



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



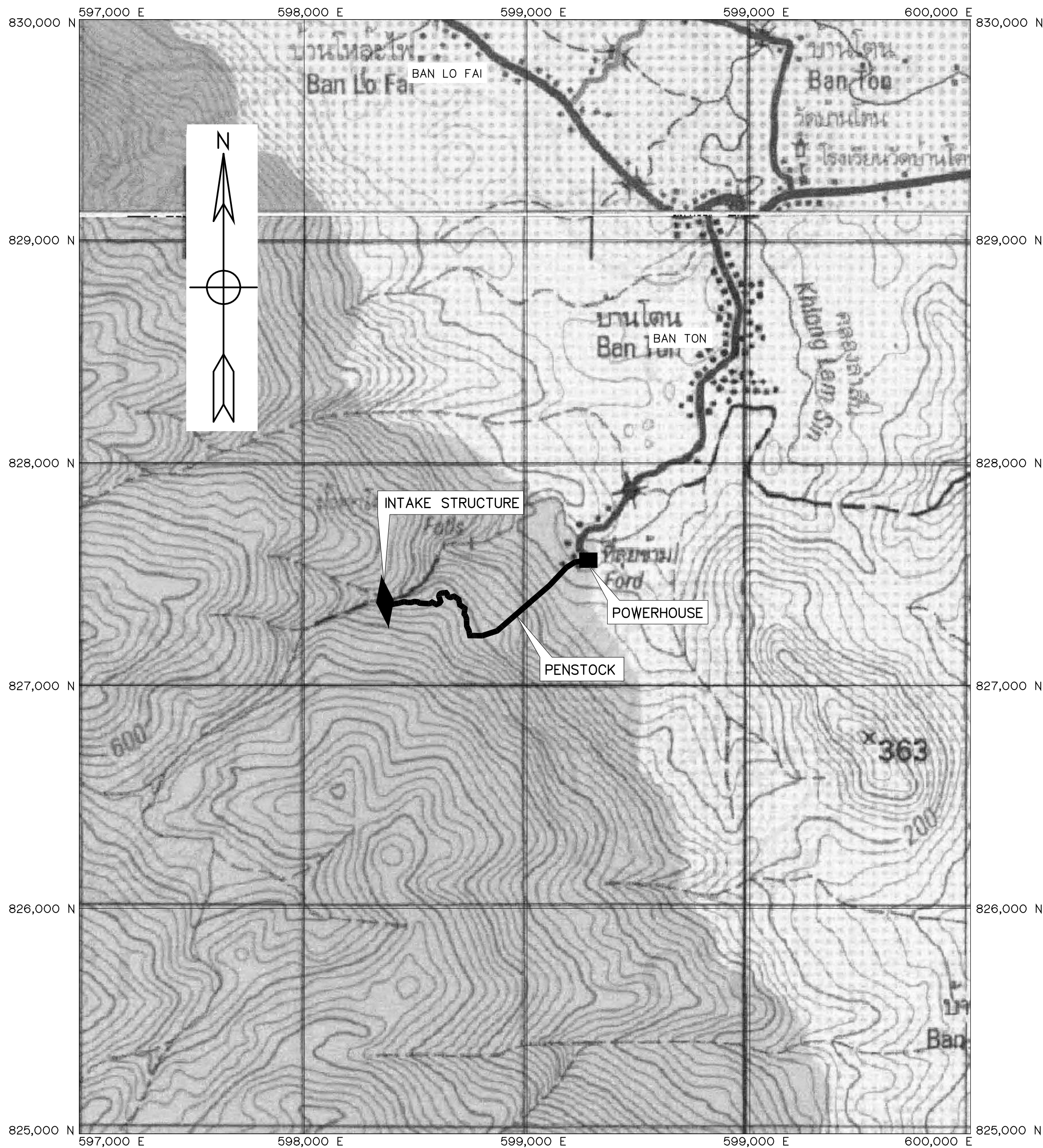
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

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	0.60 M. DIA. VERTICAL GATE
18	HLS-IS-08	1.00x1.00 m. VERTICAL GATE (GATE INSTALLATION)
19	HLS-IS-09	1.00x1.00 m. VERTICAL GATE (GATE DETAIL)
20	HLS-IS-10	PEDESTAL SCREW LIFT CAPACITY 750 KG.
21	HLS-IS-11	GATE-LIFT PEDESTALS 2.25 TONS
22	HLS-IS-12	PEDESTAL SCREW LIFT CAPACITY 2.25 TONS
PENSTOCK		
23	HLS-PS-01	PLAN AND PROFILE, STA. 0+000 TO STA. 0+400
24	HLS-PS-02	PLAN AND PROFILE, STA. 0+400 TO STA. 0+800
25	HLS-PS-03	PLAN AND PROFILE, STA. 0+800 TO STA. 1+000
26	HLS-PS-04	PLAN AND PROFILE, STA. 1+000 TO STA. 1+171.00
27	HLS-PS-05	DETAILS OF WALKWAY
28	HLS-PS-06	REINFORCEMENT DETAILS WALKWAY
29	HLS-PS-07	PIER TYPE 1 DETAILS
30	HLS-PS-08	PIER TYPE 2 DETAILS
31	HLS-PS-09	SUPPORT ELEVATION, SECTIONS AND DETAILS
32	HLS-PS-10	ANCHOR BLOCK ①, ② & ③ PLANS AND REINFORCEMENT DETAILS
33	HLS-PS-11	ANCHOR BLOCK ④, ⑤ & ⑥ PLANS AND REINFORCEMENT DETAILS
34	HLS-PS-12	ANCHOR BLOCK ⑦, ⑧ & ⑨ PLANS AND REINFORCEMENT DETAILS
35	HLS-PS-13	ANCHOR BLOCK ⑩ & ⑪ PLANS AND REINFORCEMENT DETAILS
36	HLS-PS-14	ANCHOR BLOCK ⑫, ⑬ & ⑭ PLANS AND REINFORCEMENT DETAILS
37	HLS-PS-15	ANCHOR BLOCK ⑮ PLAN, SECTIONS, AND REINFORCEMENT DETAILS
38	HLS-PS-16	EXPANSION JOINT, PLAN, SECTIONS AND DETAILS
39	HLS-PS-17	BEND DETAILS
40	HLS-PS-18	WELDING DETAILS
41	HLS-PS-19	WYE, PLAN, SECTIONS AND DETAILS
42	HLS-PS-20	EMERGENCY VALVE CHAMBER GENERAL LAY-OUT AND SECTION
43	HLS-PS-21	EMERGENCY VALVE CHAMBER PLAN SECTIONS AND DETAILS
44	HLS-PS-22	EMERGENCY VALVE CHAMBER REINFORCEMENT DETAILS

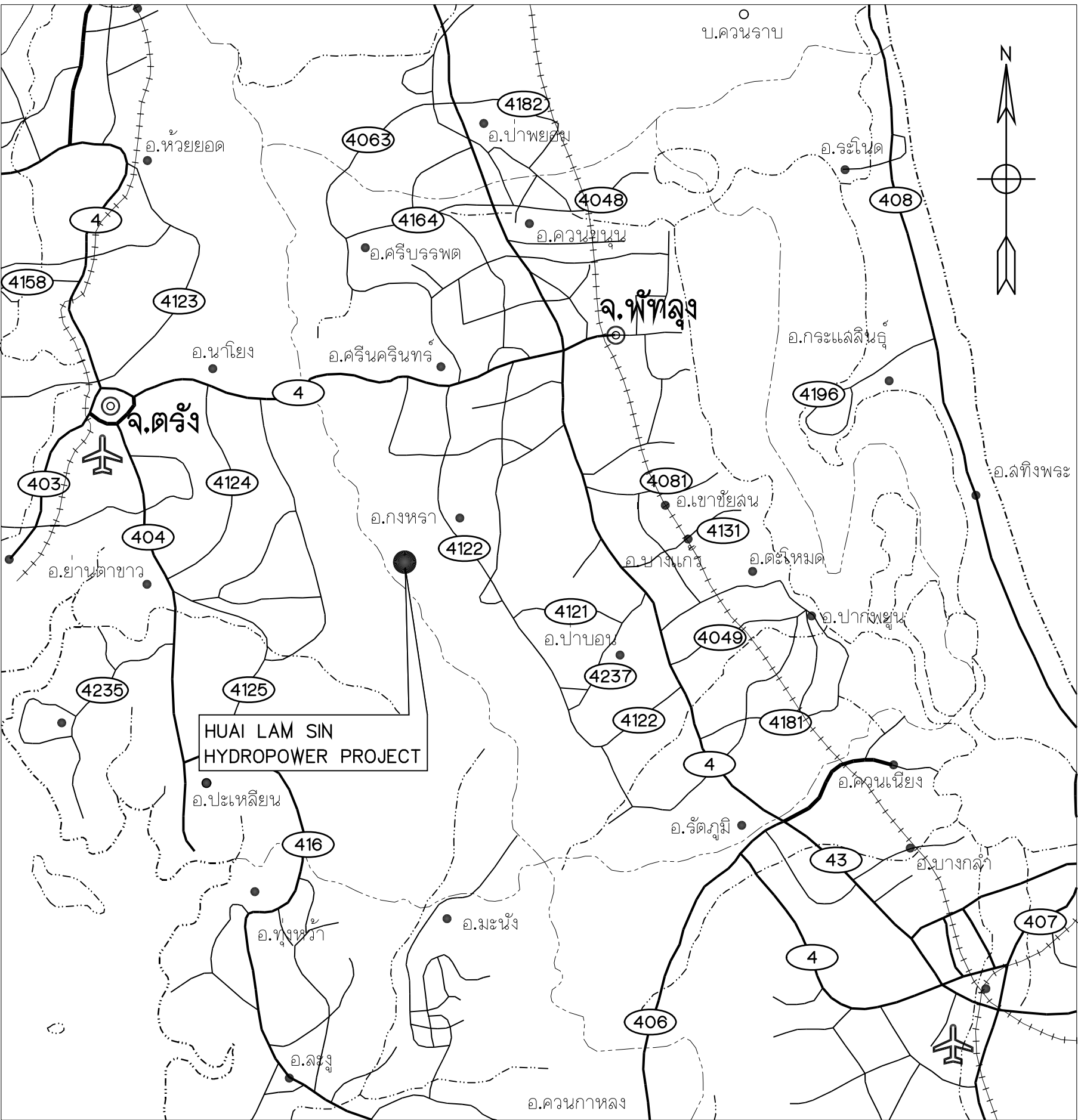
SHEET NO.	DRAWING NO.	DRAWING DETAILS
POWER HOUSE		
45	HLS-PH-01	GENERAL LAY-OUT
46	HLS-PH-02	PLAN AND ROOF PLAN
47	HLS-PH-03	ELEVATIONS
48	HLS-PH-04	SECTIONS
49	HLS-PH-05	DETAILS OF TOILET AND SEPTIC TANK
50	HLS-PH-06	DETAILS OF DOORS, WINDOWS AND NAME PLATE
51	HLS-PH-07	FOOTING, BEAM, SLAB ROOF BEAM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



PROJECT AREA MAP
SCALE 1:15,000

LEGENDS :

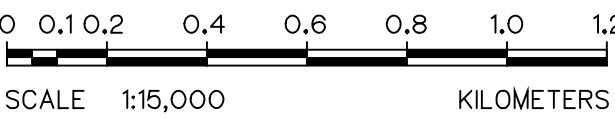
- STREAM
- INTAKE STRUCTURE
- PENSTOCK
- POWERHOUSE



LOCATION MAP
NOT TO SCALE

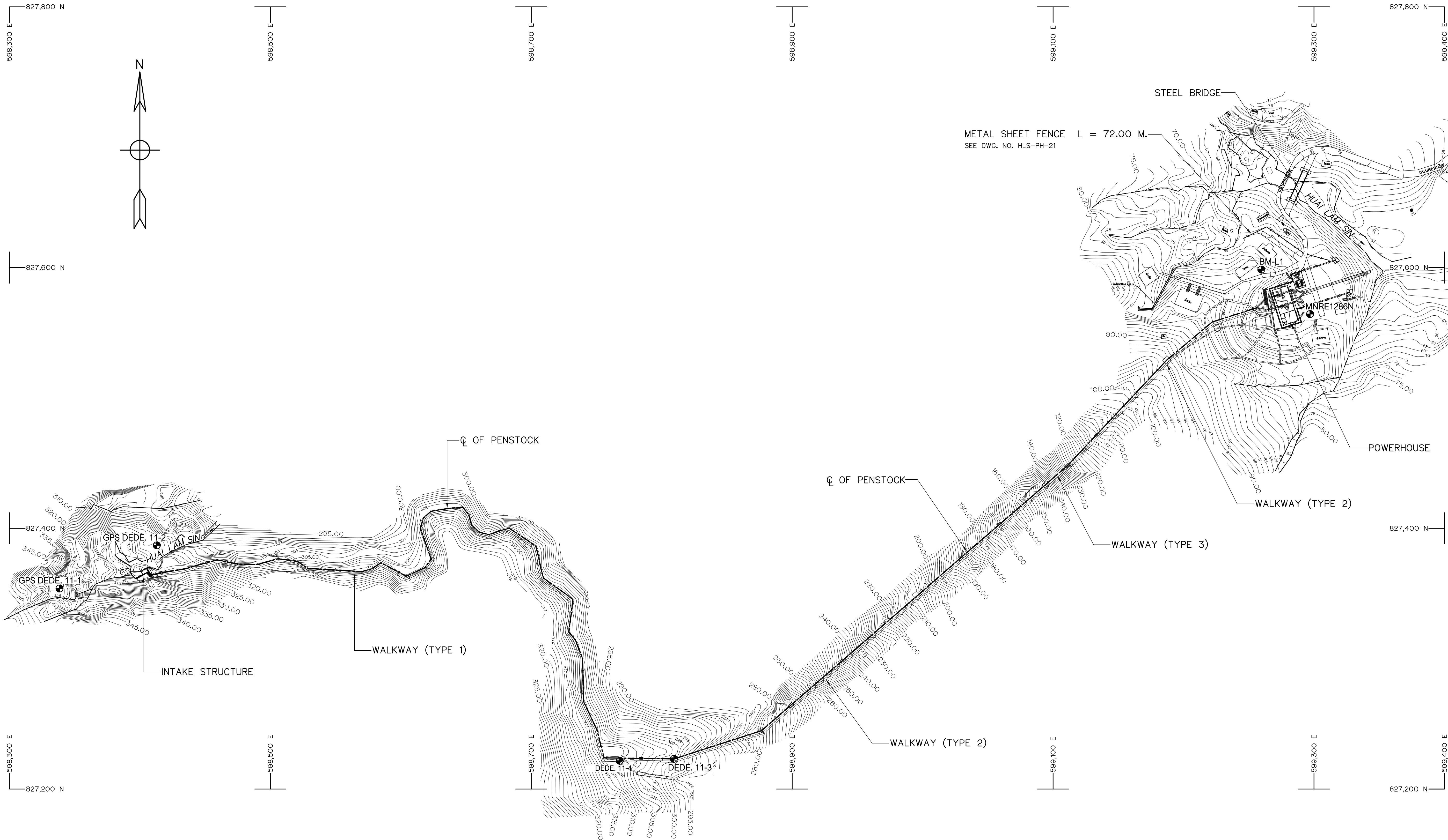
NOTES :

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



LOCATION MAP
NOT TO SCALE

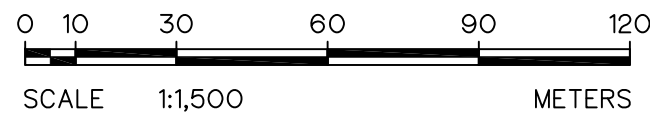
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUAI LAM SIN HYDROPOWER PROJECT			
CIVIL WORKS GENERAL LOCATION MAP AND PROJECT AREA MAP			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED ๒๒.๖๖๕1		REVIEWED S.KITICHAJ	
DRAWN ๒๒.๖๖๕1		SUBMITTED ๒๒.๖๖๕1	
CHECKED ๒๒.๖๖๕1		RECOMMENDED ๒๒.๖๖๕1	
PROJECT MANAGER ๒๒.๖๖๕1		APPROVED ๒๒.๖๖๕1	
DATE 14/01/62		DRAWING NO. HLS-GN-01	
		SHEET NO. 1 OF 78	



BM. DESCRIPTIONS			
BM NO.	COORDINATE		ELEVATION M. (MSL.)
	N	E	
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

PROJECT MAP
SCALE 1:1,500

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



3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
		CONSULTANTS	DEDE	



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

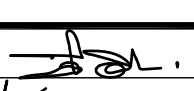
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
GENERAL
PROJECT MAP

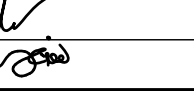
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.



REVIEWED S.KITIAKHA

DESIGNED


๑๒1.6651

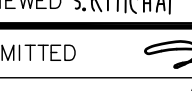
CHECKED


๑๒1.7324

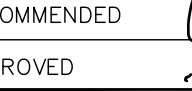
APPROVED


14/01/62

DATE

RECOMMENDED


๑๒1.7324

APPROVED


๑๒1.7324

PROJECT MANAGER


DATE

DRAWING NO.
HLS-GN-02

SHEET NO.
2 OF 78

ABBREVIATIONS :

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

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

SYMBOLS :

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

GENERAL NOTES :

- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS UNLESS OTHERWISE SHOWN.
- 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.
- 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
- ADDITIONAL SYMBOLS, IF REQUIRED, ARE DEFINED IN THE RESPECTIVE DRAWINGS.
- THE SPECIFICATIONS AND THE QUANTITIES OF MATERIALS ARE SPECIFIED IN THE TECHNICAL SPECIFICATIONS.
- ALL PLAIN CONCRETE CORNERS ARE TO BE CHEMFERED 2 cm. UNLESS OTHERWISE SHOWN.
- 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 $\frac{2}{1}$	$\frac{1}{1}$	1:0	$\frac{1}{1}$
1:1 – 1:1.5	1:0.5	1	1:0	$\frac{1}{1}$
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

$\frac{2}{1}$ = FILL SHOULD BE AVOIDED

$\frac{1}{1}$ = FOR DOUBTFUL CASES CONSULT FIELD ENGINEER

STRUCTURAL DESIGN NOTES :

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

fc' (ksc)	DESCRIPTION
350	PRESTRESS CONCRETE
210	1. WEIR / INTAKE STRUCTURE
	2. POWERHOUSE, TAILRACE
	3. TAILRACE
	4. MANHOLE
	5. ANCHOR BLOCK, PIPE SUPPORT
	6. BOX CULVERT
140	LEAN CONCRETE
- UNLESS OTHERWISE SHOWN, THE FOLLOWING CLEAR COVER OF CONCRETE OVER OF THE REINFORCEMENT SHALL BE USED :
 - FACE EXPOSED TO SCOUR 5.0 cm.
 - FACE EXPOSED TO EARTH OR WEATHER 5.0 cm.
 - FACE UNEXPOSED TO EARTH OR WEATHER 3.0 cm.
- THE REINFORCEMENT LAP SPLICES SHALL NOT BE LESS THAN 50 DIAMETERS OF BIGGER THAN BAR WITH HOOKS, UNLESS OTHERWISE SHOWN.
- EMBEDDED METALWORK SHALL BE SECURELY FASTENED IN POSITION BEFORE PLACING CONCRETE.
- ALL CONSTRUCTION JOINT SHOULD BE TREATED AS DIRECTED IN ORDER TO ASSURE THE BEST BOND.
- A 5 cm. (MIN.) LAYER OF LEAN CONCRETE (1:3:5 BY VOLUME) SHOULD BE PLACED BELOW CONCRETE STRUCTURES.
- THE STRUCTURES SHOULD BE PLACED ON UNDISTURBED SOILS OR COMPACTED FILL AND BACKFILL AROUND THE STRUCTURES SHOULD BE COMPACTED.
- THE FOUNDATION ELEVATIONS ARE SUBJECT TO CHANGE AS DIRECTED ACCORDING TO THE SOIL CONDITIONS.
- ALL SIZES OF REINFORCING BARS AND STRUCTURAL STEELS ARE IN MILLIMETERS.
- ALL STRUCTURAL STEELS ARE THOSE OF T.I.S. DESIGNATION Fe24.
- REINFORCED STEEL BARS SHALL BE CONFORM TO T.I.S. AS FOLLOW :
 - DEFORMED BARS (SD30) – T.I.S. 24–2559
 - ROUND BARS (SR24) – T.I.S. 20–2559
- ALLOWABLE BEARING CAPACITY OF FOUNDATION
SHALL NOT BE LESS THAN AS FOLLOW :
 - INTAKE STRUCTURE $Q_0 = 25 \text{ T/M.}^2$
 - POWERHOUSE $Q_0 = 10 \text{ T/M.}^2$
 - PENSTOCK $Q_0 = 15 \text{ T/M.}^2$
 - WALKWAY $Q_0 = 10 \text{ T/M.}^2$

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

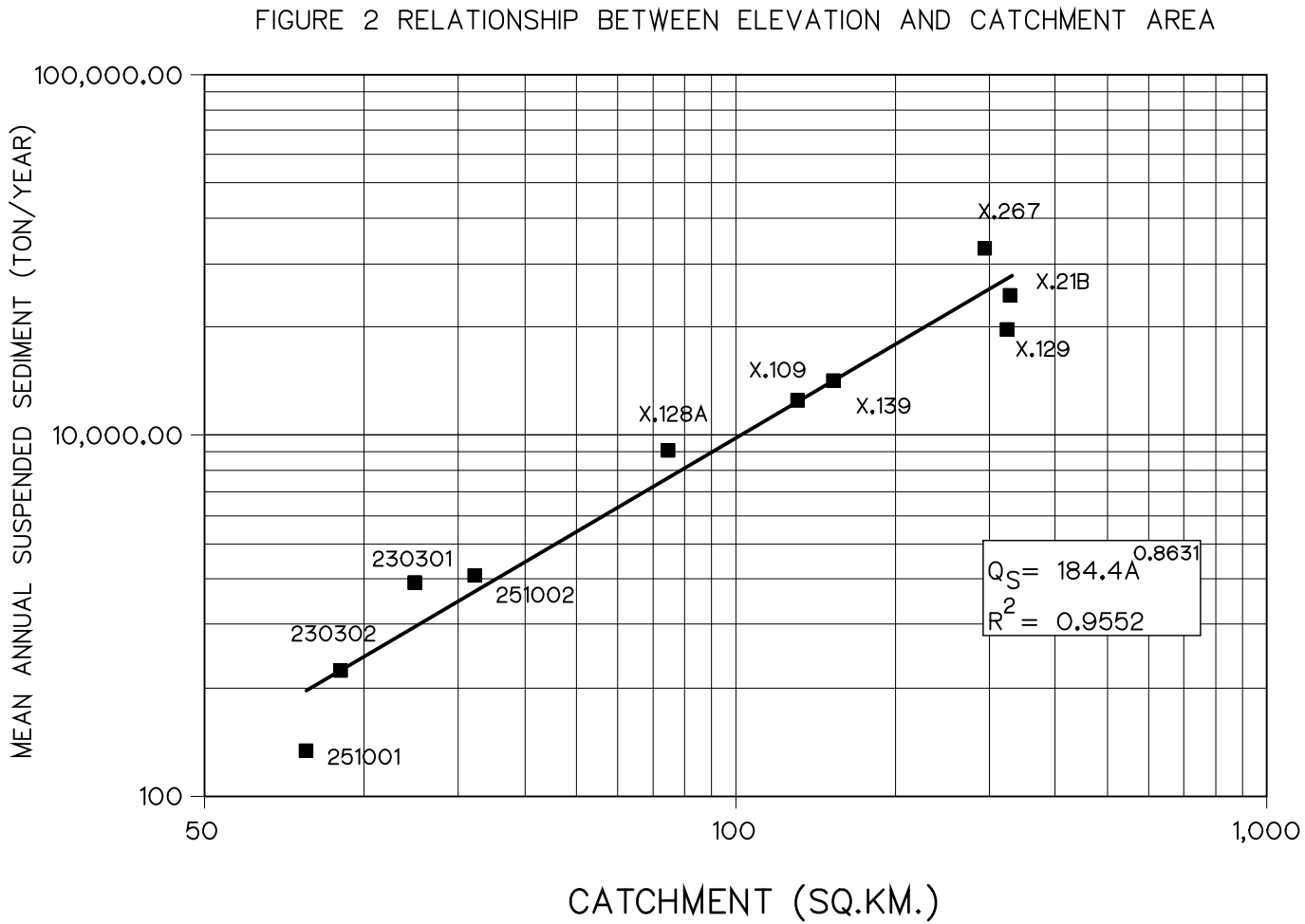
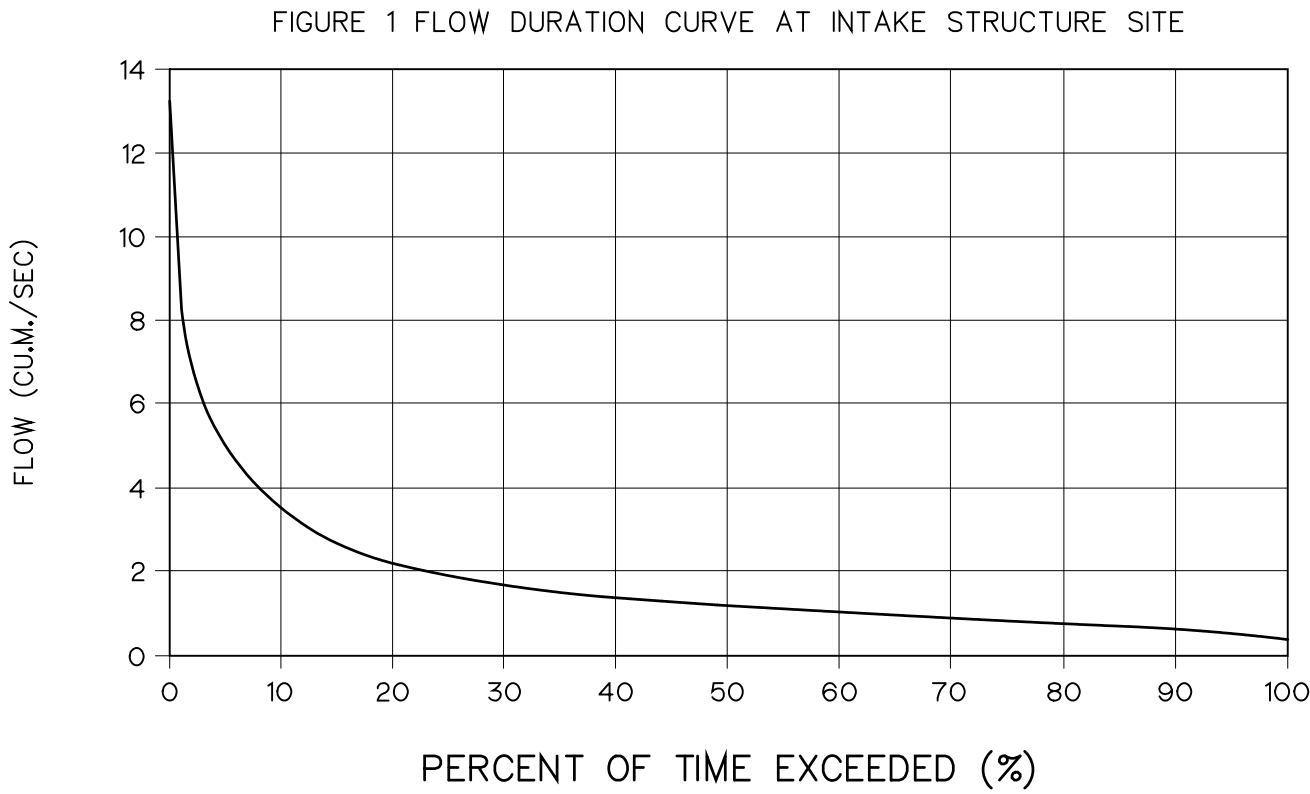
 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
HUA I LAM SIN HYDROPOWER PROJECT	
CIVIL WORKS GENERAL SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES	
 FRONTIER ENGINEERING CONSULTANTS CO., LTD.	 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED 22.6651	REVIEWED 22.6651
DRAWN	RECOMMENDED
CHECKED 22.7324	APPROVED
 PROJECT MANAGER	14/01/62 DATE
DRAWING NO. HLS-GN-03	SHEET NO. 3 OF 78

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		

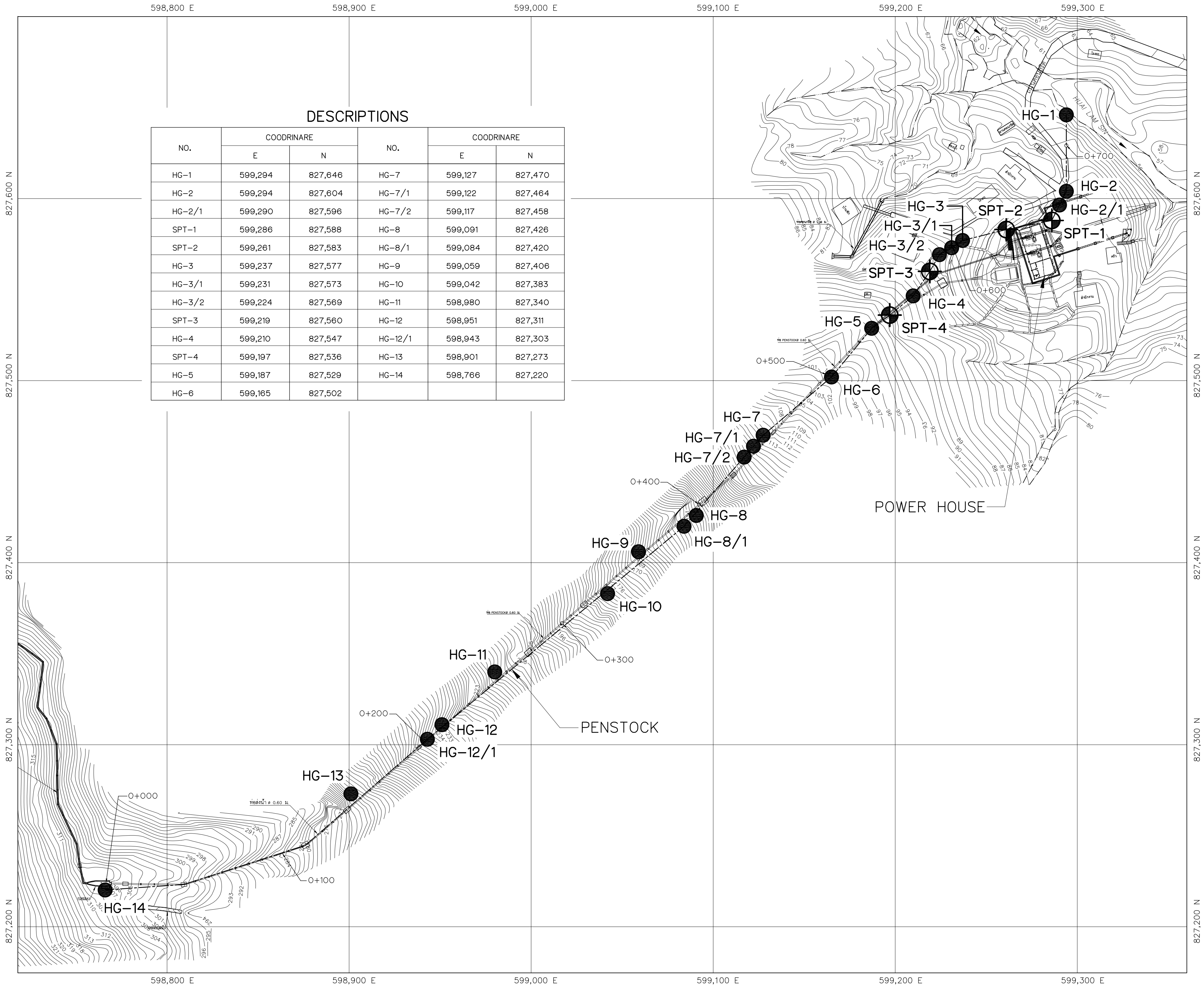
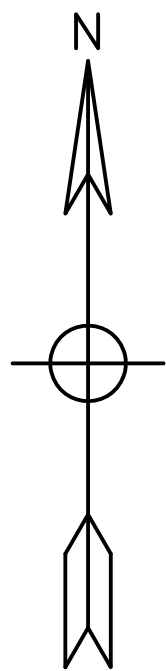
TABLE 2 FLOOD PEAK DISCHARGE FOR VARIOUS RETURN PERIODS

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



3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS			DEDE	

 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUA I LAM SIN HYDROPOWER PROJECT			
CIVIL WORKS GENERAL HYDROLOGY DATA			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED		REVIEWED	REVIEWED
DRAWN		RECOMMENDED	RECOMMENDED
CHECKED		APPROVED	APPROVED
PROJECT MANAGER		DATE	DRAWING NO. HLS-GN-04
			SHEET NO. 4 OF 78



NO.	COORDINARE		NO.	COORDINARE	
	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			

- 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

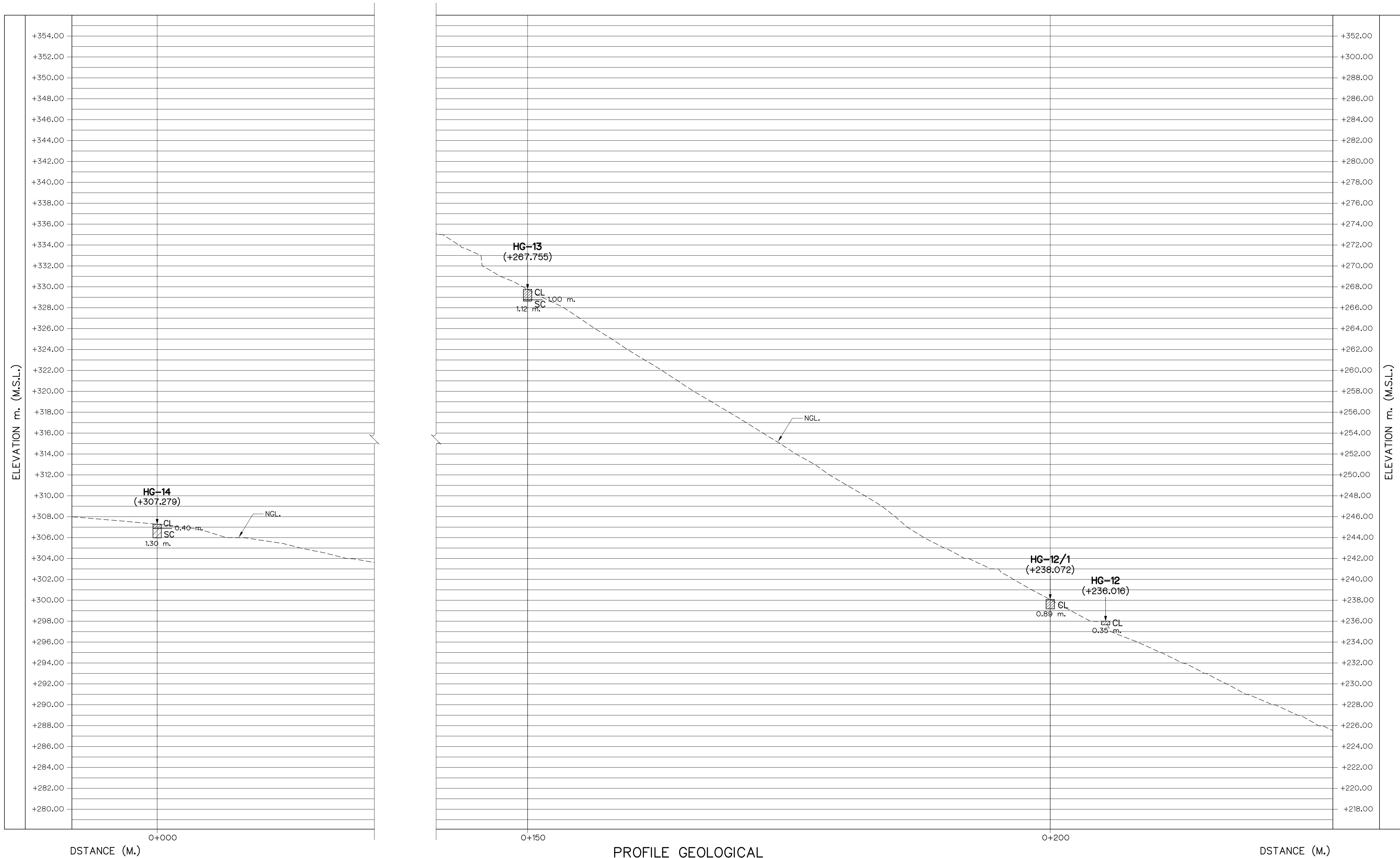
SPT BORE HOLE

HAND AUGER BORE HOLE



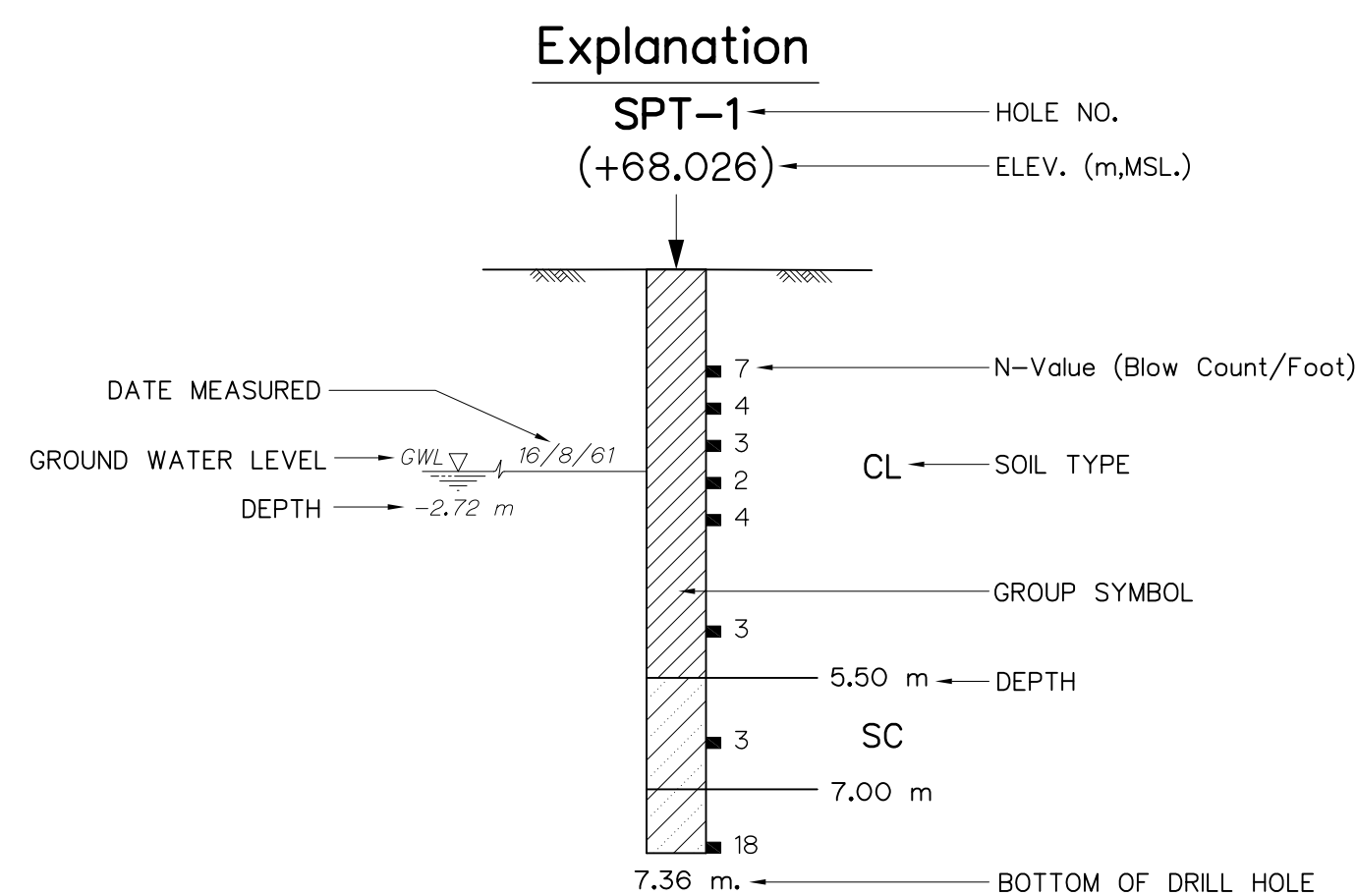
BORING LOCATION PLAN
SCALE 1:1,250

3						FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
2						DESIGNED	REVIEWED S.KITIKHAJ
1						DRAWN	SUBMITTED
NO.	DATE	REVISIONS	CHECKED	APPROVED		CHECKED	RECOMMENDED
							APPROVED
CONSULTANTS			DEDE			PROJECT MANAGER	DRAWING NO. SHEET NO.
						14/01/62	HLS-GN-06 6 OF 78
						DATE	



LEGEND

- CL = Lean Clay with Sand
SC = Clayey Sand



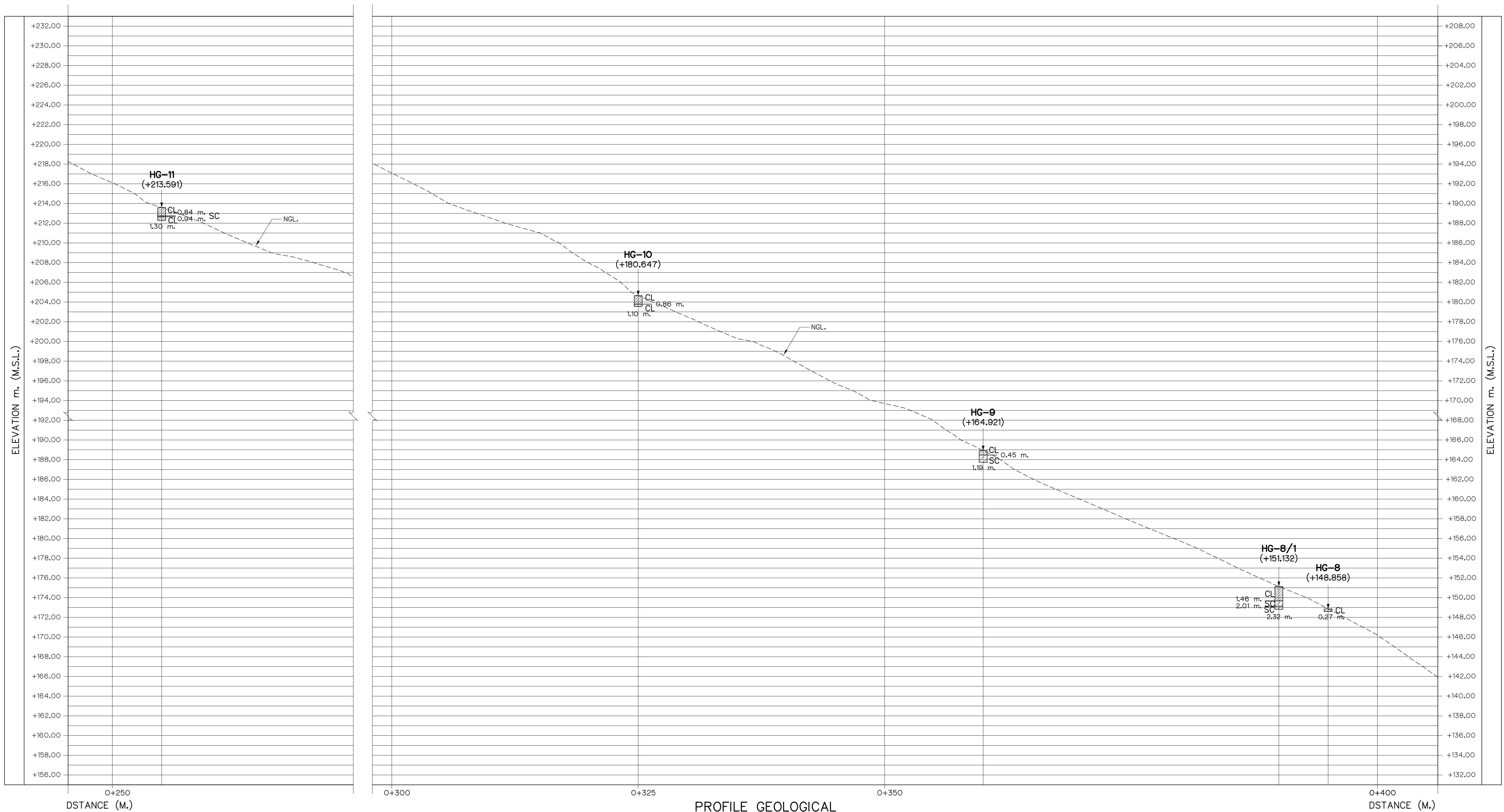
NOTES :

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				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
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	
DESIGNED		REVIEWED S.KITICHAJ	
DRAWN		SUBMITTED	
CHECKED		RECOMMENDED	
PROJECT MANAGER		APPROVED	
14/01/62		DRAWING NO.	
DATE		HLS-GN-07	
		SHEET NO.	
		7 OF 78	

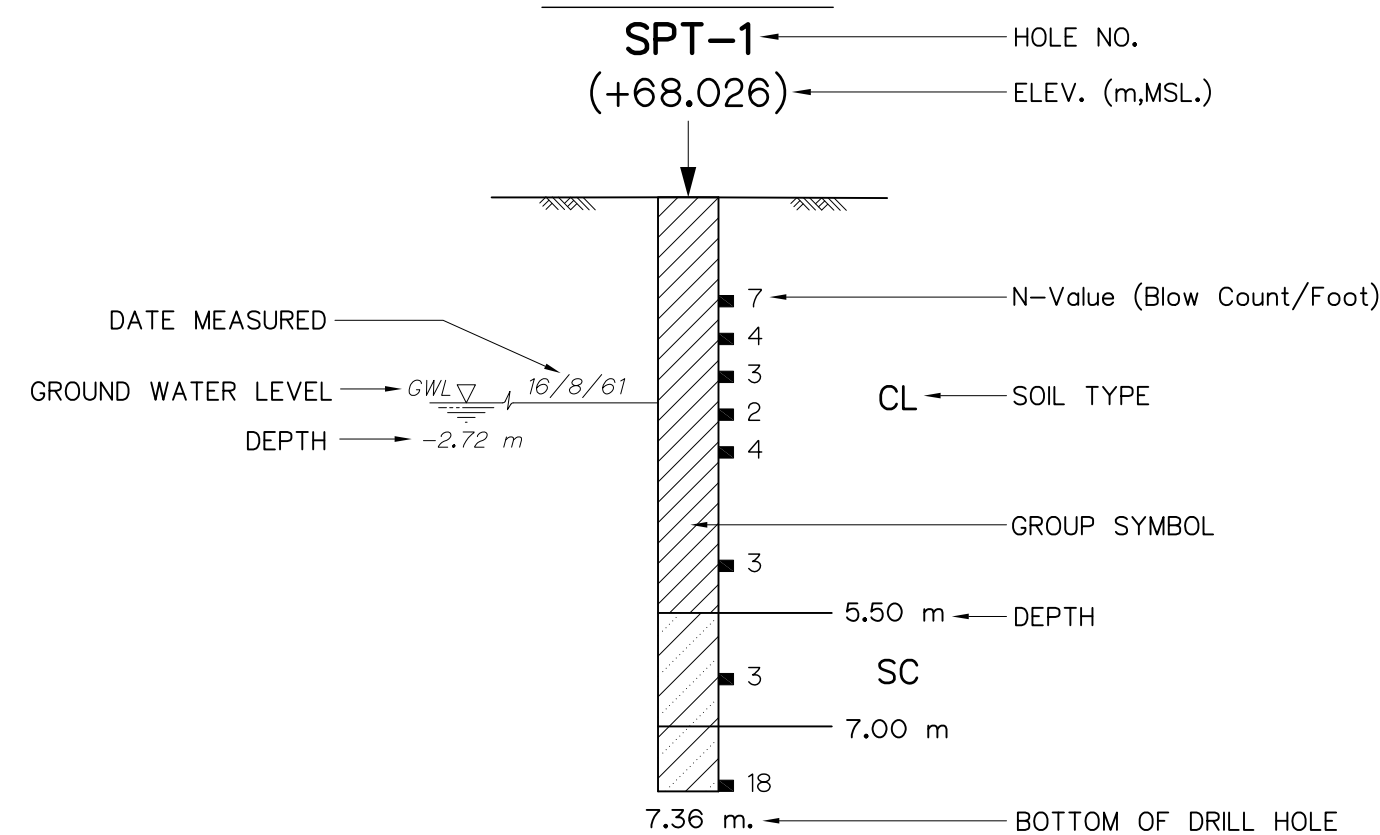


PROFILE GEOLOGICAL
SCALE 1:200

LEGEND

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

Explanation



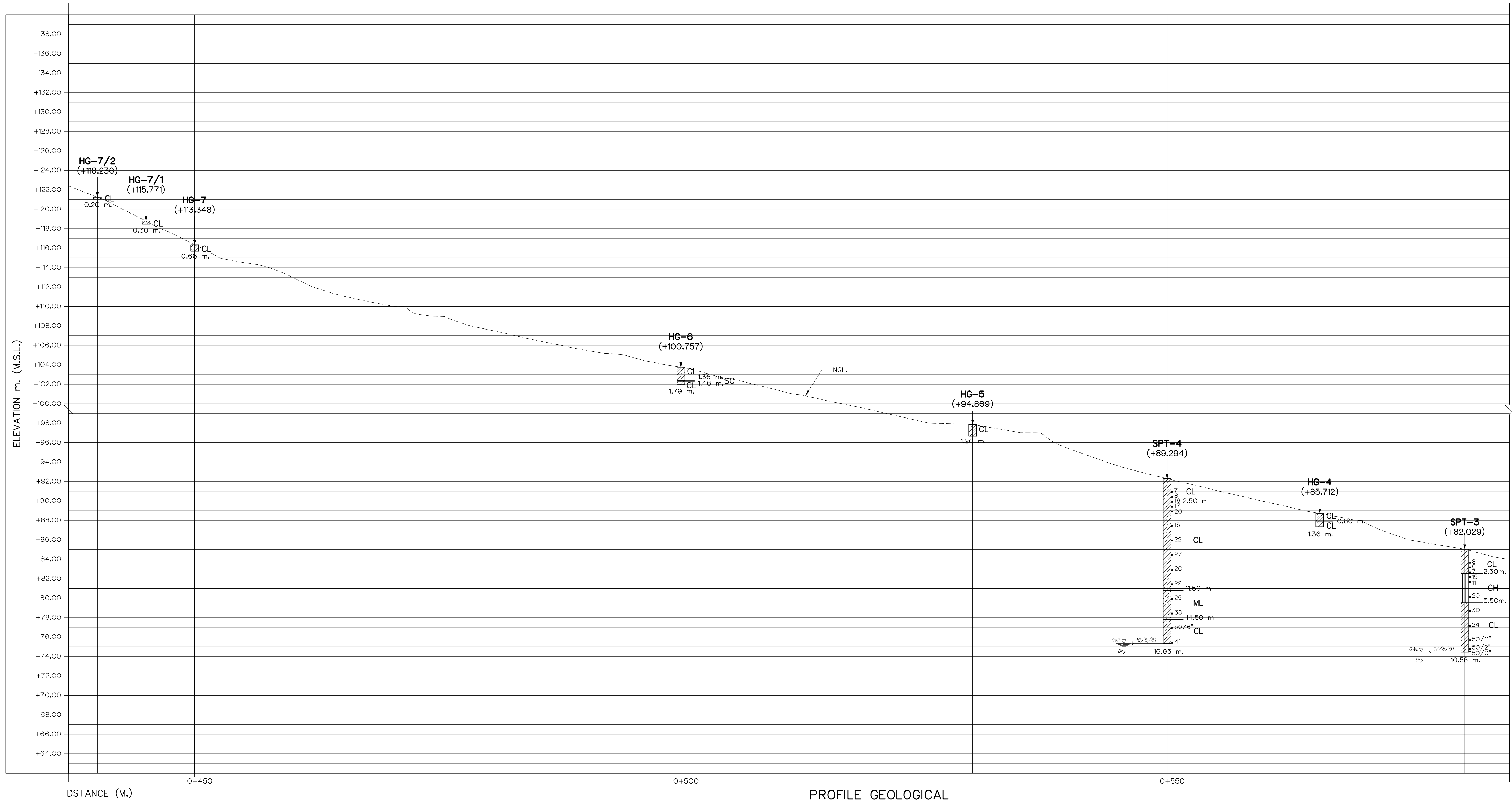
NOTES :

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



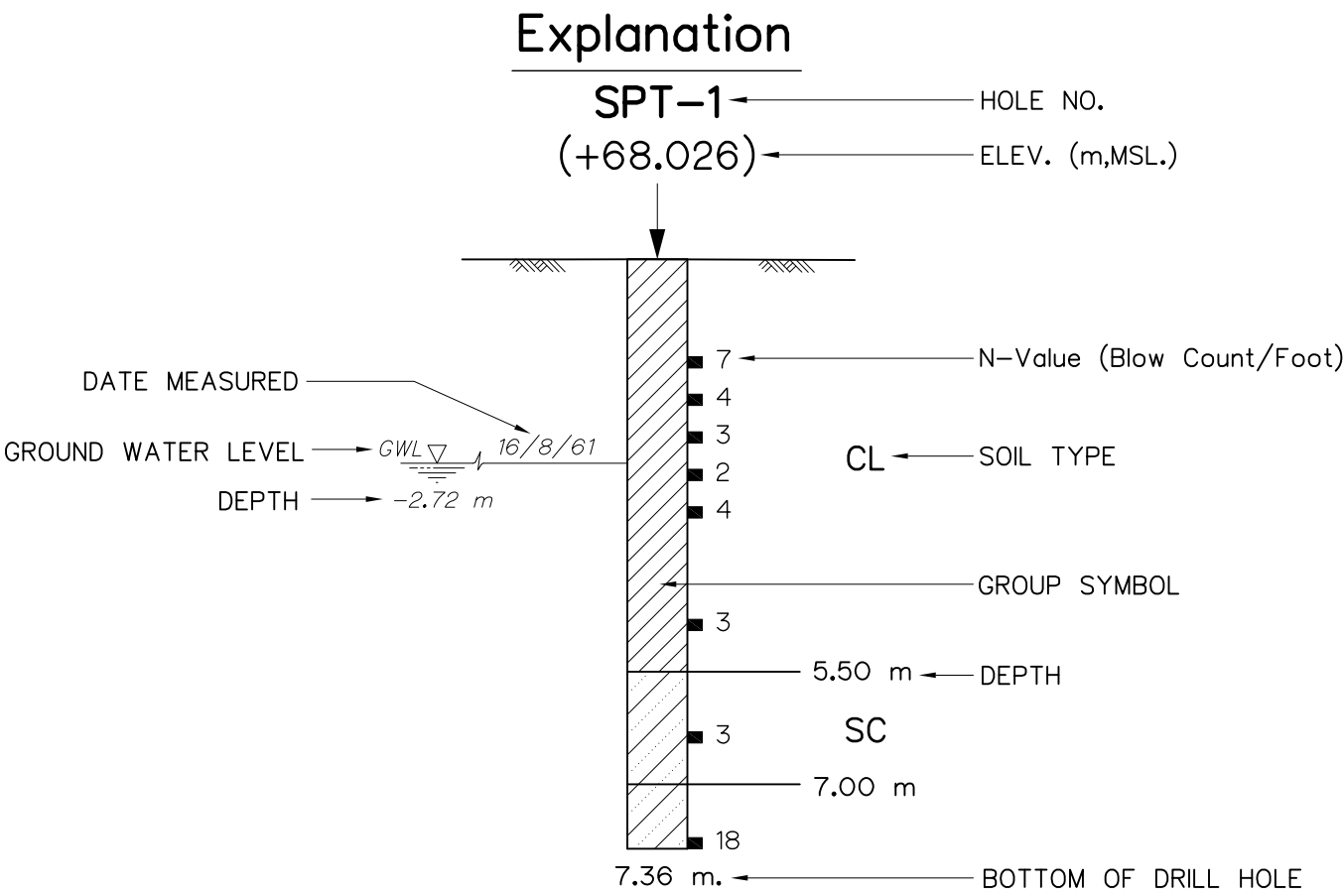
3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS			DEDE	

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.	REVIEWED S.KTICHAJ
DESIGNED 16/8/61	SUBMITTED
DRAWN 16/8/61	RECOMMENDED
CHECKED 16/8/61	APPROVED
PROJECT MANAGER 14/01/62	DRAWING NO. HLS-GN-08
DATE	SHEET NO. 8 OF 78



LEGEND

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



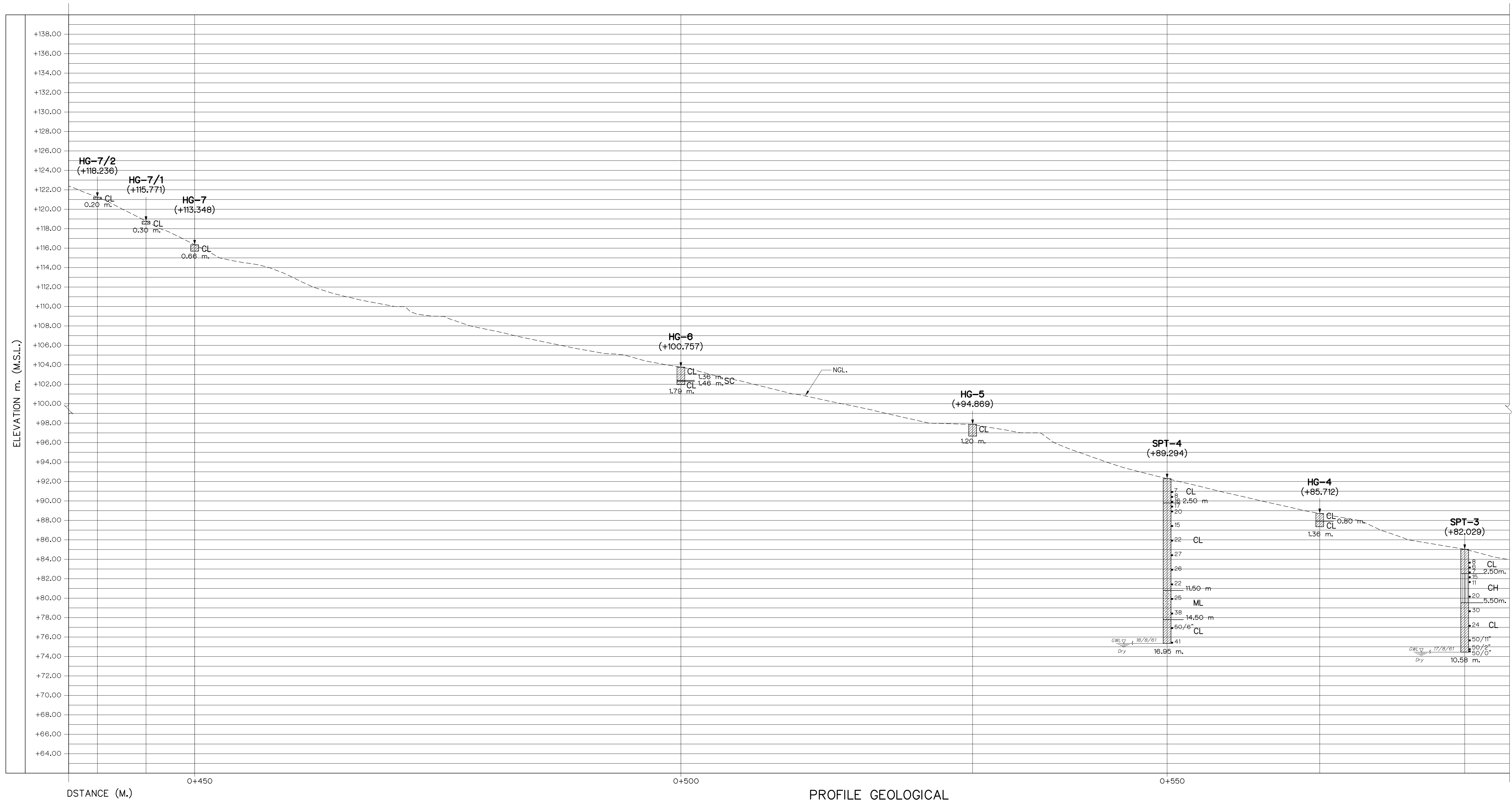
NOTES :

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



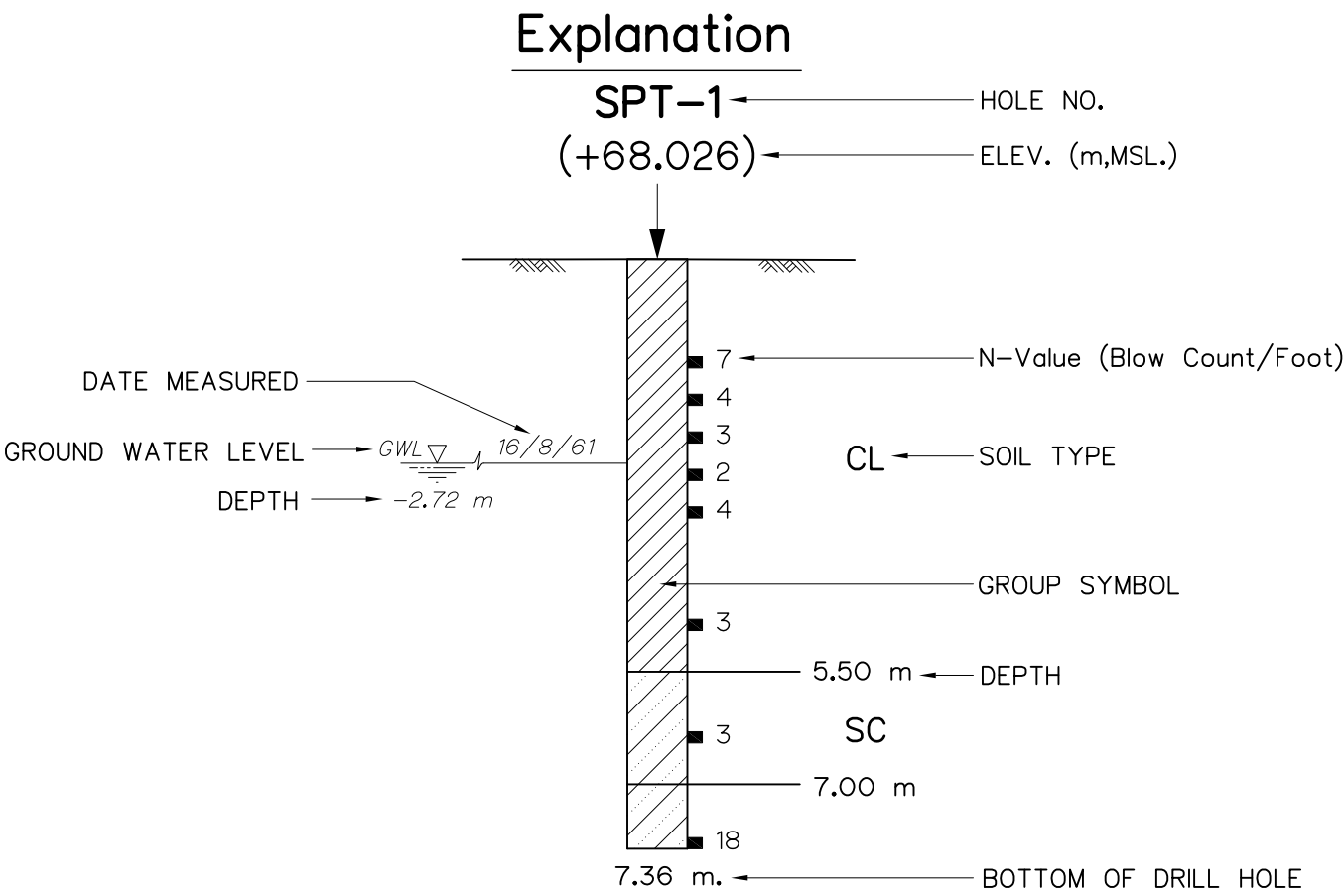
3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS			DEDE	

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.		REVIEWED S.KITIKHAJ	
DESIGNED 21/8/61 21.6651		SUBMITTED	
DRAWN 21/8/61 21.6651		RECOMMENDED	
CHECKED 21/8/61 21.6651		APPROVED	
PROJECT MANAGER 14/01/62		DRAWING NO. HLS-GN-09	
DATE		SHEET NO. 9 OF 78	



LEGEND

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



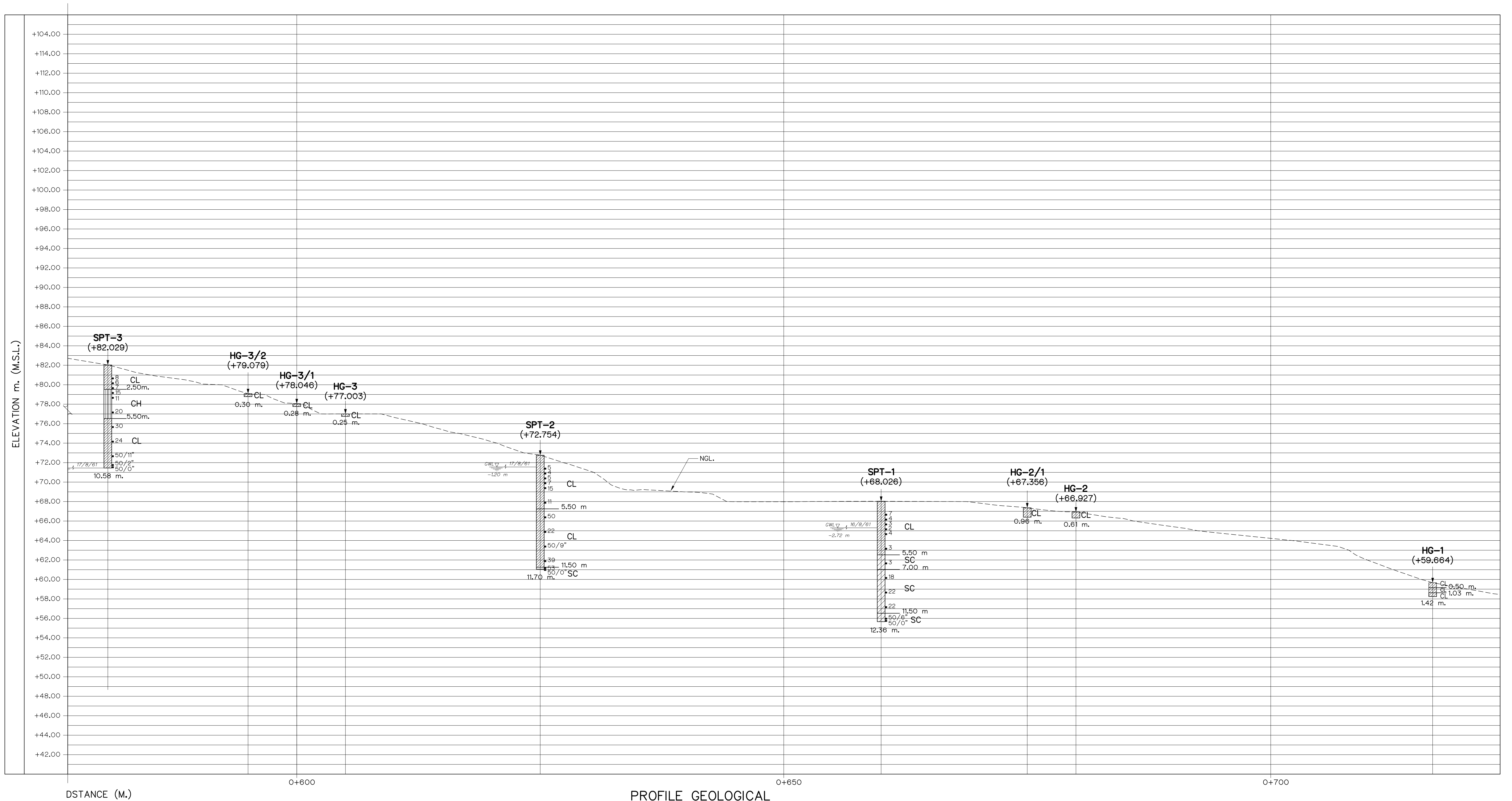
NOTES :

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				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS			DEDE	

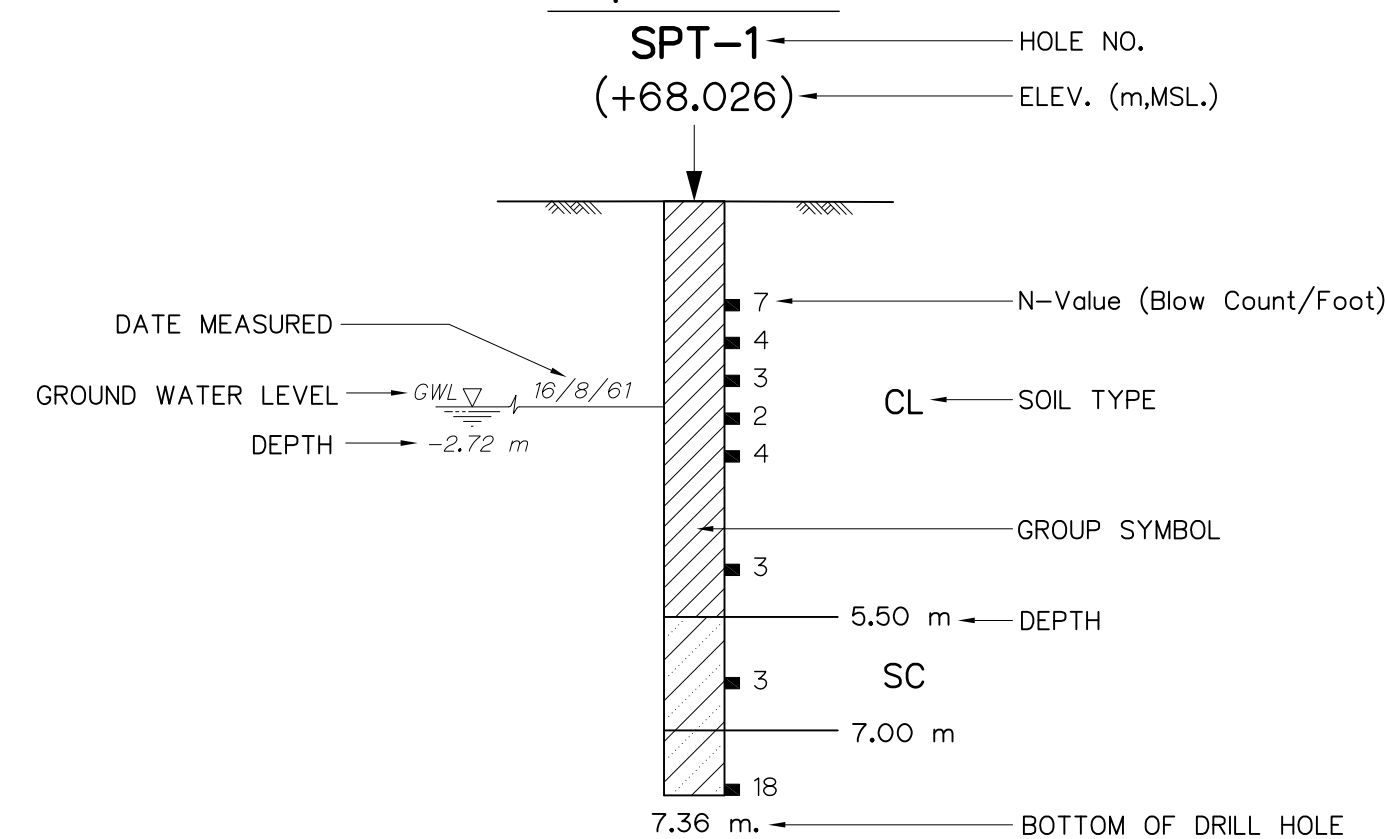
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUAI LAM SIN HYDROPOWER PROJECT			
CIVIL WORKS GENERAL GEOLOGICAL PROFILE 3/4			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED 21/8/61 21.6651		REVIEWED S.KITIKHAJ	
DRAWN 21/8/61 21.6651		SUBMITTED	
CHECKED 21/8/61 21.6651		RECOMMENDED	
PROJECT MANAGER 14/01/62		APPROVED	
DATE		DRAWING NO. HLS-GN-09	
		SHEET NO. 9 OF 78	



LEGEND

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

Explanation



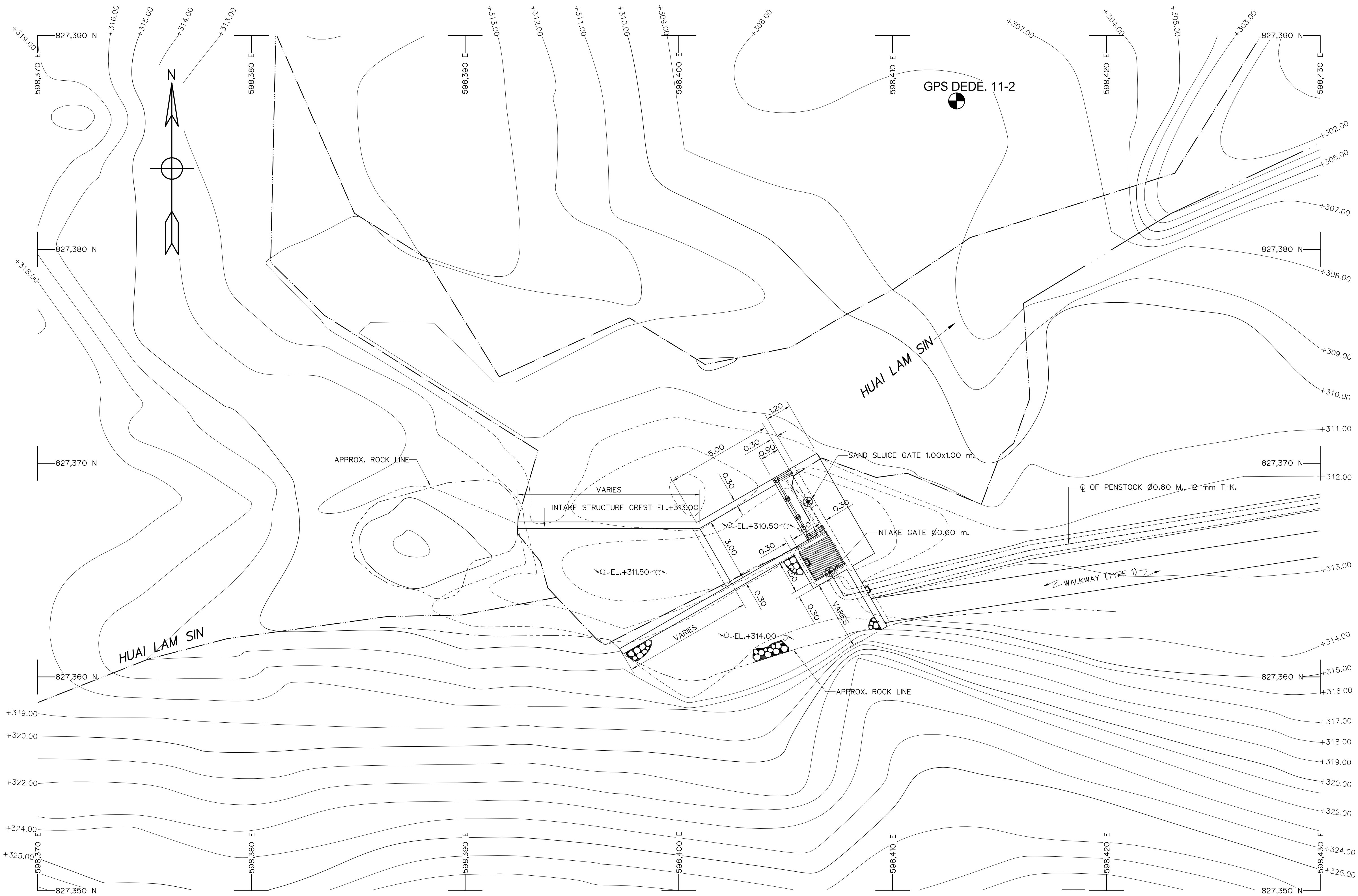
NOTES :

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



3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
		CONSULTANTS	DEDE	

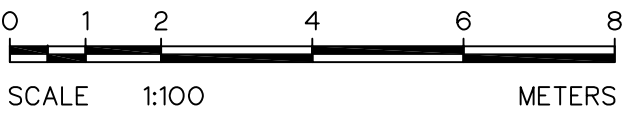
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUAI LAM SIN HYDROPOWER PROJECT			
CIVIL WORKS GENERAL GEOLOGICAL PROFILE 4/4			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED		REVIEWED S.KITIKHAJ	
DRAWN		SUBMITTED	
CHECKED		RECOMMENDED	
PROJECT MANAGER		APPROVED	
14/01/62		DRAWING NO.	
DATE		HLS-GN-10	
		SHEET NO.	
		10 OF 78	



GENERAL LAY-OUT
SCALE 1:100

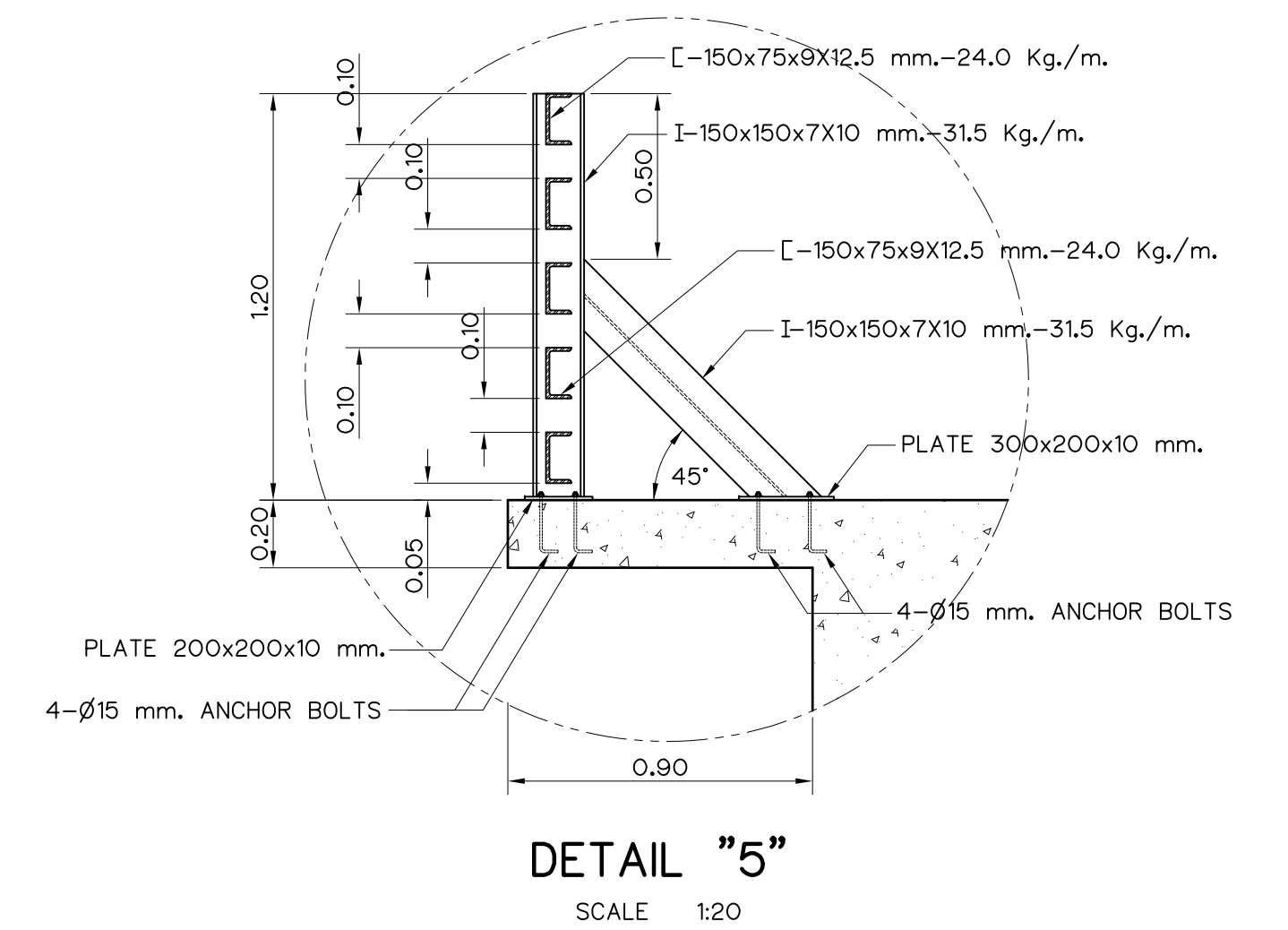
- NOTES :
- 1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
 - 2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

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

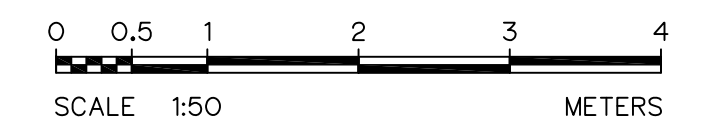


3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS			DEDE	

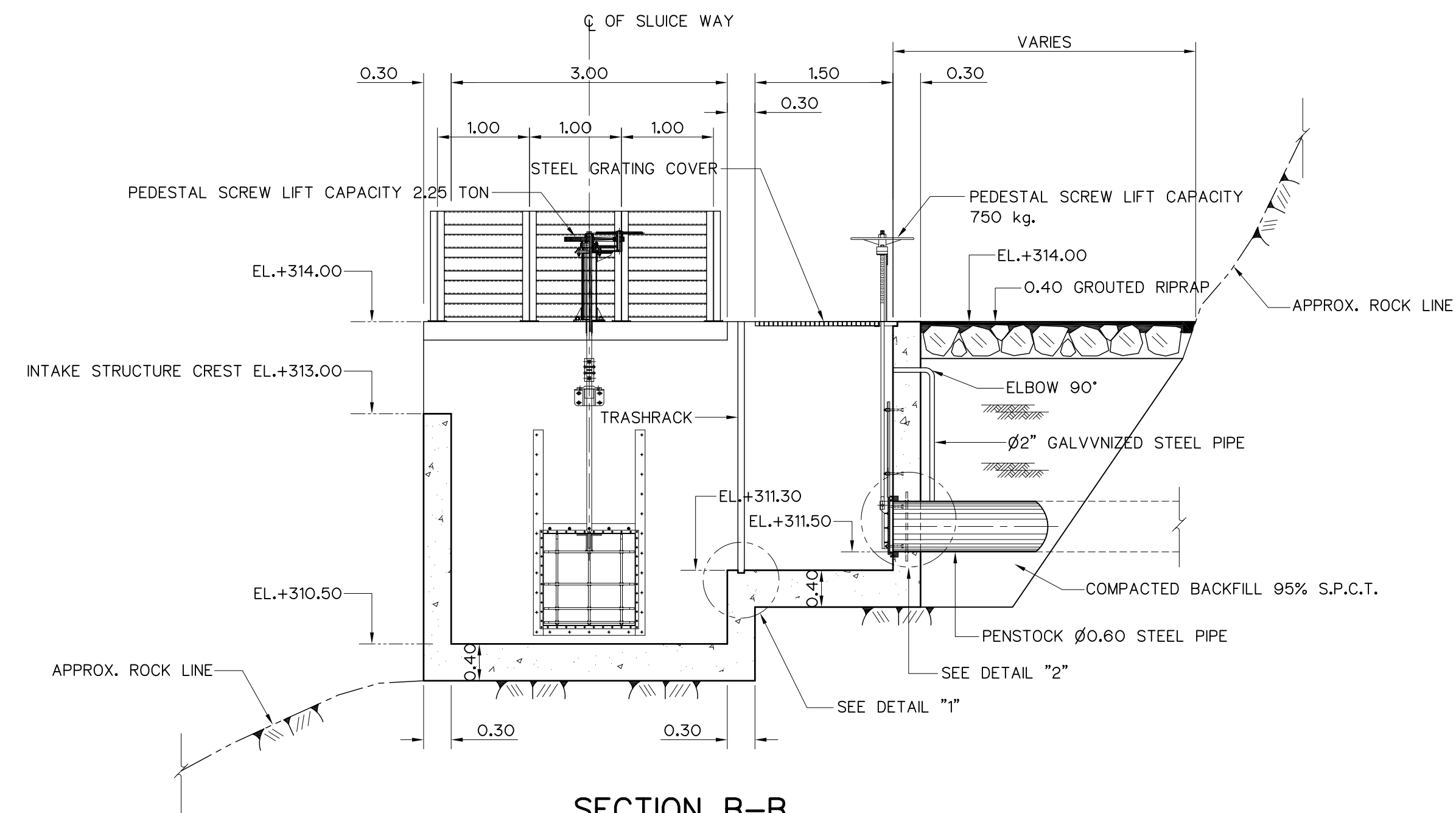
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
HUI LAM SIN HYDROPOWER PROJECT	
CIVIL WORKS INTAKE STRUCTURE GENERAL LAY-OUT	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED S.KITIKHAJ	
DESIGNED ๑๒๑.6651	SUBMITTED ๑๒๑.6651
DRAWN ๑๒๑.6651	RECOMMENDED ๑๒๑.6651
CHECKED ๑๒๑.7324	APPROVED ๑๒๑.7324
PROJECT MANAGER ๑๒๑.7324	DATE 14/01/62
DRAWING NO. HLS-IS-01	SHEET NO. 11 OF 78



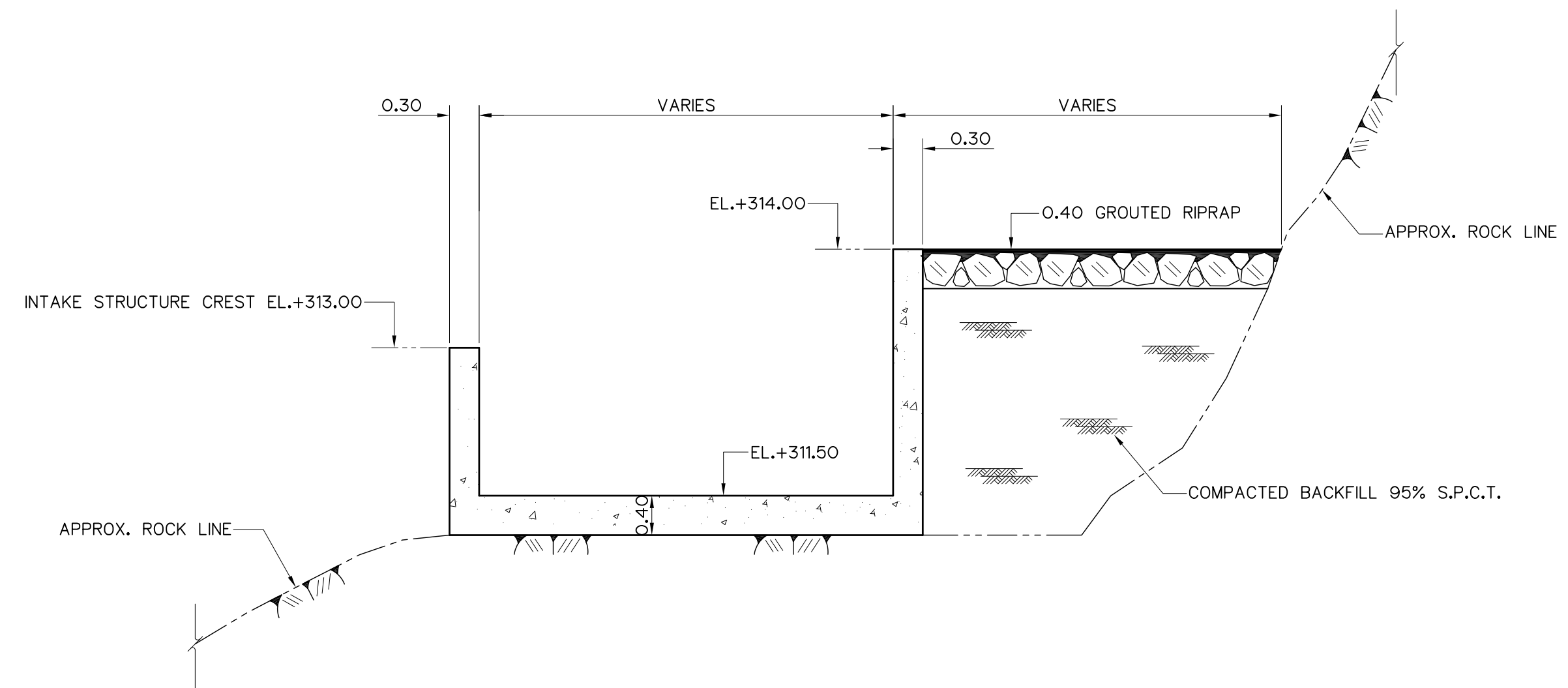
REFERENCE DRAWINGS :	
1. INTAKE STRUCTURE, GENERAL LAY-OUT	HLS-IS-01
2. INTAKE STRUCTURE, SECTION B-B, C-C, D-D AND E-E	HLS-IS-03
3. INTAKE STRUCTURE, MCELLANEOUS DETAILS	HLS-IS-04



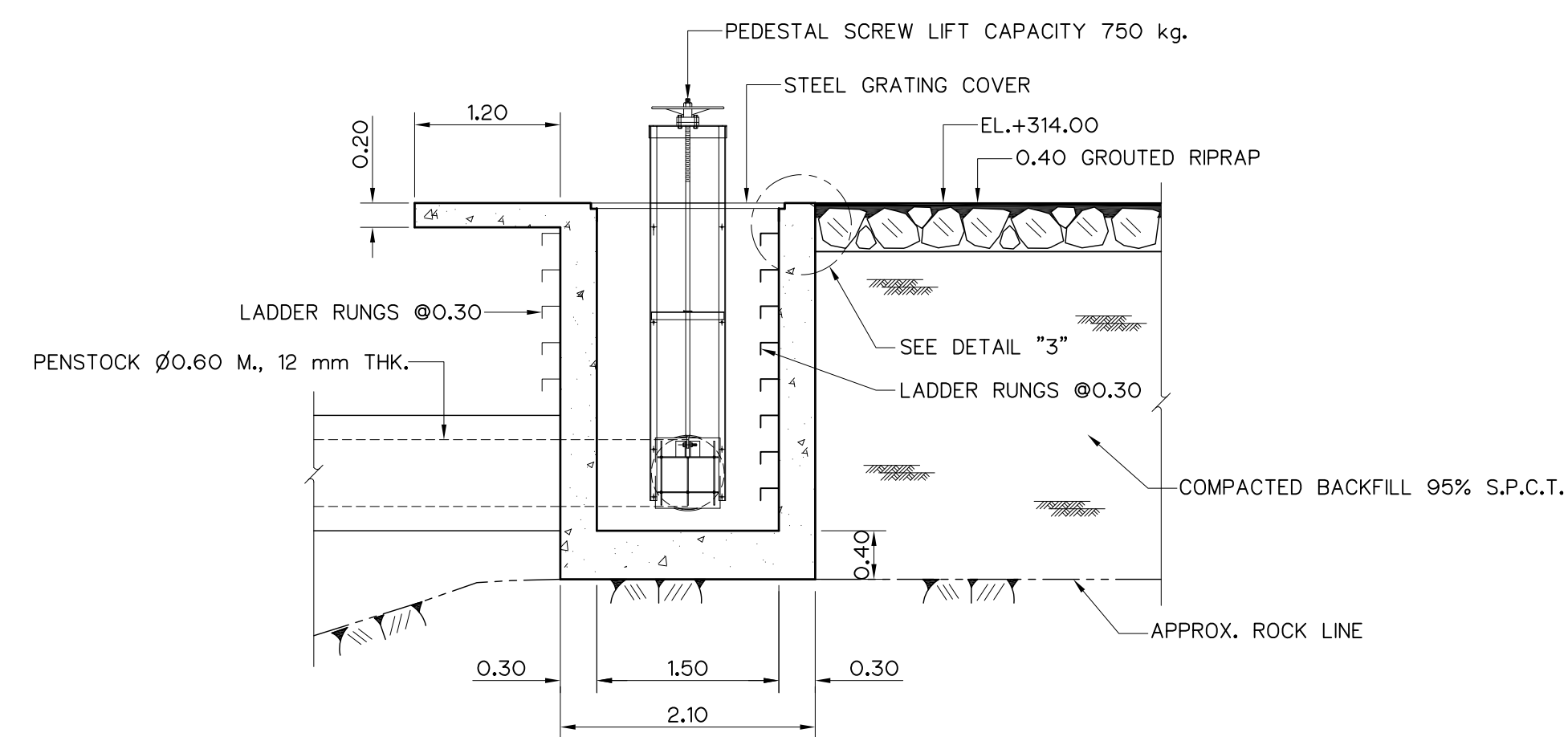
3					FRONTIER ENGINEERING CONSULTANTS CO., LTD.	MINISTRY OF ENERGY	
2					DESIGNED	REVIEWED	REVIEWED
1					DRAWN	SUBMITTED	RECOMMENDED
NO.	DATE	REVISIONS	CHECKED	APPROVED	CHECKED	APPROVED	
CONSULTANTS			DEDE		DRAWING NO.		SHEET NO.
					HLS-IS-02		12 OF 78



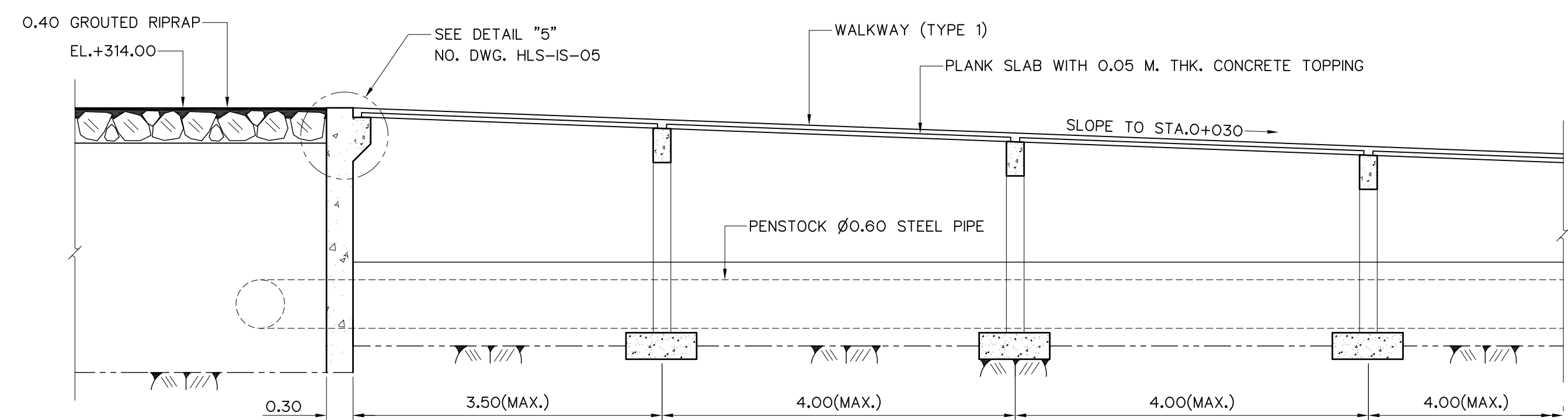
SECTION B-B
SCALE 1:50



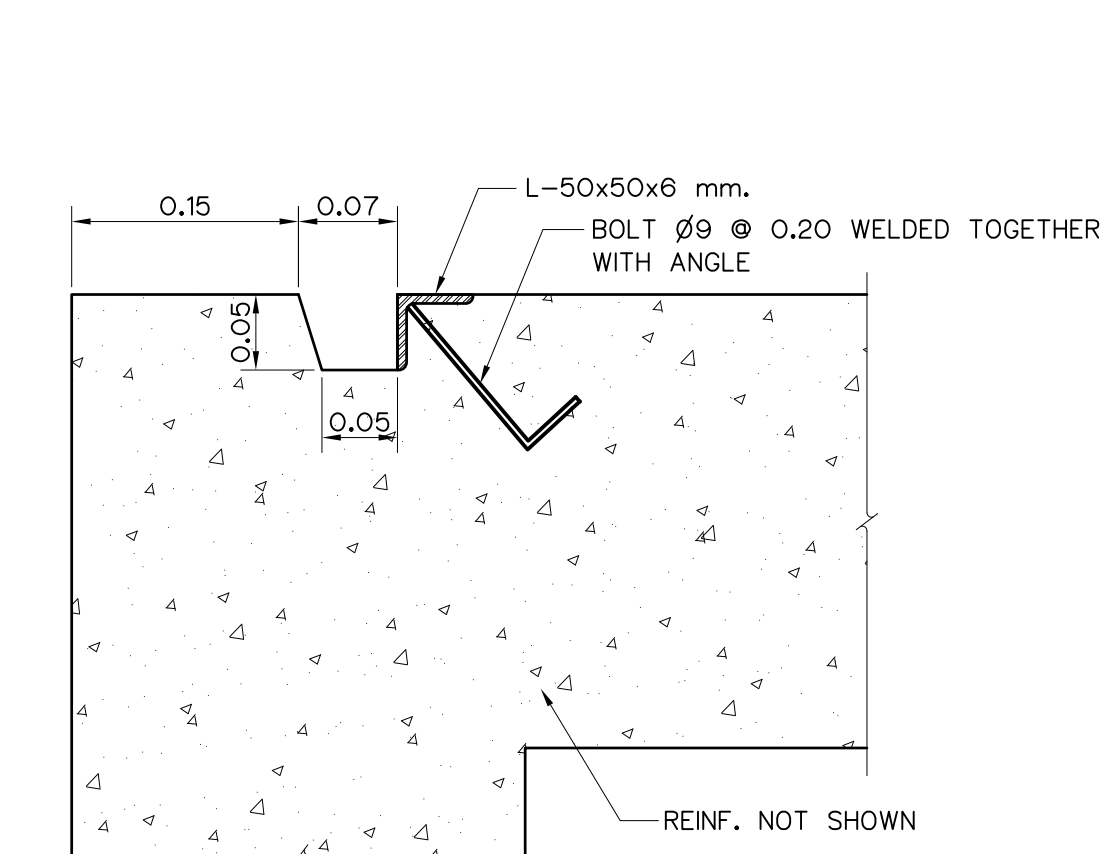
SECTION C-C
SCALE 1:50



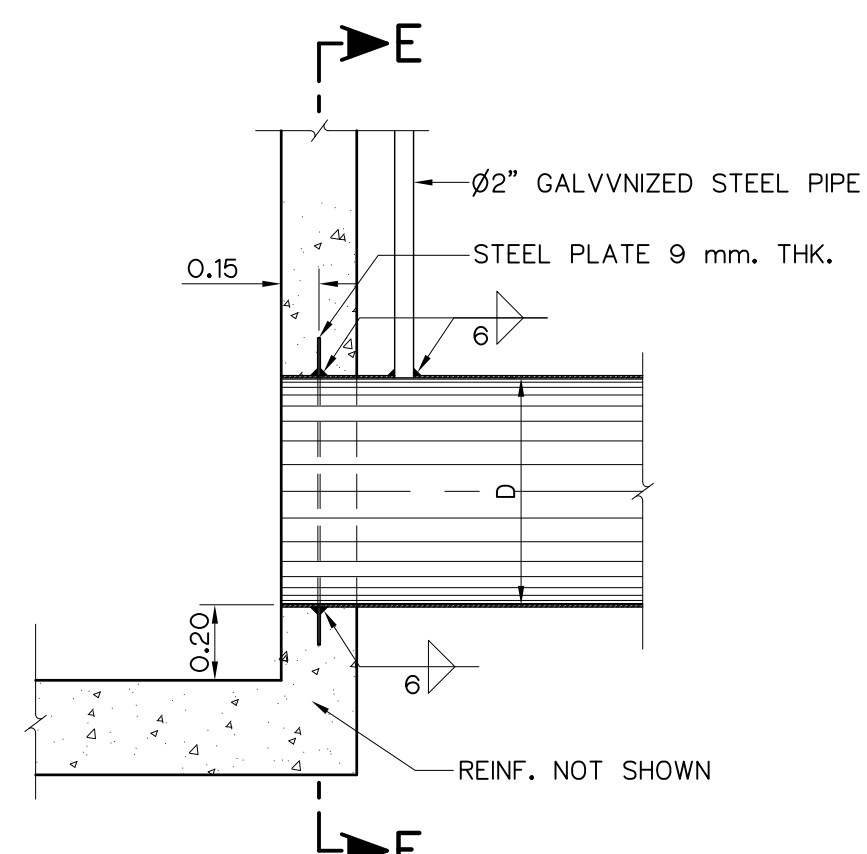
SECTION D-D
SCALE 1:50



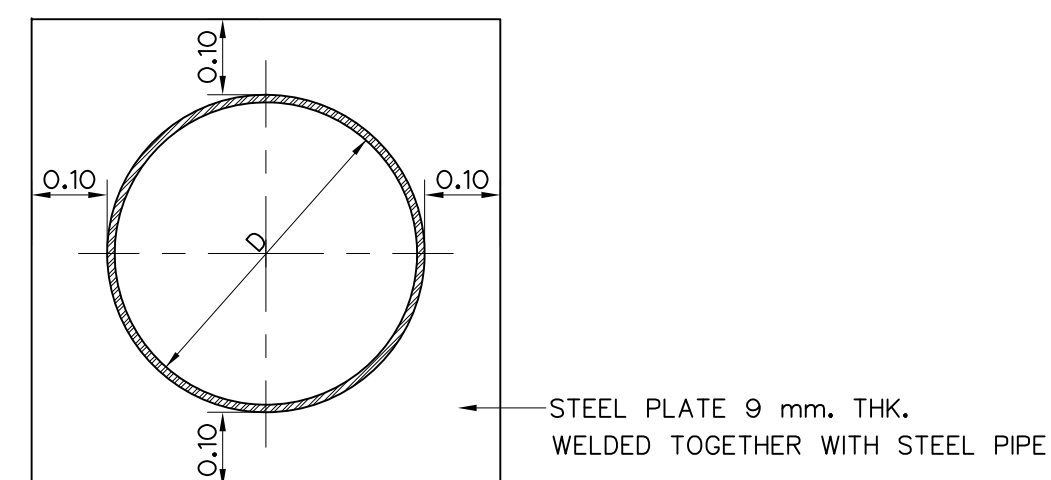
SECTION E-E
SCALE 1:50



DETAIL "1"
SCALE 1:5



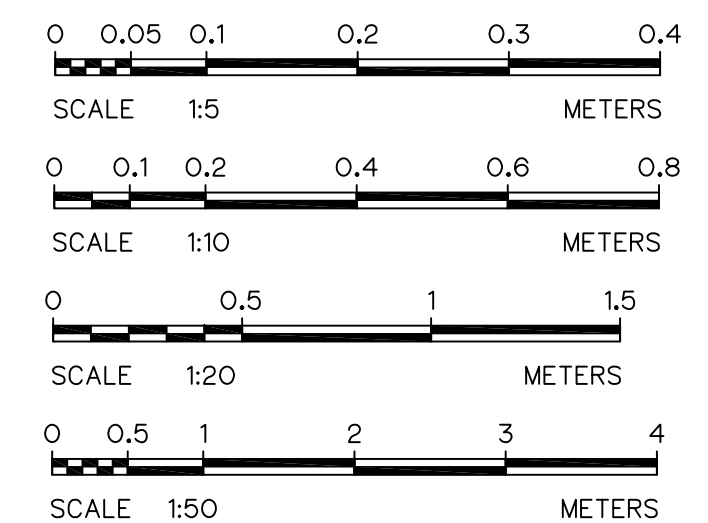
DETAIL "2"
SCALE 1:20



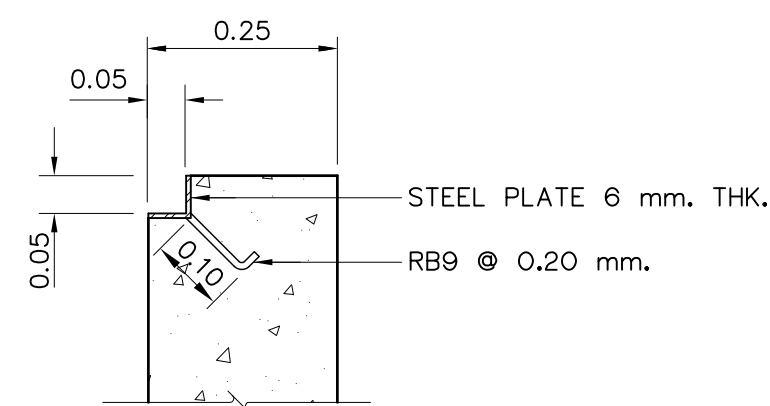
SECTION E-E
SCALE 1:10

- 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

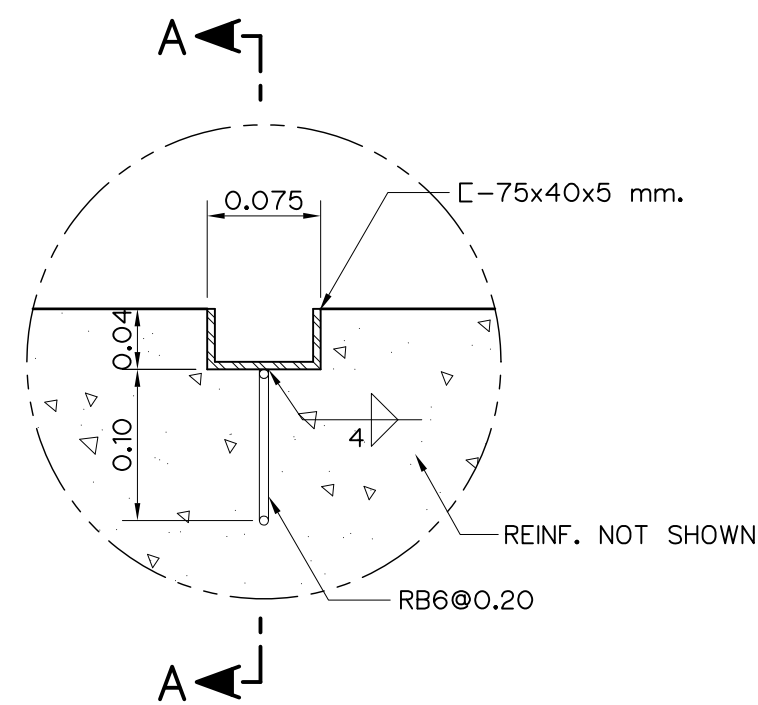
- REFERENCE DRAWINGS :
1. INTAKE STRUCTURE, PLAN AND SECTION A-A HLS-IS-02
 2. INTAKE STRUCTURE, MCELLANEOUS DETAILS HLS-IS-04



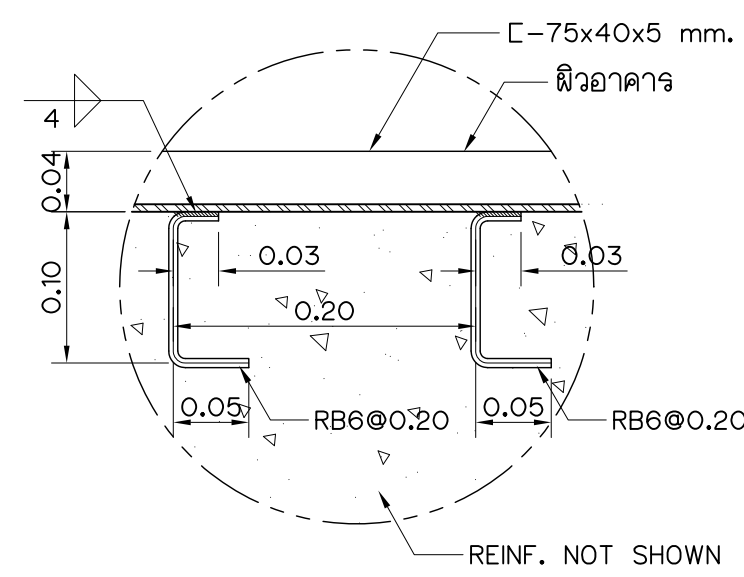
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUAI LAM SIN HYDROPOWER PROJECT			
CIVIL WORKS INTAKE STRUCTURE SECTION B-B, C-C, D-D, E-E AND DETAILS			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED		REVIEWED	
DRAWN		SUBMITTED	
CHECKED		RECOMMENDED	
APPROVED		APPROVED	
CONSULTANTS		DEDE	
PROJECT MANAGER		DATE	
14/01/62		DRAWING NO.	
HLS-IS-03		SHEET NO.	
13 OF 78			



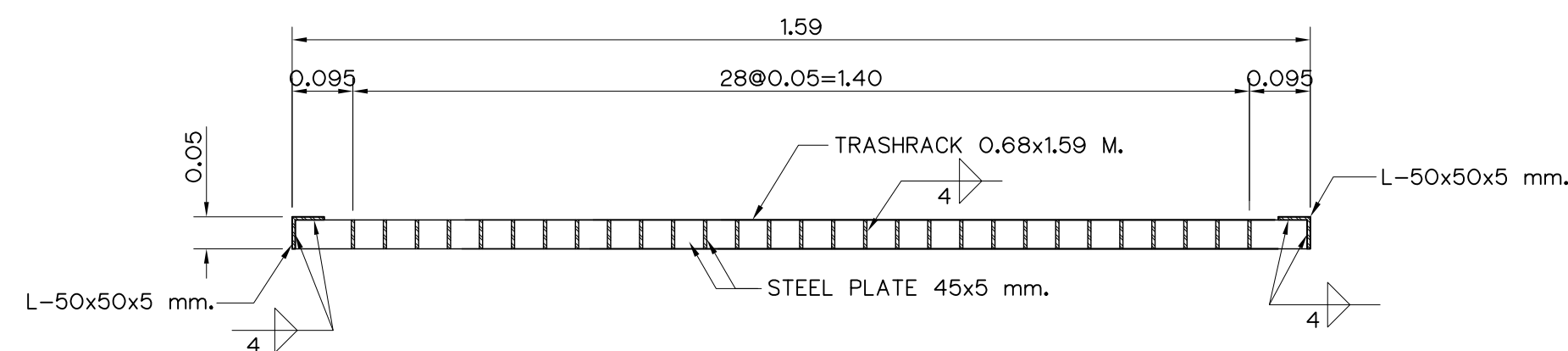
DETAIL "3"
SCALE 1:10



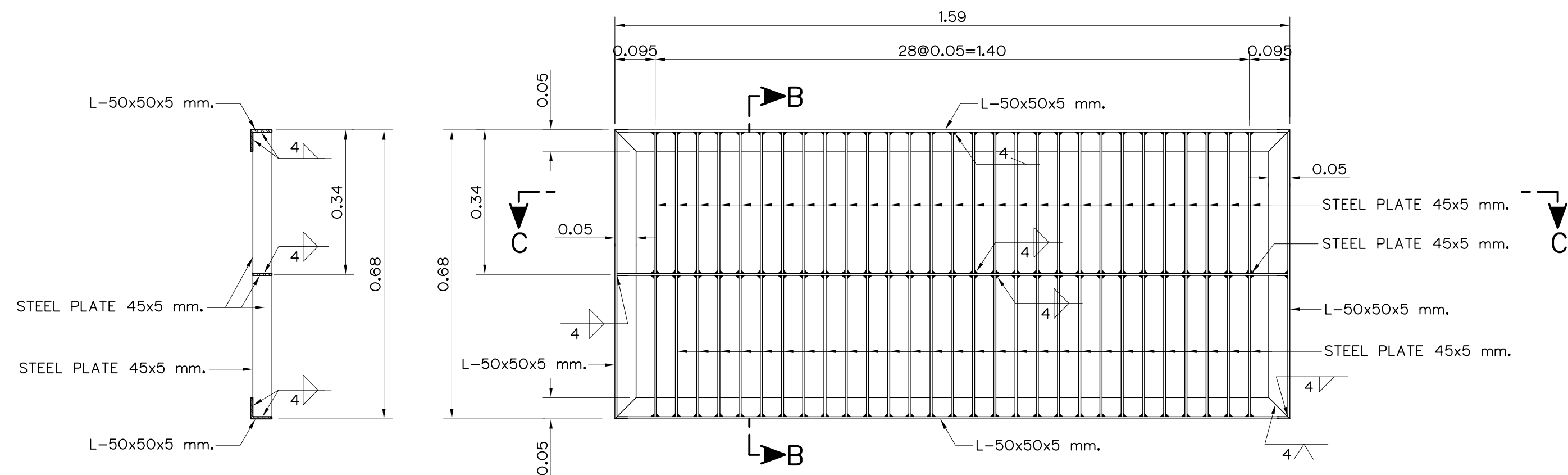
DETAIL "4"
SCALE 1:5



SECTION A-A
SCALE 1:5

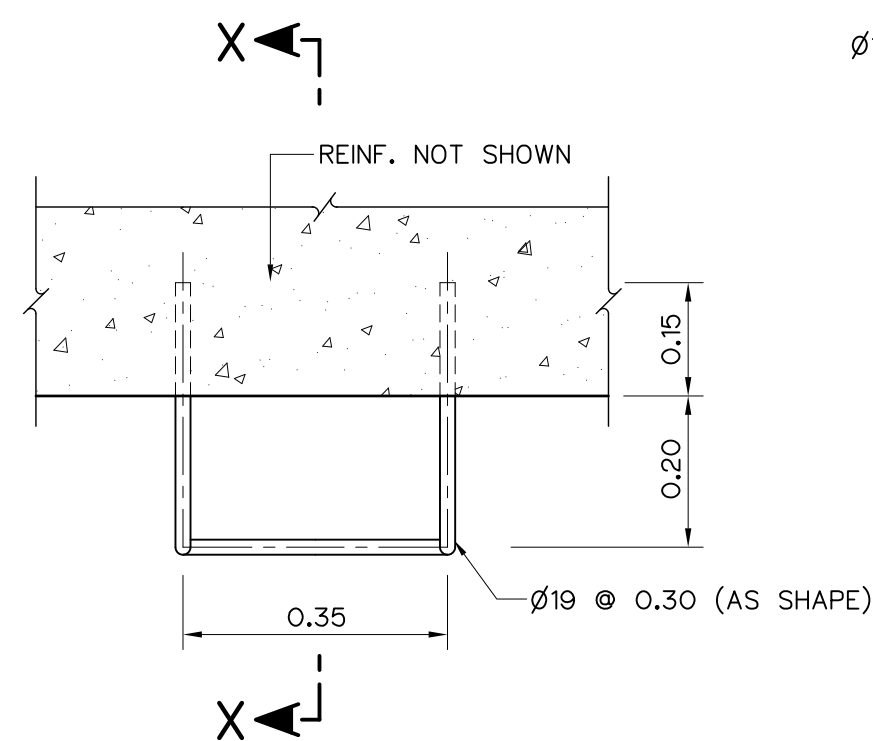


SECTION C-C
SCALE 1:10

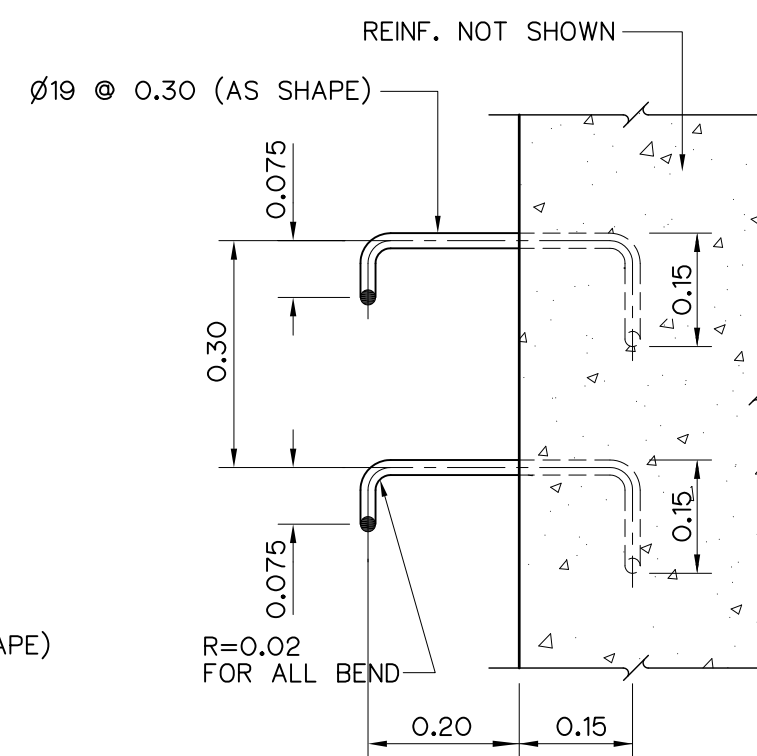


SECTION B-B
SCALE 1:10

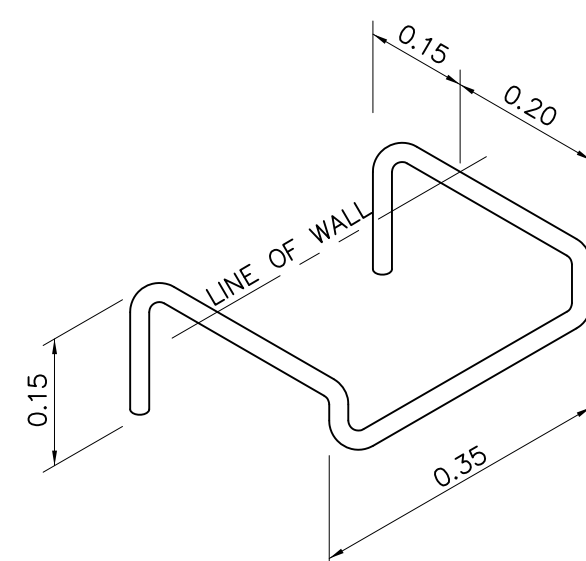
TRASHRACK DETAIL
(REQUIRED 4 PIECES)
SCALE 1:10



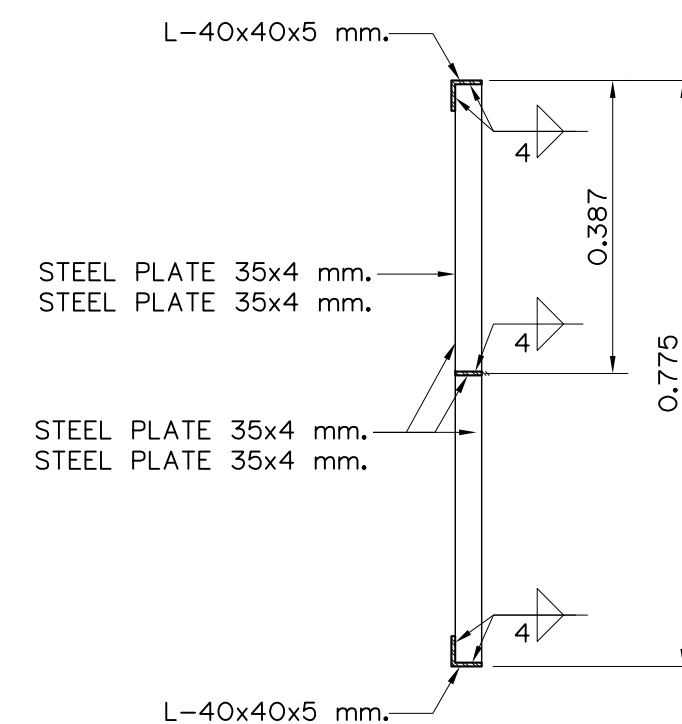
PLAN



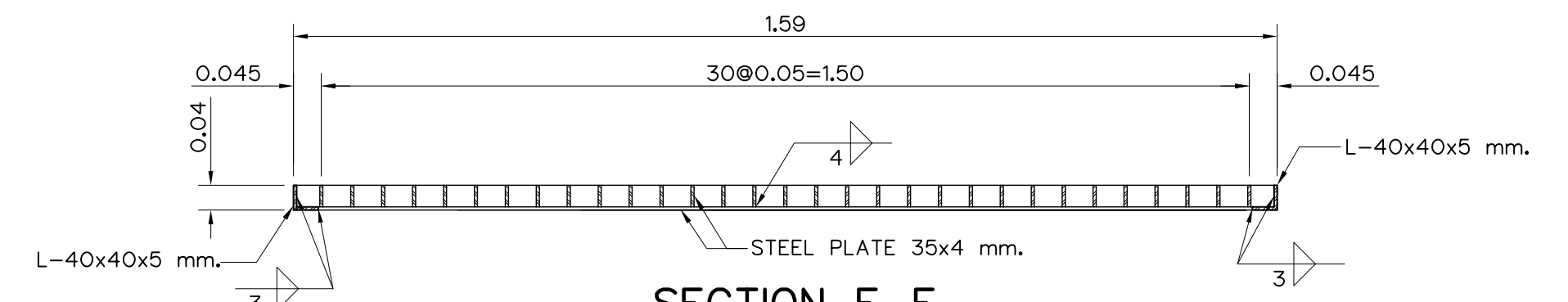
DETAIL OF LADDER RUNGS
NOT TO SCALE



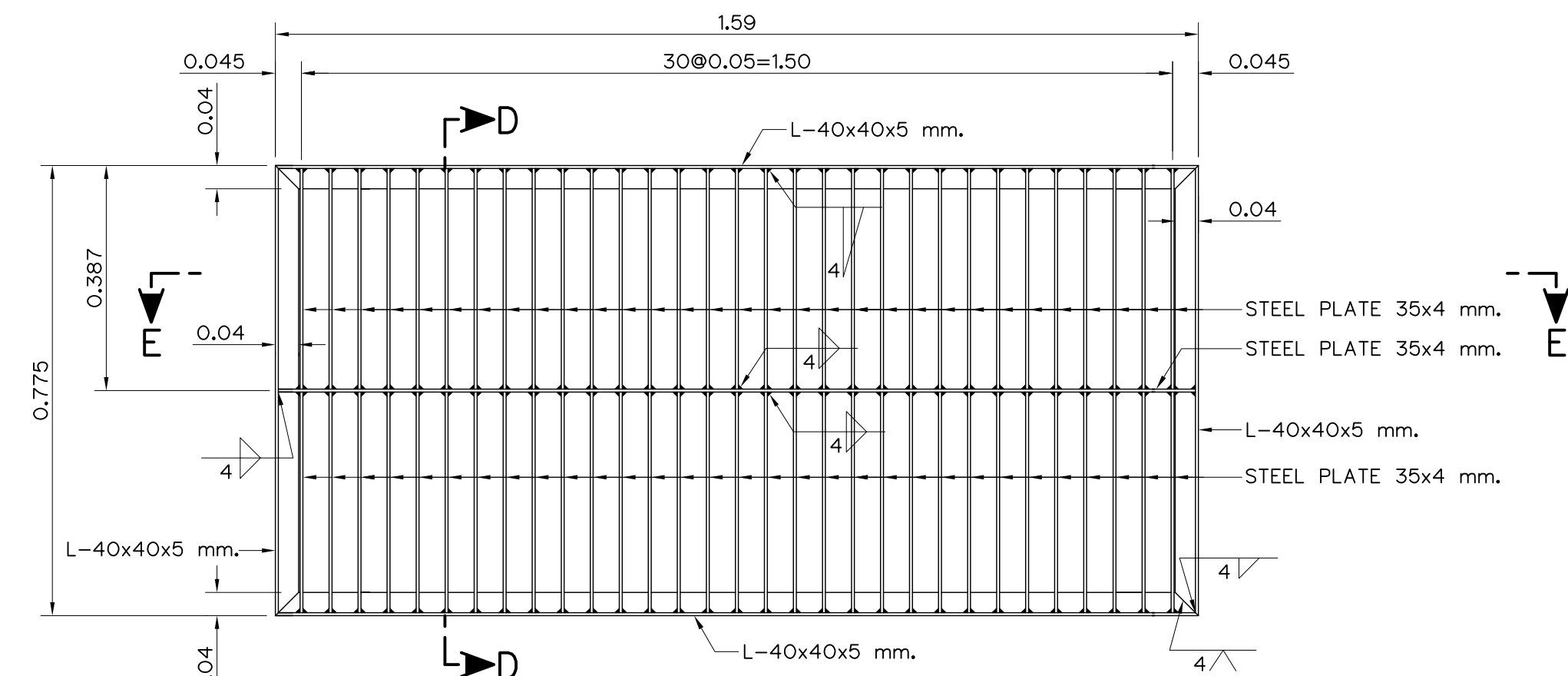
ISOMETRIC VIEW



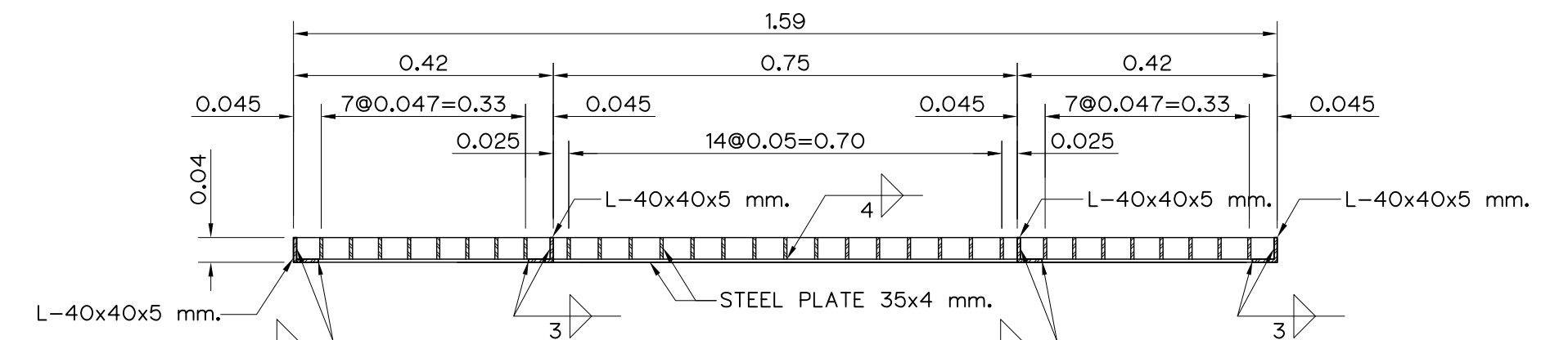
SECTION D-D
SCALE 1:10



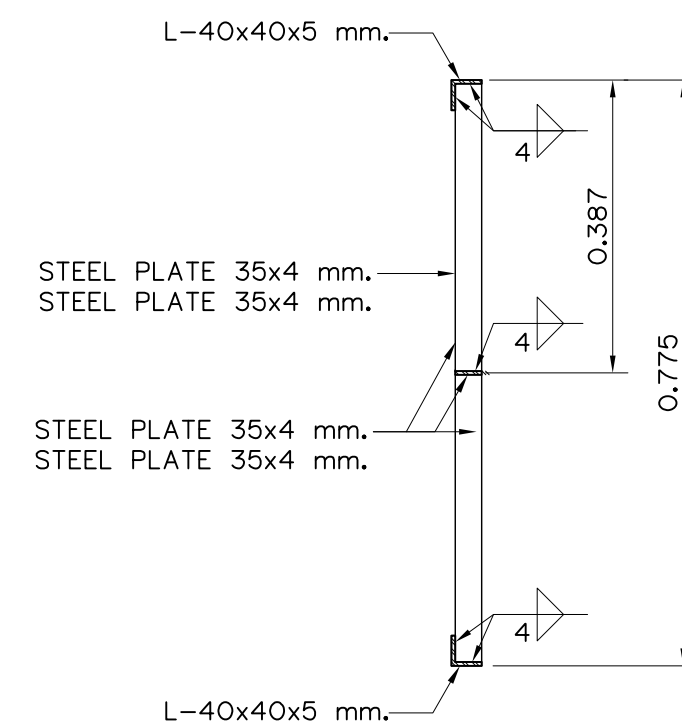
SECTION E-E
SCALE 1:10



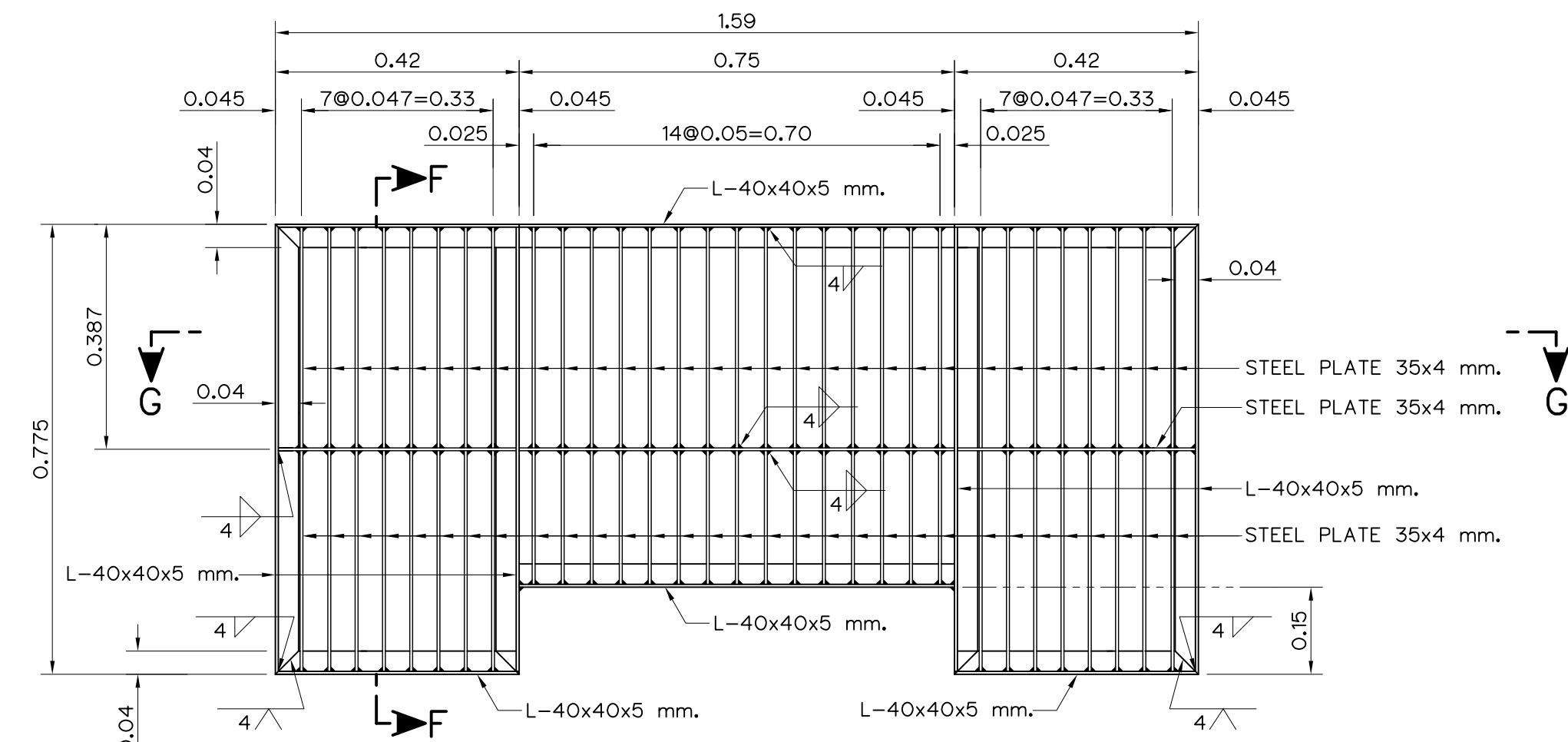
DETAIL OF STEEL GRATING COVER
(REQUIRED 1 PIECES)
SCALE 1:10



SECTION G-G
SCALE 1:10



SECTION F-F
SCALE 1:10



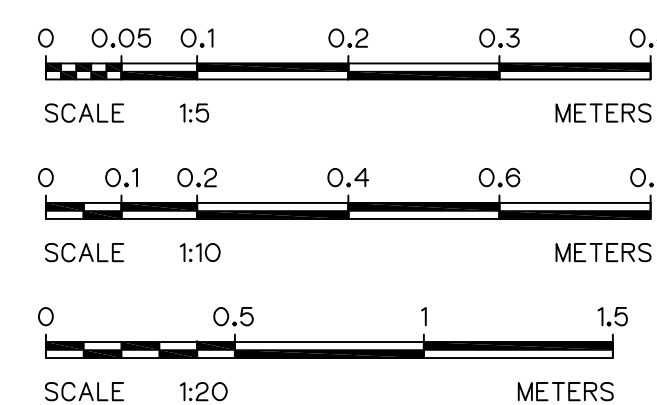
DETAIL OF STEEL GRATING COVER
(REQUIRED 1 PIECES)
SCALE 1:10

NOTES :

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

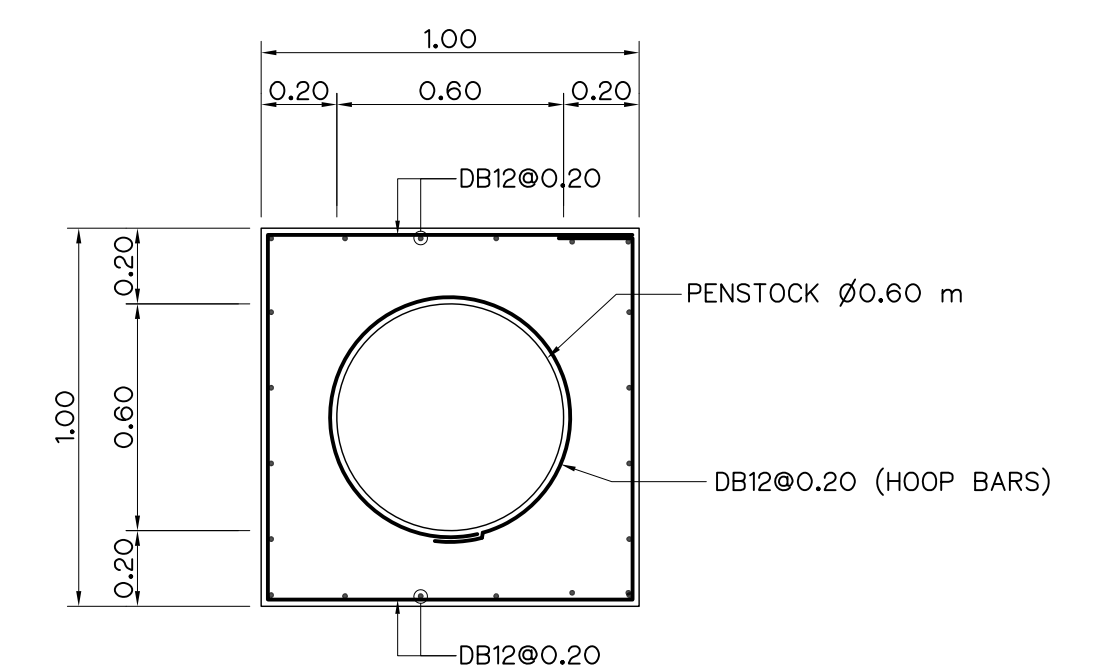
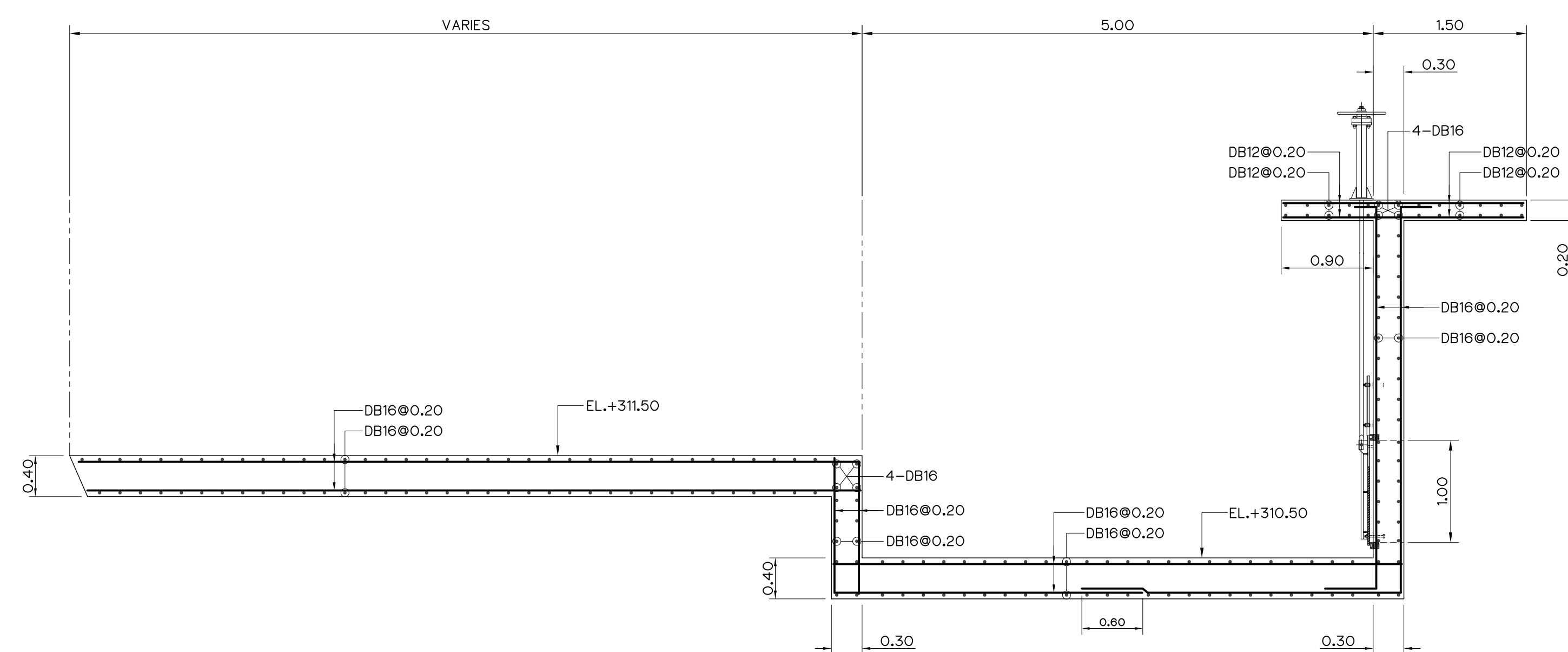
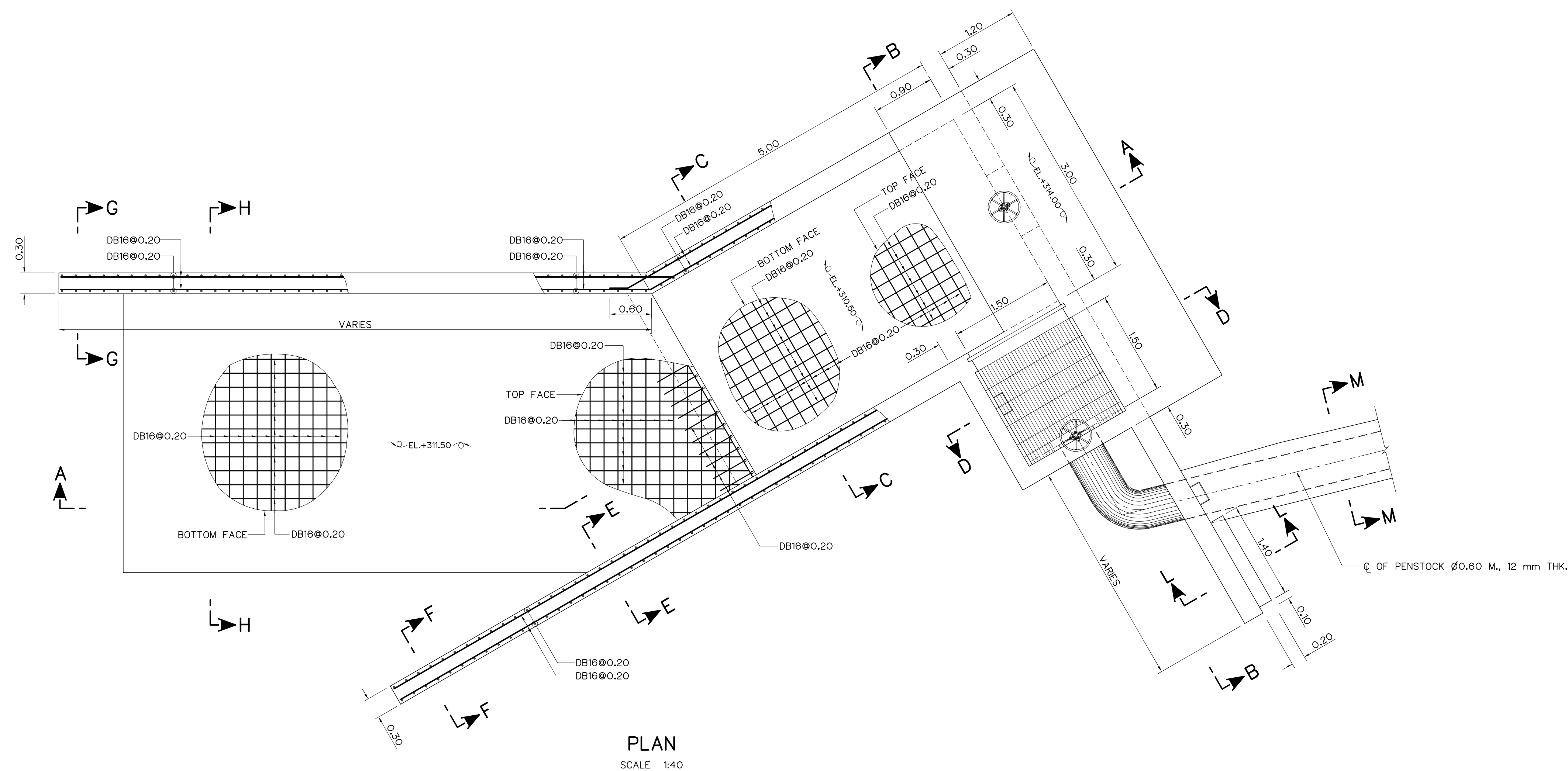
REFERENCE DRAWINGS :

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



3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

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.		REVIEWED S.KITIKHAJ	
DESIGNED		SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED		APPROVED	
PROJECT MANAGER		14/01/62 DATE	DRAWING NO. HLS-IS-04
CONSULTANTS		DEDE	SHEET NO. 14 OF 78

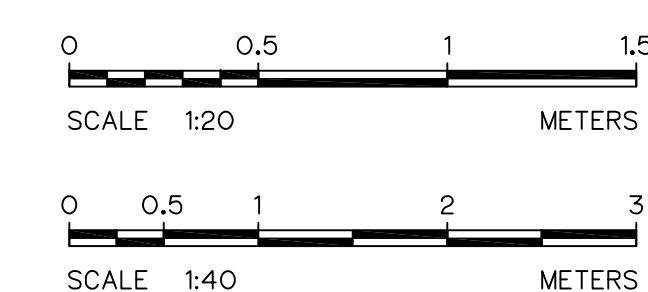
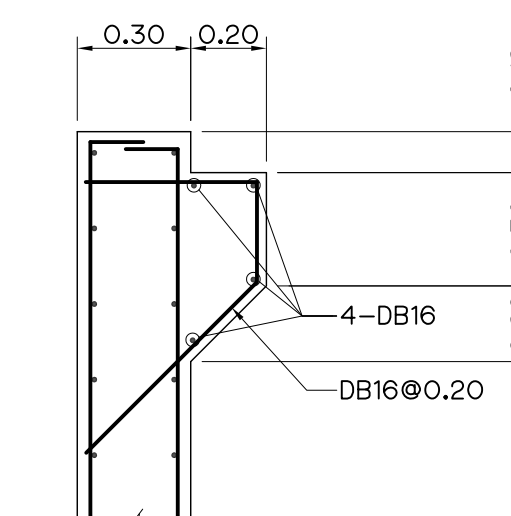


NOTES :

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 :

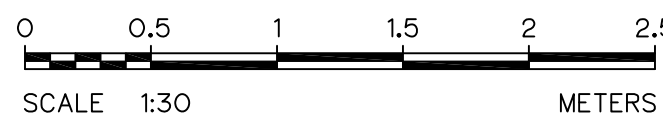
- | | |
|--|-----------|
| 1. INTAKE STRUCTURE, GENERAL LAY-OUT | HLS-IS-01 |
| 2. INTAKE STRUCTURE, PLAN AND SECTION A-A | HLS-IS-02 |
| 3. INTAKE STRUCTURE, REINFORCEMENT DETAILS (SHEET 2/2) | HLS-IS-06 |



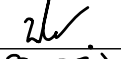
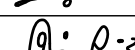
					FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		MINISTRY OF ENERGY	
3					DESIGNED	88.6651	REVIEWED S.K.T.(HA)	
2					DRAWN		SUBMITTED	
1					CHECKED	88.7324	RECOMMENDED	
NO.	DATE	REVISIONS	CHECKED	APPROVED	CHECKED	88.7324	APPROVED	
CONSULTANTS				DEDE	14/01/62 PROJECT MANAGER DATE		DRAWING NO. HLS-IS-05 SHEET NO. 15 OF 78	

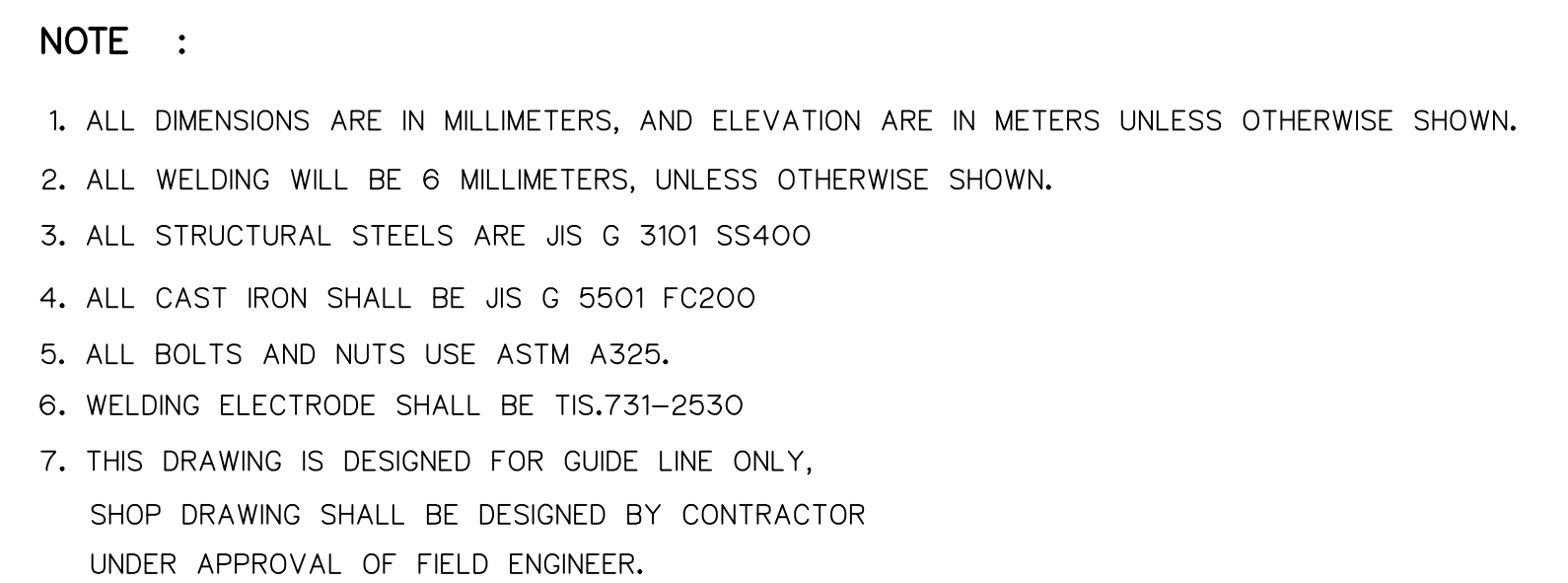
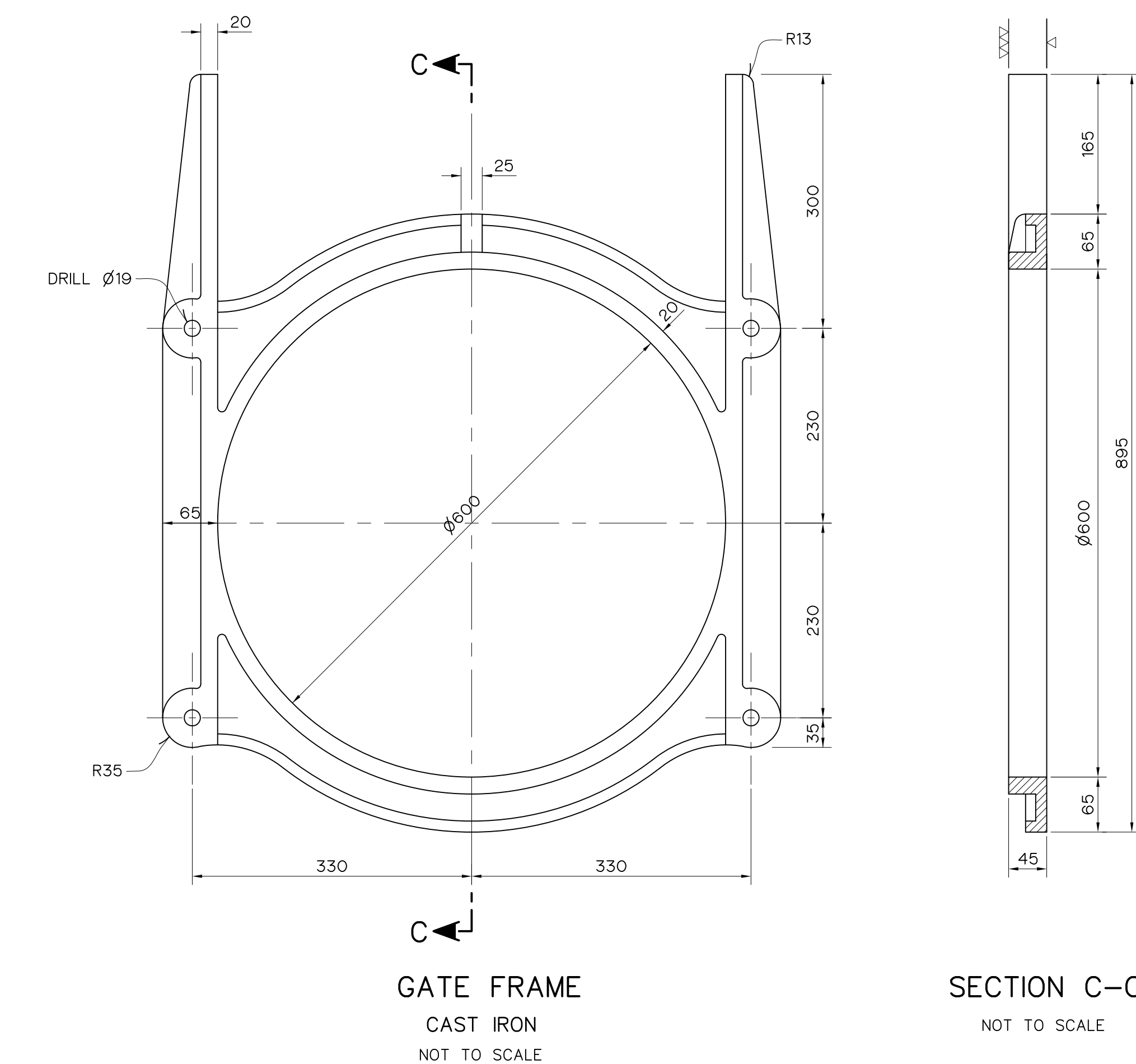


- REFERENCE DRAWINGS :
1. INTAKE STRUCTURE, REINFORCEMENT DETAILS (SHEET 2/2) HLS-IS-05



3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

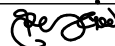
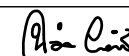
 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUAI LAM SIN HYDROPOWER PROJECT			
CIVIL WORKS INTAKE STRUCTURE REINFORCEMENT DETAILS (SHEET 2/2)			
 FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED  ๑๒๒.6651		REVIEWED S.KHIN(HA)	
DRAWN  ๑๒๒.7324		SUBMITTED 	
CHECKED  ๑๒๒.7324		RECOMMENDED 	
PROJECT MANAGER 		APPROVED 	
14/01/62 DATE		DRAWING NO. HLS-IS-06	
		SHEET NO. 16 OF 78	

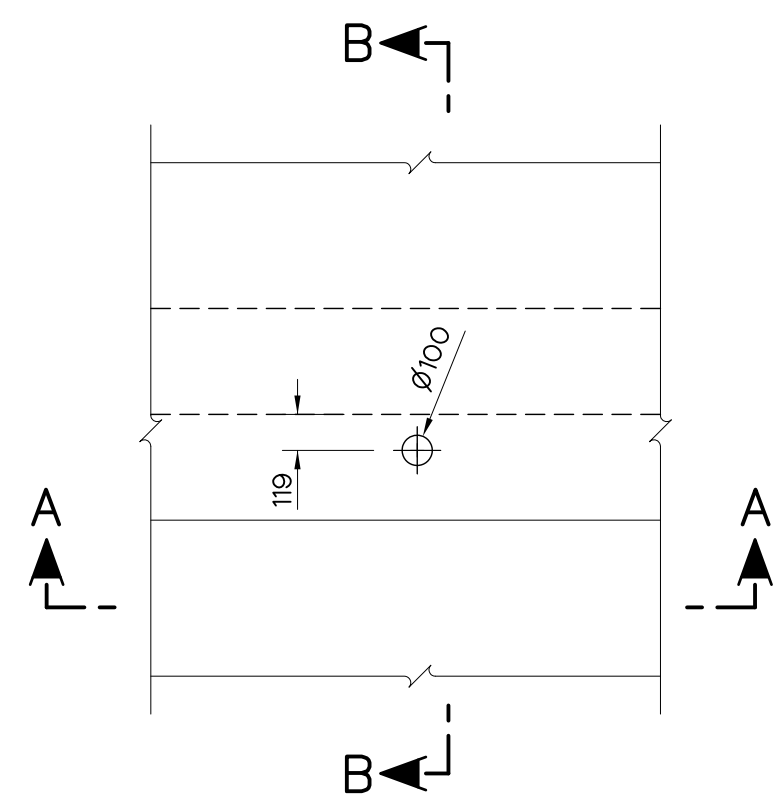


1. INTAKE STRUCTURE PEDESTAL SCREW LIFT CAPACITY 750 kg. HLS-IS-10

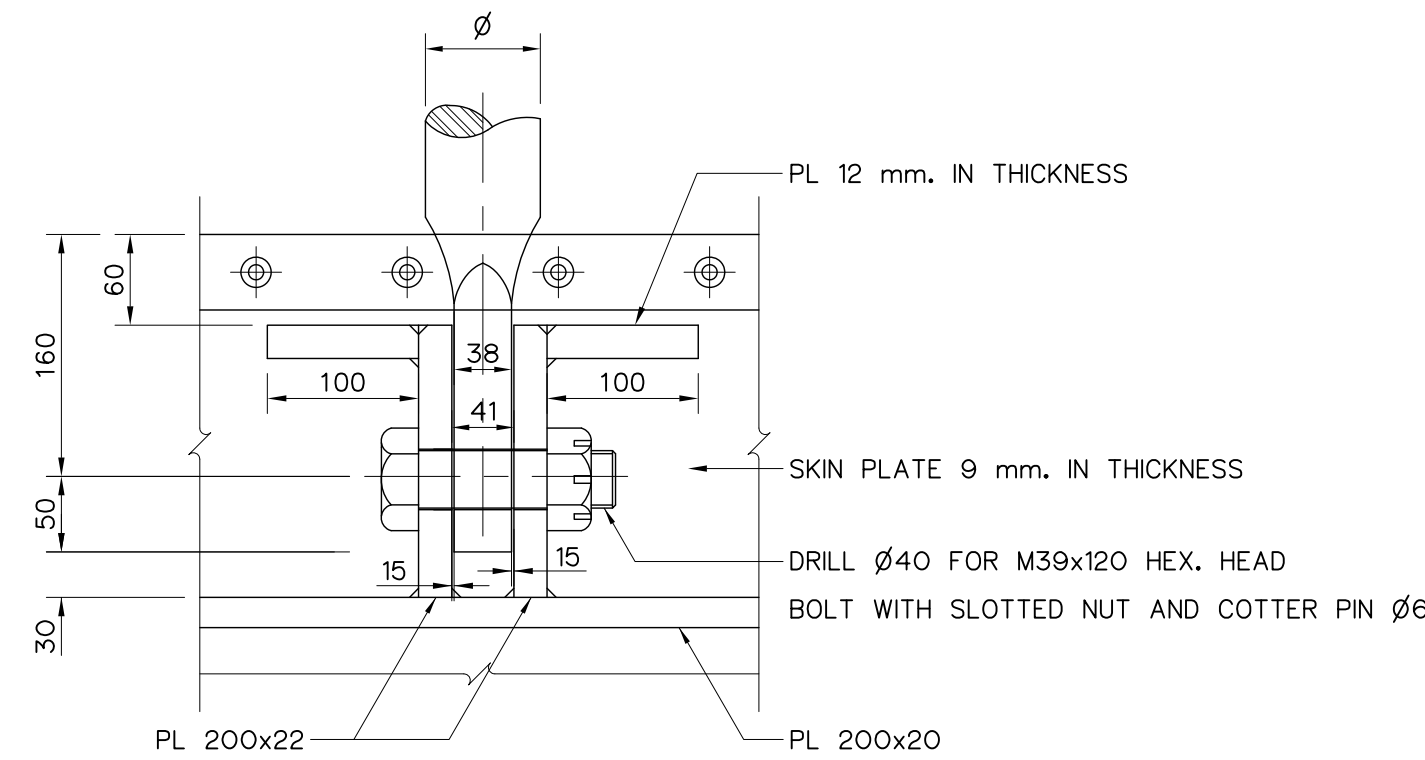
ALLOWABLE HEAD (mm.)	PEDESTAL SCREW LIFT		DRILL SIZE		STEM SIZE							
	CAPACITY (kg.)	DWG. NO.	B	C	I	E	F	G	H	T	BOLT FOR LIFT STEM	STEM THREA
≤ 3.00	750	HLS-IS-10	76	36	170	34	55	35	56	18	M 18x70, DRILL Ø21	ACME. 4P

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

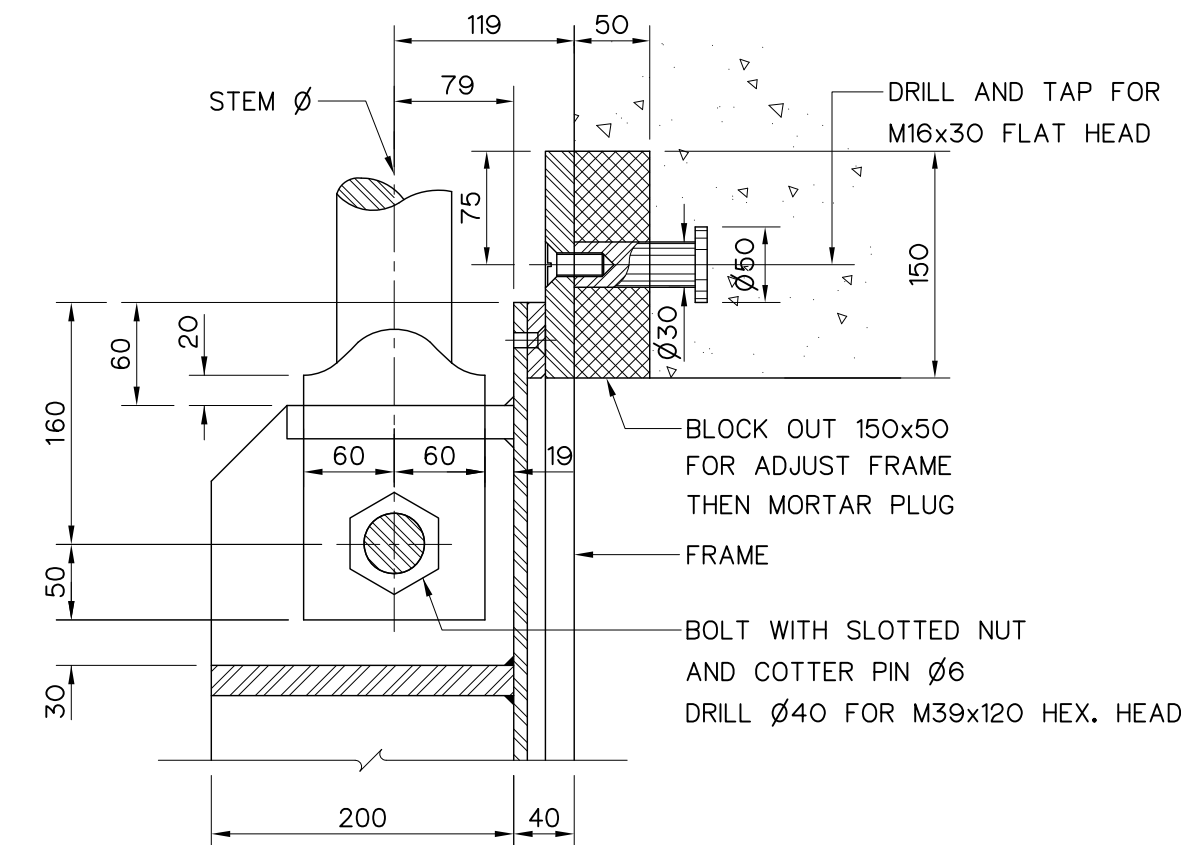
 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUAI LAM SIN HYDROPOWER PROJECT			
CIVIL WORKS			
INTAKE STRUCTURE			
0.60 M. DIA. VERTICAL GATE			
 FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED 		REVIEWED S.KTICHAJ	
DRAWN 		SUBMITTED 	
CHECKED 		RECOMMENDED 	
14/01/62		DRAWING NO.	
PROJECT MANAGER		HLS-IS-07	
DATE		SHEET NO.	
		17 OF 78	



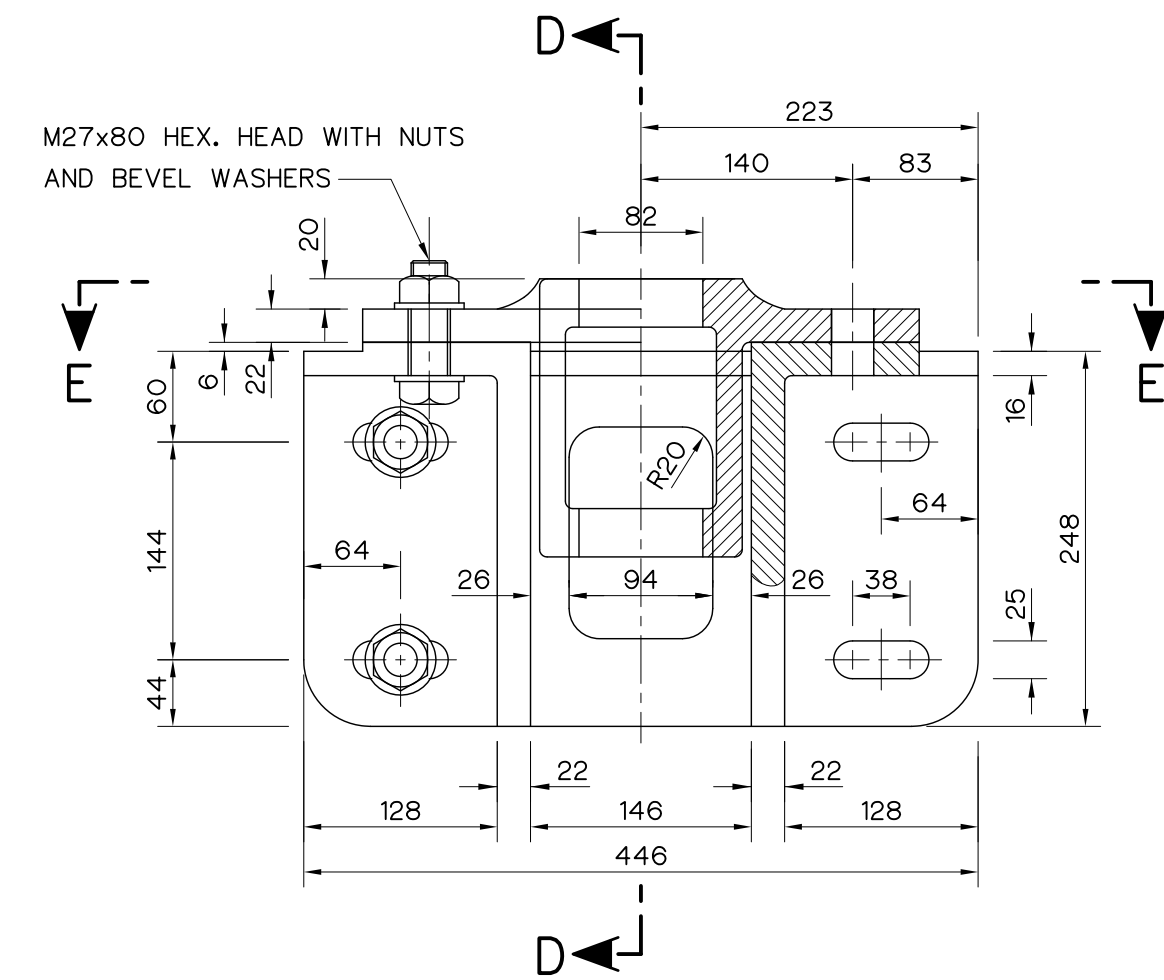
PLAN
NOT TO SCALE



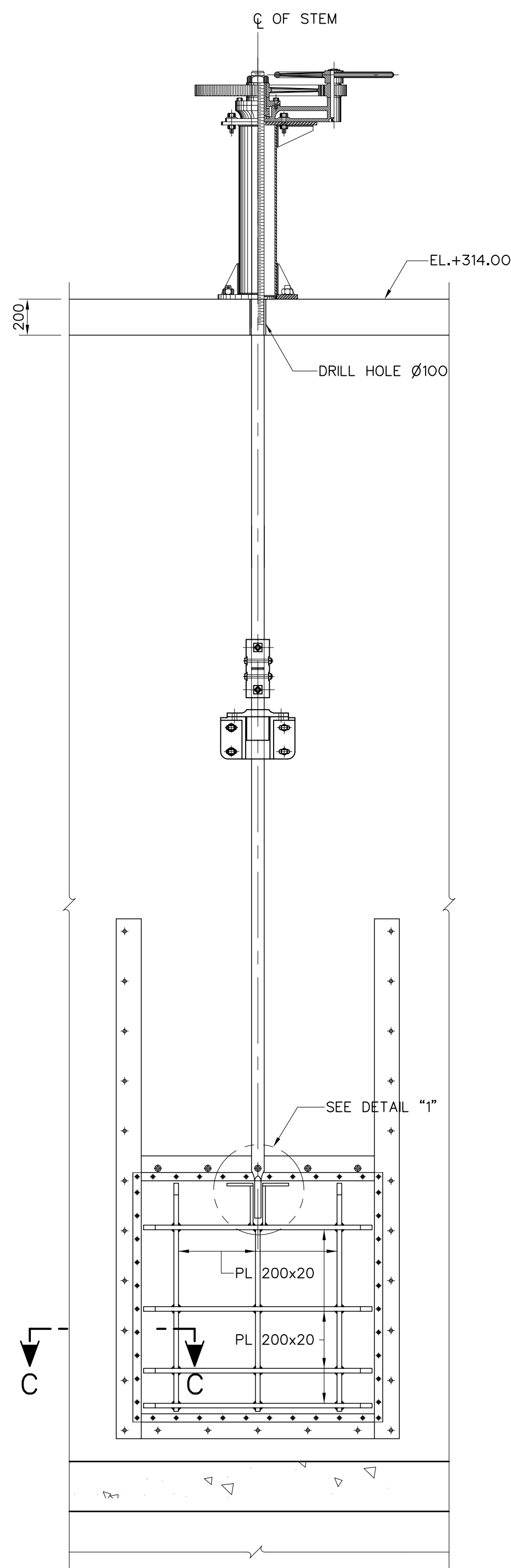
DETAIL "1"
NOT TO SCALE



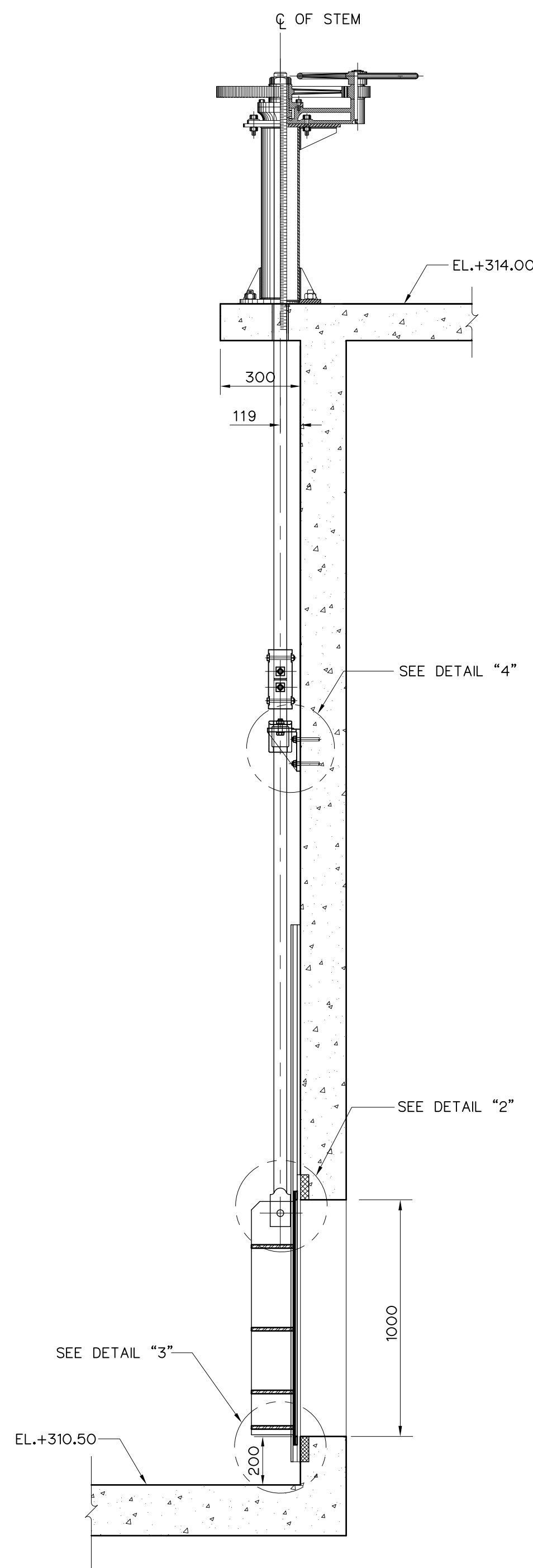
DETAIL "2"
NOT TO SCALE



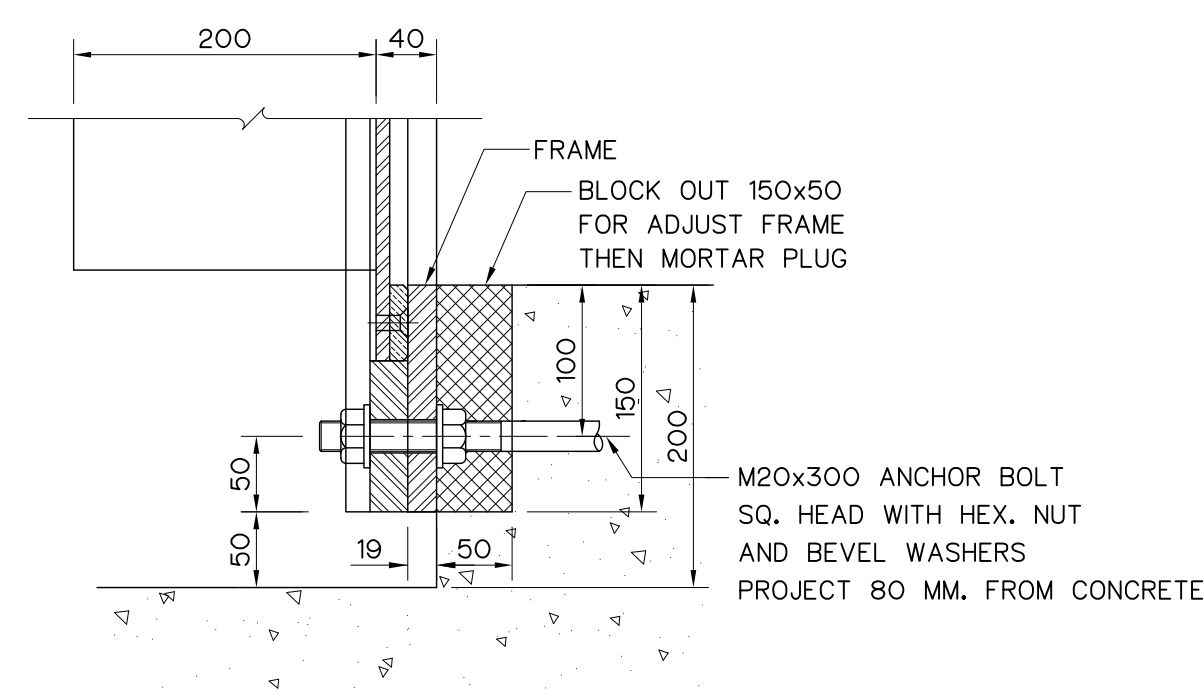
STEM GUIDE
NOT TO SCALE



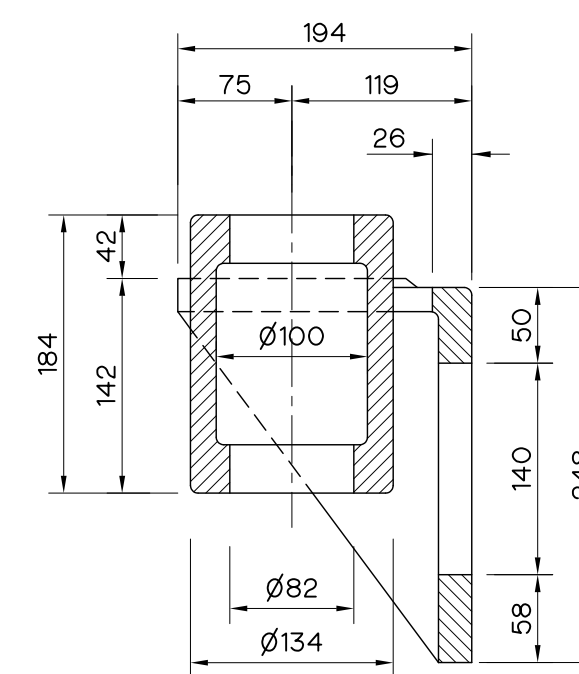
SECTION A-A
NOT TO SCALE



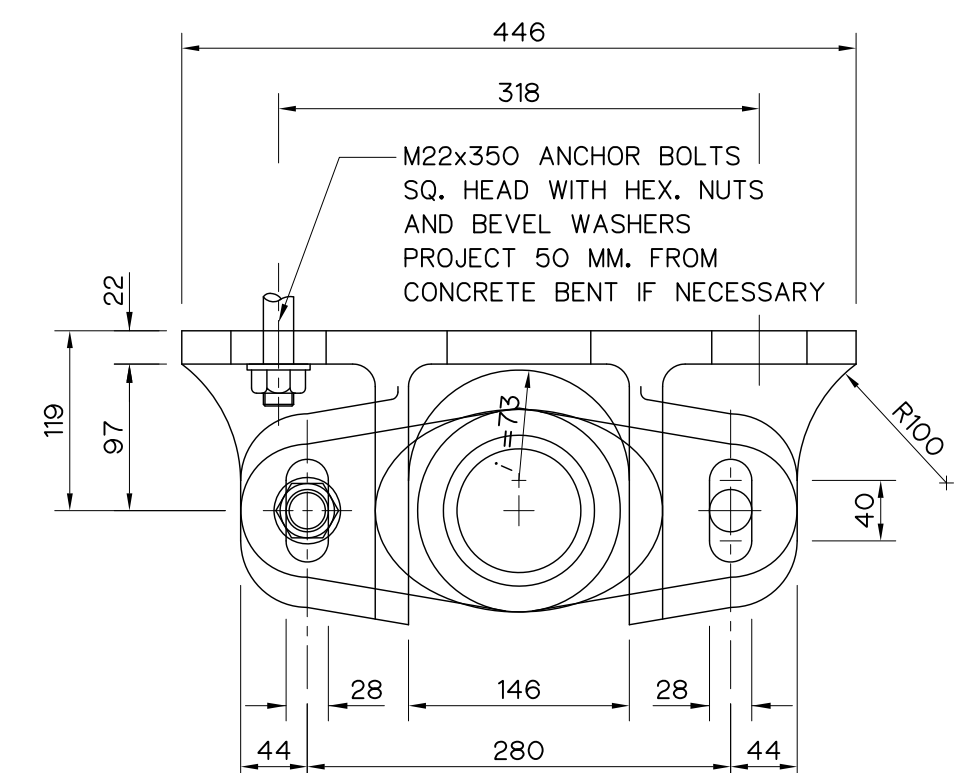
SECTION B-B
NOT TO SCALE



DETAIL "3"
SCALE 1:5



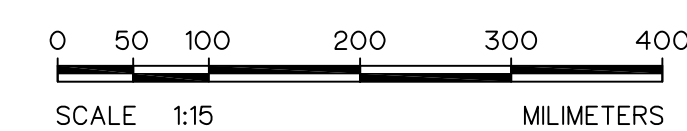
SECTION D-D
SCALE 1:5



SECTION E-E
SCALE 1:5

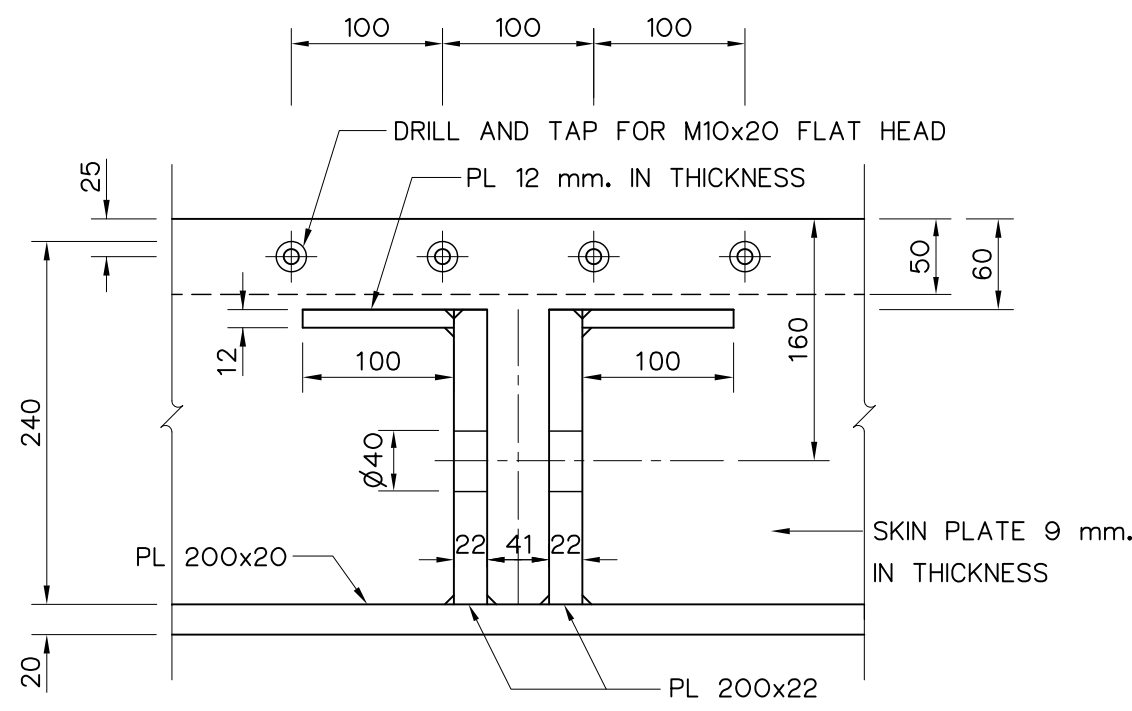
- NOTE :
1. ALL DIMENSIONS ARE IN MILLIMETERS, AND ELEVATION ARE IN METERS UNLESS OTHERWISE SHOWN.
 2. ALL WELDING WILL BE 6 MILLIMETERS, UNLESS OTHERWISE SHOWN.
 3. ALL BOLTS AND NUTS USE ASTM A325.
 4. ALL STRUCTURAL STEELS ARE JIS G 3101 SS400
 5. ALL STAINLESS STEELS PLATES ARE JIS G 4304 SUS 304.
 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 DATA) HLS-IS-09
 3. INTAKE STRUCTURE, PEDESTAL SCREW LIFT CAPACITY 2.25 TONS HLS-IS-12

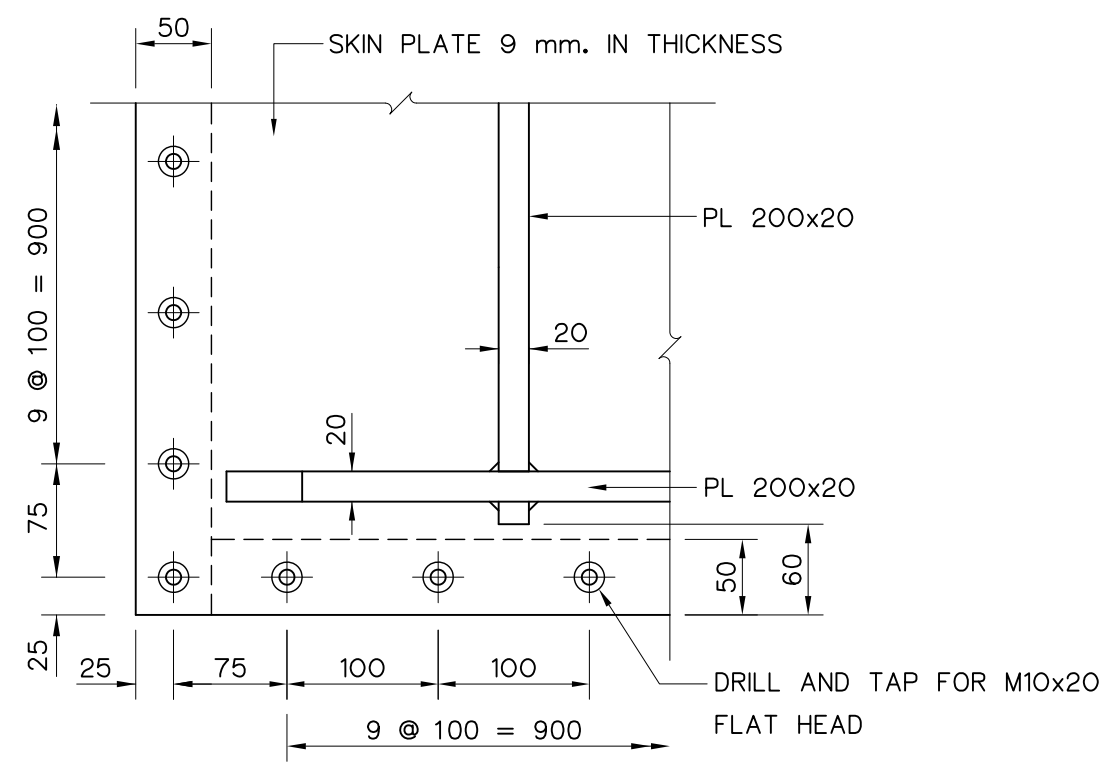


3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

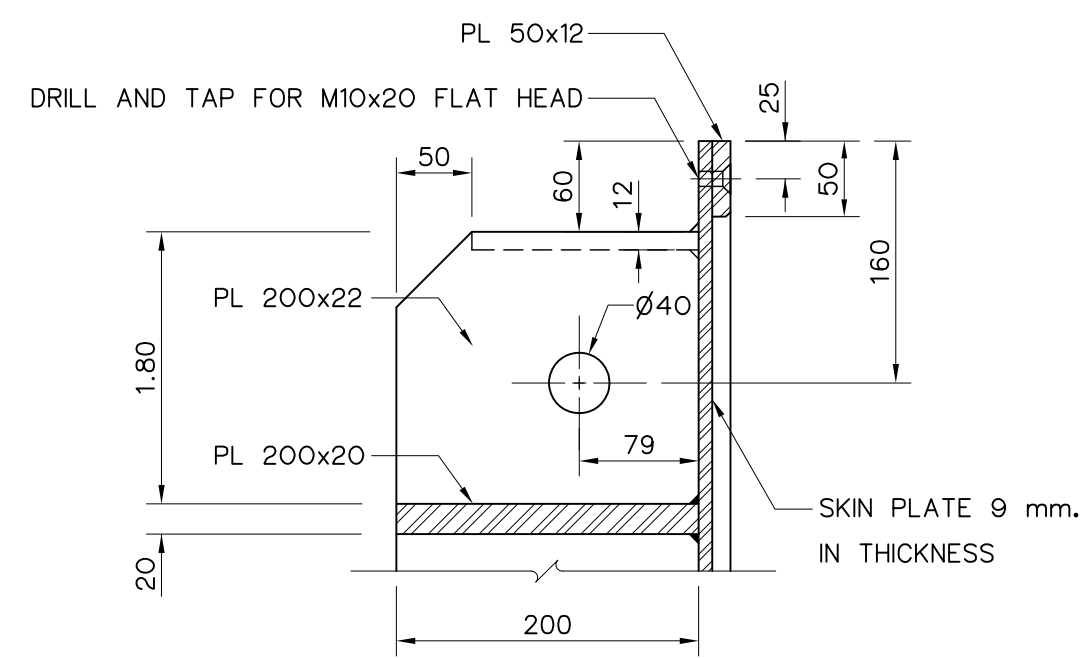
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY		
HUAI LAM SIN HYDROPOWER PROJECT		
CIVIL WORKS INTAKE STRUCTURE 1.00x1.00 m. VERTICAL GATE (GATE INSTALLATION)		
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED	REVIEWED S.KTICHAJ	
DRAWN	SUBMITTED	
CHECKED	RECOMMENDED	
14/01/62	APPROVED	
PROJECT MANAGER	DRAWING NO. HLS-IS-08	SHEET NO. 18 OF 78



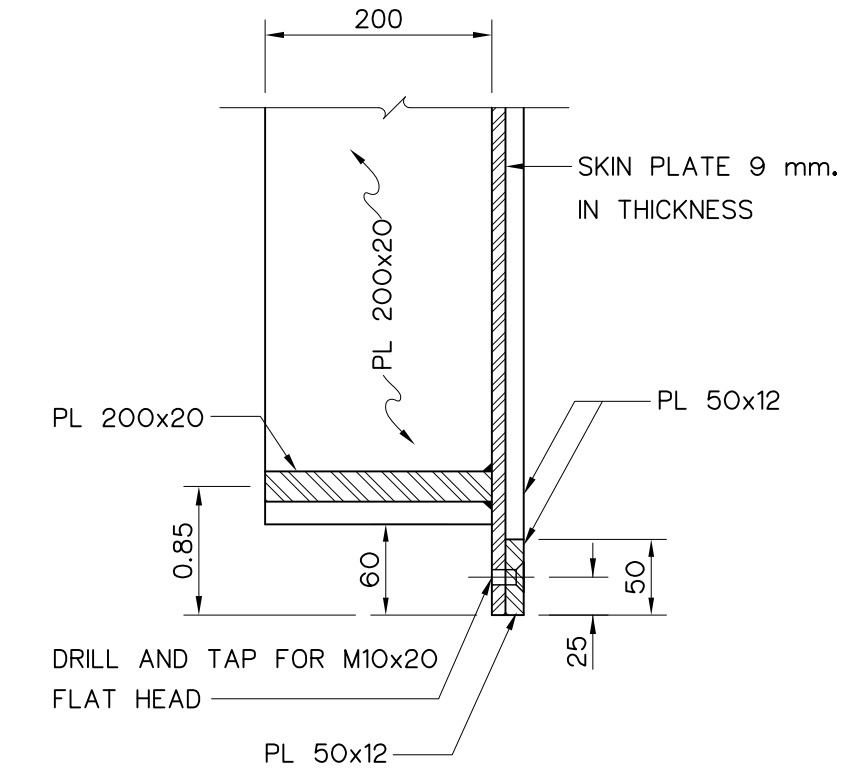
DETAIL "1"
NOT TO SCALE



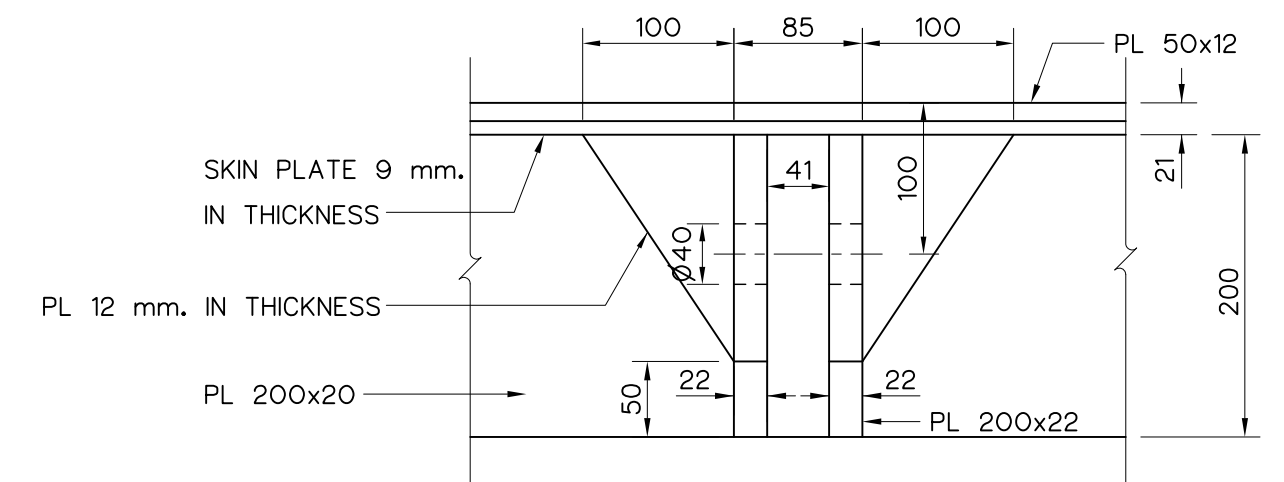
DETAIL "2"
NOT TO SCALE



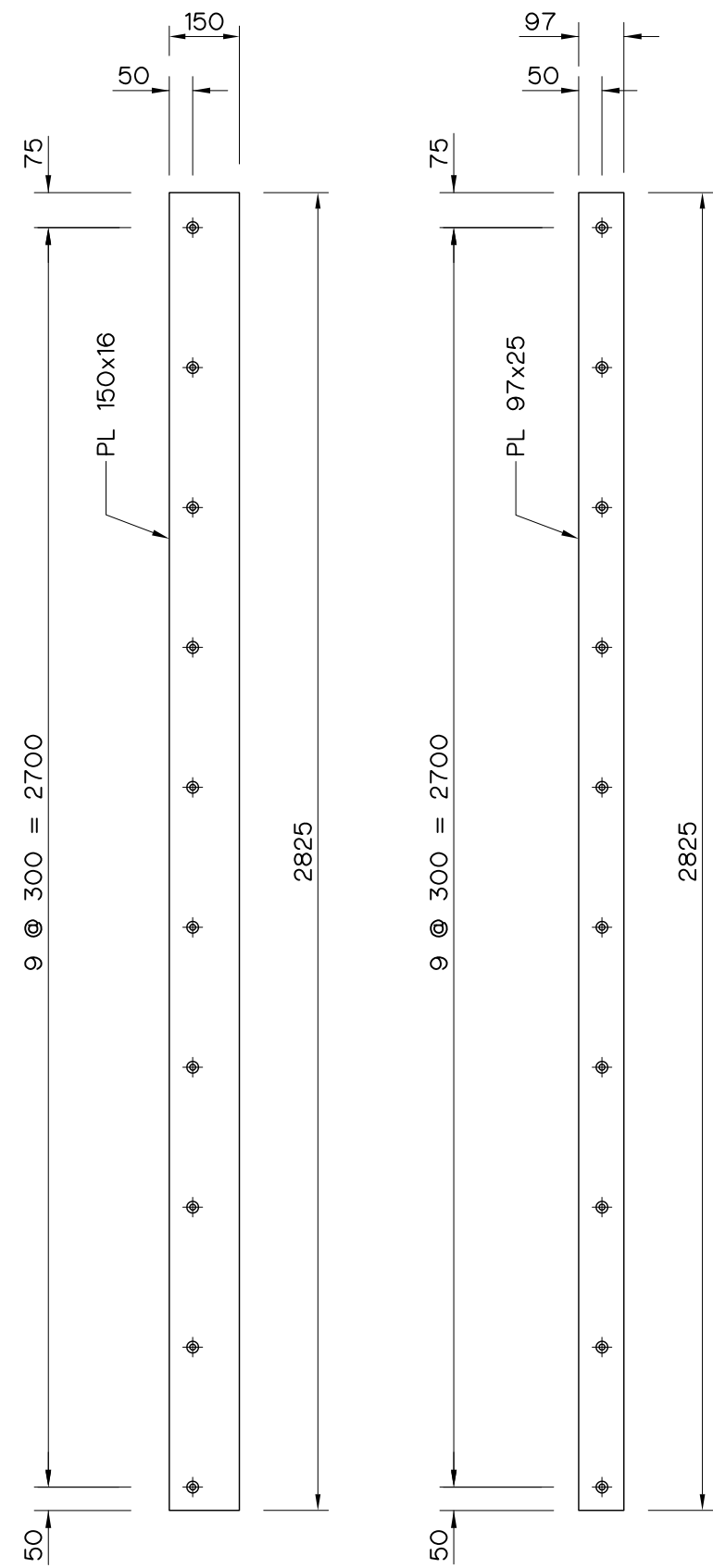
DETAIL "3"
NOT TO SCALE



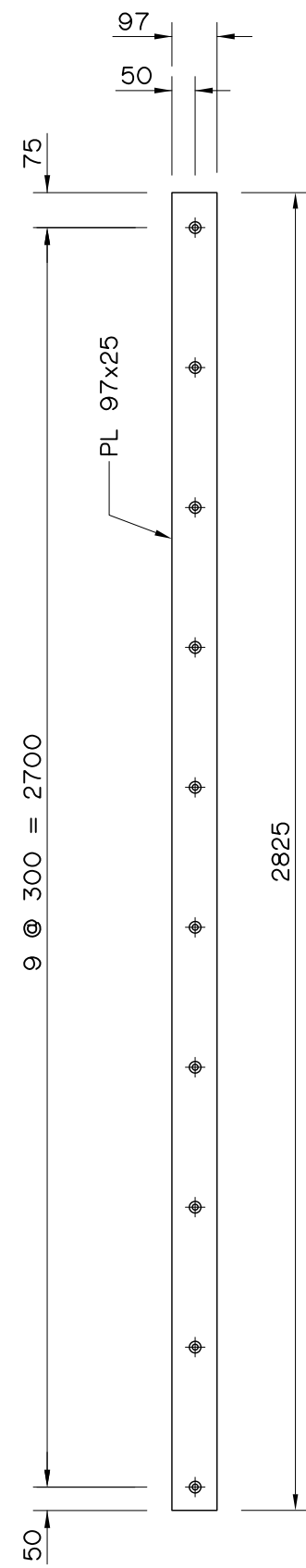
DETAIL "4"
NOT TO SCALE



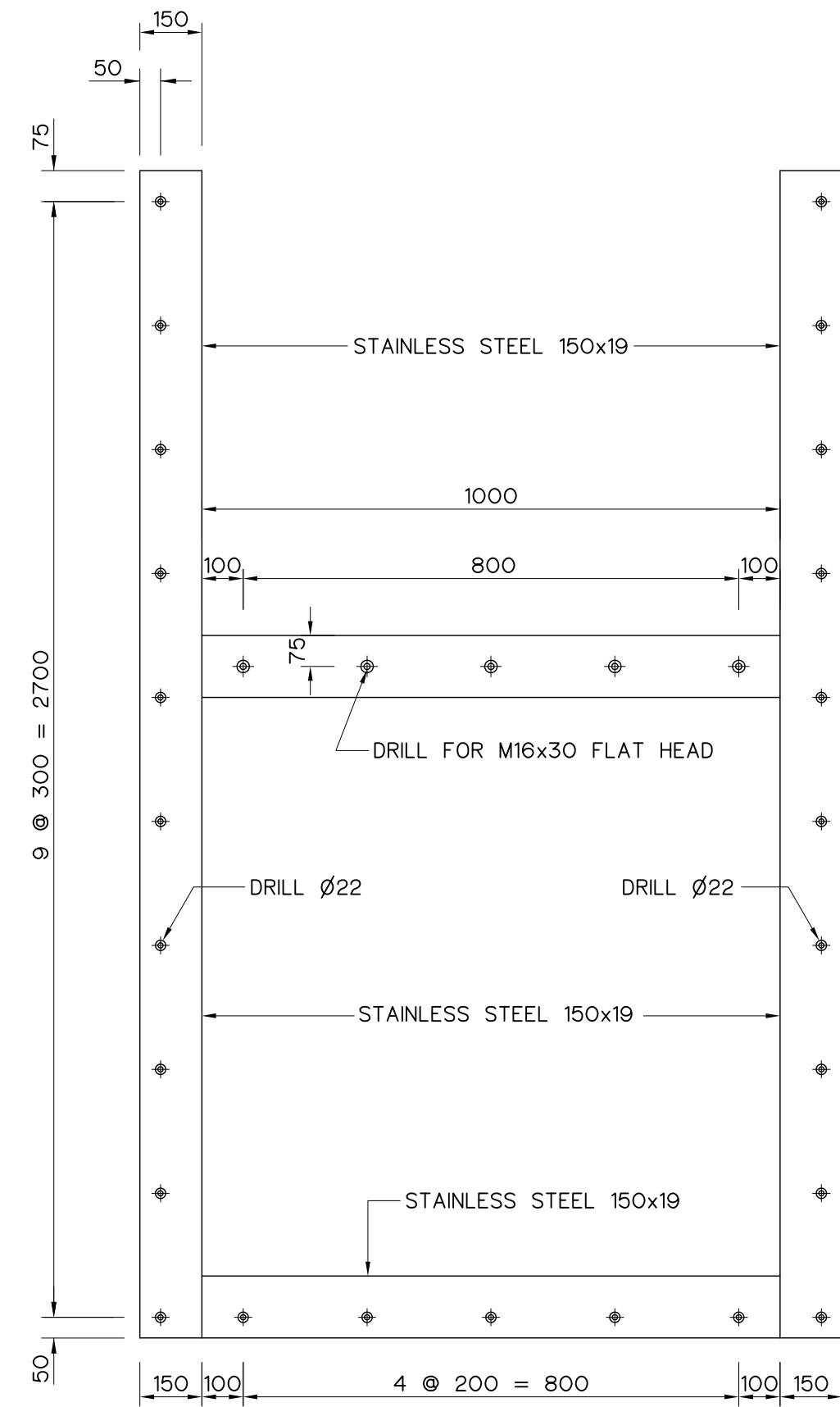
DETAIL "5"
NOT TO SCALE



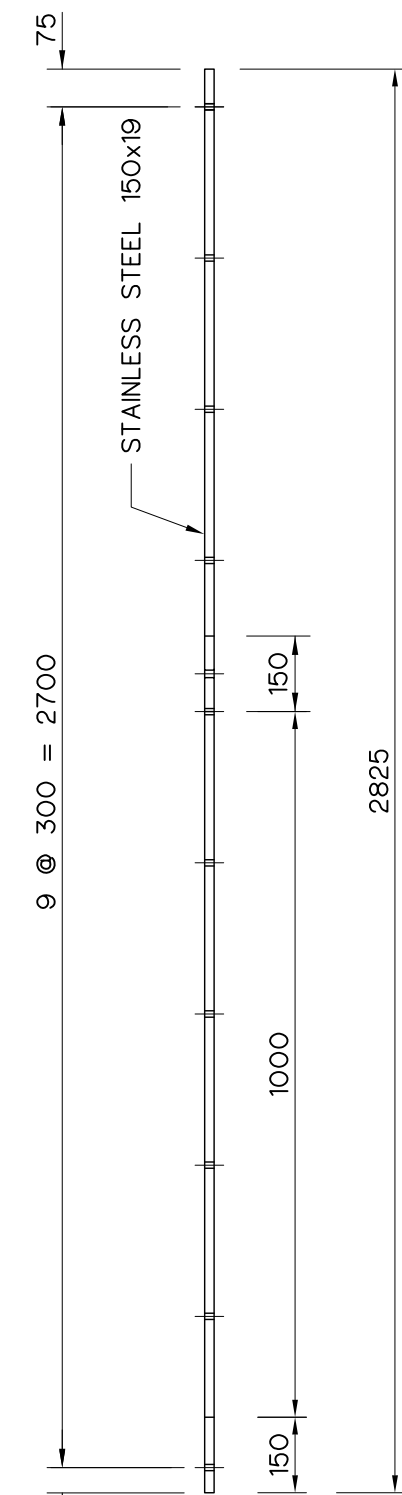
GUIDE BAR
NOT TO SCALE



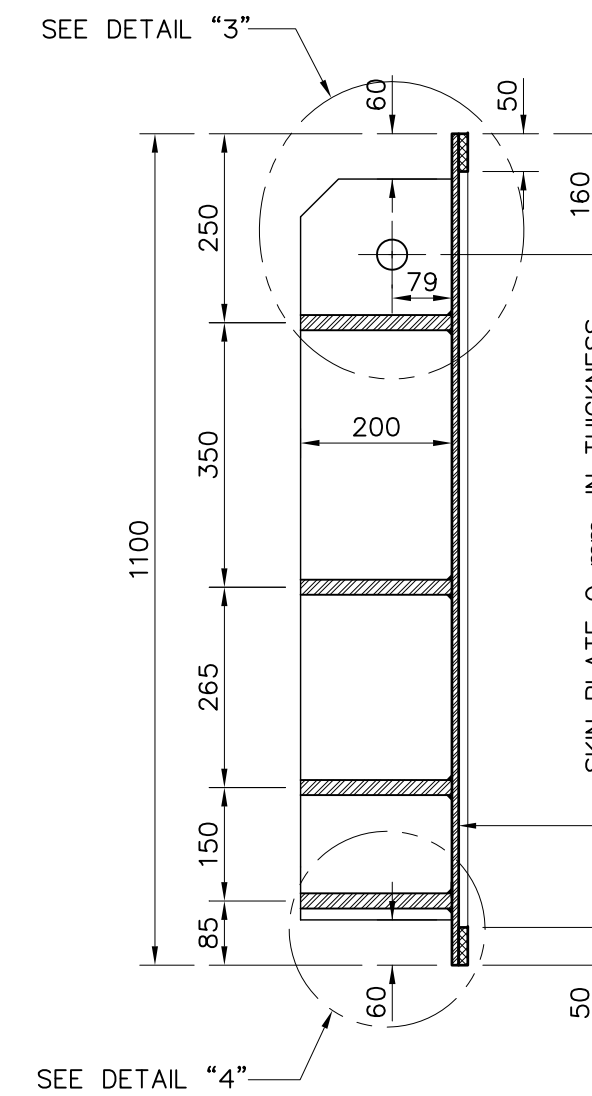
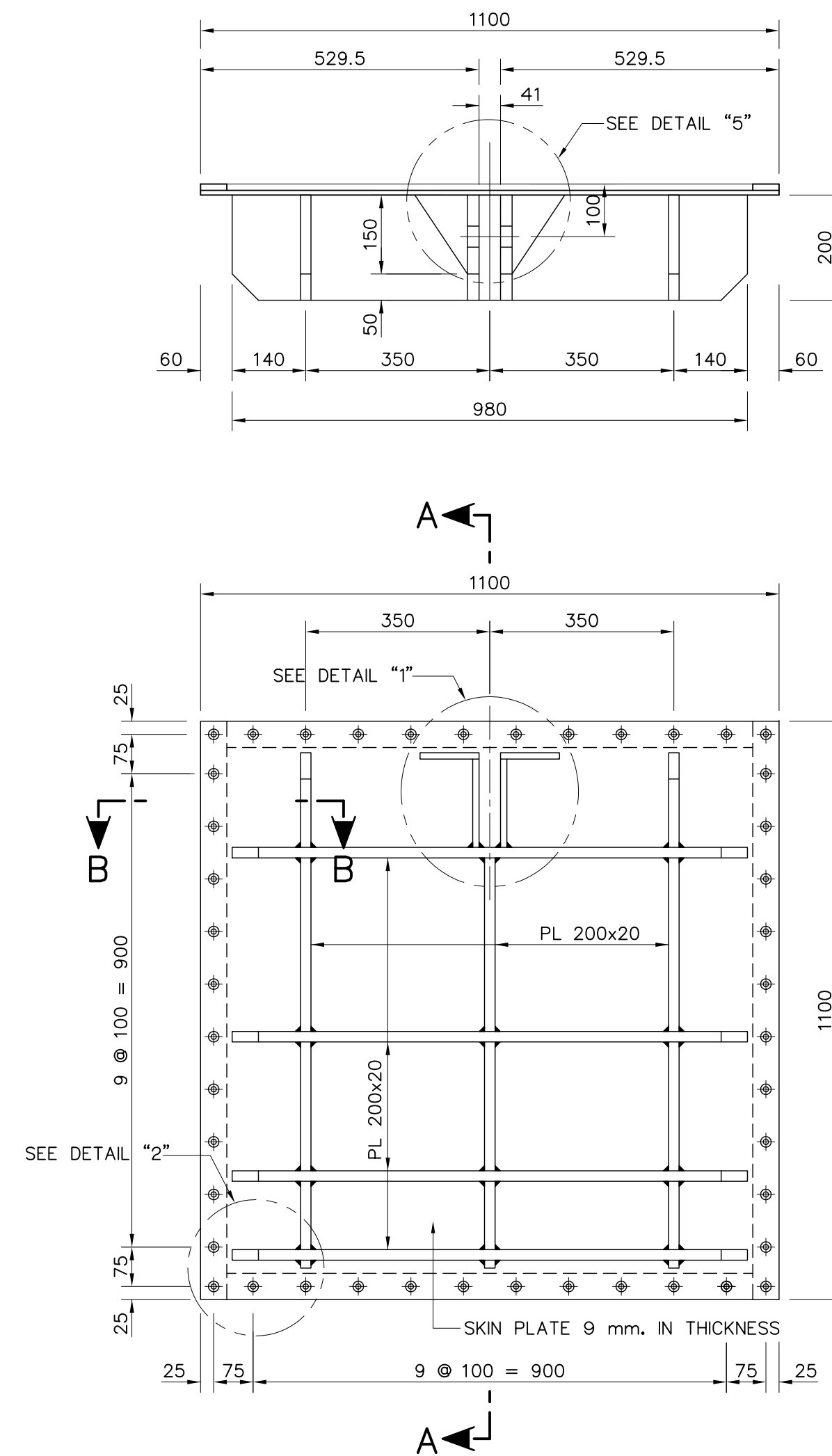
FILLER
NOT TO SCALE



FRAME
NOT TO SCALE



GATE LEAF
NOT TO SCALE



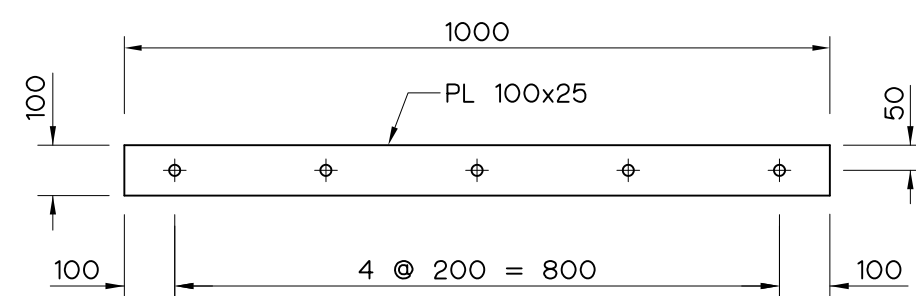
SECTION A-A
NOT TO SCALE

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.

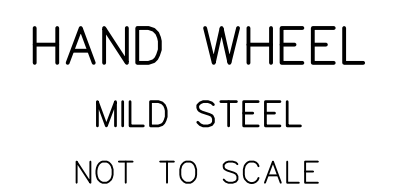
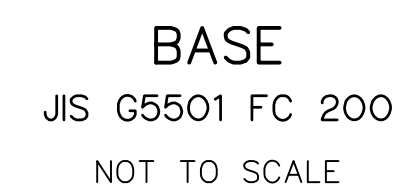
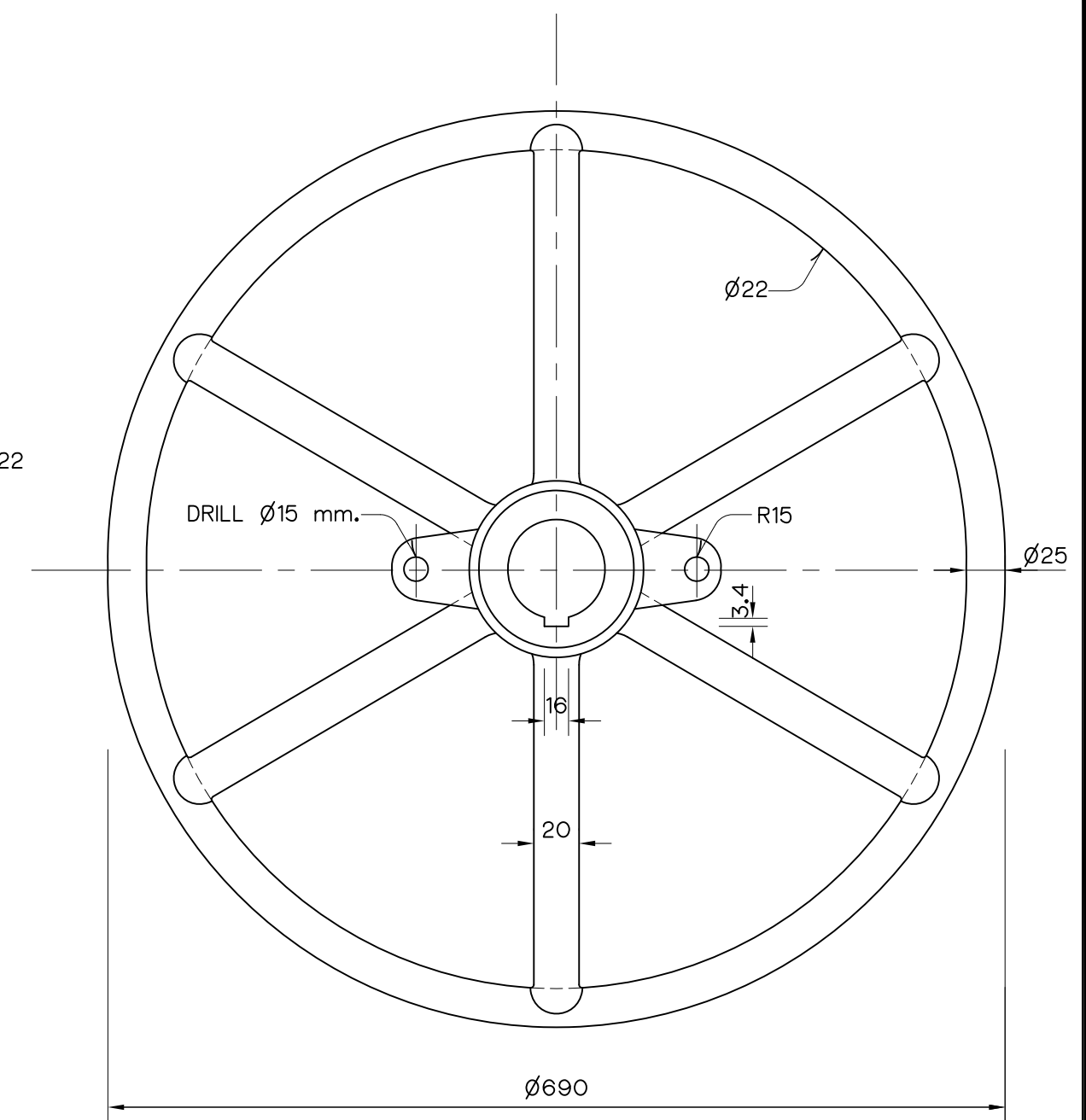
REFERENCE DWGS :

1. INTAKE STRUCTURE, PLAN AND SECTION A-A HLS-IS-02
2. INTAKE STRUCTURE, 1.00x1.00 m. VERTICAL GATE (GATE INSTALLATION) HLS-IS-09
3. INTAKE STRUCTURE, PEDESTAL SCREW LIFT CAPACITY 2.25 TONS HLS-IS-12



BOTTOM BAR
NOT TO SCALE

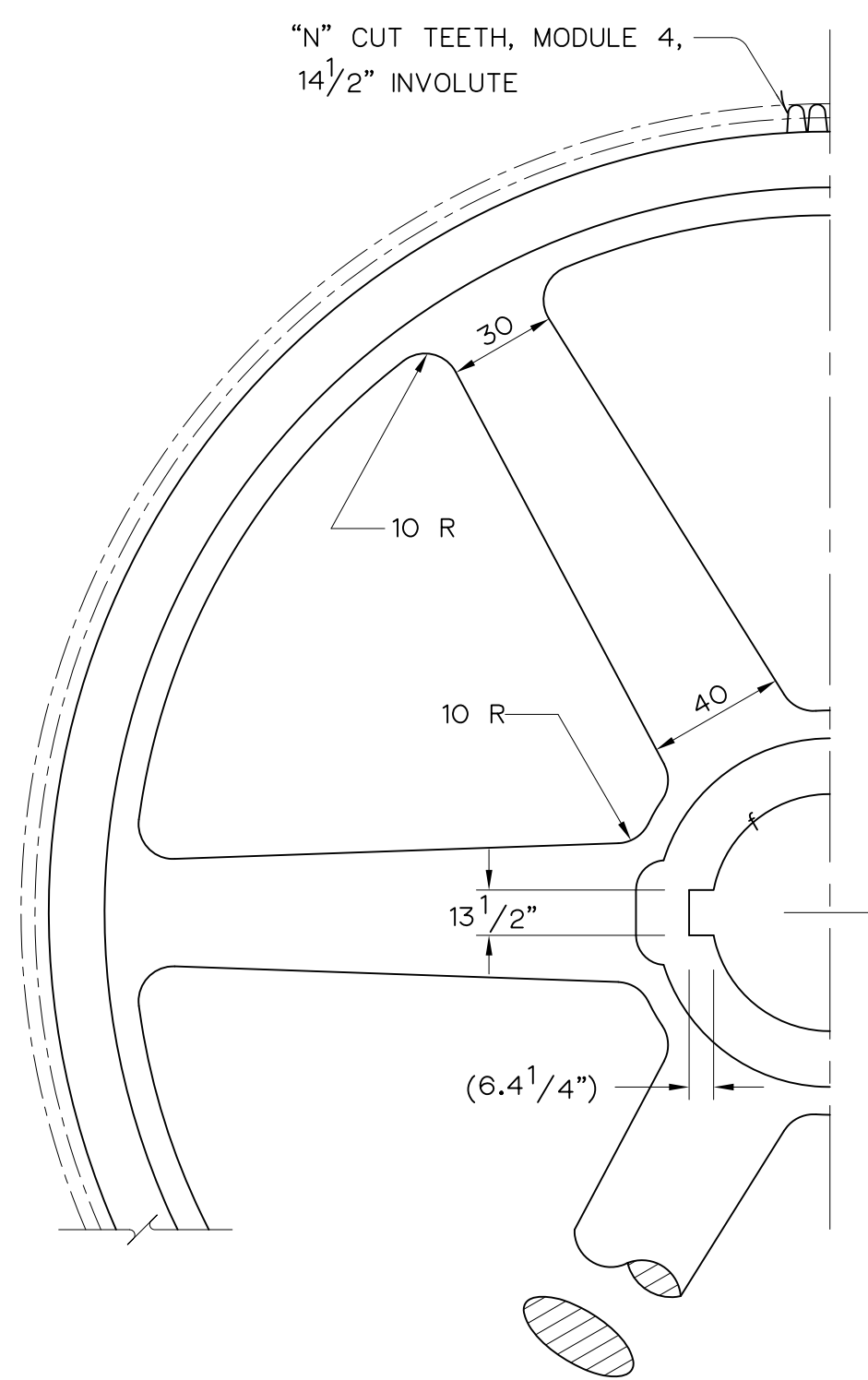
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY		
HUAI LAM SIN HYDROPOWER PROJECT		
CIVIL WORKS INTAKE STRUCTURE 1.00x1.00 m. VERTICAL GATE (GATE DETAIL)		
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	REVIEWED S.KTICHAJ	
DESIGNED 6651	SUBMITTED	
DRAWN	RECOMMENDED	
CHECKED 7324	APPROVED	
CONSULTANTS	DEDE	DRAWING NO. HLS-IS-09 SHEET NO. 19 OF 78



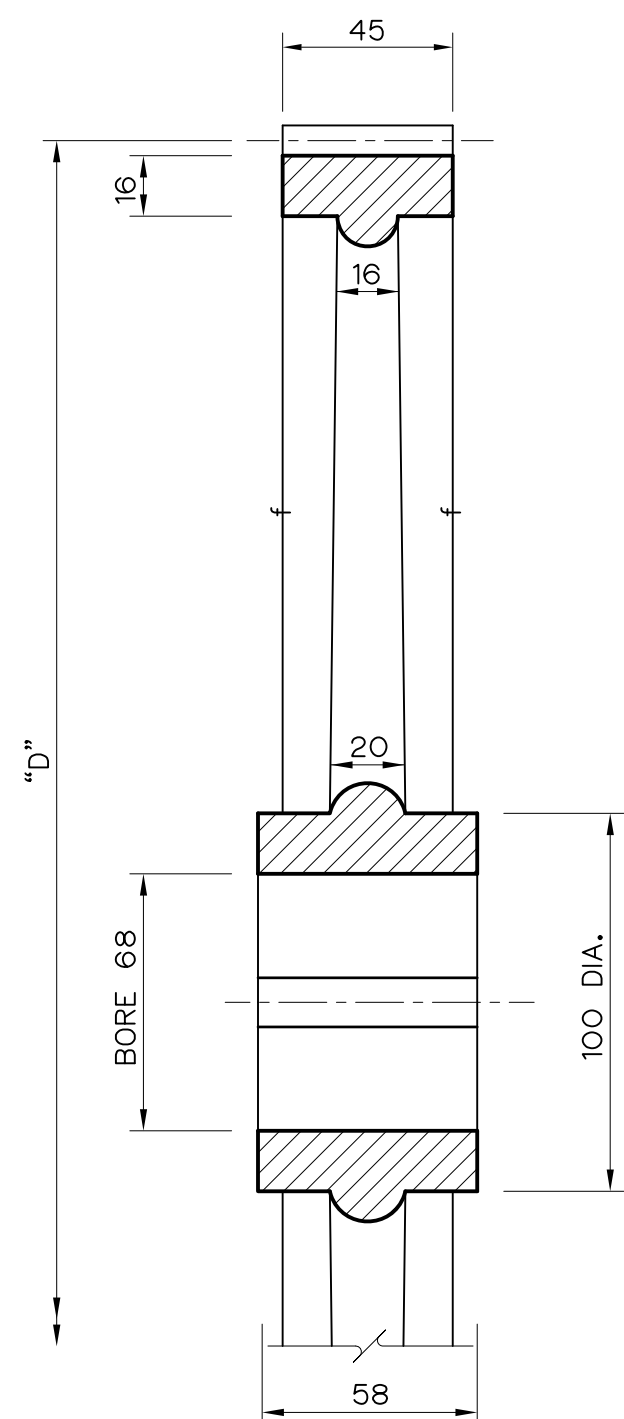
1. ALL DIMENSIONS ARE IN MILLIMETERS, AND ELEVATION ARE IN METERS UNLESS OTHERWISE SHOWN.
2. ALL WELDING WILL BE 6 MILLIMETERS, UNLESS OTHERWISE SHOWN.
3. ALL BOLTS AND NUTS USE ASTM A325.
4. ALL STRUCTURAL STEELS ARE JIS G 3101 SS400
5. ALL STAINLESS STEELS PLATES ARE JIS G 4304 SUS 304.
6. THIS DRAWING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

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

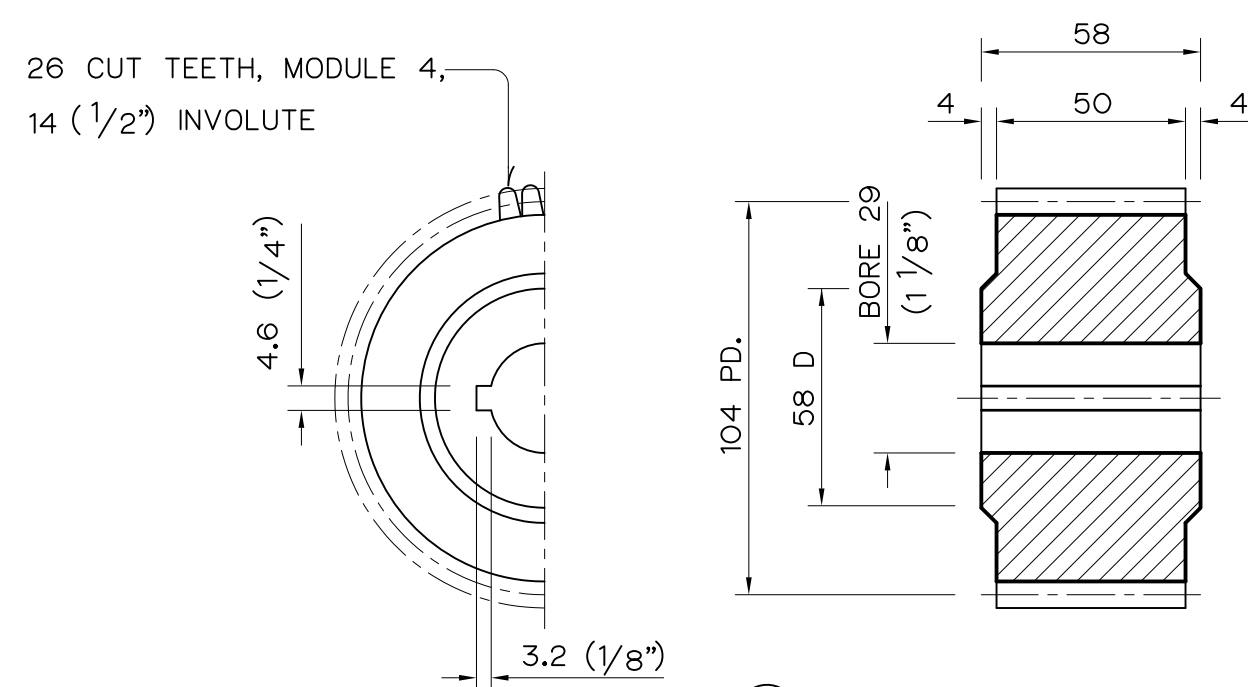
 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
HUAI LAM SIN HYDROPOWER PROJECT	
CIVIL WORKS	
INTAKE STRUCTURE	
PEDESTAL SCREW LIFT CAPACITY 750 kg.	
 FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED <i>สมชาย วัฒนศิริ</i> 21.2.197	REVIEWED <i>สมชาย วัฒนศิริ</i>
DRAWN <i>สมชาย วัฒนศิริ</i>	SUBMITTED <i>สมชาย วัฒนศิริ</i>
CHECKED <i>สมชาย วัฒนศิริ</i> 21.2.197	RECOMMENDED <i>สมชาย วัฒนศิริ</i>
<i>สมชาย วัฒนศิริ</i> 14/01/62	APPROVED <i>สมชาย วัฒนศิริ</i>
PROJECT MANAGER	DRAWING NO. HL-IS-10
DATE	SHEET NO. 20 OF 78



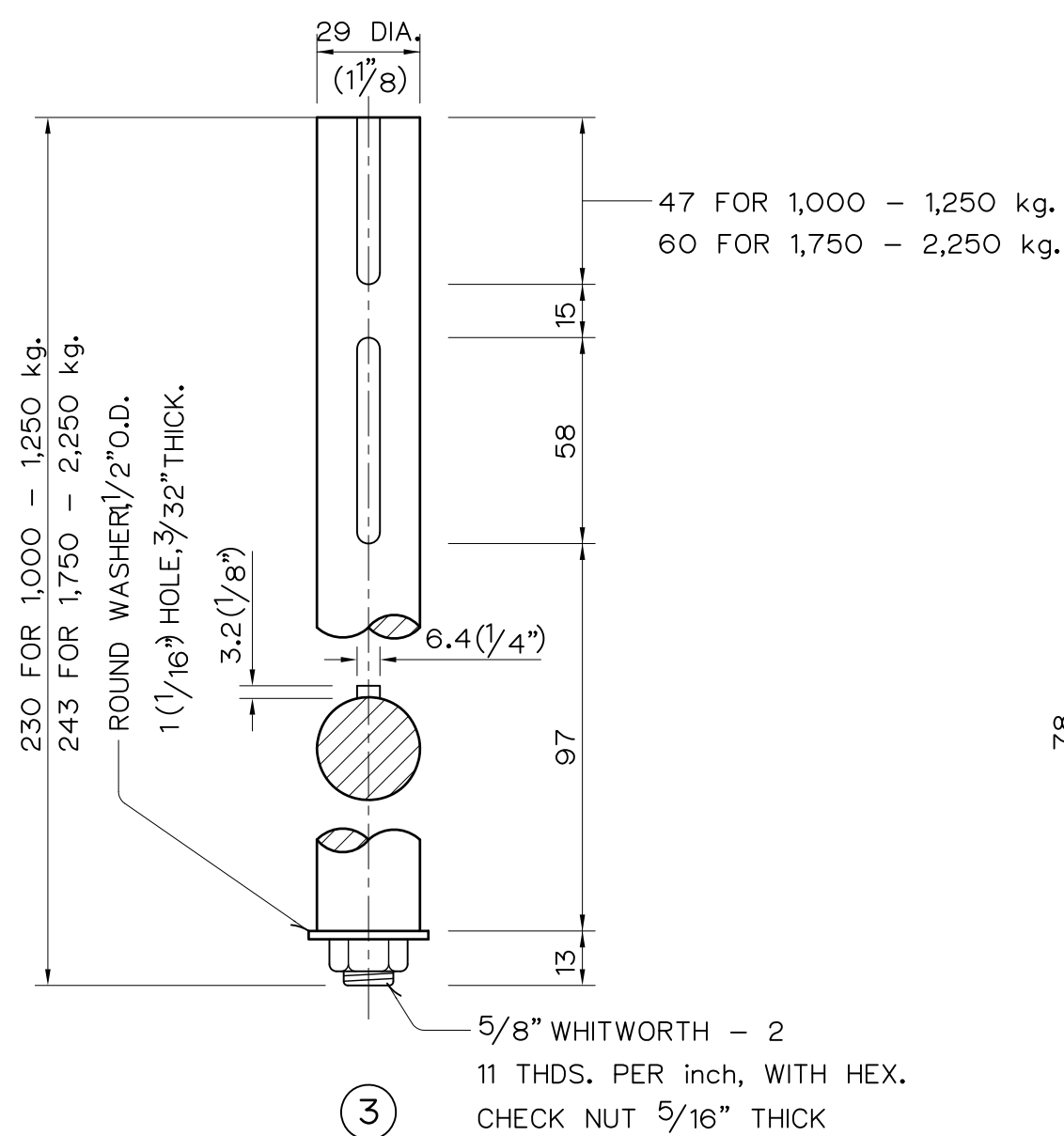
1
SPUR GEAR
CAST IRON
NOT TO SCALE



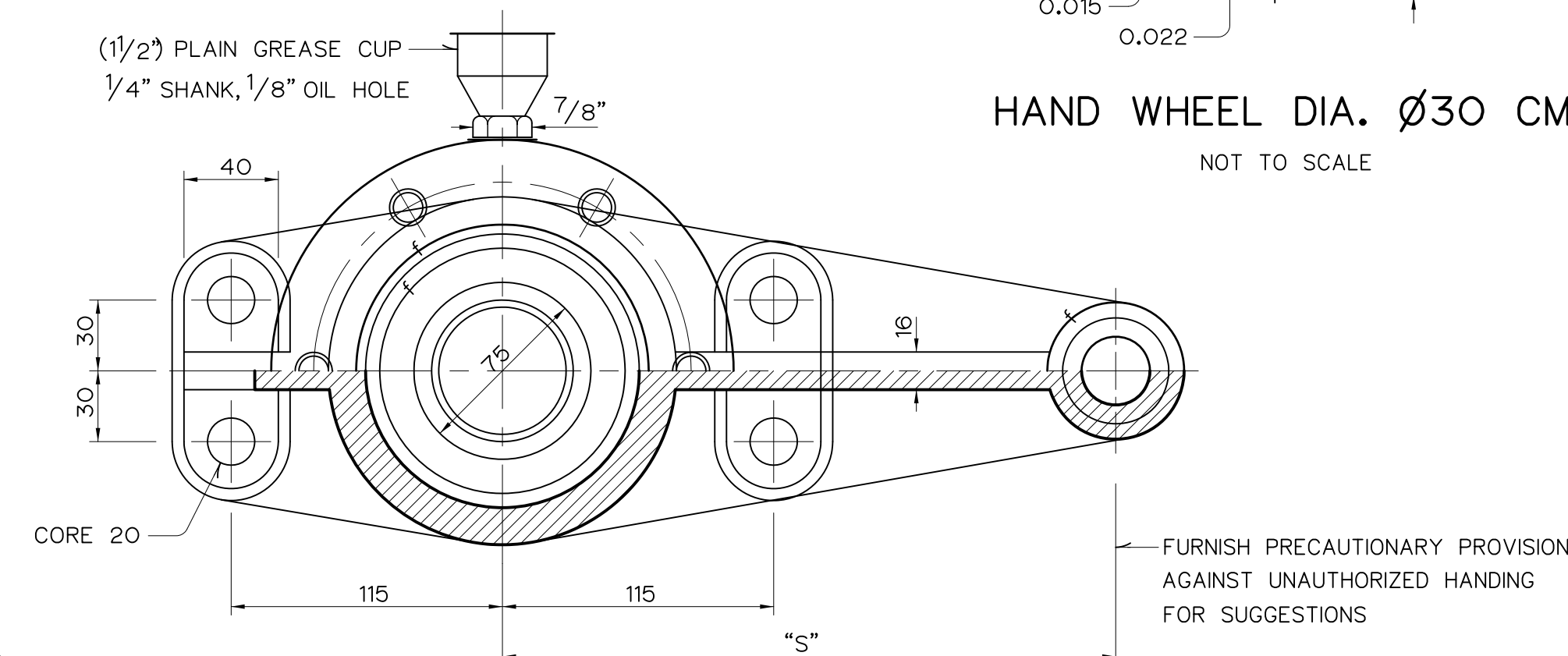
2
PINION
CAST IRON
NOT TO SCALE



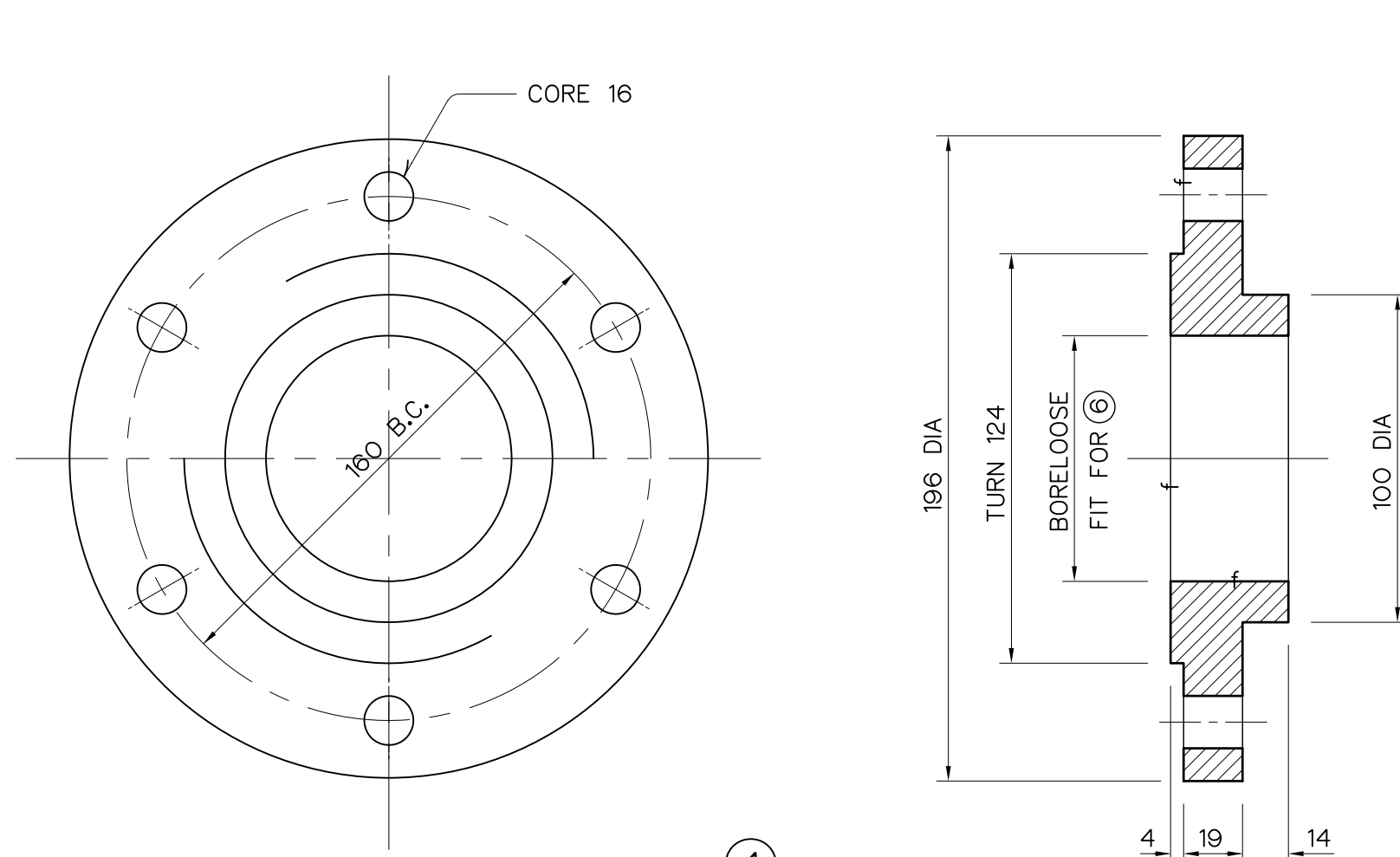
3
PINION SHAFT
MILD STEEL
NOT TO SCALE



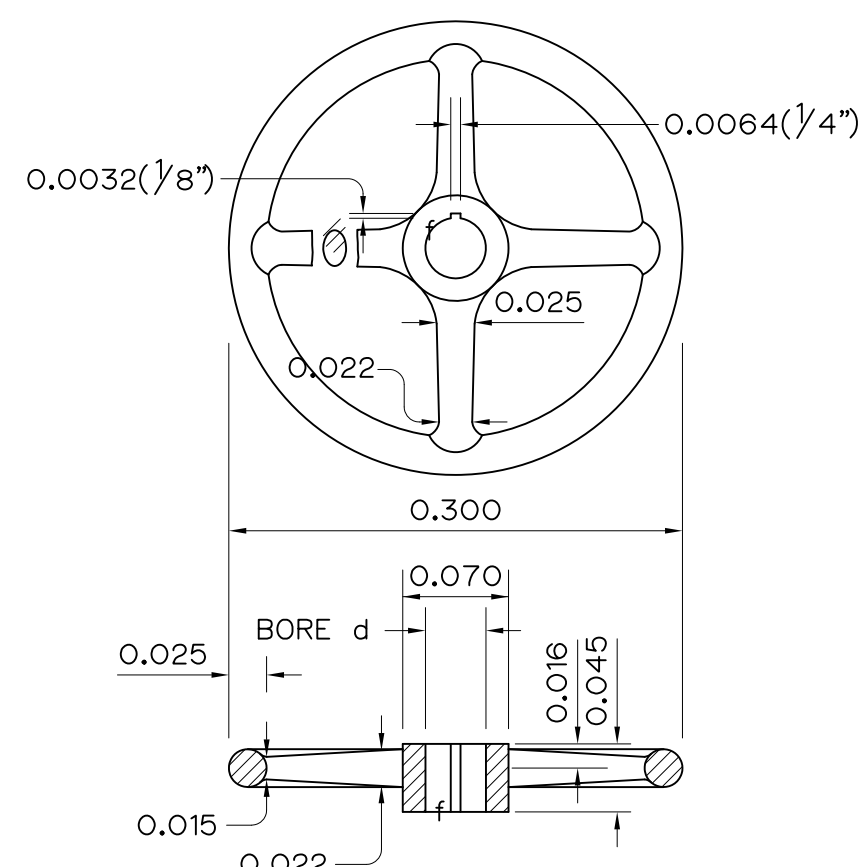
5
BASE
CAST IRON
NOT TO SCALE



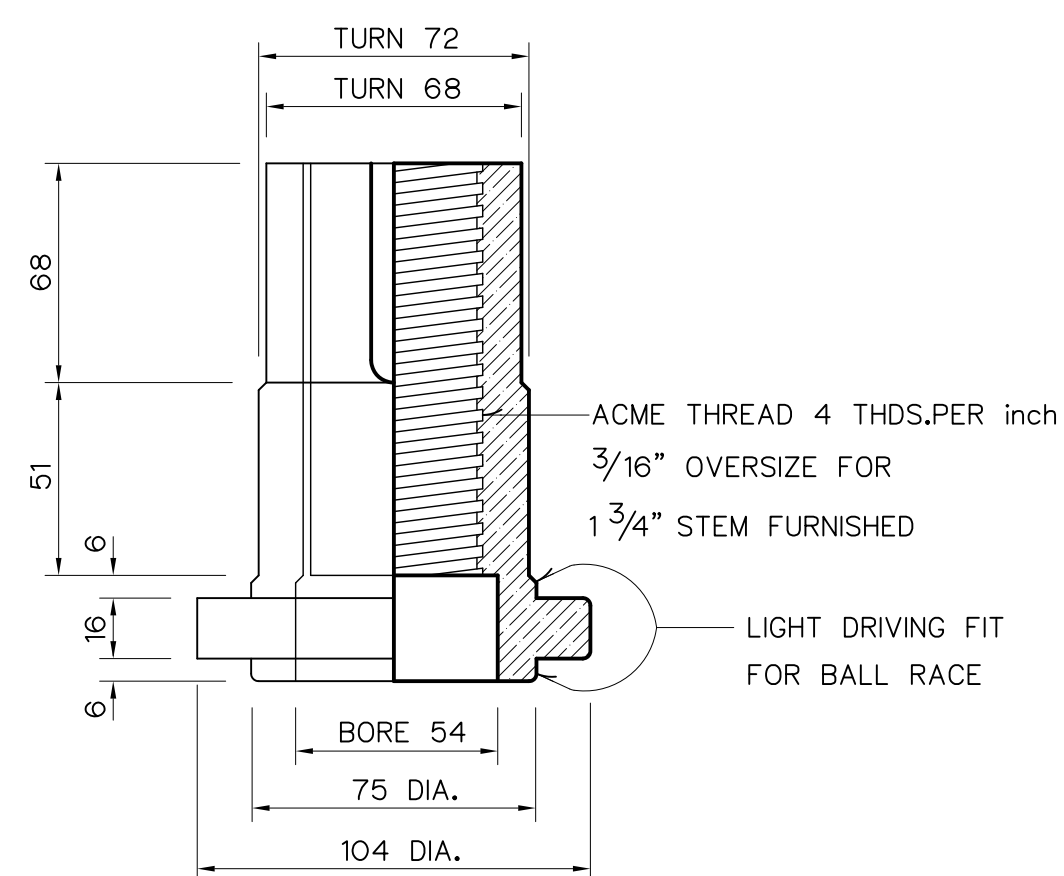
4
HAND WHEEL DIA. Ø30 CM.
NOT TO SCALE



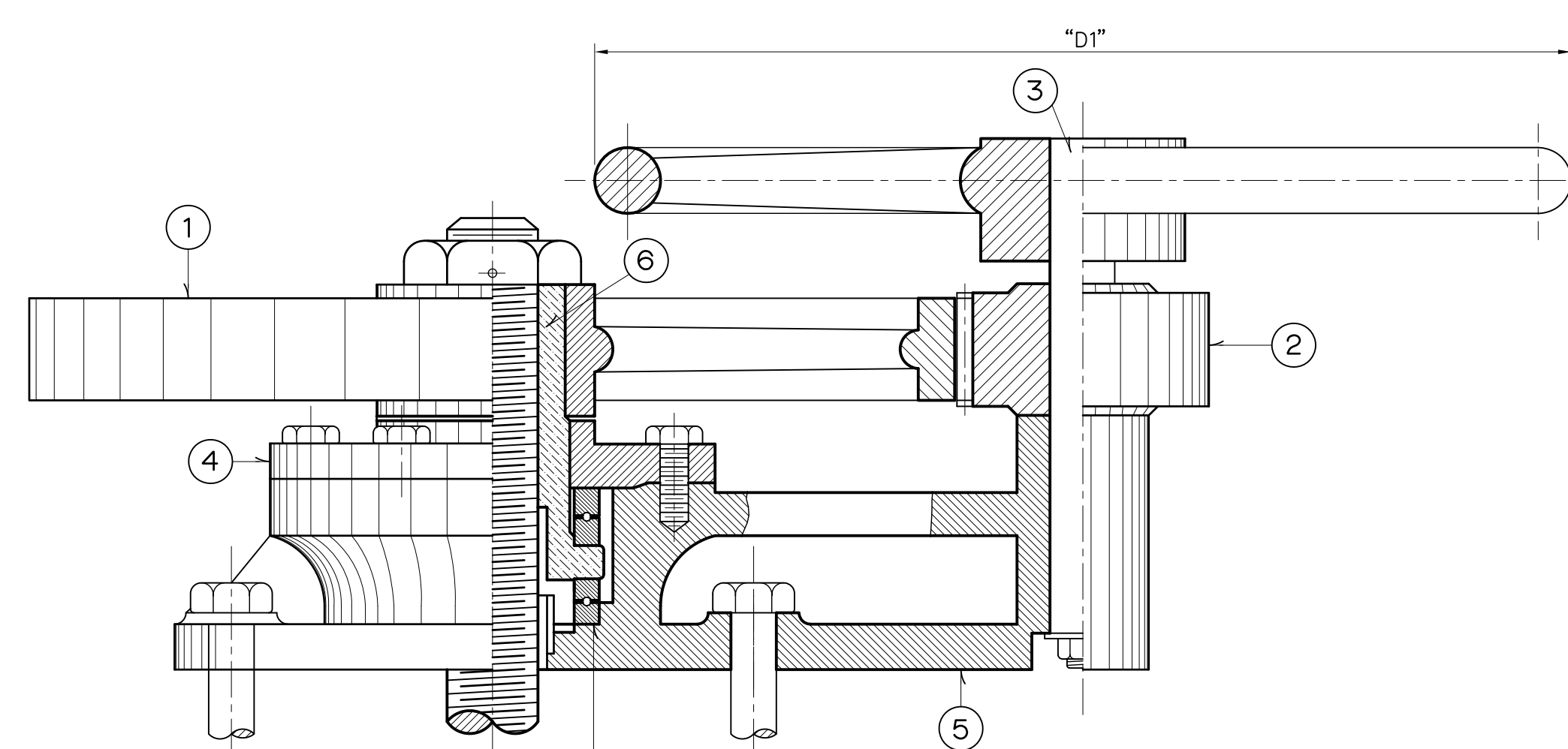
4
COVER PLATE
CAST IRON
NOT TO SCALE



6
LIFTING NUT
BRONZE
NOT TO SCALE



ASSEMBLY
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 PRESSURE ON GATE LEAF + WEIGHT OF GATE AND STEM.	

NOTE :

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

REFERENCE DWGS :

- GATE-LIFT PEDESTALS 2.25 TONS HLS-IS-11

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
HUA I LAM SIN HYDROPOWER PROJECT	
CIVIL WORKS INTAKE STRUCTURE PEDESTAL SCREW LIFT CAPACITY 2.25 TONS	
FRONTIER ENGINEERING CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED 21/10/2017	REVIEWED S. K. THIRAI
DRAWN 21/10/2017	SUBMITTED
CHECKED 21/10/2017	RECOMMENDED
APPROVED 14/01/2017	APPROVED
PROJECT MANAGER	DRAWING NO. HLS-IS-12
	SHEET NO. 22 OF 78

HORIZONTAL ALINEMENT OF HEADRACE

NO. PI.	COORDINATE		PI. - PI. (m)	DEFLECTION ANGLE (° - ' - ")	PI. STA. (km)	BEARING (N/S ° - ' - " E/W)
	N	E				
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

NOTES :

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

- PENSTOCK, PIER TYPE 1 DETAILS HLS-PS-07

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

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

Department of Alternative
Energy Development and Efficiency
MINISTRY OF ENERGY

DESIGNED ๒๒.6651

SUBMITTED ๒๒.๖๖๕๑

DRAWN ๒๒.๖๖๕๑

RECOMMENDED ๒๒.๖๖๕๑

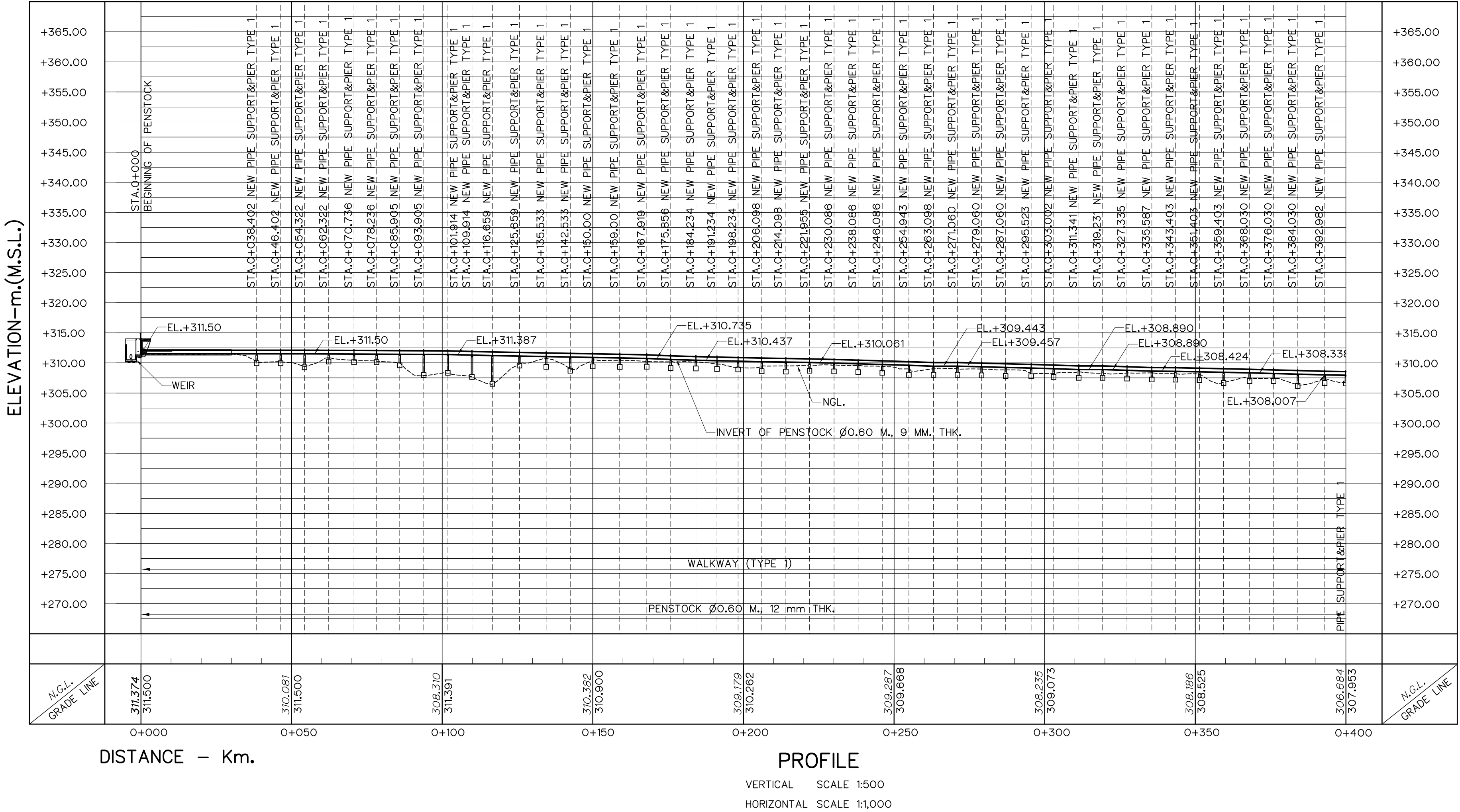
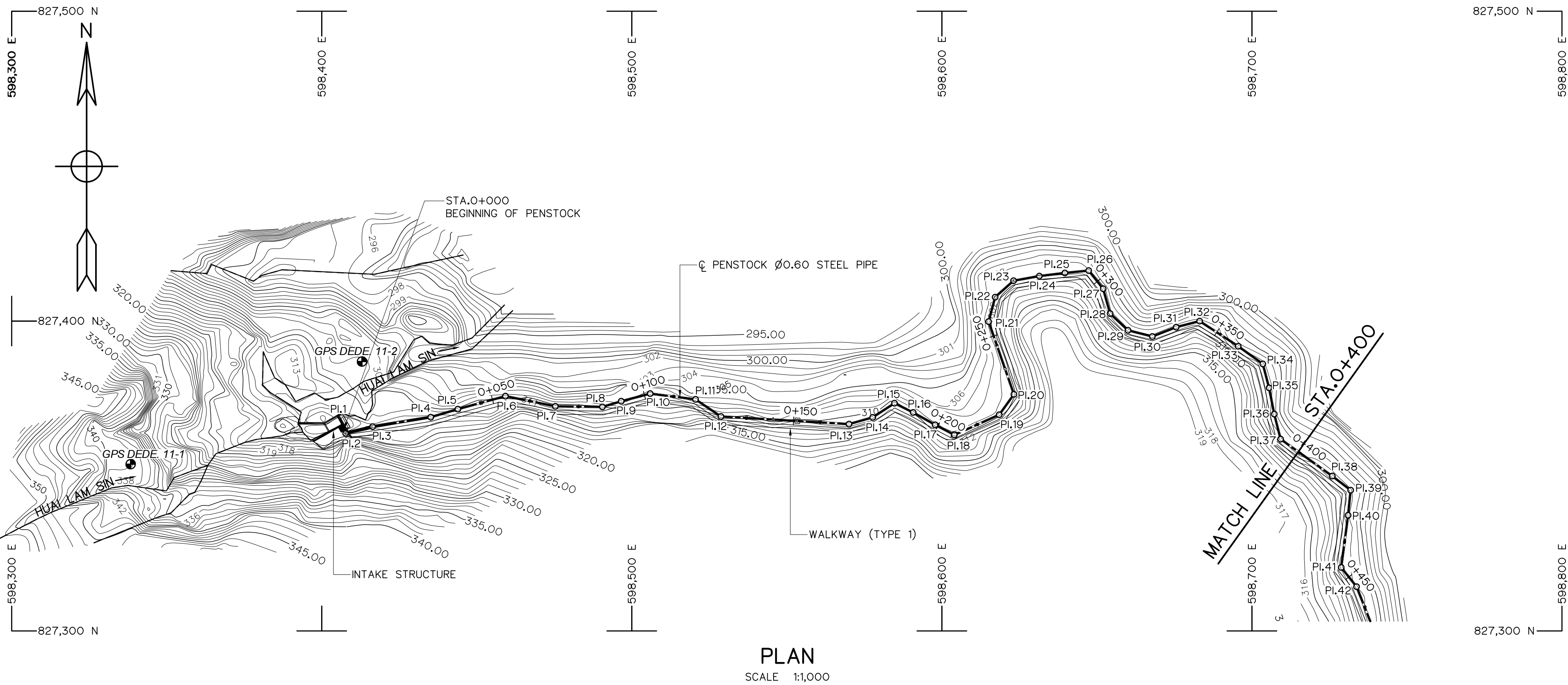
CHECKED ๒๒.๖๖๕๑

APPROVED ๒๒.๖๖๕๑

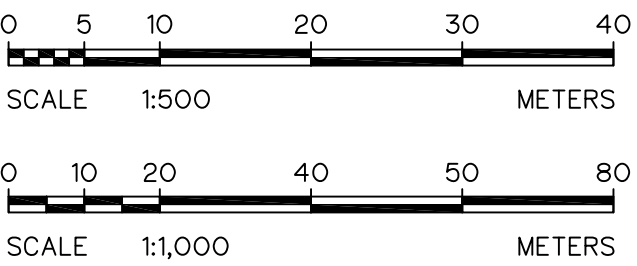
PROJECT MANAGER 14/01/62 DATE

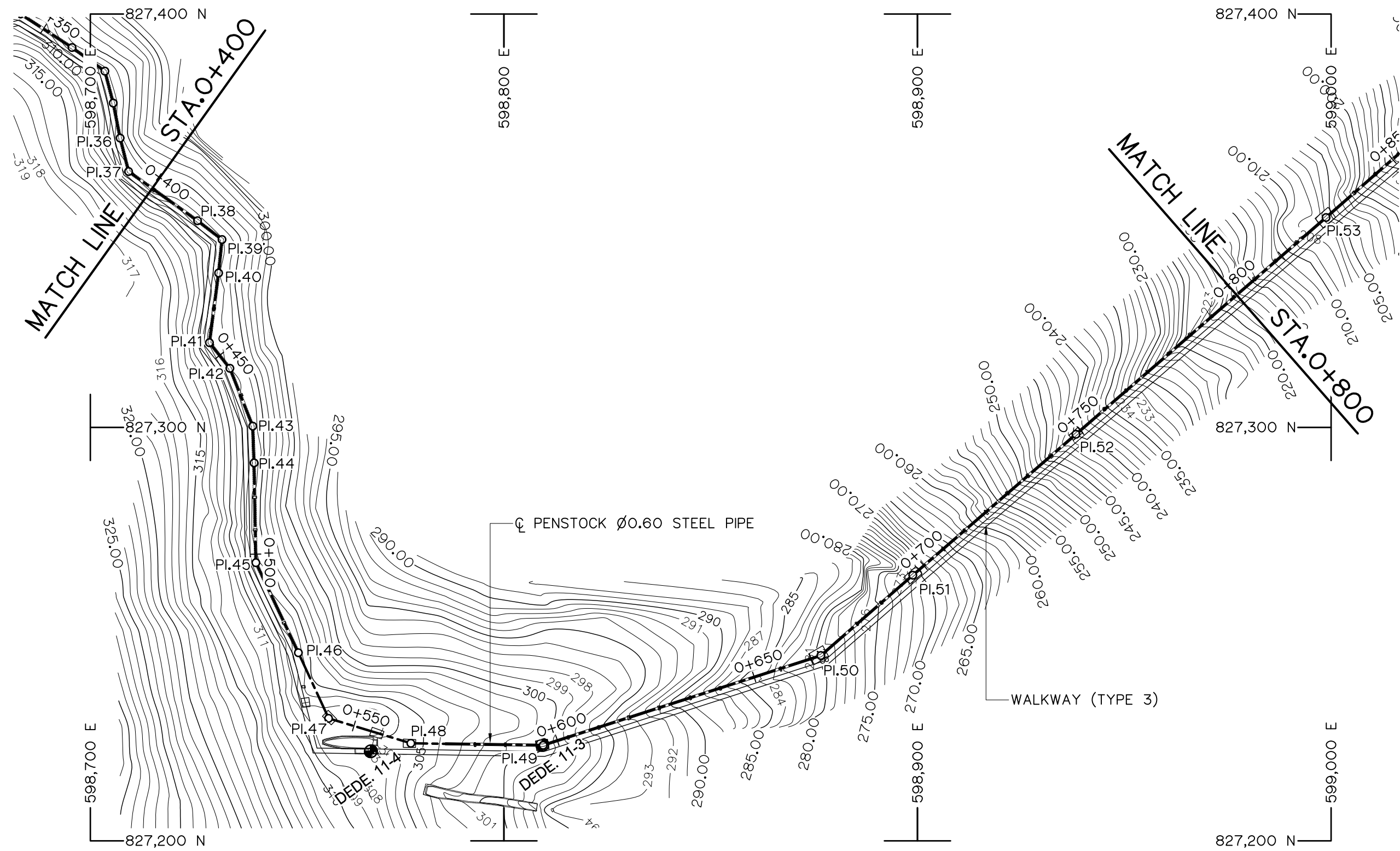
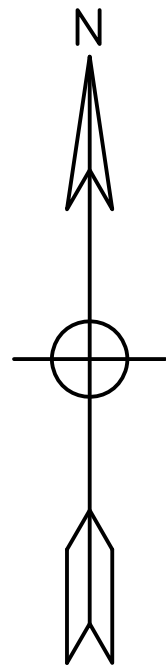
DRAWING NO. HLS-PS-01

SHEET NO. 23 OF 78

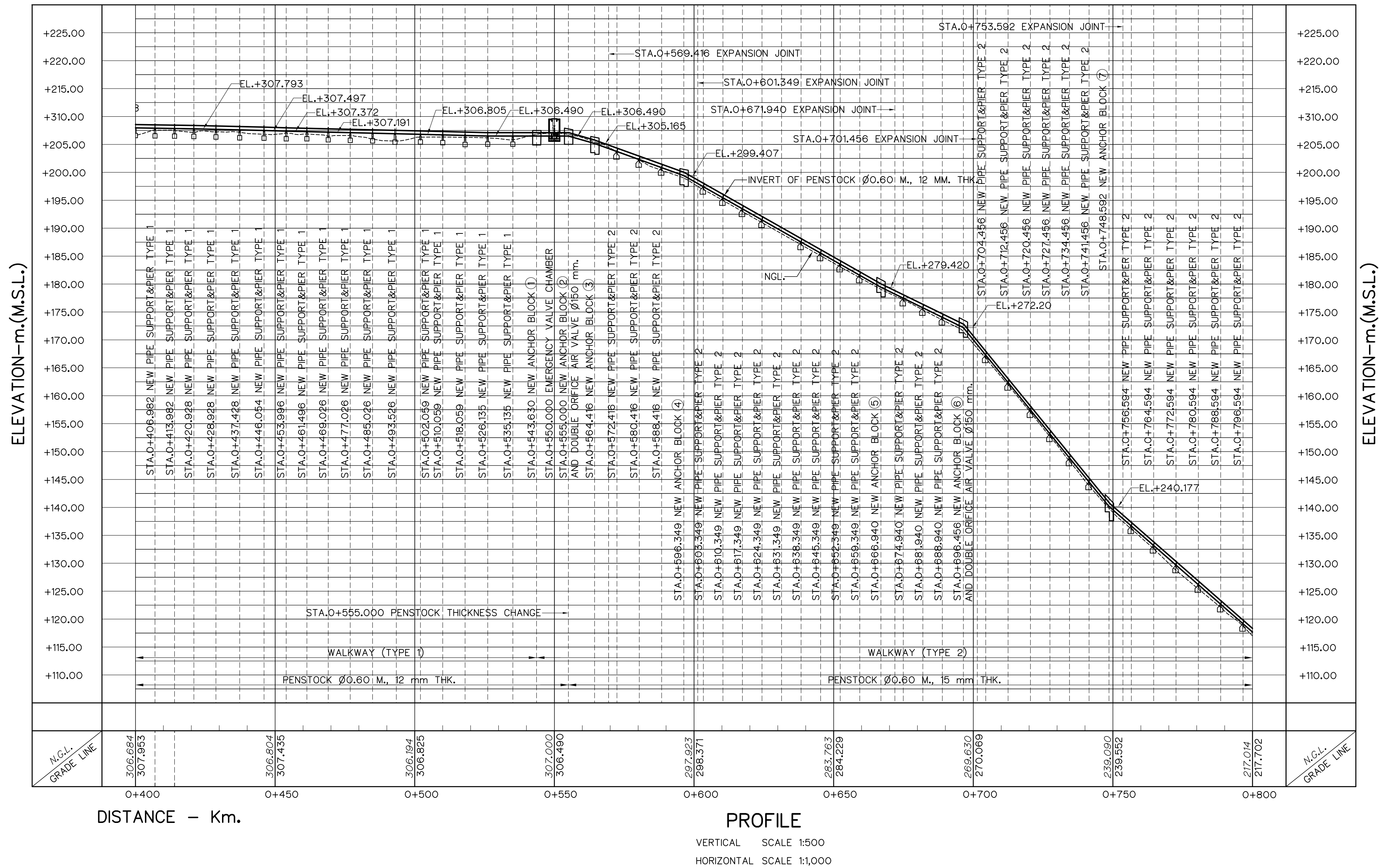


ELEVATION-m.(M.S.L.)





PLAN
SCALE 1:1,000



ELEVATION-m.(M.S.L.)

HORIZONTAL ALINEMENT OF PENSTOCK

NO. PL	COORDINATE		PI. - PI. (m)	DEFLECTION ANGLE (° - ' - ")	PI. STA. (km)	BEARING (N/S ° - ' - " E/W)
	N	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
PI.39	827,345.444	598,731.844	7.468	58°-24'-15.16"	0+420.928	S 52°-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'-46.96"	0+446.054	S 7°-30'-06.95"W
PI.42	827,314.298	598,733.751	7.942	17°-04'-06.28"	0+453.998	S 38°-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	S 25°-15'-47.94"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.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 :

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

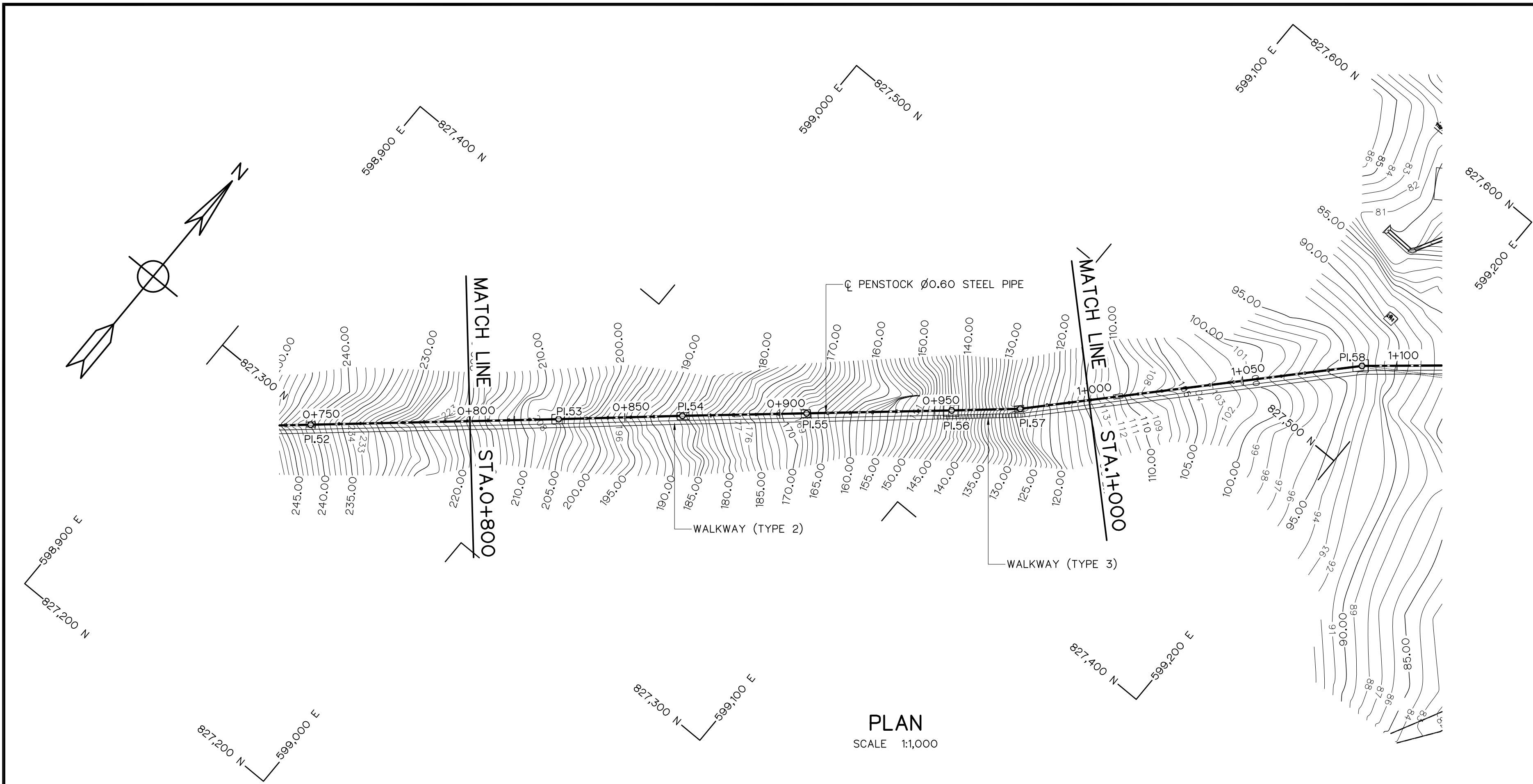
- PENSTOCK, PIER TYPE 1 DETAILS HLS-PS-07
- PENSTOCK, PIER TYPE 2 DETAILS HLS-PS-08

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

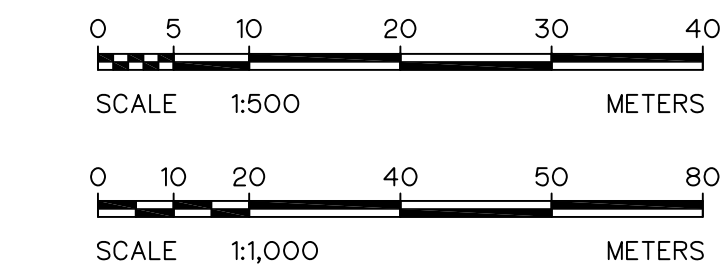
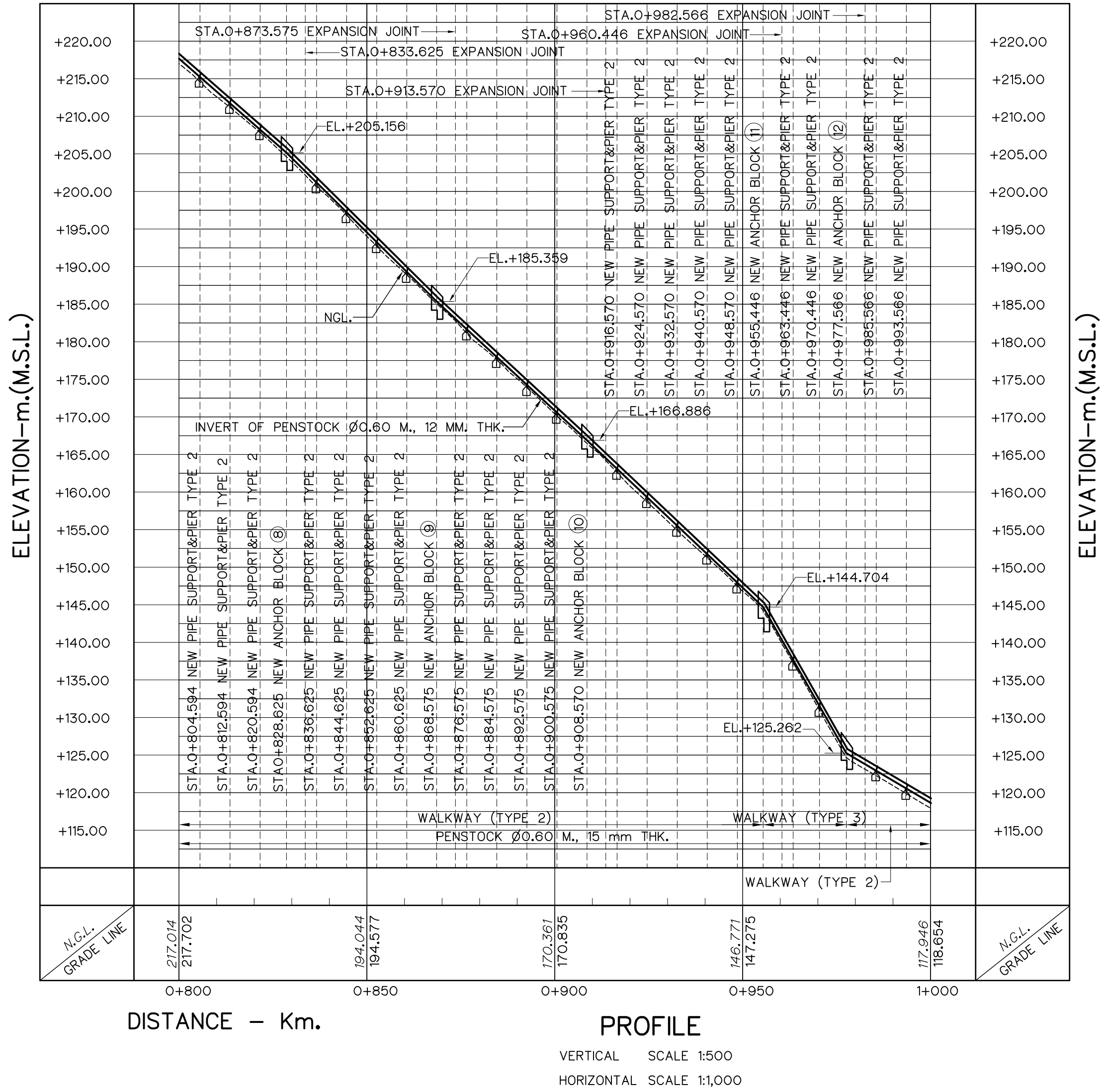
HUAI LAM SIN HYDROPOWER PROJECT

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

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED		SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED		APPROVED	
CONSULTANTS		DEDE	
PROJECT MANAGER		DATE	
14/01/62		DRAWING NO.	
		HLS-PS-02	
		SHEET NO.	
		24 OF 78	



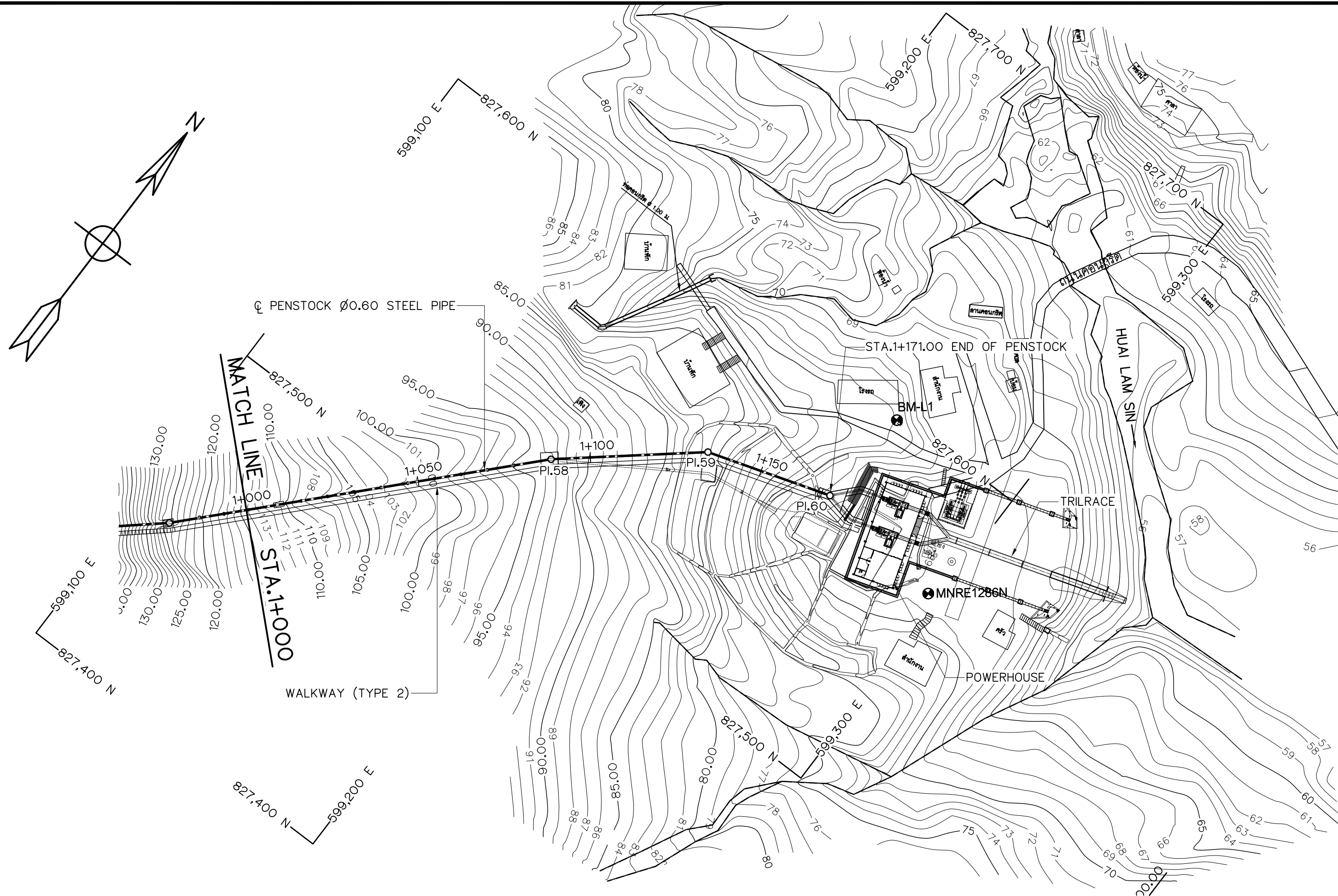
NO. PI.	COORDINATE		PI. - PI. (m)	DEFLECTION ANGLE (° - ' - ")	PI. STA. (km)	BEARING (N/S ° - ' - " E/W)
	N	E				
PI.52	827,298.350	598,938.319	52.136	00°-06'-01.70"	0+564.416	N 49°-10'-38.89" E
PI.53	827,350.775	598,998.791	80.033	00°-15'-03.29"	0+828.625	N 49°-04'-37.19" E
PI.54	827,377.076	599,028.862	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



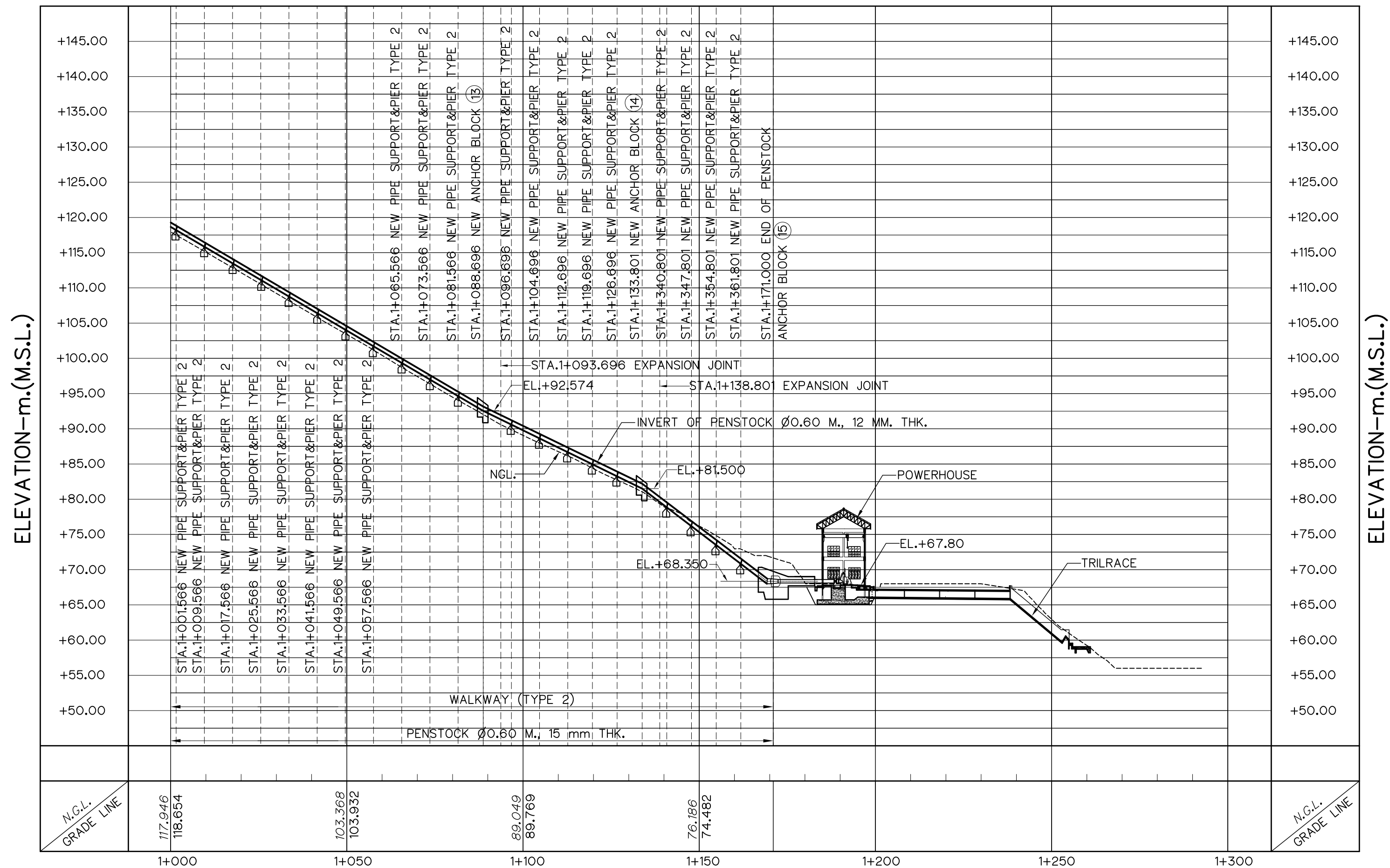
- NOTES :
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS. UNLESS OTHERWISE SHOWN.
 2. SYMBOLE, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
 3. THE ALIGNMENT OF THE PENSTOCK AND RELATED STRUCTURES SHALL BE CHECK AND CORRECTED BY THE CONTRACTOR TO SUIT THE FIELD CONDITIONS AND SHALL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

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

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUA I LAM SIN HYDROPOWER PROJECT			
CIVIL WORKS PENSTOCK PLAN AND PROFILE, STA. 0+800 TO STA. 1+000			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
REVIEWED S.KTICHAJ		REVIEWED S.KTICHAJ	
DESIGNED S. 6651		SUBMITTED S. 6651	
DRAWN S. 6651		RECOMMENDED S. 6651	
CHECKED S. 7324		APPROVED S. 7324	
PROJECT MANAGER S. 7324		DRAWING NO. HLS-PS-03	
DATE 14/01/62		SHEET NO. 25 OF 78	



PLAN
SCALE 1:1,000



DISTANCE – Km.

PROFILE

VERTICAL SCALE 1:500
HORIZONTAL SCALE 1:1,000

HORIZONTAL ALINEMENT OF PENSTOCK

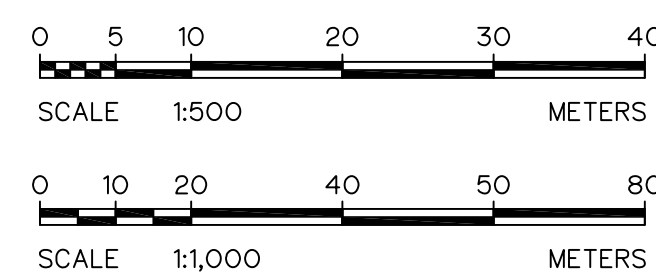
NO. PL	COORDINATE		PL. – PL. (m)	DEFLECTION ANGLE (° - ' - ")	PL. STA. (km)	BEARING (N/S ° - ' - " E/W)
	N	E				
PL57	827,448.330	599,111.336	22.120	05°–48'–44.46"	0+977.566	N 49°–01'–18.03" E
PL58	827,529.328	599,187.423	111.130	06°–51'–24.99"	1+088.696	N 43°–12'–33.58" E
PL59	827,558.281	599,222.009	45.105	22°–14'–02.16"	1+133.801	N 50°–03'–58.56" E
PL60	827,569.591	599,257.447	37.199	–	1+171.000	N 72°–17'–58.46" E

NOTES :

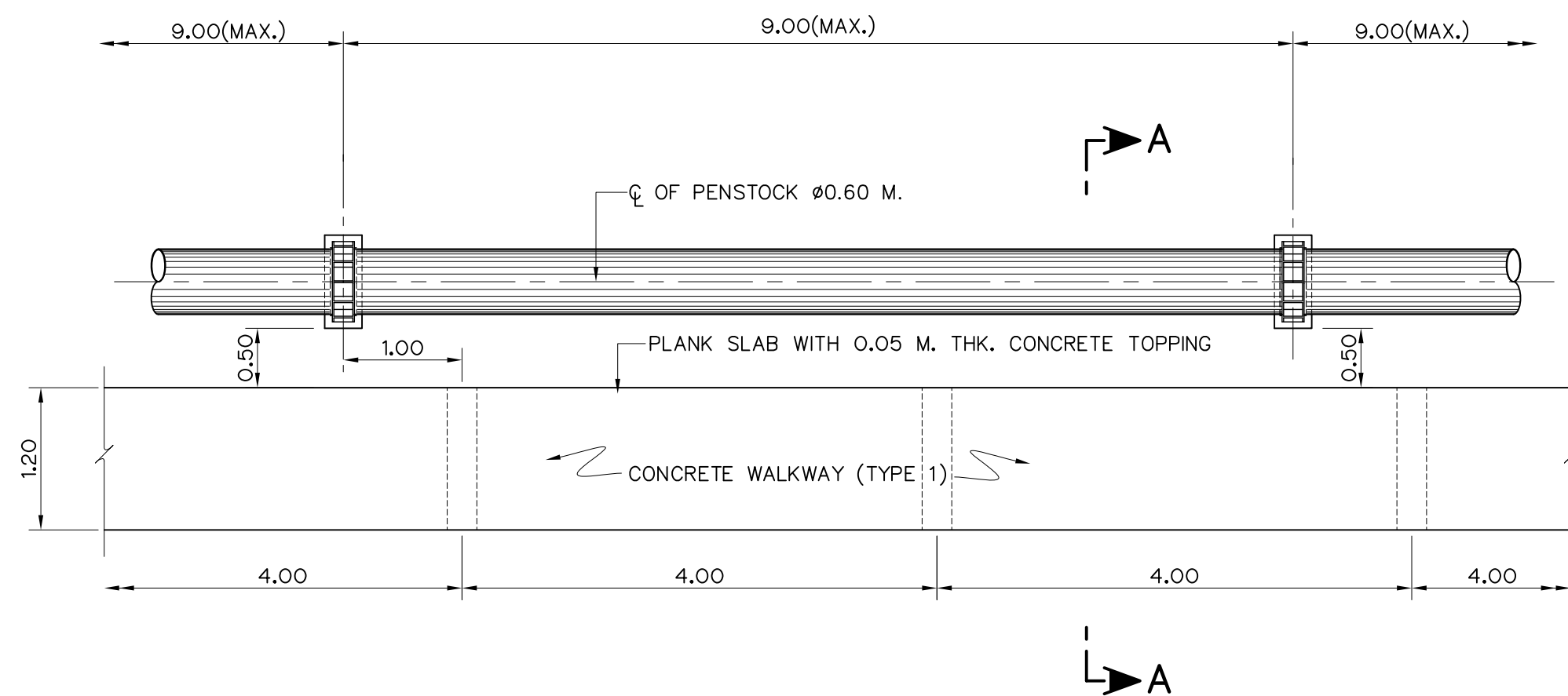
- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS–GN–03
- THE ALIGNMENT OF THE PENSTOCK AND RELATED STRUCTURES SHALL BE CHECK AND CORRECTED BY THE CONTRACTOR TO SUIT THE FIELD CONDITIONS AND SHALL BE SUBMITTED TO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

REFERENCE DRAWINGS :

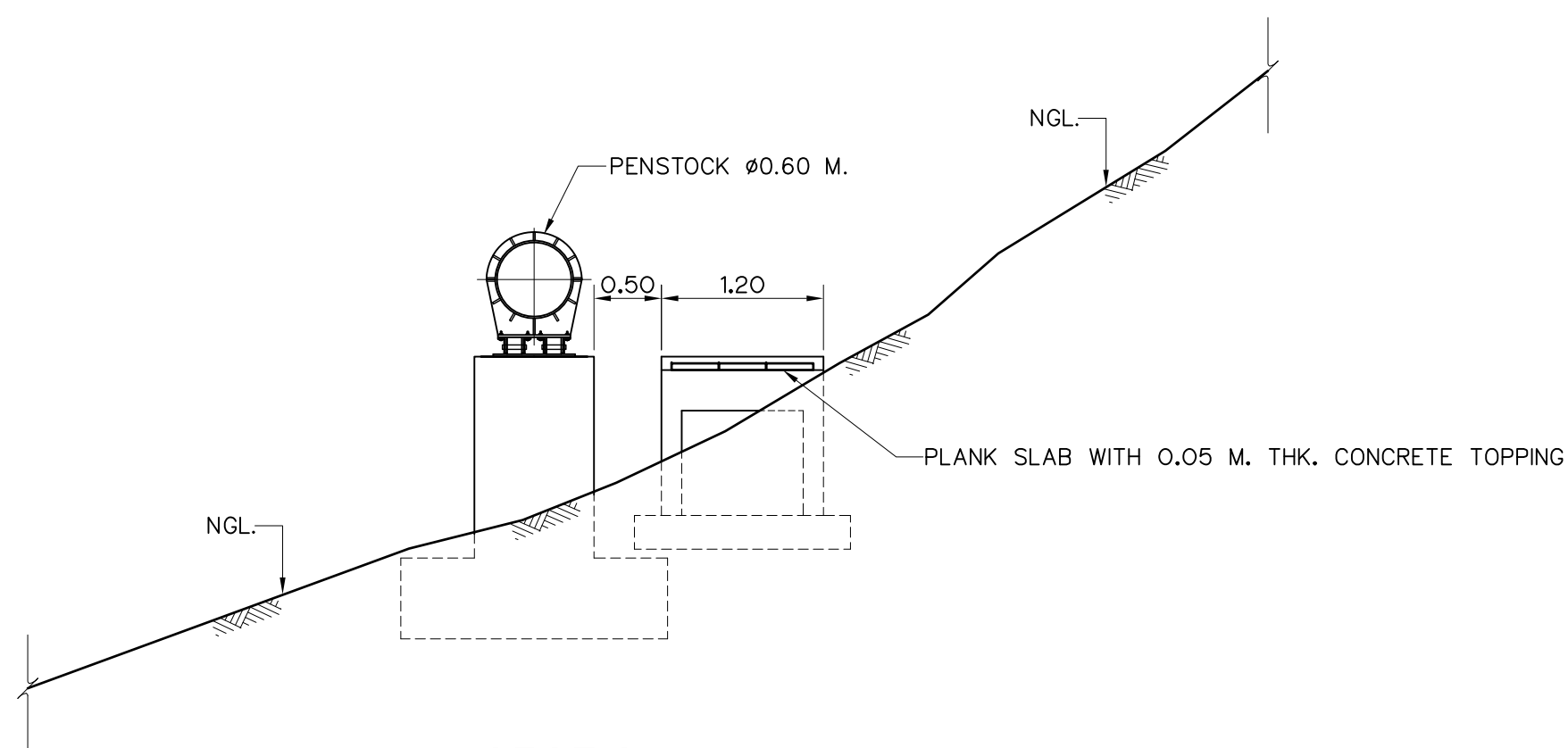
- PENSTOCK, PIER TYPE 2 DETAILS HLS–PS–08



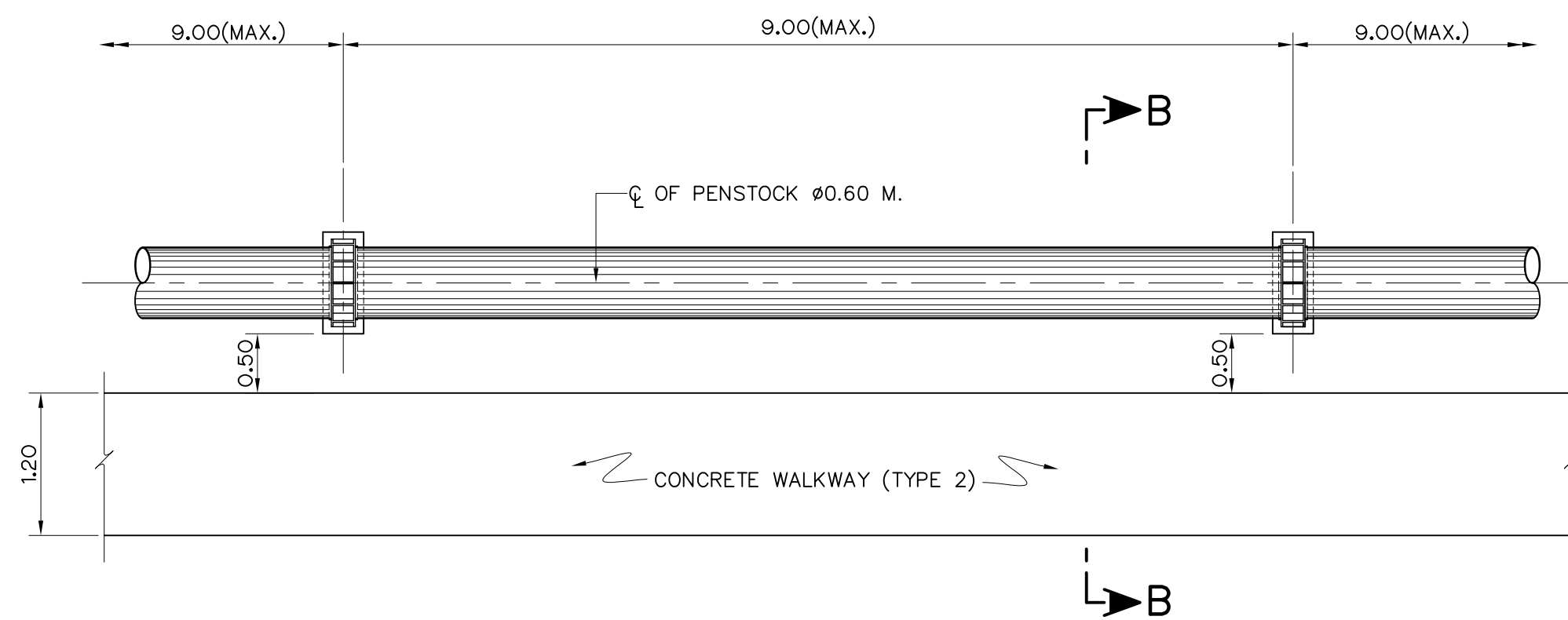
3						FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
2						DESIGNED ๒๒.6651	REVIEWED S.KITICHAJ
1						DRAWN ๒๒.๐๒๓	SUBMITTED ๒๒.๐๒๓
NO.	DATE	REVISIONS	CHECKED	APPROVED		CHECKED ๒๒.7324	RECOMMENDED ๒๒.๗๓๒
CONSULTANTS			DEDE			PROJECT MANAGER ๒๒.๗๓๒ 14/01/62 DATE	DRAWING NO. HLS–PS–04 SHEET NO. 26 OF 78



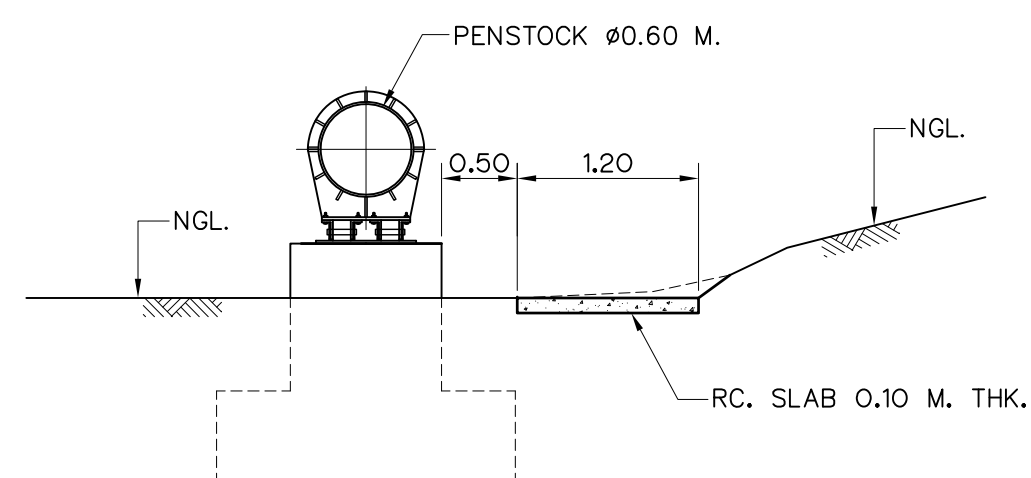
WALKWAY PLAN (TYPE 1)
SCALE 1:50



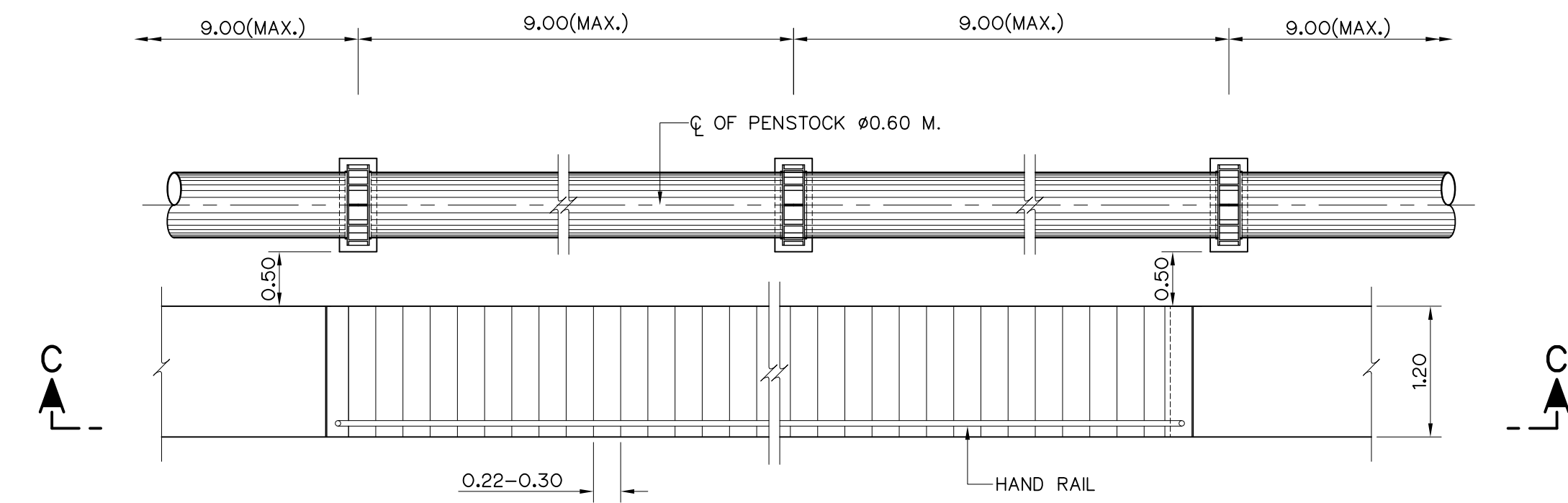
SECTION A-A
SCALE 1:50



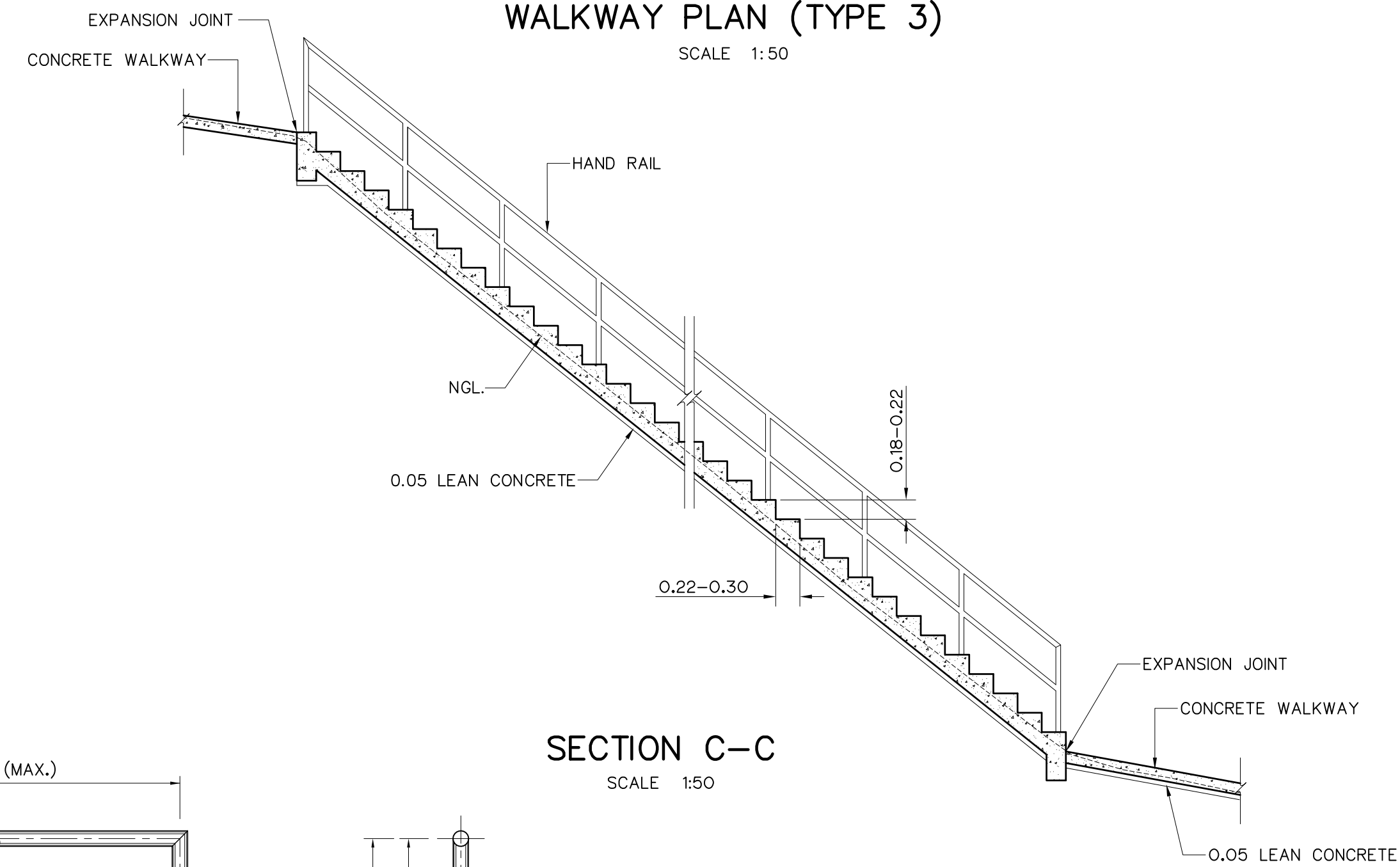
WALKWAY PLAN (TYPE 2)
SCALE 1:50



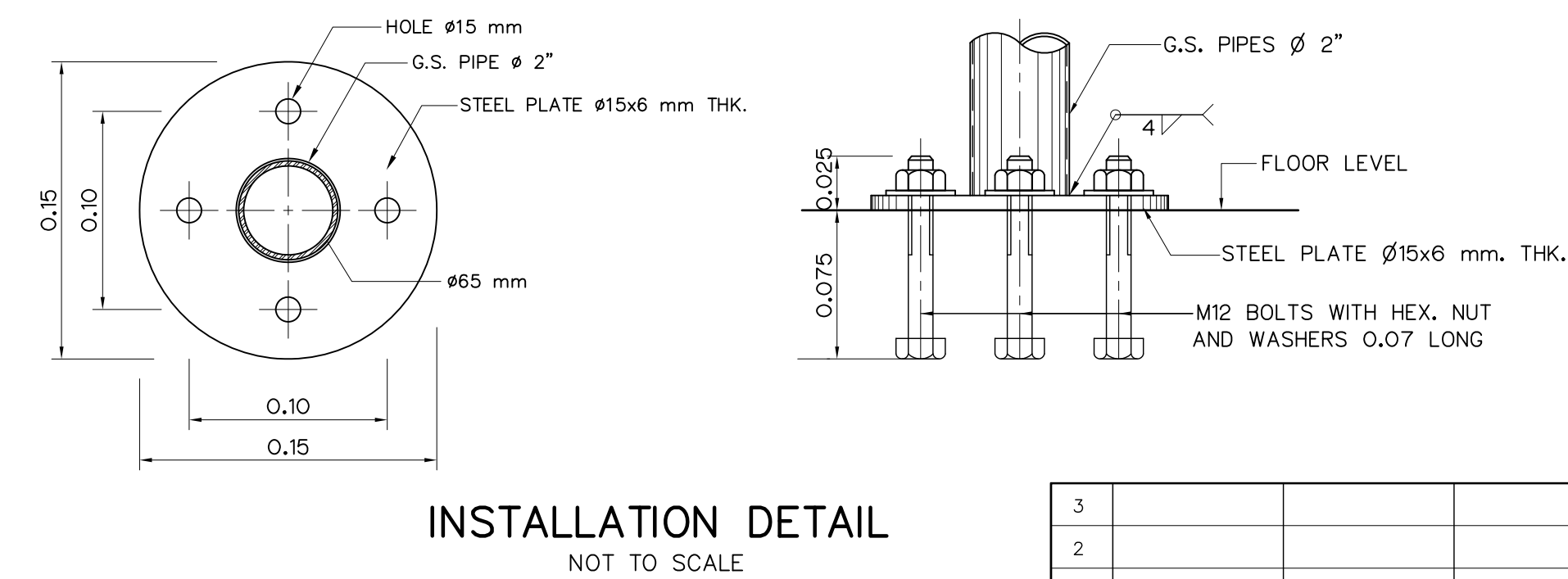
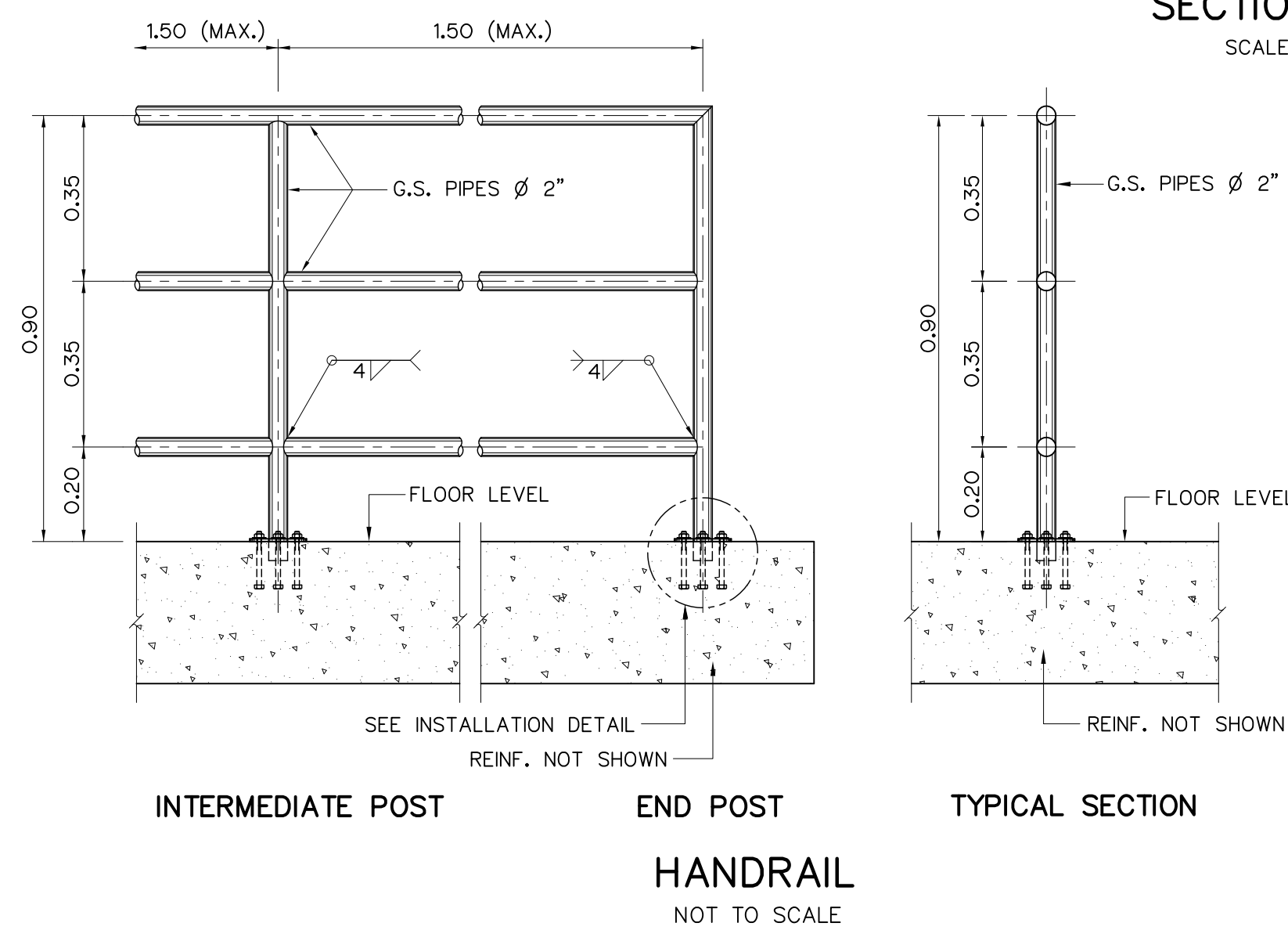
SECTION B-B
SCALE 1:50



WALKWAY PLAN (TYPE 3)
SCALE 1:50



SECTION C-C
SCALE 1:50

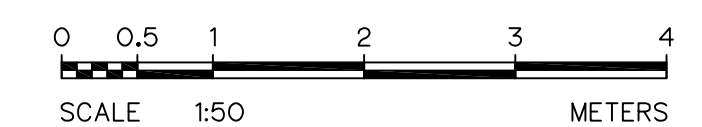


NOTES :

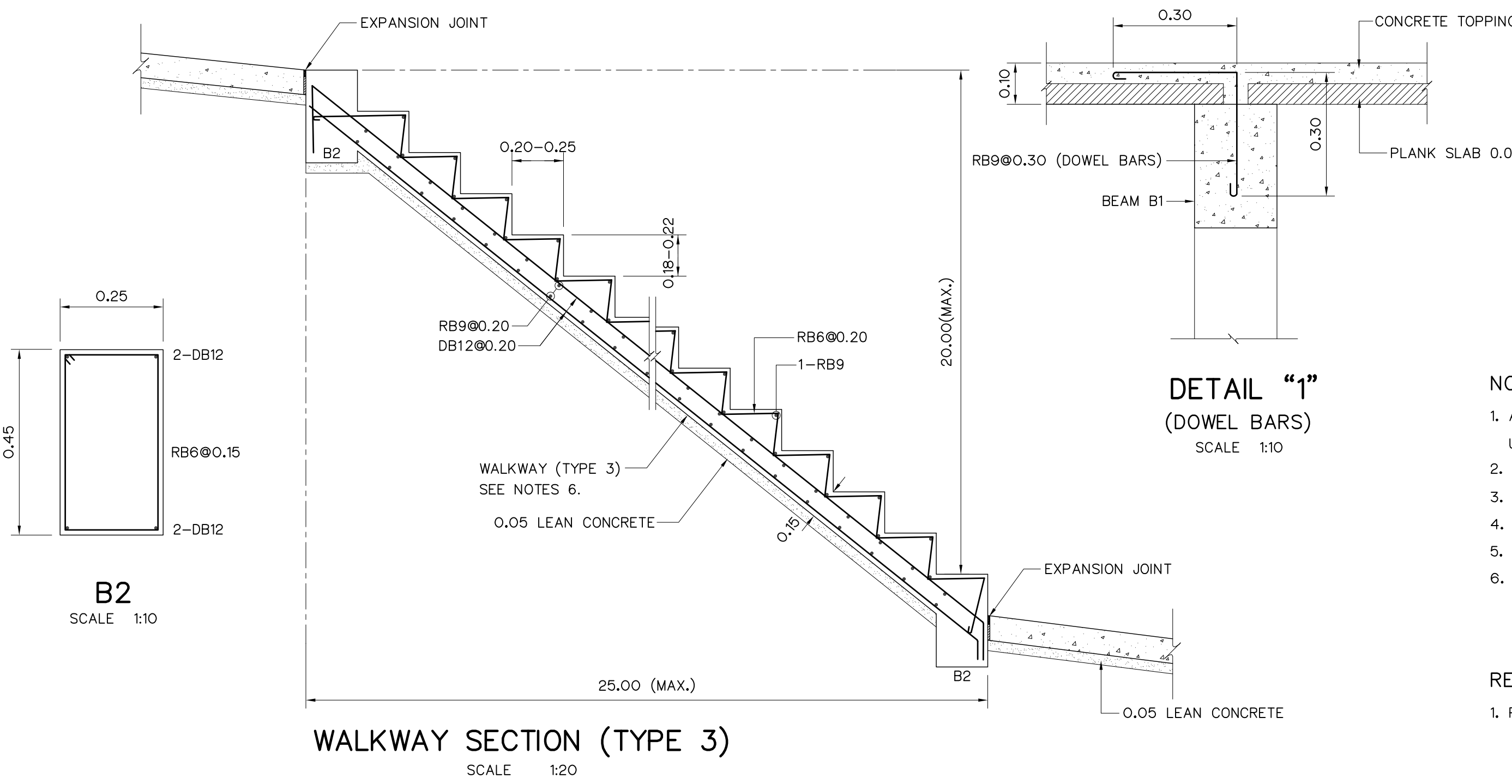
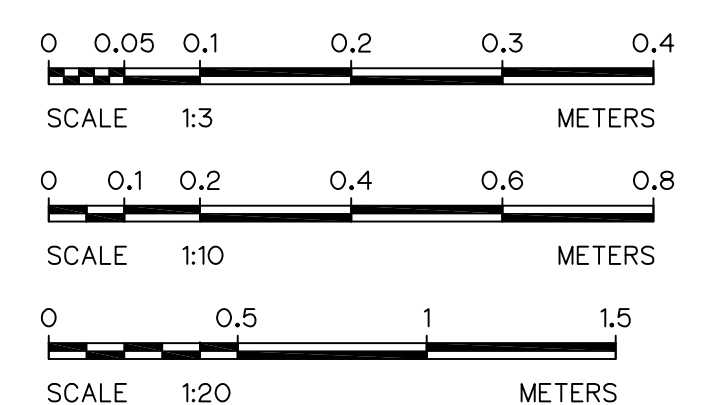
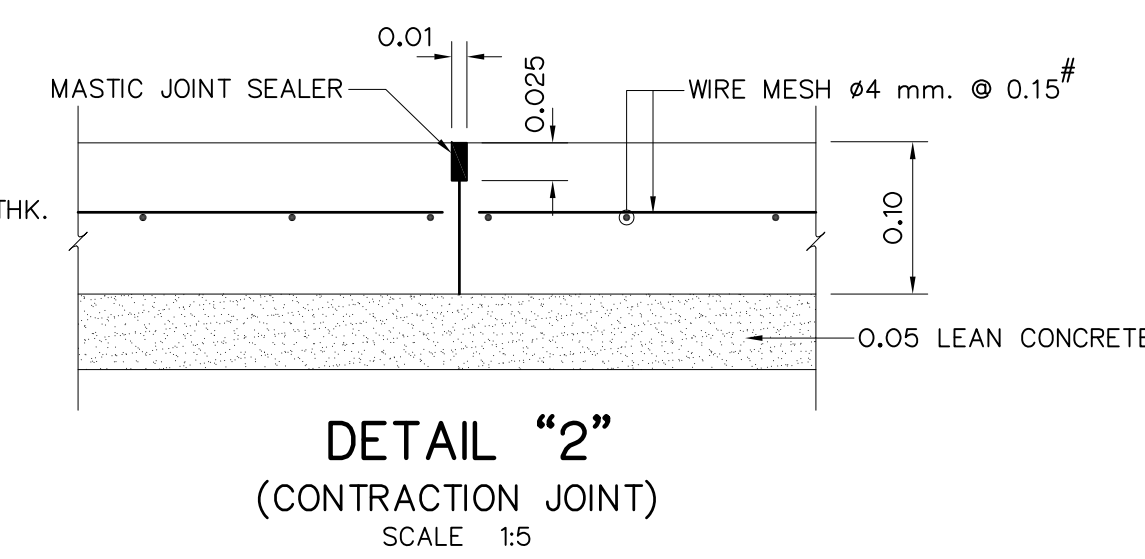
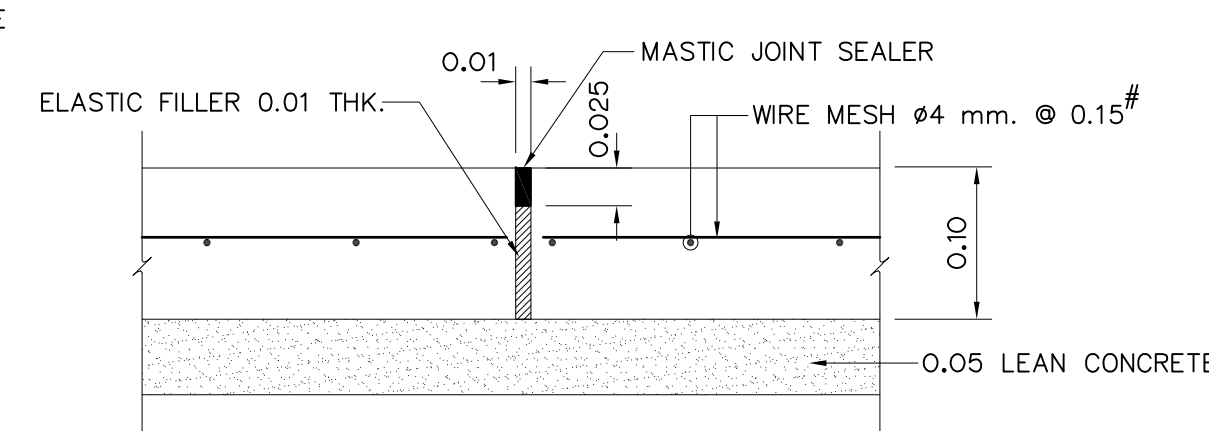
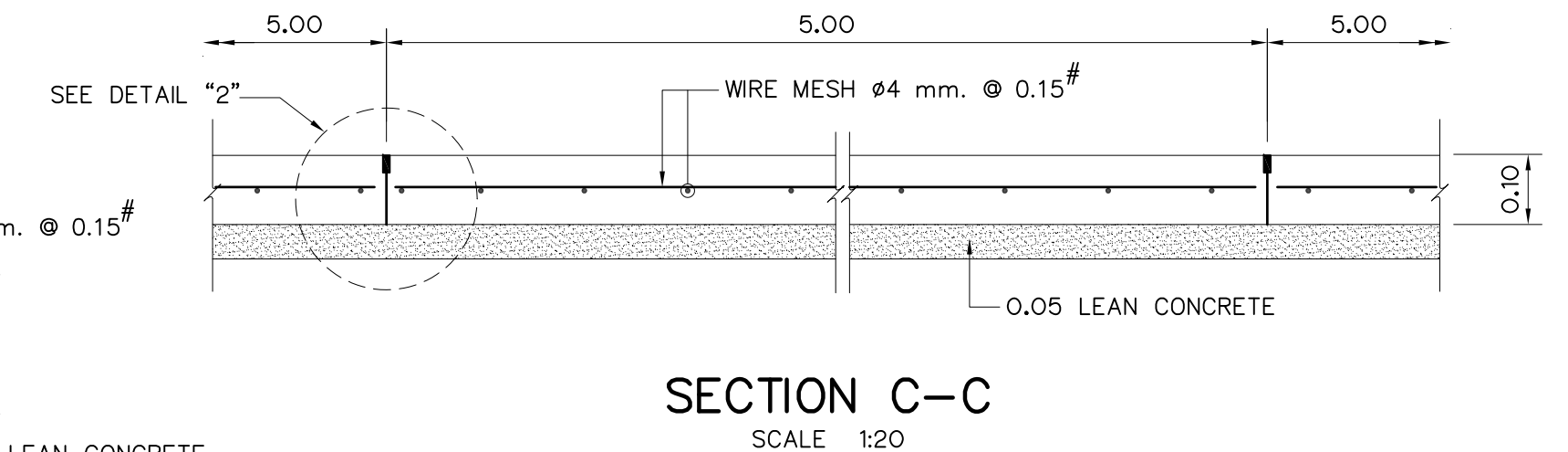
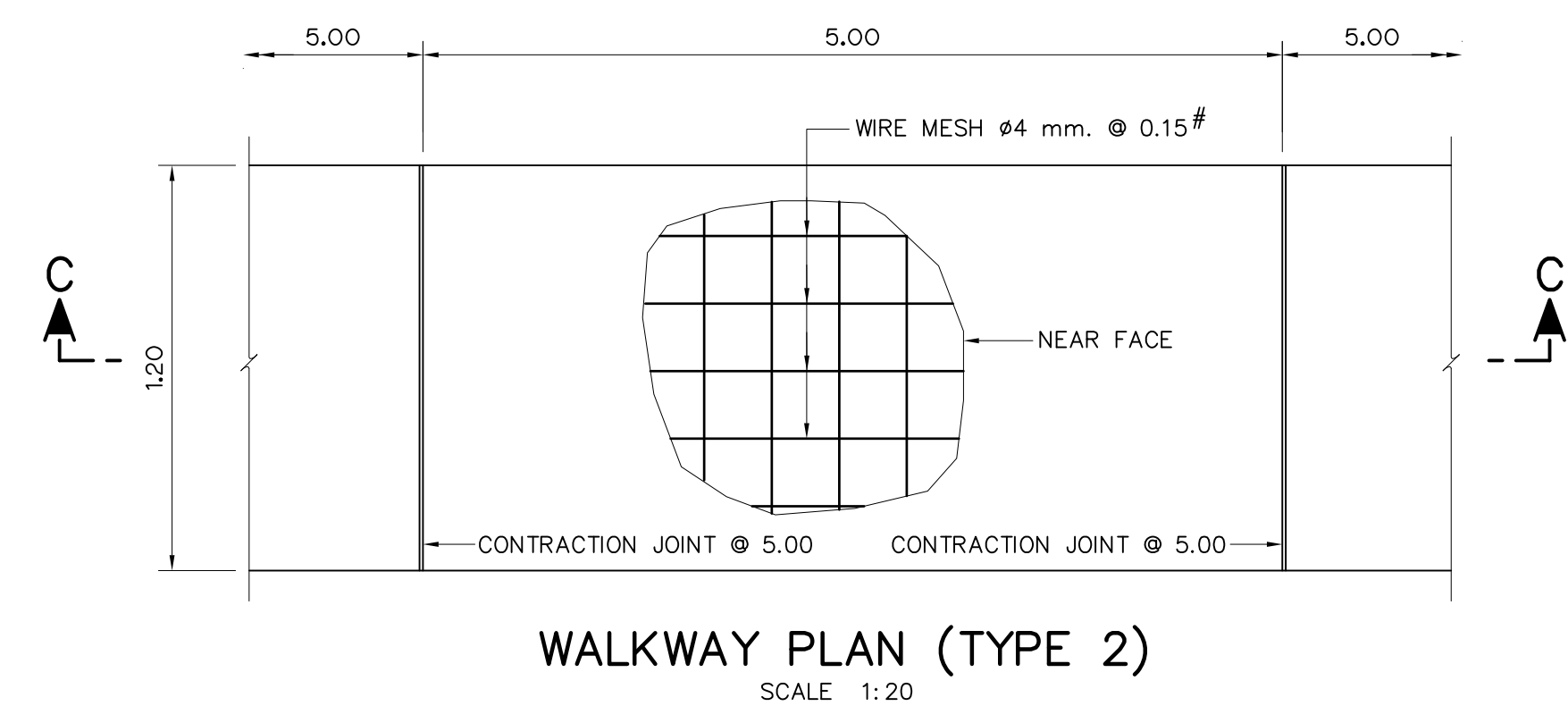
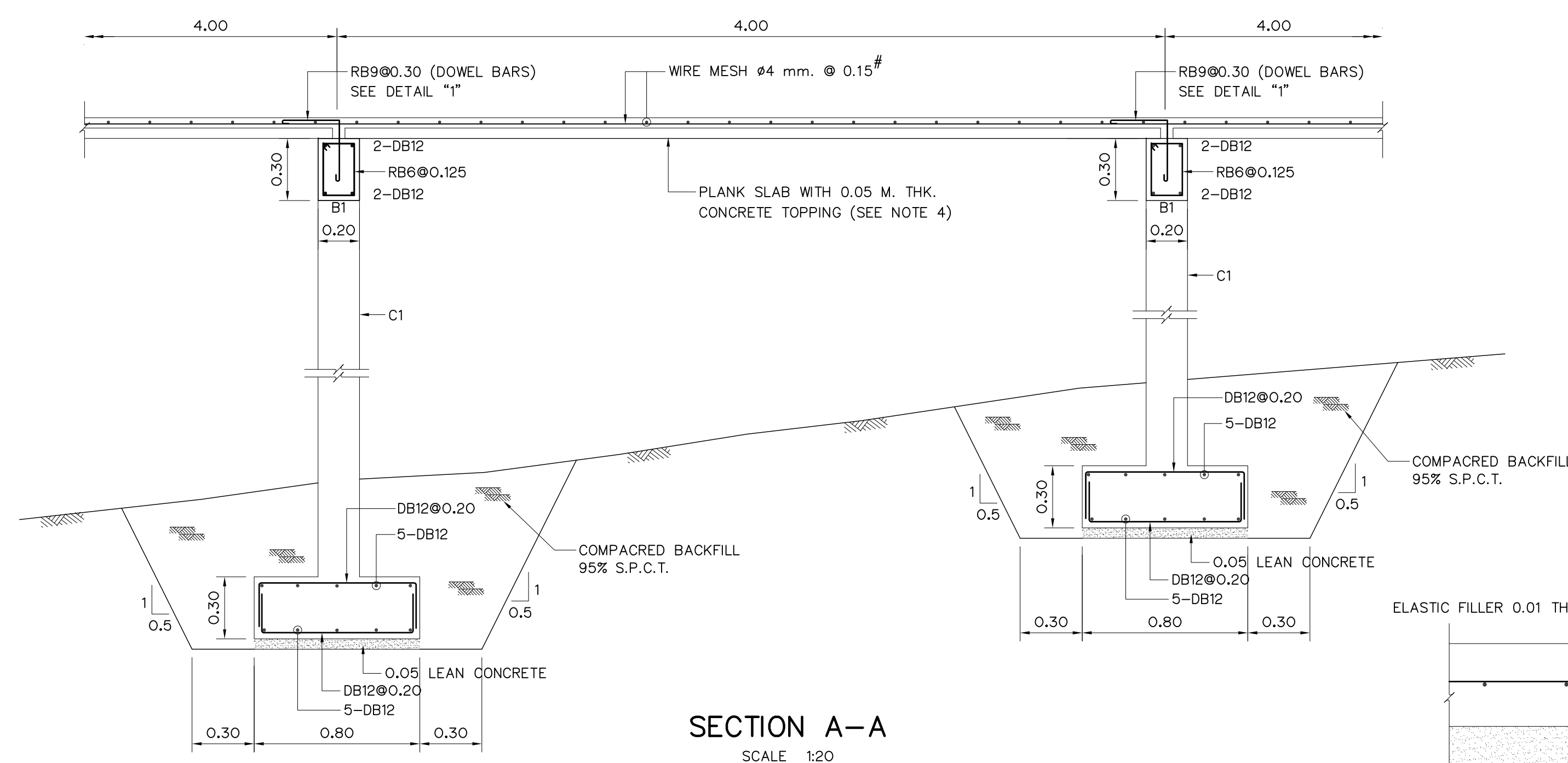
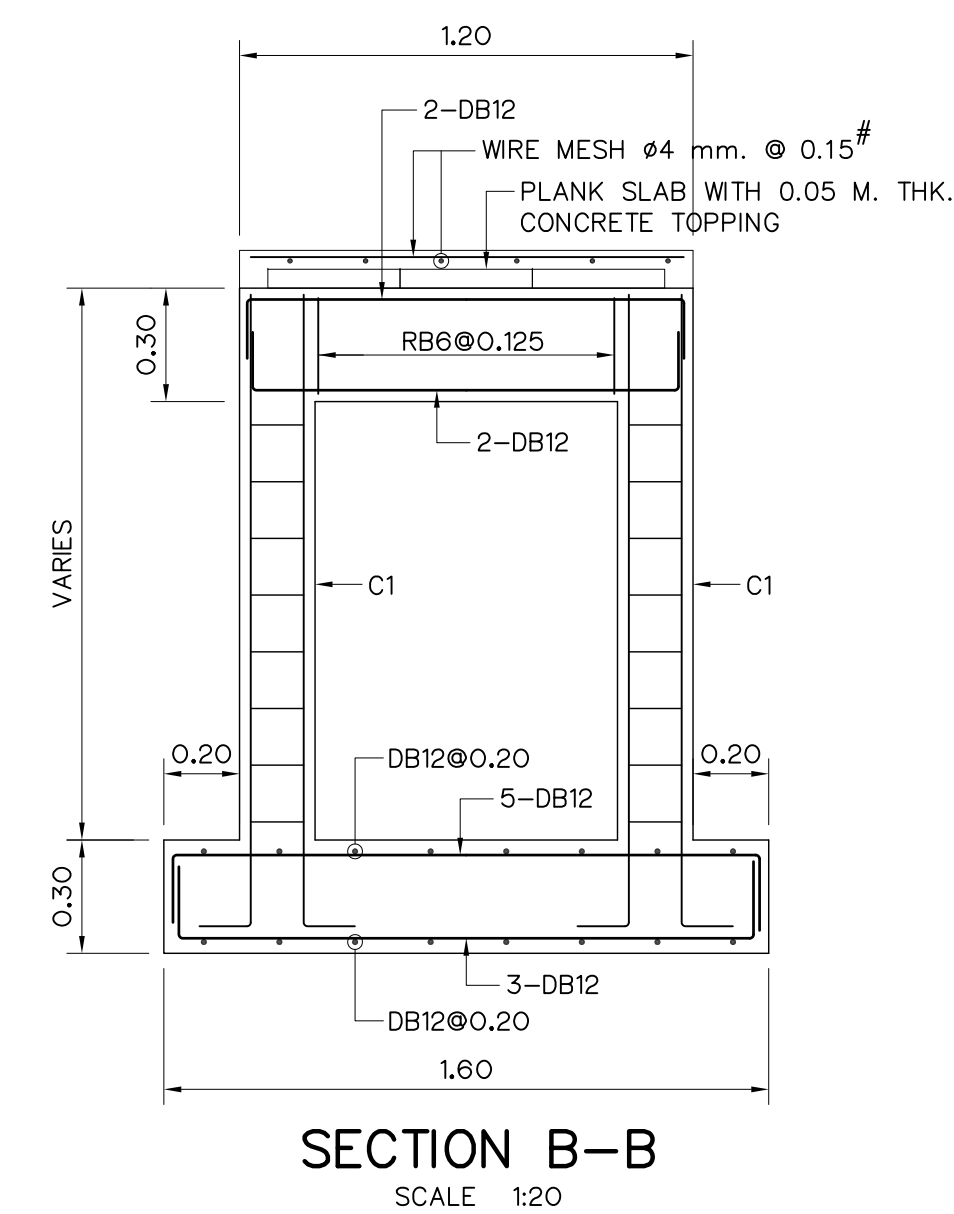
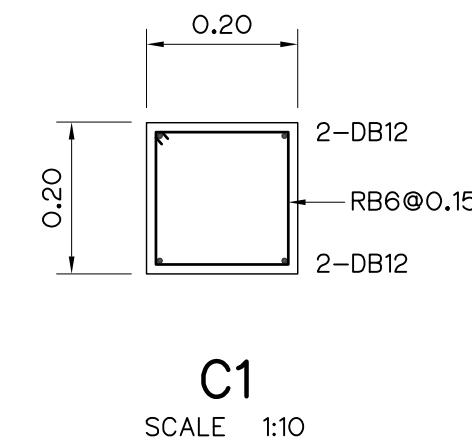
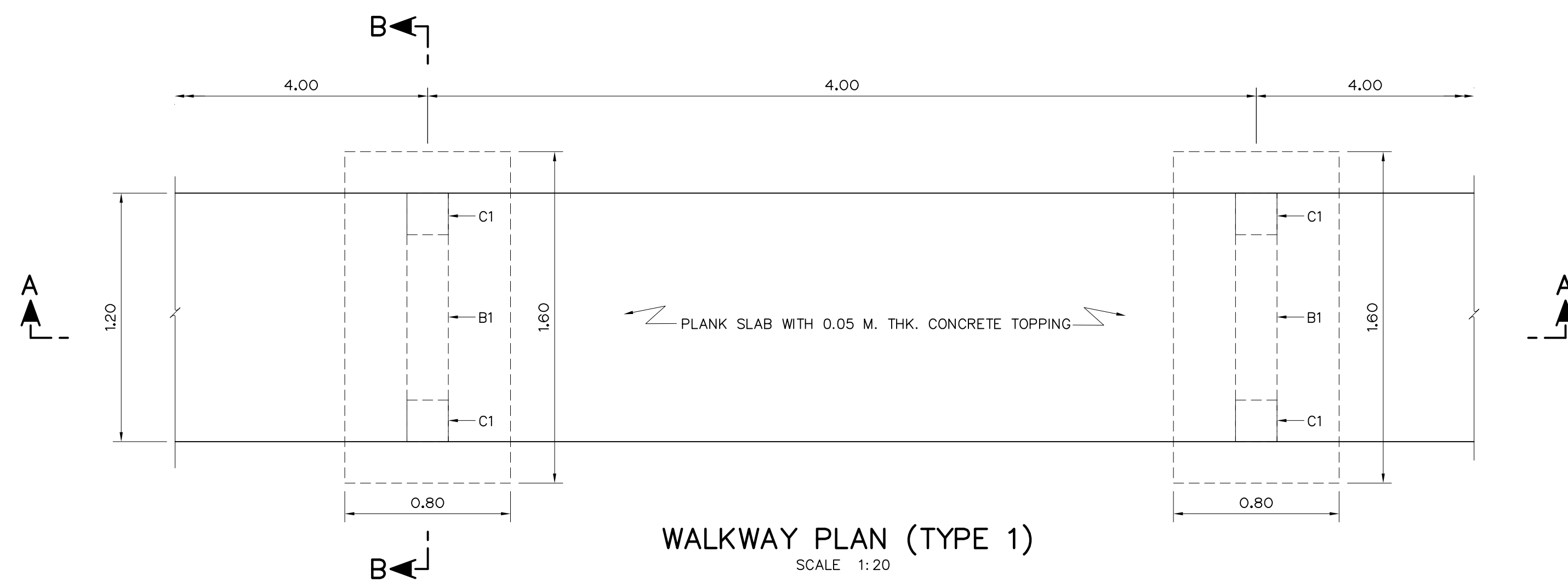
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

REFERENCE DRAWINGS :

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



KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUAI LAM SIN HYDROPOWER PROJECT			
CIVIL WORKS PENSTOCK DETAILS OF WALKWAY			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED		REVIEWED S.KTICHAJ	
DRAWN		SUBMITTED	
CHECKED		RECOMMENDED	
APPROVED		APPROVED	
CONSULTANTS		DEDE	
PROJECT MANAGER		DATE	
14/01/62		DRAWING NO.	
HLS-PS-05		SHEET NO.	
27		OF 78	



- NOTES :**
- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
 - SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
 - ALLOWABLE BEARING CAPACITY OF FOUNDATION SHALL NOT BE LESS THAN 10 T/M²
 - SAFE SUPERIMPOSED SERVICE LOAD OF PLANK SLAB SHALL NOT BE LESS THAN 400 KG./M²
 - EXPANSION JOINT SHALL BE PROVIDED AT THE INTEVAL OF 100 METERS OR LESS THAN.
 - THE RISERS AND THREADS SHALL BE DETERMINED BY THE CONTRACTOR. TO SUIT THE FIELD CONDITIONS AND SHALL BE SUBMITTED TO FIELD ENGINEER FOR APPROVAL.

- REFERENCE DRAWINGS :**
- PENSTOCK DETAILS OF WALKWAY HLS-PS-05

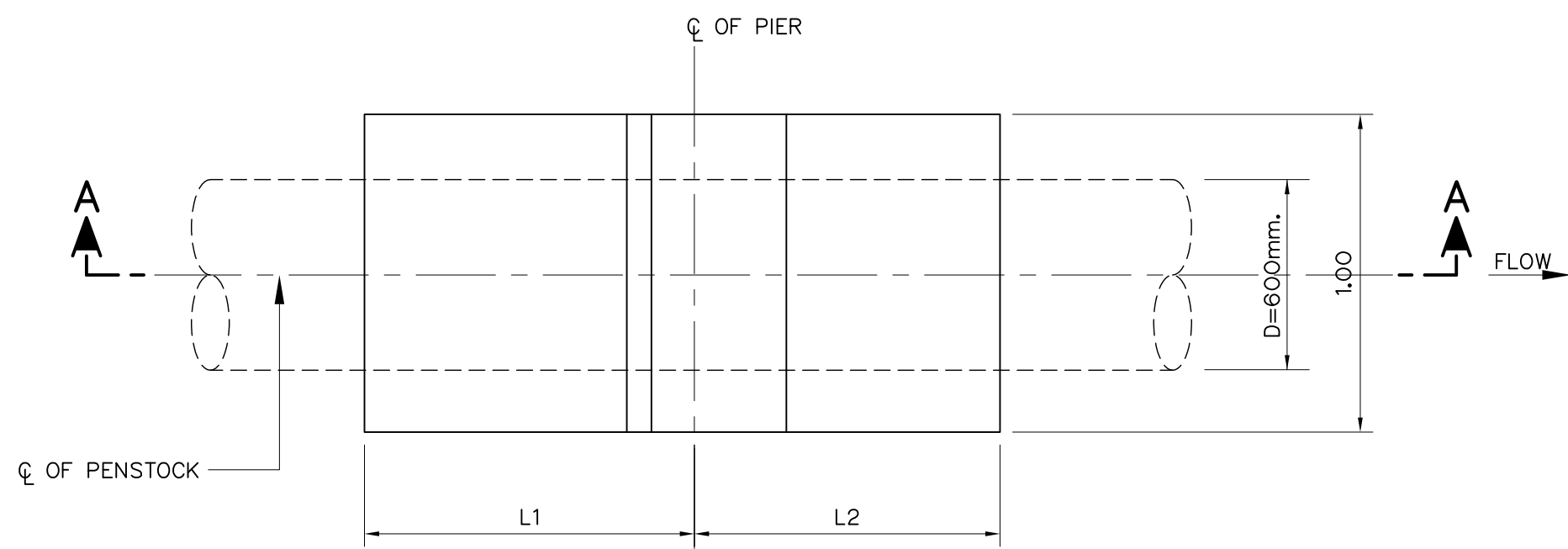
3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

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

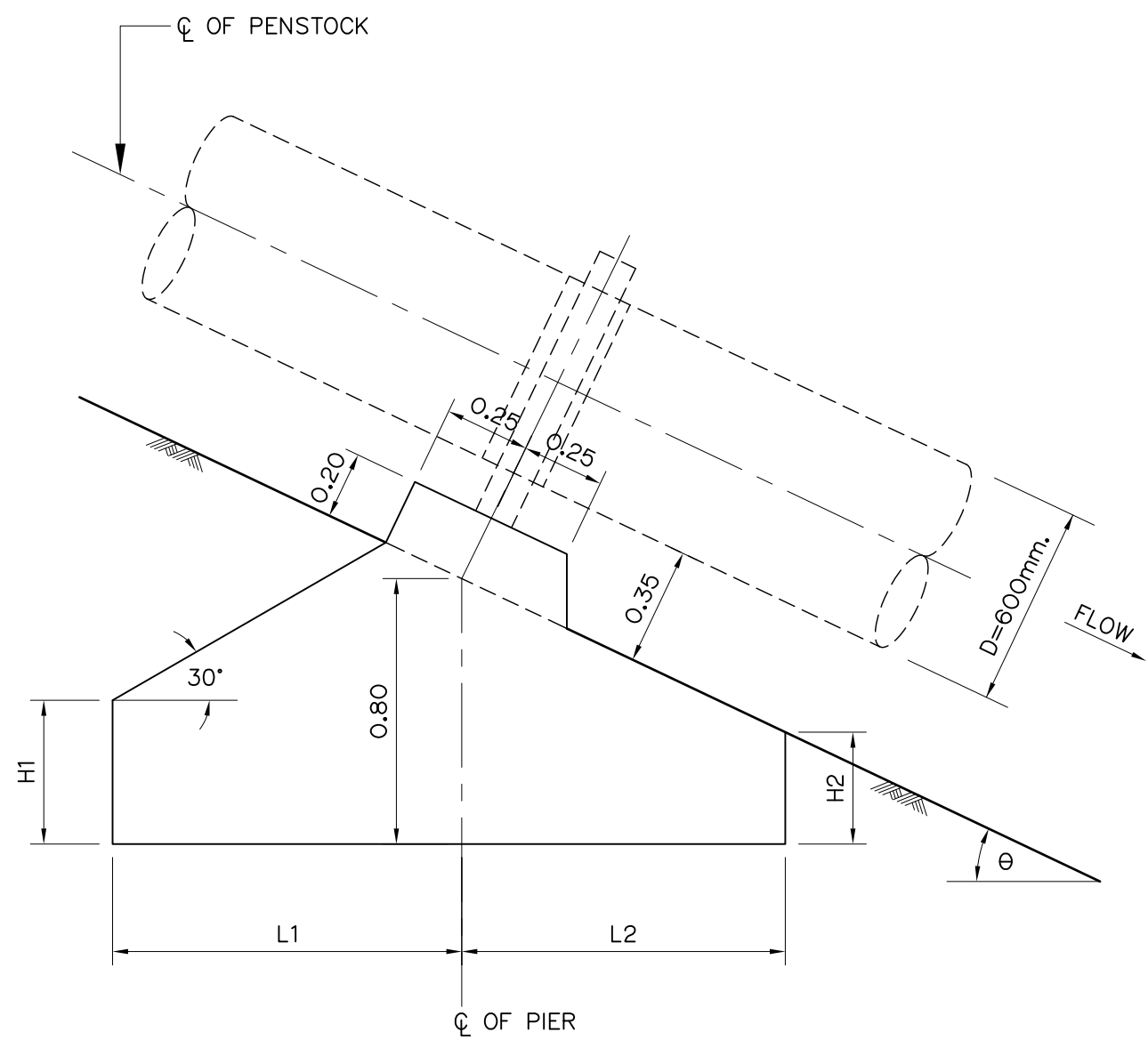
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
REINFORCEMENT DETAILS WALKWAY

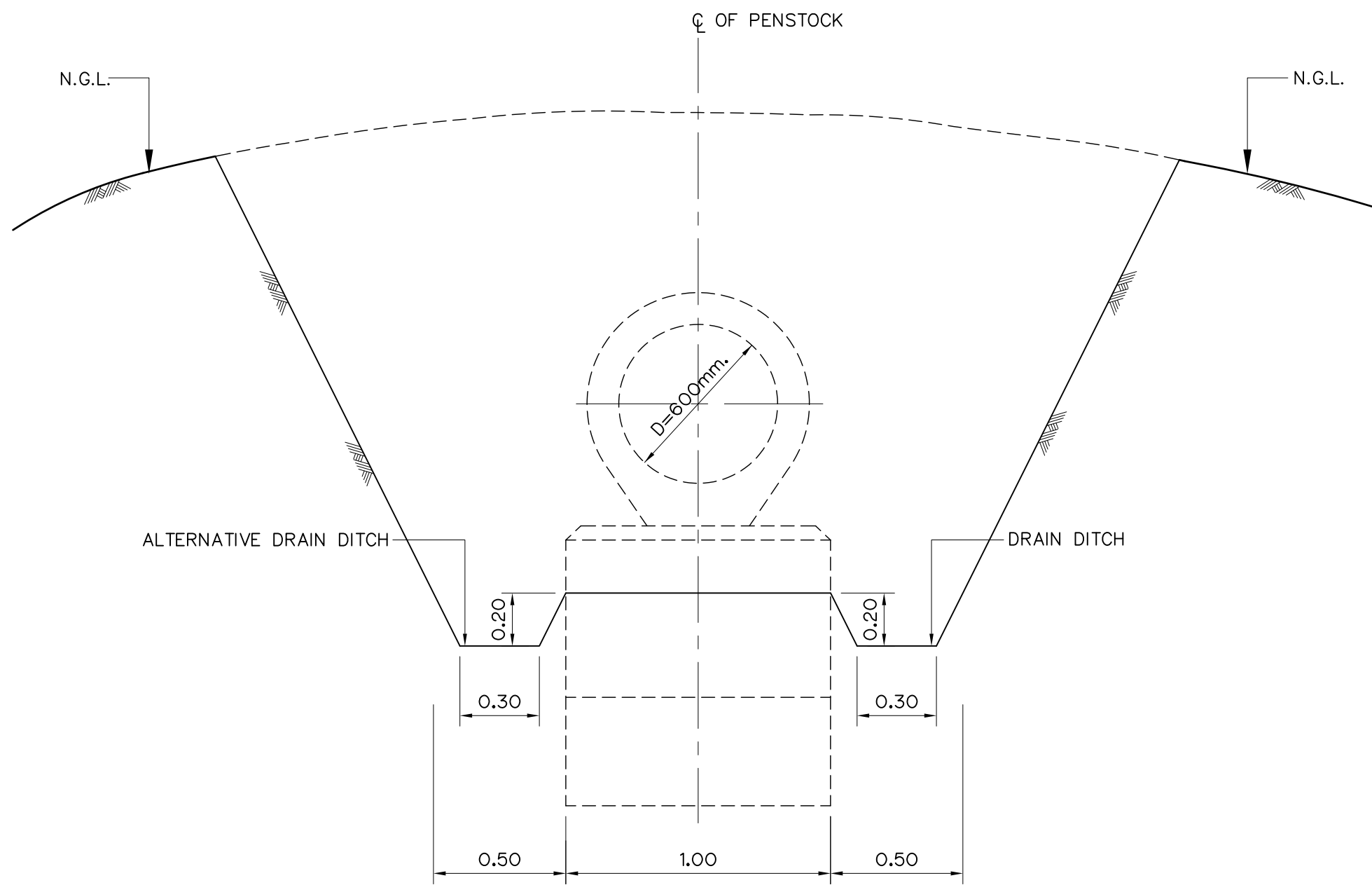
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED	REVIEWED S.KTICHAJ	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED		APPROVED	
PROJECT MANAGER		DATE	DRAWING NO.
		14/01/62	HLS-PS-06
			SHEET NO.
			28 OF 78



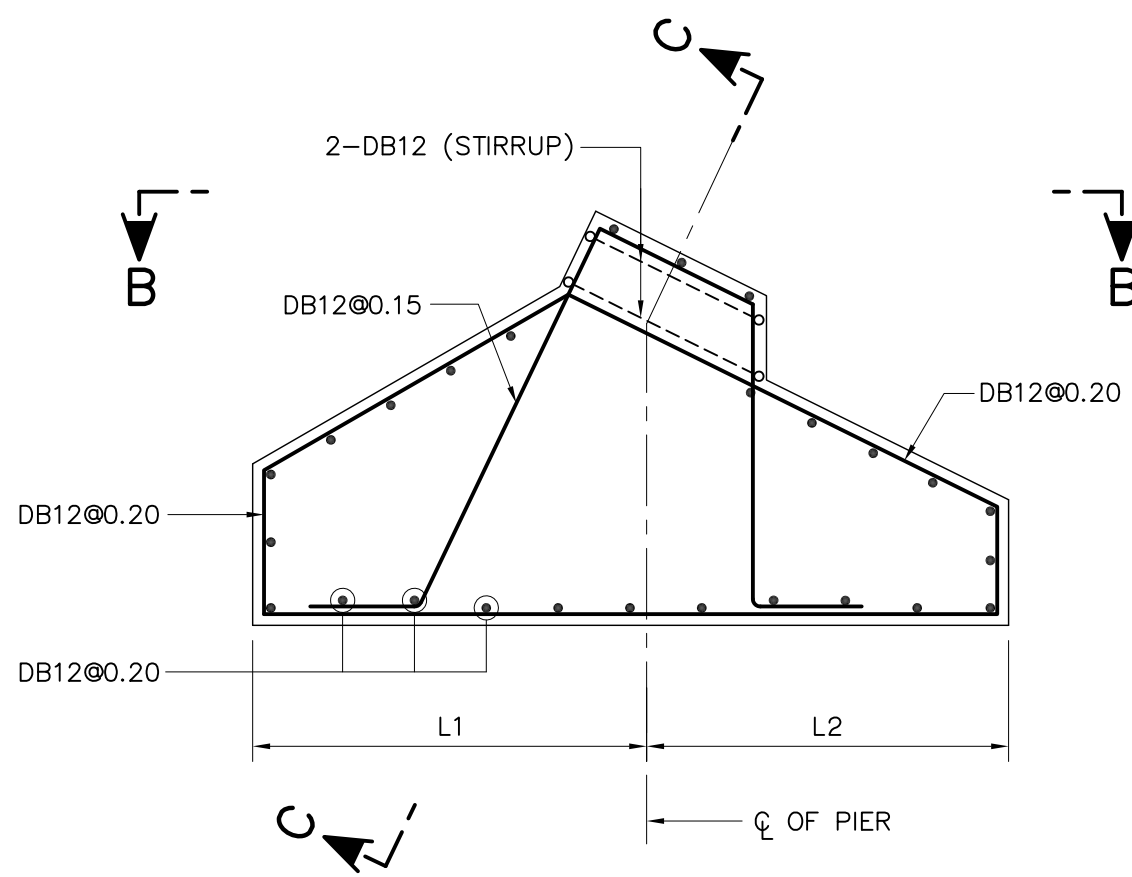
PLAN
SCALE 1:20



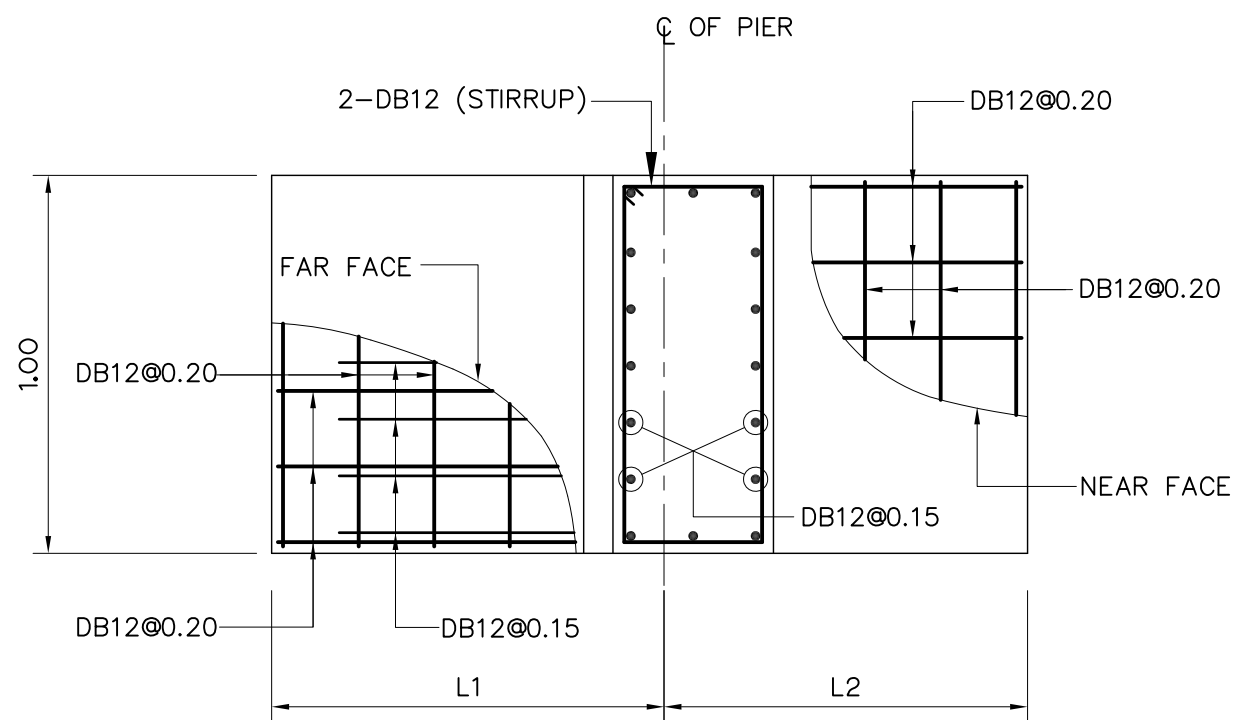
ELEVATION
SCALE 1:20



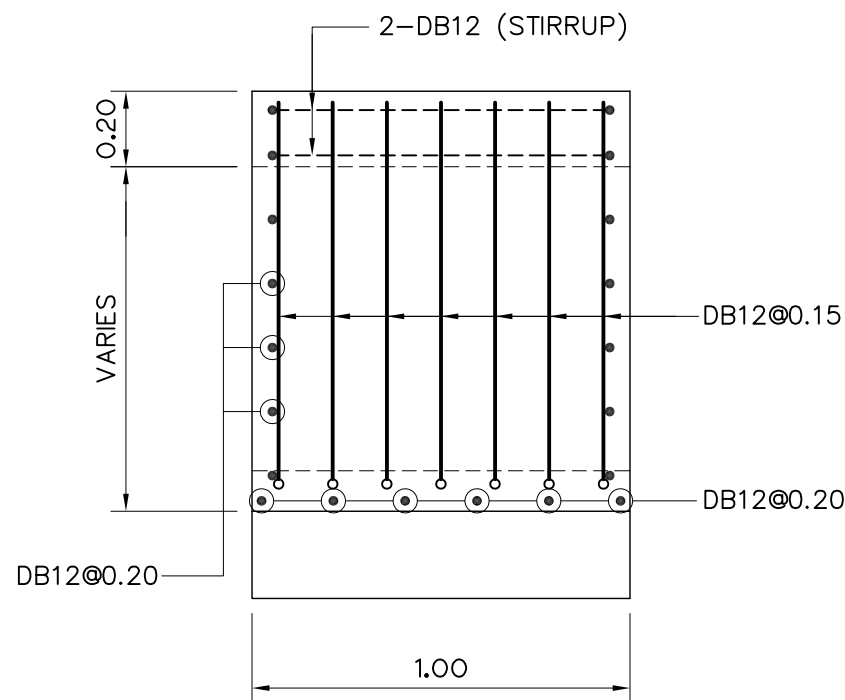
TYPICAL SECTION OF PENSTOCK TRENCH
SCALE 1:20



SECTION A-A
SCALE 1:20



SECTION B-B
SCALE 1:20



SECTION C-C
SCALE "A"

PIER DIMENSIONS

KM		SLOPE (θ) (DEGREE)	L1 (m.)	L2 (m.)	H1 (m.)	H2 (m.)
FROM	TO					
0+572.416	0+588.416	10'-13'-05"	1.00	1.00	0.41	0.62
0+605.341	0+658.349	15'-48'-34"	1.00	1.00	0.43	0.52
0+676.940	0+686.940	13'-44'-49"	1.00	1.00	0.42	0.56
0+705.456	0+740.456	31'-33'-23"	1.10	0.90	0.42	0.25
0+756.594	0+828.625	23'-38'-00"	1.10	0.90	0.40	0.41
0+836.625	0+860.625	26'-21'-39"	1.10	0.90	0.41	0.35
0+876.575	0+900.575	24'-47'-26"	1.10	0.90	0.40	0.38
0+916.570	0+948.570	25'-19'-29"	1.10	0.90	0.40	0.37
0+963.446	0+970.446	41'-18'-48"	1.35	0.65	0.29	0.23
0+985.566	1+081.566	16'-24'-51"	1.00	1.00	0.43	0.51
1+096.696	1+120.696	13'-44'-53"	1.00	1.00	0.42	0.56
1+339.801	1+355.801	20'-52'-19"	1.10	0.90	0.39	0.46

NOTES :

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

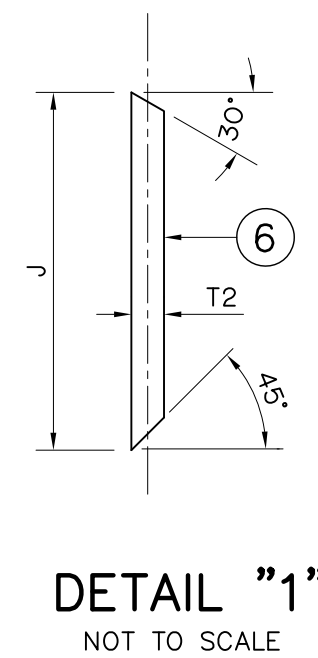


KINGDOM OF THAILAND
Department of Alternative
Energy Development and Efficiency
MINISTRY OF ENERGY

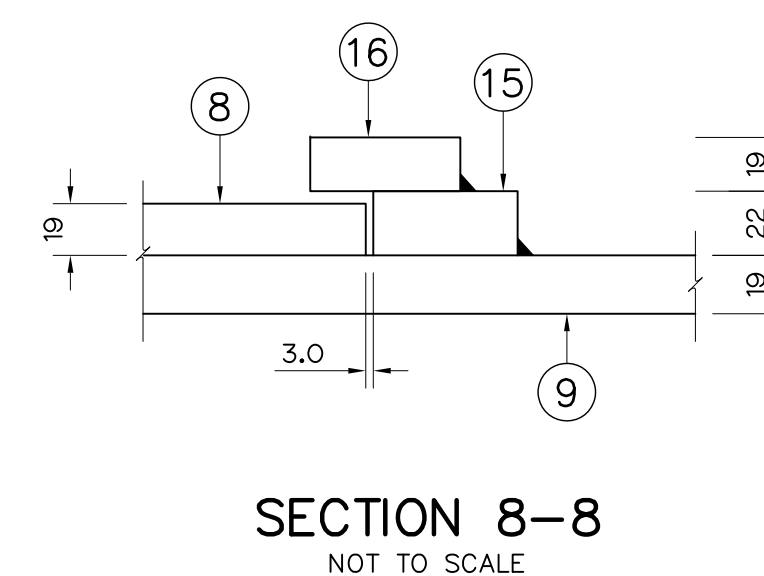
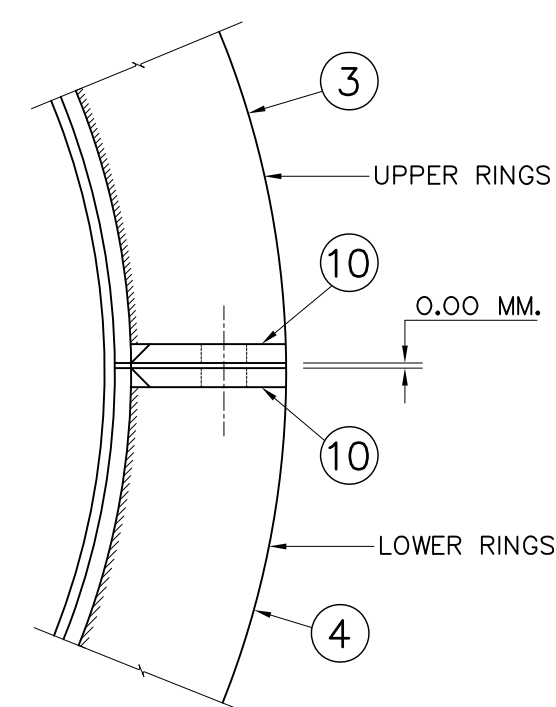
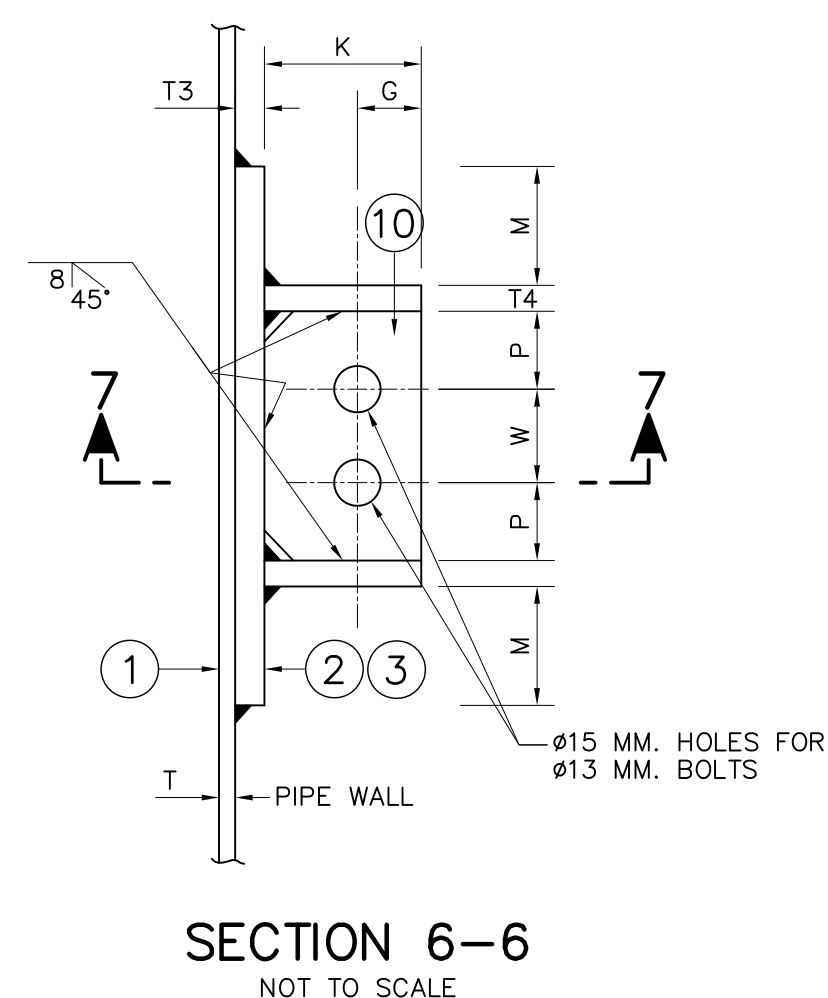
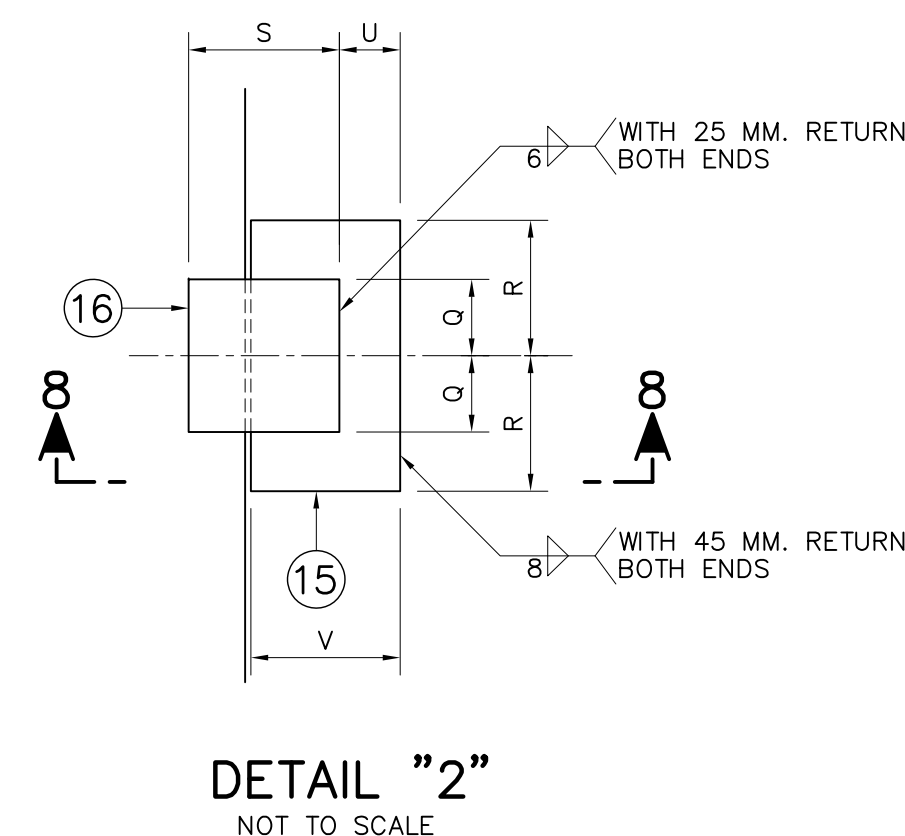
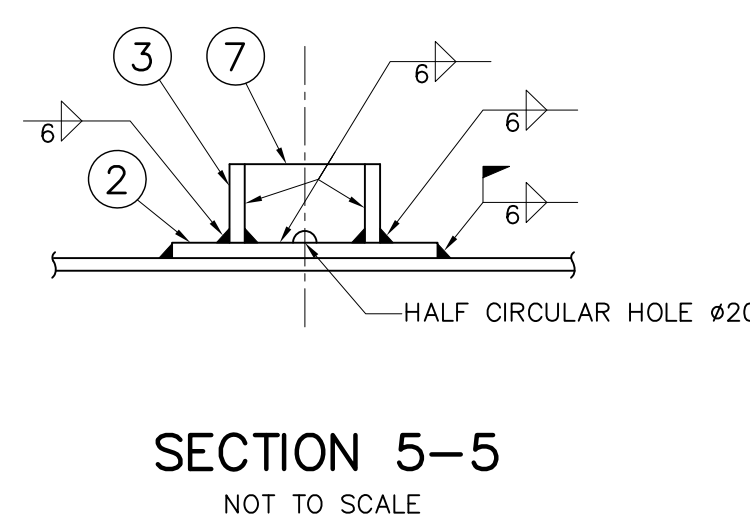
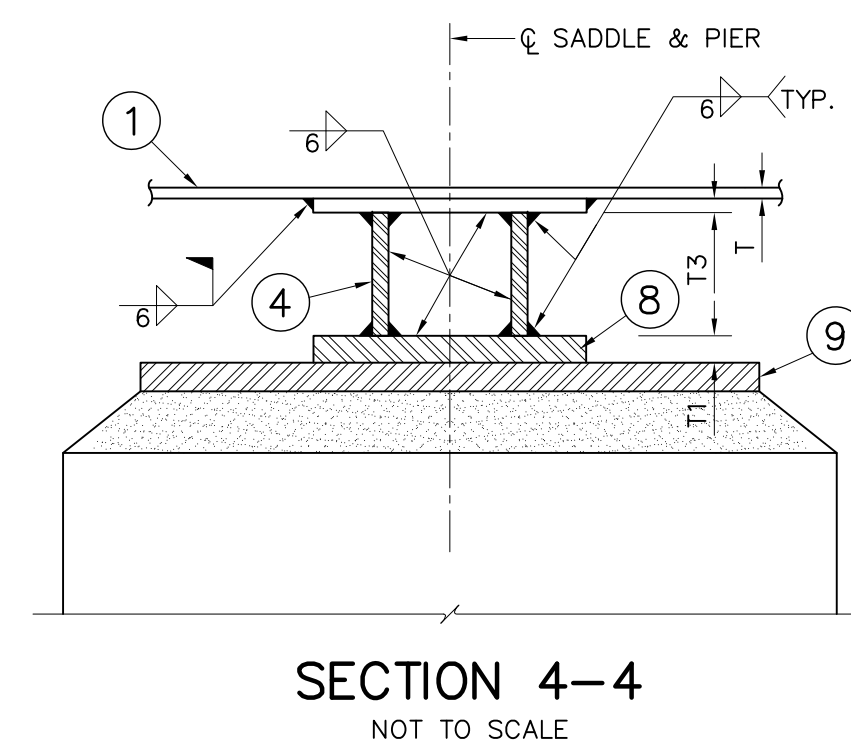
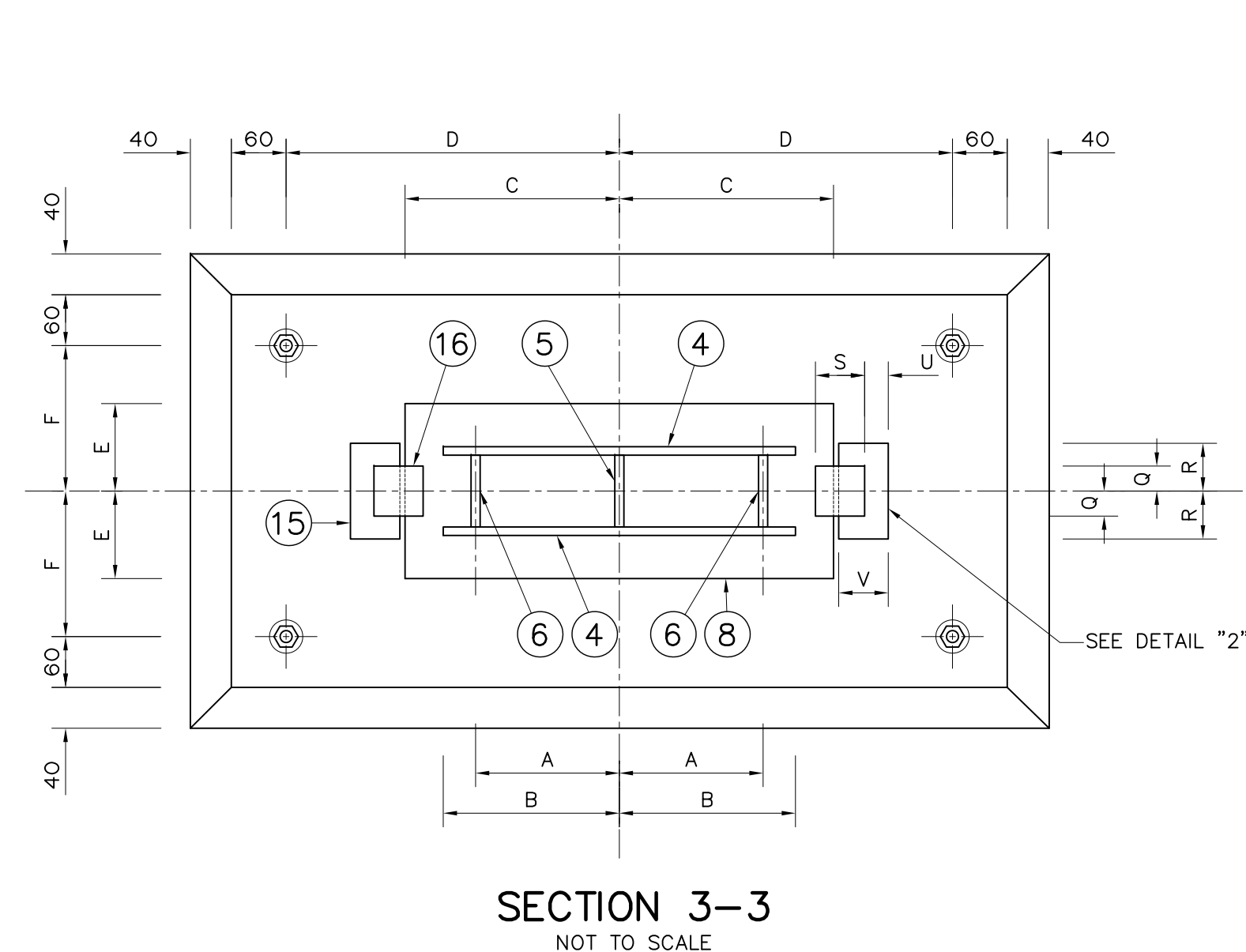
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
PENSTOCK
PIER TYPE 2 DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED		REVIEWED S.KITICHAJ	
DRAWN		SUBMITTED	
CHECKED		RECOMMENDED	
NO.		APPROVED	
CONSULTANTS		DEDE	
PROJECT MANAGER		14/01/62 DATE	
HLS-PS-08		SHEET NO. 30 OF 78	



BILL OF MATERIALS (PER ONE SET OF SUPPORT)				
ITEMS	DESCRIPTION	MATERIAL	QUAN.	REMARKS
1	PENSTOCK STEEL PIPE	ASTM — A 283 , GRADE D	—	
2	REINFORCING 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 10x80x80	ASTM — A 283 , GRADE D	1	
6	STIFFENER PLATES 10x80x116	ASTM — A 283 , GRADE D	2	
7	STIFFENER PLATES 10x80x50	ASTM — A 283 , GRADE D	7	
8	SADDLE PLATE 19x180x440	ASTM — A 36	1	SEE NOTE 3
9	BASE PLATE 19x400x800	ASTM — A 36	1	GALVANIZED
10	BOLTING PLATES 10x80x50	ASTM — A 283 , GRADE D	4	
11	BOLTS Ø13x40 W/NUT & WASHER	ASTM — A 325	4	GALVANIZED
12	ANCHOR BOLTS Ø19x350	ASTM — A 307 , GRADE B	4	SEE NOTE 4
13	NUTS Ø19	ASTM — A 307 , GRADE B	12	GALVANIZED
14	WASHER Ø19	ASTM — A 307 , GRADE B	4	GALVANIZED
15	GUIDE PLATE 22x50x90	ASTM — A 36	2	
16	UPLIFT PLATE 19x50x50	ASTM — A 36	2	

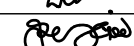
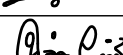


- NOTES :**
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS. UNLESS OTHERWISE SHOWN.
 2. NO SPIRAL WELDED OF PIPE IN THESE REGION
 3. GALVANIZED ONLY PORTION EXPOSED TO WEATHER
 4. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY,
SHOP DRAWING SHALL BE DESIGNED BY CONTRACTOR
UNDER APPROVAL OF FIELD 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	600	12	161	200	260	400	100	150	20	80	123	80	92	40	40	25	25	45	50	20	50	30	19	10	10	12	
2	600	15	162.5	200	260	400	100	150	20	80	123.5	80	92	40	40	25	25	45	50	20	50	30	19	10	10	12	

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	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  281.6651		REVIEWED S.KIN(CHA)	
DRAWN  21		SUBMITTED 	
CHECKED  281.7324		RECOMMENDED  A.S. C.	
 14/01/62 PROJECT MANAGER		DRAWING NO. HLS-PS-09	
DATE		SHEET NO. 31 OF 78	

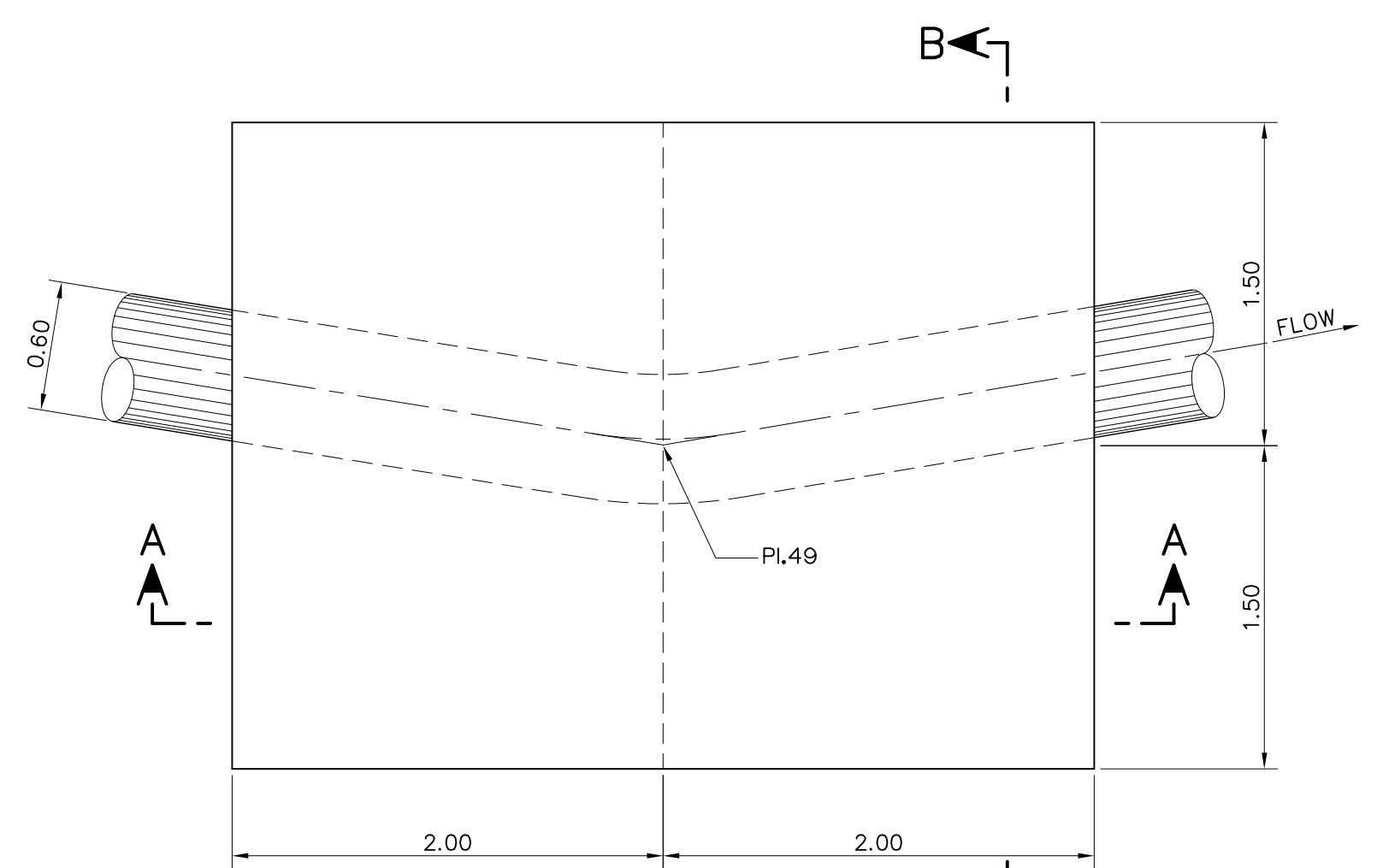


1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
3. THE ALIGNMENT OF THE PENSTOCK AND RELATED STRUCTURES SHALL BE CHECKED AND CORRECTED BY THE CONTRACTOR TO SUIT THE FIELD CONDITIONS AND SHALL BE SUBMITTED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

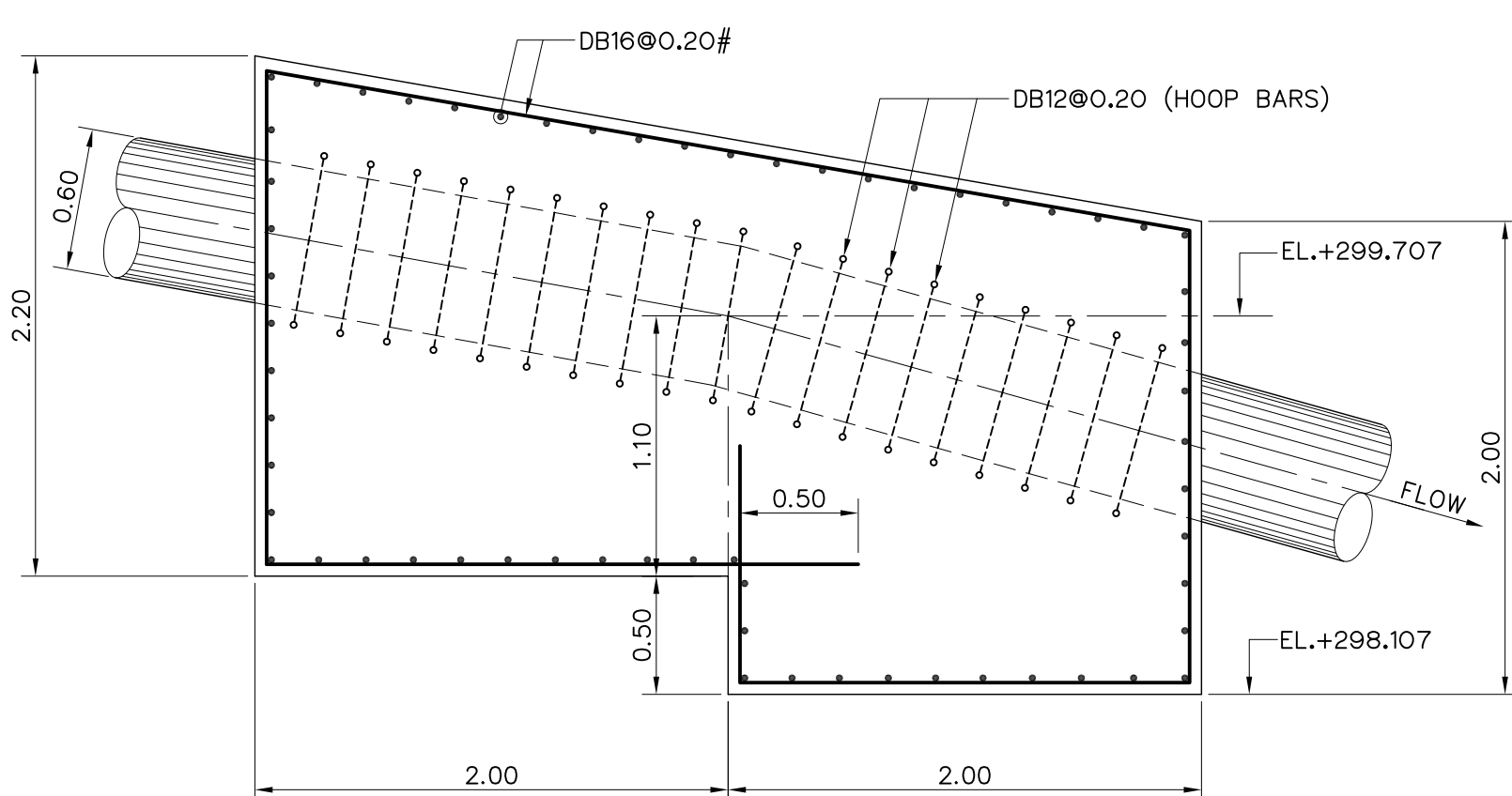
1. PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA. 1+171.00 HLS-PS-01, 04

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

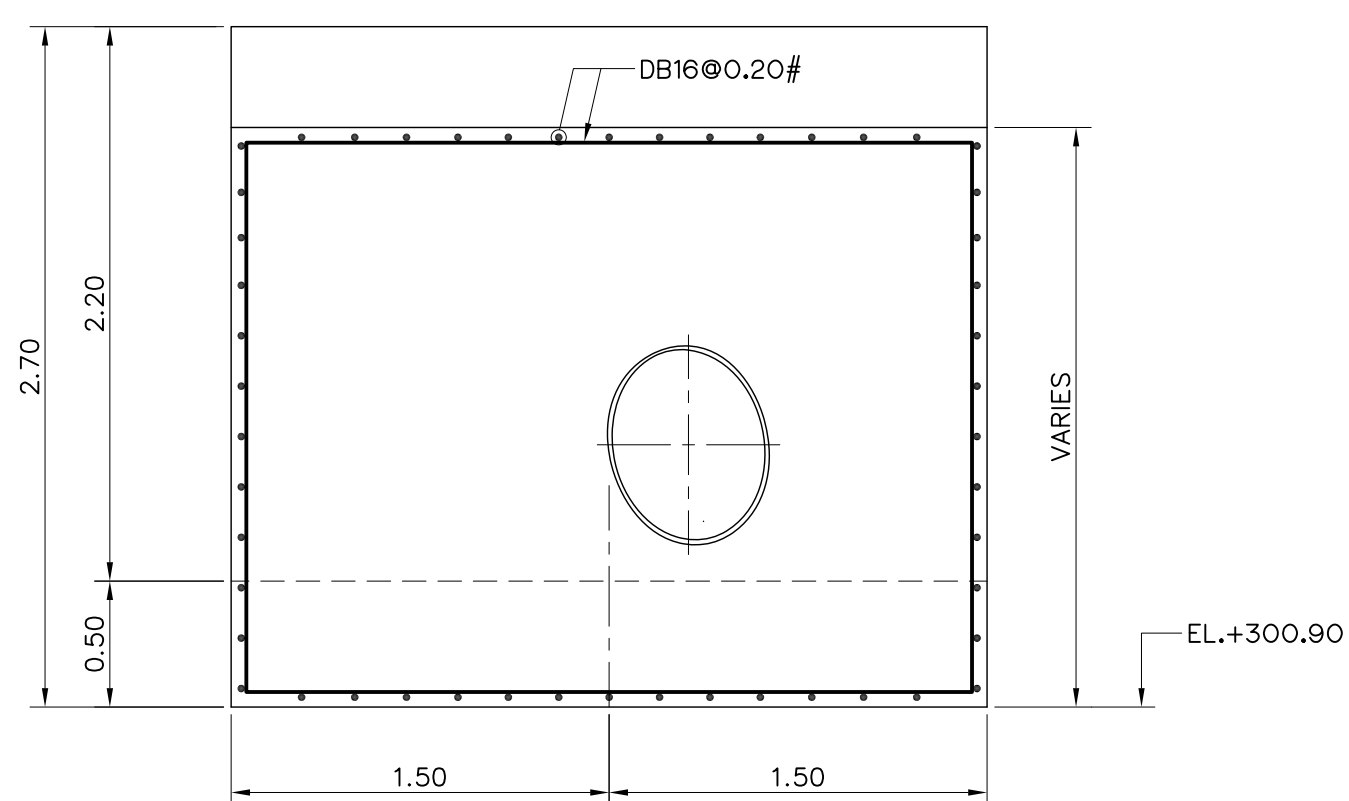
 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
HUAI LAM SIN HYDROPOWER PROJECT	
CIVIL WORKS PENSTOCK ANCHOR BLOCK ①, ② & ③ PLANS AND REINFORCEMENT DETAILS	
FEC FRONTIER ENGINEERING CONSULTANTS CO., LTD.	 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED  ๕๒,6651	REVIEWED S.KTICHAJ
DRAWN 	SUBMITTED 
CHECKED  ๕๒,7324	RECOMMENDED 
 14/01/62	APPROVED 
PROJECT MANAGER	DRAWING NO. HLS-PS-10
DATE	SHEET NO. 32 OF 72



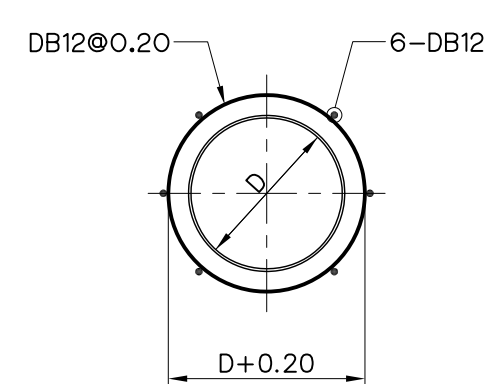
PLAN
ANCHOR ④
SCALE 1:30



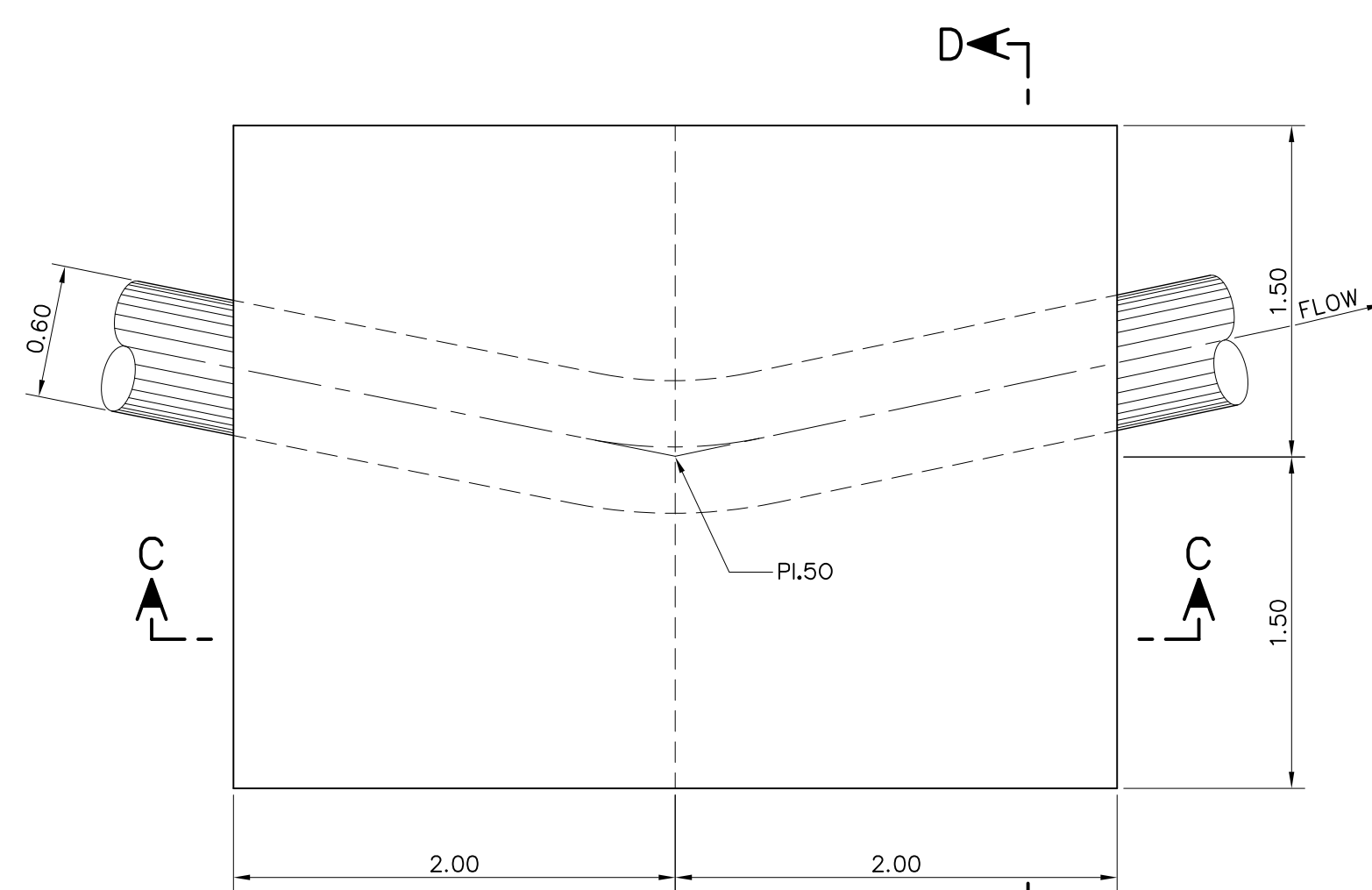
SECTION A-A
ANCHOR ④
SCALE 1:30



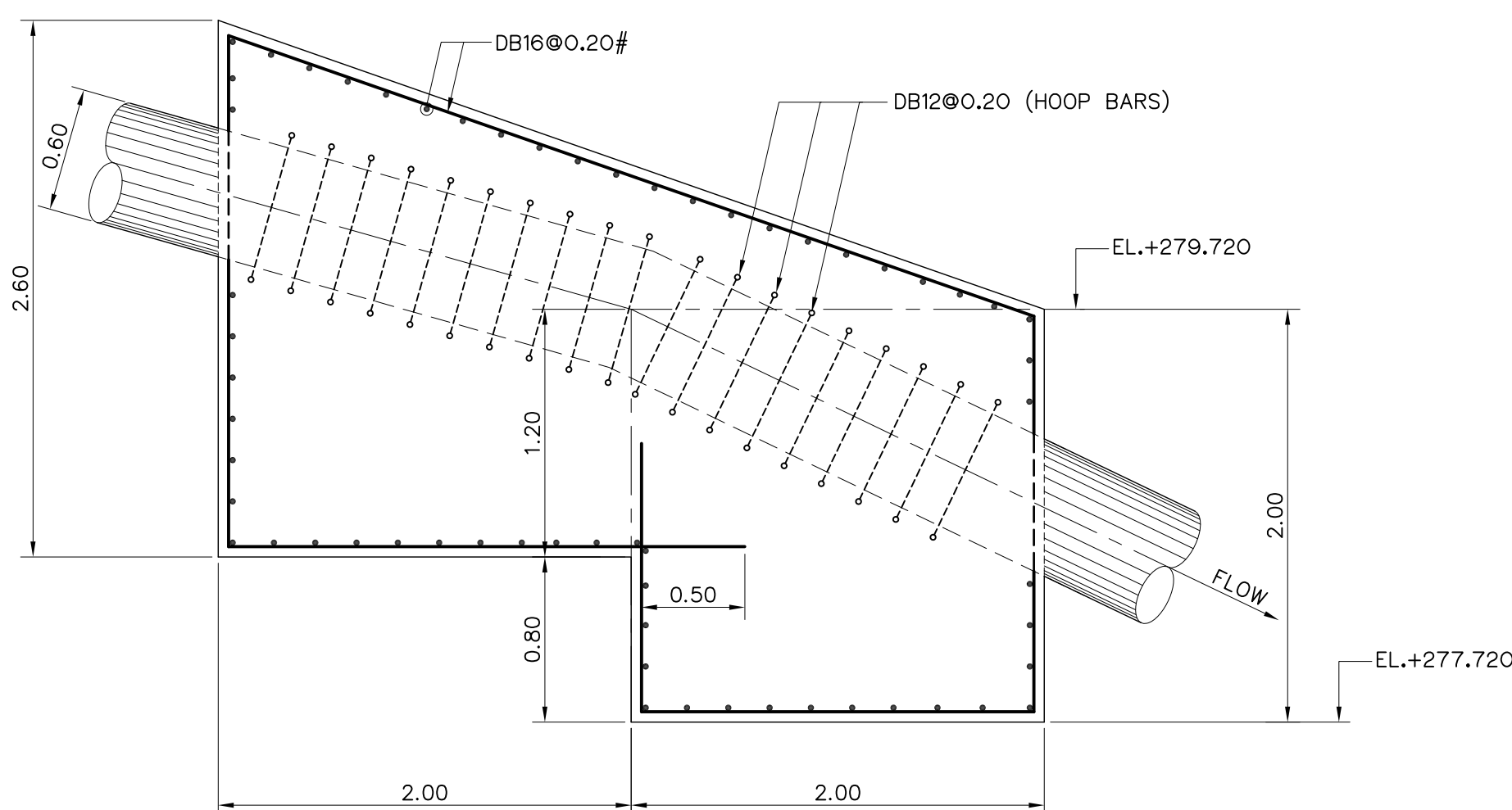
SECTION B-B
ANCHOR ④
SCALE 1:30



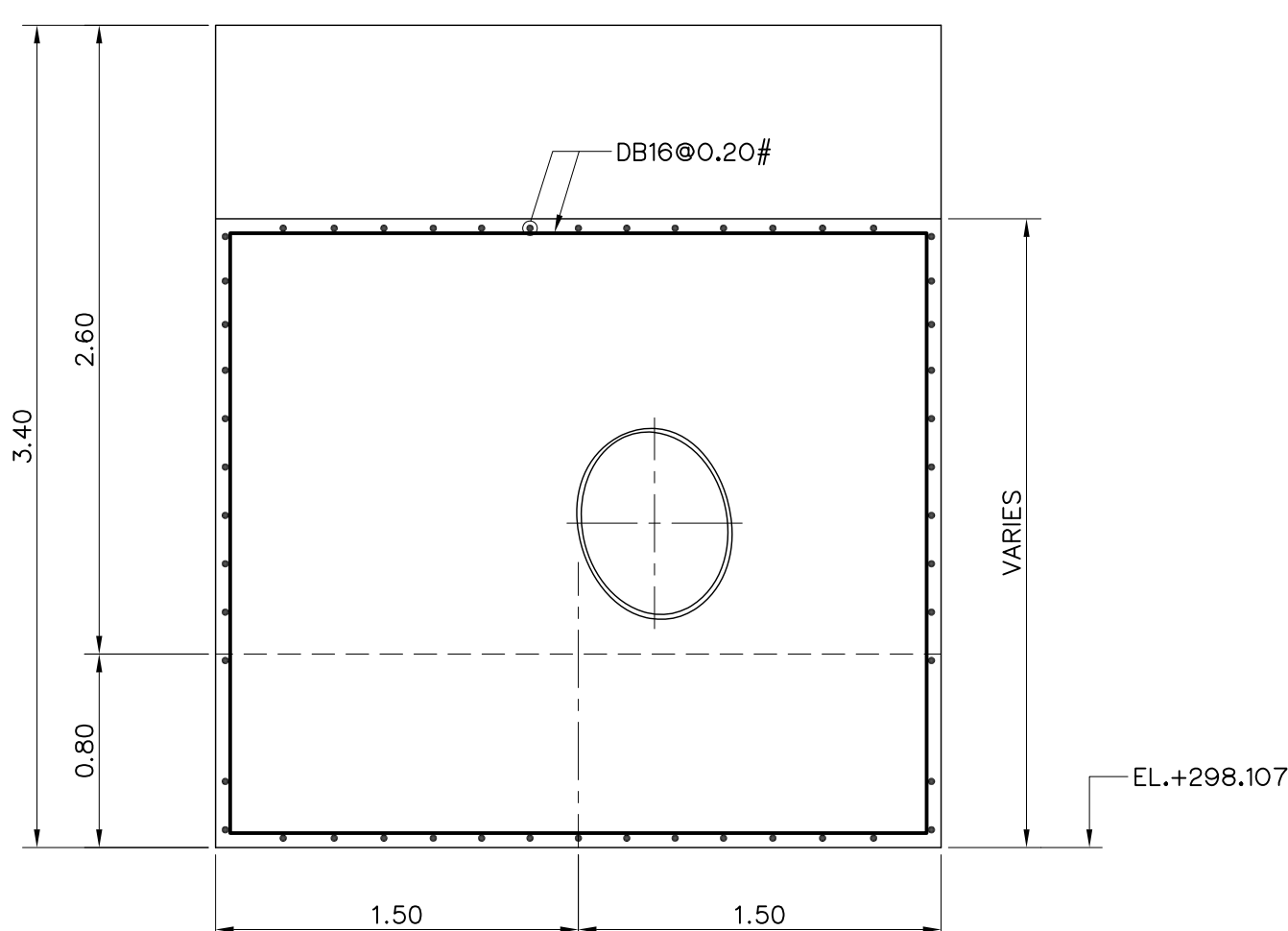
TYPICAL HOOP BAR
SCALE 1:30



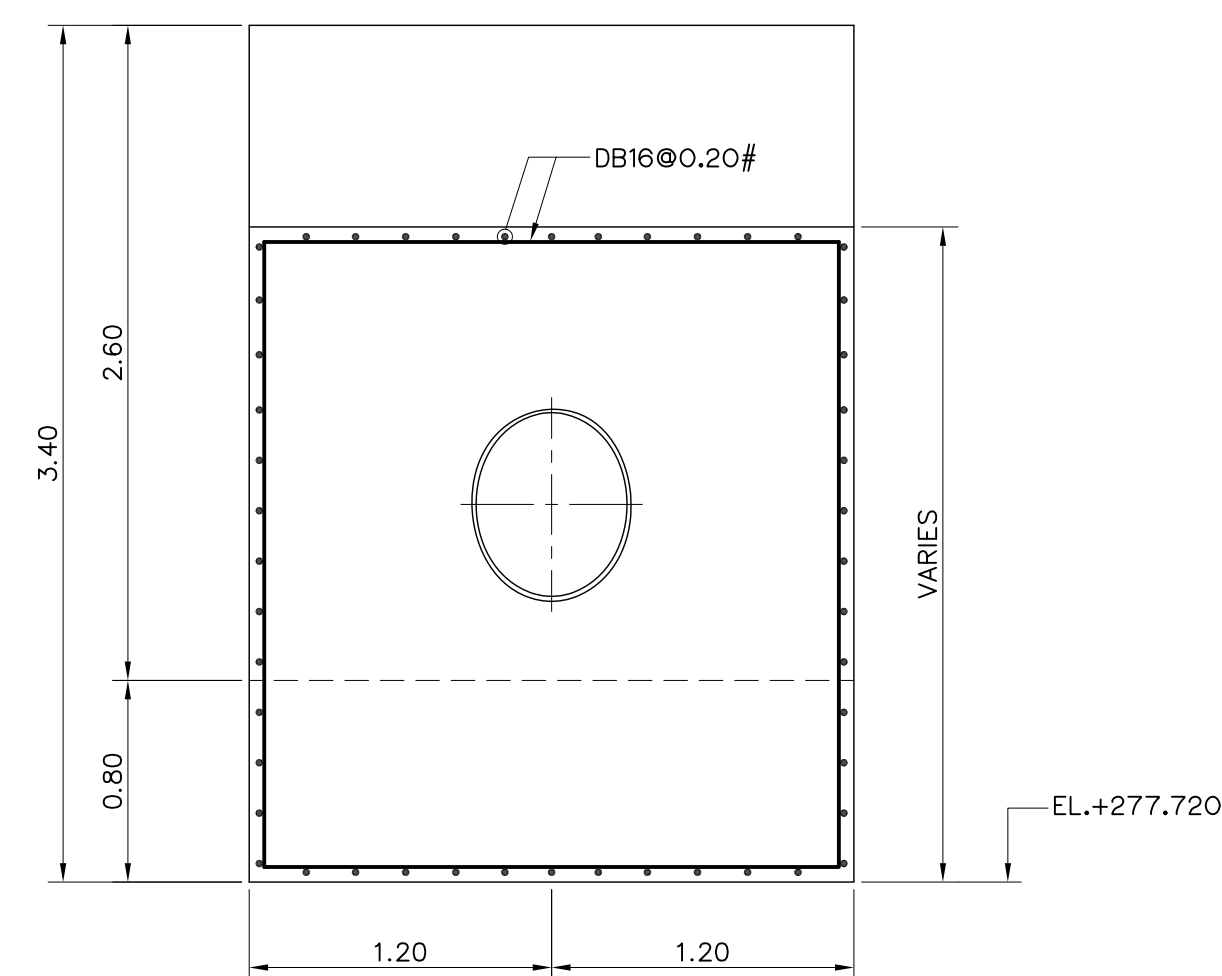
PLAN
ANCHOR ⑤
SCALE 1:30



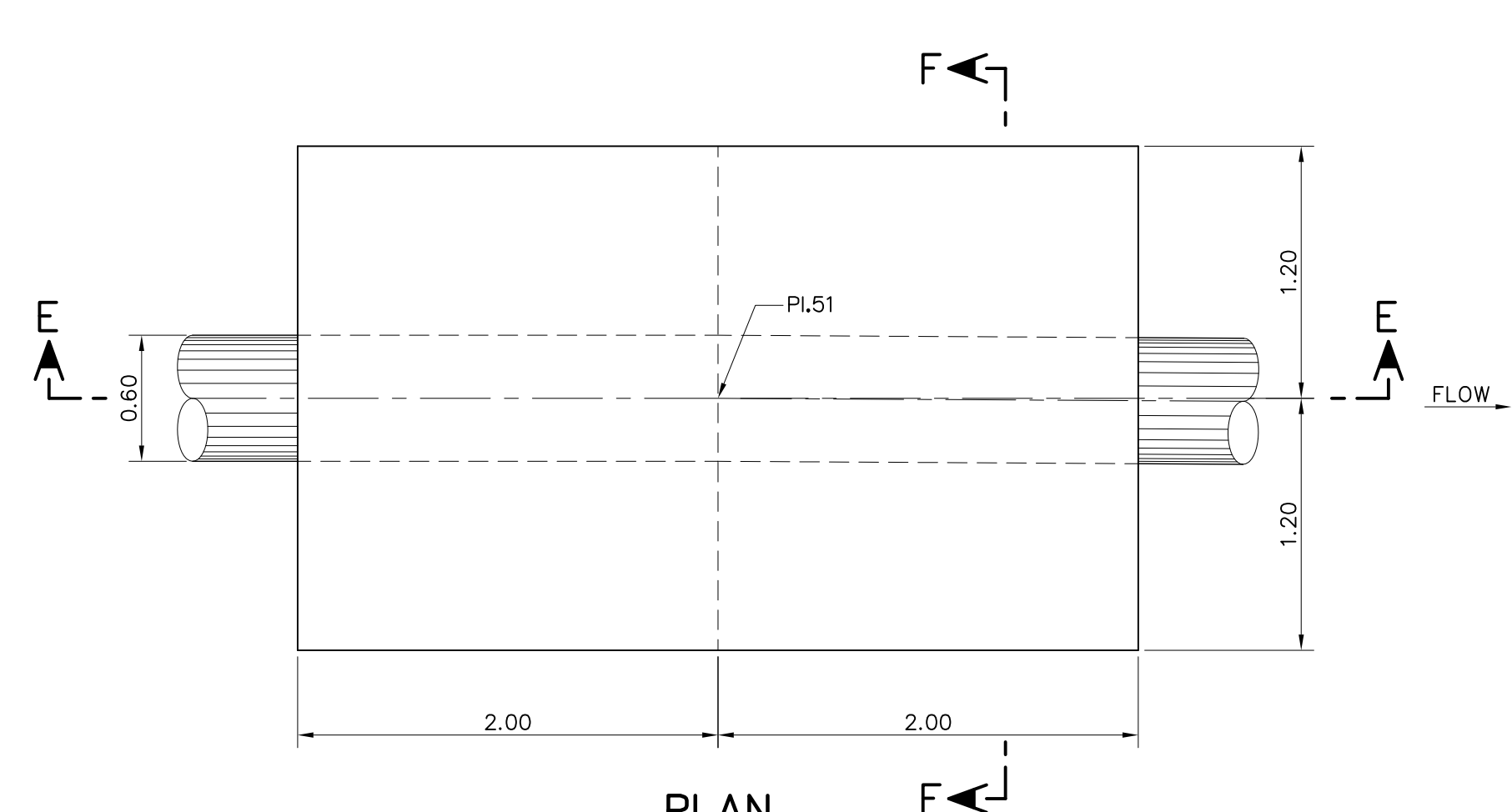
SECTION C-C
ANCHOR ⑤
SCALE 1:30



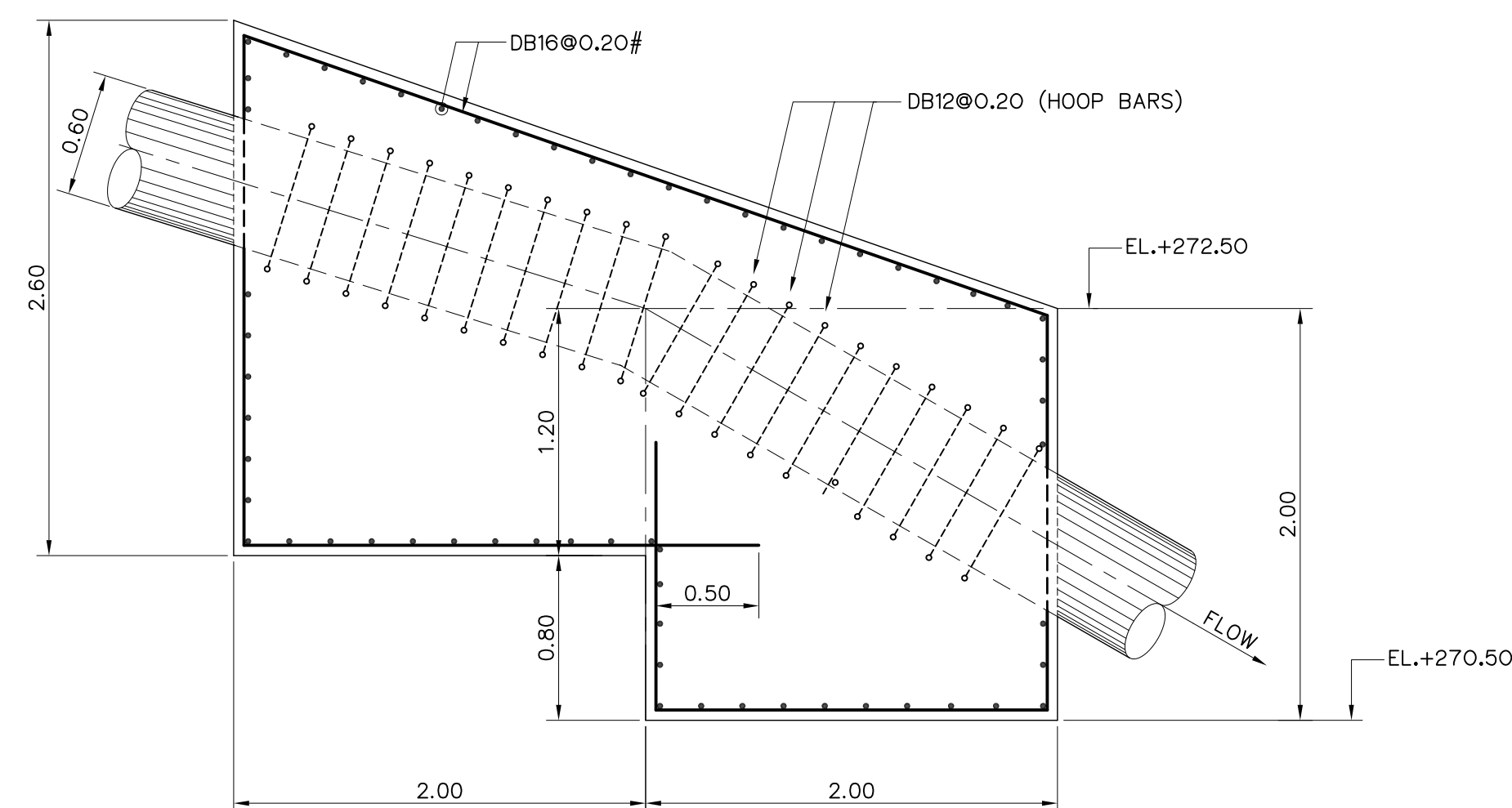
SECTION D-D
ANCHOR ⑤
SCALE 1:30



SECTION F-F
ANCHOR ⑥
SCALE 1:30



PLAN
ANCHOR ⑥
SCALE 1:30



SECTION E-E
ANCHOR ⑥
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
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 :

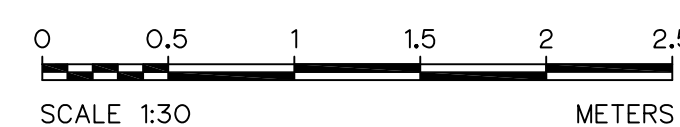
1. PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA. 1+171.00 HLS-PS-01, 04

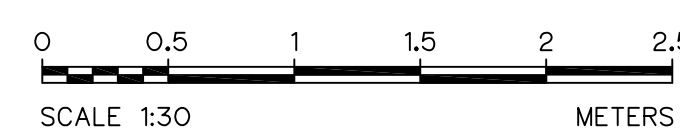
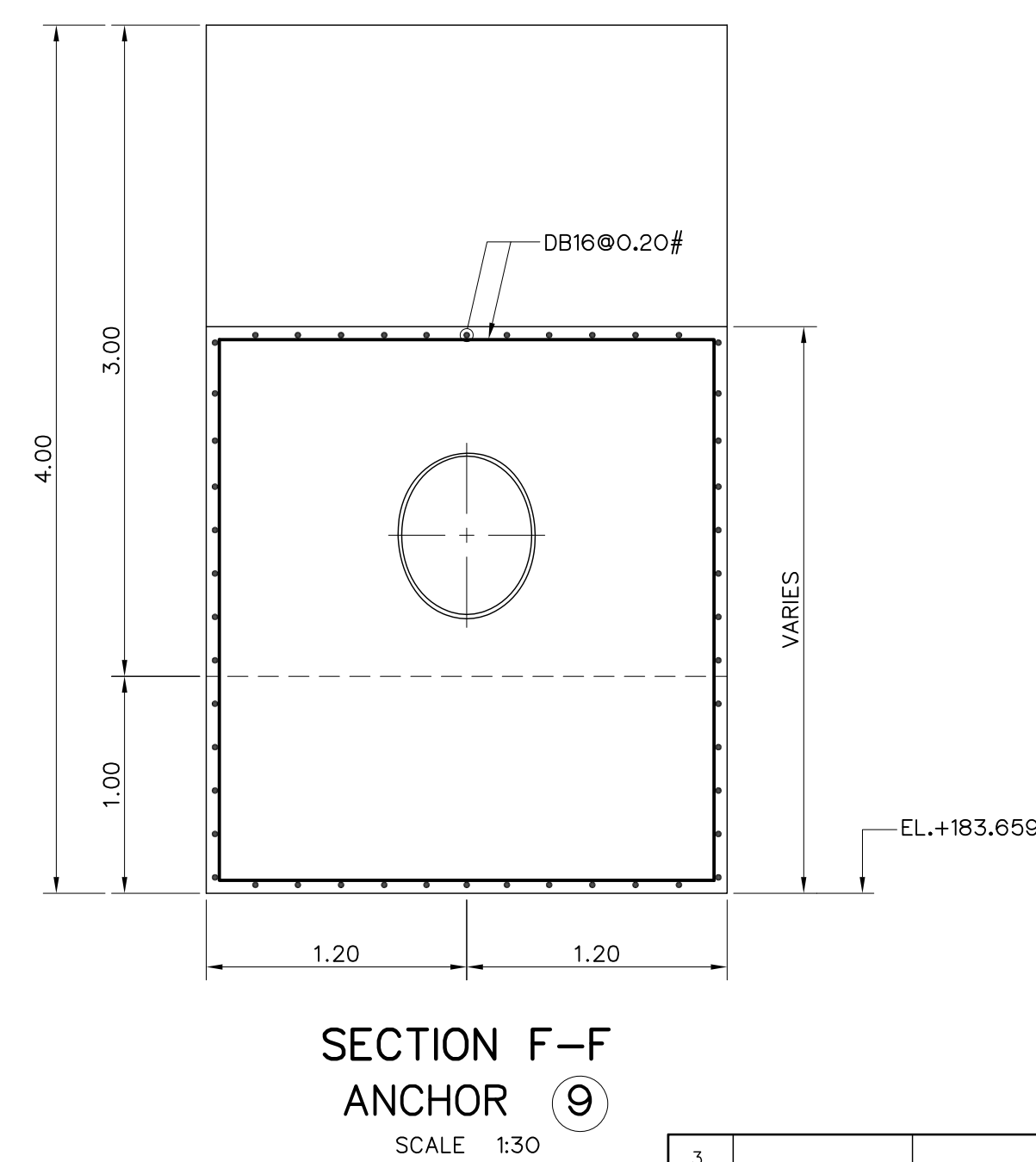
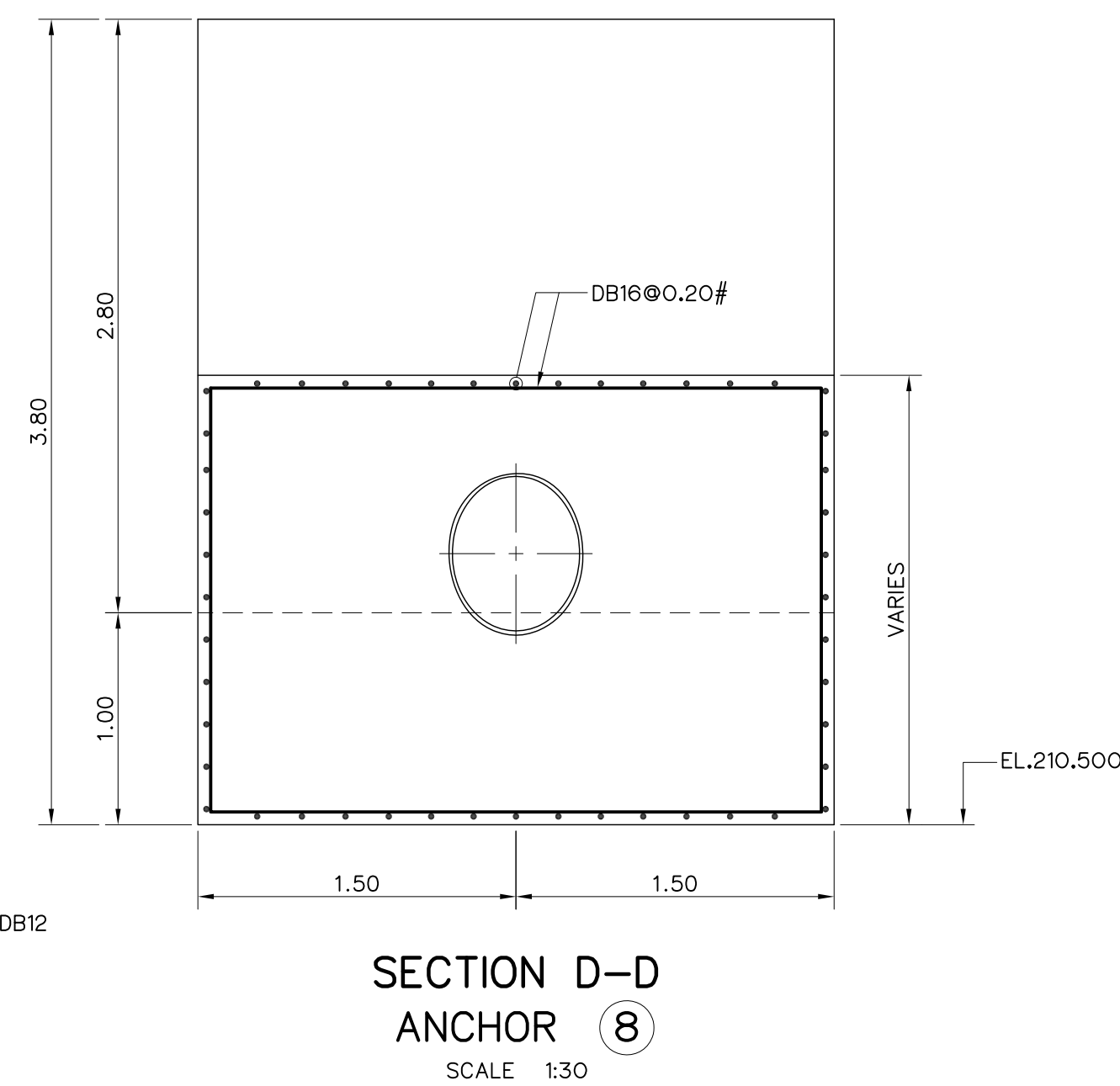
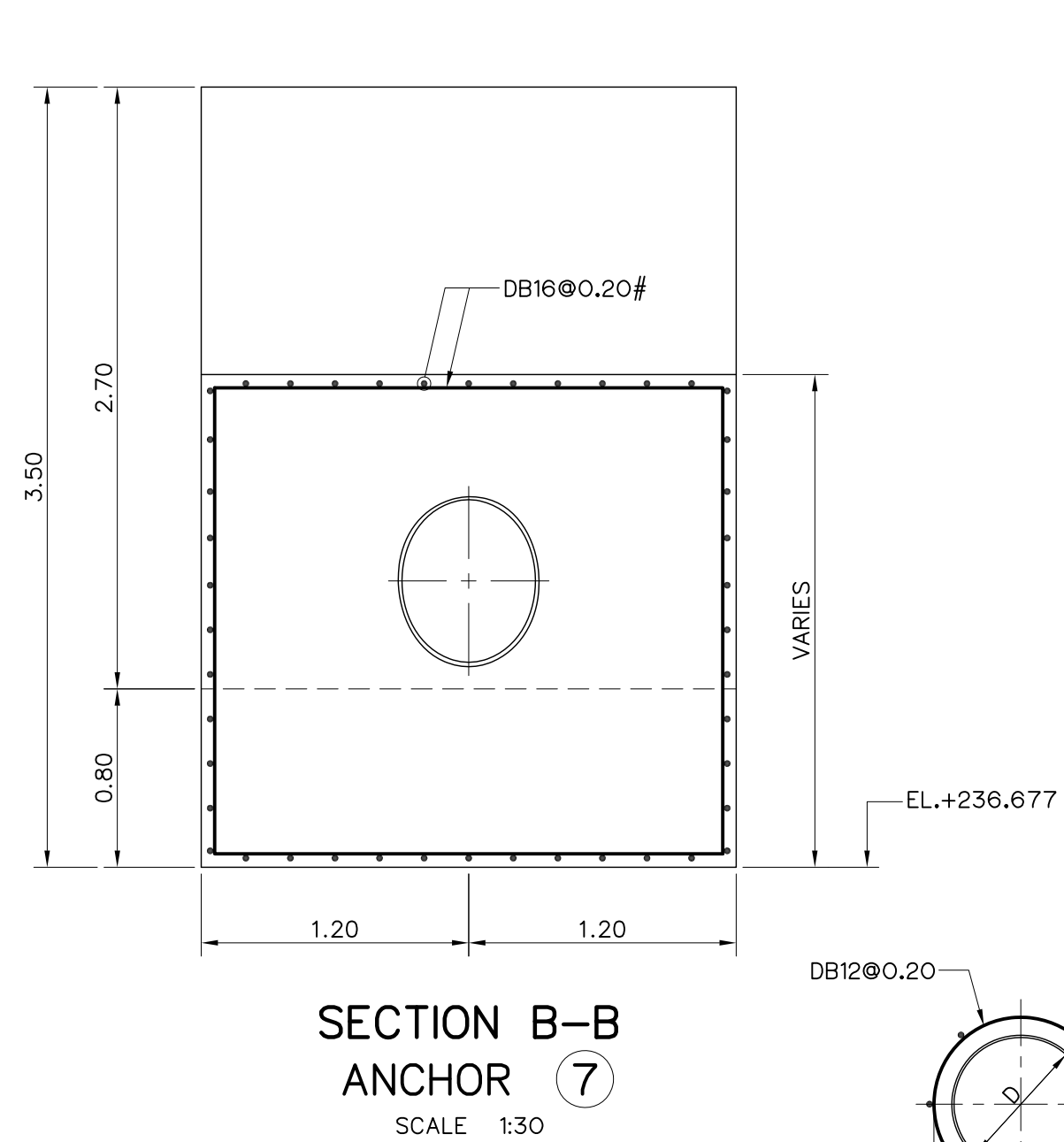
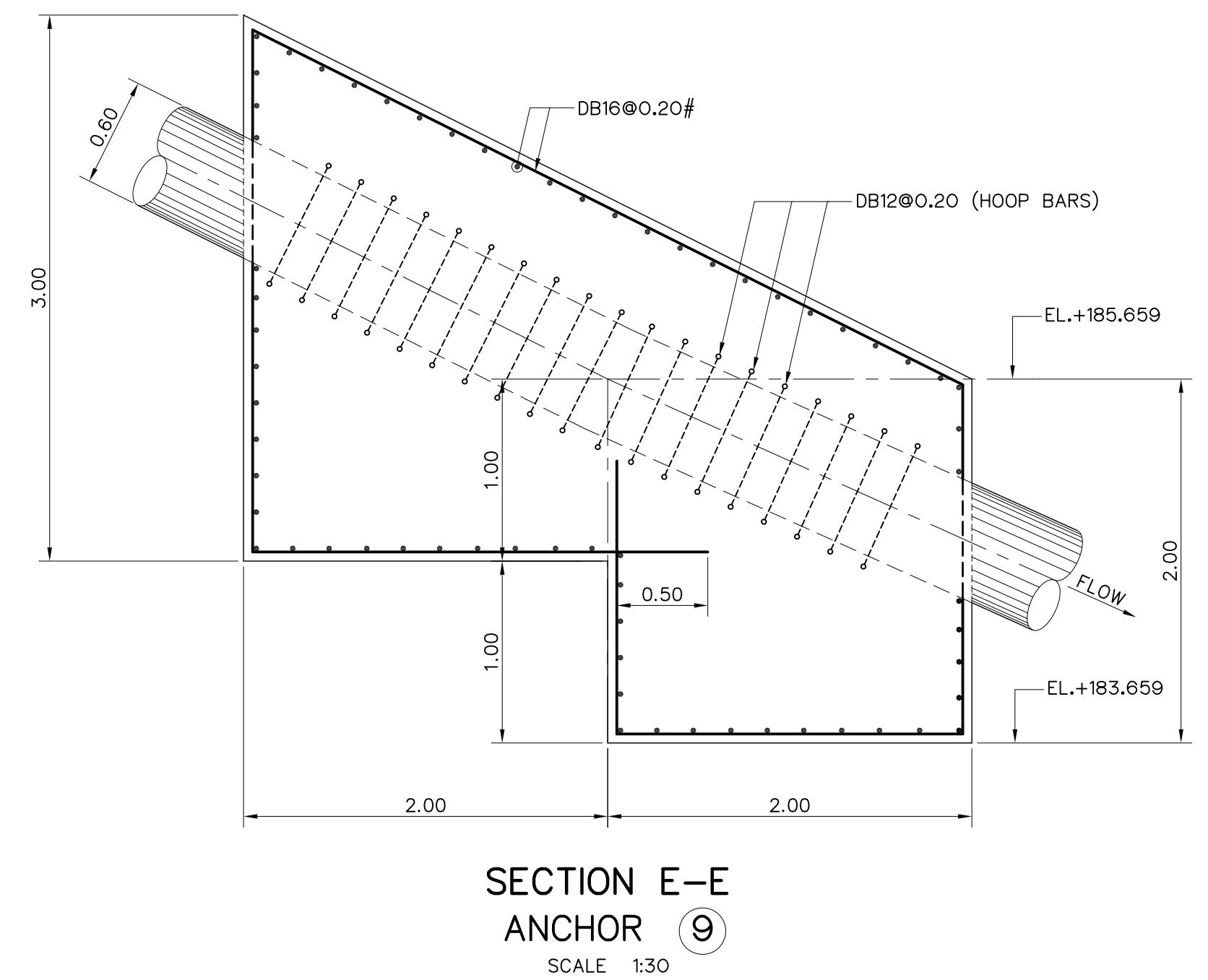
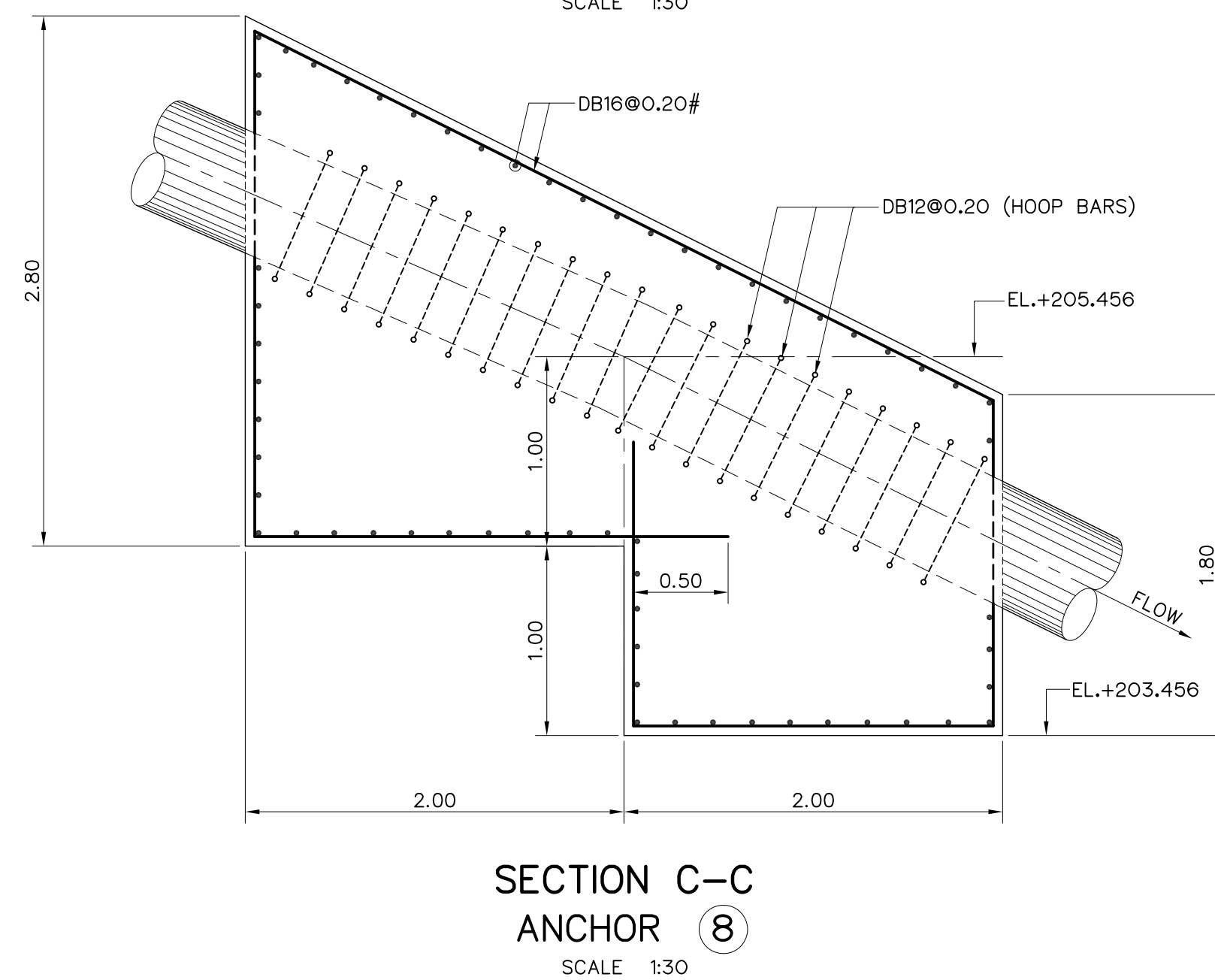
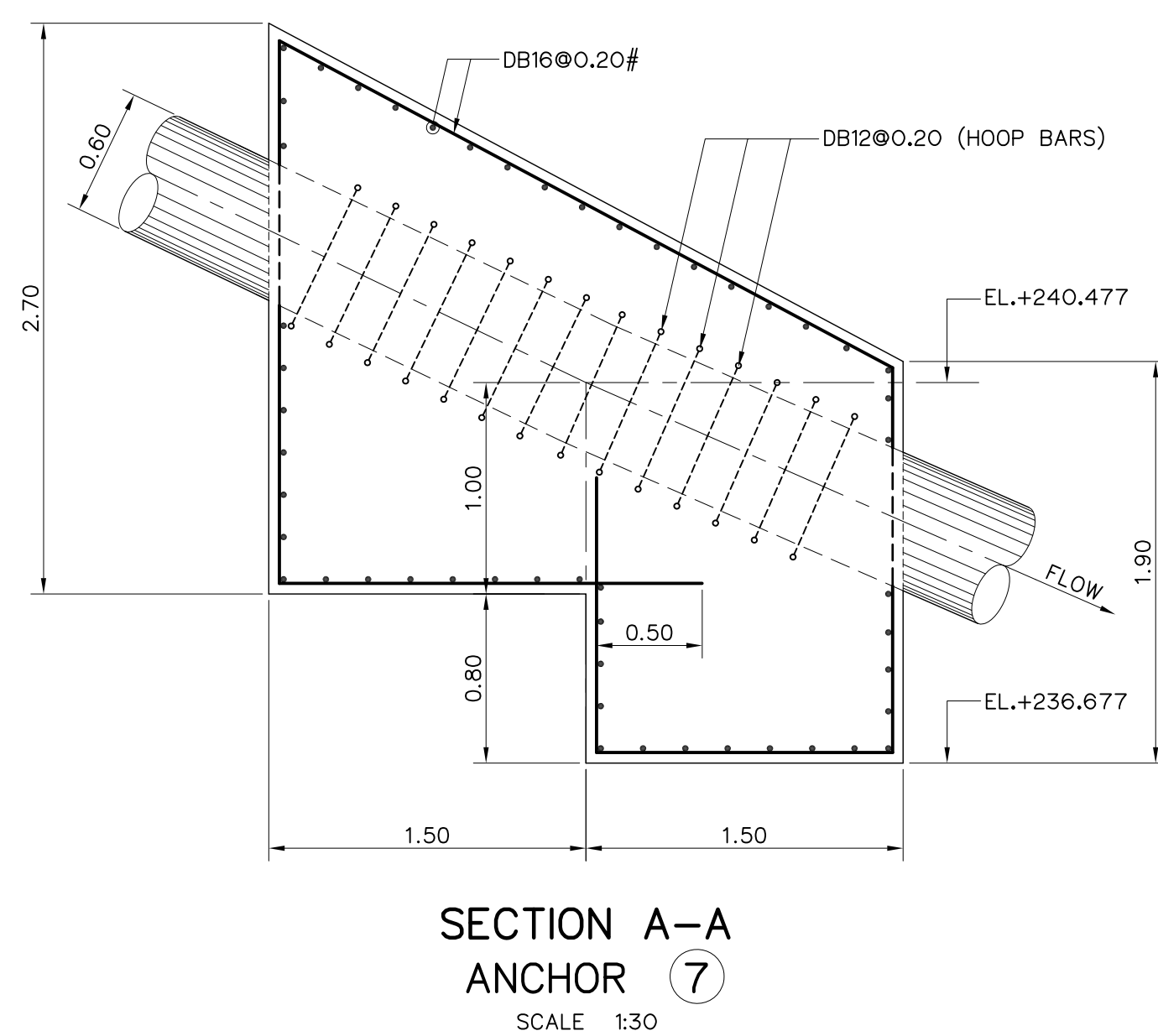
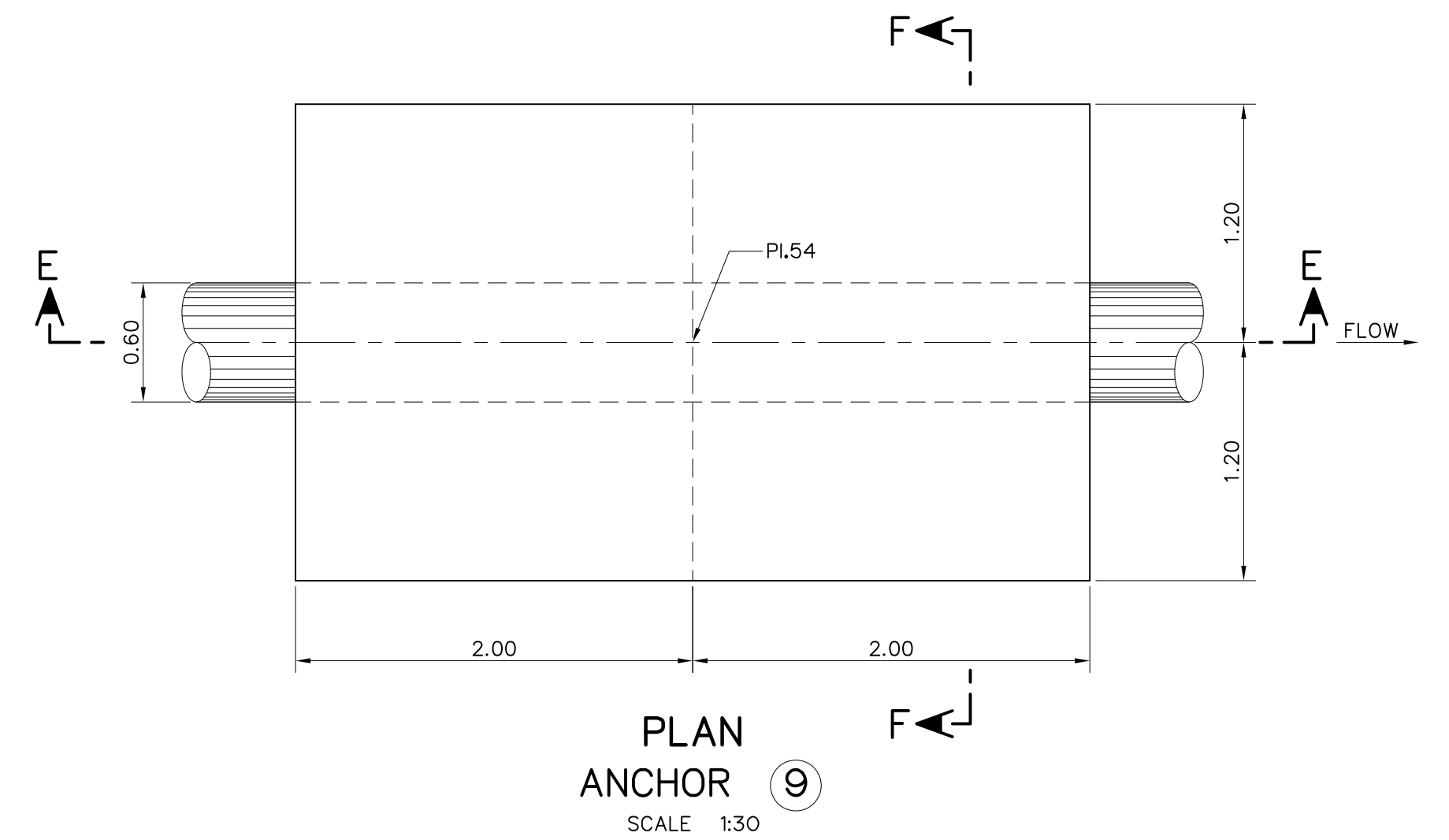
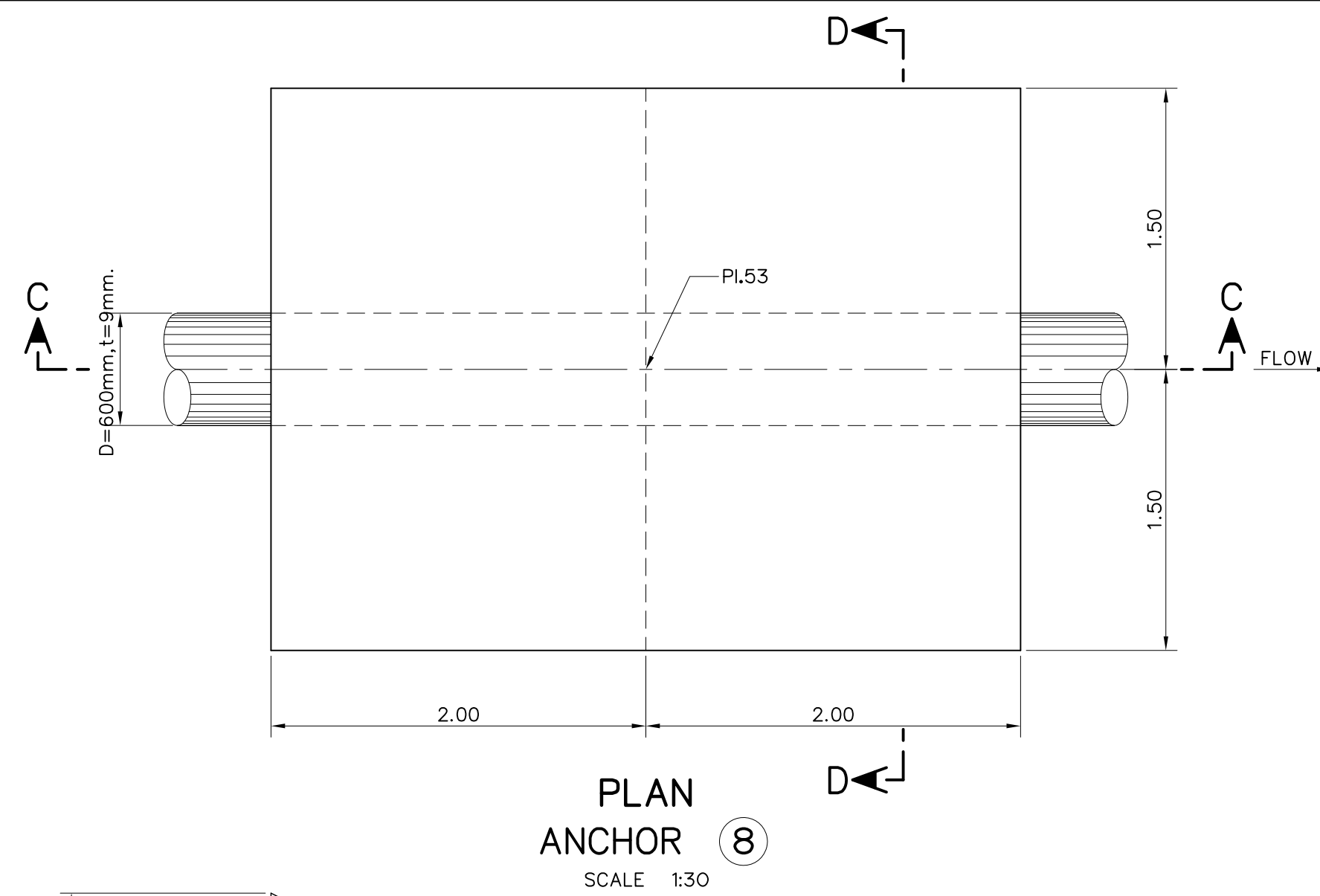
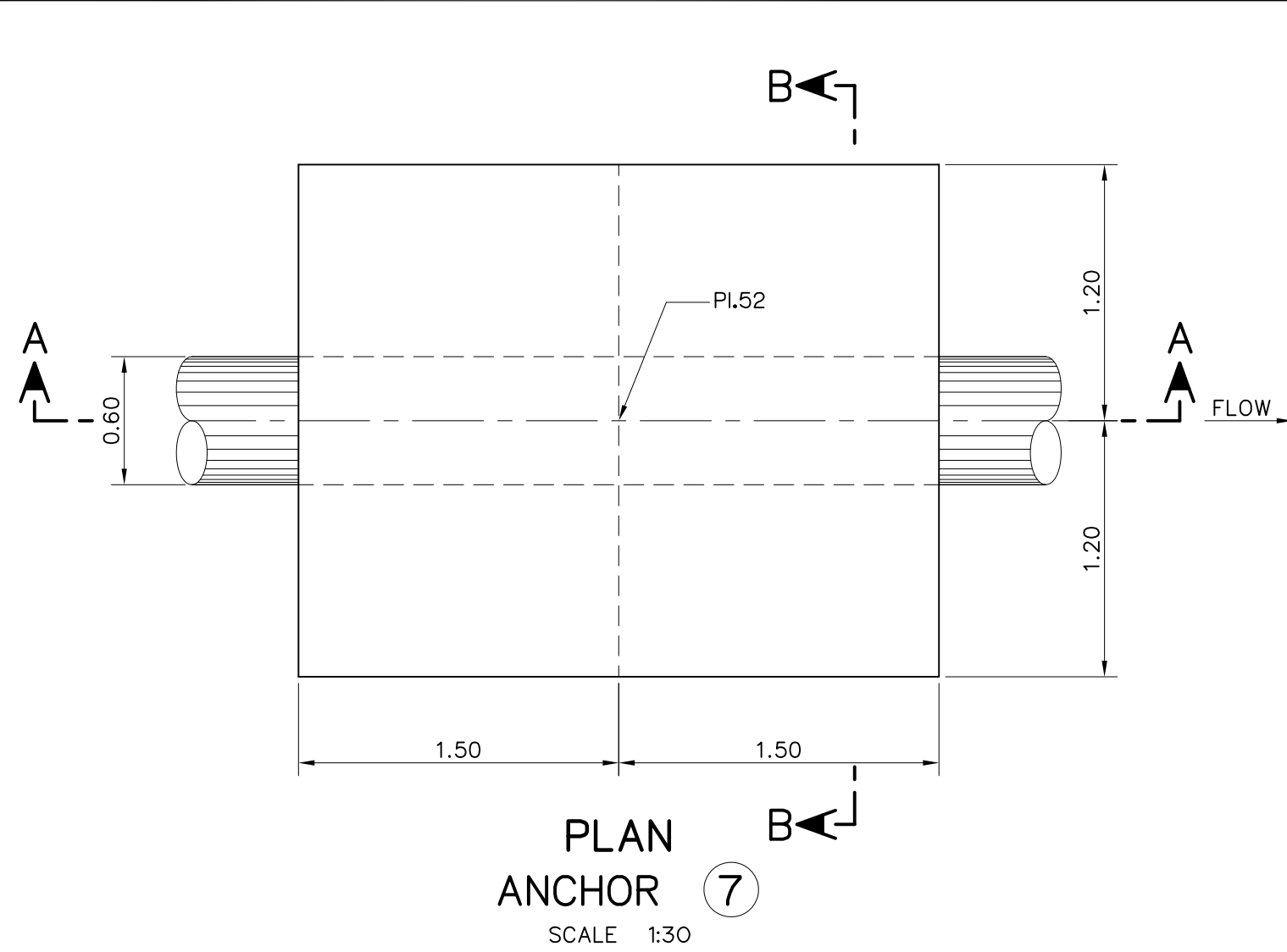
KINGDOM OF THAILAND
Department of Alternative
Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

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

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		REVIEWED S.KITIKHAJ	
DESIGNED	๑๒.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	๑๒.7324	APPROVED	
PROJECT MANAGER		DATE	
CONSULTANTS		DEDE	
DRAWING NO.		SHEET NO.	
HLS-PS-11		33 OF 78	

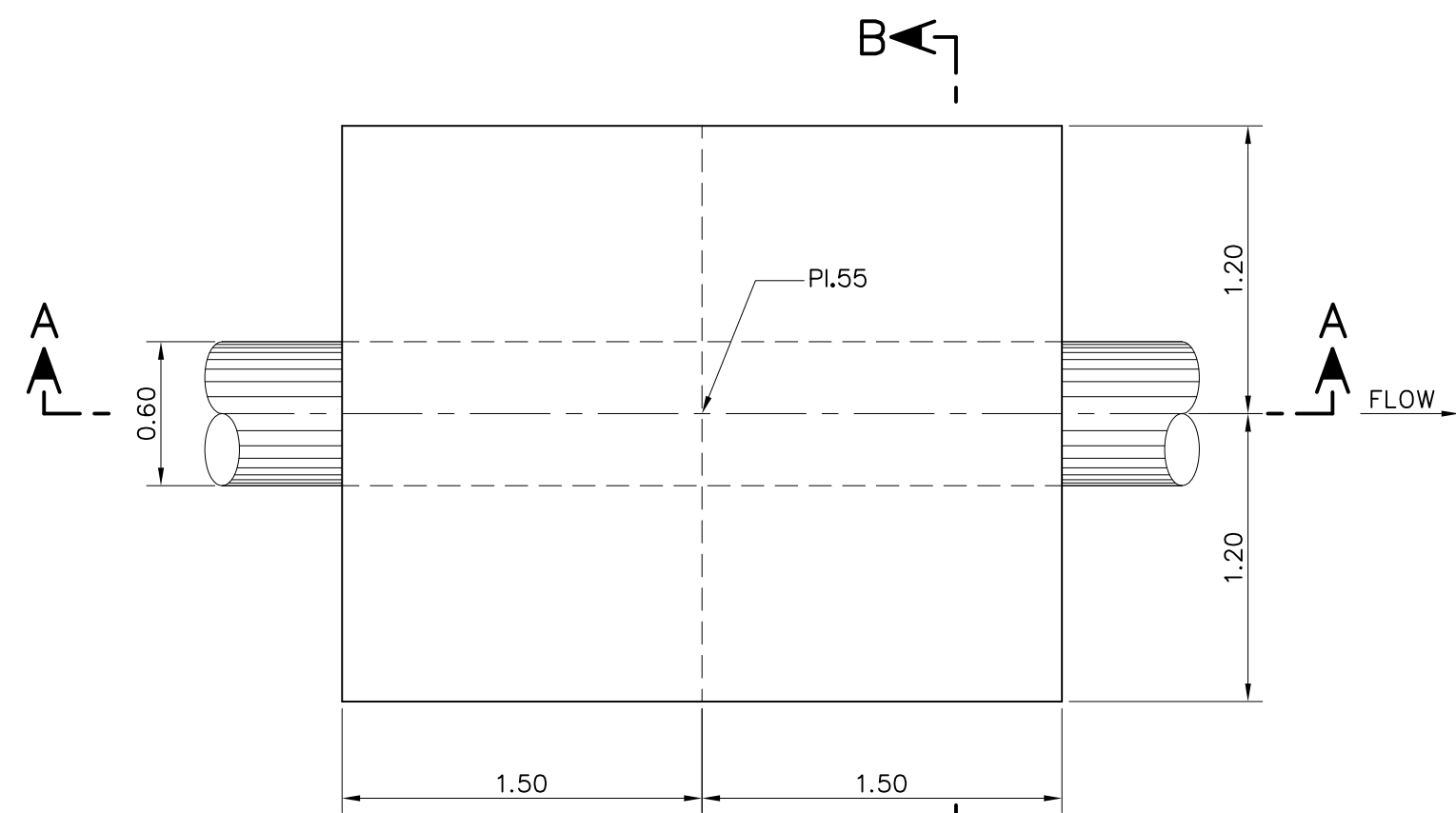




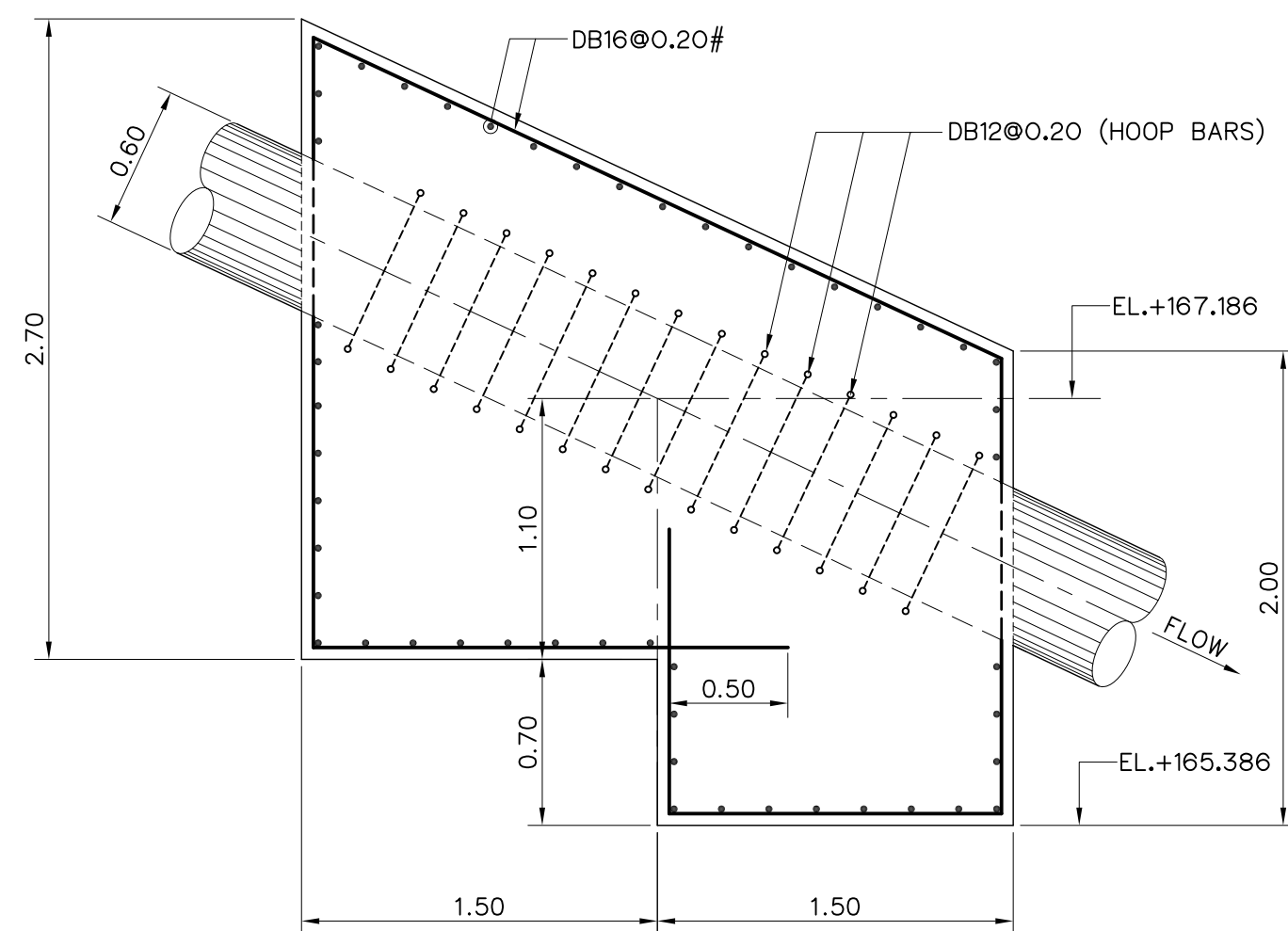
- NOTES :
- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
 - SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
 - THE ALIGNMENT OF THE PENSTOCK AND RELATED STRUCTURES SHALL BE CHECK AND CORRECTED BY THE CONTRACTOR TO SUIT THE FIELD CONDITIONS AND SHALL BE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

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

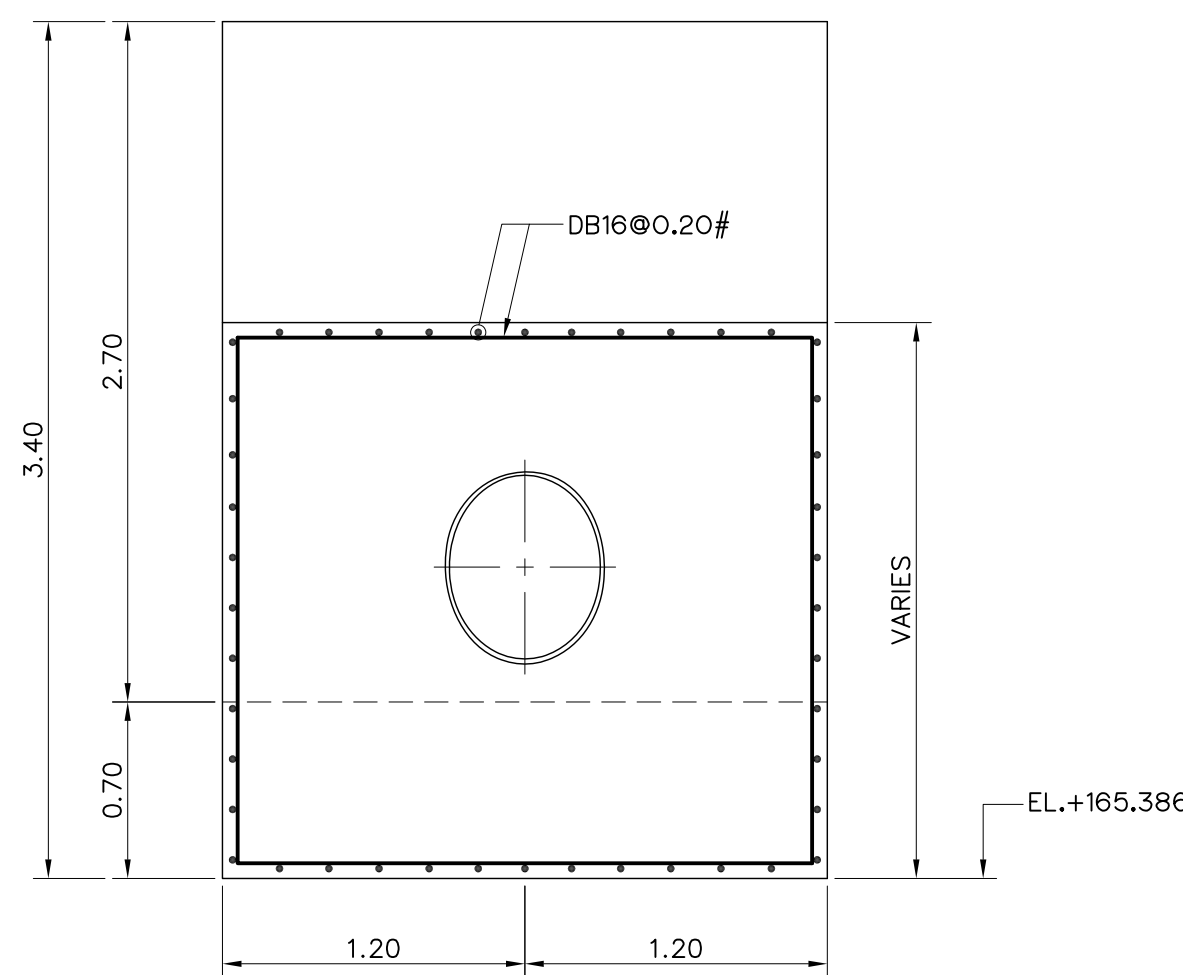
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUAI LAM SIN HYDROPOWER PROJECT			
CIVIL WORKS PENSTOCK ANCHOR BLOCK 7, 8 & 9 PLANS AND REINFORCEMENT DETAILS			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED 14/01/62 14/01/62		REVIEWED 14/01/62 14/01/62	
DRAWN 14/01/62 14/01/62		RECOMMENDED 14/01/62 14/01/62	
CHECKED 14/01/62 14/01/62		APPROVED 14/01/62 14/01/62	
CONSULTANTS		DEDE	
PROJECT MANAGER		DRAWING NO. SHEET NO.	
14/01/62		HLS-PS-12 34 OF 78	



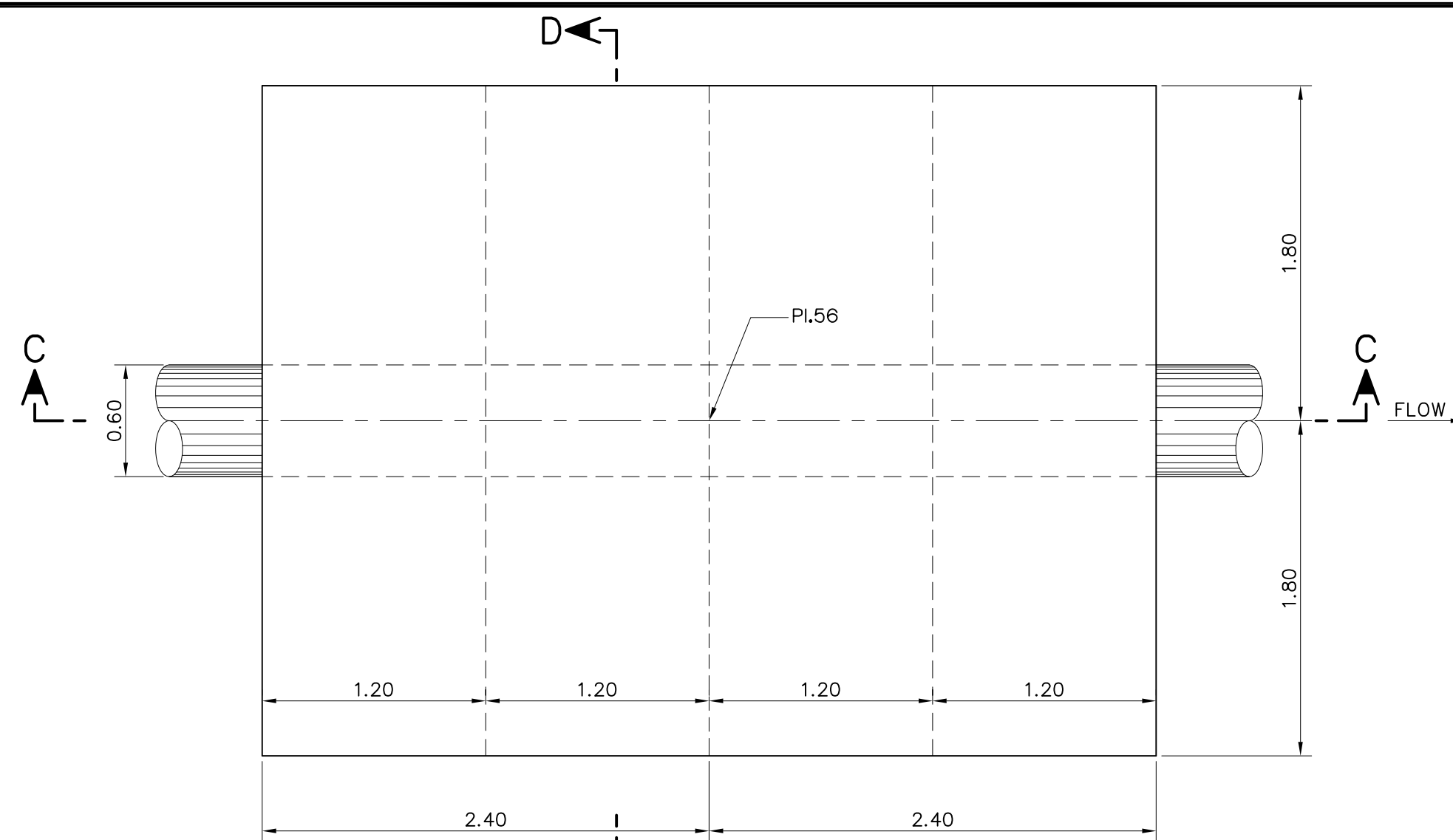
PLAN
ANCHOR 10
SCALE 1:30



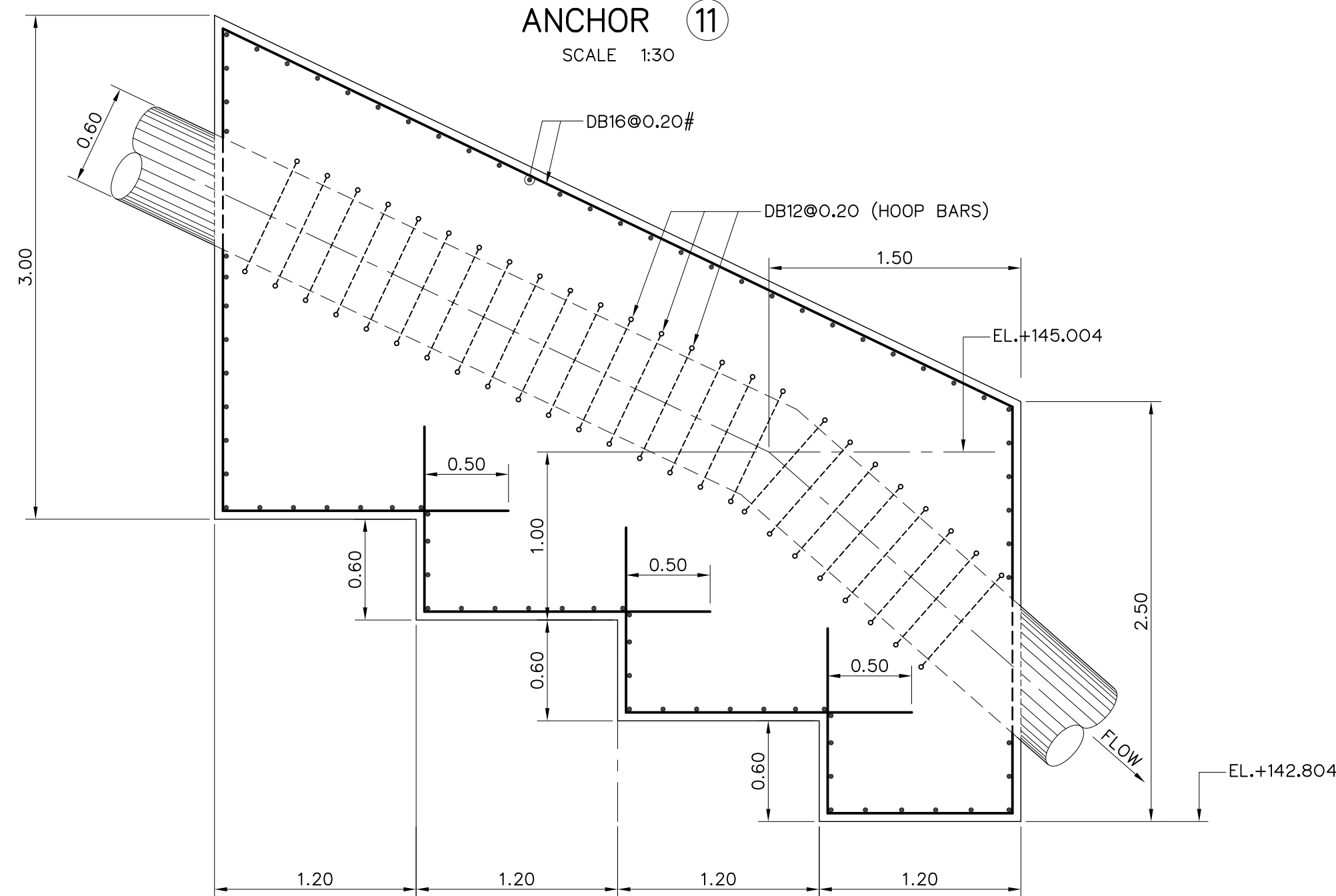
SECTION A-A
ANCHOR 10
SCALE 1:30



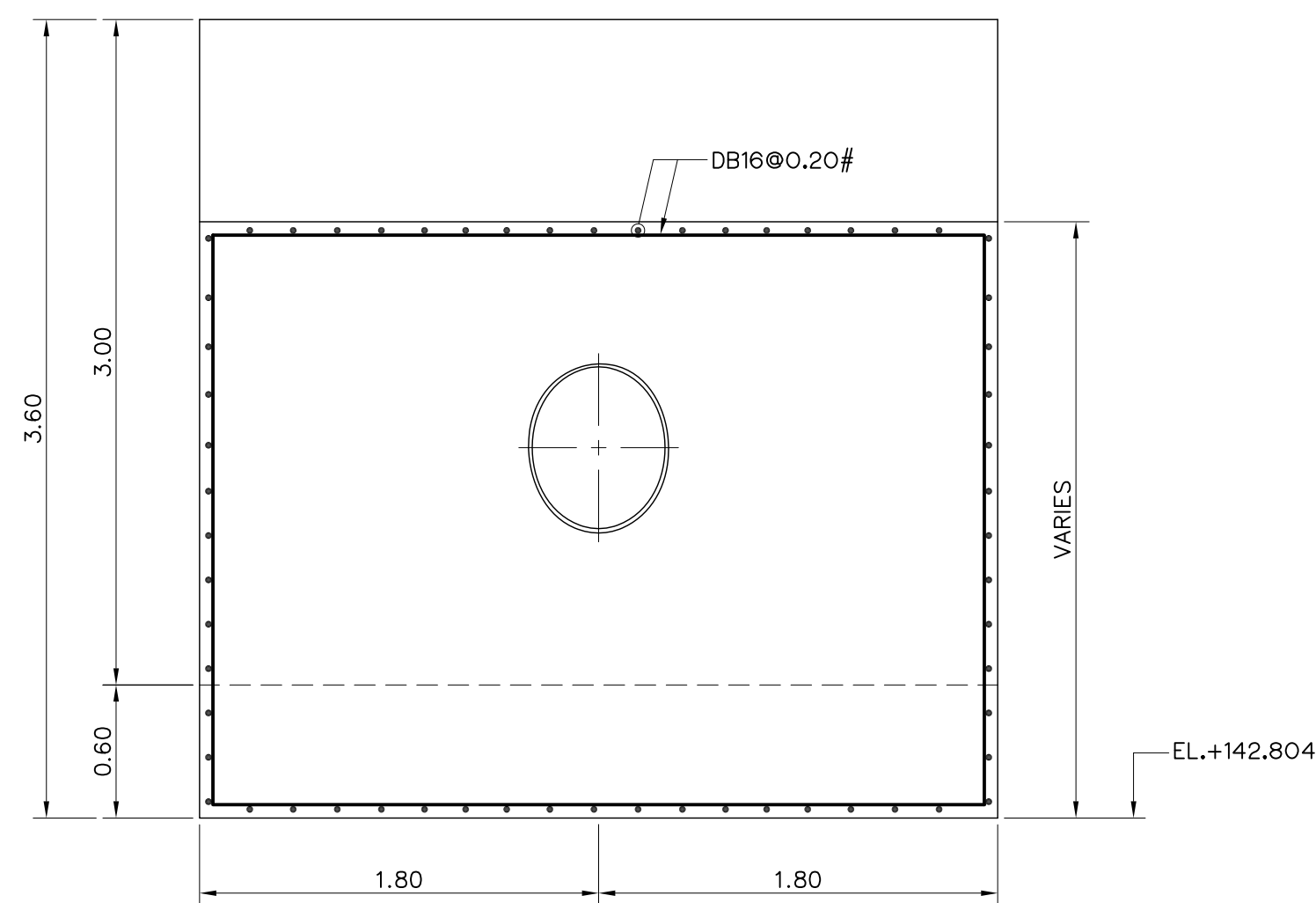
SECTION B-B
ANCHOR 10
SCALE 1:30



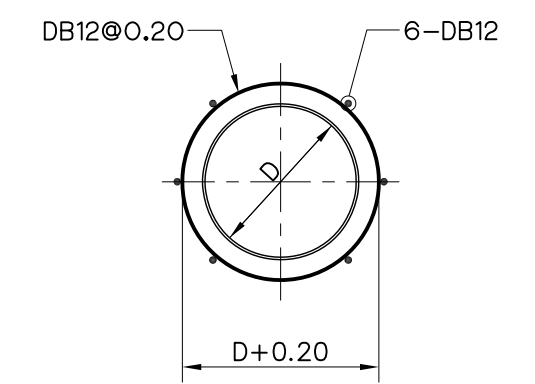
PLAN
ANCHOR 11
SCALE 1:30



SECTION C-C
ANCHOR 11
SCALE 1:30



SECTION D-D
ANCHOR 11
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 GENERAL 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



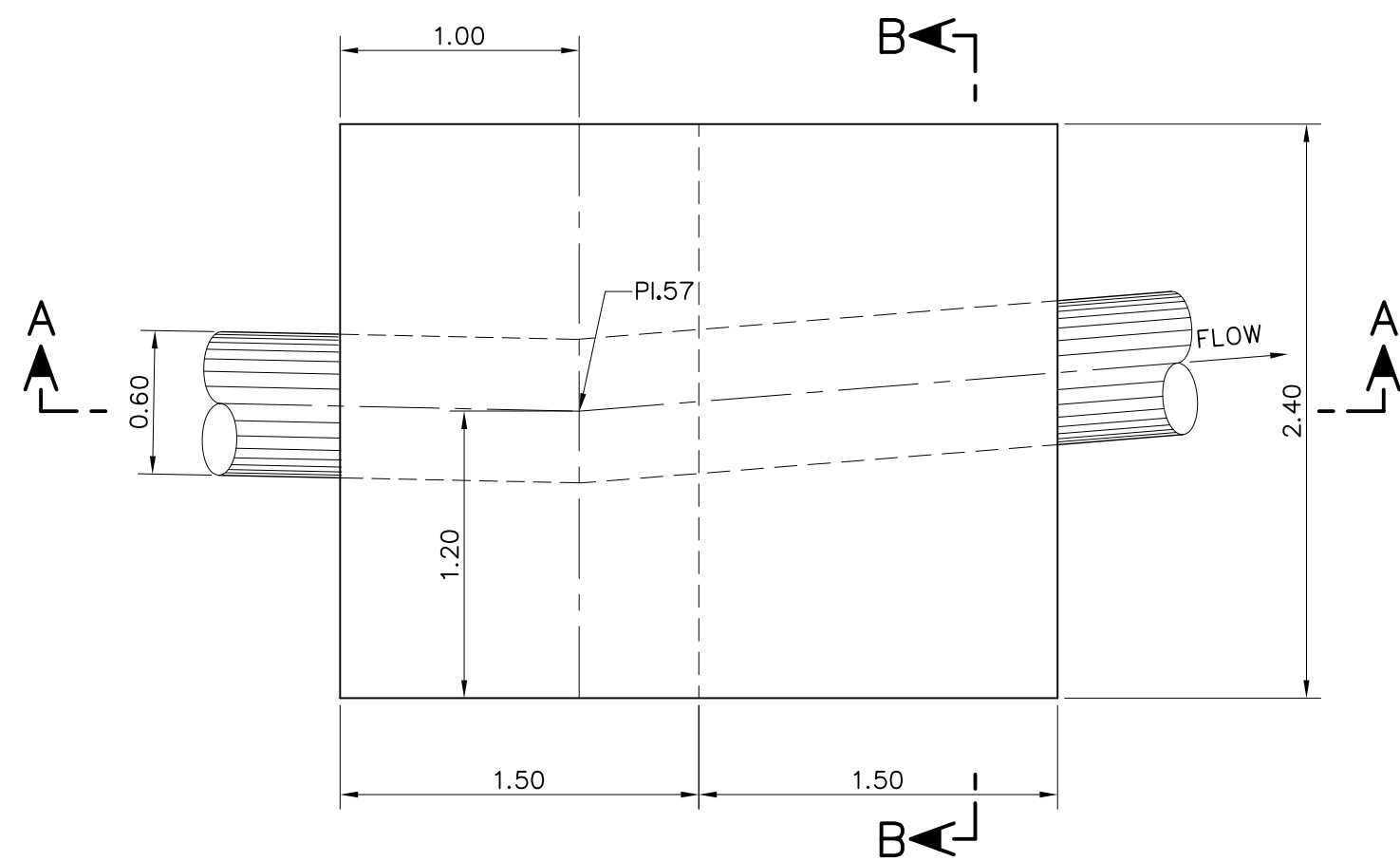
KINGDOM OF THAILAND
Department of Alternative
Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

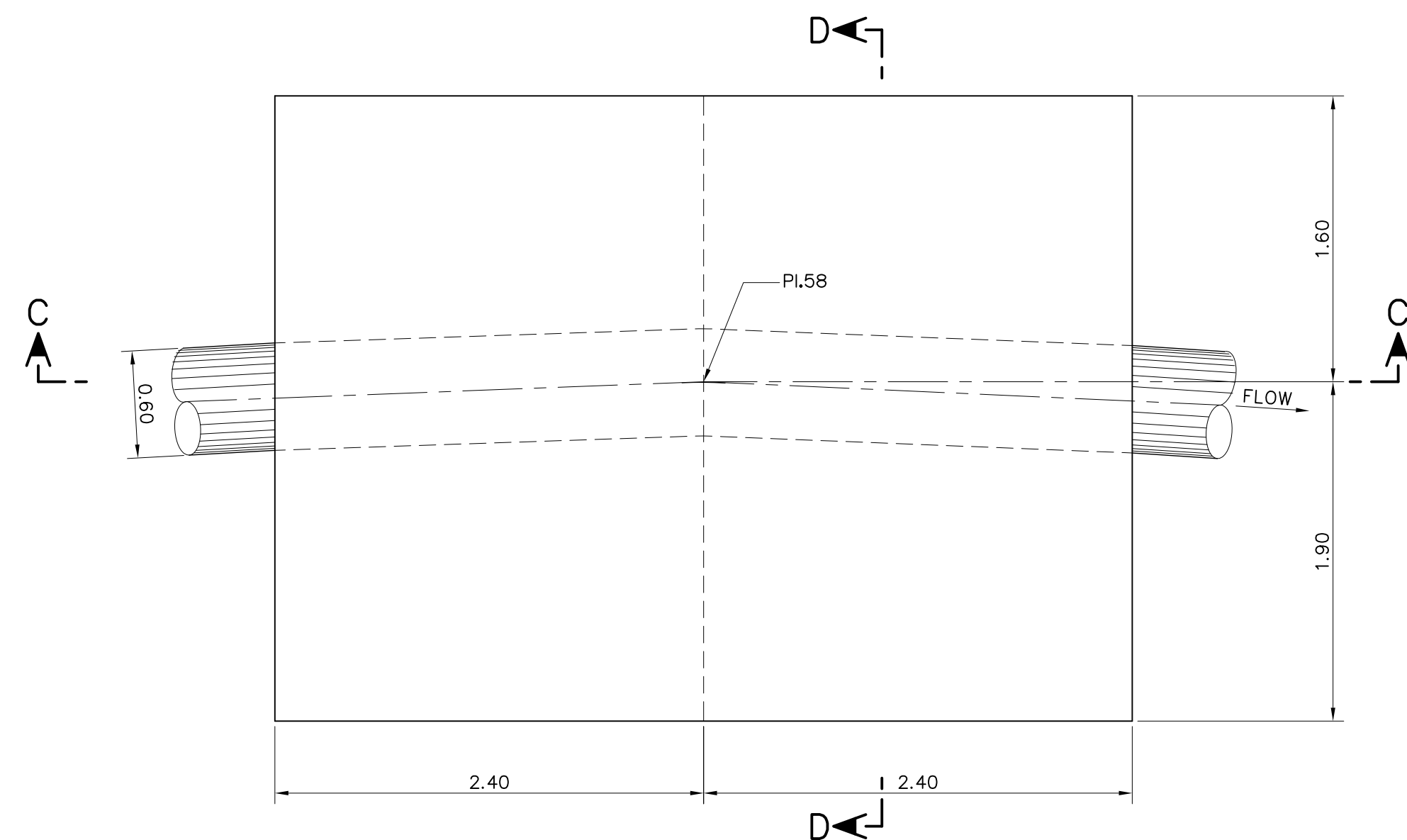
CIVIL WORKS
PENSTOCK
ANCHOR BLOCK 10 & 11
PLANS AND REINFORCEMENT DETAILS

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED S.KITIKHAJ		
DESIGNED	๑๕.6651	SUBMITTED
DRAWN		RECOMMENDED
CHECKED	๑๕.7324	APPROVED
PROJECT MANAGER		DRAWING NO. HLS-PS-13
DATE 14/01/62		SHEET NO. 35 OF 78

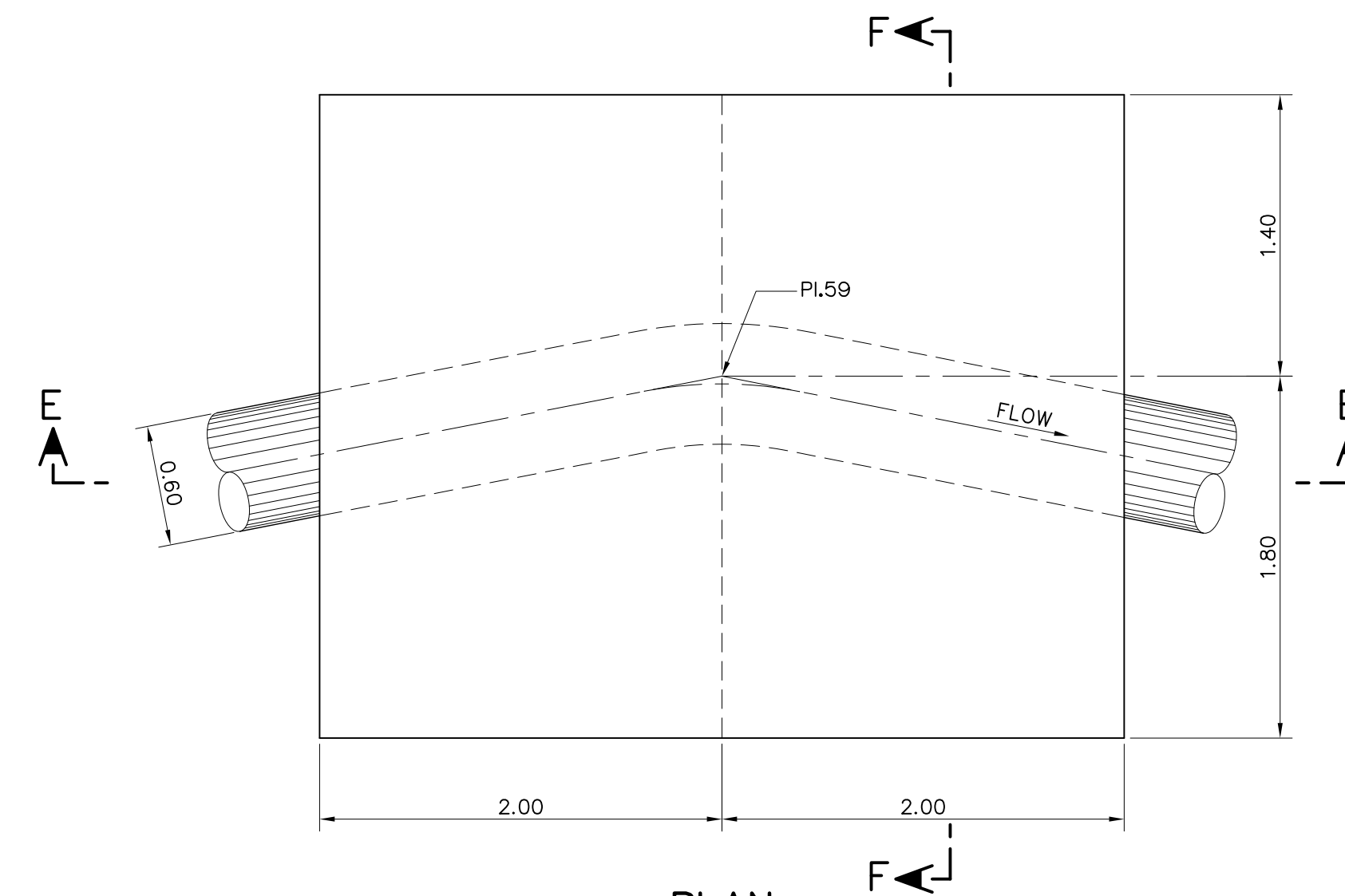
3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS		DEDE		



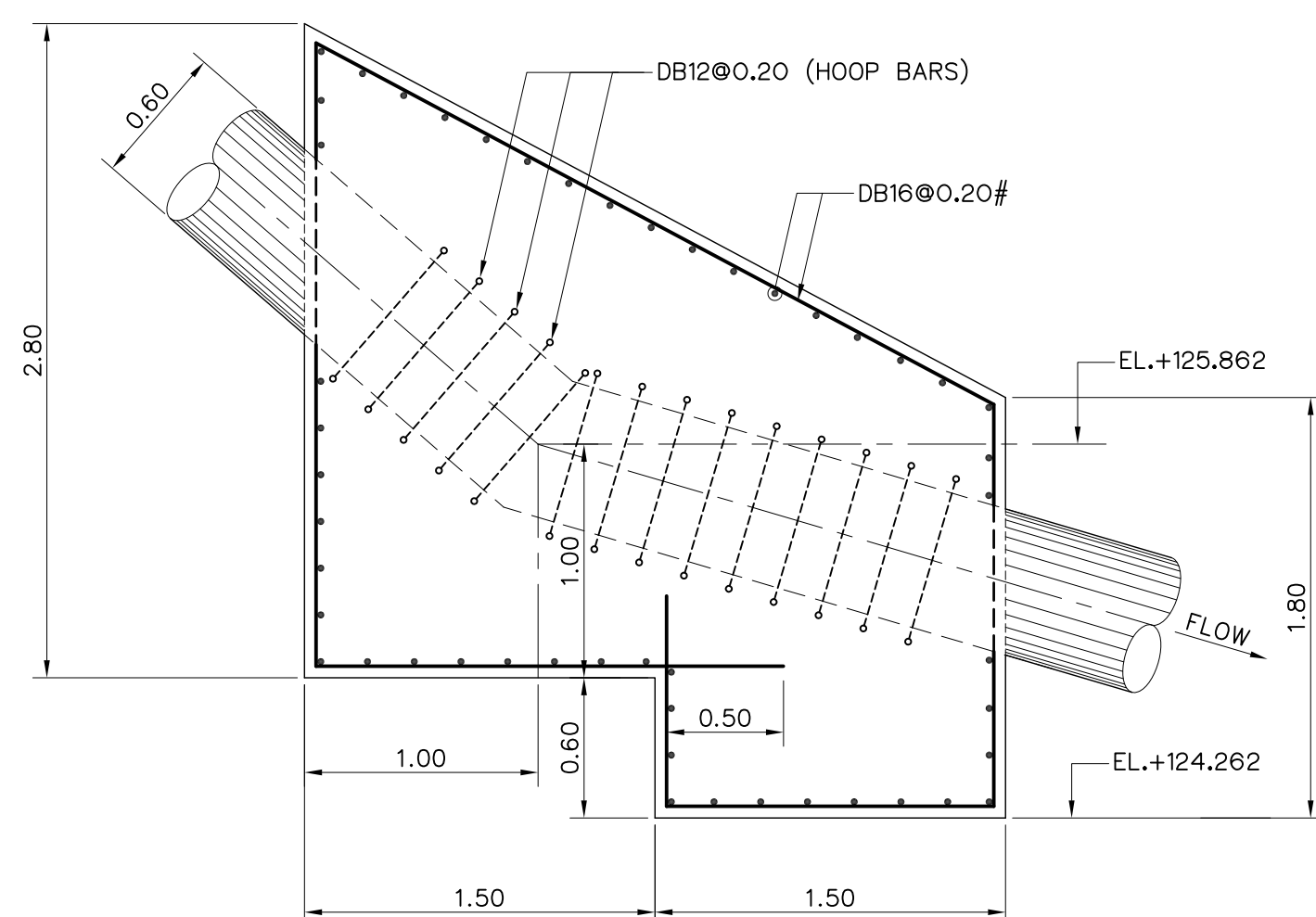
PLAN
ANCHOR 12
SCALE 1:30



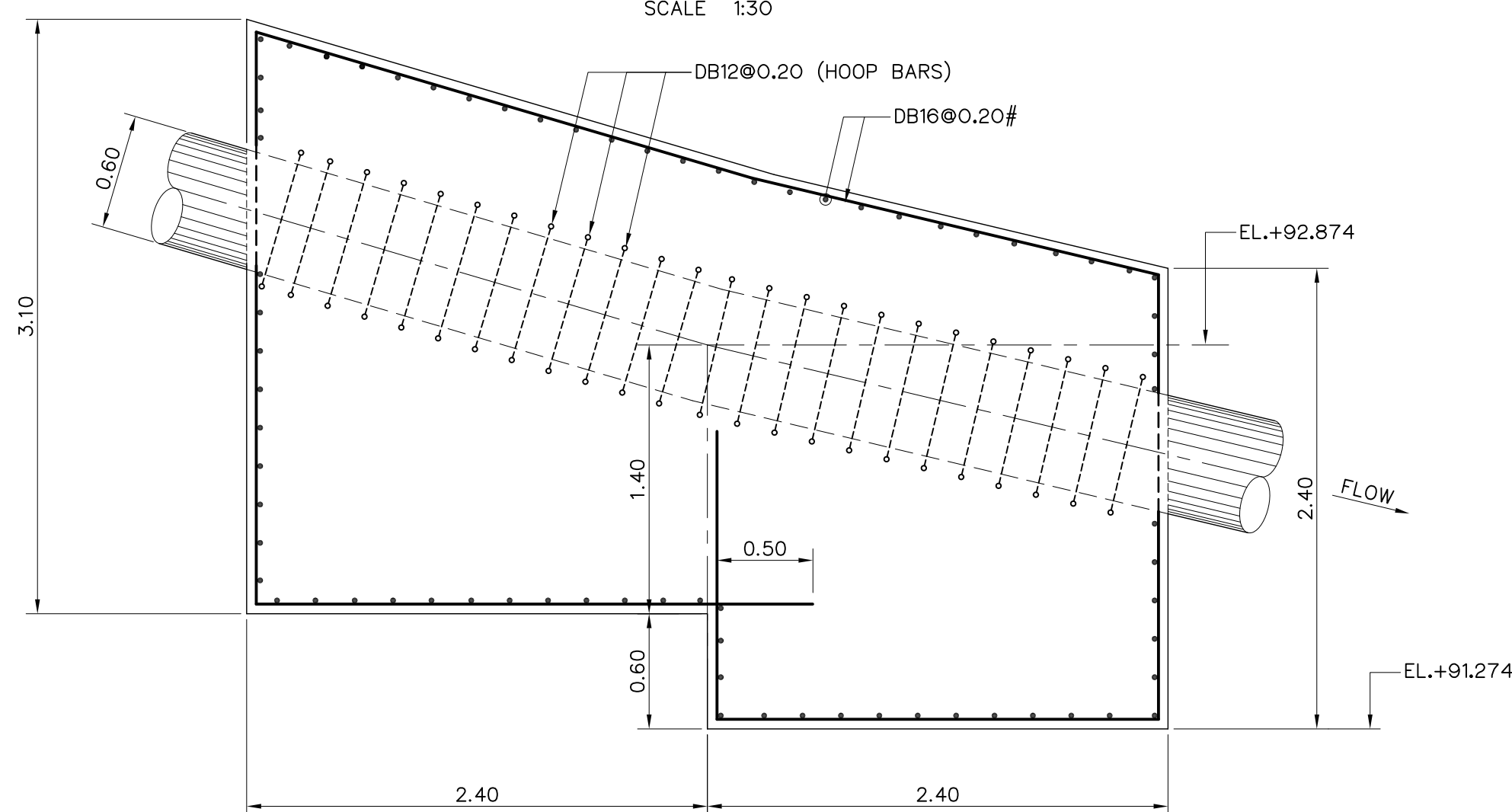
PLAN
ANCHOR 13
SCALE 1:30



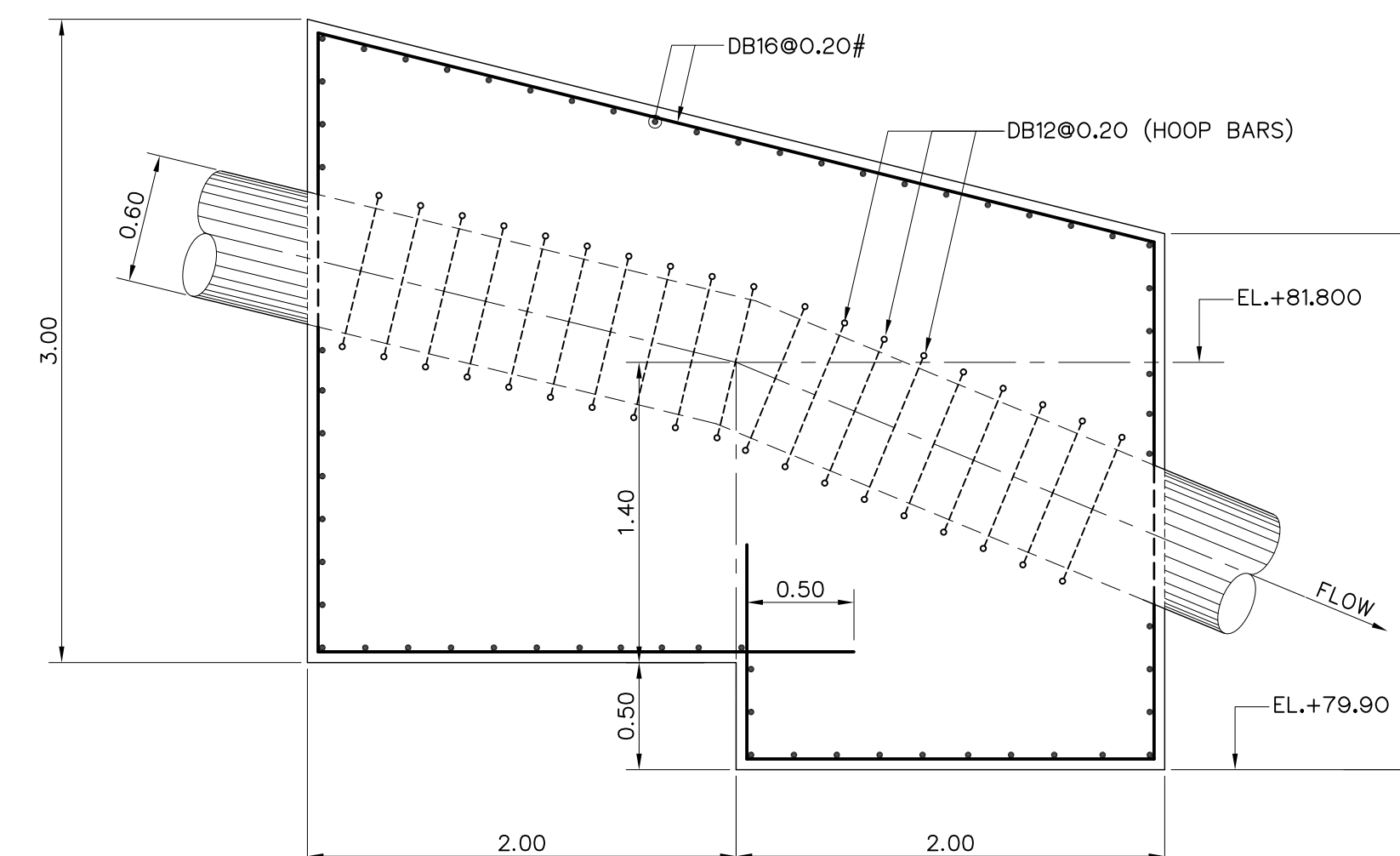
PLAN
ANCHOR 14
SCALE 1:30



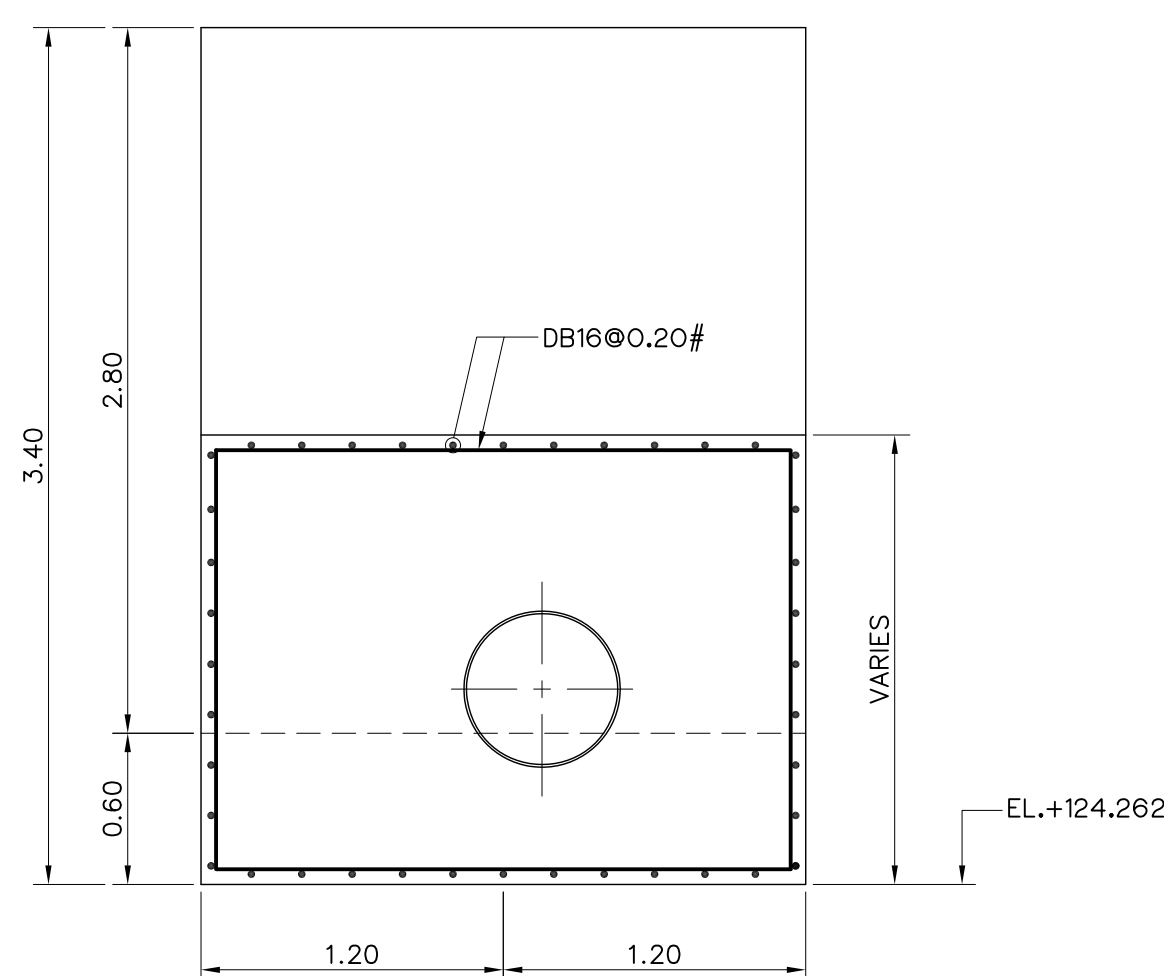
SECTION A-A
ANCHOR 12
SCALE 1:30



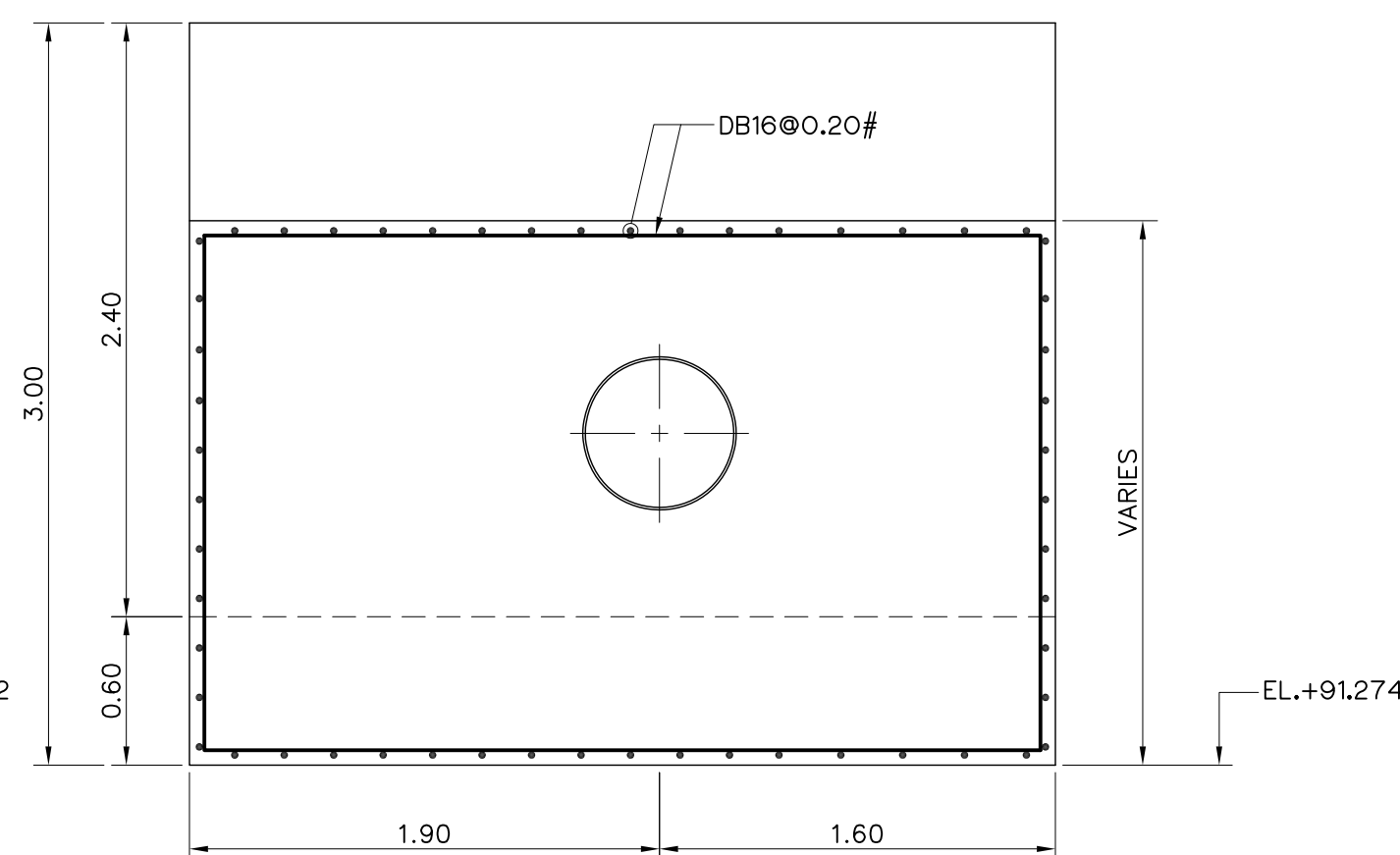
SECTION C-C
ANCHOR 13
SCALE 1:30



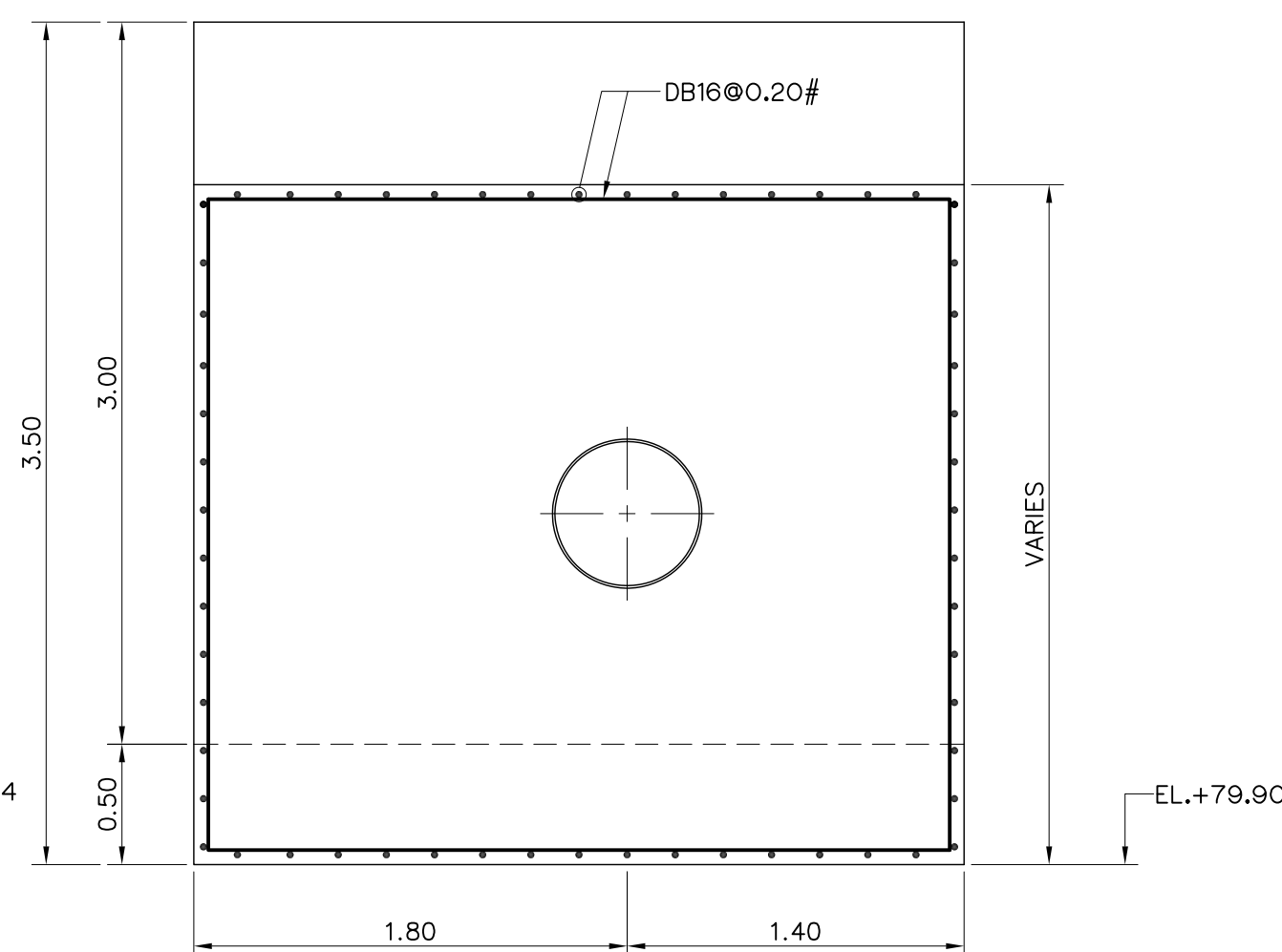
SECTION E-E
ANCHOR 14
SCALE 1:30



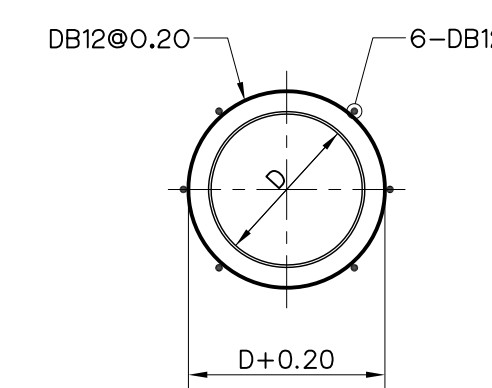
SECTION B-B
ANCHOR 12
SCALE 1:30



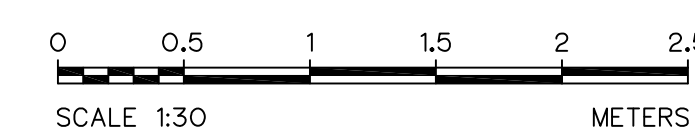
SECTION D-D
ANCHOR 13
SCALE 1:30



SECTION F-F
ANCHOR 14
SCALE 1:30



TYPICAL HOOP BAR
SCALE 1:30



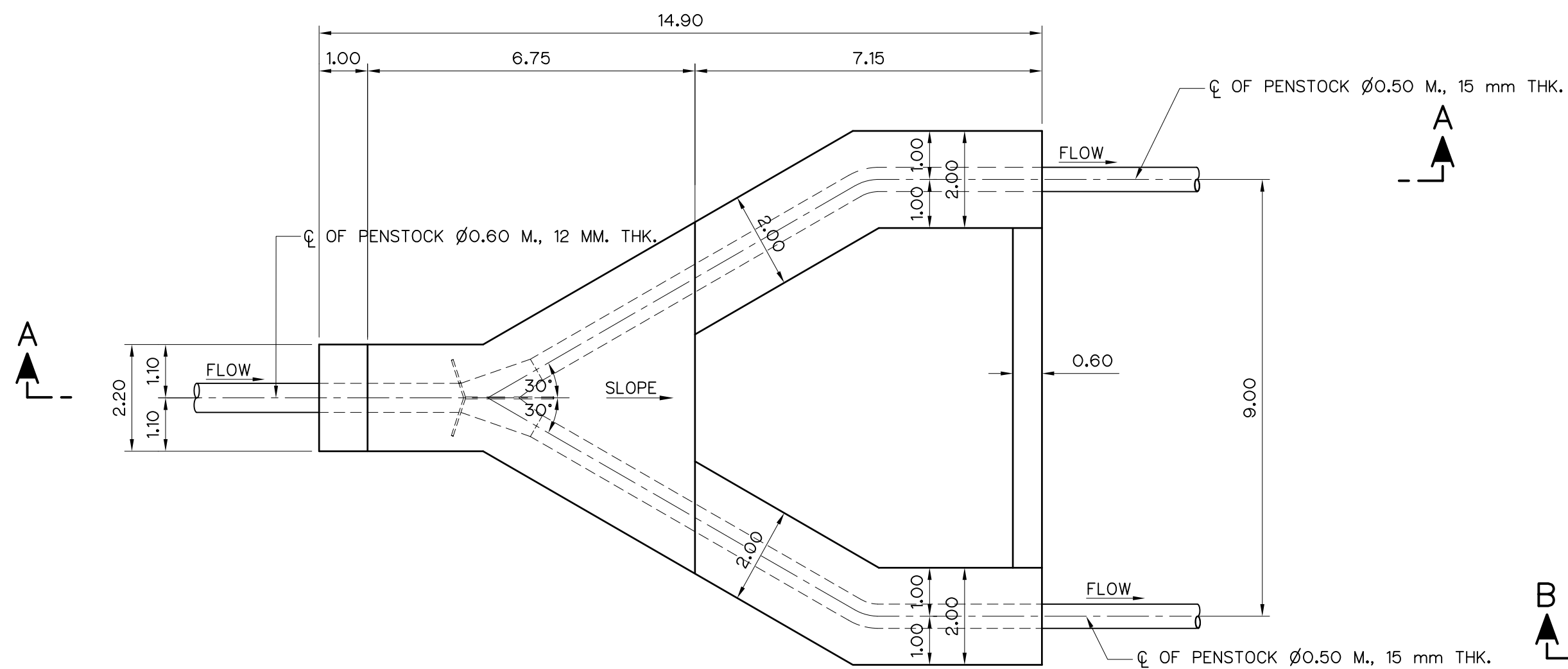
NOTES :

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

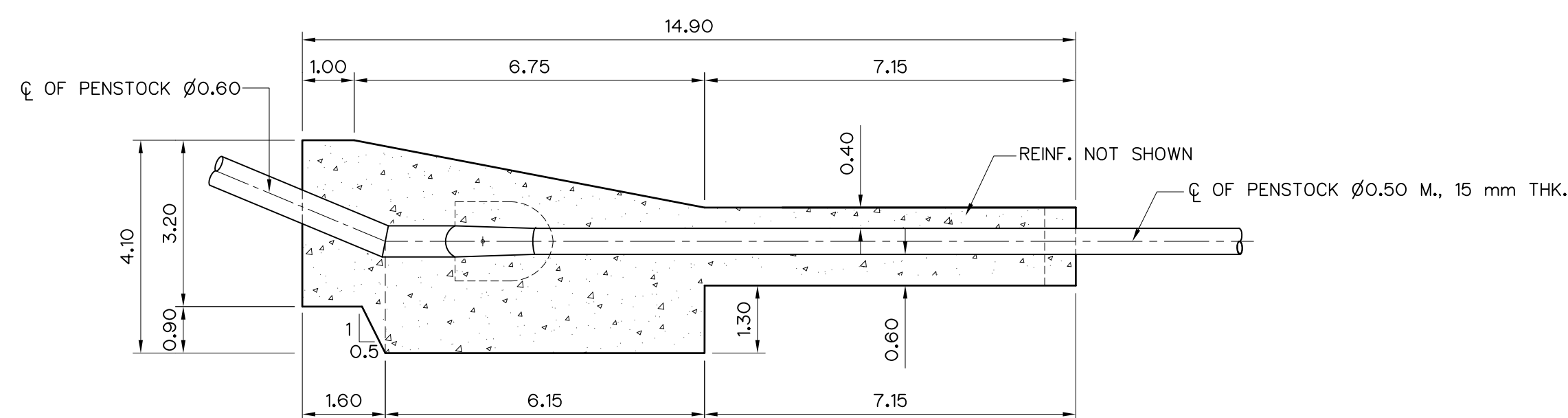
REFERENCE DRAWINGS :

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

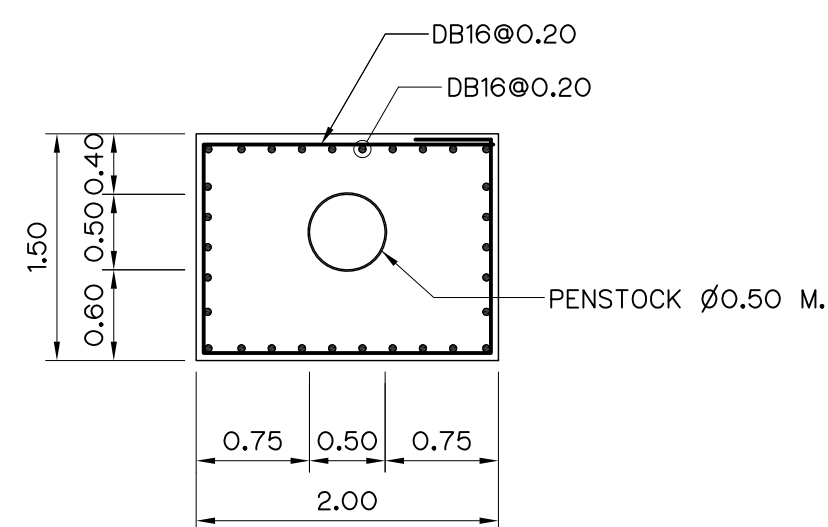
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUAI LAM SIN HYDROPOWER PROJECT			
CIVIL WORKS PENSTOCK ANCHOR BLOCK 12, 13 & 14 PLANS AND REINFORCEMENT DETAILS			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED		REVIEWED S.KITIKHAJ	
DRAWN		SUBMITTED	
CHECKED		RECOMMENDED	
APPROVED		APPROVED	
14/01/62		14/01/62	
PROJECT MANAGER		DRAWING NO. HLS-PS-14	
DATE		SHEET NO. 36 OF 78	



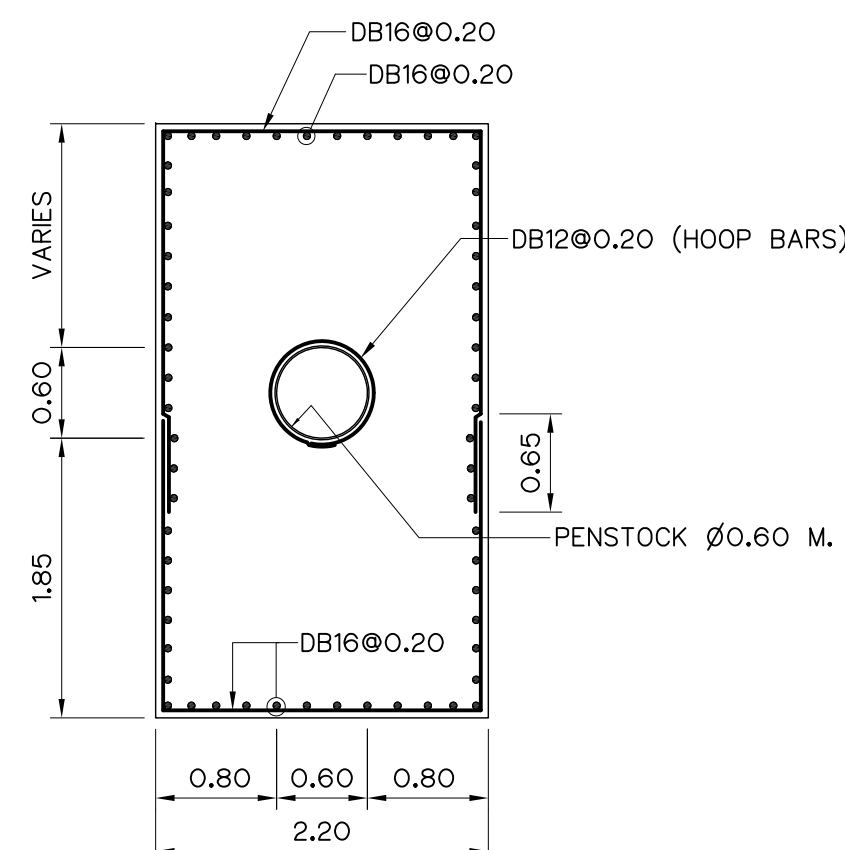
PLAN (ANCHOR BLOCK 15)
SCALE 1:100



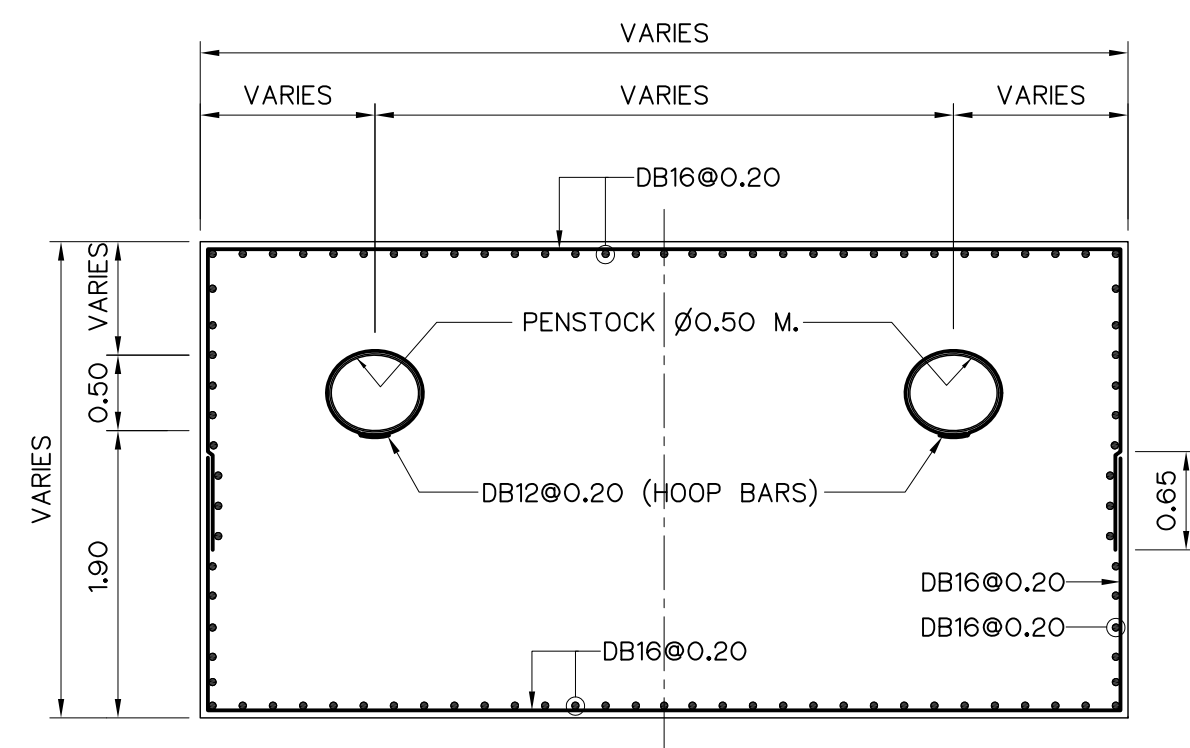
SECTION A - A
SCALE 1:100



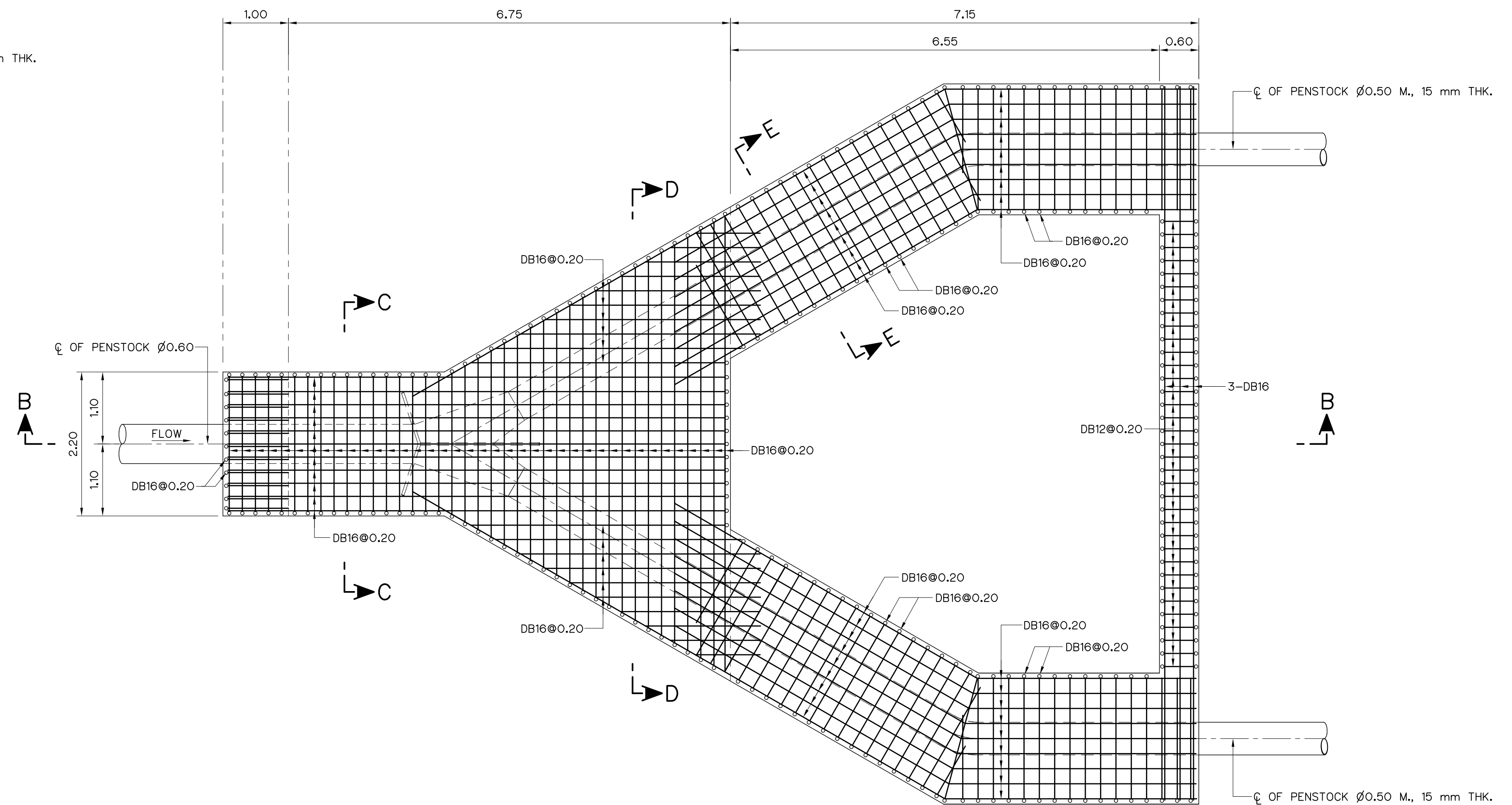
SECTION E - E
SCALE 1:50



SECTION C - C
SCALE 1:50



SECTION D - D
SCALE 1:50



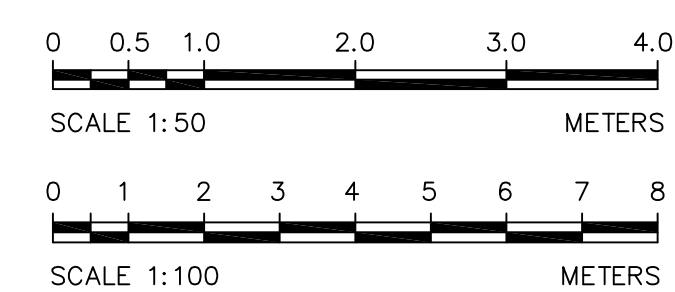
SECTION B - B
SCALE 1:50

NOTES :

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

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



3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

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	
DESIGNED		REVIEWED S.KTICHAJ	
DRAWN		SUBMITTED	
CHECKED		RECOMMENDED	
APPROVED		APPROVED	
PROJECT MANAGER		DRAWING NO. HLS-PS-15	
DATE 14/01/62		SHEET NO. 37 OF 78	



ITEM	DESCRIPTION	MATERIAL	QUANT.	REMARKS
1	PENSTOCK	ASTM A-283, GRADE D	—	—
2	PENSTOCK	ASTM A-283, GRADE D	1	NOTE 1 & 2
3	INNER SLEEVE	ASTM A-283, GRADE D	1	NOTE 1 & 3
4	GRAND RING	ASTM A-283, GRADE D	1	SEAMLESS, NOTE 2
5	OUTER RING	ASTM A-283, GRADE D	1	SEAMLESS, NOTE 2
6	STUFFING BOX	ASTM A-283, GRADE D	1	NOTE 1 & 2
7	DOUBLING PLATE	ASTM A-283, GRADE D	1	NOTE 1 & 2
8	OUTER SLEEVE	ASTM A-283, GRADE D	1	NOTE 1 & 2
9	PACKING STOPPER	ASTM A-283, GRADE D	1	NOTE 1 & 2
10	ø5/8" BOLTS (MIN. THREAD LENGTH = 125)	ASTM A-325	12	NOTE 2
11	ø5/8" NUTS	ASTM A-325	24	NOTE 2
12	ø5/8" WASHER	ASTM A-325	24	NOTE 2
13	PACKING RINGS (16 mm. S.Q. RING)	ASBESTOS—GRAPHITE	6	NOTE 4

NOTES :

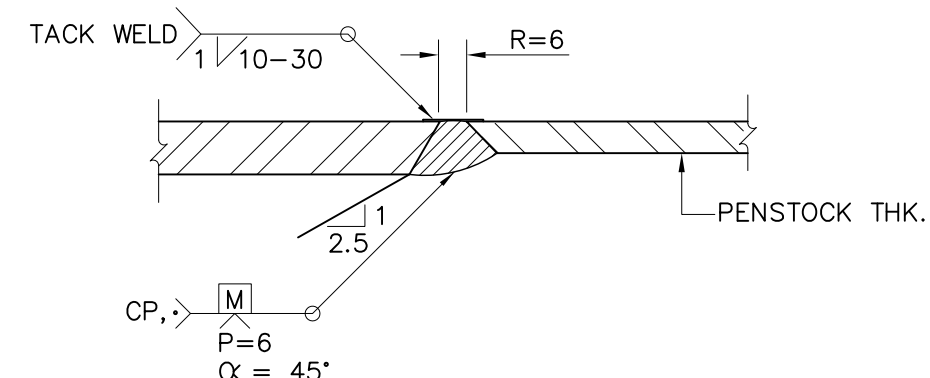
1. ALL DIMENSION ARE IN MILLIMETER, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
3. LONGITUDINAL SEAMS HAVE TO BE COMPLETE JOINT PENETRATION WELDS BY COMBINING SINGLE-V-GROOVE WITH BACKING WELDS AND GROUND FLUSH WELDING WITH BASE METAL AS REQUIRED
4. GALVANIZED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

WELDING NOTATION :

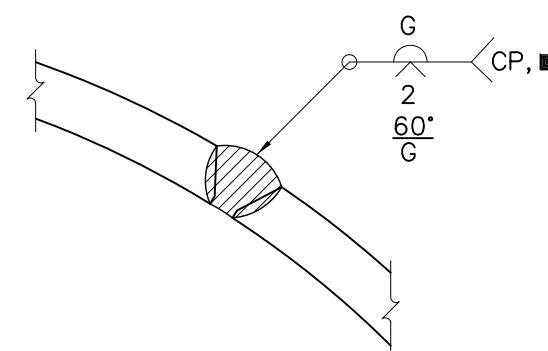
CP = COMPLETE JOINT PENETRATION GROOVE WELD

G = GRINDING WELD DEPOSITE FLUSH WITH BASE METAL

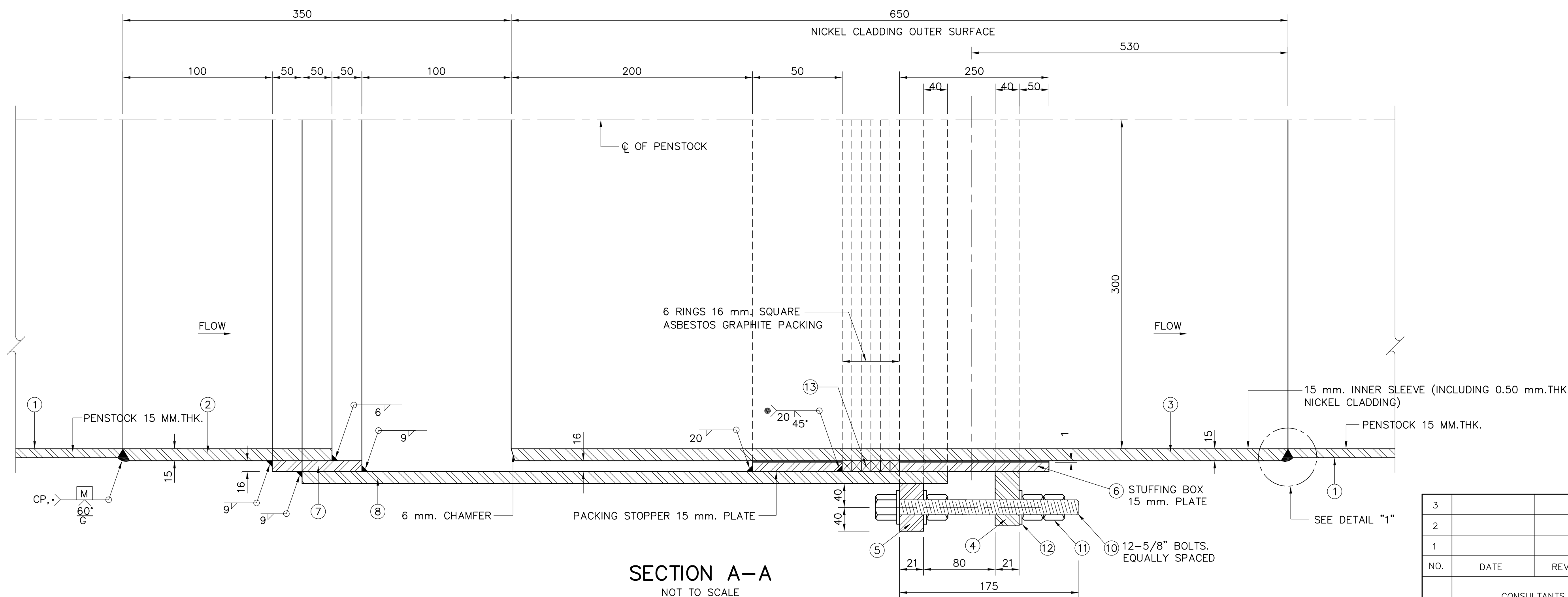
- = BACKING PLATE SIZE 1.0x1.50 mm. AND SAME MATERIAL AS PENSTOCK
- = BEVEL PLATE 9 mm. BEFORE ROLLING CHIP SQUARE AFTER WELDING
- ▲ = ROOT OPENING R = 0 mm.
ROOT FACE t = 3.0 mm.
GROOVE ANGLE = 45°
- = ROOT OPENING R = 2.0 mm.
ROOT FACE t = 2.0 mm.
GROOVE ANGLE = 60°



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

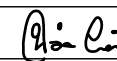


LONGITUDINAL WELD
NOT TO SCALE



SECTION A-A
NOT TO SCALE

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUA I LAM SIN HYDROPOWER PROJECT			
CIVIL WORKS			
PENSTOCK			
EXPANSION JOINT, PLAN, SECTIONS AND DETAILS			
 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY		REVIEWED S.KNICHAI	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		DESIGNED  66651	
DRAWN 		RECOMMENDED 	
CHECKED  7324		APPROVED 	
		DRAWING NO. HLS-PS-16	
PROJECT MANAGER		DATE 14/01/62	
		SHEET NO. 38 OF 78	



 FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED  02.6.651		REVIEWED S.KITCHAI	
DRAWN  02.6.651		SUBMITTED 	
CHECKED  02.6.651		RECOMMENDED 	
 14/01/62		APPROVED 	
PROJECT MANAGER		DRAWING NO.	
DATE		SHEET NO.	
		HLS-PS-17	
		39 OF 78	



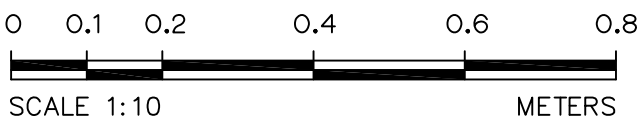
WELDING PROCESS	DESIGNATION	BASE METAL THICKNESS		GROOVE PREPARATION		TOLERANCES		REMARKS
		T1	T3	ROOT OPENING	GROOVE ANGLE	ROOT OPENING	GROOVE ANGLE	
GMAW FCAW	B-L1a-GF	12	1.0	R = T1	—	+1.5,-0	—	SINGLE-PASS WELD
GMAW FCAW	B-L1a-GF	15	1.0	R = T1	—	+1.5,-0	—	SINGLE-PASS WELD

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

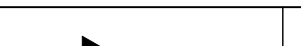
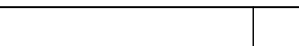
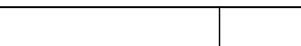
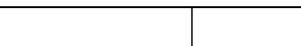
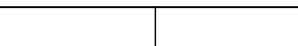
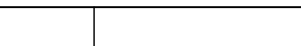
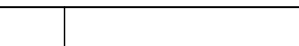
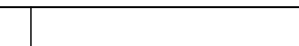
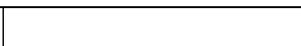
TYPE	WELDING PROCESS	DESIGNATION	BASE METAL THICKNESS		GROOVE PREPARATION			TOLERANCES			REMARKS
			T1	T3	ROOT OPENING	GROOVE ANGLE	ROOT FACE	R	A	F	
A	SMAW	B-U2	12	—	R = 2.0	A = 60°	F = 2.0	+15,-0	+10°,-0°	+15,-0	SINGLE-PASS WELD
	SMAW	B-U2	15	—	R = 2.0	A = 60°	F = 2.0	+15,-0	+10°,-0°	+15,-0	SINGLE-PASS WELD
B	GMAW FCAW	B-L1a-GF	12	1.0	R = 12.0	—	—	+15,-0	—	—	SINGLE-PASS WELD
	GMAW FCAW	B-L1a-GF	15	1.0	R = 15.0	—	—	+15,-0	—	—	SINGLE-PASS WELD

NOTES :

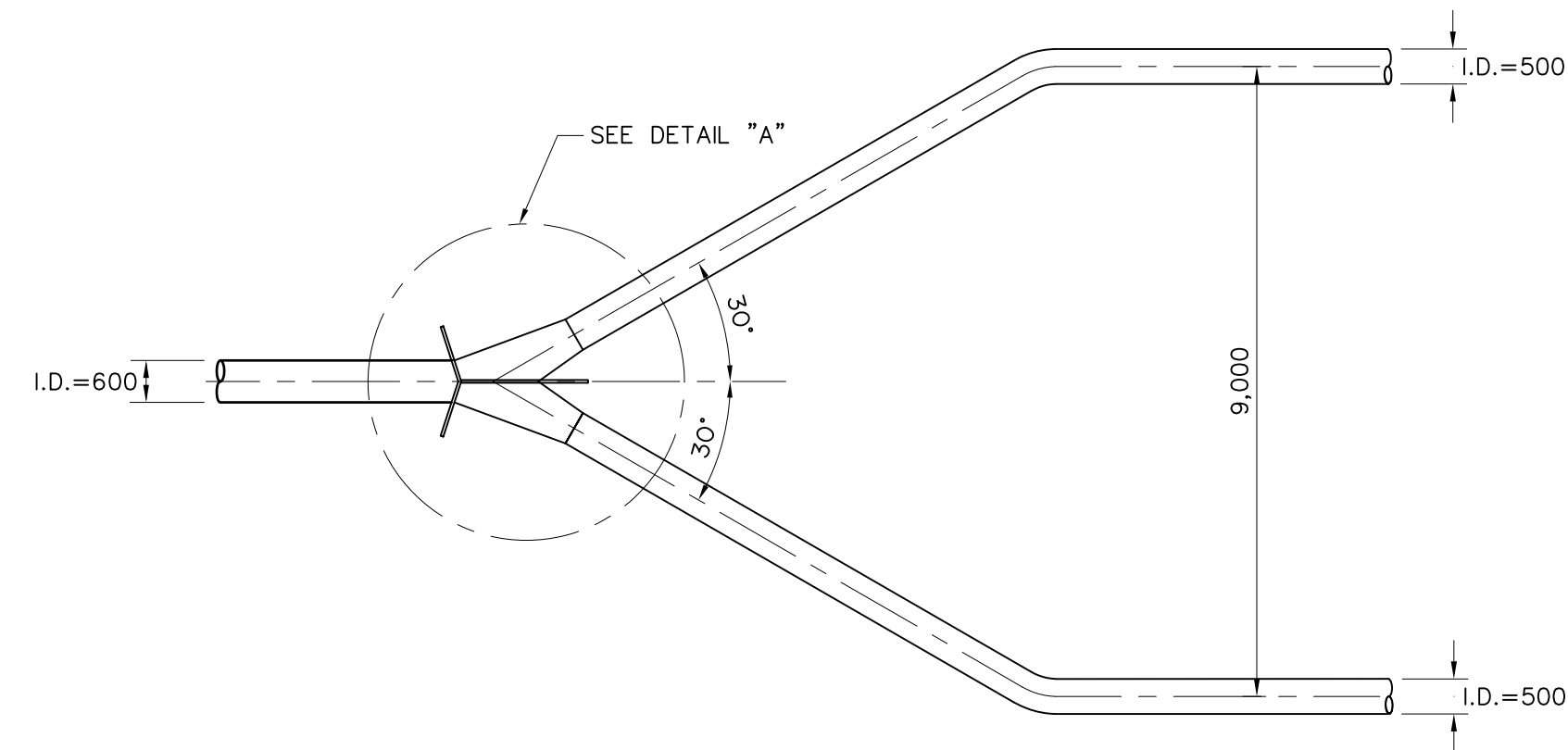
1. ALL DIMENSION ARE IN MILLIMETER, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
3. GROOVE WELD MADE AFTER WELDING OTHER SIDE
4. USE WELDING ELECTRODE TYPE "E" 70XX
5. MATERIAL OF BACKING IS THE SAME AS OF PIPE



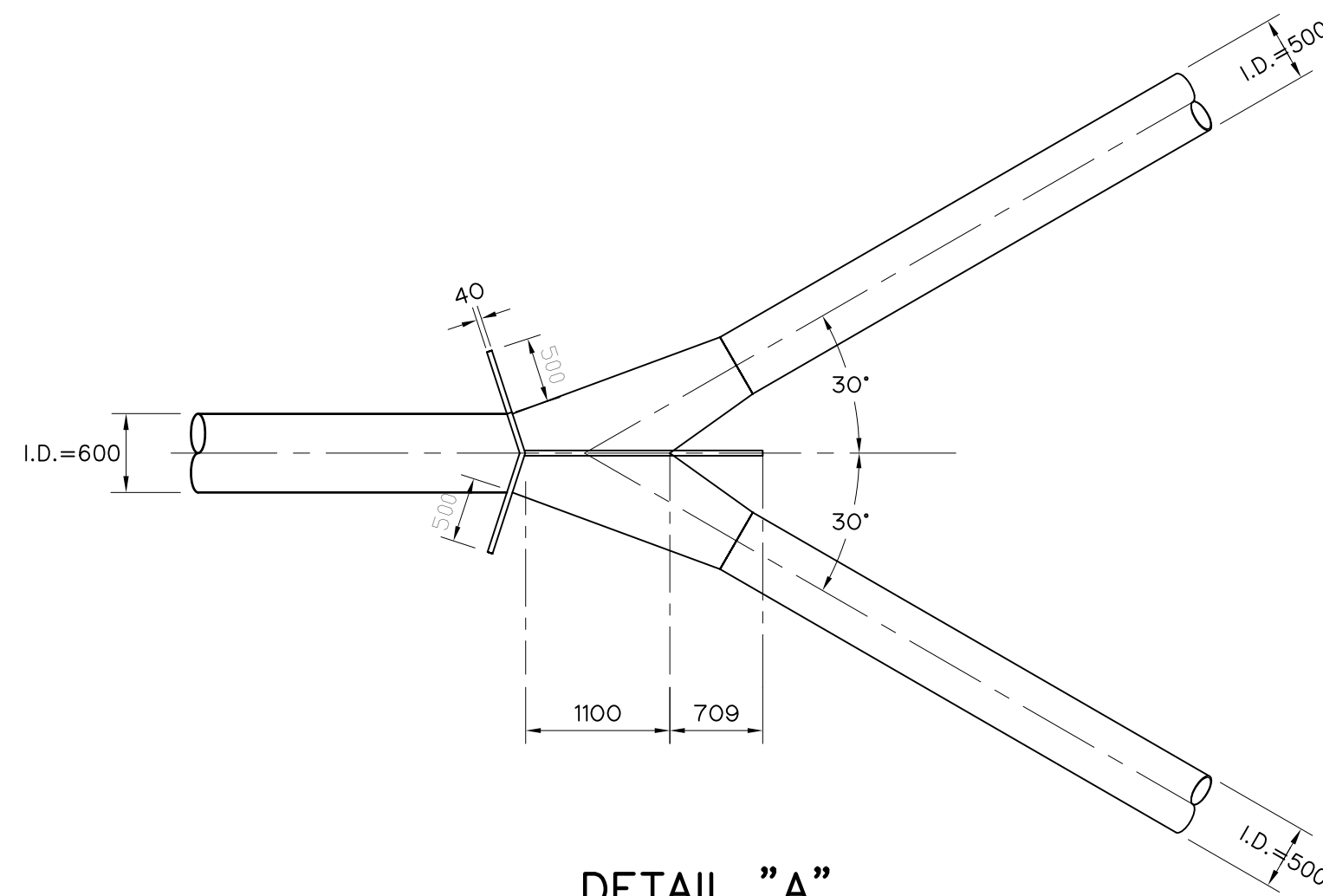
WELDING SYMBOLS

										
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

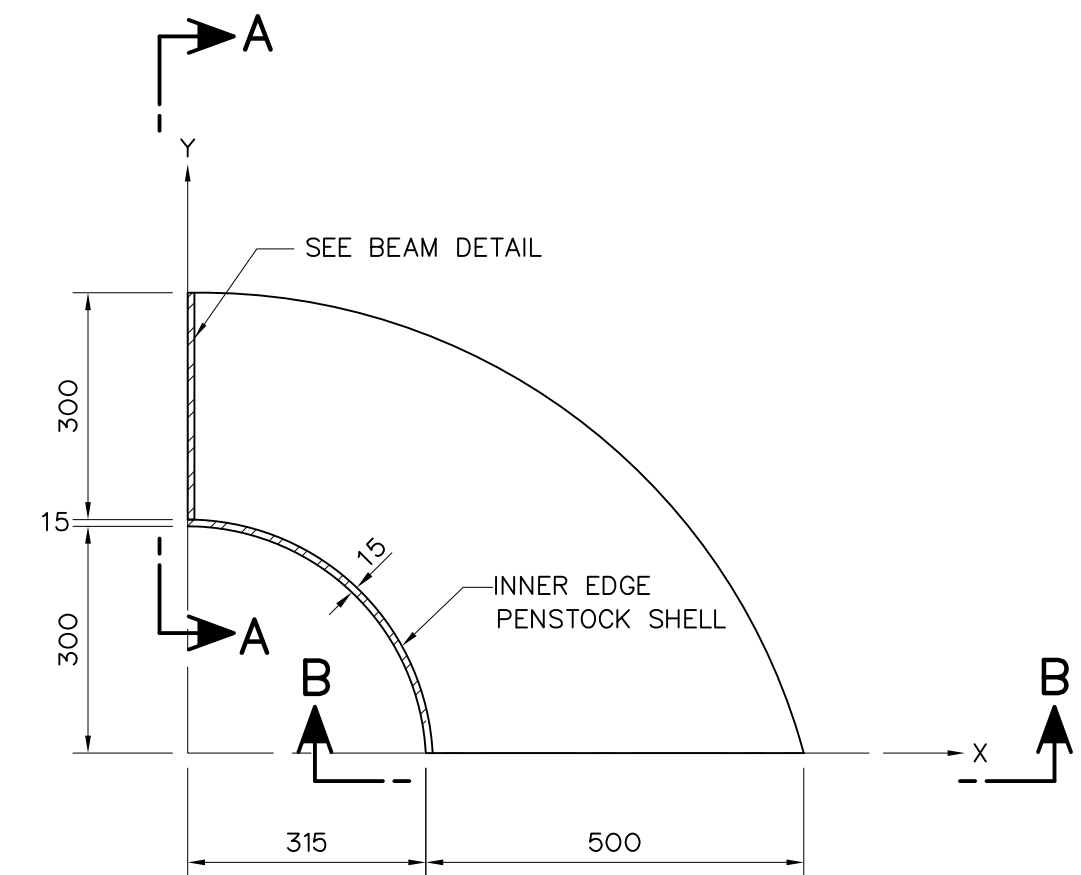
3						DESIGNED		02.6651	REVIEWED	S. KUTICHAJ
2						DRAWN			RECOMMENDED	
1						CHECKED		02.7324	APPROVED	
NO.	DATE	REVISIONS	CHECKED	APPROVED		 14/01/62 PROJECT MANAGER DATE		DRAWING NO. HLS-PS-18		SHEET NO. 40 OF 78
CONSULTANTS					DEDE					



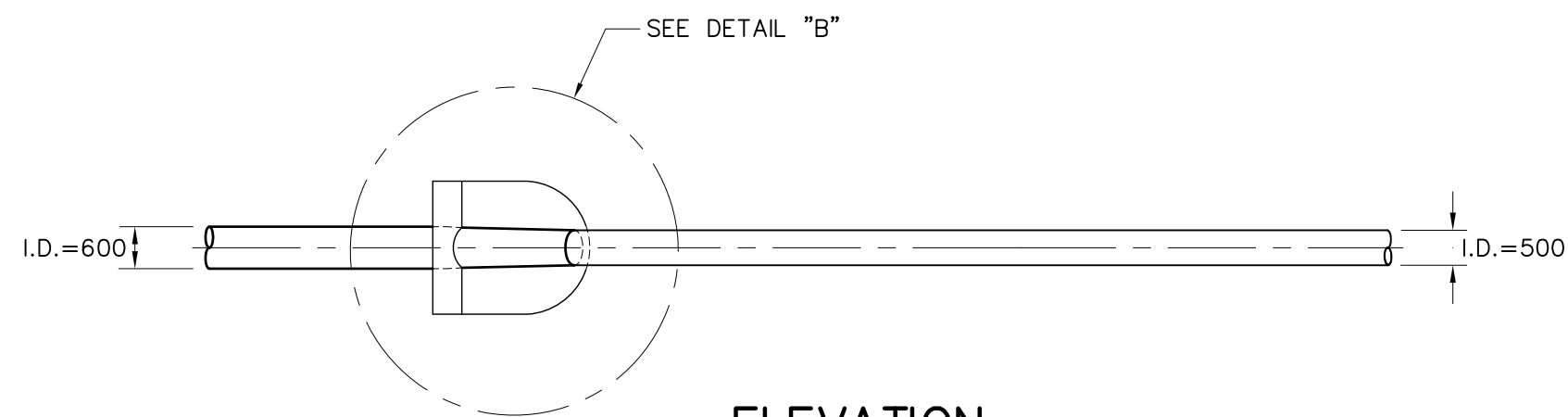
PLAN
SCALE 1:100



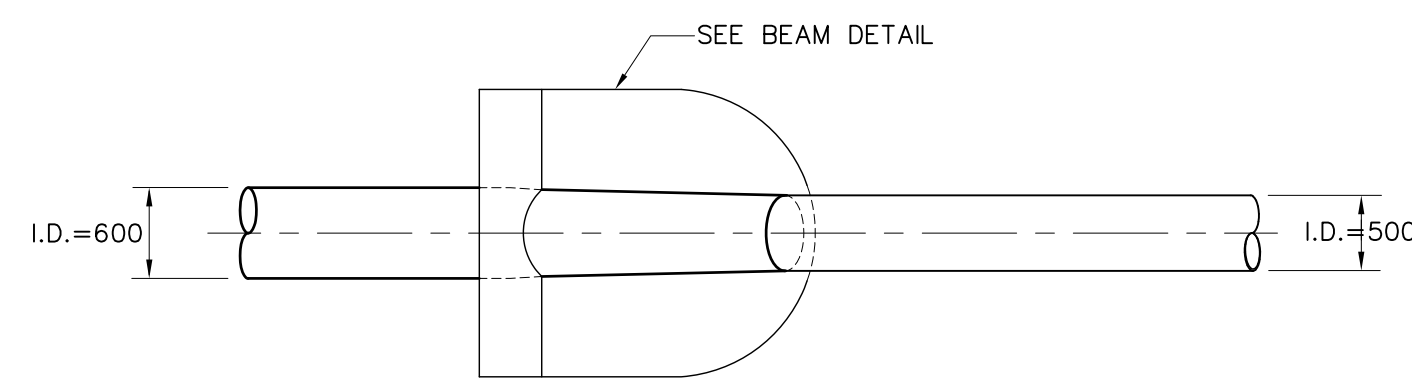
DETAIL "A"
SCALE 1:50



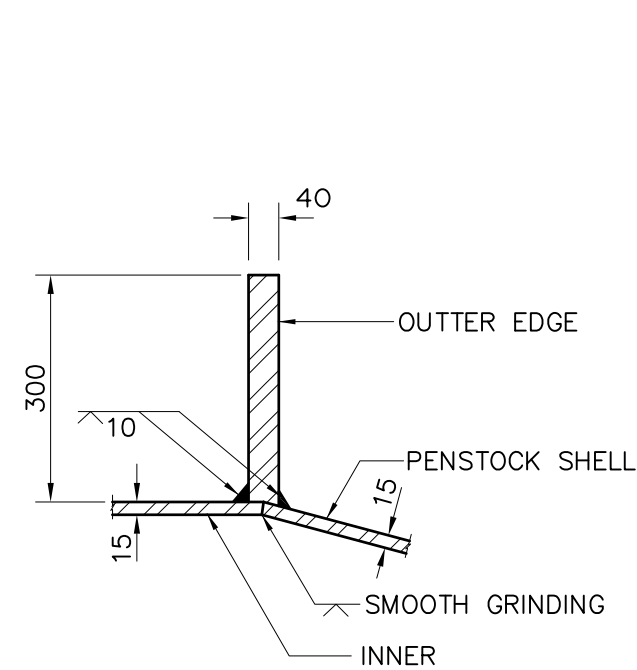
RING DETAIL
SCALE 1:10



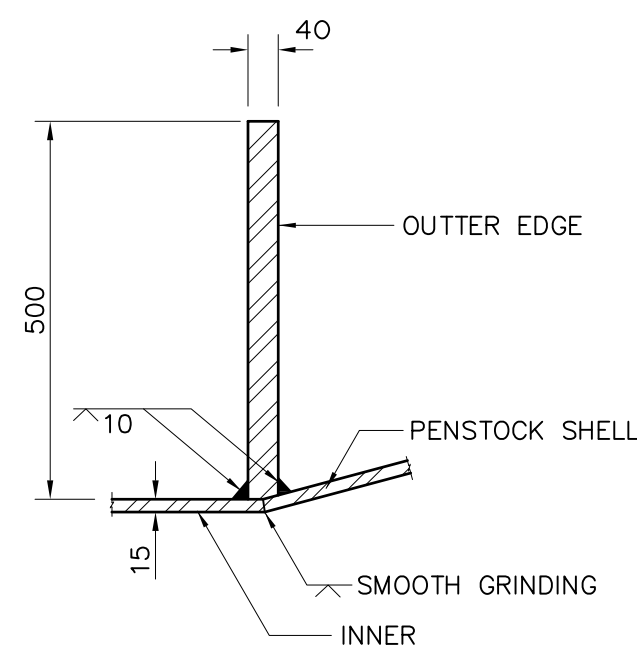
ELEVATION
SCALE 1:100



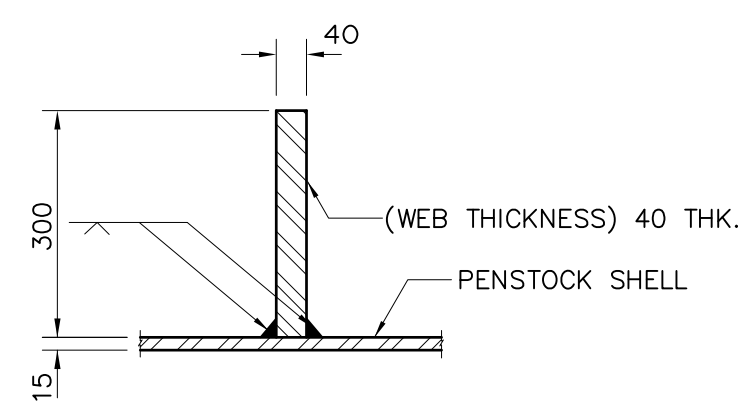
DETAIL "B"
SCALE 1:50



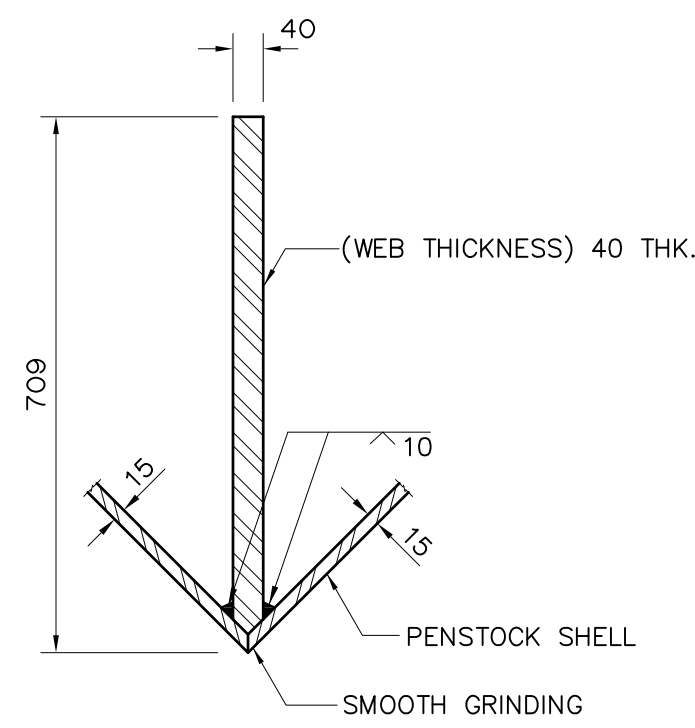
SECTION A-A
SCALE 1:10



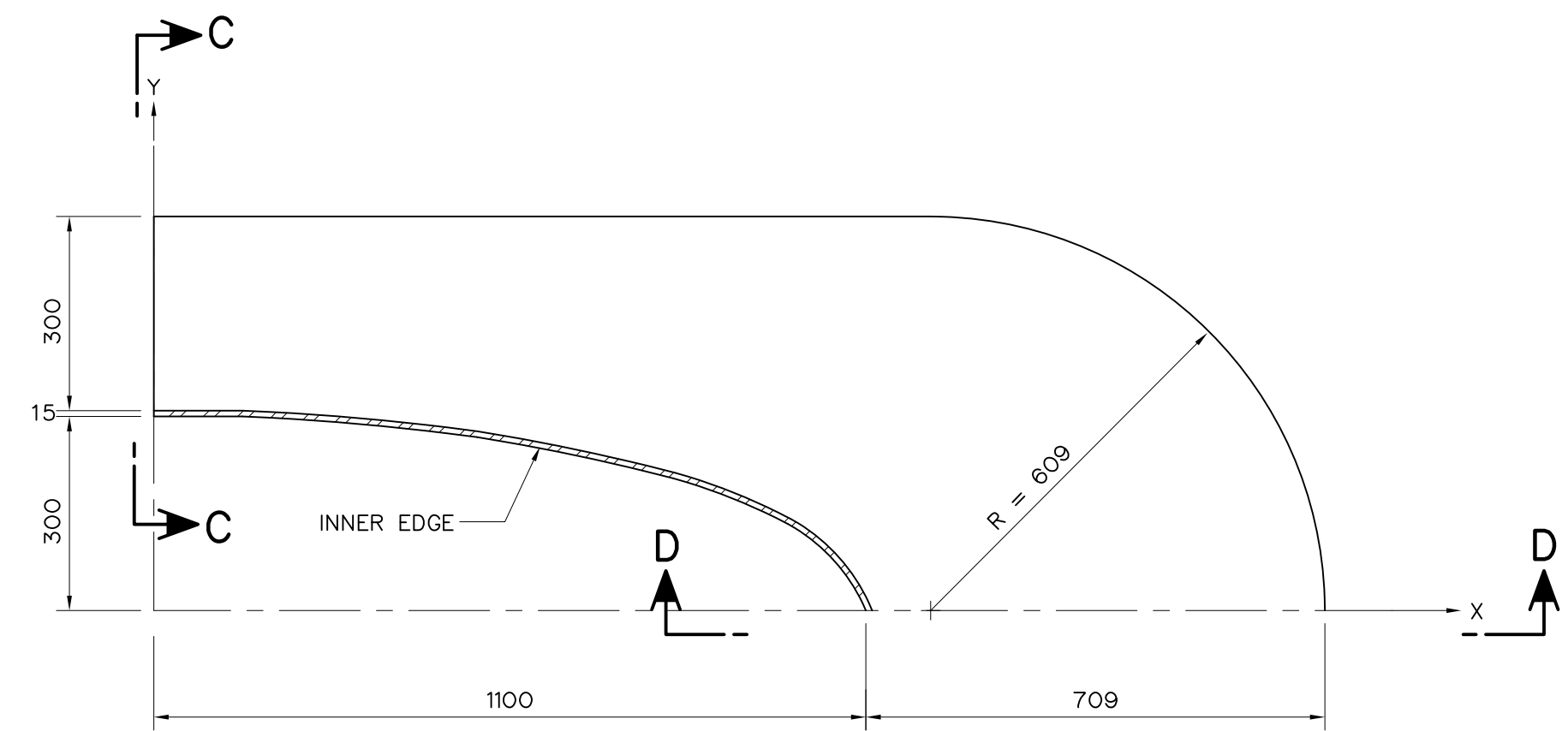
SECTION B-B
SCALE 1:10



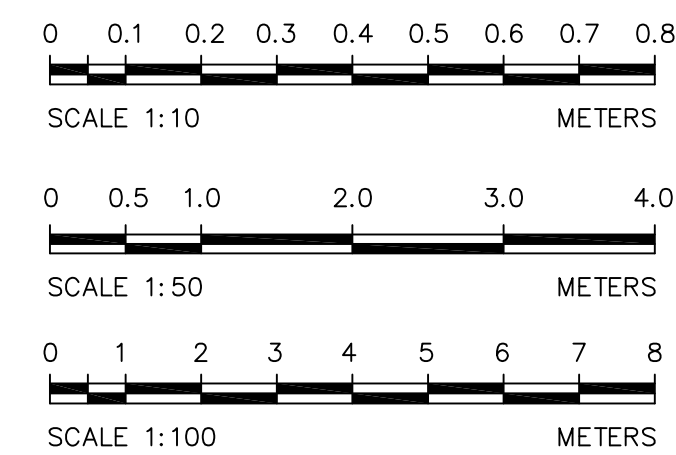
SECTION C-C
SCALE 1:10



SECTION D-D
SCALE 1:10



BEAM DETAIL
SCALE 1:10

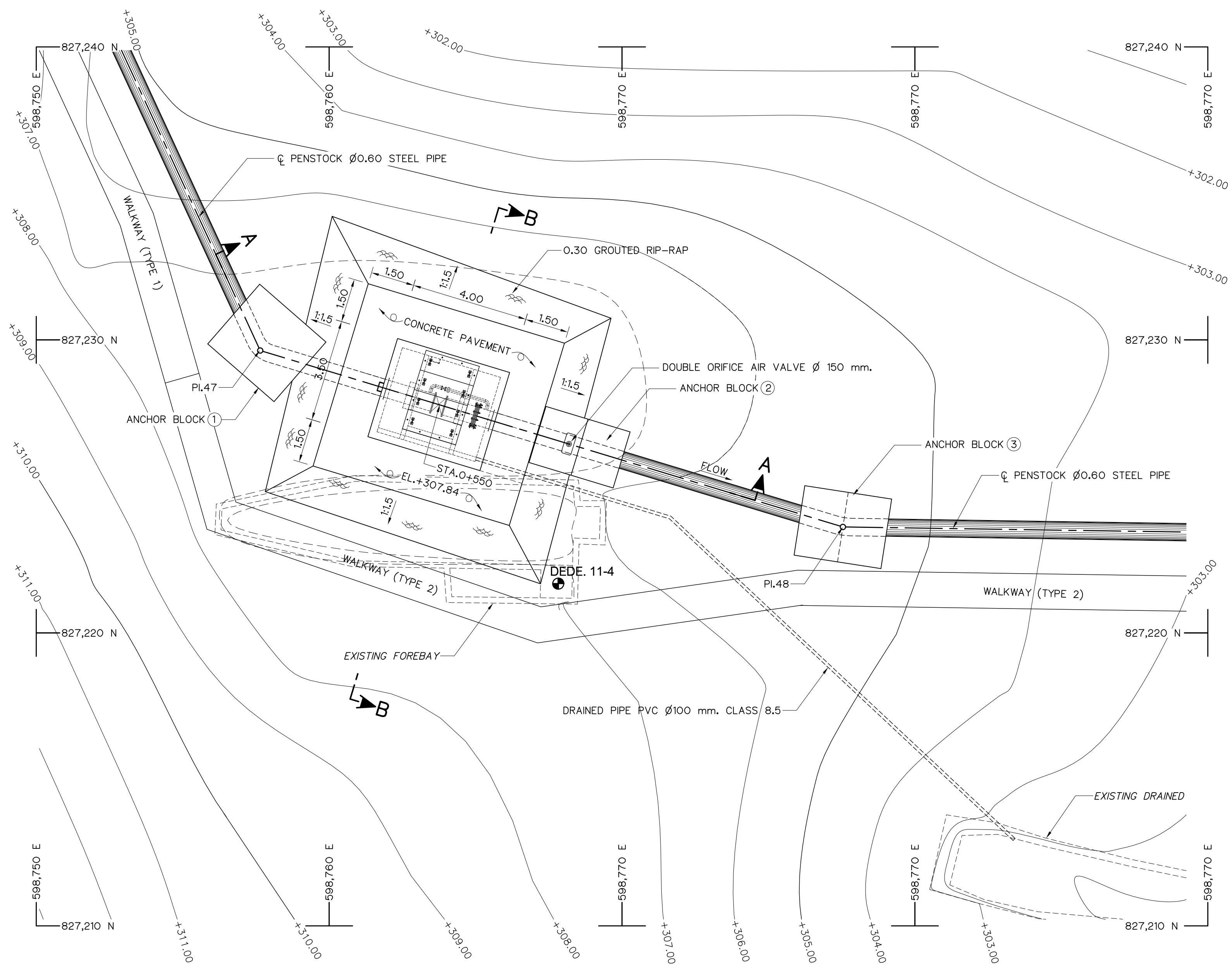
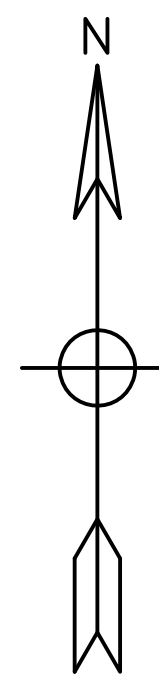


NOTES :

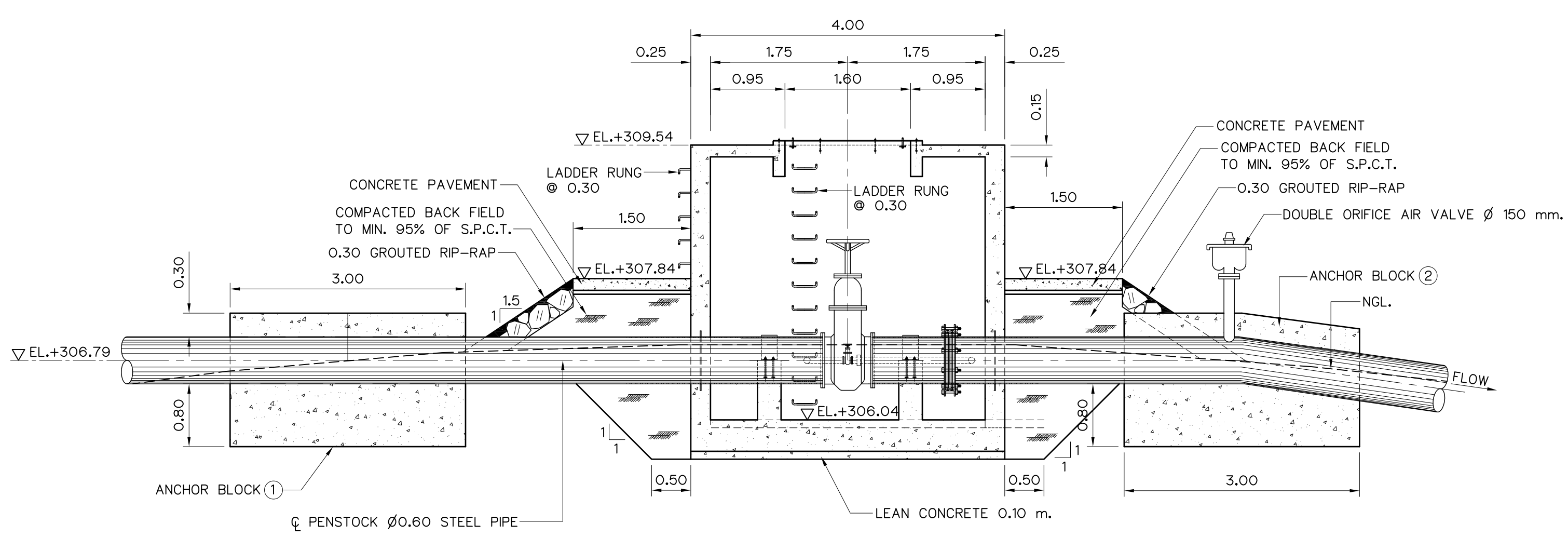
1. ALL DIMENSIONS ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
3. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY,
SHOP DRAWING SHALL BE DESIGNED BY CONTRACTOR
UNDER APPROVAL OF FIELD ENGINEER.

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

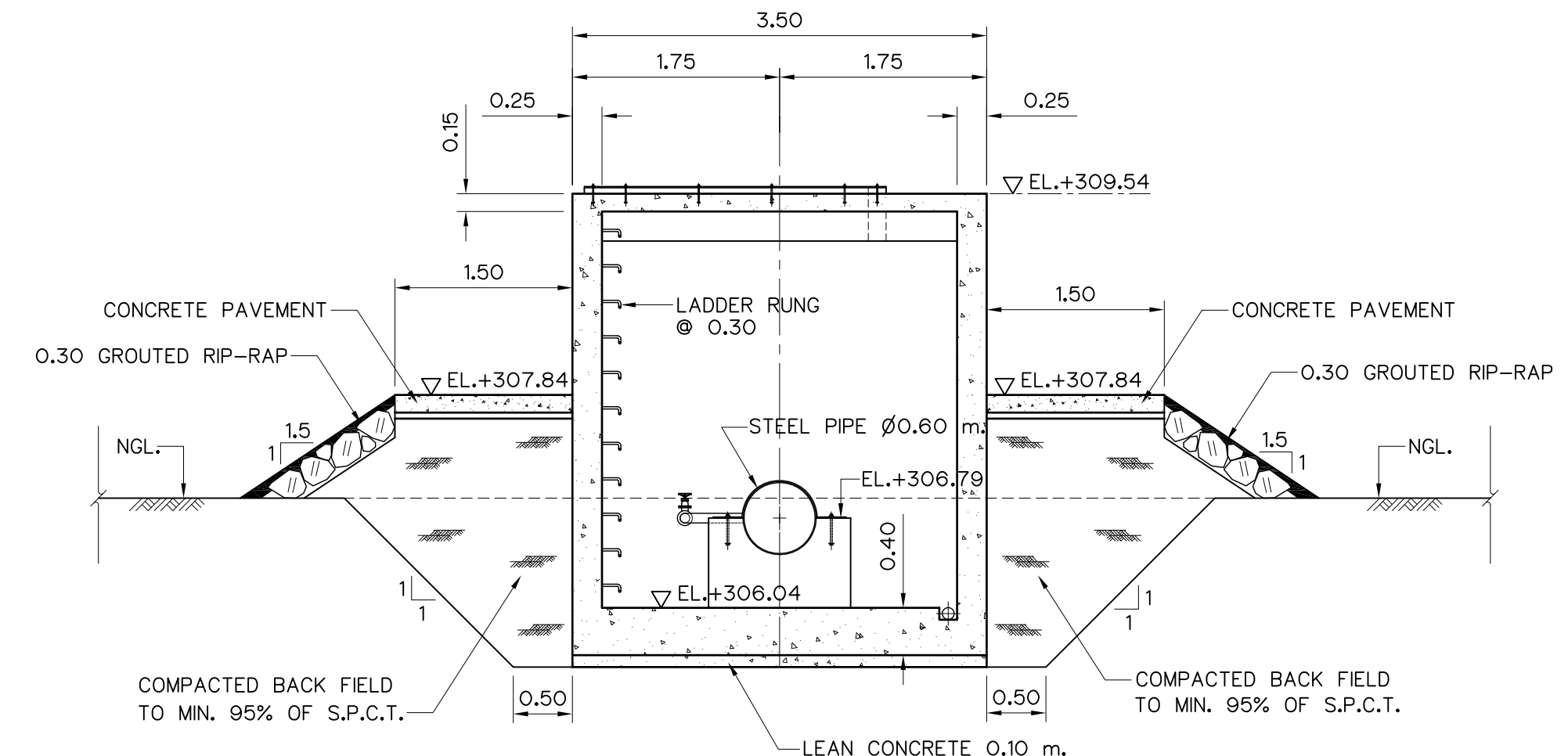
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
HUA I LAM SIN HYDROPOWER PROJECT	
CIVIL WORKS PENSTOCK WYE, PLAN, SECTIONS AND DETAILS	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	REVIEWED S.KTICKHAJ
DESIGNED S. K. 14/01/62	SUBMITTED
DRAWN S. K. 14/01/62	RECOMMENDED
CHECKED S. K. 14/01/62	APPROVED
PROJECT MANAGER	DRAWING NO. HLS-PS-19
	SHEET NO. 41 OF 78



GENERAL LAY-OUT
SCALE 1:100



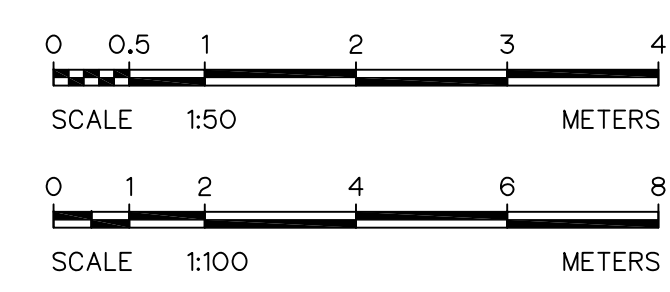
SECTION A-A
SCALE 1:50



SECTION B-B
SCALE 1:50

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

- REFERENCE DRAWINGS :
- PENSTOCK, EMERGENCY VALVE CHAMBER PLAN SECTIONS AND DETAILS HLS-PS-21
 - PENSTOCK, EMERGENCY VALVE CHAMBER REINFORCEMENT DETAILS HLS-PS-22



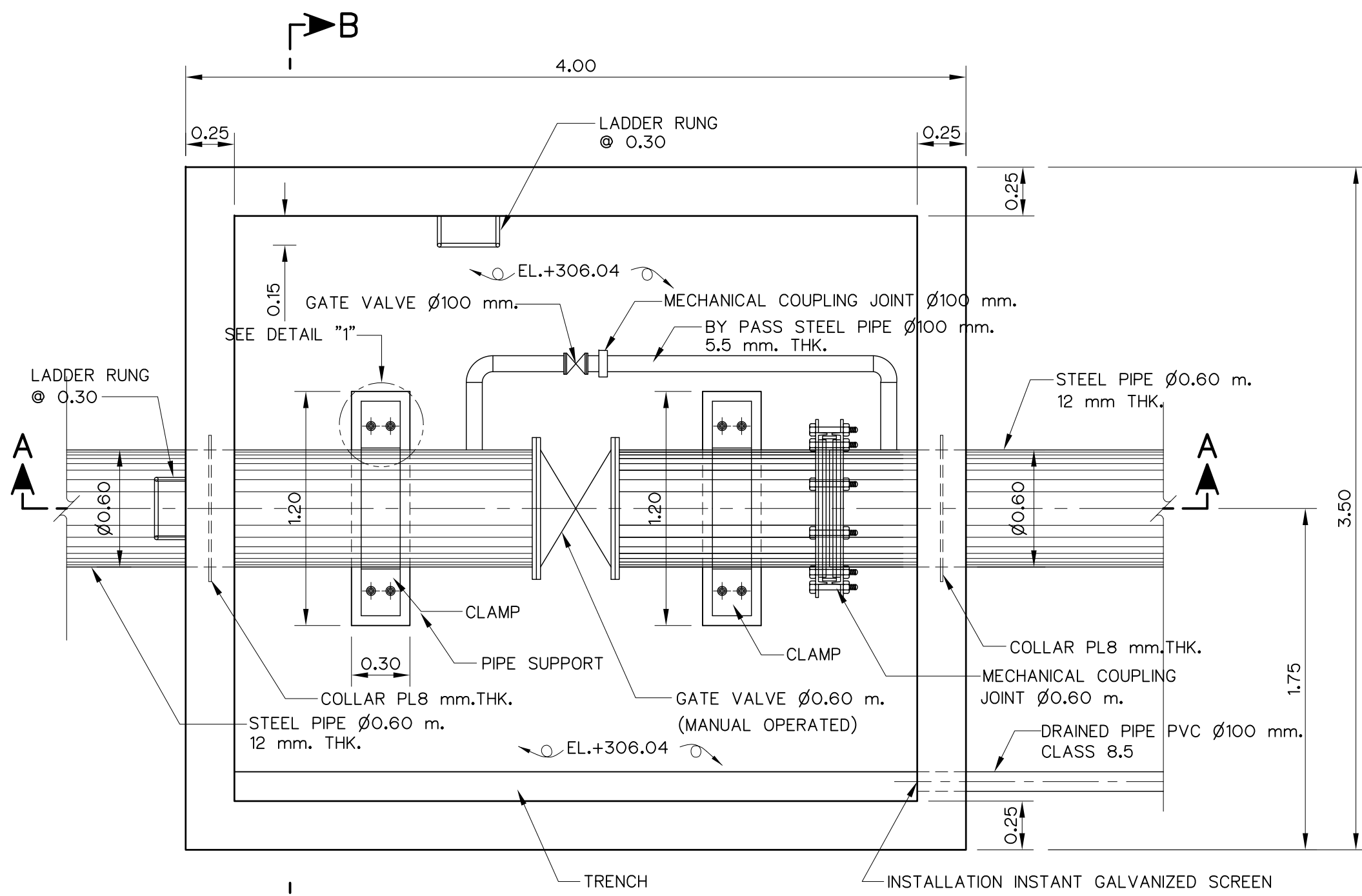
KINGDOM OF THAILAND
Department of Alternative
Energy Development and Efficiency
MINISTRY OF ENERGY

HUAI LAM SIN HYDROPOWER PROJECT

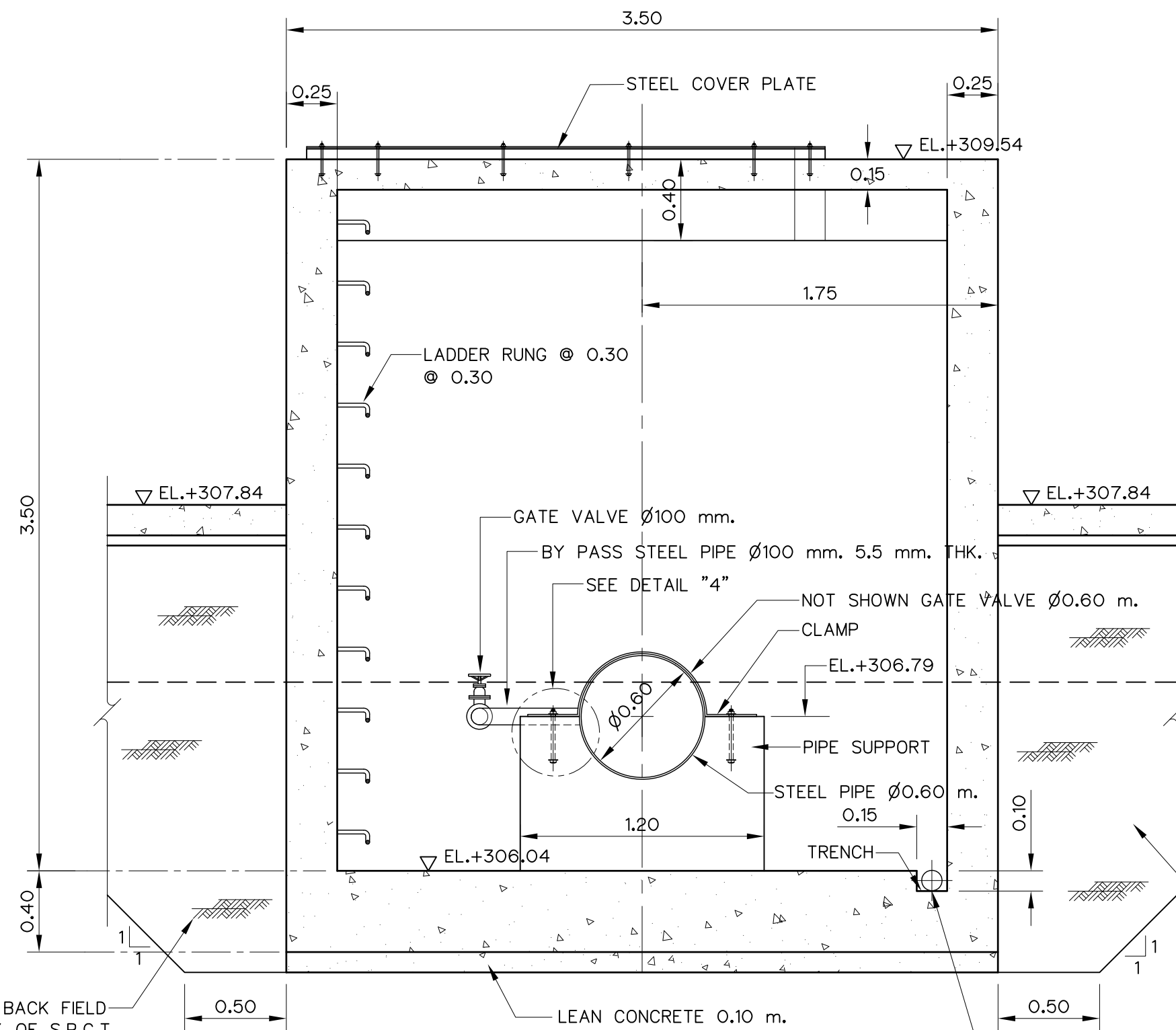
CIVIL WORKS
PENSTOCK
EMERGENCY VALVE CHAMBER GENERAL LAY-OUT AND SECTION

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	REVIEWED S.KITIKHAJ
DESIGNED 22.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED 22.7324	APPROVED
14/01/62 PROJECT MANAGER	DRAWING NO. HLS-PS-20 SHEET NO. 42 OF 78

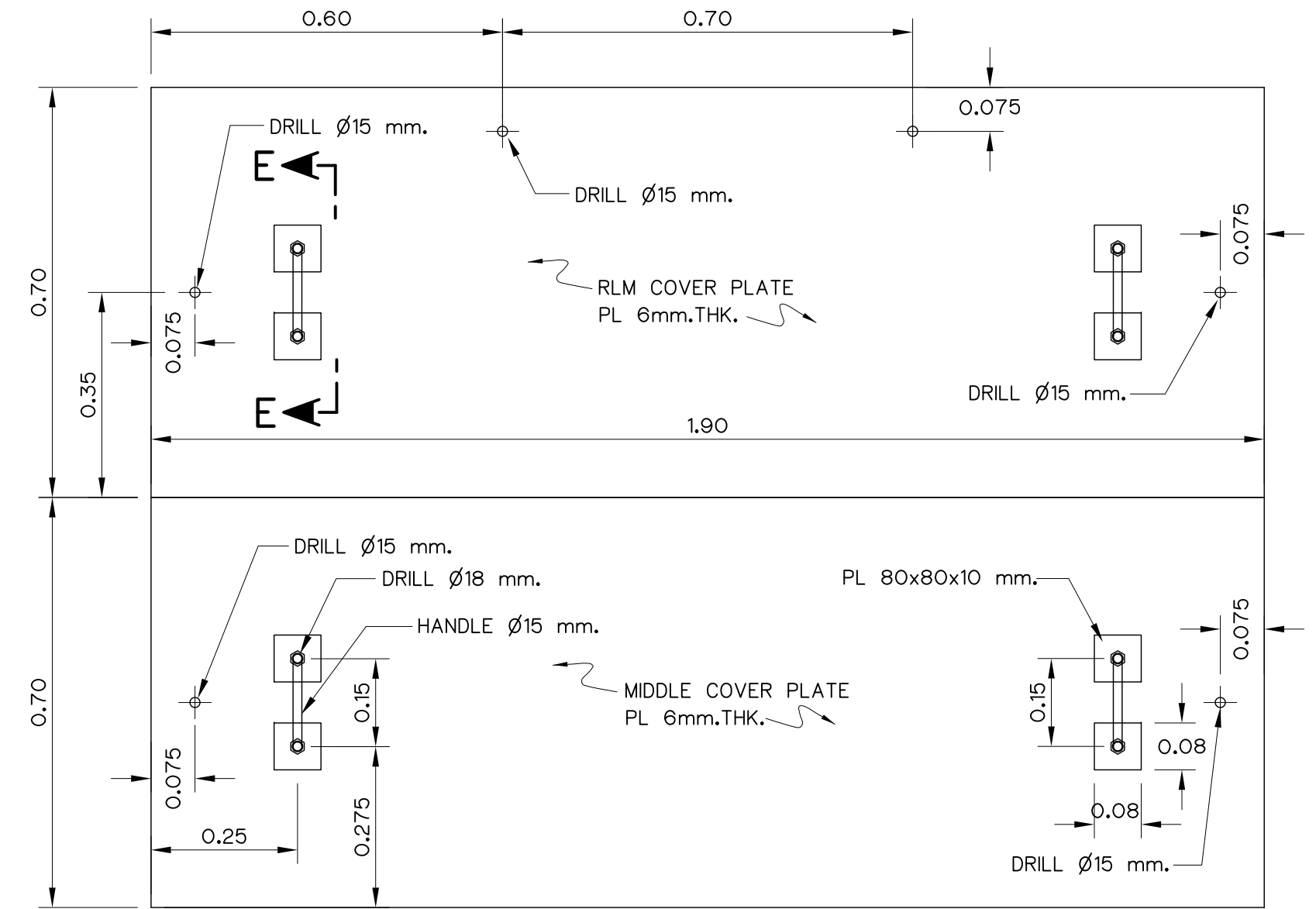
3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED



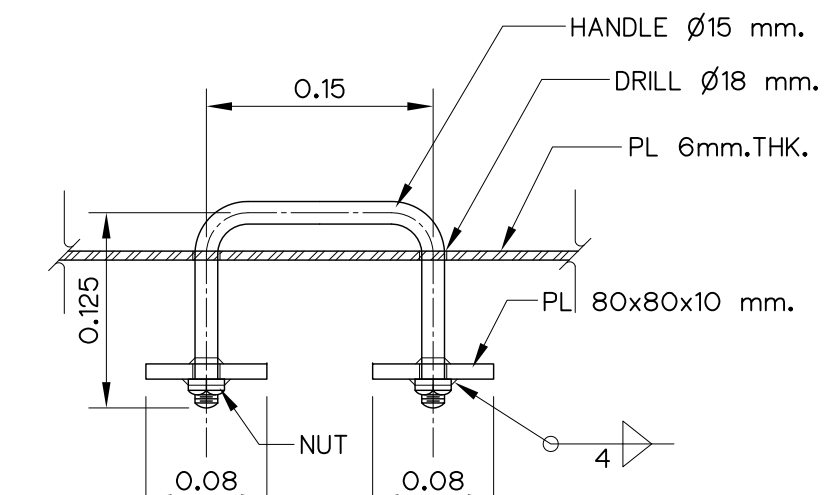
PLAN
SCALE 1:25



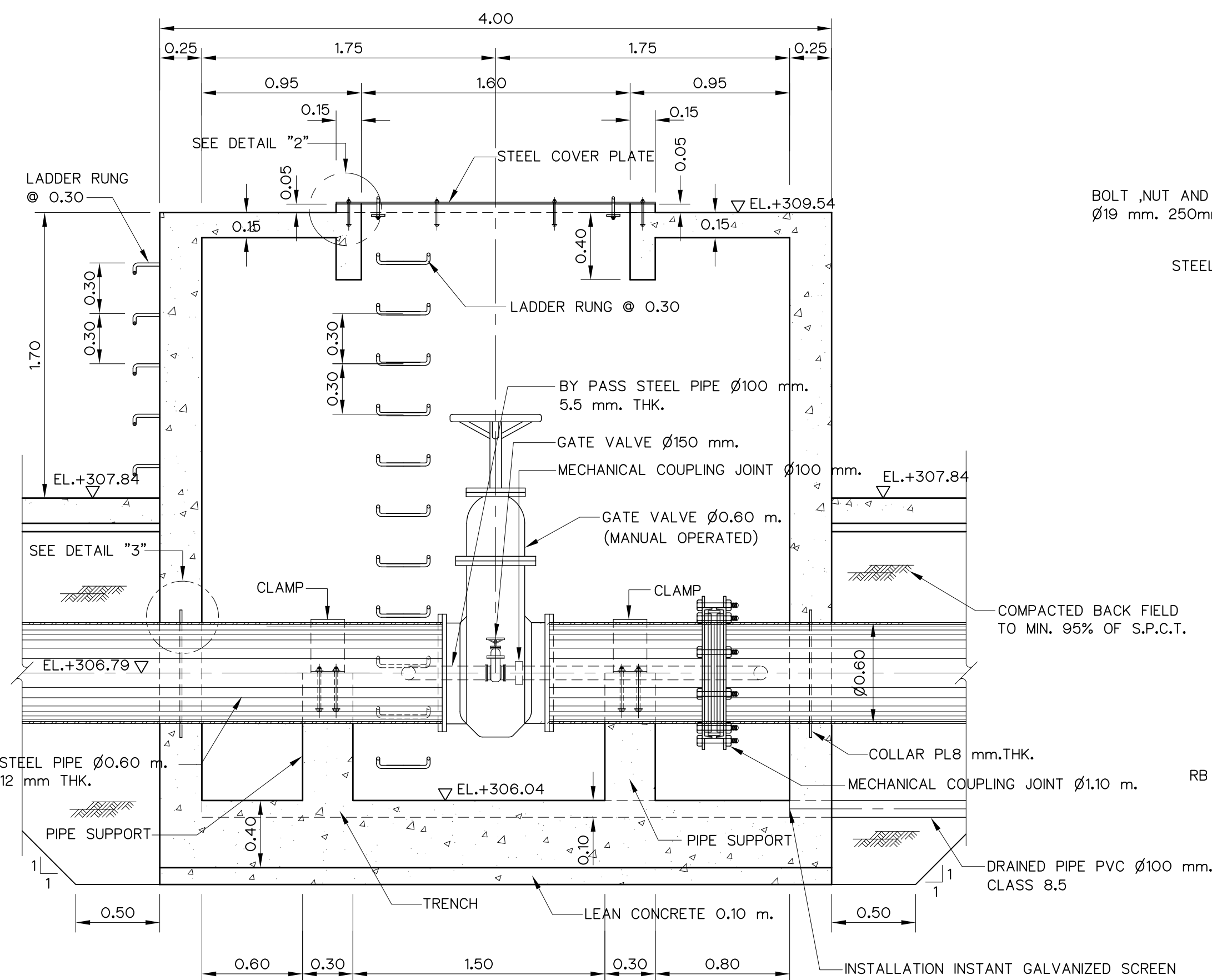
SECTION B-B
SCALE 1:25



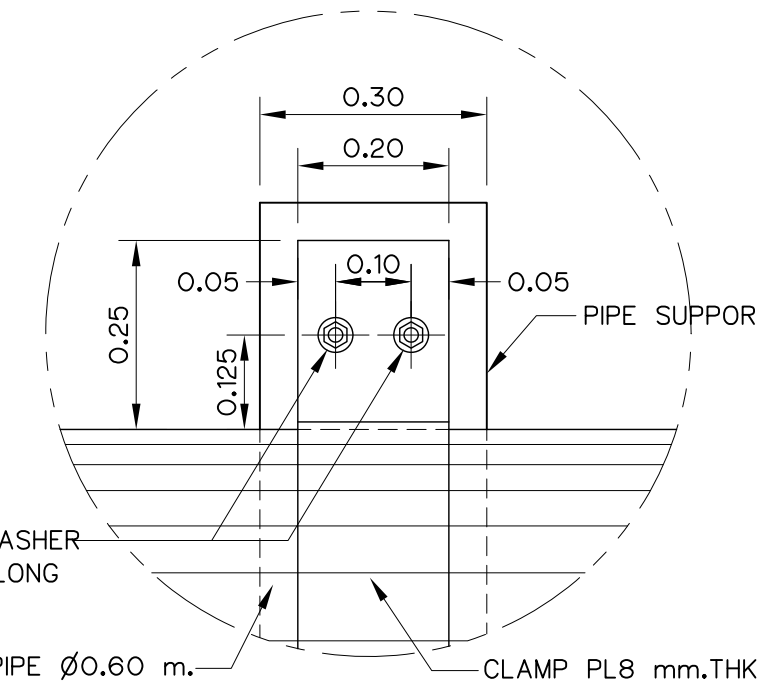
PLAN STEEL COVER PLATE
SCALE 1:10



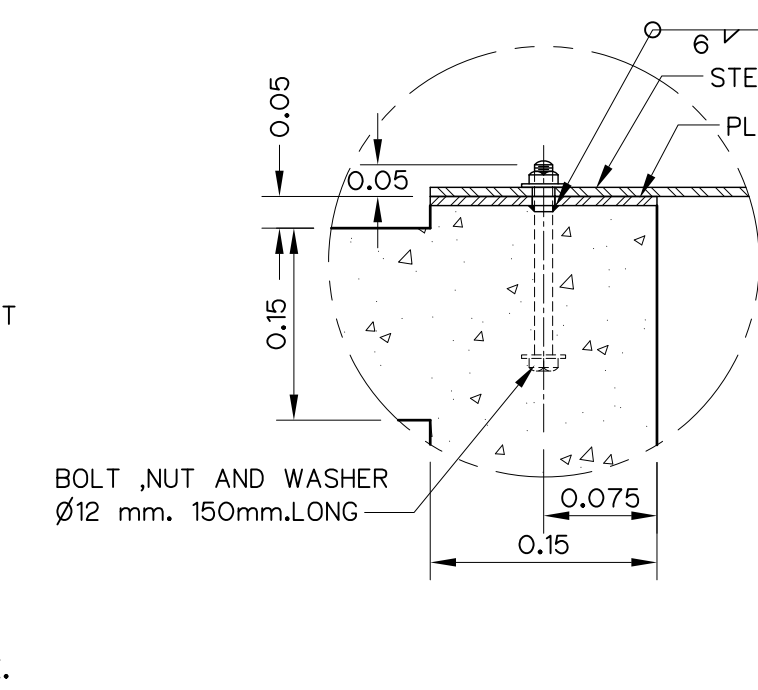
SECTION E-E
SCALE 1:5



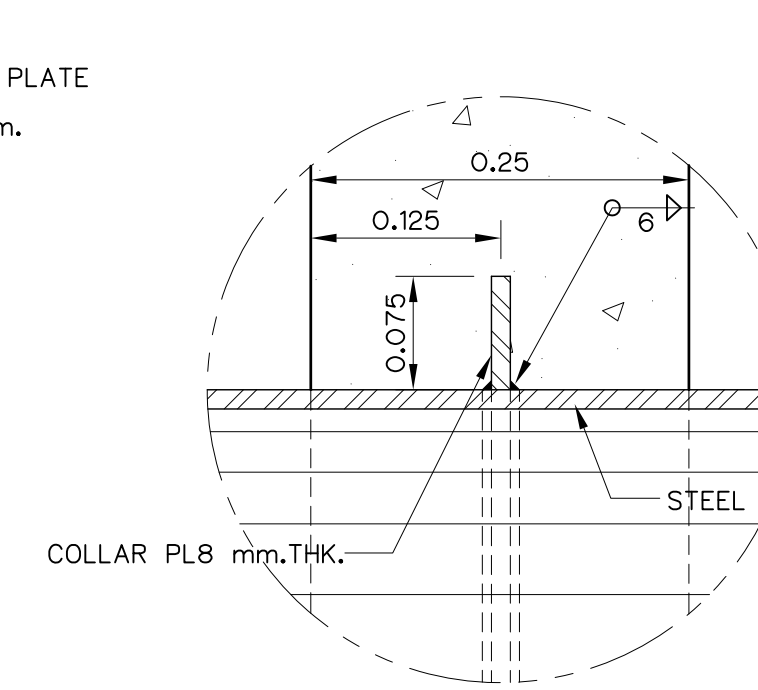
SECTION A-A
SCALE 1:25



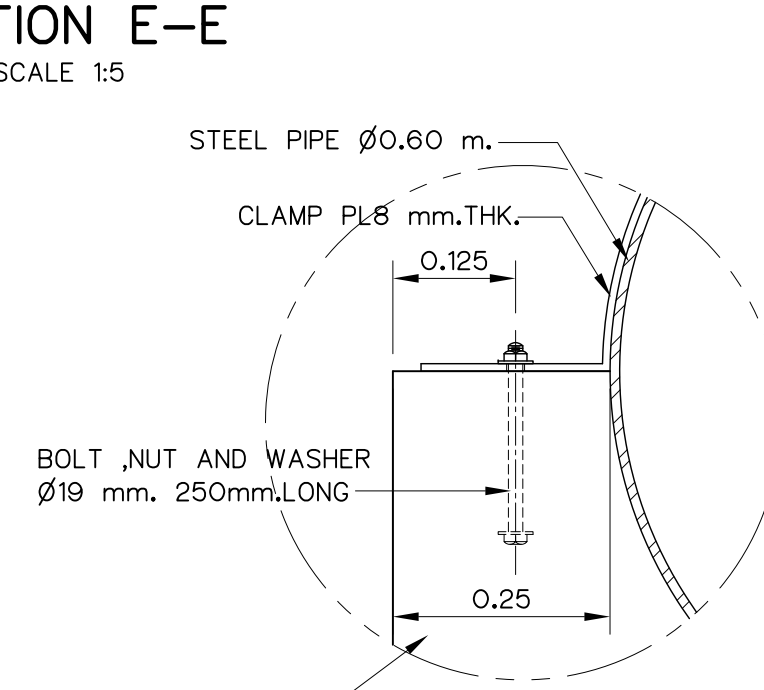
DETAIL "1"
SCALE 1:10



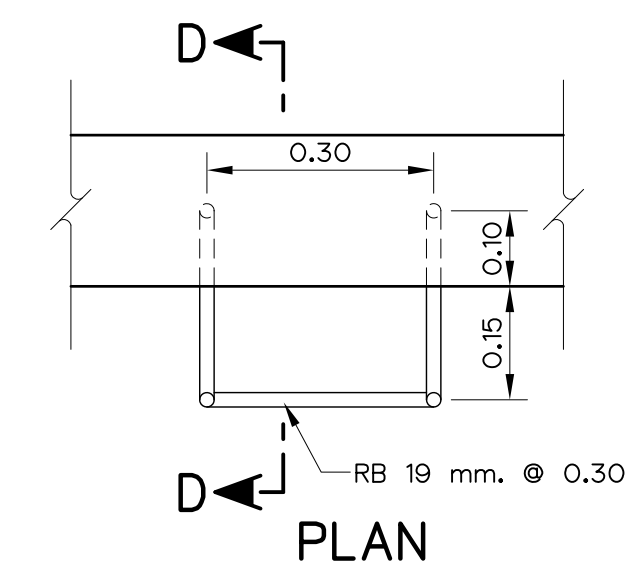
DETAIL "2"
SCALE 1:5



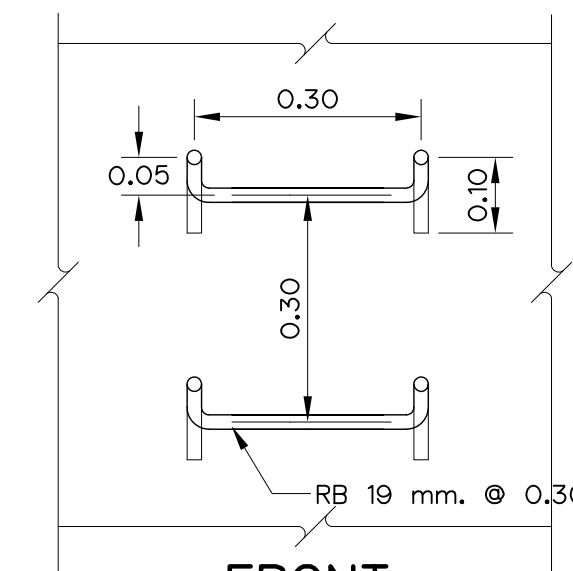
DETAIL "3"
SCALE 1:10



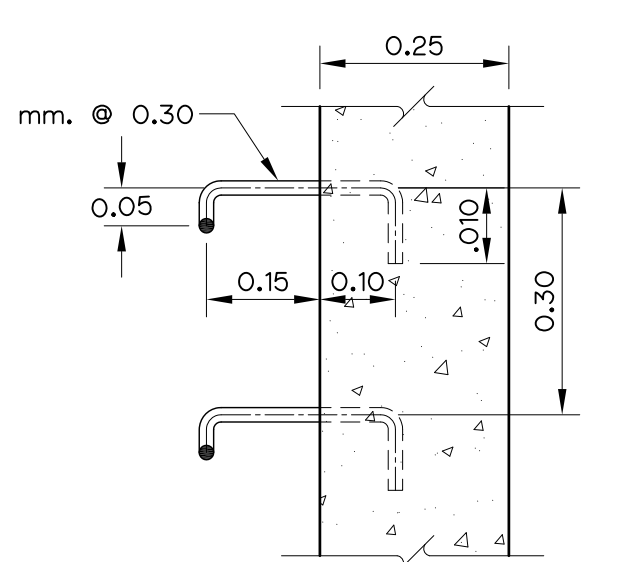
DETAIL "4"
SCALE 1:10



PLAN



FRONT



SECTION D-D
DETAIL OF LADDER RUNG
SCALE 1:10

NOTE :

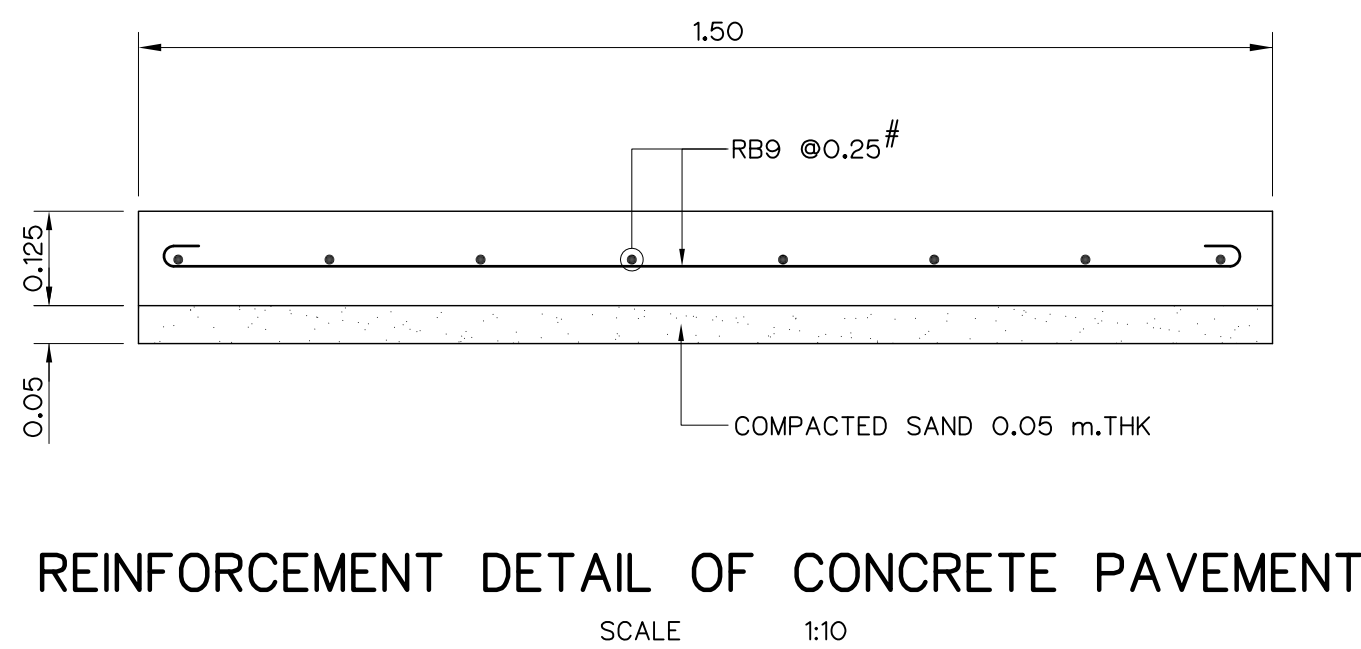
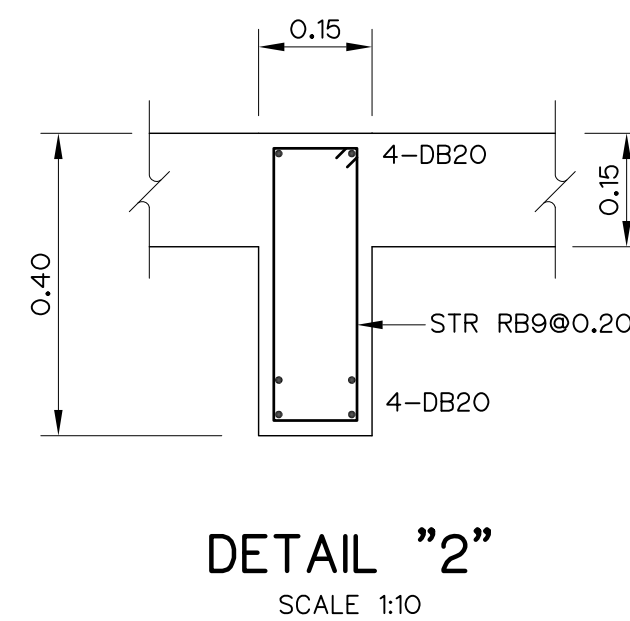
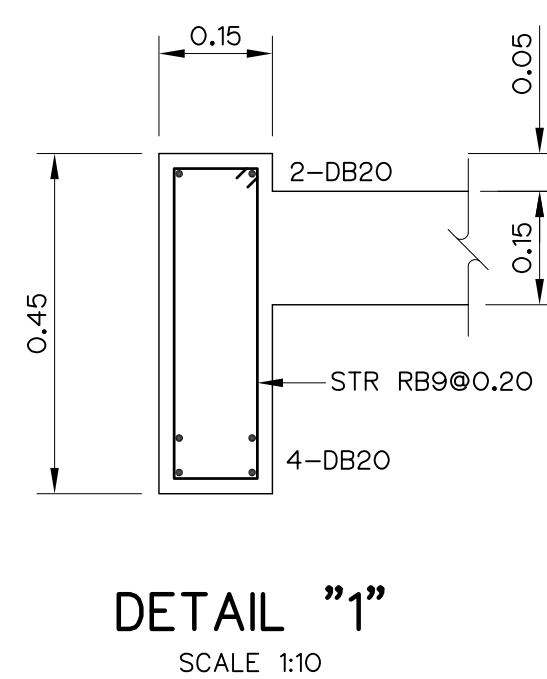
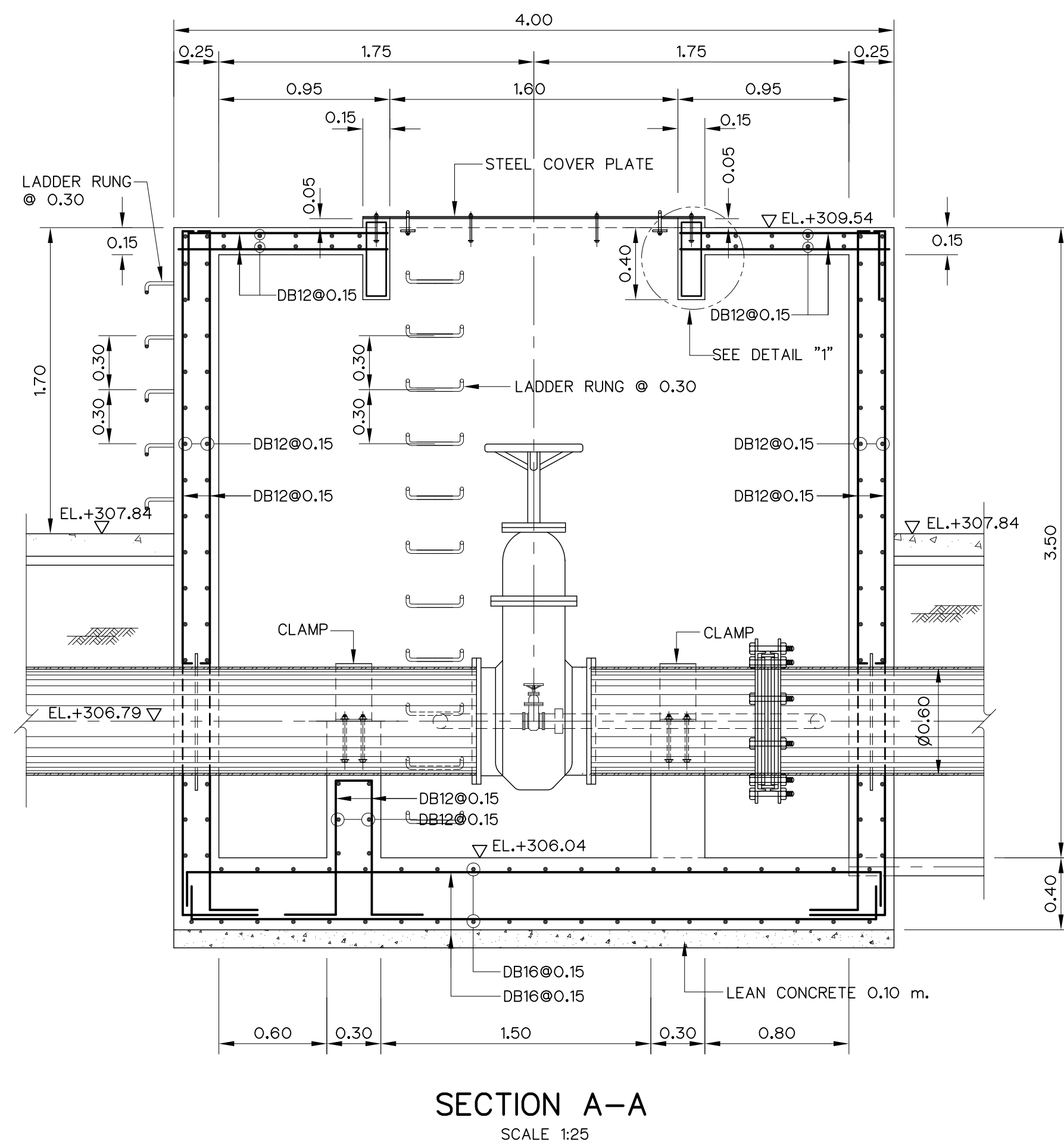
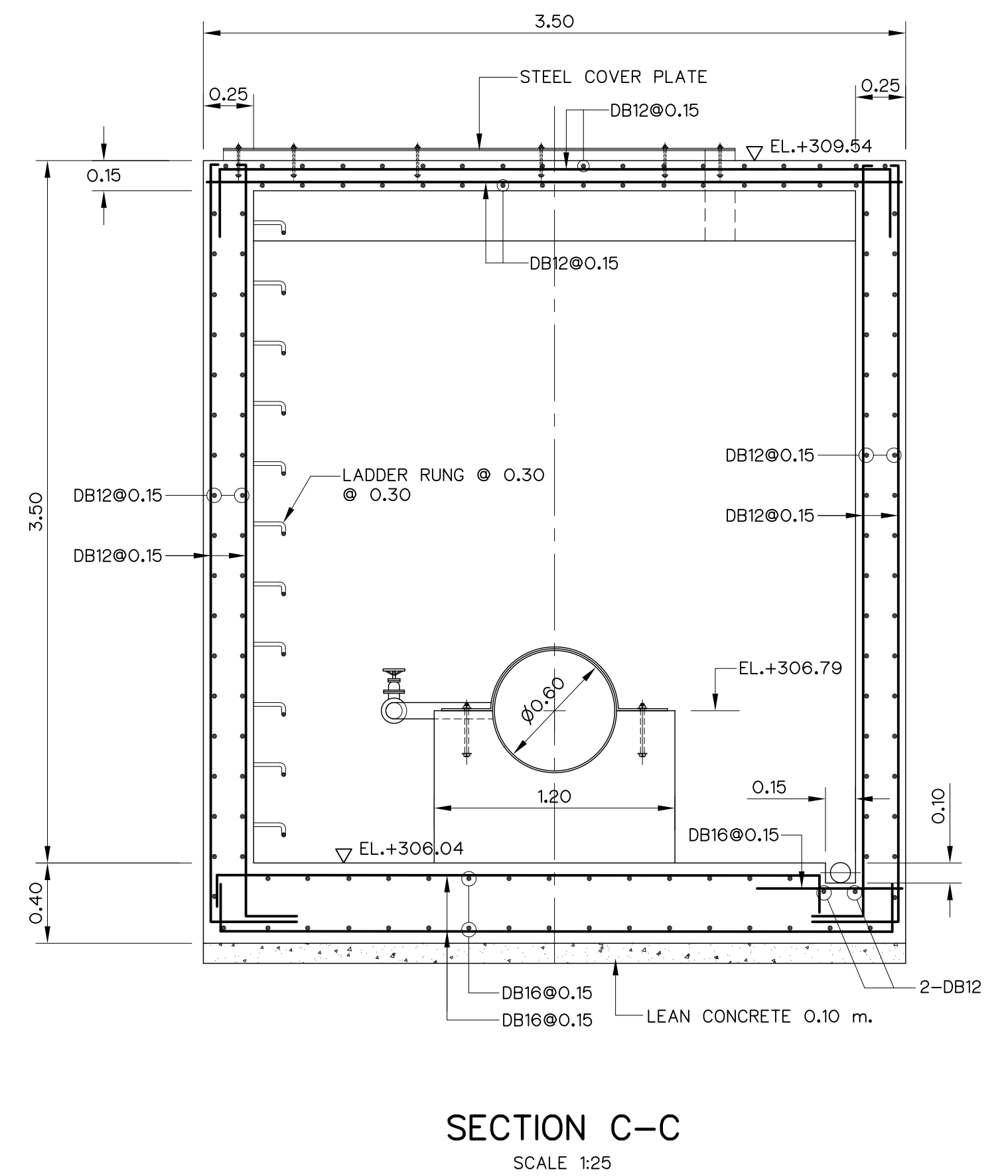
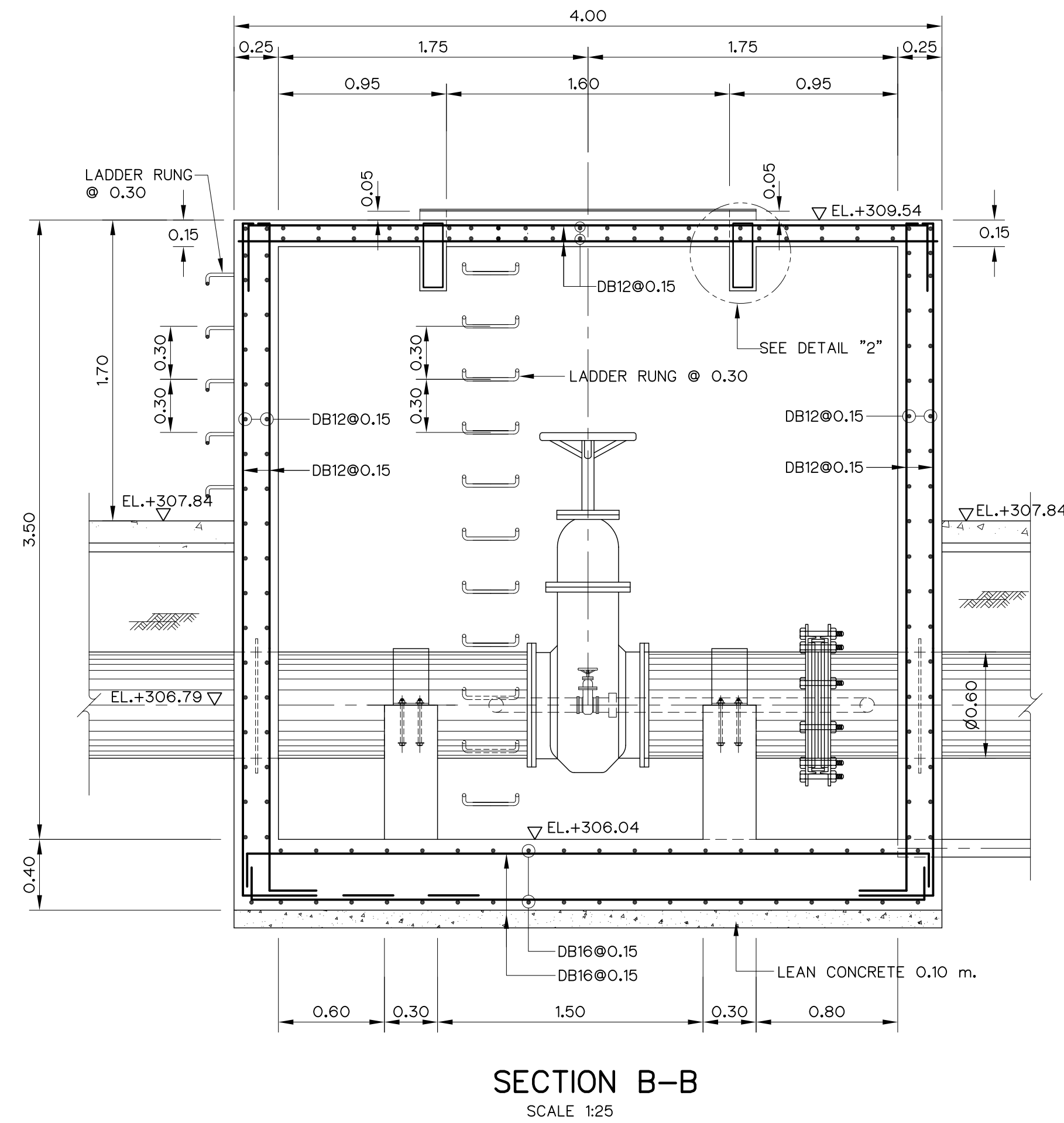
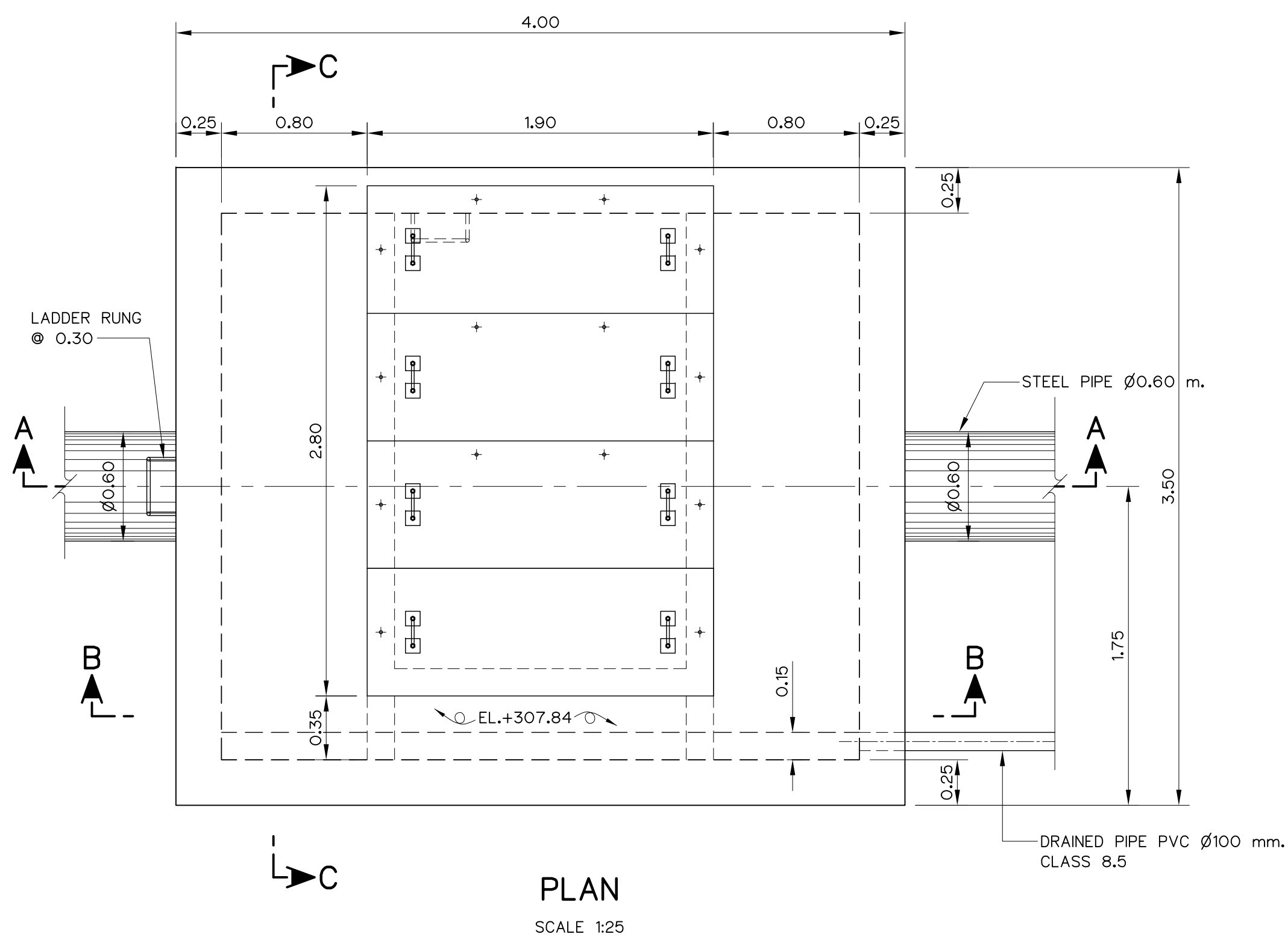
1. ALL DIMENSIONS AND ELEVATIONS ARE IN METERS, UNLESS OTHERWISE SHOWN
2. ALLOWABLE BEARING CAPACITY OF FOUNDATION SHALL NOT BE LESS THAN 15 T./M.²

REFERENCE DRAWING :

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

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

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	
DESIGNED ๒๕๖๕๑		SUBMITTED ๒๕๖๕๑	
DRAWN ๒๕๖๕๑		RECOMMENDED ๒๕๖๕๑	
CHECKED ๒๕๖๕๑		APPROVED ๒๕๖๕๑	
CONSULTANTS		DEDE	
PROJECT MANAGER		DATE 14/01/62	
		DRAWING NO. HLS-PS-21	
		SHEET NO. 43 OF 78	

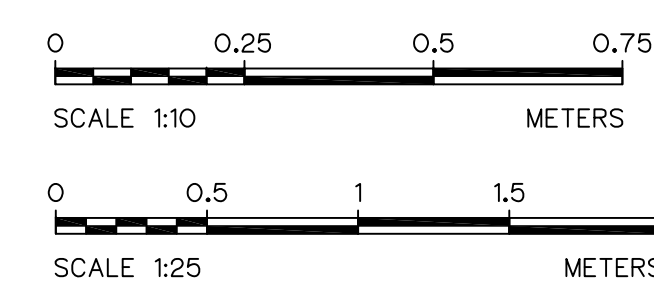


NOTE :

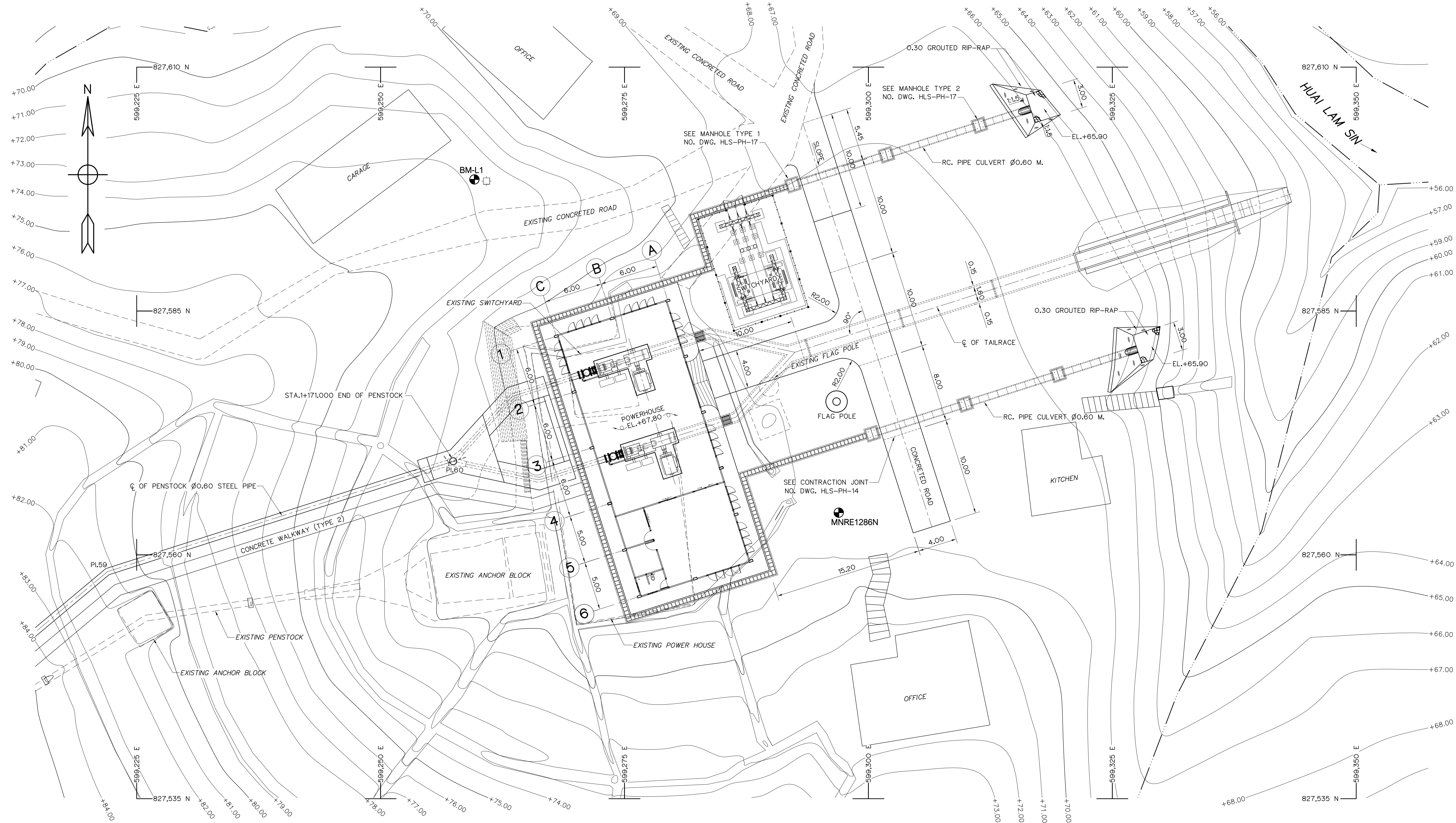
1. ALL DIMENSIONS AND ELEVATIONS ARE IN METERS, UNLESS OTHERWISE SHOWN

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



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	
DESIGNED		REVIEWED S.KTICHAJ	
DRAWN		SUBMITTED	
CHECKED		RECOMMENDED	
APPROVED		APPROVED	
CONSULTANTS		DEDE	
PROJECT MANAGER		DRAWING NO. HLS-PS-22	
DATE 14/01/62		SHEET NO. 44 OF 78	



GENERAL LAY-OUT
SCALE 1:200

NOTES :

- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
- 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.
- FOR THE DETAILS OF THE STABILITY OF THE EXCAVATION LINE, SEE DWG. NO. HLS-PH-02

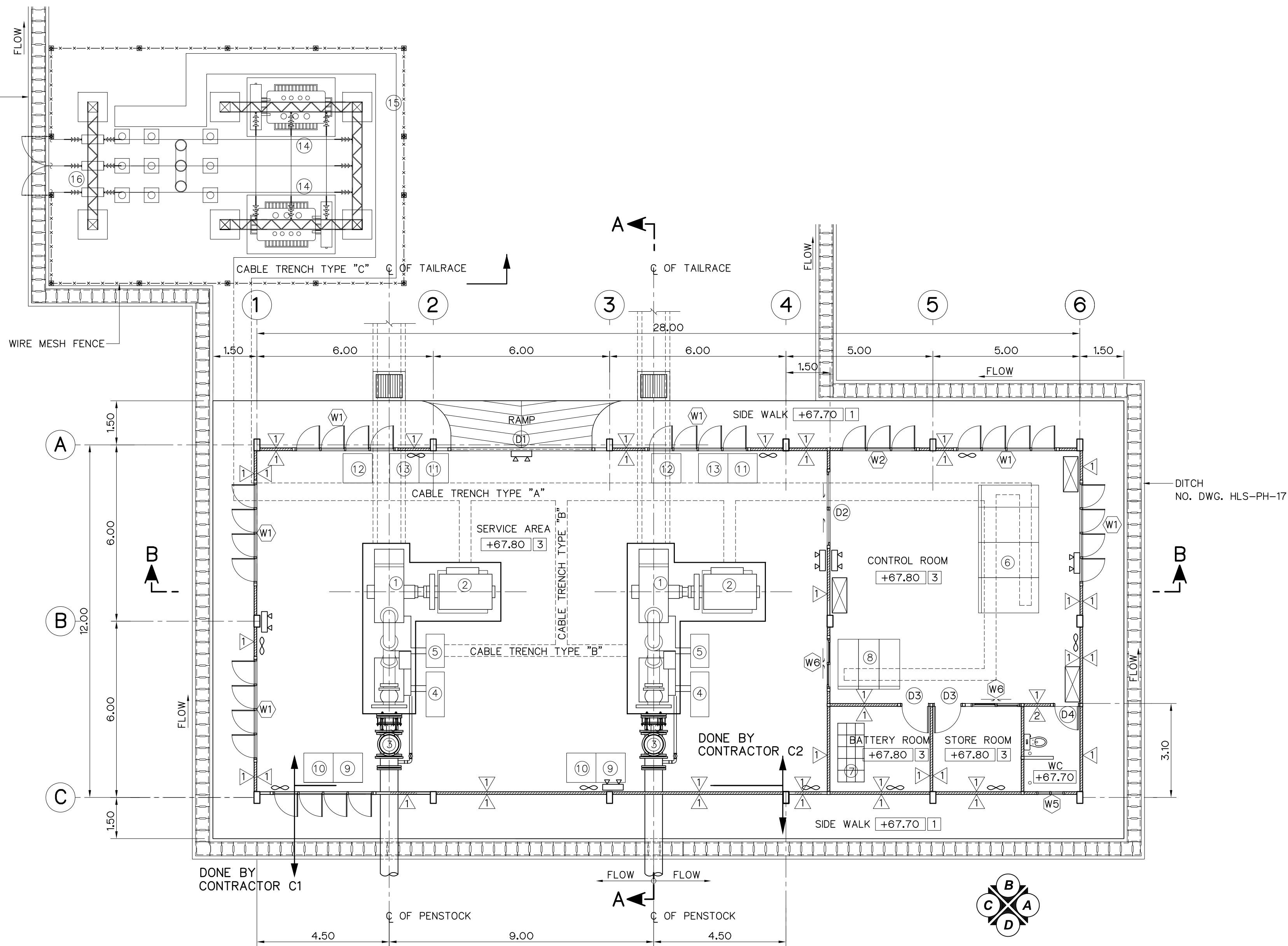
REFERENCE DRAWINGS :

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

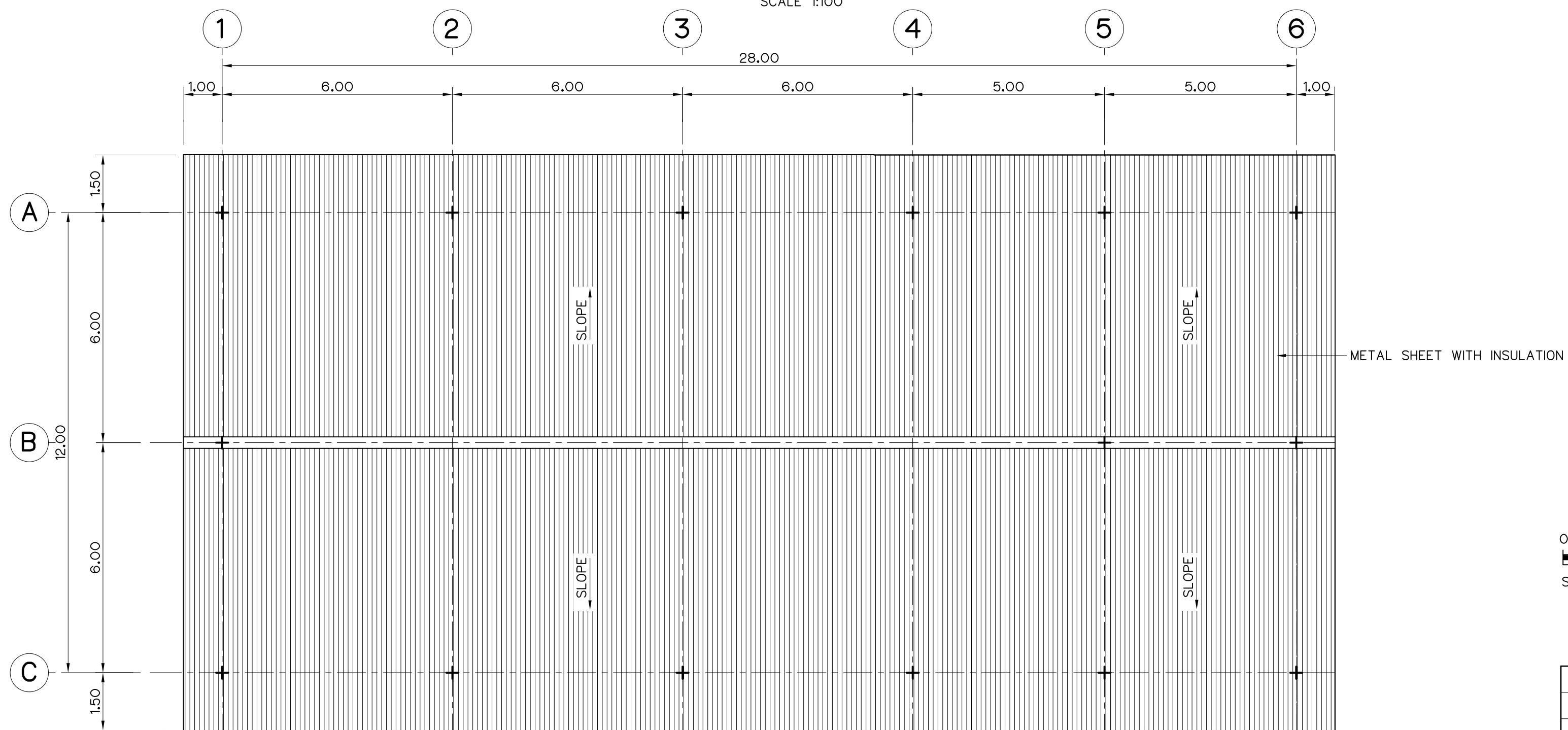


3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
		CONSULTANTS	DEDE	

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
HUA I 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 S.KITIKHAJ	
DESIGNED 21.6651	SUBMITTED
DRAWN 21.6651	RECOMMENDED
CHECKED 21.7324	APPROVED
PROJECT MANAGER 14/01/62	DRAWING NO. SHEET NO.
	HLS-PH-01 45 OF 78



PLAN
SCALE 1:100



ROOF PLAN
SCALE 1:100

DESCRIPTION :

- 1 PELTON TURBINE
- 2 SYNCHROUSE GENERATOR
- 3 INLET VALVE AND BYPASS VALVE
- 4 PRESSURE OIL EQUIPMENT
- 5 GOVERNOR AND TURBINE CONTROL PANEL
- 6 MAIN CONTROL SWITCHBOARD
- 7 BATTERIES 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 SWITCHYARD FENCE
- 16 TAKE OFF STRUCTURE

SYMBOLS :

- EXHAUST FAN $\phi 10"$
- AIR CONDITIONING
- EMERGENCY LAMP

FLOOR FINISH SYMBOLS :

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

WALL FINISH SYMBOLS :

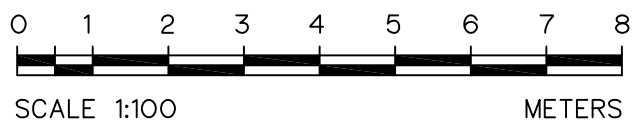
- 1 CEMENT PLASTER
- 2 8"x8" CERAMIC WALL TILES

NOTES :

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

REFERENCE DRAWINGS :

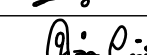
- | | |
|---|-----------|
| 1. POWERHOUSE, GENERAL LAY-OUT | HLS-PH-01 |
| 2. POWERHOUSE, ELEVATIONS | HLS-PH-03 |
| 3. POWERHOUSE, SECTIONS | HLS-PH-04 |
| 4. POWERHOUSE, DETAILS OF TOILET, SEPTIC AND SEEPAGE TANK | HLS-PH-05 |
| 5. POWERHOUSE, DETAIL OF DOORS, WINDOWS AND NAMEPLATE | HLS-PH-06 |

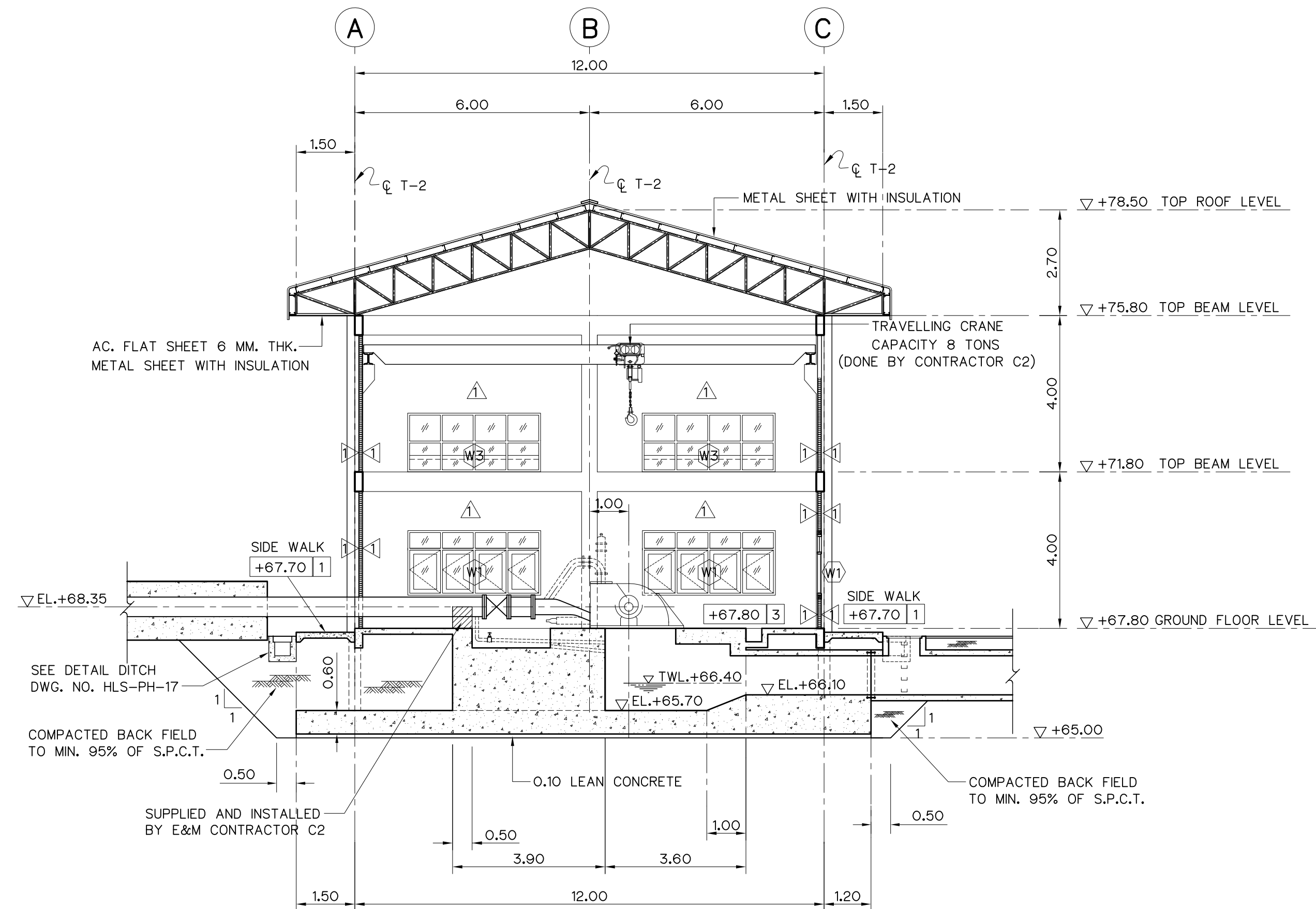


3					
2					
1					
NO.	DATE	REVISIONS	CHECKED	APPROVED	

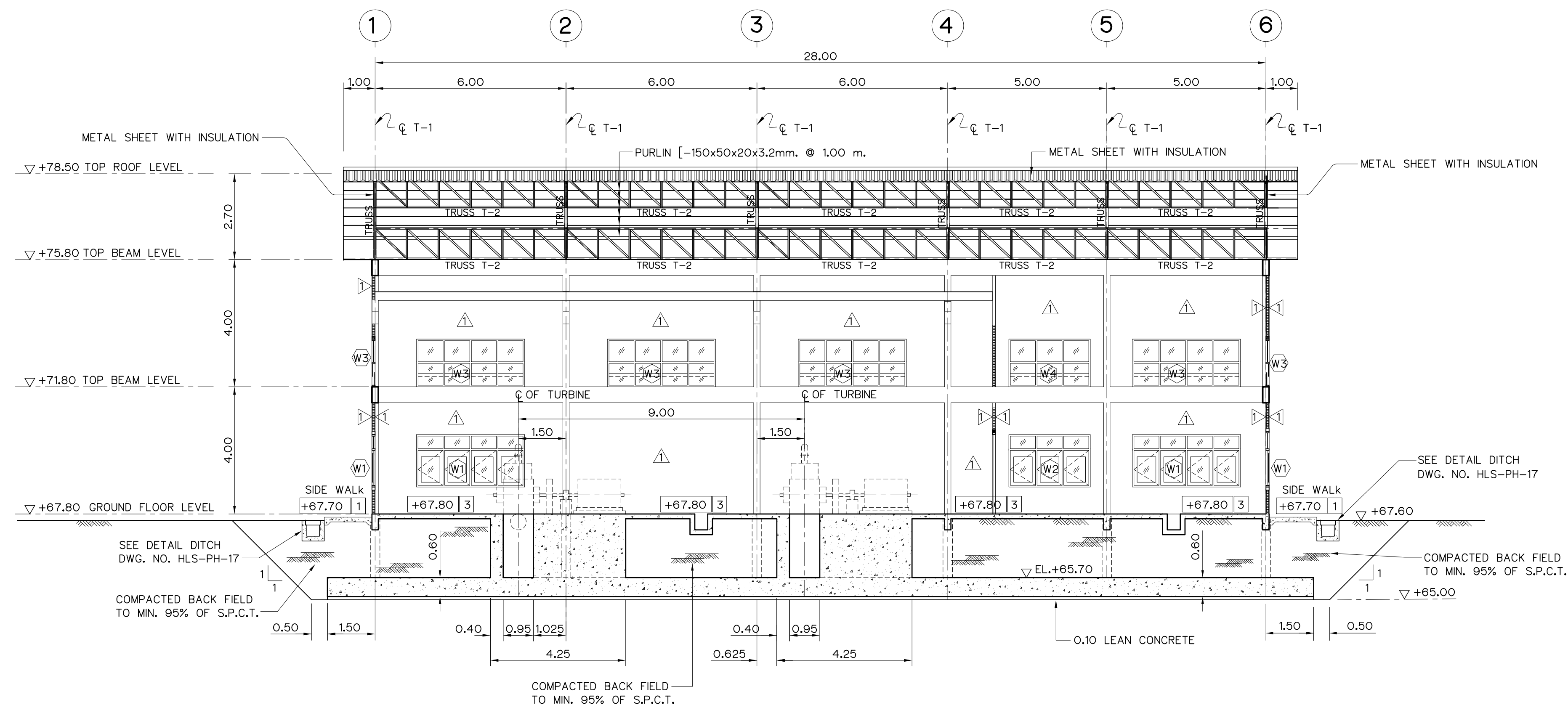
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUAI LAM SIN HYDROPOWER PROJECT			
CIVIL WORKS POWERHOUSE PLAN AND ROOF PLAN			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED		REVIEWED S.KTICHAJ	
DRAWN		SUBMITTED	
CHECKED		RECOMMENDED	
APPROVED		APPROVED	
CONSULTANTS		DEDE	
PROJECT MANAGER		14/01/62 DATE	
DRAWING NO.		SHEET NO.	
HLS-PH-02		46 OF 78	



 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  อ.อ.6651		REVIEWED S. KUNTHAI	
DRAWN 		RECOMMENDED 	
CHECKED  อ.อ.7324		APPROVED 	
 PROJECT MANAGER		DRAWING NO. HLS-PH-03	
DATE		SHEET NO. 47 OF 78	



SECTION A-A
SCALE 1:100



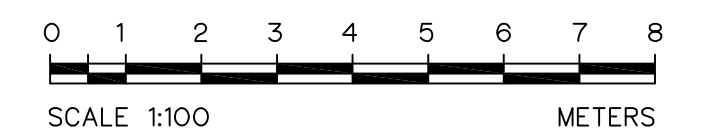
SECTION B-B
SCALE 1:100

NOTES :

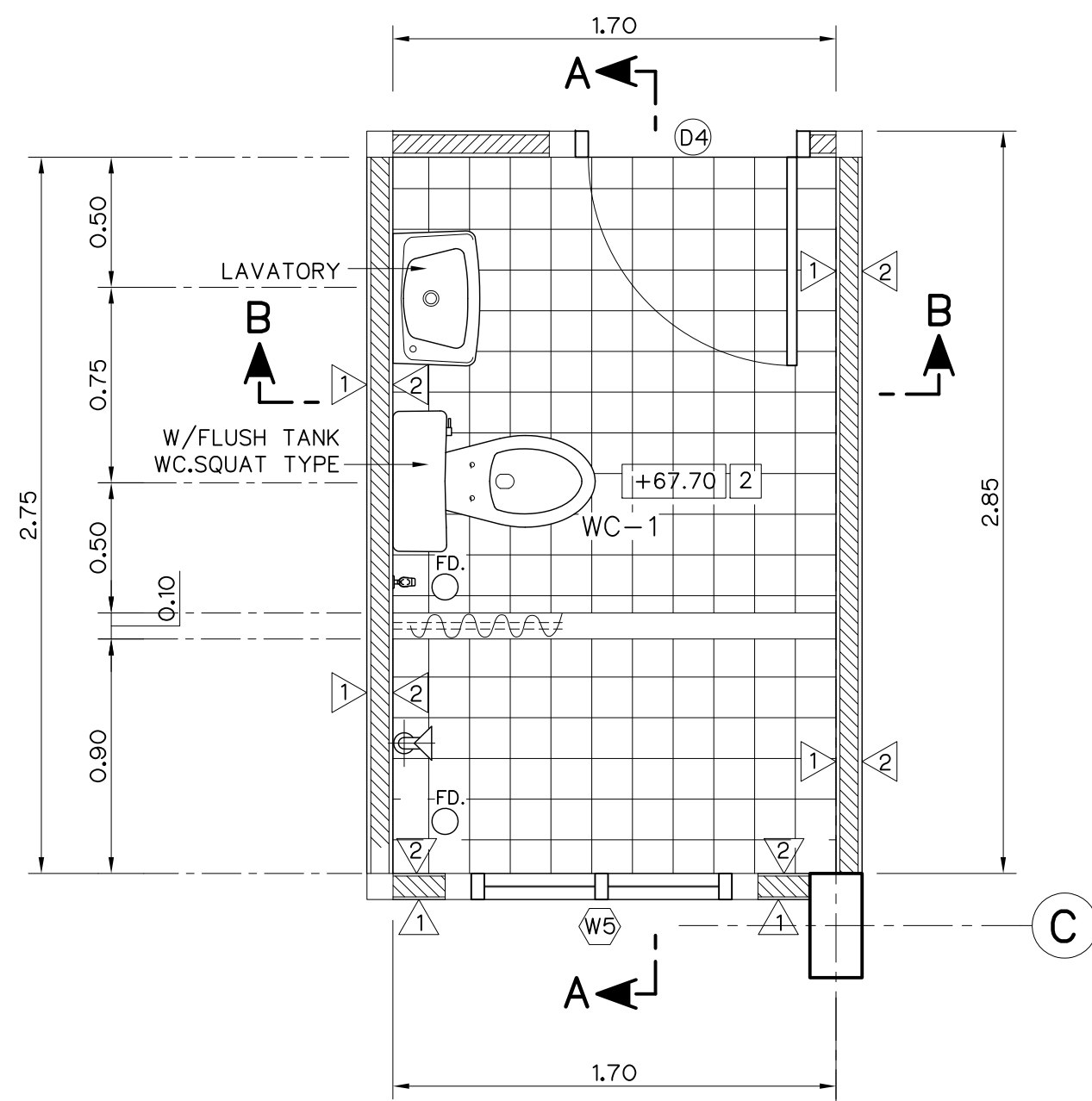
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

REFERENCE DRAWINGS :

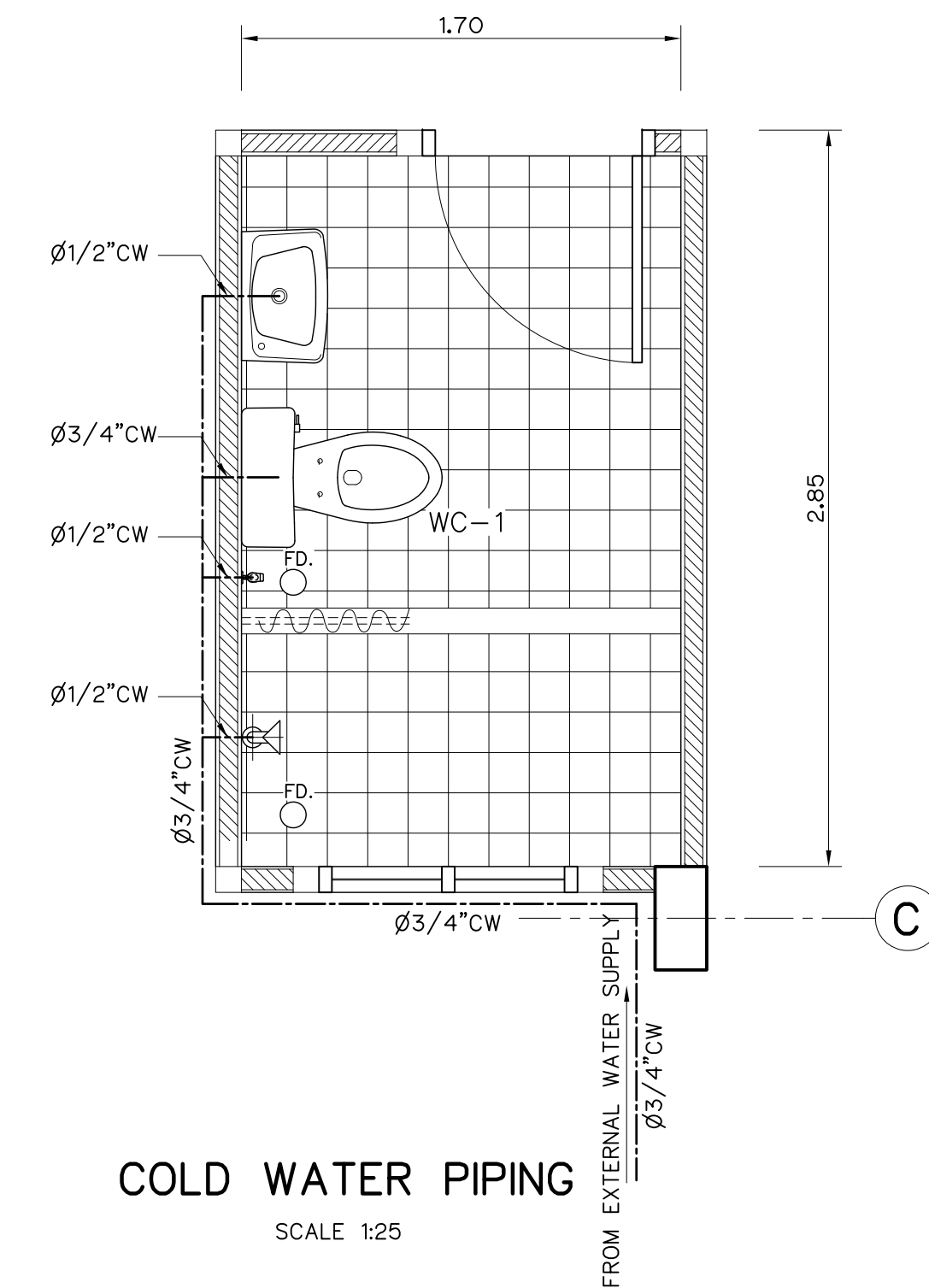
1. POWERHOUSE, PLAN AND ROOF PLAN HLS-PH-02
2. POWERHOUSE, ELEVATIONS HLS-PH-03



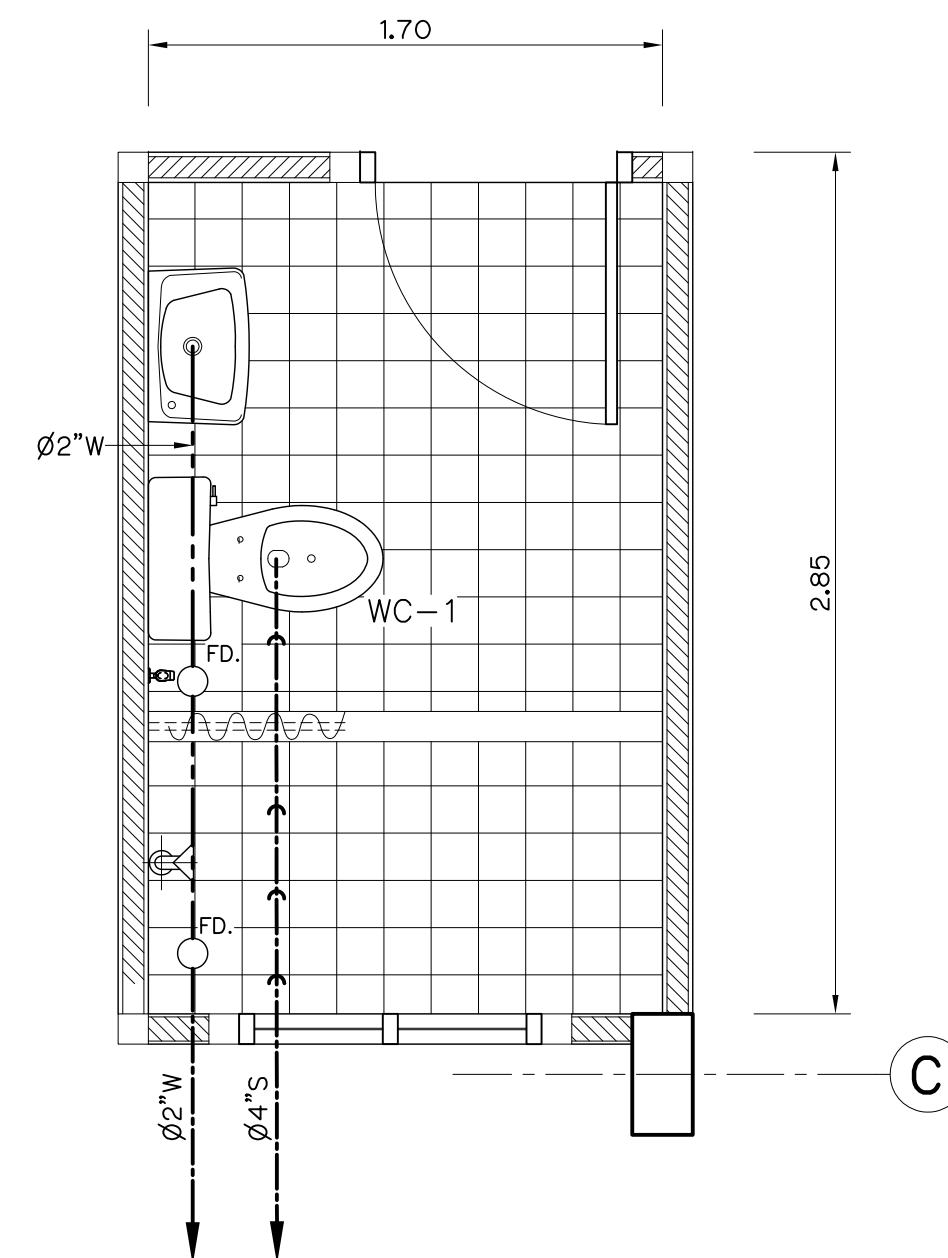
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUAI LAM SIN HYDROPOWER PROJECT			
CIVIL WORKS POWERHOUSE SECTIONS			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED <i>[Signature]</i> ๑๕.6651		REVIEWED S.KITIKHAJ	
DRAWN <i>[Signature]</i>		SUBMITTED <i>[Signature]</i>	
CHECKED <i>[Signature]</i> ๑๕.7324		RECOMMENDED <i>[Signature]</i>	
APPROVED <i>[Signature]</i>		APPROVED <i>[Signature]</i>	
CONSULTANTS		DEDE	
PROJECT MANAGER		DATE 14/01/62	
DRAWING NO. HLS-PH-04		SHEET NO. 48 OF 78	



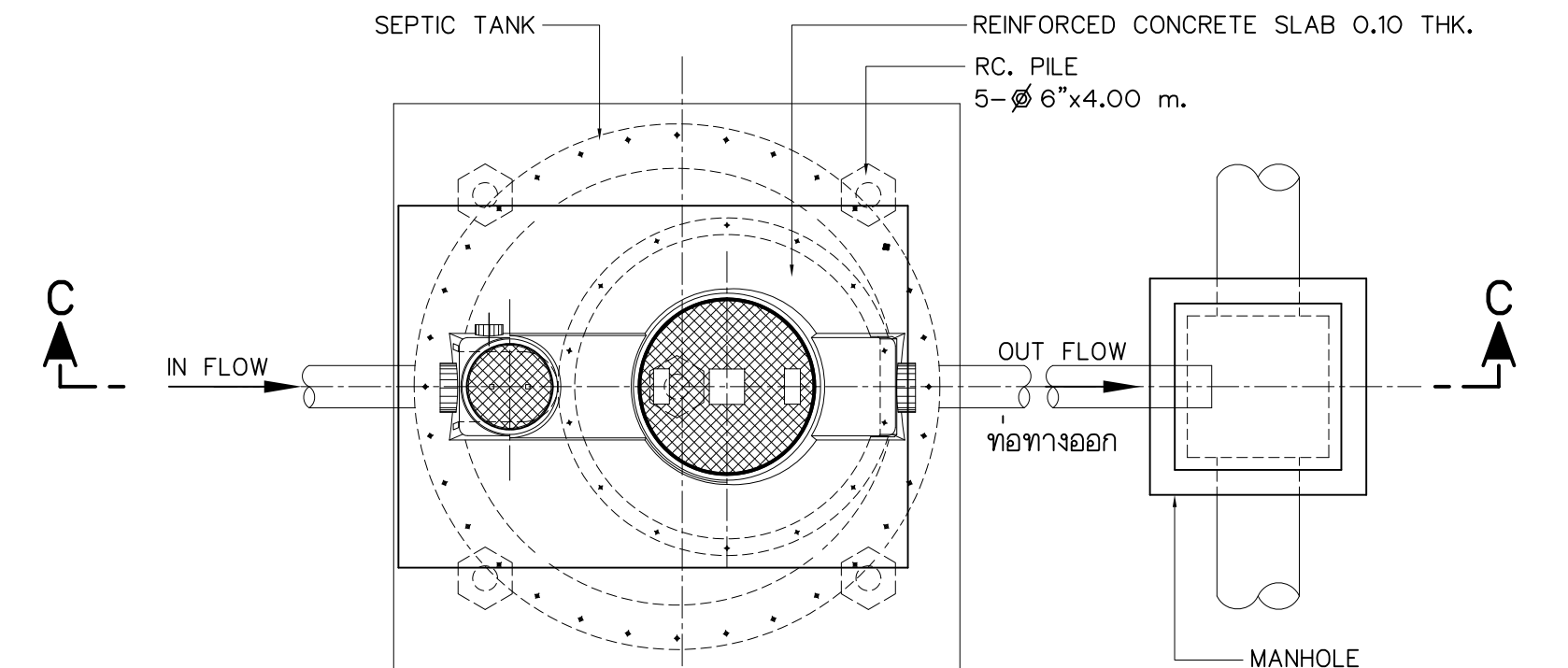
PLAN WC-1
SCALE 1:25



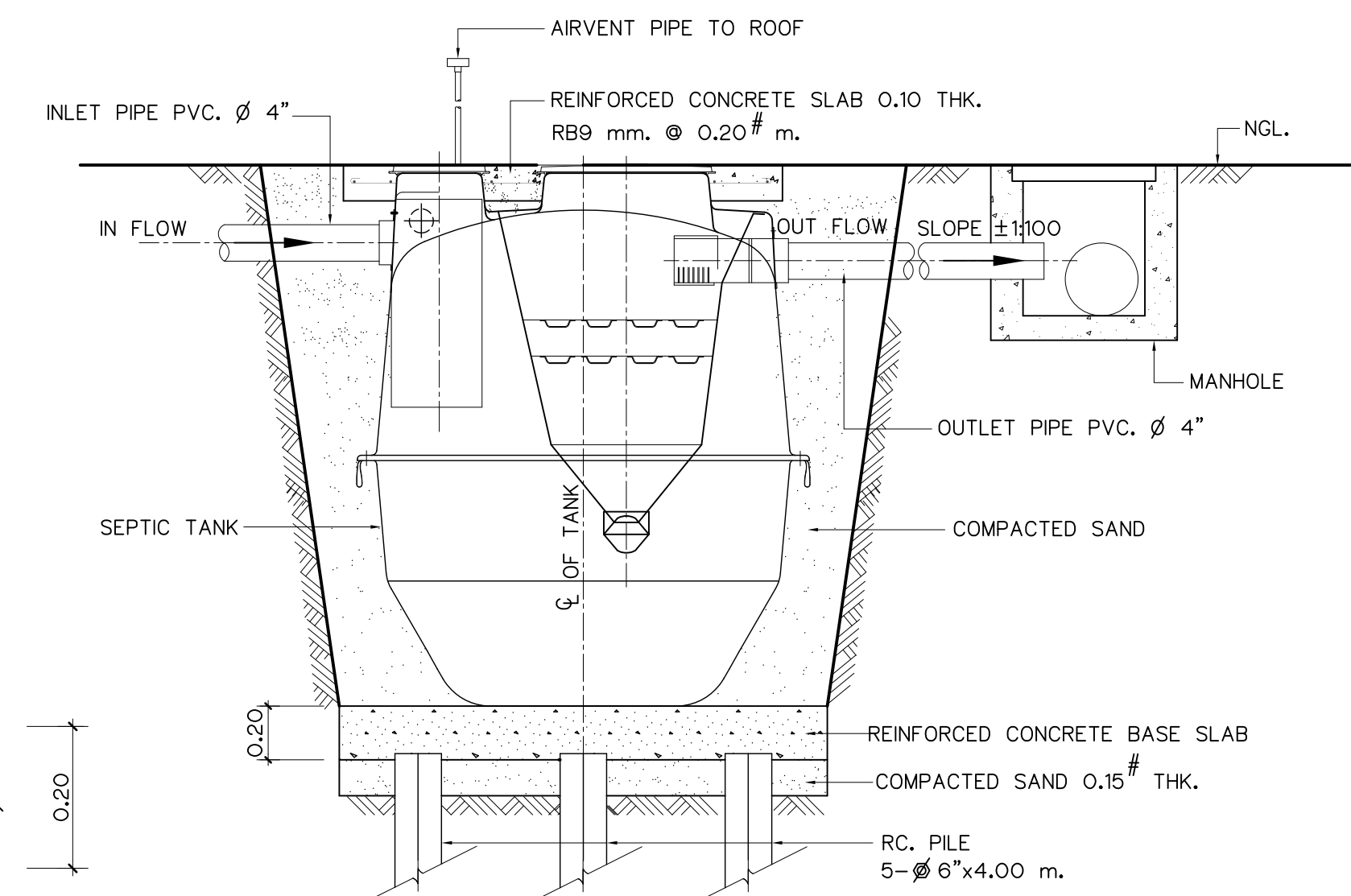
COLD WATER PIPING
SCALE 1:25



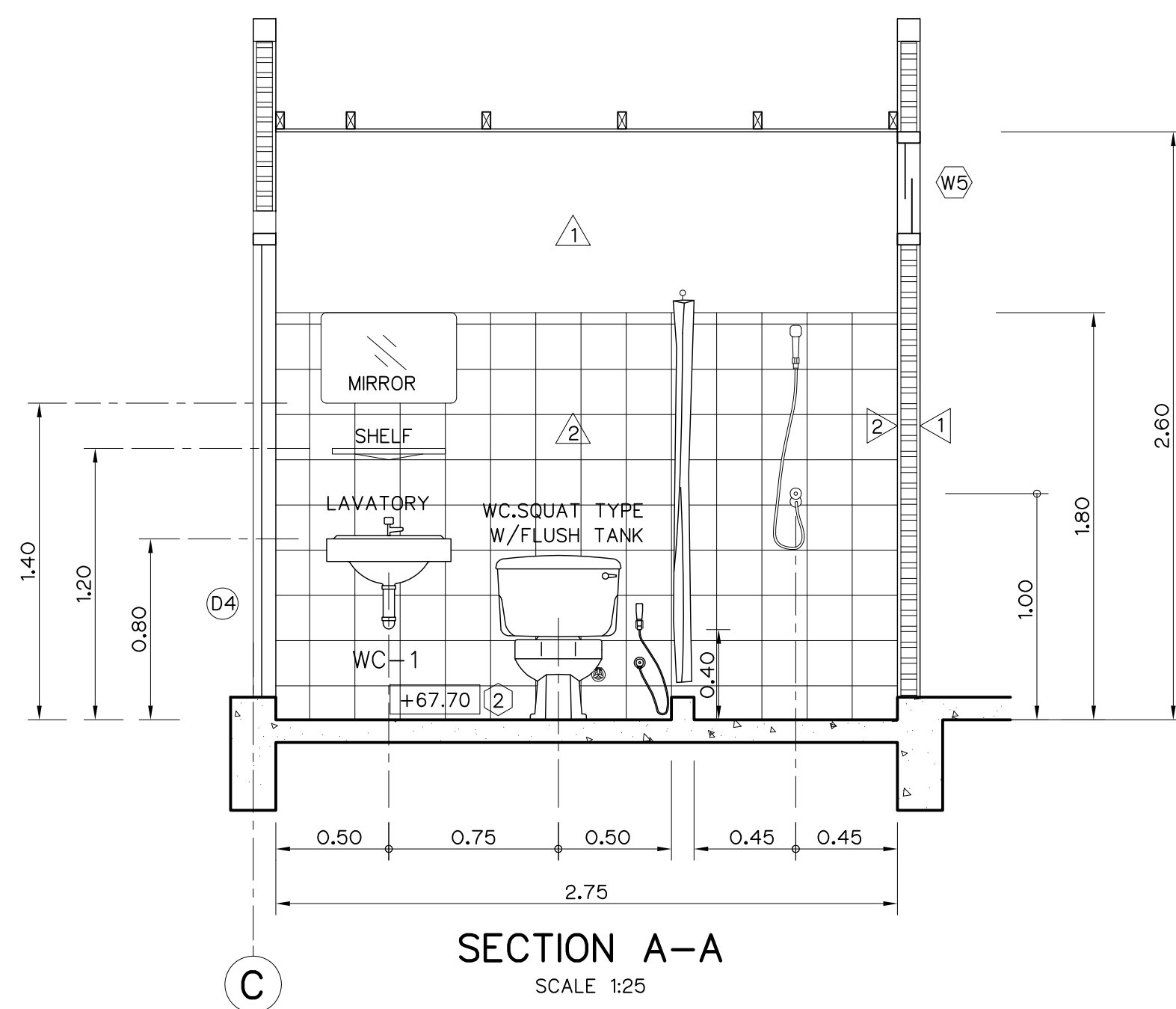
SOIL, WASTE AND VENT PIPING
SCALE 1:25



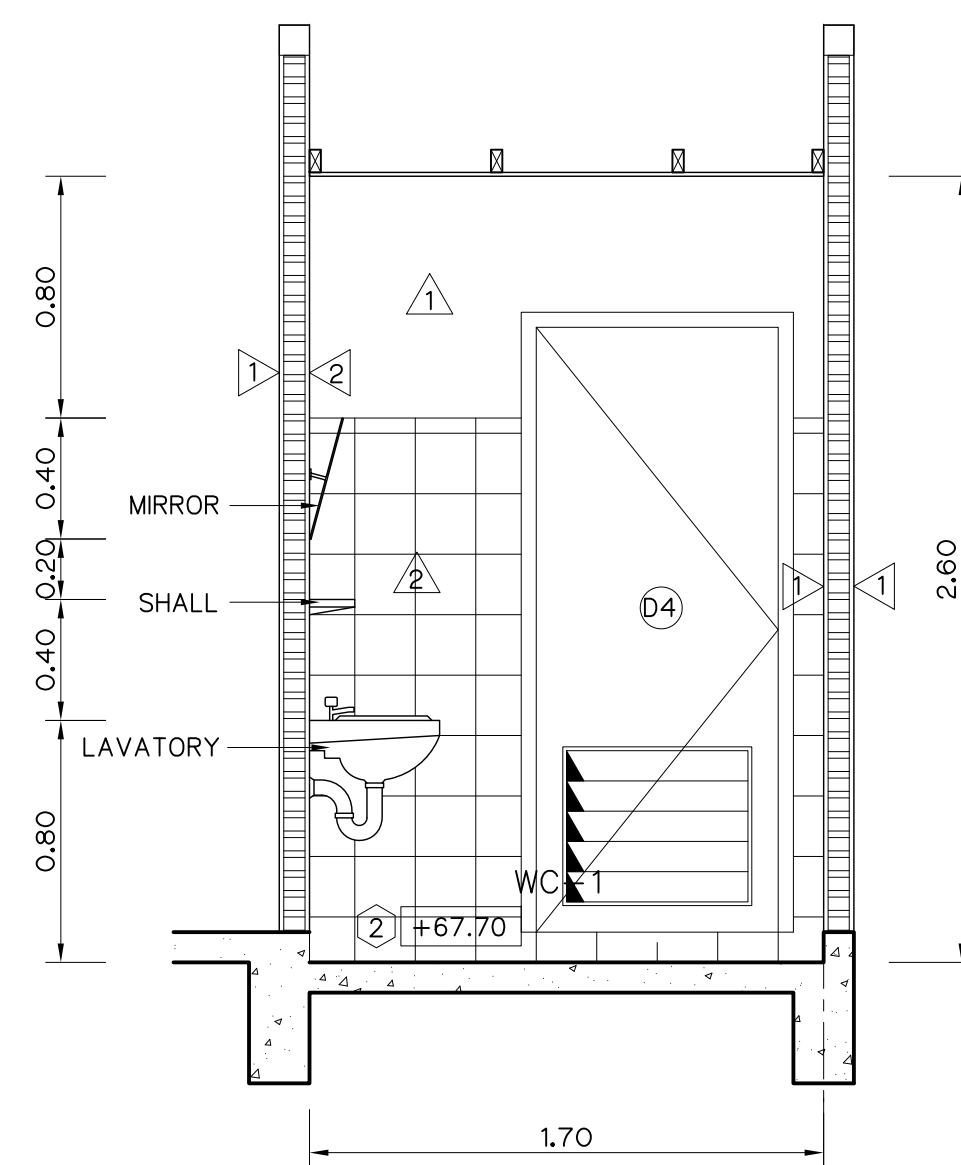
PLAN OF SEPTIC TANK
NOT TO SCALE



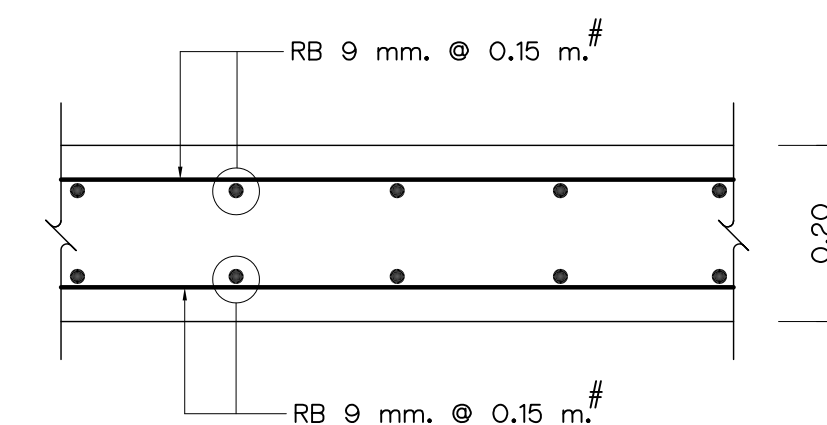
SECTION C-C
NOT TO SCALE



SECTION A-A
SCALE 1:25

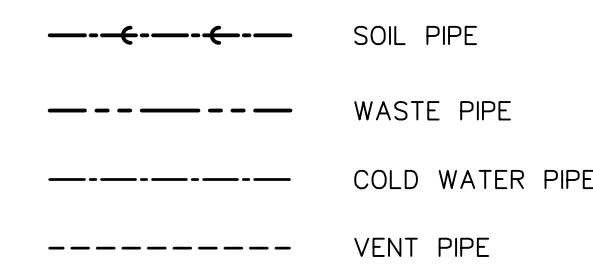


SECTION B-B
SCALE 1:25



REINFORCEMENT OF BASE SLAB
NOT TO SCALE

SYMBOLS :

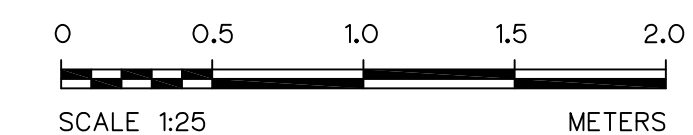


NOTES :

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

REFERENCE DRAWING :

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

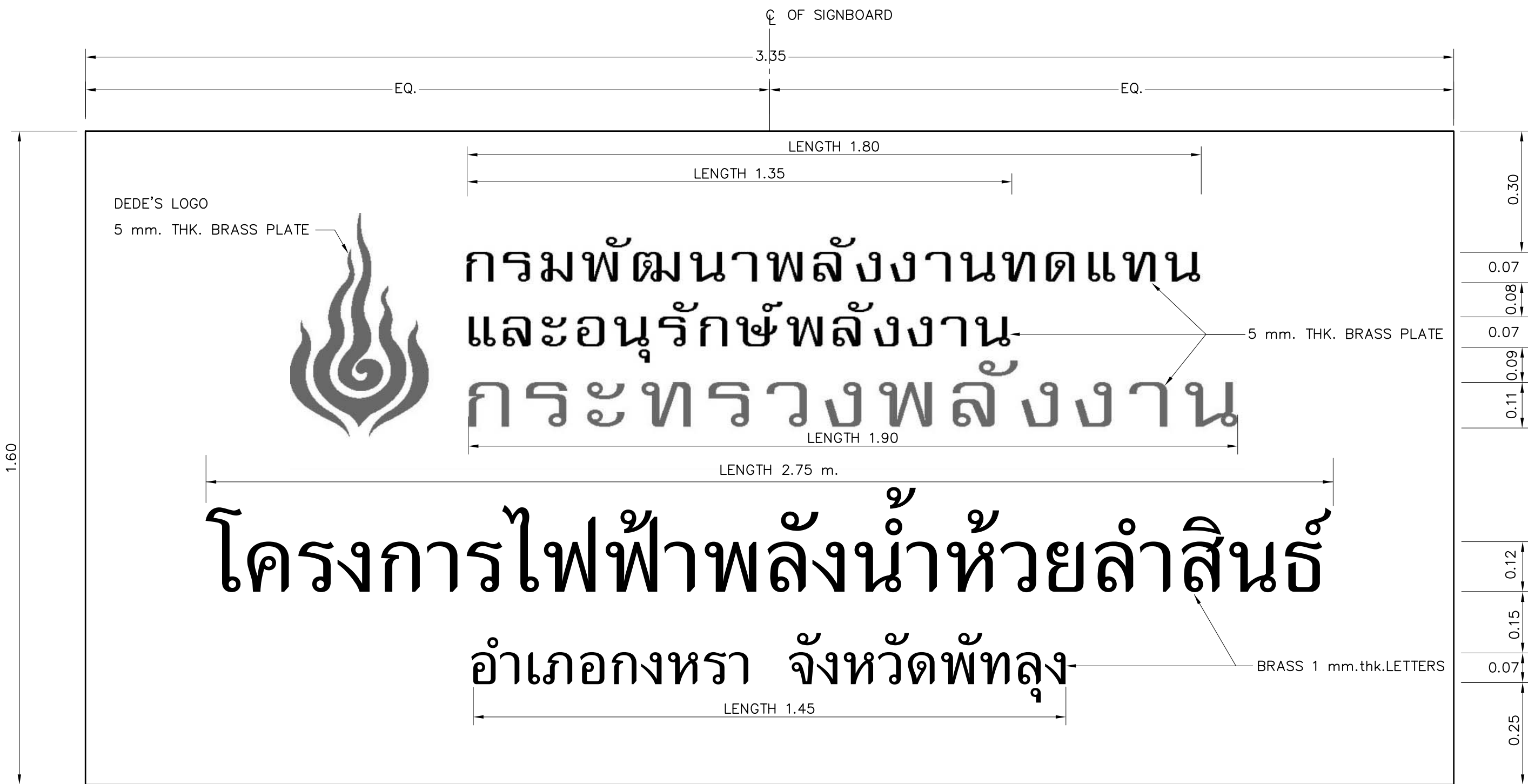
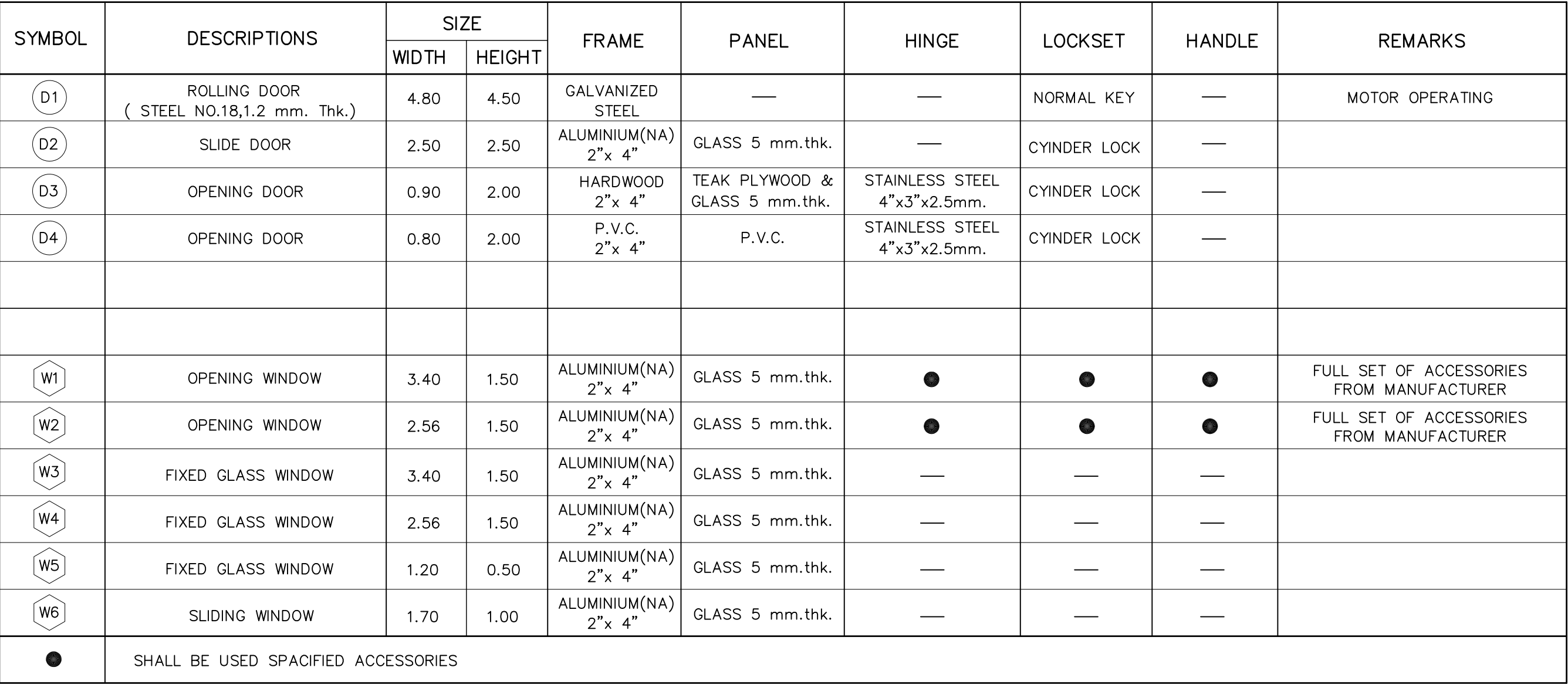


APPLICATION AND DIMENSION OF SEPTIC TANK					
NO. OF USER	VOLUMN		CONDITION		
	RESIDENTIAL	SOIL ONLY 60 LPCD	16	20	23
		TOTAL WASTE 200 LPCD	5	6	7
DIMENSION	DIAMETER (MM.)		1430	1390	1460
	HIGHT (MM.)		1490	1570	1670
	INLET,OUTLET PIPE (MM.)		100	100	100
	VENT (MM.)		50	50	50
VOLUMS	TOTAL VOLUMN (LITER)		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

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS		DEDE		

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUA I 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	
DESIGNED		REVIEWED S.KITIKHAJ	
DRAWN		SUBMITTED	
CHECKED		RECOMMENDED	
APPROVED		APPROVED	
PROJECT MANAGER		14/01/62 DATE	DRAWING NO. HLS-PH-05
			SHEET NO. 49 OF 78

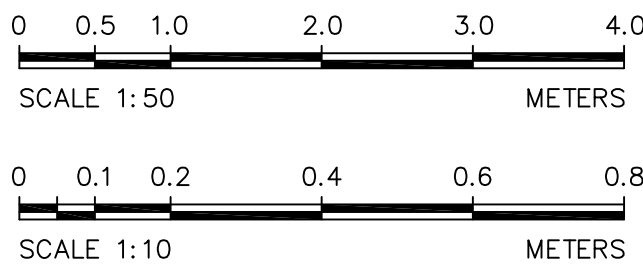


FRONT VIEW OF NAMEPLATE

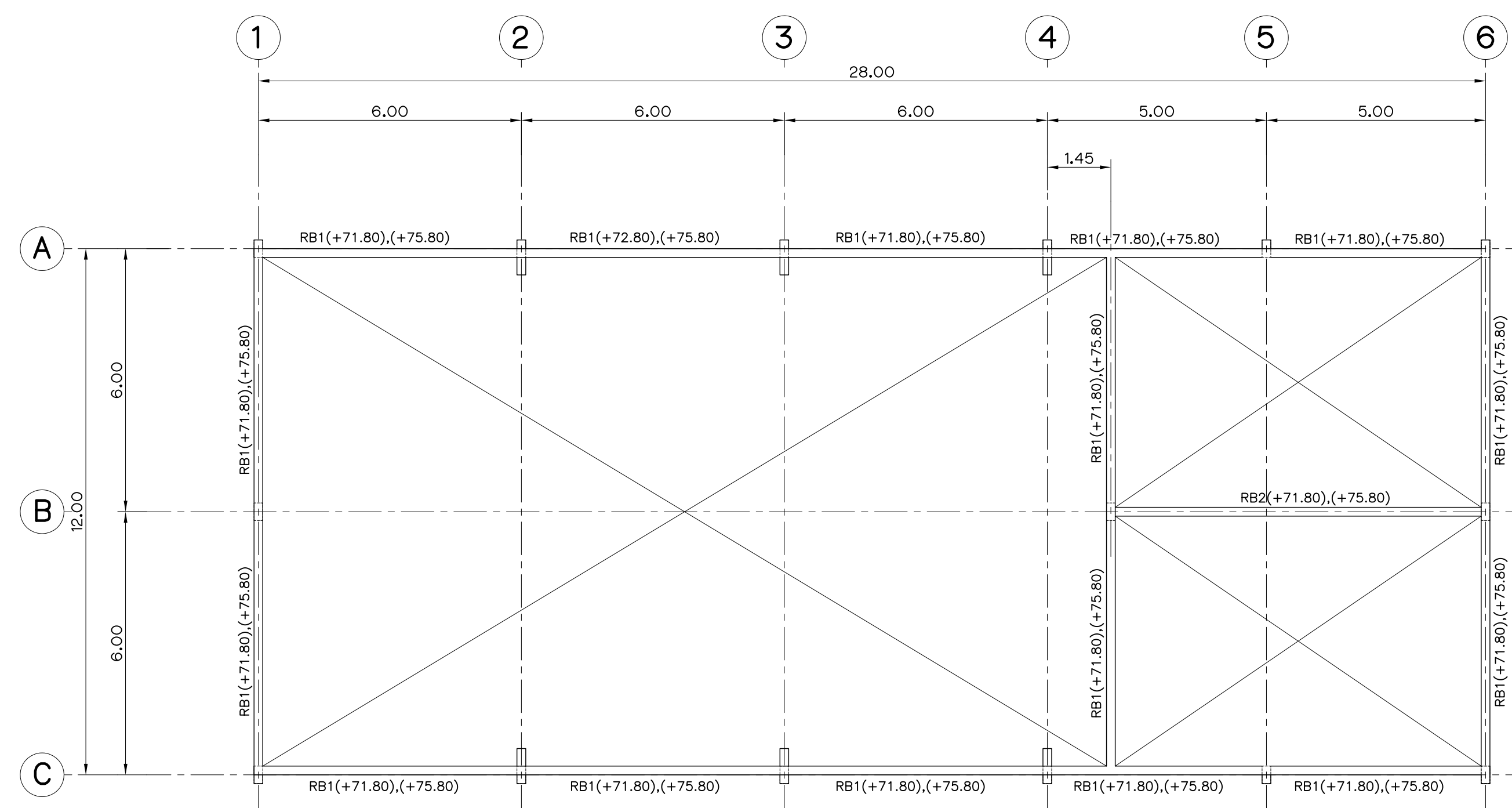
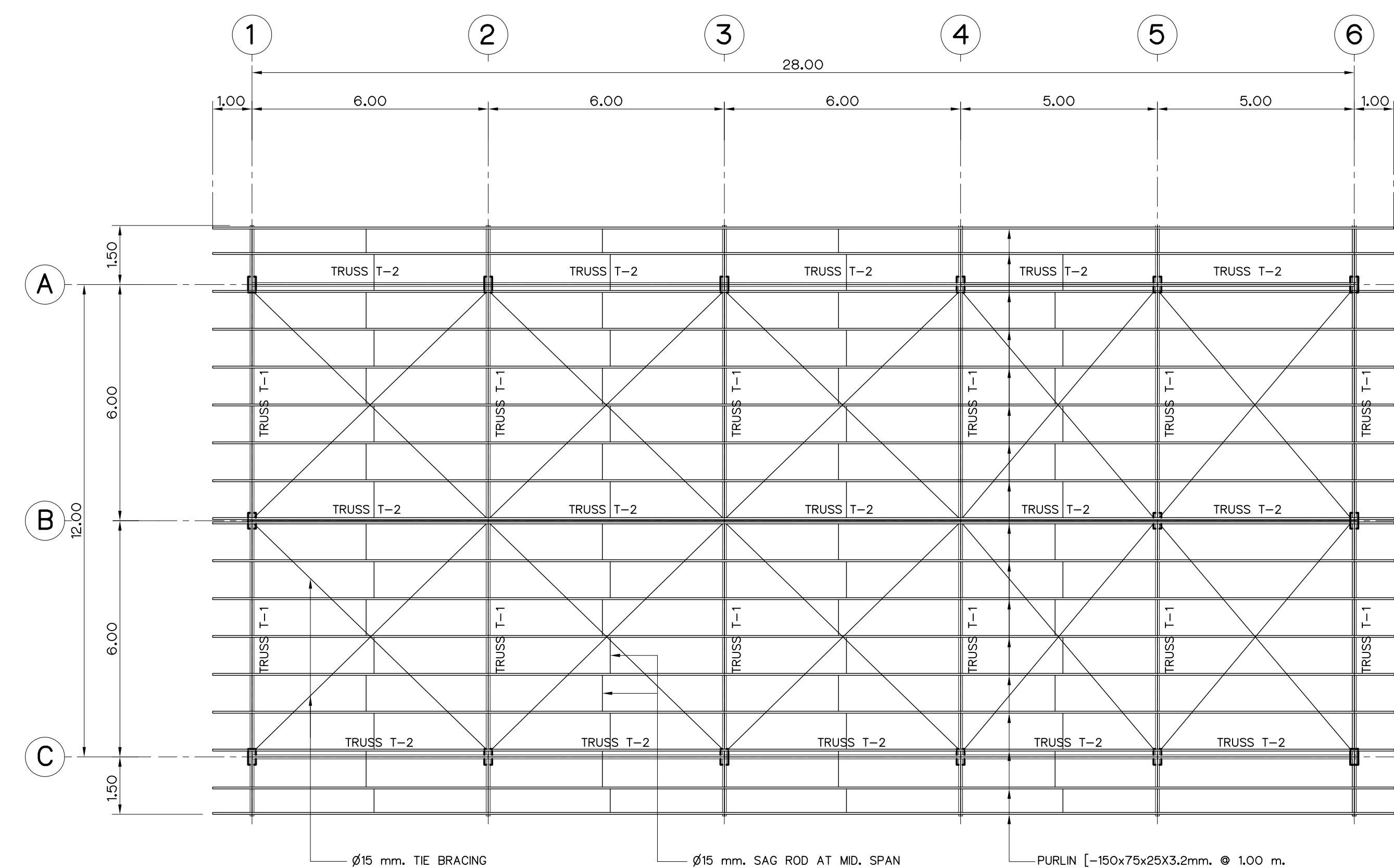
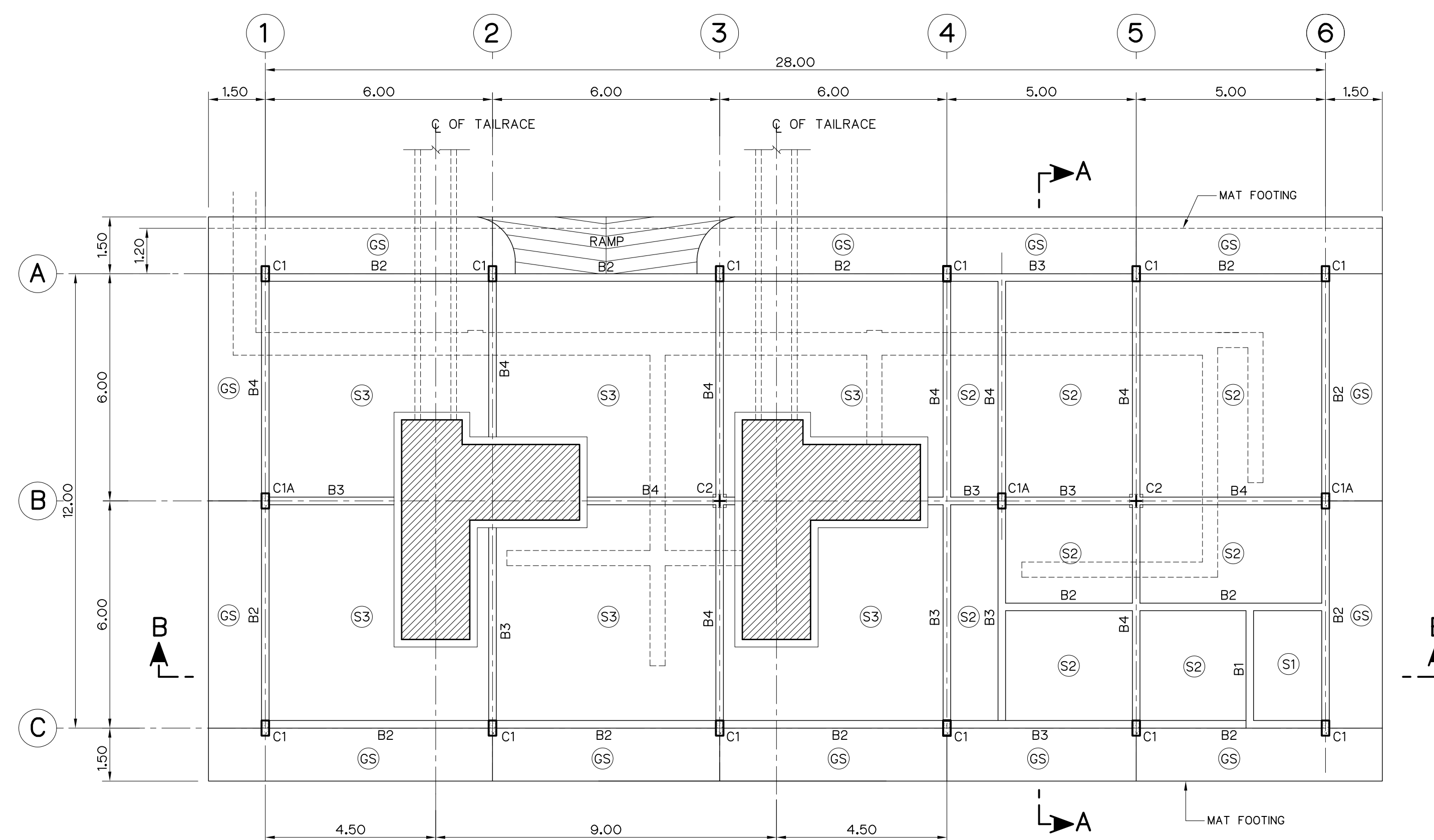
SCALE 1:10

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

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



3					DESIGNED	28.6651	REVIEWED	S.KTJCHAI
2					DRAWN	28.6651	SUBMITTED	28.6651
1					CHECKED	28.6651	RECOMMENDED	28.6651
NO.	DATE	REVISIONS	CHECKED	APPROVED	CHECKED	28.6651	APPROVED	28.6651
CONSULTANTS					DEDE		DRAWING NO.	
					PROJECT MANAGER		HLS-PH-06	
					DATE		SHEET NO.	
					14/01/62		50 OF 78	



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 :

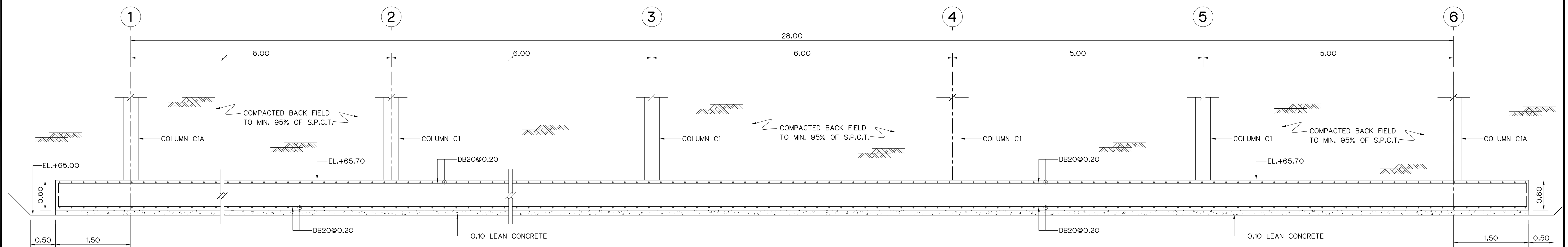
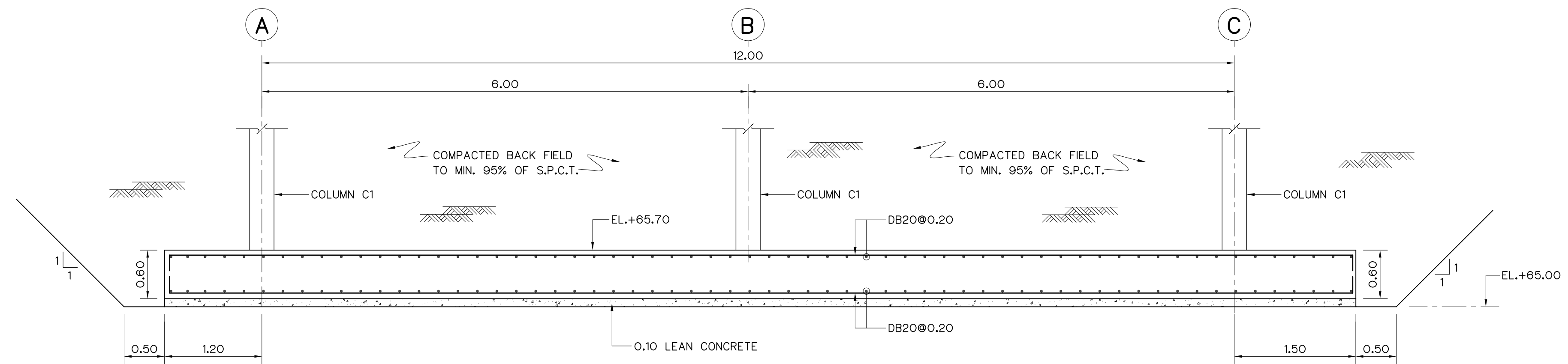
2. POWERHOUSE, ELEVATIONS

4. POWERHOUSE, DETAILS TRUSS T-1 AND T-2 (1/2)

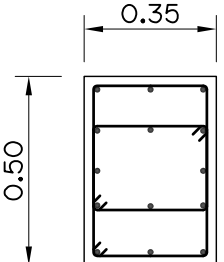
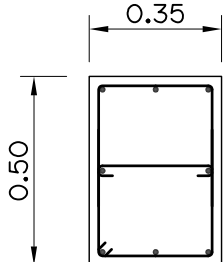
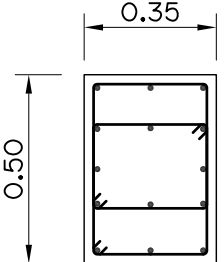
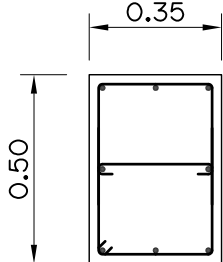
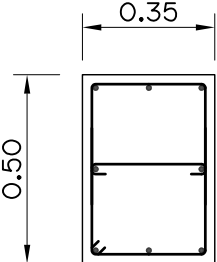
Department of Alternative
Energy Development and
Conservation

HUI LAM SIN HYDROPO

CIVIL WORKS



COLUMN DETAIL

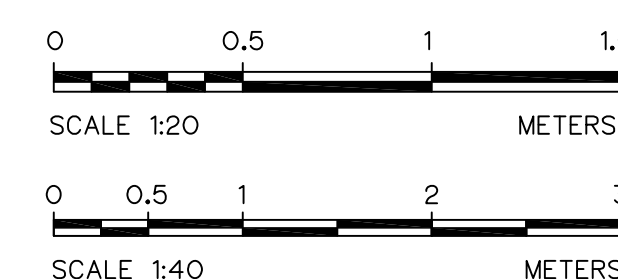
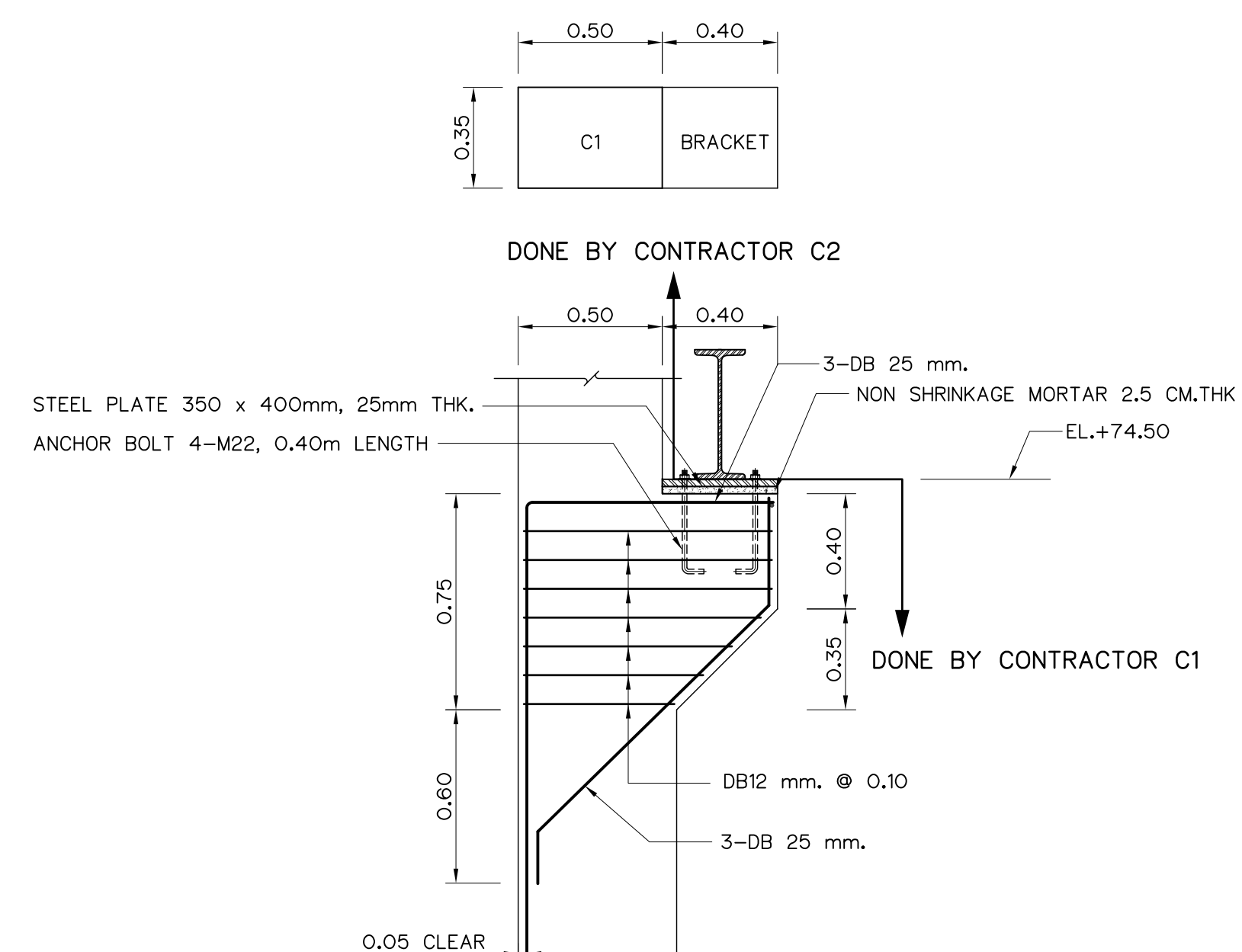
	C1	C1A	C2
ROOF BEAM  1ST FLOOR	 0.35 0.50 14-DB28 3 STR RB9 @ 0.25	 0.35 0.50 8-DB20 2 STR RB9 @ 0.25	—
1ST FLOOR  FOOTING	 0.35 0.50 14-DB28 3 STR RB9 @ 0.25	 0.35 0.50 8-DB25 2 STR RB9 @ 0.25	 0.35 0.50 8-DB20 2 STR RB9 @ 0.25

NOTES :

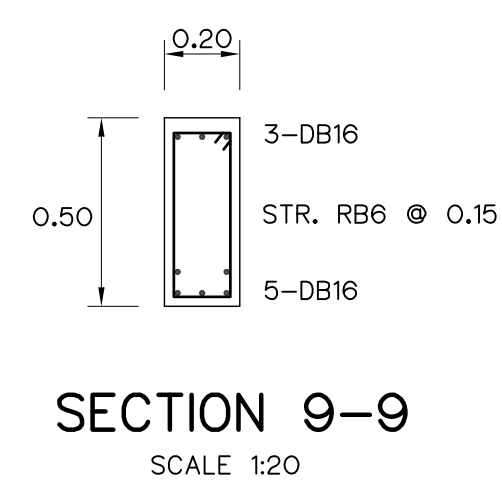
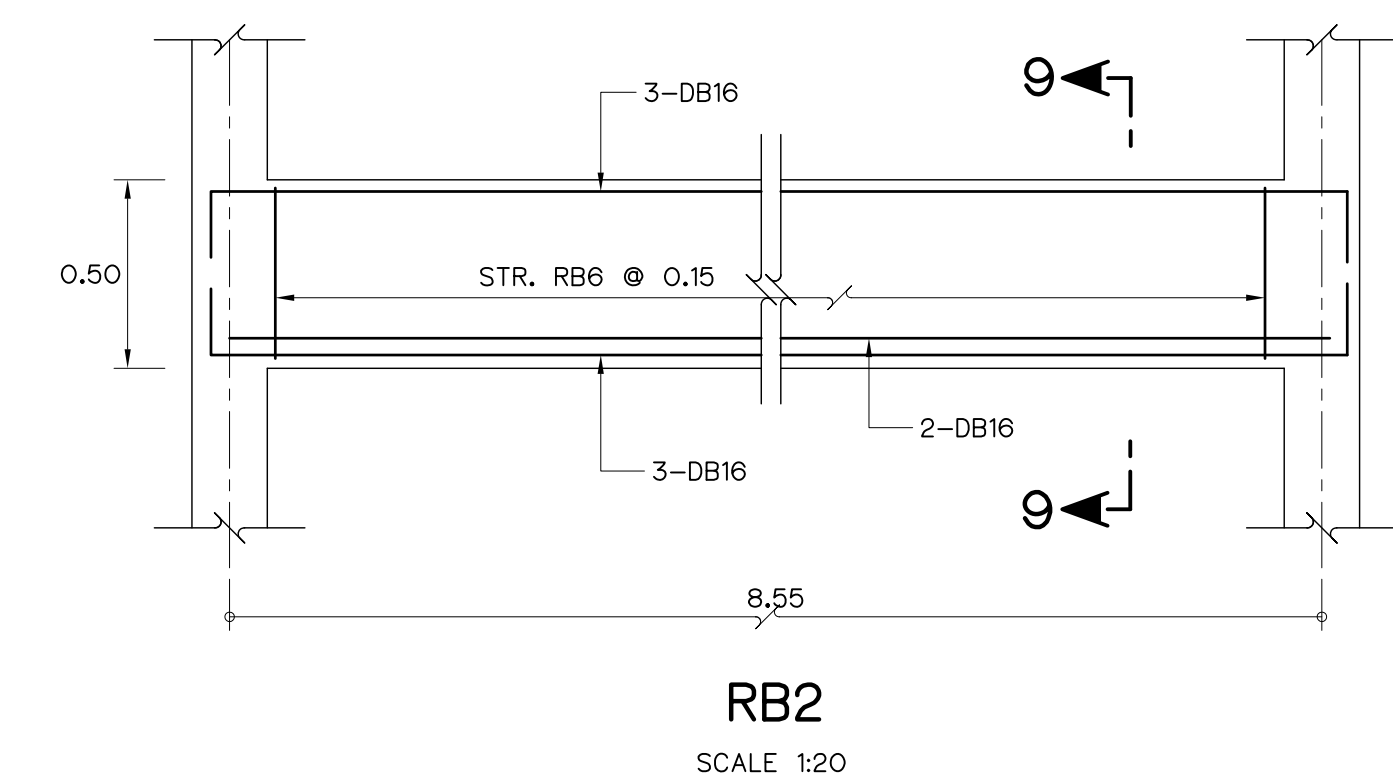
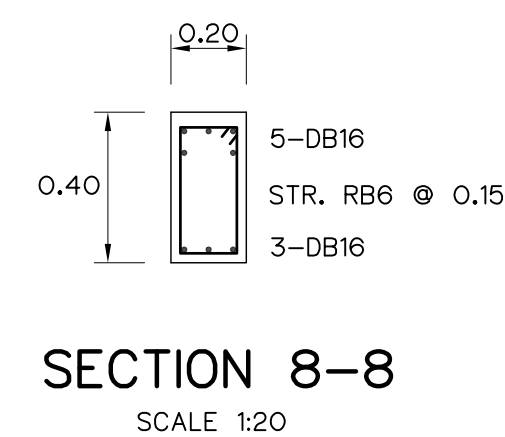
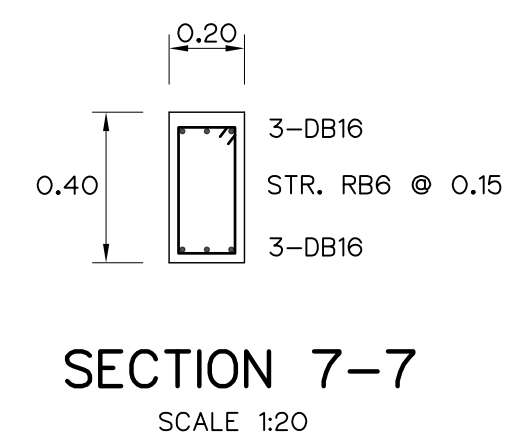
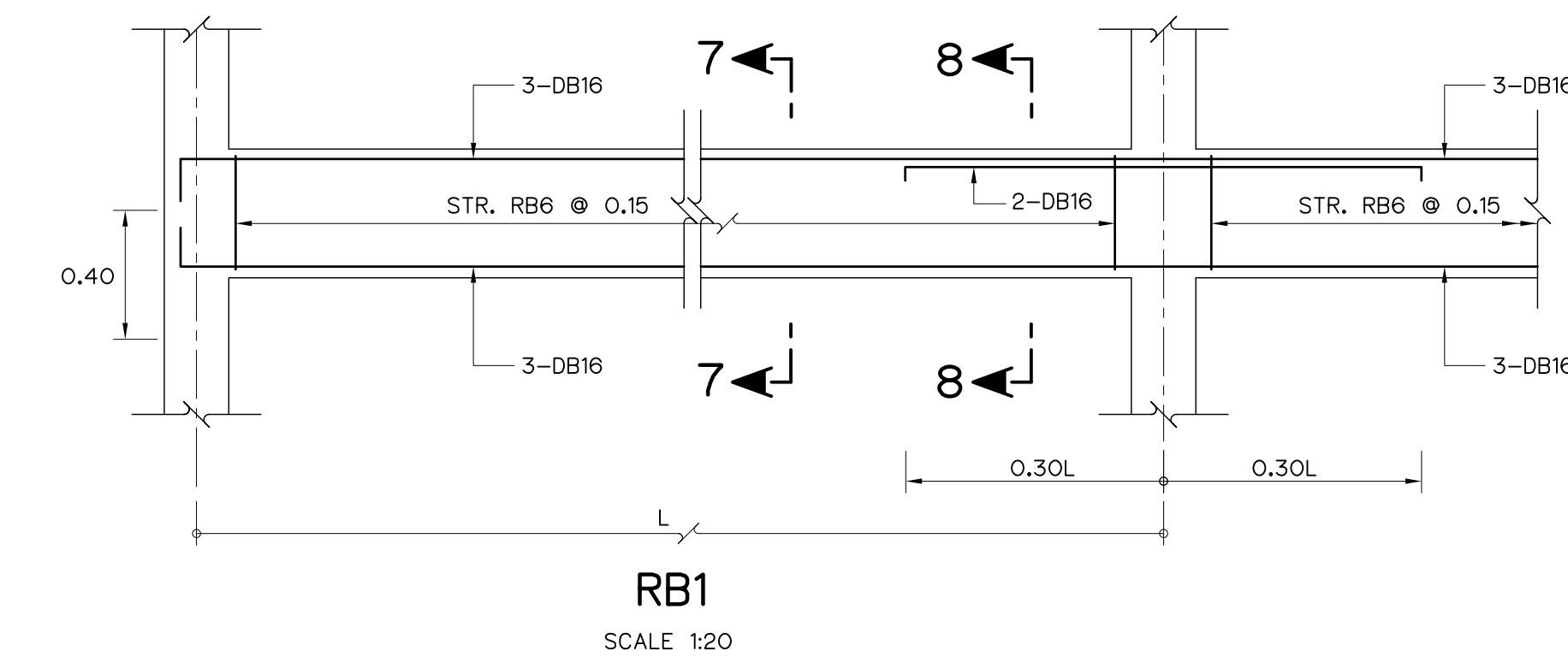
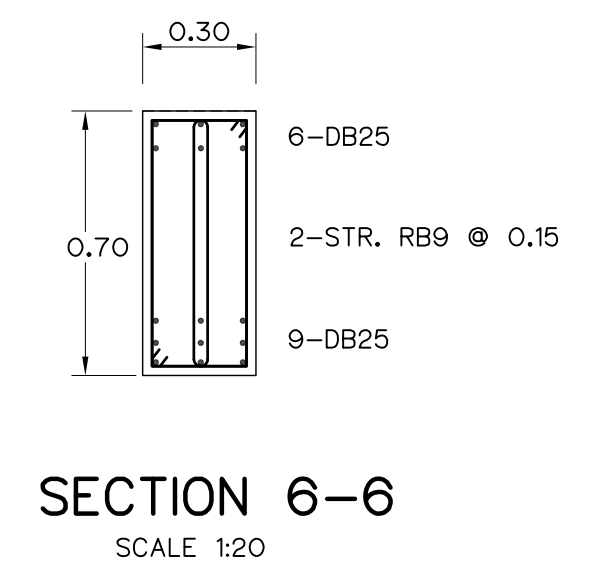
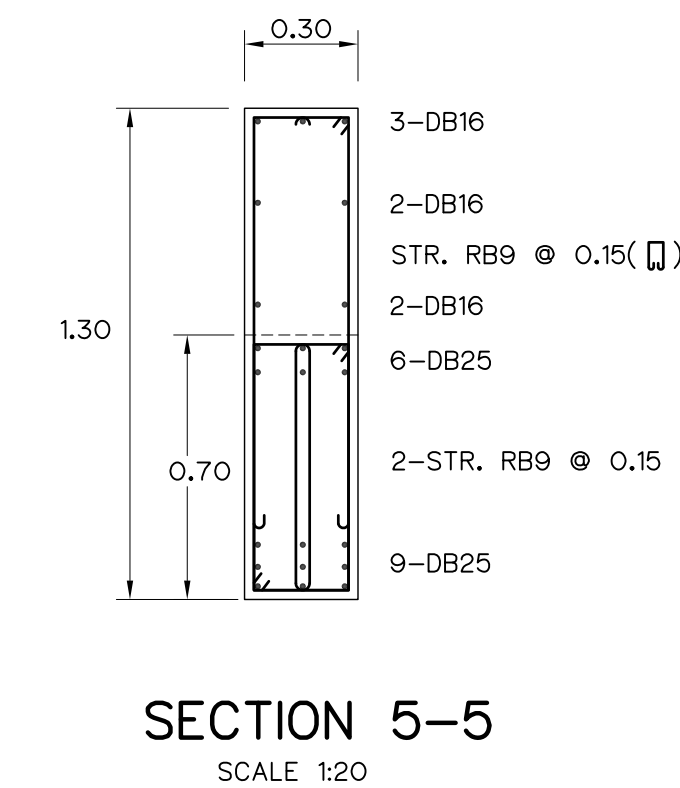
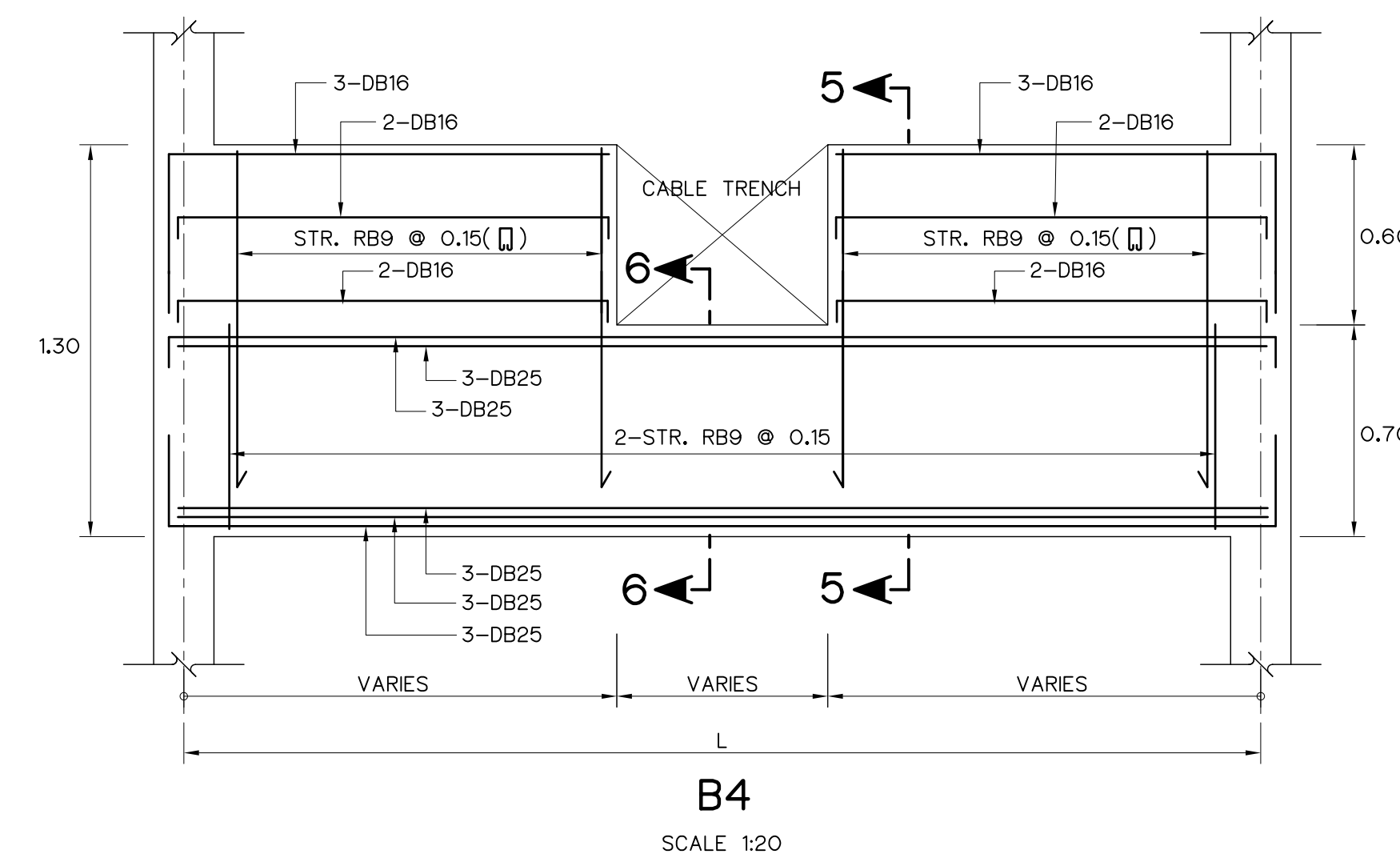
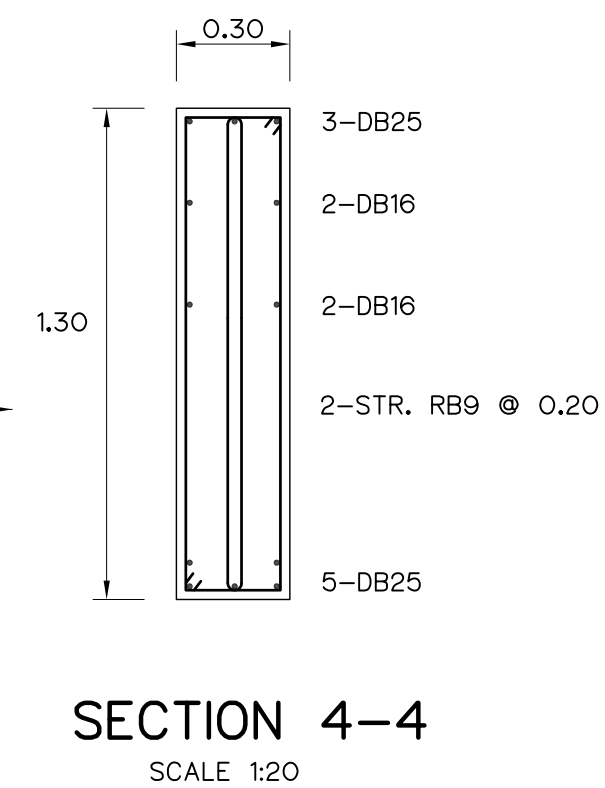
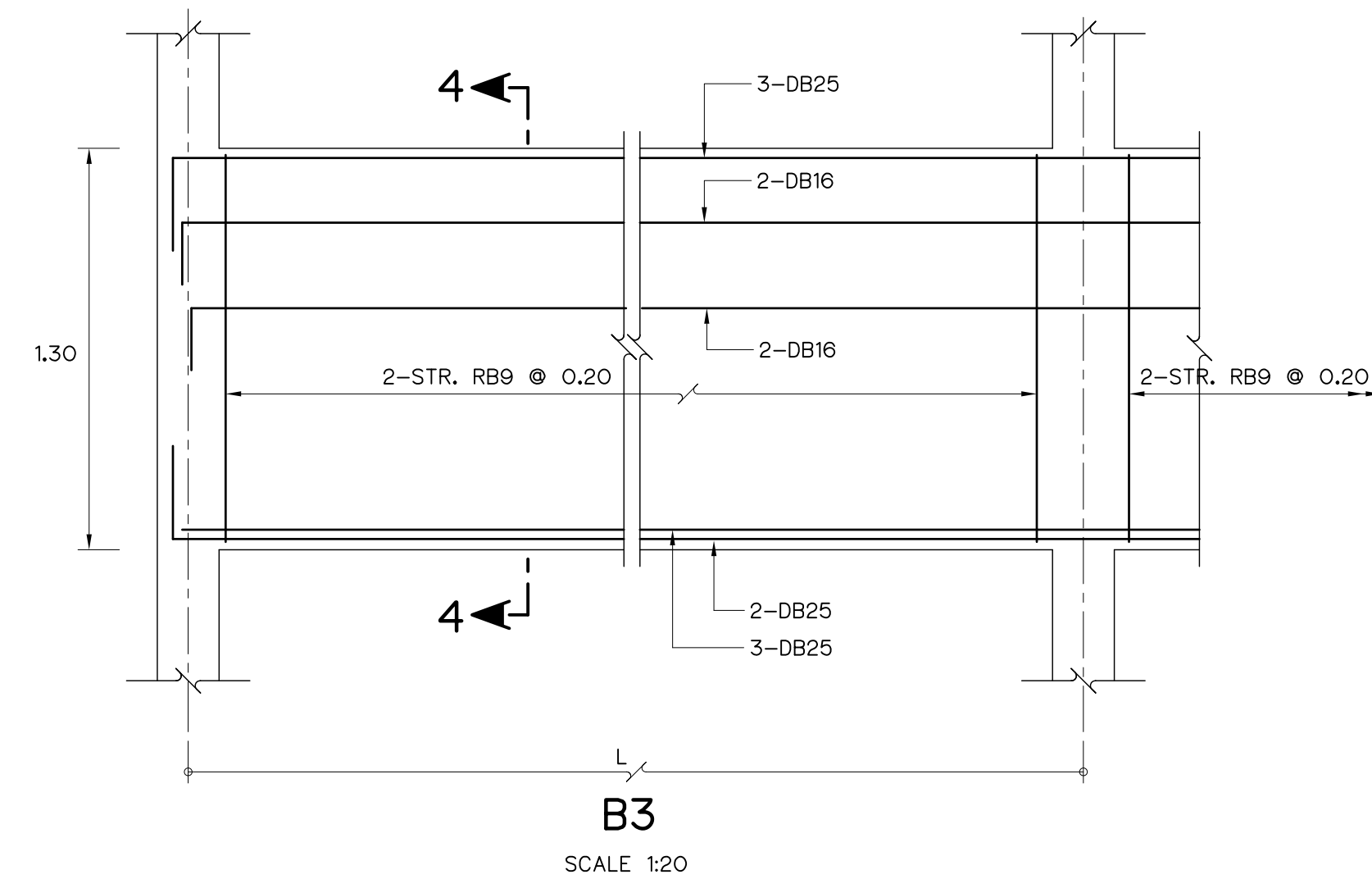
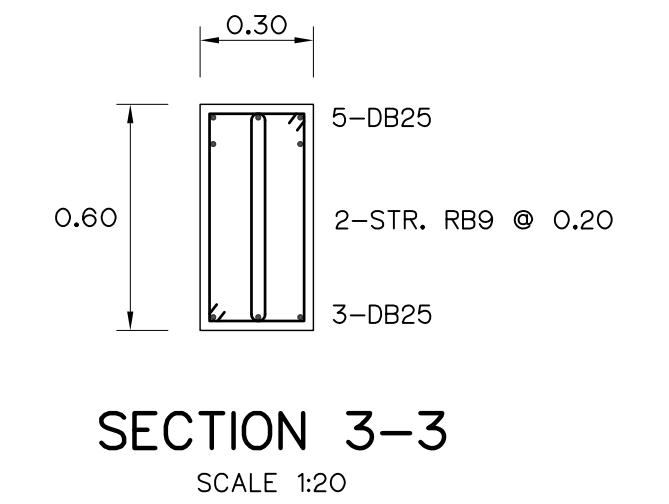
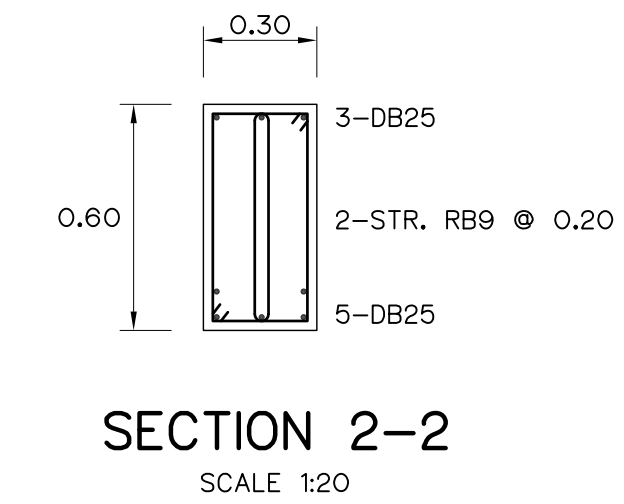
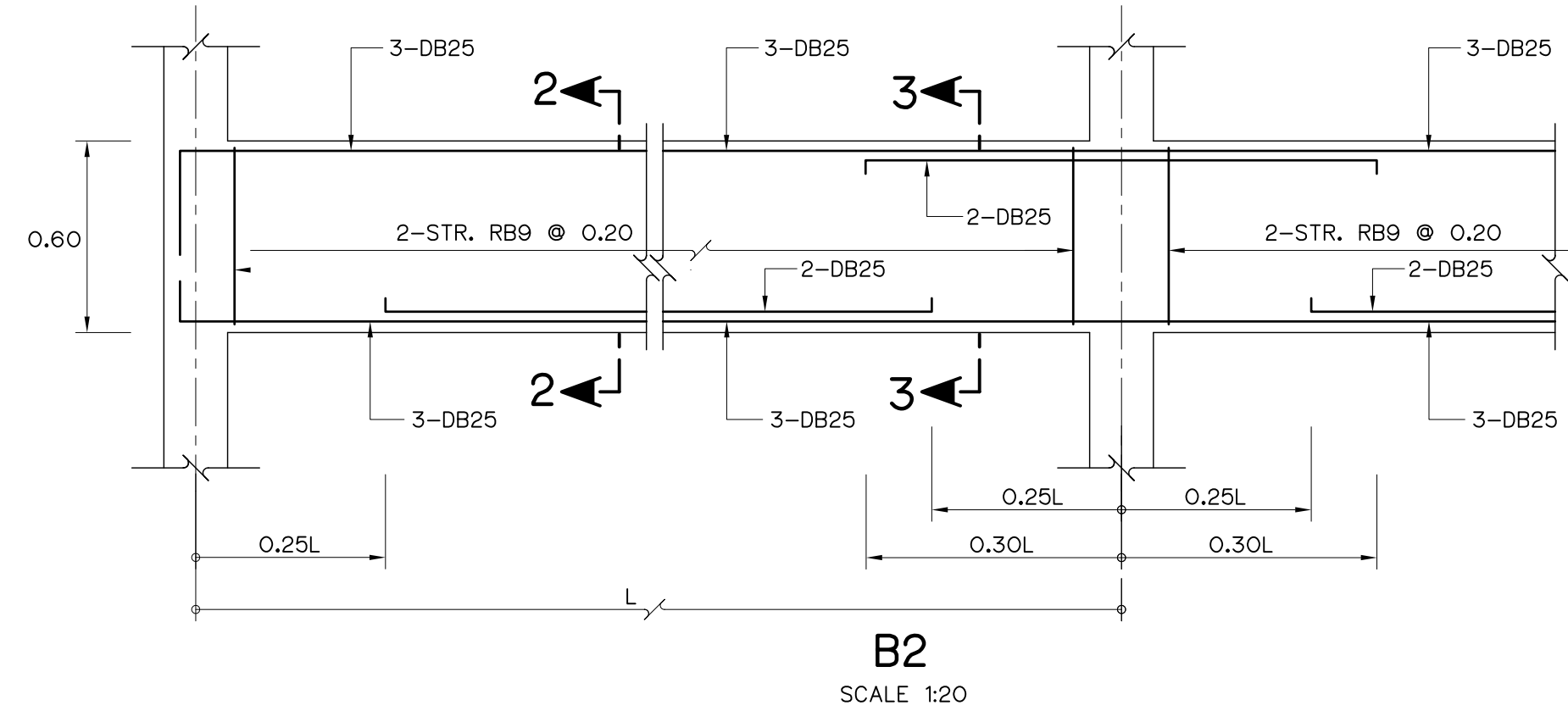
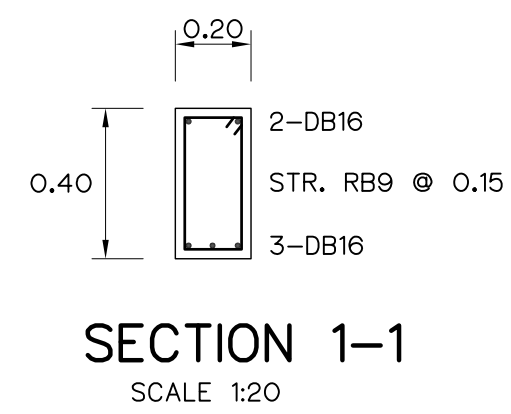
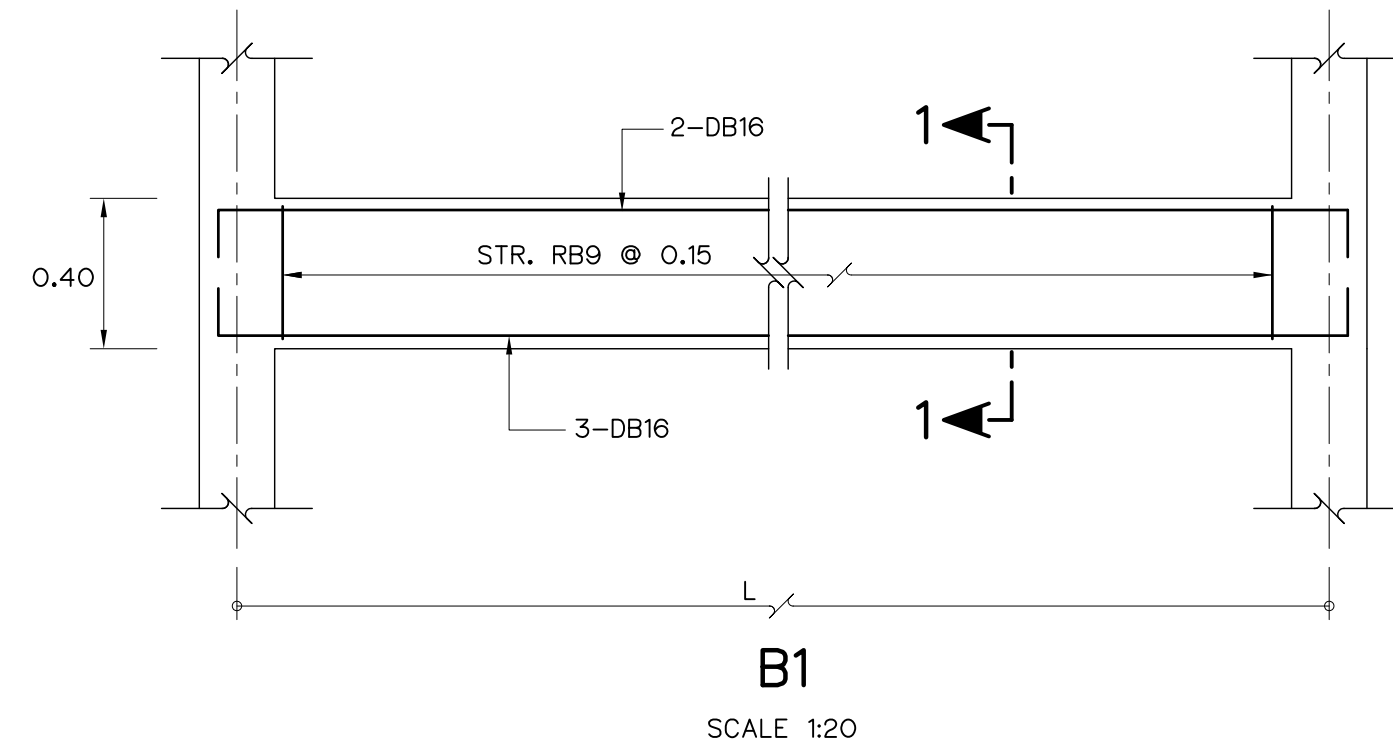
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS,
UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
3. ALLOWABLE BEARING CAPACITY OF POWERHOUSE FOUNDATION SHALL
NOT BE LESS THAN 10 T/M^2

REFERENCE DRAWINGS :

- | | |
|-----------------------------------|-----------|
| 1. POWERHOUSE, PLAN AND ROOF PLAN | HLS-PH-02 |
| 2. POWERHOUSE, ELEVATIONS | HLS-PH-03 |
| 3. POWERHOUSE, SECTIONS | HLS-PH-04 |



					FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		MINISTRY OF ENERGY	
3					DESIGNED		REVIEWED	S.K.TIHAJI
2					DRAWN		SUBMITTED	
1					CHECKED		RECOMMENDED	
NO.	DATE	REVISIONS	CHECKED	APPROVED	CHECKED		APPROVED	
CONSULTANTS				DEDE	 14/01/62		DRAWING NO.	SHEET NO.
					PROJECT MANAGER DATE		HLS-PH-08	52 OF 78



NOTE :

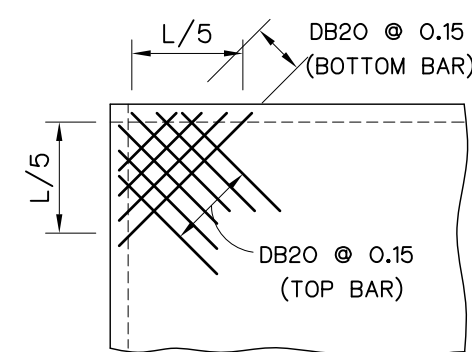
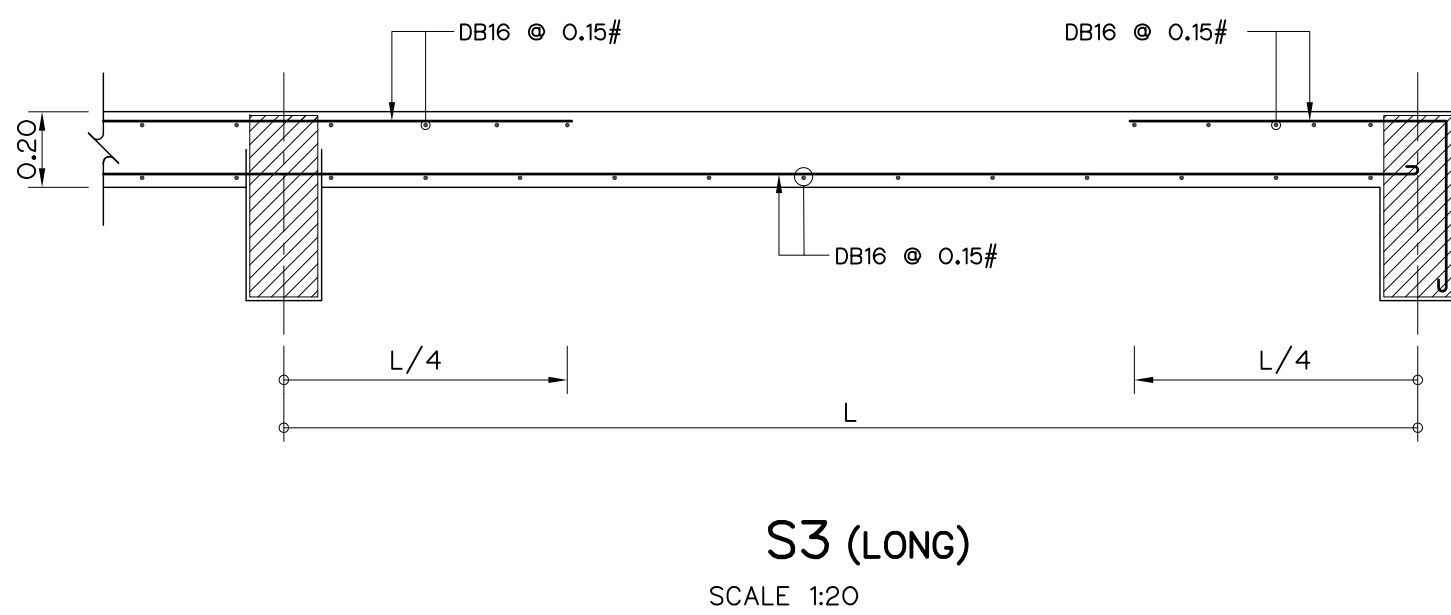
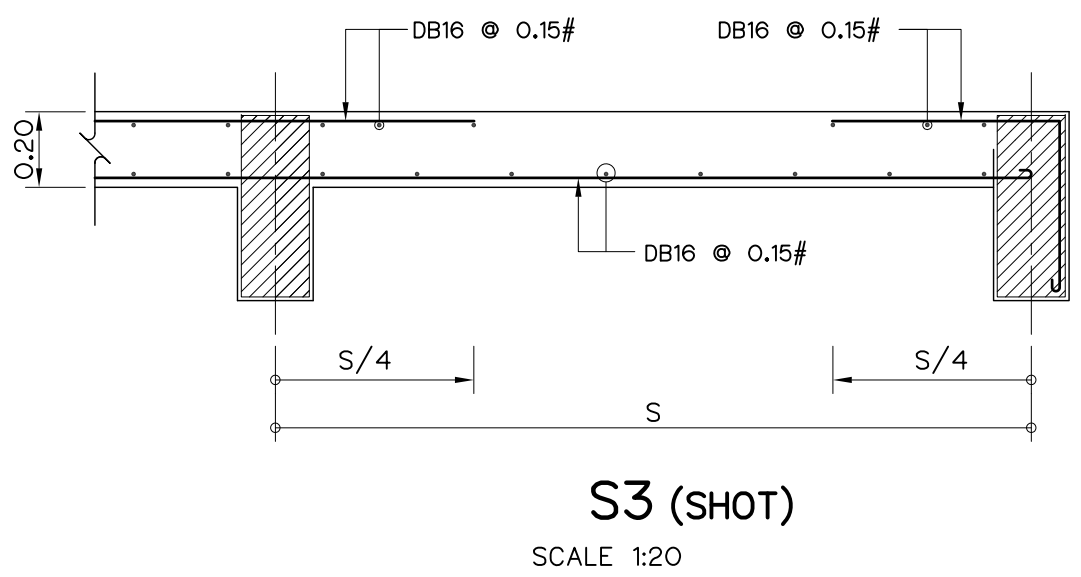
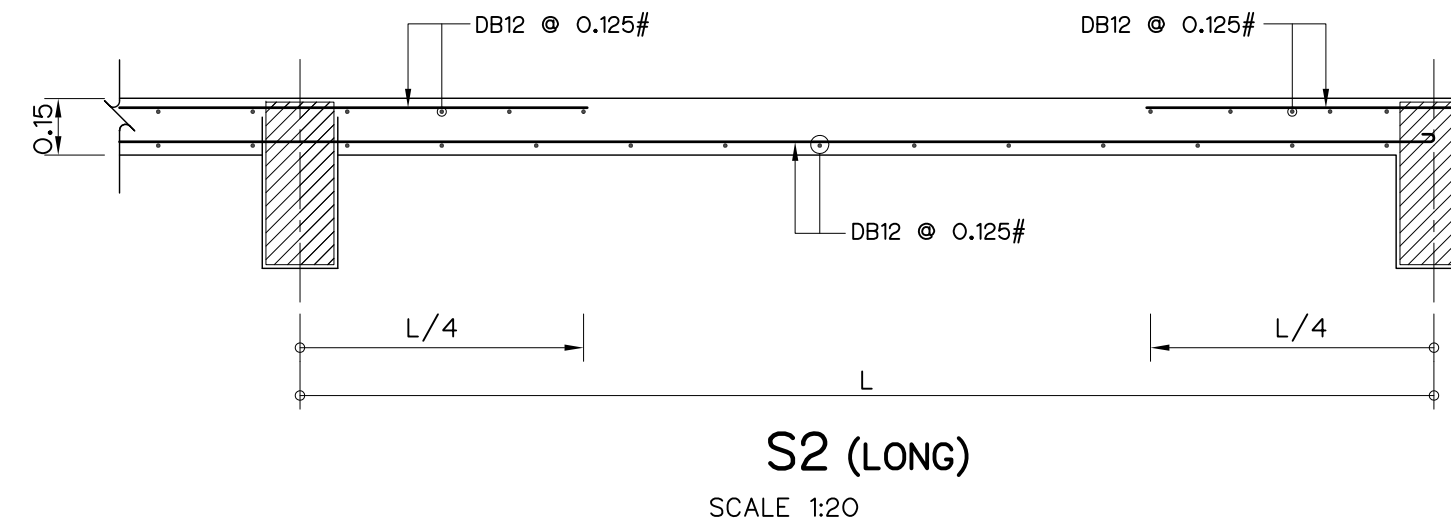
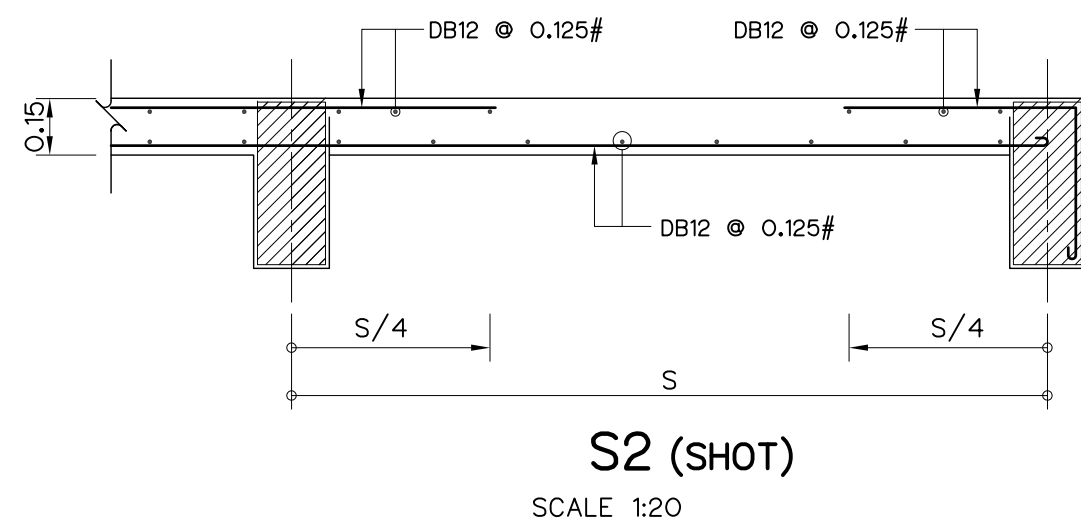
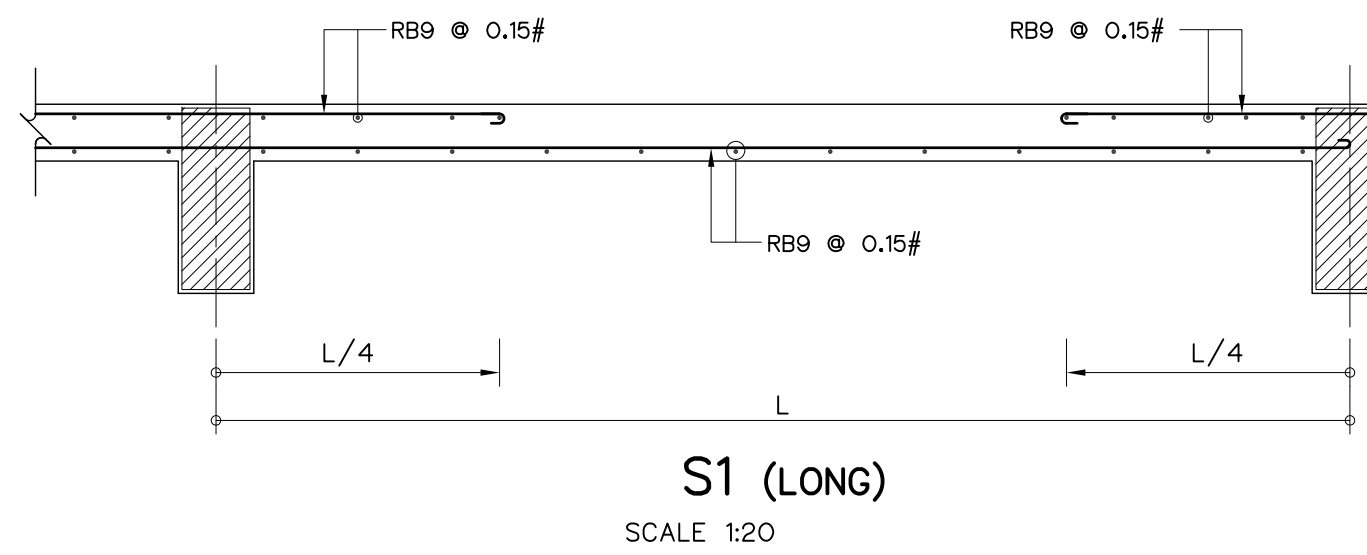
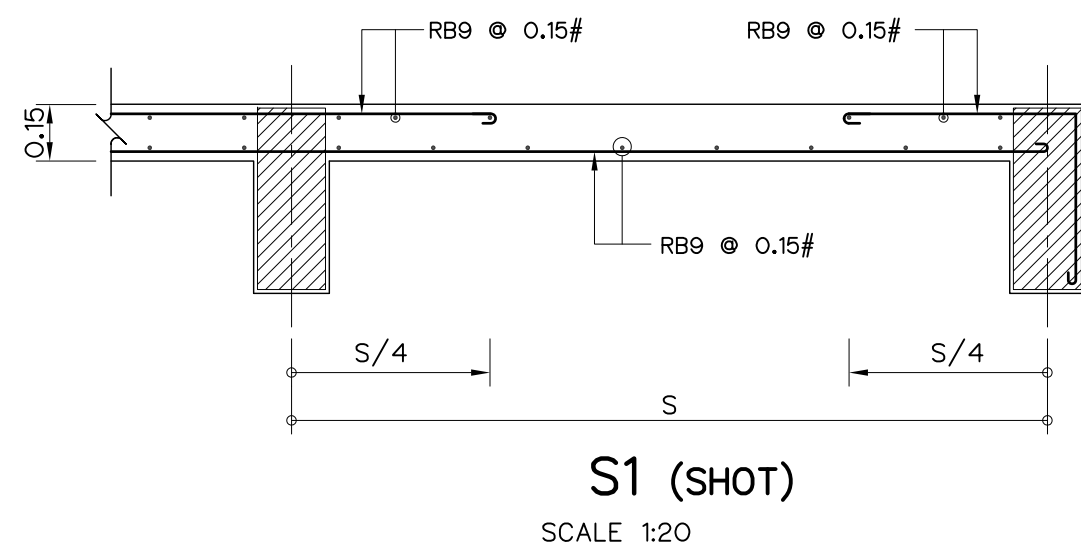
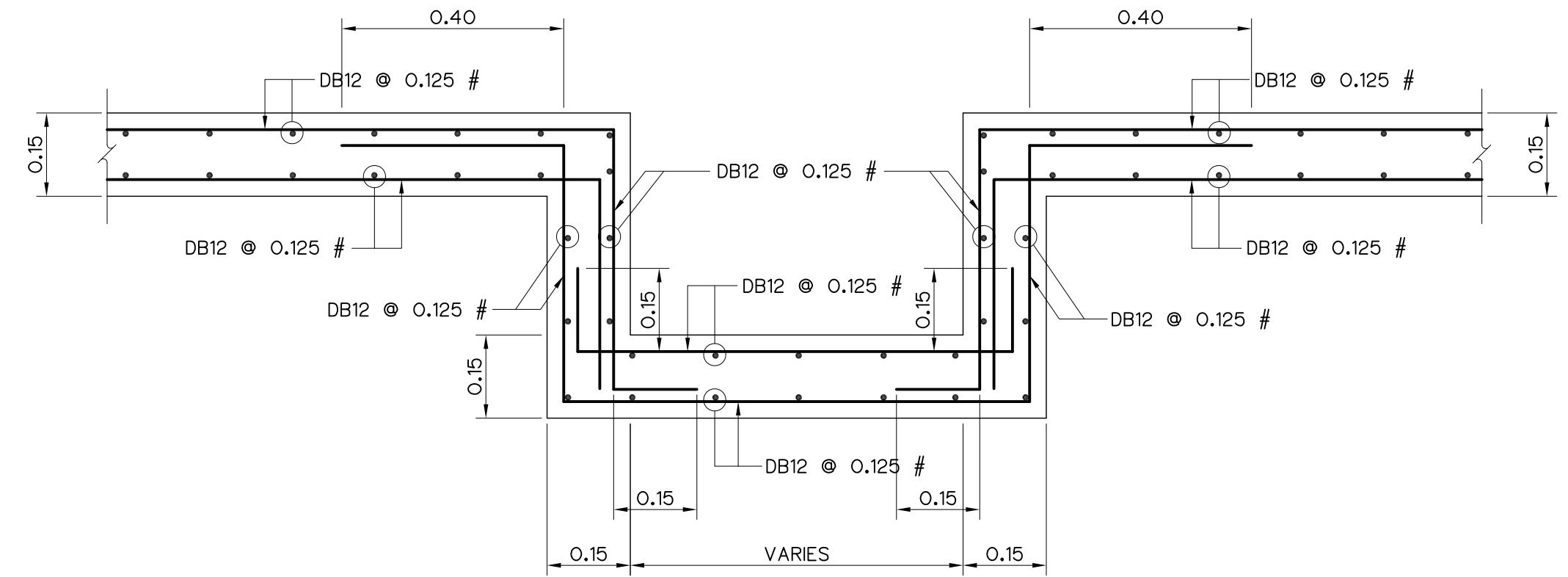
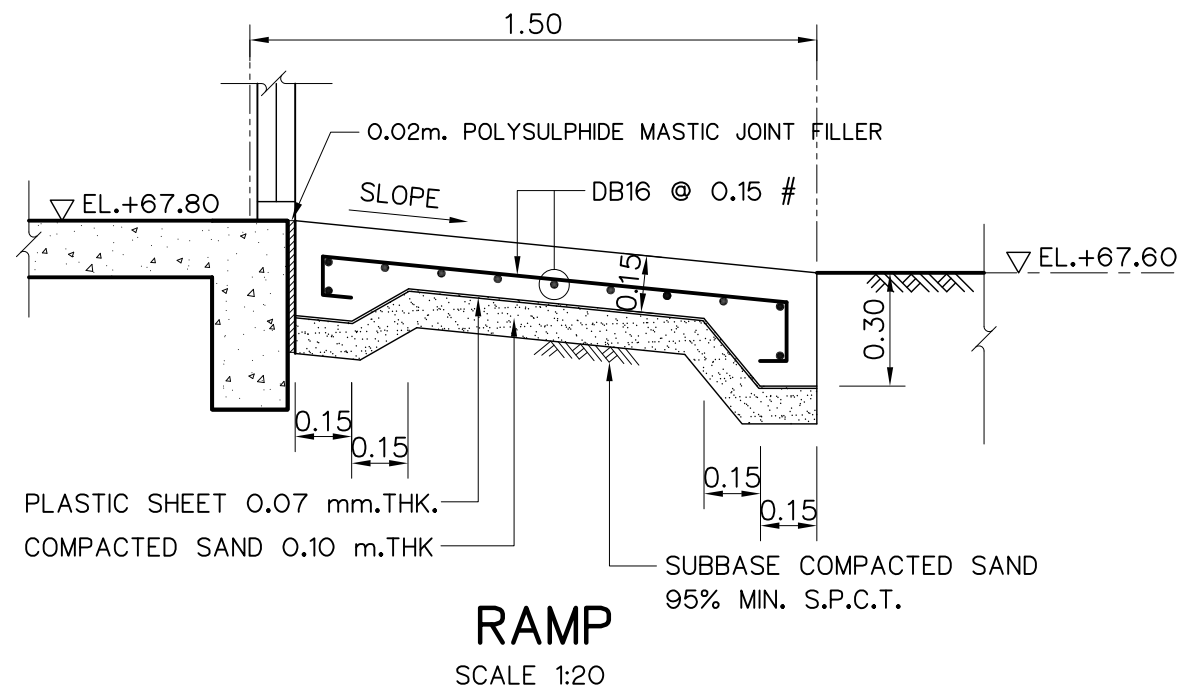
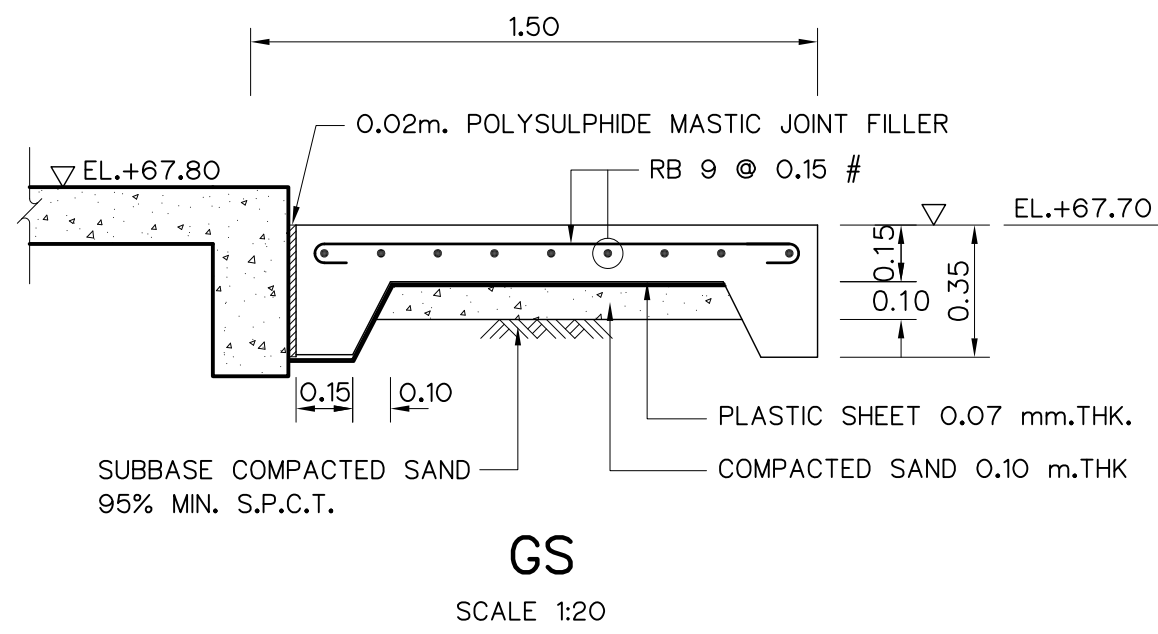
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.

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			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED <i>[Signature]</i> ๖๒.6651		REVIEWED <i>[Signature]</i> ๖๒.6651	
DRAWN <i>[Signature]</i>		RECOMMENDED <i>[Signature]</i>	
CHECKED <i>[Signature]</i> ๖๒.7324		APPROVED <i>[Signature]</i>	
CONSULTANTS		DEDE	
PROJECT MANAGER		14/01/62 DATE	
DRAWING NO. HLS-PH-09		SHEET NO. 53 OF 78	

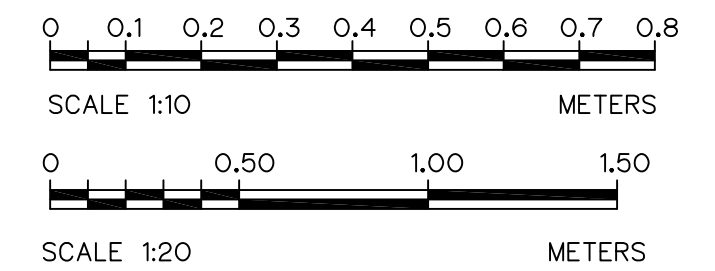


NOTES :

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

REFERENCE DRAWINGS :

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

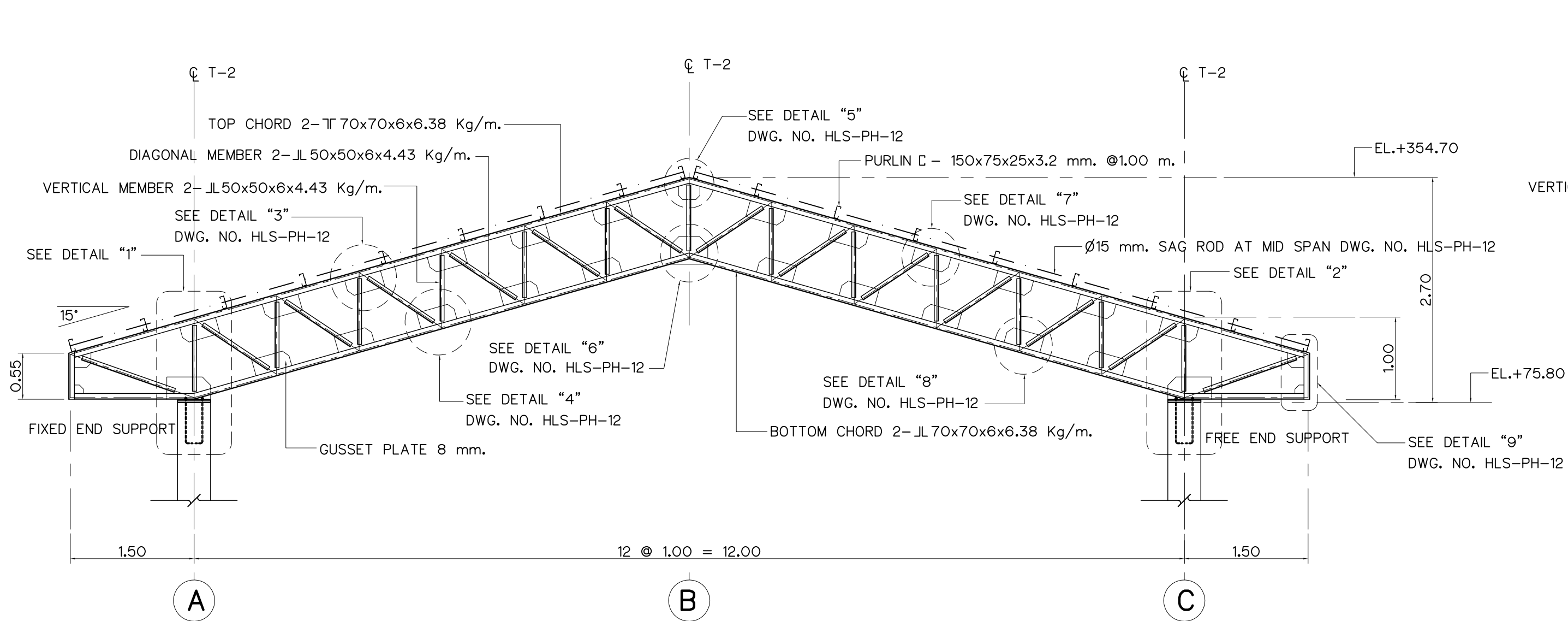


3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

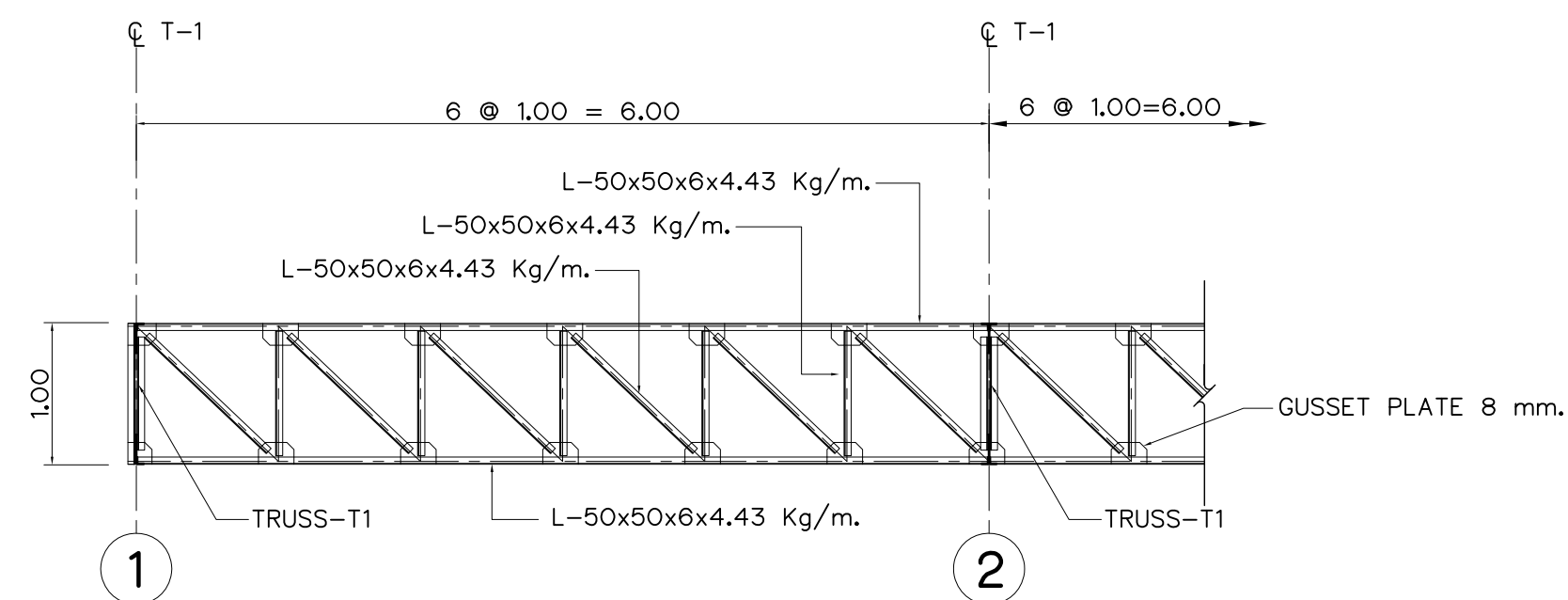
CONSULTANTS

DEDE

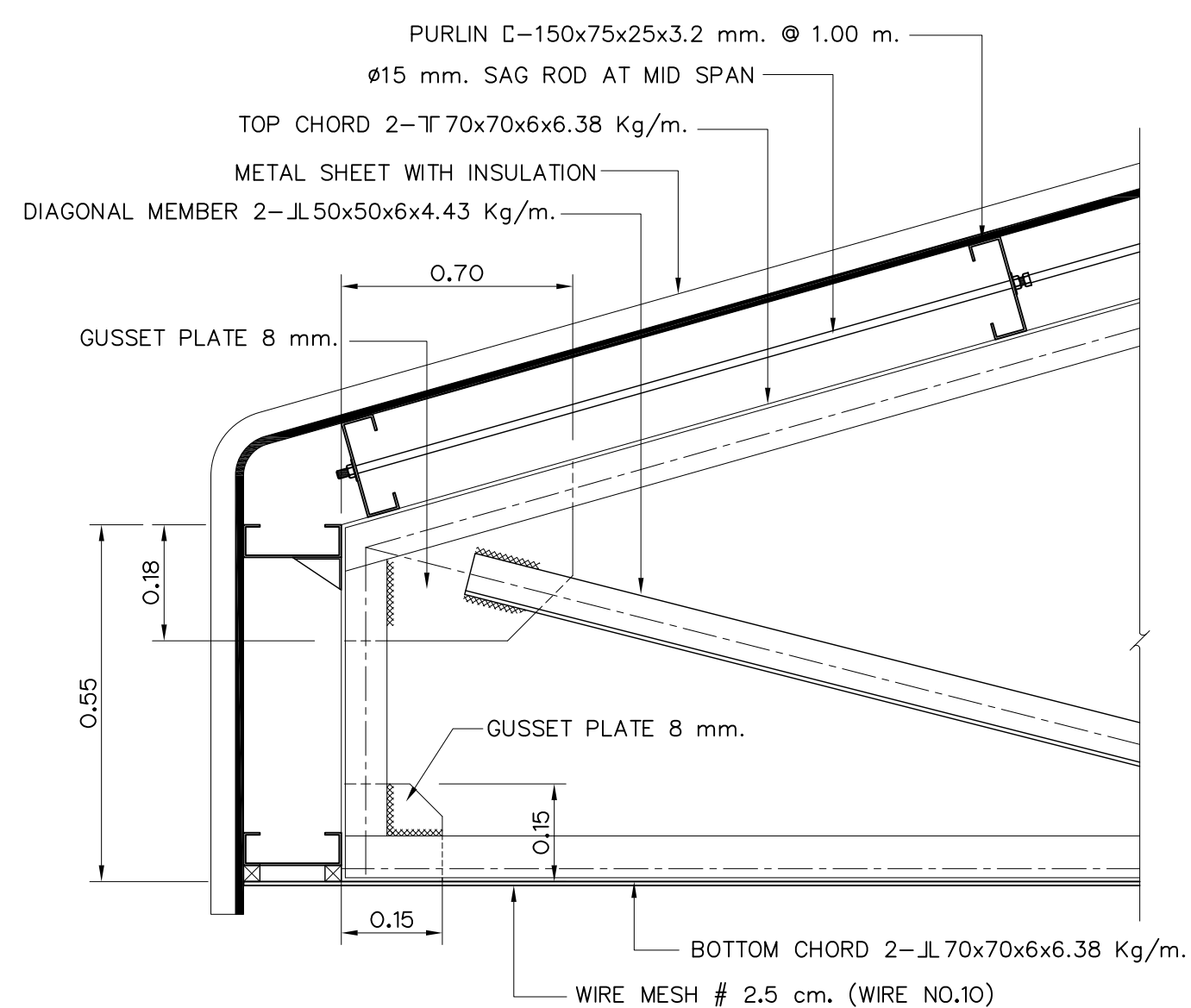
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY		
HUAI LAM SIN HYDROPOWER PROJECT		
CIVIL WORKS POWERHOUSE SLAB REINFORCEMENT DETAILS		
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	REVIEWED S.KITICHAJ	
DESIGNED ๒๒.6651	SUBMITTED	
DRAWN ๒๒.๗๓๒	RECOMMENDED ๒๒.๗๓๒	
CHECKED ๒๒.๗๓๒	APPROVED	
PROJECT MANAGER ๒๒.๗๓๒	DATE 14/01/62	DRAWING NO. HLS-PH-10
		SHEET NO. 54 OF 78



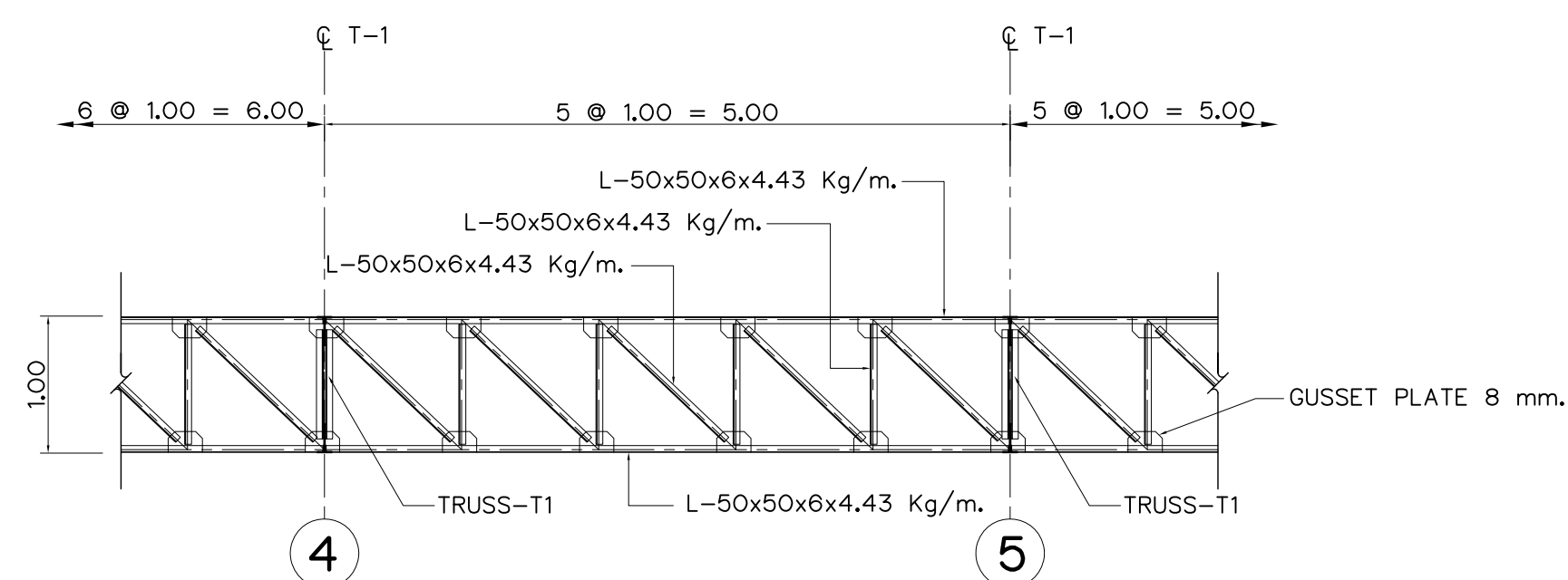
TRUSS T-1
SCALE 1:50



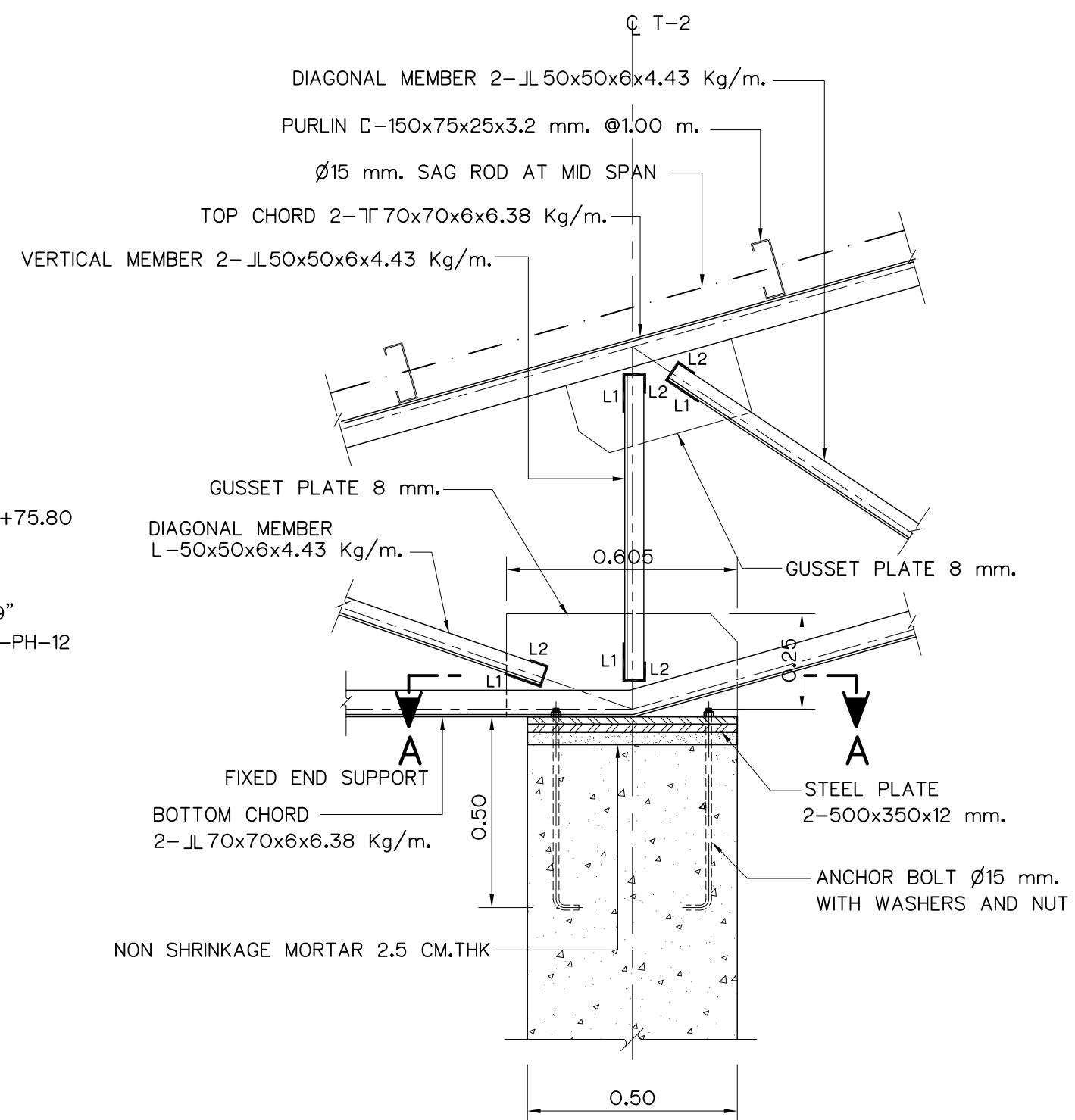
TRUSS T-2 (SPAN 6.00m.)
SCALE 1:50



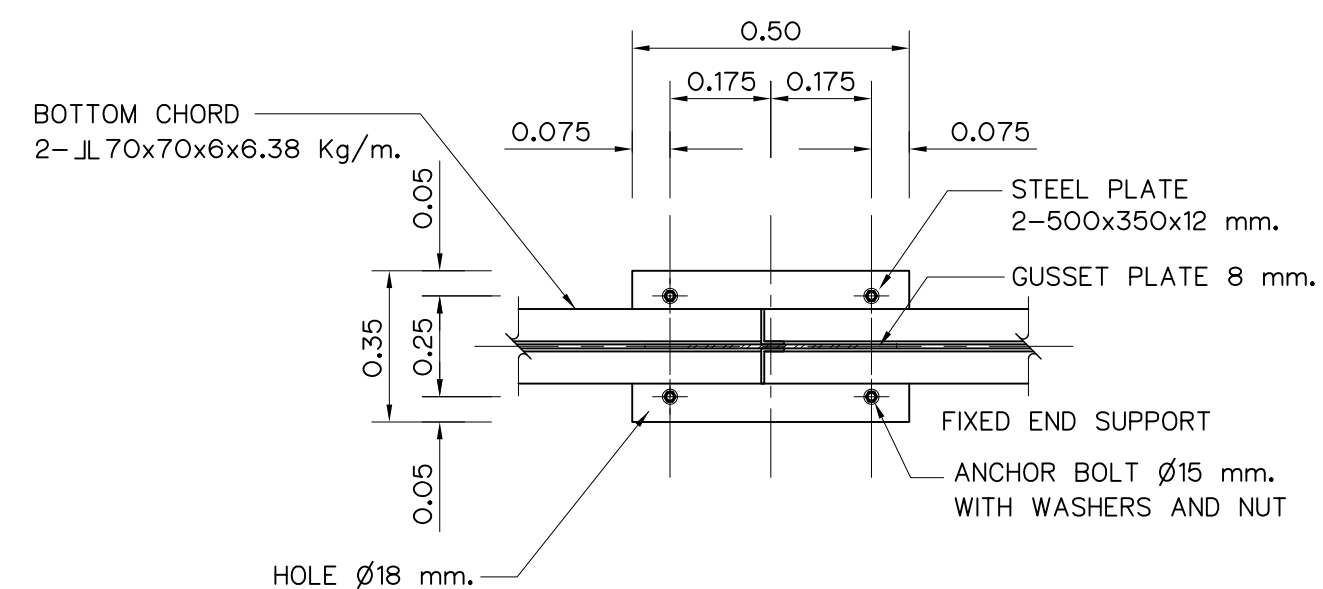
EAVES DETAIL
SCALE 1:10



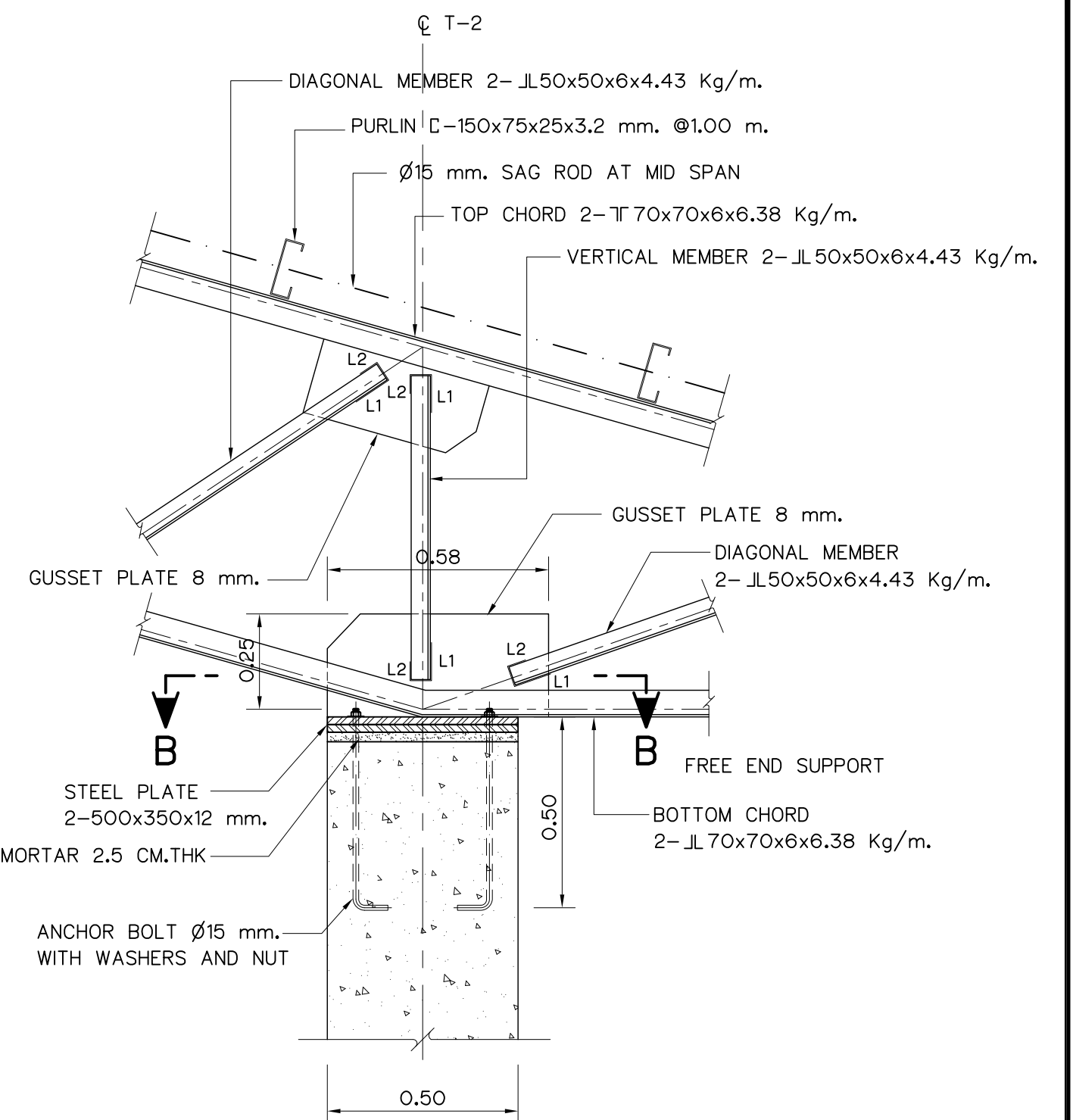
TRUSS T-2 (SPAN 5.00m.)
SCALE 1:50



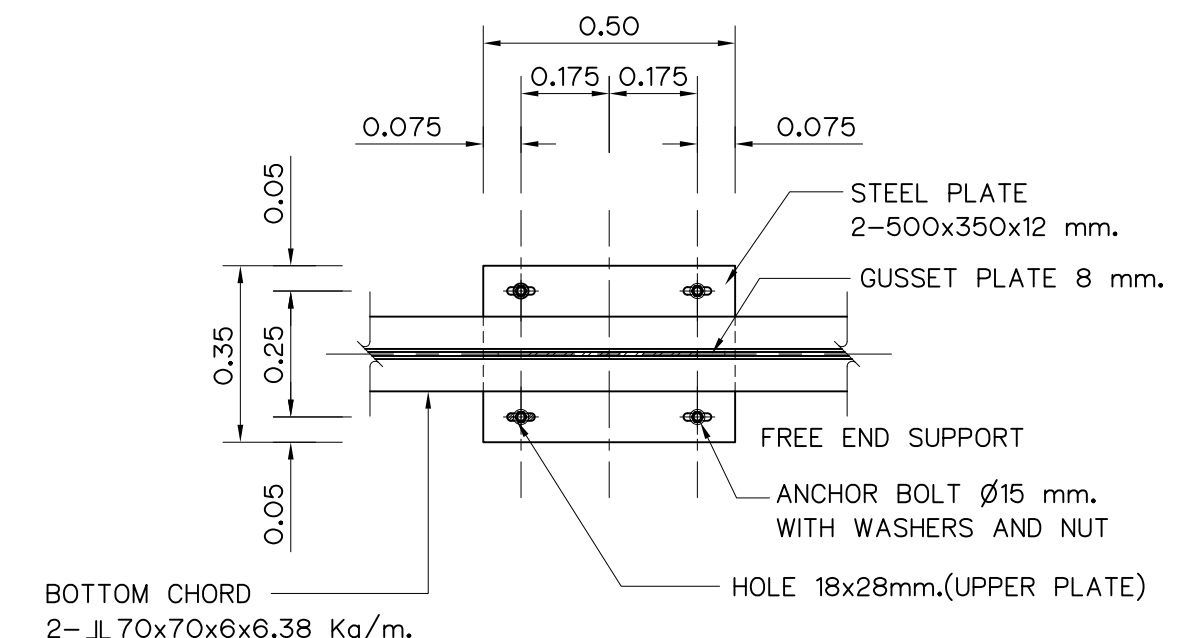
DETAILS "1"
SCALE 1:15



SECTION A-A
SCALE 1:15



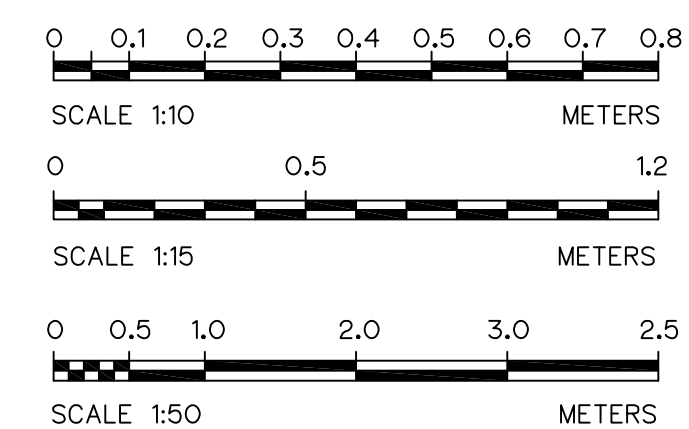
DETAILS "2"
SCALE 1:15



SECTION B-B
SCALE 1:15

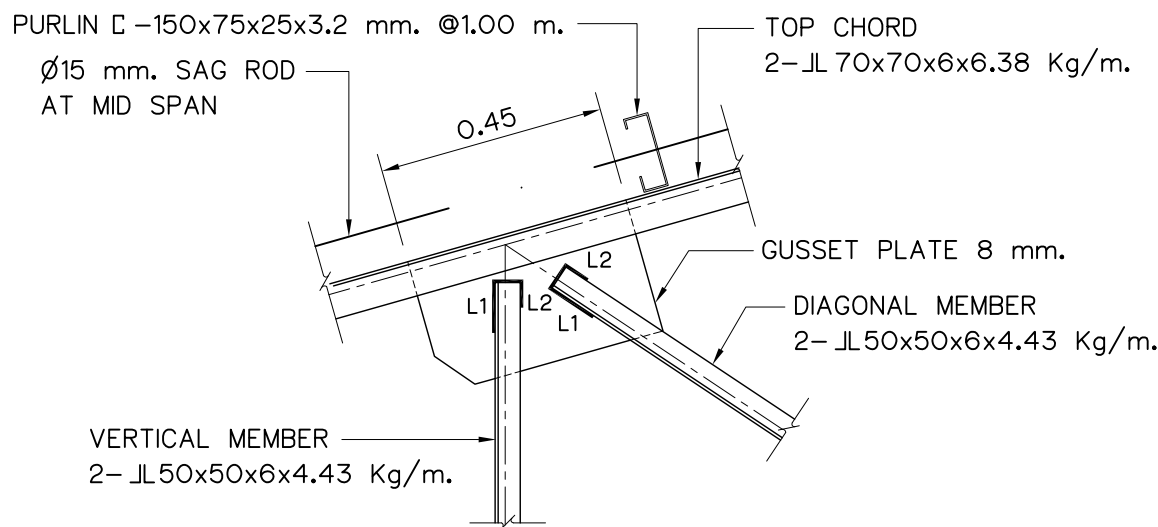
- NOTES :
- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
 - SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

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

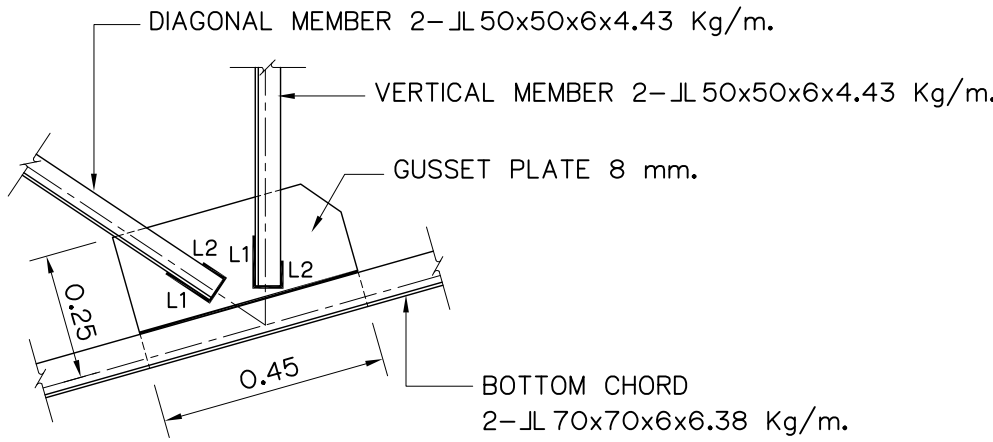


3					
2					
1					
NO.	DATE	REVISIONS	CHECKED	APPROVED	

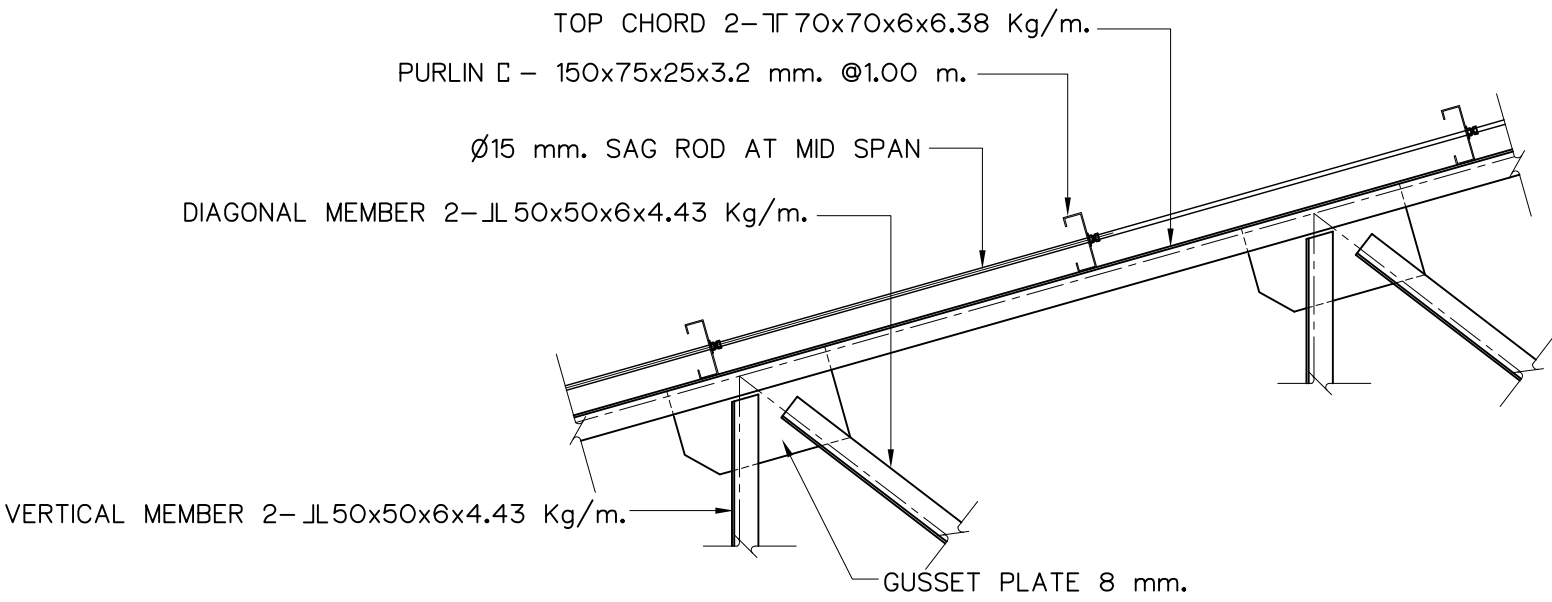
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			HUAI LAM SIN HYDROPOWER PROJECT		
CIVIL WORKS POWERHOUSE DETAILS TRUSS T-1 AND T-2 (1/2)			FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		
DESIGNED			REVIEWED S.KITICHAJ		
DRAWN			SUBMITTED		
CHECKED			RECOMMENDED		
14/01/62			APPROVED		
PROJECT MANAGER			DRAWING NO. HLS-PH-11		
DATE			SHEET NO. 55 OF 78		



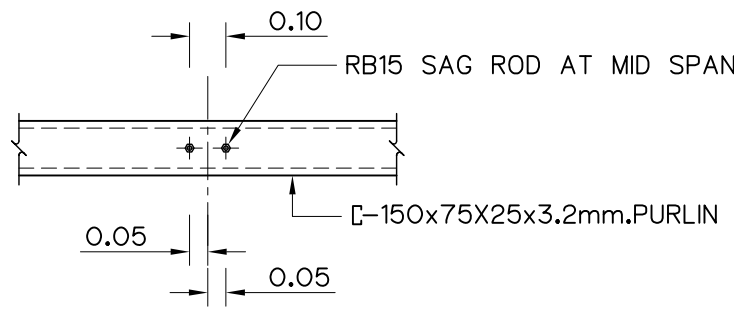
DETAILS “3”
SCALE 1:15



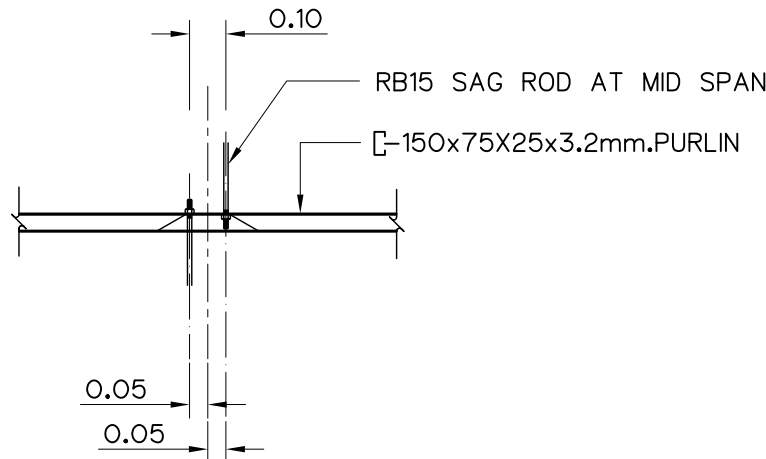
DETAILS “4”
SCALE 1:15



SECTION

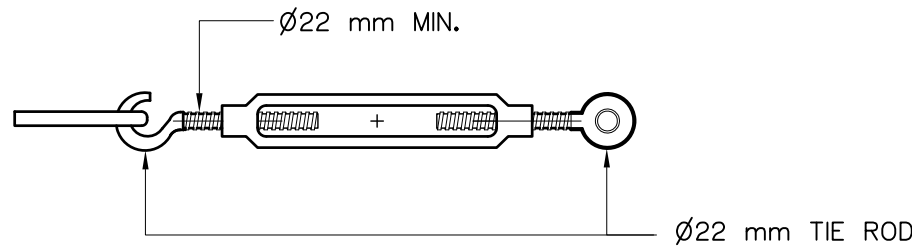
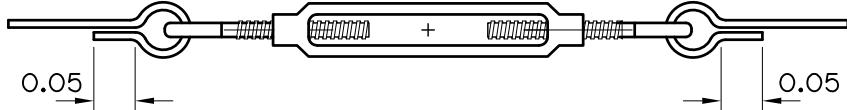


ELEVATION

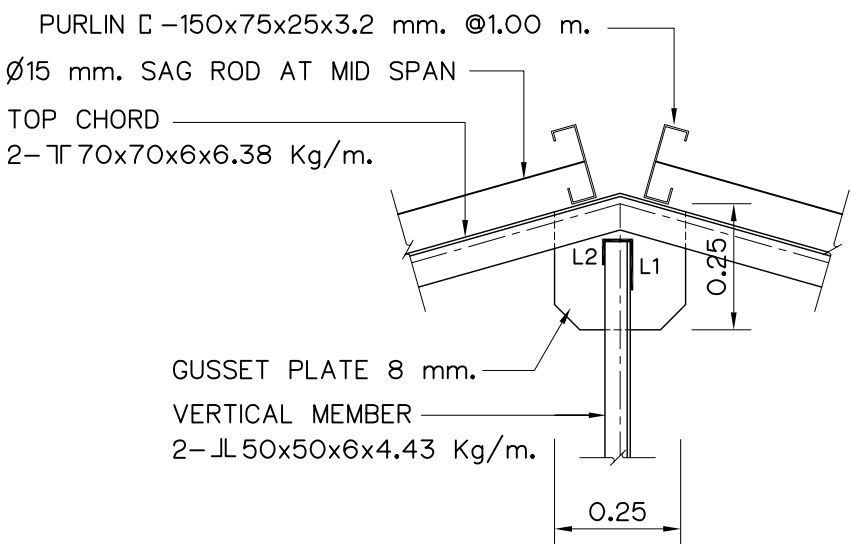


PLAN

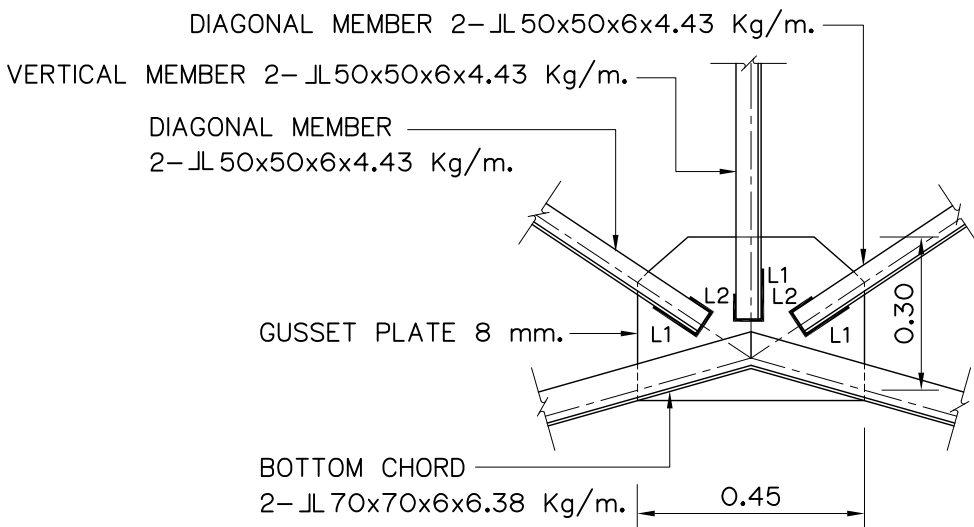
SAG ROD DETAILS
SCALE 1:20



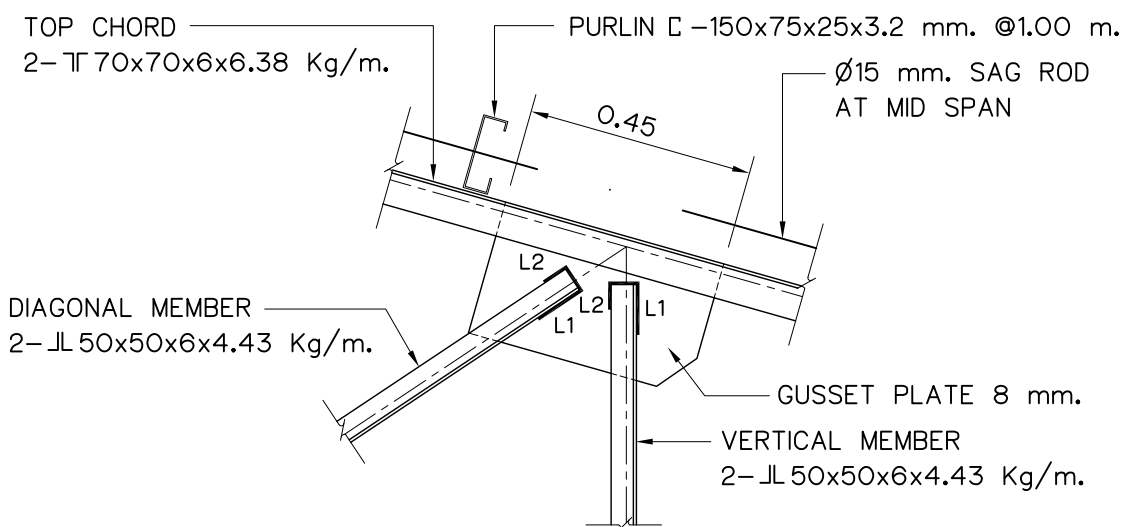
TURNBUCKLE
NOT TO SCALE



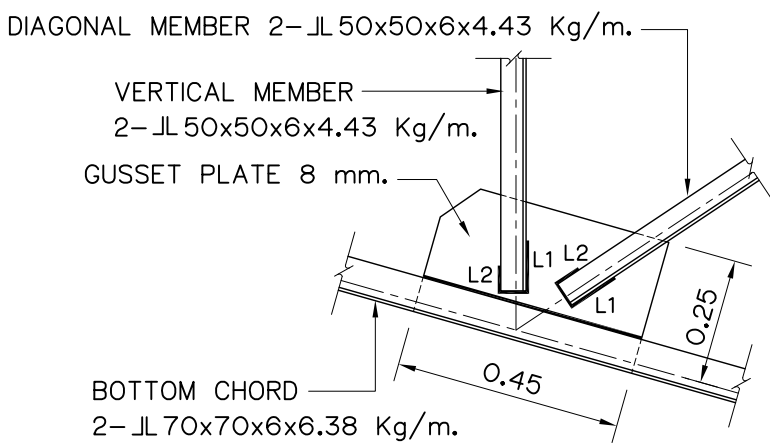
DETAILS “5”
SCALE 1:15



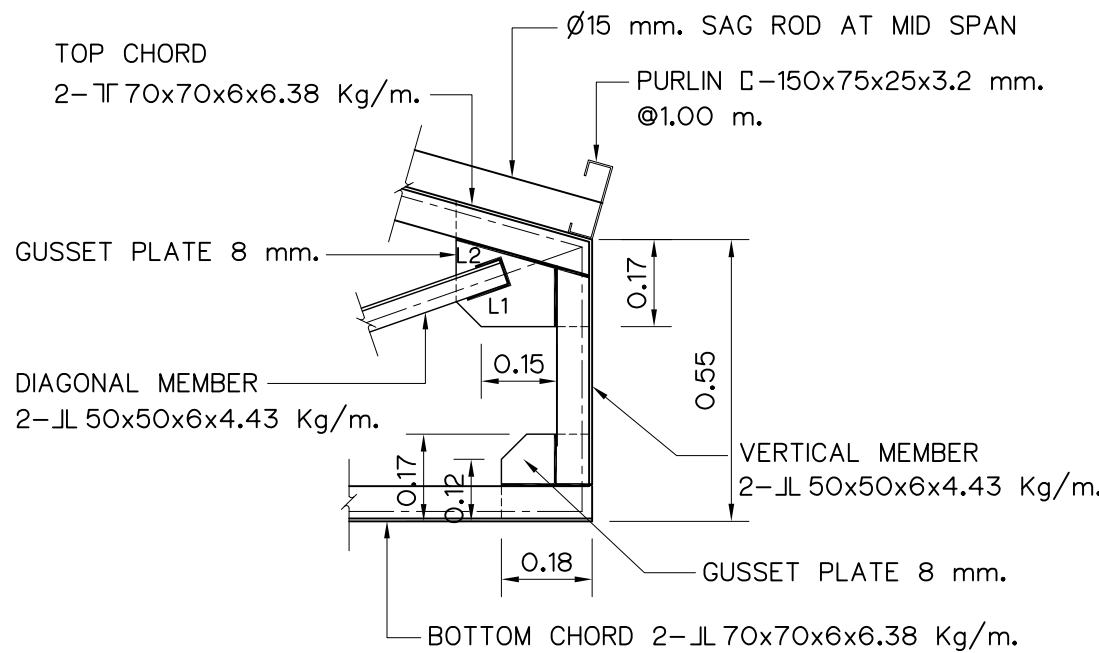
DETAILS “6”
SCALE 1:15



DETAILS “7”
SCALE 1:15



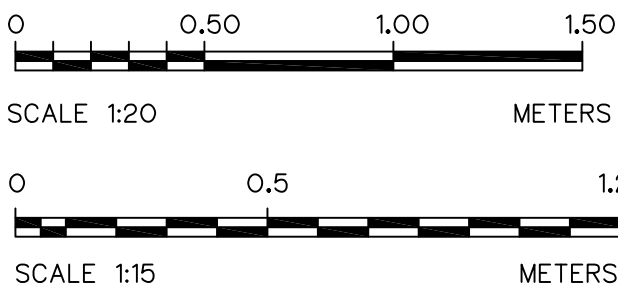
DETAILS “8”
SCALE 1:15



DETAILS “9”
SCALE 1:15

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

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

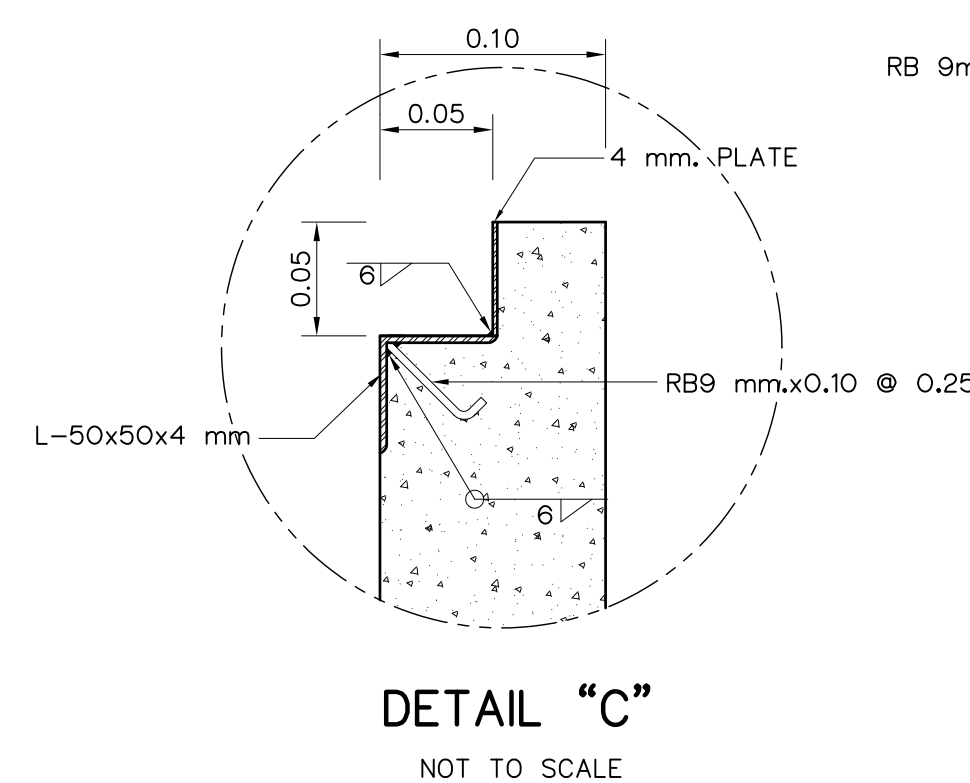
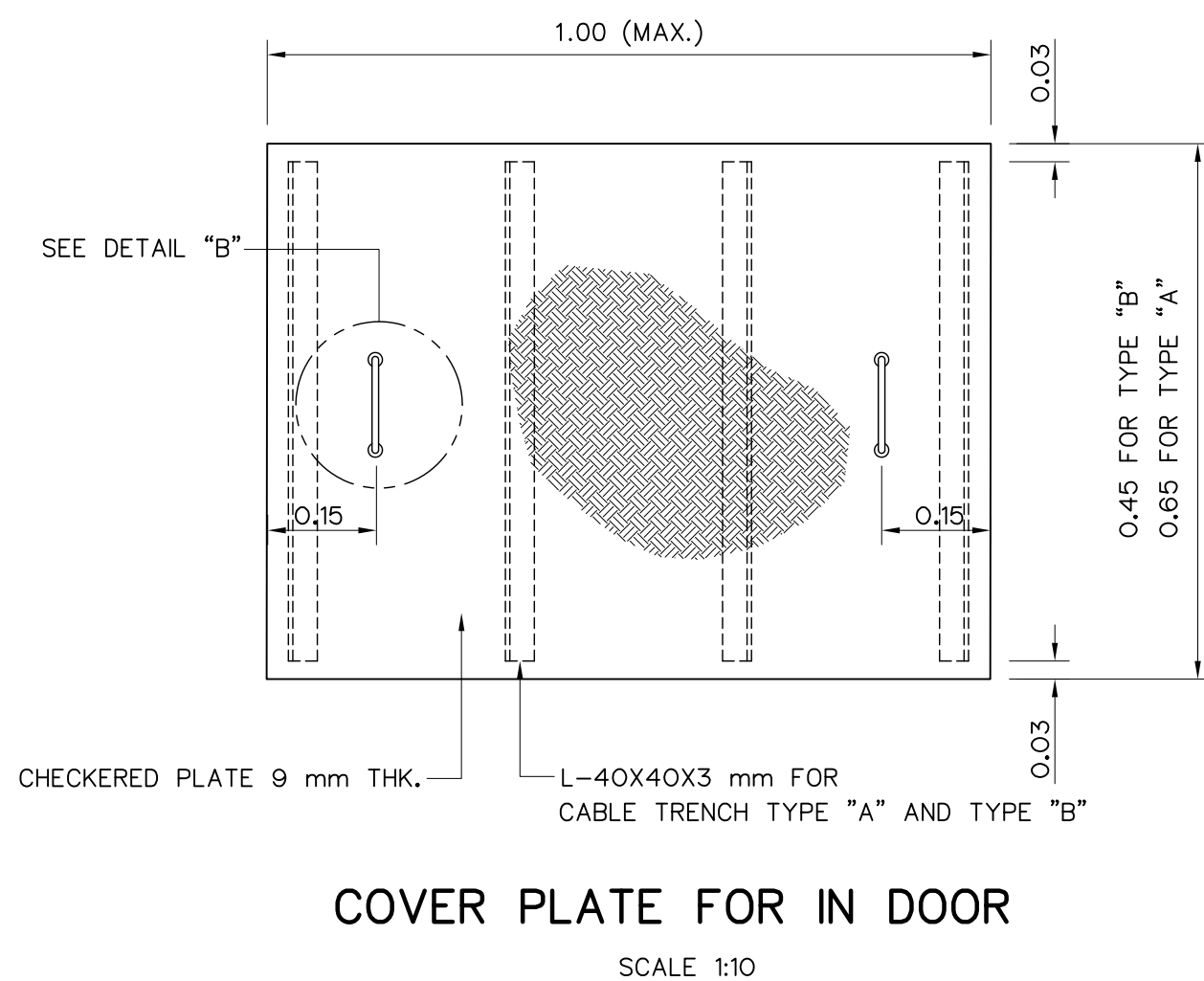
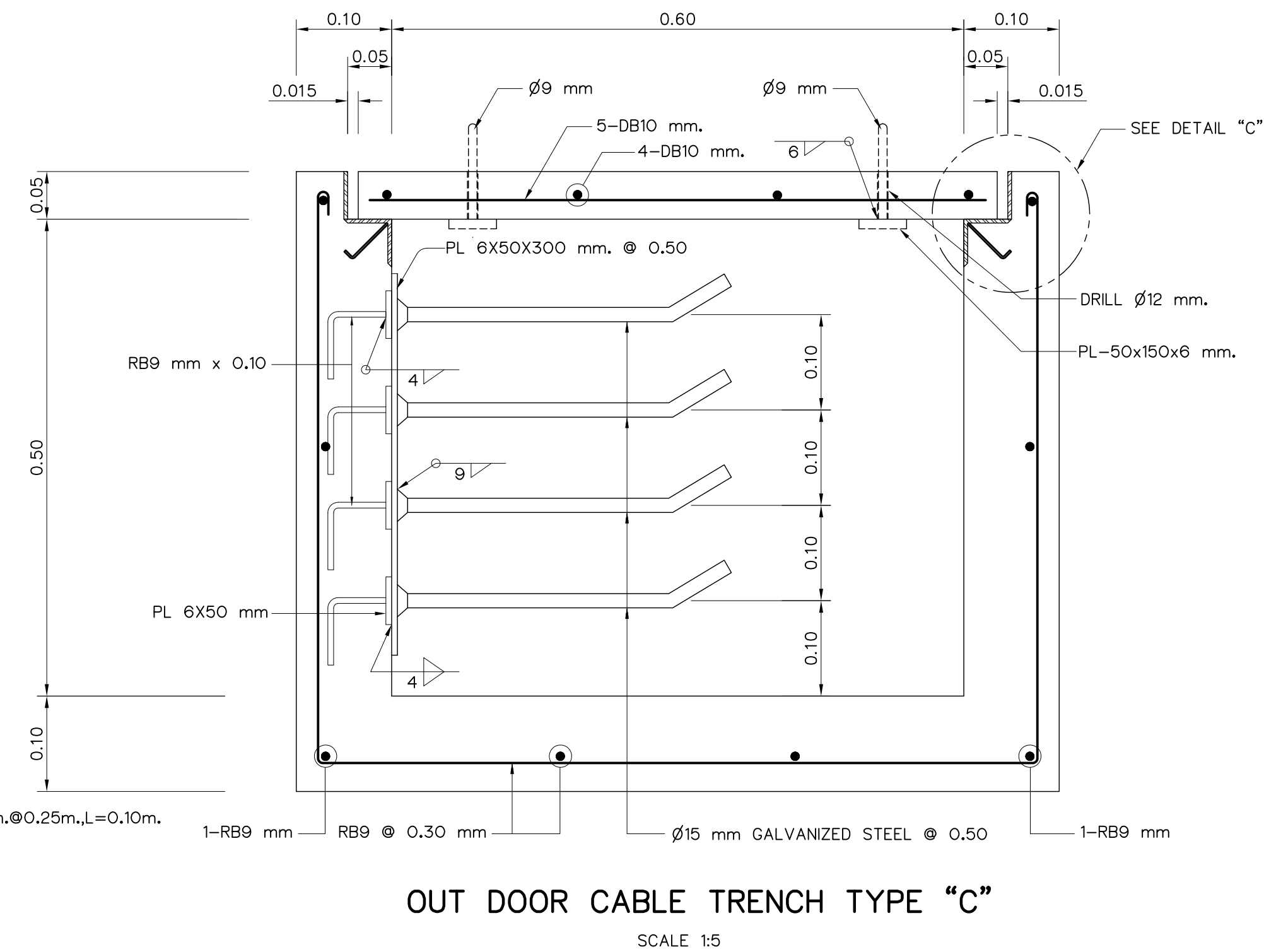
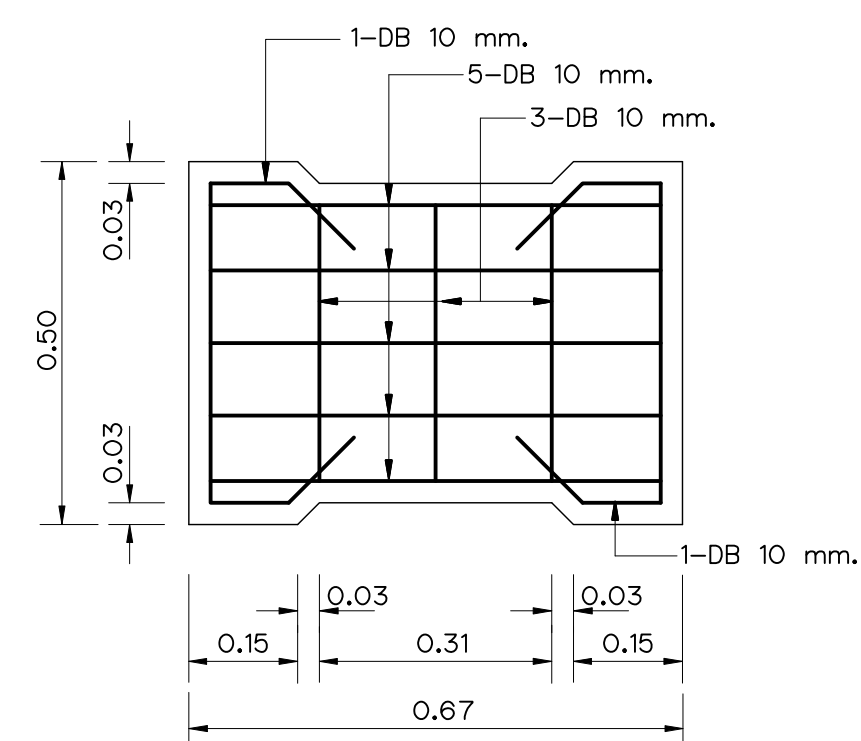
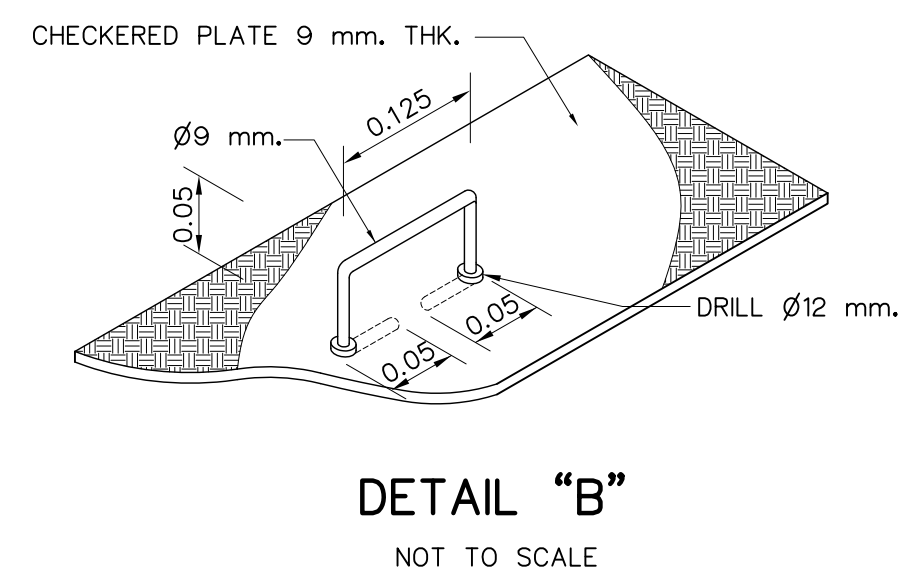
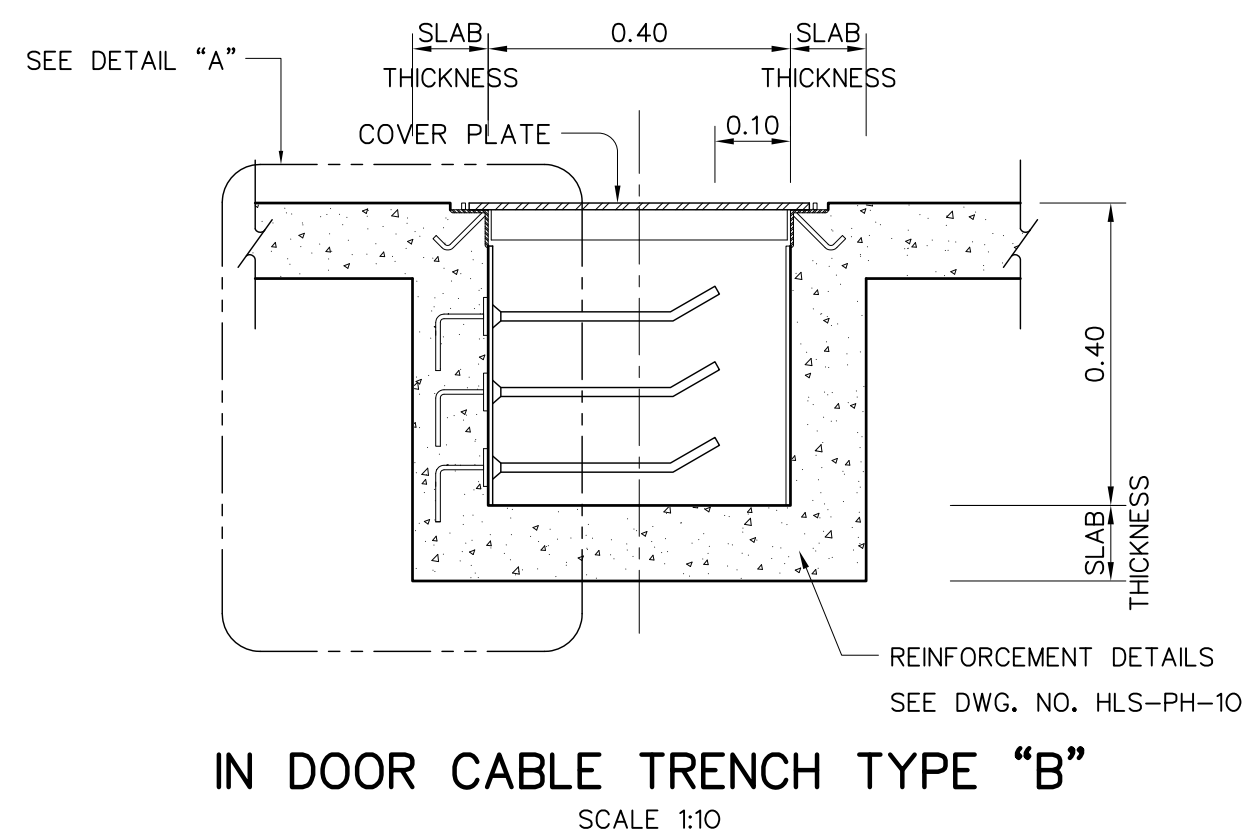
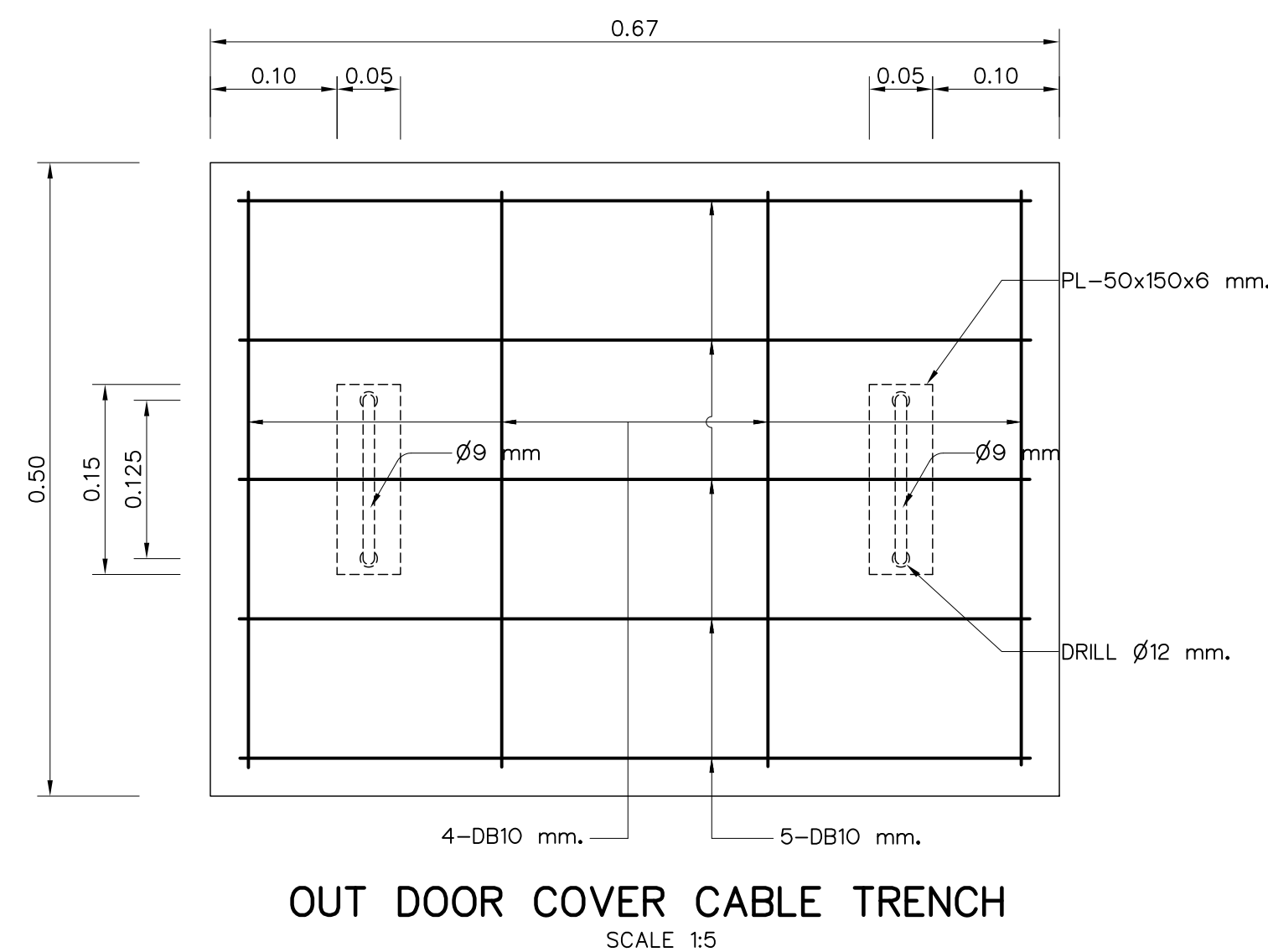
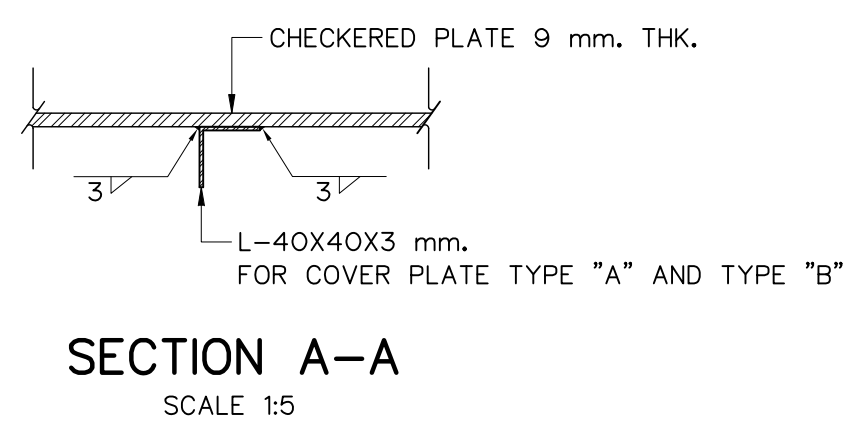
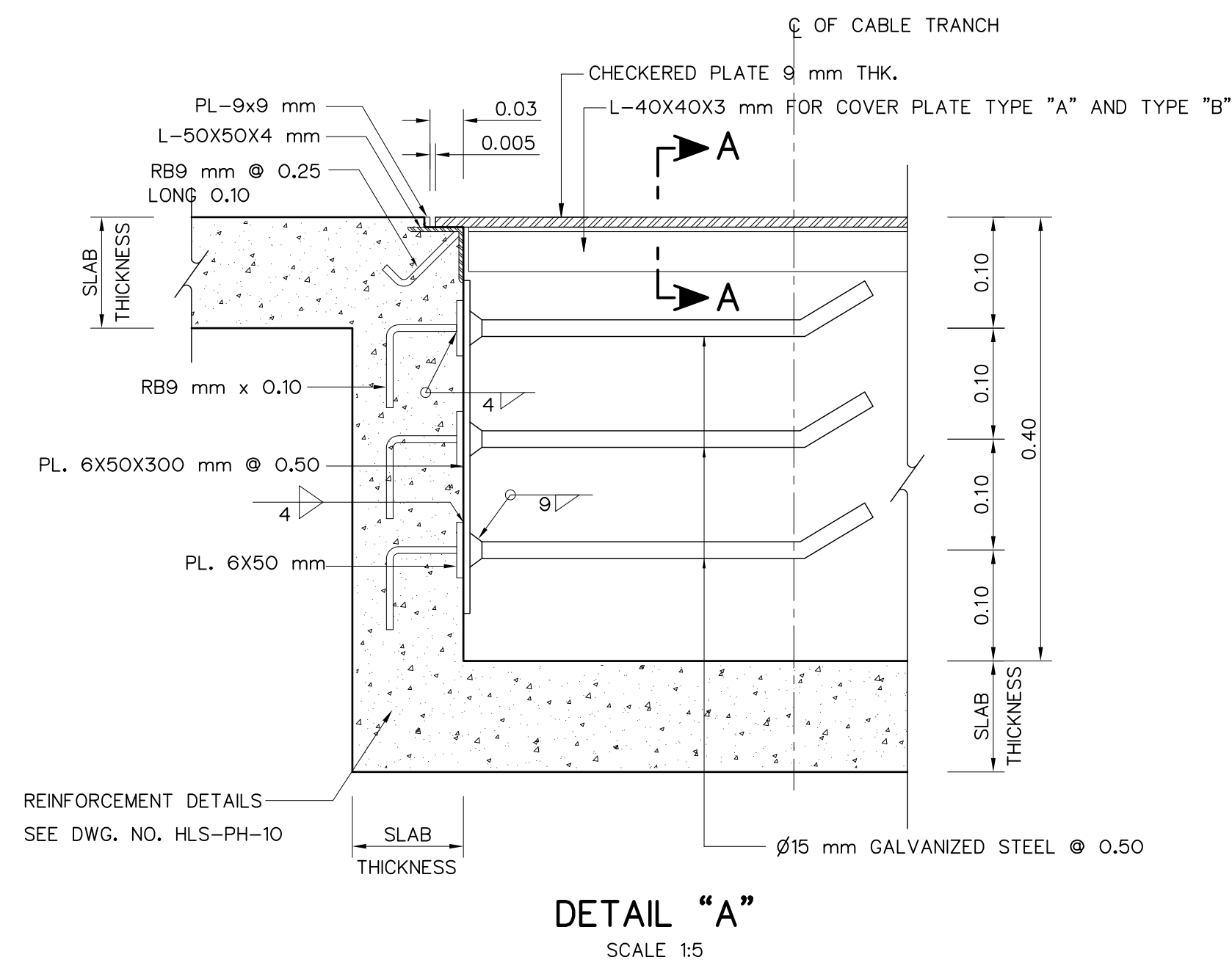
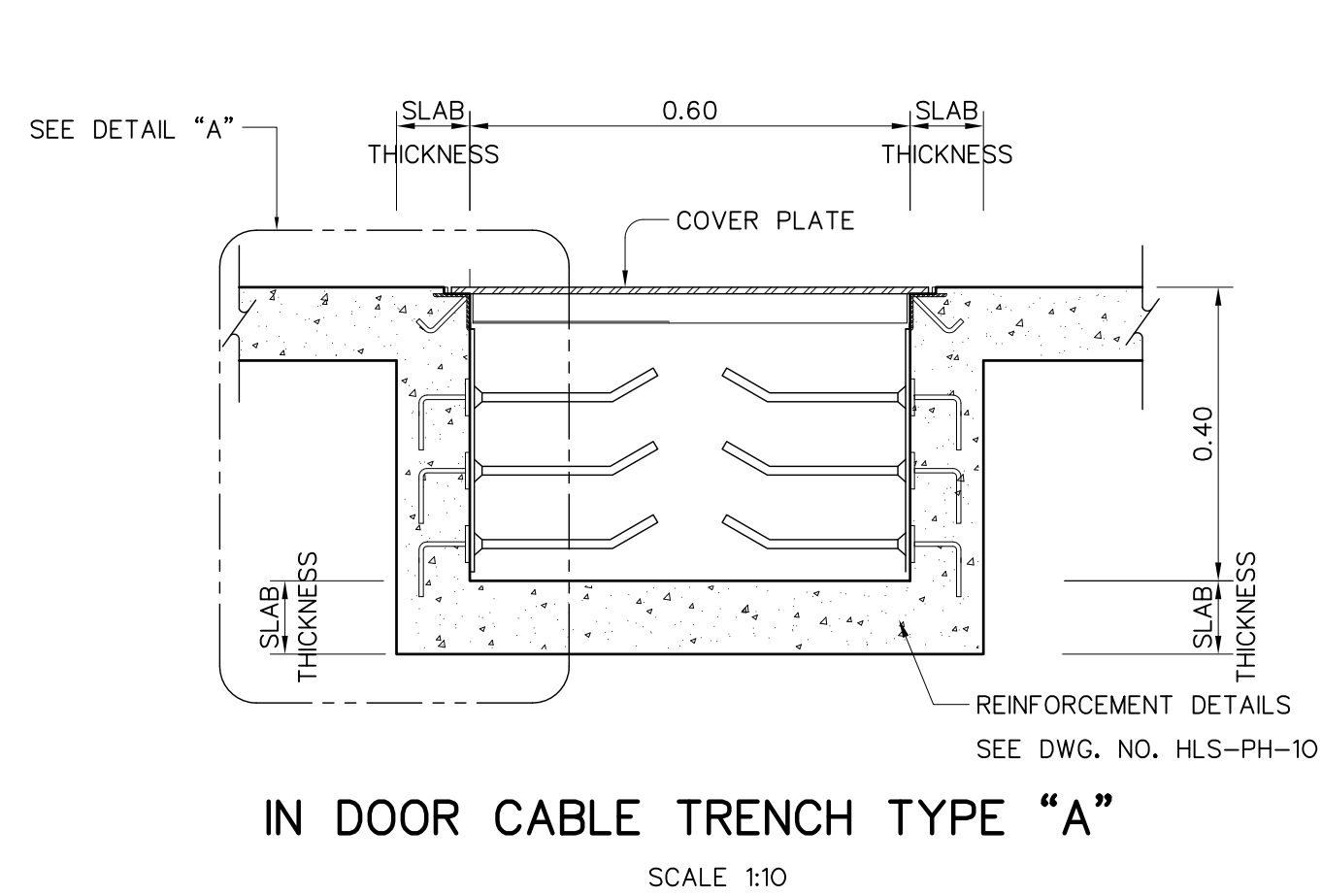


MEMBER SCHEDULE TABLE

TRUSS TYPE	MEMBER	FILLET WELD SIZE (mm)		
		L1	L2	t
TRUSS T-1	2-JL 70x70x6x6.38 Kg/m.	125	75	5
TRUSS T-2	1-L 70x70x6x6.38 Kg/m.	125	75	5

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
		CONSULTANTS	DEDE	

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
HUA I LAM SIN HYDROPOWER PROJECT	
CIVIL WORKS POWERHOUSE DETAILS TRUSS T-1 AND T-2 (2/2)	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED 6651	REVIEWED 3,KTICHAJ
DRAWN 7324	SUBMITTED
CHECKED 7324	RECOMMENDED
APPROVED 14/01/62	APPROVED
PROJECT MANAGER	DRAWING NO. HLS-PH-12
	SHEET NO. 56 OF 78

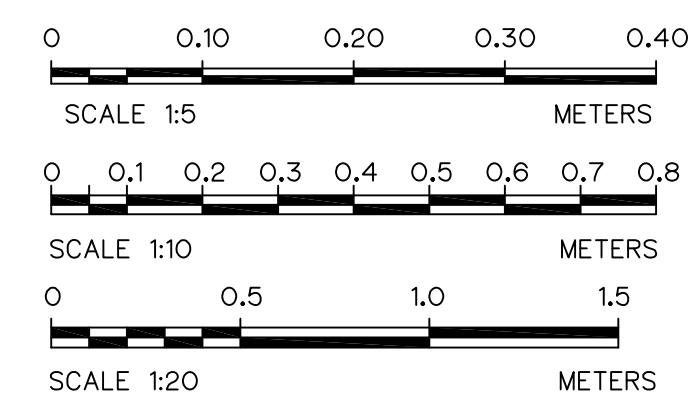


NOTES :

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

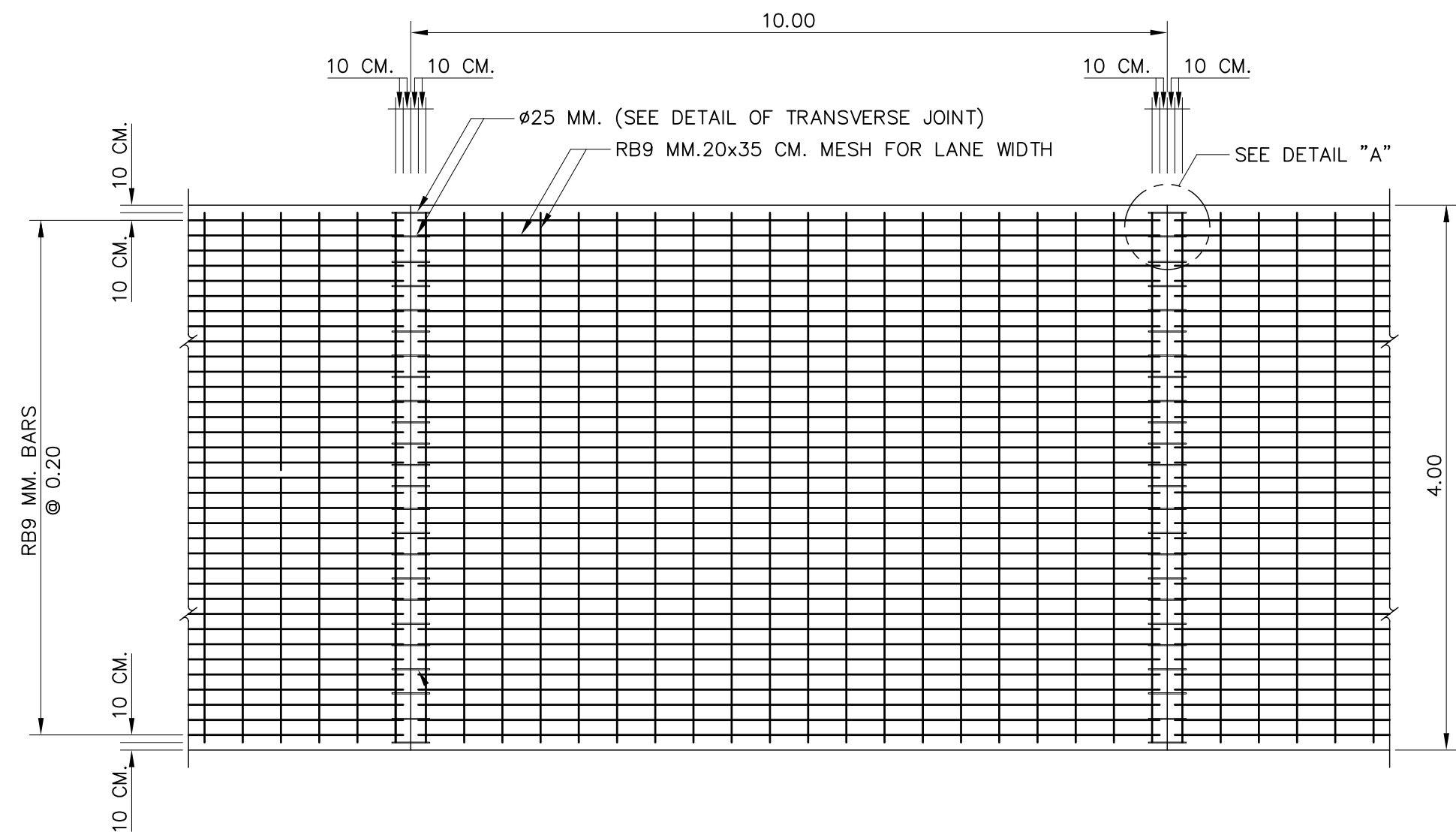
REFERENCE DRAWINGS :

- POWERHOUSE, GENERAL LAY-OUT HLS-PH-01
- POWERHOUSE, PLAN AND ROOF PLAN HLS-PH-02

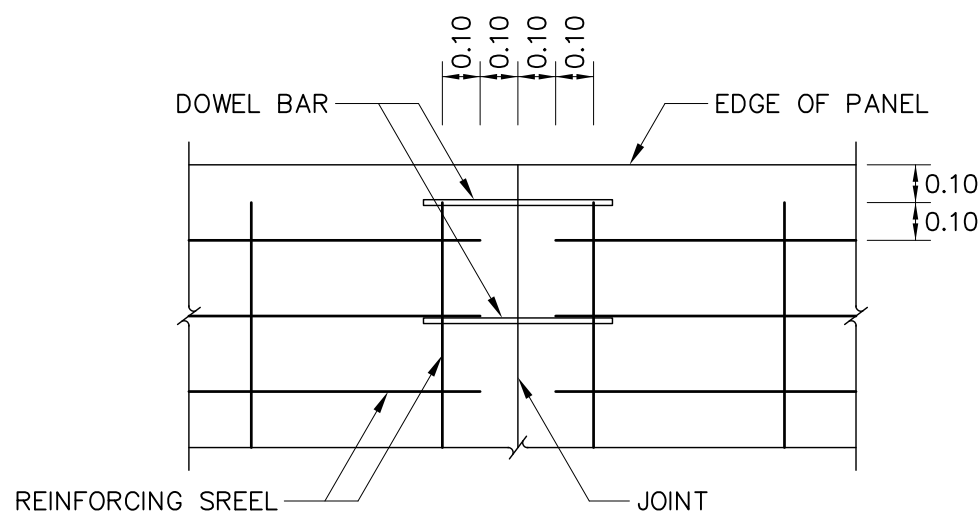


3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

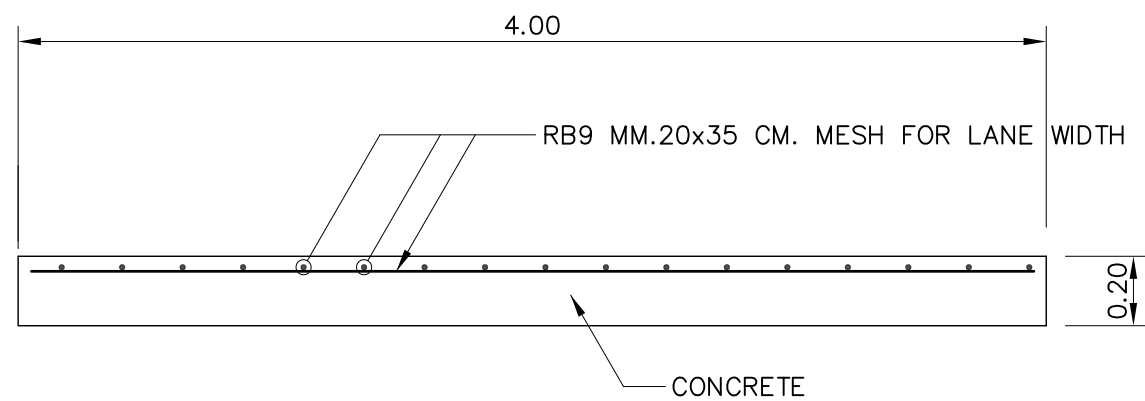
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUAI LAM SIN HYDROPOWER PROJECT			
CIVIL WORKS POWERHOUSE CABLE TRENCH DETAILS			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED		REVIEWED S.KTICHAJ	
DRAWN		SUBMITTED	
CHECKED		RECOMMENDED	
NO.		APPROVED	
CONSULTANTS		DEDE	
PROJECT MANAGER		DATE	
14/01/62		DRAWING NO.	
HLS-PH-13		SHEET NO.	
57 OF 78			



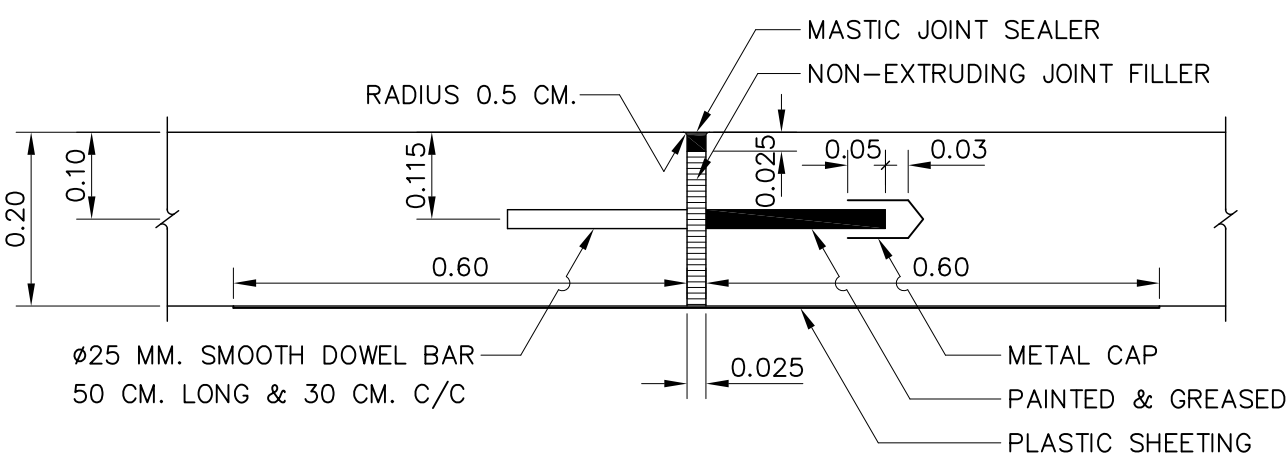
PLAN OF REINFORCED CONCRETE PAVEMENT
SCALE 1 : 75



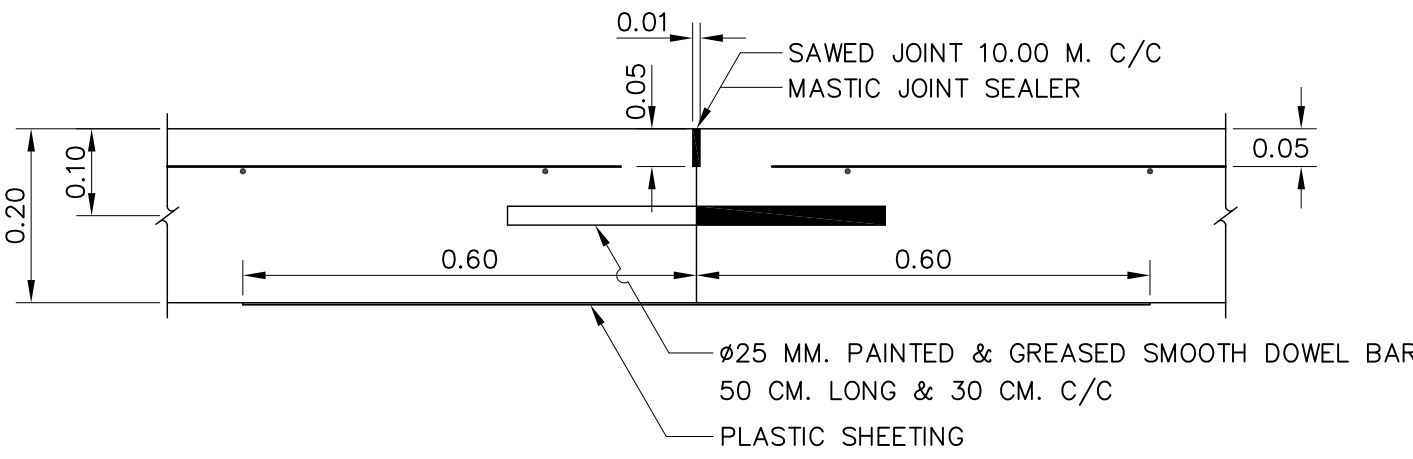
DETAIL "1"
SCALE 1 : 20



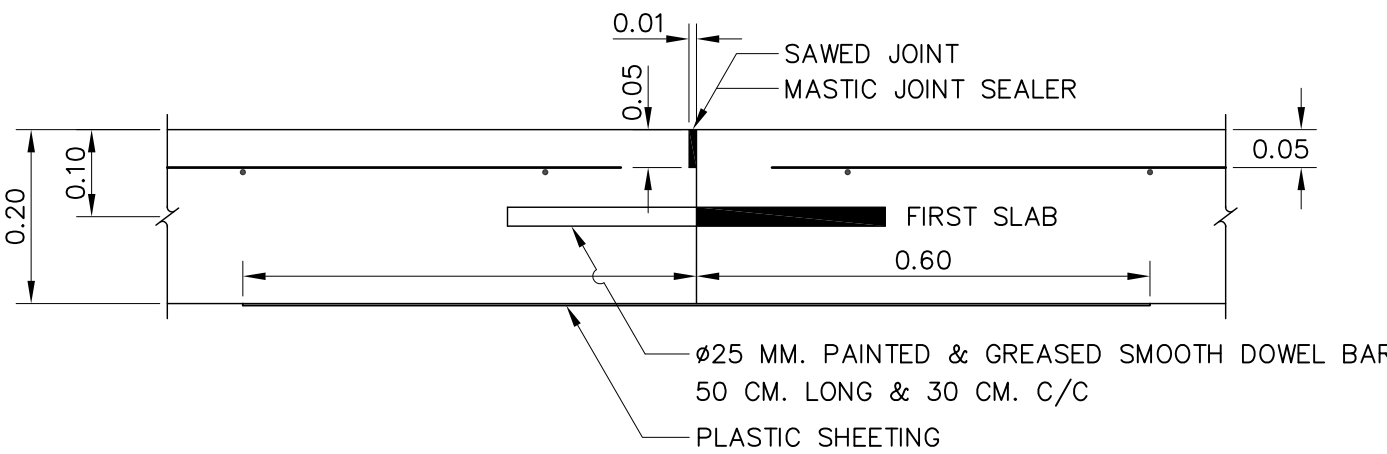
REINFORCEMENT DETAIL OF CONCRETE PAVEMENT CROSS-SECTION
SCALE 1 : 25



DETAIL OF EXPANSION JOINT

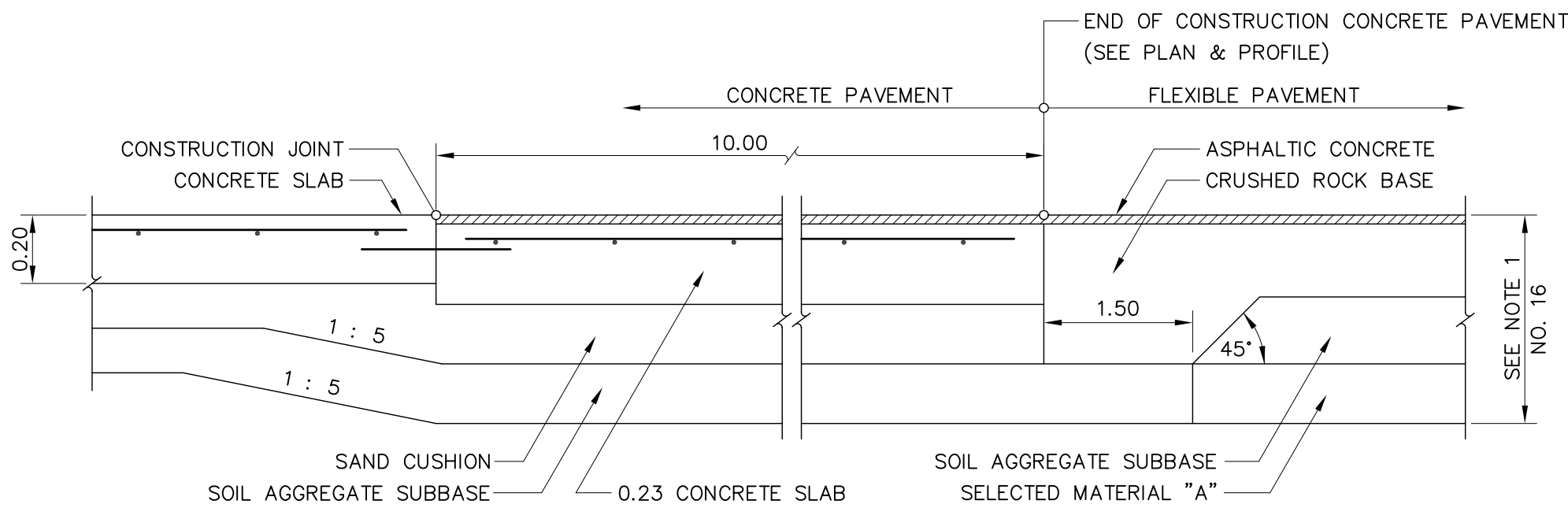


DETAIL OF CONTRACTION JOINT

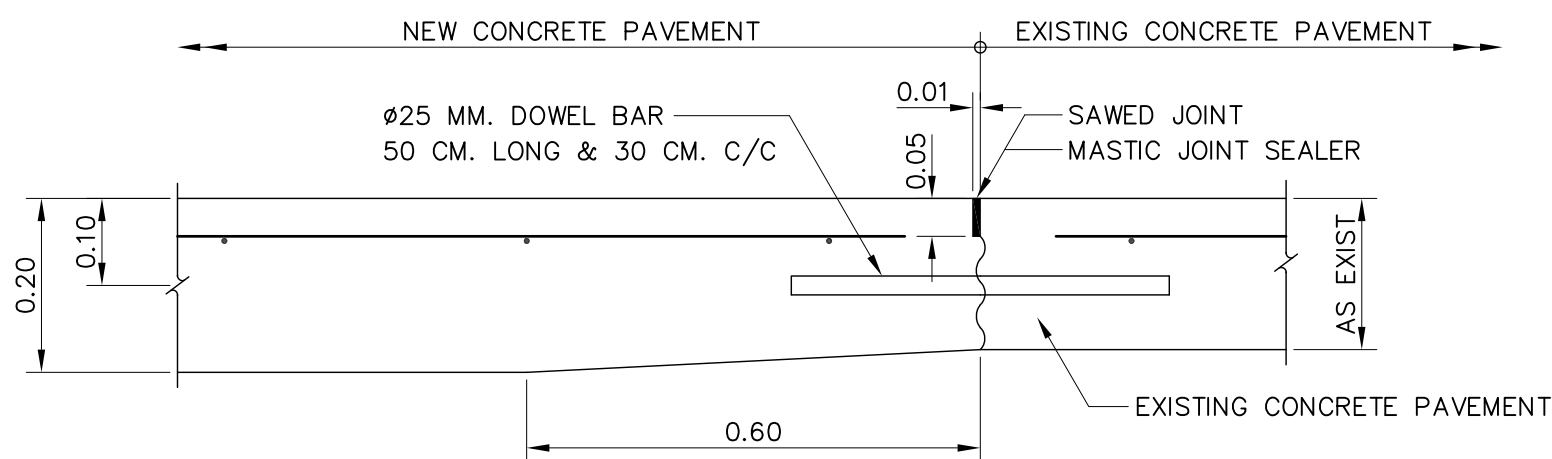


DETAIL OF CONSTRUCTION JOINT

DETAIL OF TRANSVERSE JOINT
SCALE 1 : 10



DETAIL OF JOINT BETWEEN CONCRETE PAVEMENT AND FLEXIBLE PAVEMENT
NOT TO SCALE



DETAIL OF TRANSVERSE JOINT BETWEEN
NEW AND EXISTING CONCRETE PAVEMENT
SCALE 1 : 10

NOTES 1 :

- ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
- 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.
- EXPANSION JOINT SHALL BE PROVIDED AT THE OUTER EDGE OF BOTH SIDES OF THE BOX CULVERT CROSSING.
- MASTIC JOINT SEALER SHALL BE OF THE HOT POURED ELASTIC TYPE CONFORMING TO TIS.479
- JOINT FILLER SHALL CONFORM TO THE AASHTO M.213-74 OR ASTM. D1751-73 SPECIFICATION.
- CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR STANDARD CYLINDER (Ø0.15x0.50 m.) AT 28 DAYS.
- WELDED WIRE CAN BE USED IN PLACE OF BAR MESH.
- 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.
- PLASTIC SHEET USED IN CONSTRUCTION SHALL HAVE THE FOLLOWING REQUIREMENTS :
 - THICKNESS OF 0.07 MM. WITH A TOLERANCE OF NOT MORE THAN 7% SHALL BE REQUIRED.
 - WIDTH SHALL NOT BE LESS THAN 1.20 M.
 - 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.
 - 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.

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

HUAI LAM SIN HYDROPOWER PROJECT

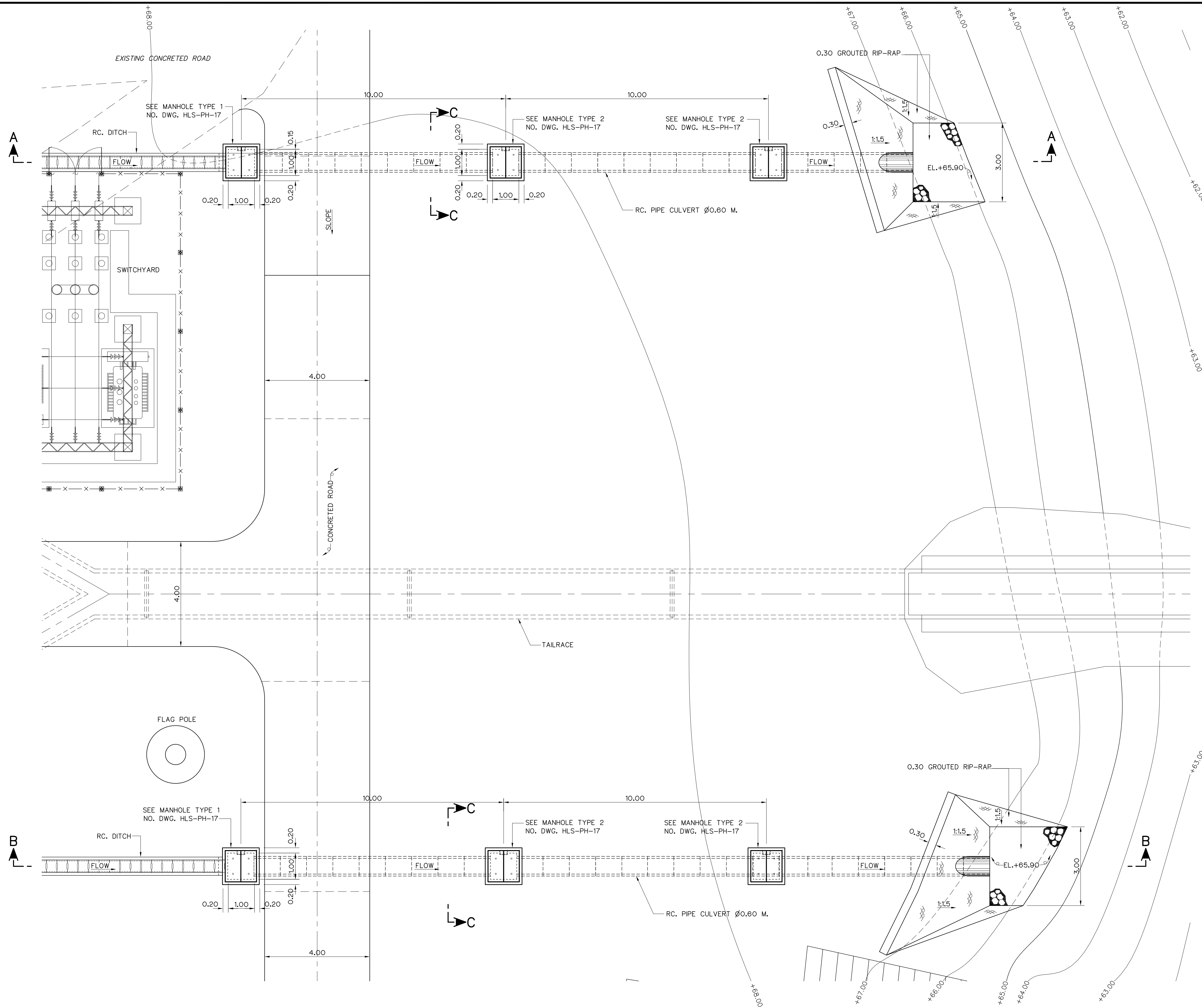
CIVIL WORKS
POWERHOUSE
CONCRETE PAVEMENT

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.
REVIEWED S.KITICHAJ

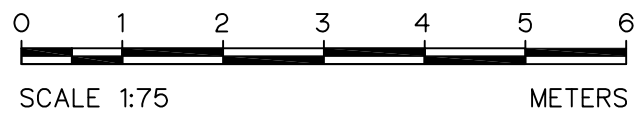
DESIGNED 14/01/62 14/01/62
DRAWN 14/01/62 14/01/62
CHECKED 14/01/62 14/01/62
APPROVED 14/01/62 14/01/62

PROJECT MANAGER 14/01/62 DATE

DRAWING NO. HLS-PH-14 SHEET NO. 58 OF 78



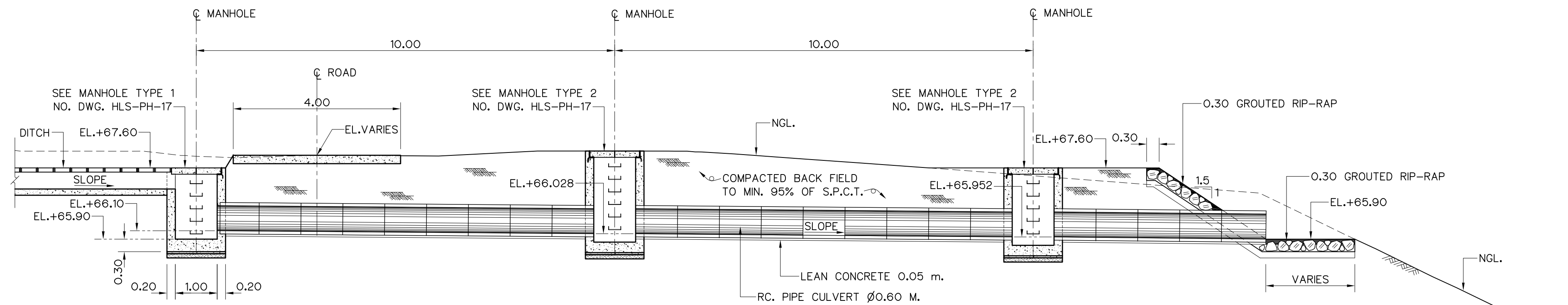
- NOTES :**
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
 2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
- REFERENCE DRAWINGS :**
- | | |
|--|-----------|
| 1. POWERHOUSE, GENERAL LAY-OUT | HLS-PH-01 |
| 2. POWERHOUSE, DITCH SECTIONS AND DETAILS | HLS-PH-16 |
| 3. POWERHOUSE, MANHOLE AND DITCH REINFORCEMENT DETAILS | HLS-PH-17 |



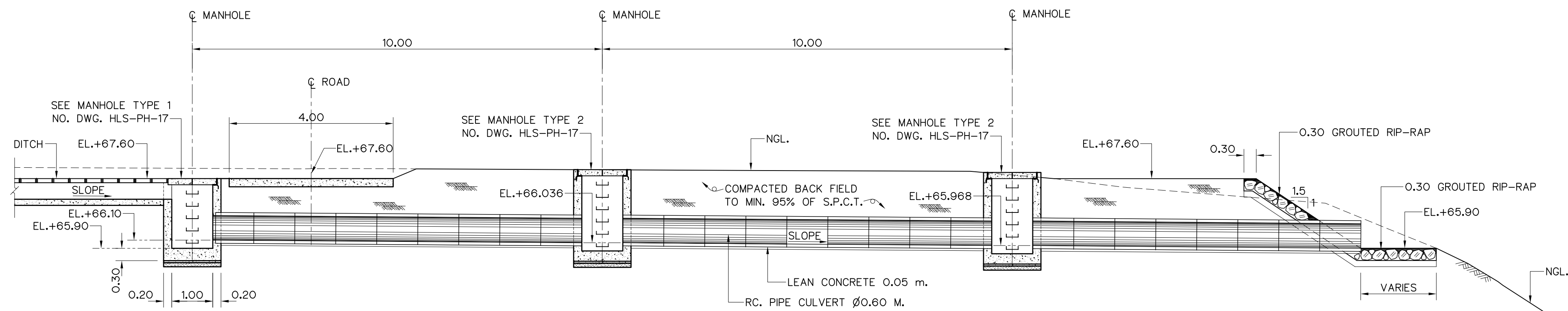
PLAN
SCALE 1:75

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS			DEDE	

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
HUA I LAM SIN HYDROPOWER PROJECT	
CIVIL WORKS POWERHOUSE DITCH PLAN	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED S.KITIKHAJ	
DESIGNED 21.6.651	SUBMITTED
DRAWN 21.6.651	RECOMMENDED
CHECKED 21.7.324	APPROVED
PROJECT MANAGER 14/01/62	DRAWING NO. HLS-PH-15
DATE	SHEET NO. 59 OF 78



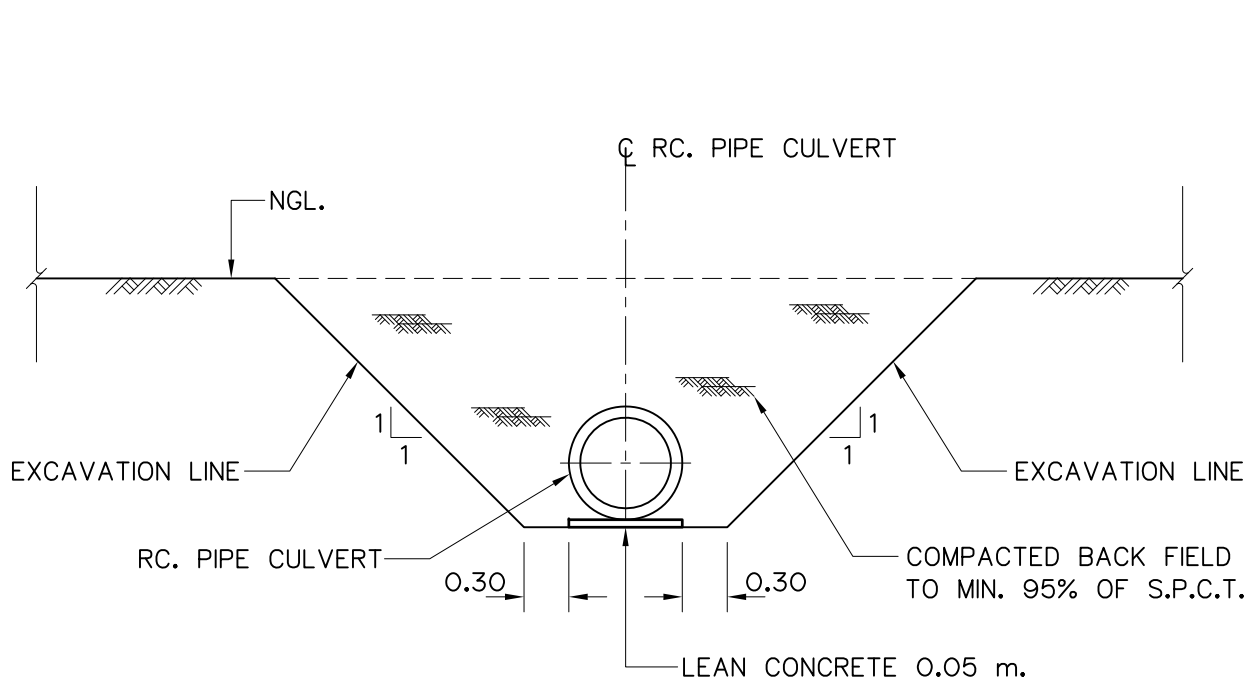
SECTION A-A
SCALE 1:75



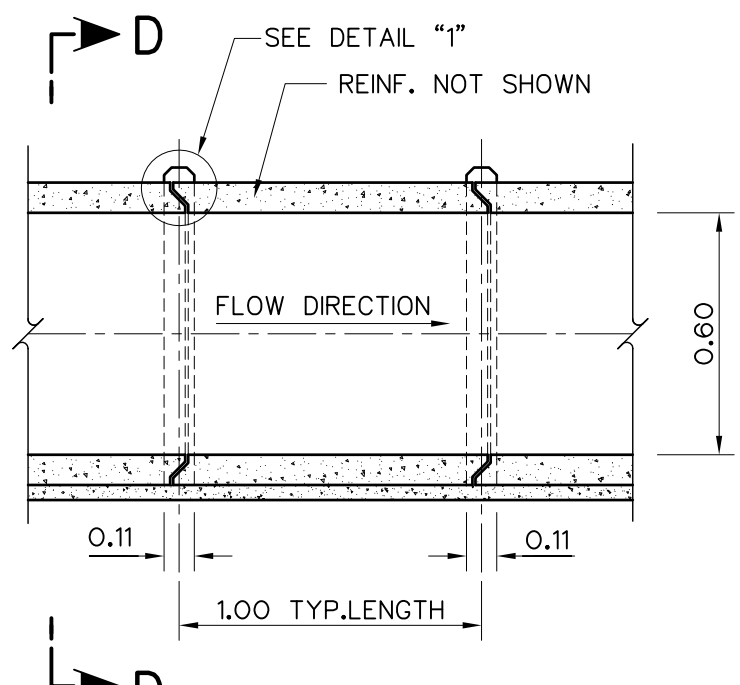
SECTION B-B
SCALE 1:75

- 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

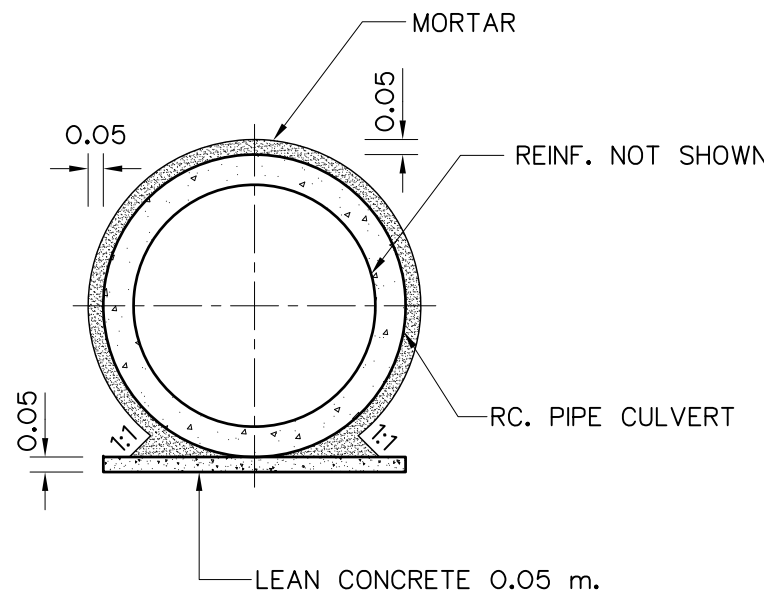
- REFERENCE DRAWINGS :**
1. POWERHOUSE, DITCH PLAN HLS-PH-01
 2. POWERHOUSE, MANHOLE AND DITCH REINFORCEMENT DETAILS HLS-PH-17



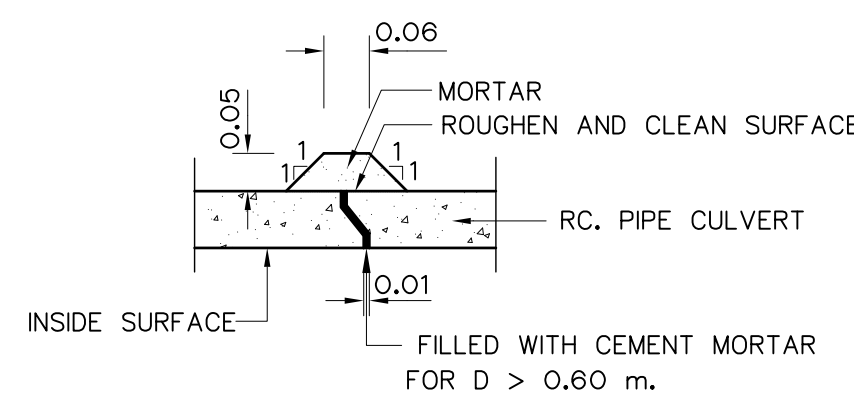
SECTION C-C
SCALE 1:50



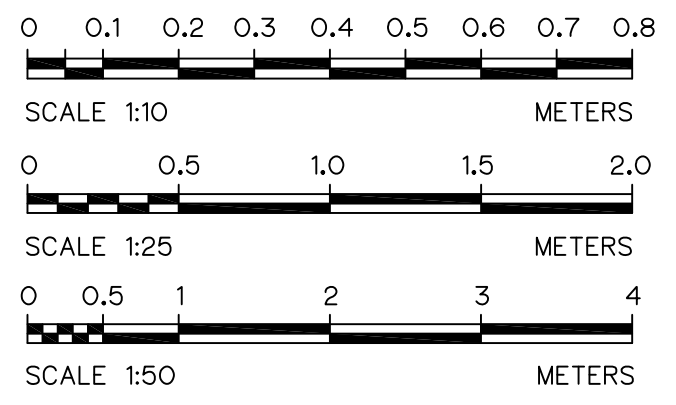
PIPE JOINT DETAIL
SCALE 1:25



SECTION D-D
SCALE 1:25



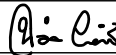
DETAIL "1"
SCALE 1:10

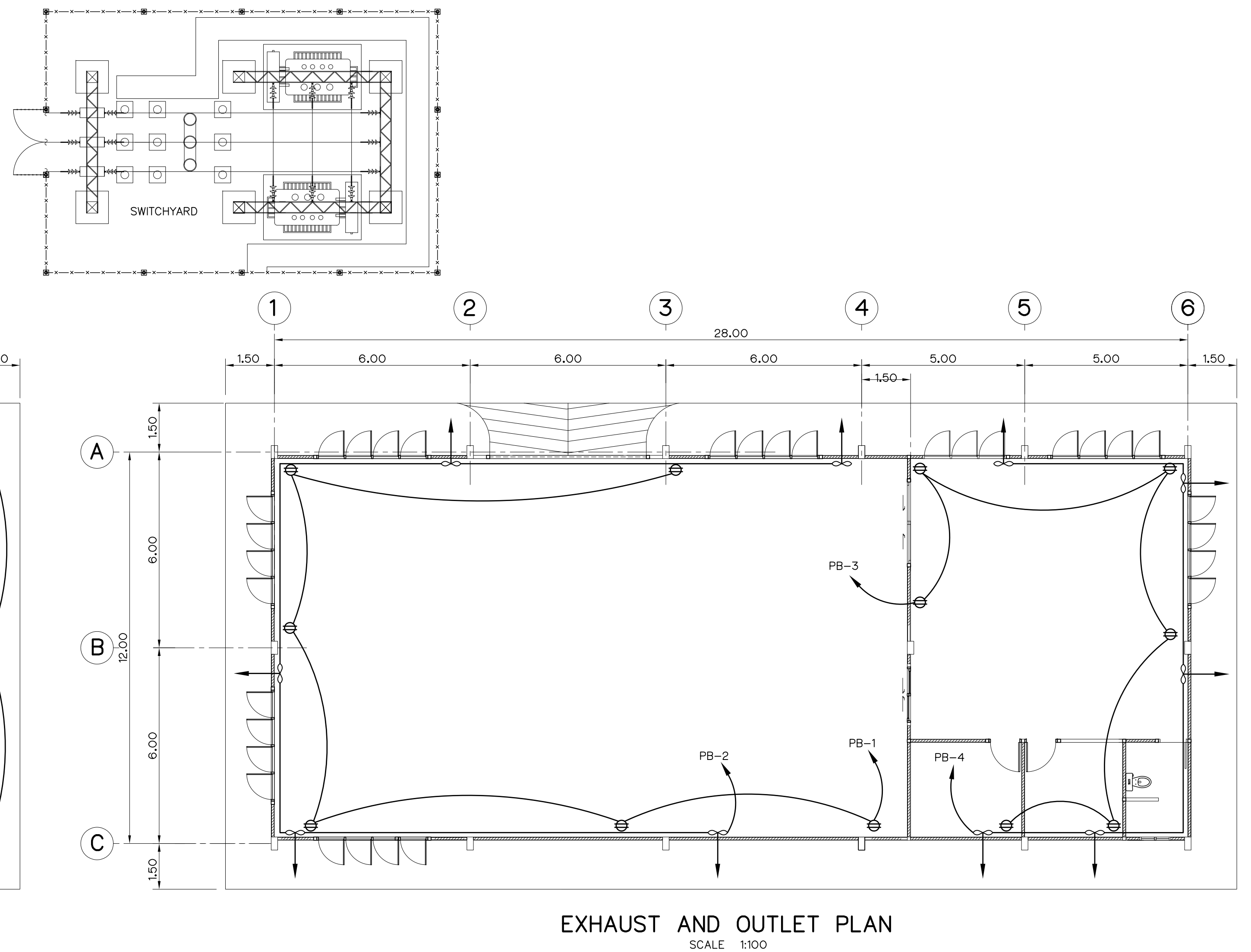
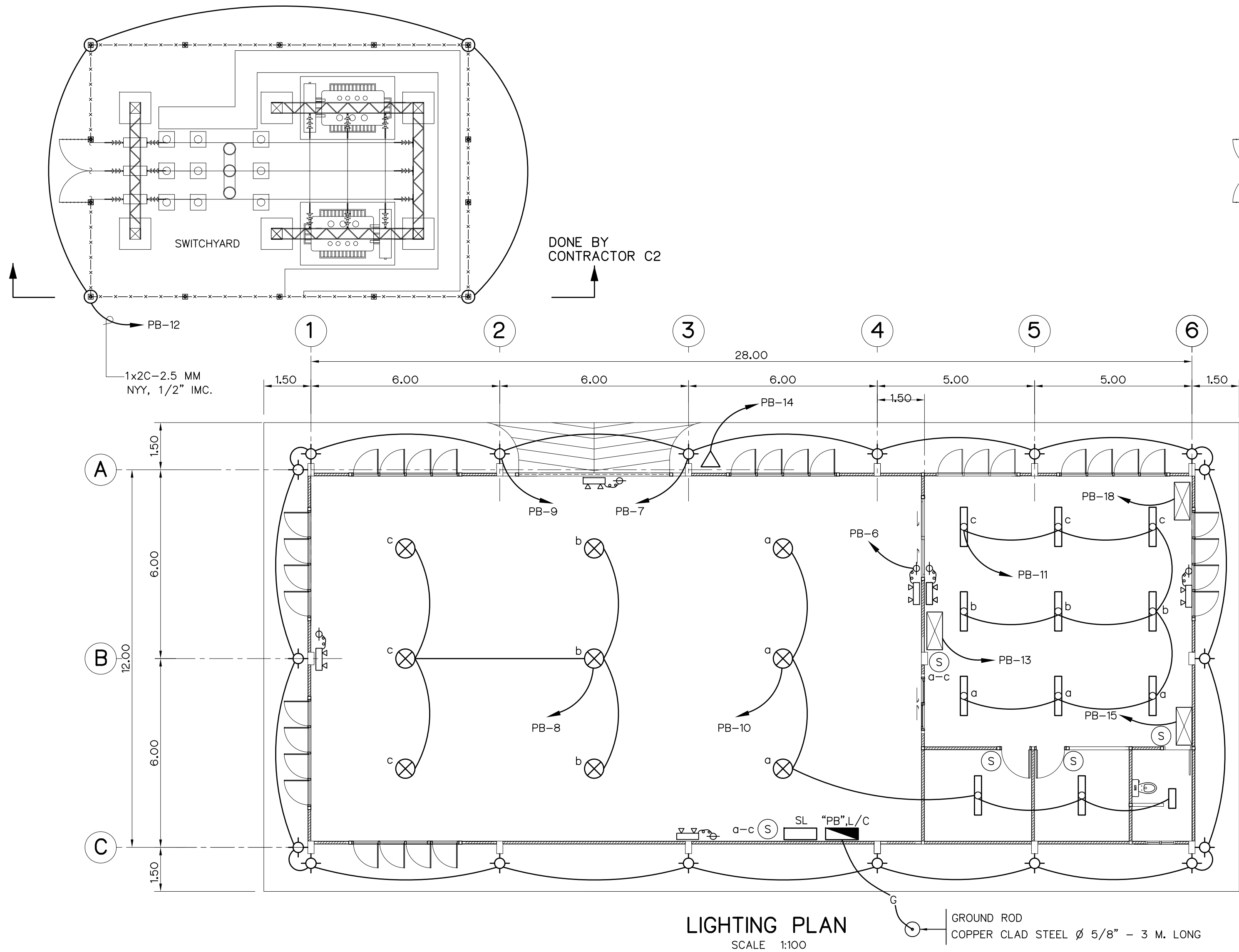


KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUAI LAM SIN HYDROPOWER PROJECT			
CIVIL WORKS POWERHOUSE DITCH SECTIONS AND DETAILS			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		REVIEWED S.KTICHAJ	
DESIGNED		SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED		APPROVED	
CONSULTANTS		DEDE	
PROJECT MANAGER		DRAWING NO. SHEET NO.	
14/01/62		HLS-PH-16 60 OF 78	



3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	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 S.KITICHAJ			
DESIGNED 	201.6651	SUBMITTED 	
DRAWN 		RECOMMENDED 	
CHECKED 	201.7324	APPROVED 	
 PROJECT MANAGER	14/01/62	DRAWING NO.	SHEET NO.
	DATE	HLS-PH-17	61 OF 78



DIAGRAM

LOCATION : MACHINE HALL "PB" LOAD CENTER 3Ø 4W WITH MCCB, 3P 50AT 100AF (24 CKTS, BRANCH MCB 5 KAIC) IC > 10 KA AT 380 VOLT									
CKT NO	DESCRIPTION	LOAD (VA)			MCB		CONDUCTOR		FROM MDB
		A	B	C	POLE	AT	SIZE(MM) ²	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	

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

LEGENDS :

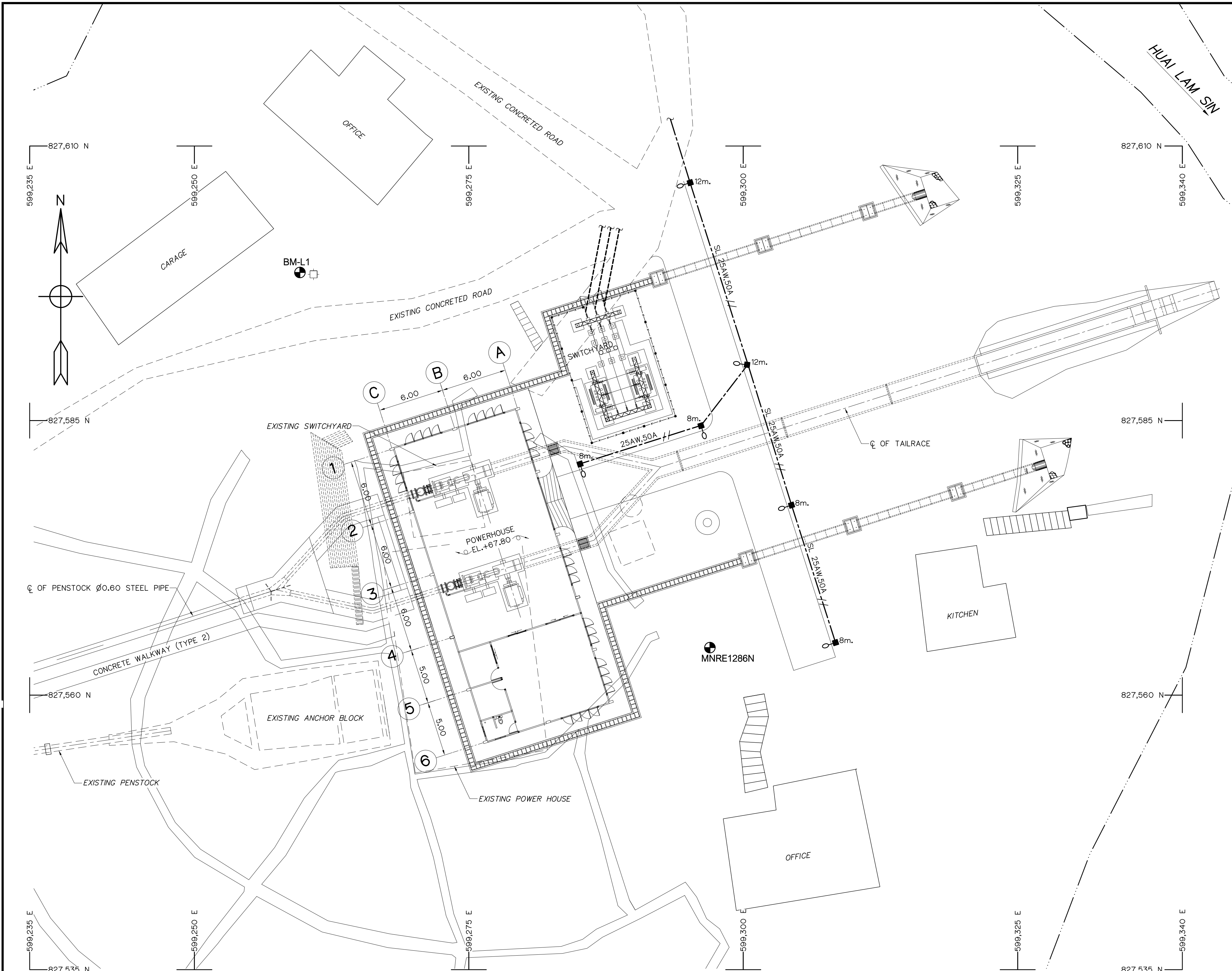
- 1 x 125 W MERCURY VAPOUR LAMP
- 2 x 36 W FLUORESCENT WITH ALUMINIUM ANODIZED REFLECTOR
- 1 x 36 W FLUORESCENT LUMINAIRE
- 1 x 18 W FLUORESCENT LUMINAIRE
- 250 W HIGH PRESSURE SODIUM FLOODLIGHT
- EXHAUST FAN Ø 10 inch.
- 2 x 25 W EMERGENCY LIGHT WITH BATTERY OPERATE RECEPTACLE
- AIR CONDITION , CEILING TYPE
- LOAD CENTER PANEL
- PB
- DUPLEX RECEPTACLE
- SIMPLEX RECEPTACLE
- POWER RECEPTACLE , 3Ø
- ONE WAY SWITCH, 15A ,1Ø , 250V
- 1 x 60 W INCANDESCENT, OUTDOOR LUMINAIRE

NOTE :

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

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
HUA I LAM SIN HYDROPOWER PROJECT	
CIVIL WORKS POWERHOUSE ELECTRICAL LIGHTING, EXHAUST AND OUTLET PLAN	
FRONTIER ENGINEERING CONSULTANTS CO., LTD.	REVIEWED S.KTICHAJ
DESIGNED [Signature] 27/11/1029	SUBMITTED [Signature]
DRAWN [Signature]	RECOMMENDED [Signature]
CHECKED [Signature] 27/11/1029	APPROVED [Signature]
PROJECT MANAGER [Signature] 14/01/62	DRAWING NO. HLS-PH-18
DATE	SHEET NO. 62 OF 78



EXTERIOR LIGHTING PLAN
SCALE 1:200

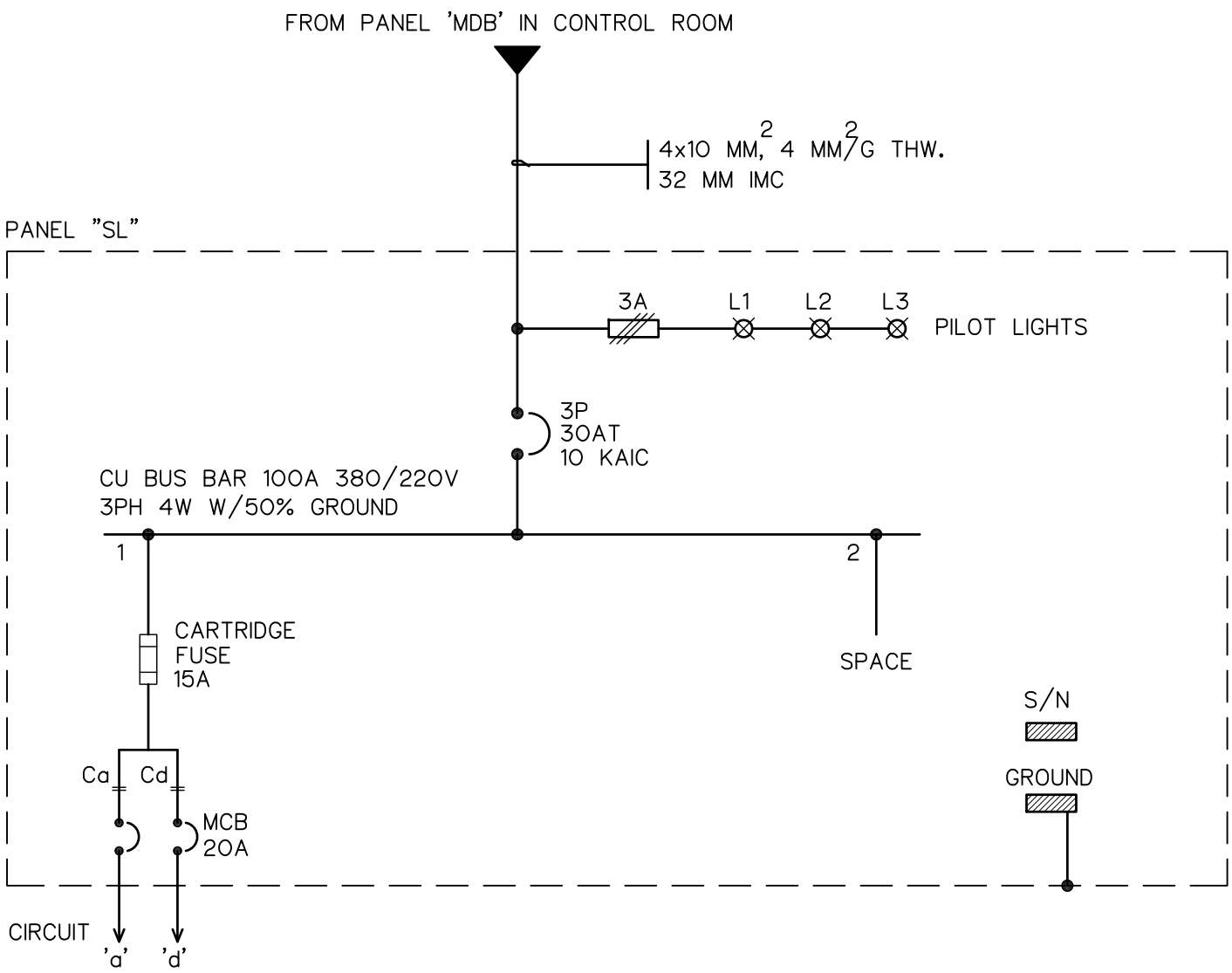
LEGENDS :

- 8, 12m CONCRETE POLE, SUFFIX INDICATES HEIGHT OF POLE
- 1x125 W MERCURY LAMP, ON CONCRETE POLE
- CONCRETE POLE WITH GUY WIRE
- MAIN DISTRIBUTION PANEL
- JUNCTION BOX
- WEATHERPROOF (WP) GALVANIZED STEEL PULL BOX
- SAFETY SWITCH OR DISCONNECT SWITCH, NEMA 3R ON CONCRETE POLE
- PRIMARY LINES, 22 KV OVERHEAD BARE CONDUCTORS
- SECONDARY LINES, 380/220 V 50 MM THW OVERHEAD INSULATED CABLES, 3Ø 4 WIRE

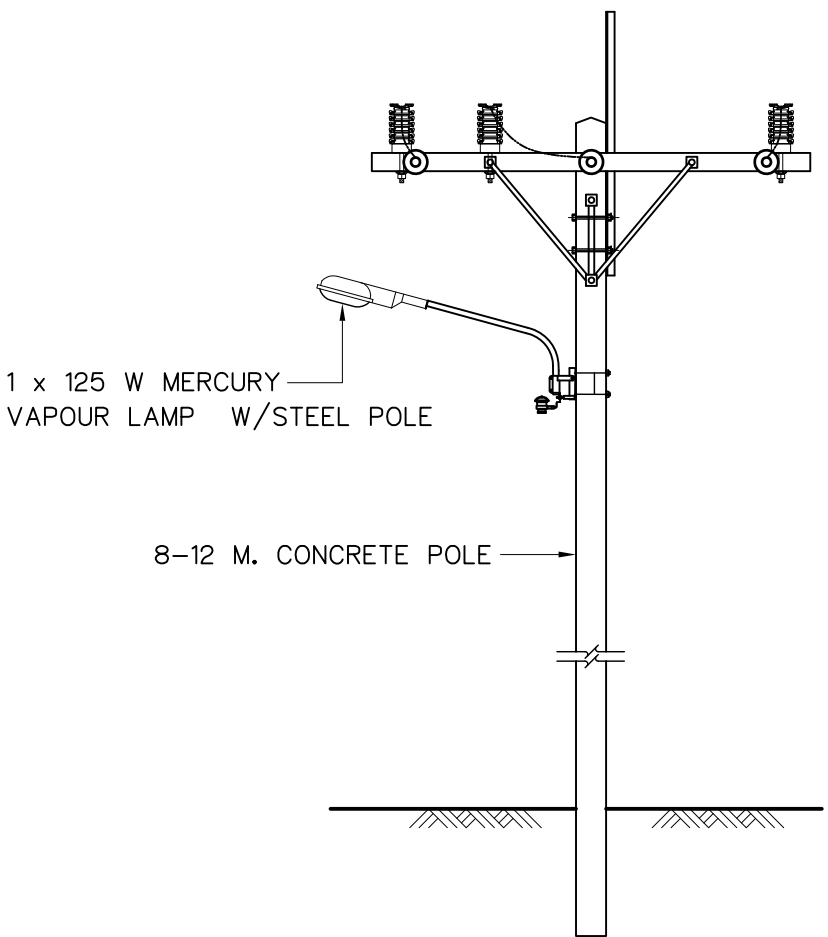
- STREET LIGHTING LINES
- CONCEALED WIRING IN CONDUIT IN CONCRETE STRUCTURE OR CABLE TRENCH
- POWER CABLE DROP FOR ELECTRICAL SUPPLY TO BUILDING 3Ø OR 1Ø
- UNDERGROUND WIRING IN CONDUIT
- LV. CABLE, ABOVE GROUND
- SPACE AERIAL CABLE 50 mm.
- GUY
- TRANSFORMER 500 kVA.
- CIRCUIT BREAKER 22 kV.

NOTES :

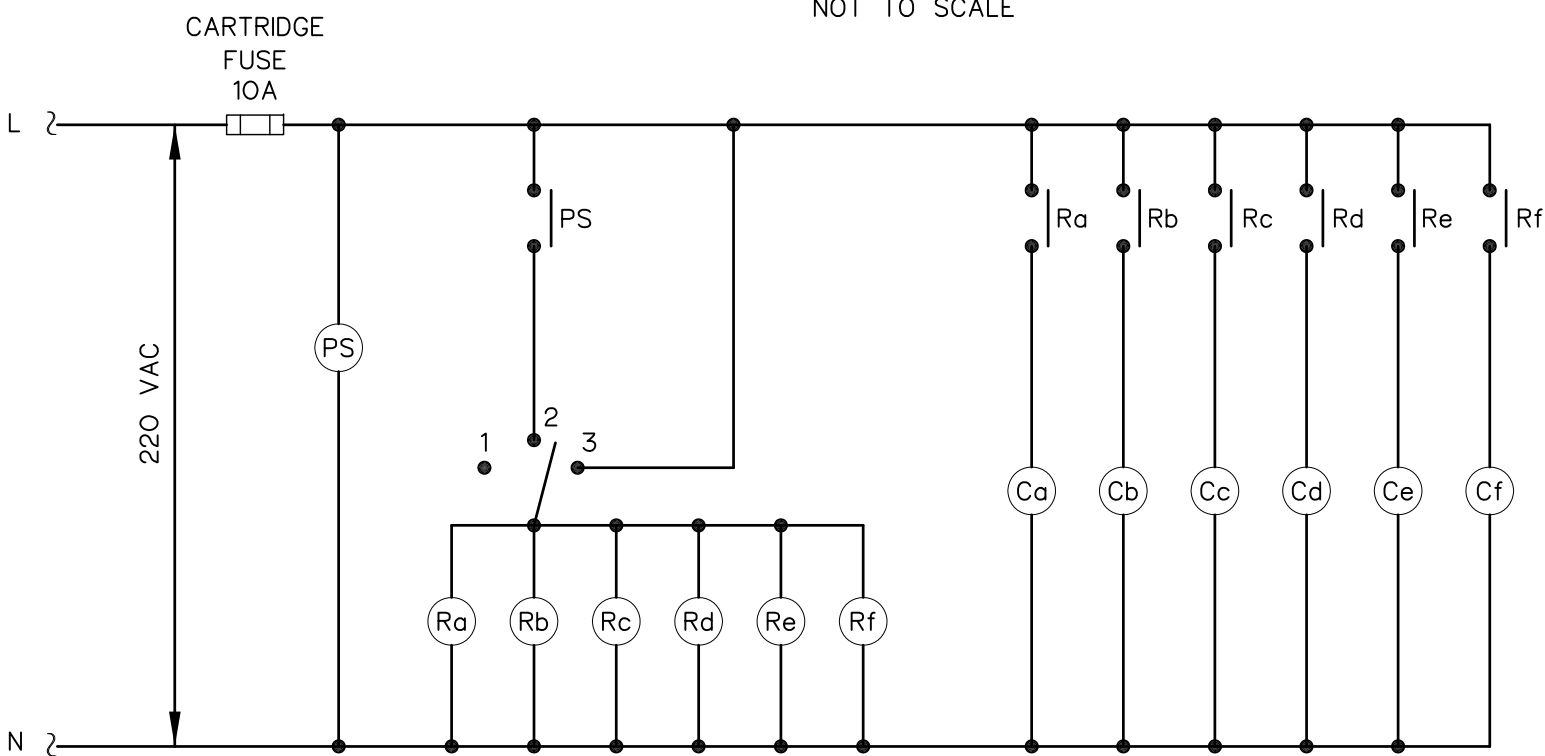
- ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SHOWN.
- ALL CONCRETE POLES, HARDWARES, TRANSFORMER, AND INSTALLATION SHALL STRICTLY CONFORM TO PEA'S STANDARD AND REGULATIONS.
- SPLICING OF CABLES IS NOT ALLOWED IN CONDUITS OR HAND HOLES EXCEPT AT JUNCTION BOXES OR PULL BOXES ABOVE GROUND LEVEL WITH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



SINGLE LINE DIAGRAM OF PANEL "SL"
NOT TO SCALE

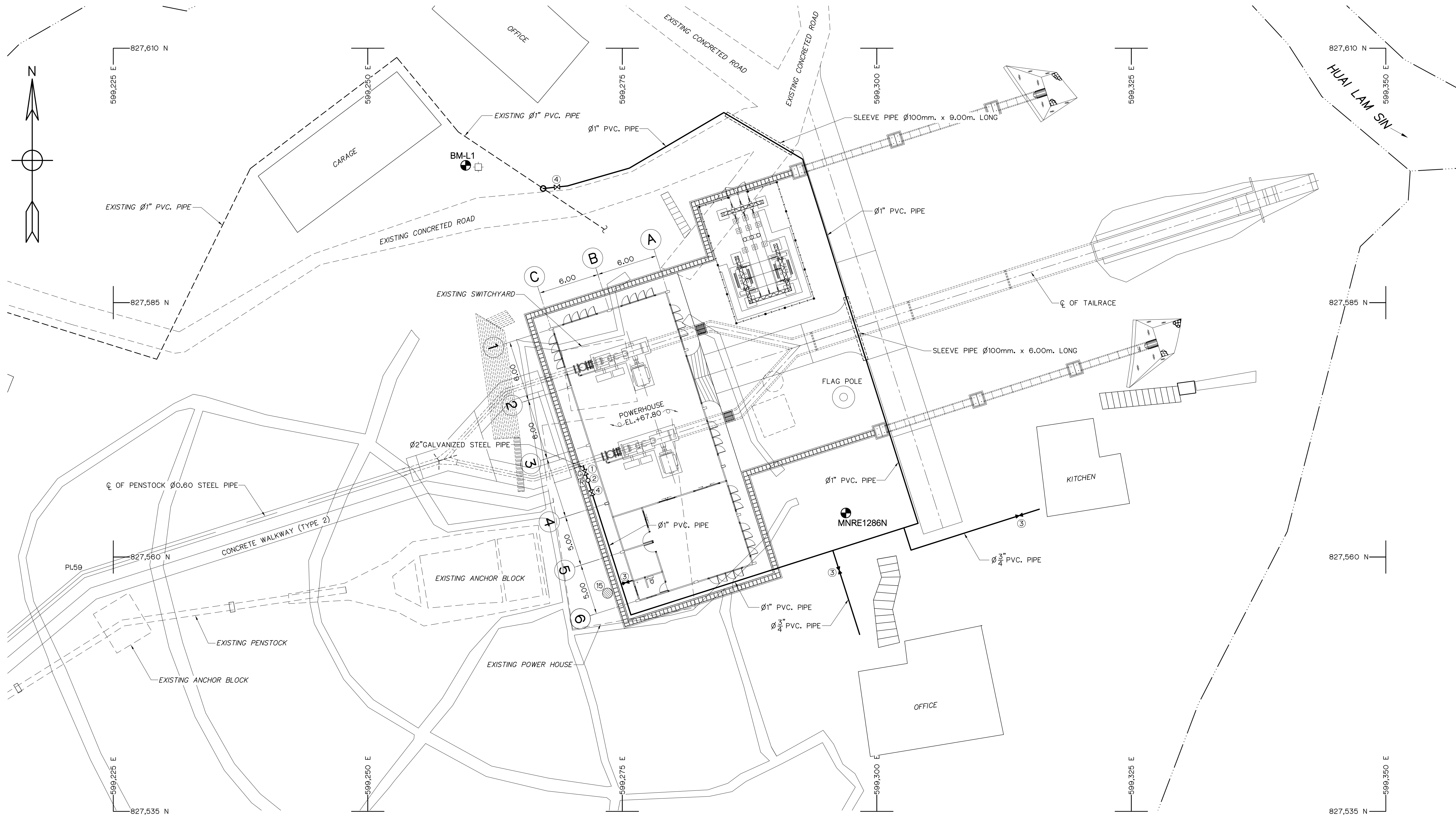


DETAIL OF STREET LIGHTING
NOT TO SCALE



STREET LIGHTING CONTROL DIAGRAM
NOT TO SCALE

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
DESIGNED <i>[Signature]</i> 21/11/1029	REVIEWED S.KITIKHAJ
DRAWN <i>[Signature]</i>	SUBMITTED <i>[Signature]</i>
CHECKED <i>[Signature]</i> 21/11/1029	RECOMMENDED <i>[Signature]</i>
APPROVED <i>[Signature]</i> 14/01/62	APPROVED <i>[Signature]</i>
PROJECT MANAGER	DRAWING NO. HLS-PH-19
	SHEET NO. 63 OF 78



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

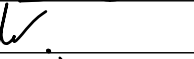
HLS-PH-21

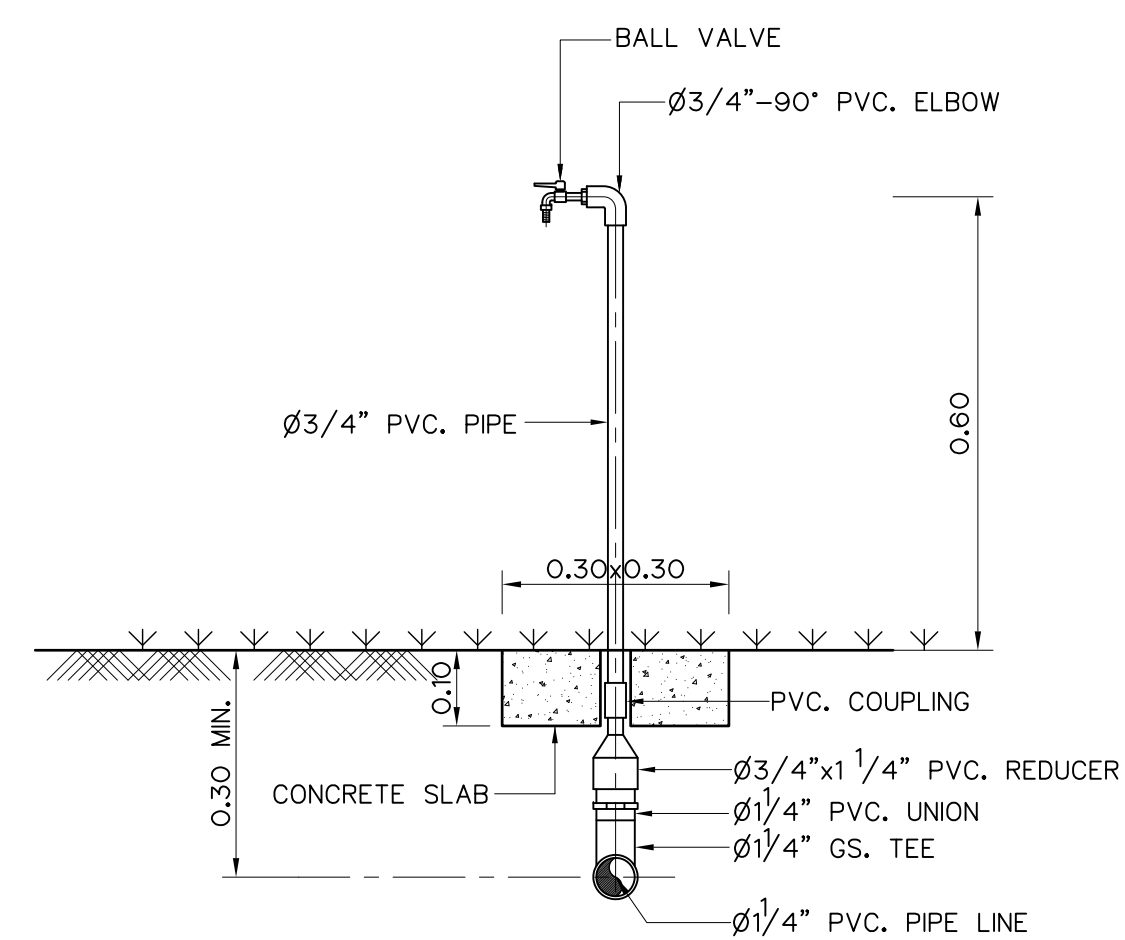
LEGENDS :

- 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 C.U.M.

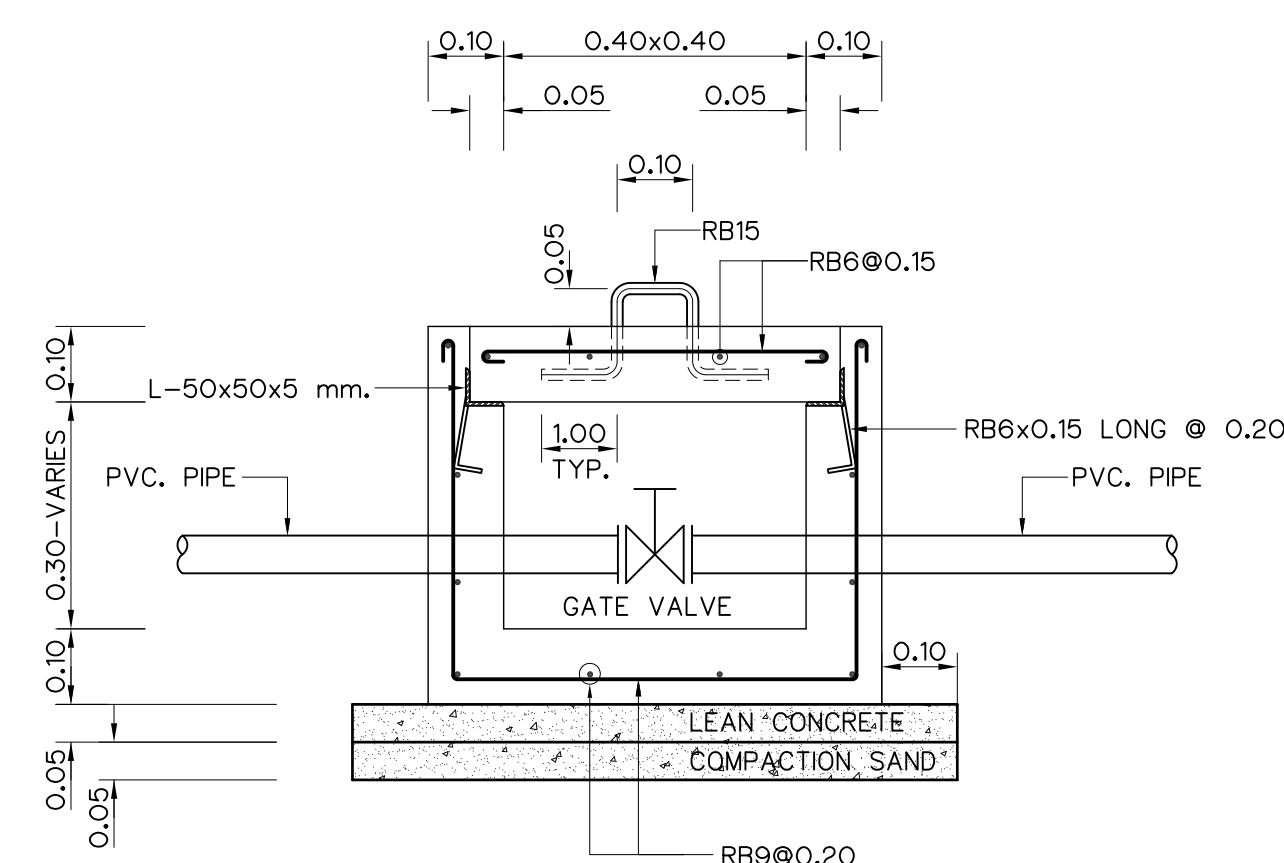


3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
		CONSULTANTS	DEDE	

 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUALAM SIN HYDROPOWER PROJECT			
CIVIL WORKS POWERHOUSE WATER SUPPLY PIPELINE SYSTEM LAY-OUT			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED  ๑๒1.6651		REVIEWED  ๑๒1.6651	
DRAWN  ๑๒1.7324		RECOMMENDED  ๑๒1.7324	
CHECKED  ๑๒1.7324		APPROVED  ๑๒1.7324	
 PROJECT MANAGER		14/01/62 DATE	DRAWING NO. HLS-PH-20
			SHEET NO. 64 OF 78

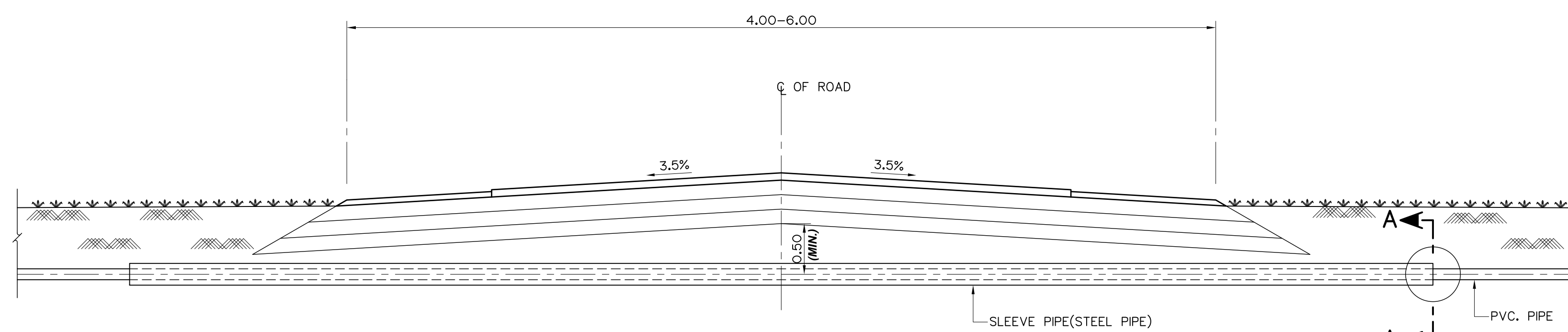


FIELD TAP TYPICAL INSTALLATION DETAIL "2"
SCALE 1:10

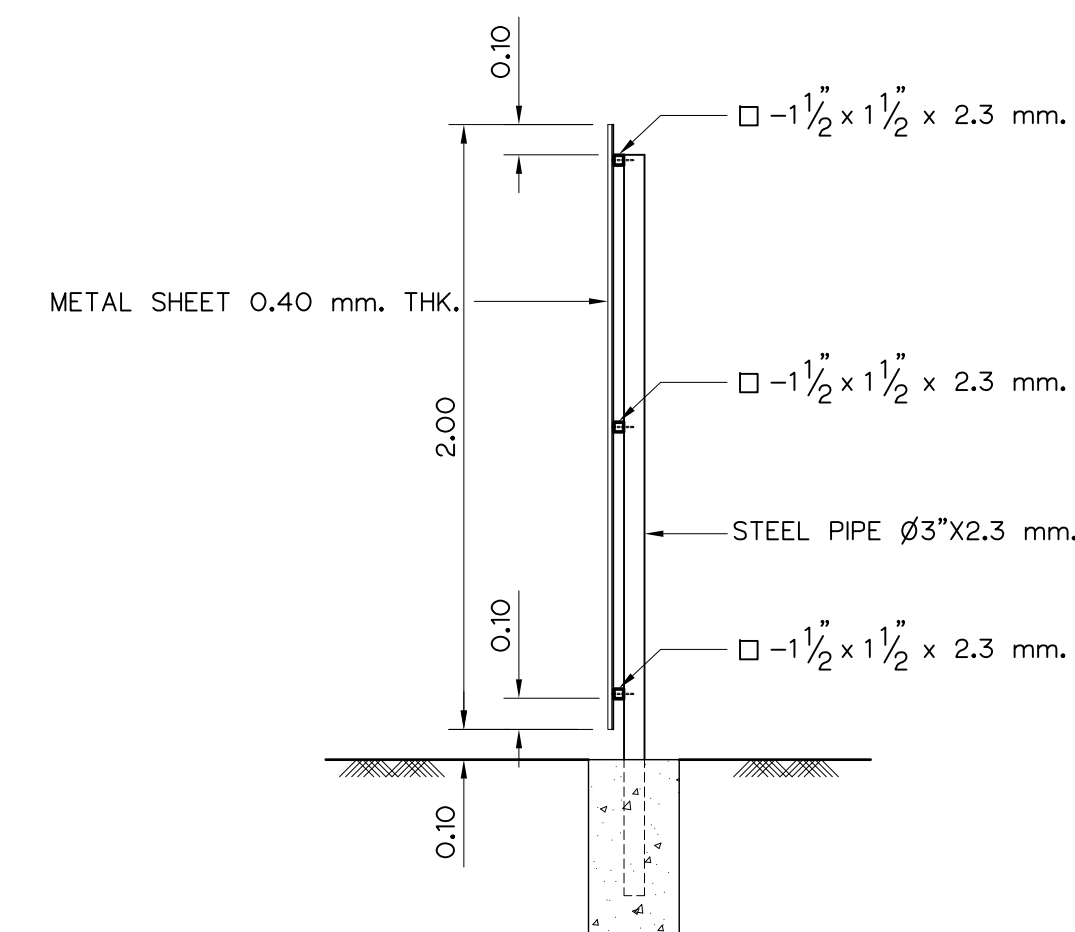


PIT VALVE DETAIL
SCALE 1:10

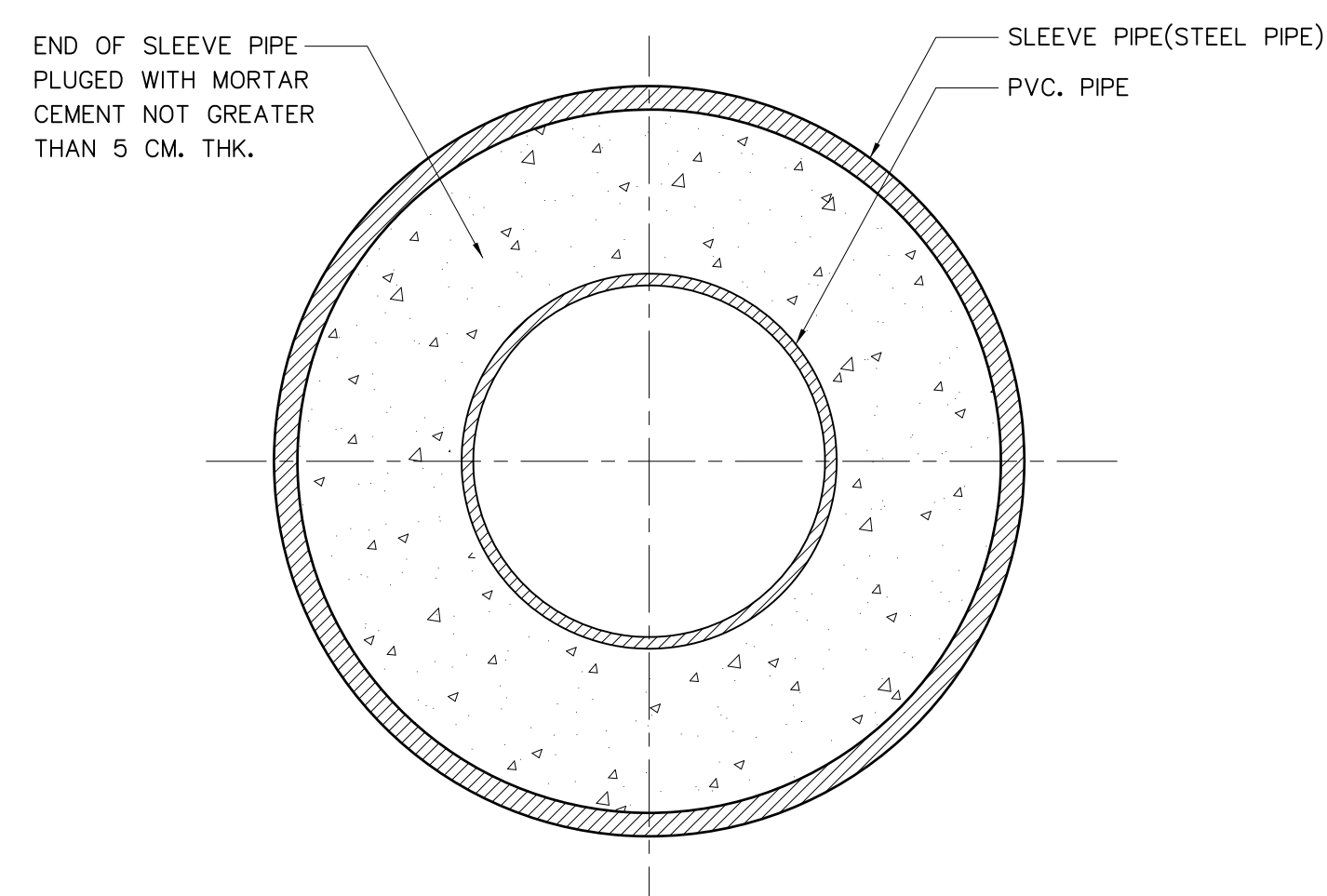
SIZE OF WATER SUPPLY PIPE (MM.)	SIZE OF SLEEVE PIPE (MM.)	THICKNESS (MM.)
20 (3/4")	100	2.65
25 (1")	100	2.65
35 (1 1/4")	100	2.65
40 (1 1/2")	100	2.65
55 (2")	100	2.65
60 (2 1/2")	150	3.45
80 (3")	150	3.45



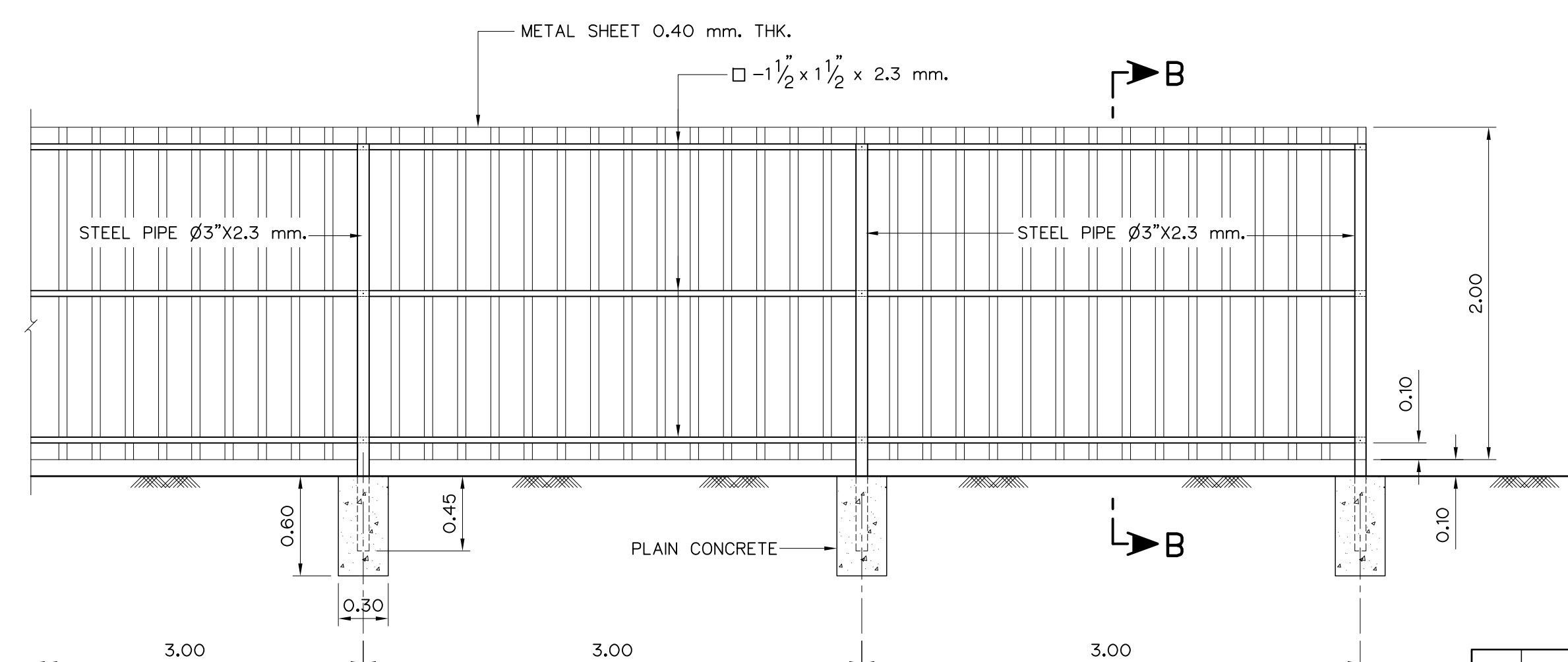
TYPICAL SECTION FOR SLEEVE PIPE INSTALLATION
SCALE 1:25



SECTION B-B
SCALE 1:25



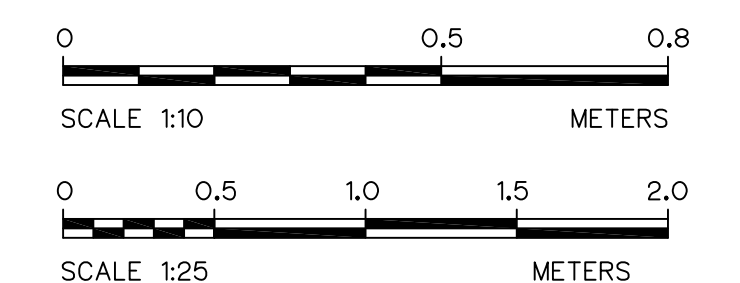
SECTION A-A
SCALE 1:25

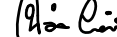


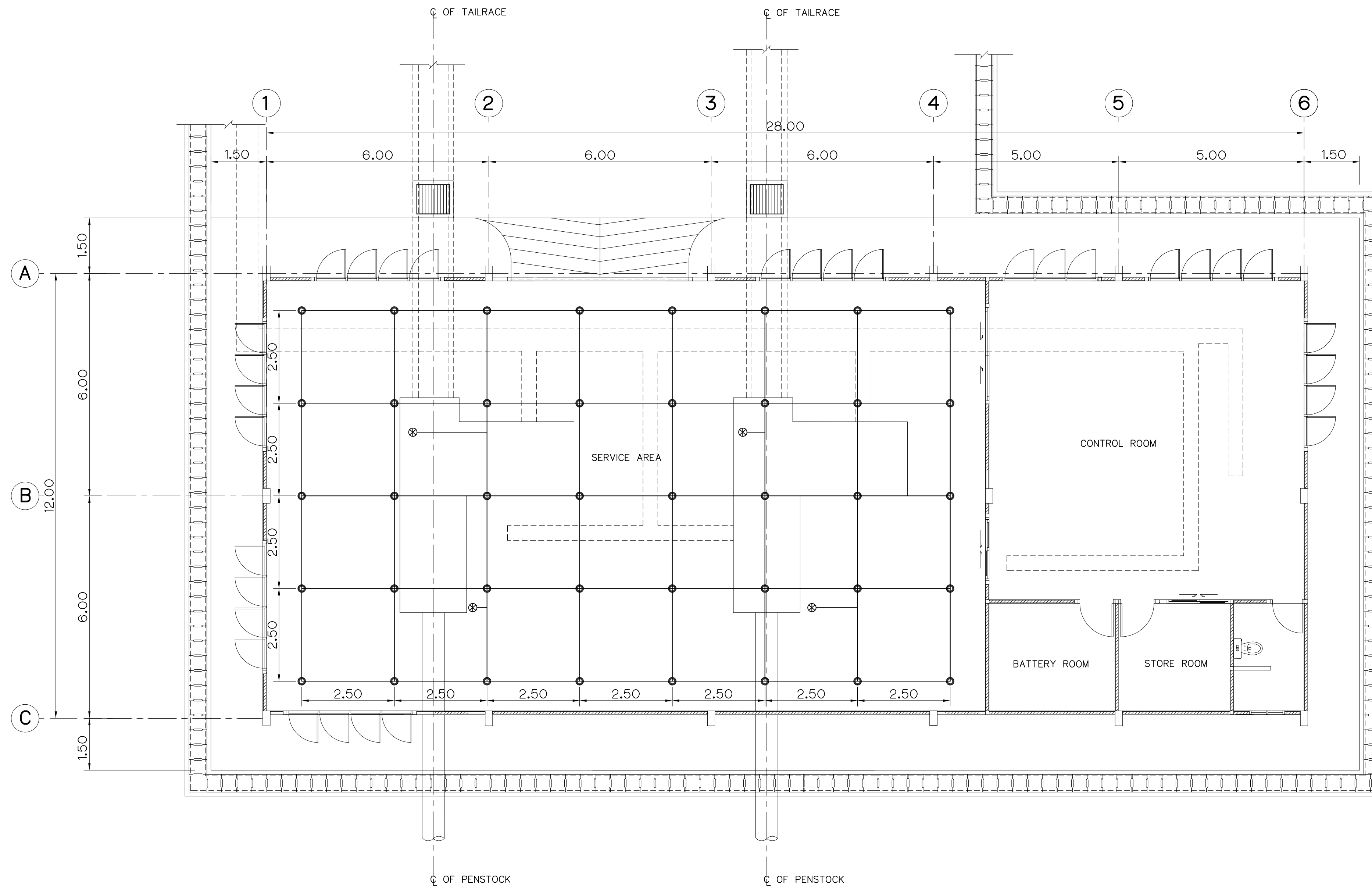
METAL SHEET FENCE DETAIL
SCALE 1:30

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

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



 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 AND SLEEVE PIPE DETAILS			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED 		REVIEWED 	
DRAWN 		RECOMMENDED 	
CHECKED 		APPROVED 	
 PROJECT MANAGER		14/01/62 DATE	DRAWING NO. HLS-PP-21
			SHEET NO. 65 OF 78



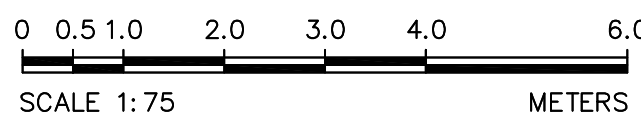
GROUNDING SYSTEM PLAN
SCALE 1:75

LEGENDS :

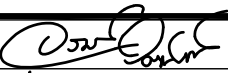
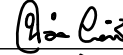
- GROUND ROD
- ⊗ GROUND POINT FOR POWER PLANT EQUIPMENT GROUNDING
- BARE COPPER CONDUCTOR

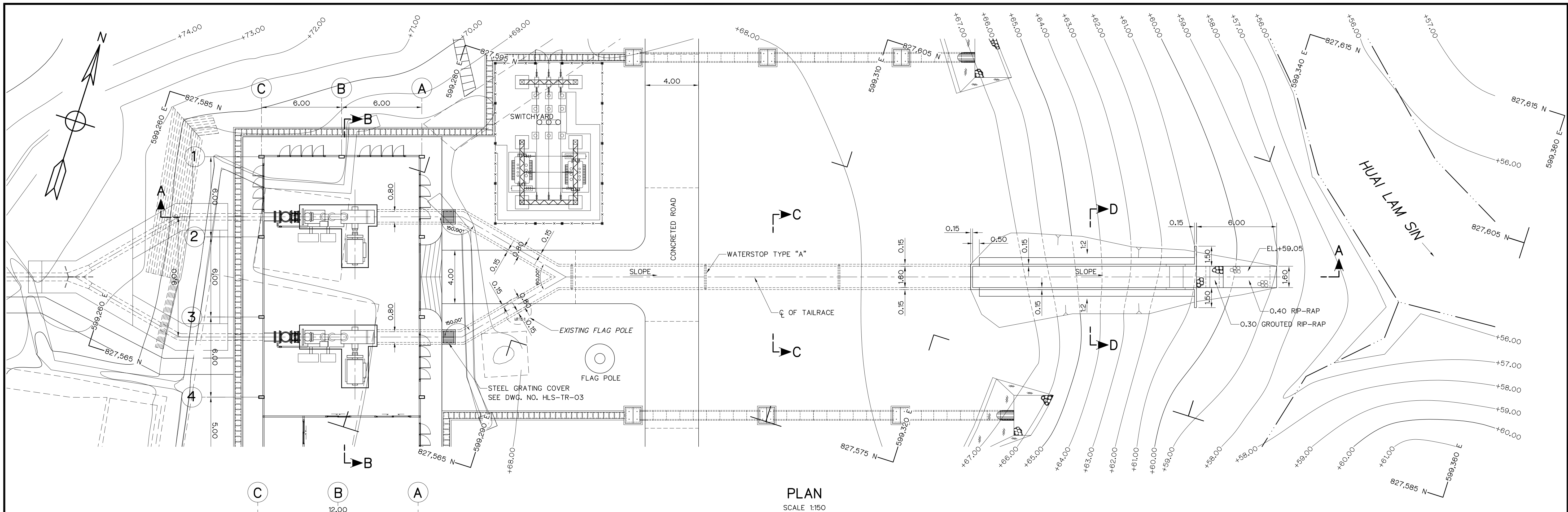
NOTES :

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

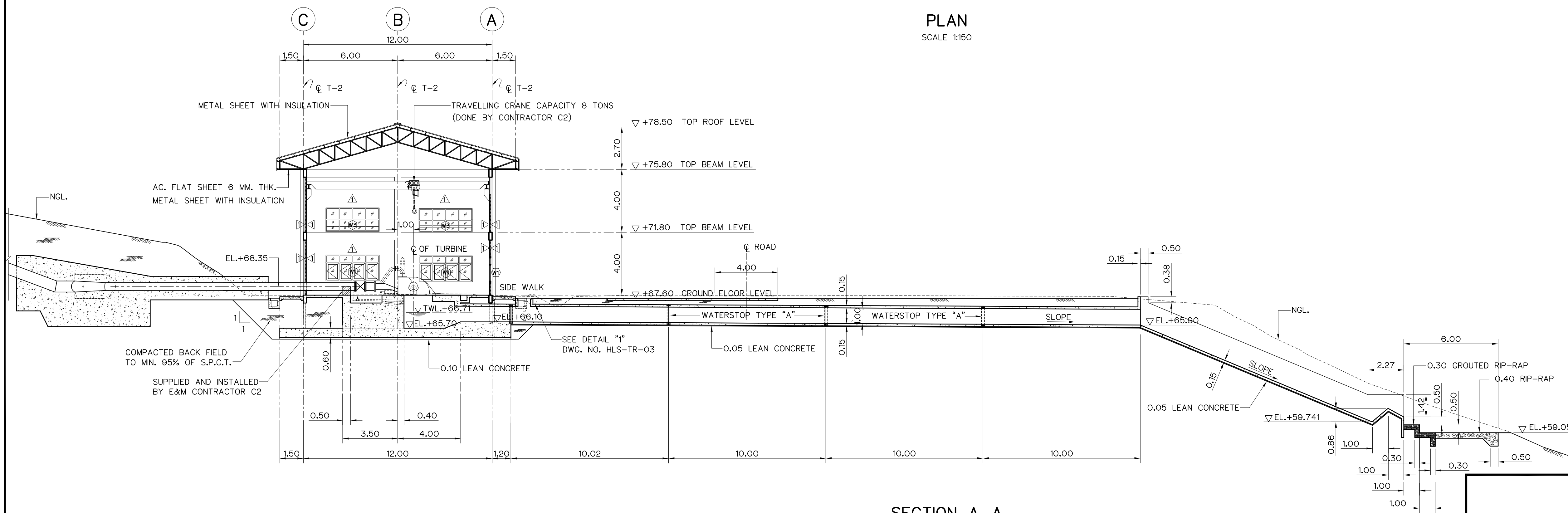


3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS			DEDE	

 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	
DESIGNED 		REVIEWED S.KITIKHAJ	
DRAWN 		SUBMITTED 	
CHECKED 		RECOMMENDED 	
		APPROVED 	
PROJECT MANAGER		14/01/62	DRAWING NO.
DATE		HLS-PH-22	SHEET NO.
			66 OF 78



PLAN
SCALE 1:150



SECTION A-A
SCALE 1:150

NOTES :

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

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



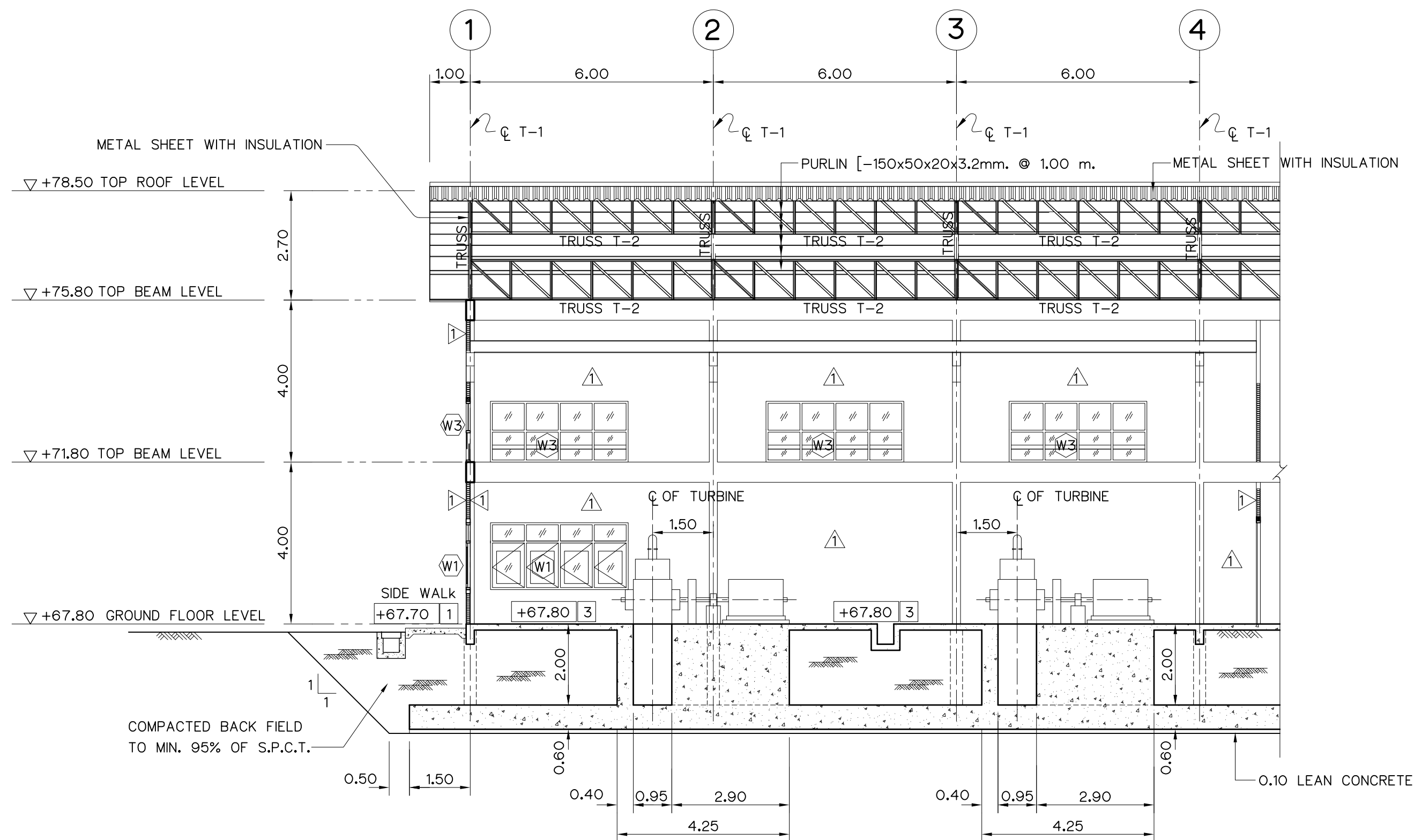
3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS			DEDE	

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

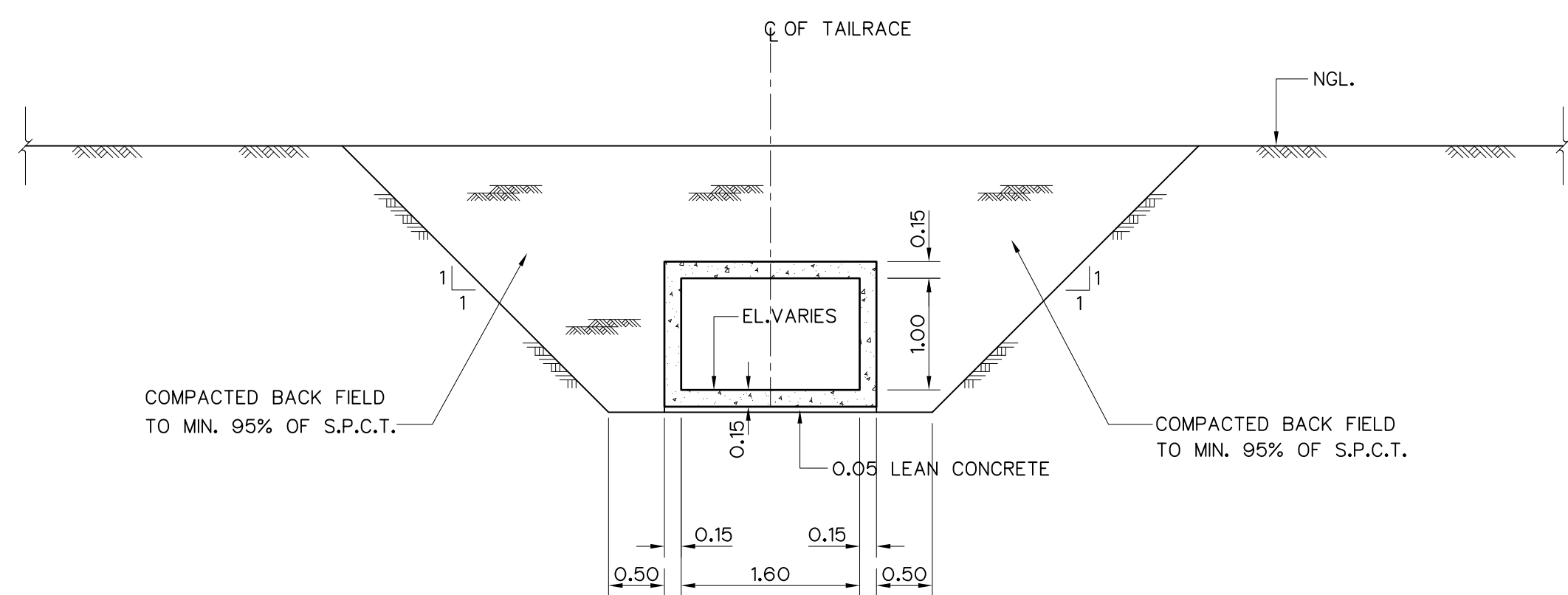
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
TAILRACE
PLAN AND SECTION A-A

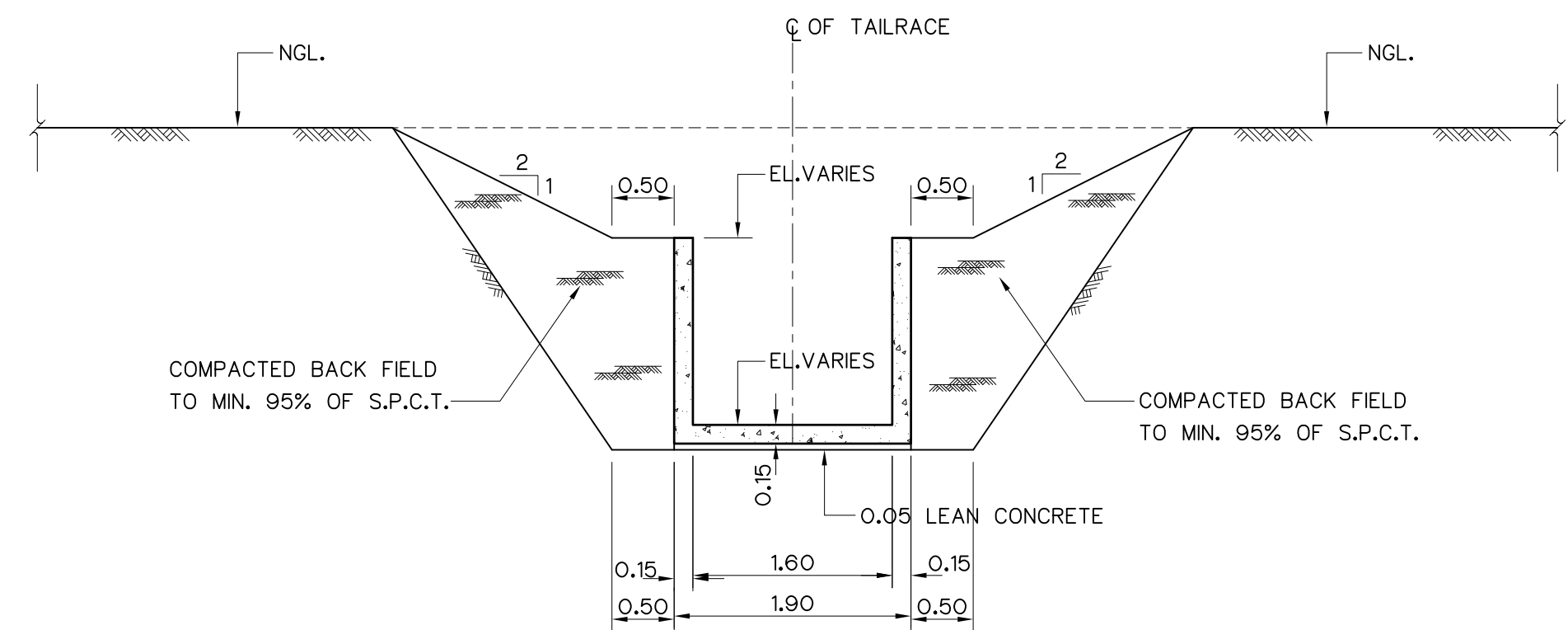
FRONTIER ENGINEERING CONSULTANTS CO., LTD.	REVIEWED S.KITIKHAJ
DESIGNED ๒๒.6651	SUBMITTED
DRAWN ๒๒.6651	RECOMMENDED ๒๒.6651
CHECKED ๒๒.7324	APPROVED ๒๒.7324
PROJECT MANAGER ๒๒.7324	DATE 14/01/62
DRAWING NO. HLS-TR-01	SHEET NO. 67 OF 78



SECTION B-B
SCALE 1:100



SECTION C-C
SCALE 1:50



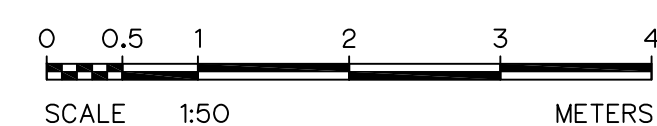
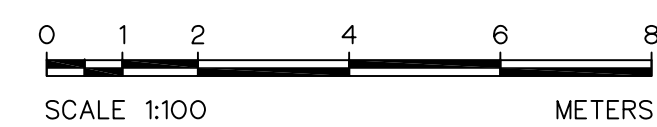
SECTION D-D
SCALE 1:50

NOTES :

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

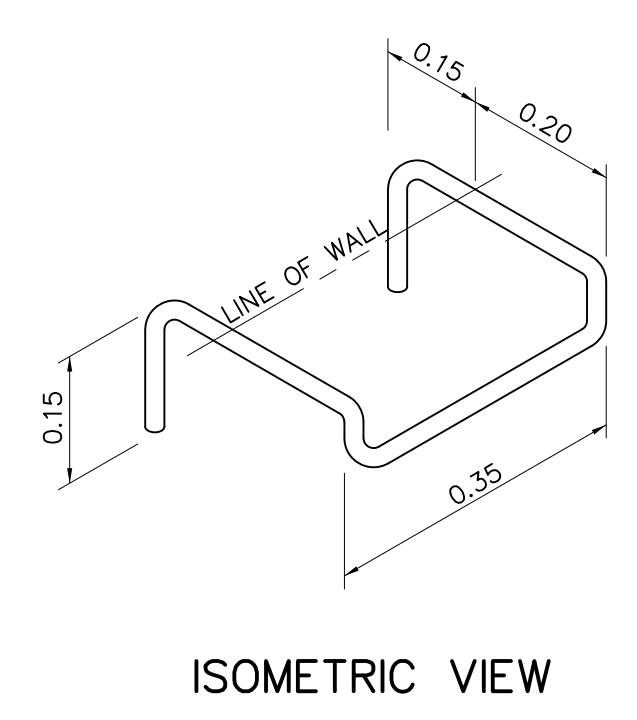
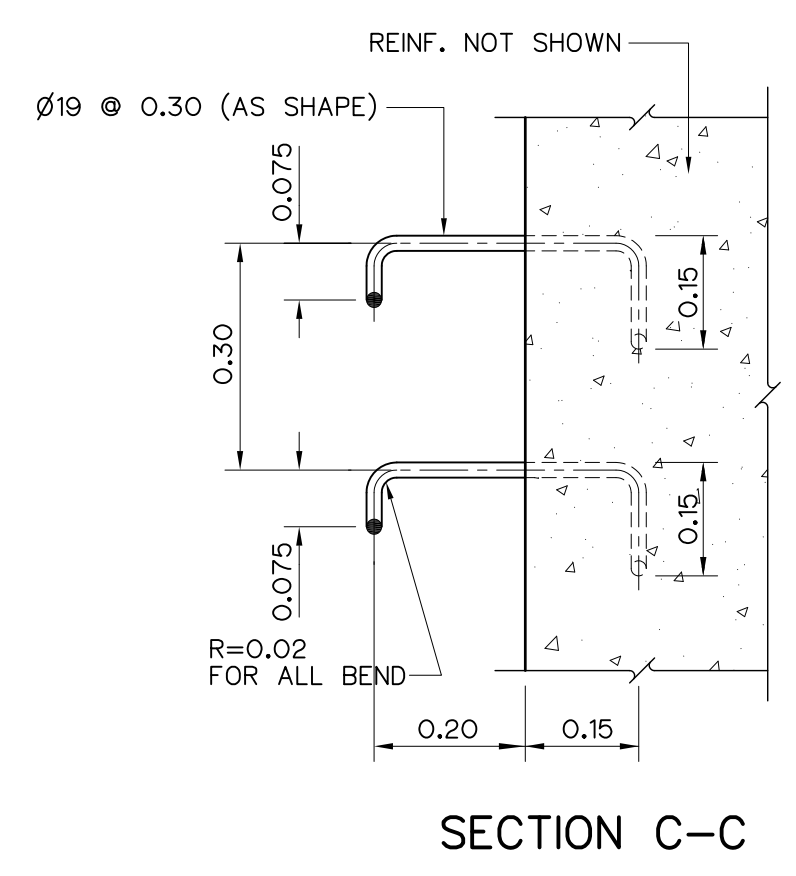
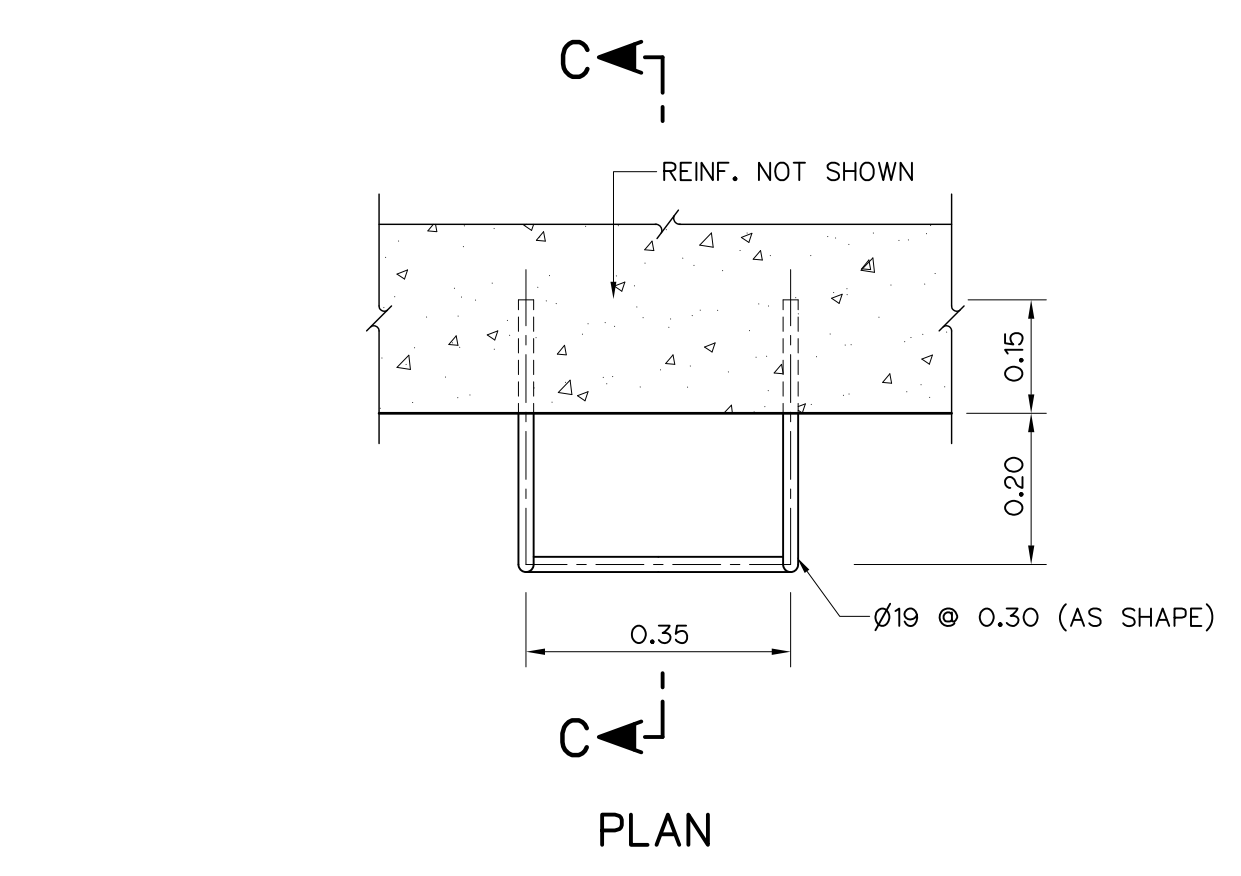
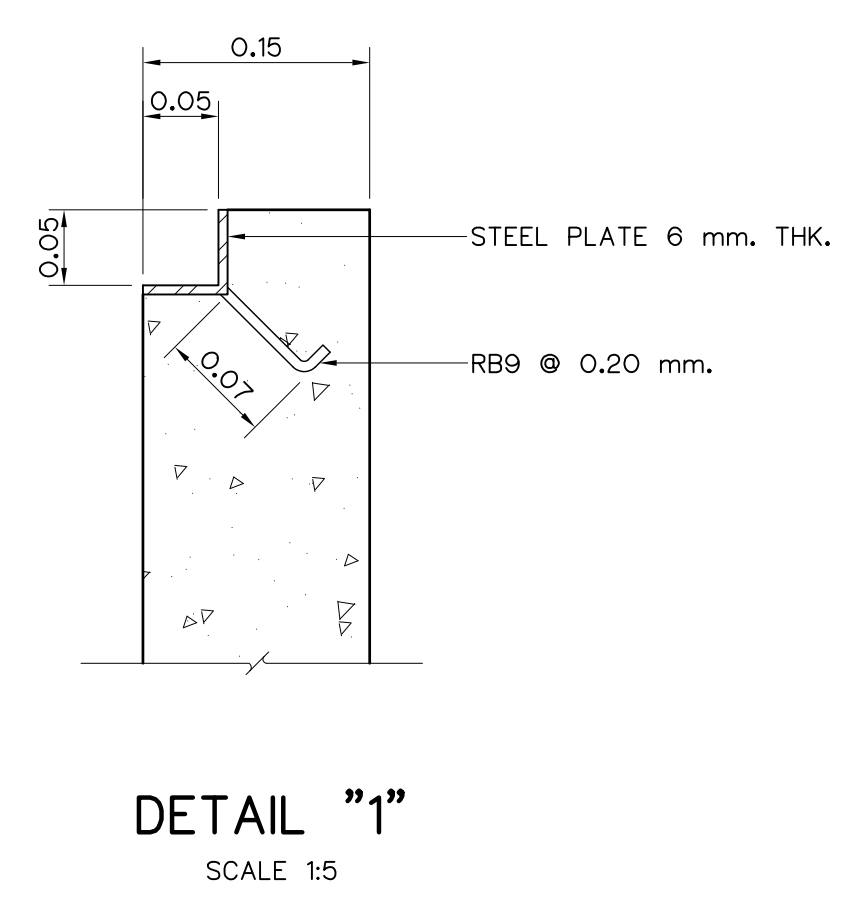
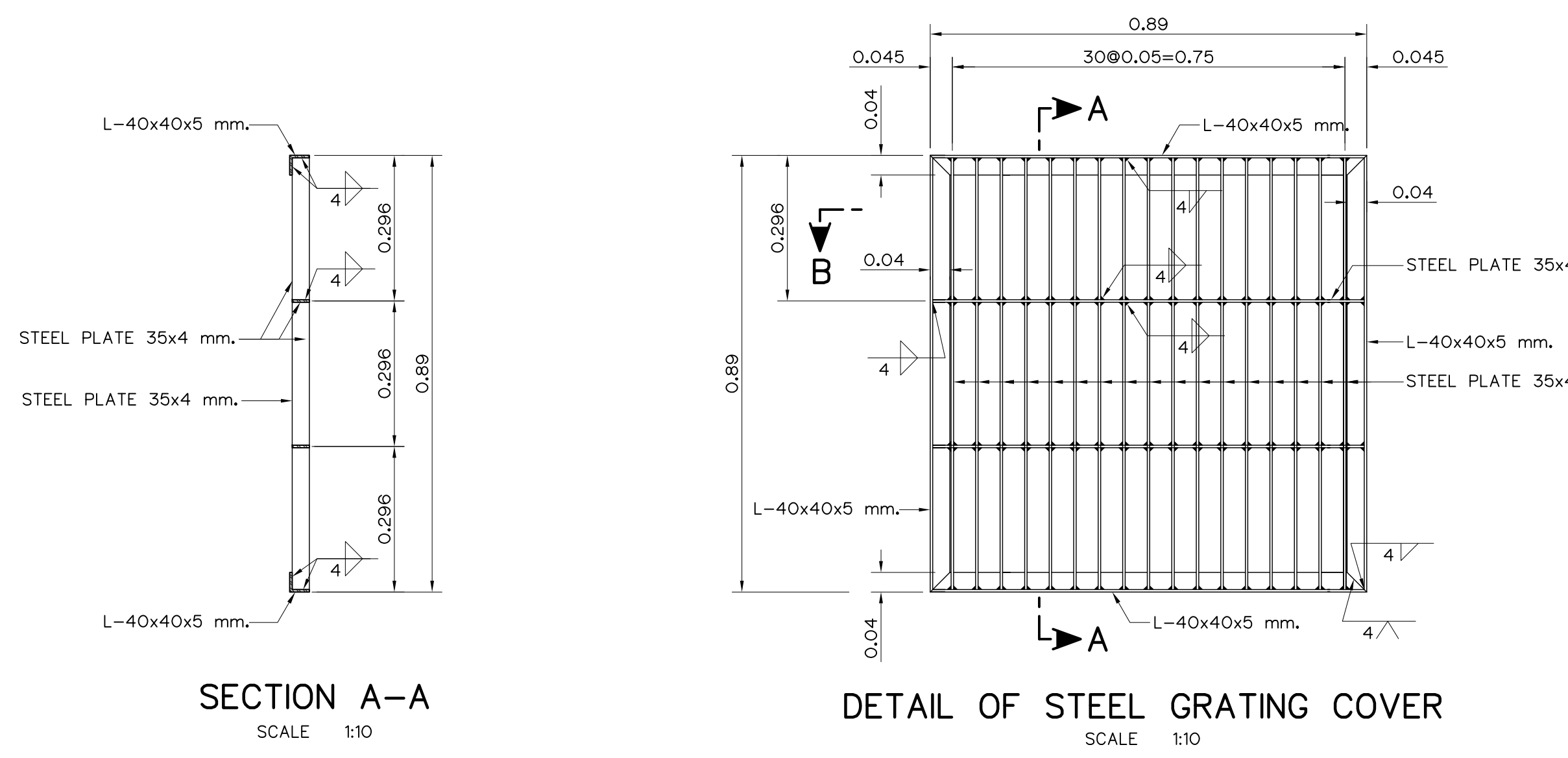
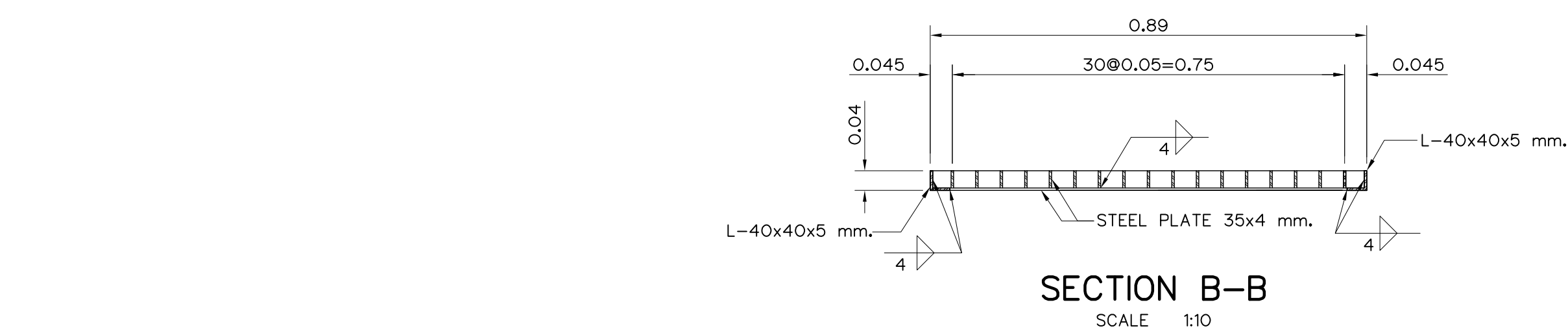


3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

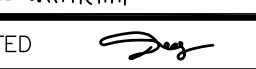
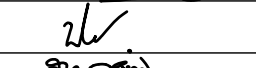
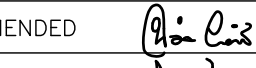
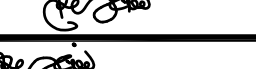
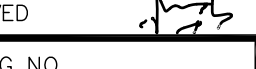
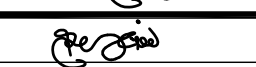
CONSULTANTS

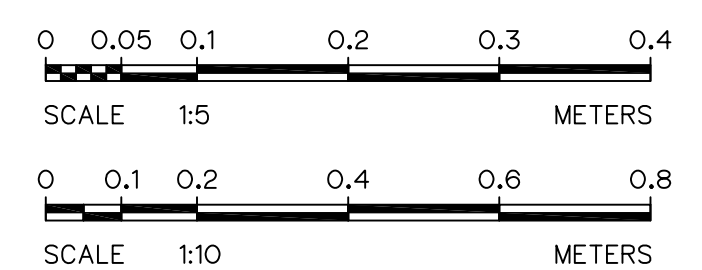
DEDE

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
DESIGNED	REVIEWED S.KTICHAI
DRAWN	SUBMITTED
CHECKED	RECOMMENDED
APPROVED	APPROVED
PROJECT MANAGER	DRAWING NO. HLS-TR-02
DATE 14/01/62	SHEET NO. 68 OF 78

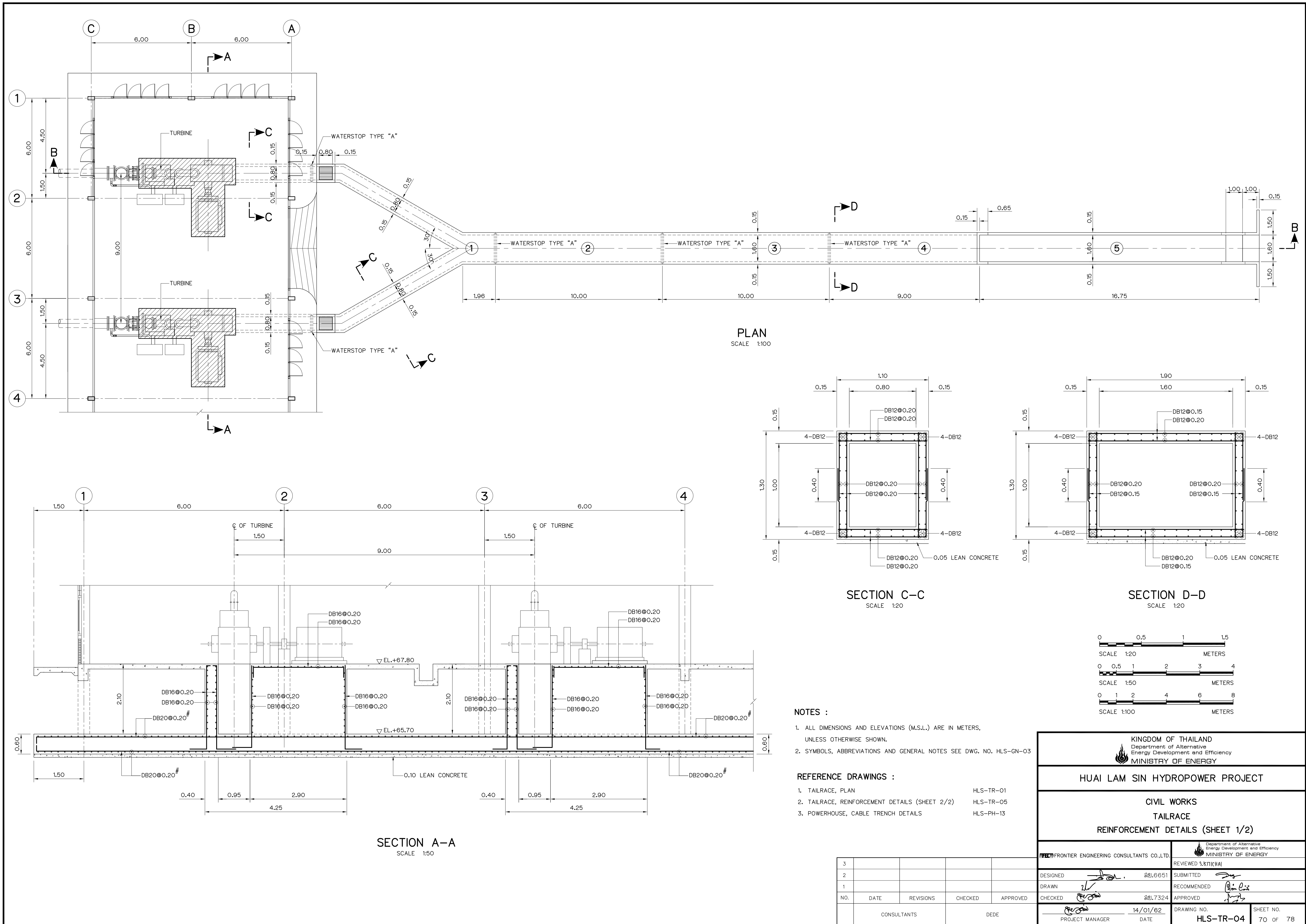


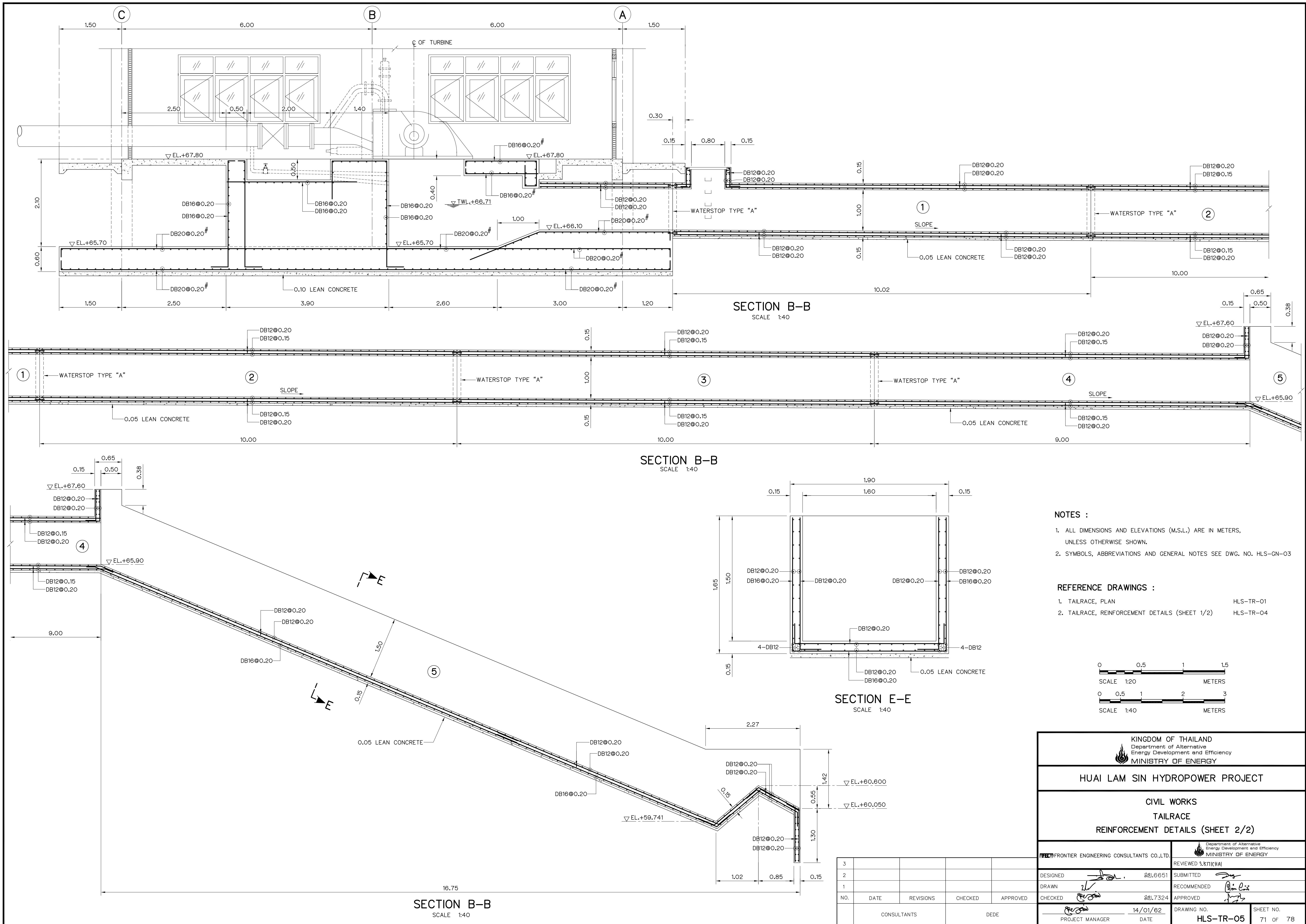
- NOTES :
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
 2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

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.	REVIEWED S.KITICHAJ
DESIGNED  ๖๒1.6651	SUBMITTED 
DRAWN 	RECOMMENDED 
CHECKED  ๖๒1.7324	APPROVED 
 PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS-TR-03 SHEET NO. 69 OF 78



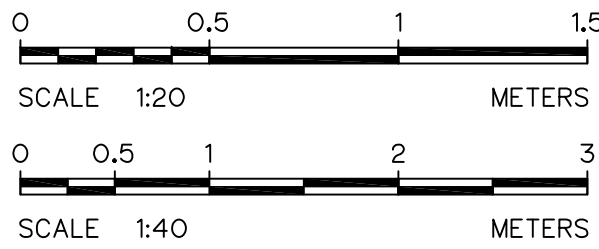
3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED



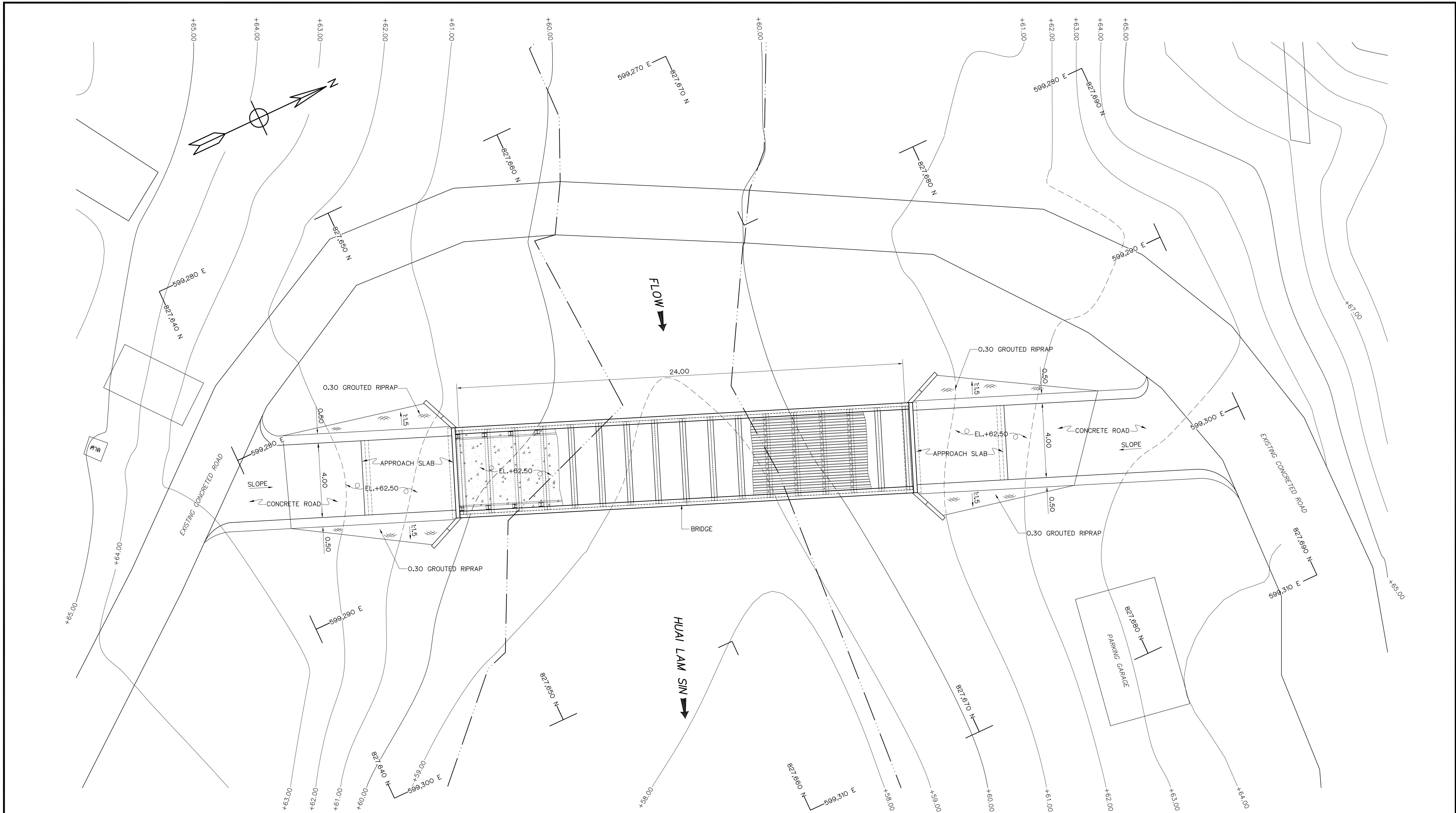


- NOTES :
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
 2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03

- REFERENCE DRAWINGS :
1. TAILRACE, PLAN HLS-TR-01
 2. TAILRACE, REINFORCEMENT DETAILS (SHEET 1/2) HLS-TR-04



KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
HUA I LAM SIN HYDROPOWER PROJECT	
CIVIL WORKS TAILRACE REINFORCEMENT DETAILS (SHEET 2/2)	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	REVIEWED S.KITICHAJ
DESIGNED 21.6.651	SUBMITTED
DRAWN 21.6.651	RECOMMENDED
CHECKED 21.6.651	APPROVED
PROJECT MANAGER 14/01/62	DRAWING NO. HLS-TR-05
DATE	SHEET NO. 71 OF 78



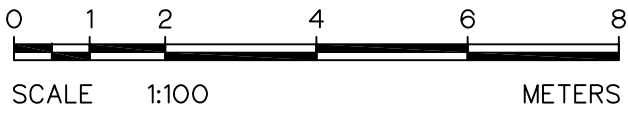
GENERAL LAY-OUT
SCALE 1:100

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

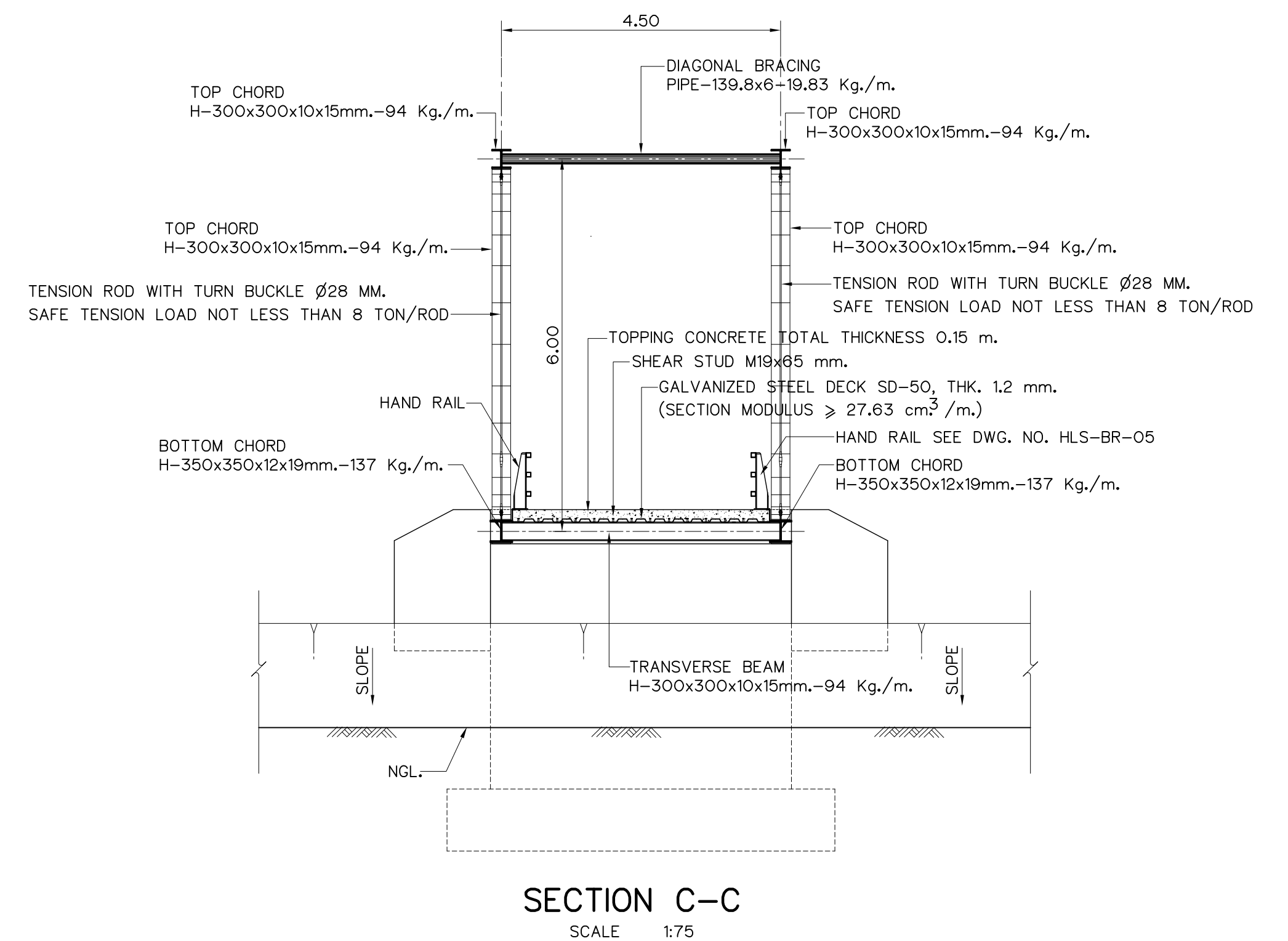
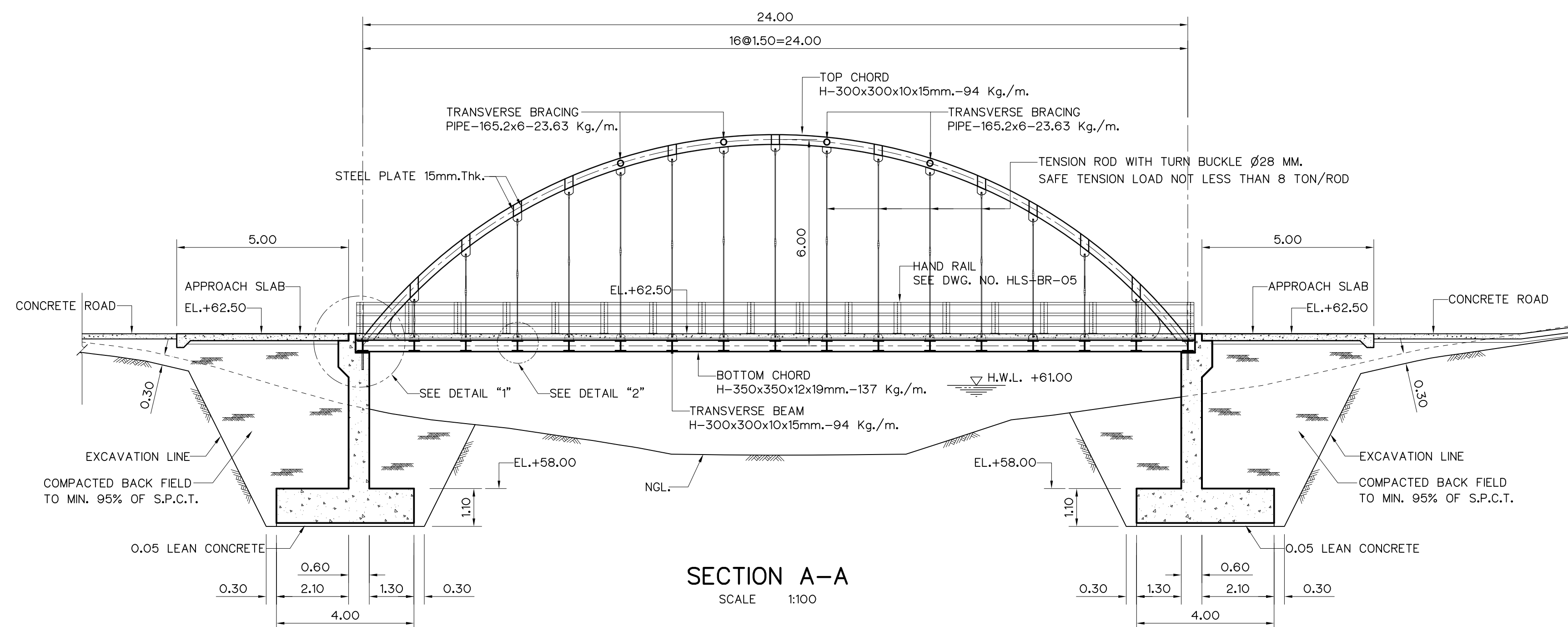
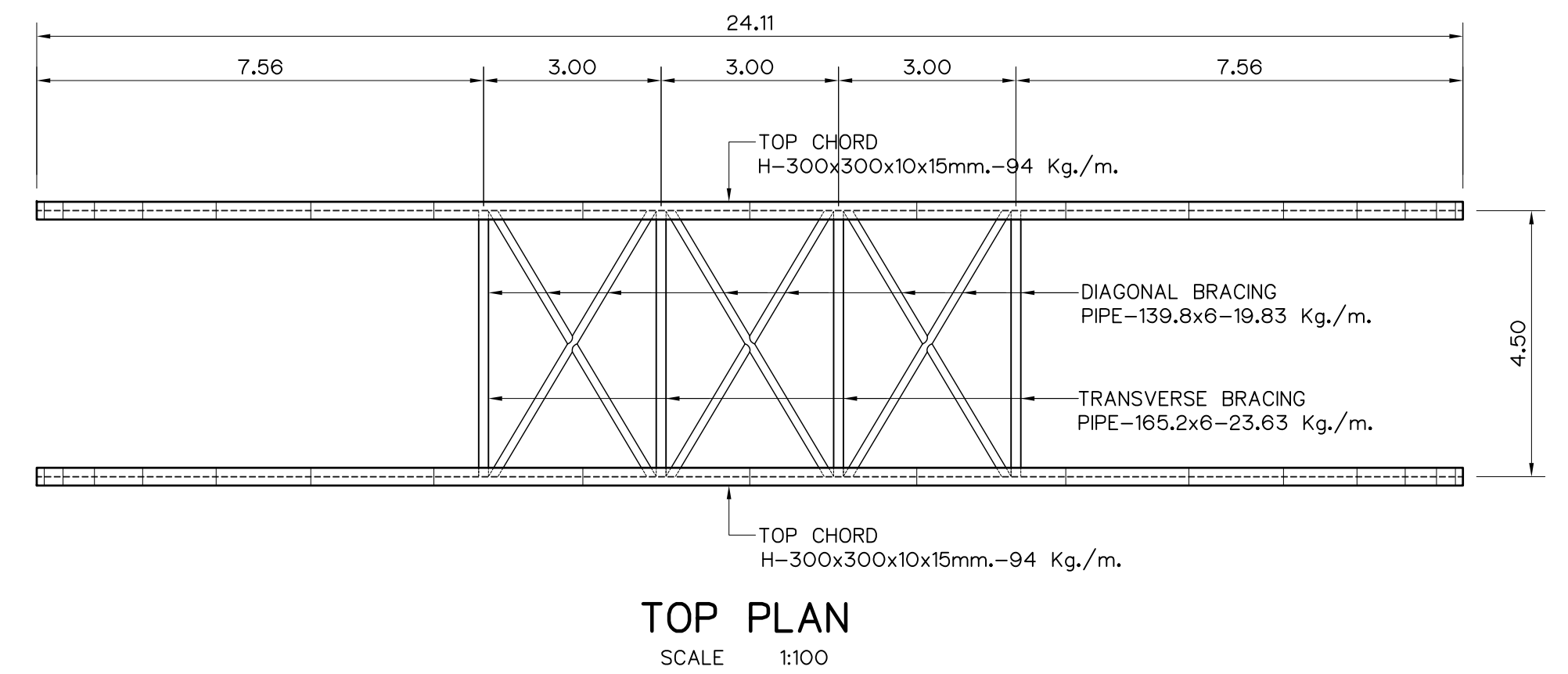
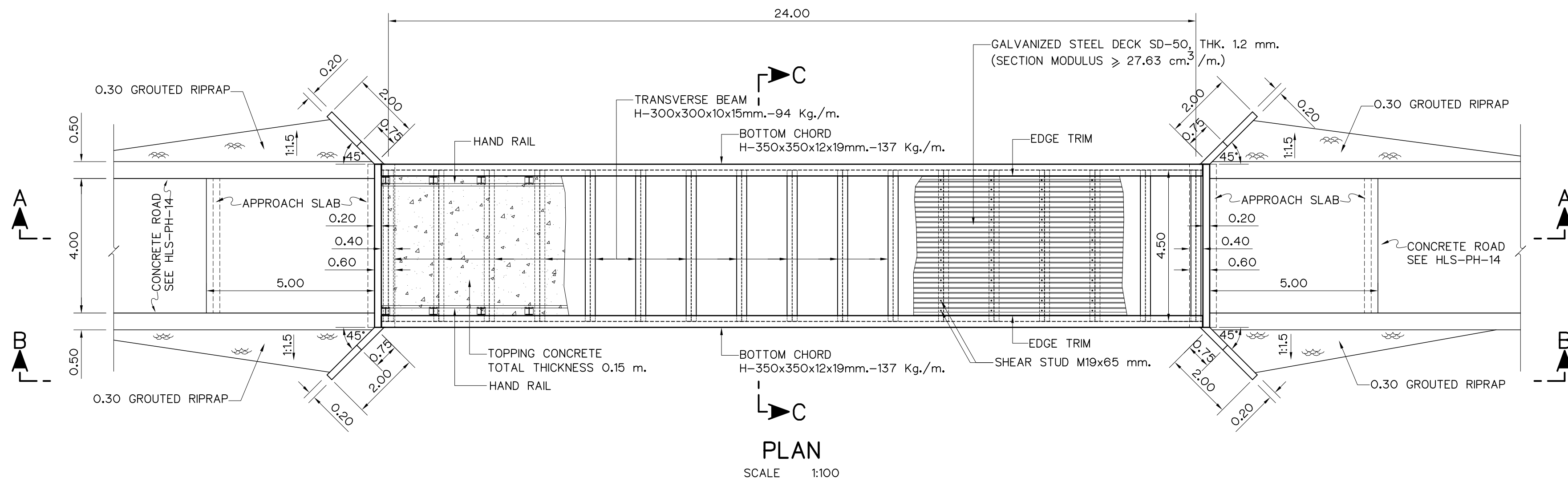
REFERENCE DRAWINGS :

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



3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
		CONSULTANTS	DEDE	

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
HUI 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 ๖๒๑.6651	REVIEWED S.KITIKHAJ
DRAWN ๖๒๑.7324	SUBMITTED
CHECKED ๖๒๑.7324	RECOMMENDED
APPROVED	APPROVED
PROJECT MANAGER 14/01/62	DRAWING NO. HLS-BR-01
DATE	SHEET NO. 72 OF 78

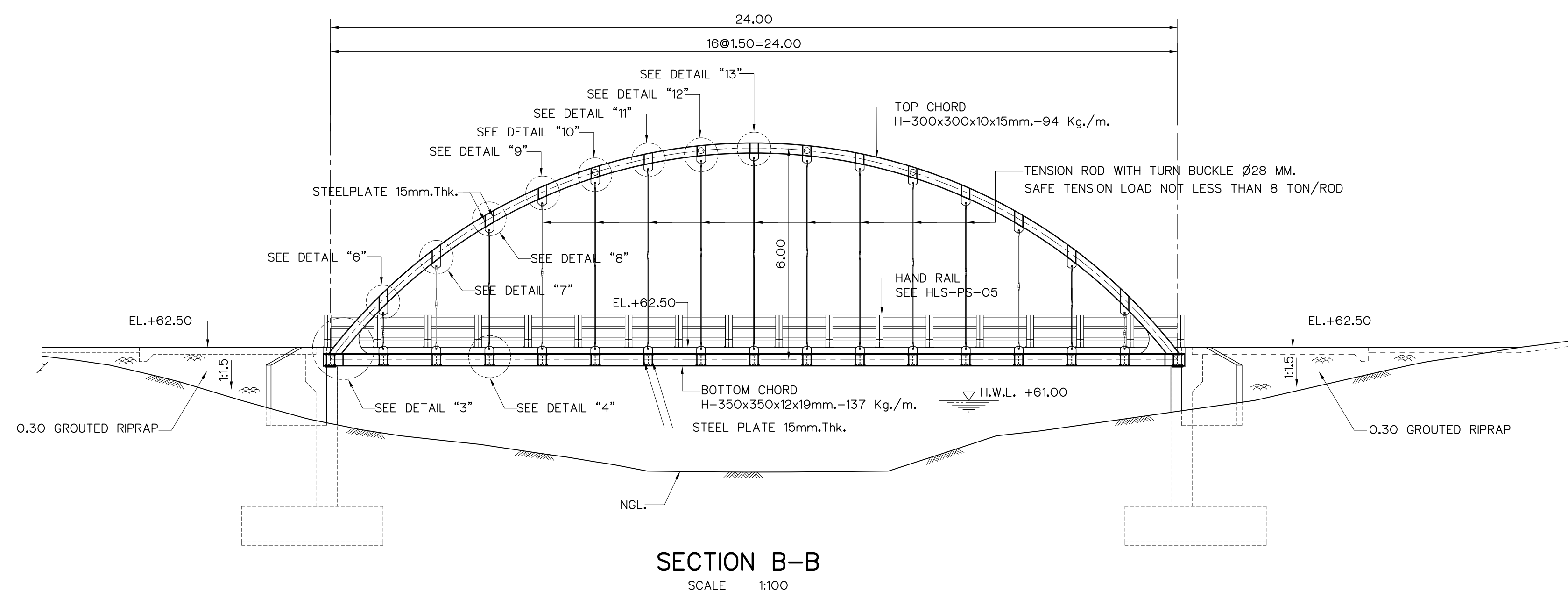
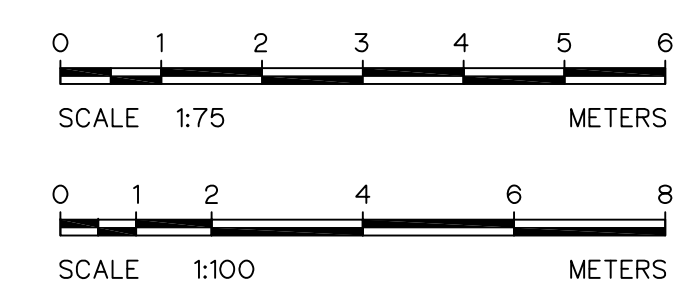


NOTES :

- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
- ALLOWABLE BEARING CAPACITY OF SOIL FOUNDATION SHALL NOT BE LESS THAN 15 T/M^2
- THE ULTIMATE COMPRESSIVE STRENGTH OF CONCRETE OF STANDARD CYLINDER ($\phi 0.15 \times 0.30 \text{ m}$) TEST AT AGE 28 DAYS SHALL BE 240 KSC.

REFERENCE DRAWINGS :

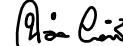
- BRIDGE, GENERAL LAY-OUT HLS-BR-01

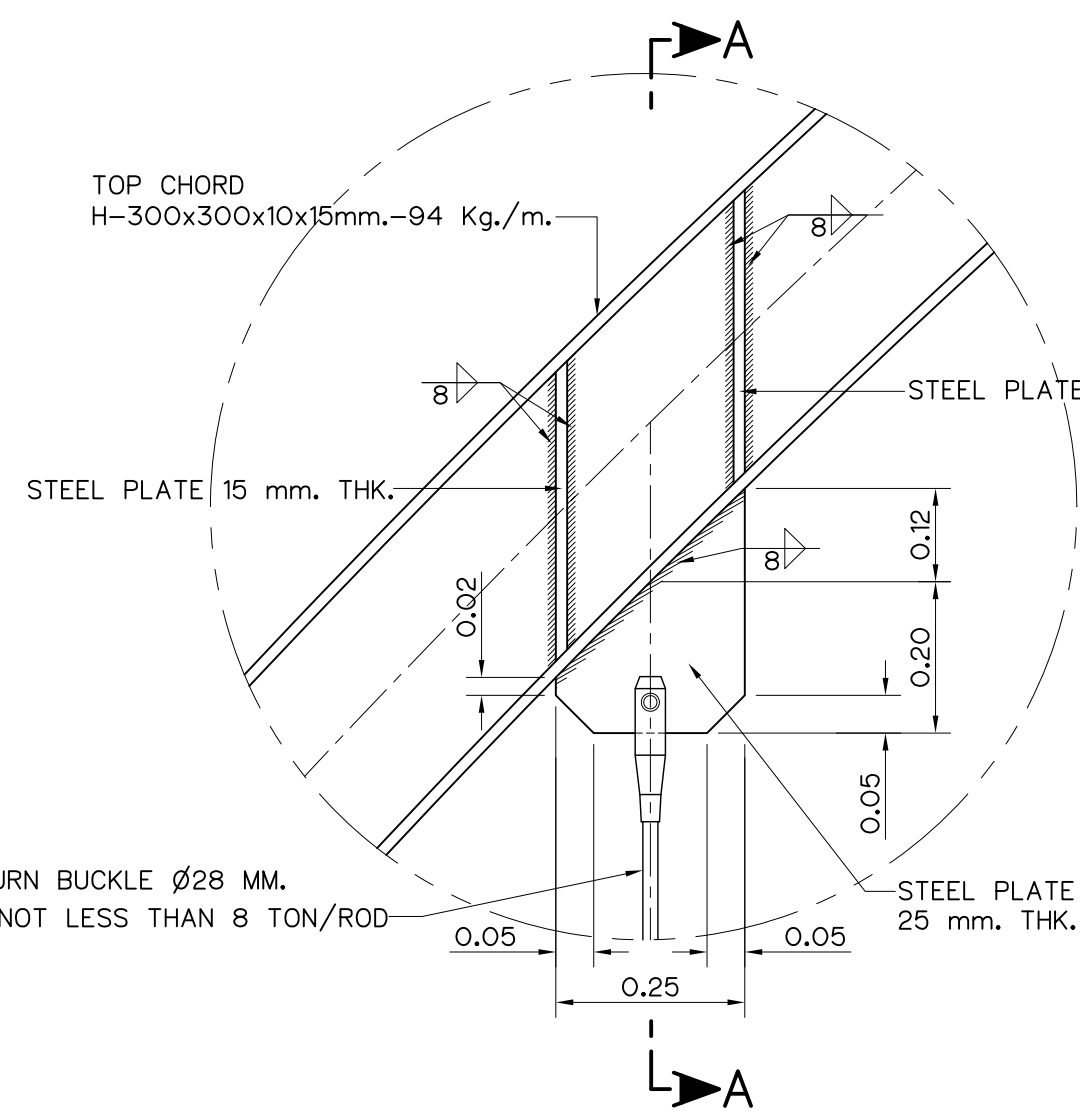


KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUAI LAM SIN HYDROPOWER PROJECT			
CIVIL WORKS BRIDGE PLAN AND SECTIONS			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED: [Signature] 22.6.651		REVIEWED: S.KITICHAJ	
DRAWN: [Signature]		SUBMITTED: [Signature]	
CHECKED: [Signature] 22.7.324		RECOMMENDED: [Signature]	
APPROVED: [Signature]		APPROVED: [Signature]	
CONSULTANTS		DEDE	
PROJECT MANAGER		14/01/62 DATE	
DRAWING NO. HLS-BR-02		SHEET NO. 73 OF 78	

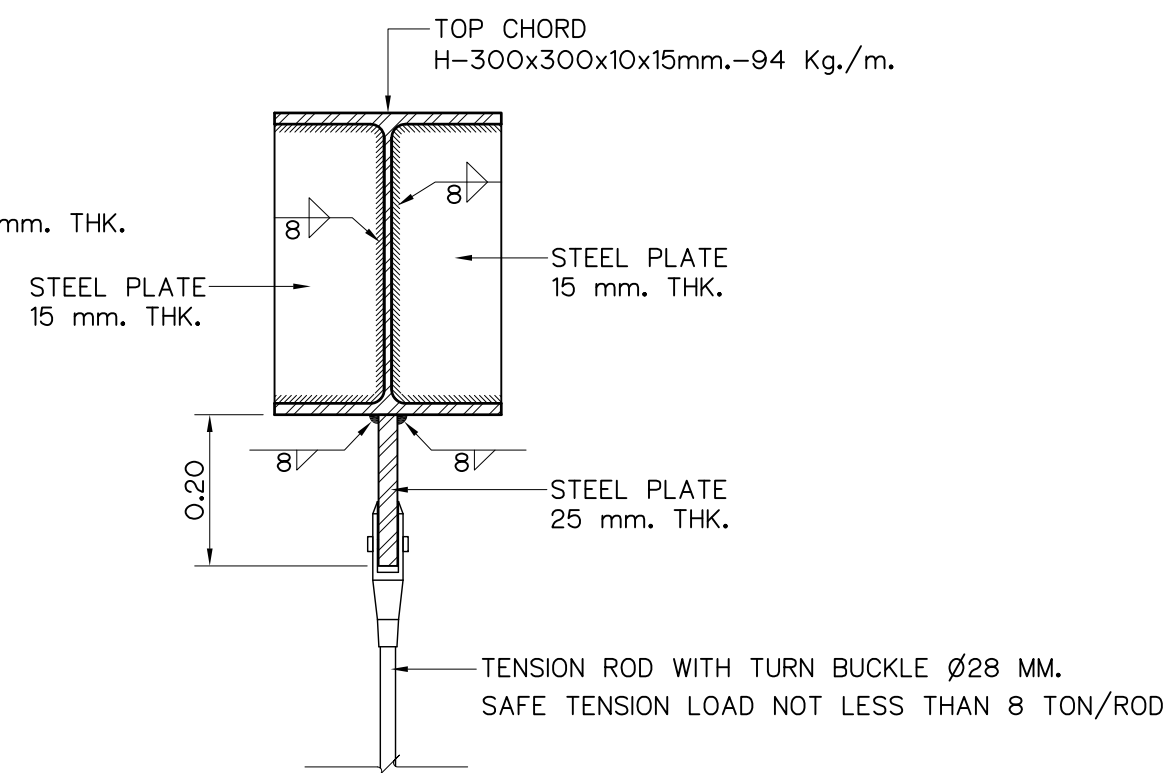


-

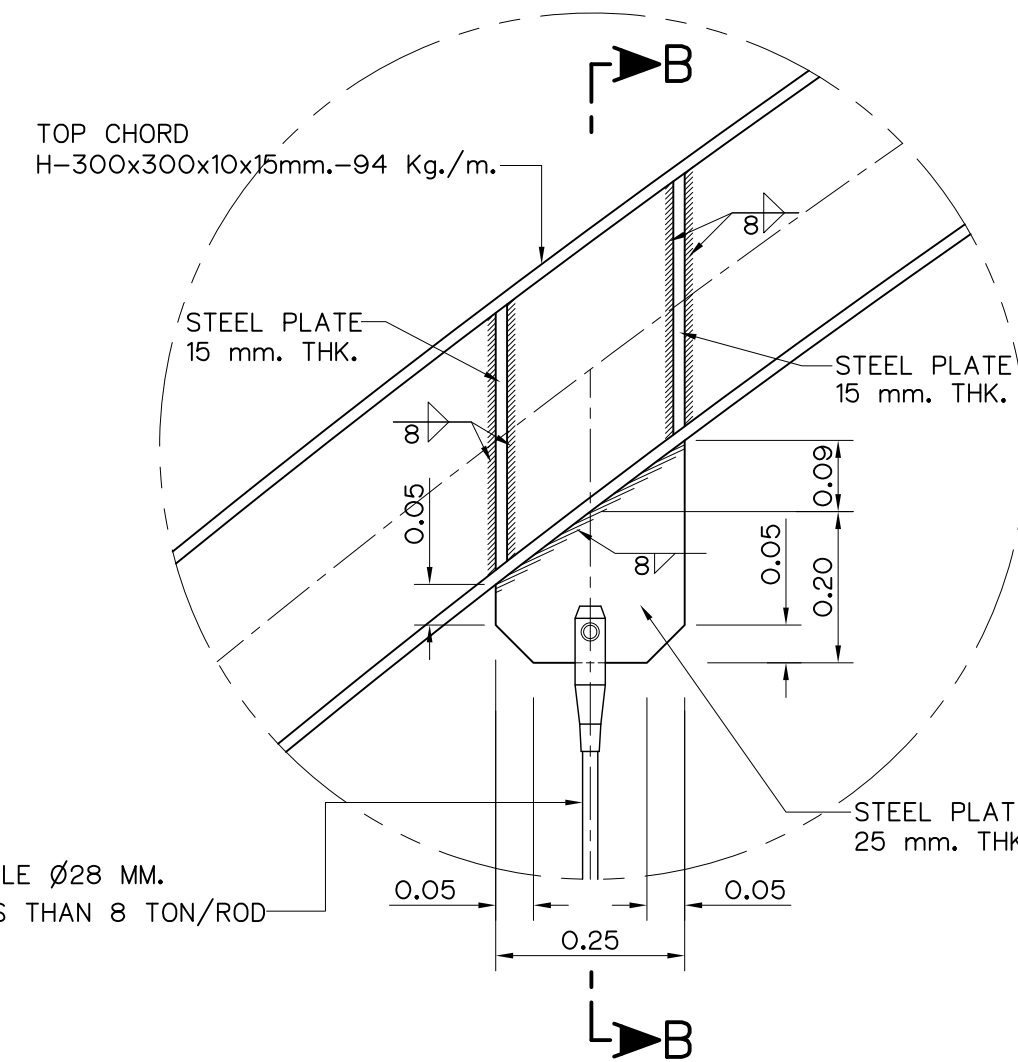
 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUAI LAM SIN HYDROPOWER PROJECT			
CIVIL WORKS			
BRIDGE			
DETAILS (1/2)			
 FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED  221.6651		REVIEWED S.KITICHA	
DRAWN  221.7324		SUBMITTED 	
CHECKED  221.7324		RECOMMENDED 	
 _____ PROJECT MANAGER		DRAWING NO. HLS-BR-03	
_____ DATE		SHEET NO. 74 OF 78	



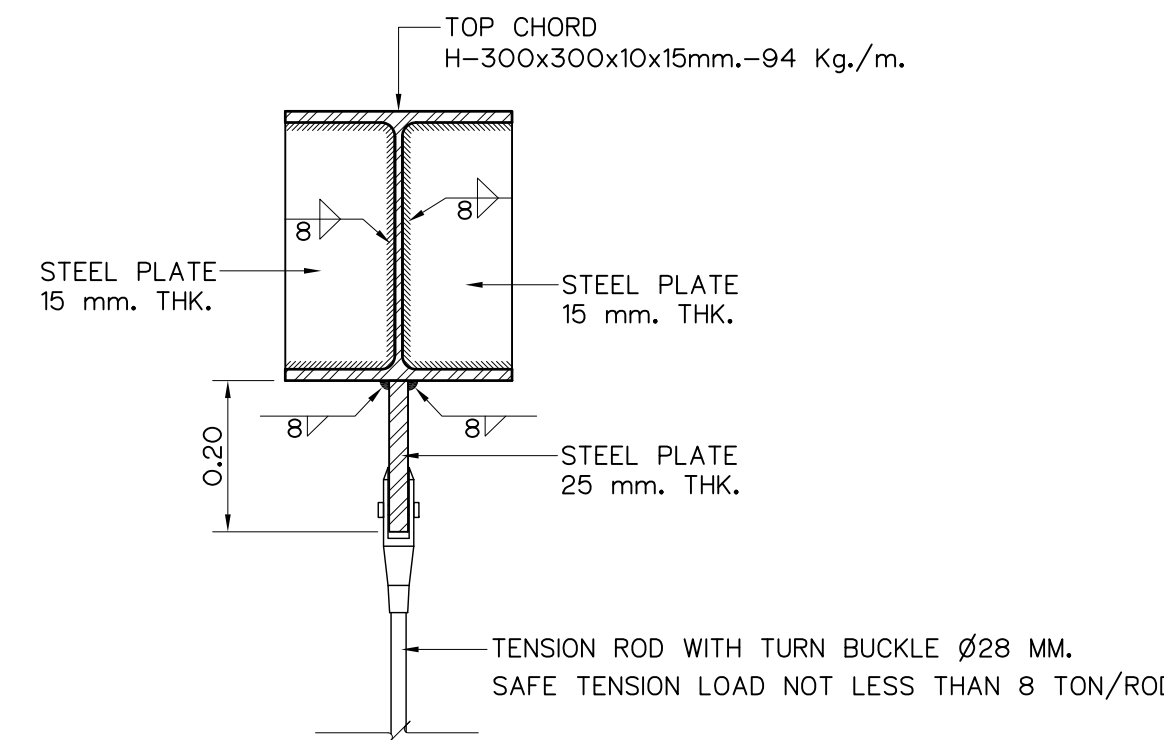
DETAIL "6"
SCALE 1:10



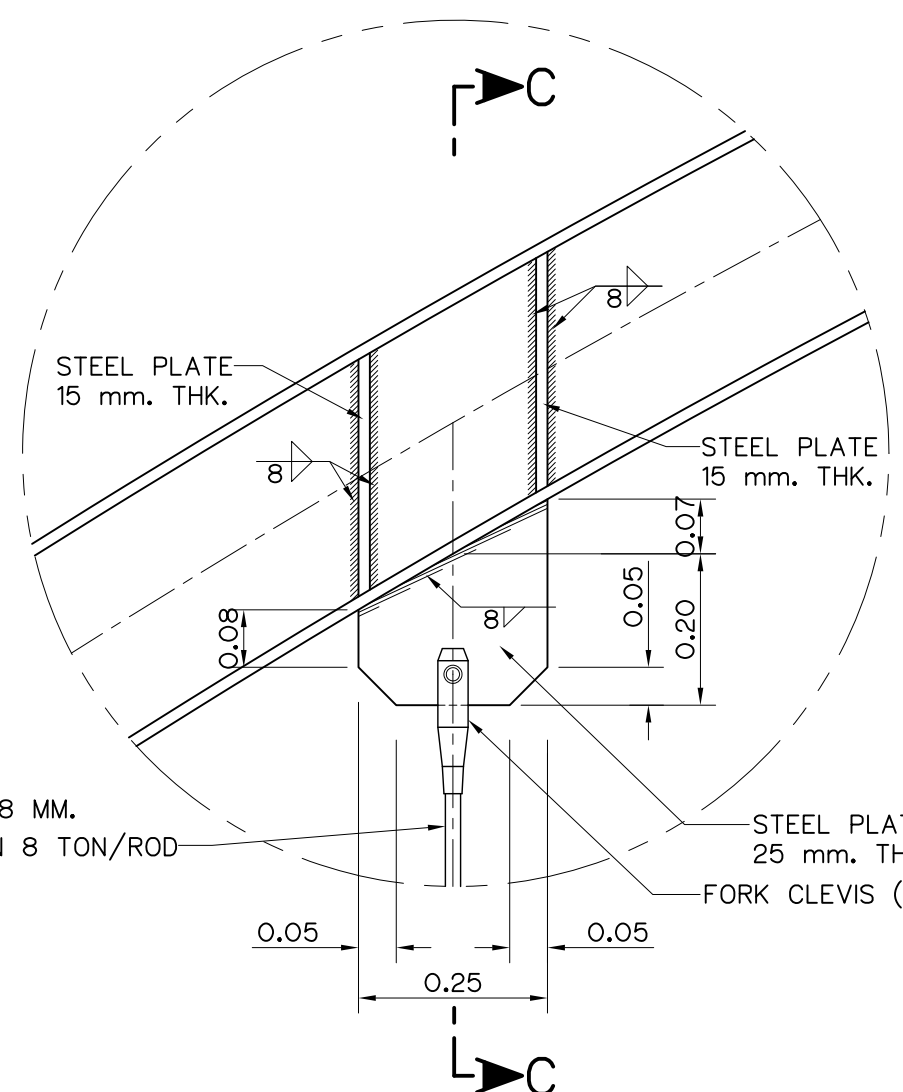
SECTION A-A
SCALE 1:10



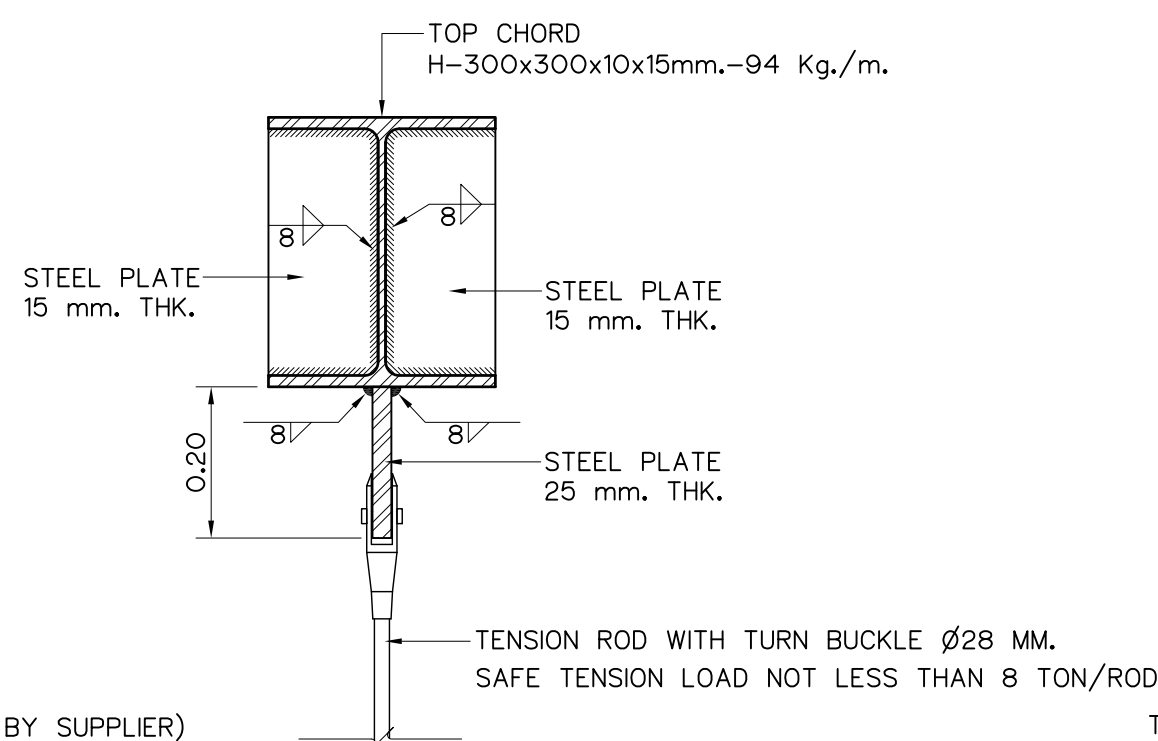
DETAIL "7"
SCALE 1:10



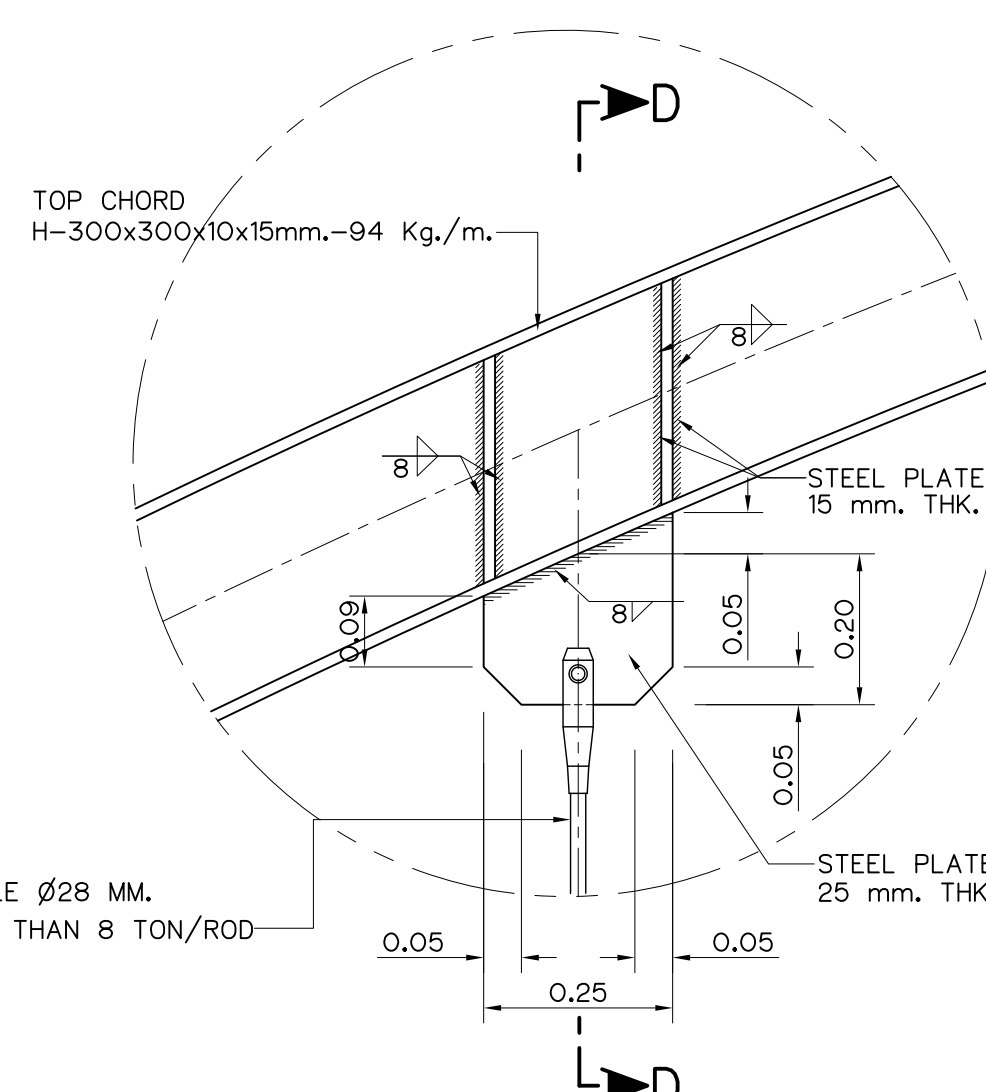
SECTION B-B
SCALE 1:10



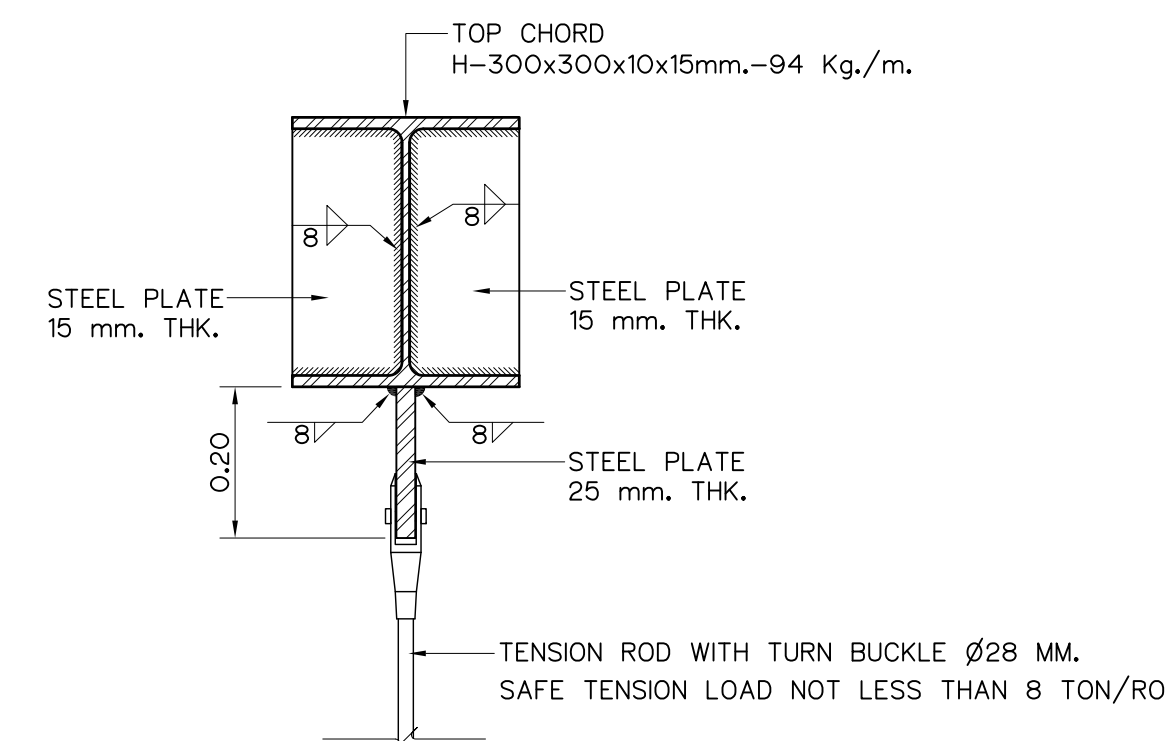
DETAIL "8"
SCALE 1:10



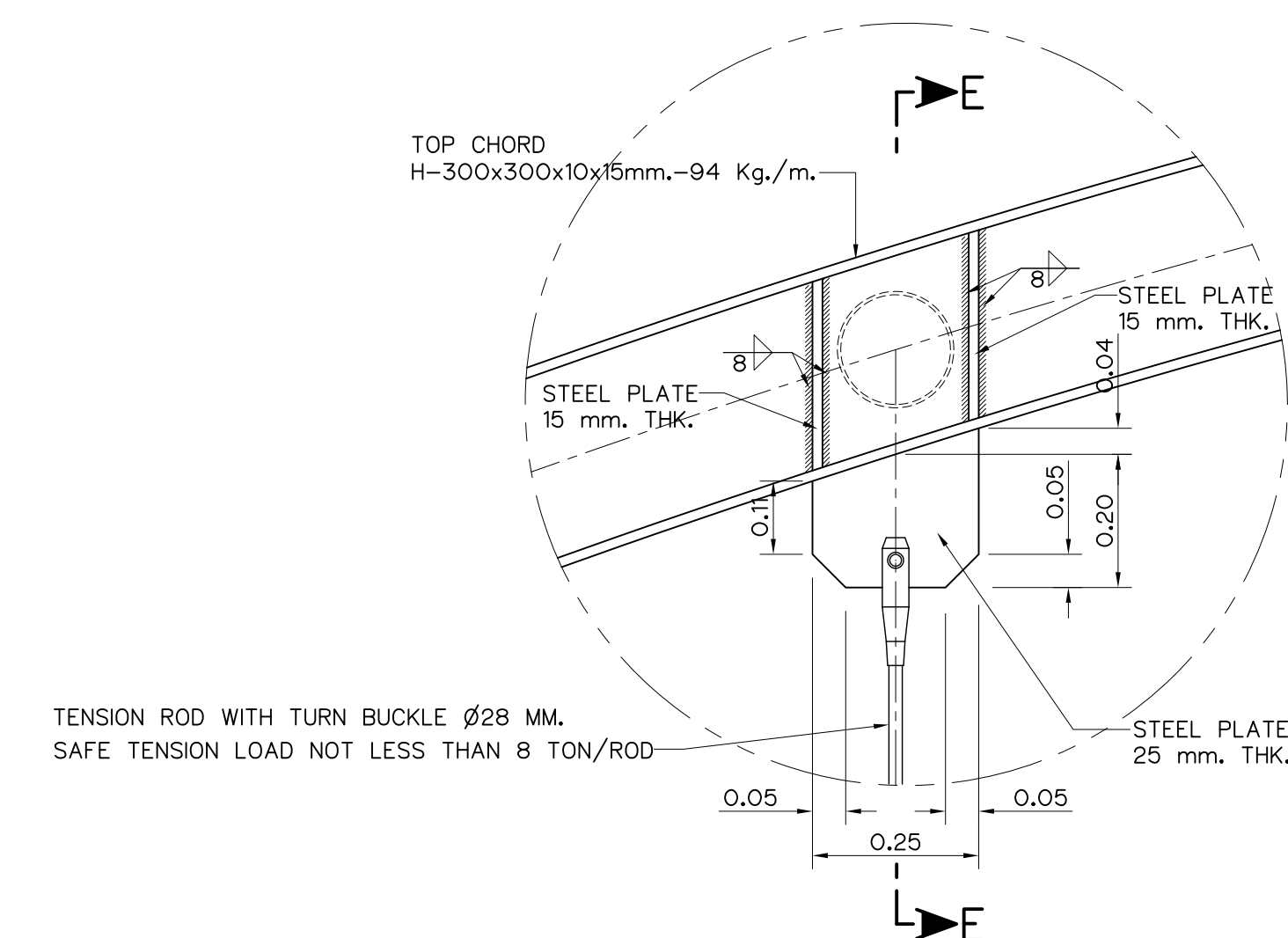
SECTION C-C
SCALE 1:10



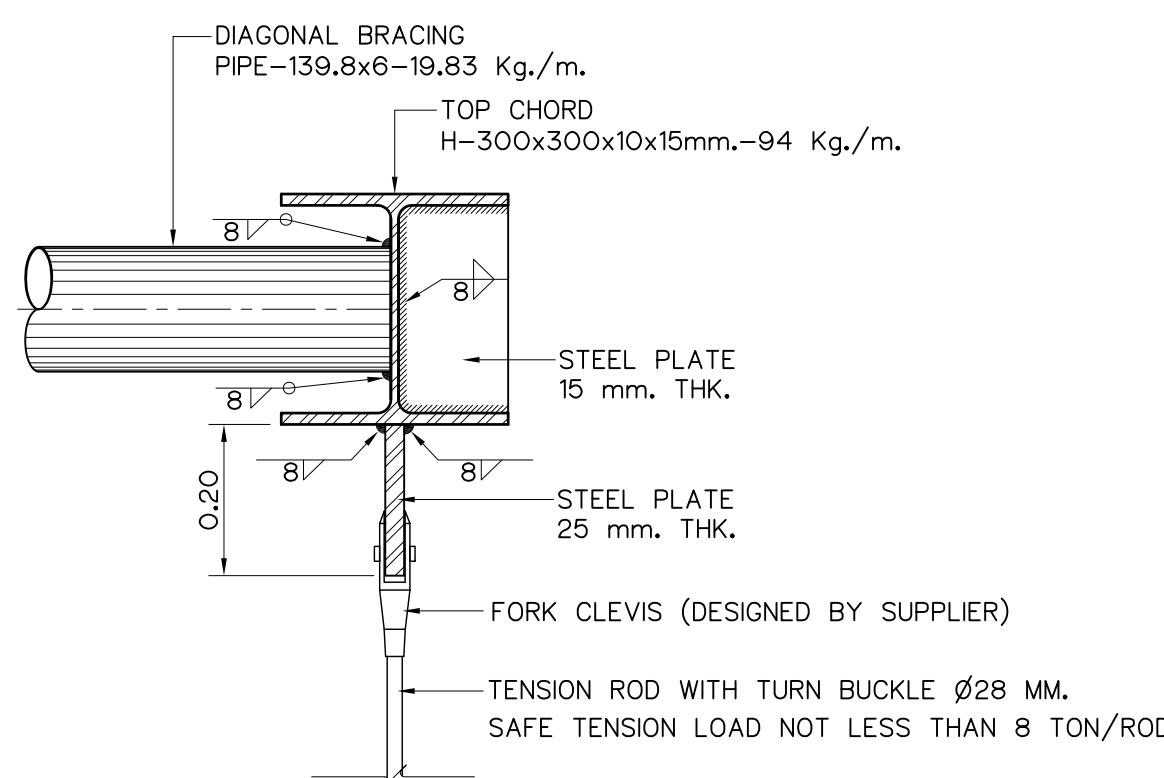
DETAIL "9"
SCALE 1:10



SECTION D-D
SCALE 1:10



DETAIL "10"
SCALE 1:10



SECTION E-E
SCALE 1:10

NOTES :

- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
- 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
- WELDING ELECTRODE SHALL CONFORM TO ASTM STANDARD TYPE E70.

REFERENCE DRAWINGS :

- BRIDGE, PLAN AND SECTIONS HLS-BR-02

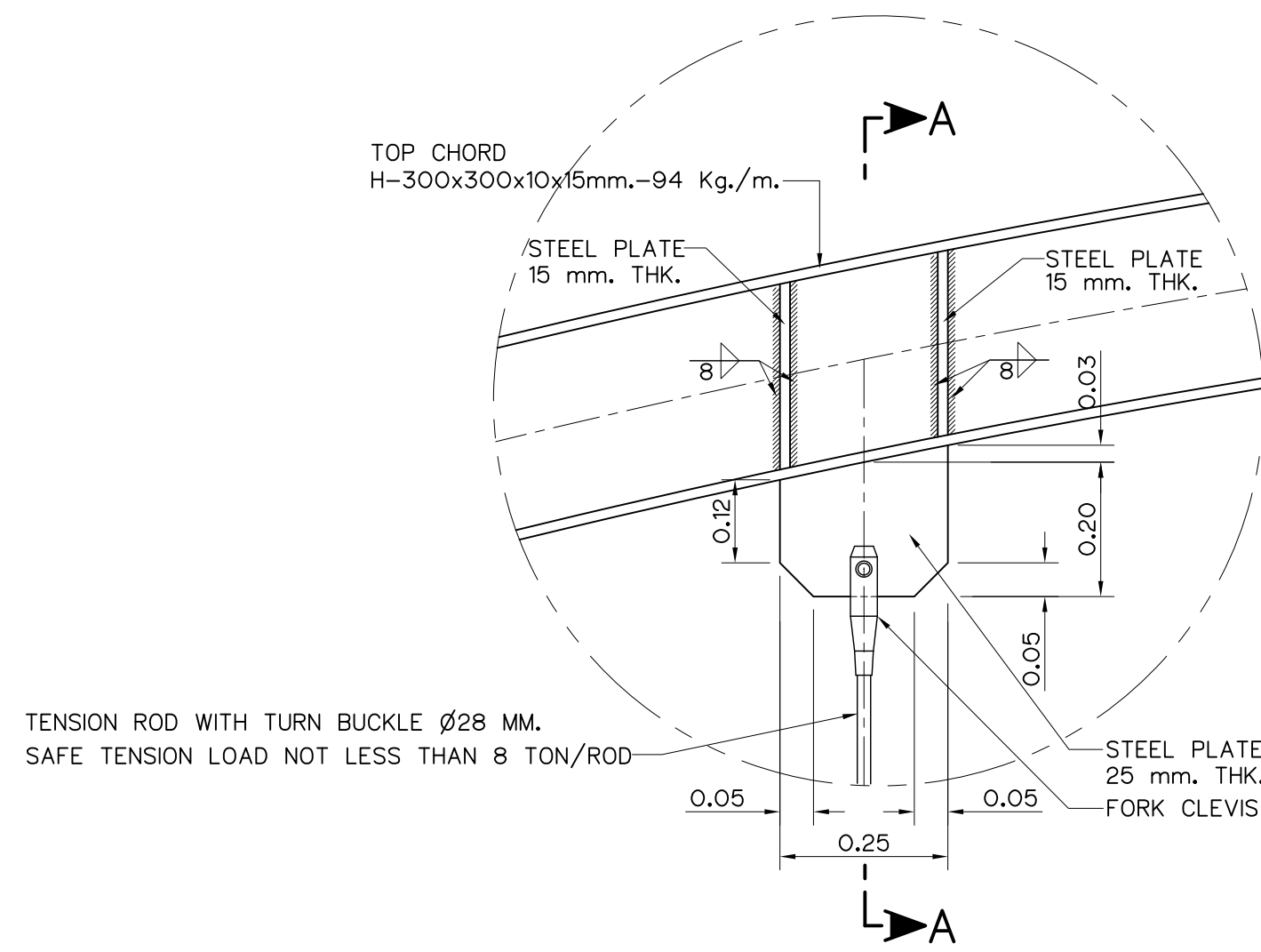
0 0.1 0.2 0.4 0.6 0.8
SCALE 1:10 METERS

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

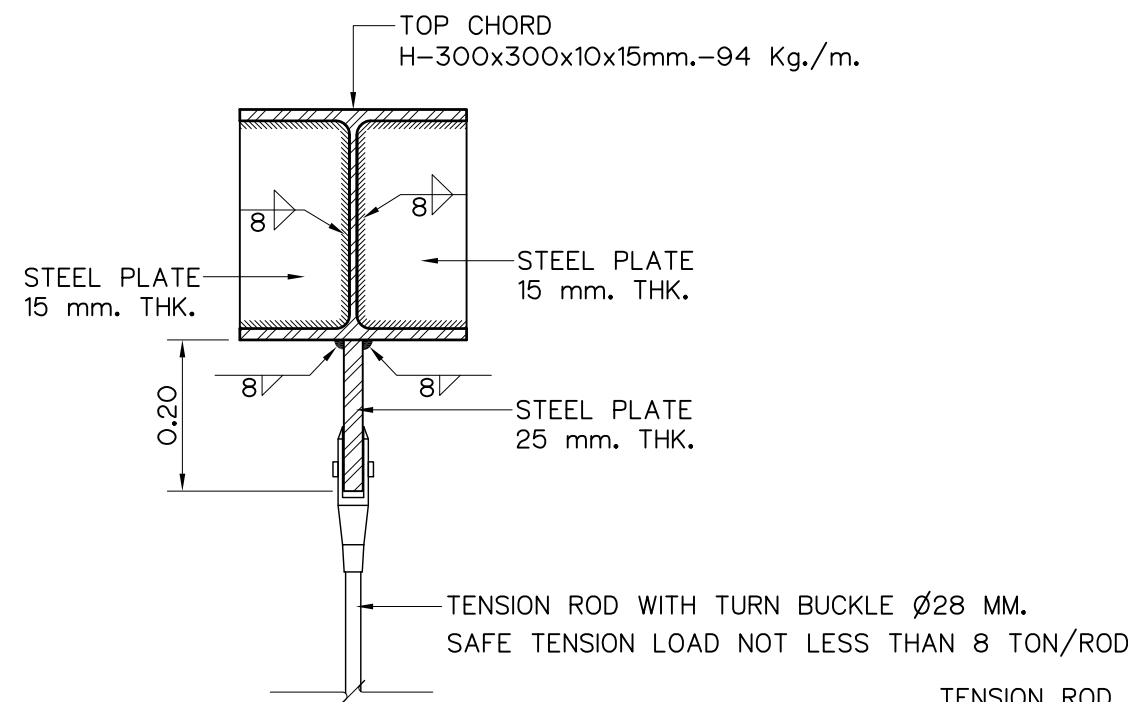
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
BRIDGE
DETAILS (2/2)

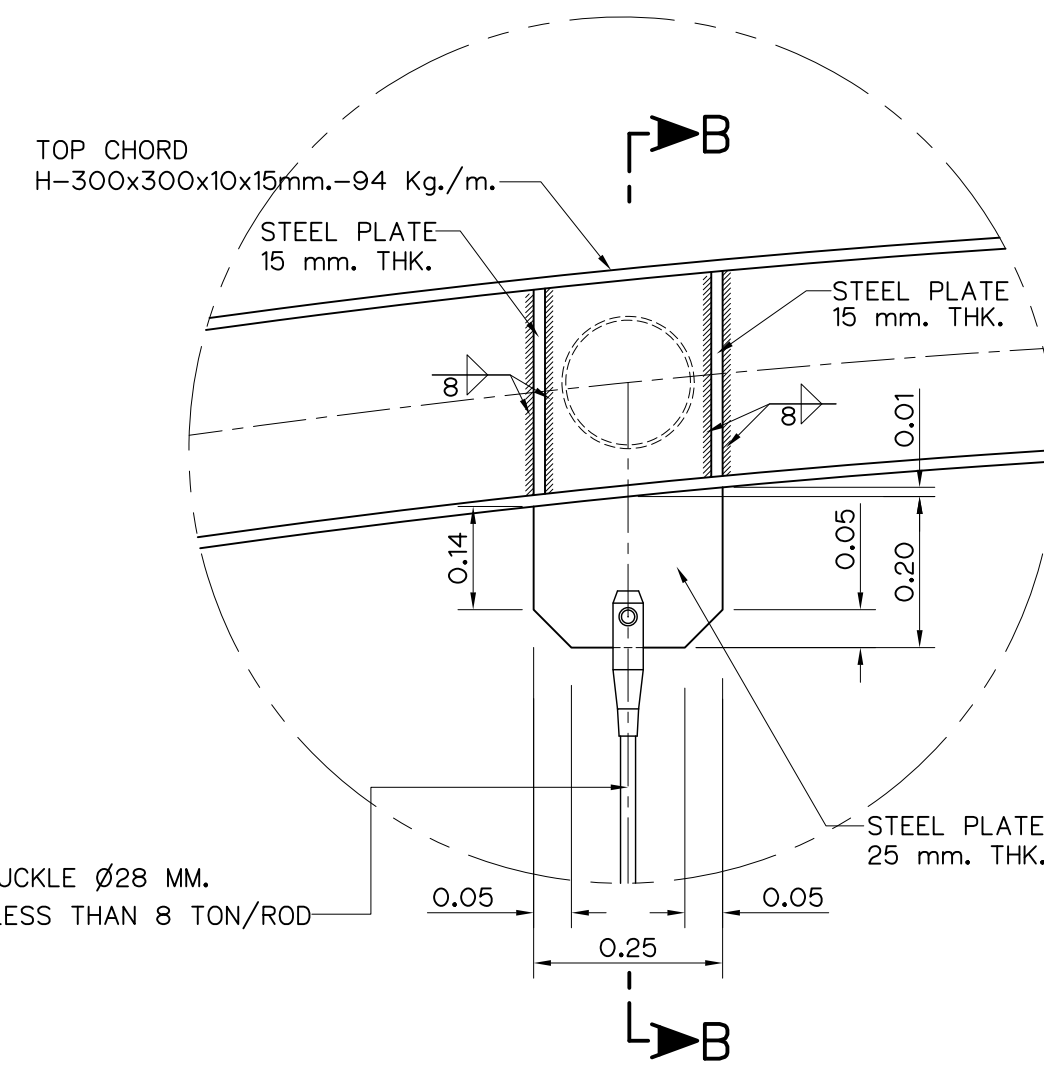
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
REVIEWED 3, KTIKHAJ		SUBMITTED	
DESIGNED 2, 26.651		RECOMMENDED 2, 26.651	
DRAWN 2, 26.651		APPROVED 2, 26.651	
NO. DATE REVISIONS CHECKED APPROVED		14/01/62 DATE	
CONSULTANTS		DEDE	
PROJECT MANAGER		HLS-BR-04	
SHEET NO. 75 OF 78			



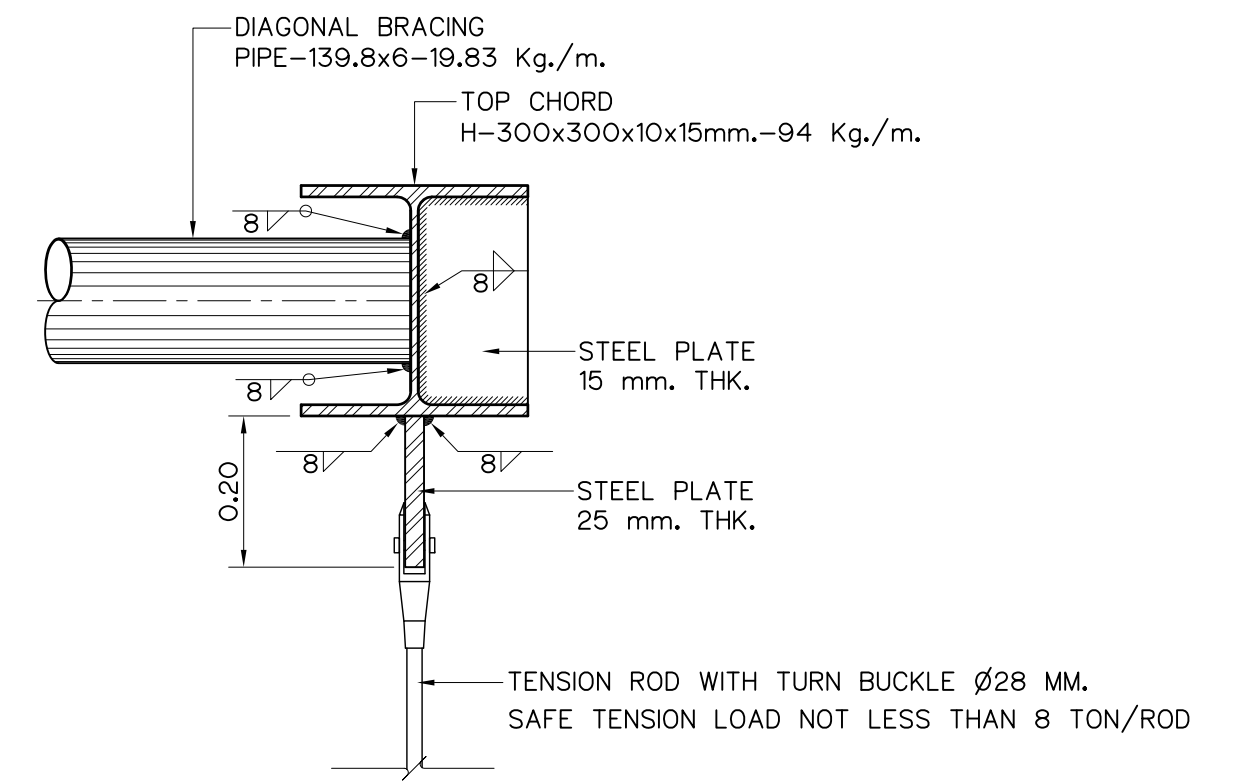
DETAIL "11"
SCALE 1:10



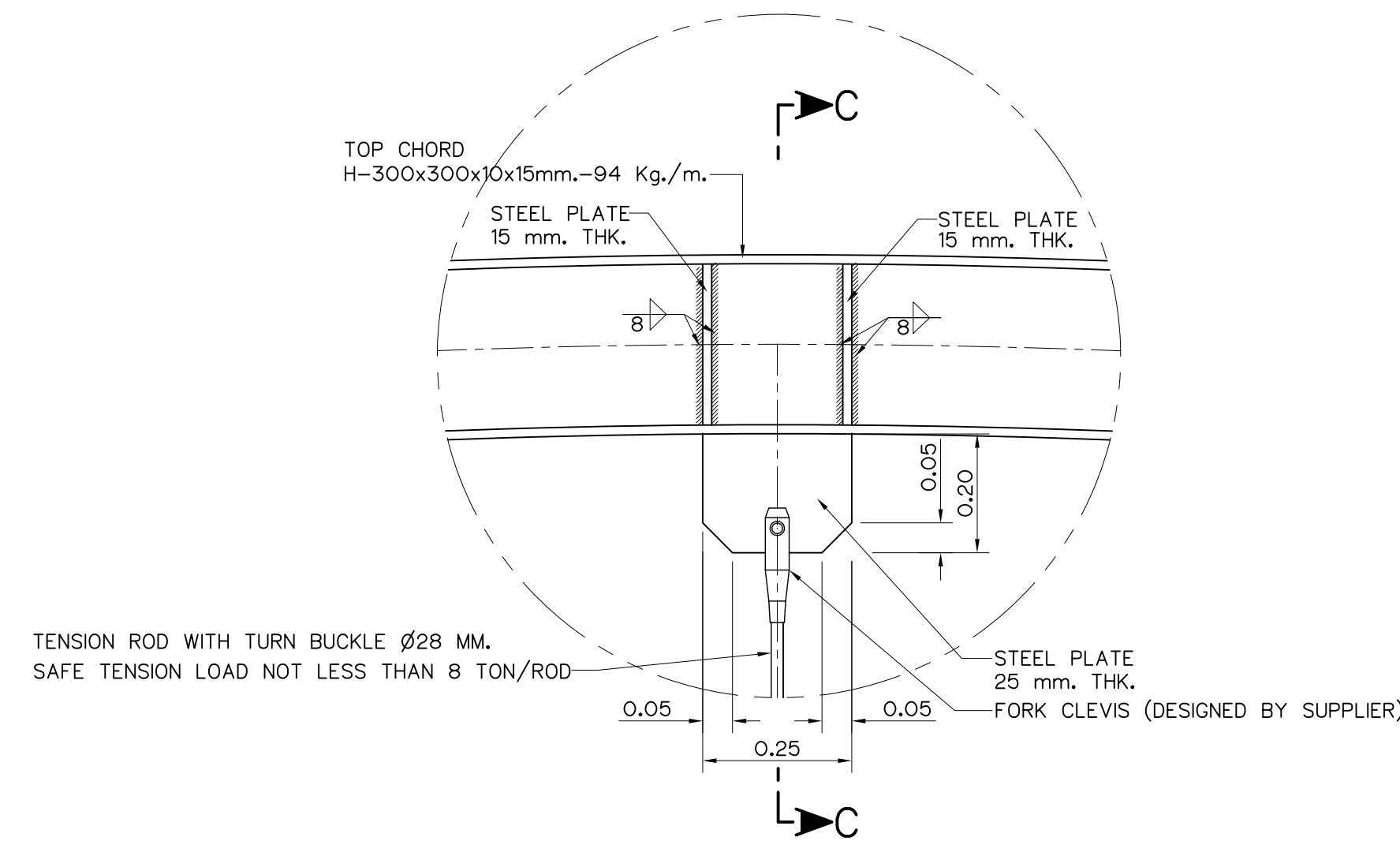
SECTION A-A
SCALE 1:10



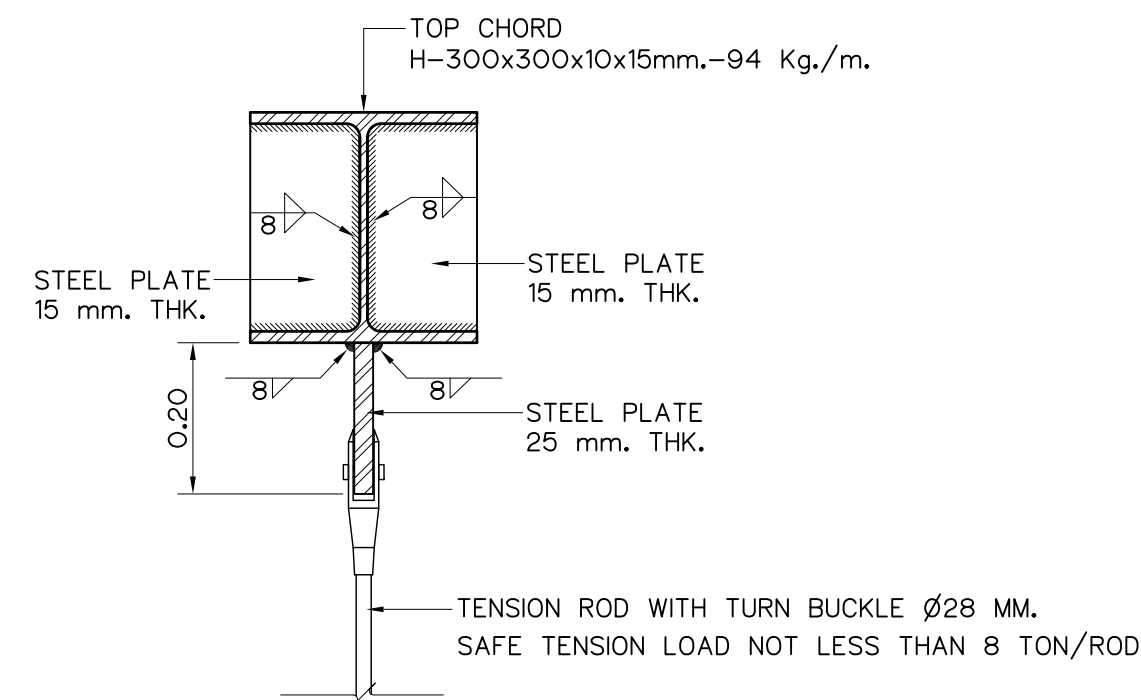
DETAIL "12"
SCALE 1:10



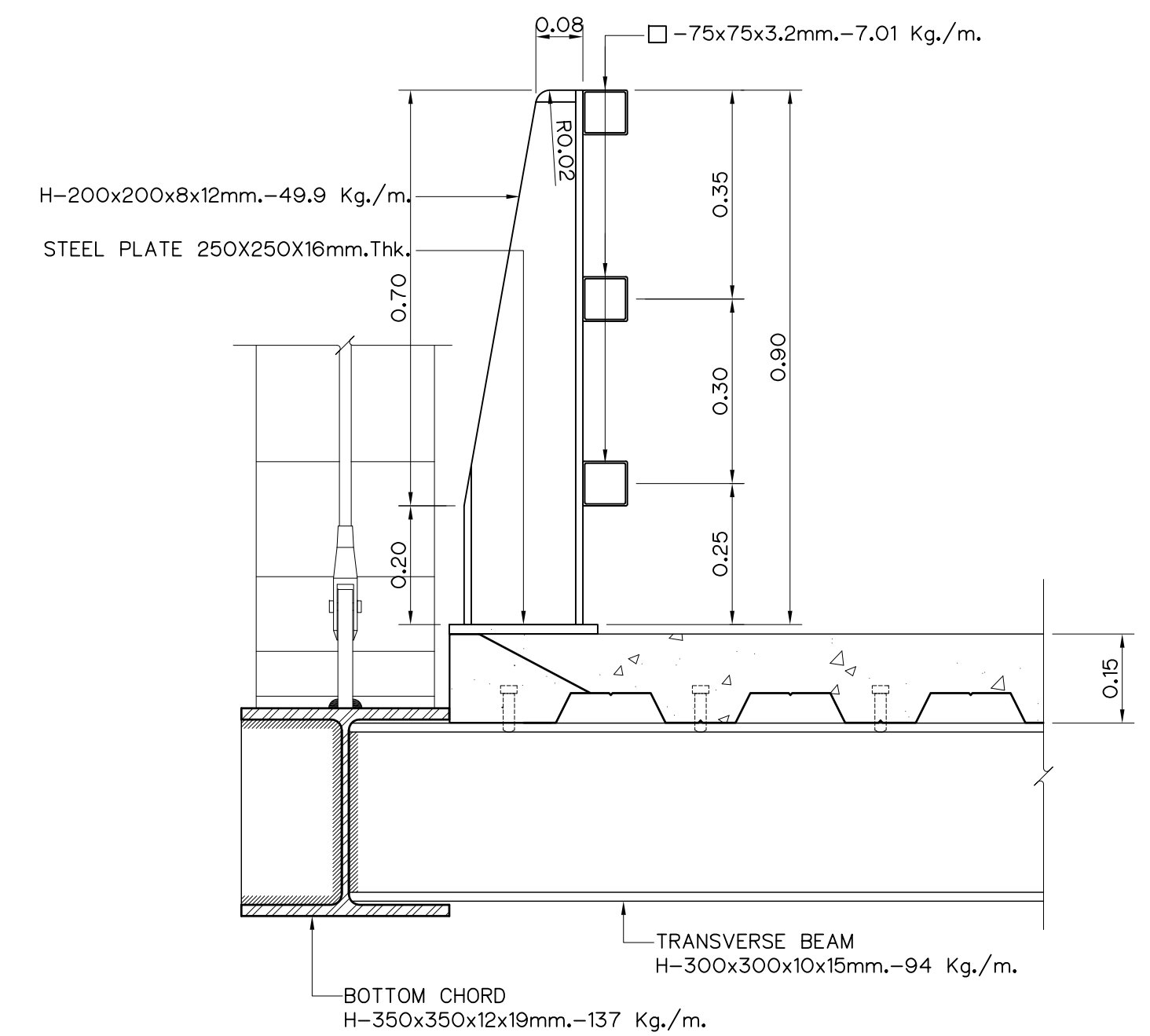
SECTION B-B
SCALE 1:10



DETAIL "13"
SCALE 1:10



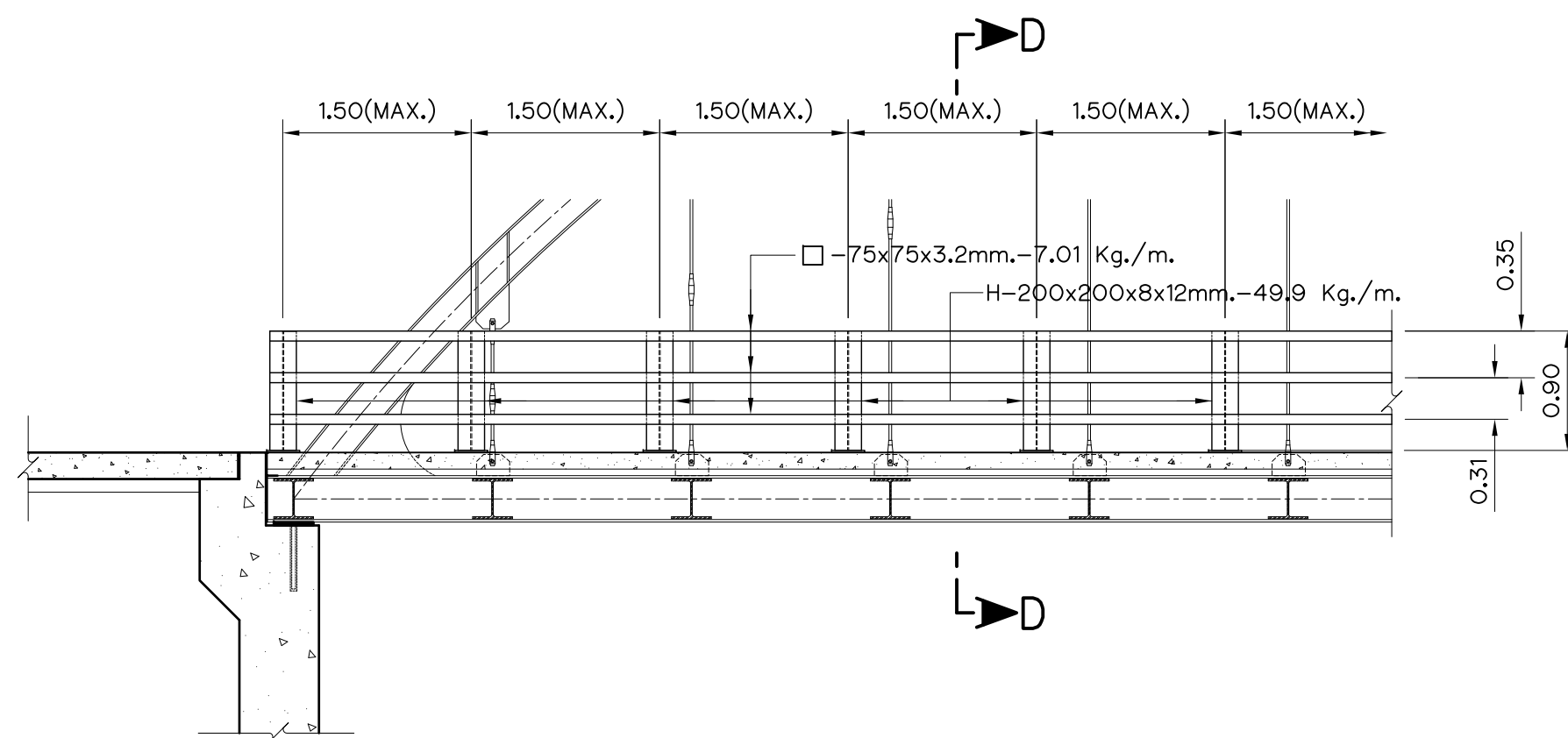
SECTION C-C
SCALE 1:10



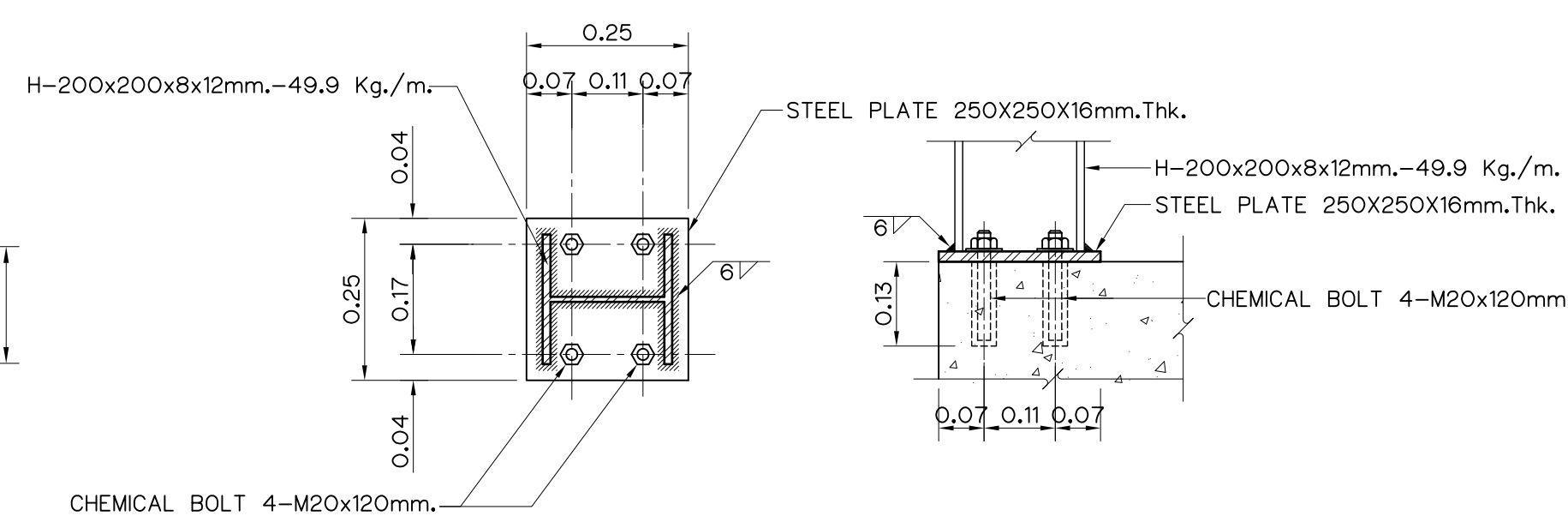
SECTION D-D
SCALE 1:10

- NOTES :
- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
 - SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. HLS-GN-03
 - 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
 - WELDING ELECTRODE SHALL CONFORM TO ASTM STANDARD TYPE E70.

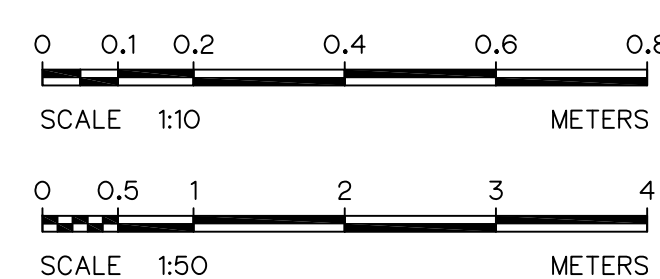
- REFERENCE DRAWINGS :
- BRIDGE, PLAN AND SECTIONS HLS-BR-02



HANDRAIL
SCALE 1:50

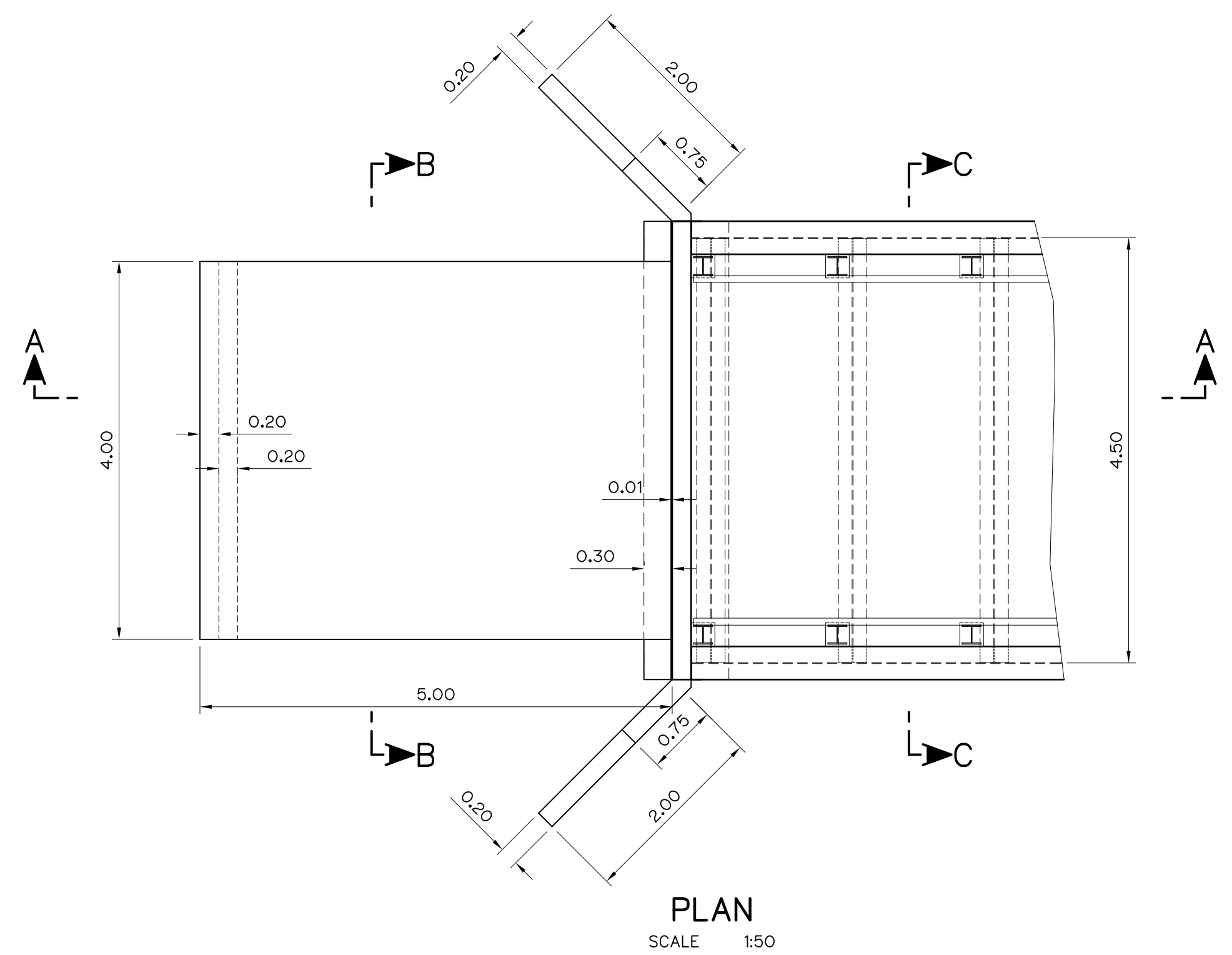


INSTALLATION DETAIL
SCALE 1:10

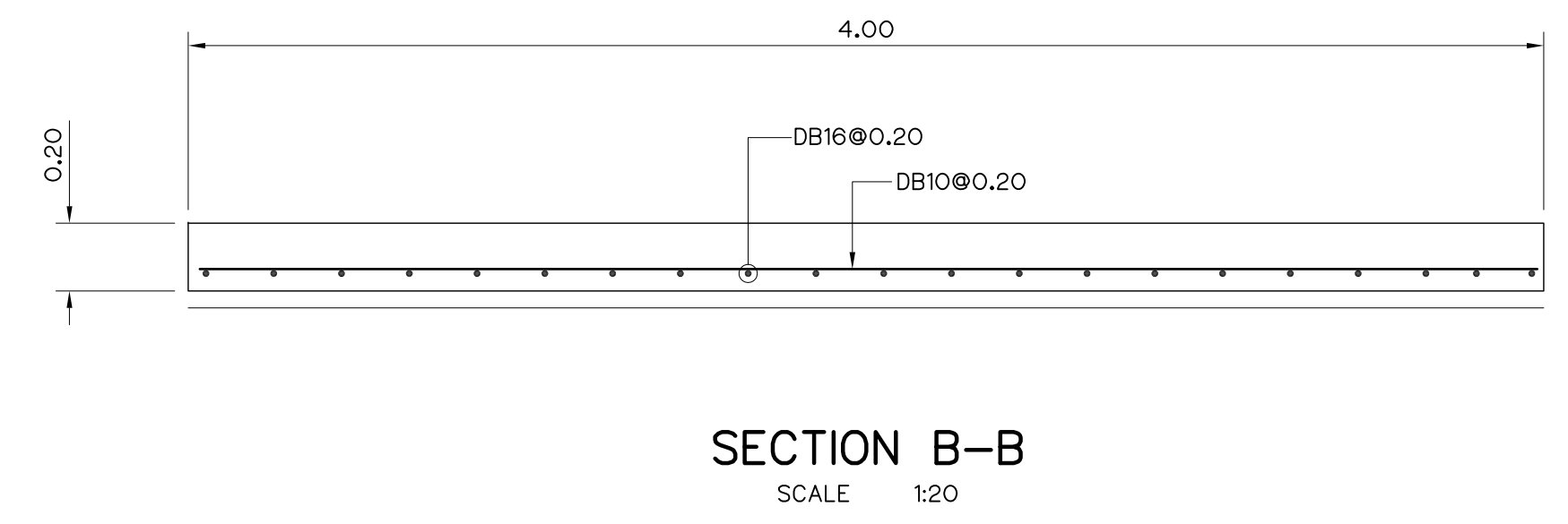


3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

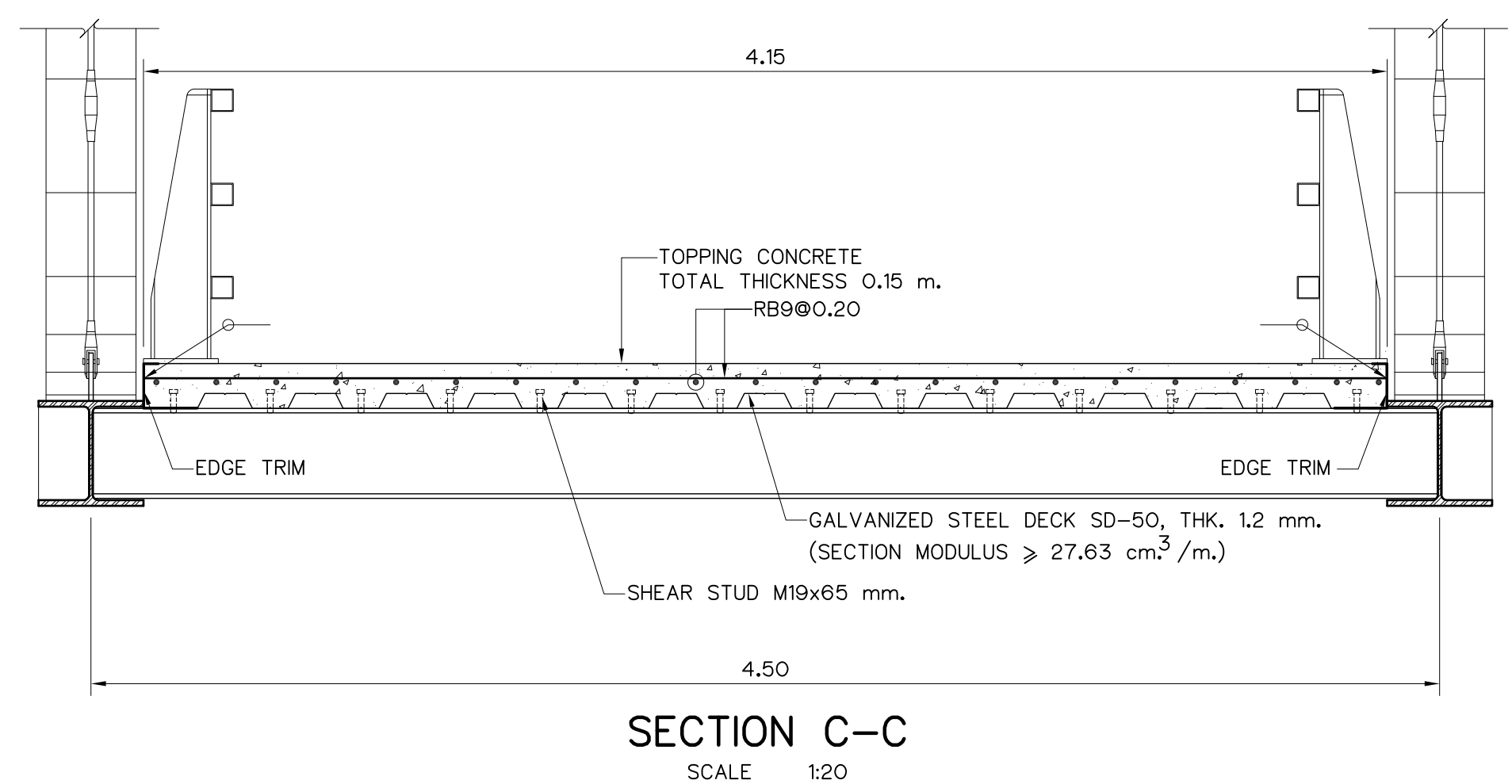
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			HUAI LAM SIN HYDROPOWER PROJECT		
CIVIL WORKS			BRIDGE		
HANDRAIL AND DETAILS			FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		
DESIGNED			REVIEWED S.KTICHAJ		
DRAWN			SUBMITTED		
CHECKED			RECOMMENDED		
APPROVED			APPROVED		
CONSULTANTS			DEDE		
PROJECT MANAGER			14/01/62 DATE		
HLS-BR-05			SHEET NO. 76 OF 78		



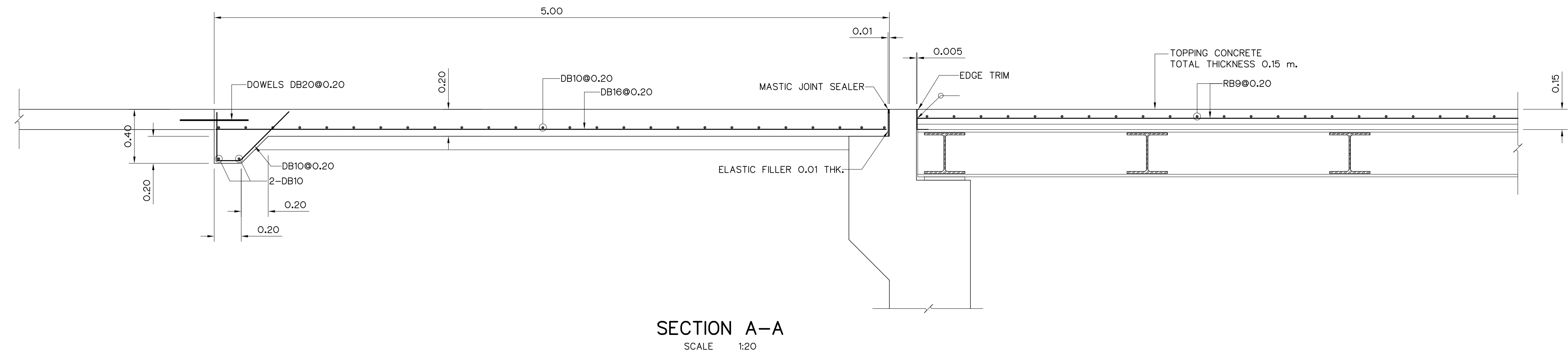
PLAN
SCALE 1:50



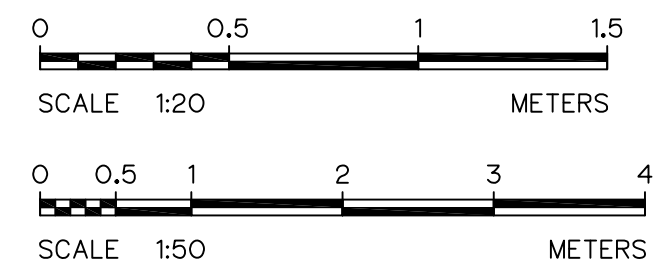
SECTION B-B
SCALE 1:20



SECTION C-C
SCALE 1:20



SECTION A-A
SCALE 1:20



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

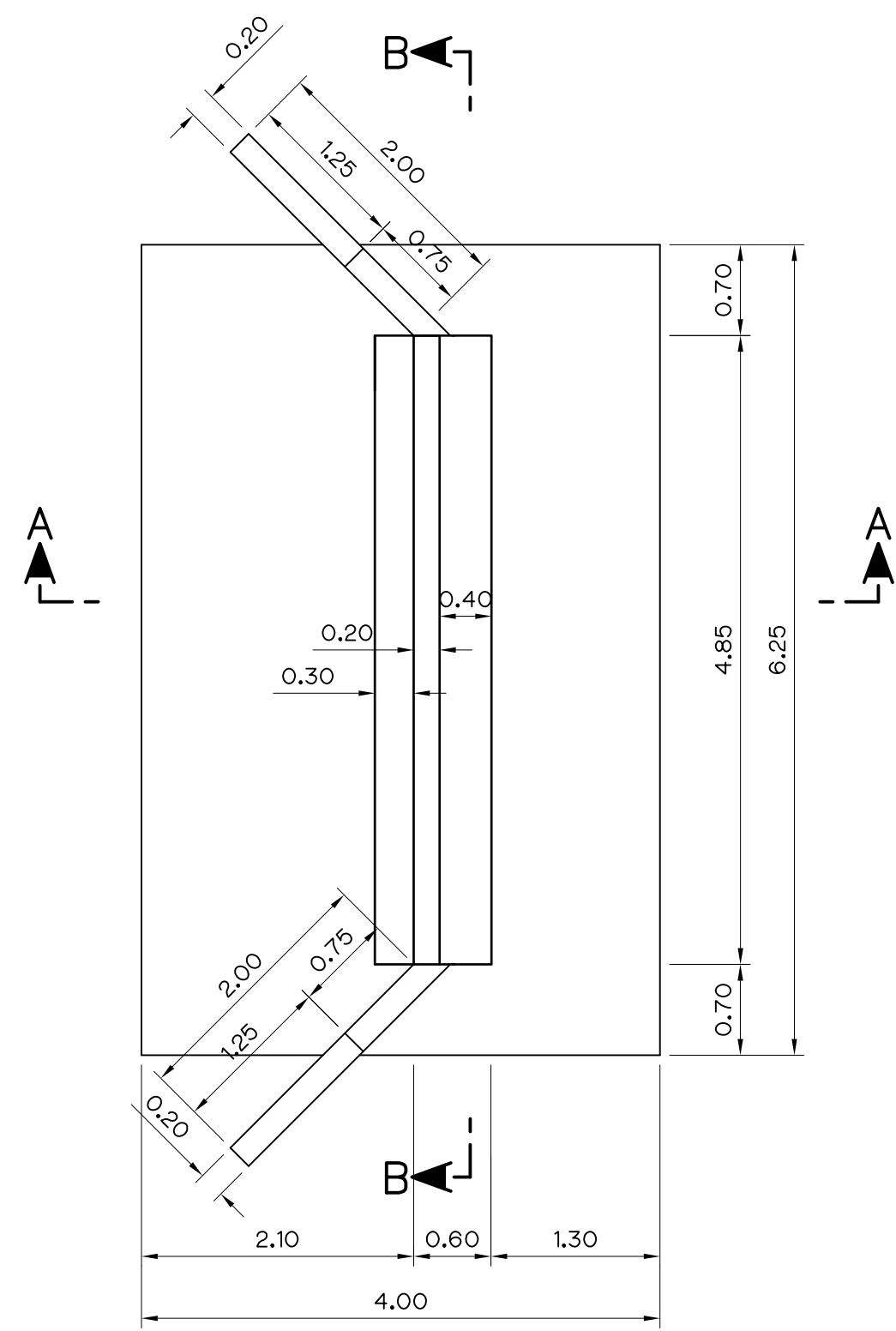
3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS			DEDE	

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

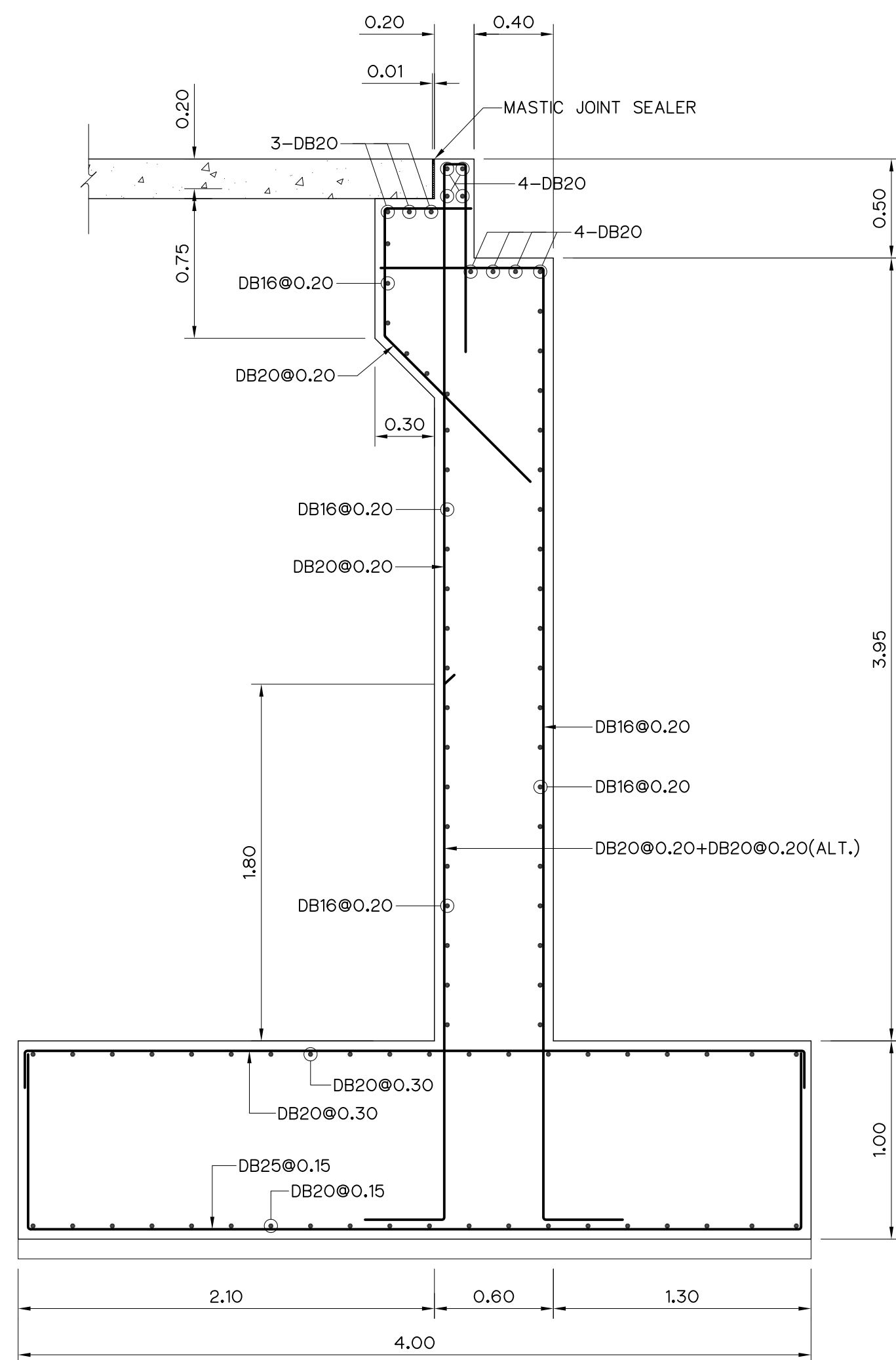
HUAI LAM SIN HYDROPOWER PROJECT

CIVIL WORKS
BRIDGE
SLAB REINFORCEMENT DETAILS

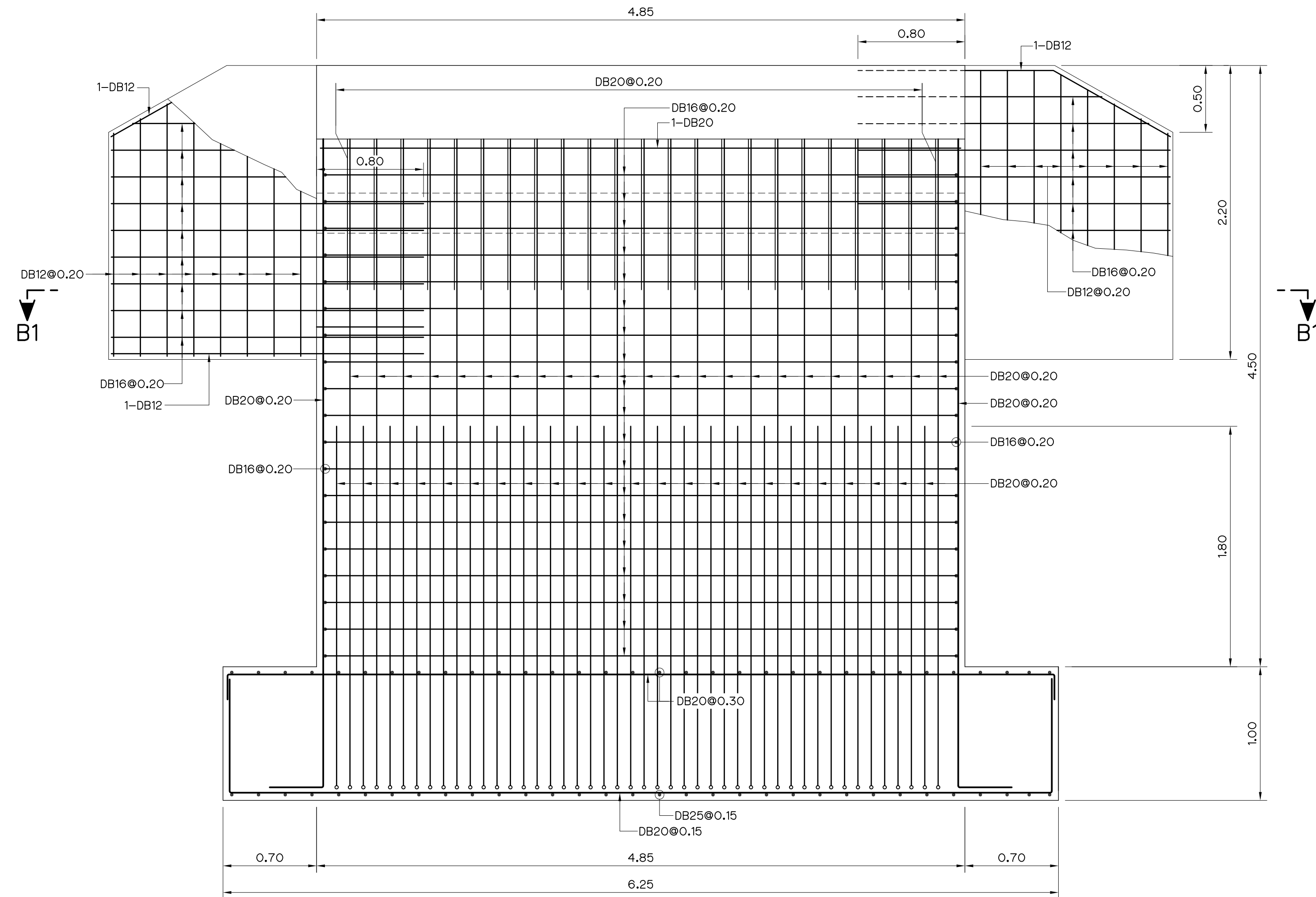
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	REVIEWED S.KITIKHAJ
DESIGNED 21.6651	SUBMITTED
DRAWN 21.6651	RECOMMENDED
CHECKED 21.7324	APPROVED
PROJECT MANAGER 14/01/62 DATE	DRAWING NO. HLS-BR-06 SHEET NO. 77 OF 78



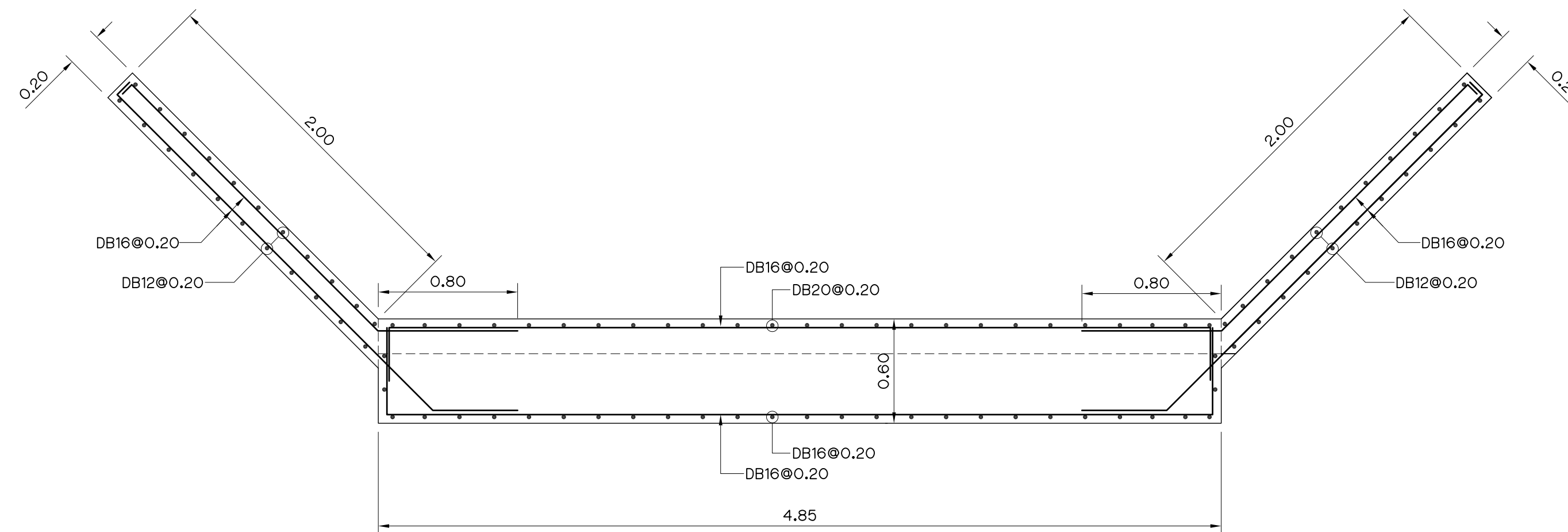
PLAN
SCALE 1:50



SECTION A-A
SCALE 1:25



SECTION B-B
SCALE 1:25



SECTION B1-B1
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/M²

REFERENCE DRAWINGS :

1. BRIDGE, PLAN AND SECTIONS

HLS-BR-02

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
		CONSULTANTS	DEDE	

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
HUA I 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	
DESIGNED		REVIEWED S.KITIKHAJ	
DRAWN		SUBMITTED	
CHECKED		RECOMMENDED	
PROJECT MANAGER		APPROVED	
14/01/62		DRAWING NO.	
DATE		HLS-BR-07	
		SHEET NO.	
		78 OF 78	