



Department of Alternative
Energy Development and Efficiency
MINISTRY OF ENERGY

FLOOD WARNING AND PREVENTION SYSTEM FOR EFFICIENCY ENHANCEMENT FOR NAM WA MINI HYDROPOWER PROJECT

CHANGWAT NAN

CONTRACT

CIVIL WORKS

VOLUME 4

DRAWINGS



PANYA CONSULTANTS CO.,LTD.

Chai Lins

FLOOD WARNING AND PREVENTION SYSTEM FOR EFFICIENCY ENHANCEMENT FOR NAM WA MINI HYDROPOWER PROJECT

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Amir Amir

SYMBOLS

	TYPICAL NORTH ARROWS
	CENTER LINE
	PAVED ROAD
	DIRT ROAD, LATERITE ROAD OR TRACK
	VILLAGE
	CITY OR DISTRICT
	POND OR SWAMP
	CULVERT UNDER ROAD
	BRIDGE
	POLE
	DIAMETER
	DEGREE, MINUTE, SECOND
	AT EQUAL DISTANCE BETWEEN CENTER TO CENTER
	AND
	PERCENT
	INCH
	DEFLECTION ANGLE
	STATION
	BC, EC, PI, PVI, PVC, 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
	ELEVATION OR PLAN OF EARTH CUT OR FILL
	ELEVATION OR PLAN OF ROCK CUT
	ELEVATION OR PLAN OF CONCRETE LINING
	BM
	NATURAL GROUND LEVEL
	CONTOUR LINE
	RIVER, STREAM OR NATURAL DRAIN
	FLOW DIRECTION
	SLOPE DIRECTION
	SLOPE RATIO

ABBREVIATIONS

A.	AMPHOE (DISTRICT)
AC	ASBESTOS CEMENT
A/C	ASPHALTIC CONCRETE
ALT.	ALTERNATE
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AZ.	AZIMUTH
Ø	SPACING
B	BEGINNING OF SURVEY
B.	BAN (VILLAGE)
B.C.	BEGINNING OF CURVE
BL.	BOTTOM LEVEL
BM	BENCH MARK
°	DEGREE CELSIUS
C.B.R.	CALIFORNIA BEARING RATIO
CL	CENTER LINE
C/C	CENTER TO CENTER
cm	CENTIMETER
cm ²	SQUARE CENTIMETER
cm ³	CUBIC CENTIMETER
cms	CUBIC METER PER SECOND
CONC.	CONCRETE
DBST	DOUBLE BITUMINOUS SURFACE TREATMENT
DEG	DEGREE
DIA.	DIAMETER
D/S	DOWNSTREAM
DWG.	DRAWING
E	EAST OR END OF SURVEY OR EAST OR EXTERNAL DISTANCE
E.C. OR P.T.	END OF CURVE OR POINT OF TANGENT
E.G.A.T.	THE ELECTRICITY GENERATING AUTHORITY OF THAILAND
EL.	ELEVATION
F.S.L.	FULL SUPPLY LEVEL
GALV.	GALVALNIZED
G.W.L.	GROUND WATER LEVEL
H	HEIGHT
HORIZ.	HORIZONTAL
H.W.L.	HIGH WATER LEVEL
HWY	HIGHWAYS
Δ OR ∇	DEFLECTION ANGLE
I.D.	INSIDE DIAMETER

ABBREVIATIONS

INV.	INVERT ELEVATION
kg	KILOGRAM
Km	KILOMETER
ksc	KILOGRAM PER SQUARE CENTIMETER
kW	KILOWATT
L	LENGTH
L.C.	LENGTH OF CURVE
L.M.	LINEAR METER
LONG.	LONGITUDINAL
LT.	LEFT
L.W.L.	LOW WATER LEVEL
m	METER
m ²	SQUARE METER
m ³	CUBIC METER
m ³ /s	CUBIC METER PER SECOND
mm	MILLIMETER
mm ²	SQUARE METER
m/s	METER PER SECOND
MAX.	MAXIMUM
MCM	MILLION CUBIC METER
MIN.	MINIMUM
MO.	MIDDLE OFFSET FOR VERTICAL CURVE
MOL.	MINIMUM OPERATING LEVEL
M.S.L.	MEAN SEA LEVEL
N.G.L.	NATURAL GROUND LINE
NO.	NUMBER
O.D.	OUTSIDE DIAMETER
O & M	OPERATION AND MAINTENANCE
PBM	PERMANENT BENCH MARK
P.C.	PRESTRESSED CONCRETE
P.I.	POINT OF INTERSECTION
PL	PLATE
PVC	POLYVINYL CHLORIDE
PVC.	POINT OF VERTICAL CURVE
PVT.	POINT OF VERTICAL TANGENT
PVI.	POINT OF VERTICAL INTERSECTION
Q.	DISCHARGE
R	RADIUS
R.C.	REINFORCED CONCRETE

ABBREVIATIONS

RCP	REINFORCED CONCRETE PIPE
REINF.	REINFORCEMENT
RID	ROYAL IRRIGATION DEPARTMENT
R.O.W	RIGHT OF WAY
RWL	RETENTION WATER LEVEL
sec.	SECOND
Σ	SURVEY LINE
S/P	STEEL PIPE
STA.	STATION
STD.	STANDARD
T	TANGENT
TB	TOP BANK
TBL	TOP BANK LEVEL
THK.	THICKNESS
T.L.	TANGENT LENGTH
TWL	TAIL WATER LEVEL
TYP.	TYPICAL
TIS	THAI INDUSTRIAL STANDARD
t/m ²	METRIC TON PER SQUARE METER
U/S	UPSTREAM
V	VELOCITY OF FLOW
VC	LENGTH OF VERTICAL CURVE
VERT.	VERTICAL
VOL.	VOLUME
WL, WS	WATER DESIGN LEVEL
W/O	WITHOUT

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
FLOOD WARNING AND PREVENTION SYSTEMS FOR EFFICIENCY ENHANCEMENT FOR NAM WA MINI HYDROPOWER PROJECT CHANGWAT NAN	
GENERAL DRAWINGS SYMBOLS AND ABBREVIATIONS	
DESIGNED <i>[Signature]</i> DRAWN <i>[Signature]</i> CHECKED <i>[Signature]</i> PROJECT MANAGER	REVIEWED <i>[Signature]</i> RECOMMENDED <i>[Signature]</i> APPROVED <i>[Signature]</i> DATE 13/11/2018
CONSULTANTS DEDE	DRAWING NO. NW-GN-01 SHEET NO. 01 OF 23

[Signature]

GENERAL NOTES :

1. GENERAL

- 1.1 ALL DIMENSIONS AND ELEVATIONS (ABOVE M.S.L.) ARE IN METERS, REINFORCING BAR AND STRUCTURAL STEEL ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN.
- 1.2 THIS NOTE SHALL BE APPLIED TO EARTH WORKS AND OTHER RELATED WORKS FOR THE DETAILED DESIGN DRAWING
- 1.3 ANY DISCREPANCY IN THE FIGURED DIMENSIONS IS TO BE REPORTED IMMEDIATELY TO THE ENGINEER
- 1.4 ALL CONCRETE CONSTRUCTION AND STRUCTURAL DETAILS SHALL BE ACCORDANCE WITH THE ACI 318-89 AND ACI 315-94 OR E.I.T. STANDARD 1001-16
- 1.5 ALL STEEL CONSTRUCTION AND STRUCTURAL DETAILS SHALL BE ACCORDANCE WITH THE AISC-ASD89 CODE
- 1.6 ALL STEEL STRUCTURAL WELDING SHALL BE ACCORDANCE WITH THE AWS-1990 CODE, E60
- 1.7 THE LOCATION OF PROPOSED CONSTRUCTION JOINT SHALL BE SUBMITTED TO THE ENGINEER APPROVAL PRIOR TO PLACEMENT OF CONCRETE

2. EARTH WORKS

- 2.1 THE BOTTOM SURFACE OF EXCAVATION LINE FOR THE STRUCTURES SHALL NOT BE DISTURBED BY OVERCUT OR UNSUITABLE DRAINAGE METHOD. FOUNDATION SOIL OF REASONABLE MATERIAL DIRECTED BY THE ENGINEER MIGHT BE ORDERED WITHOUT ANY ADDITION PAYMENT.
- 2.2 THE CONTRACTOR SHALL PROVIDE AND OPERATE THE SUFFICIENT DEWATERING FACILITIES TO DRAIN THE RAIN AND UNDER GROUND WATER AND PROVIDE BRACING AND SUPPORTING TO PREVENT THE SLOPE FAILURE AND COLLAPSE IN TRENCH.
- 2.3 DEPTH OF EXCAVATION INDICATED IN THIS DRAWINGS MEASURED FROM N.G.L. AS A GUIDE ONLY FINAL EXCAVATION LINES MAY VARY FROM THOSE SHOWN.
- 2.4 THE STRUCTURES SHOULD BE PLACED ON UNDISTURBED SOILS OR COMPACTED FILL AND BACKFILL AROUND THE STRUCTURES SHOULD BE COMPACTED.
- 2.5 ALLOWABLE BEARING CAPACITY OF SOIL FOUNDATION ARE AS FOLLOWS ON HARD ROCK
 - FLOOD PROTECTION WALL AND GUIDE WALL AND IT'S BEARING CAPACITY MUST BE MORE THAN 200 TONS/m²
 - OFFICE AND BUILDING SHALL NOT BE LESS THAN 20 TONS/m²

3. CONCRETE WORKS

- 3.1 THE ULTIMATE COMPRESSIVE STRENGTH OF CONCRETE OF STANDARD CYLINDER (#0.15x0.30 m) TEST AT AGE 28 DAYS SHALL BE AS THE FOLLOWINGS, UNLESS OTHERWISE INDICATED.

fc' (ksc)	DESCRIPTION
210	FLOOD PROTECTION WALL, GUIDE WALL AND SUMP
175	MAN HOLE

- 3.2 THE FOLLOWING MINIMUM CLEAR COVER OF CONCRETE TO THE MAIN REINFORCEMENT ARE AS FOLLOWS, UNLESS OTHERWISE INDICATED ON THE SPECIFIC DRAWINGS.
 - 3.2.1 ALL STAIR SLABS AND LANDINGS, USE 2.5 cm
 - 3.2.2 AT UNDERSIDE OF BRIDGE SLABS EXPOSED TO WEATHER, USE 4 cm
 - 3.2.3 AT FACE OF STRUCTURE EXPOSED TO WEATHER OF BACKFILL OR SUBMERGED (FOR BAR HAVING DIAMETER 32 mm AND LESS) USE 7.5 cm
 - 3.2.4 CONCRETE PLACED DIRECTLY AGAINST EARTH OR ROCK OR SURFACE SUBJECTED TO CORROSIVE LIQUID, USE 10 cm
- 3.3 CHAMFER ALL EXPOSED CORNERS 2 cm UNLESS OTHERWISE INDICATED.
- 3.4 ALL CONSTRUCTION JOINTS SHALL BE TREATED AS DIRECTED IN ORDER TO ASSUME THE BEST BOND.
- 3.5 THE MAXIMUM SIZE OF COARSE AGGREGATE FOR R.C. STRUCTURE SHALL BE LESS THAN 3/4" AND NOT EXCEEDING ONE FIFTH OF MINIMUM THICKNESS FORTH OF MINIMUM DISTANCE BETWEEN FACE TO FACE OF HORIZONTAL REINFORCEMENT.

4. REINFORCING BARS

- 4.1 ULTIMATE TENSILE STRESSES OF REINFORCING STEEL CONFORM TO THE REQUIREMENT OF THAI INDUSTRIAL STANDARD DESIGNATION.
 - SR 24, TIS 20-2527 FOR STRUCTURAL GRADE PLAIN ROUND BAR.
 - SD 30, TIS 24-2536 FOR INTERMEDIATE GRADE DEFORMED BAR.
- 4.2 ALL REINFORCEMENT DESIGNATIONS ARE CONFORM TO ACI 318-89 AND E.I.T. STANDARD 1001-16 AND DIMENSIONS TO REINFORCEMENT ARE THE CENTER OF BAR.
- 4.3 PLACING OF REINFORCEMENT BAR IS AS FOLLOWS
 - A. SINGLE REINFORCEMENT LAYER SHALL BE PLACED IN THE MIDDLE OF THE CONCRETE THICKNESS UNLESS OTHERWISE SHOWN.
 - B. DOUBLE REINFORCEMENT LAYER SHALL BE PLACED SO THAT CLEAR DISTANCE BETWEEN FACE OF CONCRETE AND REINFORCEMENT CONFORM TO NOTE 3.2
- 4.4 ALL LAP LENGTHS AND BEND OF REINFORCEMENT SHALL CONFORM TO ACI STANDARD OR E.I.T. STANDARD, UNLESS PRESENTED IN DETAIL DRAWINGS.
- 4.5 BAR ARRANGEMENT AT THE CORNERS AND AT THE DIFFERENT SURFACE LEVELS OR ECCENTRIC ALIGNMENT AS SHOWN BELOW SHALL BE THE MINIMUM SPLICE REQUIREMENT FOR DEFORMED BARS.
- 4.6 ALL HOOK, IF NOT SHOWN ON THE DRAWINGS, SHALL COMPLY WITH STANDARD HOOK AS SHOWN IN THE FIGURES AND IN THE TABLE.

BAR BENDS OF REINFORCEMENT

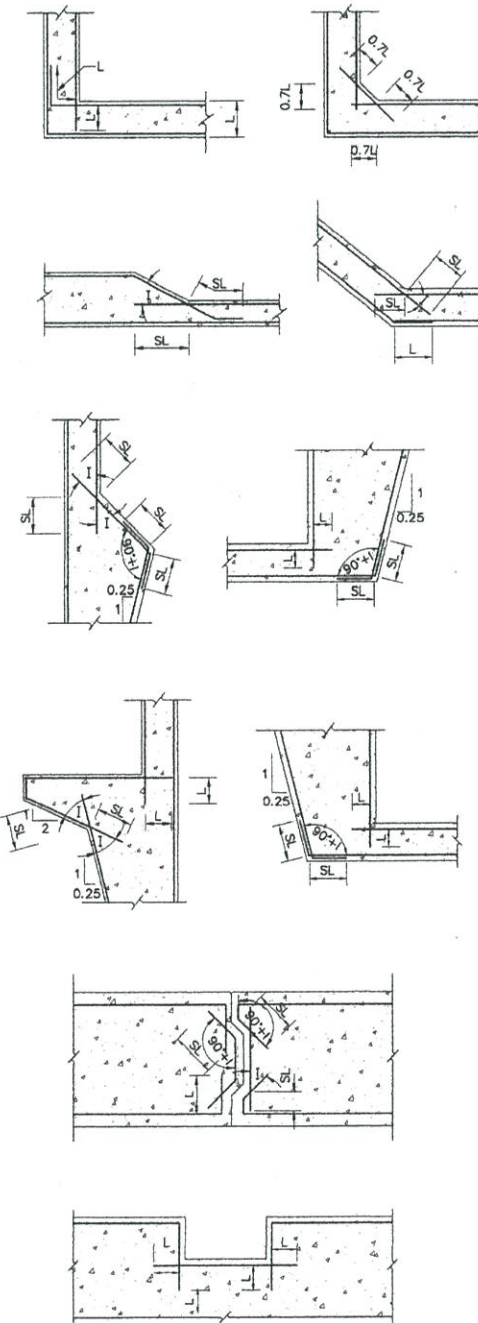
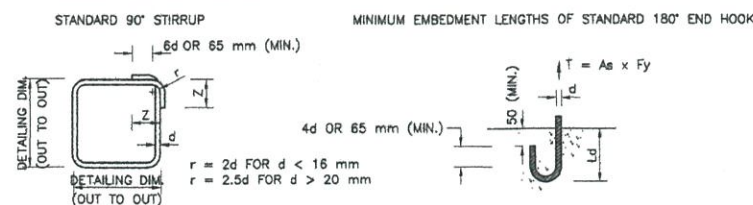


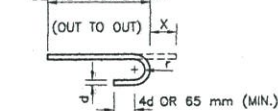
TABLE OF PLAIN ROUND BARS

BAR DIAMETER (mm)	L (cm)	0.7L (cm)	SL (cm)		
			I = 0°-30°	I = 30°-65°	I = 65°-90°
9	35	25	20	25	30
12	50	35	30	40	45
15	60	42	35	45	55
19	80	56	45	60	70
25	125	88	70	95	110

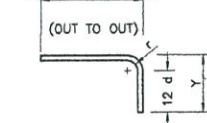
TABLE OF DEFORM BARS

BAR DIAMETER (mm)	L (cm)	0.7L (cm)	SL (cm)		
			I = 0°-30°	I = 30°-65°	I = 65°-90°
10	30	21	18	23	25
12	35	25	20	25	30
16	50	35	30	38	45
20	80	56	50	60	70
25	110	77	60	70	90
28	125	88	75	100	115
32	140	98	85	110	125

STANDARD 180° HOOK
DETAILING DIMENSION



STANDARD 90° BEND
DETAILING DIMENSION



r = BEND RADIUS
= 3d FOR BAR DIA. 6,9 AND 10 THROUGH 25 mm
= 4d FOR BAR DIA. 28 AND 32 mm

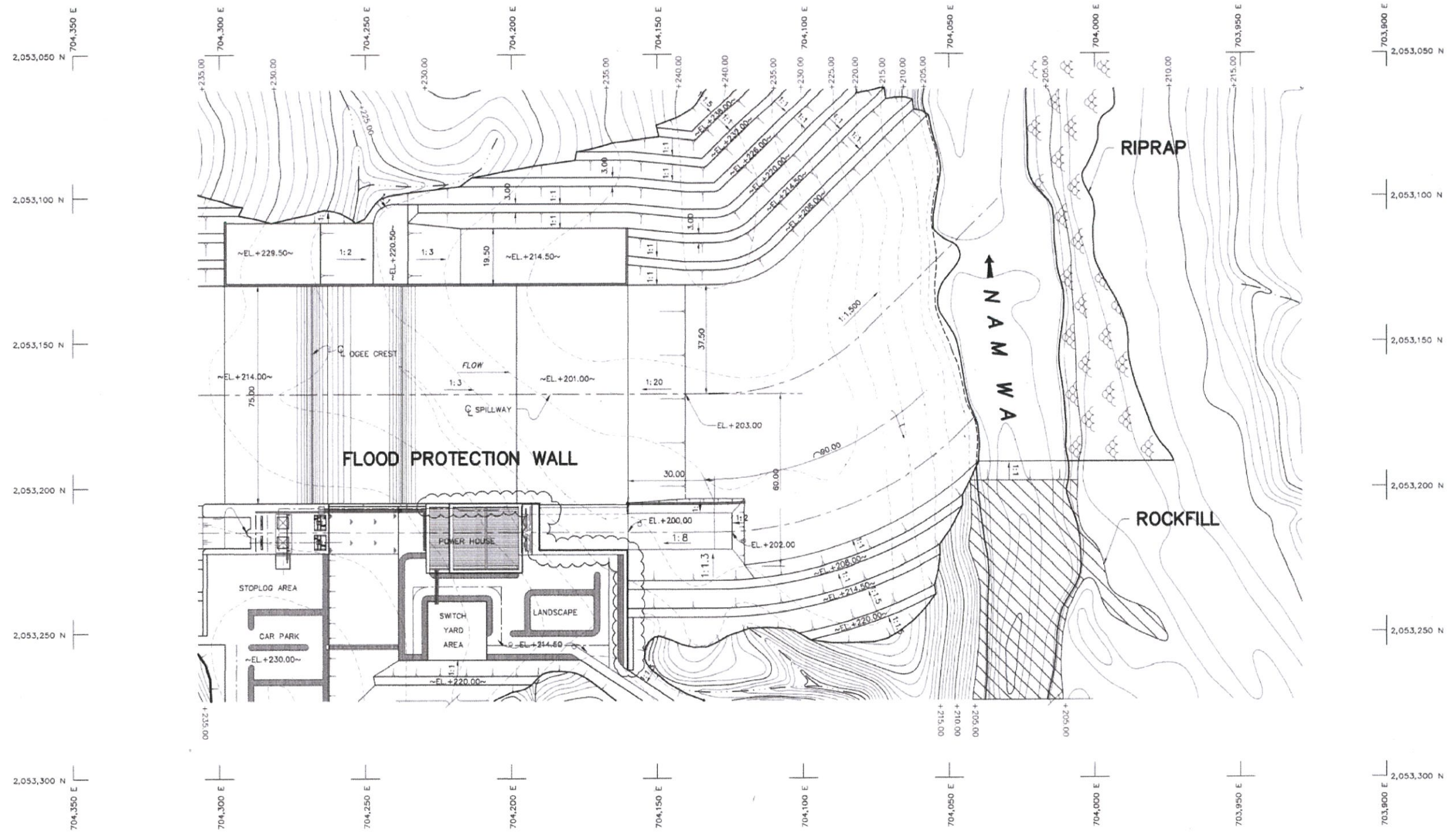
STANDARD HOOK, BEND AND STIRRUP IN MILLIMETERS

BAR DIAMETER (mm)	6	9	10	12	16	20	25	28	32
X (mm)	105	120	130	160	210	260	320	380	430
Y (mm)	96	150	160	200	260	320	400	480	550
Z * (2) (mm)	170	180	190	220	300	380	480	550	608

BAR DIAMETER (mm)	6	9	10	12	16	20	25	28
Ld (mm)	-	250	250	275	275	300	350	400

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FLOOD WARNING AND PREVENTION SYSTEMS FOR EFFICIENCY ENHANCEMENT FOR NAM WA MINI HYDROPOWER PROJECT CHANGWAT NAN	
GENERAL DRAWINGS GENERAL NOTES	
PANYA CONSULTANTS CO., LTD. REVIEWED <i>Amritipong, K. KITCHAI</i>	Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY SUBMITTED <i>Amritipong, K. KITCHAI</i>
DESIGNED <i>Amritipong, K. KITCHAI</i> DRAWN <i>Amritipong, K. KITCHAI</i>	RECOMMENDED <i>Amritipong, K. KITCHAI</i> APPROVED <i>Amritipong, K. KITCHAI</i>
NO. DATE REVISIONS CHECKED APPROVED CONSULTANTS DEDE	DRAWING NO. SHEET NO. NW-GN-02 02 OF 23

Amritipong, K. KITCHAI

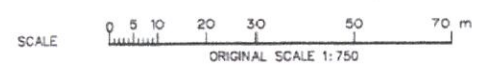


GENERAL PLAN

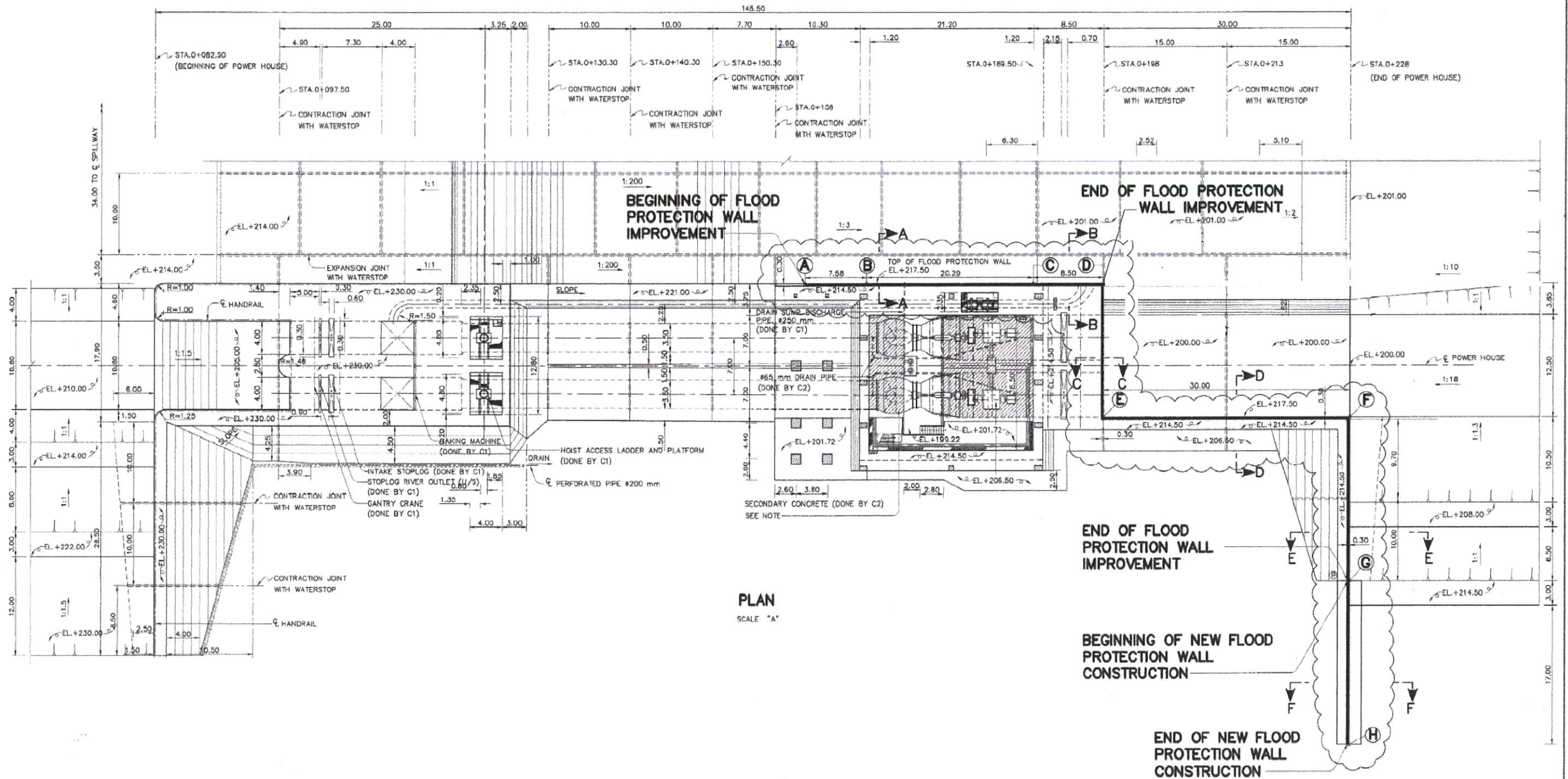
SCALE 1:750

NOTES :

1. ALL DIMENSIONS AND ELEVATIONS (M.S.L.) ARE IN METERS, DISTANCE ARE IN KILOMETERS, UNLESS OTHERWISE SHOWN.
2. SYMBOLS, ABBREVIATION AND GENERAL NOTES SEE DWG. NO. NW-QN-01 AND NW-QN-02



KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
FLOOD WARNING AND PREVENTION SYSTEMS FOR EFFICIENCY ENHANCEMENT FOR NAM WA MINI HYDROPOWER PROJECT CHANGWAT NAN	
FLOOD PROTECTION WALL GENERAL LAYOUT	
DESIGNED DRAWN CHECKED PROJECT MANAGER	REVIEWED SUBMITTED RECOMMENDED APPROVED DATE
CONSULTANTS DEDE	SHEET NO. NW-RE-01 04 OF 23



NOTES :

1. ALL DIMENSIONS AND ELEVATION ARE IN METERS UNLESS OTHERWISE SHOWN.
2. FOR GENERAL NOTE SEE DWG. NO. NW-GN-02

REFERENCE DRAWINGS :

1. FLOOD PROTECTION WALL AND GUIDE WALL, GENERAL LAYOUT
2. FLOOD PROTECTION WALL AND GUIDE WALL, ELEVATION OF FLOOD PROTECTION WALL
3. FLOOD PROTECTION WALL AND GUIDE WALL, SECTION OF FLOOD PROTECTION WALL

DWG. NO. NW-RE-01
 DWG. NO. NW-RE-03
 DWG. NO. NW-RE-04

SCALE "A" 0 5 10 15 20 25 m
 ORIGINAL SCALE 1:250

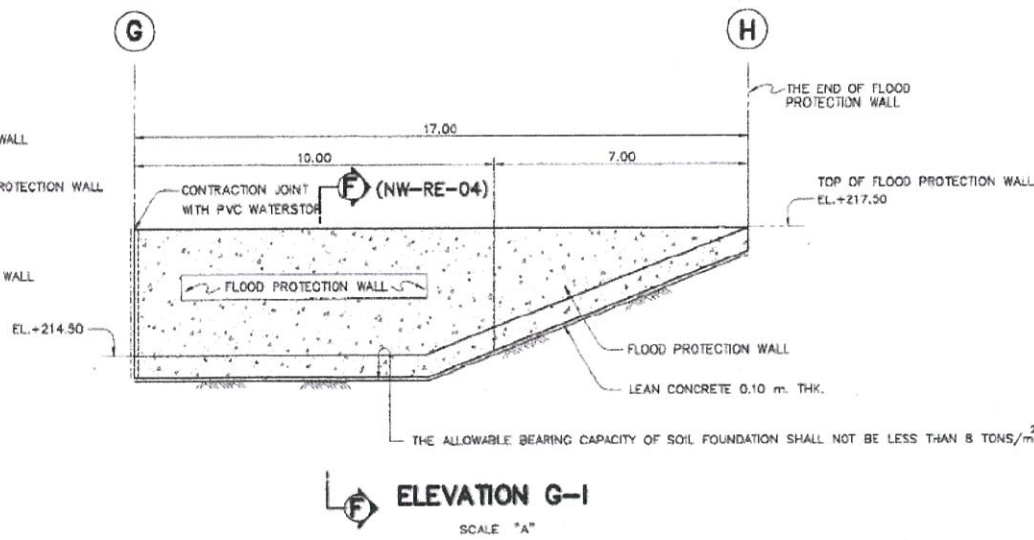
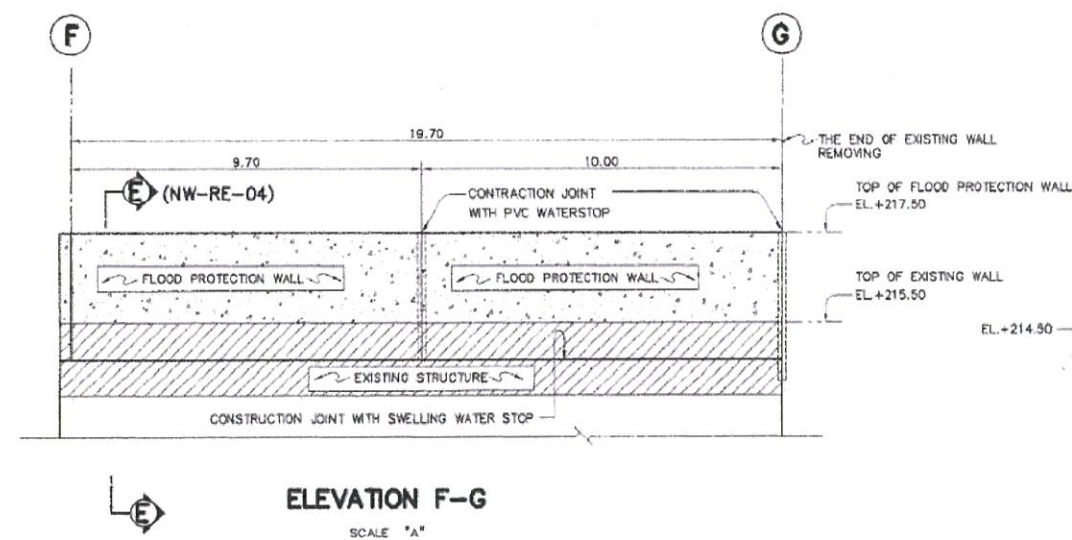
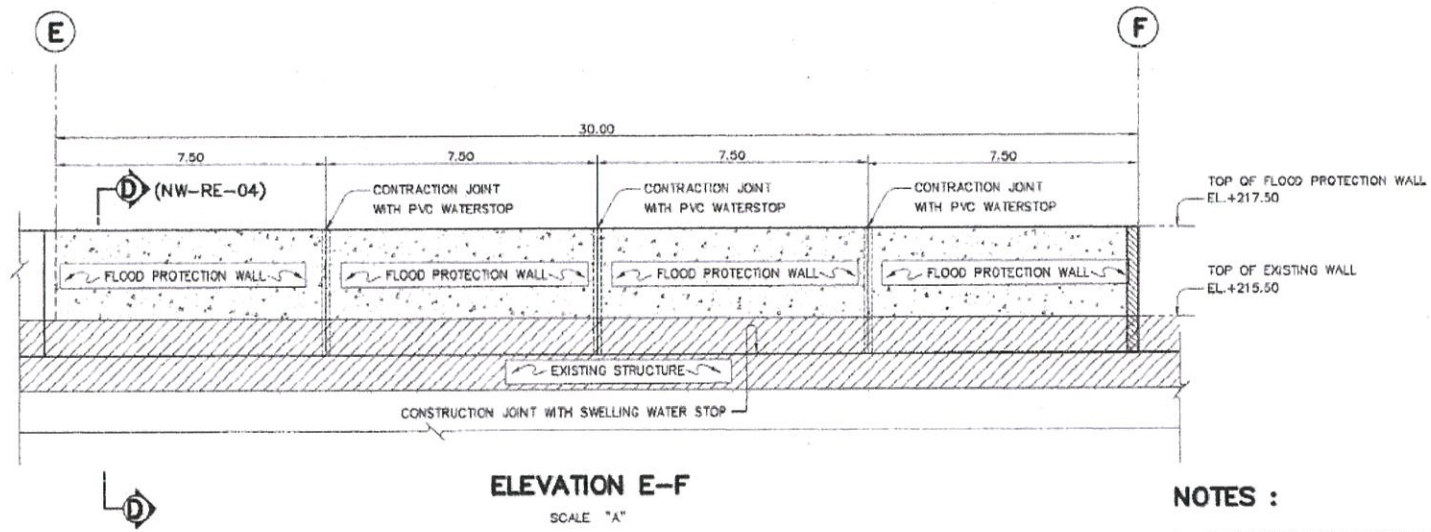
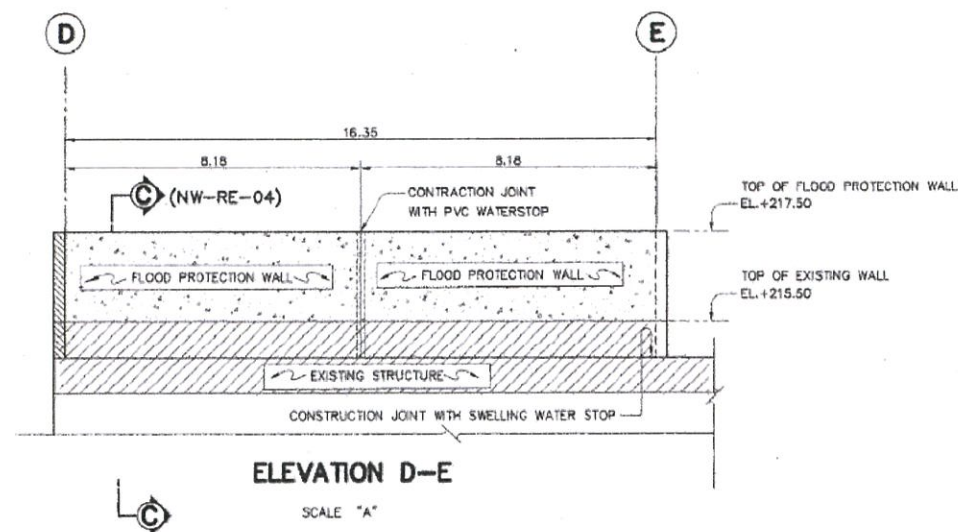
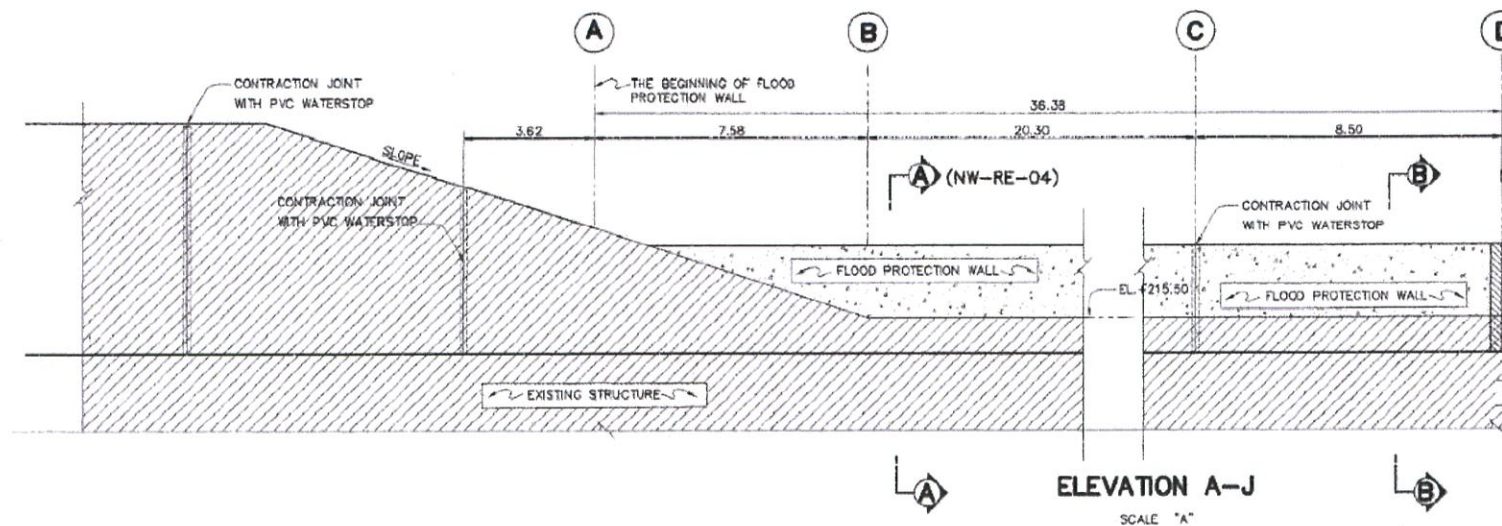
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NO.	DATE	REVISIONS	CHECKED	APPROVED

CONSULTANTS

DEDE

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
FLOOD WARNING AND PREVENTION SYSTEMS FOR EFFICIENCY ENHANCEMENT FOR NAM WA MINI HYDROPOWER PROJECT CHANGWAT NAN	
FLOOD PROTECTION WALL PLAN OF FLOOD PROTECTION WALL	
PANYA CONSULTANTS CO., LTD. DESIGNED: <i>[Signature]</i> DRAWN: <i>[Signature]</i> CHECKED: <i>[Signature]</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: 13/11/2018 DRAWING NO. NW-RE-02 SHEET NO. 05 OF 23

[Handwritten Signature]



NOTES :

1. ALL DIMENSIONS AND ELEVATION ARE IN METERS UNLESS OTHERWISE SHOWN.
2. ALL DIAMETERS OF REINFORCING BARS ARE IN MILLIMETERS.
3. THE ULTIMATE COMPRESSIVE STRENGTH OF CONCRETE OF STANDARD CYLINDER MUST NOT BE LESS THAN 210 kg/cm^2 AT AGE 28 DAYS.
4. THE ULTIMATE TENSILE STRESS OF REINFORCING BAR WILL CONFORM TO THE REQUIREMENT OF THAI INDUSTRIAL STANDARD INSTITUTE (TIS. 24-2559) DESIGNATION SD30 FOR INTERMEDIATE GRADE DEFORMED BAR WITH AN ALLOWABLE TENSILE STRESS OF $1,500 \text{ kg/cm}^2$ UNLESS OTHERWISE INDICATED.
5. FOR GENERAL NOTES OF REINFORCEMENT CONCRETE SEE DWG. NO. NW-04-02

SCALE "A" 0 1 2 3 4 5 6 7 8 9 10 m
ORIGINAL SCALE 1:100

REFERENCE DRAWINGS :

1. FLOOD PROTECTION WALL AND GUIDE WALL ,PLAN OF FLOOD PROTECTION WALL
2. FLOOD PROTECTION WALL AND GUIDE WALL ,SECTION OF FLOOD PROTECTION WALL

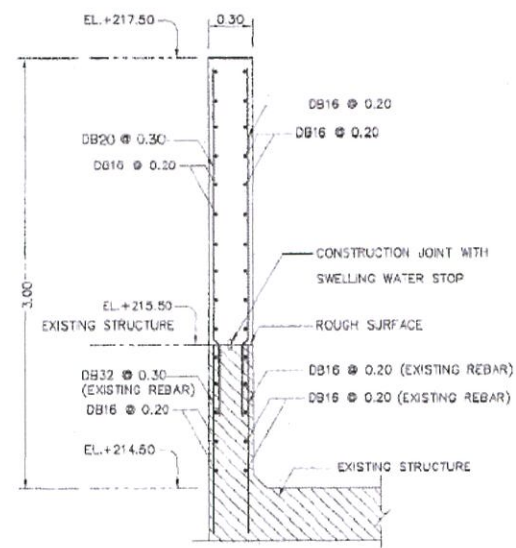
DWG. NO. NW-RE-02
DWG. NO. NW-RE-04

KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
FLOOD WARNING AND PREVENTION SYSTEMS FOR EFFICIENCY ENHANCEMENT FOR NAM WA MINI HYDROPOWER PROJECT CHANGWAT NAN	
FLOOD PROTECTION WALL ELEVATION OF FLOOD PROTECTION WALL	
DESIGNED <i>[Signature]</i> DRAWN <i>[Signature]</i> CHECKED <i>[Signature]</i> NO. DATE REVISIONS CHECKED APPROVED	REVIEWED <i>[Signature]</i> SUBMITTED <i>[Signature]</i> RECOMMENDED <i>[Signature]</i> APPROVED <i>[Signature]</i> DRAWING NO. SHEET NO.
CONSULTANTS DEDE	PROJECT MANAGER DATE 15/11/2019 NW-RE-03 06 OF 23

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SPILLWAY SIDE

POWERHOUSE SIDE



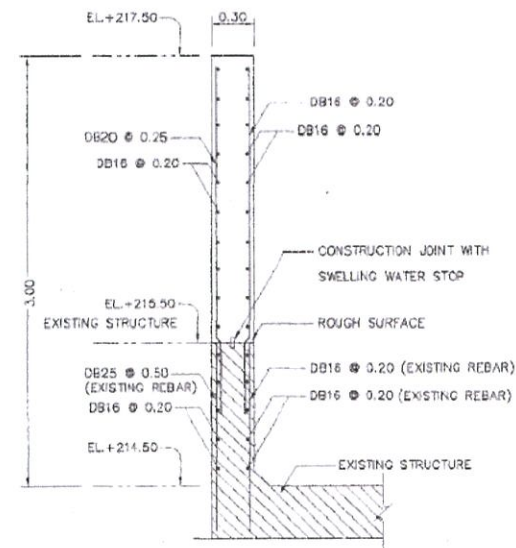
(TOTAL LENGTH 20.30 m)

SECTION A-A

SCALE "A"

SPILLWAY SIDE

POWERHOUSE SIDE



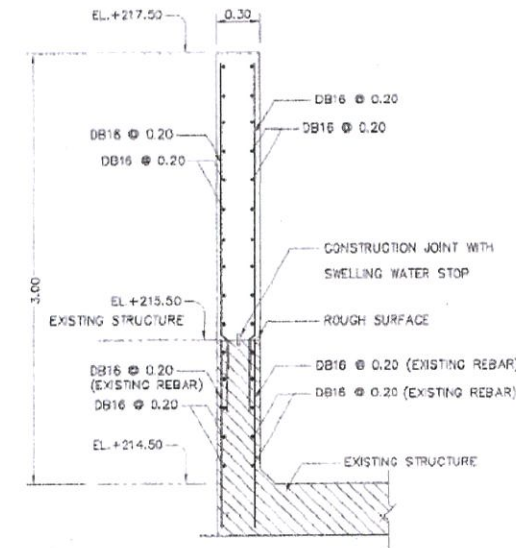
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SECTION B-B

SCALE "A"

SPILLWAY SIDE

POWERHOUSE SIDE



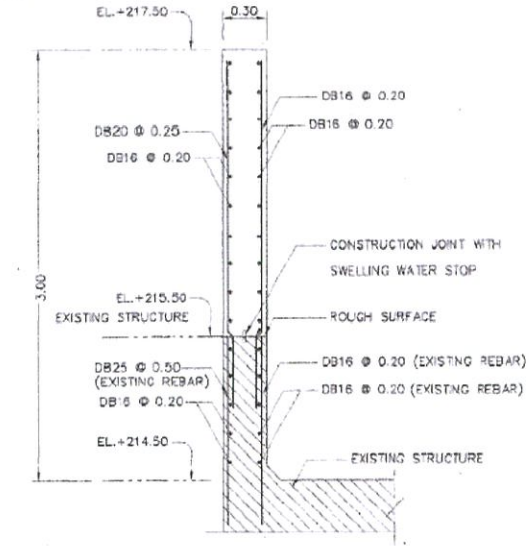
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SECTION C-C

SCALE "A"

SPILLWAY SIDE

POWERHOUSE SIDE



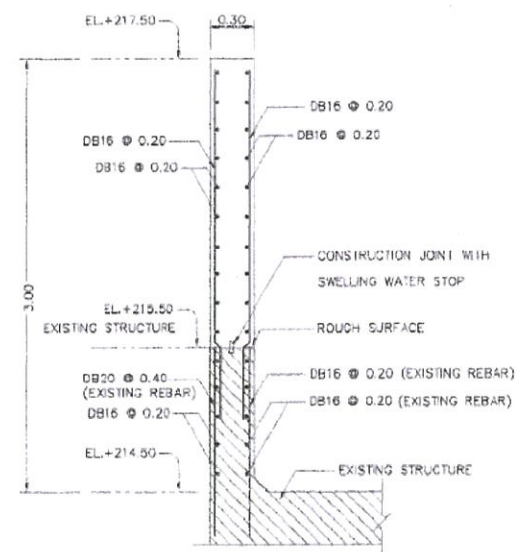
(TOTAL LENGTH 30.00 m)

SECTION D-D

SCALE "A"

TAILRACE SIDE

POWERHOUSE SIDE



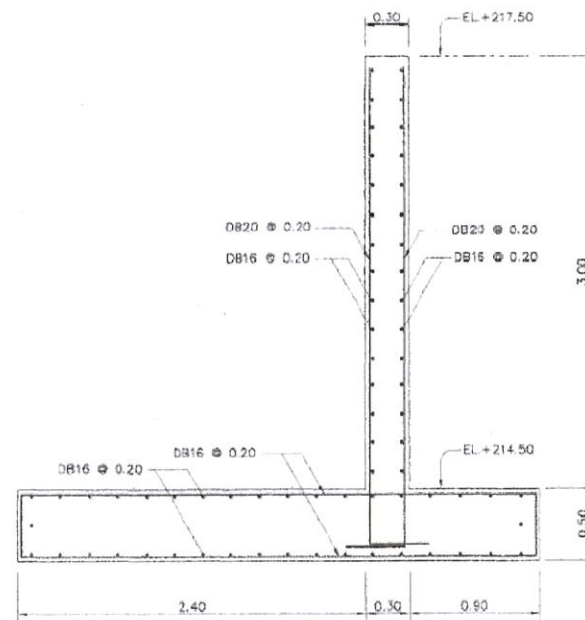
(TOTAL LENGTH 19.70 m)

SECTION E-E

SCALE "A"

TAILRACE SIDE

POWERHOUSE SIDE



(TOTAL LENGTH 17.00 m)

SECTION F-F

SCALE "A"

REFERENCE DRAWINGS :

1. FLOOD PROTECTION WALL OF POWER HOUSE, PLAN OF FLOOD PROTECTION
2. FLOOD PROTECTION WALL OF POWER HOUSE, ELEVATION

DWG. NO. NW-RE-02

DWG. NO. NW-RE-03

SCALE "A" 0 0.5 1.0 1.5 2.0 2.5 m

ORIGINAL SCALE 1:25

NOTES :

1. ALL DIMENSIONS AND ELEVATION ARE IN METERS UNLESS OTHERWISE SHOWN.
2. ALL DIAMETERS OF REINFORCING BARS ARE IN MILLIMETERS.
3. THE ULTIMATE COMPRESSIVE STRENGTH OF CONCRETE OF STANDARD CYLINDER MUST NOT BE LESS THAN 210 kg/cm² AT AGE 28 DAYS.
4. THE ULTIMATE TENSILE STRESS OF REINFORCING BAR WILL CONFORM TO THE REQUIREMENT OF THAI INDUSTRIAL STANDARD INSTITUTE (TIS. 24-2559) DESIGNATION SD30 FOR INTERMEDIATE GRADE DEFORMED BAR WITH AN ALLOWABLE TENSILE STRESS OF 1,500 kg/cm² UNLESS OTHERWISE INDICATED.
5. FOR GENERAL NOTES OF REINFORCEMENT CONCRETE SEE DWG. NO. NW-CN-02
6. OVERLAPPING LENGTH OF REINFORCEMENT BAR SHALL NOT BE LESS THAN 40 TIME OF LARGEST REINFORCEMENT BARS DIAMETERS.
7. FOR SECTION A-A, WELDING METHOD IS USED FOR STEEL OVERLAPPING. THE OVERLAPPING LENGTH OF REINFORCEMENT STEEL BAR SHALL NOT BE LESS THAN 15 TIMES OF LARGEST REINFORCEMENT BARS DIAMETERS, AND THE TENSILE STRENGTH OF WELD MUST NOT BE LESS THAN 1.25 TIMES OF YIELD STRENGTH.
8. DRILLING LENGTH OF REINFORCEMENT BAR AND CONCRETE SHALL NOT BE LESS THAN 10-12 TIME OF REINFORCEMENT BAR DIAMETERS.
9. CONCRETE EXTRACTION OF EXISTING STRUCTURE MUST EXTRACT FROM THE SURFACE TO OVERLAPPING LENGTH, AND THE EXTRACTED SURFACE MUST BE CLEANED.

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

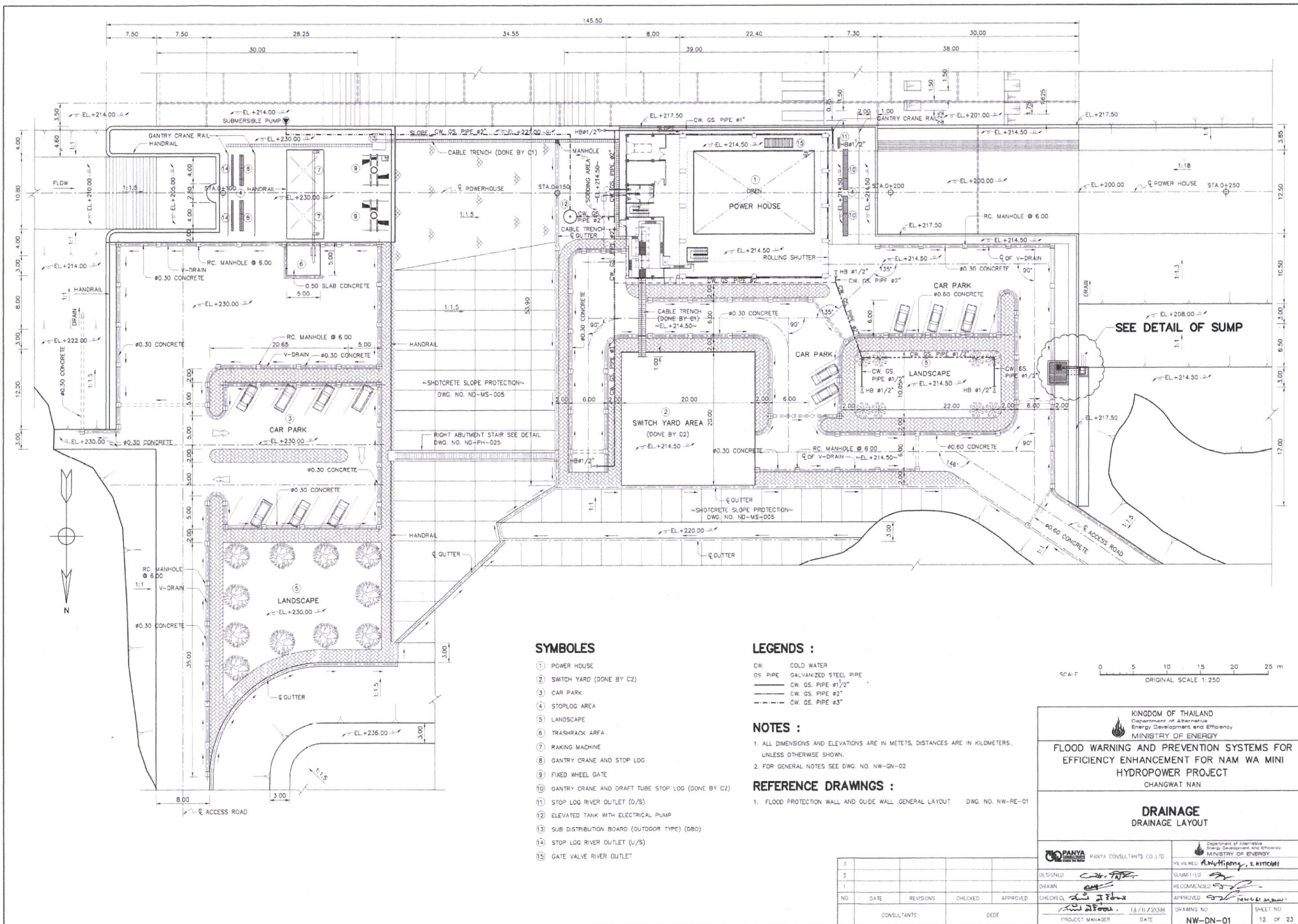
FLOOD WARNING AND PREVENTION SYSTEMS FOR
EFFICIENCY ENHANCEMENT FOR NAM WA MINI
HYDROPOWER PROJECT
CHANGWAT NAN

FLOOD PROTECTION WALL

REINFORCEMENT DETAILS OF FLOOD PROTECTION WALL

PANYA CONSULTANTS CO., LTD.		REVISOR: A. W. Panyaporn, S. KIRKHA	
DESIGNED: [Signature]		SUBMITTED: [Signature]	
DRAWN: [Signature]		RECOMMENDED: [Signature]	
CHECKED: [Signature]		APPROVED: [Signature]	
NO.	DATE	REVISIONS	CHECKED
CONSULTANTS		DEDE	
PROJECT MANAGER		DATE	
DRAWING NO.		NW-RE-04	
SHEET NO.		07 OF 23	

Chai Lait



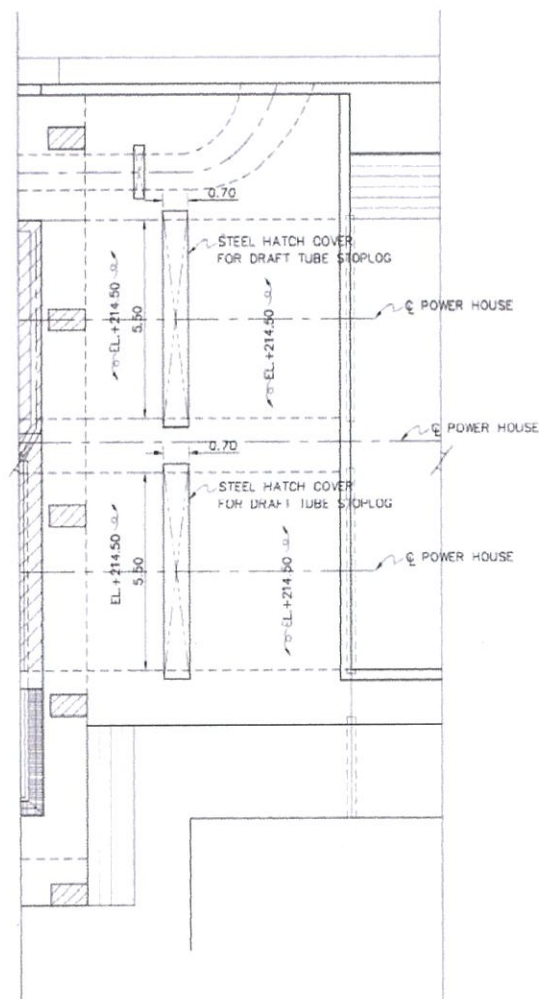


1. DRAINAGE LAYOUT ,DRAINAGE

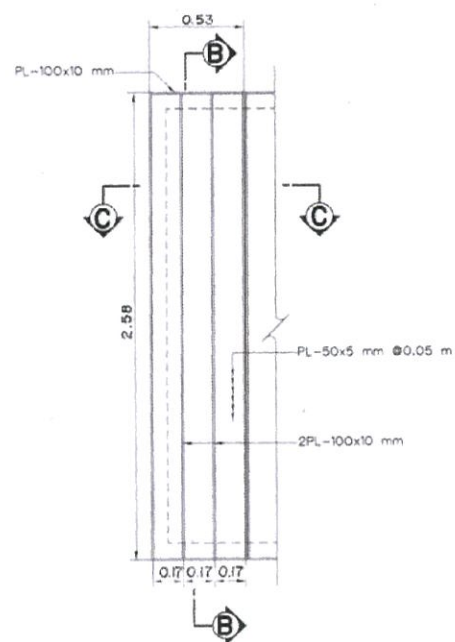
DWG. NO. NW-DN-01

 KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY		
FLOOD WARNING AND PREVENTION SYSTEMS FOR EFFICIENCY ENHANCEMENT FOR NAM WA MINI HYDROPOWER PROJECT CHANGWAT NAN		
DRAINAGE DETAIL OF SUMP AND MANHOLE		
DRAWING NO. NW-DN-02		SHEET NO. 13 OF 23

DRAWING NO.	SHEET NO.
NW-DN-02	13 OF 23

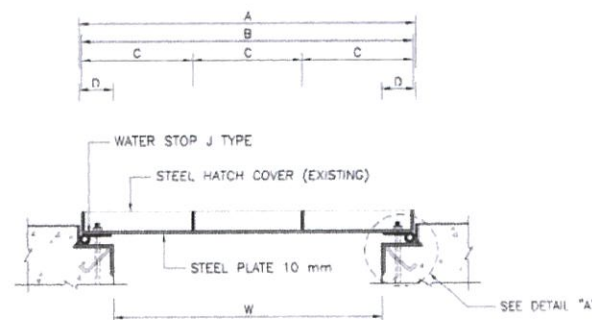


PLAN
SCALE "A"

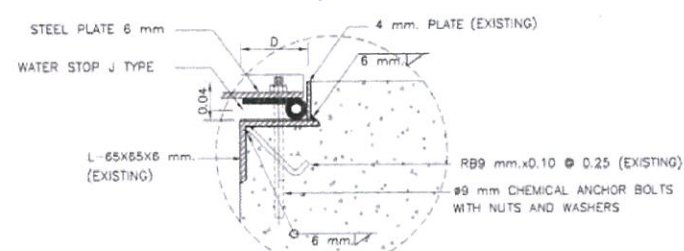


DETAIL OF GRATING
SCALE "C"

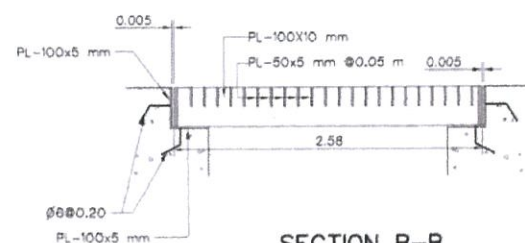
STEEL HATCH COVER	W	A	B	C	D	E
DRAFT TUBE STOPLOG 5.50x4.40	0.70	0.83	0.81	0.27	0.065	+214.50



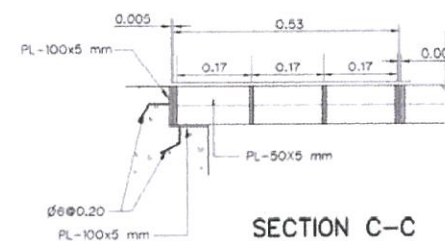
SECTION A-A
SCALE "B"



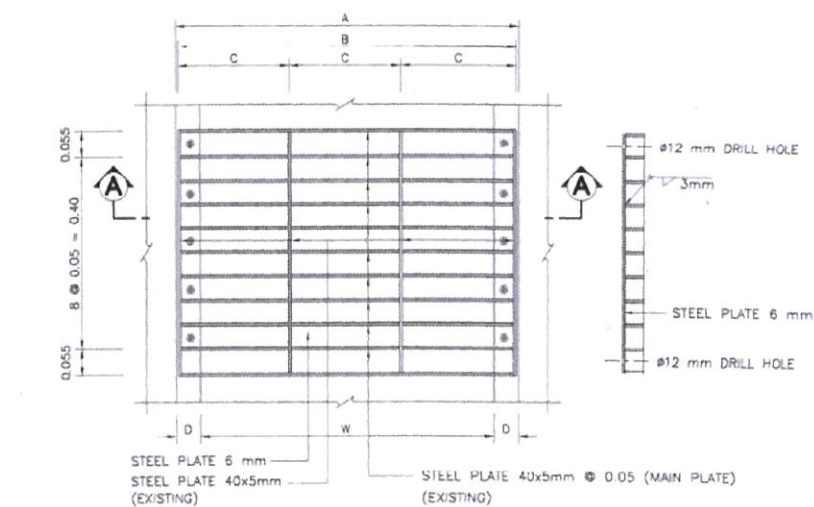
DETAIL "A"
NOT TO SCALE



SECTION B-B
NOT TO SCALE



SECTION C-C
NOT TO SCALE



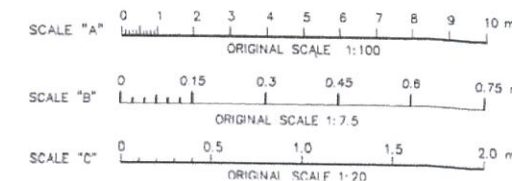
DETAIL OF STEEL HATCH COVER FOR STOPLOG GROOVES
SCALE "B"

NOTES :

1. ALL DIMENSIONS AND ELEVATION ARE IN METERS UNLESS OTHERWISE SHOWN.
2. FOR GENERAL NOTE SEE DWG. NO. NW-GN-02

REFERENCE DRAWINGS :

1. DRAINAGE LAYOUT, DRAINAGE DWG. NO. NW-DN-01
2. DETAIL OF SUMP, DRAINAGE DWG. NO. NW-DN-02



KINGDOM OF THAILAND Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY	
FLOOD WARNING AND PREVENTION SYSTEMS FOR EFFICIENCY ENHANCEMENT FOR NAM WA MINI HYDROPOWER PROJECT CHANGWAT NAN	
DRAINAGE STEEL COVER AND GRATING	
DESIGNED SHAWN CHECKED PROJECT MANAGER	REVIEWED SUBMITTED RECOMMENDED APPROVED DATE
CONSULTANTS DEDE	DRAWING NO. SHEET NO.

Signature