



Department of Alternative
Energy Development and Efficiency
MINISTRY OF ENERGY

THONG NOI DIVERSION WEIR HYDROPOWER PROJECT

AMPHOE MUEANG NAN CHANGWAT NAN

CONTRACT C2

ELECTRO – MECHANICAL EQUIPMENT

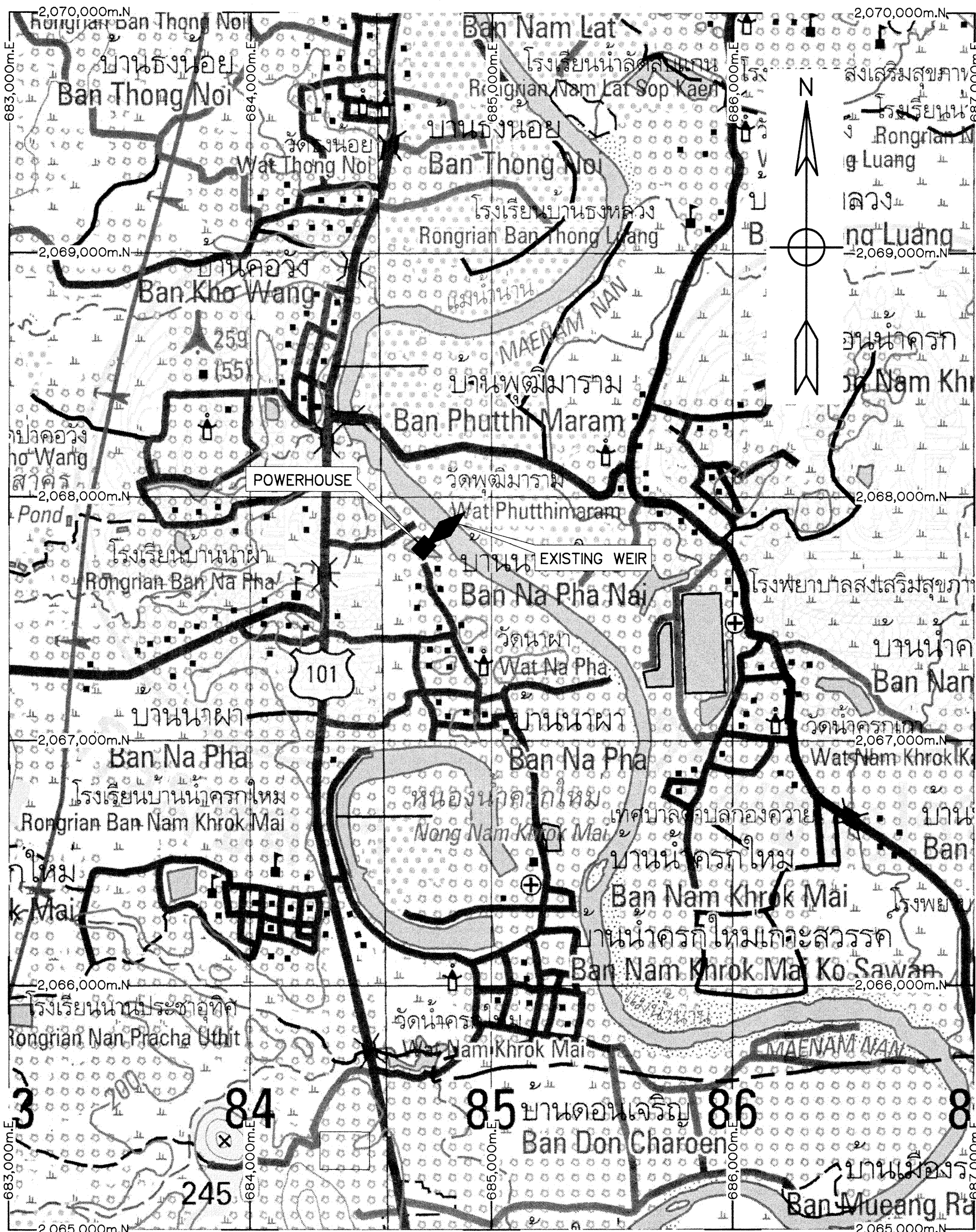
VOLUME 4 DRAWINGS



FRONTIER ENGINEERING CONSULTANTS CO.,LTD.

THONG NOI DIVERSION WEIR HYDROPOWER PROJECT
CONTRACT C2 : LIST OF DRAWINGS

SHEET NO.	DRAWING NO.	DRAWING DETAILS
GENERAL		
1	THN-GN-01	LOCATION MAP AND PROJECT AREA MAP
2	THN-GN-02	GENERAL LAY-OUT OF PROJECT
3	THN-GN-03	GENERAL PLAN AND LONGITUDINAL SECTION ALONG CENTERLINE OF CHANNEL
4	THN-GN-04	SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES
5	THN-GN-05	HYDROLOGY DATA
INTAKE CHANNEL		
6	THN-IC-01	PLAN AND SECTION A-A
7	THN-IC-02	SECTION B-B, C-C AND SECTION D-D
8	THN-IC-03	SECTION E-E AND F-F
INTAKE STRUCTURE		
9	THN-IS-01	PLAN AND SECTION A-A
10	THN-IS-02	SECTION B-B AND C-C
11	THN-IS-03	SECTION D-D AND E-E
12	THN-IS-04	SECTION F-F AND G-G
POWERHOUSE AND EMERGENCY CHANNEL		
13	THN-PH-01	GENERAL PLAN
14	THN-PH-02	SECTIONS AND DETAILS 1/3
15	THN-PH-03	SECTIONS AND DETAILS 2/3
16	THN-PH-04	SECTIONS AND DETAILS 3/3
17	THN-PH-05	POWERHOUSE, ROOF PLAN
18	THN-PH-06	POWERHOUSE, GROUND FLOOR PLAN (EL.+201.20) AND MANHOLE DETAILS
19	THN-PH-07	POWERHOUSE, 1st BASEMENT PLAN (EL.+195.60)
20	THN-PH-08	POWERHOUSE, 2nd BASEMENT PLAN (EL.+187.20)
21	THN-PH-09	POWERHOUSE, ELEVATION 1
22	THN-PH-10	POWERHOUSE, ELEVATION 2, 3 AND 4
TAILRACE		
23	THN-TR-01	PLAN AND SECTION A-A
24	THN-TR-02	SECTION B-B, C-C AND SECTION D-D
OUTLET CHANNEL		
25	THN-OC-01	PLAN AND SECTION A-A
26	THN-OC-02	SECTION B-B, C-C AND SECTION D-D
27	THN-OC-03	SECTION E-E, F-F AND SECTION H-H
ELECTRO – MECHANICAL EQUIPMENT		
28	THN-EM-01	SINGLE LINE DIAGRAM SHEET 1/2
29	THN-EM-02	SINGLE LINE DIAGRAM SHEET 2/2
30	THN-EM-03	CABLE & CABLE TRUNKING LIST
31	THN-EM-04	LOAD SCHECDULE
32	THN-EM-05	SCADA SCHEMATIC DIAGRAM
33	THN-EM-06	FIRE ALARM RISER DIAGRAM
34	THN-EM-07	CLOSE CIRCUIT TELEVISION (CCTV) SCHEMATIC DIAGRAM
35	THN-EM-08	SCHEMATIC DIAGRAM OF OIL PRESSURE UNIT FOR TURBINE AND BRAKE
36	THN-EM-09	SCHEMATIC DIAGRAM FOR COOLING SYSTEM
37	THN-EM-10	SCHEMATIC DIAGRAM FOR DRAINAGE & DEWATERING SYSTEM



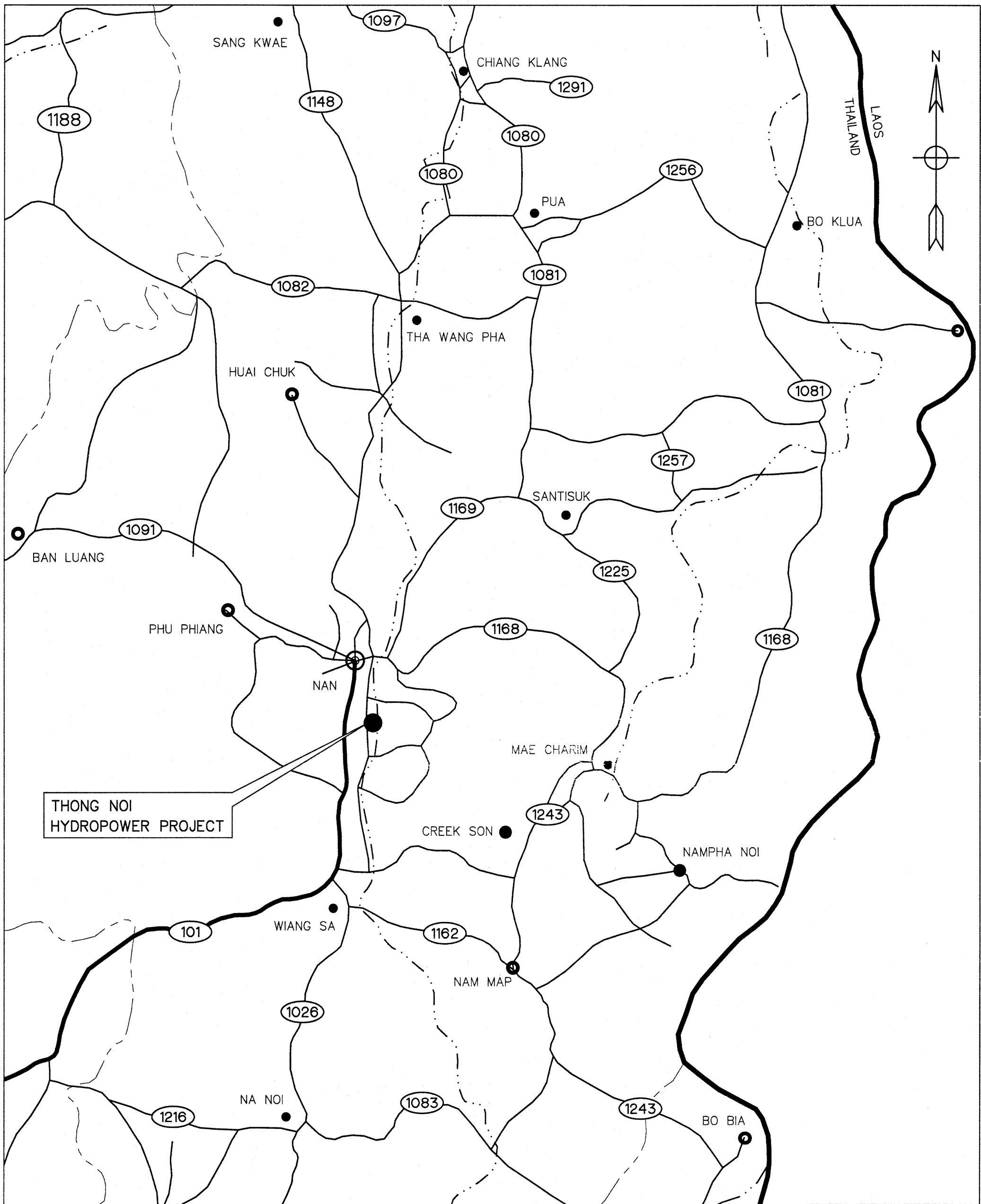
PROJECT AREA MAP
SCALE 1:15,000

LEGENDS :

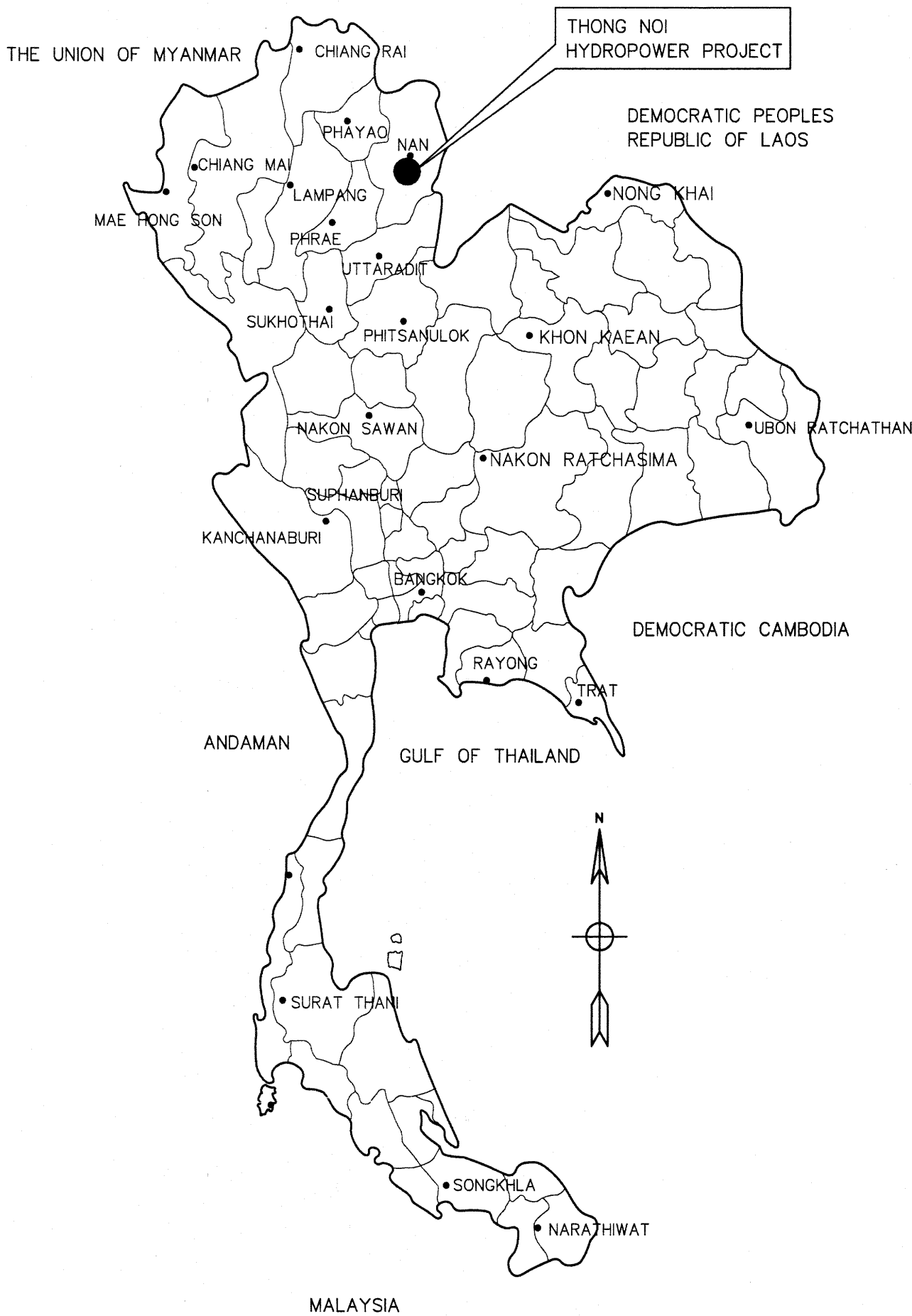
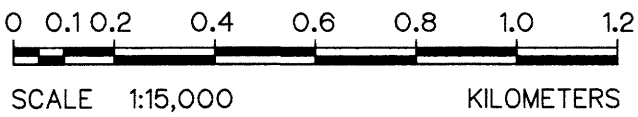
- 105 HIGHWAY
- STREAM
- EXISTING WEIR
- POWERHOUSE
- ACCESS ROAD
- PROPOSED NEW TRANSMISSION LINE

NOTES :

- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. THN-GN-04



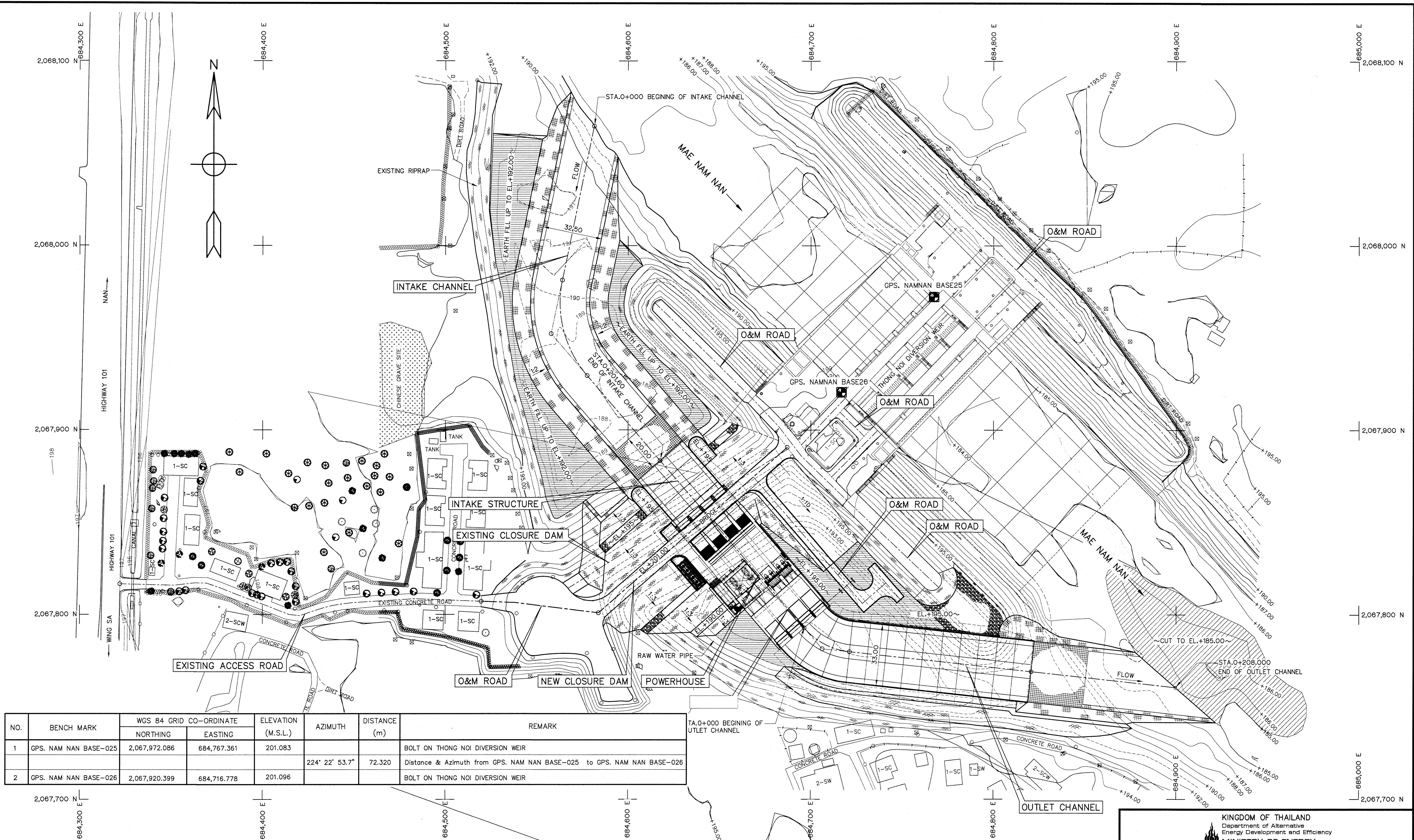
SITE LOCATION
NOT TO SCALE



LOCATION MAP
NOT TO SCALE

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

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN			
ELECTRO – MECHANICAL EQUIPMENT GENERAL LOCATION MAP AND PROJECT AREA MAP			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED 21.6.650 21.6.650 21.6.650 21.6.650		REVIEWED 21.6.650 21.6.650 21.6.650 21.6.650	
DRAWN 21.6.650 21.6.650 21.6.650 21.6.650		RECOMMENDED 21.6.650 21.6.650 21.6.650 21.6.650	
CHECKED 21.6.650 21.6.650 21.6.650 21.6.650		APPROVED 21.6.650 21.6.650 21.6.650 21.6.650	
PROJECT MANAGER		DATE 6/9/2024	
DRAWING NO. THN-GN-01		SHEET NO. 1 OF 37	

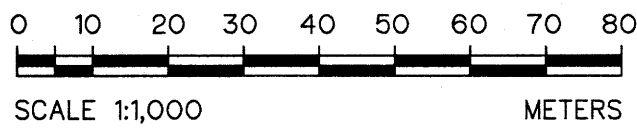


NO.	BENCH MARK	WGS 84 GRID CO-ORDINATE		ELEVATION (M.S.L.)	AZIMUTH	DISTANCE (m)	REMARK
		NORTHING	EASTING				
1	GPS. NAM NAN BASE-025	2,067,972.086	684,767.361	201.083	224° 22' 53.7"	72.320	BOLT ON THONG NOI DIVERSION WEIR
2	GPS. NAM NAN BASE-026	2,067,920.399	684,716.778	201.096			BOLT ON THONG NOI DIVERSION WEIR

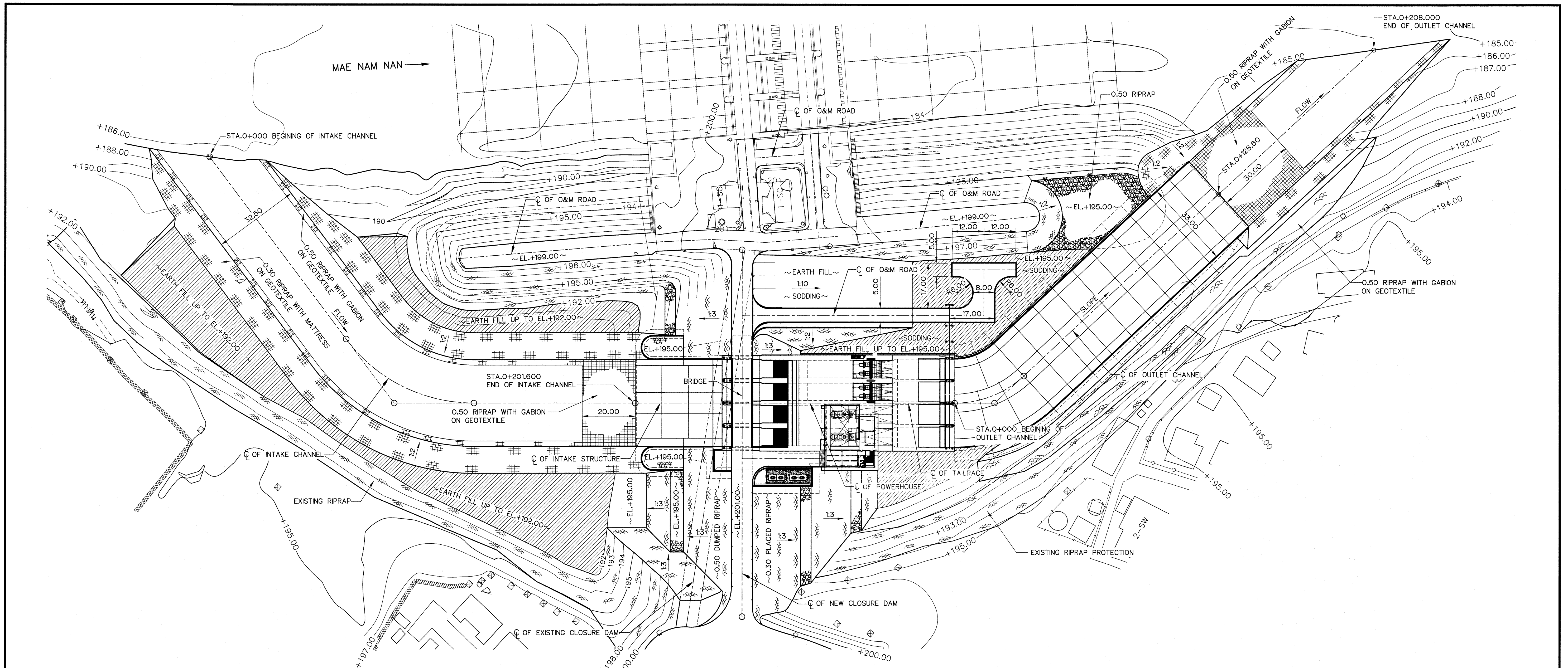
- NOTES :
- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
 - SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. THN-GN-04

- REFERENCE DRAWINGS :
- GENERAL, LOCATION AND PROJECT AREA MAP
 - INTAKE CHANNEL, PLAN AND SECTION A-A
 - INTAKE STRUCTURE, PLAN AND SECTION A-A
 - POWERHOUSE AND EMERGENCY CHANNEL, PLAN
 - TAILRACE, PLAN AND SECTION A-A
 - OUTLET CHANNEL, PLAN AND SECTION A-A

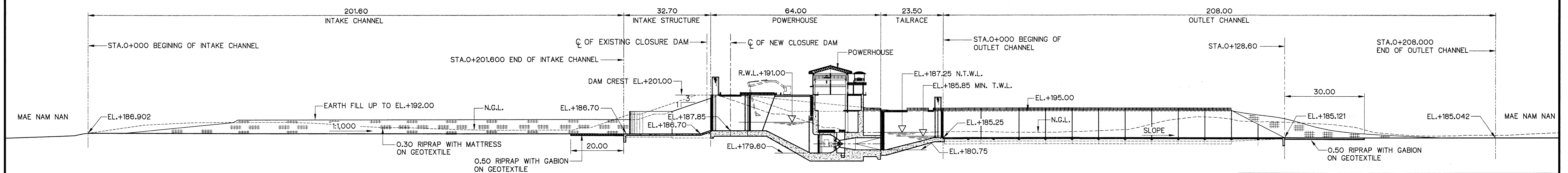
THN-GN-01
THN-IC-01
THN-IS-01
THN-PH-01
THN-TR-01
THN-OC-01



KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN			
ELECTRO - MECHANICAL EQUIPMENT GENERAL GENERAL LAY-OUT OF PROJECT			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED	REVIEWED	SUBMITTED	
DRAWN	RECOMMENDED	APPROVED	
CHECKED	DATE	DATE	
PROJECT MANAGER		SHEET NO.	
THN-GN-02		2 OF 37	



GENERAL PLAN
SCALE 1:750



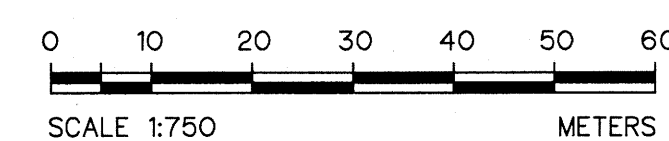
LONGITUDINAL SECTION ALONG CENTER LINE OF CHANNEL
SCALE 1:750

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. THN-GN-04

REFERENCE DRAWINGS :

1. GENERAL, GENERAL LAY-OUT OF PROJECT THN-GN-02



3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

CONSULTANTS

DEDE

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO - MECHANICAL EQUIPMENT GENERAL GENERAL PLAN AND LONGITUDINAL SECTION ALONG CENTERLINE OF CHANNEL	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD. DESIGNED <i>[Signature]</i> 21.6650 21.6650 DRAWN <i>[Signature]</i> CHECKED <i>[Signature]</i> 21.6651 PROJECT MANAGER DATE 6/9/2024	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY REVIEWED <i>[Signature]</i> SUBMITTED <i>[Signature]</i> RECOMMENDED <i>[Signature]</i> APPROVED <i>[Signature]</i> DRAWING NO. THN-GN-03 SHEET NO. 3 OF 37

ABBREVIATIONS :

A	CROSS-SECTION AREA OF FLOW	MAX.	MAXIMUM
AC.	ASBESTOS CEMENT PIPE	M.S.L.	MEAN SEA LEVEL
AGG.	AGGREGATE	MISC.	MISCELLANEOUS
ALT.	ALTERNATIVE	N	NORTH
APPROX.	APPROXIMATE	n	MANNING'S 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.T.W.L.	NORMAL TAIL WATER LEVEL
BF.	BOTTOM FACE	N.W.L.	NORMAL WATER LEVEL
B	BEAM	OD.	OUTSIDE DIAMETER
B.M.	BENCH MARK	O.F.	OUTSIDE FACE
BOTT.	BOTTOM	O&M	OPERATION & MAINTENANCE
BRG.	BEARING	PC.	POINT OF HORIZONTAL CURVATURE
C.B.R.	CALIFORNIA BEARING RATIO	PI.	POINT OF HORIZONTAL INTERSECTION
C/C	CENTER TO CENTER	PL.	PLATE
CL	CENTER LINE	P.O.C.	POINT ON CURVE
CL.	CLEARANCE	P.O.T.	POINT ON TANGENT
CM OR cm	CENTIMETER	P.O.S.T.	POINT ON SUB-TANGENT
CM/S OR cm/s	CENTIMETER PER SECOND	PRC.	POINT OF HORIZONTAL REVERSE CURVE
COL.	COLUMN	PT.	POINT OF TANGENT
CONC.	CONCRETE	PVC.	POLYVINYL CHLORIDE
D	DEGREE OF CURVE	PVC.	POINT OF VERTICAL CURVATURE
DB.	DEFORM BAR	PVI.	POINT OF VERTICAL INTERSECTION
d.	DEPTH OF WATER	PVRC.	POINT OF VERTICAL REVERSE CURVE
DIA. OR Ø	DIAMETER	PVT.	POINT OF VERTICAL TANGENT
DOH.	DEPARTMENT OF HIGHWAY	Q.	DISCHARGE
DWG.	DRAWING	QTY. QUAN.	QUANTITY
DEDE.	DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY	R	RADIUS OF CURVATURE
		r	HYDRAULIC RADIUS
E	EAST	RØ , Ø	ROUND BAR
E	END OF SURVEY	RC.	REINFORCED CONCRETE
EA.	EACH	RD.	ROAD
E.C.	END OF CURVE	REF.	REFERENCE
E.F.	END OF FACE	REINF.	REINFORCEMENT
EL. OR ELEV.	ELEVATION	REQ'D	REQUIRED
EXIST.	EXISTING	RID.	ROYAL IRRIGATION DEPARTMENT
EXP.	EXPANSION	R.W.L.	RETAINMENT WATER LEVEL
EXT.	EXTERIOR	SCHEDULE	SCHEDULE
EX.	EXTERNAL DISTANCE OF CURVE	SE.	SUPERELEVATION
f	FREE BOARD , FINISH	SETC.	SECTION
F.F.	FAR FACE	S.P.C.T.	STANDARD PROCTOR COMPACTION TEST
F.S.L.	FULL SUPPLY LEVEL	S.S.	SIDE SLOPE
FTG.	FOOTING	STIR.	STIRRUP
HD.	HEAD	STA.	STATION
HEX.	HEXAGONAL	STD.	STANDARD
HOR.	HORIZONTAL	STR.	STRUCTURE
I.D.	INSIDE DIAMETER	SYMM.	SYMMETRICAL
I.F.	INSIDE FACE	T.	TANGENT LENGTH , THICKNESS
IN OR "	INCH	T OR t	TON
INT.	INTERIOR	THK.	THICKNESS
INV.	INVERT	T.F.	TOP FACE
Kg	KILOGRAM	T.I.S.	THAI INDUSTRIAL STANDARD
Km	KILOMETER	Ts.	SUPERELEVATION TRANSITION LENGTH
KPH.	KILOMETER PER HOUR	TYP.	TYPICAL
KSC.	KILOGRAM PER SQUARE CENTIMETER	V	VELOCITY OF FLOW
L	LENGTH OF CURVE	V.C.	VERTICAL CURVE
LC.	LENGTH OF HORIZONTAL CURVE	Vc.	LENGTH OF VERTICAL CURVE
LONG.	LONGITUDINAL	VER.	VERTICAL
LT.	LEFT	VOL.	VOLUME
L.W.L.	LOW WATER LEVEL	W/O	WITHOUT
M OR m	METER	W.C.	WATER CLOSET
M ² OR m ²	SQUARE METER	Ø	ANGLE
M ³ OR m ³	CUBIC METER	△	DEFLECTION ANGLE
MM OR mm	MILLIMETER		
M/S OR m/s	METER PER SECOND		
MIN.	MINIMUM		
MIN. T.W.L.	MINIMUM TAIL WATER LEVEL		

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

- ALL EXCAVATION LINE SHOWN IN THIS DRAWINGS ARE ONLY GUIDELINE, THE CONTRACTOR MUST SUBMIT SHOP DRAWING FOR APPROVAL BY PROJECT ENGINEER BEFORE PROCEEDING.

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.

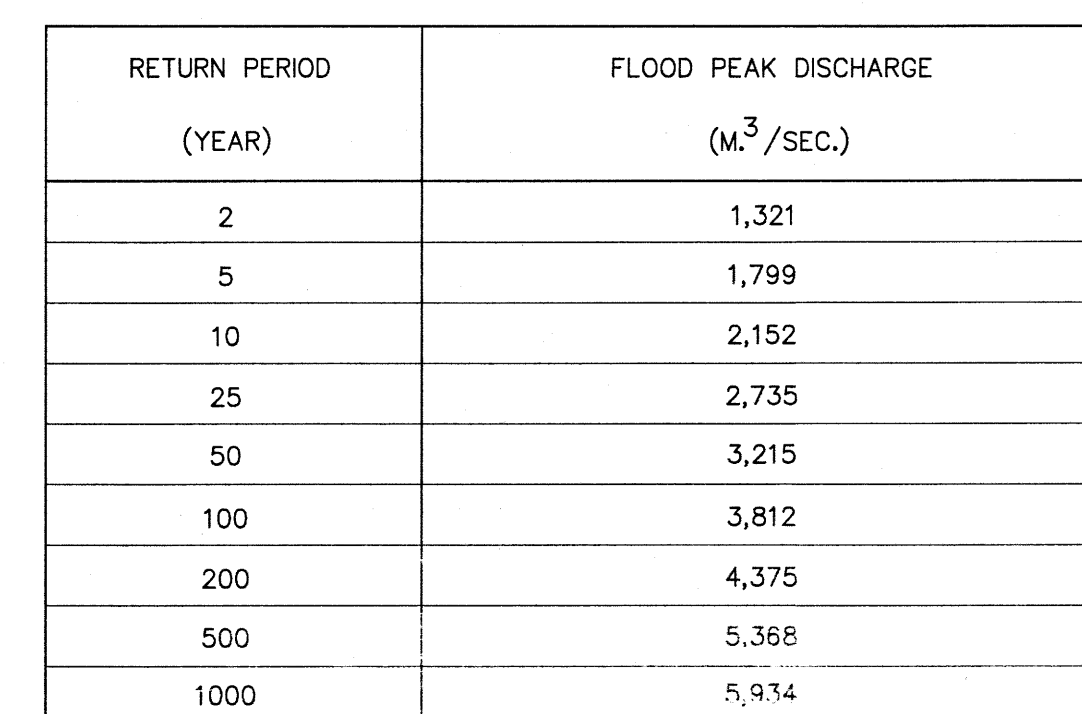
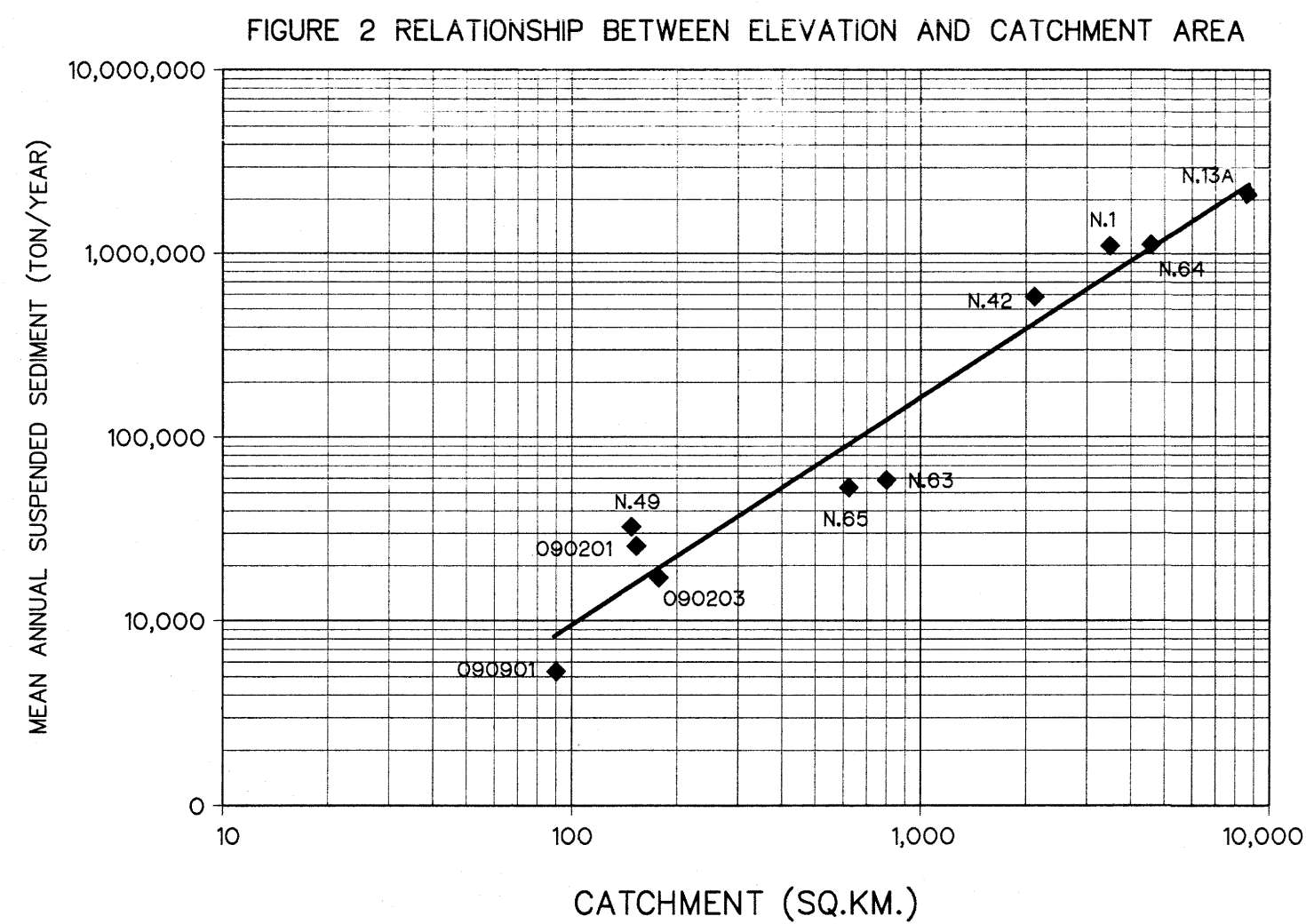
fc' (ksc)	DESCRIPTION
450	PRESTRESS CONCRETE
350	PLANK GIRDER TOPPING FOR BRIDGE
240	1. INTAKE STRUCTURE
	2. POWERHOUSE AND EMERGENCY CHANNE
	3. TAILRACE
	4. OUTLET CHANNEL
210	1. HOUSING RENOVATION
	2. PUMPING SUMP
175	1. GUTTER, SIDE DITCH AND MANHOLE
140	LEAN CONCRETE

- 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 SHALL BE CLASS SS400 AND CONFORM TO T.I.S. 1227-2558.
- REINFORCED STEEL BARS SHALL CONFORM TO T.I.S. AS FOLLOW :
 - DEFORMED BARS (SD40) - T.I.S. 24-2559
 - ROUND BARS (SR24) - T.I.S. 20-2559
- ALLOWABLE BEARING CAPACITY OF FOUNDATION SHALL NOT BE LESS THAN AS FOLLOW :
 - INTAKE STRUCTURE $Q_0 > 25 \text{ T/M}^2$
 - POWERHOUSE AND EMERGENCY CHANNEL $Q_0 > 40 \text{ T/M}^2$
 - TAILRACE $Q_0 > 30 \text{ T/M}^2$
 - OUTLET CHANNEL $Q_0 > 25 \text{ T/M}^2$

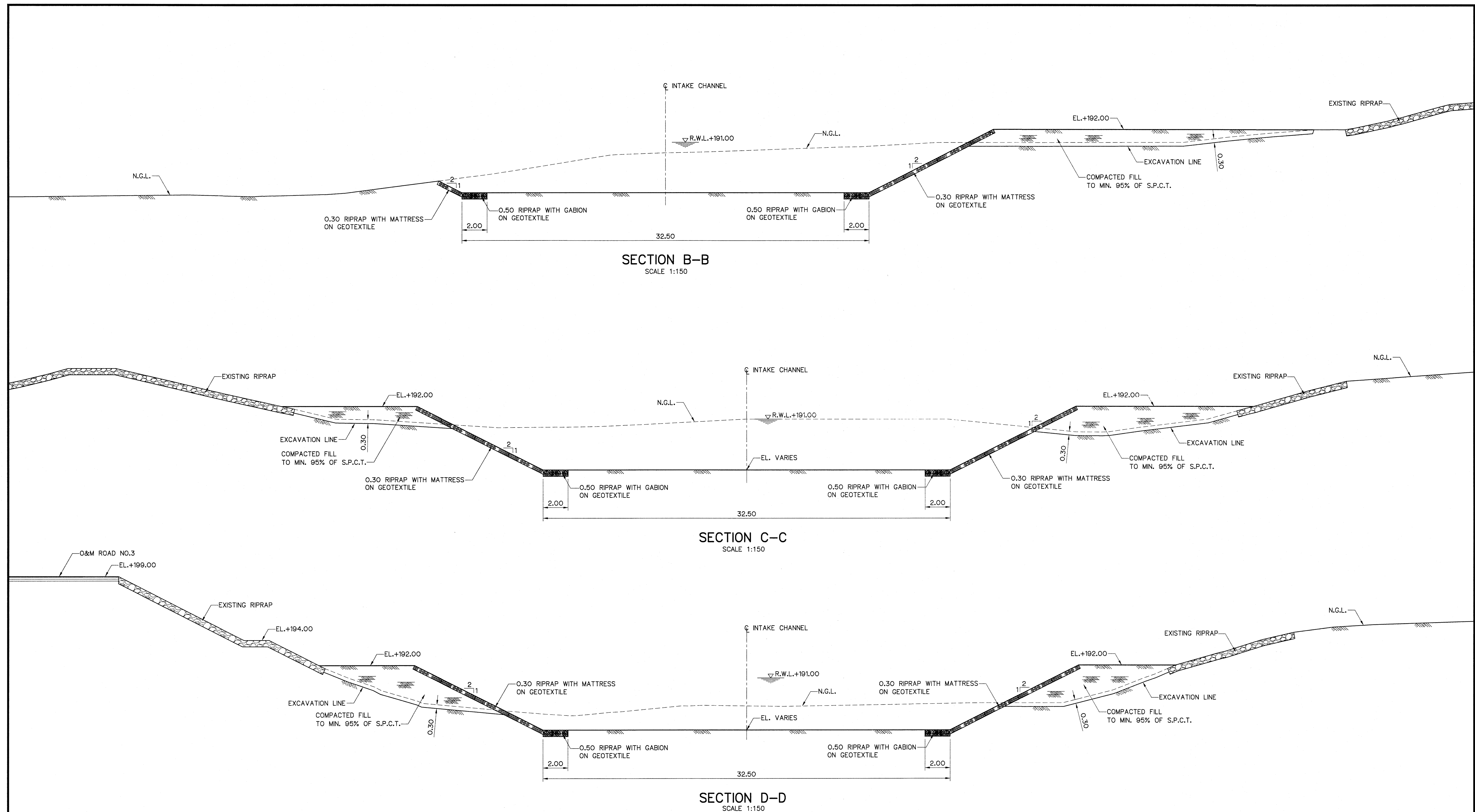
3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
		CONSULTANTS		DEDE

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO - MECHANICAL EQUIPMENT GENERAL SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	REVIEWED
DESIGNED ๖๖.๖๖๖๖ ๖๖.๖๖๖๖	SUBMITTED
DRAWN	RECOMMENDED
CHECKED ๖๖.๖๖๖๖	APPROVED
6/9/2024 PROJECT MANAGER	DRAWING NO. THN-GN-04
	SHEET NO. 4 OF 37

Station	NAN					Elavation of station above M.S.L.					200	Meters	
Index station	48331					Height of barometer above M.S.L.					201.60	Meters	
Latitude	18° 46' 47.0" N					Height of Thermometer above ground					1.20	Meters	
Longitude	100° 46' 40.0" E					Height of wind vane above ground					12.00	Meters	
						Height of rainguage					0.86	Meters	
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Pressure (Hectopascal)													
Mean	1,014.1	1,012.1	1,009.5	1,008.0	1,006.4	1,005.2	1,005.1	1,005.6	1,007.8	1,011.1	1,013.2	1,015.0	1,009.4
Ext. max.	1,027.3	1,025.2	1,031.0	1,020.0	1,015.3	1,012.7	1,014.0	1,013.3	1,019.1	1,021.1	1,025.5	1,026.9	1,031.0
Ext. min.	1,002.8	1,001.2	998.5	997.9	996.7	996.9	996.3	995.9	997.4	999.1	1,002.2	1,002.2	995.9
Mean daily range	6.6	7.1	7.2	6.8	5.6	4.7	4.3	4.5	5.2	5.5	5.8	6.2	5.8
Temperature (Celsius)													
Mean	21.8	23.9	27.1	29.1	29.0	28.7	27.9	27.4	27.4	26.7	24.6	21.8	26.3
Mean max.	30.8	33.6	36.3	36.9	35.5	34.0	32.7	32.2	32.9	32.8	31.9	30.1	33.3
Mean min.	14.9	16.1	19.4	22.6	24.0	24.4	24.2	23.9	23.7	22.3	19.2	15.5	20.8
Ext. max.	36.8	38.8	41.8	43.3	42.5	40.3	39.5	37.5	37.0	37.0	36.7	35.3	43.3
Ext. min.	6.7	8.0	11.0	16.2	19.2	20.4	20.2	19.6	19.5	13.4	9.3	2.7	2.7
Relative Humidity (%)													
Mean	76.0	69.0	65.0	68.0	75.0	78.0	82.0	84.0	84.1	81.0	79.0	77.0	76.4
Mean max.	96.0	93.0	89.0	89.0	91.0	92.0	94.0	95.0	96.0	95.0	96.0	96.0	93.4
Mean min.	45.0	38.0	37.0	43.0	53.0	59.0	64.0	67.0	64.0	58.0	52.0	48.0	52.3
Ext. min.	19.0	17.0	13.0	19.0	25.0	26.0	38.0	29.0	43.0	35.0	33.0	26.0	13.0
Dew Point (Celsius)													
Mean	16.6	16.9	18.9	21.8	23.6	24.2	24.2	24.3	24.2	22.8	20.2	17.1	21.2
Pan Evaporation (mm.)													
Mean–Pan	82.2	96.0	127.1	140.8	138.9	117.4	103.0	93.7	97.8	102.0	87.5	78.6	1265.0
Cloudiness (0–10)													
Mean	2.1	1.5	1.9	3.4	5.7	7.0	7.8	8.0	6.9	4.7	2.8	2.2	4.5
Visibility (Km.)													
07.00 LST	4.1	4.5	4.0	6.0	8.4	9.4	9.2	8.4	7.0	5.5	4.5	4.0	6.3
Wind (knots)													
Mean	0.1	0.2	0.3	0.4	0.4	0.4	0.3	0.2	0.2	0.2	0.2	0.1	0.3
Prev. Wind	S	S	S	S	S	S	S	S	S	Calm	Calm	SE	—
Max.	14.0	14.0	35.0	45.0	30.0	35.0	30.0	20.0	17.0	21.0	15.0	14.0	45.0
Rainfall (mm.)													
Mean	15.3	10.0	39.2	100.2	165.5	135.5	216.4	289.1	205.9	62.2	15.9	13.9	1269.1
Num. of Days	2.1	1.6	4.2	8.9	14.8	15.6	19.4	22.3	17.6	9.8	2.7	1.4	120.4
Daily Max.	69.3	40.4	77.6	129.4	123.0	143.5	103.2	136.6	112.7	59.6	89.2	72.6	143.5
Phenomena (Days)													
Fog	7.3	0.8	0.1	0									



3					FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	REVIEWED	2/25
2					DESIGNED	28.6650	SUBMITTED
1					DRAWN	28.66523	RECOMMENDED
NO.	DATE	REVISIONS	CHECKED	APPROVED	CHECKED	28.6651	APPROVED
		CONSULTANTS		DEDE	28.6651	6/9/2024	DRAWING NO. THN-GN-05
					PROJECT MANAGER	DATE	SHEET NO. 5 OF 37

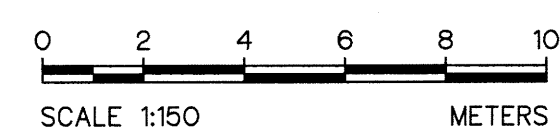


NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS. UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. THN-GN-04

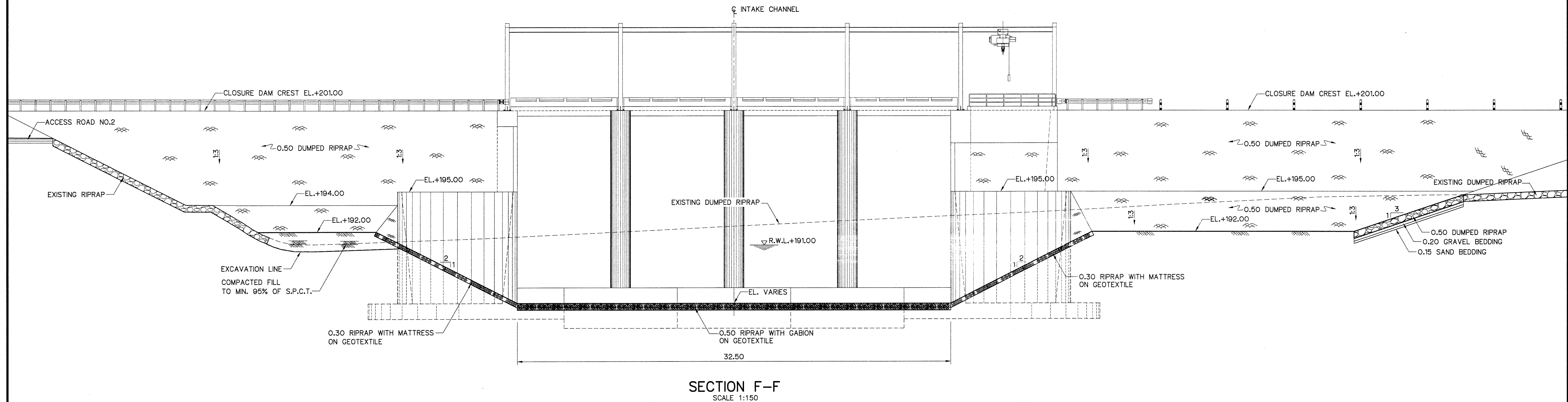
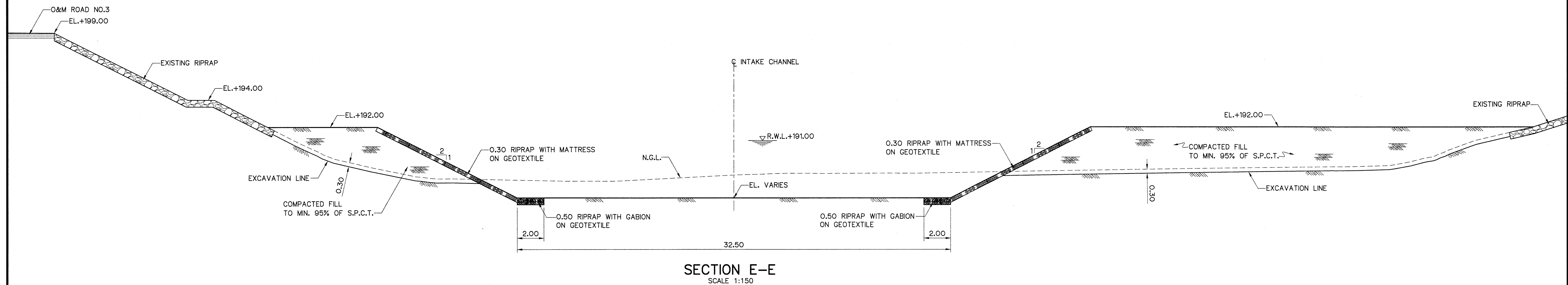
REFERENCE DRAWINGS :

- | | |
|---|-----------|
| 1. INTAKE CHANNEL, PLAN AND SECTION A-A | THN-IC-01 |
| 2. INTAKE CHANNEL, SECTION E-E AND F-F | THN-IC-03 |



3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
		CONSULTANTS	DEDE	

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO - MECHANICAL EQUIPMENT INTAKE CHANNEL SECTION B-B, C-C AND SECTION D-D	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED 28.6650 Dim 181.88523	REVIEWED 28.6650
DRAWN 28.6650	SUBMITTED 28.6650
CHECKED 28.6650	RECOMMENDED 28.6650
APPROVED 28.6650	APPROVED 28.6650
PROJECT MANAGER 6/9/2024	DRAWING NO. THN-IC-02
DATE	SHEET NO. 7 OF 37

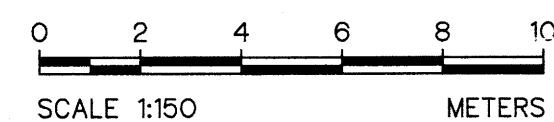


NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. THN-GN-04

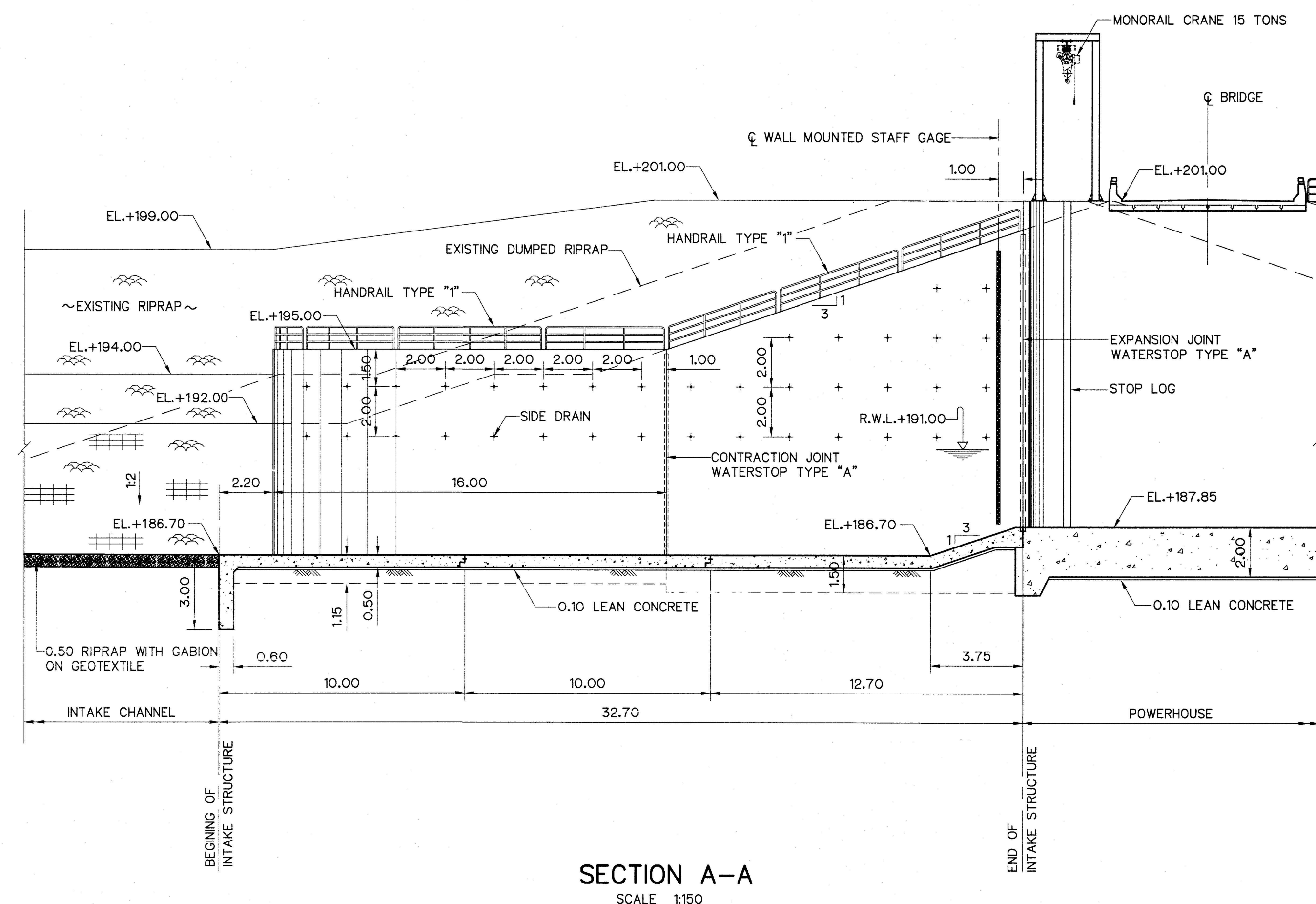
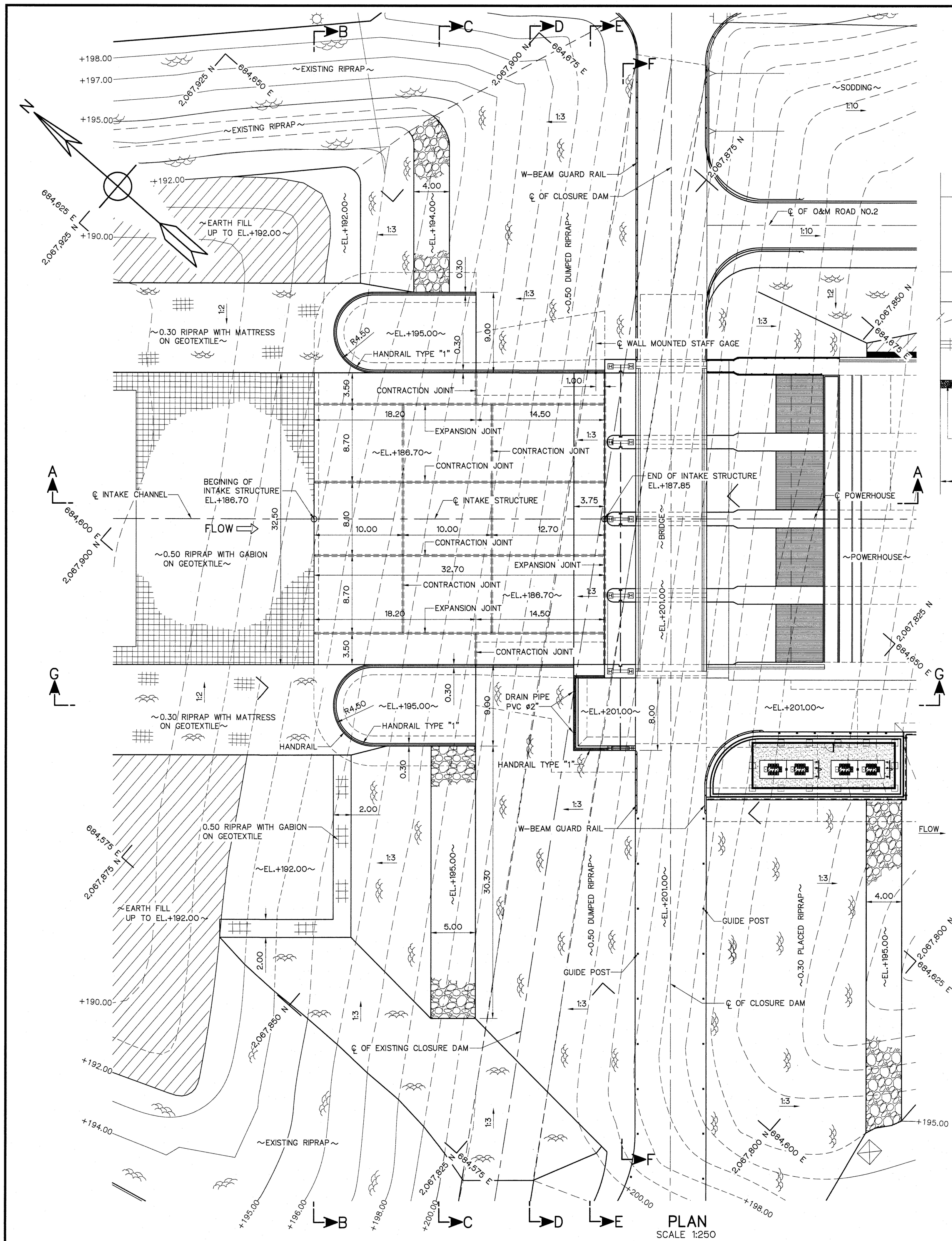
REFERENCE DRAWINGS :

1. INTAKE CHANNEL, PLAN AND SECTION A-A THN-IC-01
2. INTAKE CHANNEL, SECTION B-B, C-C AND SECTION D-D THN-IC-02



3					
2					
1					
NO.	DATE	REVISIONS	CHECKED	APPROVED	
CONSULTANTS			DEDE		
PROJECT MANAGER			DATE		
6/9/2024			DRAWING NO.		
THN-IC-03			SHEET NO.		
8 OF 37					

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO - MECHANICAL EQUIPMENT INTAKE CHANNEL SECTION E-E AND F-F	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	REVIEWED
DESIGNED 281.6650 Dmm 281.68523	SUBMITTED
DRAWN 281.6651	RECOMMENDED
CHECKED 281.6651	APPROVED
PROJECT MANAGER	DRAWING NO.
DATE	SHEET NO.
THN-IC-03	8 OF 37



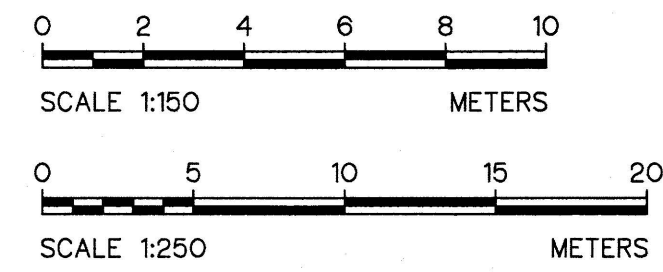
NOTES :

- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. THN-GN-04
- CONCRETE OF WEIR STRUCTURE TO BE MIN. 28 DAYS STANDARD CYLINDER COMPRESSIVE STRENGTH OF 240 KSC.
- SPACING OF HANDRAIL CAN BE ADJUSTED IN THE FIELD TO FIT WITH THE STRUCTURE BY CONTRACTOR AND APPROVED BY ENGINEER.
- INTAKE STRUCTURE SHALL BE PLACED ON BED ROCK FOUNDATION, OTHER MATERIALS SHALL BE REMOVED AND BACKFILLED WITH LEAN CONCRETE AND THE LEAN CONCRETE SHALL HAVE THE COMPRESSIVE STRENGTH OF 140 KSC. FOR STANDARD CYLINDER AT 28 DAYS.
- ALLOWABLE BEARING CAPACITY OF FOUNDATION NOT LESS THAN 25 TON/M²

REFERENCE DRAWINGS :

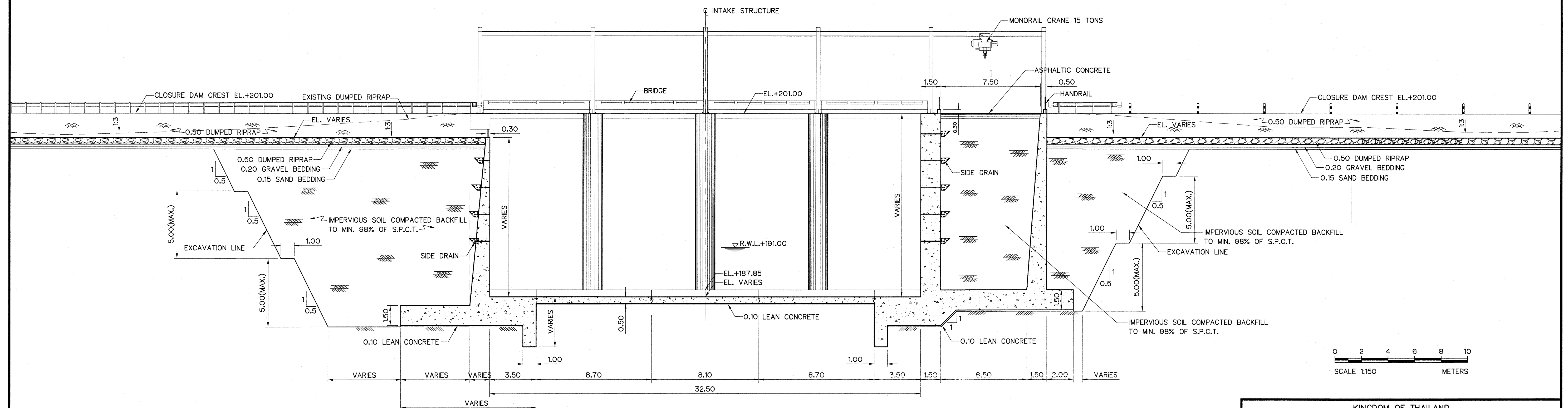
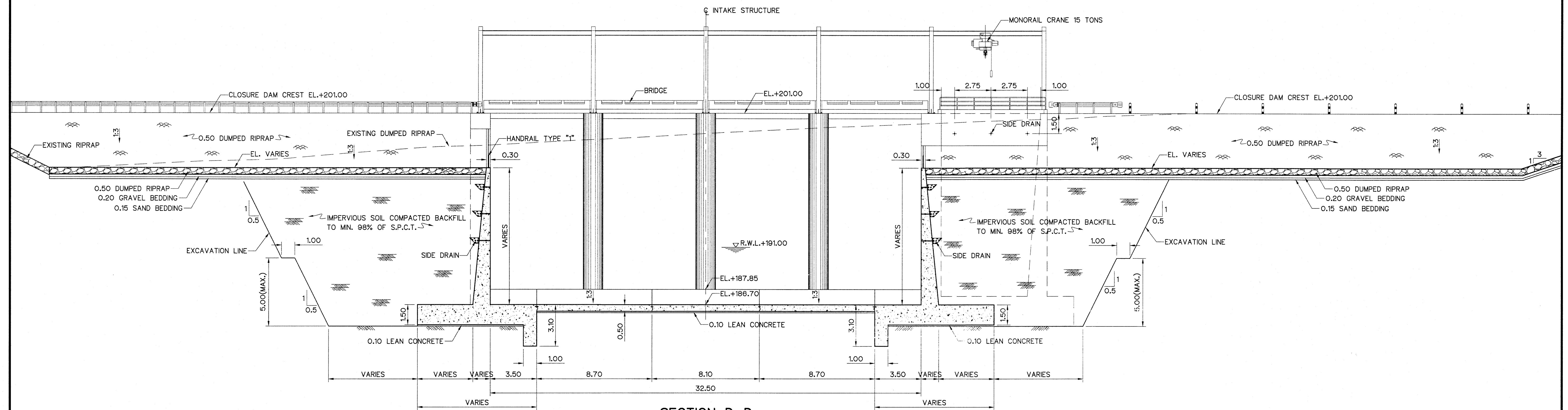
- GENERAL, GENERAL LAY-OUT OF PROJECT
- INTAKE STRUCTURE, SECTION B-B AND C-C
- INTAKE STRUCTURE, SECTION D-D AND E-E
- INTAKE STRUCTURE, SECTION F-F AND G-G

THN-GN-02
THN-IS-02
THN-IS-03
THN-IS-04

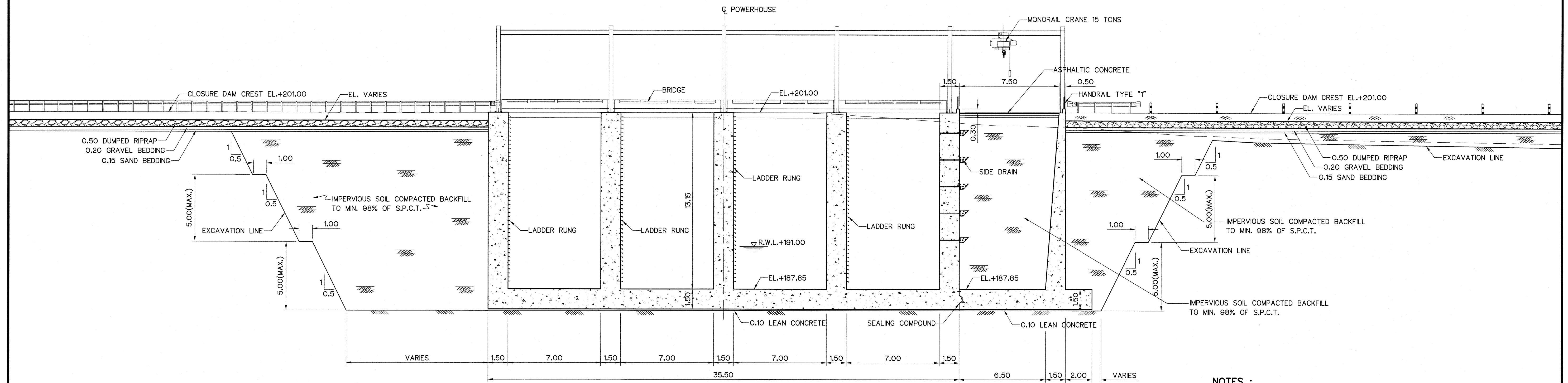


KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO - MECHANICAL EQUIPMENT INTAKE STRUCTURE PLAN AND SECTION A-A	
FRONTIER ENGINEERING CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED <i>[Signature]</i> 22.06.50 <i>[Signature]</i> 18.08.23	REVIEWED <i>[Signature]</i>
DRAWN <i>[Signature]</i>	RECOMMENDED <i>[Signature]</i>
CHECKED <i>[Signature]</i> 22.06.51	APPROVED <i>[Signature]</i>
PROJECT MANAGER	DATE 6/9/2024
DRAWING NO. THN-IS-01	SHEET NO. 9 OF 37

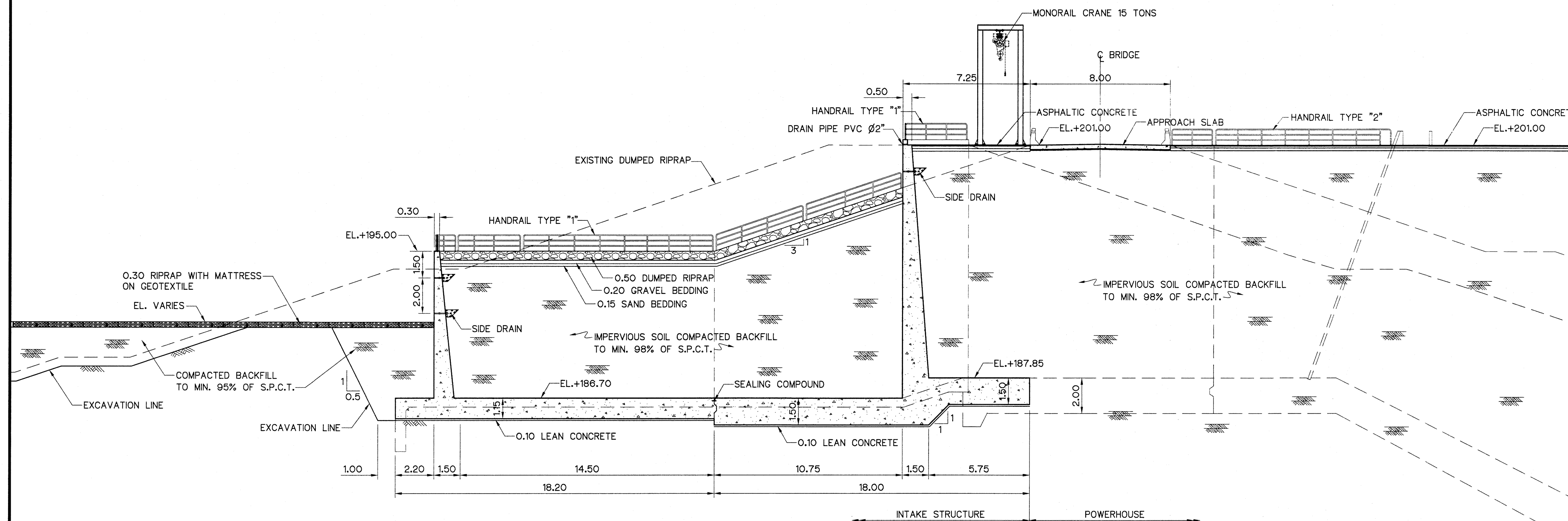
NO.	DATE	REVISIONS	CHECKED	APPROVED
3				
2				
1				
CONSULTANTS		DEDE		



 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO – MECHANICAL EQUIPMENT INTAKE STRUCTURE SECTION D-D AND E-E	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED <i>[Signature]</i> HEL.6650 <i>[Signature]</i> HEL.88523	REVIEWED <i>[Signature]</i>
DRAWN <i>[Signature]</i>	SUBMITTED <i>[Signature]</i>
CHECKED <i>[Signature]</i> HEL.6651	APPROVED <i>[Signature]</i>
<i>[Signature]</i> PROJECT MANAGER 6/9/2024 DATE	DRAWING NO. THN-IS-03 SHEET NO. 11 OF 37



SECTION F-F
SCALE 1:150



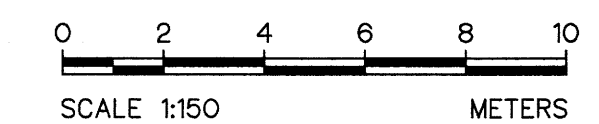
SECTION G-G
SCALE 1:150

NOTES :

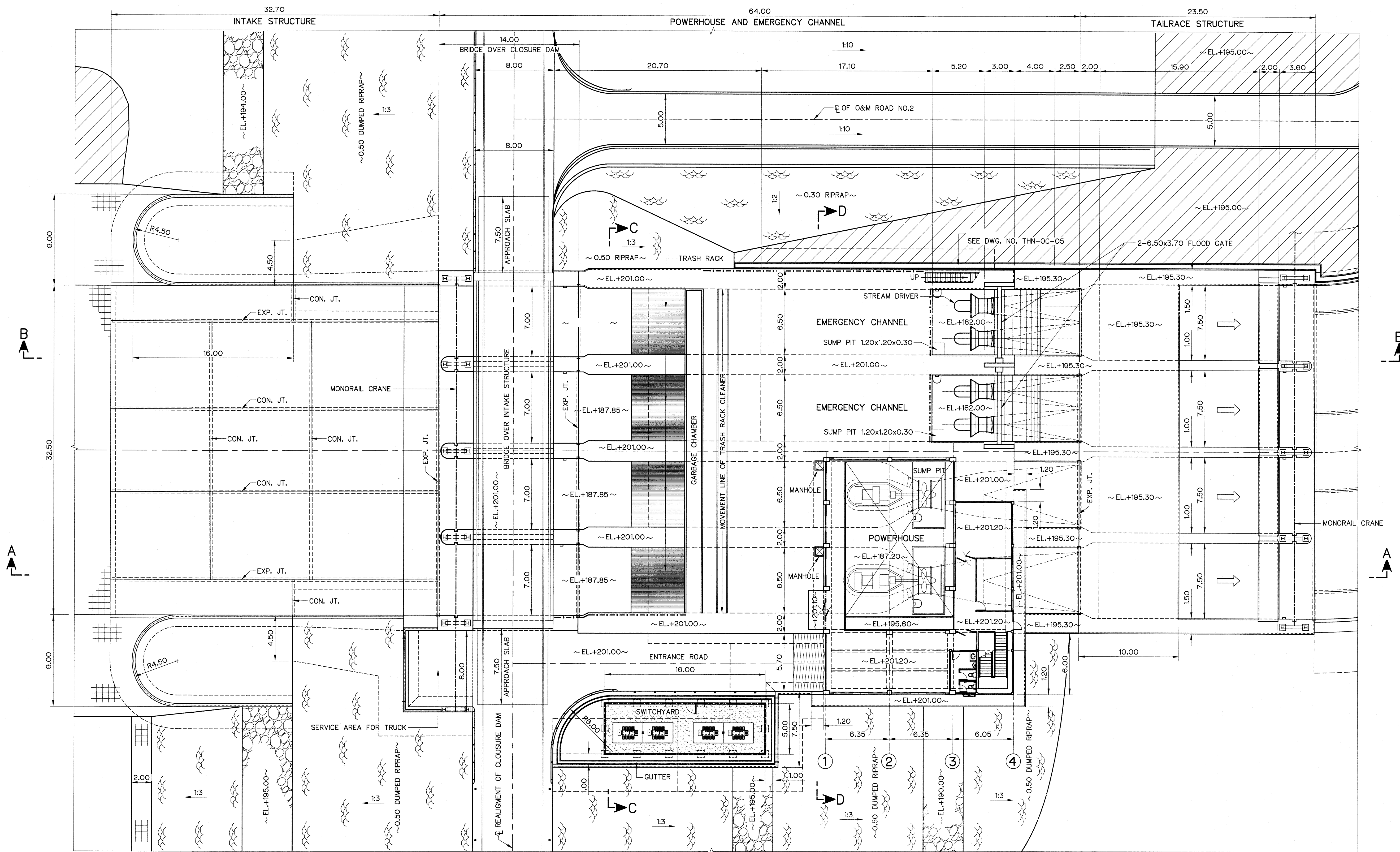
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. THN-GN-04
3. CONCRETE OF WEIR STRUCTURE TO BE MIN. 28 DAYS STANDARD CYLINDER COMPRESSIVE STRENGTH OF 240 KSC.
4. SPACING OF HANDRAIL CAN BE ADJUSTED IN THE FIELD TO FIT WITH THE STRUCTURE BY CONTRACTOR AND APPROVED BY ENGINEER.
5. INTAKE STRUCTURE SHALL BE PLACED ON BED ROCK FOUNDATION, OTHER MATERIALS SHALL BE REMOVED AND BACKFILLED WITH LEAN CONCRETE AND THE LEAN CONCRETE SHALL HAVE THE COMPRESSIVE STRENGTH OF 140 KSC. FOR STANDARD CYLINDER AT 28 DAYS.
6. ALLOWABLE BEARING CAPACITY OF FOUNDATION NOT LESS THAN 25 TON/M.²
7. IMPERVIOUS SOIL AS DETERMINING BY UNIFIED SOIL CLASSIFICATION SHALL BE GC, SC, CL OR ML.
8. THE MATERIL USED TO COMPACT FILL OR BACKFILL SHALL BE NONDISPESIVE SOIL ACCORDING TO PINHOLE TEST.
9. IMPERVIOUS ZONE MUST BE COMPACTED TO 98% STANDARD PROCTOR COMPACTION TEST.

REFERENCE DRAWINGS :

1. INTAKE STRUCTURE, PLAN AND SECTION A-A THN-IS-01



KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO – MECHANICAL EQUIPMENT INTAKE STRUCTURE SECTION F-F AND G-G	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD. DESIGNED: 28.6650 DRAWN: 28.6651 CHECKED: 28.6651 PROJECT MANAGER: 28.6651	REVIEWED: 28.6652 SUBMITTED: 28.6652 RECOMMENDED: 28.6651 APPROVED: 28.6651 DATE: 6/9/2024
CONSULTANTS DEDE	DRAWING NO. THN-IS-04 SHEET NO. 12 OF 37



NOTES :

- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. THN-GN-04
- CONCRETE OF WEIR STRUCTURE TO BE MIN. 28 DAYS STANDARD CYLINDER COMPRESSIVE STRENGTH OF 240 KSC.
- SPACING OF HANDRAIL CAN BE ADJUSTED IN THE FIELD TO FIT WITH THE STRUCTURE BY CONTRACTOR AND APPROVED BY ENGINEER.
- THE BUILDING SHALL BE PLACED ON BED ROCK FOUNDATION, OTHER MATERIALS SHALL BE REMOVED AND BACKFILLED WITH LEAN CONCRETE AND THE LEAN CONCRETE SHALL HAVE THE COMPRESSIVE STRENGTH OF 140 KSC. FOR STANDARD CYLINDER AT 28 DAYS.
- ALLOWABLE BEARING CAPACITY NOT LESS THAN 40 TON/m²

SYMBOLS

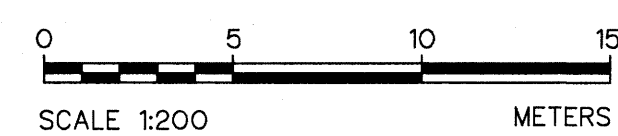
- HANDRAIL TYPE "1"
- - - - - HANDRAIL TYPE "2"

REFERENCE DRAWINGS:

- | | |
|---|-----------|
| 1. GENERAL, GENERAL LAY-OUT OF PROJECT | THN-GN-02 |
| 2. POWERHOUSE AND EMERGENCY CHANNEL, SECTIONS & DETAILS 1/3 | THN-PH-02 |
| 3. POWERHOUSE AND EMERGENCY CHANNEL, SECTIONS & DETAILS 2/3 | THN-PH-03 |
| 4. POWERHOUSE AND EMERGENCY CHANNEL, SECTIONS & DETAILS 3/3 | THN-PH-04 |

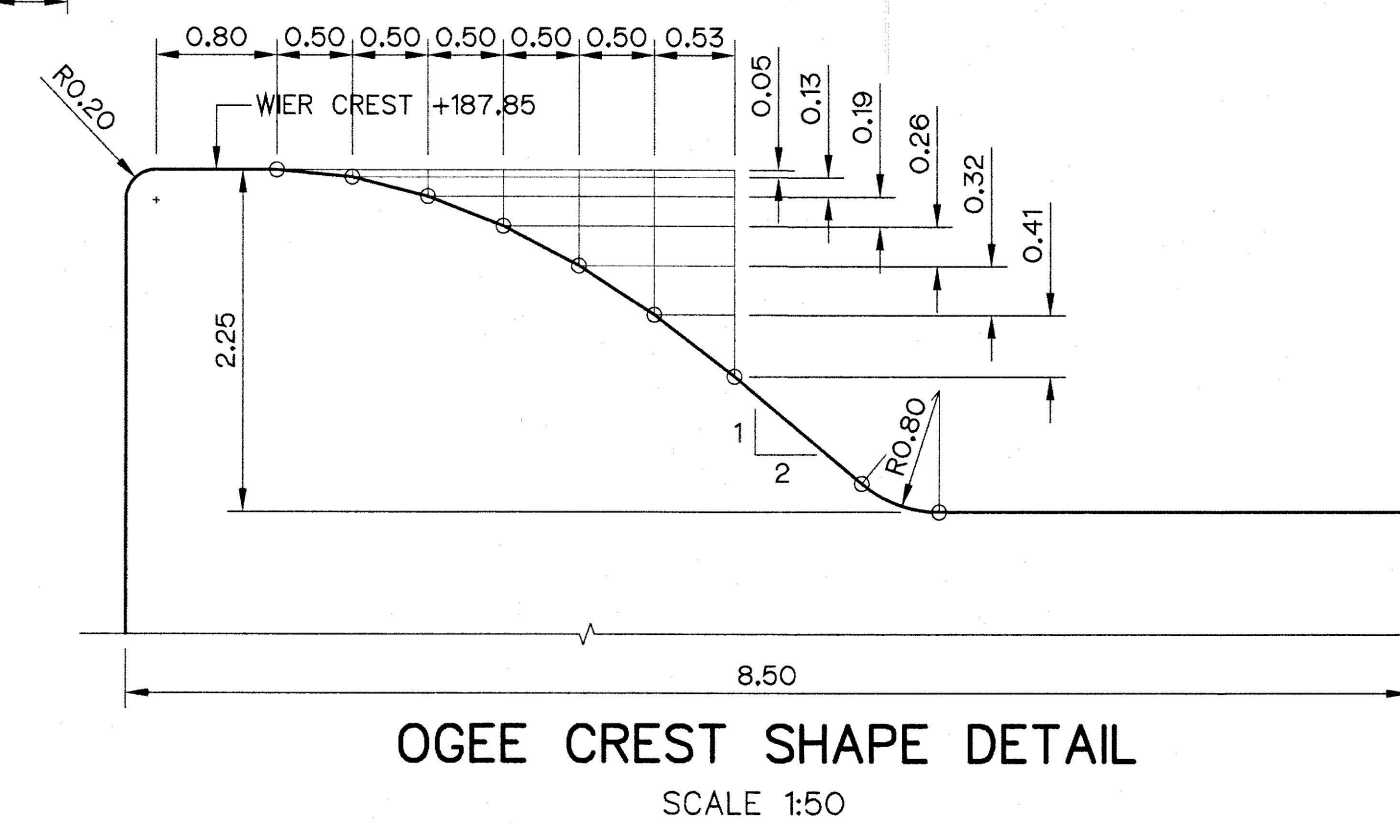
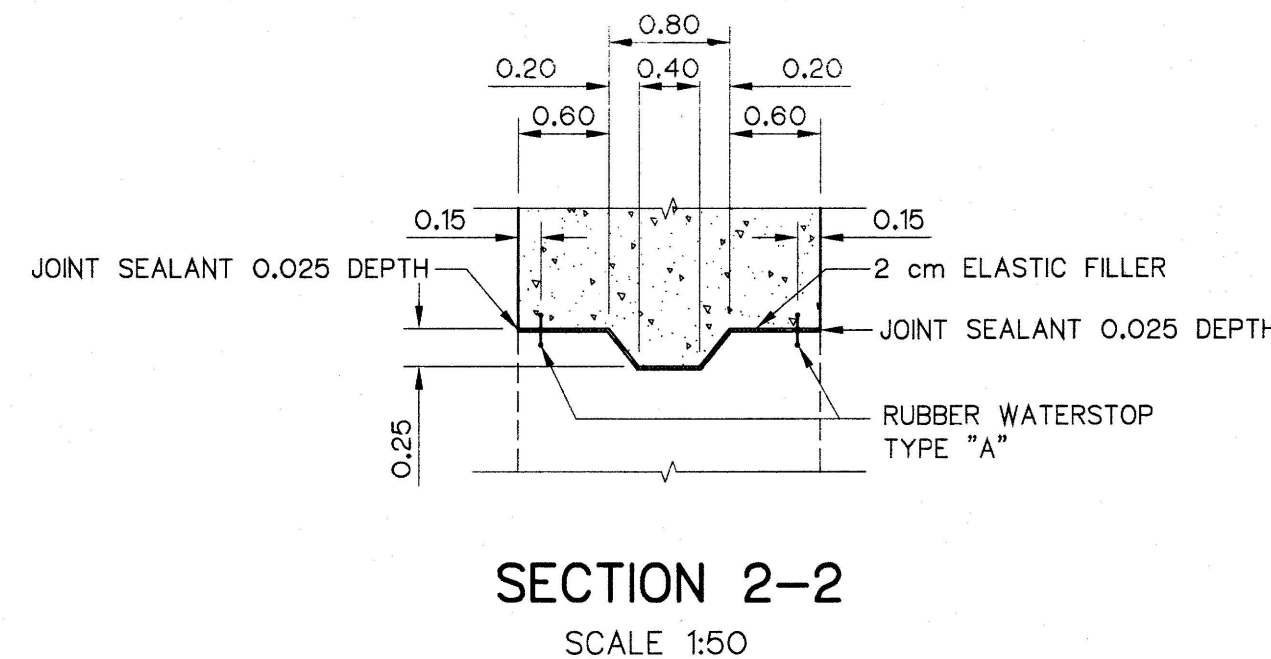
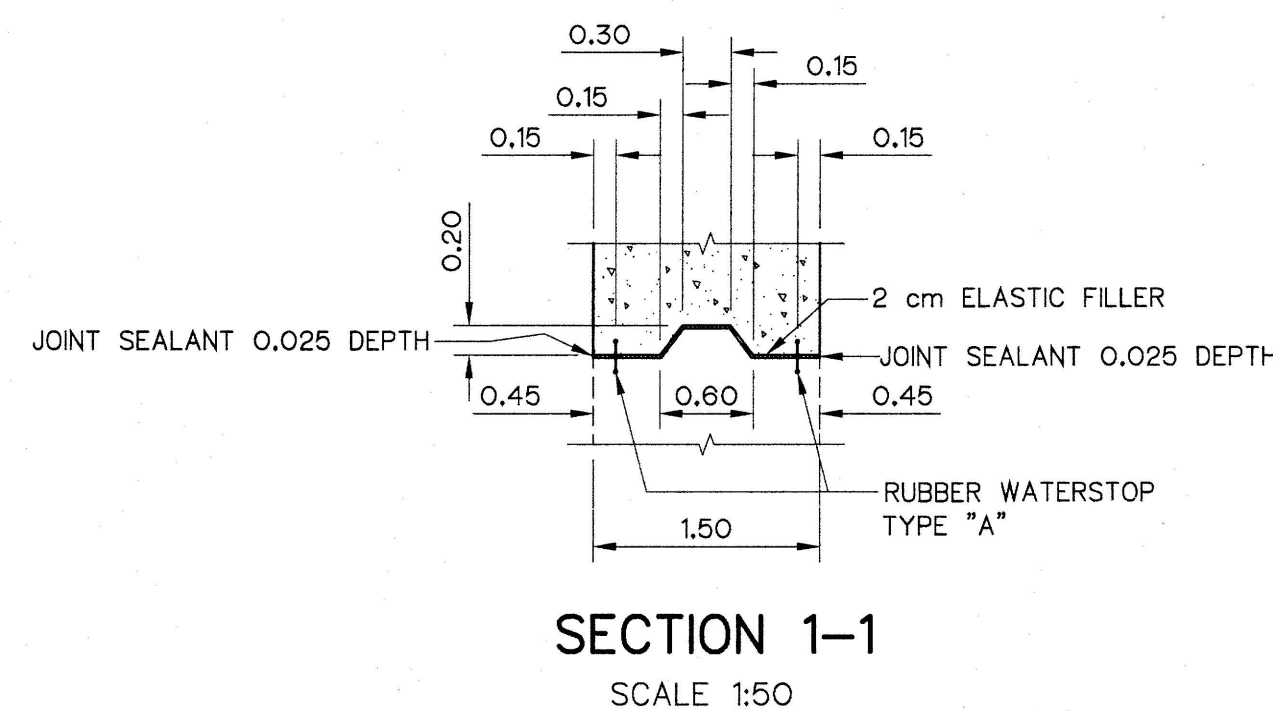
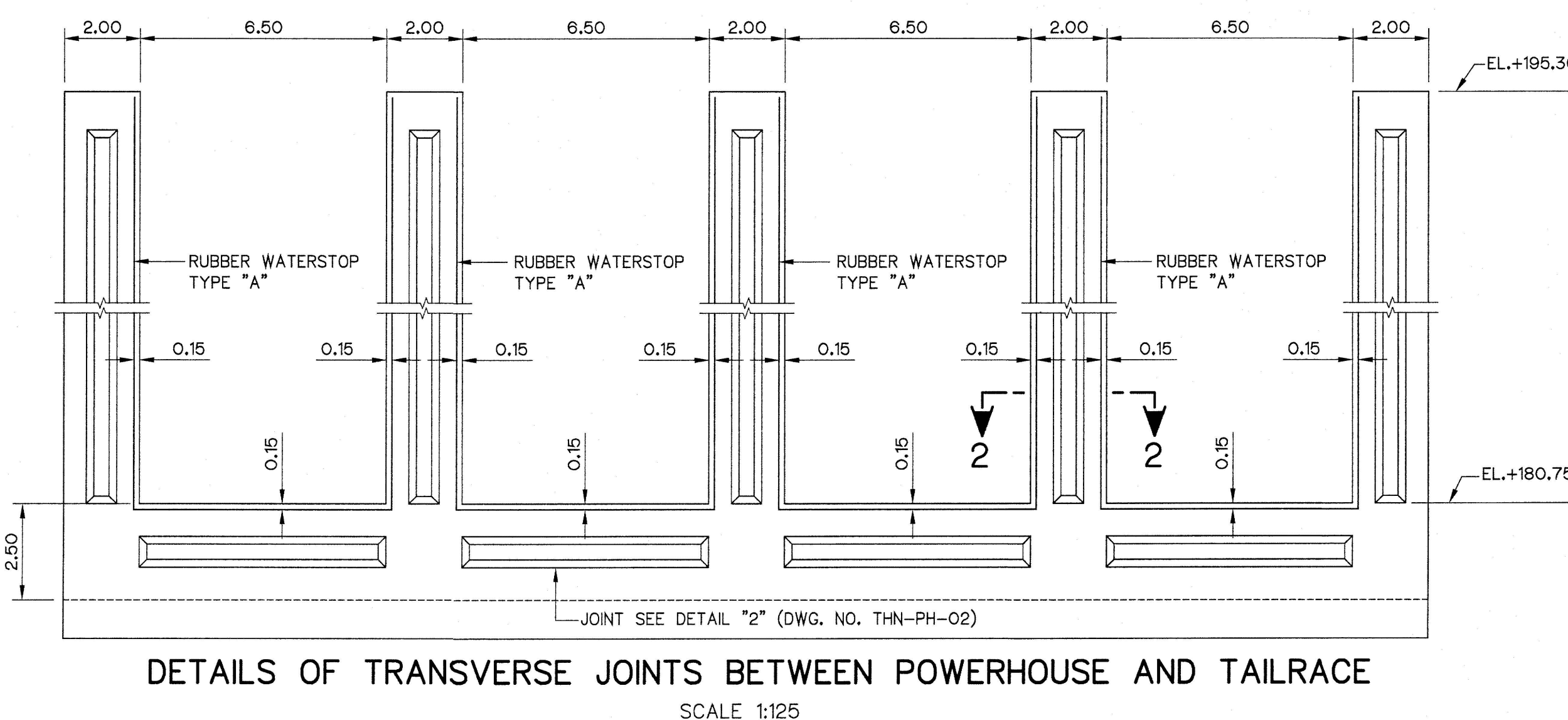
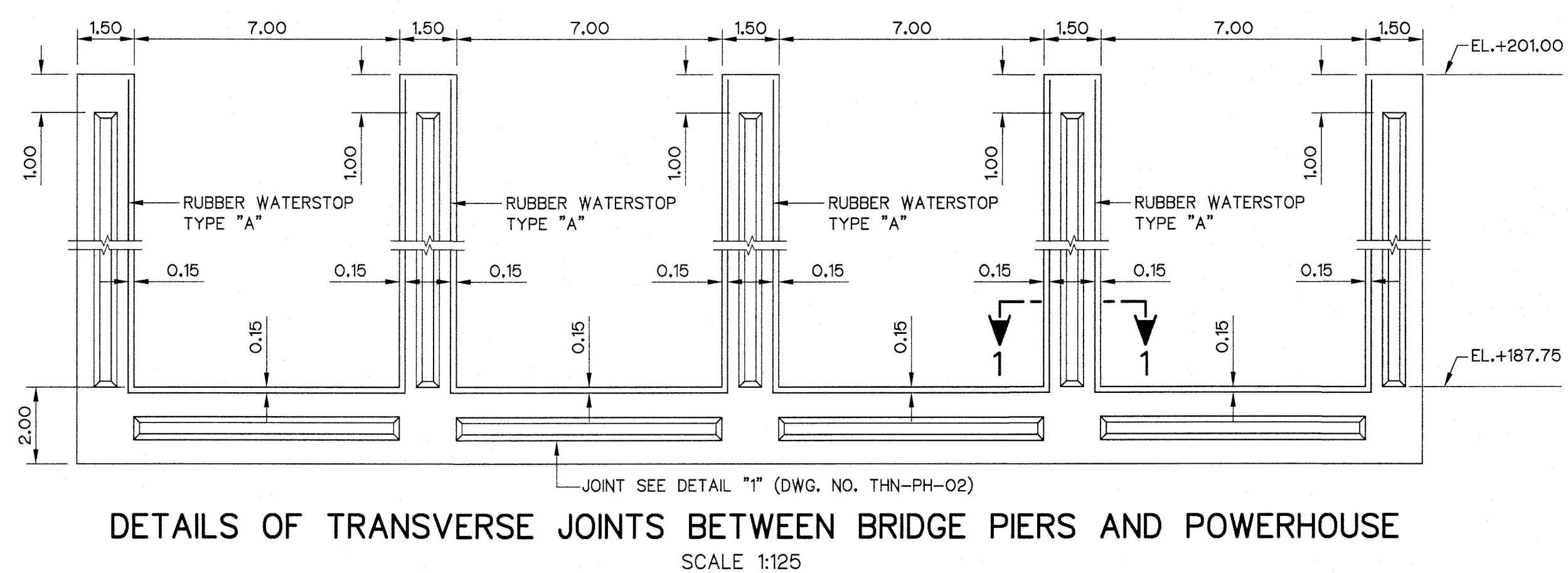
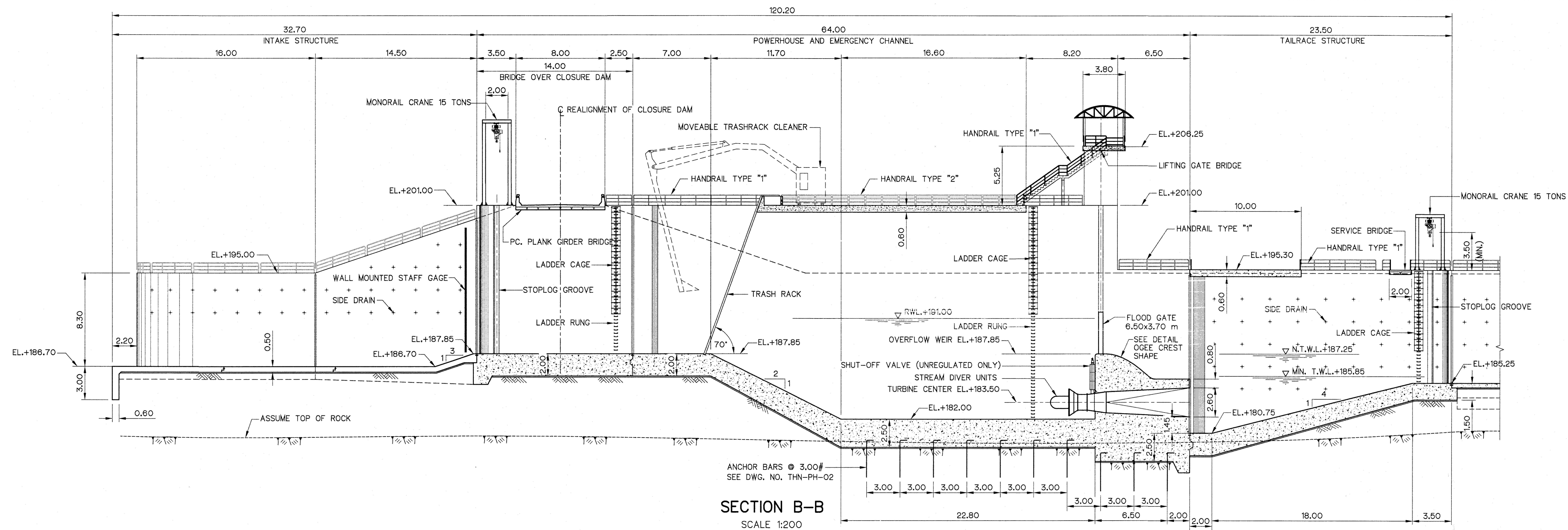
GENERAL PLAN

SCALE 1:200



3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
		CONSULTANTS	DEDE	

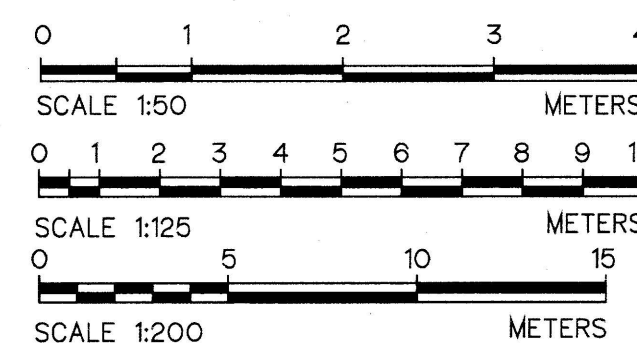
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO - MECHANICAL EQUIPMENT POWERHOUSE AND EMERGENCY CHANNEL GENERAL PLAN	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
REVIEWED	SUBMITTED
DESIGNED	RECOMMENDED
DRAWN	APPROVED
CHECKED	DATE
PROJECT MANAGER	DATE
THN-PH-01	13 OF 37

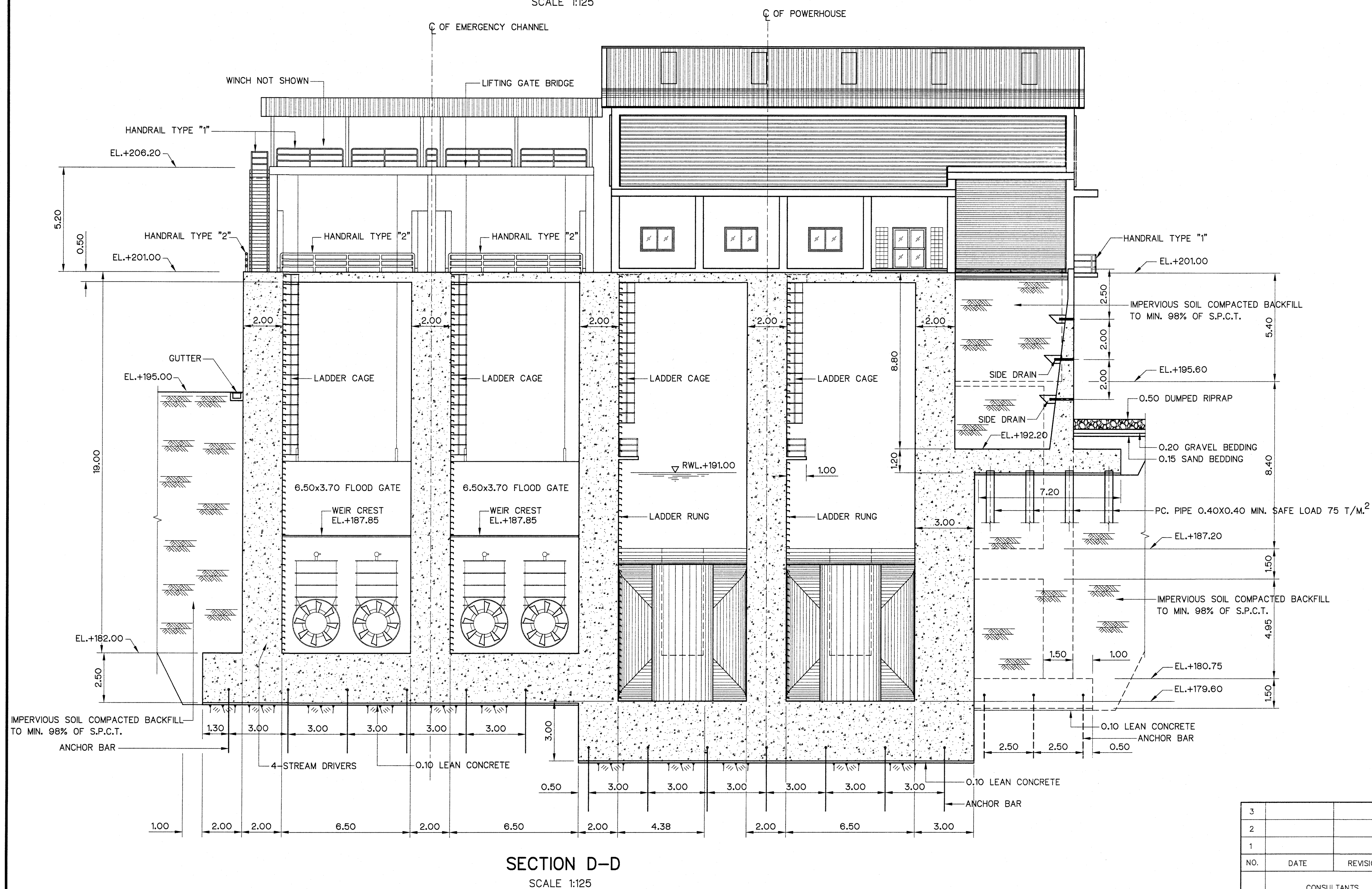
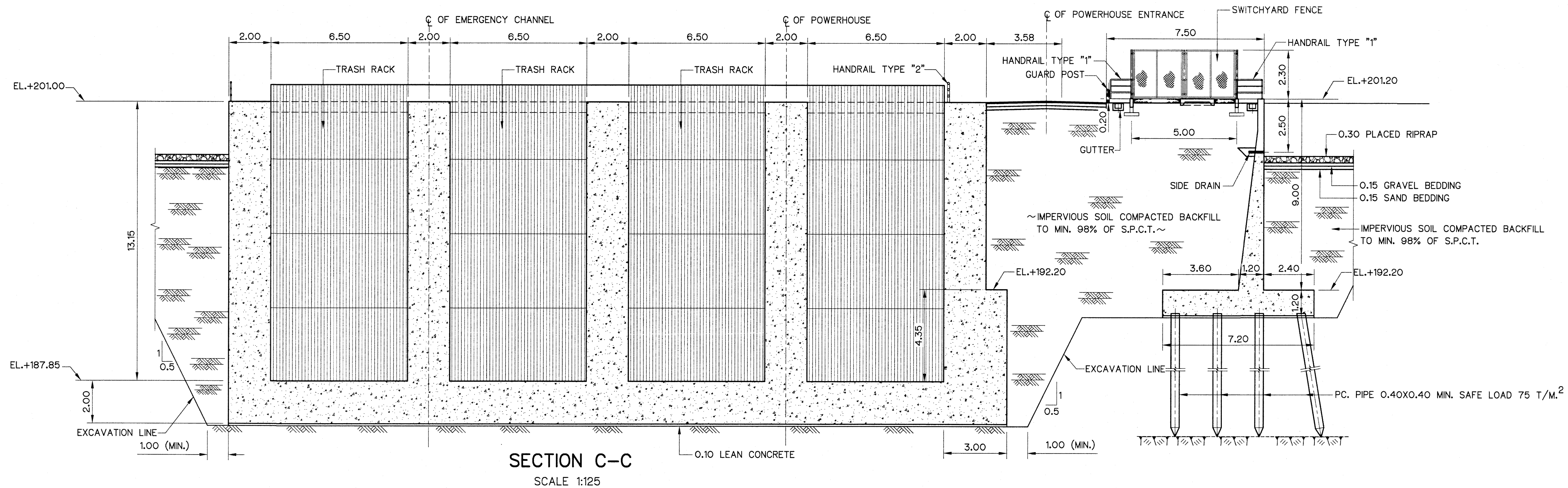


- NOTES:
- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
 - SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. THN-GN-04

- REFERENCE DRAWINGS:
- POWERHOUSE AND EMERGENCY CHANNEL, GENERAL PLAN THN-PH-01
 - POWERHOUSE AND EMERGENCY CHANNEL, SECTIONS AND DETAILS 3/3 THN-PH-04

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO - MECHANICAL EQUIPMENT POWERHOUSE AND EMERGENCY CHANNEL SECTIONS AND DETAILS 2/3	
DESIGNED DRAWN CHECKED PROJECT MANAGER	REVIEWED SUBMITTED RECOMMENDED APPROVED DATE 6/9/2024
NO. 3 DATE REVISIONS CHECKED APPROVED CONSULTANTS DEDE	SHEET NO. THN-PH-03 15 OF 37



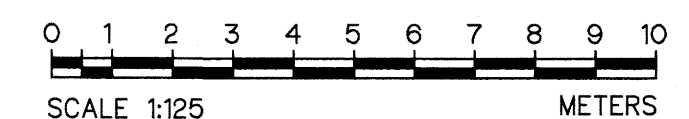


NOTES :

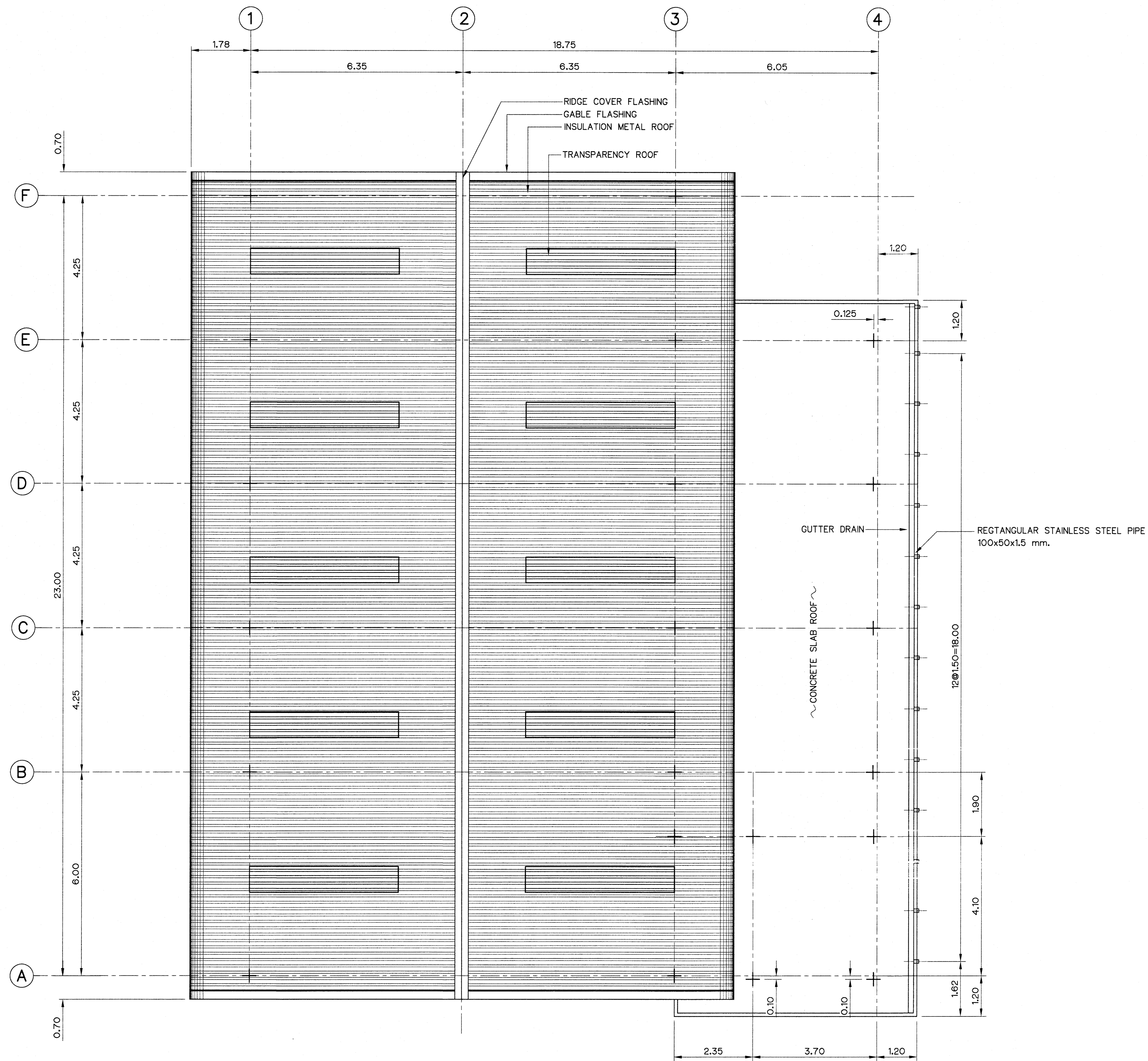
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. THN-GN-04
3. IMPERVIOUS SOIL AS DETERMINING BY UNIFIED SOIL CLASSIFICATION SHALL BE GC, SC, CL OR ML.
4. THE MATERIAL USED TO COMPACT FILL OR BACKFILL SHALL BE NONDISPESIVE SOIL ACCORDING TO PINHOLE TEST.
5. IMPERVIOUS ZONE MUST BE COMPACTED TO 98% STANDARD PROCTOR COMPACTION TEST.

REFERENCE DRAWINGS:

1. POWERHOUSE AND EMERGENCY CHANNEL, GENERAL PLAN THN-PH-01



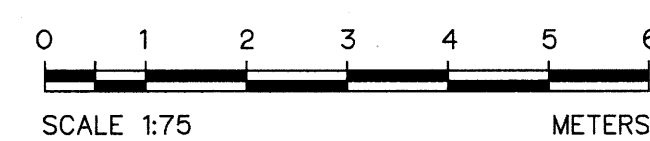
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO - MECHANICAL EQUIPMENT POWERHOUSE AND EMERGENCY CHANNEL SECTIONS AND DETAILS 3/3	
FRONTIER ENGINEERING CONSULTANTS CO., LTD. DESIGNED: 22.6650 22.6651 DRAWN: 22.6651 CHECKED: 22.6651 PROJECT MANAGER: 6/9/2024	DEPARTMENT OF ALTERNATIVE ENERGY DEVELOPMENT AND EFFICIENCY MINISTRY OF ENERGY REVIEWED: 22.6651 SUBMITTED: 22.6651 RECOMMENDED: 22.6651 APPROVED: 22.6651 DATE: 6/9/2024
CONSULTANTS DEDE	DRAWING NO. THN-PH-04 SHEET NO. 16 OF 37



- NOTES :
1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
 2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. THN-GN-04
 3. INSULATION METAL ROOF, THE THICKNESS OF BASE METAL INCLUDING THE COATING LAYER AND PAINT LAYER IS NOT LESS THAN 0.5 mm

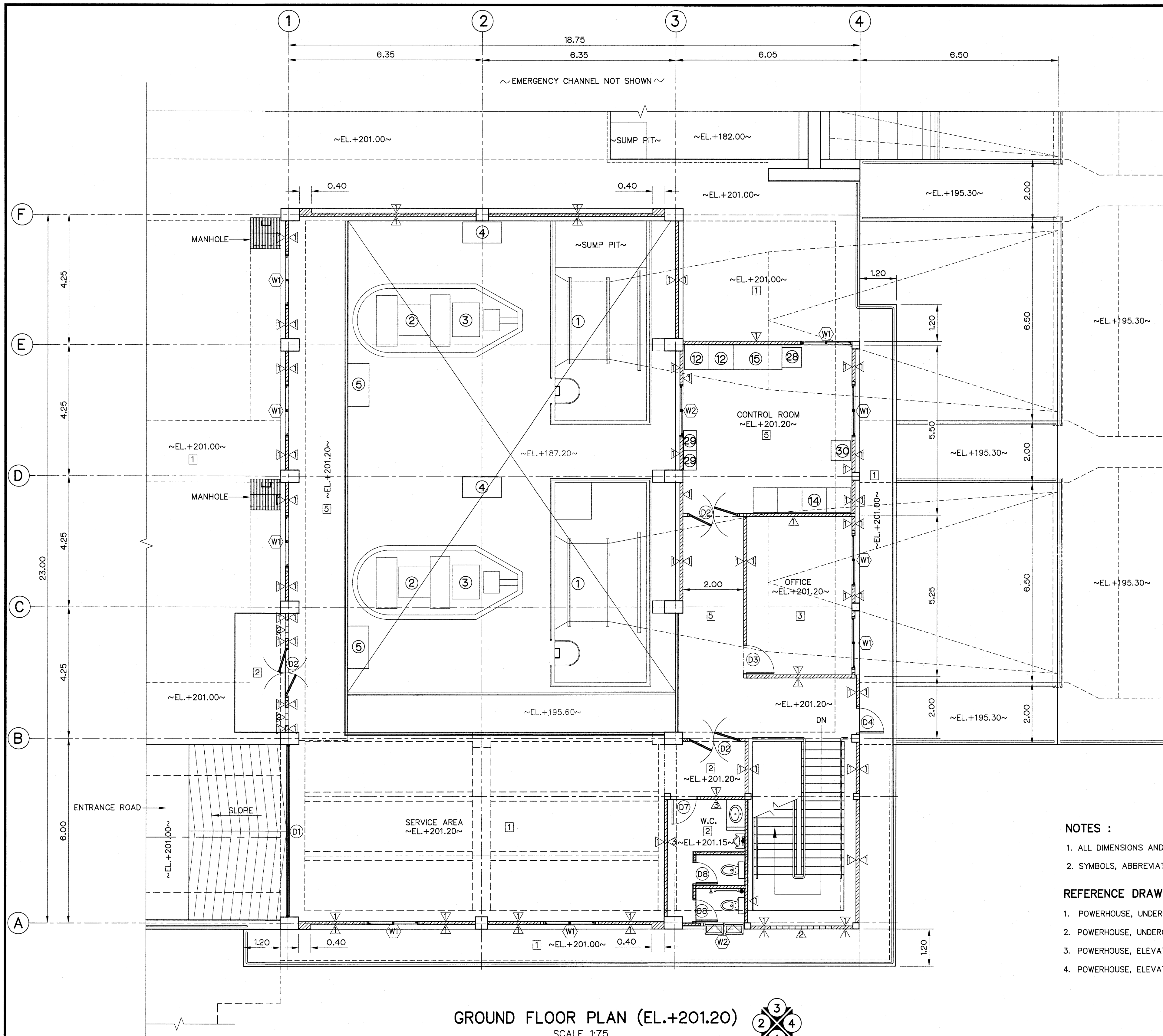
- REFERENCE DRAWINGS:
1. POWERHOUSE AND EMERGENCY CHANNEL, GENERAL PLAN THN-PH-01
 2. POWERHOUSE, GROUND FLOOR PLAN (EL.+201.20) AND MANHOLE DETAILS THN-PH-06

ROOF PLAN
SCALE 1:75



3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS		DEDE		

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO – MECHANICAL EQUIPMENT POWERHOUSE AND EMERGENCY CHANNEL POWERHOUSE ROOF PLAN	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	REVIEWED
DESIGNED 281.6650 2mm 18.88523	SUBMITTED
DRAWN	RECOMMENDED
CHECKED 281.6651	APPROVED
PROJECT MANAGER 6/9/2024	DRAWING NO. THN-PH-05
DATE	SHEET NO. 17 OF 37



DESCRIPTIONS :

- ① KAPLAN TURBINE
- ② GENERATOR
- ③ SPEED INCREASER
- ④ HYDRAULIC POWER UNIT
- ⑤ TURBINE-GOVERNOR CONTROL BOARD
- ⑥ LUBRICATION OIL SYSTEM
- ⑦ COOLING WATER SYSTEM
- ⑧ DRAINAGE CONTROL BOARD
- ⑨ AIR COMPRESSOR
- ⑩ OIL STORAGE TANK

- ⑪ WORKSHOP
- ⑫ CONTROL PANEL FOR FLOOD GATE
- ⑬ BATTERY AND RACK
- ⑭ MAIN CONTROL SWITCHBOARD
- ⑮ AC AND DC SWITCHBOARD AND BATTERY CHARGER CUBICLE
- ⑯ SCADA SWITCH RACK
- ⑰ FIRE ALARM CONTROL PANEL (FCP) AND GRAPHIC ANNUNCIATOR
- ⑱ CCTV SWITCH RACK

SYMBOLS :

- ↗ EXHAUST FAN
- ❄ AIR CONDITIONING
- 🚨 EMERGENCY LAMP
- ⊞ BLOCK OUT
- ⊞ CEILING EXHAUST FAN

FLOOR FINISH SYMBOLS :

- ① COARSE FINISHED
 - ② 0.40x0.40 NON SLIP CERAMIC FLOOR TILES
 - ③ 0.40x0.40 CERAMIC FLOOR TILES
 - ④ 0.60x0.60 CERAMIC FLOOR TILES
 - ⑤ COATED WITH EPOXY RESIN
- FLOOR FINISH BOUNDARY

WALL MATERIALS AND FINISH SYMBOLS :

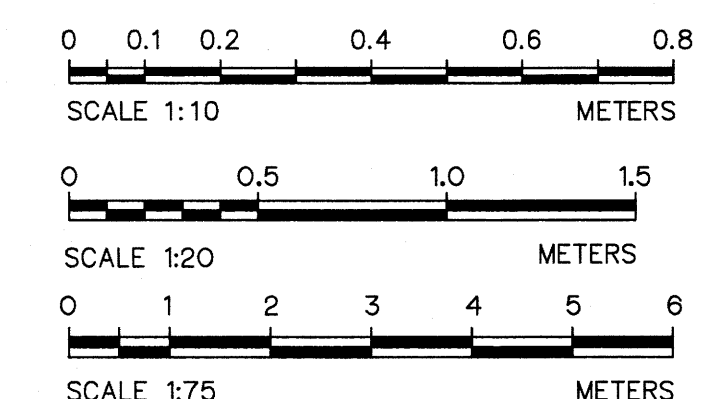
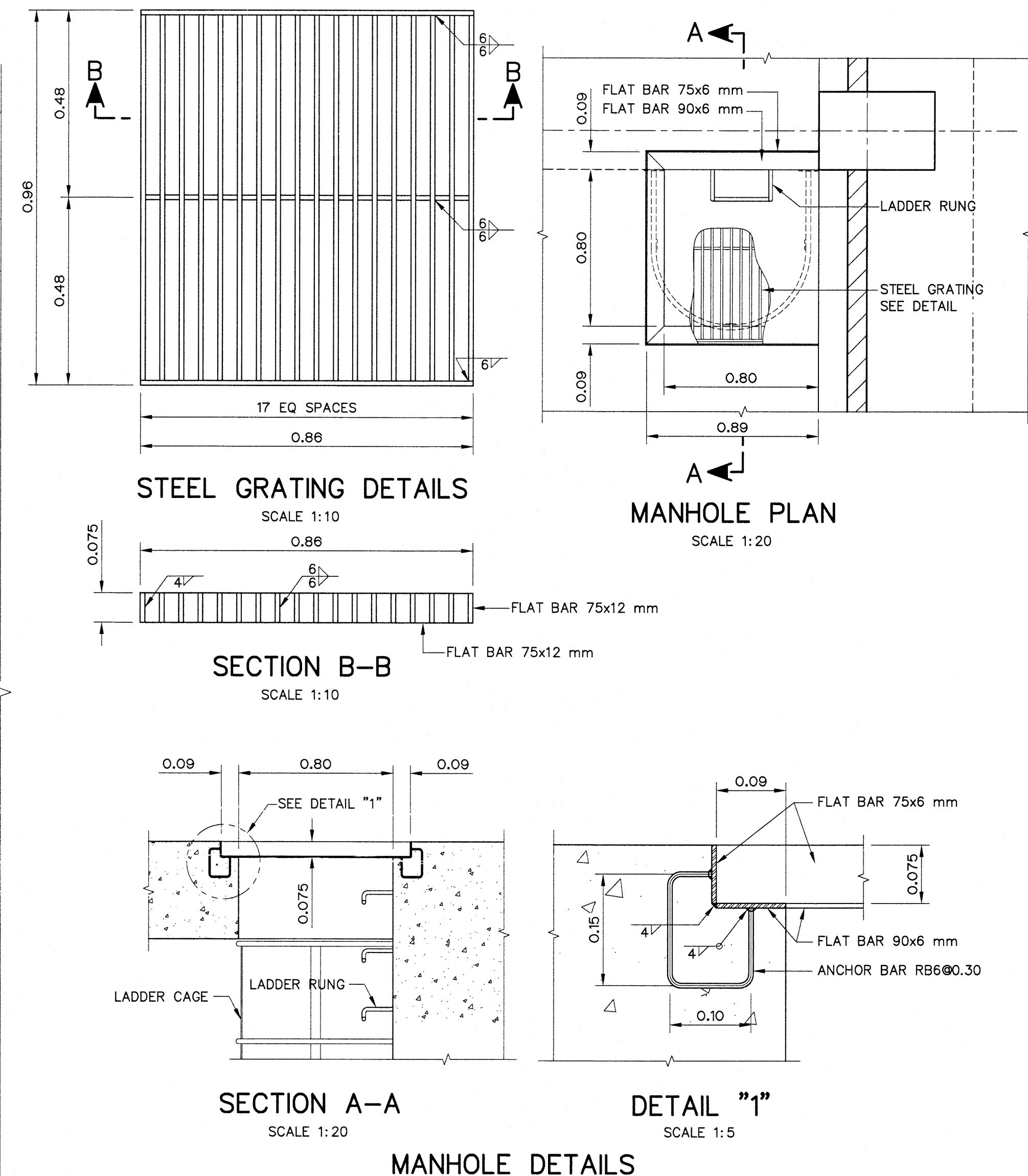
- ⚠ MASONRY WALLS PLASTERING W/PAINT
- ⚠ GLASS BLOCK
- ⚠ MASONRY WALLS WITH 0.20x0.40 CERAMIC TILES
- ⚠ MASONRY WALLS PLASTERING UNPAINTED
- ⚠ EXPOSED CONCRETE W/PAINT
- ⚠ EXPOSED CONCRETE UNPAINTED
- ⚠ METAL LOUVER
- ⚠ MASONRY WALL

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. THN-GN-04

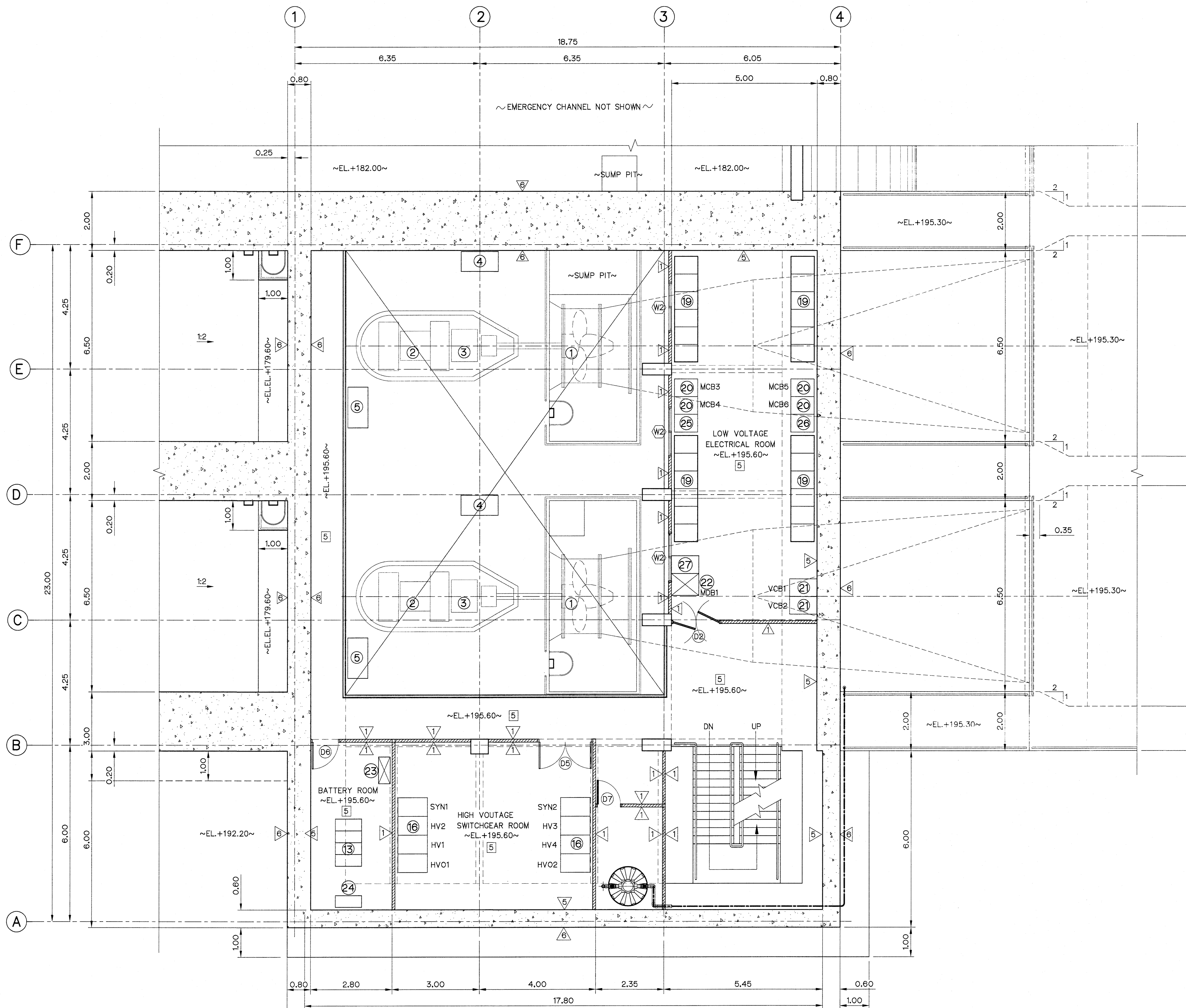
REFERENCE DRAWINGS :

1. POWERHOUSE, UNDERGROUND FLOOR PLAN (EL.+195.60) THN-PH-07
2. POWERHOUSE, UNDERGROUND FLOOR PLAN (EL.+187.20) THN-PH-08
3. POWERHOUSE, ELEVATION 1 THN-PH-09
4. POWERHOUSE, ELEVATION 2, 3 AND 4 THN-PH-10

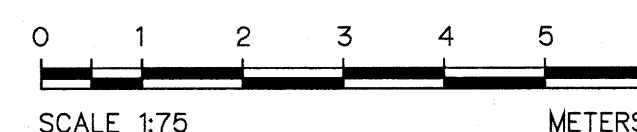


KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO - MECHANICAL EQUIPMENT POWERHOUSE AND EMERGENCY CHANNEL POWERHOUSE GROUND FLOOR PLAN (EL.+201.20) AND MANHOLE DETAILS	
FRONTIER ENGINEERING CONSULTANTS CO., LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED <i>[Signature]</i> 251.6650 Dmm 118.88523	REVIEWED <i>[Signature]</i>
DRAWN <i>[Signature]</i>	RECOMMENDED <i>[Signature]</i>
CHECKED <i>[Signature]</i> 251.6651	APPROVED <i>[Signature]</i>
PROJECT MANAGER <i>[Signature]</i> 6/9/2024	DRAWING NO. THN-PH-06
DATE	SHEET NO. 18 OF 37

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS		DEDE		



1st BASEMENT PLAN (EL.+195.60)
SCALE 1:75



DESCRIPTIONS :

- 1 KAPLAN TURBINE
- 2 GENERATOR
- 3 SPEED INCREASER
- 4 HYDRAULIC POWER UNIT
- 5 TURBINE-GOVERNOR CONTROL BOARD
- 6 LUBRICATION OIL SYSTEM
- 7 COOLING WATER SYSTEM
- 8 DRAINAGE CONTROL BOARD
- 9 AIR COMPRESSOR
- 10 OIL STORAGE TANK
- 11 WORKSHOP
- 12 CONTROL PANEL FOR FLOOD GATE
- 13 BATTERY AND RACK
- 14 MAIN CONTROL SWITCHBOARD
- 15 AC AND DC SWITCHBOARD AND BATTERY CHARGER CUBICLE
- 16 HIGH VOLTAGE SWITCHGEAR 22 KV.
- 17 TRANSFORMER
- 18 AXIAL FLOW TURBINE
- 19 ELECTRICAL SYSTEM CONTAINER FOR AXIAL FLOW TURBINE
- 20 MCBX PANEL (X=3, 4, 5, 6) 0.4 KV. FOR AXIAL FLOW GENERATOR (G3,G4,G5,G6)
- 21 VCBX PANEL (X=1, 2) 3.3 KV. FOR MAIN GENERATOR (G1, G2)
- 22 MDB1 (MAIN DISTRIBUTION BOARD 1)
- 23 BDB (BATTERY DISTRIBUTION BOARD)
- 24 UPS & DC (UNINTERRUPTIBLE POWER SUPPLY AND BATTERY CHARGER)
- 25 TS1 (TRANSFER SWITCH NO.1)
- 26 TS2 (TRANSFER SWITCH NO.2)
- 27 TS3 (TRANSFER SWITCH NO.3)
- 28 SCADA SWITCH RACK
- 29 FIRE ALARM CONTROL PANEL (FCP) AND GRAPHIC ANNUNCIATOR
- 30 CCTV SWITCH RACK

SYMBOLS :

- EXHAUST FAN
- AIR CONDITIONING
- EMERGENCY LAMP
- BLOCK OUT
- CEILING EXHAUST FAN

FLOOR FINISH SYMBOLS :

- 1 COARSE FINISHED
- 2 0.40x0.40 NON SLIP CERAMIC FLOOR TILES
- 3 0.40x0.40 CERAMIC FLOOR TILES
- 4 0.60x0.60 CERAMIC FLOOR TILES
- 5 COATED WITH EPOXY RESIN
- FLOOR FINISH BOUNDARY

WALL MATERIALS AND FINISH SYMBOLS :

- MASONRY WALLS PLASTERING W/PAIN
- GLASS BLOCK
- MASONRY WALLS WITH 0.20x0.40 CERAMIC TILES
- MASONRY WALLS PLASTERING UNPAINTED
- EXPOSED CONCRETE W/PAIN
- EXPOSED CONCRETE UNPAINTED
- METAL LOUVER
- MASONRY WALL

CEILING :

- 1 METAL PANEL, LYSAGHT PANELRIP MODEL OR EQUIVALENT
- 2 9 mm THK. GYPSUM BOARD WITH STEEL FRAME W/PAIN
- 3 9 mm THK. MOISTURE-RESISTANT GYPSUM BOARD ON ALUMINIUM T-BAR FRAME
- 4 EXPOSED CONCRETE SMOOTH SURFACE W/PAIN
- 5 EXPOSED CONCRETE SMOOTH SURFACE UNPAINTED

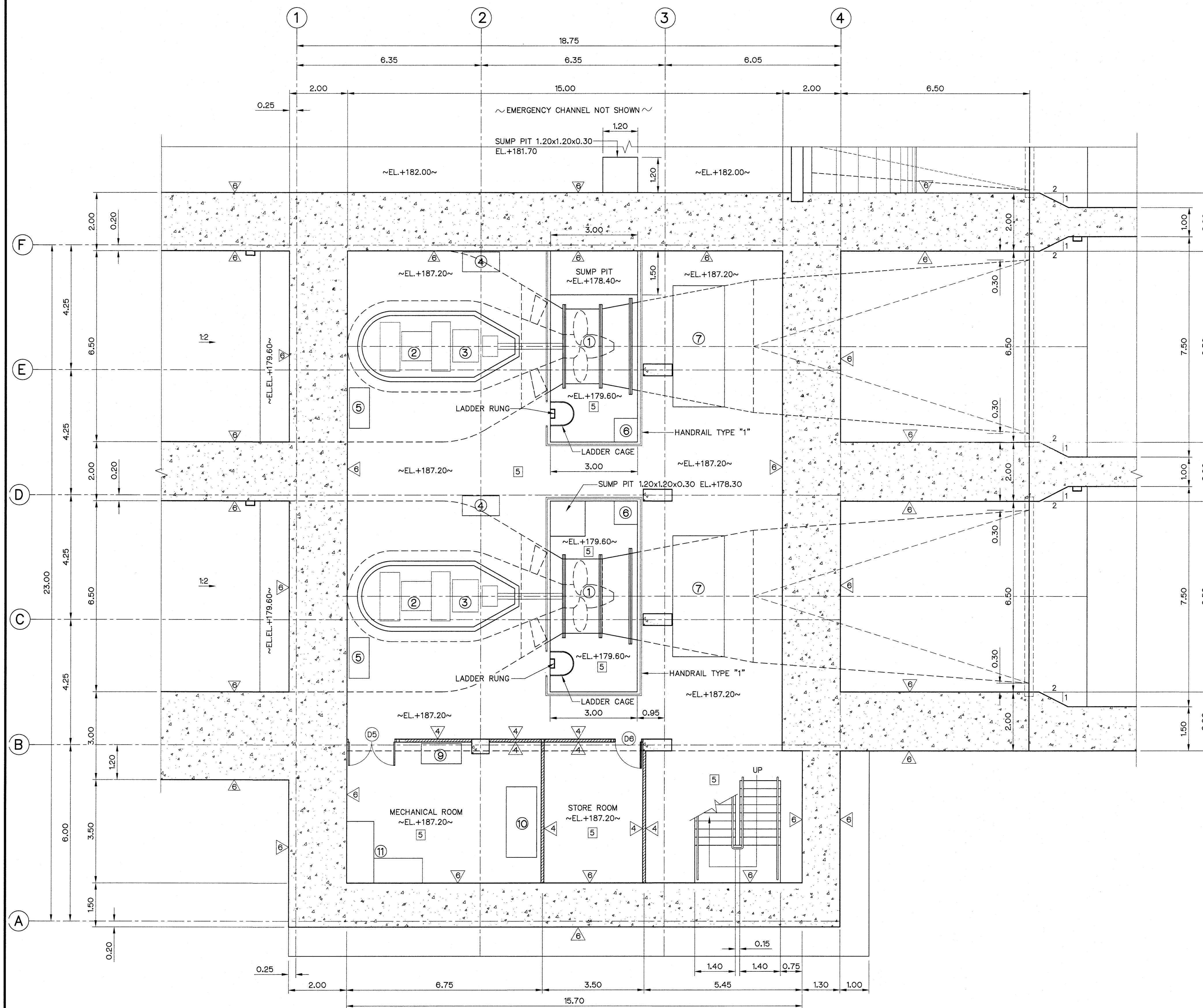
NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. THN-GN-04

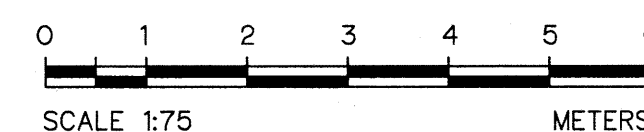
REFERENCE DRAWINGS :

1. POWERHOUSE, GROUND FLOOR PLAN (EL.+201.20) THN-PH-06
2. POWERHOUSE, 2nd BASEMENT PLAN (EL.+187.20) THN-PH-08

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO - MECHANICAL EQUIPMENT POWERHOUSE AND EMERGENCY CHANNEL POWERHOUSE 1st BASEMENT PLAN (EL.+195.60)	
FRONTIER ENGINEERING CONSULTANTS CO., LTD.	REVIEWED
DESIGNED	SUBMITTED
DRAWN	RECOMMENDED
CHECKED	APPROVED
PROJECT MANAGER	DRAWING NO. THN-PH-07
DATE 6/9/2024	SHEET NO. 19 OF 37



2nd BASEMENT PLAN (EL.+187.20)
SCALE 1:75



DESCRIPTIONS :

- ① KAPLAN TURBINE
- ② GENERATOR
- ③ SPEED INCREASER
- ④ HYDRAULIC POWER UNIT
- ⑤ TURBINE-GOVERNOR CONTROL BOARD
- ⑥ LUBRICATION OIL SYSTEM
- ⑦ COOLING WATER SYSTEM
- ⑧ DRAINAGE CONTROL BOARD
- ⑨ AIR COMPRESSOR
- ⑩ OIL STORAGE TANK
- ⑪ WORKSHOP

SYMBOLS :

- ⊕ EXHAUST FAN
- ⊕ AIR CONDITIONING
- ⊕ EMERGENCY LAMP
- ⊕ BLOCK OUT
- ⊕ CEILING EXHALST FAN

FLOOR FINISH SYMBOLS :

- ① COARSE FINISHED
- ② 0.40x0.40 NON SLIP CERAMIC FLOOR TILES
- ③ 0.40x0.40 CERAMIC FLOOR TILES
- ④ 0.60x0.60 CERAMIC FLOOR TILES
- ⑤ COATED WITH EPOXY RESIN
- FLOOR FINISH BOUNDARY

WALL MATERIALS AND FINISH SYMBOLS :

- ① MASONRY WALLS PLASTERING W/PAIN
- ② GLASS BLOCK
- ③ MASONRY WALLS WITH 0.20x0.40 CERAMIC TILES
- ④ MASONRY WALLS PLASTERING UNPAINTED
- ⑤ EXPOSED CONCRETE W/PAIN
- ⑥ EXPOSED CONCRETE UNPAINTED
- ⑦ METAL LOUVER
- ⑧ MASONRY WALL

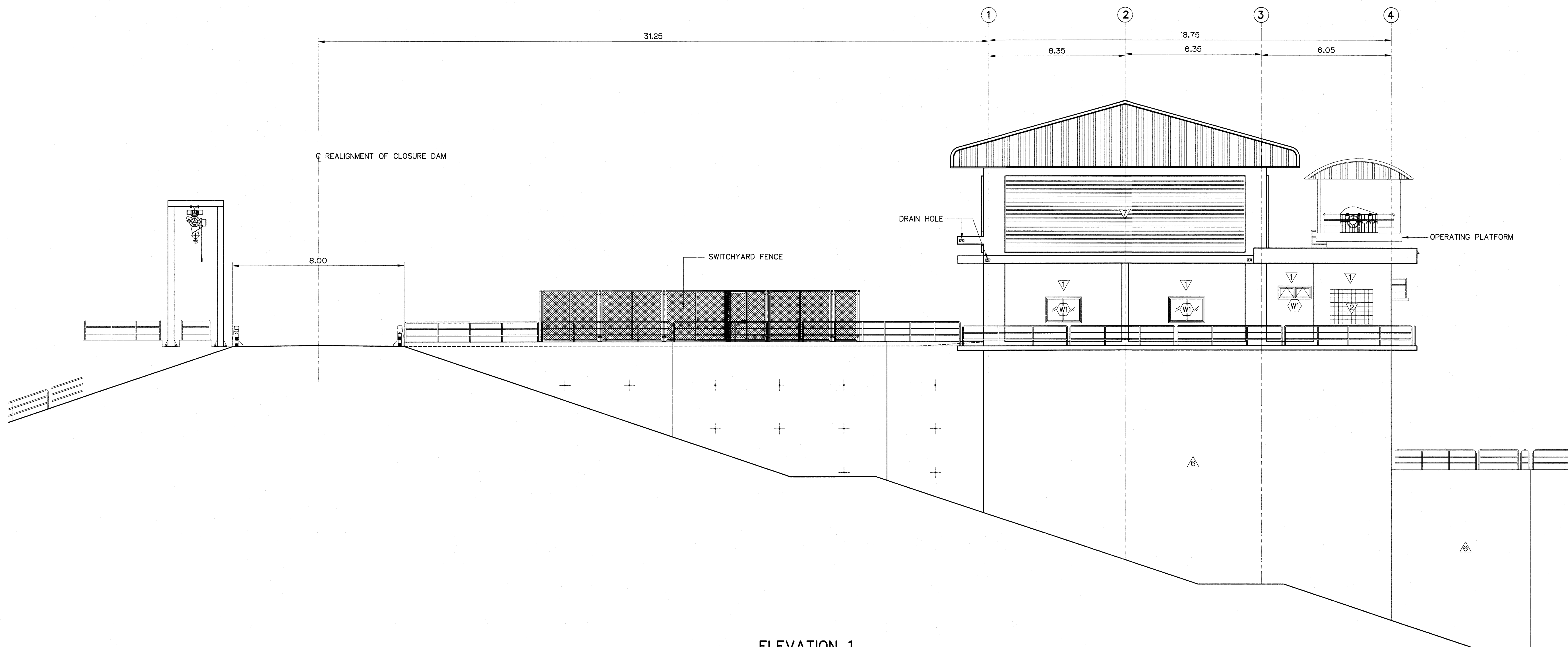
CEILING :

- ① METAL PANEL, LYSAGHT PANELRIP MODEL OR EQUIVALENT
- ② 9 mm THK. GYPSUM BOARD WITH STEEL FRAME W/PAINT
- ③ 9 mm THK. MOISTURE-RESISTANT GYPSLM BOARD ON ALUMINIUM T-BAR FRAME
- ④ EXPOSED CONCRETE SMOOTH SURACE W/PAINT
- ⑤ EXPOSED CONCRETE SMOOTH SURACE UNPAINTED

REFERENCE DRAWINGS :

- | | |
|---|-----------|
| 1. POWERHOUSE, GROUND FLOOR PLAN (EL.+201.20) | THN-PH-06 |
| 2. POWERHOUSE, 1st BASEMENT PLAN (EL.+195.60) | THN-PH-07 |
| 3. POWERHOUSE, SECTION A-A | THN-PH-11 |
| 4. POWERHOUSE, SECTION B-B | THN-PH-12 |
| 5. POWERHOUSE, SECTION C-C | THN-PH-13 |
| 6. POWERHOUSE, SECTION D-D | THN-PH-14 |
| 7. POWERHOUSE, SECTION E-E | THN-PH-15 |
| 8. POWERHOUSE, SECTION F-F | THN-PH-16 |
| 9. POWERHOUSE, DETAIL OF DOORS, WINDOWS AND SIGNBOARD | THN-PH-19 |

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUANG NAN CHANGWAT NAN	
ELECTRO - MECHANICAL EQUIPMENT POWERHOUSE AND EMERGENCY CHANNEL POWERHOUSE 2nd BASEMENT PLAN (EL.+187.20)	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED 22.6650 22.6650 22.6650 22.6650	REVIEWED 22.6650 22.6650 22.6650 22.6650
DRAWN 22.6650 22.6650 22.6650 22.6650	SUBMITTED 22.6650 22.6650 22.6650 22.6650
CHECKED 22.6650 22.6650 22.6650 22.6650	RECOMMENDED 22.6650 22.6650 22.6650 22.6650
APPROVED 22.6650 22.6650 22.6650 22.6650	APPROVED 22.6650 22.6650 22.6650 22.6650
DATE 6/9/2024	DATE 6/9/2024
PROJECT MANAGER	DATE
CONSULTANTS	DEDE
DRAWING NO. THN-PH-08	SHEET NO. 20 OF 37



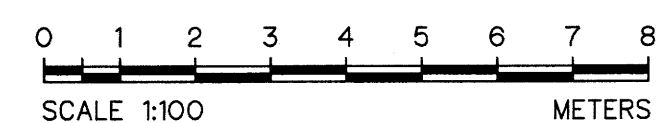
ELEVATION 1
SCALE 1:100

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. MNS-GN-04

REFERENCE DRAWINGS :

- | | |
|---|-----------|
| 1. POWERHOUSE AND EMERGENCY CHANNEL, GENERAL PLAN | THN-PH-01 |
| 2. POWERHOUSE, ROOF PLAN | THN-PH-05 |
| 3. POWERHOUSE, GROUND FLOOR PLAN (E.L.+201.20) | THN-PH-06 |



3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
		CONSULTANTS	DEDE	

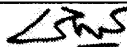
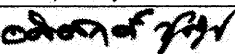
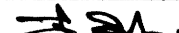
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO - MECHANICAL EQUIPMENT POWERHOUSE AND EMERGENCY CHANNEL POWERHOUSE ELEVATION 1	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	REVIEWED
DESIGNED 28.6650 28.6653	SUBMITTED
DRAWN	RECOMMENDED
CHECKED	APPROVED
PROJECT MANAGER	DATE 6/9/2024
DRAWING NO. THN-PH-09	SHEET NO. 21 OF 37

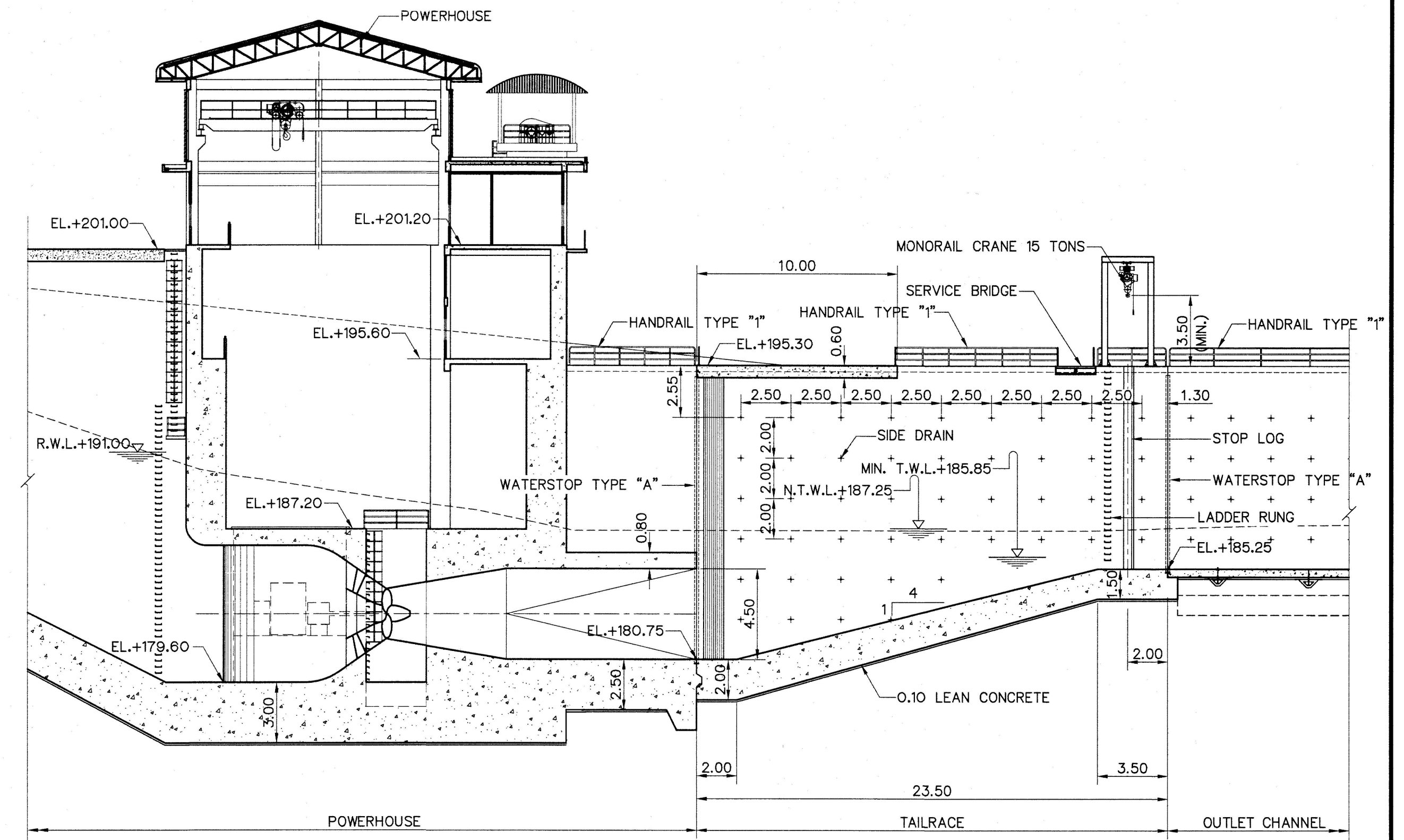


1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. THN-GN-04

1. POWERHOUSE AND EMERGENCY CHANNEL, GENERAL PLAN	THN-PH-01
2. POWERHOUSE, ROOF PLAN	THN-PH-05
3. POWERHOUSE, GROUND FLOOR PLAN (EL.+201.20)	THN-PH-06

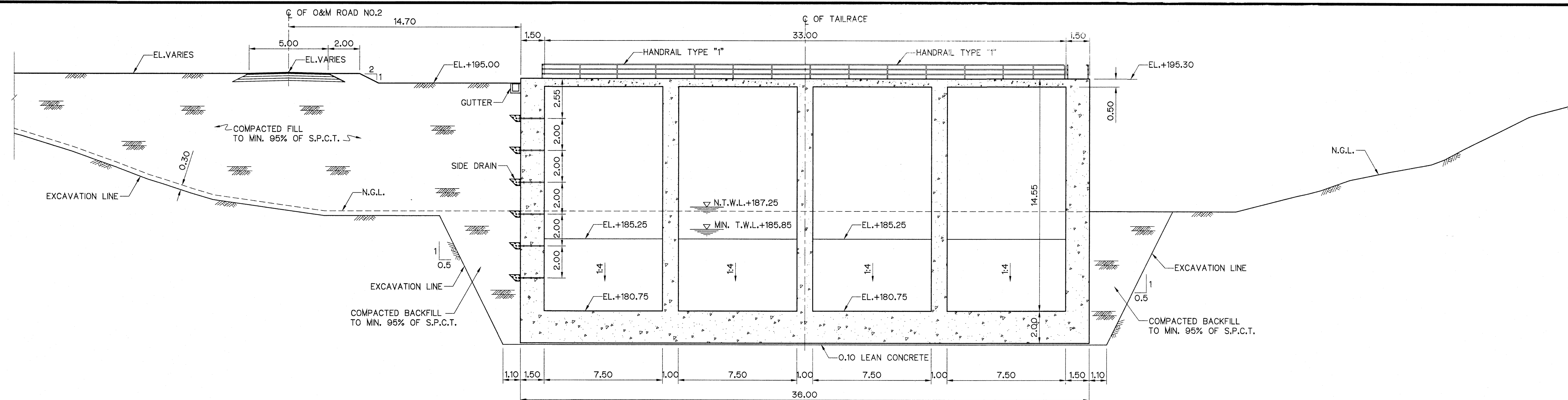
3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUANG NAN CHANGWAT NAN	
ELECTRO – MECHANICAL EQUIPMENT POWERHOUSE AND EMERGENCY CHANNEL POWERHOUSE ELEVATION 2, 3 AND 4	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED  ๕๕.6650 ๕๕.๖๕523	REVIEWED 
DRAWN 	RECOMMENDED 
CHECKED  ๕๕.6651	APPROVED 
 8/9/2024 PROJECT MANAGER DATE	DRAWING NO. THN-PH-10 SHEET NO. 22 OF 37



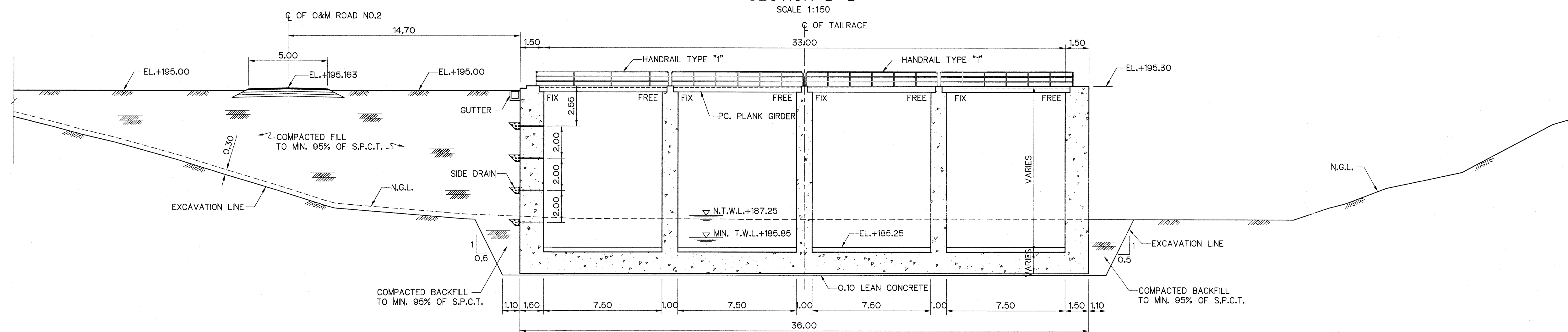
PLAN
SCALE 1:200

 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHEE MUEANG NAN CHANGWAT NAN			
ELECTRO – MECHANICAL EQUIPMENT TAILRACE PLAN AND SECTION A-A			
 FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED  ๒๕๒.๕๕๕๐ <i>Don</i> ๒๕๒.๕๕๕๒3		REVIEWED 	
DRAWN 		SUBMITTED 	
CHECKED  ๒๕๒.๕๕๕1		RECOMMENDED 	
 ๒๕๒.๕๕๕1		APPROVED 	
PROJECT MANAGER 		DRAWING NO. THN-TR-01	
DATE		SHEET NO. 23 OF 37	



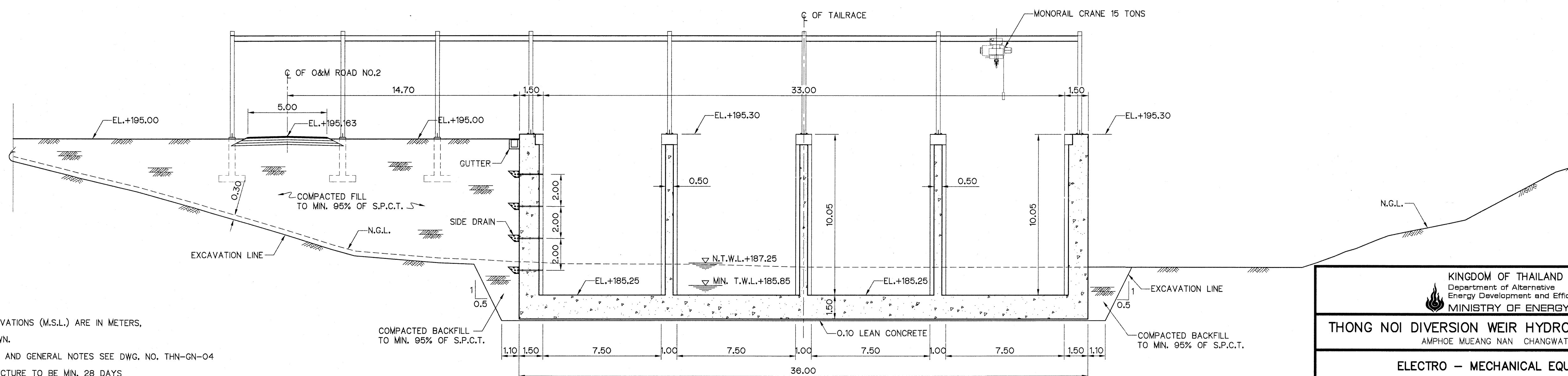
SECTION B-B

SCALE 1:150



SECTION C-C

SCALE 1:150



SECTION D-D

SCALE 1:150

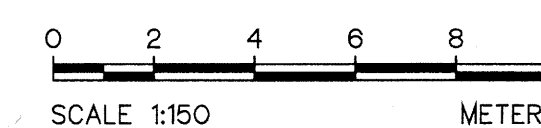
NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. THN-GN-04
3. CONCRETE OF WEIR STRUCTURE TO BE MIN. 28 DAYS STANDARD CYLINDER COMPRESSIVE STRENGTH OF 240 KSC.
4. SPACING OF HANDRAIL CAN BE ADJUSTED IN THE FIELD TO FIT WITH THE STRUCTURE BY CONTRACTOR AND APPROVED BY ENGINEER.
5. TAILRACE SHALL BE PLACED ON BED ROCK FOUNDATION, OTHER MATERIALS SHALL BE REMOVED AND BACKFILLED WITH LEAN CONCRETE AND THE LEAN CONCRETE SHALL HAVE THE COMPRESSIVE STRENGTH OF 140 KSC. FOR STANDARD CYLINDER AT 28 DAYS.
6. ALLOWABLE BEARING CAPACITY OF FOUNDATION NOT LESS THAN 30 TON/M²

REFERENCE DRAWINGS :

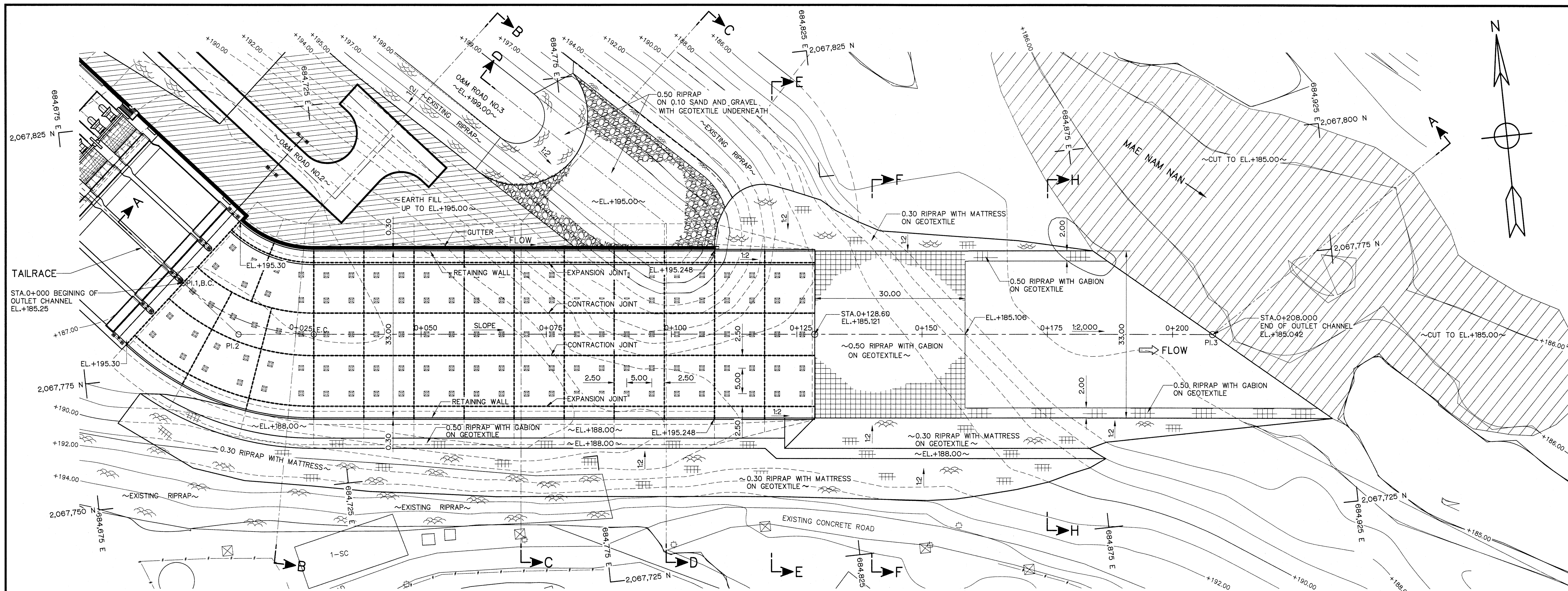
1. TAILRACE, PLAN AND SECTION A-A

THN-TR-01

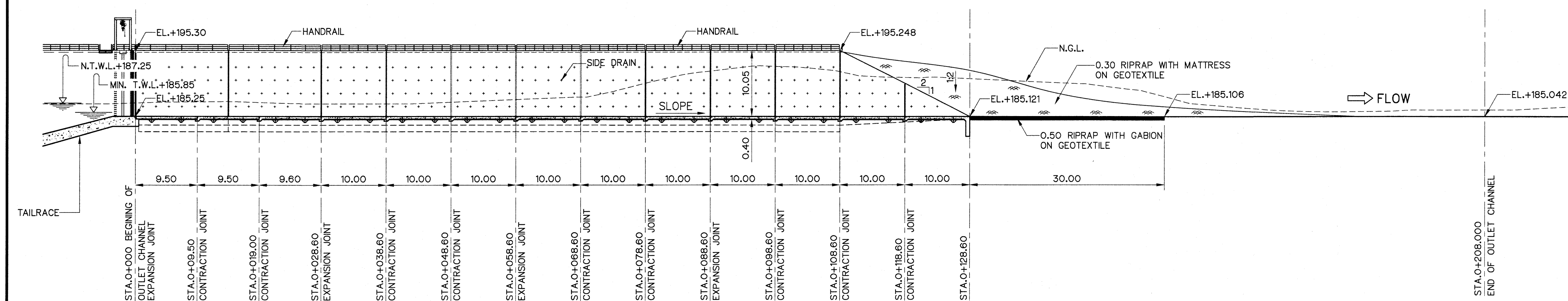


KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO – MECHANICAL EQUIPMENT TAILRACE SECTION B-B, C-C AND SECTION D-D	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED <i>[Signature]</i> 22.6650 10/11/2563	REVIEWED <i>[Signature]</i>
DRAWN <i>[Signature]</i>	SUBMITTED <i>[Signature]</i>
CHECKED <i>[Signature]</i> 22.6651	RECOMMENDED <i>[Signature]</i>
APPROVED <i>[Signature]</i> 6/9/2024	APPROVED <i>[Signature]</i>
PROJECT MANAGER DATE	DRAWING NO. THN-TR-02 SHEET NO. 24 OF 37

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS		DEDE		



PLAN
SCALE 1:400



SECTION A-A
SCALE 1:400

NOTES :

- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. THN-GN-04
- CONCRETE OF WEIR STRUCTURE TO BE MIN. 28 DAYS STANDARD CYLINDER COMPRESSIVE STRENGTH OF 240 KSC.
- SPACING OF HANDRAIL CAN BE ADJUSTED IN THE FIELD TO FIT WITH THE STRUCTURE BY CONTRACTOR AND APPROVED BY ENGINEER.
- OUTLET CHANNEL SHALL BE PLACED ON BED ROCK FOUNDATION, OTHER MATERIALS SHALL BE REMOVED AND BACKFILLED WITH LEAN CONCRETE AND THE LEAN CONCRETE SHALL HAVE THE COMPRESSIVE STRENGTH OF 140 KSC. FOR STANDARD CYLINDER AT 28 DAYS.
- ALLOWABLE BEARING CAPACITY OF FOUNDATION NOT LESS THAN 25 TON/M²

REFERENCE DRAWINGS :

- GENERAL, GENERAL LAY-OUT OF PROJECT THN-GN-02
- OUTLET CHANNEL, SECTION B-B, C-C AND SECTION D-D THN-OC-02
- OUTLET CHANNEL, SECTION E-E, F-F AND SECTION H-H THN-OC-03

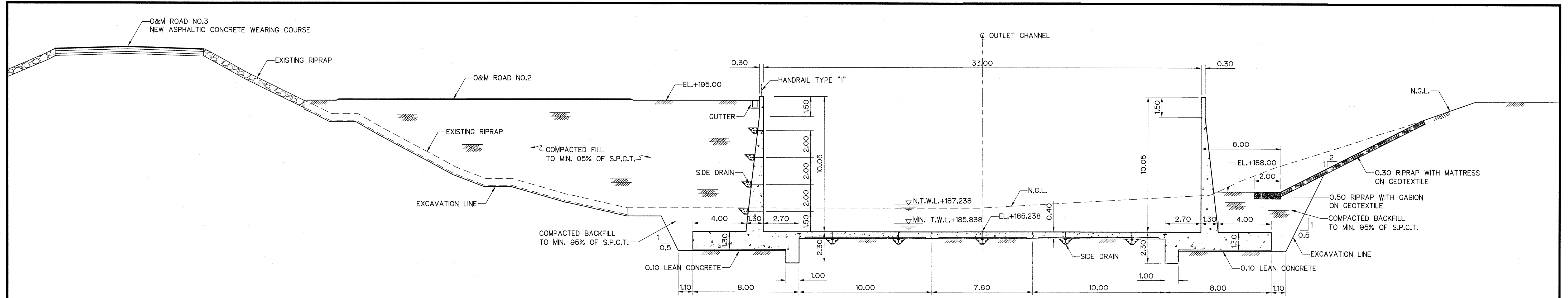
HORIZONTAL CURVE OF OUTLET CHANNEL

NO. PI.	COORDINATE		PI. - PI. (m)	DEFLECTION ANGLE (Δ) (° - ' - ")	TL (m)	R (m)	LC (m)	BC. STA. (km)	PI. STA. (km)	EC. STA. (km)	BEARING (N/S - ° - ' - " E/W)
	N	E									
PI.1	2,067,792.826	684,696.502	-	-	-	-	-	-	0+000.000	-	-
PI.2	2,067,781.514	684,706.357	15.003	42°-47'-05.90"	15.000	38.290	28.593	0+000.003	0+015.003	0+028.596	S 41°-03'-44.42"E
PI.3	2,067,760.678	684,899.642	194.405	88°-23'-56.18"	-	-	-	-	0+208.000	-	-

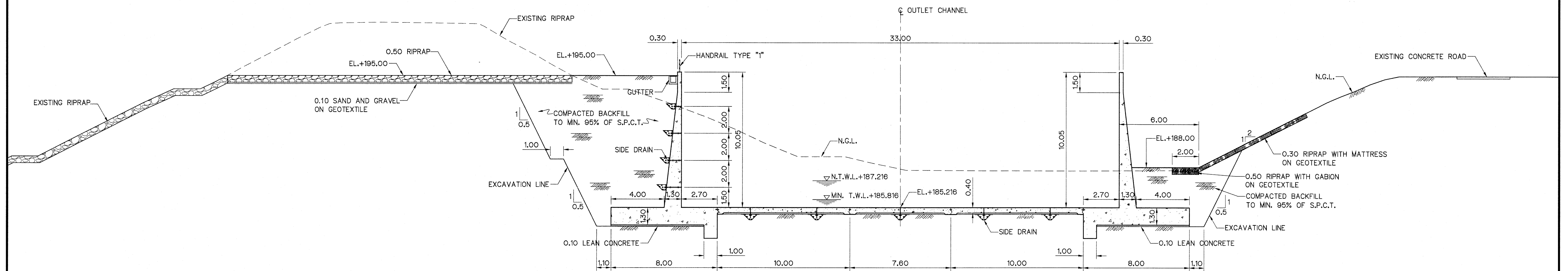


3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS		DEDE		

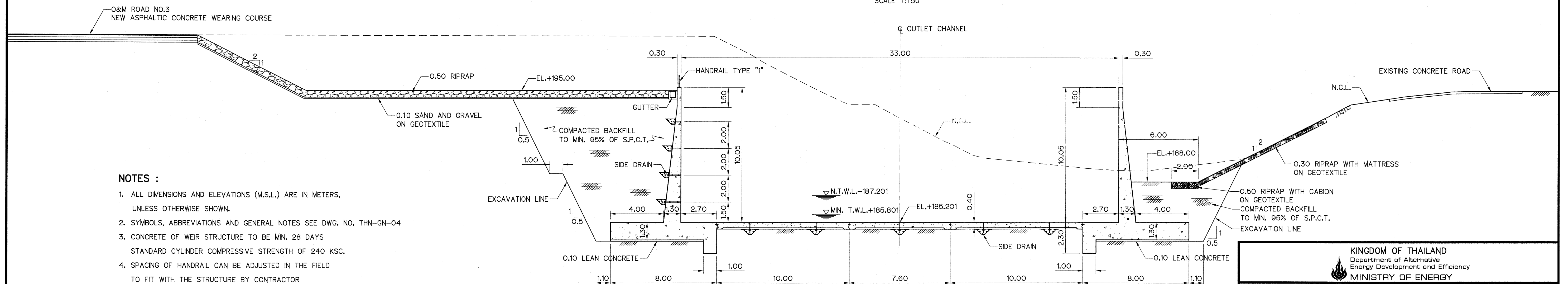
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO - MECHANICAL EQUIPMENT OUTLET CHANNEL PLAN AND SECTION A-A	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD. DESIGNED: <i>[Signature]</i> 25.6650 DRAWN: <i>[Signature]</i> CHECKED: <i>[Signature]</i> 25.6651 PROJECT MANAGER: <i>[Signature]</i> 6/9/2024	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY REVIEWED: <i>[Signature]</i> SUBMITTED: <i>[Signature]</i> RECOMMENDED: <i>[Signature]</i> APPROVED: <i>[Signature]</i> DRAWING NO. THN-OC-01 SHEET NO. 25 OF 37



SECTION B-B
SCALE 1:150



SECTION C-C
SCALE 1:150



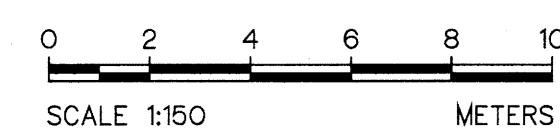
SECTION D-D
SCALE 1:150

NOTES :

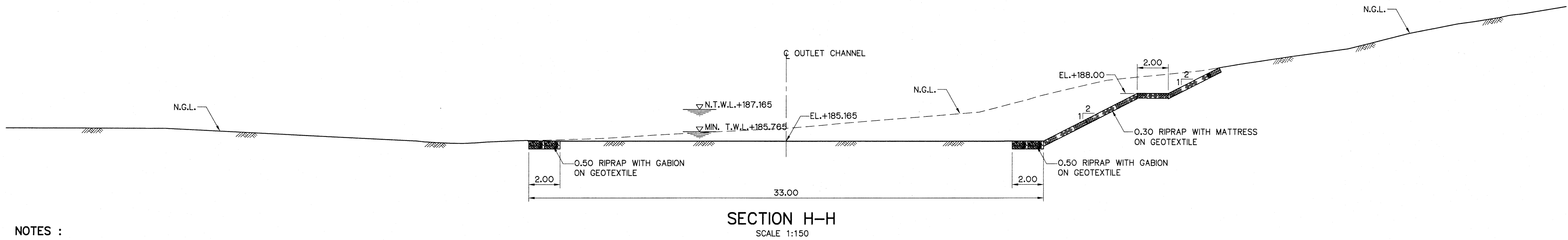
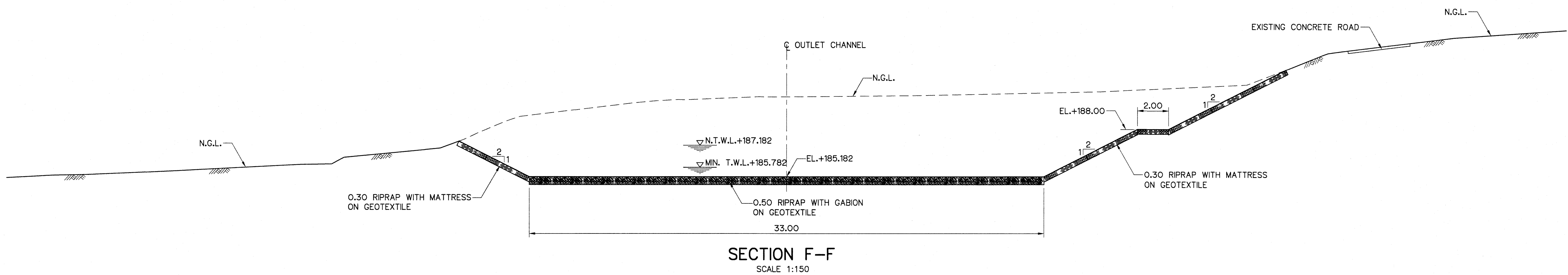
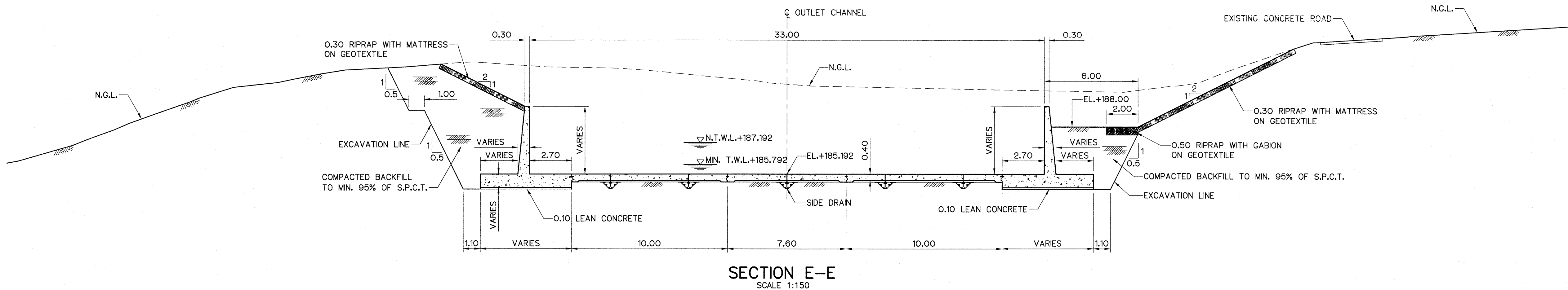
- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. THN-GN-04
- CONCRETE OF WEIR STRUCTURE TO BE MIN. 28 DAYS STANDARD CYLINDER COMPRESSIVE STRENGTH OF 240 KSC.
- SPACING OF HANDRAIL CAN BE ADJUSTED IN THE FIELD TO FIT WITH THE STRUCTURE BY CONTRACTOR AND APPROVED BY ENGINEER.
- OUTLET CHANNEL SHALL BE PLACED ON BED ROCK FOUNDATION, OTHER MATERIALS SHALL BE REMOVED AND BACKFILLED WITH LEAN CONCRETE AND THE LEAN CONCRETE SHALL HAVE THE COMPRESSIVE STRENGTH OF 140 KSC. FOR STANDARD CYLINDER AT 28 DAYS.
- ALLOWABLE BEARING CAPACITY OF FOUNDATION NOT LESS THAN 25 TON/M²

REFERENCE DRAWINGS :

- OUTLET CHANNEL, PLAN AND SECTION A-A THN-OC-01
- OUTLET CHANNEL, SECTION E-E, F-F AND SECTION H-H THN-OC-03



KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO - MECHANICAL EQUIPMENT OUTLET CHANNEL SECTION B-B, C-C AND SECTION D-D	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD. DESIGNED <i>[Signature]</i> <i>[Stamp]</i> DRAWN <i>[Signature]</i> <i>[Stamp]</i> CHECKED <i>[Signature]</i> <i>[Stamp]</i> PROJECT MANAGER	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY REVIEWED <i>[Signature]</i> SUBMITTED <i>[Signature]</i> RECOMMENDED <i>[Signature]</i> APPROVED <i>[Signature]</i> DATE 6/9/2024
NO. DATE REVISIONS CHECKED APPROVED CONSULTANTS DEDE	DRAWING NO. SHEET NO. THN-OC-02 26 OF 37

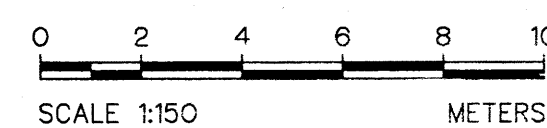


NOTES :

- ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, UNLESS OTHERWISE SHOWN.
- SYMBOLS, ABBREVIATIONS AND GENERAL NOTES SEE DWG. NO. THN-GN-04
- CONCRETE OF WEIR STRUCTURE TO BE MIN. 28 DAYS STANDARD CYLINDER COMPRESSIVE STRENGTH OF 240 KSC.
- SPACING OF HANDRAIL CAN BE ADJUSTED IN THE FIELD TO FIT WITH THE STRUCTURE BY CONTRACTOR AND APPROVED BY ENGINEER.
- OUTLET CHANNEL SHALL BE PLACED ON BED ROCK FOUNDATION, OTHER MATERIALS SHALL BE REMOVED AND BACKFILLED WITH LEAN CONCRETE AND THE LEAN CONCRETE SHALL HAVE THE COMPRESSIVE STRENGTH OF 140 KSC. FOR STANDARD CYLINDER AT 28 DAYS.
- ALLOWABLE BEARING CAPACITY OF FOUNDATION NOT LESS THAN 25 TON/M.²

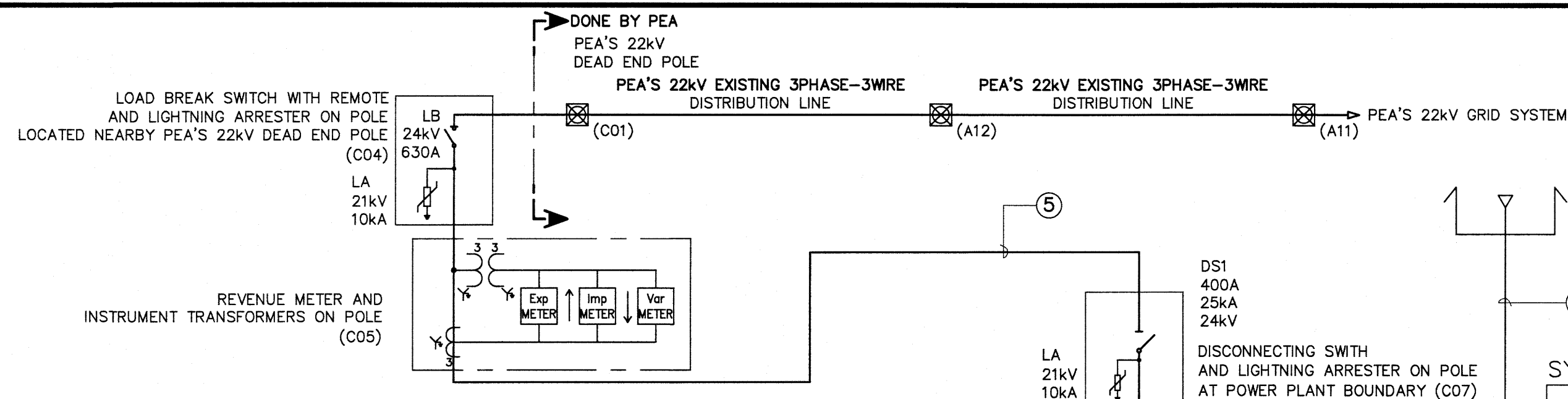
REFERENCE DRAWINGS :

- OUTLET CHANNEL, PLAN AND SECTION A-A THN-OC-01
- OUTLET CHANNEL, SECTION B-B, C-C AND SECTION D-D THN-OC-02

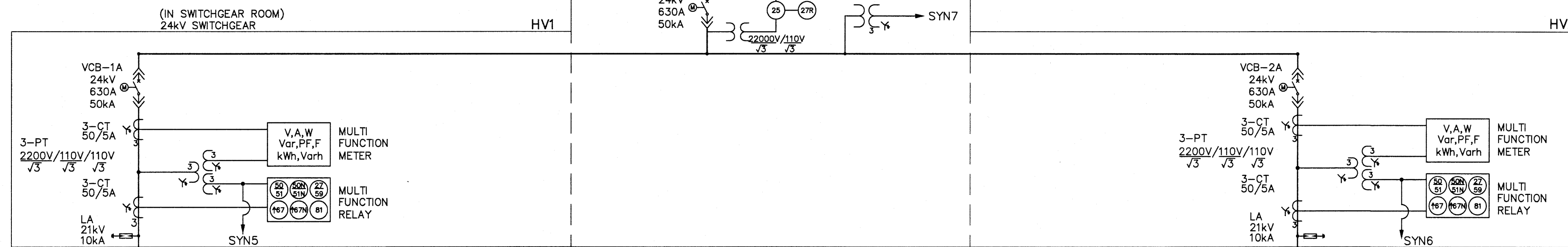
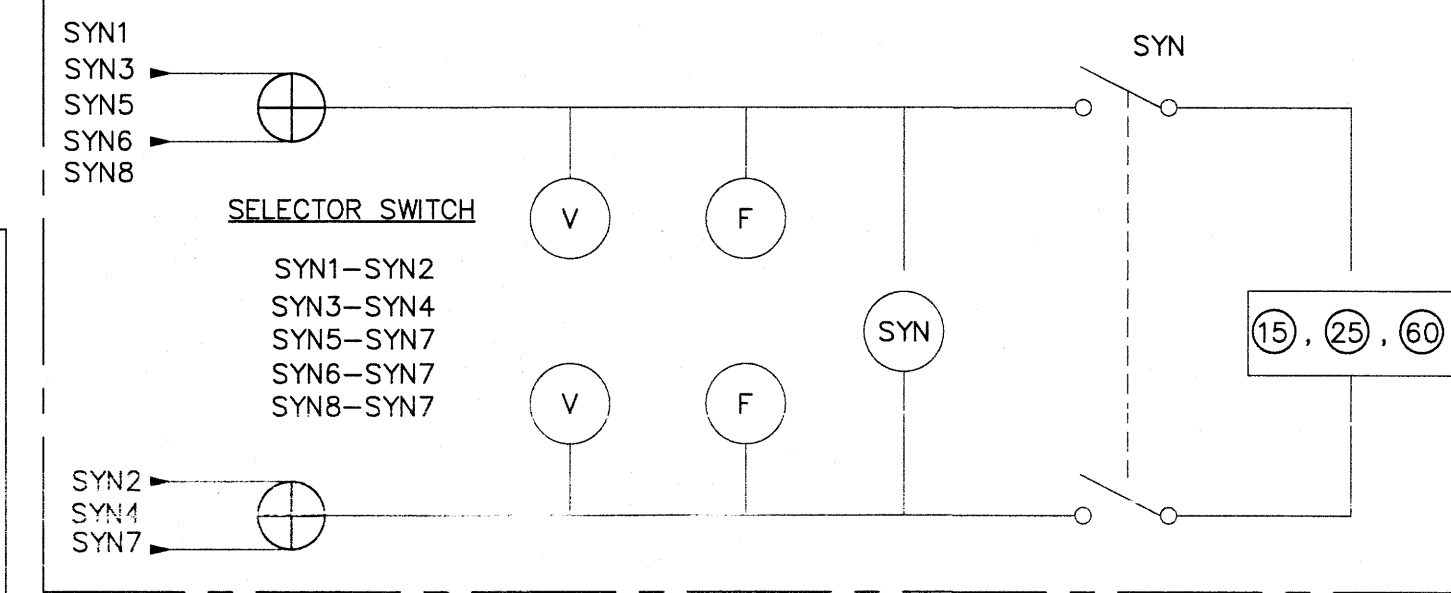


3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

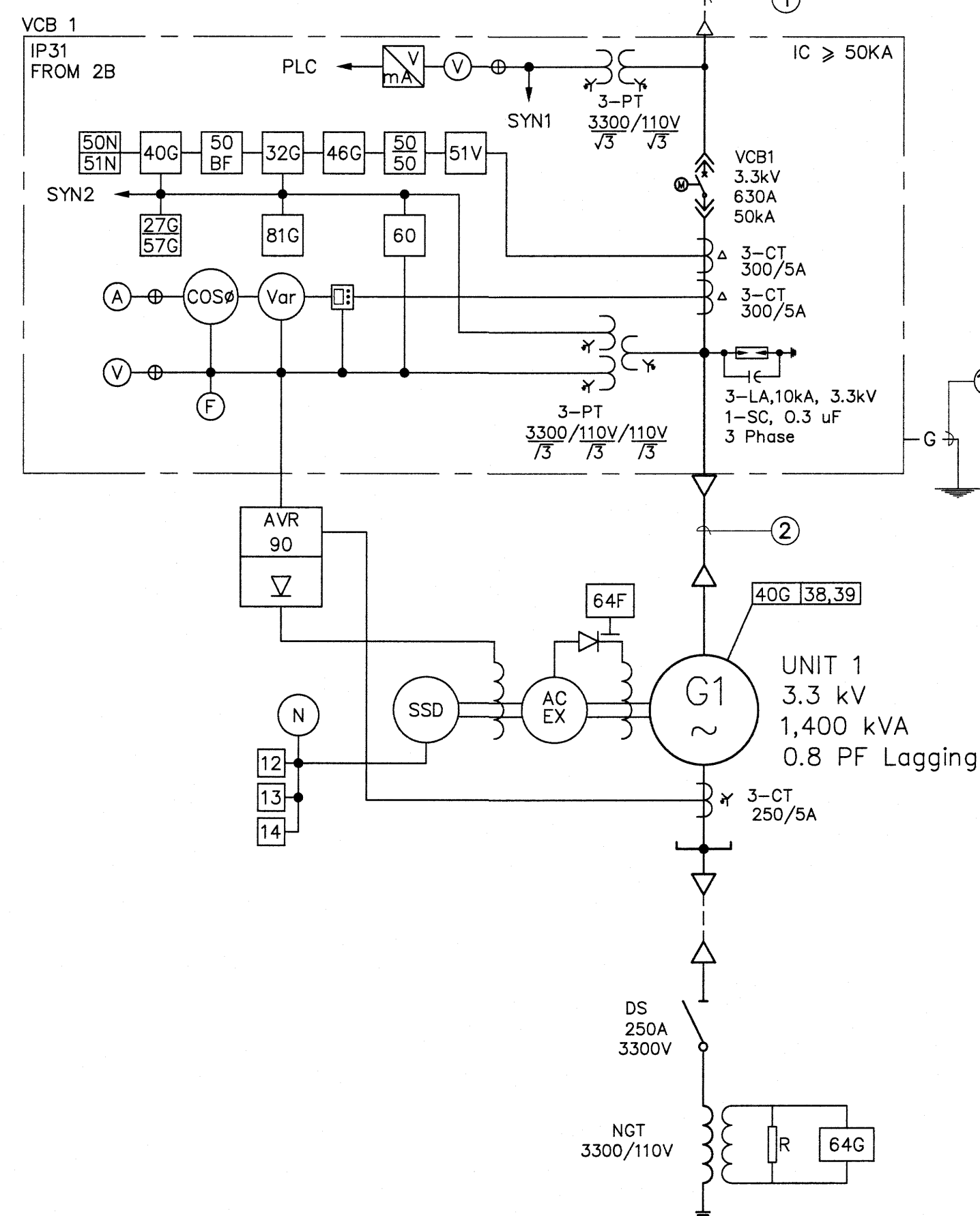
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN			
ELECTRO - MECHANICAL EQUIPMENT OUTLET CHANNEL SECTION E-E, F-F AND SECTION H-H			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED <i>[Signature]</i> 261.6650 Dam 261.88523		REVIEWED <i>[Signature]</i>	
DRAWN <i>[Signature]</i>		SUBMITTED <i>[Signature]</i>	
CHECKED <i>[Signature]</i> 261.6651		RECOMMENDED <i>[Signature]</i>	
APPROVED <i>[Signature]</i> 6/9/2024		APPROVED <i>[Signature]</i>	
PROJECT MANAGER DATE		DRAWING NO. THN-OC-03 SHEET NO. 27 OF 37	



SYNCHRONIZING1 PANEL (SYN1)



STEP-UP TRANSFORMER
3.3 kV/22 kV, 50 Hz
1700 kVA, WYE-DELTA
OIL IMMERSER TYPE



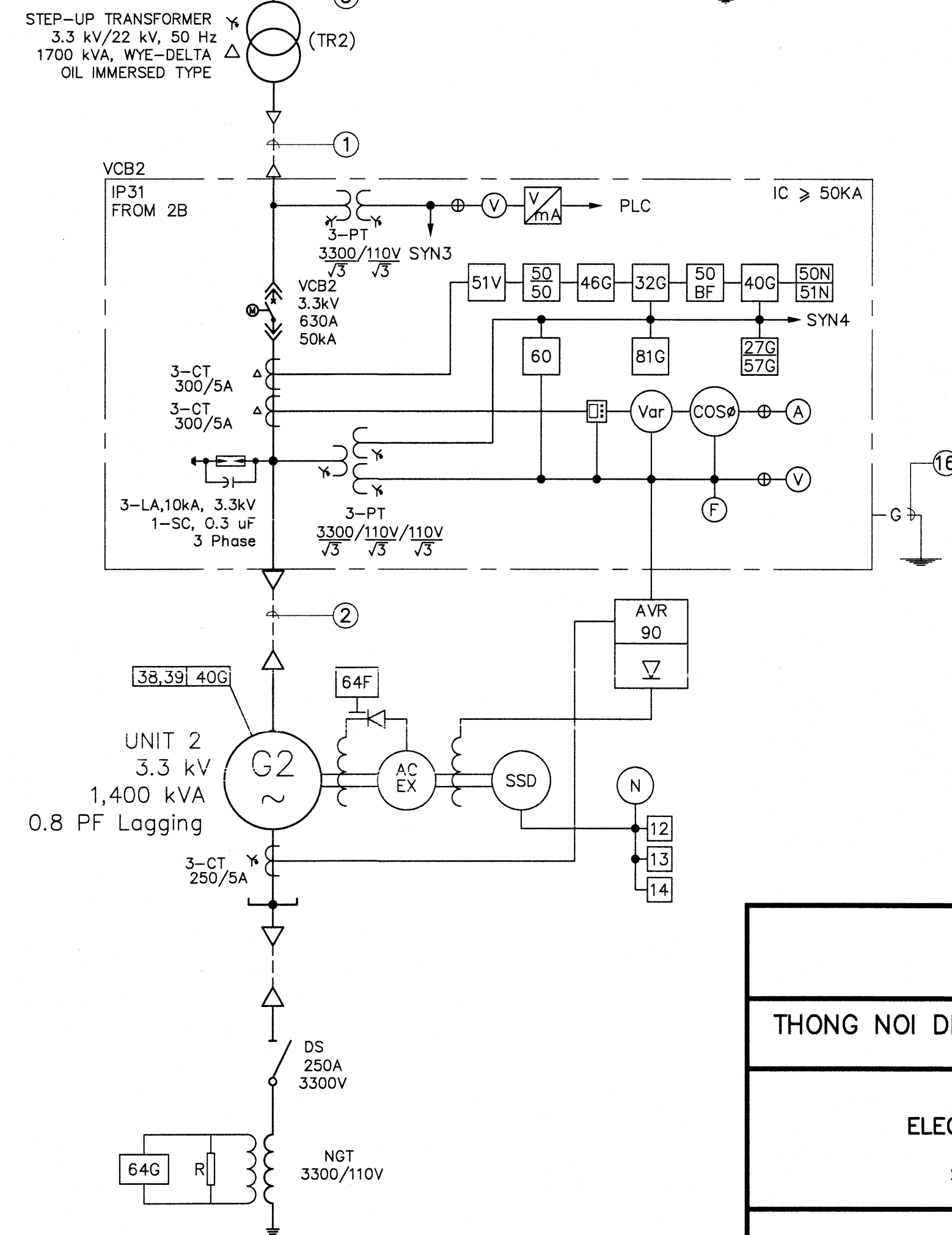
PROTECTION RELAY ANSI CODE	
CODE	DESCRIPTION
27G	UNDER VOLTAGE RELAY (GENERATOR)
32G	DIRECTIONAL OVERPOWER RELAY (GENERATOR)
46G	PHASE UNBALANCE RELAY (GENERATOR)
40G	FIELD RELAY/LOSS OF EXCITATION RELAY (GENERATOR)
50	INSTANTANEOUS OVERCURRENT RELAY
50/50	NEGATIVE SEQUENCE INSTANTANEOUS OVERCURRENT RELAY
57G	SHORT-CIRCUITING OR GROUNDING DEVICE RELAY (GENERATOR)
59	OVERVOLTAGE RELAY
60	VOLTAGE OR CURRENT BALANCE RELAY
81G	GENERATOR FREQUENCY RELAY
51V	VOLTAGE RESTRAINED TIME OVERCURRENT RELAY
50BF	INSTANTANEOUS BREAKER FIALURE RELAY
50N/51N	EARTH FAULT PROTECTION RELAY
67	AC DIRECTION OVERCURRENT RELAY
67N	NEUTRAL DIRECTIONAL OVERCURRENT RELAY
15	SPEED OF FREQUENCY MATCHING DEVICE
25	SYNCHRONIZING OR SYNCHRONISM-CHECK DEVICE

NOTE :

- THIS SNGLE LINE DIAGRAM IS DESIGNED FOR GUIDE LINE ONLY, THE CONTRACTOR HAS TO HAS TO SUBMIT THE SHOP DRAWING WHICH CONFORM TO PEA'S STANDARD AND REGULATIONS FOR APPROVAL.

REFERENCE DRAWINGS :

- ELECTRO - MECHANICAL EQUIPMENT, SINGLE LINE DIAGRAM SHEET 2/2 THN-EM-02
- ELECTRO - MECHANICAL EQUIPMENT, CABLE & CABLE TRUNKING LIST THN-EM-03



LEGEND

	STEP-UP POWER TRANSFORMER
	WITHDRAWABLE AIR CIRCUIT BRKAKER (ACB)
	MOLDED CASE CIRCUIT BREAKER (MCCB)
	MOLDED CASE CIRCUIT BREAKER (MCCB) WITH MOTOR DRIVE
	LOAD BREAK SWITCH
	FUSE
	LIGHTNING ARRESTER
	FREQUENCY METER
	VOLT METER
	AMP METER
	WATT METER
	WATT HOUR METER
	DIGITAL MERTER
	SELECTOR SWITCH
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SYNCHRO CHECK RELAY
	REMANENT UNDER VOLTAGE RELAY
	UNDER AND OVER VOLTAGE RELAY
	REVERSE POWER RELAY
	PHASE OVERCURRENT RELAY
	GROUND OVERCURRENT RELAY
	RESIDUAL VOLTAGE RELAY
	DIRECTIONAL PHASE FAULT RELAY
	DIRECTIONAL GROUND FAULT RELAY
	OVER FREQUENCY RELAY
	ANTI-STANDING RELAY
	LOSS OF EXCITATION
	PHASE UNBALANCE RELAY
	BREAKER FAILURE
	VOLTAGE RESTRAINED TIME OVERCURRENT
	VOLTAGE BALANCE RELAY
	GROUN PROTECTION RELAY
	WYE CONNECTION
	DELTA CONNECTION
	OPENED DELTA CONNECTION
	VOLTAGE TRANSDUCER
	PROGRAMMABLE LOGIC CONTROLLER
	STATION SURGE ARRESTER
	MACHINE SURGE ARRESTER
	DISCONNECTING SWITCH (DCS)
	DISCONNECTING SWITCH WITH MOTOR DRIVE
	DISCONNECTING SWITCH WITH FUSE
	MECHANICAL INTERLOCK
	PILOT LAMP
	MANUAL TRANSFER SWITCH
	TRANSFER SWITCH WITH MOTOR DRIVE
	LOW/MEDIUM VOLTAGE (MV.) CABLE TERMINATION (HEAT SHRINK OR COLD SHRINK FOR MV.)
	ISOLATING SWITCH 1P 240 VAC
	DC CIRCUIT BREAKER 2P 125 VDC

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

THONG NOI DIVERSION WEIR HYDROPOWER PROJECT
AMPHOE MUEANG NAN CHANGWAT NAN

ELECTRO - MECHANICAL EQUIPMENT

SINGLE LINE DIAGRAM SHEET 1/2

FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED	27/10/29	REVIEWED	27/10/29
DRAWN		RECOMMENDED	
CHECKED	27/10/29	APPROVED	
PROJECT MANAGER	6/9/2024	DRAWING NO.	THN-EM-01
DATE		SHEET NO.	28 OF 37

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS		DEDE		

CABLE & CABLE TRUNKING LIST

FEEDER NO.	DESTINATION		CABLE	CABLE TRUNKING	GROUNDING
	FROM	TO			
①	{ VCB1 VCB2	{ TR1 TR2	(24KV)XLPE-1C-300 mm ² x3 (24KV)XLPE-1C-300 mm ² x3	HDPE PN6 CLASS1 ø5" HDPE PN6 CLASS1 ø5"	} IEC-01-95 mm ² ,THW } PVC CONDUIT 1"
②	{ G1 G2	{ VCB1 VCB2	(24KV)XLPE-1C-300 mm ² x3 (24KV)XLPE-1C-300 mm ² x3	IMC CONDUIT 3 1/2" IMC CONDUIT 3 1/2"	} IEC-01-95 mm ² ,THW } PVC CONDUIT 1"
③	{ TR1 TR2	{ HV1 HV2	(24KV)XLPE-1C-300 mm ² x3 (24KV)XLPE-1C-300 mm ² x3	HDPE PN6 CLASS1 ø5" HDPE PN6 CLASS1 ø5"	} IEC-01-95 mm ² ,THW } PVC CONDUIT 1"
④	HV0	DS1 (C07)	(24KV)XLPE-1C-300 mm ² x3	IMC CONDUIT 3 1/2"	} IEC-01-95 mm ² ,THW } PVC CONDUIT 1"
⑤	C07	C04	(24KV)SAC-1C-135 mm ² x3	ON CONCRETE POLE	-
⑥	G3 G4 G5 G6	MCB3 MCB4 MCB5 MCB6	(0.6KV) CV-1C-240 mm ² x4 (0.6KV) CV-1C-240 mm ² x4 (0.6KV) CV-1C-240 mm ² x4 (0.6KV) CV-1C-240 mm ² x4	IMC CONDUIT 3 1/2" IMC CONDUIT 3 1/2" IMC CONDUIT 3 1/2" IMC CONDUIT 3 1/2"	} IEC-01-50 mm ² ,THW } PVC CONDUIT 1"
⑦	MCB3 MCB4 MCB5 MCB6	TR3 TR3 TR4 TR4	(0.6KV) CV-1C-240 mm ² x4 (0.6KV) CV-1C-240 mm ² x4 (0.6KV) CV-1C-240 mm ² x4 (0.6KV) CV-1C-240 mm ² x4	} ON CABLE LADDER 150 mm x 300 mm	} IEC-01-50 mm ² ,THW } PVC CONDUIT 1"
⑧	MCB3 MCB4 MCB5 MCB6	MTS1 MTS1 MTS2 MTS2	(0.6KV) CV-1C-240 mm ² x4 (0.6KV) CV-1C-240 mm ² x4 (0.6KV) CV-1C-240 mm ² x4 (0.6KV) CV-1C-240 mm ² x4	IMC CONDUIT 3 1/2" IMC CONDUIT 3 1/2" IMC CONDUIT 3 1/2" IMC CONDUIT 3 1/2"	} IEC-01-50 mm ² ,THW } PVC CONDUIT 1"
⑨	MTS1 MTS2	MTS3 MTS3	(0.6KV) CV-1C-240 mm ² x4 (0.6KV) CV-1C-240 mm ² x4	IMC CONDUIT 3 1/2" IMC CONDUIT 3 1/2"	} IEC-01-50 mm ² ,THW } PVC CONDUIT 1"
⑩	MTS3	MDB1	(0.6KV) CV-1C-240 mm ² x4	IMC CONDUIT 3 1/2"	} IEC-01-50 mm ² ,THW } PVC CONDUIT 1"
⑪	MDB1	MTS4	IEC10 NYY 1C-300 mm ² x4	HDPE PN6 CLASS1 5" AND CABLE RACK ON PLOE	} IEC-01-95 mm ² ,THW } PVC CONDUIT 1"
⑫	MTS4	EXISTING CABLE	IEC10 NYY 1C-95 mm ² x4	CABLE RACK	-
⑬	MDB1	DC1	(0.6KV) CV-1C-35 mm ² x4		} IEC-01-35 mm ² ,THW } PVC CONDUIT 1"
⑭	TR3 TR4	HV3 HV4	(24KV)XLPE-1C-300 mm ² x3 (24KV)XLPE-1C-300 mm ² x3	HDPE PN6 CLASS1 ø5" HDPE PN6 CLASS1 ø5"	} IEC-01-35 mm ² ,THW } PVC CONDUIT 1"
⑮	HV02	DS1	(24KV)XLPE-1C-300 mm ² x3	IMC CONDUIT 3 1/2"	} IEC-01-50 mm ² ,THW } PVC CONDUIT 1"
⑯	VCB1 VCB2 HV1 HV01 HV02 MCB3 MCB4 MCB5 MCB6 MDB HV3 HV02 HV4 EDB	GROUND GROUND GROUND GROUND GROUND GROUND GROUND GROUND GROUND GROUND GROUND GROUND GROUND GROUND	- - - - - - - - - - - - - -	- - - - - - - - - - - - -	} IEC-01 ,THW 1C-95 mm ² PVC CONDUIT 1" } IEC-01 ,THW 1C-50 mm ² PVC CONDUIT 1" } IEC-01 ,THW 1C-95 mm ² PVC CONDUIT 1" } IEC-01,THW 1C-6.0 mm ² } PVC CONDUIT 3/4"
⑰	EDB	TS4	IEC10 NYY 2C-16 mm ²	CABLE RACK	} IEC-01-50 mm ² ,THW } PVC CONDUIT 1/2"

PROGRAM 1 : ELECTRICAL DEVICE SWITCH OPERATED TABLE (USE FOR G1 & G2)

MODE TABLE	MAIN DEVICE SWITCH NAME					
	VCB1	VCB2	VCB-1A	VCB-2A	VCB-01	SYN
NORMAL OPERATION MODE 1 (G1 RUN/G2 STOP)	CLOSED	OPEN	CLOSED	OPEN	CLOSED	CLOSED
NORMAL OPERATION MODE 2 (G1 STOP/G2 RUN)	OPEN	CLOSED	OPEN	CLOSED	CLOSED	CLOSED
NORMAL OPERATION MODE 3 (G1 RUN/G2 RUN)	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED
PLANT SHUTDOWN (G1 STOP/G2 STOP)	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN

PROGRAM 2 : ELECTRICAL DEVICE SWITCH OPERATED TABLE (USE FOR G3 & G4)

MODE TABLE	MAIN DEVICE SWITCH NAME										
	MCCB3	MCCB4	VCB-3A	VCB-4A	VCB-02	MTS1	MTS3	MCCB7	F11	MTS4	SYN
NORMAL OPERATION MODE 1 (G3 RUN/G4 STOP) (G5, G6 STOP)	CLOSED	OPEN	CLOSED	OPEN	CLOSED	G3	A	CLOSED	CLOSED	S2	CLOSED
NORMAL OPERATION MODE 2 (G3 STOP/G4 RUN) (G5, G6 STOP)	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	G4	A	CLOSED	CLOSED	S2	CLOSED
NORMAL OPERATION MODE 3 (G3 RUN/G4 RUN) (G5, G6 STOP)	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	G4	A	CLOSED	CLOSED	S2	CLOSED
PLANT SHUTDOWN MODE 1 (G3 STOP/G4 STOP) (G5, G6 STOP)	OPEN	OPEN	CLOSED	OPEN	CLOSED	G3	A	CLOSED	OPEN	S1	OPEN
PLANT SHUTDOWN MODE 2 (G3 STOP/G4 STOP) (G5, G6 STOP)	OPEN	OPEN	OPEN	OPEN	OPEN	G3	A	OPEN			OPEN

PROGRAM 3 : ELECTRICAL DEVICE SWITCH OPERATED TABLE (USE FOR G5 & G6)

MODE TABLE	MAIN DEVICE SWITCH NAME										
	MCCB3	MCCB6	VCB-3A	VCB-4A	VCB-02	TS2	TS3	MCCB7	F11	TS4	SYN
NORMAL OPERATION MODE 1 (G5 RUN/G6 STOP) (G3, G4 STOP)	CLOSED	OPEN	OPEN	CLOSED	CLOSED	G5	B	CLOSED	CLOSED	S2	CLOSED
NORMAL OPERATION MODE 2 (G5 STOP/G6 RUN) (G3, G4 STOP)	OPEN	CLOSED	OPEN	CLOSED	CLOSED	G6	B	CLOSED	CLOSED	S2	CLOSED
NORMAL OPERATION MODE 3 (G5 RUN/G6 RUN) (G3, G4 STOP)	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	G6	B	CLOSED	CLOSED	S2	CLOSED
PLANT SHUTDOWN MODE 1 (G5 STOP/G6 STOP) (G3, G4 STOP)	OPEN	OPEN	OPEN	CLOSED	CLOSED	G6	B	CLOSED	OPEN	S1	OPEN
PLANT SHUTDOWN MODE 2 (G5 STOP/G6 STOP) (G3, G4 STOP)	OPEN	OPEN	OPEN	OPEN	OPEN	G6	B	OPEN	OPEN	S1	OPEN

PROGRAM 4 : ELECTRICAL DEVICE SWITCH OPERATED TABLE (USE FOR G3, G4, G5, G6)

MODE TABLE	MAIN DEVICE SWITCH NAME														
	MCCB3	MCCB4	MCCB5	MCCB6	VCB-3A	VCB-4A	VCB-02	TS1	TS2	TS3	MCCB7	F11	TS4	SYN	
NORMAL OPERATION MODE 1 (G3 RUN/G4 STOP/G5 STOP/G6 STOP)	CLOSED	OPEN	OPEN	OPEN	CLOSED	OPEN	CLOSED	G3	G5	A	CLOSED	CLOSED	S2	CLOSED	
NORMAL OPERATION MODE 2 (G3 STOP/G4 RUN/G5 STOP/G6 STOP)	OPEN	CLOSED	OPEN	OPEN	CLOSED	OPEN	CLOSED	G4	G5	A	CLOSED	CLOSED	S2	CLOSED	
NORMAL OPERATION MODE 3 (G3 RUN/G4 RUN/G5 STOP/G6 STOP)	CLOSED	CLOSED	CLOSED	OPEN	CLOSED	CLOSED	CLOSED	G4	G5	A	CLOSED	CLOSED	S2	CLOSED	
NORMAL OPERATION MODE 4 (G3 RUN/G4 RUN/G5 STOP/G6 RUN)	CLOSED	CLOSED	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	G4	G6	A	CLOSED	CLOSED	S2	CLOSED	
NORMAL OPERATION MODE 5 (G3 STOP/G4 STOP/G5 RUN/G6 STOP)	OPEN	OPEN	CLOSED	OPEN	OPEN	CLOSED	CLOSED	G3	G5	B	CLOSED	CLOSED	S2	CLOSED	
NORMAL OPERATION MODE 6 (G3 STOP/G4 STOP/G5 STOP/G6 RUN)	OPEN	OPEN	OPEN	CLOSED	OPEN	CLOSED	CLOSED	G3	G6	B	CLOSED	CLOSED	S2	CLOSED	
NORMAL OPERATION MODE 7 (G3 STOP/G4 STOP/G5 RUN/G6 RUN)	OPEN	OPEN	CLOSED	CLOSED	OPEN	CLOSED	CLOSED	G3	G6	B	CLOSED	CLOSED	S2	CLOSED	
NORMAL OPERATION MODE 8 (G3 RUN/G4 RUN/G5 RUN/G6 RUN)	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	G3	G6	B	CLOSED	CLOSED	S2	CLOSED	
PLANT SHUTDOWN MODE 1 (G3 STOP/G4 STOP/G5 STOP/G6 STOP)	OPEN	OPEN	OPEN	OPEN	CLOSED	OPEN	CLOSED	G3	G6	A	CLOSED	OPEN	S1	OPEN	
PLANT SHUTDOWN MODE 2 (G3 STOP/G4 STOP/G5 STOP/G6 STOP)	OPEN	OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	G3	G6	B	CLOSED	OPEN	S1	OPEN	
PLANT SHUTDOWN MODE 3 (G3 STOP/G4 STOP/G5 STOP/G6 STOP)	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	G3	G6	A	OPEN	OPEN	S1	OPEN	

NOTE :

1. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, THE CONTRACTOR HAS TO
HAS TO SUBMIT THE SHOP DRAWING WHICH CONFORM TO PE'A'S SRANDARD
AND REGULATIONS FOR APPROVAL.

REFERENCE DRAWINGS :

1. ELECTRO – MECHANICAL EQUIPMENT, SINGLE LINE DIAGRAM SHEET 1/2 THN-EM-01
2. ELECTRO – MECHANICAL EQUIPMENT, SINGLE LINE DIAGRAM SHEET 2/2 THN-EM-02

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
		CONSULTANTS		DEDE

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN			
ELECTRO – MECHANICAL EQUIPMENT CABLE & CABLE TRUNKING LIST			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
REVIEWED		SUBMITTED	
DRAWN		RECOMMENDED	
CHECKED		APPROVED	
PROJECT MANAGER		DATE	SHEET NO.
		6/8/2024	30 OF 37

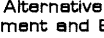


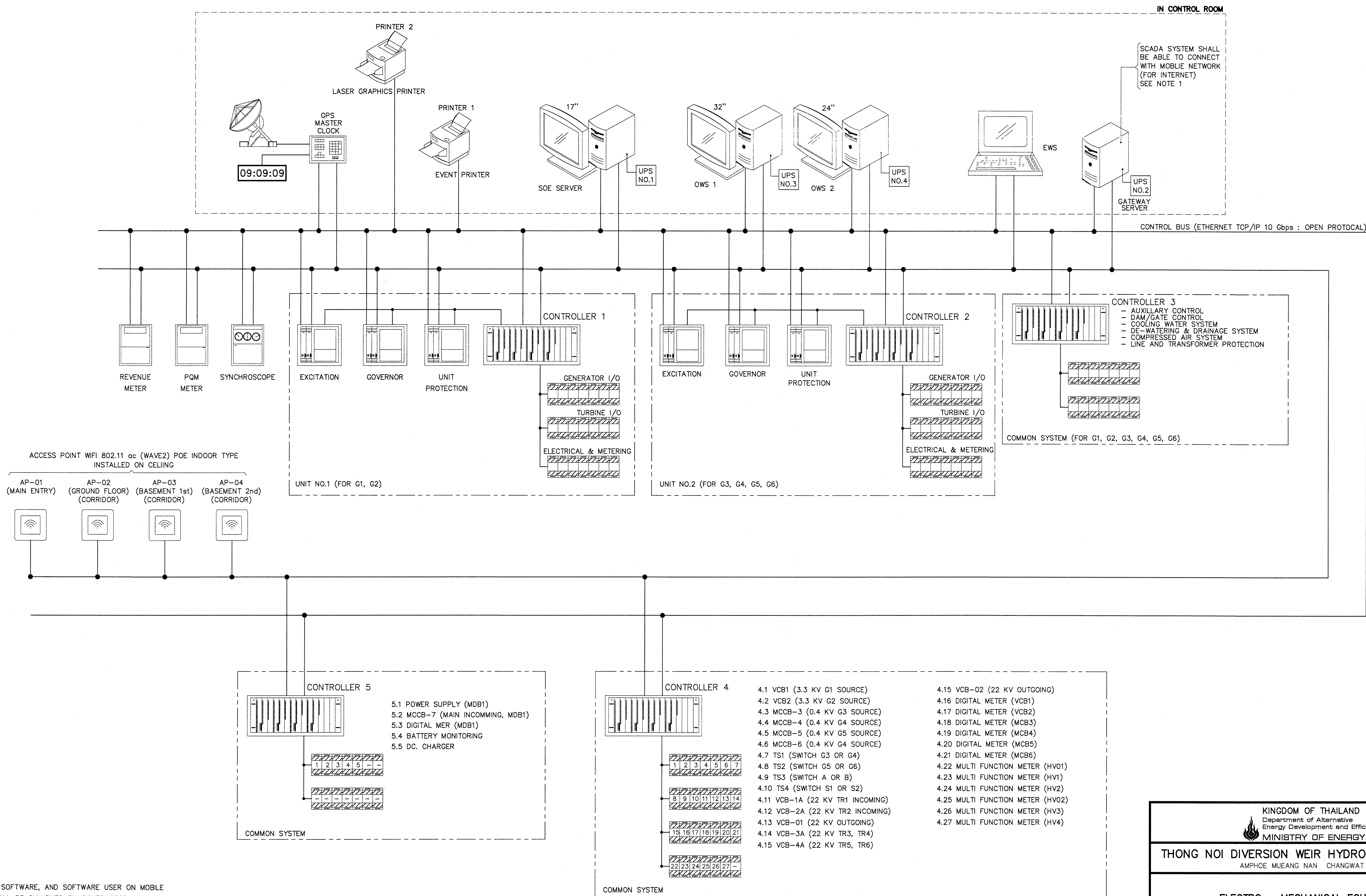
1. "WP" IS AN ABBREVIATION FOR WATER PROOF.
2. THIS DRAWING IS DESIGNED FOR GUIDE LINE ONLY, THE CONTRACTOR HAS TO
HAS TO SUBMIT THE SHOP DRAWING WHICH CONFORM TO PEA'S STANDARND
AND REGULATIONS FOR APPROVAL.

1. ELECTRO - MECHANICAL EQUIPMENT, SINGLE LINE DIAGRAM SHEET 1/2	THN-EM-01
2. ELECTRO - MECHANICAL EQUIPMENT, SINGLE LINE DIAGRAM SHEET 2/2	THN-EM-02

LOCATION : POWERHOUSE (ELECTRO-MECHANICAL EQUIPMENT)				PANEL NAME : PP1 (48 CKTS. BRANCH MCB > 25 KAIC)				3ø 4W WITH MCCB. 3P 250 AT 400AF IC > 50 KA AT 380 VOLT			
CKT NO	DESCRIPTION	LOAD (VA)			MCB		CONDUCTOR				
		A	B	C	POLE	AT	SIZE (MM2)	CONDUIT			
1		13,000					CV-4C				
3	OVERHEAD TRAVELLING CRANE 20 TON		13,000		3	>125	35 mm. ²	IMC ø 2 1/2"			
5				13,000			G-10 TWH				
7		10,666					CV-4C				
9	MONORAIL CRANE NO.1 15 TON		10,666		3	>100	35 mm. ²	IMC ø 2 1/2"			
11				10,666			G-10 TWH				
13		10,666					CV-4C				
15	MONORAIL CRANE NO.2 15 TON		10,666		3	>100	35 mm. ²	IMC ø 2 1/2"			
17				10,666			G-10 TWH				
19		7,833					CV-4C				
21	LIFTING FLOOD GATE NO.1		7,833		3	>80	35 mm. ²	IMC ø 2 1/2"			
23				7,833			G-10 TWH				
25		7,833					CV-4C				
27	LIFTING FLOOD GATE NO.2		7,833		3	>80	35 mm. ²	IMC ø 2 1/2"			
29				7,833			G-10 TWH				
31		10,416					CV-4C				
33	TRASHRACK CLEANER		10,416		3	>100	35 mm. ²	IMC ø 2 1/2"			
35				10,416			G-10 TWH				
37		625					CV-4C				
39	AIR COMPRESSOR (1.2 KW.)		625		3	>15	10 mm. ²	IMC ø 1 1/2"			
41				625			G-2.5 TWH				
43		1,000									
45	SPARE		1,000		3	>30	-	-			
47				1,000							
2		208					CV-4C				
4	COOLING WATER NO.1		208		3	>15	10 mm. ²	IMC ø 1 1/2"			
6				208			G-2.5 TWH				
8		208					CV-4C				
10	COOLING WATER NO.2		208		3	>15	10 mm. ²	IMC ø 1 1/2"			
12				208			G-2.5 TWH				
14		166					CV-4C				
16	AIR COOLING NO.1		166		3	>15	10 mm. ²	IMC ø 1 1/2"			
18				166			G-2.5 TWH				
20		166					CV-4C				
22	AIR COOLING NO.1		166		3	>15	10 mm. ²	IMC ø 1 1/2"			
24				166			G-2.5 TWH				
26		781					CV-4C				
28	DRAINAGE PUMP NO.1		781		3	>30	16 mm. ²	IMC ø 2"			
30				781			G-4 TWH				
32		781					CV-4C				
34	DRAINAGE PUMP NO.2		781		3	>30	16 mm. ²	IMC ø 2"			
36				781			G-4 TWH				
38		1,000									
40	SPARE		1,000		3	>30	-	-			
42				1,000							
44		1,000									
46	SPARE		1,000		3	>30	-	-			
48				1,000							
		66,349	66,349	66,349							
TOTAL CONNECTED LOAD		199,047		VA							

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
	CONSULTANTS		DEDE	

 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO – MECHANICAL EQUIPMENT LOAD SCHEDULE	
 FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	 Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED 	REVIEWED  
DRAWN 	SUBMITTED 
CHECKED 	RECOMMENDED 
	APPROVED 
PROJECT MANAGER DATE	DRAWING NO. SHEET NO.
6/9/2024	31 of 37



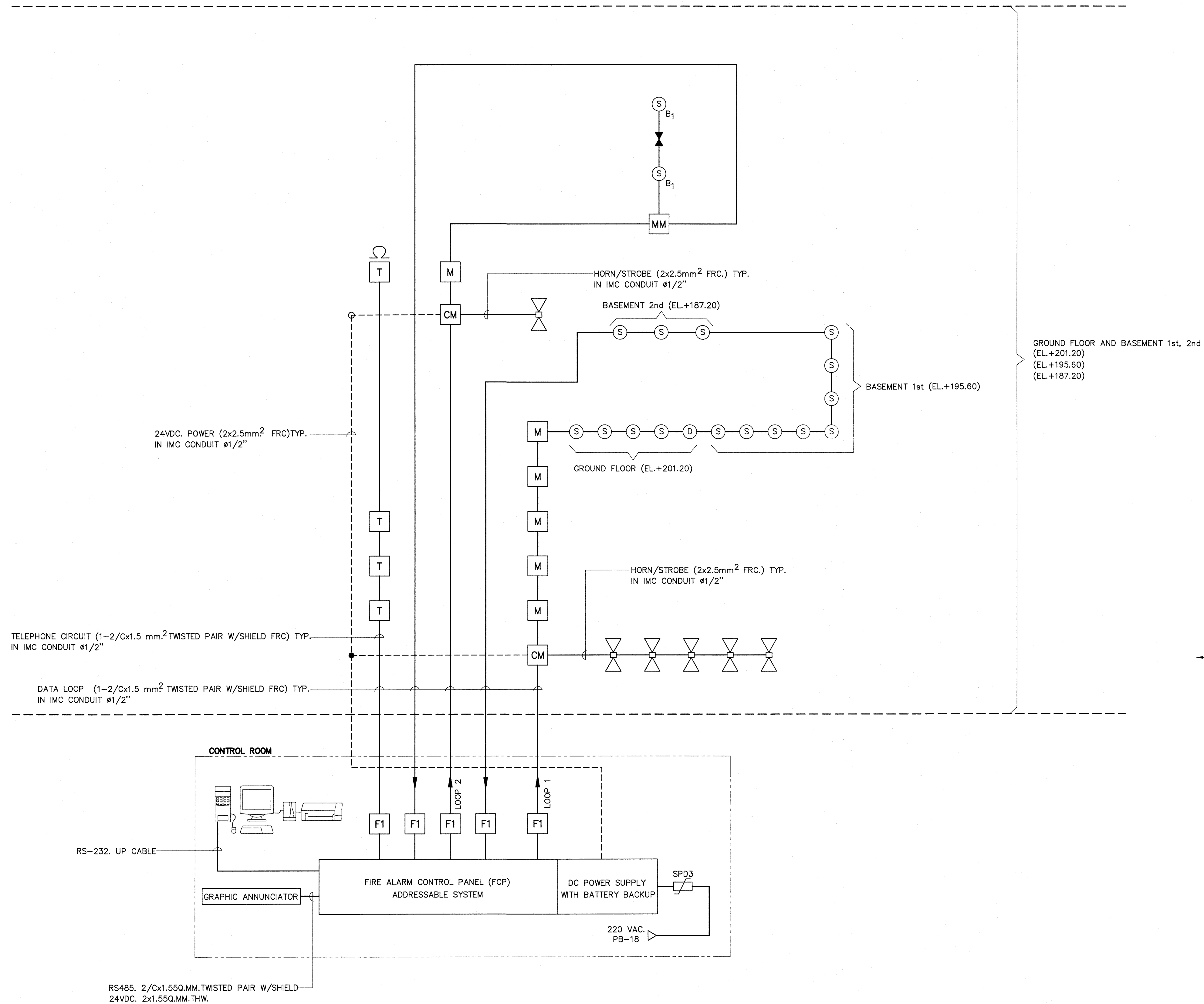
NOTE 1 :

- 1.1 SCADA SYSTEM SOFTWARE, AND SOFTWARE USER ON MOBILE APPLICATION SHALL BE SULLPLIED BY CONTRACTOR (COMPLETED WITH SOFTWARE LICENSE)
- 1.2 ALL MOBILE INTERNET NETWORK EQUIPMENT SHALL BE SULLPLIED BY CONTRACTOR (COMPLETED WITH 5 YEARS ANNUAL SERVICE FEE)

SCADA SCHEMATIC DIAGRAM
NOT TO SCALE

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
			CONSULTANTS	DEDE

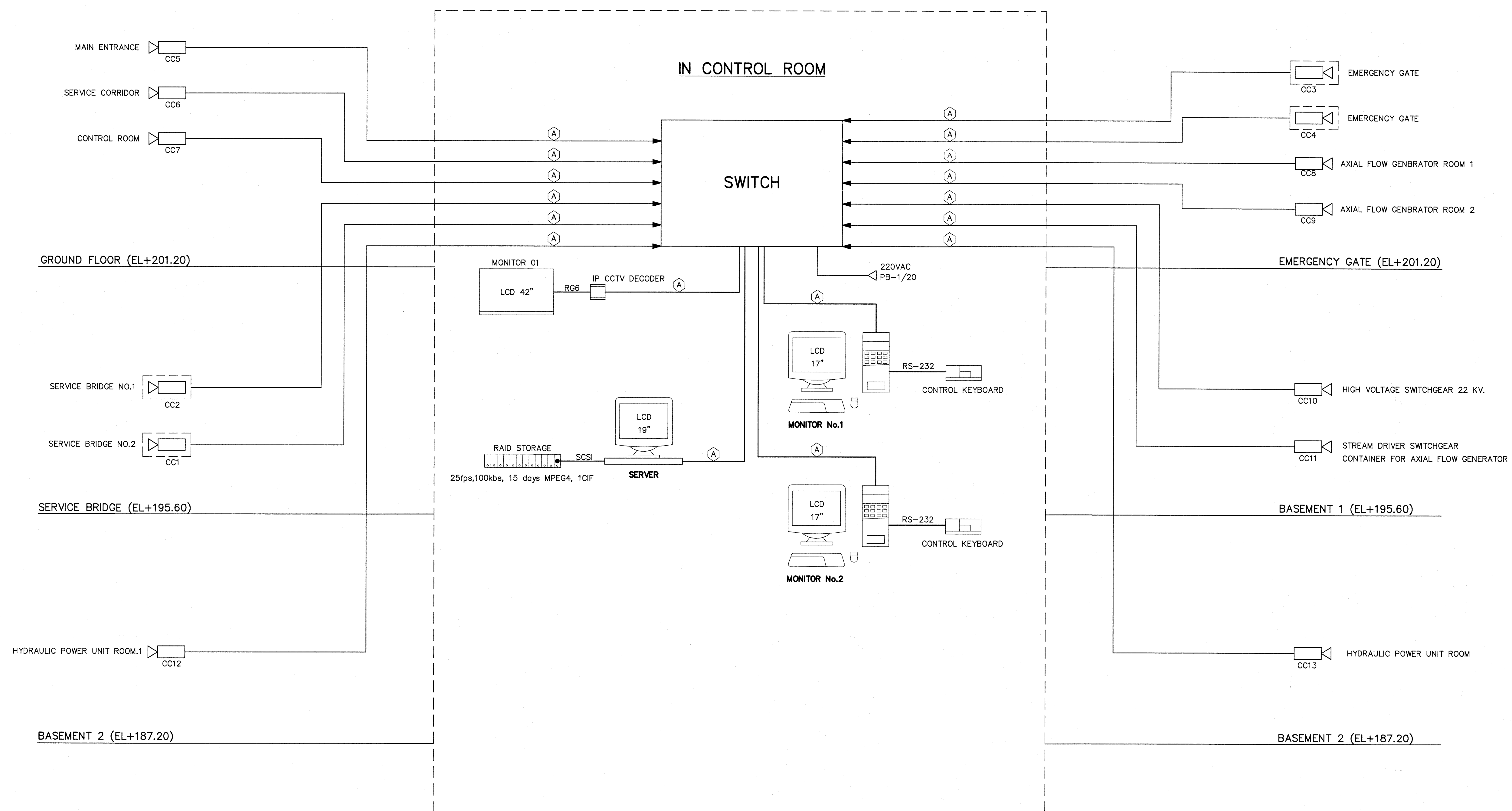
KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO – MECHANICAL EQUIPMENT SCADA SCHEMATIC DIAGRAM	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED <i>[Signature]</i> 3/11/2029	REVIEWED <i>[Signature]</i> 3/11/2029
DRAWN <i>[Signature]</i>	SUBMITTED <i>[Signature]</i>
CHECKED <i>[Signature]</i> 6/9/2024	RECOMMENDED <i>[Signature]</i>
PROJECT MANAGER DATE	APPROVED <i>[Signature]</i>
DRAWING NO. THN-EM-05	SHEET NO. 32 OF 37



FIRE ALARM SCHEMATIC AND LOGIC DIAGRAM
NOT TO SCALE

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
CONSULTANTS		DEDE		

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN			
ELECTRO – MECHANICAL EQUIPMENT FIRE ALARM RISER DIAGRAM			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED	27/11/2029	REVIEWED	27/11/2029
DRAWN	27/11/2029	SUBMITTED	27/11/2029
CHECKED	27/11/2029	RECOMMENDED	27/11/2029
APPROVED	27/11/2029	APPROVED	27/11/2029
PROJECT MANAGER		DATE	6/9/2024
DRAWING NO.		THN-EM-06	
SHEET NO.		33 OF 37	



NOTE :

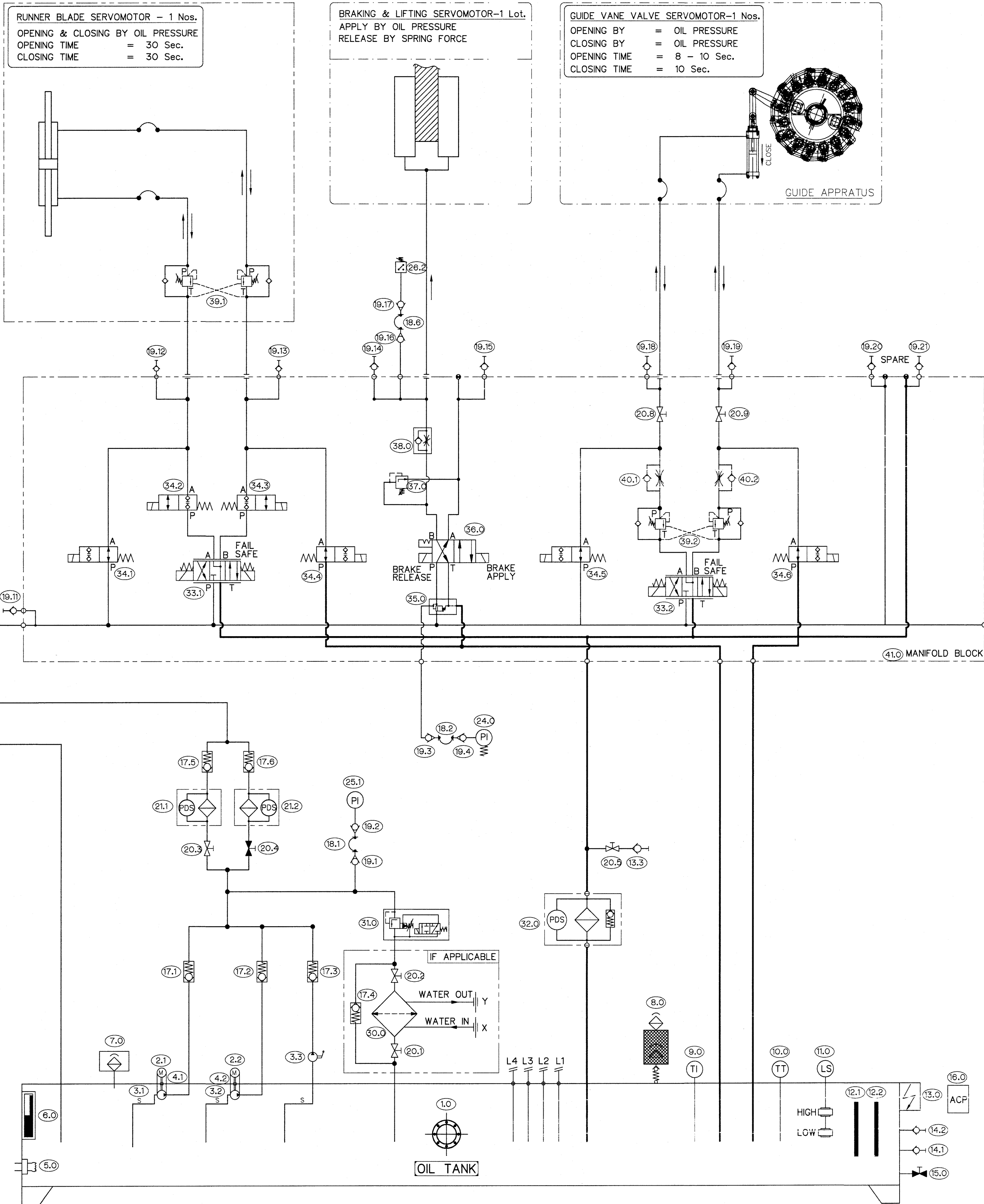
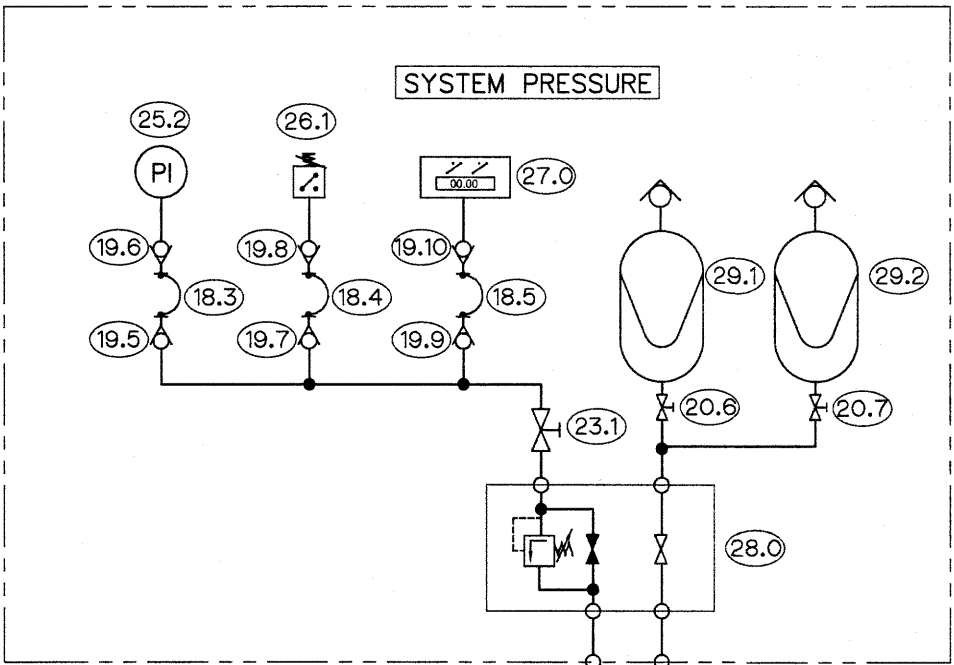
- (A) 24 AWG. BARE SOLID COPPER
4 PAIRS. CAT.6 IN IMC CONDUIT 3/4"
- OUTDOOR
CCTV CAMERA (FIX TYPE), IP55
CCX
- INDOOR
CCTV CAMERA (FIX TYPE)
CCX

CLOSE CIRCUIT TELEVISION (CCTV) SCHEMATIC DIAGRAM
NOT TO SCALE

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED
			CONSULTANTS	DEDE

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO – MECHANICAL EQUIPMENT CLOSE CIRCUIT TELEVISION (CCTV) SCHEMATIC DIAGRAM	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD. REVIEWED <i>[Signature]</i>	REVIEWED <i>[Signature]</i>
DESIGNED <i>[Signature]</i> 27/11/2024	SUBMITTED <i>[Signature]</i>
DRAWN <i>[Signature]</i>	RECOMMENDED <i>[Signature]</i>
CHECKED <i>[Signature]</i> 27/11/2024	APPROVED <i>[Signature]</i>
PROJECT MANAGER <i>[Signature]</i> 6/9/2024	DRAWING NO. THN-EM-07 SHEET NO. 34 OF 37

SYMBOL LEGEND							
NAME	ISOLATION VALVE	ISOLATION VALVE NORMALLY CLOSE	THROTTLE VALVE	PRESSURE RELIEF VALVE	PUMP	ELECTRIC MOTOR	PRESSURE REDUCING VALVE
SYMBOL							
NAME	3/2 DIRECTIONAL POPPET VALVE	3 WAY HAND OPERATED VALVE	THROTTLE CHECK VALVE	PRESSURE TRANSMITTER	SPACE HEATER	SOLENOID OPERATED	SPRING OPERATED
SYMBOL							
NAME	SOLENOID VARIABLE OPERATED	MINI-SS COUPLING	QUICK RELEASE COUPLING	ELECTRIC JUNCTION BOX	FLEXIBLE HOSE PIPE	PRESSURE SWITCH	LEVEL SWITCH
SYMBOL							
NAME	TEMPERATURE INDICATOR	4/2 WAYS DIRECTIONAL CONTROL VALVE	THROTTLE CHECK VALVE	NON - RETURN VALVE	LINE LEGEND		
SYMBOL					PRESSURE LINE		
NAME	DETENT TYPE	MANUAL ROTARY OPERATED	MANUAL HAND OPERATED	SPRING VARIABLE OPERATED	PILOT LINE		
SYMBOL					TANK RETURN LINE		
NAME	LEVEL INDICATOR SIDE MOUNTED	BLADDER ACCUMULATOR	FILLING FILTER	BREATHER WITH SILICA GEL	ALPHABET LEGEND		
SYMBOL					D - DIFFERENTIAL		
					I - INDICATOR		
					L - LEVEL		
					P - PRESSURE		
					S - SWITCH		
					TT - TRANSMITTER		
					T - TEMPERATURE		



BILL OF MATERIAL		
Sr.NO.	DESCRIPTION	QTY.
01.	OIL TANK, MATERIAL-M.S	01
02.	ELECTRIC MOTOR, 380 ± 10% AC SUPPLY, 50 Hz	02
03.	GEAR PUMP	03
04.	FLEXIBLE COUPLING TO SUIT PUMP-MOTOR SET.	02
05.	HEATER	01
06.	OIL LEVEL INDICATOR	01
07.	TANK BREATHER FILTER	01
08.	SILICA GEL BREATHER	01
09.	TEMPERATURE INDICATOR	01
10.	TEMPERATURE CONTROLLER WITH 2 SWITCHING & 1 ANALOGUE	01
11.	FLOAT SWITCH, SHREDAN MAKE	01
12.	MAGNETIC TANK CLEANER	02
13.	JUNCTION BOX	01
14.	QUICK RELEASE COUPLING	02
15.	DRAIN VALVE	01
16.	ANODISED CIRCUIT PLATE (ACP)	01
17.	CHECK VALVE	06
18.	HYDRAULIC HOSE	06
19.	MINI-SS COUPLING	21
20.	ISOLATING VALVE	09
21.	PRESSURE LINE FILTER, 5 MICRONS, WITH ELECT.& VISUAL INDICATION	02
22.	ISOLATING VALVE, LOCKABLE TYPE	01
23.	SHUT OFF VALVE (NEEDLE TYPE)	02
24.	PRESSURE INDICATOR WITH CONTACT, 100 MM DIAL	01
25.	PRESSURE INDICATOR, 100 MM DIAL	03
26.	PRESSURE SWITCH	02
27.	ELECTRONIC PRESSURE TRANSMITTER WITH TWO CONTACT AND ONE ANALOGUE OUTPUT&LOCAL INDICATION, SUPPLY VOLTAGE 24 VDC	01
28.	ACCUMULATOR SAFETY BLOCK	01
29.	BLADDER ACCUMULATOR	02
30.	PLATE TYPE HEAT EXCHANGER	01
31.	LOADING/UNLOADING VALVE	01
32.	RETURN LINE FILTER WITH ELECT.&VISUAL IND. 10 MICRON	01
33.	PROPORTIONAL VALVE	02
34.	POPPET VALVE	06
35.	PRESSURE REDUCING VALVE	01
36.	4/2 DIRECTIONAL CONTROL VALVE (DETENT TYPE)	01
37.	PRESSURE RELIEF VALVE	01
38.	THROTTLE CHECK VALVE (MANIFOLD MOUNTED)	01
39.	PRESSURE REGULATOR WITH FEEDBACK	02
40.	THROTTLE CHECK VALVE	02
41.	MANIFOLD BLOCK	01

- NOTE:-
1. SYSTEM WORKING PRESSURE IS 120 - 200 kg/cm2 (AS CONTRACTOR DESIGN)
 2. TEST PRESSURE USING EXTERNAL SOURCE IS 1.5 TIME FROM WORKING PRESSURE
 3. THE MATERIAL OF THE TANK IS AS PER ASTM516/ASME SA516
 4. WELDABLE FITTINGS SHALL BE USED FOR ALL PIPE LINES.
 5. ALL PIPES AND FITTINGS SHALL BE SEAMLESS STAINLESS STEEL AS PER ASTM A312
 6. OIL VELOCITY IN PIPES NOT TO EXCEED 4.5 M/SEC. AT MAXIMUM OIL FLOW.
 7. SERVOMOTORS DETAILS MAY VARY DURING DETAIL ENGINEERING.
 8. CONTROL VOLTAGE : 220 V DC (FOR ALL CONTROL VALVE).
 9. 24 V DC FOR Pr. TRANSMITTER & PROPORTIONAL VALVE.
 10. SUPPLY VOLTAGE : 380 ±10VAC, 50Hz
 11. OIL TI BE USED : ISO VG 46/68

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

THONG NOI DIVERSION WEIR HYDROPOWER PROJECT
AMPHOE MUEANG NAN CHANGWAT NAN

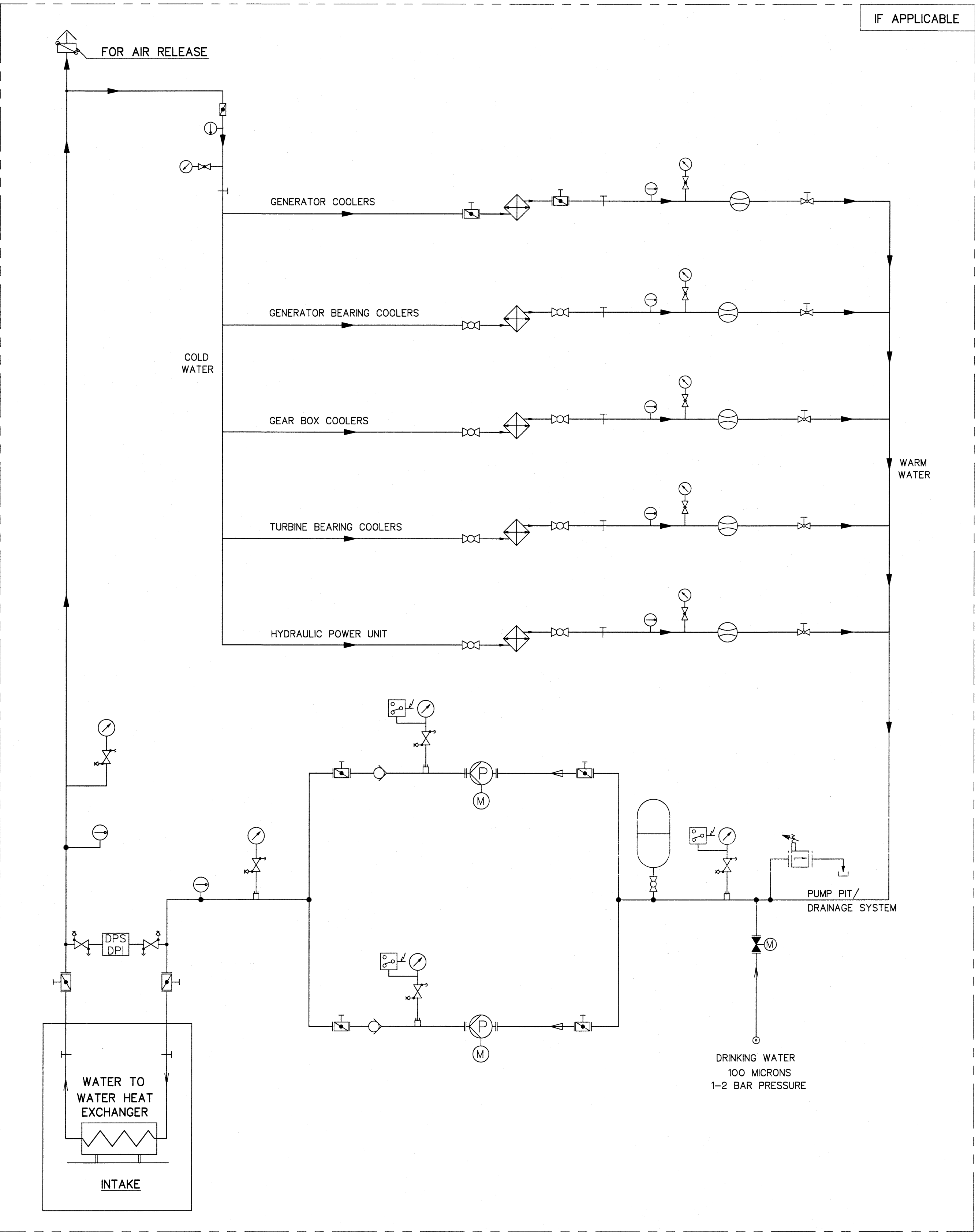
ELECTRO - MECHANICAL EQUIPMENT

SCHEMATIC DIAGRAM OF OIL PRESSURE UNIT FOR TURBINE AND BRAKE

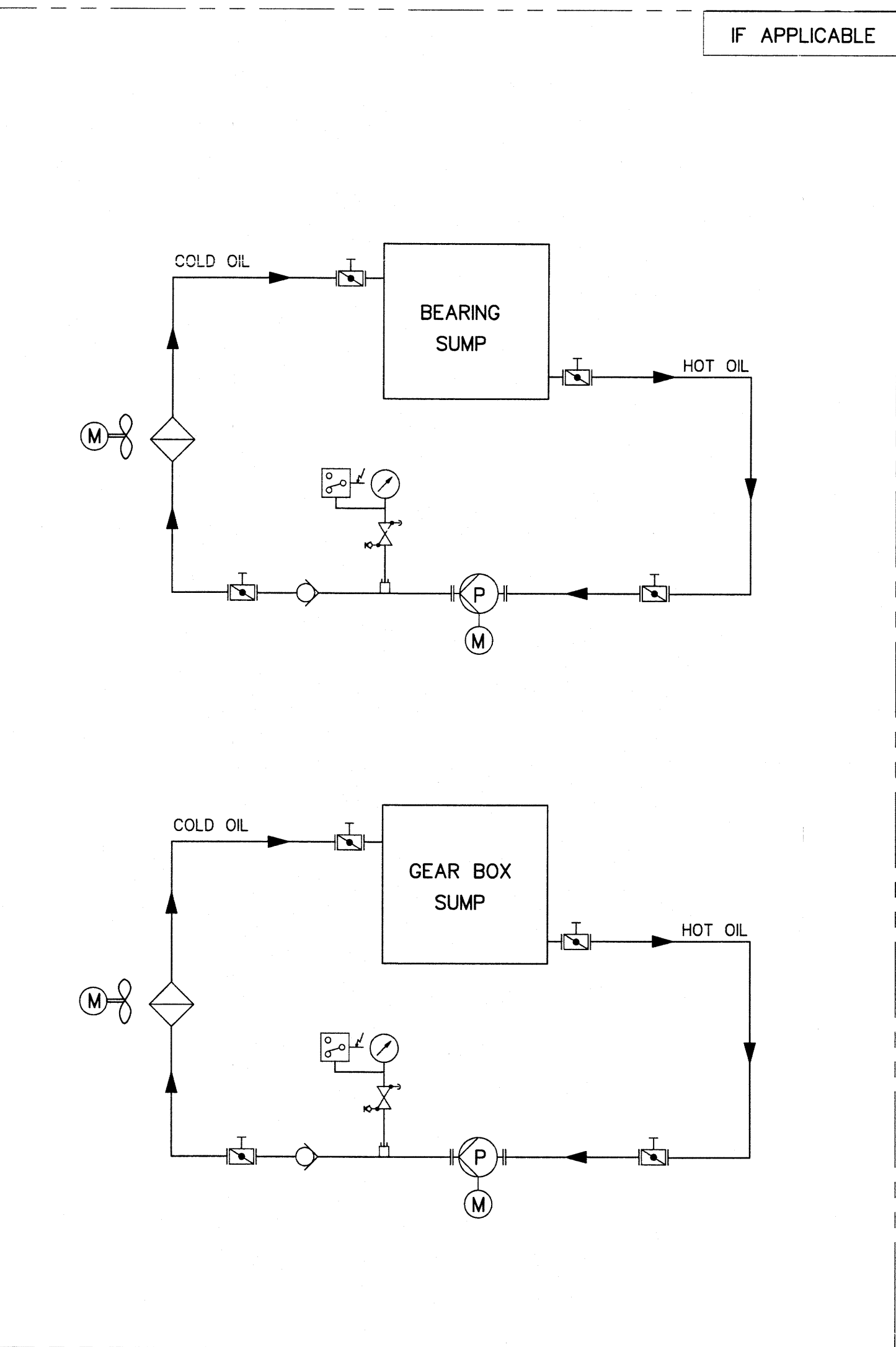
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	REVIEWED	DESIGNED	21/197	SUBMITTED
		DRAWN		RECOMMENDED
		CHECKED	21/197	APPROVED
		PROJECT MANAGER	6/9/2024	DRAWING NO.
				THN-EM-08
				SHEET NO.
				35 OF 37

SYMBOL LEGEND					
NAME	CENTRIFUGAL PUMP MOTOR SET	ISOLATION VALVE (GATE TYPE)	CHECK VALVE	INSTRUMENT ISOLATION VALVE	WATER TO WATER HEAT EXCHANGER
SYMBOL					
NAME	CONTROL VALVE (GLOBE TYPE)	ISOLATION VALVE (BALL TYPE)	PRESSURE SWITCH	PRESSURE GAUGE	FLOW INDICATOR
SYMBOL					
NAME	DIFFERENTIAL PRESSURE SWITCH	TEMPERATURE GAUGE	MOTORIZED GATE VALVE	PRESSURE RELIEF VALVE	RTD
SYMBOL					
NAME	COOLER	ELECTRIC FAN	AIR RELEASE VALVE		
SYMBOL					

CLOSE LOOP COOLING WATER SYSTEM



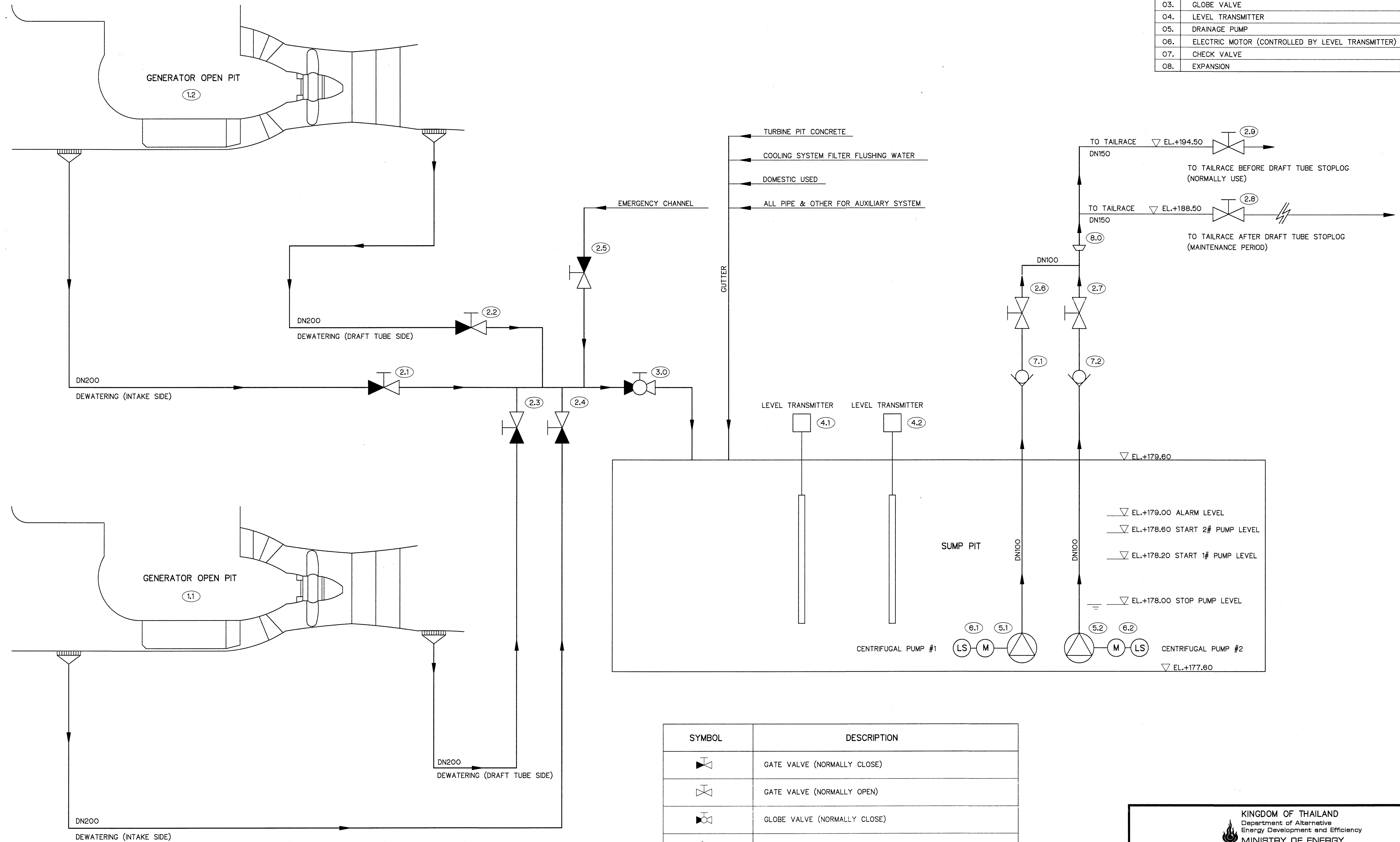
OIL COOLER WITH RADIATOR FAN



- NOTES:-**
- ALL ELEVATIONS ARE IN METER
 - SUPPLY VOLTAGE : 400 VAC $\pm 10\%$ 3PH, 50 Hz -3% to $+5\%$.
 - MATERIAL OF CONSTRUCTION FOR PIPES SHALL BE SEAMLESS STAINLESS STEEL AS PER ASTM A 312 or ISO 1127.
 - ALL FITTINGS SHALL BE OF SS AS PER ASME B 16.9, ASME A403, ASME M 16.5, ASTM A182.
 - MATERIAL OF CONSTRUCTION FOR ALL VALVES SHALL BE BODY-CAST STEEL & INTERNAL-SS.
 - TURBINE SHAFT SEAL SYSTEM SHALL BE DESIGNED AS FOLLOW THE MANUFACTURER STANDARD.

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN	
ELECTRO – MECHANICAL EQUIPMENT SCHEMATIC DIAGRAM FOR COOLING SYSTEM	
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY
DESIGNED <i>[Signature]</i> ๑๗.2197	REVIEWED <i>[Signature]</i>
DRAWN <i>[Signature]</i>	SUBMITTED <i>[Signature]</i>
CHECKED <i>[Signature]</i> ๑๗.2197	RECOMMENDED <i>[Signature]</i>
APPROVED <i>[Signature]</i>	APPROVED <i>[Signature]</i>
PROJECT MANAGER DATE 6/9/2024	DRAWING NO. THN-EM-09
	SHEET NO. 36 OF 35



BILL OF MATERIAL		
Sr.NO.	DESCRIPTION	QTY.
01.	TURBINE AND GENERATOR	02
02.	GATE VALVE	09
03.	GLOBE VALVE	01
04.	LEVEL TRANSMITTER	02
05.	DRAINAGE PUMP	02
06.	ELECTRIC MOTOR (CONTROLLED BY LEVEL TRANSMITTER)	02
07.	CHECK VALVE	02
08.	EXPANSION	01

SYMBOL	DESCRIPTION
	GATE VALVE (NORMALLY CLOSE)
	GATE VALVE (NORMALLY OPEN)
	GLOBE VALVE (NORMALLY CLOSE)
	CHECK VALVE
	EXPANSION
	PUMP WITH ELECTRIC MOTOR (CONTROLLED BY LEVEL TRANSMITTER)

NOTES:-

- ALL ELEVATIONS ARE IN METER
- SUPPLY VOLTAGE : 400 VAC $\pm 10\%$ 3PH, 50 Hz -3% to $+5\%$.
- MATERIAL OF CONSTRUCTION FOR PIPES SHALL BE SEAMLESS STAINLESS STEEL AS PER ASTM A 312 or ISO 1127.
- ALL FITTINGS SHALL BE OF SS AS PER ASME B 16.9, ASME A403, ASME M 16.5, ASTM A182.
- MATERIAL OF CONSTRUCTION FOR ALL VALVES SHALL BE BODY-CAST STEEL & INTERNAL -SS.

3				
2				
1				
NO.	DATE	REVISIONS	CHECKED	APPROVED

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY			
THONG NOI DIVERSION WEIR HYDROPOWER PROJECT AMPHOE MUEANG NAN CHANGWAT NAN			
ELECTRO – MECHANICAL EQUIPMENT SCHEMATIC DIAGRAM FOR DRAINAGE & DEWATERING SYSTEM			
FRONTIER ENGINEERING CONSULTANTS CO.,LTD.		Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
DESIGNED <i>สมชาย วัฒนศิริ</i> ๑๗.๒1๙7		REVIEWED <i>สมชาย วัฒนศิริ</i>	
DRAWN <i>สมชาย วัฒนศิริ</i>		SUBMITTED <i>สมชาย วัฒนศิริ</i>	
CHECKED <i>สมชาย วัฒนศิริ</i> ๑๗.๒1๙7		RECOMMENDED <i>สมชาย วัฒนศิริ</i>	
APPROVED <i>สมชาย วัฒนศิริ</i>		APPROVED <i>สมชาย วัฒนศิริ</i>	
PROJECT MANAGER <i>สมชาย วัฒนศิริ</i> 6/9/2024		DRAWING NO. THN-EM-10	
DATE		SHEET NO. 37 OF 37	