



Department of Alternative
Energy Development and Efficiency
MINISTRY OF ENERGY

LAM PHRA PHLOENG HYDROPOWER PROJECT

AMPHOE PAK THONG CHAI CHANGWAT NAKORN RATCHASIMA

CIVIL WORKS

VOLUME 4

DRAWINGS

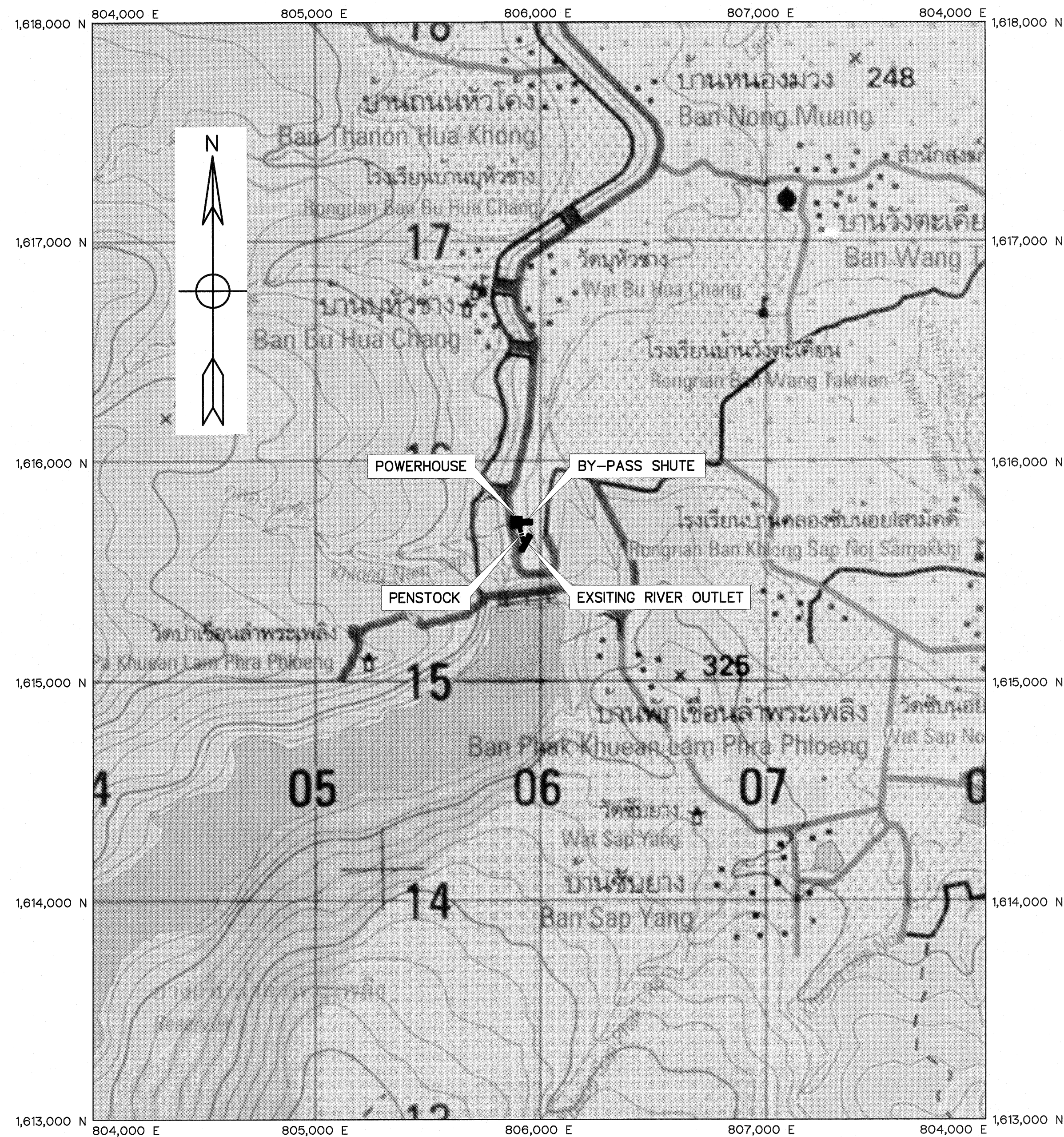


FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

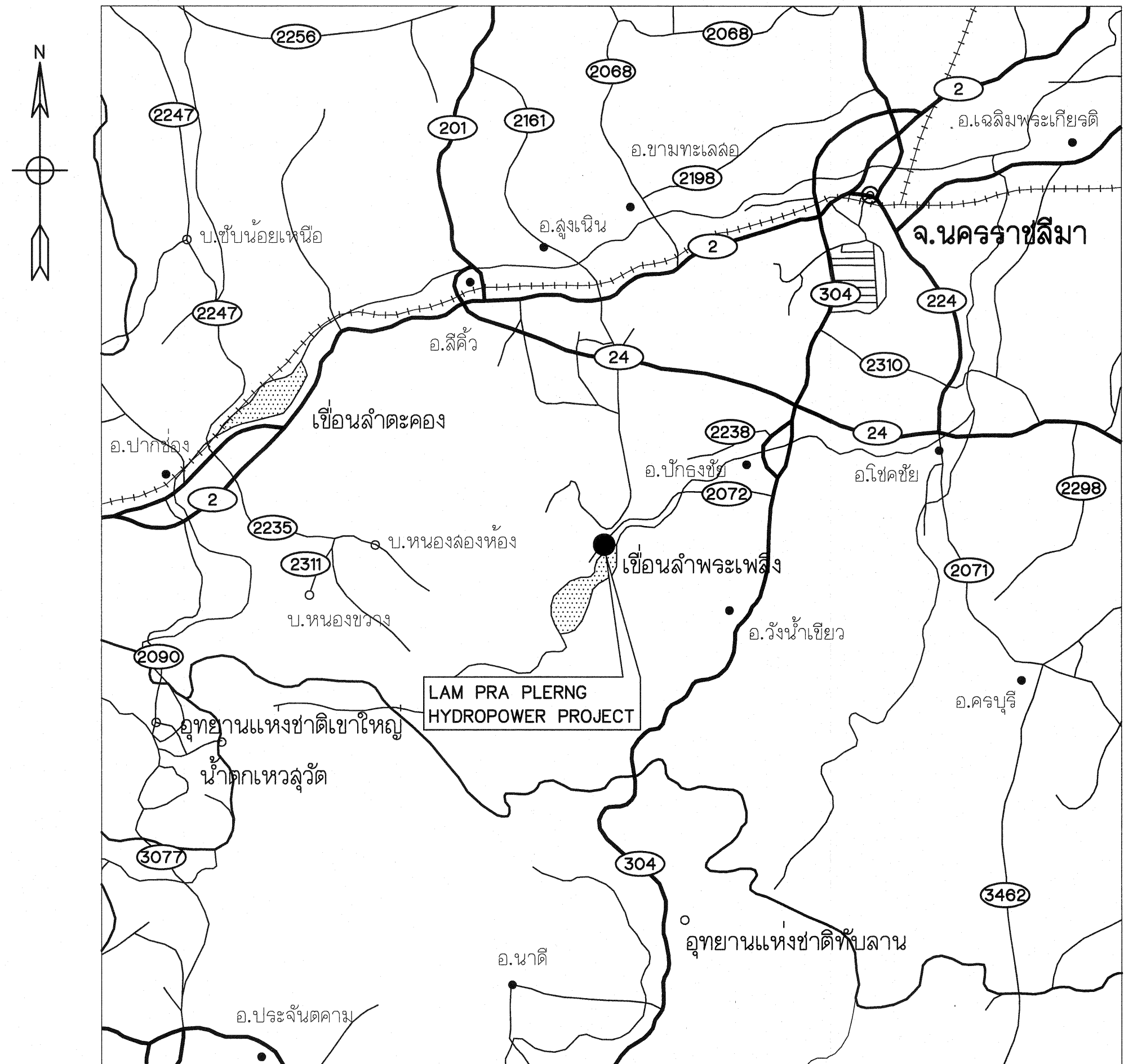
LAM PHRA PHLOENG HYDROPOWER PROJECT
CONTRACT C1 : LIST OF DRAWINGS

SHEET NO.	DRAWING NO.	DRAWING DETAILS
GENERAL		
1	LPP-GN-01	LOCATION MAP AND PROJECT AREA MAP
2	LPP-GN-02	PROJECT MAP
3	LPP-GN-03	SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES
4	LPP-GN-04	HYDROLOGY DATA
5	LPP-GN-05	HYDRAULIC GRADE LINE
6	LPP-GN-06	GEOLOGICAL DATA
PENSTOCK		
7	LPP-PS-01	PLAN AND PROFILE, STA. 0+000 TO STA. 0+034.000
8	LPP-PS-02	ANCHOR BLOCK PLAN ,SECTIONS, AND REINFORCEMENT DETAILS
9	LPP-PS-03	PIER & BEND PLAN, SECTIONS AND REINFORCEMENT DETAILS
10	LPP-PS-04	STEEL PIPE SUPPORT ELEVATIONS, SECTION & DETAILS
11	LPP-PS-05	EXPANSION JOINT, PLAN, SECTIONS AND DETAILS
12	LPP-PS-06	WELDING DETAILS
13	LPP-PS-07	WYE, PLAN, SECTIONS AND DETAILS
POWER HOUSE		
14	LPP-PH-01	GENERAL LAY-OUT
15	LPP-PH-02	GROUND FLOOR PLAN & ROOF PLAN
16	LPP-PH-03	ELEVATIONS
17	LPP-PH-04	SECTION A-A
18	LPP-PH-05	SECTION B-B , C-C
19	LPP-PH-06	ROOF TRUSS AND MISSCALLANEOUS DETAILS
20	LPP-PH-07	DETAIL OF DOORS, WINDOWS AND NAMEPLATE
21	LPP-PH-08	DETAILS OF TOILET AND SEPTIC TANK
22	LPP-PH-09	STRUCTURAL PLAN
23	LPP-PH-10	REINFORCEMENT DETAILS
24	LPP-PH-11	FOUNDATION REINFORCEMENT DETAILS
25	LPP-PH-12	CABLE TRENCH DETAILS
26	LPP-PH-13	ELECTRICAL LIGHTING, EXHAUST AND OUTLET PLAN
27	LPP-PH-14	GROUNDING SYSTEM
28	LPP-PH-15	WATER SUPPLY PIPELINE SYSTEM LAY-OUT
29	LPP-PH-16	PIT VALVE, FIELD TAP AND SUBDRAIN DETAILS
30	LPP-PH-17	CONCRETE PAVEMENT DETAILS

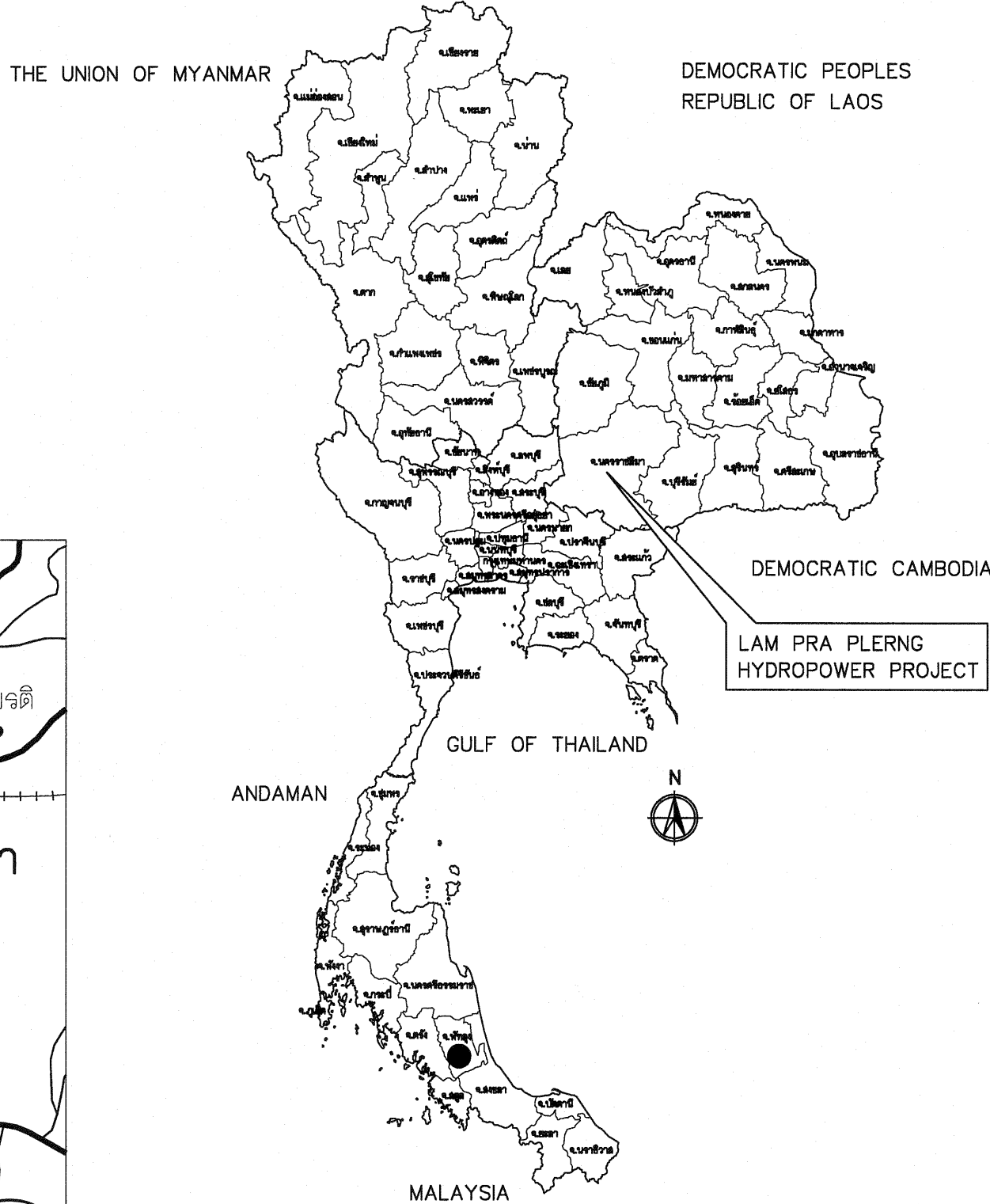
SHEET NO.	DRAWING NO.	DRAWING DETAILS
TAILRACE		
31	LPP-TR-01	GENERAL PLAN, SECTION & DETAILS
32	LPP-TR-02	SECTIONS
33	LPP-TR-03	REINFORCEMENT DETAILS 1/2
34	LPP-TR-04	REINFORCEMENT DETAILS 2/2
35	LPP-TR-05	1.55x1.90 M. SLUICE GATE DETAILS
36	LPP-TR-06	PEDESTAL SCREW LIFT CAPACITY 6.5 TONS
BY-PASS CHUTE		
37	LPP-BC-01	GENERAL PLAN & SECTION
38	LPP-BC-02	SECTIONS
39	LPP-BC-03	HANDRAIL AND LADDER RUNG DETAILS
40	LPP-BC-04	WATERSTOP DETAILS
41	LPP-BC-05	REINFORCEMENT KEY PLAN
42	LPP-BC-06	REINFORCEMENT DETAILS 1/2
43	LPP-BC-07	REINFORCEMENT DETAILS 2/2
44	LPP-BC-08	2.20x2.20 M. SLUICE GATE DETAILS



PROJECT AREA MAP
SCALE 1:15,000



LOCATION MAP
NOT TO SCALE

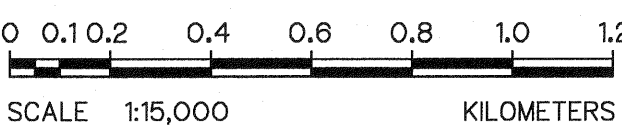


LOCATION MAP
NOT TO SCALE

LEGENDS :

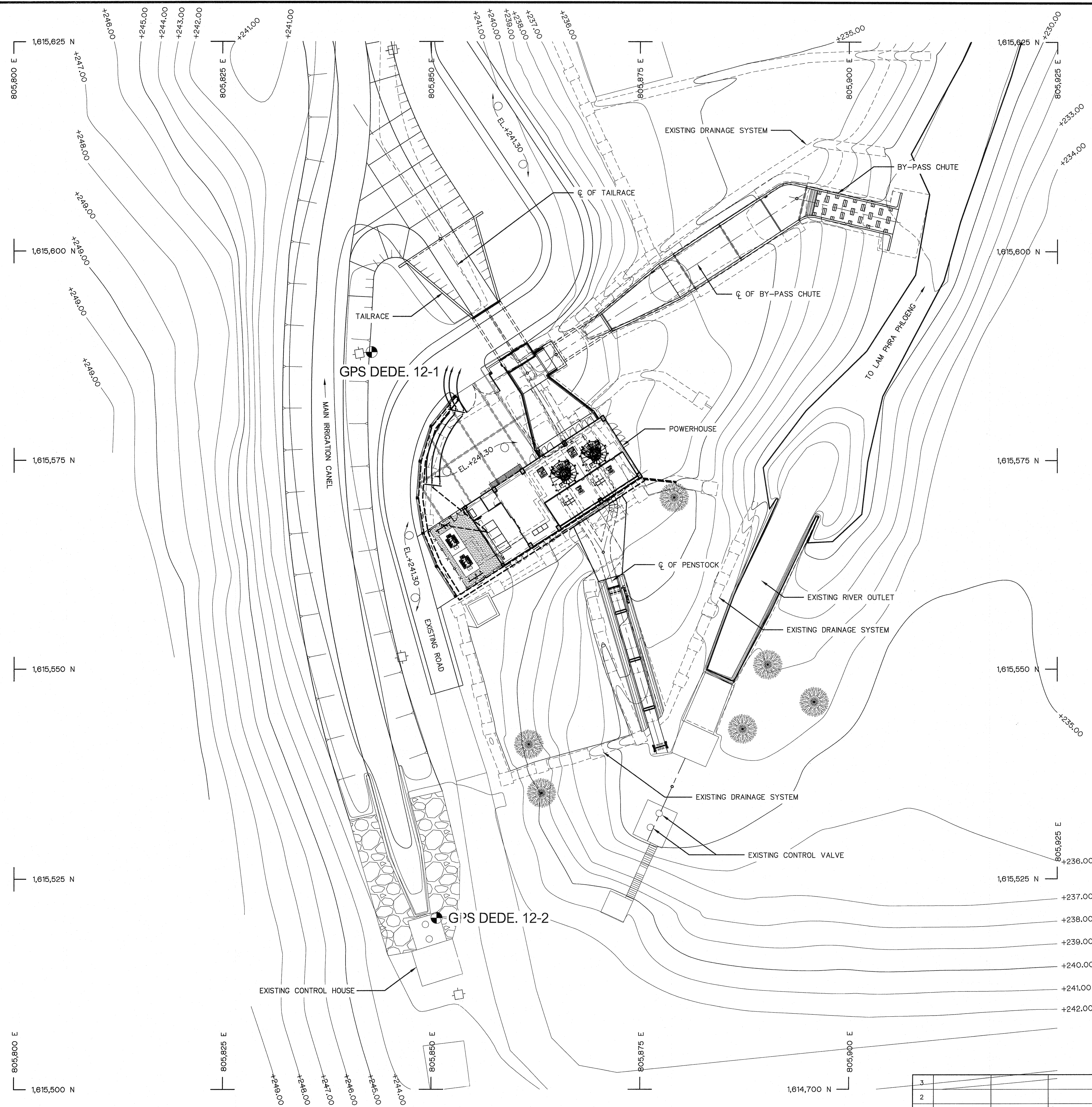
- STREAM
- WEIR
- HEADRACE
- SURGE TANK
- PENSTOCK
- POWERHOUSE

- NOTES :
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
 2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP-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			
LAM PHRA PHLOENG HYDROPOWER PROJECT			
CIVIL WORKS GENERAL LOCATION MAP AND PROJECT AREA MAP			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		REVIEWED & KITCHAI	
DESIGNED	25.6651	SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED	25.7324	APPROVED	
PROJECT MANAGER		DATE	DRAWING NO. SHEET NO.
		14/01/62	LPP-GN-01 1 OF 44



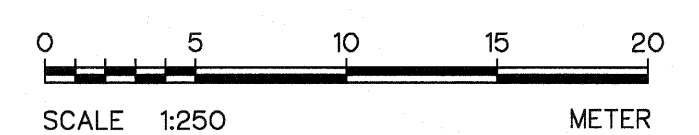
LAYOUT PLAN
SCALE 1:250

BM. DESCRIPTIONS

BM NO.	COORDINATE		ELEVATION M. (MSL.)
	N	E	
GPS DEDE. 12-1	1,615,587.879	805,842.863	241.873
GPS DEDE. 12-2	1,615,520.362	805,850.623	242.716

NOTES :

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



KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
LAM PHRA PHLOENG HYDROPOWER PROJECT			
CIVIL WORKS GENERAL PROJECT MAP			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED <i>[Signature]</i> 281.6651		REVIEWED <i>S. NITICHAI</i>	
DRAWN <i>[Signature]</i>		SUBMITTED <i>[Signature]</i>	
CHECKED <i>[Signature]</i> 281.7324		RECOMMENDED <i>[Signature]</i>	
PROJECT MANAGER		APPROVED <i>[Signature]</i>	
DATE 14/01/62		DRAWING NO. LPP-GN-02	
		SHEET NO. 2 OF 44	

ABBREVIATIONS :

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

SYMBOLS :

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

GENERAL NOTES :

- 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 AMBIGUITY 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. POWERHOUSE
	2. TAILRACE
	3. BY-PASS CHUTE
	4. ANCHOR BLOCK, PIPE SUPPORT
	5. 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 :

- POWERHOUSE $Q_0 = 20 \text{ T/M}^2$
- PENSTOCK $Q_0 = 20 \text{ T/M}^2$

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
		CONSULTANTS		DEDE

 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
LAM PHRA PHLOENG HYDROPOWER PROJECT	
CIVIL WORKS GENERAL SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	REVIEWED S. KITICHAI
DESIGNED ๑๒๒.6651	SUBMITTED
DRAWN	RECOMMENDED
CHECKED ๑๒๒.7324	APPROVED
14/01/62 PROJECT MANAGER DATE	DRAWING NO. LPP-GN-03 SHEET NO. 3 OF 44

TABLE 1 CLIMATOLOGICAL DATA FOR THE PERIOD 1980–2009

Station	KASETHOKCHAI												Elevation of station above M.S.L.	190.34	Meters
Index station	48434														
Latitude	14° 43' 8.0" N														
Longitude	102° 10' 7.0" E														
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL		
Pressure (Hectopascal)															
Mean	1013.3	1011.7	1009.9	1008.3	1007.1	1006.2	1006.1	1006.4	1007.8	1010.5	1012.3	1013.9	1009.5		
Ext. max.	1025.9	1024.6	1027.7	1019.9	1015.5	1015.5	1013.0	1012.6	1016.4	1020.5	1022.6	1025.4	1027.7		
Ext. min.	1003.5	1002.3	999.7	999.6	998.6	998.3	998.7	998.5	998.9	999.6	1002.1	1002.2	998.3		
Mean daily range	5.9	6.1	5.9	5.4	4.6	4.2	4.1	4.2	4.6	4.8	5.1	5.6	5.0		
Temperature (Celsius)															
Mean	24.4	26.5	28.6	29.7	29.0	28.8	28.3	28.0	27.4	26.7	25.5	23.8	27.2		
Mean max.	31.3	33.5	35.3	36.2	34.8	34.2	33.4	33.0	32.2	31.2	30.7	29.9	33.0		
Mean min.	18.1	20.2	23.0	24.6	25.0	25.0	24.6	24.5	24.0	23.1	20.7	18.1	22.6		
Ext. max.	37.1	39.0	41.2	42.5	40.7	39.0	37.9	37.0	36.2	35.7	36.1	35.9	42.5		
Ext. min.	8.7	11.3	14.0	18.6	21.0	21.6	21.5	21.1	20.2	16.1	13.5	6.5	6.5		
Dew Point (Celsius)															
Mean	17.4	18.6	20.7	22.5	23.7	23.5	23.3	23.4	23.8	22.9	20.2	17.4	21.5		
Relative Humidity (%)															
Mean	68	65	65	68	75	75	76	77	82	81	75	70	73		
Mean max.	89	86	86	86	90	89	90	91	94	94	91	89	90		
Mean min.	43	41	42	46	54	55	57	58	63	62	54	47	52		
Ext. min.	22	18	18	21	31	28	33	40	43	37	29	28	18		
Visibility (km.)															
07.00 LST	3.5	3.3	4.8	7.0	9.4	10.1	10.1	10.0	9.2	6.7	5.9	5.1	7.1		
Cloudiness (0–10)															
Mean	3.4	3.3	4.3	4.8	6.3	7.0	7.5	7.9	7.4	5.8	4.1	3.4	5.4		
Wind (knots)															
Mean wind speed	1.4	1.5	1.7	1.7	1.5	2.1	2.2	2.0	1.2	1.4	1.8	1.8	1.7		
Max. wind speed	25	35	33	44	40	33	34	34	32	35	25	25	44		
Evaporation (mm.)															
Mean–pan	124.1	132.4	167.0	169.5	158.3	147.9	144.3	137.2	118.1	118.3	117.2	122.0	1656.3		
Rainfall (mm.)															
Mean	9.3	14.1	41.6	72.7	153.5	113.9	120.7	150.2	204.3	164.2	25.3	3.8	1073.6		
Mean rainy day	2	3	6	8	15	14	16	17	19	14	4	1	119		
Daily maximum	47.0	35.6	100.3	98.4	147.5	107.9	78.0	86.5	112.8	112.3	74.4	31.8	147.5		
Number of days with															
Haze	3	3	1	0	0	0	0	0	1	2	2	1	11		
Fog	29	27	27	18	2	0	0	0	1	10	15	22	150		
Hail	0	0	0	0	0	0	0	0	0	0	0	0	0		
Thunderstorm	0	2	5	8	11	7	6	8	10	5	1	0	63		
Squall	0	0	0	0	0	0	0	0	0	0	0	0	1		

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	446.7	414.5
25	578.7	598.0
50	676.6	683.6
100	773.8	773.5
200	870.6	899.4
500	998.3	1,000.0
1,000	1,094.9	1,367.7

FIGURE 1 FLOW DURATION CURVE AT LAM PHRA PHLOENG DAM

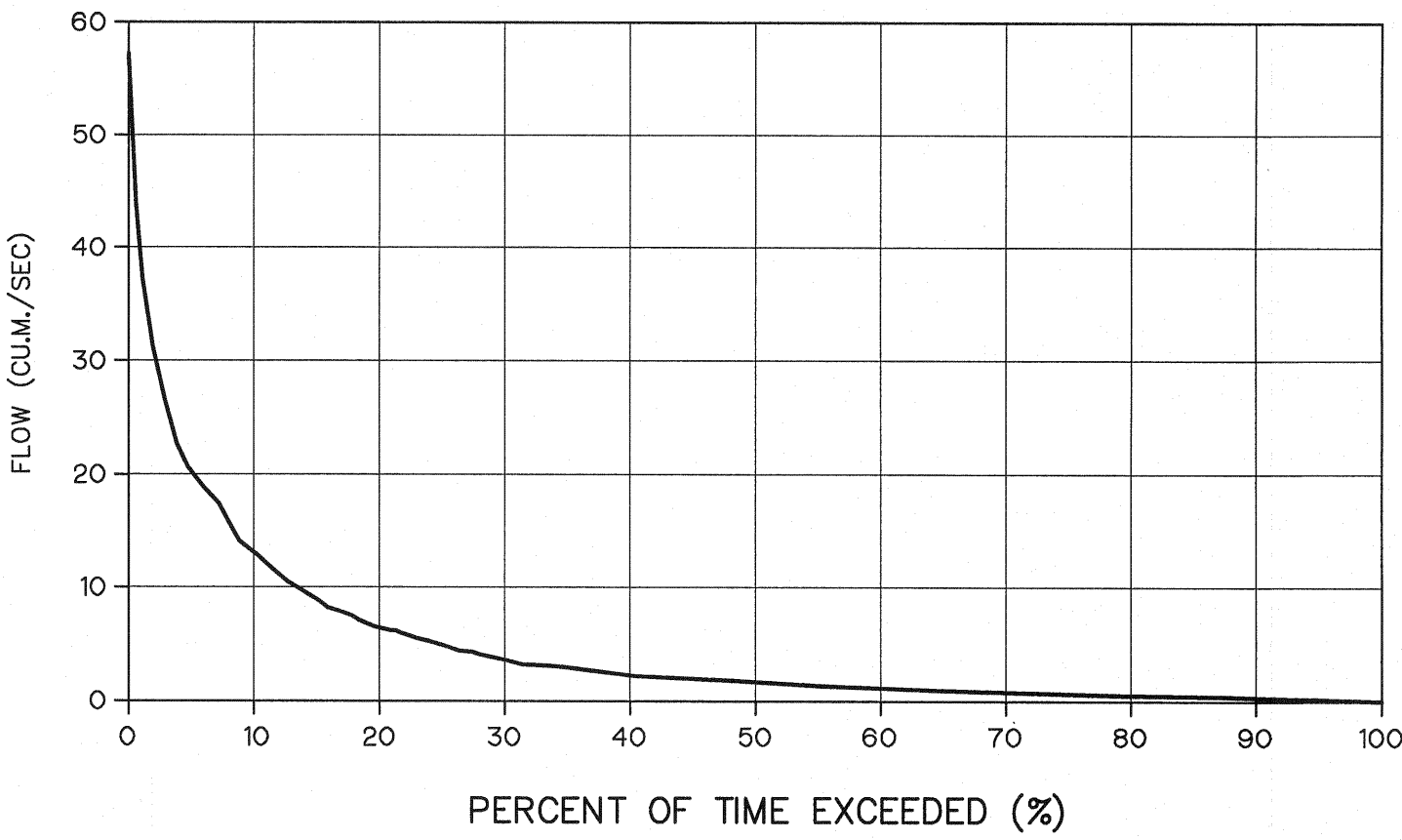


FIGURE 2 FLOW DURATION CURVE AT IRRIGATION OUTLET & RIVER OUTLET OF LAM PHRA PHLOENG DAM

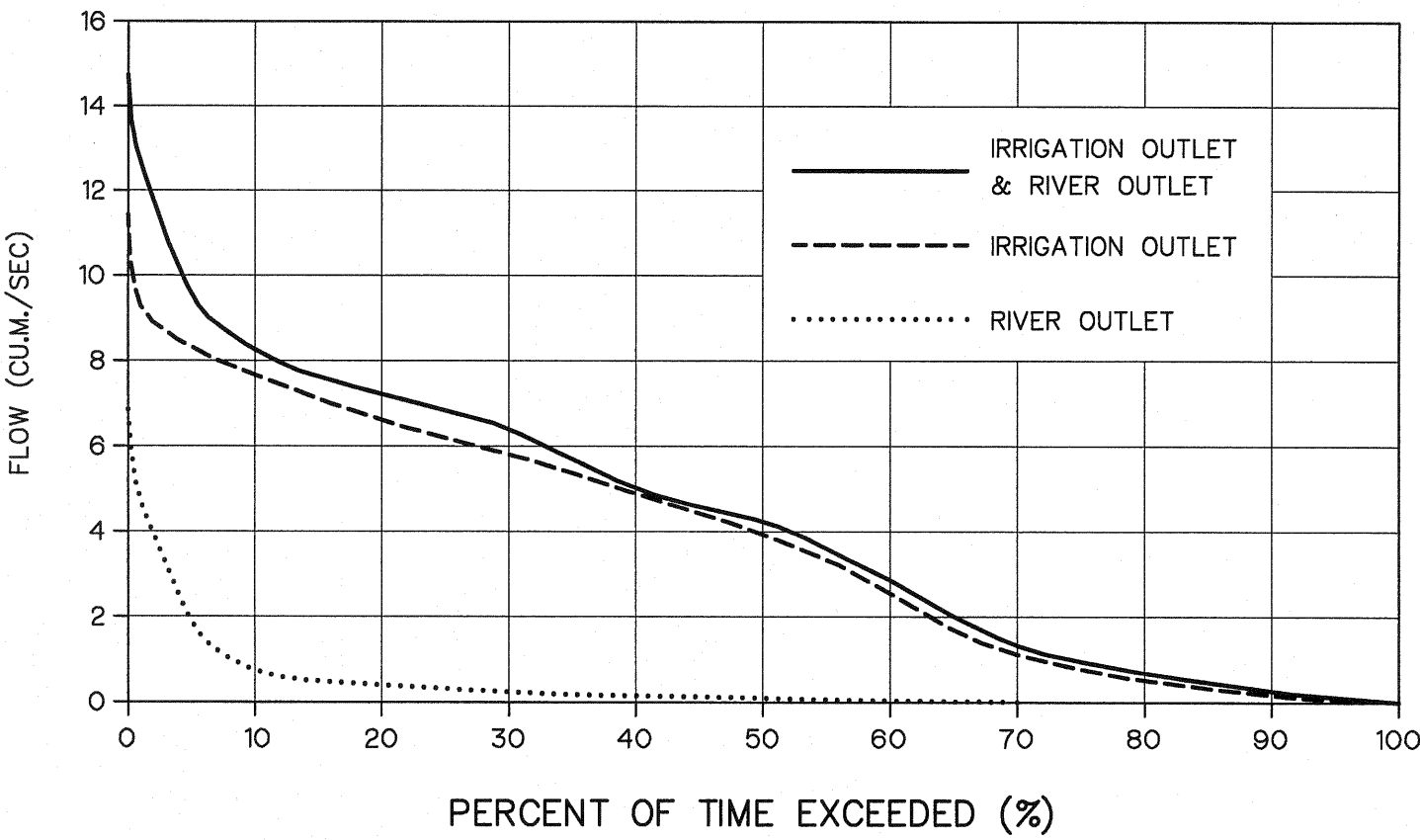
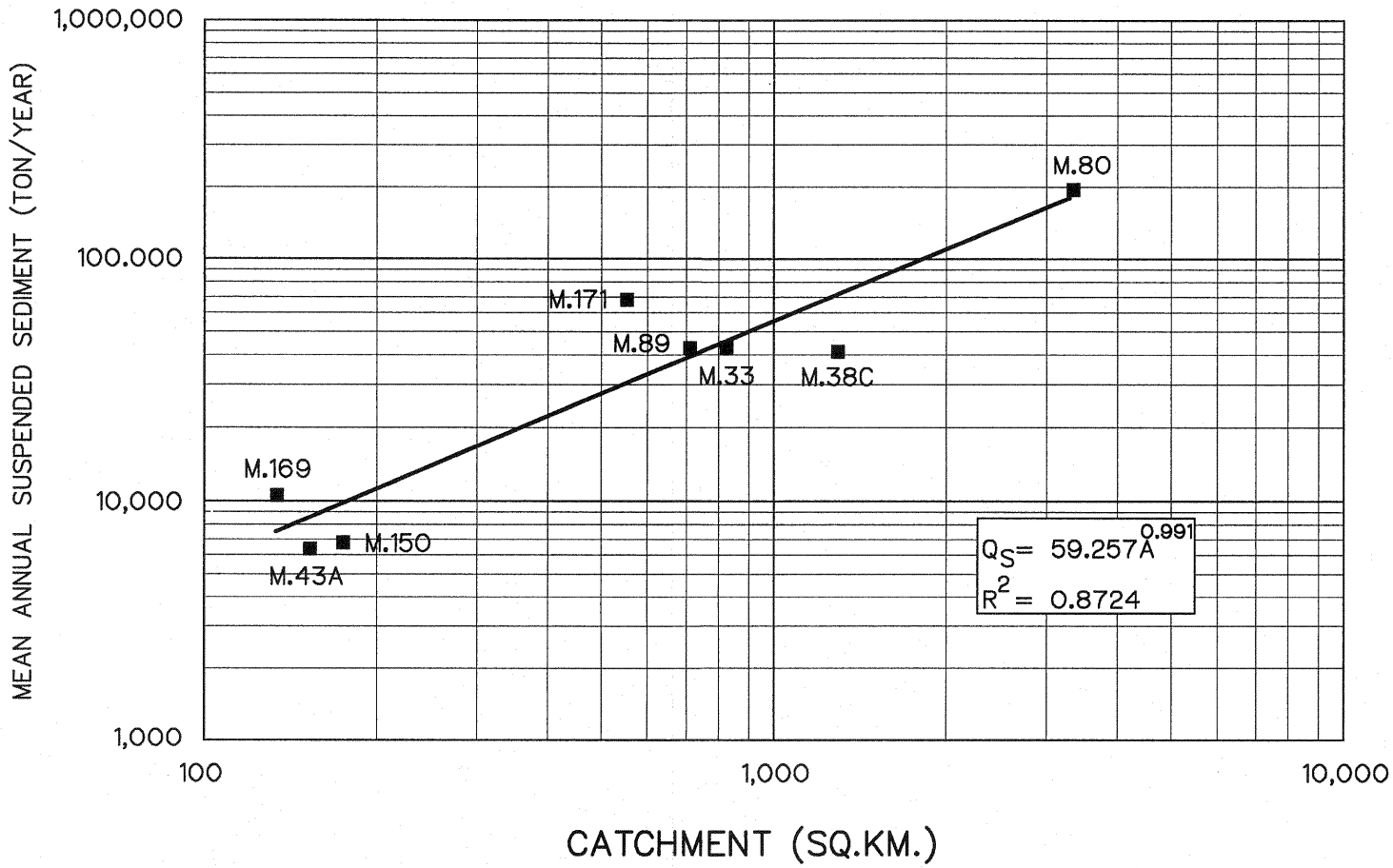


FIGURE 3 RELATIONSHIP BETWEEN ELEVATION AND CATCHMENT AREA



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

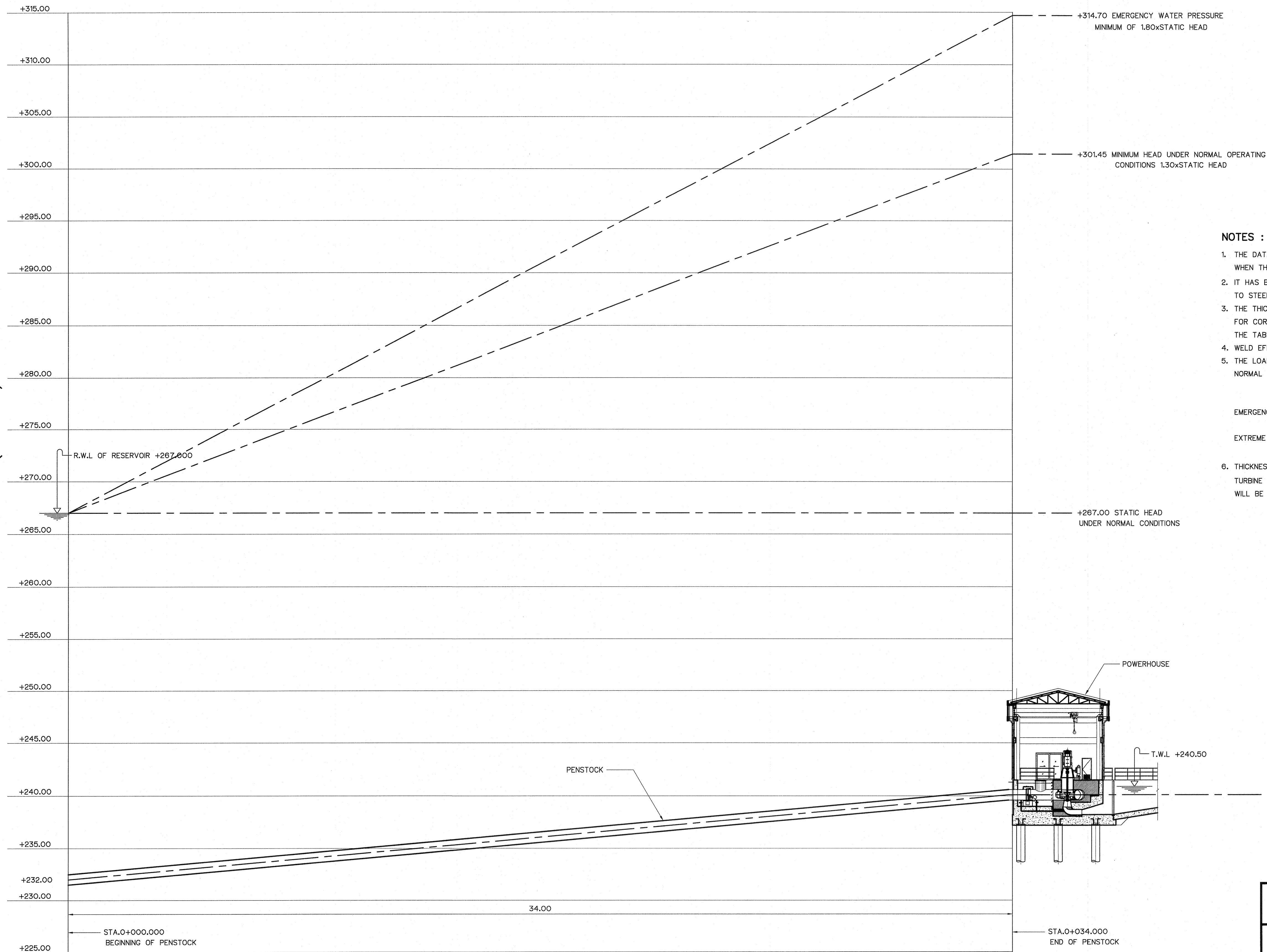
LAM PHRA PHLOENG HYDROPOWER PROJECT

CIVIL WORKS
GENERAL
HYDROLOGY DATA

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
REVIEWED S. KITICHAN		SUBMITTED	
DESIGNED S. Kitichan		RECOMMENDED S. Kitichan	
DRAWN S. Kitichan		APPROVED S. Kitichan	
CHECKED S. Kitichan		DATE 14/01/62	
PROJECT MANAGER		DRAWING NO. LPP-GN-04	
		SHEET NO. 4 OF 44	

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
		CONSULTANTS	DEDE	

ELEVATION (M.MSL.)



NOTES :

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

0 1 2 3 4 5 10 15
ขนาดจริง 1:200 เมตร

0 0.5 1 2 3 4 5 6
ขนาดจริง 1:75 เมตร

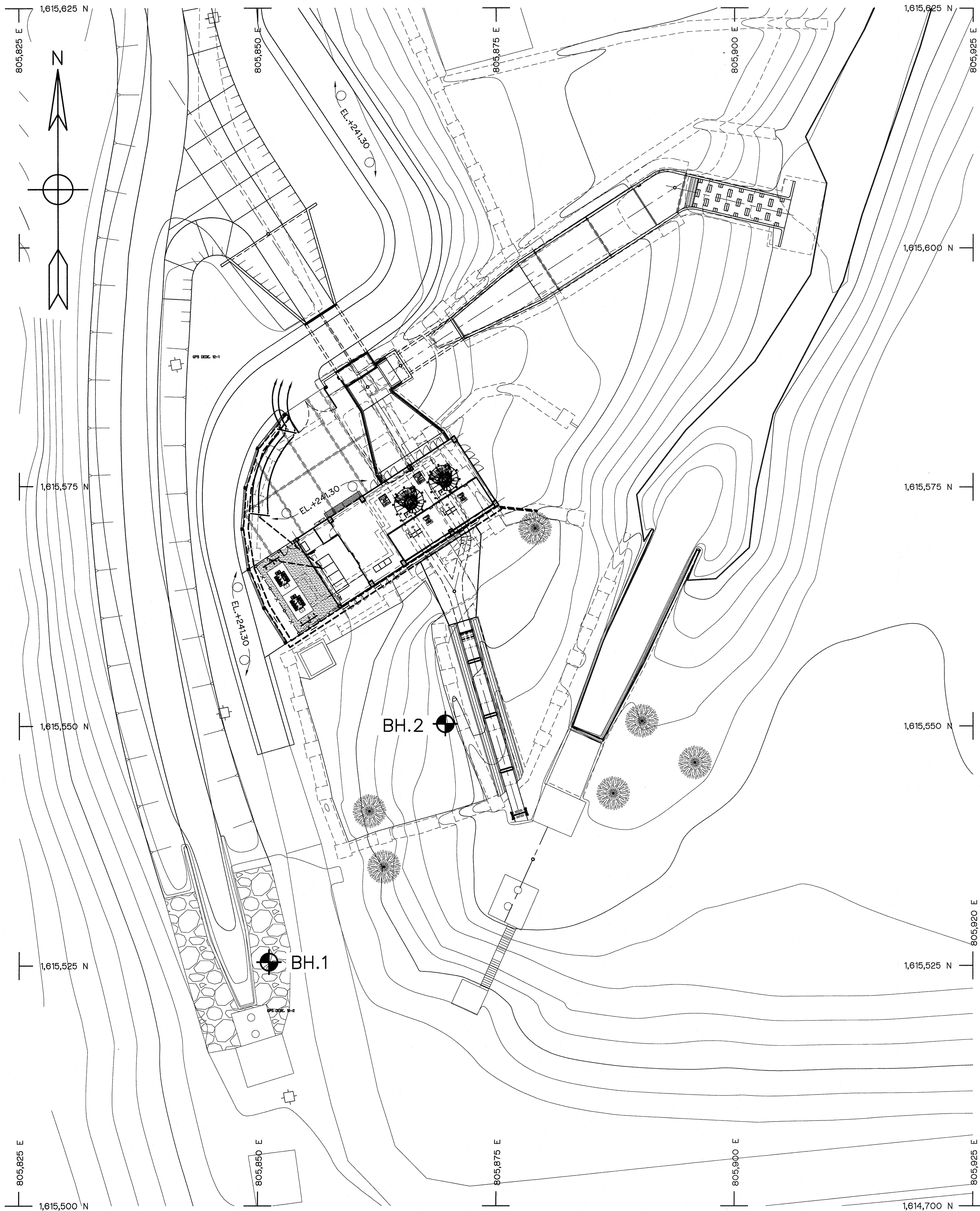
LOAD CASES	ALLOWABLE TENSILE STRESS
EXTREME WATER PRESSURE RESULTING FROM SLOWDEN CLOSURE OF THE TABLE VALVE	1.00 x MINIMUM YIELD STRESS
EMERGENCY WATER PRESSURE AND ALL OTHER NORMAL LONGITUDINAL LOADS	0.75 x MINIMUM YIELD STRESS
NORMAL WATER PRESSURE AND ALL OTHER NORMAL LONGITUDINAL LOADS	0.60 x MINIMUM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

PROFILE ALONG PENSTOCK

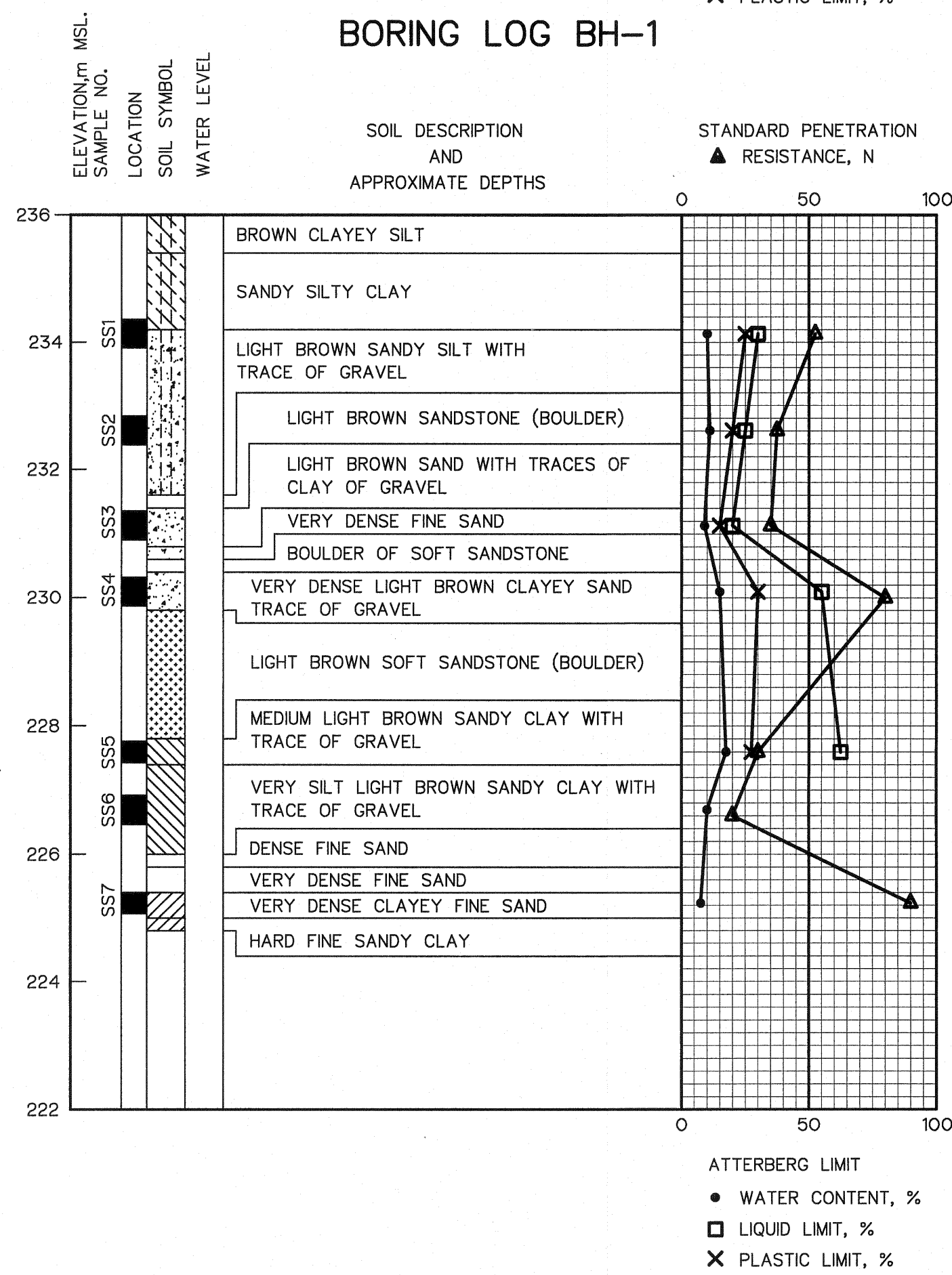
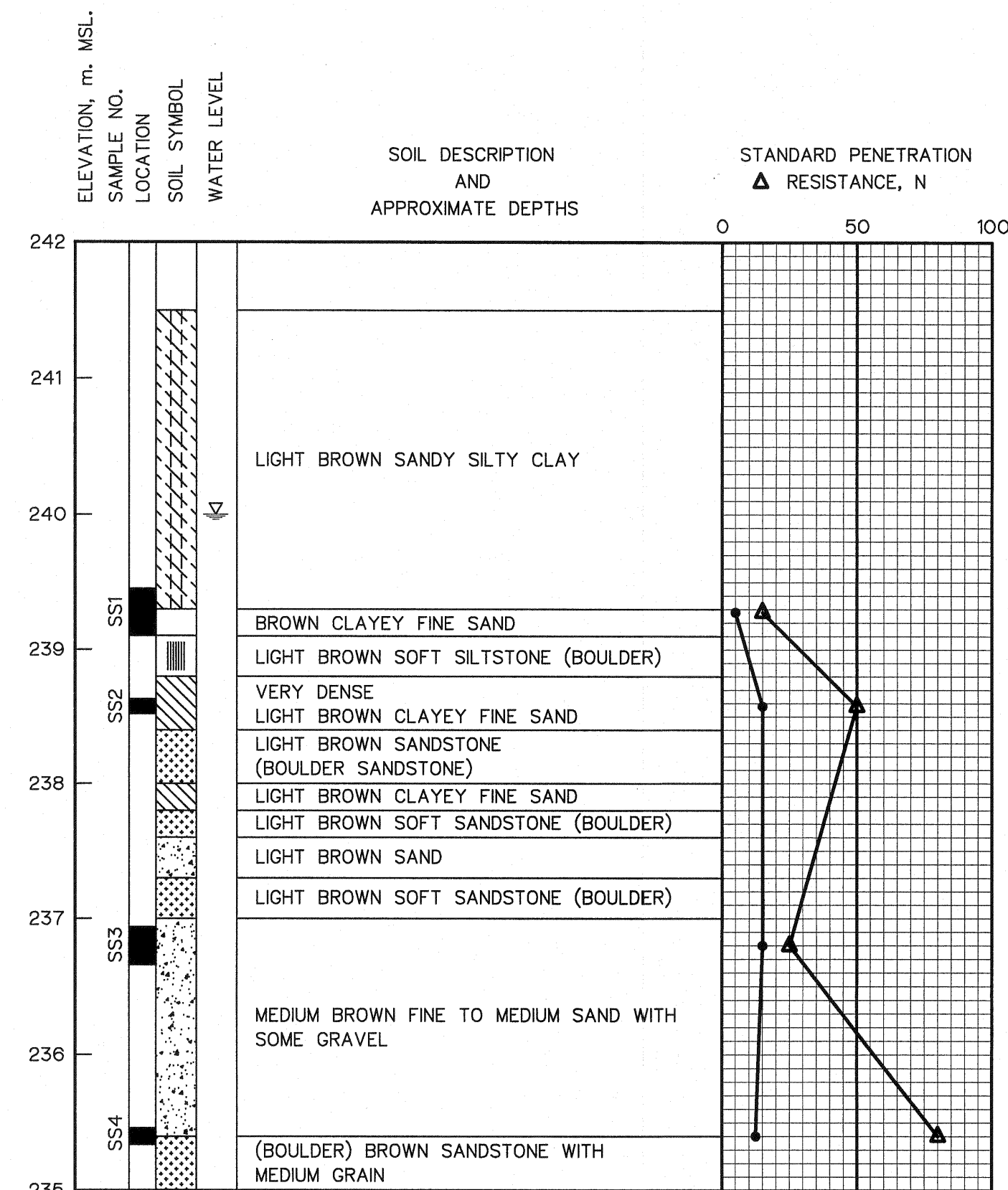
SCALE { VERTICAL 1 : 200
HORIZONTAL 1 : 75

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
		CONSULTANTS	DEDE	

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
LAM PHRA PHLOENG HYDROPOWER PROJECT	
CIVIL WORKS GENERAL HYDRAULIC GRADE LINE	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	
DESIGNED DRAWN CHECKED PROJECT MANAGER	REVIEWED S. KITTEHAI SUBMITTED RECOMMENDED APPROVED DRAWING NO. LPP-GN-05 SHEET NO. 5 OF 44



BORING LOG PLAN
SCALE 1:250



DESCRIPTIONS

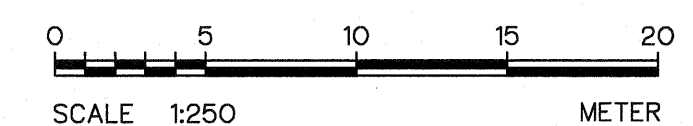
NO.	COORDINATE	
	E	N
BH.1	805,851.159	1,615,525.383
BH.2	805,872.928	1,615,550.237

SYMBOL

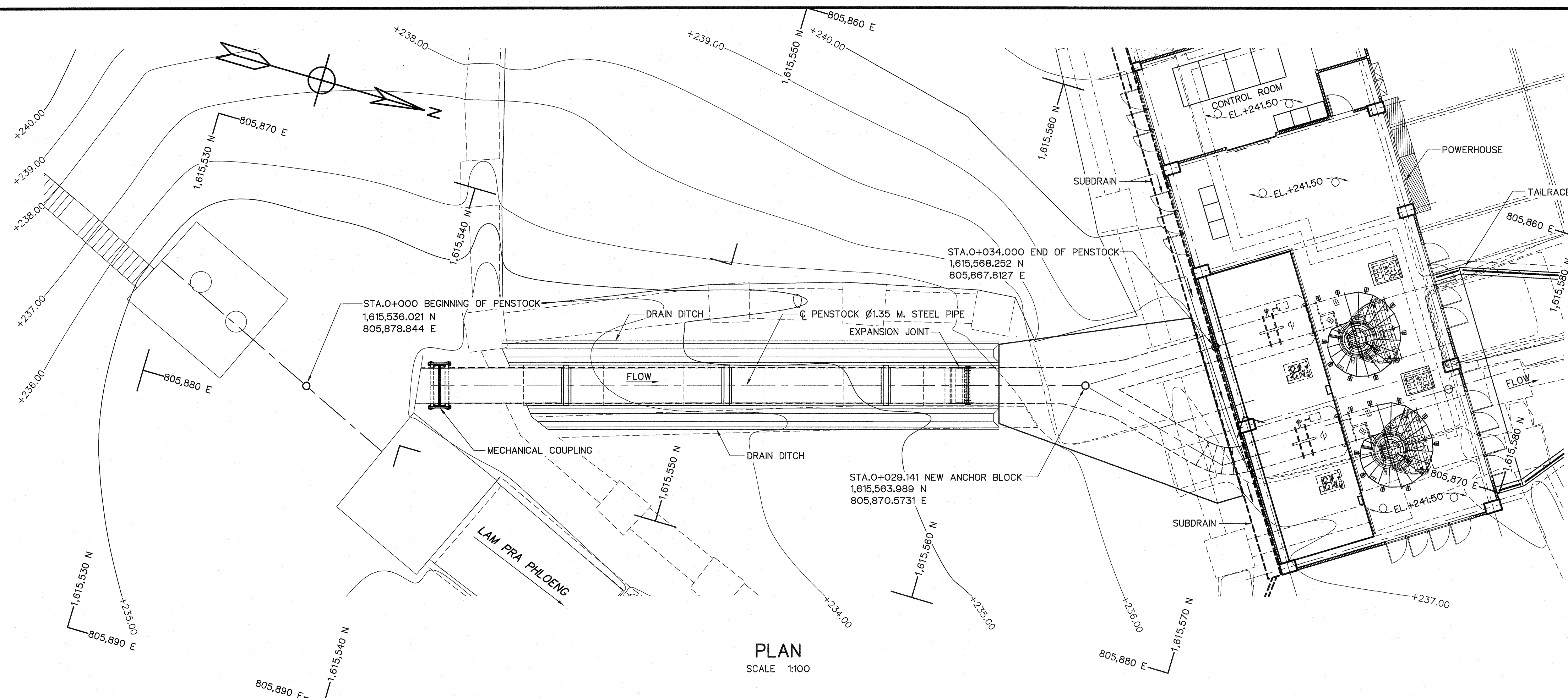


NOTES :

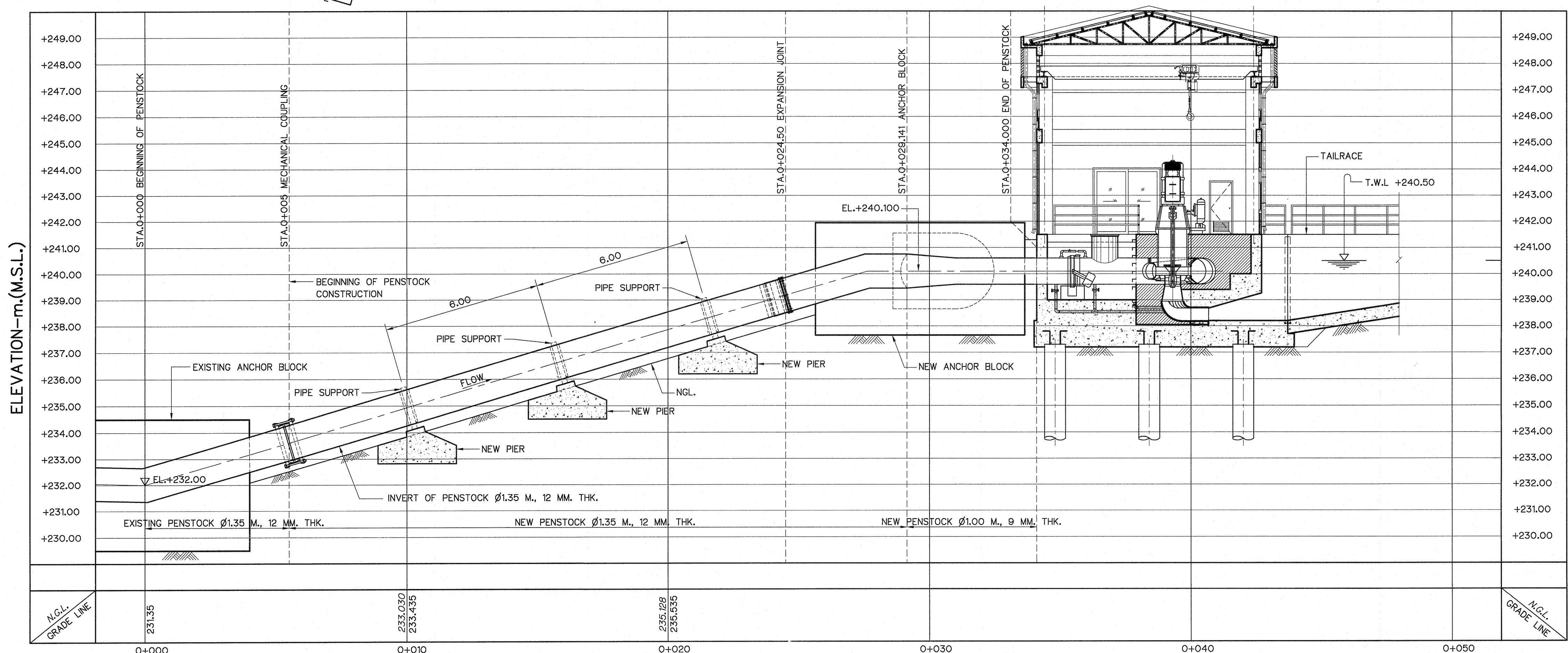
- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP-GN-03.



KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
LAM PHRA PHLOENG HYDROPOWER PROJECT	
CIVIL WORKS GENERAL GEOLOGICAL DATA	
FRONTIER ENGINEERING CONSULTANTS CO., LTD.	
DESIGNED	REVIEWED S. KITICHAH
DRAWN	SUBMITTED
CHECKED	RECOMMENDED
APPROVED	APPROVED
PROJECT MANAGER	DATE 14/01/62
DRAWING NO. LPP-GN-06	SHEET NO. 6 OF 44



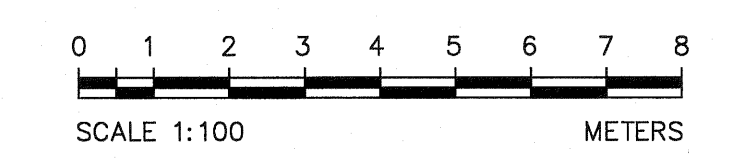
PLAN
SCALE 1:100



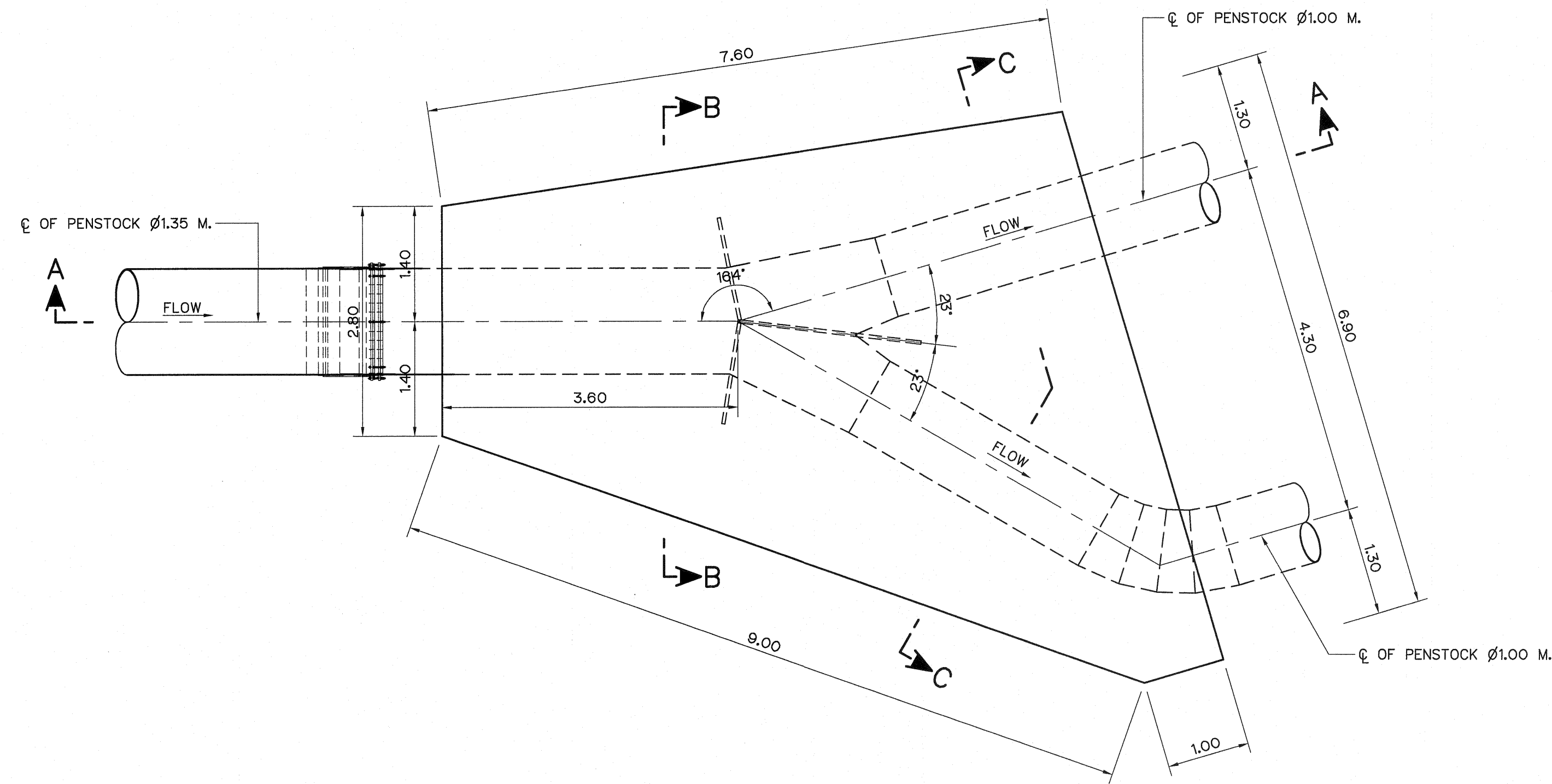
PROFILE
VERTICAL SCALE 1:100
HORIZONTAL SCALE 1:100

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

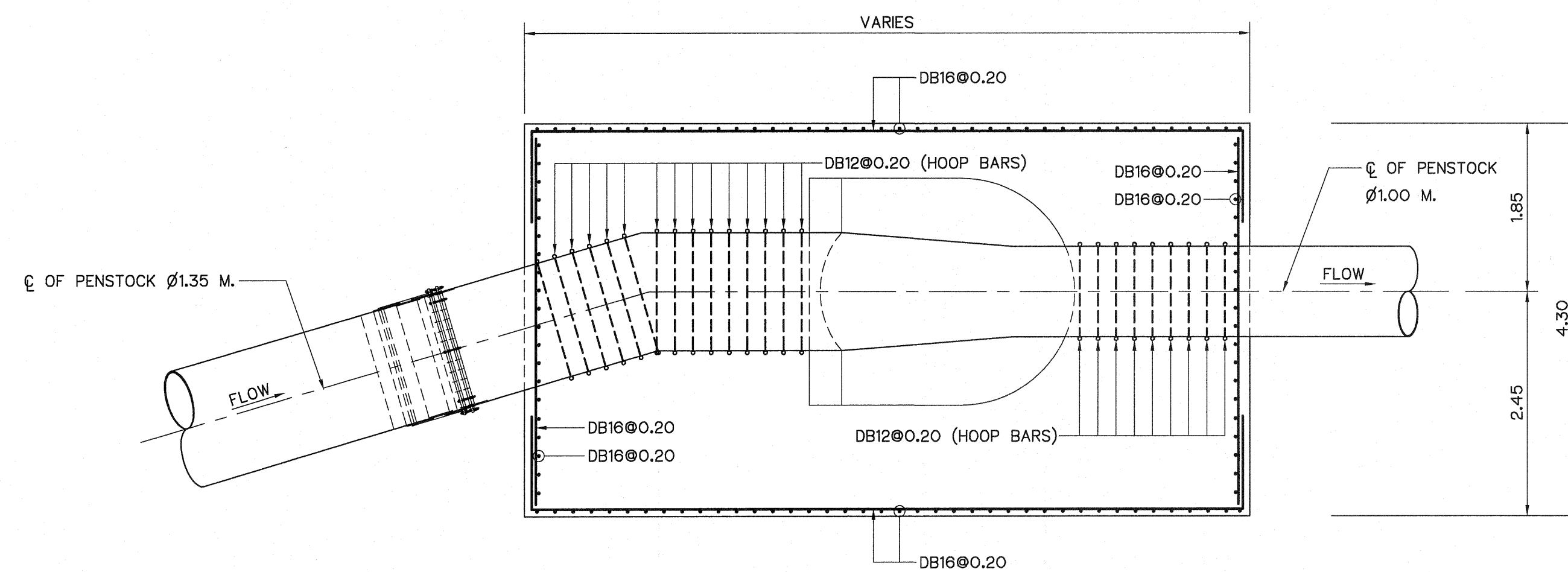
- REFERENCE DRAWINGS :
1. PENSTOCK, PIER DETAILS LPP-PS-06



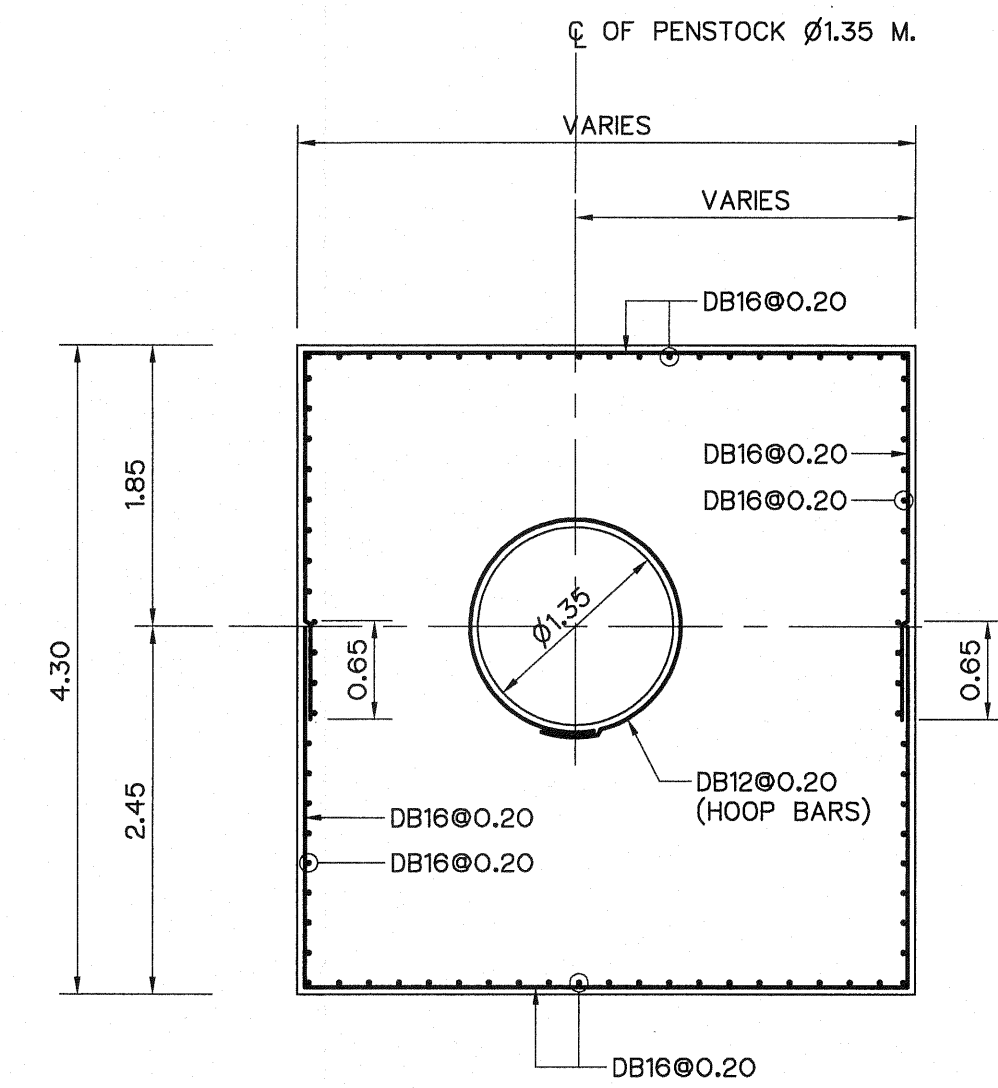
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
LAM PHRA PHLOENG HYDROPOWER PROJECT			
CIVIL WORKS PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA. 0+034.000			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		REVIEWED S. KITTHAI	
DESIGNED	DESIGNED	SUBMITTED	SUBMITTED
DRAWN	DRAWN	RECOMMENDED	RECOMMENDED
CHECKED	CHECKED	APPROVED	APPROVED
PROJECT MANAGER		DATE 14/01/62	DRAWING NO. LPP-PS-01
CONSULTANTS		DEDE	SHEET NO. 7 OF 44



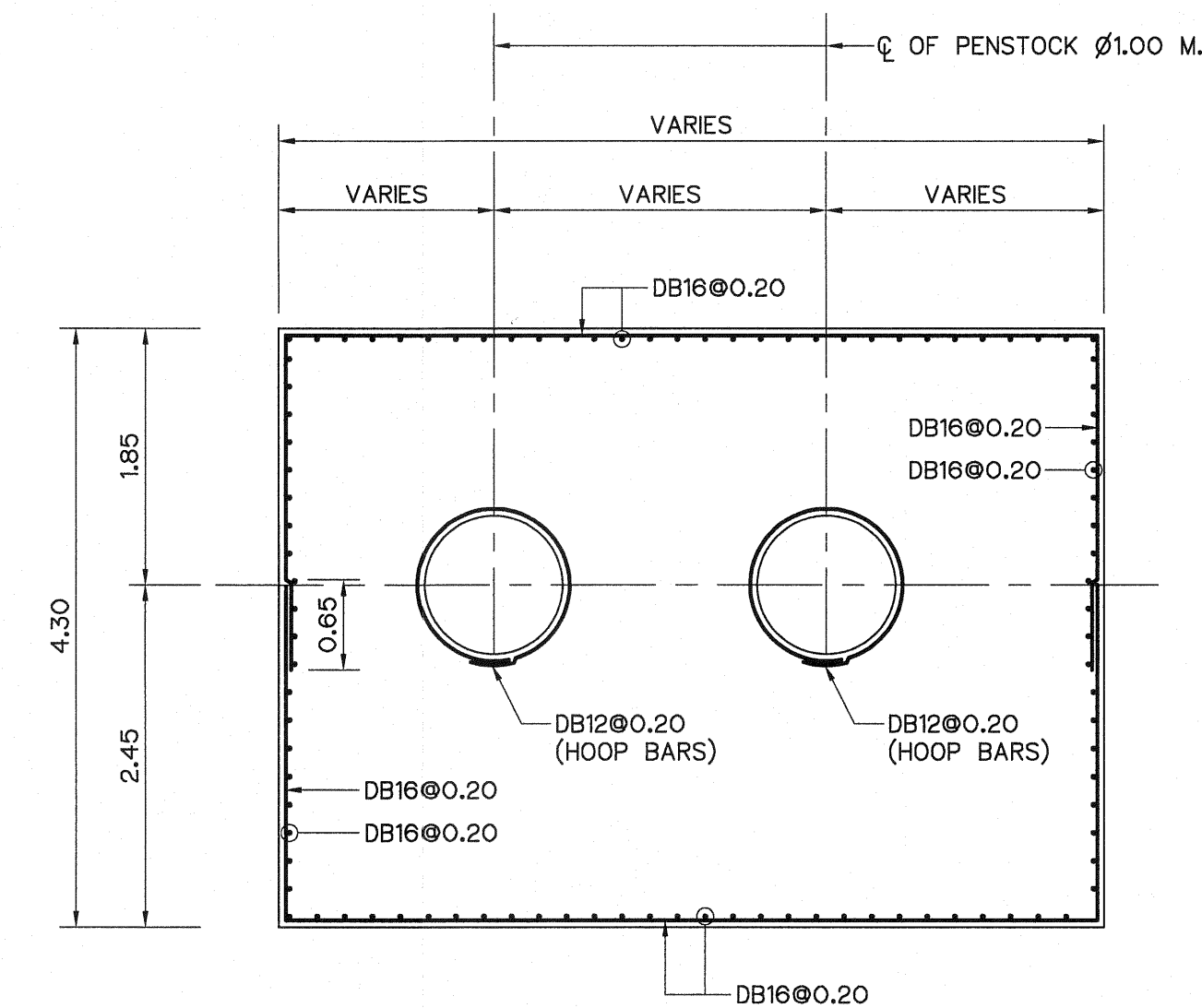
ANCHOR BLOCK PLAN
SCALE 1:50



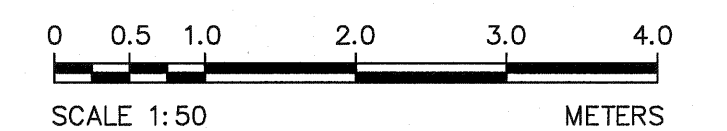
SECTION A-A
SCALE 1:50



SECTION B-B
SCALE 1:50



SECTION C-C
SCALE 1:50



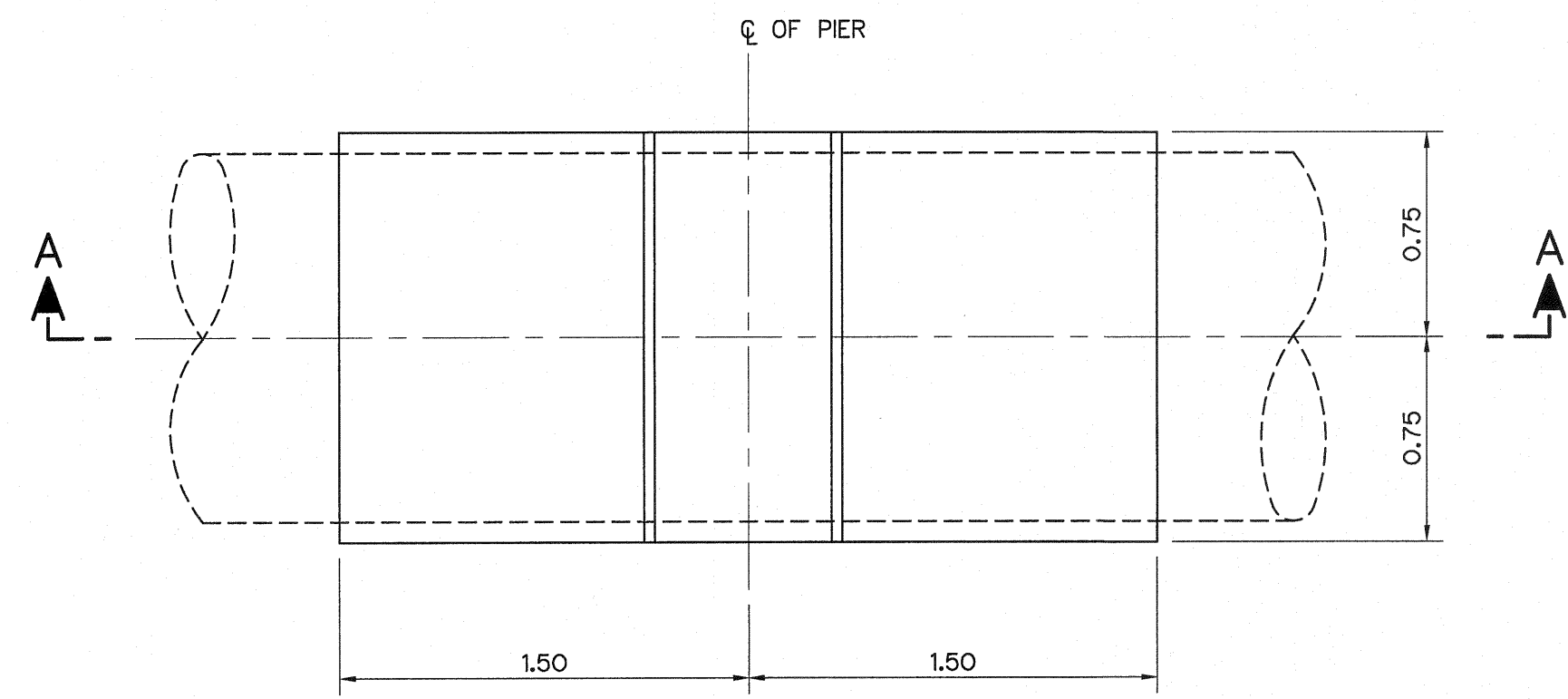
NOTES :

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

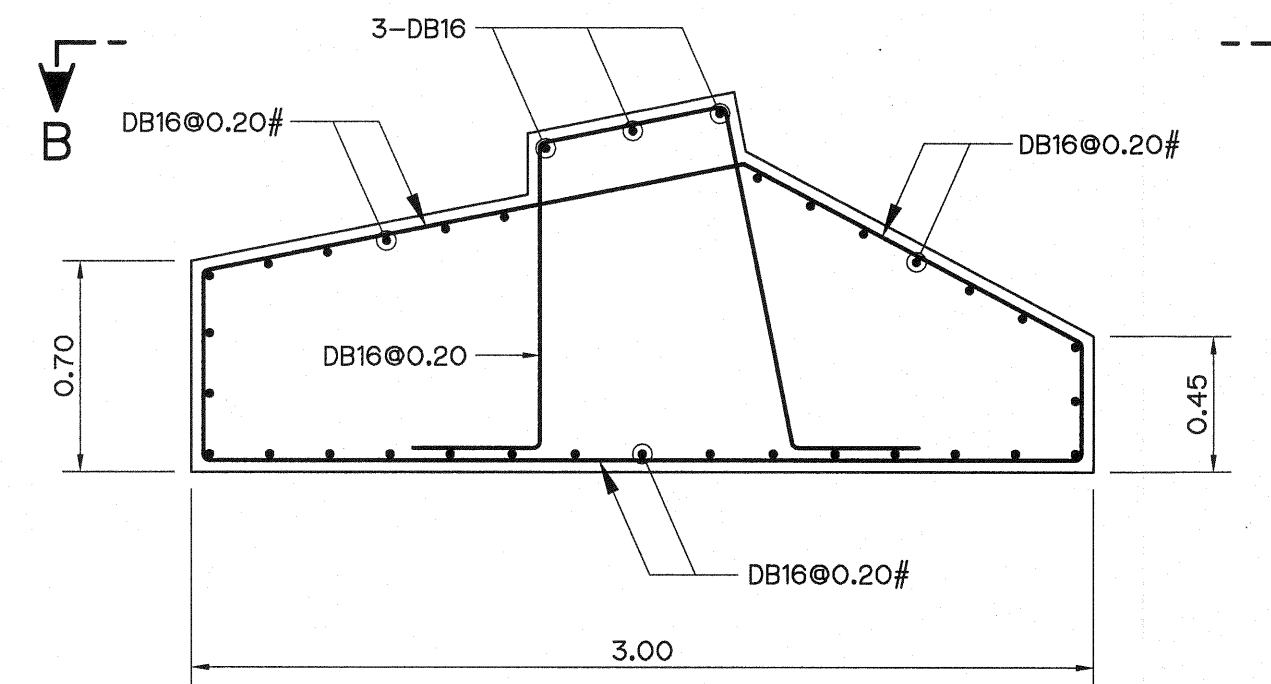
REFERENCE DRAWINGS :

- PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA. 0+034.000 LPP-PS-01

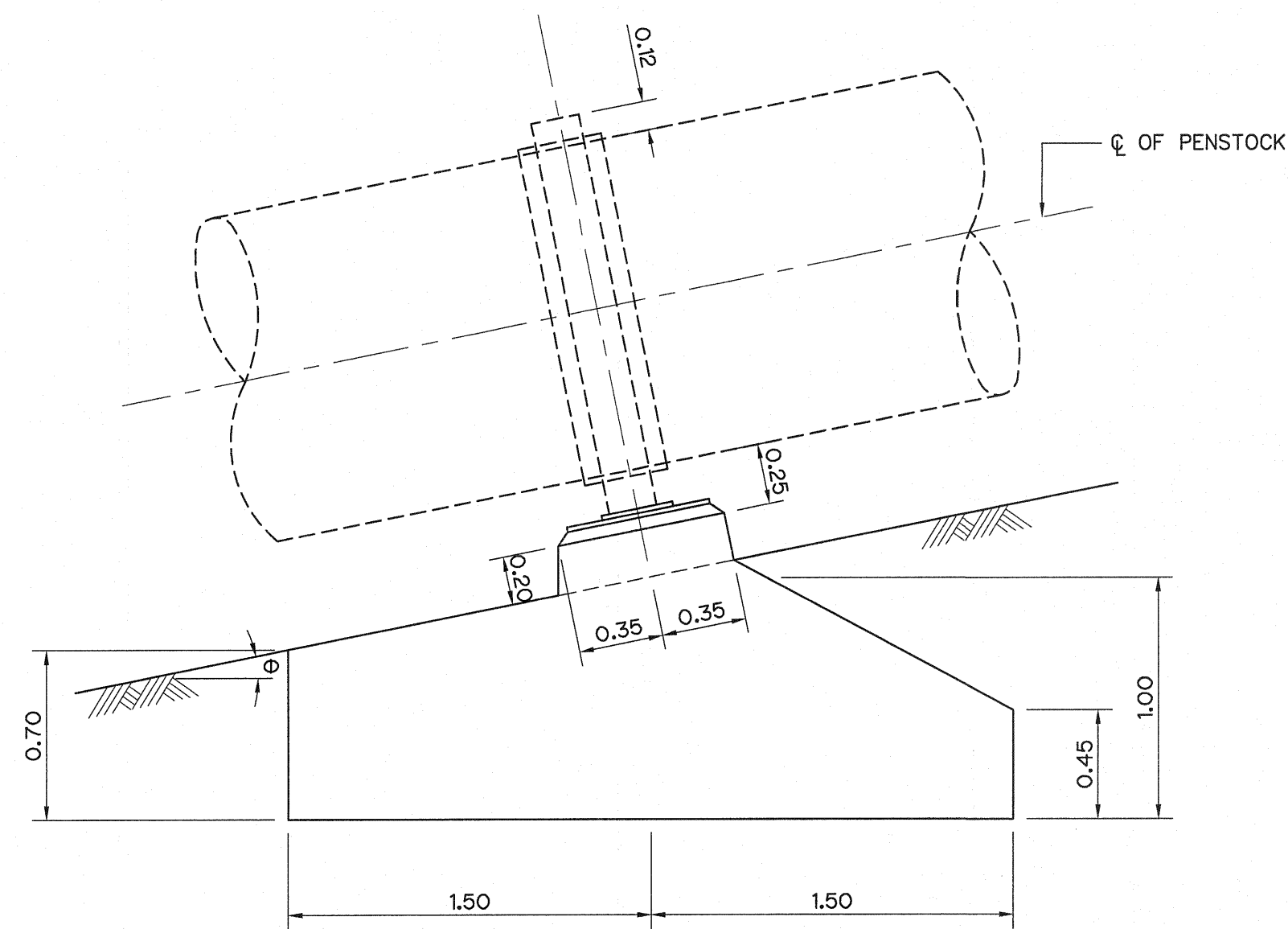
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
LAM PHRA PHLOENG HYDROPOWER PROJECT	
CIVIL WORKS PENSTOCK ANCHOR BLOCK PLAN ,SECTIONS, AND REINFORCEMENT DETAILS	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	REVIEWED S. KITICHAJ
DESIGNED S. KITICHAJ 22.6651	SUBMITTED S. KITICHAJ
DRAWN S. KITICHAJ	RECOMMENDED S. KITICHAJ
CHECKED S. KITICHAJ 22.7324	APPROVED S. KITICHAJ
CONSULTANTS	DEDE
PROJECT MANAGER	DATE 14/01/62
DRAWING NO. LPP-PS-02	SHEET NO. 8 OF 44



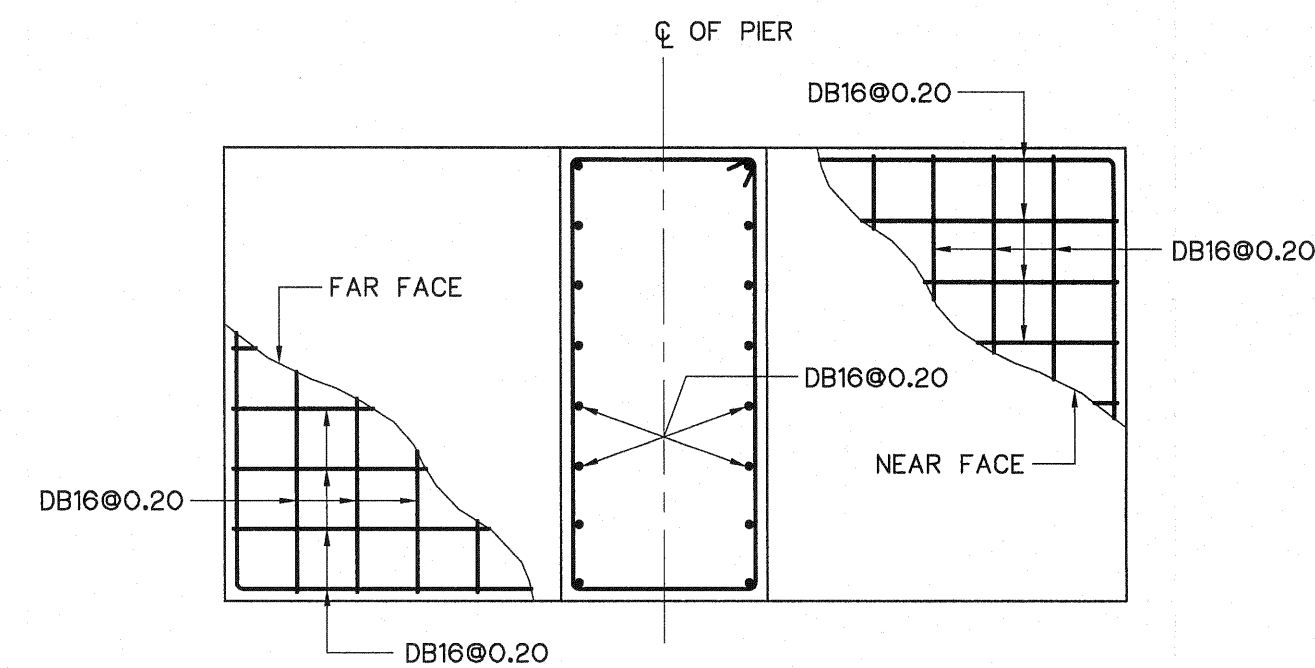
PLAN
SCALE 1:25



SECTION A - A
SCALE 1:25



ELEVATION
SCALE 1:25



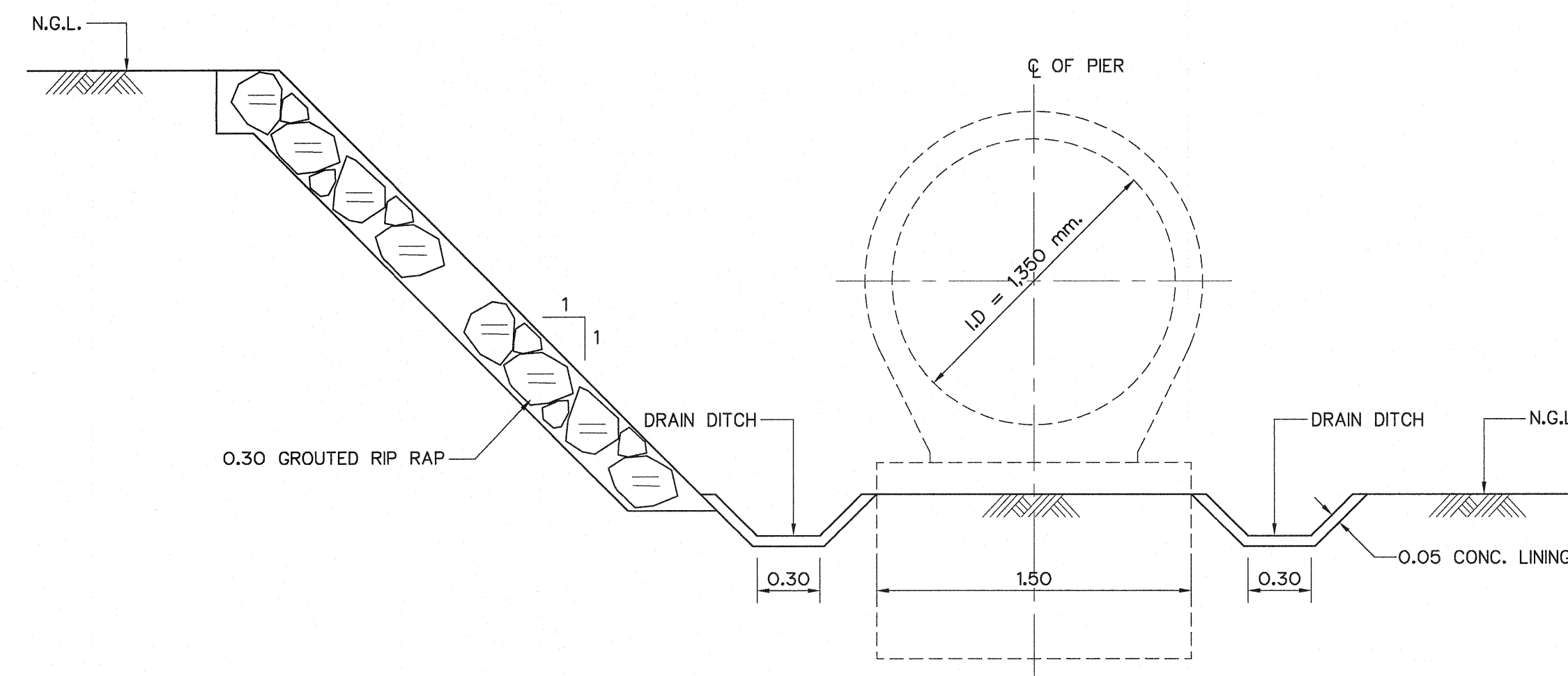
SECTION B - B
SCALE 1:25

NOTES :

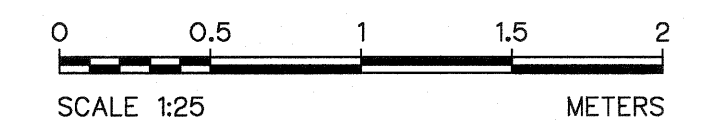
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLE, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP-GN-03.
3. THE ALIGNMENT OF THE PENSTOCK AND RELATED STRUCTURES SHALL BE CHECK AND CORRECTED BY THE CONTRACTOR TO SUIT THE FIELD CONDITIONS AND SHALL BE SUBMITTED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

REFERENCE DRAWINGS :

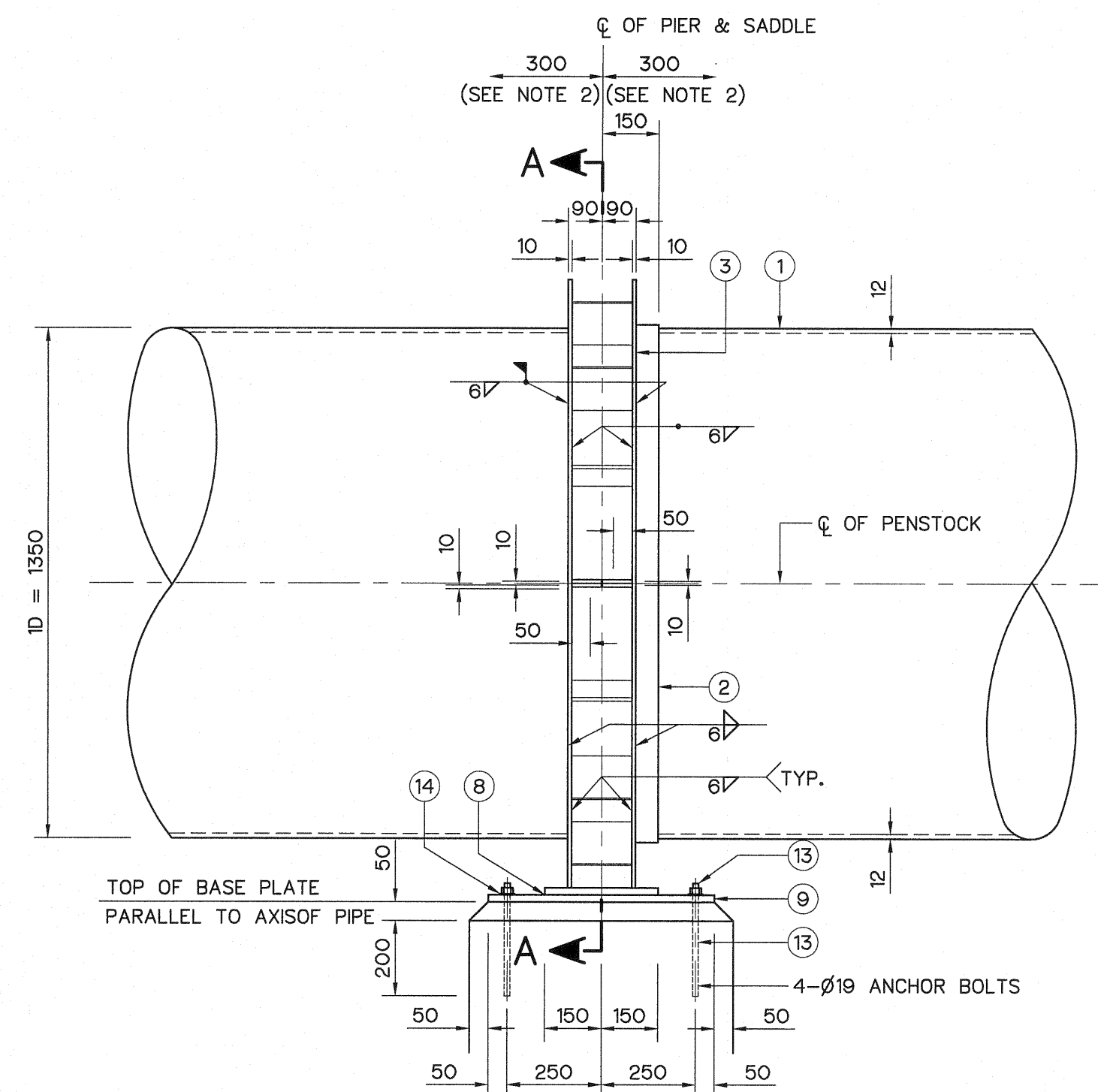
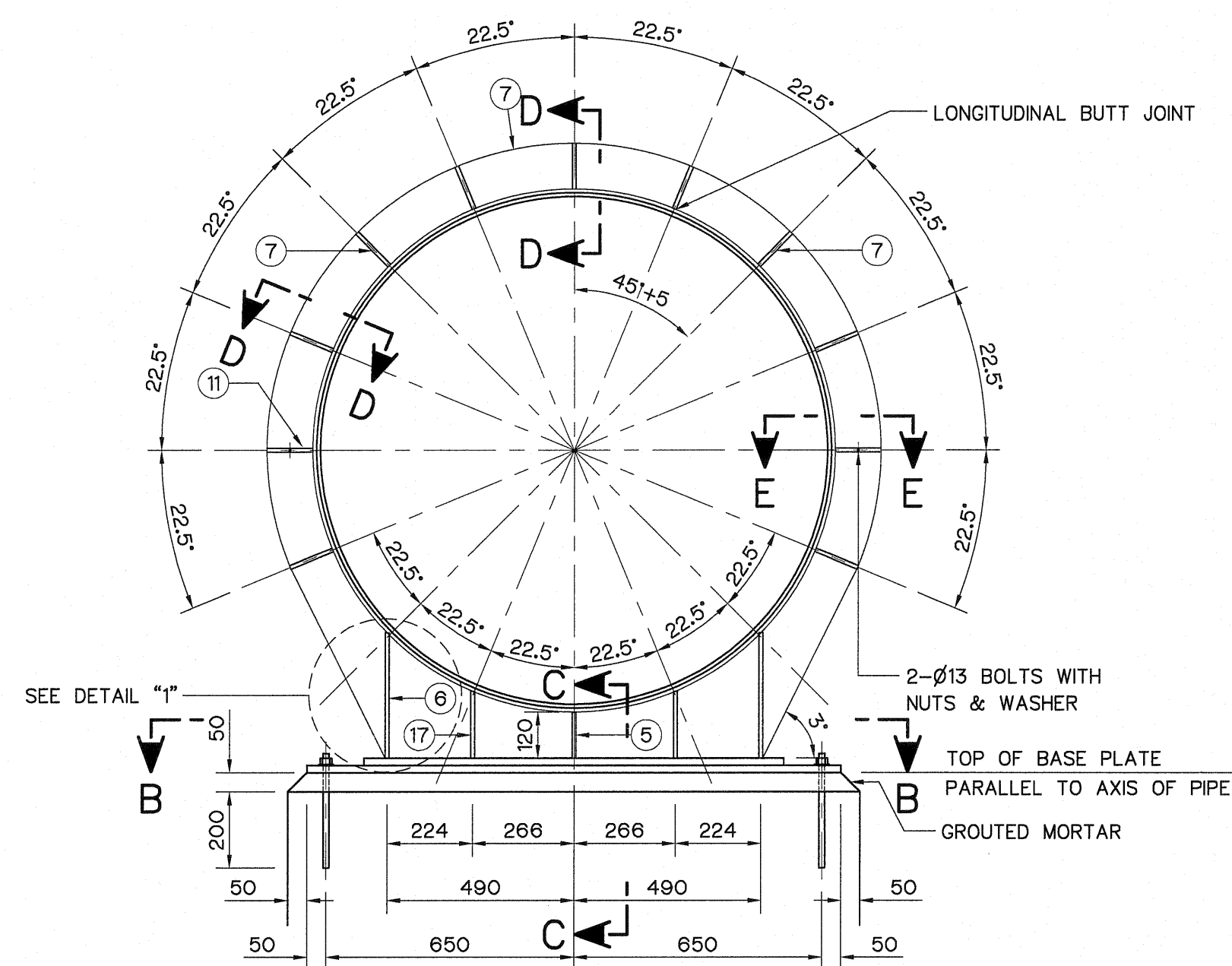
1. PENSTOCK PLAN AND PROFILE, STA. 0+000 TO STA. 0+034.000 LPP-PS-01



TYPICAL SECTION OF PENSTOCK TRENCH
SCALE 1:25



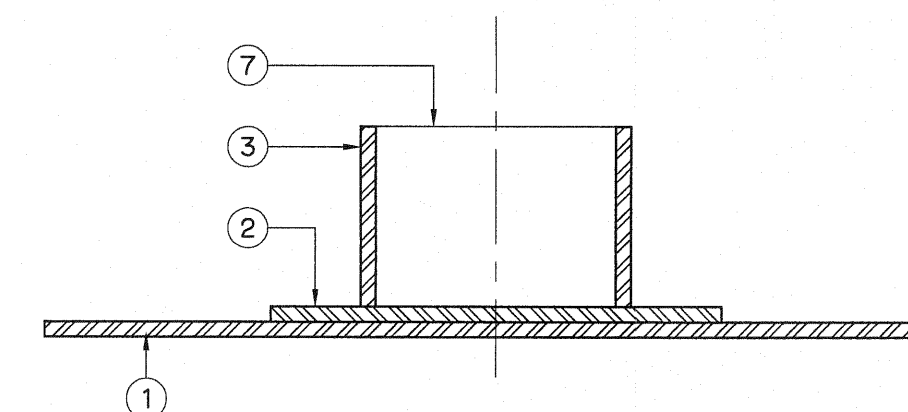
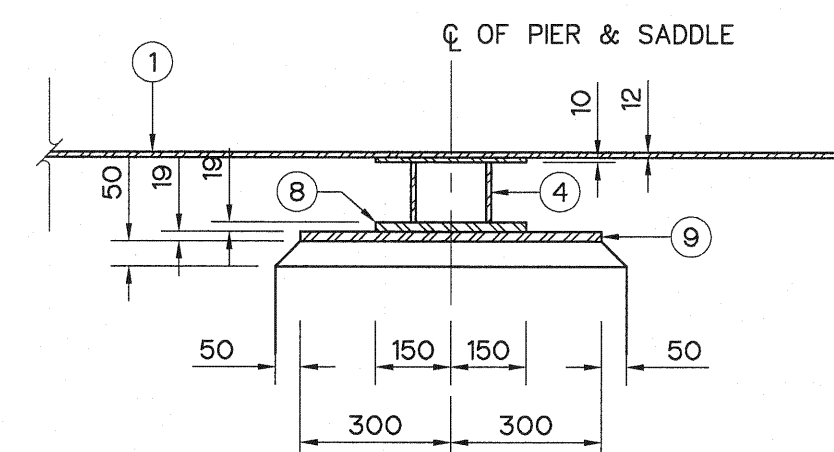
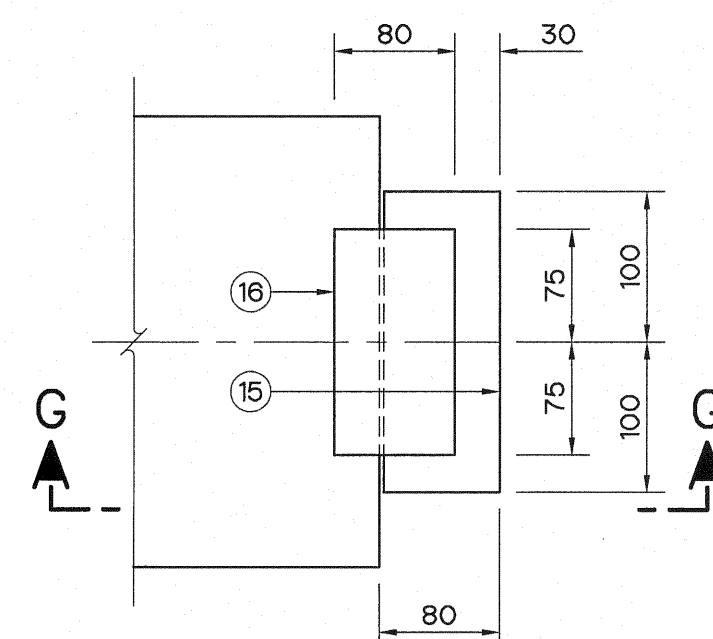
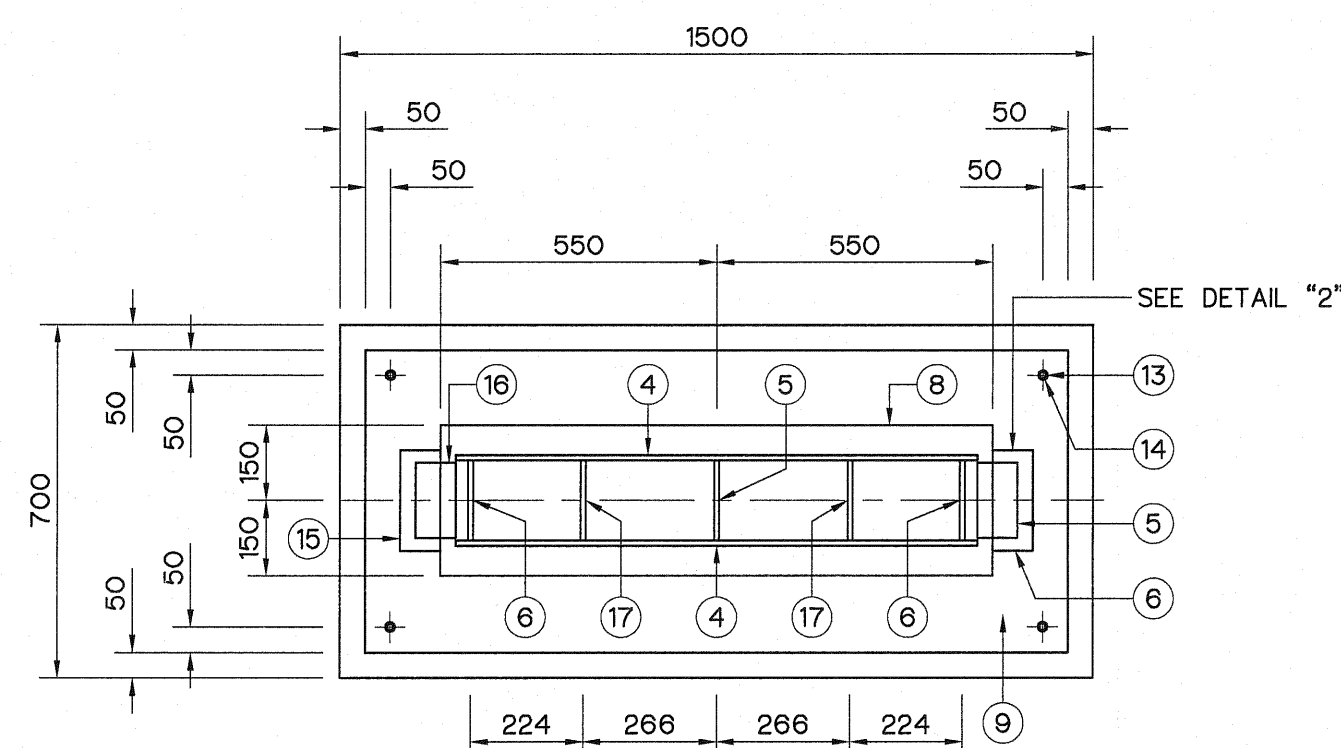
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
LAM PHRA PHLOENG HYDROPOWER PROJECT			
CIVIL WORKS PENSTOCK PIER & BEND PLAN, SECTIONS AND REINFORCEMENT DETAILS			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		REVIEWED S. KITICHAI	
DESIGNED	S. KITICHAI	SUBMITTED	S. KITICHAI
DRAWN	S. KITICHAI	RECOMMENDED	S. KITICHAI
CHECKED	S. KITICHAI	APPROVED	S. KITICHAI
PROJECT MANAGER		DATE	14/01/62
CONSULTANTS		DEDE	
DRAWING NO.		LPP-PS-03	
SHEET NO.		9 OF 44	



BILL OF MATERIALS

(PER ONE SET OF SUPPORT)

ITEM	DESCRIPTION	MATERIAL	QUAN	REMARKS
1	PENSTOCK STEEL PIPE	ASTM-A283, GUIDE D	—	
2	REINFORCING PADS	ASTM-A283, GUIDE D	2	
3	UPPER RINGS	ASTM-A283, GUIDE D	2	
4	LOWER RINGS	ASTM-A283, GUIDE D	2	
5	STIFFENER PLATES 10x120x160	ASTM-A283, GUIDE D	1	
6	STIFFENER PLATES 10x160x318	ASTM-A283, GUIDE D	2	
7	STIFFENER PLATES 10x120x160	ASTM-A283, GUIDE D	9	
8	SADDLE PLATE 19x300x1100	ASTM-A36	1	SEE NOTE 3
9	BASE PLATE 16x600x1400	ASTM-A36	1	GALVANIZED
10	BOLTING PLATE 10x120x160	ASTM-A283, GUIDE D	4	
11	BOLT Ø13x40W/NUTS & WASHERS	ASTM-A325	4	GALVANIZED
12	ANCHOR BOLTS Ø19x350	ASTM-A283, GUIDE B	4	SEE NOTE 4
13	NUTS Ø19	ASTM-A283, GUIDE B	12	GALVANIZED
14	WASHER Ø19	ASTM-A283, GUIDE B	4	GALVANIZED
15	GUIDE PLATE 20x80x200	ASTM-A36	2	
16	UPLEFT PLATE 19x80x150	ASTM-A36	2	
17	STIFFENER PLATES 10x160x171	ASTM-A283, GUIDE D	2	

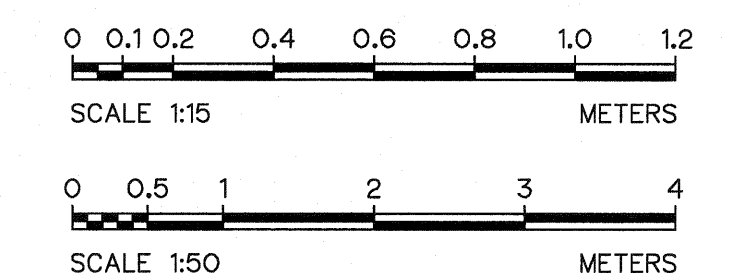
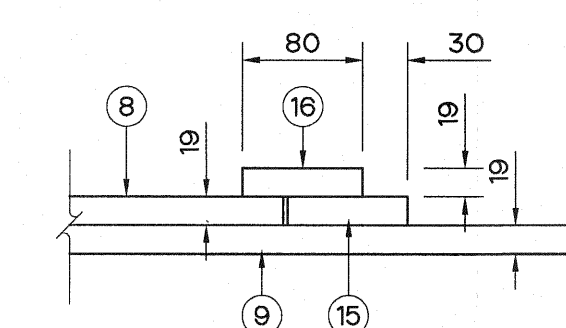
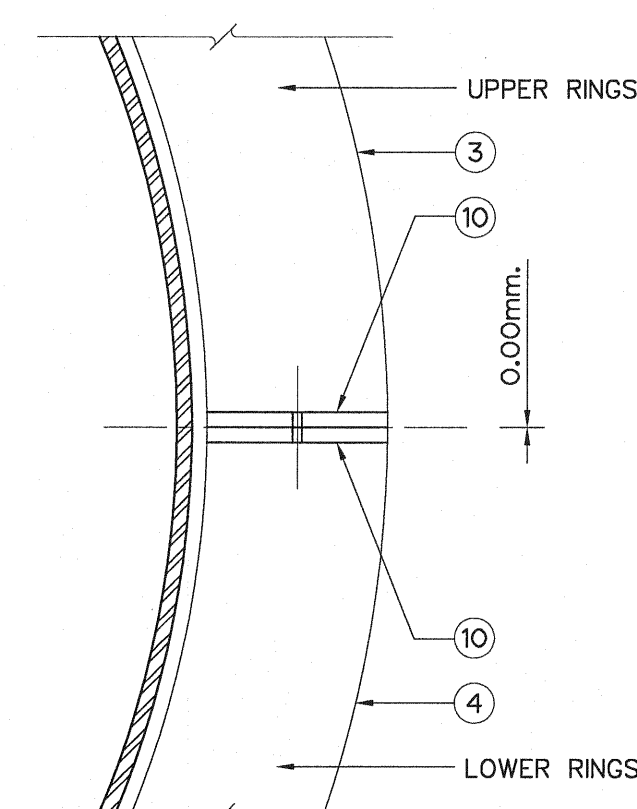
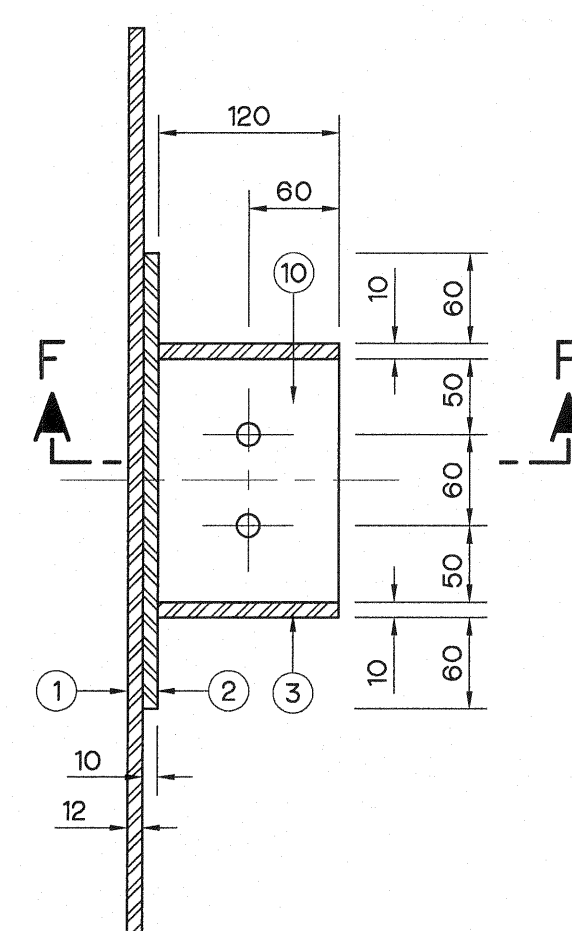
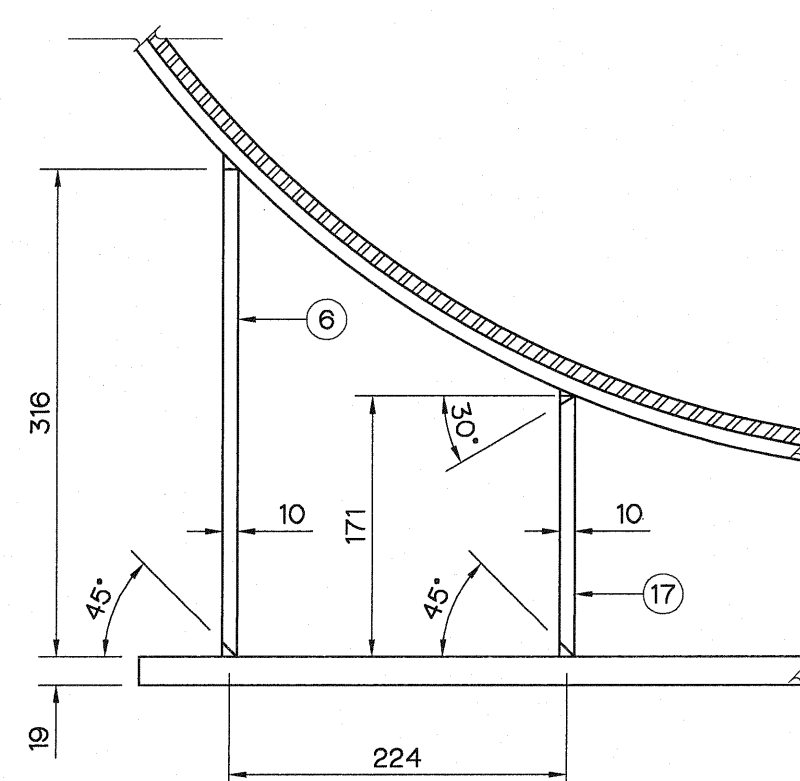


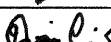
NOTES :

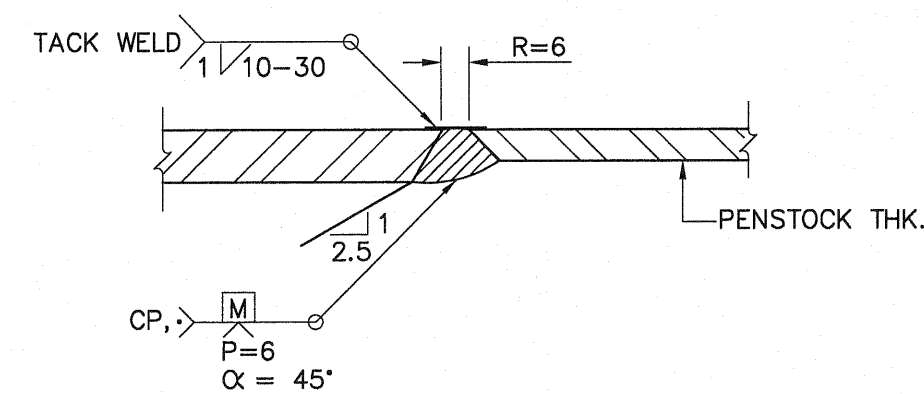
1. ALL DIMENSIONS AND ELEVATION ARE IN METER, UNLESS OTHERWISE SHOWN.
2. JOINT OF PIPE CONNECTION IS NOT ALLOWED IN THIS REGION.
3. GALVANIZED ON BOTTOM OF PLATE.
4. GALVANIZE ONLY PORTION EXPOSED TO WEATHER.
5. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY,
SHOP DRAWING SHALL BE DESIGNED BY CONTRACTOR
UNDER APPROVAL OF FIELD ENGINEER.

NOTES :

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



 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
LAM PHRA PHLOENG HYDROPOWER PROJECT			
CIVIL WORKS PENSTOCK STEEL PIPE SUPPORT ELEVATIONS, SECTION & DETAILS			
 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY		REVIEWED S. KITICHAJ	
FE FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		SUBMITTED	
DRAWN 		RECOMMENDED 	
CHECKED 		APPROVED 	
PROJECT MANAGER		DRAWING NO.	
14/01/62		LPP-PS-04	
DATE		SHEET NO.	
42		10 OF 44	



Technical drawing of a circular penstock cross-section. The drawing includes the following features and dimensions:

- Centerline:** A vertical dashed line passing through the center, labeled "C OF PENSTOCK" at the top.
- Inner Diameter:** A diagonal dimension line across the center, labeled $\phi 1350$.
- Outer Diameter:** A horizontal dimension line at the top, labeled $12'$ (twice), indicating a total width of 24 feet.
- Holes:** 30 holes, each with a diameter of $\phi 3/4"$, are distributed around the circumference. They are arranged in two concentric rings of 15 holes each.
- Labels:**
 - 3: Points to the outermost ring of holes.
 - 4: Points to the innermost ring of holes.
 - 5: Points to the outermost ring of holes (bottom left).
 - 6: Points to the innermost ring of holes (bottom left).
 - 8: Points to the innermost ring of holes (bottom center).

350

100 50 50 50 100

200 50

650

NICKEL CLADDING OUTER SURFACE

530

130 40 40 50

CL OF PENSTOCK

6 RINGS 16 mm. SQUARE ASBESTOS GRAPHITE PACKING

300

FLOW

15 mm. INNER SLEEVE (INCLUDING 0.50 mm. THK. NICKEL CLADDING)

PENSTOCK 12MM. THK.

1

2

CP. 60° 6

12

19

9

9

7

8

6 mm. CHAMFER

16

20

13

20° 45°

0.50

6 STUFFING BOX 15 mm. PLATE

3

1

SEE DETAIL "1"

175

25 80 25

10 30-5/8" BOLTS. EQUALLY SPACED

11 12

4

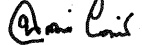
5

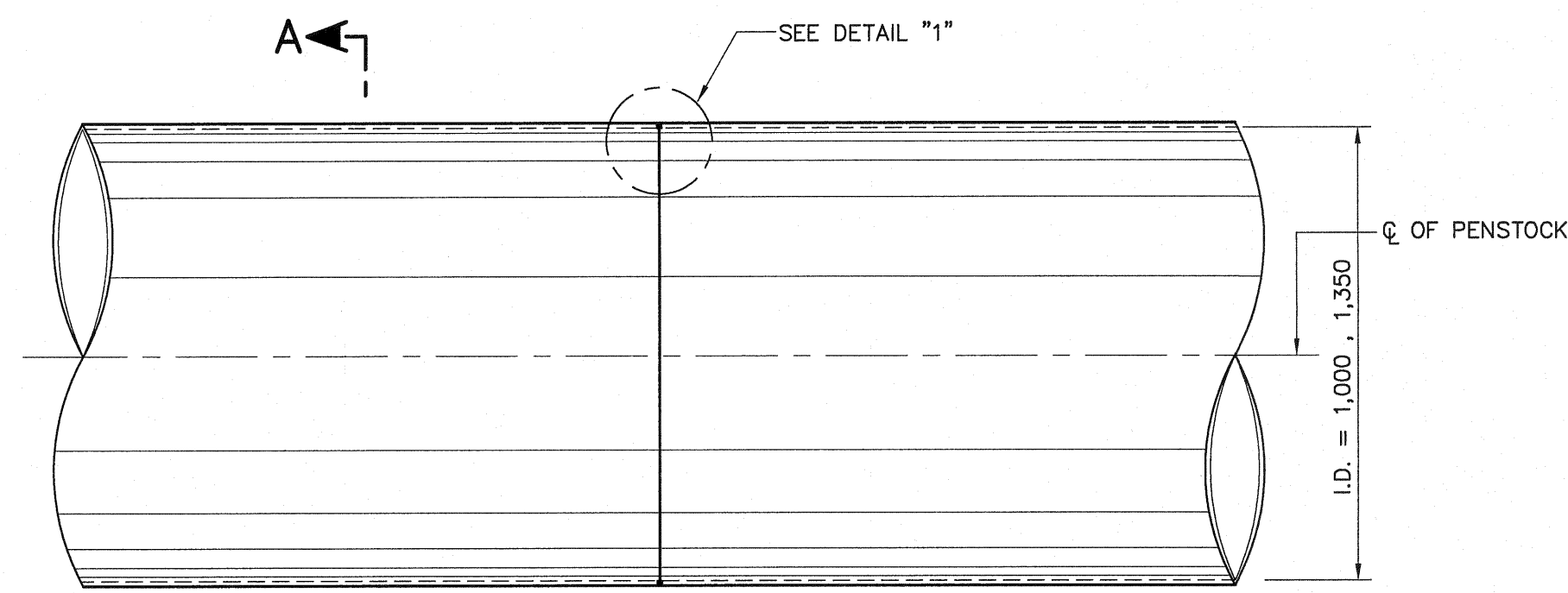
SECTION A-A

NOT TO SCALE

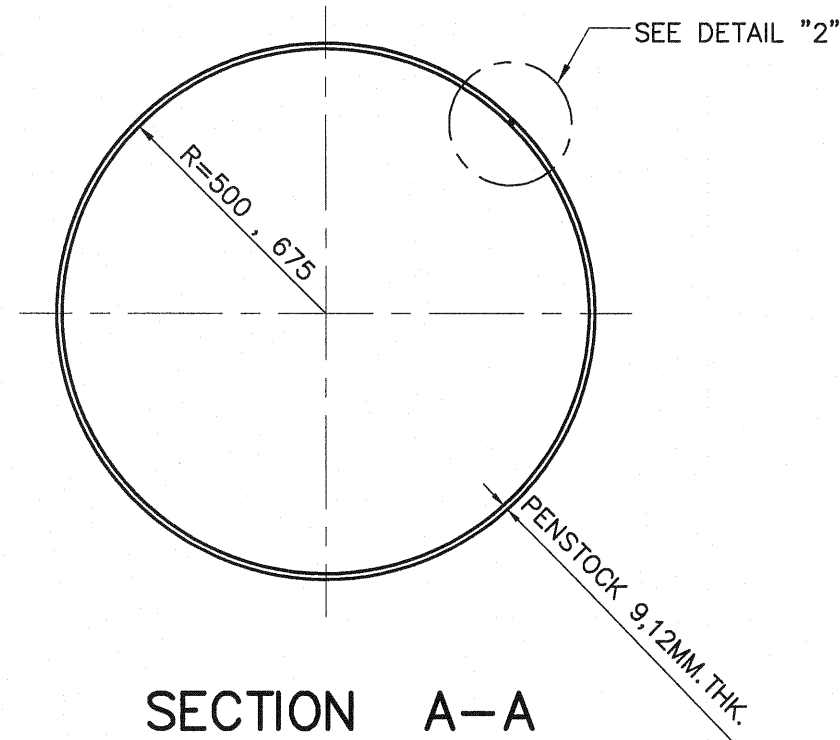
NO.	DATE	REV.
3		
2		
1		

CONSULTANTS

 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
LAM PHRA PHLOENG HYDROPOWER PROJECT			
CIVIL WORKS			
PENSTOCK			
EXPANSION JOINT, PLAN, SECTIONS AND DETAILS			
 FRONTIER ENGINEERING CONSULTANTS CO., LTD.		 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED  ๑๕1.6551		REVIEWED S. KITTHAI	
DRAWN 		SUBMITTED 	
CHECKED  ๑๕1.7324		RECOMMENDED 	
		APPROVED 	
PROJECT MANAGER		DATE 14/01/62	
		DRAWING NO. LPP-PS-05	
		11 OF 44	



ELEVATION
SCALE 1:10

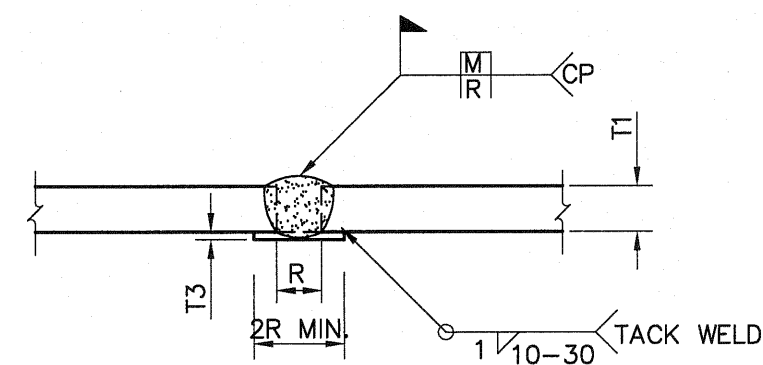


SECTION A-A
SCALE 1:10

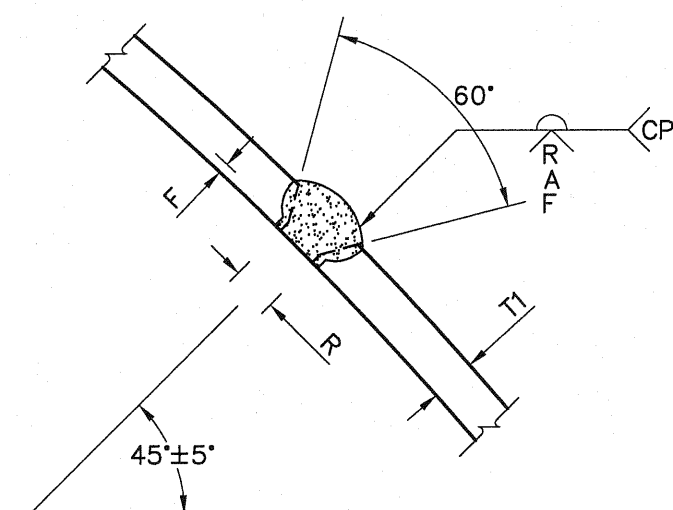
TABLE OF DETAIL "1" SQUARE-GROOVE WELD, BUTT JOINT

WELDING PROCESS	DESIGNATION	BASE METAL THICKNESS		GROOVE PREPARATION		TOLERANCES		REMARKS
		T1	T3	ROOT OPENING	GROOVE ANGLE	ROOT OPENING	GROOVE ANGLE	
GMAW FCAW	B-L1a-GF	9	1.0	R = T1	—	+1.5,—0	—	SINGLE-PASS WELD
GMAW FCAW	B-L1a-GF	12	1.0	R = T1	—	+1.5,—0	—	SINGLE-PASS WELD

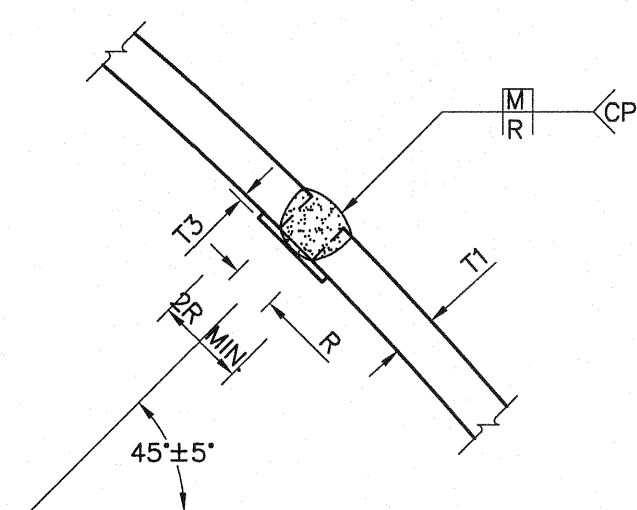
SMAW = SHIELD METAL ARC WELDING
GMAW = GAS METAL ARC WELDING
FCAW = FLUX CORED ARC WELDING



CIRCULAR BUTT JOINT
DETAIL "1"



LONGITUDINAL BUTT JOINT
TYPE "A"



LONGITUDINAL BUTT JOINT (ALTERNATIVE)
TYPE "B"

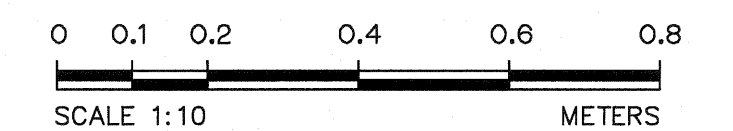
DETAIL "2"

TABLE OF DETAIL "2" SINGLE-V-GROOVE WELD, BUTT JOINT

TYPE	WELDING PROCESS	DESIGNATION	BASE METAL THICKNESS		GROOVE PREPARATION			TOLERANCES			REMARKS
			T1	T3	ROOT OPENING	GROOVE ANGLE	ROOT FACE	R	A	F	
A	SMAW	B-U2	9	—	R = 2.0	A = 60°	F = 2.0	+15,—0	+10',—0'	+15,—0	SINGLE-PASS WELD
	SMAW	B-U2	12	—	R = 2.0	A = 60°	F = 2.0	+15,—0	+10',—0'	+15,—0	SINGLE-PASS WELD
B	SMAW	B-L1a-GF	9	1.0	R = 9.0	—	—	+15,—0	—	—	SINGLE-PASS WELD
	GMAW FCAW	B-L1a-GF	12	1.0	R = 12.0	—	—	+15,—0	—	—	SINGLE-PASS WELD

NOTES :

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

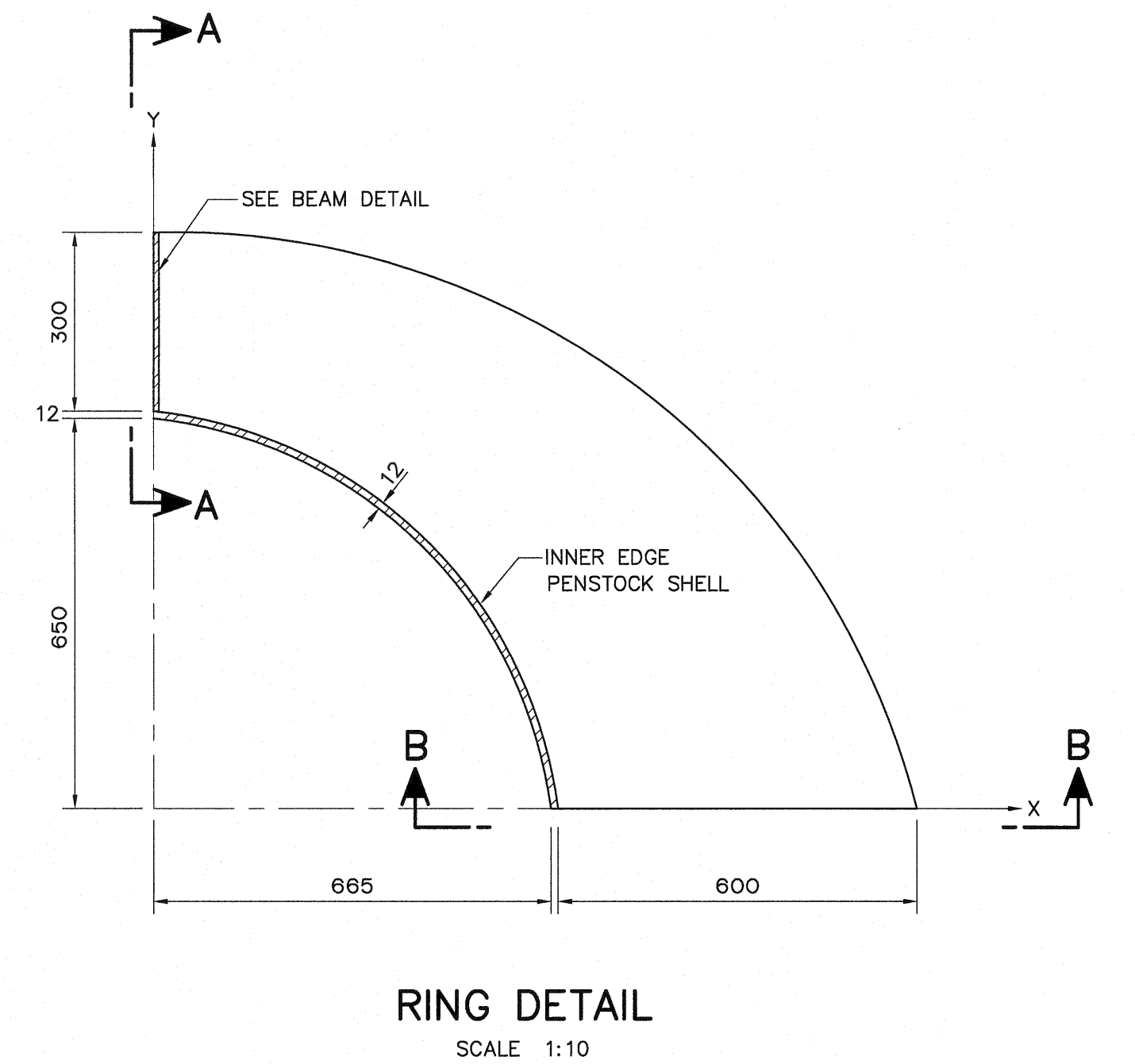
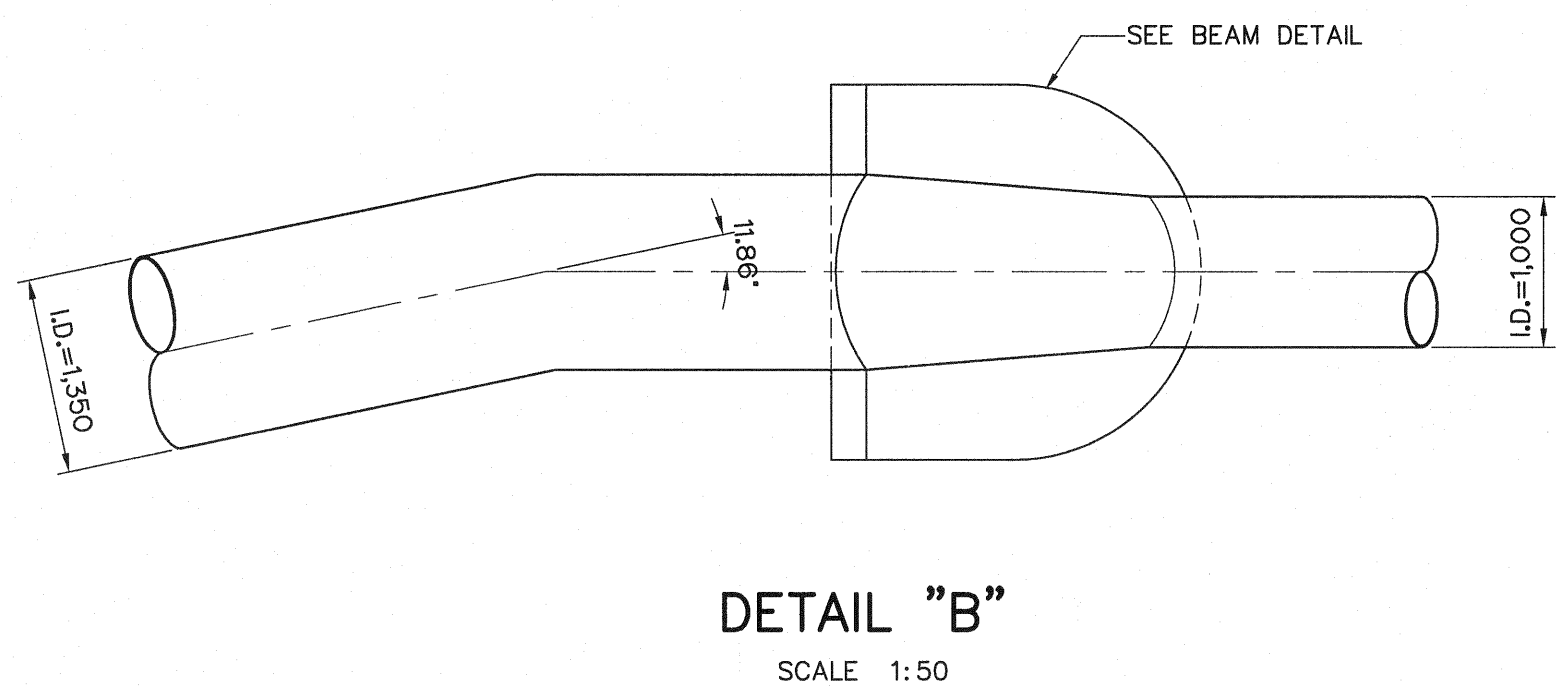
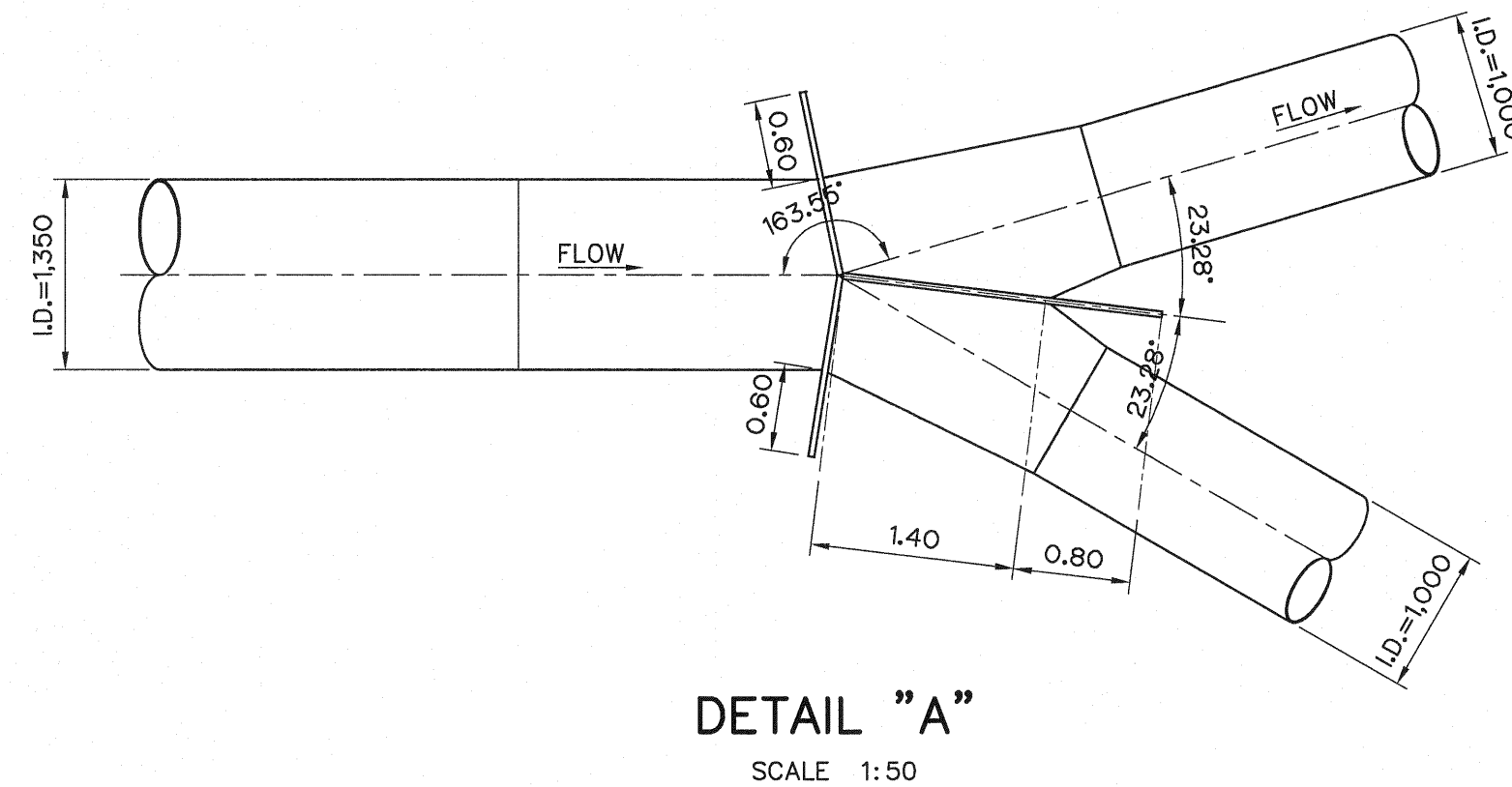
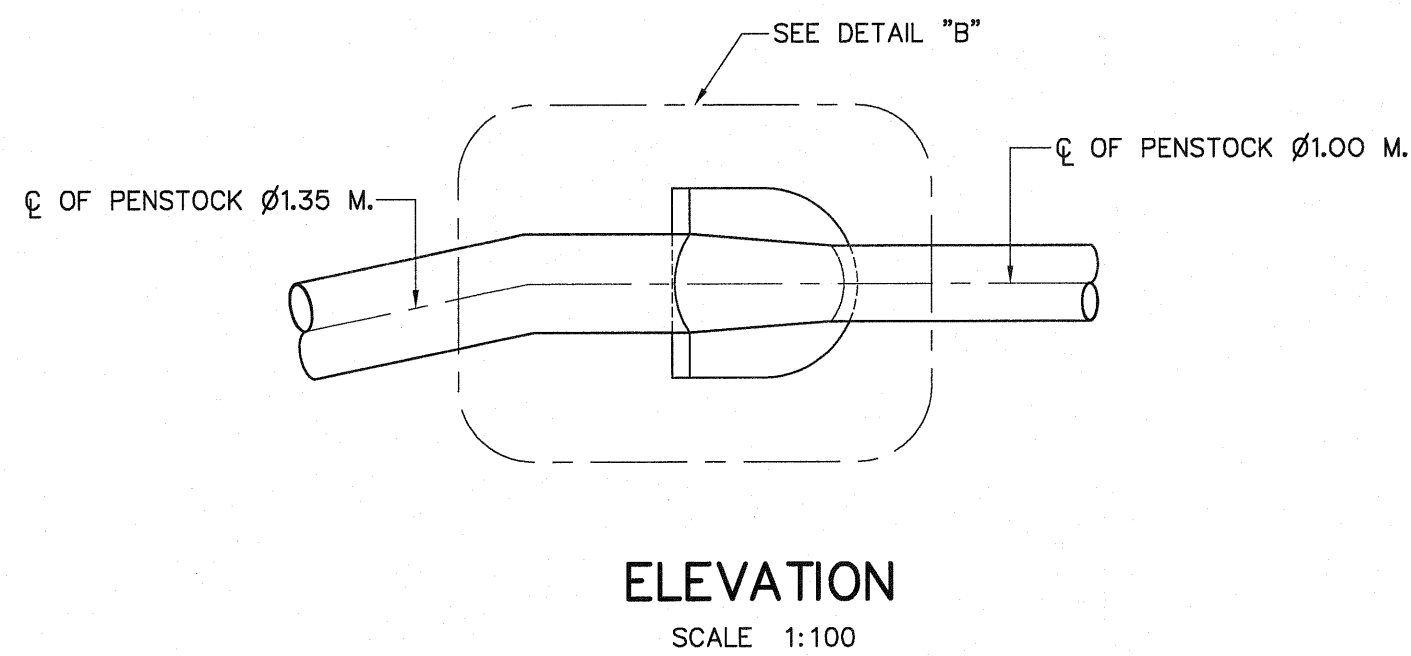
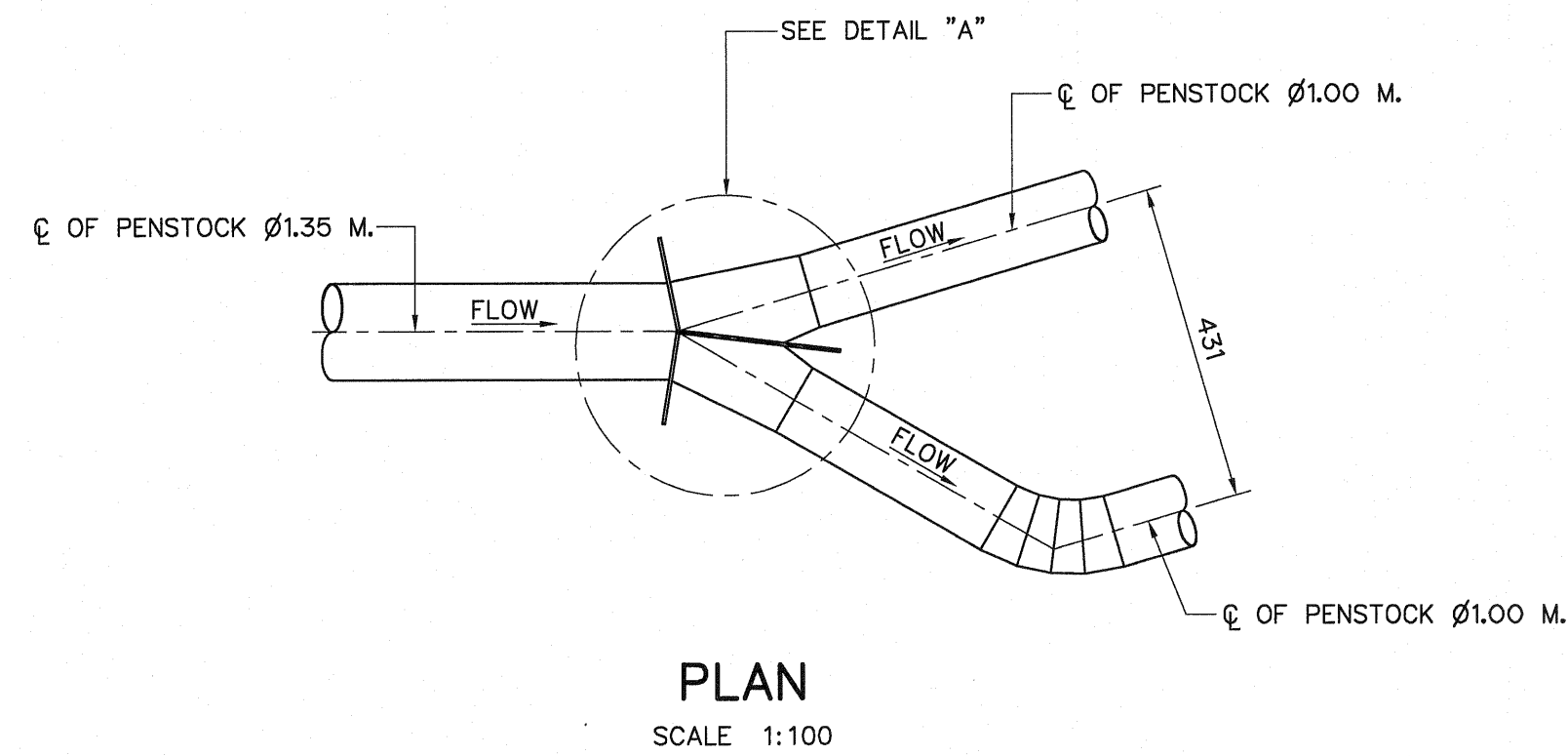
FIELDWELD SYMBOL	WELD — ALL — AROUND SYMBOL	SQUARE GROOVE WELDING SYMBOL R=ROOT OPENING	V-GROOVE WELDING SYMBOL R=ROOT OPENING A=GROOVE ANGLE F=ROOT FACE	BACKING SYMBOL (MATERIAL OF BACKING THE SAME AS OF PIPE)	COMPLETE JOINT PENETRATION WELD	FILLET WELD S=WELDING SIZE L=LENGTH OF WELD P=PITCH (CENTER 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				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

CONSULTANTS

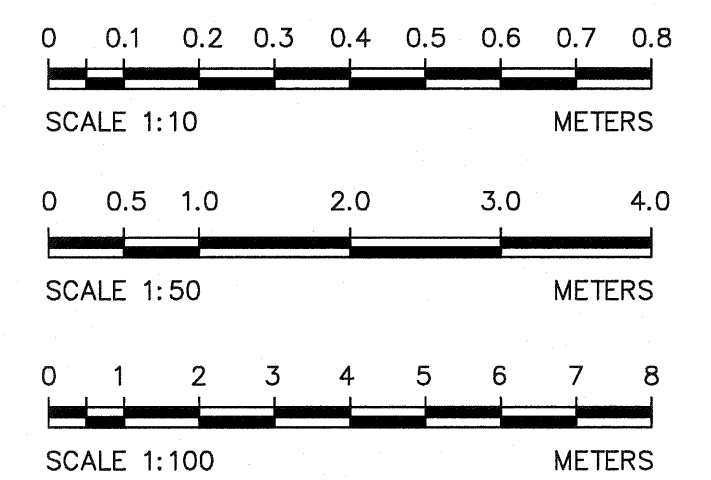
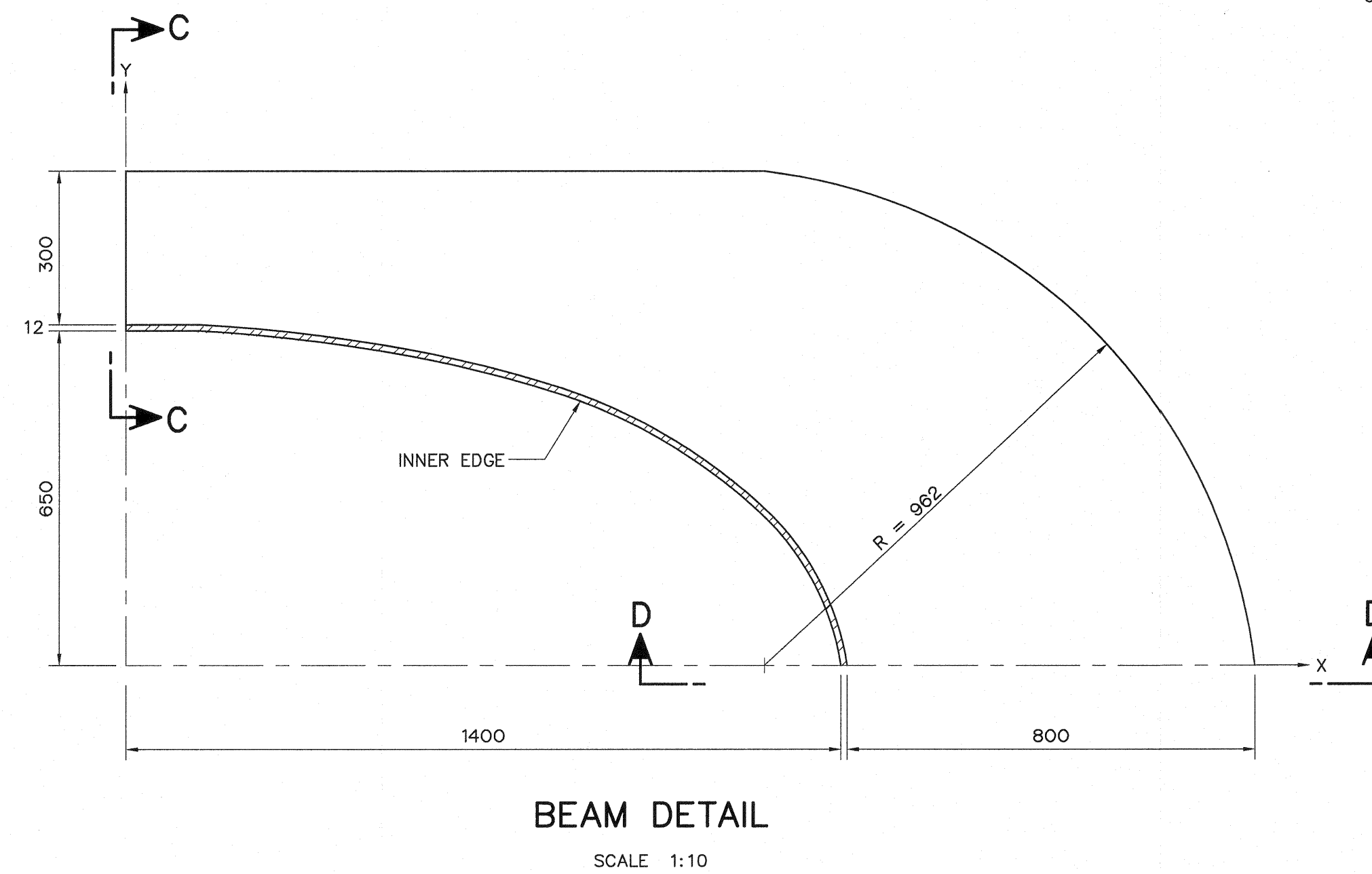
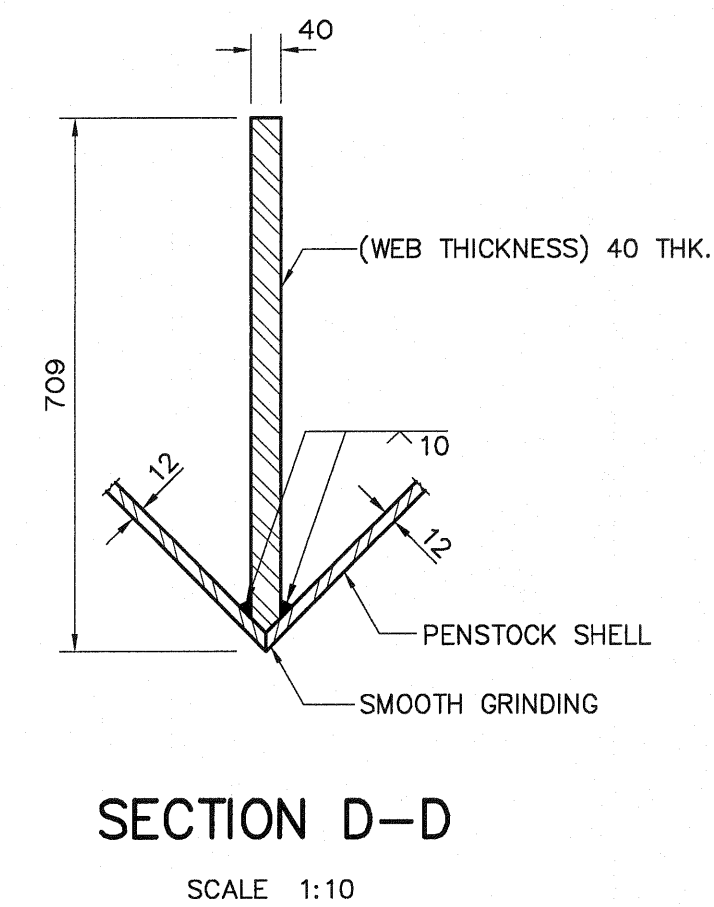
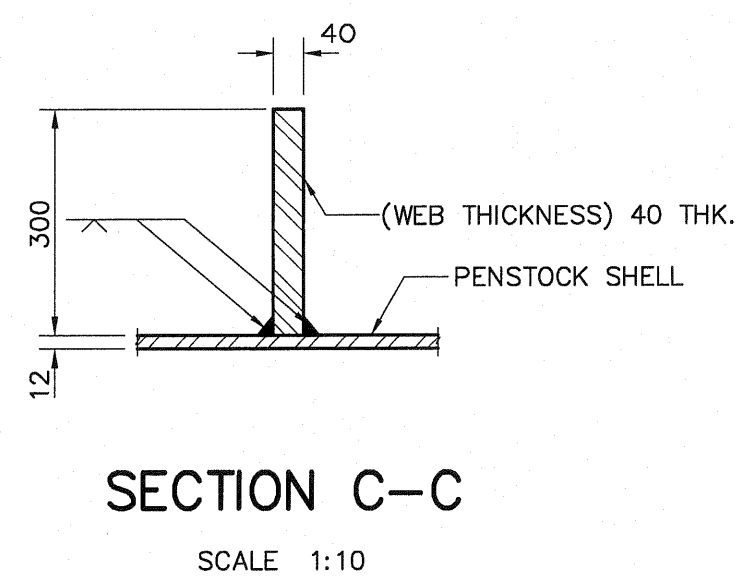
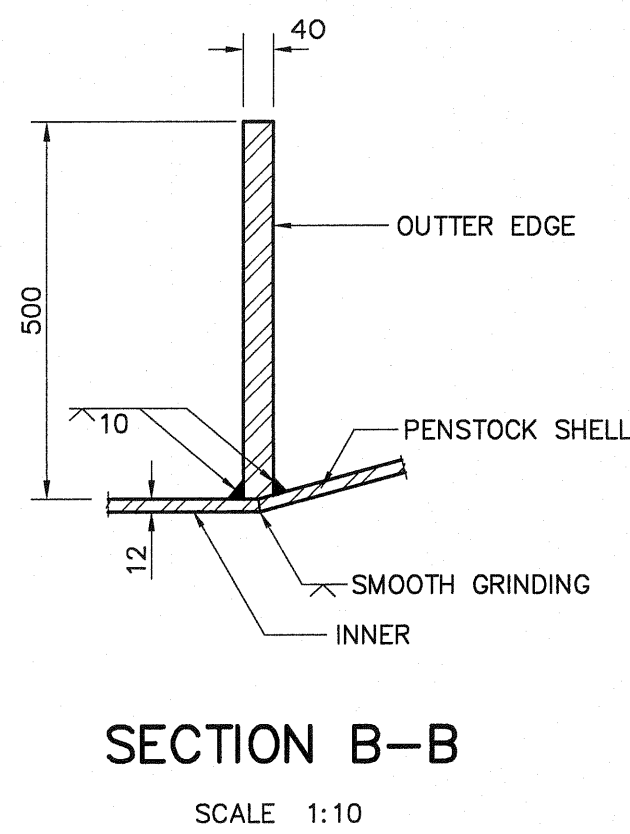
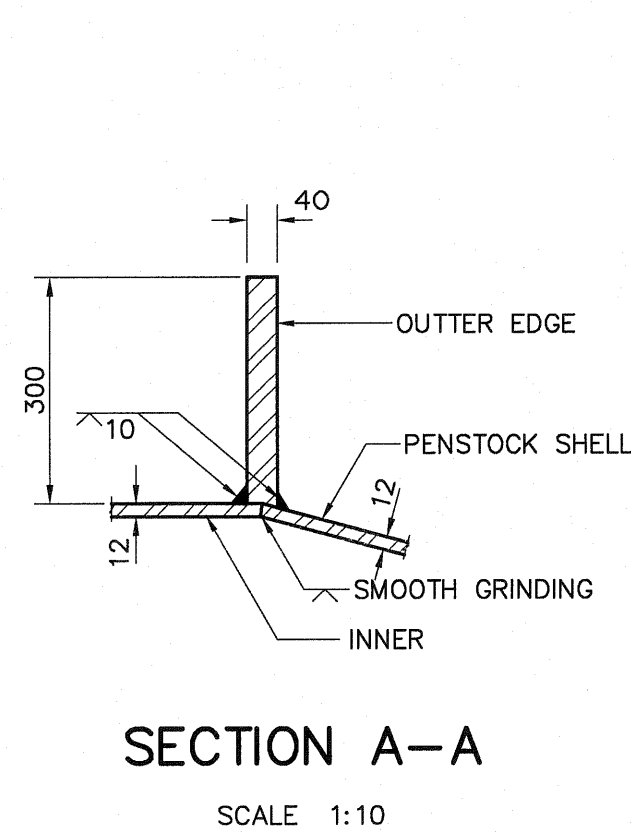
DEDE

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
LAM PHRA PHLOENG HYDROPOWER PROJECT	
CIVIL WORKS PENSTOCK WELDING DETAILS	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	REVIEWED S. KITICHAJ
DESIGNED S. KITICHAJ	SUBMITTED S. KITICHAJ
DRAWN S. KITICHAJ	RECOMMENDED S. KITICHAJ
CHECKED S. KITICHAJ	APPROVED S. KITICHAJ
PROJECT MANAGER	DATE 14/01/62
DRAWING NO. LPP-PS-06	SHEET NO. 12 OF 44



NOTES :

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

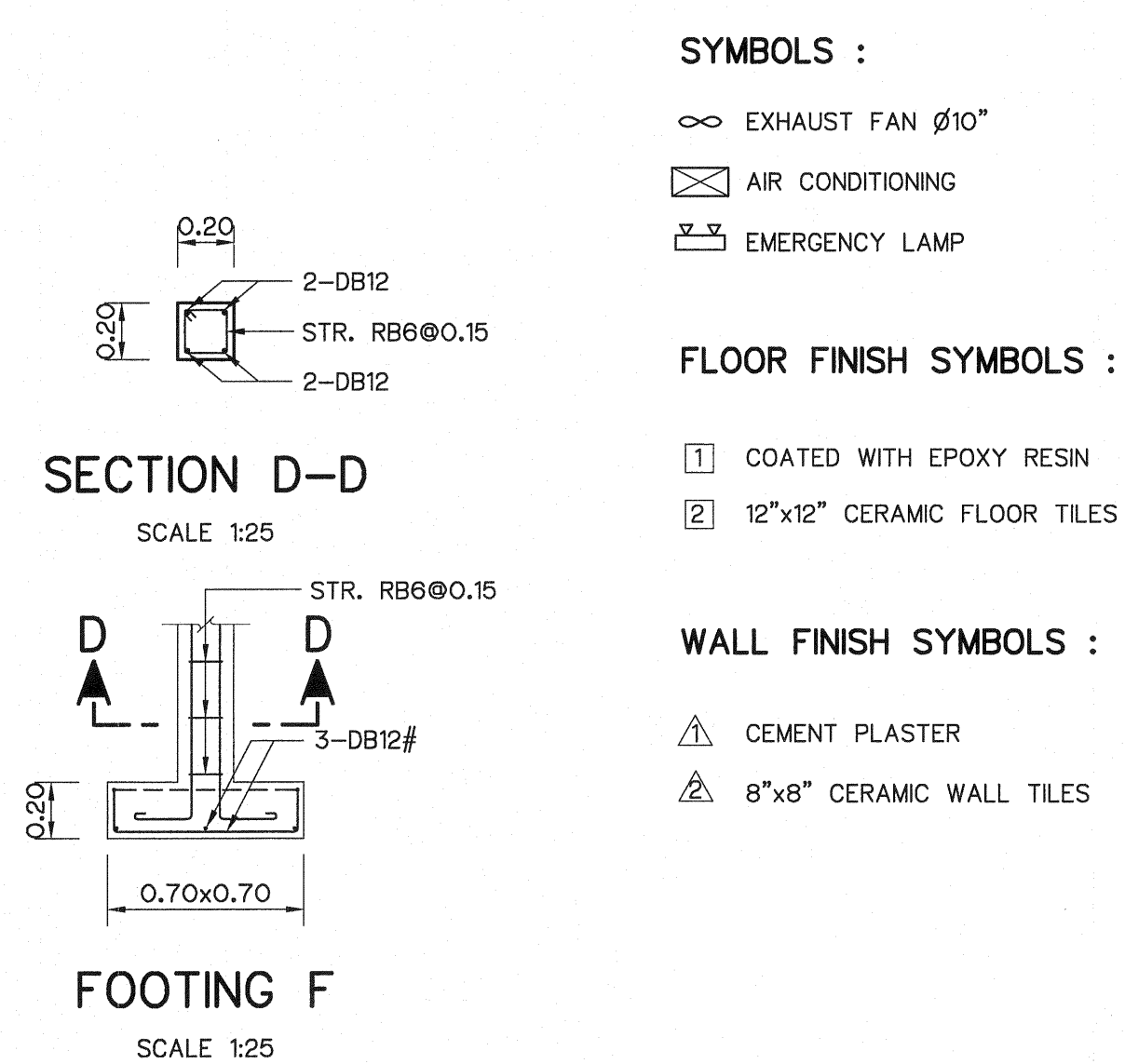
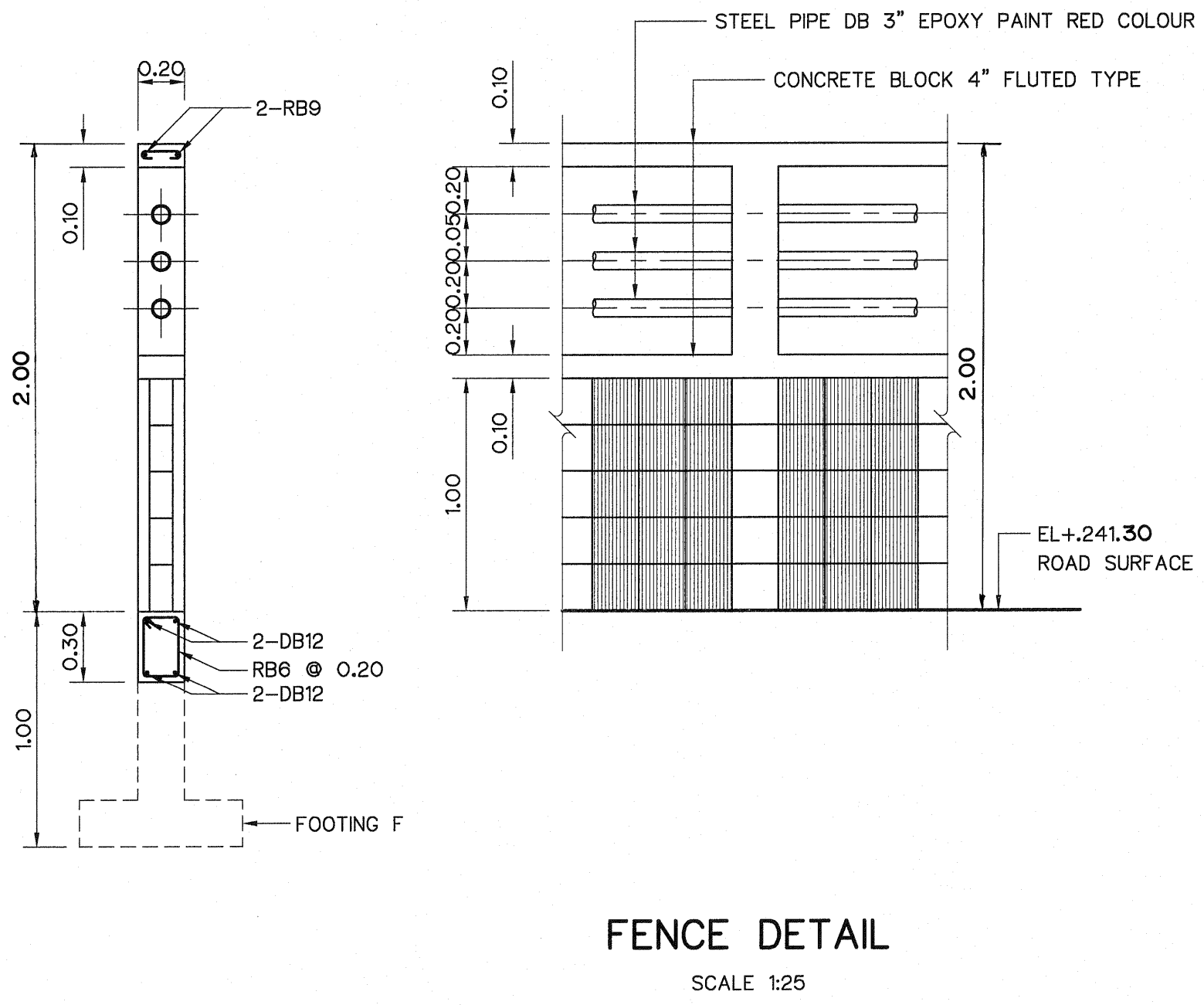
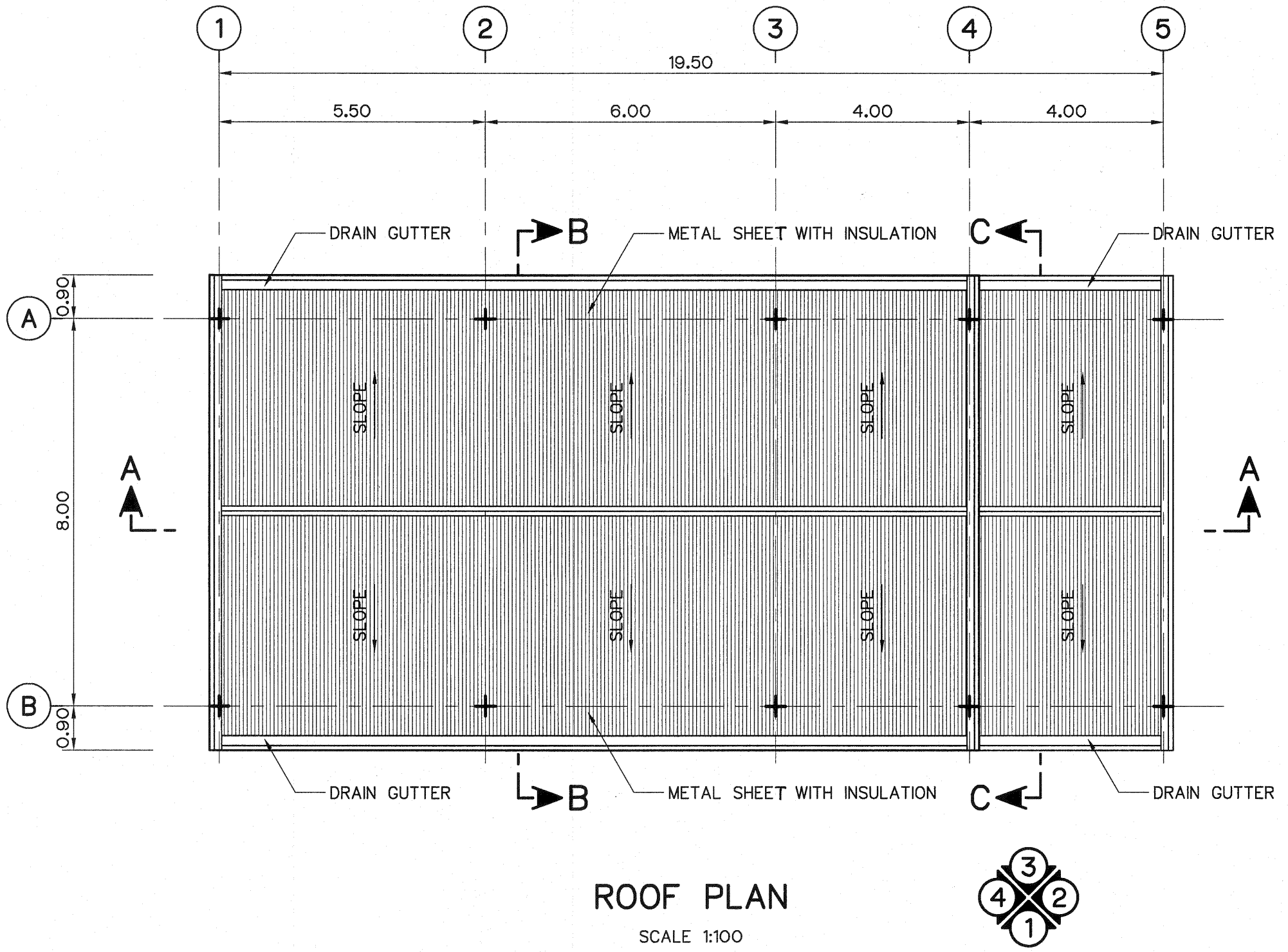
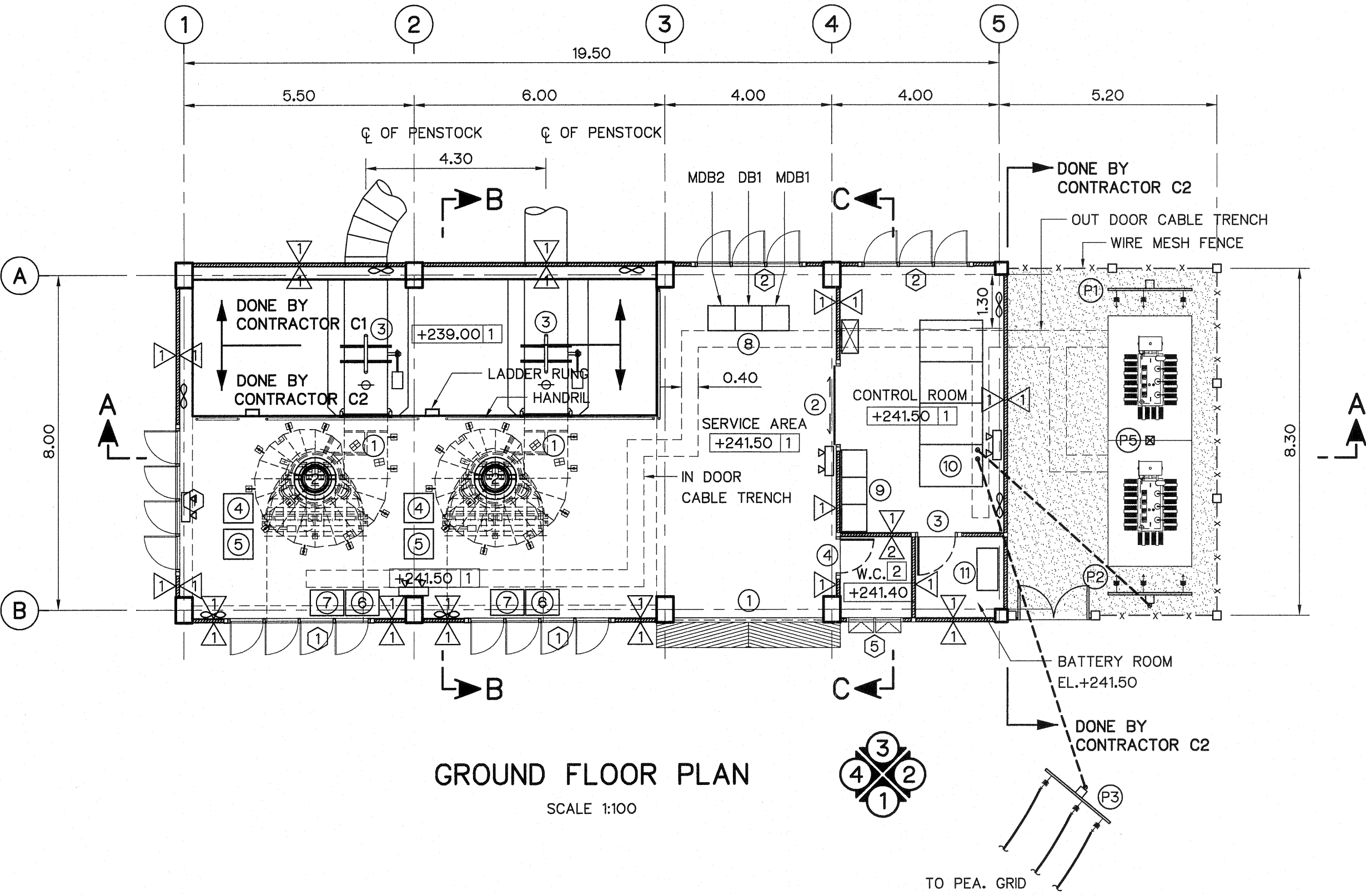


KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
LAM PHRA PHLOENG HYDROPOWER PROJECT			
CIVIL WORKS PENSTOCK WYE, PLAN, SECTIONS AND DETAILS			
FRONTIER ENGINEERING CONSULTANTS CO., LTD.		REVIEWED S. KITCHAN	
DESIGNED S. KITCHAN		SUBMITTED S. KITCHAN	
DRAWN S. KITCHAN		RECOMMENDED S. KITCHAN	
CHECKED S. KITCHAN		APPROVED S. KITCHAN	
PROJECT MANAGER		DRAWING NO. LPP-PS-07	
DATE 14/01/62		SHEET NO. 13 OF 44	

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS		DEDE		

DESCRIPTION :

- ① KAPLAN TURBINE
② SYNCHROUSE GENERATOR
③ INLET VALVE AND BYPASS VALVE
④ FILTRATION AGREGATE
⑤ HYDRAULIC GOVERNOR OF TURBINE REGULATION
⑥ SWITCHGEAR CUBICLE
⑦ GOVERNOR AND TURBINE CONTROL PANEL
⑧ MAIN CONTROL SWITCHBOARD
⑨ AC & DC SWITCHBOARD AND BATTERY CHARGER CUBICLE
⑩ HIGH VOLTAGE SWITCHGEAR 22 KV.
⑪ BATTERY RACK



SYMBOLS :

- ∞ EXHAUST FAN Ø10"
⊠ AIR CONDITIONING
⊠ EMERGENCY LAMP

FLOOR FINISH SYMBOLS :

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

WALL FINISH SYMBOLS :

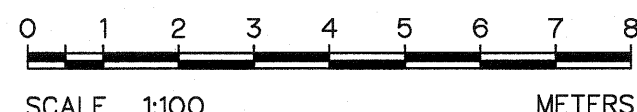
- ⊠ CEMENT PLASTER
⊠ 8"x8" CERAMIC WALL TILES

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP-GN-03.
3. CONTRACT C1 INCLUDE PENSTOCK BEYOND INLET VALVE (INCLUDE FLANGE).
4. ALL OF OUT DOOR CABLE TRENCH (INCLUDE INSIDE SWITCHYARD FENCE) SHALL BE DONE BY CONTRACT C2.

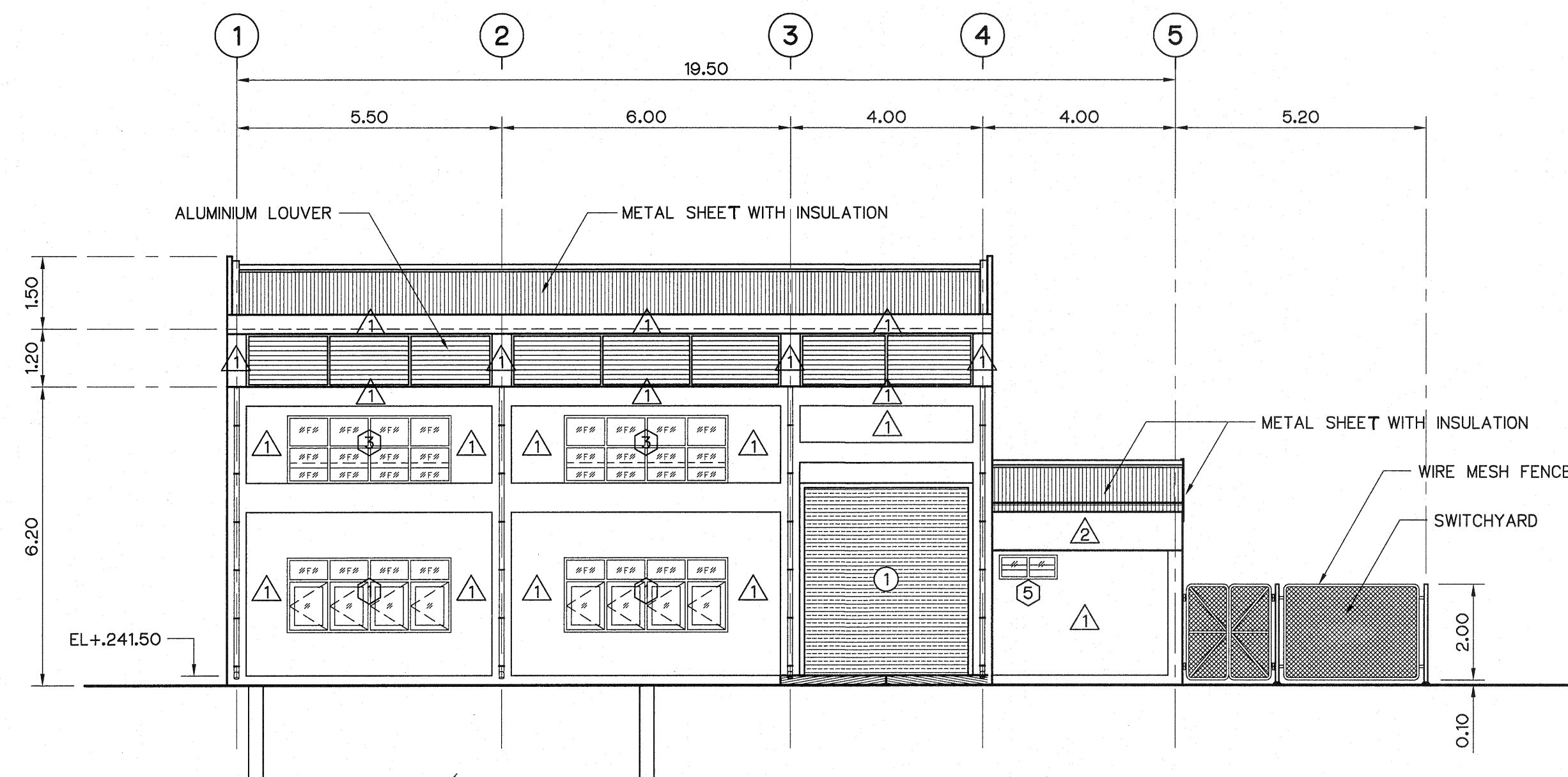
REFERENCE DRAWINGS :

1. POWERHOUSE, GENERAL LAY-OUT LPP-PH-01
2. POWERHOUSE, ELEVATIONS LPP-PH-03
3. POWERHOUSE, SECTION A-A LPP-PH-04
4. POWERHOUSE, SECTION B-B , C-C LPP-PH-05
5. POWERHOUSE, DETAIL OF DOORS, WINDOWS AND NAME PLATE LPP-PH-06
6. POWERHOUSE, DETAILS OF TOILET, SEPTIC AND SEEPAGE TANK LPP-PH-07

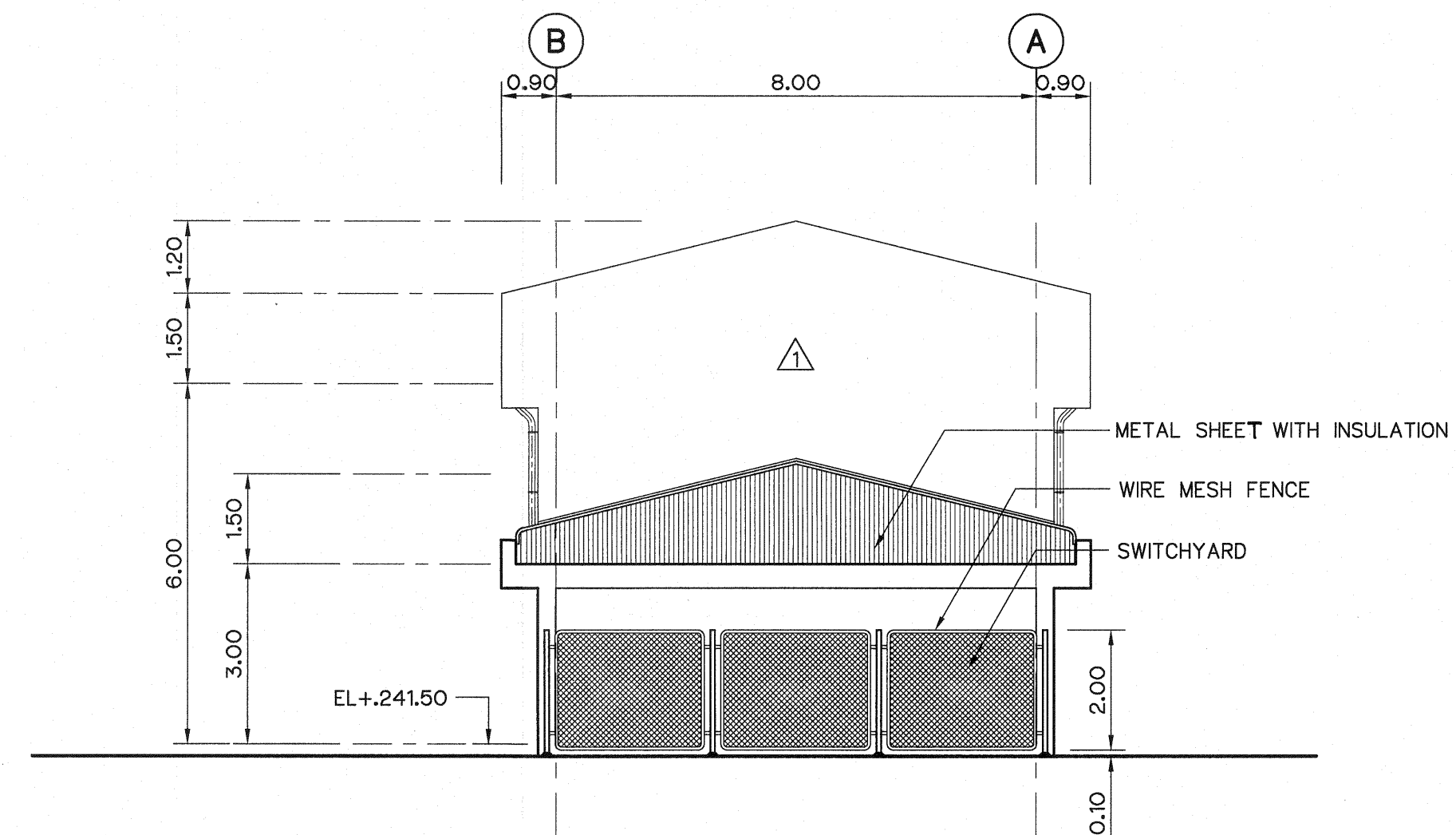


KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
LAM PHRA PHLOENG HYDROPOWER PROJECT	
CIVIL WORKS POWERHOUSE GROUND FLOOR PLAN & ROOF PLAN	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	REVIEWED S. KITICHAI
DESIGNED S. KITICHAI	SUBMITTED S. KITICHAI
DRAWN S. KITICHAI	RECOMMENDED S. KITICHAI
CHECKED S. KITICHAI	APPROVED S. KITICHAI
PROJECT MANAGER	DATE 14/01/62
DRAWING NO. LPP-PH-02	SHEET NO. 15 OF 44

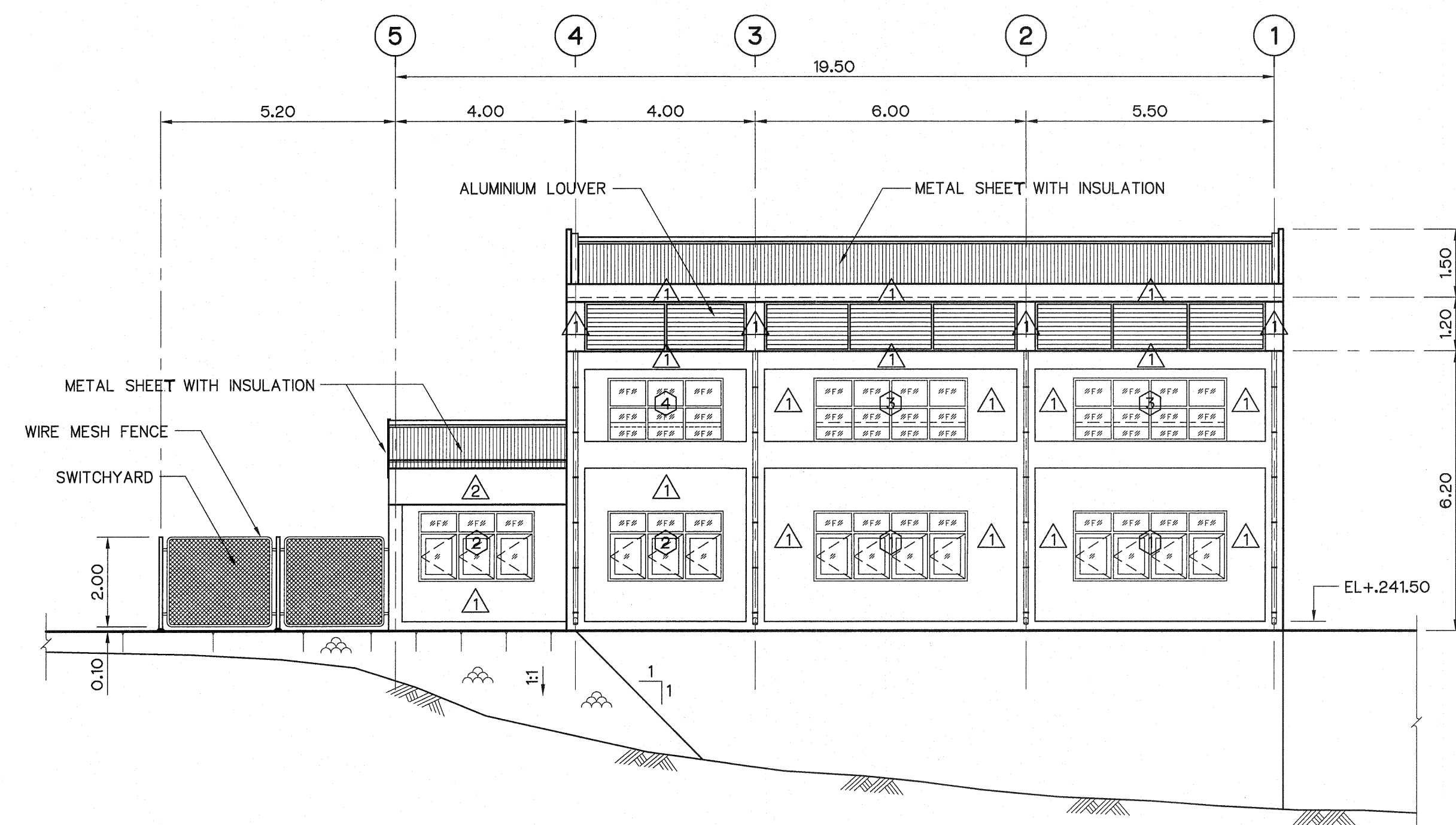
3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS		DEDE		



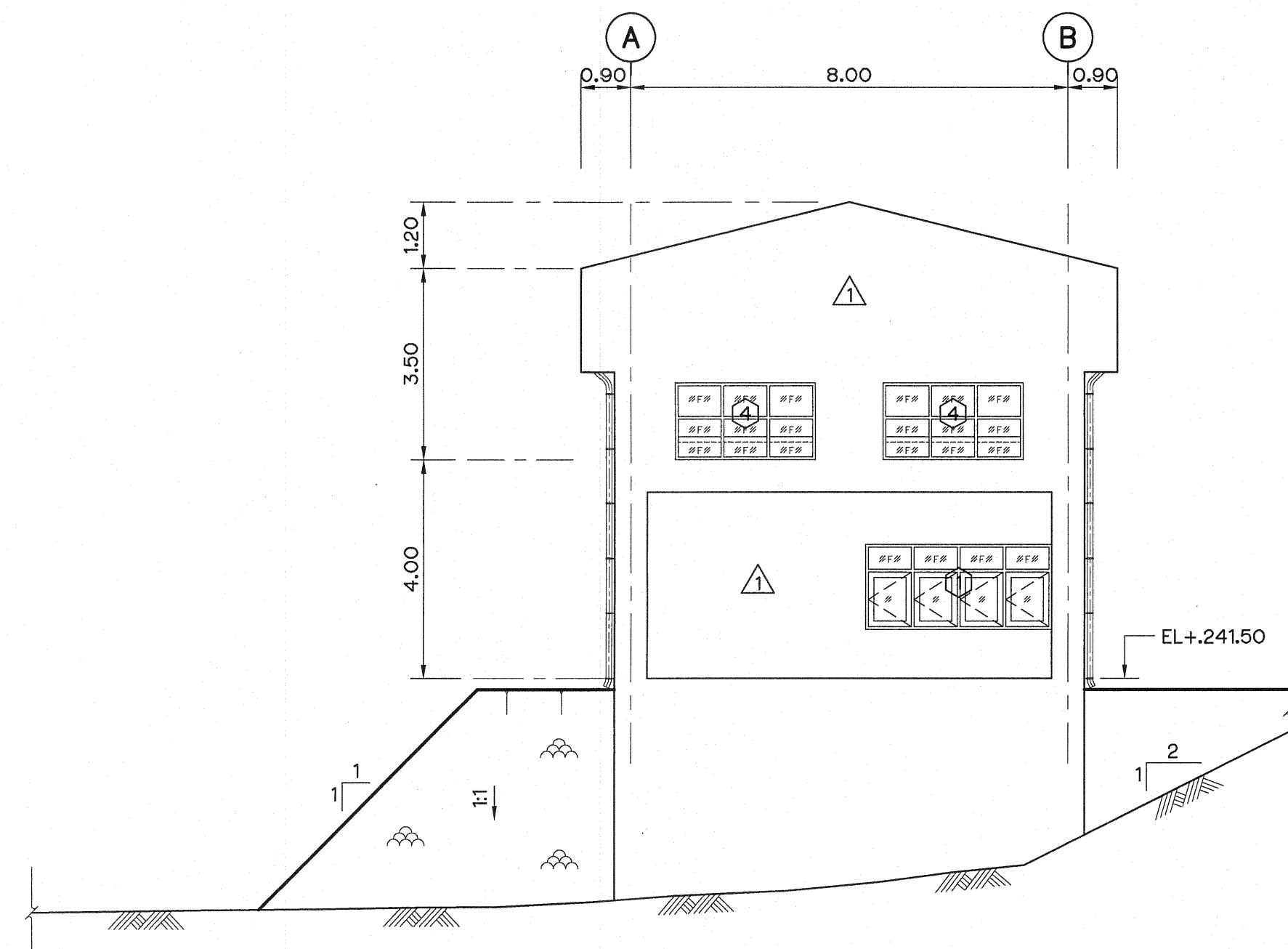
ELEVATION 1
SCALE 1:100



ELEVATION 2
SCALE 1:100



ELEVATION 3
SCALE 1:100



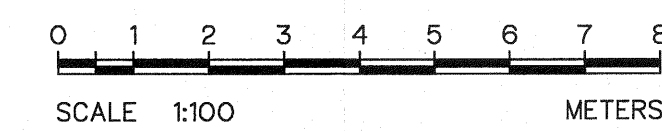
ELEVATION 4
SCALE 1:100

NOTES :

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

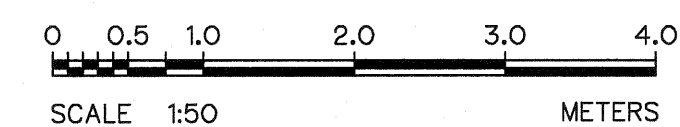
REFERENCE DRAWINGS :

1. POWERHOUSE, GROUND FLOOR PLAN & ROOF PLAN LPP-PH-02
2. POWERHOUSE, SECTION A-A LPP-PH-04
3. POWERHOUSE, SECTION B-B , C-C LPP-PH-05



3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
LAM PHRA PHLOENG HYDROPOWER PROJECT	
CIVIL WORKS POWERHOUSE ELEVATIONS	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	REVIEWED S. KITICHAI
DESIGNED S. KITICHAI 201.6651	SUBMITTED S. KITICHAI
DRAWN S. KITICHAI	RECOMMENDED S. KITICHAI
CHECKED S. KITICHAI 201.7324	APPROVED S. KITICHAI
PROJECT MANAGER S. KITICHAI 14/01/62	DRAWING NO. LPP-PH-03 SHEET NO. 16 OF 44

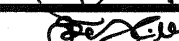


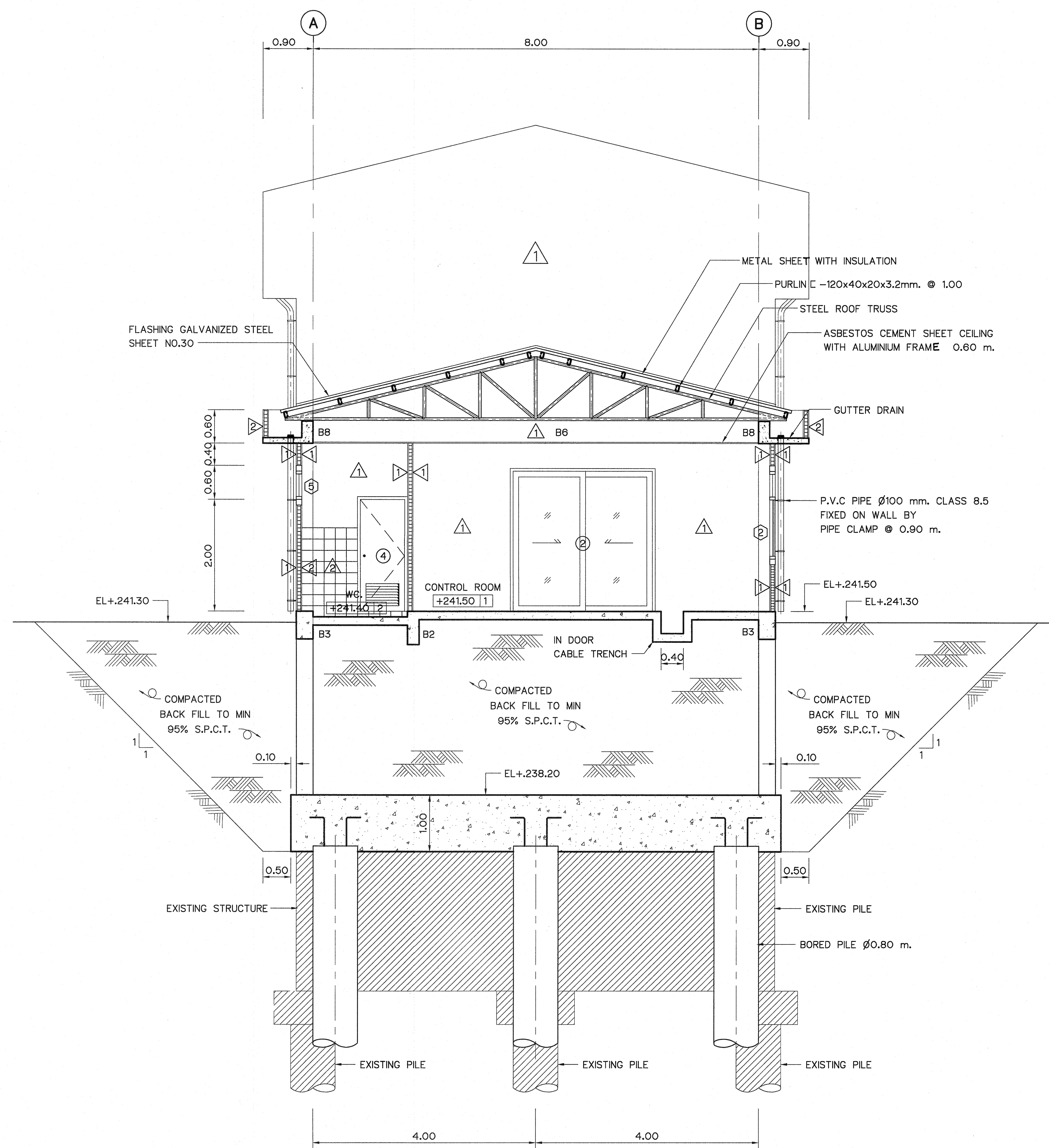
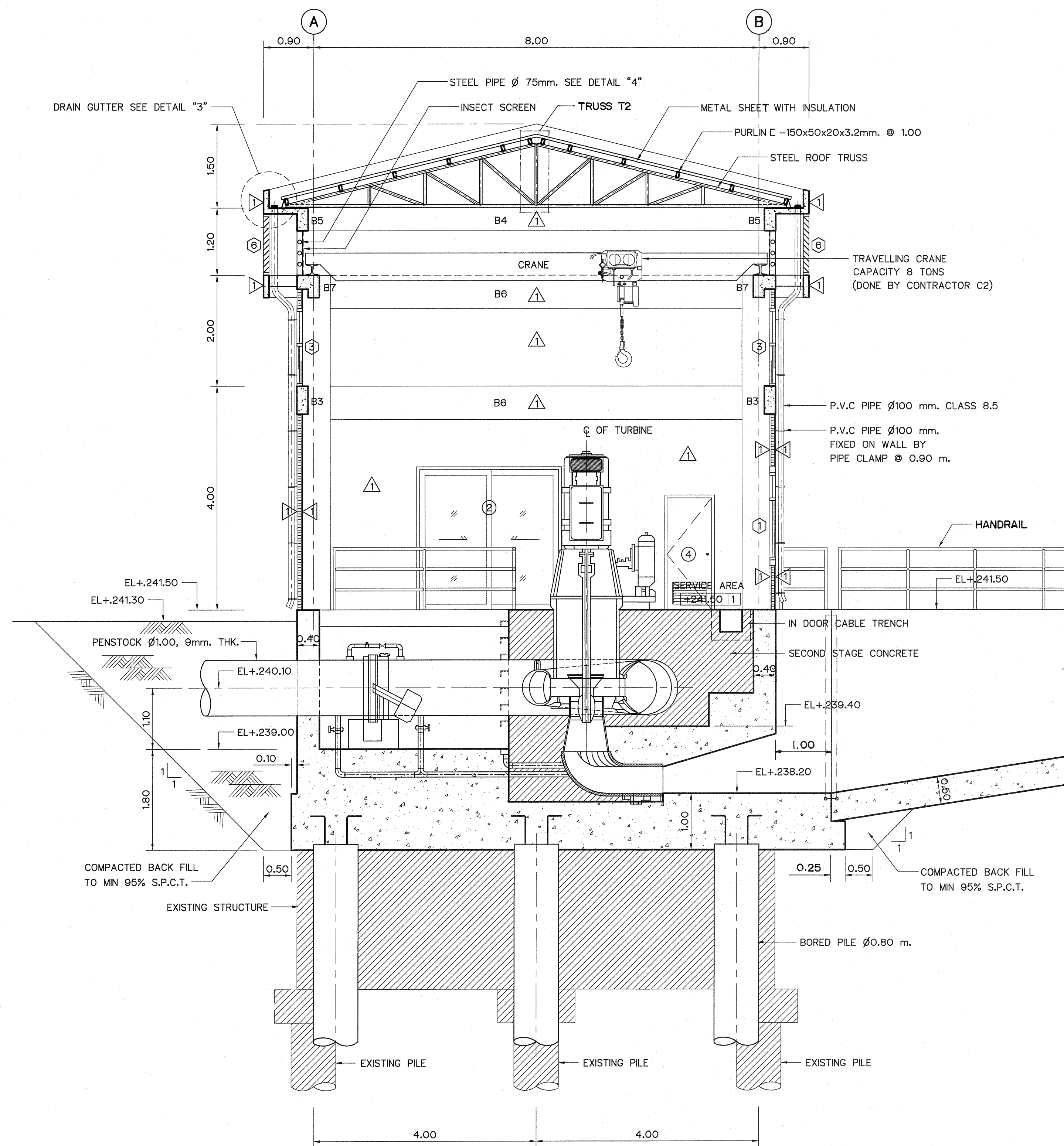
SCALE 1:50

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS,
UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP-GN-03.
3. ALLOWABLE LOAD OF BORED PILE Ø0.80 M. SHALL NOT BE LESS THAN 180 TONS.
4. BORED PILE TIP SHALL BE PLACED ON FIRM ROCK LAYER
OR DENSE SAND APPROX. PILE LENGTH 25 M.

1. POWERHOUSE, GROUND FLOOR PLAN & ROOF PLAN	LPP-PH-02
2. POWERHOUSE, ELEVATIONS	LPP-PH-03
3. POWERHOUSE, ROOF TRUSS AND MISCELLANEOUS DETAILS	LPP-PH-06

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
LAM PHRA PHLOENG HYDROPOWER PROJECT			
CIVIL WORKS			
POWERHOUSE			
SECTION A-A			
 FRONTIER ENGINEERING CONSULTANTS CO., LTD.		 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED  SEL.6651		REVIEWED S. KITICHAH	
DRAWN 		SUBMITTED 	
CHECKED  SEL.7324		RECOMMENDED 	
		APPROVED 	
PROJECT MANAGER		DRAWING NO. LPP-PH-04	
DATE 14/01/62		SHEET NO. 17 OF 44	

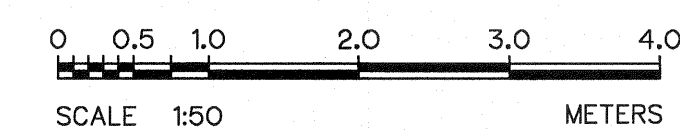


NOTES :

- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP-GN-03.
- ALLOWABLE LOAD OF BORED PILE Ø0.80 M. SHALL NOT BE LESS THAN 180 TONS.
- BORED PILE TIP SHALL BE PLACED ON FIRM ROCK LAYER OR DENSE SAND APPROX. PILE LENGTH 25 M.

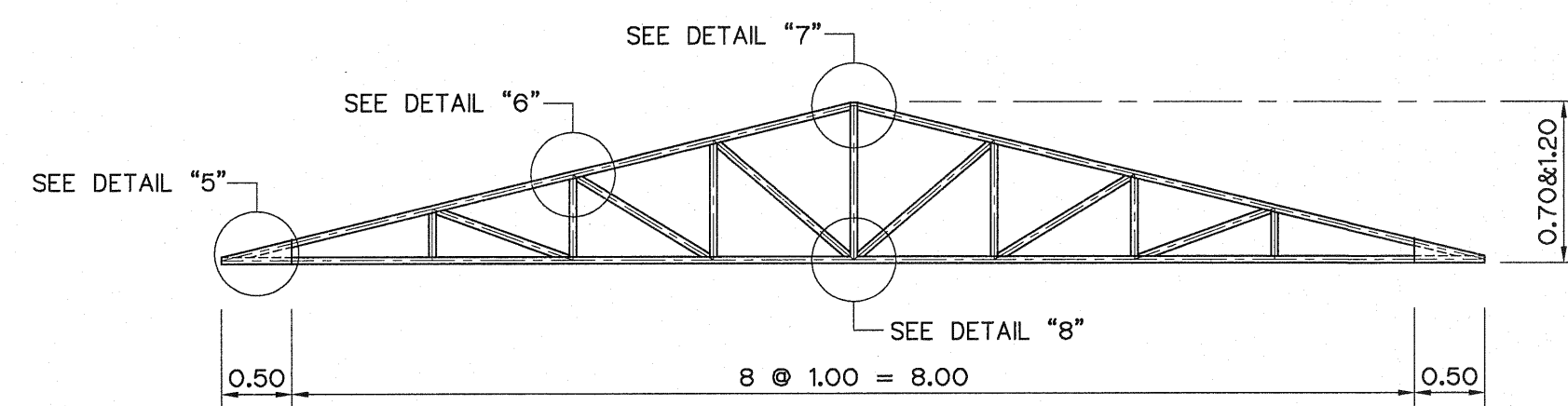
REFERENCE DRAWINGS :

- | | |
|---|-----------|
| 1. POWERHOUSE, GROUND FLOOR PLAN & ROOF PLAN | LPP-PH-02 |
| 2. POWERHOUSE, ELEVATIONS | LPP-PH-03 |
| 3. POWERHOUSE, ROOF TRUSS AND MISCELLANEOUS DETAILS | LPP-PH-06 |

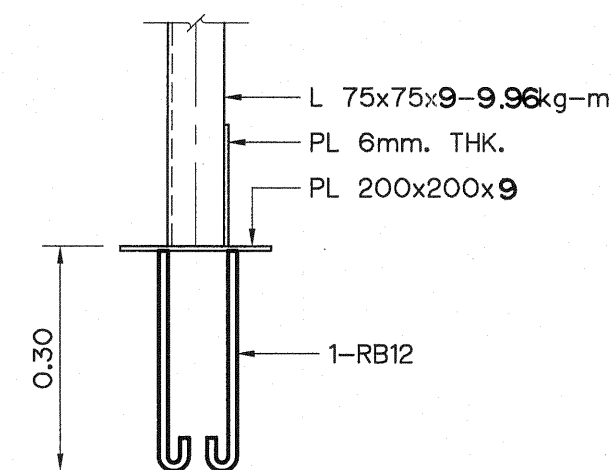


3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
			CONSULTANTS	DEDE

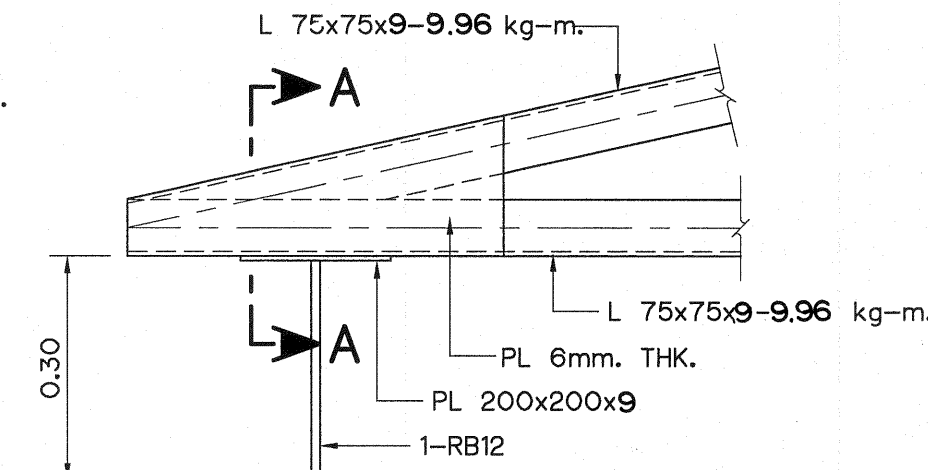
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
LAM PHRA PHLOENG HYDROPOWER PROJECT	
CIVIL WORKS POWERHOUSE SECTION B-B , C-C	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD. DESIGNED: <i>[Signature]</i> DRAWN: <i>[Signature]</i> CHECKED: <i>[Signature]</i> PROJECT MANAGER	REVIEWED: S. KITICHAI SUBMITTED: <i>[Signature]</i> RECOMMENDED: <i>[Signature]</i> APPROVED: <i>[Signature]</i> 14/01/62 DATE
DRAWING NO. LPP-PH-05	SHEET NO. 18 OF 44



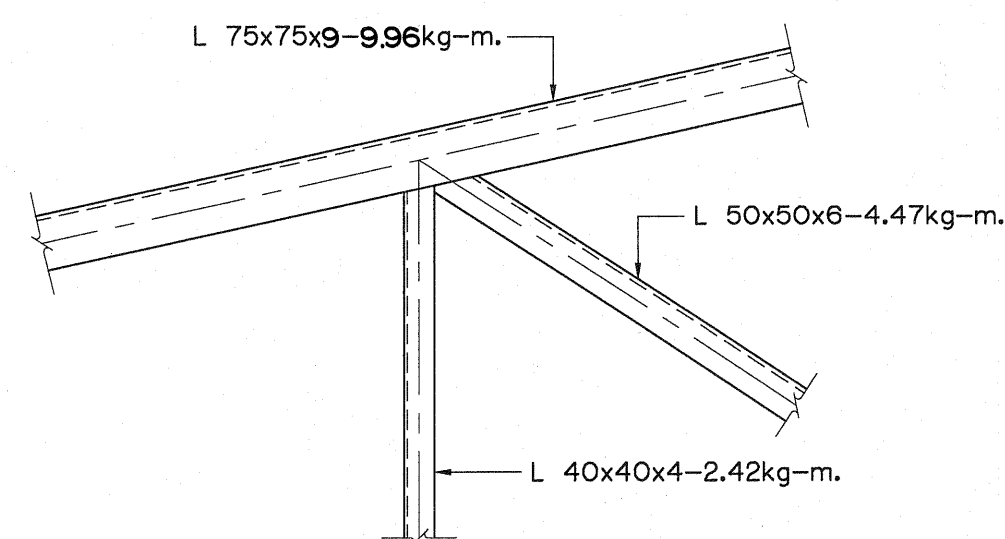
DETAIL STEEL ROOF TRUSS
SCALE 1:50



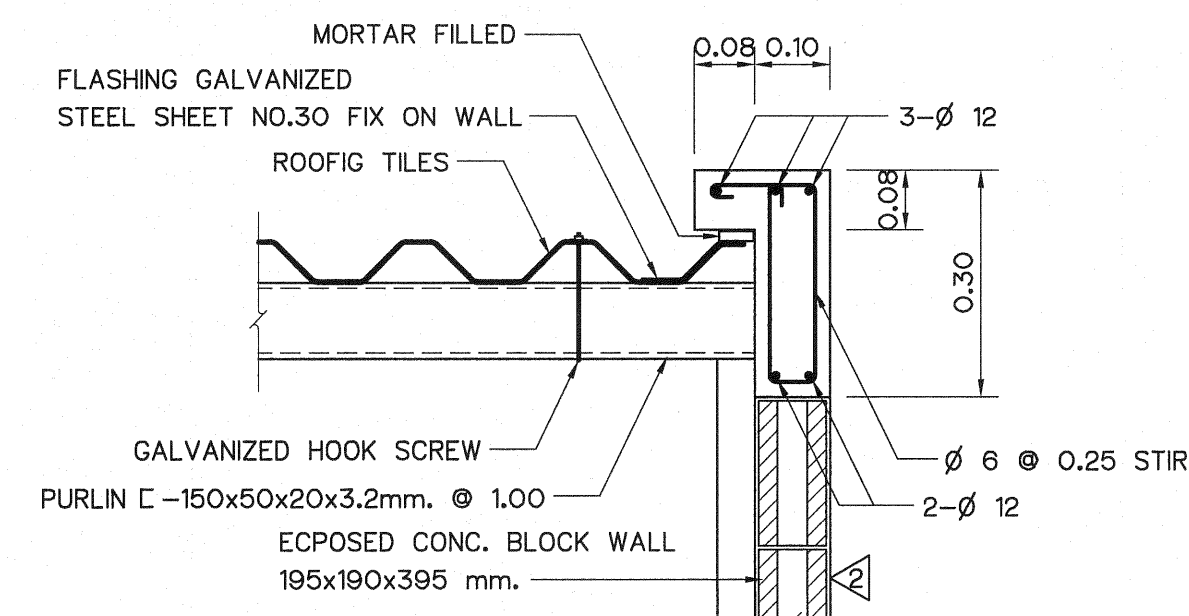
SECTION A-A
SCALE 1:20



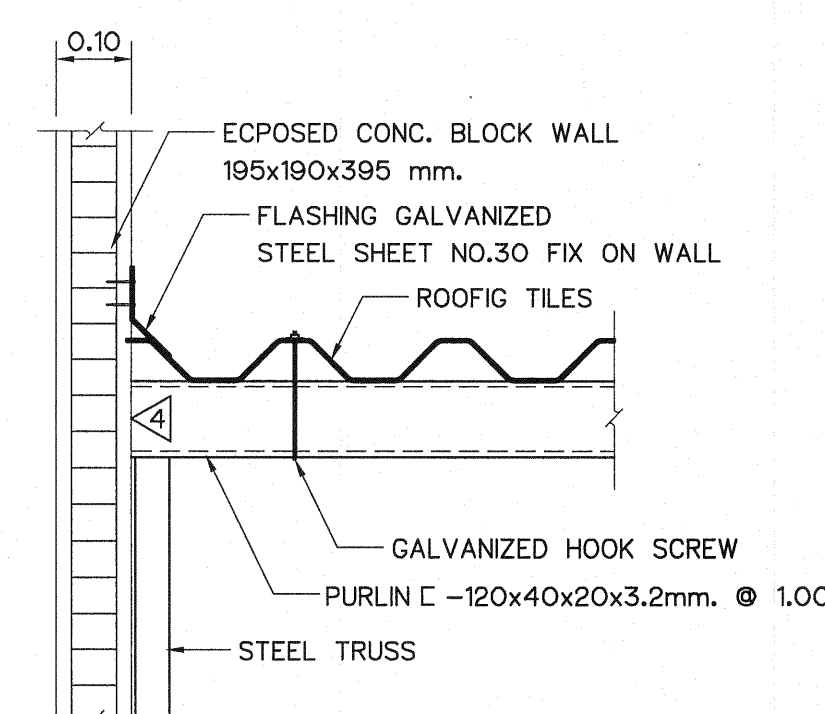
DETAIL "5"
SCALE 1:20



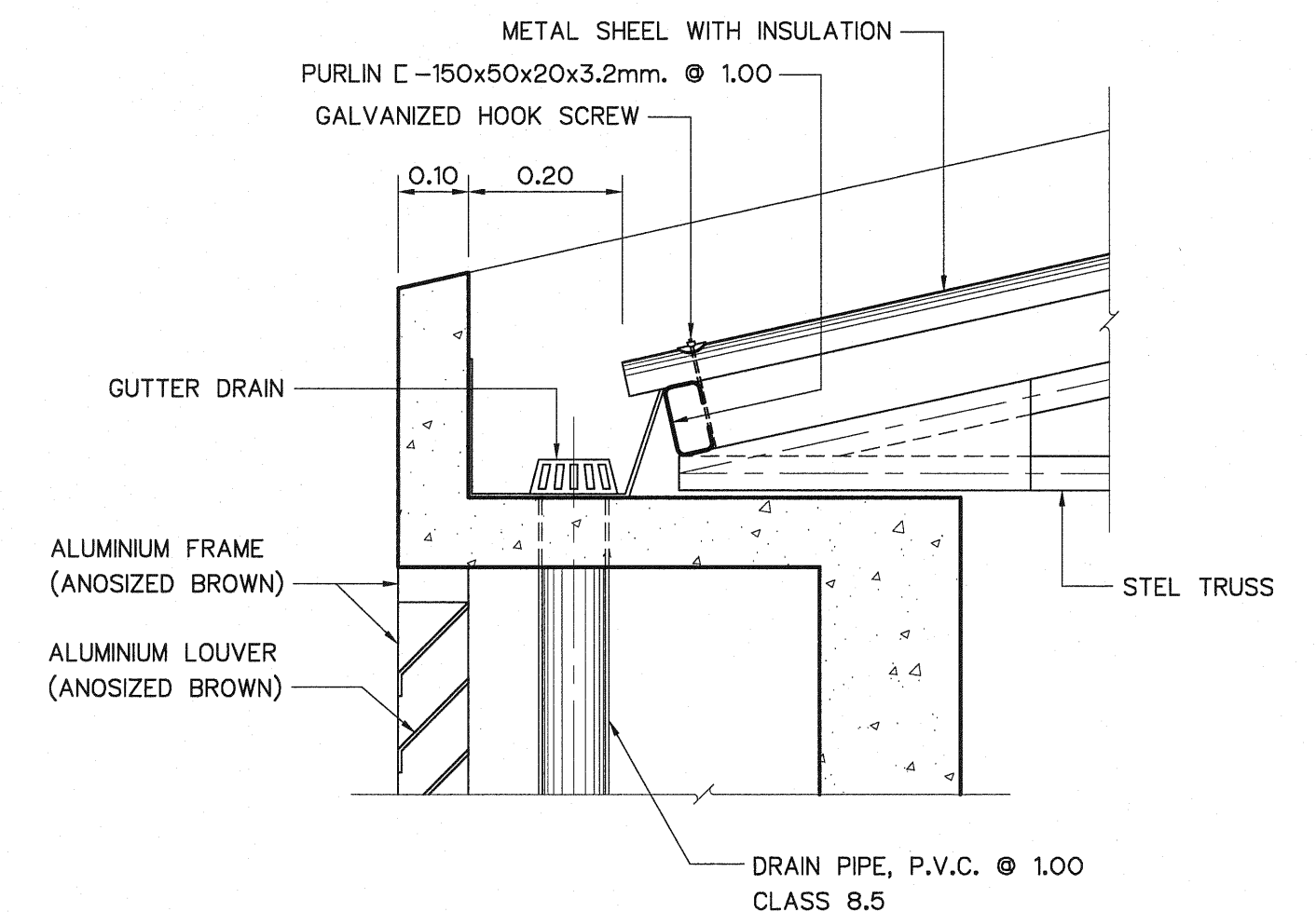
DETAIL "6"
SCALE 1:20



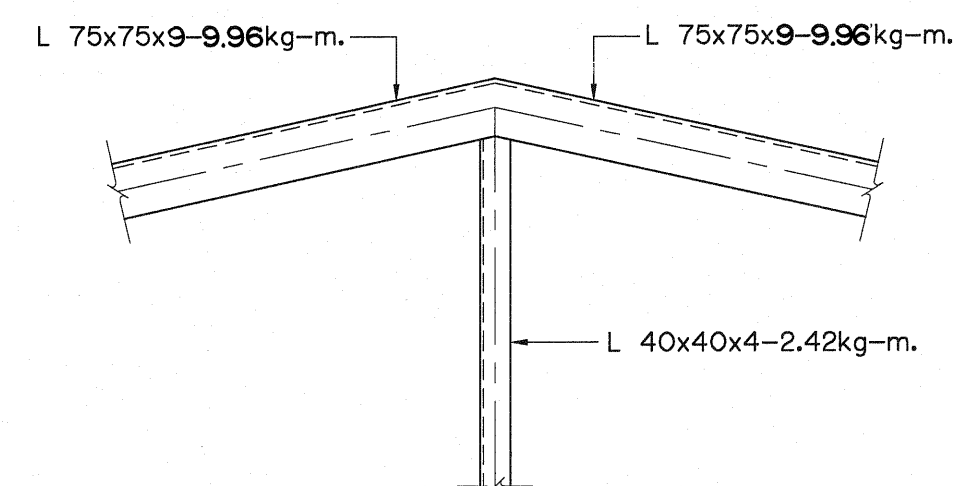
DETAIL "1"
SCALE 1:20



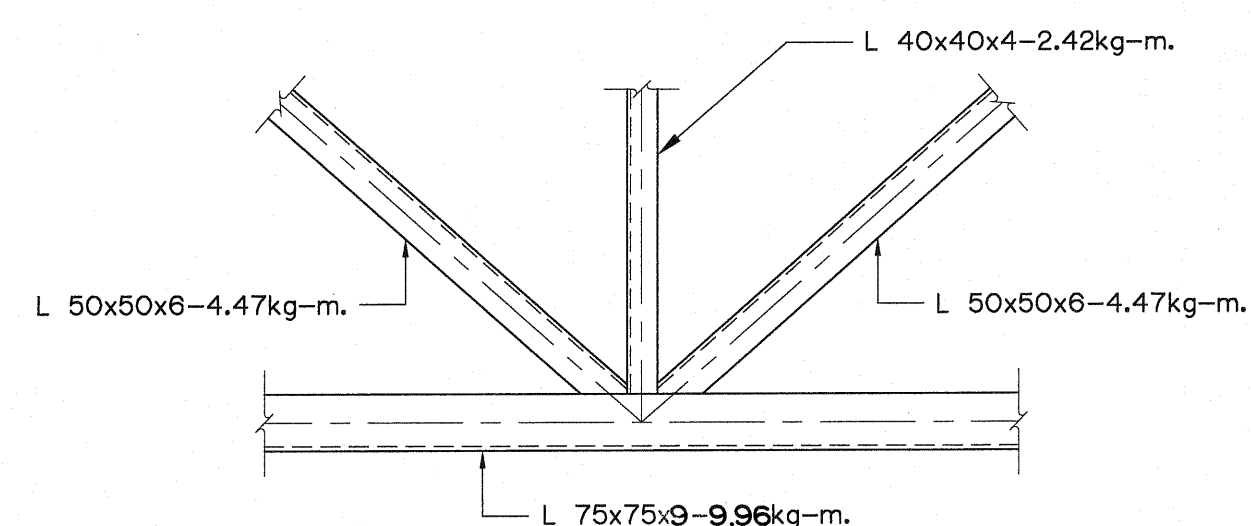
DETAIL "2"
SCALE 1:20



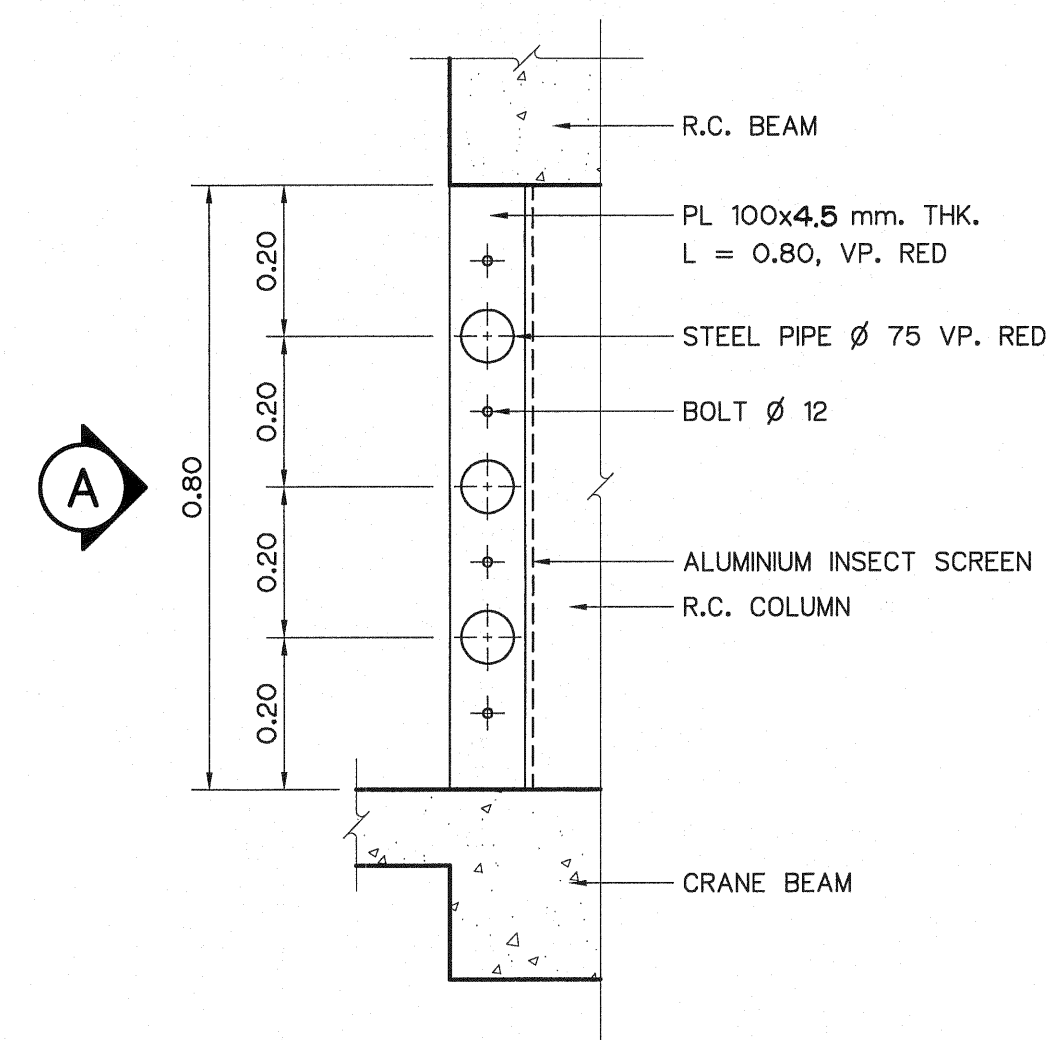
DETAIL "3"
SCALE 1:20



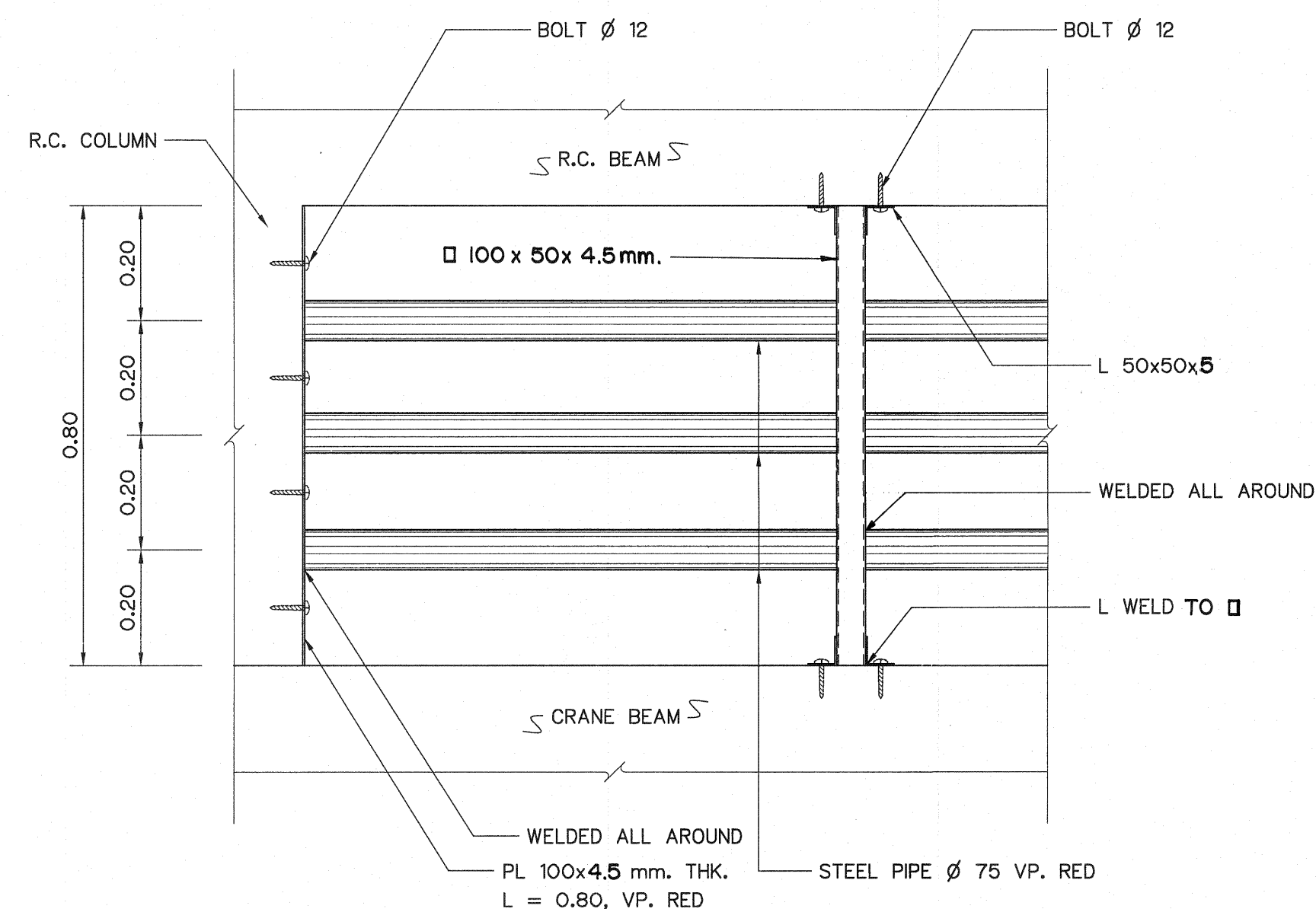
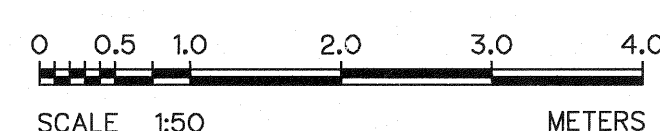
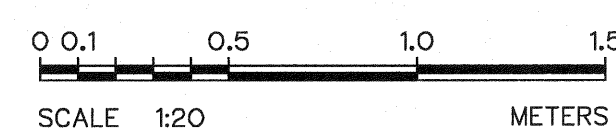
DETAIL "7"
SCALE 1:20



DETAIL "8"
SCALE 1:20



DETAIL "4"
SCALE 1:20



ELEVATION A
SCALE 1:20

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

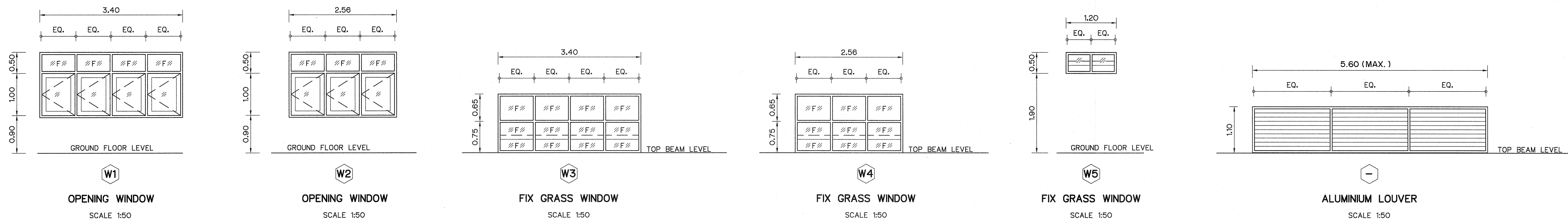
- REFERENCE DRAWINGS :**
- | | |
|--|-----------|
| 1. POWERHOUSE, GROUND FLOOR PLAN & ROOF PLAN | LPP-PH-02 |
| 2. POWERHOUSE, ELEVATIONS | LPP-PH-03 |
| 3. POWERHOUSE, SECTION A-A | LPP-PH-04 |
| 4. POWERHOUSE, SECTION B-B, C-C | LPP-PH-05 |

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
LAM PHRA PHLOENG HYDROPOWER PROJECT	
CIVIL WORKS POWERHOUSE ROOF TRUSS AND MISCELLANEOUS DETAILS	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD. REVIEWED S. KITICHAI	
DESIGNED	SUBMITTED
DRAWN	RECOMMENDED
CHECKED	APPROVED
PROJECT MANAGER DATE 14/01/62	
DRAWING NO. LPP-PH-06 SHEET NO. 19 OF 44	

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED



SYMBOL	DESCRIPTIONS	SIZE		FRAME	PANEL	HINGE	LOCKSET	HANDLE	REMARKS
		WIDTH	HEIGHT						
D1	ROLLING DOOR (STEEL NO.18,1.2 mm. Thk.)	3.60	4.00	GALVANIZED STEEL	—	—	NORMAL KEY	—	MOTOR OPERATING
D2	SLIDE DOOR	2.50	2.50	ALUMINIUM(NA) 2"x 4"	GLASS 5 mm.thk.	—	CYINDER LOCK	—	
D3	OPENING DOOR	0.90	2.00	HARDWOOD 2"x 4"	TEAK PLYWOOD & GLASS 5 mm.thk.	STAINLESS STEEL 4"x3"x2.5mm.	CYINDER LOCK	—	
D4	OPENING DOOR	0.80	2.00	P.V.C. 2"x 4"	P.V.C.	STAINLESS STEEL 4"x3"x2.5mm.	CYINDER LOCK	—	
W1	OPENING WINDOW	3.40	1.50	ALUMINIUM(NA) 2"x 4"	GLASS 5 mm.thk.	●	●	●	FULL SET OF ACCESSORIES FROM MANUFACTURER
W2	OPENING WINDOW	2.56	1.50	ALUMINIUM(NA) 2"x 4"	GLASS 5 mm.thk.	●	●	●	FULL SET OF ACCESSORIES FROM MANUFACTURER
W3	FIXED GLASS WINDOW	3.40	1.50	ALUMINIUM(NA) 2"x 4"	GLASS 5 mm.thk.	—	—	—	
W4	FIXED GLASS WINDOW	2.56	1.50	ALUMINIUM(NA) 2"x 4"	GLASS 5 mm.thk.	—	—	—	
W5	FIXED GLASS WINDOW	1.20	0.50	ALUMINIUM(NA) 2"x 4"	GLASS 5 mm.thk.	—	—	—	
●	SHALL BE USED SPECIFIED ACCESSORIES								

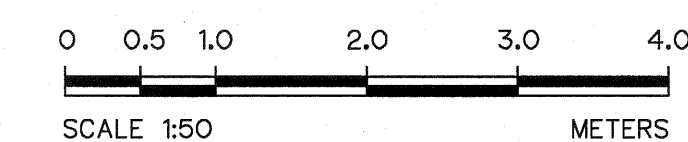
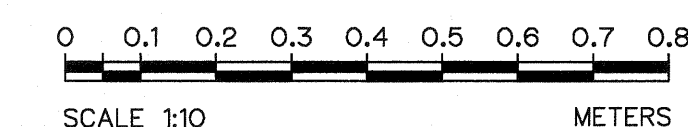


NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP-GN-03.
3. FOR PAINTING WORKS SEE TECHNICAL SPECIFICATION.

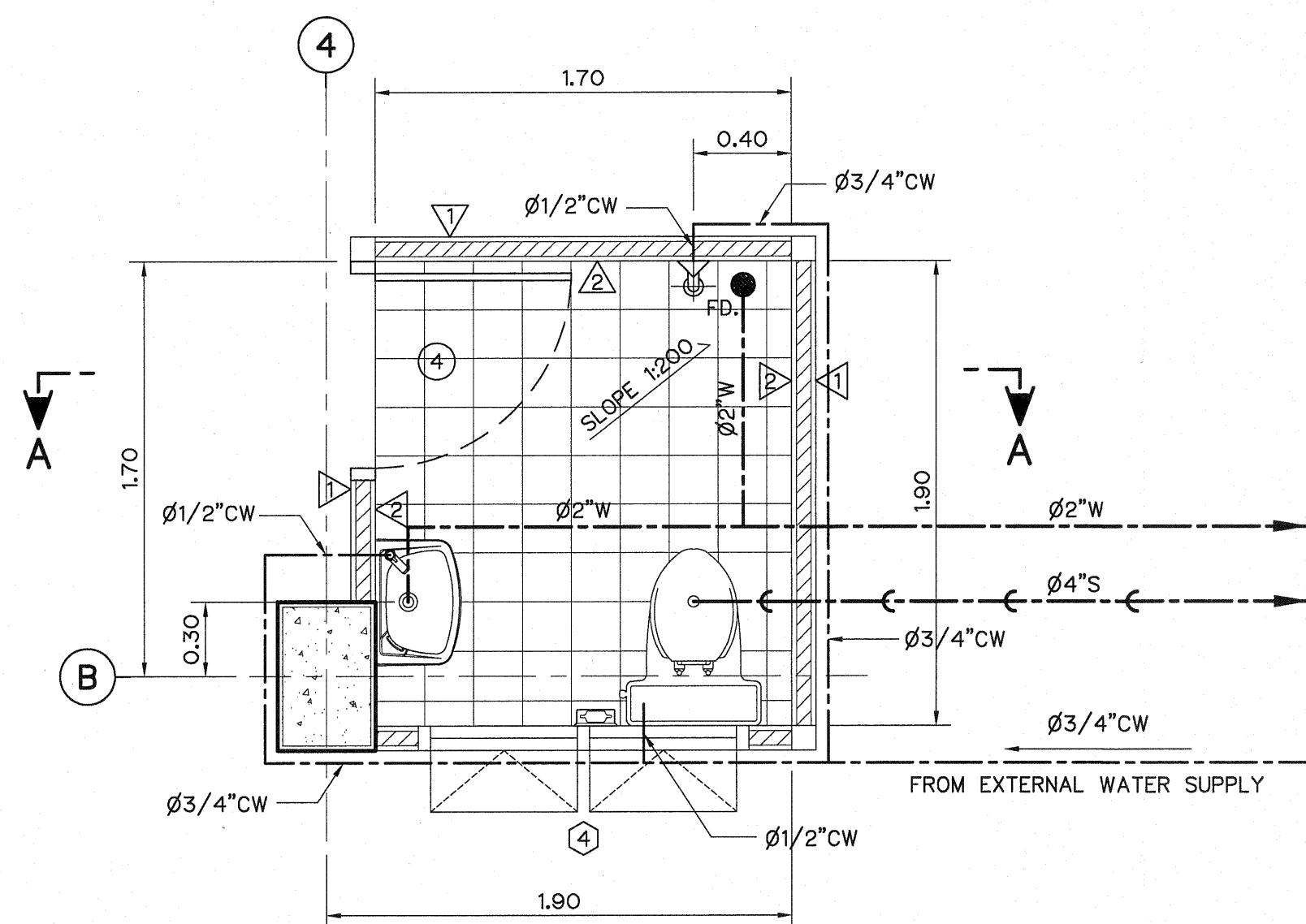
REFERENCE DRAWINGS :

- | | |
|--|-----------|
| 1. POWERHOUSE, GROUND FLOOR PLAN & ROOF PLAN | LPP-PH-02 |
| 2. POWERHOUSE, ELEVATIONS | LPP-PH-03 |
| 3. POWERHOUSE, SECTION A-A | LPP-PH-04 |
| 4. POWERHOUSE, SECTION B-B , C-C | LPP-PH-05 |



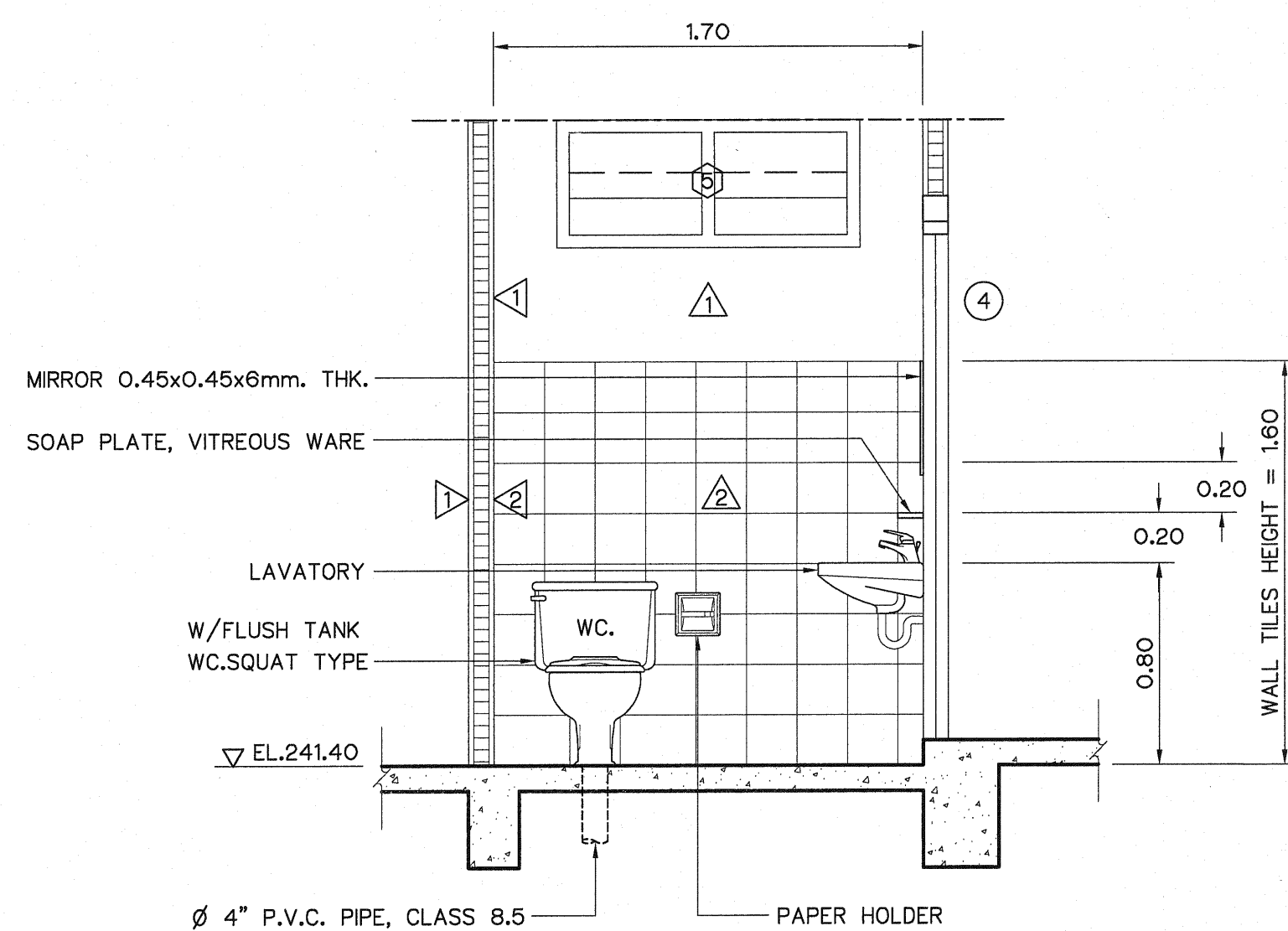
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
LAM PHRA PHLOENG HYDROPOWER PROJECT	
CIVIL WORKS	
POWERHOUSE	
DETAILS OF DOORS, WINDOWS AND NAMEPLATE	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD. DESIGNED: [Signature] 26.6651 DRAWN: [Signature] CHECKED: [Signature] 26.7324 PROJECT MANAGER: [Signature] 14/01/62	DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY MINISTRY OF ENERGY REVIEWED: S. KITICHAI SUBMITTED: [Signature] RECOMMENDED: [Signature] APPROVED: [Signature] DRAWING NO. LPP-PH-07 SHEET NO. 20 OF 44

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
		CONSULTANTS		DEDE



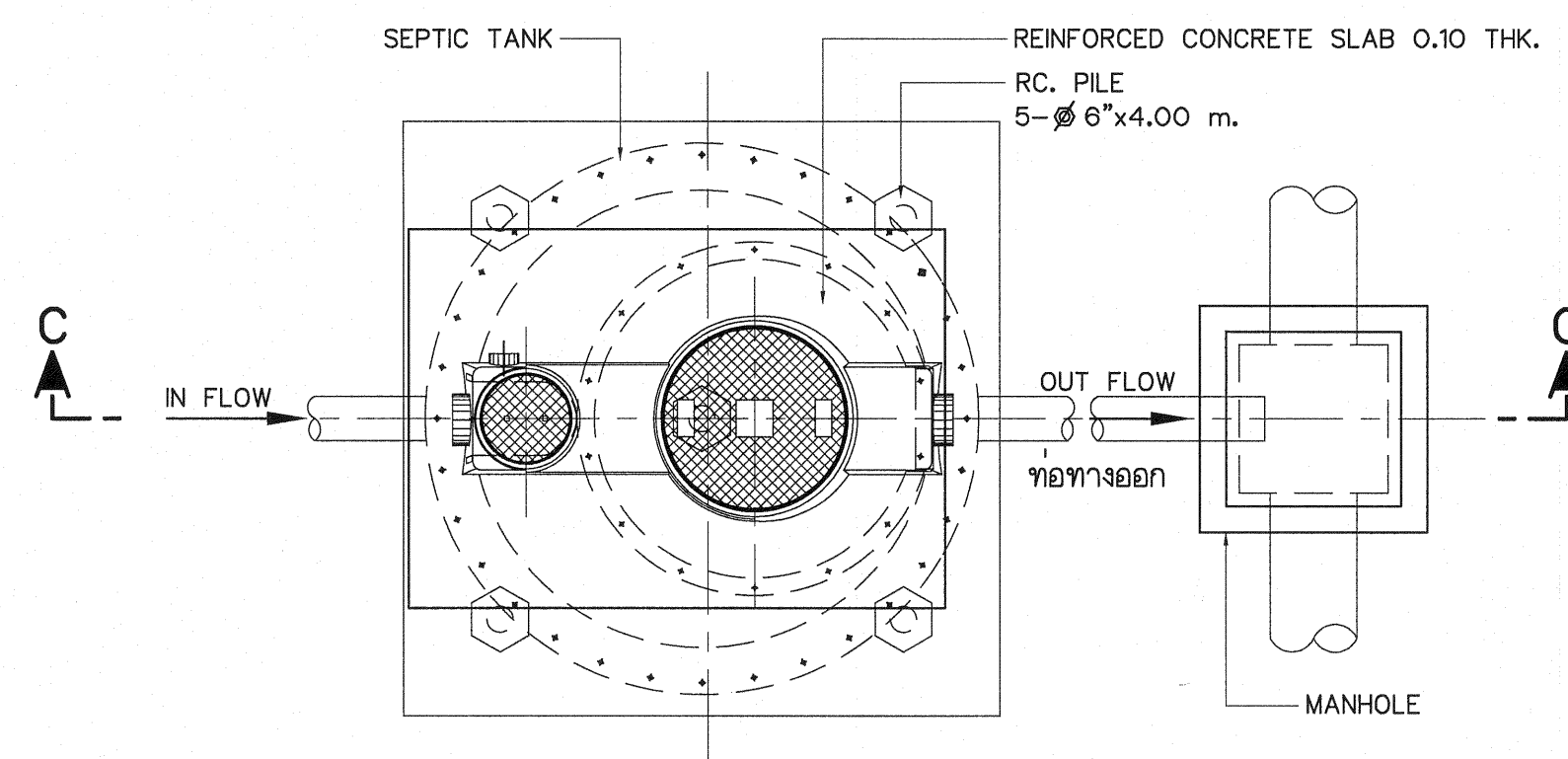
W.C. PLAN

SCALE 1:25



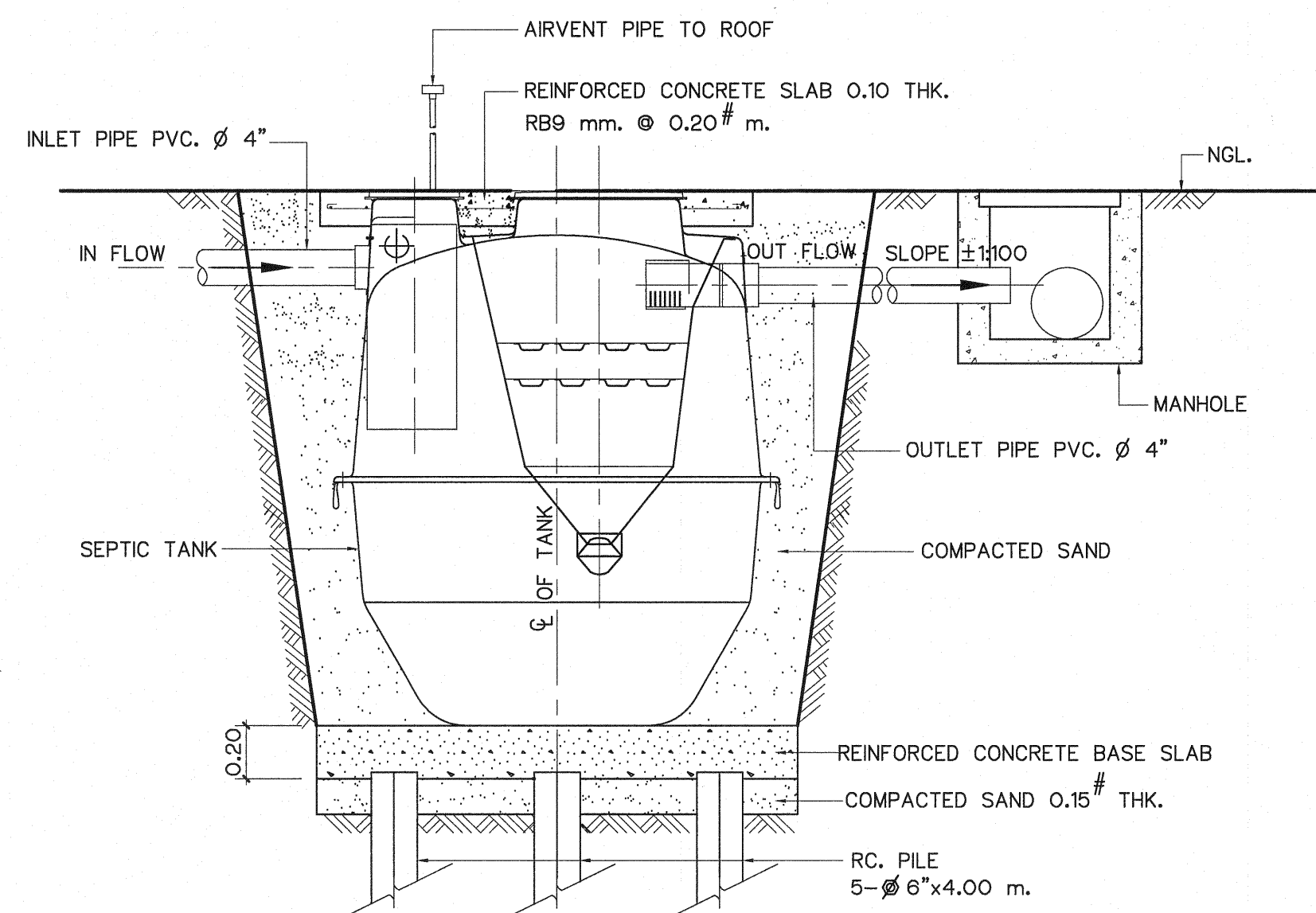
SECTION A - A

SCALE 1:25



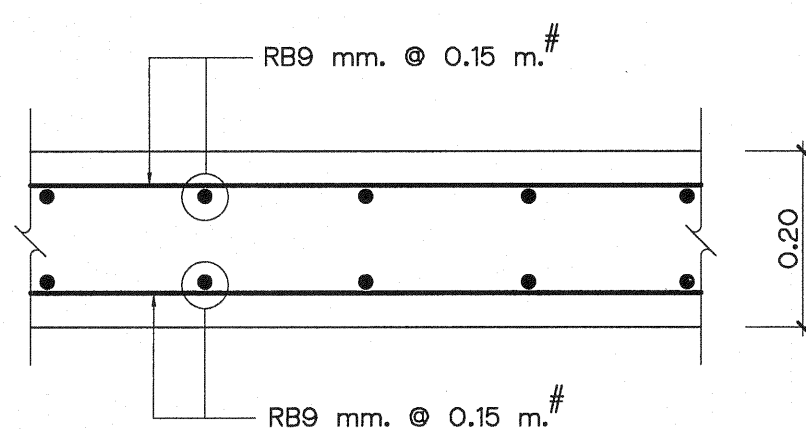
PLAN OF SEPTIC TANK

NOT TO SCALE



SECTION C-C

NOT TO SCALE



REINFORCEMENT OF BASE SLAB

NOT TO SCALE

SYMBOLS :

- ← - - - ← SOIL PIPE
- — — — — WASTE PIPE
- — — — — COLD WATER PIPE
- - - - - VENT PIPE

NOTES :

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

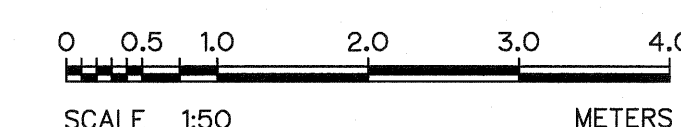
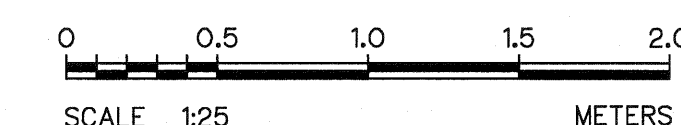
REFERENCE DRAWING :

1. POWERHOUSE, GROUND FLOOR PLAN & ROOF PLAN LPP-PH-02

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

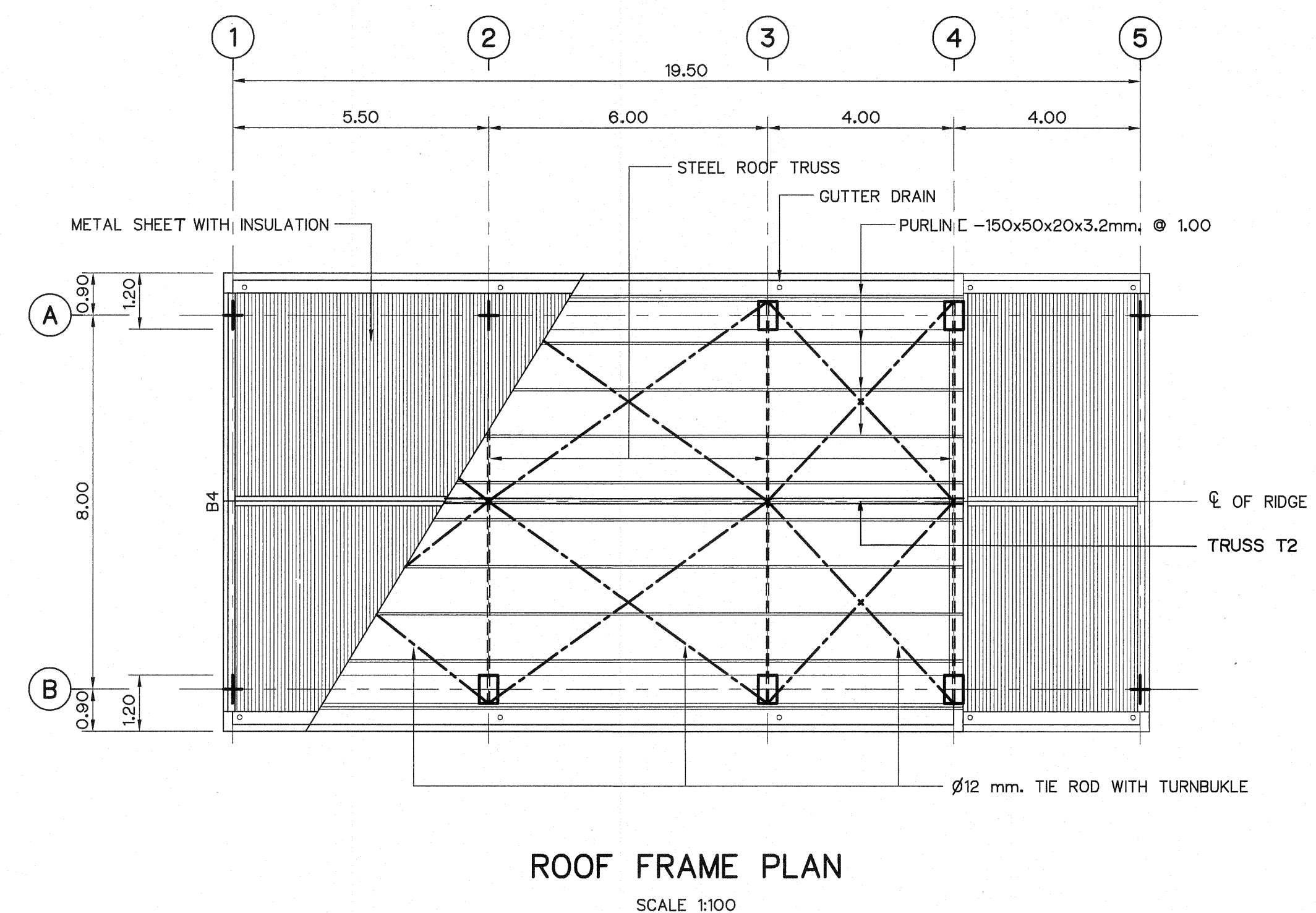
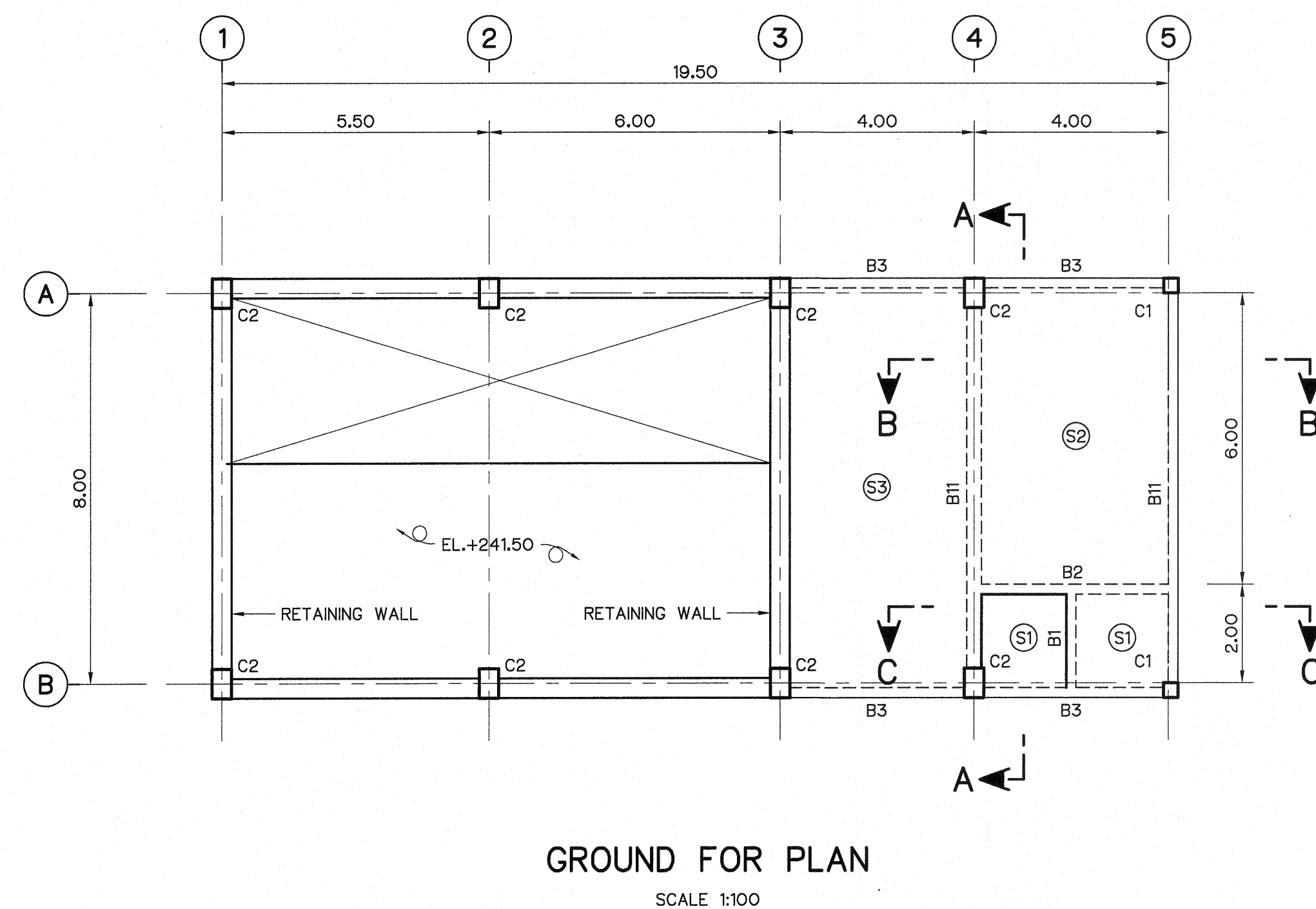
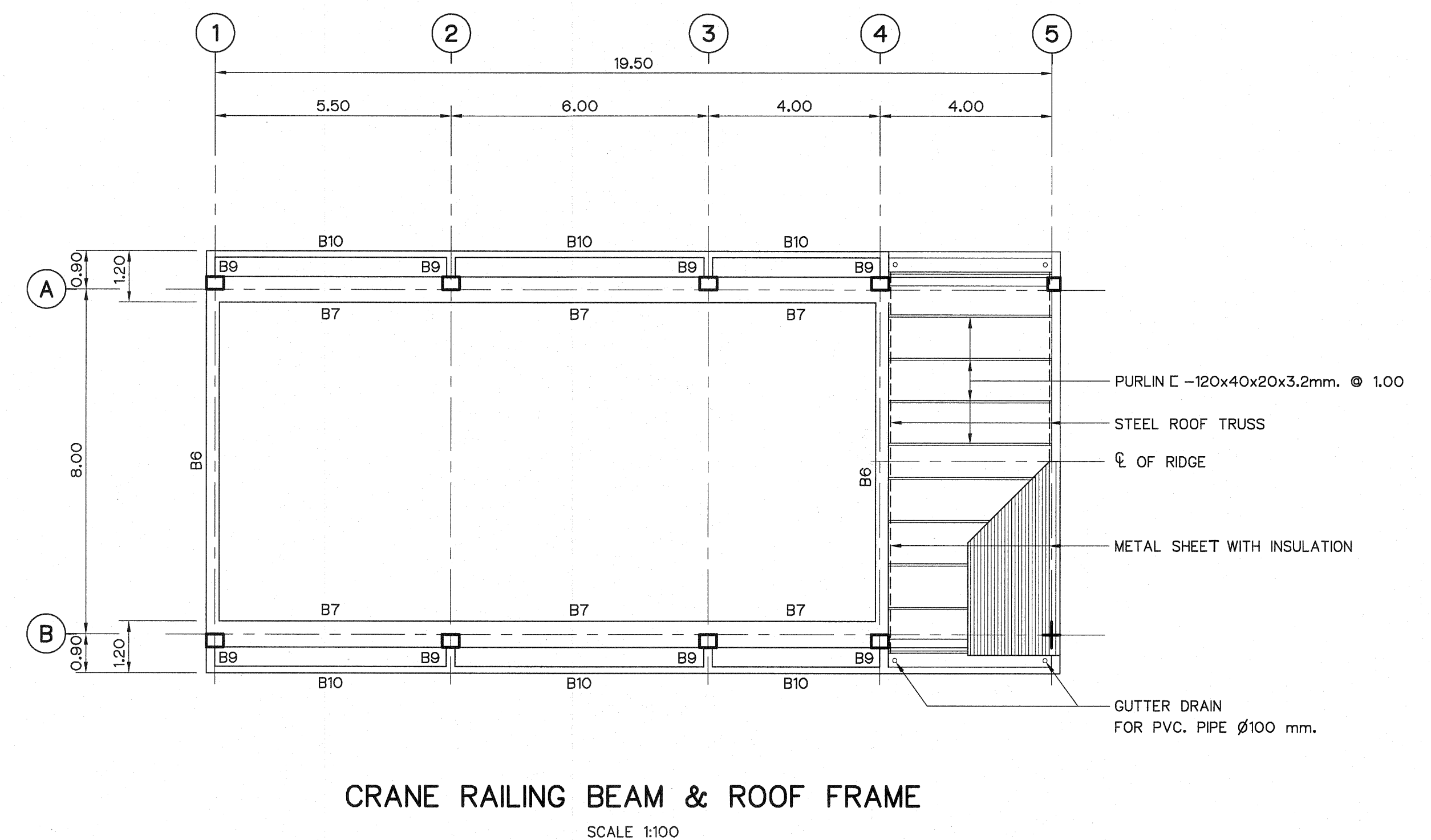
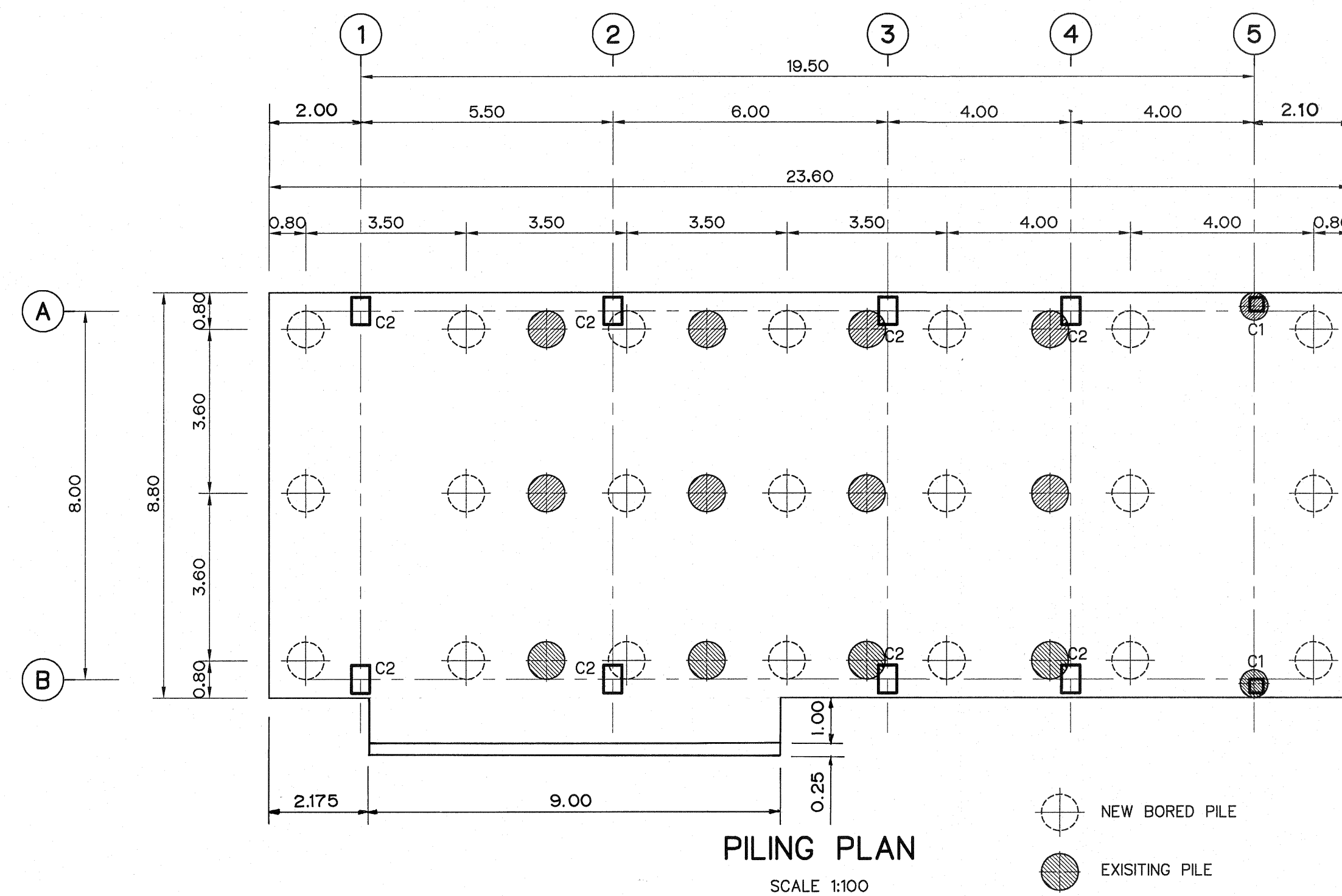
SELECTED CONDITION

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



KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
LAM PHRA PHLOENG HYDROPOWER PROJECT	
CIVIL WORKS POWERHOUSE DETAILS OF TOILET AND SEPTIC TANK	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	REVIEWED S.KITICHAN
DESIGNED S.KITICHAN 22.6651	SUBMITTED
DRAWN S.KITICHAN 22.6651	RECOMMENDED
CHECKED S.KITICHAN 22.6651	APPROVED
PROJECT MANAGER 14/01/62	DRAWING NO. LPP-PH-08
DATE	SHEET NO. 21 OF 44

NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
CONSULTANTS		DEDE		

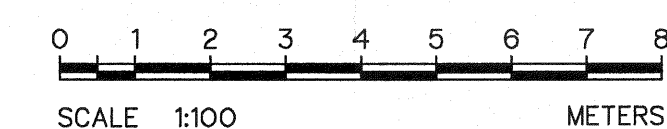


NOTES :

- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP-GN-03.
- LOCATIONS OF LAP SPLICES SHALL BE DETERMINED IN FIELD UNDER THE APPROVAL OF NEA'S FIELD ENGINEER.
- ALLOWABLE LOAD OF BORED PILE $\phi 0.80$ M. SHALL NOT BE LESS THAN 180 TONS.
- BORED PILE TIP SHALL BE PLACED ON FIRM ROCK LAYER OR DENSE SAND APPROX. PILE LENGTH 25 M.

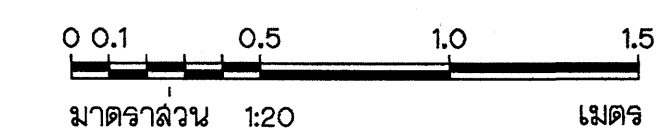
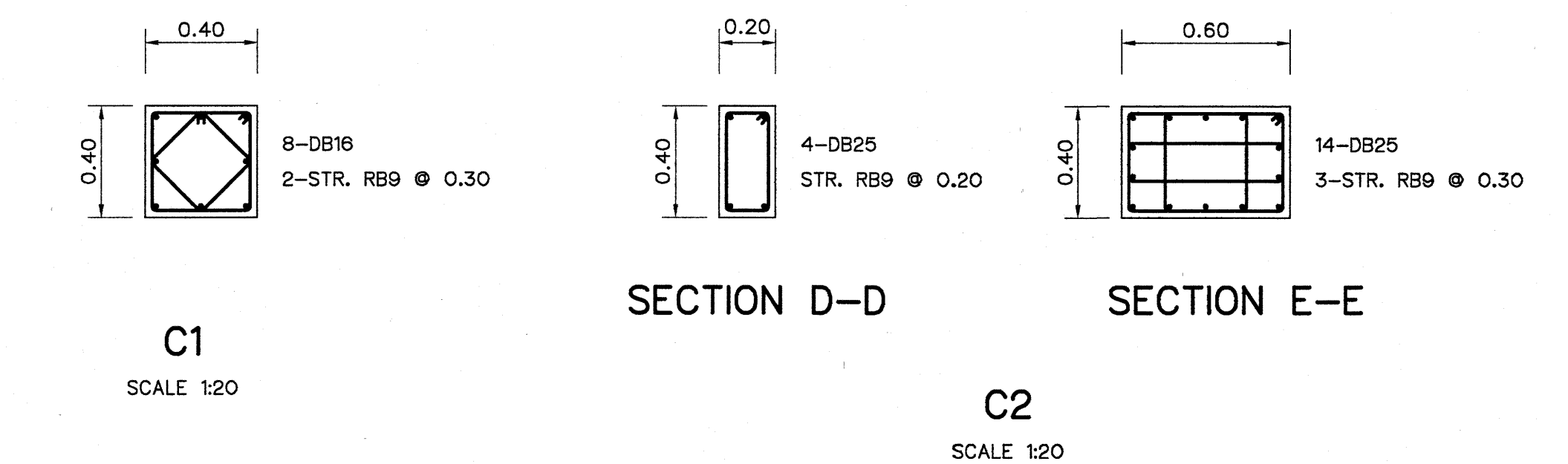
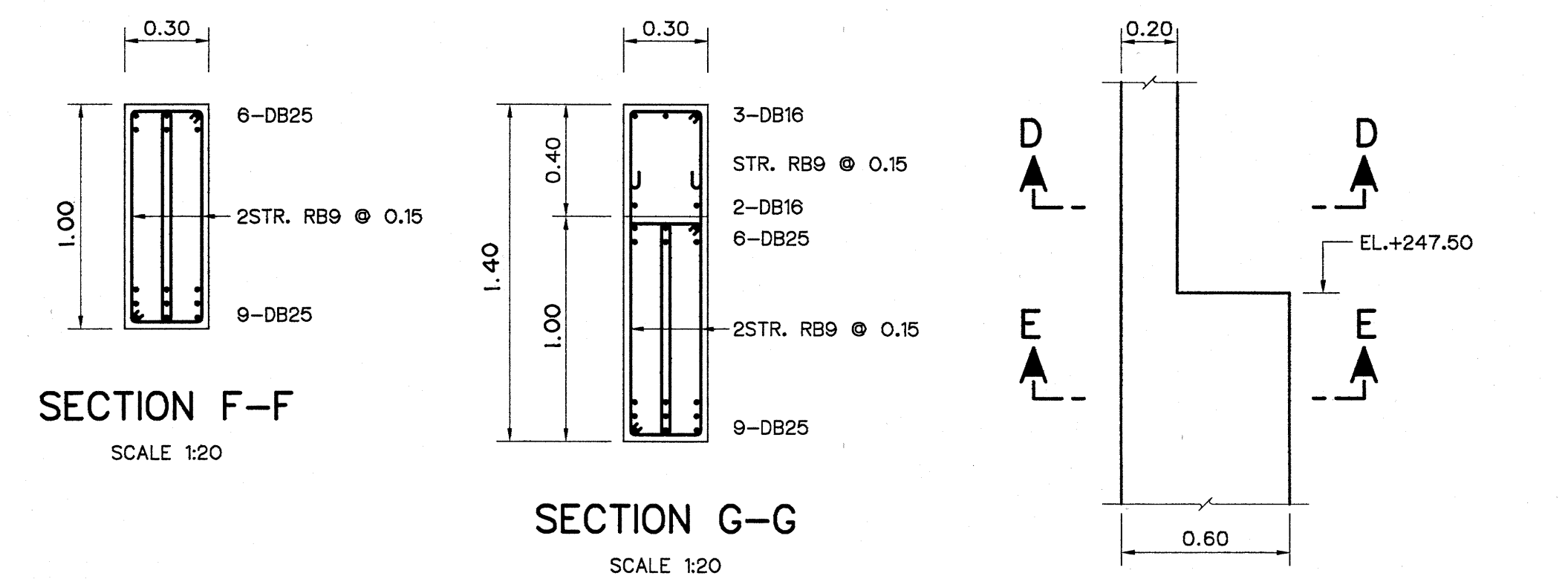
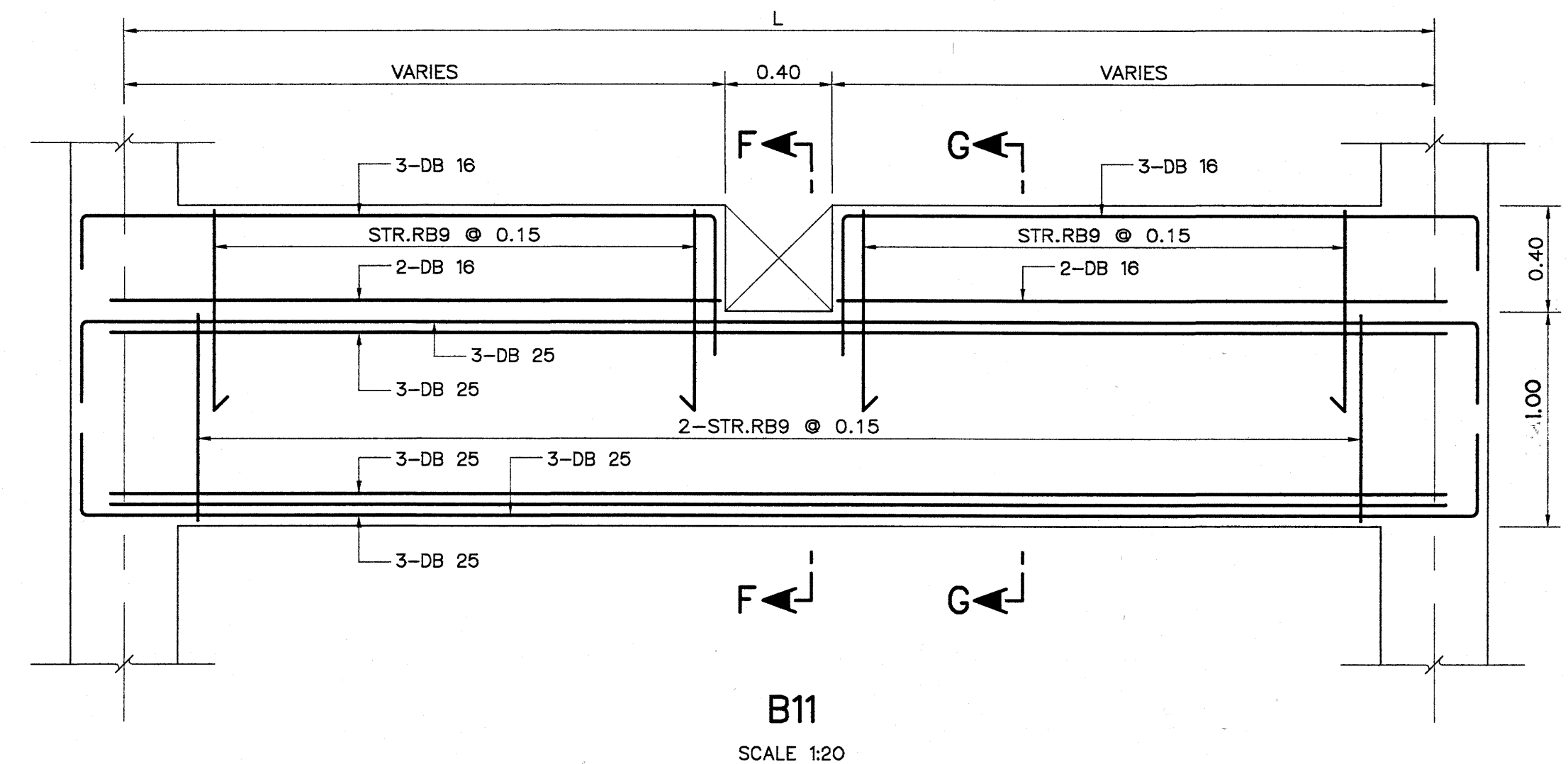
REFERENCE DRAWINGS :

- POWERHOUSE, GROUND FLOOR PLANS & ROOF PLAN LPP-PH-02
- POWERHOUSE, REINFORCEMENT DETAILS LPP-PH-10
- POWERHOUSE, FOUNDATION REINFORCEMENT DETAILS LPP-PH-11
- POWERHOUSE, CABLE TRENCH DETAILS LPP-PH-12



3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

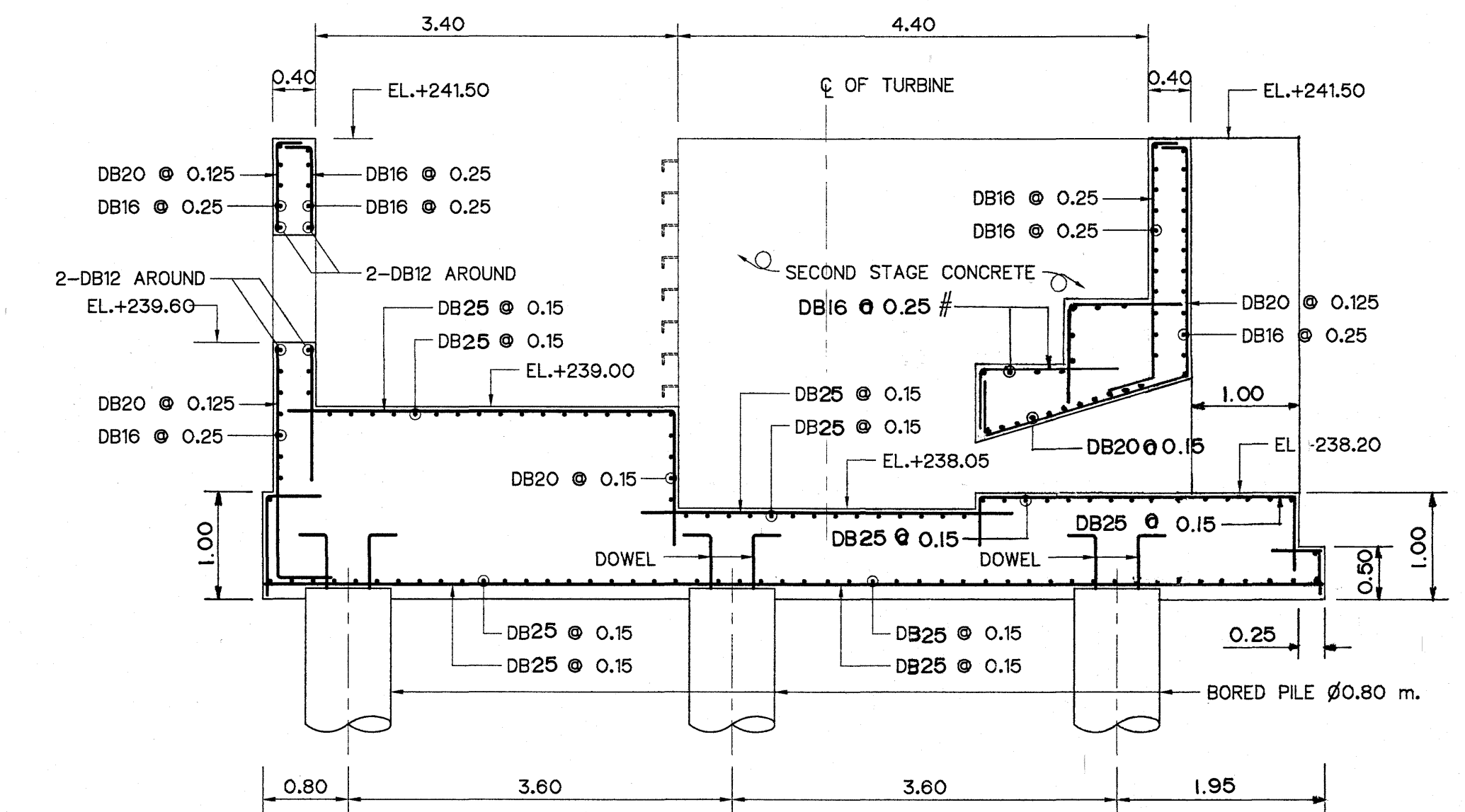
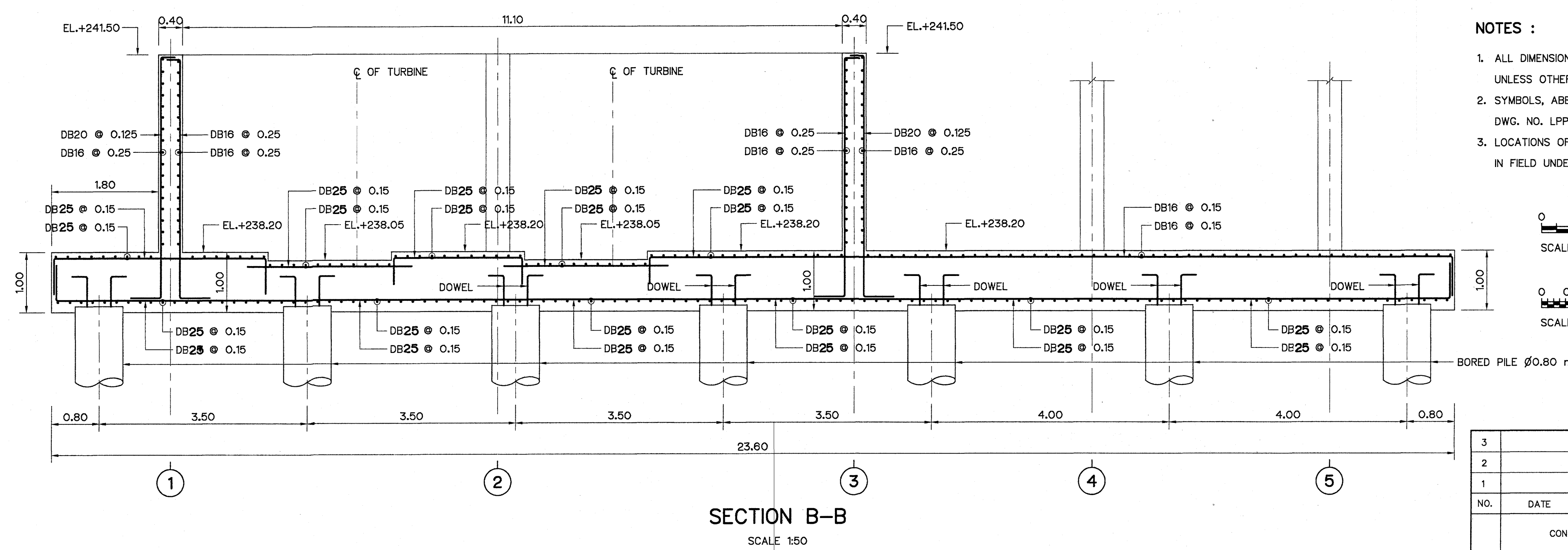
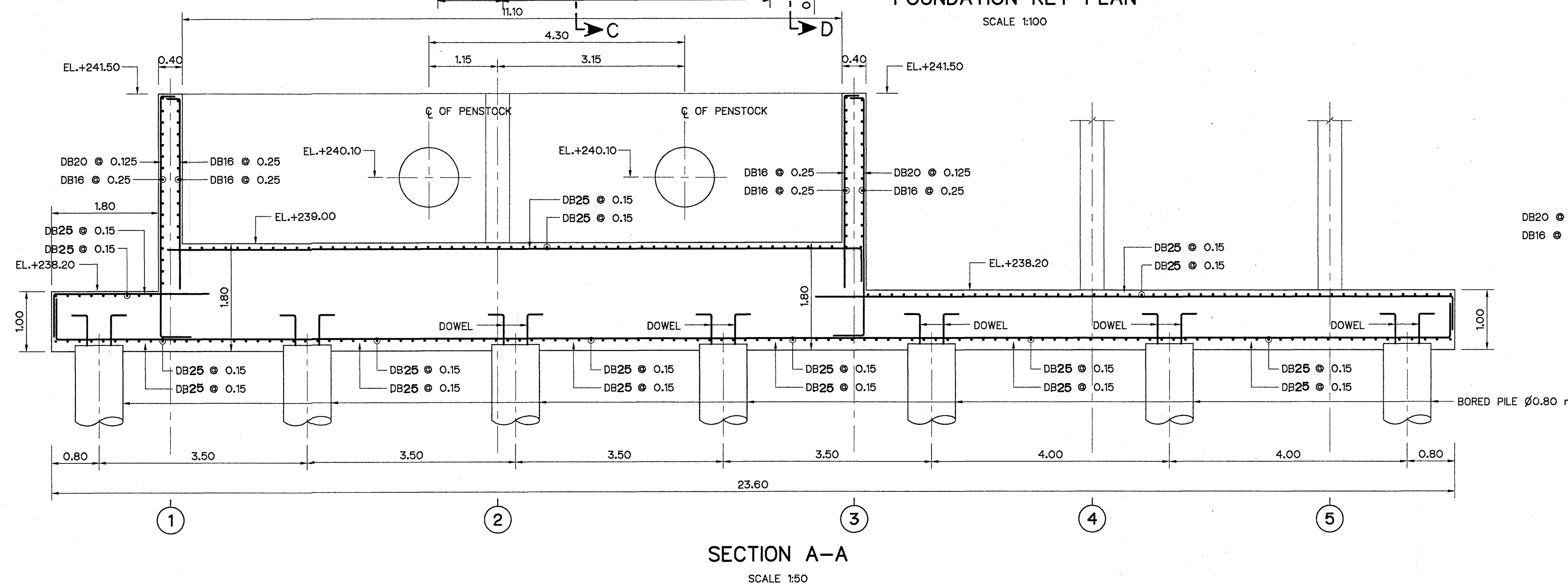
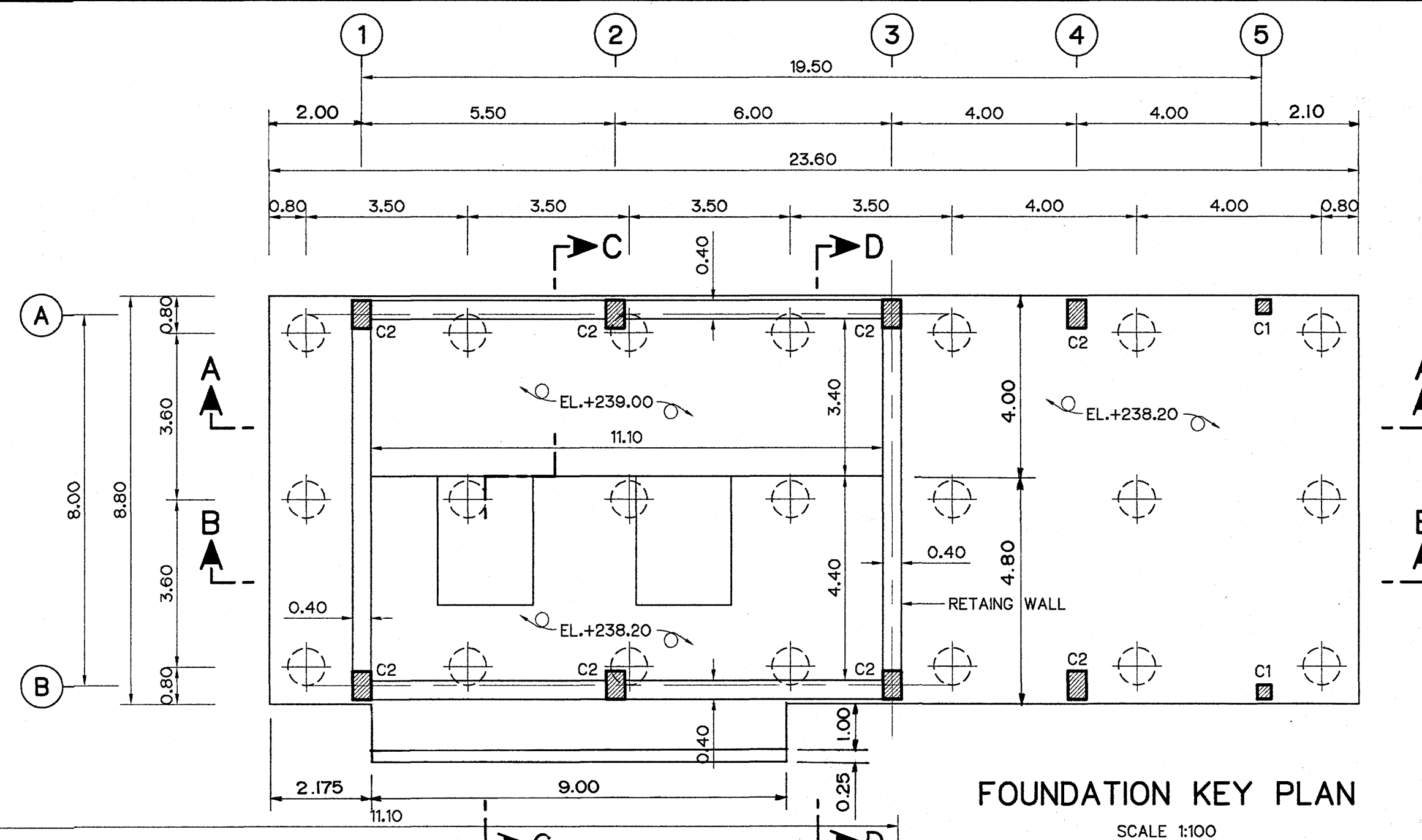
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
LAM PHRA PHLOENG HYDROPOWER PROJECT	
CIVIL WORKS POWERHOUSE STRUCTURAL PLAN	
FRONTIER ENGINEERING CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED <i>[Signature]</i> 261.6651	REVIEWED <i>[Signature]</i>
DRAWN <i>[Signature]</i>	RECOMMENDED <i>[Signature]</i>
CHECKED <i>[Signature]</i> 261.7324	APPROVED <i>[Signature]</i>
PROJECT-MANAGER	DATE 14/01/62
DRAWING NO. LPP-PH-09	SHEET NO. 22 OF 44



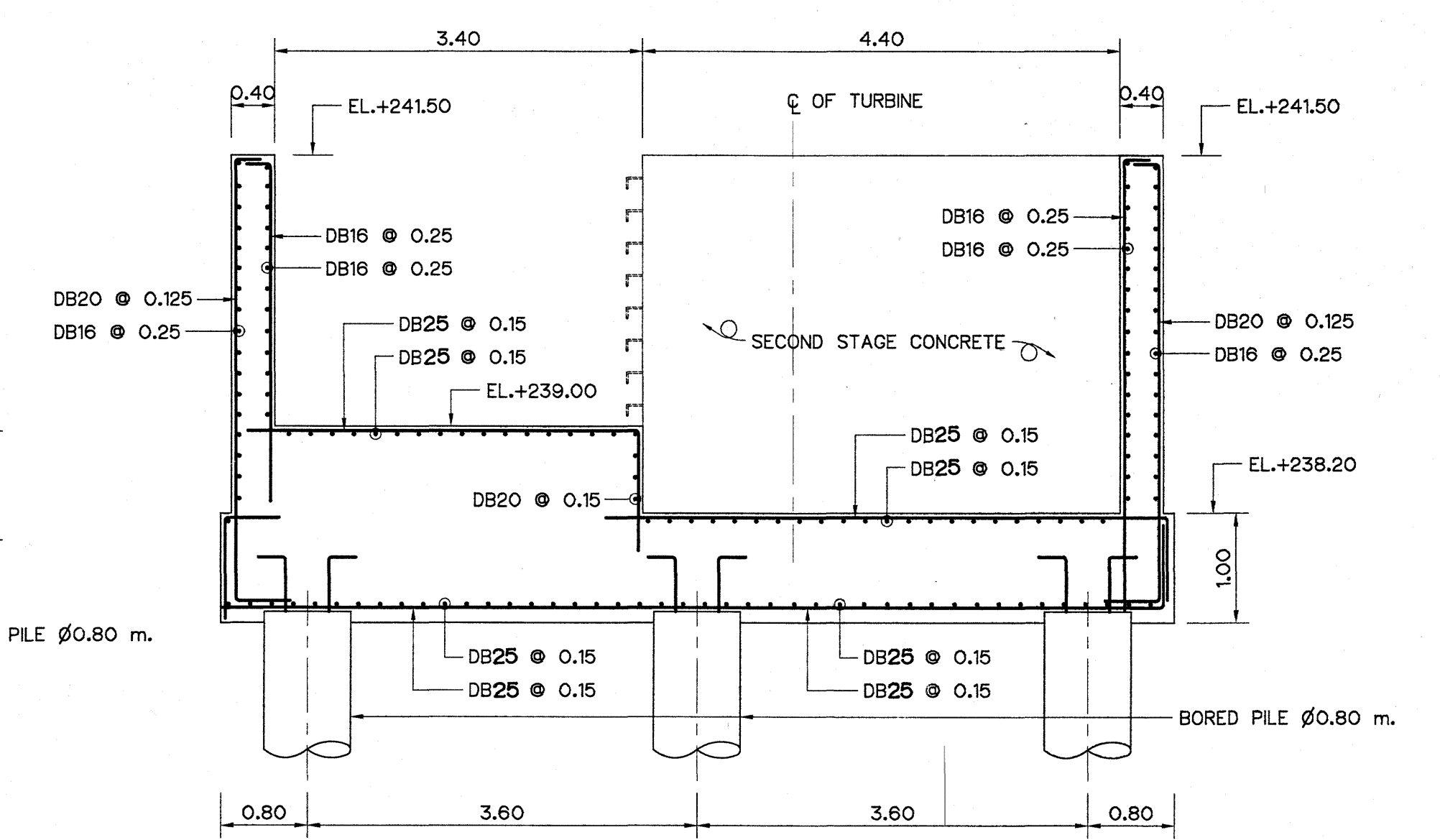
1. POWERHOUSE, STRUCTURAL PLAN	LPP-PH-09
2. POWERHOUSE, FOUNDATION REINFORCEMENT DETAILS	LPP-PH-11
3. POWERHOUSE, CABLE TRENCH DETAILS	LPP-PH-12

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP-GN-03.
3. LOCATIONS OF LAP SPLICES SHALL BE DETERMINED IN FIELD UNDER THE APPROVAL OF FIELD ENGINEER.

					FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		MINISTRY OF ENERGY	
3							REVIEWED S. KITICHAI	
2					DESIGNED	22.6651	SUBMITTED	
1					DRAWN		RECOMMENDED	
NO.	DATE	REVISIONS	CHECKED	APPROVED	CHECKED	22.7324	APPROVED	
CONSULTANTS			DEDE		PROJECT MANAGER		DRAWING NO.	
					14/01/62		LPP-PH-10	
					DATE		SHEET NO.	
							23 OF 44	

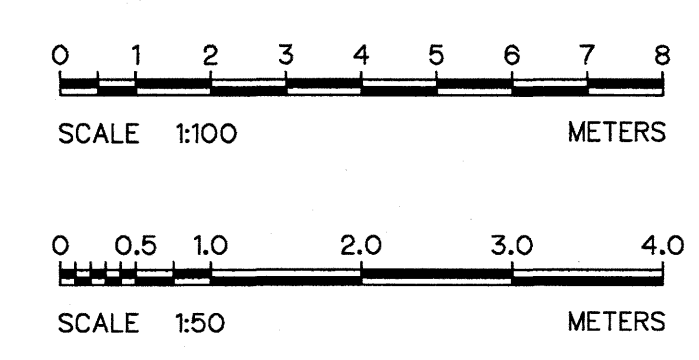


SECTION C-C
SCALE 1:50



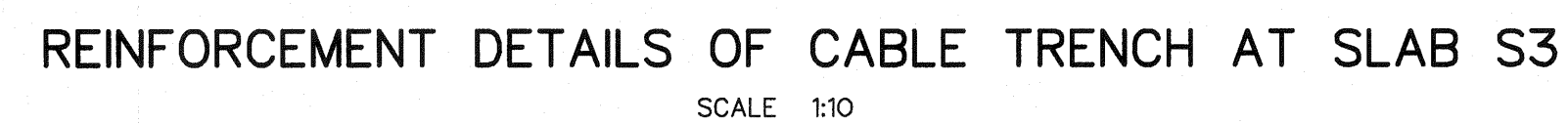
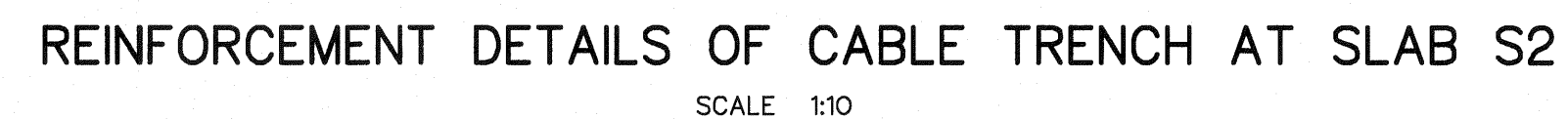
SECTION D-D
SCALE 1:50

- NOTES :**
- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
 - SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP-GN-03.
 - LOCATIONS OF LAP SPLICES SHALL BE DETERMINED IN FIELD UNDER THE APPROVAL OF FIELD ENGINEER.



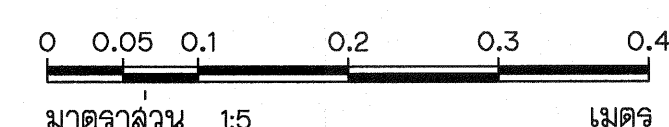
- REFERENCE DRAWINGS :**
- | | |
|--------------------------------------|-----------|
| 1. POWERHOUSE, STRUCTURAL PLAN | LPP-PH-09 |
| 2. POWERHOUSE, REINFORCEMENT DETAILS | LPP-PH-10 |
| 3. POWERHOUSE, CABLE TRENCH DETAILS | LPP-PH-12 |

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY LAM PHRA PHLOENG HYDROPOWER PROJECT CIVIL WORKS POWER HOUSE FOUNDATION REINFORCEMENT DETAILS			
FRONTIER ENGINEERING CONSULTANTS CO., LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED	REVIEWED	SUBMITTED	
DRAWN	RECOMMENDED	APPROVED	
CHECKED			
DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS		DEDE	
PROJECT MANAGER		DATE	DRAWING NO.
		14/01/62	LPP-PH-11
			SHEET NO.
			24 OF 44

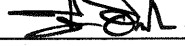
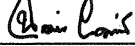


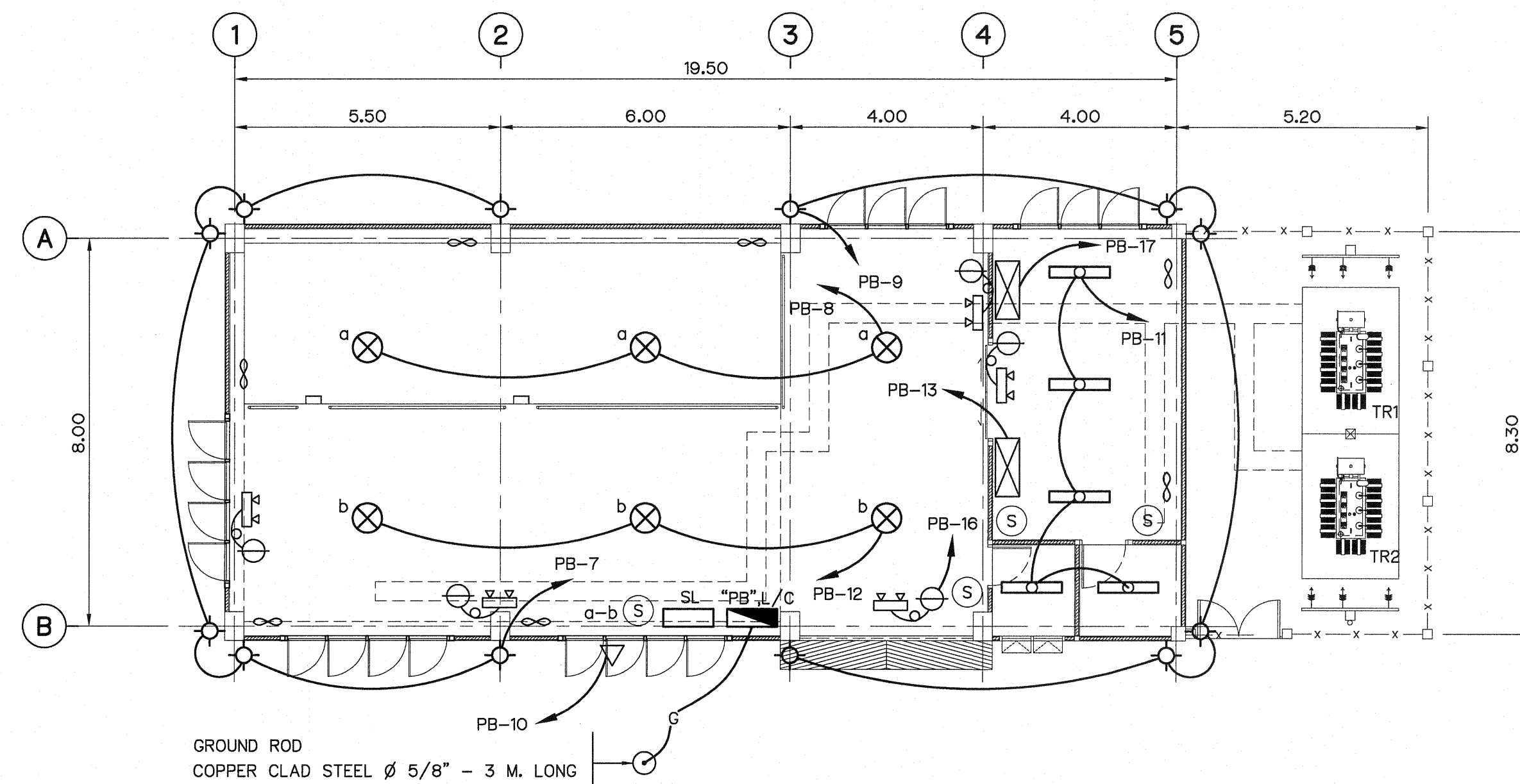
1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATION AND GENERAL NOTES SEE DWG. No. LPP-GN-03.
3. STEEL COVER FOR IN DOOR TRENCH SHALL BE COATED WITH NON BLEEDING TYPE COAL TAR EPOXY.

1. POWERHOUSE, GROUND FLOOR PLANS & ROOF PLAN LPP-PH-02



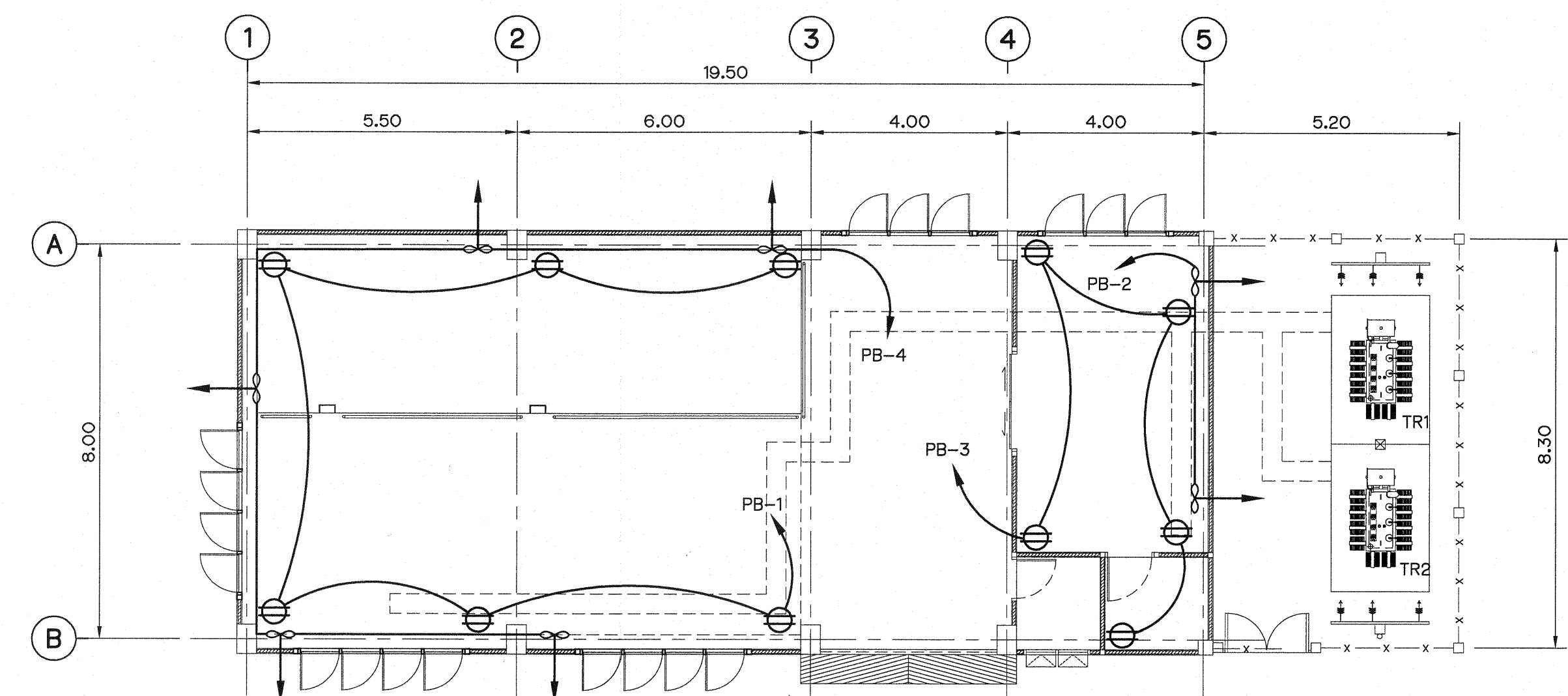
3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
LAM PHRA PHLOENG HYDROPOWER PROJECT	
CIVIL WORKS	
POWERHOUSE	
CABLE TRENCH DETAILS	
 FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED  28J.6651	REVIEWED S. KITICHAJ
DRAWN  28J.6651	SUBMITTED 
CHECKED  28J.7324	RECOMMENDED 
 14/01/62	APPROVED 
PROJECT MANAGER	DRAWING NO. LPP-PH-12
DATE	SHEET NO. 25 OF 44



LIGHTING PLAN

SCALE 1:100



EXHAUST AND OUTLET PLAN

SCALE 1:100

DIAGRAM

LOCATION : MACHINE HALL					"PB" LOAD CENTER 3Ø 4W WITH MCCB. 3P 50AT 100AF (24 CKTS,BRANCH MCB 5 KAIC)				IC > 10 KA AT 380 VOLT			
CKT NO	DESCRIPTION	LOAD (VA)			MCB		CONDUCTOR		A	B	C	FROM MDB 50AT,100AF
		A	B	C	POLE	AT	SIZE(MM) ²	TYPE				
1	RECEPTACLES	1,080			1	15	2.5/1.5	THW 1/2" PVC.				
3	RECEPTACLES		900		1	15	2.5/1.5	THW 1/2" PVC.				
5	SPARE				1	15	—	—				
7	LIGHTING	360			1	10	2.5	THW 1/2" PVC.				
9	LIGHTING		360		1	10	2.5	THW 1/2" PVC.				
11	LIGHTING			800	1	10	2.5	THW 1/2" PVC.				
13	A/C 12,000 BTU/Hr	1,500			1	20	4/4	THW 3/4" PVC.				
15	SPARE				1	20	—	—				
17	A/C 12,000 BTU/Hr			1,500	1	20	4/4	THW 3/4" PVC.				
2	EXHAUST FAN	240			1	10	2.5	THW 1C 1/2" PVC.				
4	EXHAUST FAN		600		1	10	2.5	THW 1C 1/2" PVC.				
6	SPARE				1	10	—	—				
8	LIGHTING	420			1	10	2.5	THW 1C 1/2" PVC.				
10	LIGHTING		350		1	10	2.5	THW 1C 1/2" PVC.				
12	LIGHTING			420	1	10	2.5	THW 1C 1/2" PVC.				
14	SPARE				1	10	—	—				
16	EMERGENCY LIGHT		250		1	10	2.5	THW 1C 1/2" PVC.				
18	SPARE				1	20	—	—				
		3,600	2,460	2,720								

TOTAL CONNECTED LOAD 8,780 VA
DEMAND FACTOR 75%
CALCULATED LOAD 6,585 VA

LEGENDS :

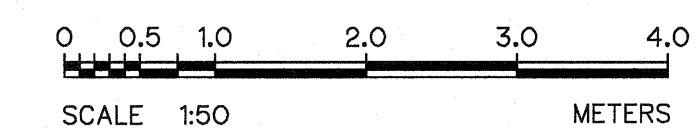
- 1 x 125 W MERCURY VAPOUR LAMP
- 2 x 36 W FLUORESCENT WITH ALUMINIUM ANODIZED REFLECTOR
- 1 x 36 W FLUORESCENT LUMINAIRE
- 1 x 18 W FLUORESCENT LUMINAIRE
- 250 W HIGH PRESSURE SODIUM FLOOD LIGHT
- EXHAUST FAN ϕ 10 inch.
- 2 x 25 W EMERGENCY LIGHT WITH BATTERY OPERATE RECEPTACLE
- AIR CONDITION, CEILING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

NOTE :

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

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

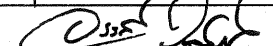
 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
LAM PHRA PHLOENG HYDROPOWER PROJECT	
CIVIL WORKS POWERHOUSE ELECTRICAL LIGHTING, EXHAUST AND OUTLET PLAN	
FRONTIER ENGINEERING CONSULTANTS CO., LTD. DESIGNED: DRAWN: CHECKED: PROJECT MANAGER	REVIEWED: SUBMITTED: RECOMMENDED: APPROVED: DATE: 14/01/62
NO. 3 DATE REVISIONS CHECKED APPROVED	DEDE DATE
DRAWING NO. LPP-PH-13	SHEET NO. 26 OF 44



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

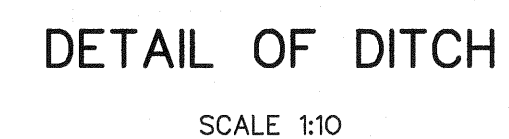
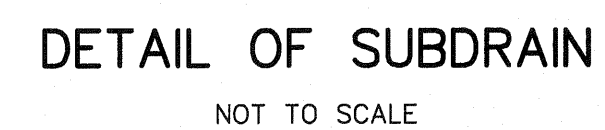
1. GROUNDING CONDUCTOR, TAP AND RISER FROM GROUNDING NETWORK
TO POWER EQUIPMENT SHALL BE FORMED BY BARE COPPER
CONDUCTOR NOT LESS THAN 95 SQ.MM.
2. GROUNDING SYSTEM RESISTANCE WILL NOT EXCEED 5 OHM.
3. CONNECTOR TO WITH IN & BETWEEN THE GROUNDING NETWORK
TO POWER PLANT EQUIPMENT WILL BE MADE BY THERMAL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

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVE
	CONSULTANTS		DEDE	

 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
LAM PHRA PHLOENG HYDROPOWER PROJECT			
CIVIL WORKS			
POWERHOUSE			
GROUNDING SYSTEM			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED		27/11/1029	REVIEWED S. KITICHA
DRAWN			SUBMITTED 
CHECKED		27/11/1029	APPROVED 
		14/01/62	DRAWING NO.
PROJECT MANAGER		DATE	LPP-PH-14
			SHEET NO.
			27 OF 44

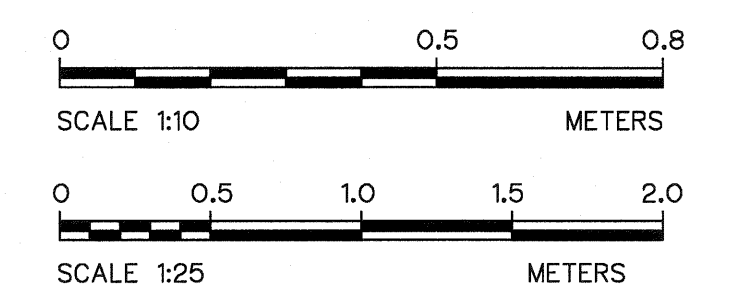


SIZE OF WATER SUPPLY PIPE (MM.)	SIZE OF SLEEVE PIPE (MM.)	THICKNESS (MM.)
20 (3/4")	100	2.65
25 (1")	100	2.65
35 (1 1/4")	100	2.65
40 (1 1/2")	100	2.65
55 (2")	100	2.65
60 (2 1/2")	150	3.45
80 (3")	150	3.45

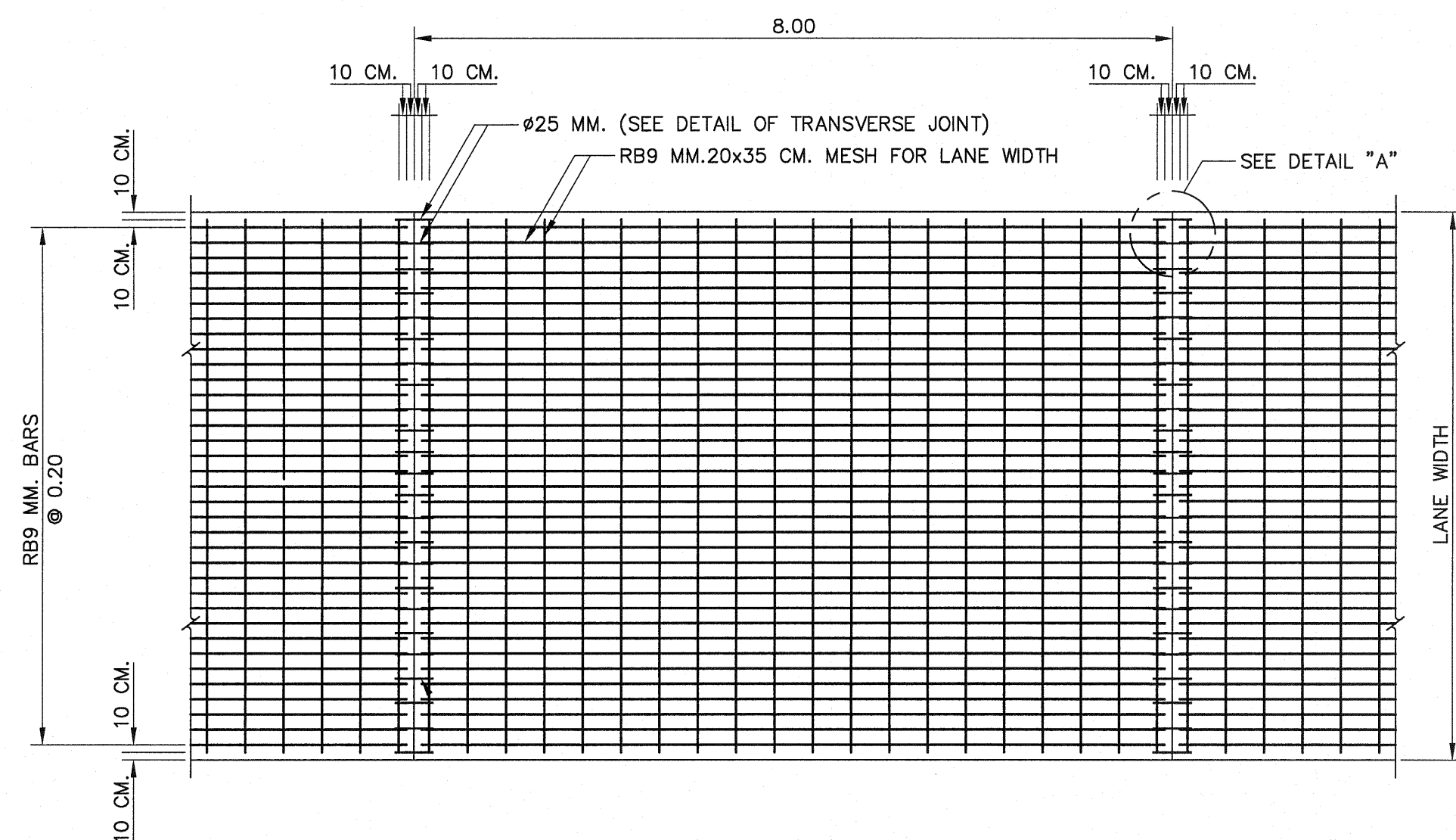


1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. REINFORCING BARS ARE IN MILLIMETERS.
3. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 175 KSC. FOR STANDARD CYLINDER AT 28 DAYS.

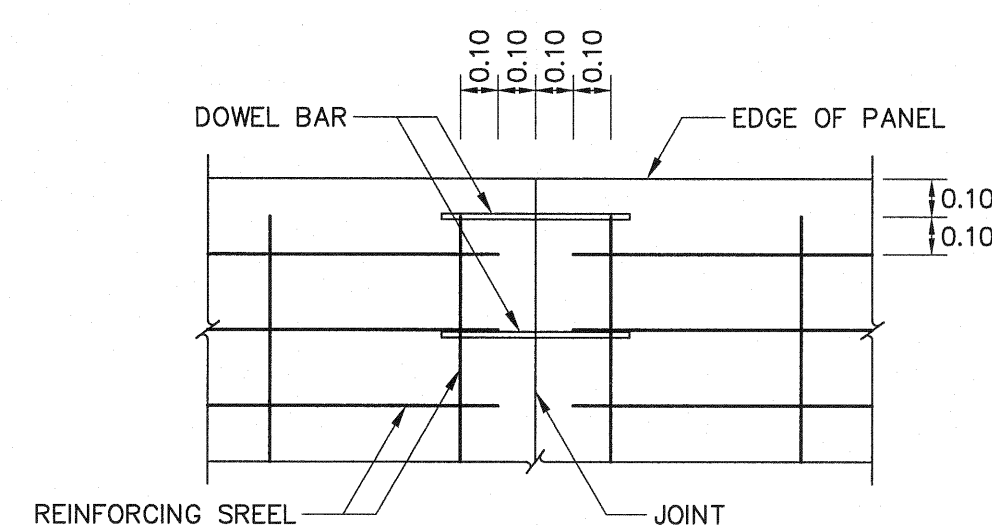
1. POWERHOUSE, WATER SUPPLY PIPELINE SYSTEM LAY-OUT LPP-PH-15



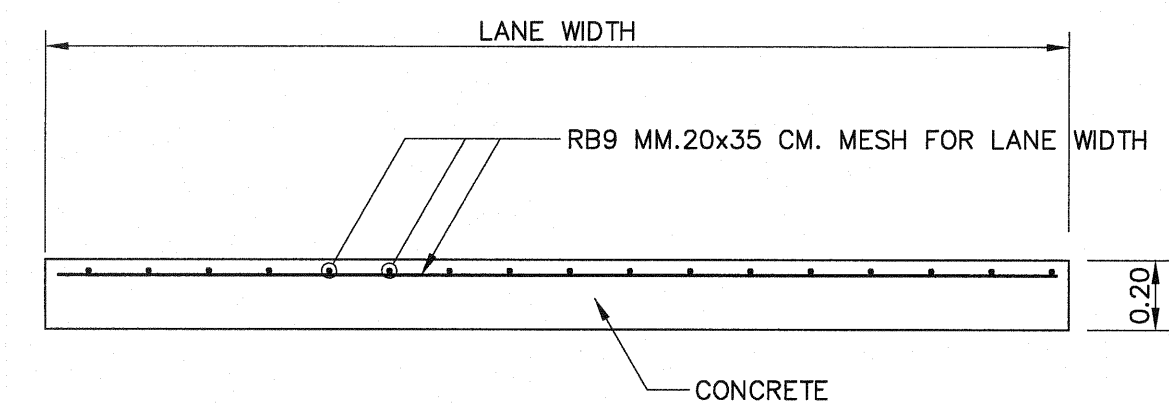
 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
LAM PHRA PHLOENG HYDROPOWER PROJECT	
CIVIL WORKS POWERHOUSE PIT VALVE, FIELD TAP, AND SUBDRAIN DETAILS	
FTL FRONTIER ENGINEERING CONSULTANTS CO., LTD.	 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED  ๑๕๒.6651	REVIEWED S. KITICHAM
DRAWN 	SUBMITTED 
CHECKED  ๑๕๒.7324	APPROVED 1-6
 PROJECT MANAGER	14/01/62 DRAWING NO. LPP-PH-16
DATE	SHEET NO. 29 OF 44



PLAN OF REINFORCED CONCRETE PAVEMENT
SCALE 1 : 75



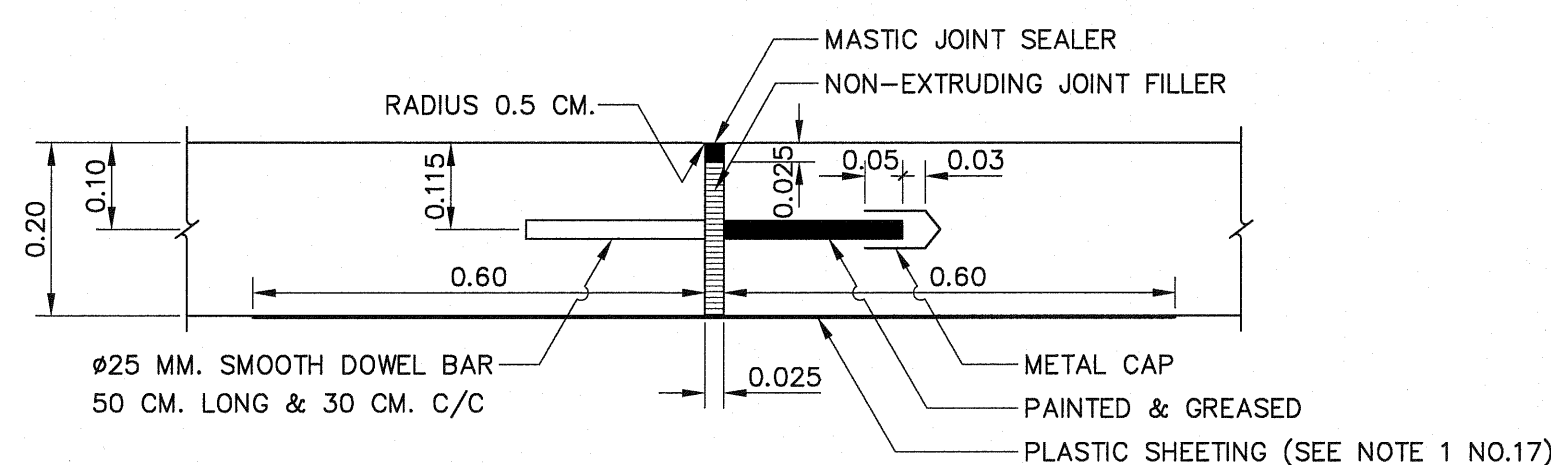
DETAIL "1"
SCALE 1 : 20



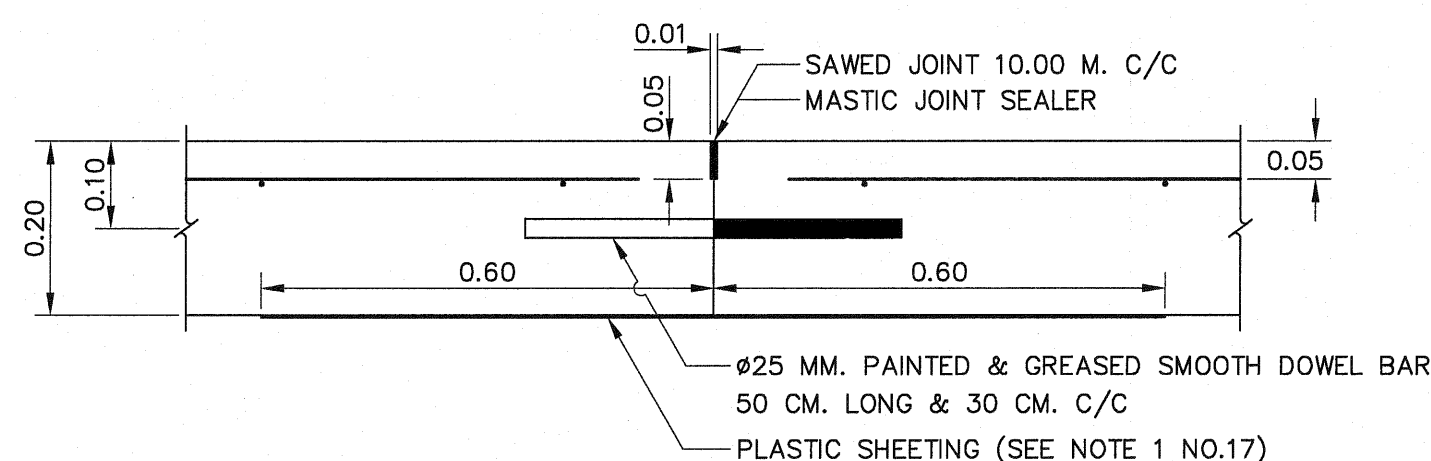
REINFORCEMENT DETAIL OF CONCRETE PAVEMENT CROSS-SECTION
SCALE 1 : 25

NOTES 1 :

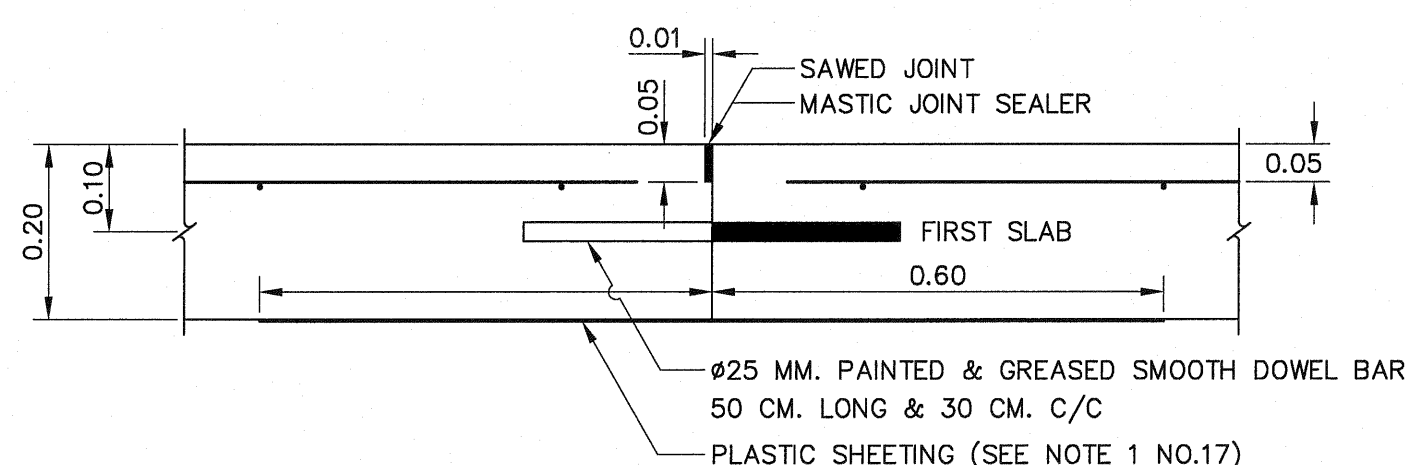
- ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP-GN-03.
- EXPANSION JOINT SHALL BE CONSTRUCTED AT THE INTERVAL OF 350 METERS. IF THE LAST INTERVAL IS LESS THAN 350 METERS , THE INTERVALS SHALL BE AVERAGED BUT BETWEEN 300 AND 350 METERS.
- 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.



DETAIL OF EXPANSION JOINT

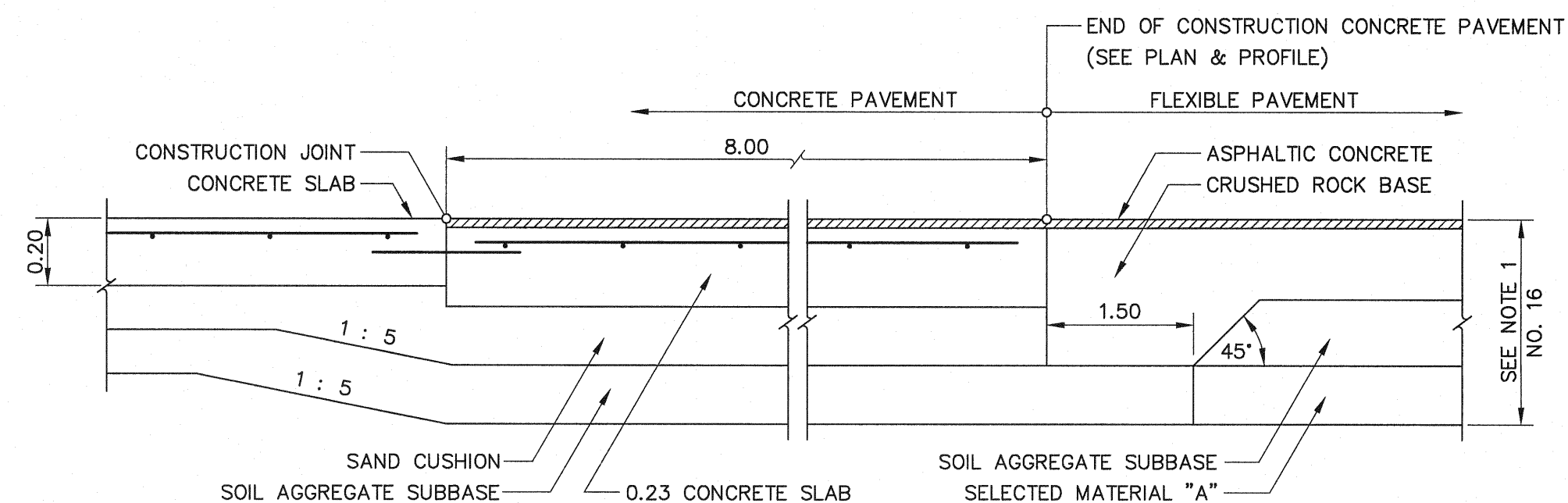


DETAIL OF CONTRACTION JOINT

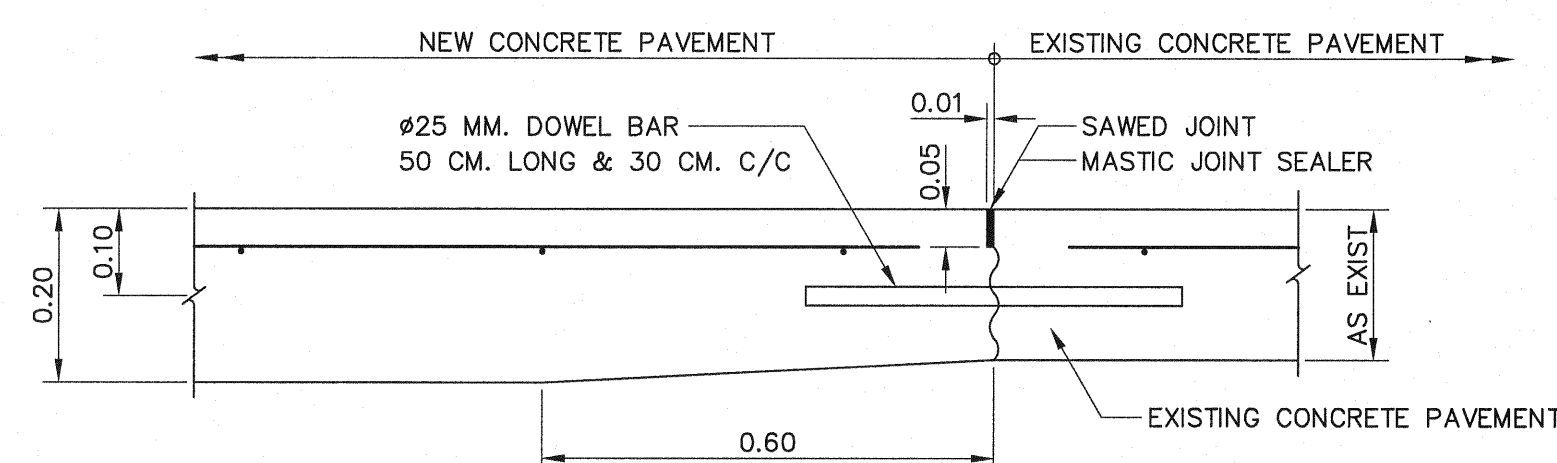


DETAIL OF CONSTRUCTION JOINT

DETAIL OF TRANSVERSE JOINT
SCALE 1 : 10

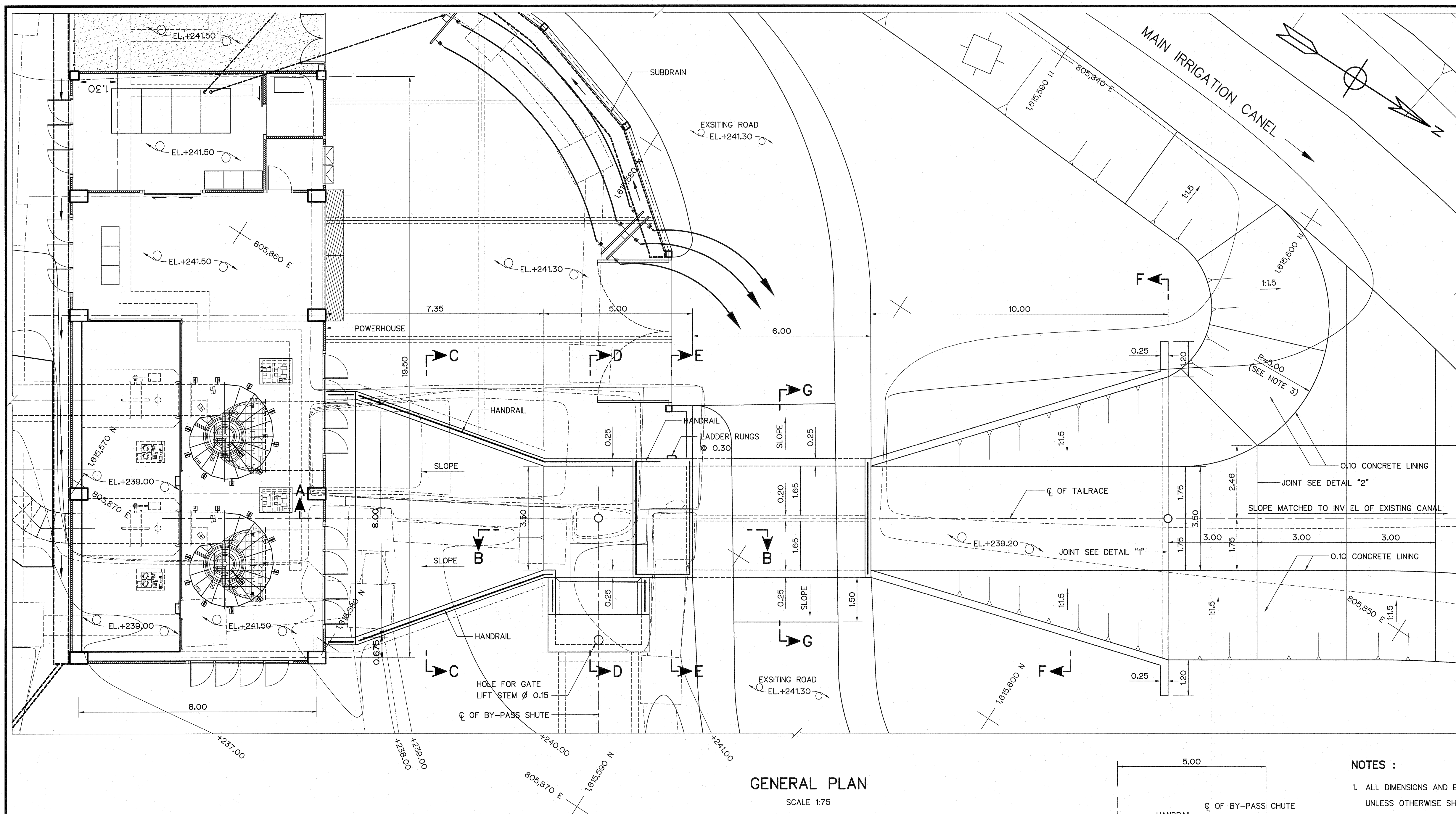


DETAIL OF JOINT BETWEEN CONCRETE PAVEMENT AND FLEXIBLE PAVEMENT
SCALE



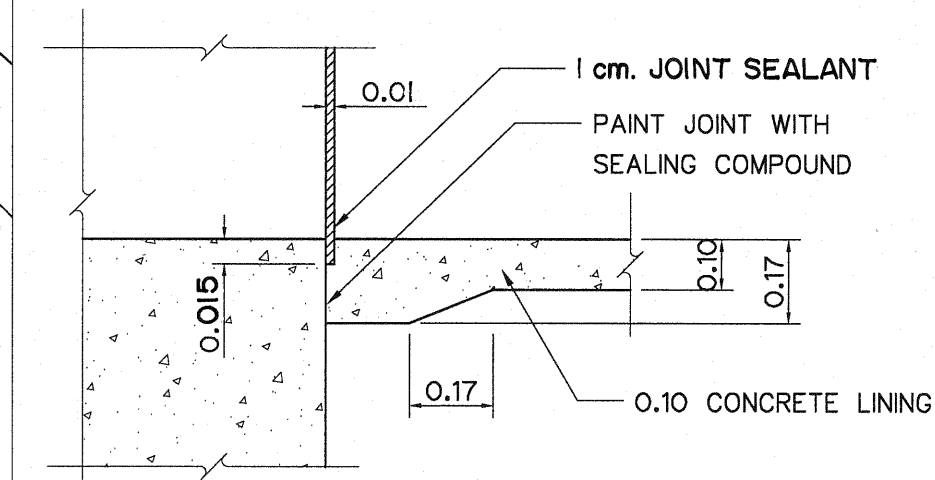
DETAIL OF TRANSVERSE JOINT BETWEEN
NEW AND EXISTING CONCRETE PAVEMENT
SCALE 1 : 10

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
LAM PHRA PHLOENG HYDROPOWER PROJECT			
CIVIL WORKS POWERHOUSE CONCRETE PAVEMENT DETAILS			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
REVIEWED S. KITCHAI		SUBMITTED S. KITCHAI	
DESIGNED S. KITCHAI		RECOMMENDED S. KITCHAI	
DRAWN S. KITCHAI		APPROVED S. KITCHAI	
CHECKED S. KITCHAI		APPROVED S. KITCHAI	
PROJECT MANAGER		DATE 14/01/82	
CONSULTANTS		DEDE	
NO. 3		DATE 14/01/82	
DATE		DRAWING NO. LPP-PH-17	
REVISIONS		SHEET NO. 30 OF 44	
CHECKED		DATE	
APPROVED		DATE	



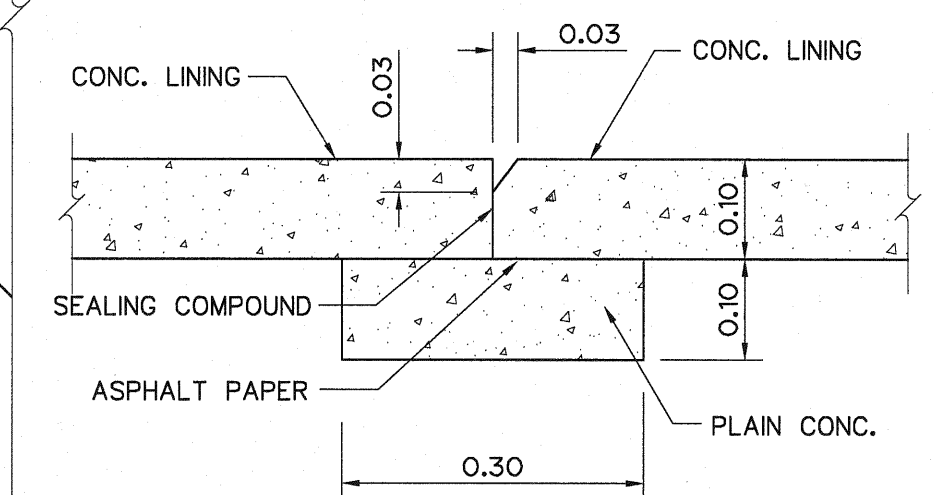
GENERAL PLAN

SCALE 1:75



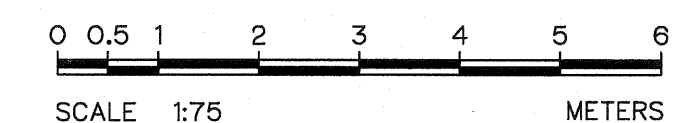
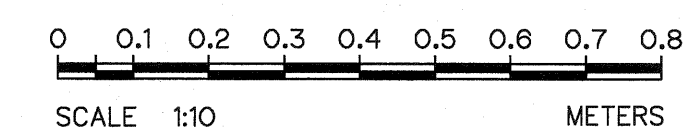
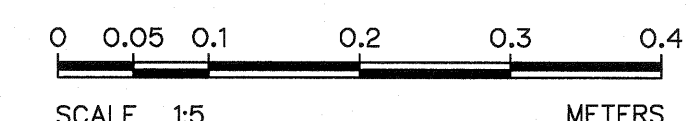
JOINT DETAIL "1"

SCALE 1:10



JOINT DETAIL "2"

SCALE 1:5

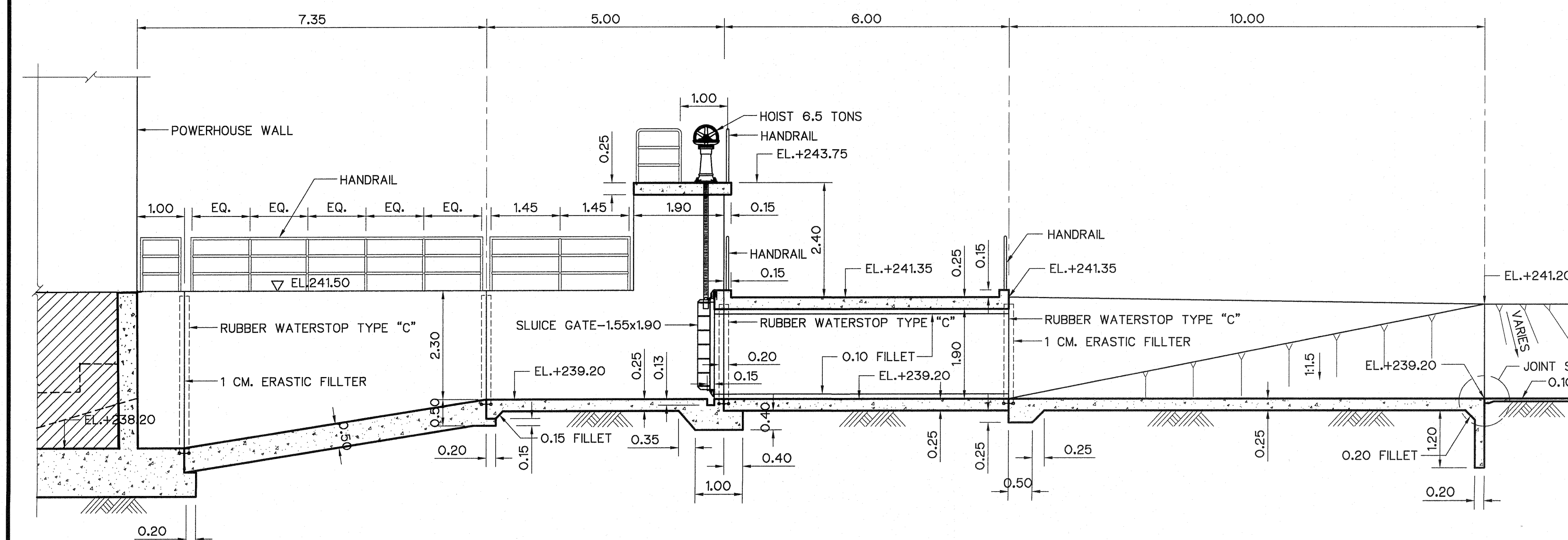


NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP-GN-03.
3. DIMENSION MY BE CHANGED TO SUIT THE FIELD CONDITION.

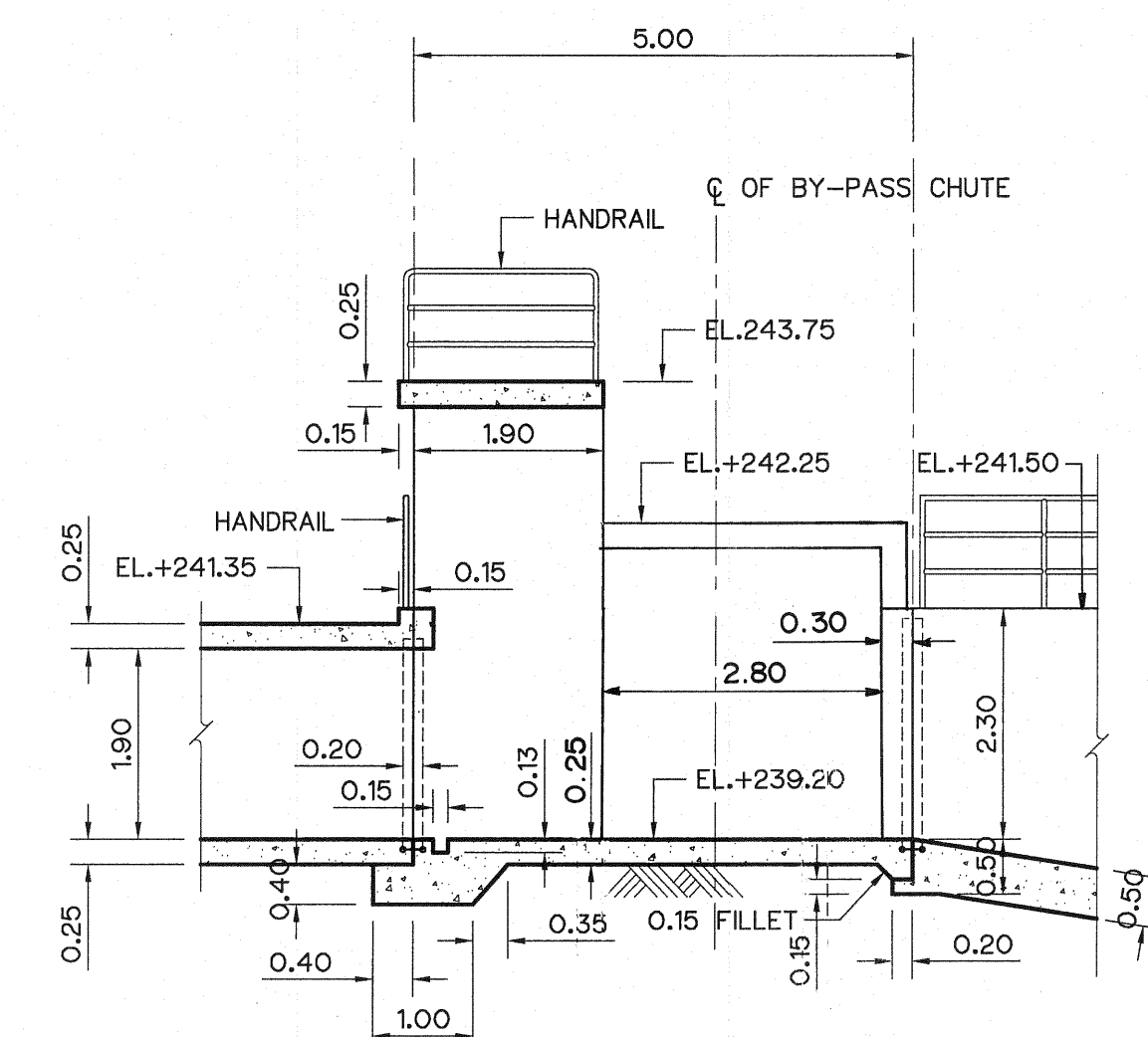
REFERENCE DRAWINGS :

1. TAILRACE, SECTIONS LPP-TR-02
2. TAILRACE, 1.55x1.90 SLUICE GATE DETAILS LPP-TR-05
3. TAILRACE, CHUTE PEDESTAL SCREW LIFT CAPACITY 6.5 TONS LPP-TR-06
4. BY-PASS, CHUTE HANDRIL AND LUDDER RUNG DETAILS LPP-BC-03
5. BY-PASS, CHUTE WATERSTOP DETAILS LPP-BC-04



SECTION A-A

SCALE 1:75

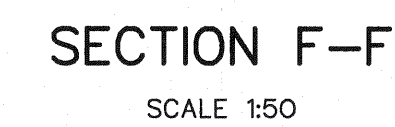
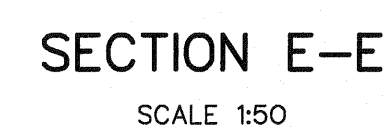
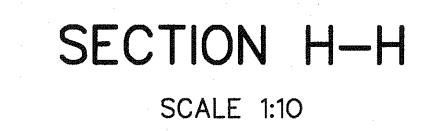
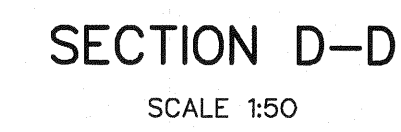


SECTION B-B

SCALE 1:75

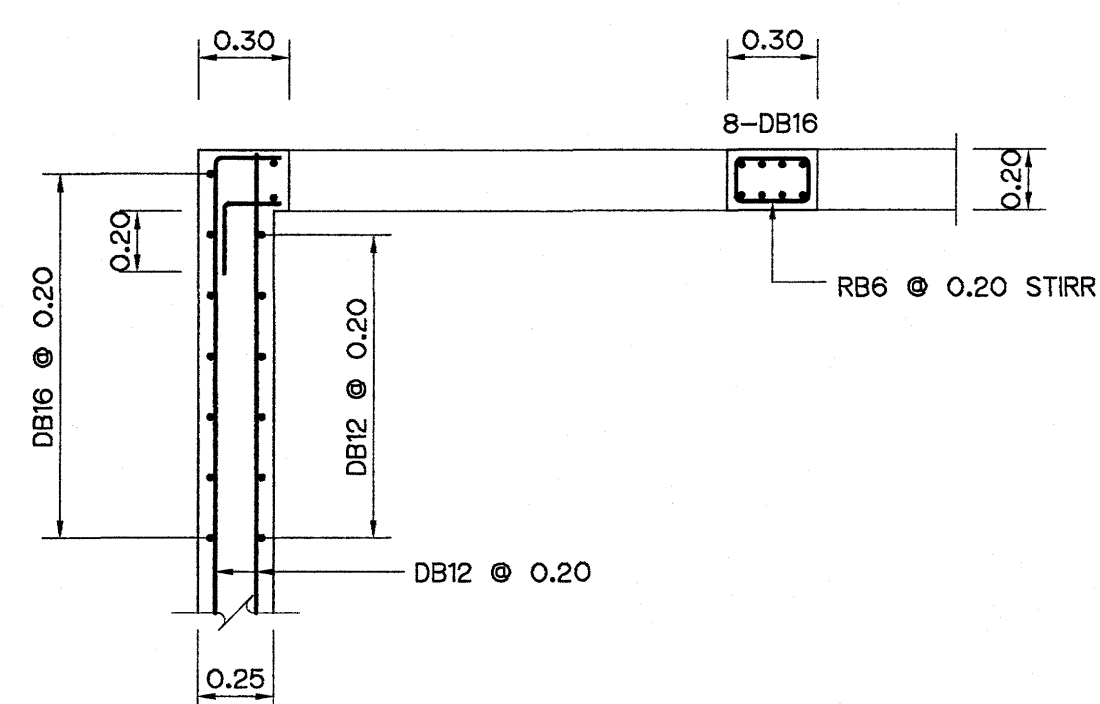
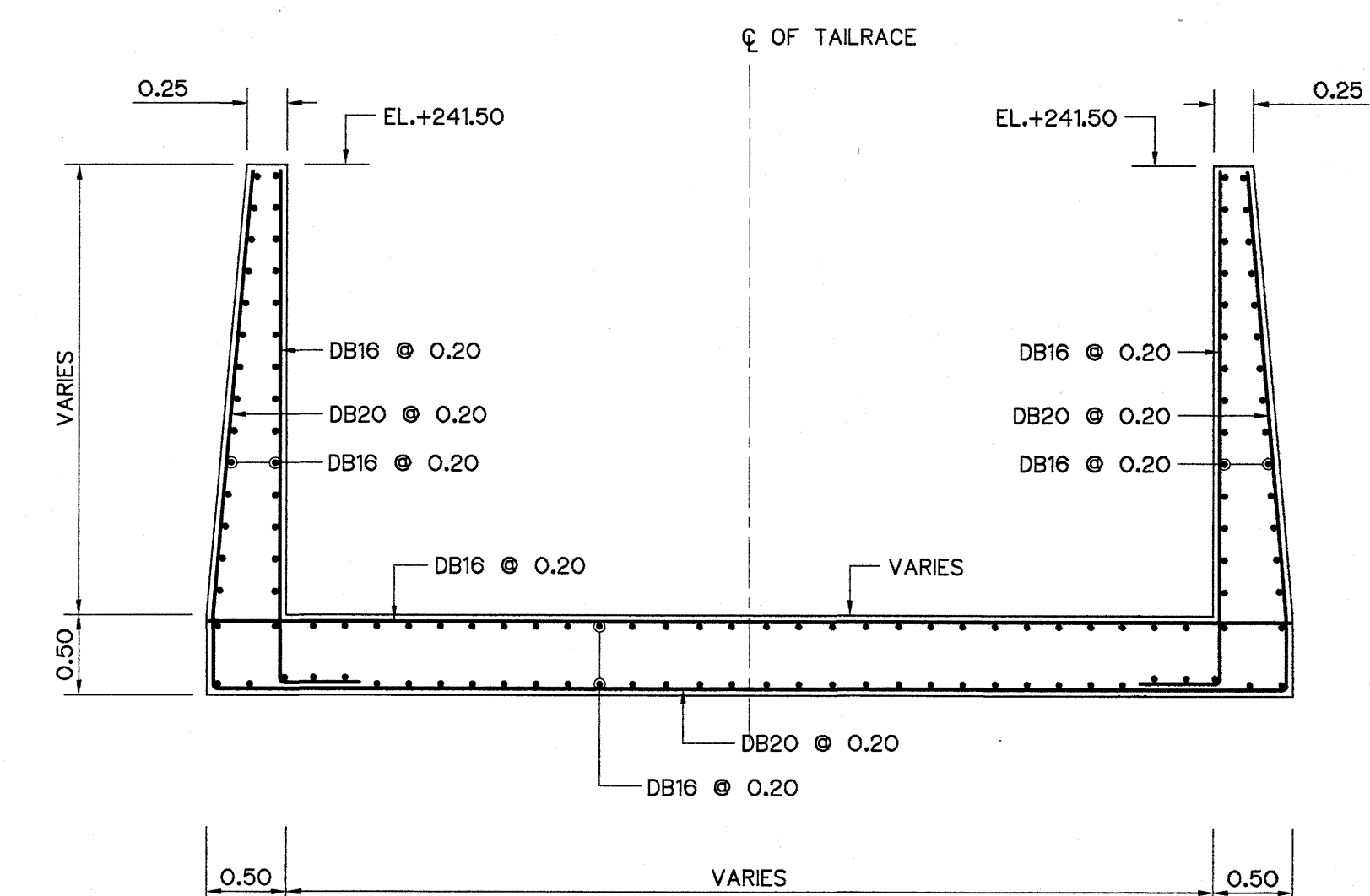
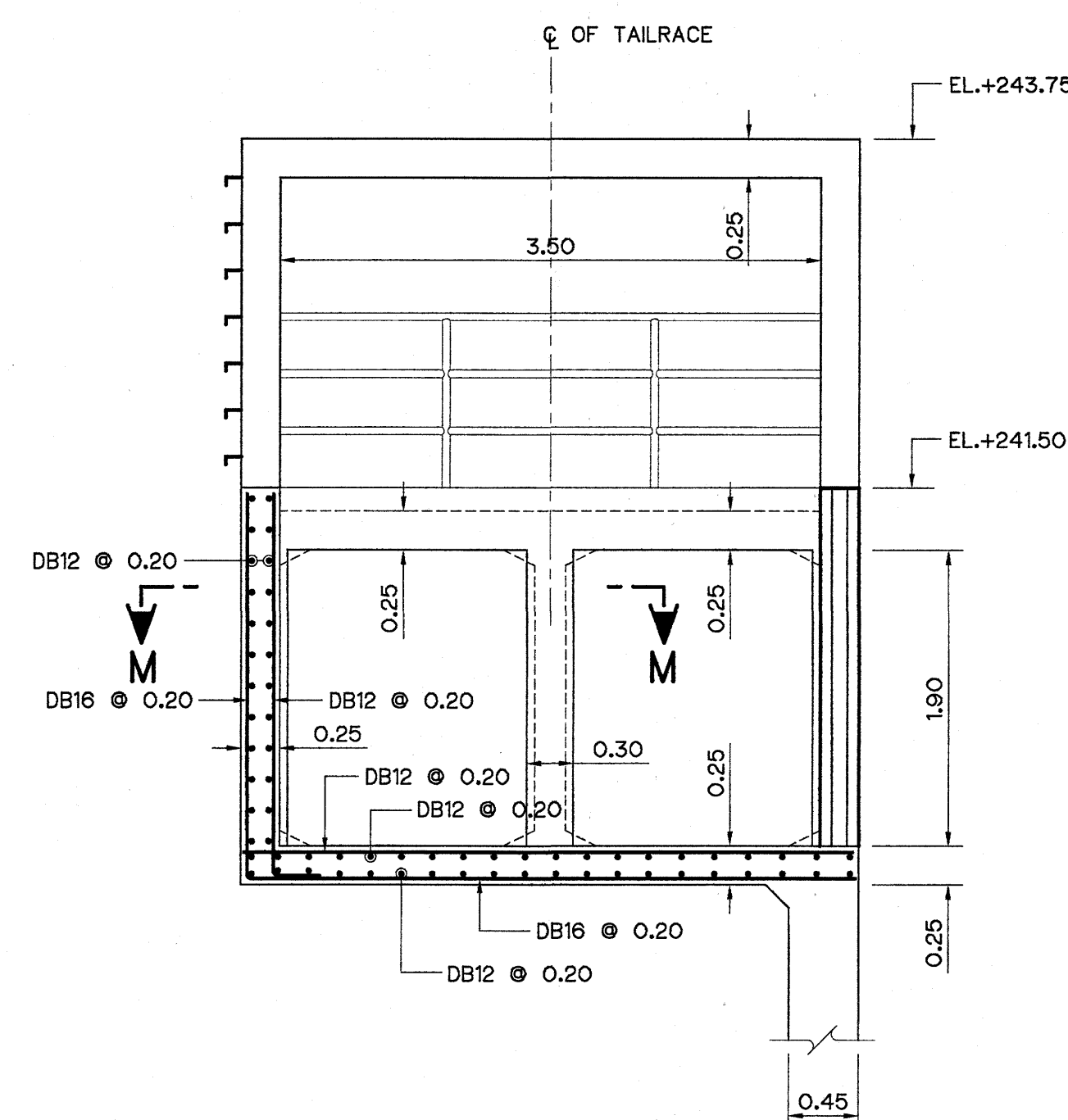
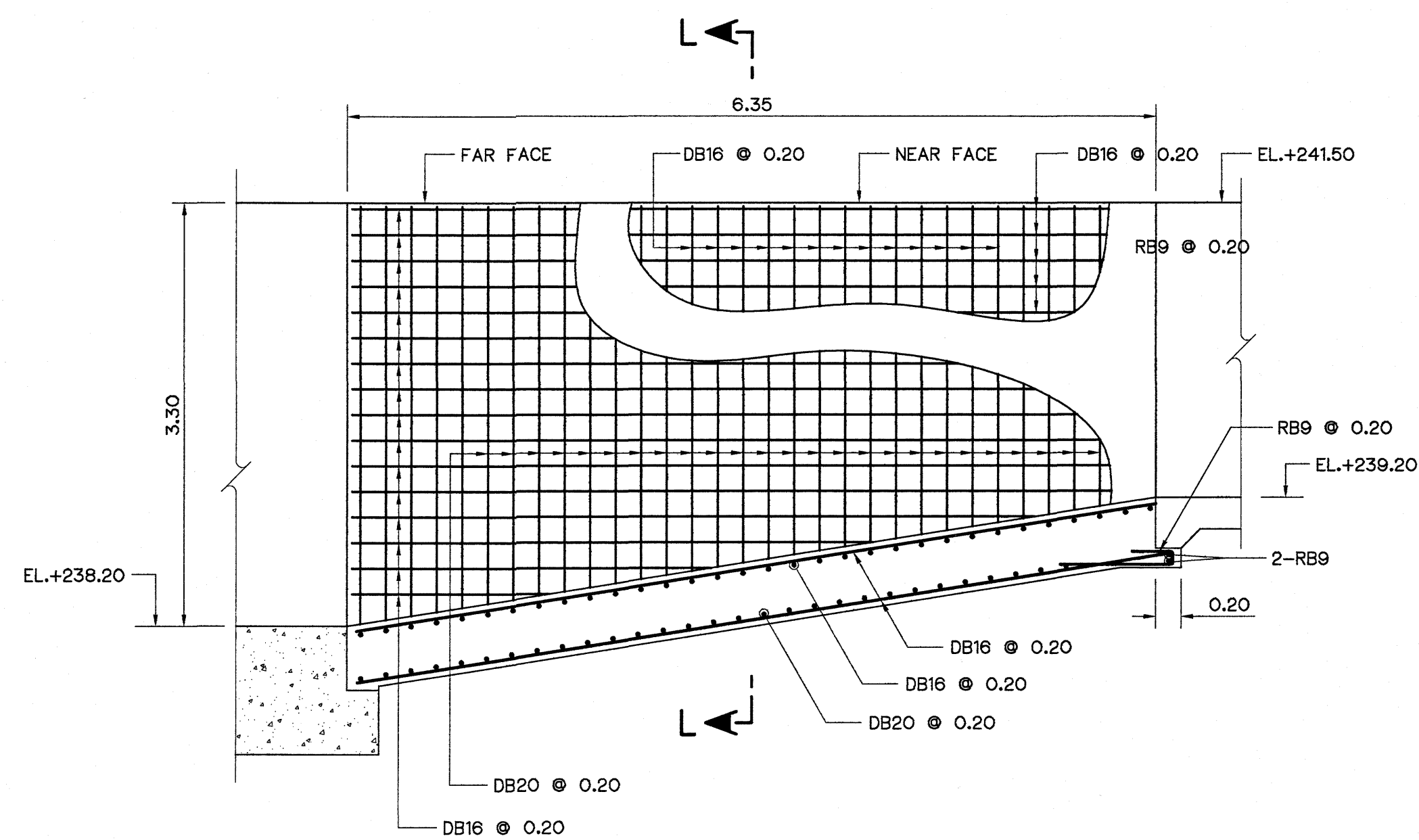
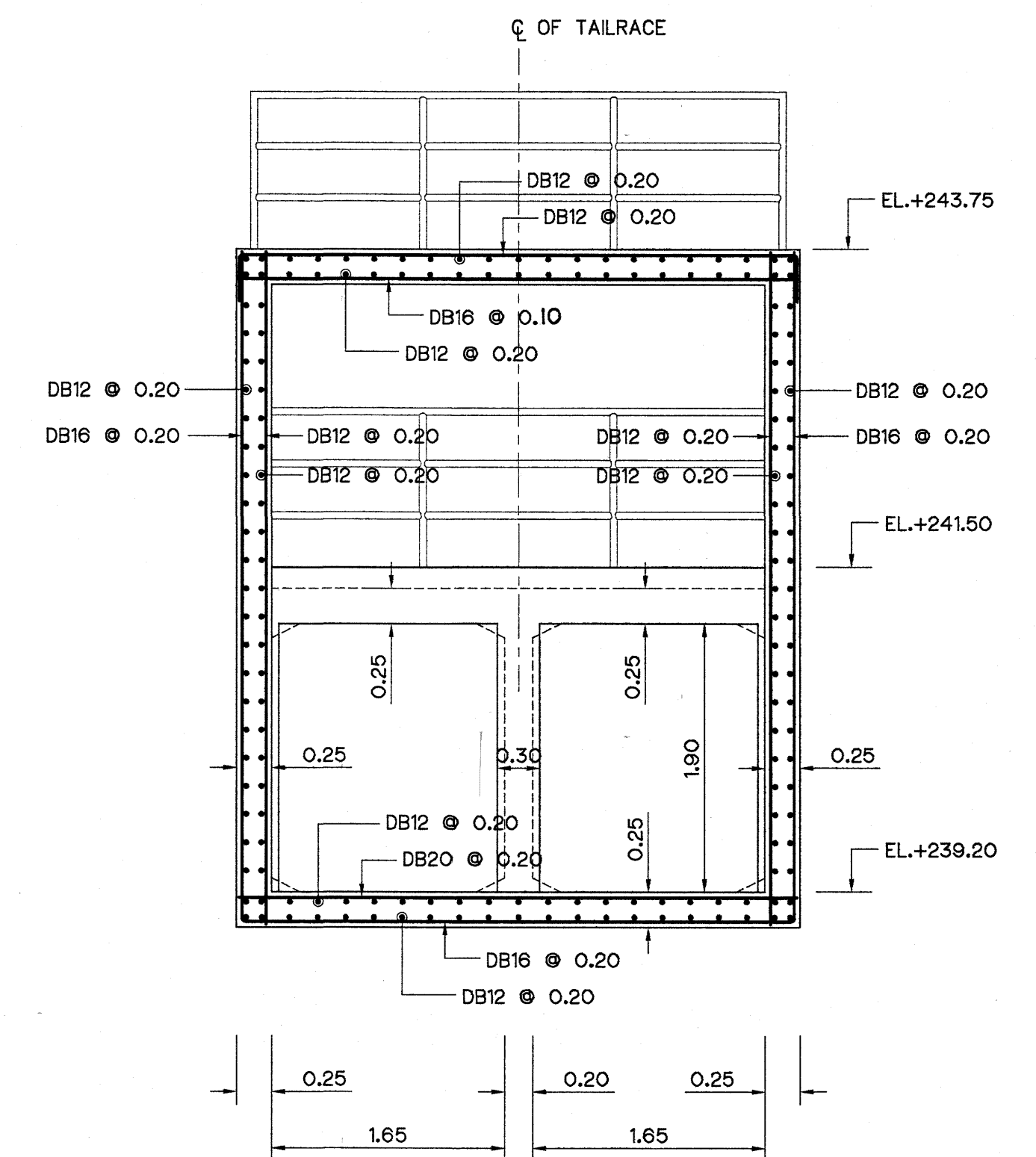
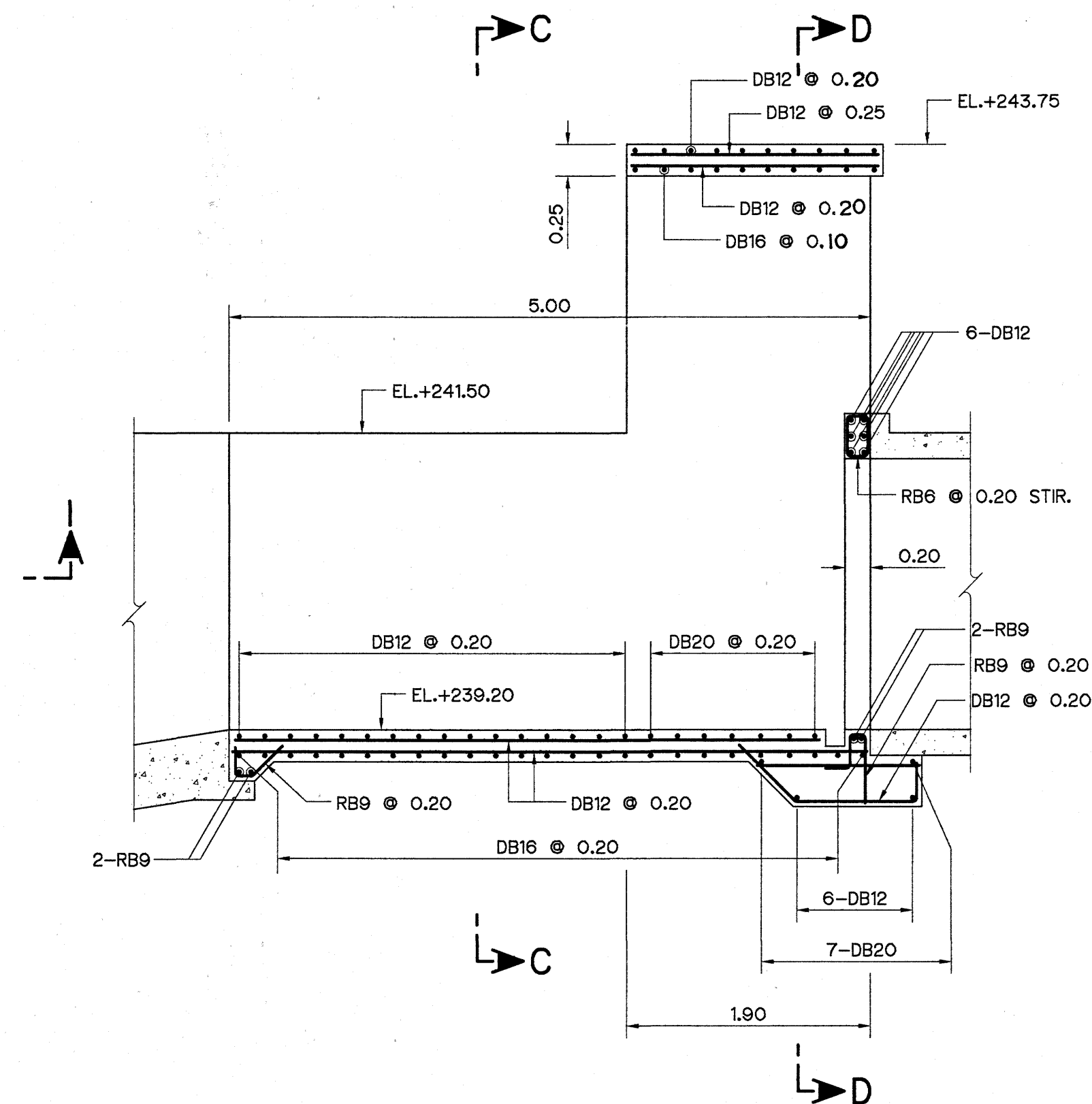
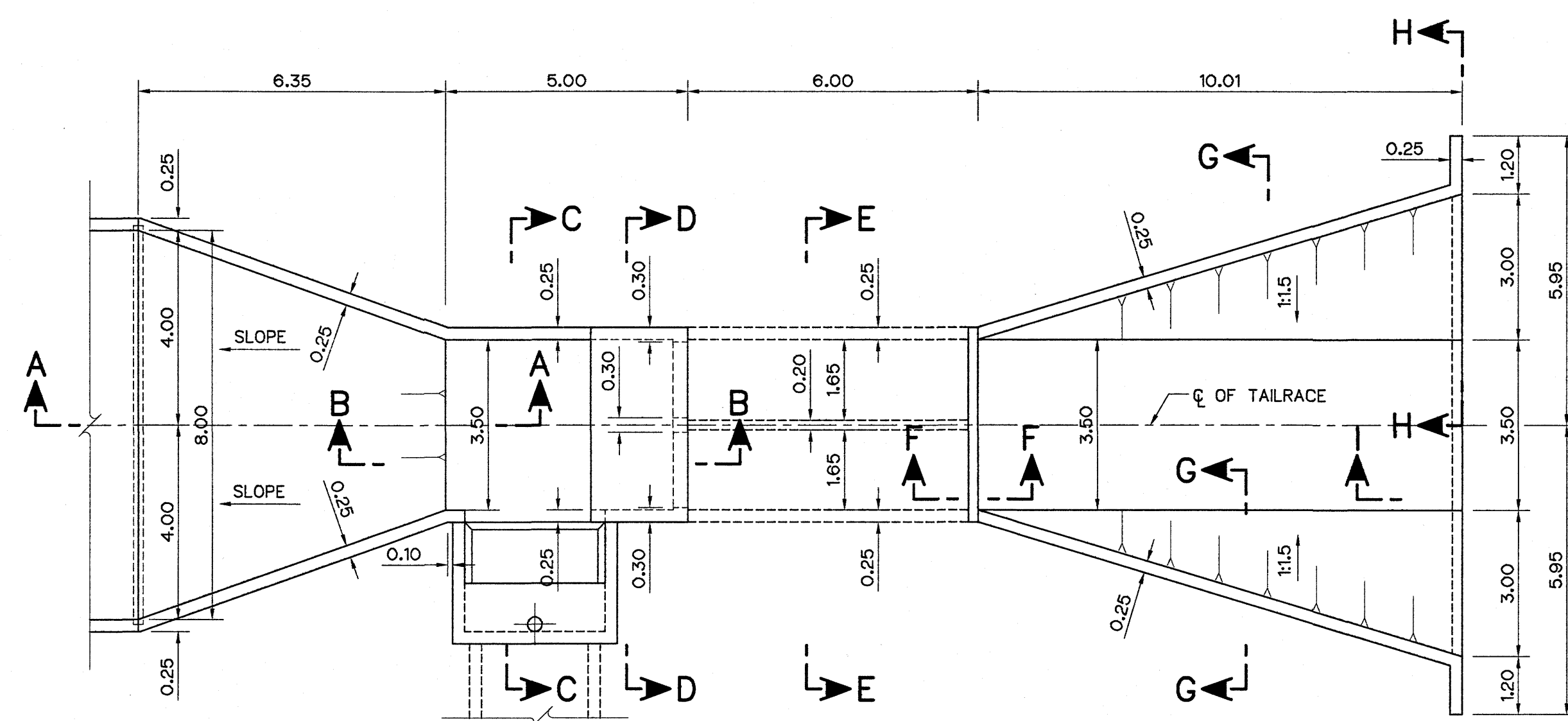
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
CONSULTANTS		DEDE		

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
LAM PHRA PHLOENG HYDROPOWER PROJECT	
CIVIL WORKS TAILRACE GENERAL PLAN, SECTION & DETAILS	
DESIGNED DRAWN CHECKED PROJECT MANAGER	REVIEWED S. KITICHAI SUBMITTED RECOMMENDED APPROVED DATE 14/01/62
DRAWING NO. LPP-TR-01	SHEET NO. 31 OF 44



3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVE
	CONSULTANTS		DEDE	

 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
LAM PHRA PHLOENG HYDROPOWER PROJECT			
CIVIL WORKS			
TAILRACE			
SECTIONS			
 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY		REVIEWED <i>S. KITICHAI</i>	
FRONTIER ENGINEERING CONSULTANTS CO., LTD.		SUBMITTED <i>[Signature]</i>	
DESIGNED <i>[Signature]</i> NO. 6651		RECOMMENDED <i>[Signature]</i>	
DRAWN <i>[Signature]</i>		APPROVED <i>[Signature]</i>	
CHECKED <i>[Signature]</i> NO. 7324		DRAWING NO.	
PROJECT MANAGER <i>[Signature]</i>		LPP-TR-02	
DATE		SHEET NO.	
		32 OF 44	

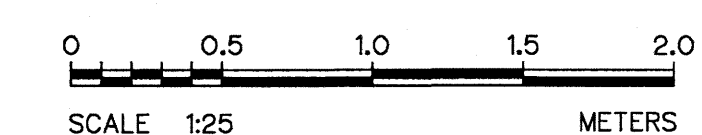
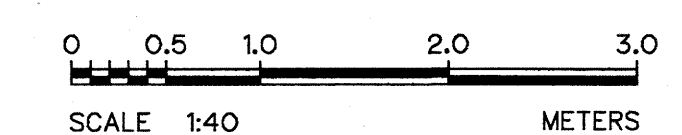
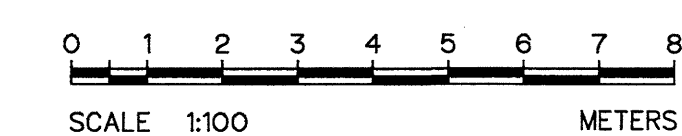


- NOTES :

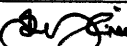
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP-GN-03.
3. LOCATIONS OF LAP SPLICES SHALL BE DETERMINED IN FIELD UNDER THE APPROVAL OF FIELD ENGINEER.

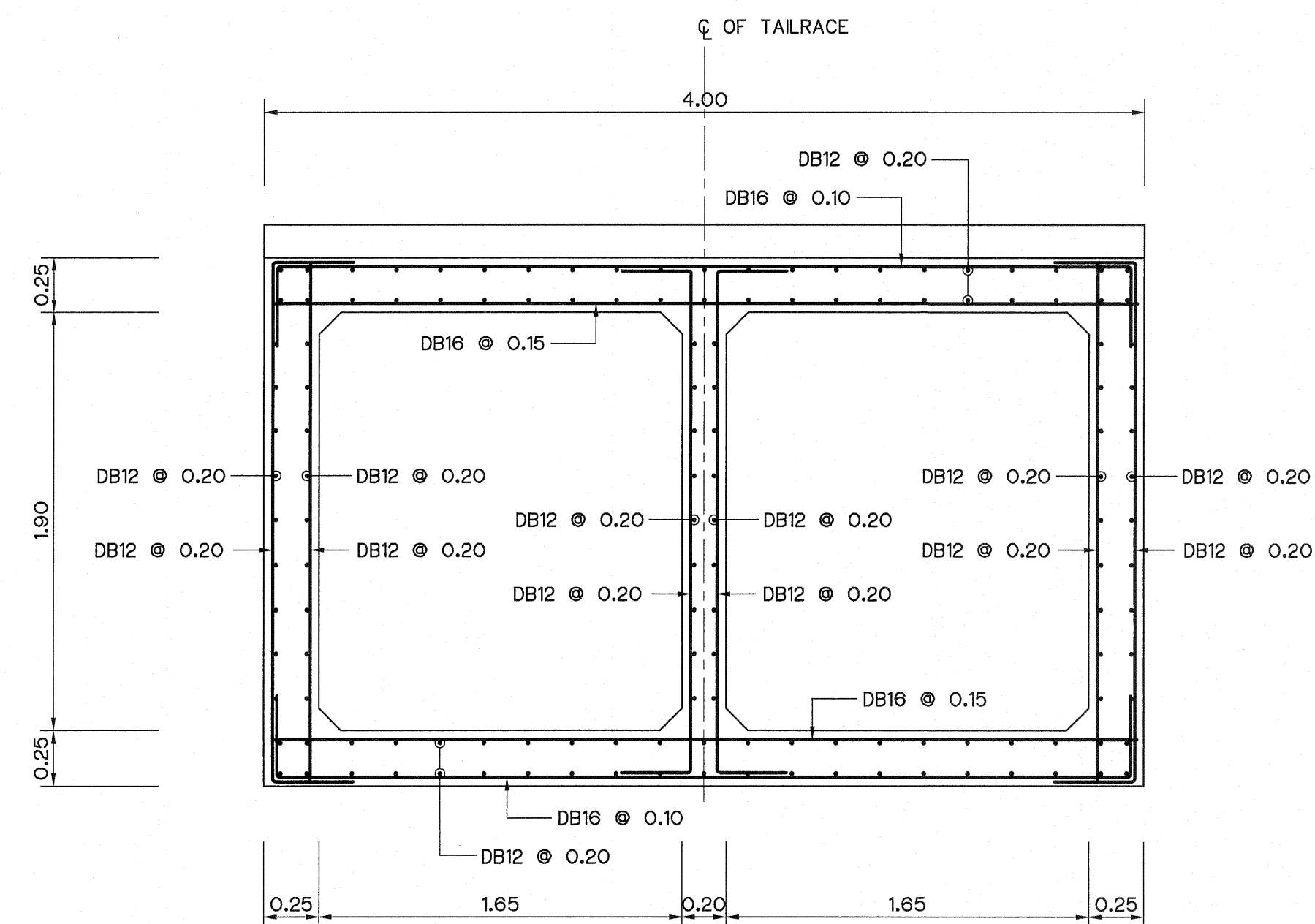
- REFERENCE DRAWINGS :

- | | |
|--|-----------|
| 1. TAILRACE, GENERAL PLAN AND SECTION | LPP-TR-01 |
| 2. TAILRACE, REINFORCEMENT DETAILS 2/2 | LPP-TR-04 |

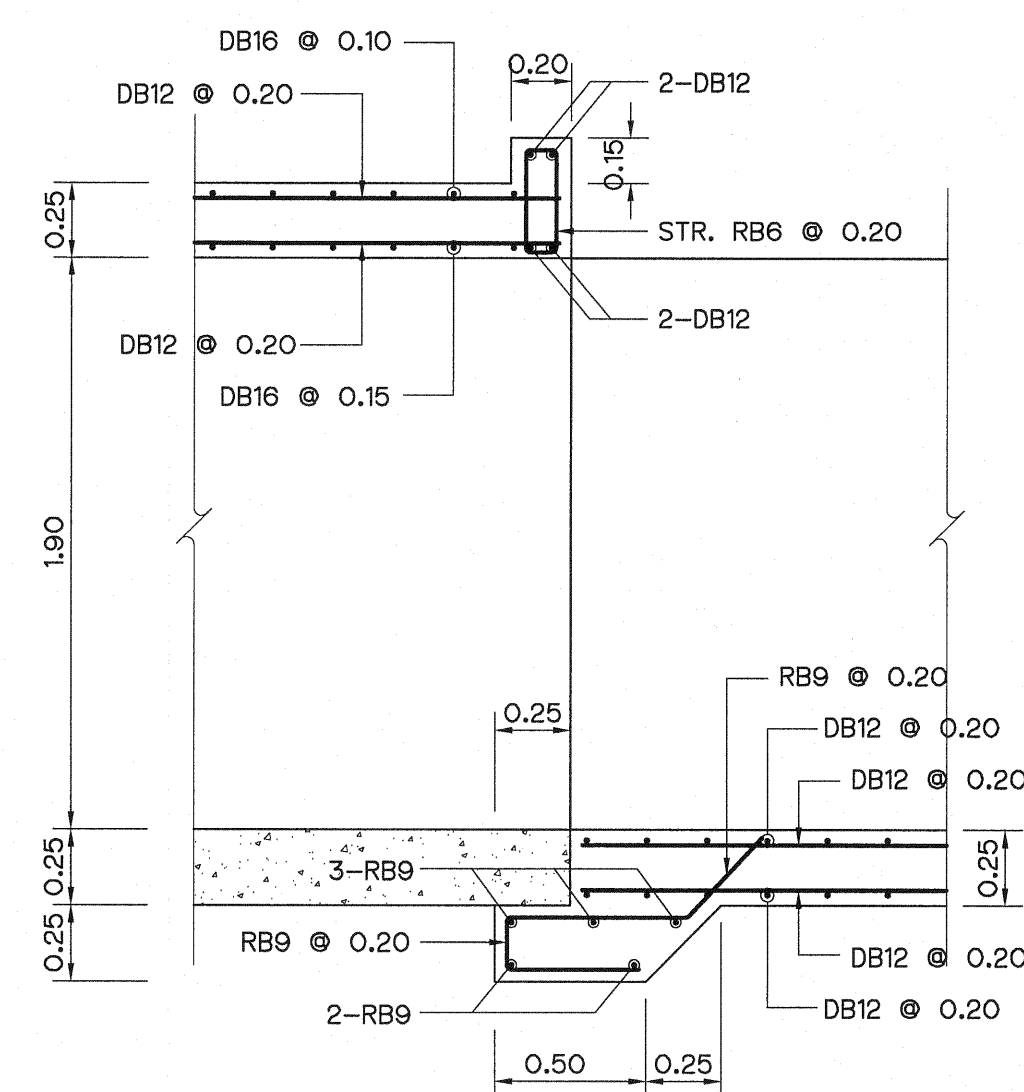


3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

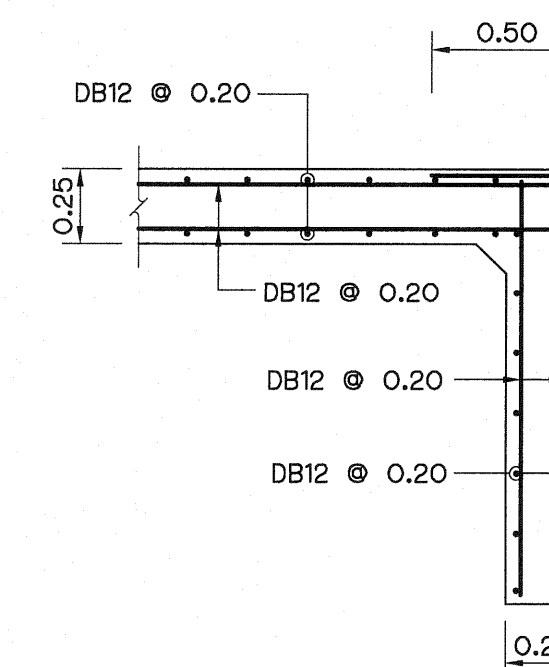
 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
LAM PHRA PHLOENG HYDROPOWER PROJECT			
CIVIL WORKS			
TAILRACE			
REINFORCEMENT DETAILS 1/2			
 FRONTIER ENGINEERING CONSULTANTS CO., LTD.		 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED 		REVIEWED S. KITICHAI	
DRAWN 		SUBMITTED 	
CHECKED 		RECOMMENDED 	
PROJECT MANAGER 		APPROVED 	
14/01/82		DRAWING NO.	
DATE		LPP-TR-03	
		SHEET NO.	
		33 OF 44	



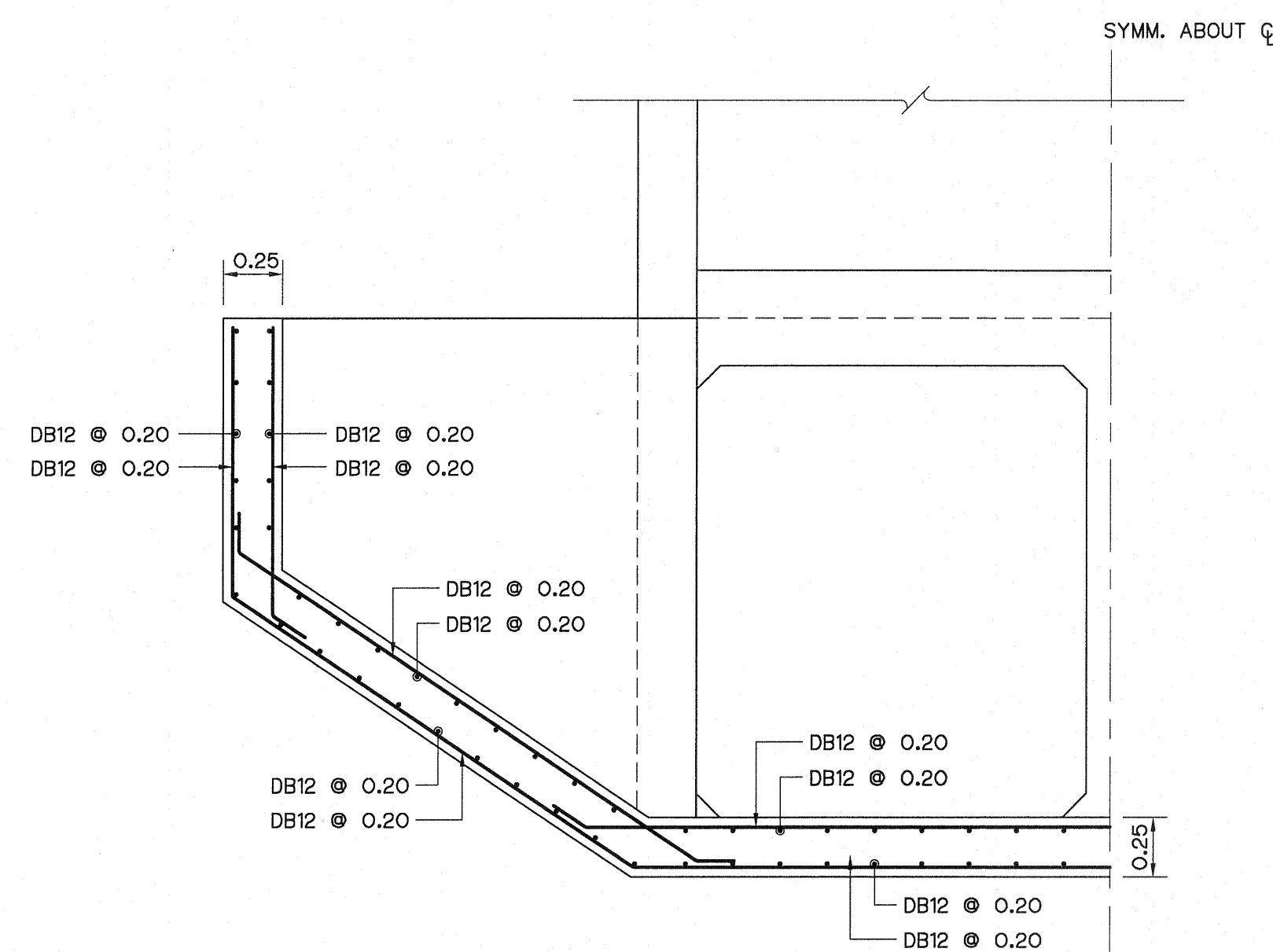
SECTION E-E
SCALE 1:25



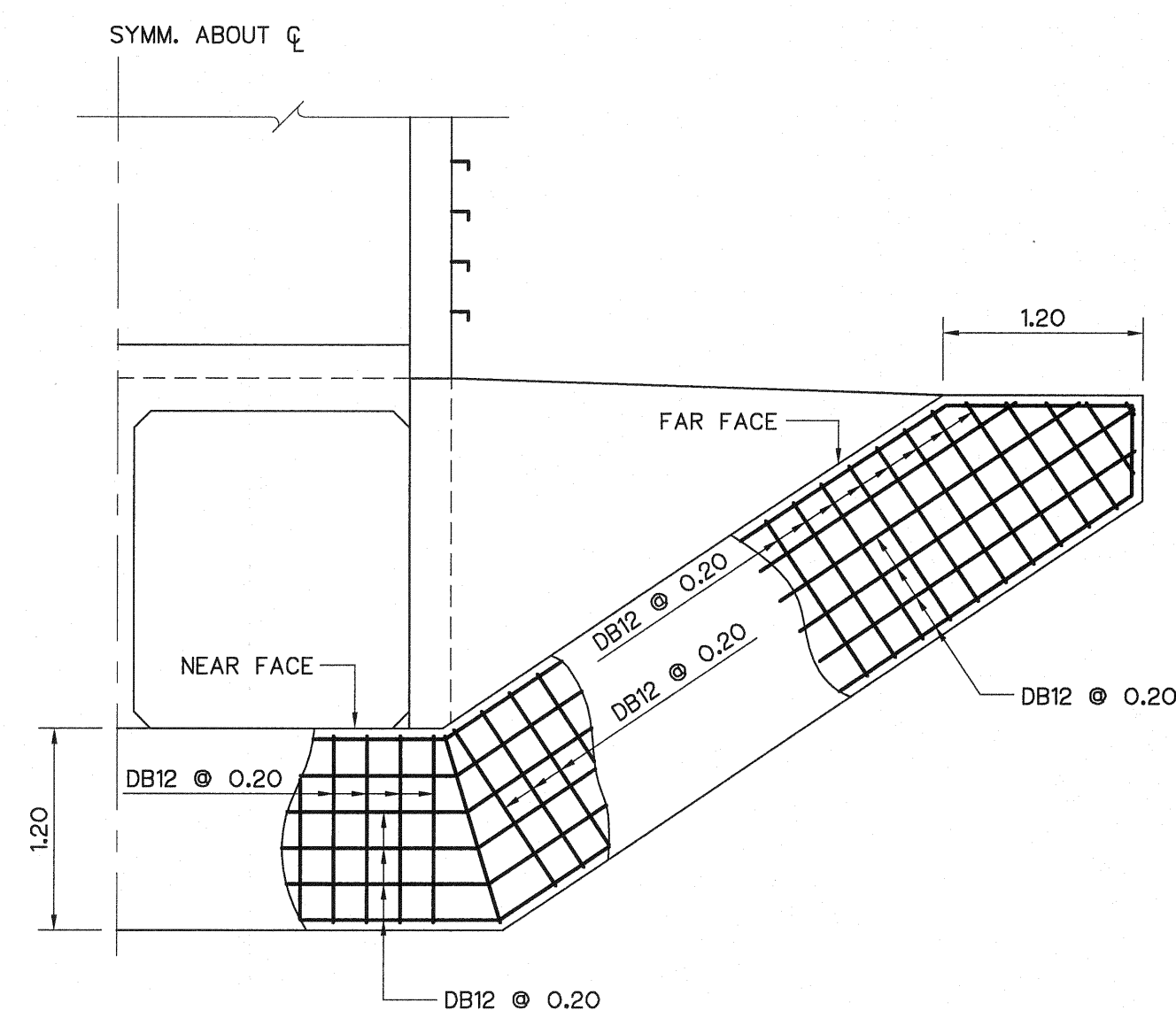
SECTION F-F
SCALE 1:25



SECTION I-I
SCALE 1:25



SECTION G-G
SCALE 1:25



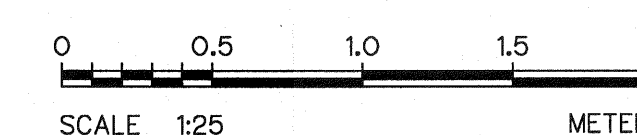
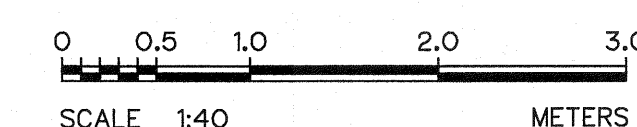
SECTION H-H
SCALE 1:40

NOTES :

- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP-GN-03.
- LOCATIONS OF LAP SPLICES SHALL BE DETERMINED IN FIELD UNDER THE APPROVAL OF FIELD ENGINEER.

REFERENCE DRAWINGS :

- TAILRACE, REINFORCEMENT DETAILS 1/2 LPP-TR-03

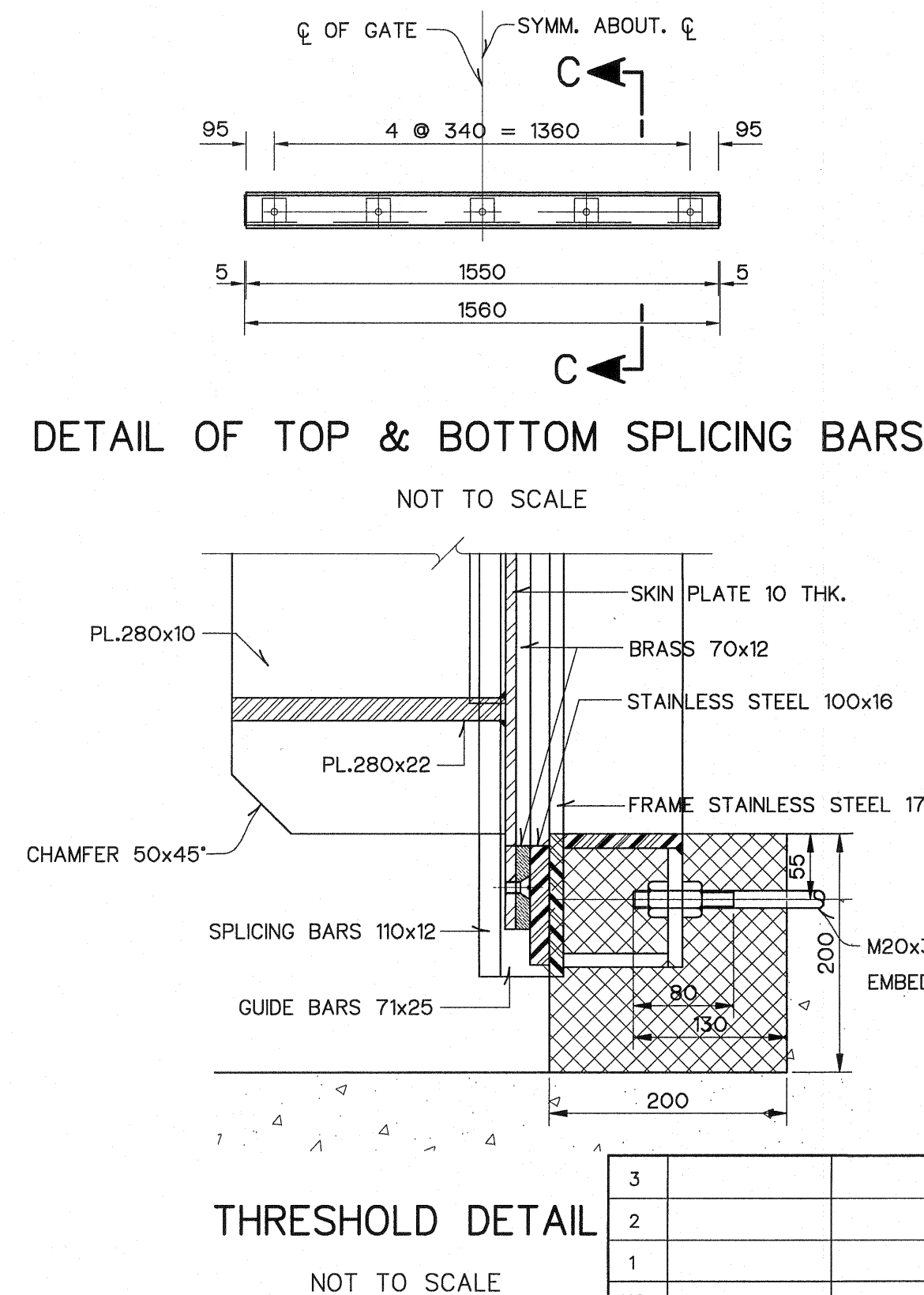
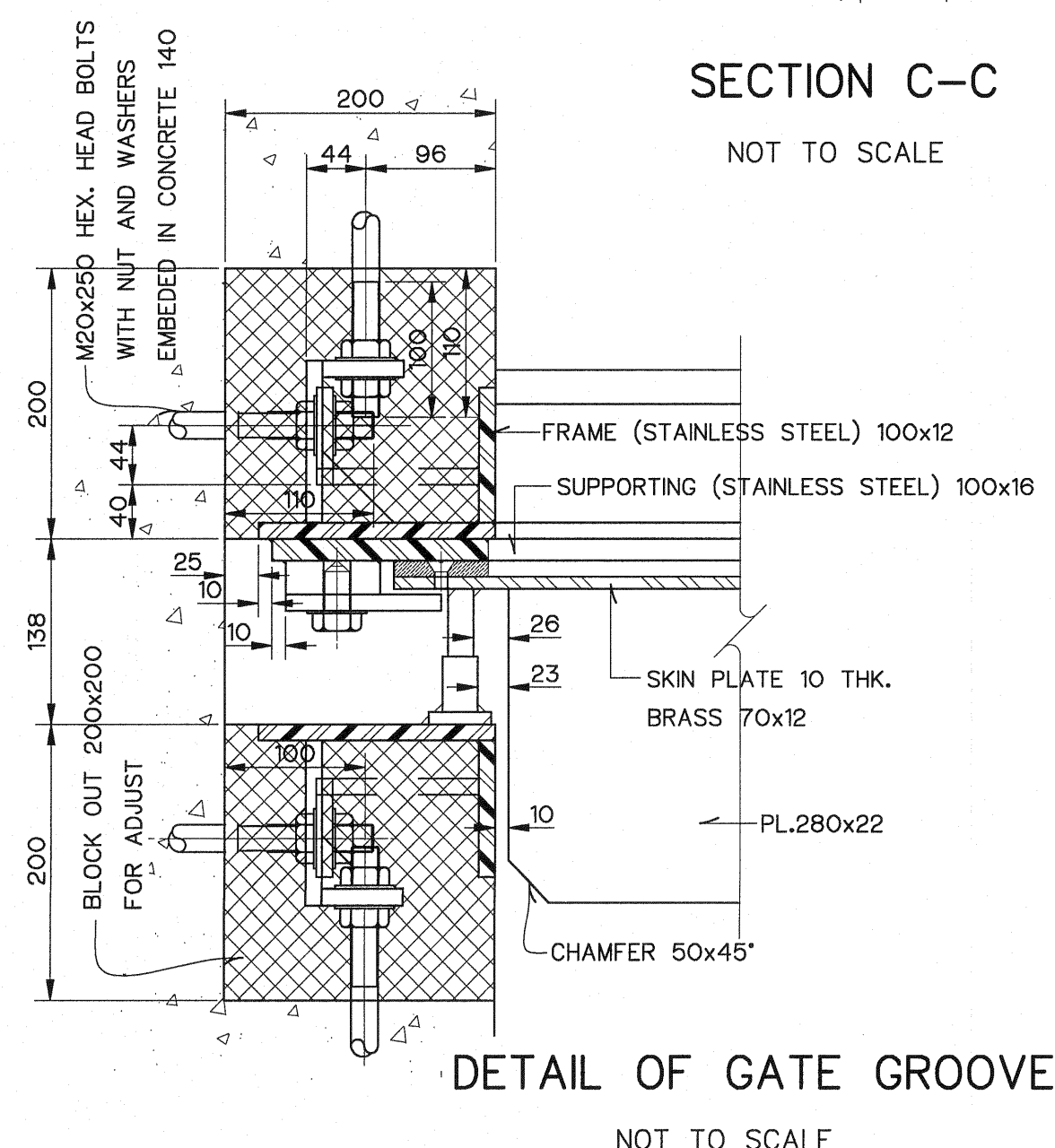
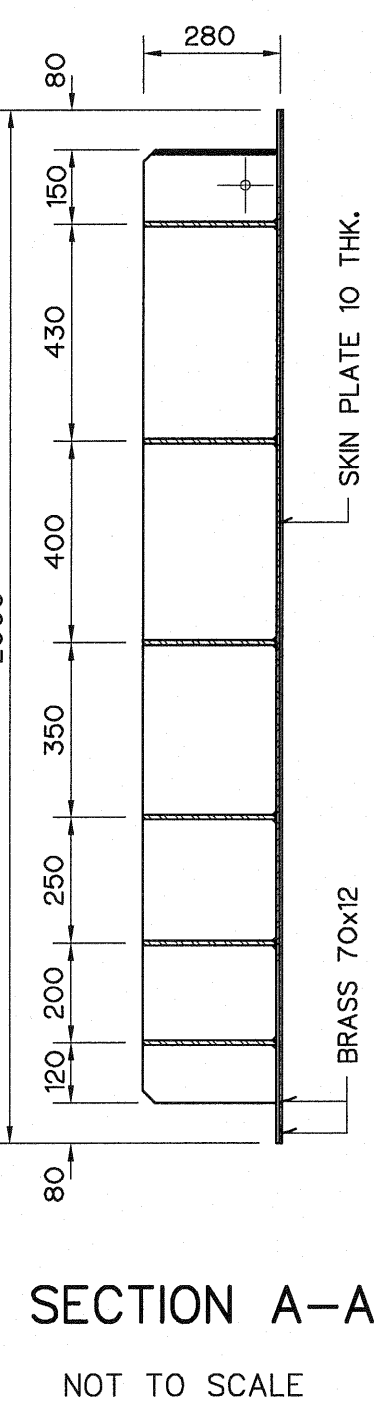
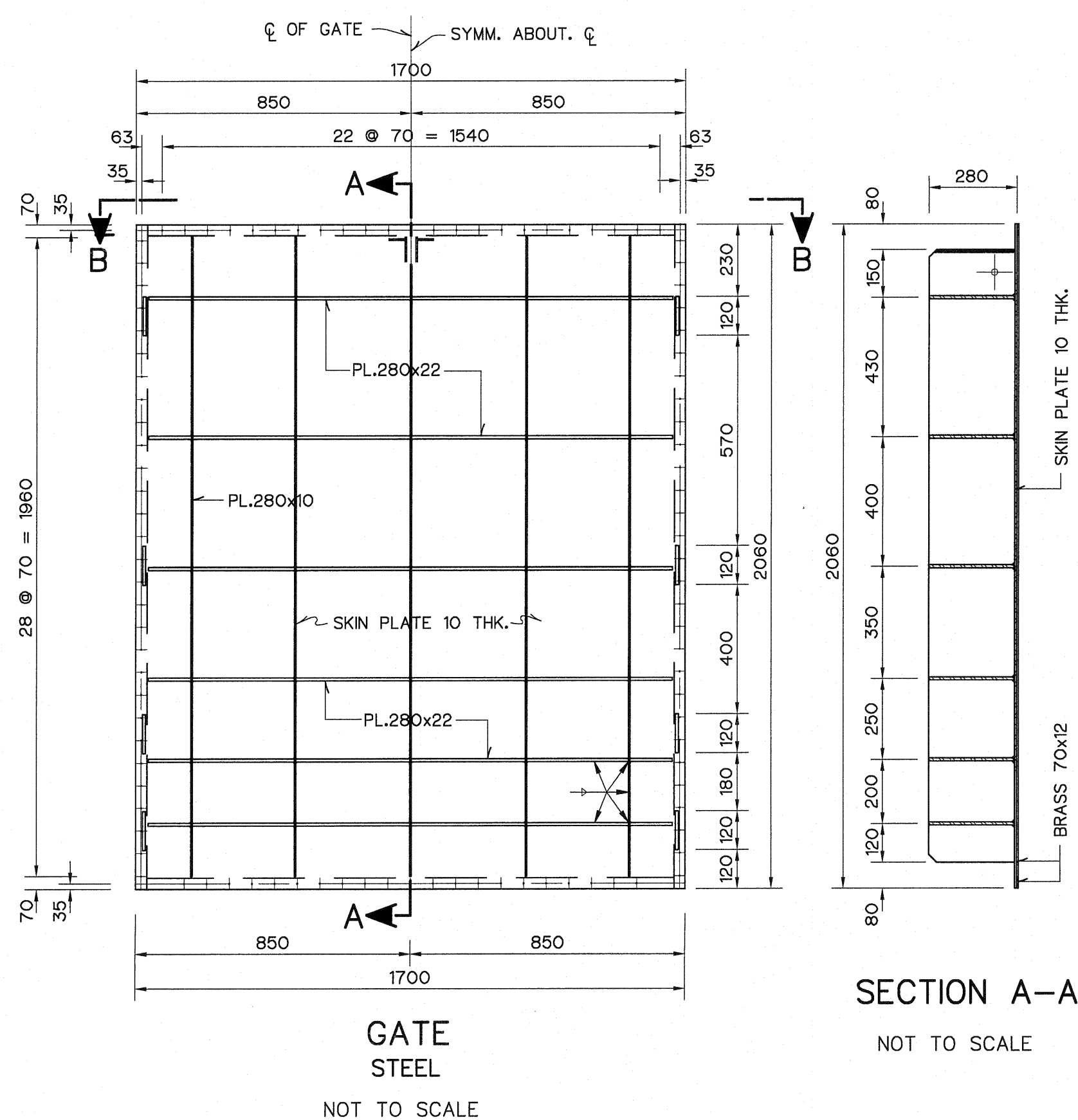
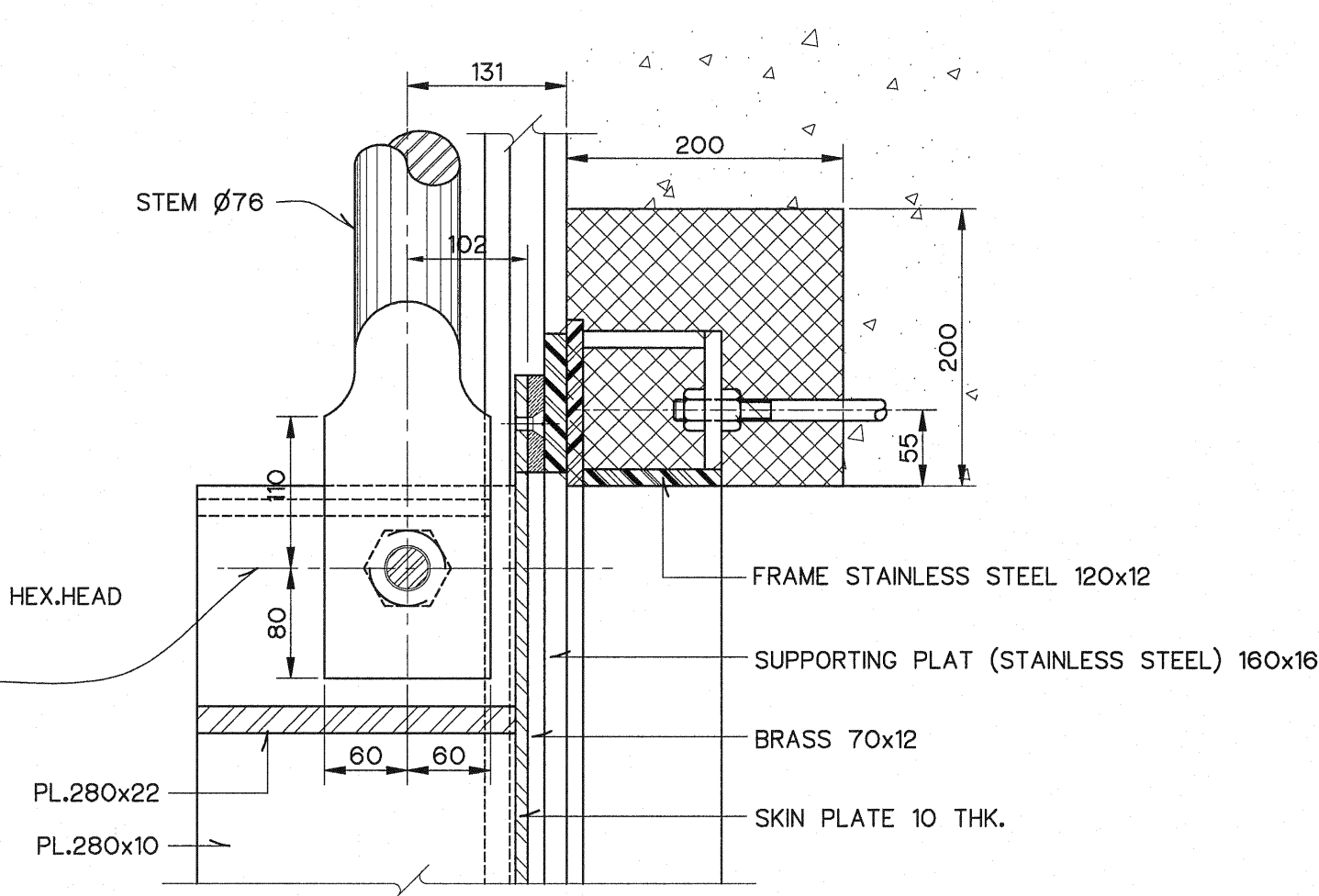
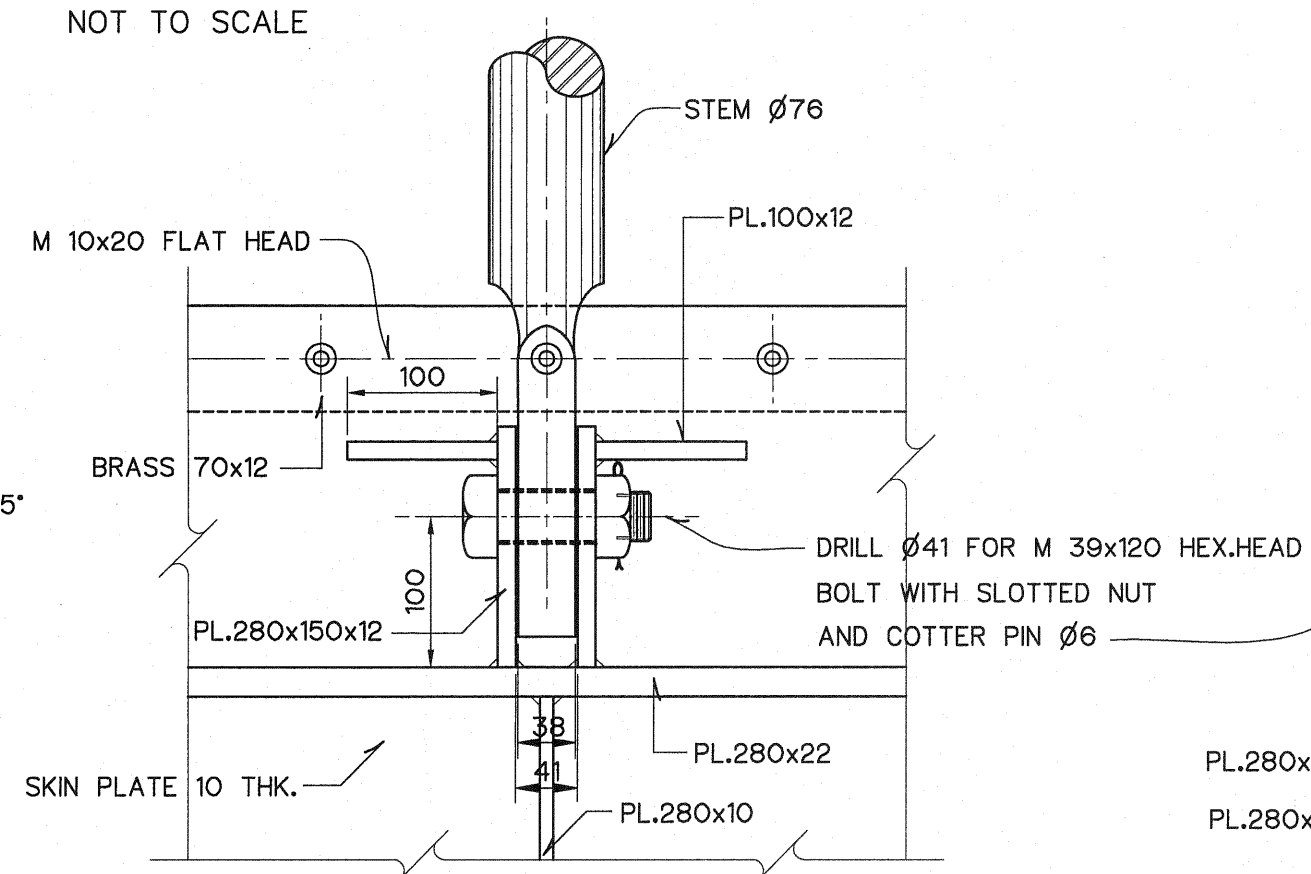
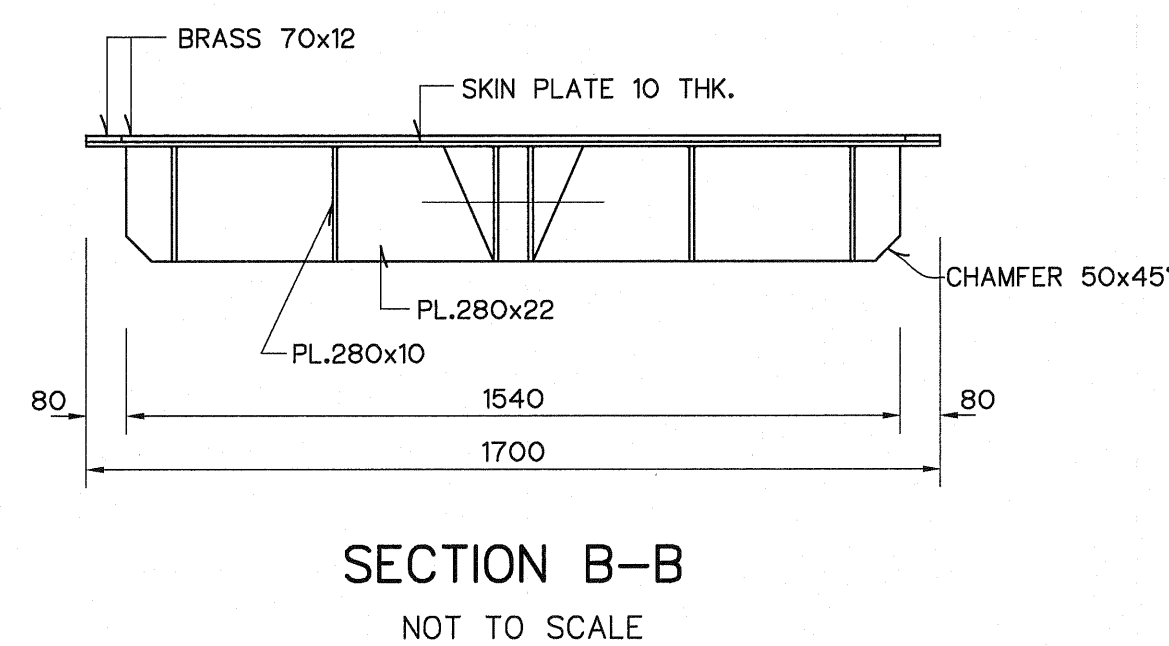
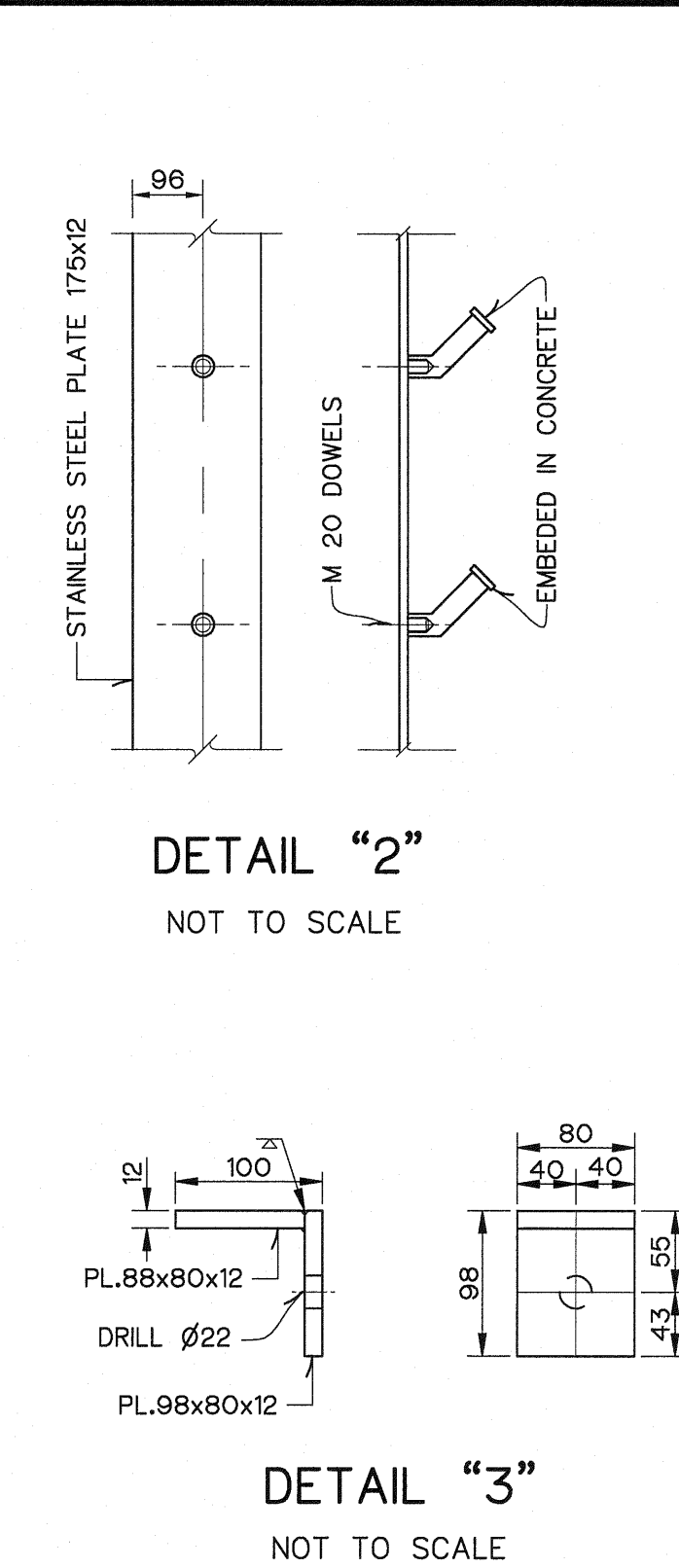
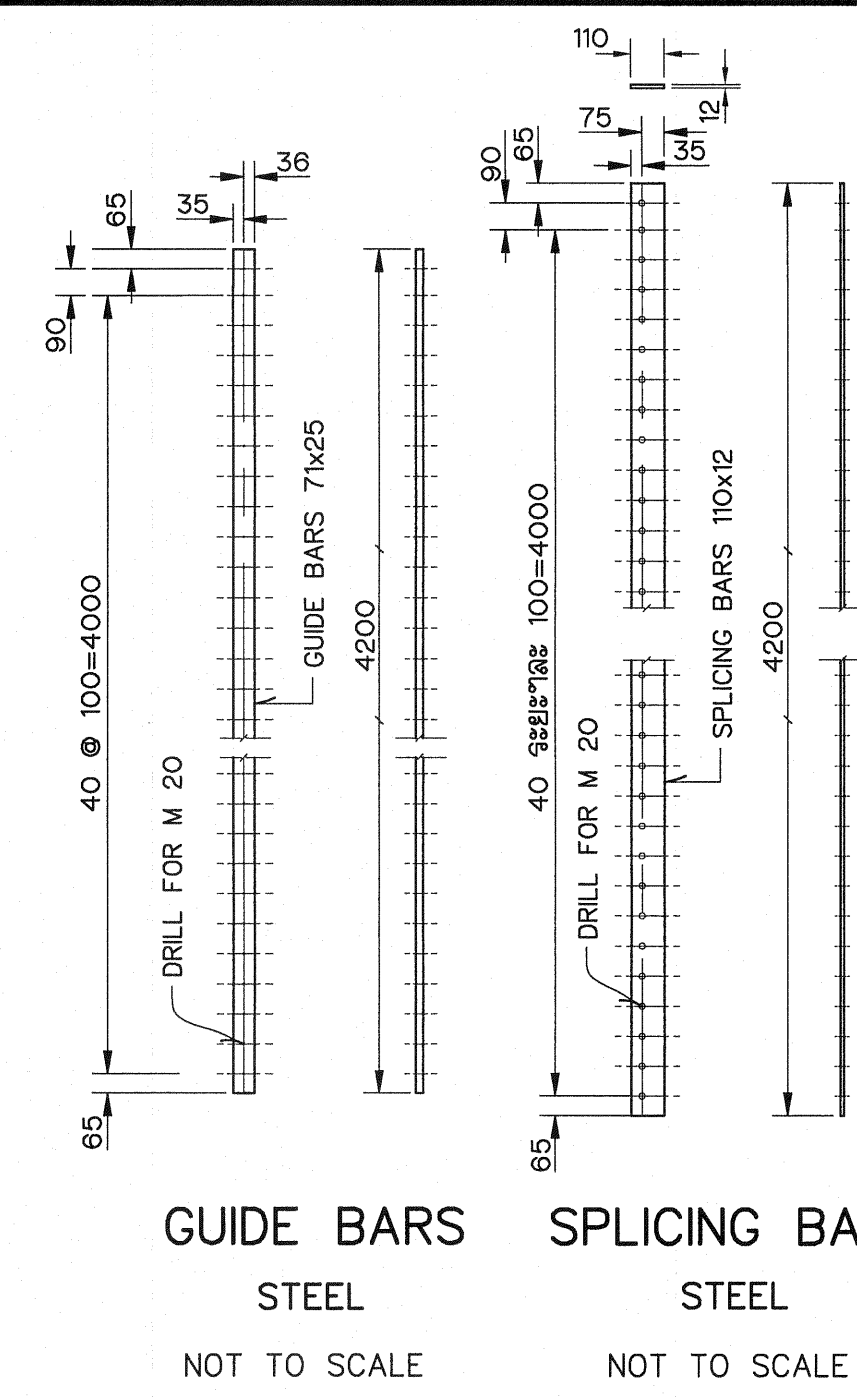
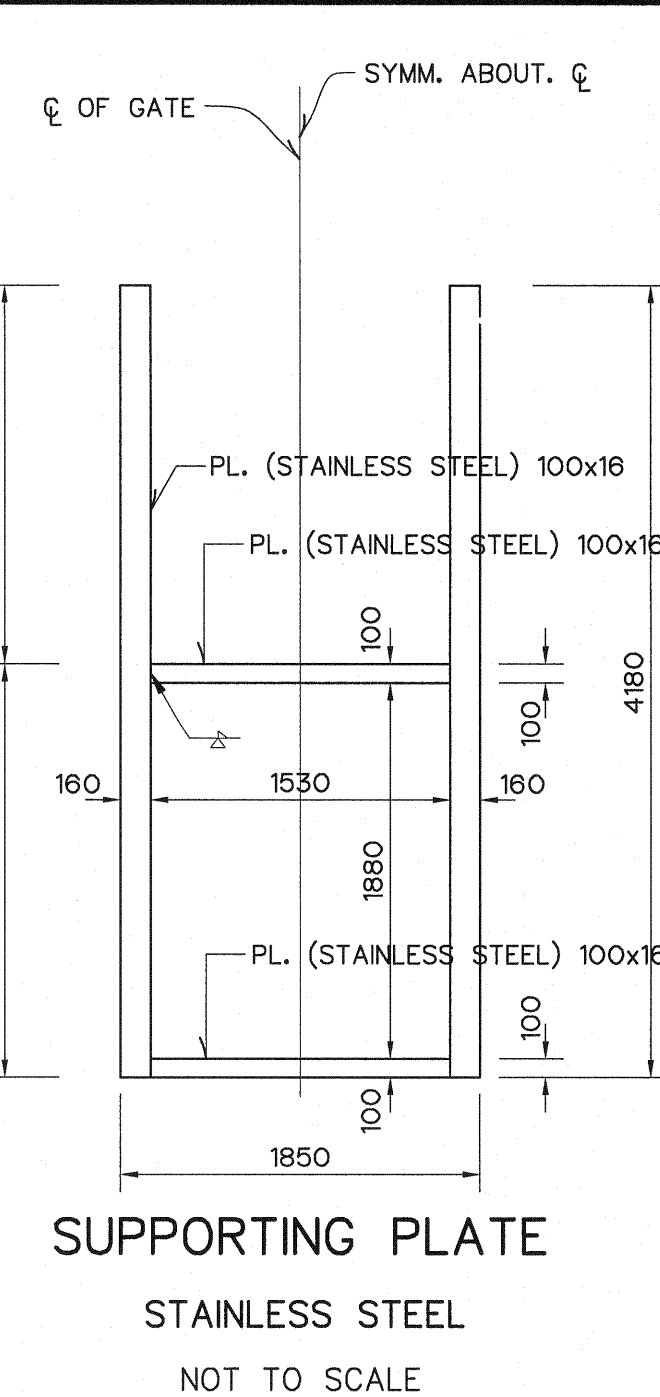
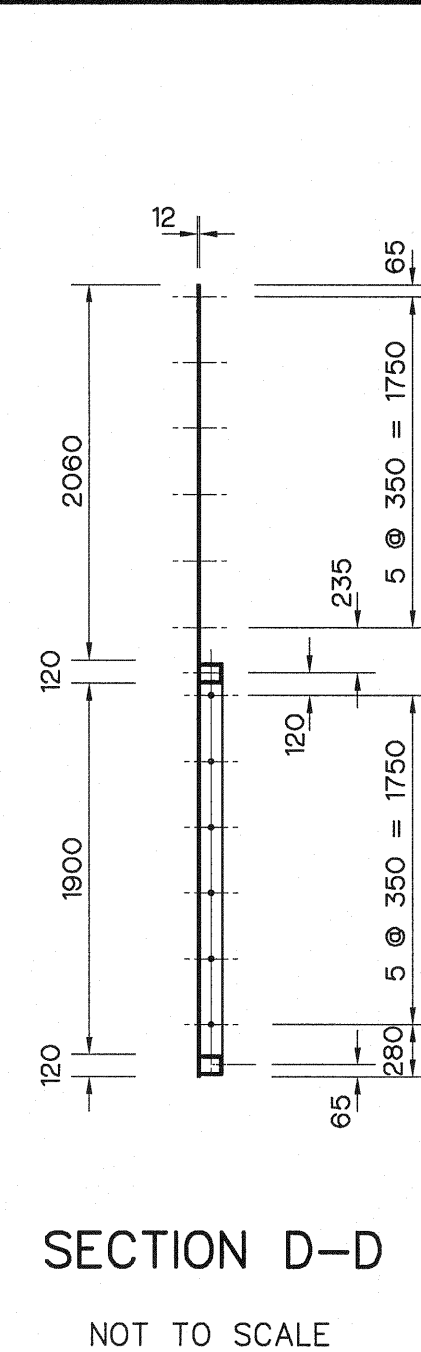
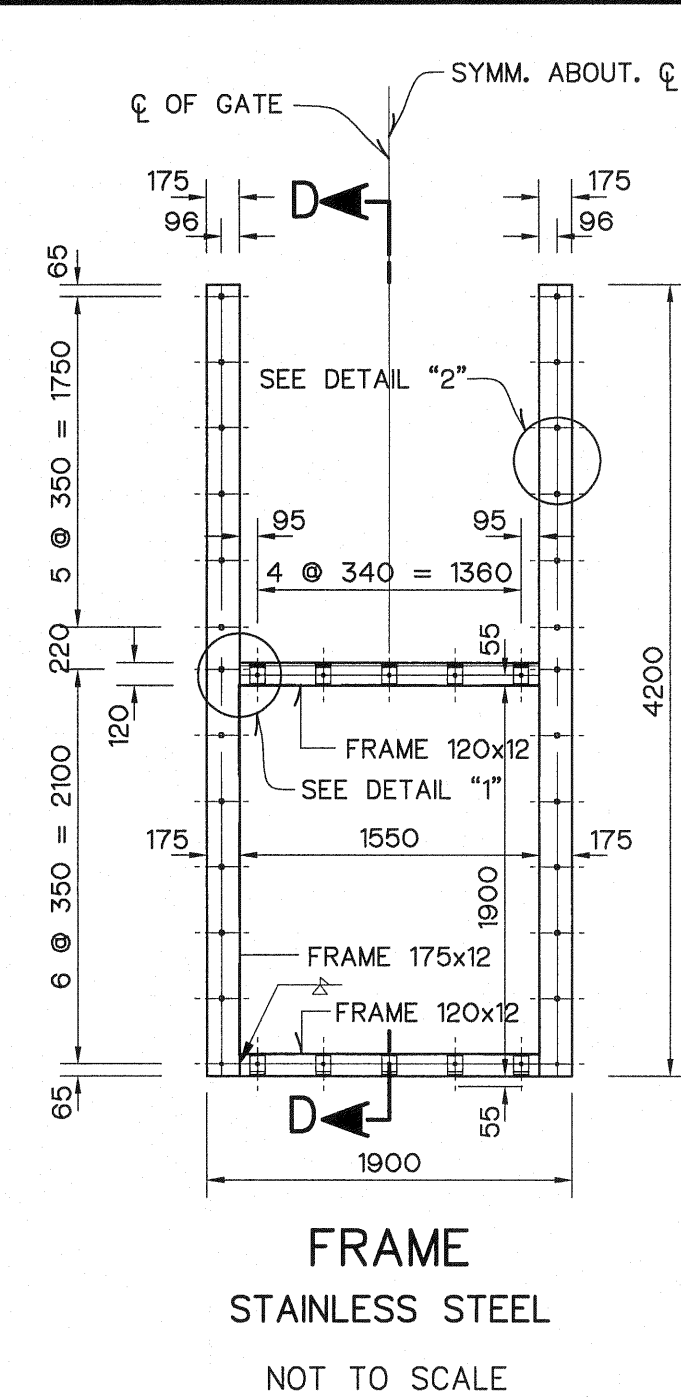
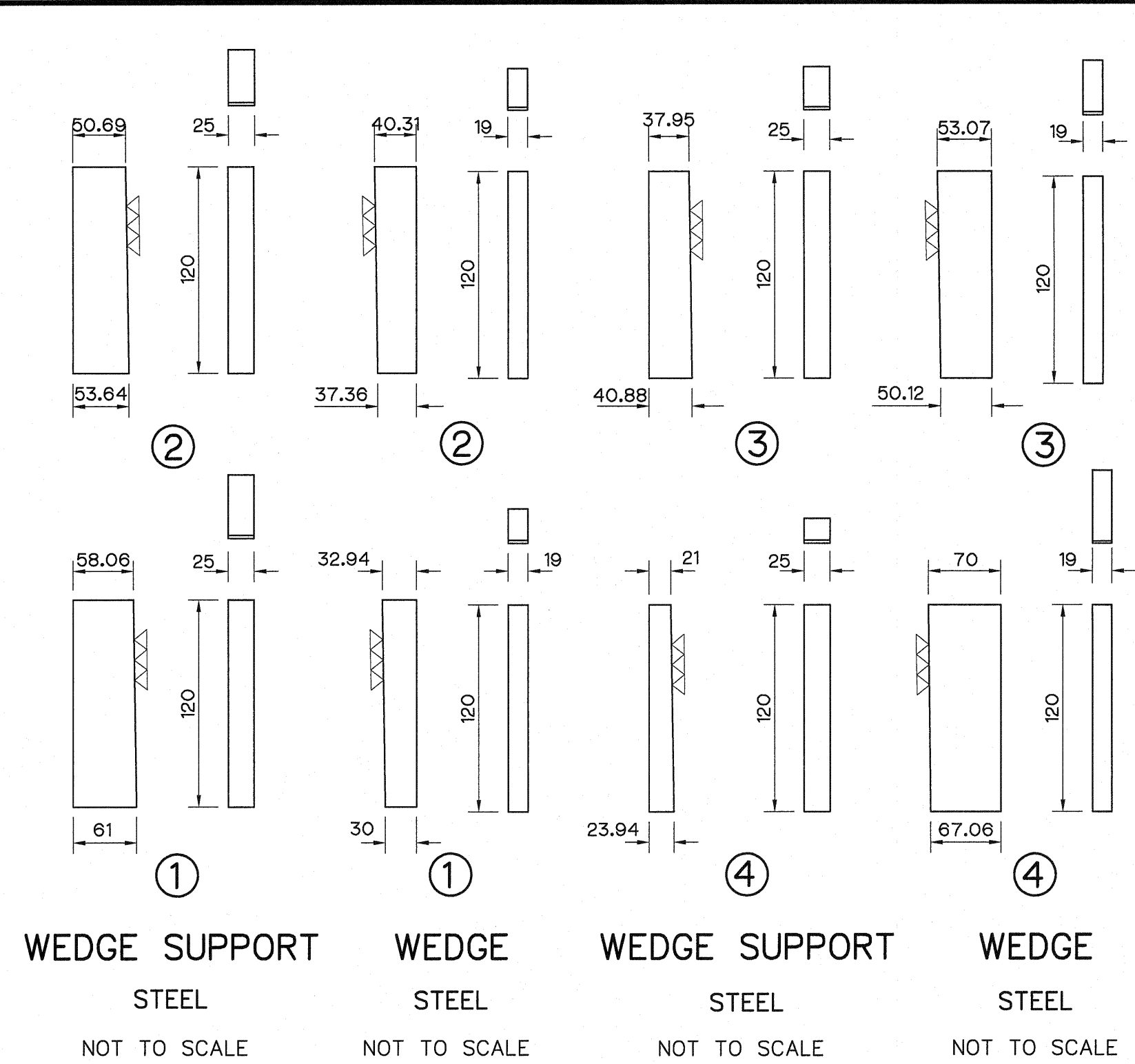


3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

CONSULTANTS

DEDE

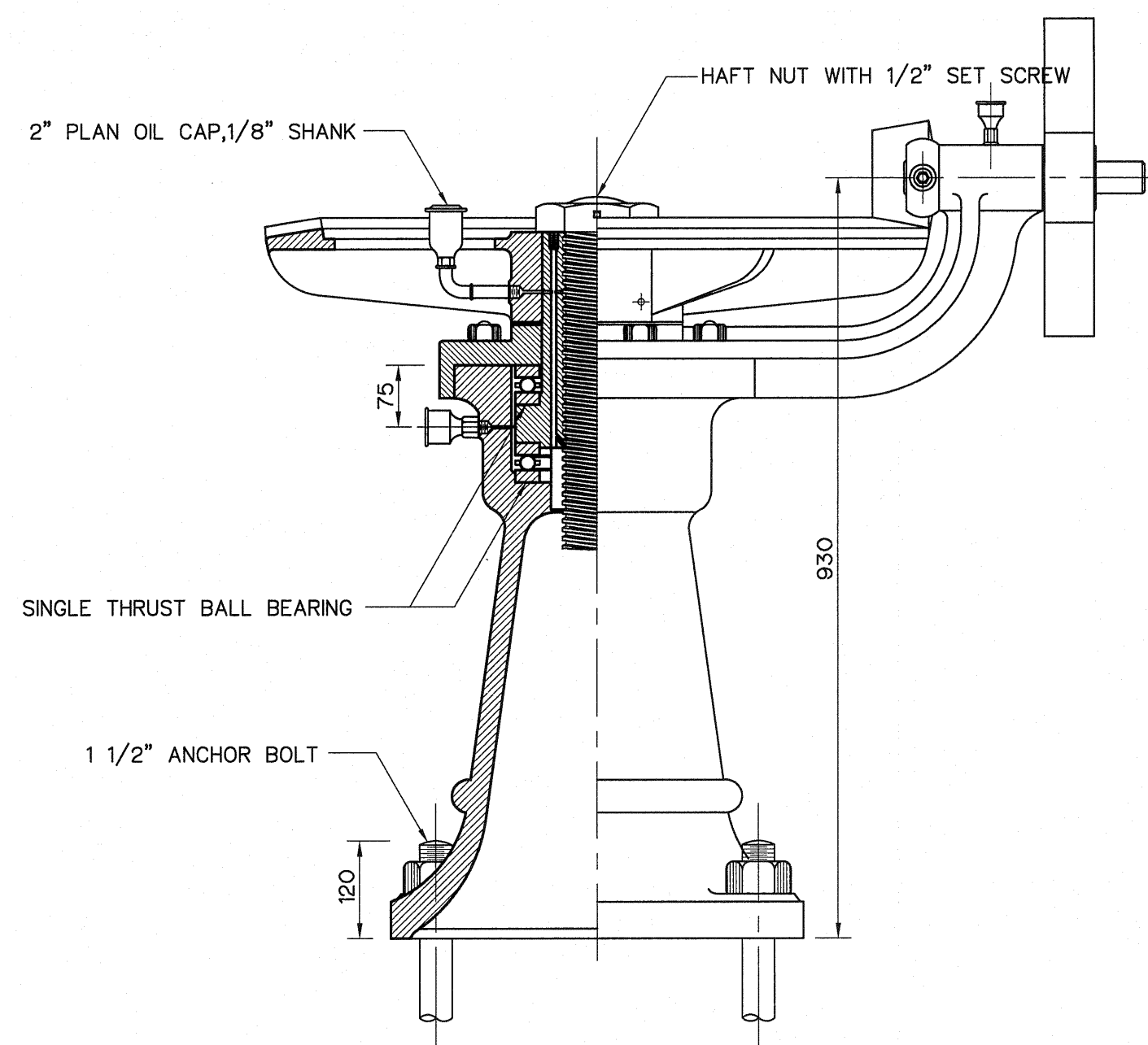
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
LAM PHRA PHLOENG HYDROPOWER PROJECT	
CIVIL WORKS TAILRACE REINFORCEMENT DETAILS 1/2	
FRONTIER ENGINEERING CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED <i>[Signature]</i> 01.6651	REVIEWED <i>S. KITICHA</i>
DRAWN <i>[Signature]</i>	SUBMITTED <i>[Signature]</i>
CHECKED <i>[Signature]</i> 01.7324	RECOMMENDED <i>[Signature]</i>
PROJECT MANAGER	APPROVED <i>[Signature]</i>
DATE 14/01/62	DRAWING NO. LPP-TR-04
SHEET NO. 34 OF 44	



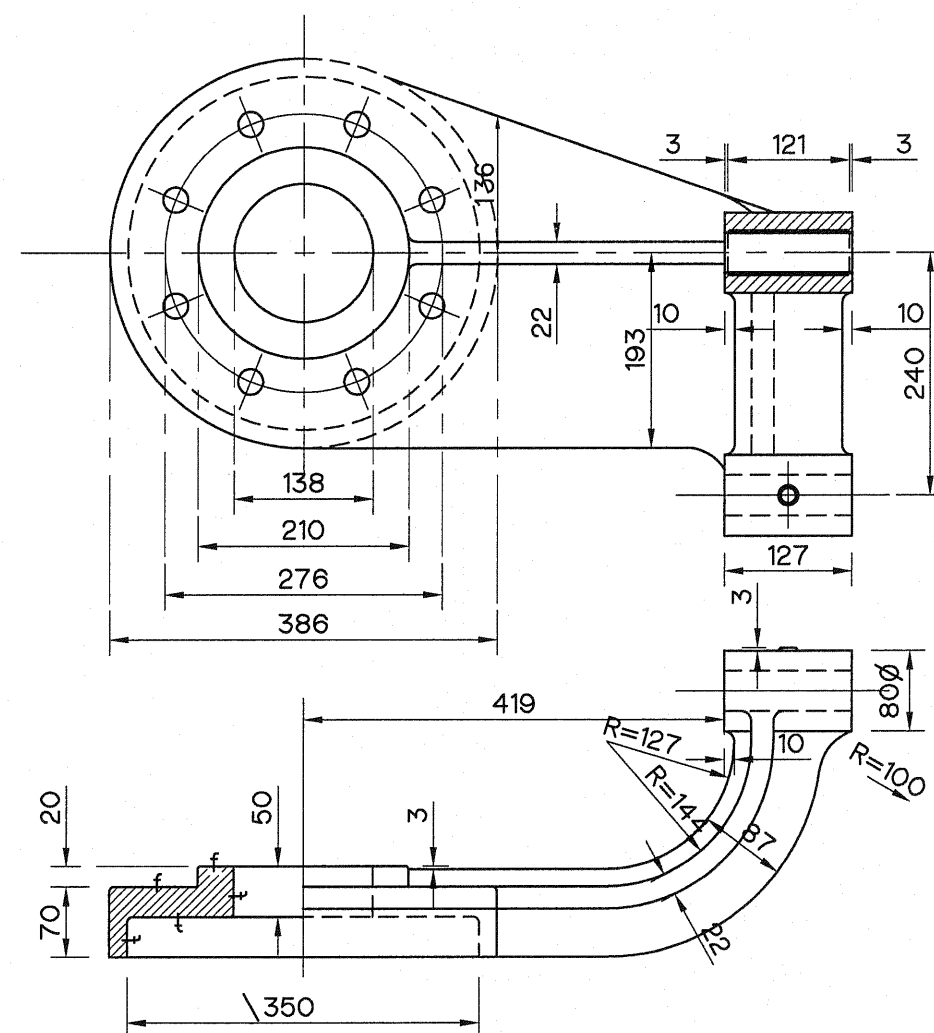
NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN.
2. ALL WELDING WILL BE 6 MILLIMETER, UNLESS OTHERWISE SHOWN.
3. ALL BOLTS AND NUTS USE ASTM. A325.
4. ALL STRUCTURAL STEELS ARE JIS G3101 SS400.
5. ALL STAINLESS STEEL PLATES ARE JIS G4304 SUS304.
6. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, THE CONTRACTOR HAS TO SUBMITTED SHOP DRAWING TO FIELD ENGINEER FOR APPROVAL.

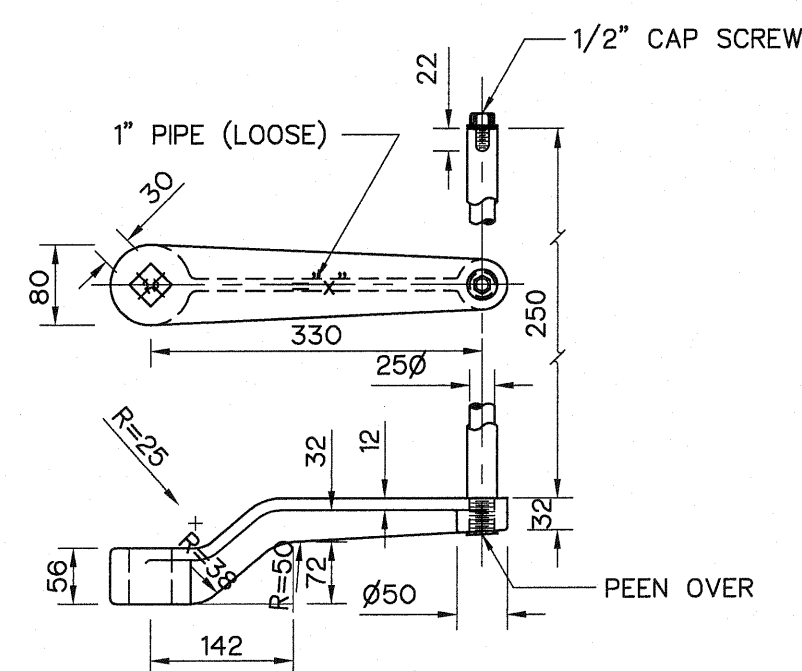
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
LAM PHRA PHLOENG HYDROPOWER PROJECT			
CIVIL WORKS			
TAILRACE			
1.55x1.90 SLUICE GATE DETAILS			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		REVIEWED S.KITICHAI	
DESIGNED ๑๒.๑๑.๖๕		SUBMITTED ๑๒.๑๑.๖๕	
DRAWN ๑๒.๑๑.๖๕		RECOMMENDED ๑๒.๑๑.๖๕	
CHECKED ๑๒.๑๑.๖๕		APPROVED ๑๒.๑๑.๖๕	
PROJECT MANAGER		DRAWING NO. LPP-TR-05	
DATE 14/01/62		SHEET NO. 35 OF 44	



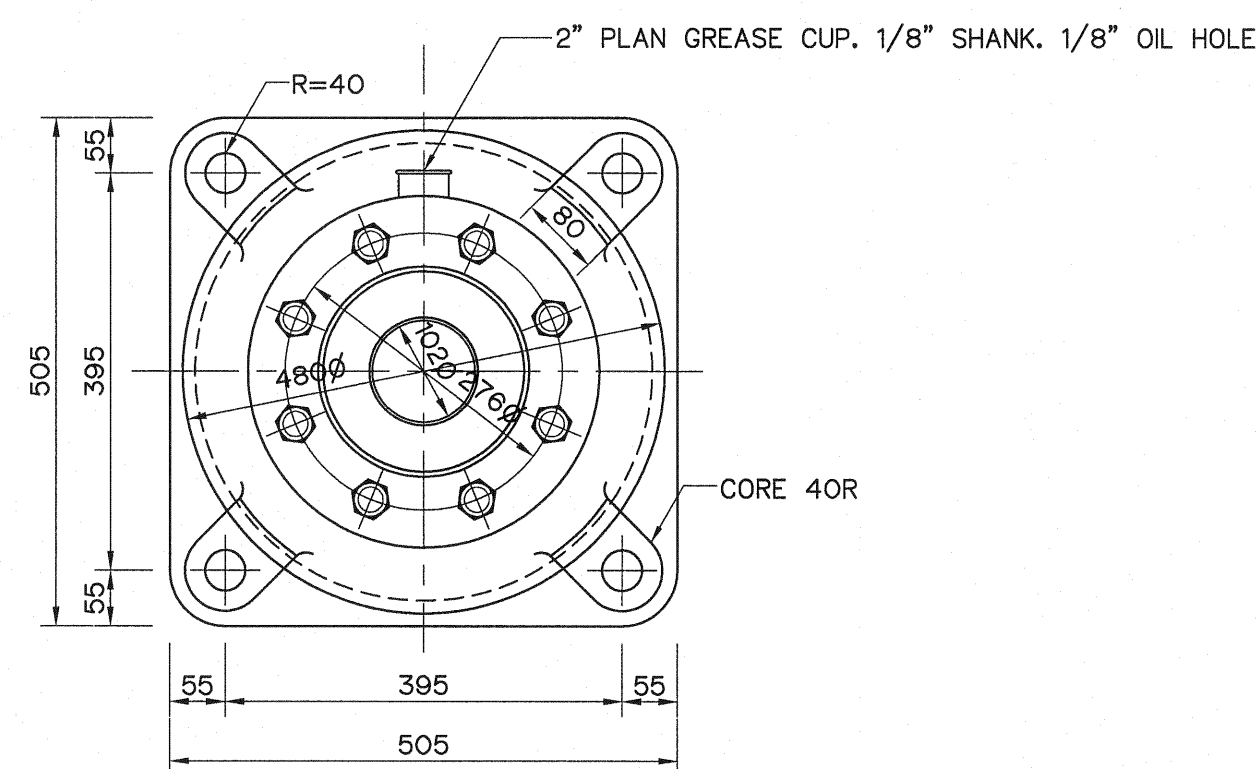
ASSEMBLY
SCALE 1 : 7.5



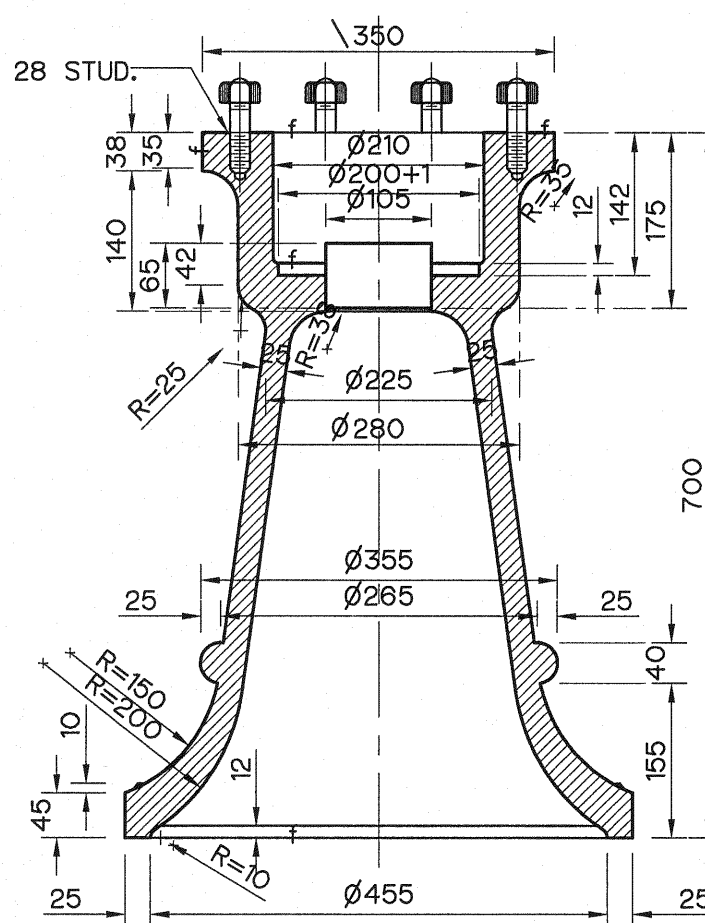
GAP AND BEARING
CAST IRON
SCALE 1:7.5



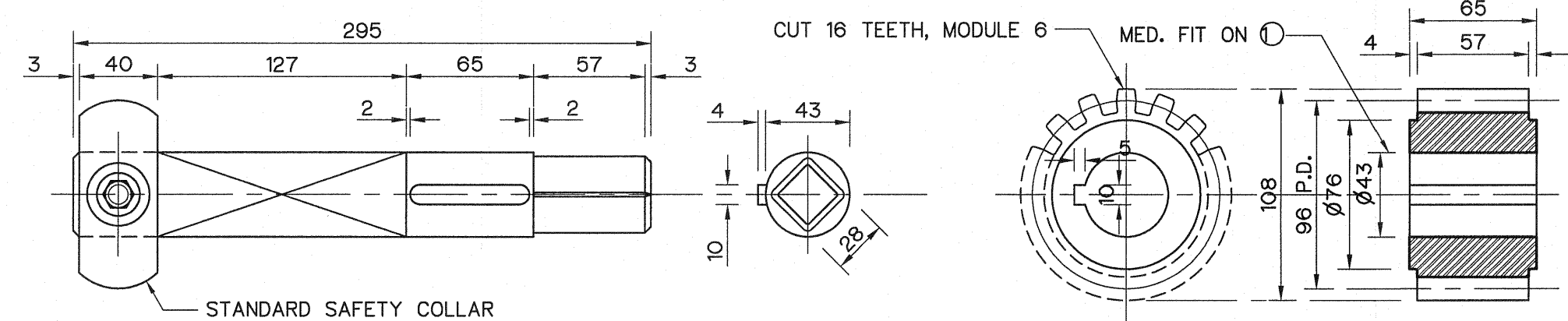
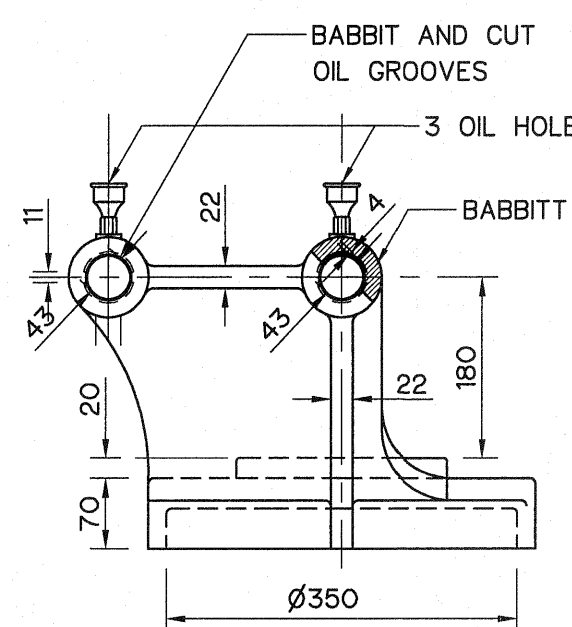
CRANK ARM
CAST IRON
SCALE 1 : 7.5



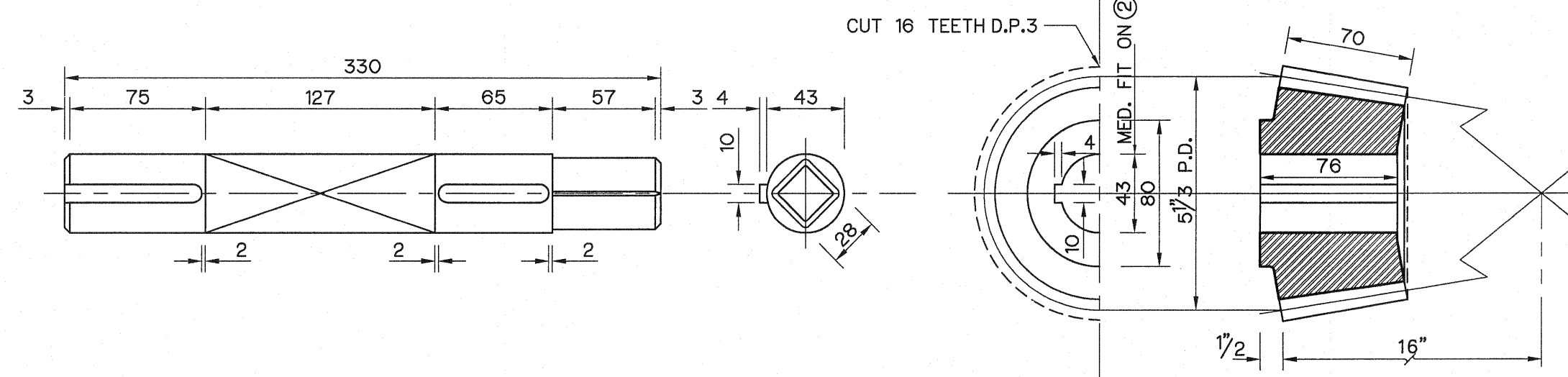
DRILL AND TAP FOR 22 x 28 STUD.



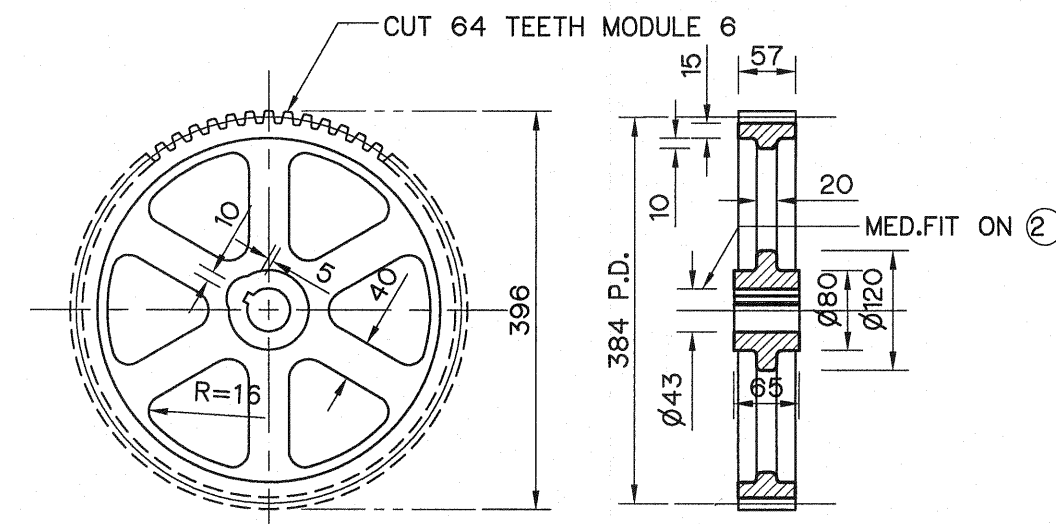
PEDESTAL
CAST IRON
SCALE 1 : 7.5



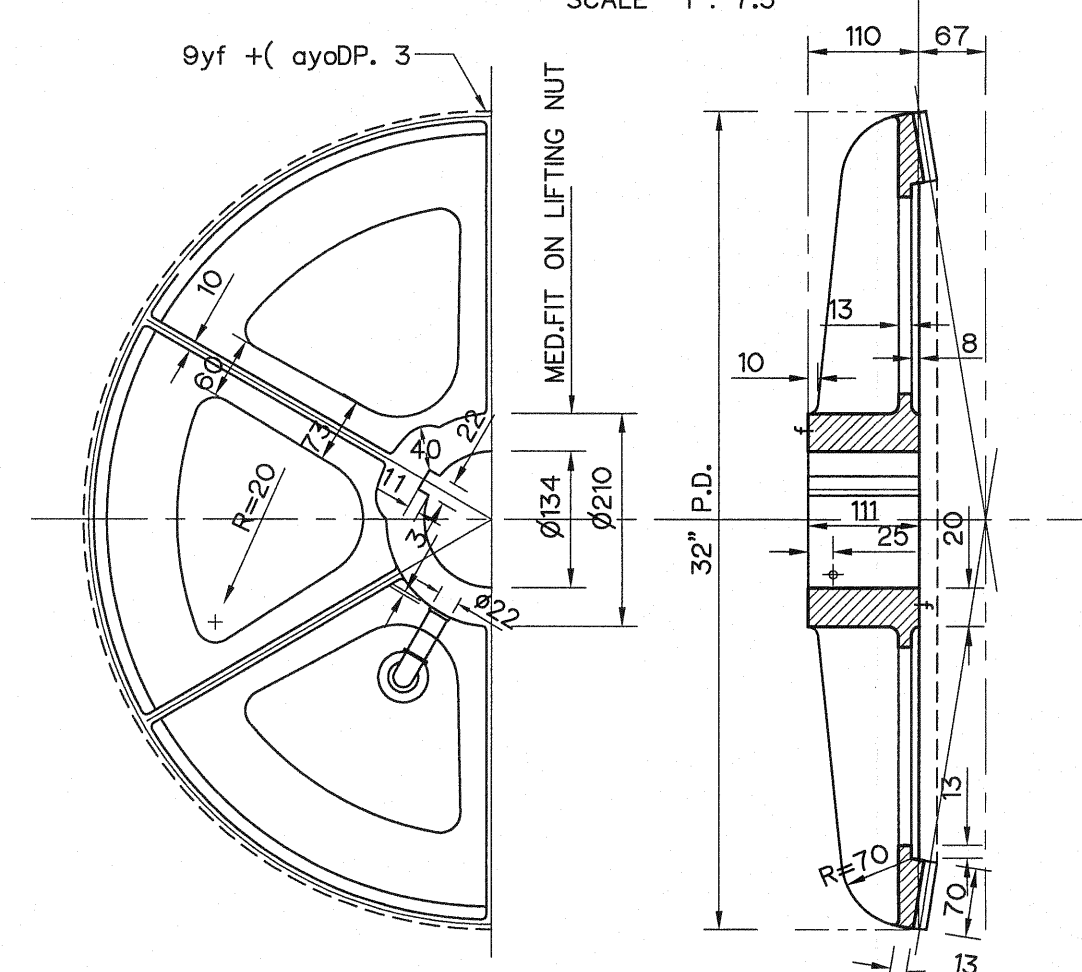
BEVEL PINION SHAFT
COLD ROLLED STEEL
SCALE 1 : 3



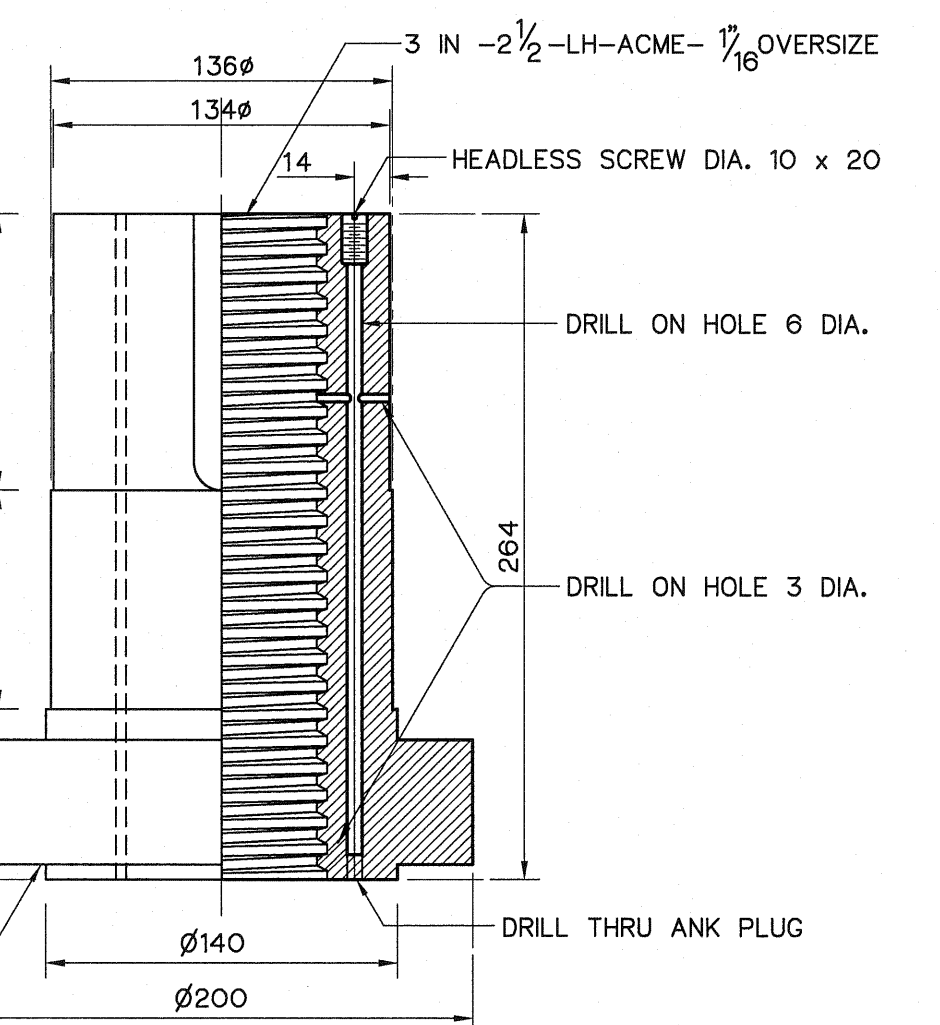
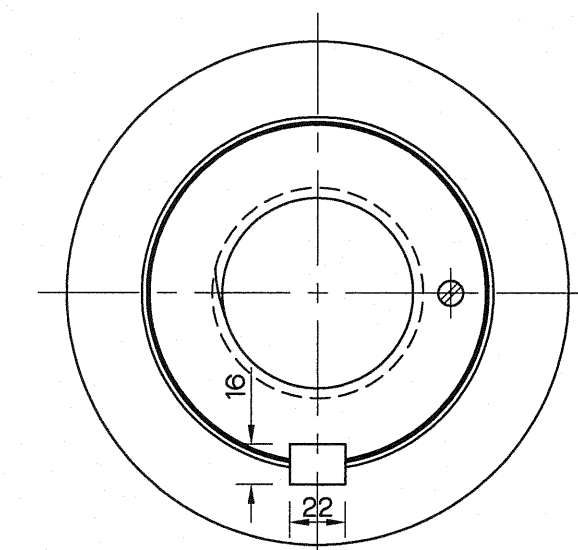
BEVEL GEAR SHAFT
COLD ROLLED STEEL
SCALE 1 : 3



SPUR GEAR
SCALE 1 : 7.5



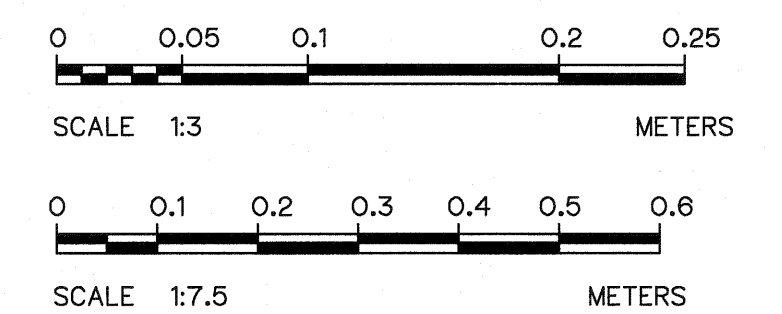
BEVEL GEAR
CAST IRON
SCALE 1 : 7.5



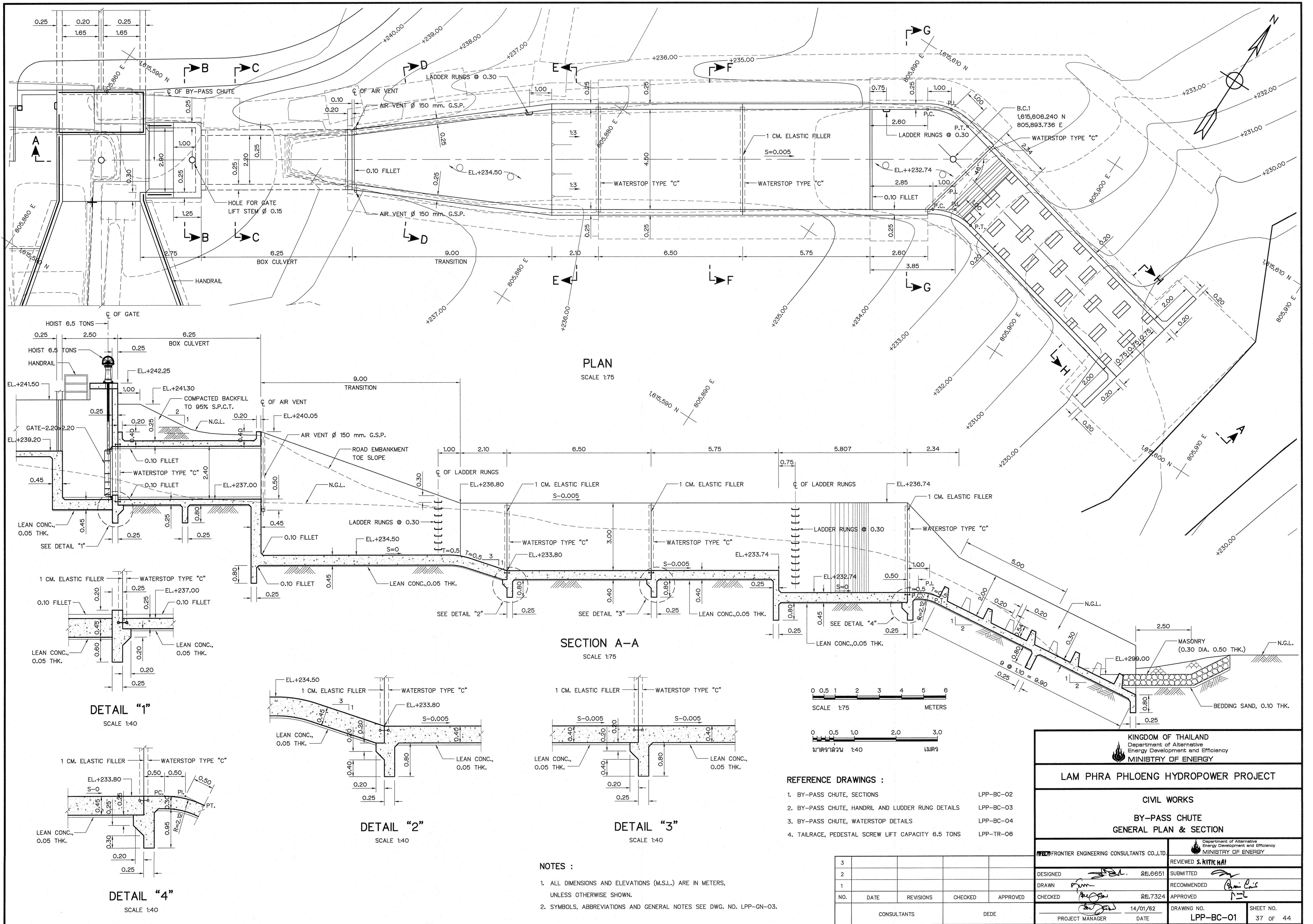
LIFTING NUT
PHOSPHOR BRONZE
SCALE 1 : 3

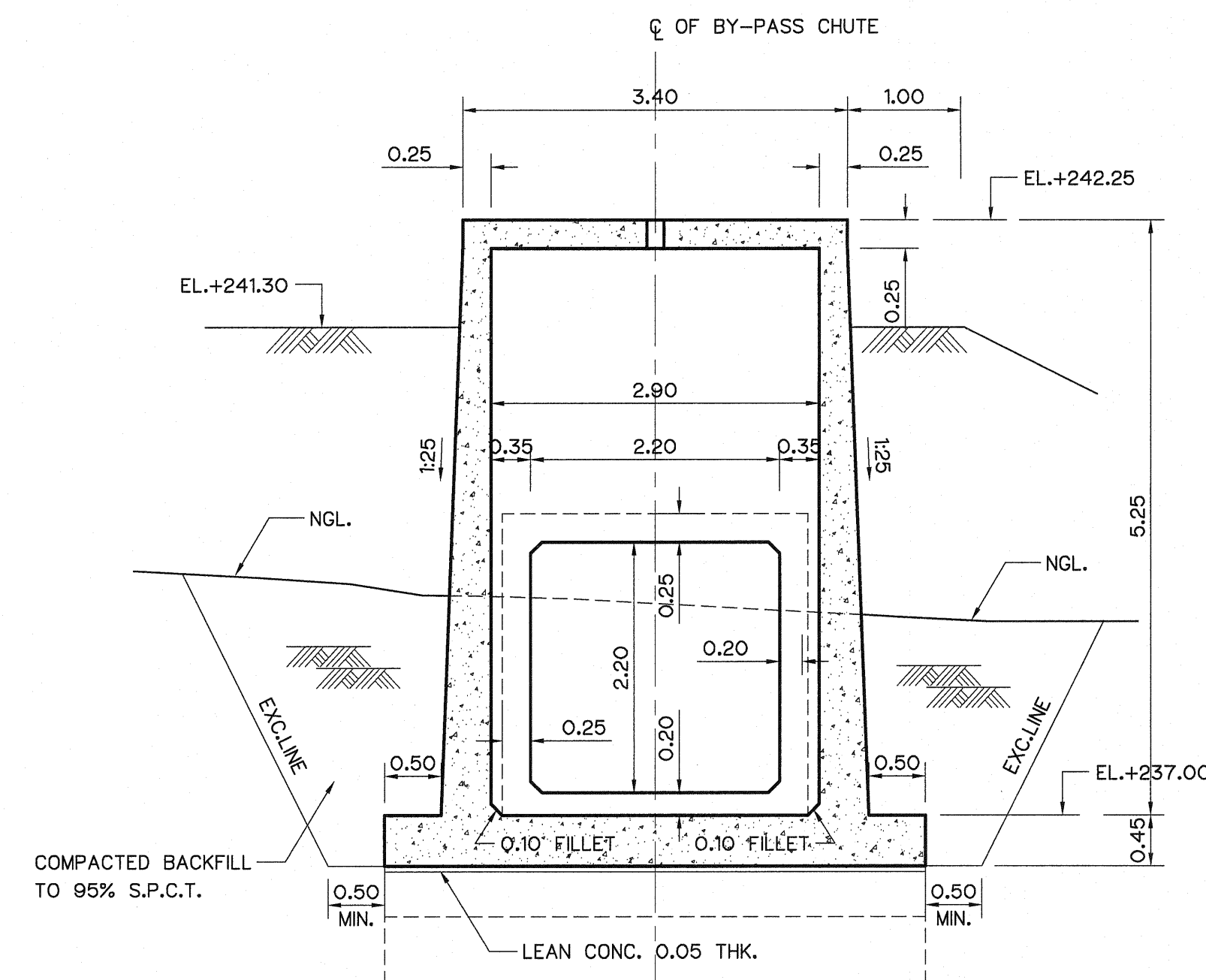
NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETER, UNLESS OTHERWISE SHOWN.
2. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, THE CONTRACTOR HAS TO SUBMITTED SHOP DRAWING TO FIELD ENGINEER FOR APPROVAL.

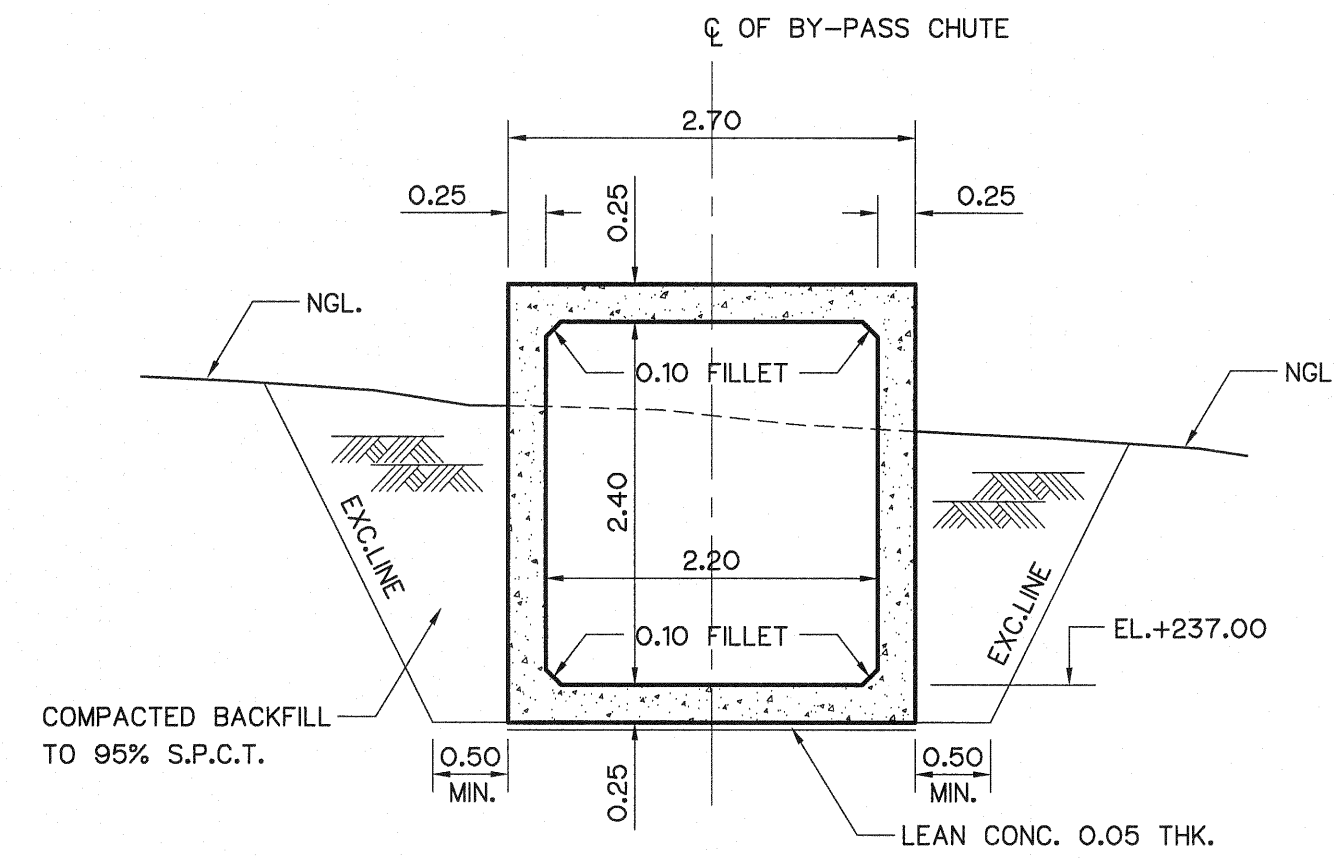


KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
LAM PHRA PHLOENG HYDROPOWER PROJECT			
CIVIL WORKS			
TAILRACE PEDESTAL SCREW LIFT CAPACITY 6.5 TONS			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED <i>S. Kitchai</i> 20/12/17		REVIEWED <i>S. Kitchai</i>	
DRAWN <i>S. Kitchai</i>		SUBMITTED <i>S. Kitchai</i>	
CHECKED <i>S. Kitchai</i> 20/12/17		RECOMMENDED <i>S. Kitchai</i>	
APPROVED <i>S. Kitchai</i>		APPROVED <i>S. Kitchai</i>	
PROJECT MANAGER		DRAWING NO. LPP-TR-06	
DATE 14/01/82		SHEET NO. 36 OF 44	

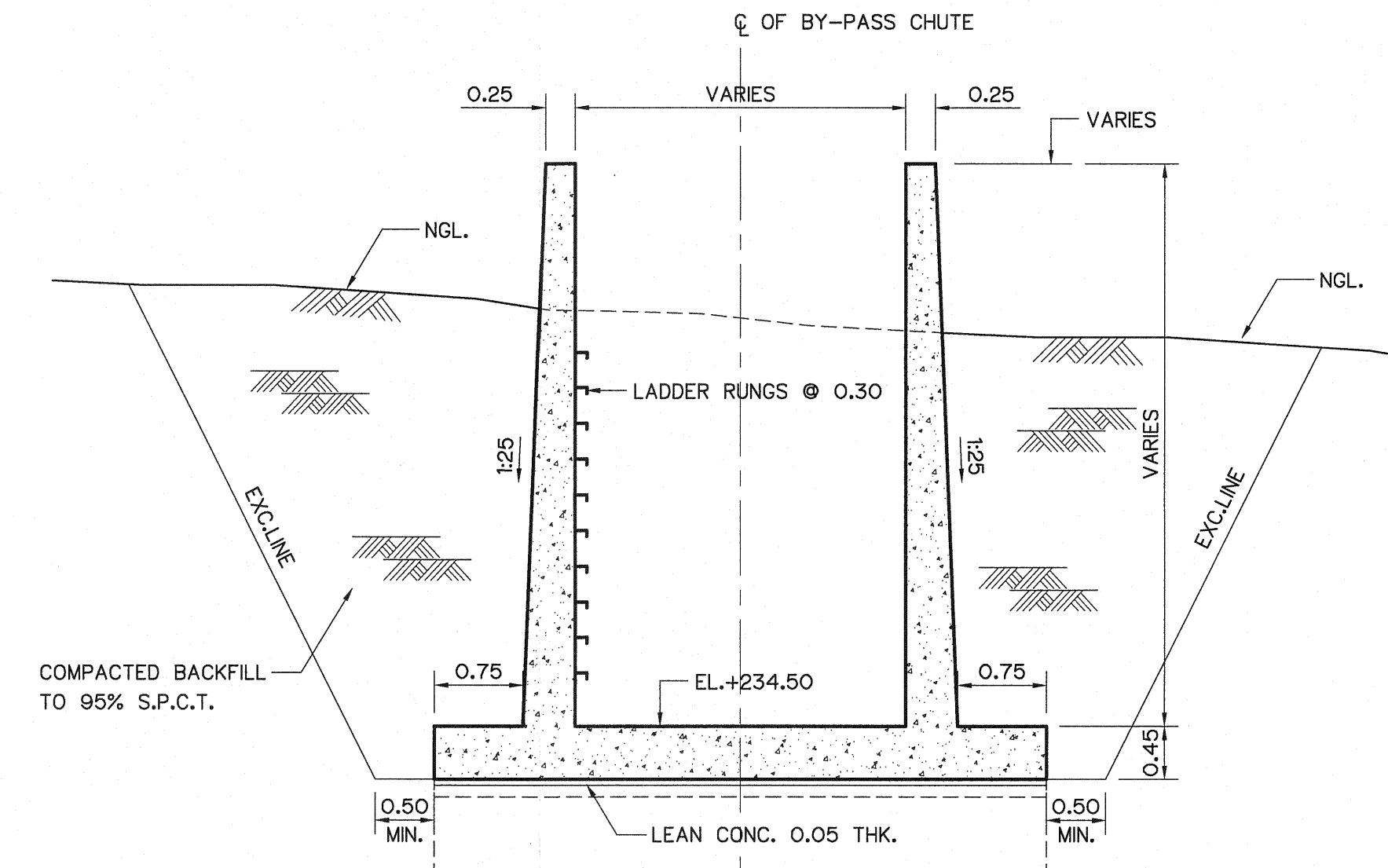




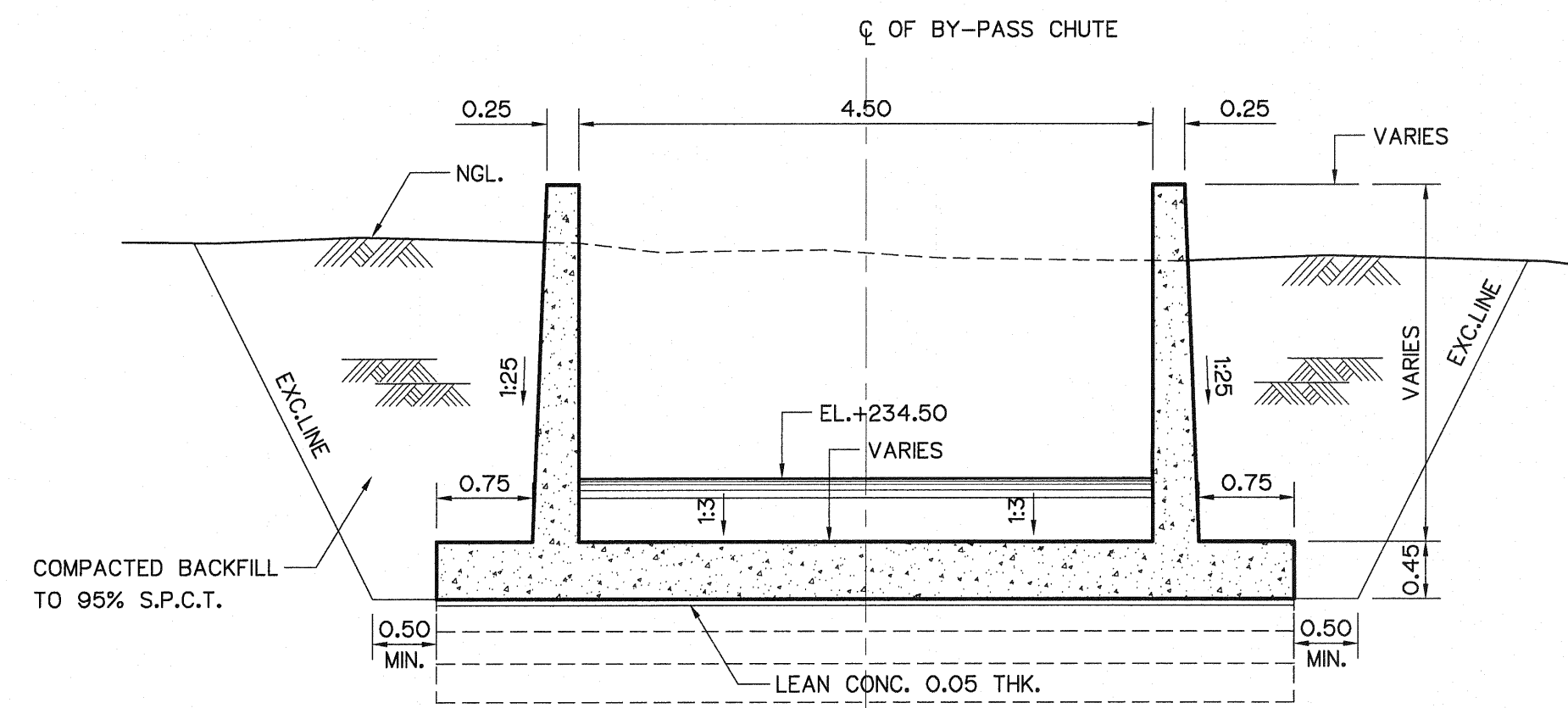
SECTION B-B
SCALE 1:50



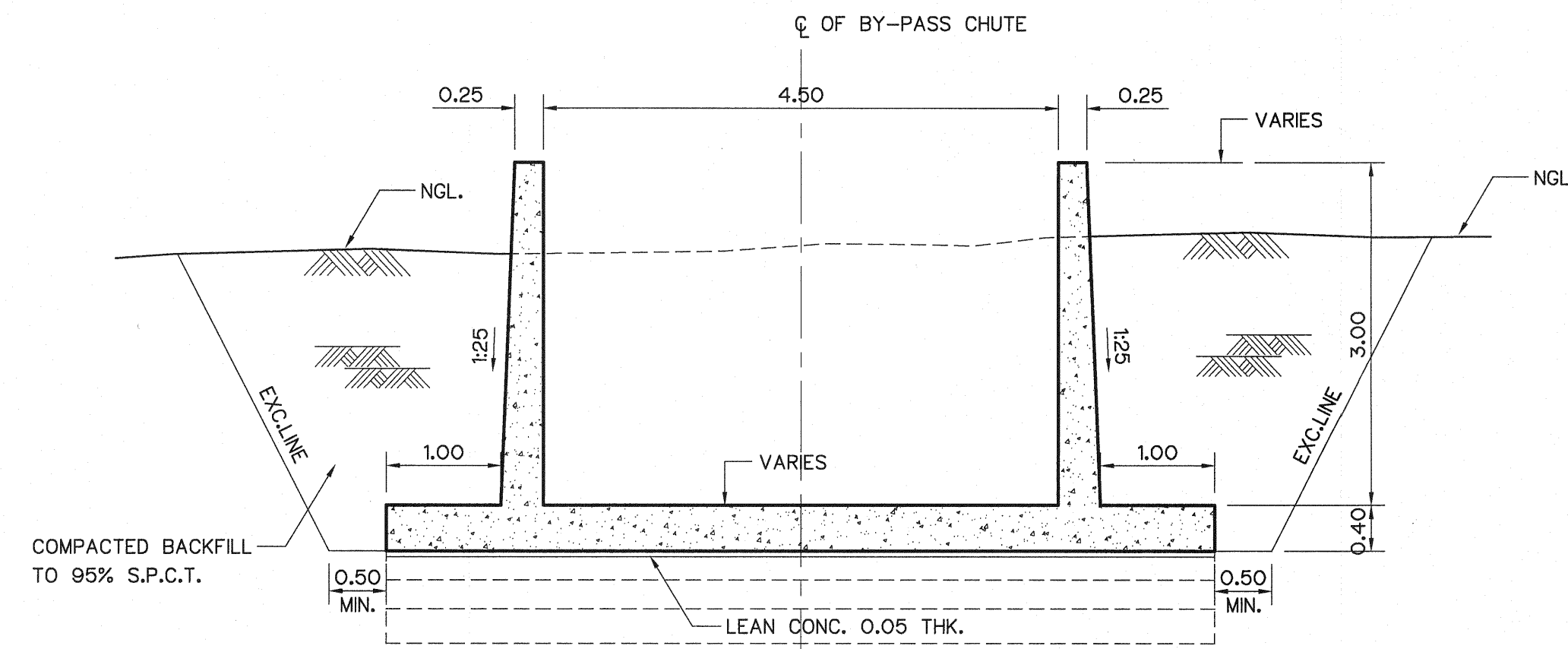
SECTION C-C
SCALE 1:50



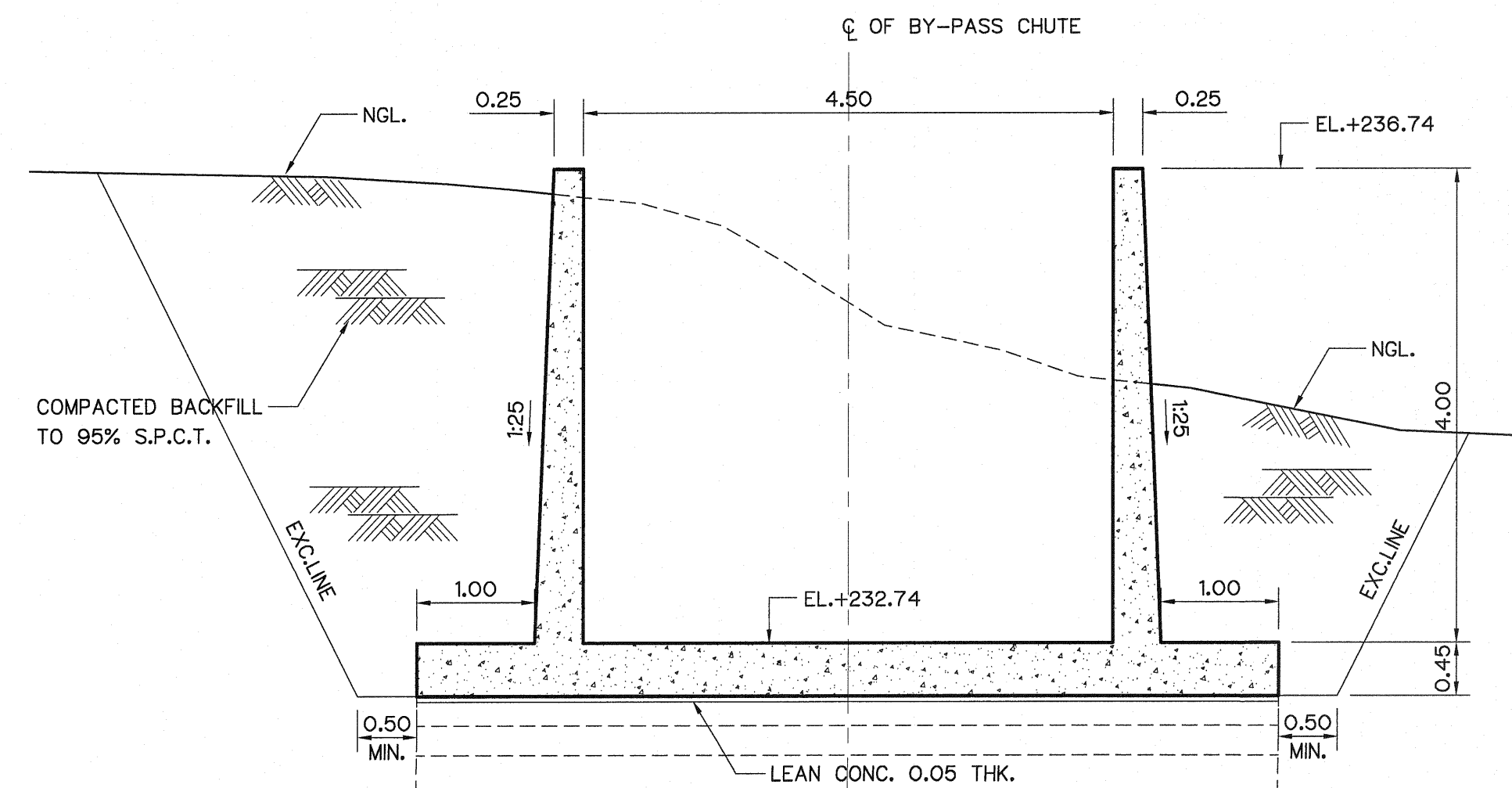
SECTION D-D
SCALE 1:50



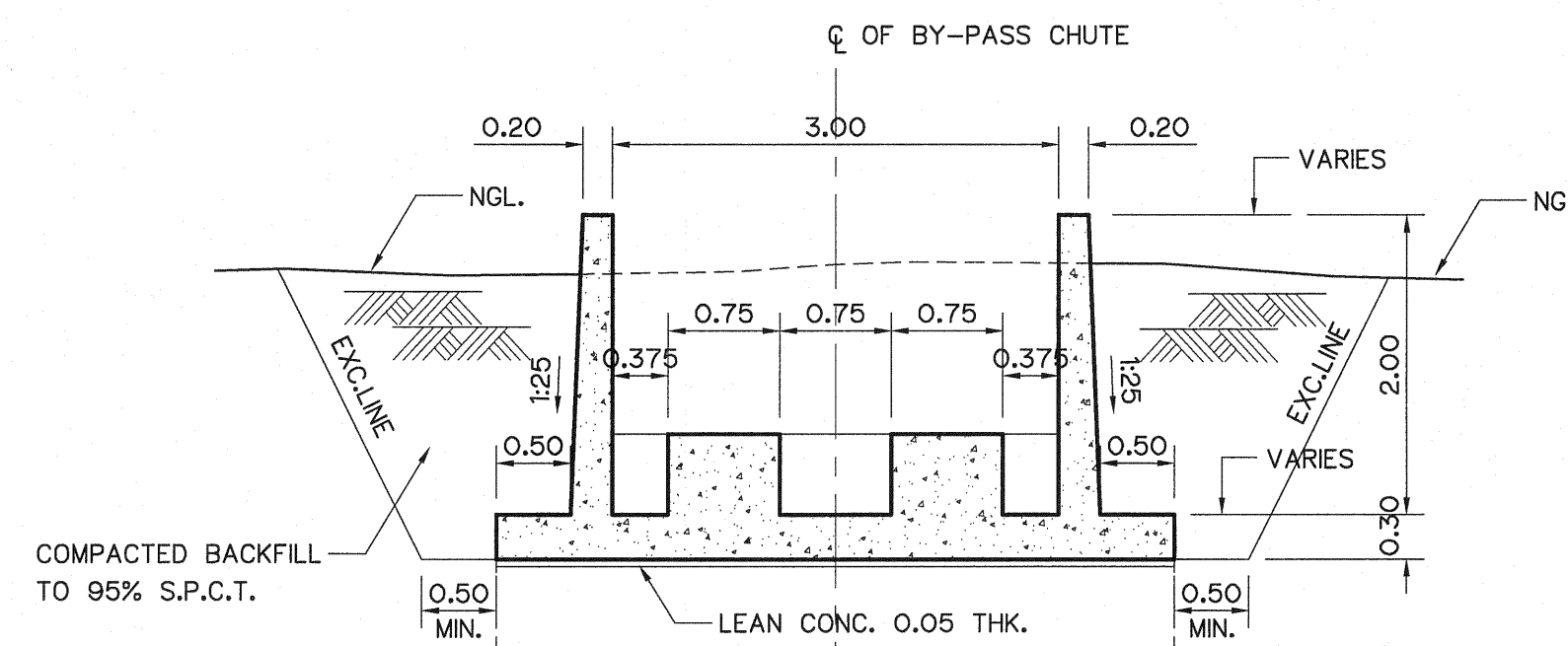
SECTION E-E
SCALE 1:50



SECTION F-F
SCALE 1:50



SECTION G-G
SCALE 1:50



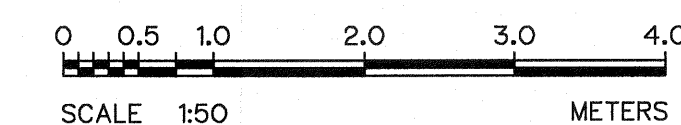
SECTION H-H
SCALE 1:50

NOTES :

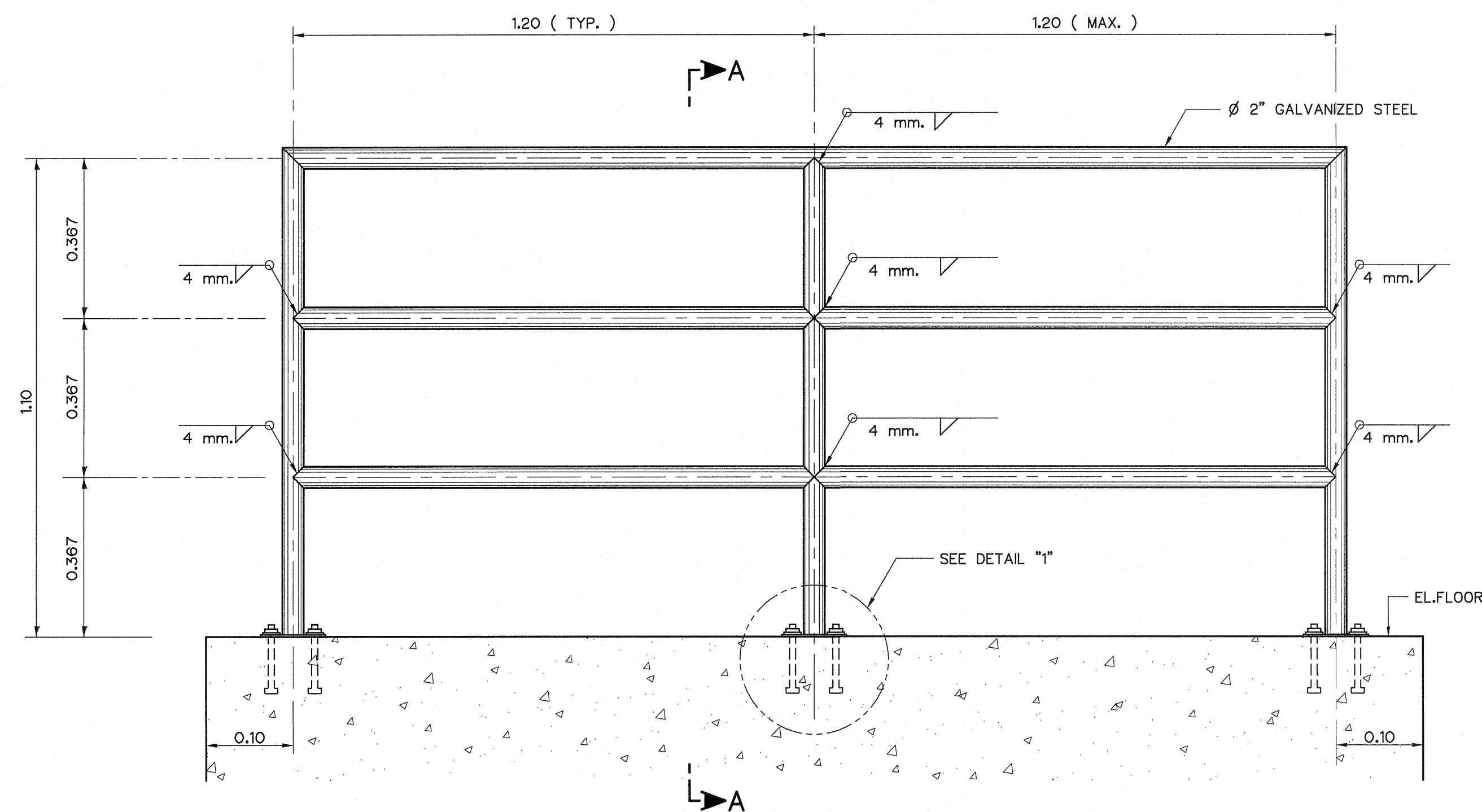
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP-GN-03.

REFERENCE DRAWINGS :

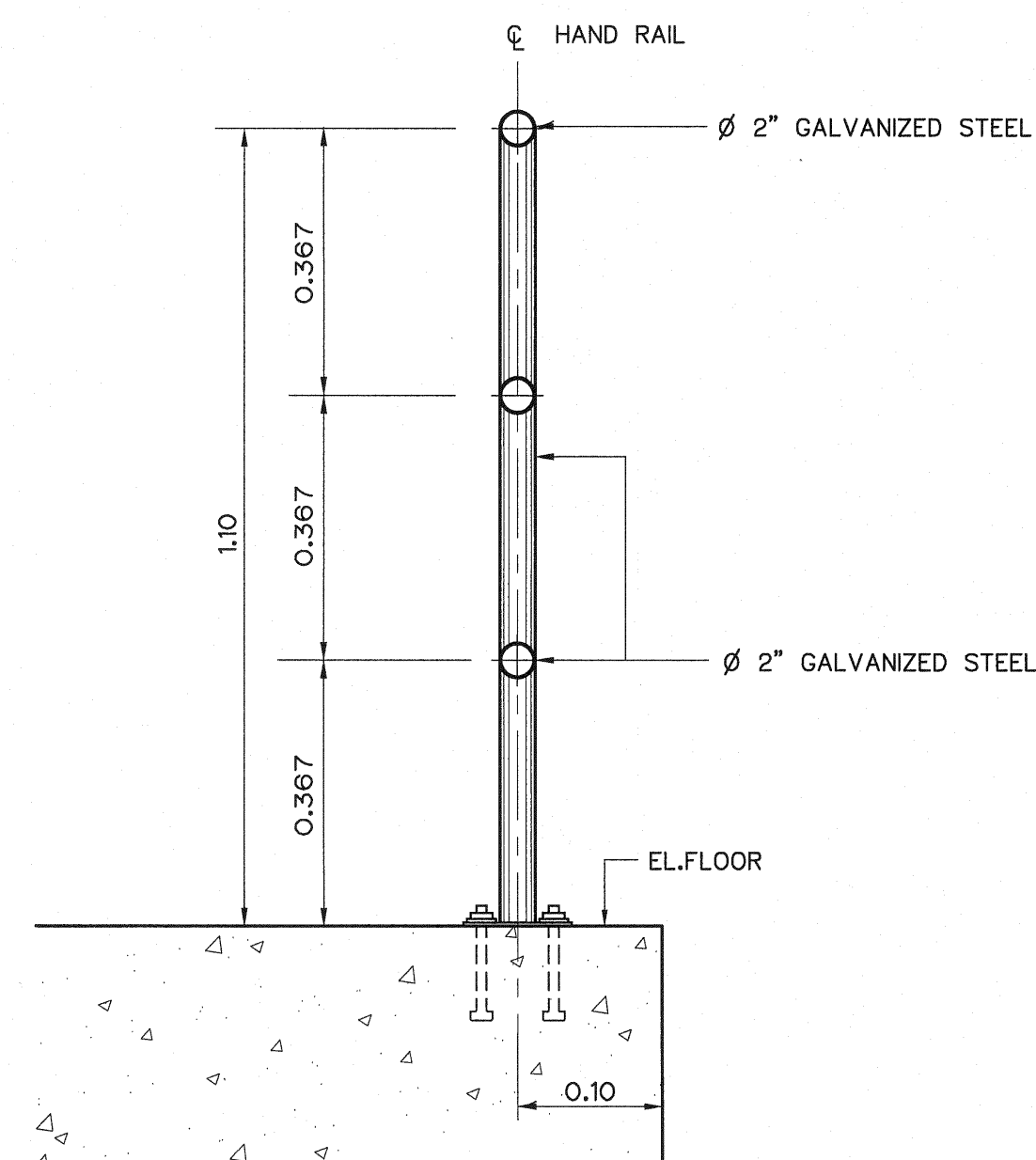
1. BY-PASS CHUTE, GENERAL PLAN & SECTION LPP-BC-01
2. BY-PASS CHUTE, HANDRAIL AND LUDDER RUNG DETAILS LPP-BC-03
3. BY-PASS CHUTE, WATERSTOP DETAILS LPP-BC-04
4. TAILRACE, PEDESTAL SCREW LIFT CAPACITY 8.5 TONS LPP-TR-06



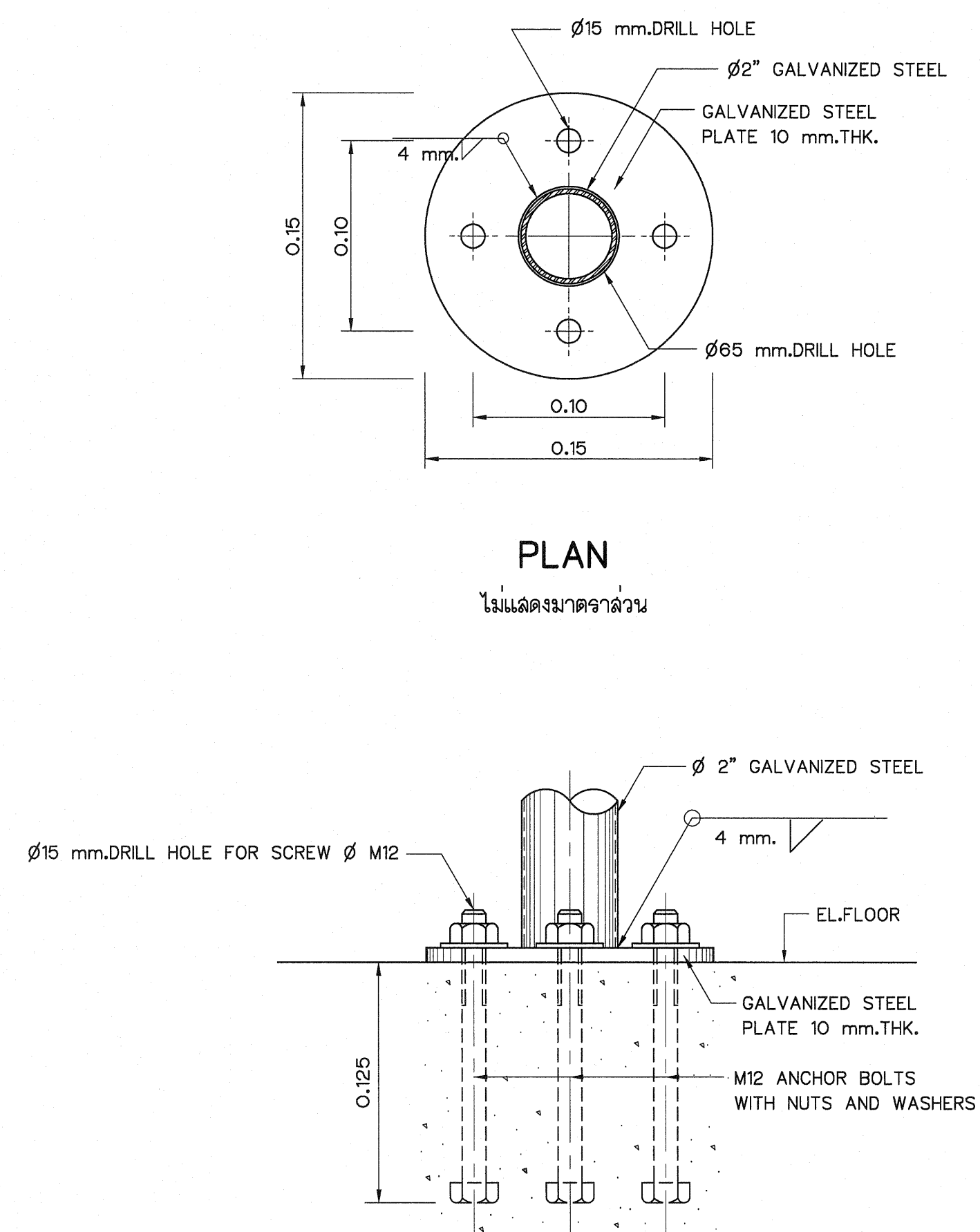
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
LAM PHRA PHLOENG HYDROPOWER PROJECT			
CIVIL WORKS BY-PASS CHUTE SECTIONS			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
REVIEWED <i>S. KIRICHAI</i>		SUBMITTED <i>[Signature]</i>	
DESIGNED <i>[Signature]</i> 21.6651		RECOMMENDED <i>[Signature]</i>	
DRAWN <i>[Signature]</i>		APPROVED <i>[Signature]</i>	
CHECKED <i>[Signature]</i> 21.7324		DATE 14/01/62	
CONSULTANTS		DEDE	
PROJECT MANAGER		DRAWING NO. LPP-BC-02	
SHEET NO. 38 OF 44			



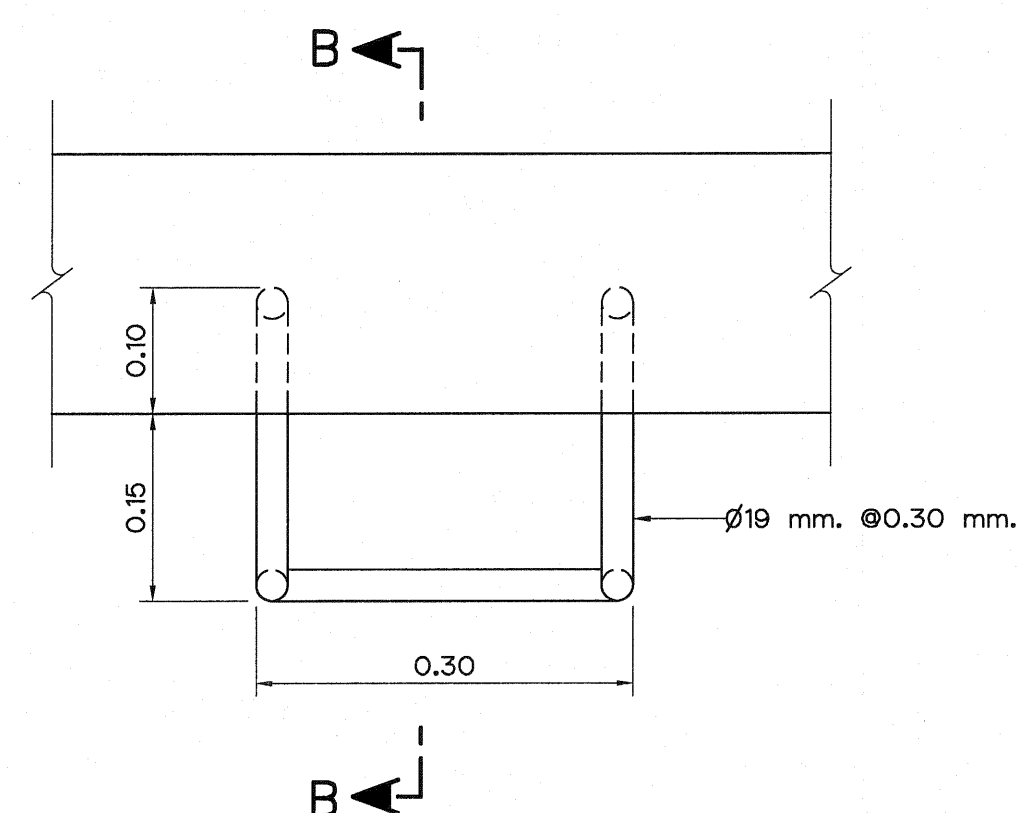
DETAIL OF HANDRAIL
NOT TO SCALE



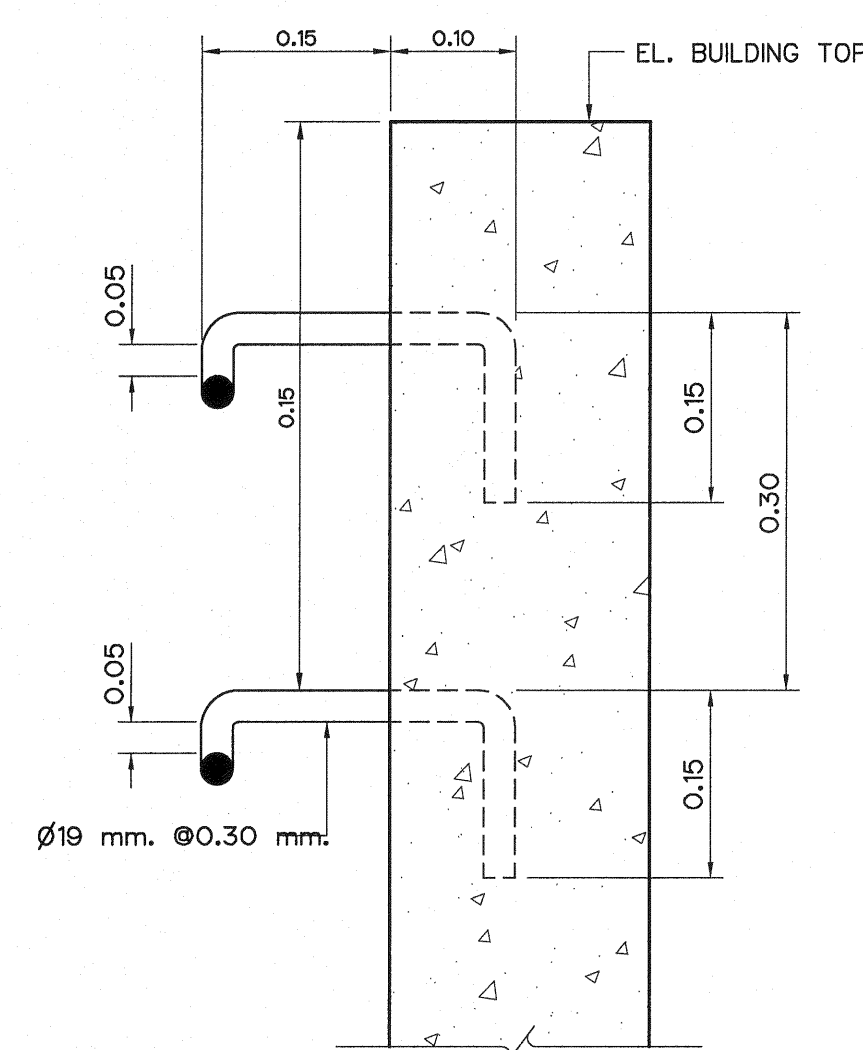
SECTION A-A
NOT TO SCALE



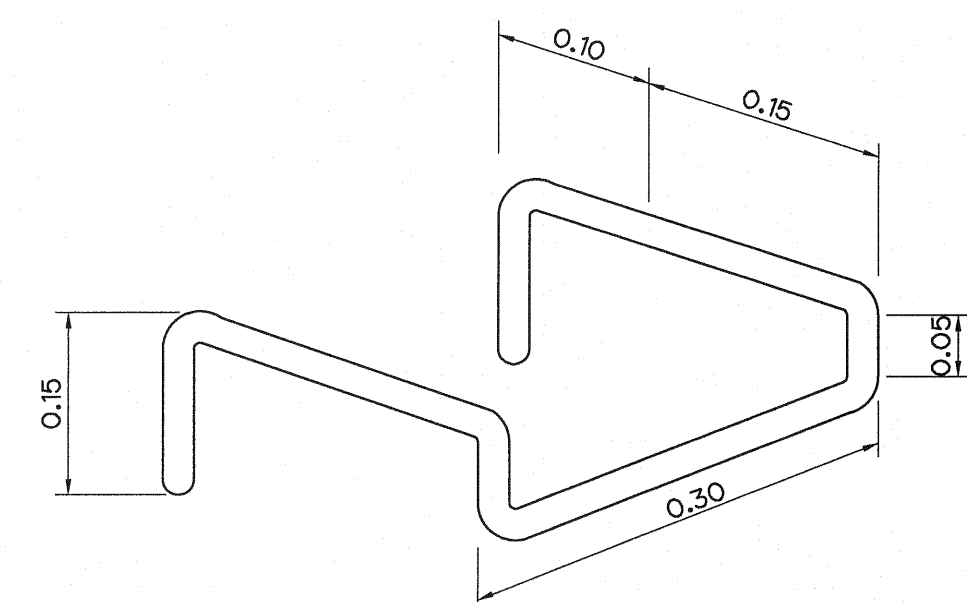
DETAIL "1"
NOT TO SCALE



LADDER RUNG PLAN
NOT TO SCALE



SECTION B-B
NOT TO SCALE



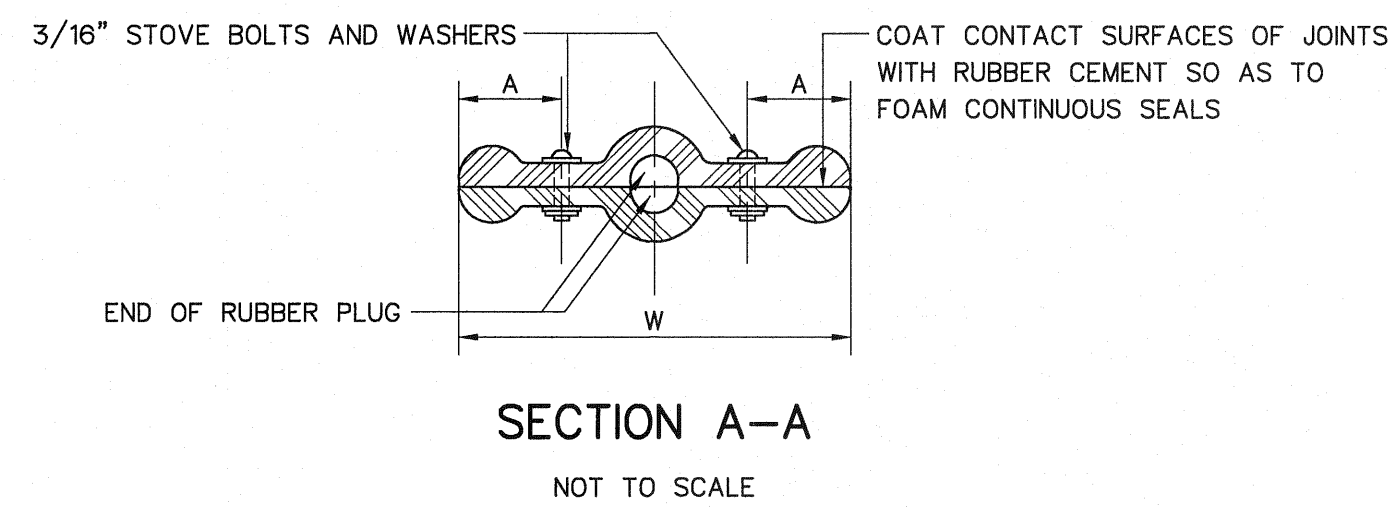
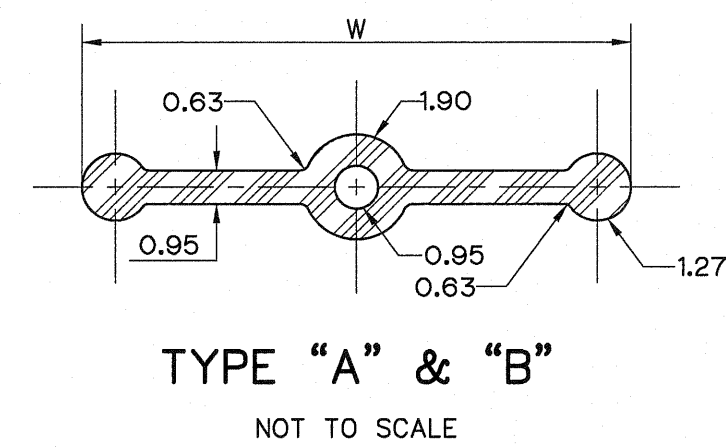
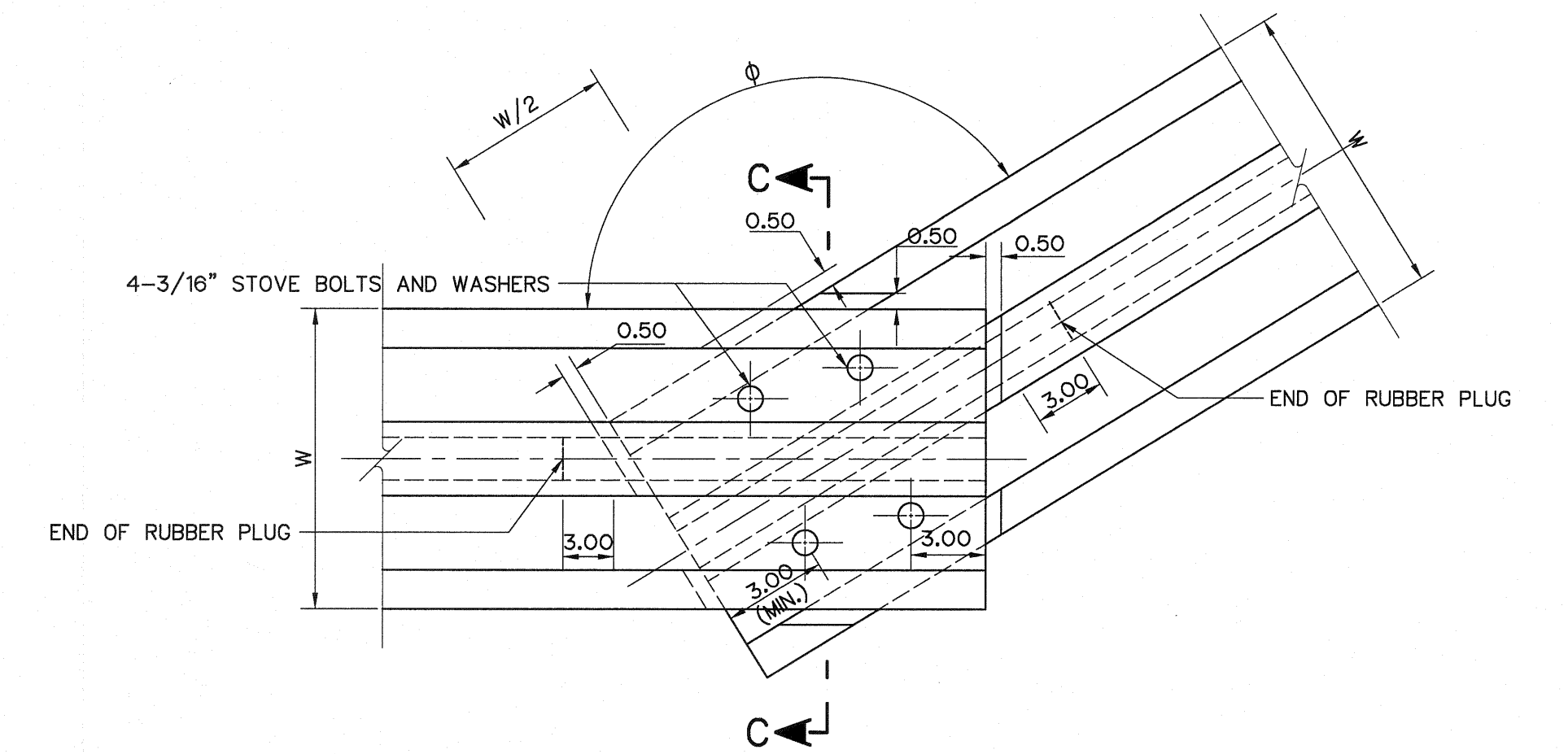
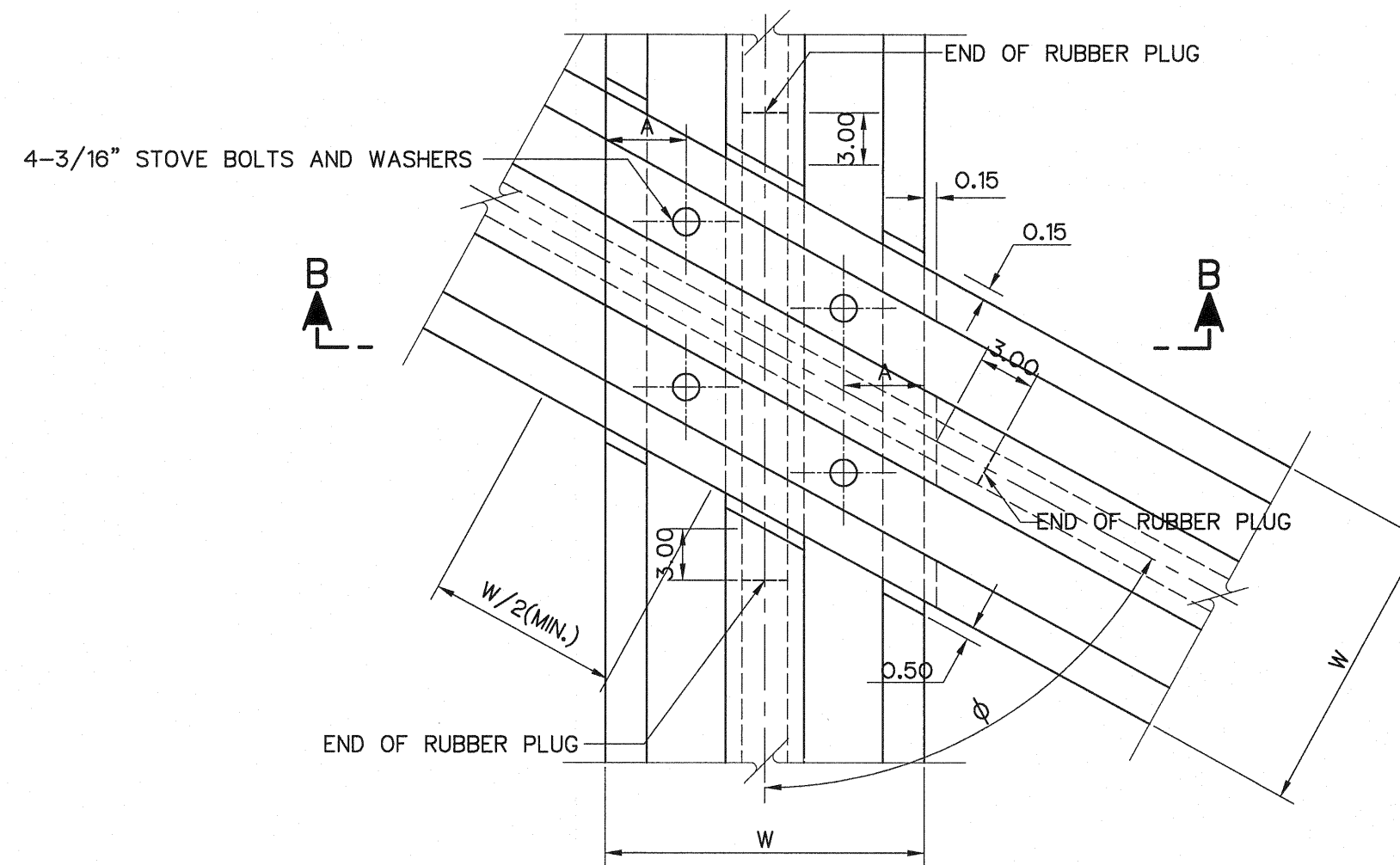
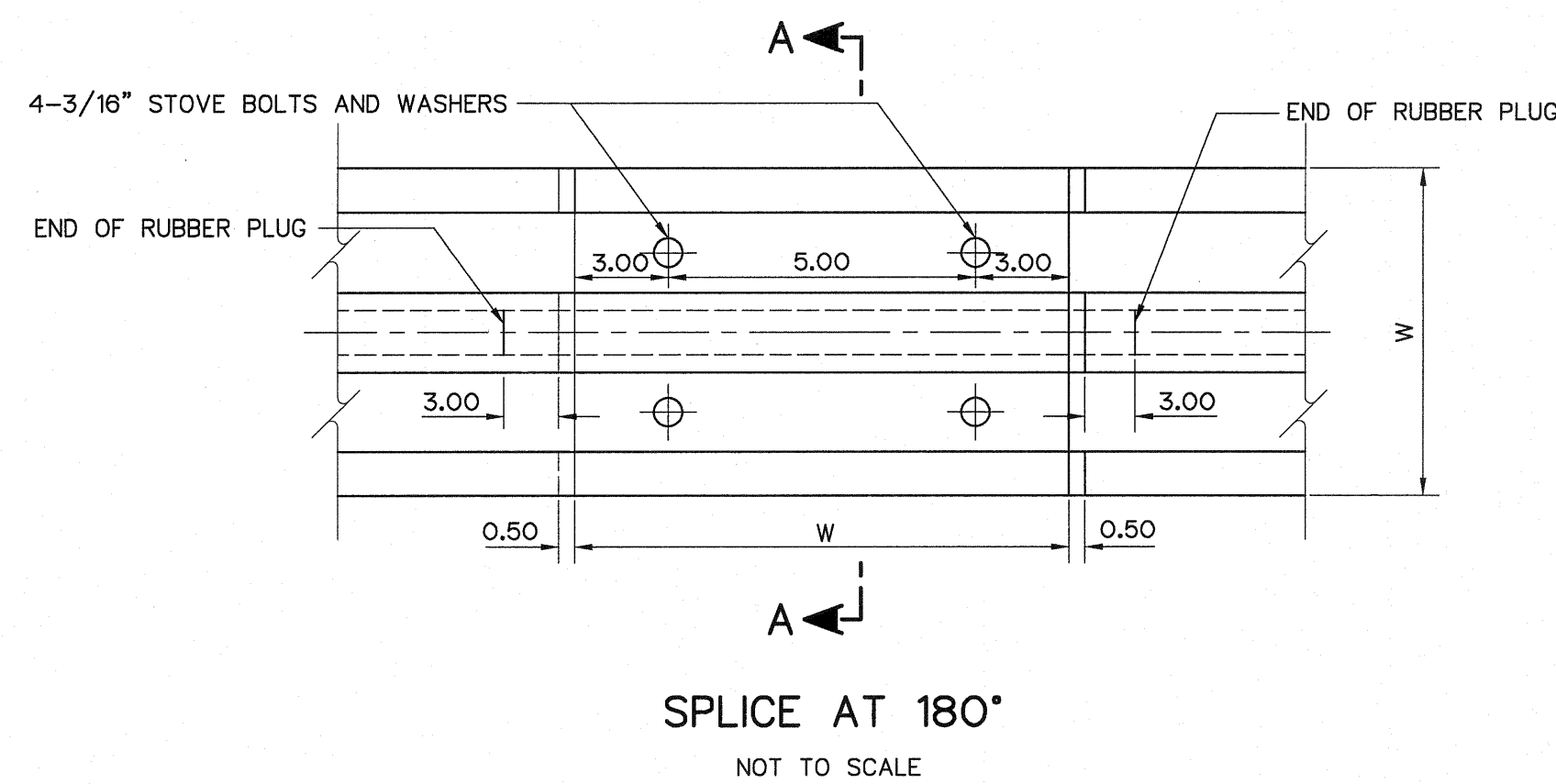
LADDER RUNG ISOMETRIC VIEW
NOT TO SCALE

NOTES :

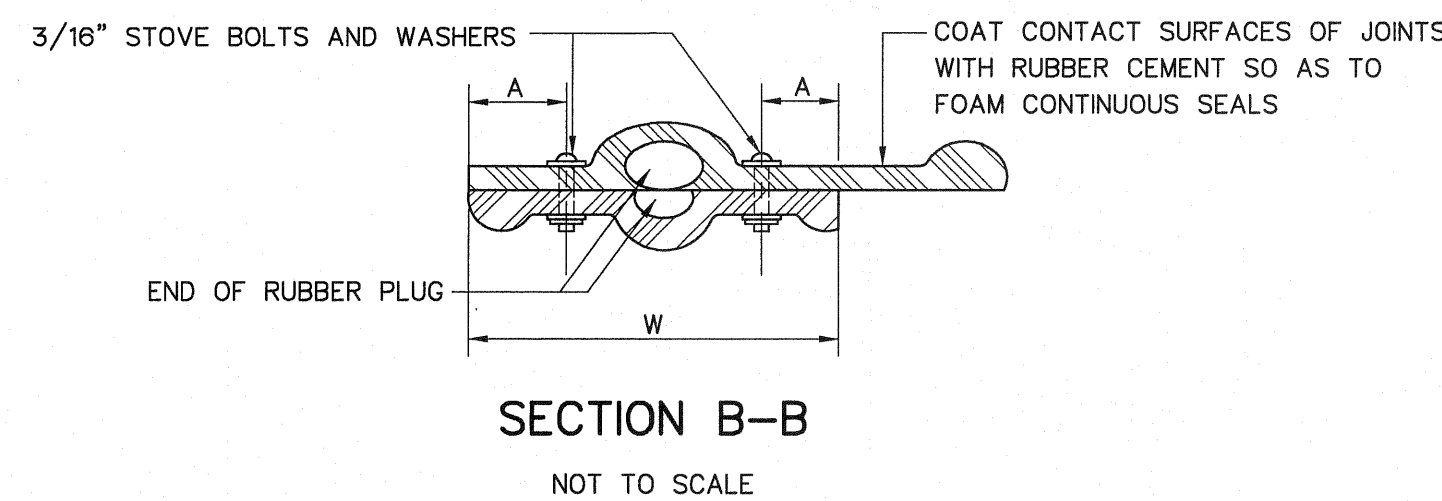
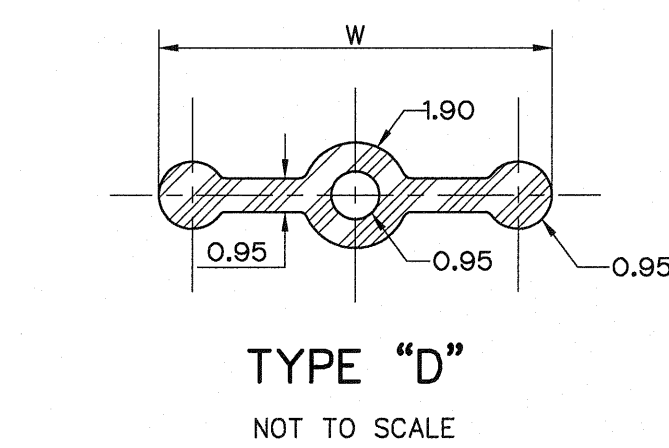
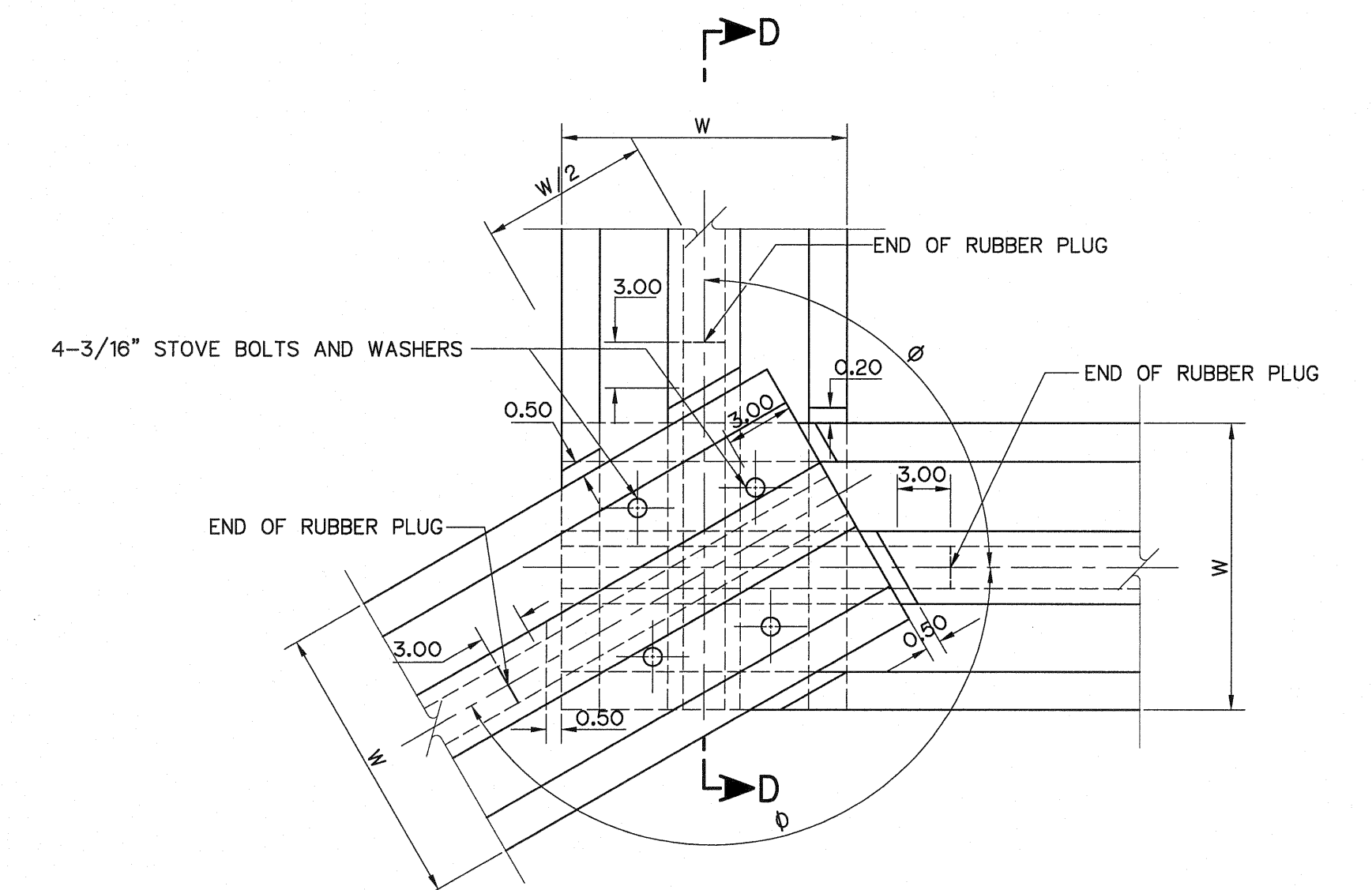
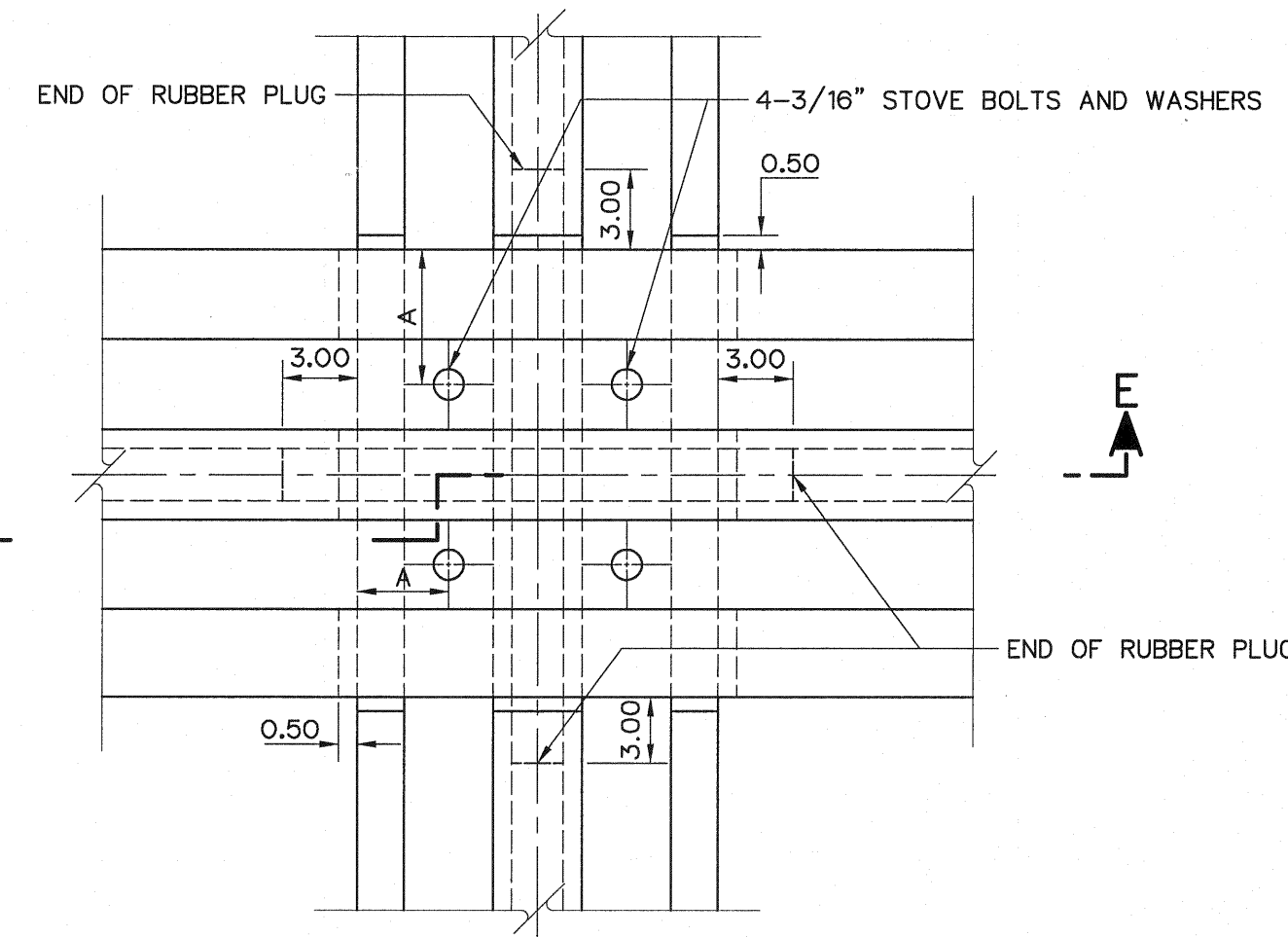
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP-GN-03.

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
LAM PHRA PHLOENG HYDROPOWER PROJECT	
CIVIL WORKS BY-PASS CHUTE HANDRAIL AND LADDER RUNG DETAILS	
FRONTIER ENGINEERING CONSULTANTS CO., LTD.	REVIEWED S. KITICHAI
DESIGNED S. KITICHAI 28.6651	SUBMITTED S. KITICHAI
DRAWN S. KITICHAI	RECOMMENDED S. KITICHAI
CHECKED S. KITICHAI 28.7324	APPROVED S. KITICHAI
PROJECT MANAGER S. KITICHAI 14/01/62	DRAWING NO. LPP-BC-03 SHEET NO. 39 OF 44

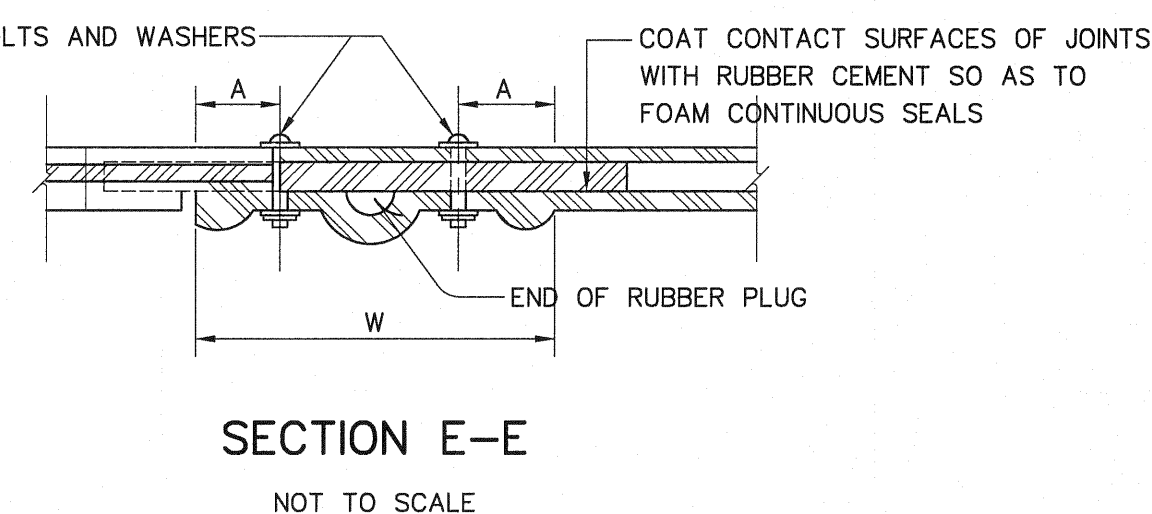
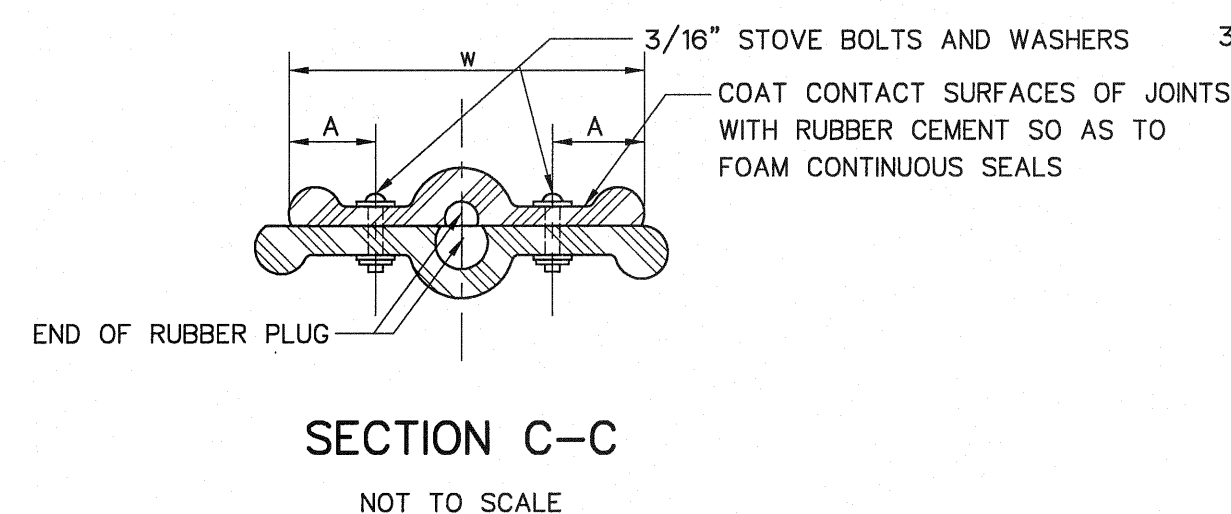
3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED



SPLICE AT ANGLE WITH CONTINUOUS STRIP
NOT TO SCALE



SPLICE BETWEEN TWO CONTINUOUS STRIP
NOT TO SCALE



NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SPLICE DETAILS FOR 6" RUBBER WATER STOP WITH OUT CENTER BULB
ARE SIMILAR TO THOSE WITH CENTER BULB. EXCEPT THAT RUBBER PLUGS ARE NOT REQUIRED
3. RUBBER PLUGS TO BE COMMENTED TO RUBBER WATER STOP

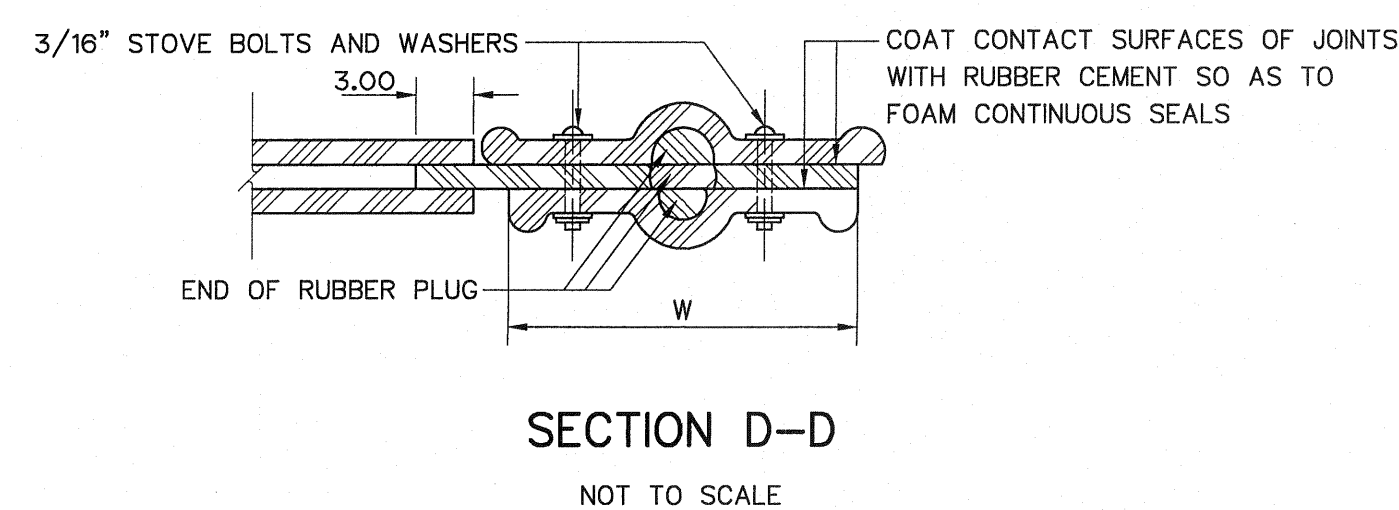
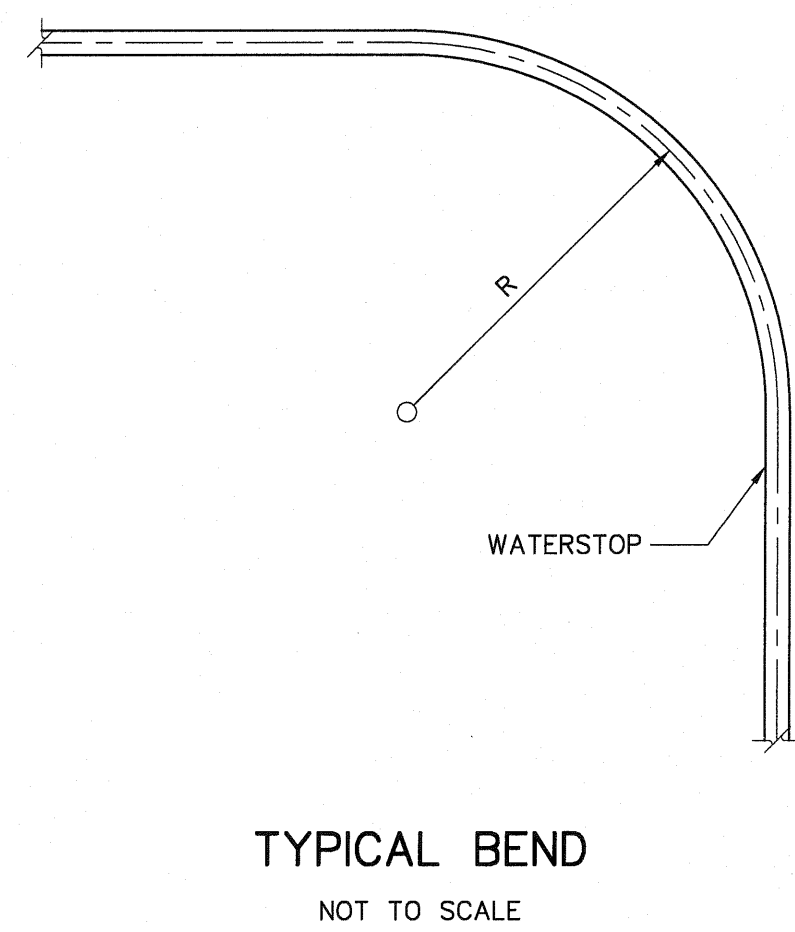


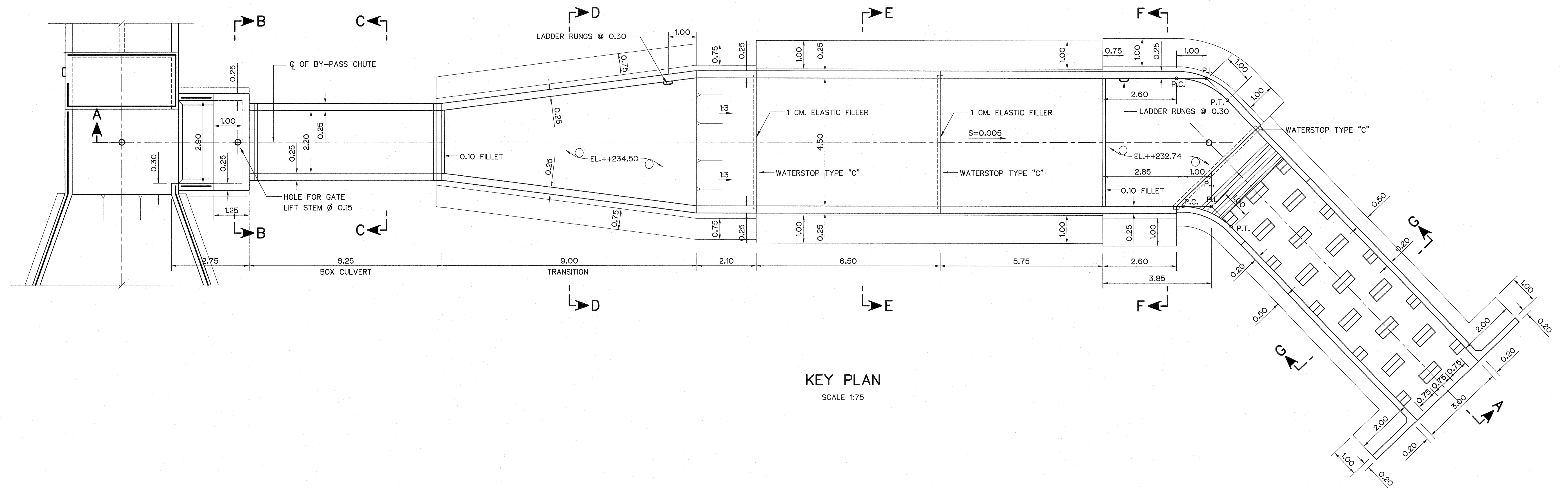
TABLE OF DIMENSIONS

WATERSTOP TYPE	W	A	R
A	22.86	4	20
B	15.24	4	15
C	15.24	4	10
D	11.42	3	10

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

CONSULTANTS DEDE

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
LAM PHRA PHLOENG HYDROPOWER PROJECT	
CIVIL WORKS BY-PASS CHUTE WATERSTOP DETAILS	
FRONTIER ENGINEERING CONSULTANTS CO., LTD. DESIGNED: [Signature] 22.6651 DRAWN: [Signature] CHECKED: [Signature] 22.7324 PROJECT MANAGER	REVIEWED: S. KITICHAJ SUBMITTED: [Signature] RECOMMENDED: [Signature] APPROVED: [Signature] DATE: 14/01/82 DRAWING NO. LPP-BC-04 SHEET NO. 40 OF 44



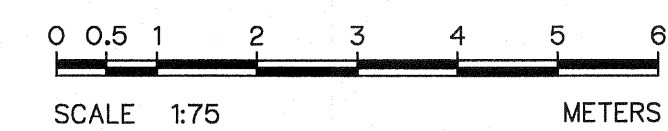
KEY PLAN
SCALE 1:75

NOTES :

- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP-GN-03.
- LOCATIONS OF LAP SPLICES SHALL BE DETERMINED IN FIELD UNDER THE APPROVAL OF FIELD ENGINEER.

REFERENCE DRAWINGS :

- | | |
|---|-----------|
| 1. BY-PASS CHUTE, GENERAL PLAN & SECTION | LPP-BC-01 |
| 2. BY-PASS CHUTE, REINFORCEMENT DETAILS 1/2 | LPP-BC-06 |
| 3. BY-PASS CHUTE, REINFORCEMENT DETAILS 2/2 | LPP-BC-07 |

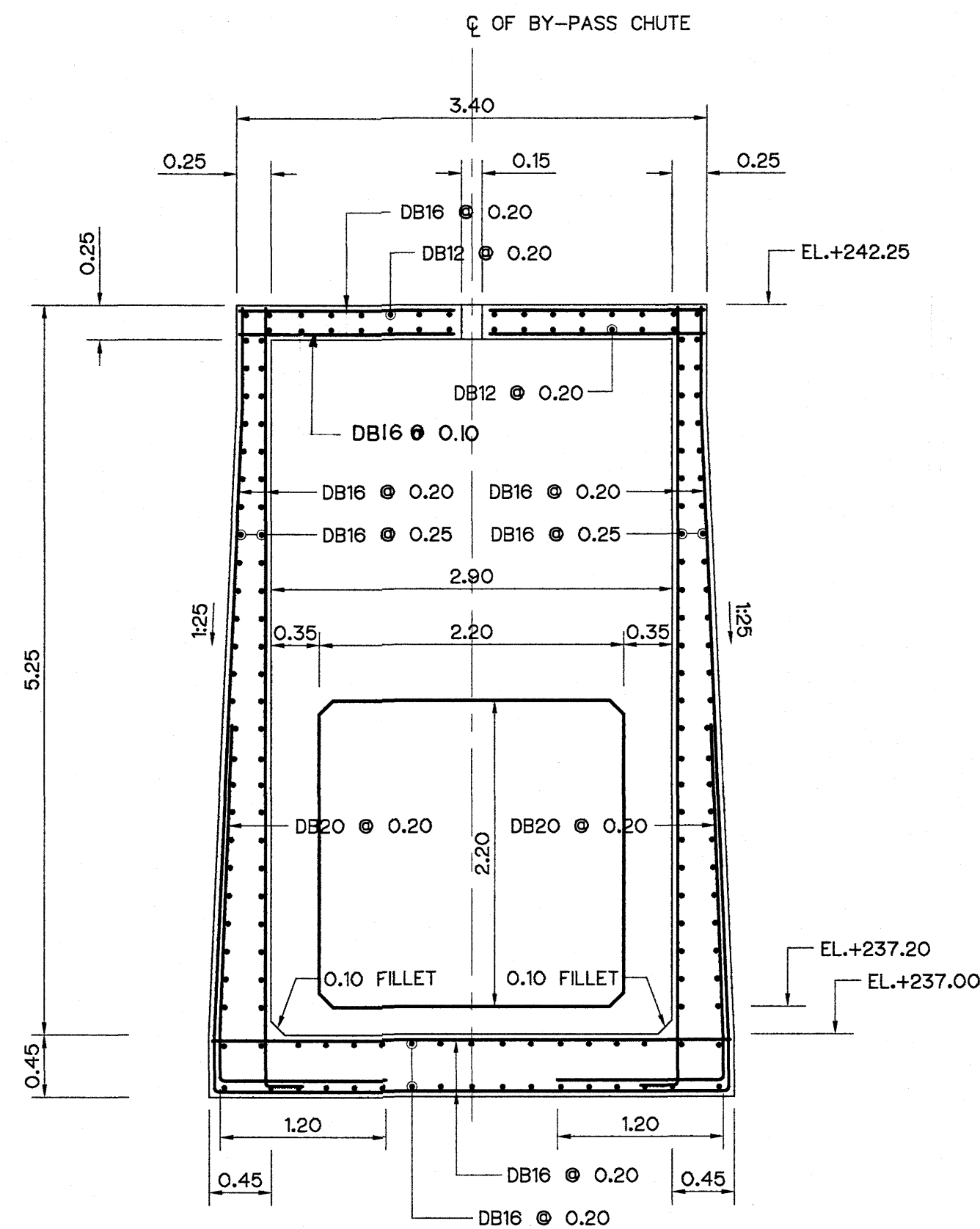


3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

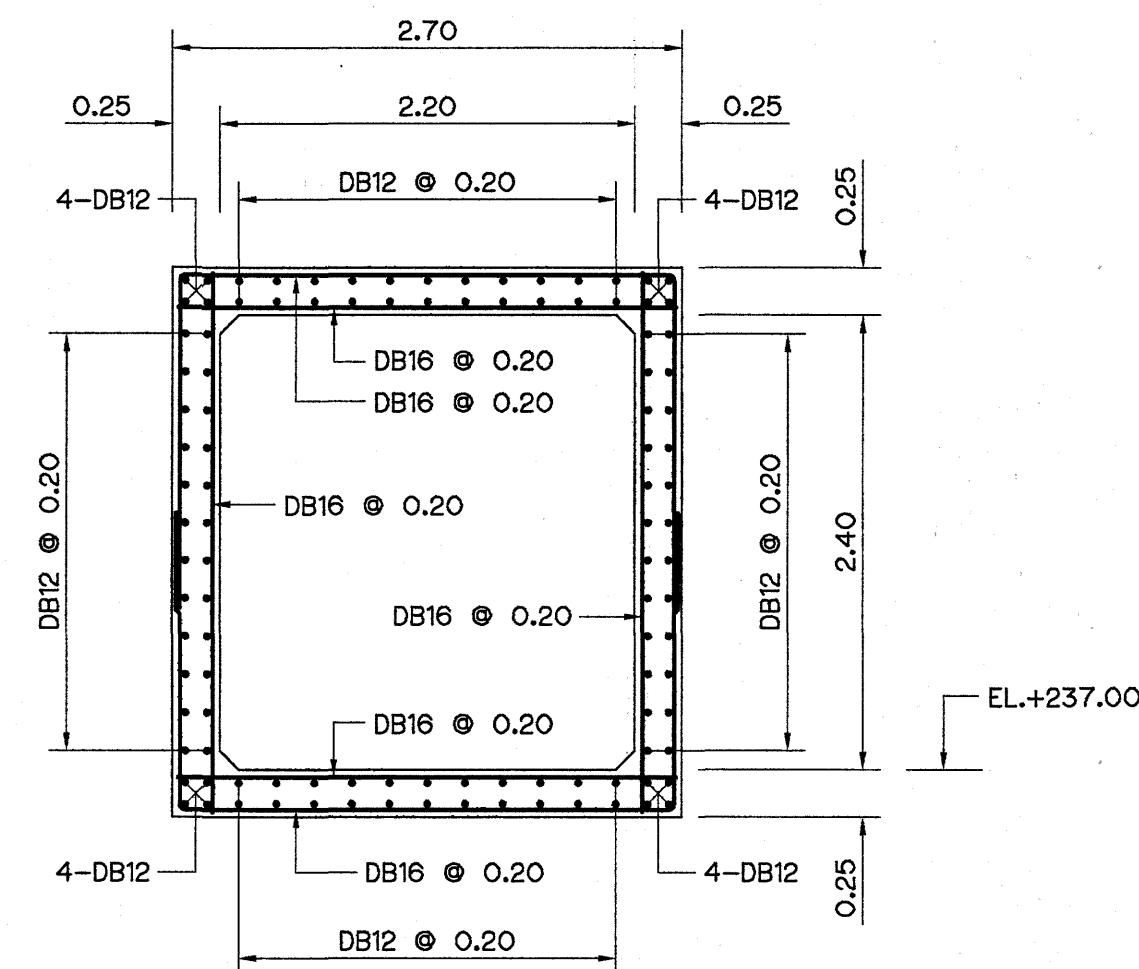
CONSULTANTS

DEDE

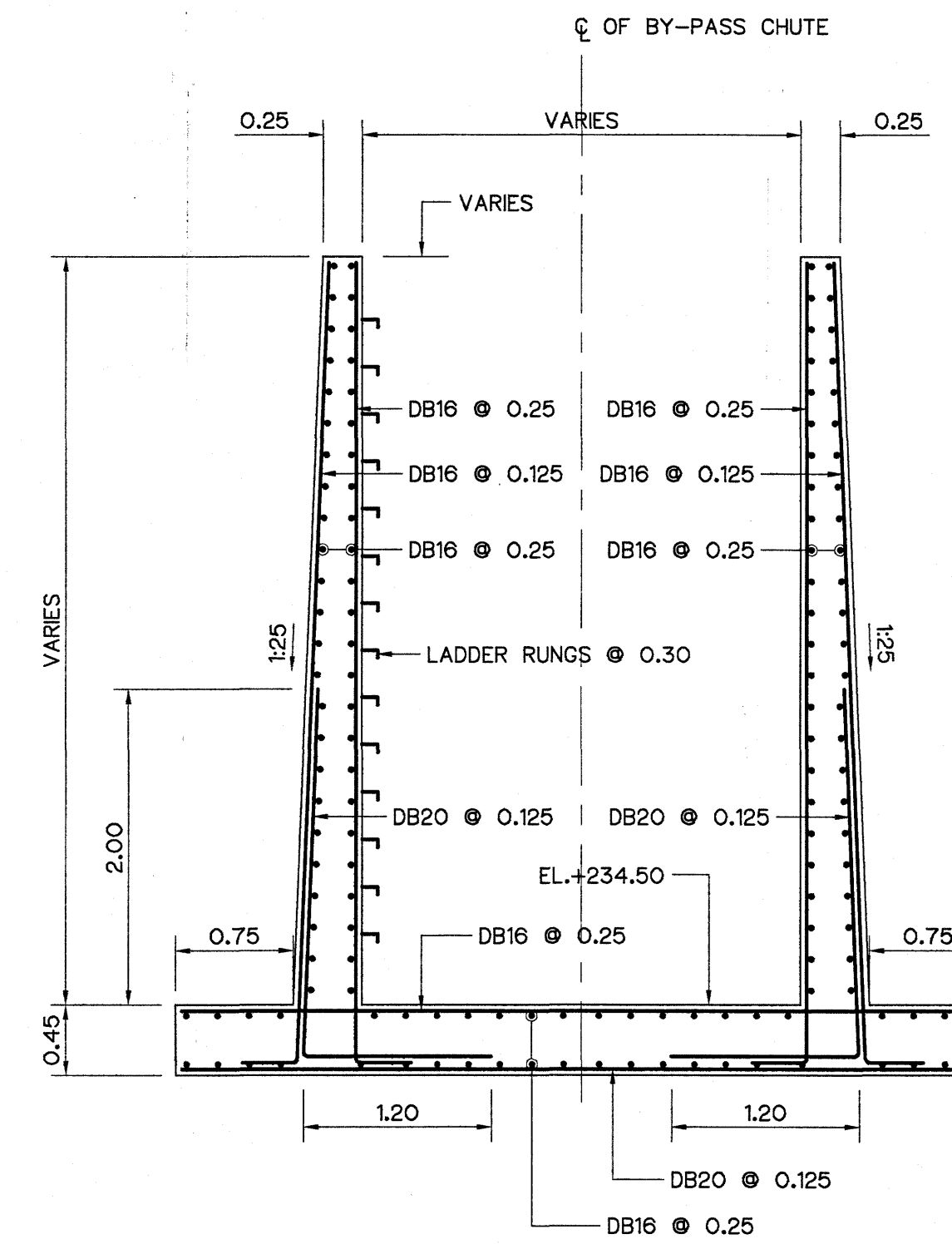
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
LAM PHRA PHLOENG HYDROPOWER PROJECT	
CIVIL WORKS BY-PASS CHUTE REINFORCEMENT KEY PLAN	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED <i>[Signature]</i> 22.6651	REVIEWED S.KITICHAJ
DRAWN <i>[Signature]</i>	SUBMITTED <i>[Signature]</i>
CHECKED <i>[Signature]</i> 22.7324	RECOMMENDED <i>[Signature]</i>
APPROVED <i>[Signature]</i>	APPROVED <i>[Signature]</i>
PROJECT MANAGER	DRAWING NO. LPP-BC-05
DATE 14/01/62	SHEET NO. 41 OF 44



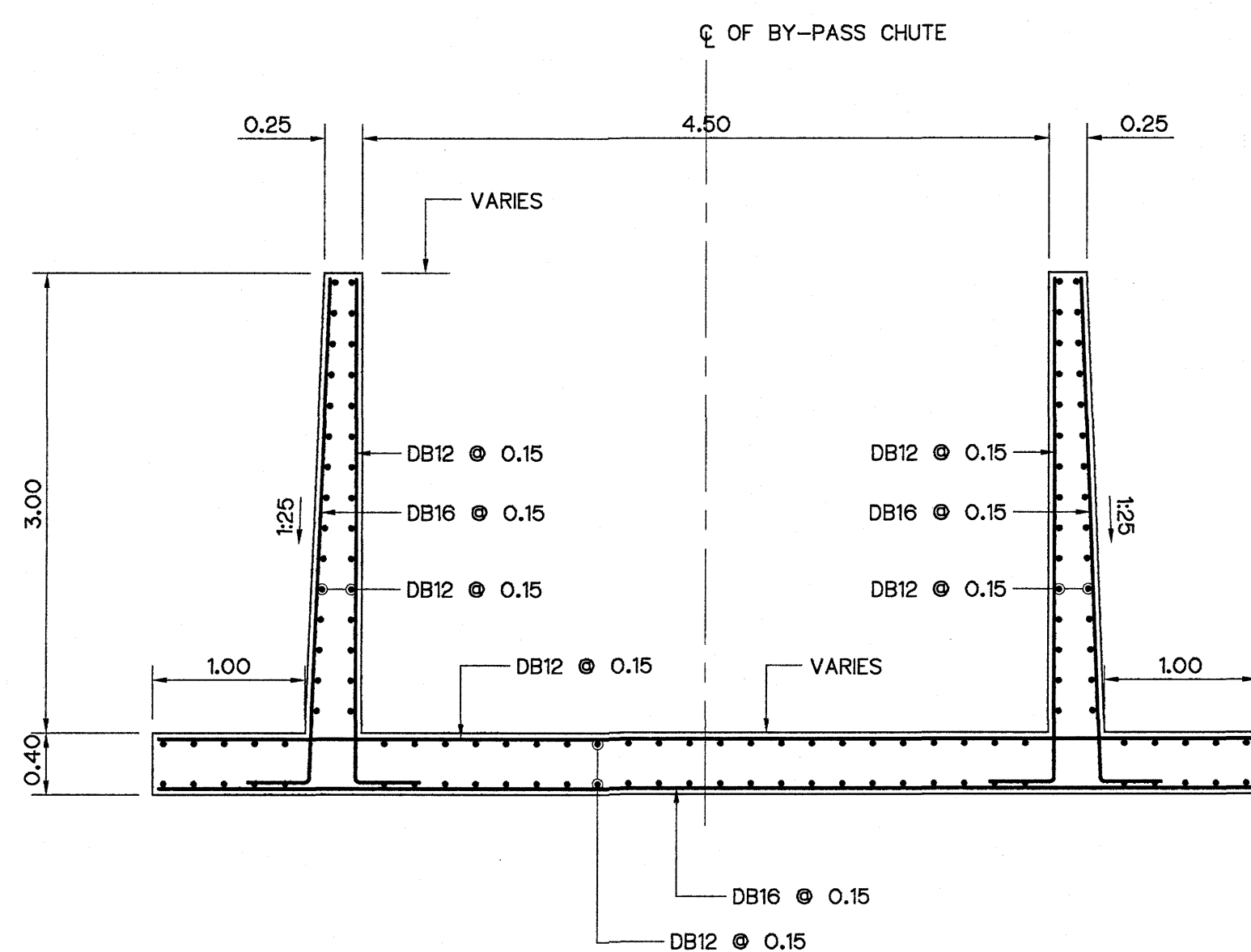
SECTION B-B
SCALE 1:40



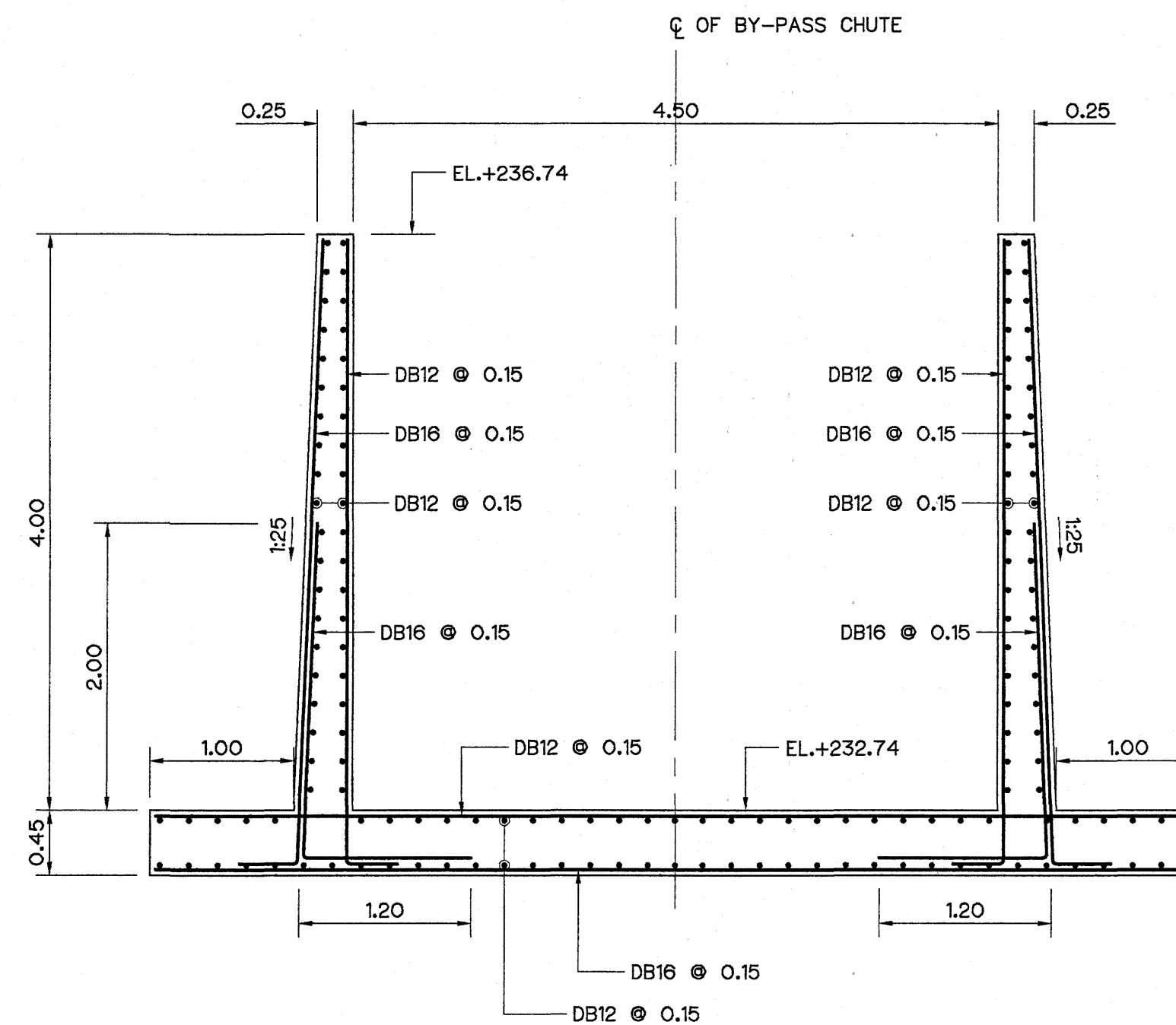
SECTION C-C
SCALE 1:40



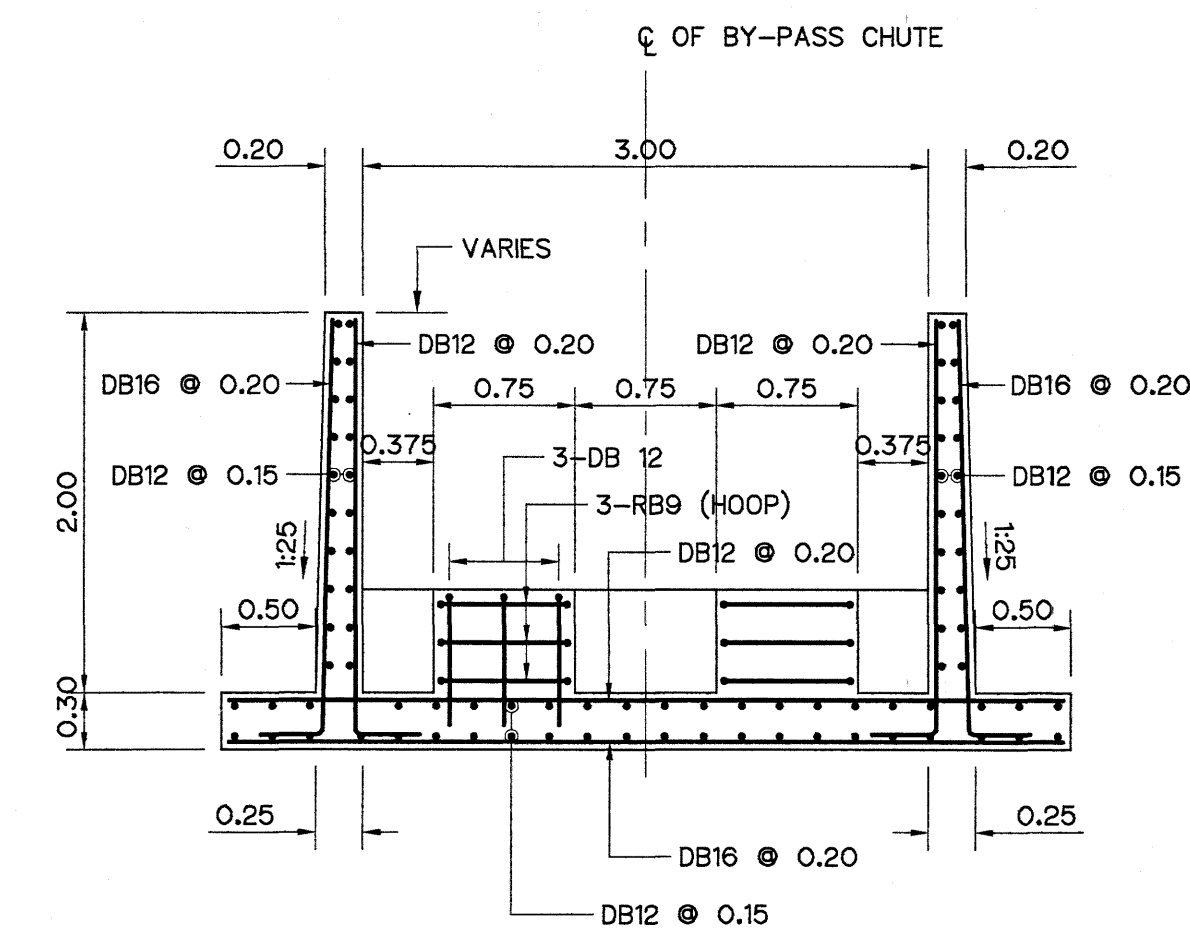
SECTION D-D
SCALE 1:40



SECTION E-E
SCALE 1:40



SECTION F-F
SCALE 1:40



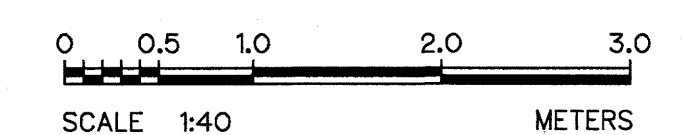
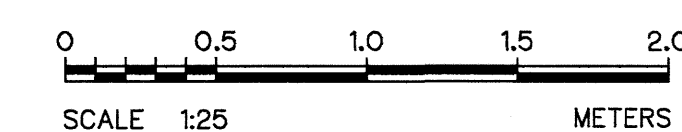
SECTION G-G
SCALE 1:40

NOTES :

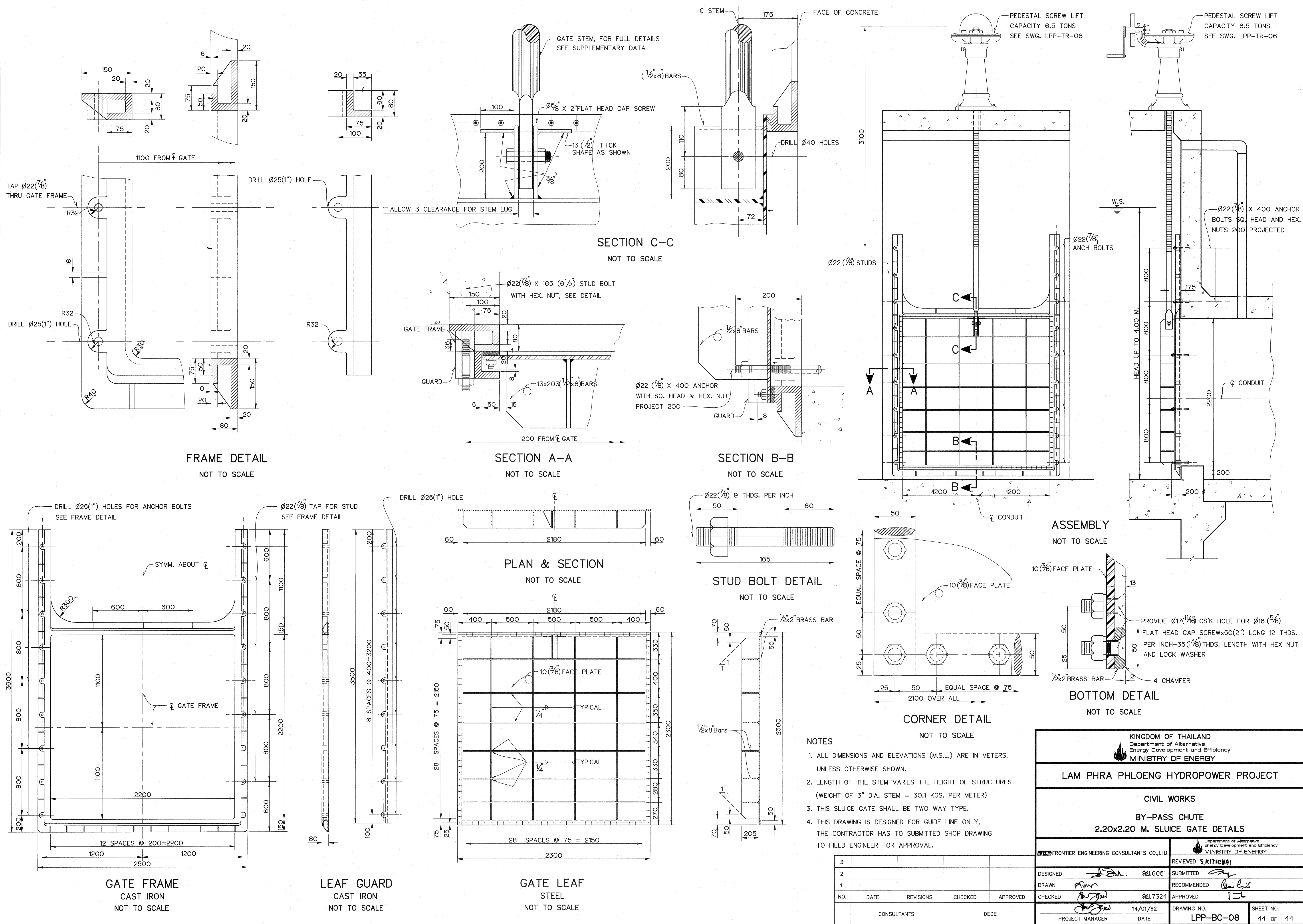
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. LPP-GN-03.
3. LOCATIONS OF LAP SPLICES SHALL BE DETERMINED IN FIELD UNDER THE APPROVAL OF FIELD ENGINEER.

REFERENCE DRAWINGS :

1. BY-PASS CHUTE, REINFORCEMENT KEY PLAN LPP-BC-05
2. BY-PASS CHUTE, REINFORCEMENT DETAILS 1/2 LPP-BC-06



					KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
					LAM PHRA PHLOENG HYDROPOWER PROJECT	
					CIVIL WORKS BY-PASS CHUTE REINFORCEMENT DETAILS 2/2	
					FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	REVIEWED S.KITICHAJ
					DESIGNED S.KITICHAJ 22.06.51	SUBMITTED S.KITICHAJ
					DRAWN S.KITICHAJ 22.06.51	RECOMMENDED S.KITICHAJ
					CHECKED S.KITICHAJ 22.06.51	APPROVED S.KITICHAJ
					CONSULTANTS	DEDE
					PROJECT MANAGER	DATE
					DRAWING NO. LPP-BC-07	SHEET NO. 43 OF 44



KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY				
LAM PHRA PHLOENG HYDROPOWER PROJECT				
CIVIL WORKS				
BY-PASS CHUTE				
2.20x2.20 M. SLUICE GATE DETAILS				
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.			REVIEWED S.KITICHAJ	
DESIGNED	<i>[Signature]</i>	28.6.651	SUBMITTED	<i>[Signature]</i>
DRAWN	<i>[Signature]</i>		RECOMMENDED	<i>[Signature]</i>
CHECKED	<i>[Signature]</i>	28.7.324	APPROVED	<i>[Signature]</i>
NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS		DEDE		
PROJECT MANAGER			DATE	DRAWING NO.
			14/01/82	LPP-BC-08
				SHEET NO.
				44 OF 44