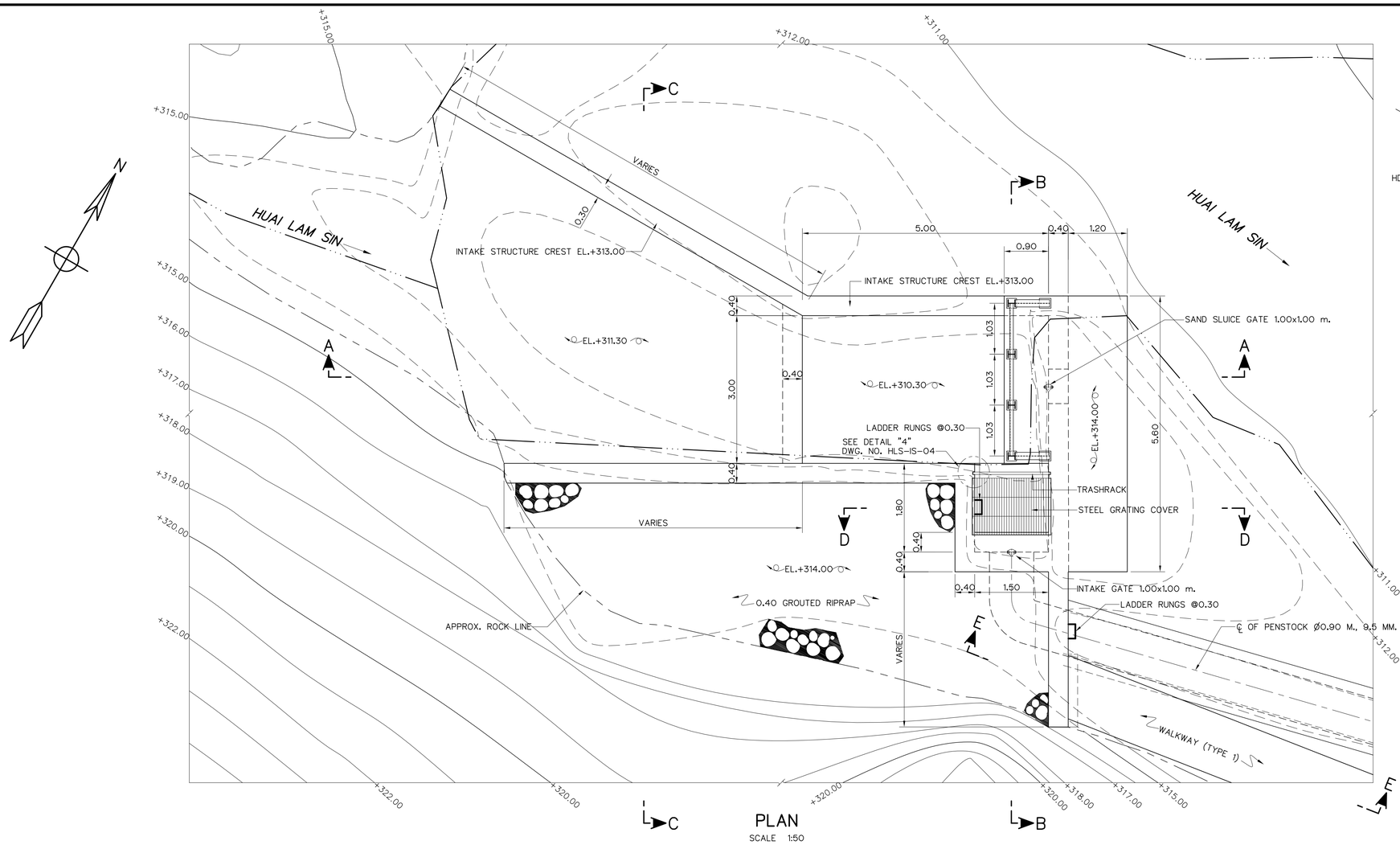
CIVIL WORKS
INTAKE STRUCTURE
GENERAL LAY-OUT

FBE FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

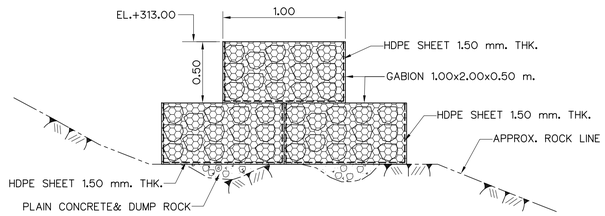
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED ร.ท.ไกรชา

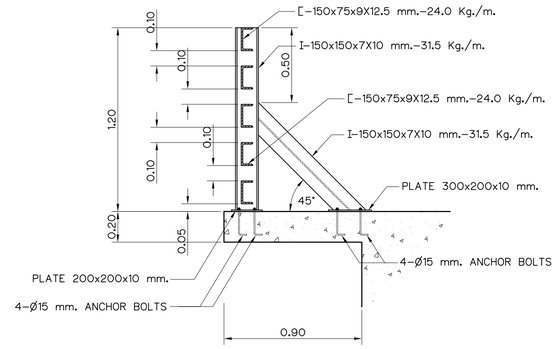
DESIGNED	สย.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สย.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO. HLS-IS-01	SHEET NO. 11 OF 77



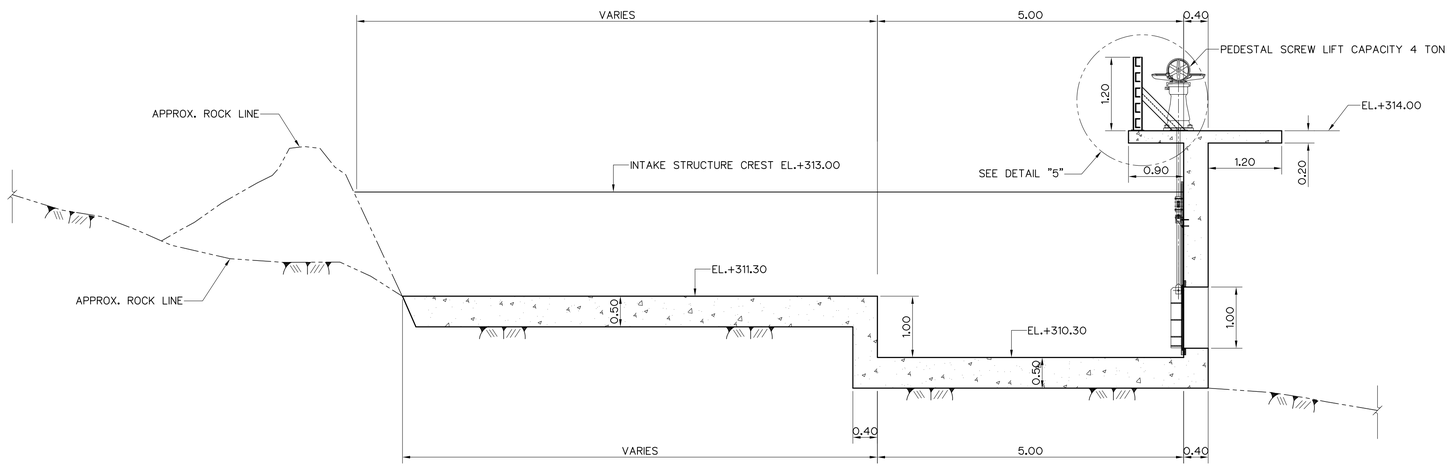
PLAN
SCALE 1:50



SECTION F–F
SCALE 1:25



DETAIL "5"
SCALE 1:20



SECTION A–A
SCALE 1:50

NOTES :

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

REFERENCE DRAWINGS :

1. INTAKE STRUCTURE, GENERAL LAY-OUT	HLS-IS-01
2. INTAKE STRUCTURE, SECTION B-B, C-C, D-D AND E-E	HLS-IS-03
3. INTAKE STRUCTURE, MSCELLANEOUS DETAILS	HLS-IS-04

0 0.5 1 1.5
SCALE 1:20 METERS

0 0.5 1 2 3 4
SCALE 1:50 METERS

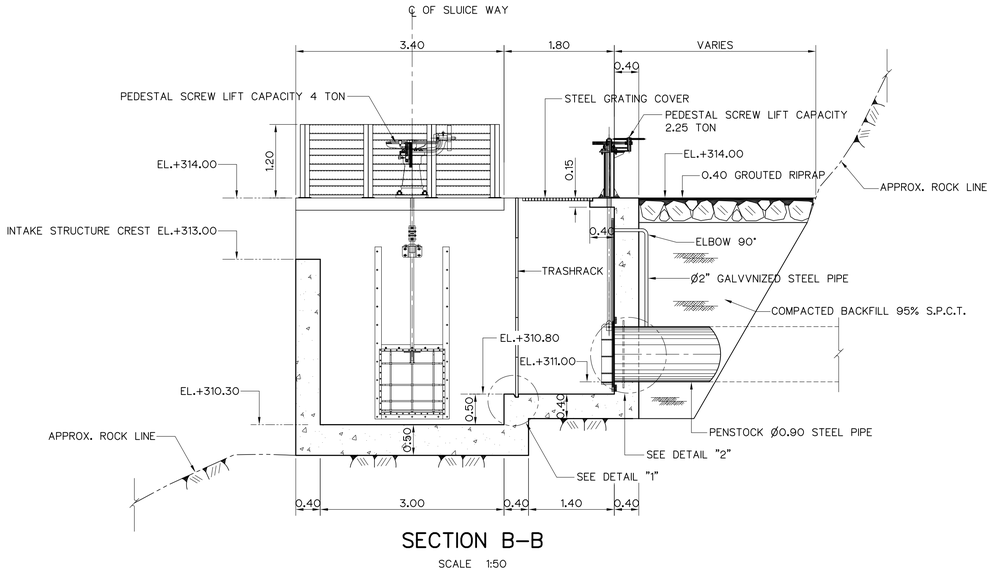
KINGDOM OF THAILAND
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
INTAKE STRUCTURE
PLAN AND SECTION A–A

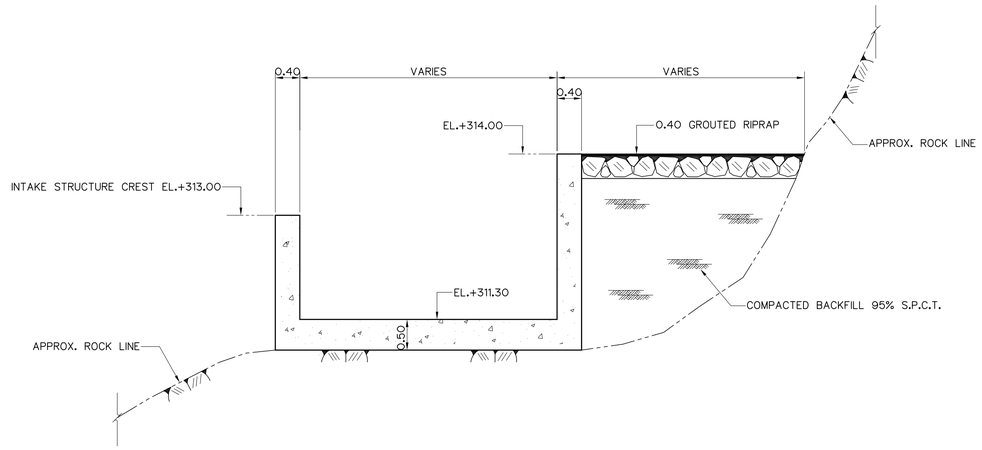
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

FEC FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED ว.ภาคิไชย
DESIGNED 28J.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED 28J.7324	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS-IS-02
	SHEET NO. 12 OF 77



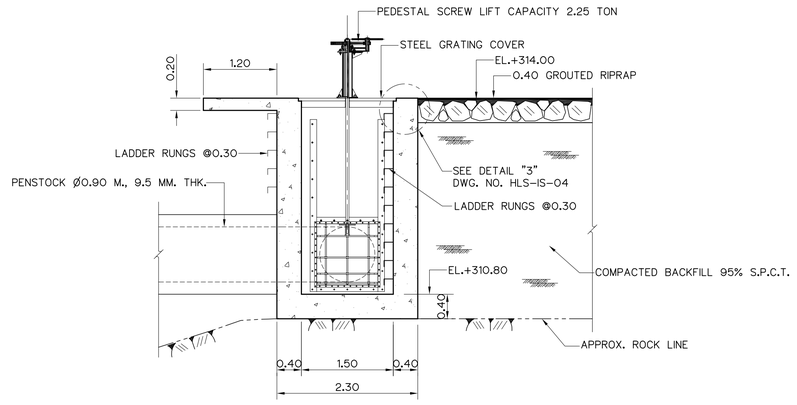
SECTION B–B

SCALE 1:50



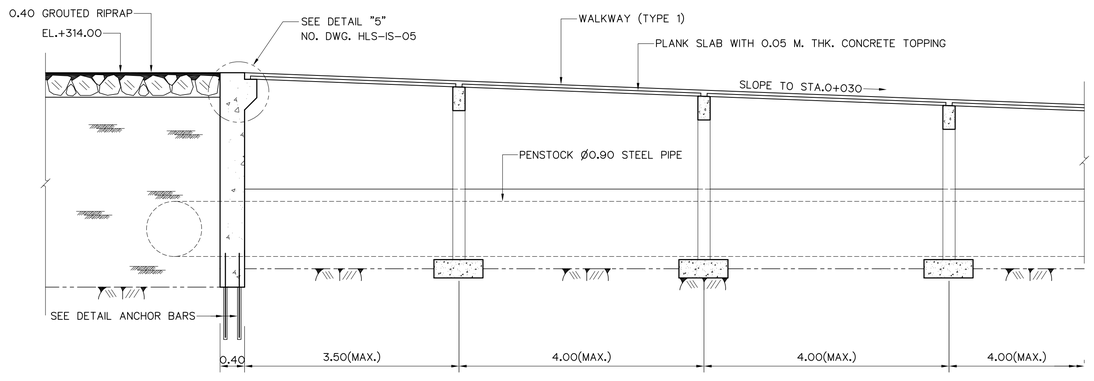
SECTION C–C

SCALE 1:50



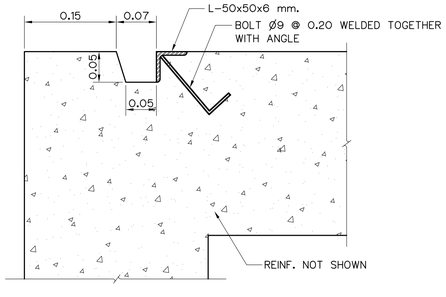
SECTION D–D

SCALE 1:50



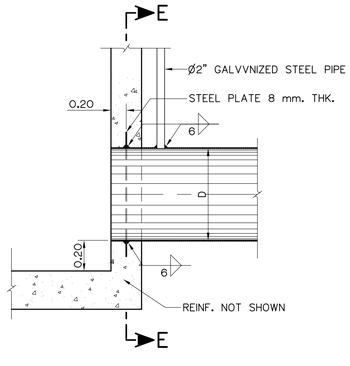
SECTION E–E

SCALE 1:50



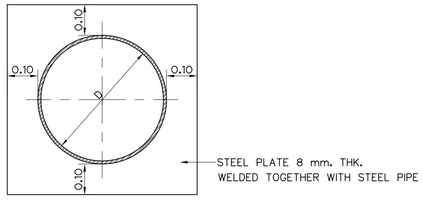
DETAIL "1"

SCALE 1:5



DETAIL "2"

NOT TO SCALE



SECTION E–E

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. HLS-GN-03

REFERENCE DRAWINGS :

1. INTAKE STRUCTURE, PLAN AND SECTION A–A	HLS-IS-02
2. INTAKE STRUCTURE, MSCELLANEOUS DETAILS	HLS-IS-04

0 0.05 0.1 0.2 0.3 0.4
SCALE 1:5 METERS

0 0.1 0.2 0.4 0.6 0.8
SCALE 1:10 METERS

0 0.5 1 1.5
SCALE 1:20 METERS

0 0.5 1 2 3 4
SCALE 1:50 METERS

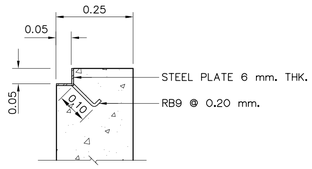
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

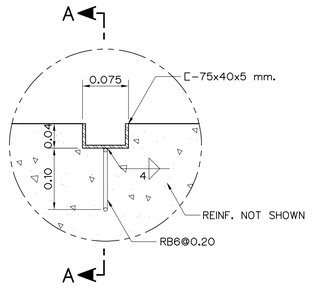
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
INTAKE STRUCTURE
SECTION B–B, C–C, D–D, E–E AND DETAILS

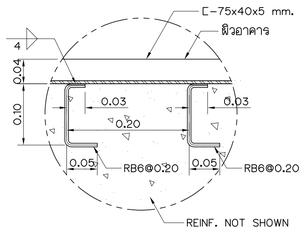
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED พ.ย.6651	REVIEWED ร.ก.ก/ชล
DRAWN	SUBMITTED
CHECKED พ.ย.7324	RECOMMENDED
PROJECT MANAGER 14/01/62 DATE	APPROVED
DRAWING NO. HLS-IS-03	SHEET NO. 13 OF 77



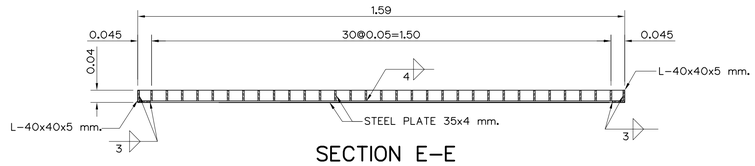
DETAIL "3"
SCALE 1:10



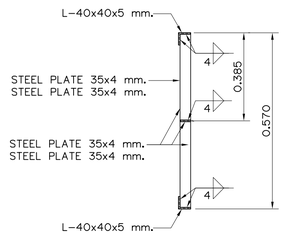
DETAIL "4"
SCALE 1:5



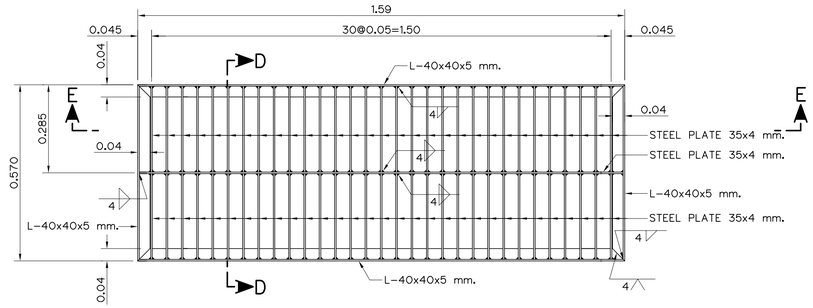
SECTION A-A
SCALE 1:5



SECTION E-E
SCALE 1:10

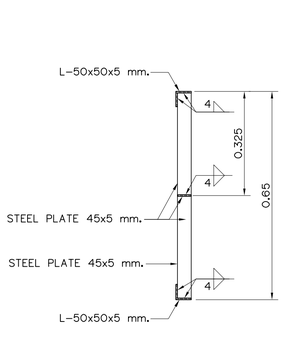


SECTION D-D
SCALE 1:10

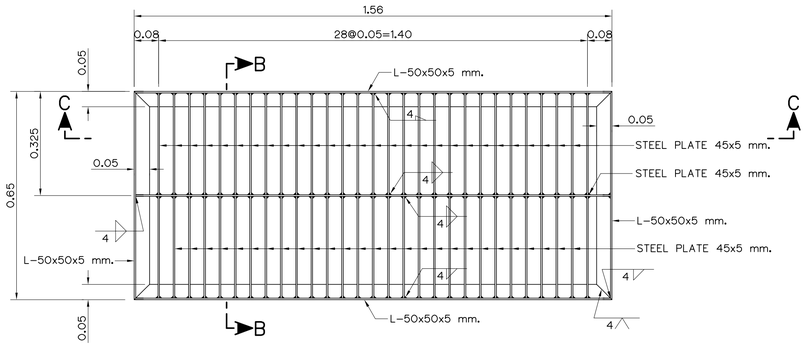


DETAIL OF STEEL GRATING COVER
(REQUIRED 2 PIECES)
SCALE 1:10

SECTION C-C
SCALE 1:10



SECTION B-B
SCALE 1:10



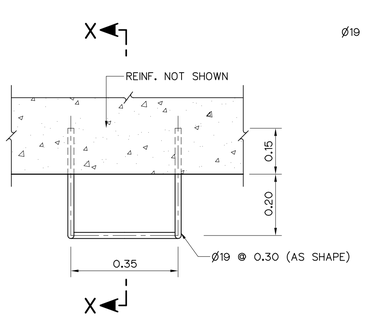
TRASHRACK DETAIL
(REQUIRED 5 PIECES)
SCALE 1:10

NOTES :

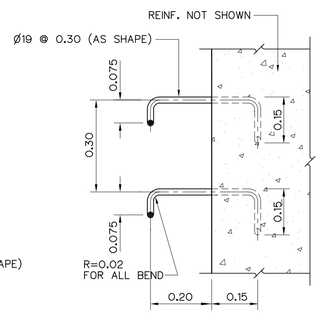
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

REFERENCE DRAWINGS :

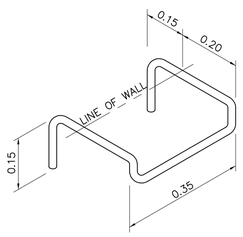
1. INTAKE STRUCTURE, PLAN AND SECTION A-A	HLS-IS-02
2. INTAKE STRUCTURE, SECTION B-B, C-C, D-D AND E-E	HLS-IS-03



PLAN

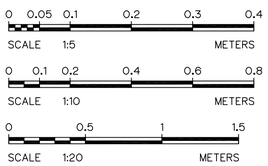


SECTION X-X



ISOMETRIC VIEW

DETAIL OF LADDER RUNGS
NOT TO SCALE



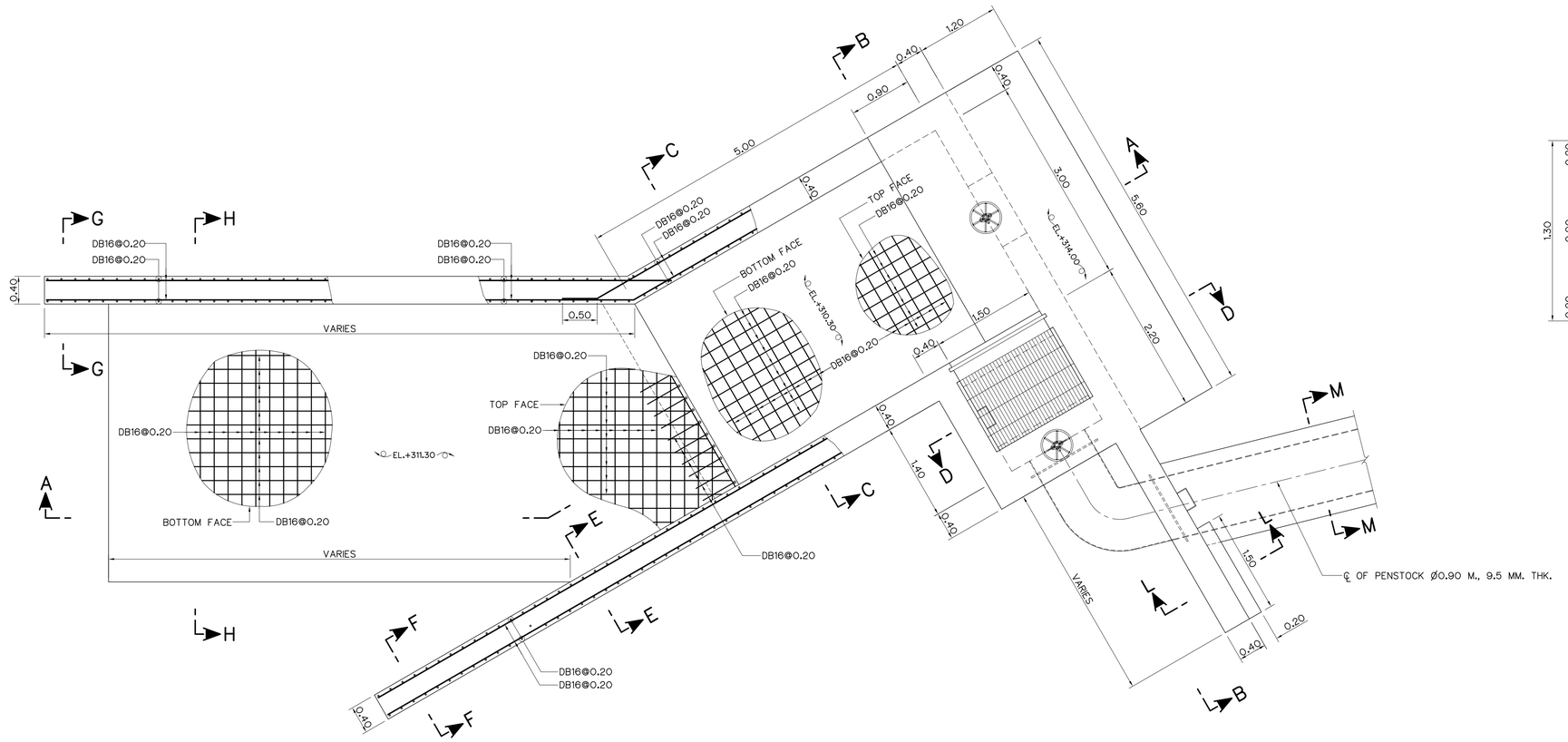
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

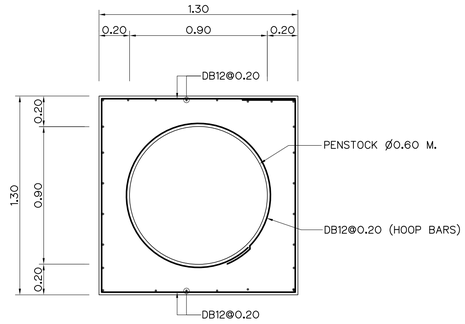
CIVIL WORKS
INTAKE STRUCTURE
MISCELLANEOUS DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED ร.ท.ไกรชา
DESIGNED สม.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED สม.7324	APPROVED
PROJECT MANAGER / 14/01/62 DATE	DRAWING NO. HLS-IS-04 / SHEET NO. 14 OF 77



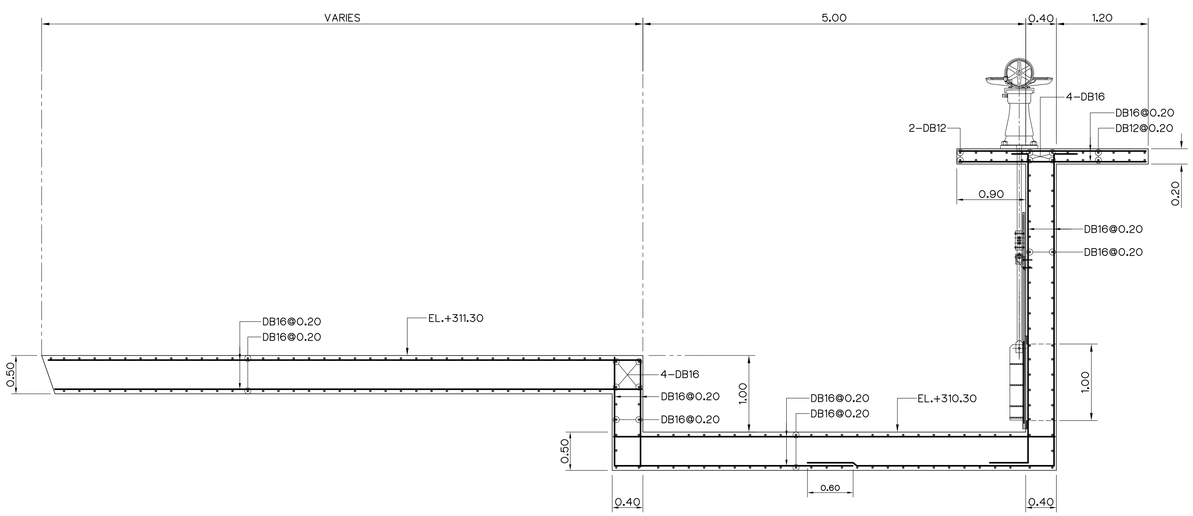
PLAN

SCALE 1:40



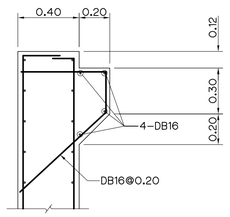
SECTION M–M

SCALE 1:20



SECTION A–A

SCALE 1:40



DETAIL "5"

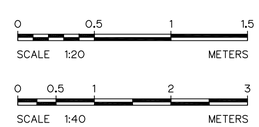
SCALE 1:20

NOTES :

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

REFERENCE DRAWINGS :

1. INTAKE STRUCTURE, GENERAL LAY–OUT	HLS–IS–01
2. INTAKE STRUCTURE, PLAN AND SECTION A–A	HLS–IS–02
3. INTAKE STRUCTURE, REINFORCEMENT DETAILS (SHEET 2/2)	HLS–IS–06



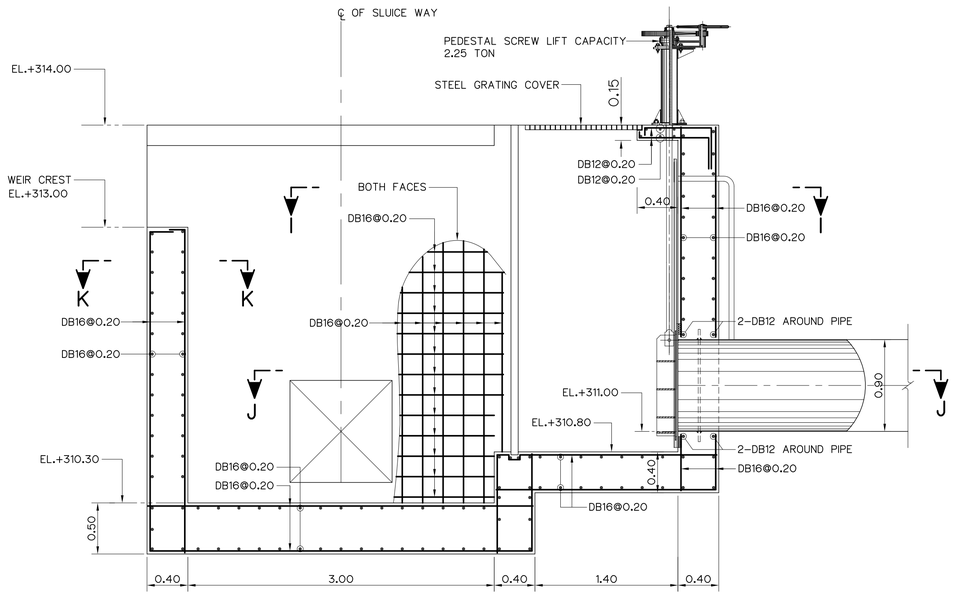
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

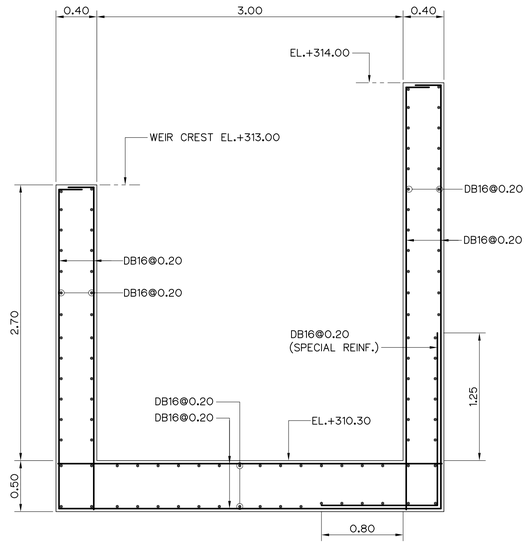
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
INTAKE STRUCTURE
REINFORCEMENT DETAILS (SHEET 1/2)

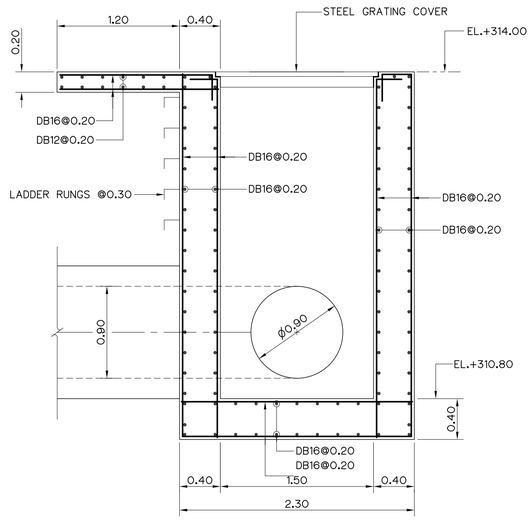
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED ร.ท.ICHAI
DESIGNED 28.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED 28.7324	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS–IS–05 / SHEET NO. 15 OF 77



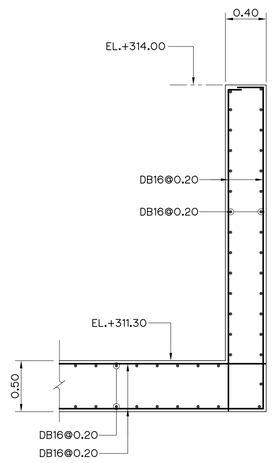
SECTION B–B
SCALE 1:30



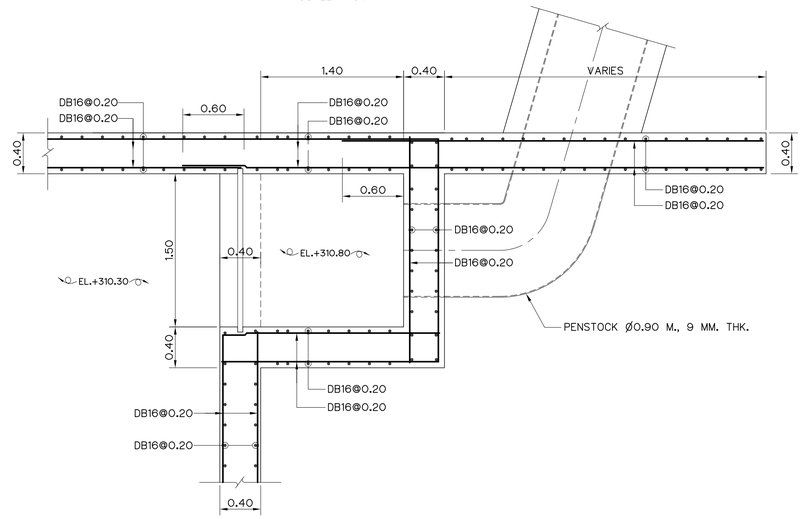
SECTION C–C
SCALE 1:30



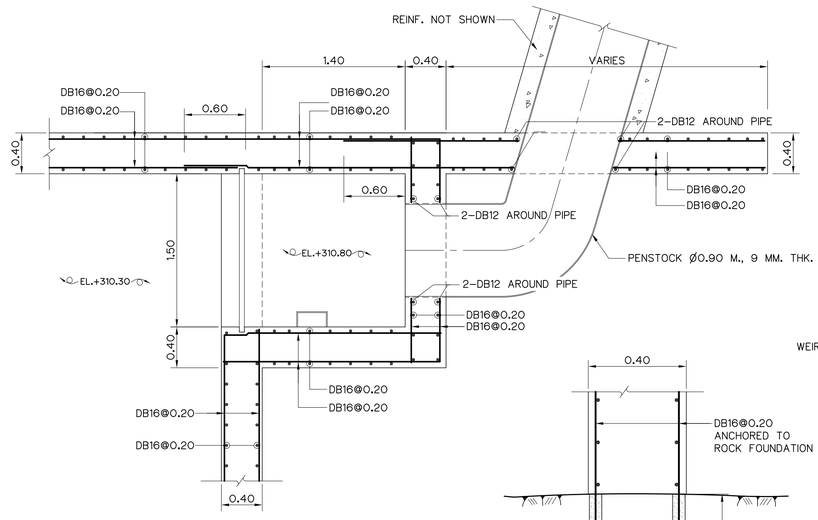
SECTION D–D
SCALE 1:30



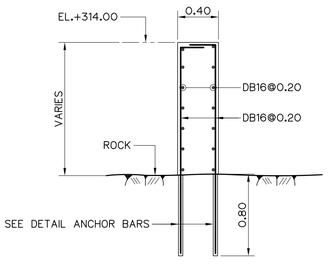
SECTION E–E
SCALE 1:30



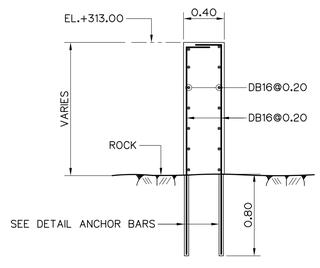
SECTION I–I
SCALE 1:30



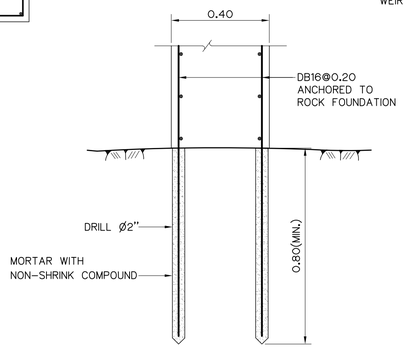
SECTION J–J
SCALE 1:30



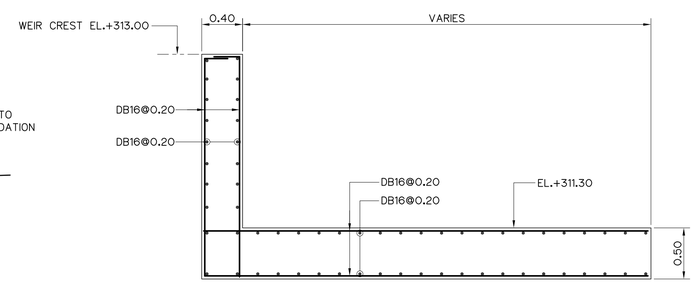
SECTION F–F
SCALE 1:30



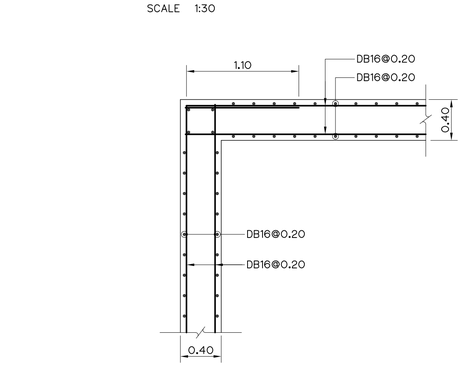
SECTION G–G
SCALE 1:30



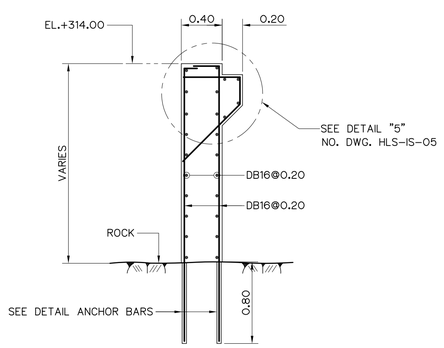
ANCHOR BARS
SCALE 1:12.5



SECTION H–H
SCALE 1:30



SECTION K–K
SCALE 1:30



SECTION L–L
SCALE 1:30

NOTES :

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

REFERENCE DRAWINGS :

1. INTAKE STRUCTURE, REINFORCEMENT DETAILS (SHEET 2/2) HLS-IS-05

0 0.5 1 1.5 2 2.5
SCALE 1:30 METERS

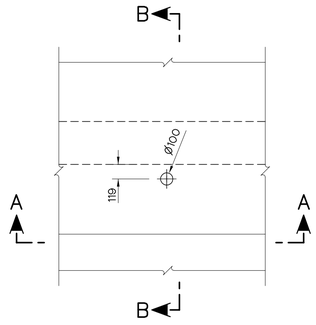
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

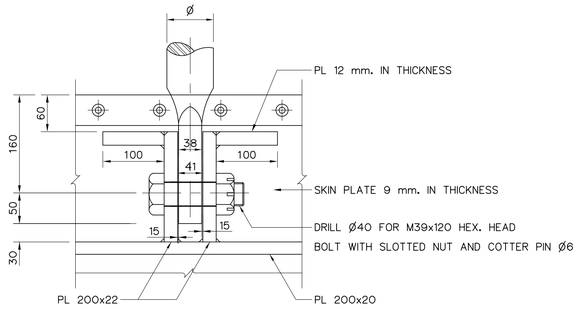
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
INTAKE STRUCTURE
REINFORCEMENT DETAILS (SHEET 2/2)

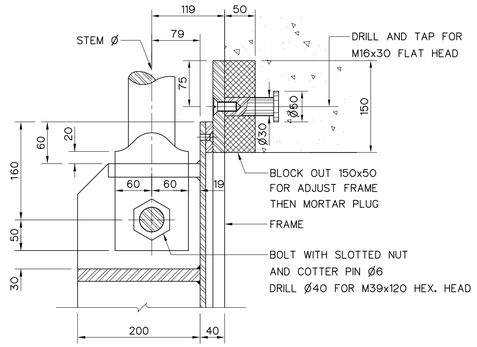
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ESSENTIAL
	REVIEWED S.KITICHAI
DESIGNED	SUBMITTED
DRAWN	RECOMMENDED
CHECKED	APPROVED
PROJECT MANAGER 14/01/62	DRAWING NO. HLS-IS-06
DATE	SHEET NO. 16 OF 77



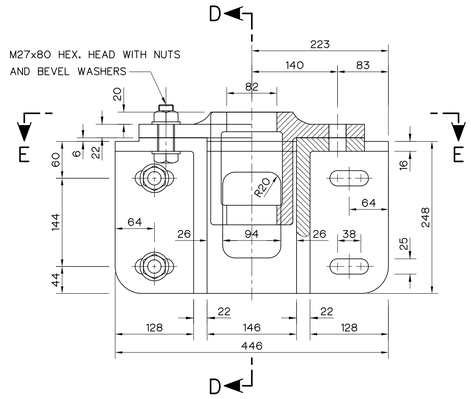
PLAN
NOT TO SCALE



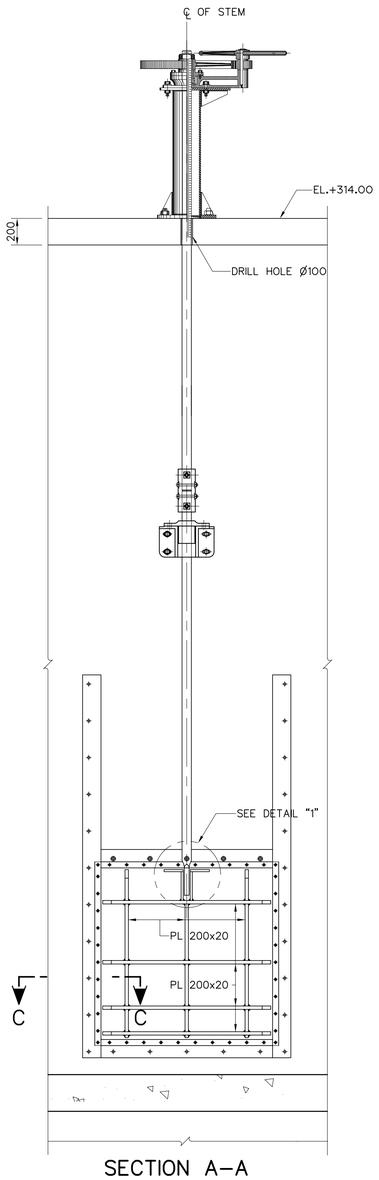
DETAIL "1"
NOT TO SCALE



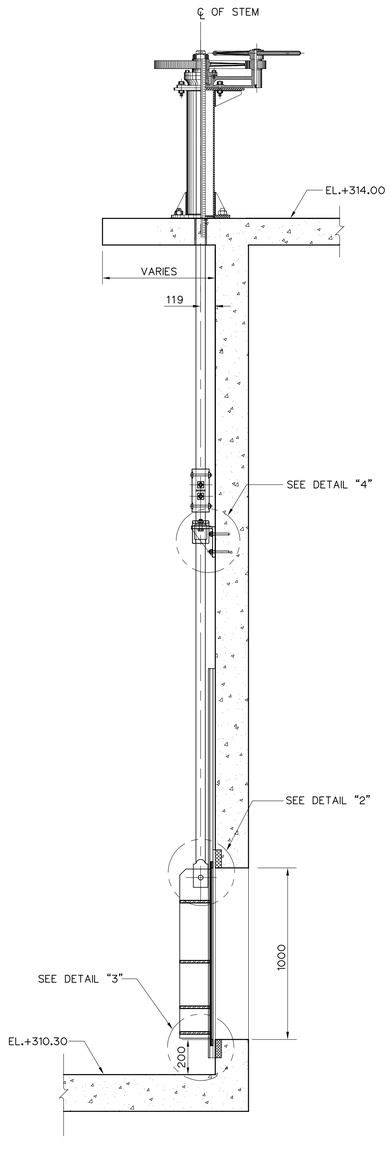
DETAIL "2"
NOT TO SCALE



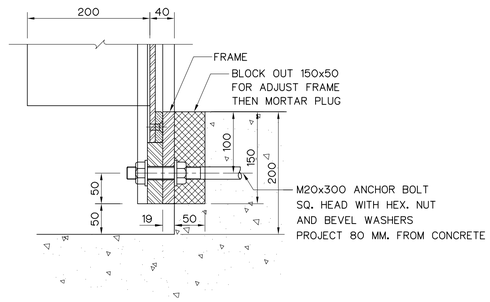
STEM GUIDE
NOT TO SCALE



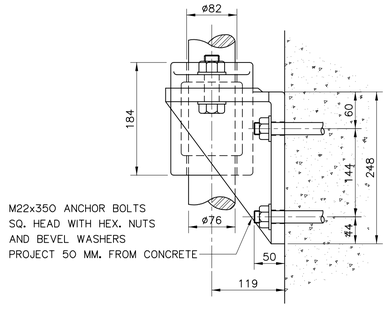
SECTION A–A
NOT TO SCALE



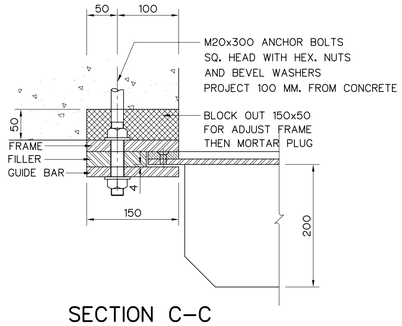
SECTION B–B
NOT TO SCALE



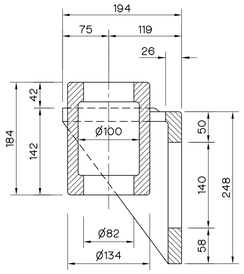
DETAIL "3"
SCALE 1:5



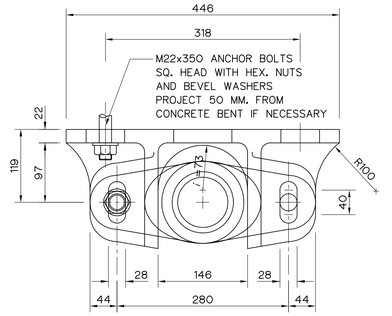
DETAIL "4"
SCALE 1:5



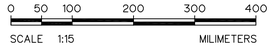
SECTION C–C
SCALE 1:5



SECTION D–D
SCALE 1:5



SECTION E–E
SCALE 1:5



NOTE :

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

REFERENCE DWGS :

1. INTAKE STRUCTURE, PLAN AND SECTION A–A	HLS–IS–02
2. INTAKE STRUCTURE, 1.00x1.00 m. VERTICAL GATE (GATE DATAIL)	HLS–IS–08
3. INTAKE STRUCTURE, PEDESTAL SCREW LIFT CAPACITY 2.25 TONS	HLS–IS–09

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

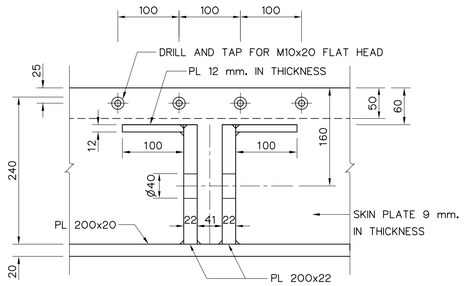
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
INTAKE STRUCTURE
1.00x1.00 m. VERTICAL GATE (GATE INSTALLATION)

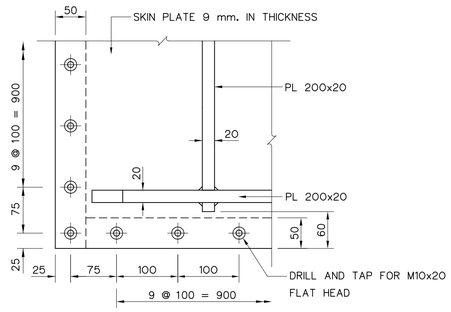
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED วิเคราะห์เฉา

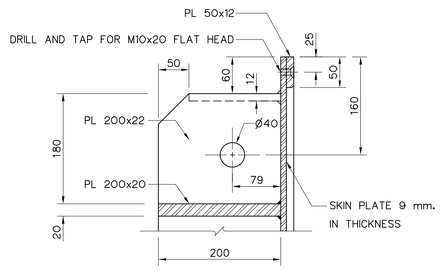
DESIGNED	สย. 6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สย. 7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO.	HLS–IS–07
		SHEET NO.	17 OF 77



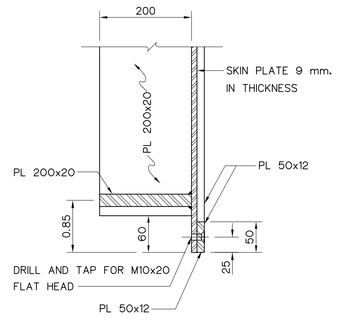
DETAIL "1"
NOT TO SCALE



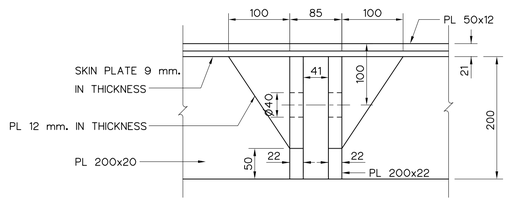
DETAIL "2"
NOT TO SCALE



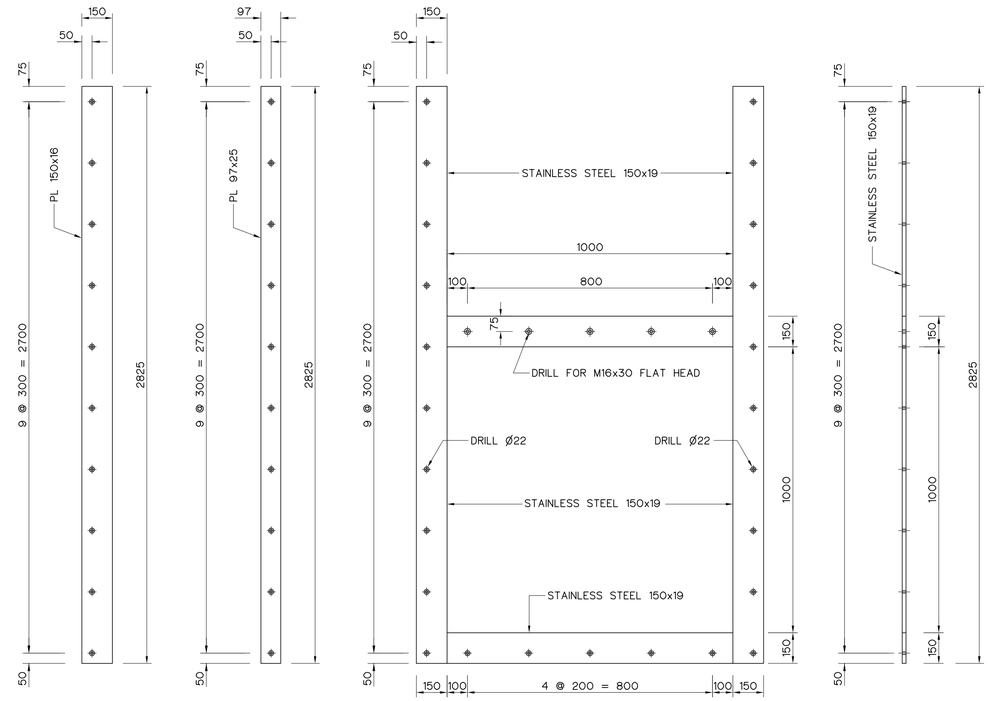
DETAIL "3"
NOT TO SCALE



DETAIL "4"
NOT TO SCALE



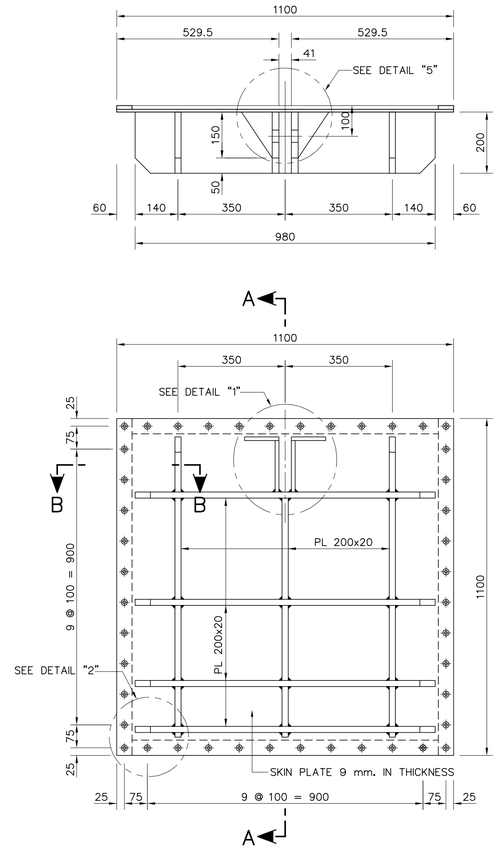
DETAIL "5"
NOT TO SCALE



GUIDE BAR
NOT TO SCALE

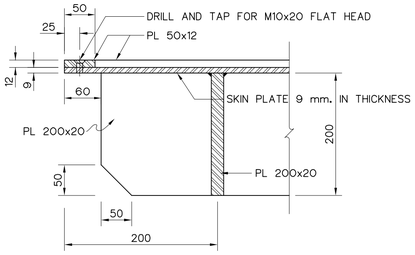
FILLER
NOT TO SCALE

FRAME
NOT TO SCALE

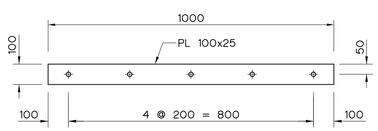


GATE LEAF
NOT TO SCALE

SECTION A–A
NOT TO SCALE



SECTION B–B
NOT TO SCALE



BOTTOM BAR
NOT TO SCALE

NOTE :

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

REFERENCE DWGS :

1. INTAKE STRUCTURE, PLAN AND SECTION A–A	HLS–IS–02
2. INTAKE STRUCTURE, 1.00x1.00 m. VERTICAL GATE (GATE INSTALLATION)	HLS–IS–07
3. INTAKE STRUCTURE, PEDESTAL SCREW LIFT CAPACITY 2.25 TONS	HLS–IS–09

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

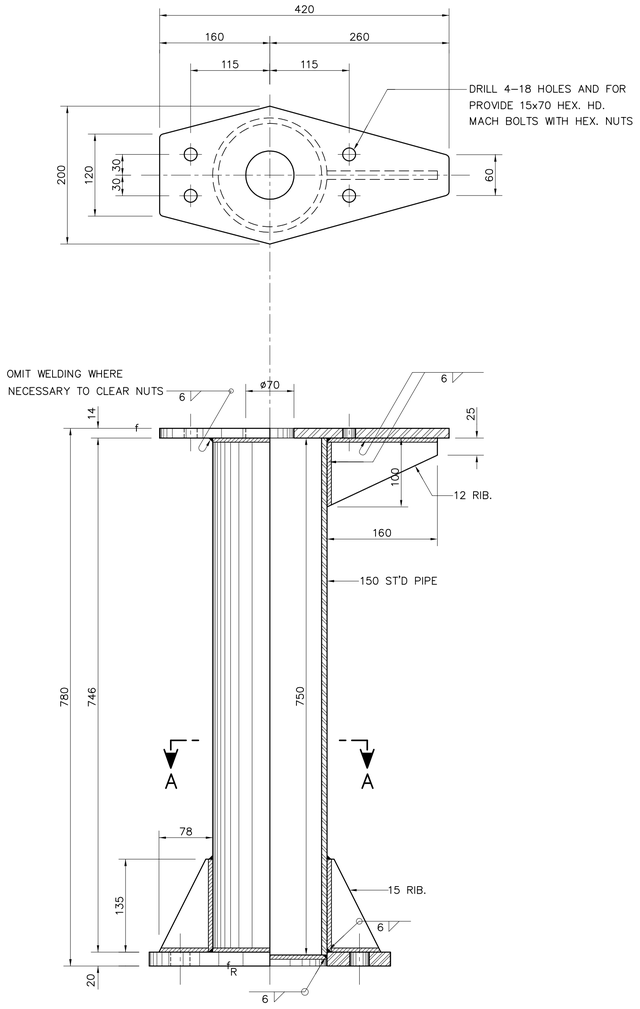
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
INTAKE STRUCTURE
1.00x1.00 m. VERTICAL GATE (GATE DETAIL)

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

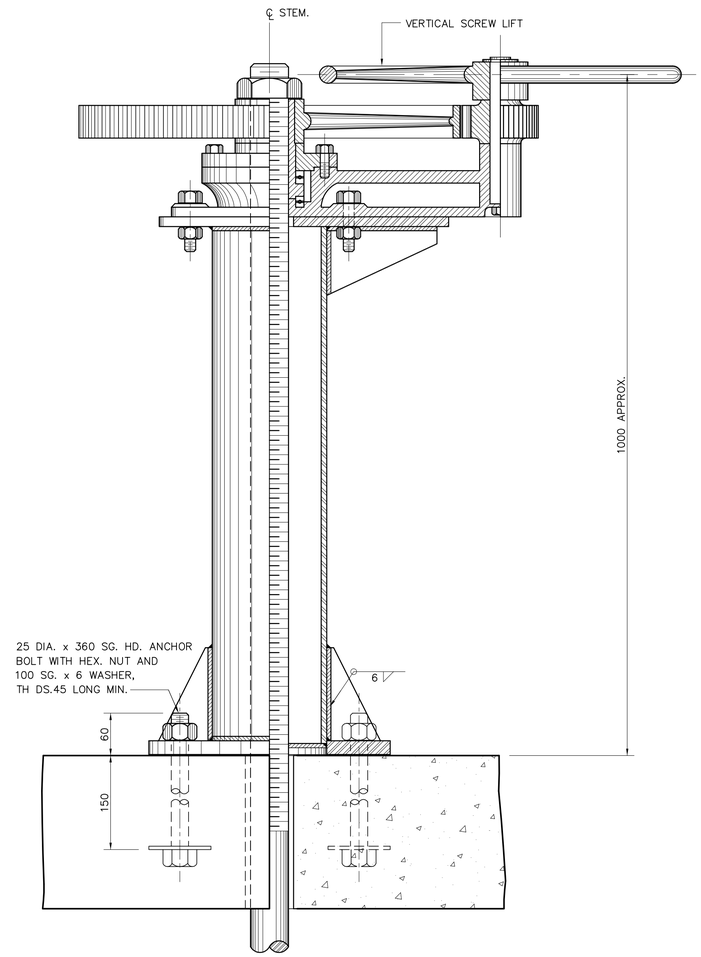
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY
REVIEWED ว.ภาชีชาติ

DESIGNED	สย.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สย.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO. HLS–IS–08	SHEET NO. 18 OF 77



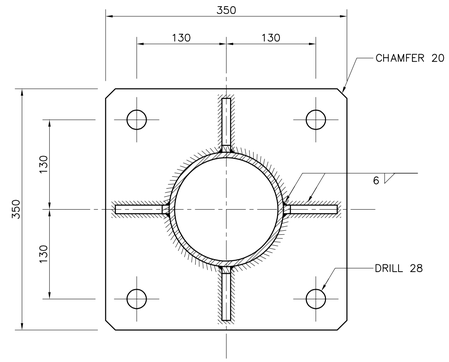
PEDESTAL

NOT TO SCALE



INSTALLATION (CAPACITY 2.25 TON)

NOT TO SCALE



SECTION A-A

NOT TO SCALE

NOTE :

1. ALL DIMENSIONS ARE IN MILLIMETERS, AND ELEVATION ARE IN METERS UNLESS OTHERWISE SHOWN.
2. ALL WELDING WILL BE 6 MILLIMETERS, UNLESS OTHERWISE SHOWN.
3. ALL BOLTS AND NUTS USE ASTM A325.
4. ALL STRUCTURAL STEELS ARE JIS G 3101 SS400
5. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, SHOP DRAWING SHALL BE DESIGNED BY CONTRACTOR UNDER APPROVAL OF FIELD ENGINEER.

REFERENCE DWGS :

1. PEDESTAL SCREW LIFT CAPACITY 2.25 TONS — HLS-IS-12

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

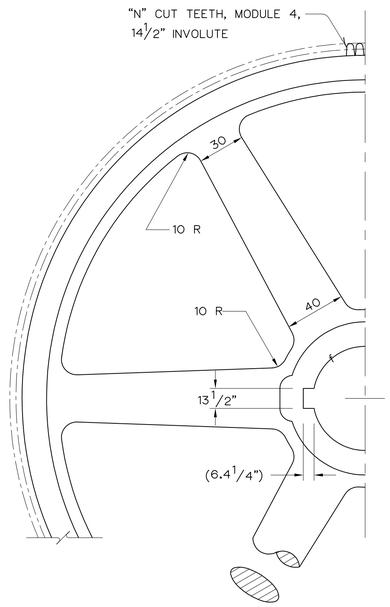
HUAI LAM SIN HYDROPOWER PROJECT

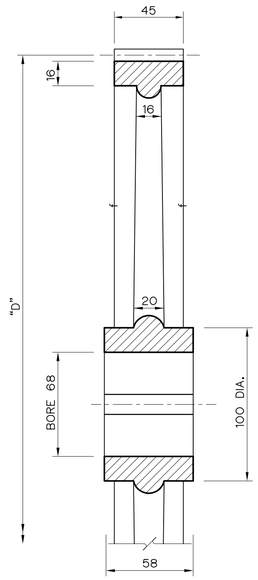
CIVIL WORKS
INTAKE STRUCTURE
GATE-LIFT PEDESTALS 2.25 TONS

FEC FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

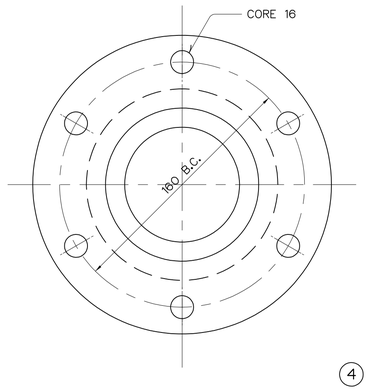
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

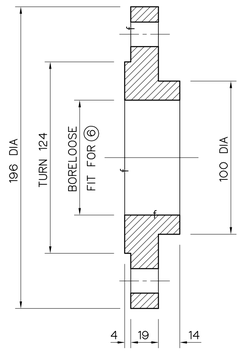
DESIGNED	สุภาพ แก้วน้อย ส.ก.2197	REVIEWED	S.KANCHAI
DRAWN		SUBMITTED	
CHECKED	สุภาพ แก้วน้อย ส.ก.2197	RECOMMENDED	
PROJECT MANAGER	14/01/62 DATE	APPROVED	
		DRAWING NO.	HLS-IS-09
		SHEET NO.	19 OF 77



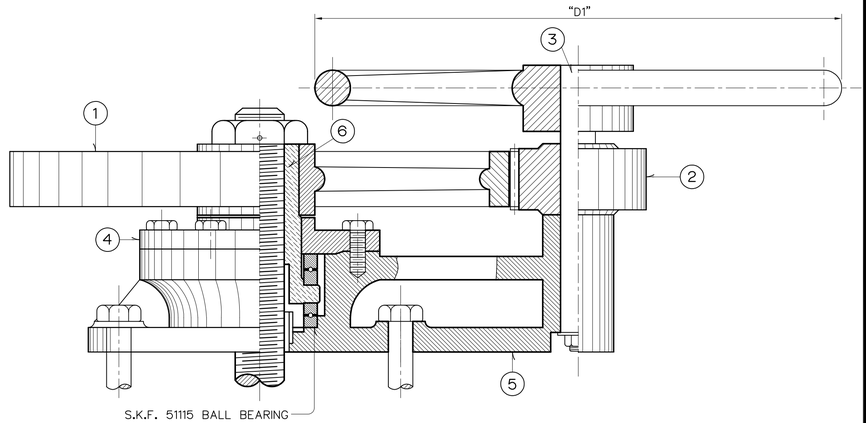


① SPUR GEAR
CAST IRON
NOT TO SCALE

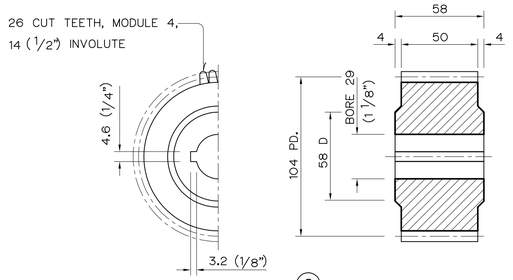




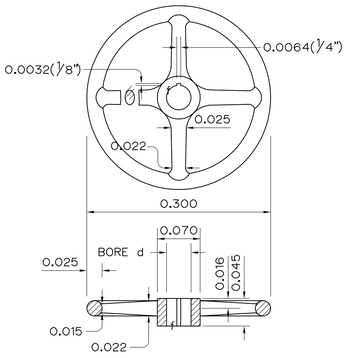
④ COVER PLATE
CAST IRON
NOT TO SCALE



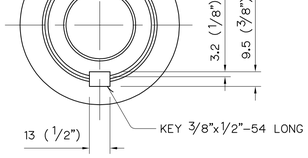
ASSEMBLY
NOT TO SCALE

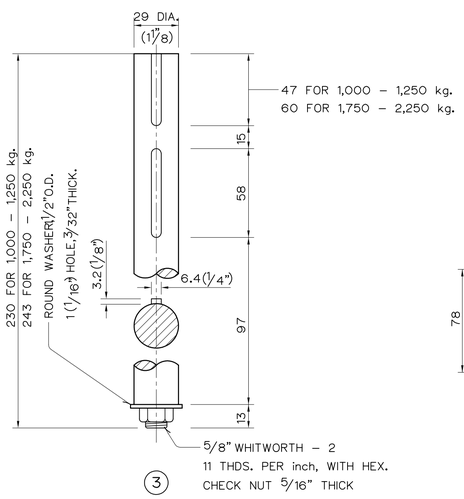


② PINION
CAST IRON
NOT TO SCALE

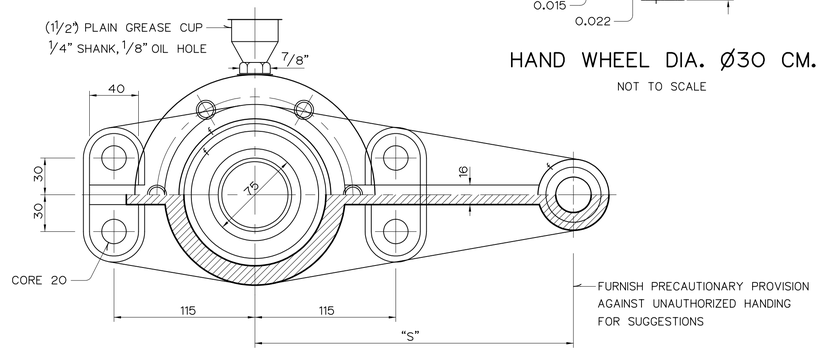


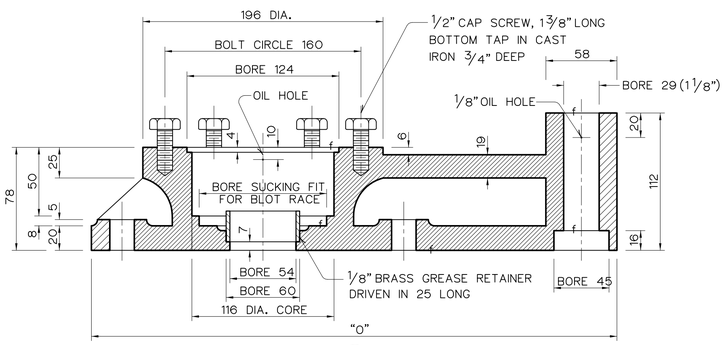
HAND WHEEL DIA. Ø30 CM.
NOT TO SCALE



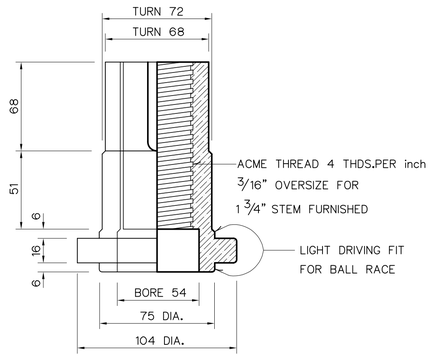


③ PINION SHAFT
MILD STEEL
NOT TO SCALE





⑤ BASE
CAST IRON
NOT TO SCALE



⑥ LIFTING NUT
BRONZE
NOT TO SCALE

CAPACITY (kg.)	"N"	"D"	"S"	"O"	"D1"
1,000	104	416	260	429	300
1,250	104	416	260	429	380
1,750	130	520	312	481	450
2,250	143	572	338	502	530

COMPUTATION NO. SCREW LIFT I
CAPACITY IS BASED ON A HANDWHEEL PULL OF 9 kg. (4.5 kg.PER HAND)
LOAD IS EQUAL TO 0.35xWATER PRESSUREON GATE LEAL + WEIGHT OF GATE AND STEM.

NOTE :

1. ALL DIMENSIONS ARE IN MILLIMETERS, AND ELEVATION ARE IN METERS UNLESS OTHERWISE SHOWN.
2. SINGLE – THRUST BALL BEARING S.K.F. 51115
   DYNAMIC CAPACITY = 8150 LBS. (3,700 kg.)
   BORE = 75
   OUTSIDE DIAMETER = 100
   HEIGHT = 19
3. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, SHOP DRAWING SHALL BE DESIGNED BY CONTRACTOR UNDER APPROVAL OF FIELD ENGINEER.

REFERENCE DWGS :

1. GATE-LIFT PEDESTALS 2.25 TONS HLS-IS-09

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

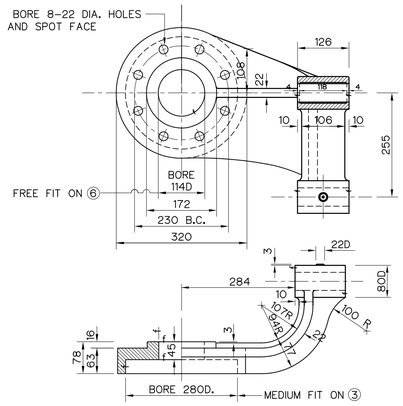
CIVIL WORKS
INTAKE STRUCTURE
PEDESTAL SCREW LIFT CAPACITY 2.25 TONS

TEL. FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

DESIGNED	กิตติพงษ์	2197	REVIEWED ชัยวัฒน์
DRAWN			SUBMITTED
CHECKED	กิตติพงษ์	2197	RECOMMENDED
PROJECT MANAGER	14/01/62	DATE	APPROVED

DRAWING NO. HLS-IS-10
SHEET NO. 20 OF 77



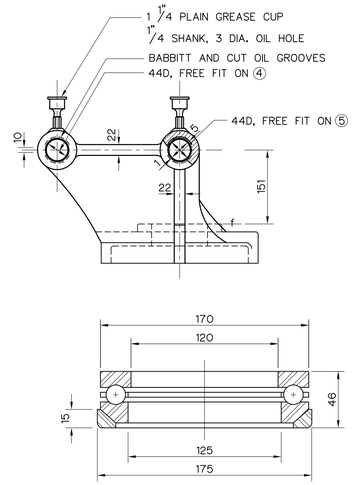
① CAP AND BEARING

CAST IRON GG-18

ONE REQ'D

SCALE 1:7.5

50 KG.



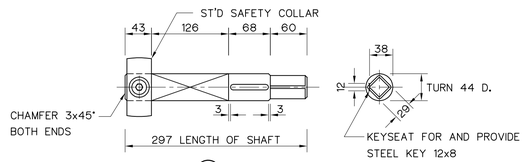
② SINGLE-THRUST BALL BEARING

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

TWO REQ'D

SCALE 1:2.5

2.5 KG.



④ SPUR PINION SHAFT

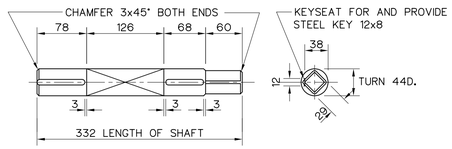
C.F. STEEL, ST 60.11

FINISH ALL OVER

ONE REQ'D

SCALE 1:5

4 KG.



⑤ BEVEL PINION SHAFT

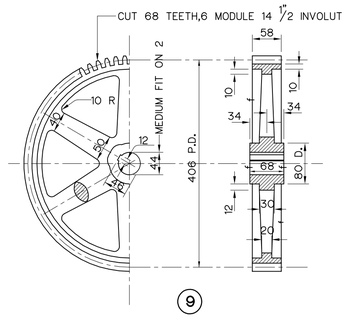
C.F. STEEL, ST 60.11

FINISH ALL OVER

ONE REQ'D

SCALE 1:5

1 1/2 KG.



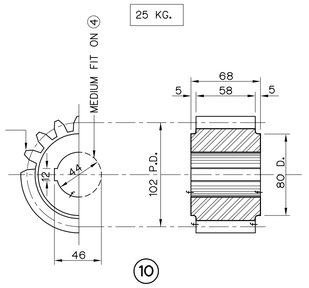
⑨ SPUR GEAR

CAST IRON GG-18

ONE REQ'D

SCALE 1:6

25 KG.



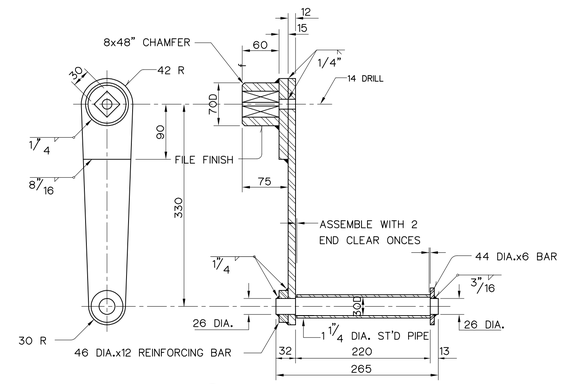
⑩ SPUR PINION

STEEL, ST 60.11

ONE REQ'D

SCALE 1:2

3 KG.



⑪ CRANK ARM

STEEL

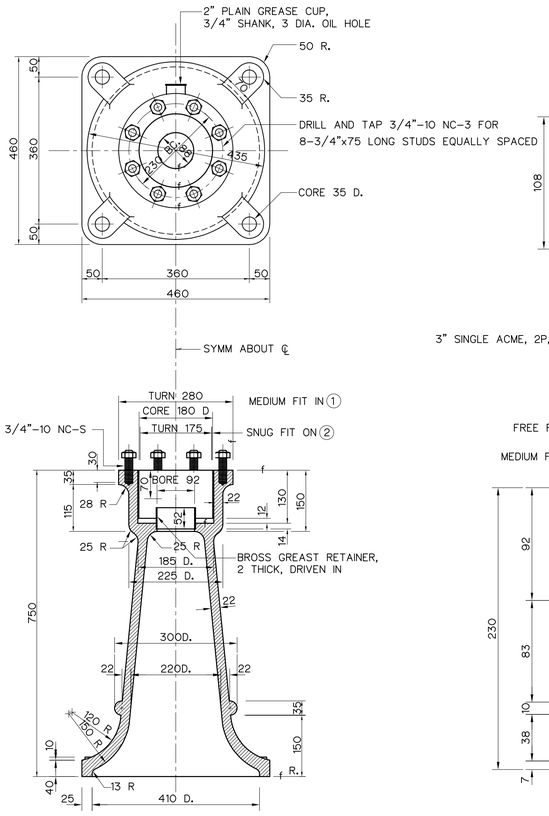
ONE REQ'D

SCALE 1:5

6 KG.

NOTE

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



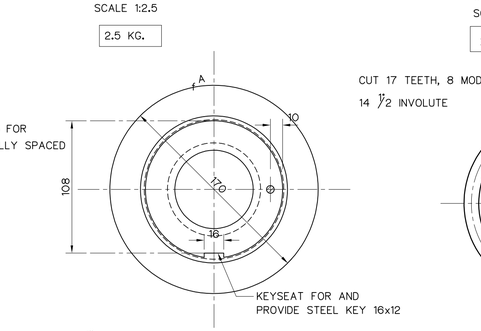
③ PEDESTAL

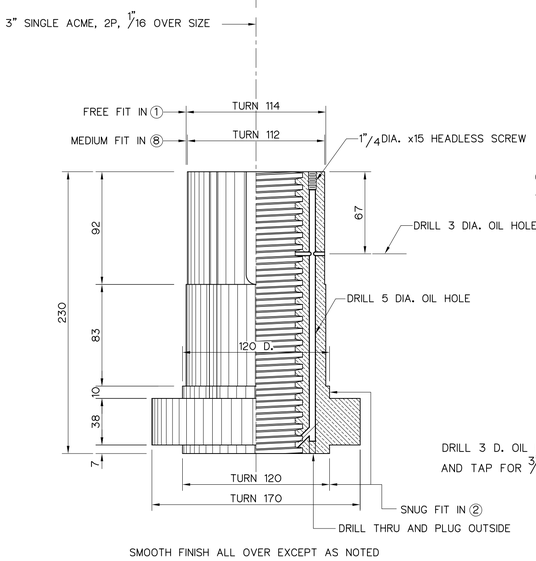
CAST IRON GG-18

ONE REQ'D

SCALE 1:7.5

140 KG.





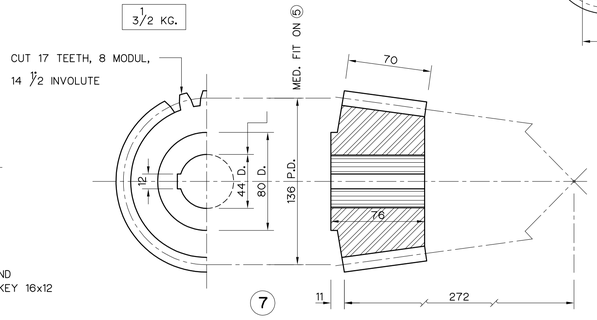
⑥ LIFTING NUT

PHOSPHOR BRONZE

ONE REQ'D

SCALE 1:2.5

17 KG.



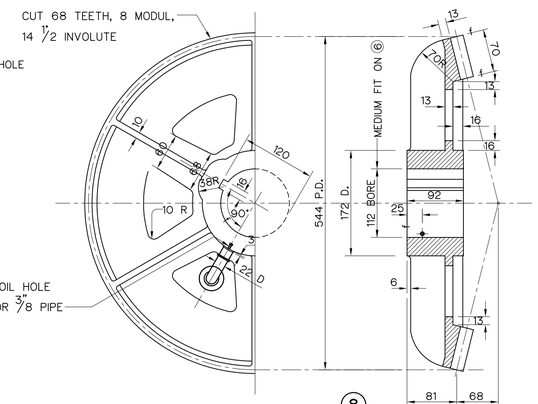
⑦ BEVEL PINION

STEEL, ST 60.11

ONE REQ'D

SCALE 1:2.5

8 KG.



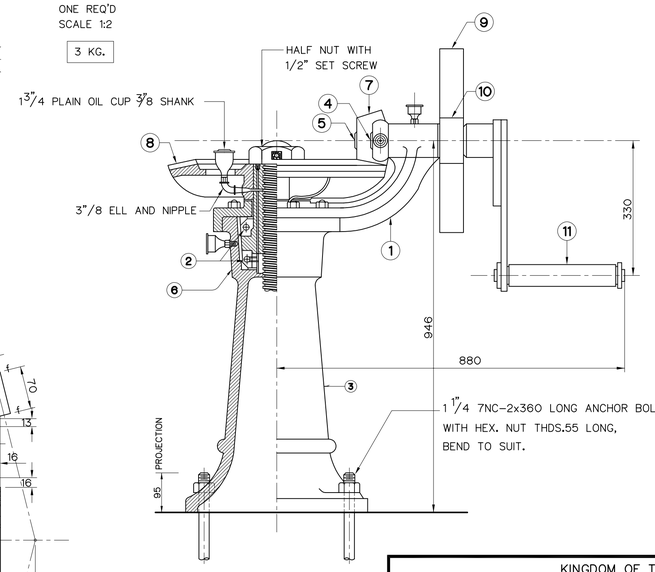
⑧ BEVEL GEAR

CAST IRON GG-18

ONE REQ'D

SCALE 1:5

40 KG.



ASSEMBLY

SCALE 1:7.5

310 KG.

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

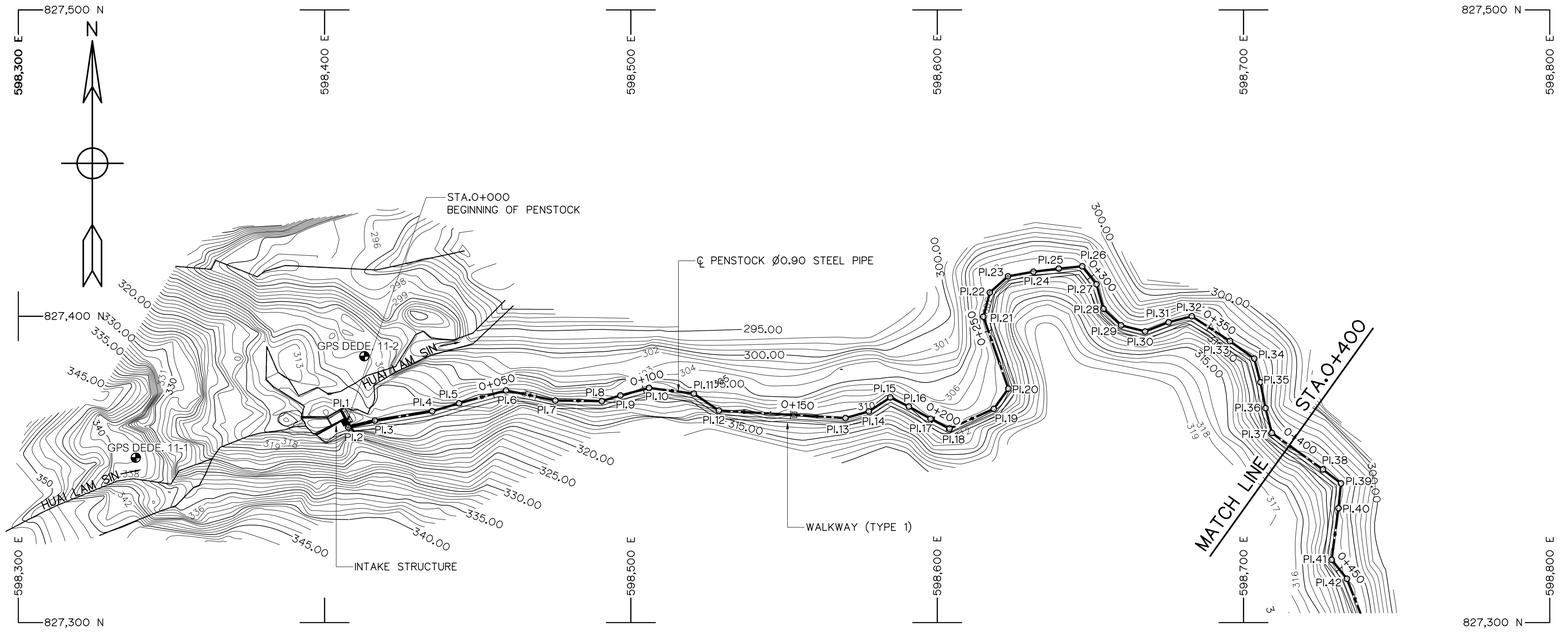
CIVIL WORKS
INTAKE STRUCTURE
GATE LIFT, CAPACITY 4.0 TONS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY
REVIEWED ร.ท.ไกรชัย

DESIGNED	วุฒิพงษ์ เกษวนัน	ลก.2197	SUBMITTED
DRAWN			RECOMMENDED
CHECKED	วุฒิพงษ์ เกษวนัน	ลก.2197	APPROVED
PROJECT MANAGER	14/01/62	DATE	DRAWING NO. HLS-IS-11

SHEET NO. 21 OF 77

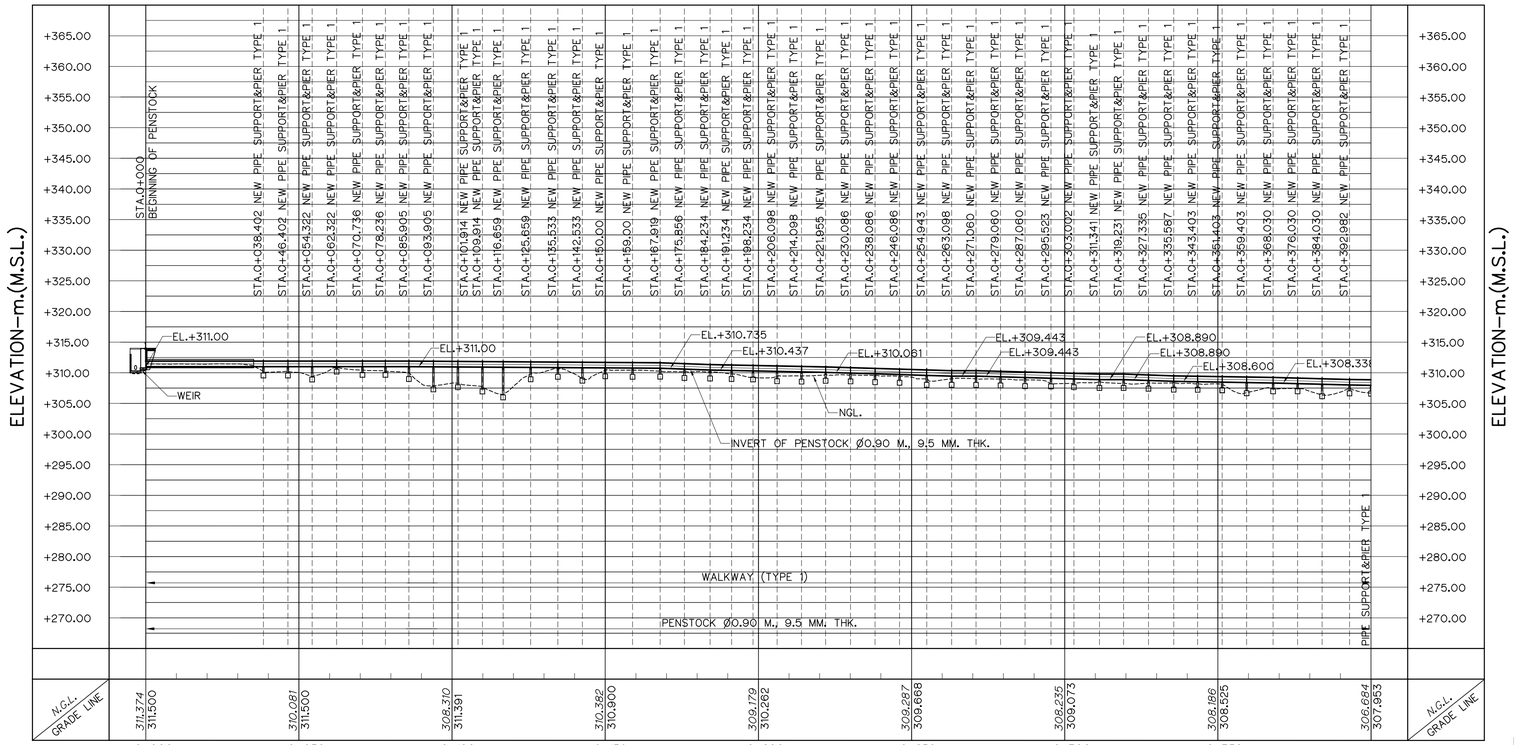


PLAN

SCALE 1:1,000

HORIZONTAL ALINEMENT OF HEADRACE

NO. PI.	COORDINATE N	COORDINATE E	PI. – PI. (m)	DEFLECTION ANGLE (° – ' – ")	PI. STA. (km)	BEARING (N/S ° – ' – " E/W)
PI.1	827,364.921	598,407.056	–	–	0+000.000	–
PI.2	827,363.779	598,407.716	1.319	73°-50'-36.53"	0+001.319	S 30°-01'-30.19" E
PI.3	827,365.924	598,416.404	8.949	04°-36'-56.57"	0+010.268	N 76°-07'-53.27"E
PI.4	827,368.982	598,435.175	19.018	07°-21'-54.54"	0+029.286	N 80°-44'-49.85"E
PI.5	827,371.589	598,443.910	9.116	01°-21'-56.49"	0+038.402	N 73°-22'-55.31" E
PI.6	827,375.777	598,459.269	15.920	26°-49'-05.66"	0+054.322	N 74°-44'-51.80" E
PI.7	827,372.486	598,475.350	16.414	10°-50'-26.65"	0+070.736	S 78°-26'-02.54"E
PI.8	827,372.294	598,490.518	15.169	17°-26'-27.05"	0+085.905	S 89°-16'-29.19" E
PI.9	827,374.125	598,496.615	6.366	01°-56'-08.77"	0+092.271	N 73°-17'-03.76"E
PI.10	827,376.585	598,505.939	9.643	21°-59'-29.86"	0+101.914	N 75°-13'-12.53" E
PI.11	827,374.734	598,520.567	14.745	26°-48'-52.82"	0+116.659	S 82°-47'-17.62" E
PI.12	827,369.209	598,528.750	9.874	30°-37'-32.44"	0+126.533	S 55°-58'-24.80"E
PI.13	827,366.754	598,570.063	41.386	19°-15'-35.63"	0+167.919	S 86°-35'-57.24"E
PI.14	827,368.923	598,577.698	7.937	17°-13'-19.48"	0+175.856	N 74°-08'-27.13" E
PI.15	827,373.496	598,584.718	8.378	59°-23'-15.56"	0+184.234	N 56°-55'-07.66"E
PI.16	827,370.510	598,590.758	6.738	03°-01'-30.56"	0+190.972	S 63°-41'-36.78"E
PI.17	827,366.534	598,597.834	8.117	01°-33'-36.43"	0+199.089	S 60°-40'-06.22"E
PI.18	827,363.268	598,604.036	7.009	51°-58'-30.04"	0+206.098	S 62°-13'-42.66"E
PI.19	827,369.769	598,618.499	15.857	29°-59'-56.85"	0+221.955	N 65°-47'-47.30"E
PI.20	827,376.364	598,623.255	8.131	54°-59'-35.88"	0+230.086	N 35°-47'-50.45"E
PI.21	827,399.839	598,615.082	24.857	34°-12'-43.18"	0+254.943	N 19° -11'-45.42"W
PI.22	827,407.716	598,617.195	8.155	33°-09'-39.47"	0+263.098	N 15°-00'-57.76"E
PI.23	827,413.025	598,623.128	7.962	31°-40 -04.90"	0+271.060	N 48°-10'-37.23"E
PI.24	827,414.514	598,631.441	8.445	03°-10'-09.96"	0+279.505	N 79°-50'-42.13" E
PI.25	827,415.524	598,639.684	8.305	01°-17'-36.30"	0+287.810	N 83°-00'-52.09"E
PI.26	827,416.289	598,647.359	7.713	57°-09'-07.01"	0+295.523	N 84°-18'-28.39"E
PI.27	827,410.439	598,652.019	7.479	22°-53'-14.41"	0+303.002	S 38°-32'-24.60"E
PI.28	827,402.409	598,654.269	8.339	31°-18'-32.43"	0+311.341	S 15°-39'-10.20"E
PI.29	827,397.024	598,660.036	7.890	28°-44'-10.09"	0+319.231	S 46°-57'-42.62"E
PI.30	827,395.022	598,667.889	8.104	35°-40'-17.48"	0+327.335	S 75°-41'-52.71" E
PI.31	827,398.029	598,675.574	8.252	06°-50'-20.35"	0+335.587	N 68°-37'-49.81"E
PI.32	827,399.990	598,683.140	7.816	47°-38'-41.80"	0+343.403	N 75°-28'-10.15" E
PI.33	827,391.876	598,695.580	14.852	02°-36'-23.54"	0+358.255	S 56°-53'-08.04"E
PI.34	827,386.169	598,703.516	9.775	39°-38'-12.15"	0+368.030	S 54°-16'-44.51"E
PI.35	827,378.449	598,705.533	7.979	03°-27'-21.96"	0+376.009	S 14°-38'-32.36"E
PI.36	827,369.984	598,707.207	8.629	03°-02'-35.55"	0+384.638	S 11° -11'-10.40"E
PI.37	827,361.896	598,709.258	8.344	40°-12'-02.48"	0+392.982	S 14°-13'-45.96"E
PI.38	827,349.984	598,725.915	20.478	01°-52'-20.66"	0+413.460	S 54°-25'-48.44"E



PROFILE

VERTICAL SCALE 1:500

HORIZONTAL SCALE 1:1,000

0 5 10 20 30 40

SCALE 1:500 METERS

0 10 20 40 50 80

SCALE 1:1,000 METERS

NOTES :

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

REFERENCE DRAWINGS :

1. PENSTOCK, PIER TYPE 1 DETAILS HLS–PS–07

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS

PENSTOCK

PLAN AND PROFILE, STA. 0+000 TO STA. 0+400

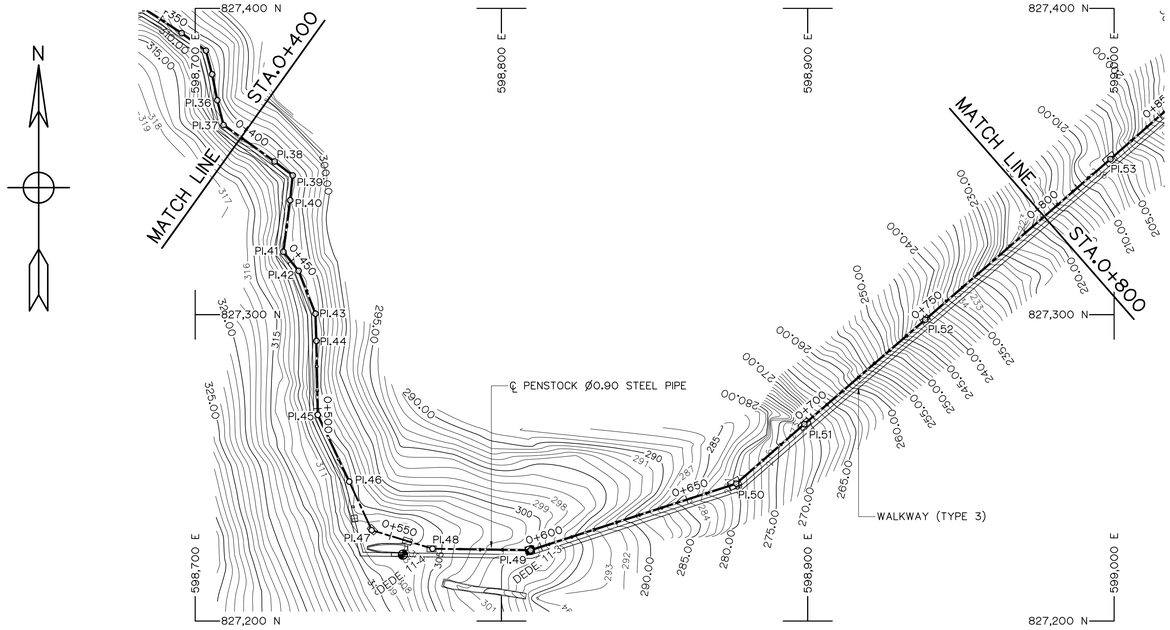
TEC FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

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

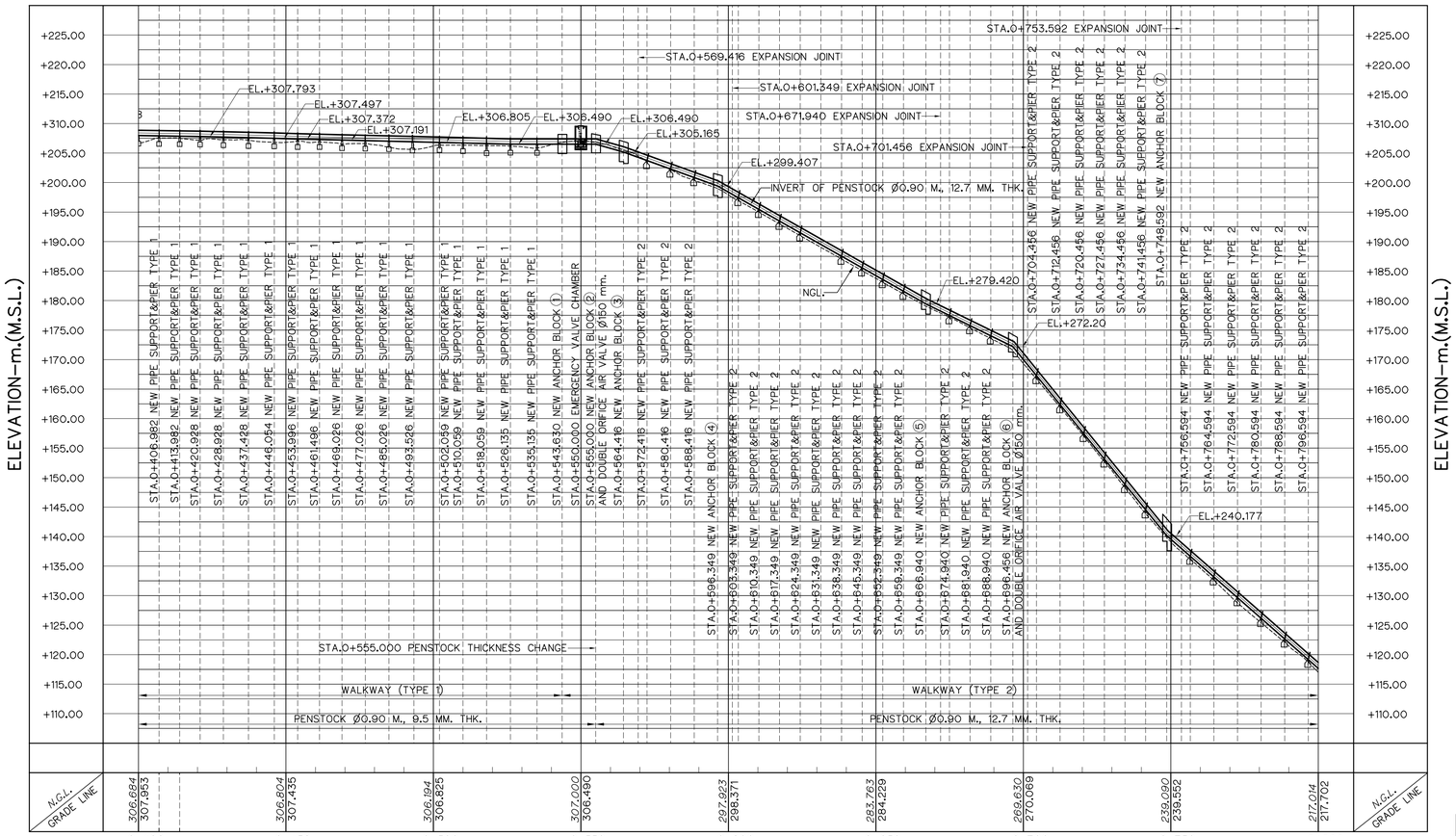
DRAWING NO. HLS–PS–01

SHEET NO. 22 OF 77



PLAN

SCALE 1:1,000



PROFILE

VERTICAL SCALE 1:500

HORIZONTAL SCALE 1:1,000

HORIZONTAL ALINEMENT OF PENSTOCK

NO. PI.	COORDINATE		PI. – PI.	DEFLECTION ANGLE	PI. STA.	BEARING
	N	E	(m)	(° – ' – ")	(km)	(N/S ° – ' – " E/W)
PI.37	827,361.896	598,709.258	8.344	40°–12'–02.48"	0+392.982	S 14°–13'–45.96"E
PI.38	827,349.984	598,725.915	20.478	01°–52'–20.66"	0+413.460	S 54°–25'–48.44"E
PI.39	827,345.444	598,731.844	7.468	58°–24'–15.16"	0+420.928	S52°–33'–27.78"E
PI.40	827,337.348	598,731.015	8.138	01°–39'–19.56"	0+429.066	S 5°–50'–47.39"W
PI.41	827,320.505	598,728.797	16.988	46°–05'–46.99"	0+446.054	S 7°–30'–06.95"W
PI.42	827,314.298	598,733.751	7.942	17°–04'–06.28"	0+453.996	S38°–35'–40.05"E
PI.43	827,300.316	598,739.266	15.030	19°–34'–47.91"	0+469.026	S 21°–31'–33.77"E
PI.44	827,291.428	598,739.568	8.893	00°–50'–58.11"	0+477.919	S 1°–56'–45.85"E
PI.45	827,267.292	598,740.030	24.140	24°–10'–00.20"	0+502.059	S 1°–05'–47.74"E
PI.46	827,245.519	598,750.305	24.076	10°–56'–35.31"	0+526.135	S25°–15'–47.94"E
PI.47	827,229.638	598,757.645	17.495	48°–21'–22.88"	0+543.630	S24°–48'–20.85"E
PI.48	827,223.617	598,777.540	20.786	15°–59'–07.95"	0+564.416	S73°–09'–43.72"E
PI.47	827,229.638	598,757.645	17.495	48°–21'–22.88"	0+543.630	S 24°–48'–20.85" E
PI.48	827,223.617	598,777.540	20.786	15°–59'–07.95"	0+564.416	S 73°–09'–43.72" E
PI.49	827,223.142	598,809.469	31.933	18°–45'–26.90"	0+596.349	S 89°–08'–51.67" E
PI.50	827,244.844	598,876.639	70.589	23°–14'–41.26"	0+666.938	N 72°–05'–41.42" E
PI.51	827,264.268	598,898.866	29.518	00°–19'–38.72"	0+696.456	N 48°–51'–00.17" E
PI.52	827,298.350	598,938.319	52.136	00°–06'–01.70"	0+748.592	N 49°–10'–38.89" E
PI.53	827,350.775	598,998.791	80.033	00°–15'–03.29"	0+828.625	N 49°–04'–37.19" E

NOTES :

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

REFERENCE DRAWINGS :

1. PENSTOCK, PIER TYPE 1 DETAILS	HLS-PS-07
2. PENSTOCK, PIER TYPE 2 DETAILS	HLS-PS-08

0 5 10 20 30 40

SCALE 1:500 METERS

0 10 20 40 50 80

SCALE 1:1,000 METERS

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
PLAN AND PROFILE, STA. 0+400 TO STA. 0+800

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS: FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

DEDE

DESIGNED ส.ต.6651

DRAWN

CHECKED ส.ต.7324

14/01/62
PROJECT MANAGER DATE

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED ว.ก.ไชยา

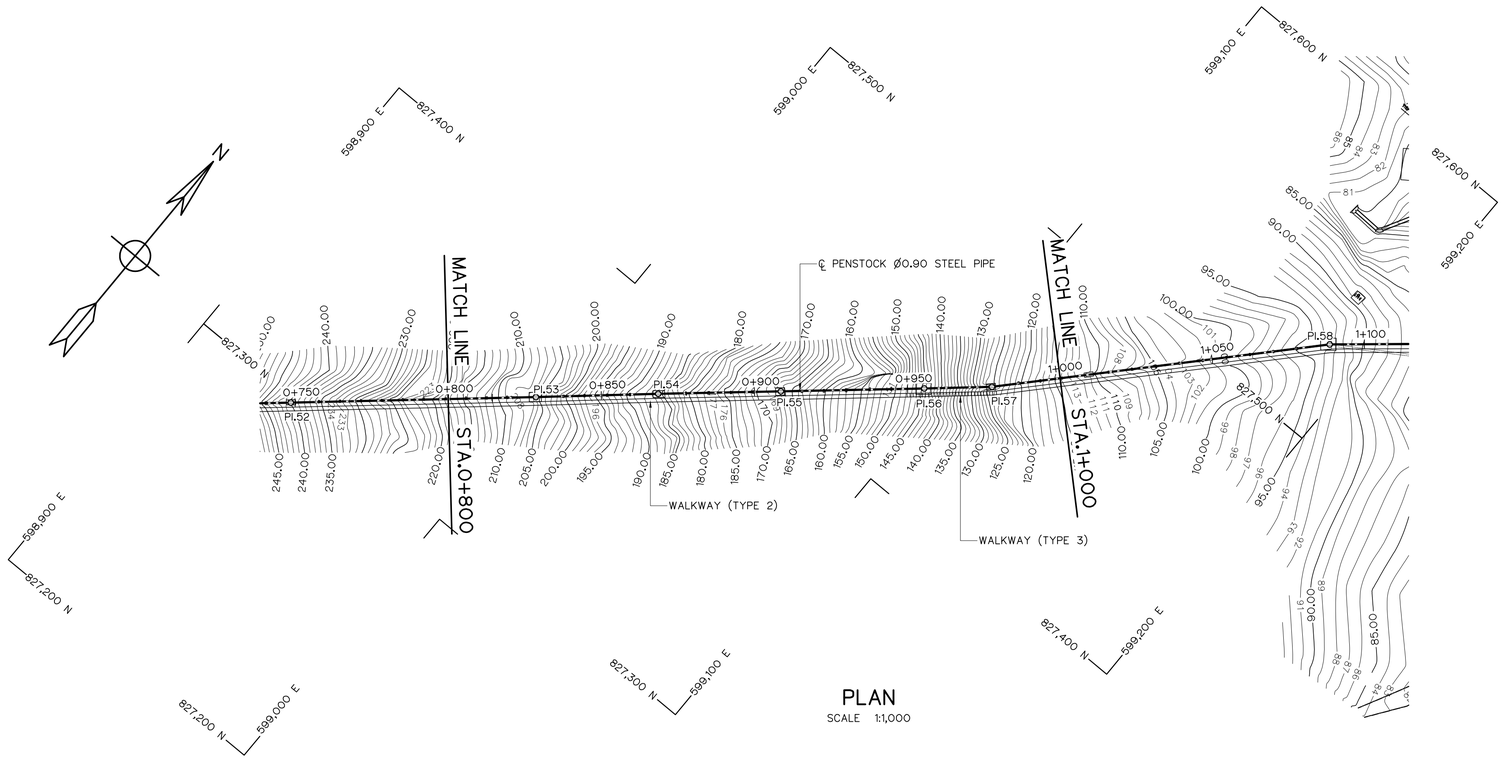
SUBMITTED

RECOMMENDED

APPROVED

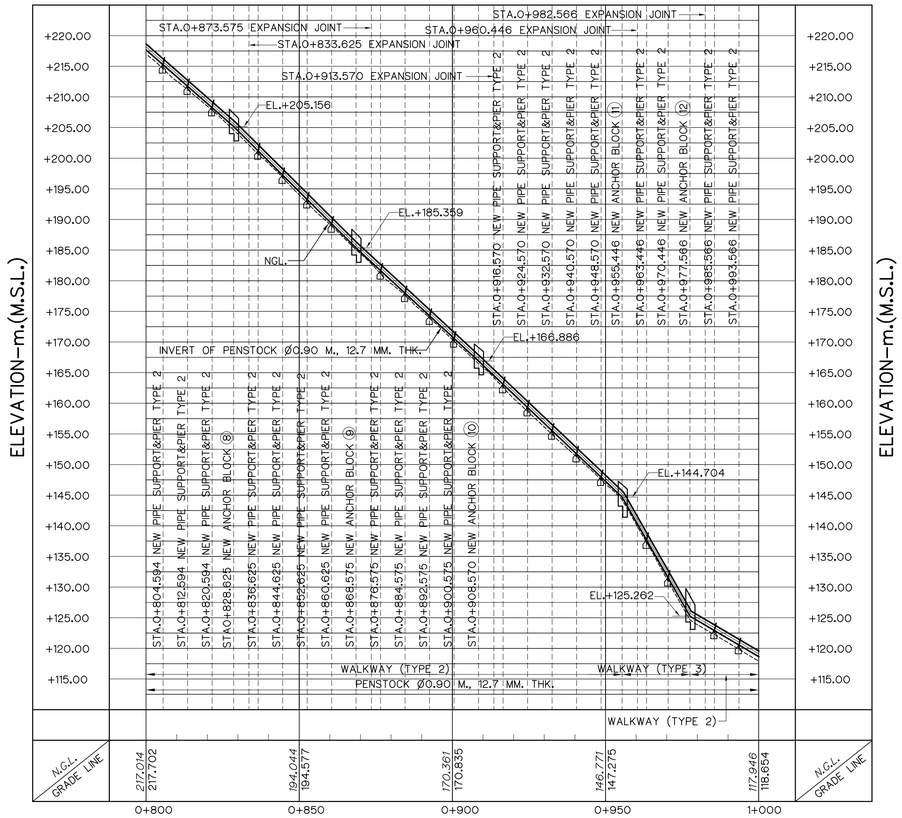
DRAWING NO. HLS-PS-02

SHEET NO. 23 OF 77



PLAN

SCALE 1:1,000



PROFILE

VERTICAL SCALE 1:500

HORIZONTAL SCALE 1:1,000

HORIZONTAL ALINEMENT OF PENSTOCK

NO. PI.	COORDINATE		PI. – PI.	DEFLECTION ANGLE	PI. STA.	BEARING
	N	E	(m)	(' – ' – ")	(km)	(N/S ' – ' – " E/W)
PI.52	827,298.350	598,938.319	52.136	00'-06'-01.70"	0+564.416	N 49'-10'-38.89" E
PI.53	827,350.775	598,998.791	80.033	00'-15'-03.29"	0+828.625	N 49'-04'-37.19" E
PI.54	827,377.076	599,028.862	39.950	00'-23'-19.14"	0+868.575	N 48'-49'-33.90" E
PI.55	827,403.202	599,059.145	39.995	00'-00'-09.70"	0+908.570	N 49'-12'-53.03" E
PI.56	827,433.824	599,094.636	46.876	00' -11'-25.30"	0+955.446	N 49'-12'-43.33" E
PI.57	827,448.330	599,111.336	22.120	05'-48'-44.46"	0+977.566	N 49'-01'-18.03" E
PI.58	827,529.328	599,187.423	111.130	06' -51'-24.99"	1+088.696	N 43'-12'-33.58" E
PI.59	827,558.281	599,222.009	45.105	22' -14'-02.16"	1+133.801	N 50'-03'-58.56" E

NOTES :

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

REFERENCE DRAWINGS :

1. PENSTOCK, PIER TYPE 2 DETAILS HLS-PS-08

0 5 10 20 30 40

SCALE 1:500 METERS

0 10 20 40 50 80

SCALE 1:1,000 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

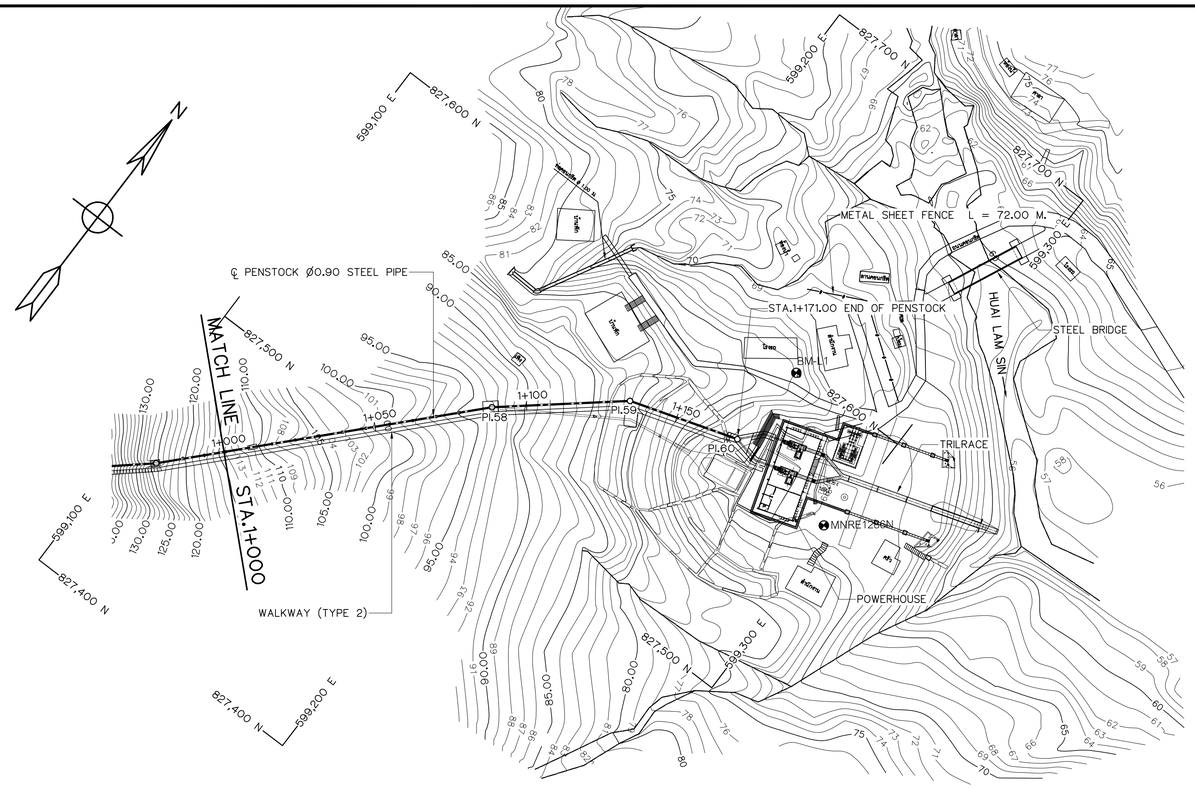
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
PLAN AND PROFILE, STA. 0+800 TO STA. 1+000

FEC FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

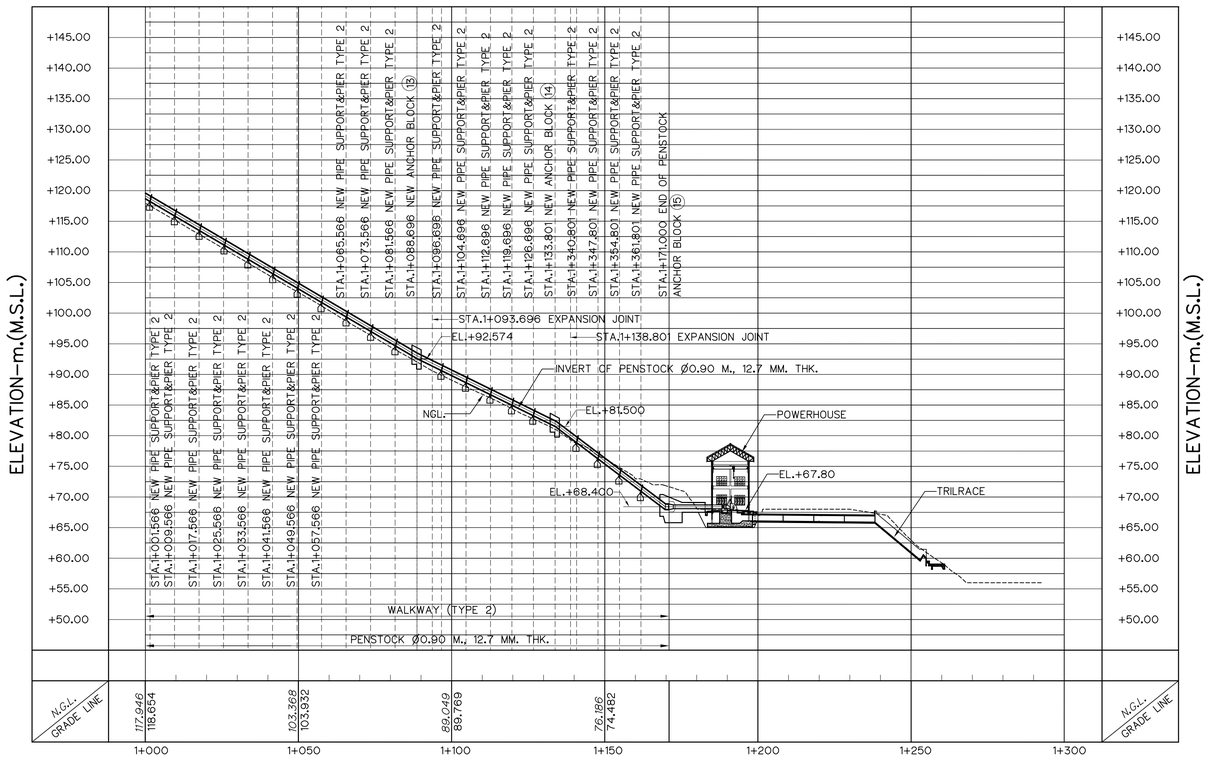
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

DESIGNED	สมชัย	REVIEWED	ไม่มีการตรวจ
DRAWN	ณัฐวุฒิ	SUBMITTED	
CHECKED	สมชัย	RECOMMENDED	
	สมชัย	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO.	HLS-PS-03
		SHEET NO.	24 OF 77



PLAN

SCALE 1:1,000



PROFILE

VERTICAL SCALE 1:500

HORIZONTAL SCALE 1:1,000

HORIZONTAL ALINEMENT OF PENSTOCK

NO. PI.	COORDINATE		PI. – PI.	DEFLECTION ANGLE	PI. STA.	BEARING
	N	E	(m)	(° – ' – ")	(km)	(N/S ° – ' – " E/W)
PI.57	827,448.330	599,111.336	22.120	05°–48'–44.46"	0+977.566	N 49°–01'–18.03" E
PI.58	827,529.328	599,187.423	111.130	06°–51'–24.99"	1+088.696	N 43°–12'–33.58" E
PI.59	827,558.281	599,222.009	45.105	22°–14'–02.16"	1+133.801	N 50°–03'–58.56" E
PI.60	827,569.591	599,257.447	37.199	–	1+171.000	N 72°–17'–58.46" E

NOTES :

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

REFERENCE DRAWINGS :

1. PENSTOCK, PIER TYPE 2 DETAILS HLS–PS–08

0 5 10 20 30 40
SCALE 1:500 METERS

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS

PENSTOCK

PLAN AND PROFILE, STA. 1+000 TO STA. 1+171.00

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED ร.ท.กิตติชัย

DESIGNED ส.ต.ต.6651 SUBMITTED

DRAWN

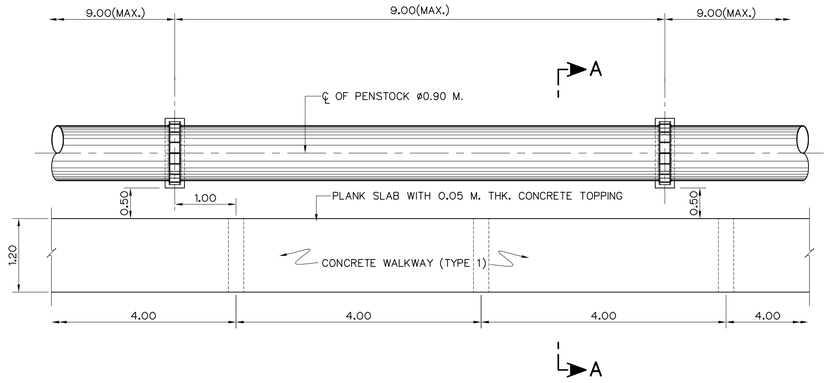
CHECKED ส.ต.ท.7324 RECOMMENDED

APPROVED

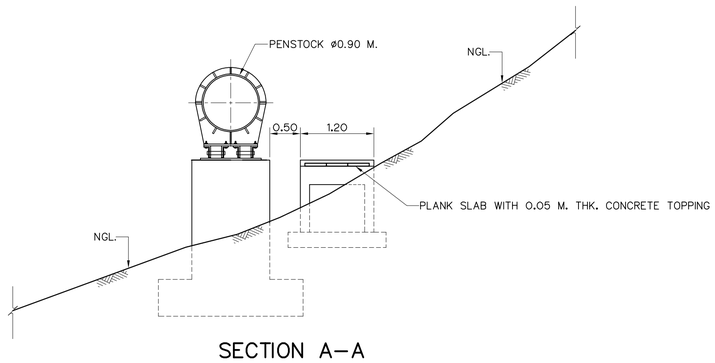
PROJECT MANAGER 14/01/62 DATE

DRAWING NO. HLS–PS–04

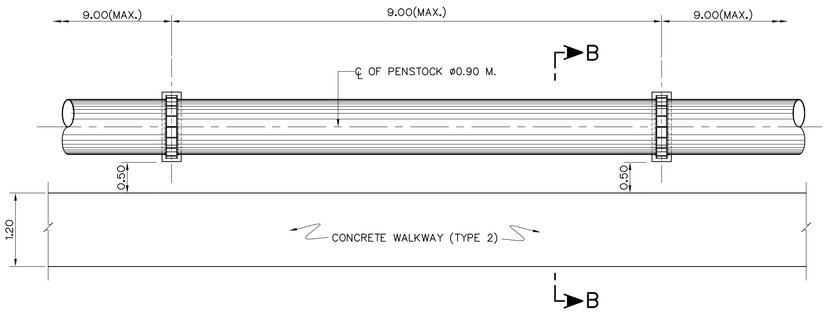
SHEET NO. 25 OF 77



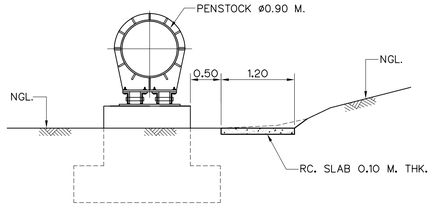
WALKWAY PLAN (TYPE 1)
SCALE 1:50



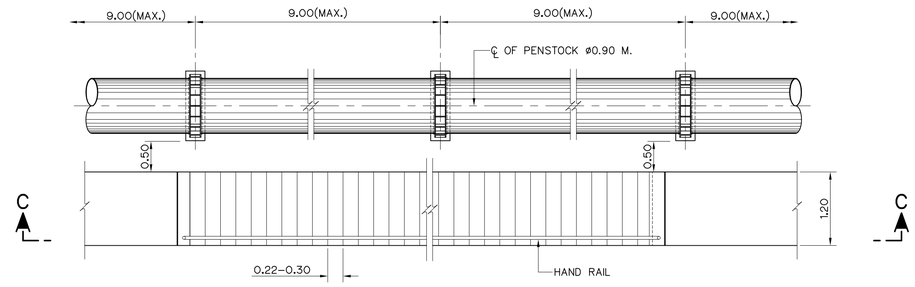
SECTION A–A
SCALE 1:50



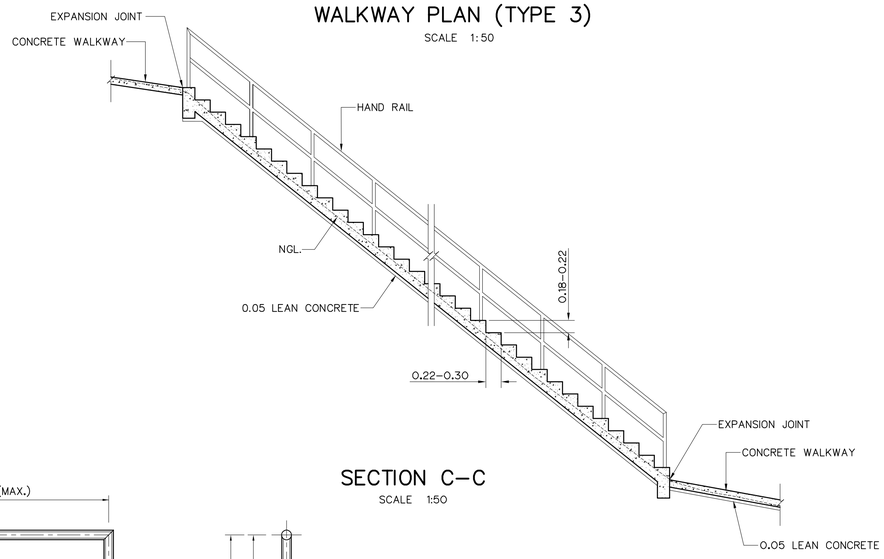
WALKWAY PLAN (TYPE 2)
SCALE 1:50



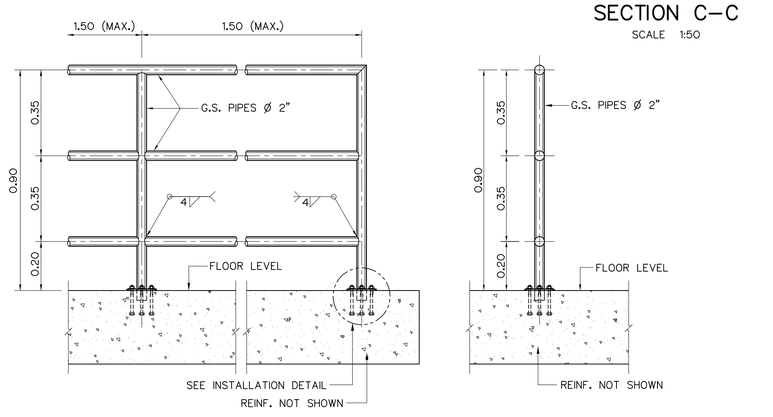
SECTION B–B
SCALE 1:50



WALKWAY PLAN (TYPE 3)
SCALE 1:50

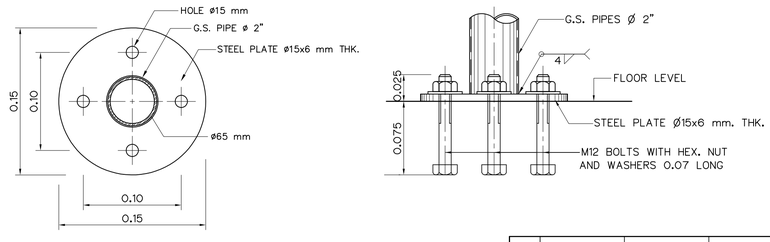


SECTION C–C
SCALE 1:50



INTERMEDIATE POST END POST TYPICAL SECTION

HANDRAIL
NOT TO SCALE



INSTALLATION DETAIL
NOT TO SCALE

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

REFERENCE DRAWINGS :
1. PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA. 1+171.00 HLS-PS-01 TO HLS-PS-04

0 0.5 1 2 3 4
SCALE 1:50 METERS

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

HUAI LAM SIN HYDROPOWER PROJECT

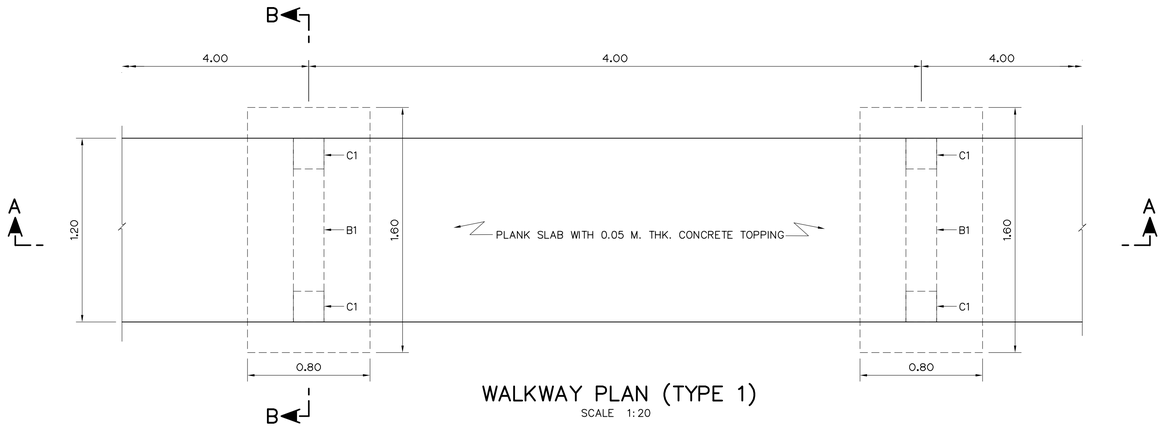
CIVIL WORKS
PENSTOCK
DETAILS OF WALKWAY

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

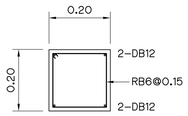
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY
REVIEWED ว.ก.ก.(ชาย)

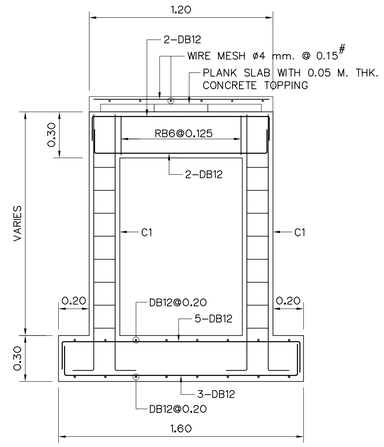
DESIGNED	ส.ต.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	ส.ต.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO. HLS-PS-05	SHEET NO. 26 OF 77



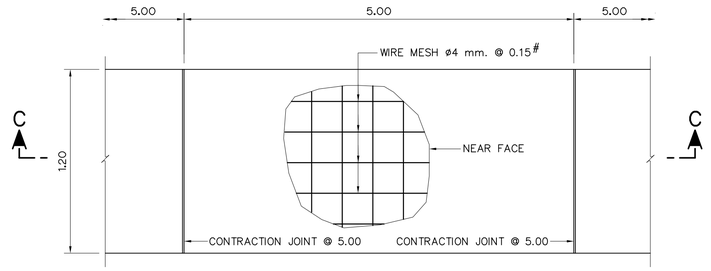
WALKWAY PLAN (TYPE 1)
SCALE 1:20



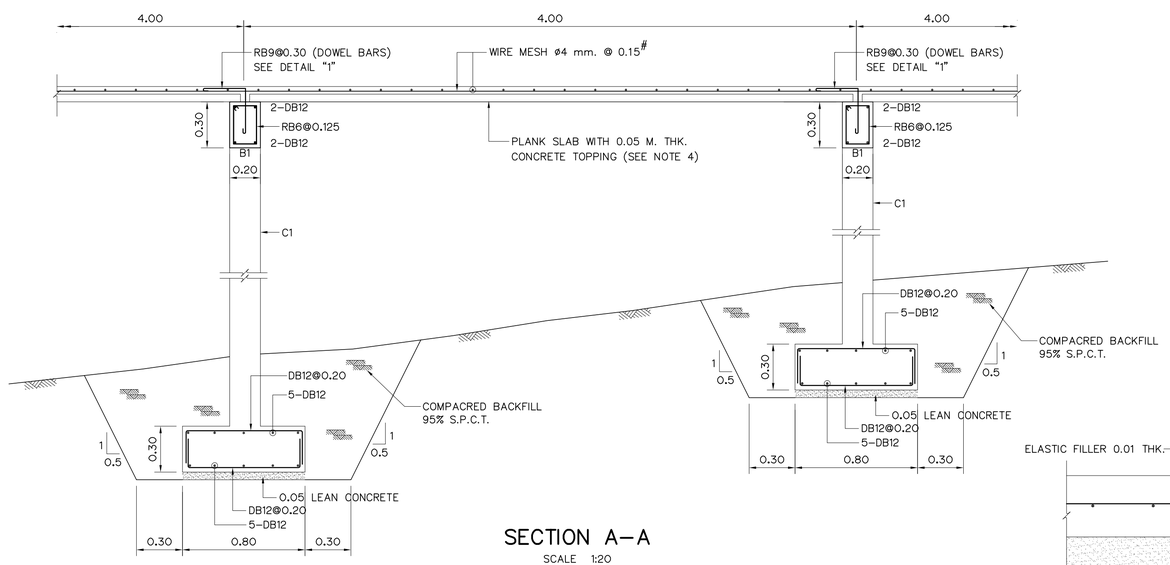
C1
SCALE 1:10



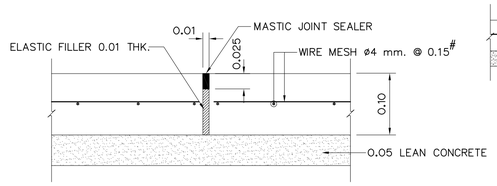
SECTION B–B
SCALE 1:20



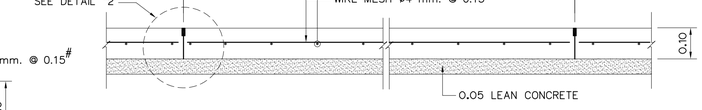
WALKWAY PLAN (TYPE 2)
SCALE 1:20



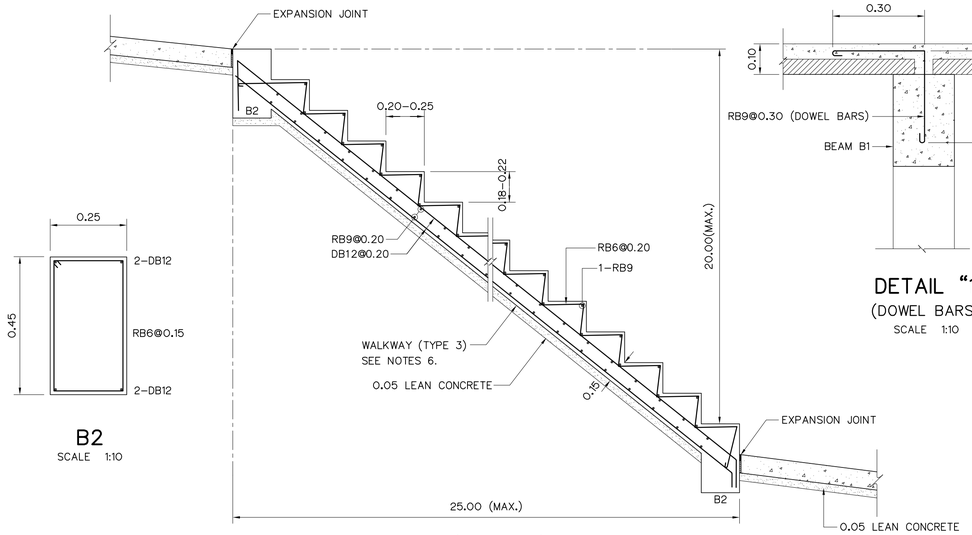
SECTION A–A
SCALE 1:20



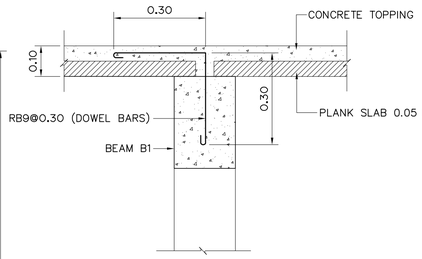
EXPANSION JOINT DETAIL
(SEE NOTES 5.)
SCALE 1:5



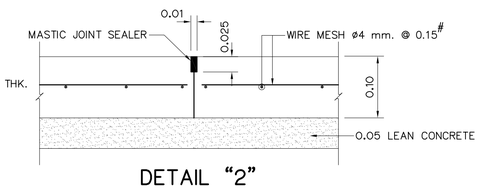
SECTION C–C
SCALE 1:20



WALKWAY SECTION (TYPE 3)
SCALE 1:20

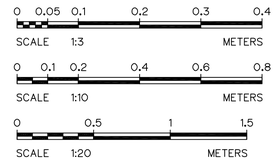


DETAIL "1"
(DOWEL BARS)
SCALE 1:10



DETAIL "2"
(CONTRACTION JOINT)
SCALE 1:5

B2
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. HLS-GN-03
3. ALLOWABLE BEARING CAPACITY OF FOUNDATION SHALL NOT BE LESS THAN 10 T/M.^{2}
4. SAFE SUPERIMPOSED SERVICE LOAD OF PLANK SLAB SHALL NOT BE LESS THAN 400 KG./M.^{2}
5. EXPANSION JOINT SHALL BE PROVIDED AT THE INTEVAL OF 100 METERS OR LESS THAN.
6. THE RISERS AND THREADS SHALL BE DETERMINED BY THE CONTRACTOR. TO SUIT THE FIELD CONDITIONS AND SHALL BE SUBMITED TO FIELD ENGINEER FOR APPROVAL.

REFERENCE DRAWINGS :

1. PENSTOCK DETAILS OF WALKWAY HLS-PS-05

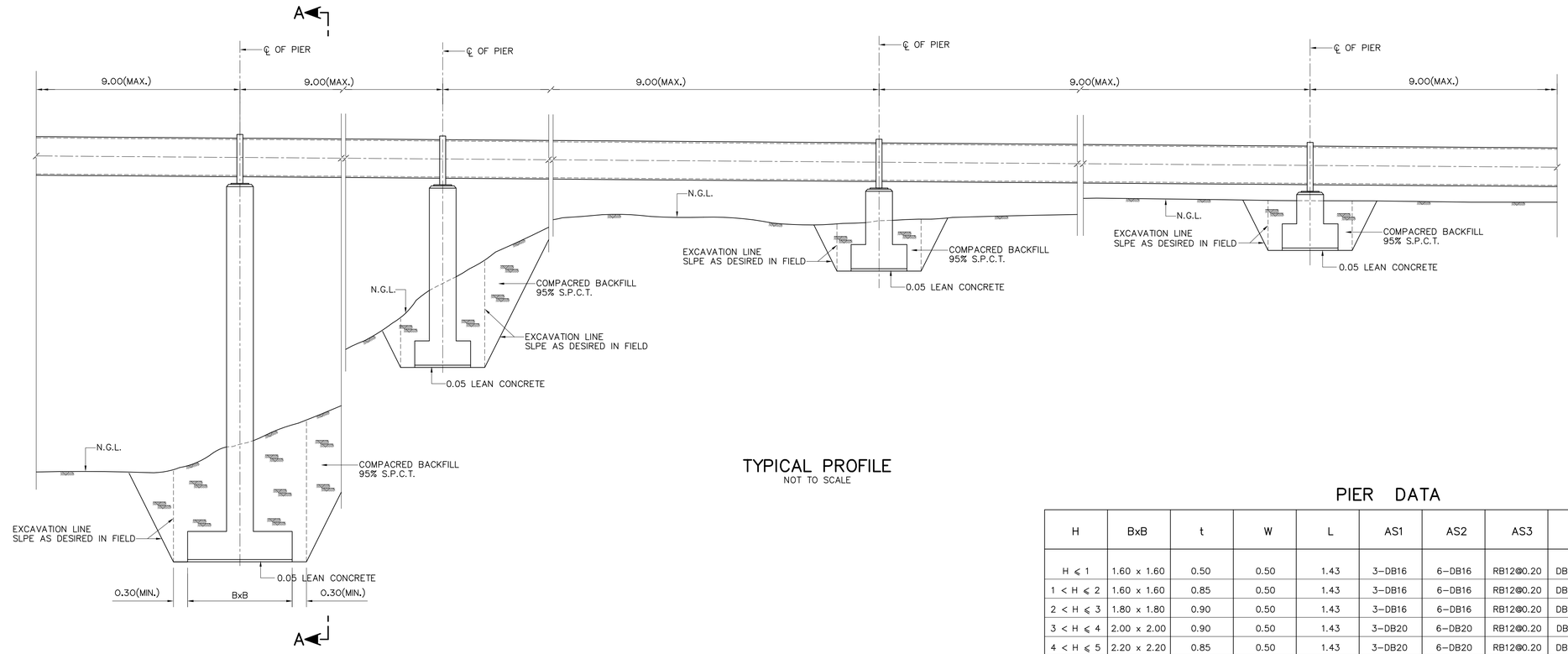
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
REINFORCEMENT DETAILS WALKWAY

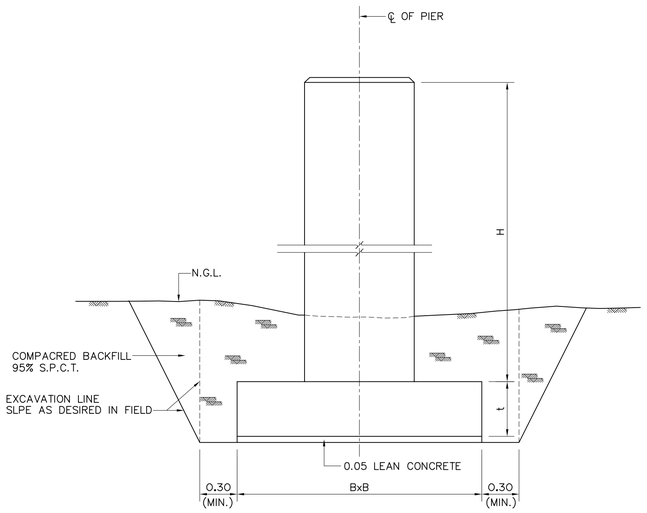
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED ว.ก.ก(ช.ห)
DESIGNED 28J.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED 28J.7324	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS-PS-06
	SHEET NO. 27 OF 77



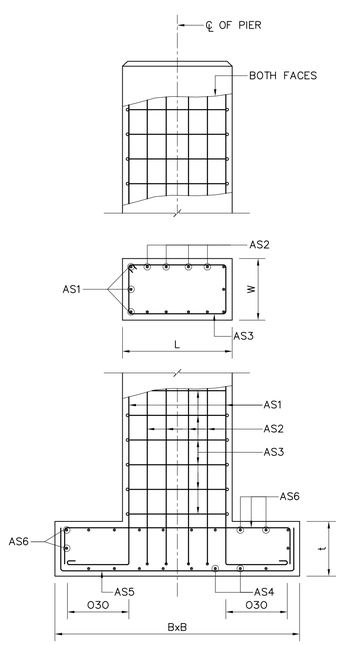
TYPICAL PROFILE
NOT TO SCALE

PIER DATA

H	BxB	t	W	L	AS1	AS2	AS3	AS4	AS5	AS6
H ⩽ 1	1.60 x 1.60	0.50	0.50	1.43	3-DB16	6-DB16	RB12@0.20	DB12@0.20	DB12@0.20	RB12@0.20
1 < H ⩽ 2	1.60 x 1.60	0.85	0.50	1.43	3-DB16	6-DB16	RB12@0.20	DB12@0.20	DB12@0.20	RB12@0.20
2 < H ⩽ 3	1.80 x 1.80	0.90	0.50	1.43	3-DB16	6-DB16	RB12@0.20	DB12@0.20	DB12@0.20	RB12@0.20
3 < H ⩽ 4	2.00 x 2.00	0.90	0.50	1.43	3-DB20	6-DB20	RB12@0.20	DB12@0.15	DB12@0.15	RB12@0.20
4 < H ⩽ 5	2.20 x 2.20	0.85	0.50	1.43	3-DB20	6-DB20	RB12@0.20	DB16@0.25	DB16@0.25	RB12@0.20
5 < H ⩽ 6	2.65 x 2.65	1.00	0.50	1.43	3-DB20	7-DB20	RB12@0.20	DB16@0.20	DB16@0.20	RB12@0.20



SECTION A-A
PIER
NOT TO SCALE



REINFORCEMENT DETAIL
PIER
NOT TO SCALE

NOTES :
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS. UNLESS OTHERWISE SHOWN.
2. BASE OF FOOTINGS SHOULD BE DETEMNED IN BY EMBEDED INTO STABLE EARTH OR ROCK FOUNDATION WHICH THE MINIMUM ALLOWABLE BEARING CAPACITY NOT LESS THAN 15 T./M.^{2} OR APPROVED BY FIELD ENCINEER

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

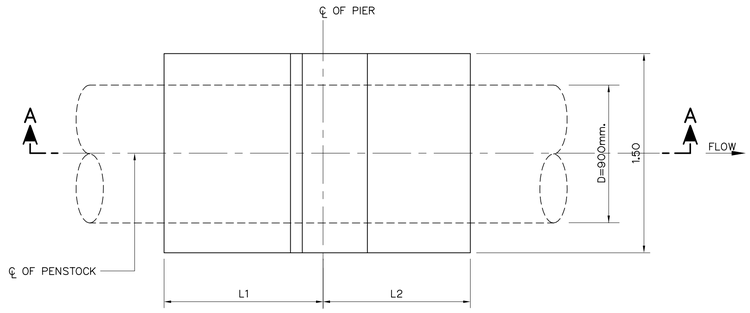
CIVIL WORKS
PENSTOCK
PIER TYPE 1 DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

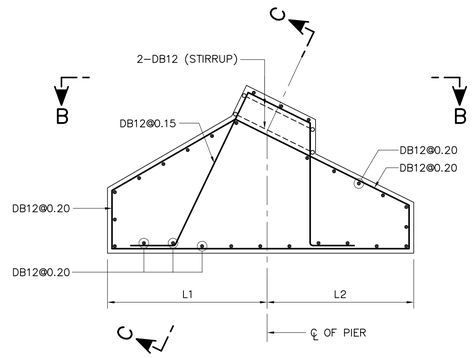
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

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

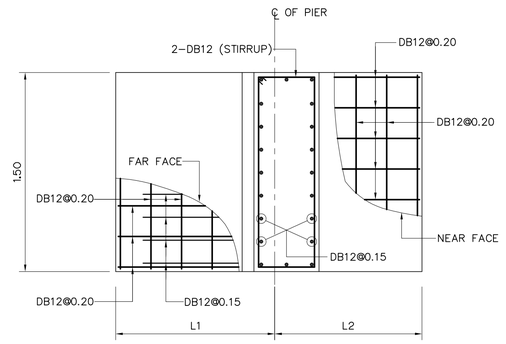
DRAWING NO. HLS-PS-07
SHEET NO. 28 OF 77



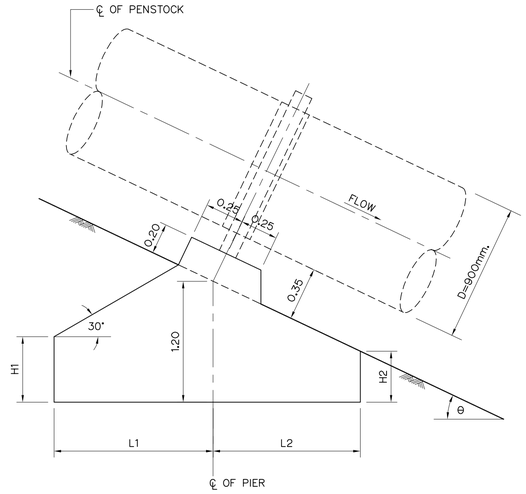
PLAN
SCALE 1:20



SECTION A-A
SCALE 1:20



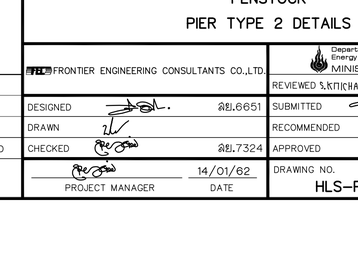
SECTION B-B
SCALE 1:20



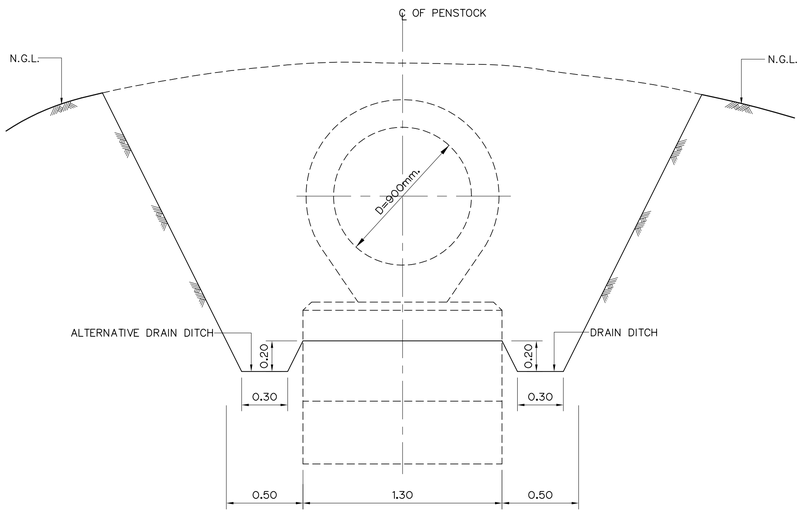
ELEVATION
SCALE 1:20

PIER DIMENSIONS

KM		SLOPE (θ)	L1	L2	H1	H2
FROM	TO	(DEGREE)	(m.)	(m.)	(m.)	(m.)
0+572.416	0+588.416	10°-13'-05"	1.50	1.50	0.52	0.93
0+605.341	0+658.349	15°-48'-34"	1.50	1.50	0.54	0.78
0+676.940	0+686.940	13°-44'-49"	1.50	1.50	0.53	0.83
0+705.456	0+740.456	31°-33'-23"	1.60	1.40	0.53	0.34
0+756.594	0+828.625	23°-38'-00"	1.60	1.40	0.51	0.59
0+836.625	0+860.625	26°-21'-39"	1.60	1.40	0.52	0.51
0+876.575	0+900.575	24°-47'-26"	1.60	1.40	0.51	0.55
0+916.570	0+948.570	25°-19'-29"	1.60	1.40	0.51	0.54
0+963.446	0+970.446	41°-18'-48"	1.95	1.05	0.35	0.28
0+985.566	1+081.566	16°-24'-51"	1.50	1.50	0.54	0.76
1+096.696	1+120.696	13°-44'-53"	1.50	1.50	0.53	0.83
1+339.801	1+355.801	20°-52'-19"	1.60	1.40	0.50	0.67



SECTION C-C
SCALE "A"



TYPICAL SECTION OF PENSTOCK TRENCH
SCALE 1:20

NOTES :
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS. UNLESS OTHERWISE SHOWN.
2. SIDE SLOPE CAN BE ADJUSTED IN FIELD FOR APPROPRIATE SOIL TYPES
3. BASE OF FOOTINGS SHOULD BE DETEMNED IN BY EMBEDED INTO STABLE EARTH OR ROCK FOUNDATION WHICH THE MINIMUM ALLOWABLE BEARING CAPACITY NOT LESS THAN 15 T./M.^{2} OR APPROVED BY FIELD ENCINEER

0 0.5 1 1.5
SCALE 1:20 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
PIER TYPE 2 DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

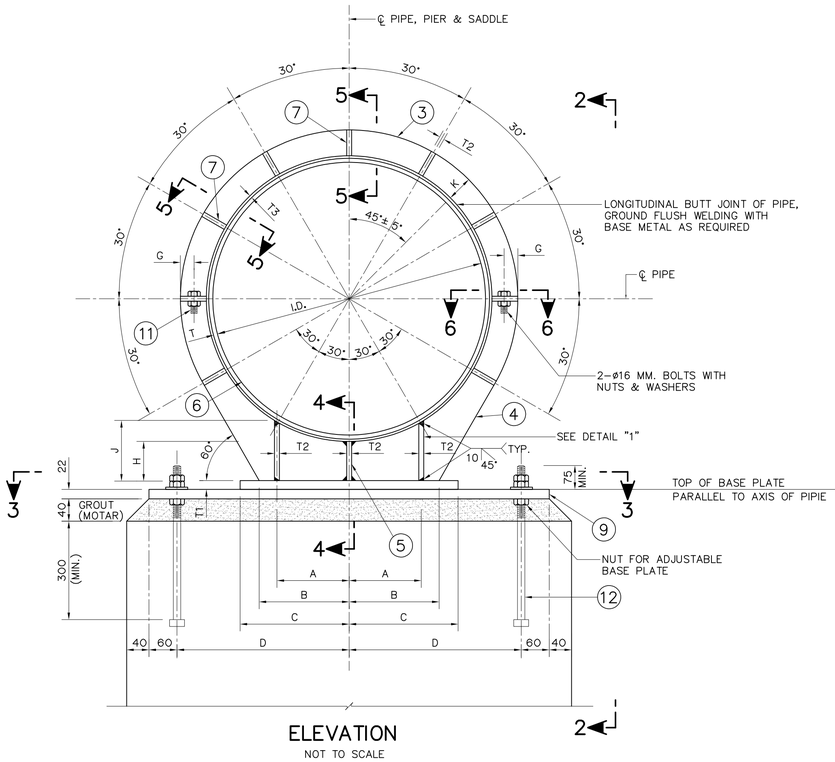
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED รศ.กิตติชัย

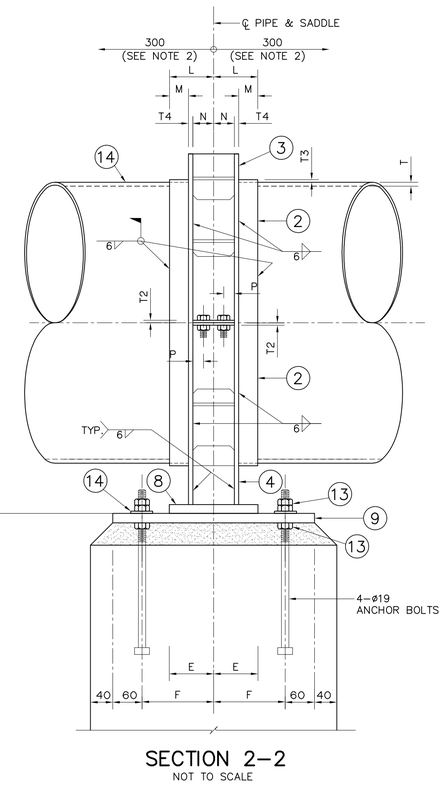
DESIGNED สย.6651
DRAWN
CHECKED สย.7324
PROJECT MANAGER 14/01/62 DATE

SUBMITTED
RECOMMENDED
APPROVED

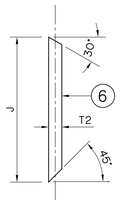
DRAWING NO. HLS-PS-08
SHEET NO. 29 OF 77



ELEVATION
NOT TO SCALE



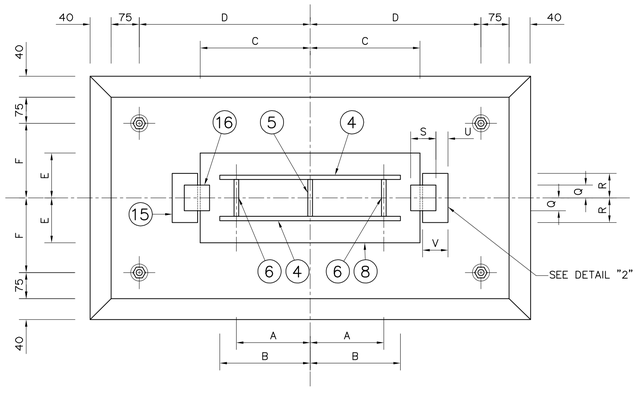
SECTION 2–2
NOT TO SCALE



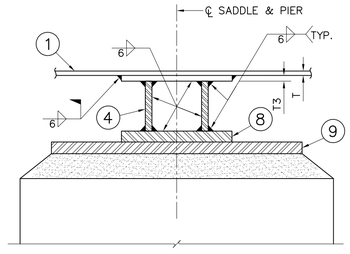
DETAIL "1"
NOT TO SCALE

BILL OF MATERIALS
(PER ONE SET OF SUPPORT)

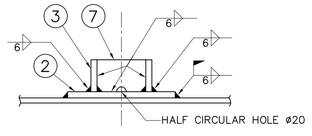
ITEMS	DESCRIPTION	MATERRIAL	QUAN.	REMARKS
1	PENSTOCK STEEL PIPE	ASTM – A 283 , GRADE D	–	
2	REINFORCINC PADS	ASTM – A 283 , GRADE D	2	
3	UPPER RINGS	ASTM – A 283 , GRADE D	2	
4	LOWER RINGS	ASTM – A 283 , GRADE D	2	
5	STIFFENER PLATES 12x120x120	ASTM – A 283 , GRADE D	1	
6	STIFFENER PLATES 12x80x116	ASTM – A 283 , GRADE D	2	
7	STIFFENER PLATES 12x120x75	ASTM – A 283 , GRADE D	7	
8	SADDLE PLATE 22x270x750	ASTM – A 36	1	SEE NOTE 3
9	BASE PLATE 22x600x1350	ASTM – A 36	1	GALVANIZED
10	BOLTING PLATES 12x75x120	ASTM – A 283 , GRADE D	4	
11	BOLTS ø16x60 W/NUT & WASHER	ASTM – A 325	4	GALVANIZED
12	ANCHOR BOLTS ø19x350	ASTM – A 307 , GRADE B	4	SEE NOTE 4
13	NUTS ø22	ASTM – A 307 , GRADE B	12	GALVANIZED
14	WASHER ø22	ASTM – A 307 , GRADE B	4	GALVANIZED
15	GUIDE PLATE 25x75x130	ASTM – A 36	2	
16	UPLIFT PLATE 22x75x70	ASTM – A 36	2	



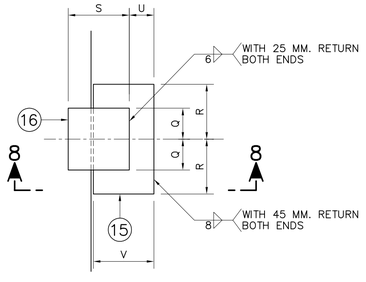
SECTION 3–3
NOT TO SCALE



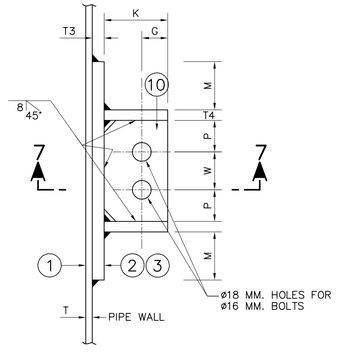
SECTION 4–4
NOT TO SCALE



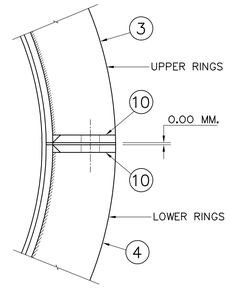
SECTION 5–5
NOT TO SCALE



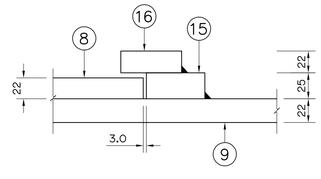
DETAIL "2"
NOT TO SCALE



SECTION 6–6
NOT TO SCALE



SECTION 7–7
NOT TO SCALE



SECTION 8–8
NOT TO SCALE

NOTES :
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS. UNLESS OTHERWISE SHOWN.
2. NO SPIRAL WELDED OF PIPE IN THESE REGION
3. GALVANIZED ONLY PORTION EXPOSED TO WEATHER
4. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, SHOP DRAWING SHALL BE DESIGNED BY CONTRACTOR UNDER APPROVAL OF FIELD ENGINEER.

SUPPORT DIMENSIONS

SUPPORT TYPE	PIPE (MM.)		FABRICATION DIMENSION, UNIT IN MM.																			PLATES THICKNESS (MM.)				REMARKS
	I.D.	T	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	U	V	W	T1	T2	T3	T4	
1	900	9.5	237	290	375	600	135	225	30	120	184	75	135	60	60	35	35	65	75	30	75	50	22	12	12	12	
2	900	12.7	239	292	375	600	135	225	30	120	184	75	135	60	60	35	35	65	75	30	75	50	22	12	12	12	

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

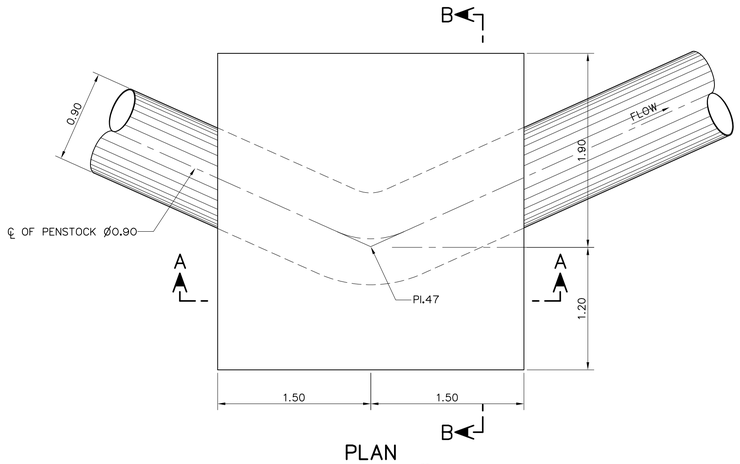
CIVIL WORKS
PENSTOCK
SUPPORT ELEVATION, SECTIONS AND DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

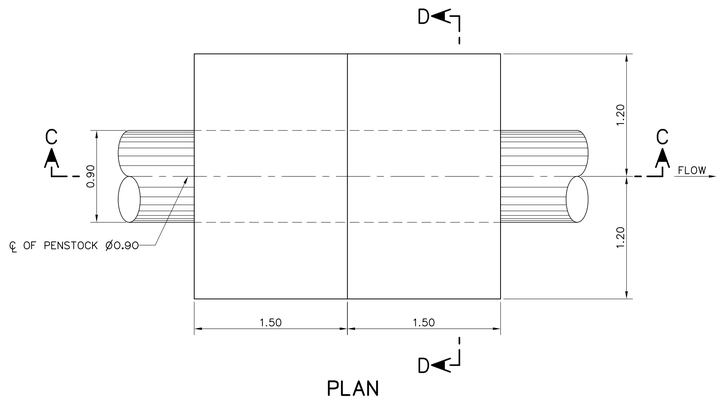
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

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

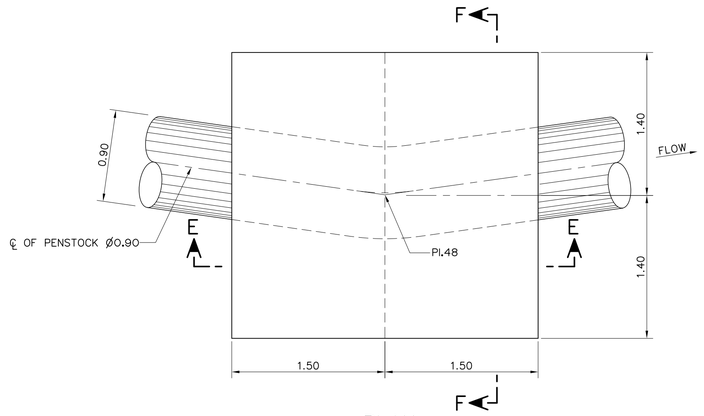
DRAWING NO. HLS-PS-09
SHEET NO. 30 OF 77



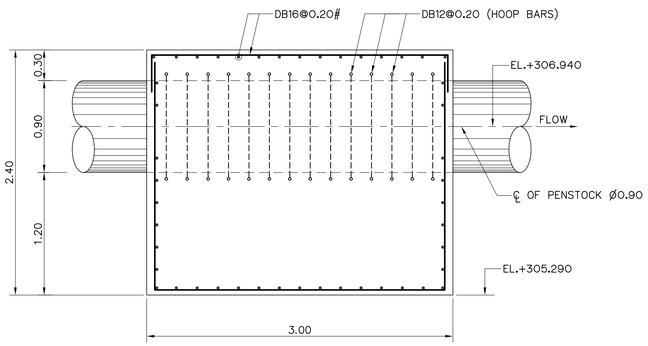
PLAN
ANCHOR (1)
SCALE 1:30



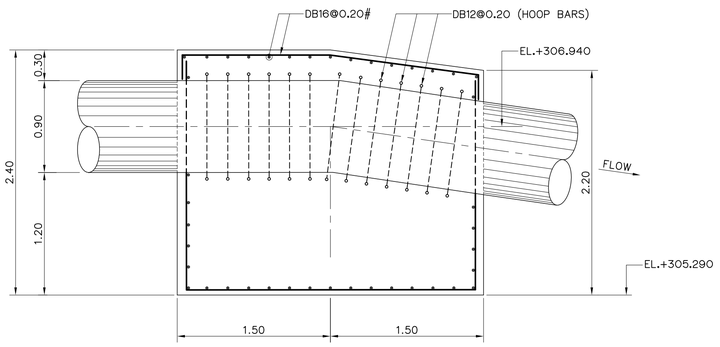
PLAN
ANCHOR (2)
SCALE 1:30



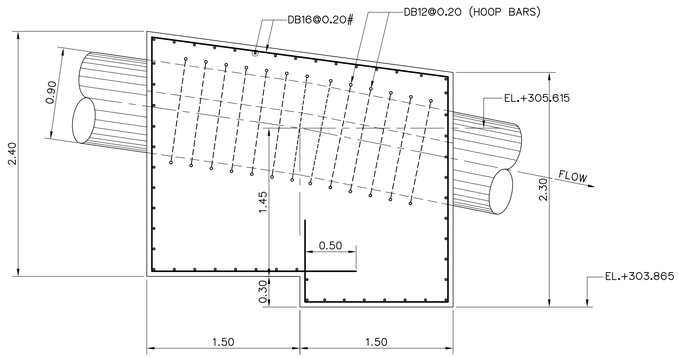
PLAN
ANCHOR (3)
SCALE 1:30



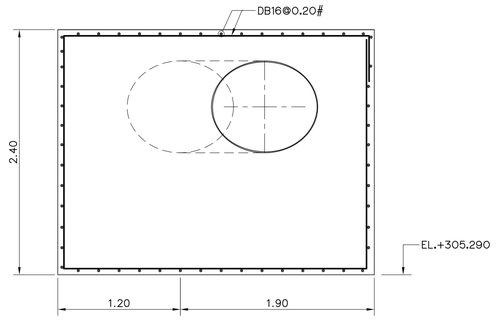
SECTION A–A
ANCHOR (1)
SCALE 1:30



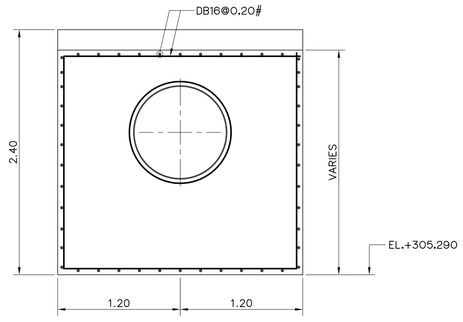
SECTION C–C
ANCHOR (2)
SCALE 1:30



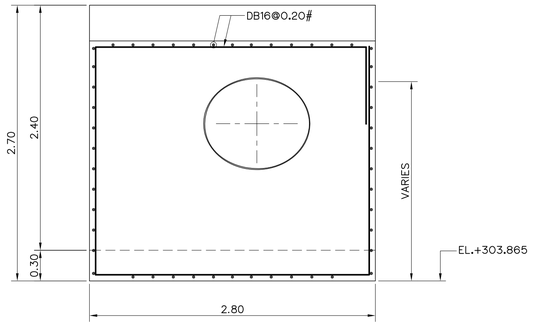
SECTION E–E
ANCHOR (3)
SCALE 1:30



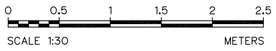
SECTION B–B
ANCHOR (1)
SCALE 1:30

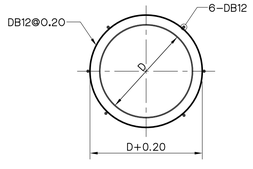


SECTION D–D
ANCHOR (2)
SCALE 1:30



SECTION F–F
ANCHOR (3)
SCALE 1:30





TYPICAL HOOP BAR
SCALE 1:30

NOTES :

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

REFERENCE DRAWINGS :

1. PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA. 1+171.00 HLS-PS-01, 04

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

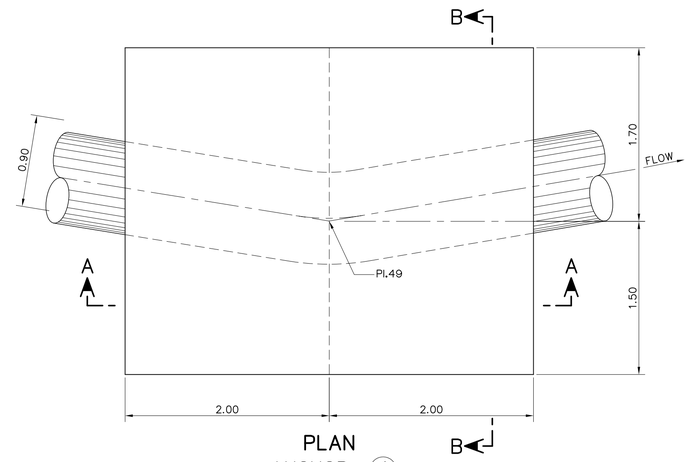
CIVIL WORKS
PENSTOCK
ANCHOR BLOCK (1), (2) & (3)
PLANS AND REINFORCEMENT DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

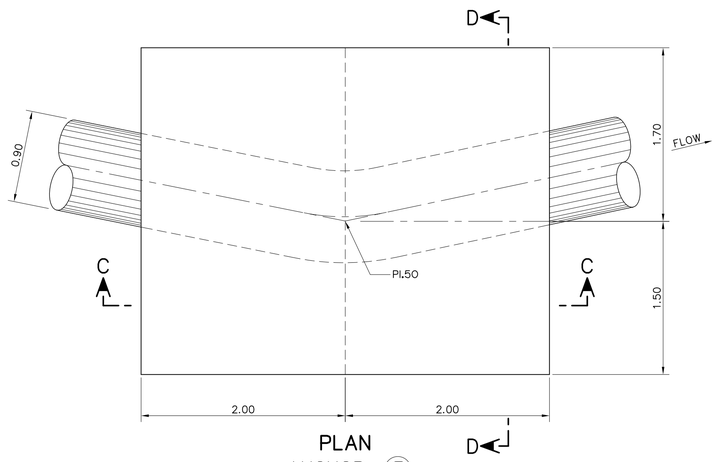
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED ว.ศักดิ์ชัย

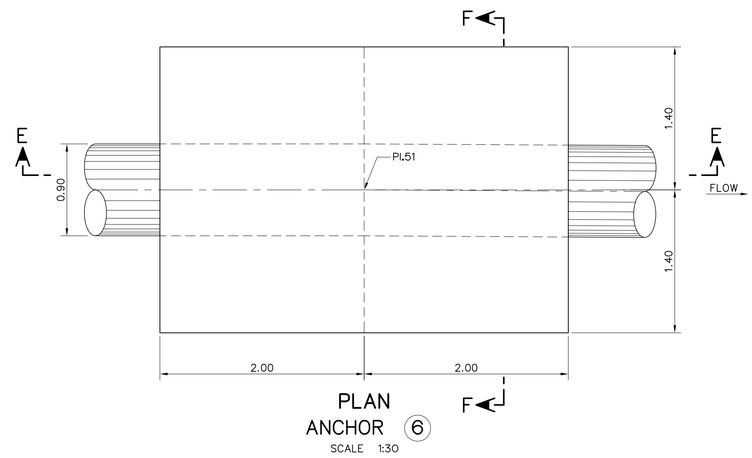
DESIGNED	ส.ย.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	ส.ย.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO.	HLS-PS-10
		SHEET NO.	31 OF 77



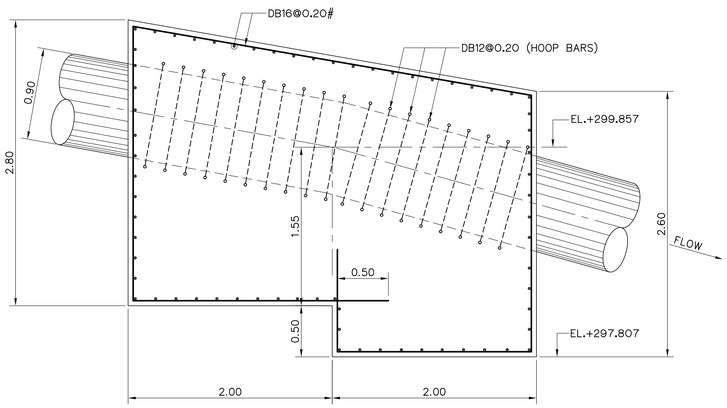
PLAN
ANCHOR (4)
SCALE 1:30



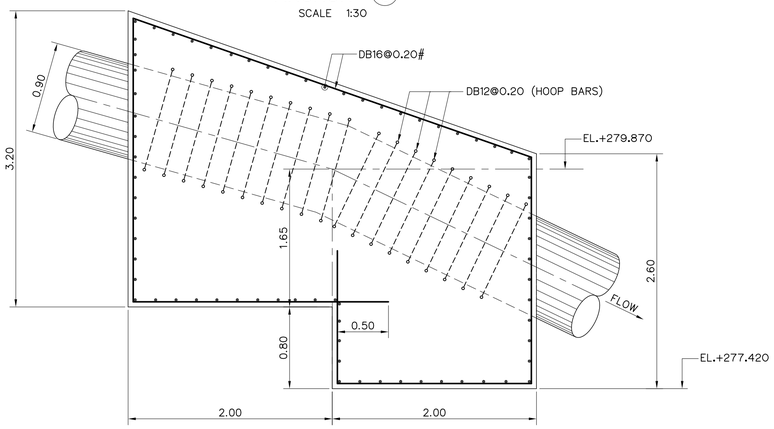
PLAN
ANCHOR (5)
SCALE 1:30



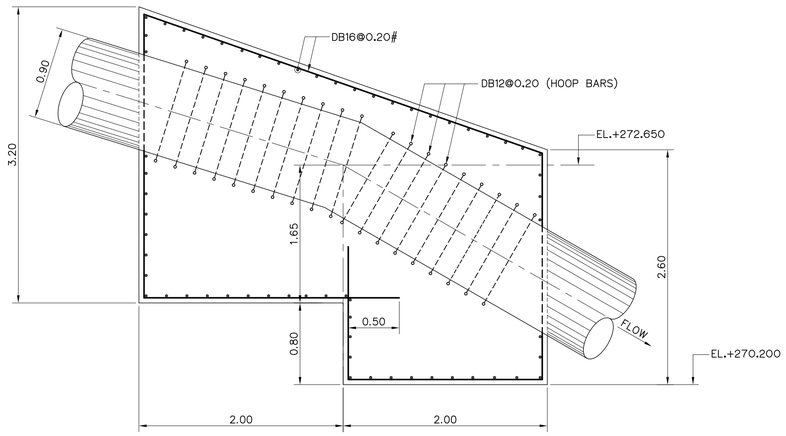
PLAN
ANCHOR (6)
SCALE 1:30



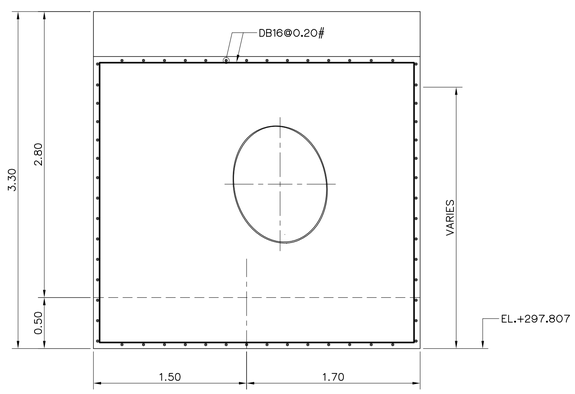
SECTION A–A
ANCHOR (4)
SCALE 1:30



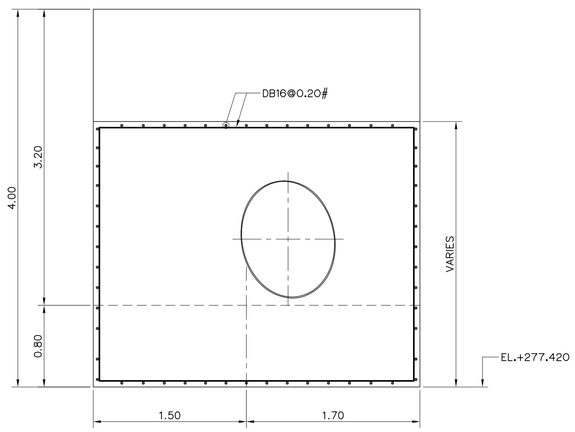
SECTION C–C
ANCHOR (5)
SCALE 1:30



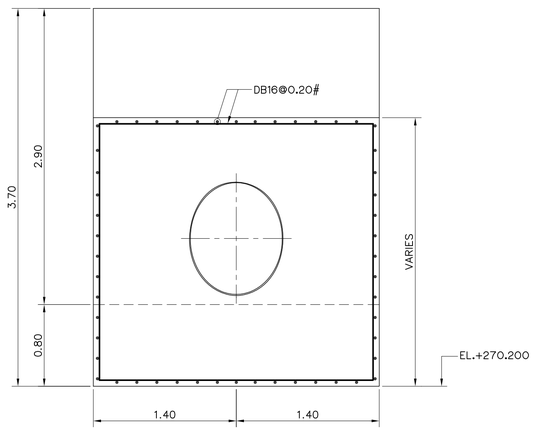
SECTION E–E
ANCHOR (6)
SCALE 1:30



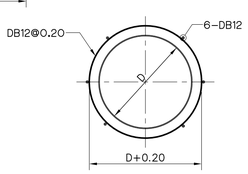
SECTION B–B
ANCHOR (4)
SCALE 1:30



SECTION D–D
ANCHOR (5)
SCALE 1:30



SECTION F–F
ANCHOR (6)
SCALE 1:30



TYPICAL HOOP BAR
SCALE 1:30

0 0.5 1 1.5 2 2.5
SCALE 1:30 METERS

NOTES :

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

REFERENCE DRAWINGS :

1. PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA. 1+171.00 HLS–PS–01, 04

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

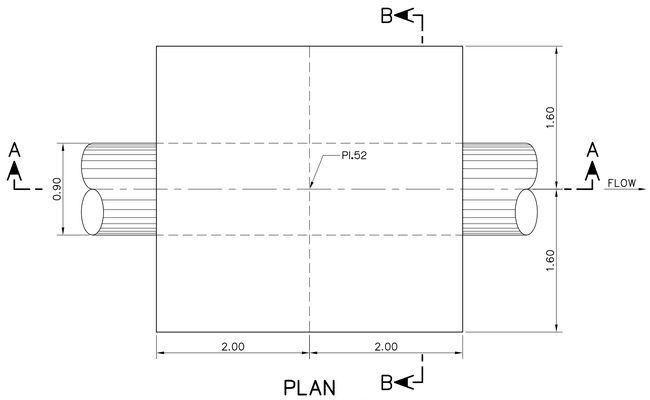
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
ANCHOR BLOCK (4), (5) & (6)
PLANS AND REINFORCEMENT DETAILS

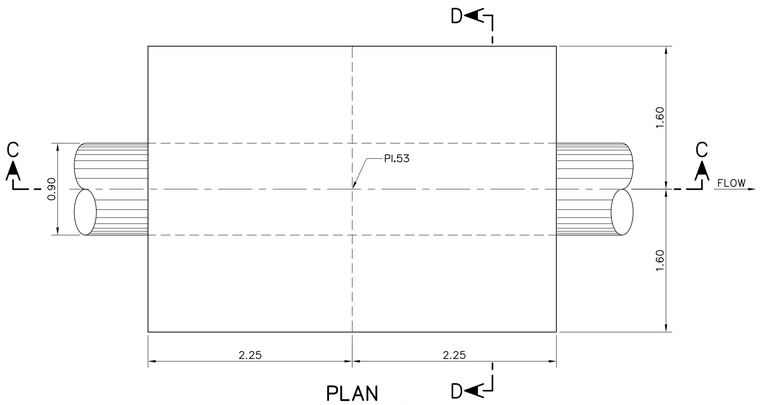
FEC FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

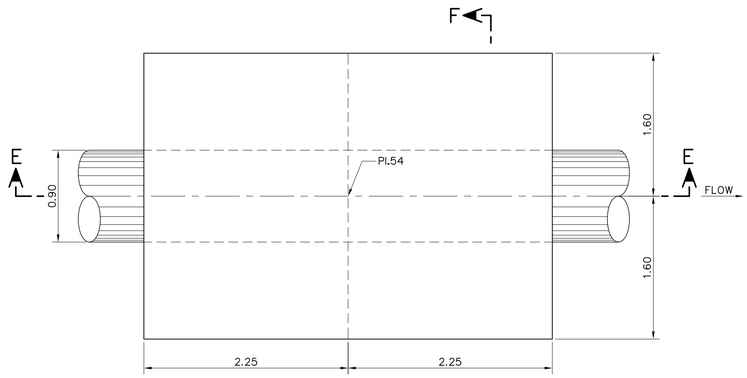
		REVIEWED	S.KITICHAI
DESIGNED	28.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	28.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO.	HLS–PS–11
		SHEET NO.	32 OF 77



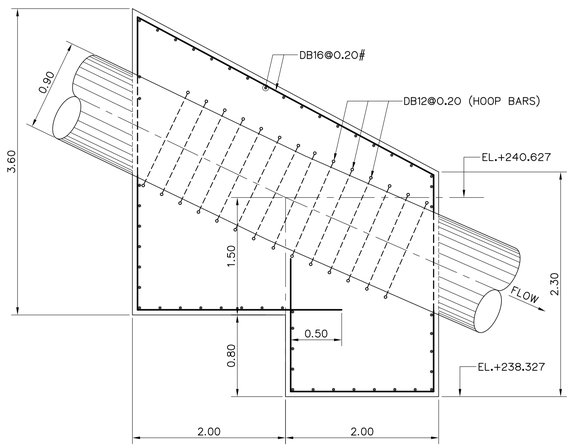
PLAN
ANCHOR (7)
NOT TO SCALE



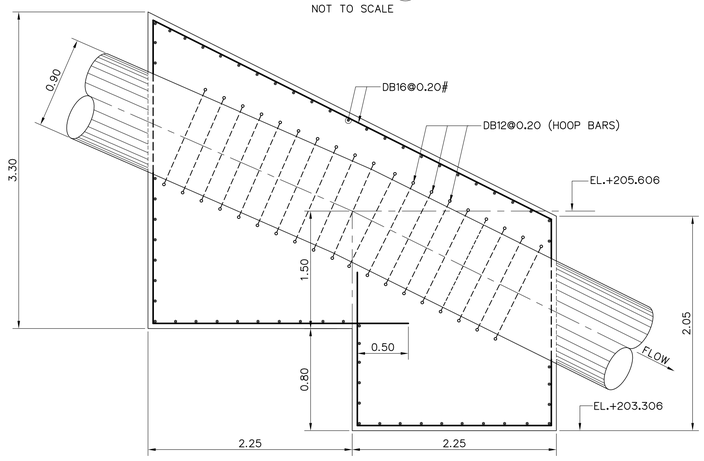
PLAN
ANCHOR (8)
NOT TO SCALE



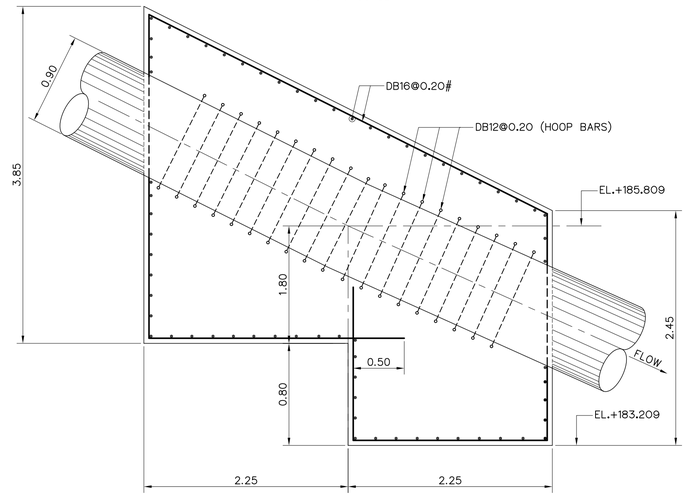
PLAN
ANCHOR (9)
NOT TO SCALE
F



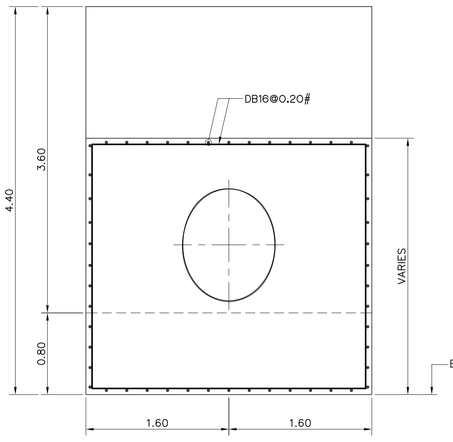
SECTION A–A
ANCHOR (7)
NOT TO SCALE



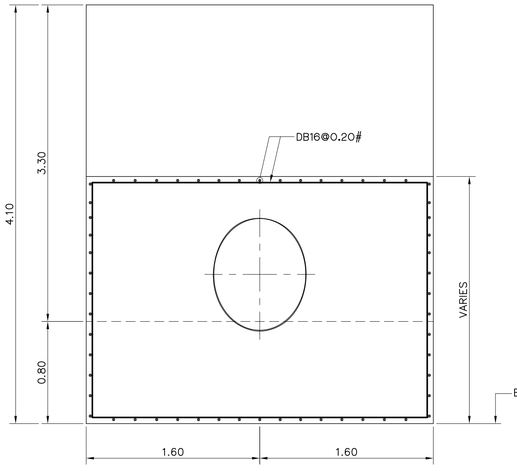
SECTION C–C
ANCHOR (8)
NOT TO SCALE



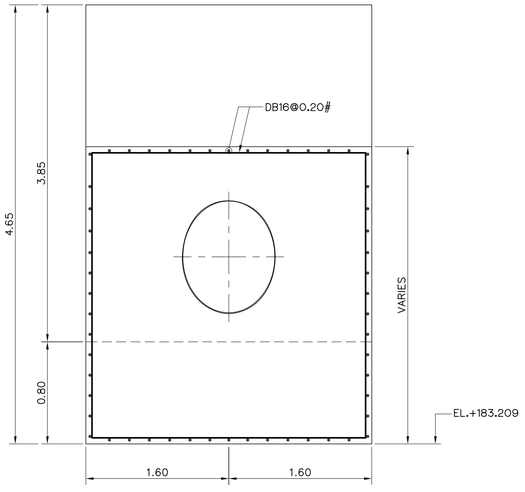
SECTION E–E
ANCHOR (9)
NOT TO SCALE



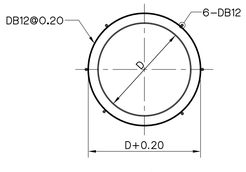
SECTION B–B
ANCHOR (7)
NOT TO SCALE



SECTION D–D
ANCHOR (8)
NOT TO SCALE



SECTION F–F
ANCHOR (9)
NOT TO SCALE



TYPICAL HOOP BAR
SCALE 1:30

0 0.5 1 1.5 2 2.5
SCALE 1:30 METERS

NOTES :

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

REFERENCE DRAWINGS :

1. PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA. 1+171.00 HLS–PS–01, 04

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
ANCHOR BLOCK (7), (8) & (9)
PLANS AND REINFORCEMENT DETAILS

FEC FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

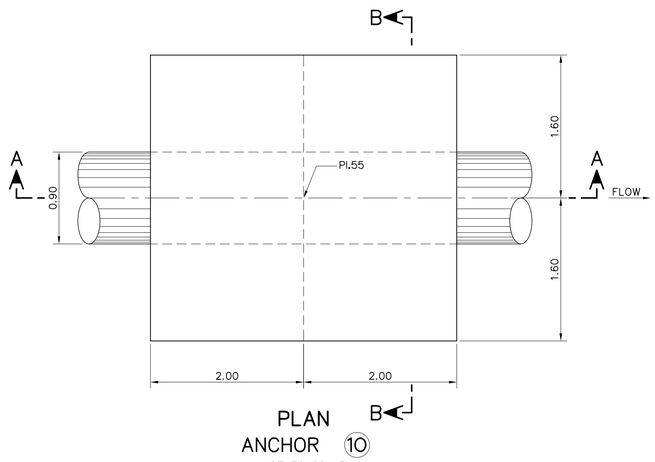
REVIEWED ว.ทวีชัย

DESIGNED ส.ต.ต.6651
DRAWN
CHECKED ส.ต.ต.7324

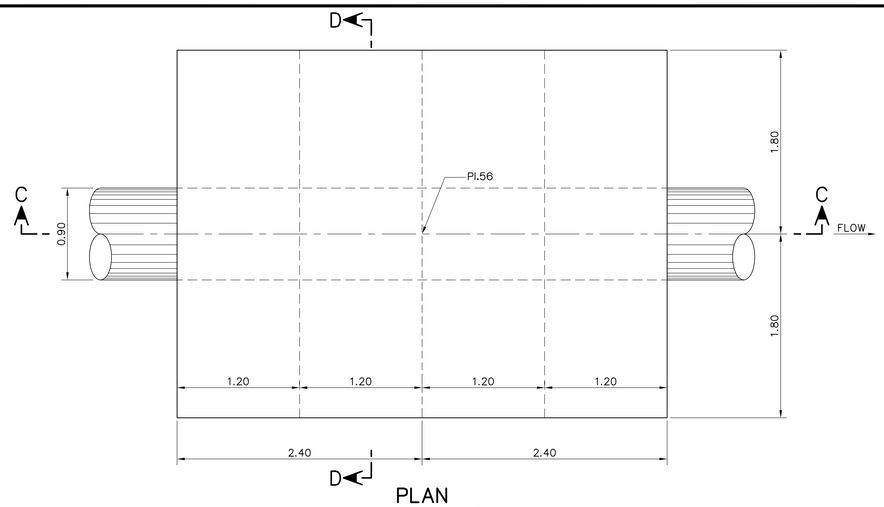
SUBMITTED
RECOMMENDED
APPROVED

14/01/62
PROJECT MANAGER DATE

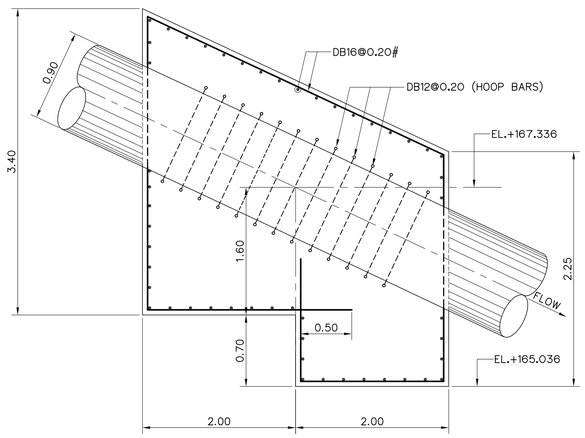
DRAWING NO. HLS–PS–12
SHEET NO. 33 OF 77



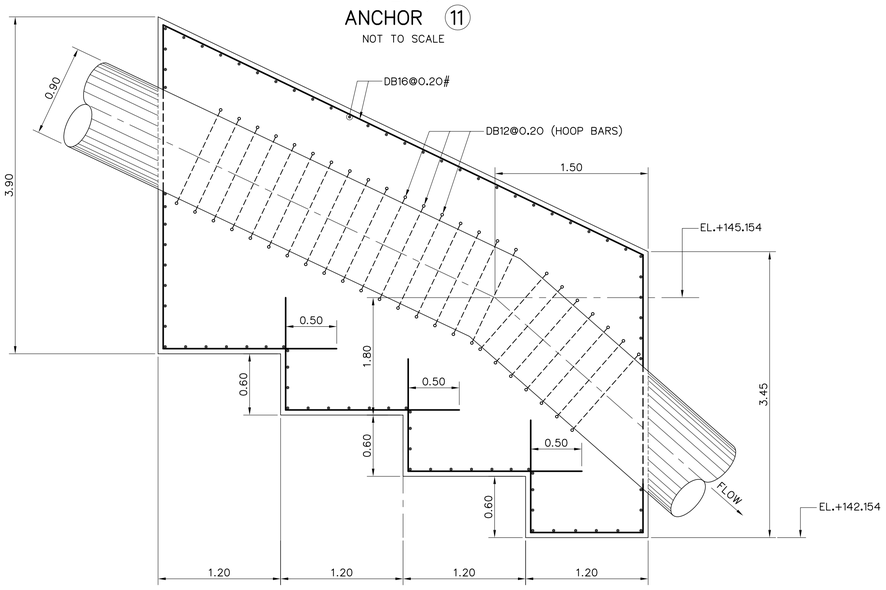
PLAN
ANCHOR (10)
NOT TO SCALE



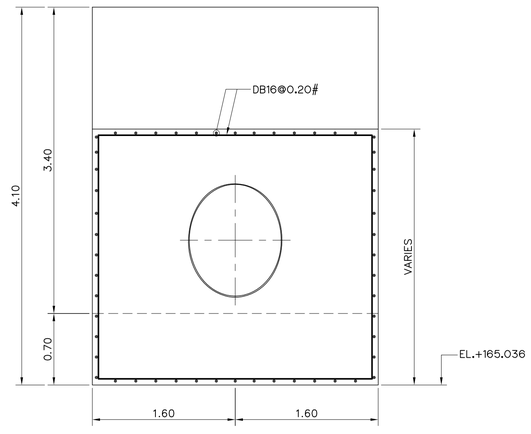
PLAN
ANCHOR (11)
NOT TO SCALE



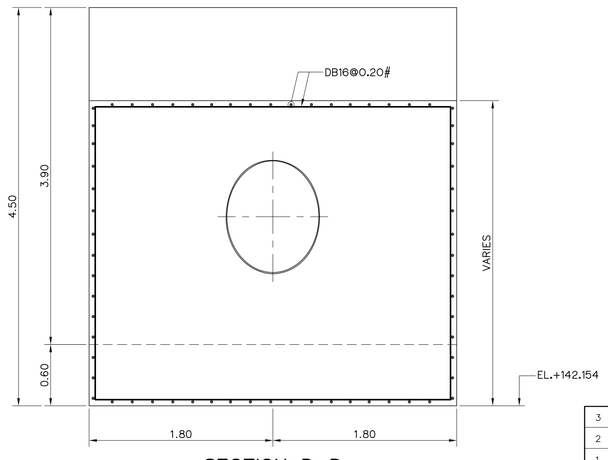
SECTION A–A
ANCHOR (10)
NOT TO SCALE



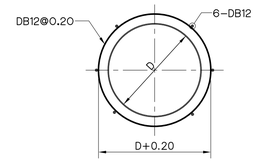
SECTION C–C
ANCHOR (11)
NOT TO SCALE



SECTION B–B
ANCHOR (10)
NOT TO SCALE



SECTION D–D
ANCHOR (11)
NOT TO SCALE



TYPICAL HOOP BAR
NOT TO SCALE

NOTES :

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

REFERENCE DRAWINGS :

1. PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA. 1+171.00 HLS–PS–01, 04

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
ANCHOR BLOCK (10) & (11)
PLANS AND REINFORCEMENT DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED รังสิกาชัย

DESIGNED สย.6651 — SUBMITTED

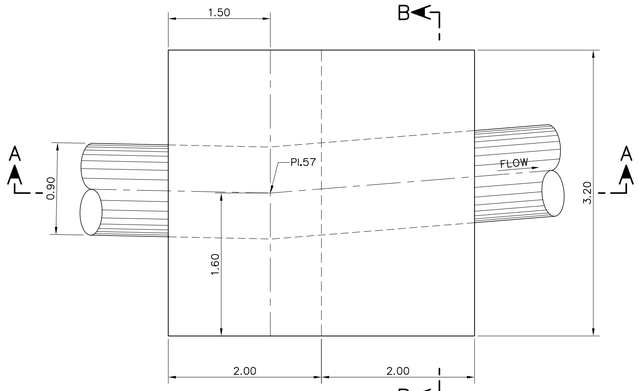
DRAWN — RECOMMENDED

CHECKED สย.7324 — APPROVED

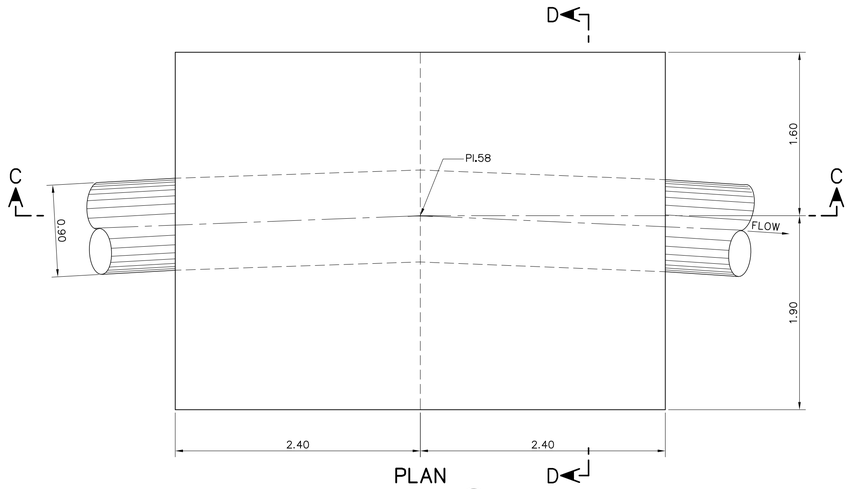
PROJECT MANAGER — 14/01/62 DATE

DRAWING NO. HLS–PS–13

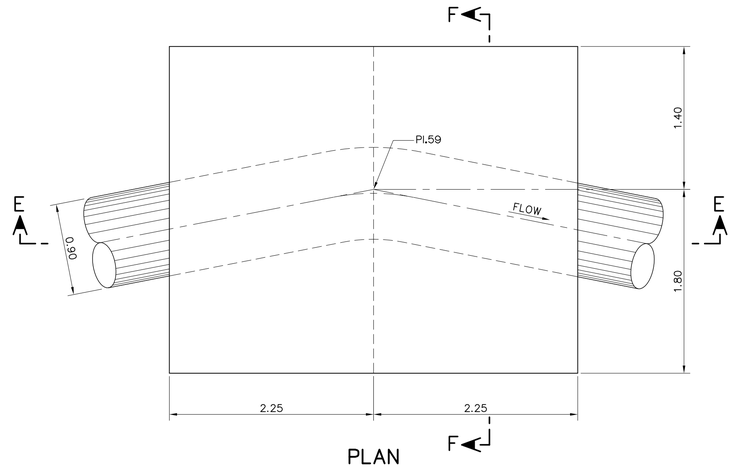
SHEET NO. 34 OF 77



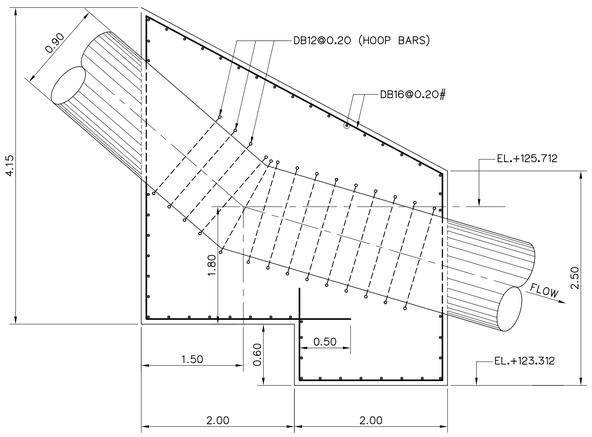
PLAN
ANCHOR (12)
NOT TO SCALE



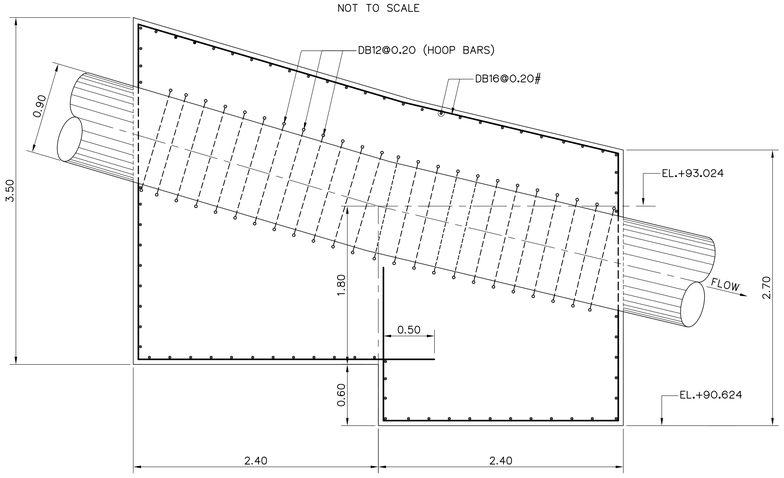
PLAN
ANCHOR (13)
NOT TO SCALE



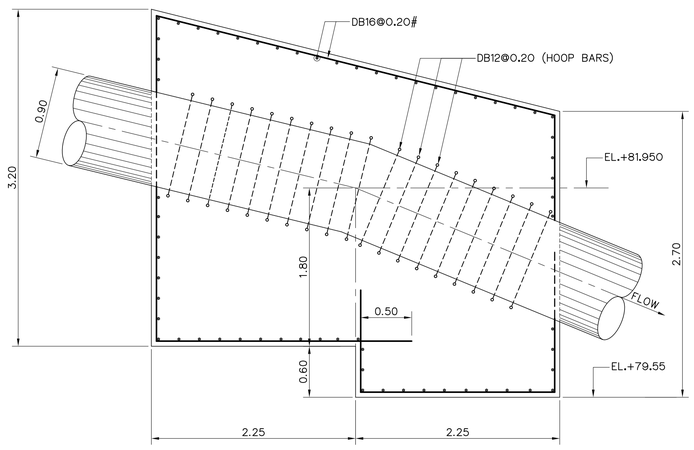
PLAN
ANCHOR (14)
NOT TO SCALE



SECTION A–A
ANCHOR (12)
NOT TO SCALE



SECTION C–C
ANCHOR (13)
NOT TO SCALE



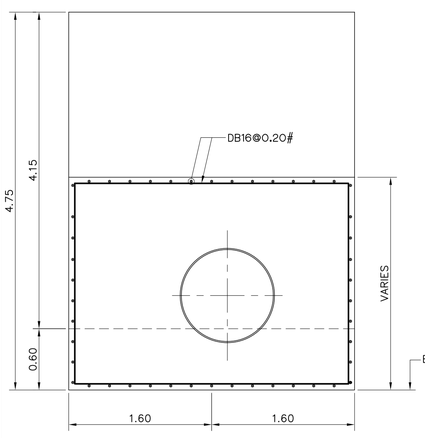
SECTION E–E
ANCHOR (14)
NOT TO SCALE

NOTES :

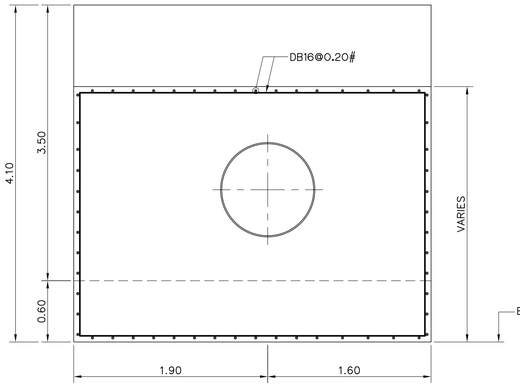
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS. UNLESS OTHERWISE SHOWN.
2. SYMBOLE, ABBREVIATIONS AND CENERAL NOTES SEE DWG. NO. HLS–GN–03
3. THE ALIGNMENT OF THE PENSTOCK AND RELATED STRUCTURES SHALL BE CHECK AND CORRECTED BY THE CONTRACTOR TO SUIT THE FIELD CONDITIONS AND SHALL BE SUBMITTED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

REFERENCE DRAWINGS :

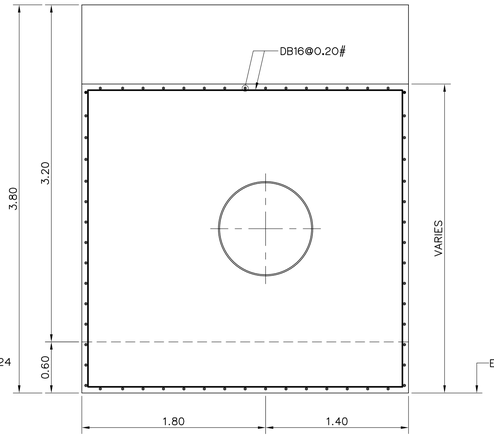
1. PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA. 1+171.00 HLS–PS–01, 04



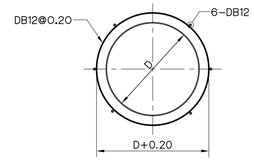
SECTION B–B
ANCHOR (12)
NOT TO SCALE



SECTION D–D
ANCHOR (13)
NOT TO SCALE



SECTION F–F
ANCHOR (14)
NOT TO SCALE



TYPICAL HOOP BAR
NOT TO SCALE

SCALE 1:30

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
ANCHOR BLOCK (12), (13) & (14)
PLANS AND REINFORCEMENT DETAILS

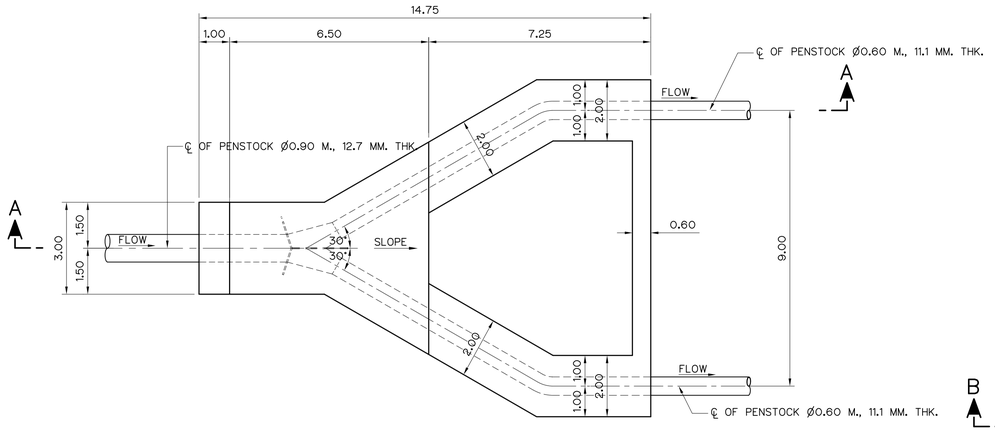
FEC FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

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

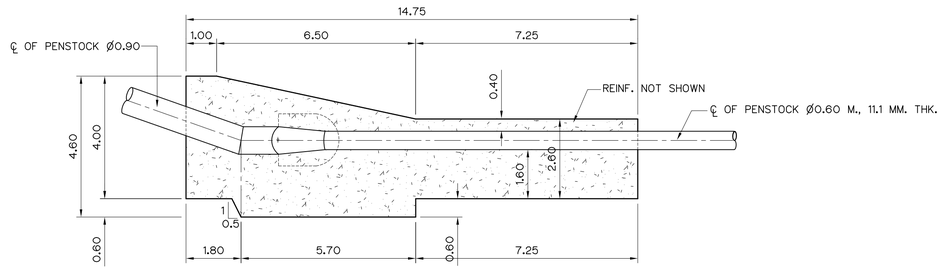
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED ร.กิจชัย
SUBMITTED
RECOMMENDED
APPROVED

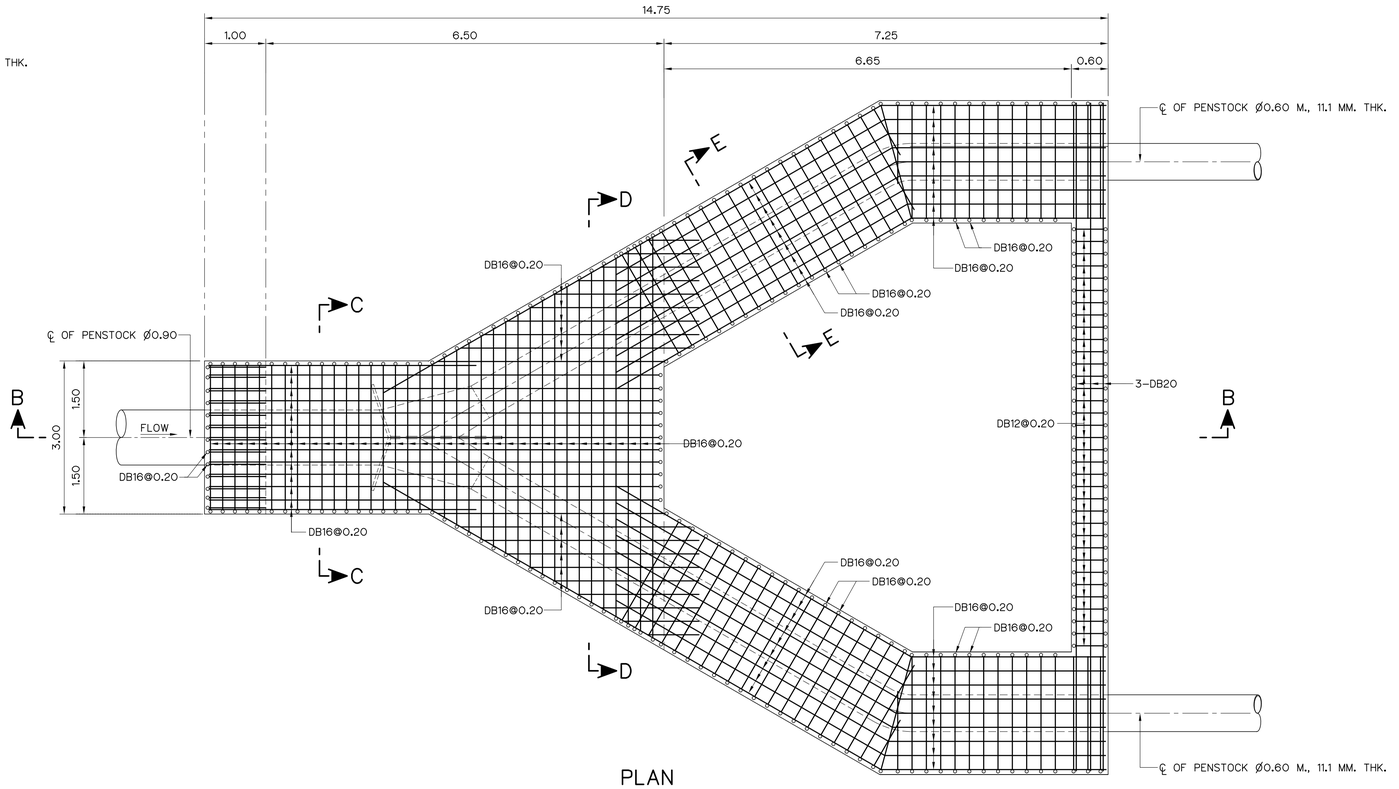
DRAWING NO. HLS–PS–14
SHEET NO. 35 OF 77



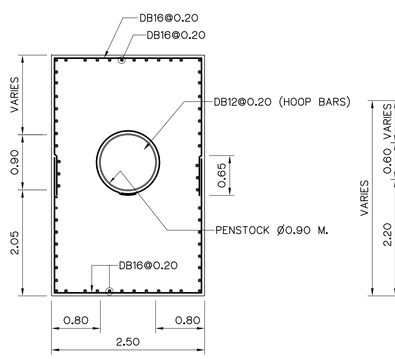
PLAN (ANCHOR BLOCK ⑮)
SCALE 1:100



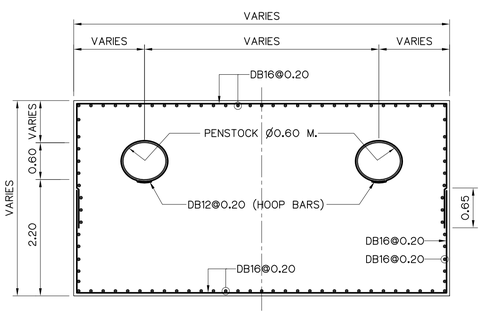
SECTION A – A
SCALE 1:100



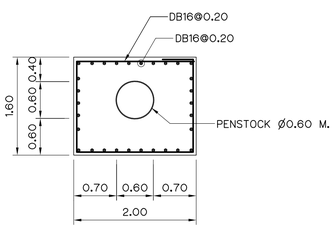
PLAN
SCALE 1:50



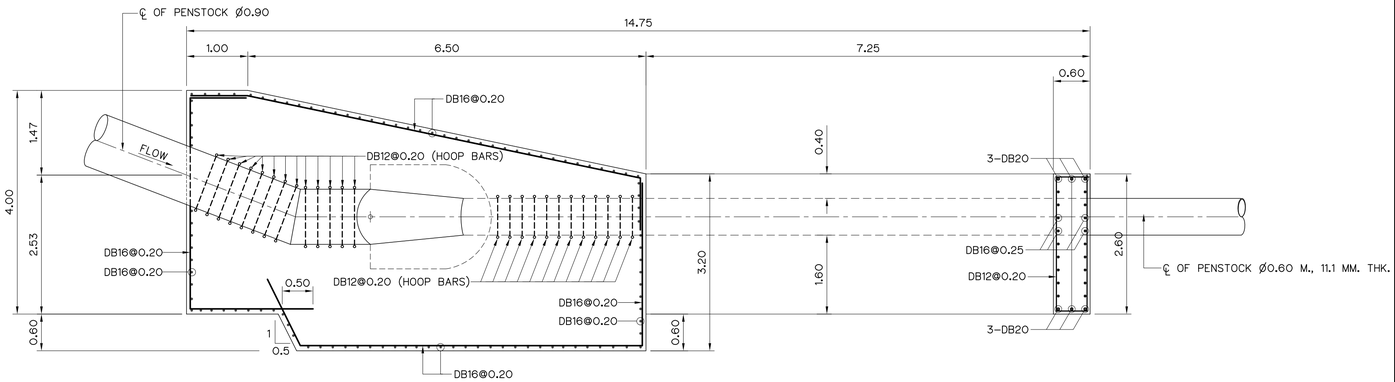
SECTION C – C
SCALE 1:50



SECTION D – D
SCALE 1:50



SECTION E – E
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. SYMBOLE, ABBREVIATIONS AND CENERAL NOTES SEE DWG. NO. HLS-GN-03
3. THE ALIGNMENT OF THE PENSTOCK AND RELATED STRUCTURES SHALL BE CHECK AND CORRECTED BY THE CONTRACTOR TO SUIT THE FIELD CONDITIONS AND SHALL BE SUBMITTED TO DEDE'S FIELD ENGINEER FOR APPROVAL

REFERENCE DRAWINGS :

1. PENSTOCK PLAN AND PROFILE, STA. 1+000 TO STA. 1+171.00 HLS-PS-04

0 0.5 1.0 2.0 3.0 4.0
SCALE 1:50 METERS

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

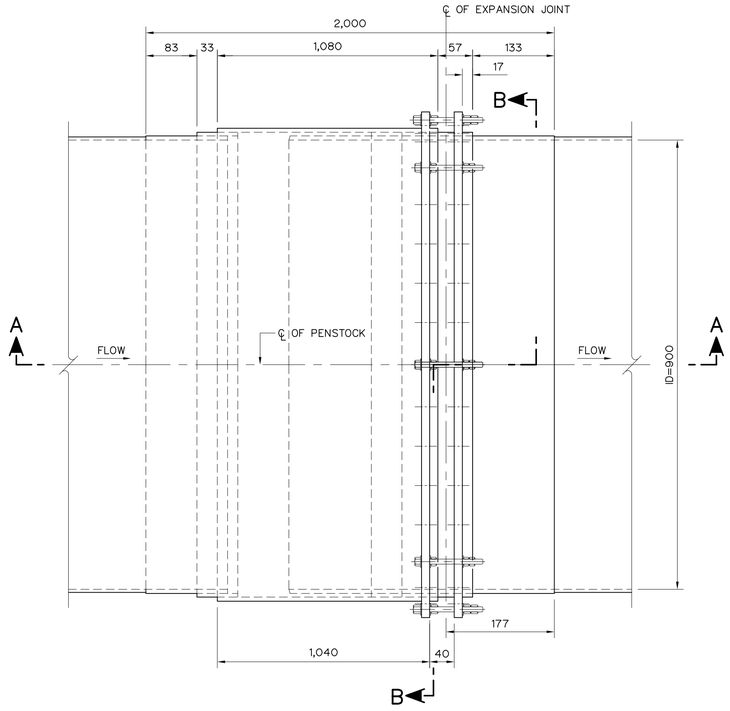
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
ANCHOR BLOCK ⑮
PLAN ,SECTIONS, AND REINFORCEMENT DETAILS

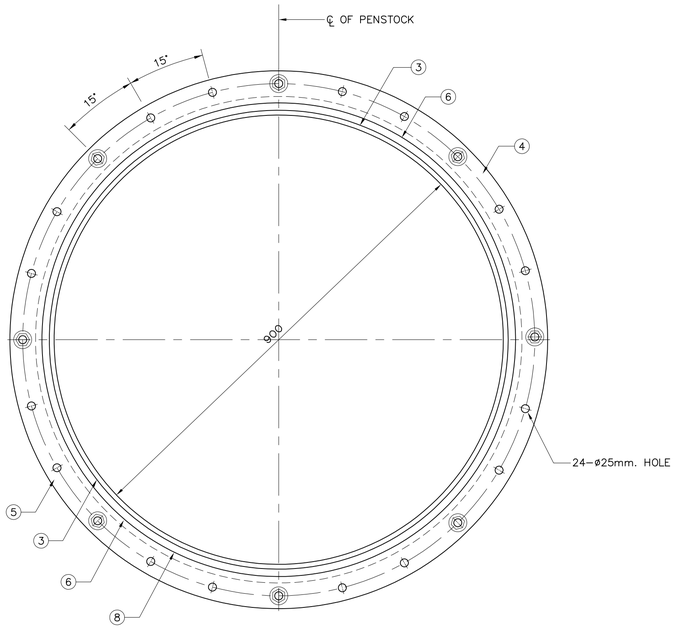
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED	S.KITICHAI		
DESIGNED		28.6651	SUBMITTED
DRAWN			RECOMMENDED
CHECKED		28.7324	APPROVED
PROJECT MANAGER		14/01/62 DATE	DRAWING NO. HLS-PS-15
			SHEET NO. 36 OF 77



ELEVATION
NOT TO SCALE



SECTION B–B
NOT TO SCALE

TABLE OF DETAIL 1 SQUARE – GROOVE WELD , BUTT JOINT

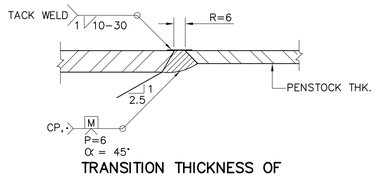
ITEM	DESCRIPTION	MATERIAL	QUANT.	REMARKS
1	PENSTOCK	ASTM A–283, GRADE D	–	--
2	PENSTOCK	ASTM A–283, GRADE D	1	NOTE 2 & 3
3	INNER SLEEVE	ASTM A–283, GRADE D	1	NOTE 2 & 4
4	GRAND RING	ASTM A–283, GRADE D	1	SEAMLESS, NOTE 3
5	OUTER RING	ASTM A–283, GRADE D	1	SEAMLESS, NOTE 3
6	STUFFING BOX	ASTM A–283, GRADE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

NOTES :

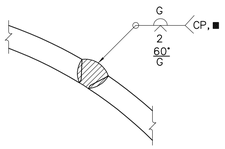
1. LONGITUDINAL SEAMS HAVE TO BE COMPLETE JOINT PENETRATION WELDS BY COMBINING SINGLE–V–GROOVE WITH BACKING WELDS AND GROUND FLUSH WELDING WITH BASE MATAL AS REQUIRED (SEE DETAIL "2")
2. GALVANIZED ALL SURFACES WITH 0.10 mm. THK.
3. NICKEL CLADDING ON OUTER SURFACE WITH 0.50 mm. THK. AND GALVANIZED INNER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

WELDING NOTATION :

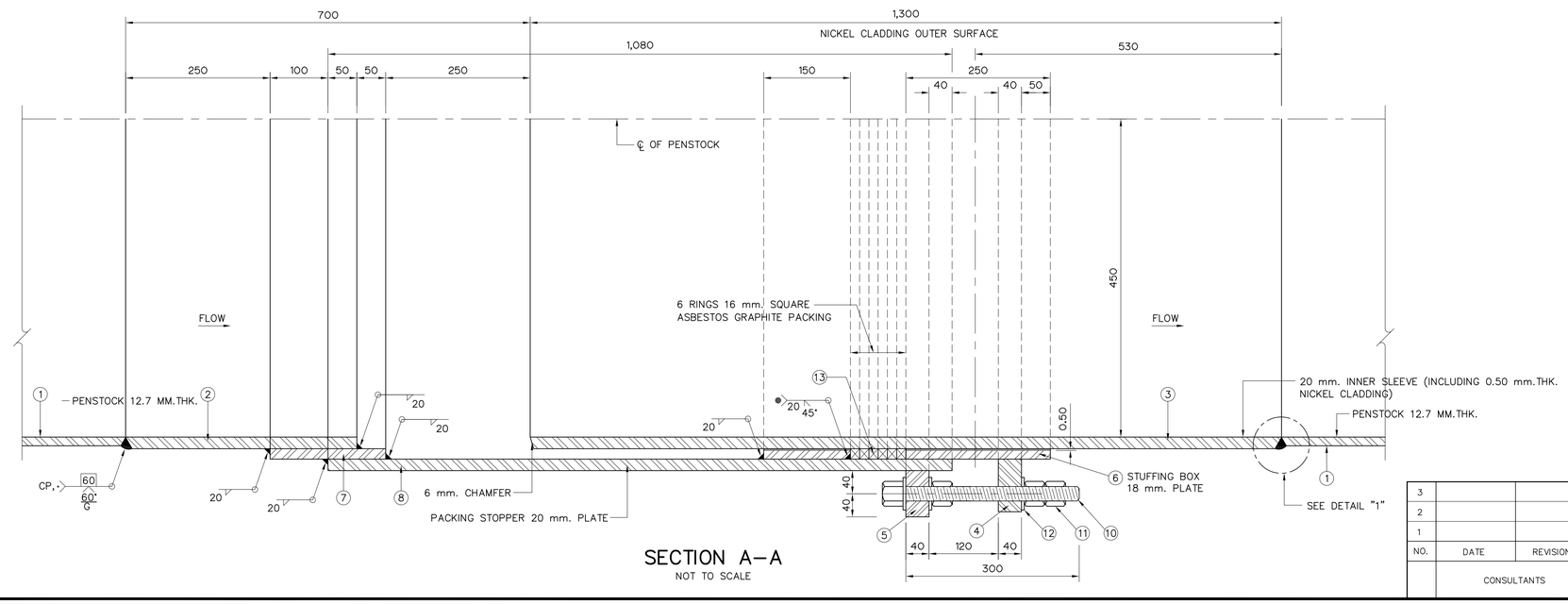
CP = COMPLETE JOINT PENETRATION GROOVE WELD
G = GRINDING WELD DEPOSITE FLUSH WITH BASE METAL
• = BACKING PLATE SIZE 0.10x1.50 mm. AND SAME METERIAL AS PENSTOCK
● = BEVEL PLATE 9 mm. BEFORE ROLLING CHIP SQUARE AFTER WELDING
▲ = ROOT OPENING R = 2.0 mm.
ROOT FACE t = 3.0 mm.
GROOVE ANGLE = 45°
■ = ROOT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



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



LONGITUDINAL WELD
NOT TO SCALE



SECTION A–A
NOT TO SCALE

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

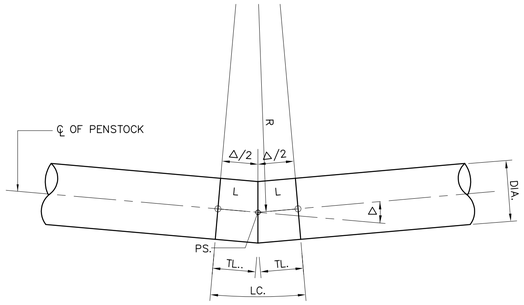
CIVIL WORKS
PENSTOCK
EXPANSION JOINT, PLAN, SECTIONS AND DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

DESIGNED	ส.ย.6651	REVIEWED	
DRAWN		SUBMITTED	
CHECKED	ส.ย.7324	RECOMMENDED	
PROJECT MANAGER	14/01/62 DATE	APPROVED	

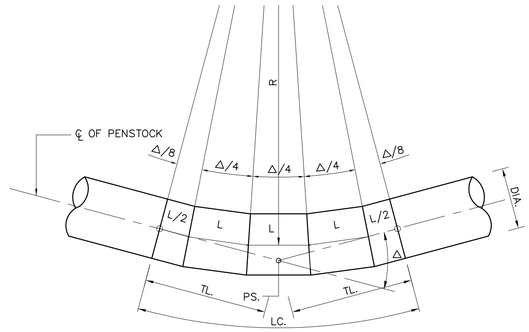
DRAWING NO. HLS–PS–16
SHEET NO. 37 OF 77



BEND TYPE "1"

DELTA(Δ) 0°–5°

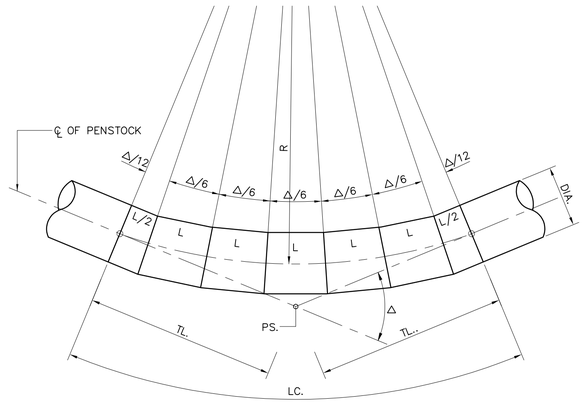
NOT TO SCALE



BEND TYPE "4"

DELTA(Δ) 25°–35°

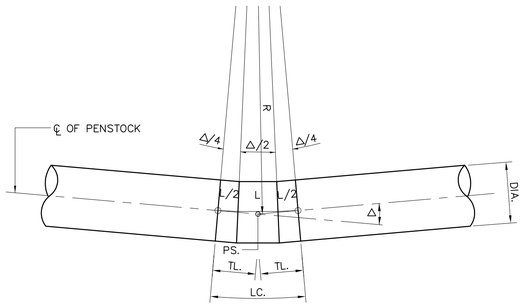
NOT TO SCALE



BEND TYPE "6"

DELTA(Δ) 55°–OVER

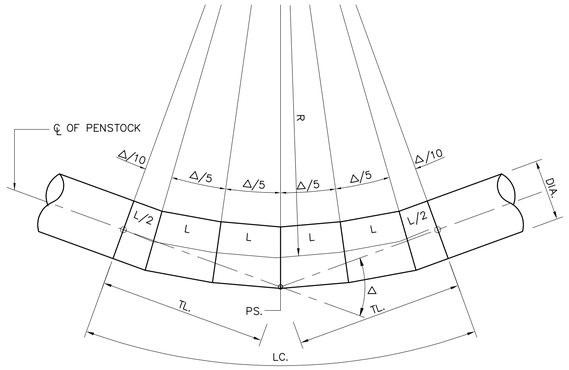
NOT TO SCALE



BEND TYPE "2"

DELTA(Δ) 5°–15°

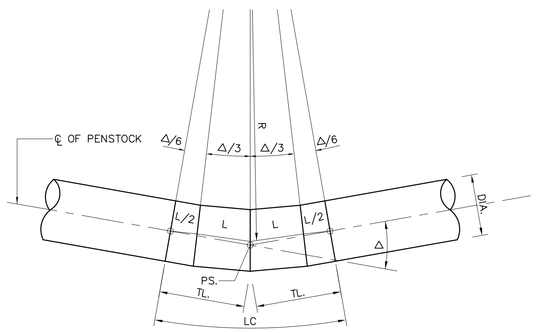
NOT TO SCALE



BEND TYPE "5"

DELTA(Δ) 35°–45°

NOT TO SCALE



BEND TYPE "3"

DELTA(Δ) 15°–25°

NOT TO SCALE

NOTES :

1. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS–GN–03

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

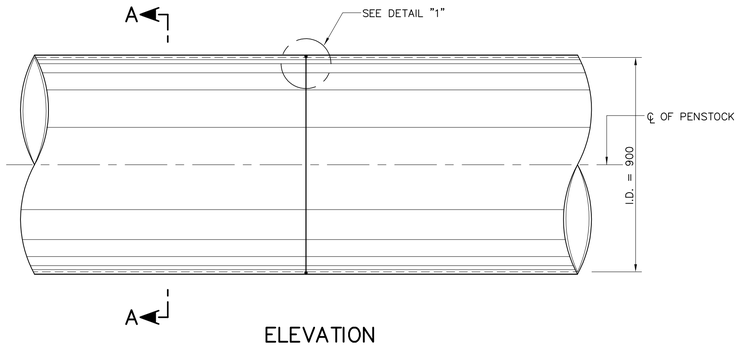
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS

PENSTOCK

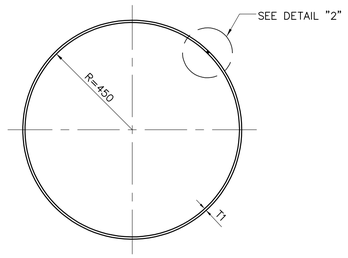
BEND DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED ร.ท.ทิชัย
DESIGNED วิ.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED วิ.7324	APPROVED
PROJECT MANAGER — 14/01/62 DATE	DRAWING NO. HLS–PS–17 — SHEET NO. 38 OF 77



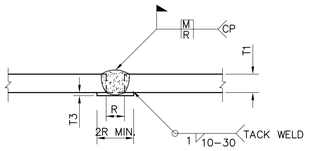
ELEVATION

SCALE 1:10



SECTION A–A

SCALE 1:10



CIRCULAR BUTT JOINT

DETAIL "1"

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

WELDING PROCESS	DESIGNATION	BASE METAL THICKNESS		GROOVE PREPARATION		TOLERANCES		REMARKS
		T1	T3	ROOT OPENING	GROOVE ANGLE	ROOT OPENING	GROOVE ANGLE	
GMAW FCAW	B–L1a–GF	9.5	1.0	R = T1	–	+1.5,–0	–	SINGLE–PASS WELD
GMAW FCAW	B–L1a–GF	12.7	1.0	R = T1	–	+1.5,–0	–	SINGLE–PASS WELD

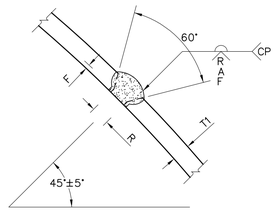
SMAW = SHIELD METAL ARC WELDING

GMAW = GAS METAL ARC WELDING

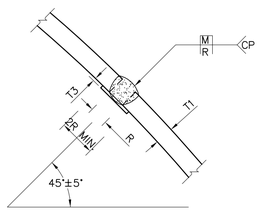
FCAW = FLUX CORED ARC WELDING

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	9.5	–	R = 2.0	A = 60°	F = 2.0	+15,–0	+10°,–0°	+15,–0	SINGLE–PASS WELD
	SMAW	B–U2	12.7	–	R = 2.0	A = 60°	F = 2.0	+15,–0	+10°,–0°	+15,–0	SINGLE–PASS WELD
B	GMAW FCAW	B–L1a–GF	9.5	1.0	R = 9.0	–	–	+15,–0	–	–	SINGLE–PASS WELD
	GMAW FCAW	B–L1a–GF	12.7	1.0	R = 12.0	–	–	+15,–0	–	–	SINGLE–PASS WELD



LONGITUDINAL BUTT JOINT
TYPE "A"



LONGITUDINAL BUTT JOINT (ALTERNATIVE)
TYPE "B"

DETAIL "2"

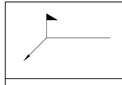
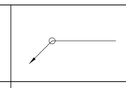
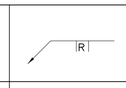
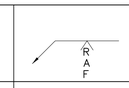
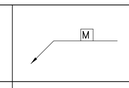
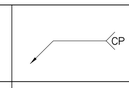
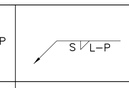
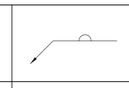
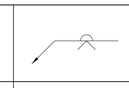
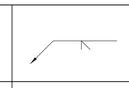
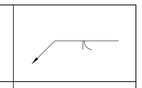
NOTES :

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

										
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

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS

PENSTOCK

WELDING DETAILS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED รังสิต(CHAI)

DESIGNED สิ.6651 SUBMITTED

DRAWN

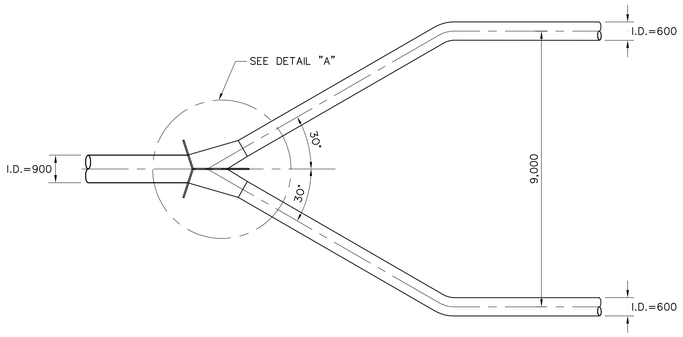
CHECKED สิ.7324 APPROVED

PROJECT MANAGER 14/01/62 DATE

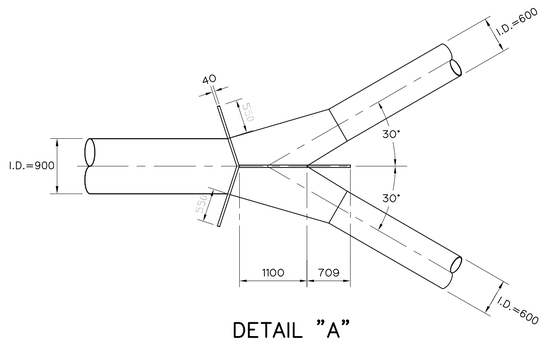
RECOMMENDED

DRAWING NO. HLS–PS–18

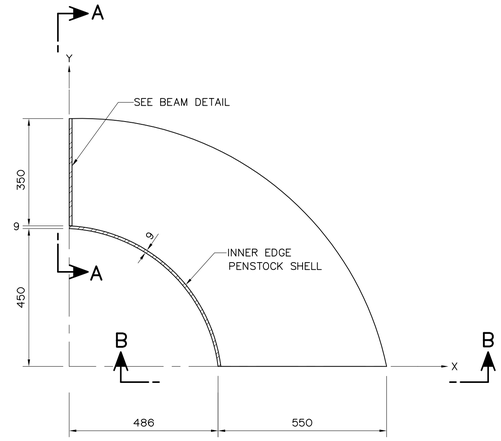
SHEET NO. 39 OF 77



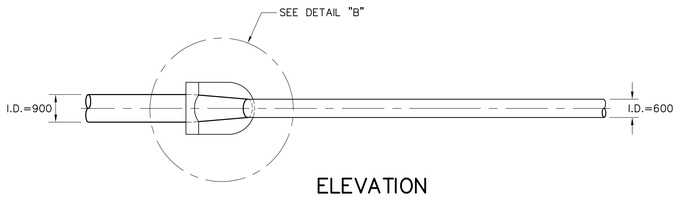
PLAN
SCALE 1:100



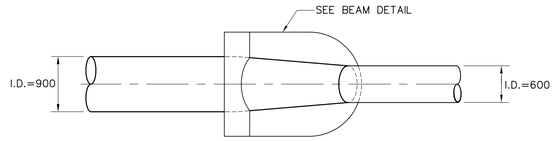
DETAIL "A"
SCALE 1:50



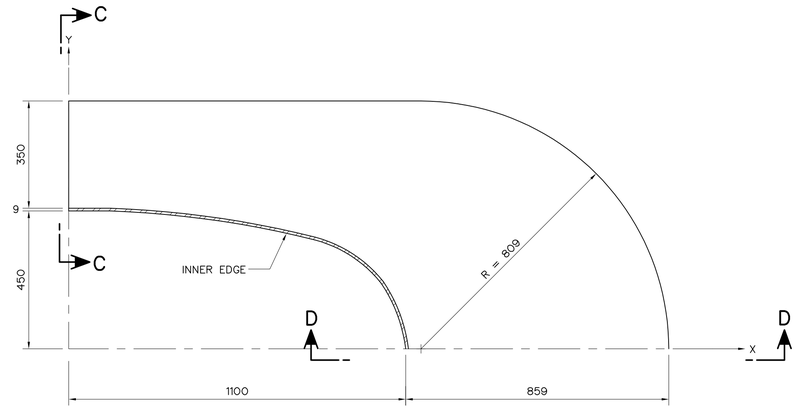
RING DETAIL
SCALE 1:10



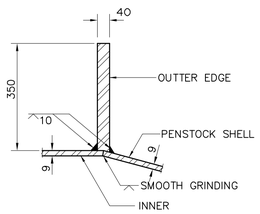
ELEVATION
SCALE 1:100



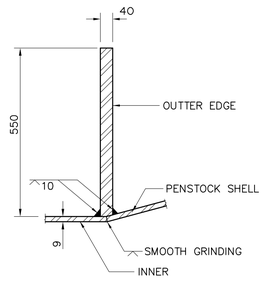
DETAIL "B"
SCALE 1:50



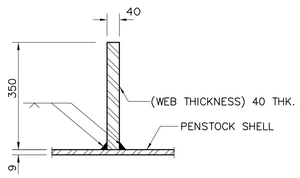
BEAM DETAIL
SCALE 1:10



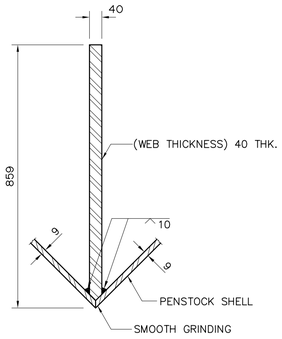
SECTION A–A
SCALE 1:10



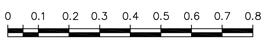
SECTION B–B
SCALE 1:10

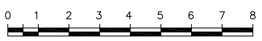


SECTION C–C
SCALE 1:10



SECTION D–D
SCALE 1:10





NOTES :

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

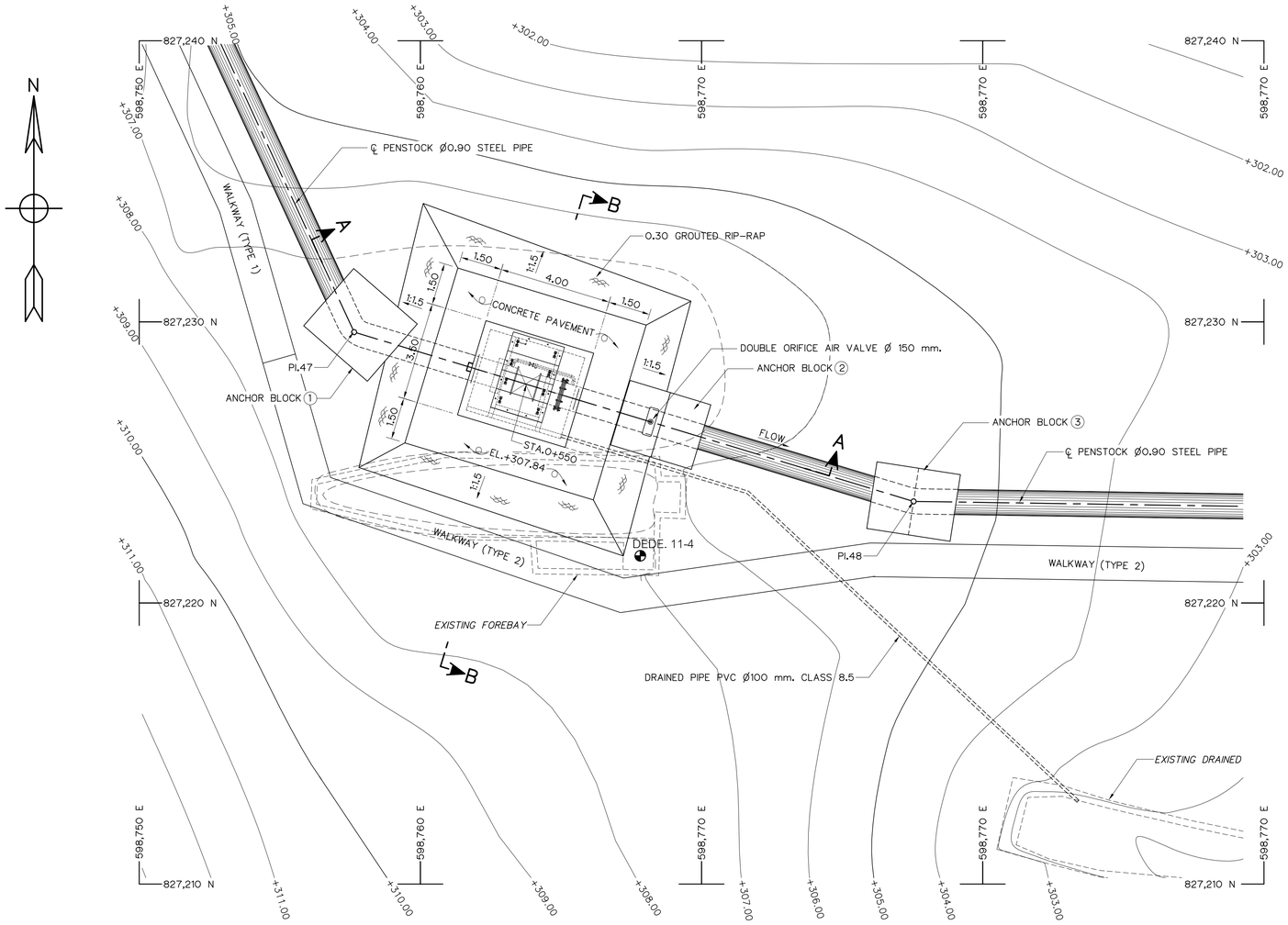
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
WYE, PLAN, SECTIONS AND DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

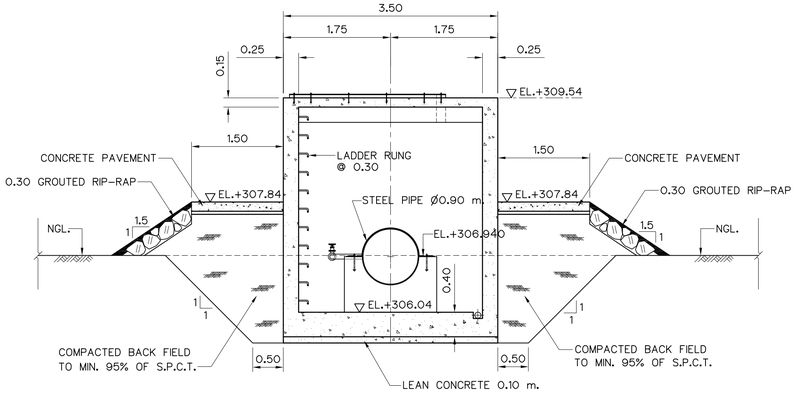
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

DESIGNED	สมิต.	REVIEWED	ชัยวัฒน์
DRAWN		SUBMITTED	
CHECKED	สมิต	RECOMMENDED	
	สมิต	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO.	HLS–PS–19
		SHEET NO.	40 OF 77



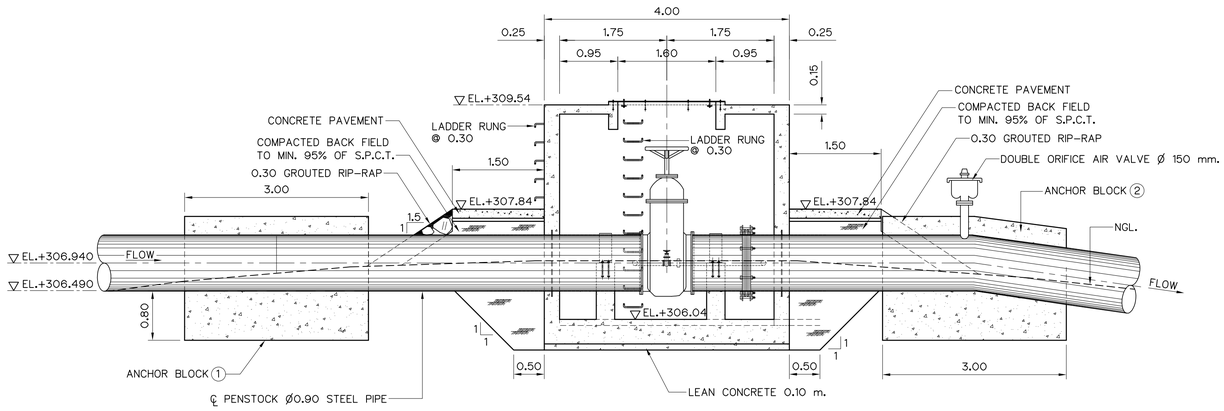
GENERAL LAY-OUT

SCALE 1:100



SECTION B-B

SCALE 1:50



SECTION A-A

SCALE 1:50

NOTES :

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

REFERENCE DRAWINGS :

1. PENSTOCK, EMERGENCY VALVE CHAMBER PLAN SECTIONS AND DETAILS — HLS-PS-21
2. PENSTOCK, EMERGENCY VALVE CHAMBER REINFORCEMENT DETAILS — HLS-PS-22

SCALE 1:50 — 0 0.5 1 2 3 4 METERS

SCALE 1:100 — 0 1 2 4 6 8 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

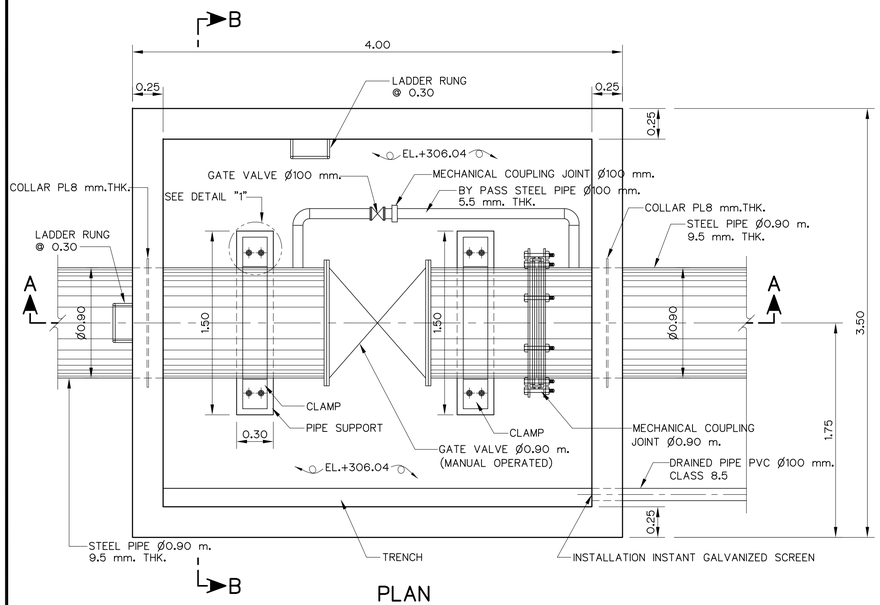
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
EMERGENCY VALVE CHAMBER GENERAL LAY-OUT AND SECTION

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

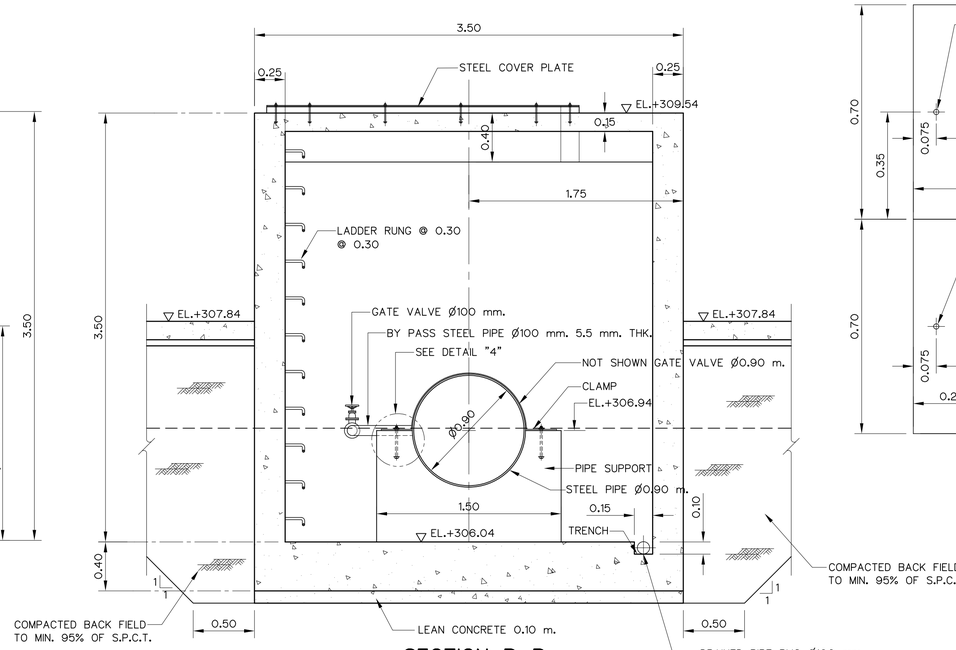
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY
REVIEWED ว.ก.ไกรชา

DESIGNED	สย.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สย.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO.	HLS-PS-20
		SHEET NO.	41 OF 77



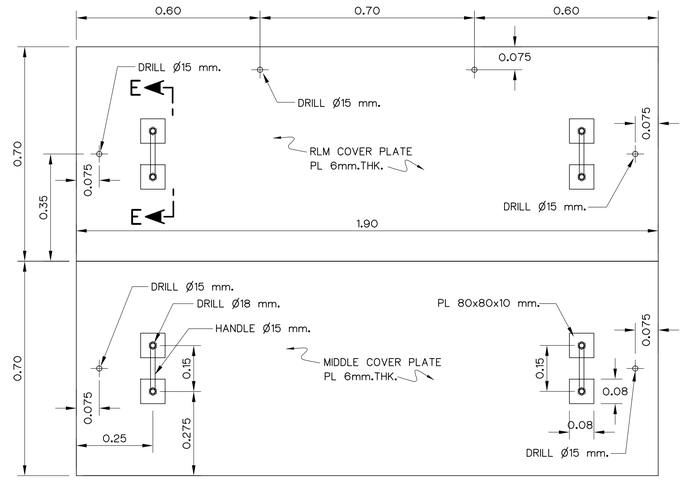
PLAN

SCALE 1:25



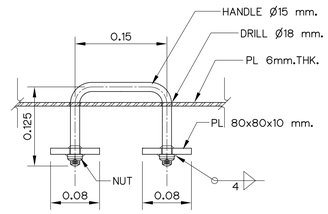
SECTION B–B

SCALE 1:25



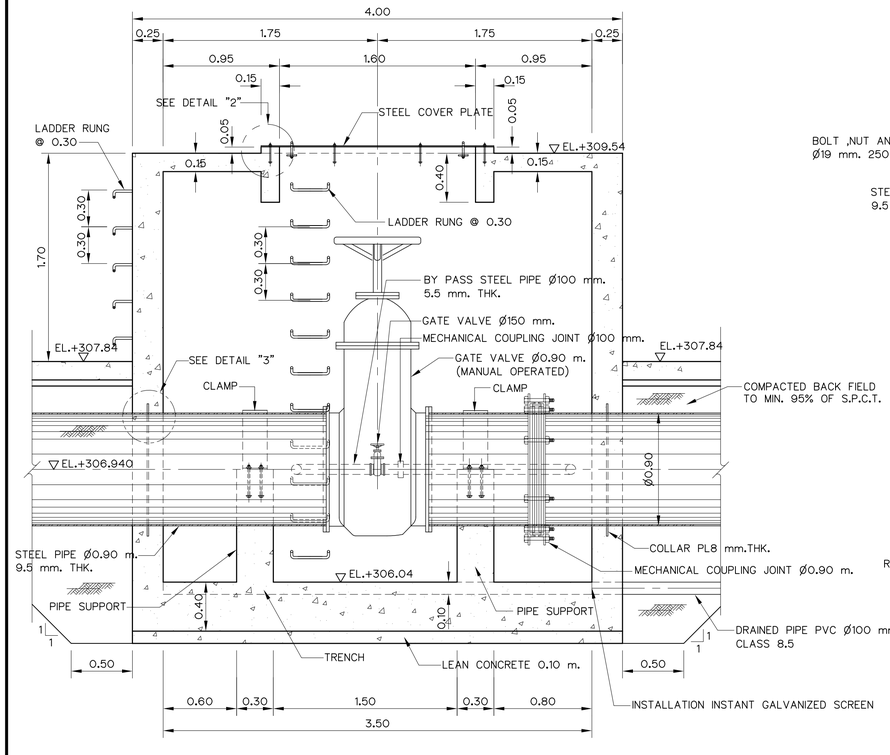
PLAN STEEL COVER PLATE

SCALE 1:10



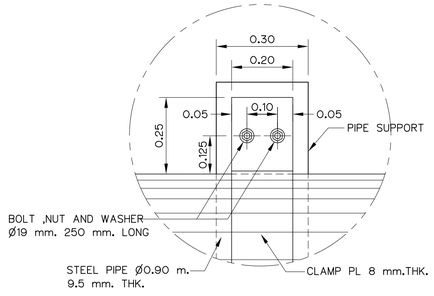
SECTION E–E

SCALE 1:5



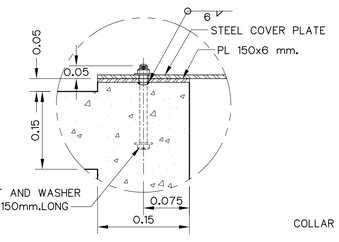
SECTION A–A

SCALE 1:25



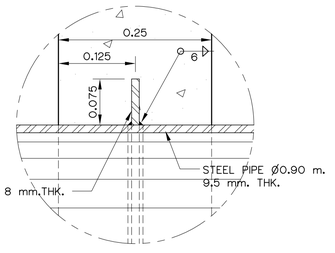
DETAIL "1"

SCALE 1:10



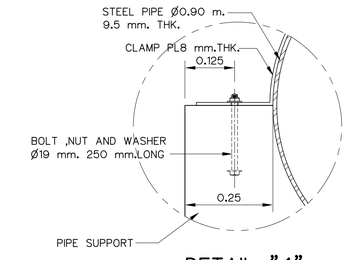
DETAIL "2"

SCALE 1:5



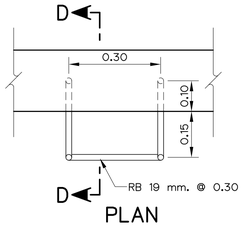
DETAIL "3"

SCALE 1:10

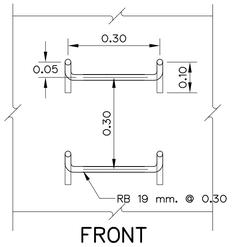


DETAIL "4"

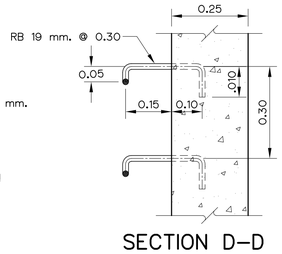
SCALE 1:10



PLAN



FRONT



SECTION D–D

DETAIL OF LADDER RUNG

SCALE 1:10

NOTE :

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METERS, UNLESS OTHERWISE SHOWN
2. ALLOWABLE BEARING CAPACITY OF FOUNDATION SHALL NOT BE LESS THAN 15 T./M.^{2}

REFERENCE DRAWING :

1. PENSTOCK, EMERGENCY VALVE CHAMBER LAY-OUT AND SECTION HLS-PS-20
2. PENSTOCK, EMERGENCY VALVE CHAMBER REINFORCEMENT DETAILS HLS-PS-22

0 0.0125 0.25 0.375
SCALE 1:5 METERS

0 0.25 0.5 0.75
SCALE 1:10 METERS

0 0.5 1 1.5 2
SCALE 1:25 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
EMERGENCY VALVE CHAMBER PLAN SECTIONS AND DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED ร.ท.ทิชัยชัย

DESIGNED 28.6651 SUBMITTED

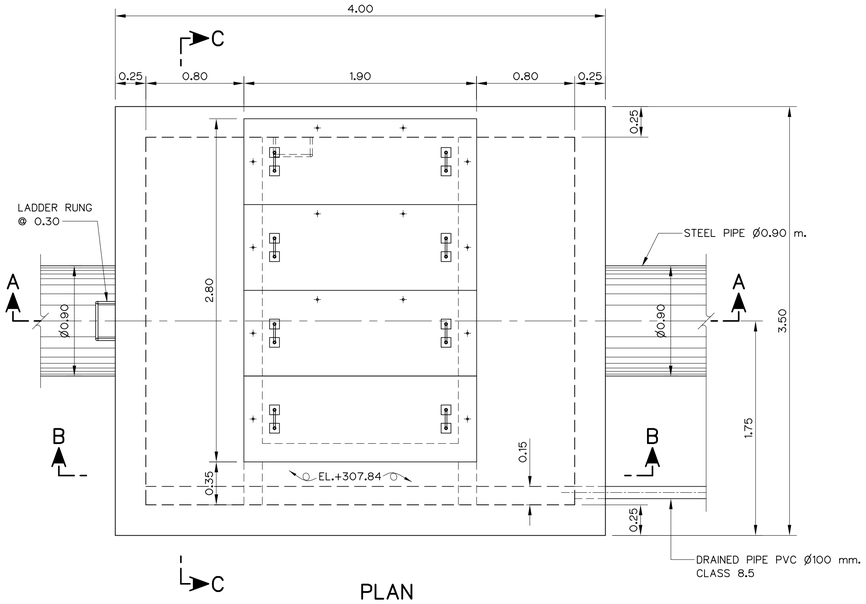
DRAWN

CHECKED 28.7324 APPROVED

PROJECT MANAGER 14/01/62 DATE

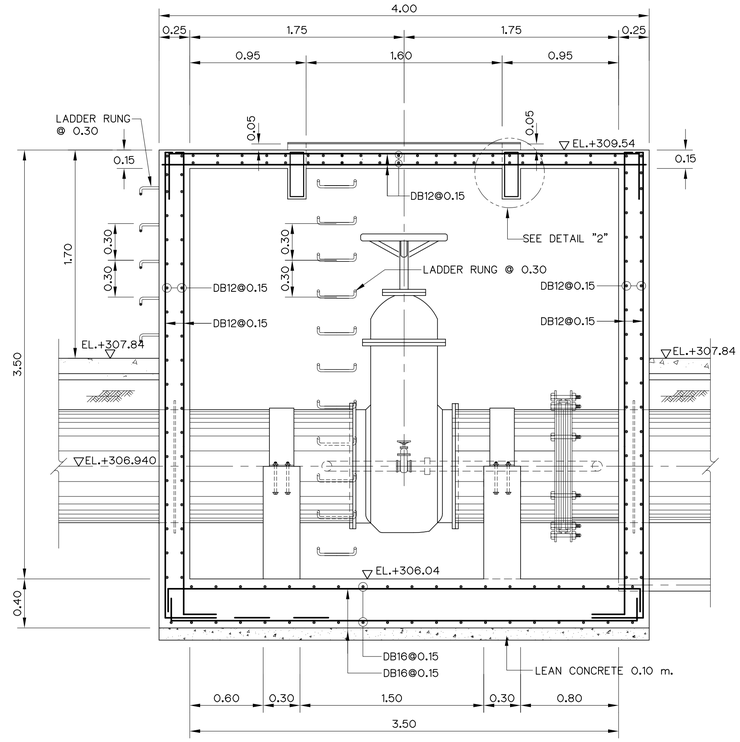
DRAWING NO. HLS-PS-21

SHEET NO. 42 OF 77



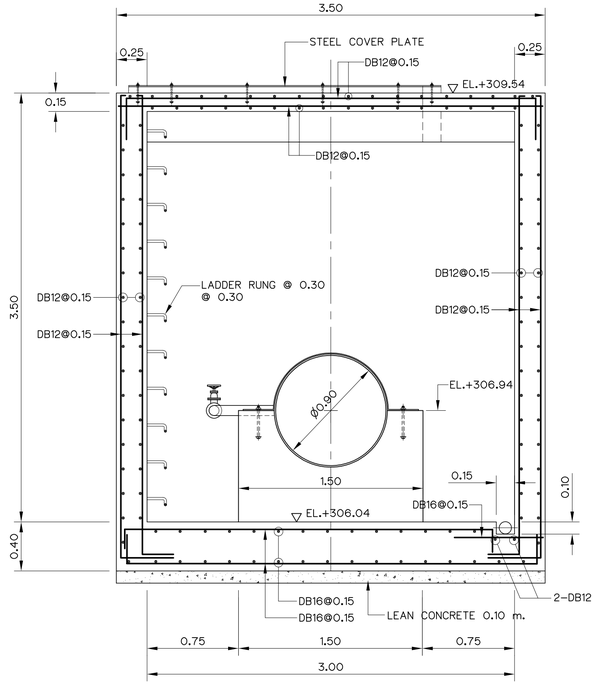
PLAN

SCALE 1:25



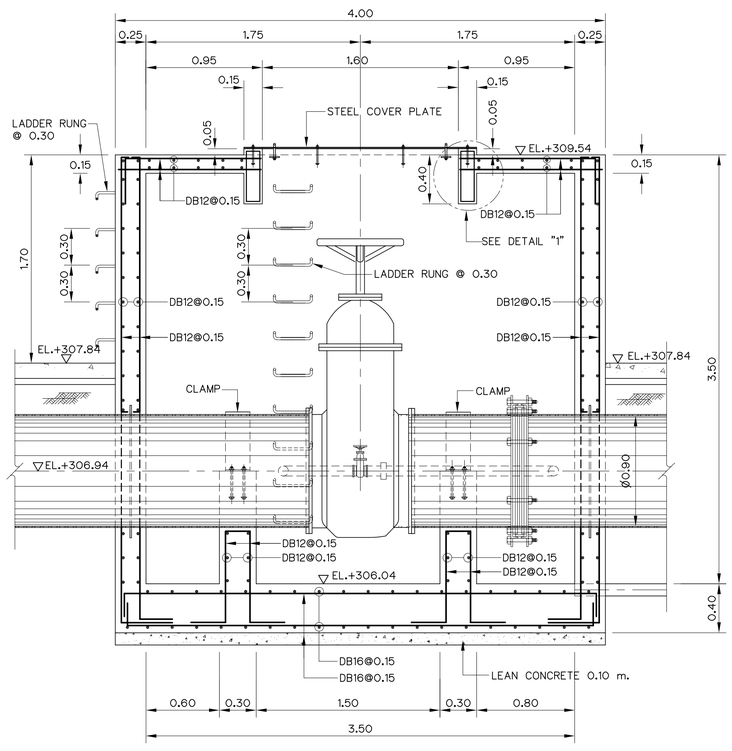
SECTION B–B

SCALE 1:25



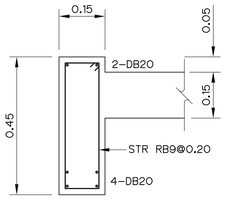
SECTION C–C

SCALE 1:25



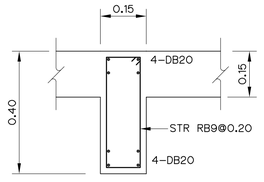
SECTION A–A

SCALE 1:25



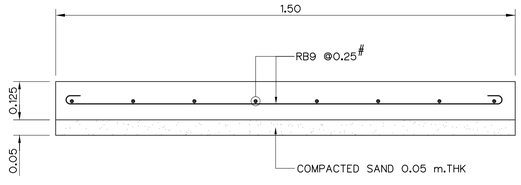
DETAIL "1"

SCALE 1:10



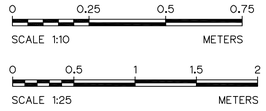
DETAIL "2"

SCALE 1:10



REINFORCEMENT DETAIL OF CONCRETE PAVEMENT

SCALE 1:10



NOTE :

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

REFERENCE DRAWING :

1. PENSTOCK, EMERGENCY VALVE CHAMBER GENERAL LAY-OUT AND SECTION HLS-PS-20
2. PENSTOCK, EMERGENCY VALVE CHAMBER PLAN SECTIONS AND DETAILS HLS-PS-21

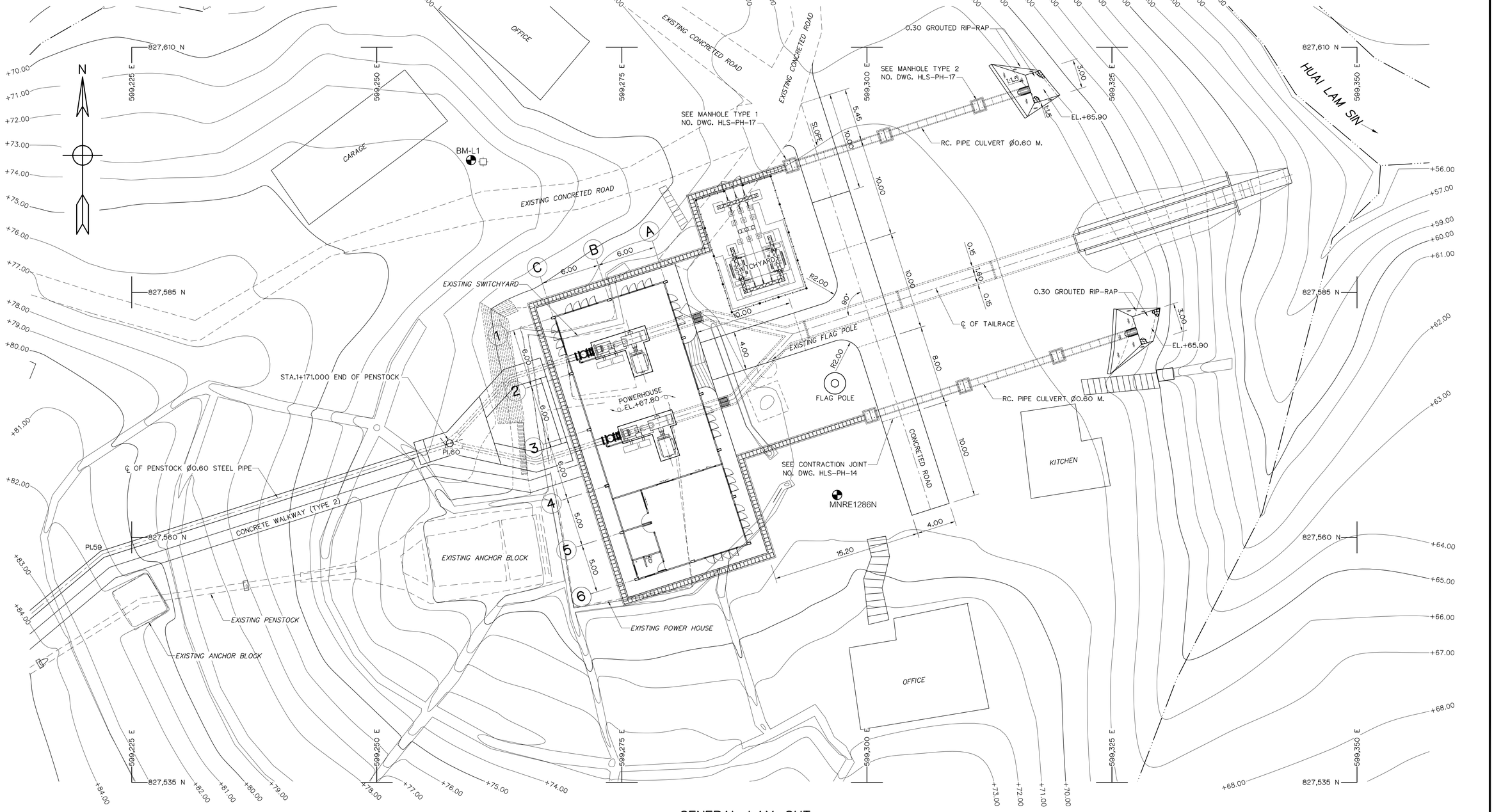
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
EMERGENCY VALVE CHAMBER REINFORCEMENT DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED ว.ก.ก.(ก.ล.)
DESIGNED ส.ย.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED ส.ย.7324	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS-PS-22 / SHEET NO. 43 OF 77



GENERAL LAY-OUT

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. HLS-GN-03
3. THE CONTRACTOR SHALL CHECK THE STABILITY OF THE EXCAVATION LINE.IF IT IS NOT SUFFICIENTLY STABLE, THE CONTRACTOR SHALL SUBMIT A REPORT TO THE PROJECT ENGINEER FOR CONSIDERING THE WAY TO IMPROVE ITS STABILITY.
4. FOR THE DETAILS OF THE STABILITY OF THE EXCAVATION LINE, SEE DWG. NO. HLS-PH-02

REFERENCE DRAWINGS :

1. POWERHOUSE, PLAN AND ROOF PLAN	HLS-PH-02
2. POWERHOUSE, ELEVATIONS	HLS-PH-03
3. POWERHOUSE, SECTIONS	HLS-PH-04
4. POWERHOUSE, CONCRETE PAVEMENT	HLS-PH-14

0 5 10 15
SCALE 1:200 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

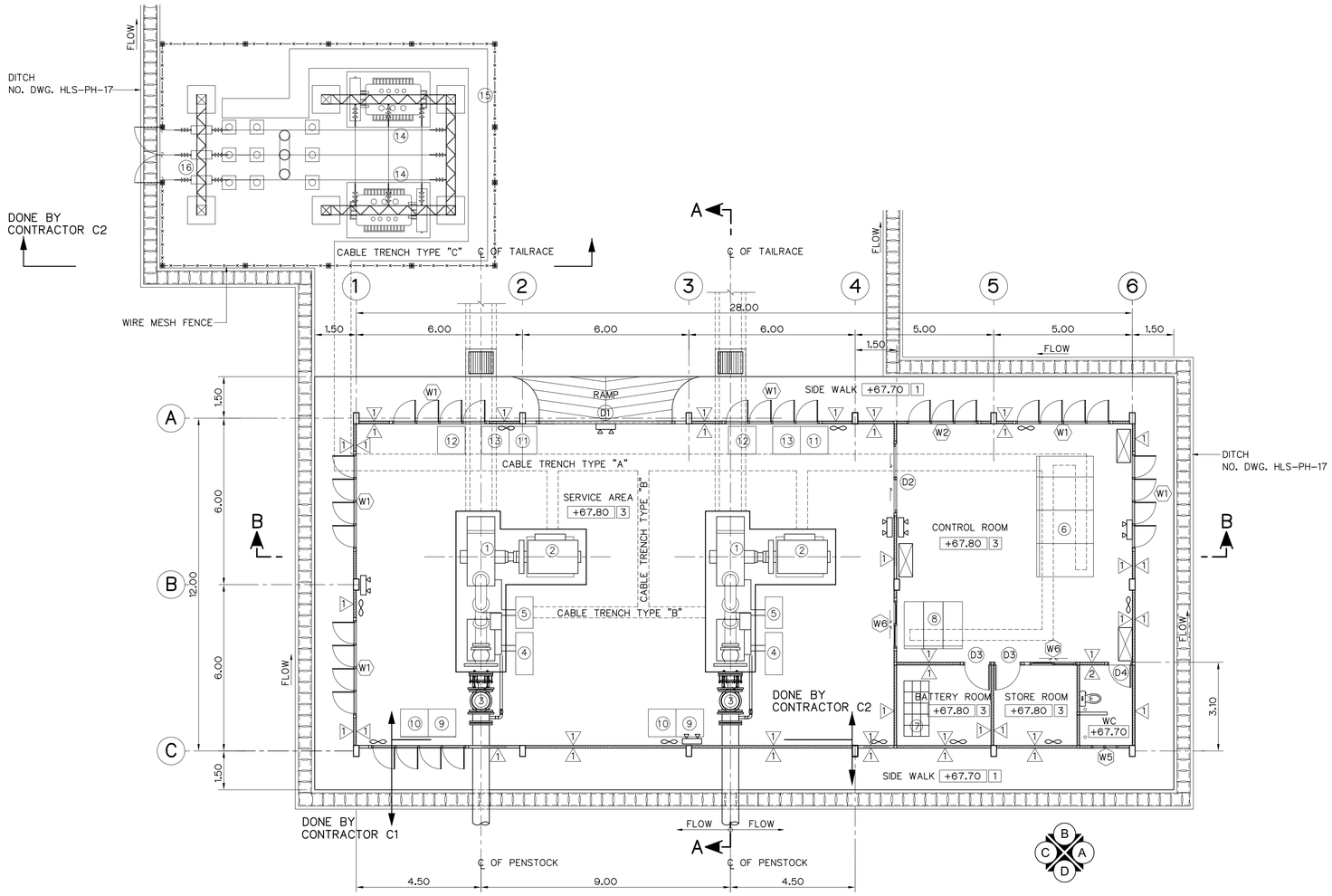
CIVIL WORKS
POWERHOUSE
GENERAL LAY-OUT

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

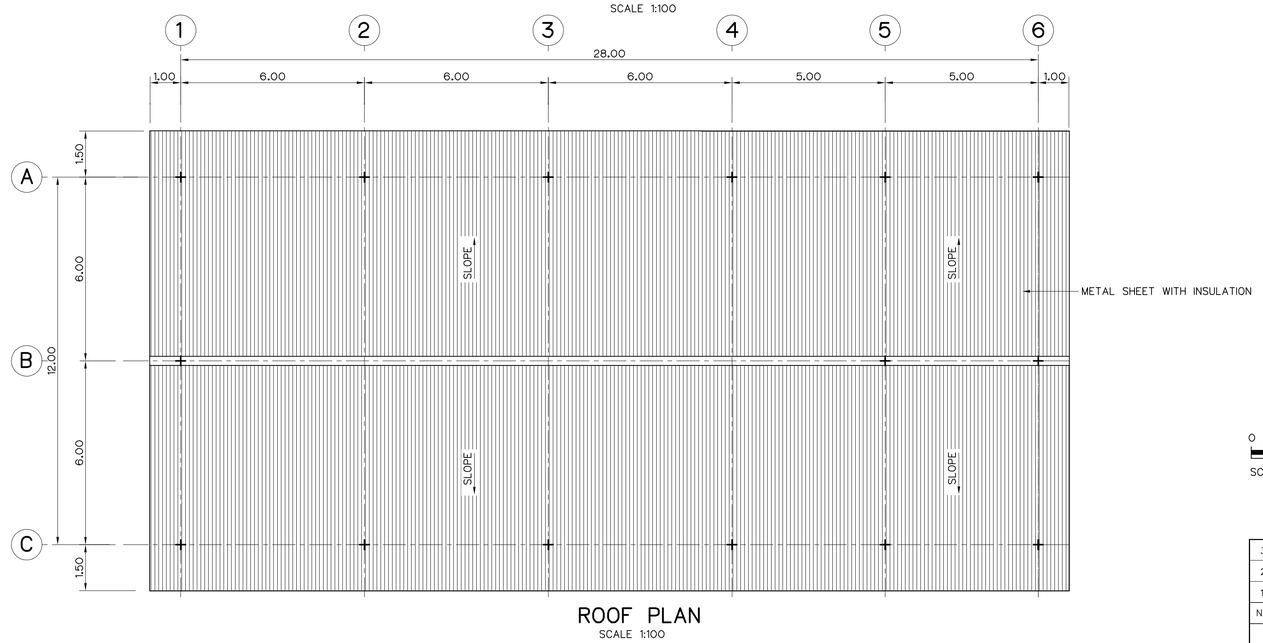
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED ร.ท.ภิชัย

DESIGNED	สย.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สย.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO. HLS-PH-01	SHEET NO. 44 OF 77



PLAN
SCALE 1:100



ROOF PLAN
SCALE 1:100

DESCRIPTION :

1. PELTON TURBINE
2. SYNCHRONOUSE GENERATOR
3. INLET VALVE AND BYBASS VALVE
4. PRESSURE OIL EQUIPMENT
5. GOVERNOR AND TURBINE CONTROL PANEL
6. MAIN CONTROL SWITCHBOARD
7. BATTERRIES AND RACKS
8. AC AND DC SWITCHBOARD AND BATTERY CHARGER CUBICLE
9. OIL PRESSURE TANK
10. OIL SUMP TANK WITH OIL PUMP SETS
11. NGR CUBICLE
12. AVR CUBICLE
13. GENERATOR DISCONNECTING SWITCH CUBICLE
14. MAIN TRANSFORMER
15. SWICTHYARD FENCE
16. TAKE OFF STRUCTURE

SYMBOLS :

- EXHAUST FAN Ø10"
- AIR CONDITIONING
- EMERGENCY LAMP

FLOOR FINISH SYMBOLS :

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

WALL FINISH SYMBOLS :

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

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
3. CONTRACT C1 OF INCLUDE PENSTOCK BEYOND POWERHOUSE WALL 1.00 M. (INCLUDE FLANGE)
4. ALL OF CABLE TRENCH TYPE "C" (INCLUDE INSIDE SWITCHYARD FENCE) SHALL BE DONE BY CONTRACT C1.

REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAY-OUT	HLS-PH-01
2. POWERHOUSE, ELEVATIONS	HLS-PH-03
3. POWERHOUSE, SECTIONS	HLS-PH-04
4. POWERHOUSE, DETAILS OF TOILET, SEPTIC AND SEEPAGE TANK	HLS-PH-05
5. POWERHOUSE, DETAIL OF DOORS, WINDOWS AND NAMEPLATE	HLS-PH-06

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

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
PLAN AND ROOF PLAN

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

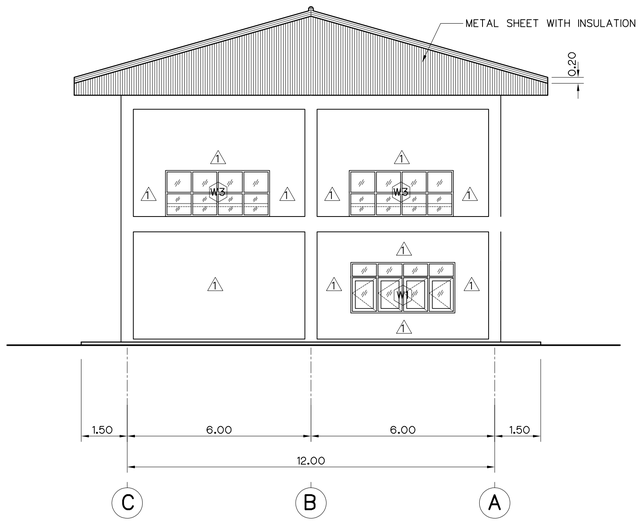
REVIEWED ร.ท.กิติชัย

DESIGNED	สม.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สม.7324	APPROVED	

PROJECT MANAGER — 14/01/62 DATE

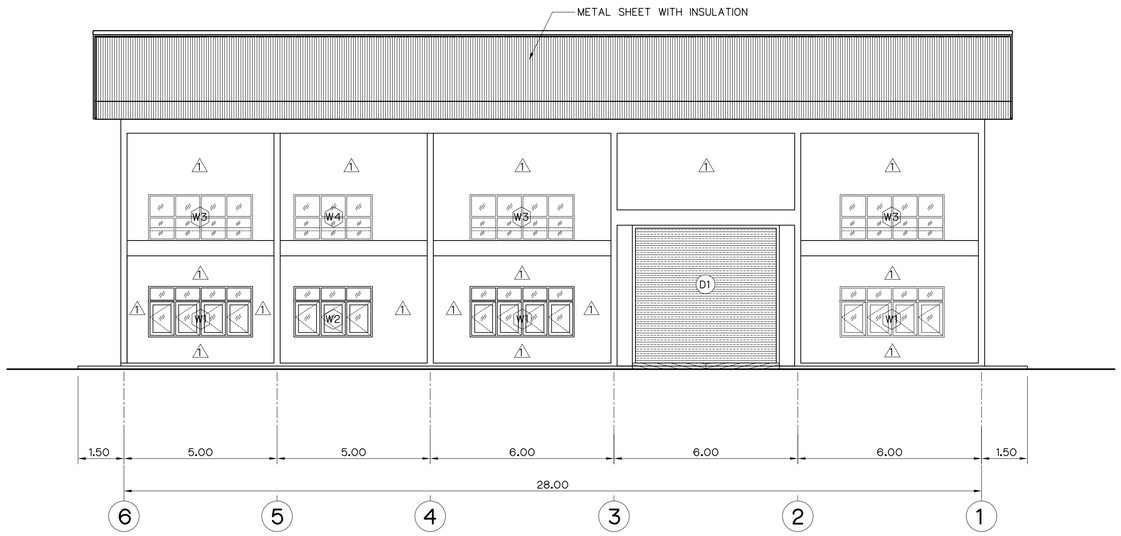
DRAWING NO. HLS-PH-02

SHEET NO. 45 OF 77



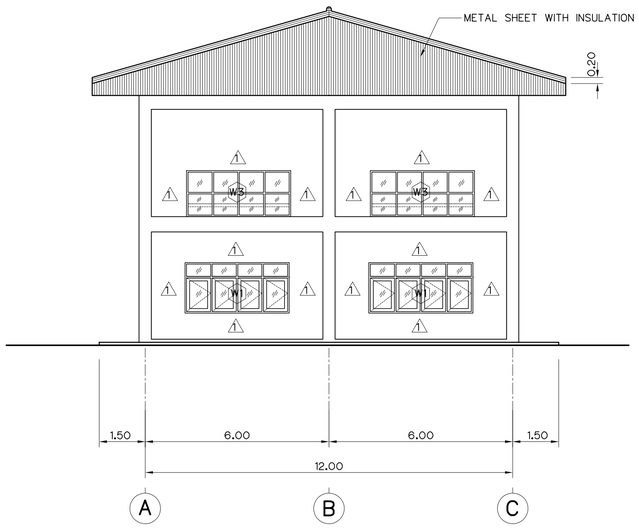
ELEVATION "A"

SCALE 1:100



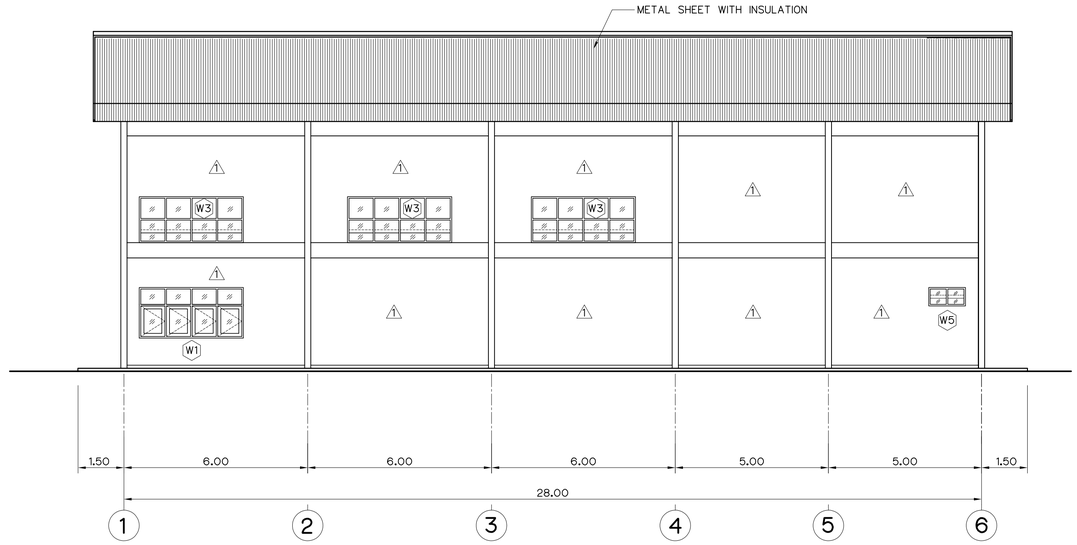
ELEVATION "B"

SCALE 1:100



ELEVATION "C"

SCALE 1:100



ELEVATION "D"

SCALE 1:100

NOTES :

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

REFERENCE DRAWINGS :

1. POWERHOUSE, PLAN ANG ROOF PLAN	HLS-PH-02
2. POWERHOUSE, SECTIONS	HLS-PH-04
3. POWERHOUSE, DETAIL OF DOORS, WINDOWS AND NAME PLATE	HLS-PH-06

0 1 2 3 4 5 6 7 8

SCALE 1:100 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

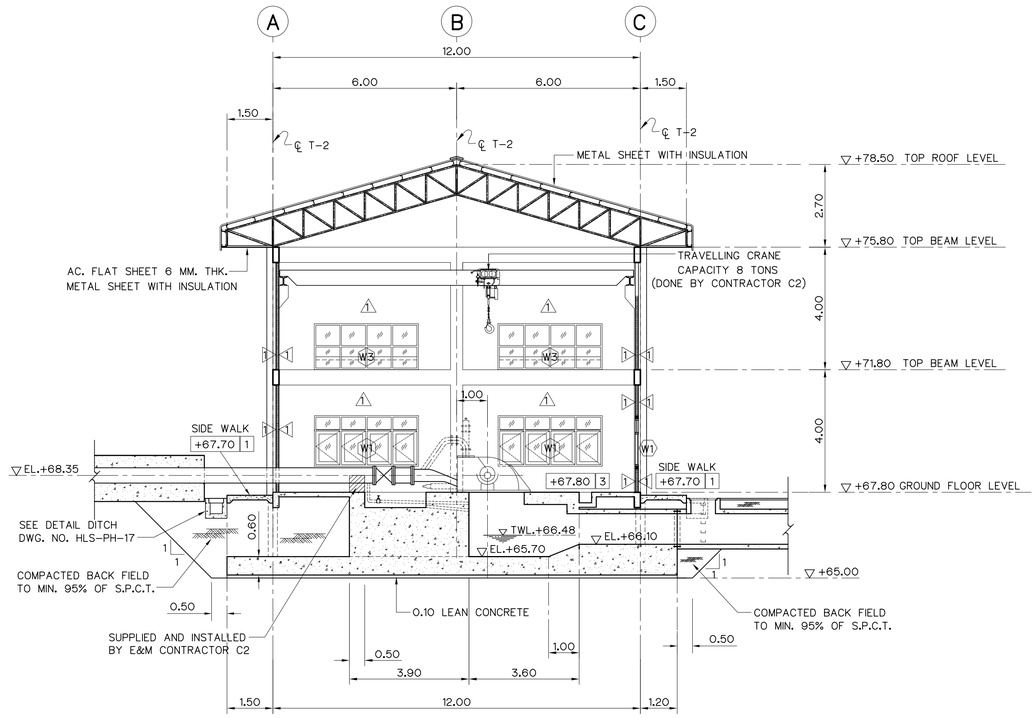
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
ELEVATIONS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

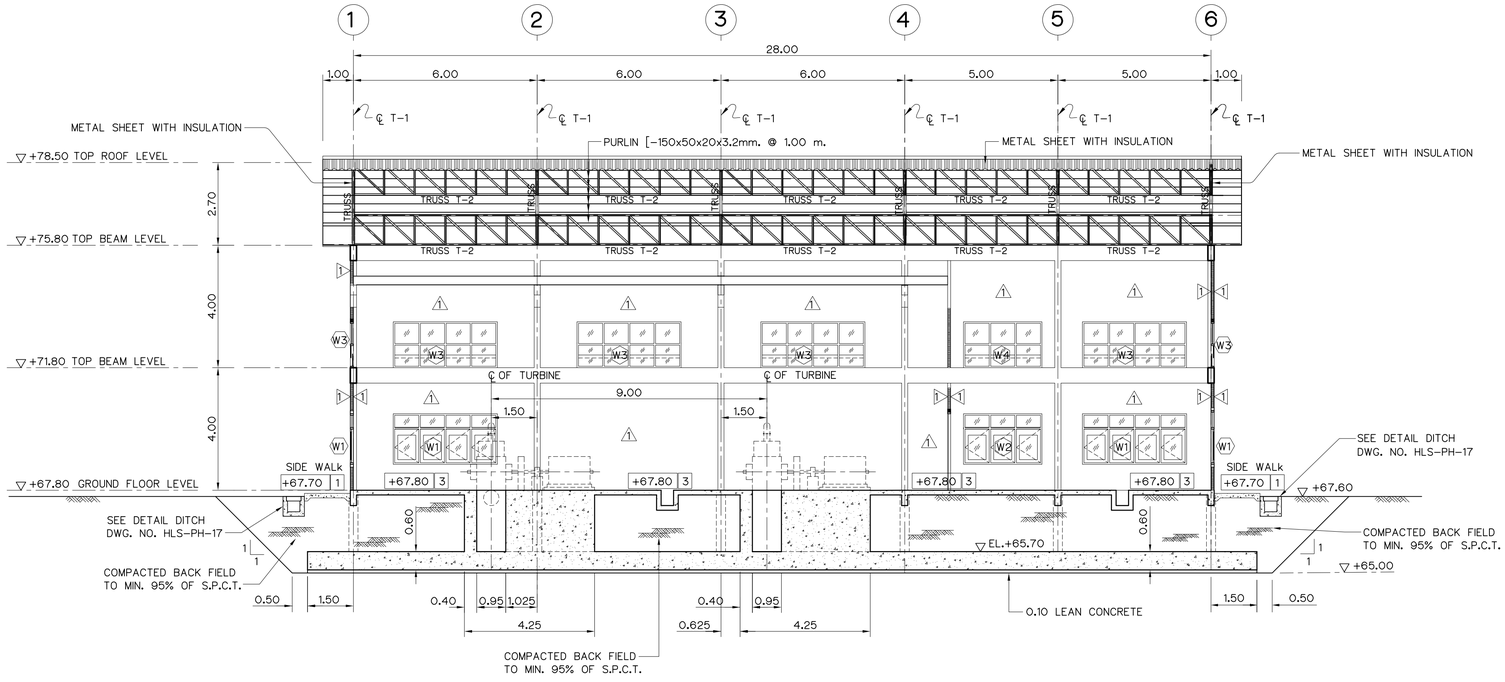
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

DESIGNED	สย.6651	REVIEWED	ว.ภาคิชัย
DRAWN		SUBMITTED	
CHECKED	สย.7324	RECOMMENDED	
PROJECT MANAGER	14/01/62	APPROVED	
	DATE	DRAWING NO.	HLS-PH-03
		SHEET NO.	46 OF 77



SECTION A–A

SCALE 1:100



SECTION B–B

SCALE 1:100

NOTES :

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

REFERENCE DRAWINGS :

1. POWERHOUSE, PLAN AND ROOF PLAN	HLS-PH-02
2. POWERHOUSE, ELEVATIONS	HLS-PH-03

0 1 2 3 4 5 6 7 8

SCALE 1:100 METERS

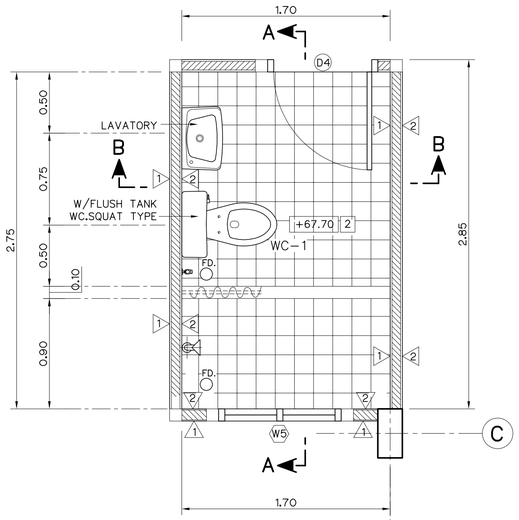
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
SECTIONS

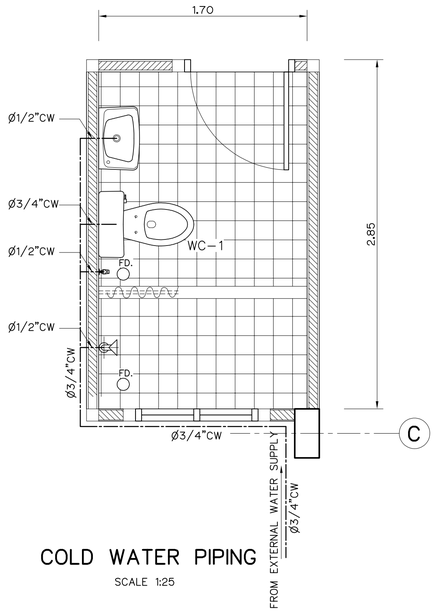
FEC FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED ส.6651	REVIEWED S.KITICHAI
DRAWN	SUBMITTED
CHECKED ส.7324	RECOMMENDED
PROJECT MANAGER 14/01/62 DATE	APPROVED
DRAWING NO. HLS-PH-04	SHEET NO. 47 OF 77



PLAN WC-1

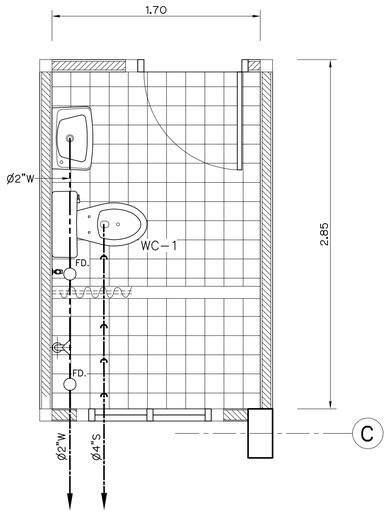
SCALE 1:25

6



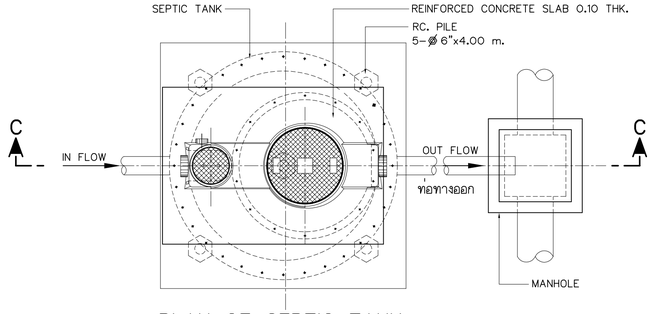
COLD WATER PIPING

SCALE 1:25



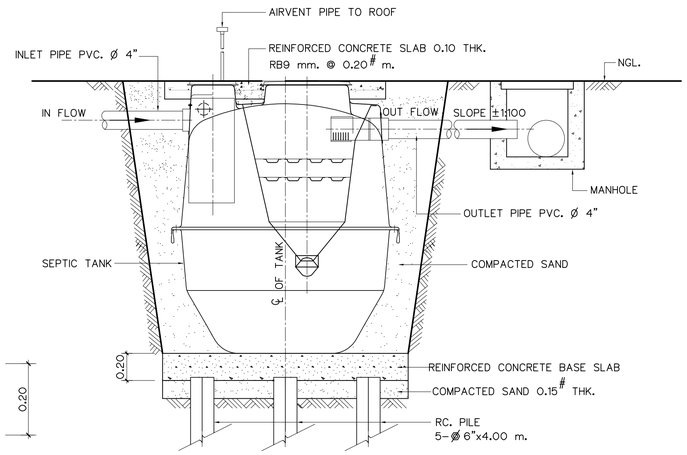
SOIL, WASTE AND VENT PIPING

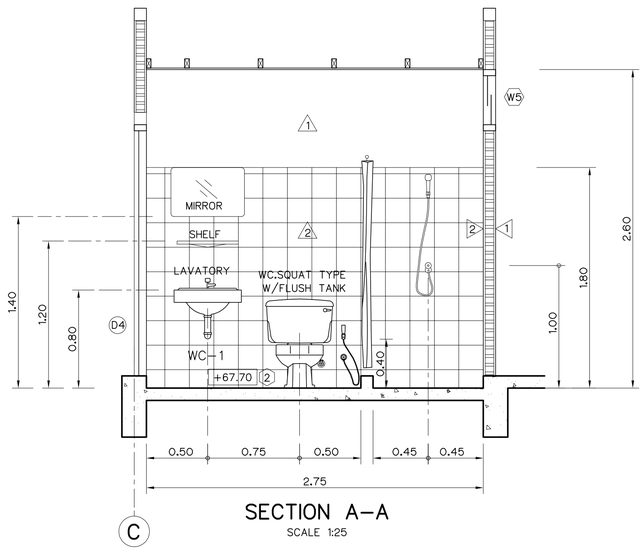
SCALE 1:25



PLAN OF SEPTIC TANK

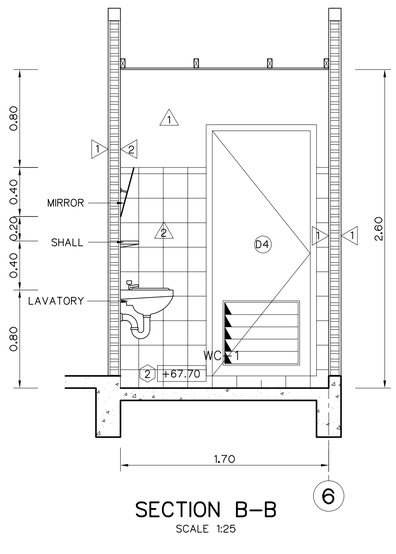
NOT TO SCALE





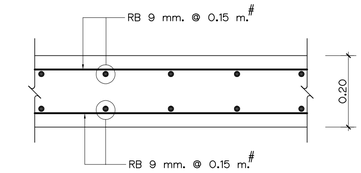
SECTION A-A

SCALE 1:25



SECTION B-B

SCALE 1:25



REINFORCEMENT OF BASE SLAB

NOT TO SCALE

SECTION C-C

NOT TO SCALE

APPLICATION AND DIMENSION OF SEPTIC TANK					
	VOLUMN		CONDITION		
NO. OF USER	RESIDENTIAL	SOIL ONLY 60 LPCD	16	20	23
		TOTAL WASTE 200 LPCD	5	6	7
DIMENSION	DIAMETER (MM.)		1430	1390	1460
	HIGHT (MM.)		1490	1570	1670
	INLET,OUTLET PIPE (MM.)		100	100	100
	VENT (MM.)		50	50	50
VOLUMNS	TOTAL VOLUMN (LITER)		1600	1800	2230
	SEPTIC ZONE (LITER)		1060	1200	1530
	FILTER ZONE (LITER)		540	600	700
REMARK:LPCD = LITER PER CAPITAL PER DAY					

SELECTED CONDITION

MATERIAL AND APPLICATION OF SEPTIC TANK	
COMPONENTS	MATERIAL
1. TANK BODY	LLDEL (LINER LOW TYPE MEDIUM DENSITY)
2. MANHOLE COVER	ABS (ACRYLONITRILE-BUTADIENCE-STYRENE), IRON CAST
3. INLET, OUTLET PIPES	POLYETHYLENE
4. FLEX	FLEXIBLE FITTING ABS Ø 100 MM.
5. MEDIA	HDPE

SYMBOLS :

SOIL PIPE

WASTE PIPE

COLD WATER PIPE

VENT PIPE

0 0.5 1.0 1.5 2.0

SCALE 1:25 METERS

NOTES :

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

REFERENCE DRAWING :

1. POWERHOUSE, PLAN AND ROOF PLAN HLS-PH-02

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

CONSULTANTS DEDE

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
DETAILS OF TOILET AND SEPTIC TANK

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED ร.ท.กิจชัย

DESIGNED 28.6651 SUBMITTED

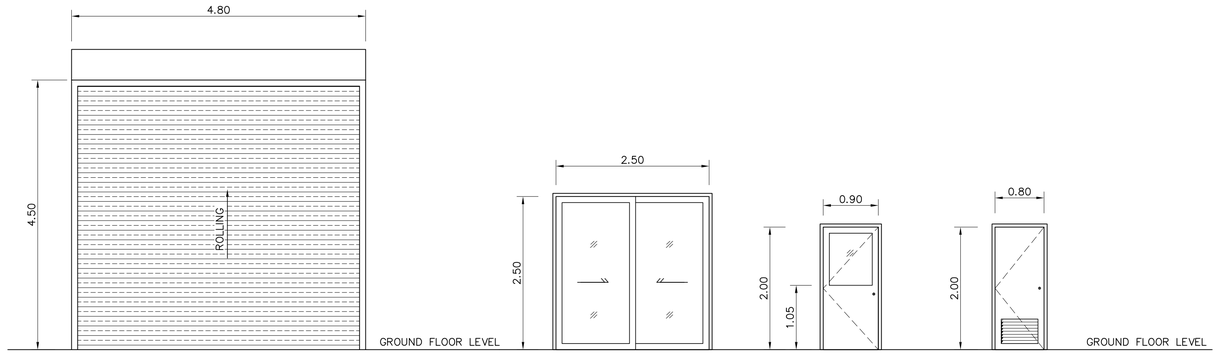
DRAWN RECOMMENDED

CHECKED 28.7324 APPROVED

PROJECT MANAGER 14/01/62 DATE

DRAWING NO. HLS-PH-05

SHEET NO. 48 OF 77



D1

ROLLING DOOR

SCALE 1:50

D2

SLIDE DOOR

SCALE 1:50

D3

OPENING DOOR

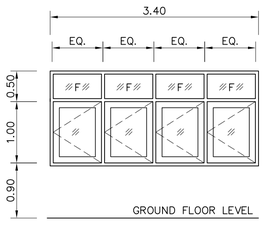
SCALE 1:50

D4

OPENING DOOR

SCALE 1:50

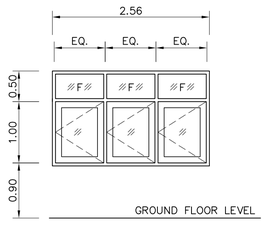
SYMBOL	DESCRIPTIONS	SIZE		FRAME	PANEL	HINGE	LOCKSET	HANDLE	REMARKS
		WIDTH	HEIGHT						
D1	ROLLING DOOR (STEEL NO.18,1.2 mm. Thk.)	4.80	4.50	GALVANIZED STEEL	—	—	NORMAL KEY	—	MOTOR OPERATING
D2	SLIDE DOOR	2.50	2.50	ALUMINIUM(NA) 2"x 4"	GLASS 5 mm.thk.	—	CYINDER LOCK	—	
D3	OPENING DOOR	0.90	2.00	HARDWOOD 2"x 4"	TEAK PLYWOOD & GLASS 5 mm.thk.	STAINLESS STEEL 4"x3"x2.5mm.	CYINDER LOCK	—	
D4	OPENING DOOR	0.80	2.00	P.V.C. 2"x 4"	P.V.C.	STAINLESS STEEL 4"x3"x2.5mm.	CYINDER LOCK	—	
W1	OPENING WINDOW	3.40	1.50	ALUMINIUM(NA) 2"x 4"	GLASS 5 mm.thk.	●	●	●	FULL SET OF ACCESSORIES FROM MANUFACTURER
W2	OPENING WINDOW	2.56	1.50	ALUMINIUM(NA) 2"x 4"	GLASS 5 mm.thk.	●	●	●	FULL SET OF ACCESSORIES FROM MANUFACTURER
W3	FIXED GLASS WINDOW	3.40	1.50	ALUMINIUM(NA) 2"x 4"	GLASS 5 mm.thk.	—	—	—	
W4	FIXED GLASS WINDOW	2.56	1.50	ALUMINIUM(NA) 2"x 4"	GLASS 5 mm.thk.	—	—	—	
W5	FIXED GLASS WINDOW	1.20	0.50	ALUMINIUM(NA) 2"x 4"	GLASS 5 mm.thk.	—	—	—	
W6	SLIDING WINDOW	1.70	1.00	ALUMINIUM(NA) 2"x 4"	GLASS 5 mm.thk.	—	—	—	
●	SHALL BE USED SPACIFIED ACCESSORIES								



W1

OPENING WINDOW

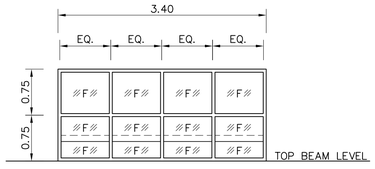
SCALE 1:50



W2

OPENING WINDOW

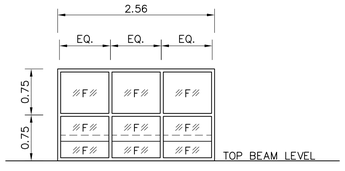
SCALE 1:50



W3

FIX GRASS WINDOW

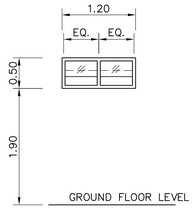
SCALE 1:50



W4

FIX GRASS WINDOW

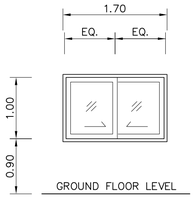
SCALE 1:50



W5

FIX GRASS WINDOW

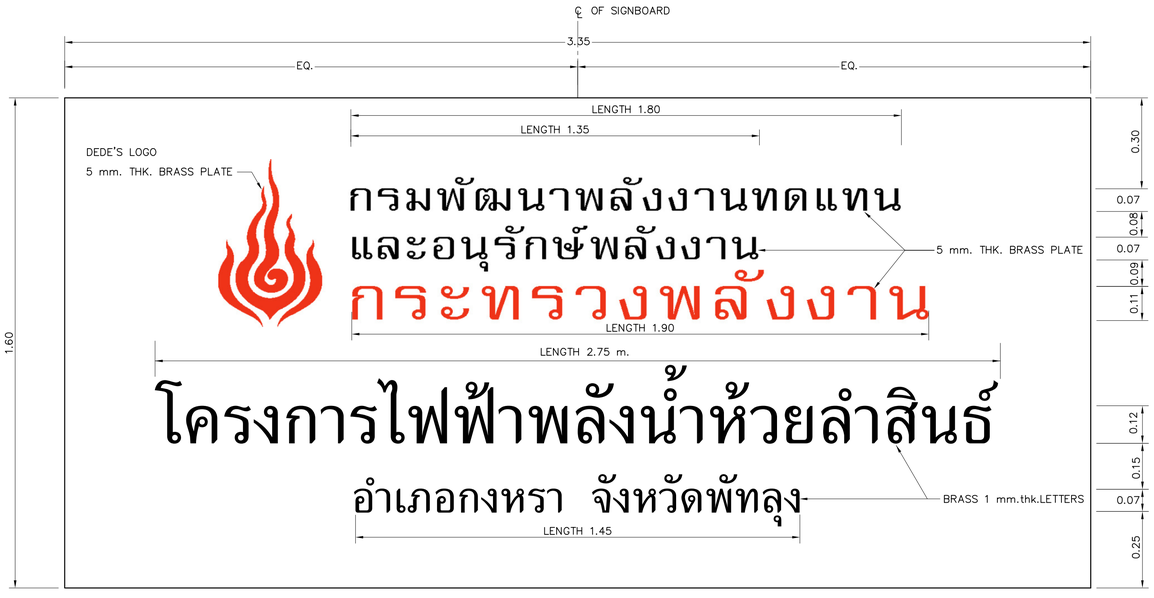
SCALE 1:50



W6

SLIDING WINDOW

SCALE 1:50



FRONT VIEW OF NAMEPLATE

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. HLS-GN-03
3. FOR PAINTING WORKS SEE TECHNICAL SPECIFICATION

REFERENCE DRAWINGS :

1. POWERHOUSE, PLAN AND ROOF PLAN	HLS-PH-02
2. POWERHOUSE, ELEVATIONS	HLS-PH-03
3. POWERHOUSE, SECTIONS	HLS-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
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS

POWERHOUSE

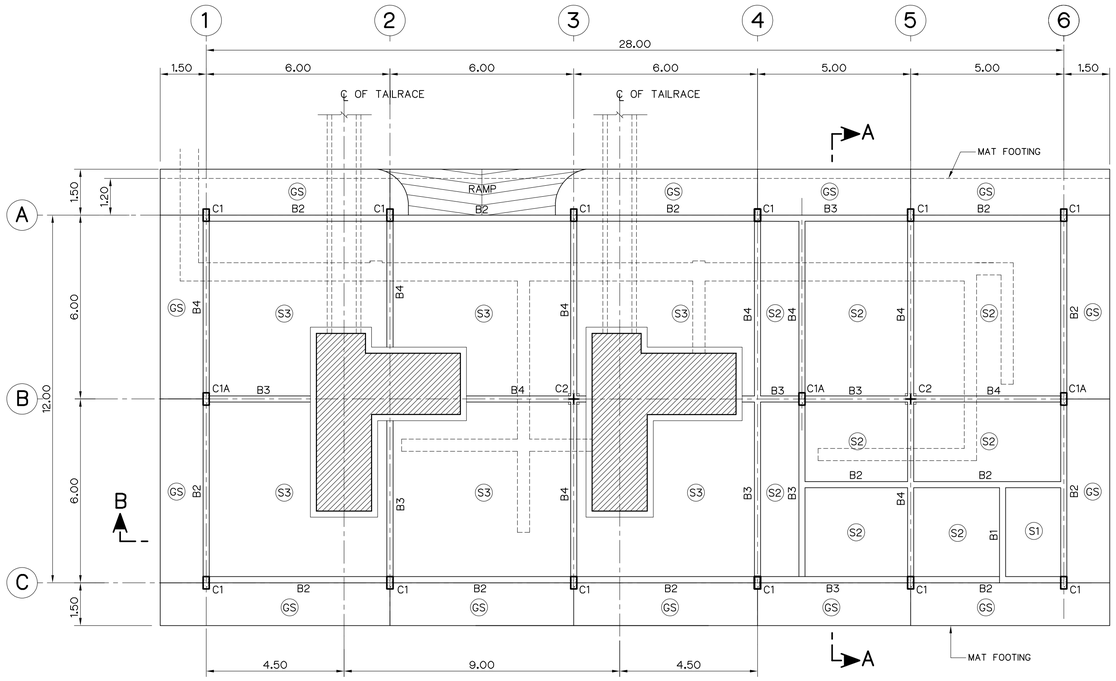
DETAILS OF DOORS, WINDOWS AND NAMEPLATE

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

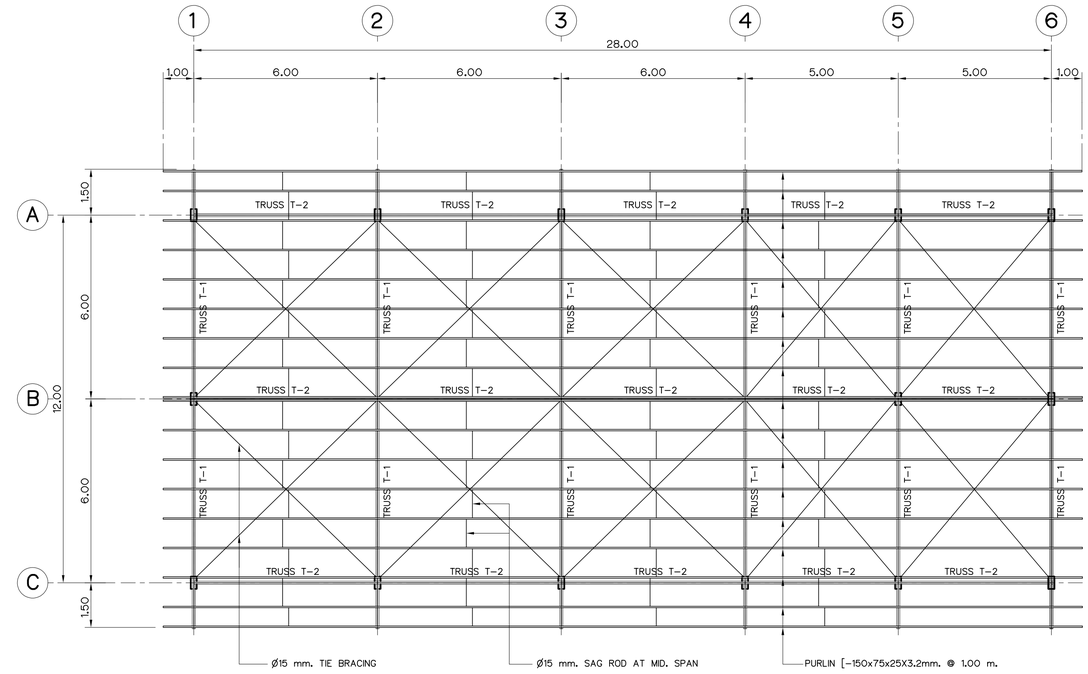
REVIEWED ร.ก.ก(CHAI)

DESIGNED	พ.ศ.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	พ.ศ.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO.	HLS-PH-06
		SHEET NO.	49 OF 77



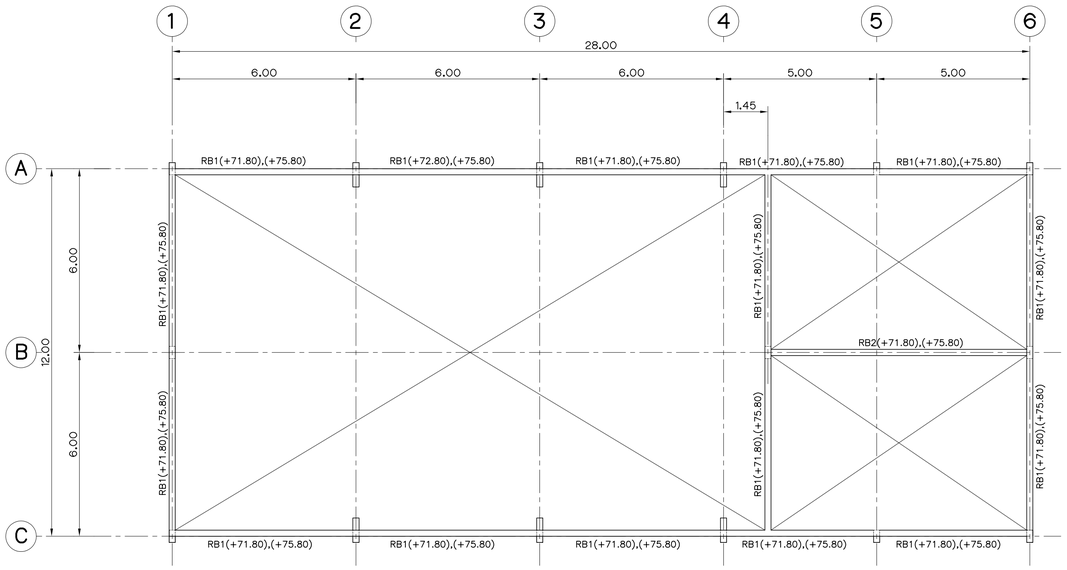
PLAN OF FOOTING, BEAM AND SLAB

SCALE 1:100



PLAN OF BEAM AND ROOF TRUSSES (TOP ROOF LEVEL+75.80)

SCALE 1:100



ROOF BEAM 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. HLS-GN-03

REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAY-OUT	HLS-PH-01
2. POWERHOUSE, ELEVATIONS	HLS-PH-03
3. POWERHOUSE, SECTIONS	HLS-PH-04
4. POWERHOUSE, DETAILS TRUSS T-1 AND T-2 (1/2)	HLS-PH-11

0 1 2 3 4 5 6 7 8

SCALE 1:100 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

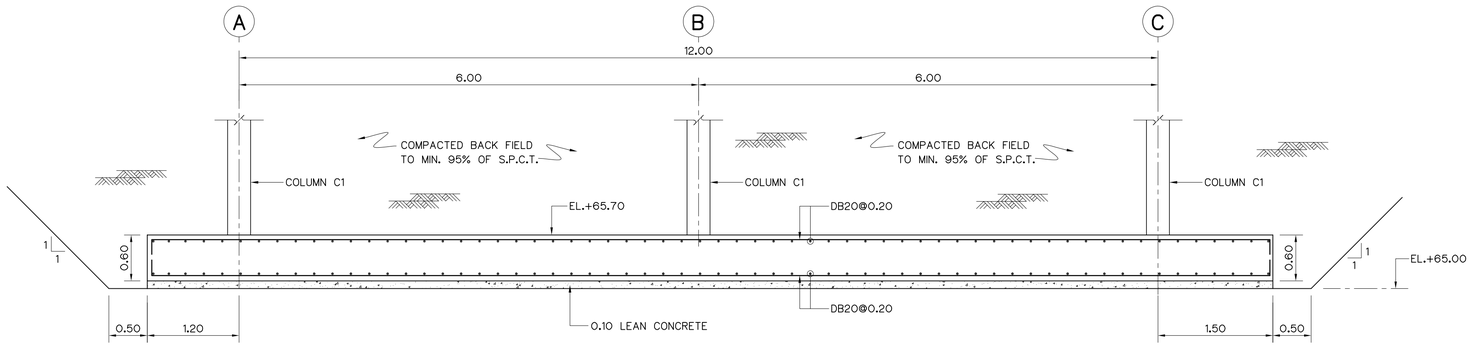
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS

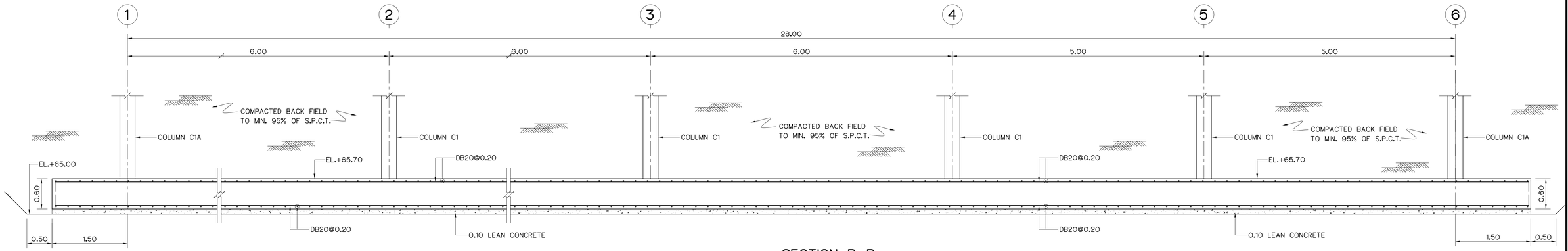
POWERHOUSE

FOOTING, BEAM, SLAB ROOF BEAM AND TRUSS PLANS

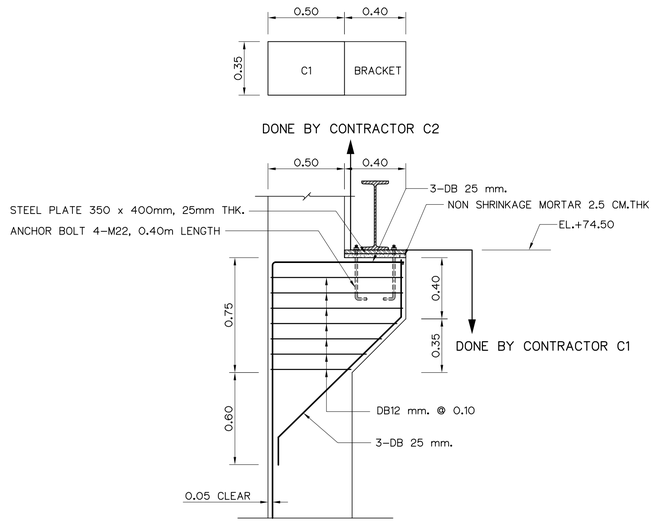
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED ร.ท.กิจชัย
DESIGNED ส.ย.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED ส.ย.7324	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS-PH-07
	SHEET NO. 50 OF 77



SECTION A–A
SCALE 1:40



SECTION B–B
SCALE 1:40



BRACKET
SCALE 1:20

COLUMN DETAIL

	C1	C1A	C2
ROOF BEAM ↑ 1ST FLOOR	0.35 × 0.50: 14–DB28, 3 STR RB9 @ 0.25	0.35 × 0.50: 8–DB20, 2 STR RB9 @ 0.25	–
1ST FLOOR ↑ FOOTING	0.35 × 0.50: 14–DB28, 3 STR RB9 @ 0.25	0.35 × 0.50: 8–DB25, 2 STR RB9 @ 0.25	0.35 × 0.50: 8–DB20, 2 STR RB9 @ 0.25

NOTES :
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS–GN–03
3. ALLOWABLE BEARING CAPACITY OF POWERHOUSE FOUNDATION SHALL NOT BE LESS THAN 10 T/M.^{2}

REFERENCE DRAWINGS :
1. POWERHOUSE, PLAN AND ROOF PLAN — HLS–PH–02
2. POWERHOUSE, ELEVATIONS — HLS–PH–03
3. POWERHOUSE, SECTIONS — HLS–PH–04

0 0.5 1 1.5
SCALE 1:20 METERS

0 0.5 1 2 3
SCALE 1:40 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

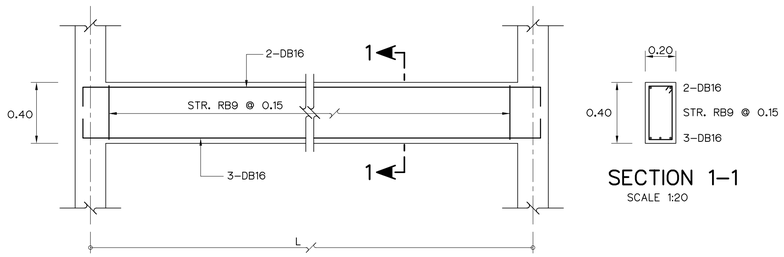
CIVIL WORKS
POWERHOUSE
PLAN AND DETAILS OF FOOTING, COLUMN ,CORBEL AND BRACKET

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

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

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED ร.ก.ก.ช.ภ.ส.
SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HLS–PH–08
SHEET NO. 51 OF 77

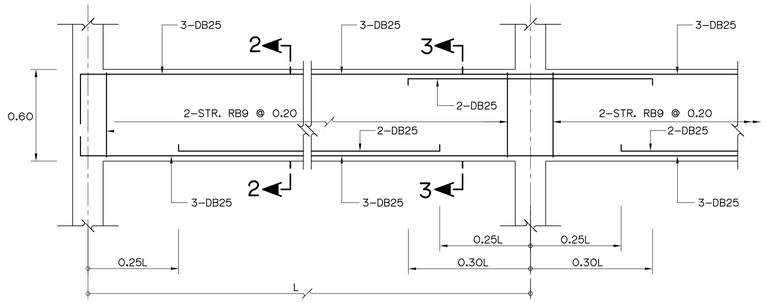


B1

SCALE 1:20

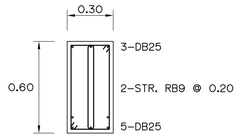
SECTION 1-1

SCALE 1:20



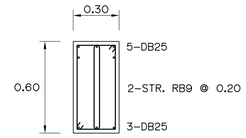
B2

SCALE 1:20



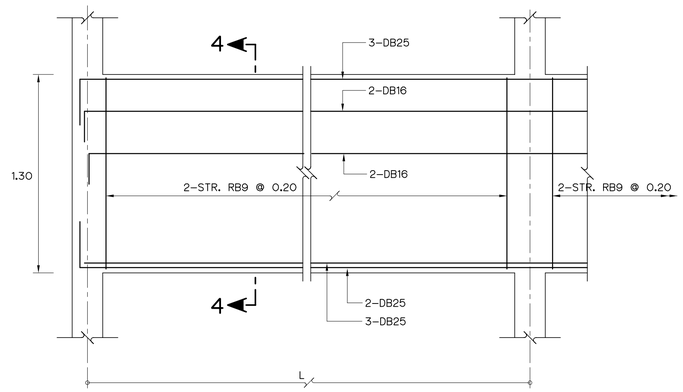
SECTION 2-2

SCALE 1:20



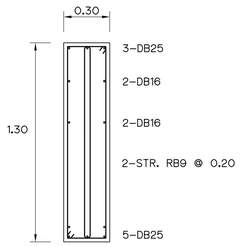
SECTION 3-3

SCALE 1:20



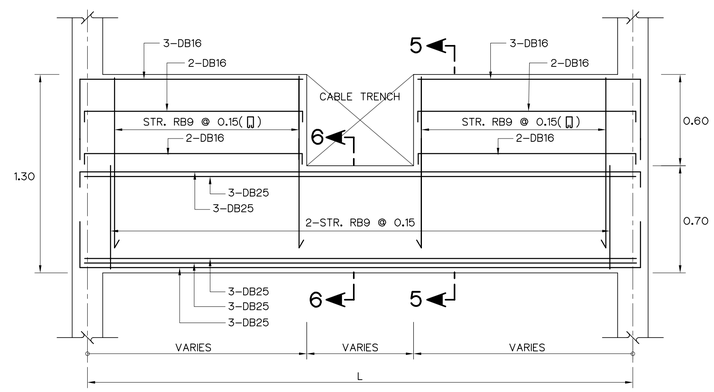
B3

SCALE 1:20



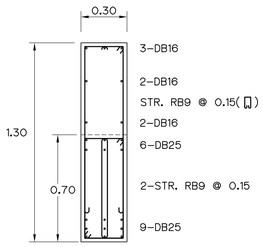
SECTION 4-4

SCALE 1:20



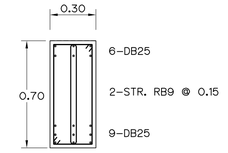
B4

SCALE 1:20



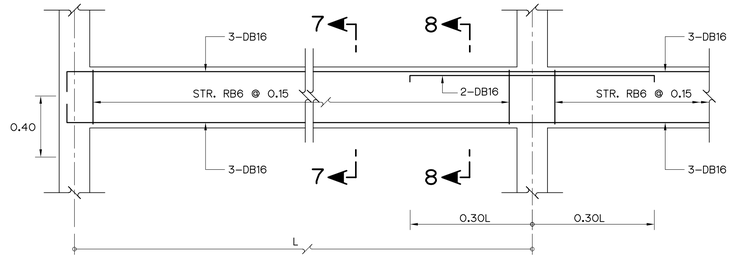
SECTION 5-5

SCALE 1:20



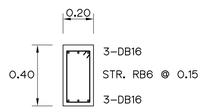
SECTION 6-6

SCALE 1:20



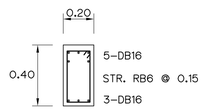
RB1

SCALE 1:20



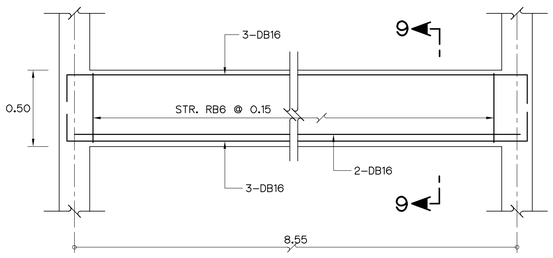
SECTION 7-7

SCALE 1:20



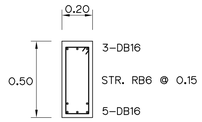
SECTION 8-8

SCALE 1:20



RB2

SCALE 1:20



SECTION 9-9

SCALE 1:20

NOTE :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.

REFERENCE DRAWING :

1. POWERHOUSE, PLAN AND DETAILS OF FOOTING, COLUMN ,CORBEL AND BRACKET HLS-PH-07

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
BEAM REINFORCEMENT DETAILS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				

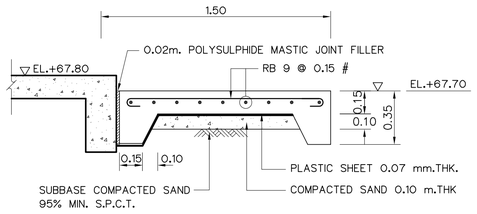
CONSULTANTS: FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

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

DESIGNED ๒๕.6651 | DRAWN | CHECKED ๒๕.7324 | PROJECT MANAGER 14/01/62 DATE

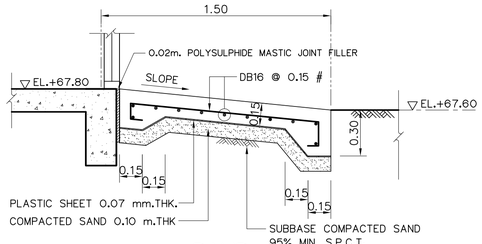
REVIEWED ว.ภัทรชัย | SUBMITTED | RECOMMENDED | APPROVED

DRAWING NO. HLS-PH-09 | SHEET NO. 52 OF 77



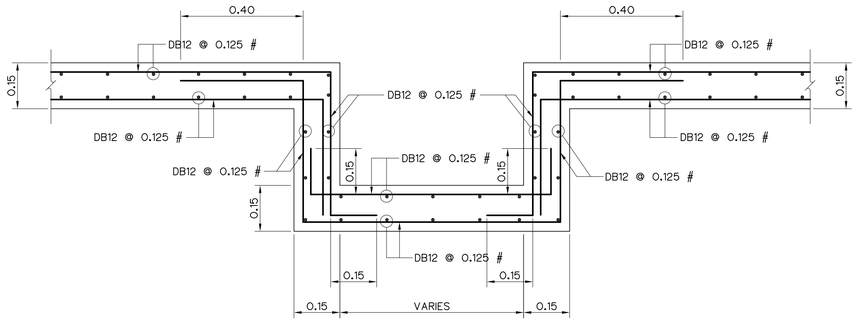
GS

SCALE 1:20



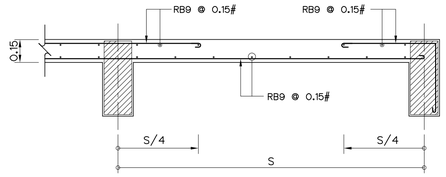
RAMP

SCALE 1:20



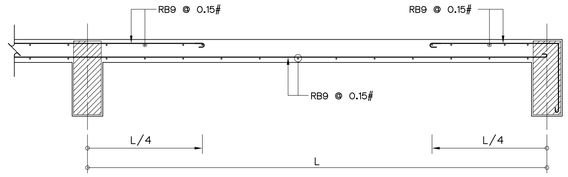
REINFORCEMENT DETAILS OF CABLE TRENCH AT SLAB S2

SCALE 1:10



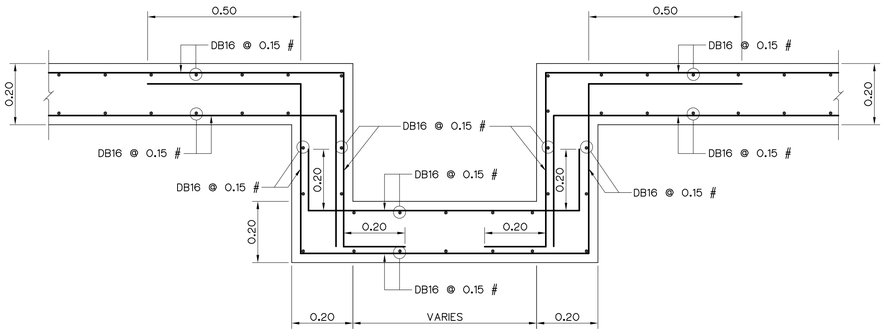
S1 (SHOT)

SCALE 1:20



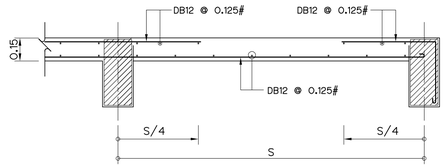
S1 (LONG)

SCALE 1:20



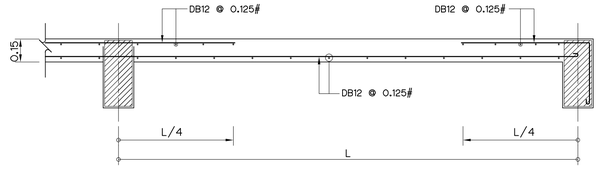
REINFORCEMENT DETAILS OF CABLE TRENCH AT SLAB S3

SCALE 1:10



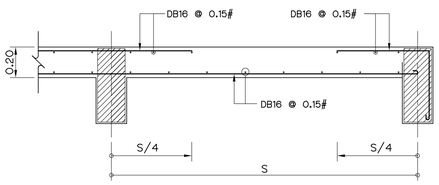
S2 (SHOT)

SCALE 1:20



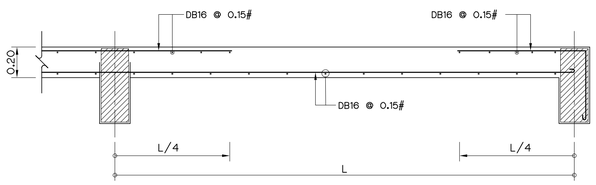
S2 (LONG)

SCALE 1:20



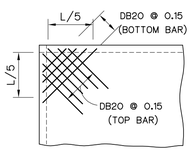
S3 (SHOT)

SCALE 1:20



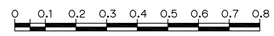
S3 (LONG)

SCALE 1:20



TYP. ALL CORNER

SCALE 1:20



SCALE 1:10 METERS

SCALE 1:20 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. HLS-GN-03

REFERENCE DRAWINGS :

1. POWERHOUSE, PLAN AND DETAILS OF FOOTING, COLUMN ,CORBEL AND BRACKET HLS-PH-07

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

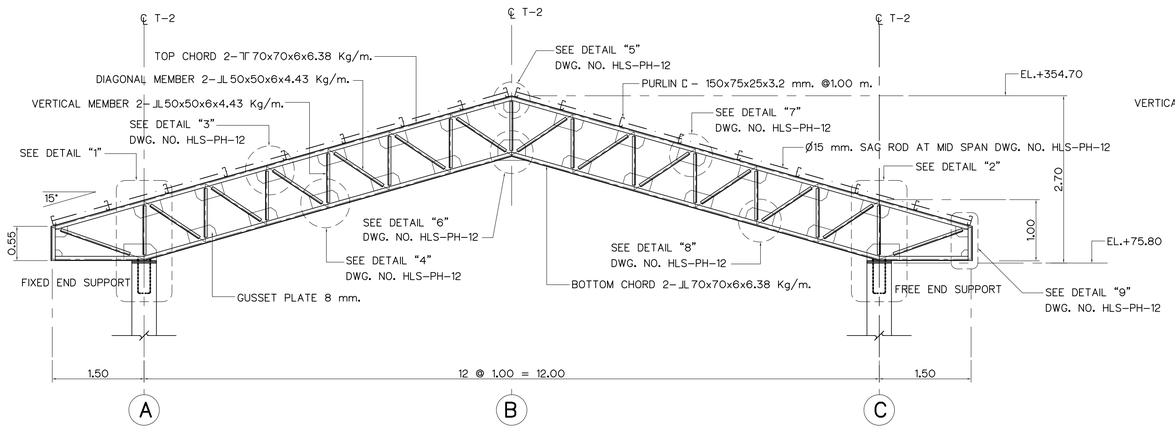
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
SLAB REINFORCEMENT DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

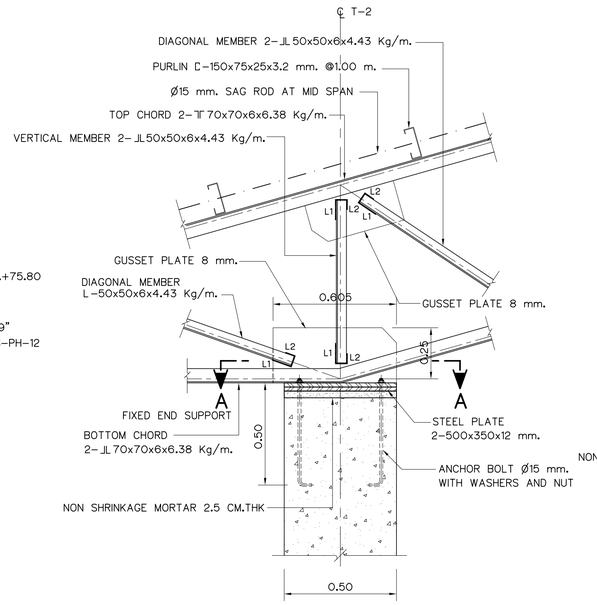
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY
REVIEWED วิเคราะห์เชิง

DESIGNED	วิย.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	วิย.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO. HLS-PH-10	SHEET NO. 53 OF 77



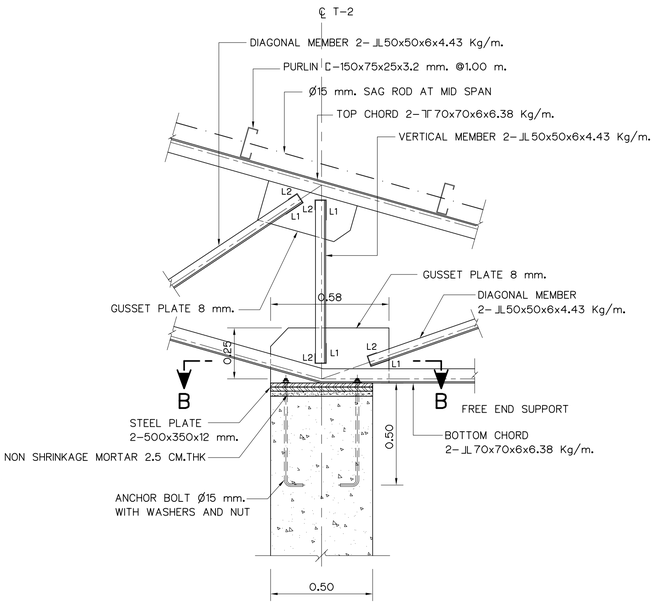
TRUSS T-1

SCALE 1:50



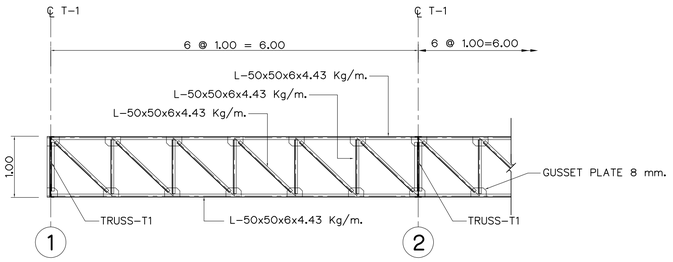
DETAILS "1"

SCALE 1:15



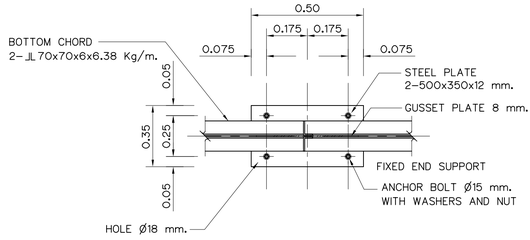
DETAILS "2"

SCALE 1:15



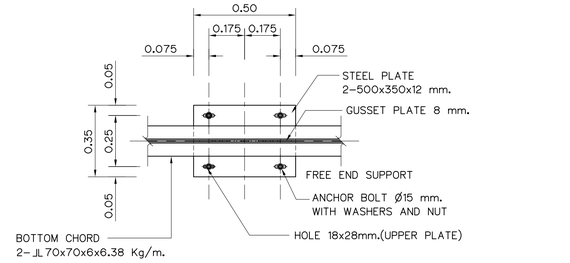
TRUSS T-2 (SPAN 6.00m.)

SCALE 1:50



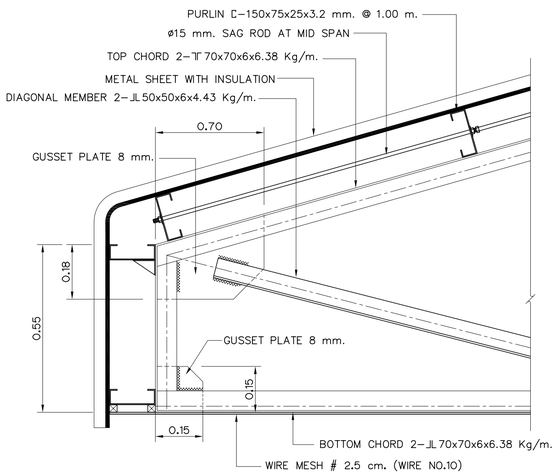
SECTION A-A

SCALE 1:15



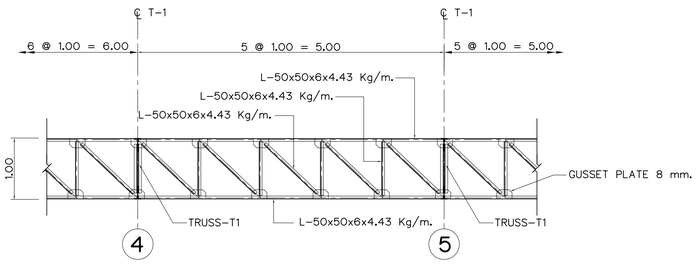
SECTION B-B

SCALE 1:15



EAVES DETAIL

SCALE 1:10



TRUSS T-2 (SPAN 5.00m.)

SCALE 1:50

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

0 0.5 1.2
SCALE 1:15 METERS

0 0.5 1.0 2.0 3.0 2.5
SCALE 1:50 METERS

NOTES :

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

REFERENCE DRAWINGS :

1. POWERHOUSE, SECTIONS	HLS-PH-04
2. POWERHOUSE, FOOTING, BEAM, SLAB ROOF BEAM AND TRUSS PLANS	HLS-PH-07
3. POWERHOUSE, DETAILS TRUSS T-1 AND T-2 (2/2)	HLS-PH-12

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS

POWERHOUSE

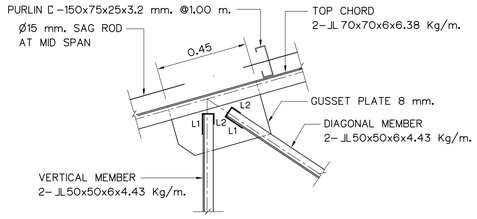
DETAILS TRUSS T-1 AND T-2 (1/2)

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

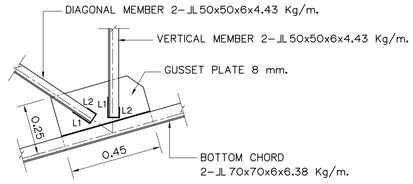
REVIEWED ร.ท.กาญจนา

DESIGNED	สย.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สย.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO. HLS-PH-11	SHEET NO. 54 OF 77



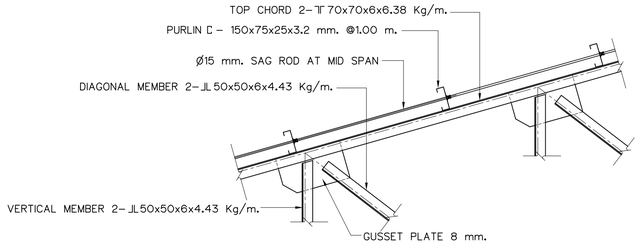
DETAILS "3"

SCALE 1:15

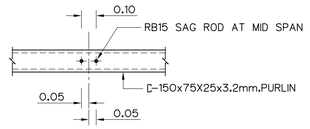


DETAILS "4"

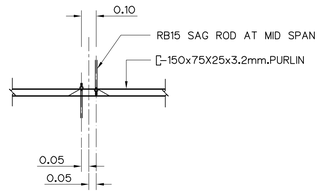
SCALE 1:15



SECTION



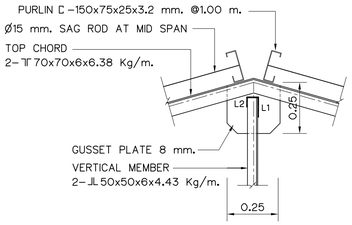
ELEVATION



PLAN

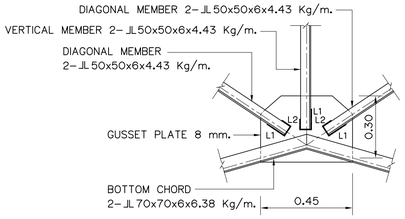
SAG ROD DETAILS

SCALE 1:20



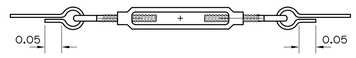
DETAILS "5"

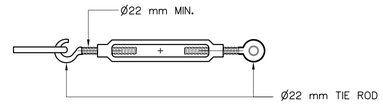
SCALE 1:15



DETAILS "6"

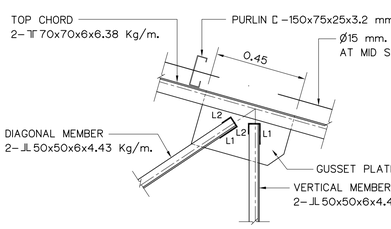
SCALE 1:15





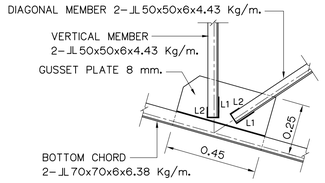
TURNBUCKLE

NOT TO SCALE



DETAILS "7"

SCALE 1:15

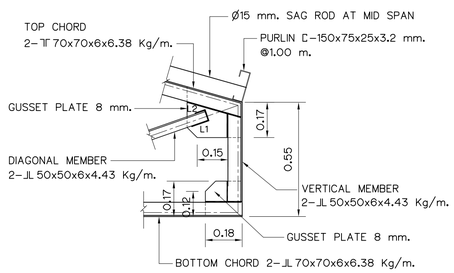


DETAILS "8"

SCALE 1:15

MEMBER SCHEDULE TABLE

TRUSS TYPE	MEMBER	FILLET WELD SIZE (mm)		
		L1	L2	t
TRUSS T-1	2-JL 70x70x6.38 Kg/m.	125	75	5
TRUSS T-2	1- L 70x70x6.38 Kg/m.	125	75	5



DETAILS "9"

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. HLS-GN-03

REFERENCE DRAWINGS :

1. POWERHOUSE, DETAILS TRUSS T-1, T-2, T-3 AND T-4 (1/2) HLS-PH-11

0 0.50 1.00 1.50
SCALE 1:20 METERS

0 0.5 1.2
SCALE 1:15 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

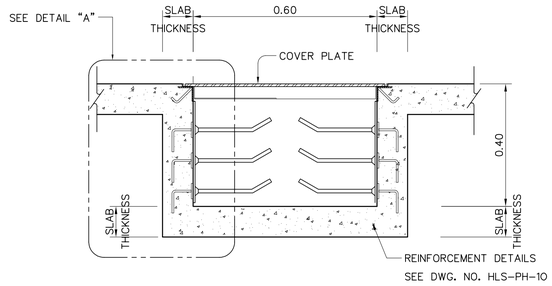
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
DETAILS TRUSS T-1 AND T-2 (2/2)

FEC FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

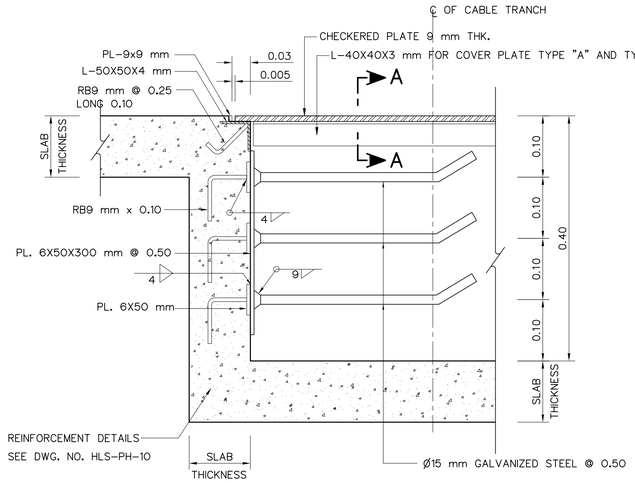
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED	ร.ท.ปิติชัย		
DESIGNED		28.6651	SUBMITTED
DRAWN			RECOMMENDED
CHECKED		28.7324	APPROVED
PROJECT MANAGER		14/01/62 DATE	DRAWING NO. HLS-PH-12
			SHEET NO. 55 OF 77



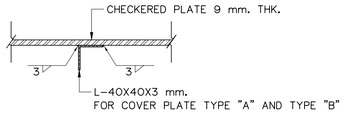
IN DOOR CABLE TRENCH TYPE "A"

SCALE 1:10



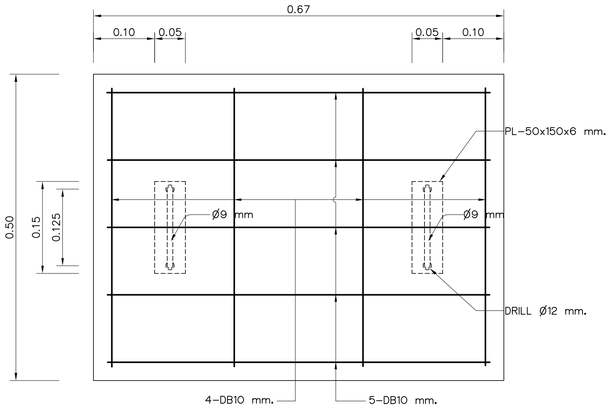
DETAIL "A"

SCALE 1:5



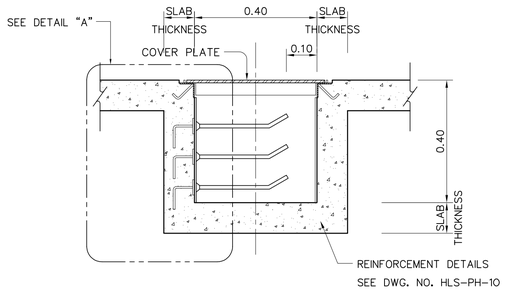
SECTION A-A

SCALE 1:5



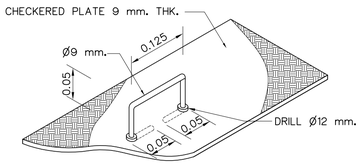
OUT DOOR COVER CABLE TRENCH

SCALE 1:5



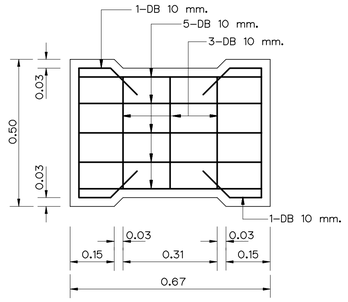
IN DOOR CABLE TRENCH TYPE "B"

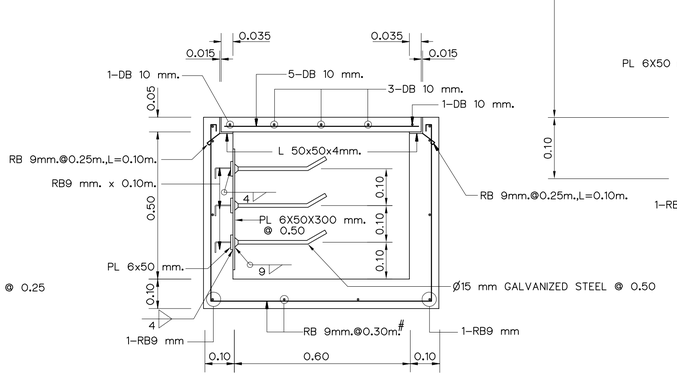
SCALE 1:10



DETAIL "B"

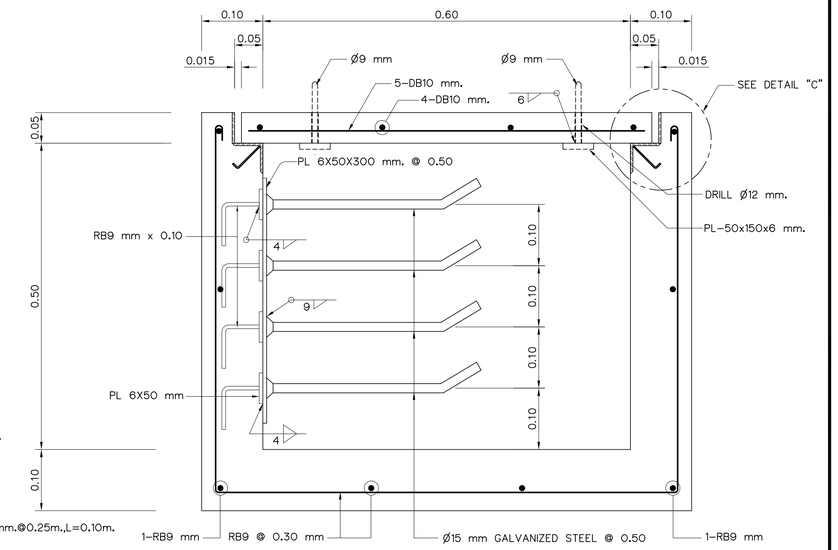
NOT TO SCALE





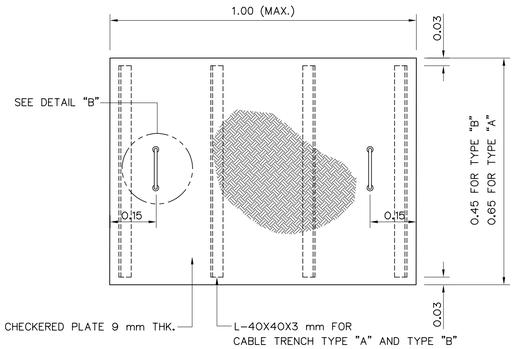
DETAIL CABLE TRENCH IN SWITCHYARD

SCALE 1:20



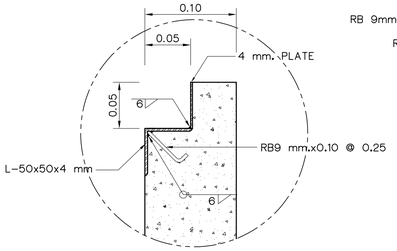
OUT DOOR CABLE TRENCH TYPE "C"

SCALE 1:5



COVER PLATE FOR IN DOOR

SCALE 1:10



DETAIL "C"

NOT TO SCALE

NOTES :

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATION AND GENERAL NOTES SEE DWG. No. HLS-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	HLS-PH-01
2. POWERHOUSE, PLAN AND ROOF PLAN	HLS-PH-02

0 0.10 0.20 0.30 0.40
SCALE 1:5 METERS

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

0 0.5 1.0 1.5
SCALE 1:20 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
CABLE TRENCH DETAILS

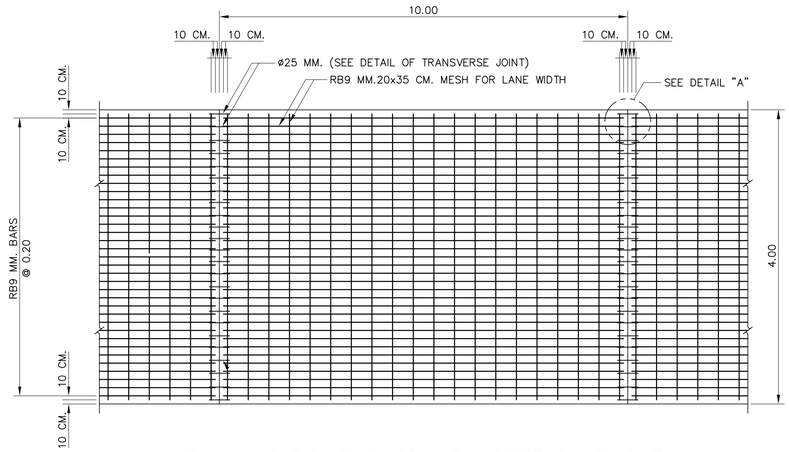
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

DESIGNED	สย.6651	REVIEWED	ร.ท.ชิโนรส
DRAWN		SUBMITTED	
CHECKED	สย.7324	RECOMMENDED	
PROJECT MANAGER	14/01/62 DATE	APPROVED	

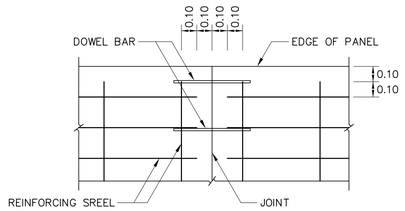
DRAWING NO. HLS-PH-13

SHEET NO. 56 OF 77



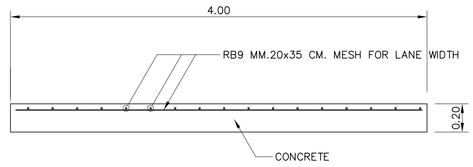
PLAN OF REINFORCED CONCRETE PAVEMENT

SCALE 1 : 75



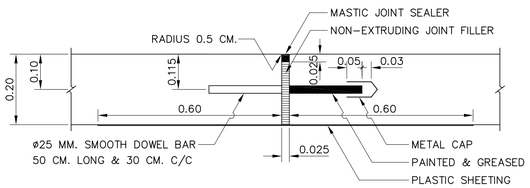
DETAIL "1"

SCALE 1 : 20

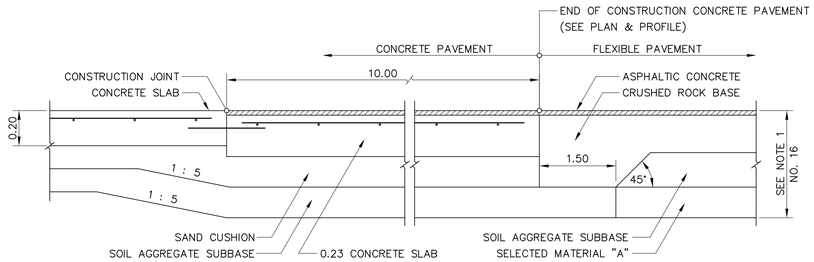


REINFORCEMENT DETAIL OF CONCRETE PAVEMENT CROSS–SECTION

SCALE 1 : 25

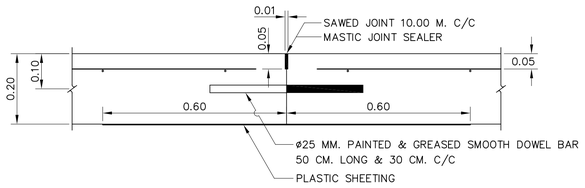


DETAIL OF EXPANSION JOINT

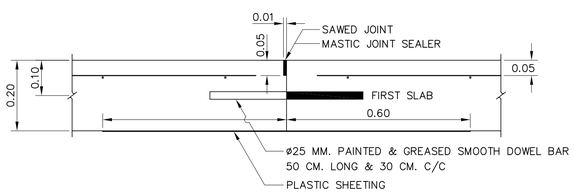


DETAIL OF JOINT BETWEEN CONCRETE PAVEMENT AND FLEXIBLE PAVEMENT

NOT TO SCALE



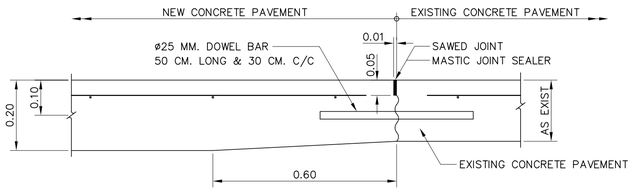
DETAIL OF CONTRACTION JOINT



DETAIL OF CONSTRUCTION JOINT

DETAIL OF TRANSVERSE JOINT

SCALE 1 : 10



DETAIL OF TRANSVERSE JOINT BETWEEN NEW AND EXISTING CONCRETE PAVEMENT

SCALE 1 : 10

NOTES 1 :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS–GN–03
3. EXPANSION JOINT SHALL BE CONSTRUCTED AT THE INTERVAL OF 350 METERS. IF THE LAST INTERVAL IS LESS THAN 350 METERS , THE INTERVALS SHALL BE AVERAGED BUT BETWEEN 300 AND 350 METERS.
4. EXPANSION JOINT SHALL BE PROVIDED AT THE OUTER EDGE OF BOTH SIDES OF THE BOX CULVERT CROSSING.
5. MASTIC JOINT SEALER SHALL BE OF THE HOT POURED ELASTIC TYPE CONFORMING TO TIS.479
6. JOINT FILLER SHALL CONFORM TO THE AASHTO M.213–74 OR ASTM. D1751–73 SPECIFICATION.
7. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR STANDARD CYLINDER (ø0.15x0.50 m.) AT 28 DAYS.
8. WELDED WIRE CAN BE USED IN PLACE OF BAR MESH.
9. ALL JOINTS EXCEPT EXPANSION JOINT SHALL BE MADE BY SLOT CUTTING MACHINE ONLY FOAM SHEET, PLYWOOD, TIMBER OR MATERIAL OF THE SAME TYPE SHALL NOT BE ALLOWED.
10. PLASTIC SHEET USED IN CONSTRUCTION SHALL HAVE THE FOLLOWING REQUIREMENTS :
    - 10.1 THICKNESS OF 0.07 MM. WITH A TOLERANCE OF NOT MORE THAN 7% SHALL BE REQUIRED.
    - 10.2 WIDTH SHALL NOT BE LESS THAN 1.20 M.
    - 10.3 IT SHALL BE COLOURLESS , TRANSPARENT AND WATERPROOF , FREE FROM POROUS AREA , TURN AREA AND BLISTERING AREA WHICH ARE VISIBLE BY NAKED EYE. EDGE SHALL BE STRAIGHT.
    - 10.4 CONTINUOUS LENGTH SHALL BE REQUIREMENT TO THE WIDTH OF TRAFFIC LANES. CONNECTION ALLOWED AT LONGITUDINAL JOINTS WITH NOT LESS THAN 20 CM. OVERLAPPING SHALL BE REQUIRED.

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
CONCRETE PAVEMENT

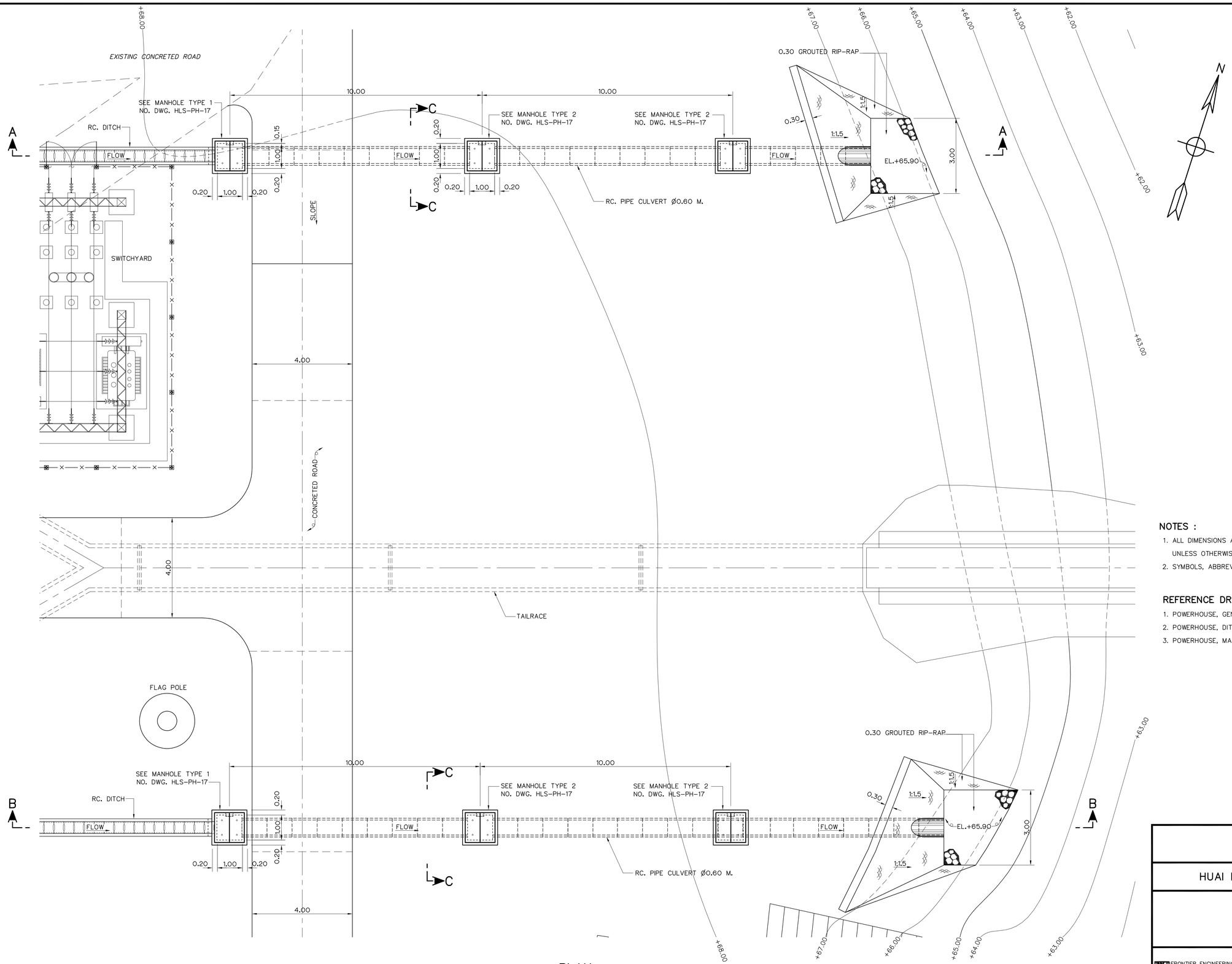
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

DESIGNED	สย.6651	SUBMITTED
DRAWN		RECOMMENDED
CHECKED	สย.7324	APPROVED
PROJECT MANAGER	14/01/62 DATE	DRAWING NO. HLS–PH–14

REVIEWED ว.ภาชัย

SHEET NO. 57 OF 77



NOTES :

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

REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAY-OUT	HLS-PH-01
2. POWERHOUSE, DITCH SECTIONS AND DETAILS	HLS-PH-16
3. POWERHOUSE, MANHOLE AND DITCH REINFORCEMENT DETAILS	HLS-PH-17

PLAN
SCALE 1:75

SCALE 1:75 METERS

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
DITCH PLAN

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

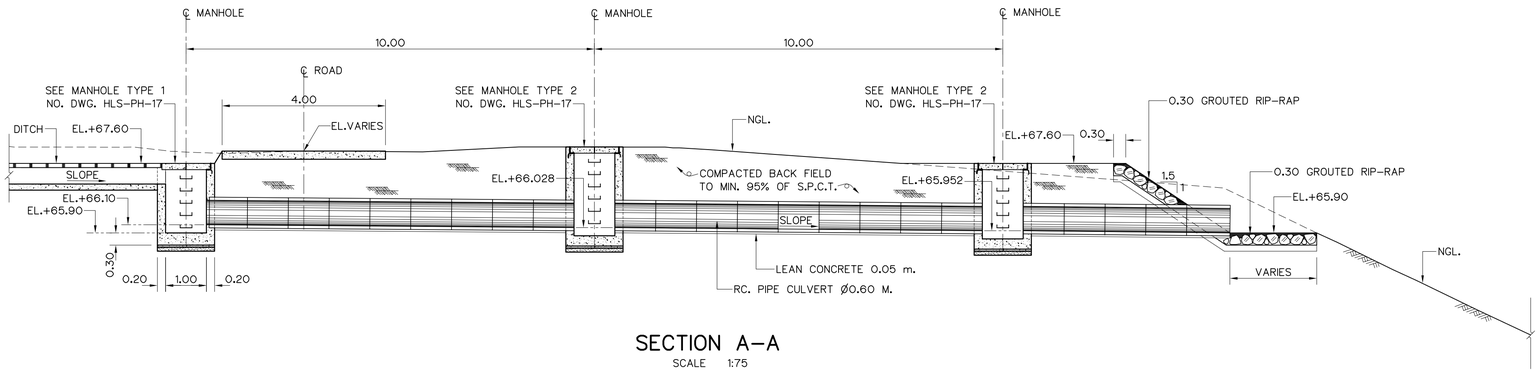
FEC FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

DESIGNED	สย.6651	REVIEWED	ร.ท.ไกรชาย
DRAWN		SUBMITTED	
CHECKED	สย.7324	RECOMMENDED	
PROJECT MANAGER	14/01/62 DATE	APPROVED	

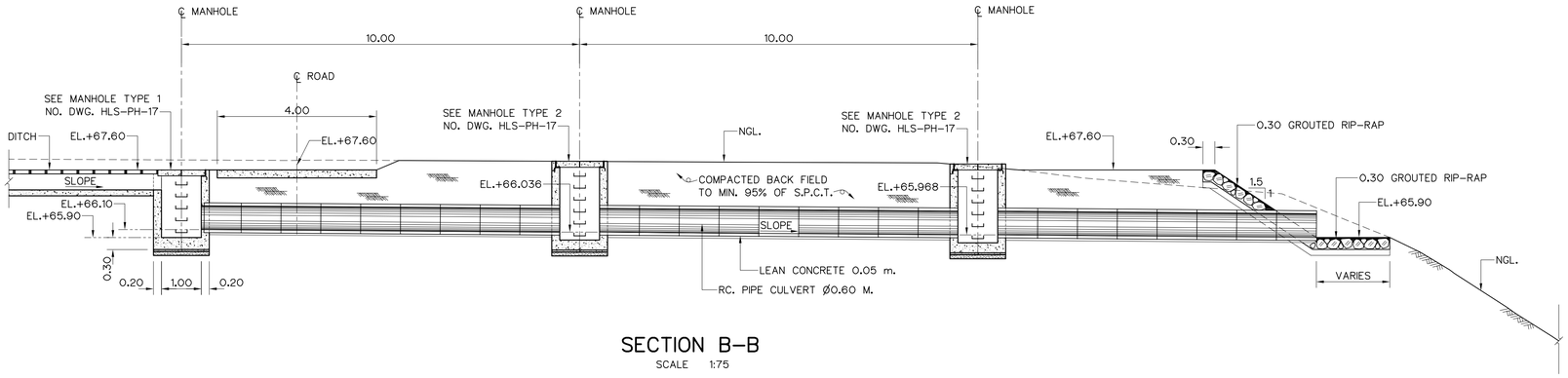
DRAWING NO. HLS-PH-15

SHEET NO. 58 OF 77



SECTION A–A

SCALE 1:75



SECTION B–B

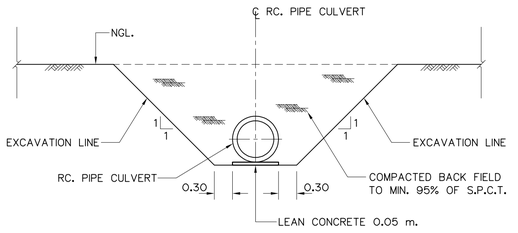
SCALE 1:75

NOTES :

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

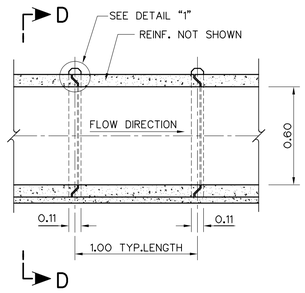
REFERENCE DRAWINGS :

1. POWERHOUSE, DITCH PLAN	HLS-PH-01
2. POWERHOUSE, MANHOLE AND DITCH REINFORCEMENT DETAILS	HLS-PH-17



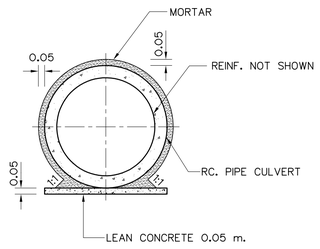
SECTION C–C

SCALE 1:50



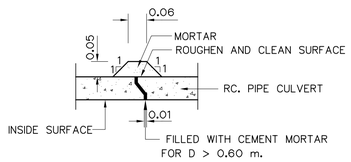
PIPE JOIN DETAIL

SCALE 1:25



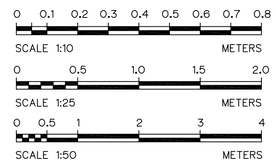
SECTION D–D

SCALE 1:25



DETAIL "1"

SCALE 1:10



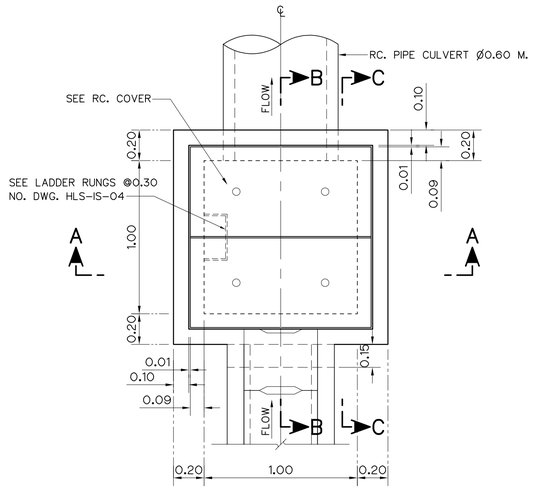
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

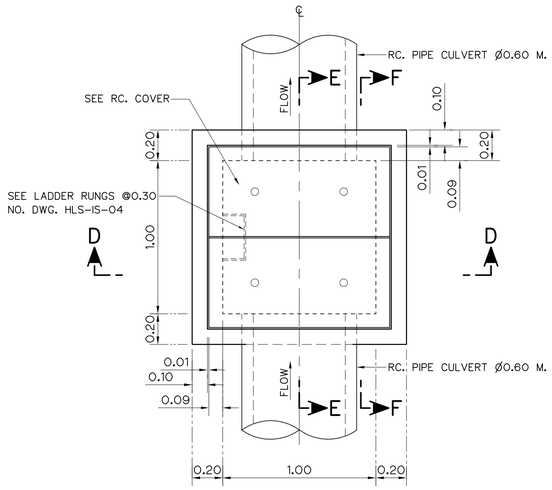
CIVIL WORKS
POWERHOUSE
DITCH SECTIONS AND DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED ว.ไกรชัย
DESIGNED ส.ต.ต.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED ส.ต.ต.7324	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS-PH-16 / SHEET NO. 59 OF 77



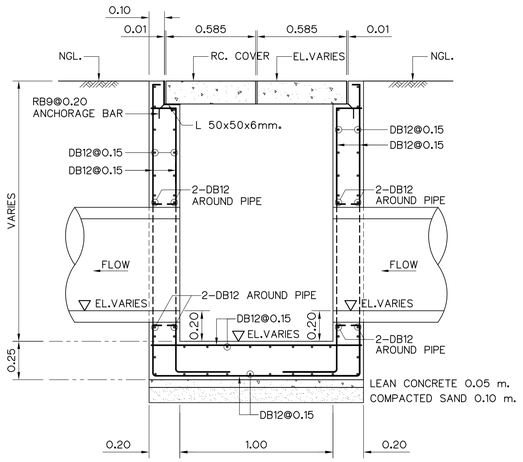
PLAN MANHOLE TYPE 1

SCALE 1:20



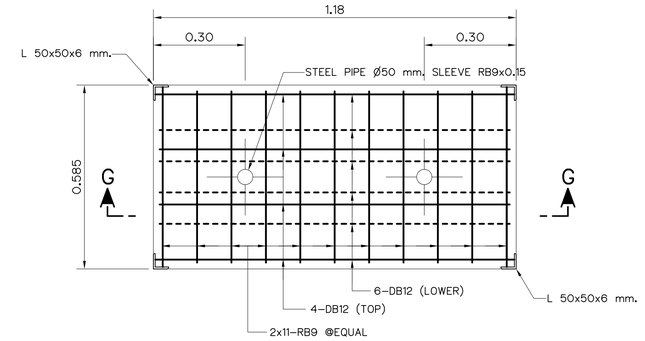
PLAN MANHOLE TYPE 2

SCALE 1:20



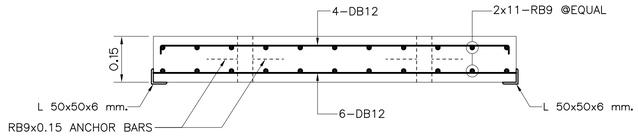
SECTION E-E

SCALE 1:20



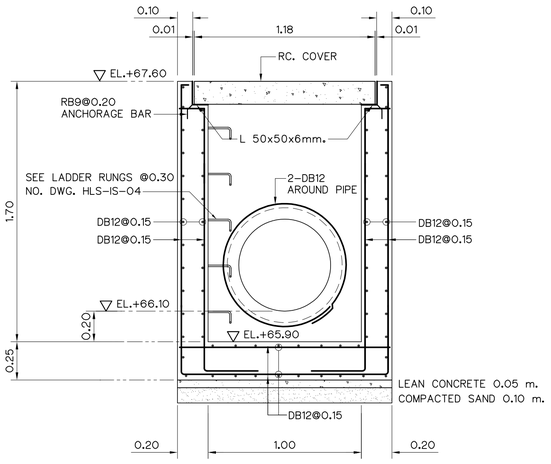
CONCRETE COVER DETAILS

SCALE 1:10



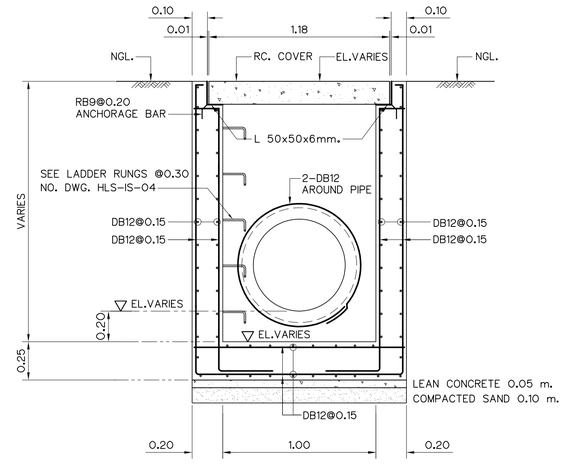
SECTION G-G

SCALE 1:10



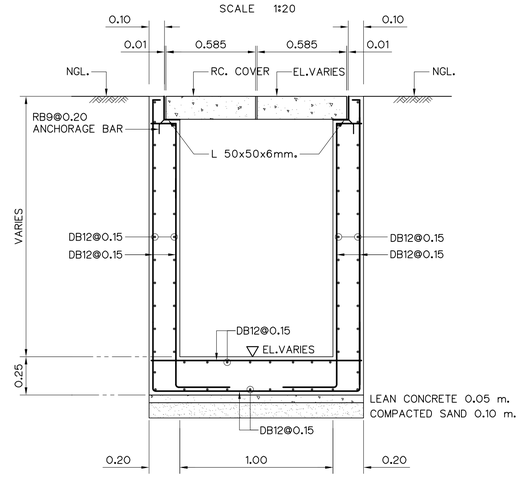
SECTION A-A

SCALE 1:20



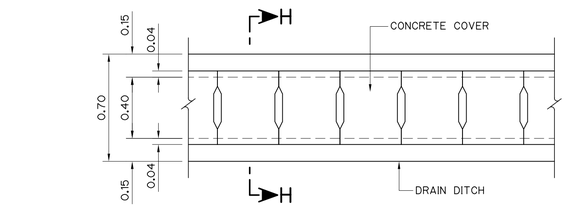
SECTION D-D

SCALE 1:20



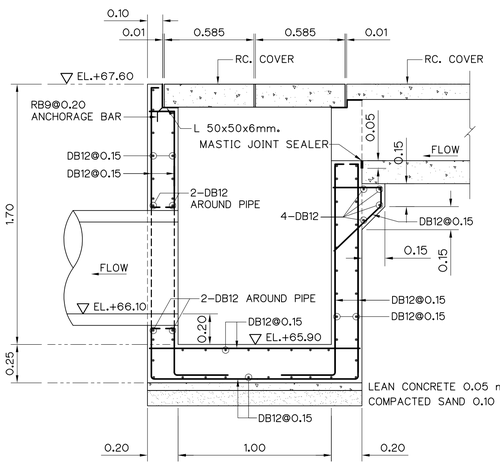
SECTION F-F

SCALE 1:20



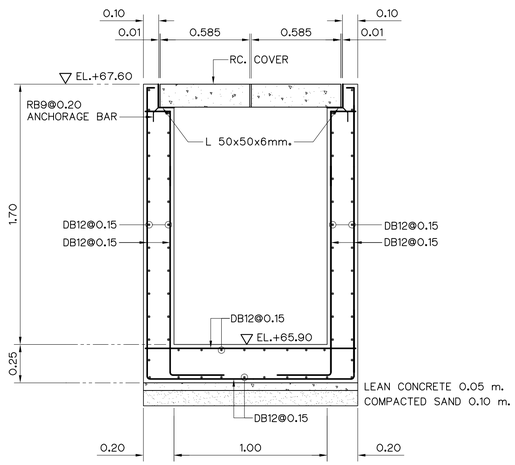
PLAN DITCH

SCALE 1:20



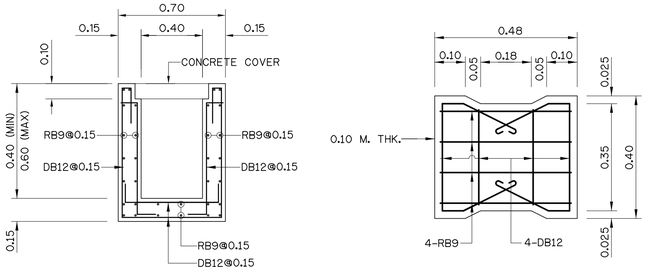
SECTION B-B

SCALE 1:20



SECTION C-C

SCALE 1:20



SECTION H-H

SCALE 1:20

CONCRETE COVER

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. HLS-GN-03
3. ALLOWABLE BEARING CAPACITY OF POWERHOUSE FOUNDATION SHALL NOT BE LESS THAN 10 T/M.^{2}

REFERENCE DRAWINGS :

1. POWERHOUSE, PLAN AND ROOF PLAN	HLS-PH-02
2. POWERHOUSE, DITCH PLAN	HLS-PH-15
3. POWERHOUSE, DITCH SECTIONS AND DETAILS	HLS-PH-16

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8

SCALE 1:10 METERS

0 0.5 1 1.5

SCALE 1:20 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS

POWERHOUSE

MANHOLE AND DITCH REINFORCEMENT DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED ร.ท.ไกรชา

DESIGNED สม.6651

DRAWN

CHECKED สม.7324

SUBMITTED

RECOMMENDED

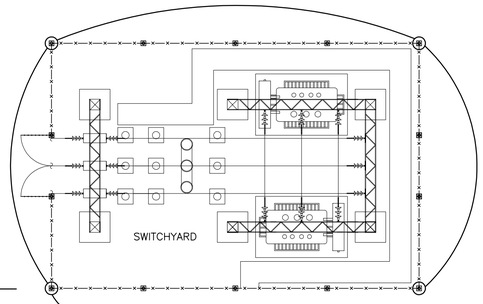
APPROVED

PROJECT MANAGER

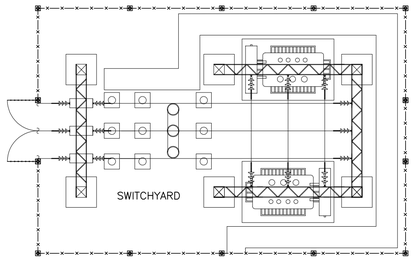
14/01/62
DATE

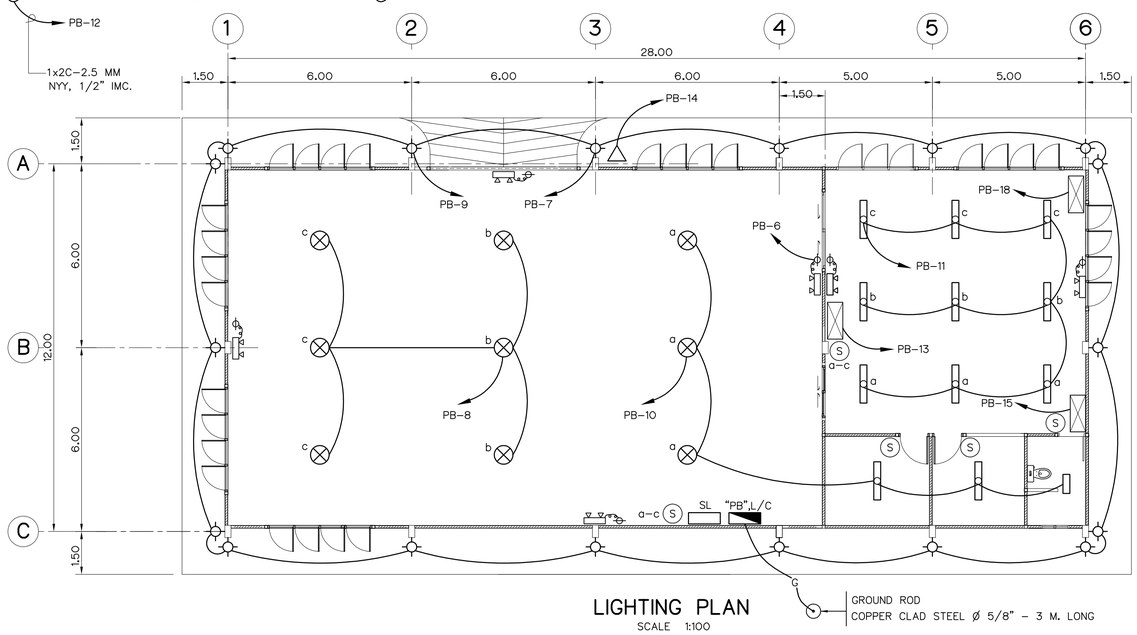
DRAWING NO. HLS-PH-17

SHEET NO. 60 OF 77

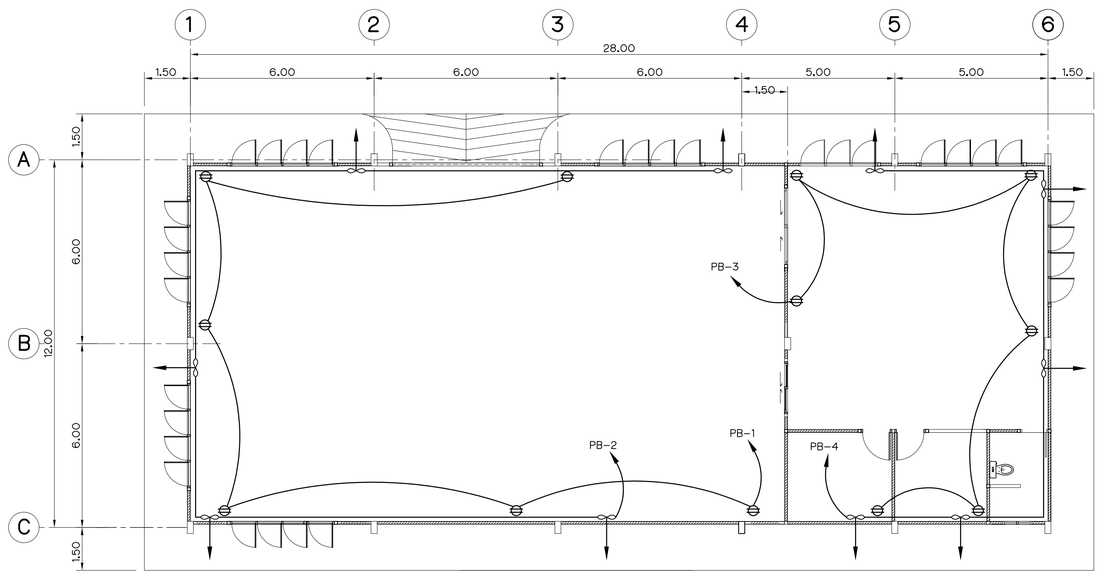


DONE BY
CONTRACTOR C2





LIGHTING PLAN
SCALE 1:100

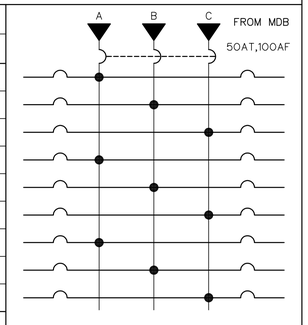


EXHAUST AND OUTLET PLAN
SCALE 1:100

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) A	LOAD (VA) B	LOAD (VA) C	MCB POLE	MCB AT	CONDUCTOR SIZE(MM)^2	CONDUCTOR TYPE
1	RECEPTACLES	1080			1	15	2.5/1.5	THW 1C 1/2" PVC
3	RECEPTACLES		1080		1	15	2.5/1.5	THW 1C 1/2" PVC
5	SPARE				1	15	–	–
7	LIGHTING	540			1	10	2.5	THW 1C 1/2" PVC
9	LIGHTING		540		1	10	2.5	THW 1C 1/2" PVC
11	LIGHTING			1800	1	20	2.5	THW 1C 1/2" PVC
13	A/C 16,000 BTU/Hr	2000			1	20	4/4	THW 3/4" PVC
15	A/C 24,000 BTU/Hr		3300		1	30	6/6	THW 3/4" PVC
17	SPARE				1	30	–	–
2	EXHAUST FAN	600			1	10	2.5	THW 1C 1/2" PVC
4	EXHAUST FAN		600		1	10	2.5	THW 1C 1/2" PVC
6	EMERGENCY LIGHT			300	1	10	2.5	THW 1C 1/2" PVC
8	LIGHTING	840			1	10	2.5	THW 1C 1/2" PVC
10	LIGHTING		870		1	10	2.5	THW 1C 1/2" PVC
12	LIGHTING			240	1	10	2.5	THW 1C 1/2" PVC
14	LIGHTING	350			1	10	2.5	THW 1C 1/2" PVC
16	SPARE				1	10	–	–
18	A/C 24,000 BTU/Hr			3300	1	30	6/6	THW 3/4" PVC
		5,410	6,390	5,640				



TOTAL CONNECTED LOAD	17,440	VA
DEMAND FACTOR	75%	
CALCULATED LOAD	13,080	VA

LEGENDS :

- 1 x 125 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
- EXHAUST FAN Ø 10 inch.
- 2 x 25 W EMERGENCY LIGHT WITH BATTERY OPERATE RECEPTACLE
- AIR CONDITION , CEILING TYPE
- LOAD CENTER PANEL (PB)
- DUPLEX RECEPTACLE
- SIMPLEX RECEPTACLE
- POWER RECEPTACLE , 3Ø
- (S) ONE WAY SWITCH, 15A ,1Ø , 250V
- 1 x 60 W INCANDESCENT, OUTDOOR LUMINAIRE

NOTE :

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. THE CONTRACTOR HAS TO SUBMIT THE SHOP DRAWING OF GROUNDING SYSTEM FOR APPROVAL.

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

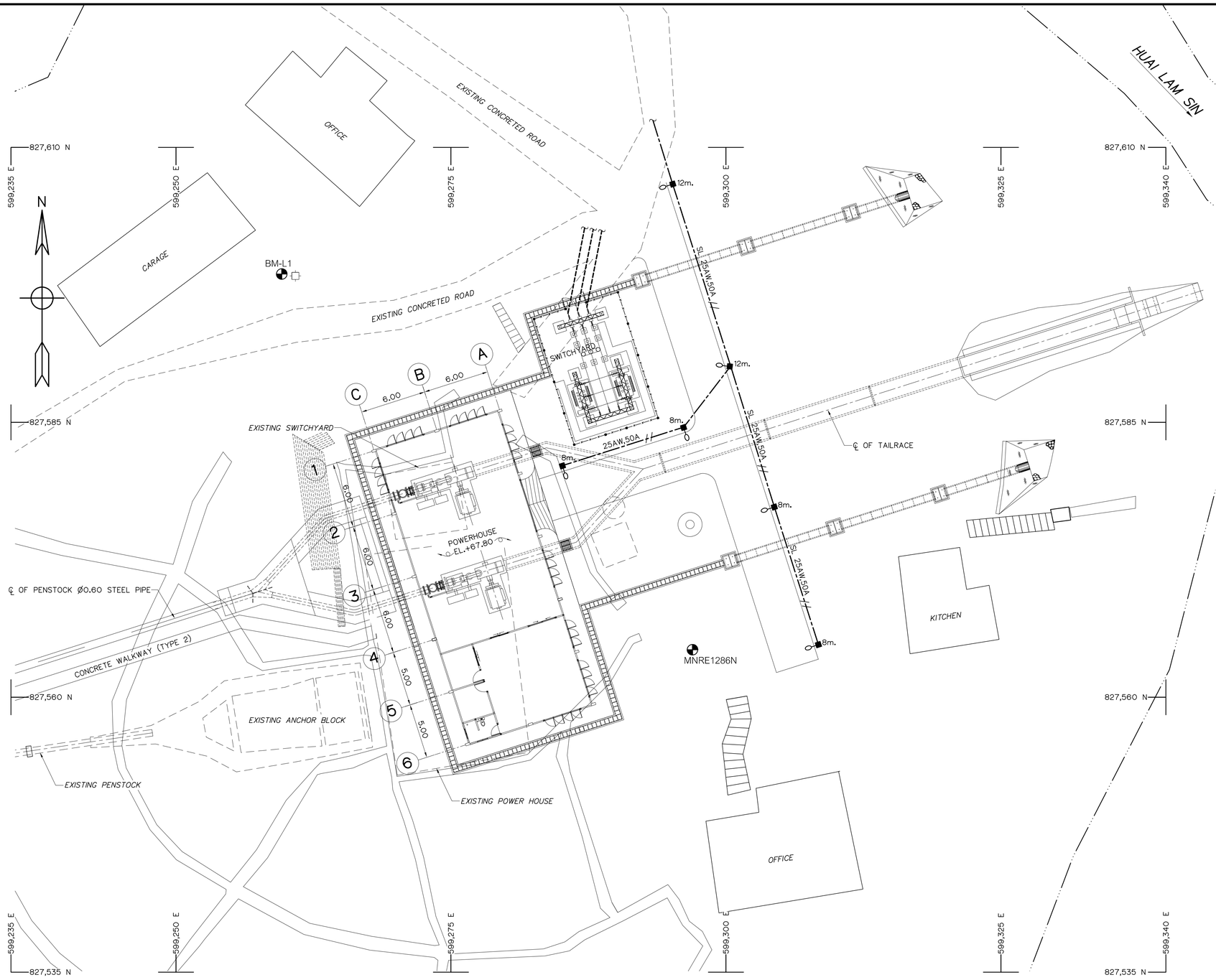
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
ELECTRICAL LIGHTING, EXHAUST AND OUTLET PLAN

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED ร.ท.ไกรไทย
DESIGNED ส.พง.1029	SUBMITTED
DRAWN	RECOMMENDED
CHECKED ส.พง.1029	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS-PH-18
	SHEET NO. 61 OF 70



EXTERIOR LIGHTING PLAN

SCALE 1:200

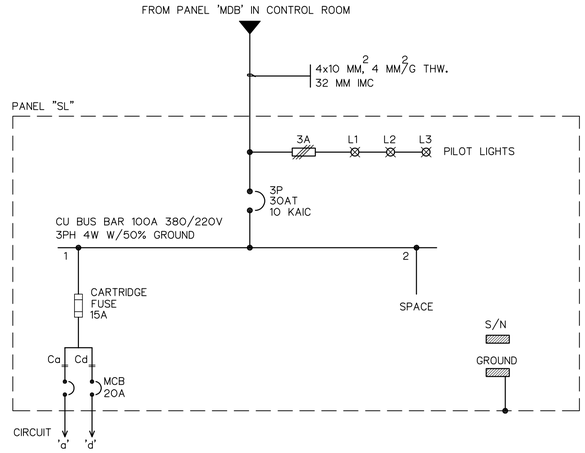
LEGENDS :

■ 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
----P----	PRIMARY LINES, 22 KV OVERHEAD BARE CONDUCTORS
///S——	SECONDARY LINES, 380/220 V 50 MM THW OVERHEAD INSULATED CABLES, 3Ø 4 WIRE
----SL----	STREET LIGHTING LINES
———	CONCEALED WIRING IN CONDUIT IN CONCRETE STRUCTURE OR CABLE TRENCH
↘	POWER CABLE DROP FOR ELECTRICAL SUPPLY TO BUILDING 3Ø OR 1Ø
———	UNDERGROUND WIRING IN CONDUIT
- - - - - -	LV. CABLE, ABOVE GROUND
~~	SPACE AERIAL CABLE 50 mm.
←	GUY
△	TRANSFORMER 500 kVA.
▭	CIRCUIT BREAKER 22 kV.

0 5 10 15
SCALE 1:200 METERS

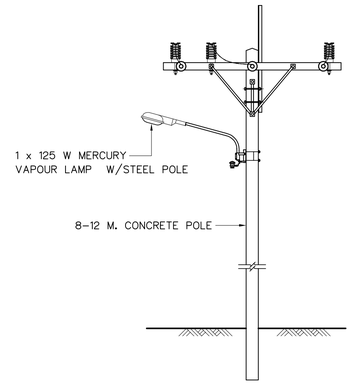
NOTES :

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.



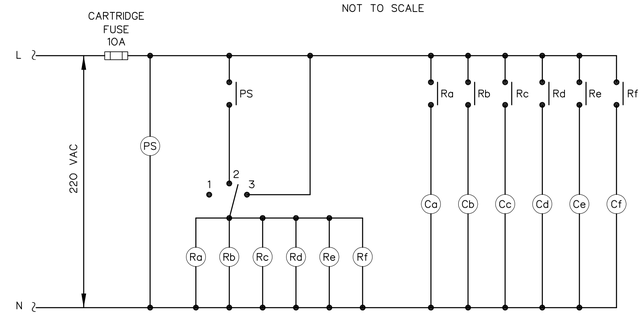
SINGLE LINE DIAGRAM OF PANEL "SL"

NOT TO SCALE



DETAIL OF STREET LIGHTING

NOT TO SCALE



STREET LIGHTING CONTROL DIAGRAM

NOT TO SCALE

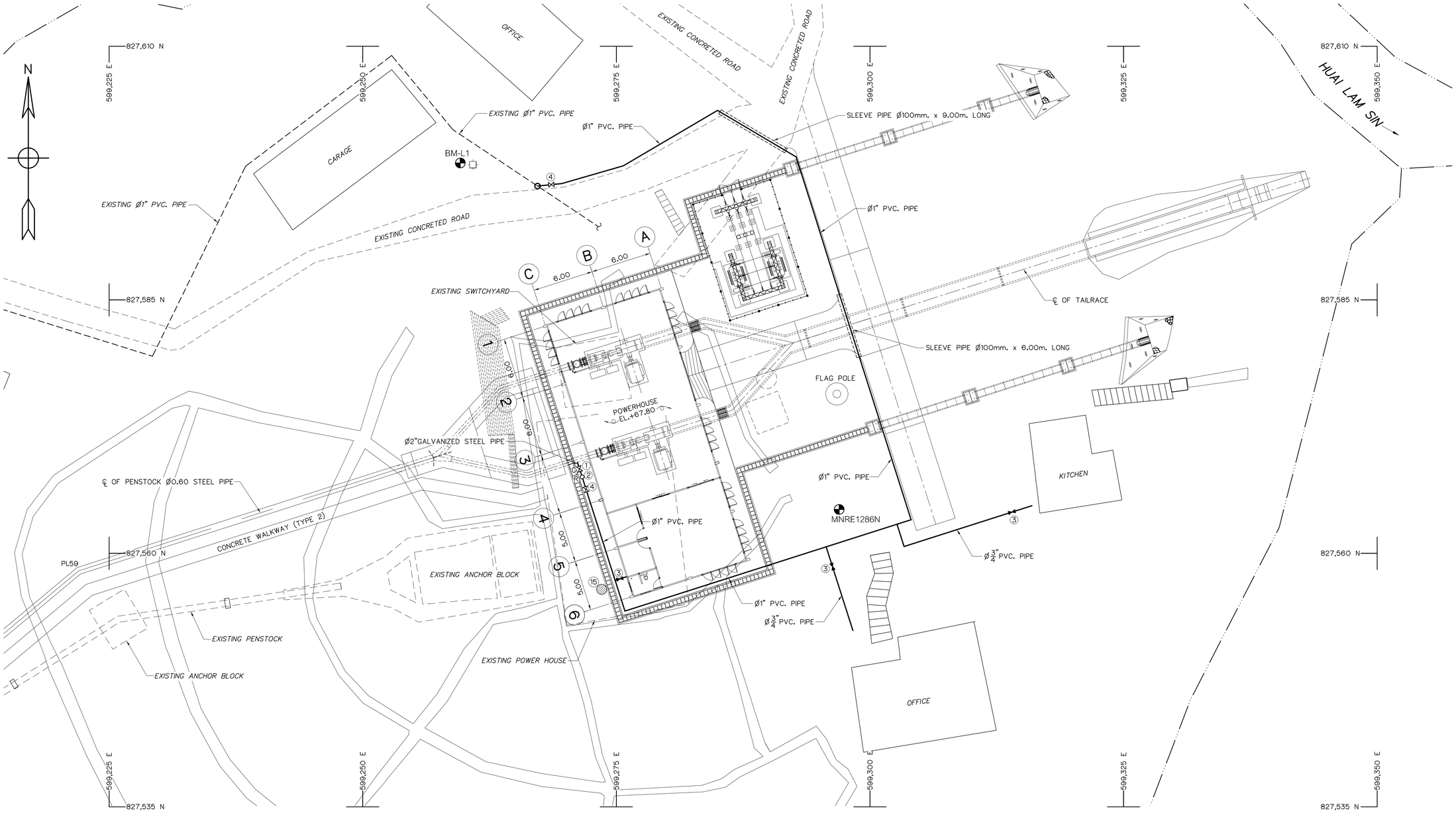
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
EXTERIOR LIGHTING PLAN

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED วิเชียร
DESIGNED วพท.1029	SUBMITTED
DRAWN	RECOMMENDED
CHECKED วพท.1029	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS–PH–19
	SHEET NO. 62 OF 70



WATER SUPPLY PIPELINE SYSTEM LAY OUT

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. HLS-GN-03

REFERENCE DRAWINGS :

1. POWERHOUSE, PIT VALVE, FIELD TAP AND SLOPE PROTECTION DETAILS — HLS-PH-21

LEGENDS :

1. GATE VALVE Ø100mm.
2. PRESSURE REDUCING VALVE Ø100mm.
3. GATE VALVE Ø3/4"
4. GATE VALVE Ø1"
5. STAINLESS STEEL WATER TANK ≥ 1.00 CU.M.

0 5 10 15
SCALE 1:200 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

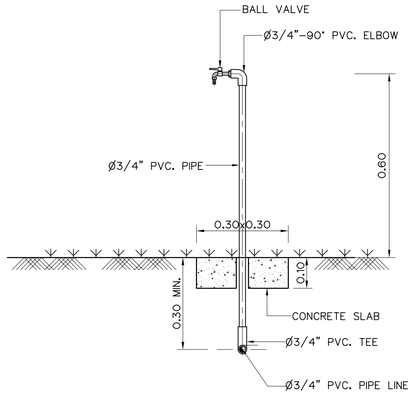
CIVIL WORKS
POWERHOUSE
WATER SUPPLY PIPELINE SYSTEM LAY-OUT

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

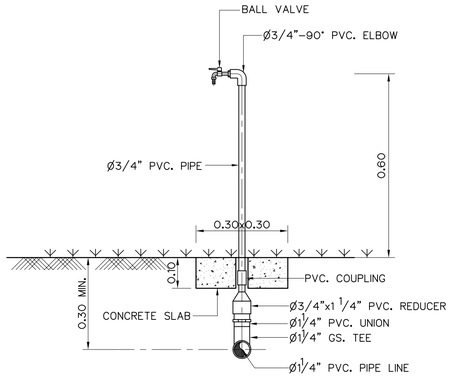
DESIGNED ส.ย.6651
DRAWN
CHECKED ส.ย.7324
PROJECT MANAGER 14/01/62 DATE

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

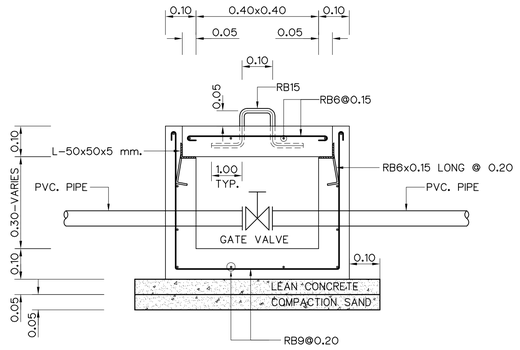
DRAWING NO. HLS-PH-20
SHEET NO. 63 OF 77



FIELD TAP TYPICAL INSTALLATION DETAIL "1"
SCALE 1:10



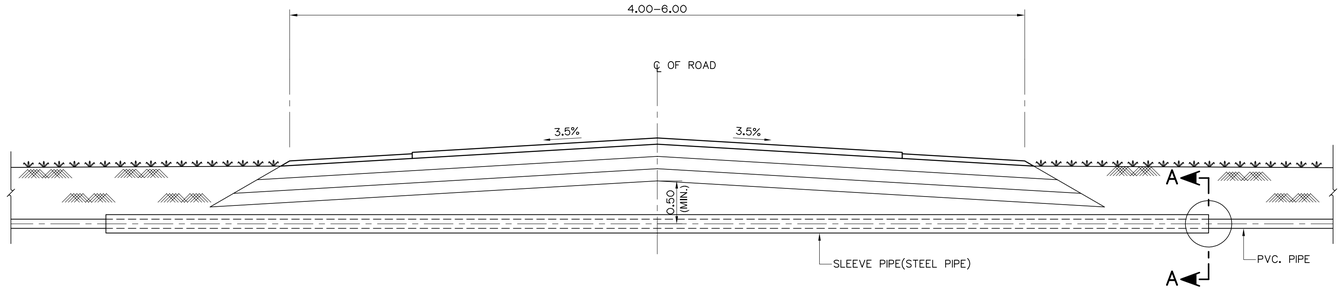
FIELD TAP TYPICAL INSTALLATION DETAIL "2"
SCALE 1:10



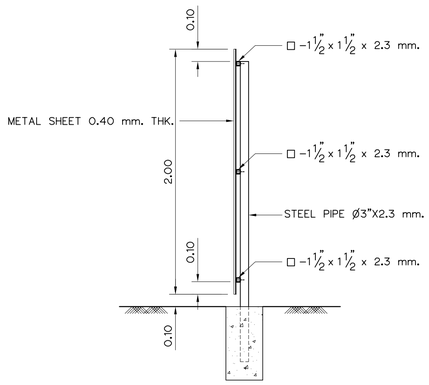
PIT VALVE DETAIL
SCALE 1:10

DIMENSIONS OF SLEEVE PIPE (STEEL PIPE)

SIZE OF WATER SUPPLY PIPE (MM.)	SIZE OF SLEEVE PIPE (MM.)	THICKNESS (MM.)
20 (3/4")	100	2.65
25 (1")	100	2.65
35 (1 1/4")	100	2.65
40 (1 1/2")	100	2.65
55 (2")	100	2.65
60 (2 1/2")	150	3.45
80 (3")	150	3.45



TYPICAL SECTION FOR SLEEVE PIPE INSTALLATION
SCALE 1:25



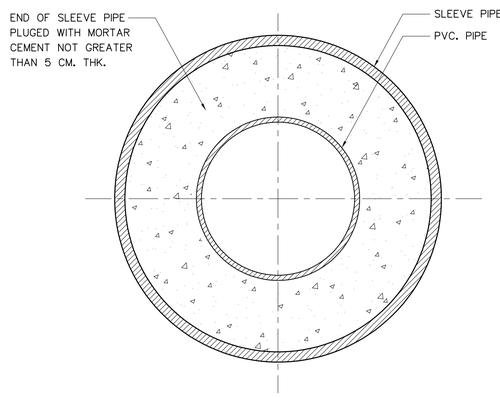
SECTION B-B
SCALE 1:25

NOTES :

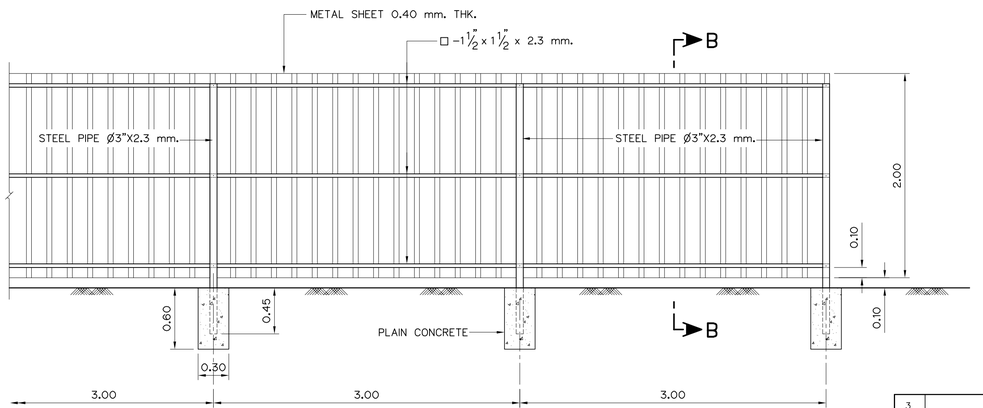
1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. REINFORCING BARS ARE IN MILLIMETERS
3. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 175 KSC. FOR STANDARD CYLINDER AT 28 DAYS
4. REINFORCING STEEL SHALL CONFORM TO SR24, TIS 20-2559

REFERENCE DRAWINGS :

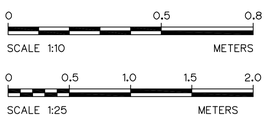
1. POWERHOUSE, WATER SUPPLY PIPELINE SYSTEM LAY-OUT HLS-PH-20



SECTION A-A
SCALE 1:25



METAL SHEET FENCE DETAIL
SCALE 1:30



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
PIT VALVE, FIELD TAP, SLEEVE PIPE
AND METAL SHEET FENCE DETAILS

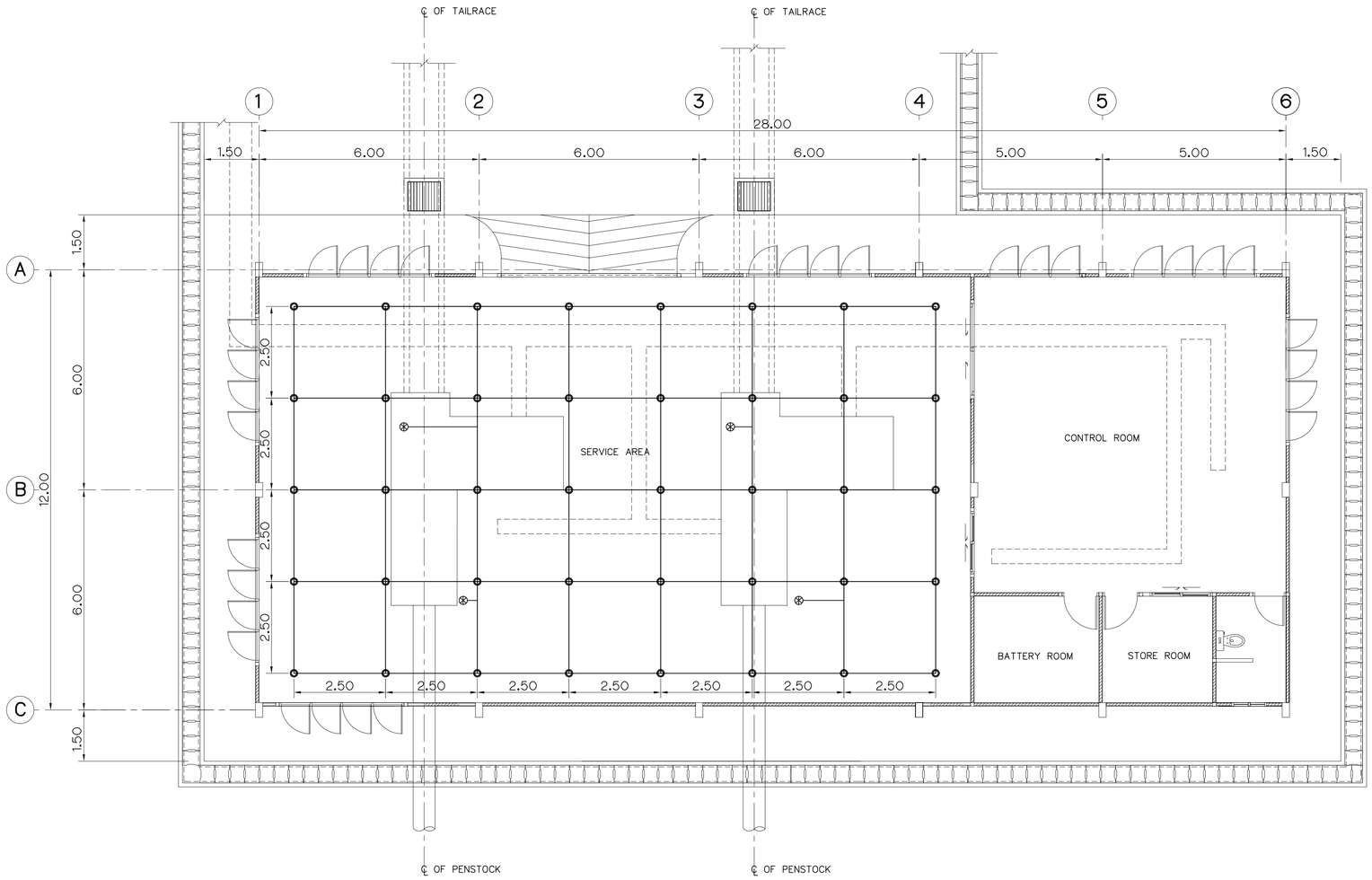
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY
REVIEWED S.KITICHAI

DESIGNED 28.6651
DRAWN
CHECKED 28.7324
PROJECT MANAGER 14/01/62

SUBMITTED
RECOMMENDED
APPROVED

DRAWING NO. HLS-PH-21
SHEET NO. 64 OF 77



GROUNDING SYSTEM PLAN

SCALE 1:75

LEGENDS :

- GROUND ROD
- GROUND POINT FOR POWER PLANT EQUIPMENT GROUNDING
- BARE CUPPER CONDUCTOR

NOTES :

1. GROUNDING CONDUCTOR, TAP AND RISER FROM GROUNDING NETWORK TO POWER EQUIPMENT SHALL BE FORMED BY BARE COPPER CONDUCTOR NOT LESS THAN 95 SQ.MM.
2. GROUNDING SYSTEM RESISTANCE WILL NOT EXCEED 5 OHM.
3. CONNECTOR TO WITH IN & BETWEEN THE GROUNDING NETWORK TO POWER PLANT EQUIPMENT WILL BE MADE BY THERMAL CADWELD
4. GROUND ROD WILL BE COPPER COVER STEEL DIAMETER 15.87 MM. 2,400 MM. LONG
5. THIS DRAWING USE FOR GUIDE ONLY

0 0.5 1.0 2.0 3.0 4.0 6.0

SCALE 1:75 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

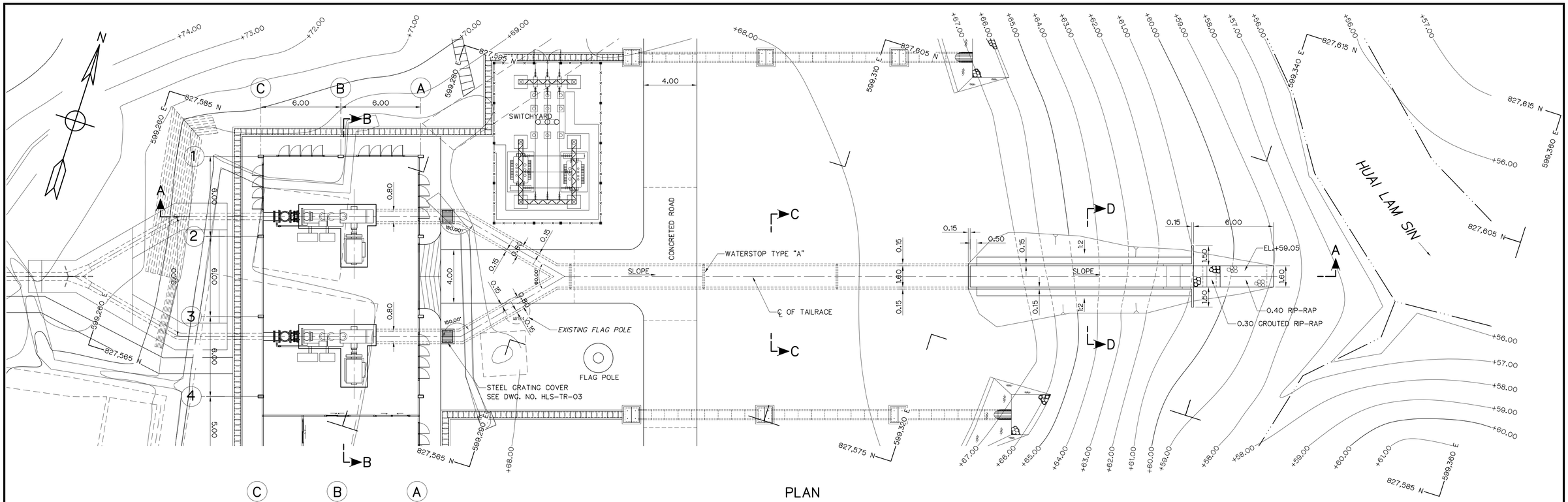
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
POWERHOUSE
GROUNDING SYSTEM

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

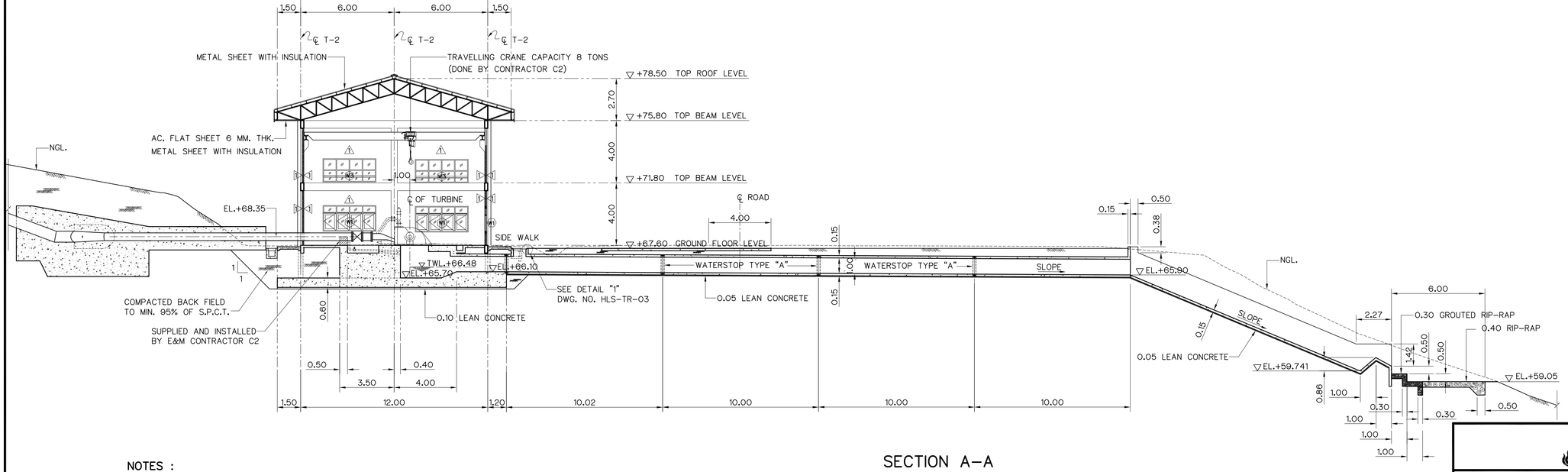
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED	วิเชียร		
DESIGNED	วุฒิพร	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	วุฒิพร	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO.	HLS-PH-22
		SHEET NO.	65 OF 70



PLAN

SCALE 1:150



SECTION A–A

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. HLS-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

REFERENCE DRAWINGS :

1. TAILRACE, SECTIONS B-B, C-C AND D-D HLS-TR-02

0 2 4 6 8 10

SCALE 1:150 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

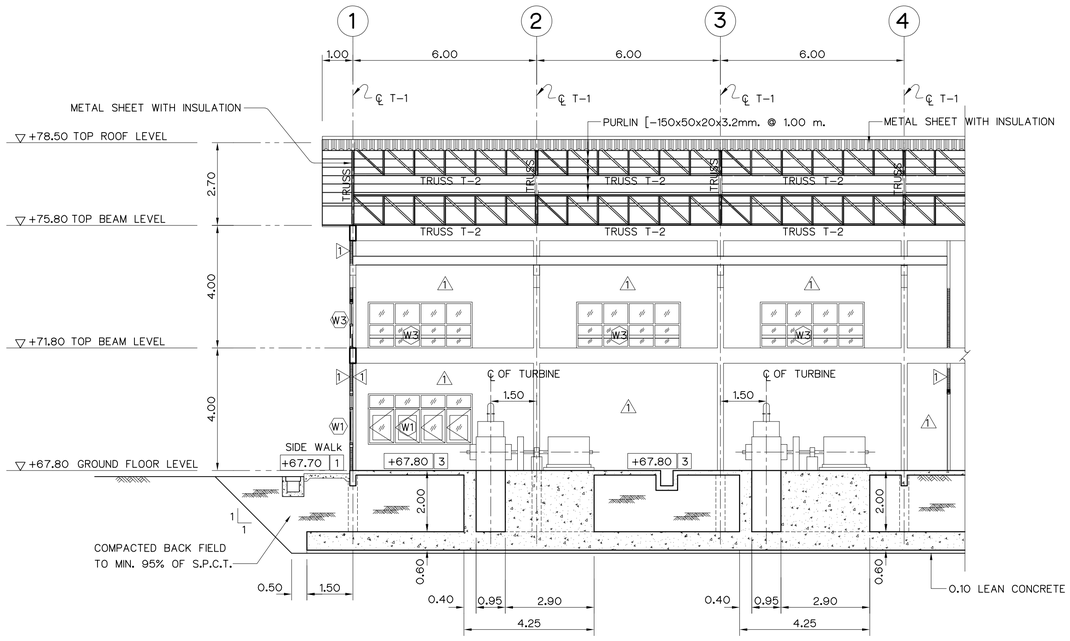
CIVIL WORKS
TAILRACE
PLAN AND SECTION A–A

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

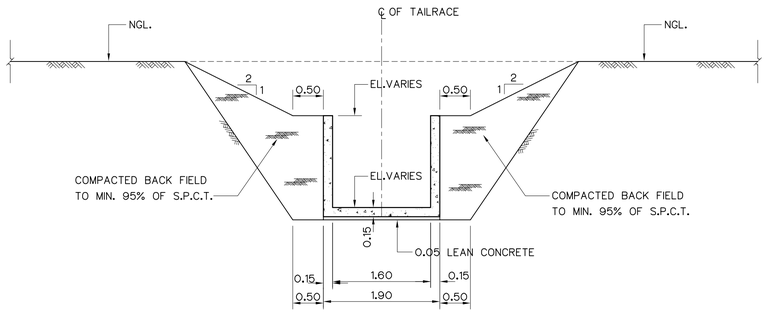
REVIEWED รังสิต

DESIGNED	สย.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สย.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO.	HLS-TR-01
		SHEET NO.	66 OF 77



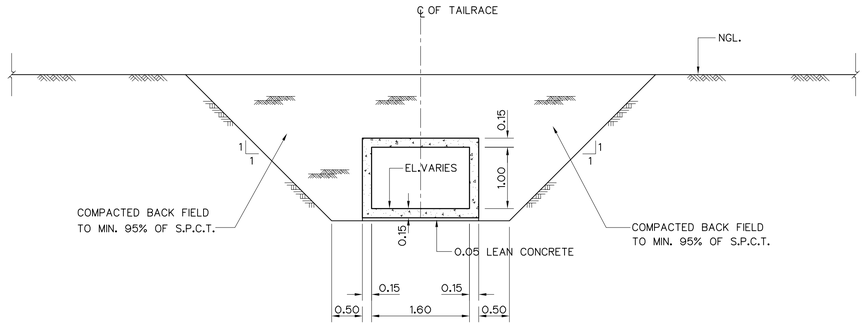
SECTION B-B

SCALE 1:100



SECTION D-D

SCALE 1:50



SECTION C-C

SCALE 1:50

NOTES :

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

REFERENCE DRAWINGS :

1. TAILRACE, PLAN AND SECTION — HLS-TR-01

0 1 2 4 6 8
SCALE 1:100 METERS

0 0.5 1 2 3 4
SCALE 1:50 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

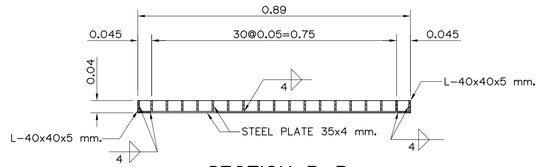
CIVIL WORKS
TAILRACE
SECTIONS B-B, C-C AND D-D

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

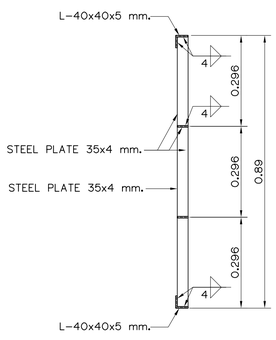
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED ว.ก.ไกรไชย

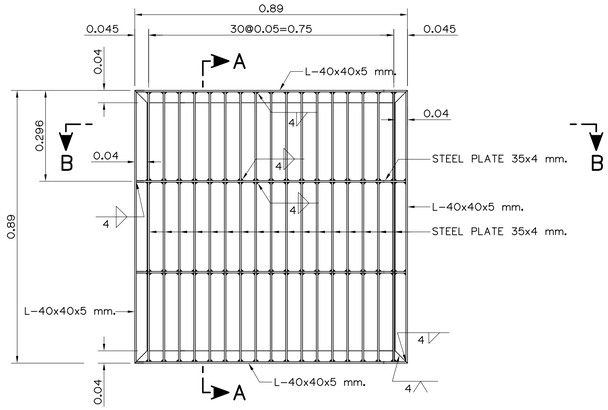
DESIGNED		ส.ย.6651	SUBMITTED
DRAWN			RECOMMENDED
CHECKED		ส.ย.7324	APPROVED
PROJECT MANAGER	14/01/62 DATE	DRAWING NO. HLS-TR-02	SHEET NO. 67 OF 77



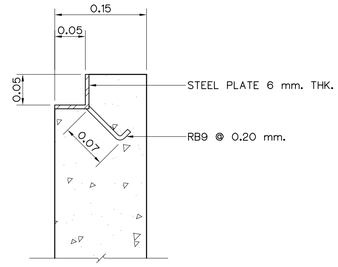
SECTION B-B
SCALE 1:10



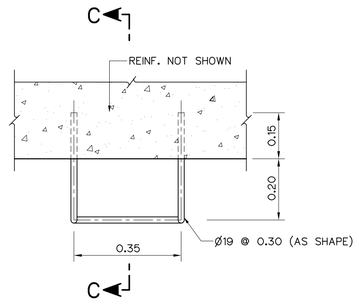
SECTION A-A
SCALE 1:10



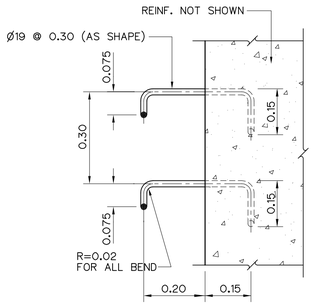
DETAIL OF STEEL GRATING COVER
SCALE 1:10



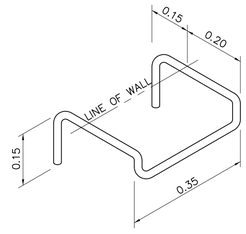
DETAIL "1"
SCALE 1:5



PLAN



SECTION C-C

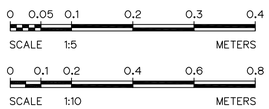


ISOMETRIC VIEW

DETAIL OF LADDER RUNGS
NOT TO SCALE

NOTES :

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



NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
TAILRACE
GRATING COVER AND LADDER RUNGS DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED ว.ที่ปรึกษา

DESIGNED ส.ย.6651 SUBMITTED

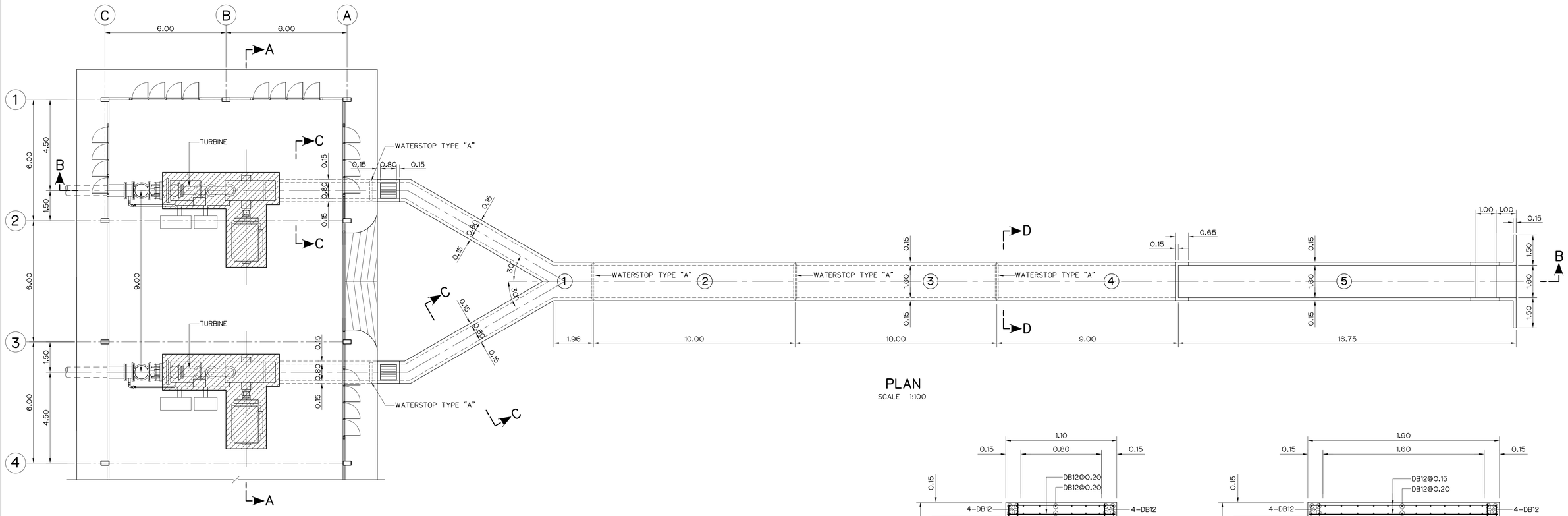
DRAWN RECOMMENDED

CHECKED ส.ย.7324 APPROVED

PROJECT MANAGER 14/01/62 DATE

DRAWING NO. HLS-TR-03

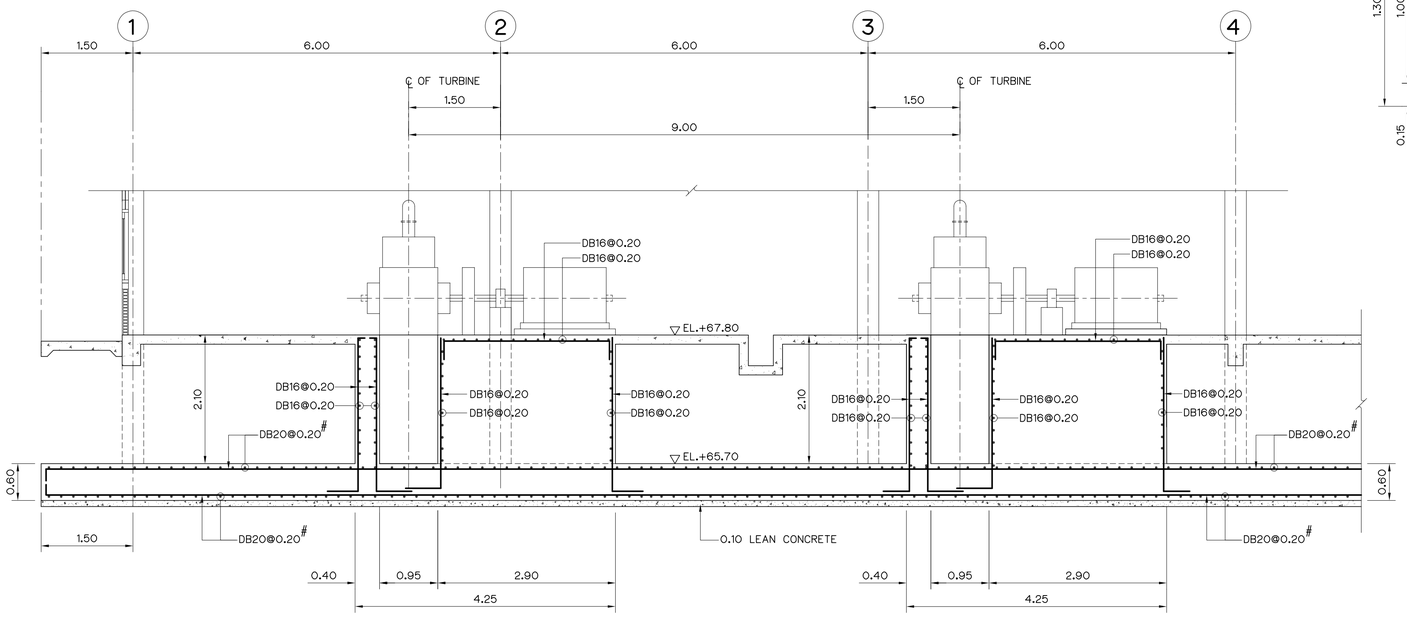
SHEET NO. 68 OF 77



PLAN
SCALE 1:100

SECTION C–C
SCALE 1:20

SECTION D–D
SCALE 1:20



SECTION A–A
SCALE 1:50

SCALE 1:20 METERS

SCALE 1:50 METERS

SCALE 1:100 METERS

NOTES :

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

REFERENCE DRAWINGS :

1.	TAILRACE, PLAN	HLS–TR–01
2.	TAILRACE, REINFORCEMENT DETAILS (SHEET 2/2)	HLS–TR–05
3.	POWERHOUSE, CABLE TRENCH DETAILS	HLS–PH–13

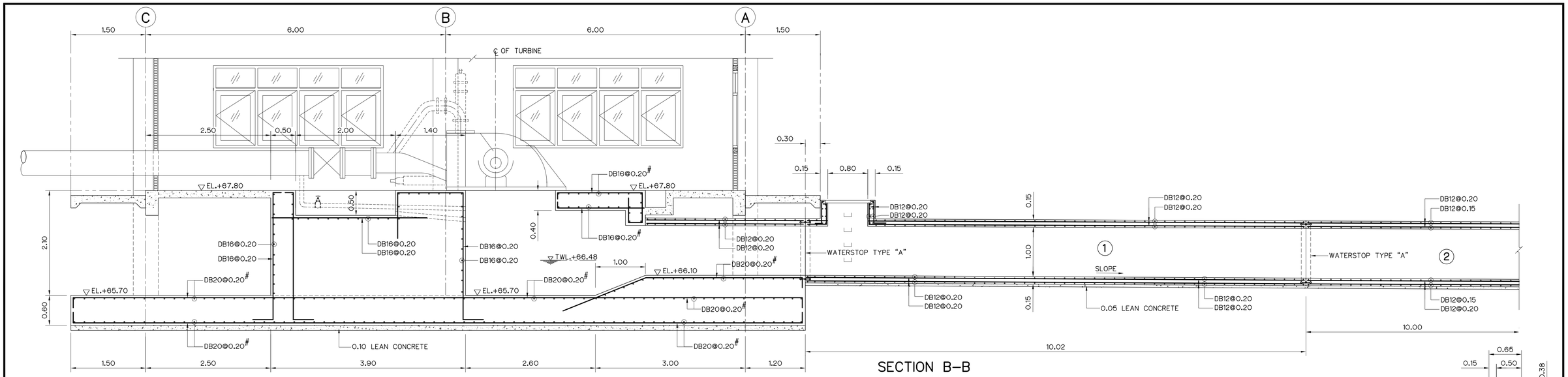
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

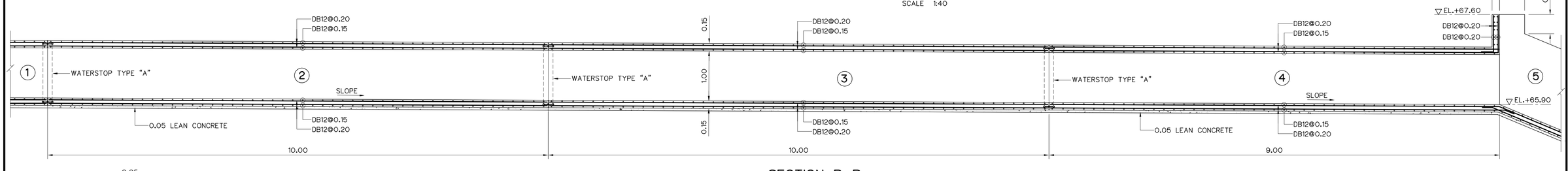
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
TAILRACE
REINFORCEMENT DETAILS (SHEET 1/2)

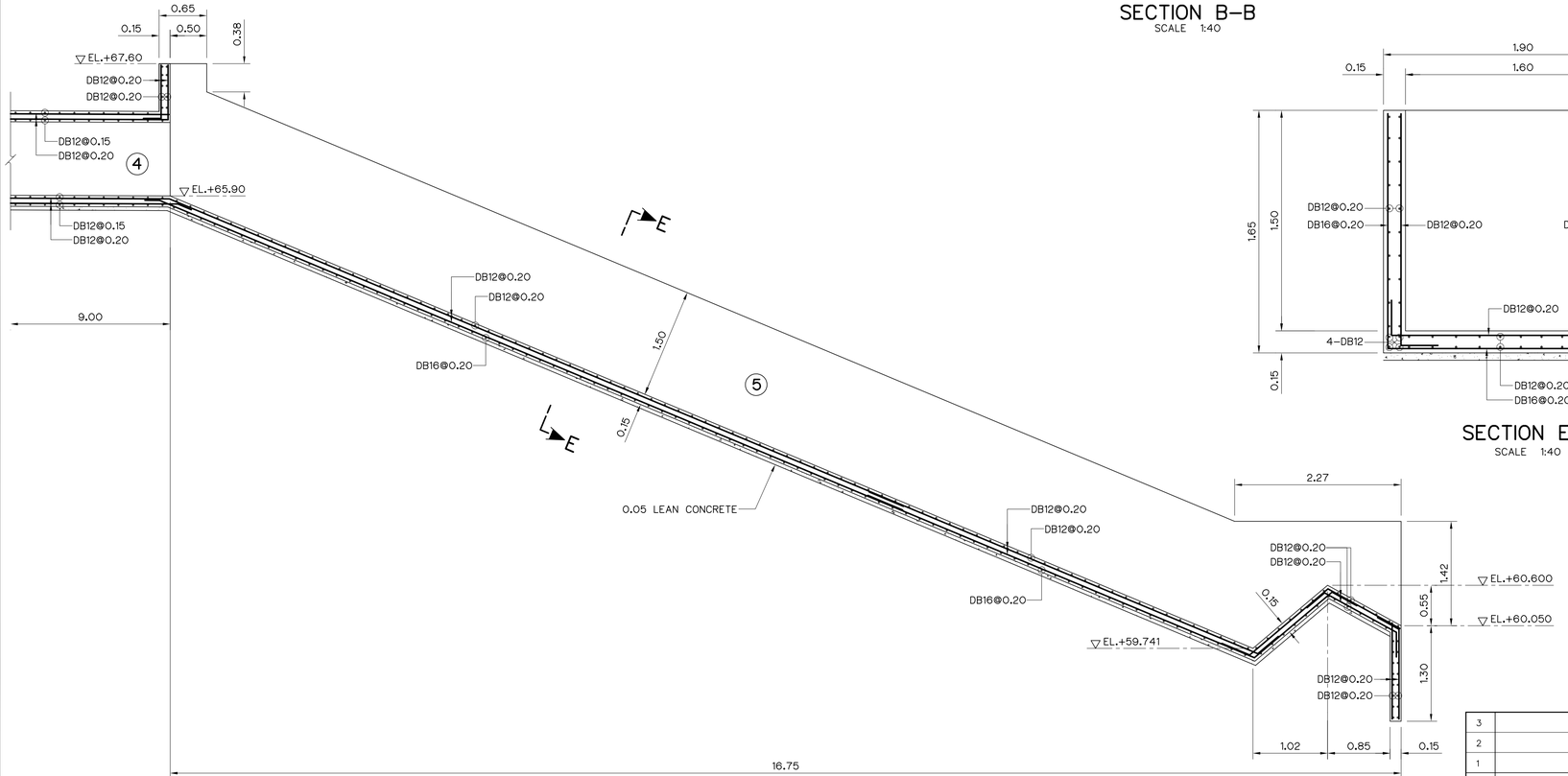
FEC FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
	REVIEWED ร.ท.ชัชชัย
DESIGNED พล.อ.ท.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED พล.อ.ท.7324	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS–TR–04 / SHEET NO. 69 OF 77



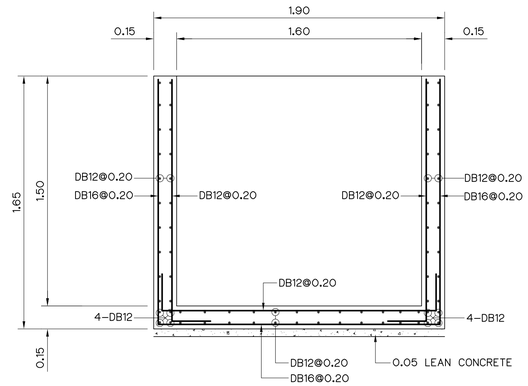
SECTION B–B
SCALE 1:40



SECTION B–B
SCALE 1:40



SECTION B–B
SCALE 1:40



SECTION E–E
SCALE 1:40

NOTES :

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

REFERENCE DRAWINGS :

1. TAILRACE, PLAN	HLS–TR–01
2. TAILRACE, REINFORCEMENT DETAILS (SHEET 1/2)	HLS–TR–04

0 0.5 1 1.5
SCALE 1:20 METERS

0 0.5 1 2 3
SCALE 1:40 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

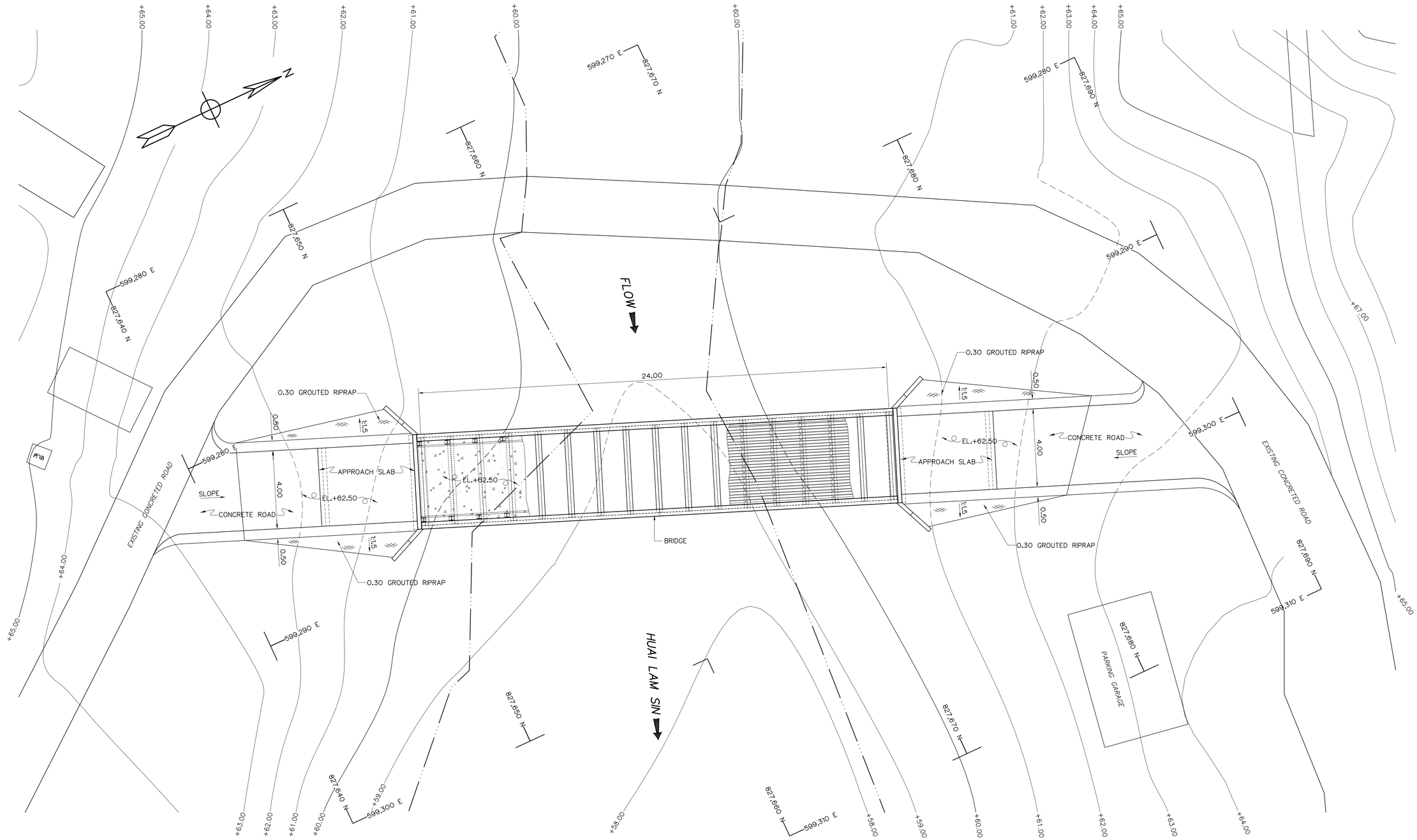
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
TAILRACE
REINFORCEMENT DETAILS (SHEET 2/2)

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED ว.ก.ไชยา

DESIGNED	ส.ต.ต.	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	ส.ต.ต.	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO. HLS–TR–05	SHEET NO. 70 OF 77



GENERAL LAY-OUT

SCALE 1:100

NOTES :

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

REFERENCE DRAWINGS :

1. BRIDGE, PLAN AND SECTIONS HLS-BR-02

0 1 2 4 6 8
SCALE 1:100 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
BRIDGE
GENERAL LAY-OUT

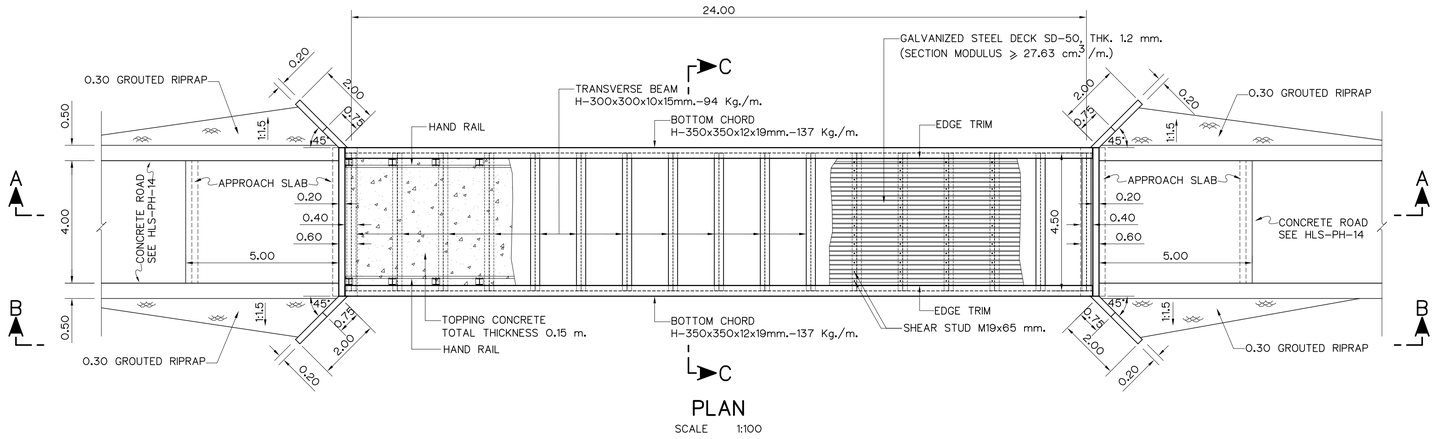
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

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

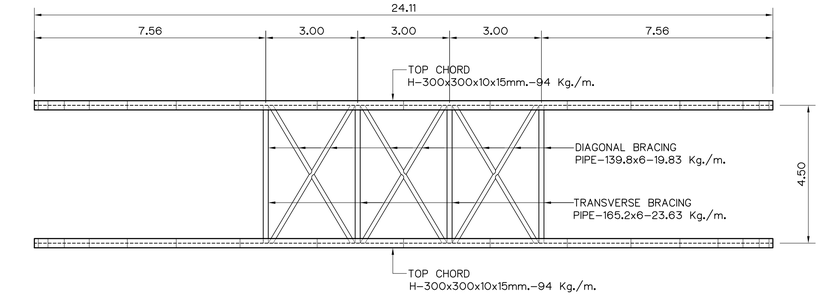
DRAWING NO. HLS-BR-01

SHEET NO. 71 OF 77



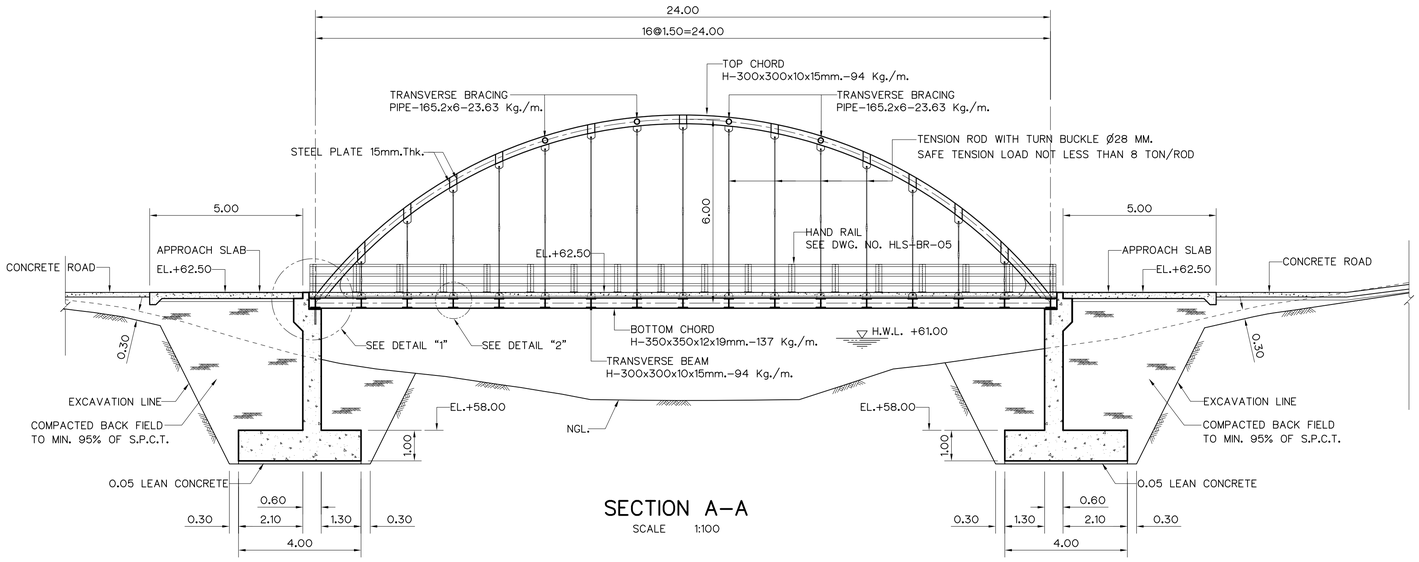
PLAN

SCALE 1:100



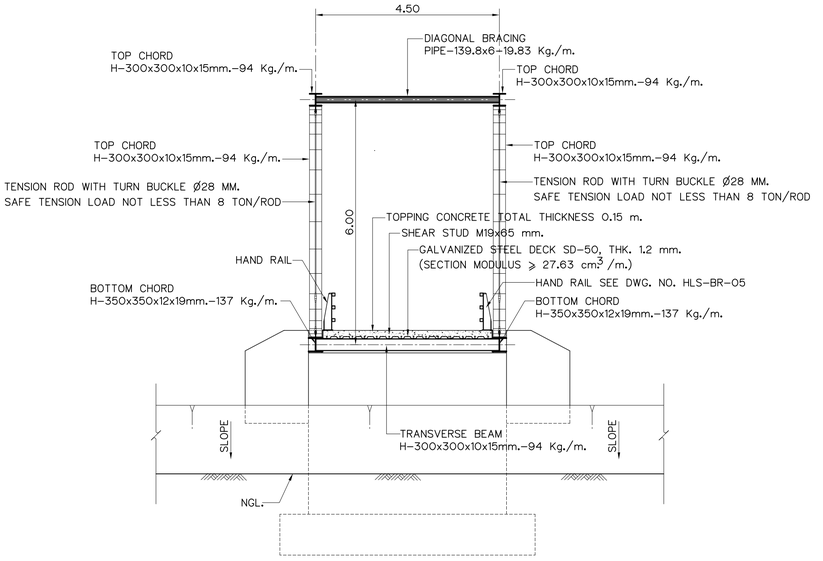
TOP PLAN

SCALE 1:100



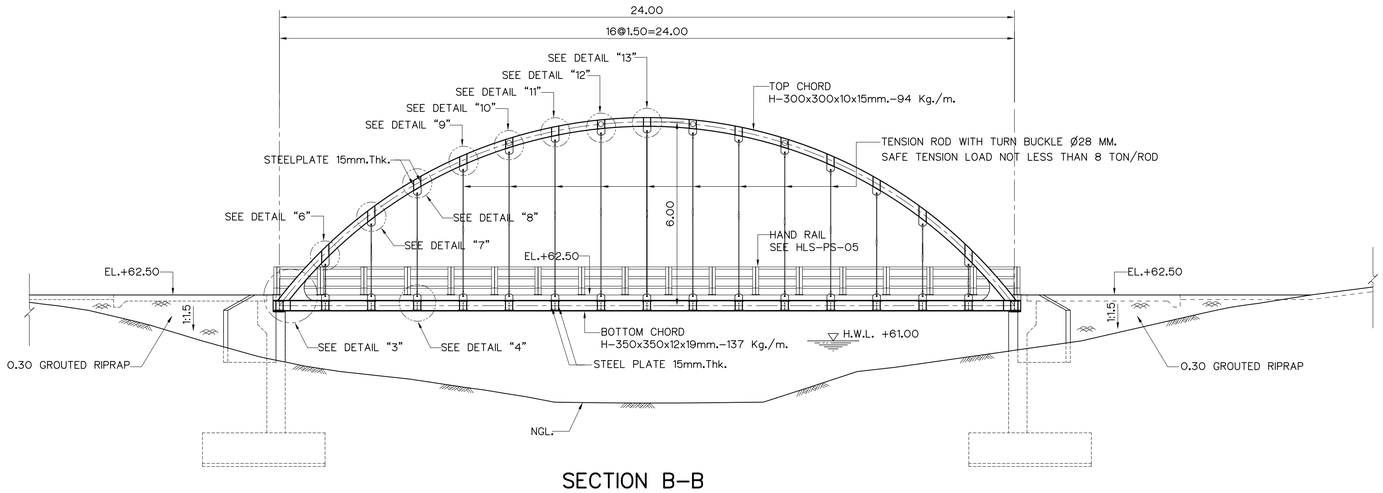
SECTION A-A

SCALE 1:100



SECTION C-C

SCALE 1:75



SECTION B-B

SCALE 1:100

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
3. ALLOWABLE BEARING CAPACITY OF SOIL FOUNDATION SHALL NOT BE LESS THAN 15T/M.^{2}
4. THE ULTIMATE COMPRESSIVE STRENGTH OF CONCRETE OF STANDARD CYLINDER (Ø0.15x0.30 m.) TEST AT AGE 28 DAYS SHALL BE 240 KSC.

REFERENCE DRAWINGS :

1. BRIDGE, GENERAL LAY-OUT HLS-BR-01

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

0 1 2 4 6 8
SCALE 1:100 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

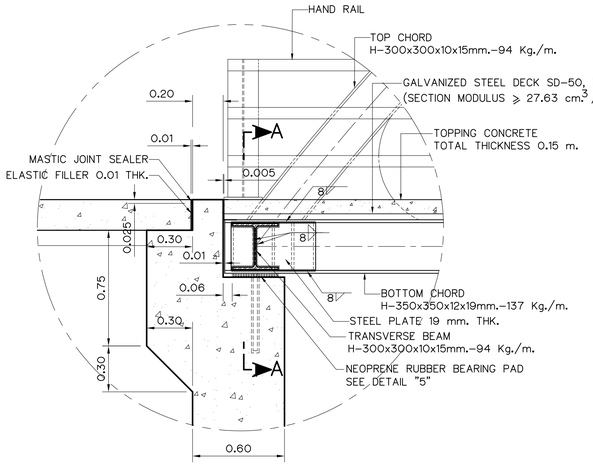
CIVIL WORKS
BRIDGE
PLAN AND SECTIONS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

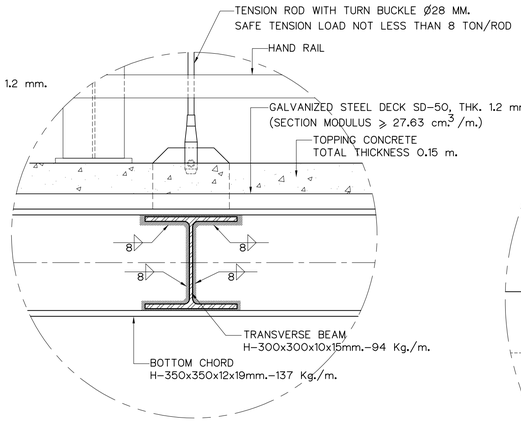
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED ว.ก.ชัยชาย

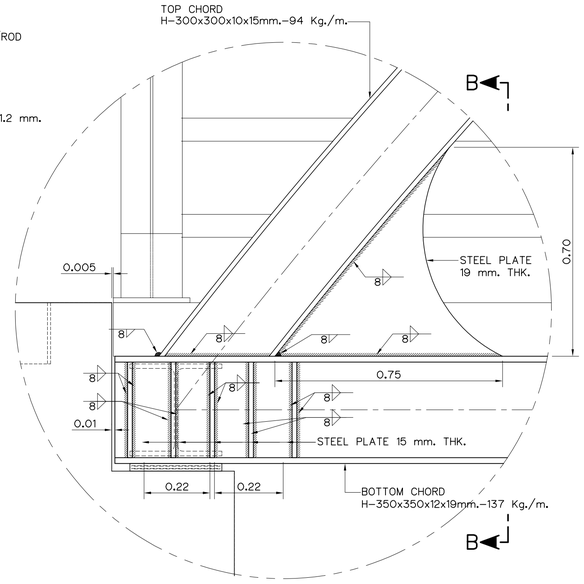
DESIGNED	ส.ต.ต.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	ส.ต.ต.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO.	HLS-BR-02
		SHEET NO.	72 OF 77



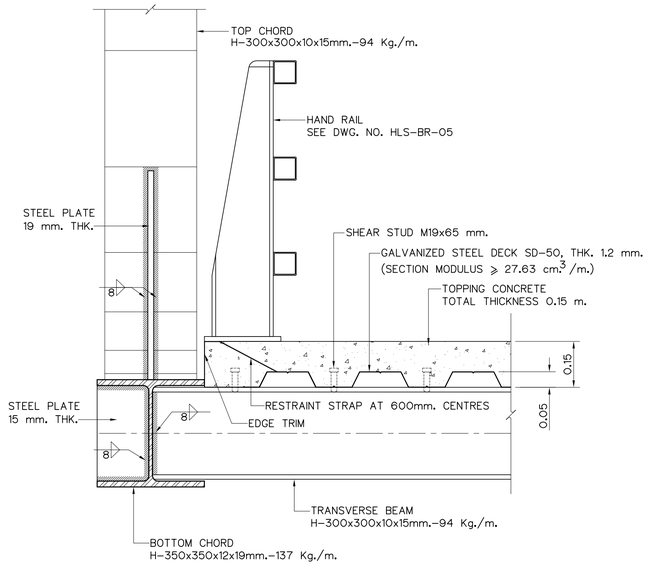
DETAIL "1"
SCALE 1:20



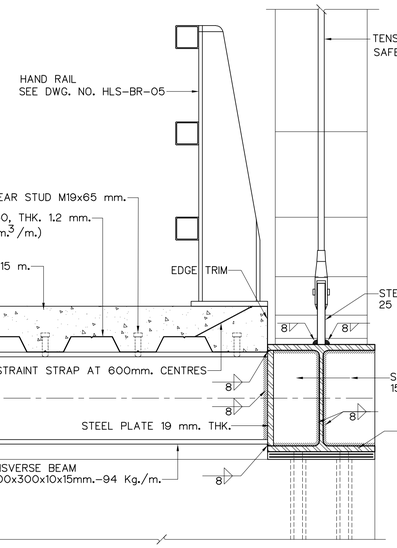
DETAIL "2"
SCALE 1:10



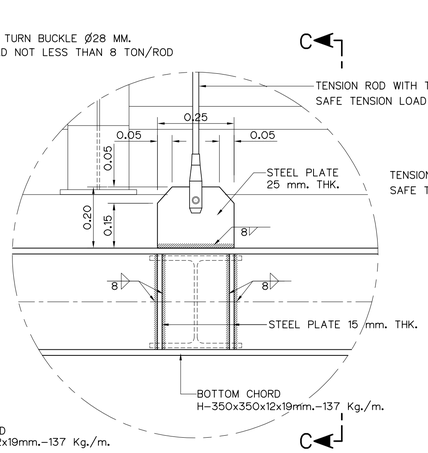
DETAIL "3"
SCALE 1:10



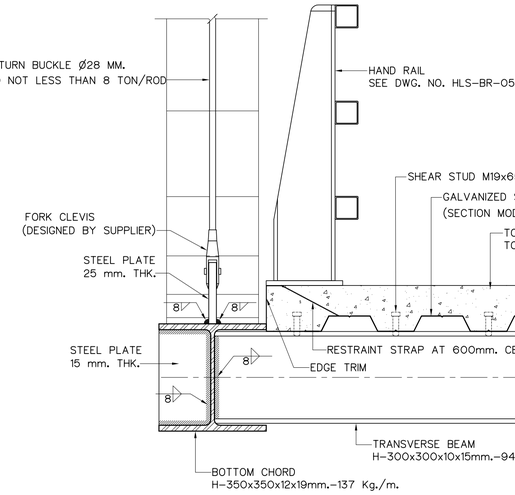
SECTION B-B
SCALE 1:10



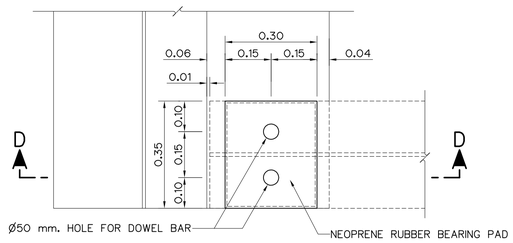
SECTION A-A
SCALE 1:10



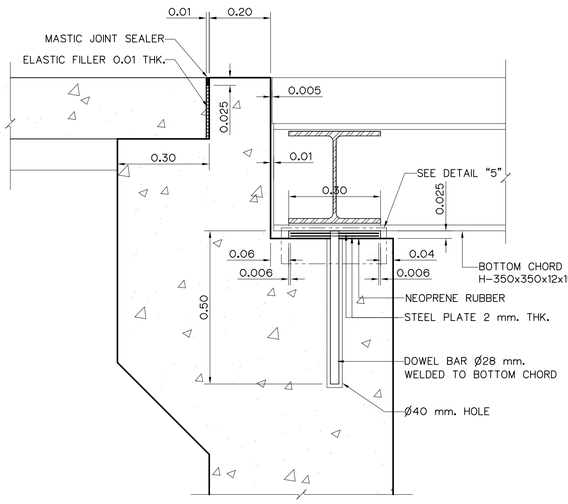
DETAIL "4"
SCALE 1:10



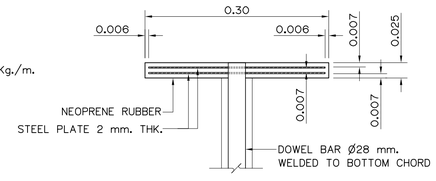
SECTION C-C
SCALE 1:10



PLAN
SCALE 1:10



SECTION D-D
SCALE 1:10



DETAIL "5"
SCALE 1:5

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
3. TENSION ROD ARE PRODUCED BY STEEL BAR CLASS SS400 CORROSION PROTECTION SHALL BE HOT-DIP-GALVANIZED. FORK CLEVIS, TURN BUCKLE AND PIN SHALL BE DESIGNED BY SUPPLIER
4. WELDING ELECTRODE SHALL CONFORM TO ASTM STANDARD TYPE E70.

REFERENCE DRAWINGS :

1. BRIDGE, PLAN AND SECTIONS HLS-BR-02

0 0.05 0.1 0.2 0.3 0.4
SCALE 1:5 METERS

0 0.1 0.2 0.4 0.6 0.8
SCALE 1:10 METERS

0 0.5 1 1.5
SCALE 1:20 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

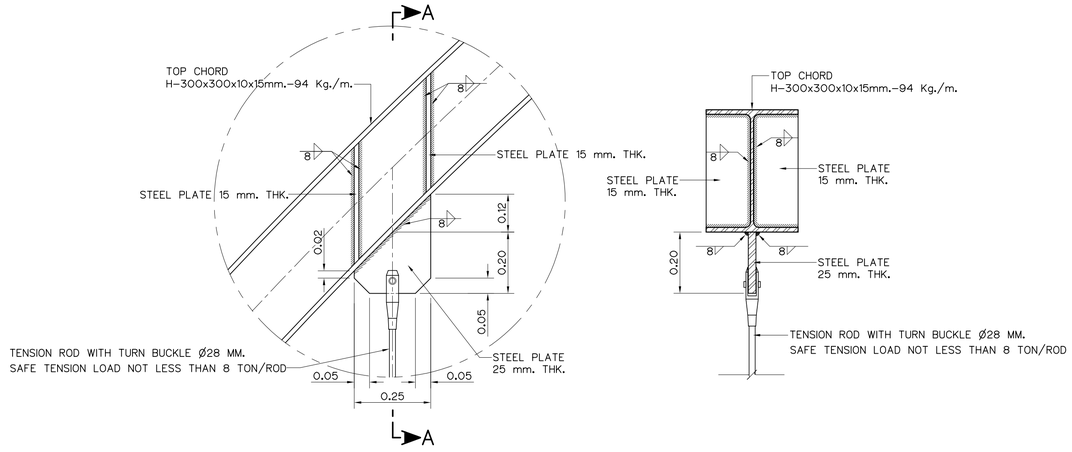
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
BRIDGE
DETAILS (1/2)

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

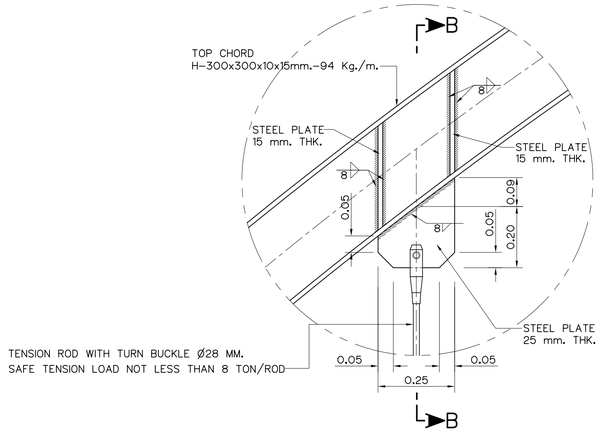
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY
REVIEWED ว.ที่ (CHAI)

DESIGNED	สย.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สย.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO. HLS-BR-03	SHEET NO. 73 OF 77

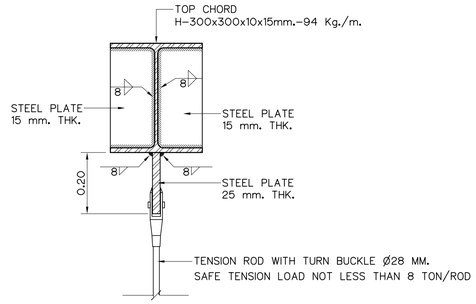


DETAIL "6"
SCALE 1:10

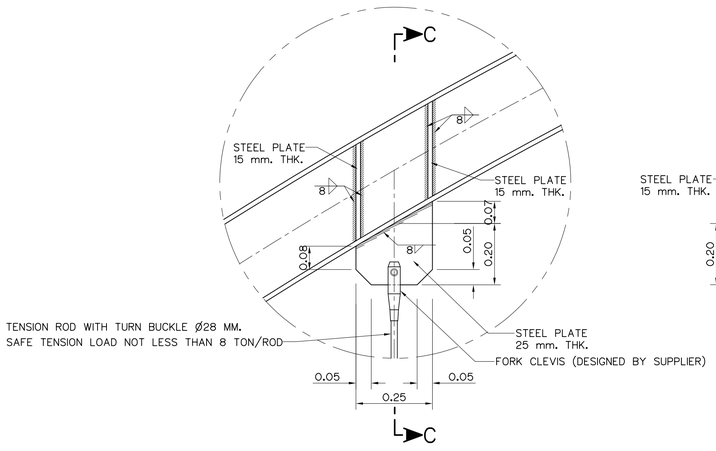
SECTION A–A
SCALE 1:10



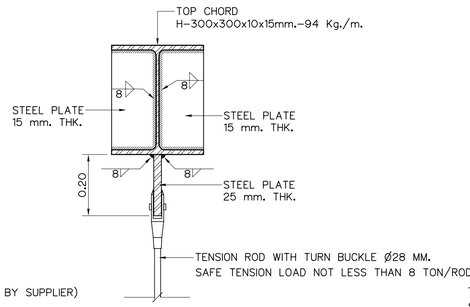
DETAIL "7"
SCALE 1:10



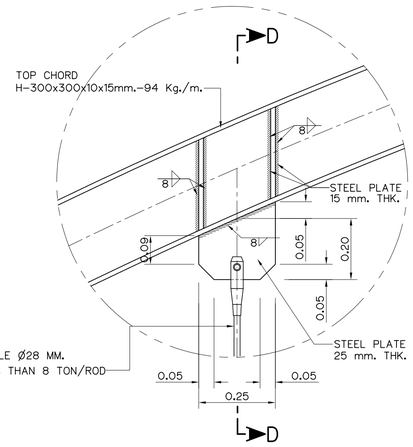
SECTION B–B
SCALE 1:10



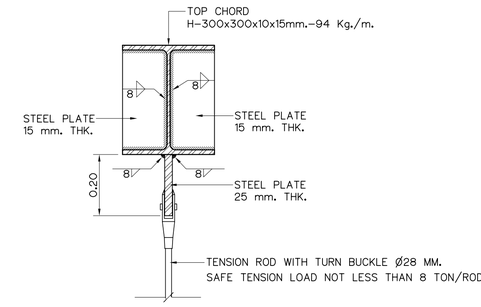
DETAIL "8"
SCALE 1:10



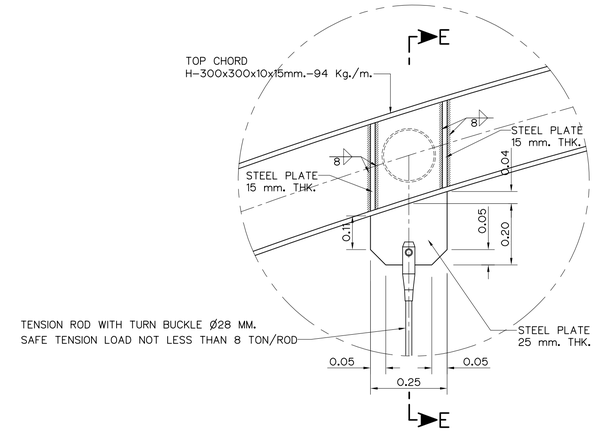
SECTION C–C
SCALE 1:10



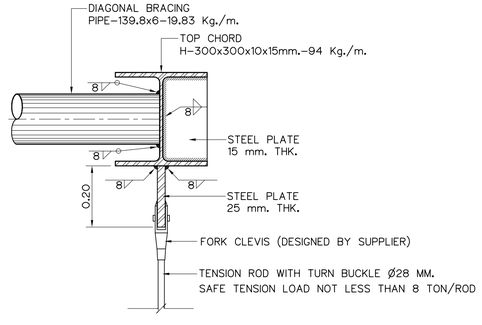
DETAIL "9"
SCALE 1:10



SECTION D–D
SCALE 1:10



DETAIL "10"
SCALE 1:10



SECTION E–E
SCALE 1:10

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
3. TENSION ROD ARE PRODUCED BY STEEL BAR CLASS SS400 CORROSION PROTECTION SHALL BE HOT-DIP-GALVANIZED. FORK CLEVIS, TURN BUCKLE AND PIN SHALL BE DESIGNED BY SUPPLIER
4. WELDING ELECTRODE SHALL CONFORM TO ASTM STANDARD TYPE E70.

REFERENCE DRAWINGS :

1. BRIDGE, PLAN AND SECTIONS HLS-BR-02

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
Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
BRIDGE
DETAILS (2/2)

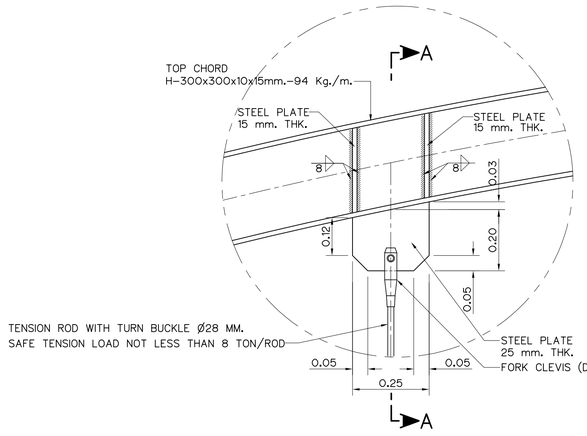
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

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

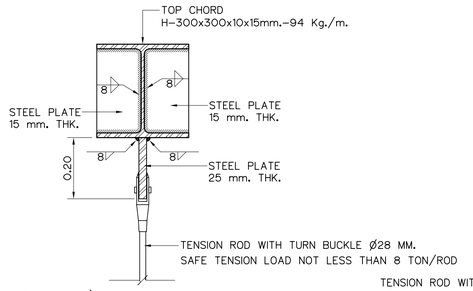
DESIGNED สิ.6651
DRAWN
CHECKED สิ.7324

PROJECT MANAGER 14/01/62 DATE

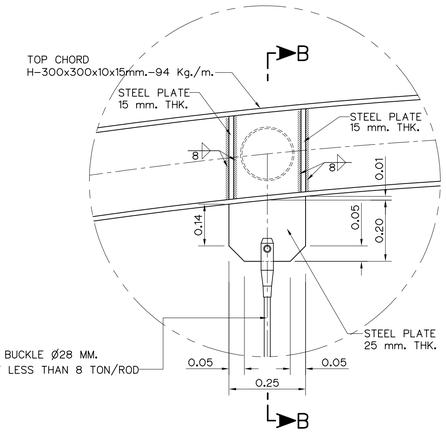
DRAWING NO. HLS-BR-04
SHEET NO. 74 OF 77



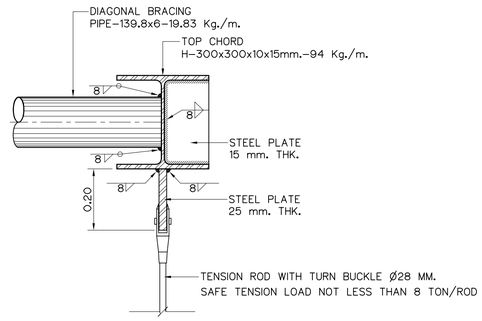
DETAIL "11"
SCALE 1:10



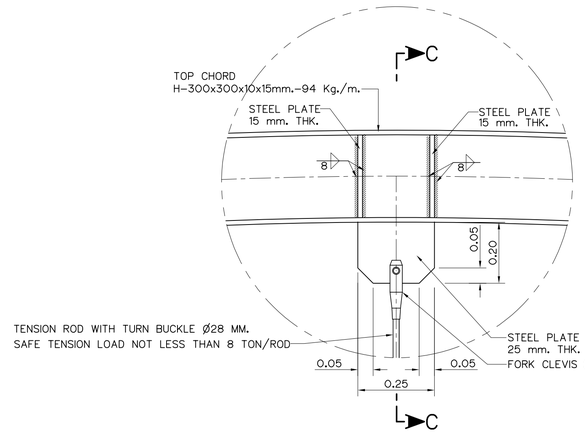
SECTION A-A
SCALE 1:10



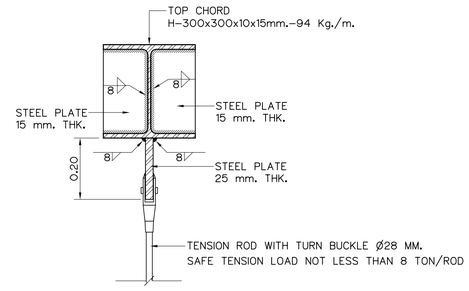
DETAIL "12"
SCALE 1:10



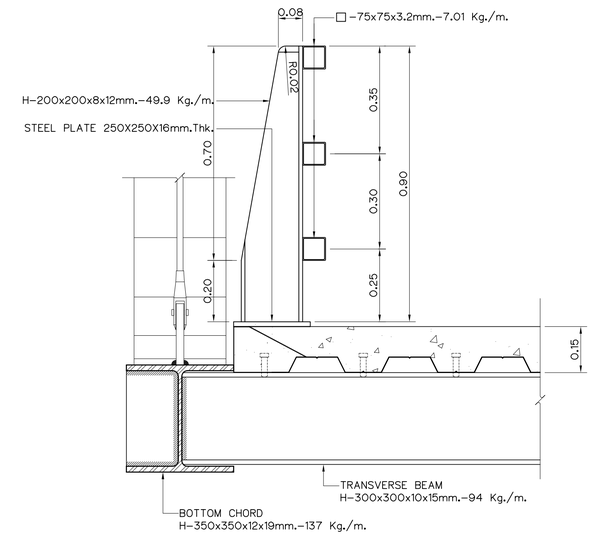
SECTION B-B
SCALE 1:10



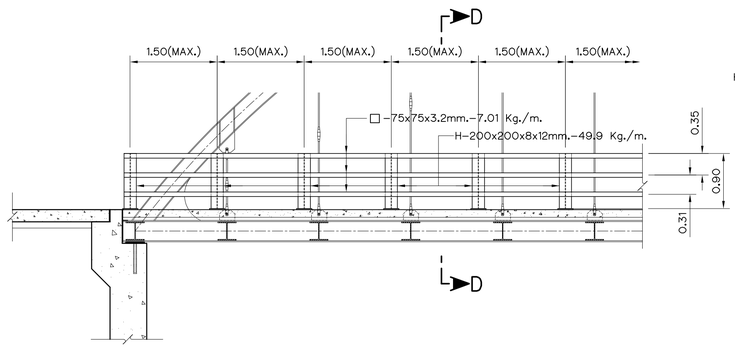
DETAIL "13"
SCALE 1:10



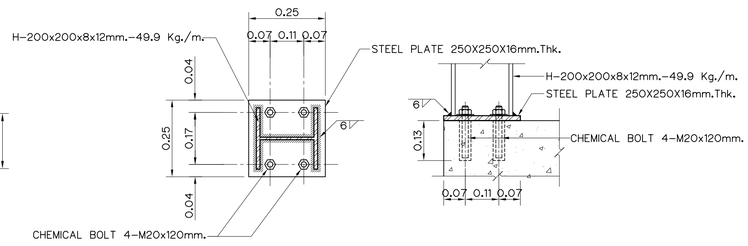
SECTION C-C
SCALE 1:10



SECTION D-D
SCALE 1:10



HANDRAIL
SCALE 1:50



INSTALLATION DETAIL
SCALE 1:10

0 0.1 0.2 0.4 0.6 0.8
SCALE 1:10 METERS

0 0.5 1 2 3 4
SCALE 1:50 METERS

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
3. TENSION ROD ARE PRODUCED BY STEEL BAR CLASS SS400 CORROSION PROTECTION SHALL BE HOT-DIP-GALVANIZED. FORK CLEVIS, TURN BUCKLE AND PIN SHALL BE DESIGNED BY SUPPLIER
4. WELDING ELECTRODE SHALL CONFORM TO ASTM STANDARD TYPE E70.

REFERENCE DRAWINGS :

1. BRIDGE, PLAN AND SECTIONS HLS-BR-02

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

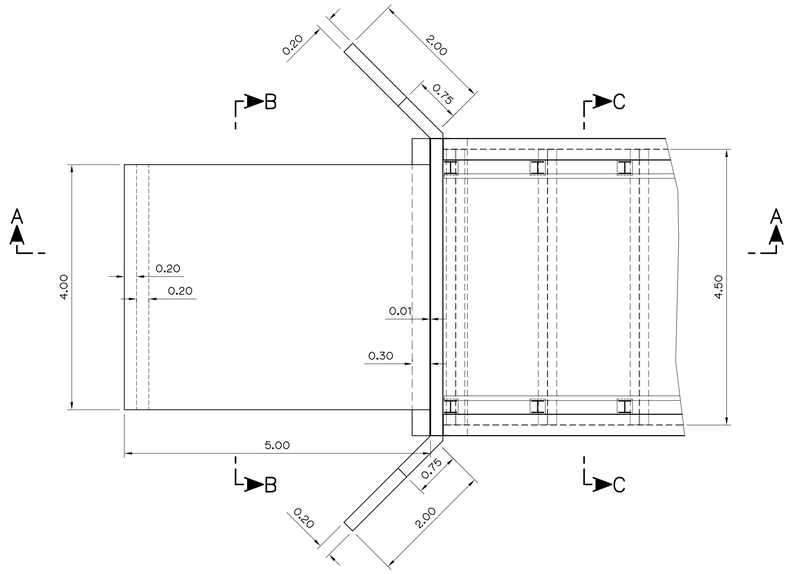
CIVIL WORKS
BRIDGE
HANDRAIL AND DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

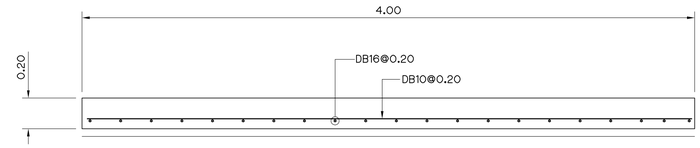
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

REVIEWED ร.ท.ปกป้อง

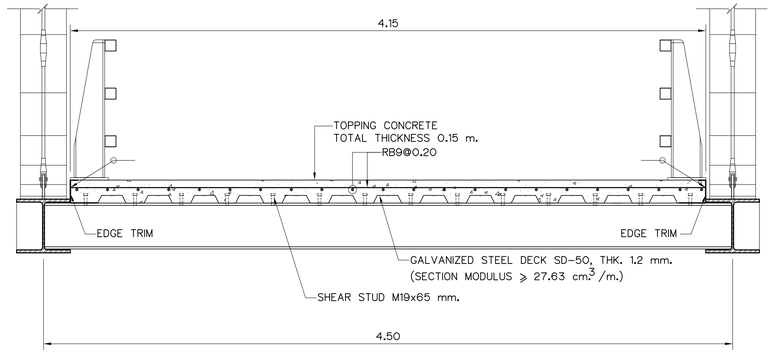
DESIGNED	สย.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	สย.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO.	HLS-BR-05
		SHEET NO.	75 OF 77



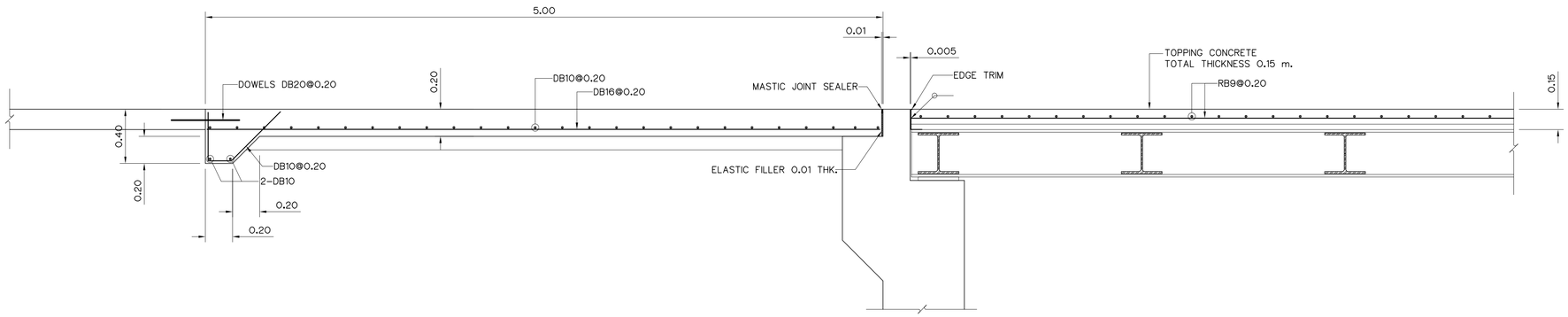
PLAN
SCALE 1:50



SECTION B–B
SCALE 1:20



SECTION C–C
SCALE 1:20



SECTION A–A
SCALE 1:20

0 0.5 1 1.5
SCALE 1:20 METERS

0 0.5 1 2 3 4
SCALE 1:50 METERS

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
3. THE ULTIMATE COMPRESSIVE STRENGTH OF CONCRETE OF STANDARD CYLINDER (Ø0.15X0.30 m.) TEST AT 28 DAYS SHALL BE 240 KSC.
4. REINFORGED STEEL BARS SHALL BE CONFORM TO T.I.S. AS FOLLOW:
   - DEFORMED BARS (SD30) – T.I.S. 24-2559
   - ROUND BARS (SD24) – T.I.S. 20-2559
5. GALVANIZED STEEL DECK SHALL CONFORM TO JIS G3352 (STANDARD FOR STEEL DECK) AND JIS G3302 (STANDARD FOR HOT DIP ZINC COATED STEEL SHEET IN COILS)

REFERENCE DRAWINGS :

1. BRIDGE, PLAN AND SECTIONS HLS-BR-02

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

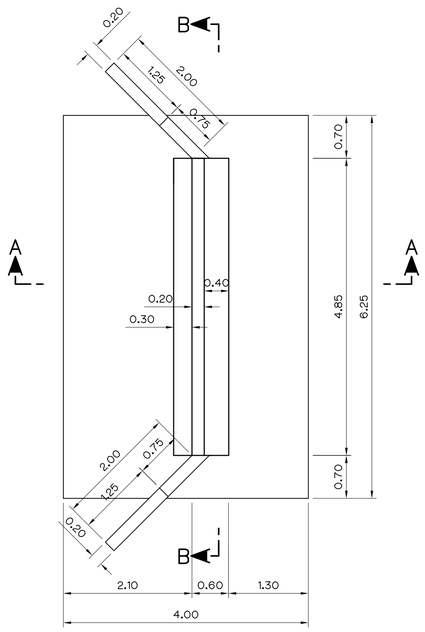
CIVIL WORKS
BRIDGE
SLAB REINFORCEMENT DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

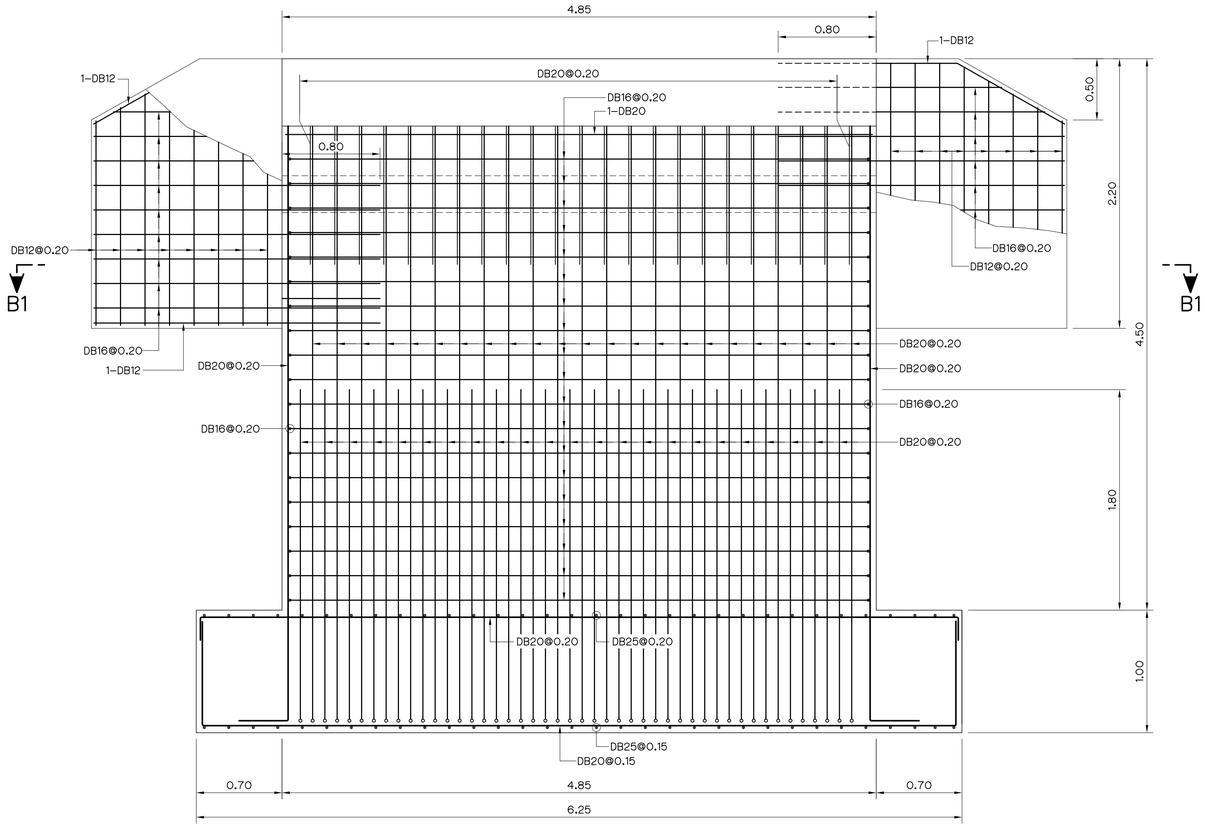
REVIEWED ว.ไกรชัย

DESIGNED	ส.ต.ท.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	ส.ต.ท.7324	APPROVED	
PROJECT MANAGER	14/01/62 DATE	DRAWING NO.	HLS-BR-06
		SHEET NO.	76 OF 77



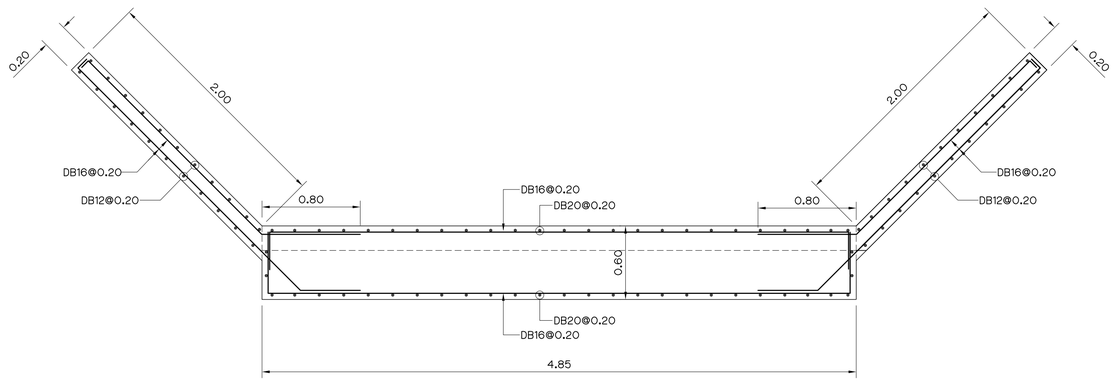
PLAN

SCALE 1:50



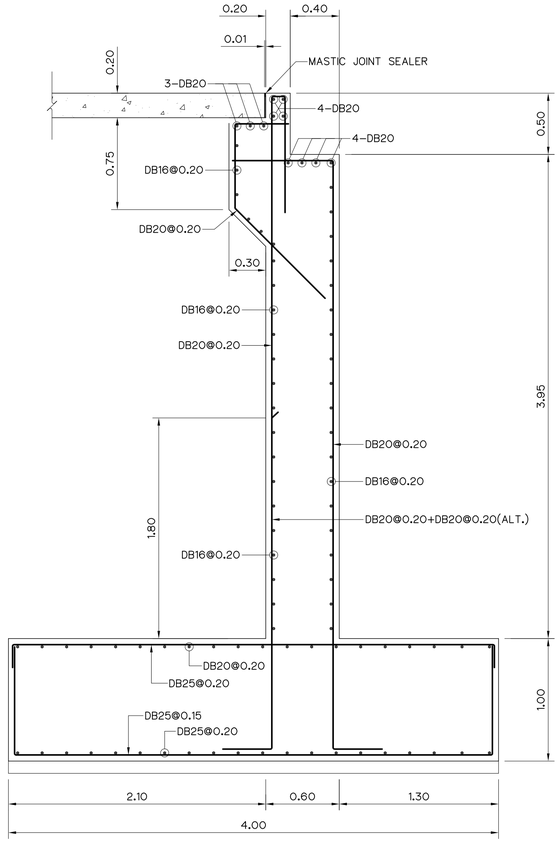
SECTION B–B

SCALE 1:25



SECTION B1–B1

SCALE 1:25



SECTION A–A

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. HLS–GN–03
3. ALLOWABLE BEARING CAPACITY OF SOIL FOUNDATION SHALL NOT BE LESS THAN 15 T/M^2

REFERENCE DRAWINGS :

1. BRIDGE, PLAN AND SECTIONS HLS–BR–02

0 0.5 1 1.5 2

SCALE 1:25 METERS

0 0.5 1 2 3 4

SCALE 1:50 METERS

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
	CONSULTANTS		DEDE	

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

HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
BRIDGE
ABUTMENT REINFORCEMENT DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

REVIEWED ธ.ภัทชัย

DESIGNED สย.6651 SUBMITTED

DRAWN RECOMMENDED

CHECKED สย.7324 APPROVED

PROJECT MANAGER 14/01/62 DATE

DRAWING NO. HLS–BR–07

SHEET NO. 77 OF 77