STANDARD DRAWING 1994

ABBREVIATIONS

A	AREA	I.D.	INSIDE DIAMETER	R.C.B.	REINFORCED CONCRETE BOX CULVERT
AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS	IN.	INCH	R.C.P.	REINFORCED CONCRETE PIPE CULVERT
		INV.	INVERT	RD.	ROAD
A.C.	ASPHALTIC CONCRETE	JT.	JOINT	R.E.	RESIDENT ENGINEER
ADT.	AVERAGE DAILY TRAFFIC	KG.	KILOGRAM	REF.	REFERENCE
AGG.	AGGREGATE	KM.	KILOMETER	REINF.	REINFORCEMENT
AH.	AHEAD	KPH.	KILOMETER PER HOUR	REQ'D	REQUIRED
AISC.	AMERICAN INSTITUTE CONSTRUCTION OF STEEL	KSC.	KILOGRAM PER SQUARE CENTIMETER	R.I.D.	ROYAL IRRIGATION DEPARTMENT
ALT.	ALTERNATIVE	L.	LENGTH OF HORIZONTAL CURVE OR LENGTH	R.P.	REFERENCE POINT
APPROX.	APPROXIMATE	LEV.	LEVEL	RT.	RIGHT
ASTM.	AMERICAN SOCIETY FOR TESTING AND MATERIALS	LG.	LIGHT GAGE STEEL	R/W(OR R.O.W.)	RIGHT-OF-WAY
AVG.	AVERAGE	L.M.	LINEAR METER	S.B.S.T.	SINGLE BITUMINOUS SURFACE TREATMENT
BIT.	BITUMINOUS	LPS.	LOW PRESSURE SODIUM LAMP	S.C.	SPIRAL – CIRCLE
BK.	BACK	Ls.	SUPERELEVATION TRANSITION LENGTH	SE.	SUPERELEVATION
BM.	BENCH MARK	L.S.	LUMP SUM	SEC. (OR Sec.)	SECANT
BOTT.	BOTTOM	LT.	LEFT	SECT.	SECTION
BRDG.	BRIDGE	L.V.C.	LENGTH OF VERTICAL CURVE	SP.	SPAN
BRG.	BEARING	L.W.L.	LOW WATER LEVEL	SPG.	SPACING
BT.	BACK TANGENT	M.	METER	S.R.	SIDE ROAD
C.B.R.	CALIFORNIA BEARING RATIO	$M.^2$	SQUARE METER	S.R.T.	STATE RAILWAYS OF THAILAND
C/C(OR C TO C)	CENTER TO CENTER	$M.^3$	CUBIC METER	S.T.	SPIRAL - TANGENT
CL.	CLEARANCE	MAG. AZ.	MAGNETIC AZIMUTH	STA.	STATION
CM.	CENTIMETER	MAX.	MAXIMUM	STD.	STANDARD
$CM.^2$	SQUARE CENTIMETER	M.E.A.	METROPOLITAN - ELECTRICITY AUTHORITY	STR.	STRAIGHT
C.M.P.	CORRUGATED METAL PIPE	M.H.	MANHOLE	SYMM.	SYMMETRY OR SYMMETRICAL
COL.	COLUMN	MIN.	MINIMUM	S/B	SOUTH BOUND
CONC.	CONCRETE	MISC.	MISCELLANEOUS	T.	TANGENT LENGTH, TON
CONSTR.	CONSTRUCTION	MM.	MILLIMETER	THK.	THICKNESS
C.P.	CONCRETE PIPE	$MM.^2$	SQUARE MILLIMETER	TIS.	THAI INDUSTRIAL STANDARD
C.S.	CIRCLE - SPIRAL	M.O.	MIDDLE ORDINATE	T.S.	TANGENT – SPIRAL
C/W	CARRIAGEWAY	MONT.	MONUMENT	TYP.	TYPICAL
CU.M.	CUBIC METER	M.S.L.	MEAN SEA LEVEL	VOL.	VOLUME
D.	DEGREE OF CURVE	N.	NORTH	V.C.	LENGTH OF VERTICAL CURVE
DB.	DEFORMED BAR	N/B	NORTH BOUND	V.	VELOCITY
D.B.S.T.	DOUBLE BITUMINOUS SURFACE TREATMENT	NC.	NORMAL CROWN	W.	WIDENING
DEG.	DEGREE	NO.	NUMBER	W/	WITH
DIA.	DIAMETER	O.D.	OUTSIDE DIAMETER	W/B	WEST BOUND
D.O.H.	DEPARTMENT OF HIGHWAYS	P.B.M.	PERMAMENT BENCH MARK	W/O	WITHOUT
DWG.	DRAWING	P.C.	POINT OF CURVE OR PRESTRESSED CONCRETE	WT.	WEIGHT
E	EXTERNAL DISTANCE OF SIMPLE CURVE OR EAST	P.C.C.	POINT OF COMPOUND CURVE	X SECT.	CROSS SECTION
EA.	EACH	P.E.A.	PROVINCIAL-ELECTRICITY AUTHORITY	℄	CENTERLINE
EL.(OR ELEV.)	ELEVATION	P.G.	PROFILE GRADE	ℙ	PROPERTY LINE
ENGR.	ENGINEER	P.G. LINE	PROFILE GRADE LINE	$	SPUR LINE OR SURVEY LINE
E.O.P.	EDGE OF PAVEMENT	P.I.	POINT OF HORIZONTAL INTERSECTION	%	PERCENT
EQ.(OR =)	EQUATION OR EQUAL	PL.	PLATE	&	AND
EQUIV.	EQUIVALENT	P.O.C.	POINT ON CURVE	@	SPACING
EXIST.	EXISTING	P.O.S.T.	POINT ON SUBTANGENT	"	INCH
EXP.	EXPANSION	P.O.T.	POINT ON TANGENT	ø	DIAMETER
E/B	EAST BOUND	P.R.C.	POINT OF REVERSE CURVE	△	DEFLECTION ANGLE
FT.	FORWARD TANGENT	PROJ.	PROJECT		
FTG.	FOOTING	P.T.	POINT OF TANGENT		
GM.	GRAM	P.V.C.	POINT OF VERTICAL CURVE		
GL.	GROUND LEVEL	P.V.I.	POINT OF VERTICAL INTERSECTION		
H. & RN.	HUB AND RED NAIL	P.V.R.C.	POINT OF VERTICAL REVERSE CURVE		
HDWL.	HEADWALL	P.V.T.	POINT OF VERTICAL TANGENT		
HOR.	HORIZONTAL	R.	RADIUS		
HPS.	HIGH PRESSURE SODIUM LAMP	RB.	ROUND BAR		
H.W.L.	HIGH WATER LEVEL	R.C.	REINFORCED CONCRETE		
HWY.	HIGHWAY	RC.	REMOVED ADVERSE CROWN		

SYMBOLS

- CONST. ℄ — CENTER LINE
- SURVEY ℄ — TRANSIT LINE
- EXIST. R/W — EXISTING R/W
- PROPOSED R/W — PROPOSED R/W
- ℙ — PROPERTY LINE
- EDGE OF NEW PAVEMENT
- EDGE OF EXISTING PAVEMENT
- EXISTING SHOULDER LINE
- NEW SHOULDER LINE
- EXISTING CURB
- NEW CURB
- GROUND PROFILE
- EXISTING ROAD PROFILE
- BACKFILLING EXISTING CHANNELS
- EXISTING INLETS
- EXISTING PIPE
- EXISTING DITCH
- PARALLEL DITCH
- PIPES
- INLET
- W — WATER & WATER VALVE
- T — TELEPHONE & MANHOLE
- E — ELECTRICITY
- PT — PT — POWER TRANSMISSION LINE WITH STEEL TOWER
- WOODEN ELECTRIC POLE
- CONCRETE ELECTRIC POLE
- INDIVIDUAL TREE
- HEDGE
- BUS STOP SHELTER
- TELEPHONE JUNCTION
- PUBLIC TELEPHONE BOX
- MAIL BOX

- TRAFFIC SIGNAL
- FIRE HYDRANT
- EXISTING PIPE CULVERT (WITH OR WITHOUT HEADWALL)
- NEW PIPE CULVERT (WITH OR WITHOUT HEADWALL)
- EXISTING BOX CULVERT
- NEW BOX CULVERT
- EXISTING HIGHWAY GUARDRAIL
- NEW HIGHWAY GUARDRAIL
- RAIL ROAD CROSSING SIGN
- RAIL ROAD CROSSING SIGNAL LIGHT
- RAIL ROAD CROSSING GATE
- GASOLINE STATION
- 350 — INDEX CONTOUR
- INTERMEDIATE CONTOUR
- WOODEN OR BARBED WIRE FENCE
- BRIDGE, ROAD OVER STREAM
- RAIL ROAD SINGLE TRUCK
- KHLONG OR RIVER
- DITCH, WATERWAY
- FLOW DIRECTION
- SWAMP AREA
- BILLBOARD, SINGLE FACE
- BILLBOARD, DOUBLE FACE
- POWER POST OR TELEPHONE POLE
- TRAFFIC SIGN
- GUIDE POST
- HIGH WATER LEVEL
- KILOMETER MARKER (EXISTING, PROPOSED)
- R/W MARKER (EXISTING, PROPOSED)
- RAILWAY
- SLOPE
- BENCH MARK

- PERMANENT BENCH MARK (P.B.M.)
- POINT OF HORIZONTAL INTERSECTION
- H — TEMPORARY SHELTER, HUT
- 1-S-W — BUILDING, ONE - STOREY WOODEN FRAME
- 2-S-W — BUILDING, TWO - STOREY WOODEN FRAME
- 1-S-C — BUILDING, ONE - STOREY CONCRETE
- 2-S-C — BUILDING, TWO - STOREY CONCRETE
- 1-S-W (IO) — COMMERCIAL BUILDING, ONE - STOREY WOODEN FRAME, IO UNITS
- 2-S-W (IO) — COMMERCIAL BUILDING, TWO - STOREY WOODEN FRAME, IO UNITS
- 1-S-C (IO) — COMMERCIAL BUILDING, ONE - STOREY CONCRETE STRUCTURE, IO UNITS
- 2-S-C (IO) — COMMERCIAL BUILDING, TWO - STOREY CONCRETE STRUCTURE, IO UNITS
- 1-S-W — SCHOOL BUILDING, ONE - STOREY WOODEN FRAME
- 2-S-W — SCHOOL BUILDING, TWO - STOREY WOODEN FRAME
- 1-S-C — SCHOOL BUILDING, ONE - STOREY CONCRETE STRUCTURE
- 2-S-C — SCHOOL BUILDING, TWO - STOREY CONCRETE STRUCTURE

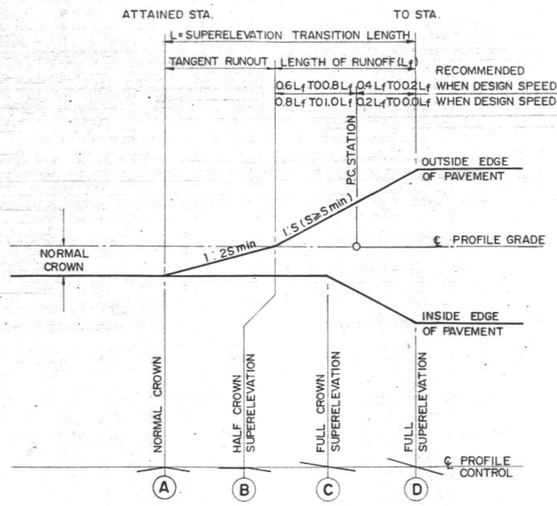
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

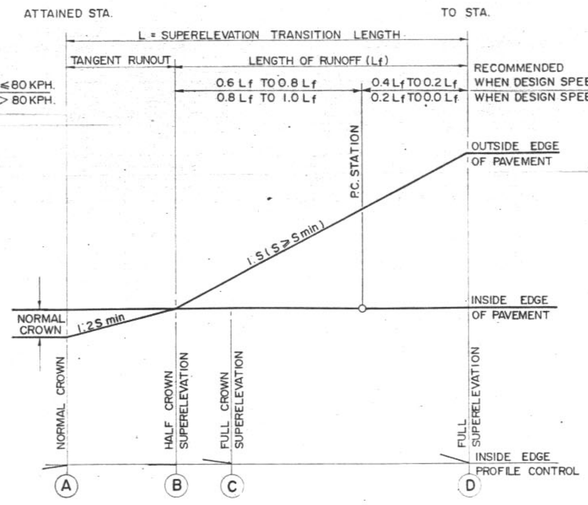
ABBREVIATION AND SYMBOLS

DESIGNED: D.O.H. & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED: (DIRECTOR GENERAL)		DWG. NO. AS-001
		SHEET NO. 1

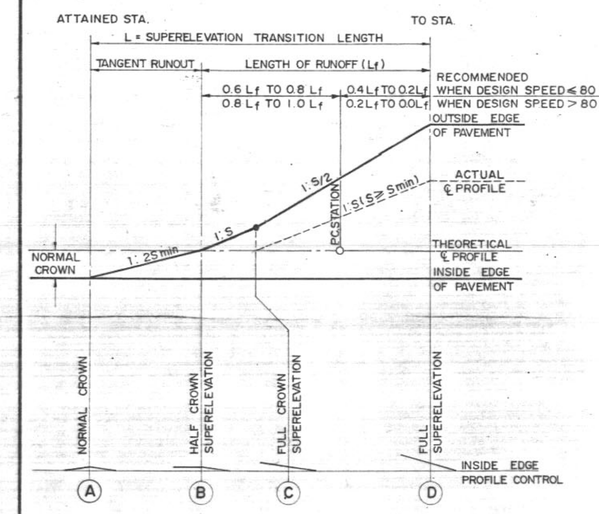
DIAGRAMMATIC PROFILES SHOWING METHODS OF ATTAINING SUPERELEVATION FOR A CURVE TO THE RIGHT



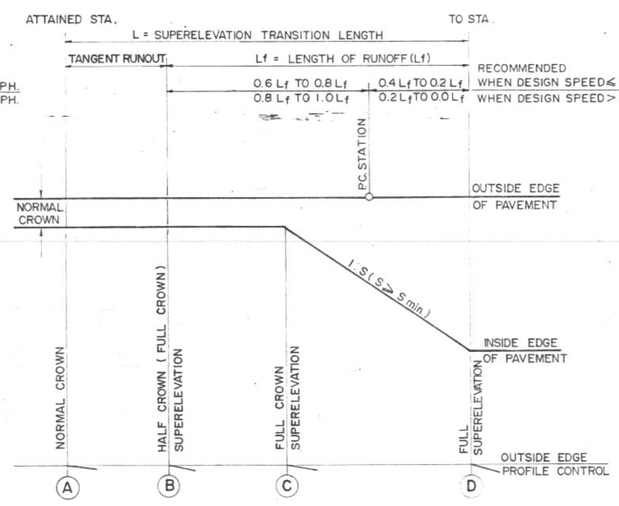
CROWNED PAVEMENT
REVOLVED ABOUT CENTERLINE



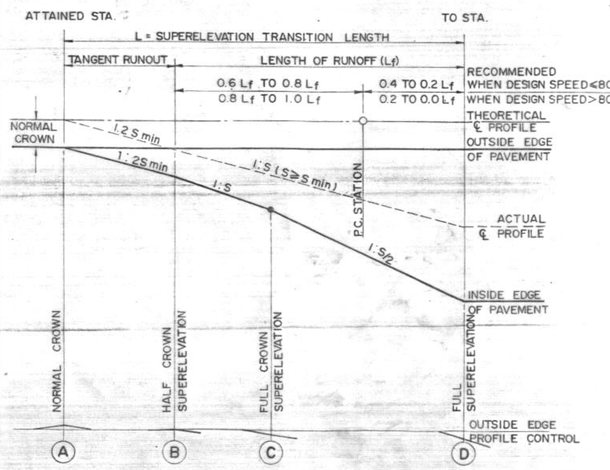
STRAIGHT CROSS SLOPE PAVEMENT
REVOLVED ABOUT INSIDE EDGE (SINGLE LANE)



CROWNED PAVEMENT
REVOLVED ABOUT INSIDE EDGE



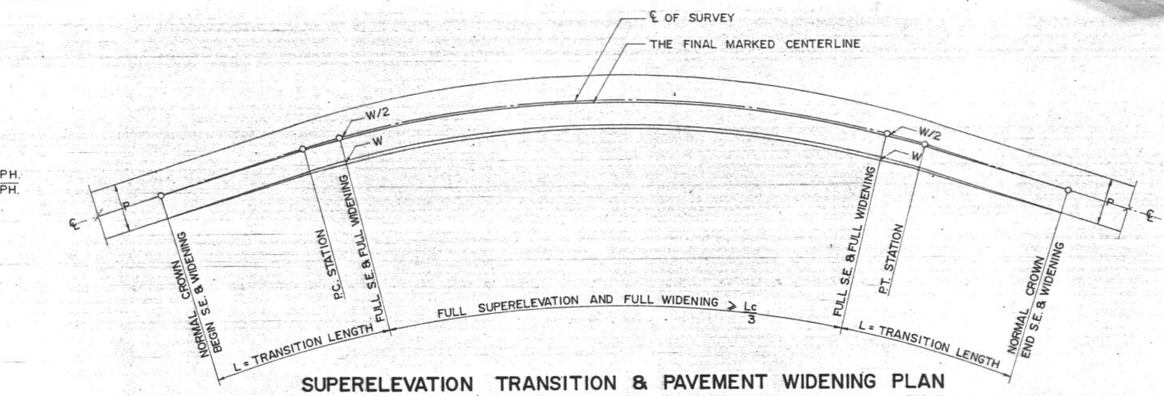
STRAIGHT CROSS SLOPE PAVEMENT
REVOLVED ABOUT OUTSIDE EDGE (SINGLE LANE)



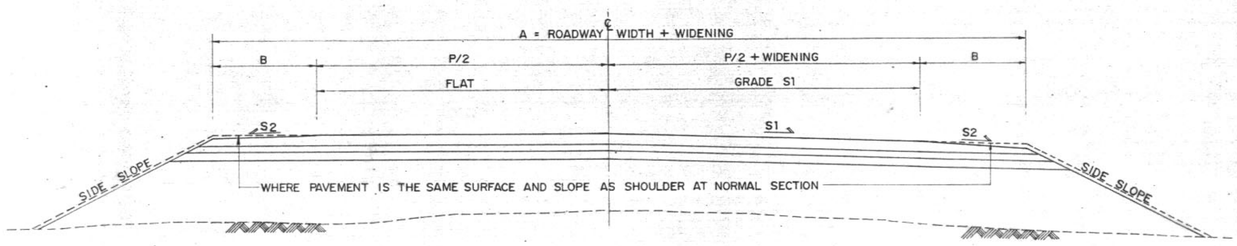
CROWNED PAVEMENT
REVOLVED ABOUT OUTSIDE EDGE

TABLE RELATIONSHIP OF DESIGN SPEED TO MAXIMUM RELATIVE PROFILE SLOPES BETWEEN THE EDGE OF TWO-LANE PAVEMENT AND THE CENTERLINE

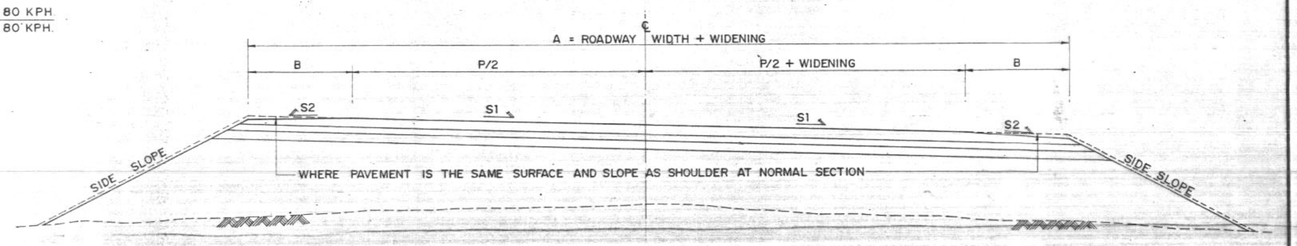
DESIGN SPEED KPH.	MAXIMUM RELATIVE SLOPES 1 : S min
30	1 : 120
35	1 : 128
40	1 : 135
45	1 : 143
50	1 : 150
55	1 : 158
60	1 : 165
65	1 : 173
70	1 : 180
75	1 : 188
80	1 : 195
85	1 : 203
90	1 : 210
95	1 : 218
100	1 : 225
105	1 : 233
110 AND OVER	1 : 240



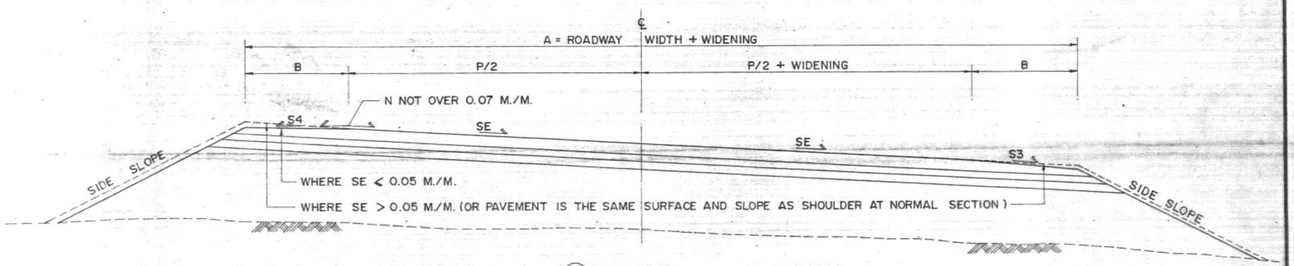
SUPERELEVATION TRANSITION & PAVEMENT WIDENING PLAN
NOT TO SCALE



SECTION (A) HALF CROWN SUPERELEVATION
NOT TO SCALE



SECTION (B) FULL CROWN SUPERELEVATION
NOT TO SCALE



SECTION (C) FULL SUPERELEVATION
NOT TO SCALE

NOTES :

1. THE MAXIMUM ROLLOVER OF PAVEMENT SLOPE "N" SHALL NOT EXCEED 0.07 M./M., "N" IS ALGEBRAIC DIFFERENCE IN CROSS SLOPE RATES "SE" AND "S4", WHICH SHALL BE ADJUSTED TO CONFORM TO THE SUPERELEVATION RATES (SE) WHENEVER "SE" IS GREATER THAN 0.05 M./M.
2. THE ROADWAY SHALL BE CONSTRUCTED IN ACCORDANCE WITH DETAILS SHOWN ON THE TYPICAL CROSS - SECTION , PLAN & PROFILE AND THIS DRAWING.
3. THE REQUIRED WIDENING (W) AND SUPERELEVATION RATE (SE) ARE GIVEN ON THE ALIGNMENT DRAWINGS.
4. THE RELATIONSHIP BETWEEN DESIGN SPEED AND MAXIMUM RELATIVE SLOPE ARE SHOWN IN THE TABLE.
5. MINIMUM - DESIGN SUPERELEVATION RUNOFF LENGTH FOR THREE - LANE PAVEMENTS SHOULD BE 1.2 TIMES THE CORRESPONDING LENGTH FOR TWO - LANE HIGHWAYS.
6. MINIMUM - DESIGN SUPERELEVATION RUNOFF LENGTH FOR FOUR - LANE PAVEMENTS SHOULD BE 1.5 TIMES THE CORRESPONDING LENGTH FOR TWO - LANE HIGHWAYS.
7. MINIMUM - DESIGN SUPERELEVATION RUNOFF LENGTH FOR SIX - LANE PAVEMENTS SHOULD BE 2.0 TIMES THE CORRESPONDING LENGTH FOR TWO - LANE HIGHWAYS.

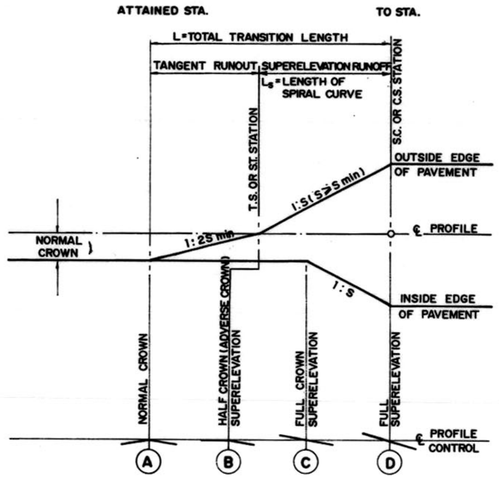
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

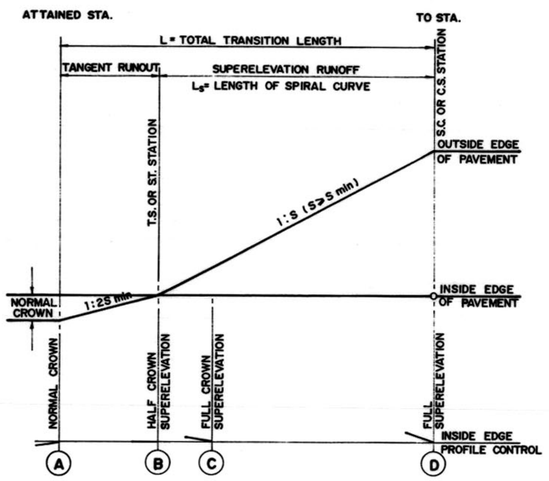
STANDARD DRAWING

METHOD OF ATTAINING SUPERELEVATION AND WIDENING OF PAVEMENT FOR CIRCULAR CURVE

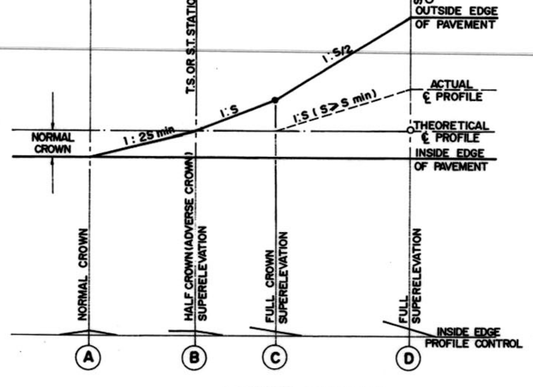
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. TS - 101
		SHEET NO. 2

DIAGRAMMATIC PROFILES SHOWING METHODS OF ATTAINING SUPERELEVATION FOR A CURVE TO THE RIGHT

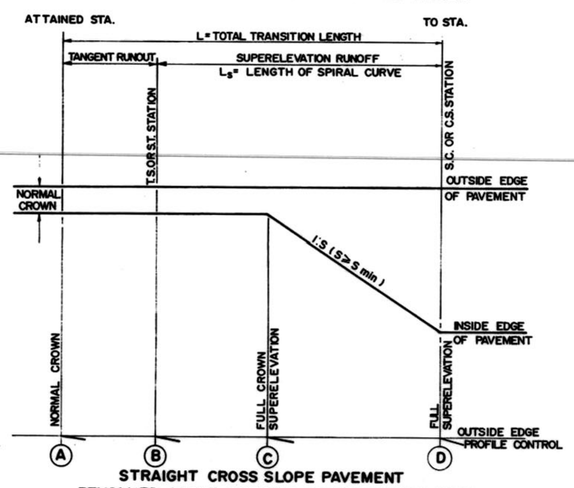




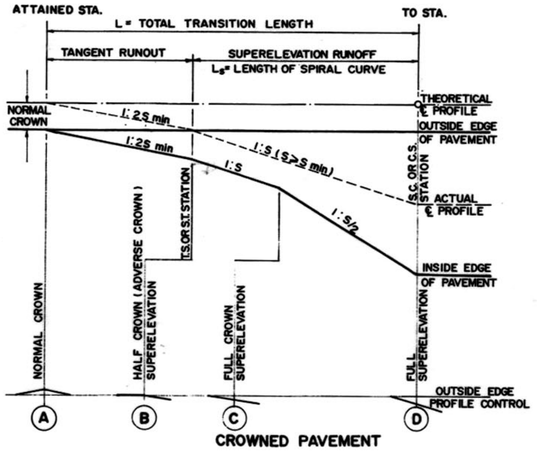
CROWNED PAVEMENT
REVOLVED ABOUT CENTERLINE



STRAIGHT CROSS SLOPE PAVEMENT
REVOLVED ABOUT INSIDE EDGE (SINGLE LANE)



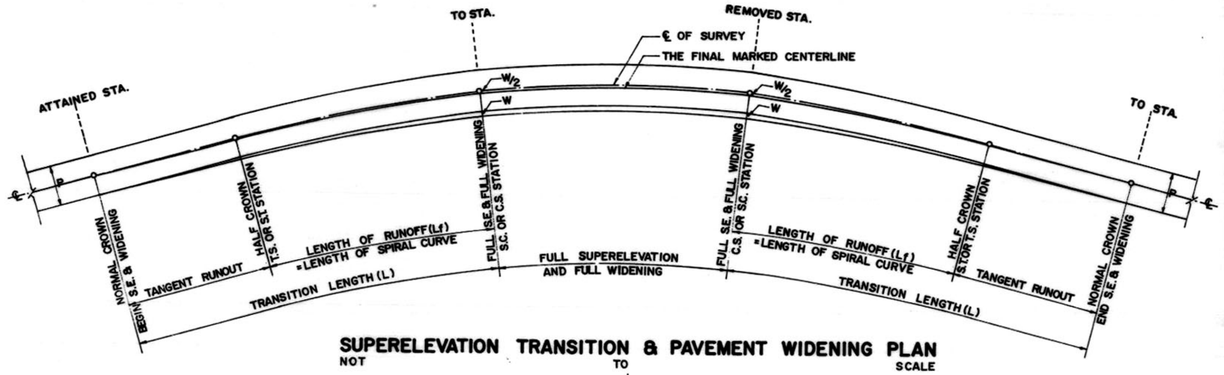
STRAIGHT CROSS SLOPE PAVEMENT
REVOLVED ABOUT OUTSIDE EDGE (SINGLE LANE)



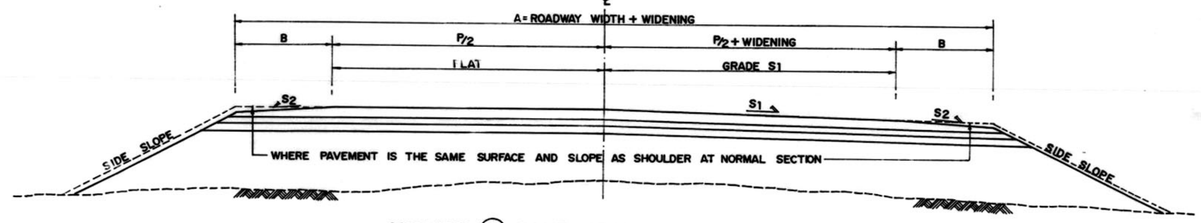
CROWNED PAVEMENT
REVOLVED ABOUT OUTSIDE EDGE

TABLE RELATIONSHIP OF DESIGN SPEED TO MAXIMUM RELATIVE PROFILE SLOPES BETWEEN THE EDGE OF TWO-LANE PAVEMENT AND THE CENTERLINE.

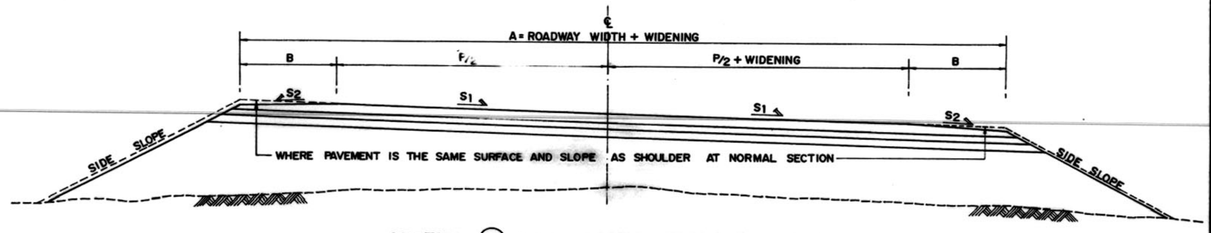
DESIGN SPEED KPH.	MAXIMUM RELATIVE SLOPES 1 : S min
30	1:120
35	1:128
40	1:135
45	1:143
50	1:150
55	1:158
60	1:165
65	1:173
70	1:180
75	1:188
80	1:195
85	1:203
90	1:210
95	1:218
100	1:225
105	1:233
110 AND OVER	1:240



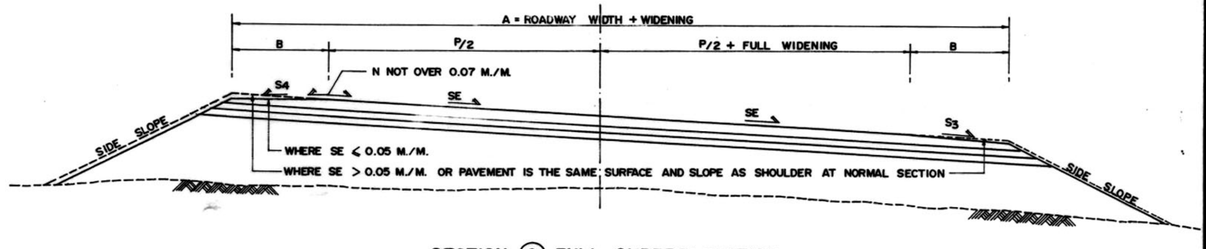
SUPERELEVATION TRANSITION & PAVEMENT WIDENING PLAN
NOT TO SCALE



SECTION (A) HALF CROWN SUPERELEVATION
NOT TO SCALE



SECTION (B) FULL CROWN SUPERELEVATION
NOT TO SCALE



SECTION (C) FULL SUPERELEVATION

NOTES :

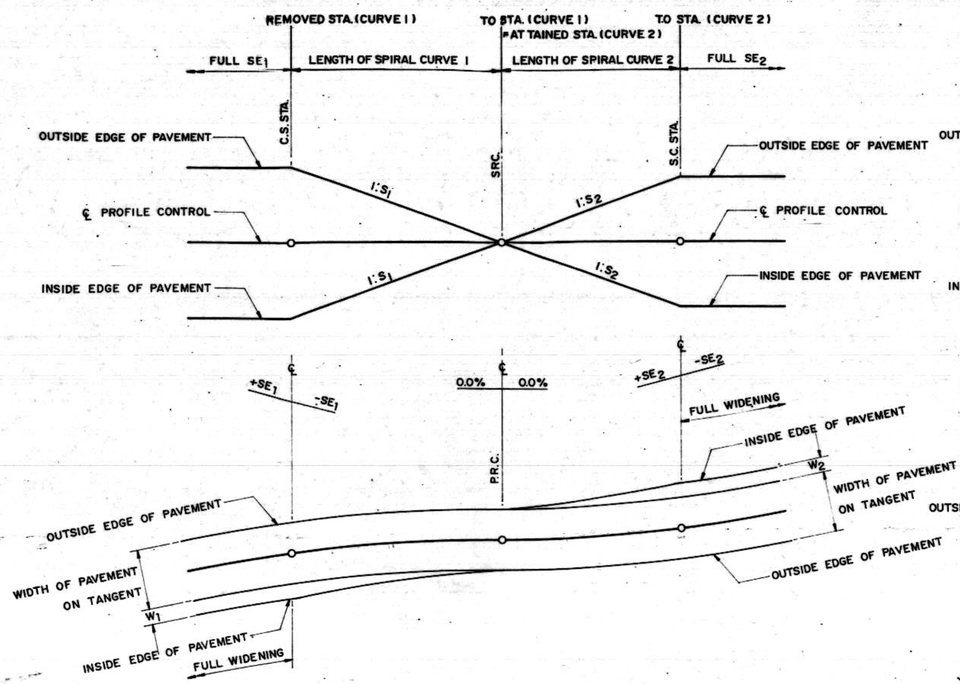
1. THE MAXIMUM ROLLOVER OF PAVEMENT SLOPE "N" SHALL NOT EXCEED 0.07 M./M., "N" IS ALGEBRAIC DIFFERENCE IN CROSS SLOPE RATES "SE" AND "S4", WHICH SHALL BE ADJUSTED TO CONFORM TO THE SUPERELEVATION RATES (SE) WHENEVER "SE" IS GREATER THAN 0.05 M./M.
2. THE ROADWAY SHALL BE CONSTRUCTED IN ACCORDANCE WITH DETAILS SHOWN ON THE TYPICAL, CROSS-SECTION, PLAN & PROFILE AND THIS DRAWING.
3. THE REQUIRED WIDENING (W) AND SUPERELEVATION RATE (SE) ARE GIVEN ON THE ALIGNMENT DRAWINGS.
4. THE RELATIONSHIP BETWEEN DESIGN SPEED AND MAXIMUM RELATIVE SLOPE ARE SHOWN IN THE TABLE.
5. MINIMUM - DESIGN SUPERELEVATION RUNOFF LENGTH FOR THREE - LANE PAVEMENTS SHOULD BE 1.2 TIMES THE CORRESPONDING LENGTH FOR TWO - LANE HIGHWAYS.
6. MINIMUM - DESIGN SUPERELEVATION RUNOFF LENGTH FOR FOUR - LANE PAVEMENTS SHOULD BE 1.5 TIMES THE CORRESPONDING LENGTH FOR TWO - LANE HIGHWAYS.
7. MINIMUM - DESIGN SUPERELEVATION RUNOFF LENGTH FOR SIX - LANE PAVEMENTS SHOULD BE 2.0 TIMES THE CORRESPONDING LENGTH FOR TWO - LANE HIGHWAYS.
8. MINIMUM LENGTH OF SPIRAL CURVE
   $L_{s(min)} = \frac{V^3}{48 R_c C}$ M.
   V = DESIGN SPEED (KPH.)
   R_c = RADIUS OF CIRCULAR CURVE (M.)
   C = RATE OF INCREASE CENTRIPETAL ACCELERATION (M/SEC^3).

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

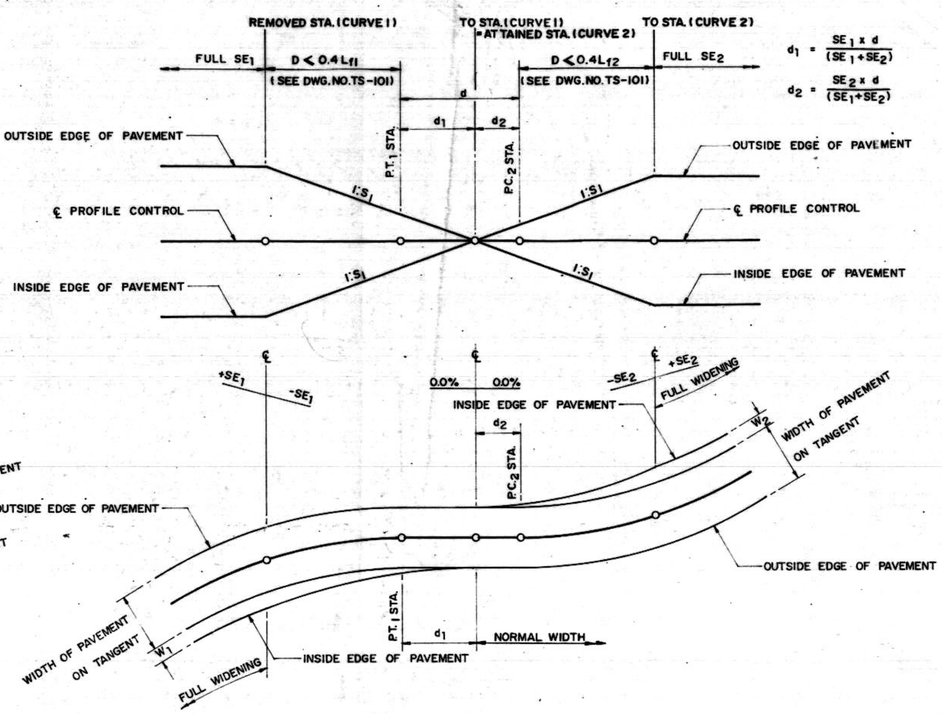
METHOD OF ATTAINING SUPERELEVATION AND WIDENING OF PAVEMENT FOR SPIRAL CURVE

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : for (DIRECTOR GENERAL)		DWG. NO. TS-102
		SHEET NO. 3



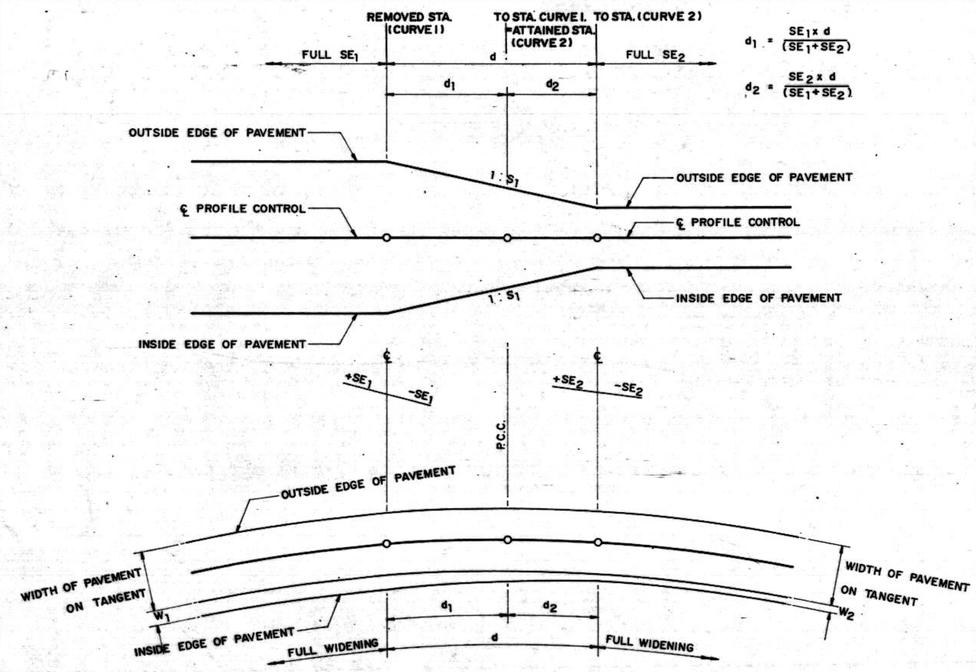
SUPERELEVATION DIAGRAM FOR REVERSE SPIRAL CURVES

NOT TO SCALE



SUPERELEVATION TRANSITION DIAGRAM FOR REVERSE CURVES WITH SHORT TANGENT

NOT TO SCALE



SUPERELEVATION TRANSITION DIAGRAM FOR COMPOUND CURVES

NOT TO SCALE

NOTES:

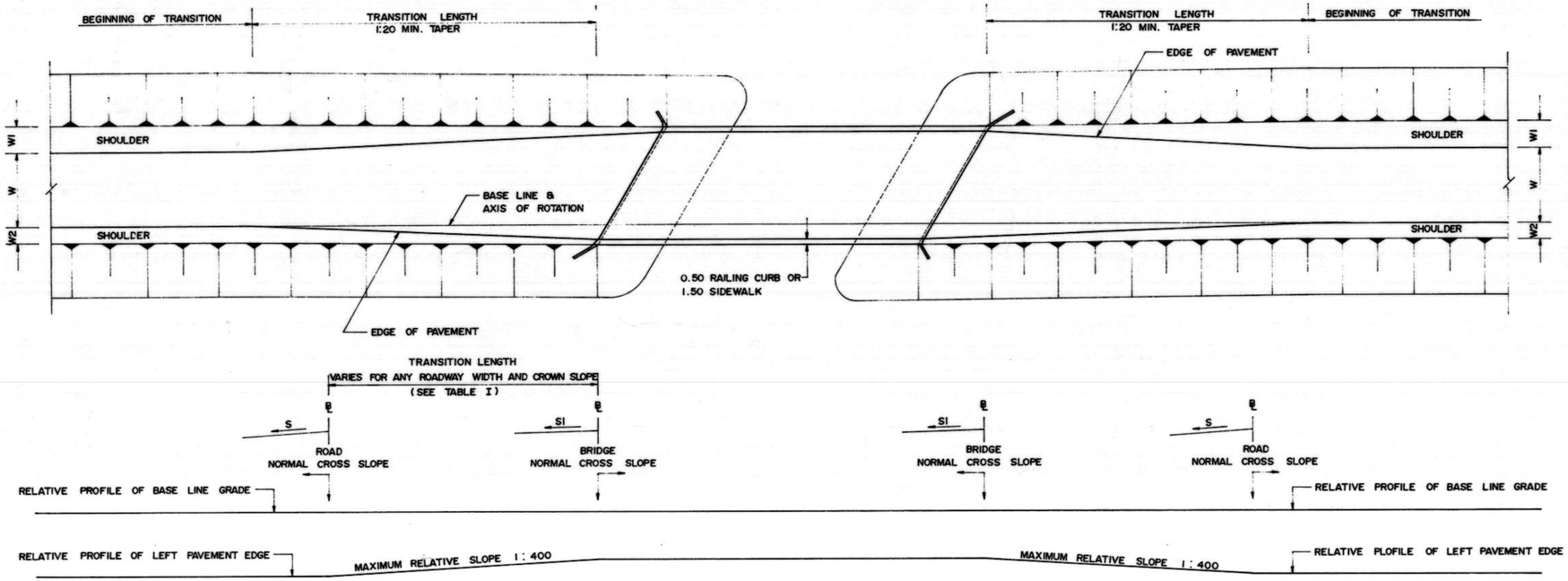
1. THIS DRAWING SHALL BE USED IN COMBINATION WITH DWG. NO. TS – 101
2. IN CASE OF THE TRANSITION LENGTH OF ADJACENT CURVES WITH OPPOSITE DIRECTION ARE OVERLAPPED "SUPERELEVATION DIAGRAM FOR REVERSE CURVES WITH SHORT TANGENT" IS APPLIED.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

METHOD OF ATTAINING SUPERELEVATION AND WIDENING OF PAVEMENT FOR COMPOUND AND REVERSE CURVES

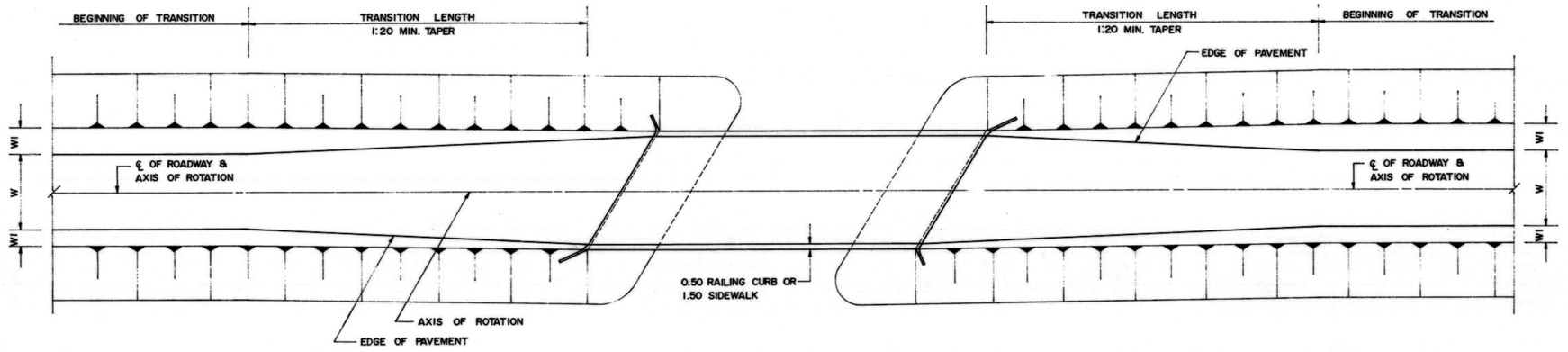
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. TS-103
		SHEET NO. 4



BRIDGE APPROACH TRANSITION TYPE I
NOT TO SCALE

TABLE I

TRANSITION LENGTH AT BRIDGE APPROACH TYPE I				
ROADWAY CROSS SLOPE (S)	ROADWAY WIDTH			
	5.50	6.00	6.50	7.00
2.0 %	11.00	12.00	13.00	14.00
2.5%	22.00	24.00	26.00	28.00
3.0%	33.00	36.00	39.00	42.00
3.5%	44.00	48.00	52.00	56.00



BRIDGE APPROACH TRANSITION TYPE II
NOT TO SCALE

TABLE II

TRANSITION LENGTH AT BRIDGE APPROACH TYPE II				
ROADWAY CROWN SLOPE (S)	ROADWAY WIDTH			
	5.50	6.00	6.50	7.00
2.0%	5.50	6.00	6.50	7.00
2.5%	11.00	12.00	13.00	14.00
3.0%	16.50	18.00	19.50	21.00
3.5%	22.00	24.00	26.00	28.00

NOTES :

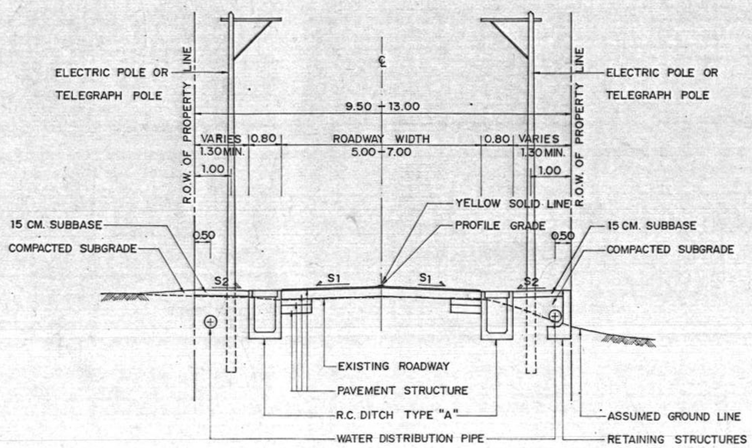
1. DIMENSION ARE IN METRES UNLESS OTHERWISE INDICATED.
2. SI = BRIDGE NORMAL CROWN OR CROSS SLOPE , 1.5 %
   S = ROAD NORMAL CROWN OR CROSS SLOPE
   W1 = WIDTH OF OUTER SHOULDER
   W2 = WIDTH OF INNER SHOULDER

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

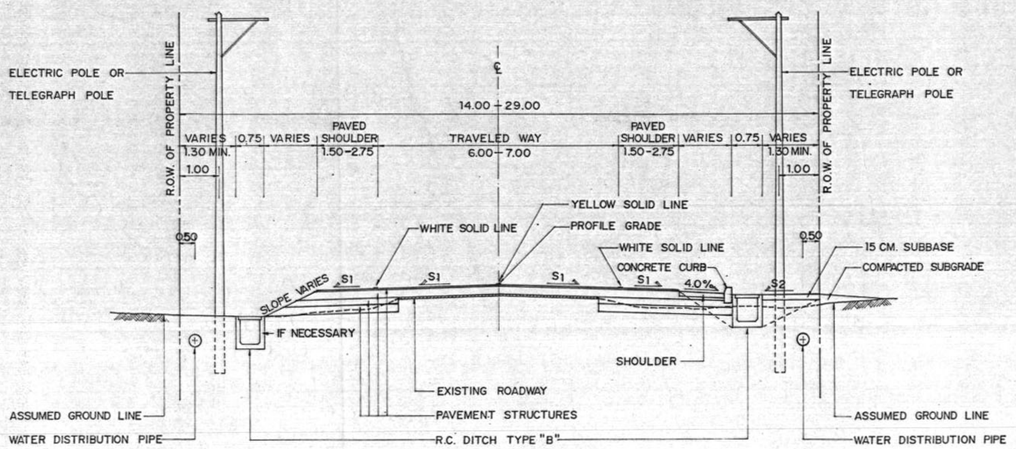
BRIDGE APPROACH TRANSITION

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. TS-201
		SHEET NO. 5



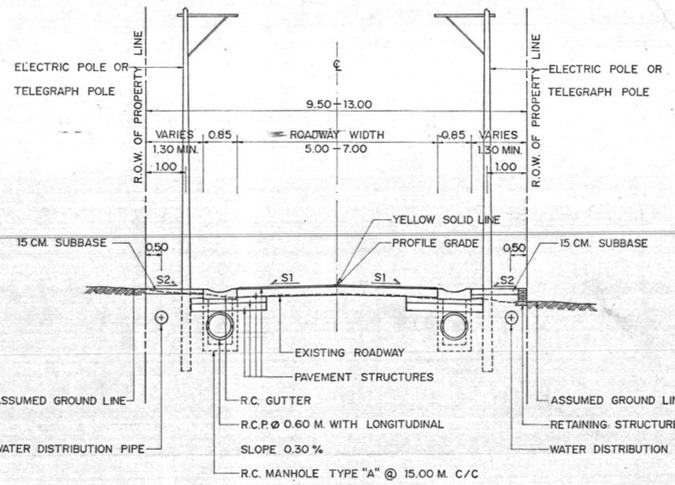
TYPICAL CROSS-SECTION FOR R.O.W. 9.50 M.MIN.(ALTERNATIVE I)

SCALE 1 : 75



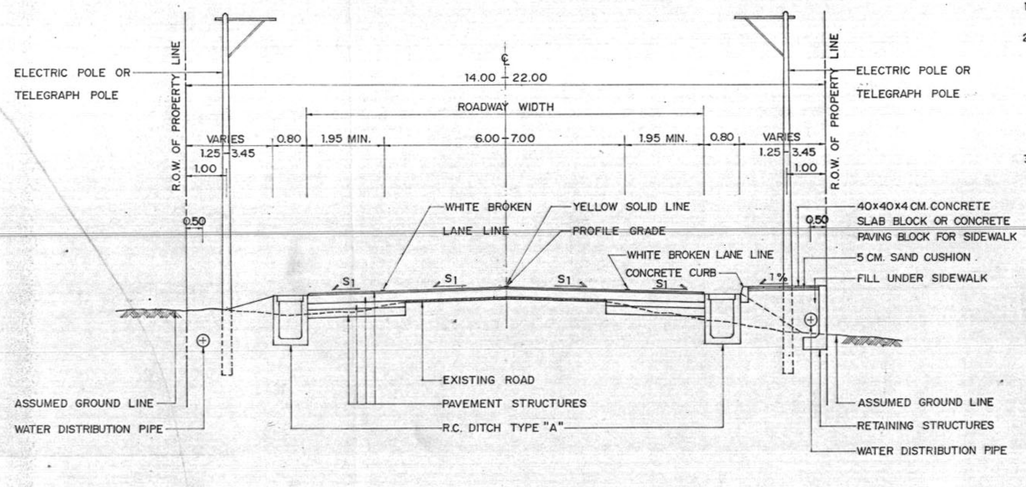
TYPICAL CROSS-SECTION FOR R.O.W. 14.00 M.MIN.(ALTERNATIVE I)

SCALE 1 : 75



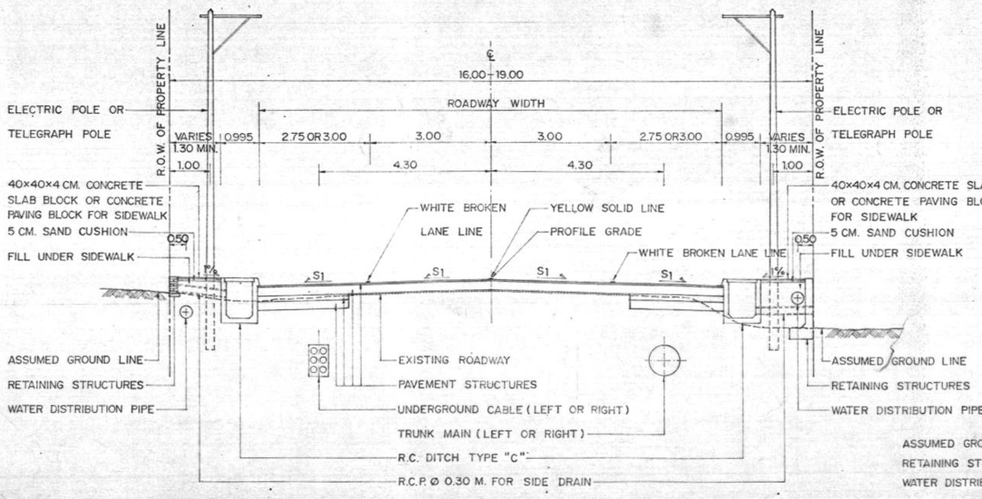
TYPICAL CROSS-SECTION FOR R.O.W. 9.50 M.MIN.(ALTERNATIVE II)

SCALE 1 : 75



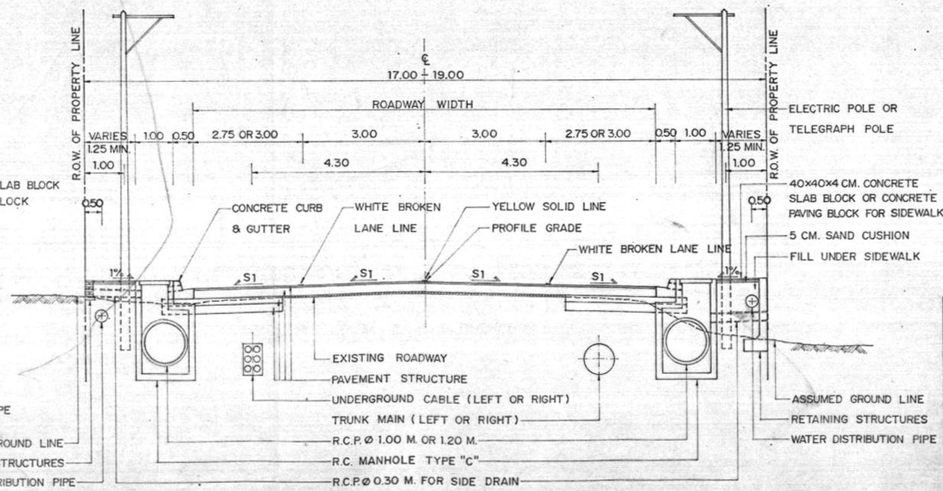
TYPICAL CROSS-SECTION FOR R.O.W. 14.00 M.MIN.(ALTERNATIVE II)

SCALE 1 : 75



ULTIMATE TYPICAL CROSS-SECTION FOR R.O.W. 16.00 M. MIN.

SCALE 1 : 75



ULTIMATE TYPICAL CROSS-SECTION FOR R.O.W. 17.00 - 19.00 M.

SCALE 1 : 75

NOTES :

1. DIMENSIONS ARE IN METRES UNLESS OTHERWISE INDICATED.
2. S_1 = NORMAL CROWN SLOPE, AS SHOWN ON TYPICAL CROSS-SECTION
   S_2 = 5% IN CASE OF SOIL AGGREGATE SHOULDER
   = 1% IN CASE OF CONCRETE SLAB BLOCK OR R.C. SLAB FOR SIDEWALK
3. THE POSITION OF UTILITY SHALL BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.

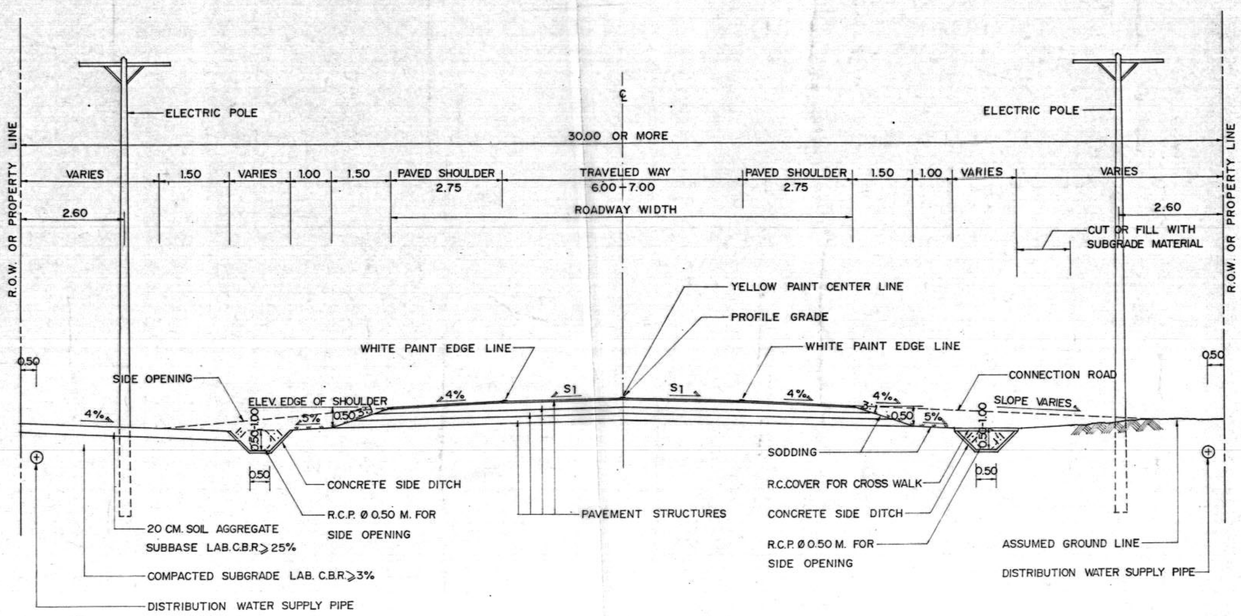
KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

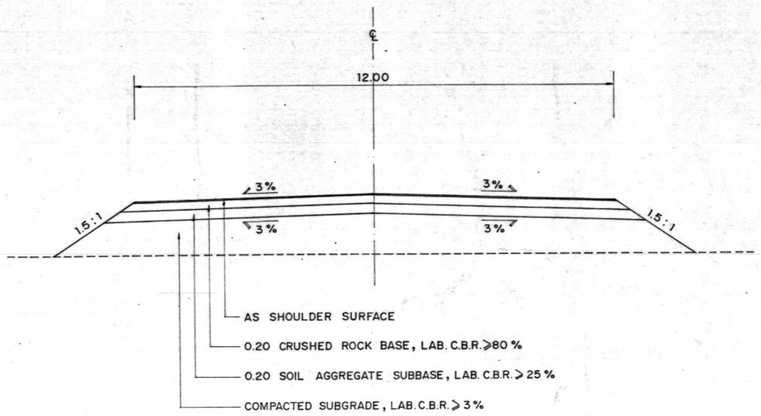
STANDARD DRAWING

TYPICAL CROSS-SECTION AT VILLAGE SECTION-I

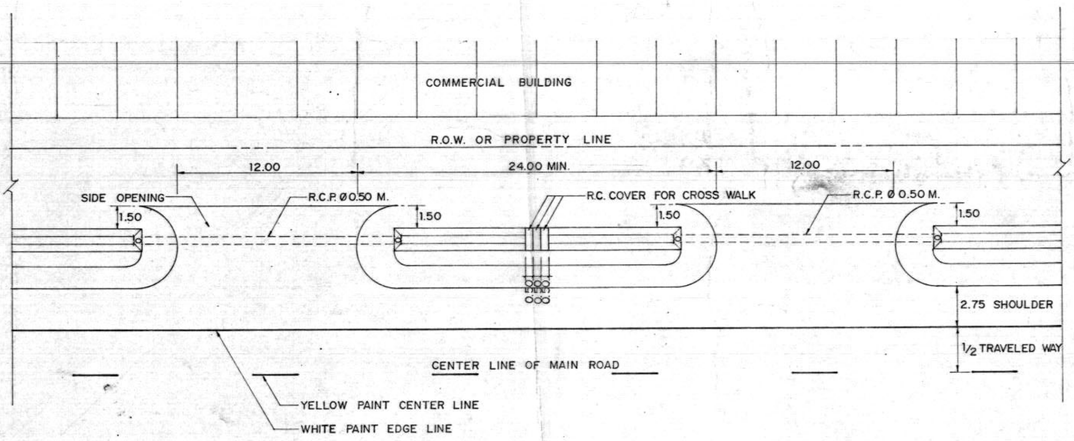
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Bunyaprapi (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE 1 : 75
		DWG. NO. TS-301
APPROVED : (DIRECTOR GENERAL)		SHEET NO. 6



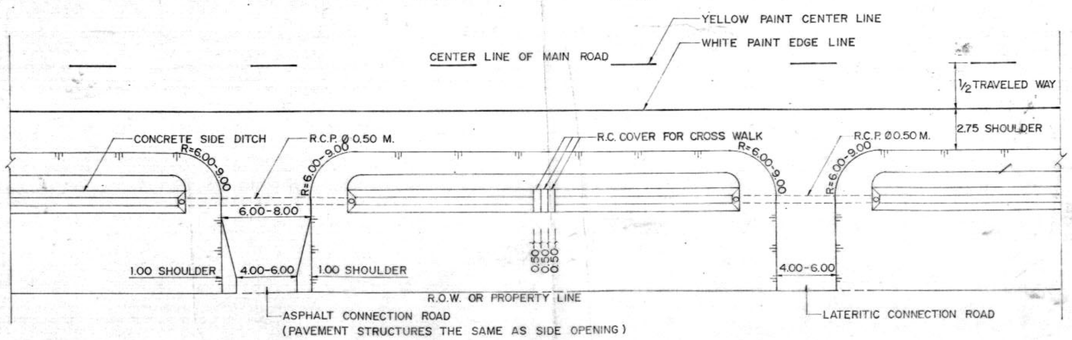
MINIMUM DESIGN FOR R.O.W. 30.00 M. OR MORE
SCALE 1 : 75



TYPICAL CROSS - SECTION FOR SIDE OPENING
SCALE 1 : 75



PLAN OF SIDE OPENING
SCALE 1 : 250



PLAN OF CONNECTION ROAD
SCALE 1 : 250

NOTE :

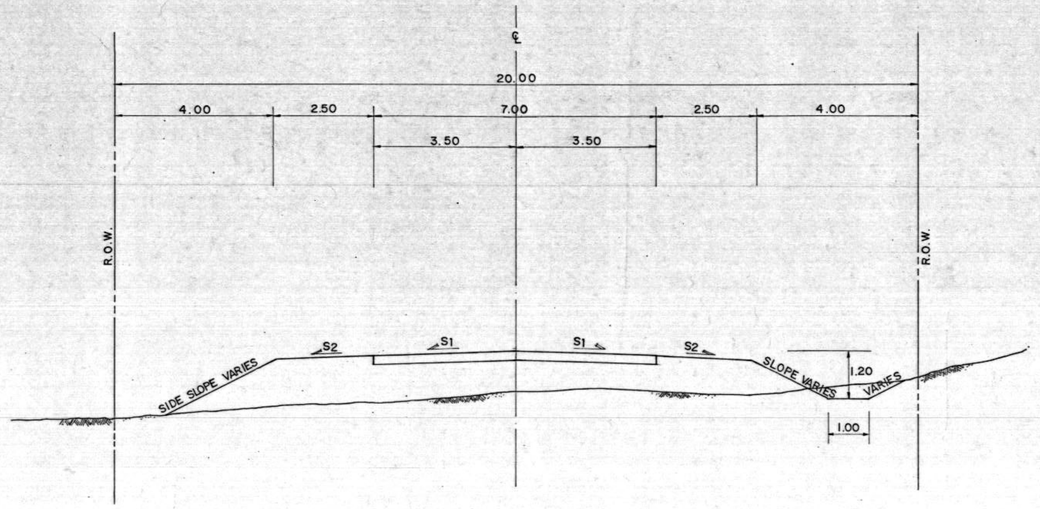
1. DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

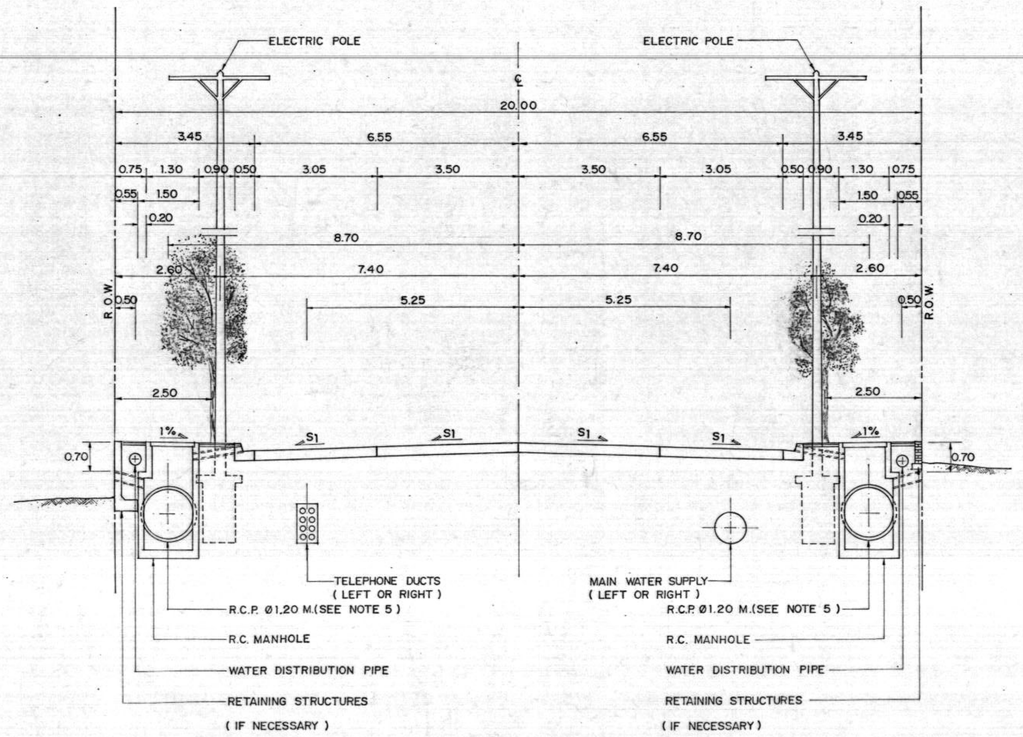
STANDARD DRAWING

TYPICAL CROSS - SECTION AT VILLAGE SECTION - II

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. TS-302
		SHEET NO. 7



PROPOSED 2 – LANE (FIRST STAGE)
SCALE 1 : 75



PROPOSED 4 – LANE (ULTIMATE STAGE)
SCALE 1 : 75

NOTES :

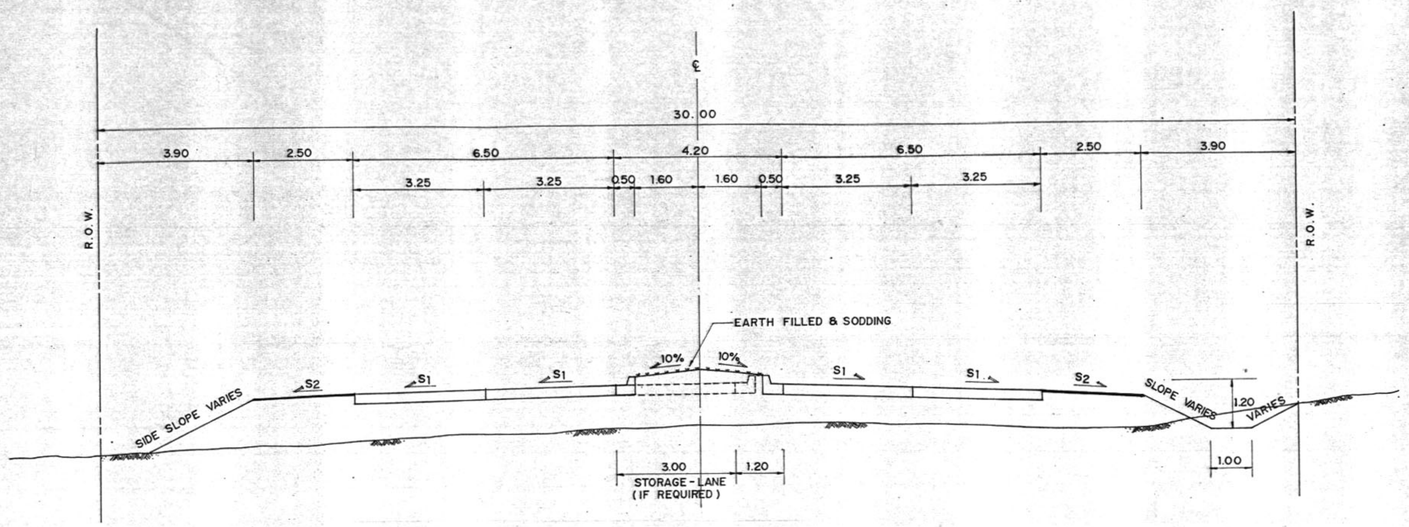
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. THIS DRAWING IS GUIDANCE ONLY. THE DIMENSION AND LOCATION OF UTILITIES MAY BE ADJUSTED TO SUIT THE FIELD CONDITION .
3. TELEPHONE DUCT AND MAIN WATER SUPPLY SHALL BE LOCATED ALTERNATELY.
4. HEIGHT OF ELECTRIC POLE SHALL BE NOT MORE THAN 22.00 M. OR WIDTH OF FOOTING SHALL BE NOT MORE THAN 1.10 M. FOR TYPICAL AS SHOWN ON THIS DRAWING.
5. BOX CULVERT SIZE 1.20 x 1.20 M. SHALL BE ALTERNATED FOR DRAINAGE STRUCTURE OR R.C.P. CULVERT Ø 1.00 M. SHALL BE SUBSTITUTED IN CASE OF NECESSARY DRAINAGE IS LOW .
6. CRITERIA FOR CONSIDERATION UTILITIES LOCATION
   - 6.1 AS SHOWN ON THIS DRAWING UTILITIES SHALL BE LOCATED FOR NEW CONSTRUCTION HIGHWAYS OR NO EXISTING UTILITIES. WHEN UTILITIES SHALL BE CONSTRUCTED MUST NOT DAMAGE TO EXISTING ROADWAY OR EXISTING UTILITY .
   - 6.2 IN CASE OF EXISTING UTILITIES ARE LOCATED AND NEW UTILITIES ARE NOT DAMAGE TO EXISTING ROADWAY OR EXISTING UTILITIES , THE NEW UTILITIES ARE LOCATED AS SHOWN ON THIS DRAWING.
   - 6.3 IN CASE OF EXISTING UTILITIES ARE LOCATED BUT NEW UTILITIES CAN NOT BE CONSTRUCTED, THE OPTIMUM LOCATION OF NEW UTILITIES SHALL BE CONSIDERED WITH THE TYPICAL CROSS – SECTION OF ROADWAY FOR ULTIMATE STAGE IN THE FUTURE.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

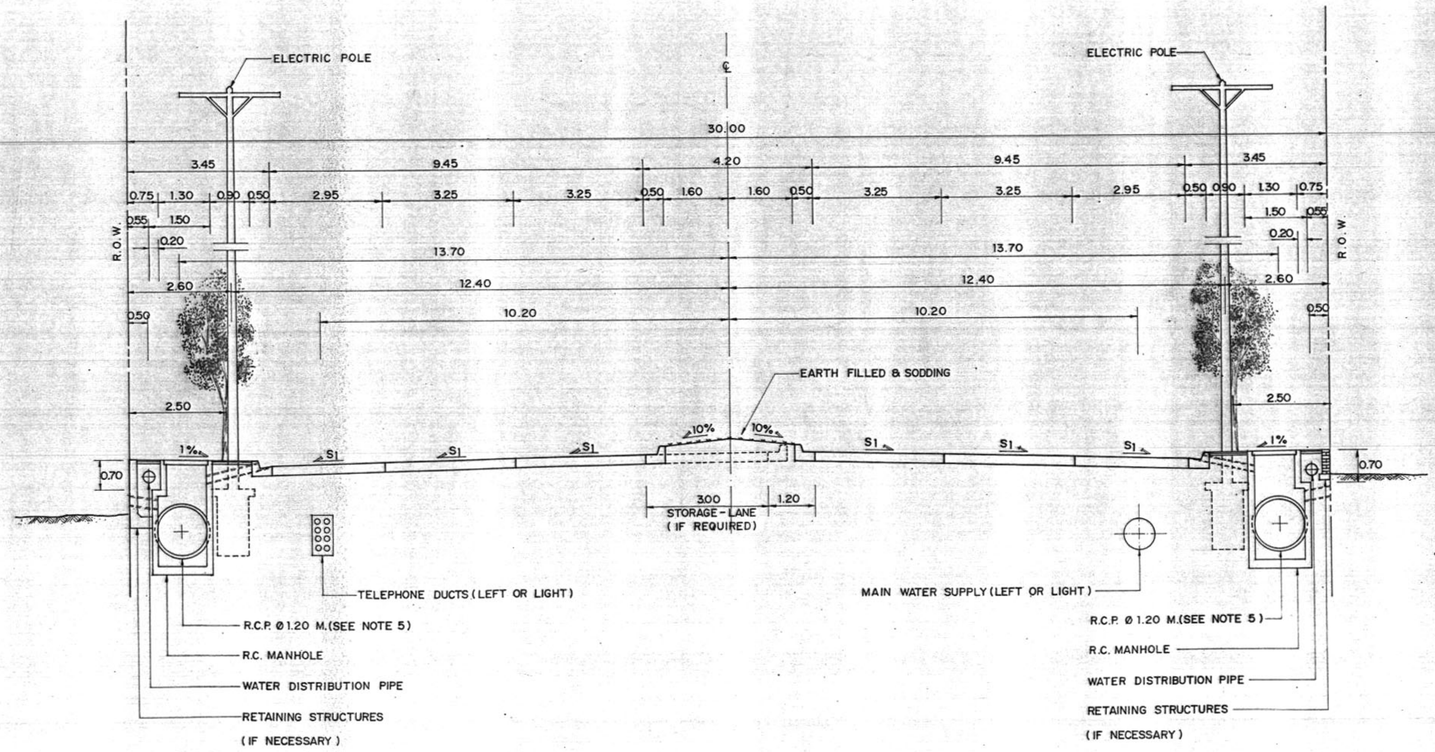
STANDARD DRAWING

TYPICAL ROADWAY CROSS – SECTION
FOR R.O.W. WIDTH 20.00 M.

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Bunyaya (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE 1 : 75
		DWG. NO. TS-303
APPROVED : (DIRECTOR GENERAL)		SHEET NO. 8



PROPOSED 4-LANE DIVIDED (FIRST STAGE)
SCALE 1 : 75



PROPOSED 4-LANE DIVIDED (ULTIMATE STAGE)
SCALE 1 : 75

NOTES :

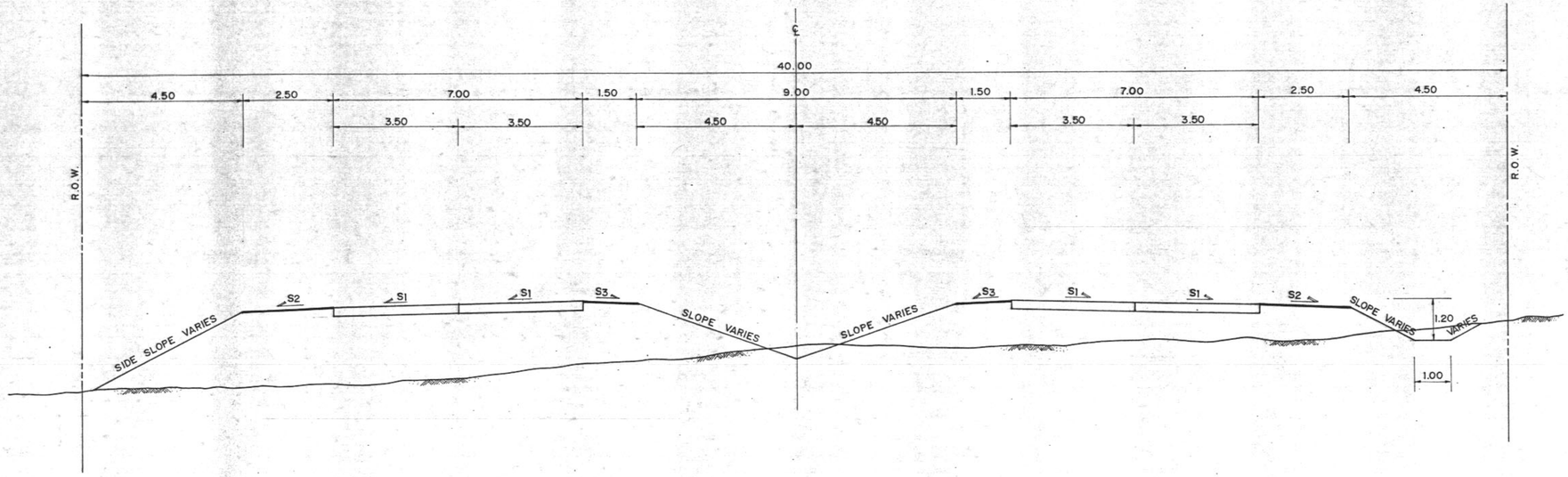
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. THIS DRAWING IS GUIDANCE ONLY. THE DIMENSION AND LOCATION OF UTILITIES MAY BE ADJUSTED TO SUIT THE FIELD CONDITION.
3. TELEPHONE DUCT AND MAIN WATER SUPPLY SHALL BE LOCATED ALTERNATELY.
4. HEIGHT OF ELECTRIC POLE SHALL BE NOT MORE THAN 22.00 M. OR WIDTH OF FOOTING SHALL BE NOT MORE THAN 1.10 M. FOR TYPICAL AS SHOWN ON THIS DRAWING.
5. BOX CULVERT SIZE 1.20 x 1.20 M. SHALL BE ALTERNATED FOR DRAINAGE STRUCTURE OR R.C.P. CULVERT Ø 1.00 M. SHALL BE SUBSTITUTED IN CASE OF NECESSARY DRAINAGE IS LOW.
6. CRITERIA FOR CONSIDERATION UTILITIES LOCATION
   - 6.1 AS SHOWN ON THIS DRAWING UTILITIES SHALL BE LOCATED FOR NEW CONSTRUCTION HIGHWAYS OR NO EXISTING UTILITIES. WHEN UTILITIES SHALL BE CONSTRUCTED MUST NOT DAMAGE TO EXISTING ROADWAY OR EXISTING UTILITY.
   - 6.2 IN CASE OF EXISTING UTILITIES ARE LOCATED AND NEW UTILITIES ARE NOT DAMAGE TO EXISTING ROADWAY OR EXISTING UTILITIES, THE NEW UTILITIES ARE LOCATED AS SHOWN ON THIS DRAWING.
   - 6.3 IN CASE OF EXISTING UTILITIES ARE LOCATED BUT NEW UTILITIES CAN NOT BE CONSTRUCTED, THE OPTIMUM LOCATION OF NEW UTILITIES SHALL BE CONSIDERED WITH THE TYPICAL CROSS – SECTION OF ROADWAY FOR ULTIMATE STAGE IN THE FUTURE.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

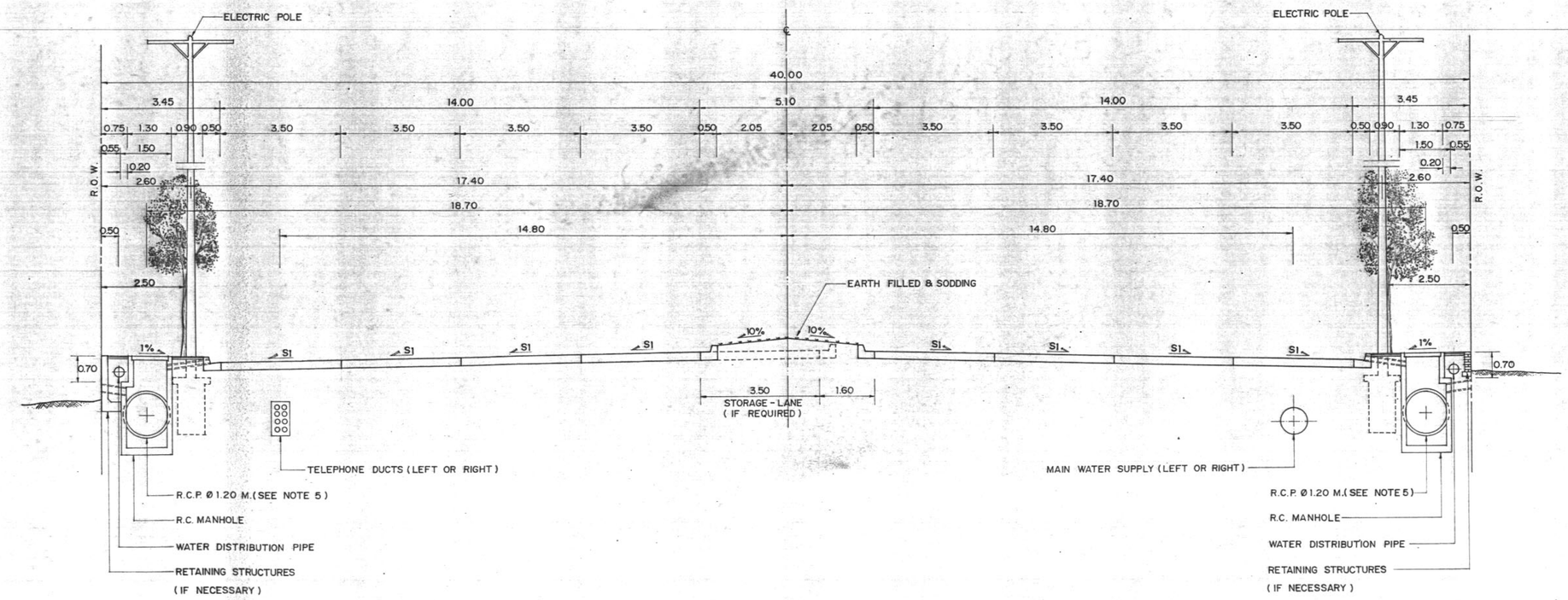
STANDARD DRAWING

TYPICAL ROADWAY CROSS – SECTION
FOR R.O.W. WIDTH 30.00 M.

DESIGNED : D.O.H. & CONSULTANTS	**CHECKED :**	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE 1 : 75
APPROVED : (DIRECTOR GENERAL)		DWG. NO. TS-304
		SHEET NO. 9



PROPOSED 4 - LANE DIVIDED (FIRST STAGE)
SCALE 1 : 75

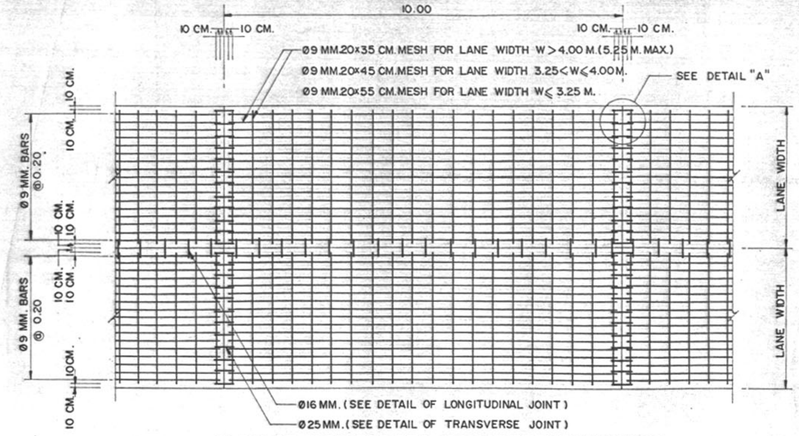


PROPOSED 8 - LANE DIVIDED (ULTIMATE STAGE)
SCALE 1 : 75

NOTES :

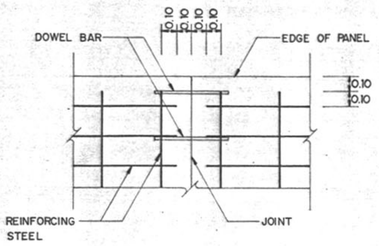
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. THIS DRAWING IS GUIDANCE ONLY. THE DIMENSION AND LOCATION OF UTILITIES MAY BE ADJUSTED TO SUIT THE FIELD CONDITION.
3. TELEPHONE DUCT AND MAIN WATER SUPPLY SHALL BE LOCATED ALTERNATELY
4. HEIGHT OF ELECTRIC POLE SHALL BE NOT MORE THAN 22.00 M. OR WIDTH OF FOOTING SHALL BE NOT MORE THAN 1.10 M. FOR TYPICAL AS SHOWN ON THIS DRAWING.
5. BOX CULVERT SIZE 1.20 x 1.20 M. SHALL BE ALTERNATED FOR DRAINAGE STRUCTURE OR R.C.P. CULVERT Ø 1.00 M. SHALL BE SUBSTITUTED IN CASE OF NECESSARY DRAINAGE IS LOW.
6. CRITERIA FOR CONSIDERATION UTILITIES LOCATION
   - 6.1 AS SHOWN ON THIS DRAWING UTILITIES SHALL BE LOCATED FOR NEW CONSTRUCTION HIGHWAYS OR NO EXISTING UTILITIES. WHEN UTILITIES SHALL BE CONSTRUCTED MUST NOT DAMAGE TO EXISTING ROADWAY OR EXISTING UTILITY.
   - 6.2 IN CASE OF EXISTING UTILITIES ARE LOCATED AND NEW UTILITIES ARE NOT DAMAGE TO EXISTING ROADWAY OR EXISTING UTILITIES, THE NEW UTILITIES ARE LOCATED AS SHOWN ON THIS DRAWING.
   - 6.3 IN CASE OF EXISTING UTILITIES ARE LOCATED BUT NEW UTILITIES CAN NOT BE CONSTRUCTED, THE OPTIMUM LOCATION OF NEW UTILITIES SHALL BE CONSIDERED WITH THE TYPICAL CROSS - SECTION OF ROADWAY FOR ULTIMATE STAGE IN THE FUTURE.

KINGDOM OF THAILAND MINISTRY OF TRANSPORT AND COMMUNICATIONS DEPARTMENT OF HIGHWAYS		
STANDARD DRAWING TYPICAL ROADWAY CROSS - SECTION FOR R.O.W. WIDTH 40.00 M.		
DESIGNED: D.O.H. & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE 1 : 75
		DWG. NO. TS-305
APPROVED: (DIRECTOR GENERAL)		SHEET NO. 10



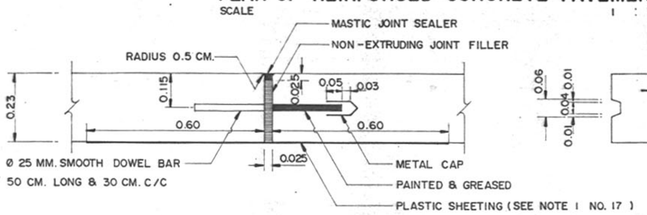
PLAN OF REINFORCED CONCRETE PAVEMENT

SCALE 1 : 75

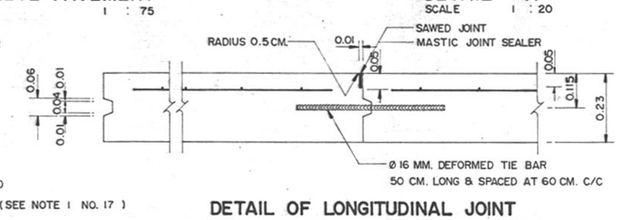


DETAIL "A"

SCALE 1 : 20

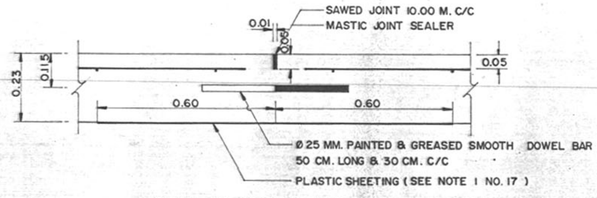


DETAIL OF EXPANSION JOINT

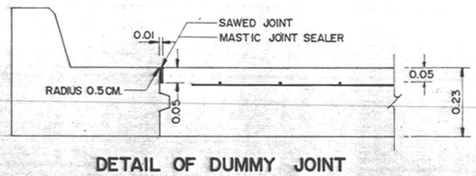


DETAIL OF LONGITUDINAL JOINT

SCALE 1 : 10



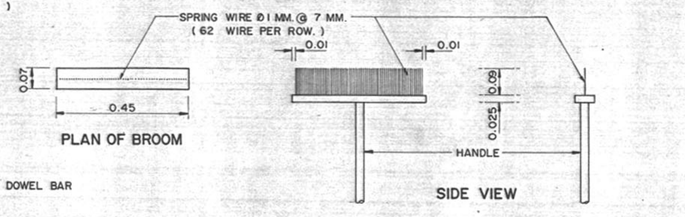
DETAIL OF CONTRACTION JOINT



DETAIL OF CONSTRUCTION JOINT

DETAIL OF DUMMY JOINT

SCALE 1 : 10

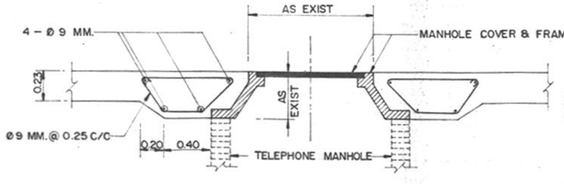


DETAIL OF BROOM SURFACE CONCRETE PAVEMENT

SCALE 1 : 10

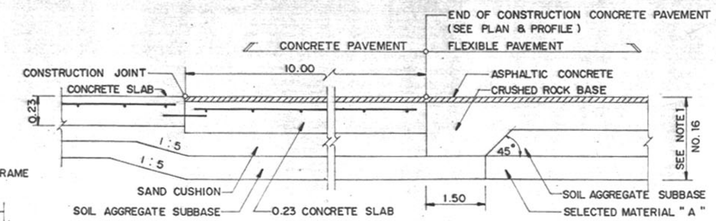
DETAIL OF TRANSVERSE JOINTS

SCALE 1 : 10



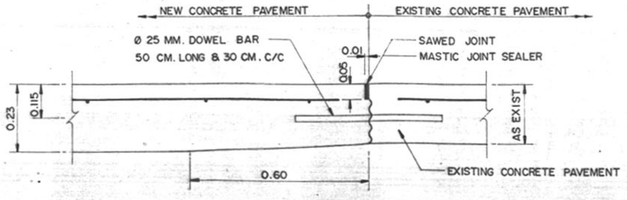
EDGE DETAIL OF CONCRETE PAVEMENT AT TELEPHONE MANHOLE

NOT TO SCALE



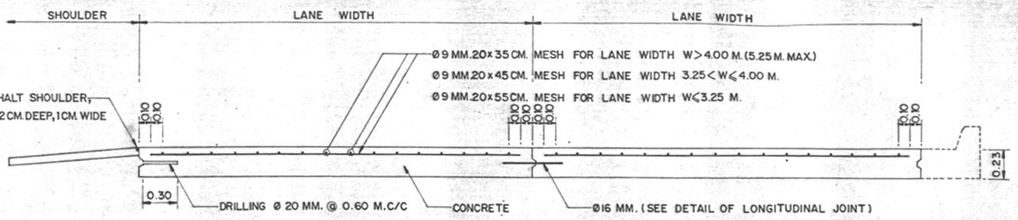
DETAIL OF JOINT BETWEEN CONCRETE PAVEMENT AND FLEXIBLE PAVEMENT

NOT TO SCALE



DETAIL OF TRANSVERSE JOINT BETWEEN NEW AND EXISTING CONCRETE PAVEMENT

SCALE 1 : 25



REINFORCEMENT DETAIL OF CONCRETE PAVEMENT CROSS-SECTION

SCALE 1 : 25

NOTES 1 :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. EXPANSION JOINT SHALL BE CONSTRUCTED AT THE INTERVAL OF 350 METERS. IF THE LAST INTERVAL IS LESS THAN 350 METERS, THE INTERVALS SHALL BE AVERAGED BUT BETWEEN 300 AND 350 METERS.
3. EXPANSION JOINT SHALL BE PROVIDED AT THE OUTER EDGE OF BOTH SIDES OF THE BOX CULVERT CROSSING.
4. MASTIC JOINT SEALER SHALL BE OF THE HOT POURED ELASTIC TYPE CONFORMING TO TIS. 479.
5. JOINT FILLER SHALL CONFORM TO THE AASHTO M. 213-74 OR ASTM. D1751-73 SPECIFICATION.
6. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 325 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	350	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	7	CM. (MAX.)

7. REINFORCING STEEL SHALL CONFORM TIS.20 GRADE SR 24 FOR ROUND BARS AND TIS. 24 GRADE SD 30 FOR DEFORMED BAR.
8. WELDED WIRE CAN BE USED IN PLACE OF BAR MESH. (SEE NOTE ②)
9. CONCRETE PAVER SHALL BE REQUIRED FOR CONCRETE POURING. IN CASE OF NECESSARY POURING CONCRETE BY MAN-POWER, CONCRETE SHALL BE POURED ONLY GAP SPACE NOT MORE THAN 30.00 METERS LONG.
10. ALL JOINTS EXCEPT EXPANSION JOINT SHALL BE MADE BY SLOT CUTTING MACHINE ONLY. FOAM SHEET, PLYWOOD, TIMBER OR MATERIAL OF THE SAME TYPE SHALL NOT BE ALLOWED.
11. TRAFFIC SHALL BE ALLOWED ONLY IF THE ULTIMATE COMPRESSIVE STRENGTH OF CONCRETE CUBE CONFORMS TO THE REQUIREMENT IN NOTE NO.6
12. ROAD CONSTRUCTION MATERIAL NOT SPECIFIED IN THIS DRAWING SHALL CONFORM TO THE STANDARD OF THE DEPARTMENT OF HIGHWAYS.
13. BROOMING CONCRETE SURFACE WITH A BROOM OF THE STANDARD TYPE SPECIFIED SHALL BE REQUIRED. THE DIRECTION OF BROOMING SHALL BE PERPENDICULAR TO THE DIRECTION OF TRAFFIC FROM ONE EDGE OR JOINT TO THE OTHER. ONE PHASE OF BROOM SURFACE SHALL PROPERLY OVERLAP WITH ANOTHER. CONCRETE BROOM SURFACE SHALL NOT BE OVER 3 MM. DEPTH. THE SURFACE SHALL BE FREE FROM PORES, HOLES OR LUMPS OF COARSE AGGREGATE OVER THE SURFACE.
14. BROOMING SURFACE CONCRETE SHALL CORRESPOND TO THE FIGURE.
15. PREPARATION OF JOINT FOR MASTIC JOINT SEALER.
    - 15.1 THE JOINT SHALL BE CLEANED WITH A BLOWER TO GET RID OF ALL KINDS OF DIRT. THE JOINT SHALL BE COMPLETELY DRY.
    - 15.2 PRIMER SHALL BE APPLIED TO THE JOINT WITH A BRUSH OR SPRAYER. THE JOINT SHALL BE LET DRY BEFORE THE POURING OF MASTIC JOINT SEALER WHICH HAS BEEN BOILED AND DISSOLVED BY MEANS OF HEAT CONDUCTIVITY TO THE SPECIFIED TEMPERATURE.
    - 15.3 JOINTS SHALL BE CUT AND MASTIC JOINT SEALER SHALL BE DROPPED AS SOON AS POSSIBLE.
    - 15.4 MASTIC JOINT SEALER SHALL BE DROPPED WITH JOINT SEALANT APPLYING MACHINE.
16. THE THICKNESS OF FLEXIBLE PAVEMENT CORRESPONDED TO THE FIGURE CONFORMING TO TYPICAL CROSS-SECTION.
17. PLASTIC SHEET USED IN CONSTRUCTION SHALL HAVE THE FOLLOWING REQUIREMENTS :
    - 17.1 THICKNESS OF 0.07 MM. WITH A TOLERANCE OF NOT MORE THAN 7 % SHALL BE REQUIRED.
    - 17.2 WIDTH SHALL NOT BE LESS THAN 1.20 M.
    - 17.3 IT SHALL BE COLOURLESS, TRANSPARENT AND WATERPROOF, FREE FROM POROUS AREA, TURN AREA AND BLISTERING AREA WHICH ARE VISIBLE BY NAKED EYE. EDGE SHALL BE STRAIGHT.
    - 17.4 CONTINUOUS LENGTH SHALL BE REQUIREMENT TO THE WIDTH OF TRAFFIC LANES. CONNECTION ALLOWED AT LONGITUDINAL JOINTS WITH NOT LESS THAN 20 CM. OVERLAPPING SHALL BE REQUIRED.
18. CONCRETE PAVEMENT CONSTRUCTION CONTROL SHALL CONFORM TO THE STANDARD DH-S 409/2530 REGARDING " REGULATIONS OF CONSTRUCTION CONTROL OF PORTLAND CEMENT CONCRETE PAVEMENT ".

NOTES 2 :

1. BAR MESH 9 MM. AS SHOWN IN THIS DRAWING SHALL BE REPLACED BY WELDED STEEL WIRE WITH PROPERTIES CONFORMING TO STANDARD SPECIFICATION FOR WELDED STEEL WIRE FABRIC FOR CONCRETE REINFORCEMENT, AASHTO DESIGNATION M 55-75 (ASTM. DESIGNATION A 185-73). BEFORE USING WELDED STEEL WIRE FABRIC, THE SAMPLES SHALL BE SENT TO MATERIAL AND RESEARCH DIVISION DOH. FOR APPROVING.
2. MINIMUM SIZE OF WIRE TO BE USED SHALL NOT BE LESS THAN STANDARD WIRE AASHTO DESIGNATION M 32-78 (ASTM DESIGNATION A 82-76) SIZE NUMBER W.12 AT NOMINAL DIAMETER OF 3.15 MM. AND NOMINAL AREA OF 0.007 $CM.^2$ WIRE TO BE USED SHALL HAVE YIELD STRENGTH OF NOT LESS THAN 65,000 lb./$INCH.^2$ (PSI.)
3. LAP SPLICES OF BAR MESH SHALL NOT BE LESS THAN 40 TIMES OF WIRE DIAMETER AND NOT LESS THAN SPACING OF CROSS WIRE + 5 CM.
4. QUANTITY OF STEEL WIRE FABRIC CALCULATED FROM NOMINAL AREA AND SPACING IN EACH DIRECTION SHALL CONFORM TO THE FOLLOWING REQUIREMENT :
    - 4.1 LONGITUDINAL STEEL (STEEL BETWEEN TRANSVERSE JOINT) SHALL HAVE THE MINIMUM AREA OF 1.511 $CM.^2/M.$
    - 4.2 TRANSVERSE STEEL :
        - 4.2.1 MINIMUM OF 0.453 $CM.^2/M.$ SHALL REQUIRED IF SPACE BETWEEN LONGITUDINAL JOINT OR FREE EDGE IS MEASURED AT 3.00 M.
        - 4.2.2 MINIMUM OF 0.491 $CM.^2/M.$ SHALL REQUIRED IF SPACE BETWEEN LONGITUDINAL JOINT OR FREE EDGE IS MEASURED AT 3.25 M.
        - 4.3.3 MINIMUM OF 0.529 $CM.^2/M.$ SHALL REQUIRED IF SPACE BETWEEN LONGITUDINAL JOINT OR FREE EDGE IS MEASURED AT 3.50 M.

    QUANTITY OF WELDED STEEL WIRE FABRIC SPECIFIED REFERS TO QUANTITY OF WELDED STEEL WIRE FABRIC MEASURED AGAINST AVERAGE SPACE LENGTH OF 1 METER FROM THE TOTAL SPACE LENGTH BETWEEN JOINT OR FREE EDGE.
5. WELDING POINTS SHALL BE ADEQUATELY STRONG AND SHALL NOT COME OFF DURING TRANSPORTATION OR PLACING. HOWEVER, THEY SHALL NOT BE SUBJECT TO REJECTION IF COMING OFF DURING CONSTRUCTION WITH WHATEVER REASON EXCEPT THAT DISCONNECTED POINTS EXCEED 1 % OF ALL WELDING POINTS. IF ROLLED OVER, DISCONNECTED POINTS SHALL NOT EXCEED 1 % OF ALL POINTS IN THE AREA OF 14 $M.^2$ DISCONNECTED POINTS FOR ONE WELDED STEEL WIRE FABRIC SHALL NOT EXCEED HALF OF ALL ALLOWABLE DISCONNECTED WELDING POINTS.
6. WELDED STEEL WIRE FABRIC SHEET SHALL BE SMOOTH NOT ROLL OR TWIST ALL DIRECTIONS, WHILE BEING PLACED DURING CONSTRUCTION.
7. CLEAR CONCRETE COVER SPACE OF WELDED STEEL WIRE FABRIC SHALL CONFORM TO BAR MESH SPECIFICATION IN THIS DRAWING.

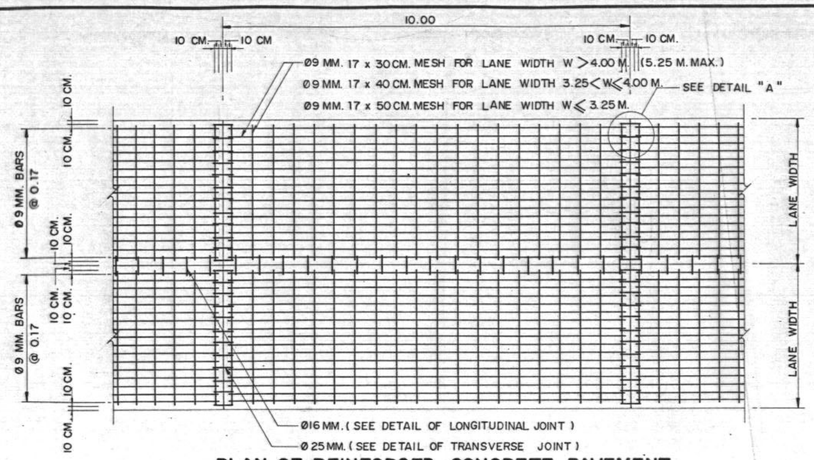
KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

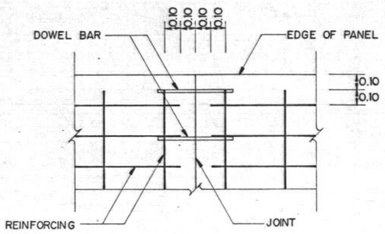
23 CM. CONCRETE PAVEMENT

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. TS-401
		SHEET NO. 11



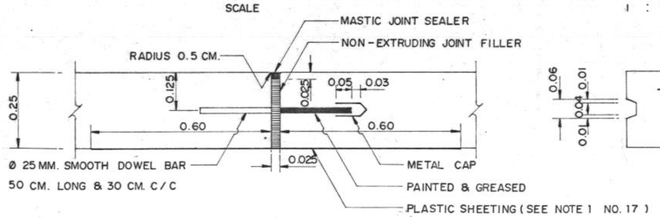
PLAN OF REINFORCED CONCRETE PAVEMENT

SCALE 1 : 75

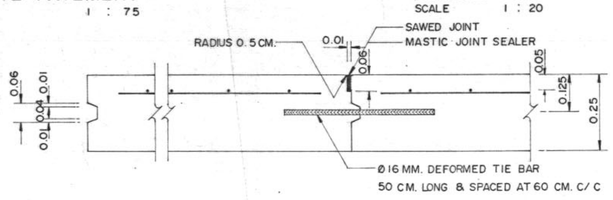


DETAIL "A"

SCALE 1 : 20

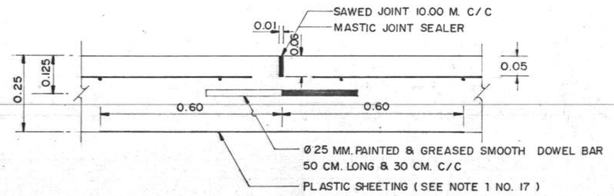


DETAIL OF EXPANSION JOINT

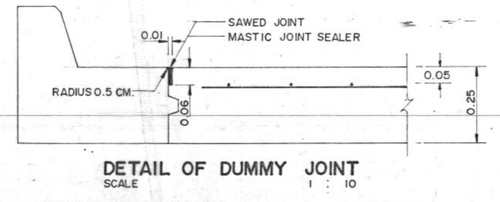


DETAIL OF LONGITUDINAL JOINT

SCALE 1 : 10

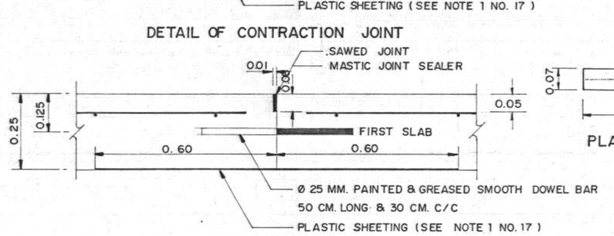


DETAIL OF CONTRACTION JOINT

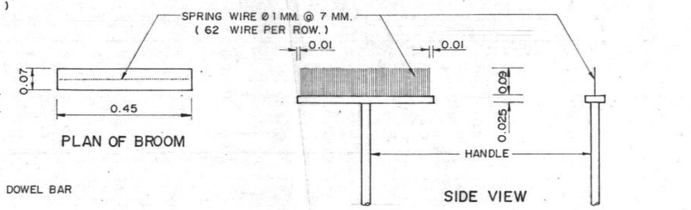


DETAIL OF DUMMY JOINT

SCALE 1 : 10

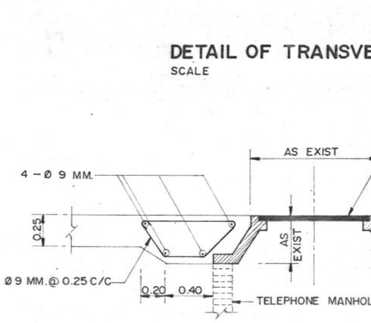


DETAIL OF CONSTRUCTION JOINT



DETAIL OF BROOM SURFACE CONCRETE PAVEMENT

SCALE 1 : 10

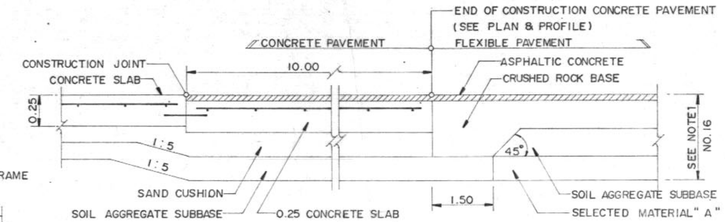


DETAIL OF TRANSVERSE JOINTS

SCALE 1 : 10

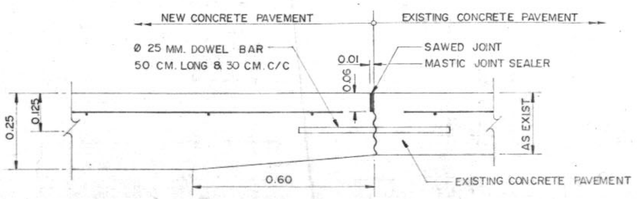
EDGE DETAIL OF CONCRETE PAVEMENT AT TELEPHONE MANHOLE

NOT TO SCALE



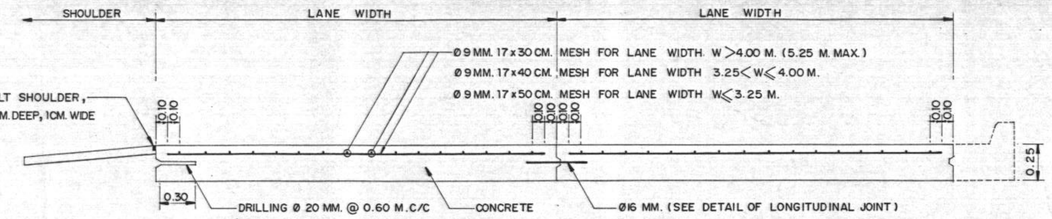
DETAIL OF JOINT BETWEEN CONCRETE PAVEMENT AND FLEXIBLE PAVEMENT

NOT TO SCALE



DETAIL OF TRANSVERSE JOINT BETWEEN NEW AND EXISTING CONCRETE PAVEMENT

SCALE 1 : 10



REINFORCEMENT DETAIL OF CONCRETE PAVEMENT CROSS-SECTION

SCALE 1 : 25

NOTES 1 :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. EXPANSION JOINT SHALL BE CONSTRUCTED AT THE INTERVAL OF 350 METERS. IF THE LAST INTERVAL IS LESS THAN 350 METERS, THE INTERVALS SHALL BE AVERAGED BUT BETWEEN 300 AND 350 METERS.
3. EXPANSION JOINT SHALL BE PROVIDED AT THE OUTER EDGE OF BOTH SIDES OF THE BOX CULVERT CROSSING.
4. MASTIC JOINT SEALER SHALL BE OF THE HOT POURED ELASTIC TYPE CONFORMING TO TIS. 479.
5. JOINT FILLER SHALL CONFORM TO THE AASHTO M. 213-74 OR ASTM. D1751-73 SPECIFICATION.
6. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 325 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX. DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE I	350	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	7	CM. (MAX.)

7. REINFORCING STEEL SHALL CONFORM TIS. 20 GRADE SR 24 FOR ROUND BARS AND TIS. 24 GRADE SD 30 FOR DEFORMED BAR.
8. WELDED WIRE CAN BE USED IN PLACE OF BAR MESH. (SEE NOTE ②)
9. CONCRETE PAVER SHALL BE REQUIRED FOR CONCRETE POURING. IN CASE OF NECESSARY POURING CONCRETE BY MAN-POWER, CONCRETE SHALL BE POURED ONLY GAP SPACE NOT MORE THAN 30.00 METERS LONG.
10. ALL JOINTS EXCEPT EXPANSION JOINT SHALL BE MADE BY SLOT CUTTING MACHINE ONLY. FOAM SHEET, PLYWOOD, TIMBER OR MATERIAL OF THE SAME TYPE SHALL NOT BE ALLOWED.
11. TRAFFIC SHALL BE ALLOWED ONLY IF THE ULTIMATE COMPRESSIVE STRENGTH OF CONCRETE CUBE CONFORMS TO THE REQUIREMENT IN NOTE NO.6
12. ROAD CONSTRUCTION MATERIAL NOT SPECIFIED IN THIS DRAWING SHALL CONFORM TO THE STANDARD OF THE DEPARTMENT OF HIGHWAYS.
13. BROOMING CONCRETE SURFACE WITH A BROOM OF THE STANDARD TYPE SPECIFIED SHALL BE REQUIRED. THE DIRECTION OF BROOMING SHALL BE PERPENDICULAR TO THE DIRECTION OF TRAFFIC FROM ONE EDGE OR JOINT TO THE OTHER. ONE PHASE OF BROOM SURFACE SHALL PROPERLY OVERLAP WITH ANOTHER. CONCRETE BROOM SURFACE SHALL NOT BE OVER 3 MM. DEPTH. THE SURFACE SHALL BE FREE FROM PORES, HOLES OR LUMPS OF COARSE AGGREGATE OVER THE SURFACE.
14. BROOMING SURFACE CONCRETE SHALL CORRESPOND TO THE FIGURE.
15. PREPARATION OF JOINT FOR MASTIC JOINT SEALER.
    - 15.1 THE JOINT SHALL BE CLEANED WITH A BLOWER TO GET RID OF ALL KINDS OF DIRT. THE JOINT SHALL BE COMPLETELY DRY.
    - 15.2 PRIMER SHALL BE APPLIED TO THE JOINT WITH A BRUSH OR SPRAYER THE JOINT SHALL BE LET DRY BEFORE THE POURING OF MASTIC JOINT SEALER WHICH HAS BEEN BOILED AND DISSOLVED BY MEANS OF HEAT CONDUCTIVITY TO THE SPECIFIED TEMPERATURE.
    - 15.3 JOINTS SHALL BE CUT AND MASTIC JOINT SEALER SHALL BE DROPPED AS SOON AS POSSIBLE.
    - 15.4 MASTIC JOINT SEALER SHALL BE DROPPED WITH JOINT SEALANT APPLYING MACHINE
16. THE THICKNESS OF FLEXIBLE PAVEMENT CORRESPONDED TO THE FIGURE CONFORMING TO TYPICAL CROSS-SECTION.
17. PLASTIC SHEET USED IN CONSTRUCTION SHALL HAVE THE FOLLOWING REQUREMENTS :
    - 17.1 THICKNESS OF 0.07 MM. WITH A TOLERANCE OF NOT MORE THAN 7 % SHALL BE REQUIRED.
    - 17.2 WIDTH SHALL NOT BE LESS THAN 1.20 M.
    - 17.3 IT SHALL BE COLOURLESS, TRANSPARENT AND WATERPROOF, FREE FROM POROUS AREA, TURN AREA AND BLISTERING AREA WHICH ARE VISIBLE BY NAKED EYE. EDGE SHALL BE STRAIGHT.
    - 17.4 CONTINUOUS LENGTH SHALL BE REQUIREMENT TO THE WIDTH OF TRAFFIC LANES. CONNECTION ALLOWED AT LONGITUDINAL JOINTS WITH NOT LESS THAN 20 CM. OVERLAPPING SHALL BE REQUIRED.
18. CONCRETE PAVEMENT CONSTRUCTION CONTROL SHALL CONFORM TO THE STANDARD DH.-S 409/2530 REGARDING "REGULATIONS OF CONSTRUCTION CONTROL OF PORTLAND CEMENT CONCRETE PAVEMENT."

NOTES 2 :

1. BAR MESH 9 MM. AS SHOWN IN THIS DRAWING SHALL BE REPLACED BY WELDED STEEL WIRE WITH PROPERTIES CONFORMING TO STANDARD SPECIFICATION FOR WELDED STEEL WIRE FABRIC FOR CONCRETE REINFORCEMENT, AASHTO DESIGNATION M 55-75 (ASTM. DESIGNATION A 185-73). BEFORE USING WELDED STEEL WIRE FABRIC, THE SAMPLES SHALL BE SENT TO MATERIAL AND RESEARCH DIVISION DOH. FOR APPROVING.
2. MINIMUM SIZE OF WIRE TO BE USED SHALL NOT BE LESS THAN STANDARD WIRE AASHTO DESIGNATION M 32-78 (ASTM DESIGNATION A82-76) SIZE NUMBER W. 12 AT NOMINAL DIAMETER OF 3.15 MM. AND NOMINAL AREA OF 0.007 $CM.^2$ WIRE TO BE USED SHALL HAVE YIELD STRENGTH OF NOT LESS THAN 65,000 $lb./INCH^2$ (PSI.).
3. LAP SPLICES OF BAR MESH SHALL NOT BE LESS THAN 40 TIMES OF WIRE DIAMETER AND NOT LESS THAN SPACING OF CROSS WIRE + 5 CM.
4. QUANTITY OF STEEL WIRE FABRIC CALCULATED FROM NOMINAL AREA AND SPACING IN EACH DIRECTION SHALL CONFORM TO THE FOLLOWING REQUIREMENT:
    - 4.1 LONGITUDINAL STEEL (STEEL BETWEEN TRANSVERSE JOINT) SHALL HAVE THE MINIMUM AREA OF 1.642 $CM.^2/M.$
    - 4.2 TRANSVERSE STEEL
        - 4.2.1 MINIMUM OF 0.492 $CM.^2/M.$ SHALL REQUIRED IF SPACE BETWEEN LONGITUDINAL JOINT OR FREE EDGE IS MEASURED AT 3.00 M.
        - 4.2.2 MINIMUM OF 0.534 $CM.^2/M.$ SHALL REQUIRED IF SPACE BETWEEN LONGITUDINAL JOINT OR FREE EDGE IS MEASURED AT 3.25 M.
        - 4.3.3 MINIMUM OF 0.575 $CM.^2/M.$ SHALL REQUIRED IF SPACE BETWEEN LONGITUDINAL JOINT OR FREE EDGE IS MEASURED AT 3.50 M.

    QUANTITY OF WELDED STEEL WIRE FABRIC SPECIFIED REFERS TO QUANTITY OF WELDED STEEL WIRE FABRIC MEASURED AGAINST AVERAGE SPACE LENGTH OF 1 METER FROM THE TOTAL SPACE LENGTH BETWEEN JOINT OR FREE EDGE.
5. WELDING POINTS SHALL BE ADEQUATELY STRONG AND SHALL NOT COME OFF DURING TRANSPORTATION OR PLACING. HOWEVER, THEY SHALL NOT BE SUBJECT TO REJECTION IF COMING OFF DURING CONSTRUCTION WITH WHATEVER REASON EXCEPT THAT DISCONNECTED POINTS EXCEED 1 % OF ALL WELDING POINTS IF ROLLED OVER, DISCONNECTED POINTS SHALL NOT EXCEED 1% OF ALL POINTS IN THE AREA OF 14 $M.^2$ DISCONNECTED POINTS FOR ONE WELDED STEEL WIRE FABRIC SHALL NOT EXCEED HALF OF ALL ALLOWABLE DISCONNECTED WELDING POINTS.
6. WELDED STEEL WIRE FABRIC SHEET SHALL BE SMOOTH NOT ROLL OR TWIST ALL DIRECTIONS, WHILE BEING PLACED DURING CONSTRUCTION.
7. CLEAR CONCRETE COVER SPACE OF WELDED STEEL WIRE FABRIC SHALL CONFORM TO BAR MESH SPECIFICATION IN THIS DRAWING.

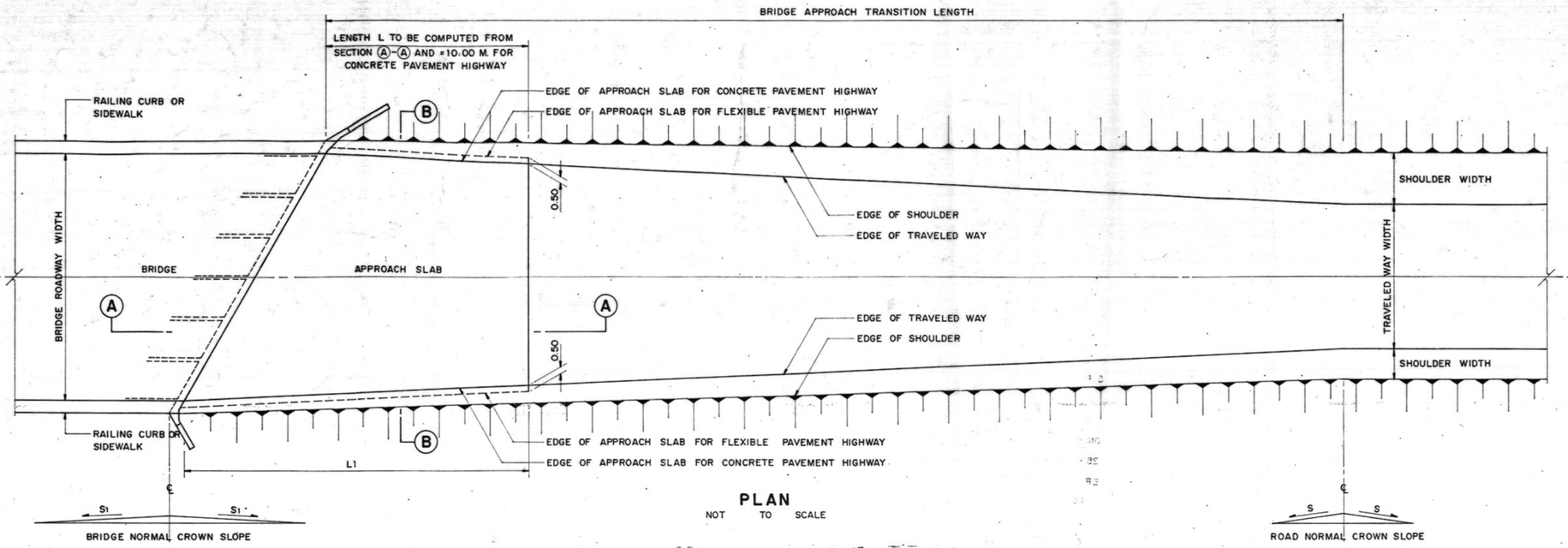
KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

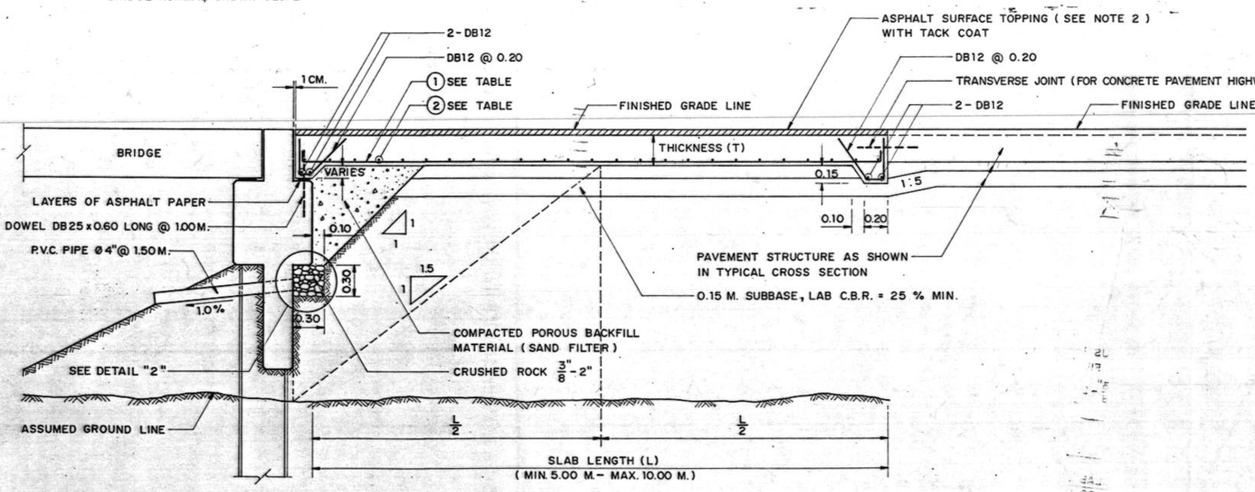
STANDARD DRAWING

25 CM. CONCRETE PAVEMENT

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. TS-402
		SHEET NO. 12



PLAN
NOT TO SCALE



SECTION (A)-(A)
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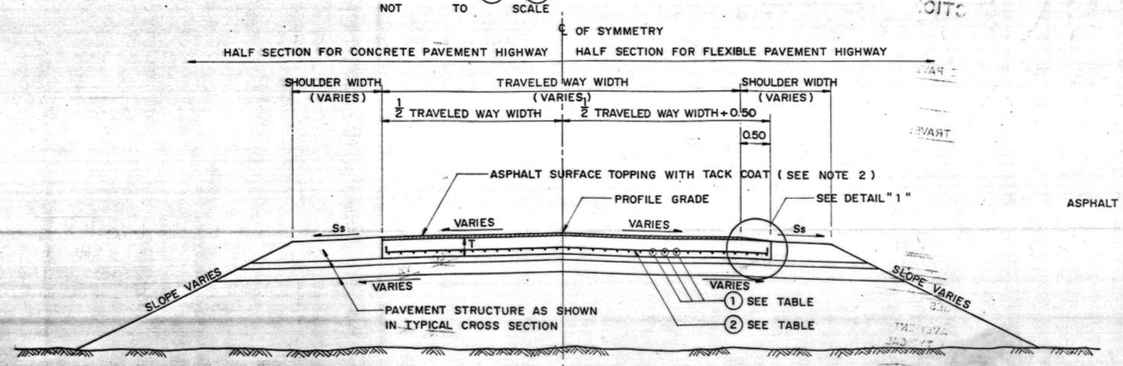

SECTION (B)-(B)
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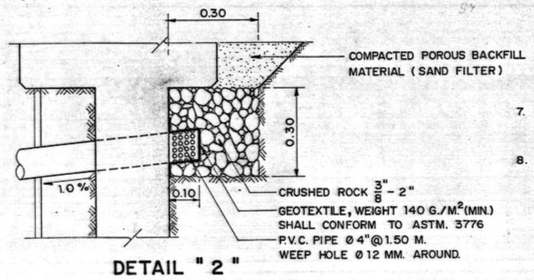
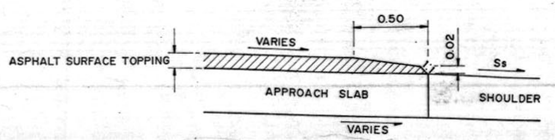
TABLE : THICKNESS AND REINFORCEMENT

SLAB LENGTH (L) M.	THICKNESS (T) CM.	REINFORCEMENT	
		BAR MARK (1)	BAR MARK (2)
5.00	20	DB20 @ 0.20	DB12 @ 0.20
6.00	22	DB20 @ 0.15	DB12 @ 0.20
7.00	24	DB20 @ 0.20	DB12 @ 0.20
8.00	26	DB20 @ 0.15	DB12 @ 0.15
9.00	28	DB25 @ 0.20	DB16 @ 0.20
10.00	30	DB25 @ 0.15	DB16 @ 0.15



DETAIL "2"
NOT TO SCALE



DETAIL "1"
NOT TO SCALE

NOTES :

1. DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. TYPE AND THICKNESS OF SURFACE TOPPING ON THE APPROACH SLAB SHALL BE AS FOLLOWS.
   - 2.1 FOR CONCRETE PAVEMENT HIGHWAY ON SOFT FOUNDATION WITH ASPHALTIC CONCRETE TREATED SHOULDER, 5 CM. OF HOT MIXED ASPHALTIC CONCRETE SHALL BE USED.
   - 2.2 FOR CONCRETE PAVEMENT HIGHWAY ON SOFT FOUNDATION WITH BITUMINOUS SURFACE TREATMENT TREATED SHOULDER OR NONTREATED SHOULDER, EITHER 5 CM. OF COLD MIX ASPHALTIC CONCRETE OR 5 CM. OF HOT MIXED ASPHALTIC CONCRETE SHALL BE USED.
   - 2.3 FOR CONCRETE PAVEMENT HIGHWAY ON NORMAL SOIL FOUNDATION NO ASPHALT SURFACE TOPPING SHALL BE REQUIRED AND THE APPROACH SLAB SHALL BE RAISED TO FINISHED GRADE LINE.
   - 2.4 FOR FLEXIBLE PAVEMENT HIGHWAY WITH ASPHALTIC CONCRETE SURFACE THE SAME THICKNESS (5 CM. MIN.) OF ASPHALTIC CONCRETE TOPPING SHALL BE USED.
   - 2.5 FOR FLEXIBLE PAVEMENT HIGHWAY WITH BITUMINOUS SURFACE TREATMENT SURFACE, EITHER 5 CM. OF COLD MIX ASPHALTIC CONCRETE OR 5 CM. OF HOT MIXED ASPHALTIC CONCRETE SHALL BE USED
3. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 325 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	350. KG. (MIN.)
SAND	0.43 M^3
CRUSHED ROCK OR GRAVEL	0.86 M^3
CONCRETE SLUMP	7 CM. (MAX.)

4. NORMAL CLEAR CONCRETE COVER SHALL BE 3 CM. BUT FOR SALINE PROTECTION, CLEAR CONCRETE COVER SHALL BE 5 CM.
5. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR24 FOR ROUND BARS AND TIS. 24 GRADE SD30 FOR DEFORMED BARS.
6. POROUS BACKFILL MATERIAL SHALL BE HARD DURABLE AND CLEAN IT SHALL BE GRAVEL OR CRUSHED ROCK OR SAND AND SHALL FREE FROM ORGANIC MATERIAL, CLAY BALLS AND OTHER DELETERIOUS SUBSTANCES LATERITE OR CONCRETIONARY MATERIAL SHALL NOT BE USED.
   SAND USED FOR POROUS BACKFILL MATERIAL SHALL CONFORM TO THE FOLLOWING GRADING REQUIREMENTS.

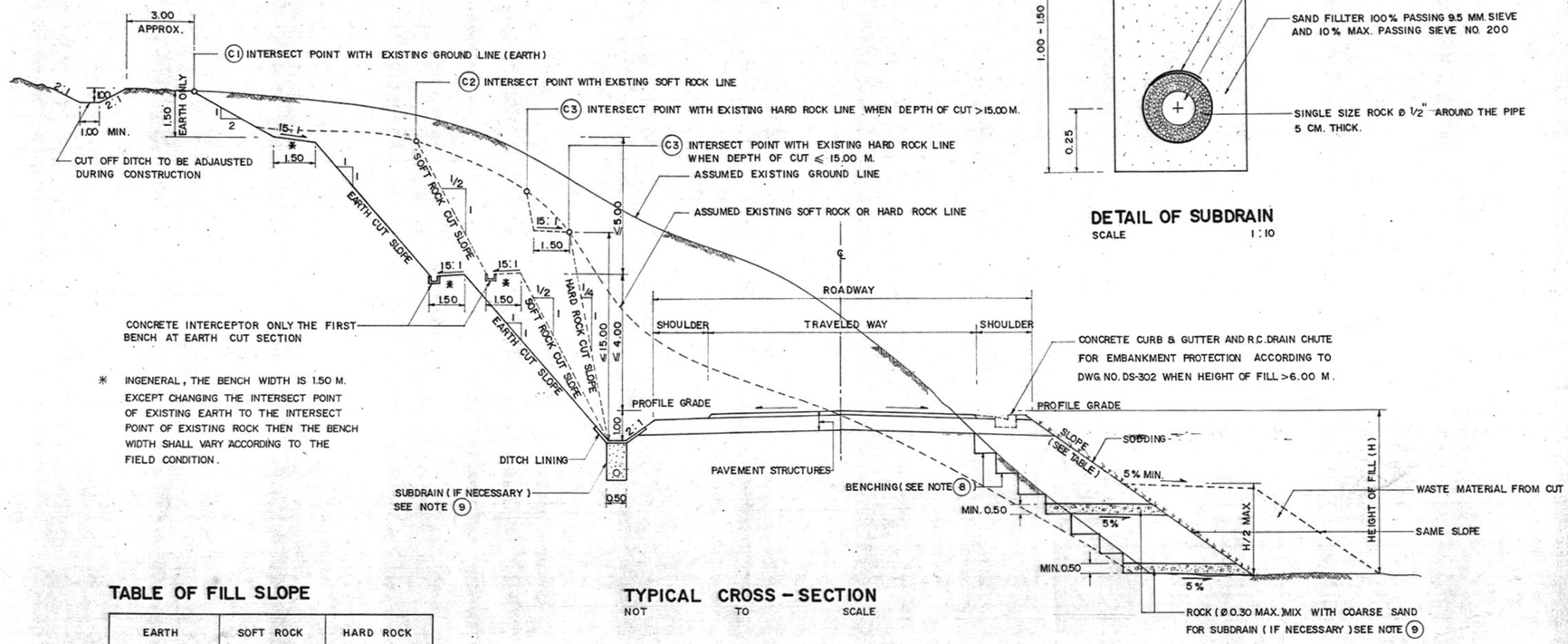
SIEVE DESIGNATION	PERCENT BY WEIGHT PASSING
3/8"	100
NO. 4	95 - 100
NO. 16	45 - 80
NO. 50	10 - 30
NO. 100	2 - 10

7. THE COST OF APPROACH SLAB SHALL INCLUDE THE COST OF POROUS MATERIAL.
8. S1 = BRIDGE NORMAL CROWN SLOPE
   S = ROAD NORMAL CROWN SLOPE
   Ss = SHOULDER CROSS SLOPE

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

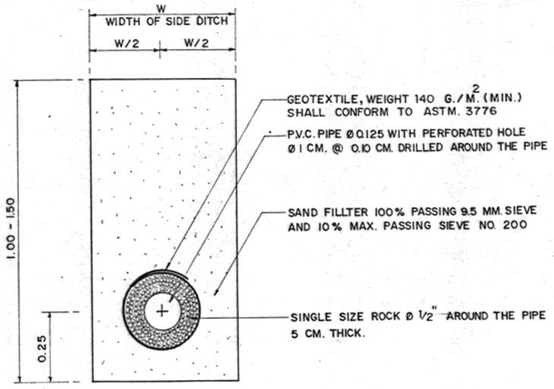
STANDARD DRAWING
BRIDGE APPROACH SLAB AND POROUS BACKFILL MATERIALS

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. TS-403
		SHEET NO. 13



TYPICAL CROSS – SECTION

NOT TO SCALE



DETAIL OF SUBDRAIN

SCALE 1 : 10

NOTES :

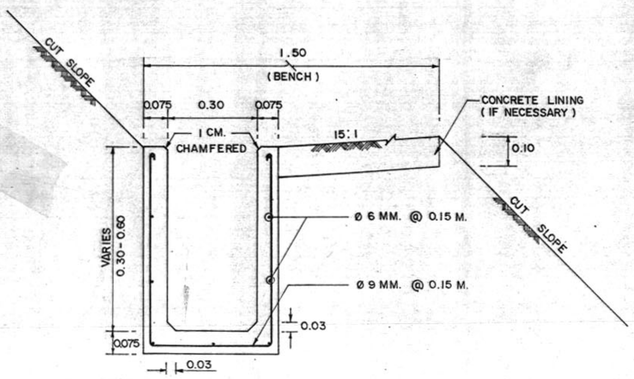
1. DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. THE CROSS-SECTION OF CUT AND FILL HEREIN SHALL BE APPLIED ONLY WHEN THE DEPTH OF CUT IS OVER 5.00 METRES FROM THE BOTTOM OF THE SIDE DITCH, AND SIDE HILL FILL ALSO.
3. PAVEMENT STRUCTURES AND OTHER DETAILS WHICH ARE NOT SPECIFIED IN THIS DRAWING SHALL BE REFERED TO THAT IN THE TYPICAL CROSS-SECTION DRAWING.
4. THE PROCESS OF RIPPING AND EXPOSING THE CUT MATERIALS SHALL BE MEASURED AS FOLLOWS :
   - 4.1 IN CASE OF SOIL WITHOUT ANY ROCKS APPEAR ABOVE THE GROUND SURFACE, THE POINT (C1) IN THE DRAWING WILL BE THE INTERSECTING POINT BETWEEN THE SLOPE OF CUT AND THE EXISTING GROUND LINE SO THE EXCAVATION SHALL START FROM THIS POINT.
   - 4.2 AFTER THE EXCAVATION AS INDICATED IN SECTION 4.1 FOR A DISTANCE AND THE SOFT ROCK OR HARD ROCK WAS FOUND, THEN THE TOE SLOPE SHALL BE CHANGED FROM POINT (C1) TO POINT (C2) OR (C3) AS INDICATED ON THE DRAWING THE STEP WIDTH OF BENCHING SHALL BE DIRECTED BY THE ENGINEER THE STABILITY OF THE CUT SLOPE SHOULD BE CAREFULLY CONSIDERED AND THE UNSUITABLE TOP SOIL MATERIALS SHALL BE REMOVED.
   - 4.3 THE CLASSIFICATION OF SOIL, SOFT ROCK OR HARD ROCK SHALL BE CONSIDERED IN ACCORDANCE WITH THE SPECIFICATION FOR HIGHWAY CONSTRUCTIONS BY THE DEPARTMENT OF HIGHWAYS, AND ALSO SHALL BE DIRECTED BY THE ENGINEER.
   - 44 THE QUANTITIES SHALL BE CALCULATED FROM THE CROSS – SECTION, SEPARATED FOR SOIL, SOFT ROCK OR HARD ROCK AT 6.25 M. INTERVAL. IN CASE OF MIXED MATERIALS FOR EACH CROSS – SECTION, THEN THE NEGOTIATION BETWEEN THE OWNER AND THE CONTRACTOR SHOULD BE ARRANGED.
5. CONCRETE INTERCEPTION ON CUT SLOPE SHALL BE CONSTRUCTURED ON SILTY SAND, GRAVAL LATERITE, SOFT ROCK OR SHALE, BUT BE NOT NECESSARY ON SHALE SOLID ROCK AREA.
6. THE LONGITUDINAL SLOPE OF CONCRETE INTERCEPTOR IN NOTE 5 SHALL NOT BE LESS THAN 0.3 PERCENT.
7. EACH SECTION OF CONCRETE INTERCEPTOR SHALL BE 0.50 M. LONG FOR PRECAST CONCRETE AND SHALL NOT BE GREATER THAN 15.00 M. FOR CAST-IN-PLACE CONCRETE. ALL JOINT SPACES SHALL BE 0.5 CM. WIDE WITH MORTARED FLUSH ON (THE RATIO OF PORTLAND CEMENT : SAND IS 1:2 BY VOLUME)
8. BENCHING SHALL BE REQUIRED ON EXISTING GROUND SLOPE OR EXISTING ROADBED IN THE PORTION OF EMBANKMENT. THE NUMBER OF STEPS FOR BENCHING DEPENDS UPON THE HEIGHT OF SLOPE THE HEIGHT OF EACH STEP SHALL BE DIRECTED BY THE ENGINEER, AND THE WIDTH SHALL BE PERMITED FOR COMPACTED EQUIPMENT, AND THE DENSITY OF THE COMPACTED MATERIAL SHALL NOT BE LESS THAN 95 PERCENT OF STANDARD PROCTOR.
9. BEFORE CONSTRUCTING PAVEMENT STRUCTURES, IF GROUND WATER SEEPAGE APPEARS ON CUT SLOPE OR SIDE HILL FILL AND SEEMS TO DAMAGE THE ROADWAY, THE SUBDRAIN AS SHOWN ON THE DRAWING SHALL BE APPLIED.
10. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 180 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	320 KG. (MIN.)
SAND	0.43 M^3
CRUSHED ROCK OR GRAVEL	0.86 M^3
CONCRETE SLUMP	10 CM. (MAX.)

11. THE REINFORCING STEEL SHALL COMFORM TO T.I.S. 20 GRADE SR 24 WITH THE MINIMUM CLEAR CONCRETE COVER OF 2.5 CM.
12. P.V.C. PIPE SHALL BE D-PLAST RIGID TYPE CLASS 8.5 (PLAIN ENDS) CONFORMING TO T.I.S. 17

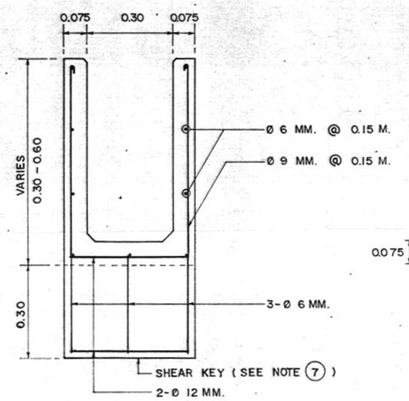
TABLE OF FILL SLOPE

EARTH	SOFT ROCK	HARD ROCK
1.5 : 1	1 : 1	1 : 1



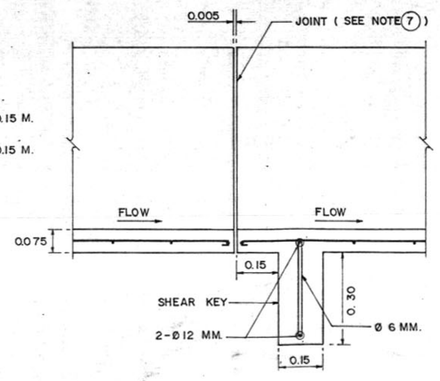
DETAIL OF CONCRETE INTERCEPTOR

SCALE 1 : 10



CROSS – SECTION OF CONCRETE INTERCEPTOR AT SHEAR KEY

SCALE 1 : 10



PROFILE SECTION OF CONCRETE INTERCEPTOR

SCALE 1 : 10

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

CROSS – SECTION FOR DEEP CUT AND HIGH FILL

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. TS-501
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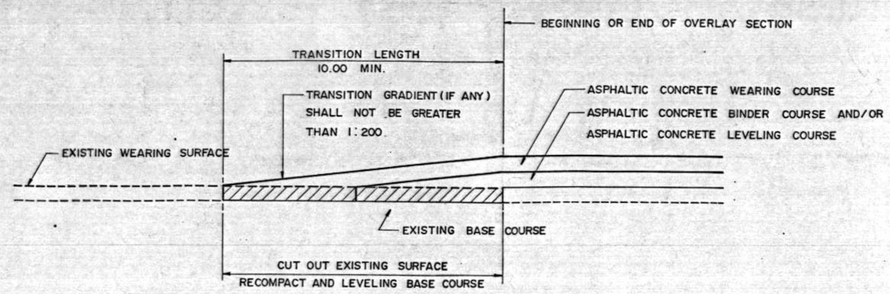
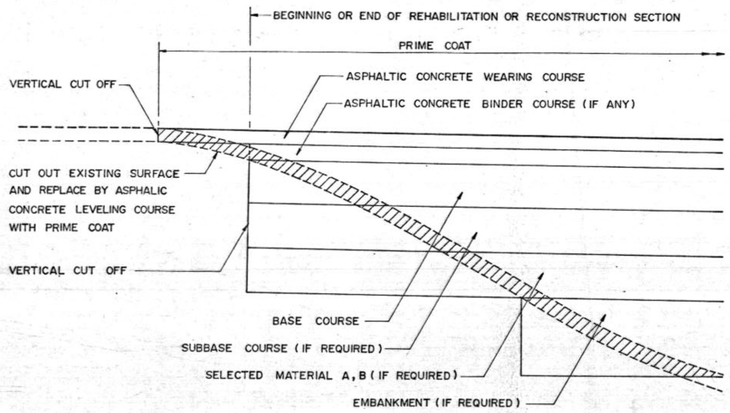


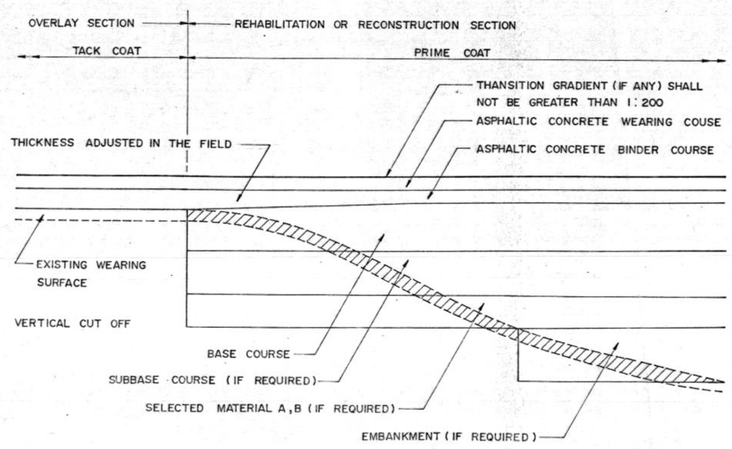
TRANSITION OF OVERLAY SECTION TO EXISTING ROAD

NOT TO SCALE



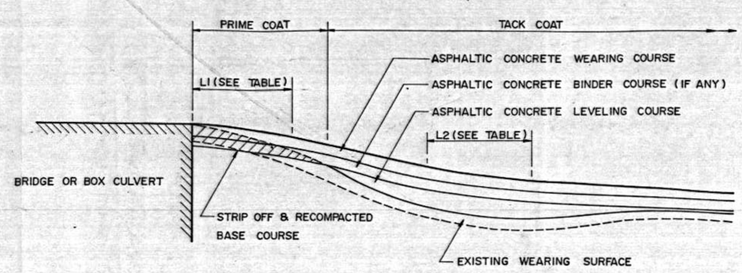
TRANSITION OF REHABILITATION OR RECONSTRUCTION TO EXISTING ROAD

NOT TO SCALE

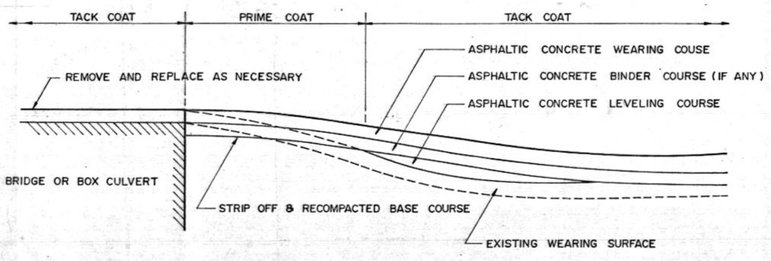


TRANSITION OF OVERLAY SECTION TO REHABILITATION OR RECONSTRUCTION SECTION

NOT TO SCALE



CASE 1 : PAVE TO EXISTING STRUCTURE



CASE 2 : PAVE OVER EXISTING STRUCTURE

OVERLAY AT BRIDGE / BOX CULVERT APPROACH

NOT TO SCALE

NOTES :

1. THE DETAILS AT LEFT ARE NOT TO SCALE AND ARE EXAGGERATED IN ORDER TO SHOW DETAIL THE ENGINEER WILL MAKE NECESSARY.
2. PRIME COAT SHALL BE APPLIED TO A COMPACTED BASE AFTER STRIPPING OFF OF THE EXISTING SURFACE APPLICATION RATE SHALL BE KEPT TO A MINIMUM DEPENDING ON THE POROSITY AND TEXTURE OF THE EXPOSED BASE COURSE.
3. TACK COAT SHALL BE APPLIED TO EACH LAYER OF ASPHALTIC CONCRETE
4. WHERE POSSIBLE, ASPHALTIC LEVELING COURSE SHALL BE PLACED IN LAYERS BY AN ASPHATIC FINISHER COMPACTED IN THE GENERAL SPECIFICATION.

TABLE

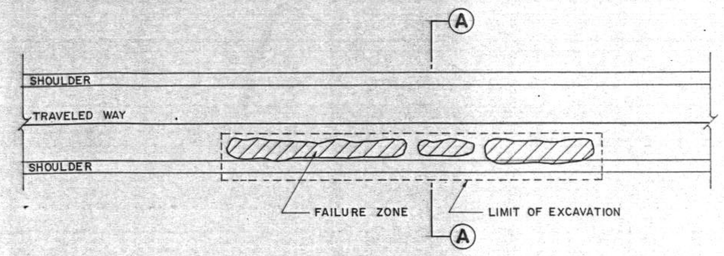
SUGGESTED MINIMUM LENGTH OF VERTICAL CURVE AT BRIDGE APPROACH		
ALGEBRAIC DIFFERRENT OF PROPOSED GRADE	LENGTH OF CREST CURVE, L1 M.	LENGTH OF SAG CURVE, L2 M.
0 - 2 %	10	20
2 - 4 %	20	35
4 - 6 %	30	50
6 - 8 %	40	65

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

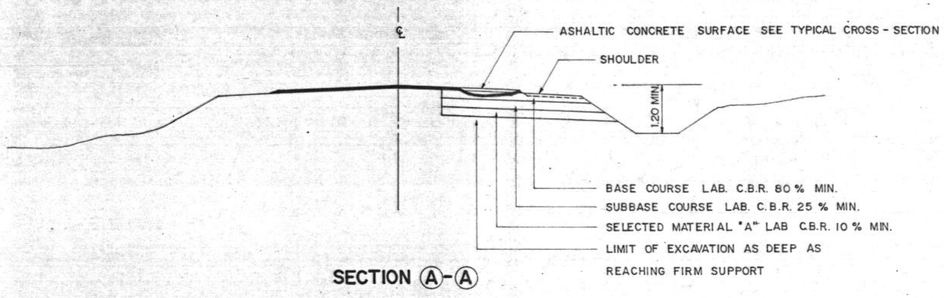
STANDARD DRAWING

PAVEMENT TRANSITION DETAILS

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : 11 พ.ค. (DIRECTOR GENERAL)		DWG. NO. TS-601
		SHEET NO. 15



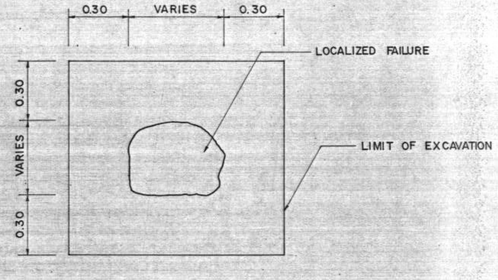
PLAN



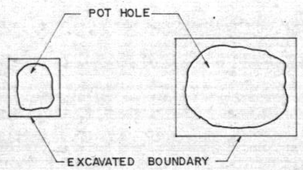
SECTION Ⓐ-Ⓐ

PAVEMENT REPAIR FOR FAILURE SETTLEMENT OR UPHEAVAL ZONE

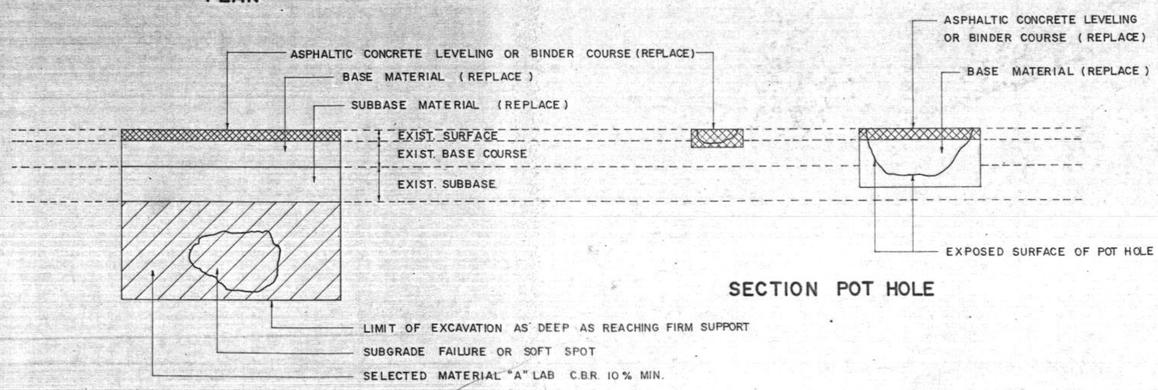
NOT TO SCALE



PLAN



PLAN

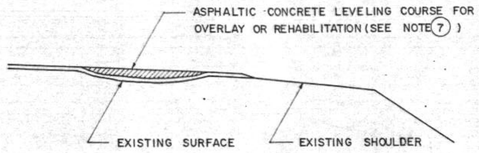


SECTION POT HOLE

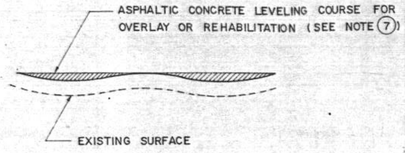
SECTION LOCALIZED FAILURE

PAVEMENT REPAIR FOR LOCALIZED FAILURE AND POT HOLE

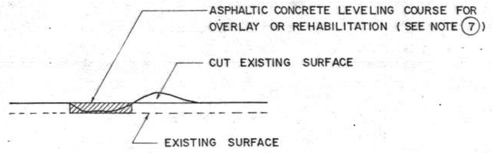
NOT TO SCALE



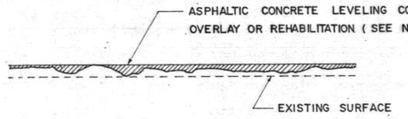
LONGITUDINAL DEPRESSION



CORRUGATION



SHOVING



RAVELING

PAVEMENT PATCHING FOR DEPRESSION CORRUGATION, SHOVING AND RAVELING

NOT TO SCALE

REPAIR OF CRACKS

1. ALLIGATOR CRACKS ARE NORMALLY CAUSED BY EXCESSIVE DEFLECTION OF THE SURFACE OVER UNSTABLE LOWER COURSES OF THE PAVEMENT ALLIGATOR CRACKS SHOULD THEN BE TREATED AND REPAIRED AS LOCALIZED FAILURE
2. REFLECTION CRACKS AND SHRINKAGE CRACKS SHALL SEALED BY EITHER TACK COAT OF A HIGHER APPLICATION RATES OR ASPHALTIC SLURRY SEAL AS DIRECTED BY THE ENGINEER.
3. SLIPPAGE CRACKS ARE CAUSED BY THE LACK OF A GOOD BOND BETWEEN THE SURFACE LAYER AND THE COURSE BENEATH REMOVE THE SLIPPING AREA, CLEAN THE SURFACE OF THE EXPOSED UNDERLYING LAYER AND APPLY A SUITABLE APPLICATION RATE OF TACK COAT AS DIRECTED BY THE ENGINEER.

NOTES :

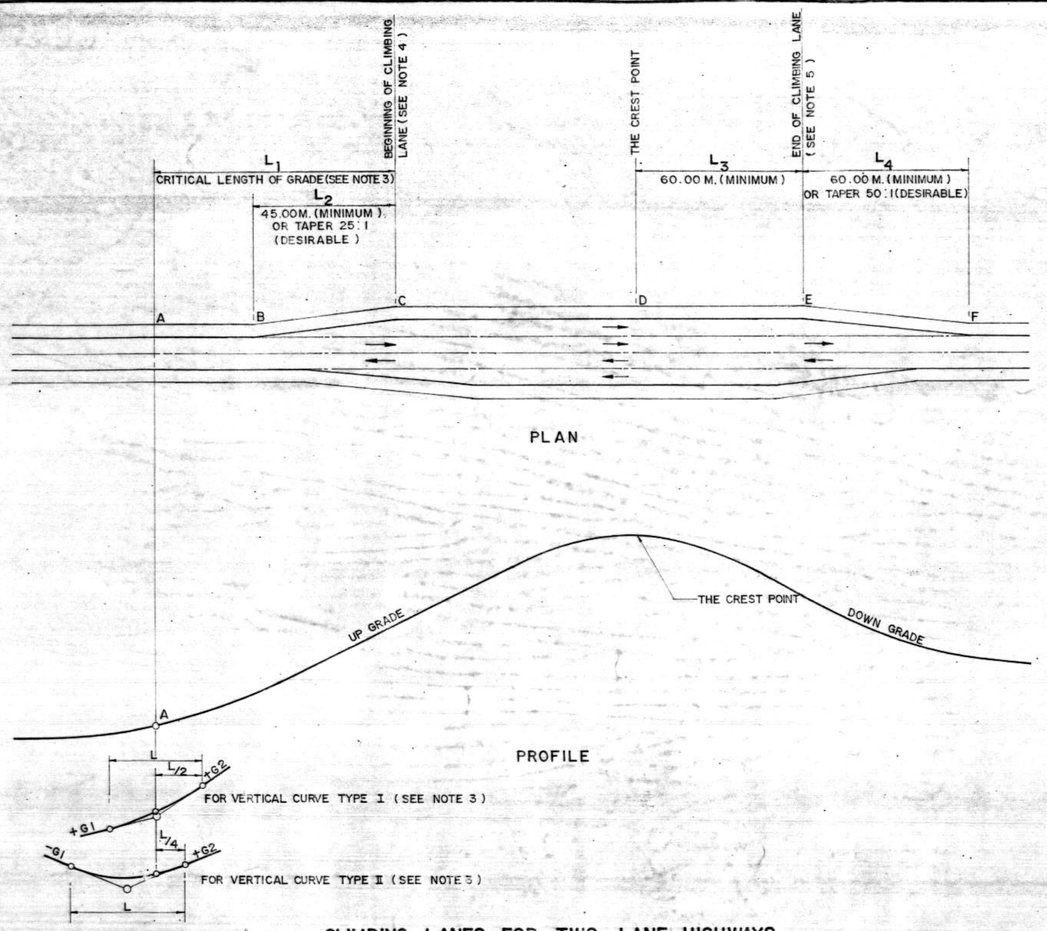
1. FOR CONTINUOUS FAILURE SECTIONS AND LOCALIZED FAILURE, FAILURE ZONES SHALL BE EXCAVATED TO THE UNDETERIORATED LAYER UNSUITABLE MATERIAL OR SOFT SPOT SHALL BE REMOVED TO THE SATISFACTION OF THE ENGINEER.
2. A SOFT SPOT IN AN EXISTING ROAD CAN BE VISUALLY DETERMINED BY THE MOVEMENT OF THE PAVEMENT UNDER PROOF ROLLING.
3. THE RECONSTRUCTION OF PAVEMENT STRUCTURE SHALL BE DONE LAYER BY LAYER TO THE REQUIRED THICKNESS SUITABLE MATERIALS MAY BE REUSED. ALL MATERIALS SHALL BE IN ACCORDANCE WITH THE DRAWING AND THE SPECIFICATION.
4. BENCHING INTO SIDE SLOPES SHALL BE DONE WITH CARE IN ORDER TO PREVENT THE EXISTING PAVEMENT FROM COLLAPSING UNDER TRAFFIC CONDITIONS.
5. THE NEED FOR SIDE DITCHES FOR PAVEMENT SUBSURFACE DRAINAGE SHALL BE VERIFIED BY THE ENGINEER AND EXCAVATION SHALL COMMENCE AS EARLY IN THE CONTRACT AS POSSIBLE TO REDUCE THE EXCESS WATER CONTENT FROM THE ROAD STRUCTURE.
6. FOR POT HOLES, THE HOLE SHALL BE SQUARED, DRESSED AND DATCHED AS SHOWN USING GOOD FIELD PRACTICE AND IN ACCORDANCE WITH THE SPECIFICATIONS.
7. FOR LONGITUDINAL DEPRESSION, CORRUGATION, SHOVING AND PITTING THE EXISTING SURFACE SHALL BE THOROUGHLY, CLEANED AND LOOSE GRAVEL REMOVED HUMPS IN THE EXISTING SURFACE SHALL BE CUT TO THE ADJACENT SURFACE LEVEL PRIOR TO OVERLAY OR REHABILITATION.
8. TACK COAT APPLIED TO PAVEMENT CRACKS OR PITTING AREA SHALL BE ADJUSTED HIGHER APPLICATION RATES IF DIRECTED BY THE ENGINEER.
9. BLEEDING SURFACE SHALL BE REMOVED AS APPLICABLE OR SEALED WITH ASPHALTIC CONCRETE LEVELING OR BINDER COURSE THE ASPHALT CONTENT SHALL BE KEPT AT A SUITABLE RATE AS APPROVED BY PROJECT ENGINEER.
10. TRAFFIC SIGN, BARRICADES, LIGHTS, ETC. SHALL BE PROVIDED AT EACH UNCOMPLETED REPAIR SECTIONS FOR SAFTY MEASURES.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

TYPICAL SURFACE OVERLAY SECTION

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. TS-602
		SHEET NO. 16

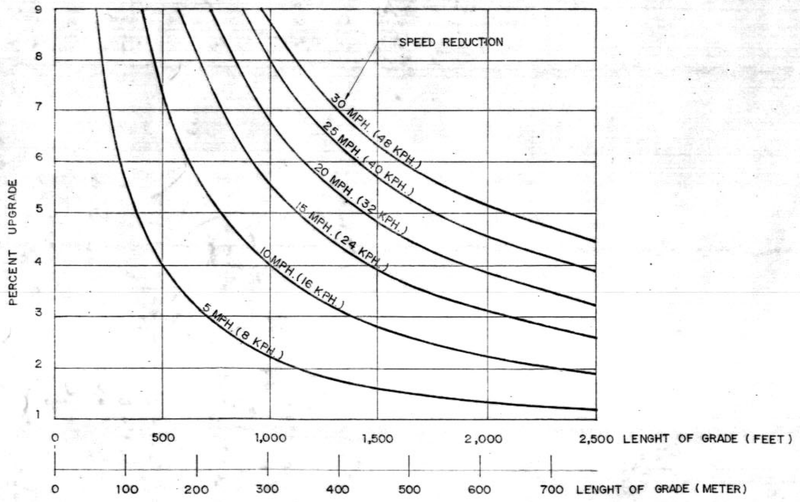


PLAN

PROFILE

CLIMBING LANES FOR TWO-LANE HIGHWAYS

NOT TO SCALE



CRITICAL LENGTHS OF GRADE FOR DESIGN, ASSUMED TYPICAL HEAVY TRUCK OF 300 lb/HP, ENTERING SPEED = 55 MPH.

CLIMBING LANES FOR TWO-LANE HIGHWAYS

1. CONDITION AND CRITERIA

   THE FOLLOWING THREE CONDITIONS AND CRITERIA, REFLECTING ECONOMIC CONSIDERATION, SHOULD BE SATISFIED TO JUSTIFY A CLIMBING LANE :

   1.1 UPGRADE TRAFFIC FLOW RATE IN EXCESS OF 200 VEHICLES PER HOUR.

   1.2 UPGRADE TRUCK FLOW RATE IN EXCESS OF 20 VEHICLES PER HOUR.

   1.3 ONE OF THE FOLLOWING CONDITIONS EXISTS :

   - A 10 MPH. (16 KPH.) OR GREATER SPEED REDUCTION IS EXPECTED FOR A TYPICAL HEAVY TRUCK.
   - LEVEL-OF-SERVICE E OR F EXISTS ON THE GRADE.
   - A REDUCTION OF TWO OR MORE LEVELS-OF-SERVICE IS EXPERIENCED WHEN MOVING FROM THE APPROACH SEGMENT TO THE GRADE.

2. THESE GENERAL GUIDES FOR THE CONSIDERATION OF CLIMBING LANES ON GRADES WOULD APPLY ONLY TO CLIMBING LANES ON TWO-LANE HIGHWAYS AND SHOULD NOT BE USED IN CONJUNCTION WITH CONSIDERATION OF CLIMBING LANES ON MULTILANE HIGHWAYS.

3. THE CRITICAL LENGTH OF GRADE IN FIGURE IS DERIVED AS THE LENGTH OF TANGENT GRADE. WHERE A VERTICAL IS PART OF A CRITICAL LENGTH OF GRADE, AN APPROXIMATE EQUIVALENT TANGENT GRADE LENGTH MUST BE USED. WHERE THE CONDITION INVOLVES VERTICAL CURVE TYPE I AND THE ALGEBRAIC DIFFERENCE IN GRADES IS NOT TOO GREAT, THE MEASUREMENT OF CRITICAL LENGTH OF GRADE MAY BE MADE BETWEEN THE POINT OF VERTICAL INTERSECTION (PVI.). WHERE VERTICAL CURVE OF TYPE II IS INVOLVED, PARTICULARLY WHERE THE ALGEBRAIC DIFFERENCE IN GRADE IS APPRECIABLE, ABOUT ONE-QUARTER OF THE VERTICAL CURVE LENGTH MAY BE CONSIDERED AS PART OF THE GRADE UNDER CONSIDERATION.

4. THE BEGINNING POINT OF CLIMBING LANE IS THE POINT WHERE A 10 MPH. (16 KPH.) DECREASE IN TRUCK SPEED BELOW THE OPERATING SPEED, AS "CRITICAL LENGTHS OF GRADE".

5. THE END POINT OF CLIMBING LANE IS THE POINT WHERE THE TRUCK CAN RETURN TO THE NORMAL LANE WITHOUT UNDUE HAZARD IN PARTICULAR, WHERE THE SIGHT DISTANCE BECOMES SUFFICIENT TO PERMIT PASSING WITH SAFETY WHEN THERE IS NO ONCOMING TRAFFIC OR, PREFERABLY, AT LEAST 60.00 M. BEYOND THE CREST POINT.

CLIMBING LANES ON MULTILANE HIGHWAYS

1. CONDITION AND CRITERIA

   1.1 IF THE CRITICAL LENGTH OF GRADE, THE LENGTH OF A PARTICULAR UPGRADE WHICH REDUCES THE OPERATING SPEED OF TRUCKS 10 MPH. (16 KPH.) BELOW THE OPERATING SPEED OF THE REMAINING TRAFFIC, IS LESS THAN THE LENGTH OF GRADE BEING STUDIED A CLIMBING LANE IS WARRANTED.

   1.2 IF THE FLOW RATE ON THE GRADE DETERMINED BY DIVIDING THE UPGRADE DDHV (THE DIRECTIONAL DISTRIBUTION OF TRAFFIC ON MULTILANE FACILITIES DURING THE DESIGN HOUR) BY THE PEAK HOUR FACTOR (PHF) EXCEEDS THAT OF THE NEXT POORER LEVEL-OF-SERVICE, A CLIMBING LANE IS WARRANTED.

   GENERALLY, CLIMBING LANES SHOULD NOT BE CONSIDERED UNLESS THE UPGRADE DIRECTIONAL TRAFFIC VOLUME IS EQUAL TO OR GREATER THAN THE LEVEL-OF-SERVICE D SERVICE VOLUME FOR TWO OF THE LANES OF A FOUR-LANE HIGHWAY WITH THE NORMAL PERCENTAGE OF TRUCKS.

2. IN MOST CASES WHEN THE SERVICE VOLUME, INCLUDING TRUCKS, IS GREATER THAN 1,700 VPH. AND THE LENGTH OF THE GRADE AND THE PERCENTAGE OF TRUCKS ARE SUFFICIENT TO CONSIDER CLIMBING LANES, THE VOLUME IN TERMS OF EQUIVALENT PASSENGER CARS IS LIKELY TO APPROACH OR EVEN EXCEED THE CAPACITY. AN INCREASE IN THE NUMBER OF LANES THROUGHOUT THE HIGHWAY SECTION WOULD REPRESENT A BETTER INVESTMENT THAN THE PROVISION OF CLIMBING LANES.

3. A CLIMBING LANE IS ALSO GENERALLY NOT WARRANTED ON FOUR-LANE HIGHWAYS FOR A DIRECTIONAL SERVICE VOLUME BELOW 1,000 VPH. REGARDLESS OF THE PERCENTAGE OF TRUCKS.

4. WHEN THE ANALYSIS INDICATES THAT A CLIMBING LANE MAY IMPROVE OPERATIONS OR MAINTAIN THE LEVEL-OF-SERVICE ON THE SECTION WITH A GRADE AN ADDITIONAL CHECK MUST BE MADE TO DETERMINE IF THE NUMBER OF LANES REQUIRED ON THE GRADE ARE SUFFICIENT EVEN WITH A CLIMBING LANE.

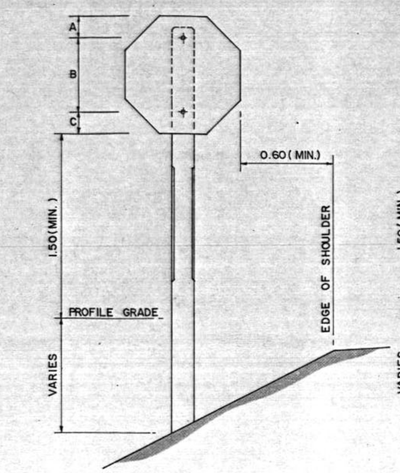
5. THE PRINCIPLES FOR CROSS SLOPES, FOR LOCATING TERMINAL POINTS, AND FOR DESIGNING TERMINAL AREAS OR TAPERS FOR CLIMBING LANES ON TWO-LANE HIGHWAYS ARE EQUALLY APPLICABLE TO CLIMBING LANES ON MULTILANE FACILITIES. THE PRIME FACTOR BEING THAT OF DETERMINING THE LOCATION OF THE UPHILL TERMINUS OF THE CLIMBING LANE AT THE POINT WHERE A SATISFACTORY SPEED IS ATTAINED BY TRUCKS, PREFERABLY ABOUT 10 MPH. (16 KPH.) BELOW THE OPERATING SPEED OF THE HIGHWAY. PASSING SIGHT DISTANCE NEED NOT BE CONSIDERED.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

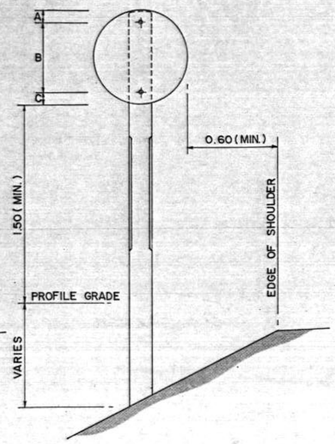
STANDARD DRAWING

TYPICAL CLIMBING LANE SECTION

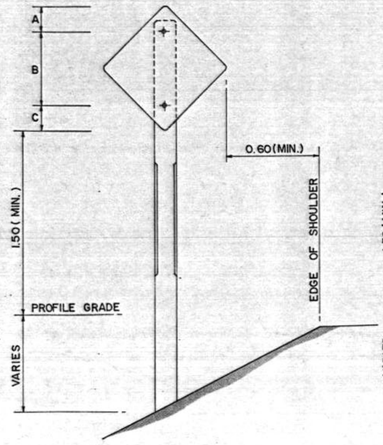
DESIGNED: D.O.H. & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED: for (DIRECTOR GENERAL)		DWG. NO. TS-701
		SHEET NO. 17



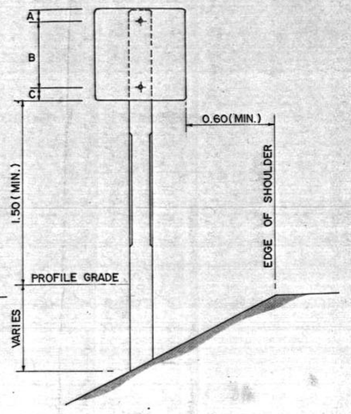
REGULATORY SIGN



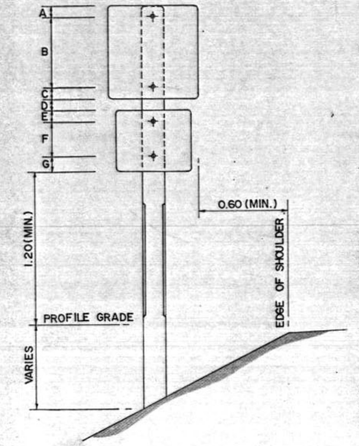
REGULATORY SIGN



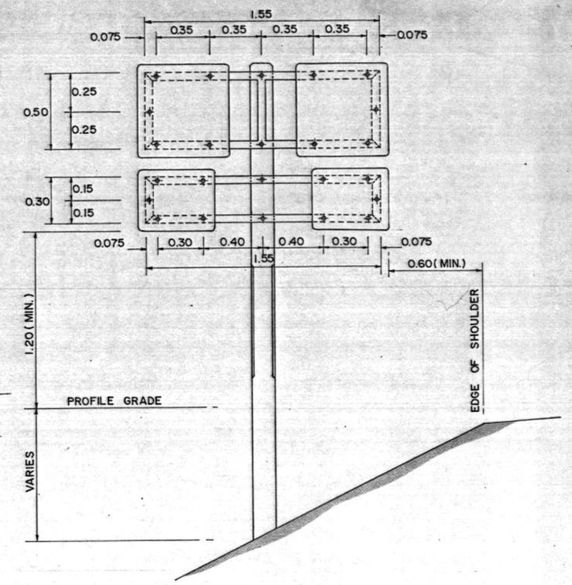
WARNING SIGN



ROUTE MARKER

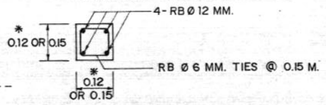


ROUTE TURN ASSEMBLIES TYPE I
OR DIRECTIONAL ASSEMBLIES

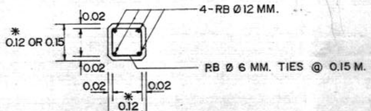


ROUTE TURN ASSEMBLIES TYPE II

* SIZE OF POST SHALL BE 0.12×0.12 M. FOR SINGLE POST AND TWIN POSTS WITH TOTAL AREA OF THE SIGN PLATES IS NOT MORE THAN 2 SQ.M. AND 4 SQ.M. RESPECTIVELY OR OTHERWISE THE SIZE SHALL BE 0.15×0.15 M.



SECTION (A)-(A)
NOT TO SCALE



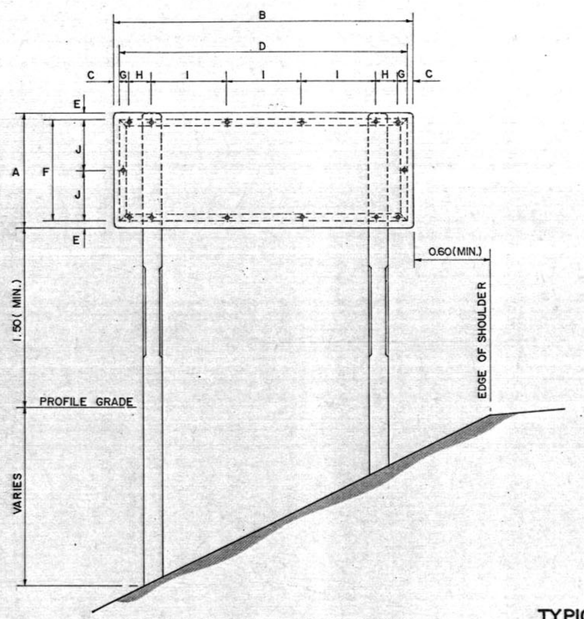
SECTION (B)-(B)
NOT TO SCALE

NOTES :

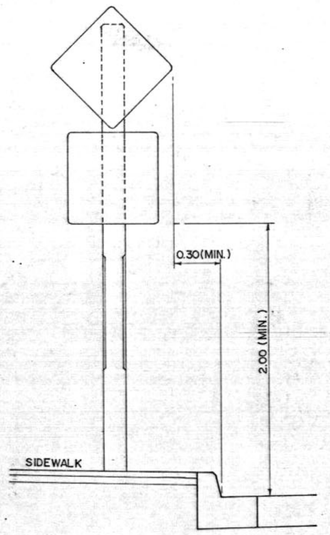
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. SIGN PLATE SHALL BE MADE OF 2 MM. THICK ALLUMINIUM ALLOY.
3. ALLUMINIUM ALLOY SIGN PLATE SHALL CONFORM TO TIS. 331
4. UNLESS OTHERWISE INDICATED, SIGN AND THEIR SUPPORTS SHALL BE OF THE SIZES, COLORS AND TYPES PRESCRIBED BY, AND SITE IN ACCORDANCE WITH THE RECOMMENDATIONS OF, THE DEPARTMENT'S TRAFFIC CONTROL DEVICE MANUAL, PAST I ISSUED B.E. 2531
5. REFLECTIVE SHEETING SHALL CONFORM TO TIS.606 TYPE 1 (ESEFFICIENT OF RETRO-REFLECTION LEVEL 1)
6. SIGN FRAME SHALL BE MADE OF 50x25x1.6 MM. STEEL RECTANGULAR TUBING FRAME WELDED AND SMOOTHED IN PRIMING PAINT FOR FRAME SHALL BE RUST PREVENTIVE PAINT (RED LEAD BASED PRIMERD FOR IRON AND STEEL SURFACED, TYPE 3) WHICH CONFORMS TO TIS. 389; THE SUCCEEDING COATING SHALL BE PAINTED WITH BLACK METAL PAINT.
7. LENGTH OF SIGN POSTS AND POSITIONS OF HOLES STATED IN THE DRAWING ARE FOR THE MIN. SIZE ONLY THESE LENGTHS AND POSITION OF HOLES SHALL BE ADJUSTED DEPENDING ON SITE CONDITIONS.
8. PORTION OF CONCRETE POST FROM GROUND LINE TO THE ELEVATION OF 20 CM. ABOVE FINISHED ROADWAY PROFILE SHALL BE PAINTED IN BLACK AND ALL OTHER PART SHALL BE PAINTED IN WHITE.
9. BACK OF SIGN, CLOSE TO EDGE OF PAVEMENT SIDE, SHALL BE STAMPED WITH DEPTH NOT LESS THAN 0.5 MM.
10. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	350	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

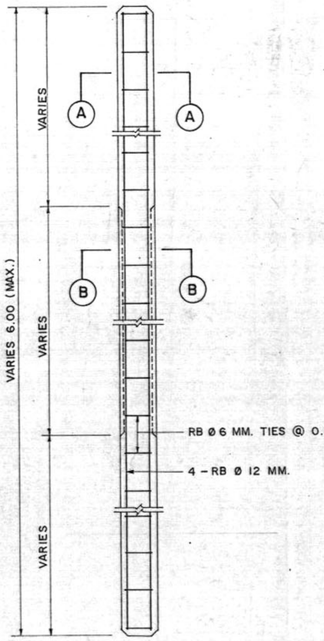
11. LEAN CONCRETE FOR SIGN POST BASE SHALL HAVE A PROPORTION OF CEMENT : SAND : AGGREGATE 1 : 3 : 6 BY VOLUME AND A CONCRETE SLUMP OF 10 CM. (MAX.).
12. CLEAR CONCRETE COVER SHALL BE 2.5 CM.
13. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24.



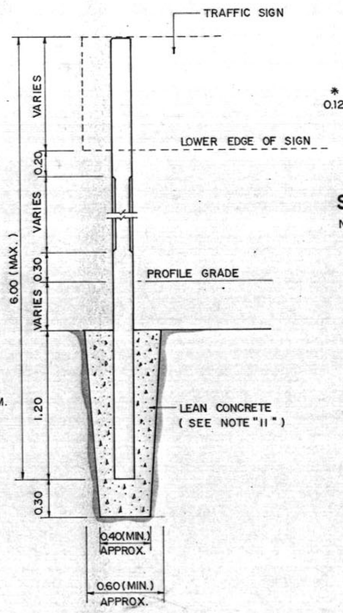
DESTINATION WITH ARROW SIGN
DESTINATION AND DISTANCE SIGN
TOWN AND DISTRICT BOUNDARY SIGN
WITH THAI AND ENGLISH WORDS
OR THAI WORDS ONLY



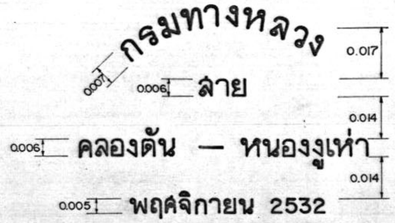
TYPICAL SIGN INSTALLATION AT SIDEWALK



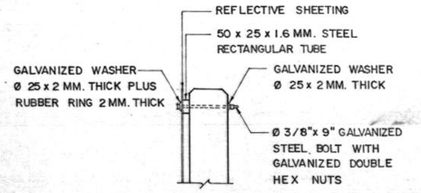
REINFORCED CONCRETE POST DETAIL
NOT TO SCALE



SIGN POST INSTALLATION DETAIL
NOT TO SCALE



TYPICAL BACK-SIGN STAMP
SCALE 1 : 1



TYPICAL FIXING OF SIGN PLATE

TABLE I POSITION OF HOLES FOR FIXING SIGN PLATES TO SIGN POST

DIMENSION	REGULATORY SIGN SIZE (CM.)			WARNING SIGN SIZE (CM.)			ROUTE MARKER (CM.)			ROUTE TURN ASSEMBLIES TYPE I & TYPE II (CM.)		
	60	75	90	60	75	90	60	75	90	60	75	90
A	7.5	15	15	20	20	20	7.5	7.5	7.5	7.5	7.5	7.5
B	45	45	60	45	60	90	45	60	75	45	60	75
C	7.5	15	15	20	17.5	17.5	7.5	7.5	7.5	7.5	7.5	7.5
D							7.5	7.5	7.5	7.5	7.5	7.5
E							7.5	7.5	7.5	7.5	7.5	7.5
F							22.5	35	45	22.5	35	45
G							10	7.5	7.5	10	7.5	7.5

TABLE II POSITION OF HOLES FOR FIXING SIGN PLATES TO SIGN POST

SIGN SIZE (CM.)		DIMENSIONS (CM.)								REMARK
WIDTH A	LENGTH B	C	D	E	F	G	H	I	J	
75	210	5	200	5	65	7.5	17.5	50	32.5	DESTINATION WITH ARROW SIGN, THAI & ENGLISH WORDS
90	240	20	200	12.5	65	7.5	17.5	50	32.5	
60	210	5	200	5	50	7.5	17.5	50	25	DESTINATION WITH ARROW SIGN, THAI WORDS ONLY
75	240	20	200	12.5	50	7.5	17.5	50	25	
75	180	5	170	5	65	7.5	17.5	40	32.5	DESTINATION AND DISTANCE SIGN, THAI & ENGLISH WORDS
90	180	5	170	12.5	65	7.5	17.5	40	32.5	
60	180	5	170	5	50	7.5	17.5	40	25	DESTINATION AND DISTANCE SIGN, THAI ONLY
75	180	5	170	12.5	50	7.5	17.5	40	25	
65	180	5	170	5	55	7.5	17.5	40	27.5	TOWN & DISTRICT BOUNDARY SIGN, THAI & ENGLISH WORDS
80	180	5	170	12.5	55	7.5	17.5	40	27.5	

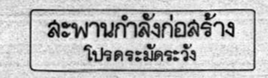
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

MINOR SIGN & SIGN POST DETAILS

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-101
		SHEET NO. 18

(2 - 90ก - 90)



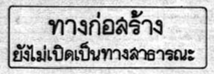
(2 - 90ข - 90)

(2 - 7 - 90)

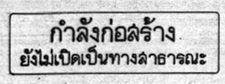
(2 - 8 - 90)

(2 - 27 - 90)

(2 - 29 - 90)



(2 - 91ก - 90)

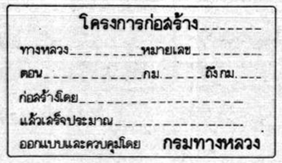


(2 - 91ข - 90)

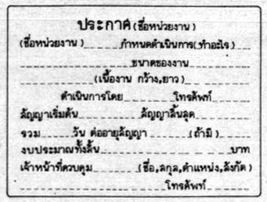
(2 - 34 - 90)

(2 - 36 - 90)

(2 - 106 - 90)



(3 - 100ก - 240)

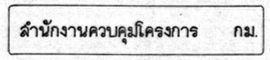


(3 - 100ข - 240)
(FOR BANGKOK AREA ONLY)

(2 - 95 - 90)

(2 - 96 - 90)

(2 - 97 - 90)



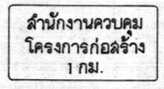
(3 - 101 - 75)

(2 - 100 - 90)

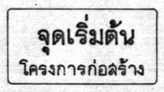
(2 - 101 - 90)

(2 - 102 - 90)

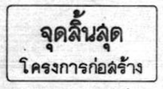
(2 - 103 - 90)



(3 - 102 - 120)



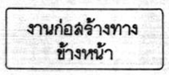
(3 - 102ก - 120)



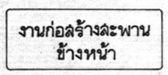
(3 - 103 - 120)

ROAD SIGNS MOUNTING AT BEGINNING AND END OF PROJECT

NOT TO SCALE

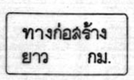


(2 - 93ก - 90)



(2 - 93ข - 90)

FOR MOUNTING DISTANCE OVER 300 M.
CHANGE WORDING " ข้างหน้า " TO " 1 กม."
OR "500 ม." OR AS MOUNTING DISTANCE



(3 - 94 - 90)

(3 - 95 - 90)

ROAD SIGNS MOUNTING AT OPENING AND END OF WORK SITE

NOT TO SCALE

(3 - 92 - 90)

TEMPORARY ROAD GUIDE SIGN

NOT TO SCALE

(2 - 26 - 90)

(2 - 105 - 90)

WARNING SIGNS MOUNTING AT APPROACHING WORKING SITE

NOT TO SCALE

(1 - 3 - 90)

(1 - 5 - 90)

(1 - 6 - 90)

(1 - 21 - 90)

(1 - 32 - 90)

(1 - 33 - 90)

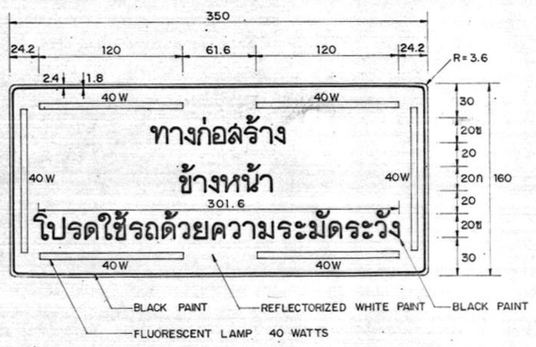
(1 - 25 - 90)

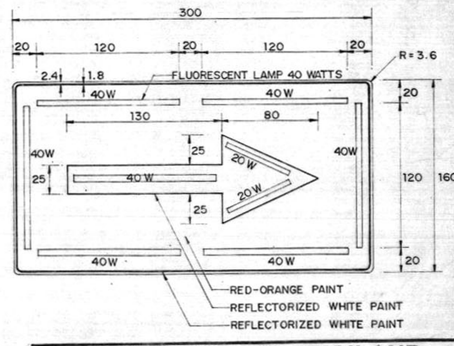
(2 - 80 - 60)

SIGNS TO CONTROL SPEED

NOT TO SCALE

TRAFFIC SIGN CONTROLLED PATTERN		SIZE (CM.)	LETTER SIZE 1 ST ROW	LETTER SIZE 2ND ROW	RECOMMENDED LOCATION	REFLETO-RIZED PROPERTIES	COLOUR ON BOARD
ROAD SIGNS MOUNTING AT BEGINNING AND END OF PROJECT	2 - 90ก - 90	90 x 240	20	15	FOR EXISTING ROAD CONSTRUCTION	REFLECT	RED - ORANGE
	2 - 90ข - 90	90 x 240	20	15	FOR EXISTING ROAD CONSTRUCTION	REFLECT	RED - ORANGE
	2 - 91ก - 90	90 x 240	20	15	FOR NEW ROAD CONSTRUCTION THAT ALLOWS SOME TRAFFIC		RED - ORANGE
	2 - 91ข - 90	90 x 240	20	15	FOR NEW ROAD CONSTRUCTION THAT ALLOWS SOME TRAFFIC		RED - ORANGE
	3 - 100ก - 240	240 x 360	FOR 1ST-2ND ROW AND กรมทางหลวง 15 OTHER 20		MOUNTING AT BEGINNING OF PROJECT		WHITE
	3 - 100ข - 240	240 x 360			MOUNTING AT BEGINNING OF PROJECT		WHITE
	3 - 101 - 75	75 x 360	20	-	MOUNTING WITH 3 - 100ก - 240 SIGN BOARD		WHITE
			1ST-2ND ROW 15 3RD ROW 20		MOUNTING ALONE		WHITE
	3 - 102ก - 120	120 x 240	25	15	MOUNTING AT BEGINNING OF PROJECT	REFLECT	RED - ORANGE
	3 - 103 - 120	120 x 240	25	15	MOUNTING AT END OF PROJECT	REFLECT	RED - ORANGE
ROAD SIGNS MOUNTING AT OPENING WORK SITE	2 - 93ก - 90	90 x 240	20	20	MOUNTING AT 200 M. BEFORE APPROACHING	REFLECT	RED - ORANGE
	2 - 93ข - 90	90 x 240	20	20	MOUNTING AT 200 M. BEFORE APPROACHING	REFLECT	RED - ORANGE
	3 - 94 - 90	90 x 180	20	20	MOUNTING AT 200 M. BEFORE APPROACHING	REFLECT	RED - ORANGE
	3 - 95 - 90	75 x 120	15	15	MOUNTING AT END OF WORK SITE	REFLECT	RED - ORANGE
TEMPORARY ROAD GUIDE SIGNS	3 - 92 - 90	90 x 135	10	10	MOUNTING WITH 3 - 90 OR 3 - 91 SIGN BOARD		WHITE
WARNING SIGNS MOUNTING AT APPROACHING WORK SITE	2 - 7 - 90	90 x 90	-	-	MOUNTING AT 100 - 200 M. BEFORE APPROACHING	REFLECT	RED - ORANGE
	2 - 8 - 90	90 x 90	-	-	MOUNTING AT 100 - 200 M. BEFORE APPROACHING	REFLECT	RED - ORANGE
	2 - 27 - 90	90 x 90	-	-	MOUNTING AT 100 - 200 M. BEFORE APPROACHING	REFLECT	RED - ORANGE
	2 - 29 - 90	90 x 90	-	-	MOUNTING AT 100 - 200 M. BEFORE APPROACHING	REFLECT	RED - ORANGE
	2 - 34 - 90	90 x 90	-	-	MOUNTING AT 100 - 200 M. BEFORE APPROACHING	REFLECT	RED - ORANGE
	2 - 36 - 90	90 x 90	-	-	MOUNTING AT 100 - 200 M. BEFORE APPROACHING	REFLECT	RED - ORANGE
	2 - 106 - 90	90 x 150	20	15	MOUNTING AT 100 - 200 M. BEFORE APPROACHING		WHITE
	2 - 95 - 90	UPPER SIGN BOARD 90x90			MOUNTING AT 150 M. BEFORE APPROACHING	REFLECT	RED - ORANGE
	2 - 96 - 90	LOWER SIGN BOARD	10 - -	10	MOUNTING AT 150 M. BEFORE APPROACHING	REFLECT	RED - ORANGE
	2 - 97 - 90	60 x 80			MOUNTING AT 150 M. BEFORE APPROACHING	-	RED - ORANGE
	2 - 102 - 90	90 x 150	20	15	MOUNTING NEAR AND SAME SIDE OF STOCKPILE MATERIAL		WHITE
	2 - 100 - 90	90 x 90	-	-	MOUNTING AT 150 M. BEFORE APPROACHING	REFLECT	RED - ORANGE
	2 - 101 - 90	90 x 90	-	-	MOUNTING AT 150 M. BEFORE APPROACHING	-	RED - ORANGE
	2 - 26 - 90	90 x 90	-	-	MOUNTING AT 100 - 200 M. BEFORE APPROACHING	REFLECT	YELLOW
	2 - 103 - 90	90 x 150	20	15	FOR EMERGENCY CASE MOUNTING ON BARRICADE	REFLECT	WHITE
	2 - 105 - 90	90 x 90	-	-	FOR EMERGENCY CASE WHERE SUITABLE ROAD SIGNS ARE NOT AVAILABLE	REFLECT	RED - ORANGE
SIGNS TO CONTROL SPEED	1 - 3 - 90	90	-	-	MOUNTING ON CONTROLLED POINT OR NEARER IN DISTANCE 3 - 5 M.	REFLECT	WHITE
	1 - 5 - 90	90	-	-	MOUNTING ON CONTROLLED POINT OR NEARER IN DISTANCE 3 - 5 M.	REFLECT	WHITE
	1 - 6 - 90	90	-	-	MOUNTING ON CONTROLLED POINT OR NEARER IN DISTANCE 3 - 5 M.	REFLECT	WHITE
	1 - 21 - 90	90	-	-	MOUNTING ON CONTROLLED POINT OR NEARER IN DISTANCE 3 - 5 M.	REFLECT	BLUE
	1 - 32 - 90	90	-	-	MOUNTING ON CONTROLLED POINT OR NEARER IN DISTANCE 3 - 5 M.	REFLECT	WHITE
	1 - 33 - 90	90	-	-	MOUNTING ON CONTROLLED POINT OR NEARER IN DISTANCE 3 - 5 M.	REFLECT	WHITE
	1 - 25 - 90	90	25	-	MOUNTING BEFORE APPROACHING CONTROLLED SPEED ZONE	REFLECT	WHITE
	2 - 80 - 60	60 x 60	20	15	MOUNTING WHERE ROAD CONDITION ALLOWS TO THE INDICATED SPEED	REFLECT	RED - ORANGE



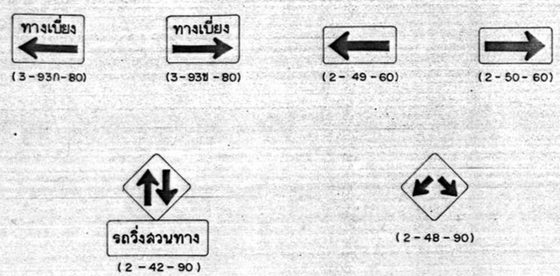


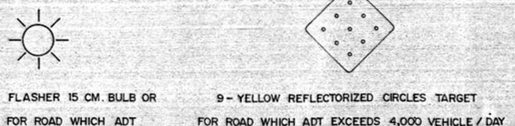
REMARKS : 1. THE SIGNS WITH FLUORESCENT LAMP SHALL BE MOUNTED FOR ROAD WHICH ADT EXCEEDS 4,000 VEHICLE/DAY.
2. ALL DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING
TRAFFIC CONTROL DEVICES
FOR HIGHWAYS UNDER CONSTRUCTION-I

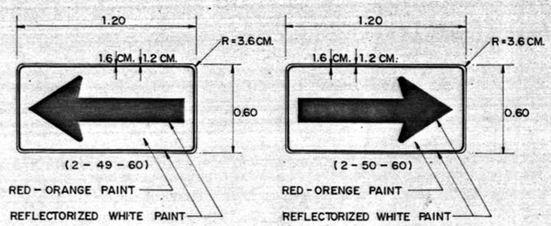
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Bunyaj. (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-102
		SHEET NO. 19





SIGNS TO INDICATE ROAD OBSTRUCTION

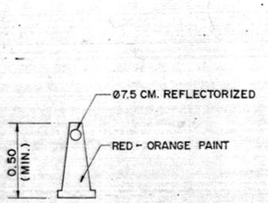
NOT TO SCALE



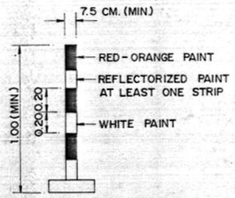
TRAFFIC SIGN CONTROLLED PATTERN		SIZE (CM.)	LETTER SIZE 1ST ROW	LETTER SIZE 2ND ROW	RECOMMENDED LOCATION	REFLECTORIZED PROPERTIES	COLOUR ON BOARD
ROAD SIGNS MOUNTING AT TRAFFIC LINE CHANGE OR TRAFFIC CONTROL ARE REQUIRED	3-93ก-80	80 x 120	15ซ		WHERE SIGN BOARD IS VISIBLE WITH NOT LESS THAN 200 M.	REFLECT	RED - ORANGE
	3-93ข-80	80 x 120	15ซ		WHERE SIGN BOARD IS VISIBLE WITH NOT LESS THAN 200 M.	REFLECT	RED - ORANGE
	2-49-60	60 x 120	-	-	MOUNTING WHERE TRAFFIC LINE CHANGE	REFLECT	RED - ORANGE
	2-50-60	60 x 120	-	-	MOUNTING WHERE TRAFFIC LINE CHANGE	REFLECT	RED - ORANGE
	2-42-90	UPPER SIGN BOARD 90 x 90	-	-	MOUNTING AT BEGINNING OF TWO - WAY TRAFFIC	REFLECT	RED - ORANGE
	2-42-90	LOWER SIGN BOARD 60 x 180	20ก	-	MOUNTING AT BEGINNING OF TWO - WAY TRAFFIC		WHITE
	2-48-90	90 x 90	-	-	MOUNTING WHERE BOTH LEFT AND RIGHT TRAFFICS ARE PERMITTED	REFLECT	RED - ORANGE
	2-62-60	60 x 75	-	-	MOUNTING AT HORIZONTAL CURVE	REFLECT	RED - ORANGE
	2-63-60	60 x 75	-	-	MOUNTING AT HORIZONTAL CURVE	REFLECT	RED - ORANGE
TRAFFIC CHANNELIZATION INSTRUMENTS	CONE OR POST	-	-	-	TO INDICATE TRAFFIC LINE OR SIDE ROAD OBSTRUCTION LINE, MOUNTING @ 30 M. (MAX.) INTERVAL		
	VERTICAL PANEL	-	-	-	TO INDICATE TRAFFIC LINE OR SIDE ROAD OBSTRUCTION LINE		
	BARREL RAIL LIGHTING	-	-	-	FOR ROAD WHICH ADT EXCEEDS 8,000 VEHICLE / DAY		
SIGNS TO INDICATE ROAD OBSTRUCTION	FLASHER	-	-	-	FOR ROAD WHICH ADT EXCEEDS 8,000 VEHICLE / DAY		
	9 YELLOW REFLECTORIZED CIRCLES TARGET	7.5 x 7.5	-	-	FOR ROAD WHICH ADT EXCEEDS 4,000 VEHICLE / DAY		
BARRICADE	SIDE ROAD BARRICADE TO REDUCE SPEED	-	-	-	MOUNTING WITH SPACING 50-100 M. APPROXIMATE, TAPERING TO PAVEMENT EDGE		

ROAD SIGN MOUNTING AT TRAFFIC LINE CHANGE OR TRAFFIC CONTROL

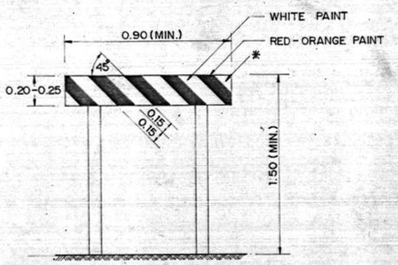
NOT TO SCALE

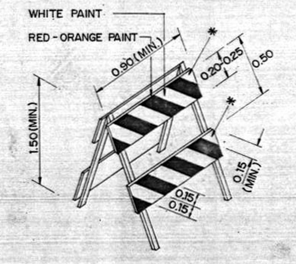


CONE



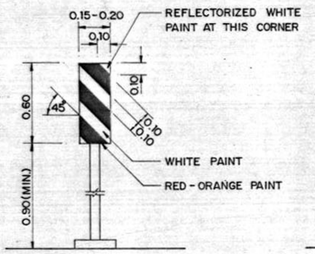
POST



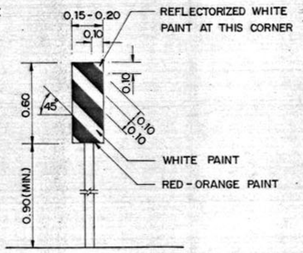


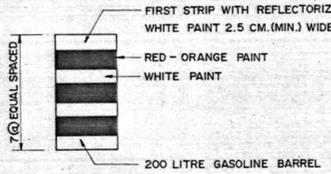
BARRICADE TYPE I

NOT TO SCALE



VERTICAL PANEL





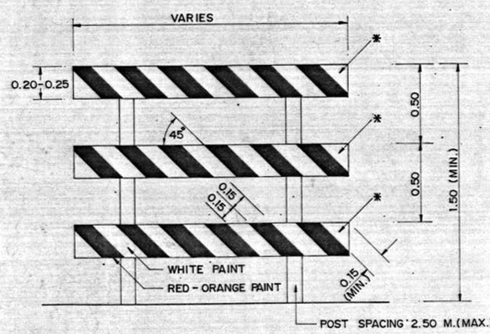
BARREL

TRAFFIC CHANNELIZATION INSTRUMENT TO BE USED

1. TO INDICATE SIDE ROAD HAZARD, VERTICAL PANEL OR BARREL SHALL BE INSTALLED BEFORE CONES, POSTS, VERTICAL PANELS, OR BARRELS FOLLOW ON THE LINE.
2. FOR ROAD WHICH ADT EXCEEDS 8,000 VEHICLE/DAY, RAIL LIGHTING SHALL BE REQUIRED ON TRAFFIC CHANNELIZATION INSTRUMENT POSITIONS.

TRAFFIC CHANNELIZATION INSTRUMENTS

(RED - ORANGE PAINT OR RED - ORANGE PAINT ALTERNATE WITH WHITE PAINT)



BARRICADE TYPE II

NOT TO SCALE

FOR BARRICADE TYPE I, II

* REFLECTIVE SHEETING OR REFLECTORIZED WHITE PAINT OR REFLECTORIZED CIRCLES TARGET OR FLASHER DEPENDED ON TRAFFIC VOLUME, MOUNTING AT THE LAST CORNER.
- FOR MOUNTING, THE PAINTED STRIPE SHALL BE INCLINED TO APPROACH TRAFFIC SIDE.

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. REFLECTORIZED PROPERTIES MEANS : SIGN BOARD WHICH REFLECTING BY REFLECTIVE SHEETING OR REFLECTIVE BEADS OR OTHERS UNDER THE APPROVAL OF THE ENGINEER.
3. SIZE OF WARNING SIGN CODE 2-49-60 AND 2-50-60 MAY BE INCREMENTED AT SUITABLE SIZE ON HIGH SPEED AND HEAVY TRAFFIC ROAD UNDER THE APPROVAL OF THE ENGINEER.

PROVISION :

1. TRAFFIC CONTROL DEVICES FOR HIGHWAYS UNDER CONSTRUCTION SHALL BE IN ACCORDANCE WITH THIS DRAWING AND THE MANUAL OF TRAFFIC CONTROL DEVICES PART 3 AS PUBLISHED BY THE DOH.
2. SIGN BOARD FOR REFLECTORIZED SHALL BE METAL OR NON - METAL WHICH TOLERANCE TO ALL CLIMATES ALONG TERM OF CONTRACT UNDER THE APPROVAL OF THE ENGINEER.
3. THE AMOUNTS (IN TWO DIRECTIONS) AND SPACING OF WARNING SIGN BEFORE CONSTRUCTION AREA BESIDES OF THE NORMAL SIGNS ARE SHOWN IN THE TABLE BELOW

CLASSIFICATION OF HIGHWAYS	WARNING SIGN SPACING BEFORE APPROACHING DIVERTED POINT(M.)	
	REDUCED TRAFFIC LANE OR DIVERTED TRAFFIC LANE	SIDE ROAD OBSTRUCTION
EXPRESSWAY AND MAJOR RURAL HIGHWAY	500 - 1,000 (2-3)	300 - 500 (2)
RURAL HIGHWAY	200 - 300 (2)	150 - 200 (1)
URBAN HIGHWAY	70 - 100 (1)	-

4. FOR URBAN HIGHWAY WITH AMOUNT OF PEDESTRIANS, WALKWAY WHICH SAFETY SHALL BE PROVIDED FOR PEDESTRIANS.
5. THE CONTRATOR SHALL BE PROVIDED THE TRAFFIC CONTROL DEVICES FOR HIGHWAYS UNDER CONSTRUCTION ALL ITEMS.
6. IN CASE OF THE FORMAT IS NOT THE SAME AS THE DRAWINGS, THE MOUNTING OF TRAFFIC CONTROL DEVICES SHALL BE DIRECTED BY THE ENGINEER.

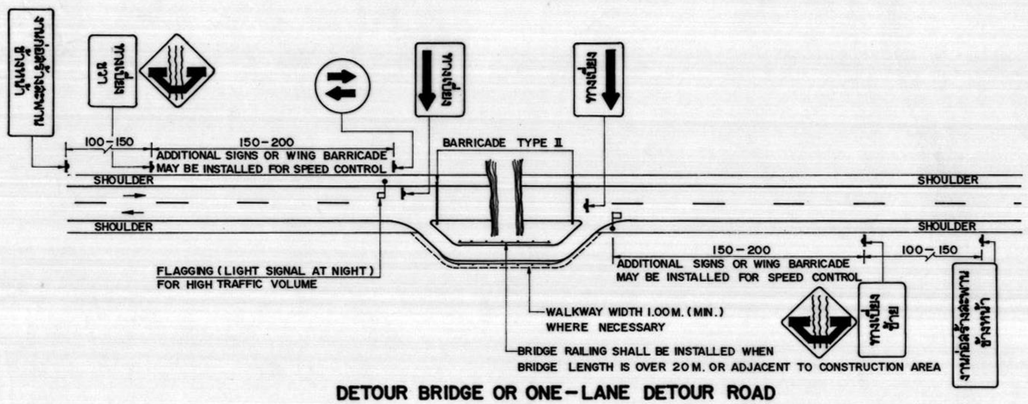
KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

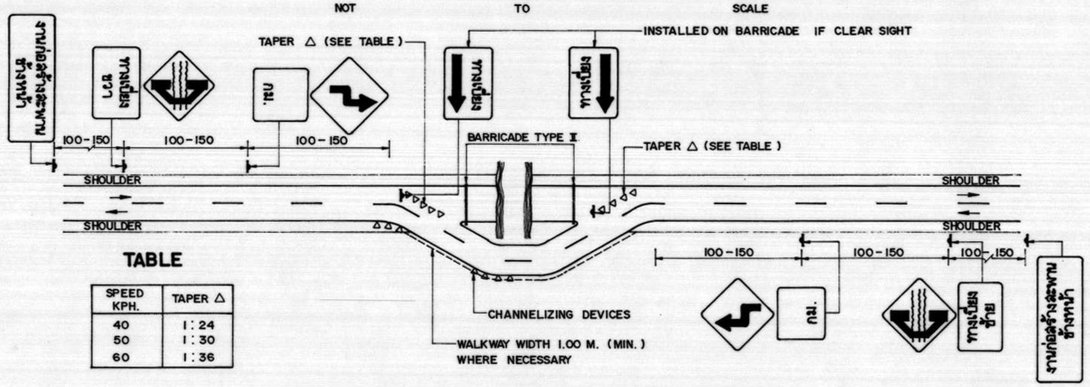
STANDARD DRAWING

TRAFFIC CONTROL DEVICES
FOR HIGHWAYS UNDER CONSTRUCTION - II

DESIGNED : D.O.H.	CHECKED :	DATE JULY 1994
SUBMITTED : P. Buatti (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : For (DIRECTOR GENERAL)		DWG. NO. RS-103
		SHEET NO. 20



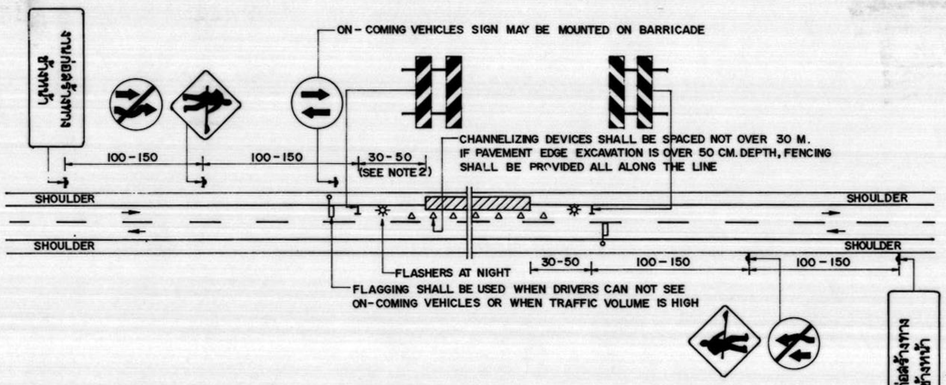
DETOUR BRIDGE OR ONE-LANE DETOUR ROAD
NOT TO SCALE



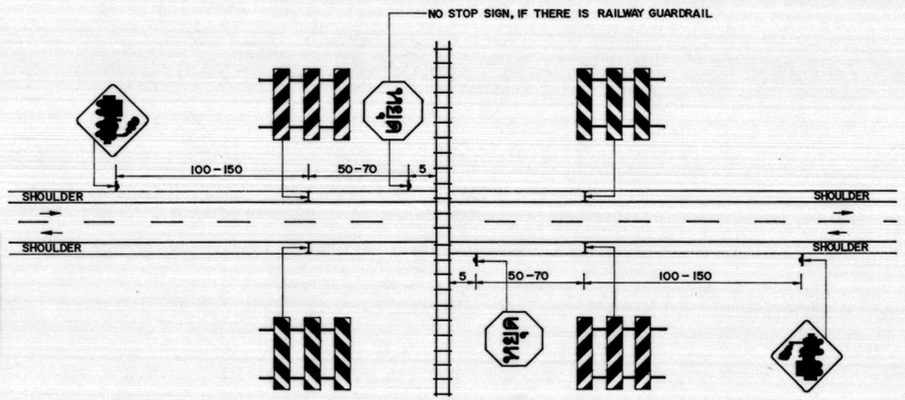
TABLE

SPEED KPH.	TAPER Δ
40	1:24
50	1:30
60	1:36

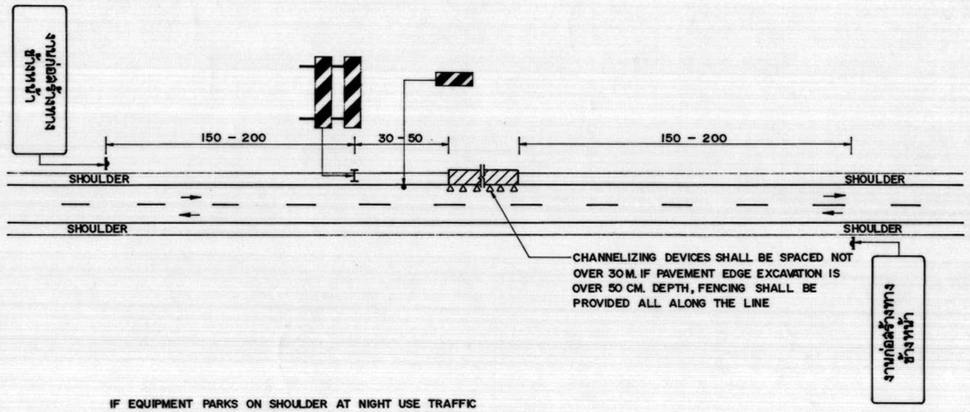
DETOUR BRIDGE OR TWO-LANE DETOUR ROAD
NOT TO SCALE



FOR ONE WAY TRAFFIC CONSTRUCTION
NOT TO SCALE

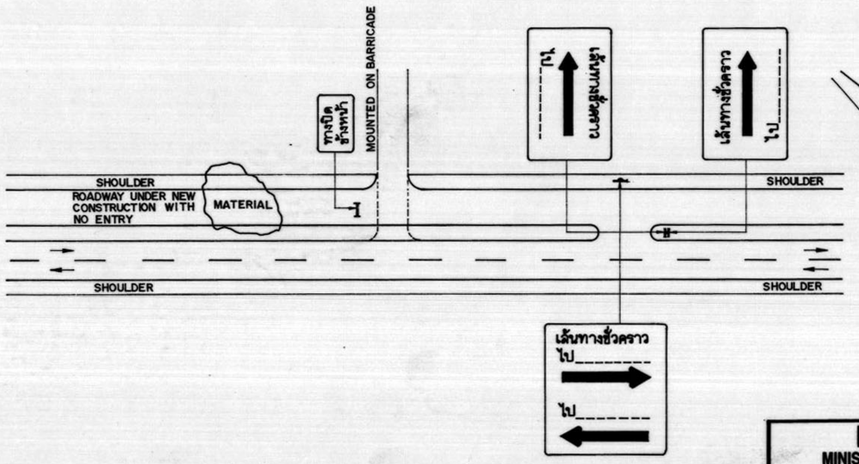


HIGHWAY CONSTRUCTION FOR RAILWAY CROSSING (NO PERMANENT CONTROL DEVICES)
NOT TO SCALE

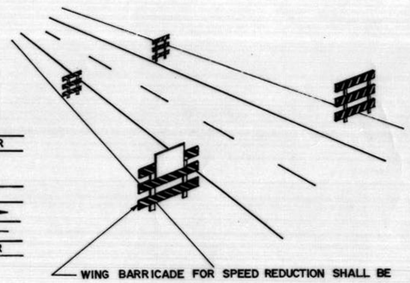


IF EQUIPMENT PARKS ON SHOULDER AT NIGHT USE TRAFFIC CONTROL DEVICES AS THIS DRAWING BUT " ระวังอันตราย " SIGN (2-105-90). SHALL BE INSTALLED INSTEAD OF " งานก่อสร้างทางข้างหน้า " SIGN (2-93ก-90)

PAVEMENT WIDENING
NOT TO SCALE



NEW HIGHWAY CONSTRUCTION IN CASE OF CLOSED AND ONE-WAY ENTRANCE
NOT TO SCALE



SPEED CONTROL SIGN
NOT TO SCALE

SYMBOLS :

- TRAFFIC SIGN
- BARRICADE TYPE I ONE FACE
- BARRICADE TYPE I ON TWO FACES
- BARRICADE TYPE II
- VERTICAL PANEL OR BARREL REFLECTORIZED BY RETRO REFLECTIVE SHEETING OR REFLECTIVE MARKING
- Δ CHANNELIZING DEVICES ARE CONES, POSTS, BARRELS, VERTICAL PANEL
- FLAGGING OR GREEN, YELLOW AND RED TRAFFIC SIGNAL
- CONSTRUCTION AREA

NOTES :

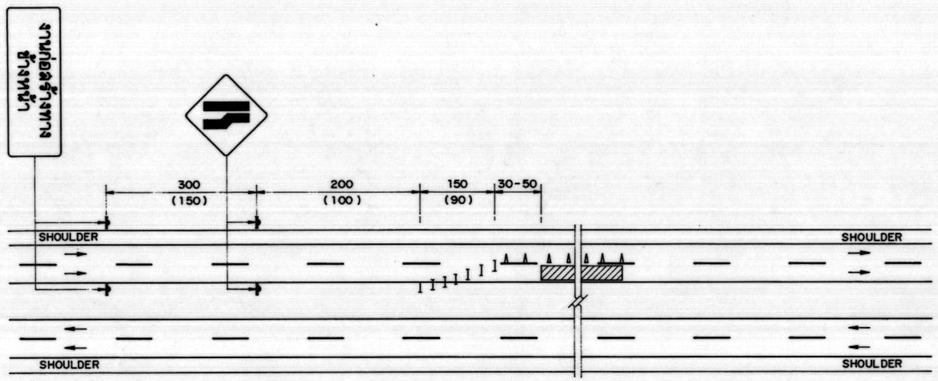
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED
2. IF CONSTRUCTION AREA IS OUT OF VERTICAL OR HORIZONTAL CURVE WITH SIGHT DISTANCE UNDER 100 M., THE BARRICADE SHALL BE INSTALLED AT BEGINNING POINT OF CURVE.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

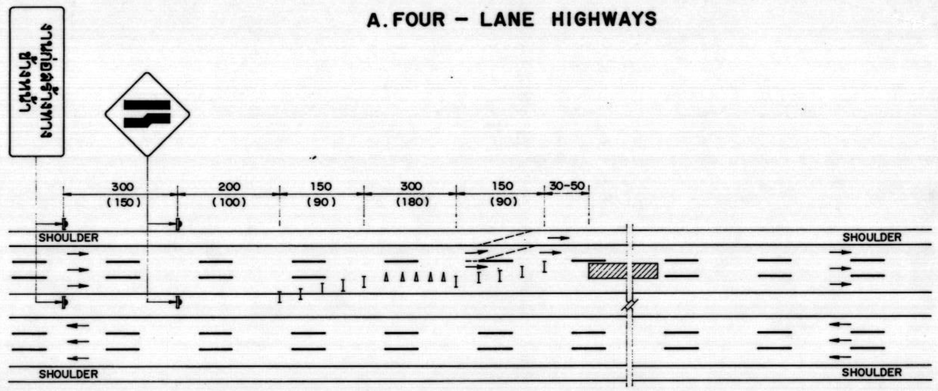
STANDARD DRAWING

TRAFFIC CONTROL DEVICES FOR HIGHWAYS UNDER CONSTRUCTION - III

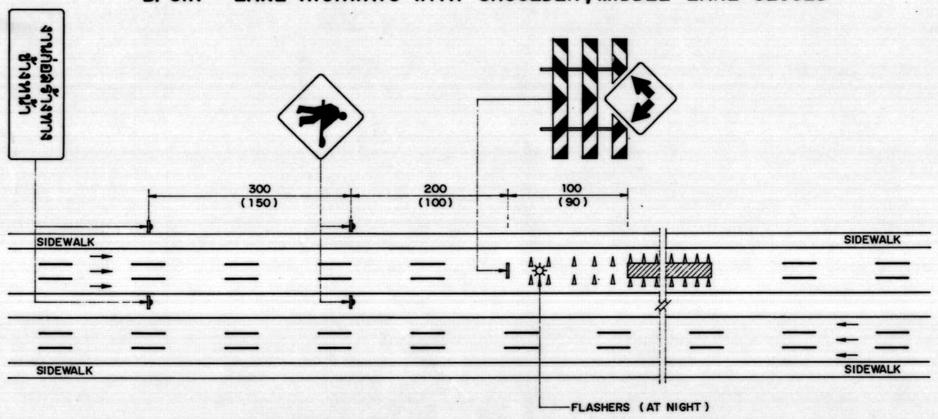
DESIGNED : D.O.H.	CHECKED :	DATE JULY 1994
SUBMITTED : P. Bunnag (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-104
		SHEET NO. 21



A. FOUR - LANE HIGHWAYS

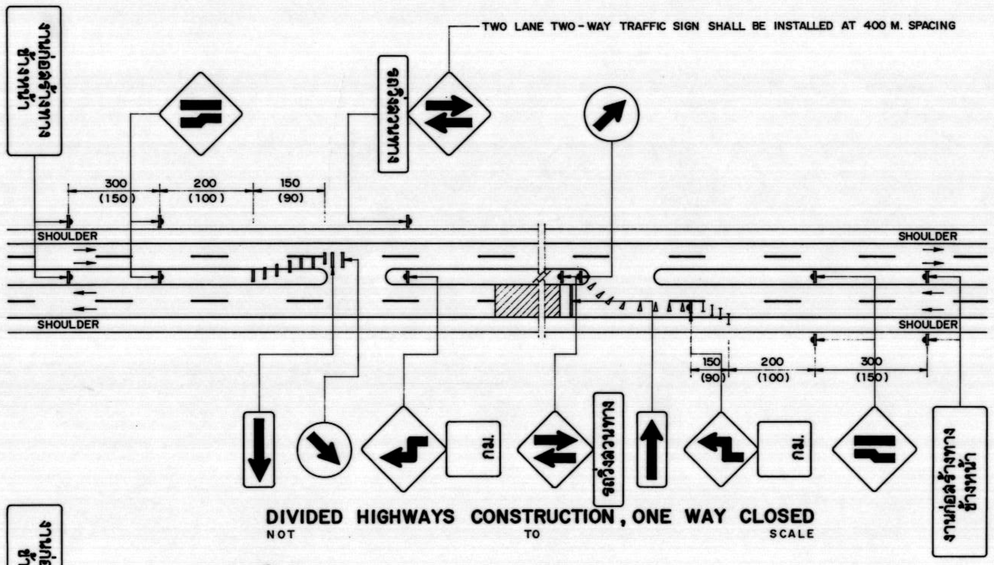


B. SIX - LANE HIGHWAYS WITH SHOULDER, MIDDLE LANE CLOSED

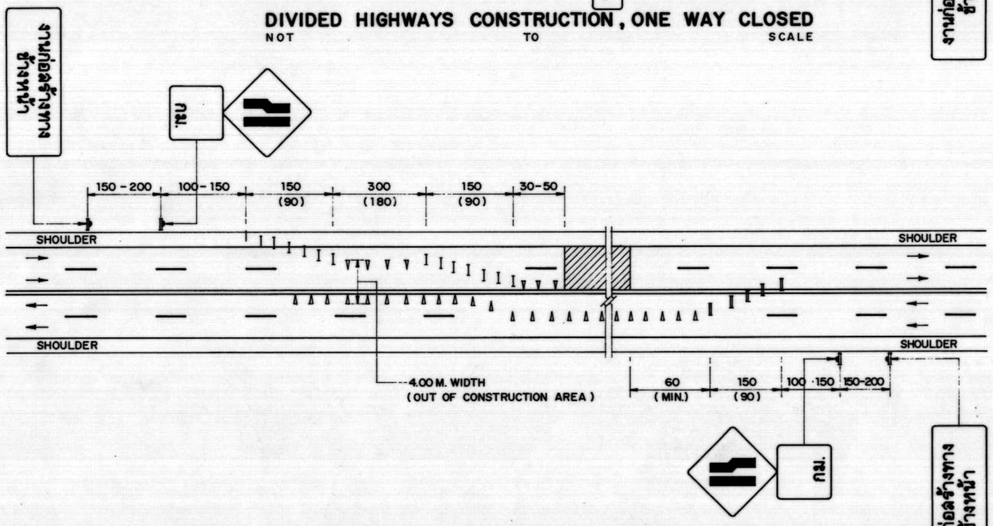


C. SIX - LANE HIGHWAYS WITHOUT SHOULDER, MIDDLE LANE CLOSED

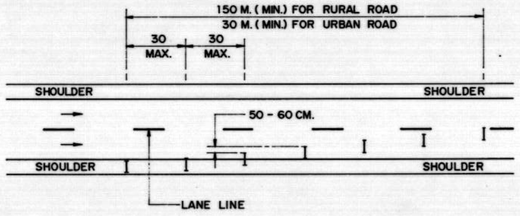
HIGHWAYS CONSTRUCTION WITH ONE LANE CLOSED
NOT TO SCALE



DIVIDED HIGHWAYS CONSTRUCTION, ONE WAY CLOSED
NOT TO SCALE



MULTI - LANE HIGHWAYS CONSTRUCTION WITHOUT MEDIAN
NOT TO SCALE



DETAIL OF LANE TRANSITION
NOT TO SCALE

SYMBOLS :

- TRAFFIC SIGN
- BARRICADE TYPE I ONE FACE
- BARRICADE TYPE I ON TWO FACES
- BARRICADE TYPE II
- VERTICAL PANEL OR BARREL REFLECTORIZED BY RETRO REFLECTIVE SHEETING OR REFLECTIVE MARKING
- CHANNELIZING DEVICE ARE
  - CONES
  - POST
  - BARRELS
  - VERTICAL PANEL
- FLAGGING OR GREEN, YELLOW AND RED TRAFFIC SIGNAL
- CONSTRUCTION AREA

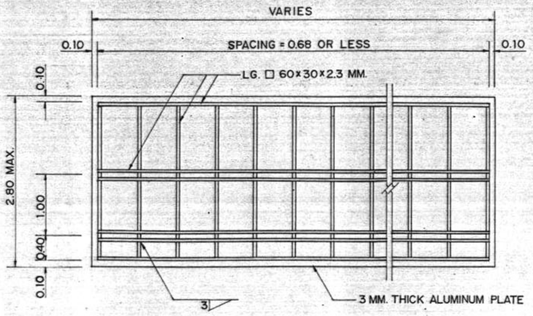
NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. NUMBER IN PARENTHESIS IS INSTALLATION DISTANCE FOR URBAN HIGHWAY.
3. INSTALLATION DISTANCE AND THE NUMBER OF AHEAD WARNING SIGN SHALL BE DETERMINED FROM PROVISION NO. 3 DWG. NO. RS - 102

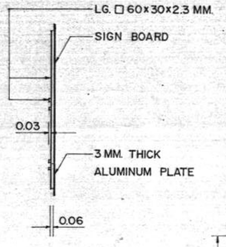
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING
TRAFFIC CONTROL DEVICES
FOR HIGHWAYS UNDER CONSTRUCTION - IV

DESIGNED : D.O.H.	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-105
		SHEET NO. 22

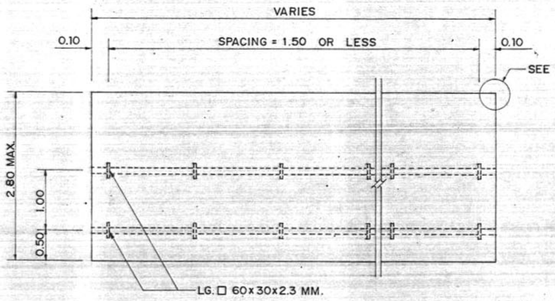


FRONT VIEW

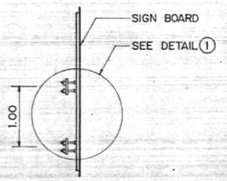


SIDE VIEW

TYPICAL SIGN FRAME
SCALE 1 : 50

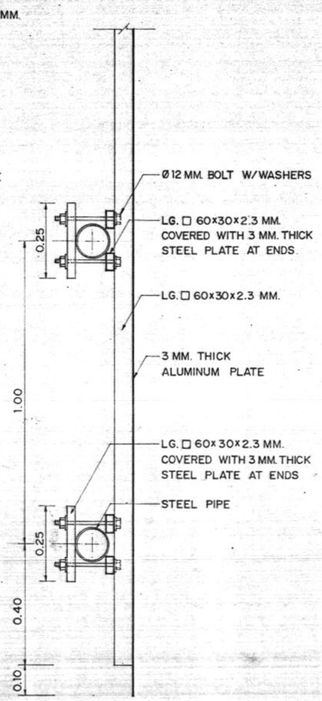


FRONT VIEW

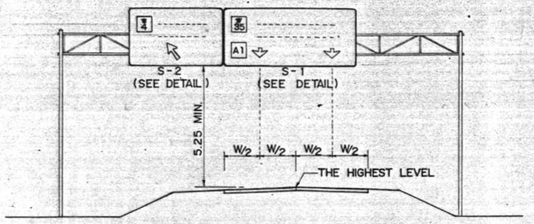


SIDE VIEW

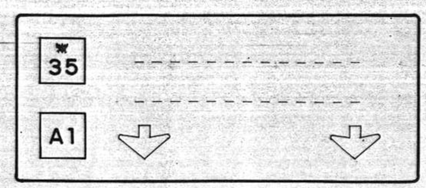
ERECTION FOR SIGN BOARD
SCALE 1 : 50



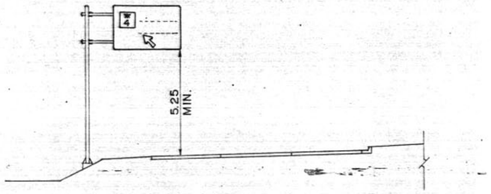
DETAIL (1)
SCALE 1 : 10



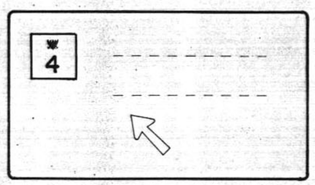
SECTION FOR OVERHEAD TRAFFIC SIGN
NOT TO SCALE



DETAIL "S-1"



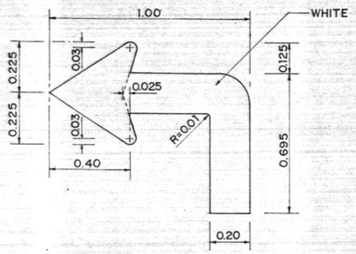
SECTION FOR OVERHANGING TRAFFIC SIGN
NOT TO SCALE



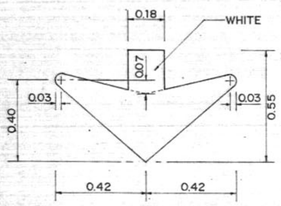
DETAIL "S-2"

NOTES :

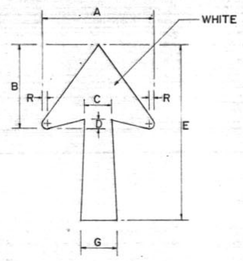
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. LIGHT GAUGE STEEL (LG.) OF SIGN FRAME SHALL BE CONNECTED TOGETHER WITH 3 MM. WELD.
3. ALL STEEL AND BOLT ASSEMBLY SHALL BE GALVANIZED ZINC COATING SHALL NOT BE LESS THAN 550 GRAMS PER SQUARE METER.
4. OVERHEAD SIGN BOARD SHALL BE OF ALUMINUM PLATE COVERED WITH REFLECTIVE SHEETING CONFORMED TO TIS 606 TYPE 2 (ESEFFICIENT OF RETRO-REFLECTION LEVEL 2)



TURN OFF ARROW
SCALE 1 : 15

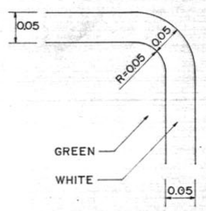


VERTICAL DOWN ARROW
SCALE 1 : 15

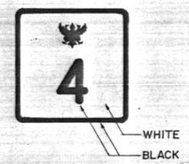


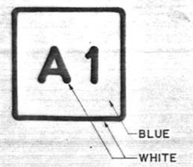
TURN OFF ARROW
NOT TO SCALE

ALPHABET HEIGHT (CM.)	DIMENSION (CM.)						
	A	B	C	D	E	F	G
20	38	30	9	3	62	1.5	12
25–35	46	35	12	4	75	2	16
40	56	42	14	5	87	2.5	18



DETAIL (2)
SCALE 1 : 5



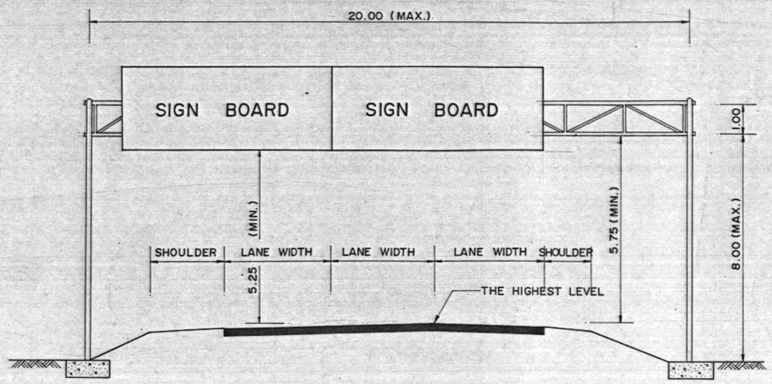


KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

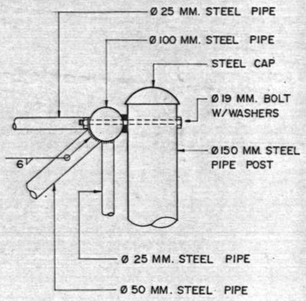
STANDARD DRAWING

OVERHEAD SIGN BOARD DETAILS

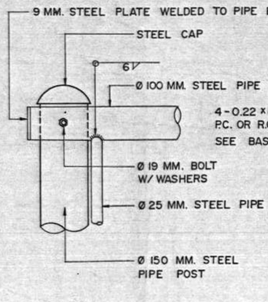
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
		DWG. NO. RS-106
APPROVED : (DIRECTOR GENERAL)		SHEET NO. 23



FRONT ELEVATION
SCALE 1 : 100

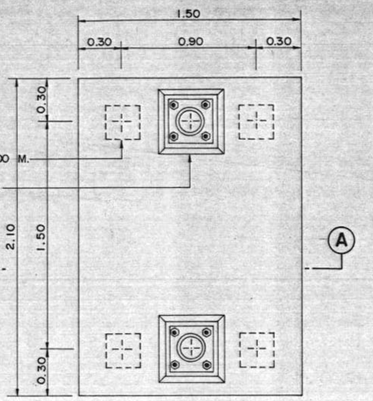


SIDE VIEW

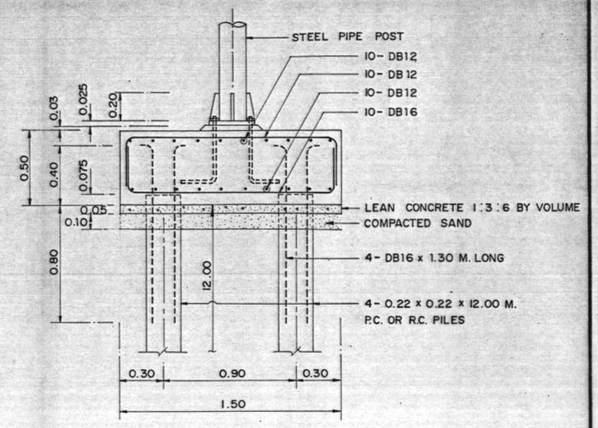


FRONT VIEW

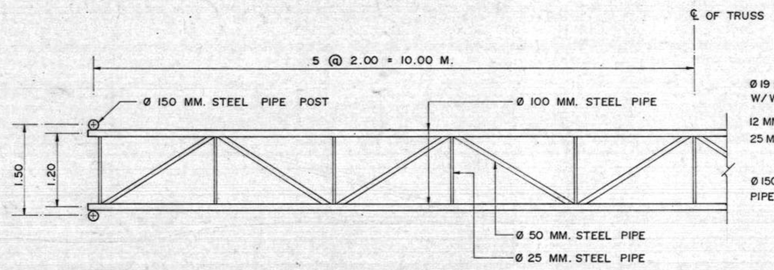
DETAIL "1"
NOT TO SCALE



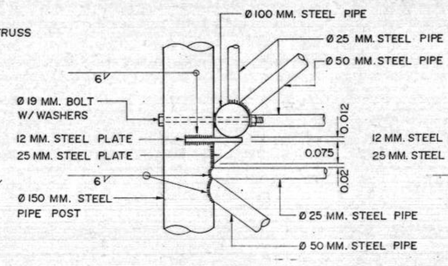
FOOTING PLAN
SCALE 1 : 20



SECTION (A)-(A)
SCALE 1 : 20

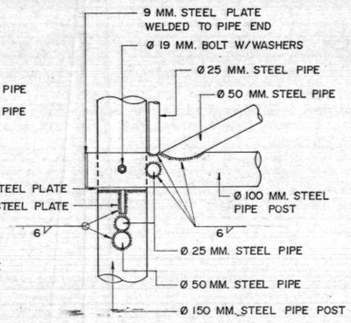


TRUSS PLAN
SCALE 1 : 50

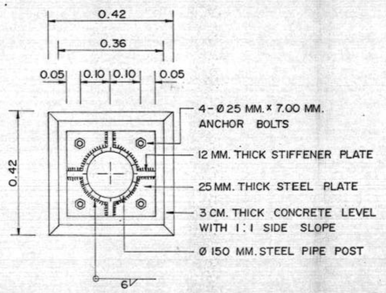


SIDE VIEW

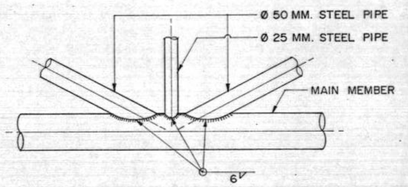
DETAIL "2"
NOT TO SCALE



FRONT VIEW



BASE DETAIL
SCALE 1 : 50



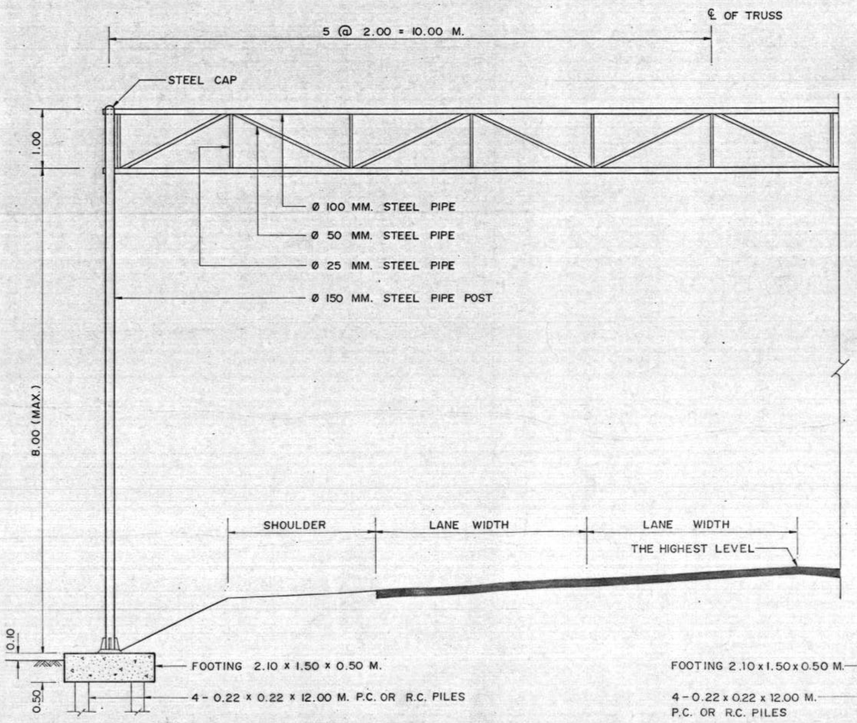
JOINT DETAIL
SCALE 1 : 10

NOTES :

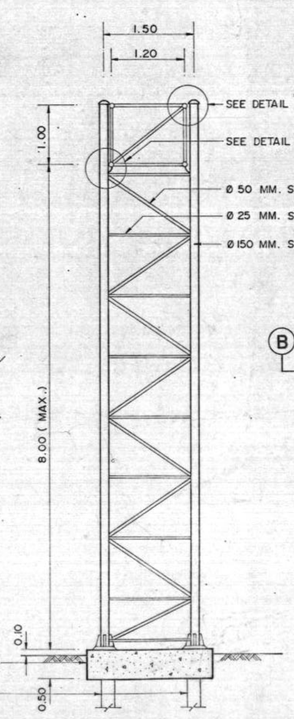
1. ALL DIMENSIONS ARE IN METERS EXCEPT WELDING SYMBOLS AND PIPE DIAMETER ARE IN MILLIMETERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE I	350	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

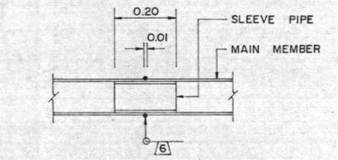
3. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24 FOR ROUND BARS AND TIS. 24 GRADE SD 30 FOR DEFORMED BARS.
4. ALL HOLLOW STEEL SECTIONS, STEEL PIPES SHALL CONFORM TO TIS. 107 GRADE HS 41
   - FOR Ø 25 MM. STEEL PIPE WT. 1.99 Kg/M.
   - Ø 50 MM. STEEL PIPE WT. 4.11 Kg/M.
   - Ø 100 MM. STEEL PIPE WT. 9.83 Kg/M.
   - Ø 150 MM. STEEL PIPE WT. 17.82 Kg/M.
5. VERTICAL PIPE POST SHALL BE CONNECTED AT UPPER PART.
6. ALL WELDING SHALL BE DONE WITH WELDING RODS WHICH CONFORM TO TIS. 49 TYPE E 4202 x 13.
7. ALL STEEL SHALL BE GALVANIZED. ZINC COATING SHALL NOT BE LESS THAN 550 GRAMS PER SQUARE METER.
8. SPREAD FOOTING SHALL BE USED FOR ALLOWABLE SOIL BEARING CAPACITY UNDER THE FOUNDATION MORE THAN 10 TON PER SQUARE METER.



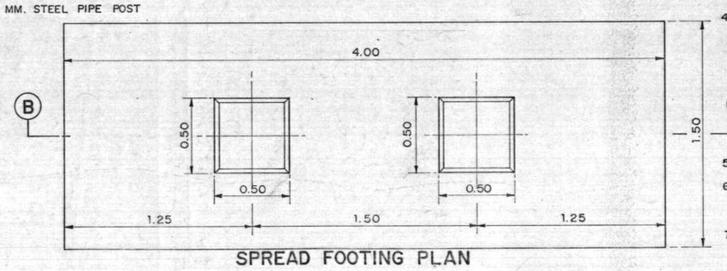
FRONT ELEVATION
SCALE 1 : 50



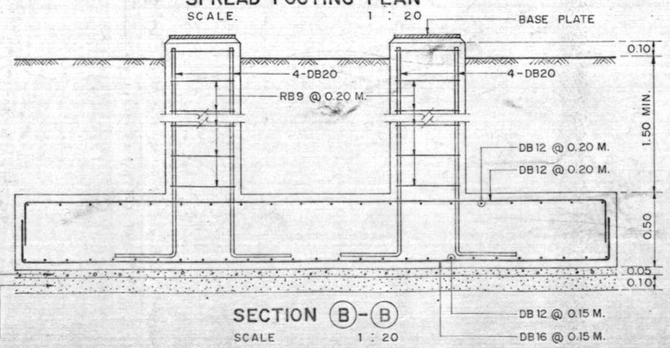
SIDE ELEVATION
SCALE 1 : 50



PIPE CONNECTION DETAIL
SCALE 1 : 10



SPREAD FOOTING PLAN
SCALE. 1 : 20



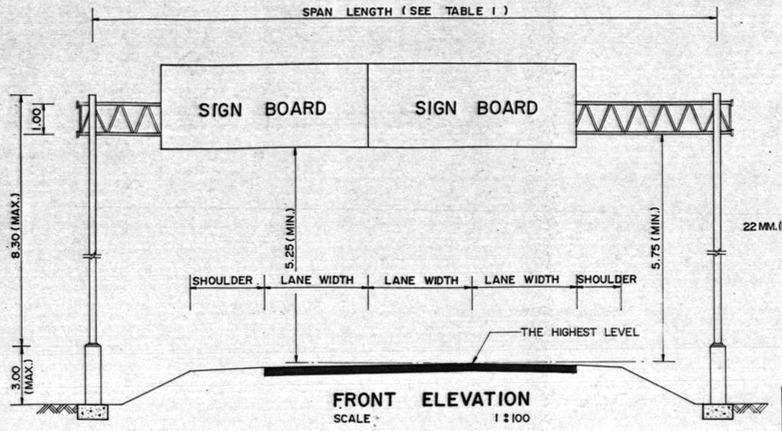
SECTION (B)-(B)
SCALE 1 : 20

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

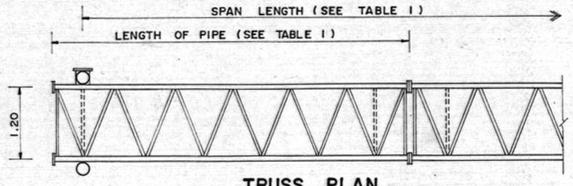
STANDARD DRAWING

STEEL FRAME FOR MOUNTING OVERHEAD SIGN TYPE I
SPAN 20.00 M. MAX.

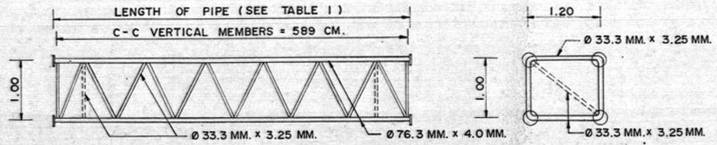
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Buranapong (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
		DWG. NO. RS-107
APPROVED : For (DIRECTOR GENERAL)		SHEET NO. 24



FRONT ELEVATION
SCALE 1 : 100



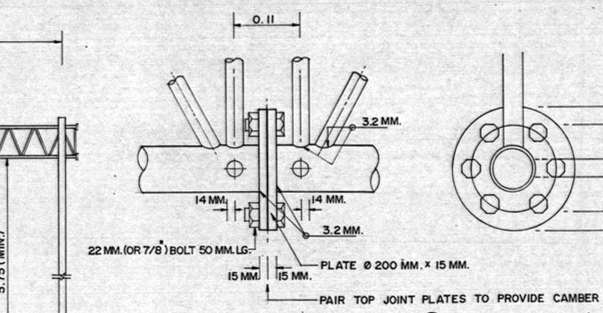
TRUSS PLAN
SCALE 1 : 50



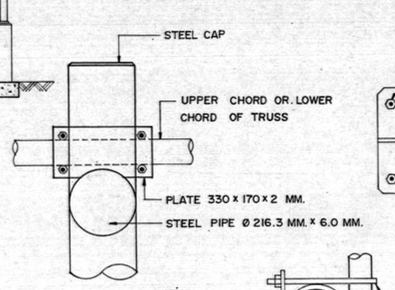
DETAIL TRUSS MEMBER
SCALE 1 : 50

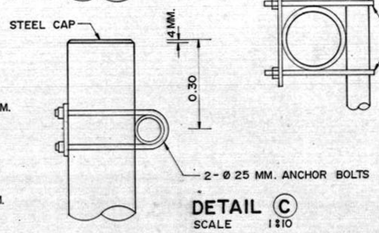
SECTION (5) - (5)
SCALE 1 : 25

FRONT ELEVATION
SCALE 1 : 50

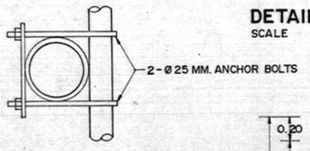


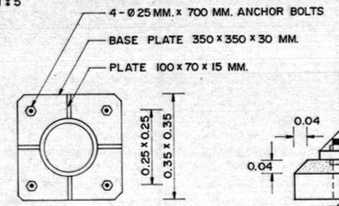
DETAIL (A)
SCALE 1 : 5



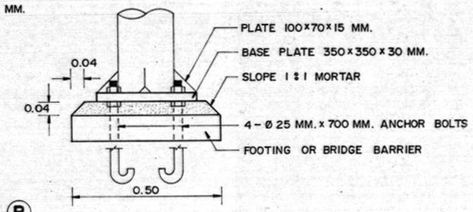


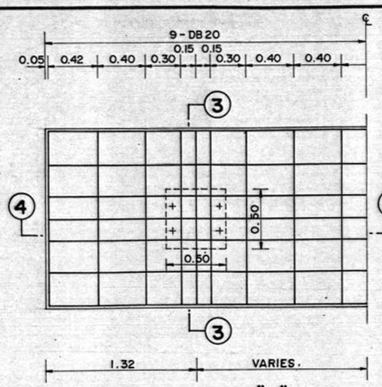
DETAIL (C)
SCALE 1 : 10



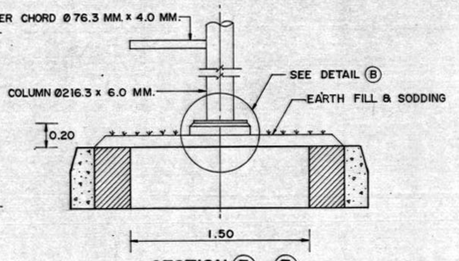


DETAIL (B)
SCALE 1 : 10

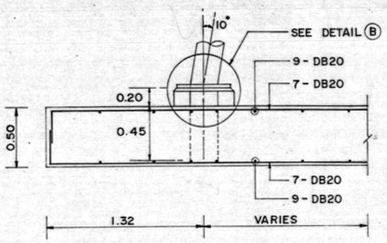




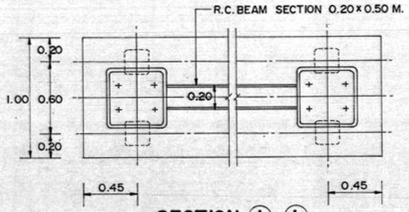
FOOTING TYPE "B"
SCALE 1 : 25



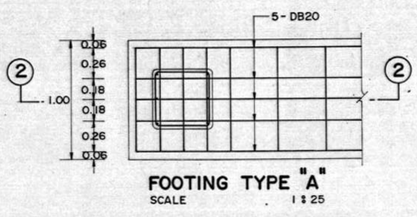
SECTION (3) - (3)
SCALE 1 : 25



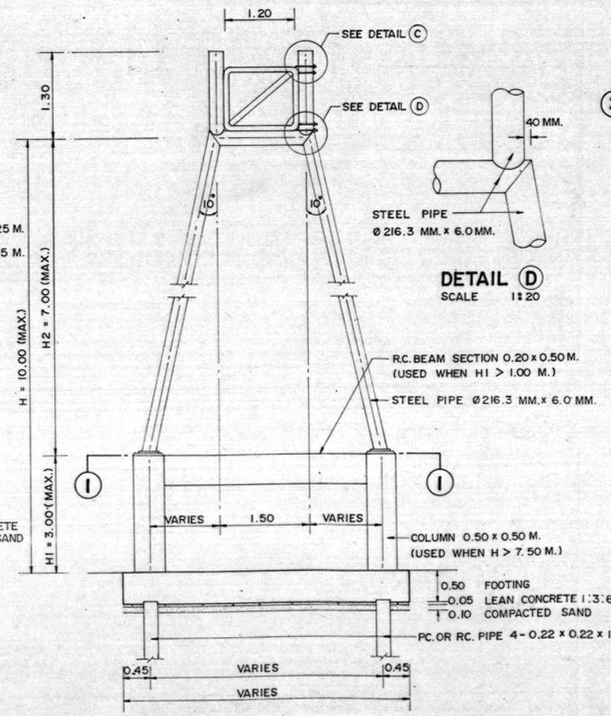
SECTION (4) - (4)
SCALE 1 : 25



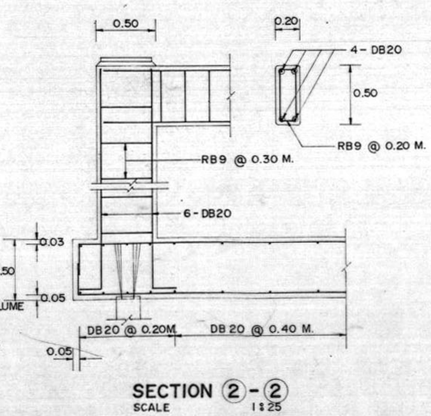
SECTION (1) - (1)
SCALE 1 : 25



FOOTING TYPE "A"
SCALE 1 : 25



SIDE ELEVATION
SCALE 1 : 50



SECTION (2) - (2)
SCALE 1 : 25

TABLE I

NO.	SPAN LENGTH(M.)	LENGTH OF STEEL PIPE (M.)	SIZE OF STEEL PIPE
1.	17.00	6.00 + 6.00 + 6.00 = 18.00	Ø 76.3 MM. WT. 5.71 KG/M.
2.	19.00	6.00 + 4.00 + 4.00 + 6.00 = 20.00	Ø 76.3 MM. WT. 5.71 KG/M.
3.	21.00	6.00 + 5.00 + 5.00 + 6.00 = 22.00	Ø 76.3 MM. WT. 5.71 KG/M.
4.	23.00	6.00 + 6.00 + 6.00 + 6.00 = 24.00	Ø 76.3 MM. WT. 7.13 KG/M.
5.	25.00	6.00 + 6.00 + 2.00 + 6.00 + 6.00 = 26.00	Ø 76.3 MM. WT. 7.13 KG/M.
6.	28.00	6.00 + 6.00 + 4.00 + 6.00 + 6.00 = 28.00	Ø 89.1 MM. WT. 8.39 KG/M.

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOW :

PORTLAND CEMENT TYPE I	350	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

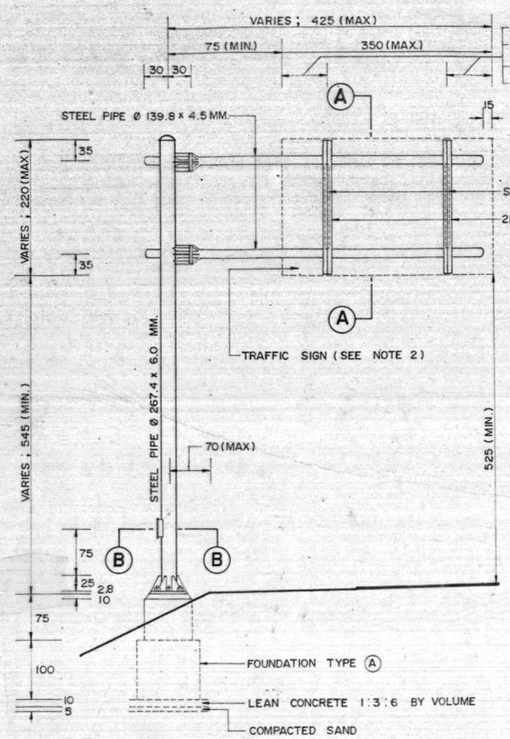
3. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24 FOR ROUND BARS AND TIS. 24 GRADE SD 30 FOR DEFORMED BARS.
4. FOR STEEL COLUMN AND CHORD SHALL BE STRUCTURAL STEEL CONFORM TO JIS. G3444 GRADE STK 41 OR EQUIVALENT.
5. DIAGONAL MEMBER STEEL PIPE SHALL CONFORM TO TIS. 26 CLASS 2.
6. JOINT OF MEMBER SHALL BE WELDED AROUND WITH 3.2 MM. FILLET WELD AS AISC SPECIFICATION.
7. ALL STEEL AND BOLT ASSEMBLY SHALL BE GALVANIZED. ZINC COATING SHALL NOT BE LESS THAN 550 GRAMS PER SQUARE METERS.
8. FOOTING TYPE "A" SHALL BE USED ON EXISTING GROUND OR SOFT CLAY AND TYPE "B" SHALL BE USED ON RAISED MEDIAN.
9. FOOTING TYPE "C" SHALL BE USED FOR ALLOWABLE SOIL BEARING CAPACITY UNDER THE FOUNDATION MORE THAN 10 TON PER SQUARE METER.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

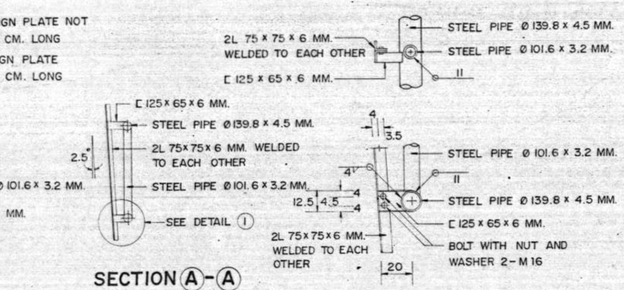
STANDARD DRAWING

STEEL FRAME FOR MOUNTING OVERHEAD SIGN TYPE II
SPAN 17.00 – 28.00 M.

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Bongsri. (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : Subsri (DIRECTOR GENERAL)		DWG. NO. RS-108
		SHEET NO. 25

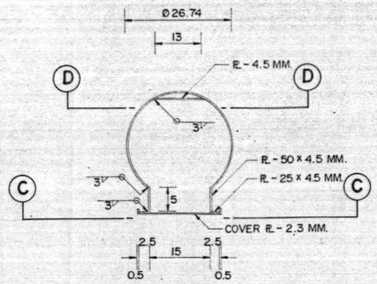


STEEL POLE FOR OVERHANGING TRAFFIC SIGN TYPE I
SCALE 1 : 50

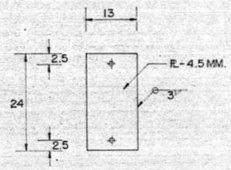


SECTION (A) - (A)
SCALE 1 : 50

DETAIL (I)
SCALE 1 : 20



SECTION (B) - (B)
SCALE 1 : 7.5



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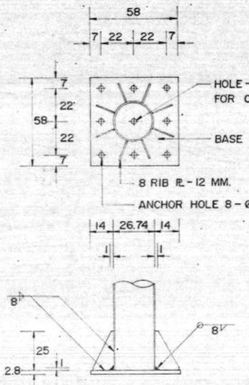
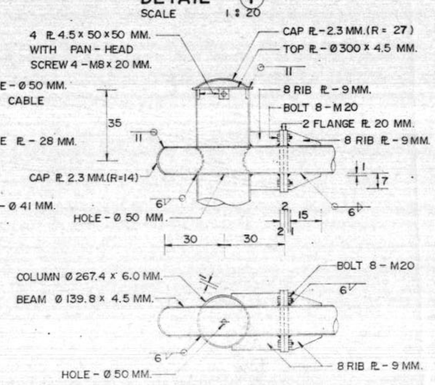
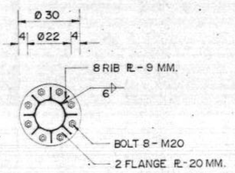
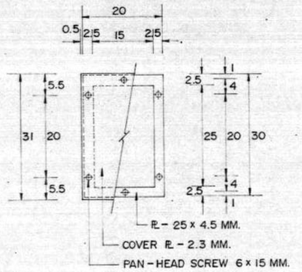


BASE OF STEEL POLE
SCALE 1 : 20



TOP OF STEEL POLE AND JOINT DETAIL
SCALE 1 : 15





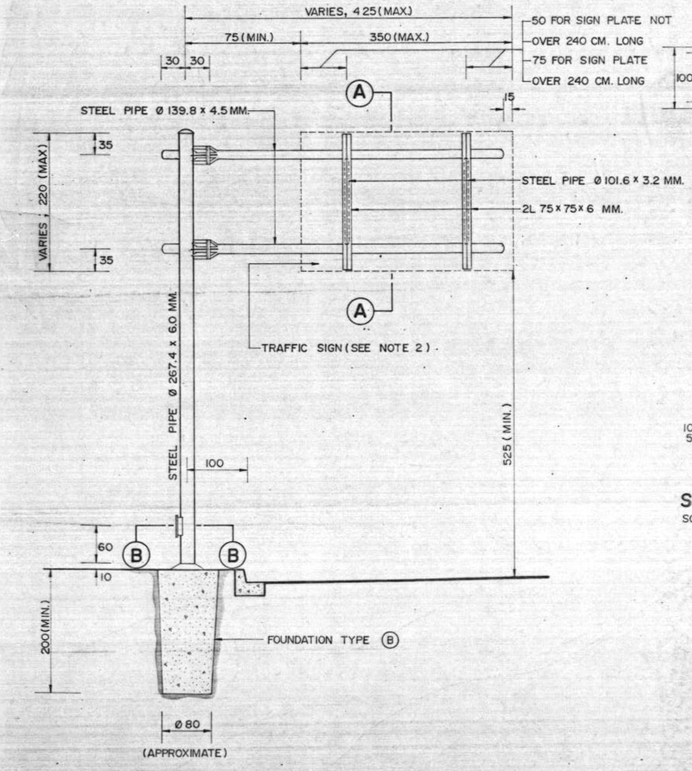
SECTION (C) - (C)
SCALE 1 : 7.5

NOTES :

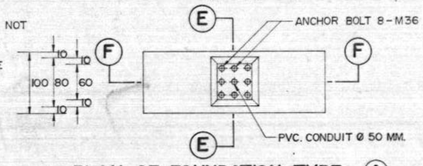
1. DIMENSIONS FOR WELDING SYMBOLS ARE IN MILLIMETERS, ALL OTHER DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. THIS DRAWING SHALL BE USED FOR TRAFFIC SIGNS, WHERE THE AREA OF THE SIGN INCLUDING THE GAPS BETWEEN PLATES IS NOT MORE THAN 52,800 SQ.CM. THE MAXIMUM LENGTH AND WIDTH OF THE SIGN SHALL NOT EXCEED 350 CM. AND 220 CM. RESPECTIVELY.
3. THE FOUNDATION TYPE (A) SHALL BE USED IN A SIDE SLOPE AREA AND FOUNDATION TYPE (B) SHALL BE USED IN A SIDEWALK OR RAISED MEDIAN.
4. THE ALLOWABLE SOIL BEARING CAPACITY UNDER THE FOUNDATION TYPE (A) SHALL BE MORE THAN 5 TONS PER SQ.M. EMBANKMENT AROUND FOUNDATION TYPE (B) SHALL BE COMPACTED TO 90 % OF THE MAXIMUM STANDARD DRY DENSITY.
5. THE DIMENSIONS OF STEEL PIPE SHOWN ARE THE OUTER DIAMETER AND THE THICKNESS OF THE PIPE FOR EXAMPLE ; Ø 267.4 x 6.0 MM. MEANS THE OUTER DIAMETER OF THE PIPE IS 267.4 MM. AND THE THICKNESS IS 6.0 MM.
6. STEEL PIPE SHALL CONFORM TO ONE OF THE FOLLOWING SPECIFICATIONS
   - 6.1 TIS. 107 GRADE HS 41
   - 6.2 JIS. G3444 GRADE STK 41
   - 6.3 ASTM. A252 - 75 GRADE 2
7. STRUCTURAL STEEL SECTION SHALL CONFORM TO TIS 116 GRADE Fe 24.
8. STEEL PIPE, STRUCTURAL STEEL SECTION, STEEL PLATE, BOLTS, NUTS, AND WASHERS SHALL BE GALVANIZED. ZINC COATING SHALL NOT BE LESS THAN 550 GRAMS PER SQUARE METER.
9. ELECTRIC ARC WELDING WHICH CONFORMS TO AISC STANDARD SHALL BE USED FOR WELDING STEEL.
10. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	350	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

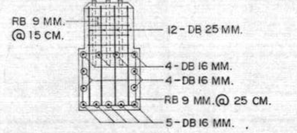
11. MORTAR SHALL BE COMPRISED OF PORTLAND CEMENT AND SAND IN THE PROPORTION 1 TO 1
12. REINFORCING STEEL SHALL CONFORM TO TIS.20 GRADE SR 24 FOR ROUND BARS AND TIS. 24 GRADE SD 30 FOR DEFORMED BARS.
13. CANTILEVER BEAM SHALL BE INSTALLED PERPENDICULAR TO THE ROADWAY ALIGNMENT. CAMBER SHALL BE PROVIDED FOR BEAM DEFLECTION.
14. WHERE SIGN LIGHTING IS REQUIRED, THE ELECTRICAL COMPONENTS SHALL CONFORM TO THE ELECTRICITY SUPPLY AUTHORITY'S REQUIREMENTS AND REGULATIONS.



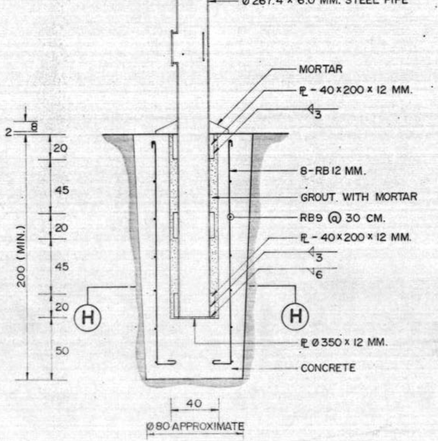
STEEL POLE FOR OVERHANGING TRAFFIC SIGN TYPE II
SCALE 1 : 50



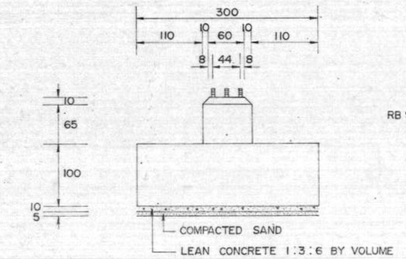
PLAN OF FOUNDATION TYPE (A)
SCALE 1 : 50



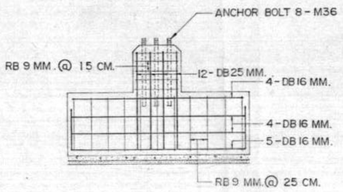
SECTION (E) - (E)
SCALE 1 : 50



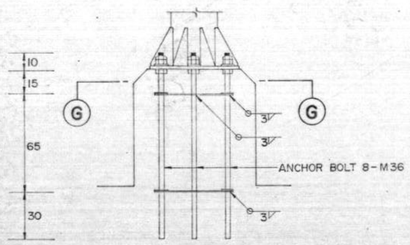
FOUNDATION TYPE (B)
SCALE 1 : 25



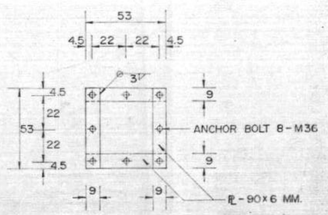
SIDE ELEVATION OF FOUNDATION TYPE (A)
SCALE 1 : 50



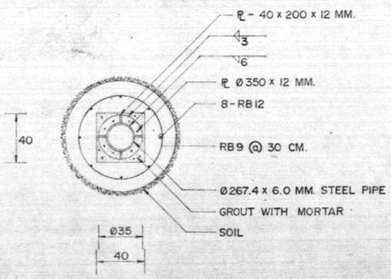
SECTION (F) - (F)
SCALE 1 : 50



ANCHOR BOLT DETAIL
SCALE 1 : 20



SECTION (G) - (G)
SCALE 1 : 20



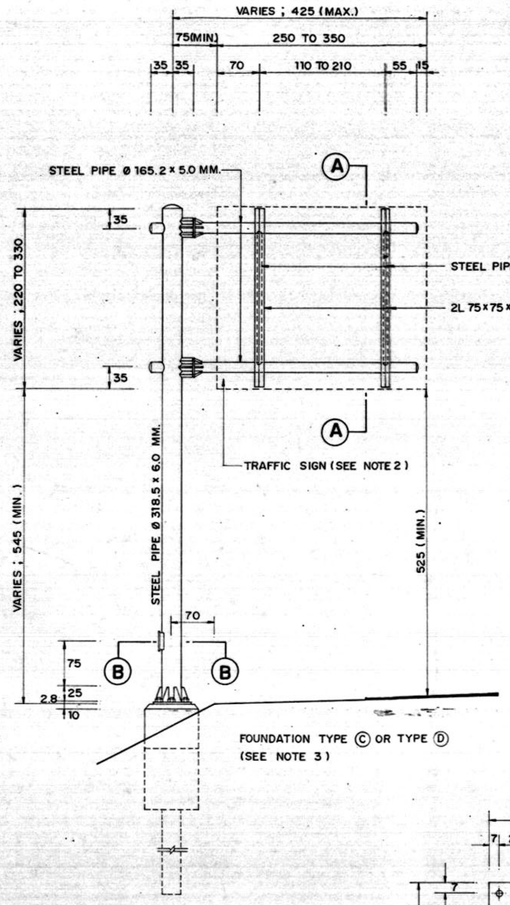
SECTION (H) - (H)
SCALE 1 : 25

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

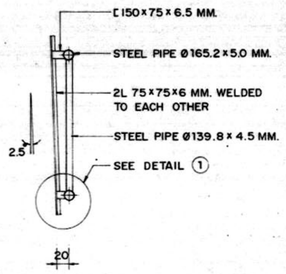
STEEL POLE FOR OVERHANGING TRAFFIC SIGN FOR SIGN PLATES NOT MORE THAN 52,800 SQ.CM.

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-109
		SHEET NO. 26



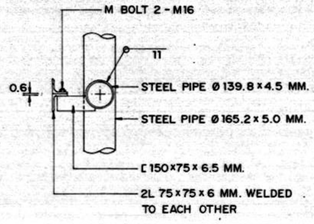
STEEL POLE FOR OVERHANG TRAFFIC SIGN TYPE 3 AT SIDE SLOPE

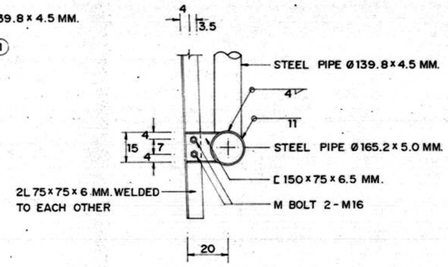
SCALE 1 : 50



SECTION Ⓐ - Ⓐ

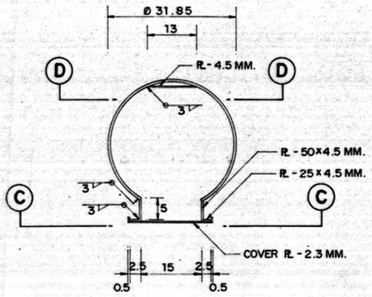
SCALE 1 : 50





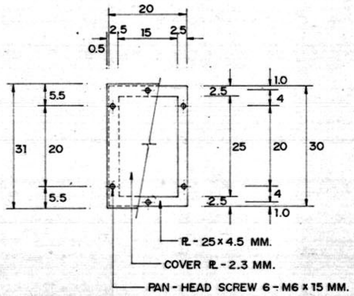
DETAIL ①

SCALE 1 : 15



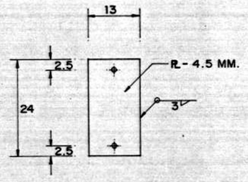
SECTION Ⓑ - Ⓑ

SCALE 1 : 7.5



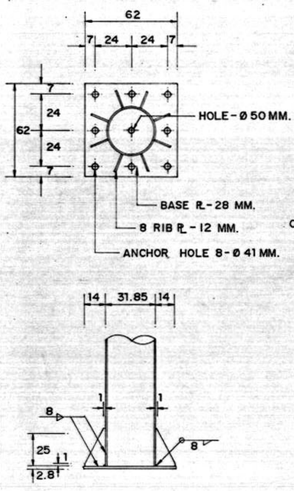
SECTION Ⓒ - Ⓒ

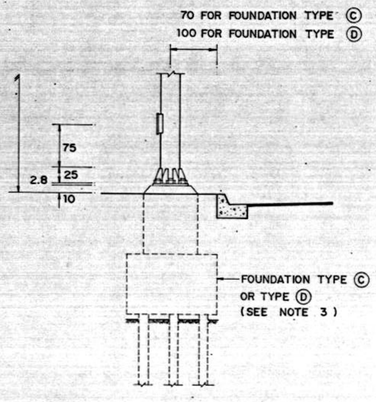
SCALE 1 : 7.5



SECTION Ⓓ - Ⓓ

SCALE 1 : 7.5



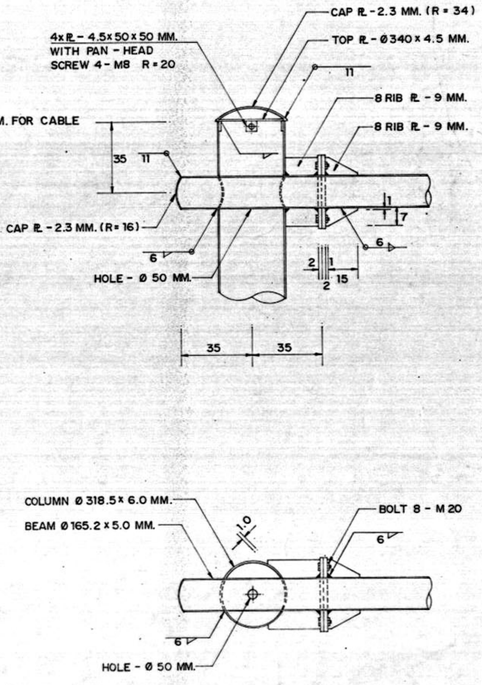


STEEL POLE FOR OVERHANG TRAFFIC SIGN TYPE 3 AT SIDEWALK OR RAISED MEDIAN

SCALE 1 : 50

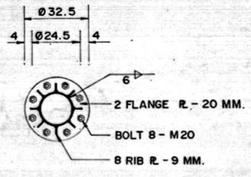
BASE OF STEEL POLE

SCALE 1 : 20



TOP OF STEEL POLE AND JOINT DETAIL

SCALE 1 : 15



NOTES :

1. DIMENSIONS FOR WELDING SYMBOLS ARE IN MILLIMETERS, ALL OTHER DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. THIS DRAWING SHALL BE USED FOR TRAFFIC SIGNS, WHERE THE AREA OF THE SIGN IS NOT MORE THAN 108,000 SQ.CM. THE MAXIMUM LENGTH AND WIDTH OF THE SIGN SHALL NOT EXCEED 350 CM. AND 330 RESPECTIVELY.
3. GENERALLY, THE FOUNDATION SHALL BE TYPE © OR TYPE ⓓ. IN CASE OF THE PILES SHALL NOT BE DRIVEN TO THE SOIL OR THE ALLOWABLE SOIL BEARING CAPACITY UNDER THE FOUNDATION MORE THAN 10 TON PER SQUARE METER, THE FOUNDATION TYPE ⓓ WITH NO PILES SHALL BE USED.
4. THE DIMENSIONS OF STEEL PIPE SHOWN ARE THE OUTER DIAMETER AND THE THICKNESS OF THE PIPE FOR EXAMPLE ; Ø 318.5 x 6.0 MM. MEANS THE OUTER DIAMETER OF THE PIPE IS 318.5 MM. AND THE THICKNESS IS 6.0 MM.
5. STEEL PIPE SHALL CONFORM TO ONE OF THE FOLLOWING SPECIFICATIONS
   - 5.1 TIS. 107 GRADE HS 41
   - 5.2 JIS. G3444 GRADE STK 41
   - 5.3 ASTM. A252 - 75 GRADE 2
6. STRUCTURAL STEEL SECTION SHALL CONFORM TO TIS. 116 GRADE Fe 24.
7. STEEL PIPE, STRUCTURAL STEEL SECTION, STEEL PLATE, BOLTS, NUTS AND WASHERS SHALL BE GALVANIZED. ZINC COATING SHALL NOT BE LESS THAN 550 GRAMS PER SQUARE METER.
8. ELETRIC ARC WELDING WHICH CONFORMS TO AISC STANDARD SHALL BE USED FOR WELDING STEEL.
9. CONCRETE FOR REINFORCED CONCRETE PILE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 300 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS ;

PORTLAND CEMENT TYPE 1	375	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

10. CONCRETE FOR PRESTRESS CONCRETE PILE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 440 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOW ;

PORTLAND CEMENT TYPE 1	375	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	8	CM. (MAX.)

11. CONCRETE FOR FOUNDATION SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOW ;

PORTLAND CEMENT TYPE 1	350	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

12. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24 FOR ROUND BARS AND TIS. 24 GRADE SD 30 FOR DEFORMED BARS.
13. PRESTRESSING WIRE SHALL CONFORM TO TIS. 95.
14. NORMAL CLEAR CONCRETE COVER SHALL BE 5 CM. BUT FOR FOUNDATION SHALL BE 7.5 CM., UNLESS OTHERWISE INDICATED.
15. CANTILEVER BEAM SHALL BE INSTALLED PERPENDICULAR TO THE ROADWAY ALIGNMENT. CAMBER SHALL BE PROVIDED FOR BEAM DEFLECTION.
16. WHERE SIGN LIGHTING IS REQUIRED, THE ELECTRICAL COMPONENTS SHALL CONFORM TO THE ELECTRICITY SUPPLY AUTHORITY'S REQUIREMENTS AND REGULATIONS.
17. THIS DRAWING SHALL BE USED IN COMBINATION WITH DWG. NO. RS - 111.

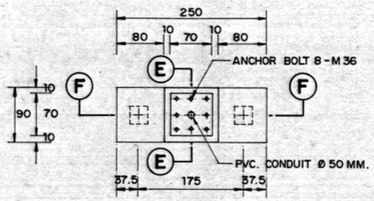
KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

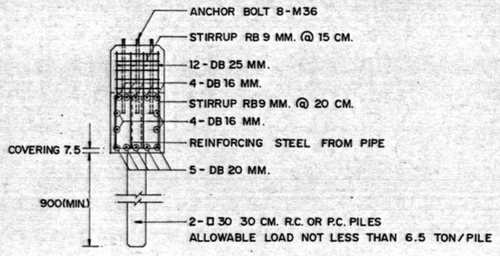
STANDARD DRAWING

STEEL POLE FOR OVERHANGING TRAFFIC SIGN FOR SIGN PLATES NOT MORE THAN 108,000 SQ.CM. - I

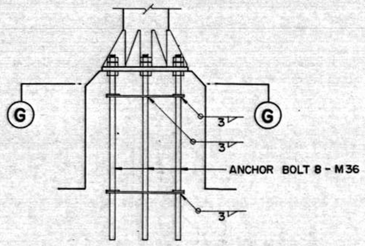
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-110
		SHEET NO. 27



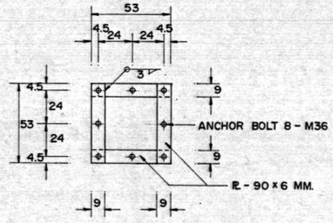
PLAN OF FOUNDATION TYPE (C)
SCALE 1 : 50



SECTION (E) - (E)
SCALE 1 : 50



ANCHOR BOLT DETAIL
SCALE 1 : 20



SECTION (G) - (G)
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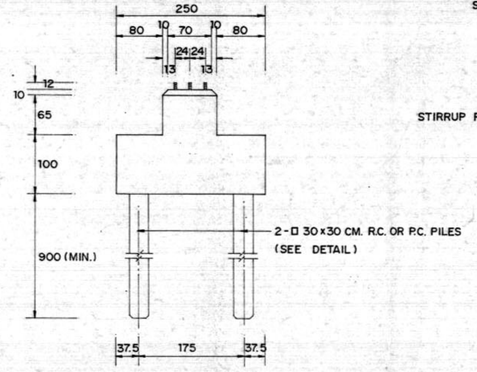
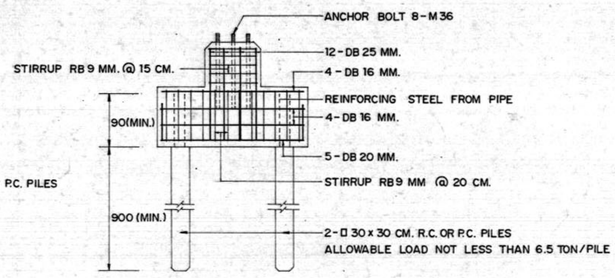
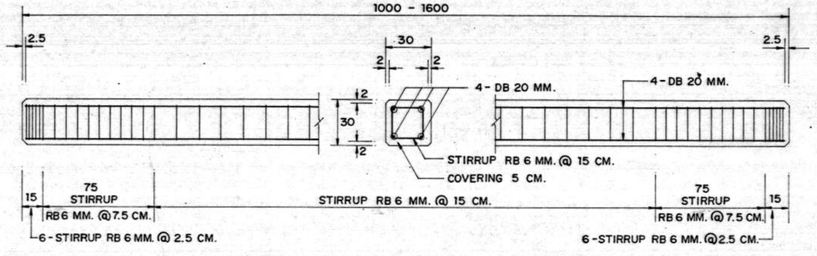


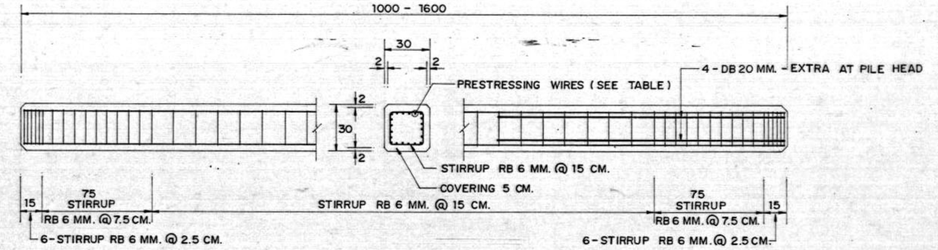
SIDE ELEVATION OF FOUNDATION TYPE (C)
SCALE 1 : 50



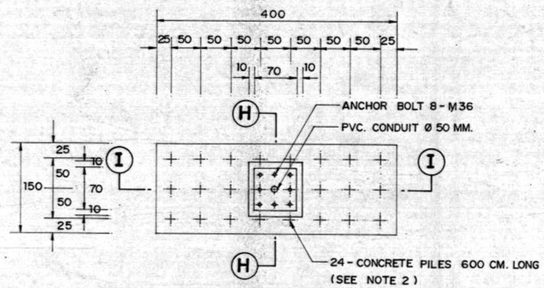
SECTION (F) - (F)
SCALE 1 : 50



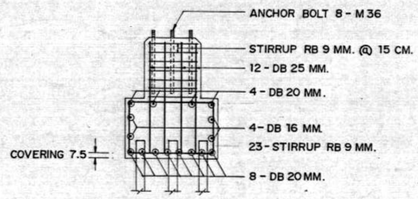
30 x 30 CM. REINFORCED CONCRETE PILE
SCALE 1 : 20



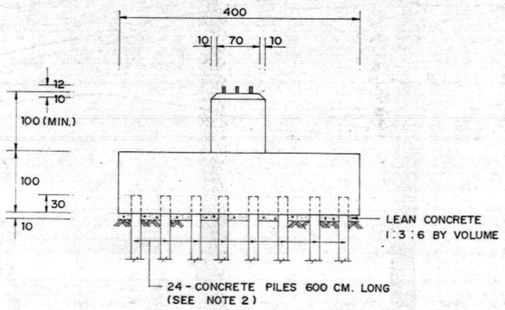
30 x 30 CM. PRESTRESSED CONCRETE PILE
SCALE 1 : 20



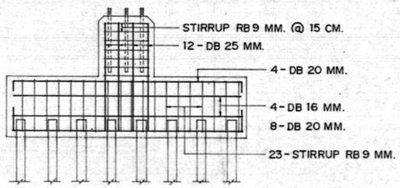
PLAN OF FOUNDATION TYPE (D)
SCALE 1 : 50



SECTION (H) - (H)
SCALE 1 : 50

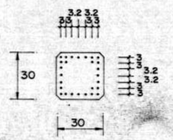
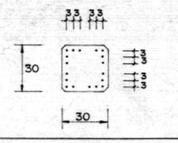
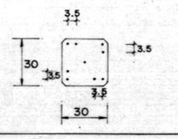


SIDE ELEVATION OF FOUNDATION TYPE (D)
SCALE 1 : 50



SECTION (I) - (I)
SCALE 1 : 50

TABLE OF PRESTRESSING WIRES

AMOUNT AND DIMETER	ARRANGEMENT
28 - Ø 4 MM.	
18 - Ø 5 MM.	
9 - Ø 7 MM.	

NOTES :

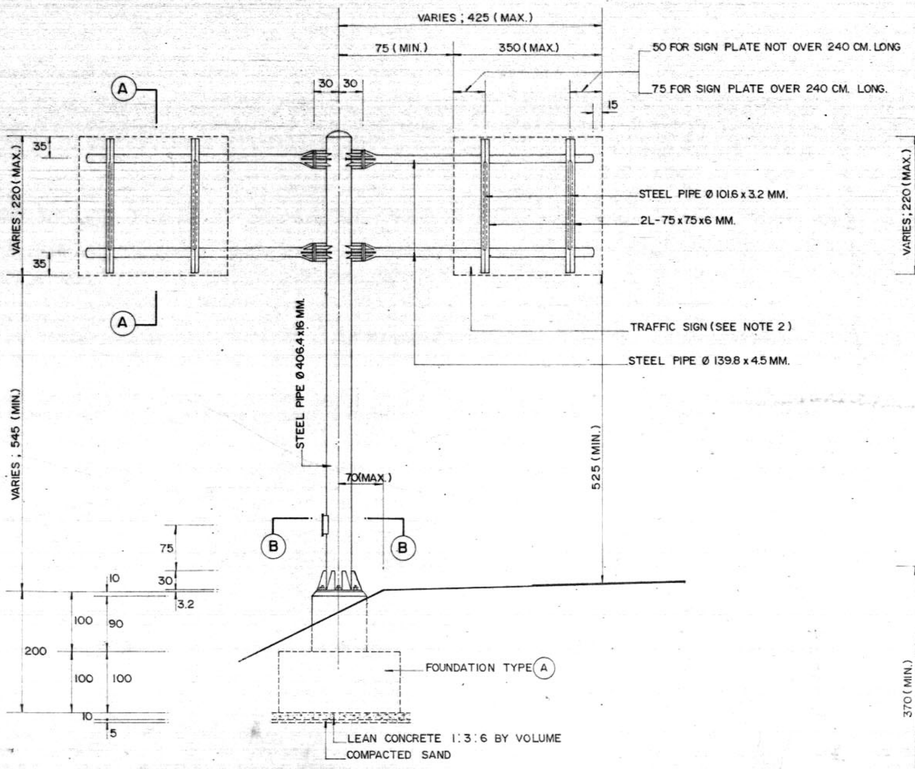
1. ALL DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. PRE - CAST CONCRETE PILES 600 CM. LONG WITH CIRCULAR, HEXAGON, OCTAGON, SQUARE OR I - SHAPE SECTIONS WHICH CONFORMING TO TIS. 395 OR TIS. 396 OR TIS. 397 OR TIS. 398 SHALL BE USED AS APPROVED BY THE ENGINEER.
3. IN CASE OF FOUNDATION ARE NOT CONSTRUCTED AS SPECIFIED IN THIS DRAWING, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADAPTATION TO CONSTRUCTION AS APPROVED BY THE ENGINEER.
4. THIS DRAWING SHALL BE USED IN COMBINATION WITH DWG. NO. RS - 110.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

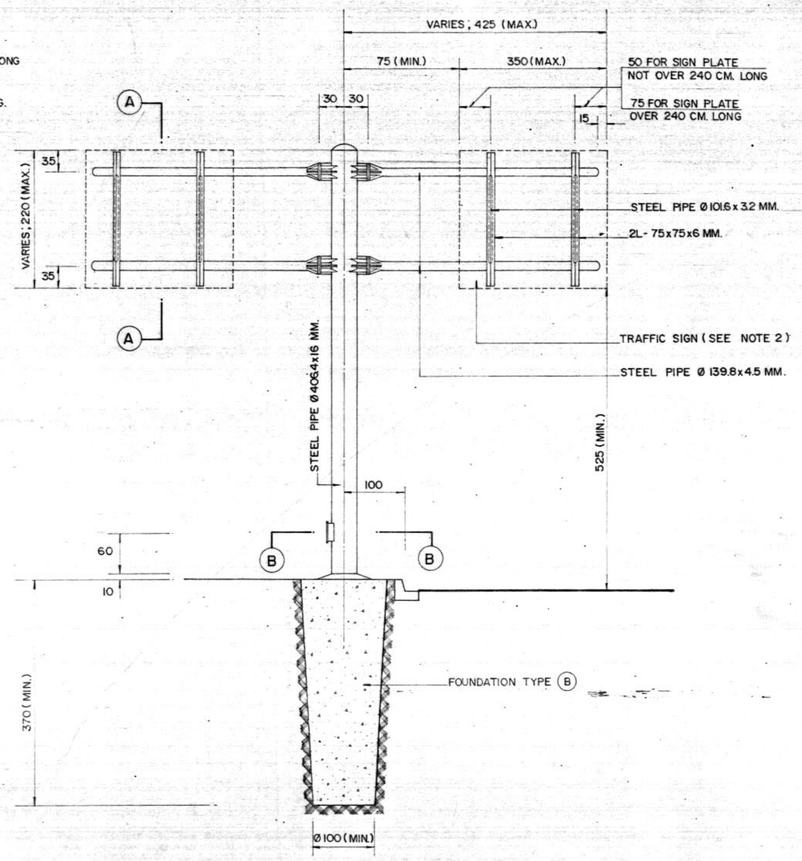
STEEL POLE FOR OVERHANGING TRAFFIC SIGN
FOR SIGN PLATE NOT MORE THAN 108,000 SQ.CM. - II

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS - 111
		SHEET NO. 28



STEEL POLE FOR OVERHANGING TRAFFIC SIGN TYPE I

SCALE 1 : 50



STEEL POLE FOR OVERHANGING TRAFFIC SIGN TYPE II

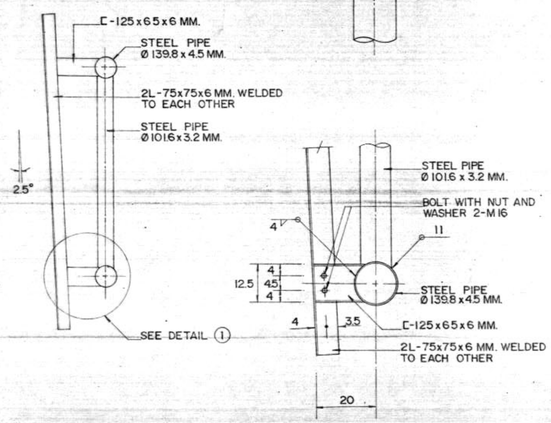
SCALE 1 : 50

NOTES :

1. DIMENSIONS FOR WELDING SYMBOLS ARE IN MILLIMETERS, ALL OTHER DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. THIS DRAWING SHALL BE USED FOR TRAFFIC SIGNS. WHERE THE AREA OF THE SIGN INCLUDING THE GAPS BETWEEN PLATES IS NOT MORE THAN 2x52,800 SQ.CM. THE MAXIMUM LENGTH AND WIDTH OF THE SIGN SHALL NOT EXCEED 350 CM. AND 220 CM. RESPECTIVELY.
3. THE FOUNDATION TYPE (A) SHALL BE USED IN A SIDE SLOPE AREA AND FOUNDATION TYPE (B) SHALL BE USED IN A SIDEWALK OR RAISED MEDIAN.
4. THE ALLOWABLE SOIL BEARING CAPACITY UNDER THE FOUNDATION TYPE (A) SHALL BE MORE THAN 5 TONS PER SQ.M. EMBANKMENT AROUND FOUNDATION TYPE (B) SHALL BE COMPACTED TO 90% OF THE MAXIMUM STANDARD DRY DENSITY.
5. THE DIMENSIONS OF STEEL PIPE SHOWN ARE THE OUTER DIAMETER AND THE THICKNESS OF THE PIPE. FOR EXAMPLE : Ø 406.4 x 16 MM. MEANS THE OUTER DIAMETER OF THE PIPE IS 406.4 MM. AND THE THICKNESS IS 16.0 MM.
6. STEEL PIPE SHALL CONFORM TO ONE OF THE FOLLOWING SPECIFICATIONS.
   - 6.1 TIS. 107 - 2517 GRADE HS 41
   - 6.2 JIS. G3444 GRADE STK 41
   - 6.3 ASTM. A 252-75 GRADE 2
7. STRUCTURAL STEEL SECTION SHALL CONFORM TO TIS 116 GRADE Fe 24.
8. STEEL PIPE, STRUCTURAL STEEL SECTION, STEEL PLATE, BOLTS, NUTS AND WASHERS SHALL BE GALVANIZED ZINC COATING SHALL NOT BE LESS THAN 550 GRAMS PER SQUARE METER.
9. ELECTRIC ARC WELDING WHICH CONFORMS TO AISC STANDARD SHALL BE USED FOR WELDING STEEL.
10. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOW :

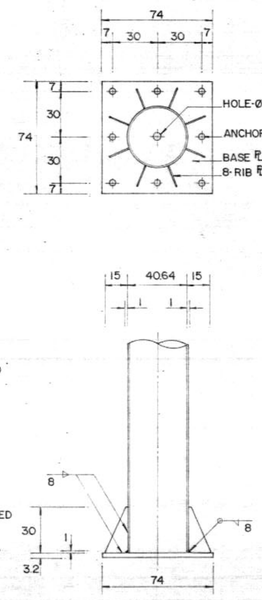
PORTLAND CEMENT TYPE I	350	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

11. MORTAR SHALL BE COMPRISED OF PORTLAND CEMENT AND SAND IN THE PROPORTION 1 TO 1.
12. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24 FOR ROUND BAR AND TIS. 24 GRADE SD 30 FOR DEFORMED BARS.
13. CANTILEVER BEAM SHALL BE INSTALLED PERPENDICULAR TO THE ROADWAY ALIGNMENT. CAMBER SHALL BE PROVIDED, FOR BEAM DEFLECTION.
14. WHERE SIGN LIGHTING IS REQUIRED, THE ELECTRICAL COMPONENTS SHALL CONFORM TO THE ELECTRICITY SUPPLY AUTHORITY'S REQUIREMENTS AND REGULATIONS.
15. THIS DRAWING SHALL BE USED IN COMBINATION WITH DWG. NO. RS-113.



SECTION (A)-(A)

SCALE 1 : 20

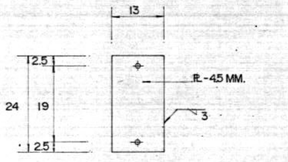


DETAILS (1)

SCALE 1 : 10

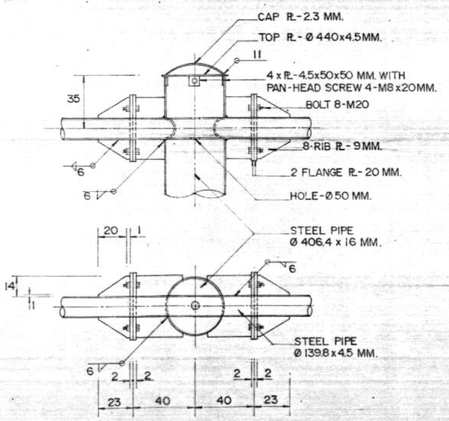
BASE OF STEEL POLE

SCALE 1 : 20



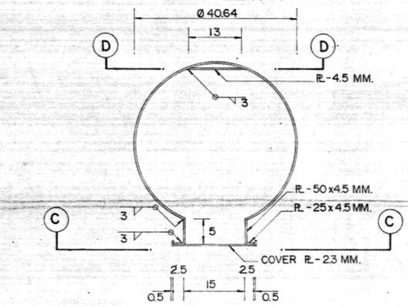
SECTION (D)-(D)

SCALE 1 : 7.5



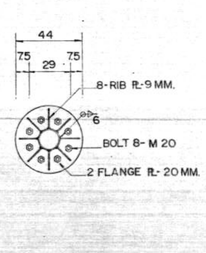
TOP OF STEEL POLE AND JOINT DETAILS

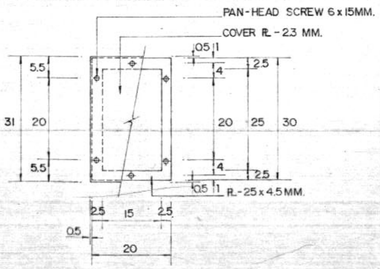
SCALE 1 : 20



SECTION (B)-(B)

SCALE 1 : 7.5





SECTION (C)-(C)

SCALE 1 : 7.5

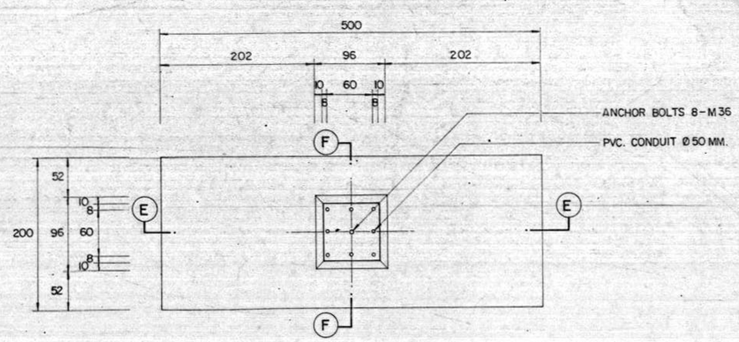
KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

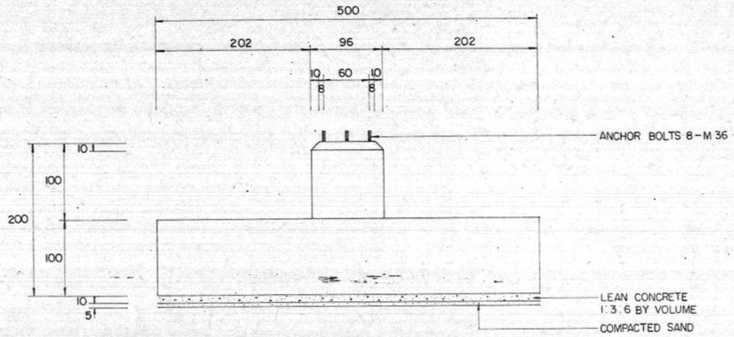
STANDARD DRAWING

STEEL POLE FOR TWO LEGS OVERHANGING TRAFFIC SIGN FOR SIGN PLATES NOT MORE THAN 2 x 52,800 SQ.CM.-I

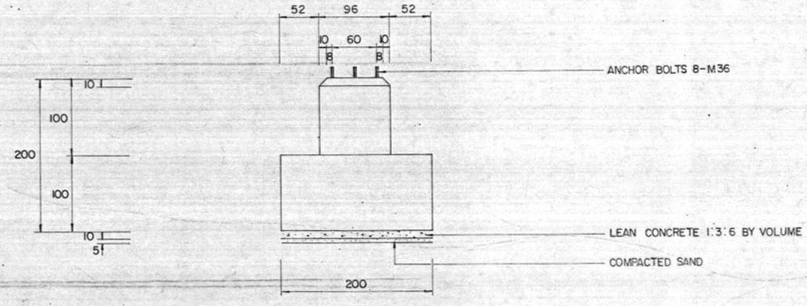
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-112
		SHEET NO. 29



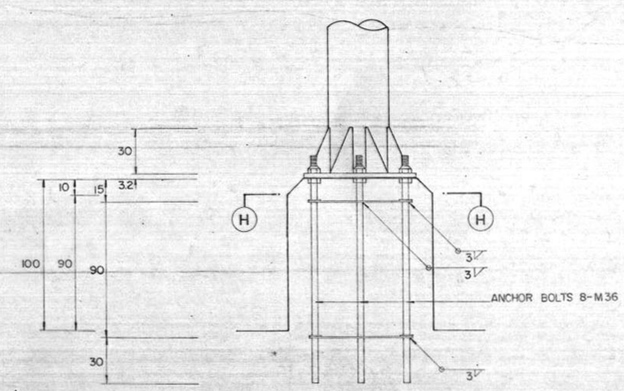
PLAN OF FOUNDATION TYPE (A)
SCALE 1 : 40



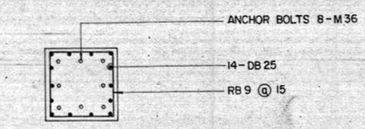
FRONT OF FOUNDATION TYPE (A)
SCALE 1 : 40



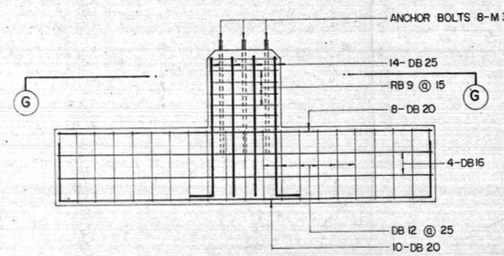
SIDE OF FOUNDATION TYPE (A)
SCALE 1 : 40



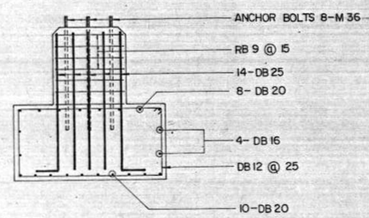
ANCHOR BOLT DETAILS
SCALE 1 : 20



SECTION (G) - (G)
SCALE 1 : 40



SECTION (E) - (E)
SCALE 1 : 40



SECTION (F) - (F)
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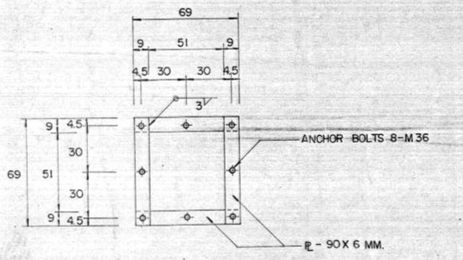
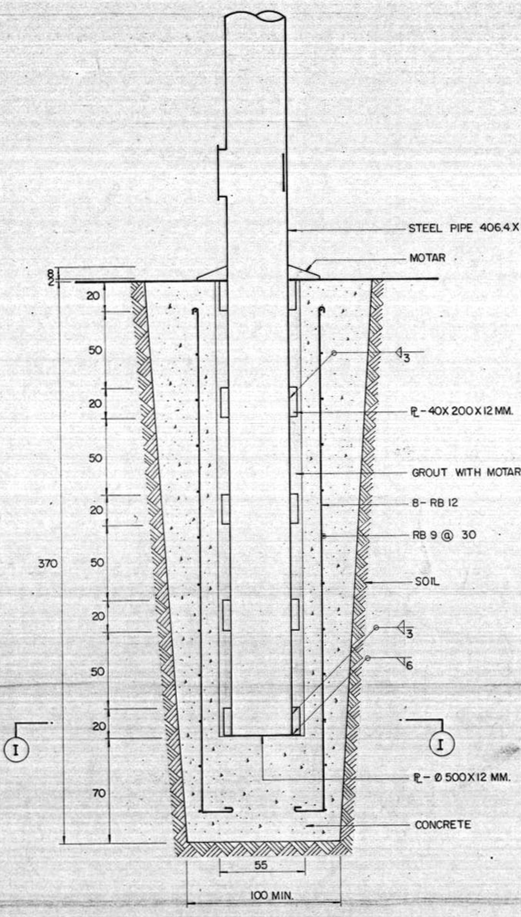
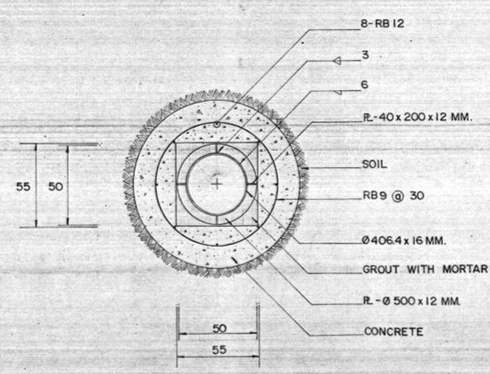


SECTION (H) - (H)
SCALE 1:20



FOUNDATION TYPE (B)
SCALE 1 : 20



SECTION (I) - (I)
SCALE 1 : 20

NOTES :

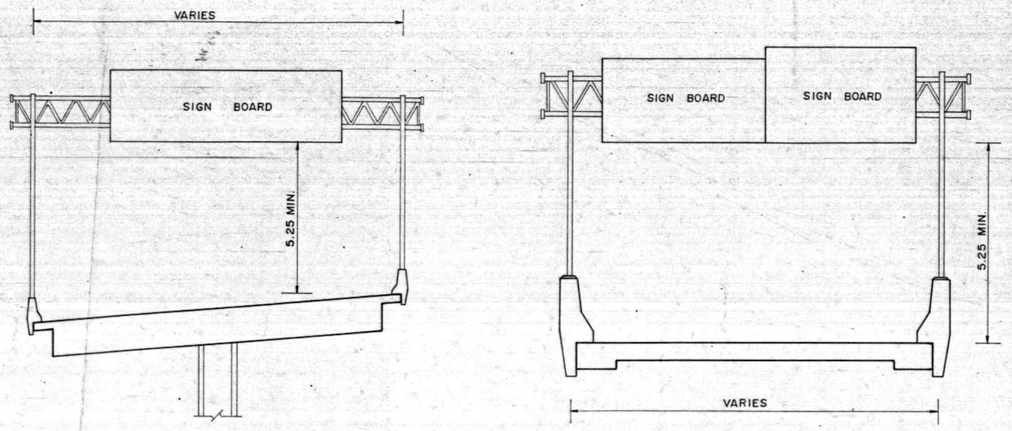
1. DIMENSIONS FOR WELDING SYMBOLS ARE IN MILLIMETERS, ALL OTHER DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. THIS DRAWING SHALL BE USED IN COMBINATION WITH DWG. NO. RS-112.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

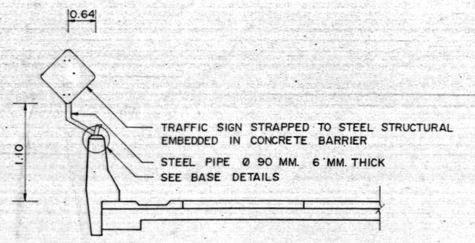
STANDARD DRAWING

STEEL POLE FOR TWO LEGS OVERHANGING TRAFFIC SIGN FOR SIGN PLATES NOT MORE THAN 2 x 52,800 SQ.CM.-II

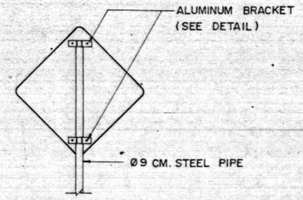
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-113
		SHEET NO. 30

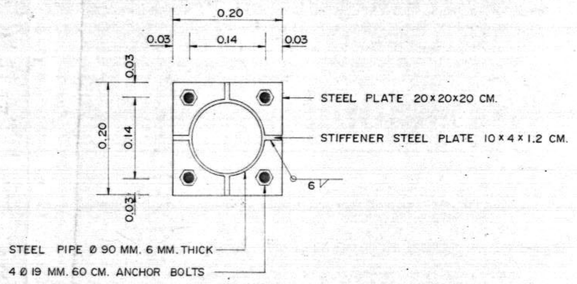


FRONT ELEVATION

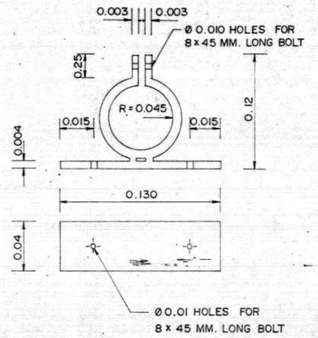


FRONT ELEVATION

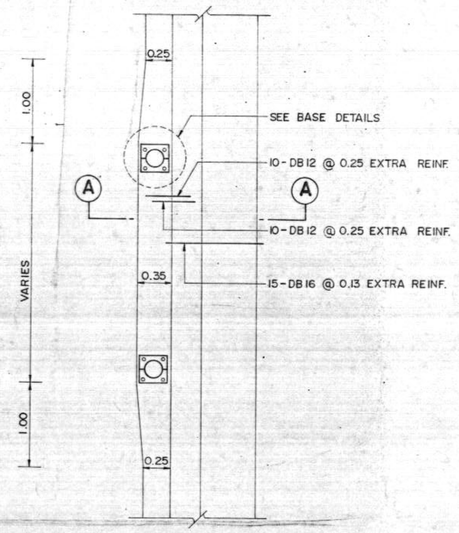




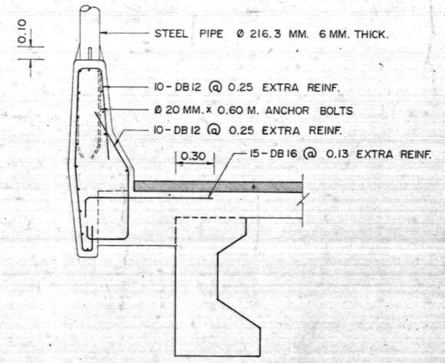
BASE DETAILS



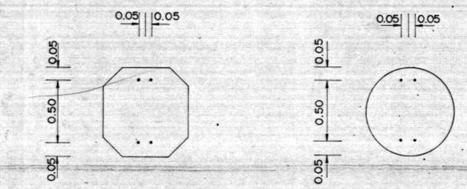
ALUMINUM BRACKET ASSEMBLY DETAILS
NOT TO SCALE



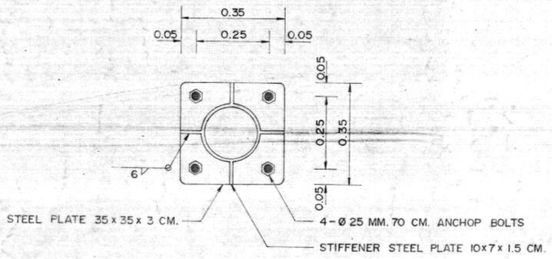
TOP VIEW



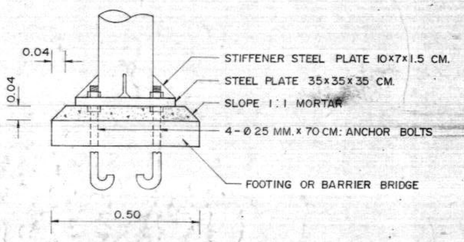
SECTION (A)-(A)



ASSEMBLY DETAILS



PLAN



SECTION

BASE DETAILS

OVERHEAD SIGN AND FRAME ON BARRIER
NOT TO SCALE

TRAFFIC SIGN AND FRAME ON BARRIER
NOT TO SCALE

NOTES :

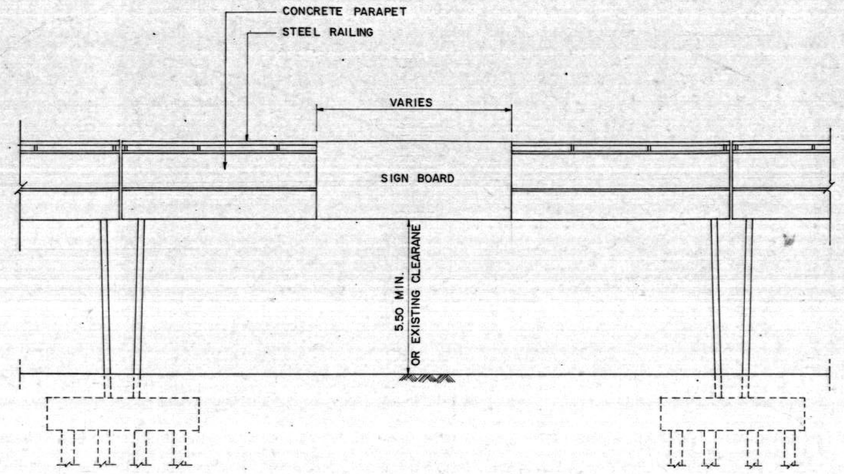
ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

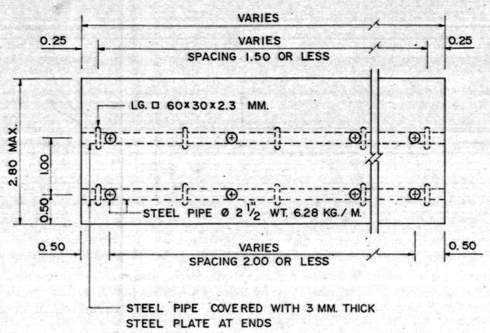
STANDARD DRAWING

INSTALLATION OF OVERHEAD SIGN AND FRAME TYPE II & TRAFFIC SIGN AND FRAME ON BARRIERS

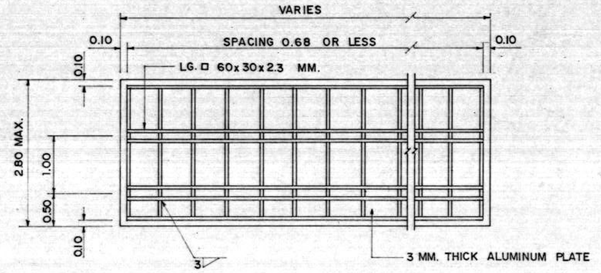
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-114
		SHEET NO. 31

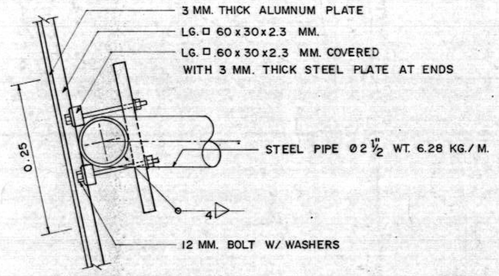


SIGN BOARD ERECTION ON BRIDGE DECK
SCALE 1 : 100

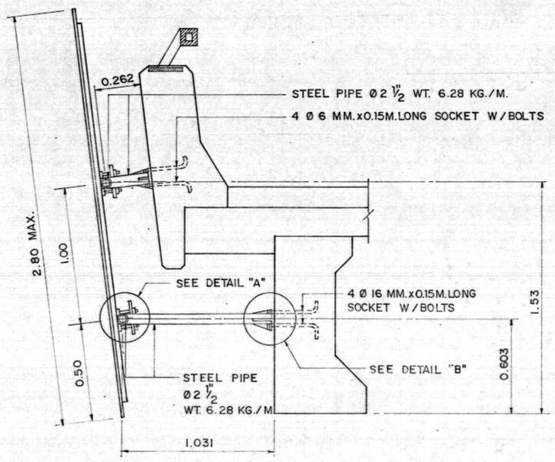


TYPICAL SIGN FRAME
SCALE 1 : 50

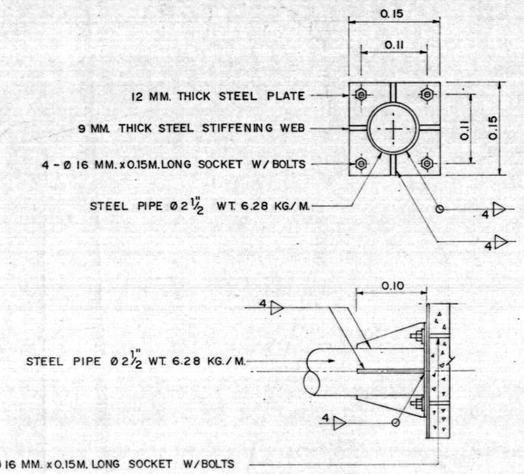




DETAIL "A"
SCALE 1 : 5



TYPICAL SIGN FRAME SUPPORT
SCALE 1 : 20



DETAIL "B"
SCALE 1 : 5

NOTES

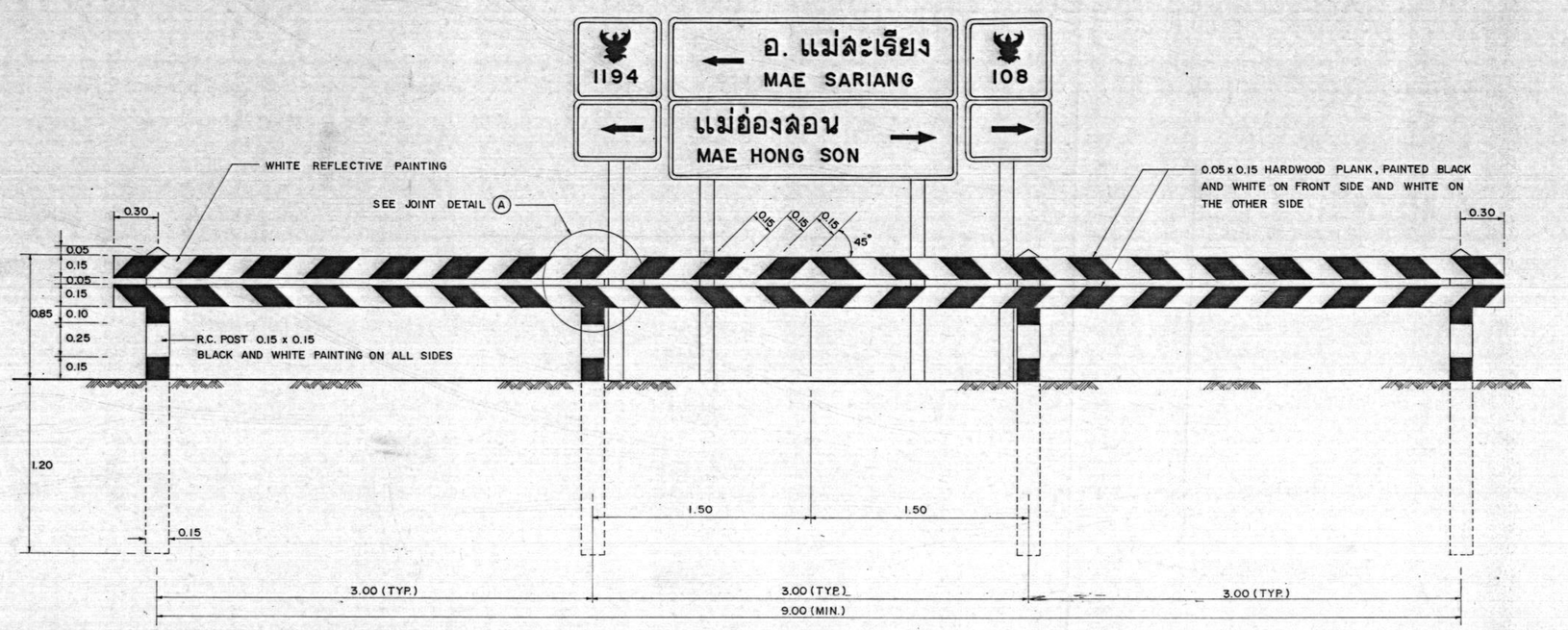
1. DIMENSIONS SHOWN ARE IN METERS EXCEPT WELDING SYMBOLS ARE IN MILLIMETERS, OR OTHERWISE INDICATED.
2. STRUCTURAL CARBON STEEL SHALL CONFORM TO TIS. 116 GRADE Fe 24.
3. STEEL PIPE SHALL BE PLAIN ENDS, MEDIUM CLASS CONFORM TO TIS. 107 GRADE HS 41.
4. VERTICAL PIPE POST SHALL BE CONNECTED AT UPPER PART.
5. LIGHT GAUGE STEEL (L.G.) OF SIGN FRAME SHALL BE CONNECTED TOGETHER WITH 3 MM. WELD.
6. ALL STEEL AND BOLT ASSEMBLY SHALL BE GALVANIZED. ZINC COATING SHALL NOT BE LESS THAN 550 GRAMS PER SQUARE METER.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

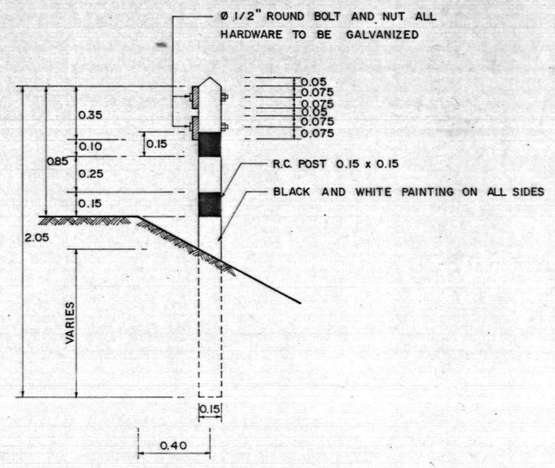
STANDARD DRAWING

STEEL FRAME FOR MOUNTING OVERHEAD SIGNS AT BRIDGE DECK

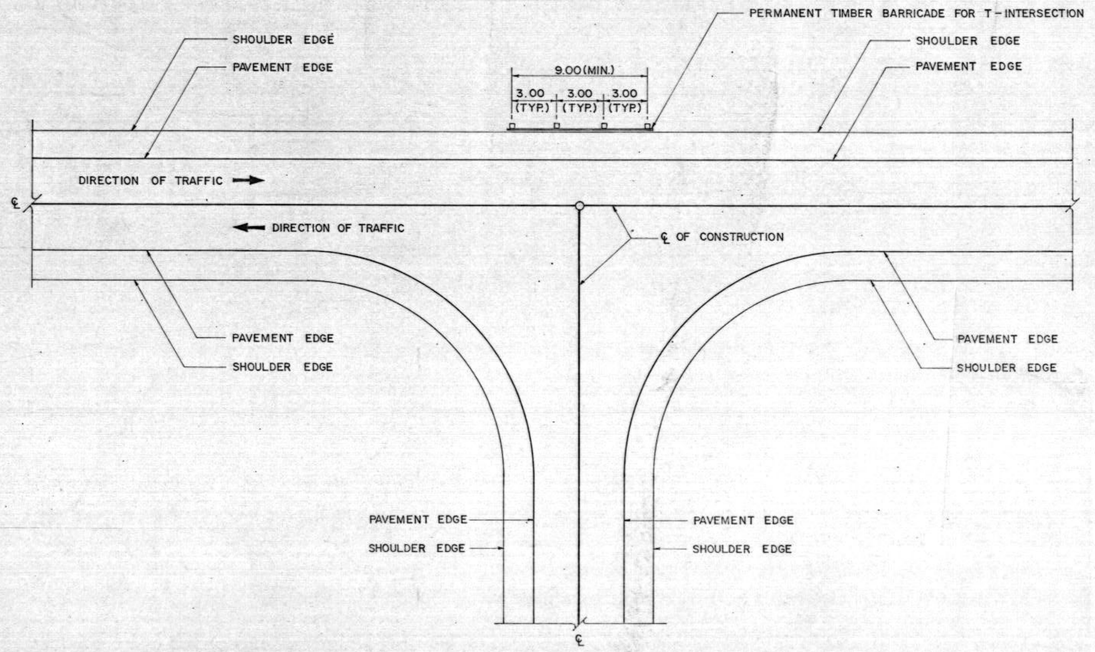
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-115
		SHEET NO. 32



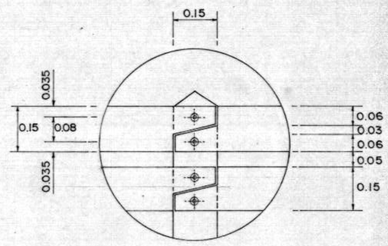
FRONT ELEVATION
SCALE 1 : 20



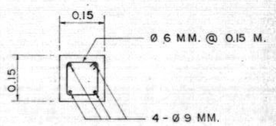
SIDE VIEW
SCALE 1 : 20



PLAN
NOT TO SCALE



JOINT DETAIL "A"
SCALE 1 : 10



R.C. POST SECTION
SCALE 1 : 10

NOTES :

1. DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. THIS DRAWING SHOWN THE DETAIL OF TIMBER BARRICADE ONLY, ACTUAL LOCATION OF BARRICADE SHALL BE AS INDICATED ON THE DETAIL OF INTERSECTION DRAWING OR AS DIRECTED BY THE ENGINEER.
3. ALL WOOD PORTION SHALL BE GIVEN ONE COAT OF PRIMING PAINT IN ACCORDANCE WITH TIS. 357 AND TO FIELD COATS OF GLOSS ENAMEL PAINT IN ACCORDANCE WITH TIS. 327 WHITE PAINT IN THE LAST COATING SHALL BE REFLECTORIZED.
4. R.C. POST SHALL BE GIVEN TWO COATS OF PAINT IN ACCORDANCE WITH TIS. 327.
5. ALL TRAFFIC SIGNS SHALL BE IN ACCORDANCE WITH THE MANUAL OF TRAFFIC CONTROL DEVICES AS PUBLISHED BY THE DEPARTMENT OF HIGHWAYS 1988, THE SPECIFICATIONS, THE SPECIAL PROVISIONS AND THE DRAWINGS.
6. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 180 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	320	KG.(MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM.(MAX.)

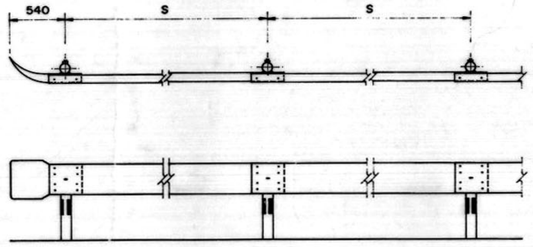
7. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

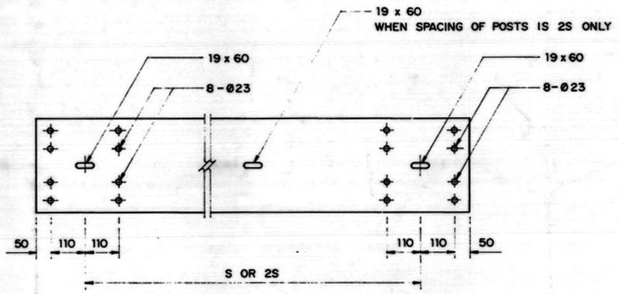
STANDARD DRAWING

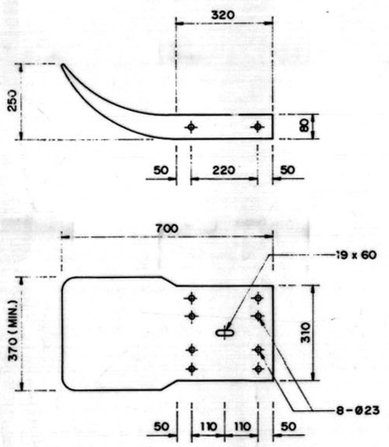
PERMANENT TIMBER BARRICADE FOR T-INTERSECTION

DESIGNED: D.O.H. & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: (DIRECTOR GENERAL)		DWG. NO. RS-201
		SHEET NO. 33

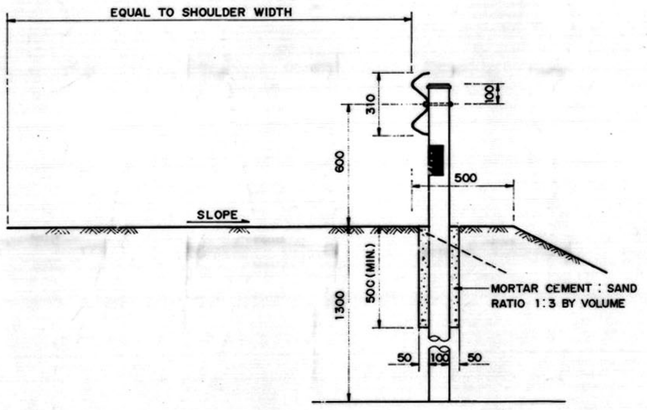


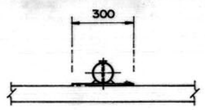
PLAN AND ELEVATION
SCALE 1 : 30



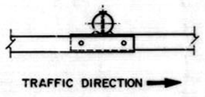


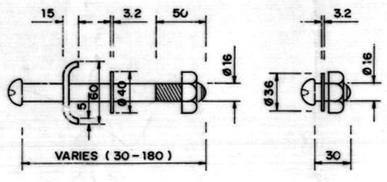
TERMINAL SECTION
SCALE 1 : 10



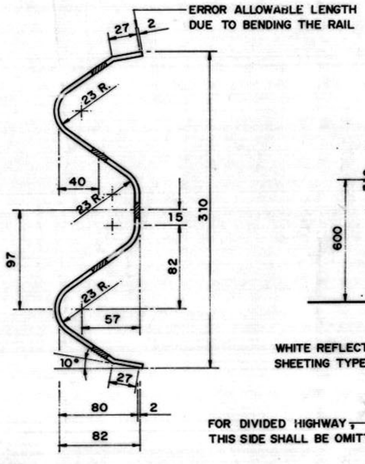


BACK-UP PLATE
SCALE 1 : 15

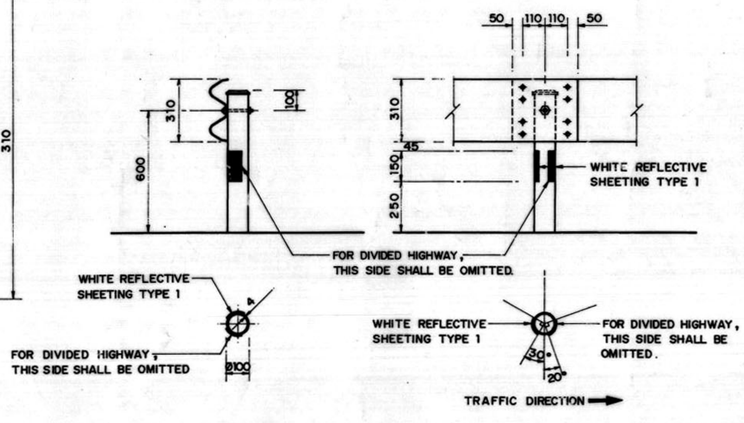




BOLT & NUT
SCALE 1 : 3



RAIL SECTION
SCALE 1 : 3



POST
SCALE 1 : 15

NOTES :

1. ALL DIMENSION ARE IN MILLIMETERS UNLESS OTHERWISE INDICATED.
2. GUARDRAIL SHALL CONFORM TO THE FOLLOWING REQUIREMENT :
   - 2.1 STEEL RAIL SHALL BE MADE FROM STEEL OF THICKNESS NOT LESS THAN THE MINIMUM THICKNESS SPECIFIED FOR EACH CLASS OF RAIL AND SHALL BE GALVANIZED WITH THE MINIMUM WEIGHT OF ZINC COATING ACCORDING TO THE TYPE OF RAIL AS SPECIFIED IN TABLE BELOW :

RAIL CLASS	RAIL TYPE	MIN. RAIL THICKNESS (MILLIMETER)	MIN. WEIGHT OF ZINC COATING (GRAMS PER SQUAREMETER)
1	1	3.2	550
	2	3.2	1,100
2	1	2.5	550
	2	2.5	1,100

   - 2.2 MECHANICAL PROPERTES OF RAIL :

RAIL CLASS	RAIL TYPE	MIN. ULTIMATE TENSILE STRENGTH (KG/MM.²)	MIN. PERCENTAGE OF ELONGATION	MAX. DEFLECTION			
				MAX.LOAD TRAFFIC FACE UP		MAX.LOAD TRAFFIC FACE DOWN	
				KG.	DEFLECTION (MM.)	KG.	DEFLECTION (MM.)
1	1	41	21	910	50	720	50
	2			1,360	75	1,090	75
2	1	41	21	680	50	545	50
	2			910	75	720	75

   - 2.3 POST SHALL BE GALVANIZED STANDARD STEEL PIPE
   - 2.4 THE GALVANIZING OF BOLTS, NUTS, WASHERS AND SIMILAR THREADED FASTENERS SHALL BE IN ACCORDANCE WITH TIS.171 CLASS 5.8
3. UNLESS OTHERWISE SPECIFIED, GUARDRAIL CLASS 1 SHALL BE USED FOR HIGHWAY CLASS D AND CLASS 1 FOR OTHER HIGHWAY CLASSES, GUARDRAIL CLASS 2 SHALL BE USED.
4. IN CASE OF HIGH RESISTANCE TO CORROSION REQUIREMENT, GUARDRAIL TYPE 2 SHALL BE USED.
5. SPACING OF POSTS SHALL BE LOCATED AS FOLLOWS

RADIUS OF CURVE R (M.)	SPACING OF POSTS S (M.)
ON TANGENT OR R ≥ 700	4.00
450 ≤ R < 700	3.00
150 ≤ R < 450	2.00
R < 150	1.00

*HEIGHT OF FILL H (M.)	SPACING OF POSTS S (M.)
H ≤ 3.00	4.00
3.00 < H ≤ 4.00	3.00
4.00 < H ≤ 5.00	2.00
5.00 < H ≤ 7.00	1.00

*FOR SIDE SLOPE 2 : 1 OR STEEPER

FOR HORIZONTAL CURVE WITH HIGH FILL, THE MINIMUM SPACING VALUE OF THE ONE SHALL BE GOVERN.

6. GUARDRAIL, IN GENERAL, IS MORE SUITABLE THAN GUIDE POST ON HORIZONTAL CURVE SECTION WITH HIGH FILL MORE THAN 5.00 M. (AND SIDE SLOPE IS STEEPER THAN 3:1) AND NOT RECOMMENDED FOR HIGH FILL OVER 700 M.
7. GUARDRAIL INSTALLED IN CURVE WHERE RADIUS IS LESS THAN 50 M. SHALL BE PRE-BENT FROM THE FACTORY.
8. BACK-UP PLATE OF THE SAME CLASS AND TYPE AS THE RAIL WITH INTERMEDIATE POST SHALL BE PROVIDED WHERE SPACING OF POSTS IS 2S M.
9. UNLESS OTHERWISE SPECIFIED ON THIS DRAWING, GUARDRAIL SHALL BE IN ACCORDANCE WITH TIS. 248
10. REFLECTIVE SHEETING SHALL CONFORM TO TIS. 606 TYPE 1. (ESEFFICIENT OF RETRO-REFLECTION LEVEL 1)

REMARK :

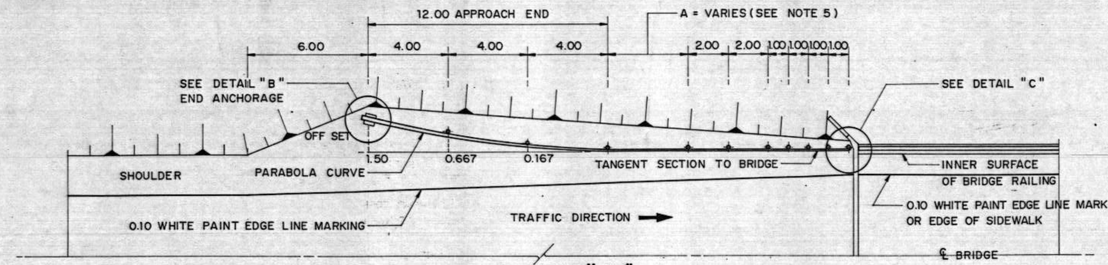
THIS BARRIER IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

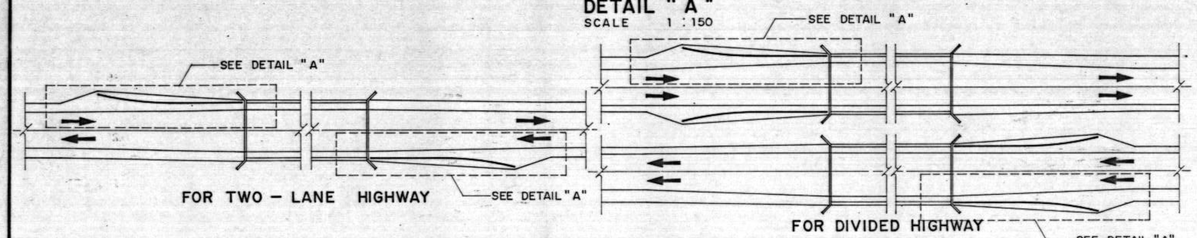
STANDARD DRAWING

W-BEAM GUARDRAIL

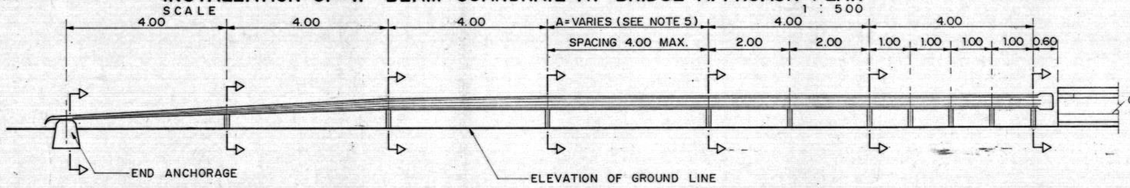
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Buranapong (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-301
		SHEET NO. 24

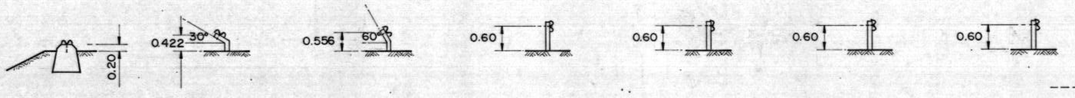


DETAIL "A"
SCALE 1 : 150

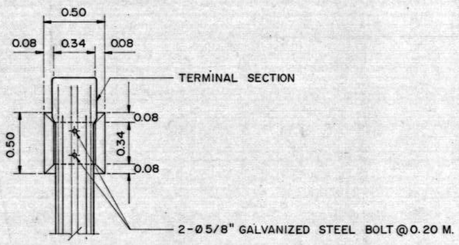


INSTALLATION OF W-BEAM GUARDRAIL AT BRIDGE APPROACH PLAN
SCALE 1 : 500

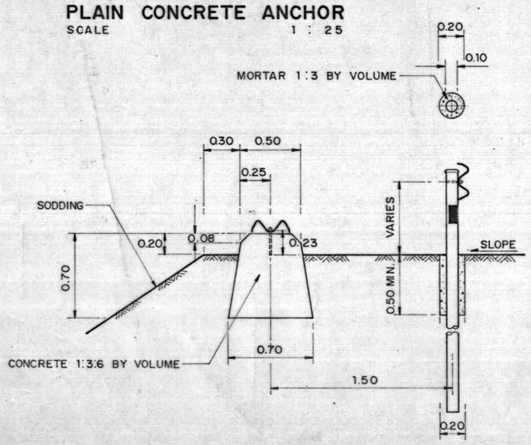




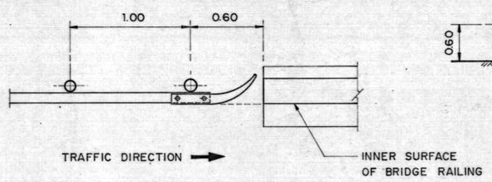
ELEVATION
SCALE 1 : 75



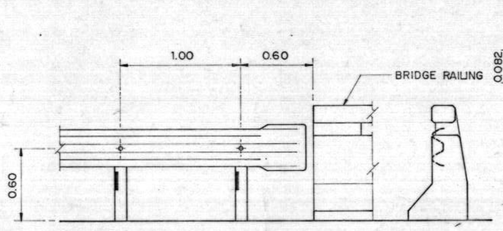
PLAIN CONCRETE ANCHOR
SCALE 1 : 25



DETAIL "B"
SCALE 1 : 25

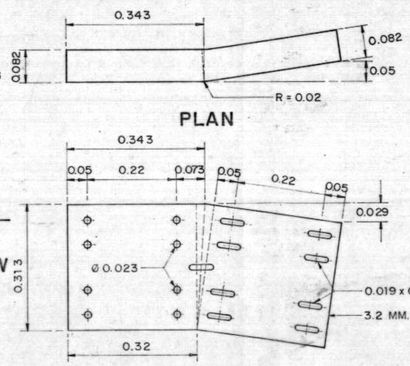


PLAN



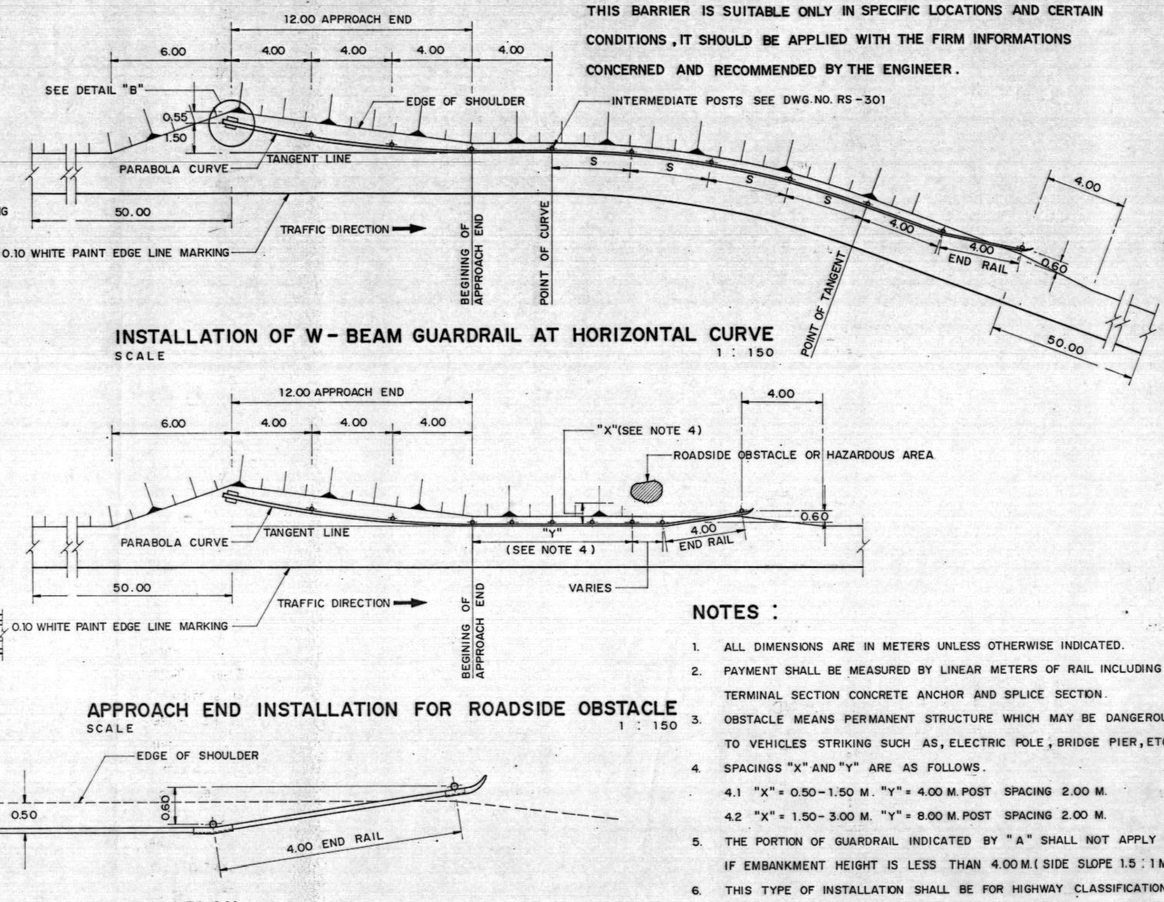
ELEVATION SIDE VIEW

DETAIL "C"
SCALE 1 : 25



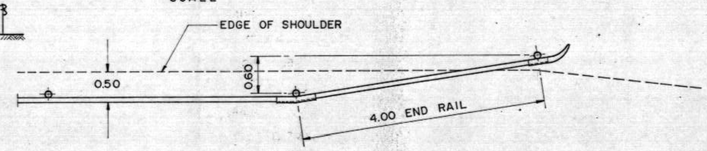
ELEVATION

SPLICE SECTION
NOT TO SCALE

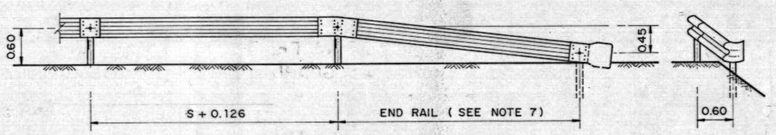


INSTALLATION OF W-BEAM GUARDRAIL AT HORIZONTAL CURVE
SCALE 1 : 150

APPROACH END INSTALLATION FOR ROADSIDE OBSTACLE
SCALE 1 : 150

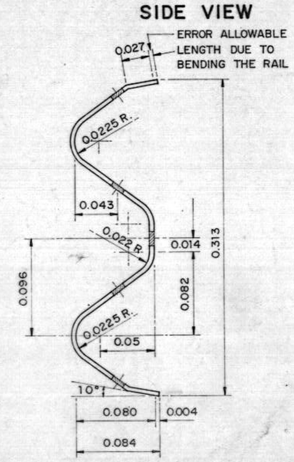


PLAN



ELEVATION

END RAIL
SCALE 1 : 50



SIDE VIEW

REMARK :

THIS BARRIER IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. PAYMENT SHALL BE MEASURED BY LINEAR METERS OF RAIL INCLUDING TERMINAL SECTION CONCRETE ANCHOR AND SPLICE SECTION.
3. OBSTACLE MEANS PERMANENT STRUCTURE WHICH MAY BE DANGEROUS TO VEHICLES STRIKING SUCH AS, ELECTRIC POLE, BRIDGE PIER, ETC.
4. SPACINGS "X" AND "Y" ARE AS FOLLOWS.
   - 4.1 "X" = 0.50 – 1.50 M. "Y" = 4.00 M. POST SPACING 2.00 M.
   - 4.2 "X" = 1.50 – 3.00 M. "Y" = 8.00 M. POST SPACING 2.00 M.
5. THE PORTION OF GUARDRAIL INDICATED BY "A" SHALL NOT APPLY IF EMBANKMENT HEIGHT IS LESS THAN 4.00 M. (SIDE SLOPE 1.5 : 1 MAX.)
6. THIS TYPE OF INSTALLATION SHALL BE FOR HIGHWAY CLASSIFICATIONS OF D AND 1 OR OTHERWISE INDICATED.
7. DIVIDED HIGHWAYS DO NOT NEED END RAIL.

WARRANTING FEATURES FOR W-BEAM GUARDRAIL INSTALLATION

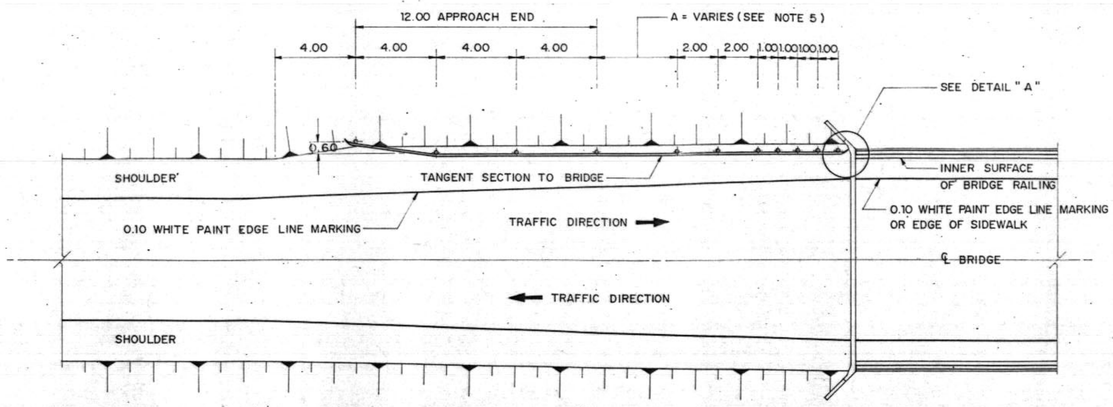
1. POSSIBLE HAZARDS FROM ROAD SIDE.
2. HEIGHT OF EMBANKMENT OF ROADWAY IS MORE THAN 5.00 M. (7.00 M. MAXIMUM.) AND SIDE SLOPE IS STEEPER THAN 3 : 1.
3. STEEPNESS OF DOWNGRADE IS MORE THAN 6% AND HEIGHT OF EMBANKMENT IS MORE THAN 3.00 M.
4. DEPTH OF WATER AT TOE OF SLOPE IS MORE THAN 1.50 M.
5. HORIZONTAL CURVE WITH RADIUS OF CURVE LESS THAN 150 M.
6. ROADSIDE HAZARDOUS TOPOGRAPHY, SUCH AS RIVERS, DEEP VALLEYS, ROCKS ON THE FILL SLOPE WHICH MAY POSSIBLE GIVE SERIOUS DAMAGE TO VEHICLES, SPECIAL CONSIDERATION MUST BE PAID TO BOTH ECONOMY AND SAFETY.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

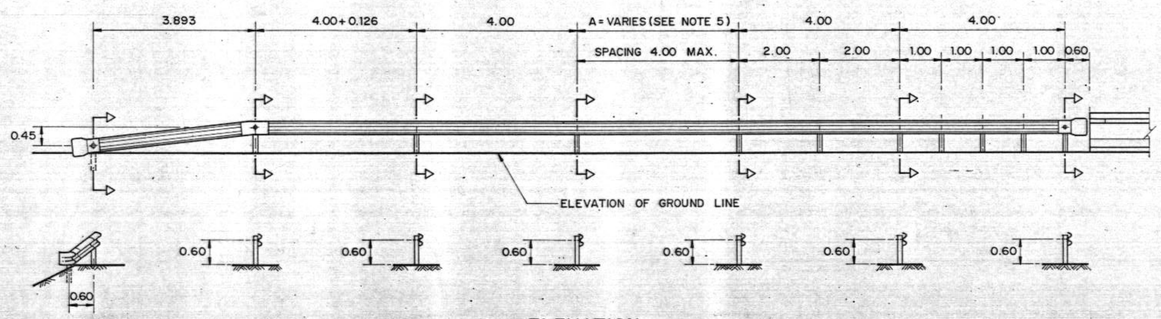
W-BEAM GUARDRAIL INSTALLATION AND
W-BEAM GUARDRAIL APPROACH TYPE I

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-302
		SHEET NO. 35



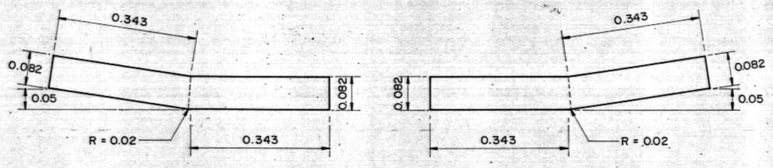
INSTALLATION OF W-BEAM GUARDRAIL AT BRIDGE APPROACH PLAN

SCALE 1 : 150

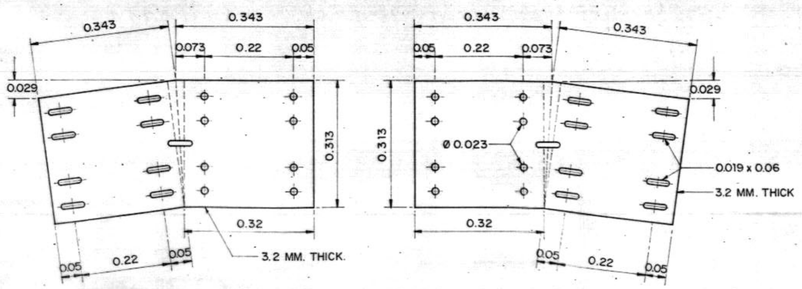


ELEVATION

SCALE 1 : 75



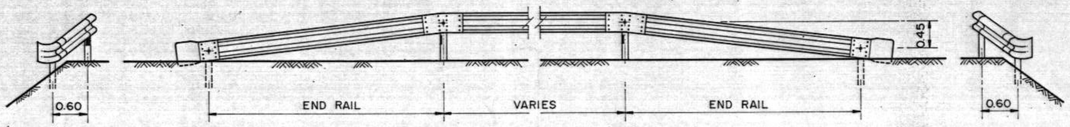
PLAN



ELEVATION

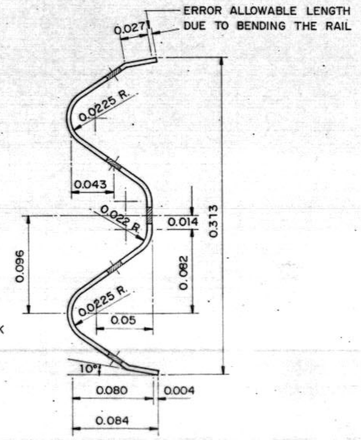
SPLICE SECTION

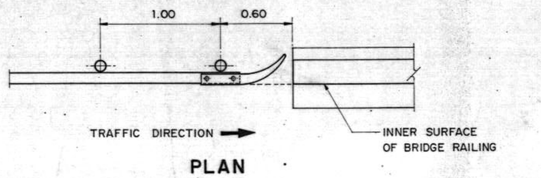
NOT TO SCALE



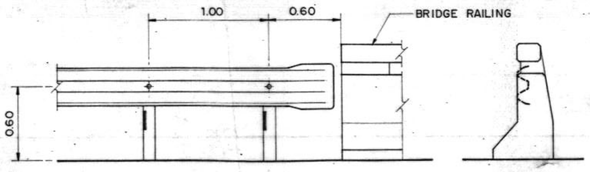
ELEVATION

SCALE 1 : 50





PLAN



ELEVATION

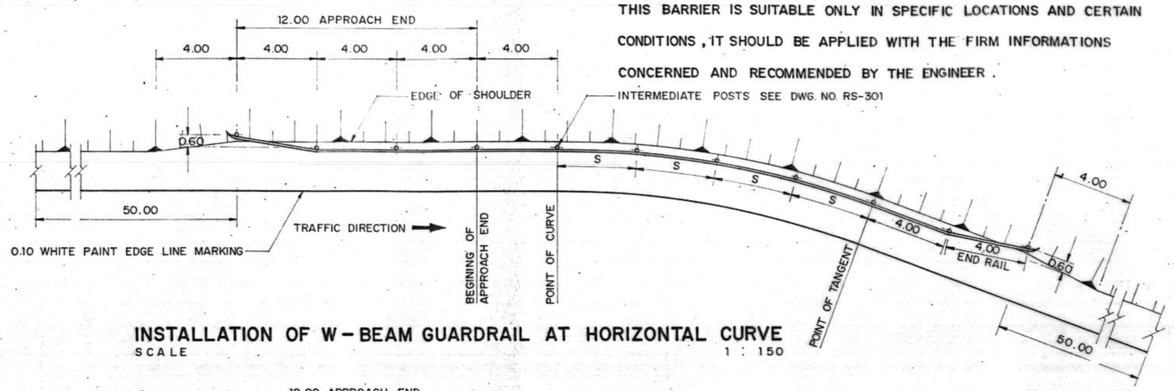
SIDE VIEW

DETAIL "A"

SCALE 1 : 25

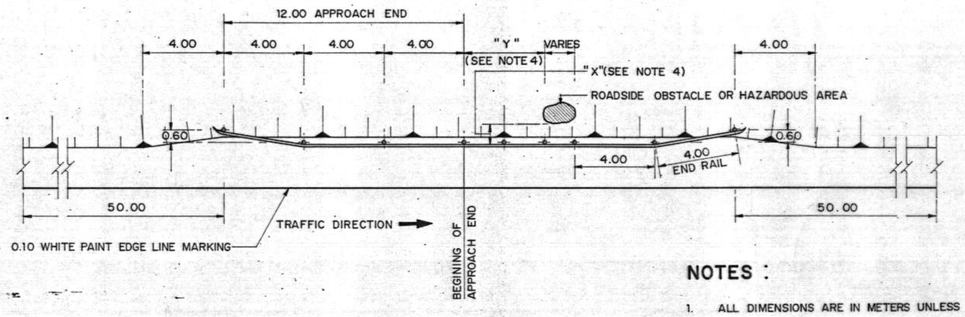
REMARK :

THIS BARRIER IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.



INSTALLATION OF W-BEAM GUARDRAIL AT HORIZONTAL CURVE

SCALE 1 : 150



APPROACH INSTALLATION FOR ROADSIDE OBSTACLE

SCALE 1 : 150

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. PAYMENT SHALL BE MEASURED BY LINEAR METERS OF RAIL INCLUDING TERMINAL SECTION AND SPLICE SECTION.
3. OBSTACLE MEANS PERMANENT STRUCTURE WHICH MAY BE DANGEROUS TO VEHICLES STRIKING SUCH AS, ELECTRIC POLE, BRIDGE PIER, ETC.
4. SPACINGS "X" AND "Y" ARE AS FOLLOWS.
   - 4.1 "X" = 0.50 - 1.50 M. "Y" = 4.00 M. POST SPACING 2.00 M.
   - 4.2 "X" = 1.50 - 3.00 M. "Y" = 6.00 M. POST SPACING 2.00 M.
5. THE PORTION OF GUARDRAIL INDICATED BY "A" SHALL NOT APPLY IF EMBANKMENT HEIGHT IS LESS THAN 4.00 M. (SIDE SLOPE 1.5 : 1 MAX.)
6. THIS TYPE OF INSTALLATION SHALL BE FOR HIGHWAY CLASSIFICATIONS OF 2, 3 AND 4.

WARRANTING FEATURES FOR W-BEAM GUARDRAIL INSTALLATION

1. POSSIBLE HAZARDS FROM ROAD SIDE.
2. HEIGHT OF EMBANKMENT OF ROADWAY IS MORE THAN 5.00 M. (7.00 M. MAXIMUM.) AND SIDE SLOPE IS STEEPER THAN 3 : 1
3. STEEPNESS OF DOWNGRADE IS MORE THAN 6% AND HEIGHT OF EMBANKMENT IS MORE THAN 3.00 M.
4. DEPTH OF WATER AT TOE OF SLOPE IS MORE THAN 1.50 M.
5. HORIZONTAL CURVE WITH RADIUS OF CURVE LESS THAN 150 M.
6. ROADSIDE HAZARDOUS TOPOGRAPHY SUCH AS RIVERS, DEEP VALLEYS, ROCKS ON THE FILL SLOPE WHICH MAY POSSIBLE GIVE SERIOUS DAMAGE TO VEHICLES, SPECIAL CONSIDERATION MUST BE PAID TO BOTH ECONOMY AND SAFETY.

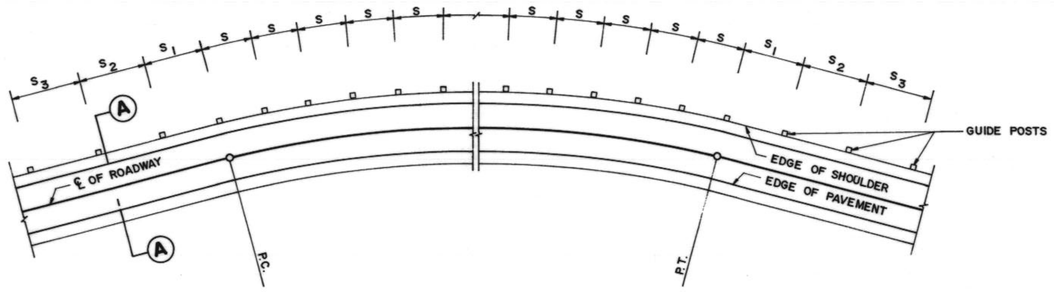
KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

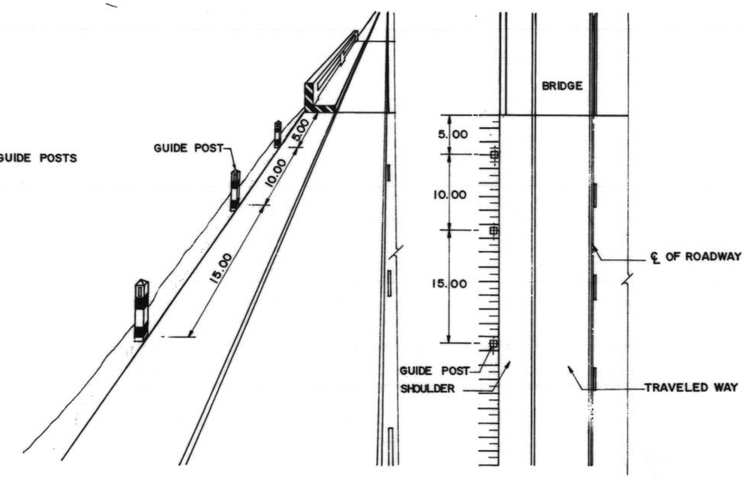
STANDARD DRAWING

W-BEAM GUARDRAIL INSTALLATION AND
W-BEAM GUARDRAIL APPROACH TYPE II

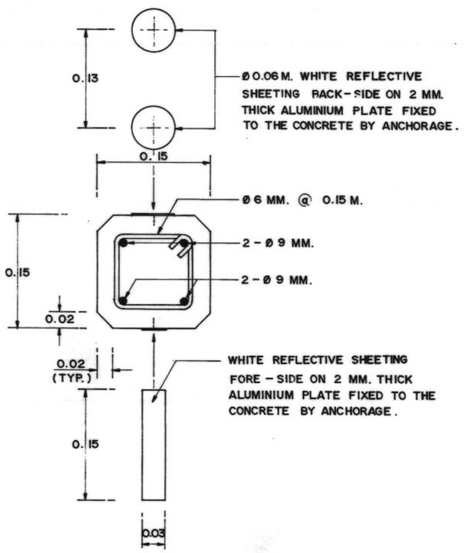
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-303
		SHEET NO. 36



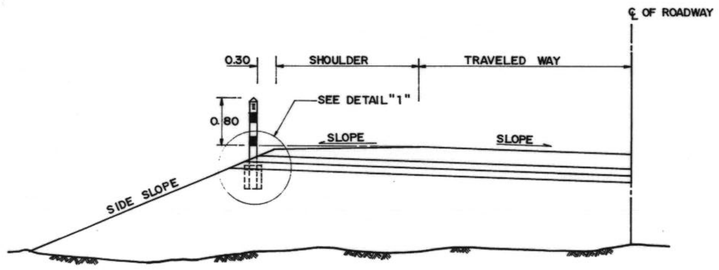
PLAN
NOT TO SCALE



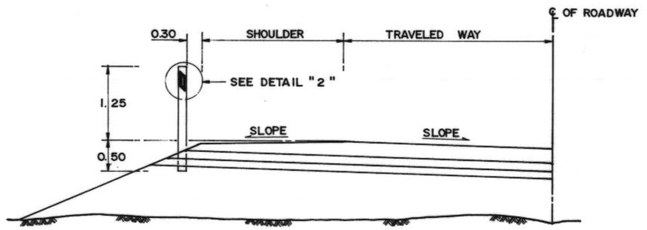
GUIDE POST INSTALLATION AT BRIDGE APPROACH
NOT TO SCALE



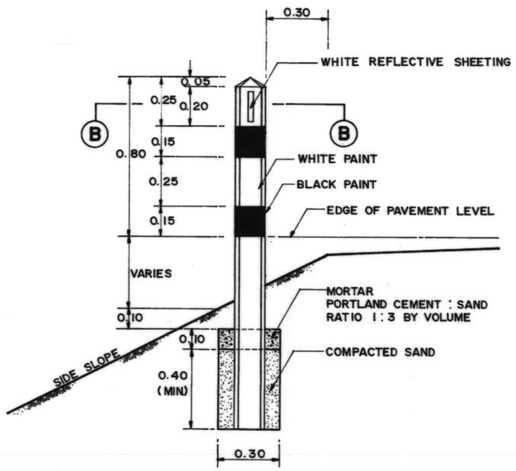
SECTION (B)-(B) CONCRETE TYPE
SCALE 1 : 4



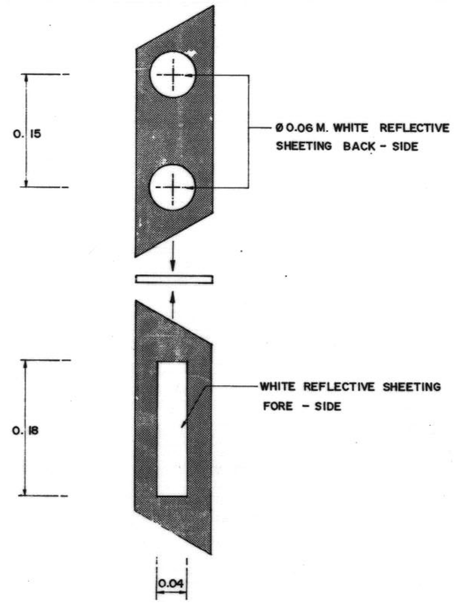
SECTION (A) - (A) CONCRETE TYPE
NOT TO SCALE



SECTION (A) - (A) FLEXIBLE TYPE
NOT TO SCALE



DETAIL "1"
SCALE 1 : 15



DETAIL "2"
SCALE 1 : 4

TABLE SPACING OF GUIDE POST

RADIUS OF CURVE (METER)	SPACING OF GUIDE POST (METER)			
	S	S_1	S_2	S_3
15-74	4	7	12	24
75-99	6	11	18	36
100-149	7	13	21	42
150 199	8	14	24	48
200-299	9	16	27	54
300-499	10	18	30	60
500-999	15	27	45	60
1000-1500	21	38	60	60

NOTES :

1. DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. REFLECTIVE SHEETING SHALL CONFORM TO TIS. 606 TYPE I (ESEFFICIENT OF RETRO-REFLECTION LEVEL 1)
3. BLACK AND WHITE PAINTS SHALL CONFORM TO TIS 327 AND SHALL BE APPLIED ON ALL FACES IN TWO LAYERS.
4. POST SHALL BE ERECTED TRULY VERTICAL.
5. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 180 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE I	320	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

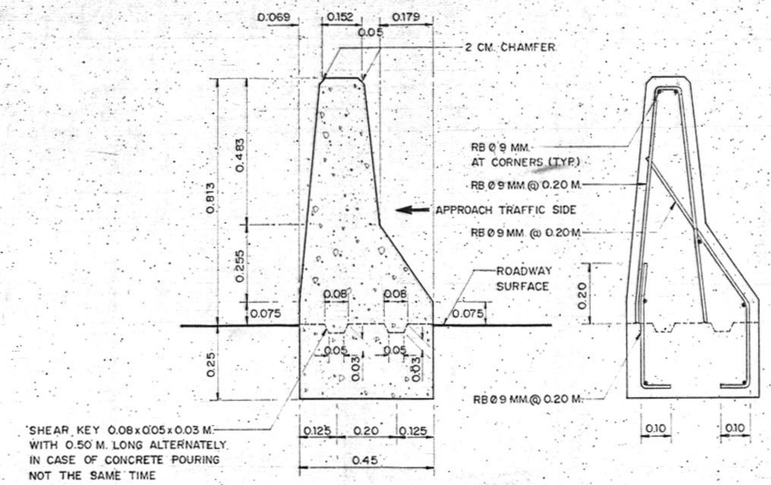
6. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR. 24

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

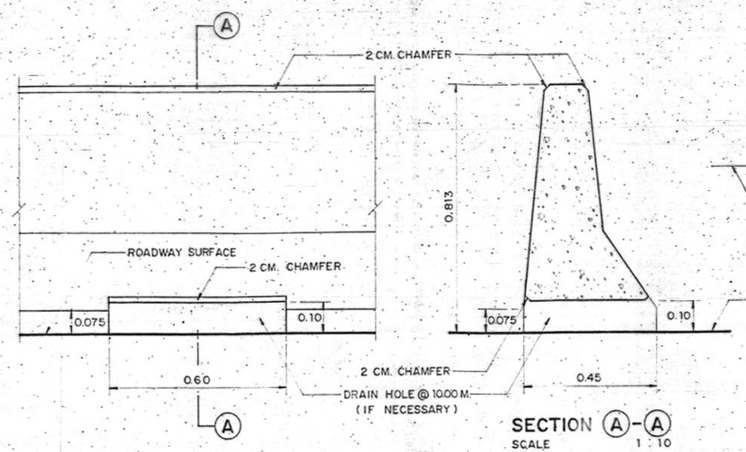
GUIDE POST INSTALLATION

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-401
		SHEET NO. 37



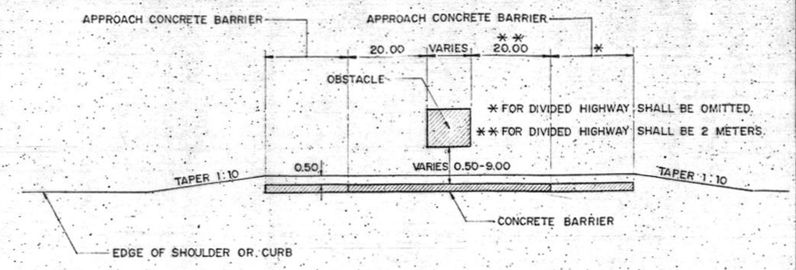
FRONT ELEVATION OF CONCRETE BARRIER TYPE I
SCALE 1 : 10

CONCRETE BARRIER TYPE I REINFORCEMENT DETAIL
SCALE 1 : 10.

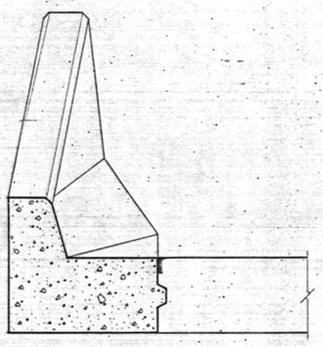


SIDE ELEVATION OF CONCRETE BARRIER TYPE I
SCALE 1 : 10

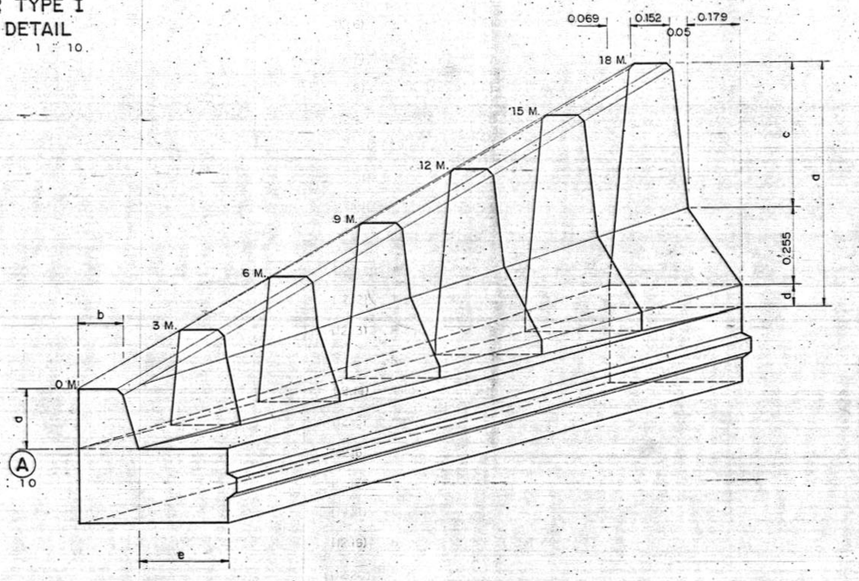
SECTION (A)-(A)
SCALE 1 : 10



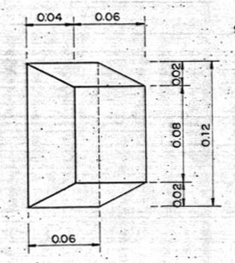
INSTALLATION OF CONCRETE BARRIER AT OBSTACLE
NOT TO SCALE



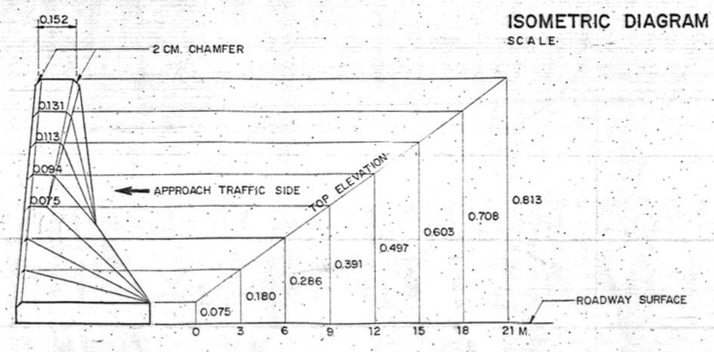
FRONT ELEVATION OF APPROACH CONCRETE BARRIER TYPE (A)
SCALE 1 : 10



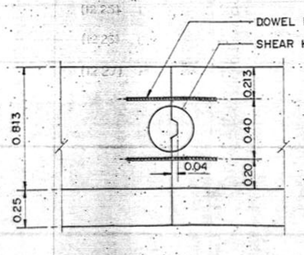
ISOMETRIC DIAGRAM OF APPROACH CONCRETE BARRIER TYPE (A)
SCALE 1 : 10



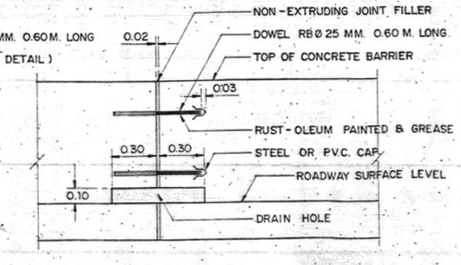
SHEAR KEY DETAIL
SCALE 1 : 2.5



APPROACH CONCRETE BARRIER TYPE (B)
SCALE 1 : 10



CONSTRUCTION JOINT DETAIL
SCALE 1 : 20



EXPANSION JOINT DETAIL
SCALE 1 : 20

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	350 KG. (MIN.)
SAND	0.43 M^3
CRUSHED ROCK OR GRAVEL	0.86 M^3
CONCRETE SLUMP	10 CM. (MAX.)

3. CLEAR CONCRETE COVER SHALL BE 5 CM.
4. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24 FOR ROUND BARS AND TIS. 24 GRADE SD 30 FOR DEFORMED BARS.
5. REINFORCEMENT AND OTHER DETAILS OF APPROACH CONCRETE BARRIER SHALL BE THE SAME AS CONCRETE BARRIER.
6. CONSTRUCTION JOINT SHALL BE PROVIDED AT 10.00 M. INTERVAL.
7. EXPANSION JOINT WITH NON-EXTRUDING JOINT FILLER SHALL BE PROVIDED AT 60.00 M. INTERVAL.
8. APPROACH CONCRETE BARRIER SHALL BE PAINTED IN BLACK AND WHITE STRIPE, 0.50 M. WIDE, IN TWO COATS. THE PAINT SHALL CONFORM TO TIS. 327.
9. PRE-CAST CONCRETE BARRIER TYPE 1 ACCORDING TO DRAWING NO. RS-504 SHALL BE USED INSTEAD OF CAST-IN-SITU CONCRETE BARRIER.

TABLE OF DIMENSIONS FOR APPROACH CONCRETE BARRIER TYPE (A)

TRANSITION DISTANCE (M.)	DIMENSIONS (M.)				
	a	b	c	d	e
0	0.200	0.150	0.000	0.000	0.300
3	0.302	0.150	0.082	0.013	0.250
6	0.404	0.150	0.161	0.025	0.200
9	0.507	0.151	0.242	0.038	0.150
12	0.609	0.151	0.322	0.050	0.100
15	0.711	0.152	0.403	0.063	0.050
18	0.813	0.152	0.483	0.075	0.000

REMARK :

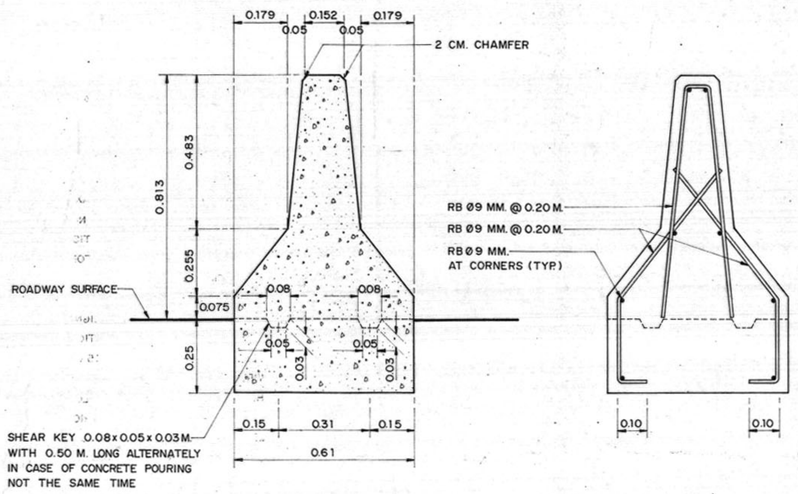
THIS BARRIER IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

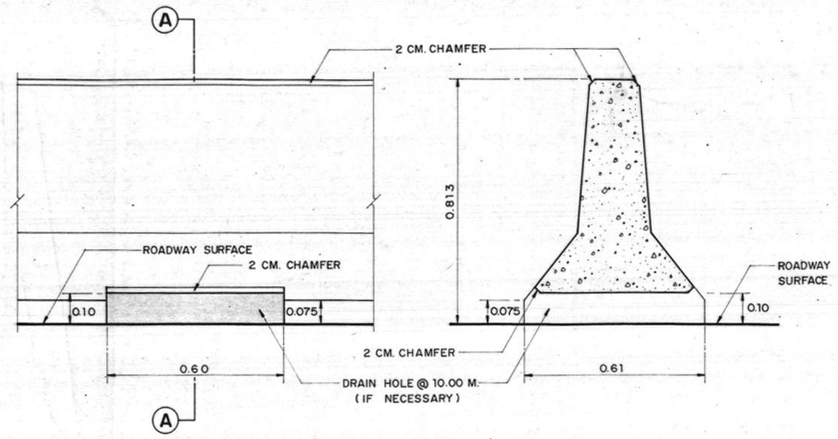
CONCRETE BARRIER TYPE I

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-501
		SHEET NO. 38



FRONT ELEVATION OF
CONCRETE BARRIER TYPE II
SCALE 1 : 10

CONCRETE BARRIER TYPE II
REINFORCEMENT DETAIL
SCALE 1 : 10



SIDE ELEVATION OF CONCRETE BARRIER TYPE II
SCALE 1 : 10

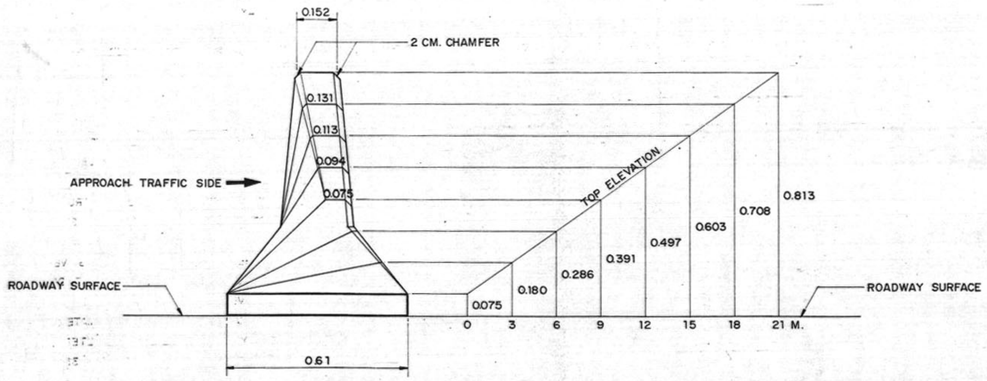
SECTION (A)-(A)
SCALE 1 : 10

NOTES :

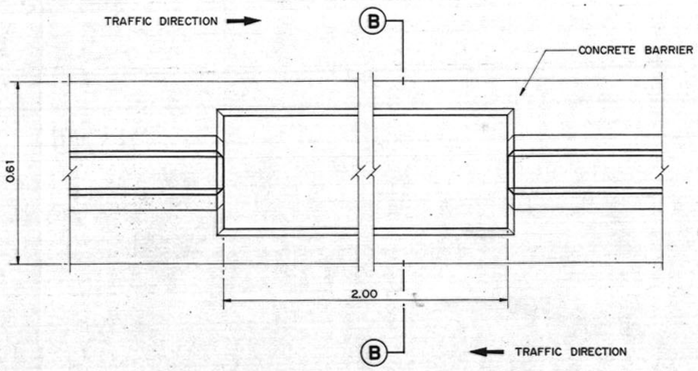
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	350 KG. (MIN.)
SAND	0.43 $M.^3$
CRUSHED ROCK OR GRAVEL	0.86 $M.^3$
CONCRETE SLUMP	10 CM. (MAX.)

3. CLEAR CONCRETE COVER SHALL BE 5 CM.
4. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24 FOR ROUND BARS AND TIS. 24 GRADE SD 30 FOR DEFORMED BARS.
5. REINFORCEMENT AND OTHER DETAILS OF APPROACH CONCRETE BARRIER SHALL BE THE SAME AS CONCRETE BARRIER.
6. CONSTRUCTION JOINT SHALL BE PROVIDED AT 10.00 M. INTERVAL.
7. EXPANSION JOINT WITH NON-EXTRUDING JOINT FILLER SHALL BE PROVIDED AT 60.00 M. INTERVAL.
8. APPROACH CONCRETE BARRIER SHALL BE PAINTED IN BLACK AND WHITE STRIPE 0.50 M. WIDE, IN TWO COATS. THE PAINT SHALL CONFORM TO TIS. 327.
9. PRE-CAST CONCRETE BARRIER TYPE II ACCORDING TO DRAWING NO. RS-505 SHALL BE USED INSTEAD OF CAST-IN-SITU CONCRETE BARRIER.



APPROACH CONCRETE BARRIER TYPE (C)
SCALE 1 : 10

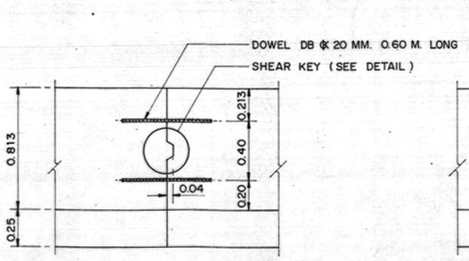


PLAN OF CONCRETE BARRIER OPENING FOR
PEDESTRIAN CROSS WALK
SCALE 1 : 10

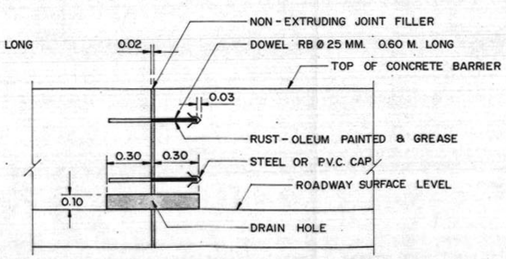
SECTION (B)-(B)
SCALE 1 : 10

REMARK :

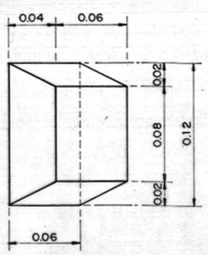
THIS BARRIER IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.



CONSTRUCTION JOINT DETAIL
SCALE 1 : 20



EXPANSION JOINT DETAIL
SCALE 1 : 20



SHEAR KEY DETAIL
SCALE 1 : 2.5

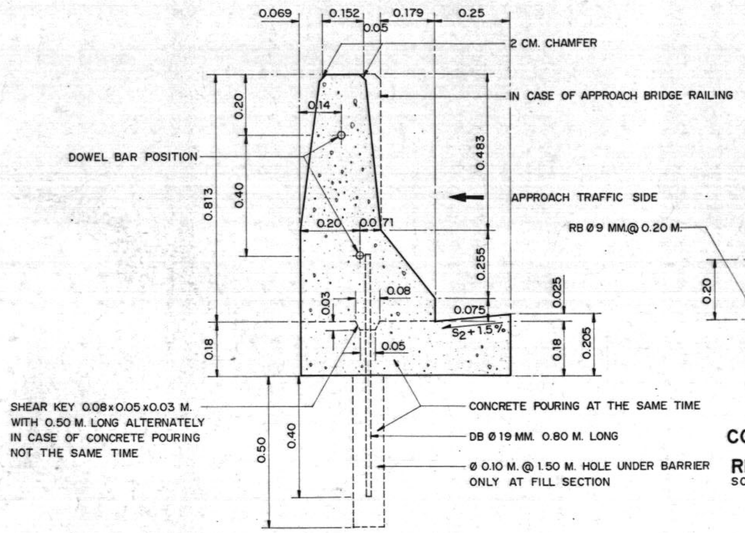
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

CONCRETE BARRIER TYPE II

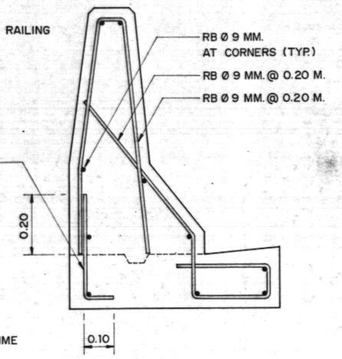
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-502
		SHEET NO. 39

REMARK : THIS BARRIER IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.



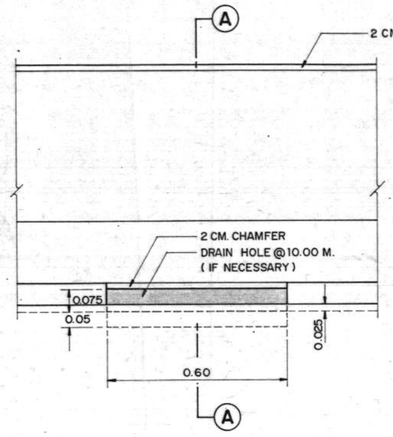
FRONT ELEVATION OF CONCRETE BARRIER TYPE I

SCALE 1 : 10



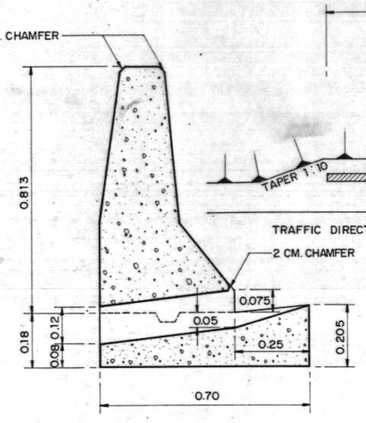
CONCRETE BARRIER TYPE I REINFORCEMENT DETAIL

SCALE 1 : 10



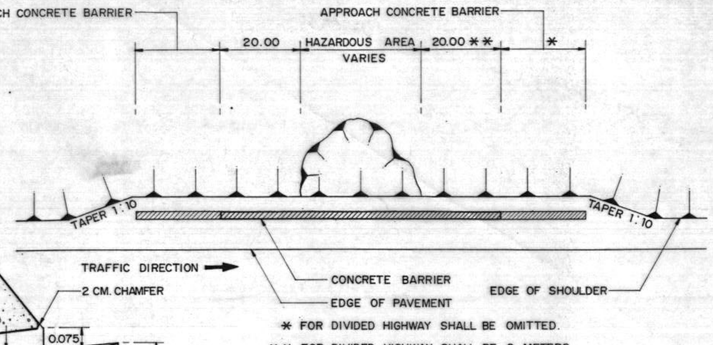
SECTION (A)-(A)

SCALE 1 : 10



SIDE ELEVATION OF CONCRETE BARRIER TYPE I

SCALE 1 : 10



* FOR DIVIDED HIGHWAY SHALL BE OMITTED.

** FOR DIVIDED HIGHWAY SHALL BE 2 METERS.

INSTALLATION OF CONCRETE BARRIER

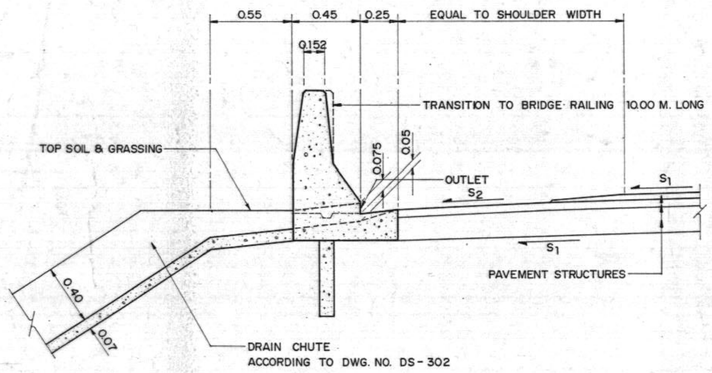
NOT TO SCALE

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

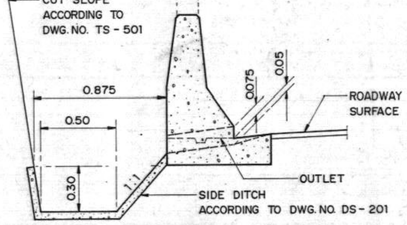
PORTLAND CEMENT TYPE 1	350	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

3. CLEAR CONCRETE COVER SHALL BE 5 CM.
4. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24 FOR ROUND BARS AND TIS. 24 GRADE SD 30 FOR DEFORMED BARS.
5. REINFORCEMENT AND OTHER DETAILS OF APPROACH CONCRETE BARRIER SHALL BE THE SAME AS CONCRETE BARRIER.
6. CONSTRUCTION JOINT SHALL BE PROVIDED AT 10.00 M. INTERVAL.
7. EXPANSION JOINT WITH NON-EXTRUDING JOINT FILLER SHALL BE PROVIDED AT 60.00 M. INTERVAL AND/OR DRAIN CHUTE POSITION.
8. OUTLET OF CONCRETE BARRIER AT OUTER EDGE SHALL NOT BE CONSTRUCTED WHERE SHOULDER SLOPES TOWARD INNER EDGE AND EXPANSION JOINT SHALL BE PROVIDED NOT MORE THAN 30.00 M. INTERVAL.
9. APPROACH CONCRETE BARRIER SHALL BE PAINTED IN BLACK AND WHITE STRIPE 0.50 M. WIDE, IN TWO COATS. THE PAINT SHALL CONFORM TO TIS. 327.



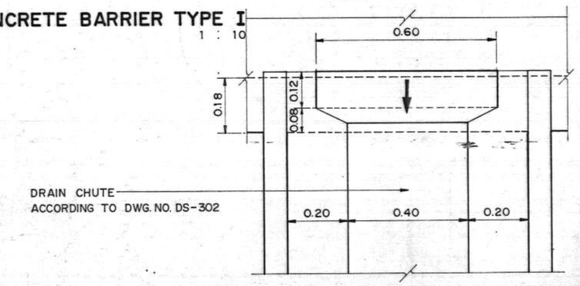
CONCRETE BARRIER TYPE I AT HIGH FILL SECTION

SCALE 1 : 20



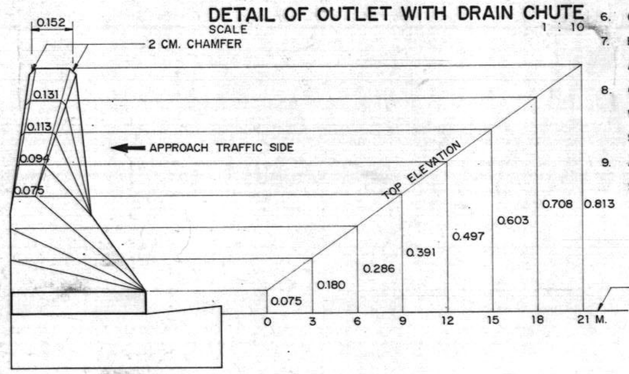
CONCRETE BARRIER TYPE I AT DEEP CUT SECTION

SCALE 1 : 20



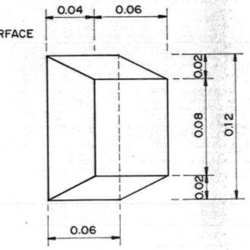
DETAIL OF OUTLET WITH DRAIN CHUTE

SCALE 1 : 10



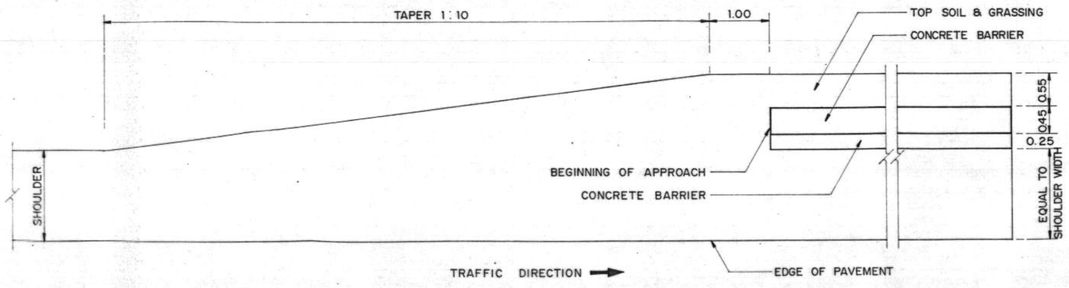
APPROACH CONCRETE BARRIER TYPE (D)

SCALE 1 : 10



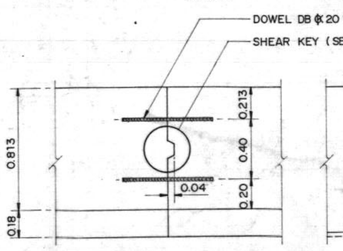
SHEAR KEY DETAIL

SCALE 1 : 2.5



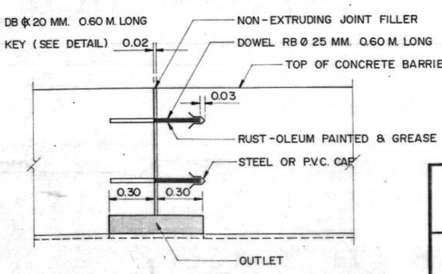
SHOULDER TRANSITION AT APPROACH CONCRETE BARRIER

SCALE 1 : 50



CONSTRUCTION JOINT DETAIL

SCALE 1 : 20



EXPANSION JOINT DETAIL

SCALE 1 : 20

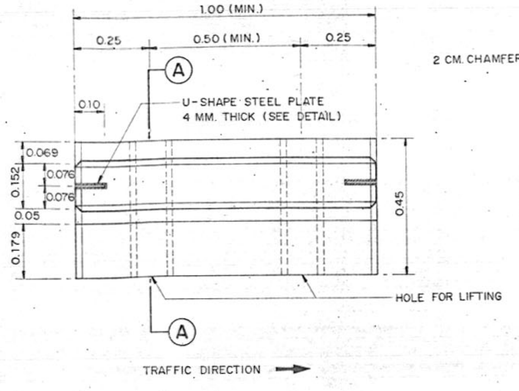
KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

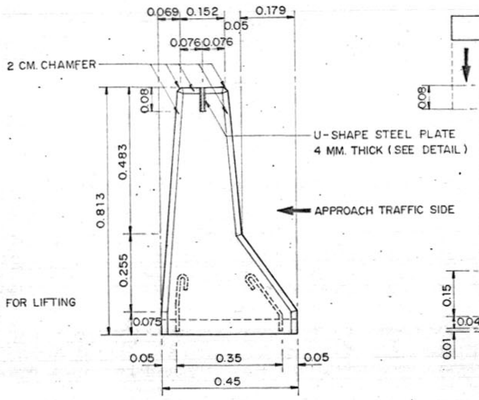
STANDARD DRAWING

CONCRETE BARRIER TYPE I
FOR DEEP CUT AND HIGH FILL SECTION

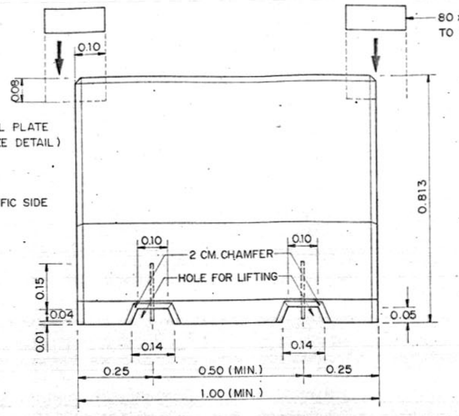
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-503
		SHEET NO. 40



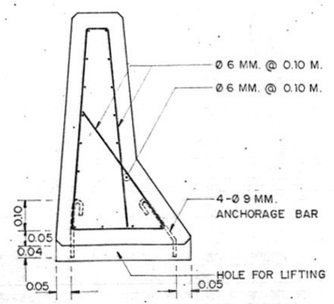
PLAN
SCALE 1 : 10



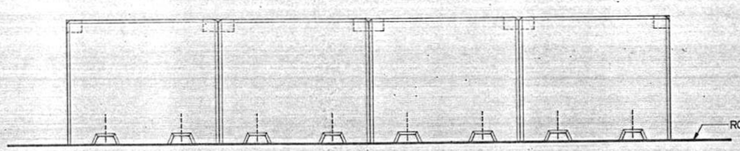
FRONT ELEVATION
SCALE 1 : 10



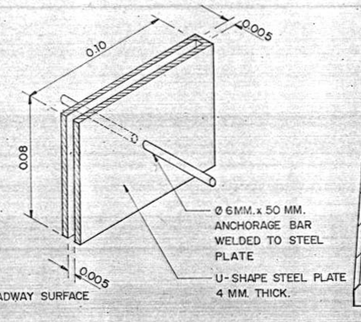
SIDE ELEVATION
SCALE 1 : 10



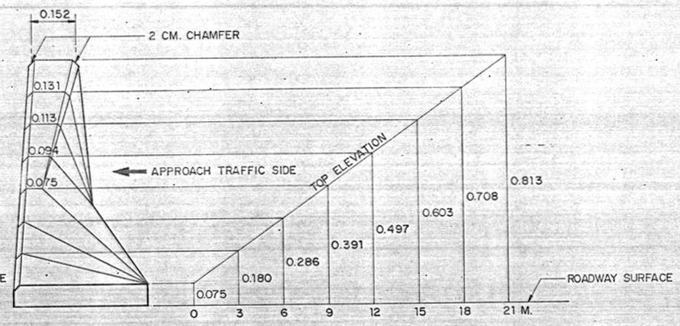
REINFORCEMENT DETAIL
SCALE 1 : 10



INSTALLATION
SCALE 1 : 20



DETAIL OF U-SHAPE STEEL PLATE
SCALE 1 : 2



APPROACH CONCRETE BARRIER
SCALE 1 : 10

GENERAL NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 350 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	375 KG. (MIN.)
SAND	0.43 M^3
CRUSHED ROCK OR GRAVEL	0.86 M^3
CONCRETE SLUMP	10 CM. (MAX.)

3. CLEAR CONCRETE COVER SHALL BE 5 CM.
4. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR. 24
5. STRUCTURAL STEEL SECTION SHALL CONFORM TO TIS. 116 GRADE Fe 24, PAINTED WITH RUSTPROOF RUST-OLEUM PAINT OR EQUIVALENT TWICE.
6. PRE-CAST CONCRETE BARRIER TYPE I SHALL CONFORM TO ASTM C 825-79 (REAPPROVED 1985) STANDARD SPECIFICATION FOR PRE-CAST CONCRETE BARRIER.
7. METHOD AND TYPE OF WELDING TO CONNECT EACH CONCRETE BARRIER SEGMENT WHICH STRONGER THAN THAT SHOWN IN THIS DRAWING MAY BE USED AS APPROVED BY THE ENGINEER.
8. APPROACH CONCRETE BARRIER SHALL BE PAINTED IN BLACK AND WHITE STRIPE 0.50 M. WIDE, IN TWO COATS. THE PAINT SHALL CONFORM TO TIS. 327.
9. IF NECESSARY, DRAIN HOLE SIZE 0.40 M. WIDE, 0.10 M. HIGH SHALL BE APPLIED FOR DRAINAGE.

PERMANENT INSTALLATION :

METHOD OF INSTALLATION :

1. 0.20 M. BASE SHALL BE CASTED-IN-SITU WITH INSERTING ANCHORAGE BAR AS SHOWN IN THE FIGURE.
2. GENERALLY THICKNESS OF THE BASE SHALL BE 0.20 M., FOR CONCRETE PAVEMENT THE THICKNESS SHALL EQUAL TO THICKNESS OF CONCRETE PAVEMENT.
3. GENERALLY WIDTH OF THE BASE SHALL BE 0.45 M., IF EDGE OF PAVEMENT CONSTRUCTED ADJACENT TO CONCRETE BARRIER, THE WIDTH SHALL BE ADJUSTED TO 1.45 M. MINIMUM.
4. PRE-CAST CONCRETE BARRIER SHALL BE LIFTED AT HOLE FOR LIFTING TO INSTALLED. THE ANCHORAGE BARS SHALL BE IN THE SAME POSITION IF NOT, THE CONCRETE BASE SHALL BE ADJUSTED.
5. BOTH ANCHORAGE BARS SHALL WELDED TOGETHER WITH WELDING LENGTH NOT LESS THAN 2.5 CM.
6. 80 x 198 x 4 MM. STEEL PLATE SHALL BE INSERTED INTO U-SHAPE STEEL PLATE. BOTH STEEL PLATES SHALL BE WELDED TOGETHER. THE WELDING FILLED FULLY U-SHAPE STEEL PLATE TO WATERPROOF, PAINTED WITH RUSTPROOF RUST-OLEUM PAINT OR EQUIVALENT TWICE AND WITH GRAY OIL PAINT TWICE (TIS. 327).
7. THE HOLE FOR LIFTING SHALL BE FILLED FULLY WITH CONCRETE RATIO 1:2:4 BY VOLUME, THE OUTER FACE SHALL BE SMOOTH.
8. JOINTS SHALL BE DECORATED SMOOTHLY BY MORTAR RATIO 1 : 3 BY VOLUME.
9. DRAIN HOLE AT 10.00 M. SPACING SHALL BE APPLIED IN CASE OF DRAINAGE REQUIREMENT.

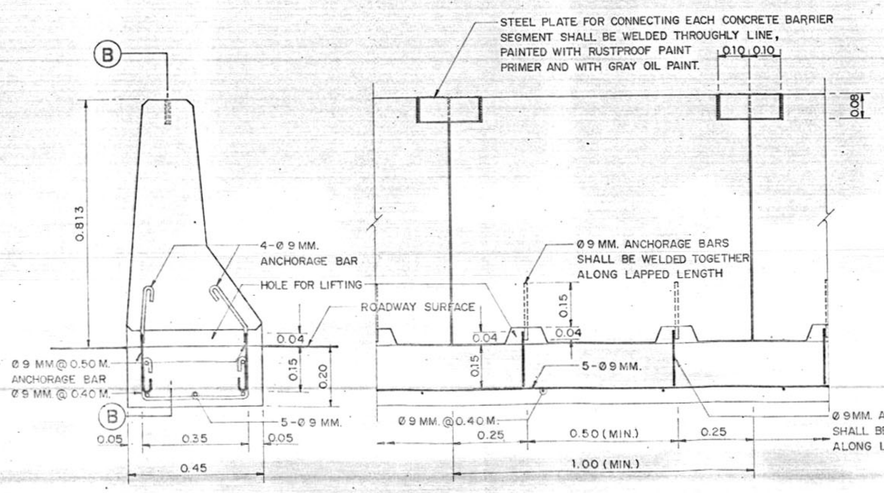
TEMPORARY INSTALLATION :

METHOD OF INSTALLATION :

1. PRE-CAST CONCRETE BARRIER SHALL BE LIFTED AT HOLE FOR LIFTING TO INSTALLED. THE ANCHORAGE BARS SHALL BE IN THE SAME POSITION IF NOT, THE CONCRETE BASE SHALL BE ADJUSTED.
2. 80 x 198 x 4 MM. STEEL PLATE SHALL BE INSERTED INTO U-SHAPE STEEL PLATE, NOT BE WELDED TOGETHER. THE STEEL PLATES SHALL BE PAINTED WITH RUSTPROOF RUST-OLEUM PAINT OR EQUIVALENT TWICE AND WITH GRAY OIL PAINT TWICE (TIS. 327).
3. TEMPORARY INSTALLATION SHALL BE USED AS NECESSARY ONLY BECAUSE LACK OF STRENGTH. THE CONCRETE BARRIER SHALL BE REMOVED IMMEDIATELY IF NOT USED OR CONVERTED TO PERMANENT INSTALLATION AS SOON AS.

REMARK :

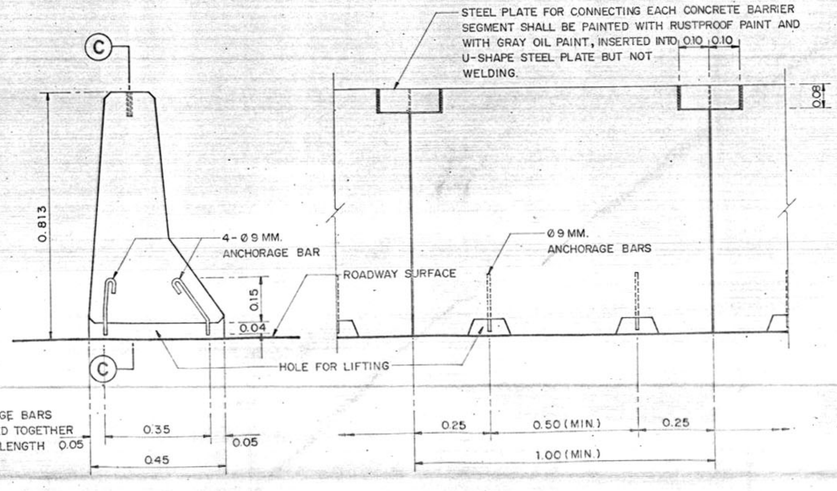
THIS BARRIER IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.



SECTION (A)-(A)

SECTION (B)-(B)

PERMANENT INSTALLATION
SCALE 1 : 10



SECTION (A)-(A)

SECTION (C)-(C)

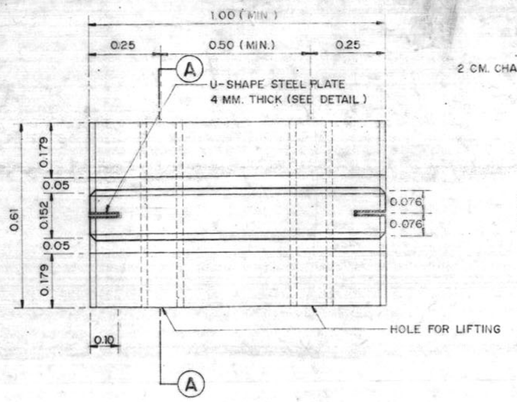
TEMPORARY INSTALLATION
SCALE 1 : 10

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

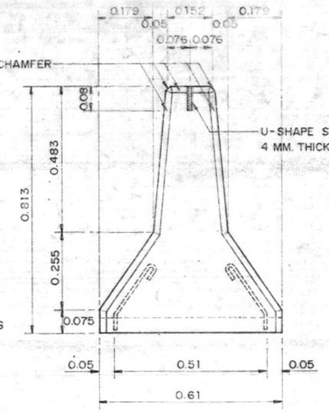
STANDARD DRAWING

PRE-CAST CONCRETE BARRIER TYPE I

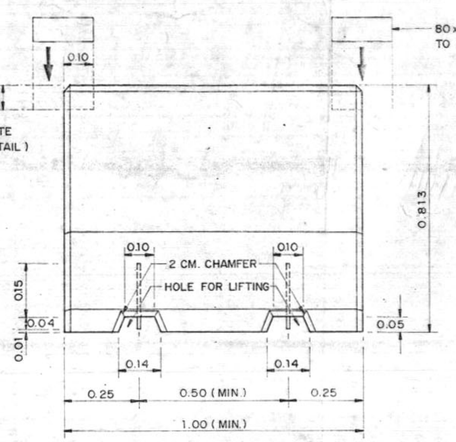
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-504
		SHEET NO. 41



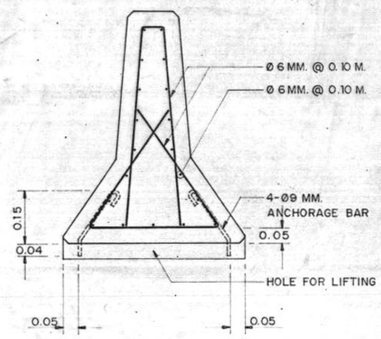
PLAN
SCALE 1 : 10



FRONT ELEVATION
SCALE 1 : 10



SIDE ELEVATION
SCALE 1 : 10



REINFORCEMENT DETAIL
SCALE 1 : 10

GENERAL NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 350 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	375 KG. (MIN.)
SAND	0.43 M^3
CRUSHED ROCK OR GRAVEL	0.86 M^3
CONCRETE SLUMP	10 CM. (MAX.)

3. CLEAR CONCRETE COVER SHALL BE 5 CM.
4. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR. 24
5. STRUCTURAL STEEL SECTION SHALL CONFORM TO TIS. 116 GRADE Fe 24, PAINTED WITH RUSTPROOF RUST - OLEUM PAINT OR EQUIVALENT TWICE.
6. PRE - CAST CONCRETE BARRIER TYPE II SHALL CONFORM TO ASTM. C 825 - 79 (REAPPROVED 1985) STANDARD SPECIFICATION FOR PRE - CAST CONCRETE BARRIER.
7. METHOD AND TYPE OF WELDING TO CONNECT EACH CONCRETE BARRIER SEGMENT WHICH STRONGER THAN THAT SHOWN IN THIS DRAWING MAY BE USED AS APPROVED BY THE ENGINEER.
8. APPROACH CONCRETE BARRIER SHALL BE PAINTED IN BLACK AND WHITE STRIPE 0.50 M. WIDE, IN TWO COATS. THE PAINT SHALL CONFORM TO TIS 327.
9. IF NECESSARY, DRAIN HOLE SIZE 0.40 M. WIDE, 0.10 M. HIGH SHALL BE APPLIED FOR DRAINAGE.

PERMANENT INSTALLATION :

METHOD OF INSTALLATION :

1. 0.20 M. BASE SHALL BE CASTED - IN - SITU WITH INSERTING ANCHORAGE BAR AS SHOWN IN THE FIGURE.
2. GENERALLY THICKNESS OF THE BASE SHALL BE 0.20 M. FOR CONCRETE PAVEMENT THE THICKNESS SHALL EQUAL TO THICKNESS OF CONCRETE PAVEMENT.
3. PRE - CAST CONCRETE BARRIER SHALL BE LIFTED AT HOLE FOR LIFTING TO INSTALLED. THE ANCHORAGE BARS SHALL BE IN THE SAME POSITION IF NOT, THE CONCRETE BASE SHALL BE ADJUSTED.
4. BOTH ANCHORAGE BARS SHALL WELDED TOGETHER WITH WELDING LENGTH NOT LESS THAN 2.5 CM.
5. 80 x 198 x 4 MM. STEEL PLATE SHALL BE INSERTED INTO U - SHAPE STEEL PLATE. BOTH STEEL PLATES SHALL BE WELDED TOGETHER. THE WELDING FILLED FULLY U - SHAPE STEEL PLATE TO WATERPROOF, PAINTED WITH RUSTPROOF RUST - OLEUM PAINT OR EQUIVALENT TWICE AND WITH GRAY OIL PAINT TWICE (TIS. 327).
6. THE HOLE FOR LIFTING SHALL BE FILLED FULLY WITH CONCRETE RATIO 1 : 2 : 4 BY VOLUME, THE OUTER FACE SHALL BE SMOOTH.
7. JOINTS SHALL BE DECORATED SMOOTHLY BY MORTAR RATIO 1 : 3 BY VOLUME.
8. DRAIN HOLE AT 10.00 M. SPACING SHALL BE APPLIED IN CASE OF DRAINAGE REQUIREMENT.

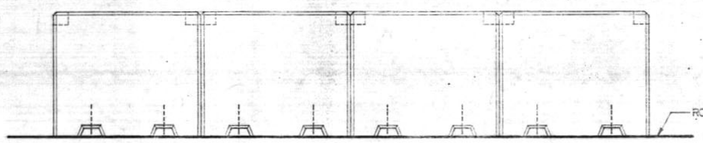
TEMPORARY INSTALLATION :

METHOD OF INSTALLATION :

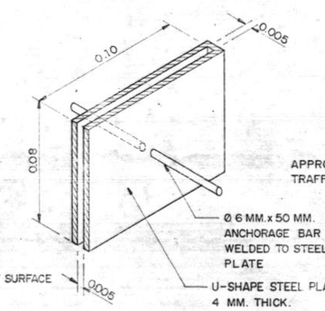
1. PRE - CAST CONCRETE BARRIER SHALL BE LIFTED AT HOLE FOR LIFTING TO INSTALLED. THE ANCHORAGE BARS SHALL BE IN THE SAME POSITION IF NOT, THE CONCRETE BASE SHALL BE ADJUSTED.
2. 80 x 198 x 4 MM. STEEL PLATE SHALL BE INSERTED INTO U - SHAPE STEEL PLATE, NOT BE WELDED TOGETHER. THE STEEL PLATES SHALL BE PAINTED WITH RUSTPROOF RUST - OLEUM PAINT OR EQUIVALENT TWICE AND WITH GRAY OIL PAINT TWICE (TIS. 327).
3. TEMPORARY INSTALLATION SHALL BE USED AS NECESSARY ONLY BECAUSE LACK OF STRENGTH. THE CONCRETE BARRIER SHALL BE REMOVED IMMEDIATELY IF NOT USED OR CONVERTED TO PERMANENT INSTALLATION AS SOON AS.

REMARK :

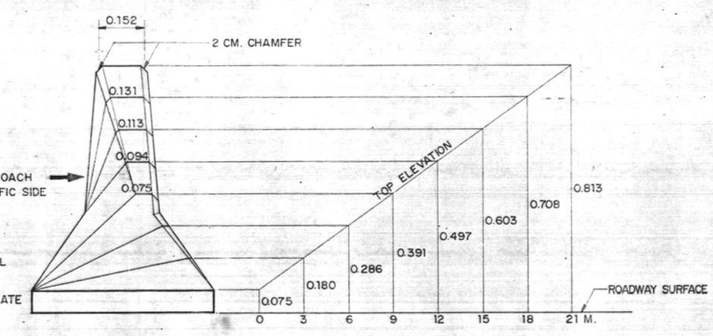
THIS BARRIER IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.



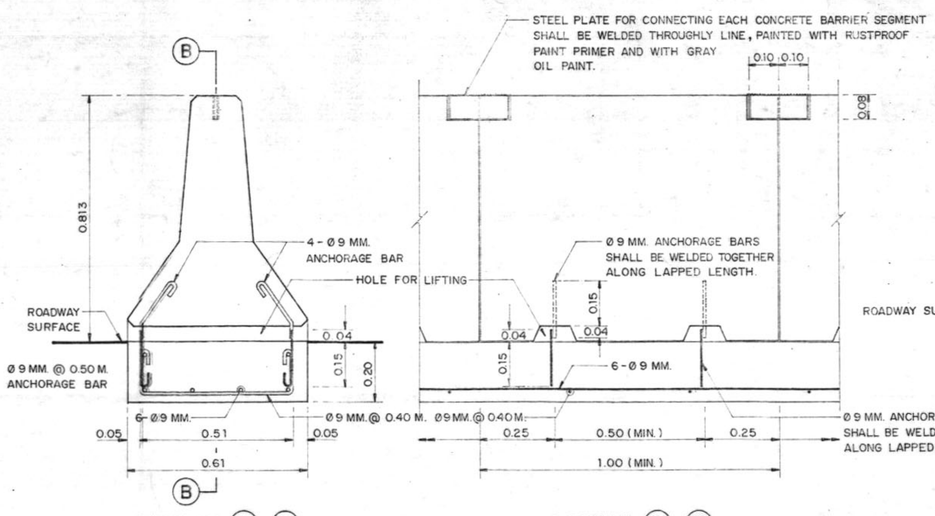
INSTALLATION
SCALE 1 : 20



DETAIL OF U - SHAPE STEEL PLATE
SCALE 1 : 2

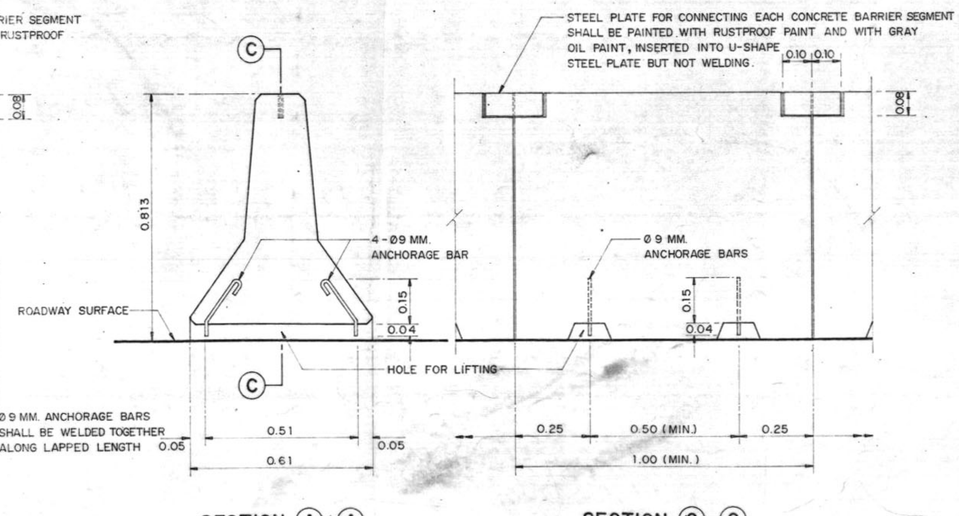


APPROACH CONCRETE BARRIER
SCALE 1 : 10



SECTION (A)-(A) SECTION (B)-(B)

PERMANENT INSTALLATION
SCALE 1 : 10



SECTION (A)-(A) SECTION (C)-(C)

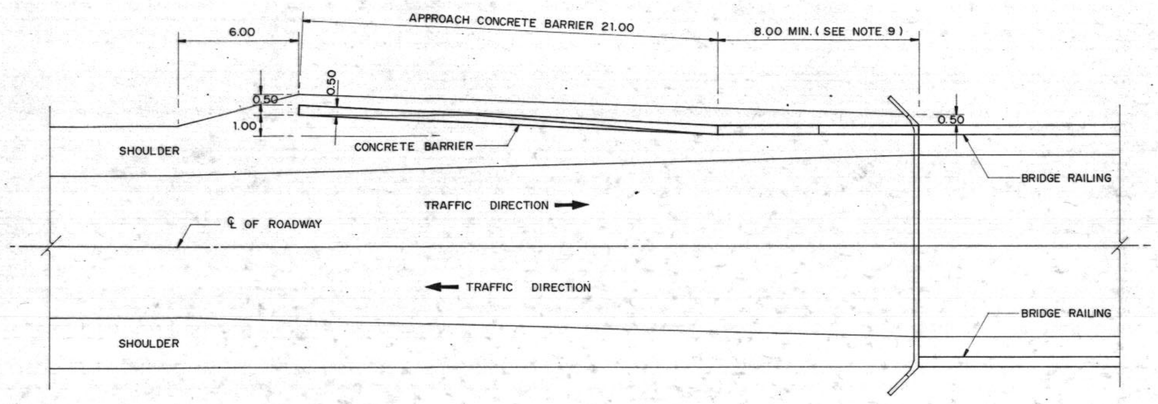
TEMPORARY INSTALLATION
SCALE 1 : 10

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

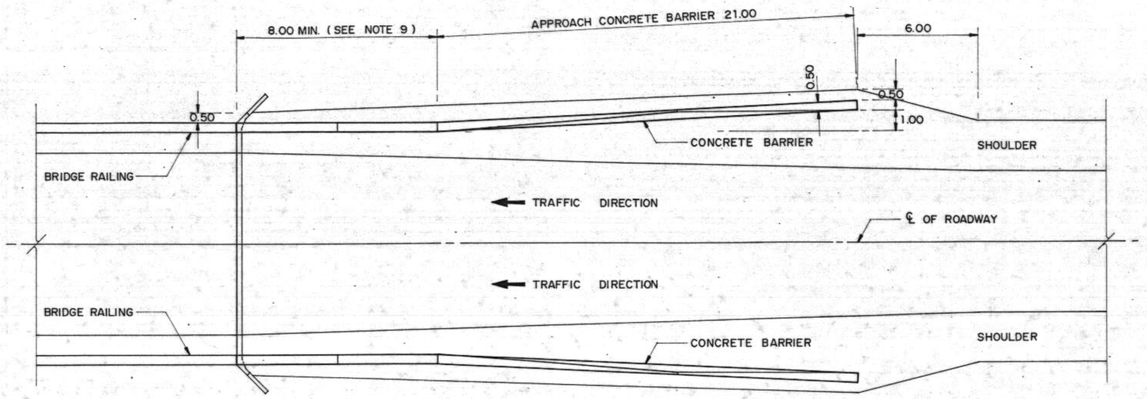
PRE - CAST CONCRETE BARRIER TYPE II

DESIGNED : D.O.H & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS - 505
		SHEET NO. 42



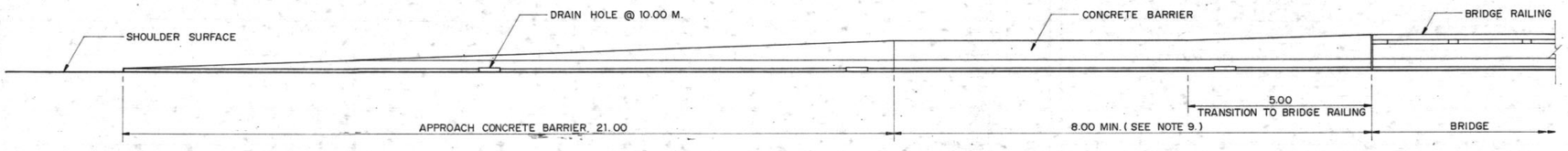
CONCRETE BARRIER AT BRIDGE APPROACH FOR TWO-WAY TRAFFIC

SCALE 1 : 150



CONCRETE BARRIER AT BRIDGE APPROACH FOR DIVIDED HIGHWAY

SCALE 1 : 150



SIDE ELEVATION

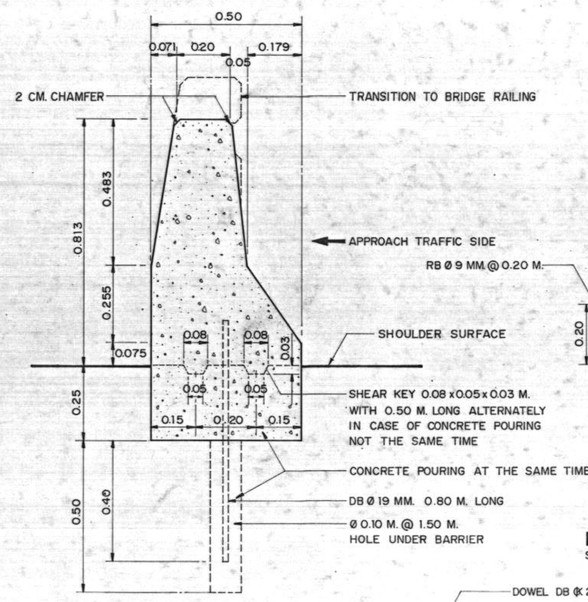
SCALE 1 : 75

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

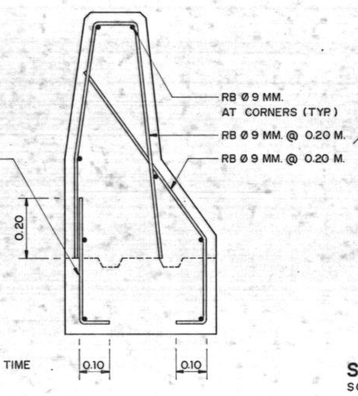
PORTLAND CEMENT TYPE 1	350	KG (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

3. CLEAR CONCRETE COVER SHALL BE 5 CM.
4. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24 FOR ROUND BARS AND TIS. 24 GRADE SD 30 FOR DEFORMED BARS.
5. REINFORCEMENT AND OTHER DETAILS OF APPROACH CONCRETE BARRIER SHALL BE THE SAME AS CONCRETE BARRIER.
6. CONSTRUCTION JOINT SHALL BE PROVIDED AT 10.00 M. INTERVAL.
7. EXPANSION JOINT WITH NON-EXTRUDING JOINT FILLER SHALL BE PROVIDED AT 60.00 M. INTERVAL.
8. APPROACH CONCRETE BARRIER SHALL BE PAINTED IN BLACK AND WHITE STRIPE 0.50 M. WIDE, IN TWO COATS. THE PAINT SHALL CONFORM TO TIS. 327.
9. THE LENGTH SHALL BE BETWEEN BRIDGE ABUTMENT AND POSITION AT EMBANKMENT 2.50 M. HIGH, BUT NOT LESS THAN 8.00 M. IN CASE OF DEEP CUT AND HIGH FILL, DRAWING NO. RS-503 SHALL BE USED INSTEAD OF THIS DRAWING.



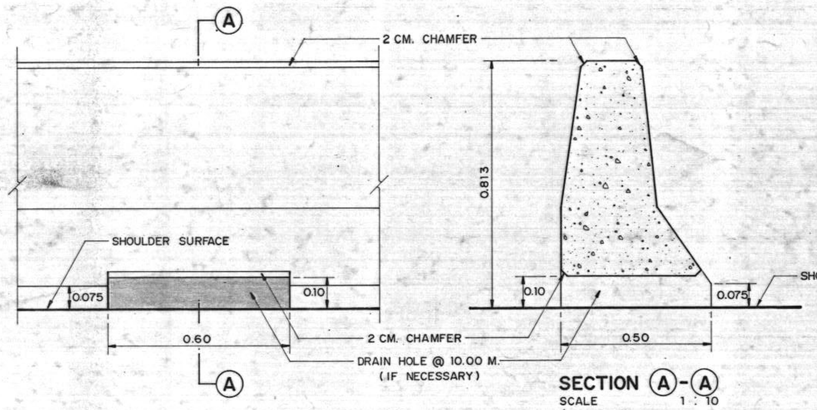
FRONT ELEVATION OF CONCRETE BARRIER

SCALE 1 : 10



CONCRETE BARRIER REINFORCEMENT DETAIL

SCALE 1 : 10

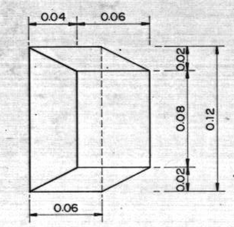


SIDE ELEVATION OF CONCRETE BARRIER

SCALE 1 : 10

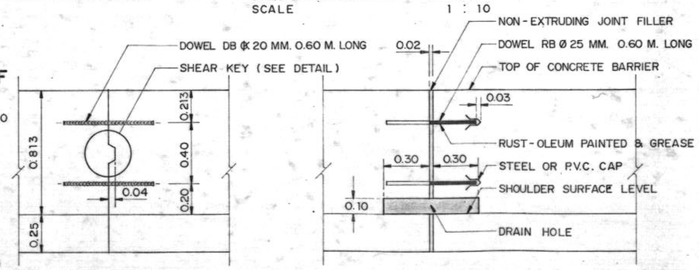
SECTION (A)-(A)

SCALE 1 : 10



SHEAR KEY DETAIL

SCALE 1 : 2.5

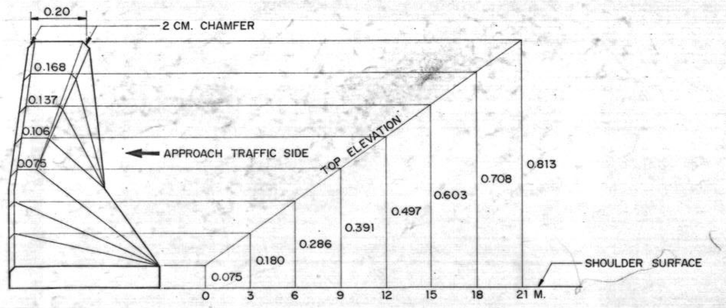


CONSTRUCTION JOINT DETAIL

SCALE 1 : 20

EXPANSION JOINT DETAIL

SCALE 1 : 20



APPROACH CONCRETE BARRIER TYPE (E)

SCALE 1 : 10

REMARK :

THIS BARRIER IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.

KINGDOM OF THAILAND

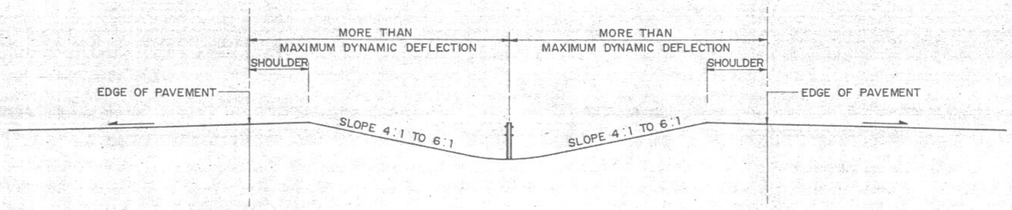
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

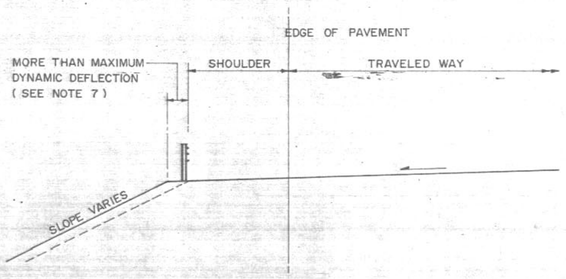
CONCRETE BARRIER AT BRIDGE APPROACH

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-506
		SHEET NO. 43

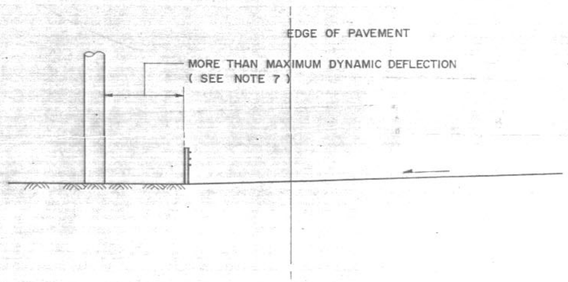
CABLE GUARDRAIL
NOT TO SCALE



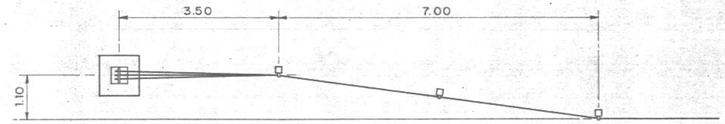
CABLE GUARDRAIL AT MEDIAN OF DIVIDED HIGHWAYS
NOT TO SCALE



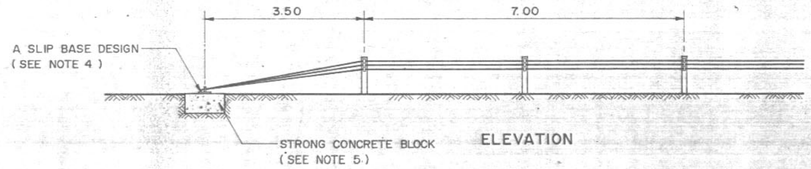
CABLE GUARDRAIL AT OUTER SHOULDER
NOT TO SCALE



CABLE GUARDRAIL AT RIGID OBJECTS
NOT TO SCALE

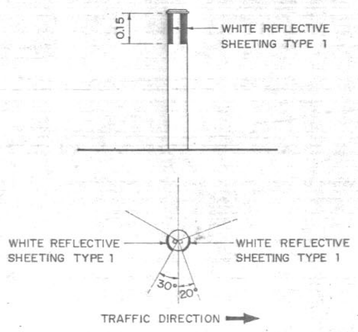


PLAN



ELEVATION

CABLE GUARDRAIL TERMINAL
NOT TO SCALE



DETAIL OF REFLECTIVE SHEETING ATTACHMENT
NOT TO SCALE

WARRANTING FEATURES FOR CABLE GUARDRAIL INSTALLATION :

1. CABLE GUARDRAIL SHALL BE INSTALLED AT LOCATION FOR VISIBILITY PURPOSE.
2. CABLE GUARDRAIL SHALL BE USED ONLY IF ADEQUATE DEFLECTION DISTANCE EXISTS.
3. NOT RECOMMENDED FOR USE IN URBAN AREAS.
4. NOT RECOMMENDED FOR USE IN MEDIANS NARROWER THAN 8.00 METERS, NOR IN MEDIANS WHICH CONTAIN RIGID OBJECTS.
5. CABLE GUARDRAIL SYSTEMS AT MEDIANS ARE RECOMMENDED FOR USE ON IRREGULAR TERRAIN, AND ON WIDER MEDIANS WHERE THE NEED IS ONLY TO PREVENT POTENTIALLY CATASTROPHIC CROSS MEDIAN ACCIDENTS.
6. NOT RECOMMENDED FOR USE IN AREAS WHERE IT IS LIKELY TO BE HIT FREQUENTLY BECAUSE CABLE GUARDRAIL SYSTEMS REQUIRE MORE MAINTENANCE PER HIT THAN ANY OF THE SYSTEM.
7. NOT RECOMMENDED FOR HIGH FILL OVER 7.00 M.

NOTES :

1. THE SYSTEM OF CABLE GUARDRAIL CONSISTS OF 16 MM. (MINIMUM) DIAMETER STEEL CABLES SPACED 7.5 CM. TO 10 CM. APART AND MOUNTED ON WEAK POSTS. THE TOP CABLE HEIGHT RANGES FROM 67.5 CM. TO 75 CM. CABLE GUARDRAIL HAVE BEEN SUCCESSFULLY CRASH - TESTED (SEE REMARK 1) OR OTHER CRITERIA OF ACCEPTED INSTITUTE.
2. IMPACT PERFORMANCE : THIS SYSTEM WILL GENERALLY REDIRECT VEHICLES IN THE 1,800 - 4,500 lb. RANGE, THE MAXIMUM DYNAMIC DEFLECTION OBSERVED DURING THE STANDARD STRENGTH TESTING IS 11.5 FEET (3.50 METERS).
3. THE CABLE GUARDRAIL IS FLARED BACKWARD AT FULL HEIGTH TO AN END POST OFFSET 1.10 METER FROM THE TANGENT LINE. FROM THE END POST, ALL CABLE STRANDS ARE THEN TURNED DOWN AND ANCHORED TO A CONCRETE BLOCK IN THE GROUND.
4. THE CABLE SYSTEM IS PLACED ON SUPPOSEDLY " WEAK" POSTS, THE END POST IS FURTHER WEAKENED BY USED OF A SLIP BASE.
5. A CRASHWORTHY END TERMINAL IS CRITICAL IN EACH OF THE CABLE SYSTEMS, BOTH TO PROVIDE ADEQUATE ANCHORAGE TO DEVELOP FULL TENSILE STRENGTH IN THE CABLE AND TO MINIMIZE VEHICLE DECELERATIONS FOR IMPACTS ON EITHER END OF AN INSTALLATION.
6. CABLE GUARDRAIL WHEN USED IN A MEDIAN, ONE (OR TWO) OF THE CABLES SHALL BE INSTALLED ON THE OPPOSITE SIDE OF EACH POST FROM THE OTHERS.
7. THE DISTANCE SHALL NOT BE LESS THAN THE DYNAMIC DEFLECTION OF THE BARRIER FOR IMPACT BY A FULL - SIZE AUTOMOBILE AT IMPACT CONDITIONS OF APPROXIMATELY 25° AND 60 MPH.(96 KPH.). SOME REDUCTION IN DEFLECTION DISTANCE MAY BE JUSTIFIED IF THE OPERATING SPEED IS LESS THAN 60 MPH. (96 KPH.).
8. ALL STEEL SHALL BE GALVANIZED. ZINC COATING SHALL NOT BE LESS THAN 550 GRAMS PER SQUARE METER.
9. REFLECTIVE SHEETING SHALL CONFORM TO TIS. 606 TYPE 1. (ESEFFICIENT OF RETRO - REFLECTION LEVEL 1)
10. SPACING OF POSTS SHALL BE REDUCED WITH DECREASING RADIUS OF CURVES AS RECOMMENDED BY THE MANUFACTURER OR PROPORTION ACCORDING TO DWG. NO. RS - 301.
11. SPACING OF POSTS SHALL BE REDUCED WITH INCREASING HEIGHT OF FILL IN PROPORTION ACCORDING TO DWG. NO. RS - 301.
12. PAYMENT OF CABLE GUARDRAIL SHALL BE MEASURED BY METER INCLUDING END TERMINAL.

REMARK 1 : CRASH TEST CRITERIA

STANDARD CRASH TESTS ARE PRESENTED IN NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM (NCHRP) PEPORT NO. 230 "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY APPURTENANCES" THIS REPORT CURRENTLY RECOMMENDS TWO TESTS ON STANDARD SECTIONS OF LONGITUDINAL BARRIERS, ONE WITH AN 1,800 lb (816 KG.) VEHICLE IMPACTING AT 60 MPH. (96 KPH.) AND 15° TO EVALUATE OCCUPANT RISK, AND ONE WITH A 4,500 lb. (2,041 KG.) VEHICLE IMPACTING AT 60 MPH. (96 KPH.) AND 25° TO EVALUATE THE STRUCTURAL INTEGRITY OF THE CABLES.

REMARK 2 :

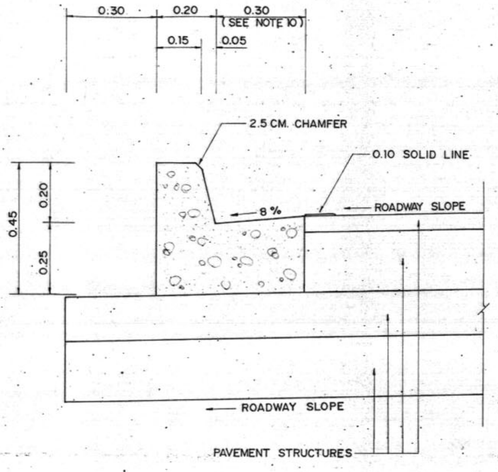
THIS BARRIER IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

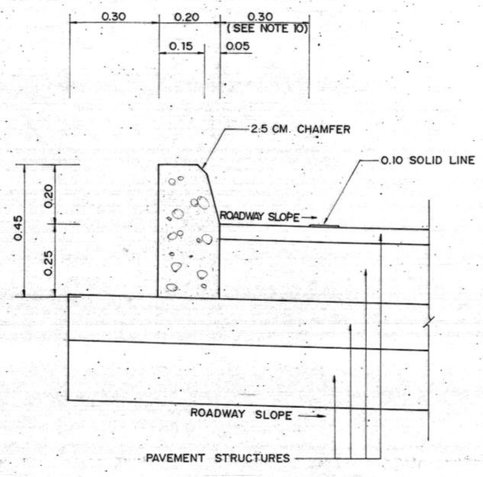
STANDARD DRAWING

IMPLEMENT OF CABLE GUARDRAIL

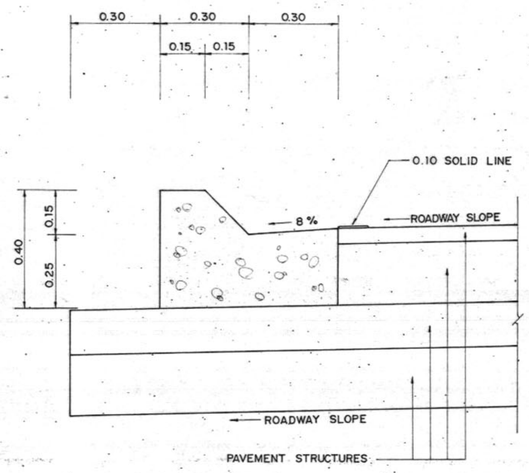
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-507
		SHEET NO. 44



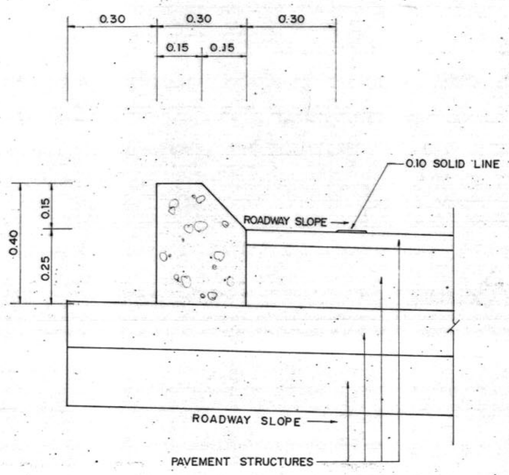
BARRIER CURB AND GUTTER
SCALE 1 : 10



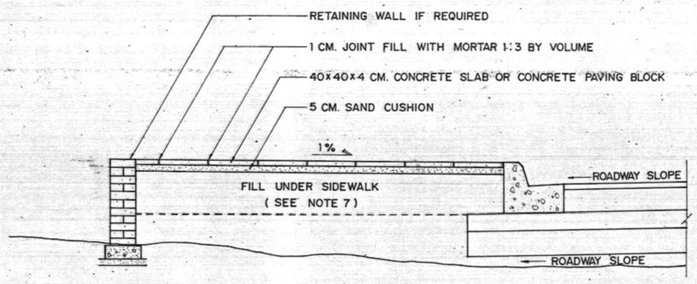
BARRIER CURB
SCALE 1 : 10



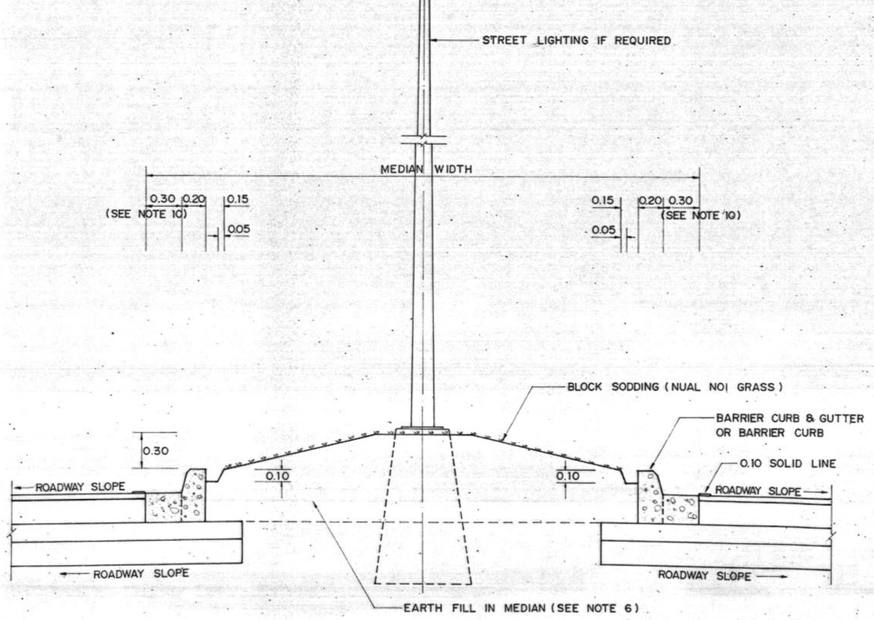
MOUNTABLE CURB AND GUTTER
SCALE 1 : 10



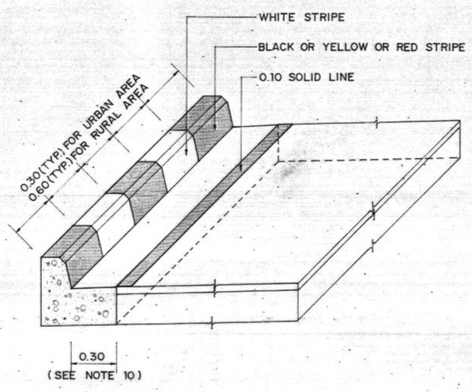
MOUNTABLE CURB
SCALE 1 : 10



SIDEWALK SLAB
NOT TO SCALE



DETAIL OF CURB AND GUTTER OR CURB AT RAISED MEDIAN
SCALE 1 : 25



CURB MARKING DETAIL
NOT TO SCALE

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15×15×15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOW :

PORTLAND CEMENT TYPE 1	350	KG.(MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM.(MAX.)

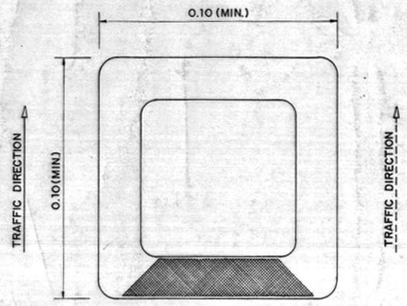
3. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24
4. 40×40×4 CM. CONCRETE SLAB SHALL CONFORM TO TIS. 378
5. WHITE, BLACK, YELLOW AND RED PAINTS SHALL BE GLOSS ENAMEL PAINT AND CONFORM TO TIS. 327
6. EARTH FILL IN MEDIAN SHALL BE TOP SOIL.
7. FILL UNDER SIDEWALK SHALL BE THE SAME MATERIAL AS EMBANKMENT AND COMPACTED TO 90 %(MIN.) STANDARD PROCTOR (DOH. – T107)
8. LOCATION FOR CURB MARKING SHALL BE AS SHOWN ON PLAN OR DIRECTED BY THE ENGINEER.
9. JOINT IN CONCRETE CURB & CURB AND GUTTER SHALL BE SPACED AT 10.00 M. INTERVAL, THE WIDTH OF THE JOINT IS 1 CM. AND FILLED WITH MORTAR 1 : 3 (PORTLAND CEMENT : SAND) BY VOLUME.
10. THE WIDTH MAY BE 0.50 M.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

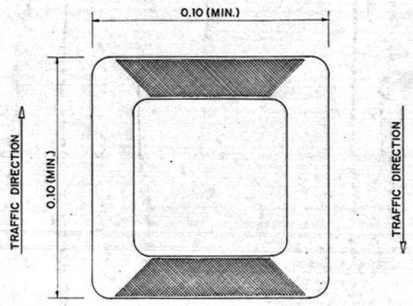
STANDARD DRAWING

CONCRETE CURB & CURB AND GUTTER DETAILS

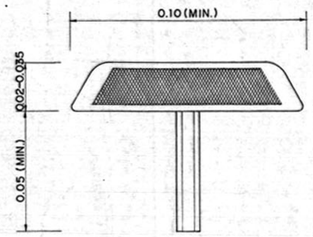
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
		DWG. NO. RS-508
APPROVED : (DIRECTOR GENERAL)		SHEET NO. 45



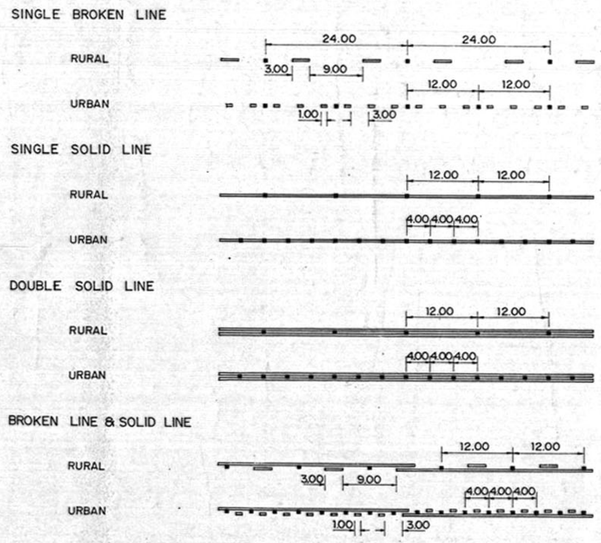
PLAN OF UNI-DIRECTIONAL TYPE ROAD STUD
NOT TO SCALE



PLAN OF BI-DIRECTIONAL TYPE ROAD STUD
NOT TO SCALE



SIDE ELEVATION OF ROAD STUD
NOT TO SCALE



ROAD STUD AT CENTER LINE OF ROADWAY
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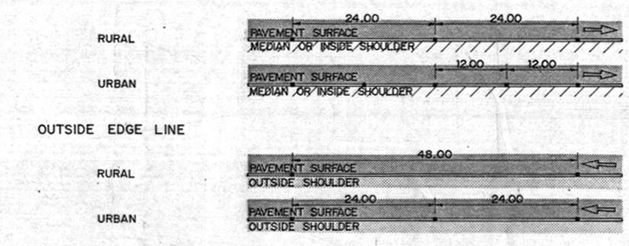
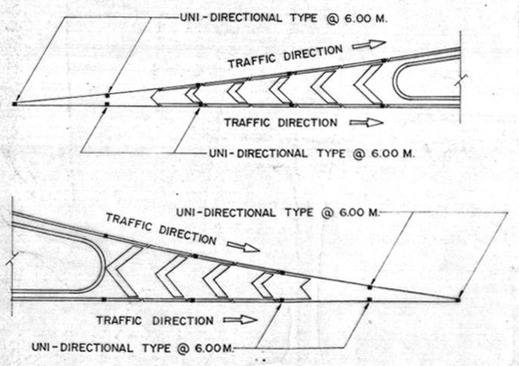
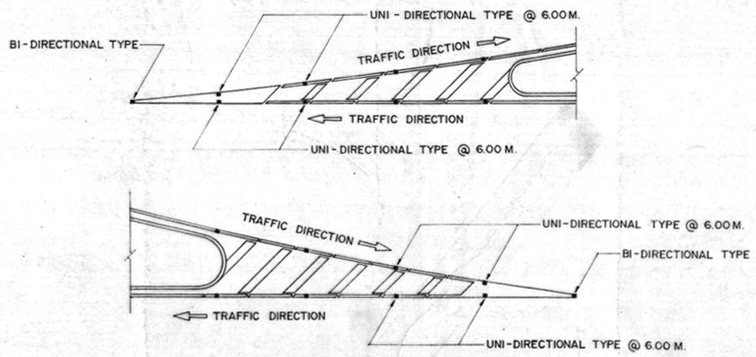


ROAD STUD AT LANE LINE & EDGE LINE
NOT TO SCALE



ROAD STUD AT [illegible] HATCHING
NOT TO SCALE



ROAD STUD AT CROSS HATCHING
NOT TO SCALE

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. ROAD STUD SHALL BE MADE OF ALLUMINIUM OR ALLUMINIUM ALLOY. SIZE OF THE BASE SHALL BE NOT LESS THAN 100x100 MM. WITH 20-35 MM. HIGH. LENGTH OF THE SHANK SHALL BE NOT LESS THAN 50 MM. ROAD STUD SHALL WITHSTAND TO IMPACT LOAD WITHOUT DISTORTION OR CRACK.
3. REFLECTOR SHALL BE YELLOW OR WHITE REFLECTIVE BEADS WHICH MANUFACTURING EXCLUSIVELY FOR REFLECTOR. AMOUNT OF BEADS SHALL BE NOT LESS THAN 40 PER SIDE, EMBEDED TO THE ROAD STUD.
4. THE PROCEDURES OF INSTALLATION
   - 4.1 THE HOLE SHALL BE DRILLED WIDER THAN DIAMETER OF THE SHANK ABOUT 3 MM.
   - 4.2 MATERIALS IN THE HOLE SHALL BE REMOVED.
   - 4.3 EPOXY ADHESIVE SHALL BE APPLIED FULLY INTO THE HOLE.
   - 4.4 THE SHANK SHALL BE EMBEDED INTO THE HOLE. THE ROAD STUD SHALL BE PRESSED UNTIL EPOXY ADHESIVE SHALL BE BLEEDED TO ADHERE BETWEEN PAVEMENT SURFACE AND ROAD STUD.
5. ROAD STUDS AT CENTER LINE OF ROADWAY SHALL BE BI-DIRECTIONAL TYPE OTHERS SHALL BE UNI-DIRECTIONAL TYPE.
6. ROAD STUDS SHALL BE INSTALLED BEFORE P.C. STATION OF CURVE AND AFTER P.T. STATION OF CURVE ABOUT 65 METERS.
7. INSTALLATION OF ROAD STUDS IN CURVE WITH RADIUS MORE THAN 320 METERS SHALL BE INSTALLED AS TANGENT INSTALLATION.

TABLE 1 INSTALLATION OF ROAD STUD ON TANGENT

TYPE OF LINE	COLOUR OF REFLECTOR	SPACING OF ROAD STUD (M.)		LOCATION
		RURAL	URBAN	
CENTER LINE				
SINGLE BROKEN LINE	YELLOW	24.00	12.00	BETWEEN BROKEN LINE
SINGLE SOLID LINE	YELLOW	12.00	4.00	ON SOLID LINE
DOUBLE SOLID LINE FOR MULTI - LANE	YELLOW	12.00	4.00	BETWEEN DOUBLE SOLID LINES
LANE LINE				
BROKEN LINE	WHITE	24.00	12.00	BETWEEN BROKEN LINE
SOLID LINE	WHITE	12.00	6.00	ON SOLID LINE
EDGE LINE				
INSIDE EDGE LINE	YELLOW	24.00	12.00	ON EDGE LINE
OUTSIDE EDGE LINE	WHITE	48.00	24.00	ON EDGE LINE

TABLE 2 INSTALLATION OF ROAD STUD IN CURVE

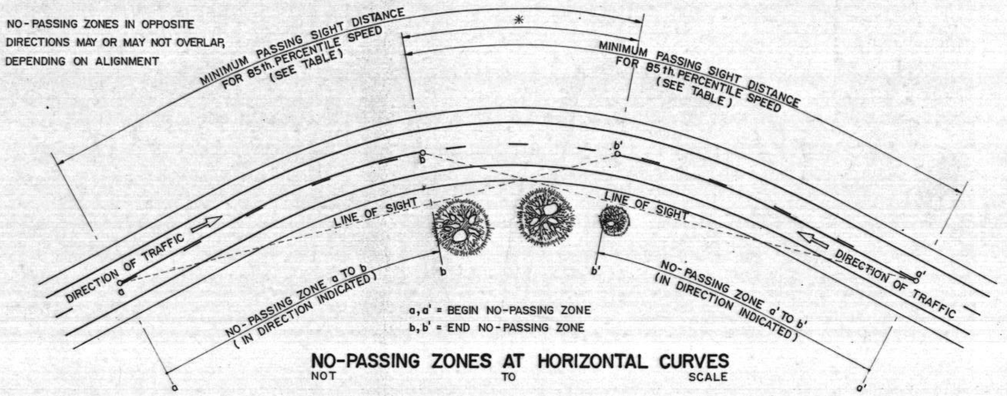
TYPE OF LINE	COLOUR OF REFLECTOR	SPACING OF ROAD STUD (M.)		LOCATION
		RADIUS OF CURVE BETWEEN 100-300 M.	RADIUS OF CURVE LESS THAN 100 M.	
BROKEN LINE	THE SAME COLOUR AS THE LINE	12.00	-	BETWEEN BROKEN LINE
SINGLE SOLID LINE		12.00	4.00	ON SOLID LINE
DOUBLE SOLID LINE		12.00	4.00	BETWEEN DOUBLE SOLID LINES
BROKEN LINE & SOLID LINE		12.00	4.00	BETWEEN THE LINES

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

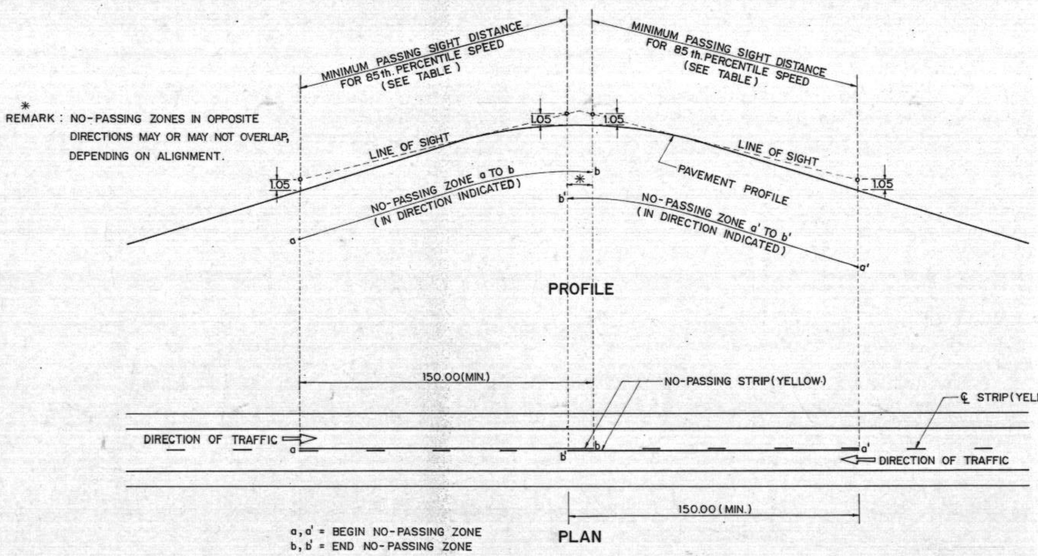
STANDARD DRAWING

ROAD STUD

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-601
		SHEET NO. 46



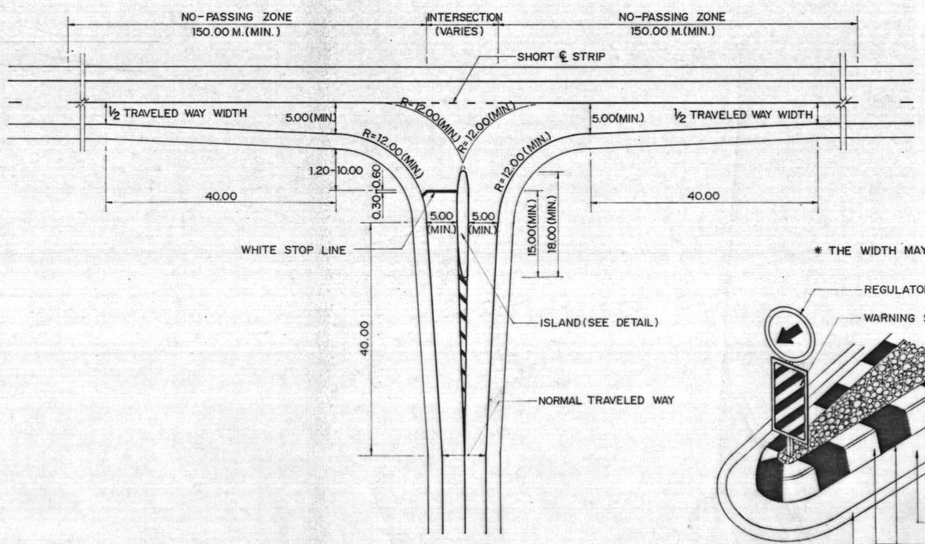
NO-PASSING ZONES AT HORIZONTAL CURVES
NOT TO SCALE



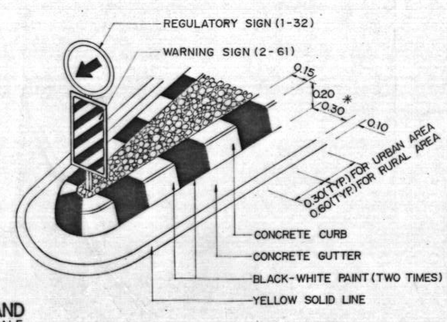
PROFILE

PLAN

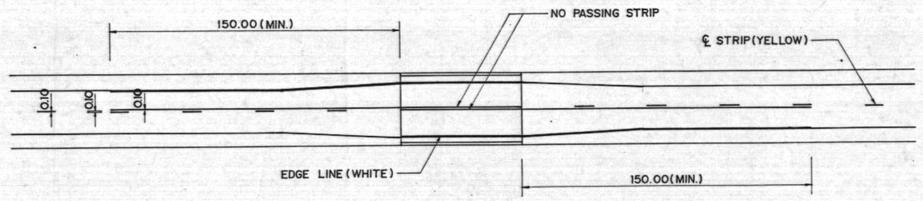
NO-PASSING ZONES AT VERTICAL CURVES
NOT TO SCALE



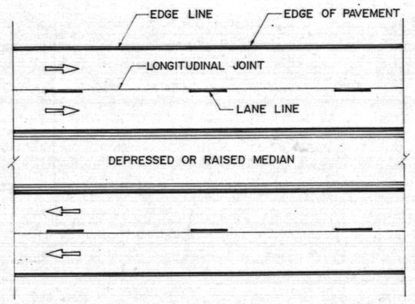
TYPICAL MARKING AT JUNCTION WITH DIVISIONAL ISLAND
NOT TO SCALE



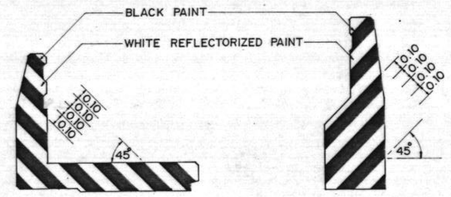
PAINTING AT CONCRETE CURB
NOT TO SCALE



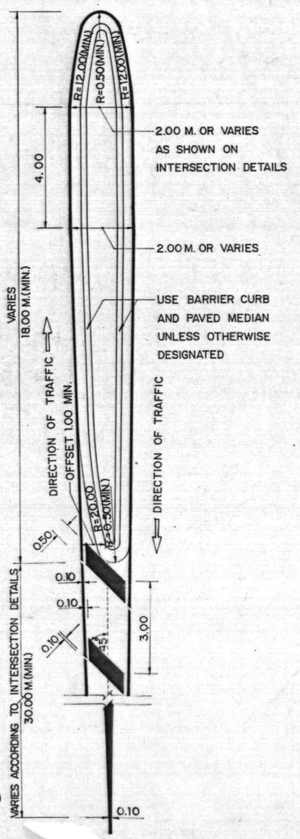
BRIDGE APPROACH
NOT TO SCALE



MARKING AT CONCRETE PAVEMENT
NOT TO SCALE



PAINTING AT BRIDGE ENDS
NOT TO SCALE



INTERSECTION DETAILS
SCALE

TABLE MINIMUM PASSING SIGHT DISTANCE

85 PERCENTILE SPEED (KPH.)	MINIMUM PASSING SIGHT DISTANCE (M.)
50	150
60	180
70	210
80	240
90	275
100	315
110	345
120	380

NOTES :

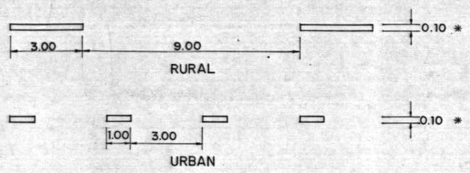
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. ALL MARKINGS SHALL BE IN ACCORDANCE WITH THE DEPARTMENT OF HIGHWAYS' TRAFFIC CONTROL DEVICE MANUAL, PART 2 ISSUED BE 2533.
3. PAVEMENT MARKING FOR THE ASPHALTIC CONCRETE AND THE REINFORCED CONCRETE PAVEMENTS SHALL BE REFLECTORIZED THERMOPLASTIC PAINT, CONFORMING TO TIS.542. PAVEMENT MARKINGS FOR THE SURFACE TREATMENT PAVEMENT SHALL BE REFLECTORIZED PAINT, CONFORMING TO TIS.415 AND TIS.543.
4. THIS DRAWING SHALL BE REFERENCED TO DWG. NO. RS-603

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

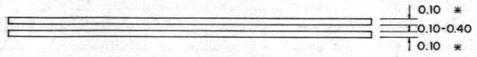
MARKING DETAILS-I

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-602
		SHEET NO. 47

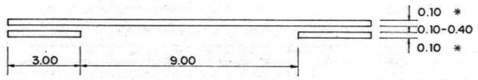


SINGLE BROKEN LINE

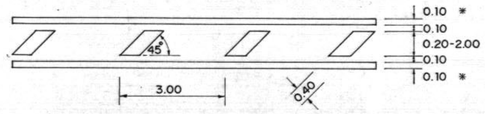
SINGLE SOLID LINE



DOUBLE SOLID LINE



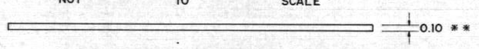
BROKEN LINE & SOLID LINE



DOUBLE LINE WITH CROSS HATCHING

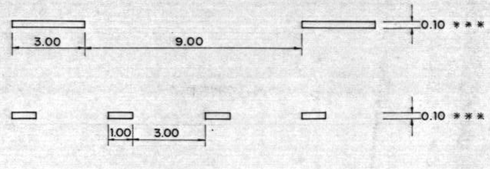
* STANDARD WIDTH IS 10CM., THE ADJUSTED WIDTH SHALL CONFORM TO THE TABLE.

CENTER LINE MARKINGS
NOT TO SCALE



** STANDARD WIDTH IS 10CM., FOR UNINTERRUPTED-FLOW HIGHWAY WITH ADT. IS MORE THAN 32,000 VEHICLE/DAY, THE WIDTH SHALL BE 15 CM.

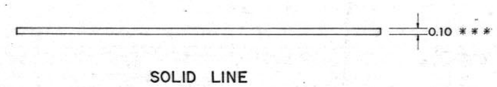
EDGE LINE MARKING
NOT TO SCALE



BROKEN LINE

WIDE BROKEN LINE

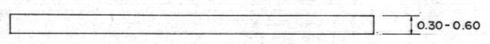
SHORT BROKEN LINE



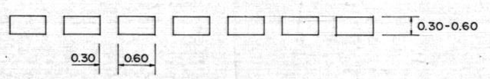
SOLID LINE

*** FOR UNINTERRUPTED-FLOW HIGHWAY WITH ADT. IS MORE THAN 32,000 VEHICLE/DAY, THE WIDTH SHALL BE 15 CM.

LANE LINE MARKINGS
NOT TO SCALE



STOP LINE MARKING
NOT TO SCALE



GIVEWAY LINE MARKING
NOT TO SCALE

TABLE : WIDTH OF CENTER LINE MARKING

A. TWO-LANE HIGHWAY

(NUMBERS ARE IN CENTIMETERS)

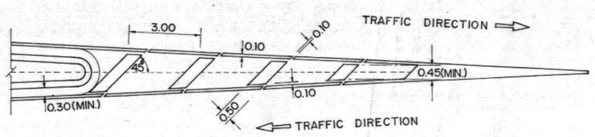
ADT. (VEHICLE / DAY)	WIDTH OF TRAVELED WAY (METERS)					
	5.00	5.50	6.00	6.50	7.00	MORE THAN 7.00
LESS THAN 500	7	7	10	10	10	10
MORE THAN 500	10	10	10	10	10	10
MORE THAN 4000	10	10	15	15	15	15
MORE THAN 8000	10	10	15	15	15	20

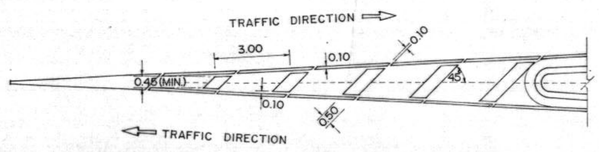
B. MULTILANE UNDIVIDED HIGHWAY (DOUBLE SOLID LINE)

(NUMBERS ARE IN CENTIMETERS)

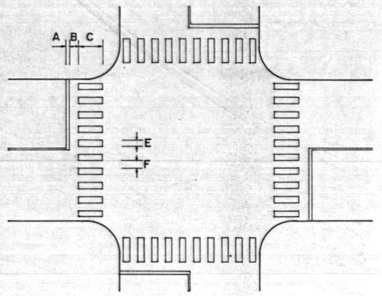
ADT. (VEHICLE / DAY)	WIDTH OF TRAVELED WAY (METERS)		
	LESS THAN 14.00(1)	14.00	MORE THAN 14.00
MORE THAN 8000	WIDTH 10 GAP 10	WIDTH 10 GAP 10	WIDTH 10 GAP 10
MORE THAN 16000	WIDTH 10 GAP 10	WIDTH 15 GAP 15	WIDTH 15 GAP 15-60(2)
MORE THAN 32000	WIDTH 15 GAP 15	WIDTH 20 GAP 20	WIDTH 20 GAP 20-80(2)

REMARKS: (1) FOR ULTIMATE STAGE WHICH THE TRAVELED WAY WIDTH IS LESS THAN 13.00 METERS, THE CENTER LINE MARKINGS SHALL BE TWO-LANE HIGHWAY FORMAT.
(2) IF WIDTH OF GAP IS MORE THAN 40 CM., THE CENTER LINE MARKING SHALL BE DOUBLE LINE WITH CROSS HATCHING FORMAT.

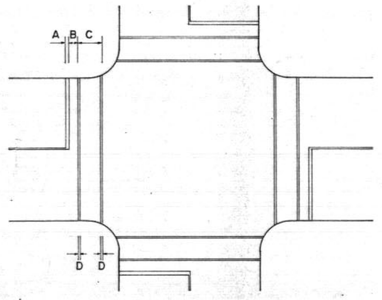




CROSS HATCHING MARKING
NOT TO SCALE

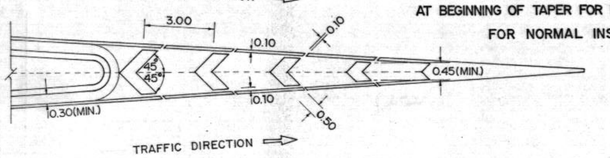


CROSSWALK MARKING WITH LONGITUDINAL LINES FOR ADDED VISIBILITY

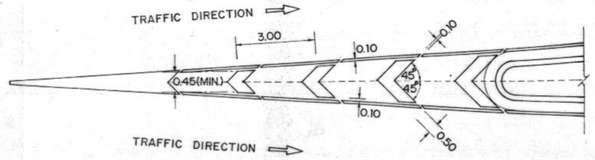


STANDARD CROSSWALK MARKING

CROSSWALK MARKINGS
NOT TO SCALE

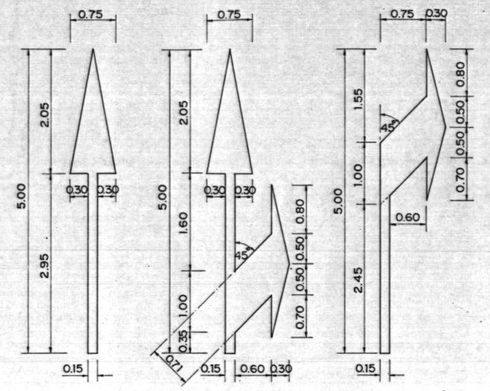


AT BEGINNING OF TAPER FOR DECELERATION LANE, FOR NORMAL INSTALLATION



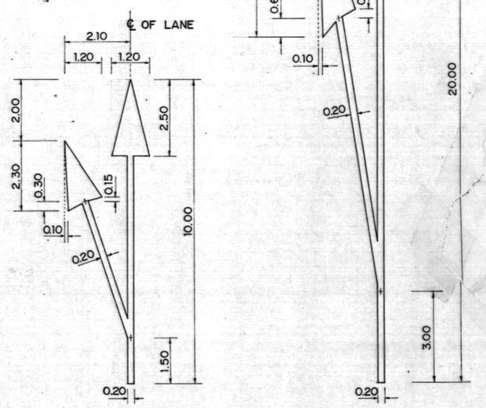
AT BEGINNING OF TAPER FOR DECELERATION LANE, FOR DIVIDED HIGHWAY

CHEVRON HATCHING MARKING
NOT TO SCALE



DIRECTIONAL ARROWS
SCALE 1 : 50

- A = 0.30 - 0.60 M.
- B = 1.00 M.
- C = 2.00 - 4.00 M.
- D = 0.5 A
- E = 0.60 M.
- F = 0.80 M.



LONG DIRECTIONAL ARROWS
SCALE 1 : 100

NOTES :

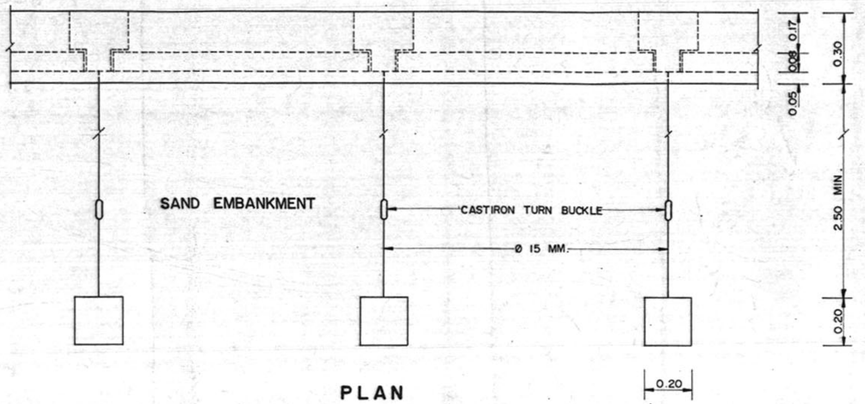
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. THIS DRAWING SHALL BE REFERENCED TO DWG. NO. RS-602

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

MARKING DETAILS - II

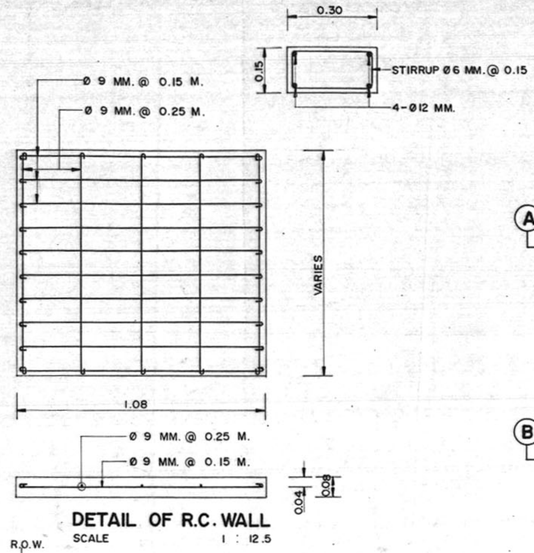
DESIGNED: D.O.H. & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: (DIRECTOR GENERAL)		DWG. NO. RS-603
		SHEET NO. 48



PLAN

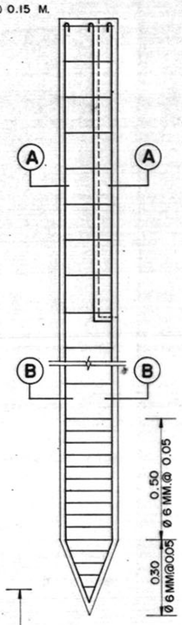
RETAINING WALL TYPE III

SCALE 1 : 12.5



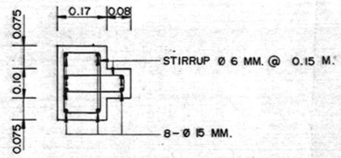
DETAIL OF R.C. WALL

SCALE 1 : 12.5



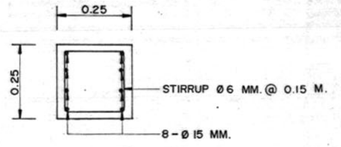
DETAIL OF PILE

SCALE 1 : 12.5



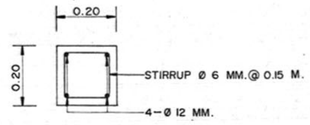
SECTION (A) - (A)

SCALE 1 : 10



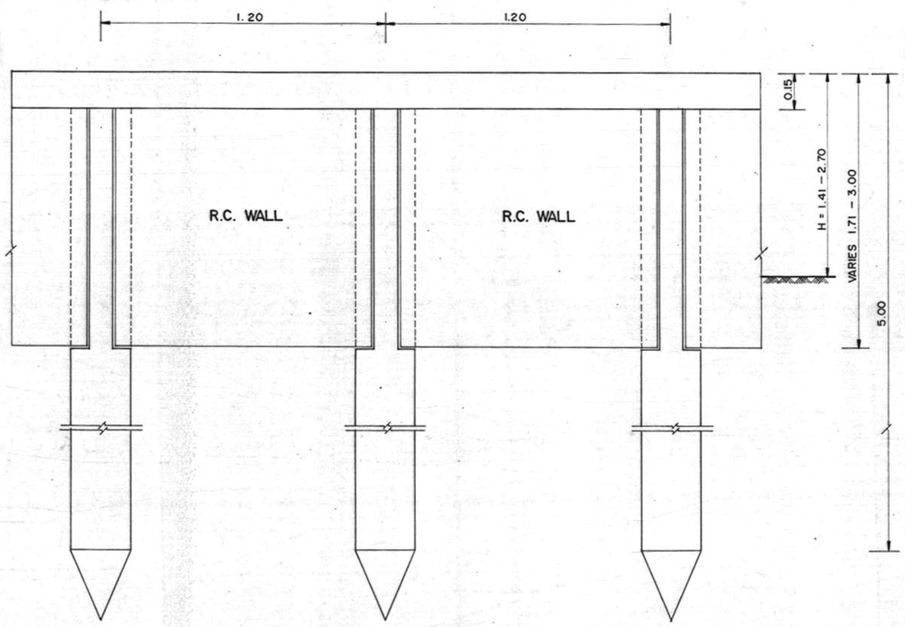
SECTION (B) - (B)

SCALE 1 : 10



SECTION (C) - (C)

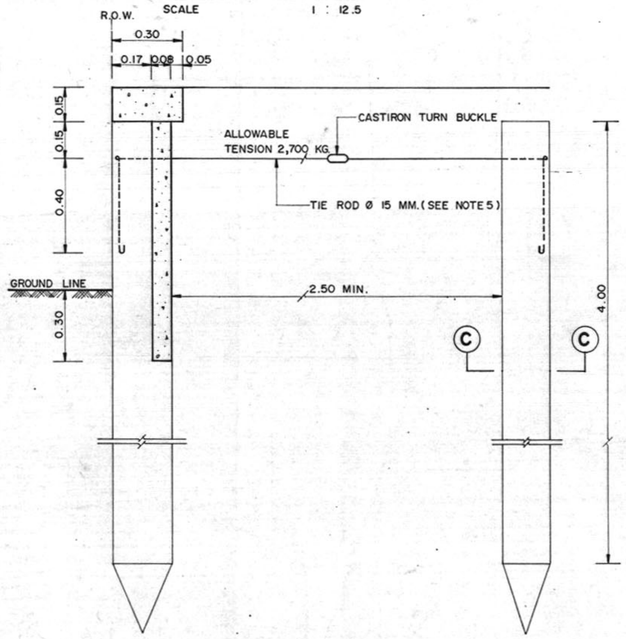
SCALE 1 : 10



FRONT VIEW

RETAINING WALL TYPE III

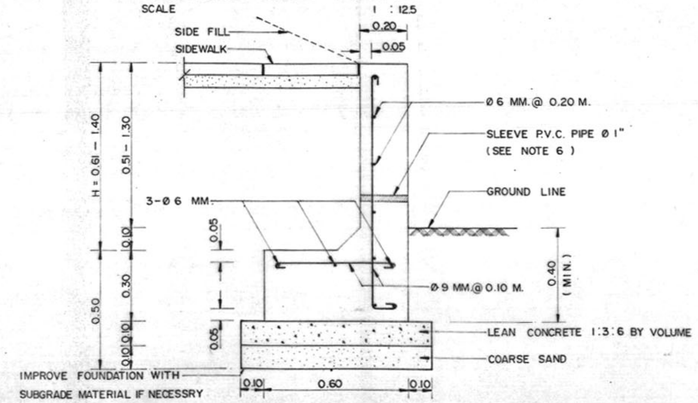
SCALE 1 : 12.5



SIDE VIEW

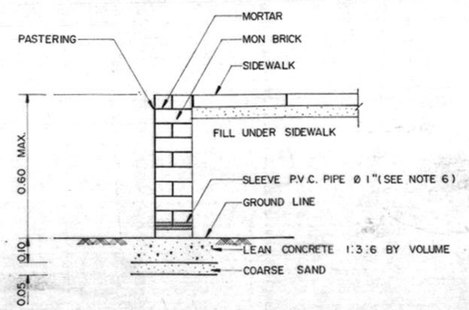
RETAINING WALL TYPE III

SCALE 1 : 12.5



RETAINING WALL TYPE II (RETAINING R.C. WALL)

SCALE 1 : 12.5



RETAINING WALL TYPE I (MASONRY BRICK WALL)

SCALE 1 : 12.5

NOTES :

1. ALL DIMENSION ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15 x 15 x 15 CM. CUBE. AT 28 DAY. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	350	KG. (MIN.)
SAND	0.43	M^3.
CRUSHED ROCK OR GRAVEL	0.86	M^3.
CONCRETE SLUMP	10	CM. (MAX.)

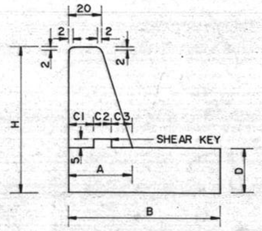
3. CLEAR CONCRETE COVER SHALL BE 2.5 CM.(MIN.).
4. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24.
5. TIE ROD SHALL BE COATED TWICE ASPHALTIC MATERIAL AND WOUND WITH SACK.
6. THE P.V.C. PIPE FOR THE SLEEVE SHALL CONFORM TO TIS. 17 CLASS 13.5 THE SLEEVE SHALL BE MADE AT THE CONNECTION POINT OF THE WATER SUPPLY DISTRIBUTION PIPE TO THE ROADSIDE BUILDING IN CASE OF NO DISTRIBUTION PIPE OR NO ROADSIDE BUILDINGS, THE SLEEVE SHALL ALSO BE MADE BUT AT THE POINTS EXPECTING FOR FUTURE WATER SUPPLY AS DIRECTED BY THE ENGINEER AND THE ENDS OF THE SLEEVE SHALL BE PLUGGED WITH P.V.C. PLUG WHEN NOT IN USE.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

RETAINING WALL - I

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-701
		SHEET NO. 49

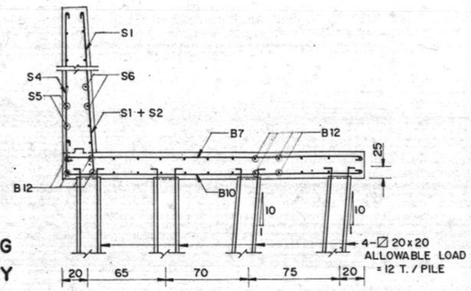


SIDE VIEW OF RETAINING WALL SHOWING POSITION AND DISTANCES OF SHEAR KEY

NOT TO SCALE

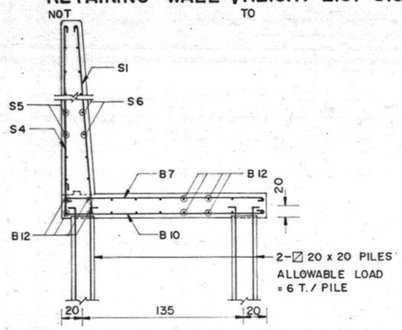
H	B	D	A	C1	C2	C3
100	100	25	25	10	7.5	7.5
200	175	30	30	10	10	10
300	250	35	39	15	14	10

NOTE : IN CASE THE HEIGHT, H IS IN THE INTERVAL OF THE HEIGHT GIVEN IN THE TABLE THE VALUE D, A, C1, C2 AND C3 SHALL BE CALCULATED FOR THE HEIGHT, H BY LINEAR RATIO COMPARING IN THE INTERVAL OF THE HEIGHT GIVEN. THE VALUE B SHALL BE CALCULATED IN THE SAME WAY IN CASE OF RETAINING WALL USING SPREAD FOOTING. USING THE VALUE B WHICH ARE GIVEN IN THIS TABLE FOR RETAINING WALL USING PILES.



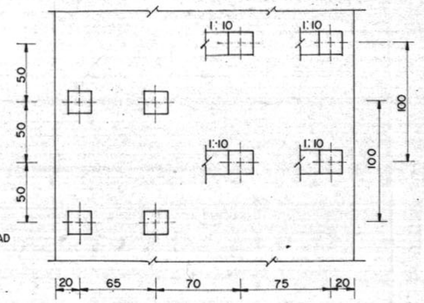
RETAINING WALL , HEIGHT 2.01-3.00 M.

NOT TO SCALE



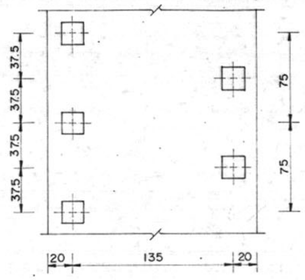
RETAINING WALL , HEIGHT 1.01 - 2.00 M.

NOT TO SCALE



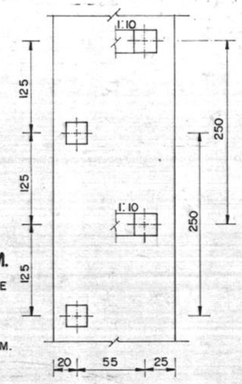
PLAN OF PILE

NOT TO SCALE



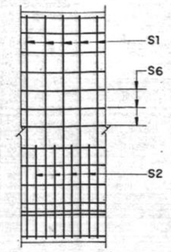
PLAN OF PILE

NOT TO SCALE



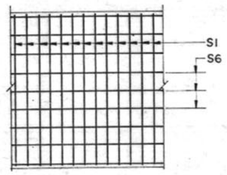
PLAN OF PILE

NOT TO SCALE



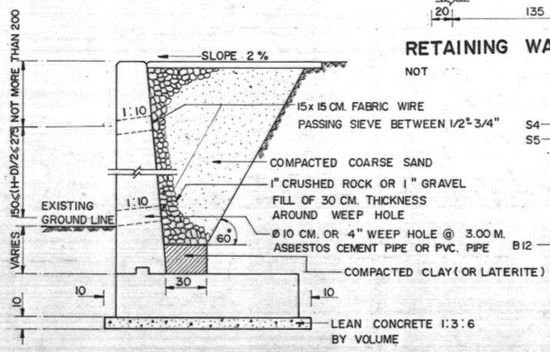
REINFOCEMENT OF INNER WALL, HEIGHT 2.01-3.00 M.

NOT TO SCALE

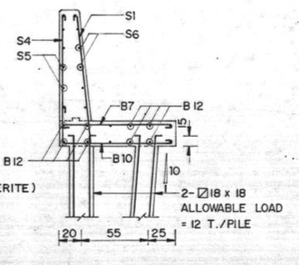


REINFORCEMENT OF INNER WALL, HEIGHT ⩽ 2.00 M.

NOT TO SCALE

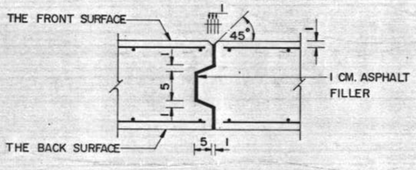


DETAIL OF BASE OF RETAINING WALL, WEEP HOLE AND EARTH BACK FILL



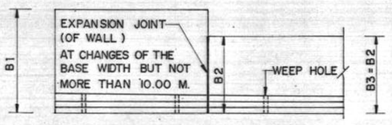
RETAINING WALL, HEIGHT ⩽ 1.00 M.

NOT TO SCALE



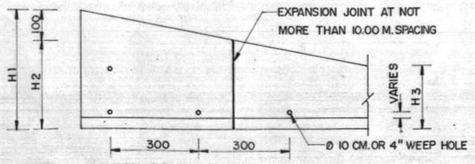
EXPANSION JOINT DETAIL OF WALL

NOT TO SCALE



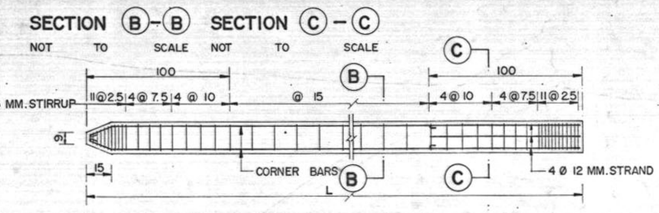
PLAN OF BASE OF RETAINING WALL USING PILE WHEN WALL HEIGHT VARIES LINEARLY WITH LENGTH

NOT TO SCALE



SIDE VIEW OF RETAINING WALL USING PIPE WHEN WALL HEIGHT VARIES LINEARLY WITH LENGTH

NOT TO SCALE

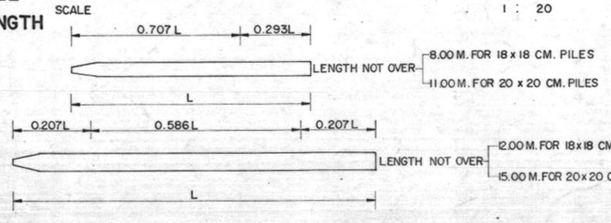


SECTION (B)-(B) SECTION (C)-(C)

NOT TO SCALE NOT TO SCALE

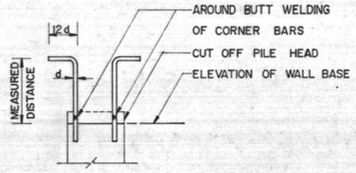
REINFORCEMENT OF 18 x 18 CM. AND 20 x 20 CM. PILES

SCALE 1 : 20



PICK-UP DETAILS FOR PILES

NOT TO SCALE



DETAIL OF CORNER BAR AT PILE HEAD

SCALE 1 : 10

CONSTRUCTION SPECIFICATIONS

1. GENERAL NOTES FOR RETAINING WALL

1.1 CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	350	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

WATER - CEMENT RATIO 0.45-0.50 BY WEIGHT

1.2 AFTER THE FOUNDATION UNDERNEATH IS COMPACTED, THE LEAN CONCRETE SHALL BE PLACED FOR 10 CM. THICK AS THE BASE WITH 10 CM. AROUND WIDER THAN THE FOUNDATION THE MIX DESIGN OF THE LEAN CONCRETE IS 1:3:6 BY VOLUME.

1.3 CONCRETE COVER SHALL BE 2.5 CM. EXCEPT FOR THE FOUNDATION STRUCTURE THE CONCRETE COVER SHALL BE 5 CM. IN CASE OF THE MARINE CLAY, CONCRETE COVER FOR THE OTHER PART OF THE WALL AND THE FOUNDATION FACING THE MARINE SOIL SHALL BE ADDED 2.5 CM. FROM THE DIMENSIONS SHOWN ON THIS DRAWING.

1.4 EARTH BACKFILL SHALL BE SANDY SOIL OR GRAVEL SOIL OR ROCK OR OTHER SOIL IN THE CONSTRUCTION AREA HAVING THE SAME QUALITIES BY THE APPROVAL OF THE ENGINEER.

2. SPECIAL NOTES OF RETAINING WALL USING PILES

2.1 THE ELEVATION OF THE FOUNDATION SHALL BE AT LEAST THE SAME ELEVATION AS THE EXISTING GROUND LINE. MEASURED FROM THE SURFACE OF THE LEAN CONCRETE IN NO. 1.2

2.2 R.C. PILES USED ARE AS SHOWN IN THIS DRAWING AND SHALL MEET THE FOLLOWING REQUIREMENT

2.2.1 20 x 20 CM. PILES SHALL BE DRIVEN TO SUCH A DEPTH THAT IT CAN SUPPORT THE ALLOWABLE LOAD OF NOT LESS THAN 12 TONS AND THE LENGTH OF THE PILE UNDER THE GROUND SURFACE IS NOT LESS THAN 10.00 M. FOR RETAINING WALL WITH 2.01 - 3.00 M. IN HEIGHT.

2.2.2 20 x 20 CM. PILES SHALL BE DRIVEN TO SUCH A DEPTH THAT IT CAN SUPPORT THE ALLOWABLE LOAD OF NOT LESS THAN 6 TONS AND THE LENGTH OF THE PILE UNDER THE GROUND SURFACE IS NOT LESS THAN 10.00 M. FOR RETAINING WALL WITH 1.01 - 2.00 M. IN HEIGHT.

2.2.3 18 x 18 CM. PILES SHALL BE DRIVEN TO SUCH A DEPTH THAT IT CAN SUPPORT THE ALLOWABLE LOAD OF NOT LESS THAN 2 TONS FOR RETAINING WALL WITH NOT MORE THAN 1.00 M. IN HEIGHT

2.2.4 THE METHOD OF DETERMINING THE ALLOWABLE LOAD (STATIC PIPE LOAD TEST) SHALL BE CALCULATED AS FOLLOWS :

2.2.4.1 IN CASE OF A TEST PIPE SUPPORTED, THE APPLIED LOAD MUST NOT BE LESS THAN THE GIVEN ALLOWABLE LOAD FOR PILES IN NO.2.2.1, NO.2.2.2 AND NO. 2.2.3 AND IF THE AVERAGE SETTLEMENT OF A PILE (THE TOTAL SETTLEMENT OF A PILE AT THAT TIME/THE APPLIED LOAD AT THAT TIME) DOES. NOT EXCEED 0.025 CM./PILE IN 24 HOURS, THE ALLOWABLE LOAD OF A PILE IS HALF OF THE APPLIED LOAD AT THAT TIME. (SAFETY FACTOR=2)

2.2.4.2 IF THE SETTLEMENT RATE OF A PILE EXCEEDS THE VALUE GIVEN IN NO.2.2.4.1 OR THE APPLIED LOAD IS LOADED TO A NEAR-FAILURE CONDITION, THE APPLIED LOAD SHALL BE DIVIDED BY 2.5 TO BE THE ALLOWABLE LOAD (SAFETY FACTOR = 2.5) IN CASE IF THE ABOVE METHOD CAN NOT DETERMINE THE LOAD OF A PILE, THE ALLOWABLE LOAD CAN BE CALCULATED BY USING ONE OF THESE PILE DRIVING FORMULAS SUCH AS HILEY FORMULA, JANBU FORMULA OR DANISH FORMULA AND THE SAFETY FACTOR USED FOR THE THREE FORMULAS SHALL NOT BE LESS THAN 3 TIMES OF THE CALCULATED LOAD.

2.2.5 CONCRETE FOR PILES SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 300 KSC. FOR 15x15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	375	KG. (MIN.)
SAND	0.43	M.
CRUSHED ROCK OR GRAVEL	0.86	M.
CONCRETE SLUMP	8	CM. (MAX.)

WATER - CEMENT RATIO 0.40 - 0.45 BY WEIGHT

2.2.6 PILE HEADS SHALL BE CUT OFF BEFORE THE RETAINING WALL BASE IS CONSTRUCTED AND THE CORNER BARS SHALL BE BENDED OR WELDED WITH THE SAME SIZE OF BARS AS SHON IN THIS DRAWING.

3. REINFORCING STEEL NOTES

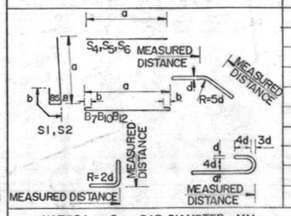
3.1 ALL REINFORCING STEEL SHALL BE INTERMEDIATE GRADE DEFORMED BARS (CONFORM TO TIS.24 GRADE SD 30) EXCEPT FOR BAR DIAMETER LESS THAN 12 MM. WHICH MAY BE OF STRUCTURAL GRADE (CONFORM TO TIS.24 GRADE SR 24)

3.2 IN CASE OF SPLICING OF THE REINFORCEMENT, SPLICING SHALL BE BY AROUND BUTT WELDING WHICH THE STRENGTH OF WELD JOINT IS NOT LESS THAN THE ULTIMATE TENSILE STRENGTH OR BY LAPPING BARS WITH THE LAP LENGTH NOT LESS THAN 20 TIMES THE BAR DIAMETERS FOR THE INTERMEDITE GRADE REINFORCING STEEL (40 TIMES THE BAR DIAMETERS FOR STRUCTURAL GRADE REINFORCING STEEL), LOCATIONS OF THE LAPPED BARS SHALL BE SPACED APART UNDER CONSIDERATION OF THE ENGINEER.

NOTES :

1. ALL DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. ANY PROBLEMS DUE TO THE DESIGNATIONS SHALL BE CONSIDERED AND DECIDED BY THE ENGINEER.
3. RETAINING WALLS SHOWN ON THIS DRAWING SHALL BE USED FOR ROADWAY EMBANKMENT THAT IS PROPERLY DESIGNED.

REINFORCING STEEL FOR ONE LINEAR METER OF RETAINING WALL



BAR MARK	HEIGHT 3.00 M. Ø	@	MEASURED DISTANCE a	MEASURED DISTANCE b	LENGTH	HEIGHT 2.00 M. Ø	@	MEASURED DISTANCE a	MEASURED DISTANCE b	LENGTH	HEIGHT 1.00 M. Ø	@	MEASURED DISTANCE a	MEASURED DISTANCE b	LENGTH
REINFORCEMENT OF WALL															
S_1	12	22	293*	56.5	349.5	9	12	193*	47	240*	9	12	93*	42	135*
S_2	12	22	115.5	56.5	172	-	-	-	-	-	-	-	-	-	-
S_4	9	20	293**	0	293*	9	20	193*	0	193*	9	20	93*	0	93*
S_5	9	20	100	0	100	9	20	100	0	100	9	20	100	0	100
S_6	9	25	100	0	100	9	25	100	0	100	9	25	100	0	100
REINFORCEMENT OF BASE															
B_7	16	12	245	0	245	9	20	170	7.5	185	9	20	95	7.5	110
B_{10}	9	20	245	0	245	9	20	170	0	170	9	20	95	0	95
B_{12}	9	12*	100	0	100	9	20*	100	0	100	9	20*	100	0	100

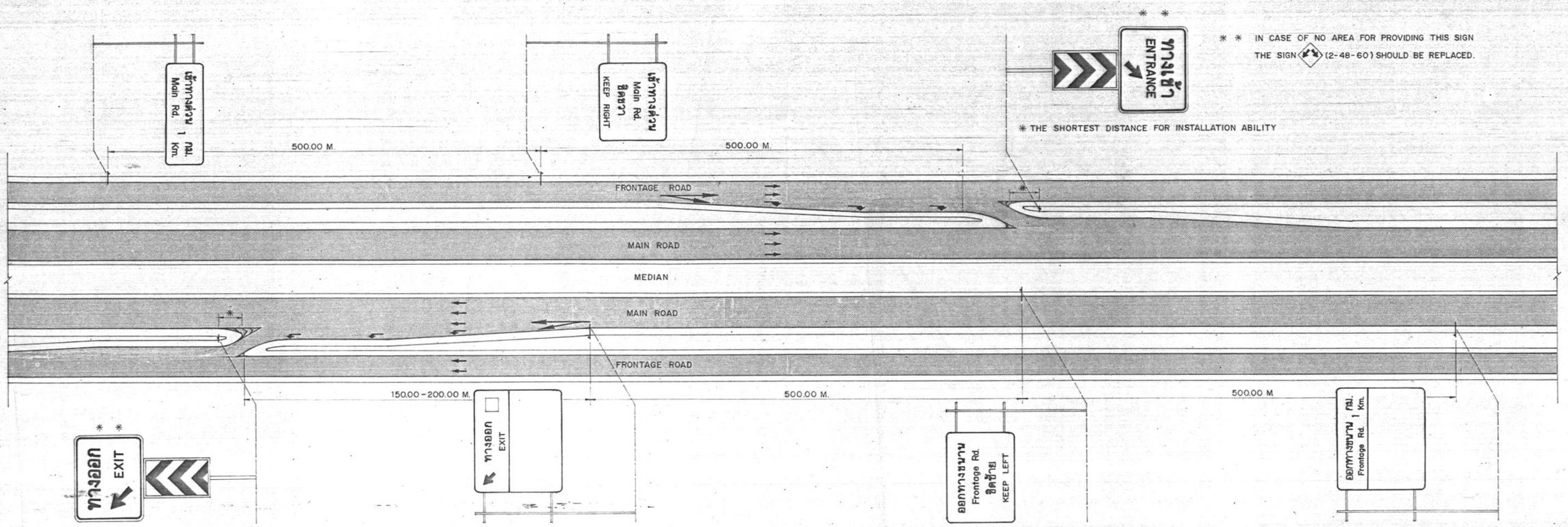
NOTES : Ø BAR DIAMETER, MM.
* DECREASING THE LENGTH OF BAR IN CASE THE HEIGHT OF WALL IS LESS THAN THE VALUE GIVEN.
** OR AS SHOWN IN CROSS - SECTION

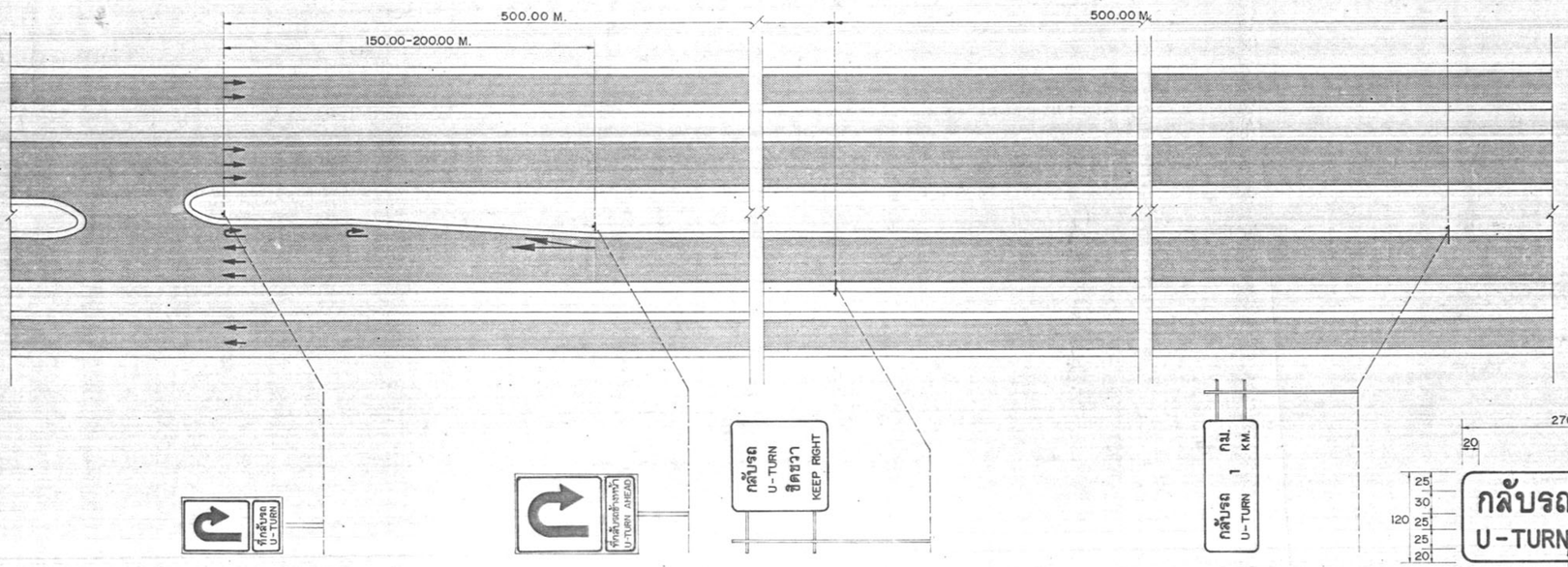
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

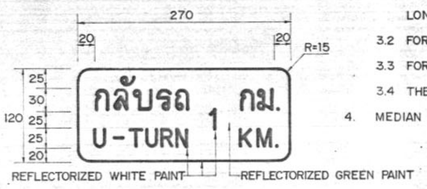
STANDARD DRAWING

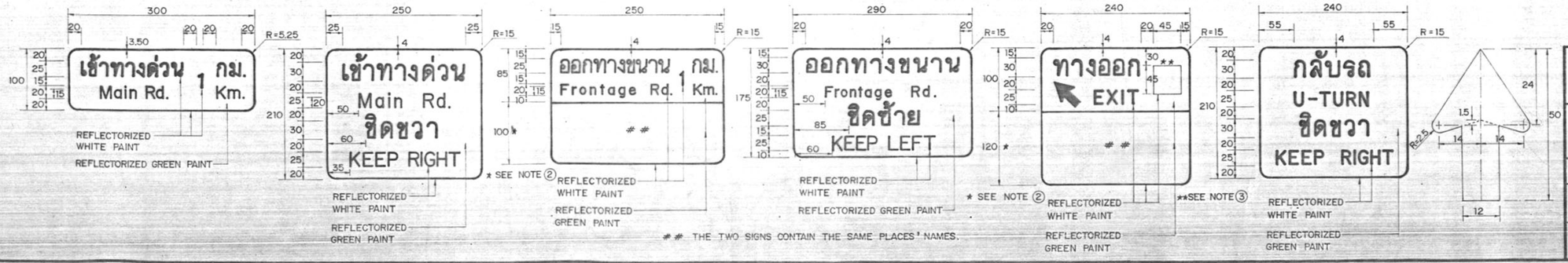
RETAINING WALL - II

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-702
		SHEET NO. 50









NOTES :

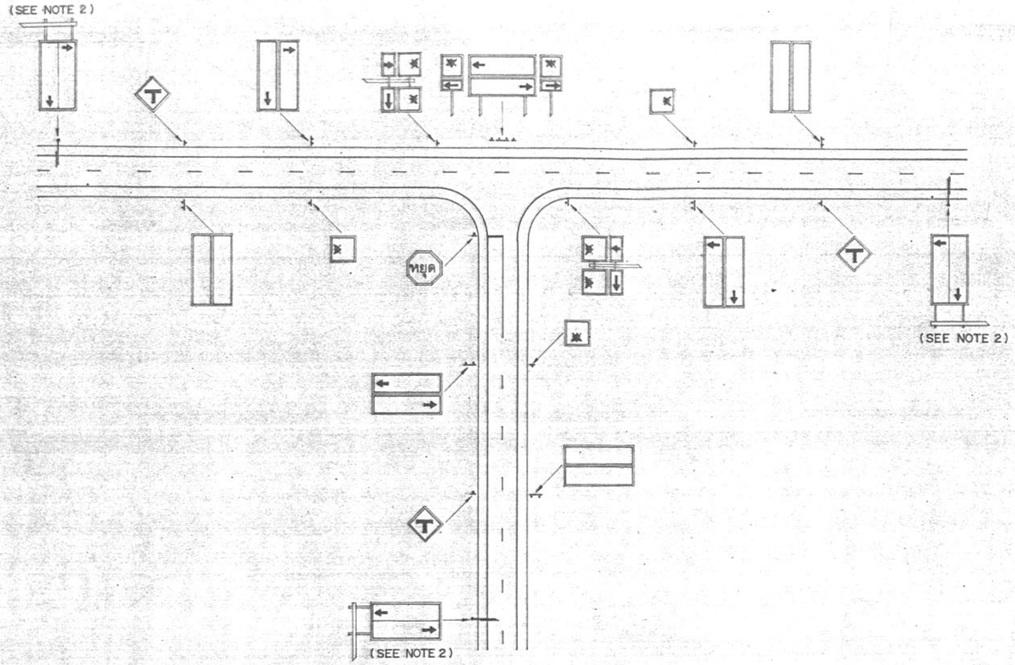
1. ALL DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. THE BLANK AREA CONTAINS PLACE'NAME, TO CONSIDER AS FOLLOWS :
   - 2.1 ONLY 1-2 NAMES ARE CONTAINED IN THE AREA, EXCEPT NECESSARY FOR SPECIAL CASE SHALL BE 3 NAMES.
   - 2.2 THE PLACES' NAME SHALL BE THE NAME OF PLACE WHERE PUBLICITY TO USE.
   - 2.3 IF MORE THAN 3 PLACES, THE ORDER OF IMPORTANCE AND DISTRIBUTION OF PLACES ARE CONSIDERED.
   - 2.4 THE HOSPITAL THAT HAVE EMERGENCY ROOM IS CONSIDERED THE FIRST.
   - 2.5 THE WORDS "PUBLICITY TO USE" MEANS THE PUBLICITY WHO USE THE PLACES WITHOUT FAMILIAR OR REST AT THE PLACES.
   - 2.6 THE PROJECT ENGINEER AND THE DISTRICT ENGINEER CONSIDER THE PLACES' NAME TOGETHER AND PRESENTS TO DIRECTOR OF THE HIGHWAY DIVISION FOR APPROVAL.
3. THE 45×45 CM. SQUARE CONTAINS EXITS' NUMBER WHICH AS FOLLOWS :
   - 3.1 THE EXITS' NUMBER SHALL BE APPLIED FOR PRIMARY HIGHWAY WITH LONG FRONTAGE ROAD.
   - 3.2 FOR OUTBOUND ROUTE, THE NUMBERS ARE ODD.
   - 3.3 FOR INBOUND ROUTE, THE NUMBERS ARE EVEN.
   - 3.4 THE BEGINNING OF EXITS' NUMBER IS AT THE ORIGIN OF PRIMARY HIGHWAY.
4. MEDIAN OPENING FOR U-TURNS IN RURAL AREAS SHOULD BE 3-5 KM. INTERVAL.

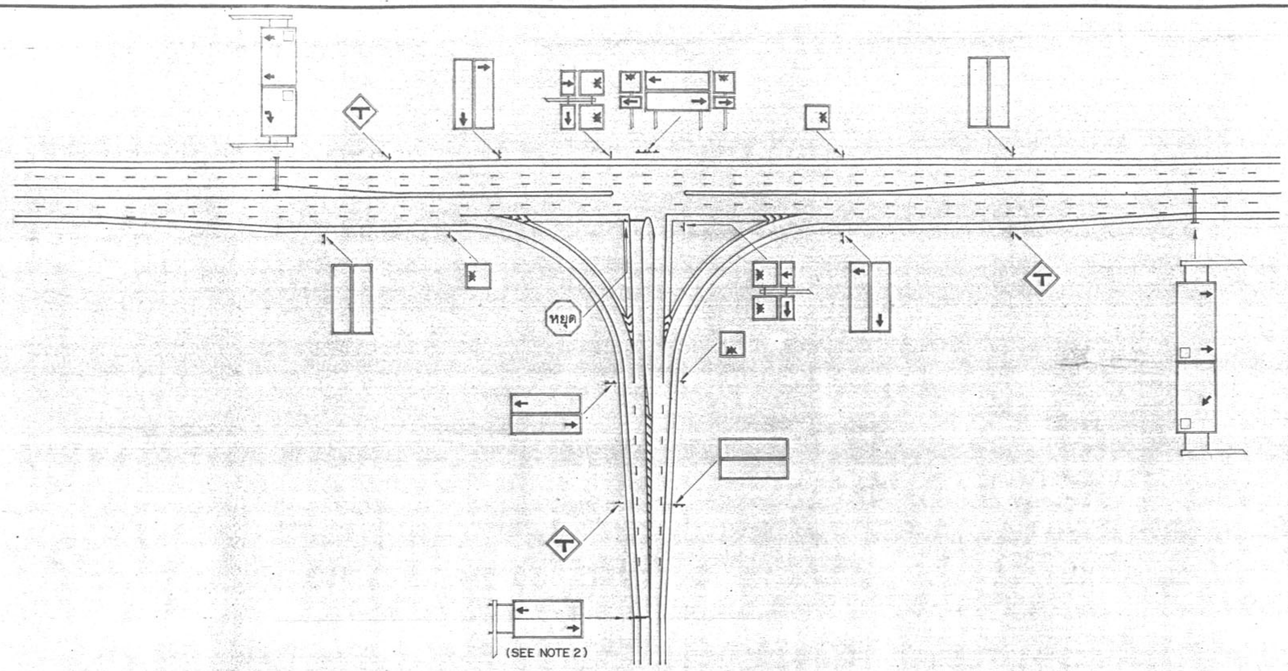
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

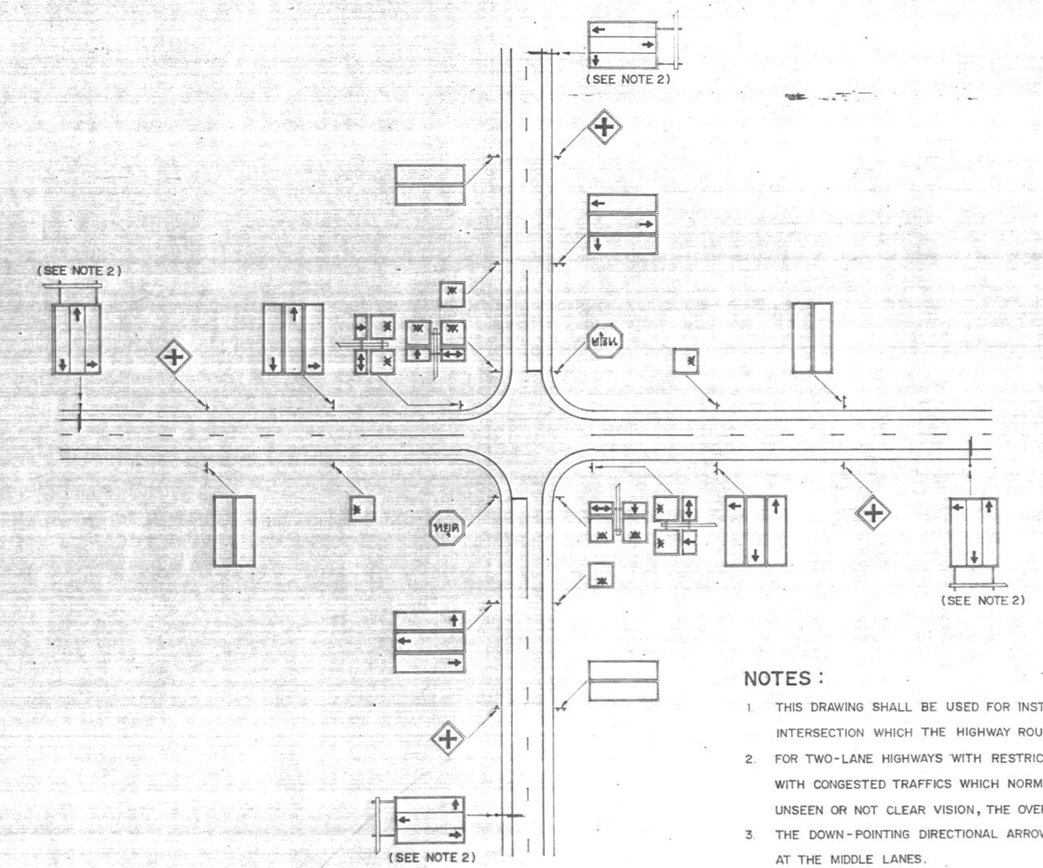
STANDARD DRAWING

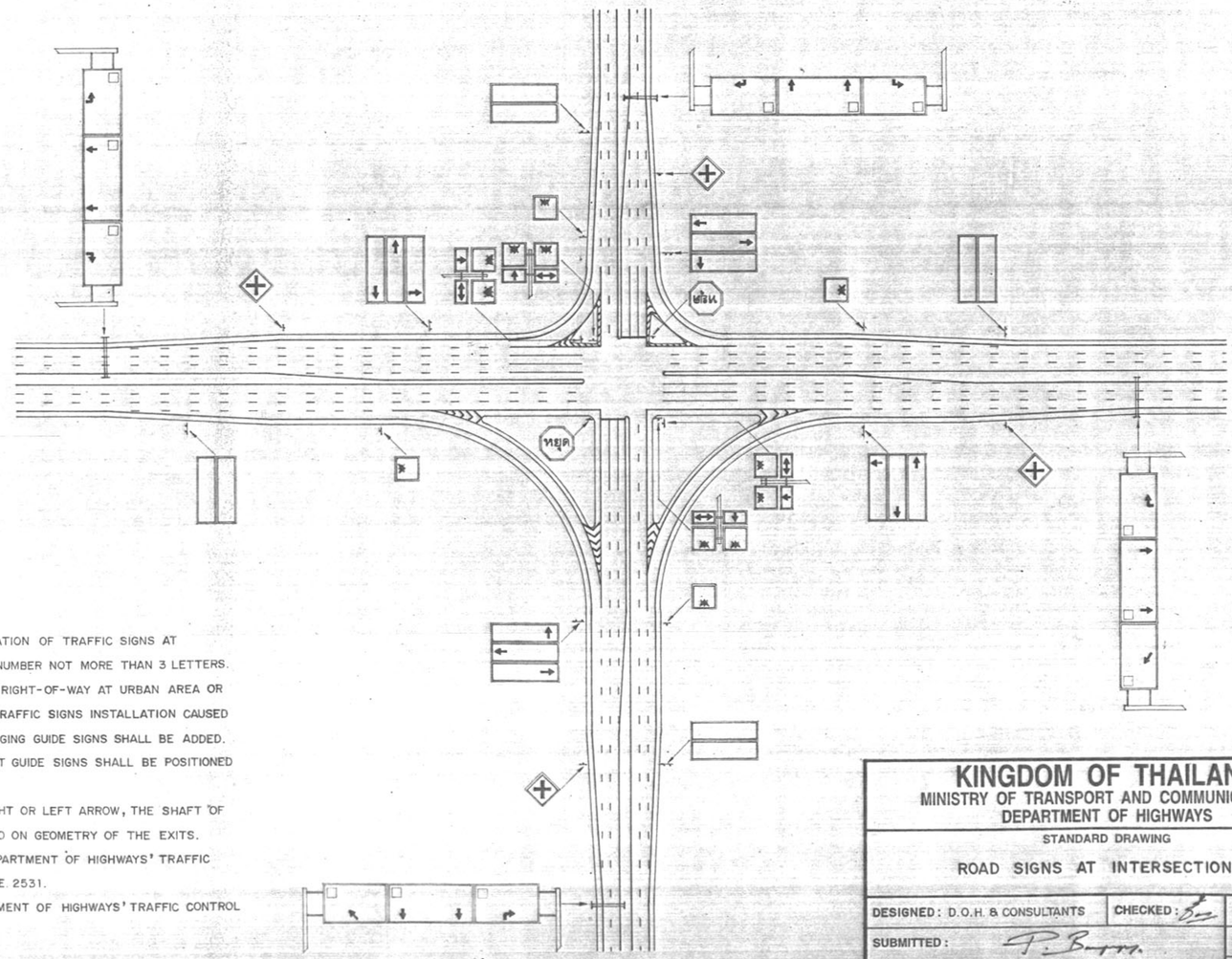
ROAD SIGNS AT MEDIAN OPENING & EXIT AND ENTRANCE

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
		DWG. NO. RS-801
APPROVED : FOR (DIRECTOR GENERAL)		SHEET NO. 51









NOTES :

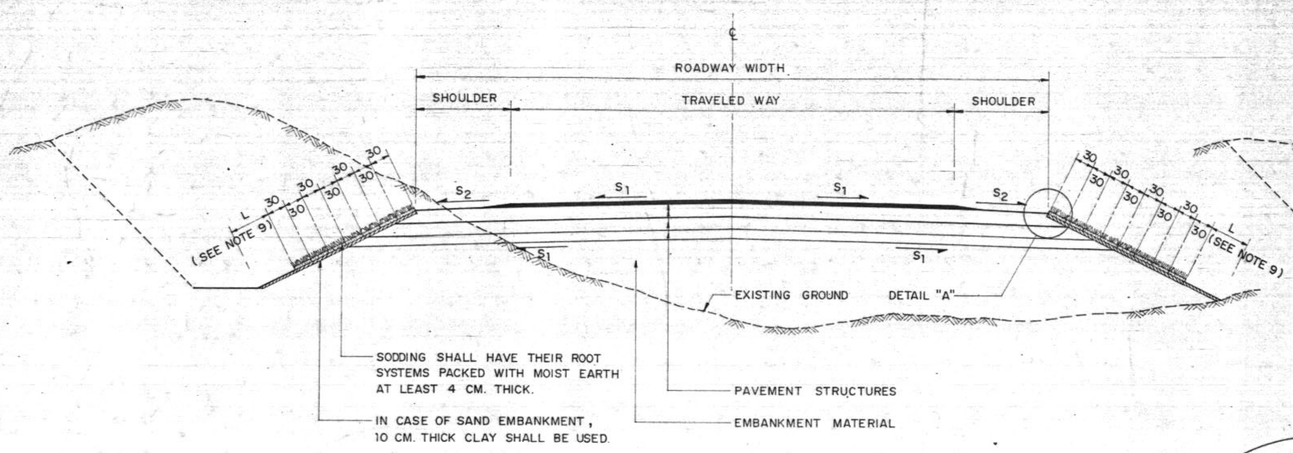
1. THIS DRAWING SHALL BE USED FOR INSTALLATION OF TRAFFIC SIGNS AT INTERSECTION WHICH THE HIGHWAY ROUTE NUMBER NOT MORE THAN 3 LETTERS.
2. FOR TWO-LANE HIGHWAYS WITH RESTRICTED RIGHT-OF-WAY AT URBAN AREA OR WITH CONGESTED TRAFFICS WHICH NORMAL TRAFFIC SIGNS INSTALLATION CAUSED UNSEEN OR NOT CLEAR VISION, THE OVERHANGING GUIDE SIGNS SHALL BE ADDED.
3. THE DOWN-POINTING DIRECTIONAL ARROWS AT GUIDE SIGNS SHALL BE POSITIONED AT THE MIDDLE LANES.
4. THE ADVANCE TURN ARROWS DISPLAYS A RIGHT OR LEFT ARROW, THE SHAFT OF WHICH IS BENT OR AT A 45°ANGLE DEPENDED ON GEOMETRY OF THE EXITS.
5. TRAFFIC SIGNS SHALL CONFORM TO THE DEPARTMENT OF HIGHWAYS' TRAFFIC CONTROL DEVICE MANUAL, PART 1 ISSUED B.E. 2531.
6. MARKINGS SHALL CONFORM TO THE DEPARTMENT OF HIGHWAYS' TRAFFIC CONTROL DEVICE MANUAL, PART 2 ISSUED B.E. 2533.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

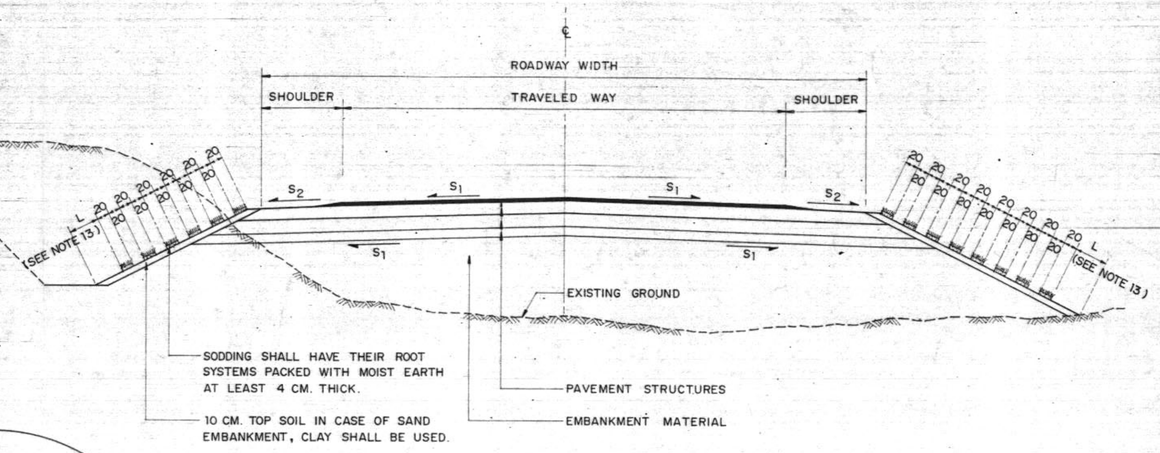
STANDARD DRAWING

ROAD SIGNS AT INTERSECTION

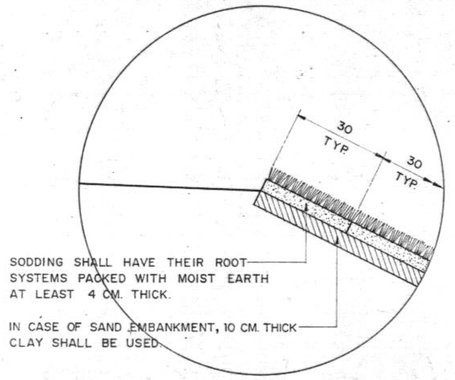
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. RS-802
		SHEET NO. 52



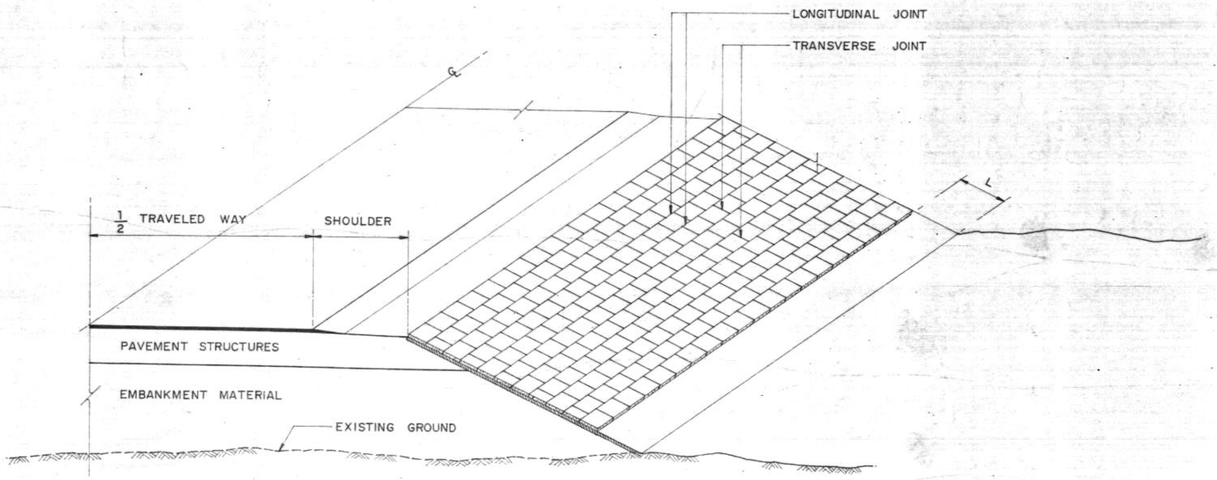
BLOCK SODDING (TYPE I)
NOT TO SCALE



STRIP SODDING (TYPE II)
NOT TO SCALE



DETAIL "A"
NOT TO SCALE



ISOMETRIC DIAGRAM BLOCK SODDING (TYPE I)
NOT TO SCALE

NOTES :

GENERAL

1. ALL DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. THE ENGINEER SHALL DECIDE WHETHER OR NOT TO PROVIDE SODDING FOR SLOPE PROTECTION GENERALLY EMBANKMENTS COMPOSED OF SANDY OR SILTY MATERIALS WILL REQUIRE SODDING. CUT SLOPE WILL NOT NORMALLY BE SODDED AND THEN ONLY AT THE DIRECTION OF THE ENGINEER.
3. WHERE THE SIDE SLOPE MATERIAL IS NOT SUITABLE FOR GROWING GRASS, ORGANIC TOP SOIL APPROXIMATELY 10 CM. THICK SHALL BE PLACED ON THE SIDE SLOPES AND LIGHTLY COMPACTED TO THE SATISFACTION OF THE ENGINEER, THOROUGHLY MOISTENED WITH WATER AND SODDING PLACED.
4. WHERE THE SIDE SLOPE MATERIAL IS SUITABLE FOR GRASS, THE FOLLOWING PROCEDURES SHALL APPLY AFTER THE ROADWAY FORMATION IS CONSTRUCTED TO THE ELEVATION AS SHOWN ON THE DRAWING AND THE SIDE SLOPE HAS BEEN SHAPED AS REQUIRED, THE SIDE SLOPE MATERIAL SHALL BE SCARIFIED TO A MINIMUM DEPTH OF 5 CM., THOROUGHLY MOISTENED WITH WATER AND SODDING PLACED.
5. THE TYPE OF GRASS USED SHALL BE A LOCAL SPECIES WHICH GROWS RAPIDLY THE ENGINEER SHALL DECIDE IN THE FIELD WHETHER TOP SOIL IS REQUIRED AND WHICH TYPE OF GRASS SHALL BE USED THE WORK SHALL BE COMPLETED TO THE DETAILS AS SPECIFIED ON THE DRAWING.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE GRASS UNTIL THE END OF THE MAINTENANCE PERIOD.

BLOCK SODDING (TYPE I)

7. BLOCK SODDING OBTAINED FROM PLANTED GROUND FOR PLACING SHALL HAVE THEIR ROOT SYSTEM PACKED WITH MOIST EARTH AT LEAST 4 CM. THICK AND HAVE A MINIMUM SIZE OF APPROXIMATELY 30 x 30 CM. THE SODDING SHALL BE PLACED ON THE SIDE SLOPES WITHIN 48 HOURS AFTER REMOVAL FROM BORROW AREA.
8. SODDING SHALL BE LAID IN STAGGERED ROWS PARALLEL TO ROADWAY ALIGNMENT AS SHOWN ON THE DRAWING EACH BLOCK SHALL BE STAGGERED ONE HALF ITS LENGTH AND BE FIRMLY BUTTED AGAINST THE PREVIOUS BLOCK(S).
9. THE LENGTH OF "L" SHALL BE DIRECTED BY THE ENGINEER WHICH ABOVE EXISTING GROUND APPROXIMATELY 30 CM. OR NO EROSIVE POSITION.
10. PLANTED BLOCK SHALL BE PLACED AND LIGHTLY COMPACTED ON THE DESIGNATED AREAS AND THE LONGITUDINAL INTERSTICES SEALED WITH TOP SOIL. THE PLANTED SODS SHALL BE WATERED DAILY UNTIL THEY HAVE ROOTED AND HAVE ESTABLISHED THEMSELVES IN THE NEW AREAS.

STRIP SODDING (TYPE II)

11. STRIP SODDING SHALL ALSO HAVE THEIR ROOT SYSTEMS PACKED WITH MOIST EARTH AT LEAST 4 CM. THICK AND HAVE A MINIMUM WIDTH OF 20 CM. STRIP SODDING SHALL ALSO BE PLACED WITHIN 48 HOURS AFTER REMOVAL FROM BORROW AREAS.,
12. SODDING SHALL BE PLACED IN CONTINUOUS ROW PARALLEL TO ROADWAY ALIGNMENT AS SHOWN ON THE DRAWINGS EACH ROW SHALL BE AT LEAST 20 CM. WIDE AND GAPS BETWEEN ROWS SHALL NOT EXCEED 20 CM.
13. THE LENGTH OF "L" SHALL BE DIRECTED BY THE ENGINEER WHICH ABOVE EXISTING GROUND APPROXIMATELY 30 CM. OR NO EROSIVE POSITION.
14. PLANTED STRIPS SHALL BE PLACED AND LIGHTLY COMPACTED ON THE DESIGNATED AREA AND THE TRANSVERSE INTERSTICES SEALED WITH TOP SOIL STRIP SODDING SHALL BE MAINTAINED AS DESCRIBED IN NOTE NO. 3 AND NO. 6 ABOVE.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

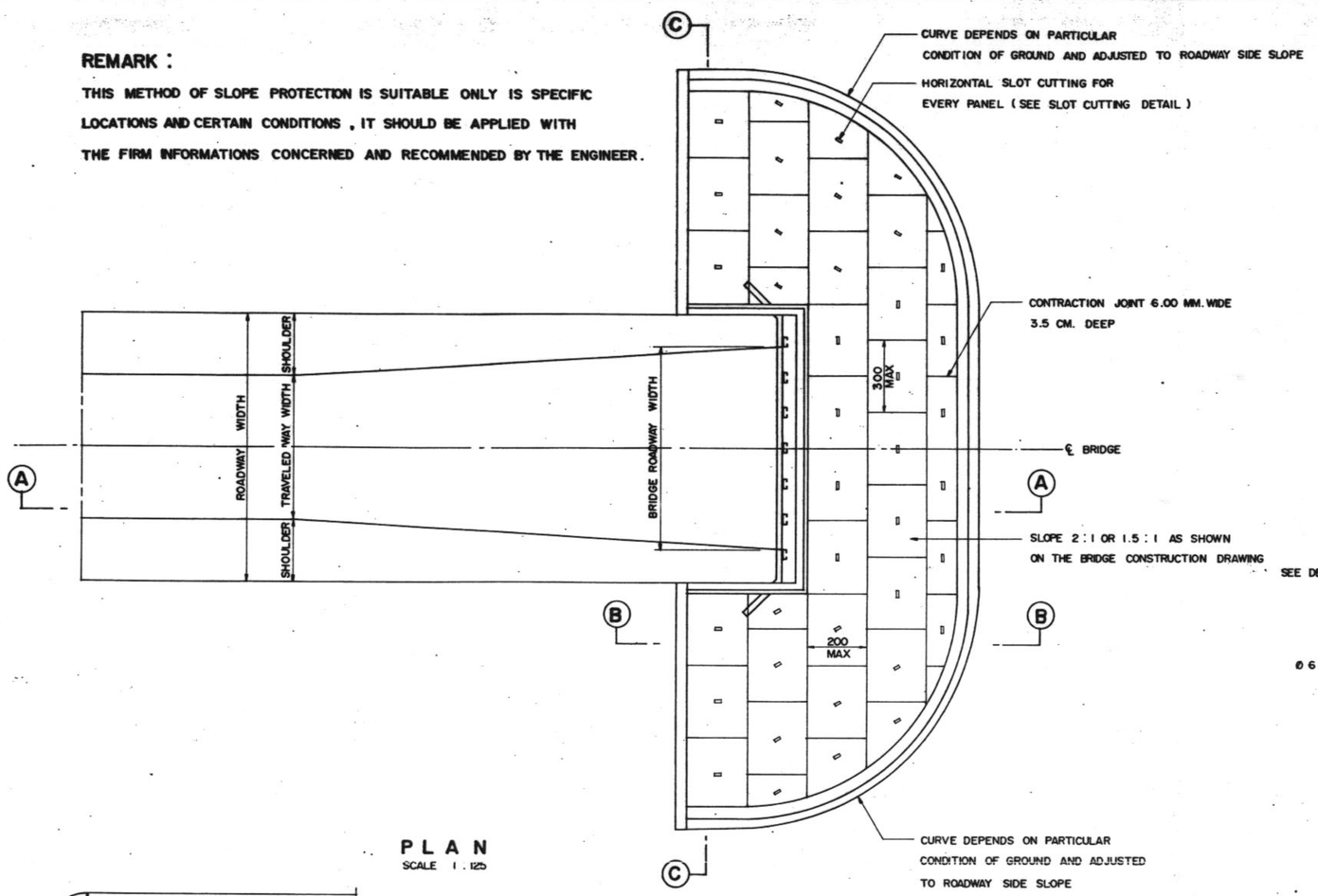
STANDARD DRAWING

SODDING DETAILS

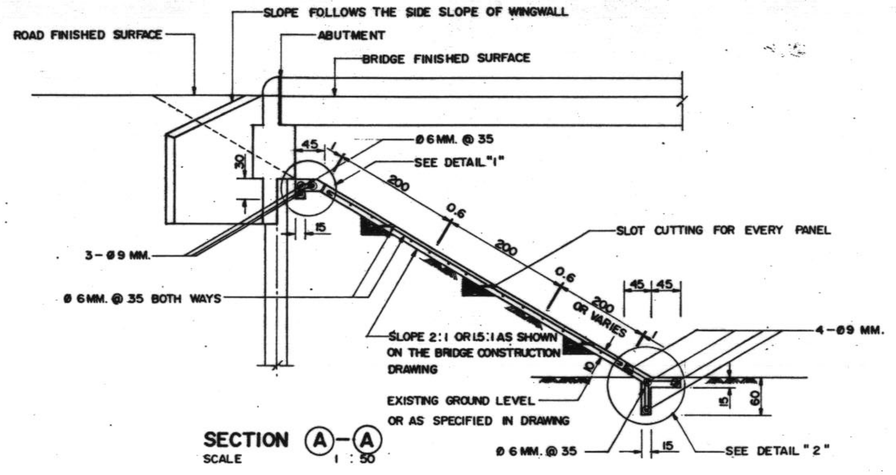
DESIGNED : D.O.H & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
		DWG. NO. SP-101
APPROVED : (DIRECTOR GENERAL)		SHEET NO. 53

REMARK :

THIS METHOD OF SLOPE PROTECTION IS SUITABLE ONLY IS SPECIFIC LOCATIONS AND CERTAIN CONDITIONS , IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.



PLAN
SCALE 1 : 125



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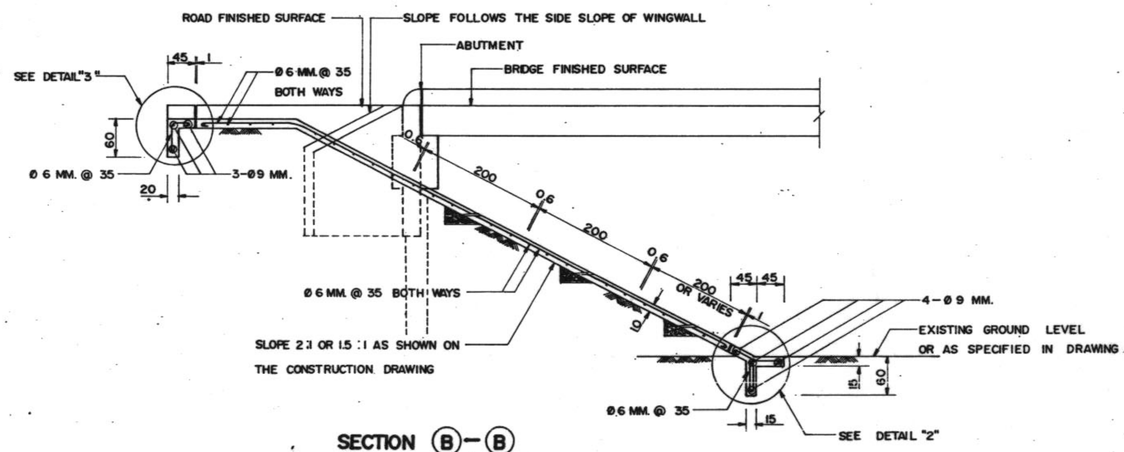

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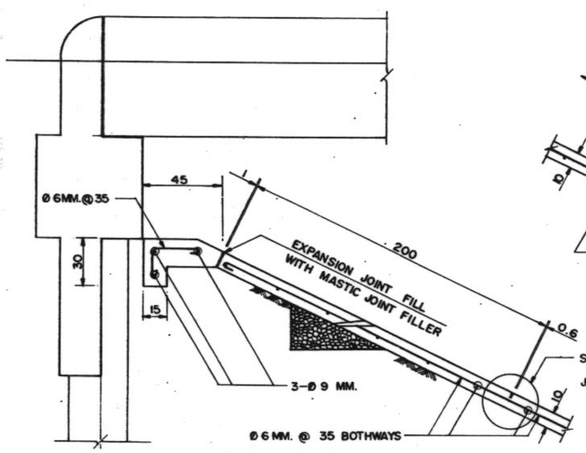
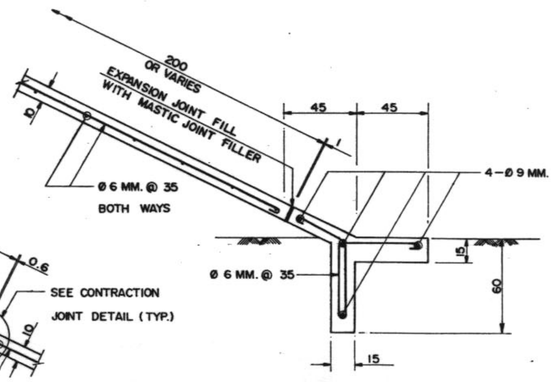
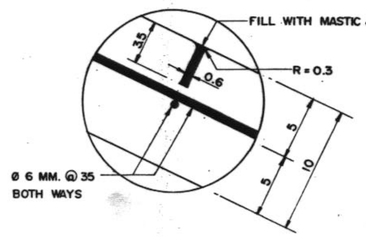


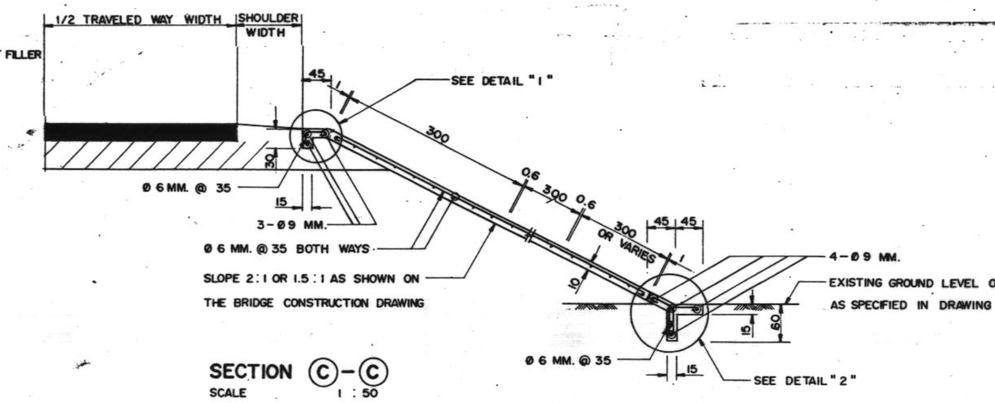
DETAIL "1"
SCALE 1 : 20



DETAIL "2"
SCALE 1 : 20



CONTRACTION JOINT DETAILS
SCALE 1 : : 2.5



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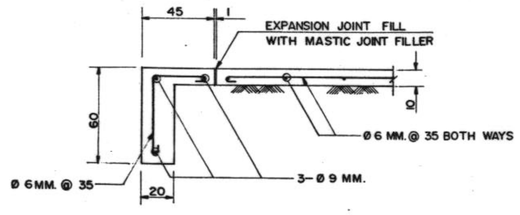
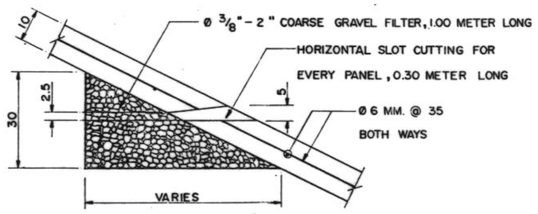


DETAIL "3"
SCALE 1 : 20



SLOT CUTTING DETAILS
SCALE 1 : 10

NOTES :

1. ALL DIMENSIONS ARE IN CENTIMETERS UNLEES OTHERWISE INDECATED.
2. BEFORE POURING THE CONCRETE SLAB ,THE EXISTING SLOPE SHALL BE WELL PREPARED AND COMPACTED TO MEET THE SIDE SLOPES OF THE ROADBED.
3. WHERE EXISTING SOIL CONDITIONS ARE POOR OR WHERE ROADBED IS VERY HIGH, A DESIGN MUST BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION .
4. THE CONCRETE SLAB SHALL BE 10 CM. THICK .
5. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGHTH OF 210 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	320	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

6. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR. 24.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

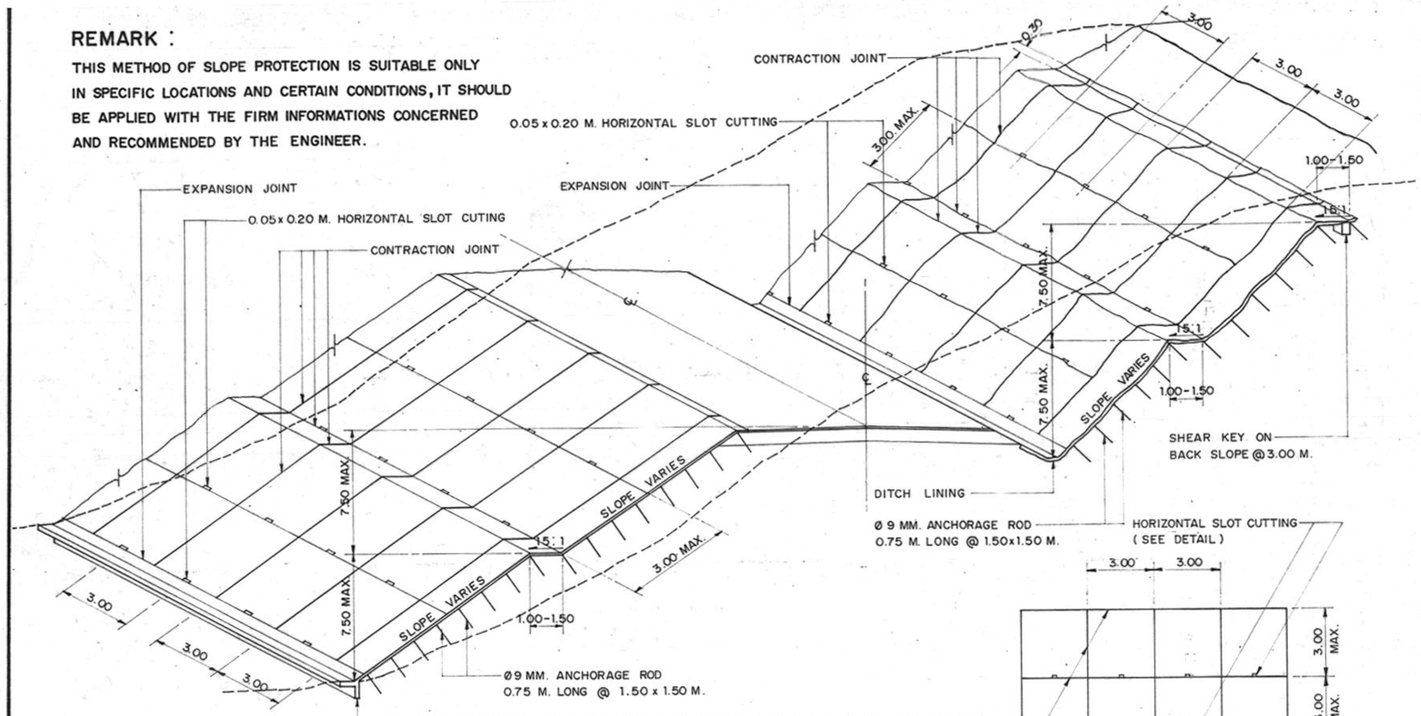
STANDARD DRAWING

CONCRETE SLOPE PROTECTION

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. SP-102
		SHEET NO. 54

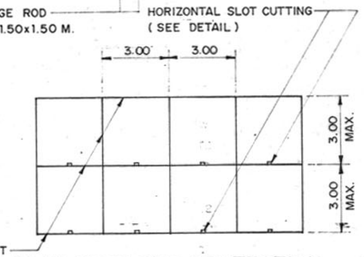
REMARK :

THIS METHOD OF SLOPE PROTECTION IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.



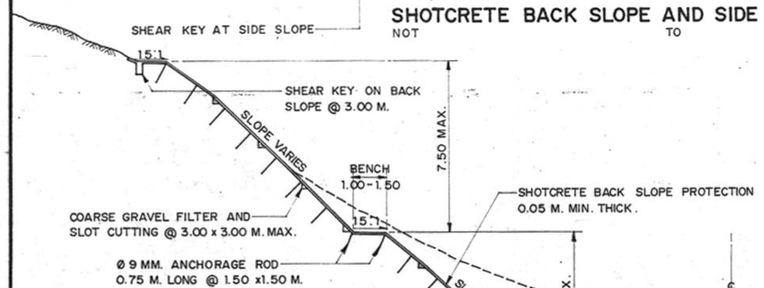
SHOTCRETE BACK SLOPE AND SIDE SLOPE PROTECTION

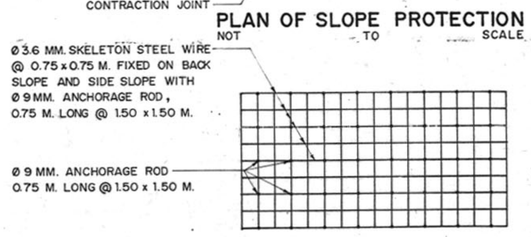
NOT TO SCALE



PLAN OF SLOPE PROTECTION

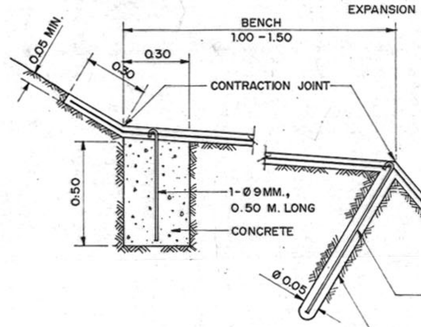
NOT TO SCALE





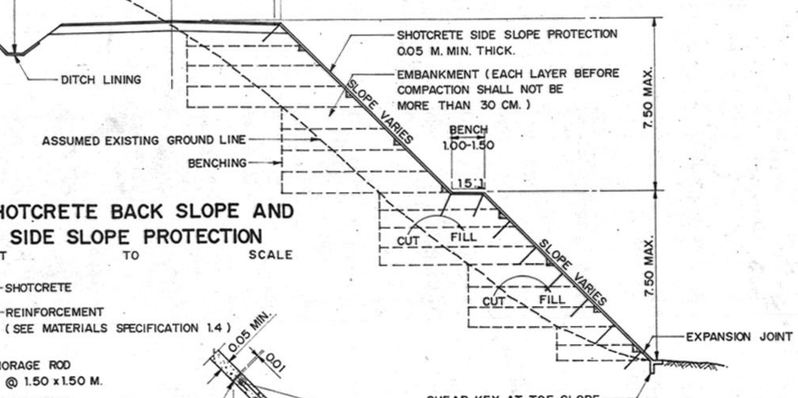
PLAN OF SKELETON STEEL WIRE

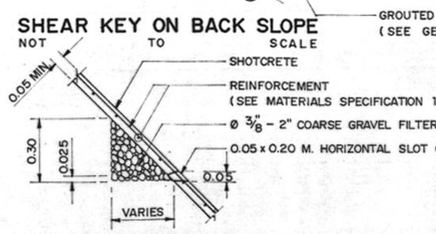
NOT TO SCALE



SHOTCRETE BACK SLOPE AND SIDE SLOPE PROTECTION

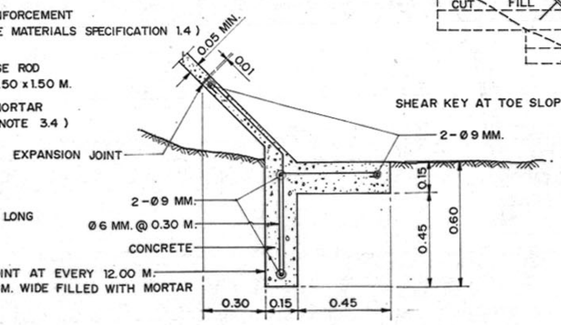
NOT TO SCALE





SHEAR KEY ON BACK SLOPE

NOT TO SCALE



COARSE GRAVEL FILTER AND SLOT CUTTING DETAILS

NOT TO SCALE

SHEAR KEY AT TOE SLOPE

NOT TO SCALE

MATERIALS SPECIFICATION :

1. SHOTCRETE

1.1 PORTLAND CEMENT TYPE I SHALL CONFORM TO TIS. 15 AN APPROXIMATE CONCRETE MIX SHALL BE PORTLAND CEMENT : FINE AGGREGATE OR SAND : COARSE AGGREGATE RATIO 1 : 2 : 2 BY VOLUME, WATER - CEMENT RATIO (W/C) = 0.40.

1.2 FINE AGGREGATE AND COARSE AGGREGATE SHALL CONFORM TO ONE OF THE FOLLOWING GRADING REQUIREMENTS.

SIEVE DESIGNATION	PERCENTAGE BY WEIGHT PASSING			
	FINE AGGREGATE	COARSE AGGREGATE		
		TYPE A	TYPE B	TYPE C
1"	–	–	–	100
3/4	–	–	100	90 – 100
1/2	–	100	90 – 100	–
3/8	100	85 – 100	40 – 70	20 – 55
NO. 4	95 – 100	10 – 30	0 – 15	0 – 10
NO. 8	80 – 100	0 – 10	0 – 5	0 – 5
NO. 16	50 – 85	0 – 5	–	–
NO. 30	25 – 60	–	–	–
NO. 50	10 – 30	–	–	–
NO. 100	2 – 10	–	–	–

1.3 SHOTCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 250 KSC. FOR Ø 7.5 CM. CYLINDER AT 28 DAYS.

1.4 REINFORCING STEEL FOR SHOTCRETE CAN BE EITHER OF THESE :

1.4.1 WELDED WIRE FABRIC Ø 3.15 MM. @ 0.075 x 0.075 M. WIRE SHALL CONFORM TO TIS. 194, AND THE WELDED WIRE FABRIC SHALL CONFORM TO AASHTO DESIGNATION M55 - 75 (ASTM DESIGNATION A185 - 73) OR AASHTO DESIGNATION M32 - 78 (ASTM DESIGNATION A82 - 76)

1.4.2 HEXAGONAL STEEL WIRE MESH SHALL CONFORM TO TIS. 208 TYPE "A". THE STEEL WIRE MESH IS 1.25 MM. DIAMETER. THE SIZE OF MESH IS 52 MM., AND PITCH LENGTH IS 55.2 MM. THE SKELETON STEEL WIRE SHALL CONFORM TO TIS. 747.

1.4.3 50 x 50 MM. SQUARE WELDED WIRE FABRIC OF 2 MM. DIAMETER WIRE SHALL CONFORM TO TIS. 747.

1.5 ANCHORAGE ROD SHALL CONFORM TO TIS. 20 GRADE SR. 24.

2. SHEARKEY

2.1 CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :—

PORTLAND CEMENT TYPE I	350 KG. (MIN.)
SAND	0.43 M^3
CRUSHED ROCK OR GRAVEL	0.86 M^3
CONCRETE SLUMP	10 CM. (MAX.)

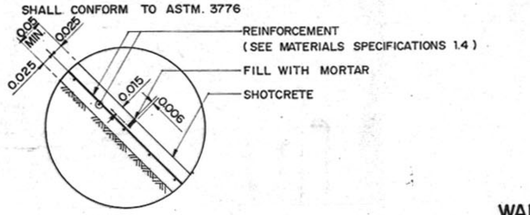
2.2 REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR. 24.

3. FILTER MATERIAL

3.1 SIZE OF COARSE GRAVEL FILTER SHALL BE BETWEEN 3/8" AND 2"

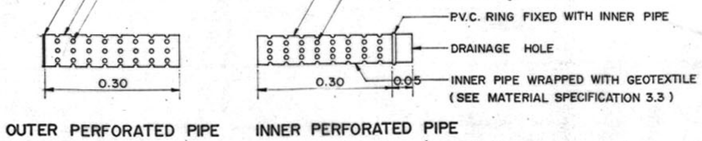
3.2 P.V.C. PIPE SHALL BE CONFORM TO TIS. 17 CLASS 13.5.

3.3 GEOTEXTILE SHALL BE NONWOVENS TYPE, WEIGHT 140 G./M^2 (MIN.) SHALL CONFORM TO ASTM. 3776



CONTRACTION JOINT DETAILS

NOT TO SCALE



OUTER PERFORATED PIPE INNER PERFORATED PIPE

DETAIL OF PERFORATED PIPE FOR DRAINAGE

NOT TO SCALE

CONSTRUCTION PROCESS :

1. BACK SLOPE PROTECTION

1.1 THE SHOTCRETE BACK SLOPE PROTECTION AS SHOWN ON THIS DRAWING SHALL APPLY FOR SOFT ROCK BACK SLOPE ONLY.

1.2 PRIOR TO CONSTRUCTION, THE BACK SLOPE SHALL BE FURNISHED AND WELL COMPACTED TO THE EXISTING BACK SLOPE BUT NOT STEEPER THAN THE SPECIFIED BACK SLOPE AT TYPICAL CROSS SECTION DRAWING.

1.3 IF THE EXISTING BACK SLOPE IS STEEPER THAN THAT MENTIONED IN THE TYPICAL CROSS SECTION DRAWING, THE EXISTING BACK SLOPE MUST BE ADJUSTED SO THAT THE WIDTH OF BENCH IS 1.00 - 1.50 M. AT EVERY 7.50 M. HIGHT.

2. SIDE SLOPE PROTECTION

2.1 CUT OFF LOOSED SOIL ON THE EXISTING SIDE SLOPE.

2.2 IN CASE OF THE EXISTING SIDE SLOPE IS FLATTER THAN THAT MENTIONED IN THE TYPICAL CROSS SECTION DRAWING, WELL COMPACT THE EXISTING SIDE SLOPE AND COVER IT WITH SHOTCRETE SIDE SLOPE PROTECTION AS IN THE FIGURE.

2.3 IN CASE OF THE EXISTING SIDE SLOPE IS STEEPER THAN THAT MENTIONED IN THE TYPICAL CROSS SECTION DRAWING, THE EXISTING SIDE SLOPE SHALL BE BENCHING AND FILLED WITH SUBGRADE MATERIAL. THE THICKNESS OF EACH LAYER IS NOT MORE THAN 30 CM., COMPACTED TO 95 % OF THE STANDARD MAXIMUM DRY DENSITY (DOH.-T. 107/2517) AND COVER IT WITH SHOTCRETE SIDE SLOPE PROTECTION AS IN THE FIGURE.

3. GENERAL NOTE

3.1 WELDED WIRE FABRIC SHALL BE PUT IN THE MIDDLE OF SHOTCRETE SLAB AND CONNECTED AS THE INNER - LONG SIDE AND WIDE SIDE ARE AT LEAST 15 CM. OVERLAPPING.

3.2 IN CASE OF HEXAGONAL STEEL WIRE MESH OR SQUARE WELDED WIRE IS USED, ITS INNER - LONG SIDE AND WIDE SIDE ARE AT LEAST 10 CM. OVERLAPPING AND TIED WITH STEEL WIRE AT EVERY 10 CM.

3.3 FOR SOFT SOIL OR SAND, THE FIRST LAYER OF SHOTCRETE SHALL BE THIN LAYER AND APPLIED THROUGHLY THE DESIGNATED AREA. AFTER WAITING ABOUT 15 MINUTES OR SETTING TO STIFFEN, THE SECOND LAYER OF SHOTCRETE SHALL BE APPLIED TO MEET THE SPECIFIED THICKNESS.

3.4 FOR GRANULAR SOIL, THE ANCHORAGE ROD Ø 9 MM. SHALL BE GROUTED WITH MORTAR CEMENT : SAND RATIO = 1 : 3 BY VOLUME (Ø 5 CM. APPROXIMATELY).

3.5 THE NUMBER OF SLOT AND COARSE GRAVEL FILTER SHALL BE ADDED, IF WATER SEEPAGE IS APPEARED, AS DIRECTED BY THE PROJECT ENGINEER.

3.6 IF SEEPAGE FLOW IS HIGH, PERFORATED PIPE SHALL BE INSTALLED WITH ITEM 3.5, AS DIRECTED OF THE PROJECT ENGINEER.

3.7 MORTAR CEMENT : SAND RATIO = 1 : 3 BY VOLUME, SHALL BE USED TO FILL CONTRACTION AND EXPANSION JOINTS.

3.8 THE BOUNDARY OF SHOTCRETE CONSTRUCTION SHALL BE AT THE BEGINNING AND END OF EROSION AND AT THE BEGINNING, SHOTCRETE SHALL BE CONSTRUCTED AT THE SUITABLE DISTANCE PRIOR TO THE EROSION POINT.

3.9 PAYMENT OF SHOTCRETE SHALL BE MEASURED BY SQUARE METER INCLUDING PREPARED AND COMPACTED EXISTING SLOPE, EXPANSION JOINT, CONTRACTION JOINT, COARSE GRAVEL FILTER, Ø 9 MM. ANCHORAGE ROD, MORTAR GROUTING AND ANY OTHER INCIDENTAL WORKS OF SHOTCRETE

3.10 FOR BACK SLOPE CUTTING OR LOOSED SOIL CUTTING ON SIDE SLOPE, THE PAYMENT SHALL BE EXCAVATION ITEM.

3.11 FOR SUBGRADE MATERIAL FILLING AND COMPACTING ON SIDE SLOPE, THE PAYMENT SHALL BE EMBANKMENT ITEM.

3.12 ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.

WARRANTING FEATURES FOR SHOTCRETE CONSTRUCTION

1. THE EXISTING SLOPES MUST BE STABLE.
2. EROSION OF WATER APPEARS BUT NOT SLIDE.
3. NOT RECOMMENDED FOR HIGHWAYS LEADING TO PLACES TO VISIT OR VIEWING POINTS E.G. KHAO KHO, DOI TUNG.

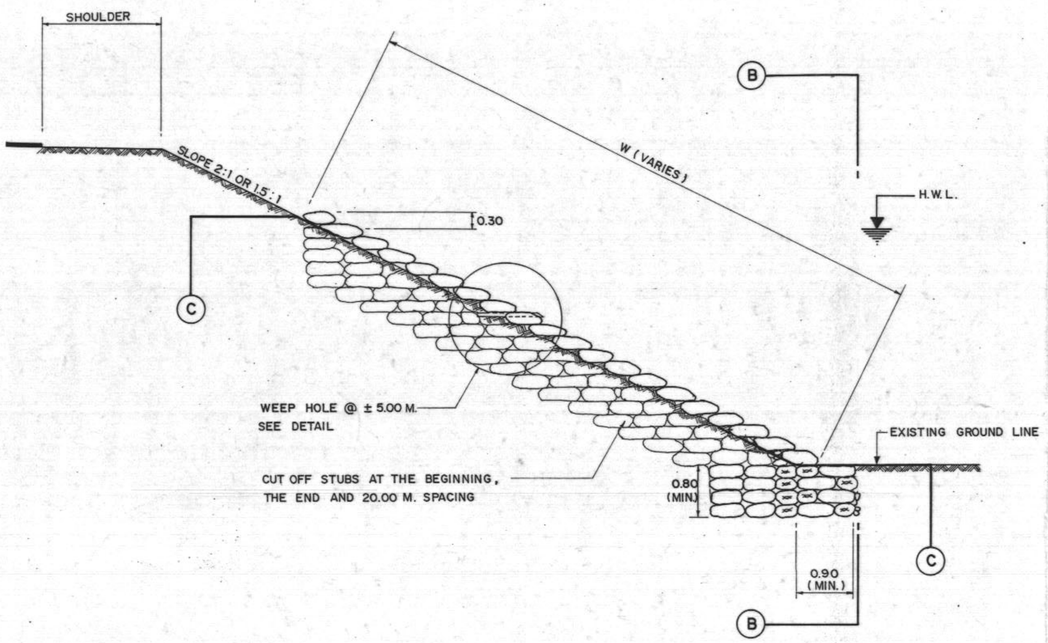
KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

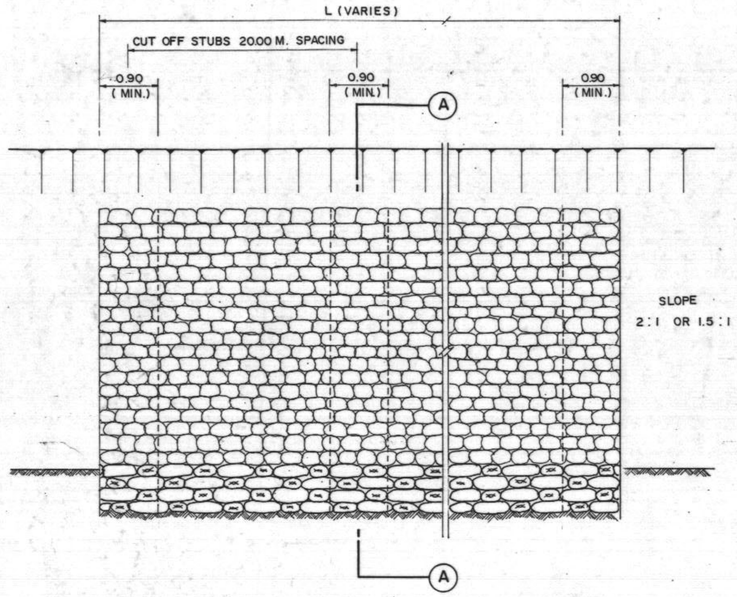
STANDARD DRAWING

SHOTCRETE BACK SLOPE AND SIDE SLOPE PROTECTION

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : P.P.C. (DIRECTOR GENERAL)		DWG. NO. SP-103
		SHEET NO. 55



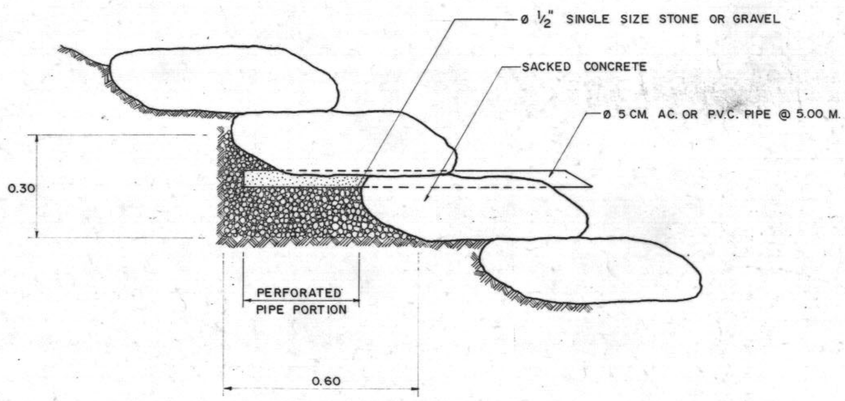
SECTION (A) – (A)
SCALE 1 : 50



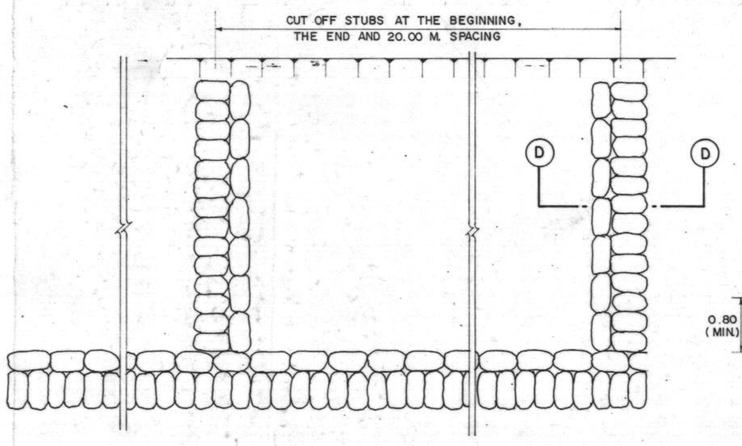
SECTION (B) – (B)
SCALE 1 : 50

NOTES :

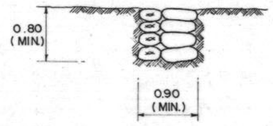
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. THE SACKS SHALL BE MADE OF TOUGH AND DURABLE SYNTHETIC MATERIAL. THE SIZE OF SACK SHALL BE LARGE ENOUGH TO CONTAIN CONCRETE NOT LESS THAN 30 LITERS AND THICKNESS NOT LESS THAN 20 CENTIMETERS WHEN PLACING. THE LENGTH OF SACK SHALL BE LONG ENOUGH TO BE FOLDED.
3. SOIL AGGREGATE MIXTURE FILLED IN THE SACKS SHALL CONSIST OF CEMENT AND AVAILABLE SOIL AGGREGATE OF THE PROPORTION 1 : 10 BY VOLUME. THE MAXIMUM SIZE OF AVAILABLE SOIL AGGREGATE SHALL BE NOT LARGER THAN 8 CENTIMETERS AND THE QUANTITIES OF FINE MATERIAL (PASSING SIEVE NO. 200) SHALL BE NOT MORE THAN 25 %
4. CEMENT AND SOIL SHALL BE MIXED IN DRY CONDITION. AFTER FILLING WITH THE MIXTURED MATERIALS, THE SACK SHALL BE FOLDED AND SEWED AT THE TOP WITH THE SAME MATERIAL AS THE SACKS.
5. THE EMBANKMENT SLOPE SHALL BE COMPACTED SLOPED AS SHOWN IN THE DRAWING.
6. THE SACKS SHALL ALWAYS BE PLACED FROM BOTTOM TO TOP AS SHOWN IN THE DRAWING AND THE TOP OF SACKS ARE INSIDE.
7. AFTER READY PLACED, THE SACKS SHALL BE SPRAYED BY WATER IF TIME USED FOR SOIL AGGREGATE AND CONCRETE MIXING TO WATER SPRAYING IS LONGER THAN 2 HOURS OR THE INTERLOCKING OF SACKS IS NOT GOOD ENOUGH, CEMENT SHALL BE SPRINGLED TO THE JOINTS OF SACKS BEFORE SPRAYING WATER.
8. PAYMENT SHALL BE MEASURED BY SQUARE METERS OF SACKS-CONCRETE INCLUDING CUT OFF STUBS.



WEEP HOLE DETAIL
SCALE 1 : 10



SECTION (C) – (C) CUT OFF STUBS PLACING
SCALE 1 : 50



SECTION (D) – (D)
SCALE 1 : 50

REMARK :

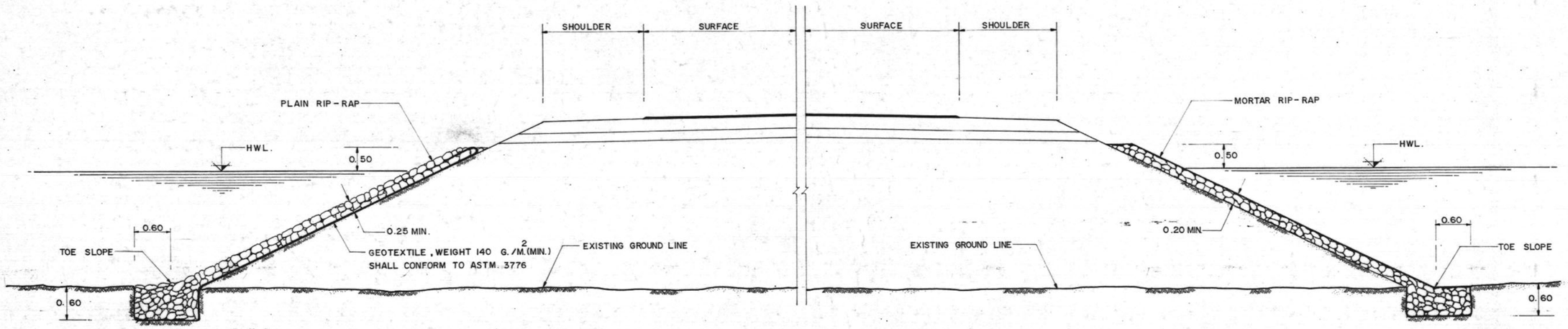
THIS METHOD OF SLOPE PROTECTION IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

SACKED - CONCRETE SLOPE PROTECTION

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. SP-104
		SHEET NO. 56



PLAIN AND MORTAR RIP-RAP PROTECTION

NOT TO SCALE

PLAIN RIP-RAP CONSTRUCTION

1. EMBANKMENT SLOPES SHALL BE COMPACTED AND SHAPED TO TYPICAL CROSS-SECTION SPECIFIED.
2. STONE USED FOR PLAIN RIP-RAP SHALL WEIGH BETWEEN 25-70 KG. EACH AND AT LEAST 75 PERCENT SHALL WEIGH MORE THAN 45 KG. WITH KEY STONE SIZE IN SUITABLE.
3. THE LARGEST STONE SHALL BE PLACED FIRST. THE INTERSTICES SHALL BE FILLED WITH SMALL STONES. THE THICKNESS OF PLAIN RIP-RAP SHALL NOT LESS THAN 25 CENTIMETERS.
4. THE PLACING OF STONES SHALL BE AT LEAST 60 CM. UNDER EXISTING GROUND LEVEL.
5. STONES SHALL BE CONSIDERED TO FILL AT TOE SLOPE AS SUITABLY IN CASE OF EXISTING GROUND ARE SOFT.

MORTAR RIP-RAP CONSTRUCTION

1. EMBANKMENT SLOPES SHALL BE COMPACTED AND SHAPED TO TYPICAL CROSS-SECTION SPECIFIED.
2. STONE USED FOR MORTAR RIP-RAP SHALL WEIGH BETWEEN 15-40 KG. EACH AND AT LEAST 50 PERCENT SHALL WEIGH MORE THAN 30 KG. WITH KEY STONE SIZE IN SUITABLE.
3. THE LARGEST STONE SHALL BE PLACED FIRST. THE INTERSTICES SHALL BE FILLED WITH SMALL STONES. THE THICKNESS OF MORTAR RIP-RAP SHALL NOT LESS THAN 20 CENTIMETERS.
4. THE VOIDS BETWEEN STONE SHALL BE FILLED WITH MORTAR CEMENT : SAND RATIO 1:1 BY VOLUME.
5. THE PLACING OF STONES SHALL BE AT LEAST 60 CM. UNDER EXISTING GROUND LEVEL.
6. STONE SHALL BE CONSIDERED TO FILL AT TOE SLOPE AS SUITABLY IN CASE OF EXISTING GROUND ARE SOFT.

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.

REMARK :

THIS METHOD OF SLOPE PROTECTION IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

RIP - RAP PROTECTION FOR EMBANKMENT SLOPE

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. SP-105
		SHEET NO. 57

SPECIAL PROVISION :

1. GABIONS SHALL BE AS SPECIFIED IN THE " SPECIFICATION OF GABIONS ", AND BE OF THE SIZES STATED IN THE BILL OF QUANTITIES .

2. ASSEMBLY AND ERECTION OF GABIONS SHALL BE AS SPECIFIED IN THE " SPECIFICATION FOR GABIONS CONSTRUCTION ".

3. FILLING MATERIALS :

FILLING MATERIALS SHALL NOT BE LESS THAN 100 MM. OR LARGER THAN 250 MM. AND BE OF TYPES A OR B AS SPECIFIED IN THE "TABLE OF FILLING MATERIALS " WHERE THE SPECIFIED FILLING MATERIALS CAN NOT BE OBTAINED , FILLING MATERIALS OF TYPES C , D OR E MAY BE USED BY THE APPROVAL OF THE ENGINEER OF DESIGN .

4. PERVIOUS BACKFILL :

TYPES OF PERVIOUS BACKFILL MATERIALS SHALL BE COARSE-GRAINED SOILS OR GRANULAR MATERIALS I.E. CLEAN SAND , GRAVEL OR CRUSHED ROCK , SHALL BE HARD DURABLE AND CLEAN AND SHALL BE FREE FROM ORGANIC MATERIALS , CLAY BALLS AND OTHER DELETERIOUS SUBSTANCE . LATERITE OR CONCRETIONARY MATERIAL SHALL NOT BE USED .

SAND USED FOR PERVIOUS BACKFILL MATERIAL SHALL CONFORM TO THE FOLLOWING GRADING REQUIRMENTS .

SIEVE DESIGNATION	PERCENTAGE BY WEIGHT PASSING
3/8 "	100
NO. 4	95 – 100
NO. 16	45 – 80
NO. 50	10 – 30
NO. 100	2 – 10

GRAVEL AND CRUSHED ROCK SHALL CONFORM TO ONE OF THE FOLLOWING GRADING REQUIREMENTS.

SIEVE DESIGNATION	PERCENTAGE BY WEIGHT PASSING			
	TYPE B	TYPE C	TYPE D	TYPE E
2"	100	–	–	–
1 1/2"	70-100	100	–	–
1"	55-85	75-100	100	–
3/4"	50-80	60-90	70-100	100
3/8"	40-70	45-75	58-75	–
NO. 4	30-60	30-60	35-65	45 – 80
NO. 10	20-50	20-50	25-50	30 – 60
NO. 40	10-30	10-30	15-30	20 – 35
NO. 200	0 – 2	0 – 2	0 – 2	0 – 2

5. BACKFILL COMPACTION

a) BACKFILL MATERIALS SHALL BE PLACED IN THIN LAYERS NOT THICKER THAN 20 CM. EACH. EACH LAYER SHALL BE COMPACTED BEFORE THE NEXT ONE IS PLACED.

b) BACKFILL MATERIALS SHALL BE COMPACTED BY HAND-OPERATED OR OTHER LIGHTWEIGHT COMPACTORS. CARE MUST BE MADE NOT TO OVERCOMPACT THE BACKFILL SINCE OVERCOMPACTION WILL CAUSE EXCESSIVE EARTH PRESSURE.

6. THE ENGINEER OF DESIGN SHALL MAKE ANY VARIATION OF THE FORM QUALITY OR QUANTITY OF THE WORKS OR ANY PART THERE OF THAT MAY BE NECESSARY.

7. NO ANY VARIATION OR AMENDMENT SHALL BE MADE WITHOUT THE APPROVAL OF THE ENGINEER OF DESIGN.

REMARK :

THIS METHOD OF SLOPE PROTECTION IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS , IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER .

BILL OF QUANTITIES

ITEM.	DESCRIPTION		UNIT.	QUANTITY						
	TYPES	SIZES		APRON LAYER	1st LAYER	2nd LAYER	3rd LAYER	4th LAYER	5th LAYER	TOTAL
1.	GABIONS GALVANIZED 80 x	4 x 1 x 0.5 M.	NO.	292	–	–	–	–	–	292
2.	100 MM. MESH, 2.7 MM. WIRE	2 x 1 x 0.5 M.	NO.	4	–	–	–	–	–	4
3.	CORE WITH NECESSARY BINDING WIRE	1.5 x 1 x 0.5 M.	NO.	36	–	–	–	–	–	36
4.	GABIONS GALVANIZED 100 x	4 x 1 x 1 M.	NO.	–	152	70	105	36	68	431
5.	120 MM. MESH, 2.7 MM. WIRE	3 x 1 x 1 M.	NO.	–	–	6	8	–	–	14
6.	CORE WITH NECESSARY	2 x 1 x 1 M.	NO.	–	–	1	–	1	8	10
7.	BINDING WIRE	1.5 x 1 x 1 M.	NO.	–	–	150	–	146	–	296
8.	ASSEMBLE, PLACE IN POSITION AND PACK WITH FILLING MATERIALS IN ITEM 1 TO 7 INCLUDING FOR TYING DOWN LIDS AFTER FILLING		CU.M.							2,845
9.	PERVIOUS BACKFILL MATERIALS PLACE IN POSITION AND COMPACT		CU.M.							1,800
10.	EMBANKMENT MATERIAL		CU.M.							APPROX. 3,700

TABLE OF FILLING MATERIALS

TYPE	FILLING MATERIAL	WEIGHT OF MATERIAL (KG. / CU.M.)
A	BASALT	1,650
	GRANITE	1,600
B	SHINGLE & SLAG	1,500
	LIME STONE	1,440
C	SAND STONE	1,390
	BROKEN CONCRETE	1,340
D	BRICK	1,240
E	ORTHERS AS APPROVAL OF THE LOCATION AND DESIGN DIVISION	

REMARKS : THIS TABLE OF DIFFERENT FILLING MATERIALS INCLUDES ALLOWANCE FOR 40% VOIDS

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

SPECIAL PROVISION OF GABIONS

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : 11/94 (DIRECTOR GENERAL)		DWG. NO. SP-106
		SHEET NO. 58

TABLES OF WEIGHTS AND MEASUREMENTS

GALVANIZED BOX GABIONS WITH DIAPHRAGMS

MESH TYPE 100 x 120 MM. GALVANIZED TO SPECIFICATION

DIMENSIONS (M.)			DIAPHRAGMS	APPROXIMATE WEIGHT (KG)	
LENGTH	WIDTH	HEIGHT		WIRE Ø2.7 MM.	WIRE Ø 3.0MM.
1.5	1	0.5	—	8.600	10.300
2	1	0.5	1	10.800	13.500
3	1	0.5	2	14.400	19.200
4	1	0.5	3	19.000	25.000
1.5	1	1	—	11.800	13.800
2	1	1	1	15.200	18.200
3	1	1	2	20.400	25.800
4	1	1	3	27.000	34.000

THE WEIGHTS INDICATED IN THE TABLE DO NOT INCLUDE BINDING AND CONNECTING WIRE, AND ARE SUBJECT TO THE USUAL TOLERANCES.

MESH TYPE 80x100 MM. GALVANIZED TO SPECIFICATION

DIMENSIONS (M.)			DIAPHRAGMS	APPROXIMATE WEIGHT (KG.)	
LENGTH	WIDTH	HEIGHT		WIRE Ø2.7 MM.	WIRE Ø 3.0 MM.
1.5	1	0.3	—	8.600	10.500
2	1	0.3	1	10.100	12.500
3	1	0.3	2	14.600	17.800
4	1	0.3	3	18.800	23.100
1.5	1	0.5	—	9.200	11.500
2	1	0.5	1	12.600	15.400
3	1	0.5	2	18.000	21.800
4	1	0.5	3	23.200	28.200
1.5	1	1	—	12.800	16.000
2	1	1	1	17.300	21.300
3	1	1	2	24.700	30.000
4	1	1	3	32.000	39.000

PVC. COATED BOX GABIONS

MESH TYPE 100 x 120 MM. GALVANIZED TO SPECIFICATION

DIMENSIONS (M.)			DIAPHRAGMS	APPROXIMATE WEIGHT (KG.)
LENGTH	WIDTH	HEIGHT		
1.5	1	0.5	—	8.800
2	1	0.5	1	12.800
3	1	0.5	2	18.000
4	1	0.5	3	23.200
1.5	1	1	—	12.800
2	1	1	1	17.000
3	1	1	2	24.000
4	1	1	3	31.500

THE WEIGHTS INDICATED IN THE TABLE DO NOT INCLUDE BINDING AND CONNECTING WIRE, AND ARE SUBJECT TO THE USUAL TOLERANCES.

MESH TYPE 80x100 MM. GALVANIZED TO SPECIFICATION

DIMENSIONS (M.)			DIAPHRAGMS	APPROXIMATE WEIGHT (KG)
LENGTH	WIDTH	HEIGHT		
1.5	1	0.3	—	9.100
2	1	0.3	1	11.500
3	1	0.3	2	16.700
4	1	0.3	3	21.700
1.5	1	0.5	—	10.800
2	1	0.5	1	14.500
3	1	0.5	2	21.000
4	1	0.5	3	27.000
1.5	1	1	—	15.400
2	1	1	1	20.000
3	1	1	2	28.800
4	1	1	3	37.200

1. GENERAL

GABIONS SHALL CONSIST OF WOVEN STEEL WIRE MESH BOXES OF APPROVED MODULE AS SPECIFIED IN THE CIRCULAR OF THE SENIOR COUNCIL OF THE ITALIAN LL.PP. NO. 2078 OF THE 27.8.1962 OR BY FEDERAL SPECIFICATION QQ.-W-461g IN THE UNITED STATES OF AMERICA, OR BY THE BRITISH STANDARD INSTITUTION 443-1961 AND OR SIMILAR APPROVED, AND BE OF THE SIZES STATED IN THE "TABLES OF WEIGHTS AND MEASUREMENTS." PARTICULAR CARE SHALL BE EXERCISED THROUGHOUT CONSTRUCTION TO ENSURE TIGHTNESS OF MESH, WELL PACKED FILLING WITH MINIMUM OF VOIDS, AND SECURE LACING. THE EXPOSED FACES OF COMPLETED WORK SHALL PRESENT A NEAT FACE AND LINE, FREE OF EXCESSIVE BULGES OR DEPRESSIONS.

2. GABION FABRIC

(a) **MESH:** MESH OPENINGS SHALL BE HEXAGONAL IN SHAPE, THE MINIMUM DIMENSION OF WHICH SHALL NOT EXCEED 105 MM. IN THE CASE OF 100 x 120 MM. MESH, AND NOT EXCEED 83 MM. IN THE CASE OF 80 x 100 MM. MESH.

(b) **MESH JOINTS:** ALL JOINTS SHALL BE FLEXIBLE AND CONSIST OF NOT LESS THAN ONE AND ONE HALF FULL TURNS.

(c) **GALVANIZING:** ALL WIRE USED SHALL BE GALVANIZED TO BSS 443/1969 OR EQUIVALENT, PRIOR TO WEAVING OF THE MESH.

GALVANIZED GABIONS

(d) **MESH WIRE:** THE DIAMETER OF THE MESH WIRE SHALL BE THAT STATED IN THE RELEVANT ITEM IN THE BILL OF QUANTITIES (± 2.5%)

(e) **BINDING WIRE:** THE DIAMETER OF THE WIRE USED FOR BINDING AND LACING SHALL BE 2.2 MM. (± 2.5%)

(f) **SELVEDGE WIRE:** SELVEDGE WIRE 3.4 MM. DIAMETER WHERE THE MESH WIRE DIAMETER IS 2.7 MM. AND 3.9 MM. DIAMETER WHERE THE MESH WIRE DIAMETER IS 3.00 MM. SHALL BE INCORPORATED ALONG THE EDGES OF THE WIRE MESH.

PVC. COATED GABIONS

(g) **PVC. COATING:** WHERE STATED IN THE BILL OF QUANTITIES OR WHERE SPECIFIED BY THE ENGINEER, ALL WIRE SHALL BE ADDITIONALLY COATED WITH A MINIMUM 0.55 MM. THICKNESS OF BLACK PVC. WHICH SHALL BE CAPABLE OF RESISTING DELETERIOUS EFFECTS OF IMMERSION IN SALT WATER, EXPOSURE TO ULTRA VIOLET LIGHT AND ABRASION TO THE SATISFACTION OF THE ENGINEER, AND RETAIN THESE CHARACTERISTICS AFTER A PERIOD OF NOT LESS THAN 3,000 HOURS UNDER TEST IN ACCORDANCE WITH ASTM. E 42-65.

(h) **MESH WIRE:** THE DIAMETER OF THE MESH WIRE CORE SHALL BE THAT STATED IN THE BILL OF QUANTITIES.

(i) **BINDING WIRE:** THE DIAMETER OF THE CORE OF THE PVC. COATED WIRE USED FOR BINDING AND VACING SHALL BE 2.2 MM.

(j) **SELVEDGE WIRE:** SELVEDGE WIRE WHOSE CORE DIAMETER IS 3.4 MM. SHALL BE INCORPORATED ALONG THE EDGES OF THE WIRE MESH EXCEPT IN THE CASE OF THE 80 x 100 MM. MESH IN 2.2 MM. WIRE CORE, WHERE IT SHALL BE 2.7 MM.

REMARK :

THIS METHOD OF SLOPE PROTECTION IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

SPECIFICATION OF GABIONS

DESIGNED: D.O.H. & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED: (DIRECTOR GENERAL)		DWG. NO. SP-107
		SHEET NO. 59

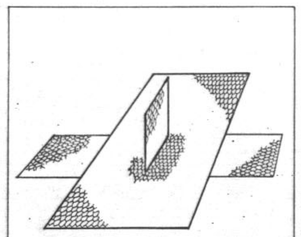


FIGURE 1.

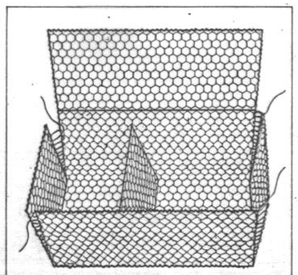


FIGURE 2.

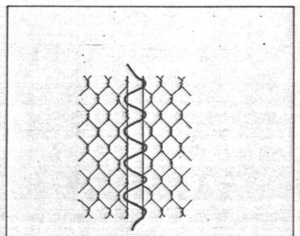


FIGURE 3.

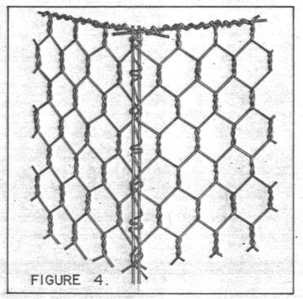


FIGURE 4.

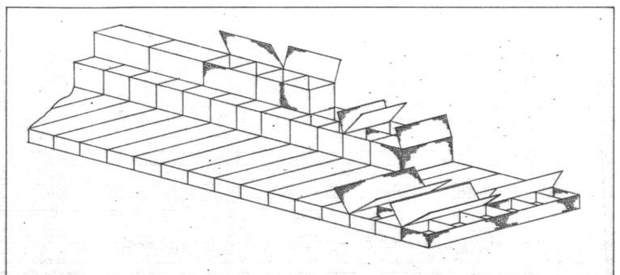


FIGURE 5.

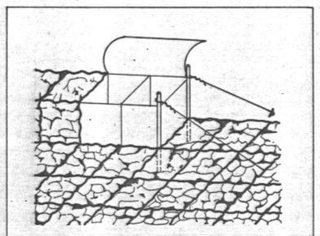


FIGURE 6.

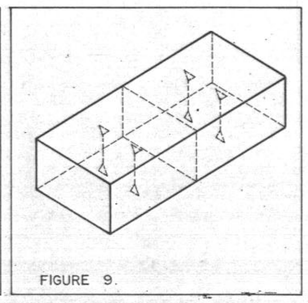


FIGURE 9.

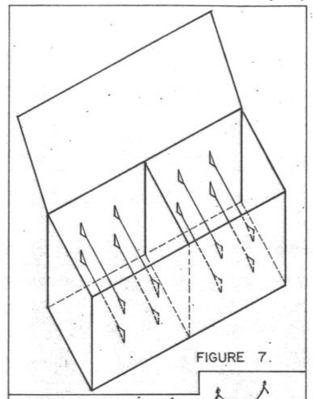


FIGURE 7.

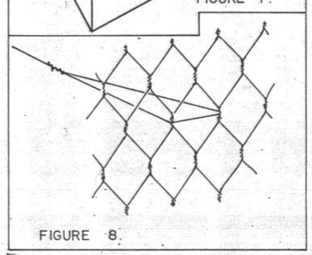


FIGURE 8.

GENERAL NOTES :

1. THE SPECIFICATION COVERS CONSTRUCTION IN BOTH GALVANIZED AND PVC. COATED GABIONS.
2. CLAUSE 6 SHOULD ONLY BE INCLUDED WHERE THE GABION MESH MUST BE CUT AND FOLDED TO FORM MITRE JOINTS, ANGLES, CURVES OR SLOPES IN THE STRUCTURES WHICH ARE NOT POSSIBLE TO OBTAIN WITH THE STANDARD RECTANGULAR GABIONS.

1. ASSEMBLY

PRIOR TO ASSEMBLY, THE GABION MATERIAL SHALL BE OPENED OUT FLAT ON THE GROUND AND STRETCHED TO REMOVE. ALL KINKS AND BENDS. (FIGURE.1)

THE GABION BOXES SHALL THEN BE ASSEMBLED INDIVIDUALLY, BY RAISING THE SIDES, ENDS AND DIAPHRAGMS, ENSURING THAT ALL CREASES ARE IN THE CORRECT POSITION AND THAT THE TOPS OF ALL FOUR SIDES ARE EVEN.

THE FOUR CORNERS OF THE GABION BOXES SHALL BE LACED FIRST, FOLLOWED BY THE EDGES OF INTERNAL DIAPHRAGMS TO THE SIDES (FIGURE.2)

IN ALL CASES, LACING SHALL COMMENCE AT THE TOP OF THE BOX BY TWISTING THE END OF THE LACING WIRE AROUND THE SELVEDGE. IT SHALL THEN BE PASSED ROUND THE TWO EDGES BEING JOINED, THROUGH EACH MESH IN TURN, AND SECURELY TIED OFF AT THE BOTTOM. THE ENDS OF ALL LACING WIRES SHALL BE TURNED TO THE INSIDE OF BOX ON COMPLETION OF EACH LACING OPERATION. (FIGURE.3 & FIGURE.4)

2. ERECTION

ONLY ASSEMBLED BOXES, OR GROUPS OF BOXES, SHALL BE POSITIONED IN THE STRUCTURE. THE SIDE, OR END, FROM WHICH WORK IS TO PROCEED, SHALL BE SECURED EITHER TO COMPLETED WORK, OR BY RODS OR STAKES DRIVEN INTO THE GROUND AT THE CORNERS. THESE MUST BE SECURED AND REACH AT LEAST TO THE TOP OF THE GABION BOX.

FURTHER GABION BOXES SHALL THEN BE POSITIONED IN THE STRUCTURE AS REQUIRED, EACH BEING SECURELY LACED TO THE PRECEEDING ONE AT ALL CORNERS AND DIAPHRAGM POINTS. (FIGURE. 5)

3. STRETCHING

FINAL STRETCHING OF THE GABION BOXES SHALL BE CARRIED OUT USING A WIRE STRAINER OR WINCH OF AT LEAST ONE TON CAPACITY, FIRMLY SECURED TO THE FREE END OF THE ASSEMBLED GABION BOXES. (FIGURE. 6)

WHILST UNDER TENSION THE GABION BOXES SHALL BE SECURELY LACED ALONG ALL EDGES, (TOP, BOTTOM AND SIDES) AND AT DIAPHRAGM POINTS, TO ALL ADJACENT BOXES.

TIGHTNESS OF MESH, WELL PACKED FILLING AND SECURE LACING IS ESSENTIAL IN ALL STRUCTURES.

4. FILLING

FILLING SHALL BE CARRIED OUT ONLY WHILST GABION BOXES ARE UNDER TENSION.

FILLING MATERIAL SHALL NOT BE LESS THAN 100 MM. OR LARGER THAN 250 MM. AND SHALL BE SO PLACED TO PRODUCE A NEAT FACE AND LINE, WITH A MINIMUM OF VOIDS.

WHERE SUITABLE FILLING MATERIAL CANNOT BE OBTAINED, THE ENGINEER MAY APPROVE A PERCENTAGE OF SMALLER FILLING MATERIAL IN WHICH CASE LARGE MATERIAL SHALL BE PLACED ON OUTER EXPOSED FACES, AND SMALLER MATERIAL ON THE INSIDE AS A "CORE".

ONLY MECHANICAL EQUIPMENT APPROVED BY THE ENGINEER MAY BE USED FOR FILLING OPERATIONS.

INTERNAL HORIZONTAL BRACING WIRE (USE BINDING WIRE) SHALL BE PROVIDED AT 330 MM. VERTICAL CENTERS IN 1 M. DEEP UNITS, AT A RATIO OF 4 TO 1 CU.M. (FIGURE.7) THESE BRACING WIRES SHALL BE WRAPPED ROUND TWO MESH WIRES (FIGURE.8) AND EXTENDED FROM FRONT TO BOCK, SO POSITIONED TO ENSURE A NEAT FACE AND LINE, FREE OF EXCESSIVE BULGES AND DEPRESSIONS ON COMPLETION TO THE SATISFACTION OF THE ENGINEER. GABION BOXES SHALL BE FILLED IN STAGES AND HORIZONTAL BRACING WIRES INSERTED AS FILLING IS BROUGHT UP.

SIMILAR BRACING WIRES, USED VERTICALLY (FIGURE. 9) MAY BE REQUIRED IN 0.5 M. DEEP GABIONS, AT SPACINGS SPECIFIED BY THE ENGINEER, WHERE SUCH UNITS ARE USED IMMEDIATELY DOWN-STREAM OF WEIRS OR IN OTHER CASES WHERE WATER FALLS DIRECTLY ON TO THE GABIONS OR WHERE A NEAT FACE IS REQUIRED.

TENSION ON THE GABION BOXES SHALL BE RELEASED ONLY WHEN SUFFICIENTLY FULL TO PREVENT THE MESH FROM SLACKENING.

GABION BOXES SHALL BE OVERFILLED BY 20 TO 50 MM. ABOVE THEIR TOPS TO ALLOW FOR SUBSEQUENT SETTLEMENT. 100 MM. FILLING MATERIAL MAY BE USED FOR THIS PURPOSE.

5. FINAL WIRING

CLOSING AND WIRING DOWN OF LIDS SHALL PROCEED AS SOON AS PRACTICABLE AFTER FILLING OPERATIONS, AND CERTAINLY IN THE LIKELIHOOD OF STORMS OR FLOODS DURING CONSTRUCTION.

LIDS SHALL BE STRETCHED TIGHT OVER THE FILLING WITH BARS AND WIRED DOWN SECURELY THROUGH EACH MESH ALONG ALL EDGES, ENDS AND DIAPHRAGMS. THE ENDS OF ALL TYING AND BRACING WIRES SHALL BE TURNED INTO THE GABION BOX ON COMPLETION OF ALL LACING OPERATIONS. TIGHTNESS OF MESH, WELL PACKED FILLING AND SECURE LACING IS ESSENTIAL IN ALL STRUCTURES.

6. CUTTING AND FOLDING MESH

WHERE SHOWN ON THE DRAWINGS OR OTHERWISE DIRECTED BY THE ENGINEER, THE GABION MESH SHALL BE CUT, FOLDED AND WIRED TOGETHER TO FORM MITER JOINTS, ANGLES, CURVES OR SLOPES WHICH ARE NOT POSSIBLE TO OBTAIN IN THE STRUCTURES WITH THE STANDARD RECTANGULAR GABIONS. THE MESH MUST BE CLEANLY CUT, AND THE SURPLUS MESH CUT COMPLETELY OUT, OR FOLDED BACK OR ON TO, AND NEATLY WIRED TO AN ADJACENT GABION FACE. THE CUT EDGES OF THE MESH SHALL BE SECURELY LACED TOGETHER WITH BINDING WIRE IN THE MANNER SPECIFIED UNDER ASSEMBLY ABOVE.

THE ASSEMBLY, ERECTION, STRETCHING, FILLING AND FINAL WIRING OF THE RE-SHAPED GABIONS SHALL OTHERWISE BE CARRIED OUT AS SPECIFIED ABOVE.

7. SPECIAL FINISH

WHERE SPECIFIED BY THE ENGINEER THE OUTER FACE OF THE GABIONS SHALL BE CAREFULLY PACKED OUT BY HAND WITH SELECTED (IGNEOUS OR LIMESTONE, ETC.) STONE OF A SIZE 100 MM. TO 250 MM.

REMARK :

THIS METHOD OF SLOPE PROTECTION IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.

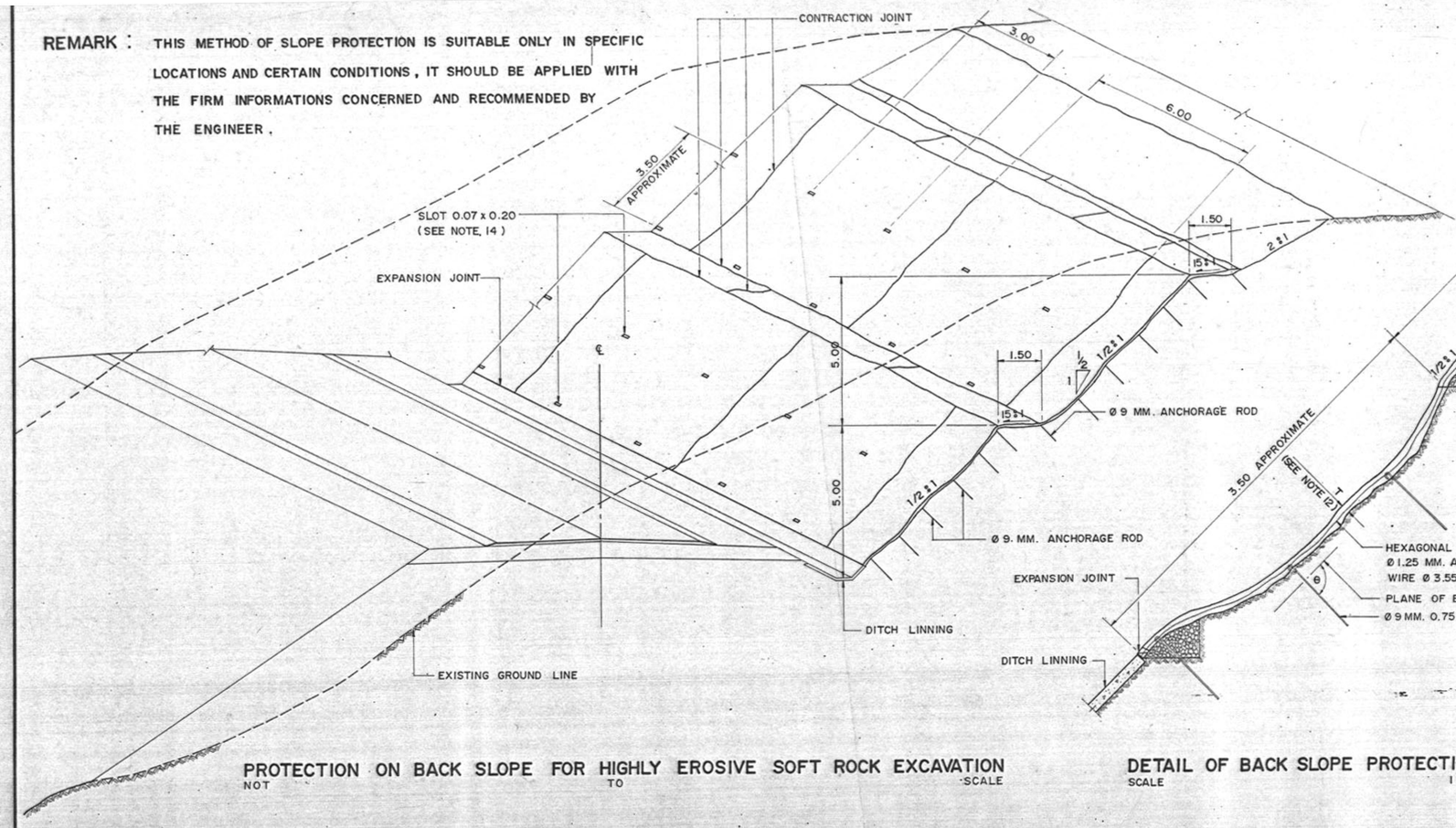
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

SPECIFICATION FOR GABIONS CONSTRUCTION

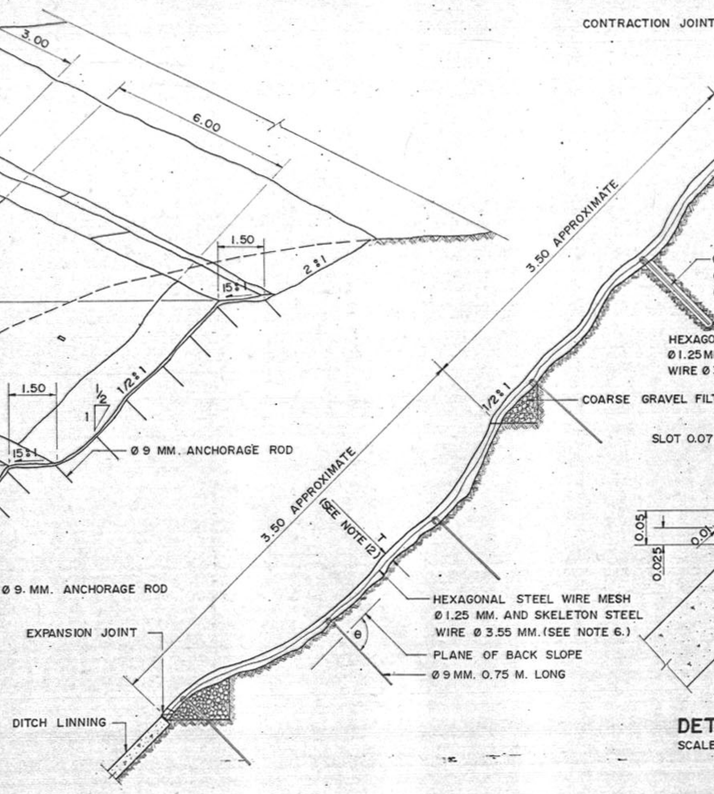
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. SP-108
		SHEET NO. 60

REMARK : THIS METHOD OF SLOPE PROTECTION IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.



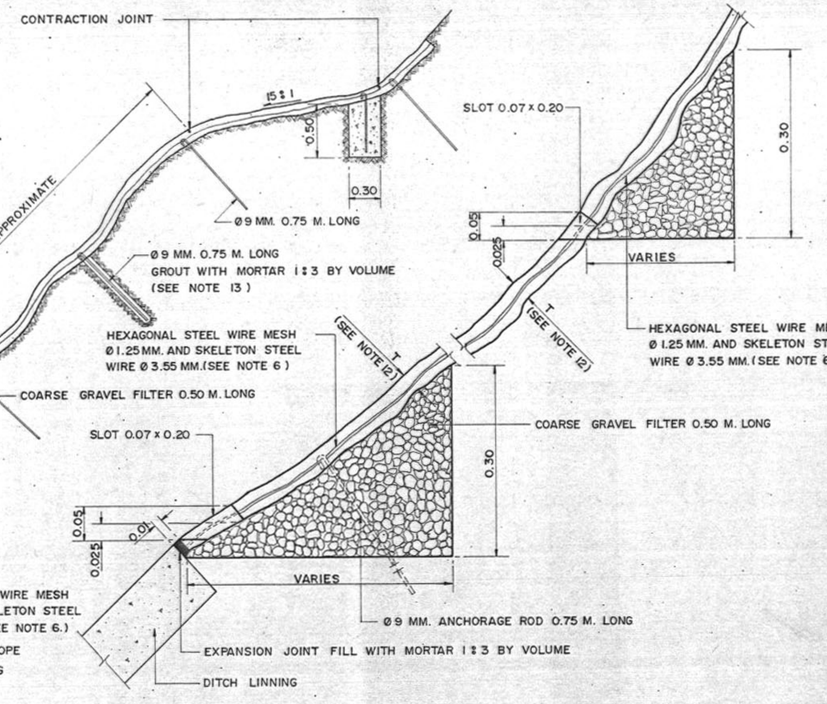
PROTECTION ON BACK SLOPE FOR HIGHLY EROSIVE SOFT ROCK EXCAVATION

NOT TO SCALE



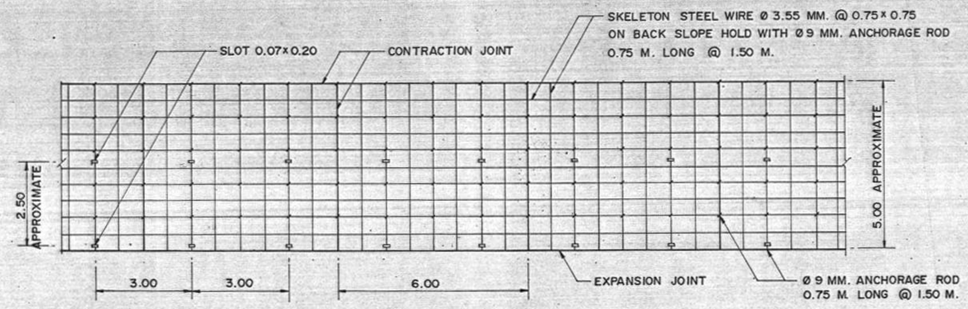
DETAIL OF BACK SLOPE PROTECTION

SCALE 1:25



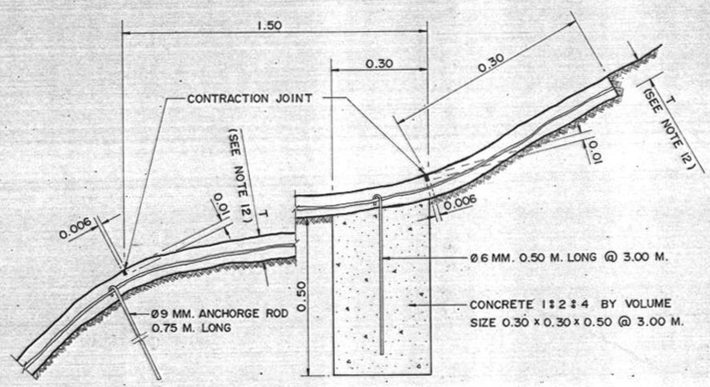
DETAIL OF COARSE GRAVEL FILTER FOR AREA OF SEEPAGE

SCALE 1:5



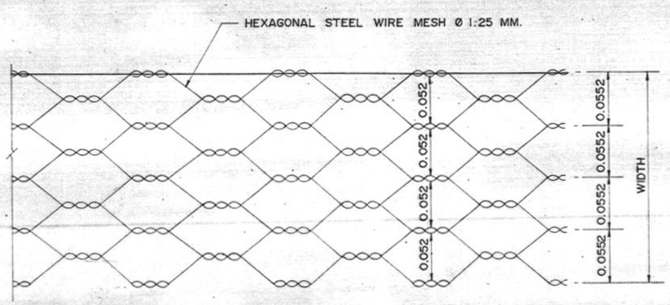
PLAN OF BACK SLOPE PROTECTION

SCALE 1:100



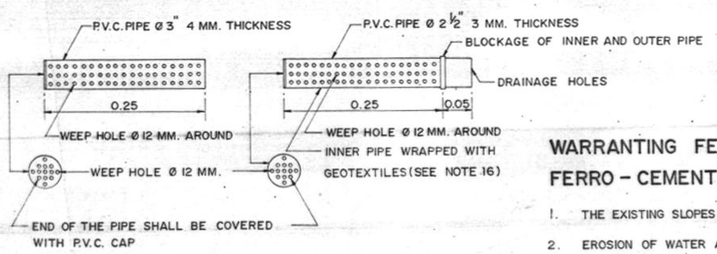
DETAIL OF ANCHORAGE ROD

SCALE 1:5



DETAIL OF HEXAGONAL STEEL WIRE MESH

NOT TO SCALE



DETAIL OF PERFORATED PIPE FOR DRAINAGE

NOT TO SCALE

WARRANTING FEATURES FOR FERRO - CEMENT CONSTRUCTION

1. THE EXISTING SLOPES MUST BE STABLE.
2. EROSION OF WATER APPEARS BUT NOT SLIDE.
3. NOT RECOMMENDED FOR HIGHWAY LEADING TO PLACES TO VISIT OR VIEWING POINTS E.G. KHAO KHO, DOI TUNG.

NOTES :

1. ALL DIMENSION ARE IN METERS UNLESS OTHERWISE INDICATED.
2. THE FERRO - CEMENT BACK SLOPE PROTECTION AS SHOWN ON THIS DRAWING SHALL APPLY FOR HIGHLY EROSIVE SOFT ROCK BACK SLOPE ONLY.
3. PRIOR TO CONSTRUCTION, THE BACK SLOPE SHALL BE FURNISHED AND WELL COMPACTED TO THE SPECIFIED SLOPE.
4. THE MORTAR PROPORTION SHALL BE CEMENT : SAND RATIO 1:1.75 BY WEIGHT AND W/C RATIO = 0.40
5. CEMENT USED SHALL CONFORM TO TIS. 80.
6. HEXAGONAL STEEL WIRE MESH SHALL CONFORM TO TIS 208 TYPE "A". THE SIZE OF MESH IS 52 MM. AND PITCH LENGTH IS 55.2 MM. 50x50 MM. SQUARE WELDED WIRE FRABRIC OF 2 MM. DIAMETER WIRE SHALL BE USED INSTEAD OF HEXAGONAL STEEL WIRE MESH, PROVIDED THAT THE STEEL WIRE SHALL CONFORM TO TIS 194. RUSTY WIRE SHALL NOT BE USED.
7. SKELETON STEEL WIRE (FOR HEXAGONAL STEEL WIRE MESH ONLY) SHALL CONFORM TO TIS 194.
8. ANCHORAGE ROD SHALL CONFORM TO TIS 20 GRADE SR 24.
9. LAPPING OF HEXAGONAL STEEL WIRE MESH SHALL NOT BE LESS THAN 5 AND 10 CM. FOR NARROW SIDE AND LONG SIDE RESPECTIVETY, AND TIED WITH STEEL WIRE AT EVERY 10 CM.
10. CONTRACTION JOINT AND EXPANSION JOINT SHALL BE SEALED WITH MORTAR 1:3 BY VOLUME.
11. SIZE OF COARSE GRAVEL FILTER SHALL BE BETWEEN 3/8" AND 2"
12. THE THICKNESS (T) OF FERRO - CEMENT SHALL BE VARIED FROM 3 TO 5 CM. DEPENDING ON SMOOTHNESS OF BACK SLOPE AREA.
13. IF SOIL CONDITION ON BACK SLOPE IS GRANULAR SOIL, THE ANCHORAGE ROD SHALL BE GROUTED WITH MORTAR (1:3 BY VOLUME) 5 CM. WIDE.
14. AS DIRECTED BY THE ENGINEER PERFORATED PIPE SHALL BE SUBSTITUTED FOR DRAINAGE SLOT IN AREA WHERE SEEPAGE FLOW IS HIGH.
15. BY THE APPROVAL OF THE ENGINEER, THE CONTRACTOR MAY USE THE SHOTCRETE SYSTEM IN APPLYING MORTAR.
16. GEOTEXTILE SHALL BE NONWOVENS TYPE, WEIGHT 140 G./M.^{2}(MIN.) SHALL CONFORM TO ASTM. 3776
17. IF NECESSARY THE SLOPE MAY BE SHAPED TO BE STEPS WITH 1.00 METER WIDE FOR MAINTENANCE PURPOSE.
18. THE BOUNDARY OF FERRO-CEMENT CONSTRUCTION SHALL BE AT THE BEGINNING AND END OF EROSION AND AT THE BEGINNING, FERRO-CEMENT SHALL BE CONSTRUCTED AT THE SUITABLE DISTANCE PRIOR TO THE EROSION POINT.

KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

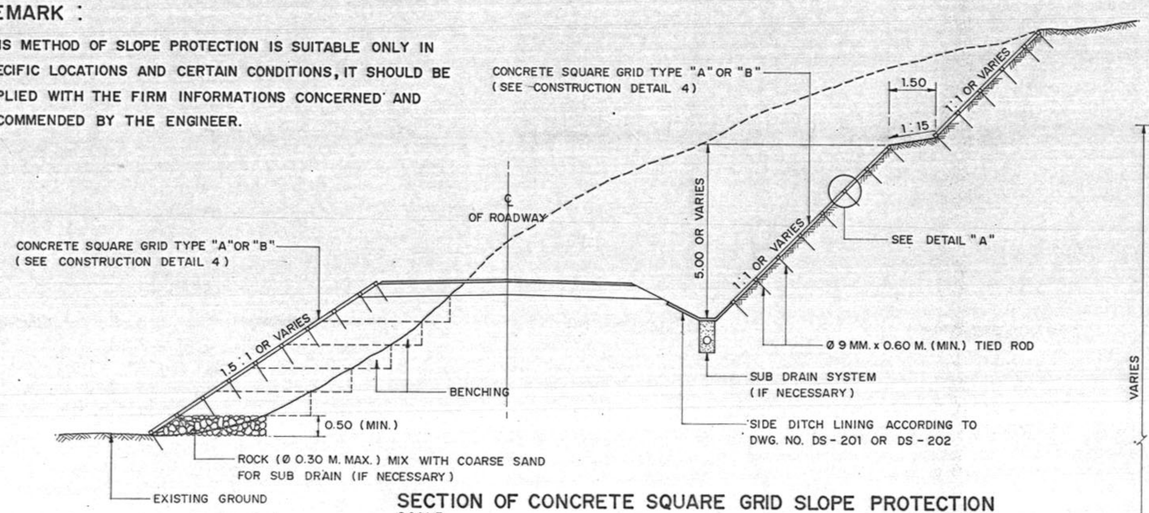
STANDARD DRAWING

FERRO-CEMENT BACK SLOPE PROTECTION

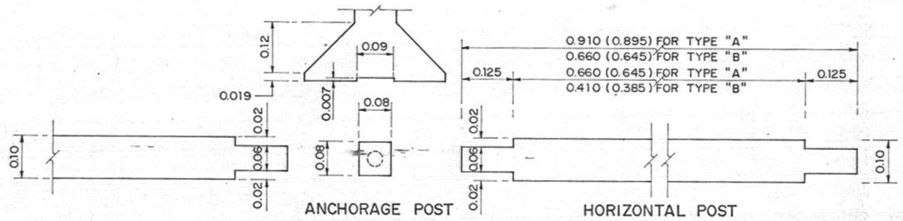
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. SP-20
		SHEET NO. 61

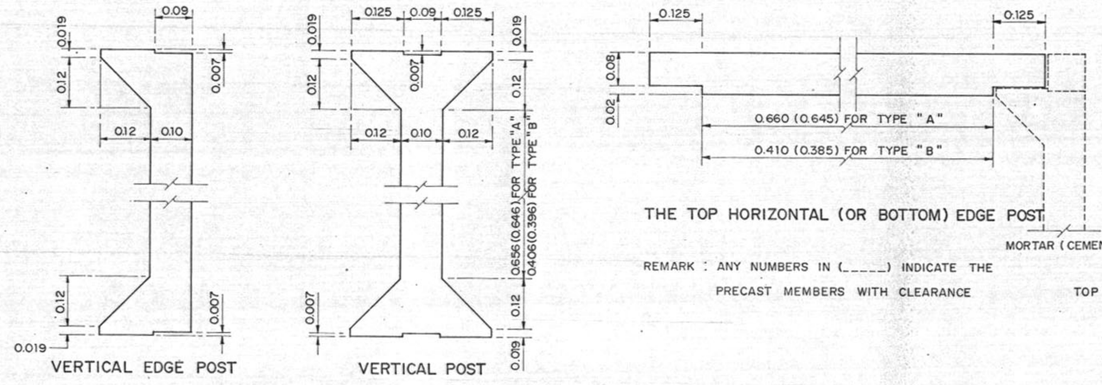
REMARK :

THIS METHOD OF SLOPE PROTECTION IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.



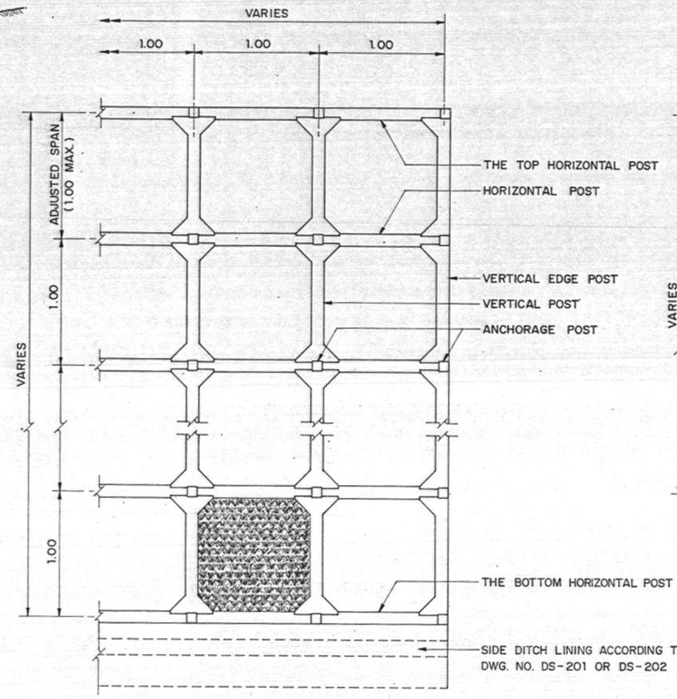
SECTION OF CONCRETE SQUARE GRID SLOPE PROTECTION
SCALE 1 : 100



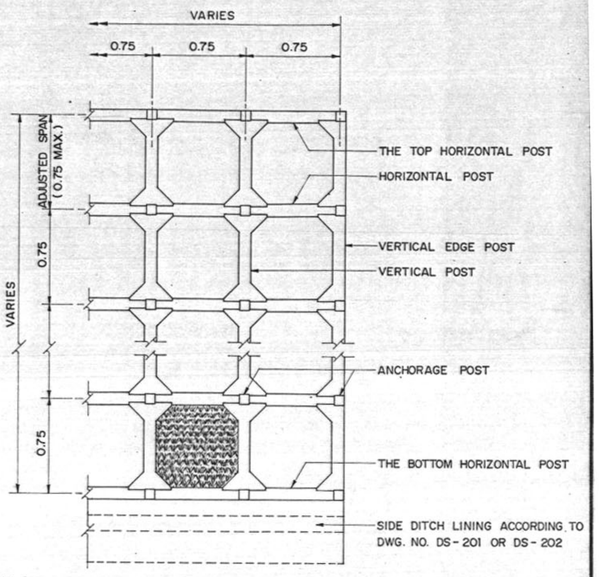


MEMBER DETAILS
SCALE 1 : 7.5

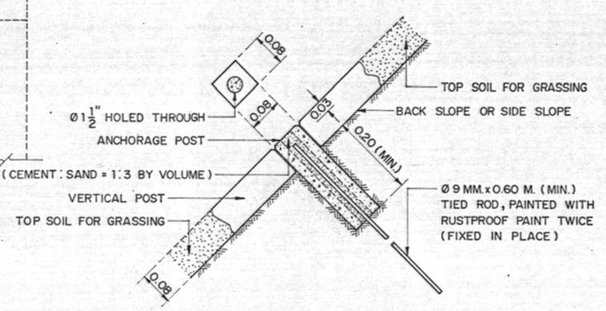
REMARK : ANY NUMBERS IN (_____) INDICATE THE PRECAST MEMBERS WITH CLEARANCE



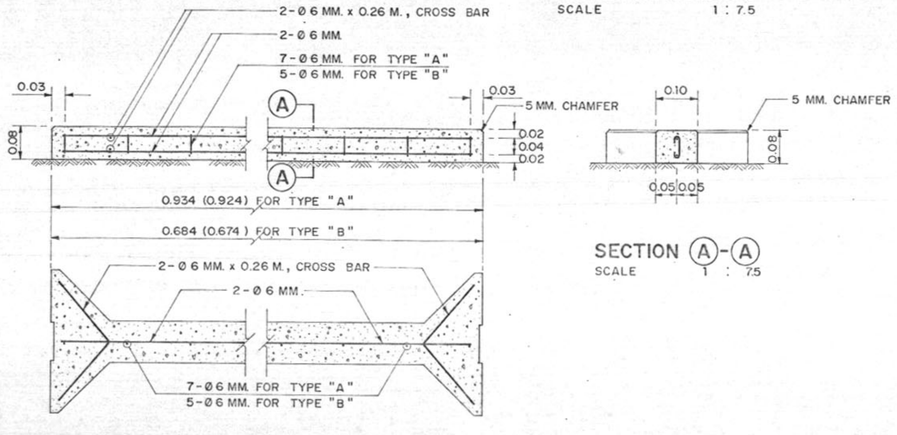
PLAN OF CONCRETE SQUARE GRID (SIZE 1.00 x 1.00 M.) TYPE "A"
SCALE 1 : 25



PLAN OF CONCRETE SQUARE GRID (SIZE 0.75 x 0.75 M.) TYPE "B"
SCALE 1 : 25

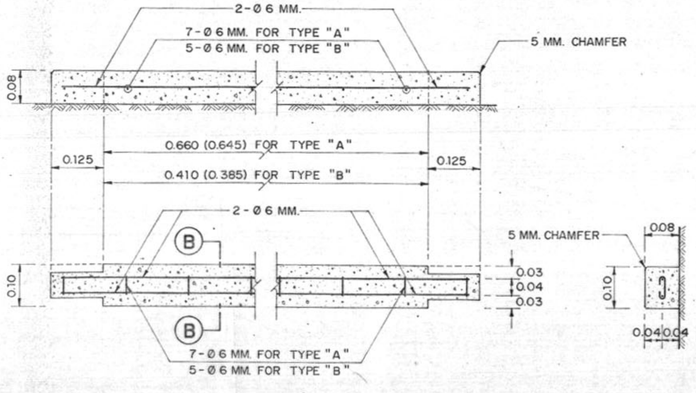


DETAIL "A" ANCHORAGE POST & TIED ROD
SCALE 1 : 7.5



REINFORCING STEEL OF THE VERTICAL POST
SCALE 1 : 7.5

SECTION (A)-(A)
SCALE 1 : 7.5



REINFORCING STEEL OF THE HORIZONTAL POST
SCALE 1 : 7.5

SECTION (B)-(B)
SCALE 1 : 7.5

CONSTRUCTION DETAILS

1. CONCRETE SQUARE GRID USED HERE ARE THOSE OF PRECAST MEMBERS EXCEPT FOR THE ANCHORAGE POST WHICH CAN BE CASTED IN-PLACE. THE PROPORTION OF THE CONCRETE MIXTURE. IS 1 : 2 : 4 BY VOLUME (WITH CRUSHED ROCK OF 1" MAXIMUM).
2. THE PRECAST MEMBERS MENTIONED ABOVE MAY BE THE KIND OF PRESTRESSED CONCRETE. NEVERTHELESS IT IS UP TO THE APPROVAL OF THE LOCATION AND DESIGN DIVISION D.O.H.
3. REINFORCING STEEL AND TIED ROD SHALL CONFORM TO TIS. 20 GRADE SR 24.
4. THE CONCRETE SQUARE GRID SLOPE PROTECTION CAN BE BROUGHT TO USE FOR ANY BACK SLOPE AND SIDE SLOPE PROTECTION AS LONG AS THE EXISTING SLOPE STABILITY OF THAT PARTICULAR SOILS CAN BE STABLE. IN THE CASE OF TOO STEEPER SLOPE OR THE TENDENCY OF SOIL'S EROSION, CONCRETE SQUARE GRID TYPE "B" (SIZE 0.75 x 0.75 M.) IS SUGGESTED.
5. AFTER FINISHING THE BACK AND SIDE SLOPES ACCORDING TO PLAN, THE CONSTRUCTION OF CONCRETE SQUARE GRID SHOULD BE PROCEEDED RIGHT AWAY BY WORKING FROM THE BOTTOM UP TO THE NEXT LEVEL. IF A LITTLE EROSION IS SHOWN IN THE BACK OR SIDE SLOPE, IT IS THE ENGINEER'S DIRECTION TO ADAPT OR ADJUST THE SLOPE. THE LENGTH OF ANCHORAGE POST OR TIED ROD SHALL BE ADJUSTED TO FIELD CONDITION. THE TIED ROD CAN BE LONGER IN RICH SOIL.
6. 8 CM. THICK OF TOP SOIL IS USED. IN CONCRETE SQUARE GRID IF NOTHING ELSE IS STATED. THE SOIL MUST BE WELL MIXED AND COMPACTED WITH ORGANIC FERTILIZER IN THE PROPORTION OF 2 : 1 BY VOLUME.
7. IN THE AREA OF UNDERGROUND WATER SEEPAGE, 1 1/2" - 3" CRUSHED ROCKS CAN BE COMPACTED IN THE CONCRETE SQUARE GRID AS WELL AS TOP SOIL.
8. IN CASE SPECIFIC OF GRASSING IN CONCRETE SQUARE GRID, DWG. NO. SP-203 OR SP-204 WHICH IS FOR GROWING VETIVER GRASS ARE TO BE CONSULTED.
9. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.

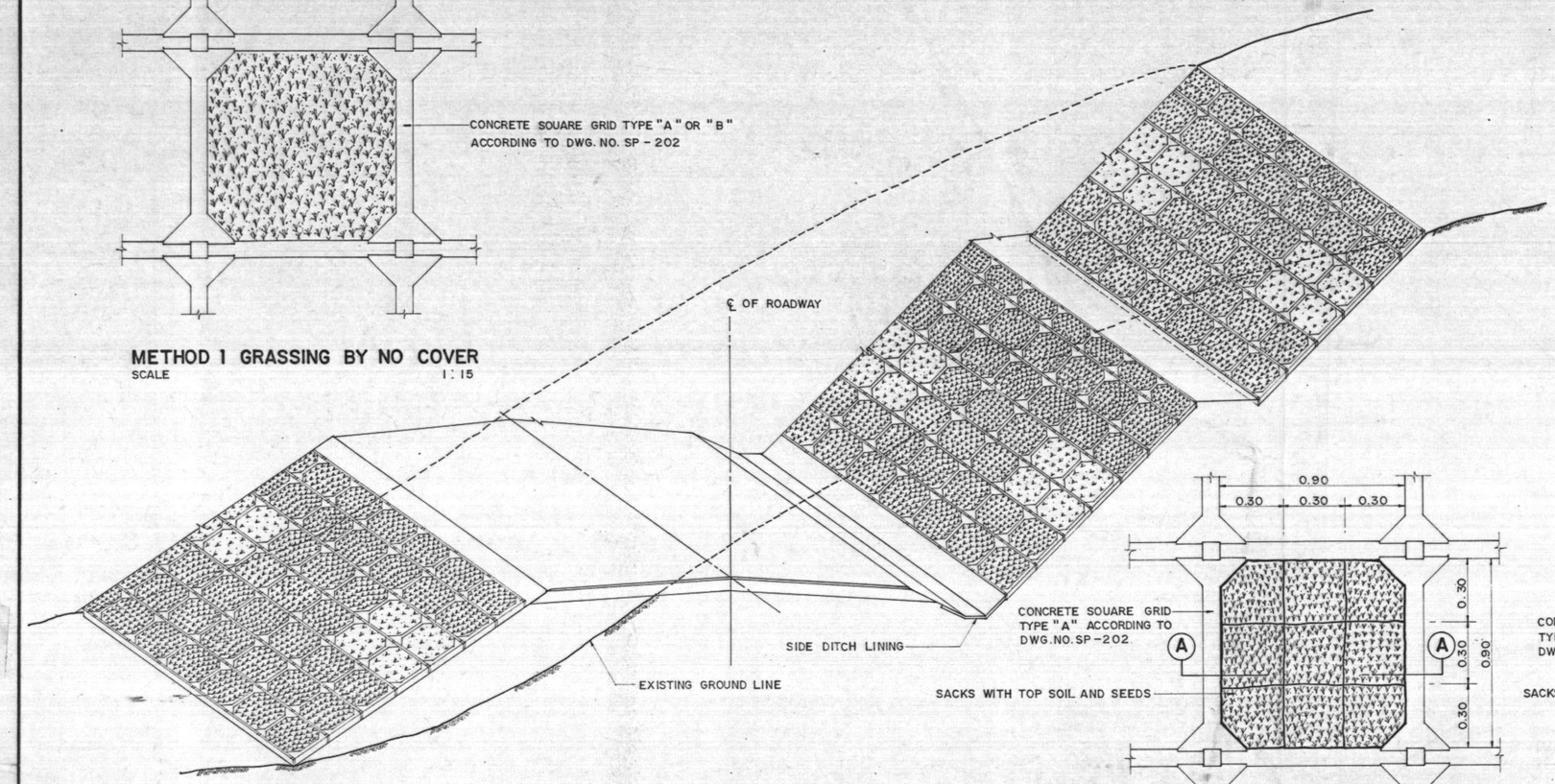
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

CONCRETE SQUARE GRID SLOPE PROTECTION

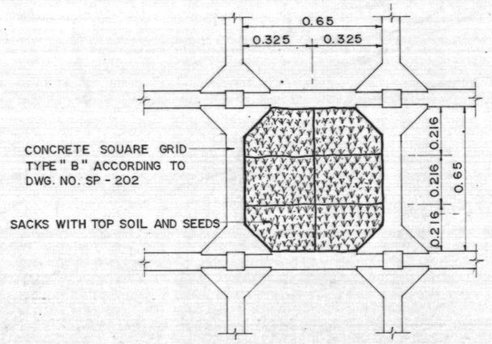
DESIGNED : D.O.H. & CONSULTANTS.	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. SP-202
		SHEET NO. 62

METHOD 1 GRASSING BY NO COVER
SCALE 1 : 15

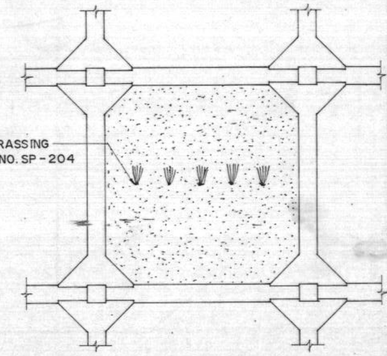


GRASSING IN CONCRETE SQUARE GRID SLOPE PROTECTION
SCALE 1 : 15

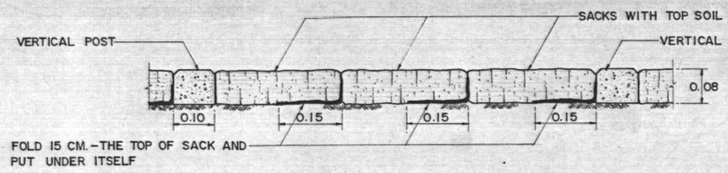
FOR CONCRETE SQUARE GRID TYPE "A"



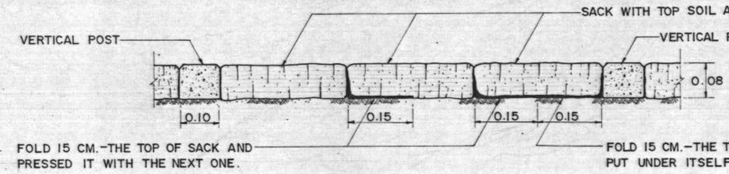
FOR CONCRETE SQUARE GRID TYPE "B"



METHOD 3 VETIVER GRASSING IN CONCRETE SQUARE GRID TYPE "A"
SCALE 1 : 15



ALTERNATIVE 1



ALTERNATIVE 2

SECTION (A)-(A) ARRANGEMENT OF SACKS
SCALE 1 : 7.5

METHOD 2 GRASSING BY SACKS WITH TOP SOIL AND SEEDS
SCALE 1 : 15

CONSTRUCTION DETAILS

1. PERIOD FOR GRASSING : AFTER THE CONSTRUCTION OF CONCRETE SQUARE GRID IS FINISHED, GRASSING SHOULD BE QUICKLY PROCEEDED ACCORDING TO CERTAIN GRASSING METHODS AND SUITABLE PERIOD WHICH IS THE TIME OF 1-2 WEEKS BEFORE RAINY SEASON.
2. TOP SOIL : TOP SOIL IS COMPOSED OF RICH SOIL (NO STONES OR EXISTING BUILDING MATERIALS) AND GOOD ORGANIC FERTILIZERS SUCH AS BKK.2 (BANGKOK 2) ORGANIC FERTILIZER OR DRY COW MANURE. THE PROPORTION IS 2 : 1 BY VOLUME WITH ENOUGH MOISTURE FOR GRASS GROWING.
3. GRASSING METHOD 1 (NO COVER) : THERE ARE 3 WAYS - SEEDING, NODING, BULBING, AS FOLLOW :
   - 3.1 SEEDING
     - 3.1.1 PUT 6 - 7 CM. THICK OF TOP SOIL IN THE CONCRETE SQUARE GRID AND WELL COMPACTED.
     - 3.1.2 SCATTER THE SELECTED SEEDS ACCORDING TO ITEM 6 INTO THE SQUARE GRID.
     - 3.1.3 FILL 1-2 CM. OF TOP SOIL OVER THE SEEDS AND WELL COMPACTED IT, MAKING EQUAL THICK TO CONCRETE SQUARE GRID (8 CM.).
   - 3.2 NODING
     - 3.2.1 FOLLOW THE STEP 3.1.1 EXCEPT FOR THE THICKNESS OF THE TOP SOIL - 8 CM.
     - 3.2.2 USE THE WELL SELECTED AND PREPARED GRASS NODES ACCORDING TO STATED AMOUNTS IN ITEM 6. SCATTERED PLANTING THE NODES.
   - 3.3 BULBING
     - 3.3.1 FOLLOW THE STEP 3.2.1
     - 3.3.2 USE THE WELL SELECTED AND PREPARED BULBS ACCORDING TO STATED AMOUNTS IN ITEM 6. SCATTERED PLANTING THE NODES.

   THE CONTRACTOR MAY EXPLOIT EITHER WAY OUT OF THOSE THREE WAYS MENTIONED ACCORDING TO THE AREA AND CONVENIENCE OF FINDING THE GRASS. THE WAYS 3.1 AND 3.2 AND 3.3 CAN BE MIXED. IF SO, THE AMOUNTS OF SEEDS, NODES, AND BULBS SHOULD BE REDUCED UP TO THE SUITABILITY AS DIRECTED BY THE ENGINEER AND APPROVED BY LOCATION AND DESIGN DIVISION D.O.H.
4. GRASSING METHOD 2 (WITH SACKS OF TOP SOIL AND SEEDS) : DO AS FOLLOWS.
   - 4.1 PREPARE TOP SOIL AS IN ITEM 2.
   - 4.2 GET CERTAIN SACKS AS FROM ITEM 5.
   - 4.3 MIX THE SELECTED SEEDS AS FROM ITEM 6 WITH TOP SOIL. THE SEEDS USED HERE MUST BE TWICE THE AMOUNTS OF STEPS 3.1, THE AMOUNT OF SOIL IS 17.5 KG./SACK AND 13.75 - KG./SACK FOR CONCRETE SQUARE GRID TYPE "A" AND "B" RESPECTIVELY.
   - 4.4 ARRANGE THE SACKS OF TOP SOIL AND SEEDS IN THE CONCRETE SQUARE GRID BY LAYING THEM DOWN AND FOLDING THE SACKS AS SHOWN IN THE FIGURE. ADJUST THE SACKS AND MAKE THEM LOOK LIKE THE SHOWN FIGURE (THE APPROXIMATE THICKNESS OF 8 CM.) THE QUANTITY OF TOP SOIL IN THE SACKS CAN BE ADJUSTED SO THAT THE SACKS CAN WELL FIT THE GRID.
5. DETAIL OF SACKS : THE SACKS SHOULD BE AS FOLLOW
   - 5.1 SACKS MADE FROM NATURAL FIBRE : THE SACKS SHOULD HAVE THEIR NETS THAT ARE NOT TOO LOOSE OR TOO TIGHT. THEY SHOULD BE STRONG ENOUGH SO THAT THEY WILL NOT BE BROKEN WHILE BEING REMOVED. ALSO THEY SHOULD DECAY IN THE COURSE OF ONE YEAR. THUS THE JUTE BAGS ARE INTRODUCED AS THEIR 1 INCH WOVEN THREADS CONTAIN 7.5 WARP STRINGS AND 12 WEFT STRINGS (± 0.5 STRING DEVIATION). THE SIZE OF SACK FOR CONCRETE SQUARE GRID TYPE "A" IS 39 x 50 CM. (± 1 CM. DEVIATION) AND THE SIZE FOR THE TYPE "B" IS 30.5 x 52 CM. (± 1 CM. DEVIATION).
   - 5.2 SACKS MADE FROM SYNTHETIC FIBERS : THE SACKS MUST POSSES THE QUALITIES ACCORDING TO ITEM 5.1 AND MUST COMPLETELY DECAY WITHIN ONE YEAR. YET THE APPROVAL OF THE LOCATION AND DESIGN DIVISION D.O.H.
6. KINDS OF GRASS AND WAYS OF REPRODUCING :
   - 6.1 GENERAL SPECIFICATION : USE ANY OF LOCAL KINDS OR ANY THAT CAN BE FOUND IN THAILAND AS THEY LIVE LONG AND CAN HOLD VERY WELL TO THE GROUND. THEY ALSO SURVIVE IN ANY BAD STATE OF SOIL AND ENVIRONMENT. INFORMATION IS AS FOLLOW :

NO.	COMMON NAMES	SCIENTIFIC NAMES	WAYS OF REPRODUCING	SEEDS' QUALITY	
				PURITY NOT LESS THAN (%)	RATE OF GROWTH NOT LESS THAN (%)
1	หญ้ารูซี่	BRACHIARIA RUZIZIENSIS	SEEDS	70	30
2	หญ้าพลิแคทูลัม	PASPALUM PLICATULUM	SEEDS	60	40
3	หญ้าแพรก	CYNODON DACTYLON	SEEDS OR NODES	40	30
4	หญ้าสตาร์	CYNODON PLECTOSTACHYUS	NODES OR BULBS		
5	หญ้าซิกแนลเลี้ยย	BRACHIARIA HUMIDICOLA	NODES OR BULBS		
6	หญ้าบาเฮีย	PASPALUM NOTATUM	OFFSHOOTS OR SEEDS		
7	หญ้าตีนกา	ELEUCINE INDICA	SEEDS	40	25
	พืชตระกูลถั่ว				
8	ถั่วลาย	CENTROSEMA PUBESCENS	SEEDS	90	50
9	ถั่วฮามาต้า	STYLOSANTHES HAMATA	SEEDS	70	25
10	ถั่วสิราโต	MACROPTILIUM ATROPURPUREUM	SEEDS	60	25

   AND SEEDS' MOISTURE IS NOT MORE THAN 10 %
   - 6.2 SEEDING : QUALITY OF SEEDS SHOULD CONFORM TO ITEM 6.1 (10 - 15 GM./M²)
   - 6.3 NODING : USE RATHER OLD BUT STRONG STEMS WHICH HAVE AT LEAST 4 NODES EACH (100 - 120 STEMS/M²)
   - 6.4 BULBING : USE STRONG BULBS (120 - 140 BULBS / M²)

   THE CONTRACTOR CAN USE ONLY ONE KIND OF GRASS OR MANY DIFFERENT KINDS, BUT THE NUMBERS OF EACH KIND NEED TO BE ADJUSTED ACCORDING TO SUITABLE PROPORTION. GENERALLY, BEANS WITH THE RATE OF GROWTH 10 - 15 STEMS/M². ARE USED TO MIX WITH OTHER GRASS. ANY OTHER KINDS OF GRASS (NOT MENTIONED IN THE TABLE ABOVE) CAN ALSO BE USED AS DIRECTED BY THE ENGINEER AND APPROVED BY THE LOCATION AND DESIGN DIVISION D.O.H.
7. GRASS CARING : THE CONTRACTOR MUST TAKE GOOD CARE OF THE GRASS SO THAT THEY GROW WELL WITHIN 3 MONTHS, THERE SHOULD BE COVERED NOT LESS THAN 75 % OF THE GRID AREA ANYWHERE. THE GROWTH PERCENTAGE LESS THAN THIS THE CONTRACTOR MUST MANAGE TO REACH THE PERCENT OTHERWISE. THE AGRICULTURAL OPERATION TO INCREASE GROWTH OF GRASS COULD BE DONE.
8. THIS DRAWING CAN BE USED FOR GRASSING IN CONCRETE GRID BEAM (ACCORDING TO DWG. NO. SP-301).
9. ALL DIMENSION ARE IN METERS UNLESS OTHERWISE INDICATED.

REMARK :

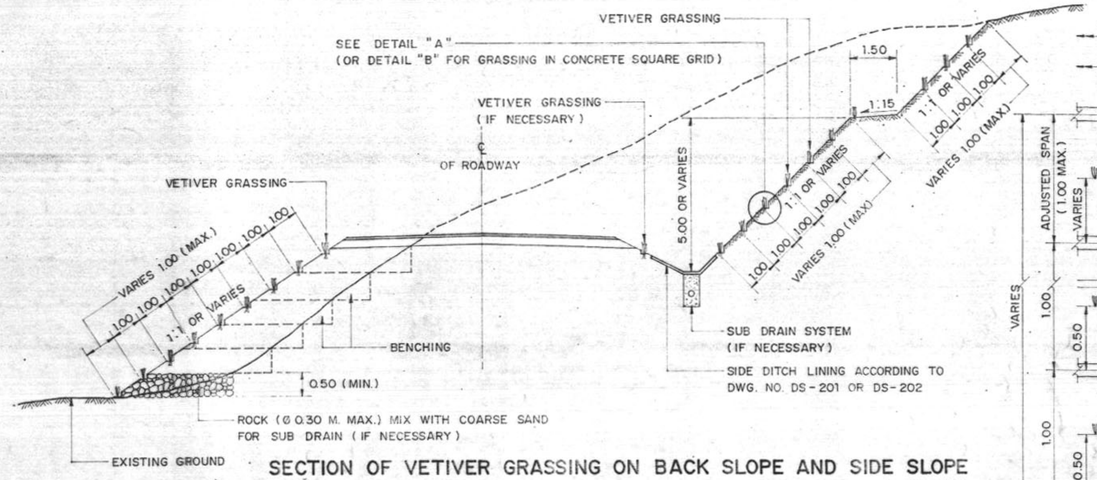
THIS METHOD OF SLOPE PROTECTION IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

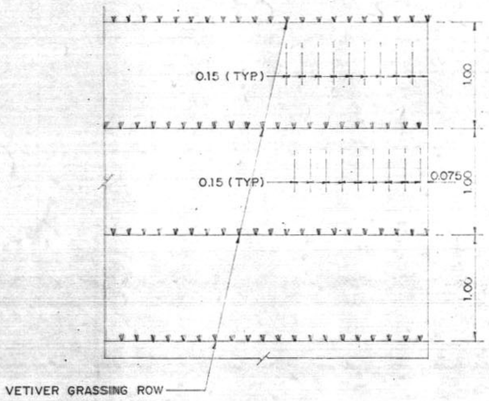
GRASSING IN CONCRETE SQUARE GRID AND GRID BEAM

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. SP-203
		SHEET NO. 63



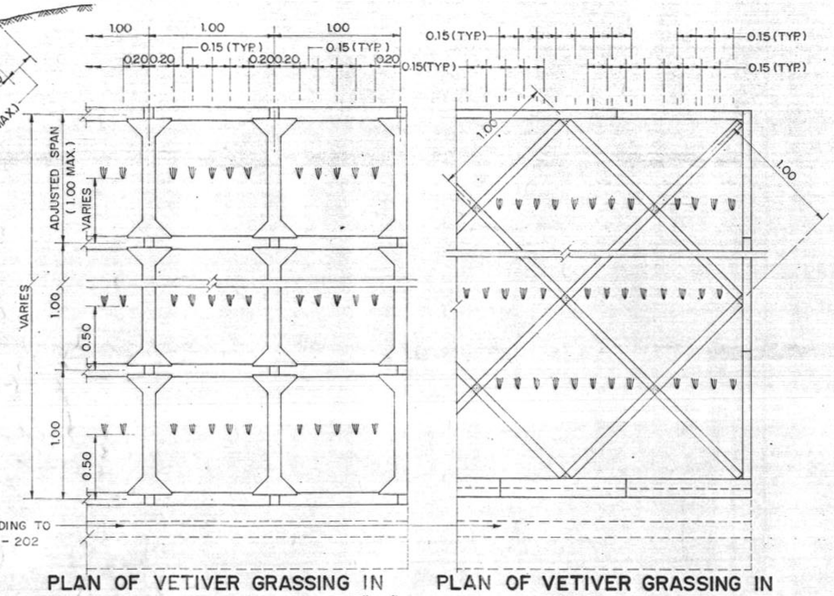
SECTION OF VETIVER GRASSING ON BACK SLOPE AND SIDE SLOPE

SCALE 1 : 100



PLAN OF VETIVER GRASSING ROW

SCALE 1 : 30

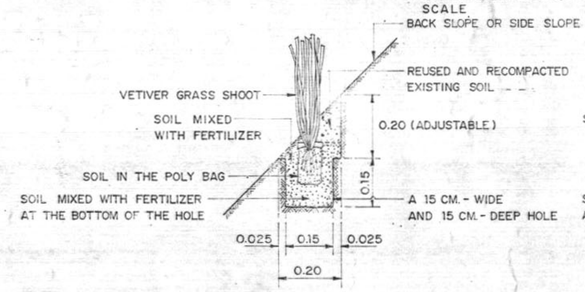


PLAN OF VETIVER GRASSING IN CONCRETE SQUARE GRID TYPE "A"

SCALE 1 : 25

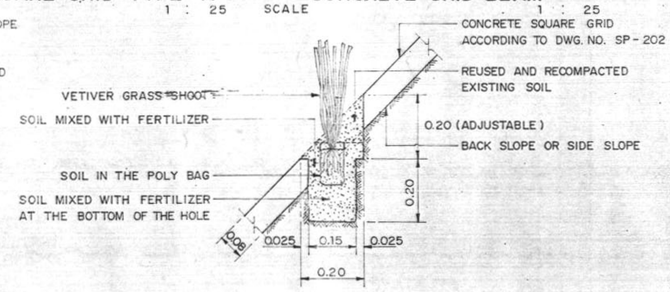
PLAN OF VETIVER GRASSING IN CONCRETE GRID BEAM

SCALE 1 : 25



DETAIL "A"

SCALE 1 : 10



DETAIL "B"

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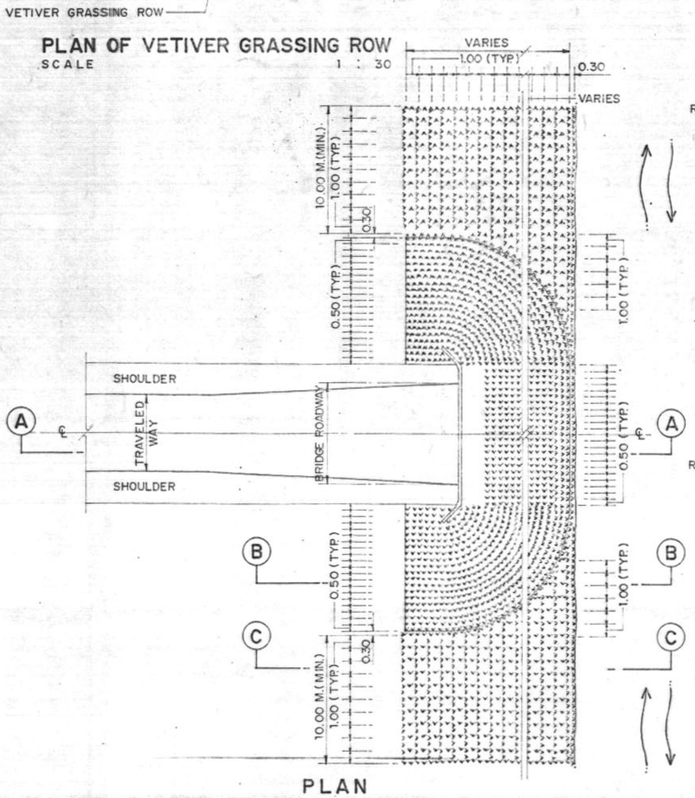
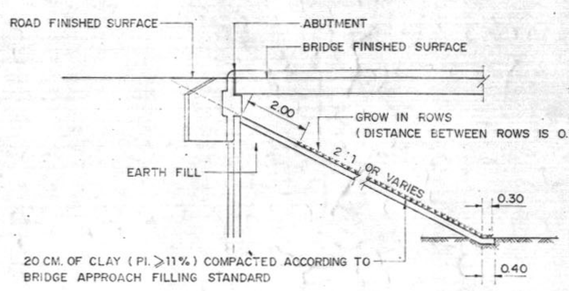


PLAN

SCALE 1 : 250



SECTION (A)-(A)

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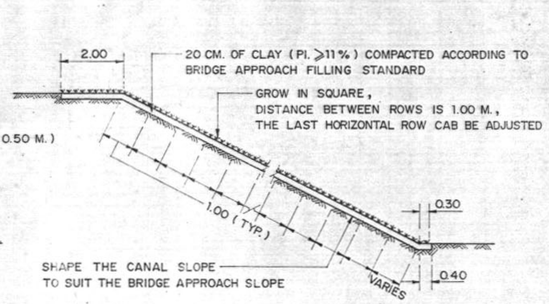

SECTION (C)-(C)

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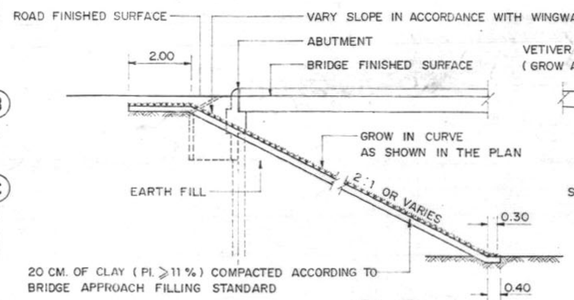

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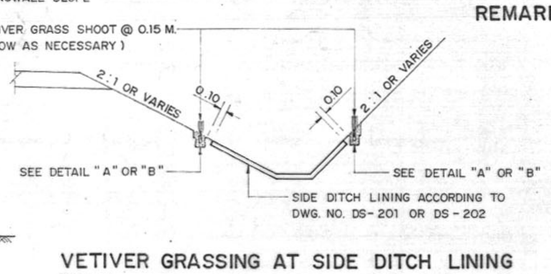


VETIVER GRASSING AT SIDE DITCH LINING

SCALE 1 : 50

VETIVER GRASSING AT BRIDGE SLOPE PROTECTION

CONSTRUCTION DETAILS

1. THE VETIVER GRASS SHOOTS : VETIVER (VETIVERIA ZIZANIOIDES NASH) SHALL BE LOCAL KINDS OR ANY OTHER APPROPRIATE ONES AS APPROVED BY THE LOCATION AND DESIGN DIVISION D.O.H. VETIVER SHOOTS SHOULD BE RESTED IN A POLY BAG WHICH HAS DIAMETER OF 3 INCHES AND THE LENGTH OF 7 INCHES (SIDE - FOLDED) BEFORE PLANTING. EACH BAG WHICH CONTAINS SOIL AND FERTILIZER IS TO SERVE 1 - 2 VETIVER SHOOTS. THE SHOOTS WILL BE RESTED IN THE BAGS FOR $1\frac{1}{2} - 2\frac{1}{2}$ MONTHS BEFORE BEING TAKEN TO THE PREPARED SOIL.
2. HOLE DIGGING AND GROUND PREPARATION : AFTER THE WORKS FOR BACK SLOPE, SIDE SLOPE, BRIDGE APPROACH SLOPE, AND BANK SLOPE ARE FINISHED ACCORDING TO THE CONSTRUCTION PLAN, GROUND PREPARATION FOR VETIVER PLANTING SHOULD BE STARTED BY DIGGING A HOLE WHICH IS 15 CM. WIDE AND 15 - 20 CM. DEEP. A GROOVE ALONG THE ROW OF VETIVER SHOULD BE MADE AND THE BOTTOM OF THE GROOVE SHOULD BE COVERED WITH 8 - 10 CM. OF EXISTING SOIL MIXED WITH SOME FERTILIZER. THE FERTILIZER MUST HAVE THE SAME QUALITY AS BKK. 2 (BANGKOK 2) FERTILIZER OR DECAYED MANURE. THE PROPORTION OF SOIL AND FERTILIZER IS 1 : 1 BY VOLUME AND THE SOIL AND THE FERTILIZER SHOULD BE WELL MIXED.
3. PLANTING : THE SPACE BETWEEN ROWS IS AS SHOWN IN THE PLAN. THE DISTANCE BETWEEN TWO SHOOTS IS 15 CM. TRIM AND LEAVE THE LEAVES OF THE SHOOTS FOR 20 CM. BEFORE PLANTING. CUT OFF THE BOTTOM PART OF THE BAG AND LET 10 CM. OF THE ROOT BE SHOWN. TAKE OFF THE BAG AND PUT THE VETIVER SHOOT ON THE PREPARED HOLE. FILL THE HOLE WITH THE PREPARED SOIL AS SHOWN AT DETAIL "A" AND "B". AFTER 15 - 20 DAYS OF PLANTING, POUR HALF A TEA - SPOON OF AMMONIAM SULPHATE FERTILIZER (21:0:0) OR ONE-FOURTH OF TEA-SPOON OF UREA FERTILIZER (46 : 0 : 0) OVER EACH HOLE AND OVER EACH SPACE BETWEEN HOLES. FILL THE HOLE WITH SOME EXISTING SOIL AND COMPACT TO MEET EXISTING SLOPE.
4. PERIOD FOR PLANTING : THE SUITABLE PERIOD SHALL BE 1-3 WEEKS BEFORE RAINY SEASON. PLANTING FOR THE BRIDGE APPROACH SLOPE PROTECTION SHOULD BE DONE DURING THE LOWER WATER LEVEL.
5. PLANT CARING : THE RATE OF SURVIVAL OF VETIVER SHOULD BE NOT LESS THAN 95 % AFTER 2 MONTHS OF PLANTING. IF LESS, THE CONTRACTOR HAS TO REDO THE PLANTING WITHIN 15 DAYS. THE NEW PLANTING WILL BE RECHECKED AFTER ANOTHER 2 MONTHS. THE INEVITABLE DESTRUCTION OF THE SHOOTS BY NATURE AT THE BOTTOM OF BRIDGE APPROACH IS AN EXCEPTION.
6. THE SHOOTS : OTHER THAN THE LOCAL SHOOTS, THE CONTRACTOR MAY USE ANY SHOOTS REPRODUCED THROUGH VARIOUS WAYS, SUCH AS BY TISSUE CULTURE BUT THE QUALITY OF THE SHOOTS NEED TO BE APPROVED BY THE LOCATION AND DESIGN DIVISION D.O.H.
7. LEAF TRIMMING AND FERTILIZING : THE VETIVER WILL BE TRIMMED AND FERTILIZED EVERY 4 MONTHS IN THE FIRST YEAR OF VETIVER GROWTH AND EVERY 6 MONTHS IN THE CONSECUTIVE YEARS. THE TRIMMING SHOULD LEAVE THE HEIGHT OF THE PLANT FOR 30 - 50 CM. AFTER THE SECOND LEAF TRIMMING, NPK FERTILIZER (15 - 15 - 15) SHOULD BE PUT ON THE GROUND IN THE PROPORTION 15 GRAMS PER METER OF VETIVER GRASS ROW.
8. VETIVER GRASSING FOR BANK PROTECTION : VETIVER GRASSING CAN ALSO BE APPLIED TO PROTECT EROSION OF ROADWAY SLOPE ALONG THE RIVER. THE LENGTH OF PLANTING SHOULD BE DEPENDED ON THE NATURE OF THE RIVER CONDITION AND APPROVAL BY THE ENGINEER.
9. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.

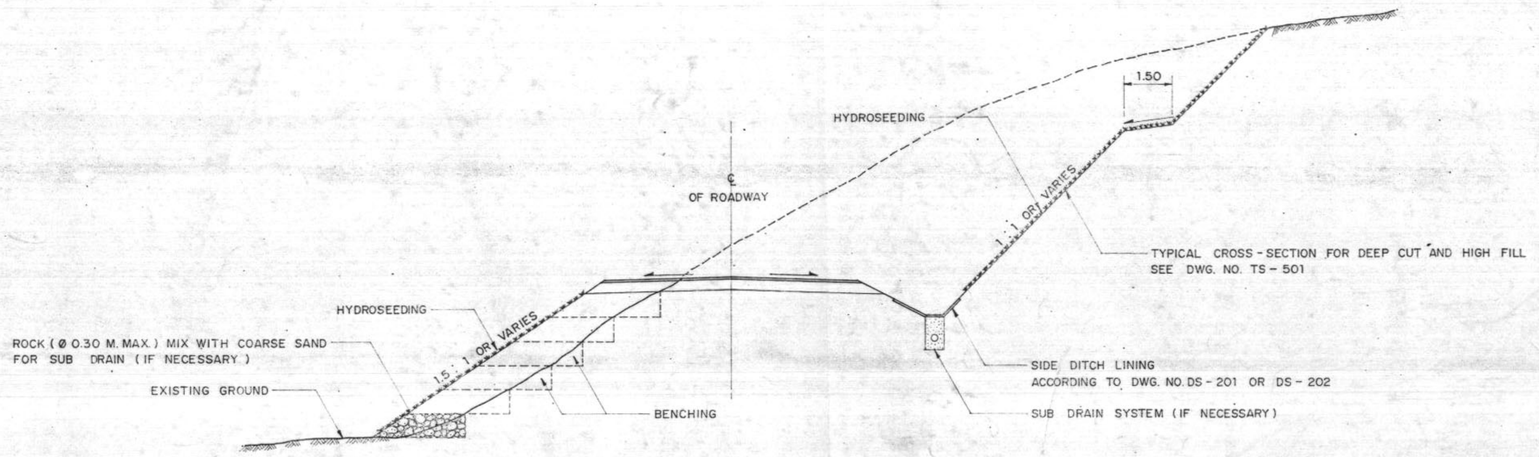
REMARK : THIS METHOD OF SLOPE PROTECTION IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

VETIVER GRASSING FOR SLOPE PROTECTION

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. SP-204
		SHEET NO. 64



HYDROSEEDING FOR SLOPE PROTECTION

NOT TO SCALE

CONSTRUCTION DETAILS

1. AREA PREPARATION
   - 1.1 AFTER THE EARTH WORKS OF CUT AND FILL ARE FINISHED AS PLANNED, HYDROSEEDING SHOULD BE DONE RIGHT AWAY BEFORE THE OCCURRENCE OF SLOPE EROSION.
   - 1.2 IF THE SURFACE OF BACK SLOPE IS TOO HARD, SHAPE IT BY STRIPPING SOME EXISTING SOIL THAT IS COVERING THE SURFACE. THE SHAPING WILL MAKE THE SURFACE SOFT AND SHOULD LEAVE THE 2.5 CM. THICKNESS OF THE SURFACE. THERE SHOULD BE GROOVED WHICH ARE 5 - 7 CM. APART ALONG THE LENGTH OF AREA.
   - 1.3 SHAPING THE SURFACE OF THE SIDE SLOPE IS DONE THE SAME WAY AS IN ITEM 1.2 AND YET AS DIRECTED BY THE ENGINEER.
   - 1.4 IN SOME AREAS THAT ARE COVERED WITH BOULDERS, SOFT ROCK OR ROCK WITH SEEPAGE FLOW OR HAVE RELLS OR GULLIES, THE SOIL SHAPING SHOULD BE DIRECTED BY THE ENGINEER.
2. SUGGESTED GRASS AND QUALITIES OF ITS SEEDS
   - 2.1 IN GENERAL, THE SUGGESTED GRASS IS THAT OF LOCAL KINDS OR ANY KINDS THAT HAVE BEEN WELL GROWN IN THAILAND. THE GRASS USED AS PERMANENT GRASS FOR PREVENTION SOIL EROSION SHOULD BE PERENNIAL GRASS AND HAS STRONG ROOTS SYSTEM THAT CAN FIRMLY HOLD TO THE GROUND AND CAN BEAR ANY BAD STATE OF SOIL. WHILE IN USE, THE GRASS SHOULD BE MIXED WITH BEAR PLANTS WHICH WILL BE A NITROGEN CATCHER OR MIXED WITH SHORT - LIFE GRASS WHICH WILL BE SACRIFY GRASS, AS DIRECTED BY THE ENGINEER.
   - 2.2 SUGGESTED GRASS AND QUALITY OF ITS SEEDS

NO.	COMMON NAMES	SCIENTIFIC NAMES	SEEDS' QUALITY			NOTE
			MOISTURE NOT MORE THAN (%)	PURITY NOT LESS THAN (%)	RATE OF GROWTH NOT LESS THAN (%)	
1	หญ้ารูซี่	BRACHIARIA RUZIZIENSIS	10	70	50	
2	หญ้าพลิแคทูลัม	PASPALUM PLICATULUM	10	60	40	
3	หญ้าแพรก	CYNODON DACTYLON	10	50	30	
4	หญ้าซิกแนลเลี่ยย	BRACHIARIA HUMIDICOLA	10	–	–	
5	หญ้าสตาร์	CYNODON PLECTOSTACHYUS SPP.	10	–	–	
6	หญ้าบาเฮีย	PASPALUM NOTATUM	10	50	30	
7	หญ้าหวาย	ERAGROSTIS DIPLACHNOIDES	10	50	30	
8	หญ้า WEEPING LOVE GRASS	ERAGROSTIS PARVIFLORA ERAGROSTIS CURVULA	10	50	30	
9	หญ้าตีนกา	ELEUCINE INDICA	10	40	25	
10	หญ้า RYE	LOLIUM PERENNE	10	50	30	
11	หญ้า FESCUE	FESTUCA ELATOR	10	50	30	GOOD FOR COLD WEATHER
12	หญ้า ACACIA พืชตระกูลถั่ว	ACACIA SPP.	10	50	30	
13	ถั่วลาย	CENTROSEMA PUBESCENS	10	90	50	
14	ถั่วฮามาต้า	STYLOSANTHES HAMATA	10	70	30	
15	ถั่วซิราโตเร	MACROPTILIUM ATROPURPUREUM	12	90	50	

ANY OTHER KINDS THAT HAVE THE SAME QUALITIES AS MENTIONED IN ITEM 2.1 CAN ALSO BE USED, YET AS DIRECTED BY THE ENGINEER AND APPROVAL BY THE LOCATION AND DESIGN DIVISION D.O.H.

- 2.3 TWO KINDS OF GRASS OR MORE AS MENTIONED IN ITEM 2.2 SHOULD BE USED TOGETHER ACCORDING TO THE SITE. THE PROPORTION OF THE GRASS MIXED SHOULD BE 15 GM./M^2 AND BEANS WITH RATE OF GROWTH 10 - 15 STEMS/M.^{2}

3. OTHER MATERIALS
   - 3.1 ACID DILUTE : IN GENERAL, THE pH OF SOIL SUITABLE FOR GRASSING IS ABOUT 5 - 8. IF THE SOIL HAS CONCENTRATED ACID, USE THESE CHEMICALS TO DILUTE THE ACID CONDITION OF THE SOIL.
     - 3.1.1 CRUSHED AND BURNED OYSTER SHELL OR
     - 3.1.2 DOLOMITE

     THE SUITABLE PROPORTION OF THESE CHEMICALS IS USED TO DILUTE THE ACID CONDITION OF SOIL, TO BE NEUTRAL CONDITION.
   - 3.2 NPK FERTILIZER (15 : 15 : 15) : NOT LESS THAN 30 GM./M.^{2}
   - 3.3 TACKIFIER OR BINDER MATERIALS (TAKEN FROM PLANTS) : WHITE GLUE OR EMULSION PRODUCED FROM PETROLEUM SHOULD NOT BE USED BECAUSE IT HINDERS THE GROWTH OF THE SEEDS. THE TACKIFIER USED SHOULD BE 30 GM./M.^{2}.
   - 3.4 WETTING AGENT : USED TO PREVENT THE CLINGING AMONG THE SEEDS, WITH SUITABLE PROPORTION.
   - 3.5 INDUSTRIAL DETERGENT : USED TO INCREASE K - VALUE (PERMEABILITY) OF SOIL. THE APPROPRIATE AMOUNT IS 0.1 - 0.2 GM./M.^{2}
   - 3.6 MULCH MATERIALS : NOT LESS THAN 200 GM./M.^{2}
4. PUMPING MACHINE

   THE PREFERABLE KIND IS THAT OF HIGH PRESSURE MACHINE THAT CAN FORCE THE MIXTURES AS HIGH AS 30 M. AND THAT HAS ITS HEAD THAT CAN SPRAY THE MIXTURES ALL OVER THE PLACE.
5. PERIOD OF TIME

   HYDROSEEDING SHOULD BE DONE 2 - 4 WEEKS BEFORE RAINY SEASON.
6. FERTILIZING

   10 - 15 GM./M.^{2} OF UREA FERTILIZER SHOULD BE SPRAYED ON THE AREA ONE MONTH AFTER HYDROSEEDING.
7. 75 % OF GRASS SHOULD GROW AND COVER THE GROUND 2 - 3 MONTHS AFTER HYDROSEEDING, EXCEPT HARD SOIL OR ROCK OR BOULDERS.
8. INVESTIGATION : IF THERE ARE STILL SOME AREAS THAT ARE NOT SUCCESSFULLY DONE ACCORDING TO ITEM 7, THE CONTRACTOR NEEDS TO REDO THE HYDROSEEDING.
9. ANY OTHER OPERATION CONFORMING TO AGRICULTURAL, TO INCREASE EFFICIENCY OF GROWTH, CAN BE DONE.

REMARK :

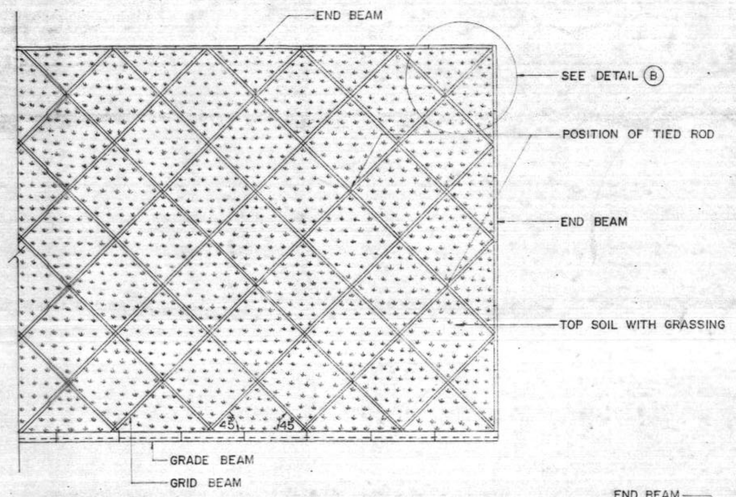
THIS METHOD OF SLOPE PROTECTION IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

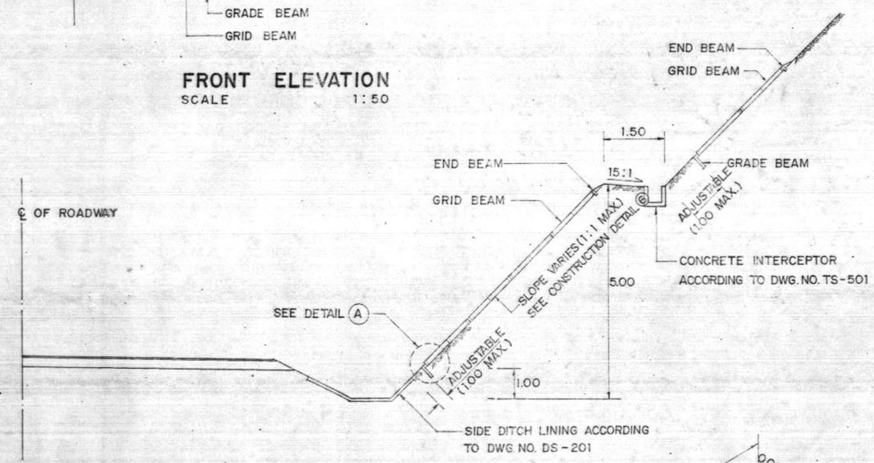
STANDARD DRAWING

HYDROSEEDING FOR SLOPE PROTECTION

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 199
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. SP-20
		SHEET NO. 65



FRONT ELEVATION
SCALE 1:50



SIDE ELEVATION
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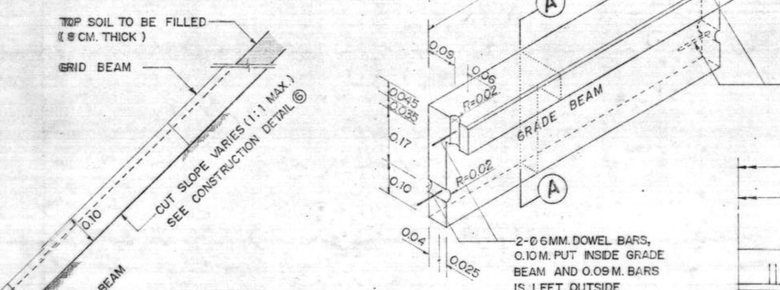
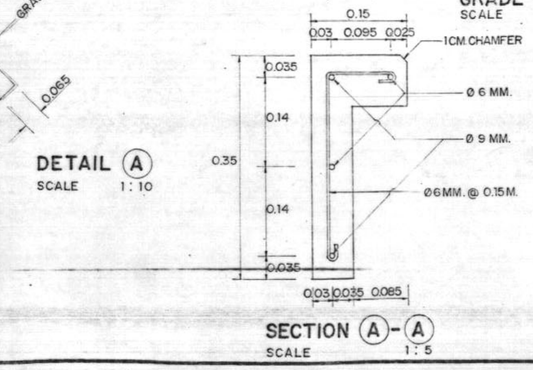


DETAIL (A)
SCALE 1:10

GRADE BEAM
SCALE 1:10



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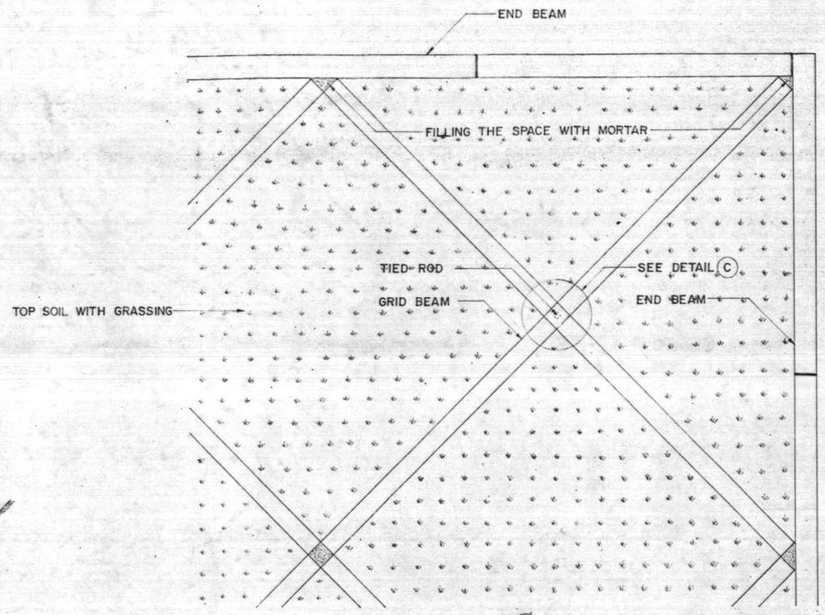

DETAIL (B)
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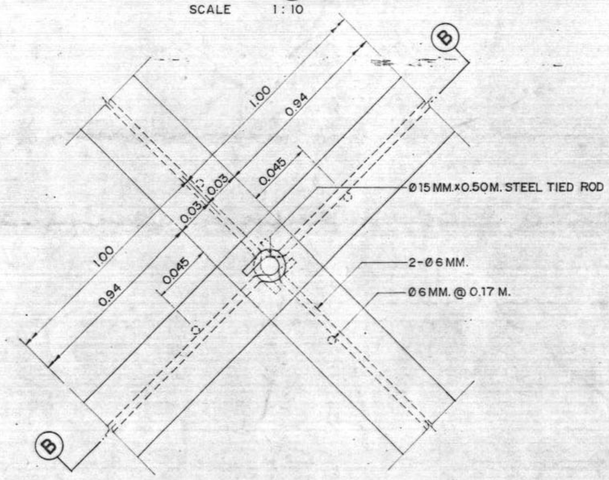
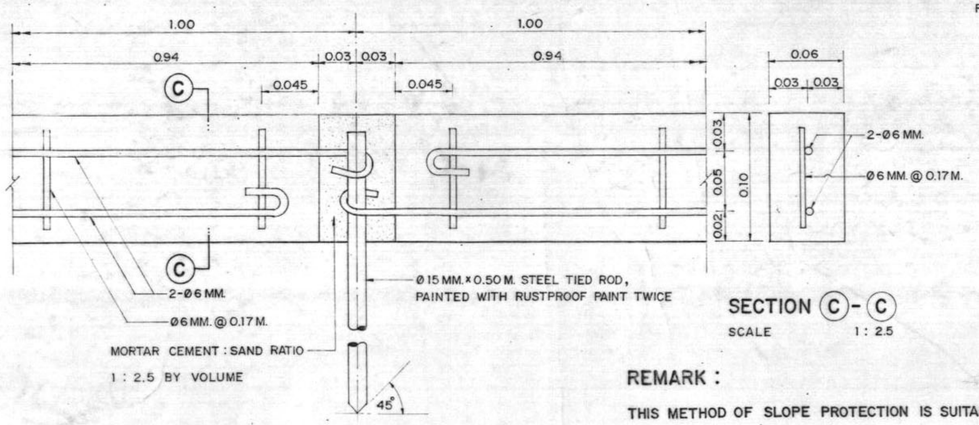
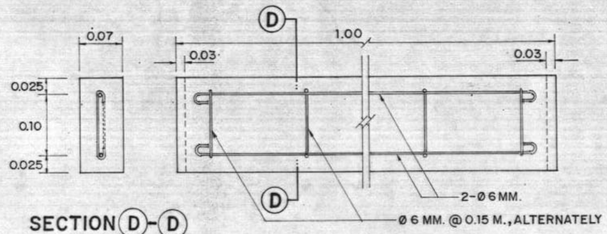


DETAIL (C)
SCALE 1:2.5



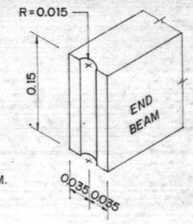
SECTION (B)-(B)
SCALE 1:2.5

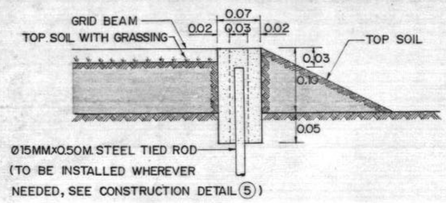
SECTION (C)-(C)
SCALE 1:2.5



SECTION (D)-(D)
SCALE 1:5

END BEAM
SCALE 1:5





END BEAM SETTING
SCALE 1:5

CONSTRUCTION DETAILS

1. GRADE BEAM, GRID BEAM AND END BEAM ARE PRE-CAST. THE LENGTH OF BOTH GRADE BEAM AND END BEAM IS 100 CM. AND OF GRID BEAM IS 94 CM.
2. TO SET THE GRADE BEAM, POUR SOME MORTAR INTO A GRADE BEAM'S EMPTY SPACE THAT IS FOR INSERTING THE DOWEL BAR. WHEN THE SPACE IS FULL, PUT ANOTHER GRADE BEAM DOWN SO THAT ITS DOWEL BAR INSERTS INTO THE MORTAR-FULL SPACE OF THE PREVIOUS GRADE BEAM. SEAL THE JOINT WITH MORTAR.
3. TO SET ANCHORAGE TIED ROD (FOR 4-MEMBER JOINT), AFTER GRID BEAM IS SET AS IN THE DRAWING, DRIVE TIED ROD INTO IT AND FILL THE JOINT WITH MORTAR.
4. FILL TOP SOIL INTO EMPTY SPACE OF GRID BEAM (8 CM. THICK) AND WELL COMPACT IT, IF THERE IS NO SEEPAGE OF UNDERGROUND WATER IN THE BACK SLOPE. FILL 1½"-3" STONES INTO EMPTY SPACE OF GRID BEAM (10 CM. THICK), IF THERE IS SEEPAGE OF UNDERGROUND WATER IN THE BACK SLOPE.
5. TO SET END BEAM, DIG INTO 5 CM.-DEEP HOLES. THE END BEAM ARE 0.5 CM. APART. STICK EACH TIED RODS (Ø 15 MM. x 0.50 M., RUSTPROOF PAINTED TWICE) INTO THE 0.5 CM. SPACES. (NOT ALL THE SPACE ARE NECESSARILY USED, AS DIRECTED BY THE PROJECT ENGINEER) THEN SEAL THE JOINTS WITH MORTAR. END BEAMS ARE TO BE SET ON THE SIDE AND THE UPPER WHEN THE GRID BEAM SETTING IS FINISHED.
6. IF THE CONSTRUCTION IS DONE ON SLOPE ½ : 1 TO 1:1, TIED RODS MUST BE STICKED INTO EVERY JOINT OF THE GRID BEAM. THE GRID BEAM SHOULD BE PUT HORIZONTALLY AND VERTICALLY. THERE IS NO NEED FOR CONSTRUCTION OF END BEAM, AS DIRECTED BY THE PROJECT ENGINEER AND APPROVAL BY THE LOCATION AND DESIGN DIVISION D.O.H.
7. GRADE BEAM AND END BEAM CAN BE CAST-IN-PLACE, YET AS DIRECTED BY THE PROJECT ENGINEER.
8. THE CONCRETE MIXTURES ARE 1:2:4 BY VOLUME. PORTLAND CEMENT SHALL BE TYPE I.
9. REINFORCING STEEL, DOWEL BAR AND TIED ROD SHALL CONFORM TO TIS.20 GRADE SR24.
10. GRID BEAM SHOULD BE CONSTRUCTED FOR EARTH OR EARTH-SOFT ROCK BACK SLOPE AND/OR AREA WITH UNDERGROUND WATER SEEPAGE. THE CONSTRUCTION WILL BE DIRECTED BY THE PROJECT ENGINEER IN TERMS OF EXPENSE AND EROSIVE PREVENTION AND APPROVAL BY THE LOCATION AND DESIGN DIVISION D.O.H.
11. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.

REMARK :

THIS METHOD OF SLOPE PROTECTION IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.

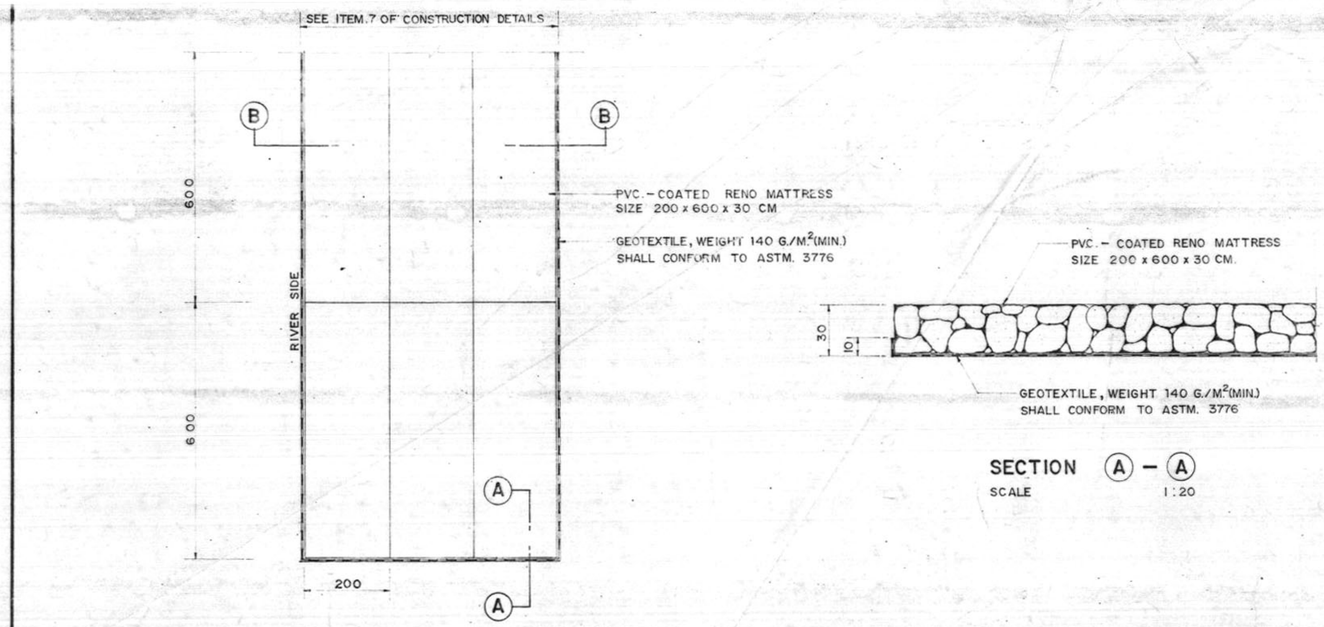
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

CONCRETE GRID BEAM BACK SLOPE PROTECTION

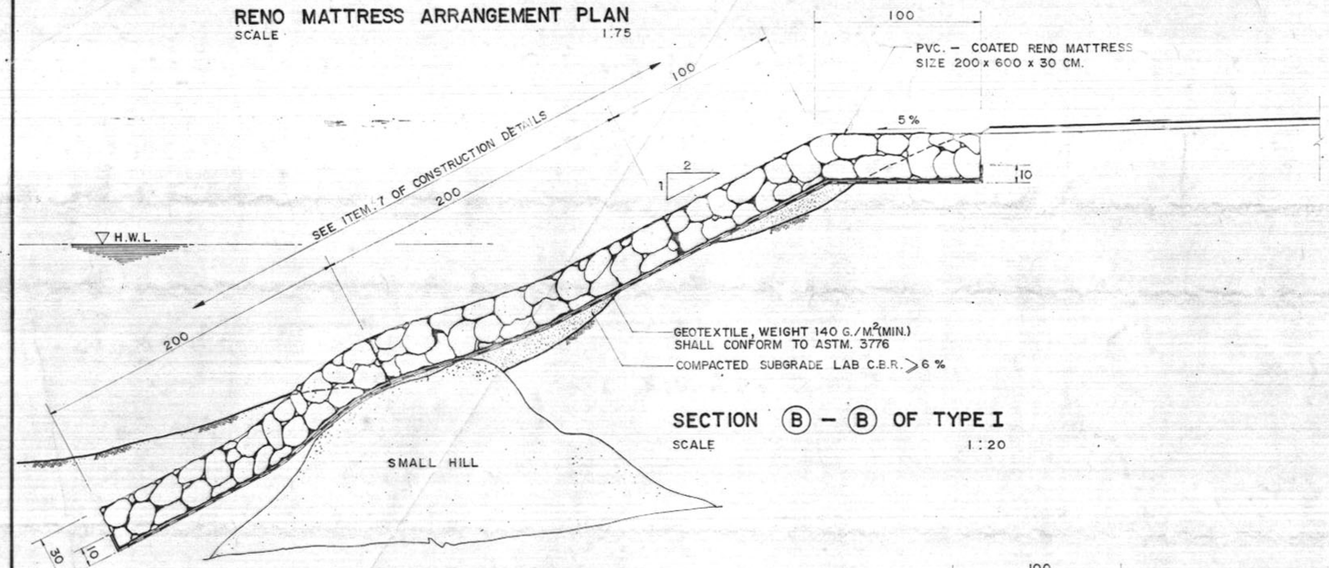
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. SP-301
		SHEET NO. 66

GRID BEAM

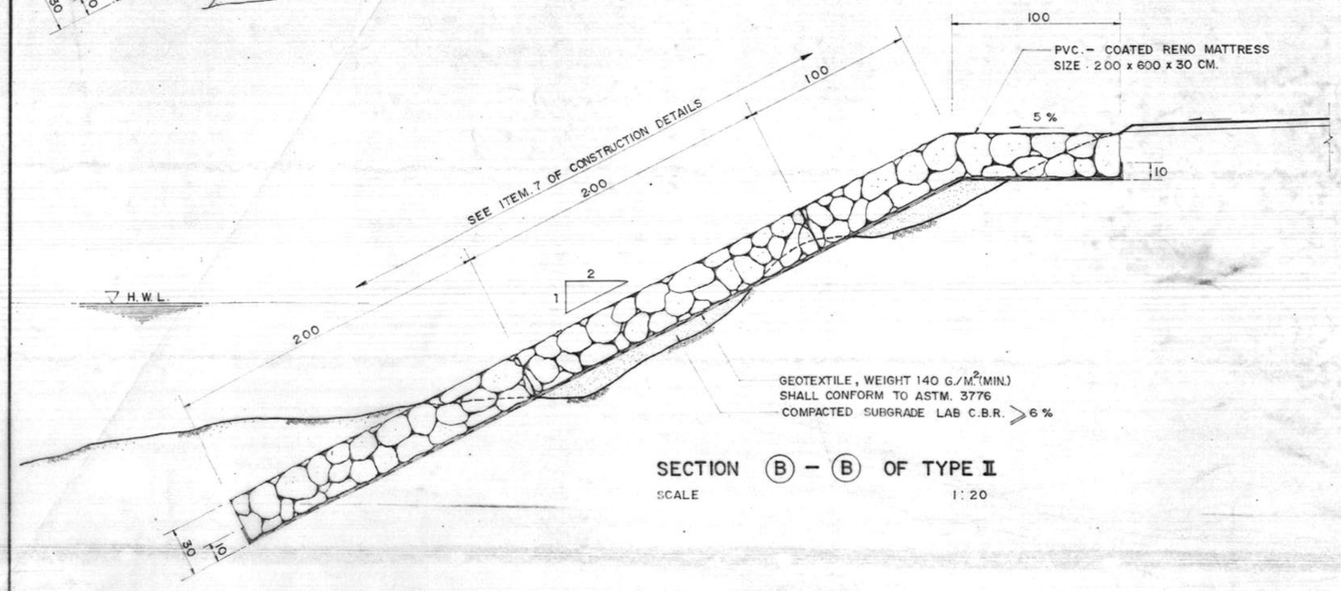


RENO MATTRESS ARRANGEMENT PLAN
SCALE 1:75

SECTION (A) – (A)
SCALE 1:20



SECTION (B) – (B) OF TYPE I
SCALE 1:20



SECTION (B) – (B) OF TYPE II
SCALE 1:20

RENO OR WIRE MATTRESS

PVC. – COATED RENO MATTRESS : OR GALVANIZED WIRES THAT IS COATED WITH PVC. DETAILS ARE AS FOLLOWS :

1. NETTING

THE GALVANIZED WIRES COATED WITH PVC. ARE MADE INTO 6 x 8 CM. (± 10%) HEXAGONAL NETTING JOINED TOGETHER BY TWISTING THE WIRES ROUND EACH OTHER TWICE AS SHOWN IN THE PICTURE.

2. WIRES

THE WIRE MUST BE ABLE TO RESIST THE TENSION OF 28.5 – 51 KG./MM.² (ACCORDING TO BS 1052 / 1980 STANDARD)

THE DIAMETER OF WIRE FOR FRAME IS AT LEAST 2.7 MM.

THE DIAMETER OF WIRE FOR NETTING IS AT LEAST 2.0 MM.

THE DIAMETER OF WIRE FOR BOX WRAPPING IS AT LEAST 2.0 MM.

AND THE WIRE IS LONG ENOUGH TO BE USED IN INSTALLATION (ABOUT 5% OF RENO MATRESS' WEIGHT).

3. GALVANIZING

THE WIRES MUST BE GALVANIZED ACCORDING TO BS 443 / 1982 STANDARD.

THE MINIMUM OF ZINC'S WEIGHT USED IN ACCORDANCE WITH THE DIAMETER OF WIRE IS SHOWN :

WIRE'S DIAMETER (MM.)	WEIGHT OF ZINC COATING (GM./M².)
2.0	240
2.7	260

4. PVC. – COATED

AFTER HAVING GALVANIZED, THE WIRE MUST ALSO BE COATED WITH BLACK OR GREY PAINT PVC. (POLY VINYL CHLORIDE). THE AVERAGE THICKNESS OF PVC. COATING IS 0.55 MM. (AND NOT LESS THAN 0.40 MM.) THE QUALITIES OF PVC. SHOULD BE AS FOLLOWS :

A. BONDING TO WIRE

THE BONDING QUALITY CAN BE TESTED BY DIPPING PVC.– COATED WIRE INTO DISSOLVED POTASSIUM PERMANGANATE (1%) FOR 50 HOURS CONTINUOUSLY AT THE ROOM TEMPERATURE. THE DISSOLVED POTASSIUM PERMANGANATE WILL ERODE, INTO THE WIRE'S SURFACE AND PVC., NOT MORE THAN 15 MM. WHICH EXAMINATION BY CUTTING THE END OF WIRE.

B. EROSION DURABILITY OF PVC.

AFTER THE PVC.– COATED WIRE (NOT THE TWO END PARTS) HAS BEEN PUT INTO THE CONCENTRATED SOLUTION OF SODIUM CHLORIDE FOR 60 HOURS CONTINUOUSLY AT THE ROOM TEMPERATURE, THE PVC.'S TOTAL WEIGHT MUST STILL REMAIN.

C. EROSION DURABILITY OF END PART'S WIRE

AFTER THE PVC.– COATED WIRE HAS BEEN PUT INTO THE 50 % SOLUTION OF HYDROCHLORIC ACID FOR 50 HOURS CONTINUOUSLY AT THE ROOM TEMPERATURE, ITS END PART SHOULD NOT BE ERODE MORE THAN 20 MM.

D. TEMPERATURE DURABILITY

AFTER THE PVC.– COATED WIRE HAS BEEN LEFT IN 100°C FOR 100 HOURS CONTINUOUSLY, IT QUALITIES SHOULD NOT CHANGE WHEN THE WIRE BE BROUGHT BACK TO TEST IN ACCORDING TO ITEM A–C.

5. DEVIATION

THE DEVIATION OF THE WIRE'S DIAMETER IS LESS THAN ± 2.5 %

6. ROCKS

THE ROCKS USED FOR THIS WORK MUST BE HARD ENOUGH AND NOT CRUMBLE WHEN WET AND ENDURE REGARDLESS OF THE CLIMATE. THEY ARE GRANITE, LIME STONE, SAND STONE, GRAVEL AND CRACKED CONCRETE. THE AVERAGE SIZE OF THE ROCKS SHOULD BE 6–10 CM. OR ±(5% – 7%).

CONSTRUCTION DETAILS OF RENO MATTRESS

1. CLEAR THE AREA OF RENO MATTRESS CONSTRUCTION AND MARK THE SHAPE OF SIDE SLOPE AS SHOWN IN THE DRAWING AS WELL AS WELL COMPACT THE GROUND. IF THERE IS A SMALL HILL IN THE AREA WHICH MAKES IT IMPOSSIBLE TO REGULARLY MAKE THE SIDE SLOPE, THE RENO MATTRESS ON THE SMALL HILL SHALL BE CONSTRUCTED AS SHOWN IN SECTION (B) – (B) OF TYPE I.
2. LAY THE GEOTEXTILE ON THE SIDE SLOPE BEFORE CONSTRUCTION THE RENO MATTRESS.
3. SHAPE THE GROUND TO EXISTING CONDITION AFTER THE RENO MATTRESS CONSTRUCTION IS FINISHED.
4. GENERAL DETAILS OF PVC.– COATED RENO MATTRESS ARE AS STATED IN THE TOPIC PVC.– COATED RENO MATTRESS.
5. THE PROJECT ENGINEER WILL ADJUST THE SUITABLE AREA IN SITE FOR RENO MATTRESS CONSTRUCTION.
6. THE GEOTEXTILE USED IN THIS CONSTRUCTION IS MADE FROM NONWOVENS TYPE. THE INSTRUCTION ON HOW TO USE ARE GIVEN BY THE PRODUCERS OF THE PRODUCTS AND ARE APPROVED BY THE ENGINEER.
7. THE PART OF RENO MATTRESS STICKING INTO STREAM CAN BE NECESSARILY ADJUSTED SO AS TO SUIT THE AREA.
8. ALL DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.

REMARK :

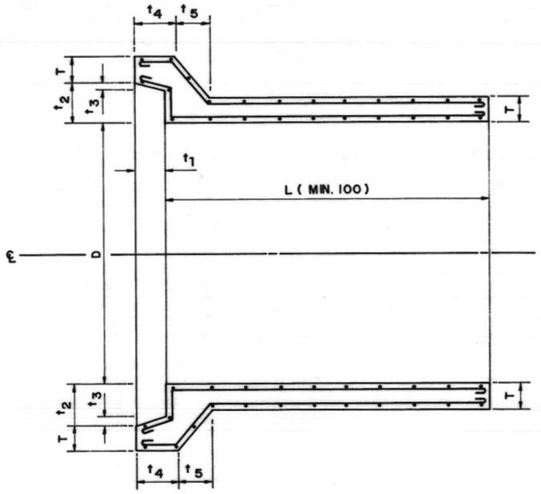
THIS METHOD OF SLOPE PROTECTION IS SUITABLE ONLY IN SPECIFIC LOCATIONS AND CERTAIN CONDITIONS, IT SHOULD BE APPLIED WITH THE FIRM INFORMATIONS CONCERNED AND RECOMMENDED BY THE ENGINEER.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

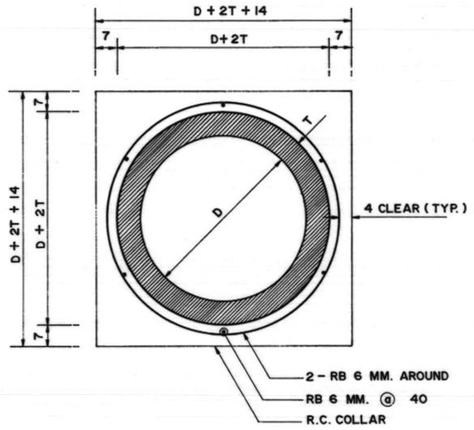
STANDARD DRAWING

RENO MATTRESS SLOPE PROTECTION

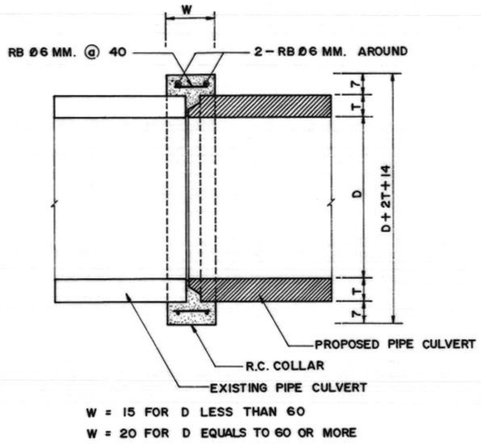
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
		DWG. NO. SP-401
APPROVED : For (DIRECTOR GENERAL)		SHEET NO. 67



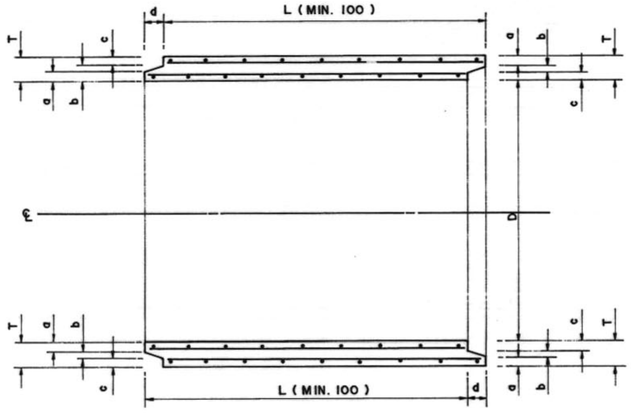
(A) BELL AND SPIGOT TYPE



(A) TRANSVERSE SECTION



(B) LONGITUDINAL SECTION



(B) TONGUE AND GROOVE TYPE

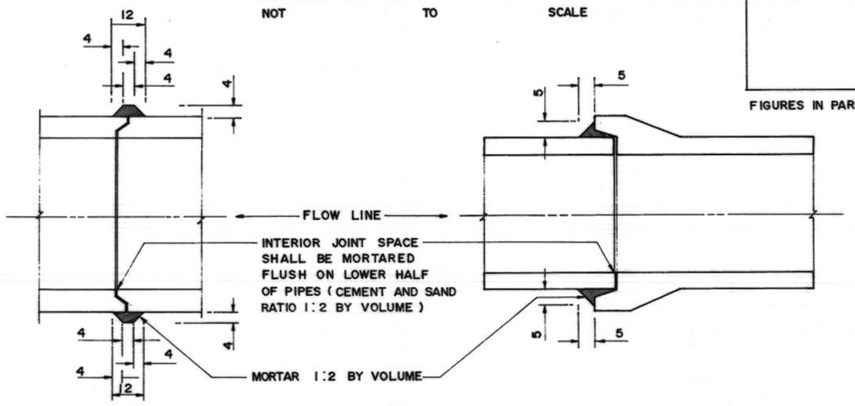
PIPE EXTENSION
NOT TO SCALE

TABLE 1

R.C. PIPE CULVERT CLASS	INSIDE DIAMETER (D) (CM.)	WALL THICKNESS (T) (CM.)	MIN. CIRCULAR REINFORCEMENT (CM.²/M.)		CRUSHING LOAD TO PRODUCE 0.03 CM. CRACK WIDTH AND 30 CM. CRACK LENGTH (KG./M.)	MAXIMUM CRUSHING LOAD (KG./M.)	ULTIMATE COMPRESSIVE STRENGTH FOR Ø 15 x 30 CM. CONCRETE CYLINDER AT 28 DAYS AGE (KG./CM.²)	OVER FILL ON R.C. PIPE CULVERT NOT MORE THAN (METERS)
			INNER CAGE	OUTER CAGE				
2	30	5.0	1.5	–	3,060	4,590	280 (350)	10.0
	40	6.0	2.5	–	4,080	6,120		
	50	7.0	3.8	–	5,100	7,650		
	60	7.5	5.7	–	6,120	9,180		
	80	9.5	5.8	4.1	8,160	12,240		
	100	11.0	7.0	5.2	10,200	15,300		
	120	12.5	8.9	6.8	12,240	18,360		
	150	15.0	12.5	9.5	15,300	22,950	350 (440)	11.0
3	30	5.0	1.5	–	1,990	3,060	280 (350)	8.0
	40	6.0	1.5	–	2,650	4,080		
	50	7.0	1.5	–	3,320	5,100		
	60	7.5	1.5	–	3,980	6,120		
	80	9.5	4.0	–	5,300	8,160		
	100	11.0	4.2	3.2	6,630	10,200		
	120	12.5	5.1	3.8	7,960	12,240		
	150	15.0	7.2	5.5	9,950	15,300		

FIGURES IN PARENTHESES ARE ULTIMATE COMPRESSIVE STRENGTH FOR 15 x 15 x 15 CM. CONCRETE CUBE AT 28 DAYS AGE

DETAIL OF R.C. PIPE CULVERT
NOT TO SCALE



(A) TONGUE AND GROOVE TYPE

(B) BELL AND SPIGOT TYPE

PIPE CONNECTION DETAILS
NOT TO SCALE

TABLE 2

R.C. PIPE CULVERT CLASS	INSIDE DIAMETER (D) (CM.)	WALL THICKNESS (T) (CM.)	PIPE END DETAILS (CM.)								
			BELL & SPIGOT TYPE					TONGUE & GROOVE TYPE			
			t_1	t_2	t_3	t_4	t_5 (MIN)	a	b	c	d
2 & 3	30	5.0	6.0	6.6	0.4	8.5	15.0	1.9	0.8	2.3	3.0
	40	6.0	6.7	7.6	0.4	9.7	18.0	2.3	1.0	2.7	3.0
	50	7.0	7.0	8.6	0.4	10.5	21.0	2.8	1.0	3.2	4.0
	60	7.5	7.6	9.1	0.4	11.4	22.5	2.8	1.5	3.2	4.0
	80	9.5	8.9	11.1	0.4	13.7	28.5	3.8	1.5	4.2	4.5
	100	11.0	9.5	12.6	0.4	15.0	33.0	4.3	2.0	4.7	4.5
	120	12.5	10.0	14.1	0.4	16.5	37.5	4.8	2.5	5.2	5.0
	150	15.0	10.0	16.6	0.4	17.7	45.0	5.7	3.0	6.3	6.0

NOTES :

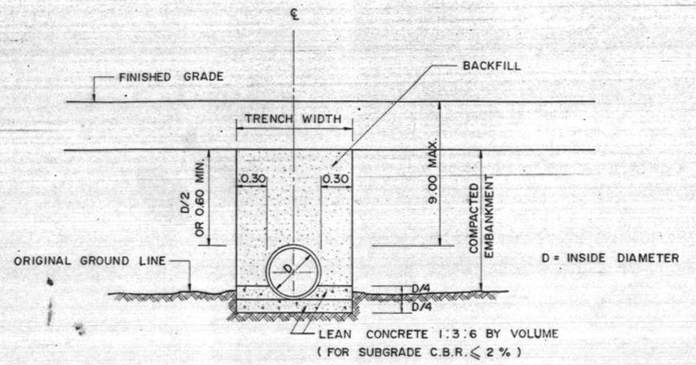
1. ALL DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED .
2. REINFORCED CONCRETE PIPE CULVERT CLASSES 2 AND 3 SHALL CONFORM TO TIS 128 .
3. CEMENT , STEEL REINFORCEMENT , AGGREGATES AND TEST METHODS USED FOR R.C. PIPE CULVERT SHALL CONFORM TO THE REQUIREMENT OF TIS . 128 OR TO THE DEPARTMENT OF HIGHWAYS STANDARDS .
   - 3.1 CEMENT CONTENT USED FOR CONCRETE MIX SHALL NOT BE LESS THAN 335 KILOGRAM PER CUBIC METER OF CONCRETE .
   - 3.2 CONCRETE COVER FOR SINGLE LAYER CIRCULAR REINFORCEMENT SHALL BE 0.35 TO 0.5 TIME OF WALL THICKNESS (MEASURED FROM INNER WALL) .
   - 3.3 CONCRETE COVER FOR DOUBLE LAYERS CIRCULAR REINFORCEMENT SHALL BE 2.5 CM. IN AVERAGE BUT NOT LESS THAN 1.5 CM.
   - 3.4 LONGITUDINAL REINFORCEMENT SPACING FOR PIPE SIZE Ø 50 CM. OR SMALLER SHALL BE A MINIMUM OF 4–Ø 4 MM. BARS OR 8–Ø 4 MM. BARS FOR PIPE Ø 60 CM. OR LARGER .
   - 3.5 CIRCULAR REINFORCEMENT SPACING FOR PIPE SIZE Ø 30 CM. TO Ø 80 CM. SHALL BE 10 CM. OR LESS AND FOR PIPE SIZE Ø 100 CM. TO Ø 150 CM. SHALL BE 15 CM. OR LESS BUT NOT MORE THAN THEIR WALL THICKNESS.
4. THE CULVERT WHICH HAVING TRANSVERSE REINFORCEMENT IN ELLIPTICAL CAGE AS SPECIFIED IN THE TIS. 128 SHALL NOT BE USED.
5. PIPE MAY BE EITHER BELL AND SPIGOT TYPE OR TONGUE AND GROOVE TYPE AS DIRECTED BY THE ENGINEER .
6. CULVERT JOINTS SHALL BE MORTARED AS SHOWN ON THE DRAWING WITH CEMENT MORTAR (1:2 BY VOLUME).
7. CULVERT LENGTH (L) SHALL BE 100 CM. UNLESS OTHERWISE SPECIFIED.
8. REINFORCED CONCRETE PIPE CULVERT CLASS 2 SHALL BE USED UNDER PAVEMENT .
9. REINFORCED CONCRETE PIPE CULVERT CLASS 3 SHALL BE USED UNDER SIDEWALK .

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

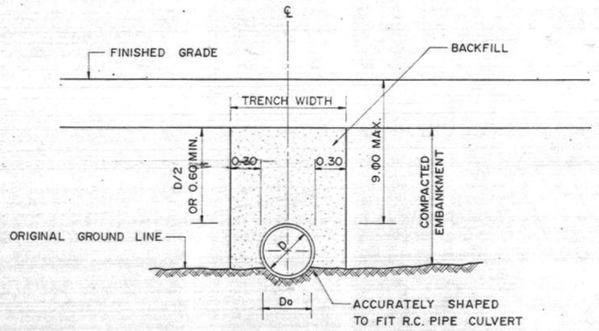
R.C. PIPE CULVERT

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. DS-101
		SHEET NO. 68

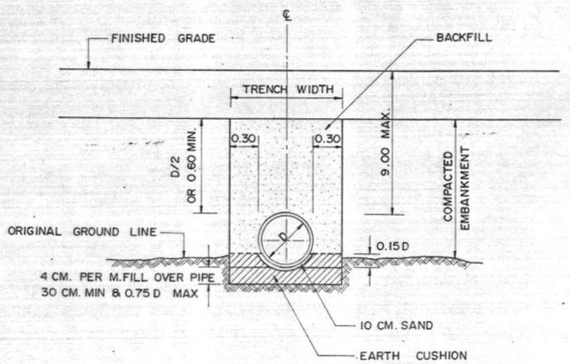


D = INSIDE DIAMETER

(a) CONCRETE CRADLE BEDDING

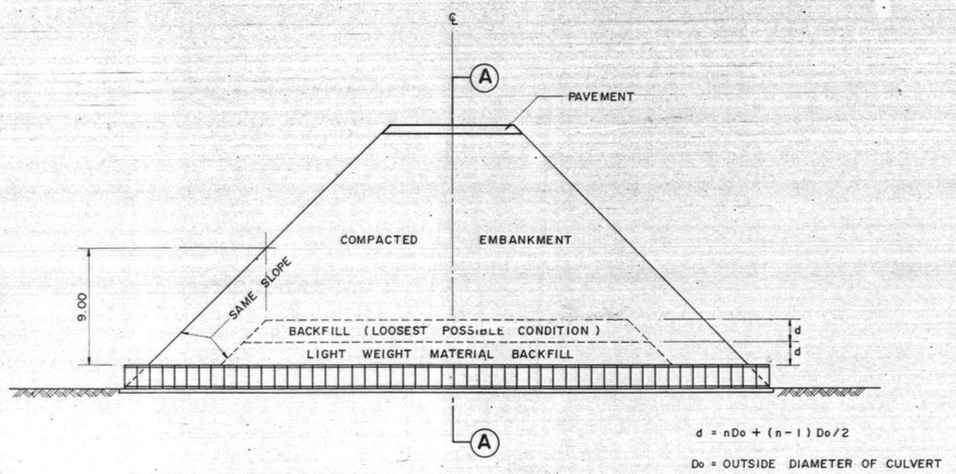


(b) ORDINARY BEDDING



(c) BEDDING FOR ROCK OR UNYIELDING FOUNDATION

R.C. PIPE CULVERTS INSTALLATION BY TRENCH METHOD
NOT TO SCALE

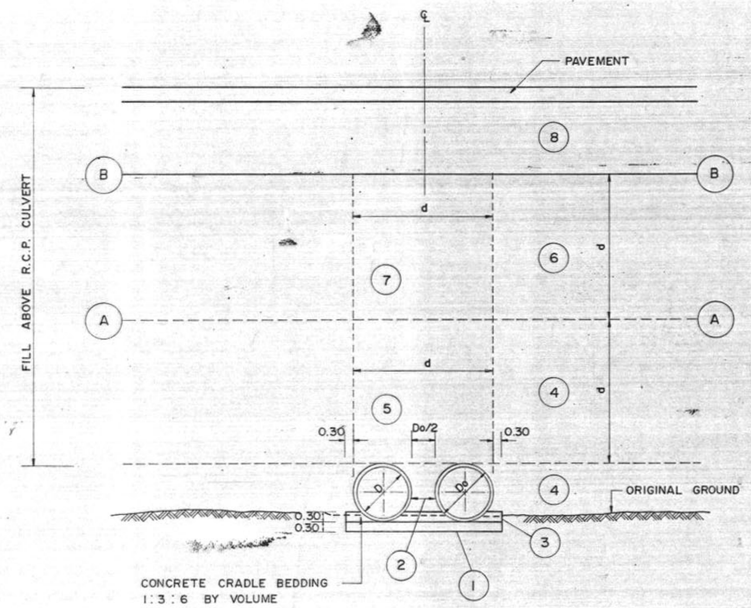


d = nDo + (n − 1) Do/2

Do = OUTSIDE DIAMETER OF CULVERT

n = NUMBER OF ROWS OF CULVERT

LONGITUDINAL SECTION



SECTION (A)-(A)

R.C. PIPE CULVERTS INSTALLATION FILL ABOVE PIPE OVER 9.00 M.
NOT TO SCALE

NOTES :

REINFORCED CONCRETE CULVERT PIPE INSTALLATION (MAX. FILL HEIGHT 9.00 M.)

A.) CONSTRUCTION METHODS WHEN FILL HEIGHT IS LESS THAN 1.20 M.

1. THE PROJECTION METHODS SHALL BE USED FOR PIPE INSTALLATION.
2. THE PIPE LINE LAYOUT SHALL BE SUITABLE FOR THE TERRAIN. THE EXISTING GROUND ALONG THE LINE OF CULVERT SHALL BE PREPARED TO THE SPECIFIED SLOPE.
3. PIPE BEDDING SHALL BE TYPE (a),(b) OR (c) AS SHOWN ON THE DRAWING AND SHALL DEPEND UPON PREVAILING SOIL CONDITION AND THE JUDGEMENT OF THE ENGINEER.
4. AFTER THE PIPE HAS BEEN PLACED, THE SUBGRADE AND/OR PORTION OF PAVEMENT SECTION WHICH ARE TO BE LAID ALONG BOTH SIDES OF THE LINE WITH IN A DISTANCE OF 4 PIPE DIAMETERS BUT NOT LESS THAN 5.00 M. FROM CENTERLINE OF THE PIPE SHALL BE CONSTRUCTED LIGHT WEIGHT CONSTRUCTION EQUIPMENT USED FOR COMPACTION SHALL OPERATE IN A DIRECTION PERPENDICULAR TO CENTERLINE OF ROADWAY (OR PARALLEL TO PIPE LINE UNTIL THE BACKFILL HAS REACHED AN ELEVATION OF AT LEAST 30 CM. ABOVE THE TOP OF PIPE.

B.) CONSTRUCTION METHODS WHEN FILL HEIGHT EXCEEDS 1.20 M.

1. PIPE INSTALLATION SHALL BE BY TRENCH METHOD. SUBGRADE SHALL BE FIRST CONSTRUCTED TO AN ELEVATION D/2 OR AT LEAST 60 CM. OVER TOP OF PROPOSED PIPE. A TRENCH SHALL THEN BE EXCAVATED ALONG THE PROPOSED LINE AS SHOWN ON THE DRAWING. TRENCH WALLS SHALL HAVE A SMOOTH SURFACE AND SHALL BE CONSTRUCTED VERTICALLY.
2. THE TRENCH BED SHALL BE PREPARED TO THE SPECIFIED SLOPE. BEDDING TYPE SHALL BE (a),(b) OR (c) DEPENDING ON FOUNDATION SOIL AND AS DIRECTED BY THE ENGINEER.
3. PIPE SHALL BE INSTALLED ACCORDING TO SIZES SHOWN ON THE DRAWINGS. BACKFILLING OF PIPE CULVERTS SHALL NOT BE PERMITTED UNTIL AT LEAST 48 HOURS HAVE ELAPSED AFTER JOINT HAVE BEEN COMPLETED.
4. BACKFILL SHALL BE PLACED TO THE SUBGRADE ELEVATION AS DESCRIBED IN NOTE 1. BACKFILL SHALL BE A SELECT MATERIAL AND SHALL REQUIRE THE APPROVAL OF THE ENGINEER. METHOD OF COMPACTION OF BACKFILL SHALL BE THE SAME AS REQUIRED FOR SUBGRADE. COMPACTION EQUIPMENT SHALL BE APPROVED BY THE ENGINEER.

REINFORCED CONCRETE CULVERT PIPE INSTALLATION (FILL HEIGHT OVER 9.00 M.)

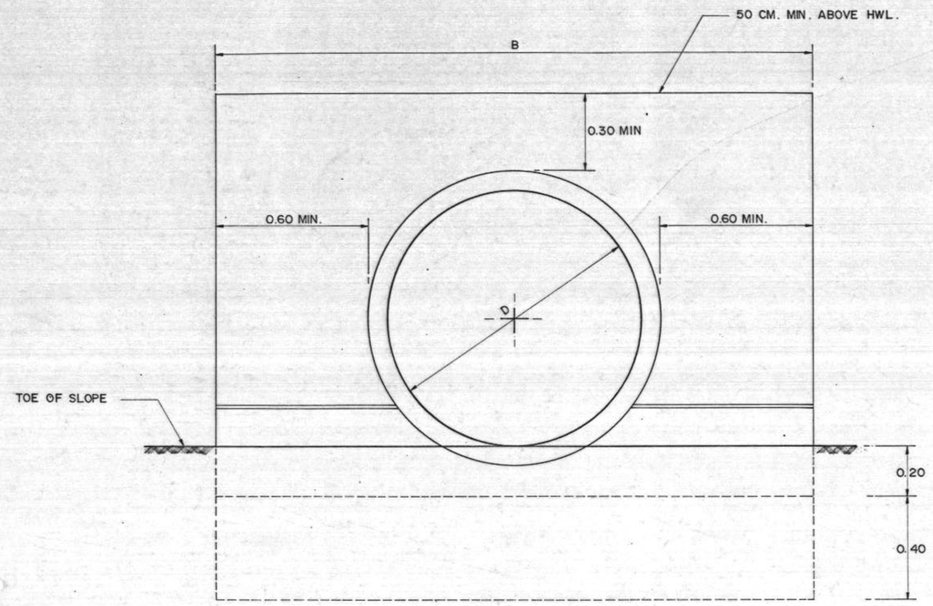
1. AFTER EXISTING GROUND HAS BEEN PREPARED TO SPECIFIED SLOPE AND ELEVATION, CONCRETE BEDDING FOR PIPE SUPPORT SHALL BE PLACED AS SHOWN IN SECTION (A)-(A)
2. THE NUMBER OF PIPE BARRELS AND SIZE OF PIPE CULVERT SHALL BE INSTALLED AS SHOWN.
3. A CONCRETE CRADLE SHALL THEN BE PLACED AS SHOWN IN SECTION (A)-(A)
4. EMBANKMENT SHALL BE CONSTRUCTED WITH SELECTED MATERIAL AND COMPACTED IN ACCORDANCE WITH THE TYPICAL CROSS-SECTION FOR THE ROUTE. EMBANKMENT SHALL BE COMPACTED TO THE (A)-(A) LEVEL, "d" METERS ABOVE THE TOP OF PIPE WITH LIGHT WEIGHT COMPACTION EQUIPMENT. CONSTRUCTION PROCEDURES SHALL REQUIRE SUPERVISION BY THE ENGINEER.
5. A TRENCH SHALL BE EXCAVATED TO A WIDTH "d" METERS WITH VERTICAL, SMOOTH WALL AND BACKFILL WITH LIGHT WEIGHT MATERIAL OF A TYPE SPECIFIED BY THE ENGINEER.
6. A) WHEN FILL HEIGHT IS LESS THAN 18.00 M. THE CONSTRUCTION HAS REACHED THE (A)-(A) LEVEL AS DESCRIBED IN NOTE 4 & 5 ABOVE, FULL EMBANKMENT SHALL THEN BE PLACED TO MEET THE FINISHED SUBGRADE LEVEL.
   B) WHEN FILL HEIGHT EXCEEDS 18.00 M, EMBANKMENT CONSTRUCTION SHALL CONTINUE AS DESCRIBED IN NOTE 4 ABOVE UNTIL THE (B)-(B) LEVEL IS REACHED.
7. A TRENCH SHALL THEN BE EXCAVATED AS DESCRIBED IN NOTE 5 ABOVE EXCEPT BACKFILL SHALL BE REGULAR BACKFILL MATERIAL AND SHALL BE PLACED AS LOOSELY AS POSSIBLE WITHOUT COMPACTION.
8. THE REMAINING EMBANKMENT SHALL THEN BE CONSTRUCTED TO SUBGRADE LEVEL AND COMPACTED BY METHODS NORMALLY USED.
9. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

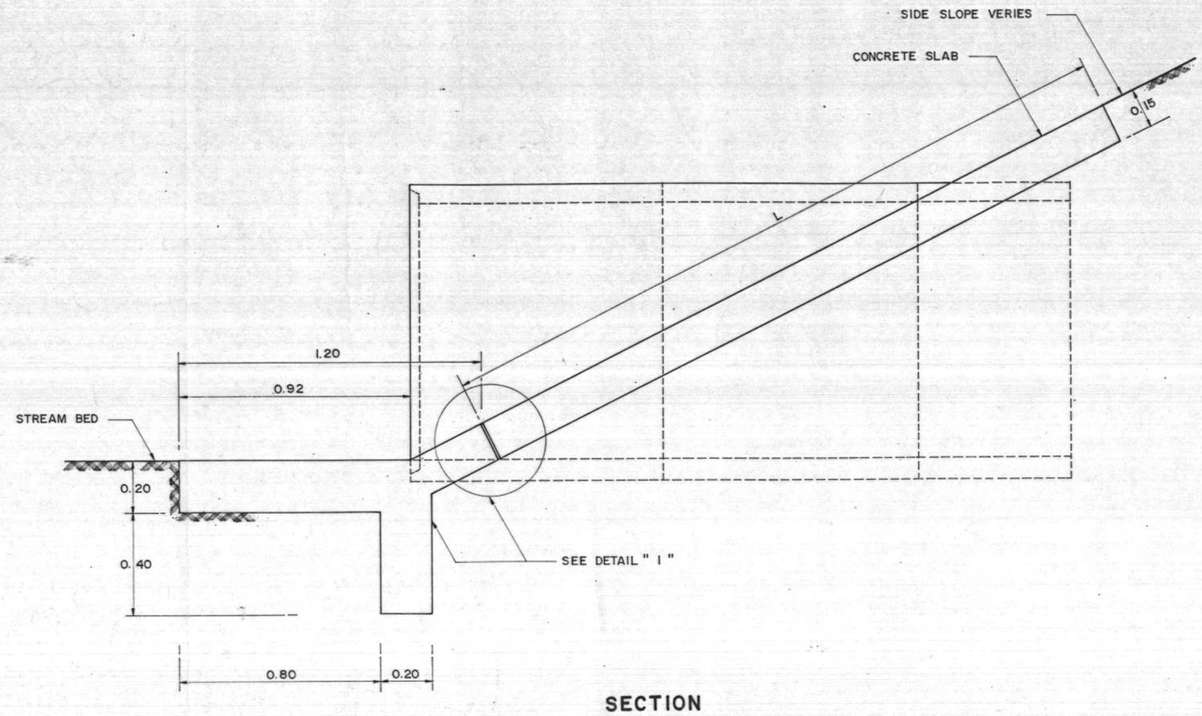
STANDARD DRAWING

R.C. PIPE CULVERT INSTALLATION

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. DS-102
		SHEET NO. 69



SINGLE PIPE
SCALE 1:12.5



SECTION
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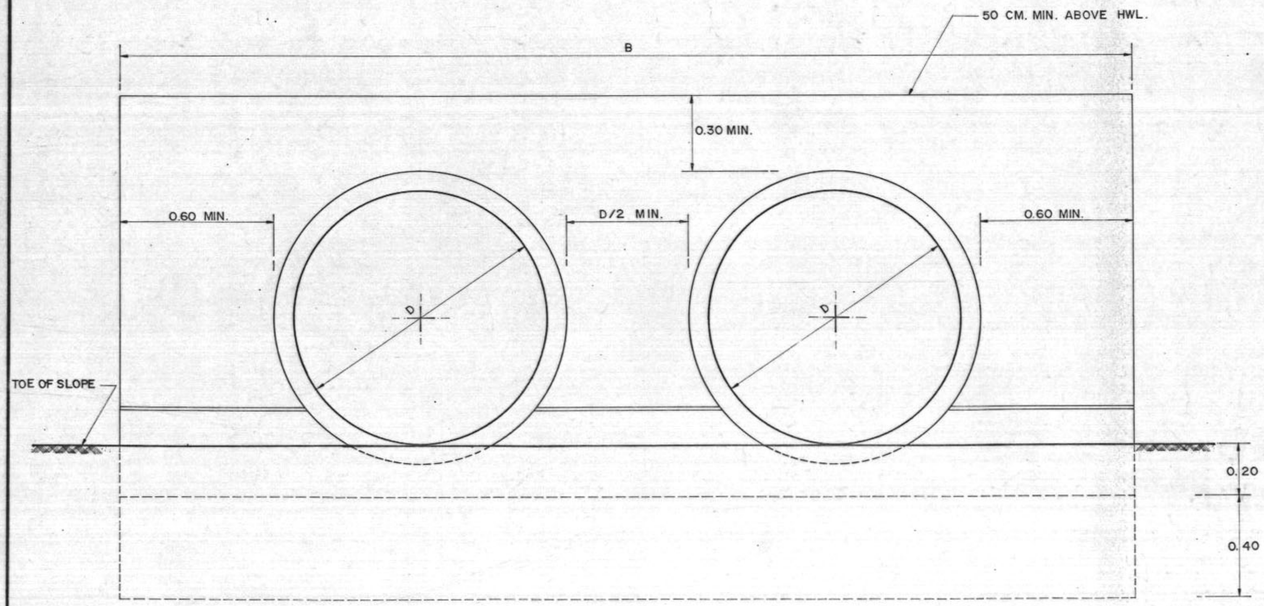

MULTIPLE PIPES
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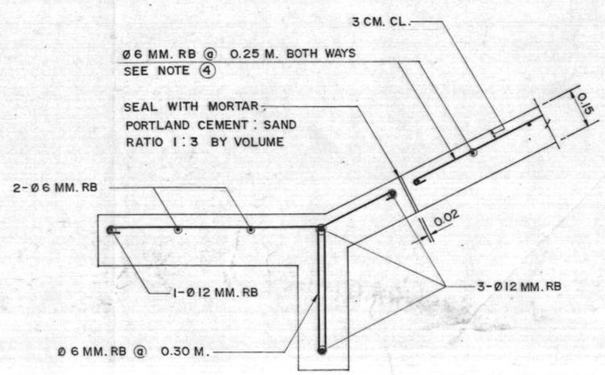


DETAIL " I "
SCALE 1:12.5

NOTES :

1. ALL DIMENSIONE ARE IN METERS UNLESS OTHERWISE INDICATED
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 180 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE I	320	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.85	M^3
CONCRETE SLUMP	10	CM. (MAX.)

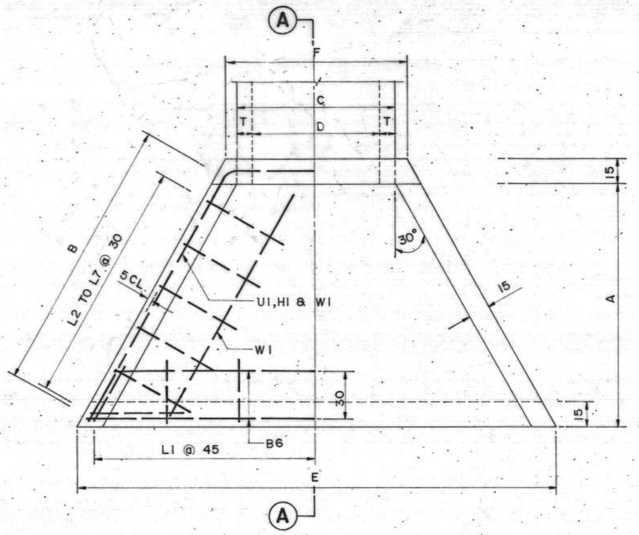
3. REINFORCING STEEL SHALL CONFROM TO TIS. 20 GRADE SR 24
4. STEEL REINFORCED IN CONCRETE SLAB SHALL BE REQUIRED ONLY WHEN (B x L) IS MORE THAN 9.00 SQ.M.
5. FOR ROLLING AND MOUNTAINOUS TERRAINS, THESE HEADWALLS SHALL BE USED AS NECESSARY.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

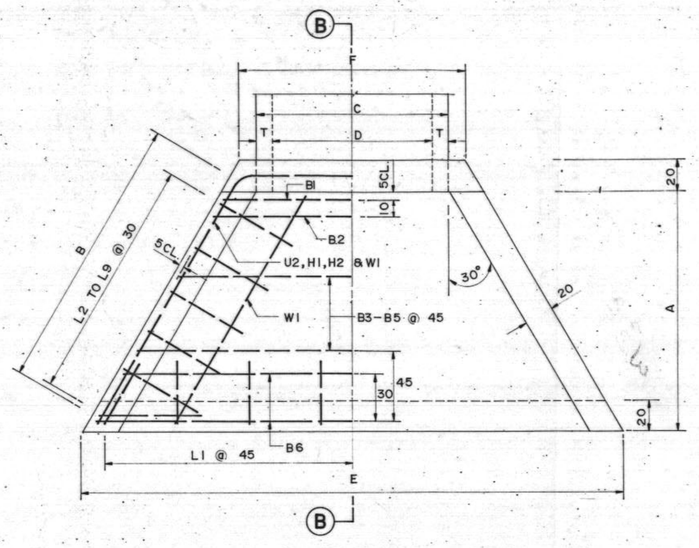
STANDARD DRAWING

HEADWALL FOR R.C. PIPE CULVERT

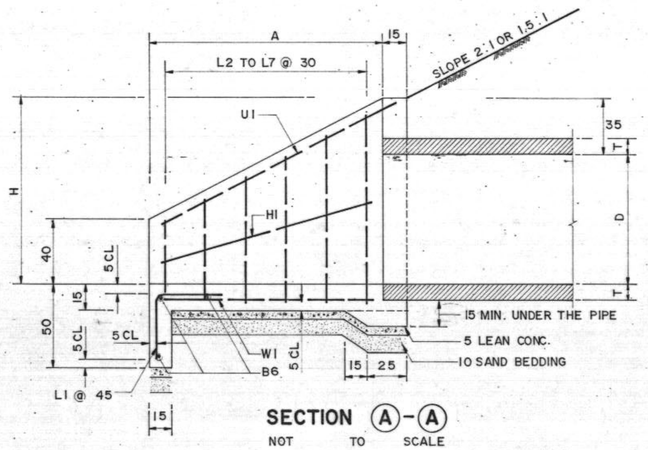
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 19
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE 1:12
APPROVED : (DIRECTOR GENERAL)		DWG. NO. DS-
		SHEET NO. 7



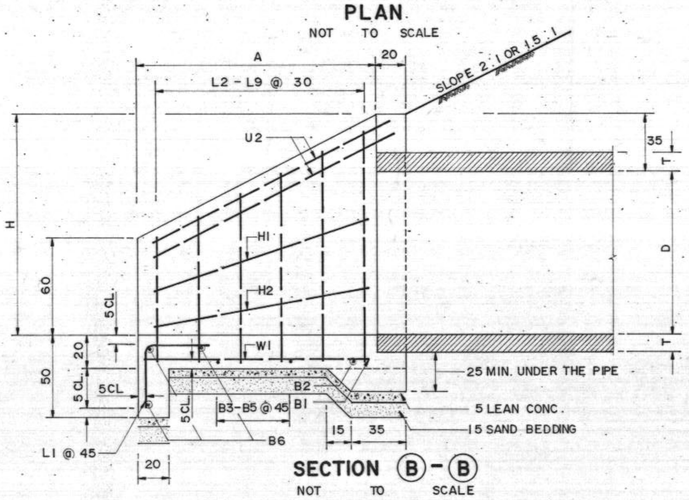
PLAN
NOT TO SCALE



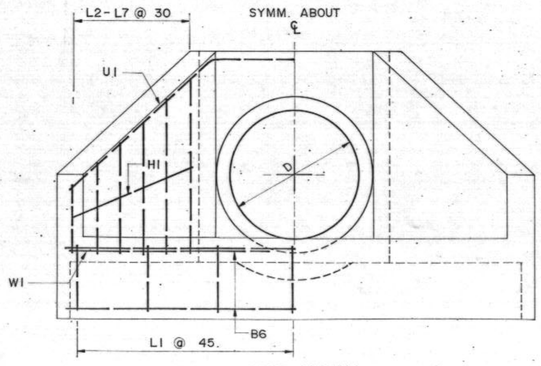
PLAN
NOT TO SCALE



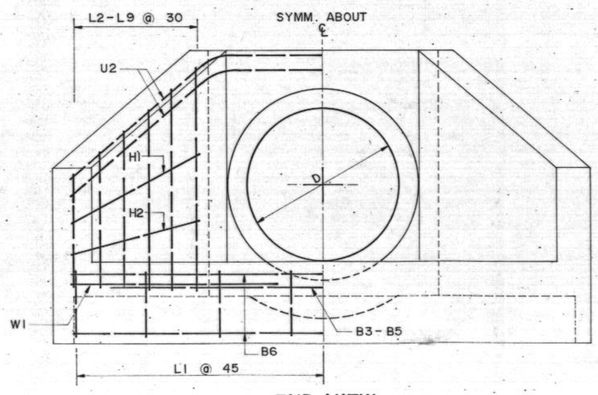
SECTION (A)-(A)
NOT TO SCALE



SECTION (B)-(B)
NOT TO SCALE



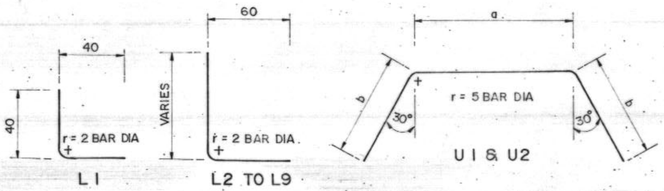
END VIEW



END VIEW

DETAILS FOR Ø50, Ø60 & Ø80 PIPE CULVERTS
NOT TO SCALE

DETAILS FOR Ø100 & Ø120 PIPE CULVERTS
NOT TO SCALE



BAR BENDING DIAGRAMS
NOT TO SCALE

TABLE OF DIMENSION

DIA. OF PIPE D	WALL THICKNESS T	DIMENSIONS A S=2:1	A S=1.5:1	B	C	E	F	H	a	b
50	7	90	75	104	64	203	81	85	77	118
60	7.5	110	90	127	75	237	92	95	88	143
80	9.5	150	120	173	99	307	116	115	112	193
100	11	150	120	173	122	341	145	135	143	196
120	12.5	190	150	219	145	411	168	155	166	246

TABLE OF REINFORCEMENTS

BAR MARK	SIZE Ø (MM.)	D=50 NO.	D=50 LENGTH	D=60 NO.	D=60 LENGTH	D=80 NO.	D=80 LENGTH	D=100 NO.	D=100 LENGTH	D=120 NO.	D=120 LENGTH
U1	12	1	313	1	374	1	498	–	–	–	–
U2	16	–	–	–	–	–	–	2	535	2	658
L1	12	5	80	6	80	8	80	8	80	10	80
L2	16(12)	2	107	2	107	2	107	2	132	2	132
L3	16(12)	2	120	2	120	2	120	2	145	2	145
L4	16(12)	2	133	2	133	2	133	2	158	2	158
L5	16(12)	2	146	2	146	2	146	2	171	2	171
L6	16(12)	–	–	2	159	2	159	2	184	2	184
L7	16(12)	–	–	–	–	2	172	2	197	2	197
L8	16	–	–	–	–	–	–	–	–	2	120
L9	16	–	–	–	–	–	–	–	–	2	225
W1	12	4	96	4	119	4	165	4	165	4	211
B1	16	–	–	–	–	–	–	1	162	1	185
B2	16	–	–	–	–	–	–	1	174	1	197
B3	12	–	–	–	–	–	–	1	220	1	242
B4	12	–	–	–	–	–	–	1	272	1	294
B5	12	–	–	–	–	–	–	–	–	1	346
B6	12	3	–	3	–	3	–	3	–	3	–
H1	12	2	99	2	122	2	169	2	181	2	225
H2	12	–	–	–	–	–	–	2	177	2	223
REINF. (KG.)		25		32		41		84		111	
CONC. (M^3)		0.6		0.8		1.2		2.0		2.8	

NOTE : FOR Ø50, Ø60 & Ø80 PIPE CULVERTS, L2 – L7 SHALL BE Ø12 MM. REBARS

NOTES :

1. ALL DIMENSION ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE I	350	KG. (MIN.)
SAND	0.43	M^3.
CRUSHED ROCK OR GRAVEL	0.86	M^3.
CONCRETE SLUMP	10	CM. (MAX.)

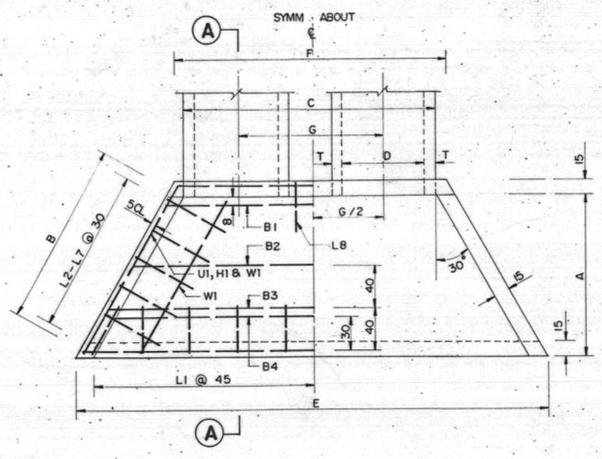
3. REINFORCING STEEL SHALL BE DEFROMED BARS CONFORMING TO TIS. 24 GRADE SD 30.
4. DESIGN WORKING STRESSES :–
   (a) CONCRETE , fc = 70 KSC.
   (b) STEEL , fs = 1400 KSC. n = 10
5. CLEAR CONCRETE COVER SHALL BE 4 CM. UNLESS OTHERWISE INDICATED.
6. LOCATION OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
7. LAP LENGTH SHALL NOT BE LESS THAN 24 BAR DIAMETER.
8. ALL CONCRETE EXPOSED CORNERS SHALL HAVE 2 CM. CHAMFER UNLESS OTHERWISE INDICATED.
9. DIMENSION OF HEADWALL AND QUANTITIES OF MATERIAL SHOWN IN THE TABLE ARE FOR EMBANKMENT SLOPE OF 2:1 ONLY. FOR EMBANKMENT SLOPE 1.5 : 1, ALL DIMENSION SHALL BE WORKED OUT FROM DIMENSION OF "A" AS SHOWN TOGETHER WITH THE FLARE ANGLE OF 30° AND THEN QUANTITIES OF MATERIALS SHALL BE CHANGED ACCORDINGLY.
10. UNLESS OTHERWISE SPECIFIED, THESE HEADWALLS SHALL BE USED FOR HIGHWAYS CLASS D AND CLASS 1.
11. FOR ROLLING AND MOUNTAINOUS TERRAINS , THESE HEADWALLS SHALL BE USED AS NECESSARY.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

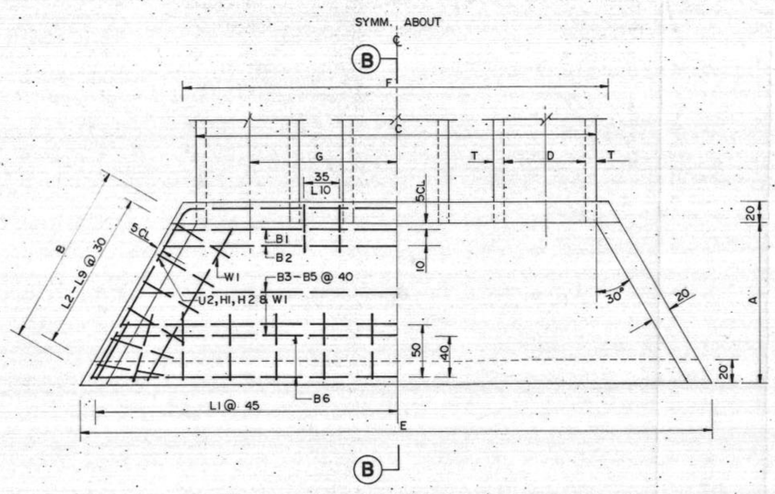
STANDARD DRAWING

R.C. HEADWALL FOR SINGLE R.C.P. CULVERT

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. DS-10
		SHEET NO. 71



PLAN



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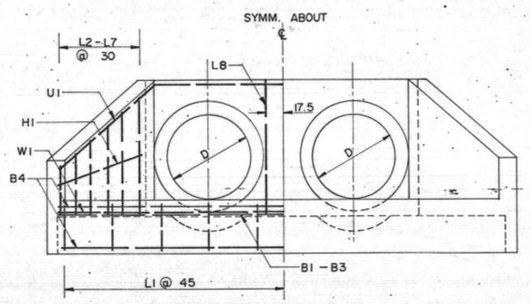
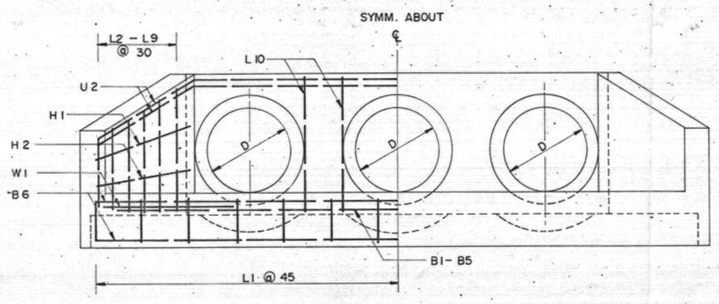
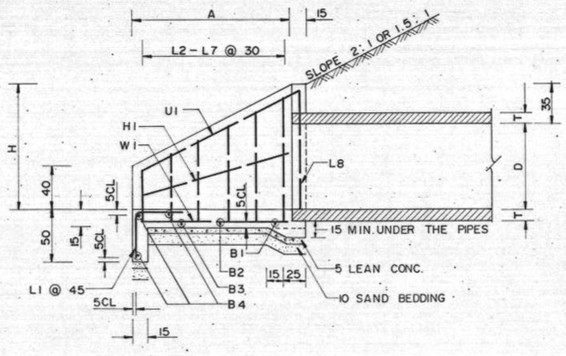


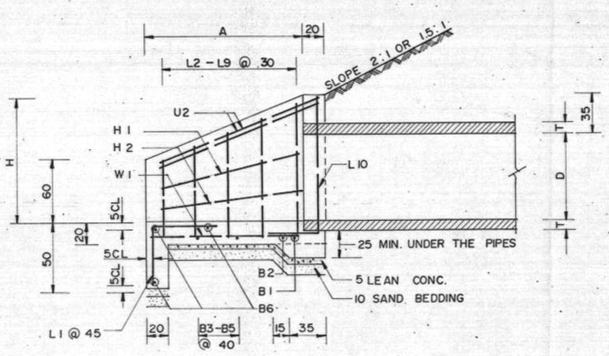
END VIEW



END VIEW



SECTION (A)-(A)



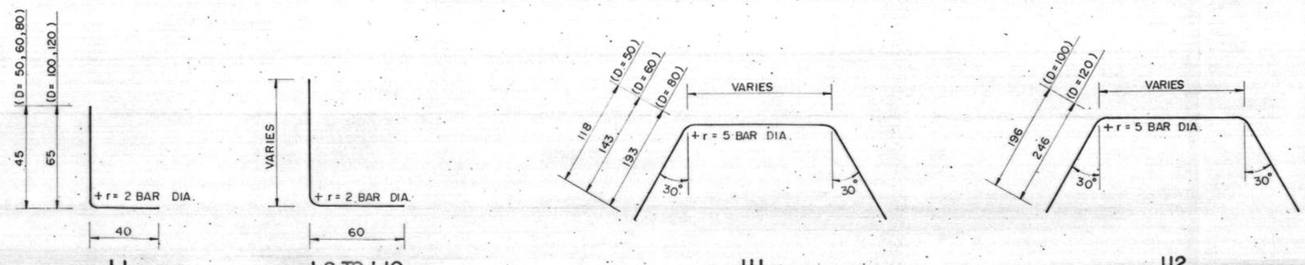
SECTION (B)-(B)

DETAILS FOR Ø50,Ø60 & Ø80 PIPE CULVERTS

NOT TO SCALE

DETAILS FOR Ø100 & Ø120 PIPE CULVERTS

NOT TO SCALE



BAR BENDING DIAGRAMS

NOT TO SCALE

TABLE OF DIMENSIONS

DIA. OF PIPE "D"	T	DIMENSIONS SAME FOR ALL MULTIPLES					DIMENSIONS							
		A		B	H	G	FOR 2 PIPES		FOR 3 PIPES			FOR 4 PIPES		
		S=2:1	S=1.5:1				C	E	F	C	E	F	C	E	F
50	7	90	75	104	85	110	174	313	191	284	423	301	–	–	–
60	7.5	110	90	127	95	120	195	357	212	315	477	332	–	–	–
80	9.5	150	120	173	115	140	239	447	256	379	587	396	–	–	–
100	11	150	120	173	135	170	292	511	315	462	681	485	632	851	655
120	12.5	190	150	219	155	190	335	601	358	525	781	548	715	981	738

TABLE OF REINFORCEMENT FOR Ø50,Ø60,Ø80 CM.

BAR MARK	SIZE Ø (M.M.)	FOR 2 PIPES						FOR 3 PIPES					
		D=50		D=60		D=80		D=50		D=60		D=80	
		NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
B1	12	1	202	1	223	1	267	1	312	1	343	1	407
B2	12	–	–	1	246	1	336	–	–	1	366	1	476
B3	12	1	248	1	292	1	382	1	358	1	412	1	522
B4	12	3	–	3	–	3	–	3	–	3	–	3	–
L1	12	8	85	9	85	11	85	10	85	11	85	14	85
L2-L7	12	8	–	10	–	12	–	8	–	10	–	12	–
L8	12	2	130	2	160	2	180	4	130	4	160	4	180
U1	12	1	423	1	494	1	638	1	533	1	614	1	778
H1	12	2	99	2	122	2	169	2	99	2	122	2	169
W1	12	4	96	4	119	4	165	4	96	4	119	4	165

TABLE OF QUANTITIES

DIA. OF PIPE "D"	T.	CONCRETE (1-HDWL.) M^3			REINF. BARS, TOTAL WT. (1-HDWL.) KG.		
		FOR 2 PIPES	FOR 3 PIPES	FOR 4 PIPES	FOR 2 PIPES	FOR 3 PIPES	FOR 4 PIPES
50	7	0.9	1.3	–	41	51	–
60	7.5	1.2	1.6	–	50	63	–
80	9.5	1.8	2.3	–	64	79	–
100	11	3.0	4.0	5.0	121	151	181
120	12.5	4.0	5.3	6.6	141	175	208

TABLE OF REINFORCMENT FOR Ø100 & Ø120 CM.

BAR MARK	SIZE Ø (MM.)	FOR 2 PIPES				FOR 3 PIPES				FOR 4 PIPES			
		D=100		D=120		D=100		D=120		D=100		D=120	
		NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
B1	16	1	332	1	375	1	502	1	565	1	672	1	755
B2	16	1	344	1	387	1	514	1	577	1	384	1	767
B3	12	1	351	1	440	1	521	1	630	1	691	1	820
B4	12	1	398	1	487	1	568	1	677	1	738	1	867
B5	12	1	444	1	533	1	614	1	723	1	784	1	913
B6	12	3	–	3	–	3	–	3	–	3	–	3	–
H1	12	2	177	2	223	2	177	2	223	2	177	2	223
H2	12	2	181	2	235	2	181	2	235	2	181	2	235
L1	12	12	105	14	105	16	105	18	105	20	105	23	105
L2	16	2	132	2	132	2	132	2	132	2	132	2	132
L3	16	2	145	2	145	2	145	2	145	2	145	2	145
L4	16	2	158	2	158	2	158	2	158	2	158	2	158
L5	16	2	171	2	171	2	171	2	171	2	171	2	171
L6	16	2	186	2	186	2	186	2	186	2	186	2	186
L7	16	2	197	2	197	2	197	2	197	2	197	2	197
L8	16	–	–	2	210	–	–	2	210	–	–	2	210
L9	16	–	–	2	225	–	–	2	225	–	–	2	225
L10	16	2	205	2	225	4	205	4	225	6	205	6	225
U2	16	2	705	2	444	2	475	2	1035	2	162	2	1228
W1	12	4	165	4	211	4	165	4	211	4	162	4	211

NOTES :

1. ALL DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15x15x15 CM. CUBE AT 28 DAY. AN APPROXIMATE MIX. DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE I	350	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM.(MAX.)

3. REINFORCING STEEL SHALL BE DEFORMED BARS CONFORMING TO TIS. 24 GRADE SD 30.
4. DESIGN STRESSES :

a) CONCRETE, fc	=	70	KSC.
b) STEEL , fs	=	1,400	KSC.
n	=	10	

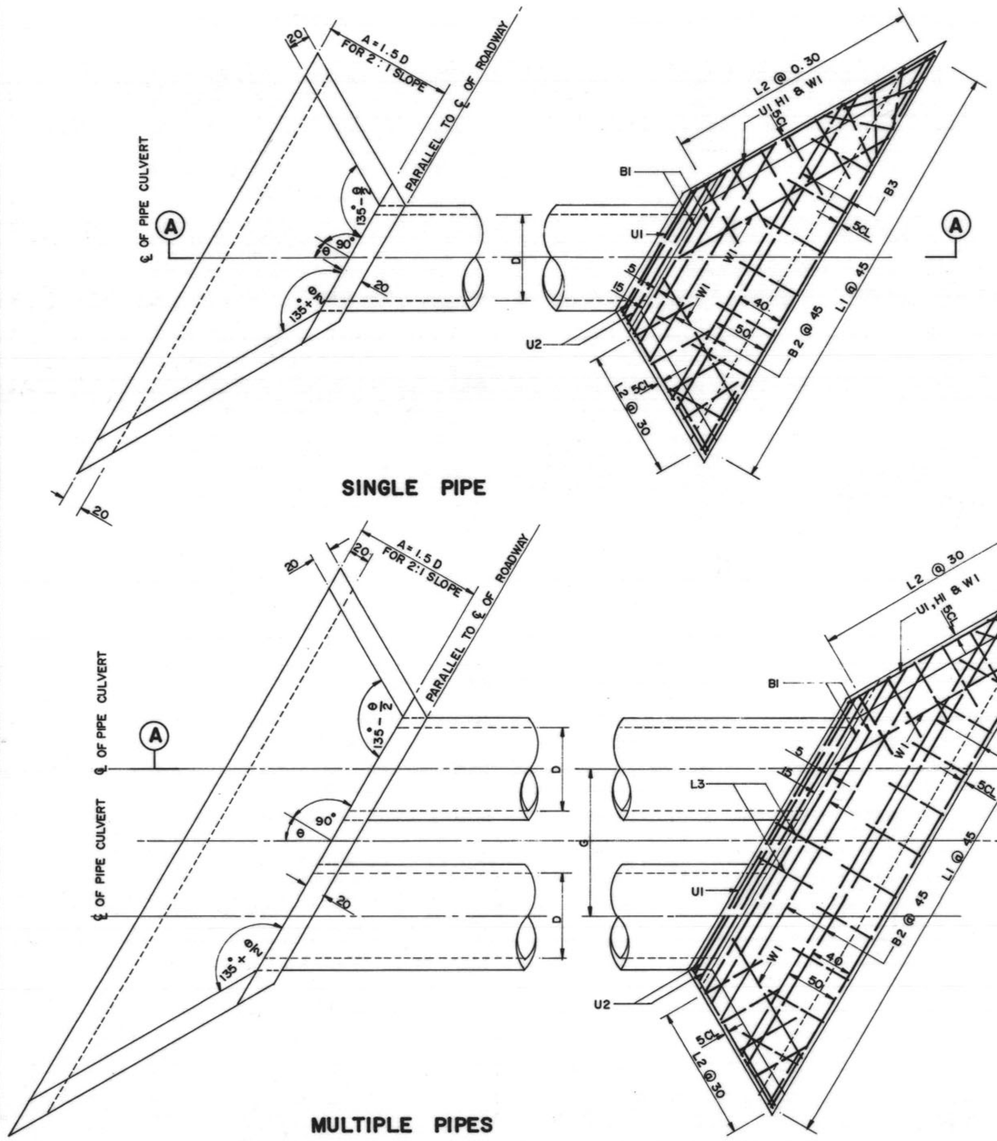
5. CLEAR CONCRETE COVER SHALL BE 4 CM. UNLESS OTHERWISE INDICATED.
6. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
7. LAP LENGTH SHALL NOT BE LESS THAN 24 BAR DIAMETERS.
8. ALL CONCRETE EXPOSED CORNERS SHALL HAVE 2 CM. CHAMFER UNLESS OTHERWISE INDICATED.
9. DIMENSION OF HEADWALL AND QUANTITIES OF MATERIALS SHOWN IN THE TABLES ARE FOR EMBANKMENT SLOPE OF 2:1 ONLY FOR EMBANKMENT SLOPE 1.5 : 1, ALL DIMENSIONS SHALL BE WORKED OUT FROM DIMENSIONS OF "A" AS SHOWN TOGETHER WITH THE FLARE ANGLE OF 30° THEN QUANTITES OF MATERIALS SHALL BE CHANGED ACCORDINGLY.
10. UNLESS OTHERWISE SPECIFIED, THESE HEADWALLS SHALL BE USED FOR HIGHWAYS CLASS D AND CLASS 1.
11. FOR ROLLING AND MOUNTAINOUS TERRAINS, THESE HEADWALLS SHALL BE USED AS NECESSARY.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

R.C. HEADWALL FOR MULTIPLE R.C.P. CULVERT

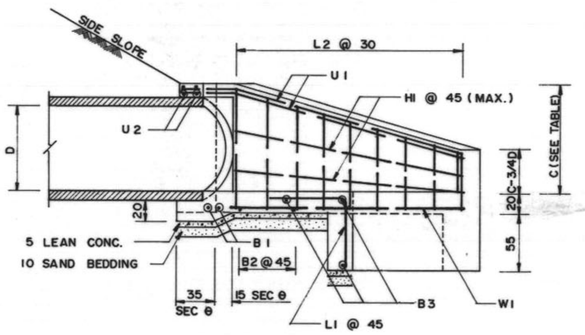
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. DS-105
		SHEET NO. 72



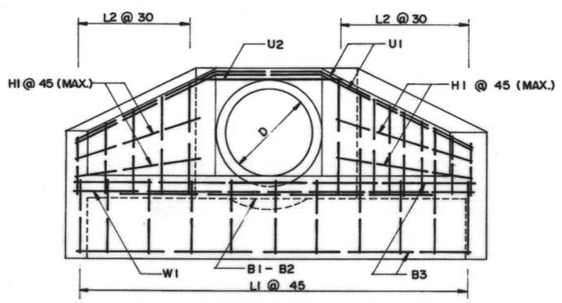
SINGLE PIPE

MULTIPLE PIPES

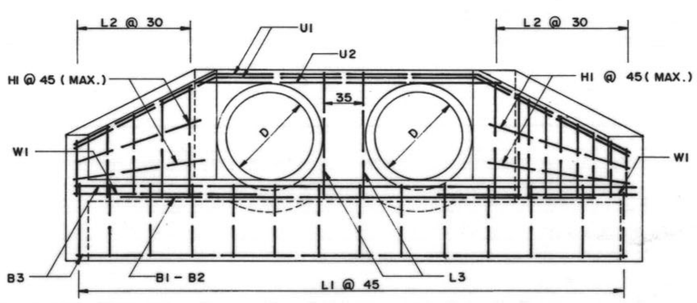
PLAN
SCALE 1:30



SECTION (A)-(A)
SCALE 1:30

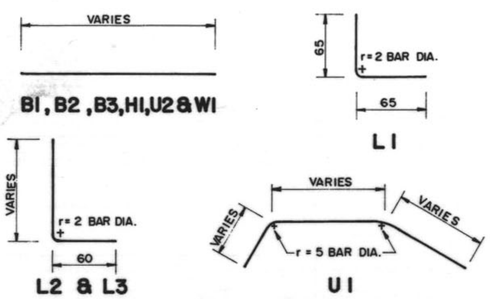


SINGLE PIPE



MULTIPLE PIPES

END VIEWS
SCALE 1:30



BAR BENDING DIAGRAMS
NOT TO SCALE

TABLE OF REINFORCEMENT FOR D = 80 CM.

BAR MARK	SIZE Ø MM.	@	FOR 1 PIPE						FOR 2 PIPES						FOR 3 PIPES						FOR 4 PIPES					
			SKEW 15°		SKEW 30°		SKEW 45°		SKEW 15°		SKEW 30°		SKEW 45°		SKEW 15°		SKEW 30°		SKEW 45°		SKEW 15°		SKEW 30°		SKEW 45°	
			NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L
B1	16	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–
B2	16	45	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–
B3	16	–	3	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–
H1	12	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–
L1	12	45	9	130	11	130	13	130	12	130	14	130	16	130	15	130	18	130	20	130	18	130	22	130	24	130
L2	16	30	13	–	14	–	16	–	13	–	14	–	16	–	13	–	14	–	16	–	13	–	14	–	16	–
L3	16	–	–	–	–	–	–	–	2	113	2	113	2	113	4	113	4	113	4	113	6	113	6	113	6	113
U1	16	–	2	488	2	144	2	175	2	275	2	306	2	373	2	420	2	468	2	571	2	565	2	630	2	769
U2	16	–	2	130	2	531	2	622	2	633	2	693	2	820	2	778	2	855	2	1018	2	923	2	1017	2	1216
W1	12	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–
CONC. (M.³)			1.74		1.93		2.29		2.45		2.72		3.26		3.16		3.51		4.23		3.87		4.30		5.20	
REINF. (KG.)			99		108		127		129		145		169		159		181		211		190		228		253	

TABLE OF REINFORCEMENT FOR D = 100 CM.

BAR MARK	SIZE Ø MM.	@	FOR 1 PIPE						FOR 2 PIPES						FOR 3 PIPES						FOR 4 PIPES					
			SKEW 15°		SKEW 30°		SKEW 45°		SKEW 15°		SKEW 30°		SKEW 45°		SKEW 15°		SKEW 30°		SKEW 45°		SKEW 15°		SKEW 30°		SKEW 45°	
			NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L
B1	16	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–
B2	16	45	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–
B3	16	–	3	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–
H1	12	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–
L1	12	45	11	130	12	130	14	130	15	130	16	130	19	130	19	130	20	130	24	130	23	130	24	130	29	130
L2	16	30	16	–	16	–	20	–	16	–	16	–	20	–	16	–	16	–	20	–	16	–	16	–	20	–
L3	16	–	–	–	–	–	–	–	2	135	2	135	2	135	4	135	4	135	4	135	6	135	6	135	6	135
U1	16	–	2	574	2	648	2	761	2	744	2	837	2	993	2	914	2	1026	2	1225	2	1084	2	1215	2	1457
U2	16	–	2	120	2	166	2	206	2	290	2	355	2	438	2	460	2	544	2	670	2	630	2	733	2	902
W1	12	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–
CONC. (M.³)			2.49		2.70		3.23		3.45		3.76		4.53		4.41		4.82		5.83		5.37		5.88		7.13	
REINF. (KG.)			124		134		163		162		175		214		199		216		266		237		257		317	

INSIDE DIA. OF PIPE "D"	DIMENSION	
	C	G
80	103	140
100	125	164
120	148	190
150	180	225

TABLE OF REINFORCEMENT FOR D = 120 CM.

BAR MARK	SIZE Ø MM.	@	FOR 1 PIPE						FOR 2 PIPES						FOR 3 PIPES						FOR 4 PIPES					
			SKEW 15°		SKEW 30°		SKEW 45°		SKEW 15°		SKEW 30°		SKEW 45°		SKEW 15°		SKEW 30°		SKEW 45°		SKEW 15°		SKEW 30°		SKEW 45°	
			NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L
B1	16	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–
B2	16	45	3	–	3	–	3	–	3	–	3	–	3	–	3	–	3	–	3	–	3	–	3	–	3	–
B3	16	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–
H1	12	–	6	–	6	–	6	–	6	–	6	–	6	–	6	–	6	–	6	–	6	–	6	–	6	–
L1	12	45	13	130	14	130	17	130	17	130	19	130	23	130	21	130	24	130	29	130	25	130	29	130	35	130
L2	16	30	18	–	19	–	23	–	18	–	19	–	23	–	18	–	19	–	23	–	18	–	19	–	23	–
L3	16	–	–	–	–	–	–	–	2	158	2	158	2	158	4	158	4	158	4	158	6	158	6	158	6	158
U1	16	–	2	721	2	783	2	919	2	918	2	1002	2	1188	2	1115	2	1221	2	1457	2	1312	2	1440	2	1726
U2	16	–	2	179	2	200	2	244	2	376	2	419	2	513	2	573	2	638	2	782	2	770	2	857	2	1051
W1	12	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–
CONC. (M.)			3.34		3.66		4.38		4.58		5.04		6.07		5.82		6.42		7.76		7.06		7.80		9.45	
REINF. (KG.)			162		174		210		209		225		273		256		276		335		303		328		397	

TABLE OF REINFORCEMENT FOR D = 150 CM.

BAR MARK	SIZE Ø MM.	@	FOR 1 PIPE						FOR 2 PIPES						FOR 3 PIPES						FOR 4 PIPES					
			SKEW 15°		SKEW 30°		SKEW 45°		SKEW 15°		SKEW 30°		SKEW 45°		SKEW 15°		SKEW 30°		SKEW 45°		SKEW 15°		SKEW 30°		SKEW 45°	
			NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L	NO	L
B1	16	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–
B2	16	45	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–
B3	16	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–
H1	12	–	6	–	6	–	6	–	6	–	6	–	6	–	6	–	6	–	6	–	6	–	6	–	6	–
L1	12	45	16	130	17	130	21	130	21	130	23	130	28	130	26	130	29	130	35	130	31	130	35	130	42	130
L2	16	30	23	–	24	–	29	–	23	–	24	–	29	–	23	–	24	–	29	–	23	–	24	–	29	–
L3	16	–	–	–	–	–	–	–	2	190	2	190	2	190	4	190	4	190	4	190	6	190	6	190	6	190
U1	16	–	2	892	2	974	2	1146	2	1125	2	1234	2	1464	2	1358	2	1494	2	1782	2	1591	2	1754	2	2100
U2	16	–	2	214	2	240	2	290	2	447	2	500	2	608	2	680	2	760	2	926	2	913	2	1020	2	1244
W1	12	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–
CONC. (M.³)			4.81		5.28		6.36		6.52		7.19		8.68		8.23		9.10		11.02		9.94		11.01		13.35	
REINF. (KG)			216		237		280		275		299		359		335		365		438		394		431		517	

NOTES :

1. ALL DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	350	KG. (MIN.)
SAND	0.43	M.³
CRUSHED ROCK OR GRAVEL	0.86	M.³
CONCRETE SLUMP	10	CM. (MAX.)

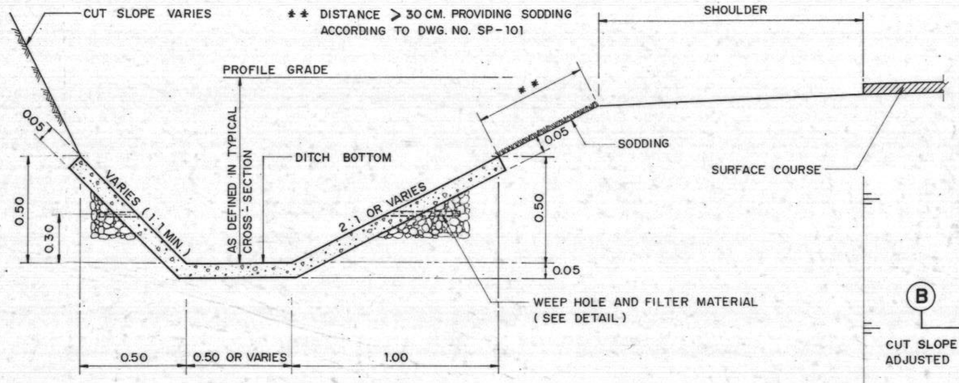
3. REINFROCING STEEL SHALL BE DEFORMED BARS CONFORMING TO TIS. 24 GRADE SD 30.
4. DESING STRESSES
   a) CONCRETE , fc = 70 KSC.
   b) STEEL , fs = 1,400 KSC.
   n = 10
5. CLEAR CONCRETE COVER SHALL BE 4 CM. UNLESS OTHERWISE INDICATED.
6. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
7. LAP LENGTH SHALL NOT BE LESS THAN 24 BAR DIAMETERS.
8. ALL CONCRETE EXPOSED CORNERS SHALL HAVE 2 CM. CHAMFERS UNLESS OTHERWISE INDICATED.
9. DIMENSIONS OF HEADWALL AND QUANTITIES OF MATERIAL SHOWN IN TABLES ARE FOR EMBANKMENT SLOPE OF 2:1 ONLY FOR EMBANKMENT SLOPE OF 1.5 : 1, ALL DIMENSIONS SHALL BE WORKED OUT FROM DIMENSIONS OF "A" = 1.2 D.
10. THE SKEW ANGLE (θ) AS SHOWN ON THIS DRAWING SHALL NOT EXCEED 45°.
11. WALL AND SLAB THICKNESSES SHALL BE 20 CM. FOR ALL SKEWED HEADWALLS. THERE WILL BE NO SKEWED HEADWALLS FOR PIPES LESS THAN 80 CM. DIA.
12. UNLESS OTHERWISE SPECIFIED, THESE HEADWALLS SHALL BE USED FOR HIGHWAYS CLASS D AND CLASS 1.
13. FOR ROLLING AND MOUNTAINOUS TERRAINS, THESE HEADWALLS SHALL BE USED AS NECESSARY.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

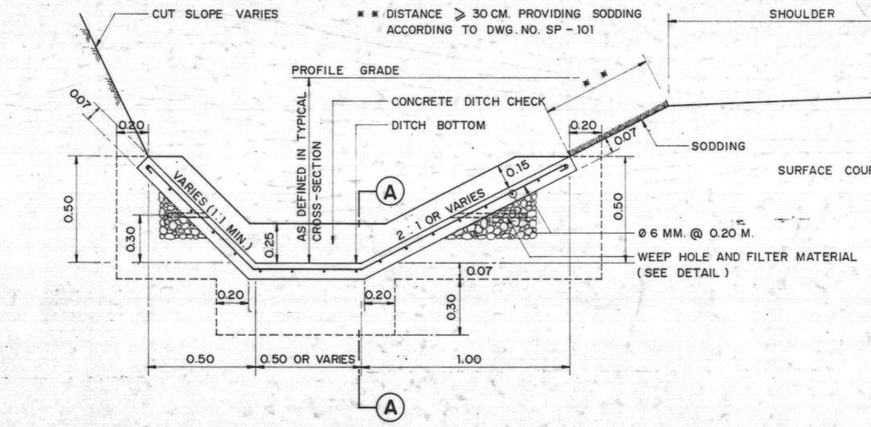
STANDARD DRAWING

R.C. HEADWALL FOR SKEW R.C.P. CULVERT

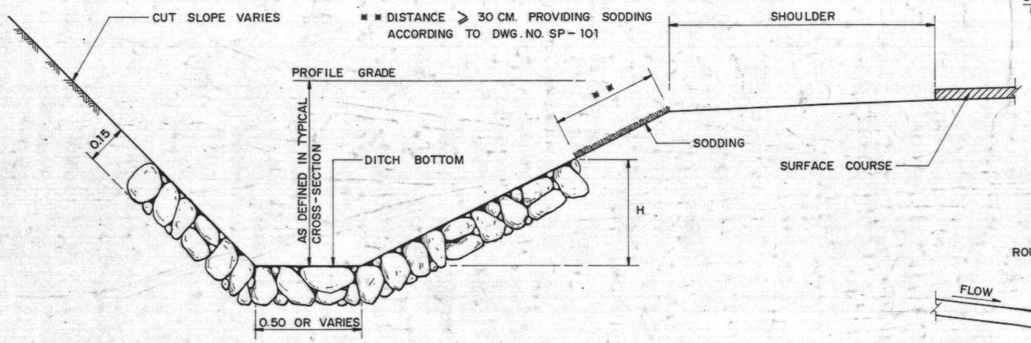
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. DS-106
		SHEET NO. 73



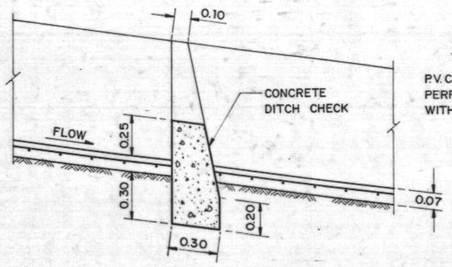
TYPE I PLAIN CONCRETE DITCH LINING
NOT TO SCALE



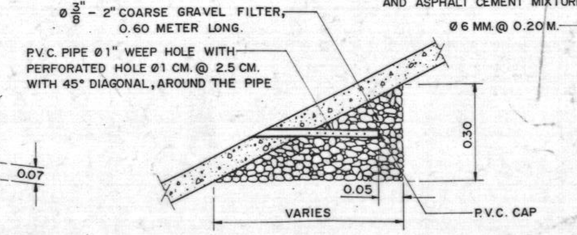
TYPE II REINFORCED CONCRETE DITCH LINING
NOT TO SCALE



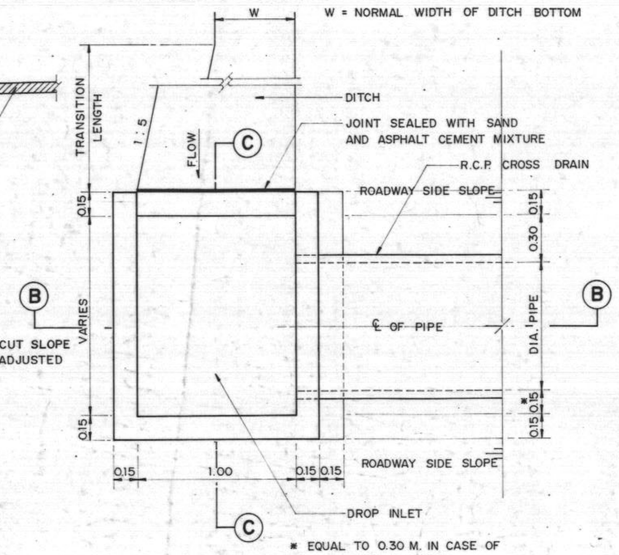
TYPE III MORTAR RIP-RAP DITCH LINING
NOT TO SCALE



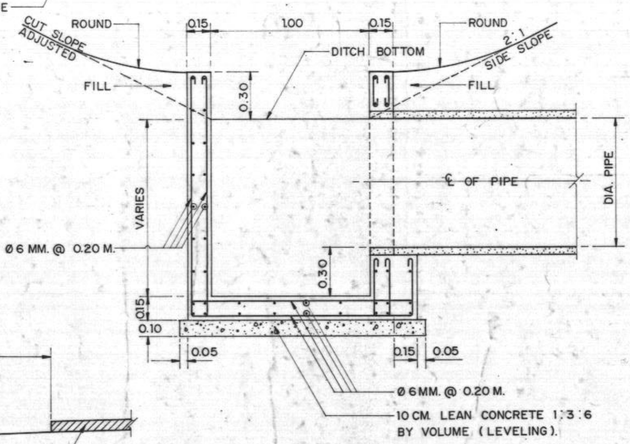
SECTION (A)-(A)
SCALE 1 : 20



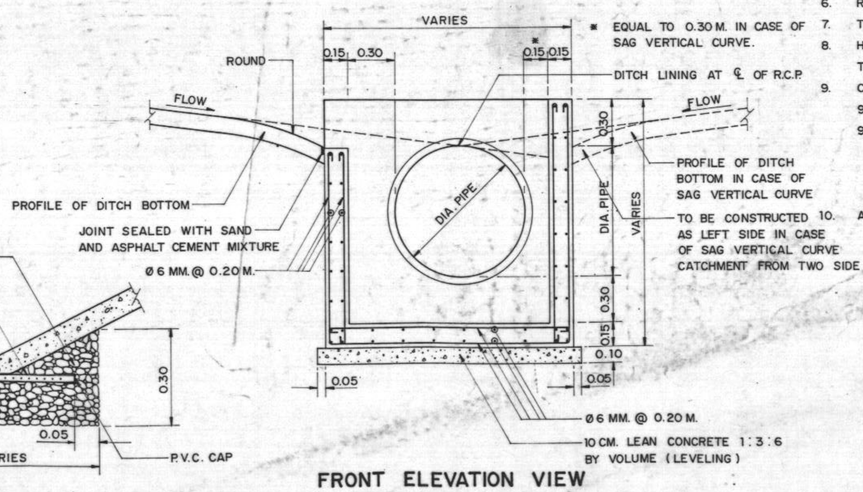
DETAIL OF WEEP HOLE AND FILTER MATERIAL
SCALE 1 : 10



PLAN VIEW OF DROP INLET
NOT TO SCALE



SIDE ELEVATION VIEW
SECTION (B)-(B)
NOT TO SCALE



FRONT ELEVATION VIEW
SECTION (C)-(C)
NOT TO SCALE

CONSTRUCTION DETAILS

TYPE I, TYPE II CONCRETE DITCH LINING

1.1 THE EXISTING DITCH OR CHANNEL SHALL BE EXCAVATED AND SHAPED IN ACCORDANCE WITH THE DRAWINGS AND THE GROUND SHALL BE COMPACTED PROPERLY. THE DITCH GRADIENT SHALL BE THE SAME OR SIMILAR TO THE ROADWAY GRADIENT.

1.2 CONCRETE MIX SHALL BE 1 : 2 : 4 BY VOLUME. CONCRETE SLUMP TEST SHALL NOT EXCEED 10 CM.

1.3 BEFORE PLACING CONCRETE, THE AREA SHALL BE THROUGHLY MOISTENED WITH WATER TO ATTAIN OPTIMUM MOISTURE. CONCRETE SHALL BE PLACED IN SECTIONS OF 1.00 M. MAXIMUM IN LENGTH FOR TYPE I AND 3.00 M. MAXIMUM FOR TYPE II. THE JOINT WIDTH BETWEEN SECTIONS SHALL NOT EXCEED 1 CM. AND THE JOINTS SHALL BE SEALED WITH SAND ASPHALT CEMENT WITH 4 : 1 MIXTURE RATIO.

1.4 REINFORCING STEEL SHALL BE PLAIN ROUND BARS CONFORMING TO TIS. 20 GRADE SR 24. LAPPING FOR Ø 6 MM. REINFORCING STEEL SHALL BE 25 CM. MINIMUM.

1.5 REINFORCING STEEL SHALL ALSO BE WELDED WIRE FABRIC WITH THE SPECIFICATIONS AS FOLLOWS ;

1.5.1 SPECIFICATION SHALL CONFORM TO AASHTO DESIGNATION M. 55 - 75 (ASTM DESIGNATION A 185 - 73) AND AASHTO DESIGNATION M. 32 - 78 (ASTM DESIGNATION A 82 - 76)

1.5.2 LAPPED SPLICES OF WELDED WIRE FABRIC IS 15 CM. MINIMUM.

1.5.3 MESH SIZE OF THE WIRE FABRIC IS 2"x 2"

1.5.4 THE QUANTITIES OF THE WELDED WIRE FABRIC CALCULATED FROM NOMINAL AREA MUST BE AT LEAST 0.730 $CM^2/M.$ (IN EACH DIRECTION) AND THE WELDED WIRE FABRIC SHALL BE SMOOTH AND THE WELDED JOINT SHALL NOT LOOSE OVER 1% WHILE PLACING FOR CONSTRUCTION OF CONCRETE DITCH LINING.

1.5.5 CONCRETE SHALL BE CURED AFTER PLACING.

TYPE III MORTAR RIP - RAP DITCH LINING

2.1 THE METHOD OF CONSTRUCTION SHALL BE THE SAME AS IN NO. 1.1

2.2 THE STONES USED FOR RIP - RAP DITCH LINING SHALL WEIGH 20 - 45 KG. EACH AND AT LEAST 50% SHALL WEIGH MORE THAN 35 KG. STONES SHALL HAVE SUCH SHAPE AND DIMENSIONS AS TO MINIMIZE THE INTERSPLICES AFTER PLACING. THE THICKNESS OF THE STONES SHALL BE APPROXIMATELY 15 CM.

2.3 THE LARGER STONES SHALL BE PLACED FIRST AND THE INTERSPLICES SHALL BE FILLED WITH SPALLS OR SMALL STONES UNTIL A SMOOTH SURFACE IS OBTAINED. FRESH MORTAR SHALL THEN BE APPLIED TO SEAL ALL JOINTS.

2.4 THE DEPTH OF THE DITCH (H) SHALL BE DEFINED AS FOLLOWS ;

ROADWAY GRADIENT (%)	H (CM.)
2.00 — 2.70	60
2.70 — 3.70	50
OVER 3.70	45

NOTES :

1. THE THREE TYPES OF DITCH LINING SHALL BE CONSTRUCTED IN THE AREA OF RAINFALL INTENSITY NOT OVER 10 IN./HR. IN CASE OF RAINFALL INTENSITY IS OVER 10 IN./HR., DITCH LINING SHALL BE DESIGNED BY THE ENGINEER.
2. DITCH LINING SHALL BE CONSTRUCTED BY CONSIDERATION OF THE SOIL CONDITION, EROSION AND THE DISCHARGE IN THE DITCH. GENERALLY, DITCH LINING SHALL BE CONSTRUCTED IF ROADWAY GRADE EXCEEDS 6 %
3. DROP INLET SHALL BE CONSTRUCTED IN THE LONG AND STEEP SIDE DITCH OR SIDE DITCH ALONG CIRCULAR CURVE AND THE HIGH CUT GRADIENT IN WHICH THE WATER CAN BE DRAINED TO THE OTHER SIDE OF THE ROADWAY OR AT THE LOWEST POINT OF THE SIDE DITCH IN THE SAG VERTICAL CURVE.
4. THE SIZE OF THE R.C. PIPE CULVERT INSTALLED AT THE DROP INLET SHALL BE SELECTED SUITABLY IN THE FIELD. GENERALLY THE R.C. PIPE CULVERT SHALL BE Ø 0.80 M.
5. CONCRETE FOR THE DROP INLET SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS ;

PORTLAND CEMENT TYPE 1.	350 KG. (MIN.)
SAND	0.43 $M.^3$
CRUSHED ROCK OR GRAVEL	0.86 $M.^3$
CONCRETE SLUMP	10 CM. (MAX.)

6. REINFORCING STEEL FOR THE DROP INLET SHALL CONFORM TO TIS. 20 GRADE SR 24 WITH A CLEAR COVER OF 2.5 CM.
7. THE QUANTITIES OF THE DROP INLET SHALL INCLUDE TAPERED LENGTH OF THE SIDE DITCH TO THE DROP INLET.
8. HEAD WALL SHALL BE CONSTRUCTED AT THE OUTLET OF THE R.C. PIPE CULVERT. WHEN THE OUTLET END OF THE DRAIN PIPE IS NOT AT THE TOE OF SLOPE, R.C. DRAIN CHUTE SHALL BE CONSTRUCTED.
9. CONCRETE DITCH CHECK :

9.1 CONCRETE MIX. SHALL BE 1 : 2 : 4 BY VOLUME. CONCRETE SLUMP TEST SHALL NOT EXCEED 10 CM.

9.2 CONCRETE DITCH CHECK SHALL BE CONSTRUCTED FOR TYPE II AND TYPE III OF THE LINING GENERALLY THE SPACING OF DITCH CHECK SHALL NOT EXCEED 150 M., 120 M., 100 M. AND 80 M. FOR ROADWAY GRADE OF 6 %, 8 %, 10 % AND 12 % RESPECTIVELY, BUT THE LOCATION SHALL SUITABLY BE CONSIDERED IN THE FIELD AND BY THE APPROVAL OF THE ENGINEER FOR THE PARTICULAR TYPE OF TERRAINS.

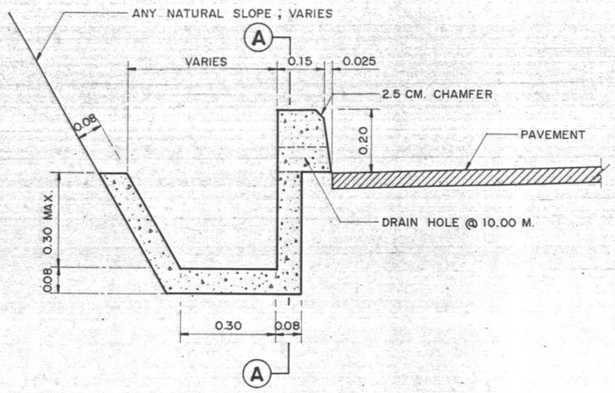
ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

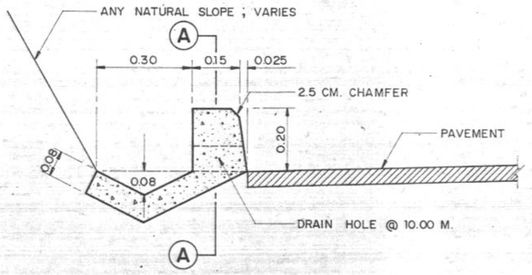
STANDARD DRAWING

SIDE DITCH LINING & DROP INLET CROSS DRAIN

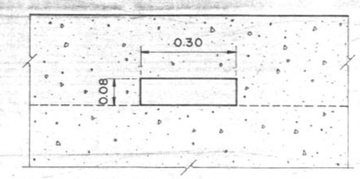
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Bunyasaj. (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : 11/14 (DIRECTOR GENERAL)		DWG. NO. DS-201
		SHEET NO. 74



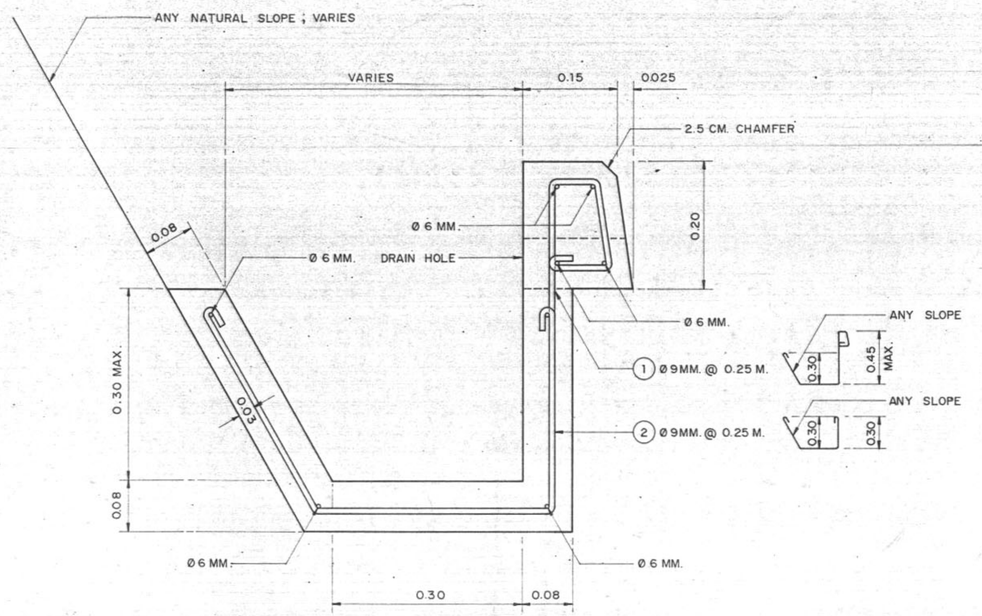
CONCRETE DITCH TYPE "A"
SCALE 1 : 10



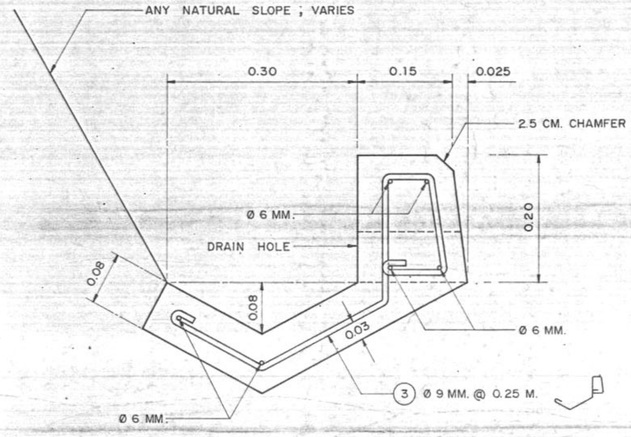
CONCRETE DITCH TYPE "B"
SCALE 1 : 10



SECTION (A)-(A)
SCALE 1 : 10



CONCRETE DITCH TYPE "A"
SCALE 1 : 5



CONCRETE DITCH TYPE "B"
SCALE 1 : 5

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 180 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT	320 KG. (MIN.)
SAND	0.43 M^3
CRUSHED ROCK OR GRAVEL	0.86 M^3
CONCRETE SLUMP	10 CM. (MAX.)

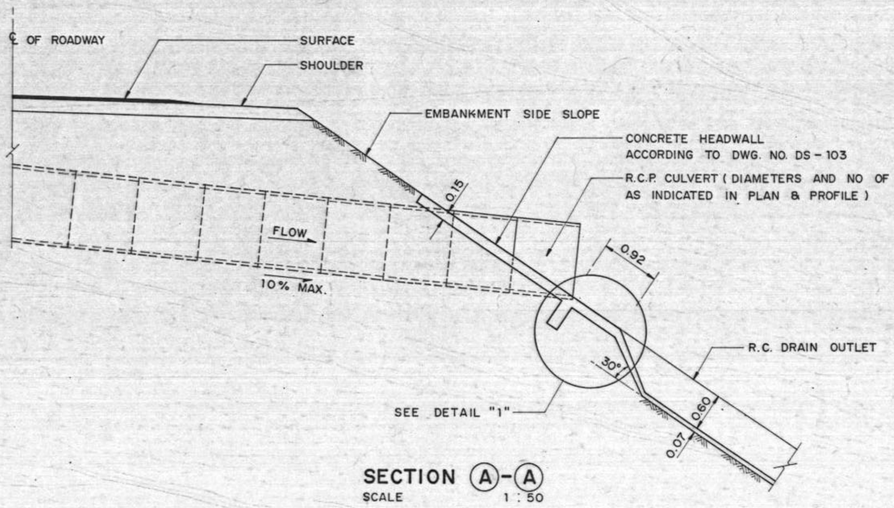
3. REINFORCING STEEL SHALL CONFORMED TO TIS. 20 GRADE SR 24.
4. CLEAR CONCRETE COVER SHALL BE 3 CM.
5. IN CASE OF LAPPED SPLICES OF THE REINFORCEMENT THE LAPPED DISTANCE MUST NOT BE LESS THAN 40 TIMES OF THE DIAMETER OF THE REINFORCING STEEL OR AS DIRECTED BY THE ENGINEER.
6. ALL OF THE CONSTRUCTION MATERIALS MUST CONFORMED TO D.O.H. STANDARDS.
7. EXPANSION JOINT OF 1 CM. WIDTH MUST BE PROVIDED AT THE INTERVAL OF 10 METERS AND FILLED WITH MORTAR (1:3 BY VOLUME)

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

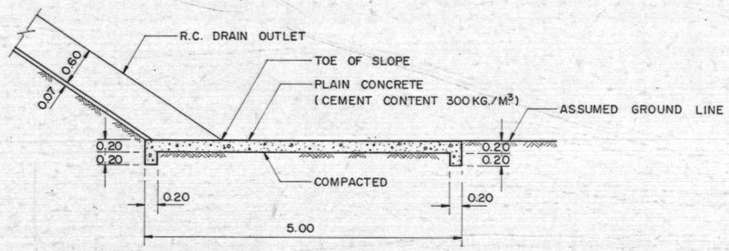
STANDARD DRAWING

CONCRETE DITCH AT HILLSIDE

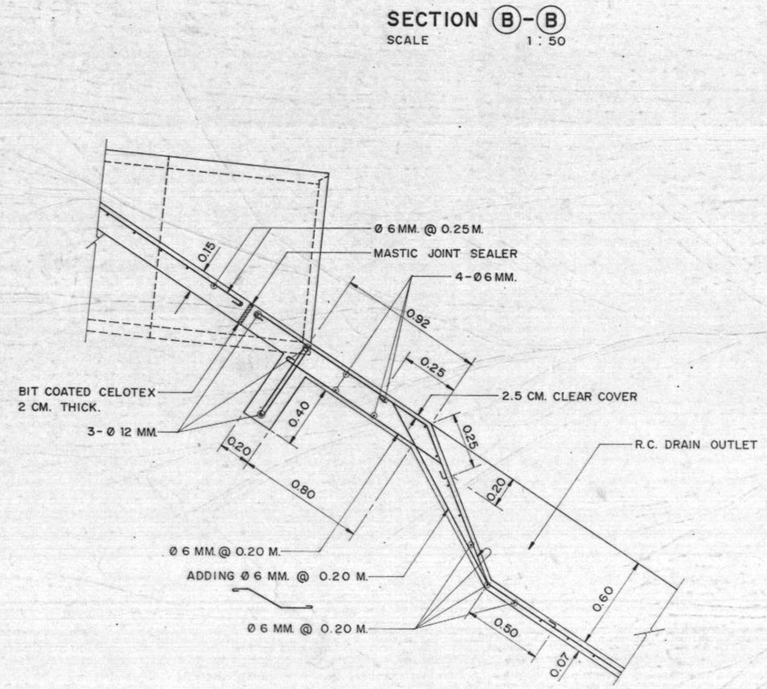
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. DS-202
		SHEET NO. 75



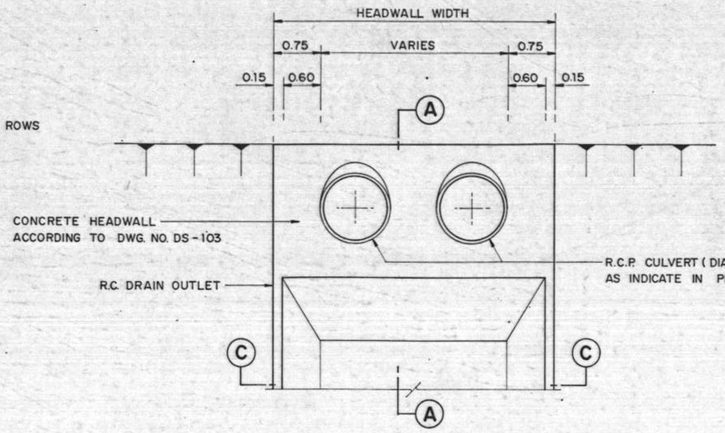
SECTION (A)-(A)
SCALE 1 : 50



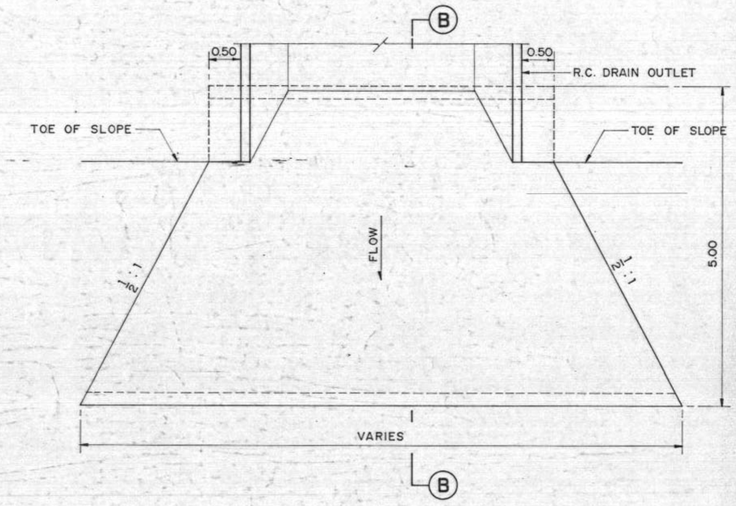
SECTION (B)-(B)
SCALE 1 : 50



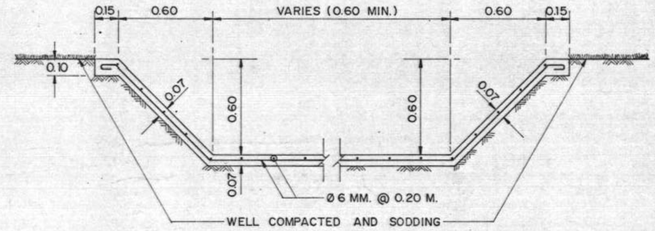
DETAIL "1"
SCALE 1 : 20



FRONT OF R.C. DRAIN OUTLET
SCALE 1 : 50



R.C. DRAIN OUTLET PLAN
SCALE 1 : 50



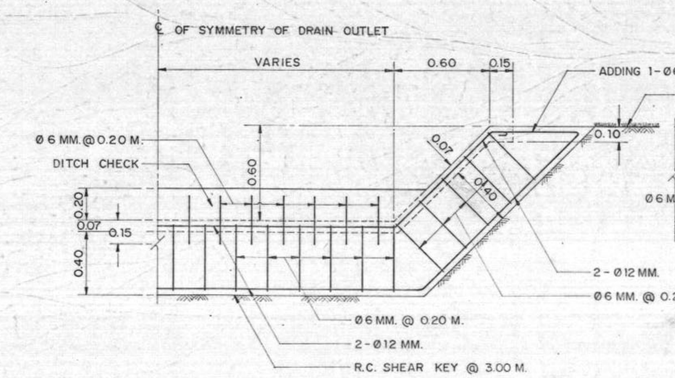
SECTION (C)-(C)
SCALE 1 : 20

NOTES :

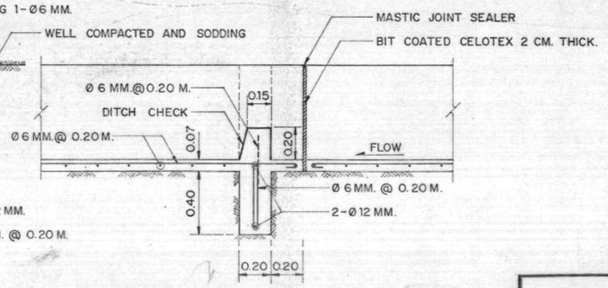
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. WHERE THE HEIGHT OF R.C.P. OUTLET IS 4.00 M. ABOVE THE TOE OF SLOPE AND MAY CAUSE SIDE SLOPE EROSION, THE R.C. DRAIN OUTLET SHALL BE PROVIDED OR AS DIRECTED BY THE ENGINEER.
3. THE EMBANKMENT SLOPE SHALL BE WELL COMPACTED AND SHAPED TO THE LINE AND GRADE SHOWN ON THE PLANS.
4. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 180 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	320	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

5. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24.



SECTION DRAIN OUTLET AT SHEAR KEY
SCALE 1 : 20



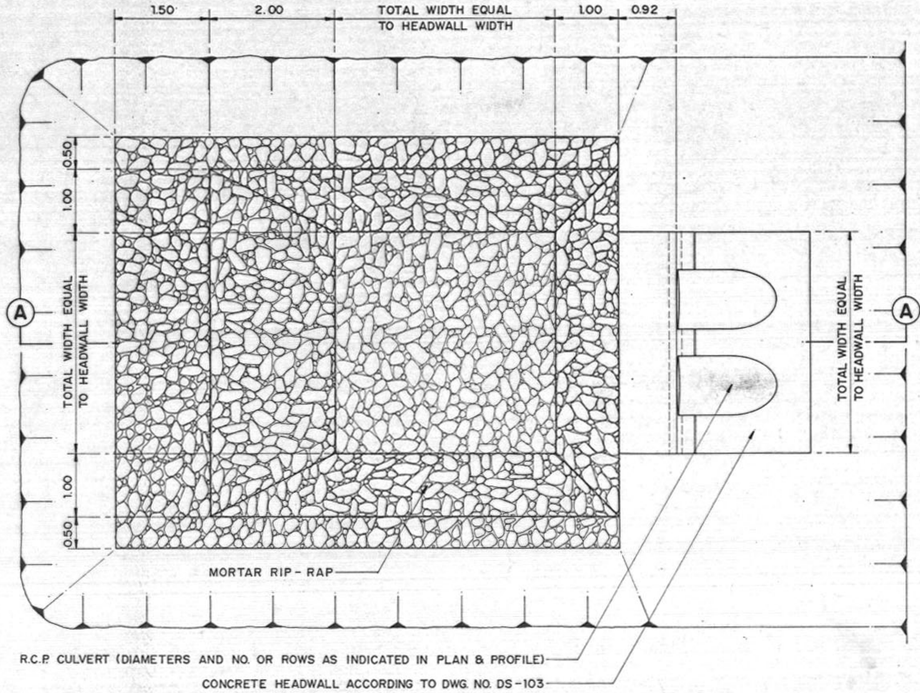
SECTION DRAIN OUTLET LONGITUDINAL JOINT AND SHEAR KEY
SCALE 1 : 20

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

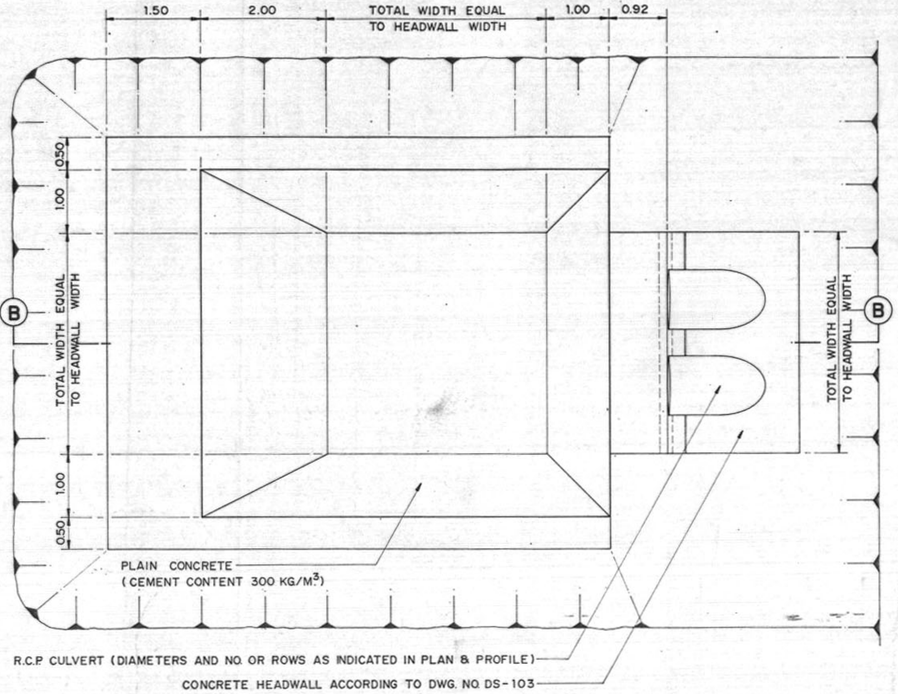
STANDARD DRAWING

R.C. DRAIN OUTLET FOR R.C.P. CULVERT

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. DS-203
		SHEET NO. 76



PLAN OF MORTAR RIP-RAP CATCH BASIN
SCALE 1 : 50



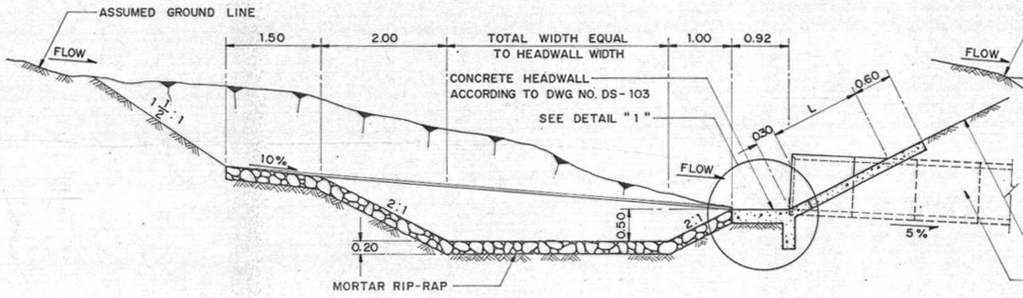
PLAN OF PLAIN CONCRETE CATCH BASIN
SCALE 1 : 50

NOTES :

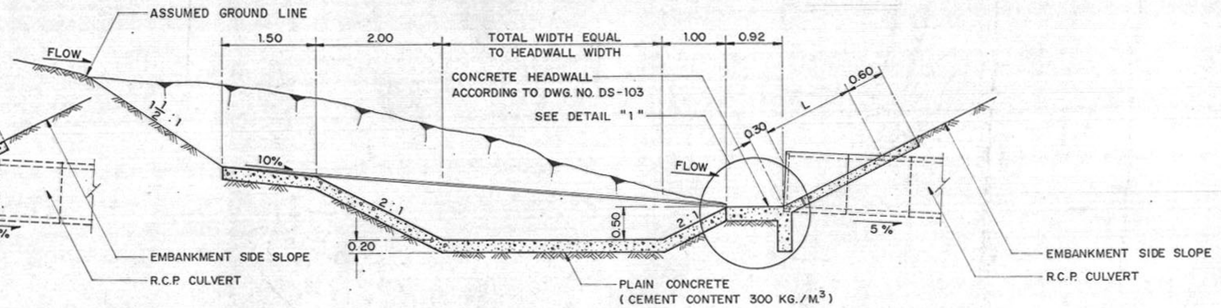
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. EXCAVATION OR CONSTRUCTION OF EMBANKMENTS SHALL BE PROCESSED AND COMPACTED TO PLANNED SHAPES AND DIMENSIONS.
3. STONE USED FOR MORTAR RIP-RAP SHALL WEIGH BETWEEN 20-45 KG. EACH AND AT LEAST 50 PERCENT SHALL WEIGH MORE THAN 35 KG. STONES SHALL HAVE SUCH SHAPE AND DIMENSIONS AS TO MINIMIZE THE INTERSTICES AFTER PLACING. THE THICKNESS OF THE STONES SHALL BE APPROXIMATELY 15 CM. OR SHOWN ON THE DRAWING.
4. THE LARGEST STONE SHALL BE PLACED FIRST. THE INTERSTICES SHALL BE FILLED WITH SPALLS OR SMALL STONES UNTIL A SMOOTH SURFACE IS OBTAINED. THEN FRESH MORTAR SHALL BE APPLIED TO SEAL ALL JOINTS.
5. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 180 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	320	KG. (MIN.)
SAND	0.43	$M.^3$
CRUSHED ROCK OR GRAVEL	0.86	$M.^3$
CONCRETE SLUMP	10	CM. (MAX.)

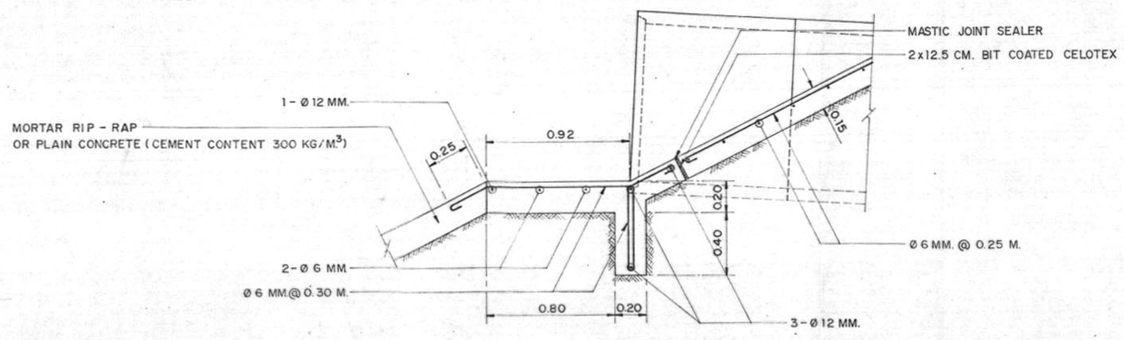
6. CLEAR CONCRETE COVER SHALL BE 3 CM.
7. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24.
8. MORTAR MIXTURE SHALL BE 1 : 2 BY VOLUME.
9. MASTIC JOINT SEALER SHALL CONFORM TO TIS. 479.



SECTION (A)-(A)
SCALE 1 : 50



SECTION (B)-(B)
SCALE 1 : 50



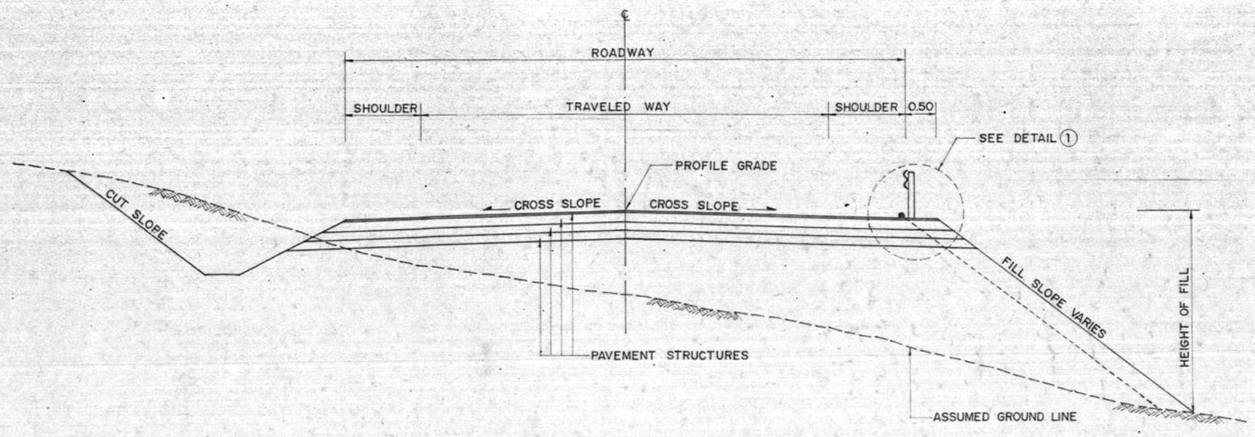
DETAIL "1"
SCALE 1 : 20

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

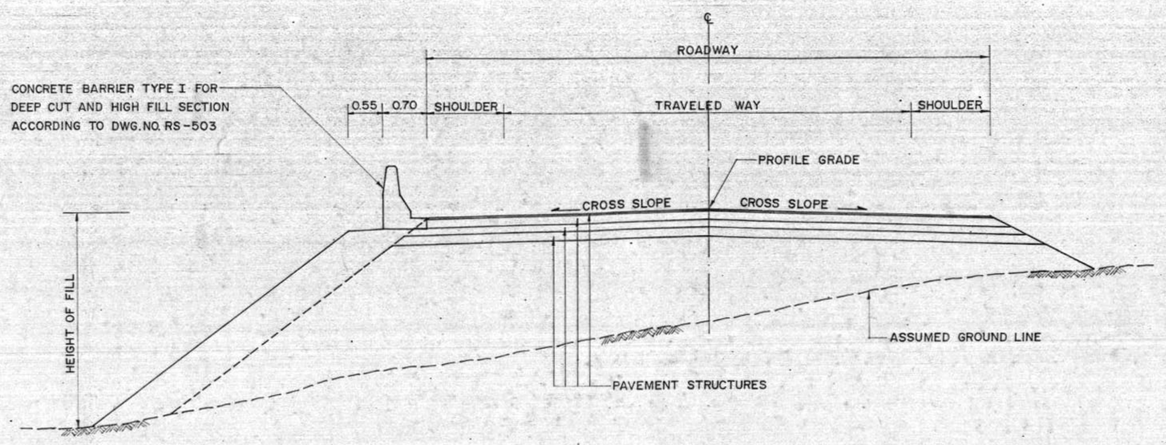
STANDARD DRAWING

CATCH BASIN AT INLET FOR R.C.P. CULVERT

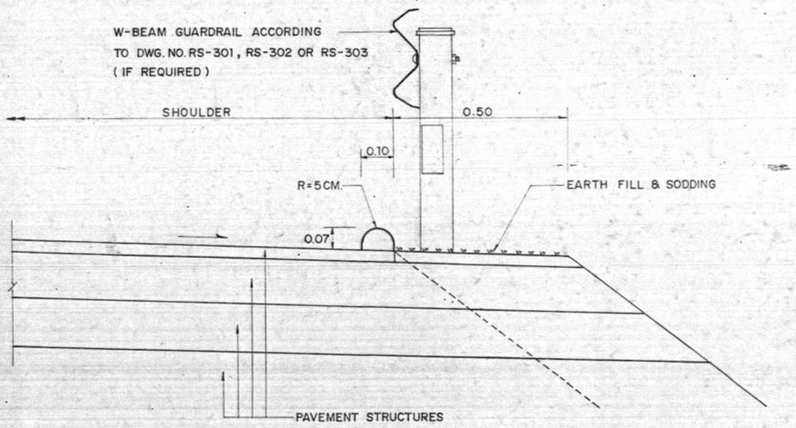
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. DS-301
		SHEET NO. 77



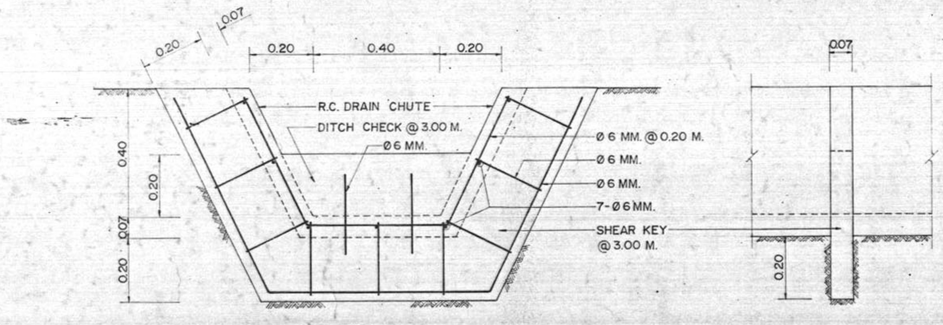
ASPHALT CURB FOR FILL SECTION (HEIGHT OF FILL ≥ 6.00 M.)
NOT TO SCALE



CONCRETE BARRIER TYPE I FOR FILL SECTION (HEIGHT OF FILL ≥ 6.00 M.)
NOT TO SCALE



DETAIL (1)
NOT TO SCALE



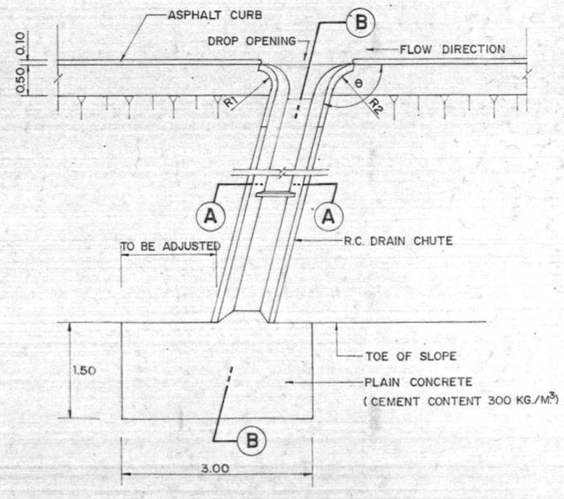
SECTION (A) - (A) R.C. DRAIN CHUTE, SHEAR KEY AND DITCH CHECK
SCALE 1 : 10

NOTES :

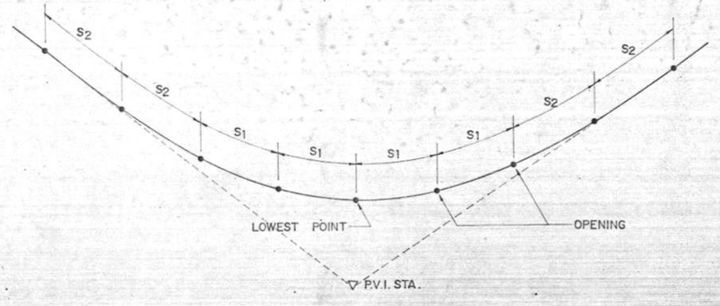
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. WHERE THE HEIGHT OF EMBANKMENT IS MORE THAN 6.00 M. ASPHALT CURB (OR CONCRETE BARRIER TYPE I) SHALL BE PROVIDED. FOR NORMAL CROWN SECTION, ASPHALT CURB (OR CONCRETE BARRIER TYPE I) SHALL BE PROVIDED ON BOTH SIDES OF THE ROADWAY. FOR SUPERELEVATED SECTION, ASPHALT CURB (OR CONCRETE BARRIER TYPE I) SHALL BE PROVIDED ON THE INNER SIDE ONLY.
3. FOR FLAT TO 2% GRADE, R.C. DRAIN CHUTE SHALL BE SPACED AT 40.00 M. INTERVALS.
4. FOR GRADE MORE THAN 2% AND ALONG SAG VERTICAL CURVES, R.C. DRAIN CHUTE INTERVALS SHALL BE AS SHOWN IN TABLE 1.
5. R1, R2 AND θ SHALL BE AS DIRECTED BY THE ENGINEER.
6. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 180 KSC. FOR 15×15×15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	320	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

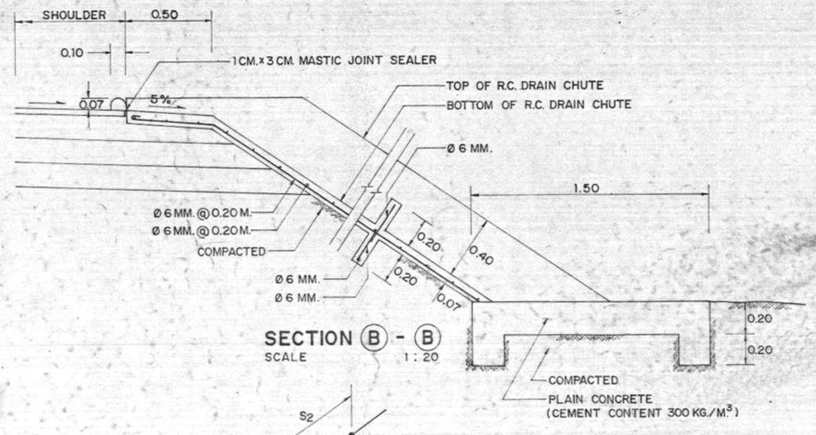
7. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24.



PLAN OF ASPHALT CURB AND R.C. DRAIN CHUTE
NOT TO SCALE



DRAIN CHUTE OPENING ALONG SAG VERTICAL CURVE
NOT TO SCALE



SECTION (B) - (B)
SCALE 1 : 20

TABLE 1

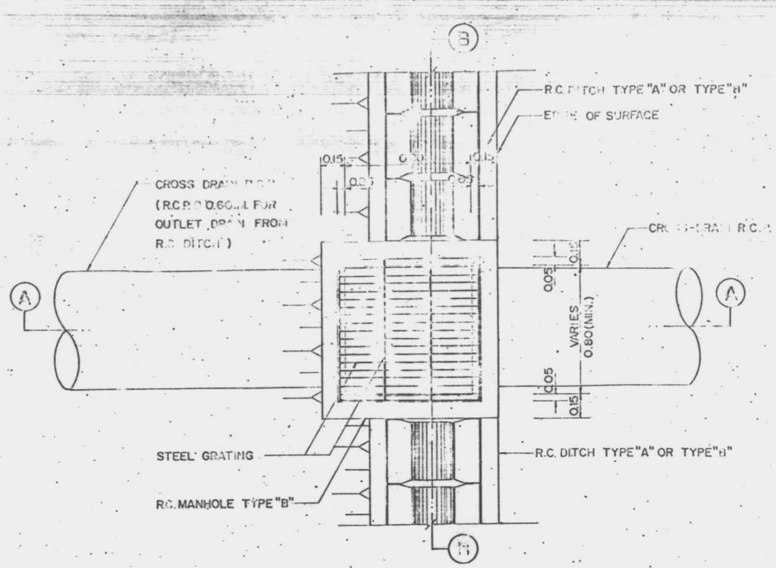
GRADE (%)	OPENING INTERVALS - M.	
	S_1	S_2
LESS THAN 2%	30	40
2% — 3%	35	45
4 AND MORE	40	55

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

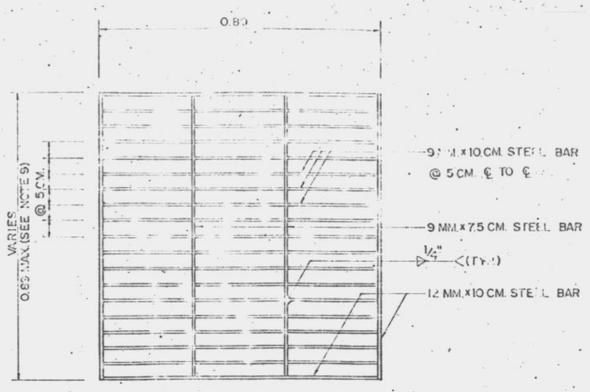
STANDARD DRAWING

ASPHALT CURB & DRAIN CHUTE FOR EMBANKMENT PROTECTION

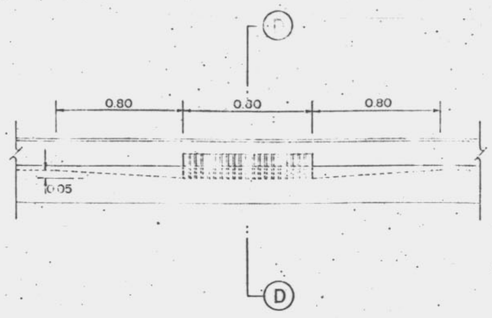
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
		DWG. NO. DS-302
APPROVED : (DIRECTOR GENERAL)		SHEET NO. 78



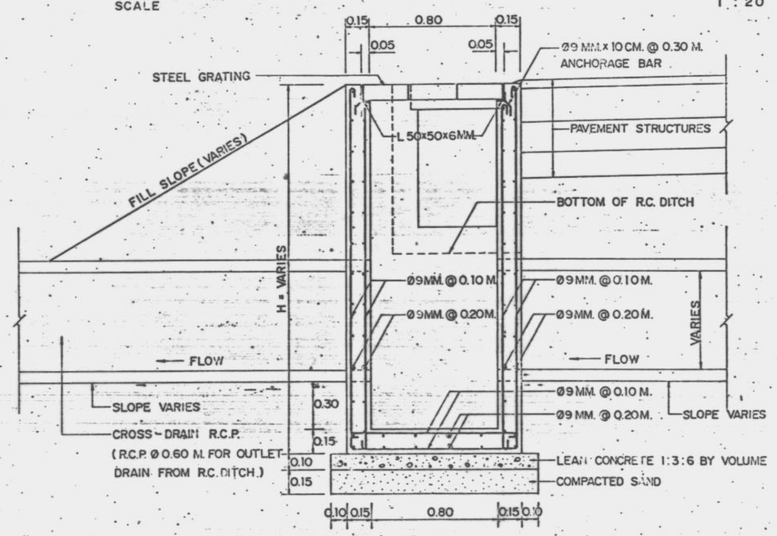
PLAN OF R.C. DITCH TYPE "A" OR TYPE "B"
WITH MANHOLE TYPE "B" AND CROSS-DRAIN PIPE CULVERT
SCALE 1 : 20



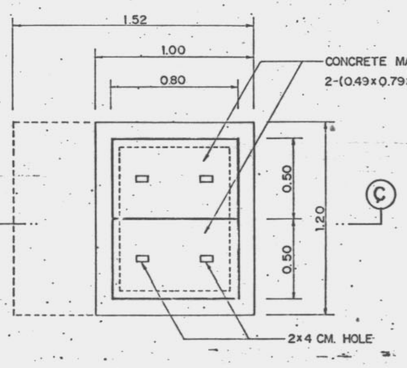
STEEL MANHOLE COVER FOR MANHOLE TYPE "B"
SCALE 1 : 20



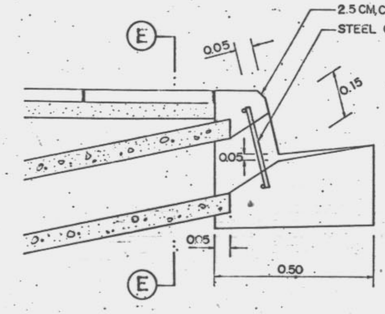
INLET DRAIN FOR MANHOLE TYPE "C"
SCALE 1 : 10



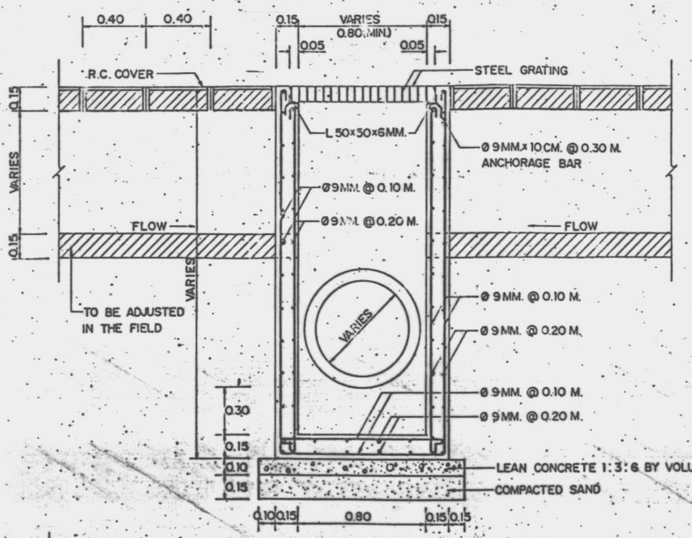
SECTION (A) - (A) MANHOLE TYPE "B"
SECTION 1 : 20



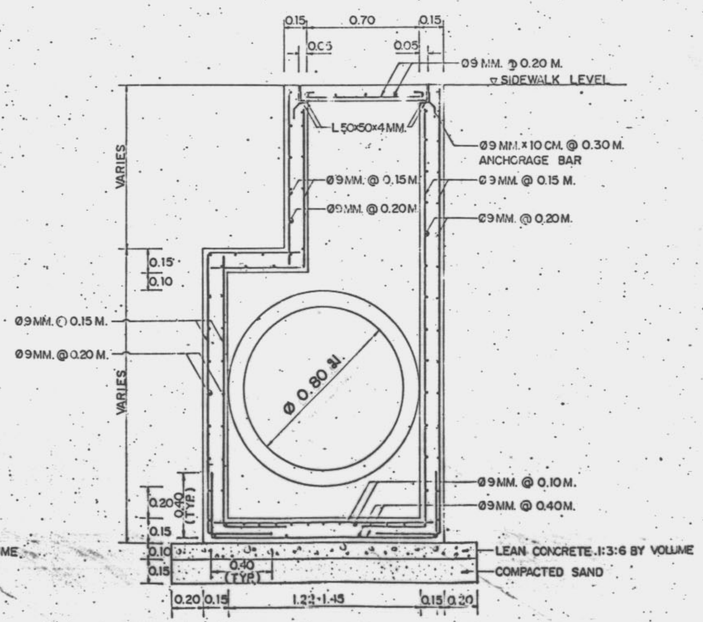
PLAN OF MANHOLE TYPE "C"
SCALE 1 : 20



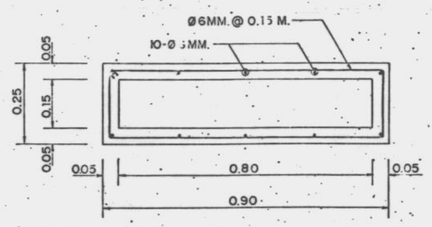
SECTION (D) - (D)
SCALE 1 : 10



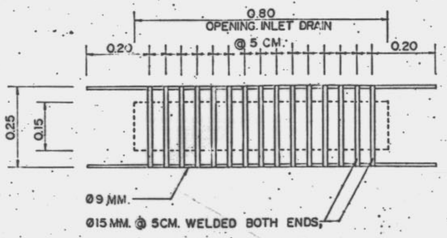
SECTION (B) - (B) MANHOLE TYPE "B"
SCALE 1 : 20



SECTION (C) - (C) MANHOLE TYPE "C"
SCALE 1 : 20



SECTION (E) - (E)
SCALE 1 : 10



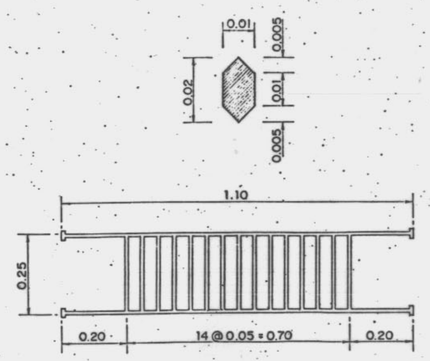
STEEL GRATING DETAILS
SCALE 1 : 10

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15×15×15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	350	KG.(MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM(MAX.)

3. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24
4. STRUCTURAL STEEL SHALL CONFORM TO TIS.116 GRADE Fe 30 AND PAINTED WITH RUST-OLEUM PAINT OR EQUIVALENT IN TWO LAYER.
5. FLAT PLATE STEEL SHALL CONFORM TO TIS.55 GRADE SR 24.
6. LAP LENGTH SHALL NOT BE LESS THAN 40 BAR DIAMETERS.
7. CLEAR CONCRETE COVER SHALL BE 3 CM. UNLESS OTHERWISE INDICATED.
8. MANHOLE TYPE "B" SHALL BE CONSTRUCTED WHERE THE R.C. DITCH TYPE "A" OR TYPE "B" CROSS WITH CROSS-DRAIN R.C.P. OR TO DRAIN WATER FROM THE R.C. DITCH.
9. IF THE WIDTH OF STEEL MANHOLE COVER IS MORE THAN 0.89 M., THE TWO STEEL MANHOLE COVERS SHALL BE USED.



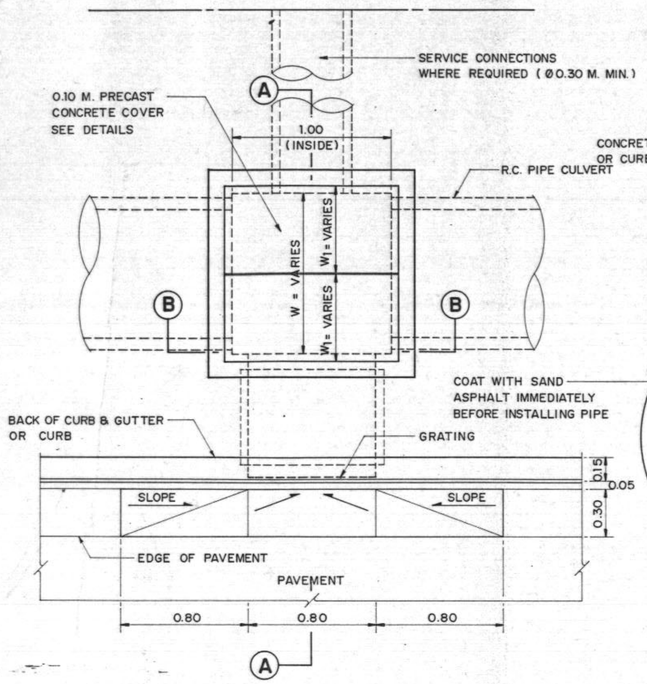
CAST-IRON GRATING DETAILS
SCALE 1 : 10

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

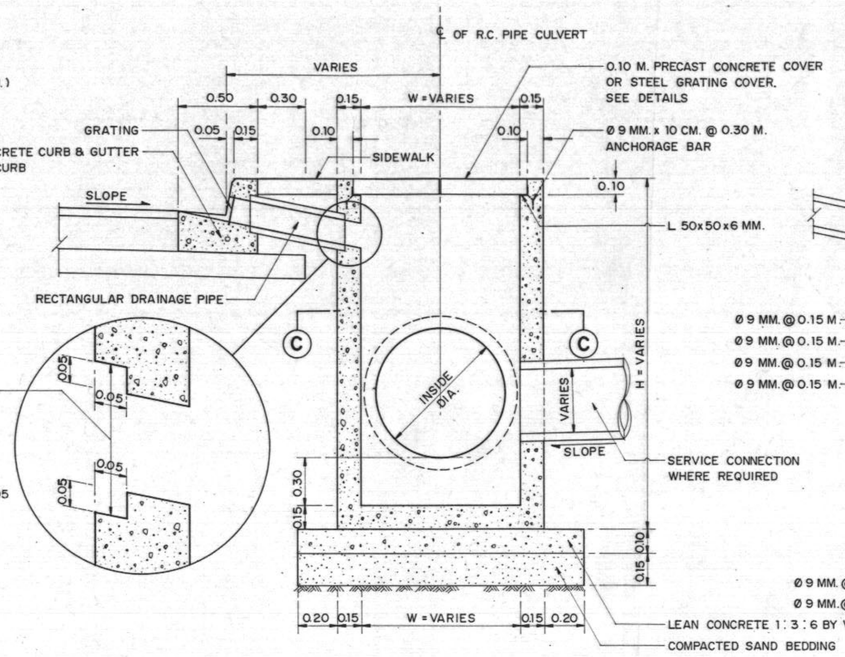
STANDARD DRAWING

MANHOLE DETAILS - I

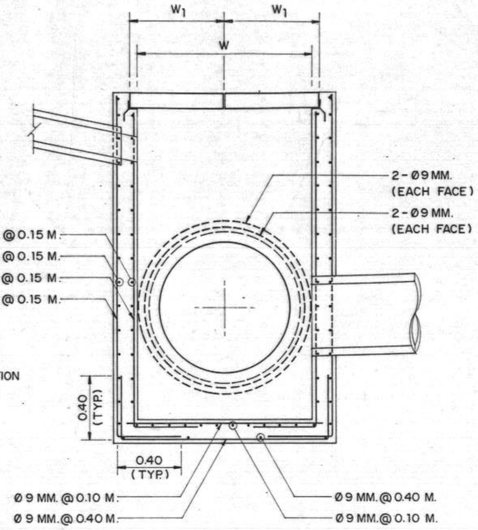
DESIGNED: D.O.H. & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: P. Burapi (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: (DIRECTOR GENERAL)		DWG. NO. DS-401
		SHEET NO. 75



PLAN OF MANHOLE TYPE "D"
SCALE 1 : 20



SECTION (A)-(A)
SCALE 1 : 20



SECTION (A)-(A)
SCALE 1 : 20

NOTES :

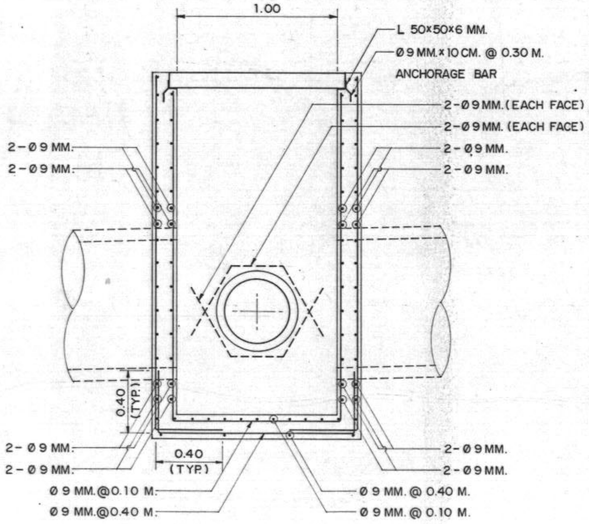
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15×15×15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	350	KG.(MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM.(MAX.)

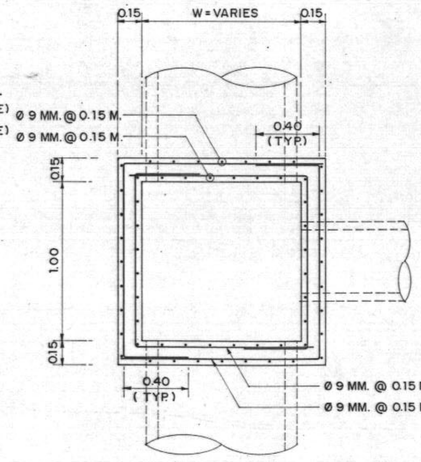
3. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24
4. STRUCTURAL STEEL SHALL CONFORM TO TIS.116 GRADE Fe 30
5. FLAT PLATE STEEL SHALL CONFORM TO TIS. 55 GRADE SR 24
6. STRUCTURAL STEEL AND FLAT PLATE STEEL SHALL BE PAINTED WITH RUST-OLEUM PAINT OR EQUIVALENT TWICE AND WITH OIL PAINT ONCE.
7. CLEAR CONCRETE COVER SHALL BE 3 CM.
8. MANHOLE SIZE SHALL VARY ACCORDING TO THE SIZE OF R.C. PIPE CULVERT (SEE TABLE I)
9. MANHOLES SHALL BE ARRANGED AT 15.00 M.(TYP.) INTERVAL OR AS DIRECTED BY THE ENGINEER.

TABLE I

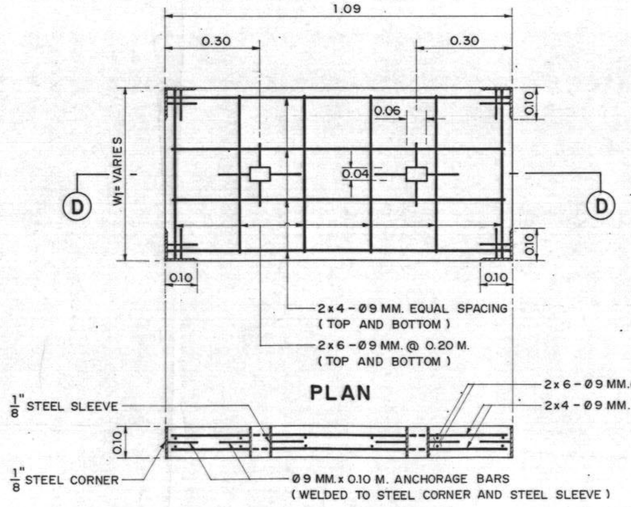
INSIDE DIA. OF R.C. PIPE CULVERT	DIMENSIONS		
	W	W1	H
Ø 0.60	0.80	0.440	VARIES
Ø 0.80	1.00	0.540	VARIES
Ø 1.00	1.25	0.665	VARIES
Ø 1.20	1.50	0.790	VARIES



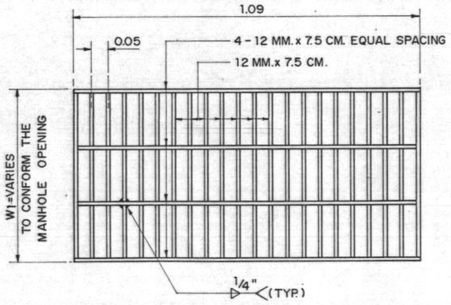
SECTION (B)-(B)
SCALE 1 : 20



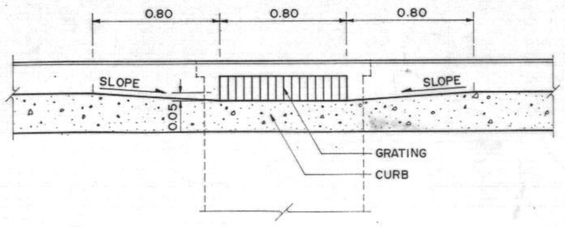
SECTION (C)-(C)
SCALE 1 : 20



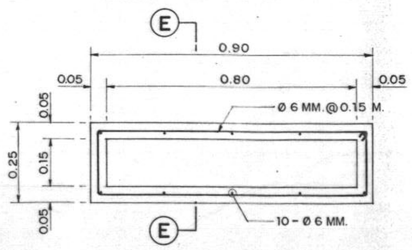
SECTION (D)-(D)
CONCRETE COVER DETAILS
SCALE 1 : 10



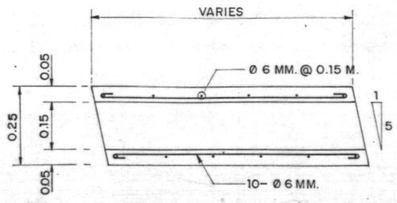
STEEL GRATING COVER DETAILS
SCALE 1 : 10



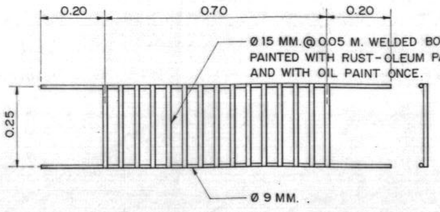
FRONT VIEW OF GRATING
SCALE 1 : 20



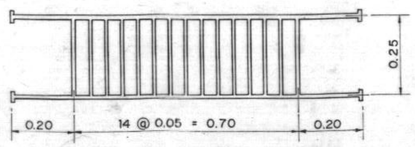
SECTION OF RECTANGULAR DRAINAGE PIPE
SCALE 1 : 10



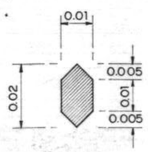
SECTION (E)-(E)
SCALE 1 : 10



STEEL GRATING DETAILS
SCALE 1 : 10



CAST-IRON GRATING DETAILS
SCALE 1 : 10

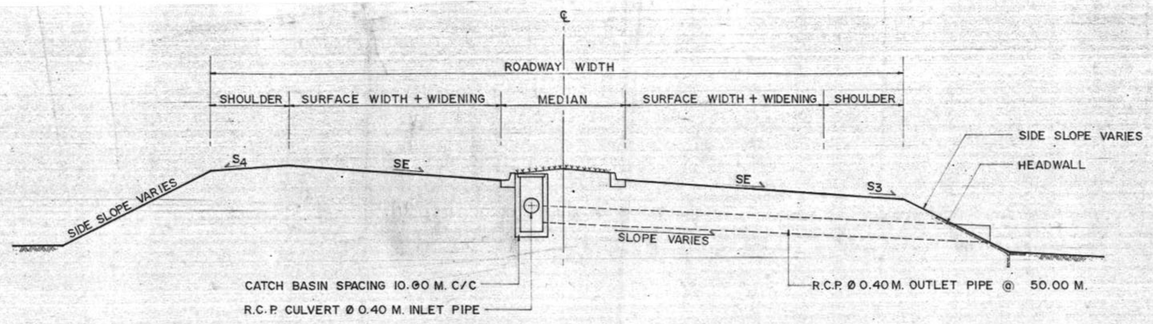


KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

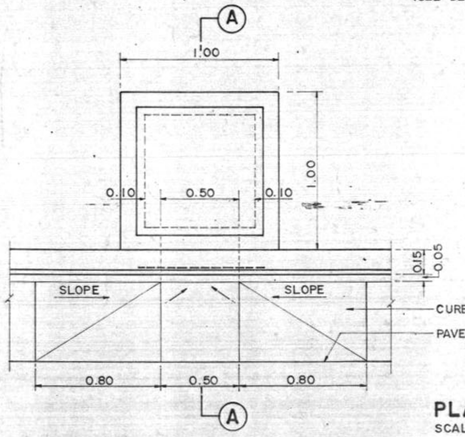
STANDARD DRAWING

MANHOLE DETAILS- II

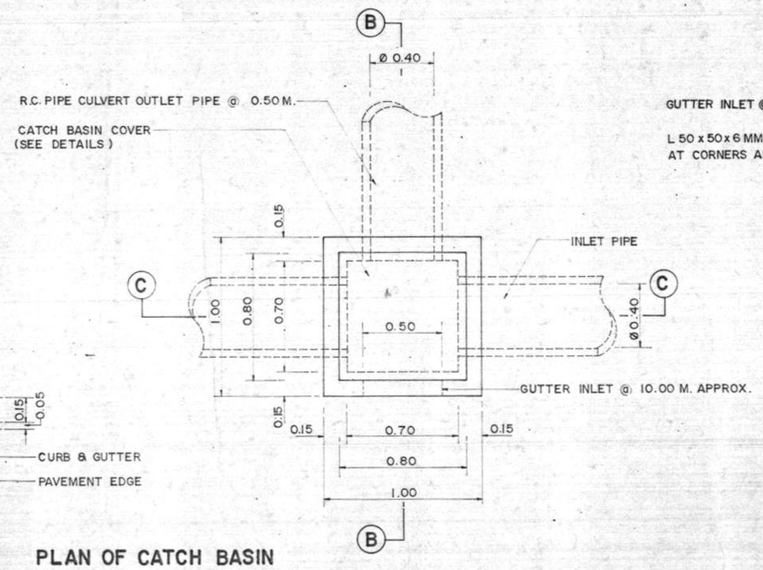
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. DS-40
		SHEET NO. 80

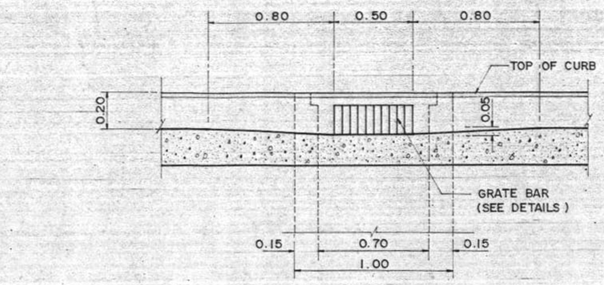


TYPICAL CROSS SECTION ALONG SUPERELEVATION SECTION
SCALE 1:100

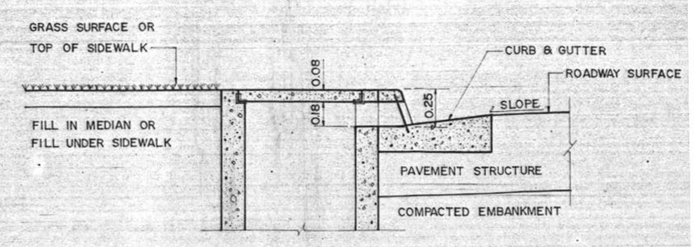


PLAN OF CATCH BASIN
SCALE 1:20

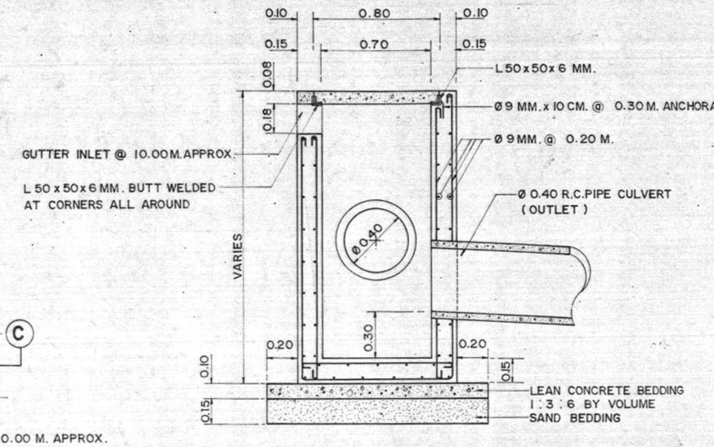




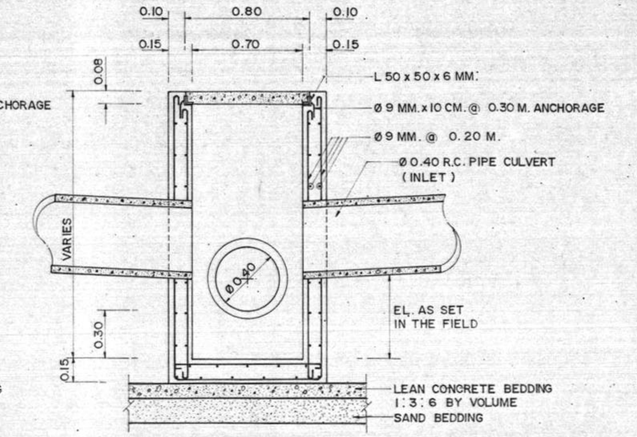
FRONT VIEW OF GRATING
SCALE 1:20



SECTION (A)-(A)
SCALE 1:20



SECTION (B)-(B)
SCALE 1:20



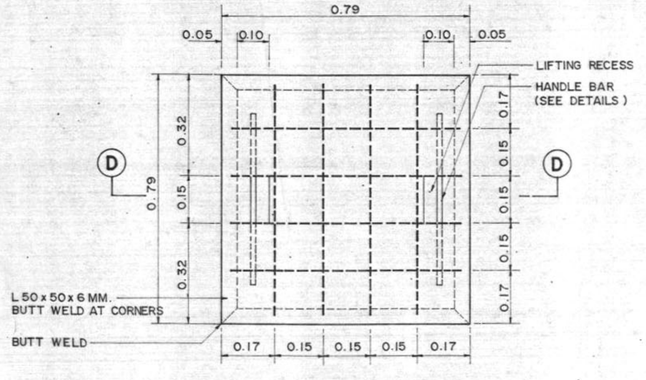
SECTION (C)-(C)
SCALE 1:20

NOTES :

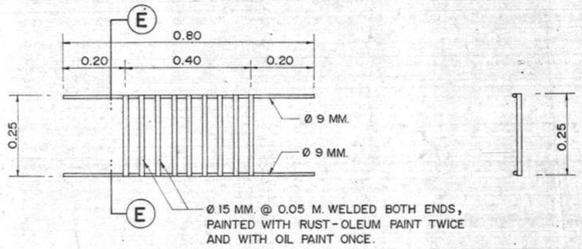
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	350	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

3. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24.
4. STRUCTURAL STEEL SHALL CONFORM TO TIS. 116 GRADE Fe 30.
5. FLAT PLATE STEEL SHALL CONFORM TO TIS. 55 GRADE SR 24.
6. STRUCTURAL STEEL AND FLAT PLATE STEEL SHALL BE PAINTED WITH RUST-OLEUM PAINT OR EQUIVALENT TWICE AND WITH OIL PAINT ONCE.
7. CLEAR CONCRETE COVER SHALL BE 3 CM.

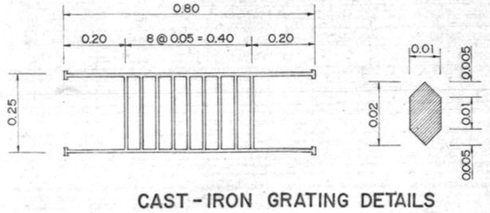


PLAN

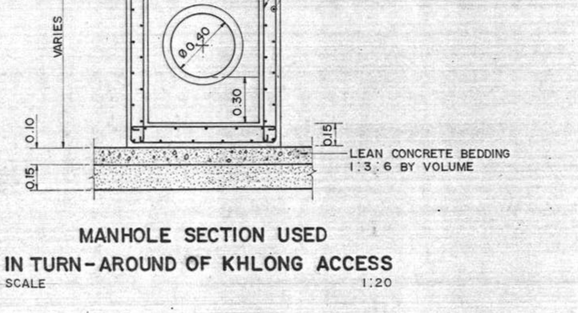


GRATE BAR DETAILS
SCALE 1:10

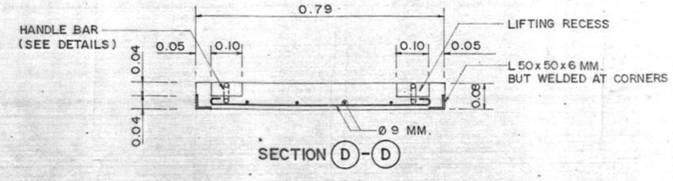
SECTION (E)-(E)
SCALE 1:10



CAST-IRON GRATING DETAILS
SCALE 1:10

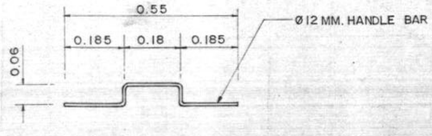


MANHOLE SECTION USED IN TURN-AROUND OF KHLONG ACCESS
SCALE 1:20

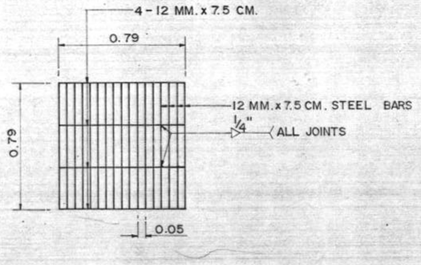


SECTION (D)-(D)

CATCH BASIN COVER
SCALE 1:10



HANDLE BAR DETAILS
SCALE 1:10



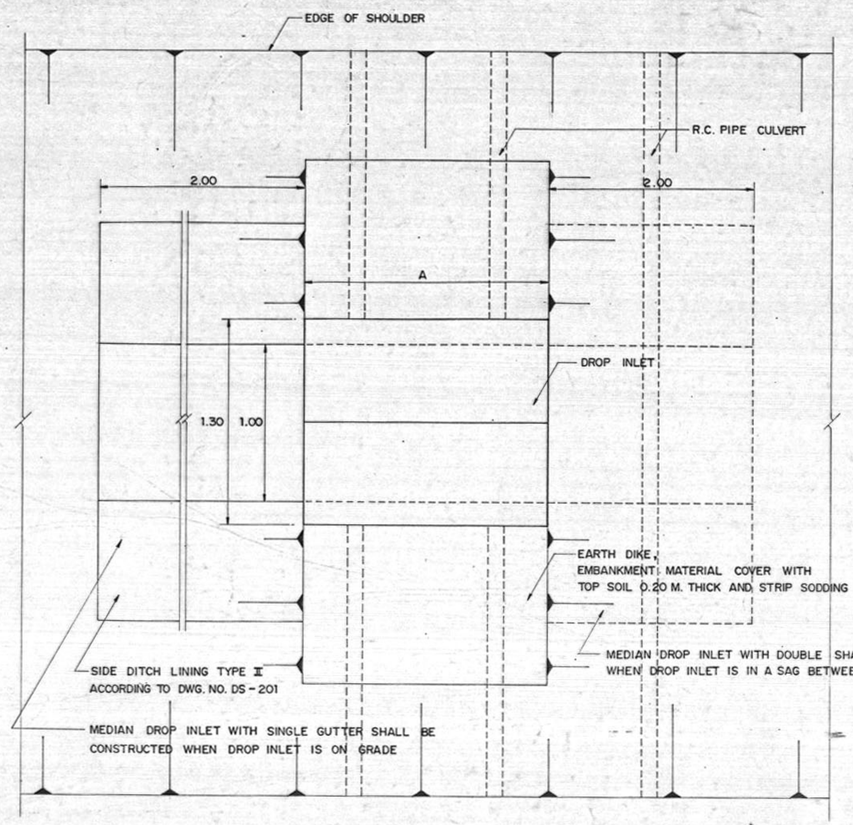
STEEL GRATING COVER PLAN
SCALE 1:10

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

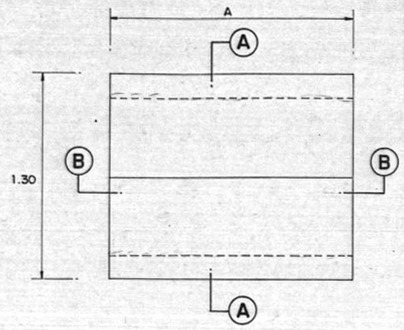
STANDARD DRAWING

CATCH BASIN

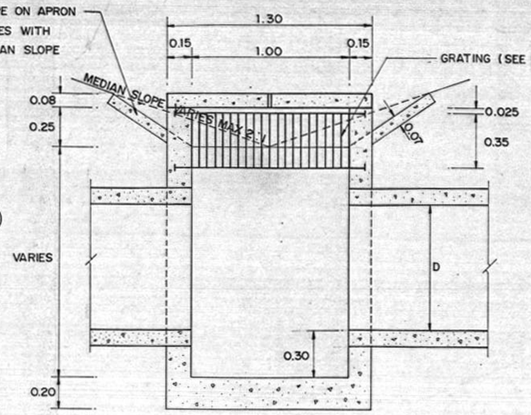
DESIGNED: D.O.H. & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: (DIRECTOR GENERAL)		DWG. NO. DS-403
		SHEET NO. 81



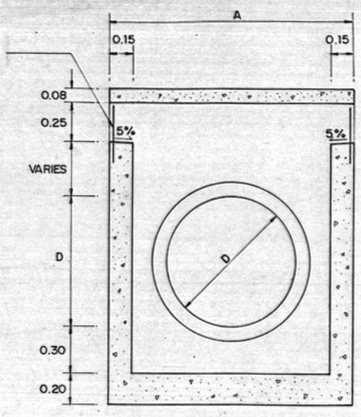
PLAN
SCALE 1:20



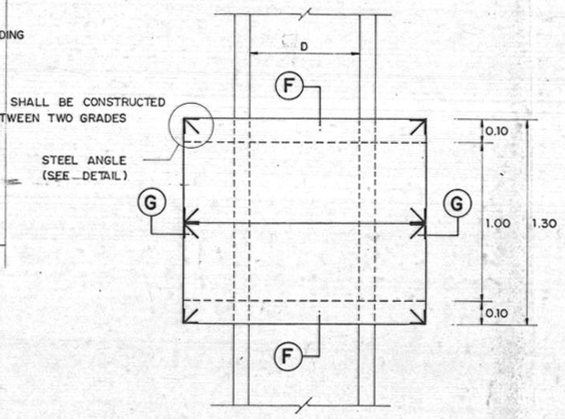
PLAN DROP INLET
SCALE 1:20



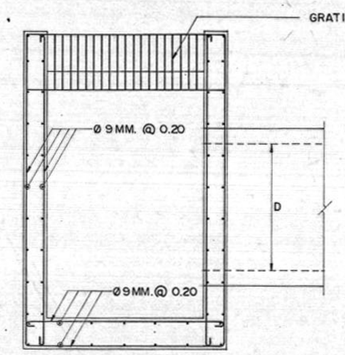
SECTION (A)-(A)
SCALE 1:20



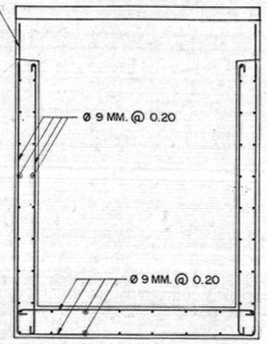
SECTION (B)-(B)
SCALE 1:20



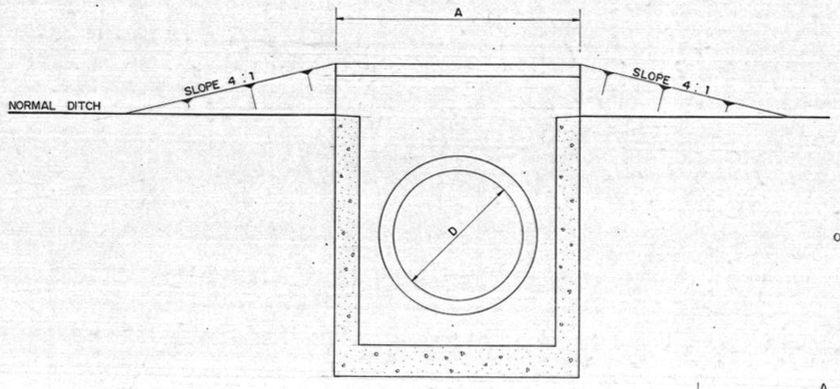
STEEL CORNER GUARD
SCALE 1:20



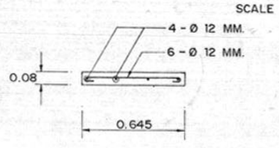
SECTION (F)-(F)
SCALE 1:20



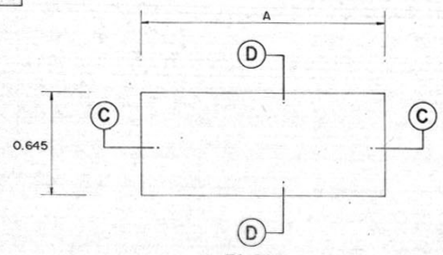
SECTION (G)-(G)
SCALE 1:20



SECTION (E)-(E)
SCALE 1:20

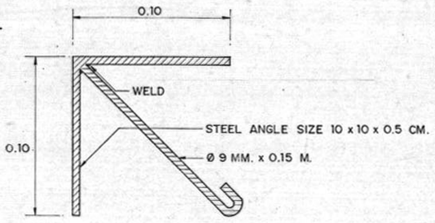


SECTION (D)-(D)

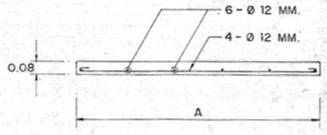


PLAN

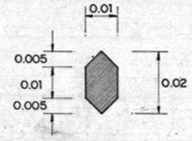
COVER FOR DROP INLET DETAIL
SCALE 1:20

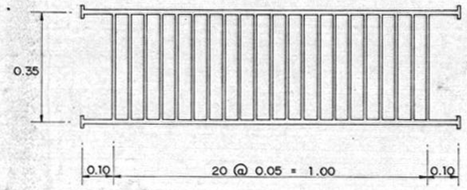


DETAIL OF STEEL ANGLE
SCALE 1:20

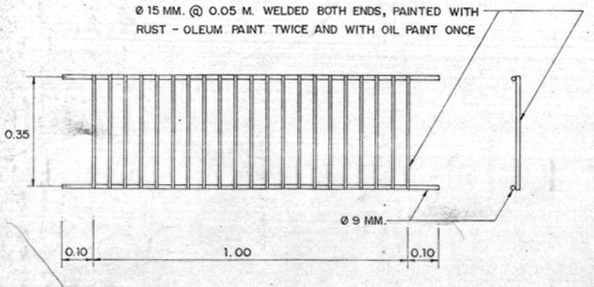


SECTION (C)-(C)





CAST - IRON GRATING DETAILS
SCALE 1:10



STEEL GRATING DETAILS
SCALE 1:10

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MAXIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METERS IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE I	350	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

3. CLEAR CONCRETE COVER SHALL BE 5 CM.
4. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24.
5. STRUCTURE STEEL SHALL CONFORM TO TIS. 116 GRADE Fe 24.
6. WIDTH OF DROP INLET (A)

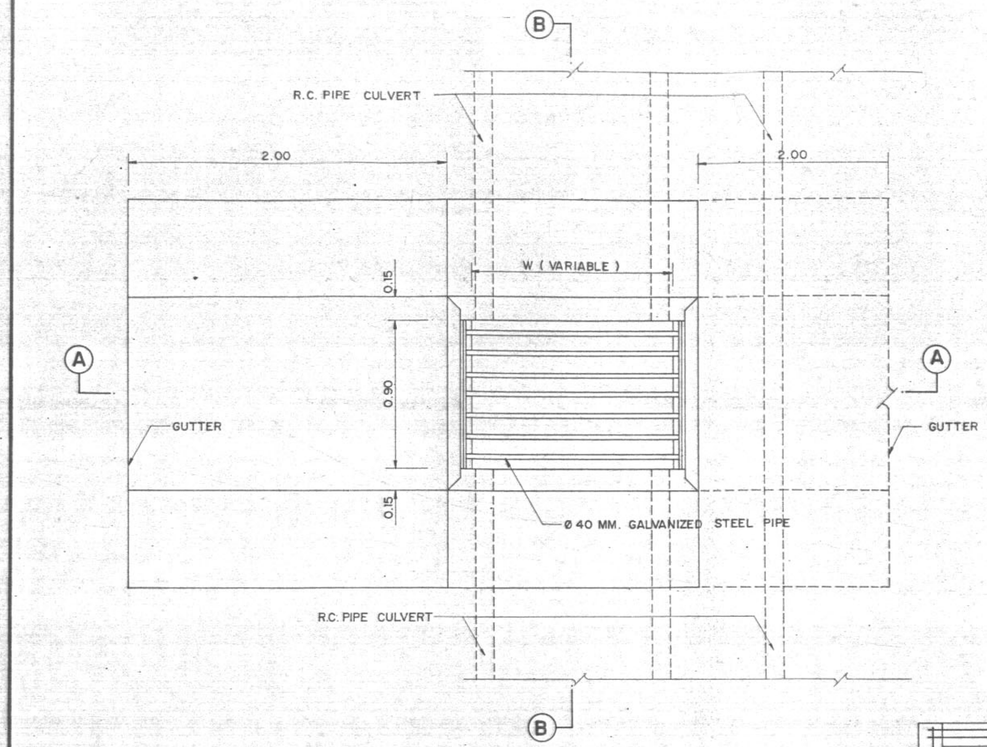
A = 1.10 M.	FOR R.C. PIPE CULVERT DIAMETER	D =	0.40 M.
A = 1.10 M.	"	D =	0.60 M.
A = 1.55 M.	"	D =	0.80 M.
A = 1.55 M.	"	D =	1.00 M.
A = 1.80 M.	"	D =	1.20 M.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

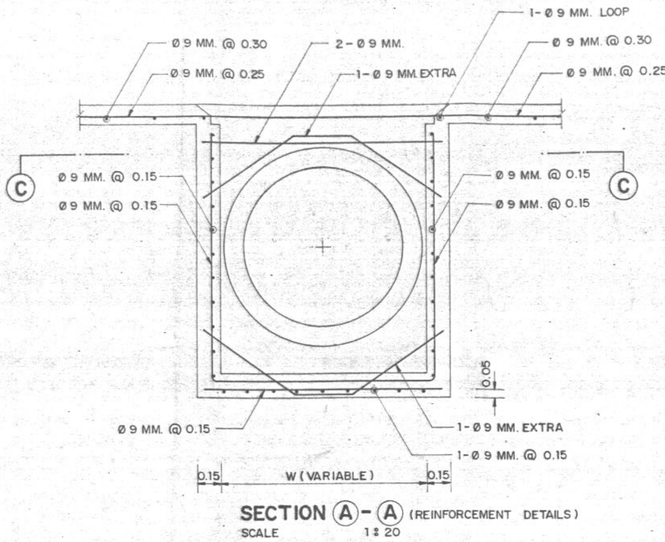
STANDARD DRAWING

MEDIAN DROP INLET TYPE I

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Bunyay (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. DS-40
		SHEET NO. 82

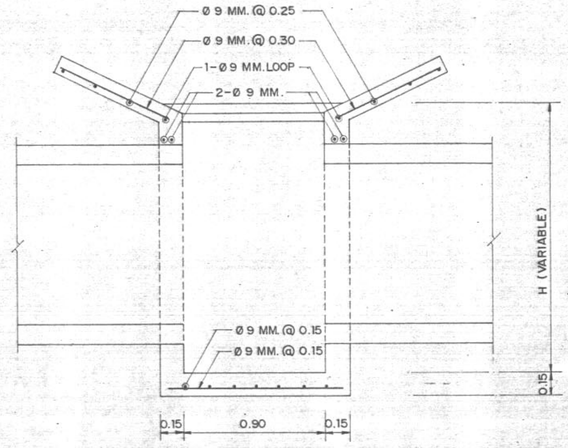


PLAN
SCALE 1 : 20

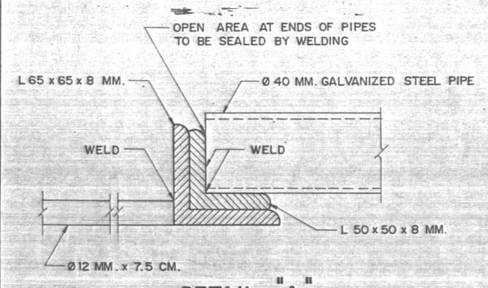


SECTION (A) - (A) (REINFORCEMENT DETAILS)
SCALE 1 : 20

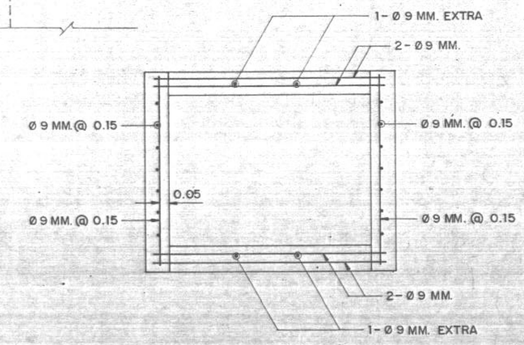
DIMENSIONAL REQUIREMENTS OF MEDIAN DROP INLET		
INSIDE DIA. OF R.C. PIPE CULVERT (M.)	W (M.)	MIN. H (M.)
0.40	0.80	1.00
0.60	0.80	1.20
0.80	1.25	1.40
1.00	1.25	1.60
1.20	1.50	1.80



SECTION (B) - (B) (REINFORCEMENT DETAILS)
SCALE 1 : 20



DETAIL "A"
SCALE 1 : 2



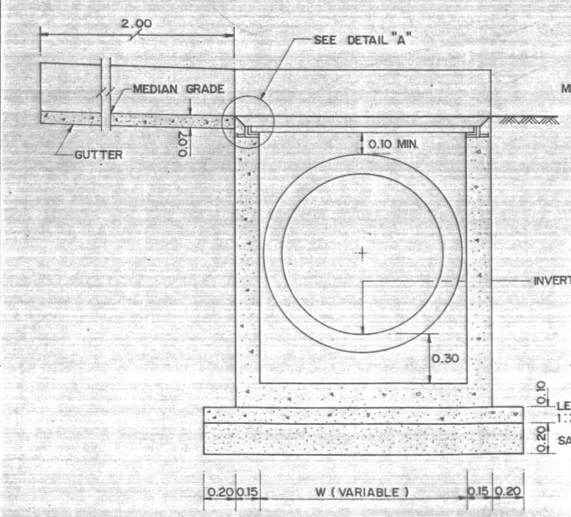
SECTION (C) - (C) (REINFORCEMENT DETAILS)
SCALE 1 : 20

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. MEDIAN DROP INLET WITH SINGLE GUTTER SHALL BE CONSTRUCTED WHEN DROP INLET IS ON GRADE.
3. MEDIAN DROP INLET WITH DOUBLE GUTTER SHALL BE CONSTRUCTED WHEN DROP INLET IS IN A SAG BETWEEN TWO GRADES.
4. MEDIAN DITCH TO BE WARPED TO TIE SMOOTHLY INTO INLET GUTTER.
5. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

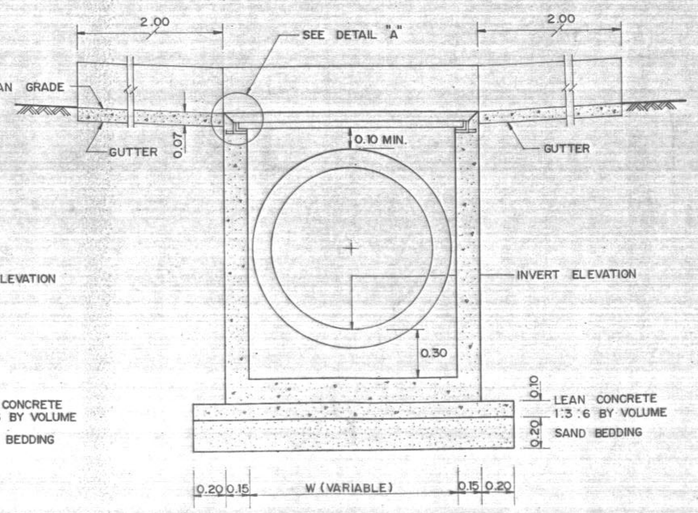
PORTLAND CEMENT TYPE 1	350	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

6. CLEAR CONCRETE COVER SHALL BE 5 CM.
7. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24.



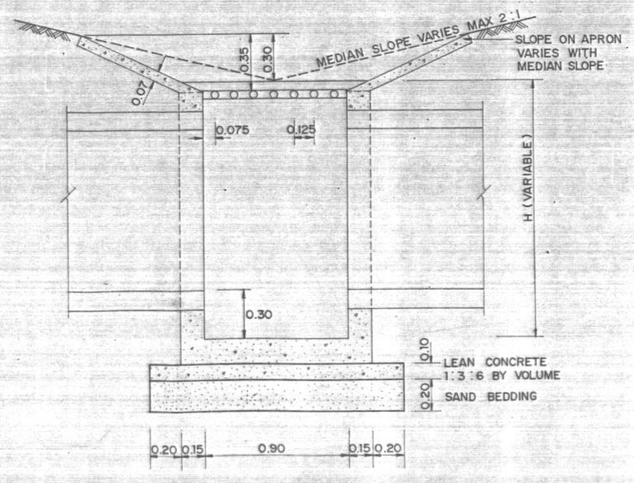
SECTION (A) - (A)
SCALE 1 : 20

FOR SINGLE GUTTER



SECTION (A) - (A)
SCALE 1 : 20

FOR DOUBLE GUTTER



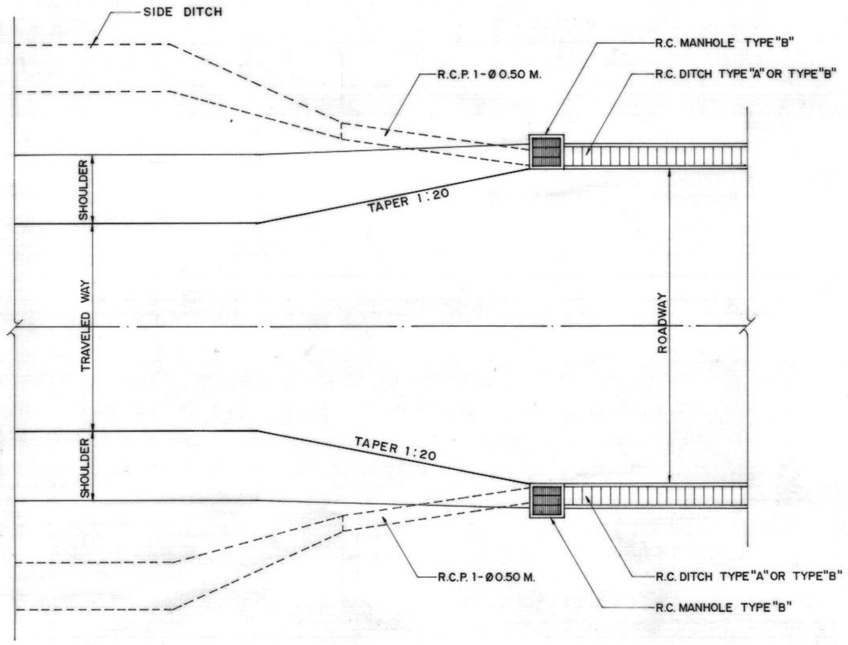
SECTION (B) - (B)
SCALE 1 : 20

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

MEDIAN DROP INLET TYPE II

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SH
APPROVED : (DIRECTOR GENERAL)		DWG. NO. DS-
		SHEET NO.

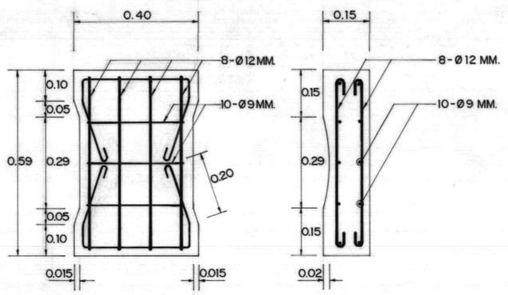


PLAN OF DRAIN CHUTE FOR R.C. DITCH TYPE "A" AND TYPE "B"

NOT TO SCALE

PLAN OF R.C. DITCH TYPE "A" WITH R.C. COVER

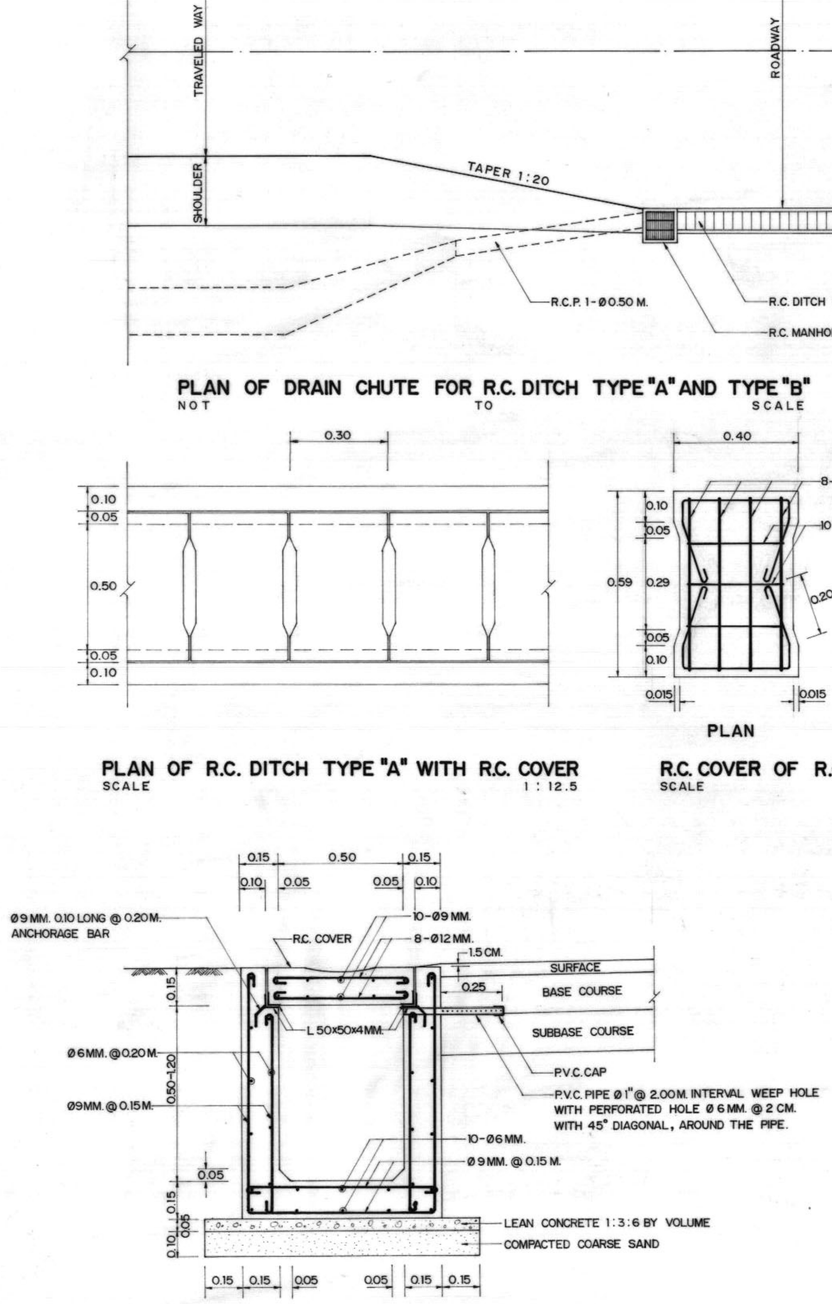
SCALE 1 : 12.5



PLAN SECTION

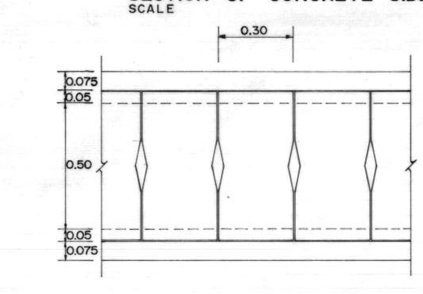
R.C. COVER OF R.C. DITCH TYPE "A"

SCALE 1 : 10



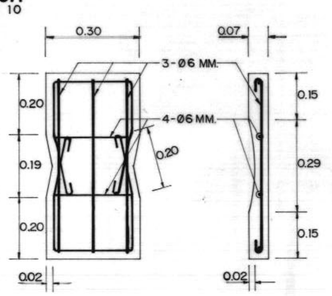
SECTION OF R.C. DITCH TYPE "A"

SCALE 1 : 12.5



PLAN OF R.C. DITCH TYPE "B" WITH R.C. COVER

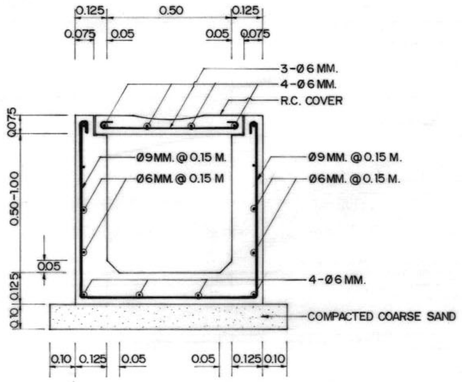
SCALE 1 : 12.5



PLAN SECTION

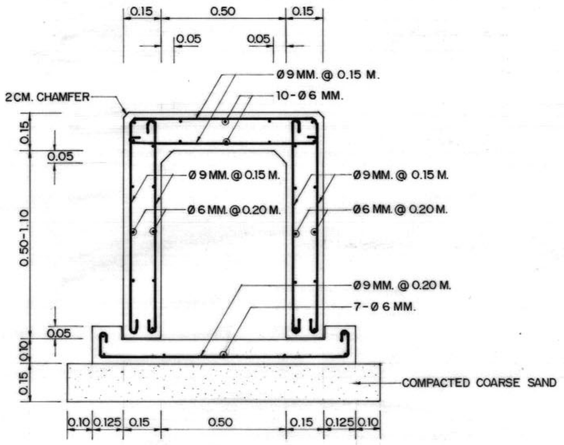
R.C. COVER OF R.C. DITCH TYPE "B"

SCALE 1 : 10



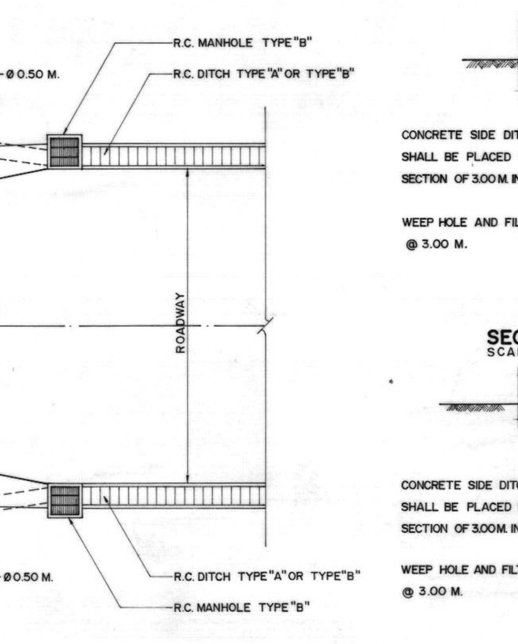
SECTION OF R.C. DITCH TYPE "B"

SCALE 1 : 12.5



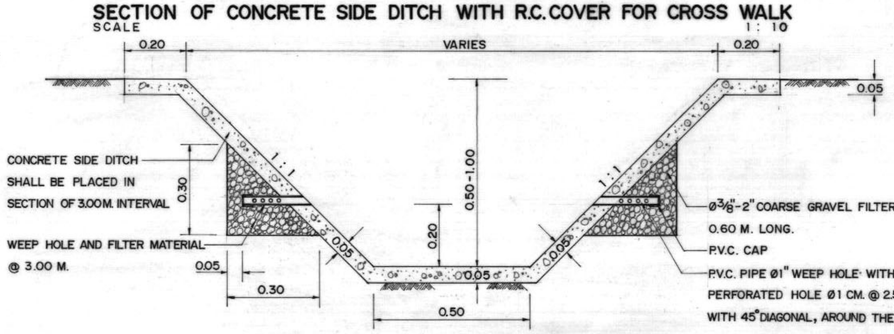
SECTION OF R.C. DITCH TYPE "A" AND TYPE "B" CROSS DRAIN AT CONNECTION ROAD

SCALE 1 : 12.5



SECTION OF CONCRETE SIDE DITCH WITH R.C. COVER FOR CROSS WALK

SCALE 1 : 10



SECTION OF CONCRETE SIDE DITCH

SCALE 1 : 10

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONCRETE FOR SIDE DITCH SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 180 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOW :

PORTLAND CEMENT TYPE 1	320	KG.(MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM.(MAX.)

3. CONCRETE FOR R.C. DITCH TYPE "A" AND TYPE "B" SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOW :

PORTLAND CEMENT TYPE 1	350	KG.(MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM.(MAX.)

4. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24
5. STRUCTURAL STEEL SHALL CONFORM TO TIS. 116 GRADE Fe 30 AND PAINTED WITH RUST-OLEUM PAINT OR EQUIVALENT IN TWO LAYERS.
6. FLAT PLATE STEEL SHALL CONFORM TO TIS. 55 GRADE SR 24
7. LAP LENGTH SHALL NOT BE LESS THAN 40 BAR DIAMETERS.
8. CLEAR CONCRETE COVER SHALL BE 3 CM. UNLESS OTHERWISE INDICATED.
9. JOINT IN R.C. DITCH TYPE "A" AND TYPE "B" SHALL BE SPACED AT 10.00 M. INTERVAL. WIDTH OF THE JOINT IS 1 CM. AND FILLED WITH MORTAR (PORTLAND CEMENT : SAND) RATIO 1:3 BY VOLUME.
10. R.C. DITCH TYPE "A" AND TYPE "B" CROSS DRAIN AT CONNECTION ROAD SHALL BE PRECAST 1 M. LONG. WIDTH OF THE JOINT IS 1 CM. AND FILLED WITH MORTOR (PORTLAND CEMENT : SAND) RATIO 1:3 BY VOLUME.
11. P.V.C. PIPE SHALL CONFORM TO TIS. 17 CLASS 13.5
12. PAYMENT FOR R.C. DITCH TYPE "A" SHALL INCLUDE THE COST OF P.V.C. PIPE AND FILTER MATERIAL.

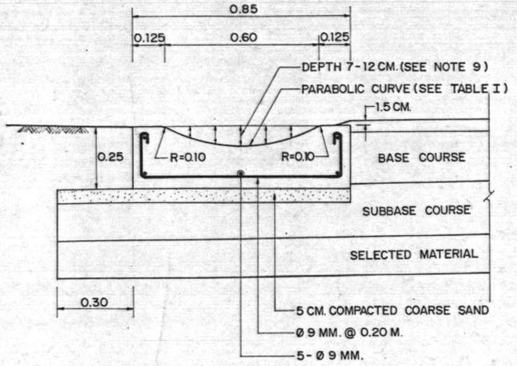
KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

R.C. DITCH DETAILS-I

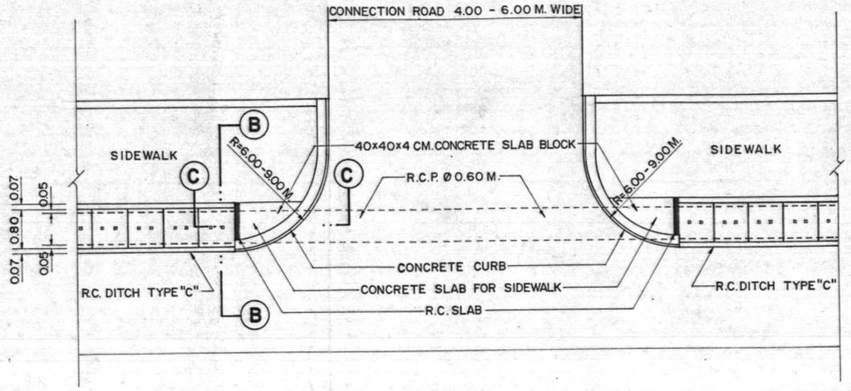
DESIGNED : D.O.H. & CONSULTANTS	**CHECKED :**	**DATE** JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		**SCALE** AS SHOWN
APPROVED : (DIRECTOR GENERAL)		**DWG. NO.** DS-406
		SHEET NO. 84



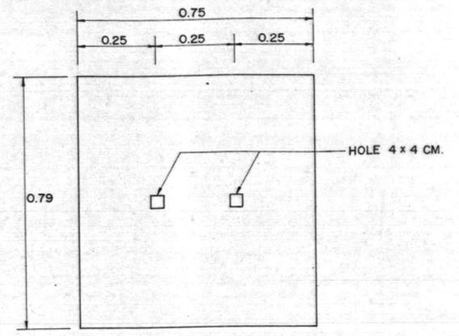
SECTION OF R.C. GUTTER
SCALE 1 : 12.5

TABLE I

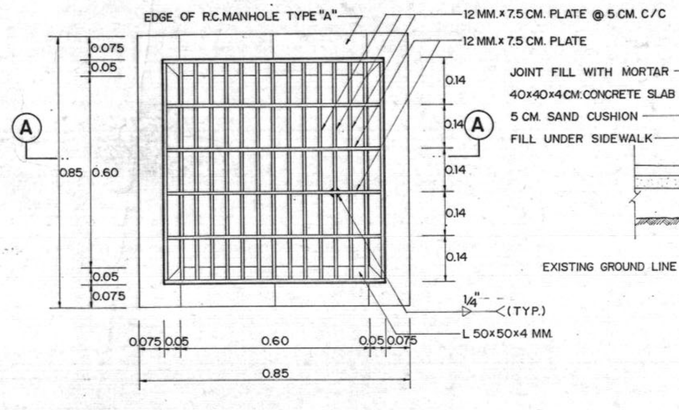
DEPTH (CM.)	X = 10 CM. Y(CM.)	X = 20 CM. Y(CM.)
7.00	6.22	3.89
8.00	7.11	4.44
9.00	8.00	5.00
10.00	8.89	5.56
11.00	9.78	6.11
12.00	10.67	6.67



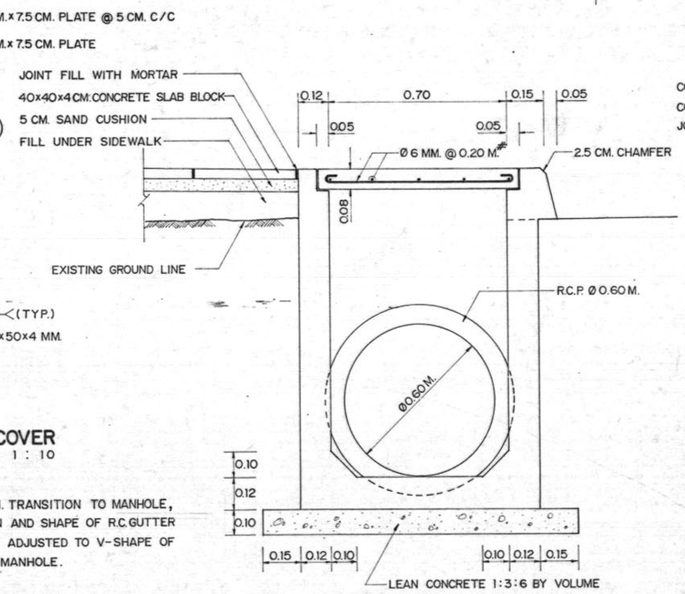
R.C. DITCH TYPE "C" AT SIDE ROAD CONNECTION
NOT TO SCALE



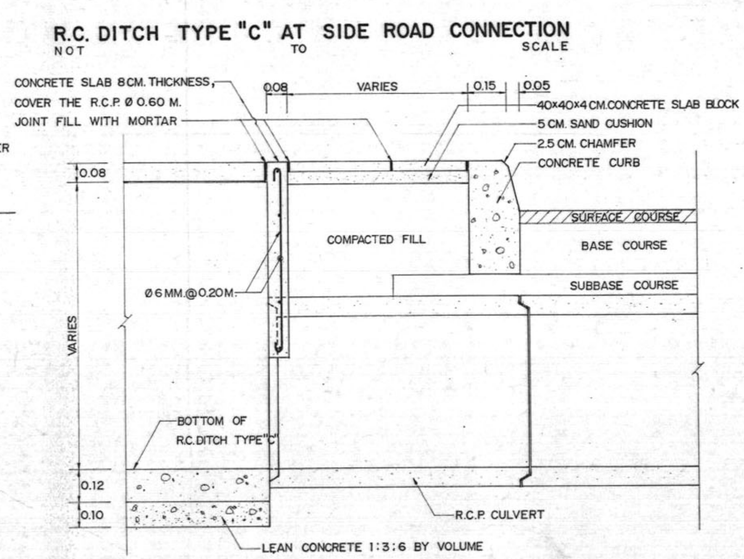
R.C. COVER FOR R.C. DITCH TYPE "C"
SCALE 1 : 10



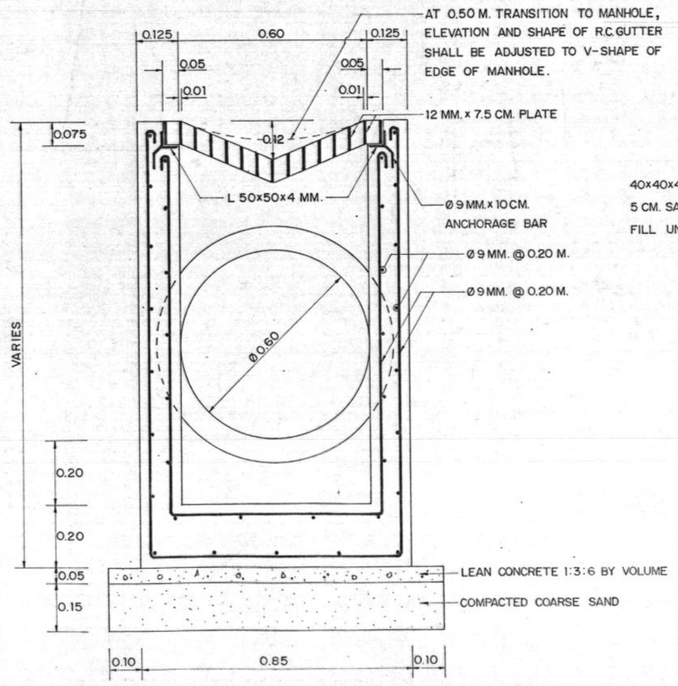
PLAN OF MANHOLE TYPE "A" WITH STEEL COVER
SCALE 1 : 10



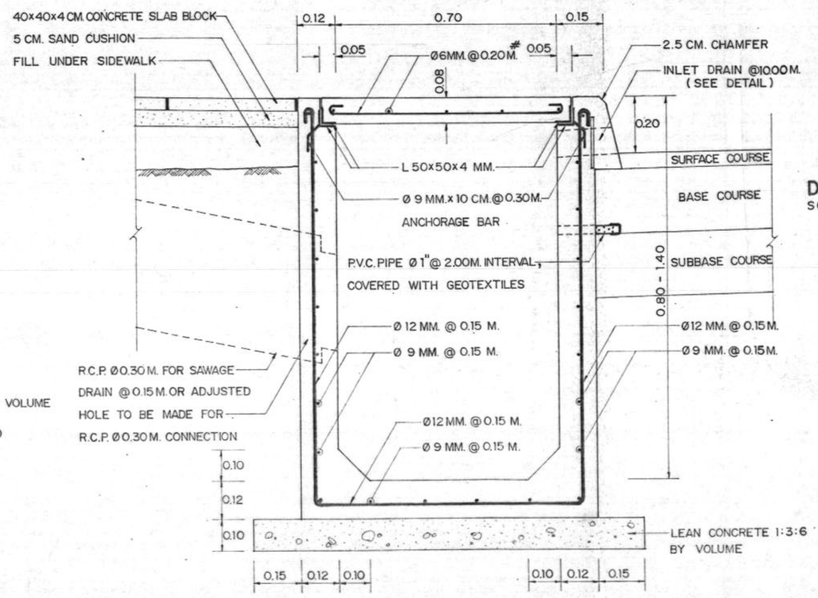
SECTION (B) - (B) FOR R.C. DITCH TYPE "C"
SCALE 1 : 12.5



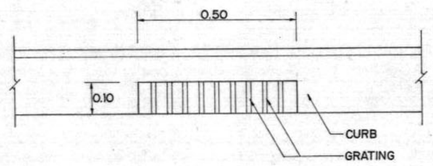
SECTION (C) - (C) FOR R.C. DITCH TYPE "C"
SCALE 1 : 12.5



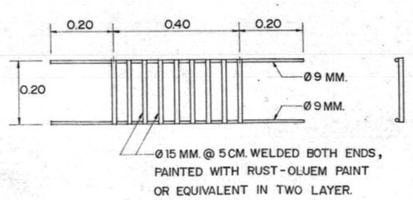
SECTION (A) - (A) FOR MANHOLE TYPE "A"
SCALE 1 : 10



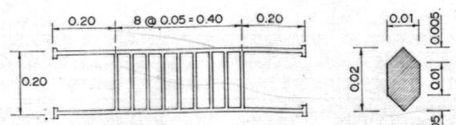
SECTION OF R.C. DITCH TYPE "C"
SCALE 1 : 10



DETAIL OF INLET DRAIN FOR R.C. DITCH TYPE "C"
SCALE 1 : 10



STEEL GRATING DETAILS
SCALE 1 : 10



CAST - IRON GRATING DETAILS
SCALE 1 : 10

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	350	KG.(MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.80	M^3
CONCRETE SLUMP	10	CM.(MAX.)

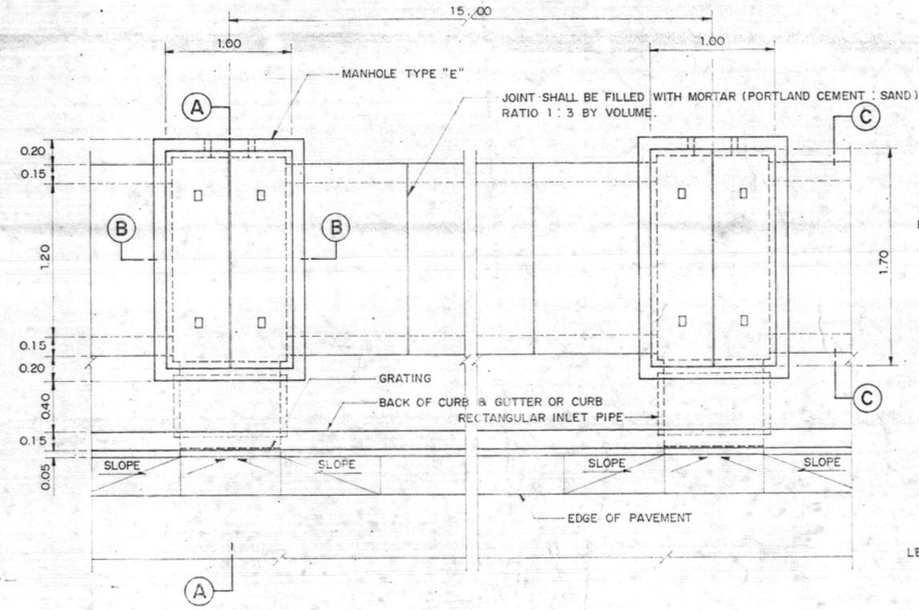
3. REINFORCING STEEL SHALL CONFROM TO TIS. 20 GRADE SR 24
4. STRUCTURAL STEEL SHALL CONFROM TO TIS. 116 GRADE Fe 30 AND PAINTED WITH RUST-OLEUM PAINT OR EQUIVALENT IN TWO LAYERS.
5. FLAT PLATE STEEL SHALL CONFORM TO TIS. 55 GRADE SR 24
6. LAP LENGTH SHALL NOT BE LESS THAN 40 BAR DIAMETERS.
7. CLEAR CONCRETE COVER SHALL BE 3 CM. UNLESS OTHERWISE INDICATED.
8. MANHOLE TYPE "A" SHALL BE CONSTRUCTED AT 15.00 M. INTERVAL UNLESS CONNECTION ROAD WITH AMOUNT OF TRAFFICS, THE R.C. GUTTER SHALL BE VOID AT THE CONNECTION ROAD AND R.C.P. Ø 0.60 M. SHALL BE INSTALLED UNDER THE CONNECTION ROAD WITH MANHOLE TYPE "A" AT BOTH SIDES OF THE CONNECTION ROAD.
9. DEPTH OF R.C. GUTTER AT THE HALF DISTANCE BETWEEN MANHOLE TYPE "A" SHALL BE 7 CM. AND VARY TO BE 12 CM. AT BOTH EDGES OF MANHOLE OR THE LONGITUDINAL SLOPES SHALL NOT BE LESS THAN 0.60 %
10. JOINT IN R.C. GUTTER AND R.C. DITCH TYPE "C" SHALL BE SPACED AT 10.00 M. INTERVAL. WIDTH OF JOINT IS 1 CM. AND FILLED WITH MORTAR (PORTLAND CEMENT : SAND) RATIO 1 : 3 BY VOLUME.
11. THE LONGITUDINAL SLOPES OF R.C. DITCH TYPE "C" SHALL NOT BE LESS THAN 1 : 300.
12. P.V.C. PIPE SHALL CONFORM TO TIS. 17 CLASS 13.5
13. PAYMENT FOR R.C. DITCH TYPE "C" SHALL INCLUDE THE COST OF P.V.C. PIPE AND FILTER MATERIAL.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

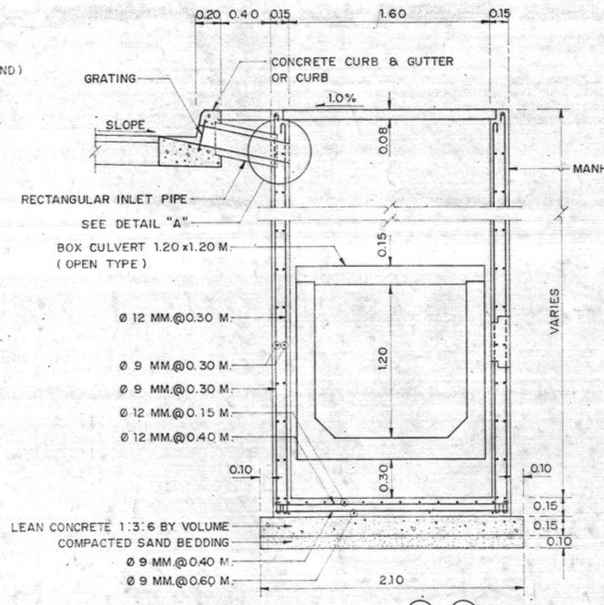
STANDARD DRAWING

R.C. DITCH DETAILS - II

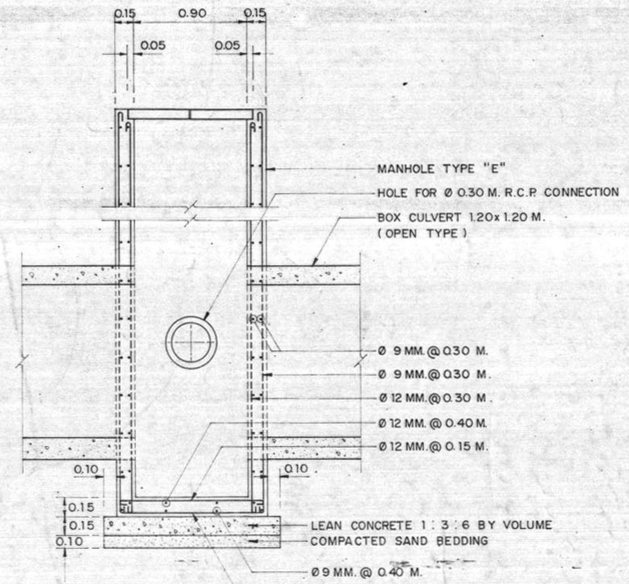
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. DS-407
		SHEET NO. 85



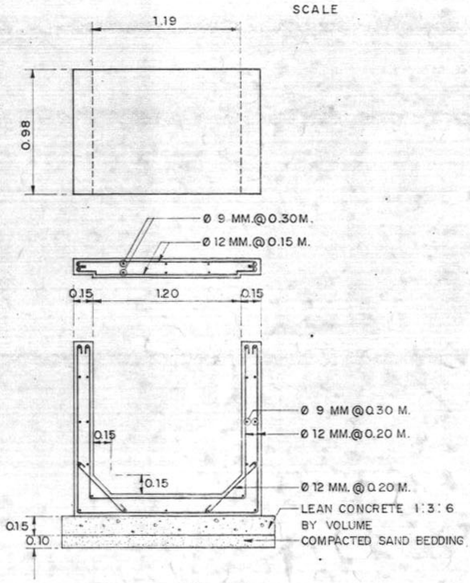
STANDARD INLET MANHOLE & BOX CULVERT
SCALE 1 : 25



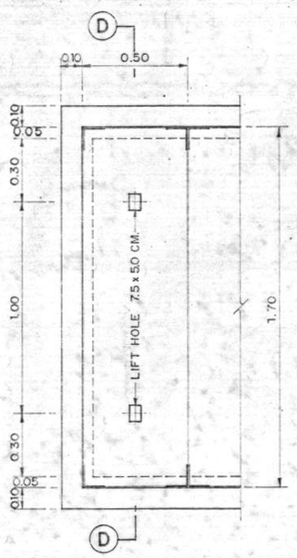
SECTION (A)-(A)
SCALE 1 : 25

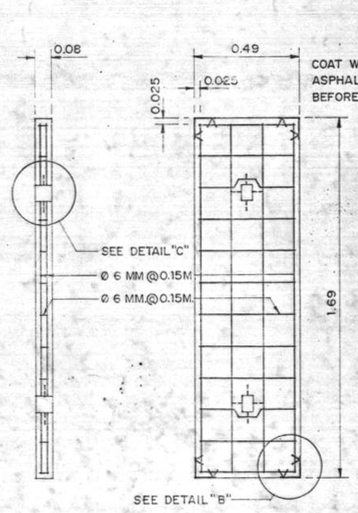


SECTION (B)-(B)
SCALE 1 : 25

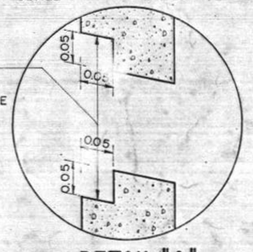


SECTION (C)-(C)
SCALE 1 : 25

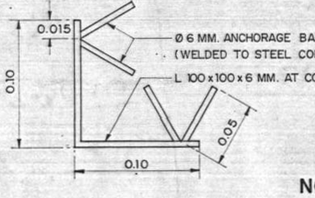




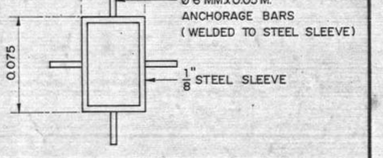
SECTION (D)-(D)
SCALE 1 : 15



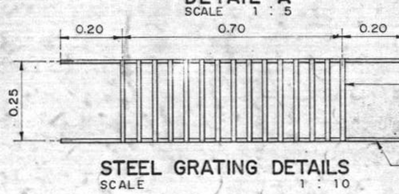
DETAIL "A"
SCALE 1 : 5



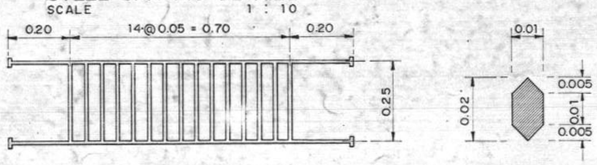
DETAIL "B"
SCALE 1 : 2.5



DETAIL "C"
SCALE 1 : 2.5



STEEL GRATING DETAILS
SCALE 1 : 10



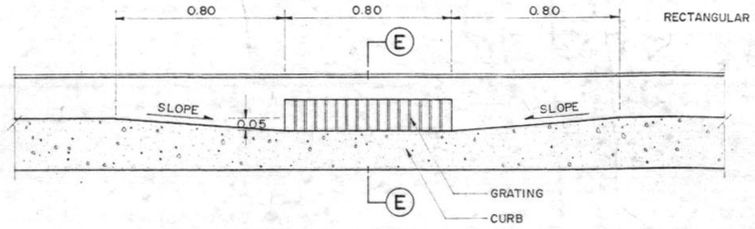
CAST-IRON GRATING DETAILS
SCALE 1 : 10

NOTES :

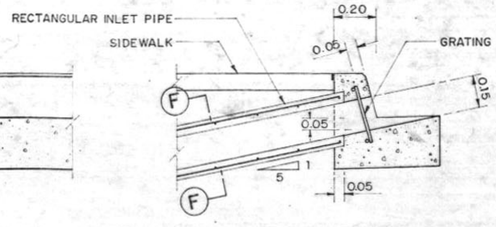
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE I	350 KG. (MIN.)
SAND	0.43 M^3
CRUSHED ROCK OR GRAVEL	0.86 M^3
CONCRETE SLUMP	10 CM. (MAX.)

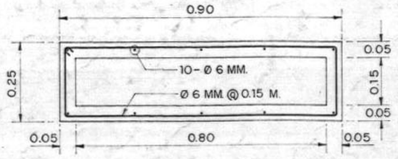
3. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24
4. STRUCTURAL STEEL SHALL CONFORM TO TIS. 116 GRADE Fe 30
5. FLAT PLATE STEEL SHALL CONFORM TO TIS. 55 GRADE SR 24
6. STRUCTURAL STEEL AND FLAT PLATE STEEL SHALL BE PAINTED WITH RUST - OLEUM PAINT OR EQUIVALENT TWICE AND WITH OIL PAINT ONCE.
7. CLEAR CONCRETE COVER SHALL BE 3 CM.
8. MANHOLES SHALL BE ARRANGED AT 15.00 M. (TYP.) INTERVAL OR AS DIRECTED BY THE ENGINEER.



FRONT VIEW OF GRATING
SCALE 1 : 15



SECTION (E)-(E)
SCALE 1 : 15



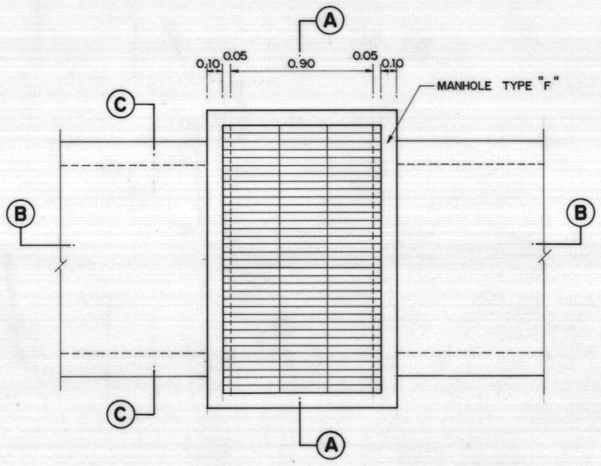
SECTION (F)-(F)
SCALE 1 : 10

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

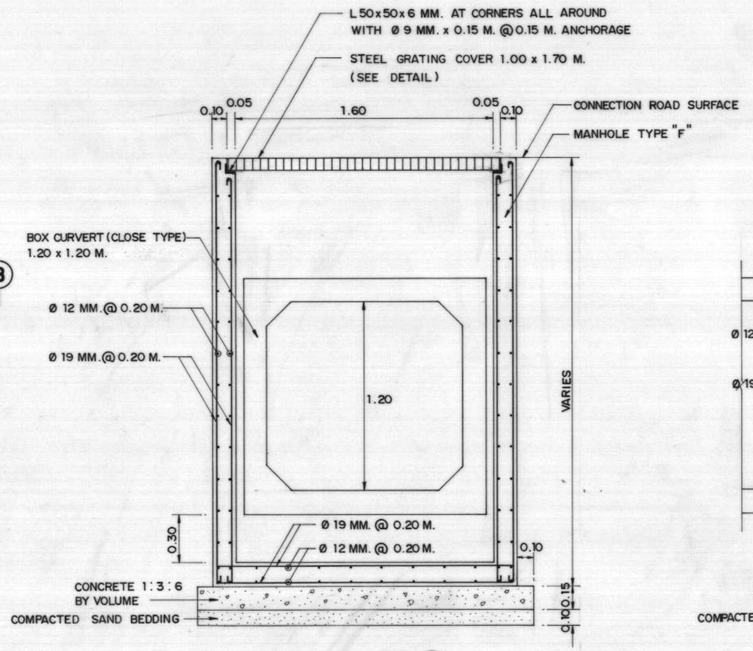
STANDARD DRAWING

DETAIL OF INLET AND MANHOLE TYPE "E" & BOX CULVERT (OPEN - TYPE)

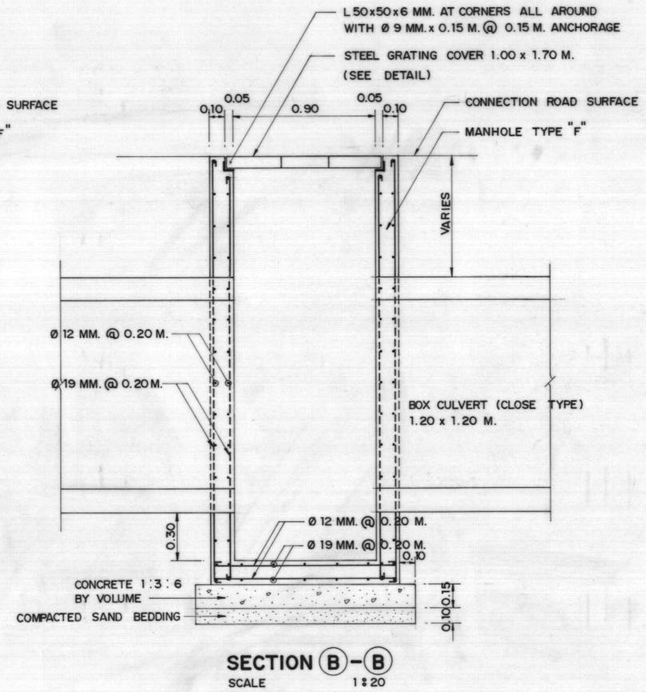
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : F.G.K. (DIRECTOR GENERAL)		DWG. NO. DS-501
		SHEET NO. 86



MANHOLE AND BOX CULVERT (CLOSE TYPE)
SCALE 1 : 20



SECTION (A)-(A)
SCALE 1 : 20



SECTION (B)-(B)
SCALE 1 : 20

NOTES :

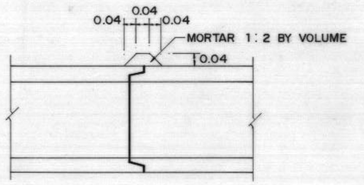
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. BOX CULVERT (CLOSE TYPE) SHALL BE USED FOR CONNECTION ROAD ONLY.
3. IF NECESSARY TO CONSTRUCT MANHOLE AT ROADWAY, MANHOLE COVER SHALL BE STEEL GRATING.
4. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	350	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM.(MAX.)

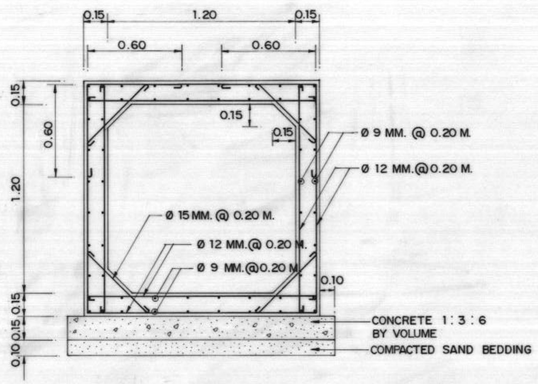
5. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24.
6. STRUCTURAL STEEL SHALL CONFORM TO TIS. 116 GRADE Fe 30.
7. FLAT PLATE STEEL SHALL CONFORM TO TIS. 55 GRADE SR 24.
8. STRUCTURAL STEEL AND FLAT PLATE STEEL SHALL BE PAINTED WITH RUST - OLEUM PAINT OR EQUIVALENT TWICE AND WITH OIL PAINT ONCE.
9. CLEAR CONCRETE COVER SHALL BE 3 CM.
10. THE LENGTH OF BOX CULVERT (CLOSE TYPE) FOR PAYMENT SHALL BE MEASURED AT OUTER EDGE OF MANHOLE.

PRE - CAST BOX CULVERT

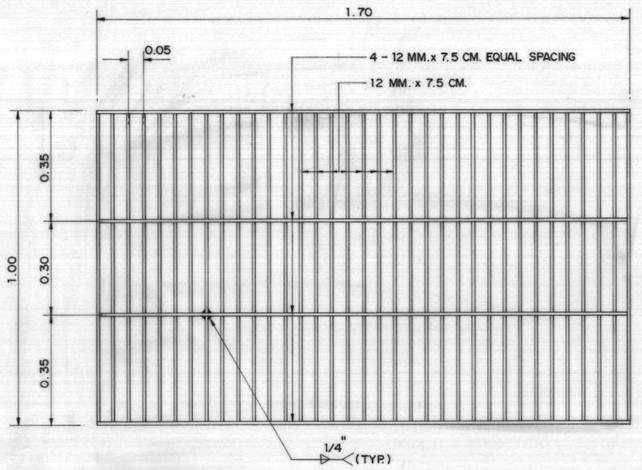
1. THE CONTRACTOR CAN USE PRE - CAST REINFORCED CONCRETE BOX SECTION WHICH CONFORM TO ASTM DESIGNATION C 789M - 83 OR AASHTO NO. M259 - 811 INSTEAD OF THE CAST IN - PLACE BOX CULVERT.
2. DESIGN REQUIREMENTS
   - 2.1 THE DESIGN EARTH COVER SHALL BE THE MAXIMUM VALUE AT FIELD CONDITION BUT NOT LESS THAN 0.60 M.
   - 2.2 BOX CULVERT SIZE SHALL BE 1.20 x 1.20 M. WITH THICKNESS NOT LESS THAN 0.125 M.
   - 2.3 THE CIRCUMFERENTIAL REINFORCEMENT OF BOX CULVERT AT ROADWAY SHALL BE CALCULATED FROM WEIGHT OF BACKFILL AND HS 20 - 44 TRUCK LOADING (FROM THE STANDARD SPECIFICATION FOR HIGHWAY BRIDGES - AASHTO). BUT UNDER SIDEWALK , THE CIRCUMFERENTIAL REINFORCEMENT SHALL BE CALCULATED FROM WEIGHT OF BACKFILL ONLY.
   - 2.4 REINFORCEMENT STEEL SHALL CONFORM TO ASTM A - 82 OR A - 496.
   - 2.5 CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 280 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS.
3. LENGTH OF THE PRE - CAST BOX CULVERT SHALL BE NOT LESS THAN 1.00 M.
4. JOINT OF PRE - CAST BOX CULVERT SHALL BE TONGUE AND GROOVE TYPE WHICH INTERIOR JOINT MUST BE SMOOTH, NOT OBSTRUCT TO FLOW OF WATER.
5. JOINT SHALL BE FILLED WITH MORTAR (PORTLAND CEMENT : SAND) RATIO 1 : 3 BY VOLUME.



6. METHOD OF PLACING AND BEDDING OF PRE - CAST BOX CULVERT SHALL BE THE SAME AS THE CAST IN - PLACE BOX CULVERT.
7. THE LONGITUDINAL REINFORCEMENT SHALL HAVE DIAMETER NOT LESS THAN 5 MM. WITH SPACING NOT MORE THAN 15 CM.



SECTION (C)-(C)
SCALE 1 : 20



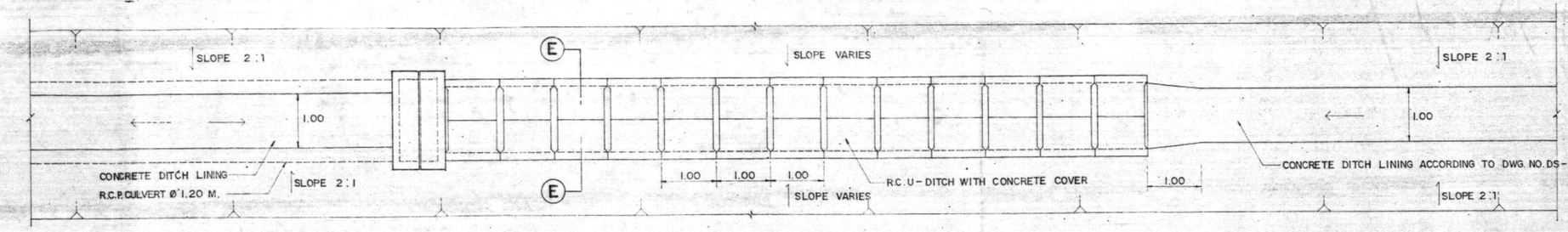
STEEL GRATING COVER DETAILS
SCALE 1 : 10

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

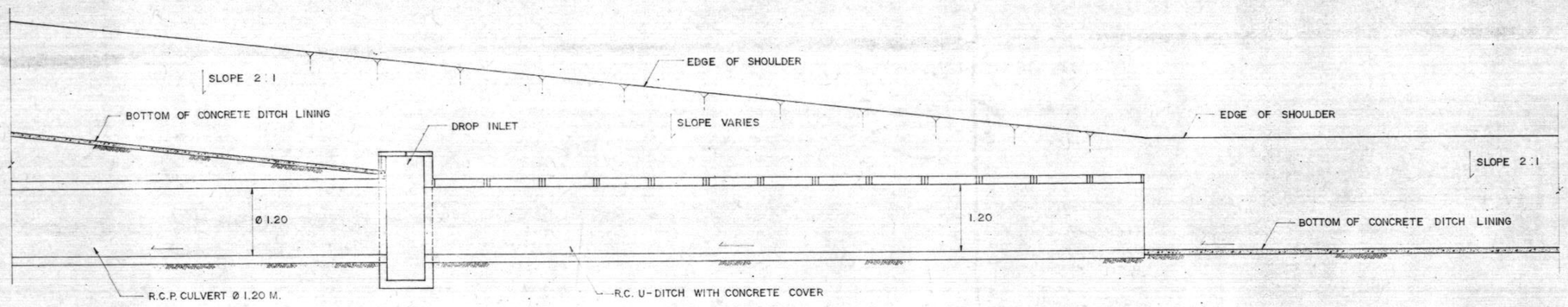
DETAIL OF INLET AND MANHOLE TYPE "F" & BOX CULVERT (CLOSE - TYPE)

DESIGNED : D.O.H & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. DS-502
		SHEET NO. 87



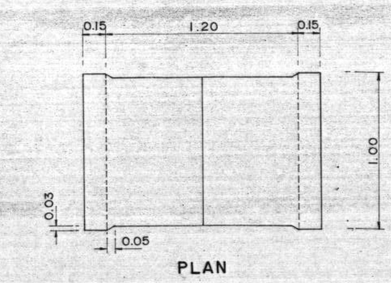
PLAN

SCALE 1 : 50

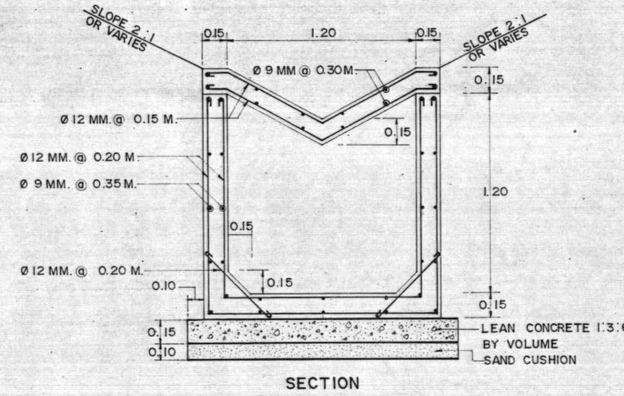


SIDE ELEVATION

SCALE 1 : 50



PLAN



SECTION

R.C. U-DITCH WITH CONCRETE COVER

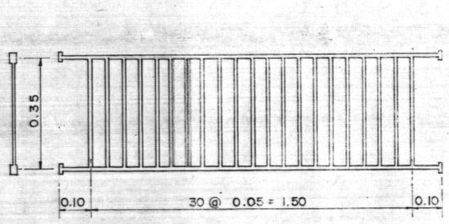
SCALE 1 : 20

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. THIS DRAWING SHALL BE USED WHERE THE DRAINAGE WITH CONCRETE DITCH LINING AT MEDIAN (WITH SIDE SLOPE 1.5 : 1 OR FLATTER) CAN NOT BE CONSTRUCTED.
3. SLOPE OF CULVERT SHALL BE 1 : 1,000 OR STEEPER.
4. SLOPE OF R.C. U-DITCH COVER SHALL BE ADJUSTED TO MEET THE SIDE SLOPES.
5. R.C.P. CULVERT 1-Ø 1.20 M. SHALL BE INSTALLED WITH DROP INLET AT 25.00 M. INTERVAL.
6. JOINT IN R.C. U-DITCH AND CONCRETE DITCH LINING SHALL BE SPACED AT 10.00 M. INTERVAL. WIDTH OF THE JOINT IS 1 CM. AND FILLED WITH MORTAR (PORTLAND CEMENT : SAND) RATIO 1 : 3 BY VOLUME
7. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AT FOLLOWS :

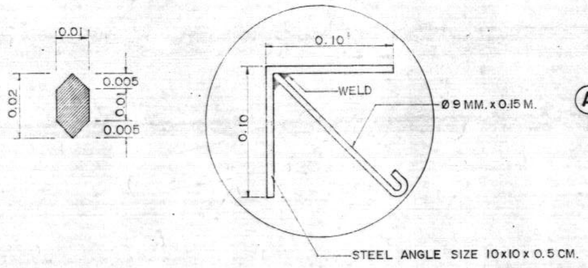
PORTLAND CEMENT TYPE 1	350	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

8. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24.



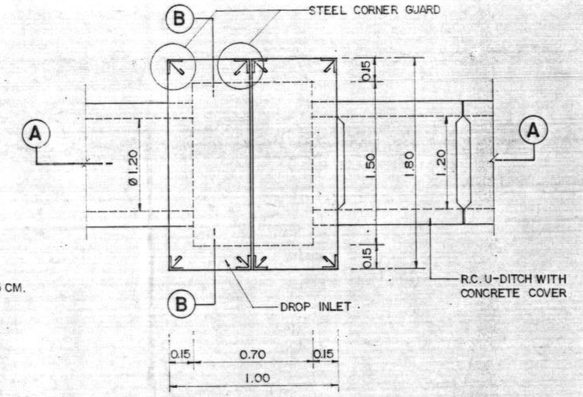
CAST-IRON GRATING DETAILS

SCALE 1 : 10



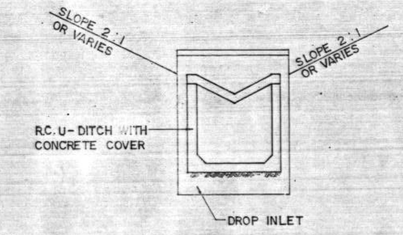
STEEL CORNER GUARD

SCALE 1 : 2.5



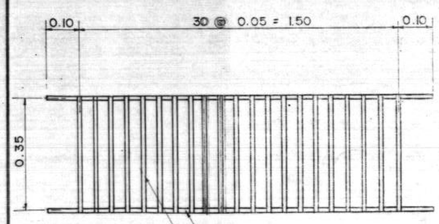
PLAN DROP INLET

SCALE 1 : 30



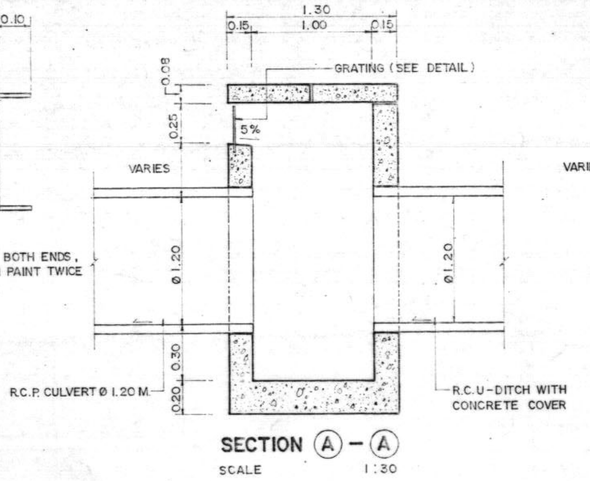
SECTION (E) – (E)

SCALE 1 : 50



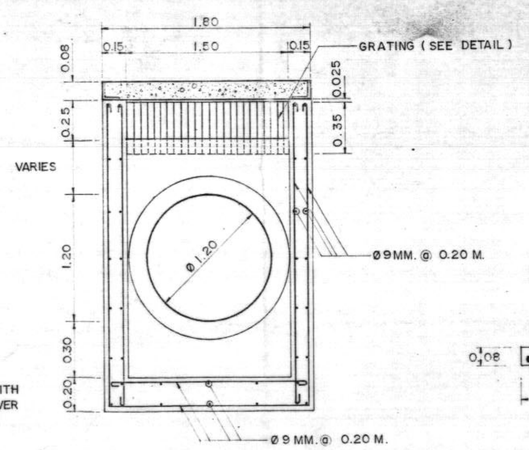
STEEL GRATING DETAILS

SCALE 1 : 10



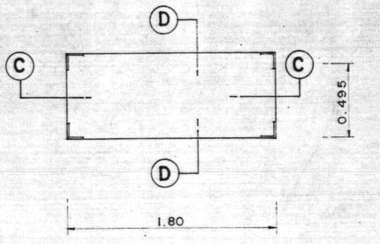
SECTION (A) – (A)

SCALE 1 : 30



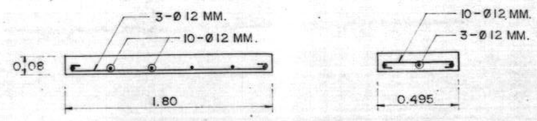
SECTION (B) – (B)

SCALE 1 : 30



PLAN

SCALE 1 : 30



SECTION (C) – (C)

SCALE 1 : 30

SECTION (D) – (D)

SCALE 1 : 30

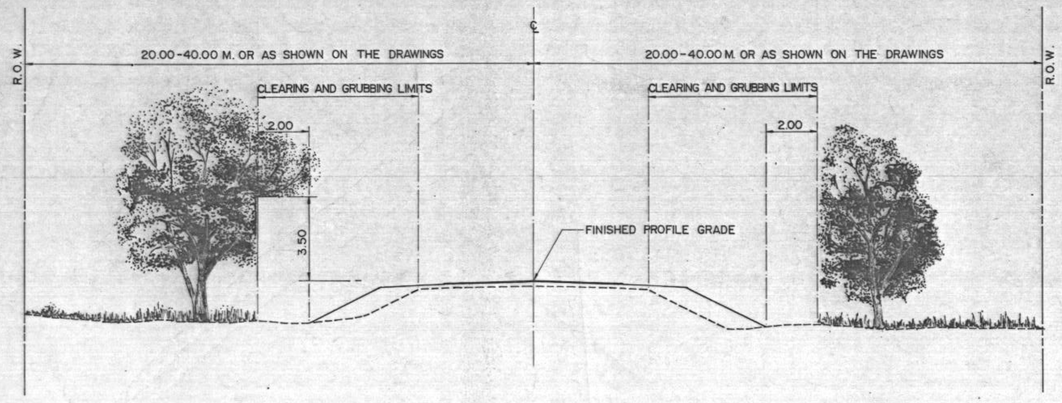
KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

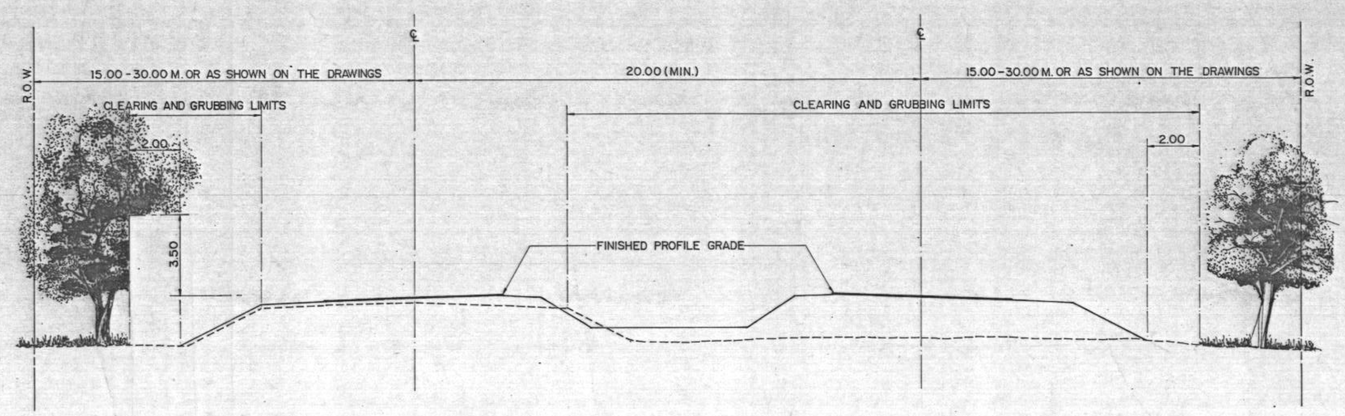
STANDARD DRAWING

DROP INLET & R.C.U-DITCH FOR BRIDGE DRAINAGE

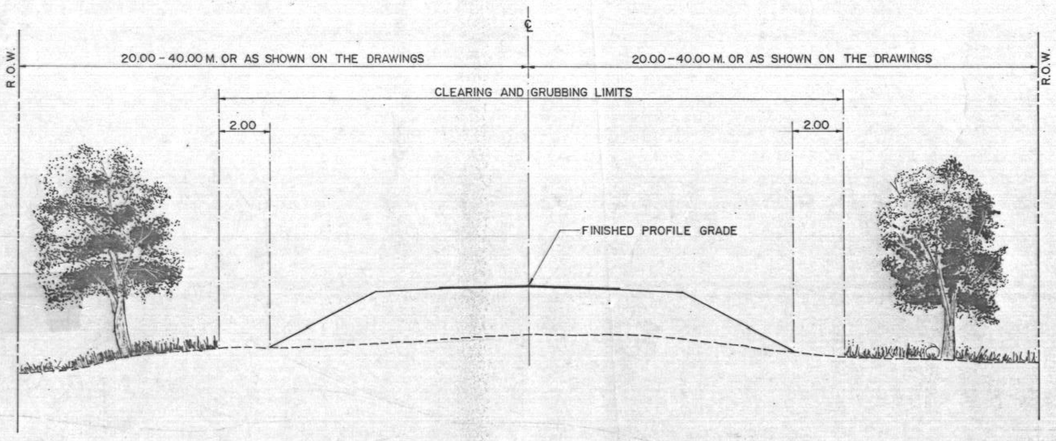
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
		DWG. NO. DS-503
APPROVED : (DIRECTOR GENERAL)		SHEET NO. 88



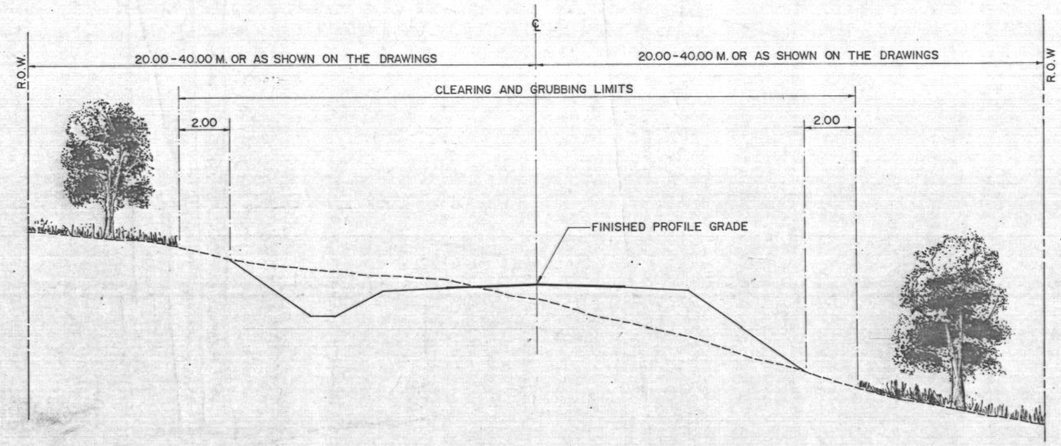
CLEARING AND GRUBBING FOR REHABILITATION OR RECONSTRUCTION PROJECT
NOT TO SCALE



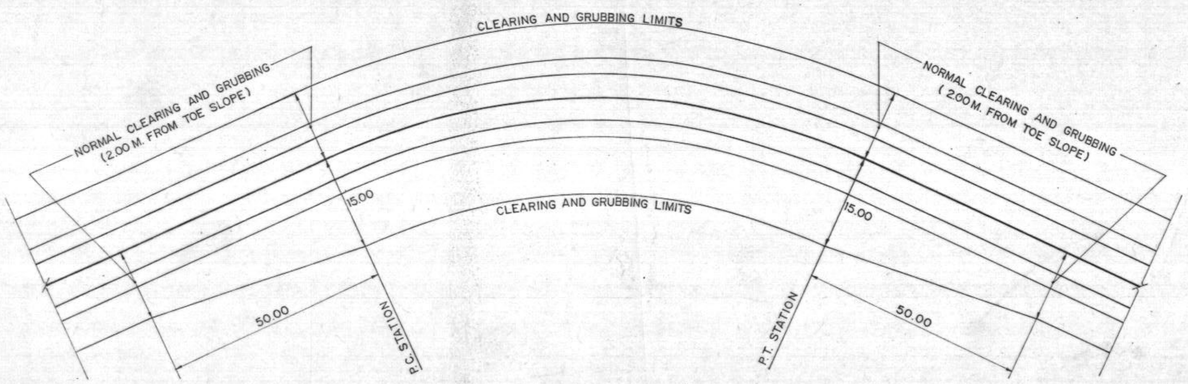
CLEARING AND GRUBBING FOR REHABILITATION (OR RECONSTRUCTION) AND CONSTRUCTION PROJECT
NOT TO SCALE



CLEARING AND GRUBBING FOR CONSTRUCTION PROJECT
NOT TO SCALE



CLEARING AND GRUBBING AT CUT-SECTION
NOT TO SCALE



CLEARING AND GRUBBING AT HORIZONTAL CURVE
NOT TO SCALE

NOTES :

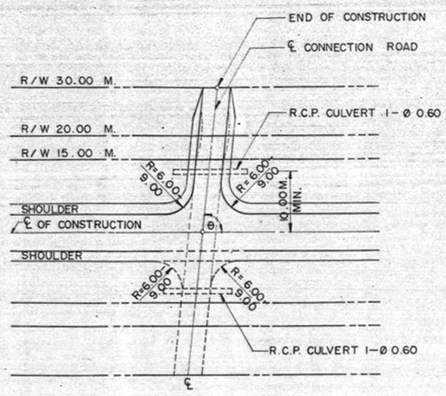
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. AT LOCATIONS WHERE OVERHANGING TREE BRANCHES, SHRUBS, BUSHES, ETC. SPREAD OVER CLEARING AND GRUBBING AREAS, THEY SHALL BE CUT TO PROVIDE A 3.50 M. CLEARANCE OVER FINISHED PROFILE GRADE.
3. SIDE DITCHES, CUT AND FILL SLOPES DIMENSIONS SHALL CONFORM TO THE TYPICAL CROSS-SECTION DRAWING.
4. CLEARING AND GRUBBING IN RESIDENTIAL AREAS SHALL CONFORM TO THE DRAWING FOR THAT PARTICULAR PROJECT OR AS DIRECTED BY THE ENGINEER.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

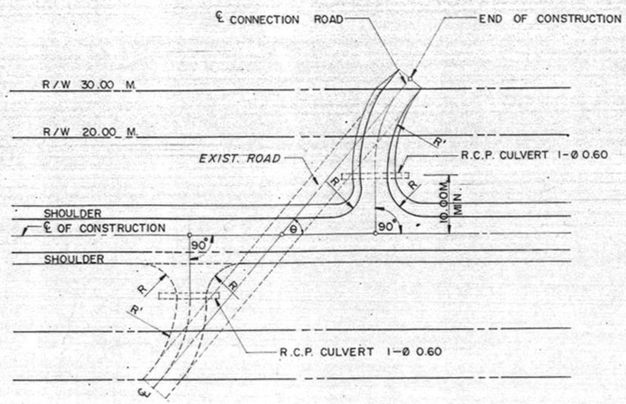
CLEARING AND GRUBBING

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. MD-10
		SHEET NO. 89



CONNECTION ROAD , θ BETWEEN 80°- 90°

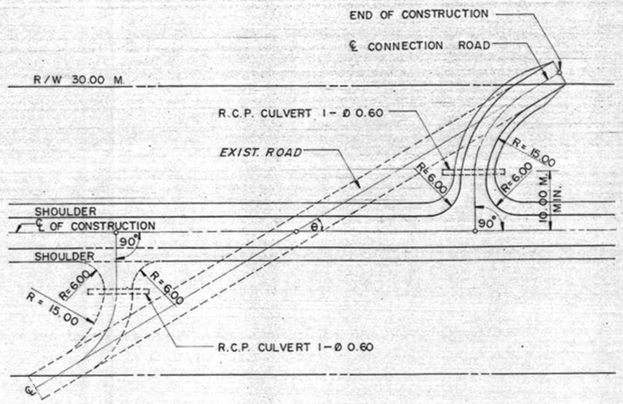
NOT TO SCALE



RIGHT OF WAY 20.00 M. R = 6.00 M. R' = 8.00 M., RIGHT OF WAY 30.00 M. R = 6.00 M. R' = 15.00 M.

CONNECTION ROAD , θ BETWEEN 45°-60°

NOT TO SCALE

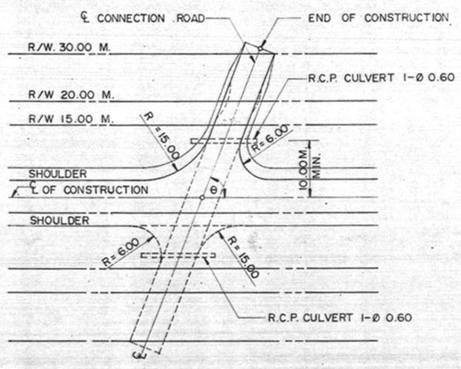


CONNECTION ROAD , θ LESS THAN 45°

NOT TO SCALE

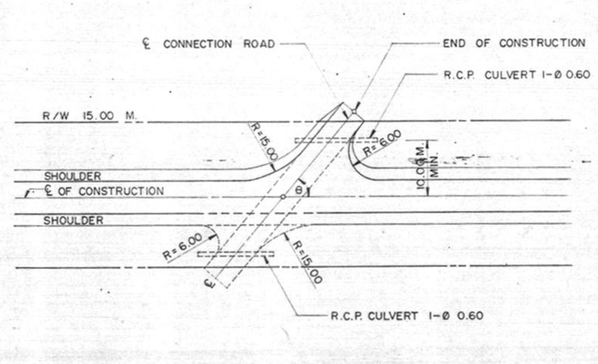
NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE . INDICATED.
2. IN GENERAL, PUBLIC SIDE ROAD CONNECTS THE HIGHWAY TO A VILLAGE, POPULATED AREA, MONASTERY, GOVERNMENT OFFICE , PUBLIC UTILITY OR SOME PLACES OF IMPORTANCE.
3. THE PAVEMENT STRUCTURE OF EACH CONNECTION ROAD SHALL BE AS RECOMMENDED IN THE DRAWING .
4. CHANGE IN SIZE AND NUMBER OF PIPE CULVERT SHALL REQUIRE APPROVAL OF THE ENGINEER . LOCATION AND LENGTH OF PIPE CULVERT DURING CONSTRUCTION SHALL BE AS DIRECTED BY THE ENGINEER IN THE FIELD.
5. THE CONSTRUCTION OF EACH CONNECTION ROAD SHALL END AT R/W LIMIT OR AS SHOWN ON THE DRAWING.
6. THE WIDTH OF PAVED SURFACE OF THE CONNECTION ROAD SHALL BE THE SAME AS OR AS THE EXISTING PAVED CONNECTION ROAD OR AS SHOWN ON THE DRAWING OR AS DIRECTED BY THE ENGINEER BUT SHALL NOT BE WIDER THAN 6.00 M.
7. THE INTERSECTIONS NOT SHOWN ON THE DRAWINGS SHALL REQUIRE PLANS SUBMITTED TO THE ENGINEER FOR APPROVAL BEFORE CONSTRUCTION.
8. FOR SIDE ROAD CONNECTED TO A SMALL VILLAGE WITH LOW TRAFFIC, THE FOLLOWING SHALL APPLY :
   a. THE CONNECTION ROAD SHALL BE UNPAVED ROAD TO THE R/W LIMIT WITH A RECOMMENDED PAVEMENT STRUCTURE AS SHOWN ON THE DRAWING.
   b. THE ROADWAY WIDTH SHALL BE AS SHOWN ON THE DRAWING OR AS DIRECTED BY THE ENGINEER.



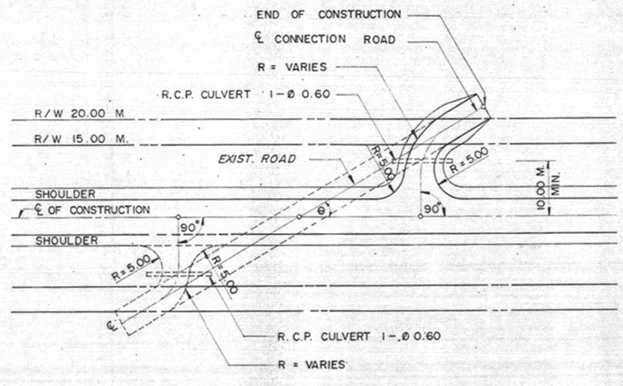
CONNECTION ROAD , θ BETWEEN 60°- 80°

NOT TO SCALE



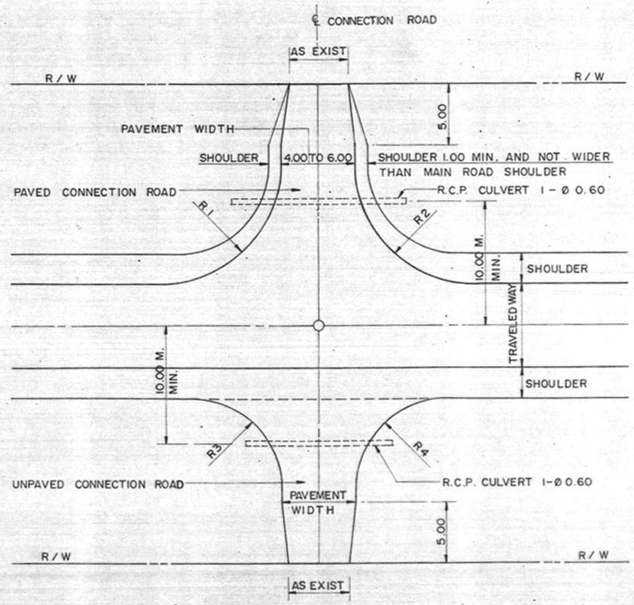
CONNECTION ROAD , θ BETWEEN 45°- 60°

NOT TO SCALE



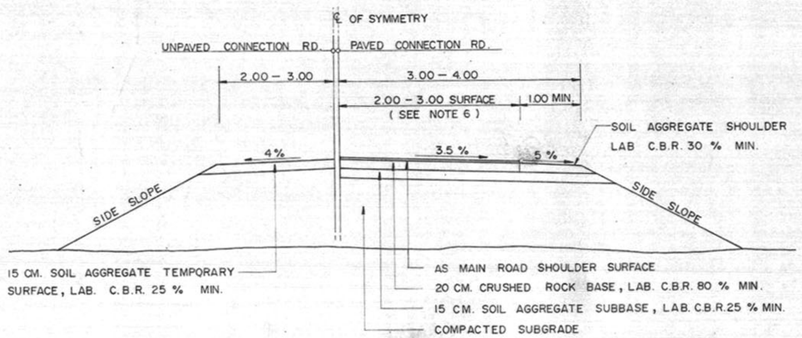
CONNECTION ROAD , θ LESS THAN 45°

NOT TO SCALE



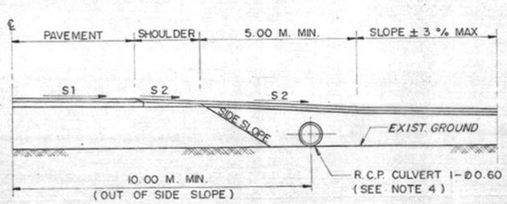
CONNECTION ROAD PLAN

NOT TO SCALE



TYPICAL CROSS-SECTION FOR PAVED AND UNPAVED CONNECTION ROAD

NOT TO SCALE



CONNECTION ROAD SECTION

NOT TO SCALE

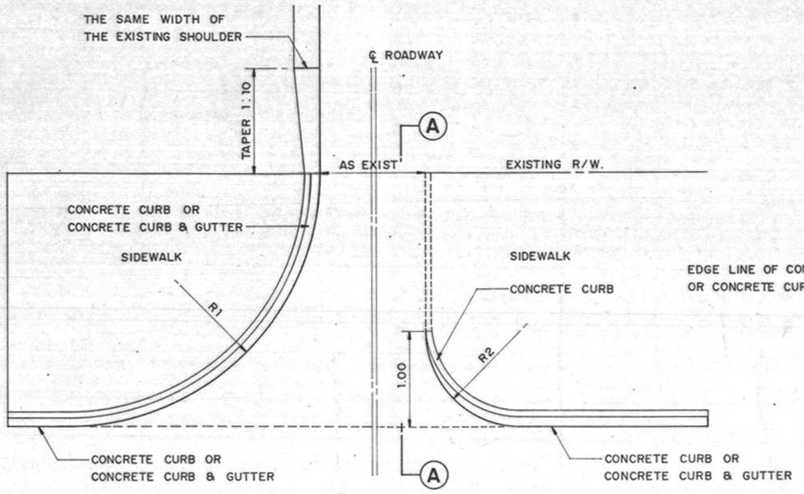
KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

CONNECTION ROAD DETAILS

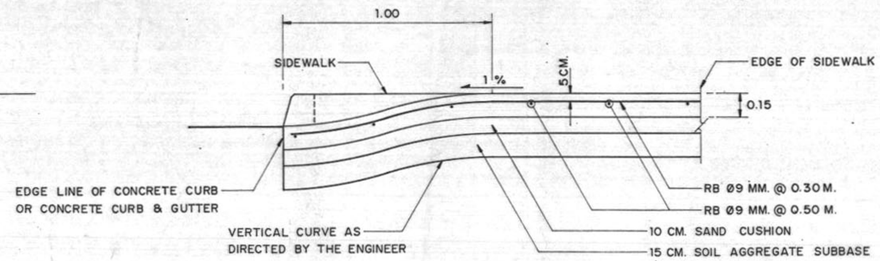
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 199
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. MD-2
		SHEET NO. 9



PUBLIC SIDE ROAD PRIVATE DRIVE

R1 = 5.00 M. - 9.00 M. } ACCORDING TO TRAFFIC VOLUME AND AVAILABLE SPACE
R2 = 2.50 M. - 3.50 M. } OR AS INDICATED IN THE PLAN & PROFILE DRAWING

PLAN OF PUBLIC SIDE ROAD & PRIVATE DRIVE AT SIDEWALK
NOT TO SCALE



SECTION (A) - (A)

R.C. CONRETE PAVEMENT OF SIDE ROAD & PRIVATE DRIVE
NOT TO SCALE

CRITERIA AND LIMITS OF CONSTRUCTION

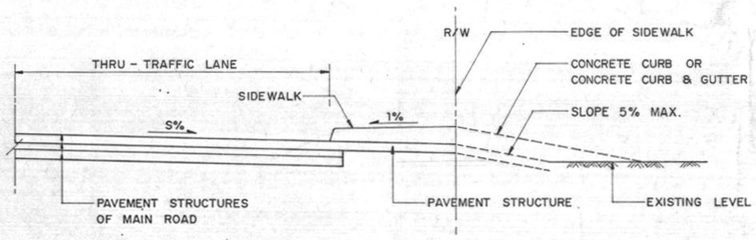
1. THE PROJECT ENGINEER SHALL LIST THE CONNECTION ROADS THAT NEED TO BE RECONSTRUCTED AT THE BEGINNING OF THE PROJECT.
2. THE PAYMENT FOR CONSTRUCTION OF THE PUBLIC SIDE ROADS (FROM THE LIST OF ITEM. 1) ARE
   - 2.1 THE DRAINAGE STRUCTURE (EXTENDED OR NEW STRUCTURE)
   - 2.2 THE PAVEMENT STRUCTURE, THAT SHOULD BE AS GOOD AS, OR BETTER THAN THE EXISTING PAVEMENT STRUCTURE.
3. THE PAYMENT FOR PRIVATE DRIVE (FROM THE LIST OF ITEM. 1) ARE
   - 3.1 IN CASE OF GETTING PERMISSION FROM THE DOH.
     - 3.1.1 THE DRAINAGE STRUCTURE (EXTENDED OR NEW STRUCTURE)
     - 3.1.2 FOR THE PAVEMENT STRUCTURE, DOH. SHALL CONSTRUCT THE TEMPORARY PAVEMENT DURING THE CONSTRUCTION OF THE HIGHWAY. WHEN THE PROJECT IS COMPLETED, THE OWNER OF EACH PRIVATE DRIVE SHALL PAY FOR THE PAVEMENT STRUCTURE FOR HIMSELF.
   - 3.2 IN CASE OF NOT GETTING PERMISSION FROM THE DOH.
     - 3.2.1 DOH. SHALL PAY FOR THE DRAINAGE STRUCTURE ONLY WHEN THE PRIVATE DRIVE INTERFERES WITH THE DRAINAGE SYSTEM OF THE HIGHWAY.
     - 3.2.2 ALL OF THE OWNERS OF THE PRIVATE DRIVED ARE REQUIRED TO SEEK THE PERMISSION FROM THE DOH. OTHERWISE, ILLEGAL PRIVATE DRIVES SHALL BE REMOVED ACCORDING TO THE ITEM 33 OF THE REVOLUTION ANNOUNCEMENT NO. 295
4. EVERY NEW PRIVATE DRIVES AFTER THE START OF THE PROJECT IS NEEDED TO GET THE PERMISSION FROM THE DOH. BEFORE THE CONNECTION CAN BE STARTED.
5. THE DOH. BY THE LOCATION AND DESIGN DIVISION SHALL DIRECT :
   - 5.1 THE ARRANGMENT OF THE DRAINAGE STRUCTURE.
   - 5.2 THE LIMIT OF CONSTRUCTION CONNECTION ROADS.
   - 5.3 THE TYPE AND QUANTITIES OF PAVEMENT STRUCTURE.

NOTES :

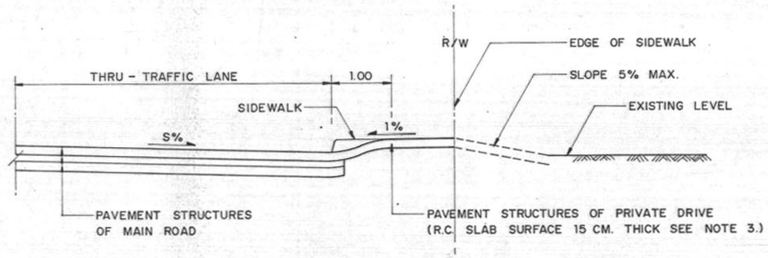
1. ALL DIMENSION ARE IN METERS UNLESS OTHERWISE INDICATED.
2. IN GENERAL, PUBLIC SIDE ROAD CONNECTS THE HIGHWAY TO THE VILLAGE, POPULATED AREA, MONASTERY, GOVERNMENT OFFICE, PUBLIC UTILITY OR SOME PLACES OF IMPORTANCE WHILE "PRIVATE DRIVE" IS THE PRIVATE CONNECTION ROAD FOR PRIVATE HOUSE.
3. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 325 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	350 KG. (MIN.)
SAND	0.43 M^3
CRUSHED ROCK OR GRAVEL	0.86 M^3
CONCRETE SLUMP	10 CM. (MAX.)

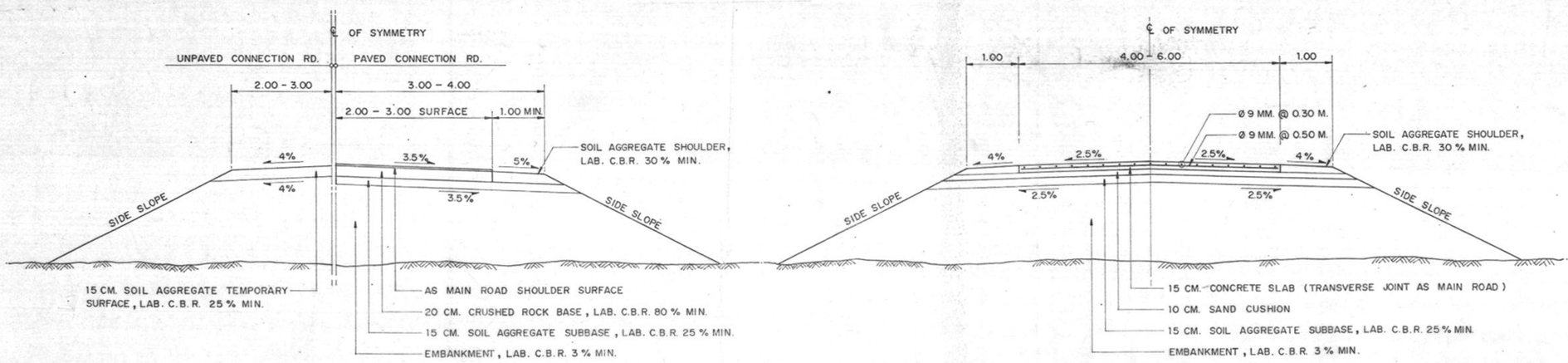
4. REINFORCING STEEL SHALL BE ROUND BARS CONFORMING TO TIS 20 GRADE SR 24.
5. CLEAR CONCRETE COVER SHALL BE 5 CM.
6. FOR THE PRIVATE DRIVE THAT NEEDS TO BE CONCRETE PAVEMENT, REFER TO SECTION (A) - (A)



TYPICAL SIDE ROAD AT SIDEWALK (PROFILE)
NOT TO SCALE



TYPICAL PRIVATE DRIVE AT SIDEWALK (PROFILE)
NOT TO SCALE



FOR UNPAVED SURFACE FOR PAVED SURFACE FOR CONCRETE PAVEMENT

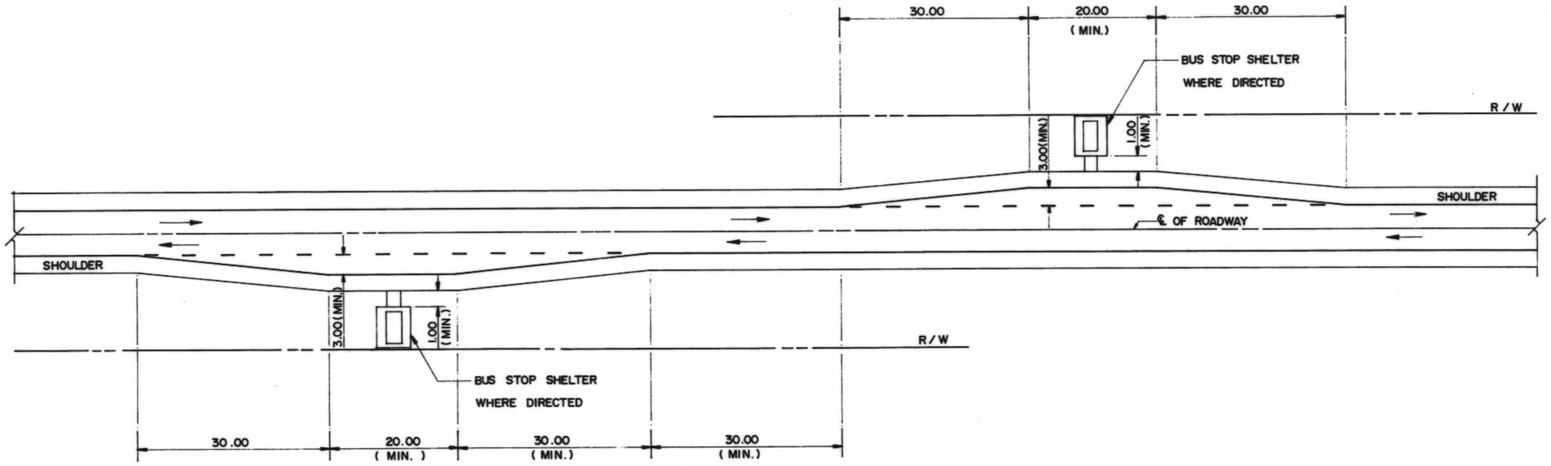
TYPICAL CROSS - SECTION FOR SIDE ROAD & PRIVATE DRIVE CONNECTION
NOT TO SCALE

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

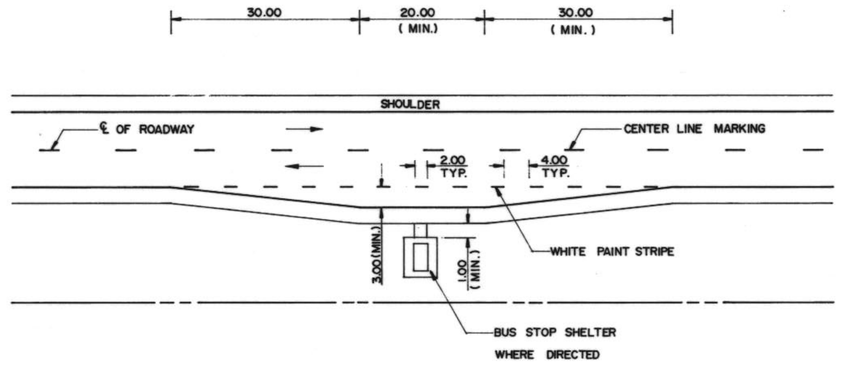
SIDE ROAD & PRIVATE DRIVE DETAILS

DESIGNED: D.O.H & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED: (DIRECTOR GENERAL)		DWG. NO. MD-20
		SHEET NO. 91



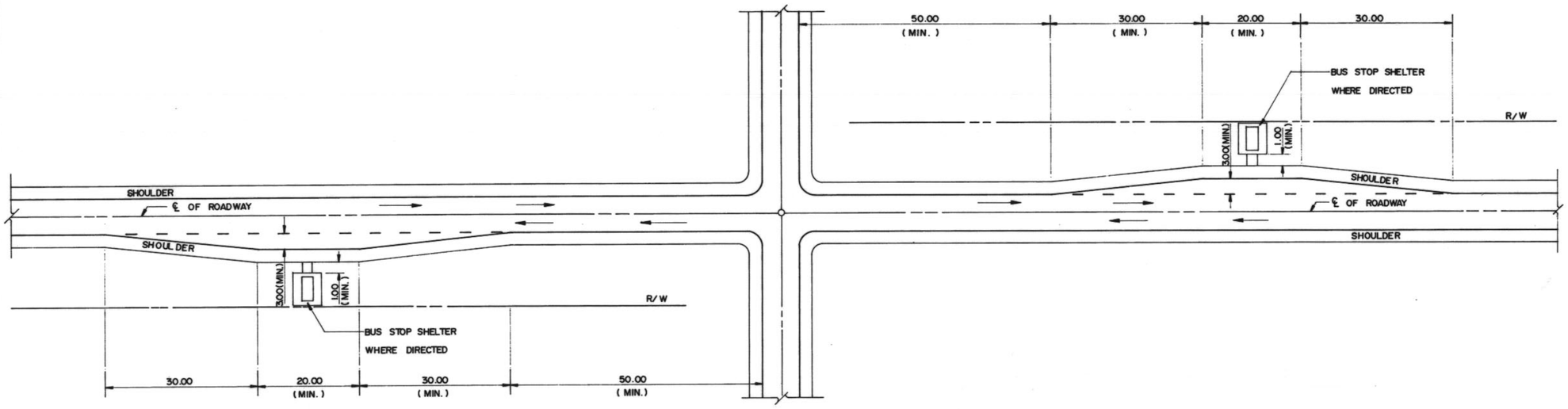
GENERAL PLAN FOR BUS STOP

NOT TO SCALE



DETAILED LAYOUT

NOT TO SCALE

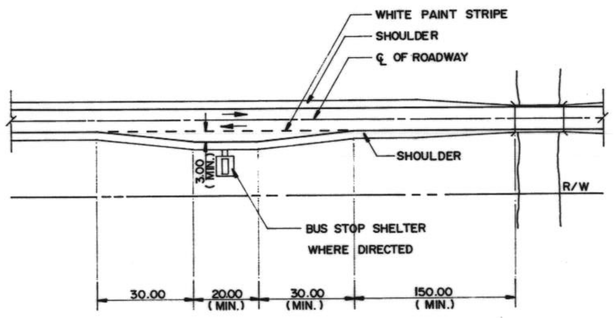


PLAN FOR BUS STOP NEAR INTERSECTION

NOT TO SCALE

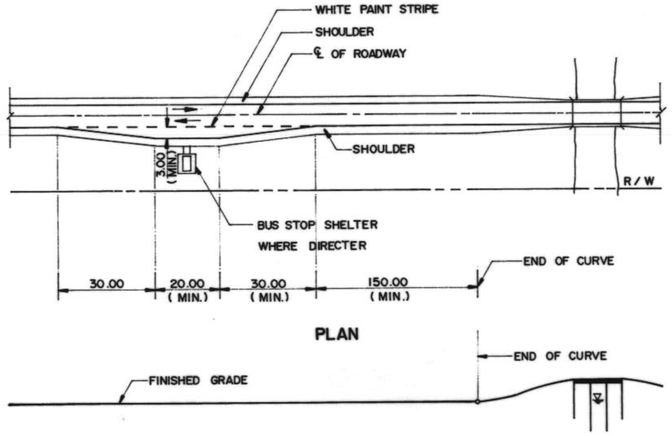
NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. BUS STOP SHALL BE CONSTRUCTED AT LOCATIONS AS SHOWN ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER.
3. CROSS SLOPE AND PAVEMENT OF THE BUS STOP ARE THE SAME AS FOR THE MAIN ROADWAY.
4. DIMENSIONS INDICATED BY " MIN." SHALL BE DIRECTED BY THE ENGINEER DEPENDING ON NUMBER AND SIZE OF BUSES, AND NUMBER OF PASSENGERS.



PLAN FOR BUS STOP NEAR BRIDGE-FLAT PROFILE

NOT TO SCALE



BUS STOP NEAR BRIDGE-SLOPE ON APPROACH TO BRIDGE

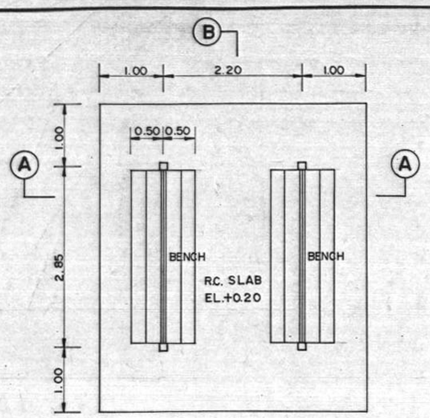
NOT TO SCALE

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

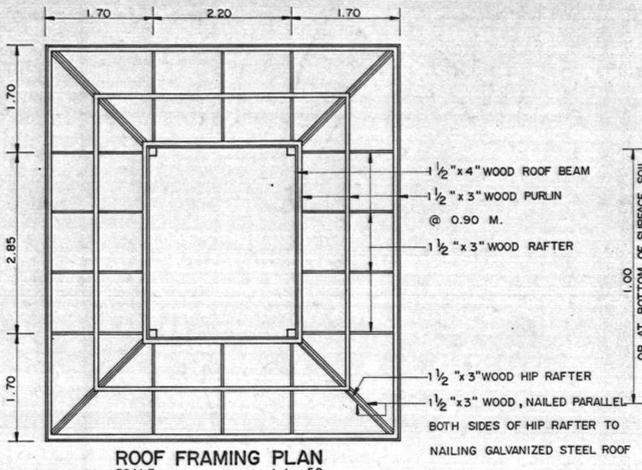
STANDARD DRAWING

BUS STOP LAYOUT

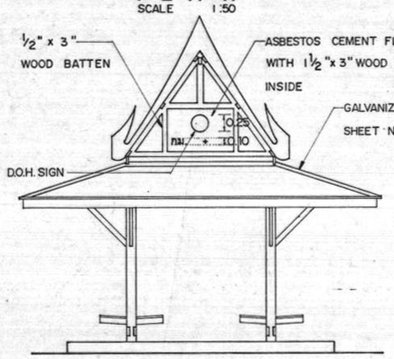
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. MD-301
		SHEET NO. 92



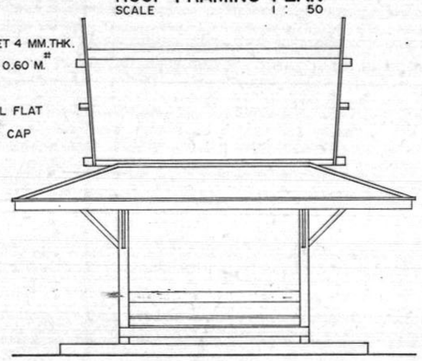
PLAN
SCALE 1:50



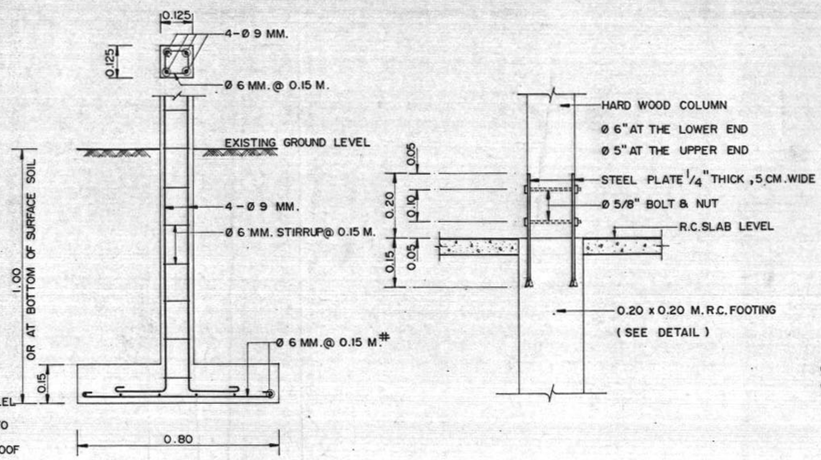
ROOF FRAMING PLAN
SCALE 1 : 50



FRONT ELEVATION
SCALE 1 : 50

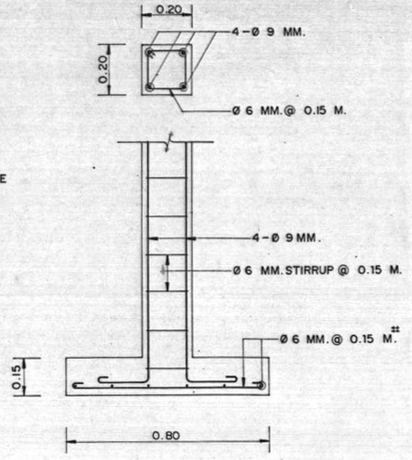


SIDE ELEVATION
SCALE 1 : 50

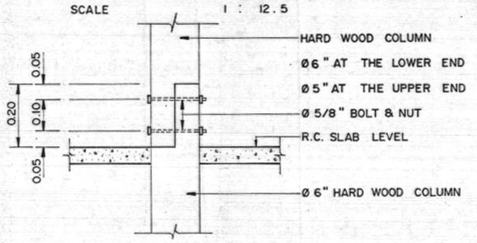


R.C. COLUMN AND
R.C. FOOTING DETAILS
SCALE 1 : 12.5

HARD WOOD COLUMN AND R.C. FOOTING
CONNECTION DETAILS
SCALE 1 : 10



0.20 x 0.20 M. R.C. FOOTING DETAILS
SCALE 1 : 12.5



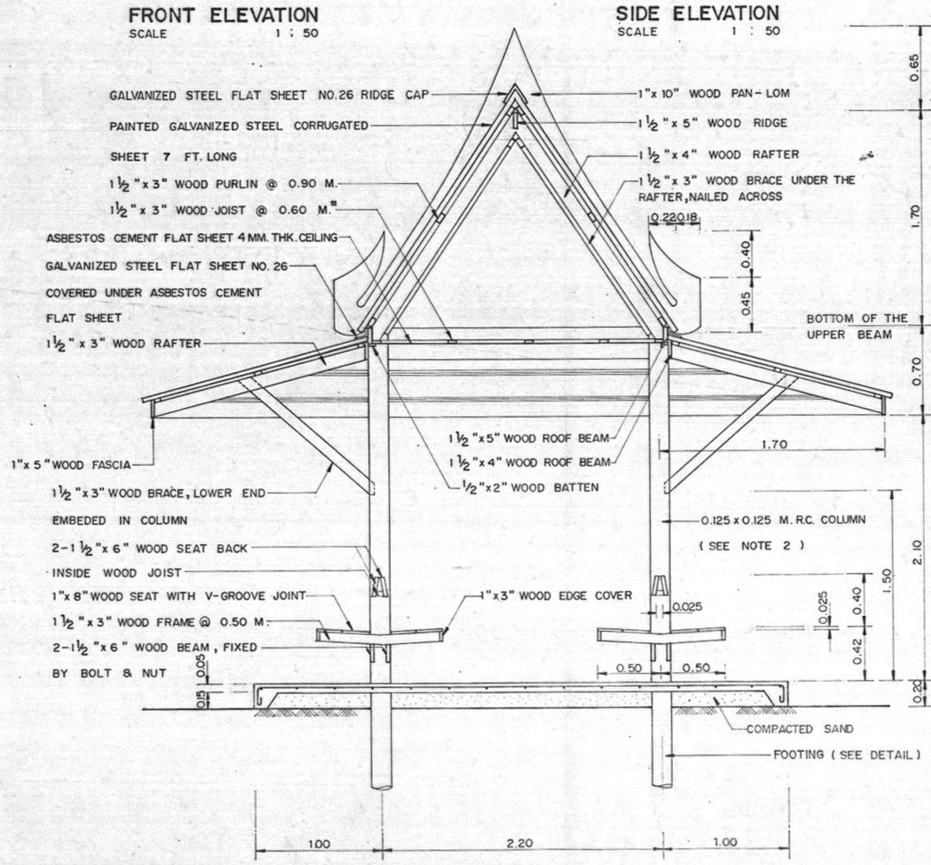
HARD WOOD COLUMNS CONNECTION DETAILS
SCALE 1 : 10

NOTES :

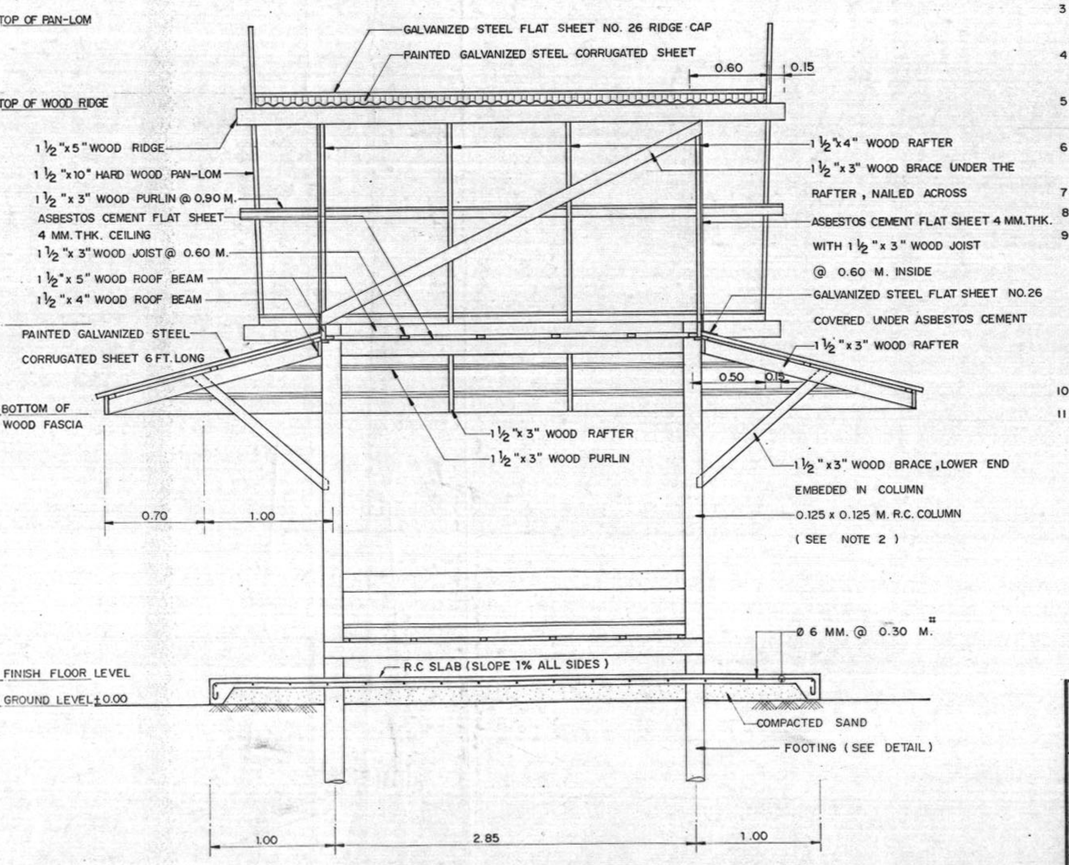
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. THE SPECIFIED COLUMNS FOR THIS BUS STOP SHELTER ARE AS FOLLOWS:
   - 2.1 WHERE USING THE 0.125 x 0.125 M. R.C. COLUMN WITH 0.15 x 0.80 x 0.80 M. FOOTING, REACHES TO THE CEILING.
   - 2.2 HARD WOOD COLUMN Ø 6" AT THE LOWER END AND Ø 5" AT THE UPPER END MUST BE NON-DECAYABLE WITH MINIMUM OF 5 METERS DRIVEN IN THE GROUND.
   - 2.3 WHERE USING CONNECTED-COLUMNS SEE DETAILS AS SHOWN IN THIS DRAWING. THE HARD WOOD COLUMNS MUST BE TENG (Shorea obtusa), RUNG (Pentacme siamensis), DANG (Xylia kerii) OR ANY OTHER KIND OF HARD WOOD OF THE SAME QUALITY.
3. ELEVATION ± 0.00 AS SHOWN IN THIS DRAWING, INDICATES THE ROADWAY SHOULDER ELEVATION.
4. CONNECTION JOINTS SHALL BE Ø 3/8" BOLTS AND NUTS WITH WASHERS UNLESS OTHERWISE SHOWN.
5. WOOD TEXTURE MUST BE PRESERVED AGAINST DECAY AND INSECT DAMAGE BY PROPER PRESERVATIVE PAINT.
6. A PATH TO THE SHELTER FROM SHOULDER EDGE SHALL BE PROVIDED BY 1.50 M. WIDE SAND MORTAR AT ELEVATION OF + 0.10 METERS.
7. GALVANIZED STEEL ROOF SHALL BE GREEN OR RED COLOR.
8. PAN – LOM, FASCIA AND CEILING SHALL BE PAINTED IN WHITE COLOR.
9. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	350	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

10. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24.
11. IN CASE OF CONSTRUCTION BY THE DEPARTMENT OF HIGHWAYS AND NOT LOCATED IN MAIN ROUTE, LOCAL MATERIALS MAY BE USED BY REMAINING SHAPE AND STRUCTURES OF THIS BUS STOP SHELTER.



SECTION (A) – (A)
SCALE 1 : 25



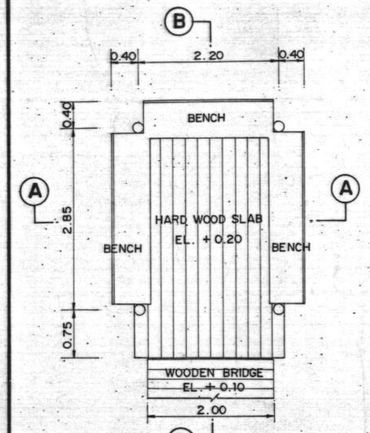
SECTION (B) – (B)
SCALE 1 : 25

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

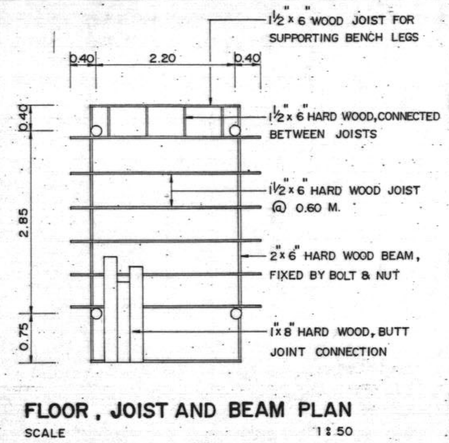
STANDARD DRAWING

BUS STOP SHELTER TYPE A

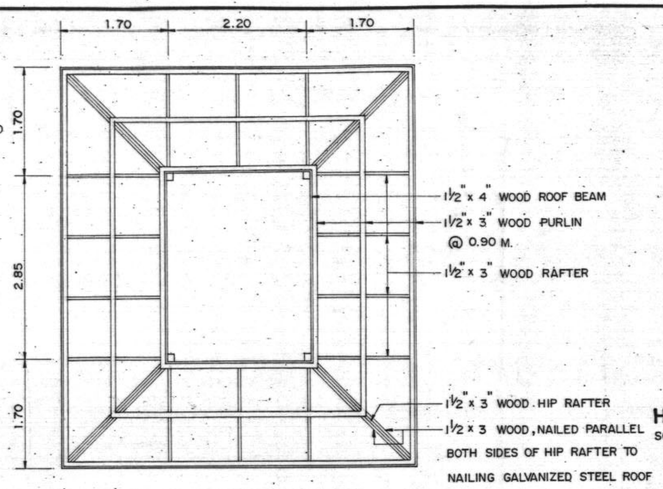
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. MD-30
		SHEET NO. 93



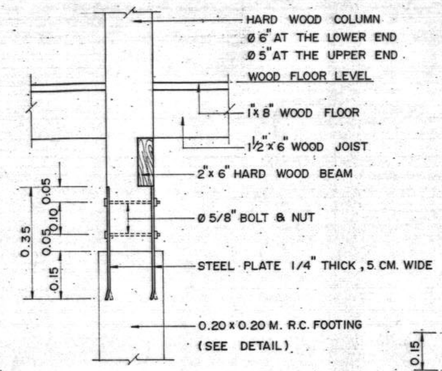
PLAN
SCALE 1:50



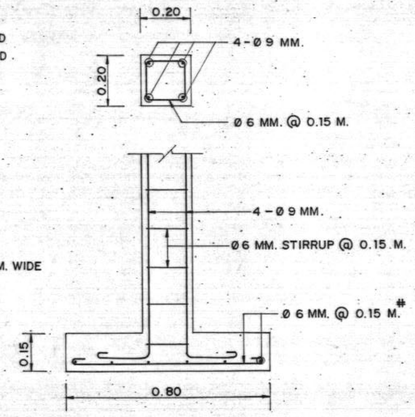
FLOOR, JOIST AND BEAM PLAN
SCALE 1:50



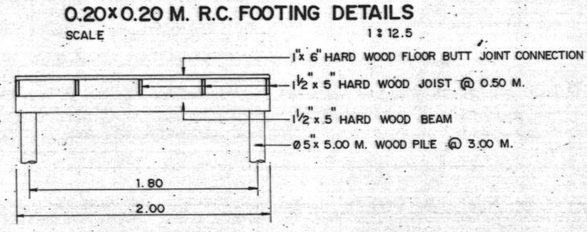
ROOF FRAMING PLAN
SCALE 1:50



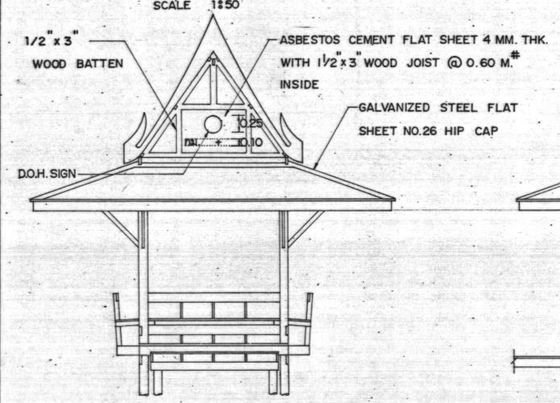
HARD WOOD COLUMN AND R.C. FOOTING
SCALE 1:10



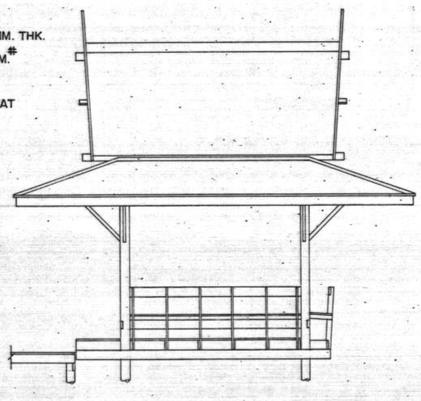
0.20 x 0.20 M. R.C. FOOTING DETAILS
SCALE 1:12.5



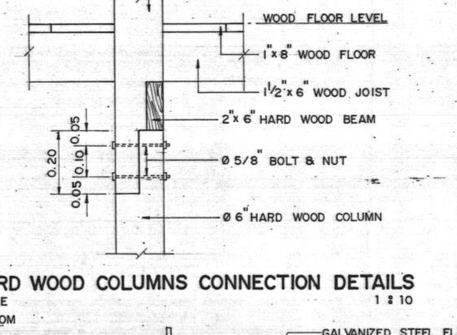
WOODEN BRIDGE DETAILS
SCALE 1:25



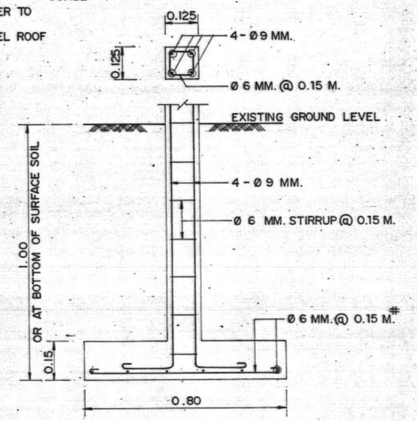
FRONT ELEVATION
SCALE 1:50



SIDE ELEVATION
SCALE 1:50



HARD WOOD COLUMNS CONNECTION DETAILS
SCALE 1:10



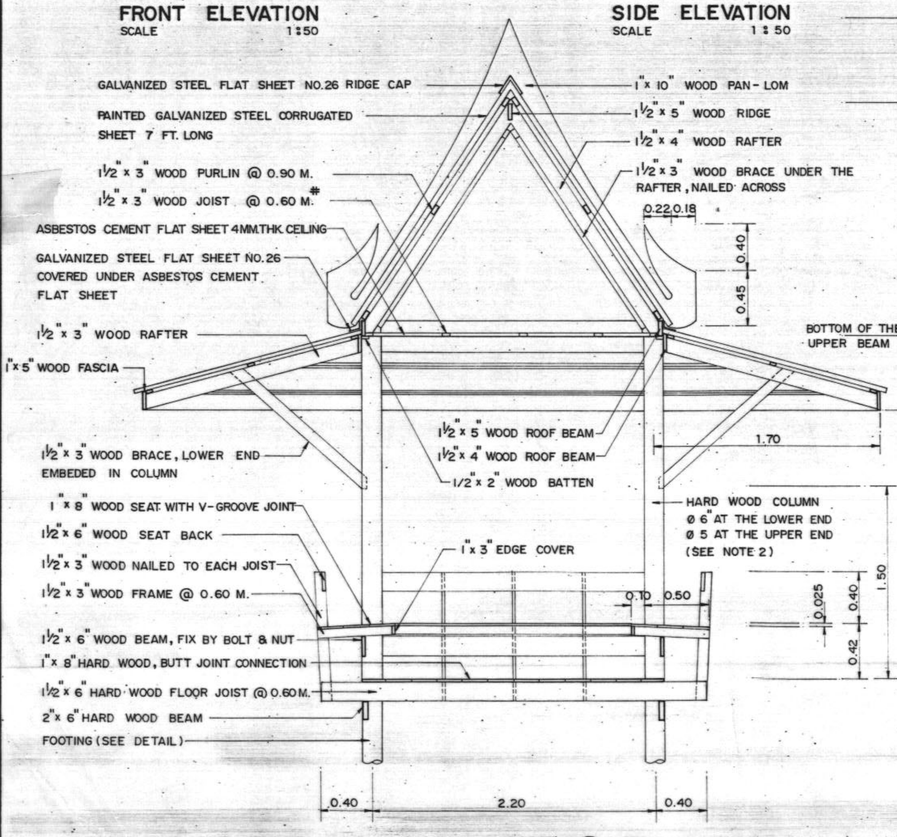
R.C. COLUMN AND R.C. FOOTING DETAILS
SCALE 1:12.5

NOTES :

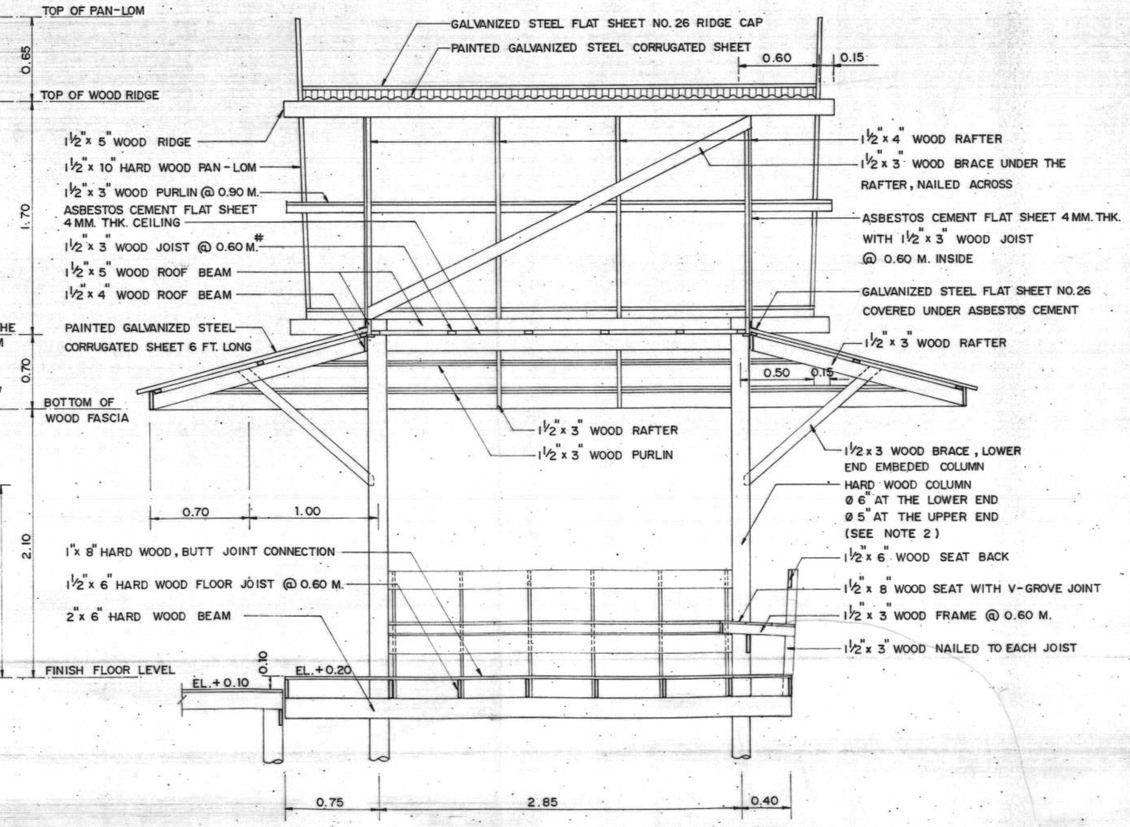
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. THE SPECIFIED COLUMNS FOR THIS BUS STOP SHELTER ARE AS FOLLOWS:
   - 2.1 WHERE USING THE 0.125 x 0.125 M. R.C. COLUMN WITH 0.15 x 0.80 x 0.80 M. FOOTING, REACHES TO THE CEILING.
   - 2.2 HARD WOOD COLUMN Ø 6" AT THE LOWER END AND Ø 5" AT THE UPPER END MUST BE NON-DECAYABLE WITH MINIMUM OF 5 METERS DRIVEN IN THE GROUND.
   - 2.3 WHERE USING CONNECTED-COLUMNS SEE DETAILS AS SHOWN IN THIS DRAWING. THE HARD WOOD COLUMNS MUST BE TENG (Shorea obtusa), RUNG (Pentacme siamensis), DANG (Xylia kerii) OR ANY OTHER KIND OF HARD WOOD OF THE SAME QUALITY.
3. ELEVATION ± 0.00 AS SHOWN IN THIS DRAWING, INDICATES THE ROADWAY SHOULDER ELEVATION.
4. CONNECTION JOINTS SHALL BE Ø 3/8 BOLTS AND NUTS WITH WASHERS UNLESS OTHERWISE SHOWN.
5. WOOD TEXTURE MUST BE PRESERVED AGAINST DECAY AND INSECT DAMAGE BY PROPER PRESERVATIVE PAINT.
6. A PATH TO THE SHELTER FROM SHOULDER EDGE SHALL BE PROVIDED BY 2.00 M. WIDE WOODEN BRIDGE AT ELEVATION OF +0.10 METERS.
7. GALVANIZED STEEL ROOF SHALL BE GREEN OR RED COLOR.
8. PAN-LOM, FASCIA AND CEILING SHALL BE PAINTED IN WHITE COLOR.
9. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS.

PORTLAND CEMENT TYPE 1	350	KG. (MIN.)
SAND	0.43	M^3.
CRUSHED ROCK OR GRAVEL	0.86	M^3.
CONCRETE SLUMP	10	CM. (MAX.)

10. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR. 24.
11. IN CASE OF CONSTRUCTION BY THE DEPARTMENT OF HIGHWAYS AND NOT LOCATED IN MAIN ROUTE, LOCAL MATERIALS MAY BE USED BY REMAINING SHAPE AND STRUCTURES OF THIS BUS STOP SHELTER.



SECTION (A) - (A)
SCALE 1:25



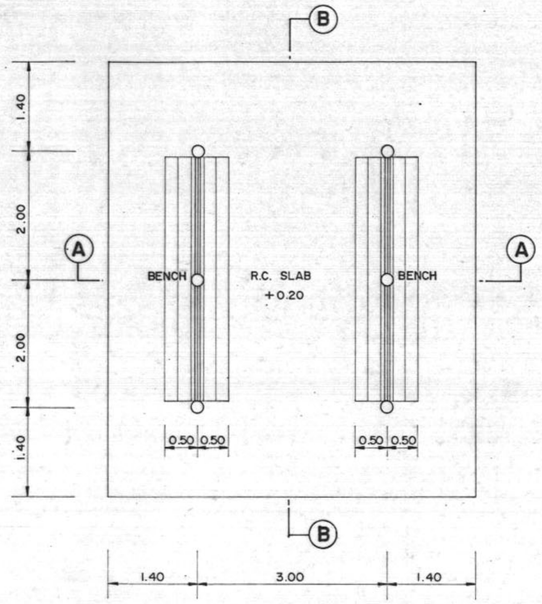
SECTION (B) - (B)
SCALE 1:25

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

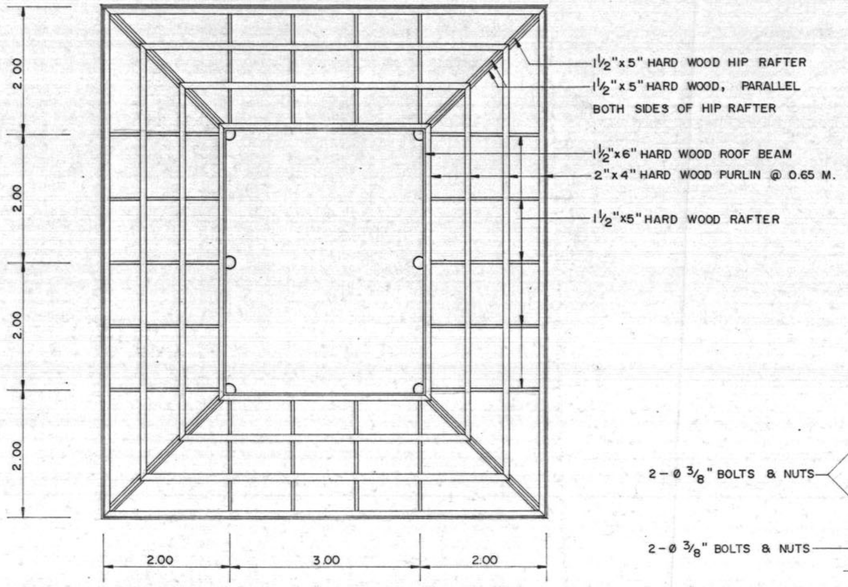
STANDARD DRAWING

BUS STOP SHELTER TYPE B

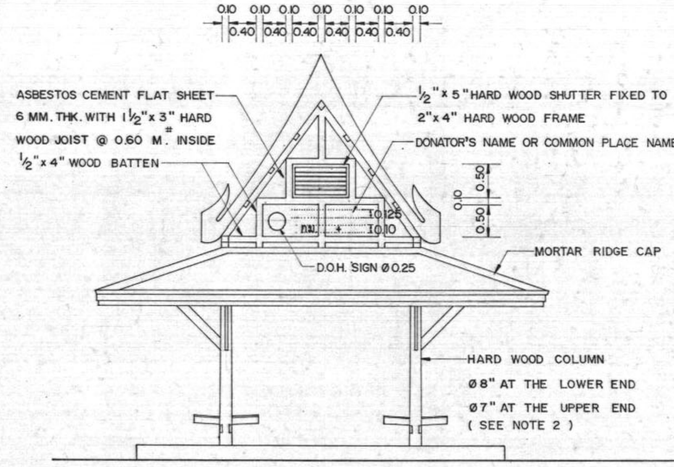
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. MD-30
		SHEET NO. 94



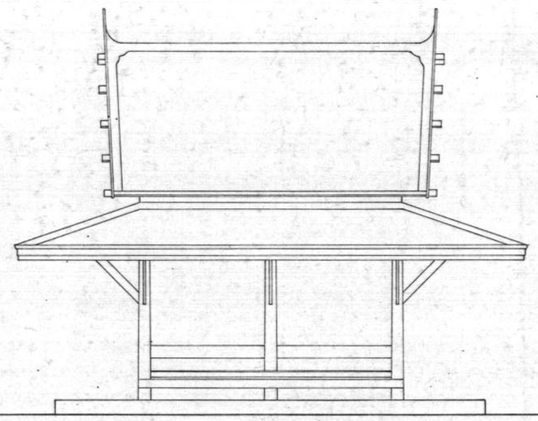
PLAN
SCALE 1 : 50



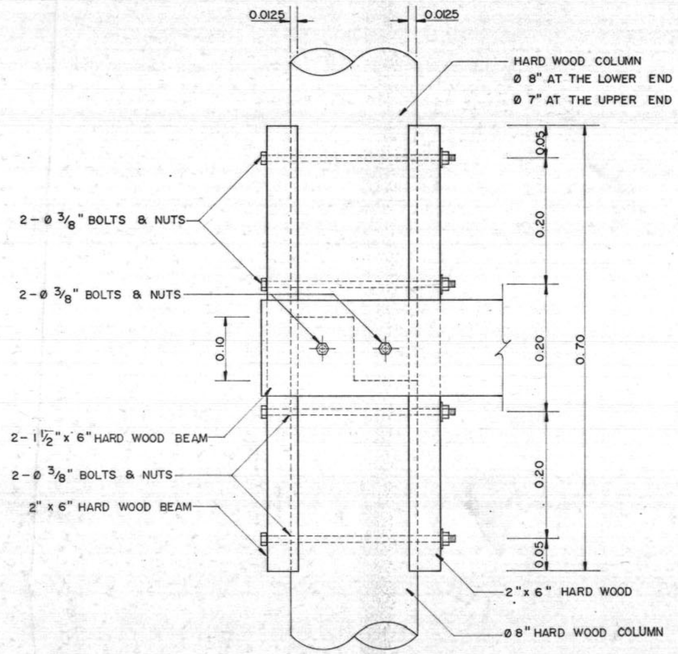
ROOF FRAMING PLAN
SCALE 1 : 50

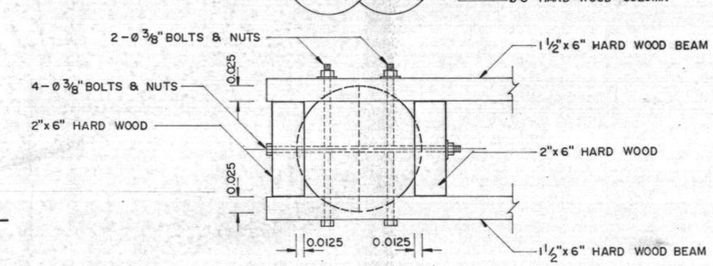


FRONT ELEVATION
SCALE 1 : 50



SIDE ELEVATION
SCALE 1 : 50





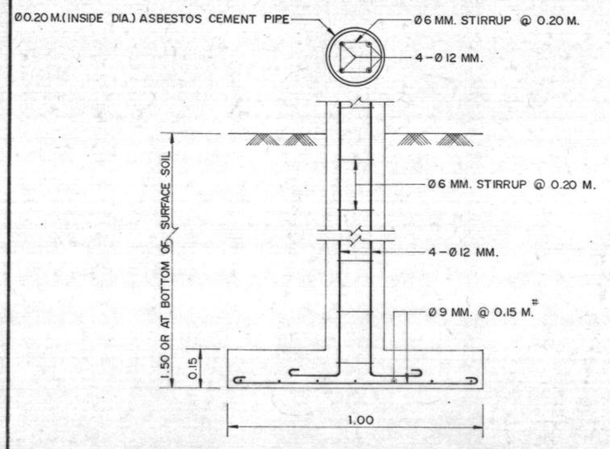
HARD WOOD COLUMN CONNECTION DETAILS
SCALE 1 : 5

NOTES :

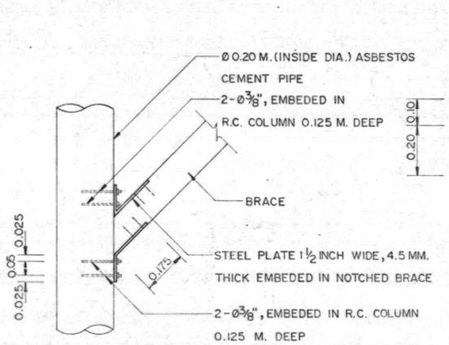
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. THE SPECIFIED COLUMNS FOR THIS BUS STOP SHELTER ARE AS FOLLOWS :
   - 2.1 WHERE USING THE Ø 20 CM. (INSIDE DIAMETER OF ASBESTOS CEMENT PIPE FORM) R.C. COLUMN WITH 0.15 x 1.00 x 1.00 M. FOOTING, REACHES TO THE CEILING.
   - 2.2 HARD WOOD COLUMN Ø 8" AT THE LOWER END AND Ø 7" AT THE UPPER END. MUST BE NON-DECAYABLE WITH MINIMUM OF 3.50 METERS DRIVEN IN THE GROUND OR ALLOWABLE LOAD NOT LESS THAN 1.5 TONS.
   - 2.3 WHERE USING CONNECTED-COLUMNS SEE DETAILS AS SHOWN IN THIS DRAWING. THE HARD WOOD COLUMNS MUST BE TENG (Shorea obtusa), RUNG (Pentacme siamensis), DANG (Xylia kerii) OR ANY OTHER KIND OF HARD WOOD OF THE SAME QUALITY.
3. ELEVATION ±0.00 AS SHOWN IN THIS DRAWING, INDICATES THE ROADWAY SHOULDER ELEVATION.
4. ALL WOODEN STRUCTURES SHALL BE HARD WOOD.
5. WOOD TEXTURE MUST BE PRESERVED AGAINST DECAY AND INSECT DAMAGE BY PROPER PRESERVATIVE PAINT.
6. A PATH TO THE SHELTER FROM SHOULDER EDGE SHALL BE PROVIDED BY 1.50 M. WIDE SAND MOTAR AT ELEVATION OF + 0.10 METERS.
7. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS.

PORTLAND CEMENT TYPE 1	350	KG. (MIN.)
SAND	0.43	M.³
CRUSHED ROCK OR GRAVEL	0.86	M.³
CONCRETE SLUMP	10	CM. (MAX.)

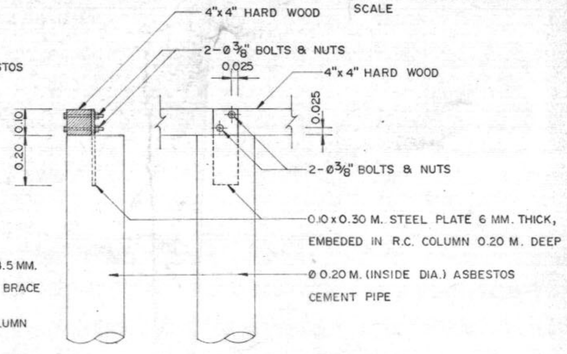
8. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR. 24
9. THIS DRAWING SHALL BE USED IN COMBINATION WITH DWG. NO. MD-305.



R.C. COLUMN AND R.C. FOOTING DETAILS
SCALE 1 : 12.5



DETAIL OF BRACE
CONNECTION WITH R.C. COLUMN
SCALE 1 : 12.5



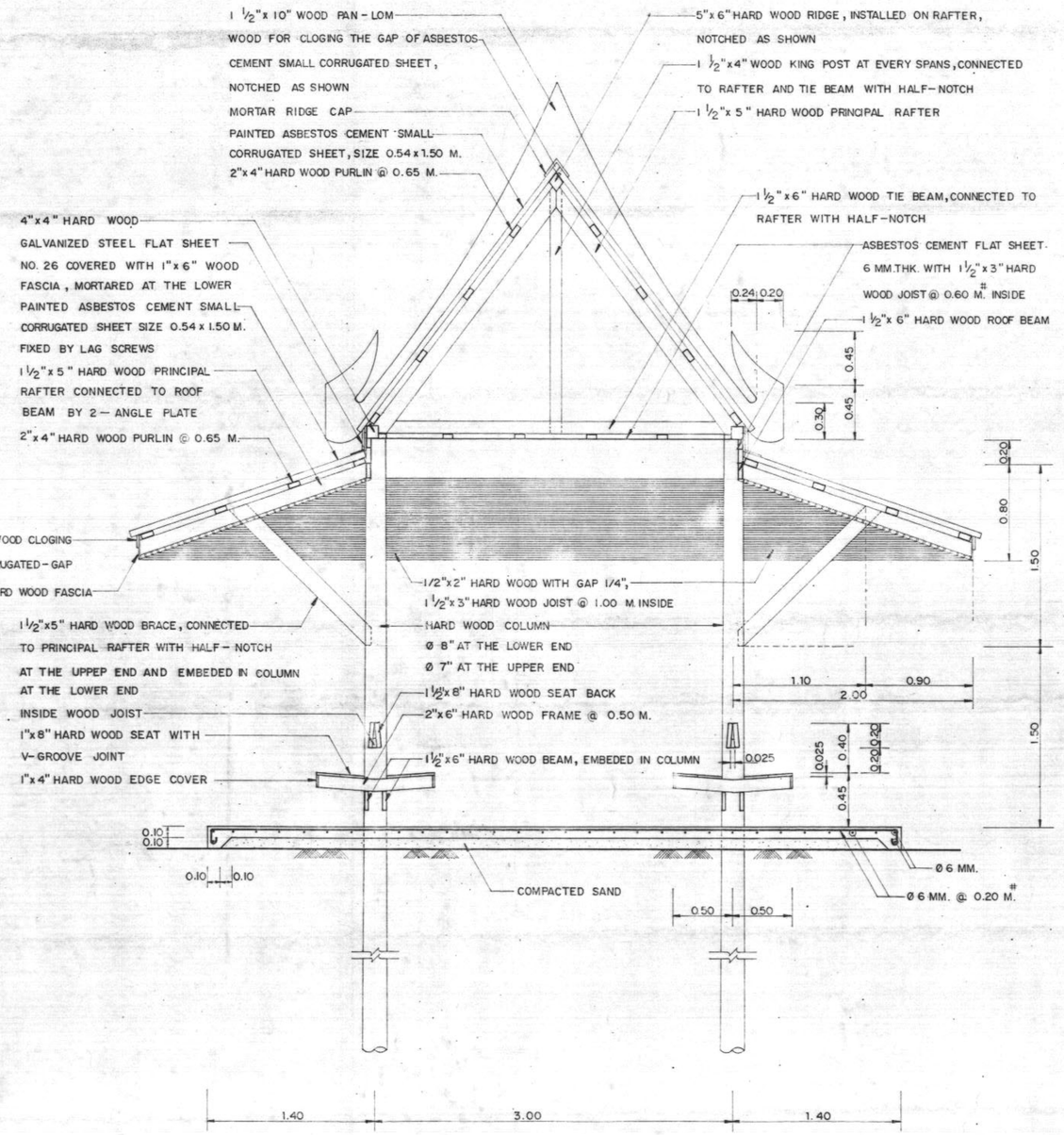
DETAIL OF 4"x4" HARD WOOD
CONNECTION AT TOP OF R.C. COLUMN
SCALE 1 : 12.5

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

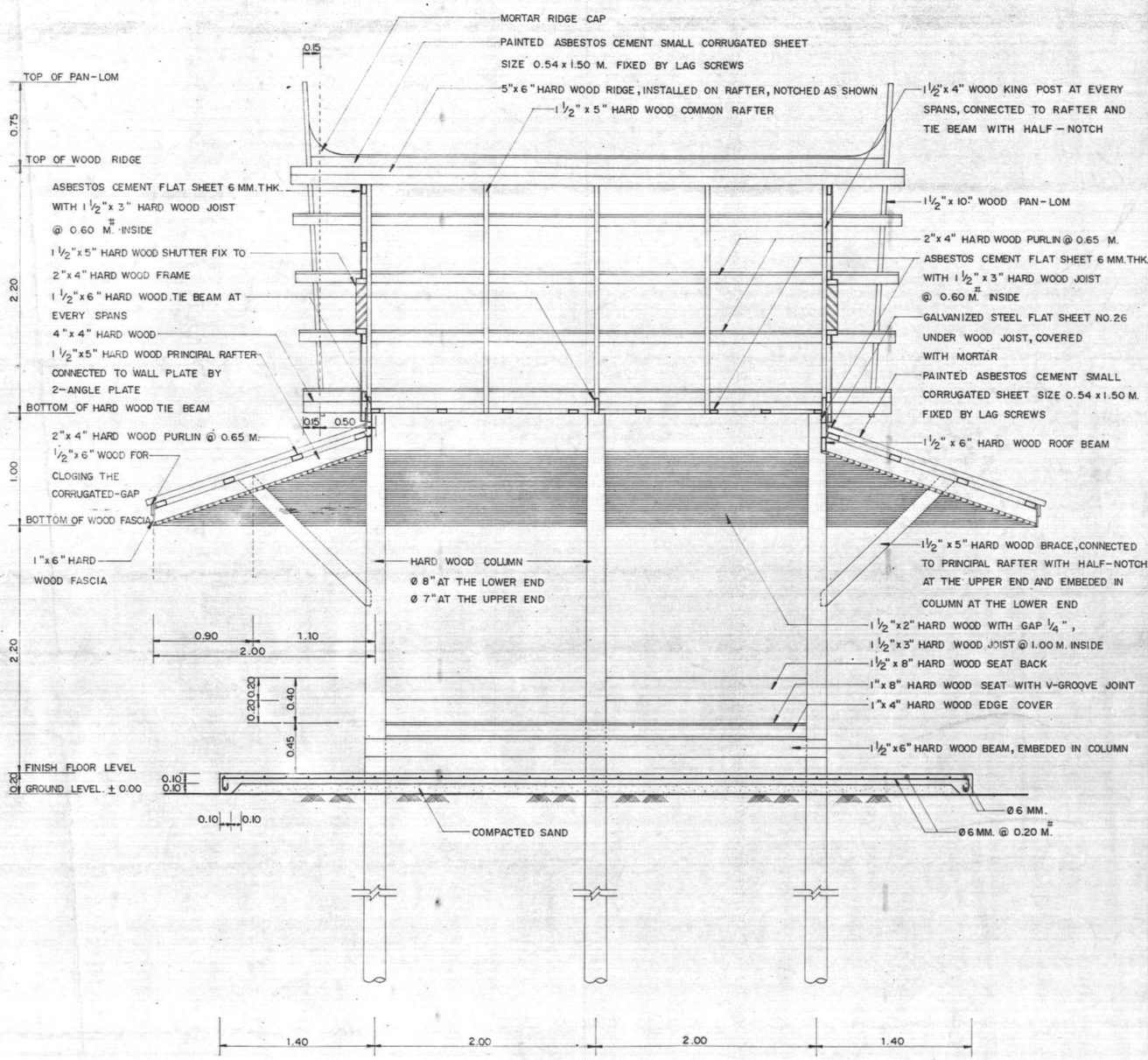
STANDARD DRAWING

BUS STOP SHELTER TYPE C-I

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. MD-304
		SHEET NO. 95



SECTION (A) - (A)
SCALE 1 : 25



SECTION (B) - (B)
SCALE 1 : 25

NOTES :

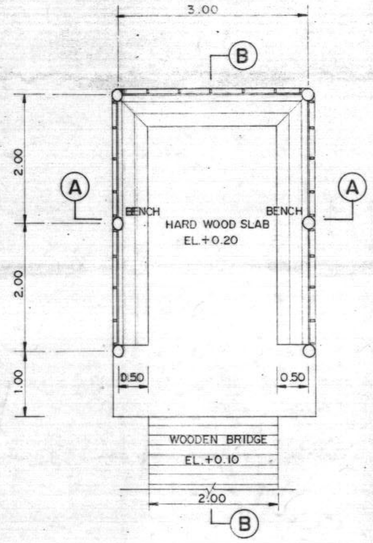
1. ALL DIMENSIONS ARE IN METER UNLESS OTHWISE INDICATED.
2. THIS DRAWING SHALL BE USED IN COMBINATION WITH DWG. NO. MD-304.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

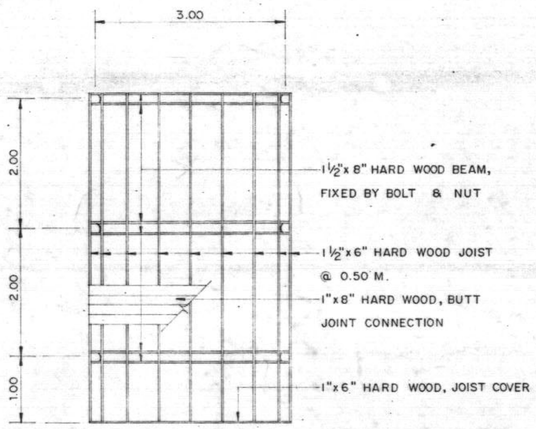
STANDARD DRAWING

BUS STOP SHELTER TYPE C - II

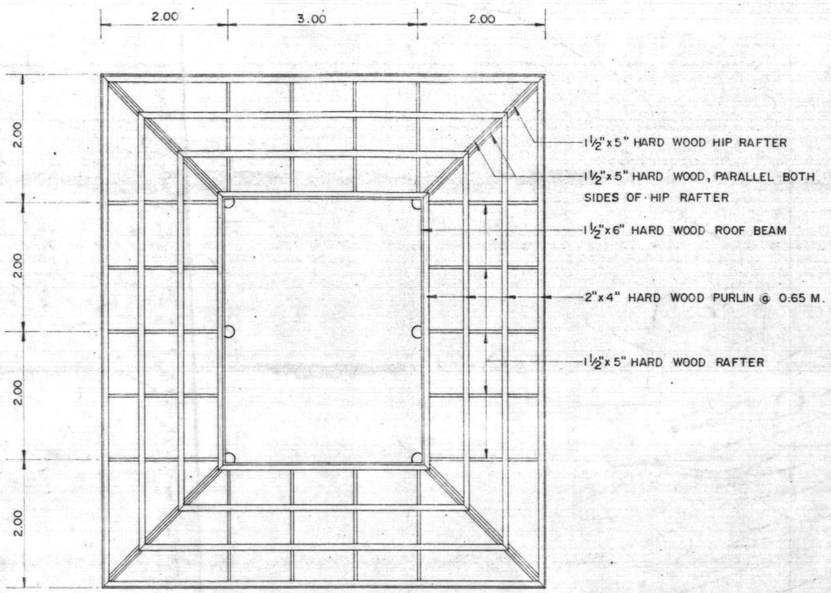
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE 1 : 25
APPROVED : (DIRECTOR GENERAL)		DWG. NO. MD-305
		SHEET NO. 96



PLAN
SCALE 1 : 50



FLOOR, JOIST AND BEAM PLAN
SCALE 1 : 50



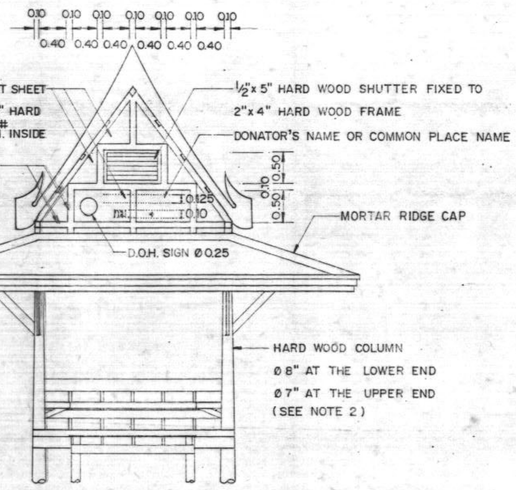
ROOF FRAMING PLAN
SCALE 1 : 50

NOTES :

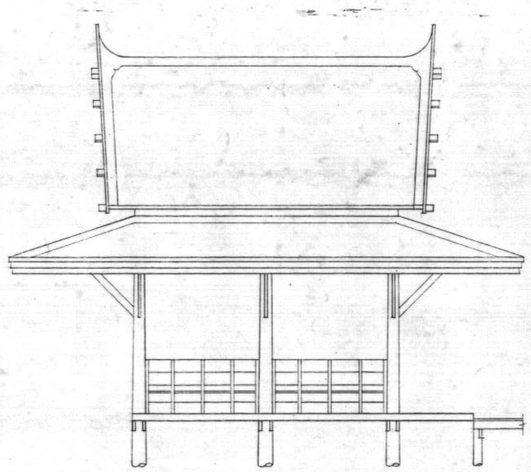
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. THE SPECIFIED COLUMNS FOR THIS BUS STOP SHELTER ARE AS FOLLOWS :
   - 2.1 WHERE USING THE Ø 20 CM. (INSIDE DIAMETER OF ASBESTOS CEMENT PIPE FORM) R.C. COLUMN WITH 0.15 x 1.00 x 1.00 M. FOOTING , REACHES TO THE CEILING.
   - 2.2 HARD WOOD COLUMN Ø 8" AT THE LOWER END AND Ø7" AT THE UPPER END MUST BE NON-DECAYABLE WITH MINIMUM OF 3.50 METERS DRIVEN IN THE GROUND OR ALLOWABLE LOAD NOT LESS THAN 1.5 TONS.
   - 2.3 WHERE USING CONNECTED - COLUMNS SEE DETAILS AS SHOWN IN THIS DRAWING. THE HARD WOOD COLUMNS MUST BE TENG (Shorea obtusa), RUNG (Pentacme siamensis), DANG (Xylia kerii) OR ANY OTHERE KIND OF HARD WOOD OF THE SAME QUALITY.
3. ELEVATION ± 0.00 AS SHOWN IN THIS DRAWING , INDICATES THE ROADWAY SHOULDER ELEVATION.
4. ALL WOODEN STRUCTURES SHALL BE HARD WOOD.
5. WOOD TEXTURE MUST BE PRESERVED AGAINST DECAY AND INSECT DAMAGE BY PROPER PRESERVATIVE PAINT.
6. A PATH TO THE SHELTER FROM SHOULDER EDGE SHALL BE PROVIDED BY 2.00 M. WIDE WOODEN BRIDGE AT ELEVATION OF + 0.10 METERS.
7. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	350	KG. (MIN.)
SAND	0.43	$M.^3$
CRUSHED ROCK OR GRAVEL	0.86	$M.^3$
CONCRETE SLUMP	10	CM. (MAX.)

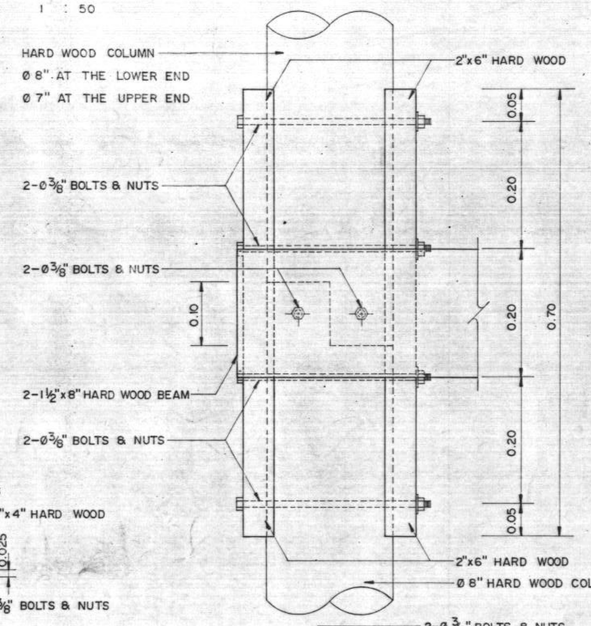
8. REINFORCING STEEL SHALL CONFORM TO TIS.20 GRADE SR.24 .
9. THIS DRAWING SHALL BE USED IN COMBINATION WITH DWG. NO. MD-307.

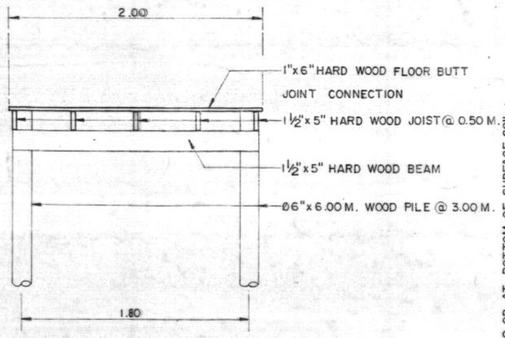


FRONT ELEVATION
SCALE 1 : 50

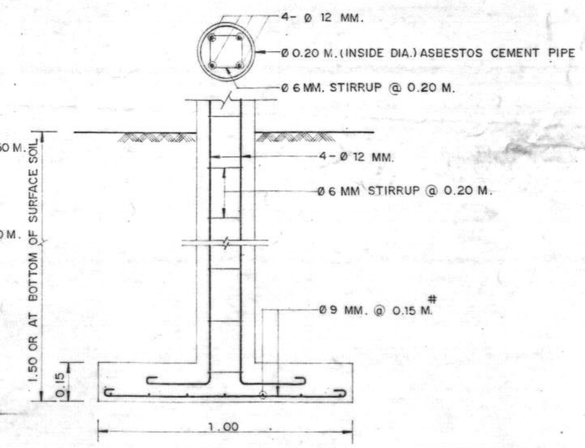


SIDE ELEVATION
SCALE 1 : 50

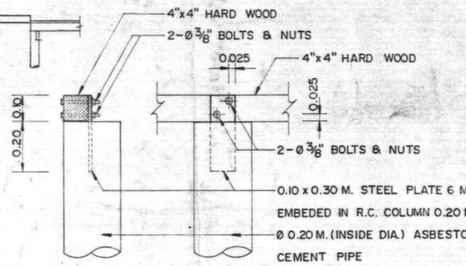




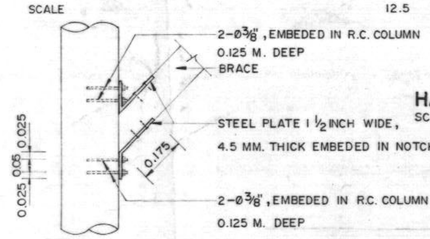
WOODEN BRIDGE DETAILS
SCALE 1 : 25



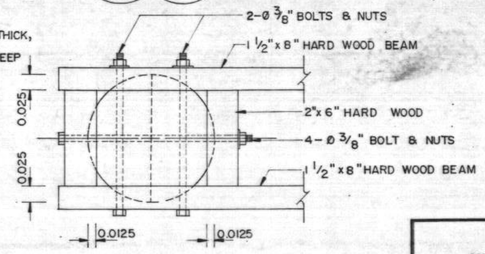
R.C. COLUMN AND R.C. FOOTING DETAILS
SCALE 1 : 12.5



DETAIL OF 4"x 4" HARD WOOD CONNECTION AT TOP OF R.C. COLUMN
SCALE 12.5



DETAIL OF BRACE
CONNECTION WITH R.C. COLUMN
SCALE 1 : 12.5



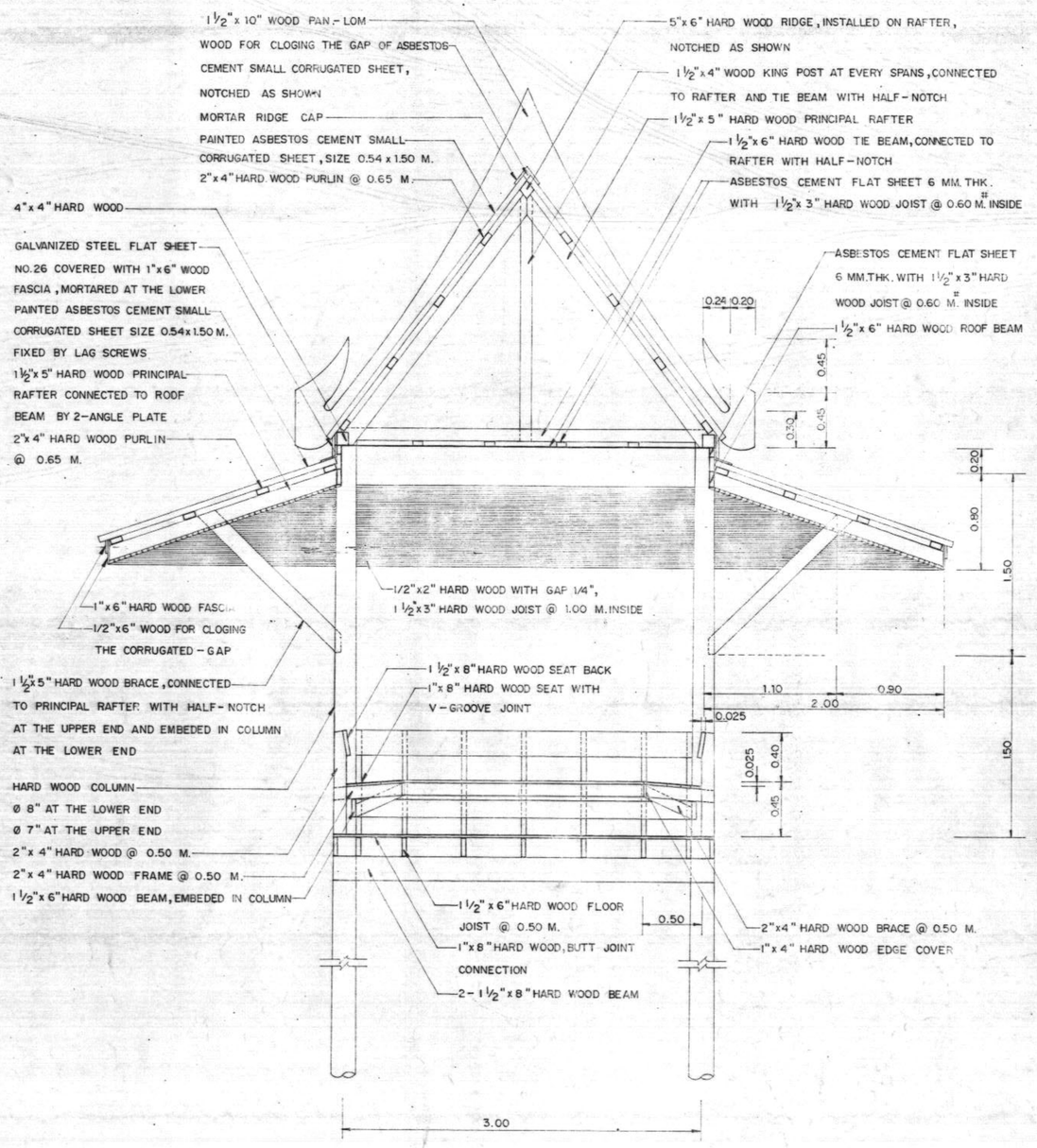
HARD WOOD COLUMN CONNECTION DETAILS
SCALE 1 : 5

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

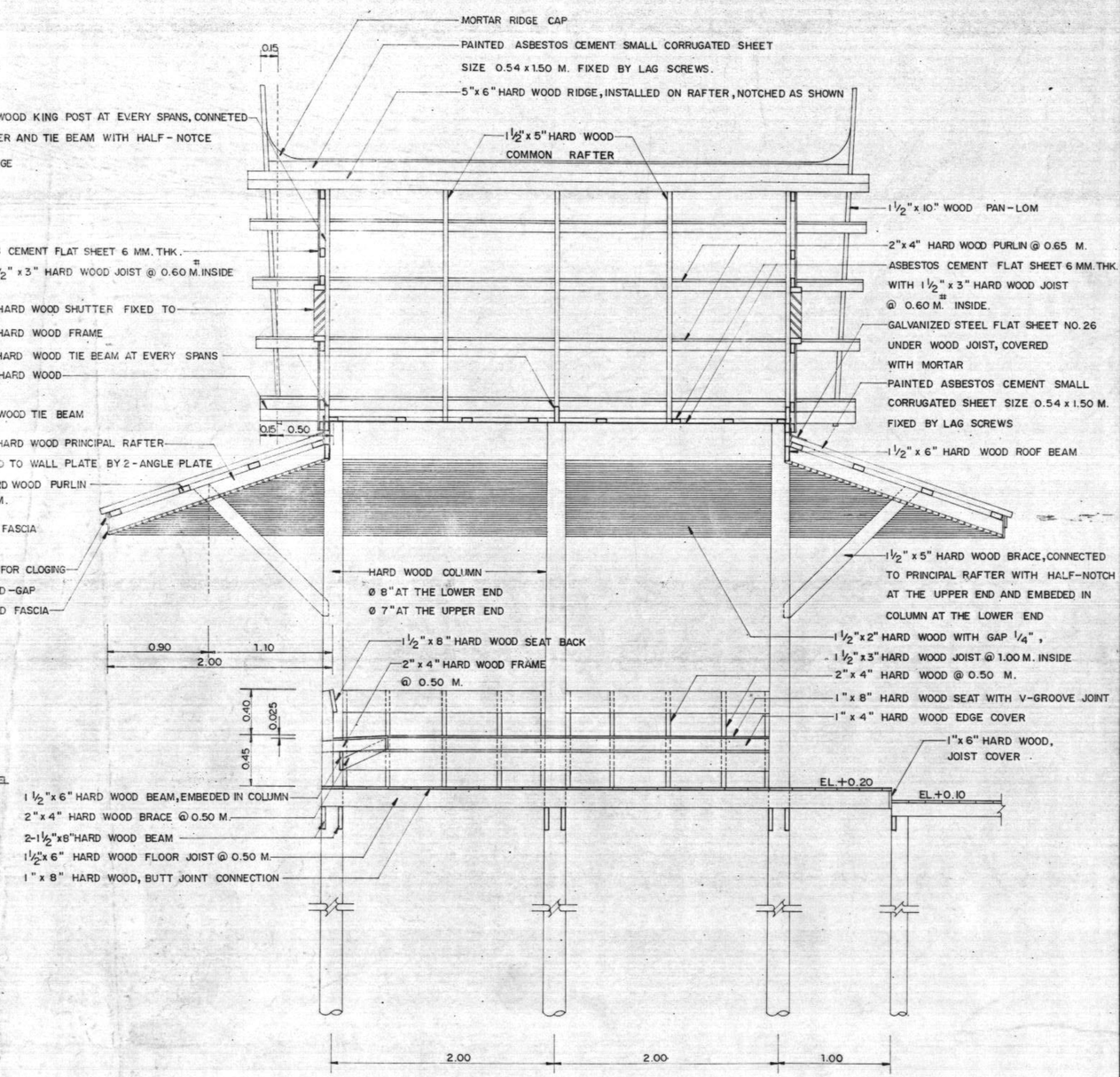
STANDARD DRAWING

BUS STOP SHELTER TYPE D - I

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. MD-306
		SHEET NO. 97



SECTION (A) - (A)
SCALE 1 : 25



SECTION (B) - (B)
SCALE 1 : 25

NOTES :

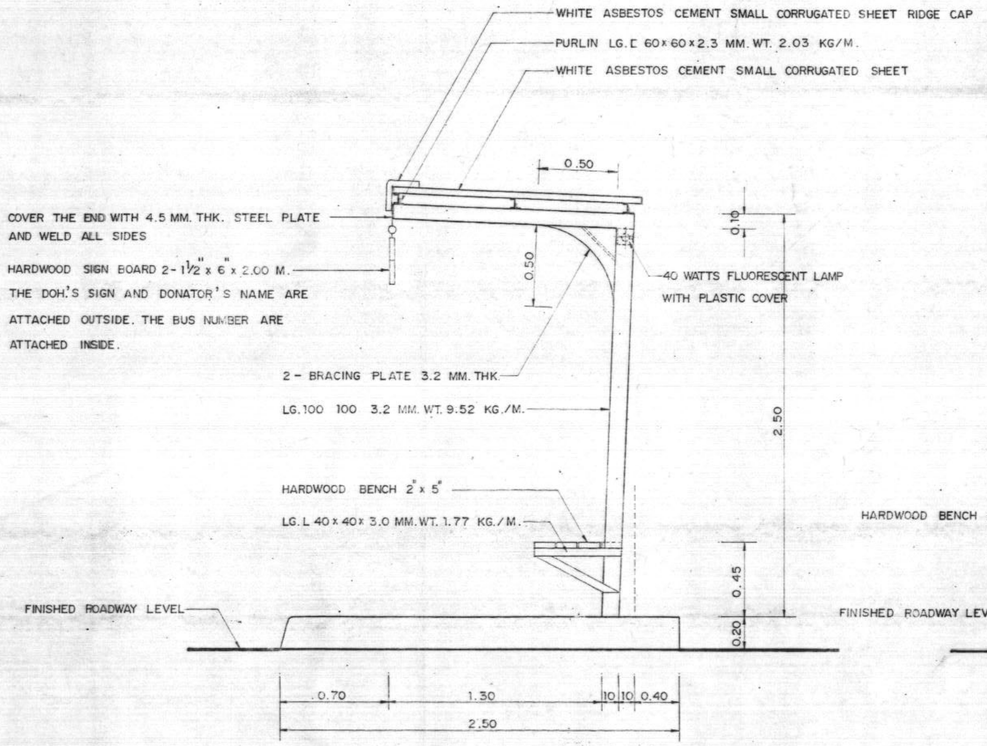
1. ALL DIMENSIONS ARE IN METER UNLESS OTHWISE INDICATED.
2. THIS DRAWING SHALL BE USED IN COMBINATION WITH DWG. NO. MD-306.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

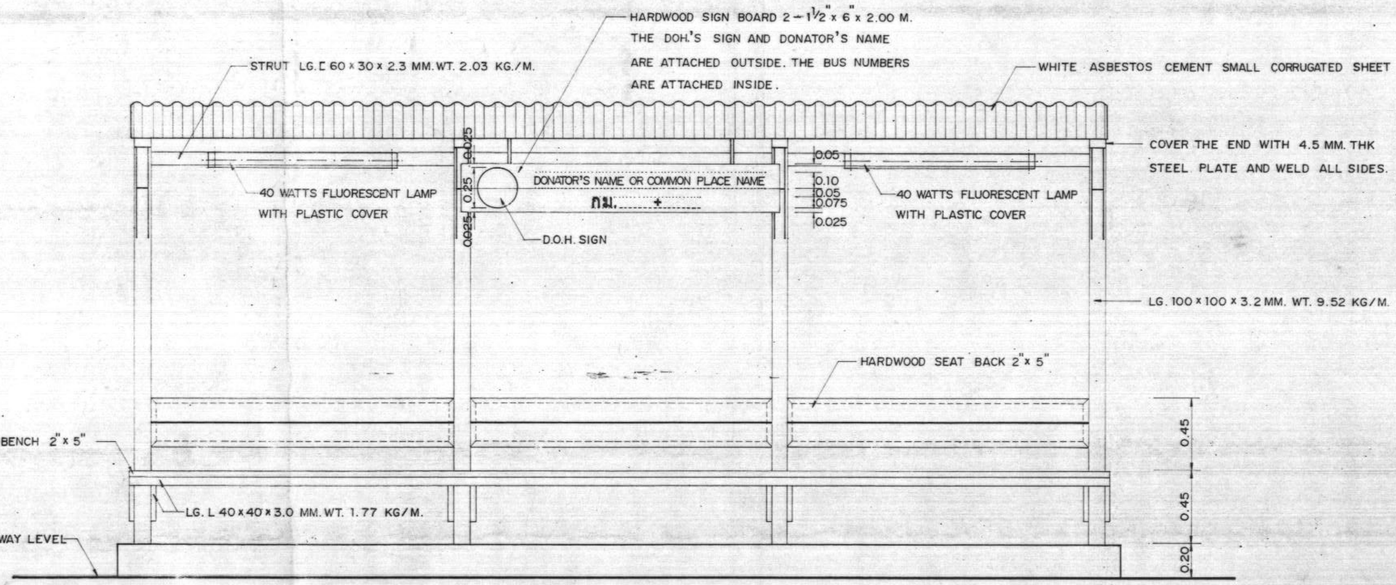
STANDARD DRAWING

BUS STOP SHELTER TYPE D - II

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE 1 : 25
APPROVED : (DIRECTOR GENERAL)		DWG. NO. MD-307
		SHEET NO. 98



SIDE ELEVATION
SCALE 1 : 20



FRONT ELEVATION
SCALE 1 : 20

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	350	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

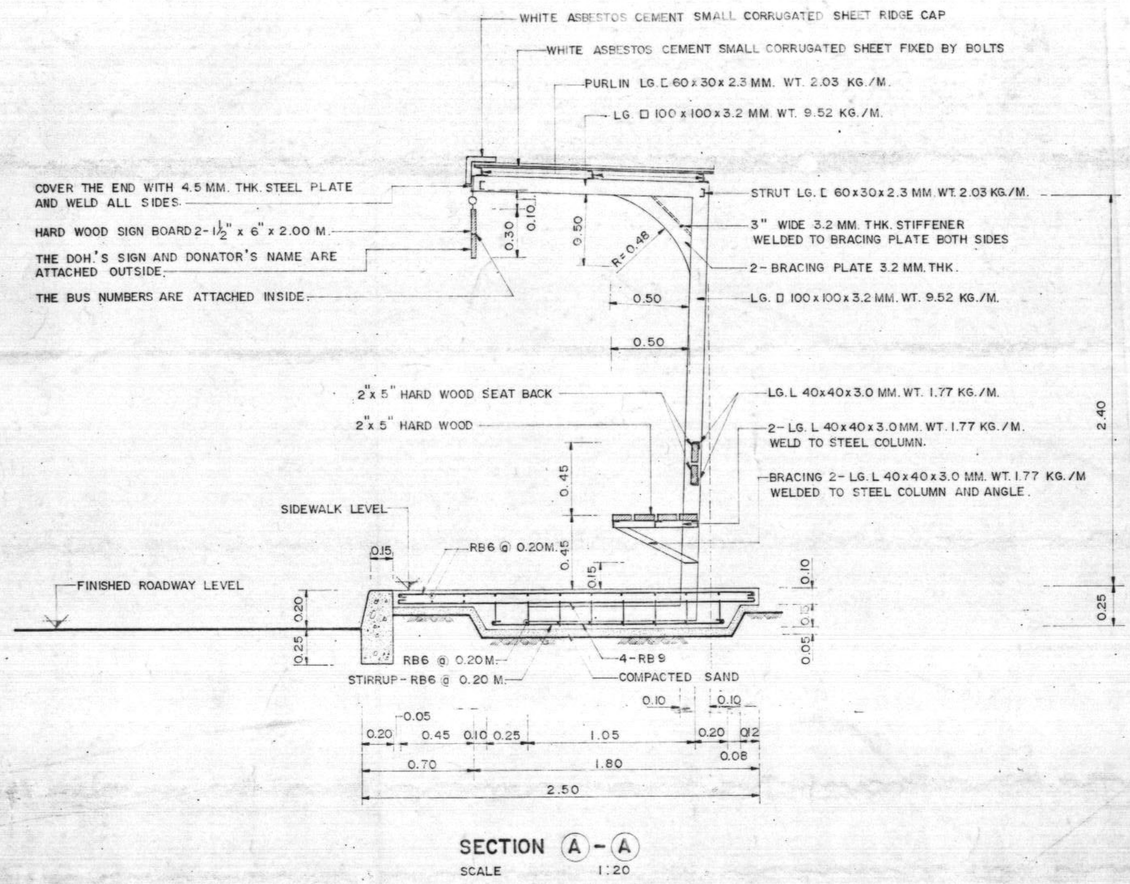
3. CLEAR CONCRETE COVER SHALL BE 2.5 CM.
4. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24 FOR ROUND BARS AND TIS. 24 GRADE SD 30 FOR DEFORMED BARS.
5. WOODEN STRUCTURES SHALL BE HARDWOOD.
6. ALL WELDING SHALL BE 3/16" FILLET WELD AS AISC. SPECIFICATIONS.
7. STEEL STRUCTURES SHALL BE PAINTED WITH RUST-OLEUM OR OTHER EQUIVALENT IN DUSKY BLACK COLOR.
8. WOODEN PARTS SHALL BE POLISHED, NOT PAINTED.
9. ONE 40 WATTS FLUORESCENT SHALL BE USED FOR OUTER SPAN.
10. THIS DRAWING SHALL BE USED IN COMBINATION WITH DWG. NO. MD-309.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

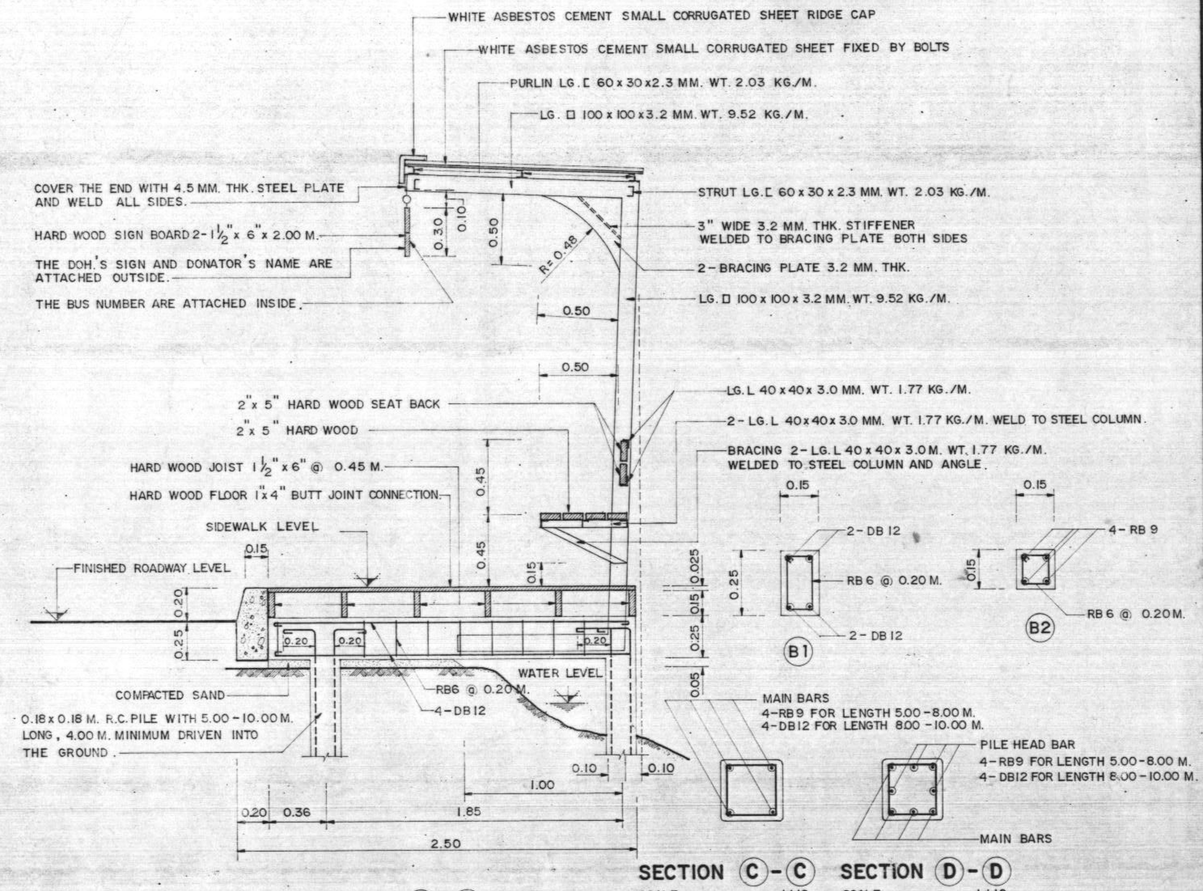
STANDARD DRAWING

BUS STOP SHELTER TYPE E-I

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE 1 : 20
APPROVED : (DIRECTOR GENERAL)		DWG. NO. MD-308
		SHEET NO. 99



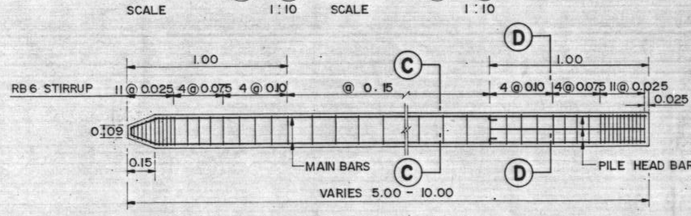
SECTION (A)-(A)
SCALE 1:20



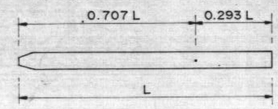
SECTION (B)-(B)
SCALE 1:20

SECTION (C)-(C)
SCALE 1:10

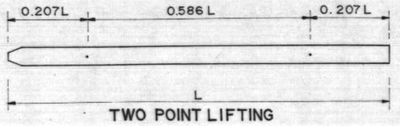
SECTION (D)-(D)
SCALE 1:10



0.18x0.18 M. PILE
SCALE 1:20

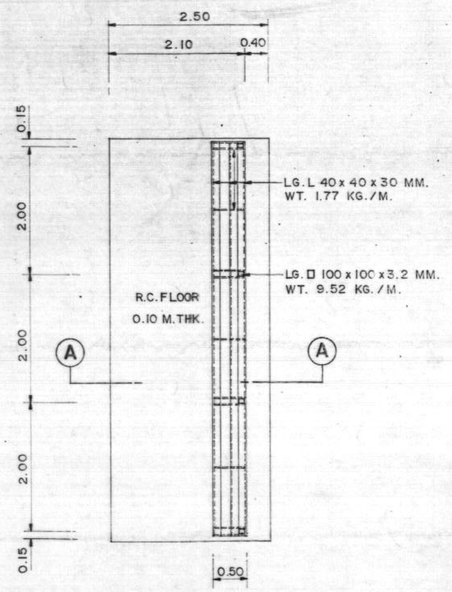


ONE POINT LIFTING

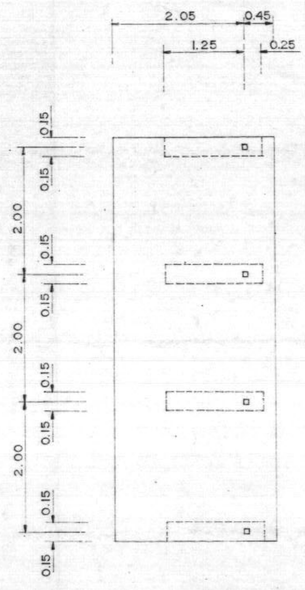


TWO POINT LIFTING

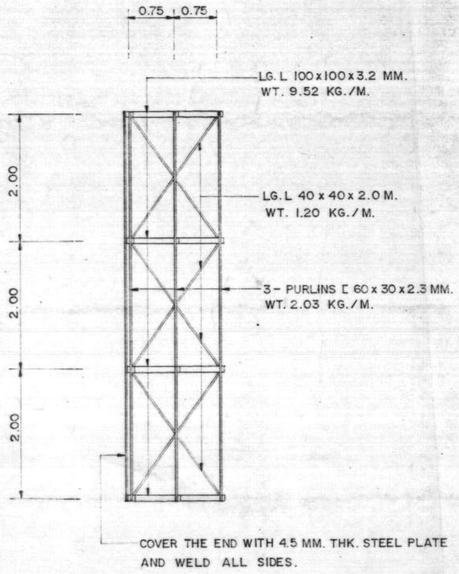
PILE LIFTING LOCATIONS
NOT TO SCALE



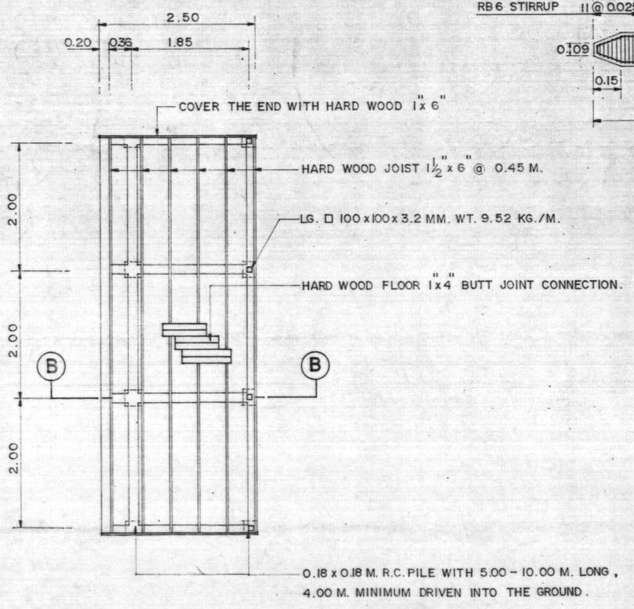
FLOOR PLAN (FOUNDATION TYPE (A))
SCALE 1:50



FLOOR, FOOTING PLAN (FOUNDATION TYPE (A))
SCALE 1:50



ROOF FRAMING PLAN
SCALE 1:50



FLOOR, JOIST, BEAM AND PILE PLAN (FOUNDATION TYPE (B))
SCALE 1:50

NOTES :

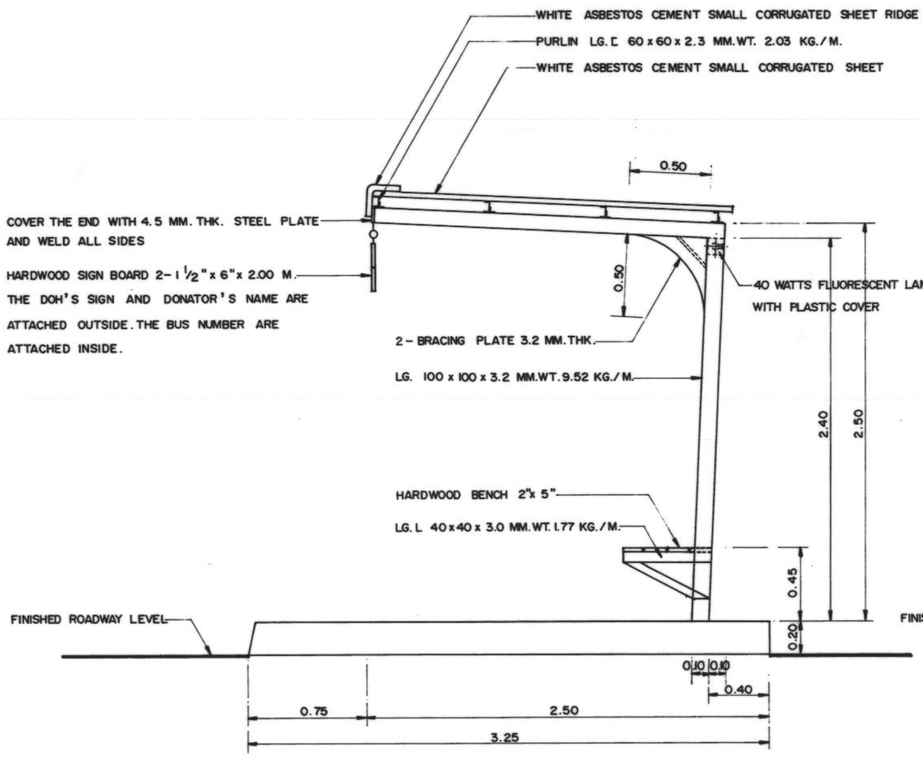
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. THIS DRAWING SHALL BE USED IN COMBINATION WITH DWG. NO. MD-308

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

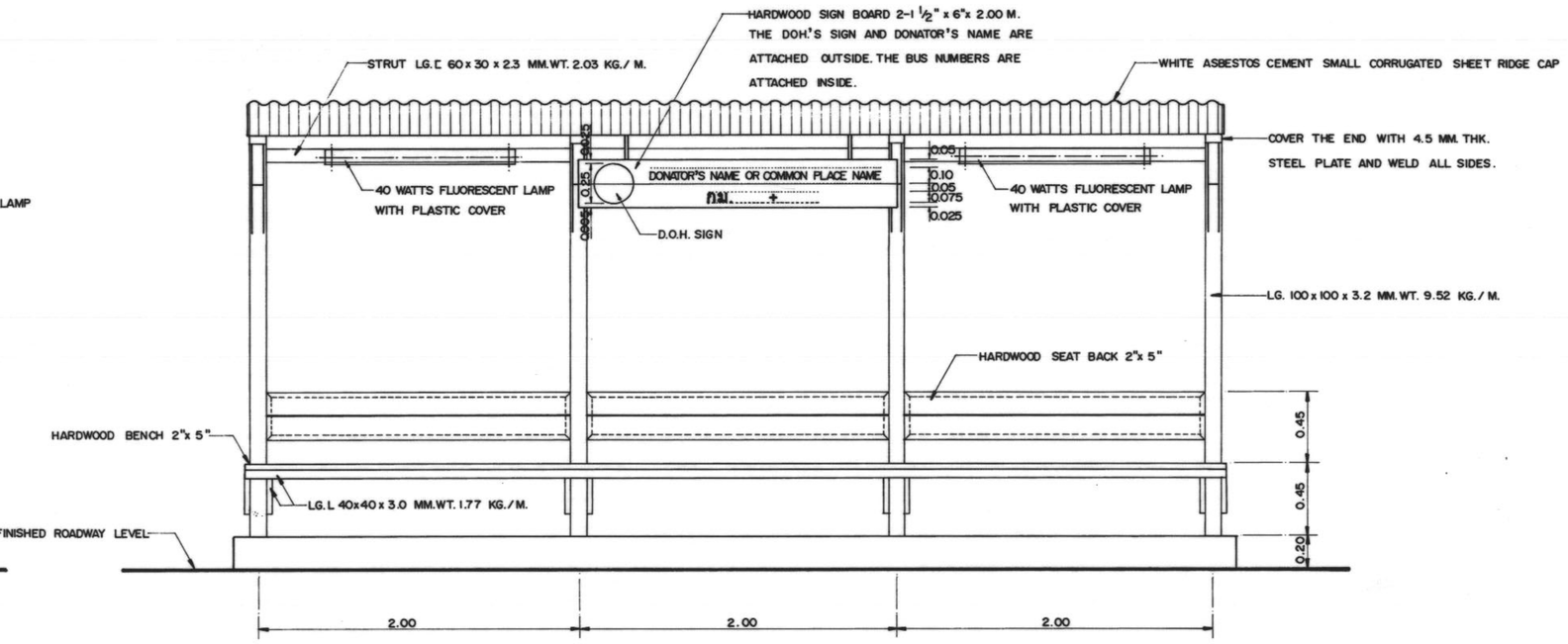
BUS STOP SHELTER TYPE E-II

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. MD-309
		SHEET NO. 100



SIDE ELEVATION

SCALE 1 : 20



FRONT ELEVATION

SCALE 1 : 20

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	350	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

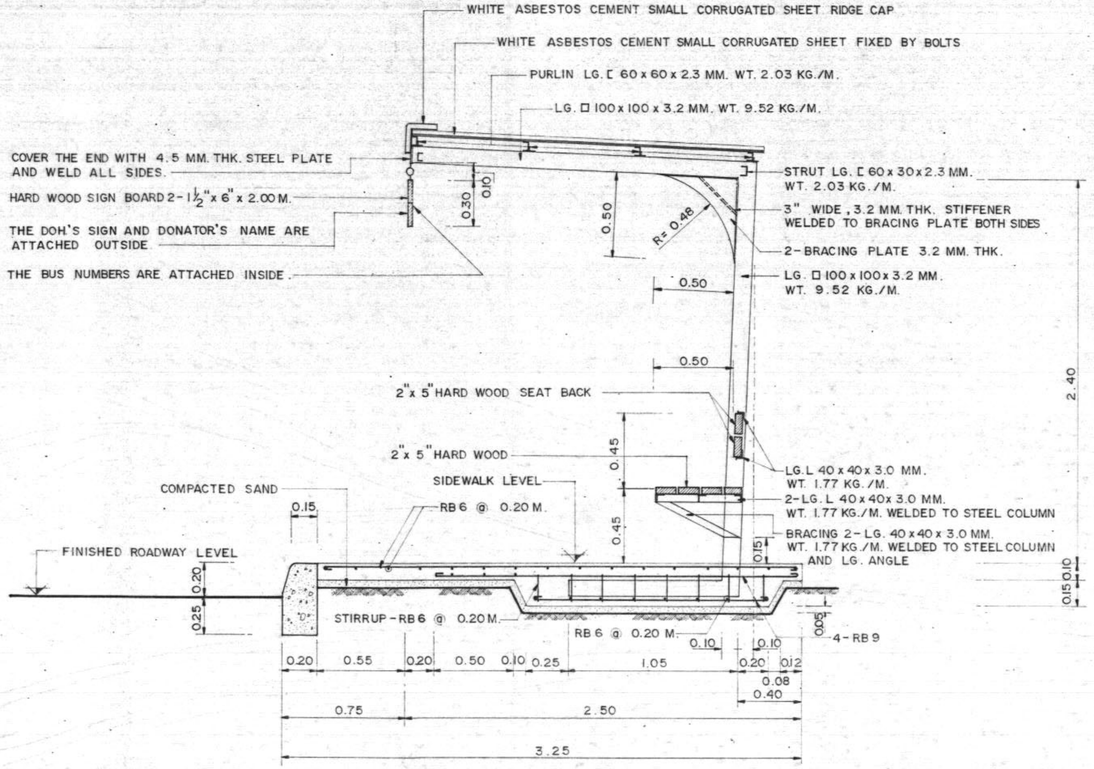
3. CLEAR CONCRETE COVER SHALL BE 2.5 CM.
4. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24 FOR ROUND BARS AND TIS. 24 GRADE SD 30 FOR DEFORMED BARS.
5. WOODEN STRUCTURES SHALL BE HARDWOOD.
6. ALL WELDING SHALL BE 3/16" FILLET WELD AS AISC. SPECIFICATIONS.
7. STEEL STRUCTURES SHALL BE PAINTED WITH RUST-OLEUM OR OTHER EQUIVALENT IN DUSKY BLACK COLOR.
8. WOODEN PARTS SHALL BE POLISHED, NOT PAINTED.
9. ONE 40 WATTS FLUORESCENT SHALL BE USED FOR OUTER SPAN.
10. THIS DRAWING SHALL BE USED IN COMBINATION WITH DWG. NO. MD-311.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

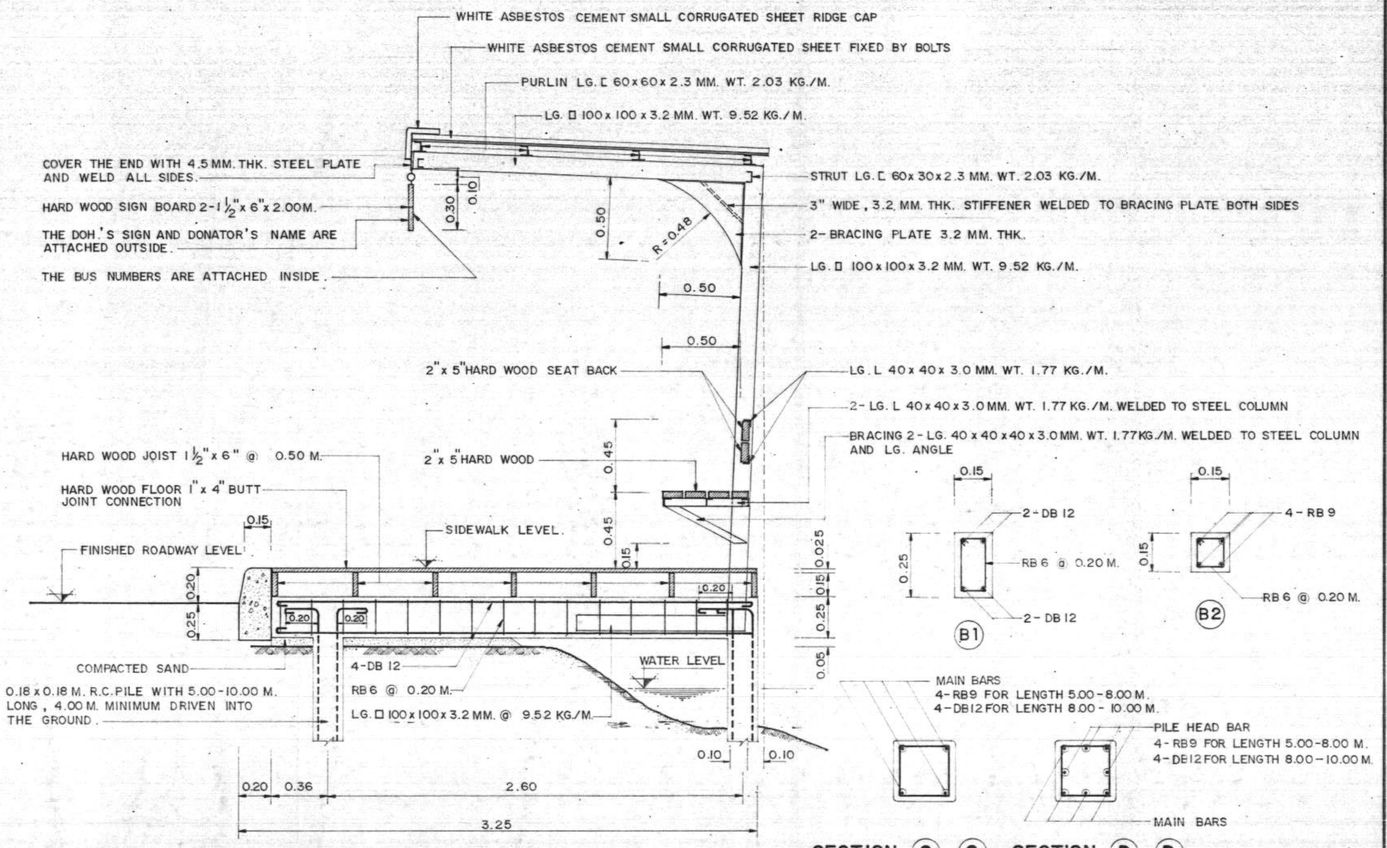
STANDARD DRAWING

BUS STOP SHELTER TYPE F-I

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE 1 : 20
APPROVED : (DIRECTOR GENERAL)		DWG. NO. MD-310
		SHEET NO. 101



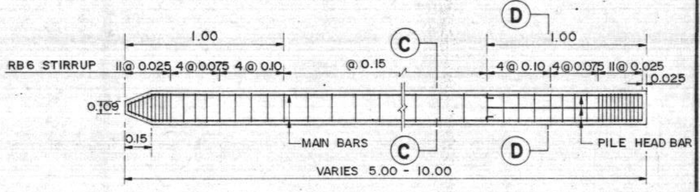
SECTION (A)-(A)
SCALE 1:20

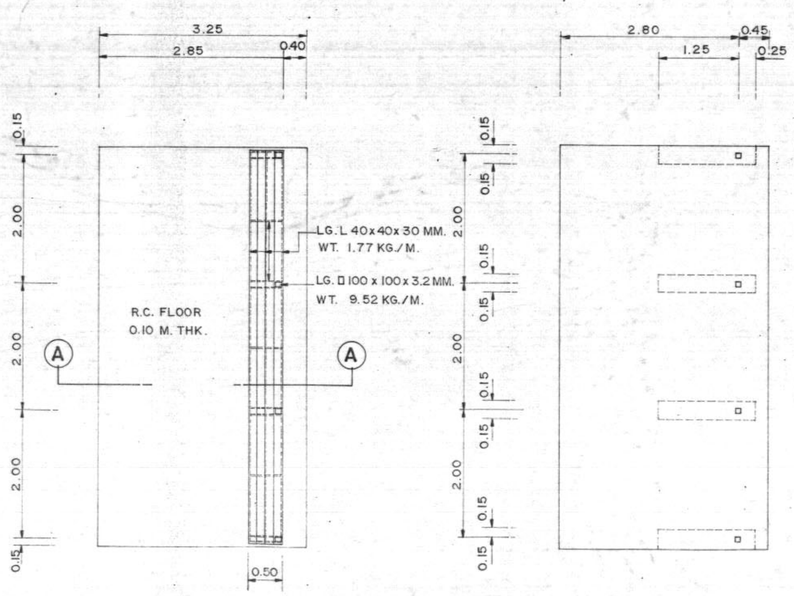


SECTION (B)-(B)
SCALE 1:20

SECTION (C)-(C)
SCALE 1:10

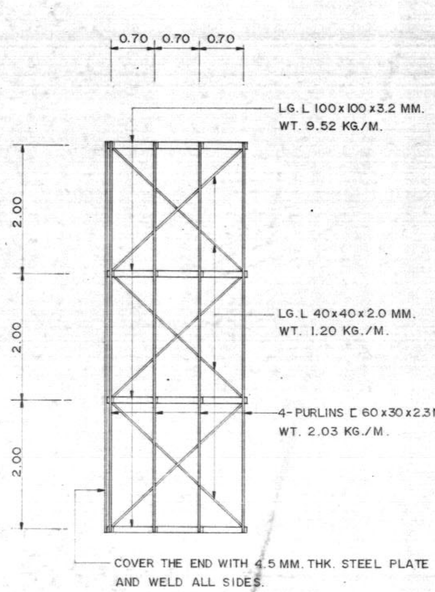
SECTION (D)-(D)
SCALE 1:10



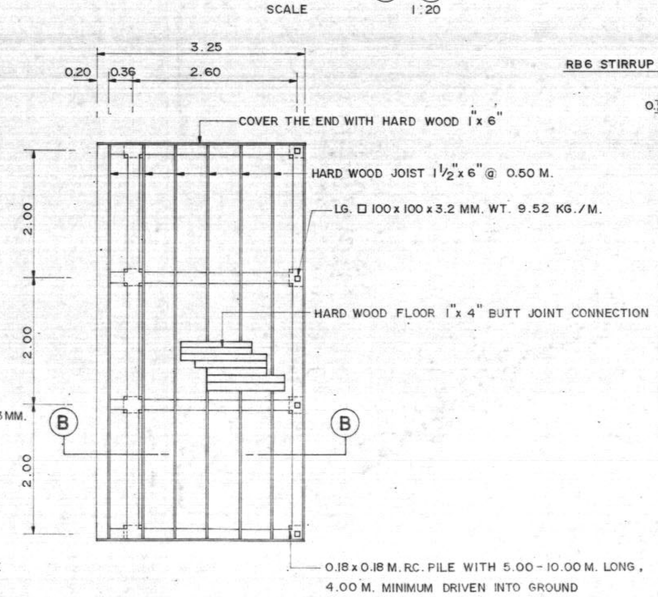


FLOOR PLAN (FOUNDATION TYPE (A))
SCALE 1:50

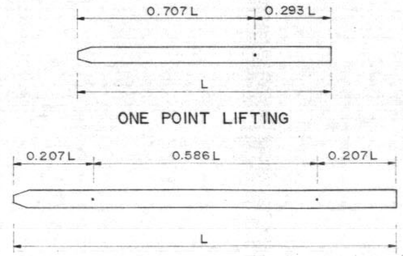
FLOOR, FOOTING PLAN (FOUNDATION TYPE (A))
SCALE 1:50



ROOF FRAMING PLAN
SCALE 1:50



FLOOR, JOIST, BEAM AND PILE PLAN (FOUNDATION TYPE (B))
SCALE 1:50



PILE LIFTING LOCATIONS
NOT TO SCALE

NOTES :

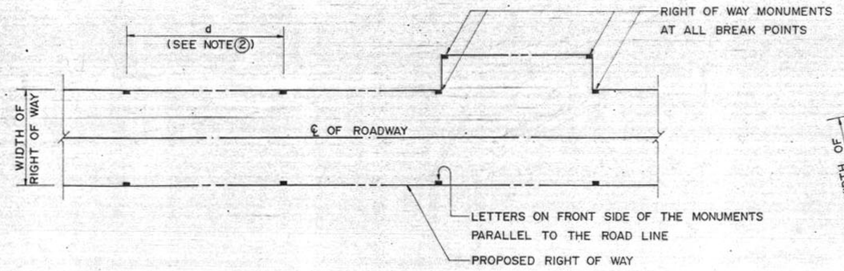
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. THIS DRAWING SHALL BE USED IN COMBINATION WITH DWG. NO. MD-310

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

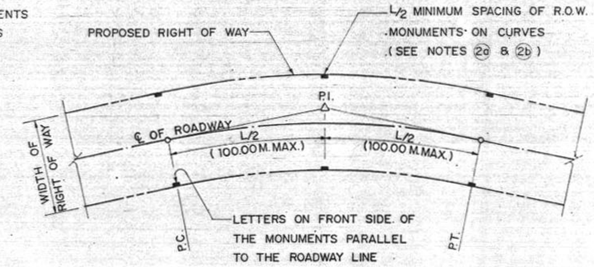
STANDARD DRAWING

BUS STOP SHELTER TYPE F-II

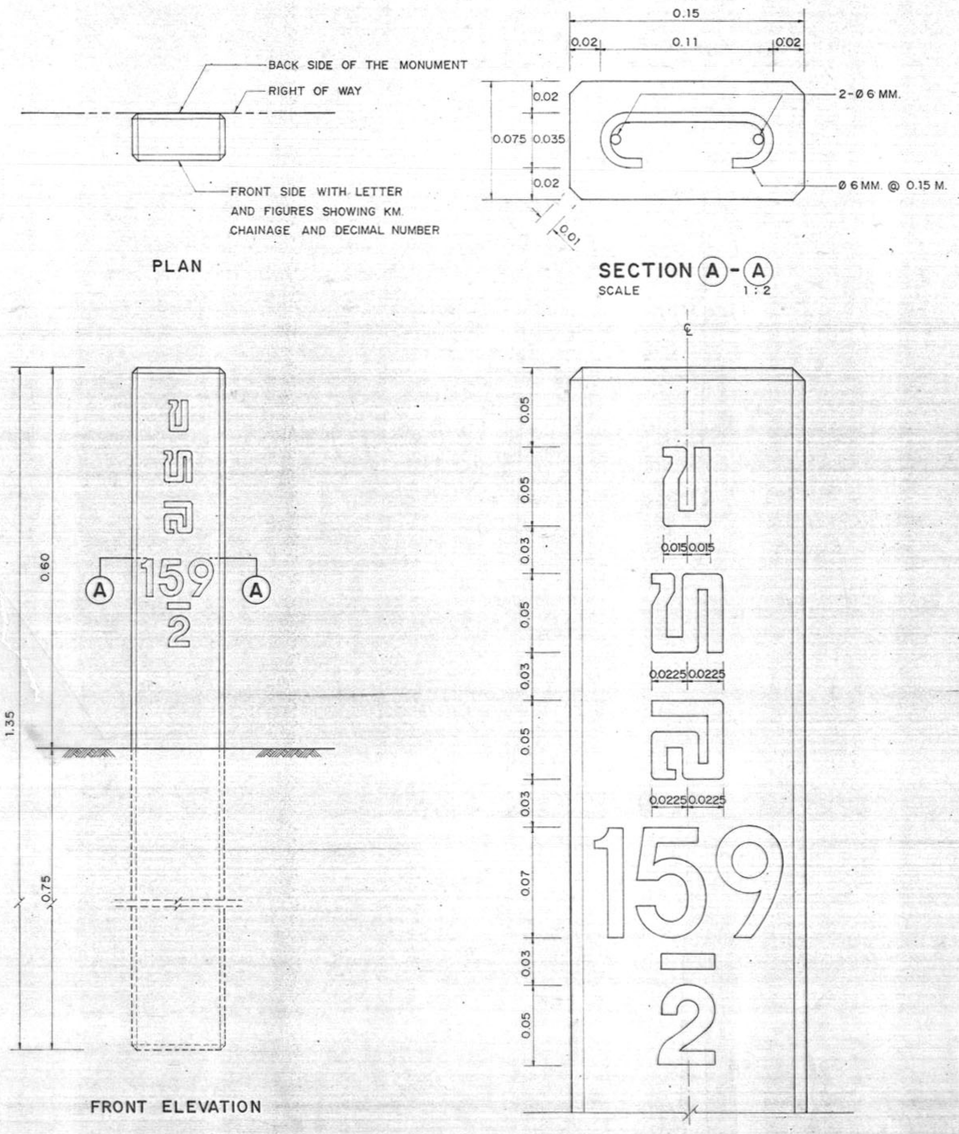
DESIGNED: D.O.H. & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: (DIRECTOR GENERAL)		DWG. NO. MD-311
		SHEET NO. 102



R.O.W. MONUMENT IN STRAIGHT LINE
NOT TO SCALE



R.O.W. MONUMENT IN HORIZONTAL CURVES
NOT TO SCALE



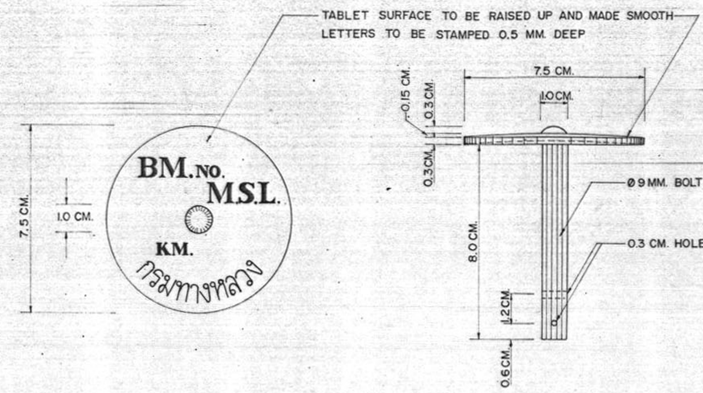
PLAN

SECTION (A)-(A)
SCALE 1 : 2

FRONT ELEVATION

RIGHT OF WAY MONUMENT
SCALE 1 : 5

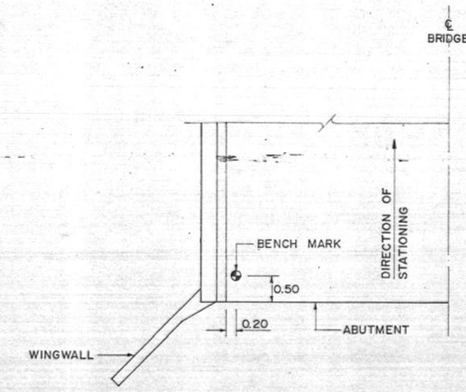
STANDARD LETTERS & FIGURES
SCALE 1 : 2



PLAN OF BRASS TABLET

ELEVATION

BENCH MARK DETAILS
NOT TO SCALE



BENCH MARK LOCATION DETAIL ON BRIDGE
NOT TO SCALE

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. LOCATION OF R.O.W. MONUMENTS SHALL BE AS SHOWN ON THE PLAN AND SHALL BE SPECIFIED AS FOLLOWS :
   a) RURAL (RICE FIELD, WOOD AND ETC.) d = 100 M.
   b) URBAN (TOWNS AND VILLAGES) d = 25 M.
   c) AT ALL BREAK POINTS OF R.O.W.
   d) AT P.C., P.T. AND MIDDLE POINT OF HORIZONTAL CURVE
3. PAINTING OF R.O.W. POSTS.
   a) POSTS, WHITE
   b) LETTERS & FIGURES, BLACK
4. BLACK AND WHITE PAINTS MUST BE GLOSS ENAMAL PAINTS IN ACCORDANCE WITH TIS. 327 AND SHALL BE APPLIED IN 2-LAYERS.
5. LETTERS ARE DEPRESSED 1 CM. INTO THE CONCRETE.
6. POSTS SHALL BE ERECTED TRULY VERTICAL.
7. SIZES OF LETTERS AND FIGURES SHALL BE IN ACCORDANCE WITH DOH'S TRAFFIC CONTROL MANUAL AND THE DRAWING.
8. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 180 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT TYPE 1	320	KG.(MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM.(MAX.)

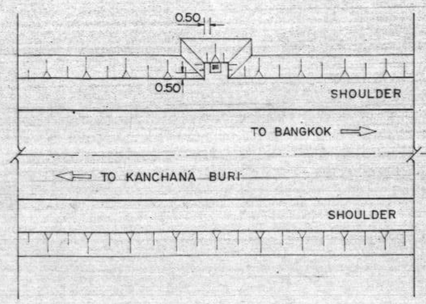
9. RAINFORCING STEEL SHALL CONFORM TO TIS.20 GRADE SR 24

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

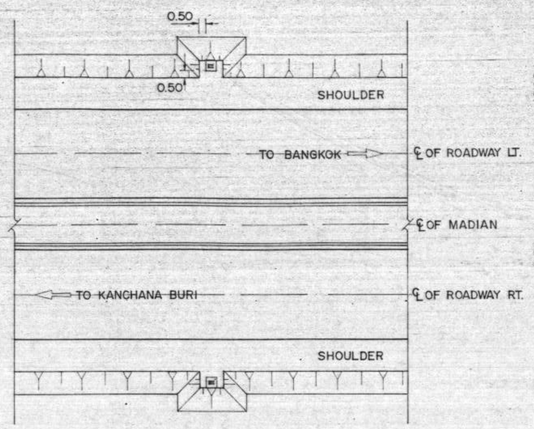
STANDARD DRAWING

RIGHT OF WAY MONUMENT & BENCH MARK

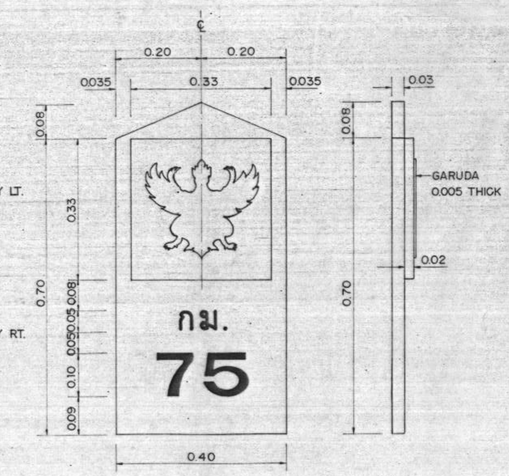
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. MD-401
		SHEET NO. 103



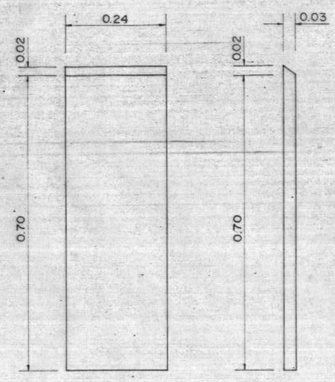
FOR TWO-LANE HIGHWAY



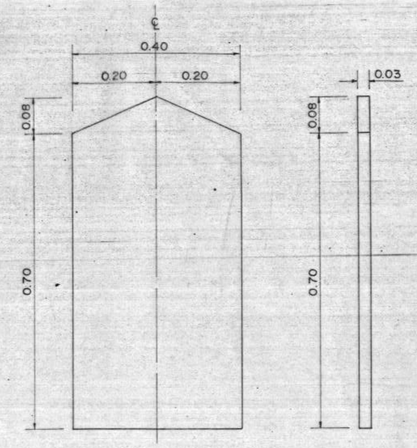
FOR DIVIDED HIGHWAY



FRONT TILE



SIDE TILE

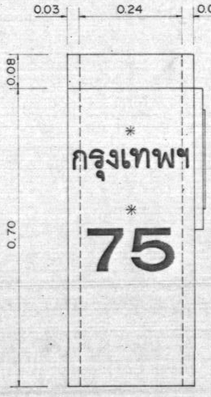


BACK TILE

PLAN
NOT TO SCALE

FRONT VIEW

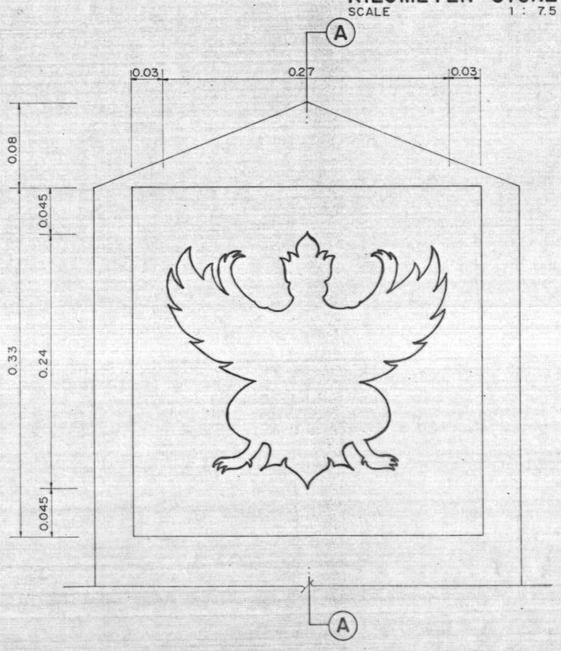
SIDE VIEW



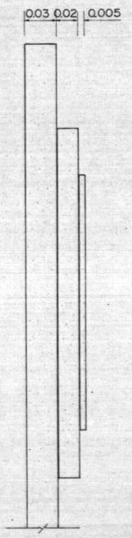
SIDE VIEW

* THE LETTERS MAY BE TWO DESTINATIONS.

KILOMETER STONE
SCALE 1 : 7.5

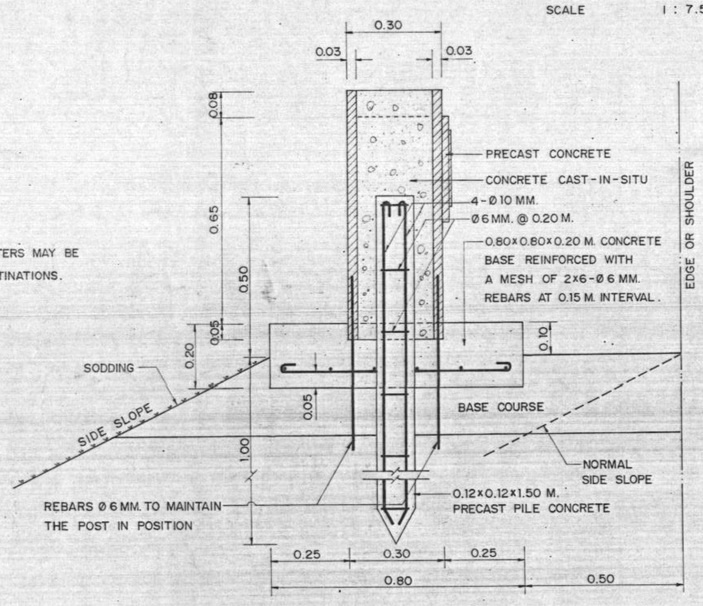


ELEVATION OF GARUDA
SCALE 1 : 3

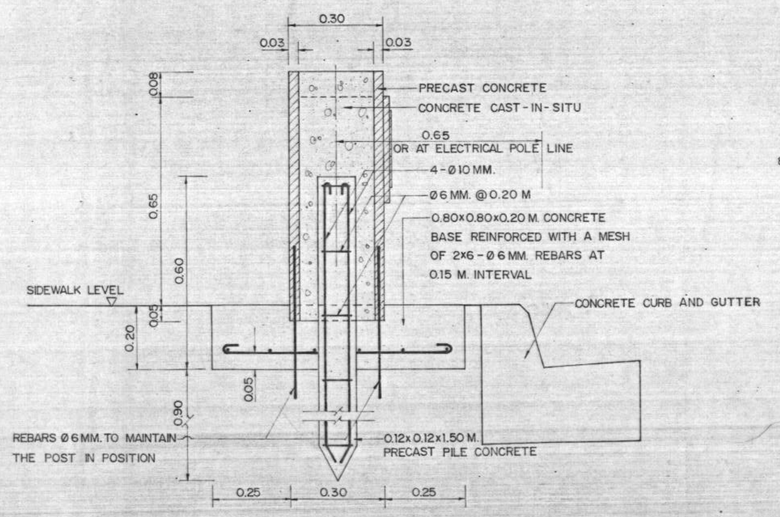


SECTION (A) - (A)
SCALE 1 : 3

TILE DETAIL
SCALE 1 : 7.5



GENERAL DETAIL AT SHOULDER
SCALE 1 : 10



GENERAL DETAIL AT SIDEWALK AND VILLAGE SECTION
SCALE 1 : 10

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. KILOMETER STONE SHALL BE PAINTED WHITE WITH ALL INSCRIPTIONS PAINTED BLACK AND WITH THE GARUDA FRAME PAINTED IN GREY LINE OF 1 CENTIMETER.
3. CONSTRUCTION METHOD
   ALL KILOMETER POST SHALL BE PRECAST IN SEPARATE PARTS AND INSTALLED INPLACE OR BY PRECASTING THE WHOLE UNIT AS SPECIFIED IN THE DRAWING WITH THE ENGINEER'S APPROVAL.
4. WHERE PENETRATION CANNOT BE ACHIEVED FOR PILING THE KILOMETER POST MAY BE ERECTED WITHOUT PILING WHEN APPROVED BY THE ENGINEER.
5. ALL INSCRIPTIONS SHOWN IN THIS DRAWING ARE SET UP FOR EXAMPLE PURPOSES ONLY.
6. THE KILOMETER STONE SHALL BE PLACED AT 1 KILOMETER INTERVAL AT 0.50 M. FROM EDGE OF LEFT SHOULDER OR AT 0.65 M. FROM CURB.
7. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 180 KSC. FOR 15x15x15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOW :

PORTLAND CEMENT TYPE 1	320	KG.(MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM.(MAX.)

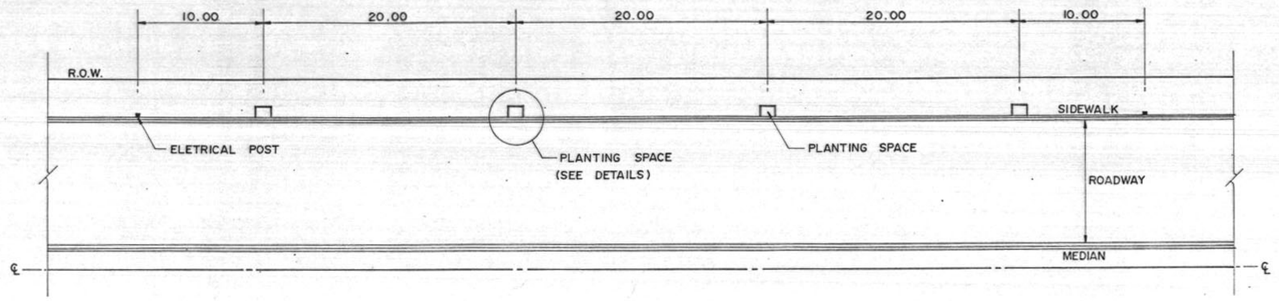
8. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR 24.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

KILOMETER STONE

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. MD-402
		SHEET NO. 104



PLANTING SPACE ON SIDEWALK

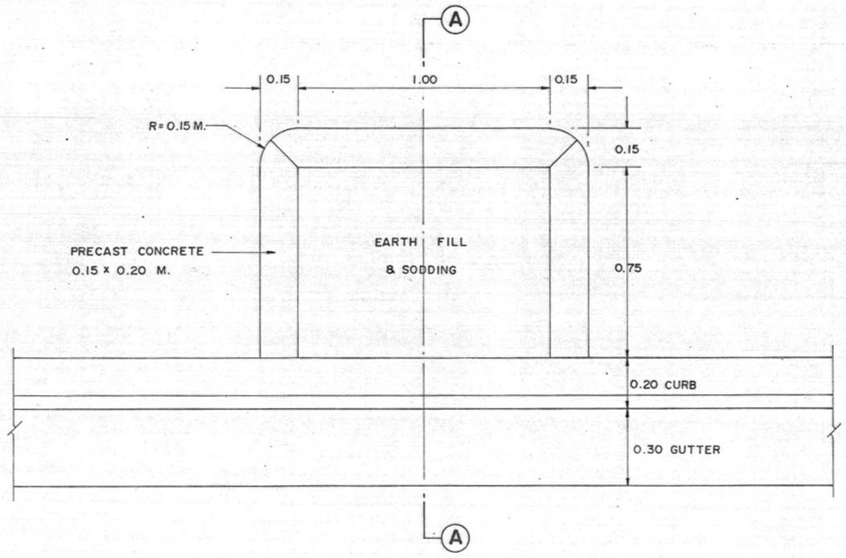
SCALE 1 : 250

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 180 KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

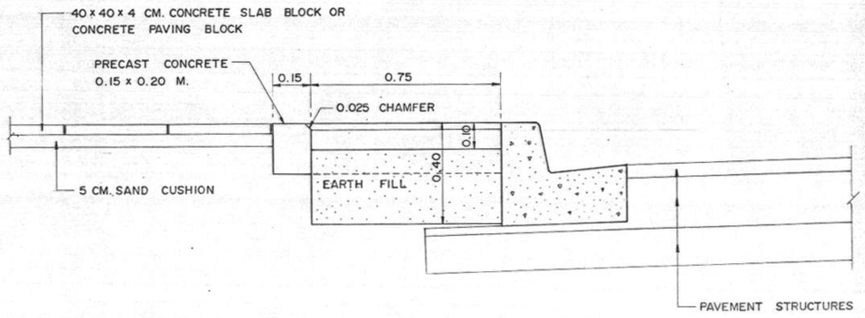
PORTLAND CEMENT TYPE I	320	KG. (MIN.)
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP	10	CM. (MAX.)

3. EARTH FILL IN PLANTING SPACE SHALL BE THE PROPORTION OF SOIL : FERTILIZER : SAND EQUAL TO 4:3:2 BY VOLUME AND SHALL INCLUDE IN THE COST OF PLANTING SPACE.
4. PLANT TREES SHALL BE PAID FOR IN A SEPARATED ITEM.



PLANTING SPACE DETAILS

SCALE 1 : 12.5



SECTION (A) - (A)

SECTION 1 : 12.5

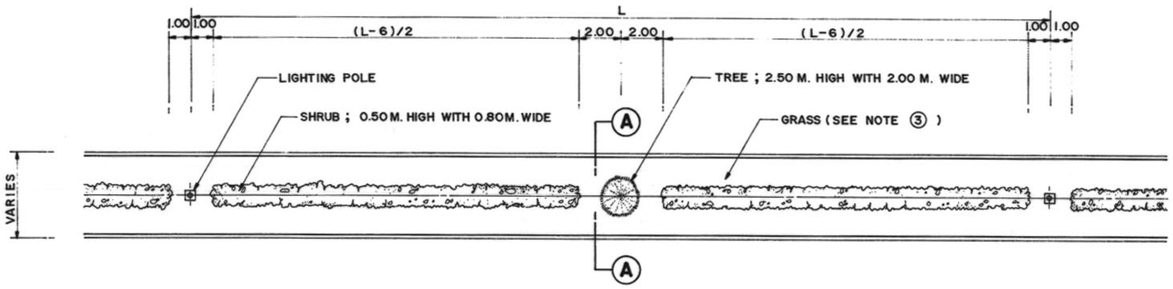
KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

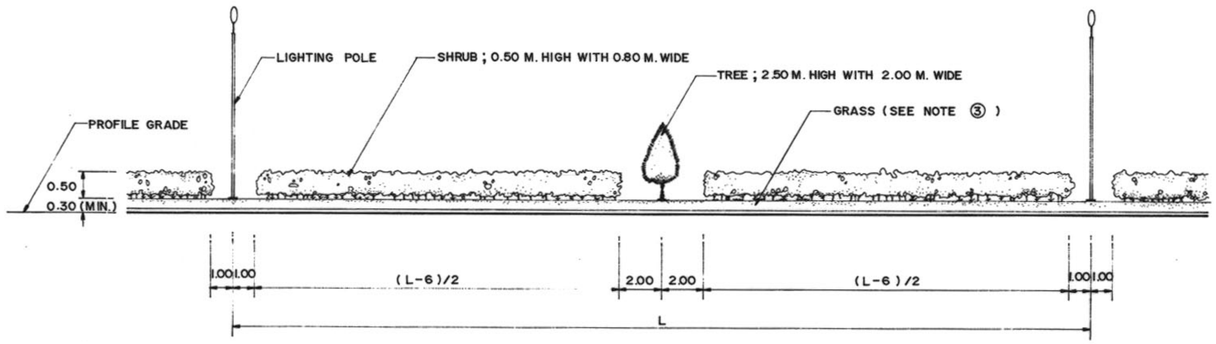
STANDARD DRAWING

PLANTING SPACE ON SIDEWALK

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. MD-501
		SHEET NO. 105

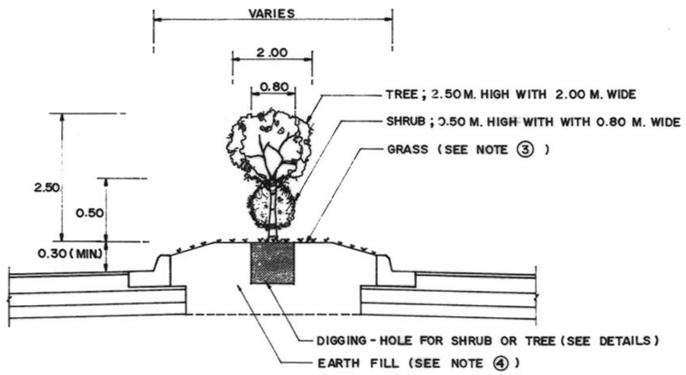


PLAN

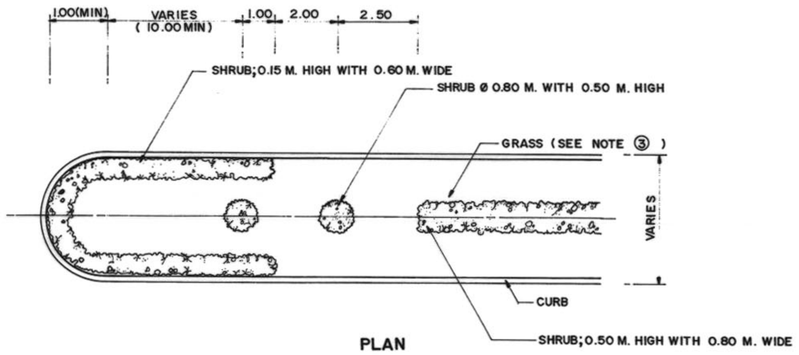


PROFILE

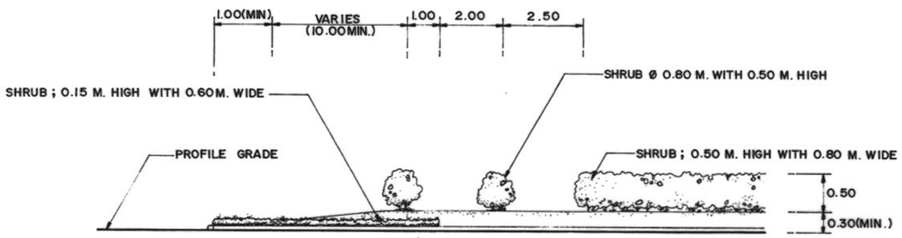
DETAIL OF PLANTING AT MEDIAN
NOT TO SCALE



SECTION Ⓐ - Ⓐ
NOT TO SCALE



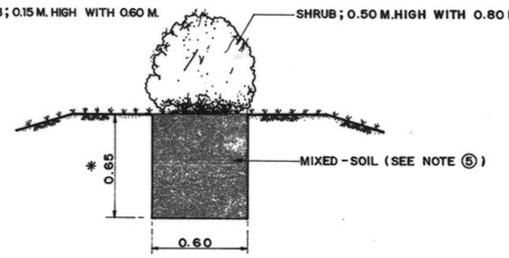
PLAN



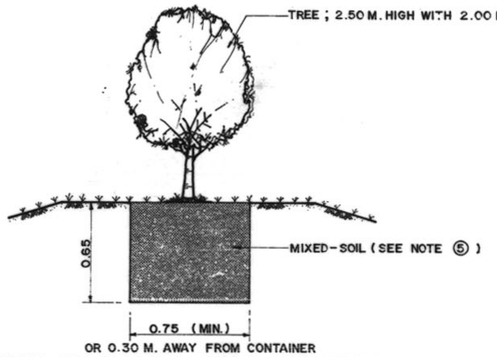
PROFILE

BEGINNING OF MEDIAN
NOT TO SCALE

* THE DEPTH SHALL BE 0.30 M. FOR SHRUB; 0.15 M. HIGH WITH 0.60 M. WIDE.



DETAIL OF DIGGING - HOLE FOR SHRUB
SCALE 1 : 20



DETAIL OF DIGGING - HOLE FOR TREE
SCALE 1 : 20

NOTES :

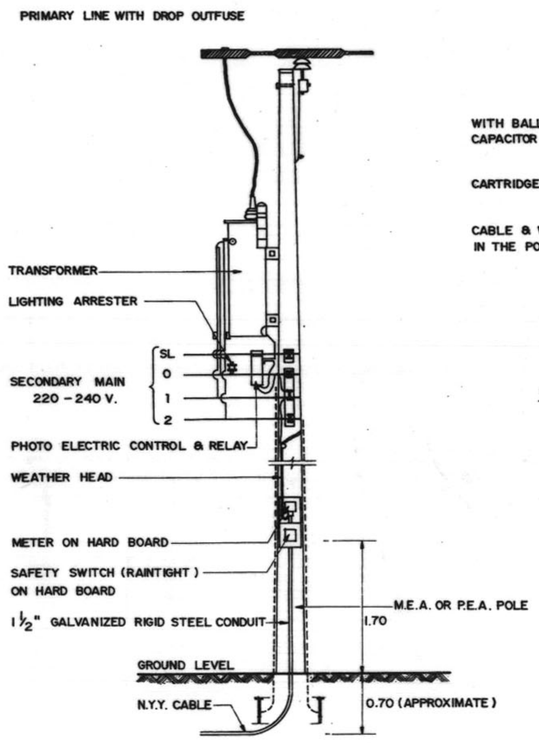
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. TREE AND SHRUB SHALL BE DIRECTED BY ENGINEERS OR OTHERWISE INDICATED IN DRAWINGS.
3. GRASS SHALL BE NUALNOI GRASS OR OTHERWISE INDICATED IN DRAWINGS.
4. EARTH FILL IN MEDIAN SHALL BE ORGANIC TOPSOIL THAT BE SUITABLE FOR GROWING GRASS.
5. MIXED - SOIL SHALL BE THE PROPORTION OF SOIL : FERTILIZER : SAND EQUAL TO 4 : 3 : 2 BY VOLUME.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE PLANTS UNTIL THE END PERIOD AS SPECIFIED IN THE SPECIAL PROVISIONS.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

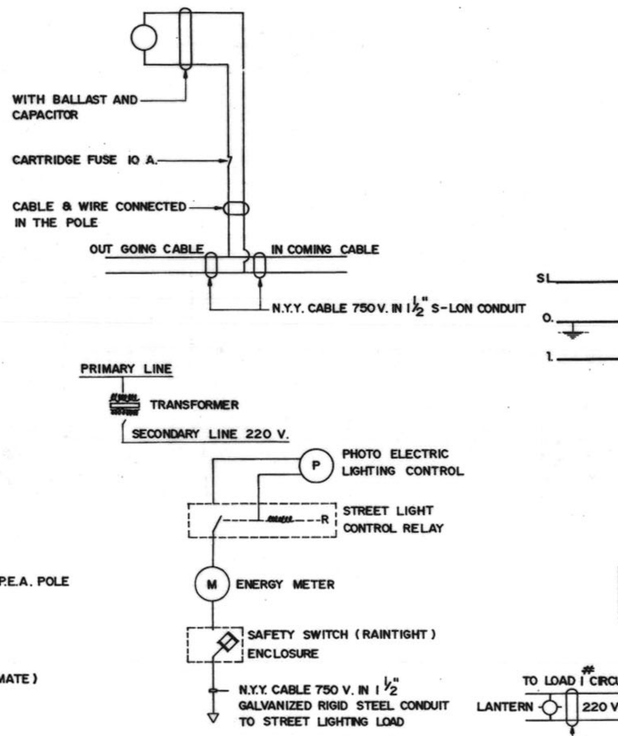
PLANTING AND GRASSING IN MEDIANS

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : (DIRECTOR GENERAL)		DWG. NO. MD-502
		SHEET NO. 106

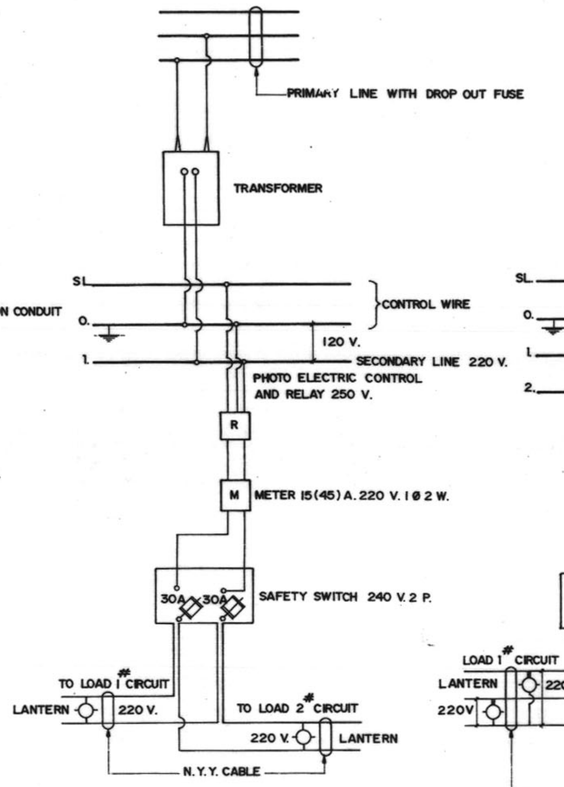


DETAIL OF THE INSTALLATION OF TRANSFORMER, RELAY METER AND SAFETY SWITCH ON ELECTRICAL POLE

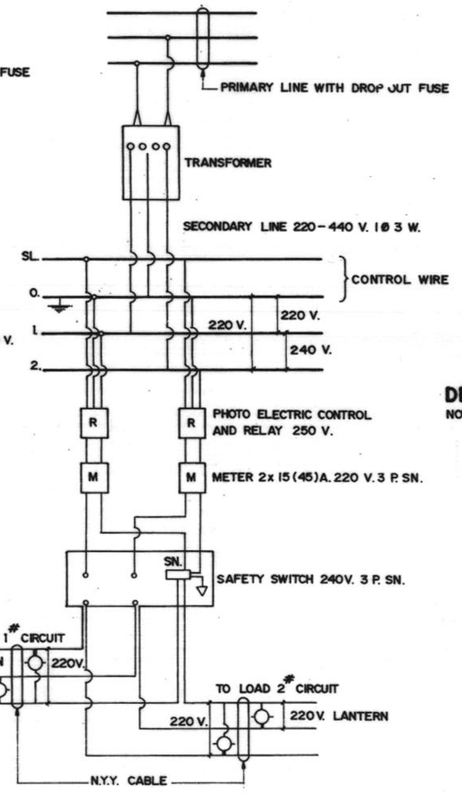
NOT TO SCALE



CIRCUIT DIAGRAM



BLOCK DIAGRAM (1)



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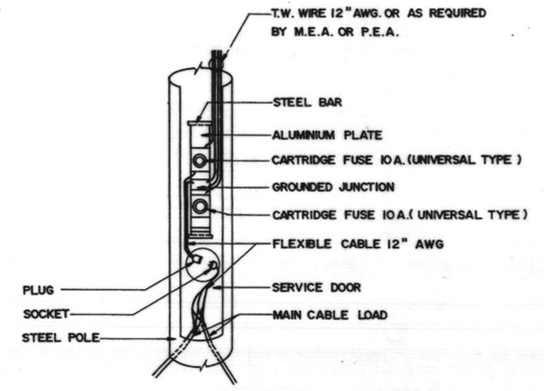
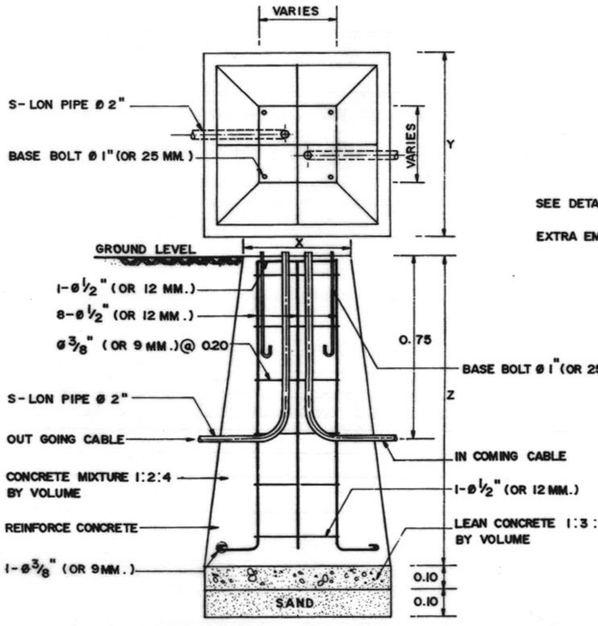


DETAIL OF PULL OUT ELECTRICAL CONNECTION

NOT TO SCALE

NOTES :

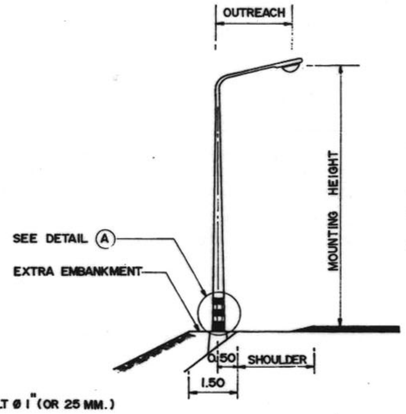
1. ALL DIMENSION ARE IN METERS UNLESS OTHERWISE INDICATED.
2. THE DETAIL DRAWING IS THE MINIMUM REQUIREMENT BY THE DOH. INCASE OF ANY DISCREPANCY BETWEEN THIS DRAWING AND M.E.A. OR P.E.A. STANDARDS ARISES, SUCH ORGANIZING STANDARDS SHALL PREVAIL AT THE EXPENSE OF THE CONTRACTOR.
3. THE ELEVATION OF LIGHTING POLE FOUNDATION SHALL BE LOCATED AS FOLLOWS :
   - 3.1 FOR LIGHTING POLE ON EDGE OF SHOULDER, RAISED MEDIAN AND SIDEWALK, THE TOP OF FOUNDATION LEVEL SHALL BE ABOUT 5 CM. HIGHER THAN GROUND LEVEL.
   - 3.2 FOR LIGHTING POLE IN DEPRESSED MEDIAN, THE TOP OF FOUNDATION LEVEL SHALL KEEP THE SAME ELEVATION AS ROAD PROFILE GRADE.
4. THE GALVANIZED RIGID STEEL CONDUIT (GRC.) SHALL CONFORM TO TIS. 770
5. GROUND ROD SHALL BE GALVANIZED NOT LESS THAN 85 MICRON.



LIGHTING POLE FOUNDATION DETAILS

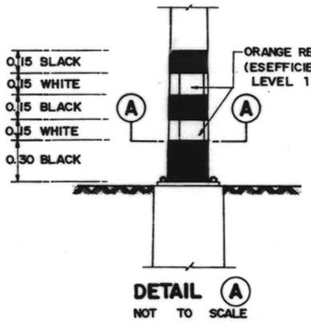
NOT TO SCALE

H	X (CM.)	Y (CM.)	Z (CM.)	REMARK
9.00	40x40	80x80	120	FOR SIDE ENTRY OR POST TOP MOUNTING
10.00	45x45	90x90	120	FOR SIDE ENTRY OR POST TOP MOUNTING
11.00	45x45	90x90	120	FOR SIDE ENTRY OR POST TOP MOUNTING
12.00	50x50	100x100	120	FOR SIDE ENTRY OR POST TOP MOUNTING
14.00	65x65	130x130	150	FOR POST TOP MOUNTING ONLY



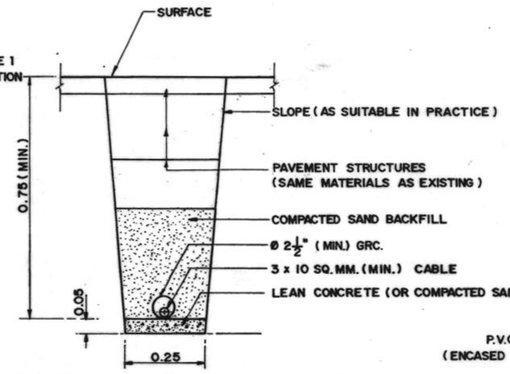
LOCATION OF LIGHTING POLE

NOT TO SCALE



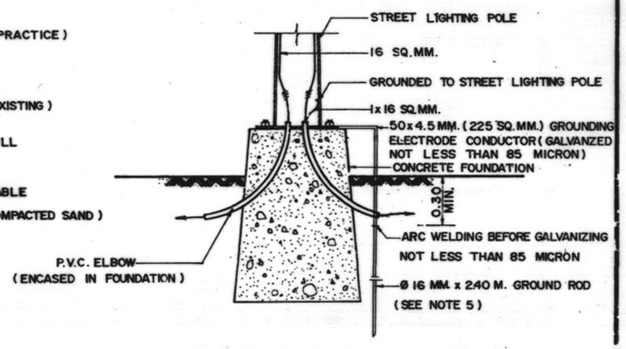
DETAIL (A)

NOT TO SCALE



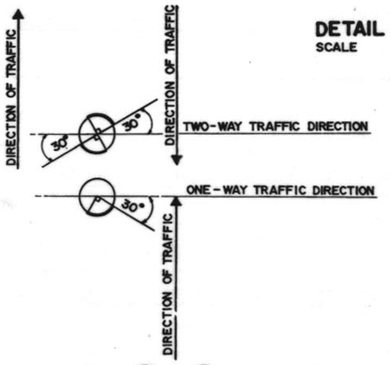
DETAIL OF BURIAL CABLE UNDER ROADWAY

SCALE 1 : 10



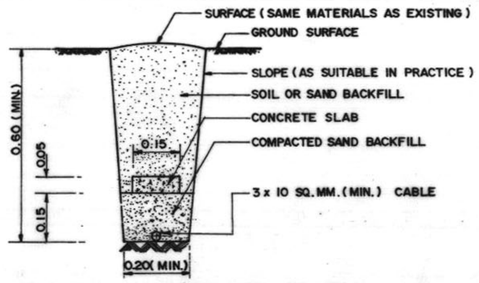
DETAIL OF GROUND ROD

SCALE 1 : 20



SECTION (A) - (A)

NOT TO SCALE



DETAIL OF BURIAL CABLE UNDER GROUND

SCALE 1 : 10

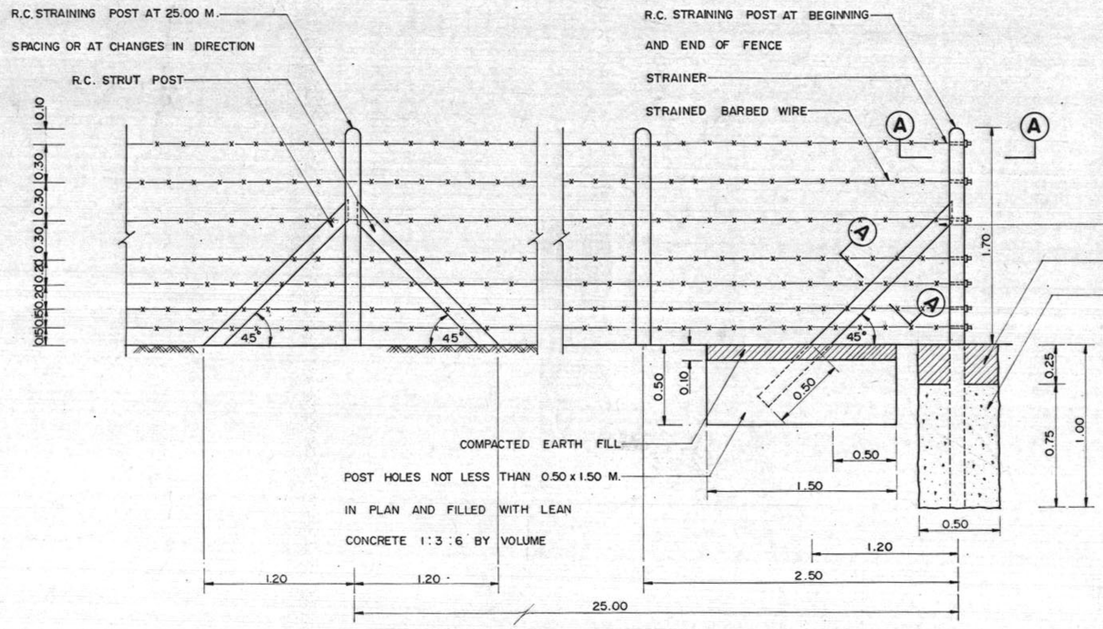
KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

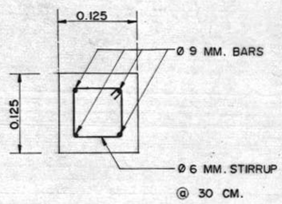
MISCELLANEOUS LIGHTING DETAILS

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)	15/2/40	SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)	18/02/97	DWG. NO. MD-601
		SHEET NO. 107



FENCE TYPE I (PROPERTY FENCE)

NOT TO SCALE



SECTION (A)-(A)

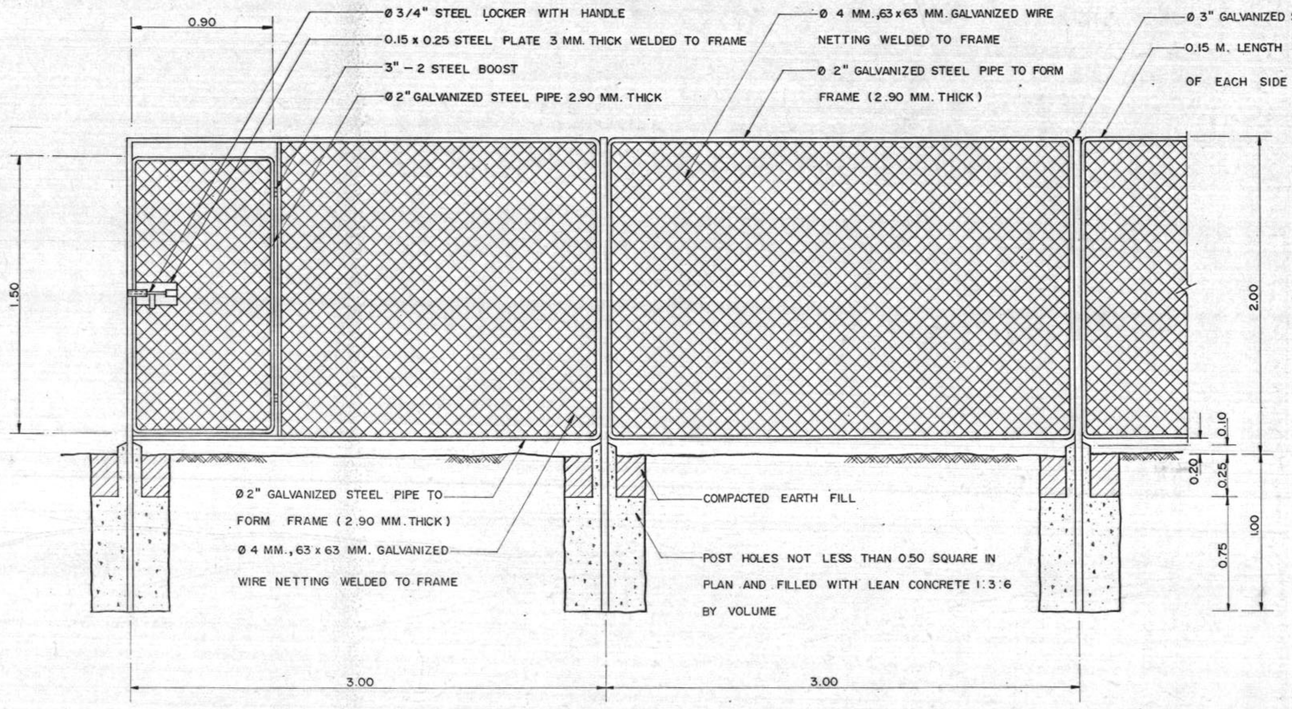
SCALE 1 : 5

NOTES :

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. CONSTRUCTION LOCATION OF THE TWO TYPES OF FENCES ARE SHOWN ON LAY OUT PLAN WHERE THE FENCES SHALL NOT BE OBSTRUCTED TRAFFIC, WHEN ACCIDENT ARE OCCURED TO THE FENCES.
3. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 180 .KSC. FOR 15 x 15 x 15 CM. CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS

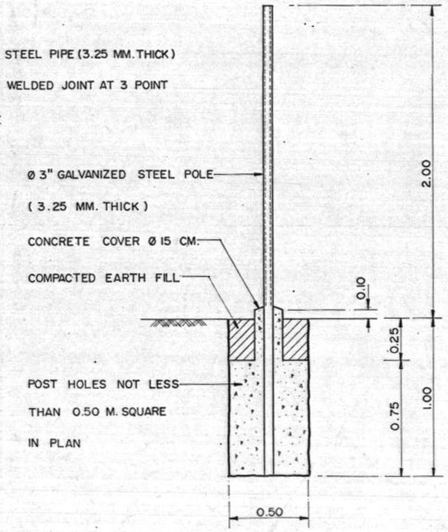
PORTLAND CEMENT TYPE 1	320	KG. (MIN.)
SAND	0.43	$M.^3$
CRUSHED ROCK OR GRAVEL	0.86	$M.^3$
CONCRETE SLUMP	10	CM. (MAX.)

4. REINFORCING STEEL SHALL CONFORM TO TIS. 20 GRADE SR. 24 .
5. WIRE NETTING SHALL BE GALVANIZED AS SPECIFIED BY TIS. 208 .
6. STRAINED BARBED WIRE SHALL BE GALVANIZED AS SPECIFIED BY TIS. 76 .
7. Ø 2" AND Ø 3" STEEL PIPE SHALL BE GALVANIZED.
8. THE COST OF FENCE TYPE I SHALL INCLUDE THE COST OF R.C. STRUT POST AND ITS FOUNDATION.
9. THE COST OF FENCE TYPE II SHALL INCLUDE THE COST OF 0.90 x 1.50 M. EXIT-ENTRANCE OF FENCE GATE, AND ITS FOUNDATION.
10. LOCATION OF EXIT-ENTRANCE OF FENCE GATE TYPE II SHALL BE AS DIRECTED BY THE ENGINEER.



FENCE TYPE II

SCALE 1 : 20



SIDE VIEW

SCALE 1 : 20

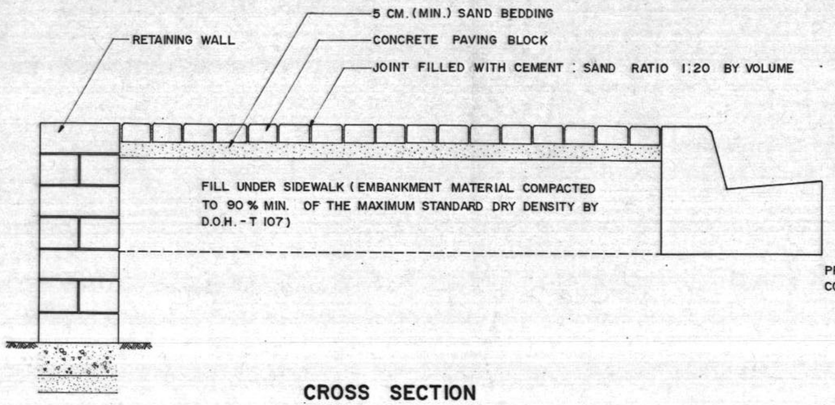
KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

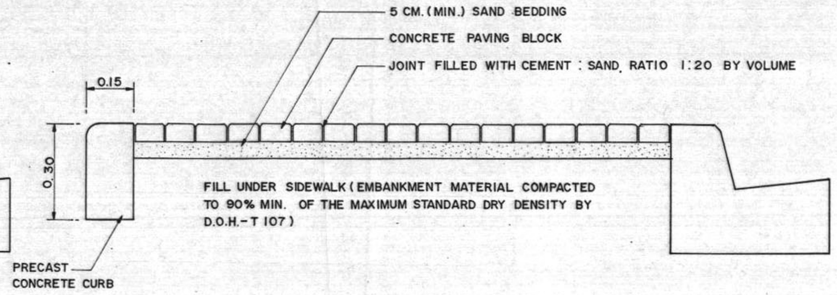
STANDARD DRAWING

FENCING DETAILS

DESIGNED: D.O.H. & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: (DIRECTOR GENERAL)		DWG. NO. MD-70
		SHEET NO. 108



CROSS SECTION
SCALE 1 : 10



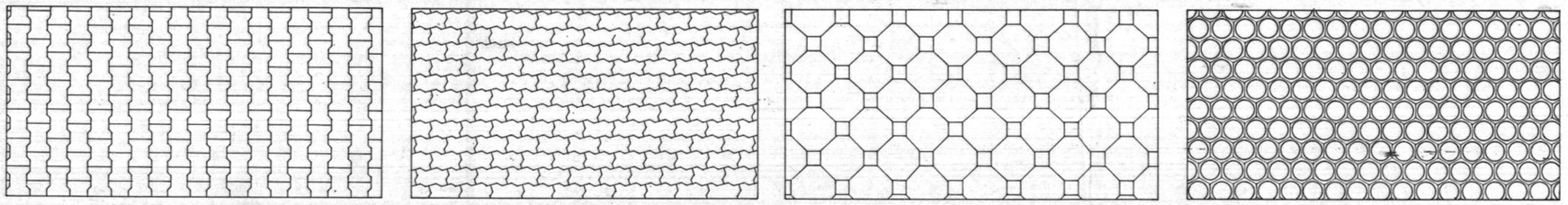
CROSS SECTION
SCALE 1 : 10

NOTES :

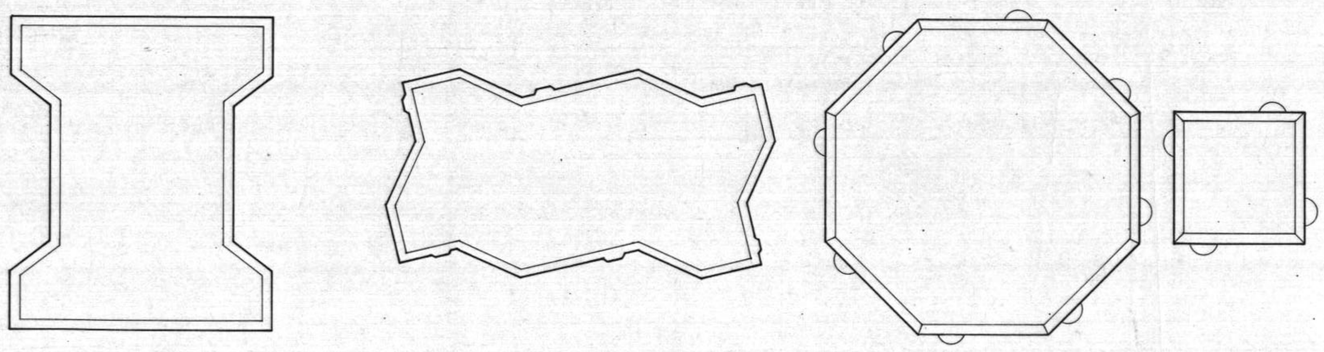
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. SHAPE AND ARRANGEMENT SHALL BE SPECIFIED IN THE DRAWINGS OR DIRECTED BY THE ENGINEER.
3. COST OF CONCRETE PAVING BLOCK SHALL INCLUDE SAND BEDDING, JOINT FILLING, AND PRECAST CONCRETE CURB.
4. CONCRETE PAVING BLOCK SHALL CONFORM TO TIS. 827
5. JOINT SHALL BE FILLED WITH CEMENT : SAND RATIO 1:20 BY VOLUME

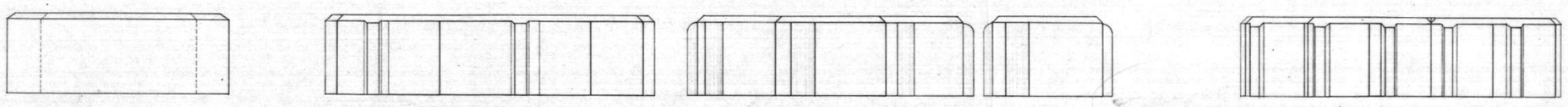
PROPERTIES OF SAND BEDDING AND JOINT FILLING SAND

SIEVE SIZE	% PASSING	
mm.	SAND BEDDING	JOINTING SAND
9.52	100	—
4.75	95 – 100	—
2.36	80 – 100	100
1.18	50 – 85	90 – 100
0.60	25 – 60	60 – 90
0.30	10 – 30	30 – 60
0.15	5 – 15	15 – 30
0.075	0 – 5	10 – 20



SHAPE AND ARRANGEMENT OF CONCRETE PAVING BLOCK
NOT TO SCALE





CONCRETE PAVING BLOCK BEHATON SHAPE
SCALE 1 : 20

CONCRETE PAVING BLOCK UNI-PAVE SHAPE
SCALE 1 : 20

CONCRETE PAVING BLOCK OCTA-CUBE SHAPE
SCALE 1 : 20

CONCRETE PAVING BLOCK DYWIDAG SHAPE
SCALE 1 : 20

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

CONCRETE PAVING BLOCK

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
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APPROVED : (DIRECTOR GENERAL)		DWG. NO. MD-801
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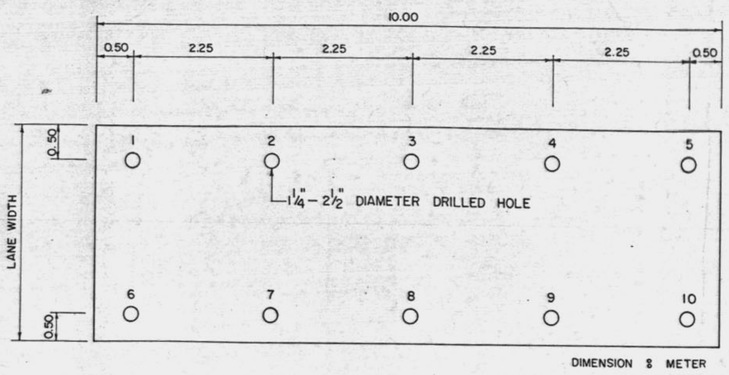


FIGURE 1 PLAN OF DRILLING FOR CEMENT MORTAR COMPRESSION ALONG THE PUMPING JOINT

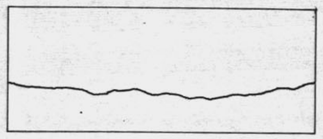


FIGURE 2A LONGITUDINAL SINGLE CRACK

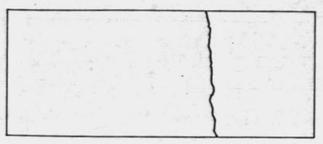


FIGURE 2B TRANSVERSE SINGLE CRACK

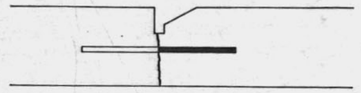


FIGURE 3 SECTION OF SHALLOW JOINT SPALLING

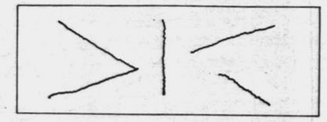


FIGURE 4 SHATTERED SLAB

1. PUMPING JOINT REPAIRING

1.1 MATERIALS

MATERIALS TO BE MIXED AND COMPRESSED INTO CONCRETE JOINT ARE AS FOLLOW :

1.1.1 **SOIL :** SOIL SHALL BE SILTY SAND WHICH IS PASSED THROUGH SIEVE NO. 10 (100 %) AND SIEVE NO. 200 (0-50 %), AND IS NON - PLASTIC MATERIAL.

1.1.2 **CEMENT :** CEMENT SHALL BE TYPE III. OR EQUIVALENT.

1.1.3 **WATER :** WATER WHICH IS USED FOR MIXING WITH SILTY SAND AND CEMENT MUST BE CLEAN.

1.1.4 **ADDITIVE :** ADDITIVE IS USED TO INCREASE CAPACITY OF FLOWING THROUGH SPACE UNDER THE CONCRETE SLAB. THE ADDITIVE SHOULD HAVE SUITABLE QUALITIES AND WILL BE APPROVED BY THE ENGINEER.

1.1.5 **MIXED RATIO :** MIXED RATIO OF SLURRY CEMENT MORTAR IS AS FOLLOW :

– SILTY SAND	20 LITERS
– CEMENT	6 LITERS
– WATER	10 LITERS
– ADDITIVE	AS NECESSARY

THE MIXED RATIO OF SLURRY CEMENT MORTAR CAN BE ADJUSTED BY THE ENGINEER TO OPTIMUM MIXED RATIO FOR SUITABLE CAPACITY OF FILLING INTO THE SPACE UNDER CONCRETE PAVEMENT.

1.2 WORK PREPARING

STEPS ARE AS FOLLOW :

1.2.1 THE ENGINEER SPECIFIES THE CONCRETE SLABS TO BE REPAIRED. THE CONCRETE SLABS SHOULD HAVE THE SIGN OF DEFLECTION OR THE TRANSVERSE OR LONGITUDINAL CRACKS THAT CAN BE CLEARLY SEEN.

1.2.2 EACH REPAIRED CONCRETE SLAB SHOULD BE MARKED AS THE DRILLING POSITION IN ORDER TO COMPRESS SLURRY CEMENT MORTAR THROUGH, AS SHOWN IN FIGURE 1.

1.2.3 DRILL THE MARKED POSITION, AS SHOWN IN STEP 1.2.2.

1.2.4 PREPARE THE SET OF SLURRY CEMENT MOTAR MIXER, SLURRY CEMENT MORTAR COMPRESSOR, AND OTHER NECESSARY MATERIALS.

1.3 SLURRY CEMENT MORTAR COMPRESSING

1.3.1 COMPRESS THE SLURRY CEMENT MORTAR INTO THE FIRST HOLE (SHOWN IN FIGURE 1). GENTLY DO IT AT FIRST SO THAT THE CEMENT CAN FLOW FREELY AND REGULARLY AND THEN INCREASINGLY COMPRESS THE CEMENT TILL THE MACHINE CAN NO LONGER PRESS.

WHILE COMPRESSING THE SLURRY CEMENT MORTAR INTO THE HOLE NO.1, THERE MAY BE SOME SLURRY CEMENT MORTAR SLIPPED INTO AND FILLED THE HOLES NO. 2 OR NO. 6 AS IN FIGURE 1. IF SO, CORK OR PLUG THOSE PARTICULAR HOLES AND DO NOT COMPRESS THE SLURRY CEMENT MOTAR INTO THEM.

1.3.2 MOVE THE COMPRESSOR TO THE HOLE NO. 2 AND DO THE SAME WAY AS TO THE HOLE NO. 1. THEN MOVE TO THE REST OF THE HOLES.

1.3.3 UNCORK OR UNPLUG THE HOLES. SOME HOLES MAY NEED TO BE REFILLED A LITTLE MORE, THEN SHAPE THE HOLES.

1.3.4 LET THE SLURRY CEMENT MORTAR DRY FOR AT LEAST 12 HOURS. THE TRAFFIC SHALL NEED TO BE STOPPED.

1.4 JOINT SEALER CHANGING

IN THE AREA WHERE HAVING PUMPING AND SLURRY CEMENT MORTAR COMPRESSING UNDERNEATH THE CONCRETE SLAB, THE OLD JOINT SEALER HAS TO BE REMOVED AND REPLACED BY A NEW JOINT SEALER. THE JOINT SEALER SHOULD BE STANDARDIZED AS SUGGESTED BY THE DEPARTMENT OF HIGHWAYS.

2. TRANSVERSE AND LONGITUDINAL SINGLE CRACK REPAIRING (STRUCTURAL CRACK)

THE TRANSVERSE AND LONGITUDINAL CRACKS ALONG THE THICK OF CONCRETE SLAB CAN BE REPAIRED BY EPOXY COMPRESSING.

THE REPAIR CAN BEGIN WITH COMPRESSING EPOXY INTO SMALL POROUS TUBES LAID ALONG THE CRACKS. THE DISTANCE BETWEEN TUBES IS ABOUT 5-10 CM. THE EPOXY COMPRESSED UNDER HIGH PRESSURE WILL SPREAD THROUGH THE CRACKS ALONG THE THICK OF THE CONCRETE SLAB.

THE ENGINEER MAY USE OTHER APPROPRIATE WAYS OF USING EPOXY AS FOR A BETTER RESULT. THE AIMED RESULT IS THAT. THE CRACKS ARE SO WELL SEALED THAT WATER CAN NOT PASS THROUGH.

THE TRANSVERSE AND LONGITUDINAL CRACKS ARE AS SHOWN IN FIGURE 2.

3. SHALLOW JOINT SPALLING REPAIRING

SHALLOW SPALLING OF JOINT CAN BE REPAIRED BY USING EPOXY MORTAR AND FOLLOWING THESE STEPS :

3.1 CUT THE CONCRETE AROUND THE AREA OF SPALLING AND MAKE A SHAPE OF RECTANGLE (AS DEEP AS 2.5 – 3.0 CM.)

3.2 SPREAD THE CUT WITH EPOXY MORTAR WHICH IS A APPROPRIATE COMBINATION OF COARSE SAND AND EPOXY.

THE USE OF EPOXY FOR REPAIRING WORK SHOULD FOLLOW THE INSTRUCTIONS OF THE PRODUCER AND ALSO THE APPROVAL OF THE ENGINEER.

SECTION OF SHALLOW SPALLING IS SHOWN IN FIGURE 3.

4. SHATTERED SLAB REPAIRING

TO REPAIR THE SHATTERED SLAB WITH MORE THAN TWO TRANSVERSE AND LONGITUDINAL CRACKS, THE CONCRETE SLAB NEEDS TO BE DISMANTLED AND THEN THE PIECES OF CONCRETE SLAB ARE TO BE REMOVED. THEN THE AREA WHERE THE SLABS WHERE REMOVED IS POURED NEW CONCRETE OVER. THE METHOD IS AS FOLLOW :

4.1 DISMANTLE THE SHATTERED SLABS BY USING A MACHINE AND REMOVE THEM.

4.2 EXAMINE AND MAKE SURE IF THE SUBBASE OR SAND CUSHION OR CRUSHED ROCK ARE IN GOOD CONDITION. COMPACTION SHOULD BE THE STANDARD OF THE DEPARTMENT OF HIGHWAYS. SOFT SPOT FOUND IN ANY AREA HAS TO BE REMOVED AND REPLACED BY SUITABLE MATERIALS SUCH AS CRUSHED ROCK OR SAND.

4.3 MAKE A HOLE AND PUT A NEW SET OF TIE BAR INTO IT. (REMOVE THE OLD SET)

4.4 THE NEW SET OF TIE BAR SHOULD BE PUT IN THE POSITION NEAR THE POSITION OF THE PREVIOUS SET.

4.5 POURING CONCRETE OVER THE PREPARED AREA. THE MATERIALS AND CONCRETE MIXING AS WELL AS CONSTRUCTION TECHNIQUES AND BROOMING SHALL BE IN ACCORDANCE WITH THE STANDARD DH. – S. 409 REGARDING " REGULATIONS OF CONSTRUCTION CONTROL OF PORTLAND CEMENT CONCRETE PAVEMENT " REQUIRE NECESSARILY FOR CONCRETE MIXING AS :

– PORTLAND CEMENT	350	KG./M^3
– WATER/CEMET RATIO	0.55	BY WEIGHT
– CONCRETE SLUMP	3-7	CM.

CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 325 KSC. FOR 15 X 15 X 15 CM. CUBE AT 28 DAYS.

4.6 JOINTS SHALL BE CUT WITHIN THE SUITABLE TIME (APPROXIMATE 4-12 HOURS AFTER CONCRETE POURING)

4.7 MASTIC JOINT SEALER SHALL BE DROPPED AS APPROVAL BY THE ENGINEER.

NOTES

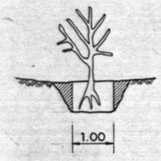
1. FOR THE CONCRETE SLAB WITH TRANSVERSE AND LONGITUDINAL SINGLE CRACKS, THE ELEVATION OF THE CONCRETE SLAB IN THE CRACK POSITION NEEDS TO BE CHECKED. IN CASE OF SETTLEMENT OR PAVEMENT STRUCTURES DAMAGE WHICH CAN CAUSE CRACKS AND WHICH WILL NOT BE REPAIRED BY METHOD (2), THE METHOD (4) SHALL BE BROUGHT TO CONSIDERATION.
2. TRANSVERSE AND LONGITUDINAL SINGLE CRACKS ON CONCRETE SLABS, AFTER REPAIRING BY USING EPOXY, SHOULD BE CONSIDERED TO COMPRESS SLURRY CEMENT MORTAR INTO THE UNDERNEATH OF THE SLABS.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

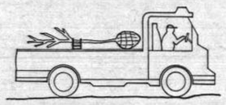
STANDARD DRAWING

CONCRETE PAVEMENT REPAIRING

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. MD-802
		SHEET NO. 110

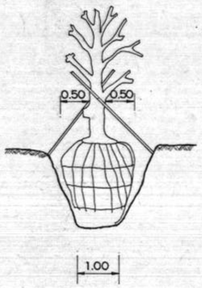


1.) TRIMMING

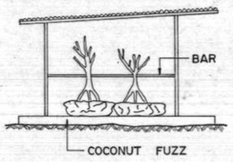


5.) REMOVING

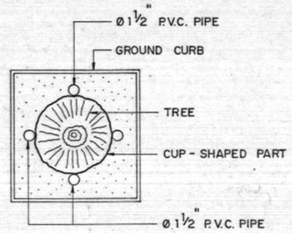
9.) WATERING



2.) DIGGING UP

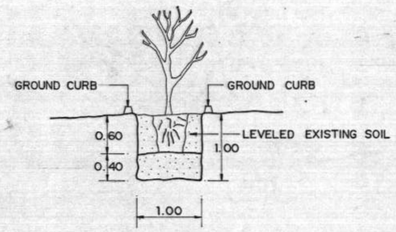


6.) GREEN HOUSE

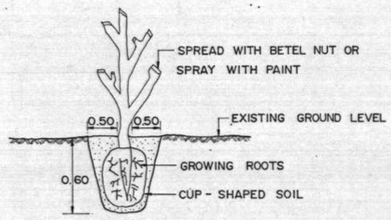


10.) P.V.C. PIPE INSTALLATION

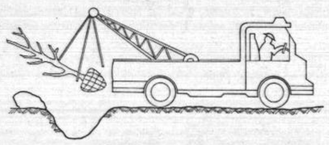
3.) TAPROOT CUTTING



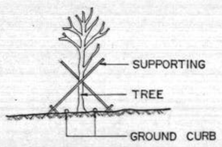
7.) PLANTING



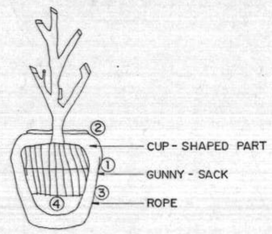
CUP - SHAPED SOIL DETAILS



4.) CRANE - TRUCK OR TRIPOD USING



8.) SUPPORTING



① THE FIRST TIED ROPE
② THE SECOND TIED ROPE
③ THE THIRD TIED ROPE
④ WRAP THE TREE BY THE KNITTED ROPE
(SIMILAR TO WRAP THE WATERMELON)

DETAIL OF WRAPING THE CUP - SHAPED SOIL WITH GUNNY - SACK

METHOD OF TRANSPLANTING TREE

1. TRIMMING UNNECESSARY BRANCHES TO REDUCE VAPORIZATION OF THE TREE
   - 1.1 CUT MINOR BRANCHES AND LEAVE THEM ABOUT 2".
   - 1.2 SPRAY THE CUTS WITH PAINT OR SPREAD WITH BETEL NUT TO PREVENT FUNGAL INFECTION.
2. DIGGING AROUND THE TREE TO REMOVE
   - 2.1 TOOLS USED ARE A HOE, A SPADE AND A CROWBAR.
   - 2.2 BIGGER OR MORE COMPLICATED GARDENING EQUIPMENTS MAY BE USED FOR BIGGER TREES.
   - 2.3 DIG AROUND THE TREE - 50 CM. AWAY FROM IT AND 60 CM. DEEP. USE THE COWBAR TO CUT OFF ONCE THE MINOR ROOT.
   - 2.4 ADJUST THE SOIL AND MAKE THE SHAPE OF A CUP. (DO NOT CUT THE TAPROOT)
   - 2.5 WRAP AROUND THE TRUNK WHICH IS BEING COVERED WITH CUP-SHAPED SOIL, WITH THE GUNNY-SACK. SEW THEM TOGETHER IF TWO OR THREE GUNNY-SACKS ARE USED. TIE UP THE GUNNY-SACKS TIGHTLY WITH 30-50 ROPES. USED TRIPOD TO HOLD UP THE TRUNK AT LEAST 21 DAYS. (SOME KINDS OF TREE DO NOT) WATERING THE GUNNY-SACKS, NOT LET TO DRY.
   - 2.6 AFTER 21 DAYS EXAMINE THE TREE, IF IN SUITABLE STATE, DIG INTO THE GROUND FOR ANOTHER 10-20 CM. CUT THE TAPROOT WITH A CROWBAR. WHILE IN THIS STEP, DO IT QUICKLY TO PROJECT THE REST OF THE TREE.
3. REMOVING
   - 3.1 WRAP AROUND THE TRUCK WITH GUNNY-SACKS.
   - 3.2 LIFT THE TREE FROM THE GROUND BY CRANE-TRUCK OR TRIPOD AND HELP WITH MAN.
   - 3.3 LAY THE TREE DOWN ON THE BACK OF TRUCK. UNDER THE TREE ARE PIECES OF GUNNY-SACKS PUT TO PROTECT THE TREE. IF THE TREE IS LONGER THAN THE BACK OF TRUCK, LAY THE BRANCHES-SIDE ON THE TRUCK'S ROOF AND THE CUP-SHAPED SIDE IN THE TRUCK.
4. PRE - TRANSPLANTING
   - 4.1 BEFORE TRANSPLANTING, THE TREE SHOULD BE PUT TO REST IN THE GREENHOUSE ABOUT 1 MONTH FOR SOFTWOOD OR 3 MONTHS FOR HARDWOOD. COVER THE CUP-SHAPED PART WITH COCONUT FUZZ AND WAIT TILL THE LEAVES GROW.
   - 4.2 THE TREE MAY BE PUT ANYWHERE OTHER THAN IN THE GREENHOUSE AS LONG AS THERE IS NO STRONG SUNLIGHT.
5. PLANTING
   - 5.1 PREPARE A HOLE OF SIZE 1.00 x 1.00 x 1.00 M.
   - 5.2 FILL THE HOLE WITH THE EXISTING SOIL WHICH IS USED AS BASE 40 CM. THICK. PUT THE TREE ON THE BASE SURFACE AND THE CUP-SHAPED PART IS AT THE SAME LEVEL AS THE EXISTING GROUND AT TOP OF THE HOLE.
   - 5.3 BEFORE FILLING THE HOLE, USE DILUTE LYSOL SOLUTION TO PREVENT FUNGAL INFECTION BY POURING THE DILUTE LYSOL SOLUTION ON THE CUP-SHAPED PART OF THE TREE. THEN FILL THE HOLE WITH THE EXISTING SOIL AND COMPACTED LOOSELY UNTIL THE SOIL IS AT THE SAME LEVEL AS THE CUP-SHAPED PART.
   - 5.4 BUILD GROUND CURB AROUND THE TREE. THIS MAKES A CIRCLE WITH A RADIUS OF 1 METER. THE CURB WILL HELP PRESERVE WATER.
   - 5.5 USE TRIPOD TO SUPPORT THE TREE.
6. MAINTENANCE
   - 6.1 WATERING SHOULD BE DONE IN THE MORNING AND EVENING.
   - 6.2 WATER SPRAYING (BY SPRINGER) SHOULD BE DONE FROM THE TOP TO THE BOTTOM OF THE TREE (VERTICALLY).
   - 6.3 IT USUALLY TAKES ONE MONTH FOR YOUNG LEAVES TO COME OUT DEPENDING UPON THE KINDS OF TREES. IN THE MEAN TIME, THE TREE WILL ALSO NEED VITAMIN B-1 AT THE MORNING AND EVENING TWICE A WEEK.
   - 6.4 AFTER ONE MONTH, FERTILIZER (15-30-15) SHALL BE GIVEN.
   - 6.5 IF IT IS DIFFICULT TO WATER THE TREE SINCE IT IS GROWN ON HARD SOIL SUCH AS LATERITE SOIL, THE P.V.C. PIPE Ø 2½" WHICH IS 30 CM. LONG WITH DRILLED AT BOTTOM PART Ø 5 MM. WITH 10 CM. APART SHALL BE BURIED. WATER WILL BE SENT THROUGH THE P.V.C. PIPE TO THE ROOTS.
   - 6.6 THE TREE WILL GROW IN ABOUT 3 MONTHS AND WILL COMPLETELY GROW IN ONE YEAR.

NOTES :

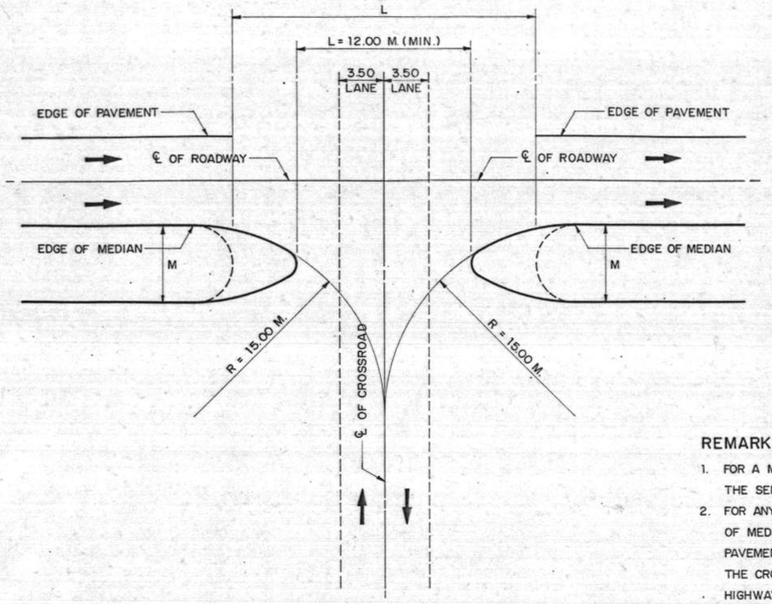
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. TREES TO BE TRANSPLANTED FROM THE AREA OF CONSTRUCTION ARE TREES THAT ARE IMPORTANT TO BE RESERVED AS DIRECTED BY THE ENGINEER.
3. THE ENGINEER WILL ASSIGN A NEW LOCATION TO PLANT OUT OF ROADBED.
4. WHEN THE TRANSPLANTING ARE FINISHED, THE CONTRACTOR SHALL TAKE CARE OF THE TREES UNTIL THEY ARE BIG ENOUGH.
5. THE DEPARTMENT OF HIGHWAYS SHALL PAY ACCORDING TO THE SIGNS OF THE GROWTH OF THE TREES. IF THE TREES DIE, THE DEPARTMENT OF HIGHWAYS SHALL PAY ACCORDING TO ROADWAY EXCAVATION (EARTH). THE NUMBERS OF THE HOLES SHALL BE TAKEN INTO ACCOUNT.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

METHOD OF TRANSPLANTING TREE

DESIGNED: D.O.H. & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED: (DIRECTOR GENERAL)		DWG. NO. MD-901
		SHEET NO. 111



MINIMUM DESIGN OF MEDIAN OPENINGS
(SU DESIGN VEHICLE, CONTROL RADIUS OF 15.00 M.)

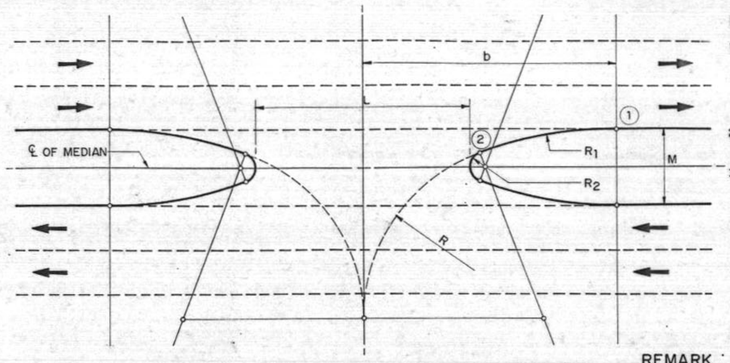
NOT TO SCALE

TABLE : MINIMUM DESIGN OF MEDIAN OPENINGS
(SU DESIGN VEHICLE, CONTROL RADIUS OF 15.00 M.)

WIDTH OF MEDIAN, M (M.)	L = MINIMUM LENGTH OF MEDIAN OPENING (M.)	
	SEMICIRCULAR	BULLET NOSE
1.20	29.00	29.00
1.80	28.00	23.00
2.40	28.00	20.00
3.00	27.00	19.00
3.60	26.00	17.00
4.20	26.00	16.00
4.80	25.00	15.00
6.00	24.00	13.00
7.20	23.00	12.00 MIN.
8.40	22.00	12.00 MIN.
9.60	20.00	12.00 MIN.
10.80	19.00	12.00 MIN.
12.00	18.00	12.00 MIN.
15.00	15.00	12.00 MIN.
18.00	12.00 MIN.	12.00 MIN.
21.00	12.00 MIN.	12.00 MIN.

REMARKS :

1. FOR A MEDIAN WIDTH OF 3.00 M. OR MORE THE BULLET NOSE IS SUPERIOR TO THE SEMICIRCULAR END AND PREFERABLY SHOULD BE USED IN DESIGN.
2. FOR ANY THREE-OR-FOUR-LEG INTERSECTION ON A DIVIDED HIGHWAY THE LENGTH OF MEDIAN OPENING SHOULD BE AS GREAT AS THE WIDTH OF CROSSROAD ROADWAY PAVEMENT PLUS SHOULDER AND IN NO CASE LESS THAN 12.00 M. (OR LESS THAN THE CROSSROAD PAVEMENT PLUS 2.40 M.) WHERE THE CROSSROAD IS A DIVIDED HIGHWAY, THE LENGTH OF OPENING SHOULD BE AT LEAST EQUAL TO THE WIDTH OF THE CROSSROAD ROADWAYS PLUS THAT OF THE MEDIAN PLUS 2.40 M.
3. THE USED OF A 12.00 M. MINIMUM LENGTH OF OPENING WITHOUT REGARD TO THE WIDTH OF MEDIAN OR THE CONTROL RADIUS SHOULD NOT BE CONSIDERED EXCEPT AT VERY MINOR CROSSROADS. THE 12.00 M. MINIMUM LENGTH OF OPENING DOES NOT APPLY TO OPENINGS FOR U-TURNS, AS DISCUSSED ELSEWHERE.



WIDTH OF MEDIAN, M (M.)	DIMENSIONS IN METERS, WHEN					
	R = 27.00 M.		R = 45.00 M.		R = 69.00 M.	
	L	b	L	b	L	b
6.00	17.00	19.00	20.00	23.00	21.00	27.00
9.00	14.00	20.00	17.00	26.00	19.00	30.00
12.00	12.00	21.00	15.00	27.00	17.00	33.00
15.00	—	—	13.00	29.00	15.00	35.00
18.00	—	—	—	—	14.00	37.00
21.00	—	—	—	—	12.00	38.00

ABOVE - MINIMUM DESIGN OF MEDIAN OPENINGS
(TYPICAL BULLET NOSE ENDS)

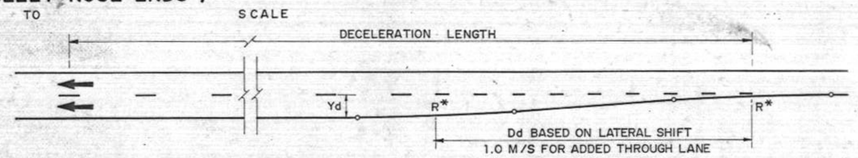
NOT TO SCALE

REMARKS :

1. RADIUS R_1 MAY VARY FROM ABOUT 24.00 - 120.00 M. OR MORE THE TABULATED VALUES SHOWN, 27.00 M., 45.00 M. AND 69.00 M. ARE ESTABLISHED MINIMUM RADII FOR TURNING SPEEDS OF 32, 40, AND 48 KPH. RESPECTIVELY.
2. TO AVOID A LARGE OPENING, R SHOULD BE HELD TO A REASONABLE MINIMUM, E.G., 15.00 M., AS USED IN FIGURE.
3. THE LENGTH OF MEDIAN OPENING IS GOVERNED BY THE RADII. FOR MEDIANS WIDER THAN ABOUT 9.00 M. COUPLED WITH A CROSSROAD OF FOUR OR MORE LANES, THE CONTROL RADIUS R GENERALLY WILL NEED TO BE GREATER THAN 15.00 M. OR THE MEDIAN OPENING WILL BE TOO SHORT.

REMARK :

THE LENGTH OF THESE LANES IN RURAL AREAS IS GENERALLY BASED ON DECELERATION CONSIDERATIONS. HOWEVER, IN URBAN AREAS WHERE TRAFFIC SPEEDS ARE SIGNIFICANTLY LOWER AND RIGHT-OF-WAY MORE RESTRICTIVE, THE LENGTH MAY BE DICTATED MORE BY VEHICLE STORAGE REQUIREMENTS, PARTICULARLY AT TRAFFIC SIGNAL CONTROLLED INTERSECTIONS. AT LOCATIONS WHERE A FULL LENGTH DECELERATION LANE CANNOT BE PROVIDED, A MINIMUM TREATMENT (E.G. 30.00 M. TAPER PLUS 30.00 M. PARALLEL LANE) CAN STILL PROVIDE SIGNIFICANT BENEFITS. THE TOTAL LENGTH REQUIRED FOR DECELERATION LANES IS GIVEN IN TABLE. THIS LENGTH IS PROVIDED BY MEANS OF A TAPER AND A PARALLEL LANE. THE LENGTH OF TAPER ADOPTED IS TYPICALLY 50.00 M. RURAL, 30.00 M. URBAN, OR LESS. THE LENGTH OF DECELERATION LANE ON GRADE. IS DETERMINED BY MULTIPLYING THE LENGTH WITH CORRECTION FACTOR FOR GRADE.



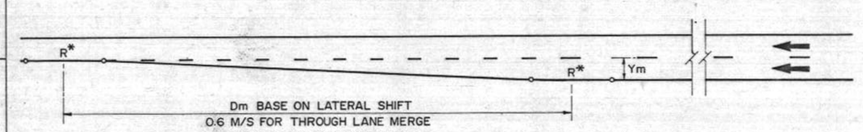
R* = EDGE OF PAVEMENT ROUNDING
(100 FOR DECEL. LANE
250 FOR ADDED THROUGH LANE)

Dd = 50 MAX. - RURAL, 30 MAX. - URBAN } FOR DECEL. LANE

$$Dd = \frac{V\,Yd}{3.6\,S}$$

WHERE
S = RATE OF LATERAL MOVEMENT (M./SEC)
V = DESIGN (OR 85 PERCENTILE OPERATING) SPEED (KM./H.)
Yd = LATERAL MOVEMENT (M) OF VEHICLE (OR ADDED ROAD WIDTH).

DIVERGE TAPERS



R* = EDGE OF PAVEMENT ROUNDING
(200 TO 400 M.)

$$Dm = \frac{V\,Ym}{3.6\,S}$$

WHERE
Dm = MINIMUM LENGTH (M) OF TAPER
S = RATE OF LATERAL MOVEMENT (M./SEC)
V = DESIGN (OR 85 PERCENTILE OPERATING) SPEED (KM./H.)
Ym = LATERAL MOVEMENT (M) OF VEHICLE, OR WIDTH REDUCTION.

MERGE TAPERS

AUXILIARY TURN LANE TAPERS

NOT TO SCALE

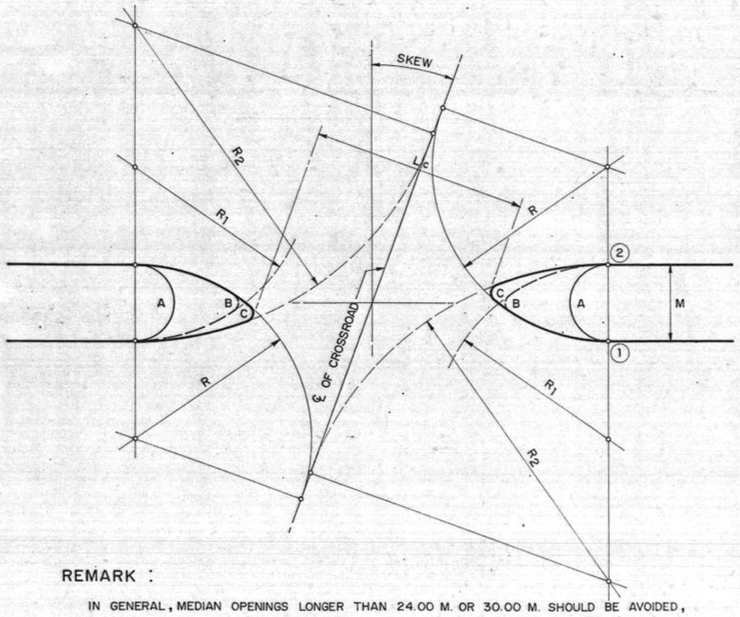
TABLE : LENGTH OF DECELERATION LANES

DESIGN SPEED OF APPROACH ROAD (KM./H.)	LENGTH OF DECELERATION LANE (M.)* (INCLUDING LENGTH OF TAPERED APPROACH) WHERE DESIGN SPEED OF EXIT CURVE (KM./H.) IS :								
	0†	20	30	40	50	60	70	80	90
50	60	54	46	32	—	—	—	—	—
60	80	74	64	50	28	—	—	—	—
70	100	94	82	70	54	34	—	—	—
80	120	112	104	94	82	64	40	—	—
90	140	134	126	116	102	88	70	44	—
100	170	162	154	144	132	118	100	80	50

* LENGTH FOR LEVEL GRADE. (SEE TABLE : CORRECTION FOR GRADE).
† LENGTH REQUIRED WHERE A VEHICLE DECELERATES TO A STOP CONDITION.

TABLE : CORRECTION FOR GRADE

GRADE	RATIO OF LENGTH ON GRADE TO LENGTH OF LEVEL	
	UPGRADE	DOWNGRADE
0 — 2 %	1.0	1.0
3 — 4 %	0.9	1.2
5 — 6 %	0.8	1.35



REMARK :

IN GENERAL, MEDIAN OPENINGS LONGER THAN 24.00 M. OR 30.00 M. SHOULD BE AVOIDED, REGARDLESS OF SKEW. THIS PLAN MAY CALL FOR SPECIAL CHANNELIZATION, RIGHT-TURN LANES, OR ADJUSTMENT TO REDUCE THE CROSSROAD SKEW, ALL OF WHICH RESULT IN ABOVE-MINIMUM DESIGNS

MINIMUM DESIGN OF MEDIAN OPENINGS
(EFFECT OF SKEW)

NOT TO SCALE

TABLE : EFFECT OF SKEW ON MINIMUM DESIGN FOR MEDIAN OPENINGS
(TYPICAL VALUES BASED ON CONTROL RADIUS OF 15.00 M.)

SKEW ANGLE (DEGREES)	WIDTH OF MEDIAN (M.)	LENGTH OF MEDIAN OPENING MEASURED NORMAL TO THE CROSSROAD (M.)			R FOR DESIGN C (M.)
		SEMICIRCULAR A	BULLET NOSE		
			SYMMETRICAL B	ASYMMETRICAL C	
0	3.00	27.00	19.00	—	—
	6.00	24.00	13.00	—	—
	9.00	21.00	12.00 MIN	—	—
	12.00	18.00	12.00 MIN.	—	—
	15.00	15.00	12.00 MIN.	—	—
	18.00	12.00	12.00 MIN.	—	—
10	3.00	32.00	24.00	23.00	21.00
	6.00	28.00	17.00	16.00	20.00
	9.00	25.00	14.00	12.00 MIN.	20.00
	12.00	21.00	12.00 MIN.	12.00 MIN.	19.00
	15.00	18.00	12.00 MIN.	12.00 MIN.	18.00
	18.00	14.00	12.00 MIN.	12.00 MIN.	18.00
20	3.00	36.00	29.00	27.00	29.00
	6.00	32.00	22.00	20.00	28.00
	9.00	28.00	18.00	14.00	26.00
	12.00	24.00	14.00	12.00 MIN.	25.00
	15.00	20.00	12.00 MIN.	12.00 MIN.	23.00
	18.00	16.00	12.00 MIN.	12.00 MIN.	21.00
30	3.00	41.00	34.00	32.00	42.00
	6.00	36.00	27.00	23.00	39.00
	9.00	31.00	23.00	17.00	36.00
	12.00	27.00	19.00	13.00	33.00
	15.00	23.00	15.00	12.00 MIN.	30.00
	18.00	18.00	12.00	12.00 MIN.	27.00
40	3.00	44.00	38.00	35.00	63.00
	6.00	39.00	32.00	27.00	58.00
	9.00	35.00	27.00	20.00	52.00
	12.00	29.00	23.00	15.00	47.00
	15.00	24.00	19.00	12.00 MIN.	42.00
	18.00	19.00	15.00	12.00 MIN.	36.00

NOTES :

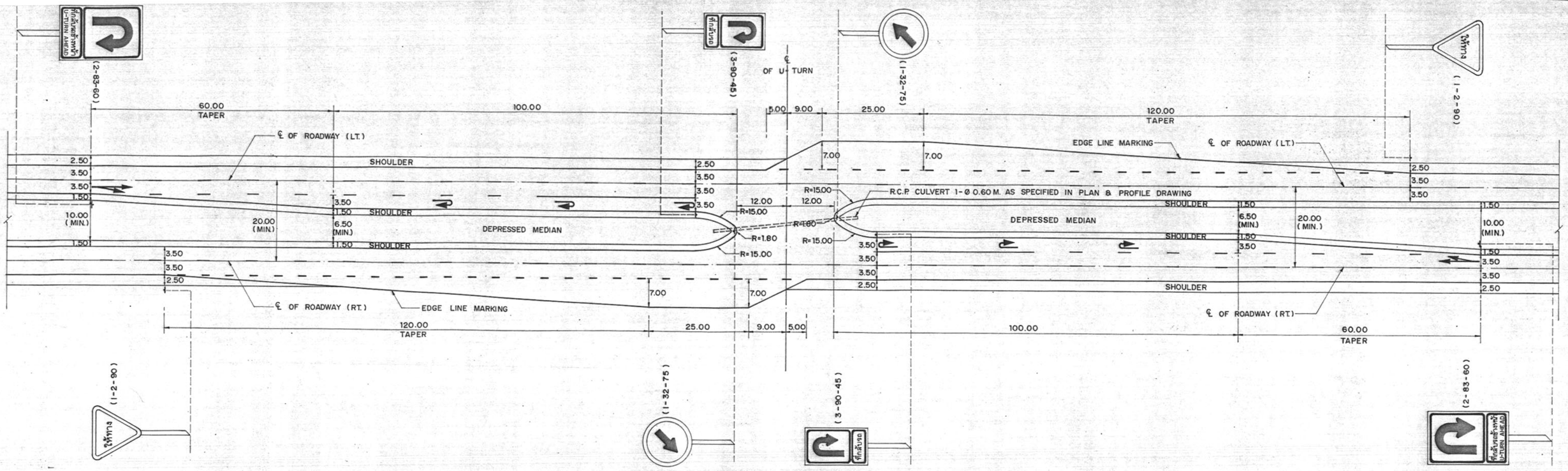
1. MEDIAN OPENING SHOULD BE 3 - 5 KM. INTERVAL FOR RURAL AREAS WITH VILLAGE 1.5 KM. (MINIMUM) LONG IN THE INTERVAL.
2. MEDIAN OPENING IN URBAN AREAS SHOULD BE 250 M. (MINIMUM) INTERVAL (FOR THE LARGE CITY).

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

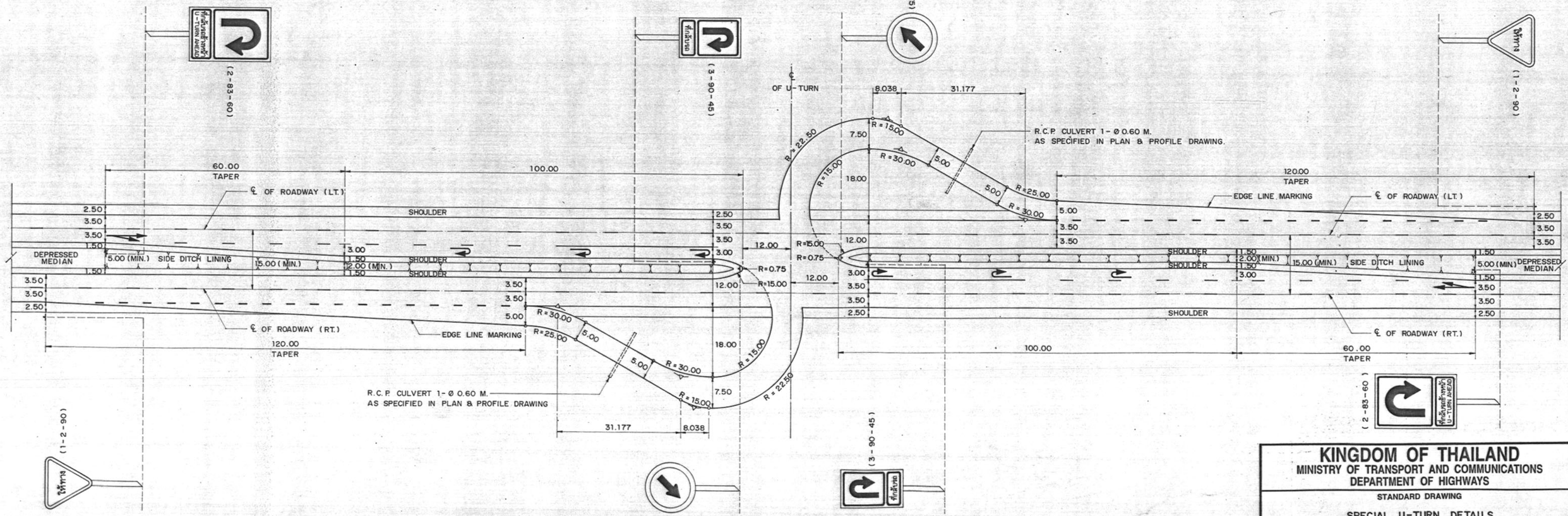
MEDIAN OPENING

DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE NONE
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. MD-902
		SHEET NO. 112



SPECIAL U - TURN TYPE I

SCALE 1 : 500



SPECIAL U - TURN TYPE II

SCALE 1 : 500

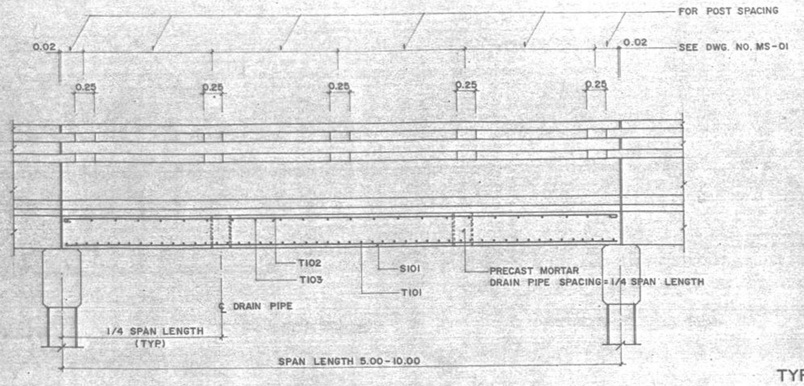
KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

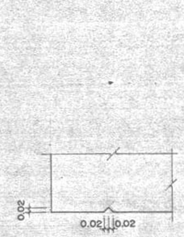
STANDARD DRAWING

SPECIAL U-TURN DETAILS

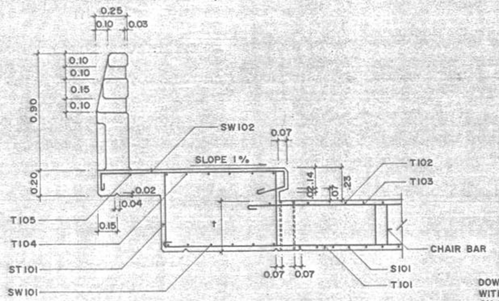
DESIGNED : D.O.H. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE 1 : 500
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. MD-903
		SHEET NO. 113



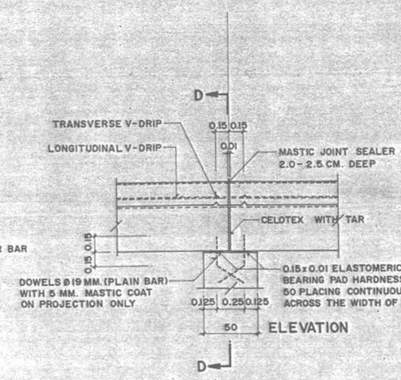
SECTION A-A
SCALE 1 : 40



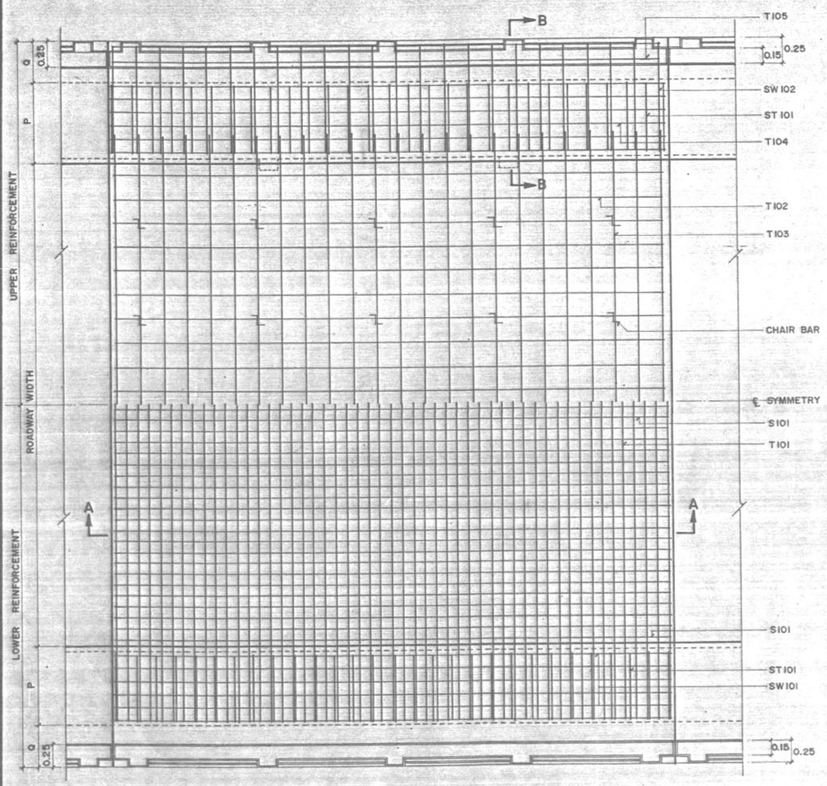
TYPICAL WATER DRIP DETAIL



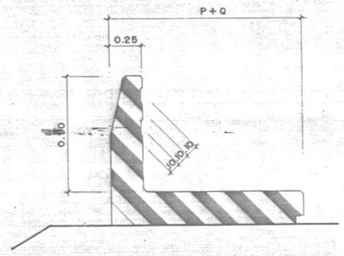
SECTION B - B
SCALE 1 : 25



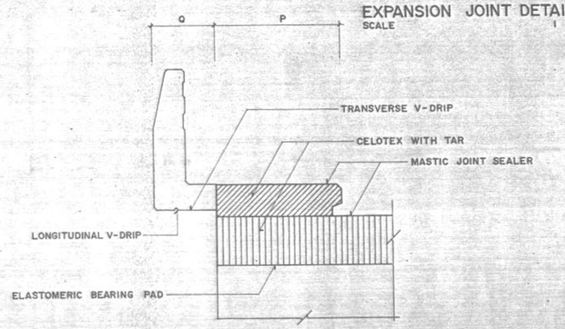
EXPANSION JOINT DETAILS
SCALE 1 : 25



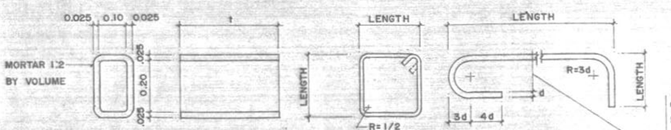
REINFORCEMENT PLAN
SCALE 1 : 40



PAINTING AT BRIDGE END
SCALE 1 : 25

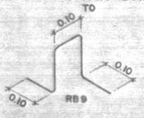


SECTION D - D
SCALE 1 : 25



PRECAST MORTAR DRAIN PIPE NOT TO SCALE

BAR BENDING DETAILS NOT TO SCALE



CHAIR BAR

TABLE OF SLAB THICKNESS						
SPAN	5.00	6.00	7.00	8.00	9.00	10.00
SLAB THICKNESS, t	0.32	0.36	0.39	0.43	0.47	0.53

SPAN	CAMBER OF DEAD LOAD	
	a	b
5.00	0.0022	0.0016
6.00	0.0034	0.0025
7.00	0.0054	0.0040
8.00	0.0076	0.0054
9.00	0.0103	0.0074
10.00	0.0122	0.0088

TABLE OF SLAB REINFORCEMENT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M.				SPAN 6.00 M.				SPAN 7.00 M.				SPAN 8.00 M.				SPAN 9.00 M.				SPAN 10.00 M.			
		#	a	NO.	L	#	a	NO.	L	#	a	NO.	L	#	a	NO.	L	#	a	NO.	L	#	a	NO.	L
	S101	8	0.16	-	4.95	8	0.15	-	5.95	8	0.13	-	6.95	8	0.12	-	7.95	8	0.10	-	8.95	8	0.09	-	9.95
	ST101	3	0.25	42	-	3	0.25	50	-	3	0.25	58	-	3	0.25	66	-	3	0.25	74	-	3	0.25	82	-
	SW102	4	0.20	51	-	4	0.20	63	-	4	0.20	72	-	4	0.20	81	-	4	0.20	93	-	4	0.20	102	-
	T101	4	0.15	34	-	4	0.15	41	-	4	0.14	51	-	4	0.14	58	-	4	0.13	70	-	4	0.11	92	-
	T102	3	0.30	-	5.10	3	0.30	-	6.10	3	0.30	-	7.10	3	0.30	-	8	3	0.30	-	9.10	3	0.30	-	10.10
	T103	3	0.30	17	-	3	0.30	21	-	3	0.30	24	-	3	0.30	27	-	3	0.30	31	-	3	0.30	34	-

#3 = Ø 3/8" OR 9 MM. #4 = Ø 1/2" OR 12 MM. #8 = Ø 1" OR 25 MM. NO. = TOTAL AMOUNT OF BARS L = TOTAL LENGTH OF EACH BAR

TABLE OF SIDEWALK AND EDGE BEAM REINFORCEMENT

WIDTH OF SIDE WALK	P	Q	R	BAR MARK	BAR BENDING DIAGRAMS	SPAN 5.00 M.				SPAN 6.00 M.				SPAN 7.00 M.				SPAN 8.00 M.				SPAN 9.00 M.				SPAN 10.00 M.			
						#	a	NO.	L	#	a	NO.	L	#	a	NO.	L	#	a	NO.	L	#	a	NO.	L	#	a	NO.	L
0.50	0.50	-	0.50	SW 101	VARIES	8	-	6	4.95	8	-	6	5.95	8	-	8	6.95	8	-	8	7.95	8	-	10	8.95	8	-	12	9.95
				T 104	VARIES	4	-	6	4.95	4	-	6	5.95	4	-	8	6.95	4	-	8	7.95	4	-	10	8.95	4	-	12	9.95
				T 105	—	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.00	0.50	0.50	0.50	SW 101	VARIES	8	-		4.95	8	-	8	5.95	8	-	10	6.95	8	-	12	7.95	8	-	12	8.95	8	-	16	9.95
				T 104	VARIES	4	-	6	4.95	4	-	8	5.95	4	-	10	6.95	4	-	12	7.95	4	-	12	8.95	4	-	12	9.95
				T 105	VARIES	4	-	6	4.95	4	-	6	5.95	4	-	6	6.95	4	-	6	7.95	4	-	6	8.95	4	-	6	9.95
1.50	1.00	0.50	1.00	SW 101	VARIES	8	-	8	4.95	8	-	10	5.95	8	-	12	6.95	8	-	16	7.95	8	-	18	8.95	8	-	20	9.95
				T 104	VARIES	4	-	8	4.95	4	-	10	5.95	4	-	12	6.95	4	-	12	7.95	4	-	12	8.95	4	-	12	9.95
				T 105	VARIES	4	-	6	4.95	4	-	6	5.95	4	-	6	6.95	4	-	6	7.95	4	-	6	8.95	4	-	6	9.95

NO = TOTAL AMOUNT OF BARS
L = TOTAL LENGTH OF EACH BAR
#4 = Ø 1/12" OR 12 MM.
#8 = Ø 1" OR 25 MM.

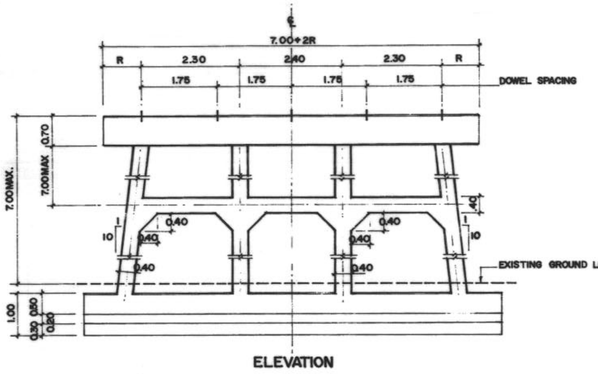
NOTES :

1. DESIGN STRESSES :
   a) CONCRETE. fc = 70 KSC.
   b) STEEL fs = 1,400 KSC. FOR DEFORMED BARS
   fs = 1,200 KSC. FOR PLAIN ROUND BARS
2. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG/M^3 AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG/CM FOR A 15 x 15 x 15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS:
   PORTLAND CEMENT 350 KG
   SAND 0.43 M^3
   CRUSHED ROCK OR GRAVEL 0.86 M^3
   CONCRETE SLUMP MAX. 10 CM.
3. CLEAR CONCRETE COVER FOR TOP REINFORCEMENT IN SLAB BRIDGE SHALL BE 3.5 CM. ELSEWERE OF SLAB BRIDGE AND SIDEWALK POSTS AND RAILING SHALL BE 2.5 CM.
4. ALL CONCRETE EXPOSED CORNERS SHALL HAVE A 2 CM. CHAMFER UNLESS OTHERWISE INDICATED.
5. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS. OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
6. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
7. LAP LENGT SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BAR.
8. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISIANT PORTLAND CEMENT TYPE 5 CONFORMING TIS. 15 SHALL BE USED AND, WITH THE EXCEPTION OF COLUMNS AND BRACING, ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED WITHOUT ALTERING THE LOCATIONS OF REBARS.
9. ALL MATERIALS SHALL BE USED UNDER THE APPROVAL OF THE ENGINEER.
10. PAINTING SHALL BE PROVIDED ON ALL SURFACES AT BRIDGE ENDS WHTH ARE EXPOSED TO TRAFFIC WHITE AND BLACK COLOURS SHALL BE PAINTED ALTERNATELY, WHITE COLOUR SHALL BE LIGHT REFLECTED TYPE.
11. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
12. BAR MARK S 101 MAY BE TAKEN OUT ONE BAR ON EACH SIDE OF THE BRIDGE WHEREVER THEY PASS THROUGH DRAIN PIPES. IF THE LOCATION OF THESE BARS ARE NEAR V-DRIP SUCH THAT CONCRETE COVER IS NOT ADEQUATE, THEY SHALL BE PLACED ON TOP OF ST 101, OTHER BARS WHICH PASS THROUGH DRA PIPES SHALL BE BENT ALONG THE PIPES.
13. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5-106 10/1A.

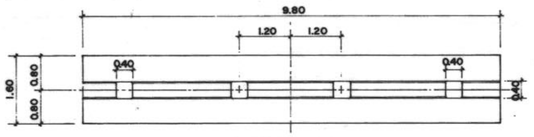
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING
R.C. SLAB BRIDGE
BRIDGE REINF. PLAN SECTIONS AND DETAILS

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. ST-01
		SHEET NO. 114

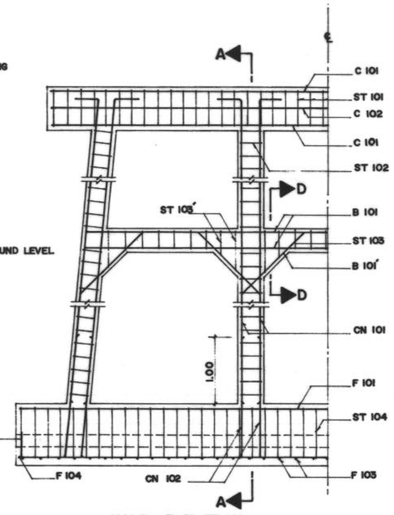


ELEVATION

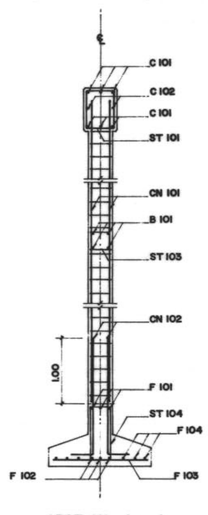


FOOTING PLAN

PIER DETAILS FOR 5.00-6.00 M. SPAN
SCALE 1:75

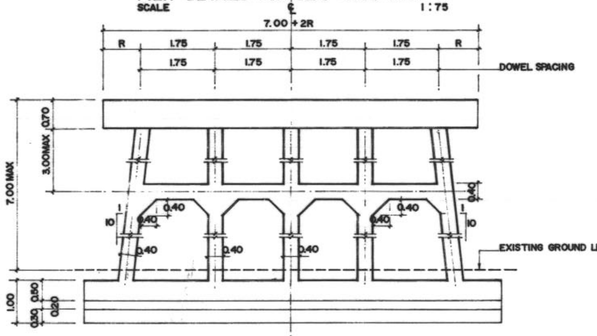


HALF ELEVATION



SECTION A - A

REINFORCEMENT DETAILS FOR 5.00-6.00 M. SPAN
SCALE 1:50



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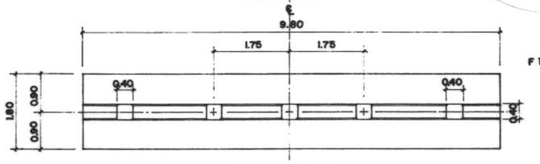
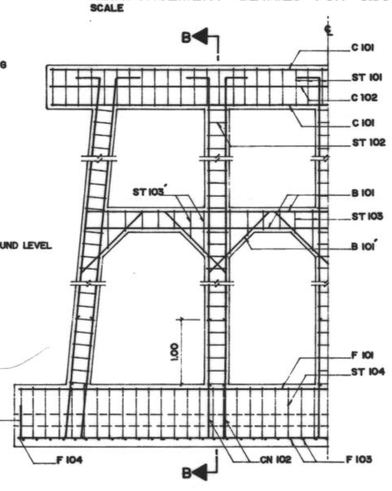
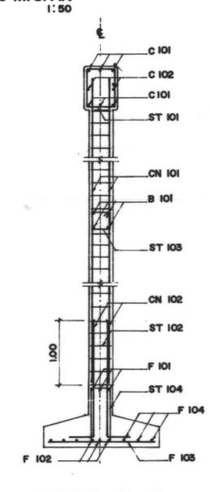


FOOTING PLAN

PIER DETAILS FOR 7.00 - 8.00 M. SPAN
SCALE 1:75

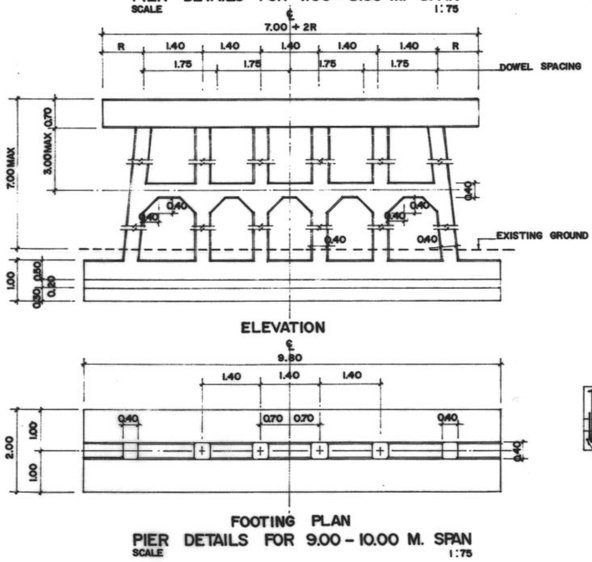


HALF ELEVATION



SECTION B - B

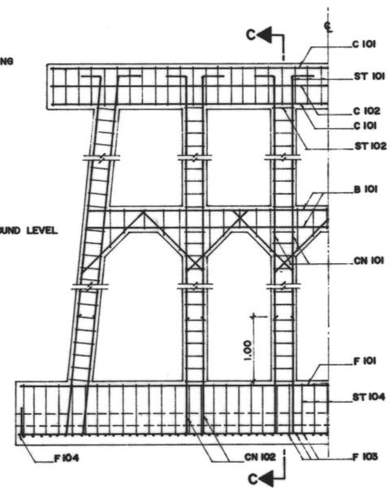
REINFORCEMENT DETAILS FOR 7.00 - 8.00 M. SPAN
SCALE 1:50



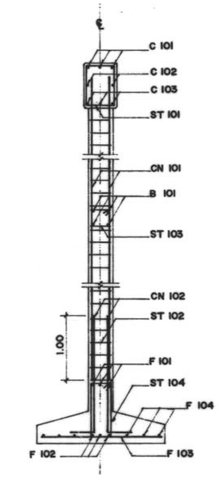
ELEVATION

FOOTING PLAN

PIER DETAILS FOR 9.00 - 10.00 M. SPAN
SCALE 1:75



HALF ELEVATION

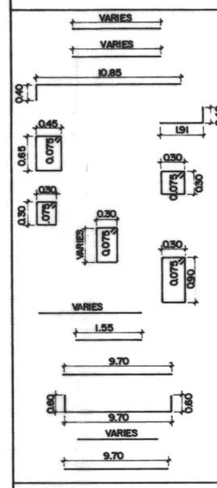


SECTION C - C

REINFORCEMENT DETAILS FOR 9.00 - 10.00 M. SPAN
SCALE 1:50

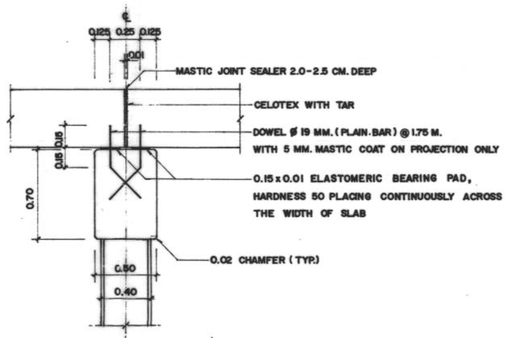
TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS

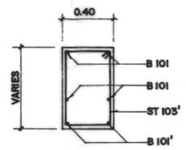


BAR MARK	SPAN 5.00M.				SPAN 6.00M.				SPAN 7.00M.				SPAN 8.00M.				SPAN 9.00M.				SPAN 10.00 M.			
	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L
C 101	8	—	6	—	8	—	6	—	8	—	6	—	8	—	6	—	8	—	6	—	8	—	6	—
C 102	4	—	2	—	4	—	2	—	4	—	2	—	4	—	2	—	4	—	2	—	4	—	2	—
CN 101	8	—	16	11.25	8	—	16	11.25	8	—	20	11.25	8	—	20	11.25	8	—	24	11.25	8	—	24	11.25
CN 102	8	—	16	2.31	8	—	16	2.31	8	—	20	2.31	8	—	20	2.31	8	—	24	2.31	8	—	24	2.31
ST 101	3	.20	—	2.35	3	.20	—	2.35	3	.20	—	2.35	3	.20	—	2.35	3	.20	—	2.35	3	.20	—	2.35
ST 102	3	.20	192	1.35	3	.20	192	1.35	3	.20	240	1.35	3	.20	240	1.35	3	.20	288	1.35	3	.20	288	1.35
ST 103	3	.25	36	1.35	3	.25	36	1.35	3	.25	26	1.35	3	.25	26	1.35	3	.25	16	1.35	3	.25	16	1.35
ST 103'	3	.25	24	—	3	.25	24	—	3	.25	32	—	3	.25	32	—	3	.25	40	—	3	.25	40	—
ST 104	3	.20	49	2.55	3	.20	49	2.55	3	.20	49	2.55	3	.20	49	2.55	3	.20	49	2.55	3	.20	49	2.55
B 101	8	—	8	—	8	—	8	—	8	—	8	—	8	—	8	—	8	—	16	—	8	—	8	—
B 101'	6	—	24	1.55	6	—	24	1.55	6	—	32	1.55	6	—	32	1.55	6	—	40	1.55	6	—	40	1.55
F 101	8	—	3	9.70	8	—	3	9.70	8	—	3	9.70	8	—	3	9.70	8	—	3	9.70	8	—	3	9.70
F 102	8	—	3	10.90	8	—	3	10.90	8	—	3	10.90	8	—	3	10.90	8	—	3	10.90	8	—	3	10.90
F 103	4	.25	39	1.50	4	.25	39	1.50	4	.20	49	1.70	4	.20	49	1.70	4	.125	78	1.90	4	.125	78	1.90
F 104	4	—	6	9.70	4	—	6	9.70	4	—	6	9.70	4	—	6	9.70	4	—	6	9.70	4	—	6	9.70

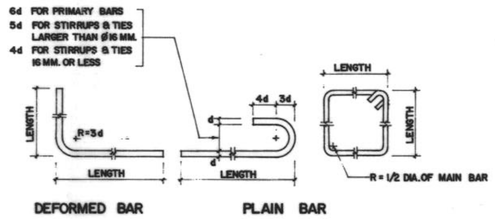
3 = Ø 3/8" OR 9 MM., # 4 = Ø 1/2" OR 12 MM., # 6 = Ø 3/4" OR 20 MM., # 8 = Ø 1" OR 25 MM., NO = TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BARS.



CAP BEAM DETAILS
SCALE 1:25



SECTION D - D
SCALE 1:25



DEFORMED BAR PLAIN BAR

BAR BENDING DETAIL
NOT TO SCALE

NOTES :

1. THE BOTTOM OF A FOOTING SHALL BE EMBEDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT ITS CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED, 10 CM. THICK OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND. COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 BY VOLUME.
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON/M.^{2}
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES :
   a) IF THE DISTANCE FROM EXISTING GROUN LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEED 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLING OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEED 3.0 M., ADDITION BRACING SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, WHERE A CLEAR COVER OF 2.5 CM SHALL BE PROVIDED.
5. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 Kg/M.^{3} AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 Kg/CM.^{2} FOR A .15x.15x.15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOW :

PORTLAND CEMENT	350	Kg.
SAND	0.45	M.^{3}
CRUSHED ROCK OR GRAVEL	0.86	M.^{3}
CONCRETE SLUMP MIX	10	CM.

6. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
7. LOCATION OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETER OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
9. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM WITHOUT ALTERING THE LOCATION OF REBARS.
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING CANAL BED TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIER HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 12.0 M.
12. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
13. THIS DRAWING IS ADAPED FROM DOH DWG. NO. 3AD5 - 106 - 14/23.

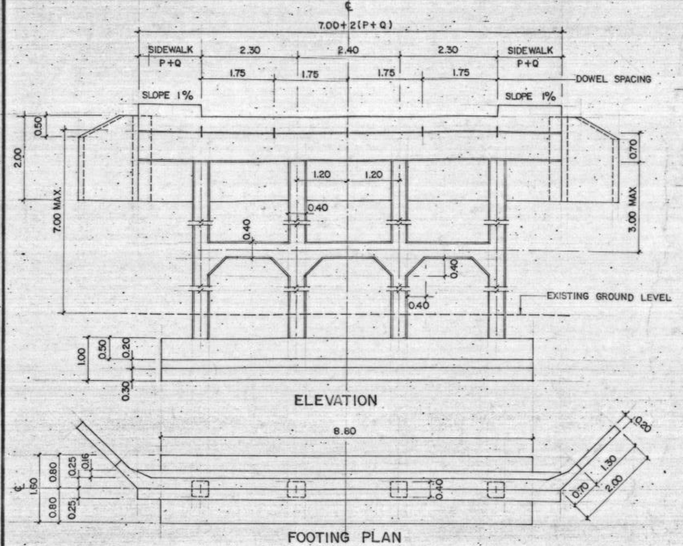
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

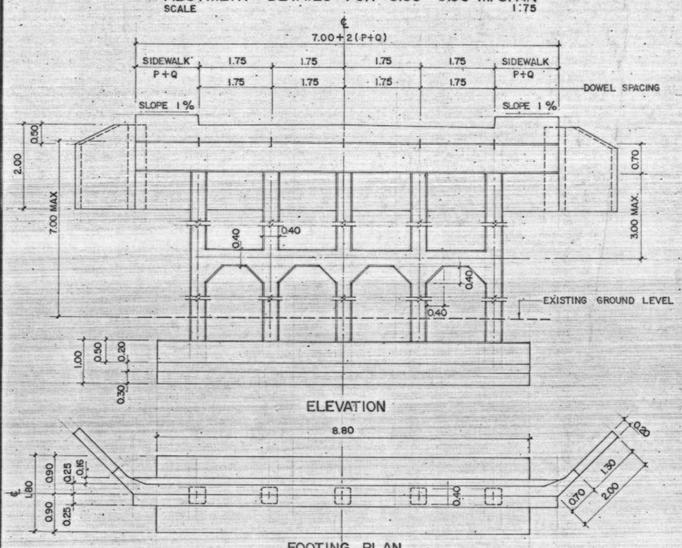
7.00 M. ROADWAY WIDTH SLAB BRIDGE

SPREAD FOOTING PIER DETAILS

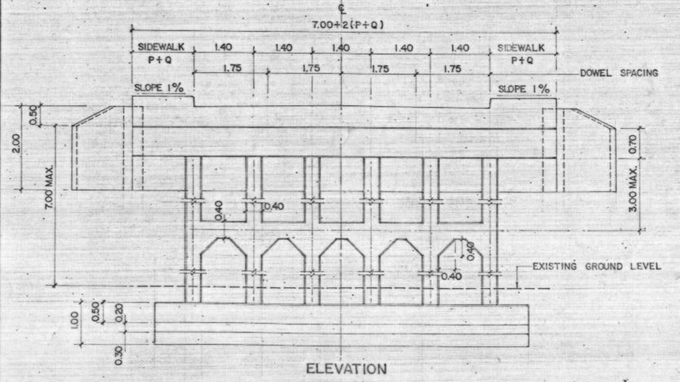
DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Bamroongsy. (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. ST-02
		SHEET NO. 115



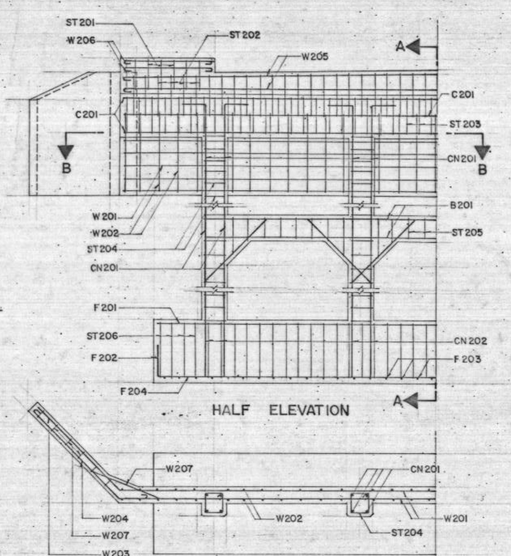
ABUTMENT DETAILS FOR 5.00 - 6.00 M. SPAN
SCALE 1:75



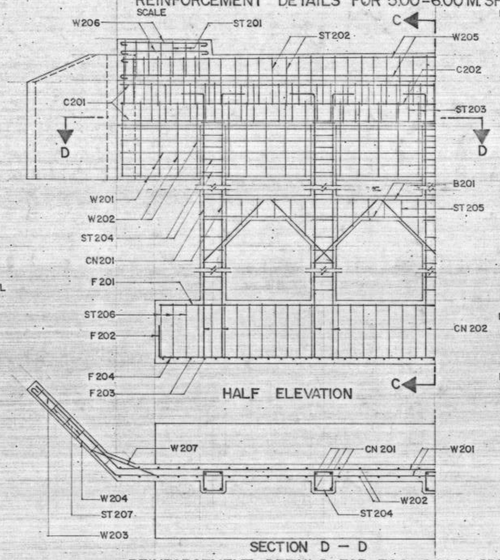
ABUTMENT DETAILS FOR 7.00 - 8.00 M. SPAN
SCALE 1:75



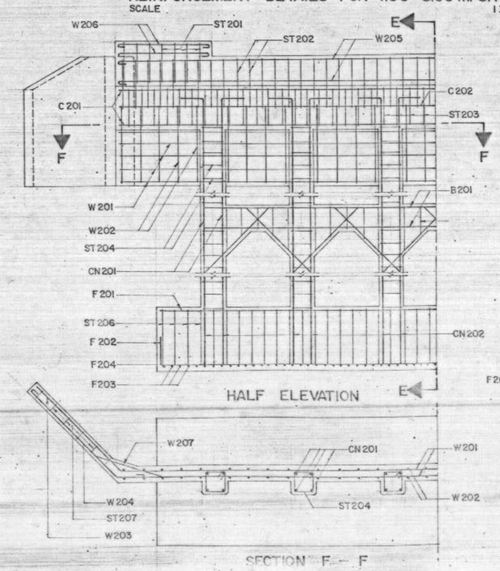
ABUTMENT DETAILS FOR 9.00 - 10.00 M. SPAN
SCALE 1:75



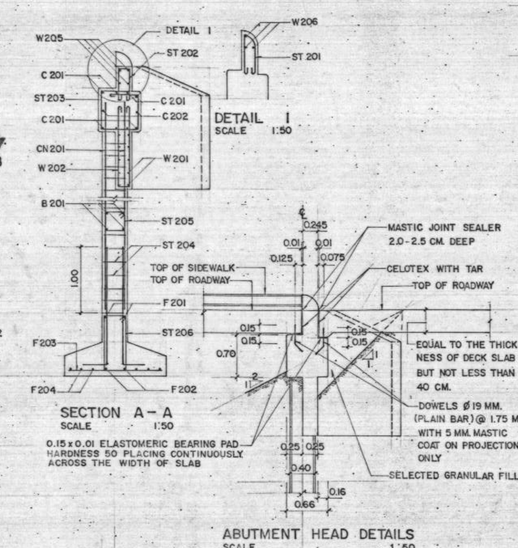
REINFORCEMENT DETAILS FOR 5.00-6.00 M. SPAN
SCALE 1:50



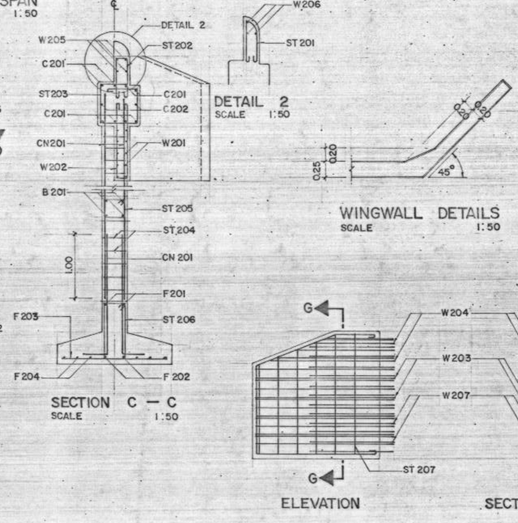
REINFORCEMENT DETAILS FOR 7.00-8.00 M. SPAN
SCALE 1:50



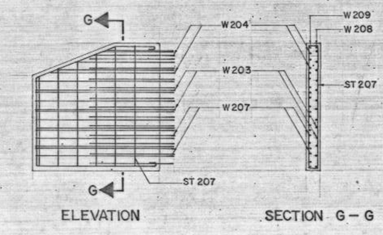
REINFORCEMENT DETAILS FOR 9.00-10.00 M. SPAN
SCALE 1:50



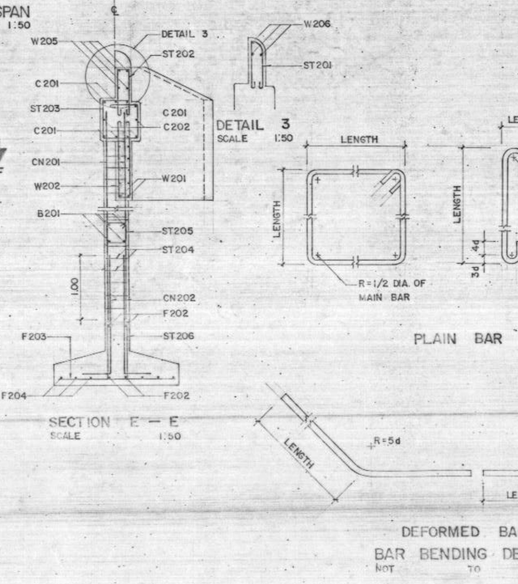
ABUTMENT HEAD DETAILS
SCALE 1:50



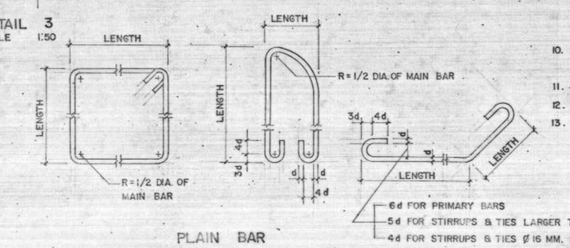
WINGWALL DETAILS
SCALE 1:50



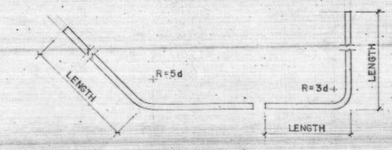
WINGWALL REINFORCEMENT DETAILS
SCALE 1:50



DETAIL 3
SCALE 1:50



PLAIN BAR



DEFORMED BAR
BAR BENDING DETAILS
NOT TO SCALE

TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M.				SPAN 6.00 M.				SPAN 7.00 M.				SPAN 8.00 M.				SPAN 9.00 M.				SPAN 10.00 M.			
		#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L
	C 201	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-
	C 202	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-
	ST 201	2		-	1.215	2		-	1.295	2		-	1.355	2		-	1.435	2		-	1.515	2		-	1.635
	ST 202	3	.20	-	1.745	3	.20	-	1.795	3	.20	-	1.845	3	.20	-	1.895	3	.20	-	1.945	3	.20	-	1.995
	ST 203	3	.20	-	-	3	.20	-	-	3	.20	-	-	3	.20	-	-	3	.20	-	-	3	.20	-	-
	ST 204	3	.20	156	1.35	3	.20	156	1.35	3	.20	195	1.35	3	.20	195	1.35	3	.20	234	1.35	3	.20	234	1.35
	ST 205	3	.25	30	1.35	3	.25	30	1.35	3	.25	16	1.35	3	.25	16	1.35	3	.25	10	1.35	3	.25	10	1.35
	ST 205'	3	.25	24	-	3	.25	24	-	3	.25	32	-	3	.25	32	-	3	.25	40	-	3	.25	40	-
	ST 206	3	.20	44	2.55	3	.20	44	2.55	3	.20	44	2.55	3	.20	44	2.55	3	.20	44	2.55	3	.20	44	2.55
	ST 207	2	.30	12	-	2	.30	12	-	2	.30	12	-	2	.30	12	-	2	.30	12	-	2	.30	12	-
	B 201	8	-	8	7.30	8	-	8	7.30	8	-	8	7.30	8	-	8	7.30	8	-	8	7.30	8	-	8	7.30
	B 201'	6	-	24	1.55	6	-	24	1.55	6	-	32	1.55	6	-	32	1.55	6	-	40	1.55	6	-	40	1.55
	CN 201	8	-	16	9.25	8	-	16	9.25	8	-	20	9.25	8	-	20	9.25	8	-	24	9.25	8	-	24	9.25
	CN 202	8	-	16	2.31	8	-	16	2.31	8	-	20	2.31	8	-	20	2.31	8	-	24	2.31	8	-	24	2.31
	F 201	8	-	2	8.70	8	-	2	8.70	8	-	2	8.70	8	-	2	8.70	8	-	2	8.70	8	-	2	8.70
	F 202	8	-	2	9.90	8	-	2	9.90	8	-	2	9.90	8	-	2	9.90	8	-	2	9.90	8	-	2	9.90
	F 203	4	.25	35	1.50	4	.25	35	1.50	4	.20	44	1.70	4	.20	44	1.70	4	.125	70	1.90	4	.125	70	1.90
	F 204	4	-	6	8.70	4	-	6	8.70	4	-	6	8.70	4	-	6	8.70	4	-	6	8.70	4	-	6	8.70
	W 201	4	.20	10	-	4	.20	10	-	4	.20	10	-	4	.20	10	-	4	.20	10	-	4	.20	10	-
	W 202	2	.30	-	2.70	2	.30	-	2.60	2	.30	-	2.60	2	.30	-	2.50	2	.30	-	2.40	2	.30	-	2.30
	W 203	4	.15	24	-	4	.15	24	-	4	.15	24	-	4	.15	24	-	4	.15	24	-	4	.15	24	-
	W 204	2	.30	12	-	2	.30	12	-	2	.30	12	-	2	.30	12	-	2	.30	12	-	2	.30	12	-
	W 205	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-
	W 206	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-
	W 207	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15
	W 208	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435
	W 209	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535

2 = Ø 1/4" OR 6 MM., # 3 = Ø 3/8" OR 9 MM., # 4 = Ø 1/2" OR 12 MM., # 8 = Ø 1" OR 25 MM., NO. = TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BAR

NOTES :

1. THE BOTTOM OF A FOOTING SHALL BE EMBEDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT IT'S CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED, 10 CM. THICKNESS OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND. COMPOSITION OF LEAN CONCRETE SHALL BE 1 : 3 : 6 VOLUME.
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON / M.^{2}
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES :
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M. A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0 M., ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, BACKWALL AND WINGWALLS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
5. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG./M.^{3} AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG./CM.^{2} FOR A .15 x .15 x .15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOW :

PORTLAND CEMENT	350	KG.
SAND	0.45	M.^{3}
CRUSHED ROCK OR GRAVEL	0.86	M.^{3}
CONCRETE SLUMP MAX.	10	CM.

6. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
7. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
9. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM, BACK WALL AND WINGWALLS WITHOUT ALTERING THE LOCATIONS OF REBARS.
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 10.0 M.
12. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
13. THIS DRAWING IS ADAPTED FROM DOH. DWG. NO. 3AD5 - 106 - 14/4.[a]

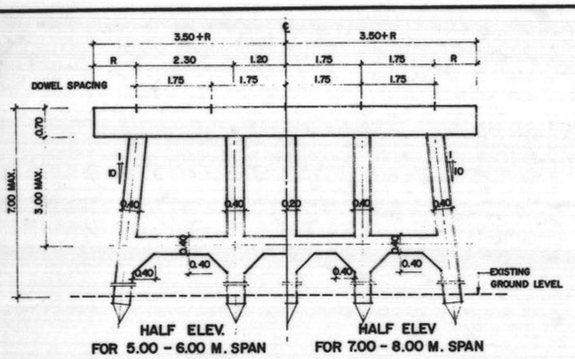
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

7.00 M. ROADWAY WIDTH SLAB BRIDGE

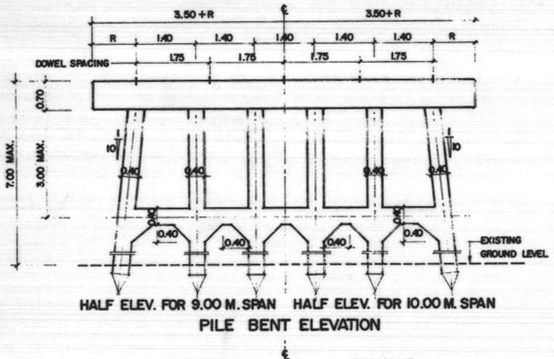
SPREAD FOOTING ABUTMENT DETAILS

DESIGNED : DOH & CONSULTANTS	CHECKED : Kyd	DATE JULY 1994
SUBMITTED : P. Bunnag (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : FOR (DIRECTOR GENERAL)		ST-03
		SHEET NO. 116



HALF ELEV. FOR 5.00 - 6.00 M. SPAN

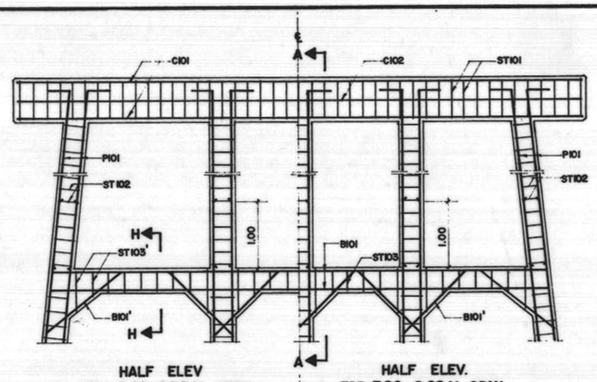
HALF ELEV FOR 7.00 - 8.00 M. SPAN



HALF ELEV. FOR 9.00 M. SPAN

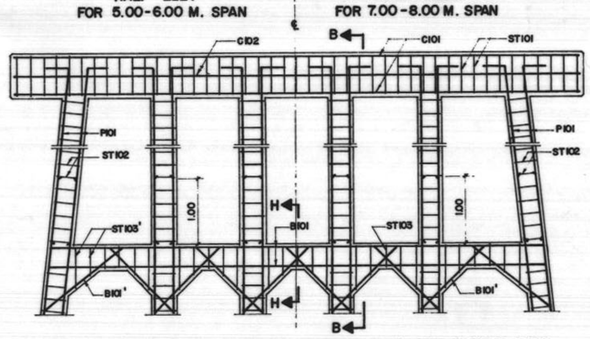
HALF ELEV. FOR 10.00 M. SPAN

PILE BENT ELEVATION



HALF ELEV FOR 5.00-6.00 M. SPAN

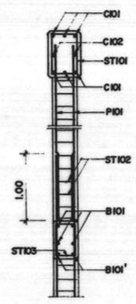
HALF ELEV. FOR 7.00-8.00 M. SPAN



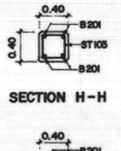
HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV. FOR 10.00 M. SPAN

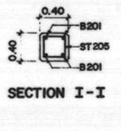
PILE BENT REINFORCEMENT DETAILS



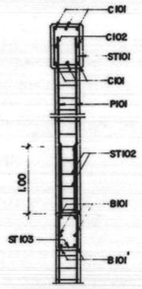
SECTION A-A



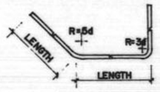
SECTION H-H



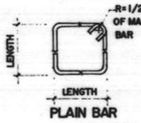
SECTION I-I



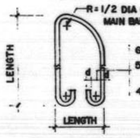
SECTION B-B



DEFORMED BAR



PLAIN BAR



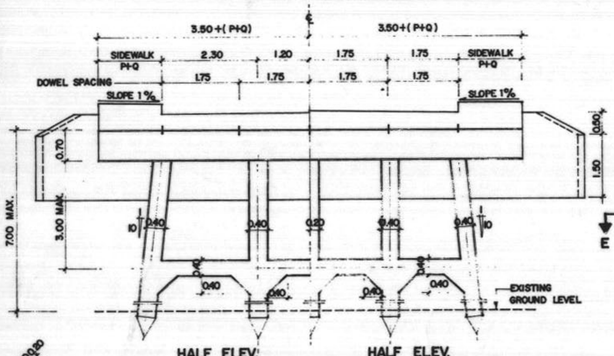
PLAIN BAR

BAR BENDING DETAILS

TABLE OF REINFORCEMENT

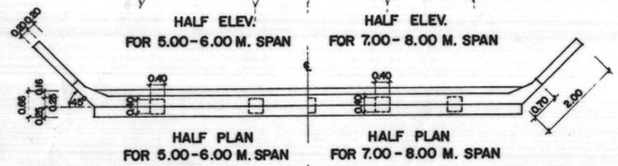
BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M. #	@	NO.	L	SPAN 6.00 M. #	@	NO.	L	SPAN 7.00 M. #	@	NO.	L	SPAN 8.00 M. #	@	NO.	L	SPAN 9.00 M. #	@	NO.	L	SPAN 10.00 M. #	@	NO.	L
PILE BENT	C101	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–
	C102	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	ST101	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35
	ST102	3	0.20	56	1.35	3	0.20	56	1.35	3	0.20	70	1.35	3	0.20	70	1.35	3	0.20	84	1.35	3	0.20	84	1.35
	ST103	3	0.25	15	1.35	3	0.25	15	1.35	3	0.25	10	1.35	3	0.25	10	1.35	3	0.25	7	1.35	3	0.25	7	1.35
	ST103'	3	0.25	12	–	3	0.25	12	–	3	0.25	16	–	3	0.25	16	–	3	0.25	20	–	3	0.25	20	–
	B101	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–
	B101'	8	–	12	1.55	8	–	12	1.55	8	–	16	1.55	8	–	16	1.55	8	–	20	1.55	8	–	20	1.55
	P101	8	–	16	3.75	8	–	16	3.75	8	–	20	3.75	8	–	20	3.75	8	–	24	3.75	8	–	24	3.75
ABUTMENT	C201	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
	C202	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	ST201	2	0.20	–	1.215	2	0.20	–	1.295	2	0.20	–	1.355	2	0.20	–	1.435	2	0.20	–	1.515	2	0.20	–	1.635
	ST202	3	0.20	–	1.745	3	0.20	–	1.795	3	0.20	–	1.845	3	0.20	–	1.895	3	0.20	–	1.945	3	0.20	–	1.995
	ST203	3	0.20	–	–	3	0.20	–	–	3	0.20	–	–	3	0.20	–	–	3	0.20	–	–	3	0.20	–	–
	ST204	3	0.20	56	1.35	3	0.20	56	1.35	3	0.20	70	1.35	3	0.20	70	1.35	3	0.20	84	1.35	3	0.20	84	1.35
	ST205	3	0.25	15	1.35	3	0.25	15	1.35	3	0.25	10	1.35	3	0.25	10	1.35	3	0.25	7	1.35	3	0.25	7	1.35
	ST205'	3	0.25	12	–	3	0.25	12	–	3	0.25	16	–	3	0.25	16	–	3	0.25	20	–	3	0.25	20	–
	ST206	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
	B201	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–
	B201'	8	–	12	1.55	8	–	12	1.55	8	–	16	1.55	8	–	16	1.55	8	–	20	1.55	8	–	20	1.55
	P201	8	–	16	3.75	8	–	16	3.75	8	–	20	3.75	8	–	20	3.75	8	–	24	3.75	8	–	24	3.75
	W201	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–
	W202	2	0.30	–	270	2	0.30	–	2.60	2	0.30		2.60	2	0.30	–	2.50	2	0.30	–	2.40	2	0.30	–	2.30
	W203	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–
	W204	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
	W205	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–
	W206	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–
	W 207	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15
	W208	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435
	W 209	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535

2= ø 1/4" OR 6 MM., 3= ø 3/8" OR 9 MM., 4= ø 1/2" OR 12 MM., 6= ø 3/4" OR 20 MM., 8= ø 1" OR 25 MM., NO= TOTAL AMOUNT OF BARS, L= TOTAL LENGTH OF EACH BAR



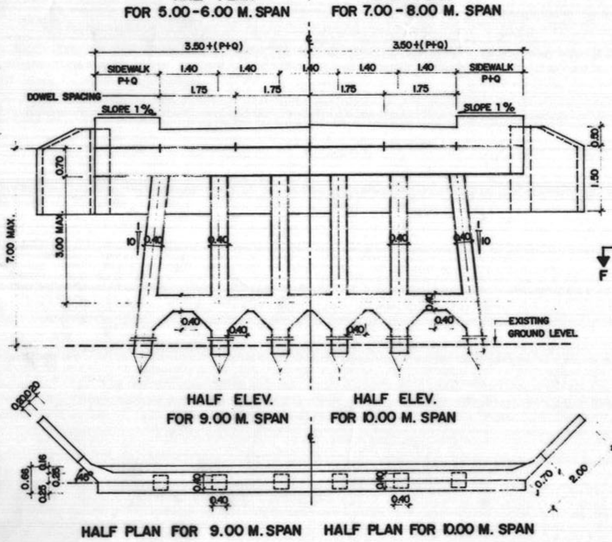
HALF ELEV. FOR 5.00-6.00 M. SPAN

HALF ELEV. FOR 7.00-8.00 M. SPAN



HALF PLAN FOR 5.00-6.00 M. SPAN

HALF PLAN FOR 7.00-8.00 M. SPAN



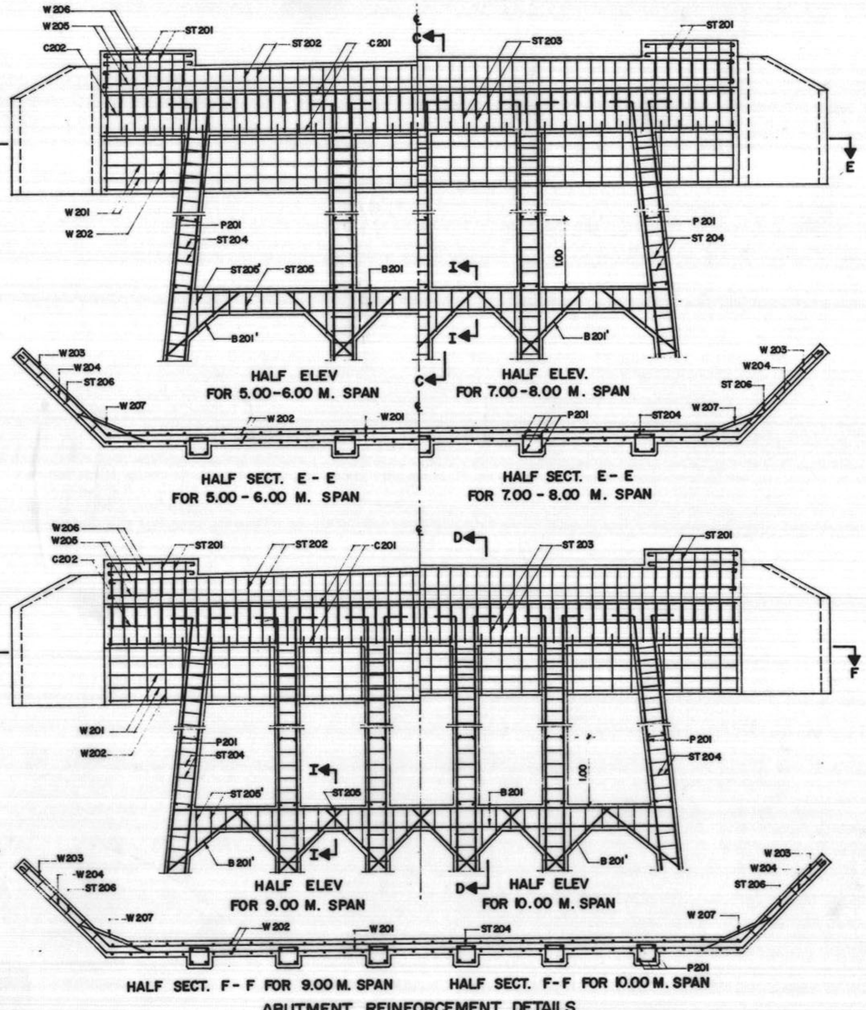
HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV. FOR 10.00 M. SPAN

HALF PLAN FOR 9.00 M. SPAN

HALF PLAN FOR 10.00 M. SPAN

ABUTMENT DETAILS



HALF ELEV FOR 5.00-6.00 M. SPAN

HALF ELEV. FOR 7.00-8.00 M. SPAN

HALF SECT. E-E FOR 5.00-6.00 M. SPAN

HALF SECT. E-E FOR 7.00-8.00 M. SPAN

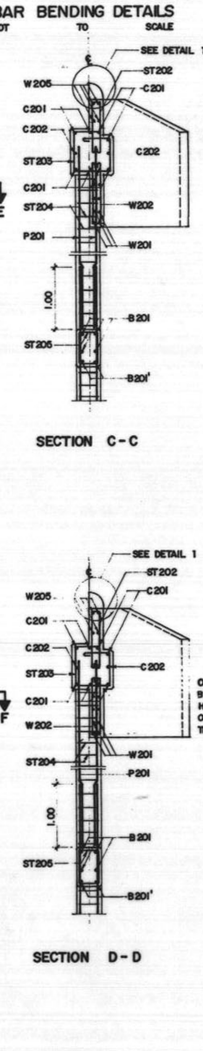
HALF ELEV FOR 9.00 M. SPAN

HALF ELEV FOR 10.00 M. SPAN

HALF SECT. F-F FOR 9.00 M. SPAN

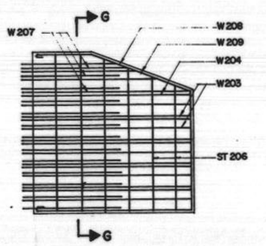
HALF SECT. F-F FOR 10.00 M. SPAN

ABUTMENT REINFORCEMENT DETAILS
SCALE 1:50

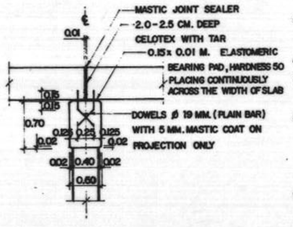


SECTION C-C

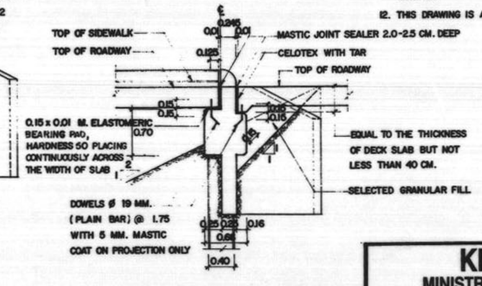
SECTION D-D



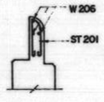
WINGWALL REFORCEMENT DETAILS
SCALE 1:50



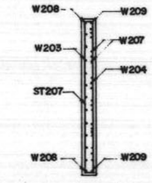
CAP BEAM DETAILS
SCALE 1:50



ABUTMENT HEAD DETAILS
SCALE 1:50



DETAIL 1
SCALE 1:50



SECTION G-G

NOTE :

1. EACH PILE SHALL BE DRIVEN TO A DEPTH WHERE SCOUR WILL NOT AFFECT CAPACITY AND SHALL HAVE A MINIMUM ULTIMATE BEARING CAPACITY OF 90 TONS FOR PILE DETAILS SEE DWG.NO. MS-02, MS-03
2. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES
   a.) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b.) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0 M., ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
3. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, BACK WALL AND WINGWALLS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED
4. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG./M. AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG./CM. FOR A 0.15 x 0.15 x 0.15 M. CUBE AT 28 DAYS CEMENT SHALL BE TIS 15 TYPE 1 PORTLAND CEMENT A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350	KG.
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP MAX	10	CM.

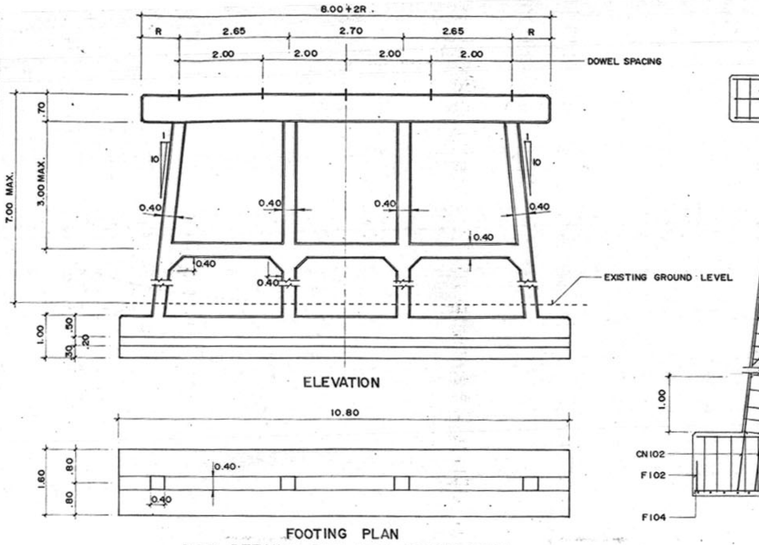
5. REBARS # 4 OR LARGER SHALL BE TIS. 24 GRADE SD.30 DEFORMED BARS, OTHERS SHALL BE TIS. 20 GRADE SR. 24 PLAIN BARS UNLESS OTHERWISE INDICATED
6. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER
7. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS
8. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT CEMENT TYPE 5 CONFROMING TO TIS. 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM, BACK WALL AND WINGWALLS WITHOUT ALTERING THE LOCATIONS OF REBARS
9. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HEIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL
10. ALL DIAMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 10.00 M.
12. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5-106-14/9

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

7.00 M. ROADWAY WIDTH SLAB BRIDGE
PILE BENT AND ABUTMENT DETAILS

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. ST-04
		SHEET NO. 117

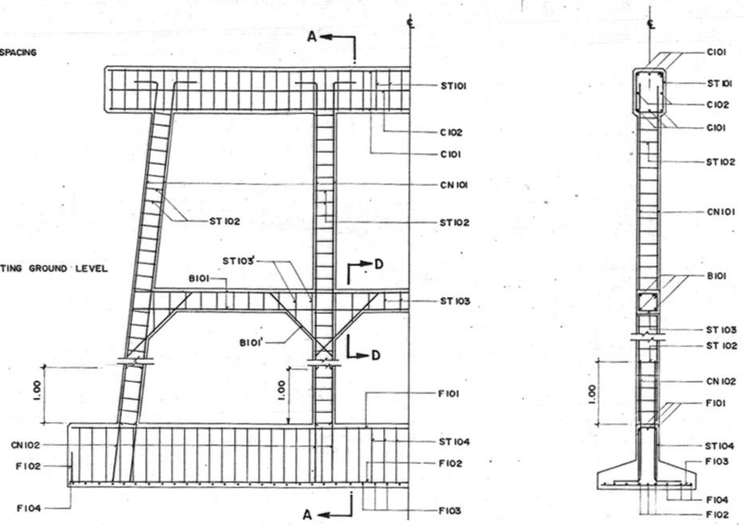


ELEVATION

FOOTING PLAN

PIER DETAILS FOR 5.00 - 6.00 M. SPAN

SCALE 1 : 75

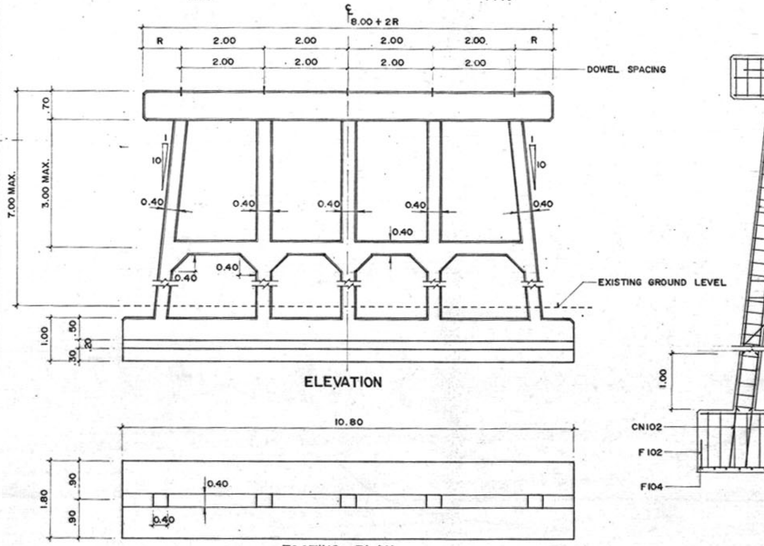


HALF ELEVATION

SECTION A - A

REINFORCEMENT DETAILS FOR 5.00 - 6.00 M. SPAN

SCALE 1 : 50

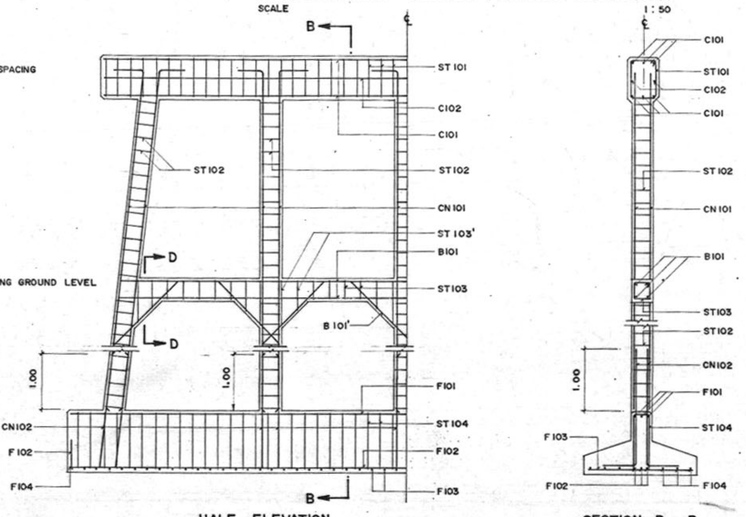


ELEVATION

FOOTING PLAN

PIER DETAILS FOR 7.00 - 8.00 M. SPAN

SCALE 1 : 75

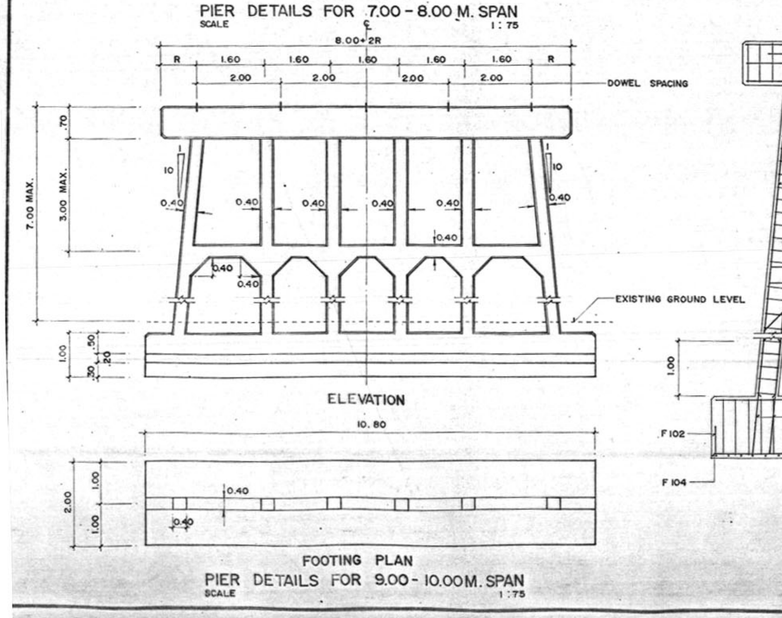


HALF ELEVATION

SECTION B - B

REINFORCEMENT DETAILS FOR 7.00 - 8.00 M. SPAN

SCALE 1 : 50

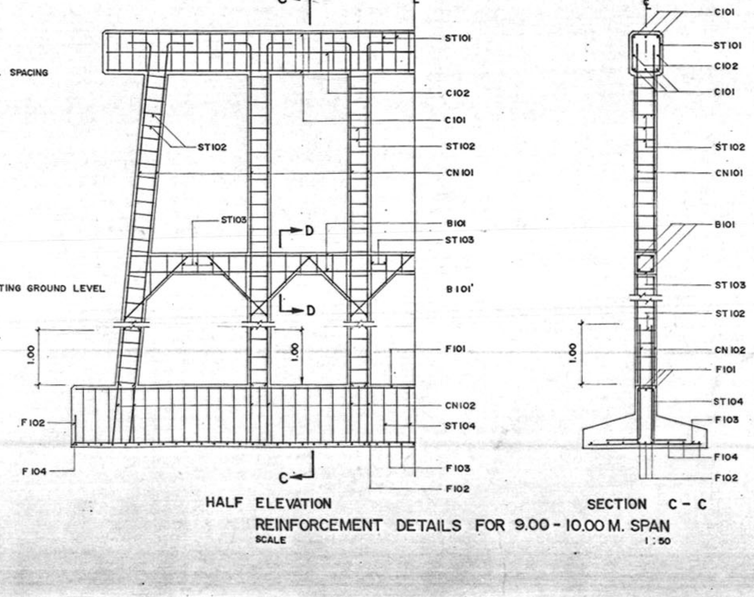


ELEVATION

FOOTING PLAN

PIER DETAILS FOR 9.00 - 10.00 M. SPAN

SCALE 1 : 75



HALF ELEVATION

SECTION C - C

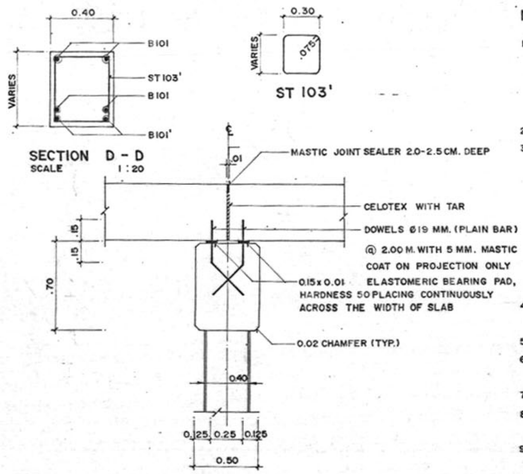
REINFORCEMENT DETAILS FOR 9.00 - 10.00 M. SPAN

SCALE 1 : 50

TABLE OF REINFORCEMENT

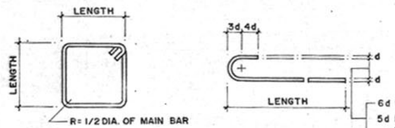
	BAR BENDING DIAGRAMS	NO.	BAR MARK	SPAN 5.00 M. #	@	NO.	L	SPAN 6.00 M. #	@	NO.	L	SPAN 7.00 M. #	@	NO.	L	SPAN 8.00 M. #	@	NO.	L	SPAN 9.00 M. #	@	NO.	L	SPAN 10.00 M. #	@	NO.	L
		1	C101	8	-	6	-	8	-	6	-	8	-	6	-	8	-	6	-	8	-	6	-	8	-	6	-
		2	C102	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-
		3	CN101	8	-	16	11.25	8	-	16	11.25	8	-	20	11.25	8	-	20	11.25	8	-	24	11.25	8	-	24	11.25
		4	CN102	8	-	16	2.31	8	-	16	2.31	8	-	20	2.31	8	-	20	2.31	8	-	24	2.31	8	-	24	2.31
		5	ST101	3	.20	-	2.35	3	.20	-	2.35	3	.20	-	2.35	3	.20	-	2.35	3	.20	-	2.35	3	.20	-	2.35
		6	ST102	3	.20	192	1.35	3	.20	192	1.35	3	.20	240	1.35	3	.20	240	1.35	3	.20	288	1.35	3	.20	288	1.35
		7	ST103	3	.25	42	1.35	3	.25	42	1.35	3	.25	34	1.35	3	.25	34	1.35	3	.25	26	1.35	3	.25	26	1.35
		8	ST105	3	.25	24	-	3	.25	24	-	3	.25	32	-	3	.25	32	-	3	.25	40	1.35	3	.25	40	-
		9	ST104	3	.20	54	2.55	3	.20	54	2.55	3	.20	54	2.55	3	.20	54	2.55	3	.20	54	2.55	3	.20	54	2.55
		10	B101	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-
		11	B101'	6	-	24	1.55	6	-	24	1.55	6	-	32	1.55	6	-	32	1.55	6	-	40	1.55	6	-	40	1.55
		12	F101	8	-	3	10.70	8	-	3	10.70	8	-	3	10.70	8	-	3	10.70	8	-	3	10.70	8	-	3	10.70
		13	F102	8	-	3	11.90	8	-	3	11.90	8	-	3	11.90	8	-	3	11.90	8	-	3	11.90	8	-	3	11.90
		14	F103	4	.25	43	1.50	4	.25	43	1.50	4	.20	54	1.70	4	.20	54	1.70	4	.125	86	1.90	4	.125	86	1.90
		15	F104	4	-	6	10.70	4	-	6	10.70	4	-	6	10.70	4	-	6	10.70	4	-	6	10.70	4	-	6	10.70

3 = Ø 3/8" OR 9 MM., # 4 = Ø 1/2" OR 12 MM., # 6 = Ø 3/4" OR 20 MM., # 8 = Ø 1" OR 25 MM. NO. = TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BAR



CAP BEAM DETAILS

SCALE 1 : 25



BAR BENDING DETAILS

NOT TO SCALE

NOTES :

1. THE BOTTOM OF A FOOTING SHALL BE EMBEDDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT ITS CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED, 10 CM. THICK OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND. COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 BY VOLUME.
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON/M^2
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0 M. ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM AT WHICH CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
5. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 12.0 M.
6. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
7. LOCATION OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
9. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS. 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM WITHOUT ALTERING THE LOCATIONS OF REBARS.
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
11. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG./M^3 AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG./CM.^{2} FOR A .15 x .15 x .15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350	KG.
SAND	0.45	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP MAX.	10	CM.

12. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
13. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5-106-14/6.

KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS

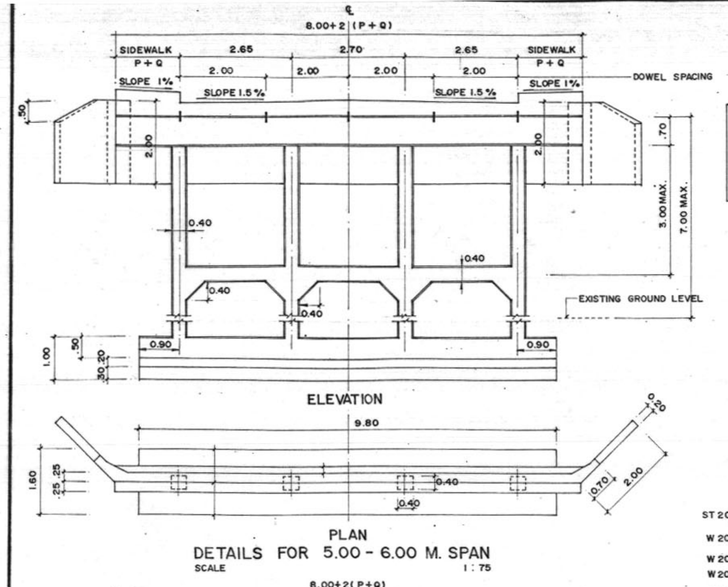
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

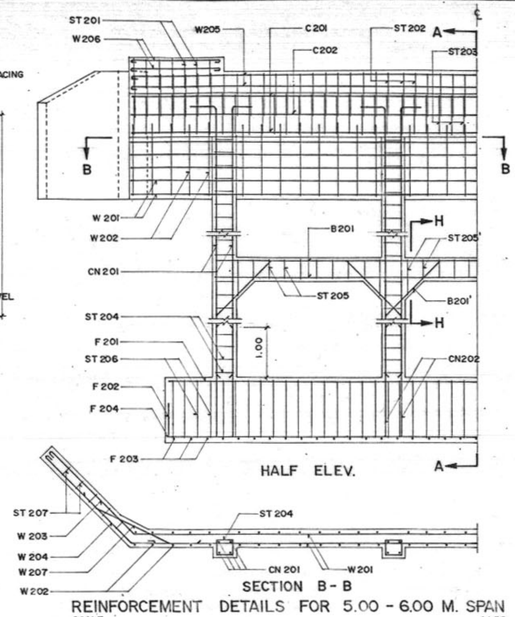
8.00 M. ROADWAY WIDTH SLAB BRIDGE

SPREAD FOOTING PIER DETAILS

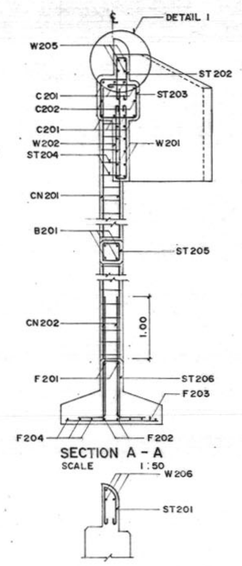
DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
		DWG. NO. ST-05
APPROVED : (DIRECTOR GENERAL)		SHEET NO. 118



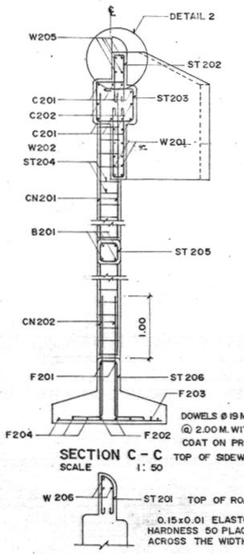
DETAILS FOR 5.00 - 6.00 M. SPAN
SCALE 1 : 75



REINFORCEMENT DETAILS FOR 5.00 - 6.00 M. SPAN
SCALE 1 : 50



SCALE 1 : 50



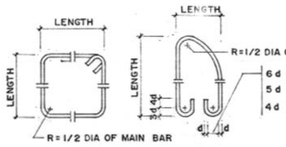
SCALE 1:50

SCALE 1 : 50

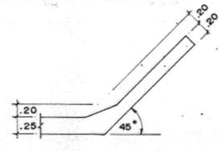
TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M.				SPAN 6.00 M.				SPAN 7.00 M.				SPAN 8.00 M.				SPAN 9.00 M.				SPAN 10.00 M.			
		#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L
	C201	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-
	C202	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-
	ST201	2	.20	-	1.215	2	.20	-	1.295	2	.20	-	1.355	2	.20	-	1.435	2	.20	-	1.515	2	.20	-	1.535
	ST202	3	.20	-	1.745	3	.20	-	1.795	3	.20	-	1.845	3	.20	-	1.895	3	.20	-	1.945	3	.20	-	1.995
	ST203	3	.20	-	-	3	.20	-	-	3	.20	-	-	3	.20	-	-	3	.20	-	-	3	.20	-	-
	ST204	3	.20	156	1.35	3	.20	156	1.35	3	.20	195	1.35	3	.20	195	1.35	3	.20	234	1.35	3	.20	234	1.35
	ST205	3	.25	36	1.35	3	.25	36	1.35	3	.25	24	1.35	3	.25	24	1.35	3	.25	20	1.35	3	.25	20	1.35
	ST205'	3	.25	24	-	3	.25	24	-	3	.25	32	-	3	.25	32	-	3	.25	40	-	3	.25	40	-
	ST206	3	.20	49	2.55	3	.20	49	2.55	3	.20	49	2.55	3	.20	49	2.55	3	.20	49	2.55	3	.20	49	2.55
	ST207	2	.30	12	-	2	.20	12	-	2	.30	12	2.55	2	.30	12	-	2	.30	12	-	2	.30	12	-
	B201	8	-	8	8.30	8	0.30	8	8.30	8	-	8	8.30	8	-	0.8	8.30	8	-	0.8	8.30	8	-	0.8	8.30
	B201'	6	-	24	1.55	6	-	24	1.55	6	-	32	1.55	6	-	32	1.55	6	-	40	1.55	6	-	40	1.55
	CN 201	8	-	16	9.25	8	-	16	9.25	8	-	20	9.25	8	-	20	9.25	8	-	24	9.25	8	-	24	9.25
	CN 202	8	-	16	2.31	8	-	16	2.31	8	-	20	2.31	8	-	20	2.31	8	-	24	2.31	8	-	24	2.31
	F 201	8	-	2	9.70	8	-	2	9.70	8	-	2	9.70	8	-	2	9.70	8	-	2	9.70	8	-	2	9.70
	F 202	8	-	2	10.90	8	-	2	10.90	8	-	2	10.90	8	-	2	10.90	8	-	2	10.90	8	-	2	10.90
	F 203	4	.25	39	1.50	4	.25	39	1.50	4	.20	49	1.70	4	.20	49	1.70	4	.125	78	1.90	4	.125	78	1.90
	F 204	4	-	6	9.70	4	-	6	9.70	4	-	6	9.70	4	-	6	9.70	4	-	6	9.70	4	-	6	9.70
	W 201	4	.20	10	-	4	.20	10	-	4	.20	10	-	4	.20	10	-	4	.20	10	-	4	.20	10	-
	W 202	2	.30	-	2.75	2	.30	-	2.60	2	.30	-	2.60	2	.30	-	2.50	2	.30	-	2.40	2	.30	-	2.30
	W 203	4	.15	24	-	4	.15	24	-	4	.15	24	-	4	.15	24	-	4	.15	24	-	4	.15	24	-
	W 204	2	.30	12	-	2	.30	12	-	2	.30	12	-	2	.30	12	-	2	.30	12	-	2	.30	12	-
	W 205	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-
	W 206	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-
	W 207	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15
	W 208	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435
	W 209	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535

2 = Ø 1/4" OR 6 MM., # 3 = 3/8" OR 9 MM., # 4 = 1/2" OR 12 MM., # 6 = 3/4" OR 20 MM., # 8 = Ø1 OR 20 MM., TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BAR

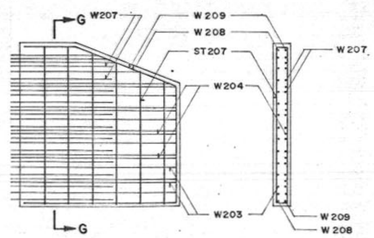


BAR BENDING DETAILS
NOT TO SCALE

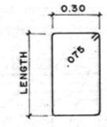


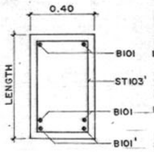
WINGWALL DETAILS
SCALE 1 : 50

ABUTMENT HEAD DETAILS
SCALE 1 : 50



WINGWALL
REINFORCEMENT DETAILS
SCALE 1 : 40



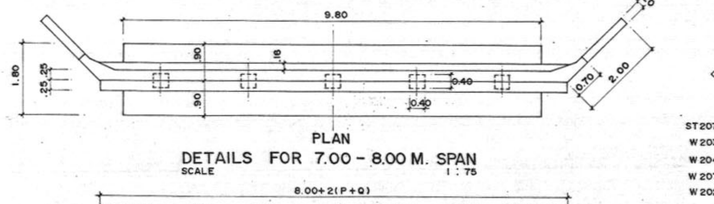


NOTES :

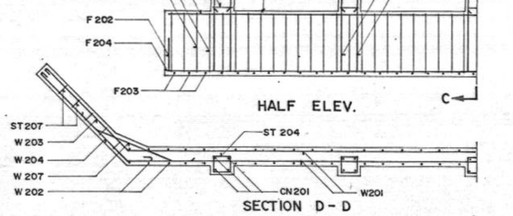
1. THE BOTTOM OF A FOOTING SHALL BE EMBEDDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT IT'S CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED, 10 CM. THICK OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND. COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 BY VOLUME.
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON/M.^{2}
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES :
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0 M ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, BACK WALL AND WINGWALLS AT WHICH CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
5. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 10.0 M.
6. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
7. LOCATION OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
9. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS. 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP. BEAM, BACK WALL AND WINGWALLS WITHOUT ALTERING THE LOCATIONS OF REBARS.
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
11. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG./M.^{3} AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG./CM.^{2} FOR A .15 x .15 x .15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350	KG.
SAND	0.45	M.^{3}
CRUSHED ROCK OR GRAVEL	0.86	M.^{3}
CONCRETE SLUMP MAX.	10	CM.

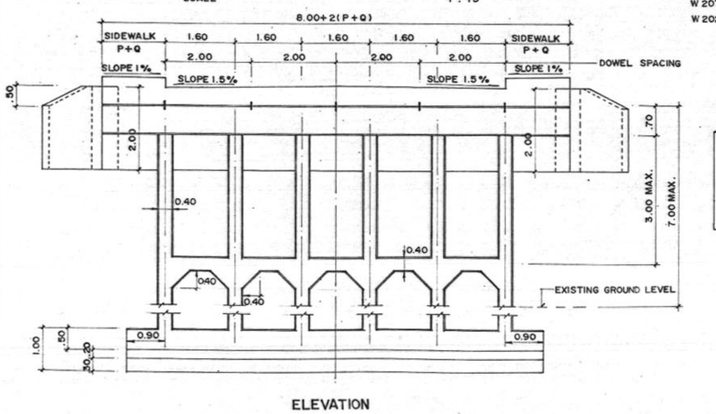
12. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
13. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5-106-14/6.



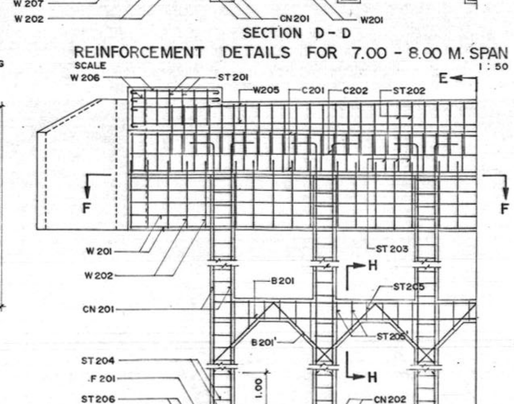
DETAILS FOR 7.00 - 8.00 M. SPAN
SCALE 1 : 75



REINFORCEMENT DETAILS FOR 7.00 - 8.00 M. SPAN
SCALE 1 : 50



DETAILS FOR 9.00 - 10.00 M. SPAN
SCALE 1 : 75



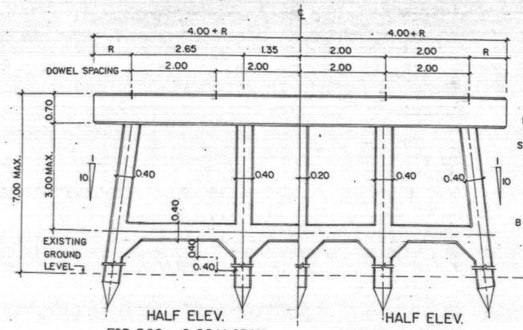
REINFORCEMENT DETAILS FOR 9.00 - 10.00 M. SPAN
SCALE 1 : 50

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

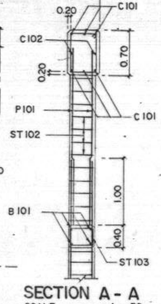
STANDARD DRAWING

8.00 M. ROADWAY WIDTH SLAB BRIDGE
SPREAD FOOTING ABUTMENT DETAILS

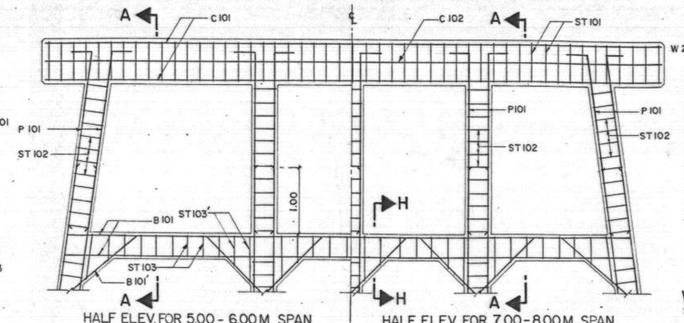
DESIGNED : DOH & CONSULTANTS	CHECKED : Kayol	DATE JULY 1994
SUBMITTED : P. Buangpo (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
		DWG. NO. ST-06
APPROVED : FOR (DIRECTOR GENERAL)		SHEET NO. 119



HALF ELEV. FOR 5.00 – 6.00 M. SPAN

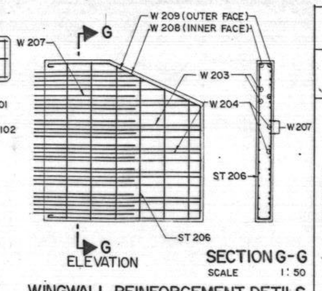


SECTION A - A
SCALE 1 : 50



HALF ELEV. FOR 5.00 - 6.00 M. SPAN

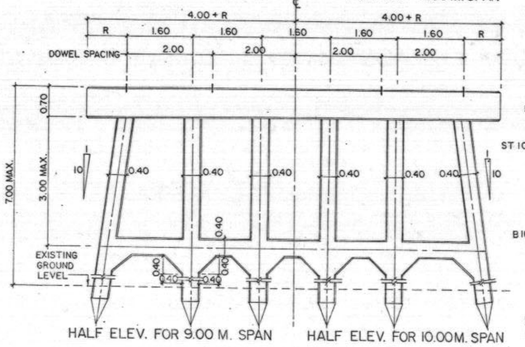
HALF ELEV. FOR 7.00 - 8.00 M. SPAN



G
ELEVATION

SECTION G-G
SCALE 1 : 50

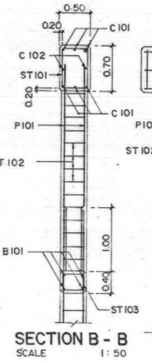
WINGWALL REINFORCEMENT DETILS
SCALE 1 : 50



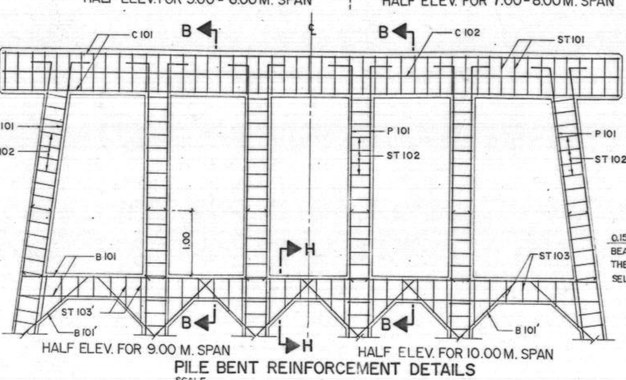
HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV. FOR 10.00 M. SPAN

PILE BENT ELEVATION
SCALE 1 : 75



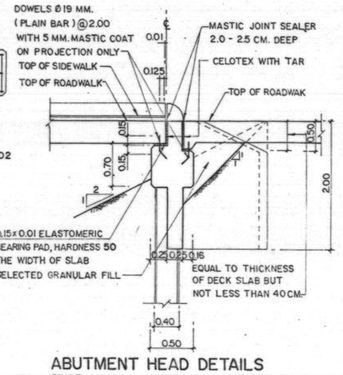
SECTION B - B
SCALE 1 : 50



HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV. FOR 10.00 M. SPAN

PILE BENT REINFORCEMENT DETAILS
SCALE 1 : 50

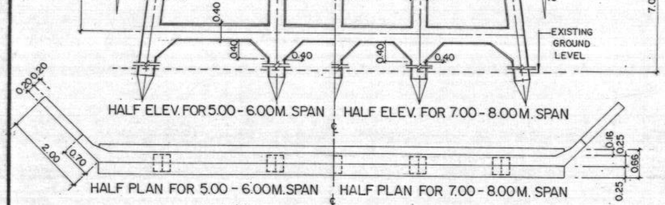


ABUTMENT HEAD DETAILS
SCALE 1 : 50

TABLE OF REINFORCEMENT

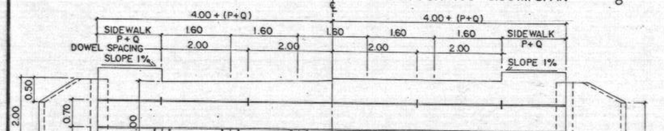
	BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M.				SPAN 6.00 M.				SPAN 7.00 M.				SPAN 8.00 M.				SPAN 9.00 M.				SPAN 10.00 M.			
			#	@	NO	L	#	@	NO	L	#	@	NO	L	#	@	NO	L	#	@	NO	L	#	@	NO	L
PILE BENT	VARIES	C 101	8	-	6	-	8	-	6	-	8	-	6	-	8	-	6	-	8	-	6	-	8	-	6	-
	VARIES	C 102	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-
		ST101	3	0.20		2.35	3	0.20		2.35	3	0.20		2.35	3	0.20		2.35	3	0.20		2.35	3	0.20		2.35
		ST102	3	0.20	56	1.35	3	0.20	56	1.35	3	0.20	70	1.35	3	0.20	70	1.35	3	0.20	84	1.35	3	0.20	84	1.35
		ST103	3	0.25	20	1.35	3	0.25	20	1.35	3	0.25	14	1.35	3	0.25	14	1.35	3	0.25	12	1.35	3	0.25	12	1.35
		ST103'	3	0.25	12	-	3	0.25	12	-	3	0.25	16	-	3	0.25	16	-	3	0.25	20	-	3	0.25	20	-
		B 101	8	-	4	-	8	-	4	-	8	-	4	-	8	-	4	-	8	-	4	-	8	-	4	-
		B 101'	8	-	12	1.55	8	-	12	1.55	8	-	16	1.55	8	-	16	1.55	8	-	20	1.55	8	-	20	1.55
		P 101	8		16	3.75	8		16	3.75	8		20	3.75	8		20	3.75	8		24	3.75	8		24	3.75
ABUTMENT	VARIES	C 201	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-
	VARIES	C 202	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-
		ST201	2	0.20	-	1.215	2	0.20	-	1.295	2	0.20	-	1.355	2	0.20	-	1.435	2	0.20	-	1.515	2	0.20	-	1.635
		ST202	3	0.20	-	1.745	3	0.20	-	1.795	3	0.20	-	1.845	3	0.20	-	1.895	3	0.20	-	1.945	3	0.20	-	1.995
		ST203	3	0.20	-	-	3	0.20	-	-	3	0.20	-	-	3	0.20	-	-	3	0.20	-	-	3	0.20	-	-
		ST204	3	0.20	56	1.35	3	0.20	56	1.35	3	0.20	70	1.35	3	0.20	70	1.35	3	0.20	84	1.35	3	0.20	84	1.35
		ST205	3	0.25	20	1.35	3	0.25	20	1.35	3	0.25	14	1.35	3	0.25	14	1.35	3	0.25	12	1.35	3	0.25	12	1.35
		ST205'	3	0.25	12	-	3	0.25	12	-	3	0.25	16	-	3	0.30	12	-	3	0.25	20	-	3	0.25	20	-
		ST206	2	0.30	12	-	2	0.30	12	-	2	0.30	12	-	3	0.30	12	-	3	0.30	12	-	3	0.30	12	-
	VARIES	B 201	8	-	4	-	8	-	4	-	8	-	4	-	8	-	4	-	8	-	4	-	8	-	4	-
	VARIES	B 201'	8	-	12	1.55	8	-	12	1.55	8	-	16	1.55	8	-	16	1.55	8	-	20	1.55	8	-	24	1.55
		P 201	8	-	16	3.75	8	-	16	3.75	8	-	20	3.75	8	-	20	3.75	8	-	24	3.75	8	-	24	3.75
		W 201	4	0.20	10	-	4	0.20	10	-	4	0.20	10	-	4	0.20	10	-	4	0.20	10	-	4	0.20	10	-
		W 202	2	0.30	-	2.70	2	0.30	-	2.60	2	0.30	-	2.60	2	0.30	-	2.50	2	0.30	-	2.40	2	0.30	-	2.30
		W 203	4	0.15	24	-	4	0.15	24	-	4	0.15	24	-	4	0.15	24	-	4	0.15	24	-	4	0.15	24	-
		W 204	2	0.30	12	-	2	0.30	12	-	2	0.30	12	-	2	0.30	12	-	2	0.30	12	-	2	0.30	12	-
		W 205	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-
		W 206	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-
		W 207	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15
		W 208	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435
		W 209	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535

2 = Ø1/4" OR 6MM., # 3 = Ø3/8" OR 9 MM, # 4 = Ø1/2" OR 12 MM. # 6 = Ø3/4" OR 20 MM. # 8 = Ø1" OR 25 MM., NO = TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BAR.



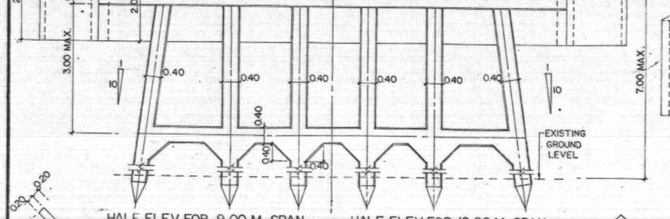
HALF ELEV. FOR 5.00 - 6.00 M. SPAN

HALF ELEV. FOR 7.00 - 8.00 M. SPAN



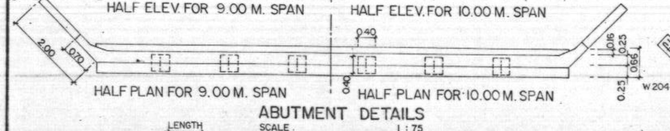
HALF PLAN FOR 5.00 - 6.00 M. SPAN

HALF PLAN FOR 7.00 - 8.00 M. SPAN



HALF ELEV. FOR 9.00 M. SPAN

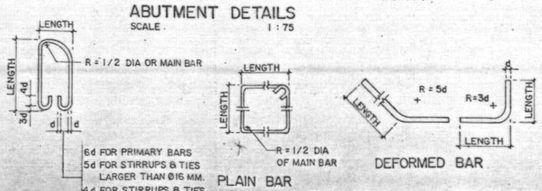
HALF ELEV. FOR 10.00 M. SPAN



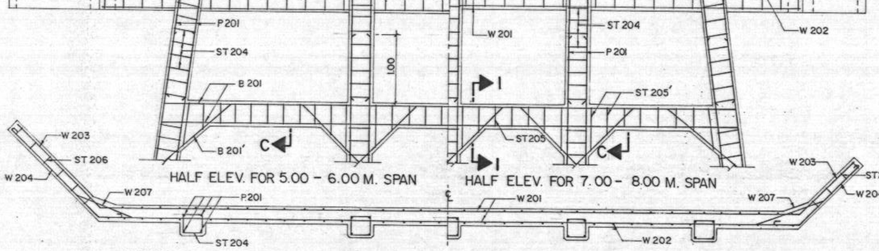
HALF PLAN FOR 9.00 M. SPAN

HALF PLAN FOR 10.00 M. SPAN

ABUTMENT DETAILS
SCALE 1 : 75

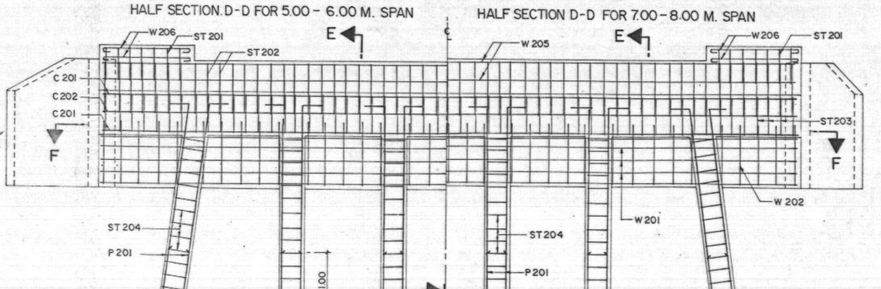


BAR BENDING DETAILS
NOT TO SCALE



HALF ELEV. FOR 5.00 - 6.00 M. SPAN

HALF ELEV. FOR 7.00 - 8.00 M. SPAN

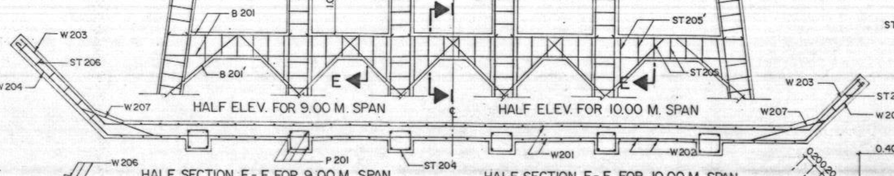


HALF SECTION D-D FOR 5.00 - 6.00 M. SPAN

HALF SECTION D-D FOR 7.00 - 8.00 M. SPAN

HALF ELEV. FOR 9.00 M. SPAN

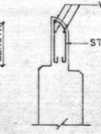
HALF ELEV. FOR 10.00 M. SPAN



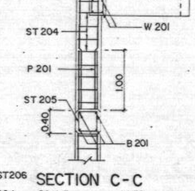
HALF SECTION F-F FOR 9.00 M. SPAN

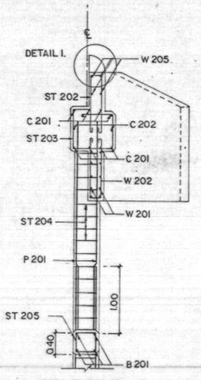
HALF SECTION F-F FOR 10.00 M. SPAN

ABUTMENT REINFORCEMENT DETAILS
SCALE 1 : 50

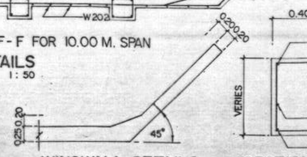


DETAIL I.
SCALE 1 : 50





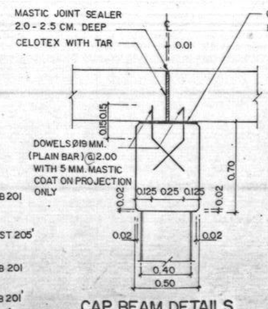
SECTION E - E
SCALE 1 : 50



WINGWALL DETAILS
SCALE 1 : 50

SECTION H - H
SCALE 1 : 25

SECTION I - I
SCALE 1 : 25



CAP BEAM DETAILS
SCALE 1 : 25

NOTES:

1. EACH PILE SHALL BE DRIVEN TO A DEPTH WHERE SCOUR WILL NOT AFFECT CAPACITY AND SHALL HAVE A MINIMUM ULTIMATE BEARING CAPACITY OF 90 TONS. FOR PILE DETAIL SEE DWG. NO. MS-02, MS-03
2. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES :
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE GROUND LEVEL EXCEEDS 3.0 M., ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
3. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, BACK WALL AND WINGWALLS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
4. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG/M^3 AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG/CM^2 FOR A 0.15 x 0.15 x 0.15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I. PORTLAND CEMENT. A SUGGESTED APPROXIMINTE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350 KG.
SAND	0.45 M^3
CRUSHED ROCK OR GRAVEL	0.86 M^3
CONCRETE SLUMP MAX	10 CM.

5. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
6. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
7. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS
8. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM, BACK WALL AND WINGWALLS WITHOUT ALTERING THE LOCATIONS OF REBARS.
9. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
10. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 10.00 M.
12. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5-106-14/7

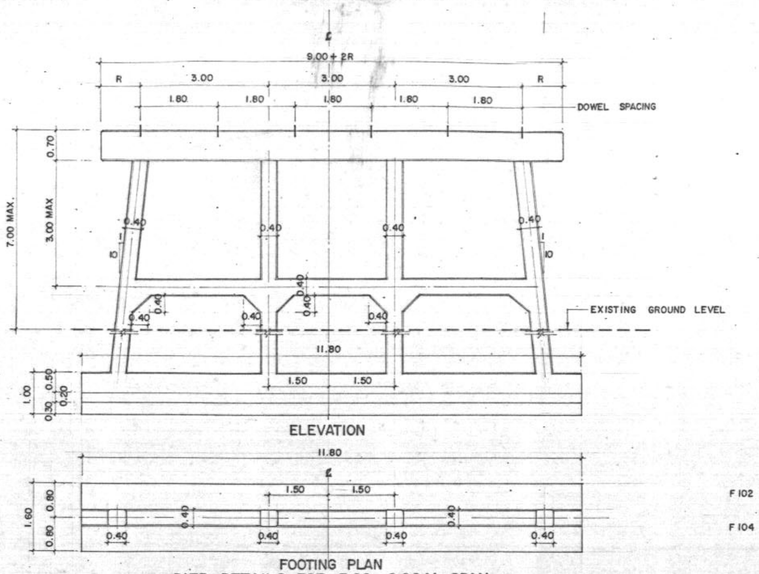
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

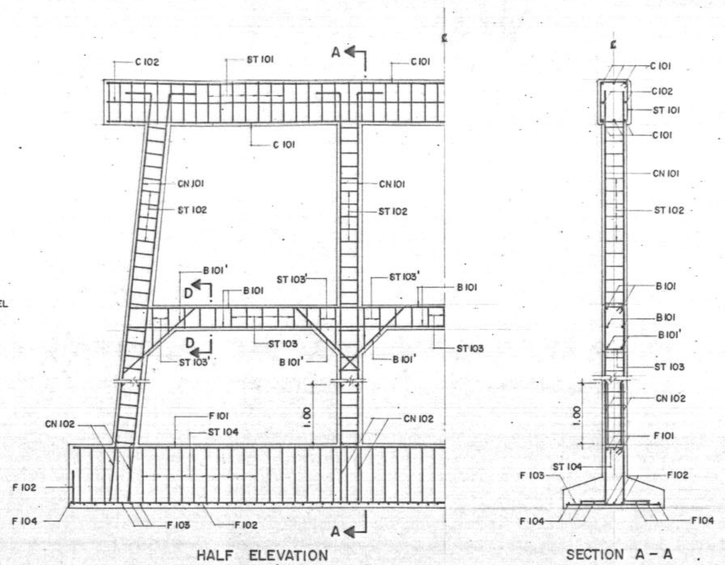
8.00 M. ROADWAY WIDTH SLAB BRIDGE

PILE BENT AND ABUTMENT DETAILS

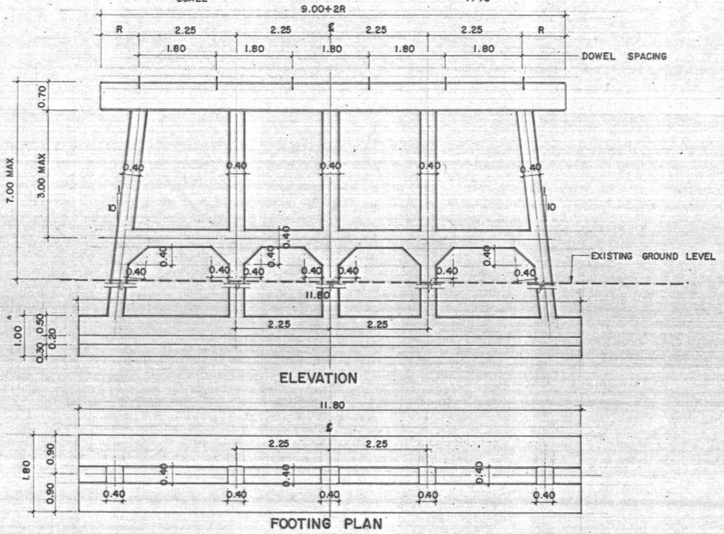
DESIGNED : DOH CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN.
APPROVED : (DIRECTOR GENERAL)		DWG. NO. ST-07
		SHEET NO. 120



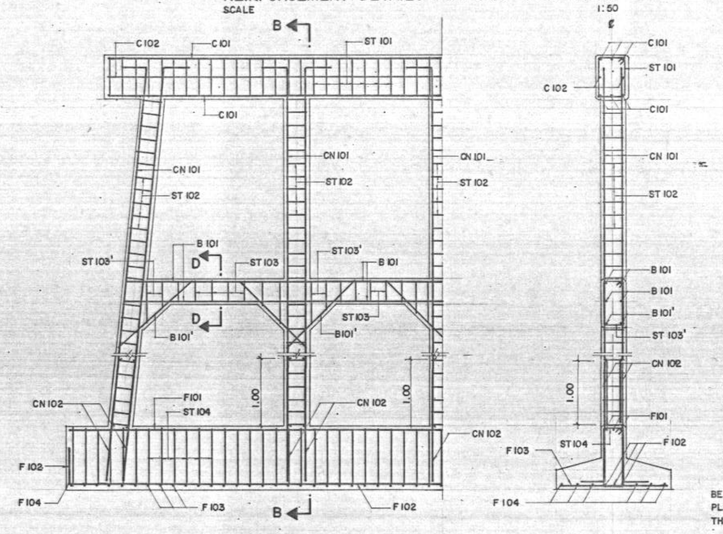
PIER DETAILS FOR 5.00-6.00 M. SPAN
SCALE 1:75



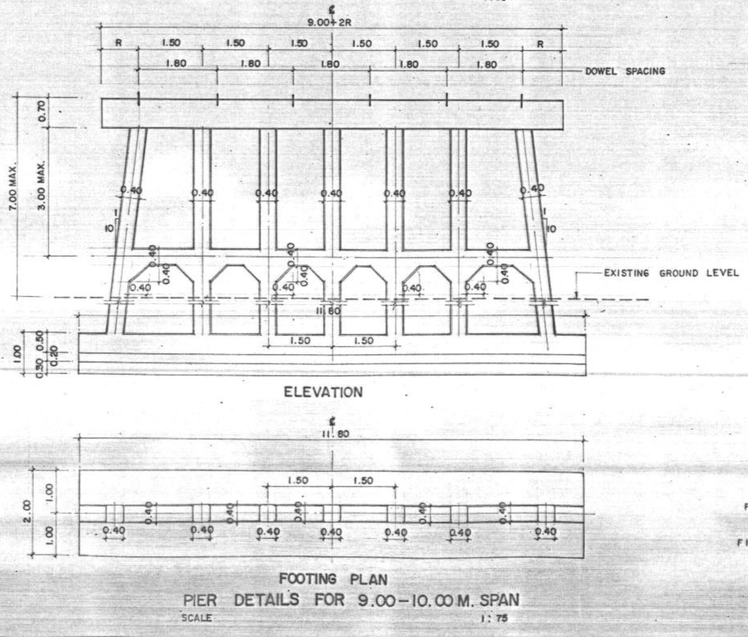
REINFORCEMENT DETAILS FOR 5.00-6.00 M. SPAN
SCALE 1:50



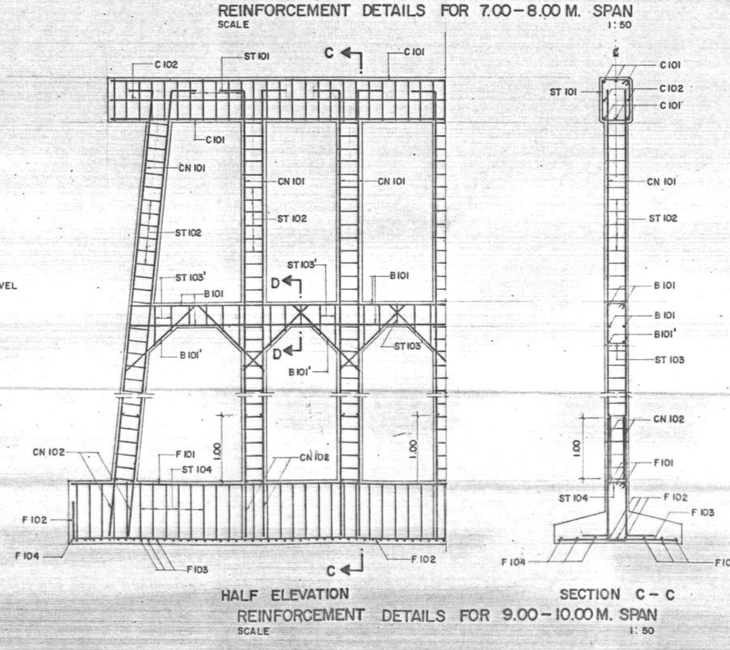
PIER DETAILS FOR 7.00-8.00 M. SPAN
SCALE 1:75



REINFORCEMENT DETAILS FOR 7.00-8.00 M. SPAN
SCALE 1:50

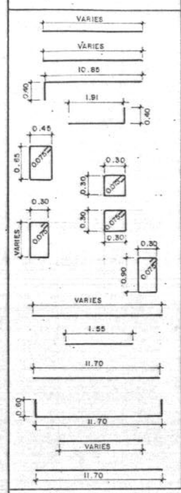


PIER DETAILS FOR 9.00-10.00 M. SPAN
SCALE 1:75

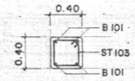


REINFORCEMENT DETAILS FOR 9.00-10.00 M. SPAN
SCALE 1:50

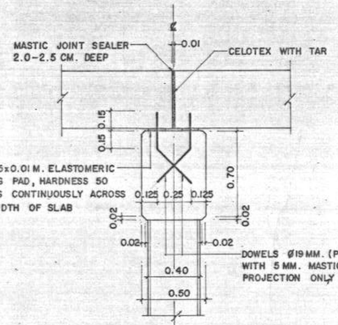
TABLE OF REINFORCEMENT

BAR BEDDING DIAGRAMPS	BAR MARK	SPAN 5.00 M.				SPAN 6.00 M.				SPAN 7.00 M.				SPAN 8.00 M.				SPAN 9.00 M.				SPAN 10.00 M.			
		#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO	L	#	@	NO	L	#	@	NO.	L
	C 101	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–
	C 102	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	CN 101	8	–	16	11.25	8	–	16	11.25	8	–	20	11.25	8	–	20	11.25	8	–	28	11.25	8	–	28	11.25
	CN 102	8	–	16	2.31	8	–	16	2.31	8	–	20	2.31	8	–	20	2.31	8	–	28	2.31	8	–	28	2.31
	ST 101	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35
	ST 102	3	0.20	192	1.35	3	0.20	192	1.35	3	0.20	240	1.35	3	0.20	240	1.35	3	0.20	336	1.35	3	0.20	336	1.35
	ST 103	3	0.25	48	1.35	3	0.25	48	1.35	3	0.25	42	1.35	3	0.25	42	1.25	3	0.25	36	1.35	3	0.25	36	1.35
	ST 103'	3	–	24	–	3	–	24	–	3	–	32	–	3	–	32	–	3	–	48	–	3	–	48	–
	ST 104	3	0.20	59	2.55	3	0.20	59	2.55	3	0.20	59	2.55	3	0.20	59	2.55	3	0.20	59	2.55	3	0.20	59	2.55
	B 101	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
	B 101'	6	–	24	1.55	6	–	24	1.55	6	–	32	1.55	6	–	32	1.55	6	–	48	1.55	6	–	48	1.55
	F 101	8	–	3	11.70	8	–	3	11.70	8	–	3	11.70	8	–	3	11.70	8	–	3	11.70	8	–	3	11.70
	F 102	8	–	3	12.90	8	–	3	12.90	8	–	3	12.90	8	–	3	12.90	8	–	3	12.90	8	–	3	12.90
	F 103	4	0.25	47	1.50	4	0.25	47	1.50	4	0.20	59	1.70	4	0.20	59	1.70	4	0.125	94	1.90	4	0.125	94	1.90
	F 104	4	–	6	11.70	4	–	6	11.70	4	–	6	11.70	4	–	6	11.70	4	–	6	11.70	4	–	6	11.70

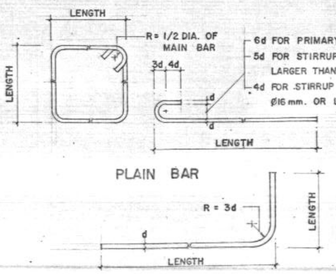
3 = Ø3/8" OR 9 MM., # 4 = Ø1/2" OR 12 MM., # 6 = Ø3/4" OR 19 MM., # 8 = Ø1" OR 25 MM., NO. = TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BAR.



SECTION D-D
SCALE 1:75



CAP BEAM DETAIL
SCALE 1:25



BAR BONDING DETAILS
NOT TO SCALE

NOTES

1. THE BOTTOM OF A FOOTING SHALL BE EMBEDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT ITS CAPACITY BUT NOT LESS THAN 2.50 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED, 10 CM. THICK OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 BY VOLUMN.
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON/M.^{2}
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES:
   a.) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.00 M. A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.00 M., AND
   b.) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.00 M., ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERNAL NOT MORE THE 3.00 M.
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
5. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG/m.^{3} AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG/cm.^{2} FOR A 0.15×0.15×0.15 m. CUBE AT 28 DAYS. CEMENT SHALL BE TIS. 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWING:

PORTLAND CEMENT	350	KG.	CRUSHED ROCK OR GRAVEL	0.86	M^3
SAND	0.43	M^3	CONCRETE SLUM MAX.	10	CM.

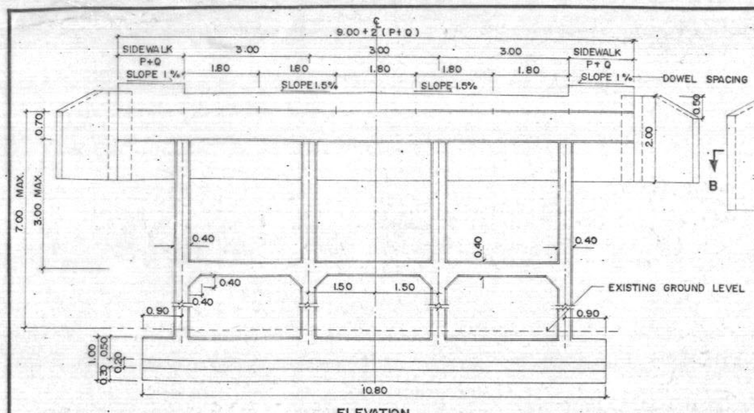
6. REBAR # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS, OTHER SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
7. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
9. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM WITHOUT ALTERING THE LOCATIONS OF REBARS
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING CANAL BED TO THE TOP OF CAP BEAM SHALL BE 7.00 M. PIER HIGHER THAN 7.00 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 12.00 M.
12. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
13. THIS DRAWING IS ADAPTED FROM DOH DWG. NO.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

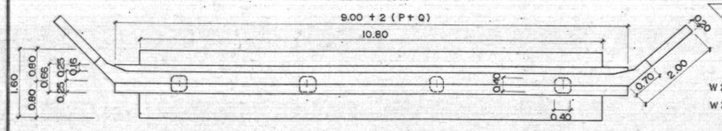
STANDARD DRAWING

9.00 M. ROADWAY WIDTH SLAB BRIDGE
SPREAD FOOTING PIER DETAILS

DESIGNED: DOH & CONSULTANTS	CHECKED:	DATE	JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE	AS SHOWN
APPROVED: FOR (DIRECTOR GENERAL)		DWG. NO.	ST - 08
		SHEET NO.	121

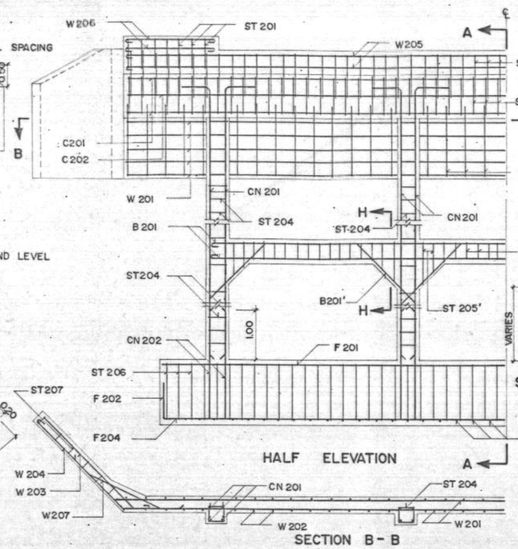


ELEVATION



PLAN

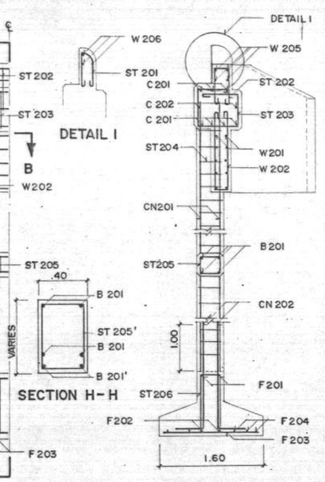
ABUTMENT DETAILS FOR 5.00-6.00 M. SPAN
SCALE 1 : 75



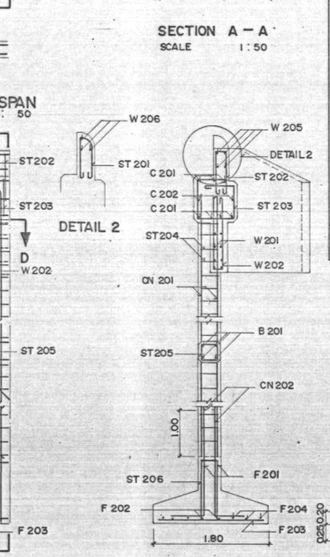
HALF ELEVATION

SECTION B-B

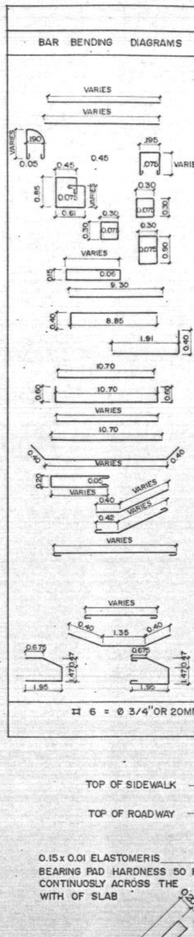
REINFORCEMENT DETAILS FOR 5.00-6.00 M. SPAN
SCALE 1 : 50



SECTION A-A
SCALE 1 : 50



SECTION H-H



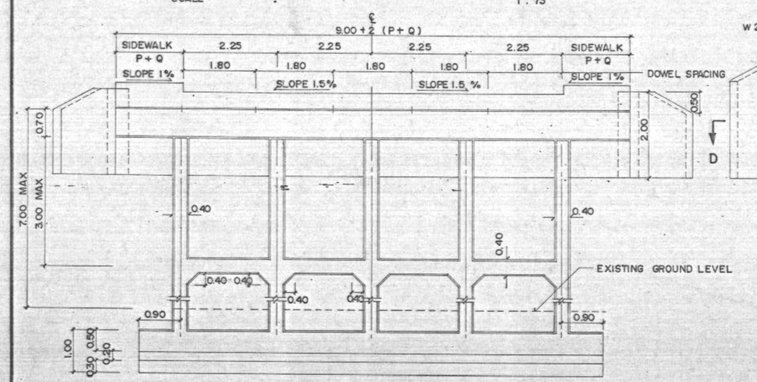
BAR BENDING DIAGRAMS

TABLE OF REINFORCEMENT

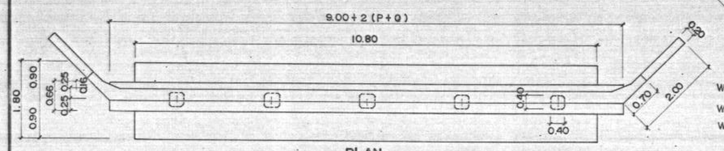
BAR	SPAN 5.00 M.				SPAN 6.00 M.				SPAN 7.00 M.				SPAN 8.00 M.				SPAN 9.00 M.				SPAN 10.00 M.			
MARK	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L
C 201	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
C 202	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
ST 201	2	.20	–	1.215	2	.20	–	1.295	2	.20	–	1.355	2	.20	–	1.435	2	.20	–	1.515	2	.20	–	1.635
ST 202	3	.20	–	1.745	3	.20	–	1.795	3	.20	–	1.845	3	.20	–	1.895	3	.20	–	1.945	3	.20	–	1.995
ST 203	3	.20	–	–	3	.20	–	–	3	.20	–	–	3	.20	–	–	3	.20	–	–	3	.20	–	–
ST 204	3	.20	156	1.35	3	.20	156	1.35	3	.20	195	1.35	3	.20	195	1.35	3	.20	273	1.35	3	.20	273	1.35
ST 205	3	.25	44	1.35	3	.25	44	1.35	3	.25	32	1.35	3	.25	32	1.35	3	.25	12	1.35	3	.25	12	1.35
ST 205'	3	–	24	–	3	–	24	–	3	–	32	–	3	–	32	–	3	–	48	–	3	–	48	–
ST 206	3	.20	54	2.55	3	.20	54	2.55	3	.20	54	2.55	3	.20	54	2.55	3	.20	54	2.55	3	.20	54	2.55
ST 207	2	.30	12	–	3	.30	12	–	3	.30	12	–	3	.30	12	–	3	.30	12	–	3	.30	12	–
B 201	8	–	8	9.30	8	–	8	9.30	8	–	8	9.30	8	–	8	9.30	8	–	8	9.30	8	–	8	9.30
B 201'	6	–	20	1.55	6	–	24	1.55	6	–	32	1.55	6	–	32	1.55	6	–	48	1.55	6	–	48	1.55
CN 201	8	–	16	9.25	8	–	16	9.25	8	–	20	9.25	8	–	20	9.25	8	–	28	9.25	8	–	28	9.25
CN 202	8	–	16	2.31	8	–	16	2.31	8	–	20	2.31	8	–	20	2.31	8	–	28	2.31	8	–	28	2.31
F 201	8	–	2	10.70	8	–	2	10.70	8	–	2	10.70	8	–	2	10.70	8	–	2	10.70	8	–	2	10.70
F 202	8	–	2	11.90	8	–	2	11.90	8	–	2	11.90	8	–	2	11.90	8	–	2	11.90	8	–	2	11.90
F 203	4	.25	43	1.5	4	.25	43	1.50	4	.20	54	1.70	4	.20	54	1.70	4	.125	86	1.90	4	.125	86	1.90
F 204	4	–	6	10.70	4	–	6	10.70	4	–	6	10.70	4	–	6	10.70	4	–	6	10.70	4	–	6	10.75
W 201	4	.20	10	–	4	.20	10	–	4	.20	10	–	4	.20	10	–	4	.20	10	–	4	.20	10	–
W 202	2	.30	–	2.75	2	.30	–	2.60	2	.30	–	2.60	2	.30	–	2.50	2	.30	–	2.40	2	.30	–	2.30
W 203	4	.15	24	–	4	.15	24	–	4	.15	24	–	4	.15	24	–	4	.15	24	–	4	.15	24	–
W 204	2	.30	12	–	2	.30	12	–	2	.30	12	–	2	.30	12	–	2	.30	12	–	2	.30	12	–
W 205	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–
W 206	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–
W 207	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15
W 208	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435
W 209	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535

6 = Ø 3/4"OR 20MM., # 2 = Ø 1/4" OR 6 MM., # 3 = Ø 3/8" OR 9 MM
4 = Ø 1/2" OR 12 MM., # 8 = Ø 1" OR 25 MM.

NO. = TOTAL AMOUNT OF BARS
L = TOTAL LENGTH OF EACH BAR

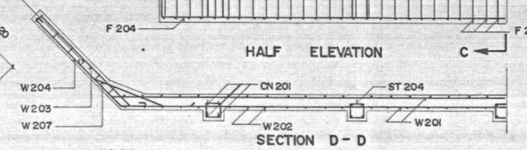


ELEVATION



PLAN

ABUTMENT DETAILS FOR 7.00 - 8.00 M. SPAN
SCALE 1 : 75



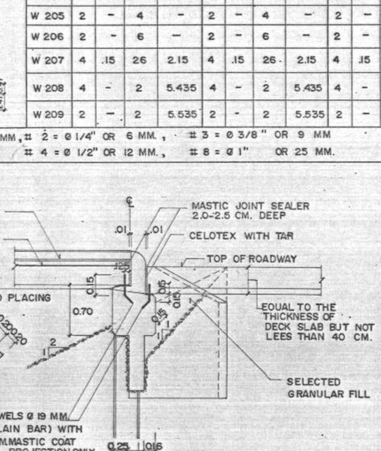
HALF ELEVATION

SECTION D-D

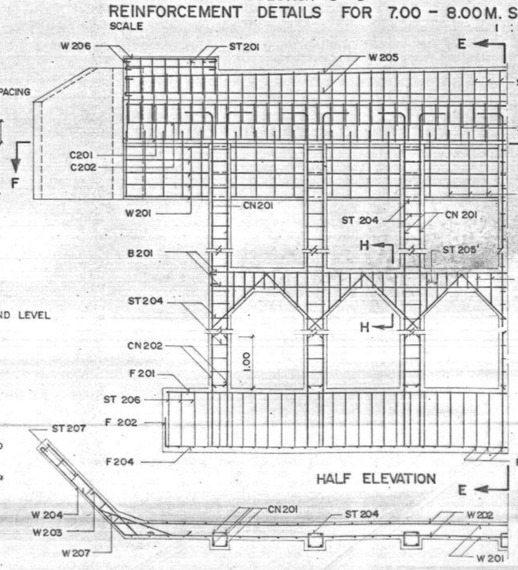
REINFORCEMENT DETAILS FOR 7.00 - 8.00 M. SPAN
SCALE 1 : 50

SECTION C-C

WINGWALL DETAILS



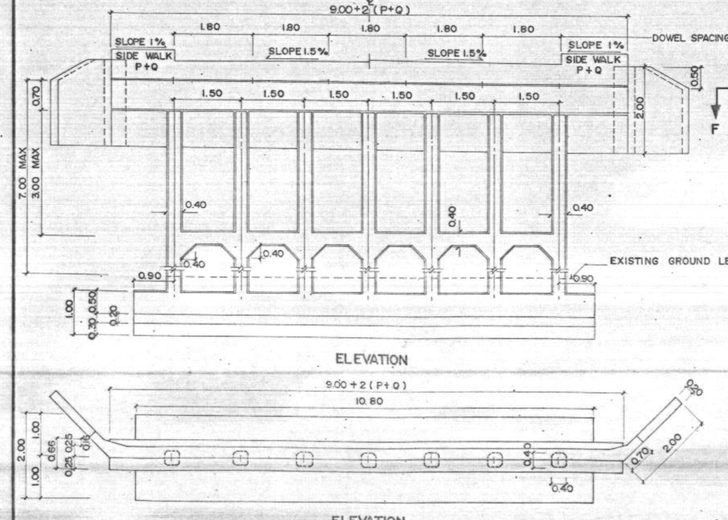
ABUTMENT HEAD DETAILS
SCALE 1 : 50



HALF ELEVATION

SECTION F-F

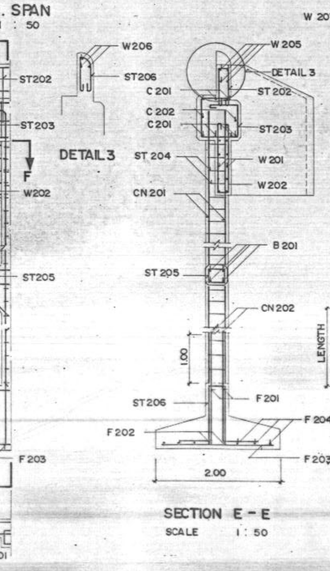
REINFORCEMENT DETAILS FOR 9.00 - 10.00 M. SPAN
SCALE 1 : 50



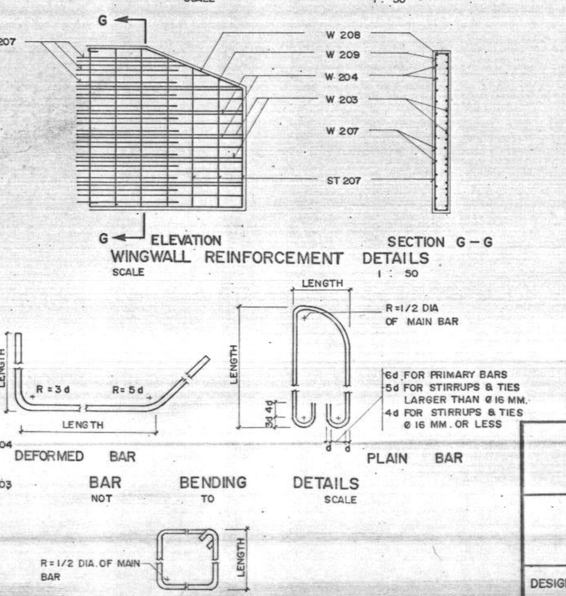
ELEVATION

PLAN

ABUTMENT DETAILS FOR 9.00 - 10.00 M. SPAN
SCALE 1 : 75



SECTION E-E



WINGWALL REINFORCEMENT DETAILS
SCALE 1 : 50

DEFORMED BAR

PLAIN BAR

BAR BENDING DETAILS
NOT TO SCALE

NOTES

1. THE BOTTOM OF FOOTING SHALL BE EMBEDDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT ITS CAPACITY BUT NOT LESS THAN 2.5M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED, 10 CM. THICKNESS OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND. COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 BY VOLUME.
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON/M^2
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES :
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0M., AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0M., ADDITIONL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0M.
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCCPT THE CAP BEAM, BACK WALL AND WINGWALLS WHEREA CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
5. CONCRETE SHALL HAVE A MINIMUN CEMENT CONTENT OF 350 KG./m^3 AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG./cm^2 FOR A .15 x .15 x .15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE 1 PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :
   PORTLAND CEMENT 350 KG., CRUSHED ROCK OR GRAVEL 0.86 m^3
   SAND 0.45 m^3, CONCRETE SLUMP MAX. 10 Cm.
6. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS. OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
7. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
9. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS. 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM, BACK WALL AND WINGWALLS WITHOUT ALTERING THE LOCATION OF REBARS.
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M. THE PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 10.0 M.
12. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
13. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5-106-14/17.

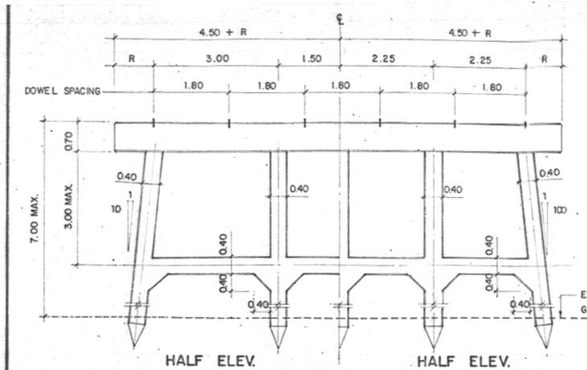
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

9.00 M. ROADWAY WIDTH SLAB BRIDGE

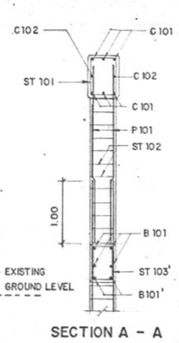
SPREAD FOOTING ABUTMENT DETAILS

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Buranaprapa (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. ST-09
		SHEET NO. 122

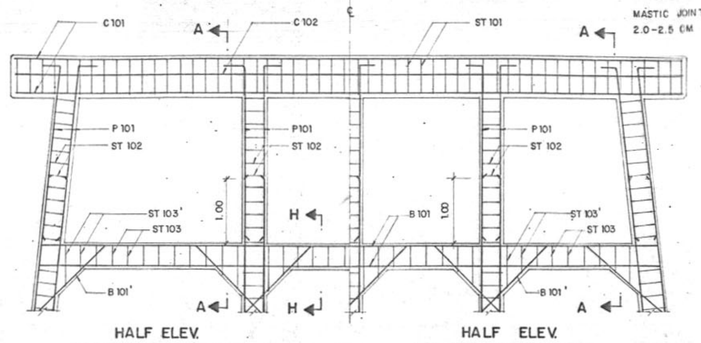


HALF ELEV. FOR 5.00 - 6.00 M. SPAN

HALF ELEV. FOR 7.00 - 8.00 M. SPAN

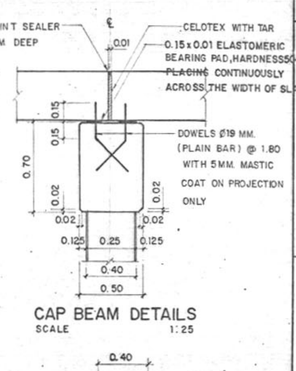


SECTION A - A

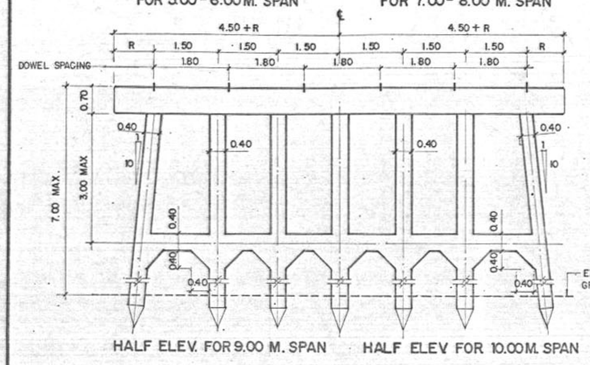


HALF ELEV. FOR 5.00 - 6.00 M. SPAN

HALF ELEV. FOR 7.00 - 8.00 M. SPAN



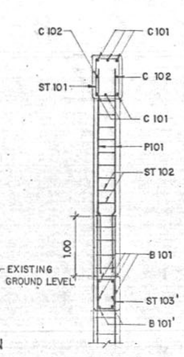
CAP BEAM DETAILS
SCALE 1:25



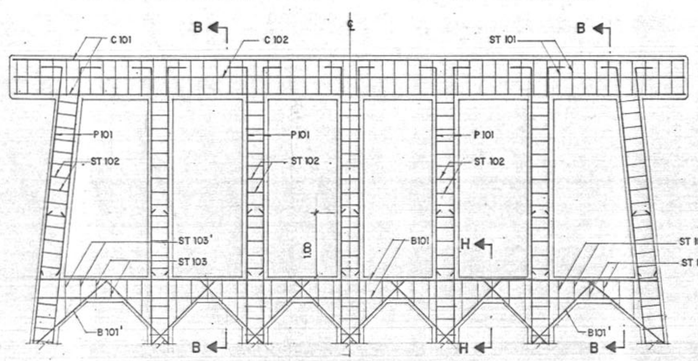
HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV FOR 10.00 M. SPAN

PILE BENT ELEVATION
SCALE 1:75



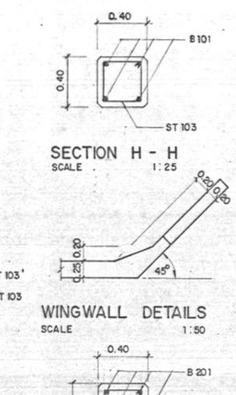
SECTION B - B



HALF ELEV. FOR 9.00 M. SPAN

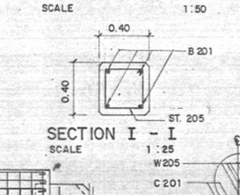
HALF ELEV. 10.00 M. SPAN

PILE BENT REINFORCEMENT DETAILS
SCALE 1:50



SECTION H - H
SCALE 1:25

WINGWALL DETAILS
SCALE 1:50



SECTION I - I
SCALE 1:25

TABLE OF REINFORCEMENT

	BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M. #	@	NO.	L	SPAN 6.00 M. #	@	NO.	L	SPAN 7.00 M. #	@	NO.	L	SPAN 8.00 M. #	@	NO.	L	SPAN 9.00 M. #	@	NO.	L	SPAN 10.00 M. #	@	NO.	L
PILE BENT	VARIES	C 101	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–
	VARIES	C 102	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	.45 .075 .075 .30 .075 .075 .65 .30 .075 .075 .30 VARIES	ST 101	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35
		ST 102	3	0.20	56	1.35	3	0.20	56	1.35	3	0.20	70	1.35	3	0.20	70	1.35	3	0.20	98	1.35	3	0.20	98	1.35
		ST 103	3	0.25	24	1.35	3	0.25	24	1.35	3	0.25	18	1.35	3	0.25	18	1.35	3	0.25	8	1.35	3	0.25	8	1.35
	VARIES	ST 103'	3	0.25	12	–	3	0.25	12	–	3	0.25	16	–	3	0.25	16	–	3	0.25	24	–	3	0.25	24	–
		B 101	8	–	4		8	–	4		8	–	4		8	–	4		8	–	4		8	–	4	
	1.55 VARIES	B 101'	8	–	12	1.55	8	–	12	1.55	8	–	16	1.55	8	–	16	1.55	8	–	24	1.55	8	–	24	1.55
	40	P 101	8	–	16	3.75	8	–	16	3.75	8	–	20	3.75	8	–	20	3.75	8	–	24	3.75	8	–	24	3.75
ABUTMENT	VARIES	C 201	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
	VARIES	C 202	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	.20 VARIES .05 .075 .075 ST 201	ST 201	2	0.20	–	1.215	2	0.20	–	1.295	2	0.20	–	1.355	2	0.20	–	1.435	2	0.20	–	1.515	2	0.20	–	1.635
		ST 202	3	0.20	–	1.745	3	0.20	–	1.795	3	0.20	–	1.845	3	0.20	–	1.895	3	0.20	–	1.945	3	0.20	–	1.995
	.65 .075 .075 .30 .075 .075 ST 203 .30 .075 .075	ST 203	3	0.20	–	–	3	0.20	–	–	3	0.20	–	–	3	0.20	–	–	3	0.20	–	–	3	0.20	–	–
		ST 204	3	0.20	56	1.35	3	0.20	56	1.35	3	0.20	70	1.35	3	0.20	70	1.35	3	0.20	98	1.35	3	0.20	98	1.35
	VARIES .30 .075 .075	ST 205	3	0.25	24	1.35	3	0.25	24	1.35	3	0.25	18	1.35	3	0.25	18	1.35	3	0.25	8	1.35	3	0.25	8	1.35
		ST 205'	3	0.25	12	–	3	0.25	12	–	3	0.25	16	–	3	0.25	16	–	3	0.25	24	–	3	0.25	24	–
	.15 VARIES .05	ST 206	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
	VARIES	B 201	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–
	1.55 B201	B 201'	6	–	12	1.55	6	–	12	1.55	6	–	16	1.55	6	–	16	1.55	6	–	24	1.55	6	–	24	1.55
	.82 3.55 VARIES .40	P 201	8	–	16	3.75	8	–	16	3.75	8	–	20	3.75	8	–	20	3.75	8	–	24	3.75	8	–	24	3.75
	.20 VARIES .05 .05 W 202	W 201	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–
		W 202	2	0.30	–	2.70	2	0.30	–	2.60	2	0.30	–	2.60	2	0.30	–	2.50	2	0.30	–	2.40	2	0.30	–	2.30
	.40 VARIES .05 .425	W 203	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–
	VARIES .05 .05	W 204	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
	VARIES .05 .05	W 205	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–
	.82 1.35 .40 .675 .47 .45 .47 .36 1.95 1.95	W 206	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–
		W 207	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15
		W 208	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435
		W 209	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535

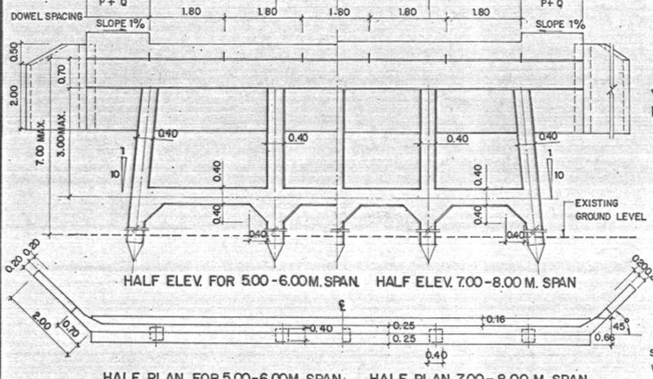
= 2 = Ø 1/4" OR 6 MM., # 3 = Ø 3/8" OR 9 MM., # 4 = Ø 1/2" OR 12 MM., # 6 = Ø 3/4" OR 20MM., # 8 = Ø 1" OR 25 MM., NO = TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BARS.

NOTES:

1. EACH PILE SHALL BE DRIVEN TO A DEPTH WHERE SCOUR WILL NOT AFFECT CAPACITY AND SHALL HAVE A MINIMUM ULTIMATE BEARING CAPACITY OF 90 TONS. FOR PILE DETAILS SEE DWG. NOS. MS – 02, MS – 03.
2. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES:
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE GROUND LEVEL EXCEEDS 3.0 M., ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVALL NOT MORE THAN 3.0 M.
3. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, BACK WALL AND WINGWALLS WHERE CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
4. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG./M.^{3} AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG./CM.^{2} FOR A 0.15 x 0.15 x 0.15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS. 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX. DESIGN PER CUBIC METER IS AS FOLLOWS:

PORTLAND CEMENT	350 KG.	CRUSHED ROCK OR GRAVEL	0.86 M.^{3}
SAND	0.43 M.^{3}	CONCRETE SLUMP MAX.	10 CM.

5. REBAR # 4 OR LARGER SHALL BE TIS. 24 GRADE SD30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
6. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
7. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
8. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS. 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM, BACK WALL AND WINGWALLS WITHOUT ALTERING THE LOCATIONS OF REBARS.
9. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
10. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 10.00 M.
12. THIS DRAWING IS ADAPTED FROM D.O.H. DWG. NO. 3AD5 - 106 - 14 / 18

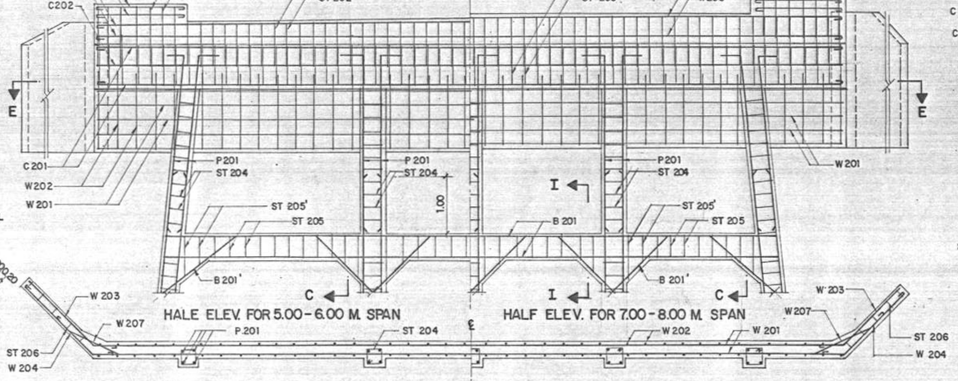


HALF ELEV. FOR 5.00 - 6.00 M. SPAN

HALF ELEV. 7.00 - 8.00 M. SPAN

HALF PLAN FOR 5.00 - 6.00 M. SPAN

HALF PLAN 7.00 - 8.00 M. SPAN

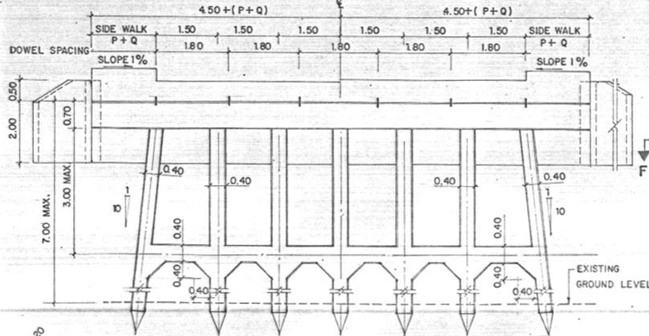


HALE ELEV. FOR 5.00 - 6.00 M. SPAN

HALF ELEV. FOR 7.00 - 8.00 M. SPAN

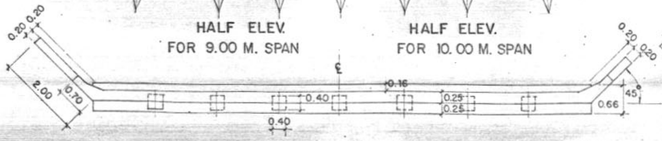
HALF SECT. E - E FOR 5.00 - 6.00 M SPAN

HALF SECT E - E FOR 7.00 - 8.00 M. SPAN



HALF ELEV. FOR 9.00 M. SPAN

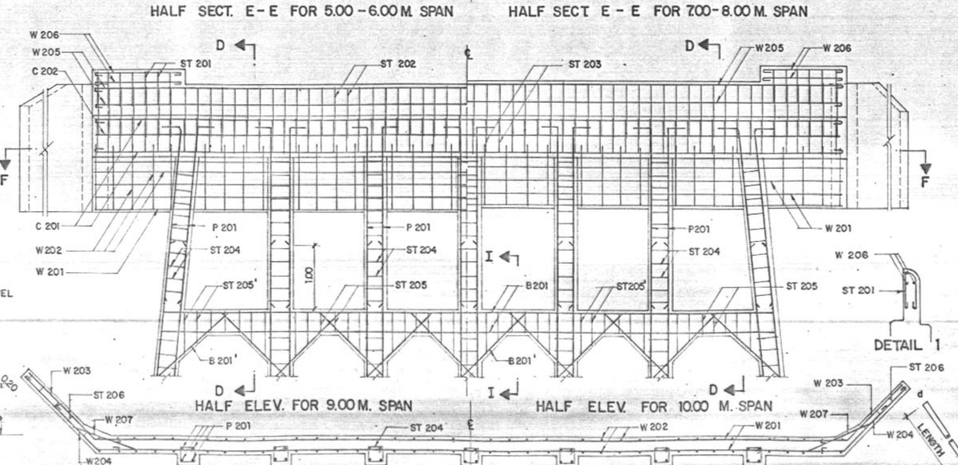
HALF ELEV. FOR 10.00 M. SPAN



HALF PLAN FOR 9.00 M. SPAN

HALF PLAN FOR 10.00 M. SPAN

ABUTMENT DETAILS
SCALE 1:75



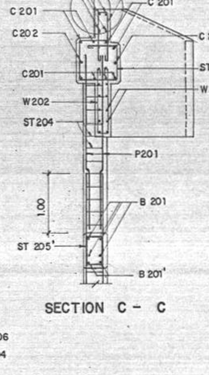
HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV. FOR 10.00 M. SPAN

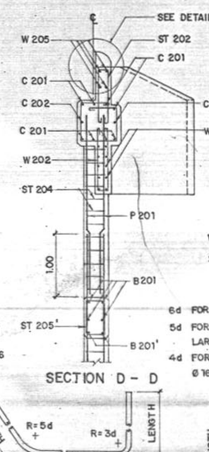
HALF SECT. F - F FOR 9.00 M. SPAN

HALF SECT. F - F FOR 10.00 M. SPAN

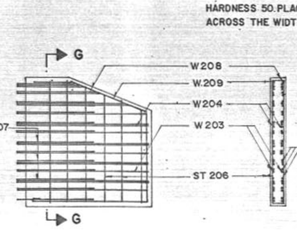
ABUTMENT REINFORCEMENT DETAILS
SCALE 1:50



SECTION C - C

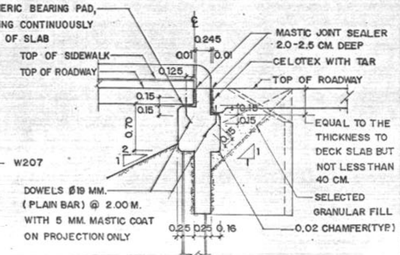


SECTION D - D



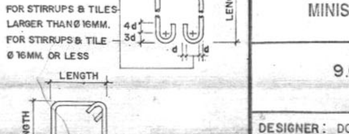
WINGWALL REINFORCEMENT DETAIL
SCALE 1:50

SECT. G-G
SCALE 1:50



ABUTMENT HEAD DETAILS
SCALE 1:50

DEFORMED BAR



PLAIN BAR

BAR BENDING DETAILS
SCALE TO SCALE

KINGDOM OF THAILAND

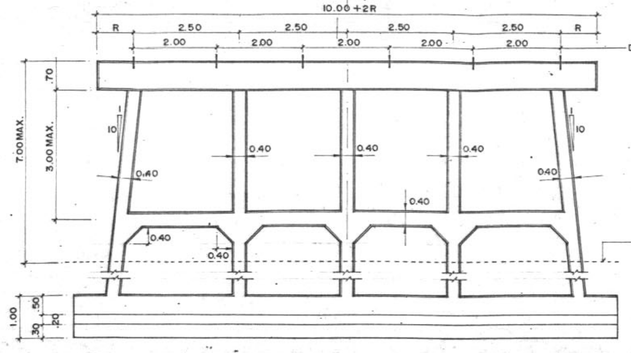
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

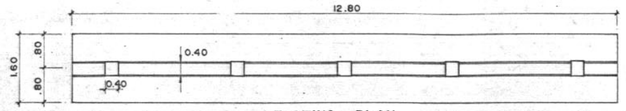
9.00 M. ROADWAY WIDTH SLAB BRIDGE

PILE BENT AND ABUTMENT DETAILS

DESIGNER: DOH & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: P. Boonprapee (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: (DIRECTOR GENERAL)		DWG. NO. ST – 10
		SHEET NO. 123



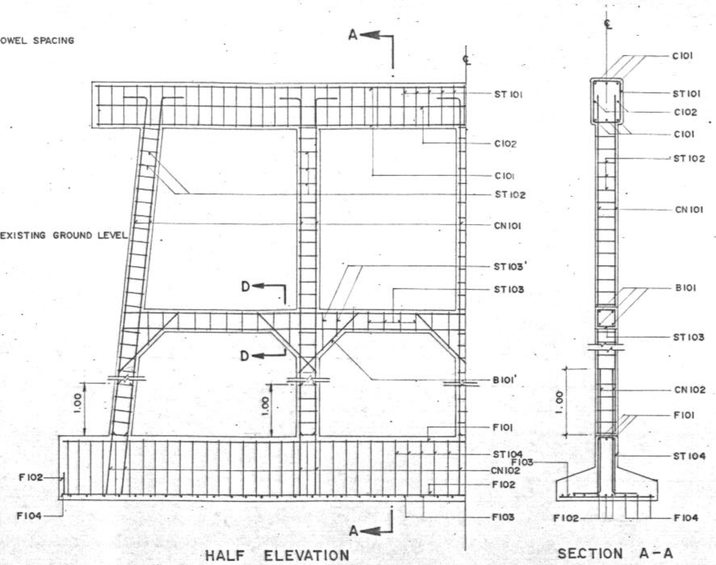
ELEVATION



FOOTING PLAN

PIER DETAILS FOR 5.00 - 6.00 M. SPAN

SCALE 1 : 75

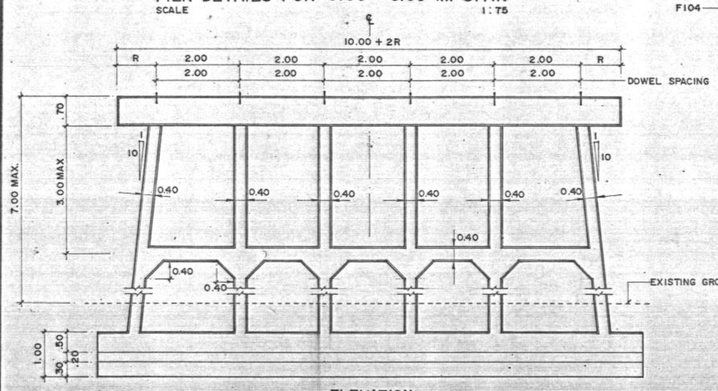


HALF ELEVATION

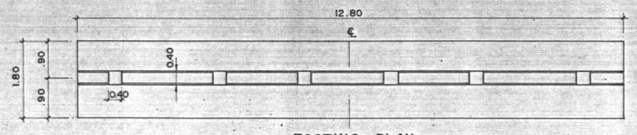
SECTION A-A

REINFORCEMENT DETAILS FOR 5.00 - 6.00 M. SPAN

SCALE 1 : 50



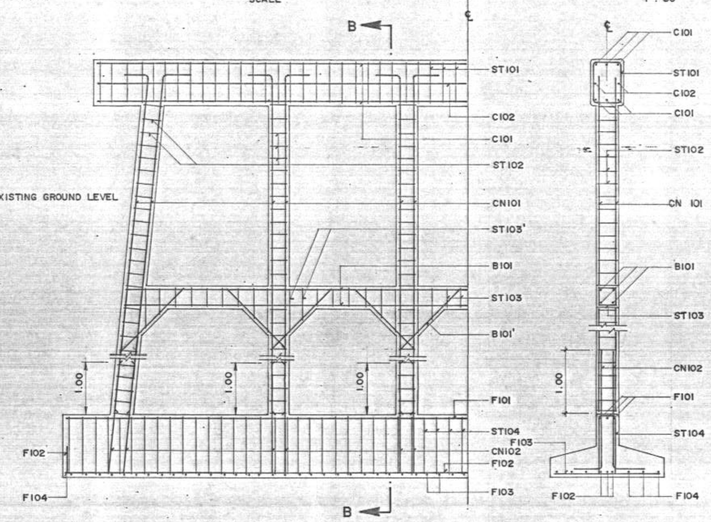
ELEVATION



FOOTING PLAN

PIER DETAILS FOR 7.00 - 8.00 M. SPAN

SCALE 1 : 75

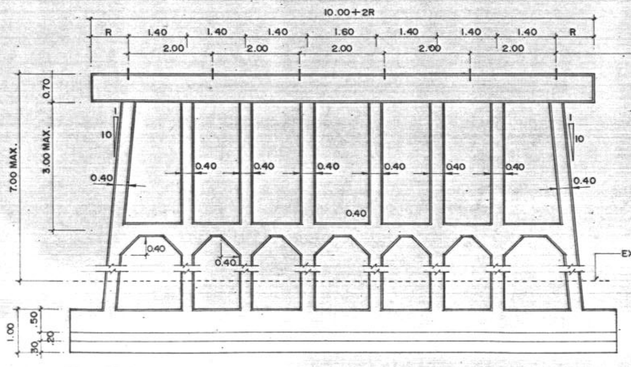


HALF ELEVATION

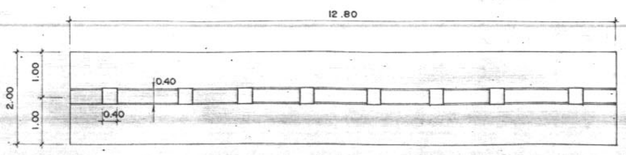
SECTION B - B

REINFORCEMENT DETAILS FOR 7.00 - 8.00 M. SPAN

SCALE 1 : 50



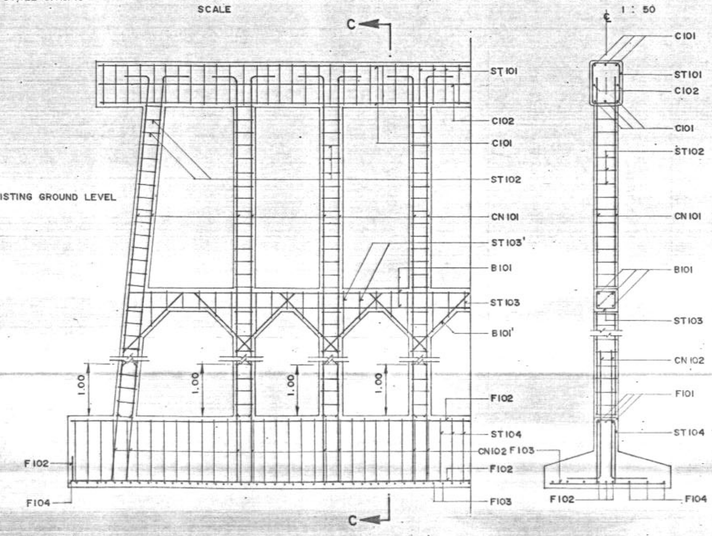
ELEVATION



FOOTING PLAN

PIER DETAILS FOR 9.00 - 10.00 M. SPAN

SCALE 1 : 75



HALF ELEVATION

SECTION C - C

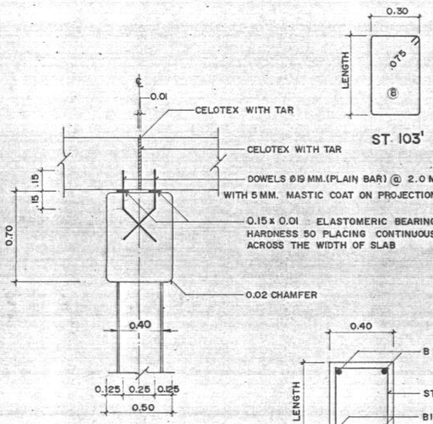
REINFORCEMENT DETAILS FOR 9.00 - 10.00 M. SPAN

SCALE 1 : 50

TABLE OF REINFORCEMENT

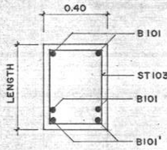
BAR BENDING DIAGRAMS	NO.	BAR MARK	SPAN 5.00 M. #	@	NO.	L	SPAN 6.00 M. #	@	NO.	L	SPAN 7.00 M. #	@	NO.	L	SPAN 8.00 M. #	@	NO.	L	SPAN 9.00 M. #	@	NO.	L	SPAN 10.00 M. #	@	NO.	L
	1	C101	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–
	2	C102	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
VARIES ①	3	CN101	8	–	20	11.25	8	–	20	11.25	8	–	24	11.25	8	–	24	11.25	8	–	32	11.25	8	–	32	11.25
VARIES ②	4	CN102	8	–	20	2.31	8	–	20	2.31	8	–	24	2.31	8	–	24	2.31	8	–	32	2.31	8	–	32	2.31
10.85 ③ 0.40	5	ST101	3	0.20	59	2.35	3	0.20	59	2.35	3	0.20	59	2.35	3	0.20	59	2.35	3	0.20	59	2.35	3	0.20	59	2.35
④ 0.40 1.91	6	ST102	3	0.20	240	1.35	3	0.20	240	1.35	3	0.20	288	1.35	3	0.20	288	1.35	3	0.20	384	1.35	3	0.20	384	1.35
⑤ 0.75 0.65 0.45 ⑥ 0.75 0.30 0.30	7	ST103	3	0.25	60	1.35	3	0.25	60	1.35	3	0.25	48	1.35	3	0.25	48	1.35	3	0.25	36	1.35	3	0.25	36	1.35
	8	ST103	3	0.25	24	–	3	0.25	24	–	3	0.25	32	–	3	0.25	32	–	3	0.25	40	–	3	0.25	40	–
0.30 ⑦ 0.75 0.30 0.90 ⑨ 0.75	9	ST104	3	0.20	64	2.55	3	0.20	64	2.55	3	0.20	64	2.55	3	0.20	64	2.55	3	0.20	64	2.55	3	0.20	64	2.55
	10	B101	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
1.55 ① VARIES ⑩	11	B101'	6	–	24	1.55	6	–	24	1.55	6	–	32	1.55	6	–	32	1.55	6	–	40	1.55	6	–	40	1.55
12.70 ⑫	12	F101	8	–	3	12.70	8	–	3	12.70	8	–	3	12.70	8	–	3	12.70	8	–	3	12.70	8	–	3	12.70
0.60 ⑬ 0.60 12.70 ⑭	13	F102	8	–	3	13.90	8	–	3	13.90	8	–	3	13.90	8	–	3	13.90	8	–	3	13.90	8	–	3	13.90
VARIES ⑮ 12.70	14	F103	4	0.25	51	1.50	4	0.25	51	1.50	4	0.20	64	1.70	4	0.20	64	1.70	4	0.125	102	1.90	4	0.125	102	1.90
	15	F104	4	–	6	12.70	4	–	6	12.70	4	–	6	12.70	4	–	6	12.70	4	–	6	12.70	4	–	6	12.70

3 = Ø 3/8" OR 9 MM. , # 4 = Ø 1/2" OR 12 MM. , # 6 = Ø 3/4" OR 20MM. , # 8 = 1" OR 25 MM. , NO. = TOTAL AMOUNT OF BARS , L = TOTAL LENGTH OF EACH BAR

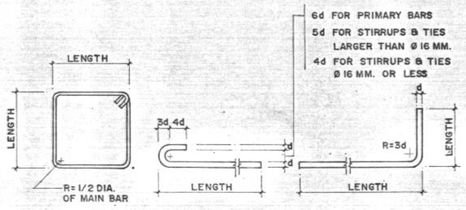


CAP BEAM DETAILS

SCALE 1 : 25



SECTION D - D



PLAIN BAR DEFORMED BAR

BAR BENDING DETAILS

NOT TO SCALE

NOTES :

1. THE BOTTOM OF A FOOTING SHALL BE EMBEDDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT IT'S CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED, 10 CM. THICK OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND COMPOSITION OF LEAN CONCRETE SHALL BE 1 : 3 : 6 BY VOLUME
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON/M.^{2}
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES :
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M, A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOF OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M, AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL 3.0 M. ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM AT WHICH CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
5. ALL DIMENSION SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED
6. REBARS #4 OR LARGER SHALL BE TIS 24 GRADE SD30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR24 PLAIN BARS UNLESS OTHERWISE INDICATED.
7. LOCATION OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
9. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS. 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM, BACK WALL AND WINGWALLS WITHOUT ALTERING THE LOCATION OF REBARS.
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 10.0 M.
12. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 Kg/M^3 AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 Kg/CM^2. FOR A .15 x .15 x .15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350	Kg.
SAND	0.45	M.^{3}
CRUSHED ROCK OR GRAVEL	0.86	M.^{3}
CONCRETE SLUMP MIX.	10	CM.

13. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3 AD 5-106-14/19.

KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS

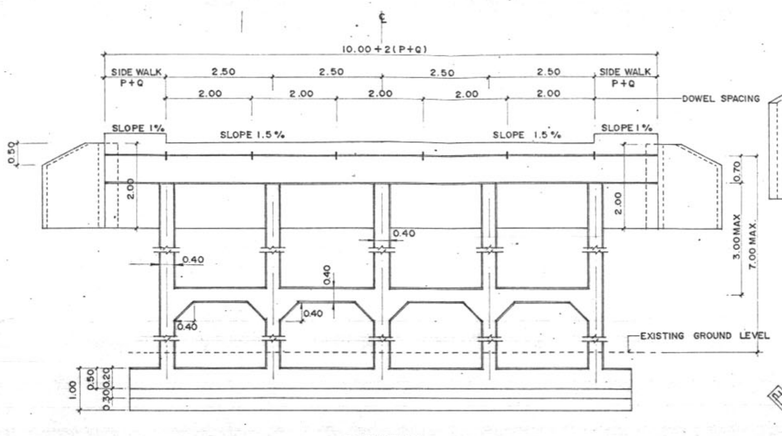
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

10.00 M. ROADWAY WIDTH SLAB BRIDGE

SPREAD FOOTING PIER DETAILS

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. ST - 11
		SHEET NO. 124

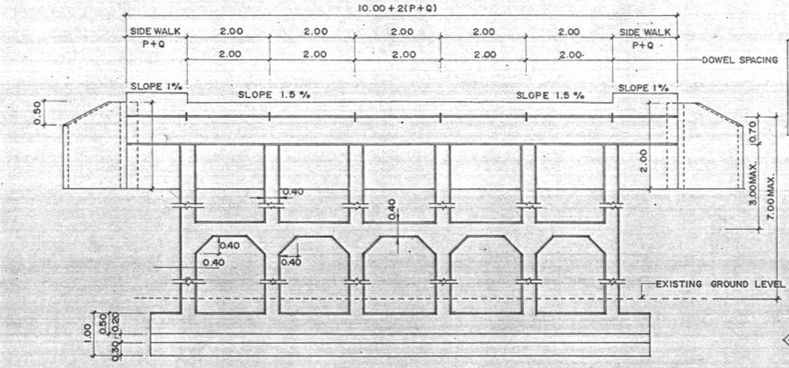


ELEVATION

PLAN

DETAILS FOR 5.00 - 6.00 M. SPAN

SCALE 1:75

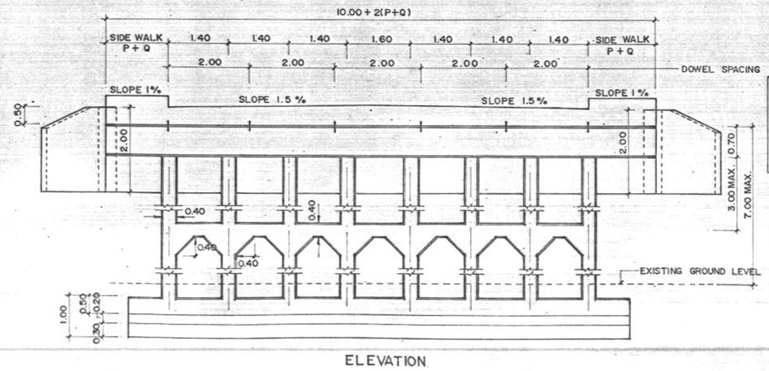


ELEVATION

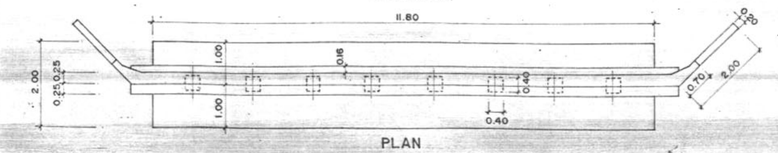
PLAN

DETAILS FOR 7.00 - 8.00 M. SPAN

SCALE 1:75



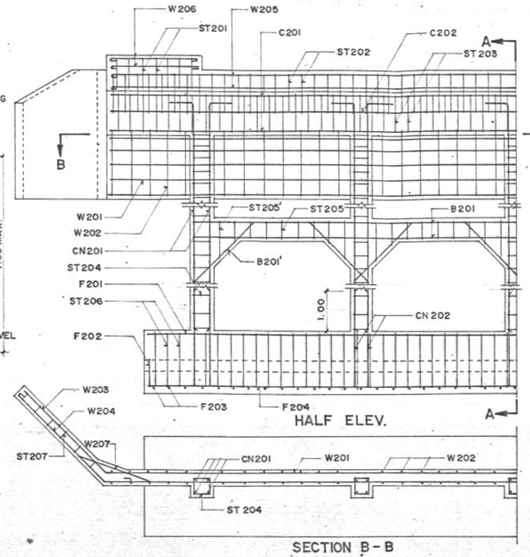
ELEVATION



PLAN

DETAILS FOR 9.00 - 10.00 M. SPAN

SCALE 1:75

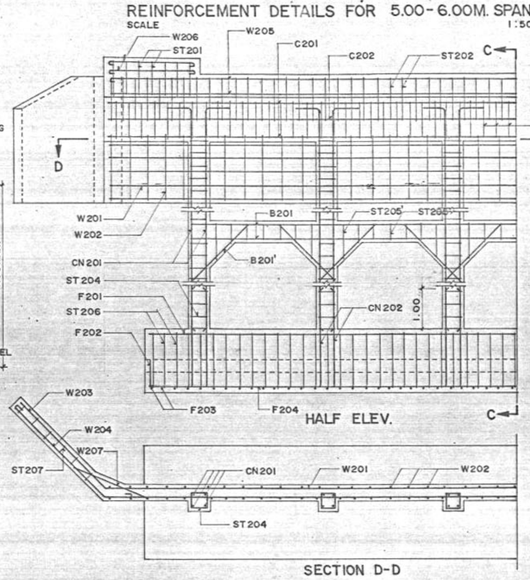


HALF ELEV.

SECTION B-B

REINFORCEMENT DETAILS FOR 5.00 - 6.00 M. SPAN

SCALE 1:50

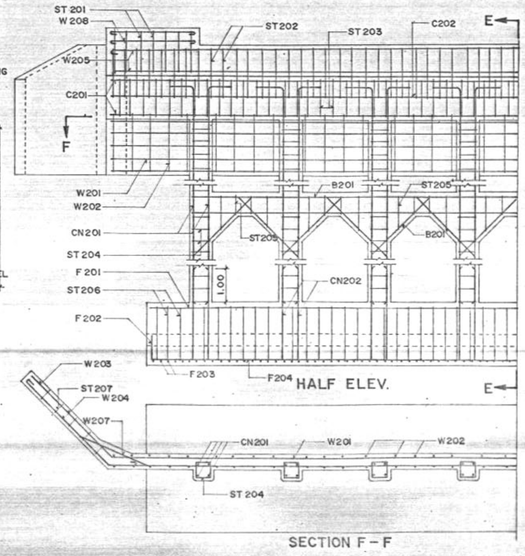


HALF ELEV.

SECTION D-D

REINFORCEMENT DETAILS FOR 7.00 - 8.00 M. SPAN

SCALE 1:50

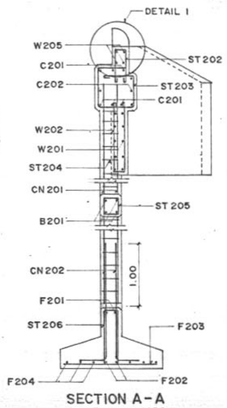


HALF ELEV.

SECTION F-F

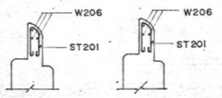
REINFORCEMENT DETAILS FOR 9.00 - 10.00 M. SPAN

SCALE 1:50



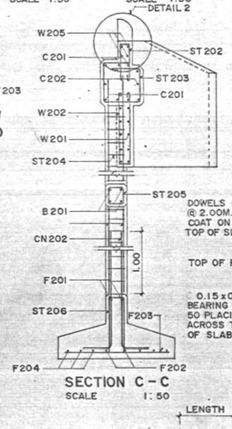
SECTION A-A

SCALE 1:50



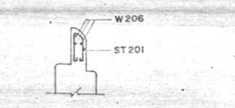
DETAIL 1 SCALE 1:50

DETAIL 2 SCALE 1:50



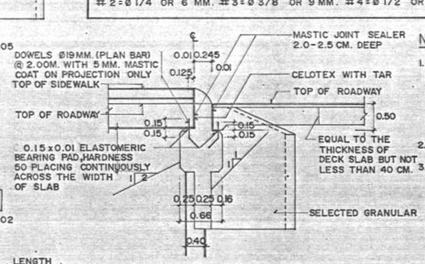
SECTION C-C

SCALE 1:50



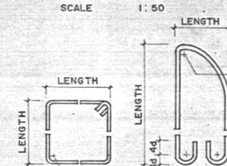
DETAIL 3

SCALE 1:50



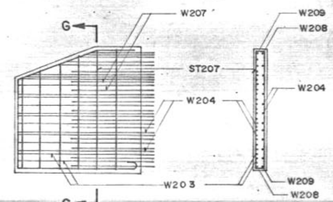
ABUTMENT HEAD DETAILS

SCALE 1:50



WINGWALL DETAILS

SCALE 1:50



ELEVATION SECTION G-G

WINGWALL

REINFORCEMENT DETAILS

SCALE 1:50

TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS	NO.	BAR MARK	SPAN 5.00 M. #	@	NO.	L	SPAN 6.00 M. #	@	NO.	L	SPAN 7.00 M. #	@	NO.	L	SPAN 8.00 M. #	@	NO.	L	SPAN 9.00 M. #	@	NO.	L	SPAN 10.00 M. #	@	NO.	L
	1.	C201	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-
	2.	C202	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-
	3.	ST201	2	0.20	-	1.215	2	0.20	-	1.295	2	0.20	-	13.55	2	0.20	-	14.35	2	0.20	-	15.15	2	0.20	-	16.35
	4.	ST202	3	0.20	65	1.745	3	0.20	65	1.795	3	0.20	65	18.45	3	0.20	65	18.95	3	0.20	65	19.45	3	0.20	85	19.95
	5.	ST203	3	0.20	64	-	3	0.20	64	-	3	0.20	64	-	3	0.20	64	-	3	0.20	64	-	3	0.20	64	-
	6.	ST204	3	0.20	195	1.35	3	0.20	195	1.35	3	0.20	234	1.35	3	0.20	234	1.35	3	0.20	312	1.35	3	0.20	312	1.35
	7.	ST205	3	0.25	40	1.35	3	0.25	40	L35	3	0.25	30	1.35	3	0.25	30	1.35	3	0.25	16	1.35	3	0.25	16	1.35
	8.	ST205'	3	0.25	32	-	3	0.25	32	-	3	0.25	40	-	3	0.25	40	-	3	0.25	56	-	3	0.25	56	-
	9.	ST206	3	0.20	59	2.55	3	0.20	59	2.55	3	0.20	59	2.55	3	0.20	59	2.55	3	0.20	59	2.55	3	0.20	59	2.55
	10.	ST207	2	0.35	12	-	2	0.35	12	-	2	0.35	12	-	2	0.35	12	-	2	0.35	2	-	2	0.35	12	-
	11.	B201	8	-	8	10.30	8	-	8	10.30	8	-	8	10.30	8	-	8	10.30	8	-	8	10.30	8	-	8	10.30
	12.	B201'	6	-	32	1.55	6	-	32	1.55	6	-	40	1.55	6	-	40	1.55	6	-	56	1.55	6	-	56	1.55
	13.	CN201	8	-	20	9.25	8	-	20	9.25	8	-	24	9.25	8	-	24	9.25	8	-	32	9.25	8	-	32	9.25
	14.	CN202	8	-	20	2.31	8	-	20	2.31	8	-	24	2.31	8	-	24	2.31	8	-	32	2.31	8	-	32	2.31
	15.	F201	8	-	2	11.70	8	-	2	11.70	8	-	2	11.70	8	-	2	11.70	8	-	2	11.70	8	-	2	11.70
	16.	F202	8	-	2	12.90	8	-	2	12.90	8	-	2	12.90	8	-	2	12.90	8	-	2	12.90	8	-	2	12.90
	17.	F203	4	0.25	47	1.50	4	0.25	4	1.50	4	0.20	59	1.70	4	0.20	59	1.70	4	0.125	94	1.90	4	0.125	94	1.90
	18.	F204	4	-	6	11.70	4	-	6	11.70	4	-	6	11.70	4	-	6	11.70	4	-	6	11.70	4	-	6	11.70
	19.	W201	4	0.20	10	-	4	0.20	10	-	4	0.20	10	-	4	0.20	10	-	4	0.20	10	-	4	0.20	10	-
	20.	W202	2	0.35	38	2.70	2	0.35	38	2.60	2	0.35	38	2.60	2	0.35	38	2.60	2	0.35	38	2.40	2	0.35	38	2.60
	21.	W203	4	0.15	24	-	4	0.15	24	-	4	0.15	24	-	4	0.15	24	-	4	0.15	24	-	4	0.15	24	-
	22.	W204	2	0.35	12	-	2	0.35	12	-	2	0.35	12	-	2	0.35	12	-	2	0.35	2	-	2	0.35	12	-
	23.	W205	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-
	24.	W206	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-
	25.	W207	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15
	26.	W208	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435
	27.	W209	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535

2 = Ø 1/4" OR 6 MM. # 3 = Ø 3/8" OR 9 MM. # 4 = Ø 1/2" OR 12 MM. # 8 = Ø 1" OR 25 MM. NO. = TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BAR

NOTES :

1. THE BOTTOM OF A FOOTING SHALL BE EMBEDDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT IT'S CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED, 10 CM. THICK OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND. COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 BY VOLUME.
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON/M.^{2}
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES:
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M. A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0 M. ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, BACK WALL AND WINGWALLS AT WHICH CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
5. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 10.0 M.
6. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
7. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
9. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS. 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM, BACK WALL AND WINGWALLS WITHOUT ALTERING THE LOCATIONS OF REBARS.
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
11. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG./M.^{3} AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG./CM.^{2} FOR A .15 x .15 x .15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350	KG.
SAND	0.45	M.^{3}
CRUSHED ROCK OR GRAVEL	0.86	M.^{3}
CONCRETE SLUMP MIX.	10	CM.

12. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
13. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5-106-14/19.

KINGDOM OF THAILAND

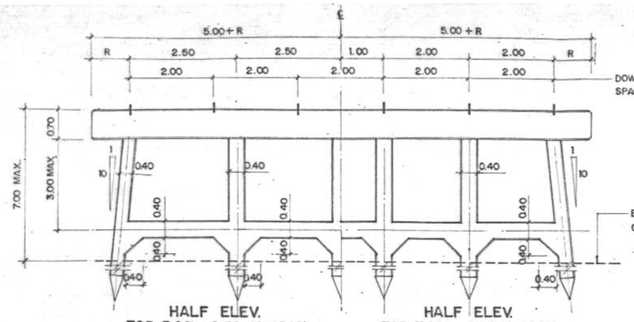
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

10.00 M. ROADWAY WIDTH SLAB BRIDGE

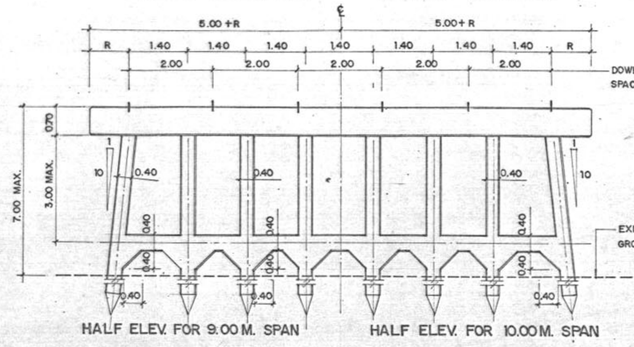
SPREAD FOOTING ABUTMENT DETAILS

DESIGNED: DOH & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: (DIRECTOR GENERAL)		DWG. NO. ST-12
		SHEET NO. 125



HALF ELEV. FOR 5.00 - 6.00 M. SPAN

HALF ELEV. FOR 7.00 - 8.00 M. SPAN

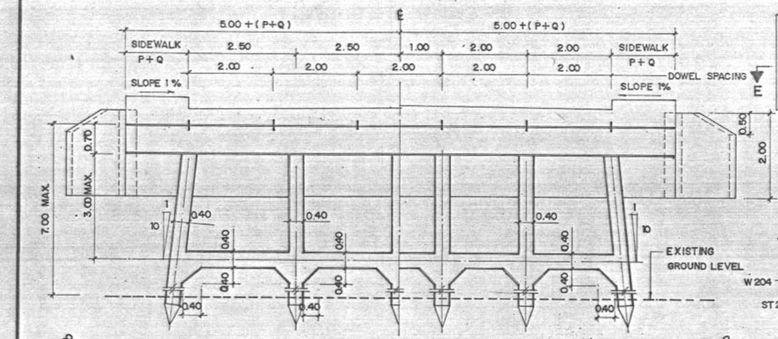


HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV. FOR 10.00 M. SPAN

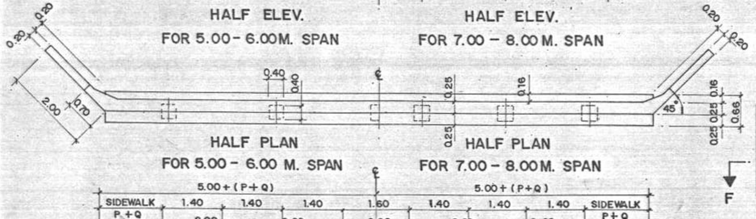
PILE BENT ELEVATION

SCALE 1 : 75



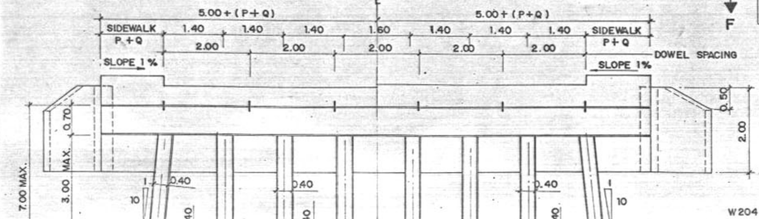
HALF ELEV. FOR 5.00 - 6.00 M. SPAN

HALF ELEV. FOR 7.00 - 8.00 M. SPAN



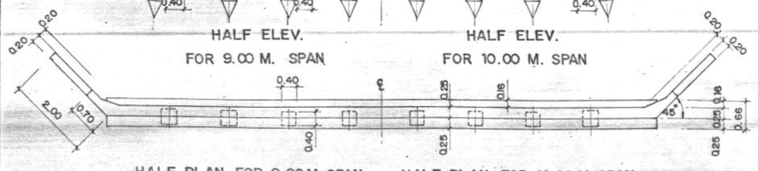
HALF PLAN FOR 5.00 - 6.00 M. SPAN

HALF PLAN FOR 7.00 - 8.00 M. SPAN



HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV. FOR 10.00 M. SPAN

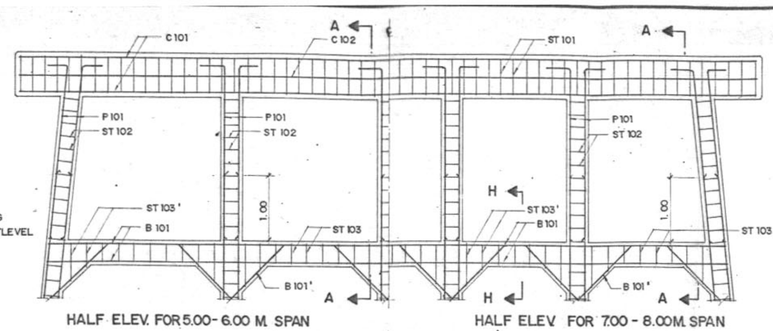


HALF PLAN FOR 9.00 M. SPAN

HALF PLAN FOR 10.00 M. SPAN

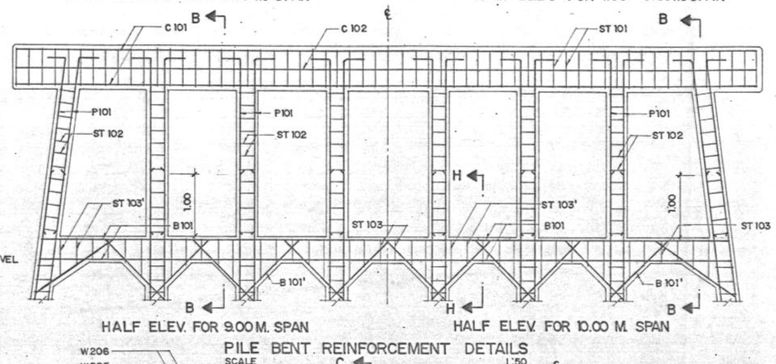
ABUTMENT DETAILS

SCALE 1 : 75



HALF ELEV. FOR 5.00 - 6.00 M. SPAN

HALF ELEV FOR 7.00 - 8.00 M. SPAN

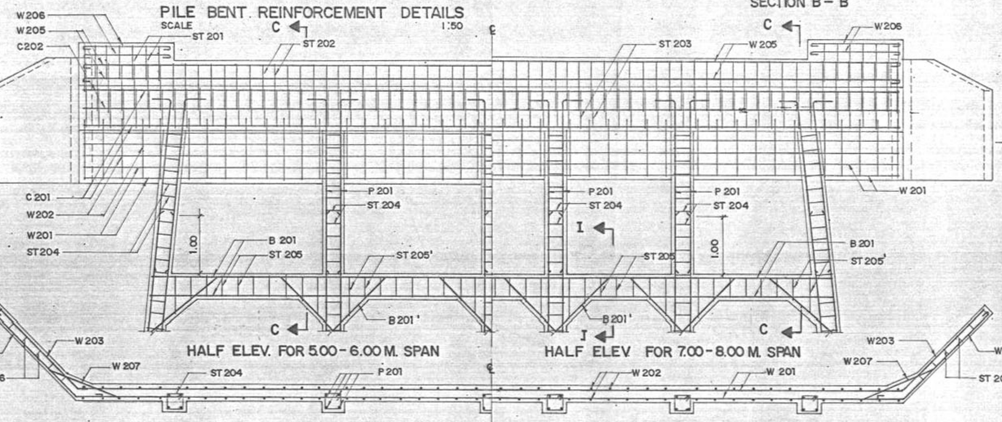


HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV. FOR 10.00 M. SPAN

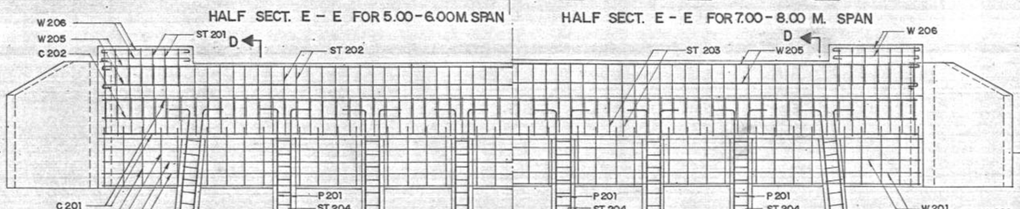
PILE BENT REINFORCEMENT DETAILS

SCALE 1:50



HALF ELEV. FOR 5.00 - 6.00 M. SPAN

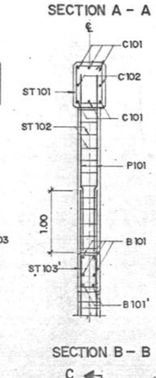
HALF ELEV FOR 7.00 - 8.00 M. SPAN



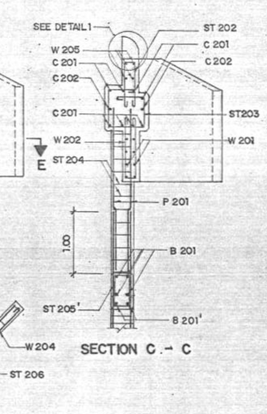
HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV. FOR 10.00 M. SPAN

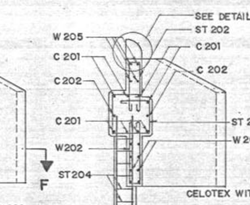
SECTION A - A



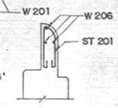
SECTION B - B



SECTION C - C

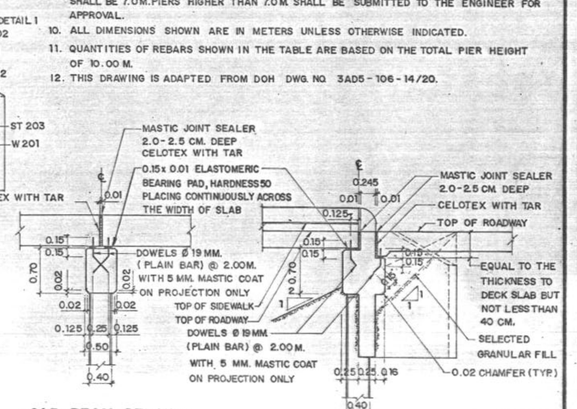


SECTION D - D



DETAIL 1

SCALE 1:50



CAP BEAM DETAILS

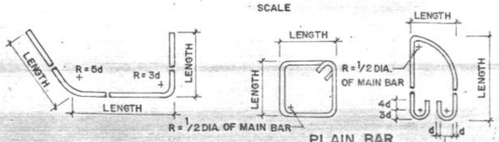
SCALE 1 : 50

ABUTMENT HEAD DETAILS

SCALE 1 : 50

ABUTMENT REINFORCEMENT DETAILS

SCALE 1 : 50



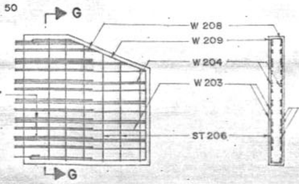
DEFORMED BAR

PLAIN BAR

BAR BENDING DETAILS

NOT TO SACLE

64 FOR PRIMARY BARS
54 FOR STIRRUPS & TIES LARGER THAN Ø 16 MM.
46 FOR STIRRUPS & TIES Ø 16 MM. OR LESS



WINGWALL REINFORCEMENT DETAIL

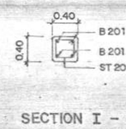
SCALE 1:50

SECT. G - G

SCALE 1:50

SECTION H - H

SCALE 1:50



SECTION I - I

SCALE 1:50

TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M. #	@	NO.	L	SPAN 6.00 M. #	@	NO.	L	SPAN 7.00 M. #	@	NO.	L	SPAN 8.00 M. #	@	NO.	L	SPAN 9.00 M. #	@	NO.	L	SPAN 10.00 M. #	@	NO.	L
PILE BENT	C 101	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–
	C 102	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	ST 101	3	0.20	59	2.35	3	0.20	59	2.35	3	0.20	59	2.35	3	0.20	59	2.35	3	0.20	59	2.35	3	0.20	59	2.35
	ST 102	3	0.20	70	1.35	3	0.20	70	1.35	3	0.20	84	1.35	3	0.20	84	1.35	3	0.20	112	1.35	3	0.20	112	1.35
	ST 103	3	0.25	22	1.35	3	0.25	22	1.35	3	0.25	18	1.35	3	0.25	18	1.35	3	0.25	10	1.35	3	0.25	10	1.35
	ST 103'	3	0.25	16	–	3	0.25	16	–	3	0.25	20	–	3	0.25	20	–	3	0.25	28	–	3	0.25	28	–
	B 101	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–
	B 101'	8	–	16	1.55	8	–	16	1.55	8	–	20	1.55	8	–	20	1.55	8	–	28	1.55	8	–	28	1.55
	P 101	8	–	20	3.75	8	–	20	3.75	8	–	24	3.75	8	–	24	3.75	8	–	32	3.75	8	–	32	3.75
ABUTMENT	C 201	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
	C 202	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	ST 201	2	0.20	14	1.215	2	0.20	14	1.295	2	0.20	14	1.355	2	0.20	14	1.435	2	0.20	14	1.515	2	0.20	14	1.635
	ST 202	3	0.20	65	1.745	3	0.20	65	1.795	3	0.20	65	1.845	3	0.20	65	1.895	3	0.20	65	1.945	3	0.20	65	1.995
	ST 203	3	0.20	65	–	3	0.20	65	–	3	0.20	65	–	3	0.20	65	–	3	0.20	65	–	3	0.20	65	–
	ST 204	3	0.20	70	1.35	3	0.20	70	1.35	3	0.20	84	1.35	3	0.20	84	1.35	3	0.20	112	1.35	3	0.20	112	1.35
	ST 205	3	0.25	22	1.35	3	0.25	22	1.35	3	0.25	18	1.35	3	0.25	18	1.35	3	0.25	10	1.35	3	0.25	10	1.35
	ST 205'	3	0.25	16	–	3	0.25	16	–	3	0.25	16	–	3	0.25	20	–	3	0.25	28	–	3	0.25	28	–
	ST 206	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
	B 201	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–
	B 201'	8	–	16	1.55	8	–	16	1.55	8	–	20	1.55	8	–	20	1.55	8	–	28	1.55	8	–	20	1.55
	P 201	8	–	20	3.75	8	–	20	3.75	8	–	24	3.75	8	–	24	3.75	8	–	32	3.75	8	–	32	3.75
	W 201	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–
	W 202	2	0.30	41	2.70	2	0.30	41	2.60	2	0.30	41	2.60	2	0.30	41	2.50	2	0.30	41	2.40	2	0.30	41	2.30
	W 203	4	0.15	24	–	4	0.15	24	–	2	0.15	24	–	2	0.15	24	–	2	0.15	24	–	2	0.15	24	–
	W 204	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
	W 205	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–
	W 206	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–
	W 207	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15
	W 208	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435
	W 209	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535

2 = Ø 1/4" OR 6 MM., # 3 = Ø 3/8" OR 9 MM. , # 4 = Ø 1/2" OR 12 MM., # 6 = Ø 3/4" OR 20 MM., #8 = Ø 1" OR 25 MM., NO. = TOTAL AMOUNT OF BARS , L = TOTAL LENGTH OF EACH BAR

NOTES :

1. EACH PILE SHALL BE DRIVEN TO A DEPTH WHERE SCOUR WILL NOT AFFECT CAPACITY AND SHALL HAVE A MINIMUM ULTIMATE BEARING CAPACITY OF 90 TONS. FOR PILE DETAILS SEE DWG. NO S. MS - 02 , MS - 03.
2. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES :
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE GROUND LEVEL EXCEEDS 3.0 M., ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
3. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM , BACK WALL AND WINGWALLS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
4. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG./M.^{3} AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG/CM.^{2} FOR A 0.15 x 0.15 x 0.15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350 KG.	CRUSHED ROCK OR GRAVEL	0.86 M.^{3}
SAND	0.43 M.^{3}	CONCRETE SLUMP MAX.	10 CM.

5. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD30 DEFORMED BARS, OTHER SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
6. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
7. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
8. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM , BACK WALL AND WINGWALLS WITHOUT ALTERING THE LOCATIONS OF REBARS.
9. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
10. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 10.00 M.
12. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5 - 106 - 14/20.

KINGDOM OF THAILAND

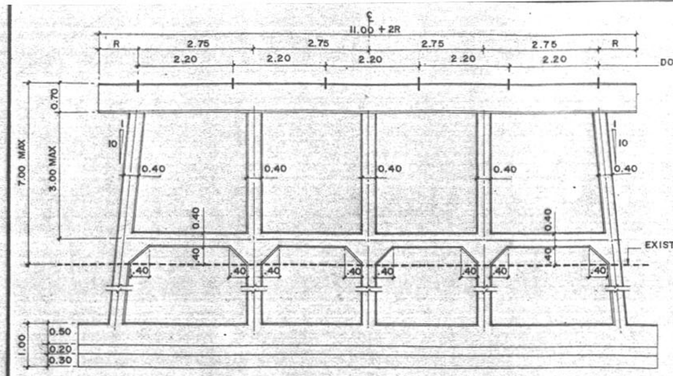
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

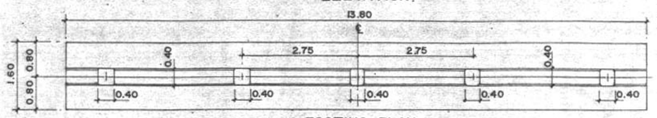
10.00 M. ROADWAY WIDTH SLAB BRIDGE

PILE BENT AND ABUTMENT DETAILS

DESIGNER : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. ST - 13
		SHEET NO. 126



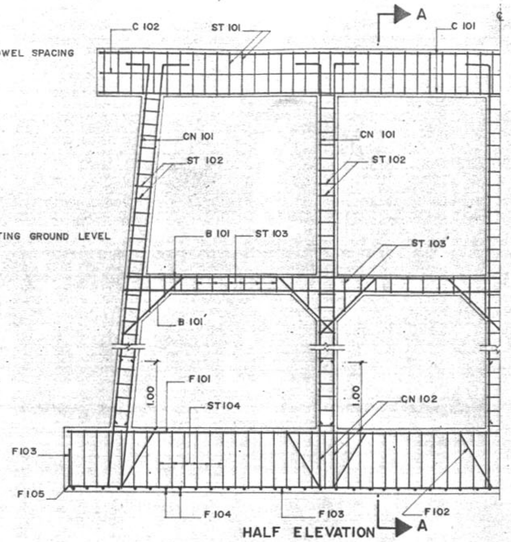
ELEVATION



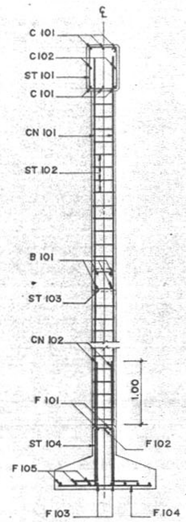
FOOTING PLAN

PIER DETAILS FOR 5.00 – 6.00 M. SPAN

SCALE 1 : 75



HALF ELEVATION



SECTION A – A

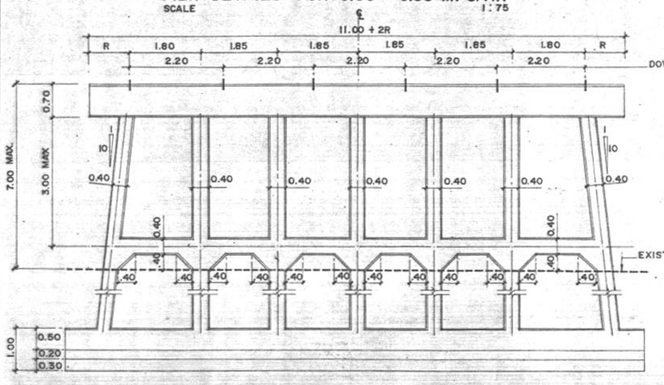
REINFORCEMENT DETAILS FOR 5.00 – 6.00 M. SPAN

SCALE 1 : 50

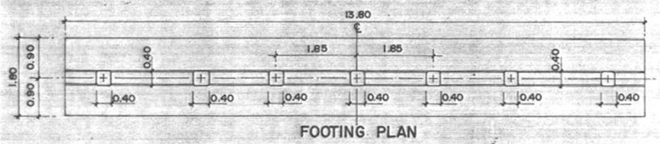
TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M.				SPAN 6.00 M				SPAN 7.00 M				SPAN 8.00 M.				SPAN 9.00 M				SPAN 10.00 M			
		#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L
	C 101	8	—	6	—	8	—	6	—	8	—	6	—	8	—	6	—	8	—	6	—	8	—	6	—
	C 102	4	—	2	—	4	—	2	—	4	—	2	—	4	—	2	—	4	—	2	—	4	—	2	—
	CN 101	8	—	20	11.25	8	—	20	11.25	8	—	28	11.25	8	—	28	11.25	8	—	32	11.25	8	—	36	11.25
	CN 102	8	—	20	2.31	8	—	20	2.31	8	—	28	2.31	8	—	28	2.31	8	—	32	2.31	8	—	36	2.31
	ST 101	3	0.20	64	2.35	3	0.20	64	2.35	3	0.20	64	2.35	3	0.20	64	2.35	3	0.20	64	2.35	3	0.20	64	2.35
	ST 102	3	0.20	240	1.35	3	0.20	240	2.35	3	0.20	336	2.35	3	0.20	336	1.35	3	0.20	384	1.35	3	0.20	432	1.35
	ST 103	3	0.25	56	1.35	3	0.25	56	1.35	3	0.25	42	1.35	3	0.25	42	1.35	3	0.25	34	1.35	3	0.25	22	1.35
	ST 103'	3	0.25	32	—	3	0.25	32	—	3	0.25	48	—	3	0.25	48	—	3	0.25	56	—	3	0.25	64	—
	ST 104	3	0.20	69	2.55	3	0.20	69	2.55	3	0.20	69	2.55	3	0.20	69	2.55	3	0.20	69	2.55	3	0.20	69	2.55
	B 101	8	—	8	—	8	—	8	—	8	—	8	—	8	—	8	—	8	—	8	—	8	—	8	—
	B 101'	6	—	32	1.55	6	—	32	1.55	6	—	48	1.55	6	—	48	1.55	6	—	56	1.55	6	—	64	1.55
	F 101	8	—	2	13.70	8	—	2	13.70	8	—	2	13.70	8	—	2	13.70	8	—	2	13.70	8	—	2	13.70
	F 102	8	—	1	—	8	—	1	—	8	—	1	—	8	—	1	—	8	—	1	—	8	—	1	—
	F 103	8	—	2	14.90	8	—	2	14.90	8	—	2	14.90	8	—	2	14.90	8	—	2	14.90	8	—	2	14.90
	F 104	4	0.25	55	1.50	4	0.25	55	1.50	4	0.20	69	1.70	4	0.20	69	1.70	4	0.125	110	1.90	4	0.125	110	1.90
	F 105	4	—	6	13.70	4	—	6	13.70	4	—	6	13.70	4	—	6	13.70	4	—	6	13.70	4	—	6	13.70

3 = Ø 3/8" OR 9 MM., # 4 = Ø 1/2"OR 12 MM , # 6 = Ø 3/4" OR 20 MM., # 8 = Ø 1" OR 25 MM., NO = TOTAL AMOUNT OF BAR, L = TOTAL LENGTH OF EAGH BAR.



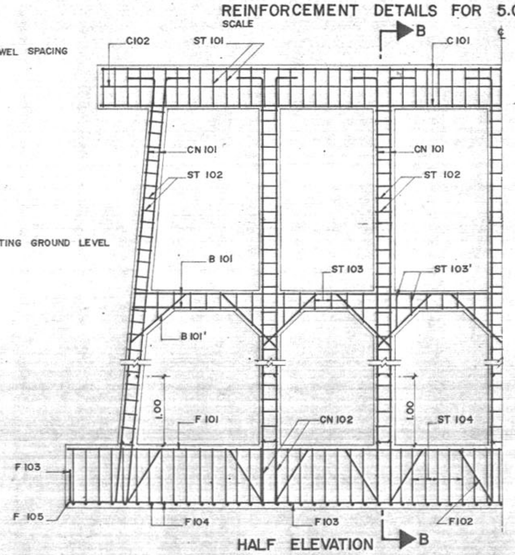
ELEVATION



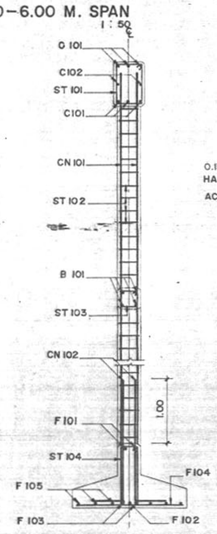
FOOTING PLAN

PIER DETAILS FOR 7.00 - 8.00 M. SPAN

SCALE 1 : 75



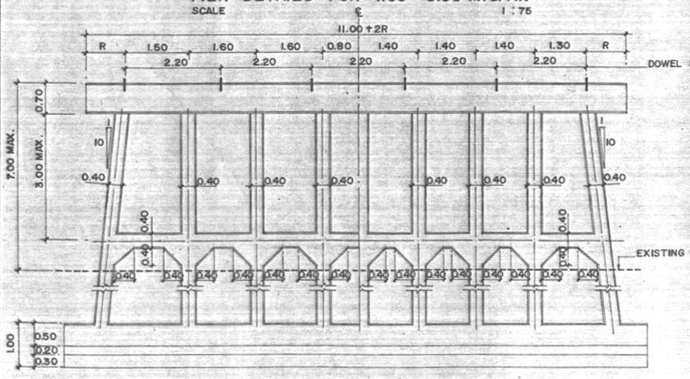
HALF ELEVATION



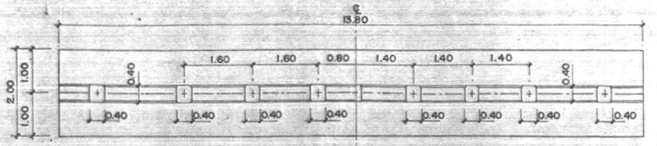
SECTION B – B

REINFORCEMENT DETAILS FOR 7.00 – 8.00M. SPAN

SCALE 1 : 50



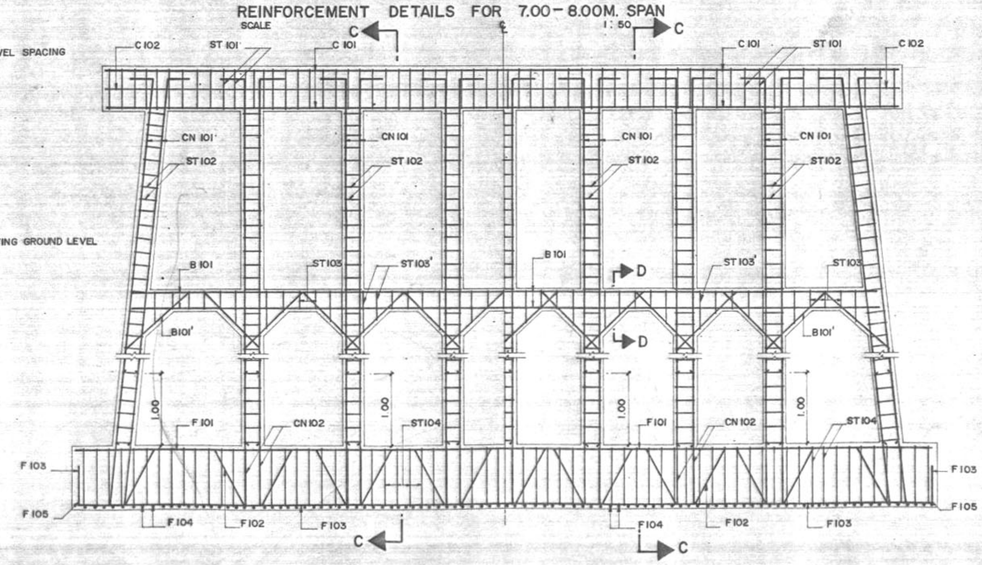
HALF ELEV FOR 9.00 M. SPAN HALF ELEV. FOR 10.00 M. SPAN



HALF ELEV FOR 9.00 M. SPAN HALF PLAN FOR 10.00 M SPAN

DETAILS FOR 9.00 M. & 10.00 M. SPAN

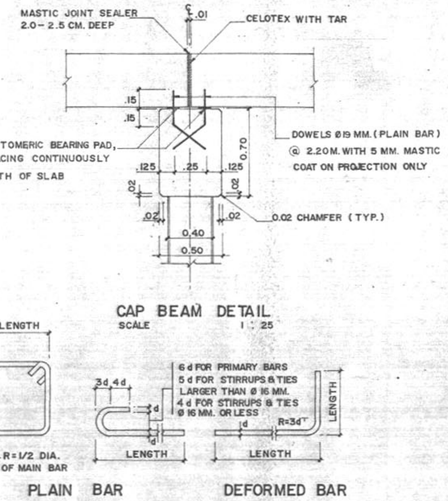
SCALE 1 : 75



HALF ELEV. FOR 9.00 M. SPAN HALF ELEV. FOR 10.00 M. SPAN

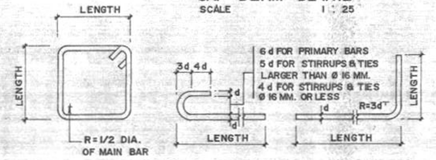
REINFORCEMENT DETAILS FOR 9.00 M. & 10.00 M. SPAN

SCALE 1 : 50



CAP BEAM DETAIL

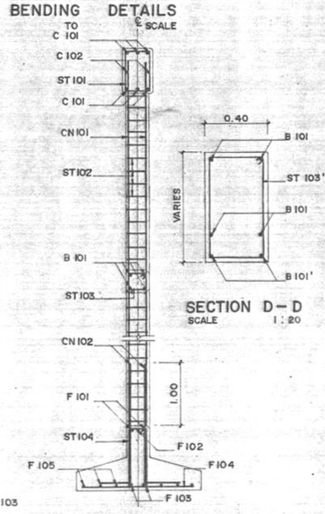
SCALE 1 : 25



PLAIN BAR DEFORMED BAR

BAR BENDING DETAILS

NOT TO SCALE



SECTION C – C

SECTION D – D

SCALE 1 : 20

NOTES :

1. THE BOTTOM OF A FOOTING SHALL BE EMBEDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT IT'S CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED, 10 CM. THICKNESS OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND. COMPOSITION OF LEAN CONCRETE SHALL BE 1 : 3 : 6 BY VOLUME.
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON/M.^{2}
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES :
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEED 3.0 M., ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BAEM, AT WHICH A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
5. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 Kg./M.^{3} AND A MINMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 Kg./CM.^{2} FOR A .15 x .15 x .15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350	Kg.
SAND	0.45	M.^{3}
CRUSHED ROCK OR GRAVEL	0.86	M.^{3}
CONCRETE SLUMP MAX.	10	CM.

6. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
7. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
9. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM WITHOUT ALTERING THE LOCATIONS OF REBARS.
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 12.00 M.
12. ALL DIMENIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
13. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5-106-14/21.

KINGDOM OF THAILAND

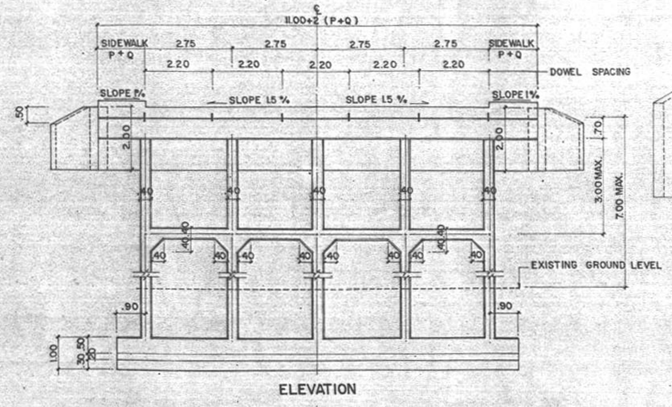
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

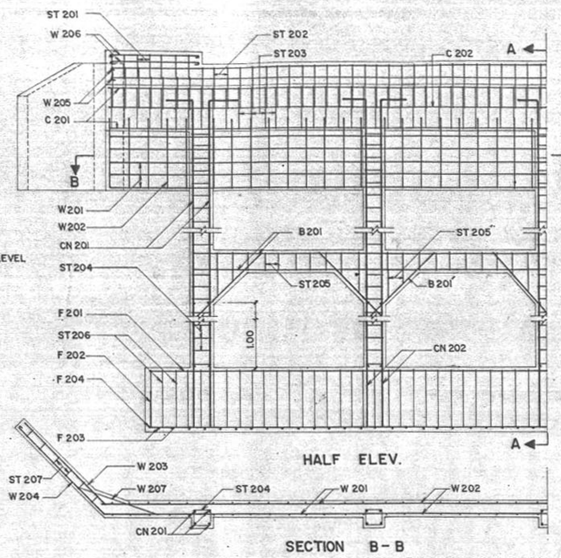
STANDARD DRAWING

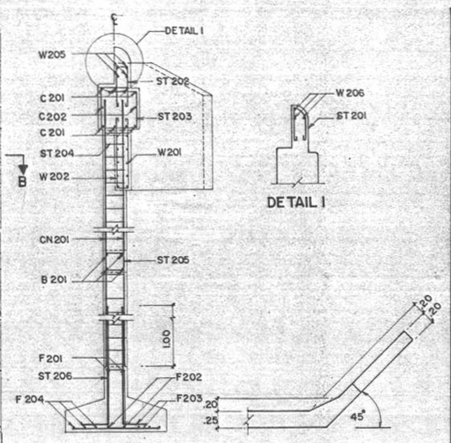
11.00 M. ROADWAY WIDTH SLAB BRIDGE

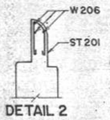
SPREAD FOOTING PIER DETAILS

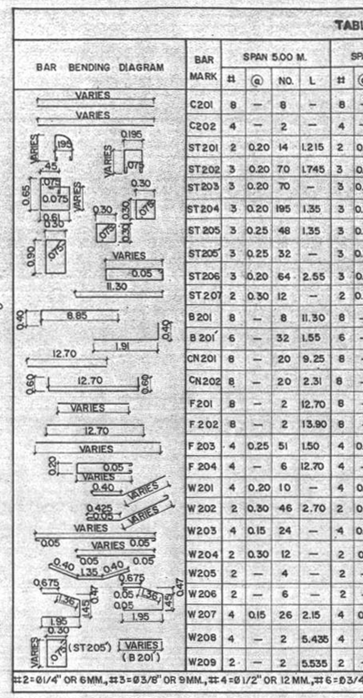
DESIGNED : DOH.& CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. ST -14
		SHEET NO. 127





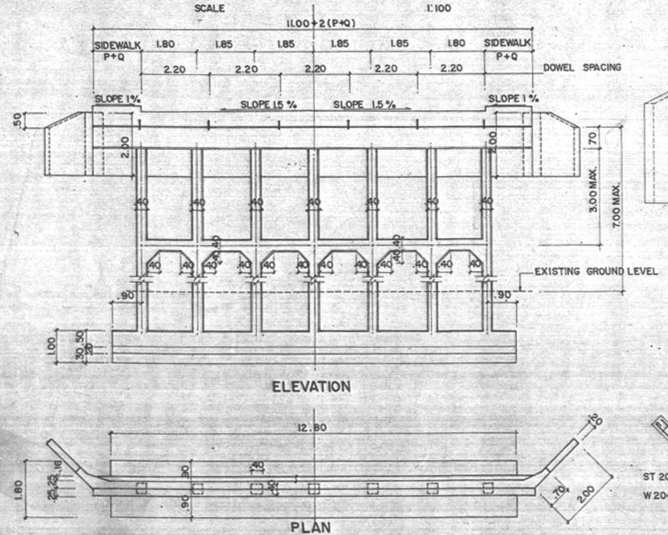


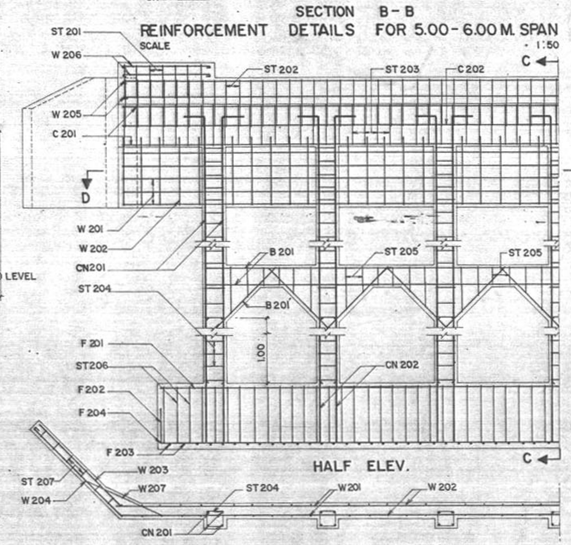


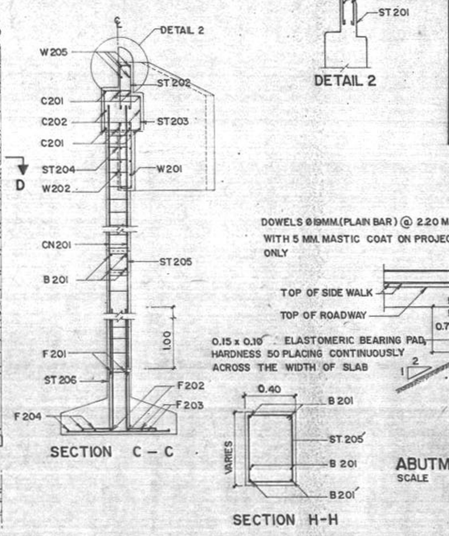


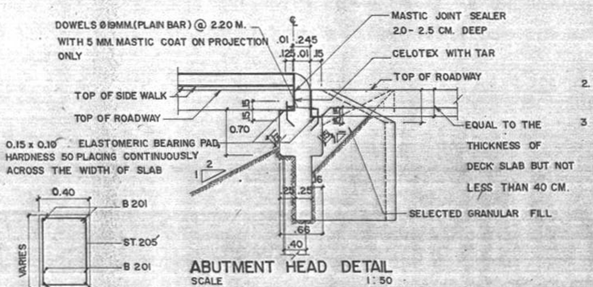
BAR MARK	SPAN 5.00 M.				SPAN 6.00 M.				SPAN 7.00 M.				SPAN 8.00 M.				SPAN 9.00 M.				SPAN 10.00 M.			
	#	@	NO.	L	#	@	NO	L	#	@	NO	L	#	@	NO	L	#	@	NO	L	#	@	NO	L
C201	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
C202	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
ST201	2	0.20	14	1.215	2	0.20	14	1.295	2	0.20	14	1.355	2	0.20	14	1.435	2	0.20	14	1.515	2	0.20	14	1.635
ST202	3	0.20	70	1.745	3	0.20	70	1.795	3	0.20	70	1.845	3	0.20	70	1.895	3	0.20	70	1.945	3	0.20	70	1.995
ST203	3	0.20	70	–	3	0.20	70	–	3	0.20	70	–	3	0.20	70	–	3	0.20	70	–	3	0.20	70	–
ST204	3	0.20	195	1.35	3	0.20	195	1.35	3	0.20	273	1.35	3	0.20	273	1.35	3	0.20	312	1.35	3	0.20	351	1.35
ST205	3	0.25	48	1.35	3	0.25	48	1.35	3	0.25	36	1.35	3	0.25	36	1.35	3	0.25	24	1.35	3	0.25	16	1.35
ST205	3	0.25	32	–	3	0.25	32	–	3	0.25	48	–	3	0.25	48	–	3	0.25	56	–	3	0.25	64	–
ST206	3	0.20	64	2.55	3	0.20	64	2.55	3	0.20	64	2.55	3	0.20	64	2.55	3	0.20	64	2.55	3	0.20	64	2.55
ST207	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
B201	8	–	8	11.30	8	–	8	11.30	8	–	8	11.30	8	–	8	11.30	8	–	8	11.30	8	–	8	11.30
B201	6	–	32	1.55	6	–	32	1.55	6	–	48	1.55	6	–	48	1.55	6	–	56	1.55	6	–	64	1.55
CN201	8	–	20	9.25	8	–	20	9.25	8	–	28	9.25	8	–	28	9.25	8	–	32	9.25	8	–	36	9.25
CN202	8	–	20	2.31	8	–	20	2.31	8	–	28	2.31	8	–	28	2.31	8	–	32	2.31	8	–	36	2.31
F201	8	–	2	12.70	8	–	2	12.70	8	–	2	12.70	8	–	2	12.70	8	–	2	12.70	8	–	2	12.70
F202	8	–	2	13.90	8	–	2	13.90	8	–	2	13.90	8	–	2	13.90	8	–	2	13.90	8	–	2	13.90
F203	4	0.25	51	1.50	4	0.25	51	1.50	4	0.20	64	1.70	4	0.20	64	1.70	4	0.20	64	1.70	4	0.125	102	1.90
F204	4	–	6	12.70	4	–	6	12.70	4	–	6	12.70	4	–	6	12.70	4	–	6	12.70	4	–	6	12.70
W201	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–
W202	2	0.30	46	2.70	2	0.30	46	2.60	2	0.30	46	2.60	2	0.30	46	2.50	2	0.30	46	2.40	2	0.30	46	2.50
W203	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–
W204	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
W205	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–
W206	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–
W207	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15
W208	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435
W209	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535

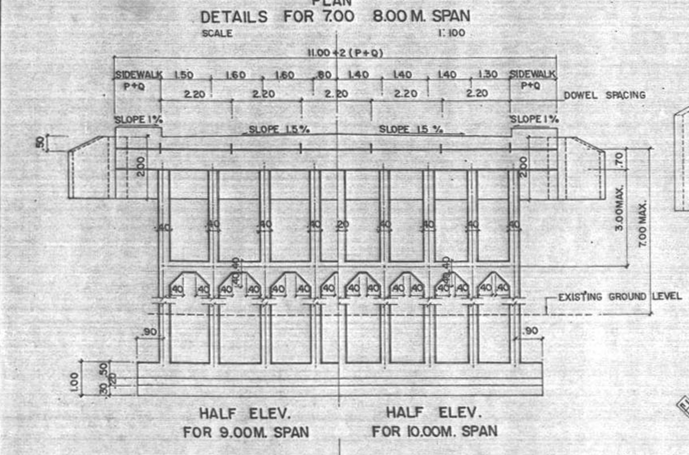
2=Ø1/4" OR 6MM., # 3=Ø3/8" OR 9MM., # 4=Ø1/2" OR 12 MM., # 6=Ø3/4" OR 20MM., # 8=Ø1" OR 25MM., NO= TOTAL AMOUNT OF BARS, L= LENGTH OF EACH BAR

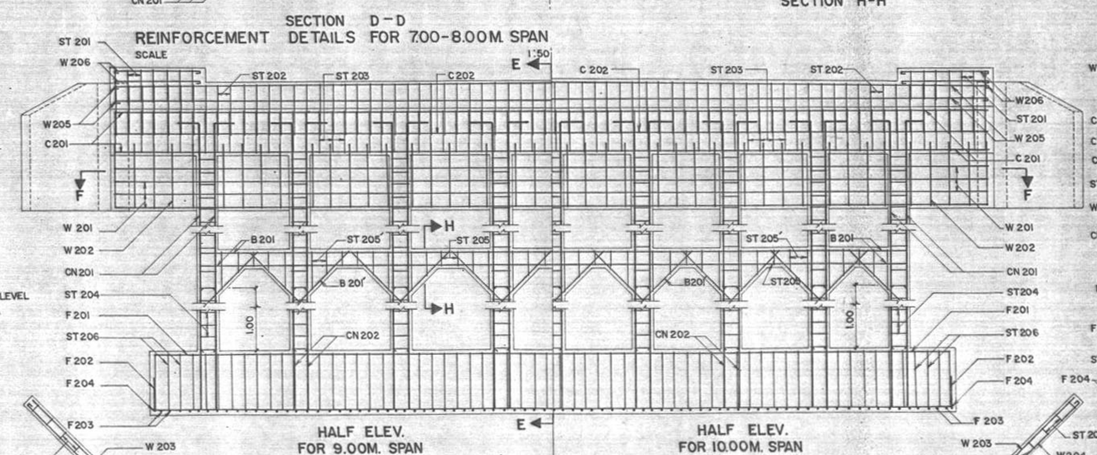


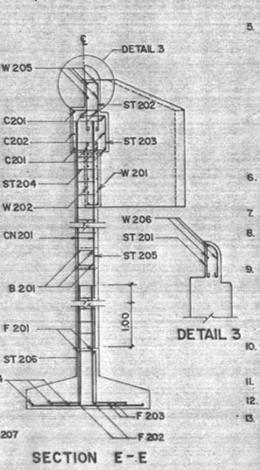


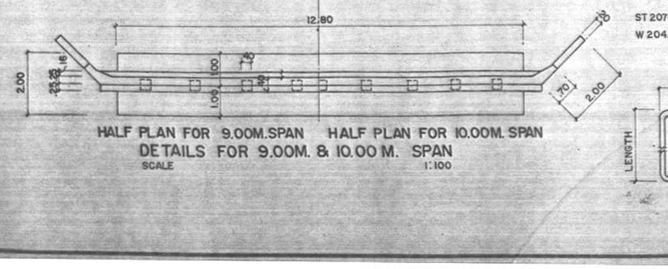


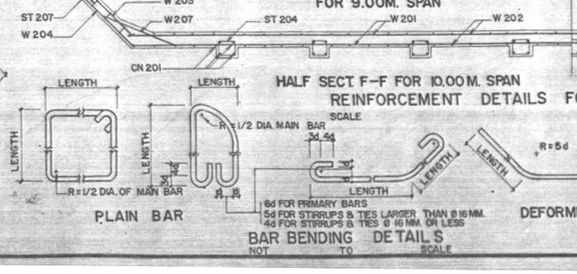


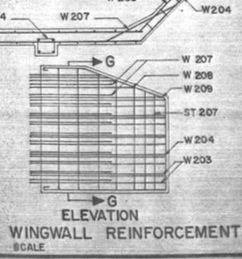












1. THE BOTTOM OF A FOOTING SHALL BE EMBEDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT IT'S CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED, 10 CM. THICKNESS OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND. COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 VOLUM.
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON/M^2.
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES :
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0 M., ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, BACK WALL AND WINGWALLS AT WHICH A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
5. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 Kg./M^3 AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 Kg./CM.^{2} FOR A 15 x 15 x 15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350	Kg.
SAND	0.45	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUM MAX.	10	CM.

6. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
7. LOCATION OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
9. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM, BACK WALL AND WINGWALLS WITHOUT ALTERING THE LOCATION OF REBARS.
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HIGHT OF 10.0M.
12. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
13. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5-16-14/2.

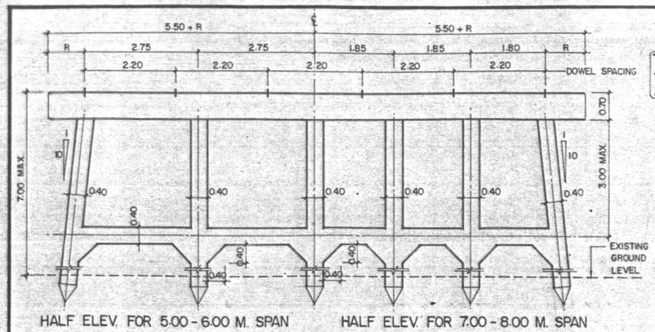
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

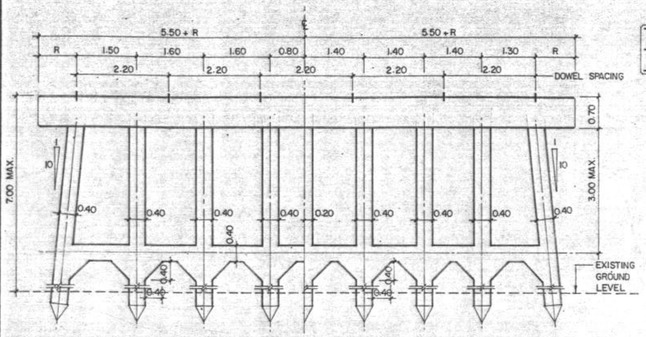
11.00 M. ROADWAY WIDTH SLAB BRIDGE

SPREAD FOOTING ABUTMENT DETAILS

DESIGNED : DOH.& CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. ST-15
		SHEET NO. 12

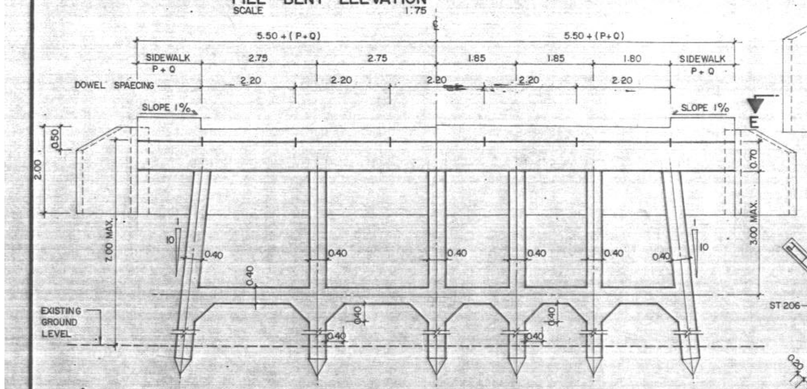


HALF ELEV. FOR 5.00 - 6.00 M. SPAN HALF ELEV. FOR 7.00 - 8.00 M. SPAN

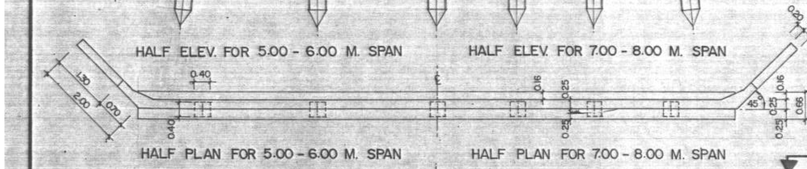


HALF ELEV. FOR 9.00 M. SPAN HALF ELEV. FOR 10.00 M. SPAN

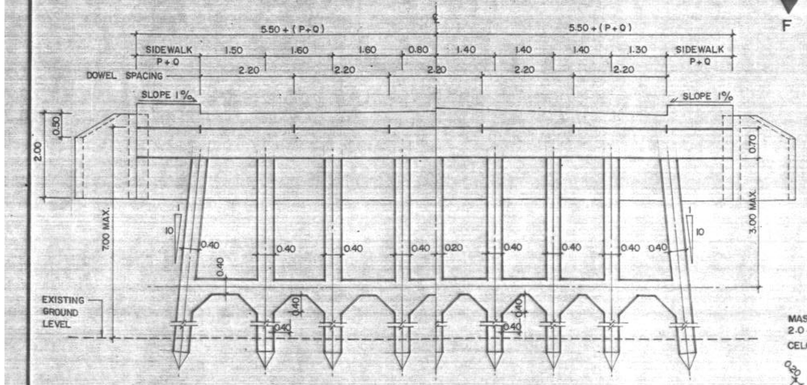
PILE BENT ELEVATION
SCALE 1:75



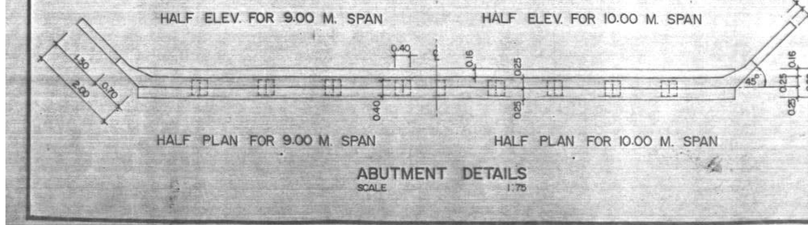
HALF ELEV. FOR 5.00 - 6.00 M. SPAN HALF ELEV. FOR 7.00 - 8.00 M. SPAN



HALF PLAN FOR 5.00 - 6.00 M. SPAN HALF PLAN FOR 7.00 - 8.00 M. SPAN

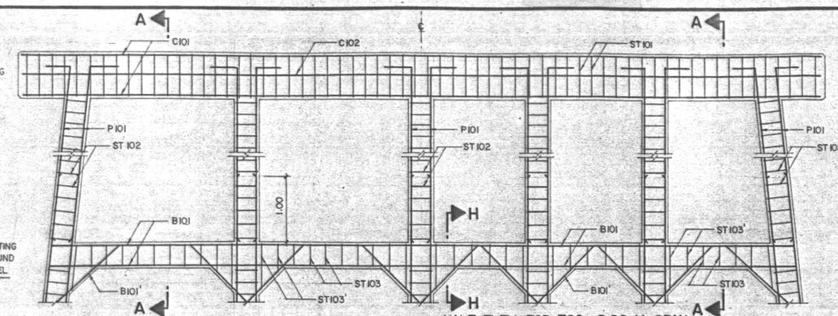


HALF ELEV. FOR 9.00 M. SPAN HALF ELEV. FOR 10.00 M. SPAN

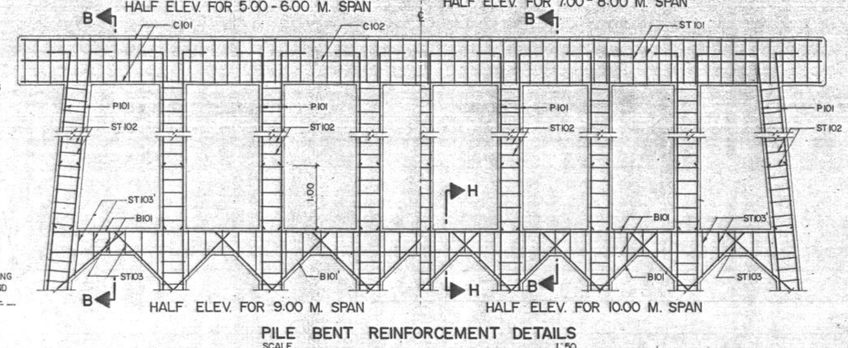


HALF PLAN FOR 9.00 M. SPAN HALF PLAN FOR 10.00 M. SPAN

ABUTMENT DETAILS
SCALE 1:75

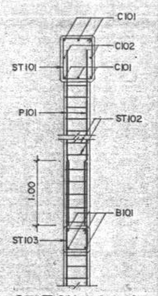


HALF ELEV. FOR 5.00 - 6.00 M. SPAN HALF ELEV. FOR 7.00 - 8.00 M. SPAN

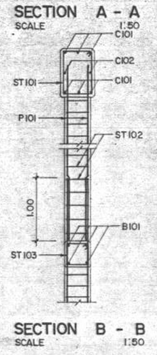


HALF ELEV. FOR 9.00 M. SPAN HALF ELEV. FOR 10.00 M. SPAN

PILE BENT REINFORCEMENT DETAILS
SCALE 1:50



SECTION A - A
SCALE 1:50

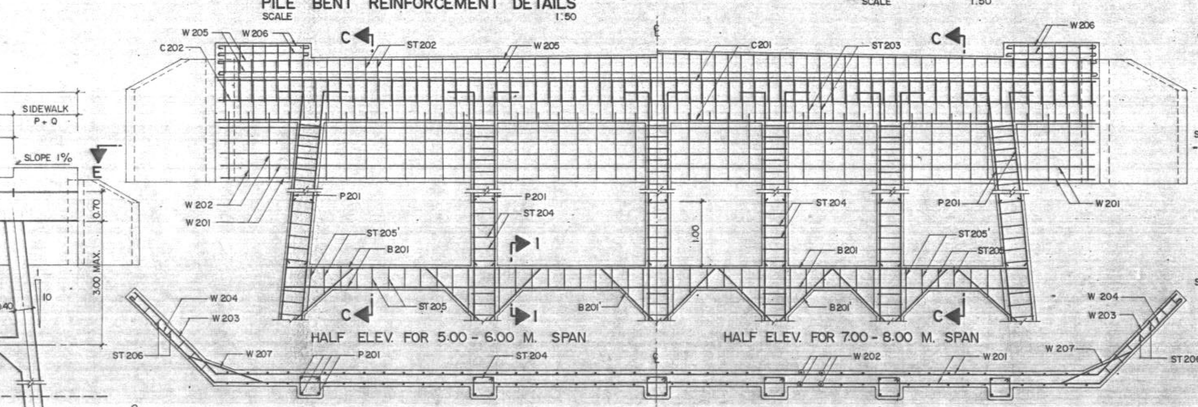


SECTION B - B
SCALE 1:50

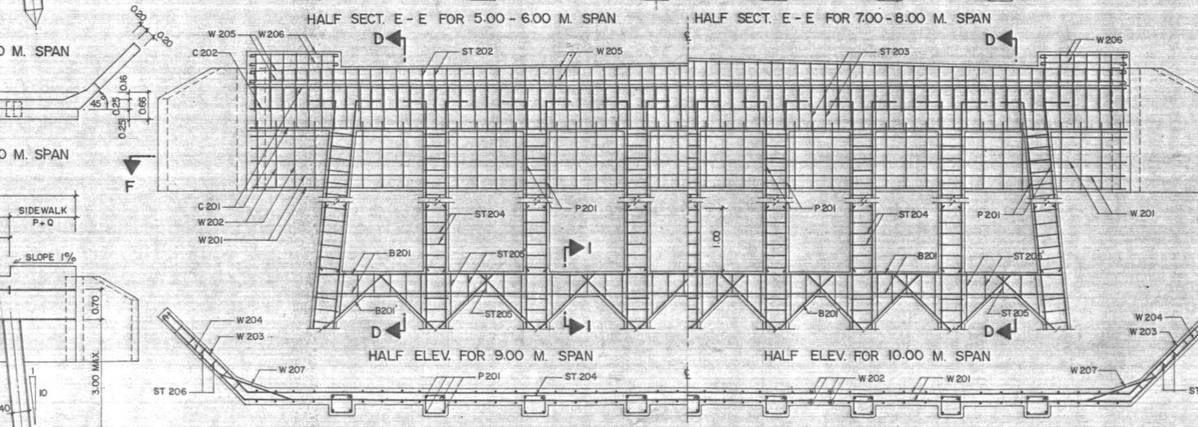
TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M. #	@	NO	L	SPAN 6.00 M. #	@	NO	L	SPAN 7.00 M. #	@	NO	L	SPAN 8.00 M. #	@	NO	L	SPAN 9.00 M. #	@	NO	L	SPAN 10.00 M. #	@	NO	L
PILE BENT	C101	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–
	C102	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	ST101	3	0.20	64	2.35	3	0.20	64	2.35	3	0.20	64	2.35	3	0.20	64	2.35	3	0.20	64	2.35	3	0.20	64	2.35
	ST102	3	0.20	70	1.35	3	0.20	70	1.35	3	0.20	98	1.35	3	0.20	98	1.35	3	0.20	112	1.35	3	0.20	112	1.35
	ST103	3	0.25	26	1.35	3	0.25	26	1.35	3	0.25	14	1.35	3	0.25	14	1.35	3	0.25	10	1.35	3	0.25	10	1.35
	ST103'	3	0.25	16	–	3	0.25	16	–	3	0.25	24	–	3	0.25	24	–	3	0.25	28	–	3	0.25	32	–
	B101	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–
	B101'	8	–	16	1.55	8	–	16	1.55	8	–	24	1.55	8	–	24	1.55	8	–	28	1.55	8	–	32	1.55
	P101	8	–	20	3.75	8	–	20	3.75	8	–	28	3.75	8	–	28	3.75	8	–	32	3.75	8	–	36	3.75
ABUTMENT	C201	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
	C202	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	ST201	2	0.20	14	1.215	2	0.20	14	1.295	2	0.20	14	1.355	2	0.20	14	1.435	2	0.20	14	1.515	2	0.20	14	1.635
	ST202	3	0.20	70	1.745	3	0.20	70	1.795	3	0.20	70	1.645	3	0.20	70	1.895	3	0.20	70	1.945	3	0.20	70	1.995
	ST203	3	0.20	70	–	3	0.20	70	–	3	0.20	70	–	3	0.20	70	–	3	0.20	70	–	3	0.20	70	–
	ST204	3	0.20	70	1.35	3	0.20	70	1.35	3	0.20	98	1.35	3	0.20	98	1.35	3	0.20	112	1.35	3	0.20	126	1.35
	ST205	3	0.25	26	1.35	3	0.25	26	1.35	3	0.25	14	1.35	3	0.25	14	1.35	3	0.25	10	1.35	3	0.25	10	1.35
	ST205'	3	0.25	16	–	3	0.25	16	–	3	0.25	24	–	3	0.25	24	–	3	0.25	28	–	3	0.25	32	–
	ST206	3	0.30	12	–	3	0.30	12	–	3	0.30	12	–	3	0.30	12	–	3	0.30	12	–	3	0.30	12	–
	B201	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–
	B201'	8	–	16	1.55	8	–	16	1.55	8	–	24	1.55	8	–	24	1.55	8	–	28	1.55	8	–	32	1.55
	P201	8	–	20	3.75	8	–	20	3.75	8	–	28	3.75	8	–	28	3.75	8	–	32	3.75	8	–	36	3.75
	W201	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–
	W202	2	0.30	47	2.70	2	0.30	47	2.60	2	0.30	47	2.60	2	0.30	47	2.50	2	0.30	47	2.40	2	0.30	46	2.50
	W203	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–
	W204	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
	W205	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–
	W206	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–
	W207	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15
	W208	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435
	W209	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535

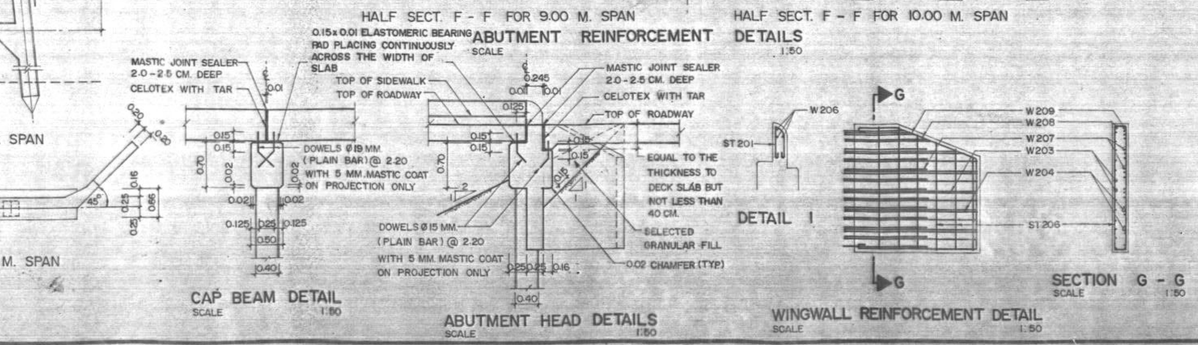
2 = Ø 1/4" OR 6 MM., # 3 = Ø 3/8" OR 9 MM., # 4 = Ø 1/2" OR 12 MM., # 8 = Ø 1" OR 25 MM., NO = TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BAR



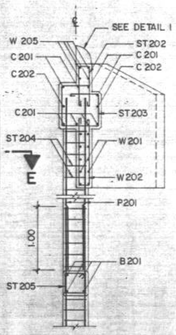
HALF ELEV. FOR 5.00 - 6.00 M. SPAN HALF ELEV. FOR 7.00 - 8.00 M. SPAN



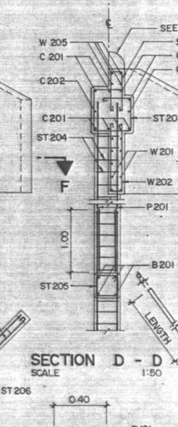
HALF ELEV. FOR 9.00 M. SPAN HALF ELEV. FOR 10.00 M. SPAN



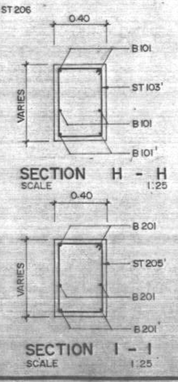
HALF SECT. F - F FOR 9.00 M. SPAN HALF SECT. F - F FOR 10.00 M. SPAN



SECTION C - C
SCALE 1:50

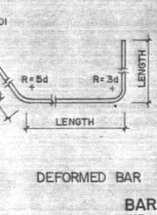


SECTION D - D
SCALE 1:50



SECTION H - H
SCALE 1:25

SECTION I - I
SCALE 1:25



DEFORMED BAR PLAIN BAR

6d FOR PRIMARY BARS
5d FOR STIRRUPS & TIES LARGER THAN Ø 16 MM.
4d FOR STIRRUPS & TIES Ø 16 MM. OR LESS

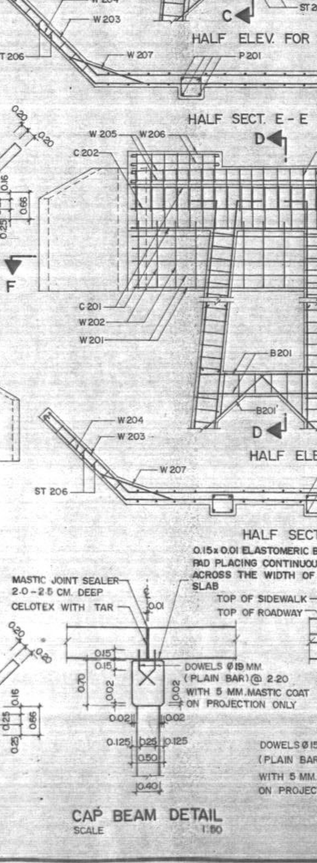
BAR BENDING DETAILS
NOT TO SCALE

NOTES :

1. EACH PILE SHALL BE DRIVEN TO A DEPTH WHERE SCOUR WILL NOT AFFECT CAPACITY AND SHALL HAVE A MINIMUM ULTIMATE BEARING CAPACITY OF 90 TONS. FOR PILE DETAILS SEE DWG. NO. MS-02, MS-03.
2. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES :
   a) IF THE DISTANCE FROM EXISTING CANAL BED TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE CANAL BED EXCEEDS 3.0 M., ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
3. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, BACK WALL AND WINGWALLS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
4. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG./M.^{3} AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG./CM.^{2} FOR A 0.15 x 0.15 x 0.15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350	KG.
SAND	0.45	M.^{3}
CRUSHED ROCK OR GRAVEL	0.86	M.^{3}
CONCRETE SLUMP MAX.	10	CM.

5. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
6. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
7. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
8. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT CEMENT TYPE 5 CONFORMING TO TIS.15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM, BACK WALL AND WINGWALLS WITHOUT ALTERING THE LOCATIONS OF REBARS.
9. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING CANAL BED TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
10. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 10.00 M.
12. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5-106-14/22.



ABUTMENT REINFORCEMENT DETAILS
SCALE 1:50

CAP BEAM DETAIL SCALE 1:50 ABUTMENT HEAD DETAILS SCALE 1:50

DETAIL I

WINGWALL REINFORCEMENT DETAIL
SCALE 1:50

SECTION G - G
SCALE 1:50

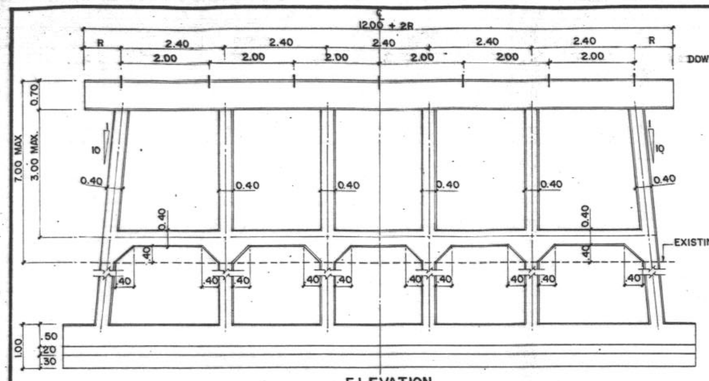
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

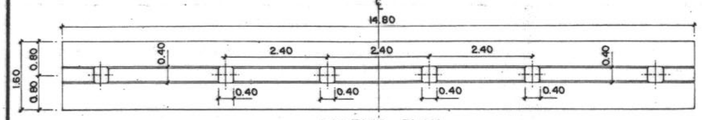
11.00 M. ROADWAY WIDTH SLAB BRIDGE

PILE BENT AND ABUTMENT DETAILS

DESIGNED : DOH. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. ST - 16
		SHEET NO. 129

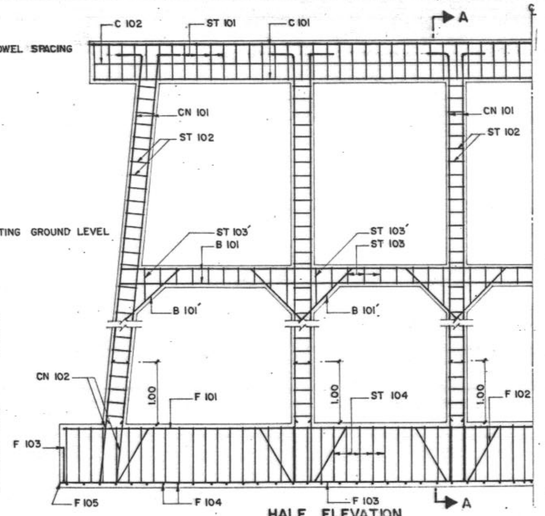


ELEVATION

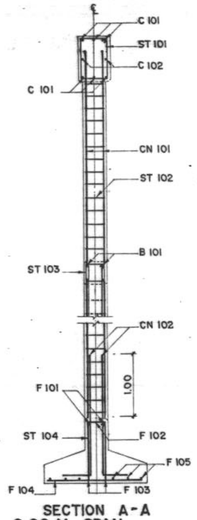


FOOTING PLAN

PIER DETAILS FOR 5.00 - 6.00 M. SPAN
SCALE 1 : 75



HALF ELEVATION



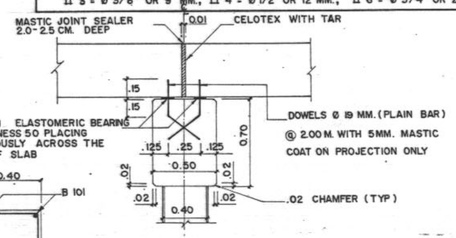
SECTION A-A

REINFORCEMENT DETAILS FOR 5.00 - 6.00 M. SPAN
SCALE 1 : 50

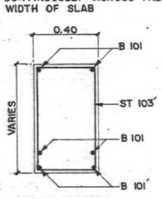
TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M.				SPAN 6.00 M.				SPAN 7.00 M.				SPAN 8.00 M.				SPAN 9.00 M.				SPAN 10.00 M.			
		⌗	@	NO.	L	⌗	@	NO	L	⌗	@	NO	L	⌗	@	NO	L	⌗	@	NO	L	⌗	@	NO	L
	C 101	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–
	C 102	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	CN 101	8	–	24	11.25	8	–	24	11.25	8	–	28	11.25	8	–	28	11.25	8	–	32	11.25	8	–	36	11.25
	CN 102	8	–	24	2.31	8	–	24	2.31	8	–	28	2.31	8	–	28	2.31	8	–	32	2.31	8	–	36	2.31
	ST 101	3	0.20	69	2.35	3	0.20	69	2.35	3	0.20	69	2.35	3	0.20	69	2.35	3	0.20	69	2.35	3	0.20	69	2.35
	ST 102	3	0.20	288	1.35	3	0.20	288	1.35	3	0.20	336	1.35	3	0.20	336	1.35	3	0.20	384	1.35	3	0.20	432	1.35
	ST 103	3	0.25	56	1.35	3	0.25	56	1.35	3	0.25	46	1.35	3	0.25	46	1.35	3	0.25	38	1.35	3	0.25	26	1.35
	ST 103'	3	0.25	40	–	3	0.25	40	–	3	0.25	48	–	3	0.25	48	–	3	0.25	56	–	3	0.25	64	–
	ST 104	3	0.20	74	2.55	3	0.20	74	2.55	3	0.20	74	2.55	3	0.20	74	2.55	3	0.20	74	2.55	3	0.20	74	2.55
	B 101	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
	B 101'	6	–	40	1.55	6	–	40	1.55	6	–	48	1.55	6	–	48	1.55	6	–	56	1.55	6	–	64	1.55
	F 101	8	–	2	14.70	8	–	2	14.70	8	–	2	14.70	8	–	2	14.70	8	–	2	14.70	8	–	2	14.70
	F 102	8	–	1	–	8	–	1	–	8	–	1	–	8	–	1	–	8	–	1	–	8	–	1	–
	F 103	8	–	2	15.90	8	–	2	15.90	8	–	2	15.90	8	–	2	15.90	8	–	2	15.90	8	–	2	15.90
	F 104	4	0.25	59	1.50	4	0.25	59	1.50	4	0.20	74	1.70	4	0.20	74	1.70	4	0.125	118	1.90	4	0.125	118	1.90
	F 105	4	–	6	14.70	4	–	6	14.70	4	–	6	14.70	4	–	6	14.70	4	–	6	14.70	4	–	6	14.70

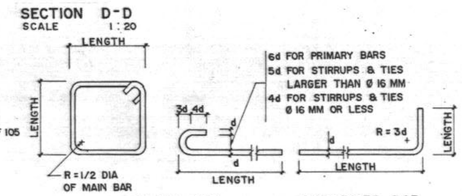
⌗ 3 = Ø 3/8" OR 9 MM., ⌗ 4 = Ø 1/2" OR 12 MM., ⌗ 6 = Ø 3/4" OR 20 MM., ⌗ 8 = Ø 1" OR 25 MM., NO= TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BAR



CAP BEAM DETAILS
SCALE 1 : 25



SECTION D-D
SCALE 1 : 20



PLAIN BAR BENDING DETAILS NOT TO SCALE

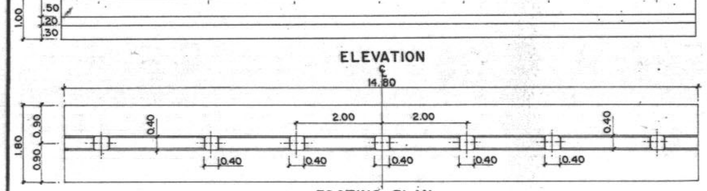
DEFORMED BAR BENDING DETAILS

NOTES:

1. THE BOTTOM OF A FOOTING SHALL BE EMBEDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT IT'S CAPACITY BUT NOT LESS THAN 2.5 M. FTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED, 10 CM. THICKNESS OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND. COMPOSITION OF LEAN CONCRETE SHALL BE 1 : 3 : 6 BY VOLUME,
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON/M^2
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES:
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTON OF THE CAP BEAM EXCEEDS 3.0 M. A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTON THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0 M., ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, AT WHICH CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
5. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 Kg./M^3 AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 Kg/CM^2. FOR A .15 x .15 x .15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE 1 PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS:

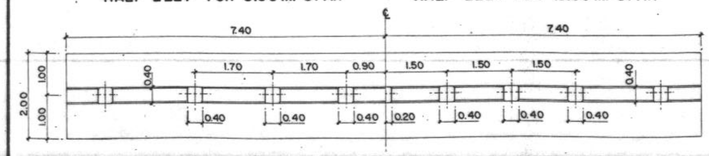
PORTLAND CEMENT	350	Kg.
SAND	0.45	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP MAX.	10	CM.

6. REBARS ⌗ 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
7. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETER OF BIGGER BAR FOR DEFORMED BARS.
9. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AN ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM WITHOUT ALTERING THE LOCATIONS OF REBARS.
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL
11. QUANTITIES OF REBARS SHOW IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 12.0 M.
12. ALL DIMENSION SHOW ARE IN METERS UNLESS OTHERWISE INDICATED.
13. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5-106-14/8.



HALF ELEV FOR 9.00 M. SPAN

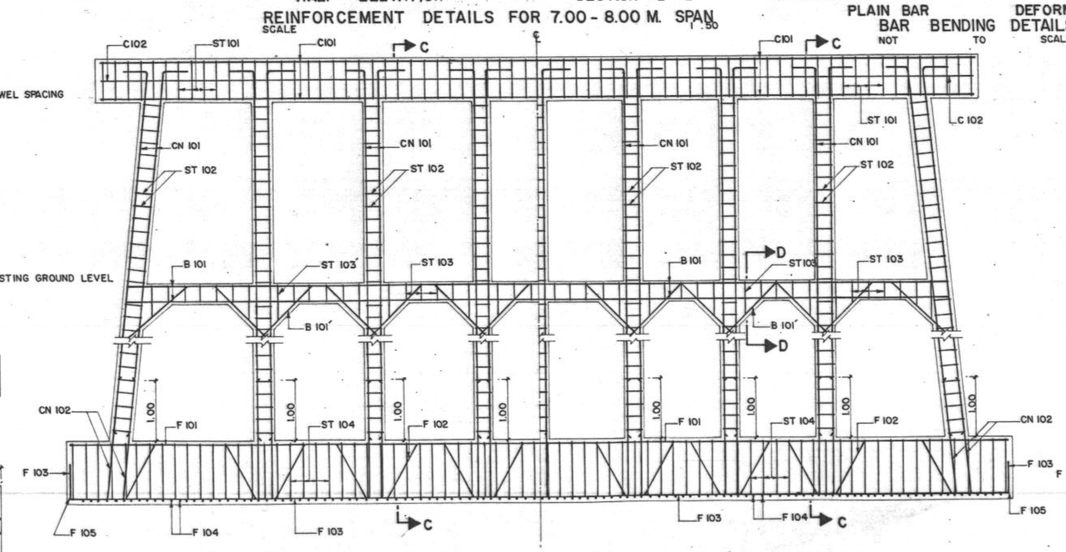
HALF ELEV FOR 10.00 M. SPAN



HALF PLAN FOR 9.00 M. SPAN

HALF PLAN FOR 10.00 M. SPAN

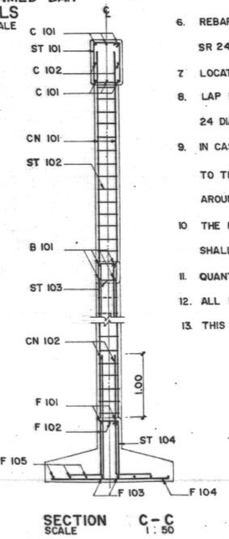
PIER DETAILS FOR 9.00 M. & 10.00 M. SPAN
SCALE 1 : 75



HALF ELEVATION FOR 9.00 M. SPAN

HALF ELEVATION FOR 10.00 M. SPAN

REINFORCEMENT DETAILS FOR 9.00 M. & 10.00 M. SPAN
SCALE 1 : 50



SECTION C-C
SCALE 1 : 50

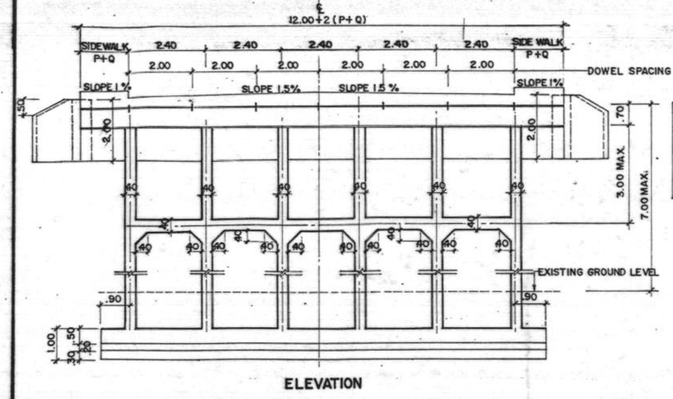
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

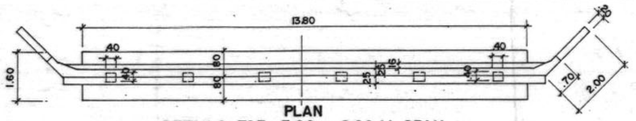
12.00 ROADWAY WIDTH SLAB BRIDGE

SPREAD FOOTION PIER DETAILS

DESIGNED : DOH. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Bunnag (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. ST.-17
		SHEET NO. 130



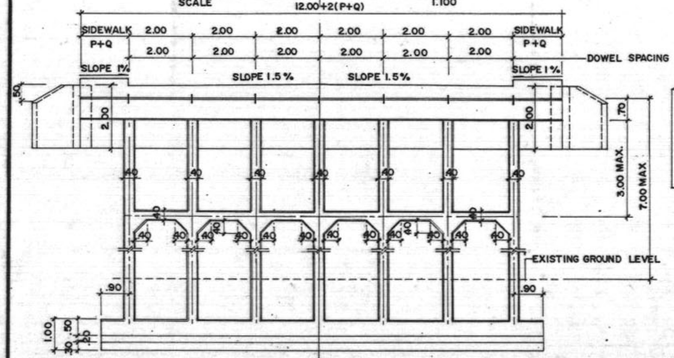
ELEVATION



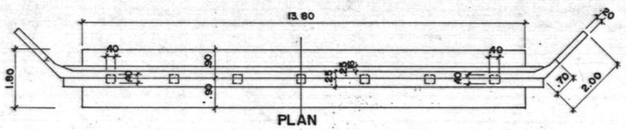
PLAN

DETAILS FOR 5.00 – 6.00 M. SPAN

SCALE 1:100



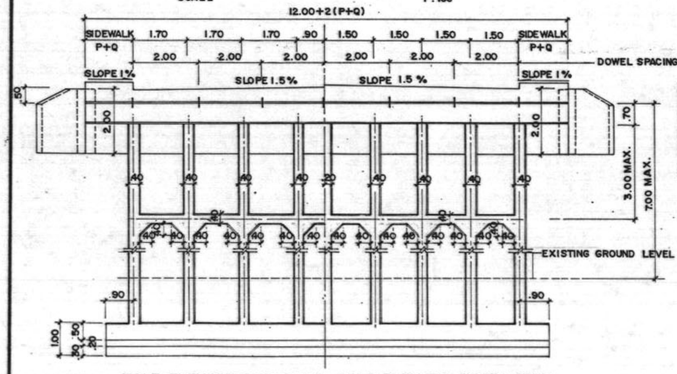
ELEVATION



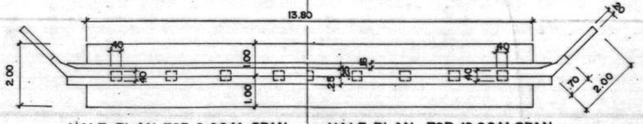
PLAN

DETAILS FOR 7.00–8.00 M. SPAN

SCALE 1:100



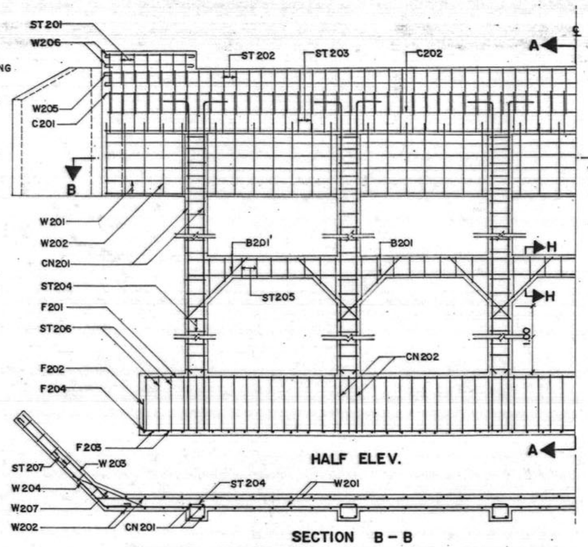
HALF ELEV. FOR 9.00 M. SPAN HALF ELEV. FOR 10.00 M. SPAN



HALF PLAN FOR 9.00 M. SPAN HALF PLAN FOR 10.00 M. SPAN

DETAILS FOR 9.00 M & 10.00 M. SPAN

SCALE 1:100



SECTION B – B

REINFORCEMENT DETAILS FOR 5.00 – 6.00 M. SPAN

SCALE 1:50

HALF ELEV.

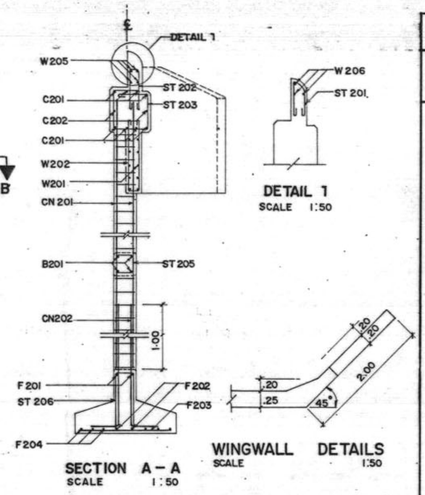
SECTION C – C

SCALE 1:50

SECTION D – D

REINFORCEMENT DETAILS FOR 7.00 – 8.00 M. SPAN

SCALE 1:50



DETAIL 1

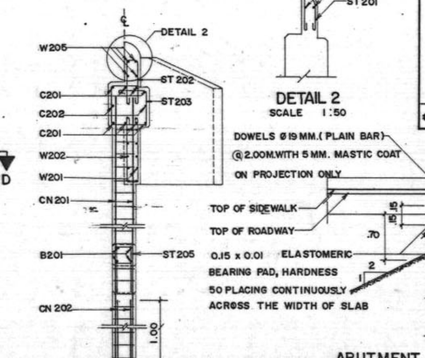
SCALE 1:50

WINGWALL DETAILS

SCALE 1:50

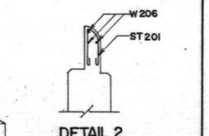
SECTION A – A

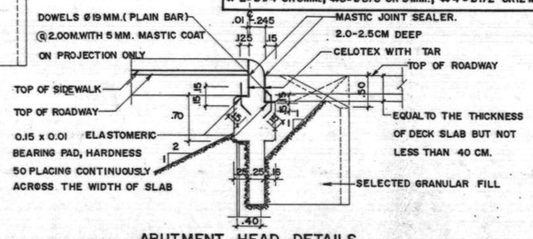
SCALE 1:50



DETAIL 2

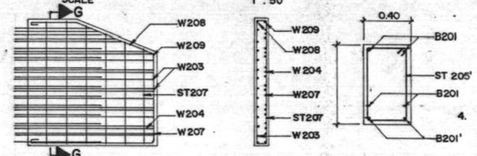
SCALE 1:50





ABUTMENT HEAD DETAILS

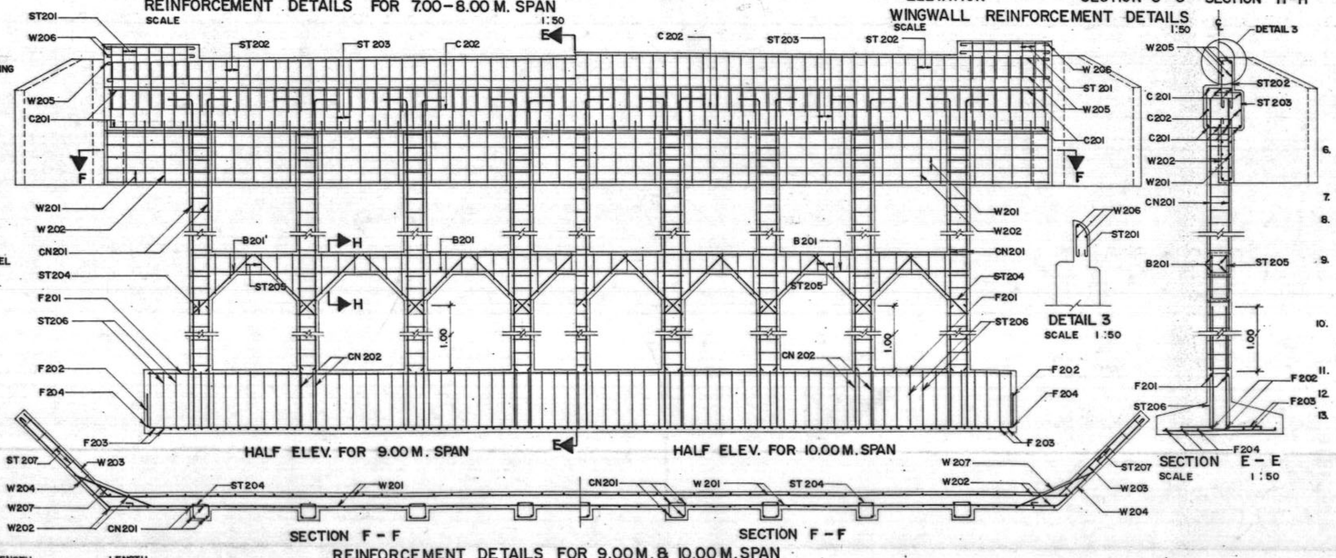
SCALE 1:50



ELEVATION SECTION G – G SECTION H – H

WINGWALL REINFORCEMENT DETAILS

SCALE 1:50



HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV. FOR 10.00 M. SPAN

SECTION F – F

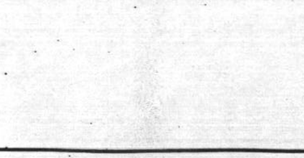
SECTION F – F

REINFORCEMENT DETAILS FOR 9.00 M. & 10.00 M. SPAN

SCALE 1:50

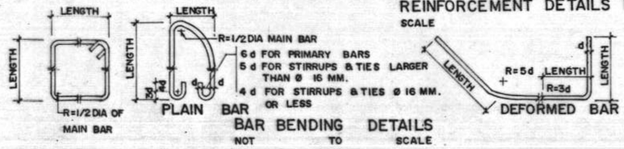
DETAIL 3

SCALE 1:50



SECTION E – E

SCALE 1:50



PLAIN BAR DEFORMED BAR

BAR BENDING DETAILS

NOT TO SCALE

TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M.				SPAN 6.00 M.				SPAN 7.00 M.				SPAN 8.00 M.				SPAN 9.00 M.				SPAN 10.00 M.			
		#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L
	C201	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
	C202	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	ST 201	2	.20	14	–	2	.20	14	–	2	.20	14	–	2	.20	14	–	2	30	14	–	2	.20	14	–
	ST 202	3	.20	75	–	3	.20	75	–	3	.20	75	–	3	.20	75	–	3	.20	75	–	3	.20	75	–
	ST 203	3	.20	75	–	3	.20	75	–	3	.20	75	–	3	.20	75	–	3	.20	75	–	3	.20	75	–
	ST204	3	.20	234	1.35	3	.20	234	1.35	3	.20	273	1.35	3	.20	273	1.35	3	.20	312	1.35	3	.20	351	1.35
	ST205	3	.25	50	1.35	3	.25	50	1.35	3	.25	36	1.35	3	.25	36	1.35	3	.25	30	1.35	3	.25	26	1.35
	ST 205'	3	.25	40	–	3	.25	40	–	3	.25	48	–	3	.25	48	–	3	.25	56	–	3	.25	64	–
	ST206	3	.20	69	2.55	3	.20	69	2.55	3	.20	69	2.55	3	.20	69	2.55	3	.20	69	2.55	3	.20	69	2.55
	ST 207	2	.30	12	–	2	.30	12	–	2	.30	12	–	2	.30	12	–	2	.30	12	–	2	.30	12	–
	B 201	8	–	8	12.30	8	–	8	12.30	8	–	8	12.30	8	–	8	12.30	8	–	8	12.30	8	–	8	12.30
	B201'	6	–	40	1.55	6	–	40	1.55	6	–	48	1.55	6	–	48	1.55	6	–	56	1.55	6	–	64	1.55
	CN 201	8	–	24	9.25	8	–	24	9.25	8	–	28	9.25	8	–	28	9.25	8	–	32	9.25	8	–	36	9.25
	CN 202	8	–	24	2.31	8	–	24	2.31	8	–	28	2.31	8	–	28	2.31	8	–	32	2.31	8	–	36	2.31
	F 201	8	–	2	13.70	8	–	2	13.70	8	–	2	13.70	8	–	2	13.70	8	–	2	13.70	8	–	2	13.70
	F 202	8	–	2	14.90	8	–	2	14.90	8	–	2	14.90	8	–	2	14.90	8	–	2	14.90	8	–	2	14.90
	F 203	4	.25	55	1.50	4	.25	55	1.50	4	.20	69	1.70	4	.20	69	1.70	4	.125	110	1.90	4	.125	110	1.90
	F204	4	–	6	13.70	4	–	6	13.70	4	–	6	13.70	4	–	6	13.70	4	–	6	13.70	4	–	6	13.70
	W 201	4	.20	10	–	4	.20	10	–	4	.20	10	–	4	.20	10	–	4	.20	10	–	4	.20	10	–
	W 202	2	.30	–	2.70	2	.30	–	2.60	2	.30	–	2.60	2	.30	–	2.50	2	.30	–	2.40	2	.30	24	2.30
	W 203	4	.15	24	–	4	.15	24	–	4	.15	24	–	4	.15	24	–	4	.15	24	–	4	.15	24	–
	W 204	2	.30	12	–	2	.30	12	–	2	.30	12	–	2	.30	12	–	2	.30	12	–	2	.30	12	–
	W 205	2	–	4	15.05	2	–	4	15.05	2	–	4	15.05	2	–	2	15.05	2	–	4	15.05	2	–	4	15.05
	W 206	2	–	6	1.55	2	–	6	1.55	2	–	6	1.55	2	–	6	1.55	2	–	6	1.55	2	–	6	1.55
	W 207	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15
	W 208	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435
	W 209	2	–	2	5.535	2	–	2	5.535	2	–	2	5535	2	–	2	5.535	2	–	2	5.535	4	–	2	5.535

2=Ø1/4"OR 6MM., #3=Ø3/8"OR 9MM., # 4 = Ø1/2" OR 12 MM., # 5 = Ø3/4"OR 20 MM., # 8=Ø1" OR 25 MM., NO=TOTAL AMOUNT OF BARS, L=TOTALL LENGTH OF EACH BARS

NOTES.

1. THE BOTTOM OF A FOOTING SHALL BE EMBEDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT IT'S CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED, 10 CM. THICKNESS OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND. COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 BY VOLUME.
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON./M.^{2}
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES:
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0M., AND
   b.) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0M, ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
4. CLEAR CONCRETE COVER SHALL BE 5.0CM. EXCEPT THE CAP BEAM, BACK WALL AND WINGWALLS AT WHICH A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
5. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 kg/M.^{3} AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 kg. /CM.^{2} FOR A .15 x .15 x .15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS

PORTLAND CEMENT	350	kg.
SAND	0.45	M.^{3}
CRUSHED ROCK OR GRAVEL	0.86	M.^{3}
CONCRETE SLUMP MAX.	10	CM.

6. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD30 DEFORMED BARS OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
7. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
9. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM WITHOUT ALTERING THE LOCATIONS OF REBARS.
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUN LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 10.0 M.
12. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
13. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5-106-14/8.

KINGDOM OF THAILAND

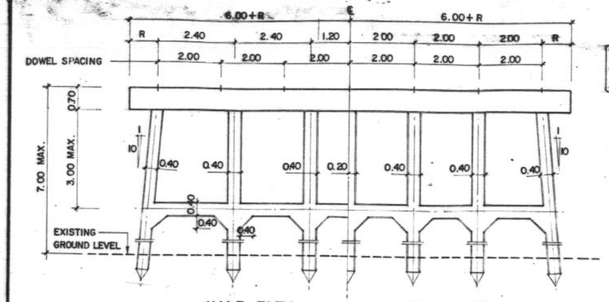
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

12.00 M. ROADWAY WIDTH SLAB BRIDGE

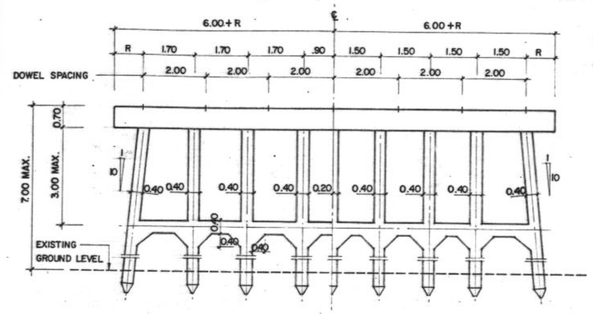
SPREAD FOOTING ABUTMENT DETAILS

DESIGNED : DOH. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. ST-18
		SHEET NO. 131



HALF ELEV. FOR 5.00 - 6.00 M. SPAN

HALF ELEV. FOR 7.00 - 8.00 M. SPAN

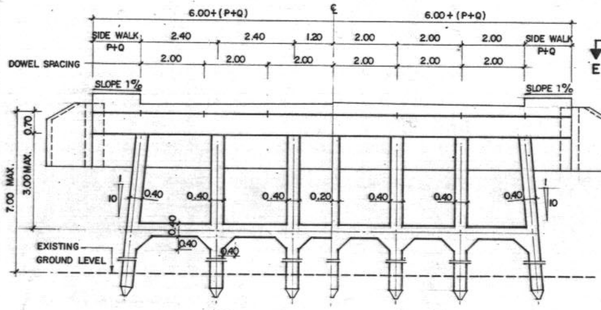


HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV. FOR 10.00 M. SPAN

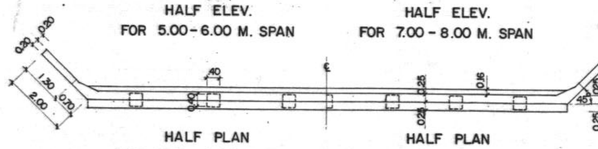
PILE BENT ELEVATION

SCALE 1:100



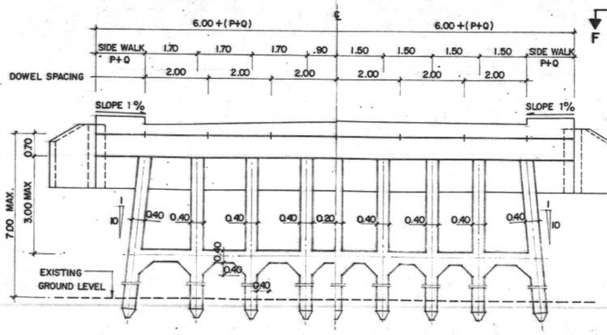
HALF ELEV. FOR 5.00 - 6.00 M. SPAN

HALF ELEV. FOR 7.00 - 8.00 M. SPAN



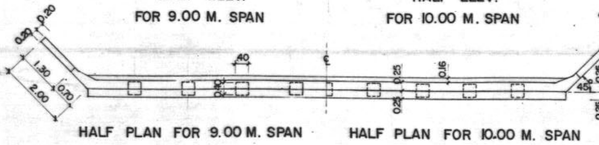
HALF PLAN FOR 5.00 - 6.00 M. SPAN

HALF PLAN FOR 7.00 - 8.00 M. SPAN



HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV. FOR 10.00 M. SPAN

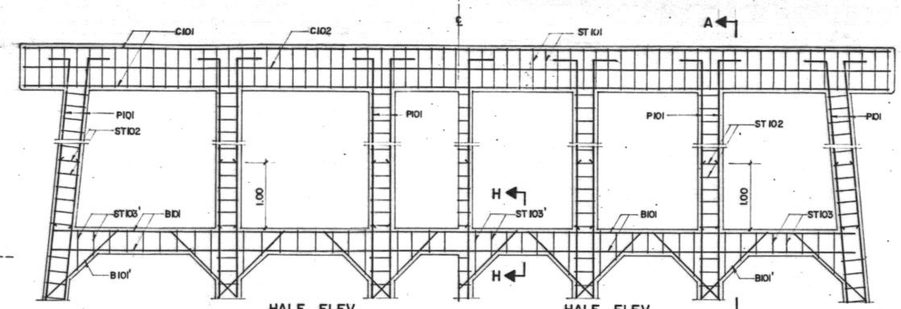


HALF PLAN FOR 9.00 M. SPAN

HALF PLAN FOR 10.00 M. SPAN

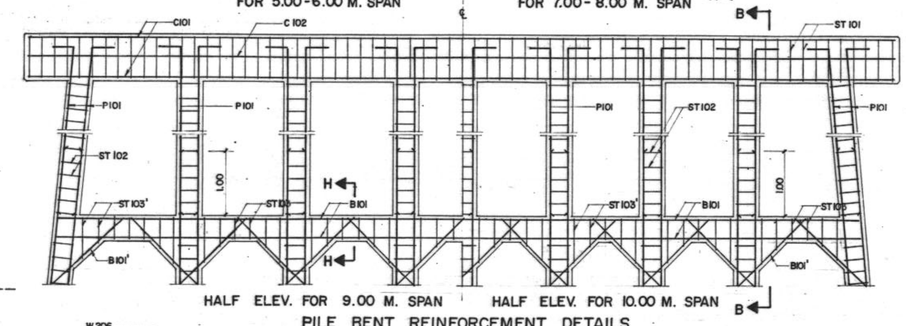
ABUTMENT DETAILS

SCALE 1:100



HALF ELEV. FOR 5.00-6.00 M. SPAN

HALF ELEV. FOR 7.00- 8.00 M. SPAN

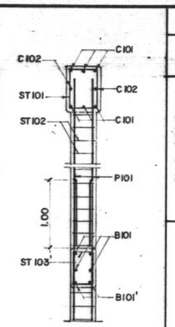


HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV. FOR 10.00 M. SPAN

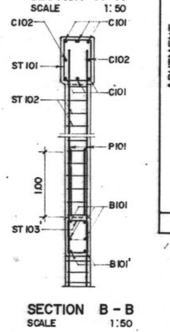
PILE BENT REINFORCEMENT DETAILS

SCALE 1:50



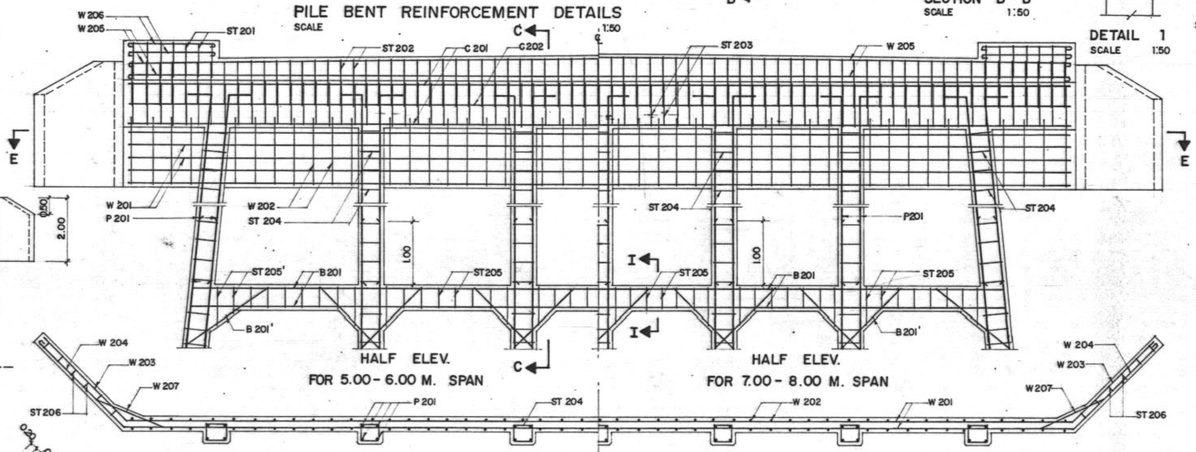
SECTION A-A

SCALE 1:50



SECTION B - B

SCALE 1:50

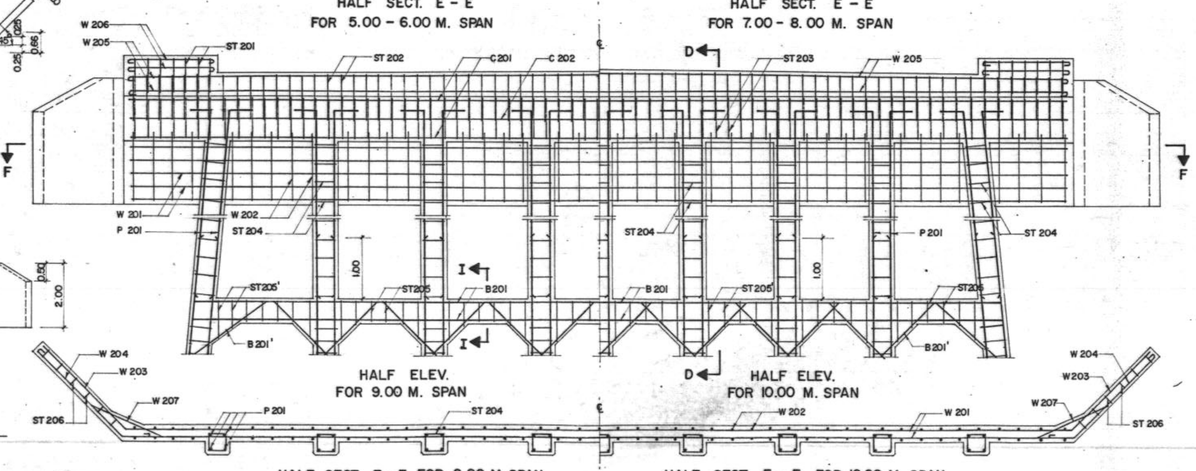


HALF ELEV. FOR 5.00 - 6.00 M. SPAN

HALF ELEV. FOR 7.00 - 8.00 M. SPAN

HALF SECT. E - E FOR 5.00 - 6.00 M. SPAN

HALF SECT. E - E FOR 7.00 - 8.00 M. SPAN



HALF ELEV. FOR 9.00 M. SPAN

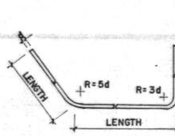
HALF ELEV. FOR 10.00 M. SPAN

HALF SECT. F - F FOR 9.00 M. SPAN

HALF SECT. F - F FOR 10.00 M. SPAN

ABUTMENT REINFORCEMENT DETAILS

SCALE 1:50



DEFORMED BAR

PLAIN BAR

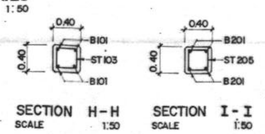
BAR BENDING DETAILS

NOT TO SCALE

6 d FOR PRIMARY BARS

5 d FOR STIRRUPS & TIES LARGER THAN Ø 16 MM.

4 d FOR STIRRUPS & TIES Ø 16 MM. OR LESS

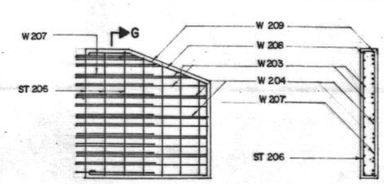


SECTION H-H

SCALE 1:50

SECTION I-I

SCALE 1:50



WINGWALL REINFORCEMENT DETAIL

SCALE 1:50

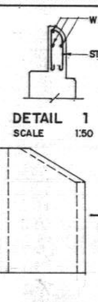
SECTION G-G

SCALE 1:50

TABLE OF REINFORCEMENT

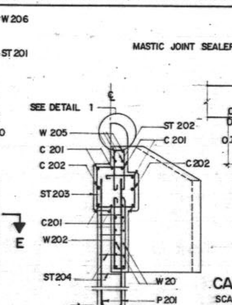
BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M. #	@	NO.	L	SPAN 6.00 M. #	@	NO.	L	SPAN 7.00 M. #	@	NO.	L	SPAN 8.00 M. #	@	NO.	L	SPAN 9.00 M. #	@	NO.	L	SPAN 10.00 M. #	@	NO.	L
PILE BENT	C 101	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–
	C 102	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	ST 101	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35
	ST 102	3	0.20	84	1.35	3	0.20	84	1.35	3	0.20	98	1.35	3	0.20	112	1.35	3	0.20	125	1.35	3	0.20	125	1.35
	ST 103	3	0.20	31	1.35	3	0.25	31	1.35	3	0.25	20	1.35	3	0.25	20	1.35	3	0.25	16	1.35	3	0.25	10	1.35
	ST 103'	3	0.25	16	–	3	0.25	16	–	3	0.25	24	–	3	0.25	24	–	3	0.25	28	–	3	0.25	32	–
	B 101	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	1.35
	B 101'	6	–	16	1.55	6	–	16	1.55	6	–	24	1.55	6	–	24	1.55	6	–	28	1.55	6	–	32	1.55
	P 101	8	–	24	3.75	8	–	24	3.75	8	–	28	3.75	8	–	28	3.75	8	–	32	3.75	8	–	36	3.75
ABUTMENT	C 201	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
	C 202	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	ST 201	2	0.20	–	1.215	2	0.20	–	1.295	2	0.20	–	1.355	2	0.20	–	1.435	2	0.20	–	1.515	2	0.20	–	1.615
	ST 202	3	0.20	–	1.745	3	0.20	–	1.795	3	0.20	–	1.845	3	0.20	–	1.895	3	0.20	–	1.945	3	0.20	–	1.995
	ST 203	3	0.20	–	–	3	0.20	–	–	3	0.20	–	–	3	0.20	–	–	3	0.20	–	–	3	0.20	–	–
	ST 204	3	0.20	84	1.35	3	0.20	84	1.35	3	0.20	98	1.35	3	0.20	98	1.35	3	0.20	112	1.35	3	0.20	125	1.35
	ST 205	3	0.25		1.35	3	0.25		1.35	3	0.25		1.35	3	0.25		1.35	3	0.25		1.35	3	0.25		1.35
	ST 205'	3	0.25	16	–	3	0.25	16	–	3	0.25	24	–	3	0.25	24	–	3	0.25	28	–	3	0.25	32	–
	ST 206	3	0.30	12	–	3	0.30	12	–	3	0.30	12	–	3	0.30	12	–	3	0.30	12	–	3	0.30	12	–
	B 201	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–
	B 201'	6	–	16	1.55	6	–	16	1.55	6	–	24	1.55	6	–	24	1.55		–	28	1.55		–	32	1.55
	P 201	8	–	24	3.75	8	–	24	3.75	8	–	28	3.75	8	–	28	3.75	8	–	32	3.75	8	–	36	3.75
	W 201	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–
	W 202	2	0.30	–	2.70	2	0.30	–	2.60	2	0.30	–	2.60	2	0.30	–	2.50	2	0.30	–	2.40	2	0.30	–	2.40
	W 203	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–
	W 204	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
	W 205	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–
	W 206	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–
	W 207	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15
	W 208	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435
	W 209	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535

2 = Ø 1/4" OR 6 MM., # 3 = Ø 3/8" OR 9 MM., # 4 = Ø 1/2" OR 12 MM., # 6 = Ø 3/4" OR 20 MM., # 8 = Ø 1" OR 25 MM., NO = TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BAR



DETAIL 1

SCALE 1:50

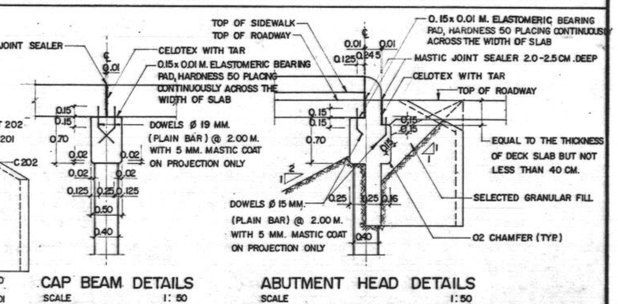


CAP BEAM DETAILS

SCALE 1:50

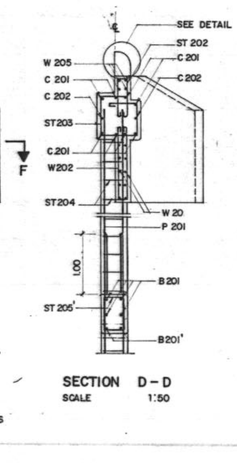
SECTION C - C

SCALE 1:50



ABUTMENT HEAD DETAILS

SCALE 1:50



SECTION D - D

SCALE 1:50

NOTES :

1. EACH PILE SHALL BE DRIVEN TO A DEPTH WHERE SCOUR WILL NOT AFFECT CAPACITY AND SHALL HAVE A MINIMUM ULTIMATE BEARING CAPACITY OF 90 TONS FOR PILE DETAILS SEE DWG.NO. MS-02,MS-03
2. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES
   a. IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b. IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0 M., ADDITIONAL BRACING SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
3. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, BACK WALL AND WINGWALLS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED
4. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG./M. AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG./CM. FOR A 0.15 x 0.15 x 0.15 M. CUBE AT 28 DAYS CEMENT SHALL SHALL BE TIS 15 TYPE 1 PORTLAND CEMENT A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350 KG.
SAND	0.43 M^3
CRUSHED ROCK OR GRAVEL	0.86 M^3
CONCRETE SLUMP MAX.	10 CM.

5. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD.30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR.24 PLAIN BARS UNLESS OTHERWISE INDICATED
6. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER
7. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS
8. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT CEMENT TYPE 5 CONFROMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM, BACK WALL AND WINGWALLS WITHOUT ALTERING THE LOCATION OF REBARS
9. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HEIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL
10. ALL DIAMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 10.00 M.
12. THIS DRAWING IS ADAPTED FROM DOH. DWG. NO. 3AD5-106-14/9

KINGDOM OF THAILAND

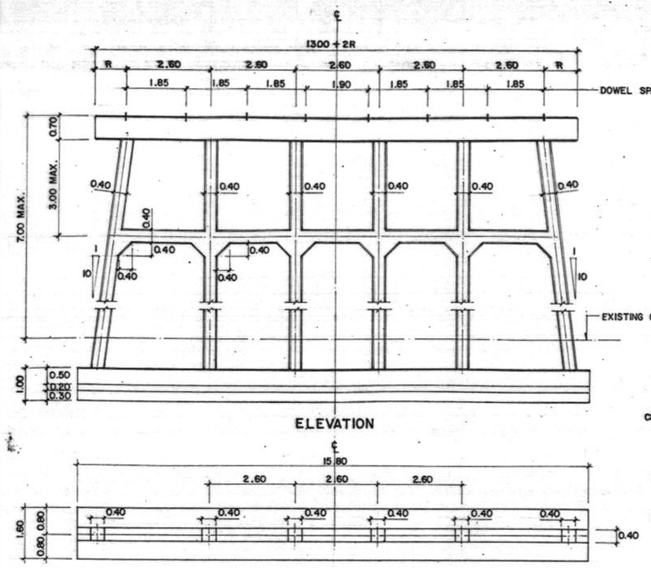
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

12.00 M. ROADWAY WIDTH SLAB BRIDGE

PILE BENT AND ABUTMENT DETAILS

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. ST-19
		SHEET NO. 132

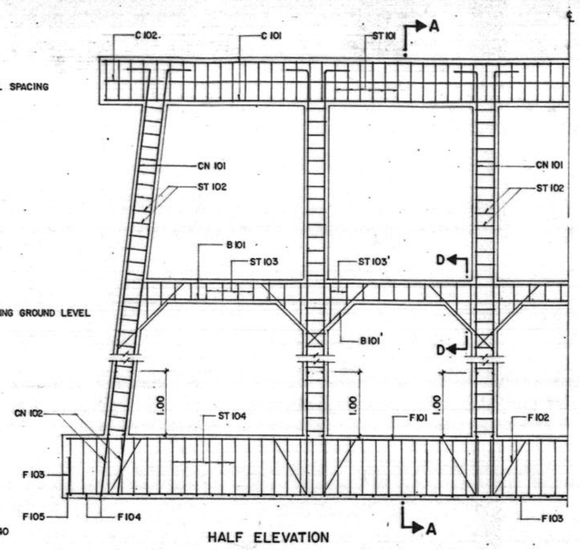


ELEVATION

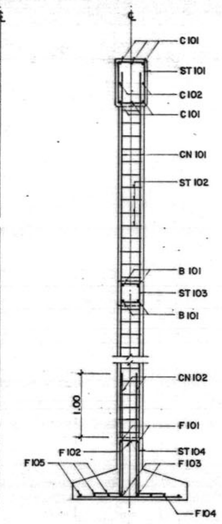
FOOTING PLAN

PIER DETAIL FOR 5.00 – 6.00 M. SPAN

SCALE 1 : 100



HALF ELEVATION

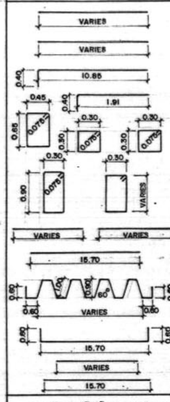


SECTION A – A

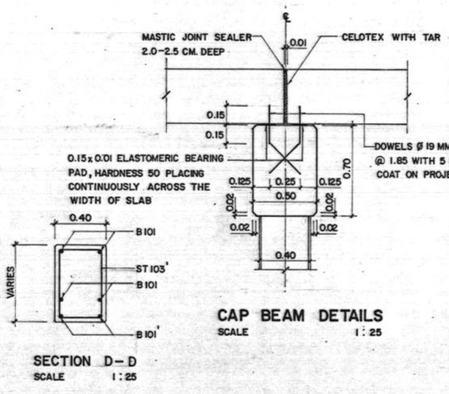
REINFORCEMENT DETAILS FOR 5.00 – 6.00 M. SPAN

SCALE 1 : 50

TABLE OF REINFORCEMENT

BAR BENDING DIAGRAM	BAR MARK	SPAN 5.00 M. #	@	NO.	L	SPAN 6.00 M. #	@	NO.	L	SPAN 7.00 M. #	@	NO.	L	SPAN 8.00 M. #	@	NO.	L	SPAN 9.00 M. #	@	NO.	L	SPAN 10.00 M. #	@	NO.	L
	C101	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–
	C102	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	CN101	8	–	24	11.25	8	–	24	11.25	8	–	32	11.25	8	–	32	11.25	8	–	36	11.25	8	–	40	11.25
	CN102	8	–	24	2.31	8	–	24	2.31	8	–	32	2.31	8	–	32	2.31	8	–	36	2.31	8	–	40	2.31
	ST101	3	0.20	74	2.35	3	0.20	74	2.35	3	0.20	74	2.35	3	0.20	74	2.35	3	0.20	74	2.35	3	0.20	74	2.35
	ST102	3	0.20	288	1.35	3	0.20	288	1.35	3	0.20	384	1.35	3	0.20	384	1.35	3	0.20	432	1.35	3	0.20	480	1.35
	ST103	3	0.25	78	1.35	3	0.25	78	1.35	3	0.25	66	1.35	3	0.25	66	1.35	3	0.25	55	1.35	3	0.25	55	1.35
	ST103'	3	–	24	–	3	–	24	–	3	–	32	–	3	–	32	–	3	–	48	–	3	–	48	–
	ST104	3	0.20	79	2.55	3	0.20	79	2.55	3	0.20	79	2.55	3	0.20	79	2.55	3	0.20	79	2.55	3	0.20	79	2.55
	B101	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
	B101'	8	–	24	1.55	8	–	24	1.55	8	–	32	1.55	8	–	32	1.55	8	–	48	1.55	8	–	48	1.55
	F101	8	–	2	15.70	8	–	2	15.70	8	–	2	15.70	8	–	2	15.70	8	–	2	15.70	8	–	2	15.70
	F102	8	–	1	–	8	–	1	–	8	–	1	–	8	–	1	–	8	–	1	–	8	–	1	–
	F103	8	–	2	16.90	8	–	2	16.90	8	–	2	16.90	8	–	2	16.90	8	–	2	16.90	8	–	2	16.90
	F104	4	0.25	63	1.50	4	0.25	63	1.50	4	0.20	79	1.70	4	0.20	79	1.70	4	0.125	126	1.90	4	0.125	126	1.90
	F105	4	–	6	15.70	4	–	6	15.70	4	–	6	15.70	4	–	6	15.70	4	–	6	15.70	4	–	6	15.70

3 = ø 3/8" OR 9 MM., # 4 = ø 1/2" OR 12 MM., # 6 = ø 3/4" OR 20 MM., # 8 = ø 1" OR 25 MM., NO. = TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BAR

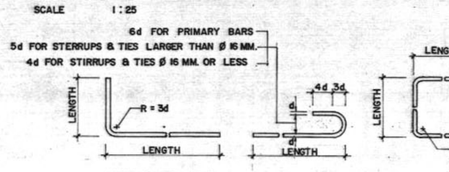


CAP BEAM DETAILS

SCALE 1 : 25

SECTION D – D

SCALE 1 : 25



DEFORMED BAR PLAIN BAR

BAR BENDING DETAILS

NOT TO SCALE

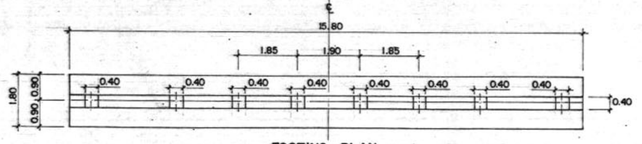
NOTES :

1. THE BOTTOM OF A FOOTING SHALL BE EMBEDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT ITS CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED, 10 CM. THICK OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND. COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 BY VOLUME.
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON/M.^{2}
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES :
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEED 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b.) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEED 3.0 M., ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
5. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 Kg./M.^{3} AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 Kg./CM.^{2} FOR A .15 x .15 x .15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350	Kg.
SAND	0.45	M.^{3}
CRUSHED ROCK OR GRAVEL	0.86	M.^{3}
CONCRETE SLUMP MIX.	10	CM.

6. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
7. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
9. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM WITHOUT ALTERING THE LOCATIONS OF REBARS.
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING CANAL BED TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 12.0 M.
12. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
13. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5 – 106 – M/23.

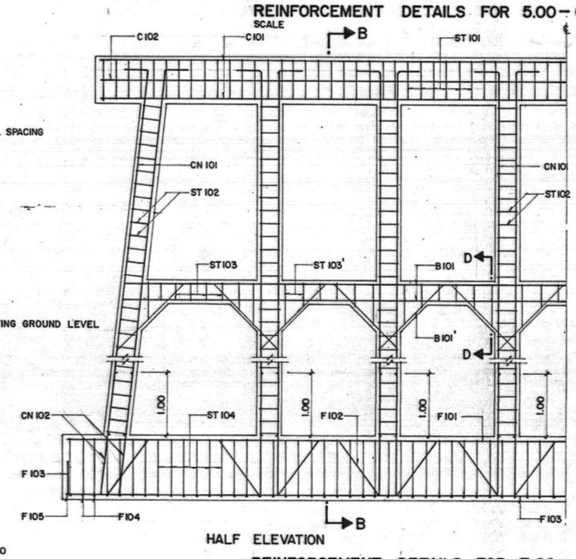
ELEVATION



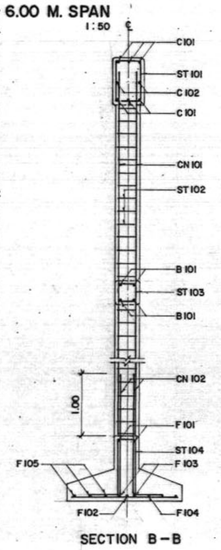
FOOTING PLAN

PIER DETAIL FOR 7.00 – 8.00 M. SPAN

SCALE 1 : 100



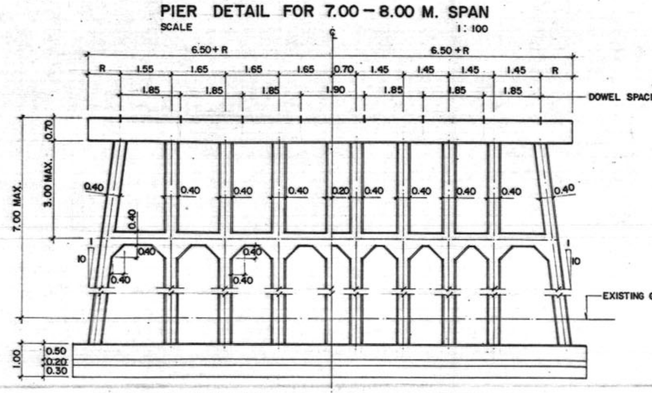
HALF ELEVATION



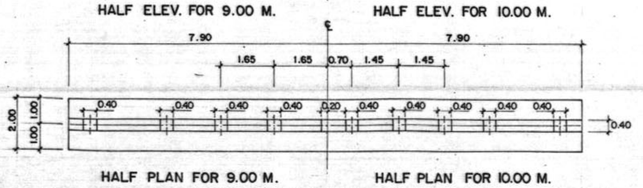
SECTION B – B

REINFORCEMENT DETAILS FOR 7.00 – 8.00 M. SPAN

SCALE 1 : 50



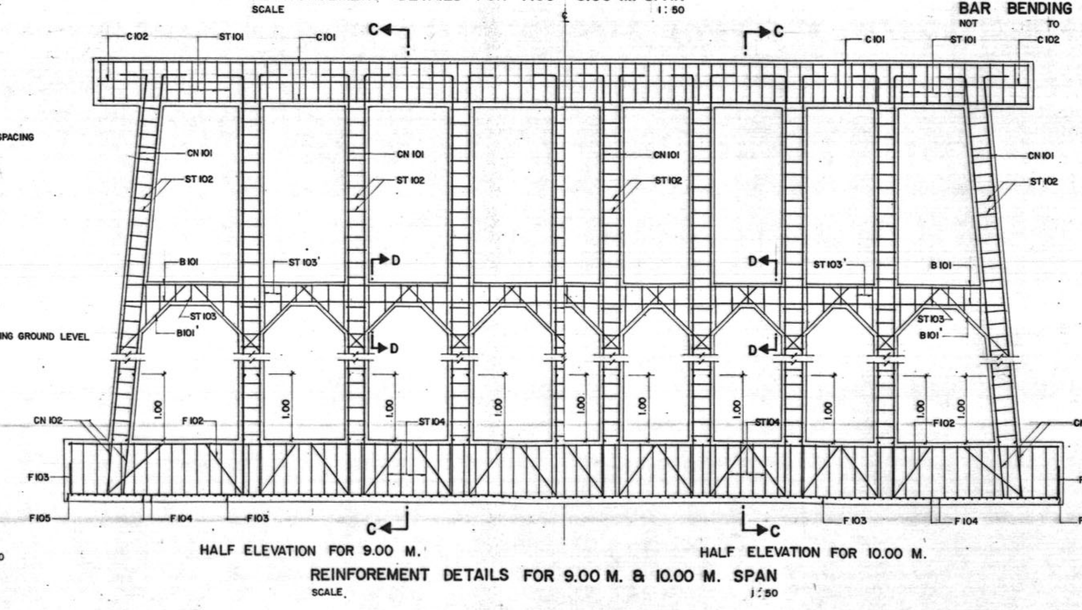
HALF ELEV. FOR 9.00 M. HALF ELEV. FOR 10.00 M.



HALF PLAN FOR 9.00 M. HALF PLAN FOR 10.00 M.

PIER DETAILS FOR 9.00 M. & 10.00 M. SPAN

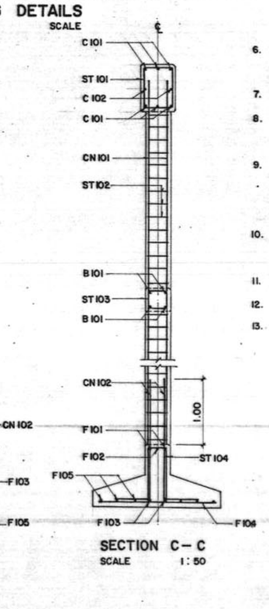
SCALE 1 : 100



HALF ELEVATION FOR 9.00 M. HALF ELEVATION FOR 10.00 M.

REINFOREMENT DETAILS FOR 9.00 M. & 10.00 M. SPAN

SCALE 1 : 50



SECTION C – C

SCALE 1 : 50

KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS

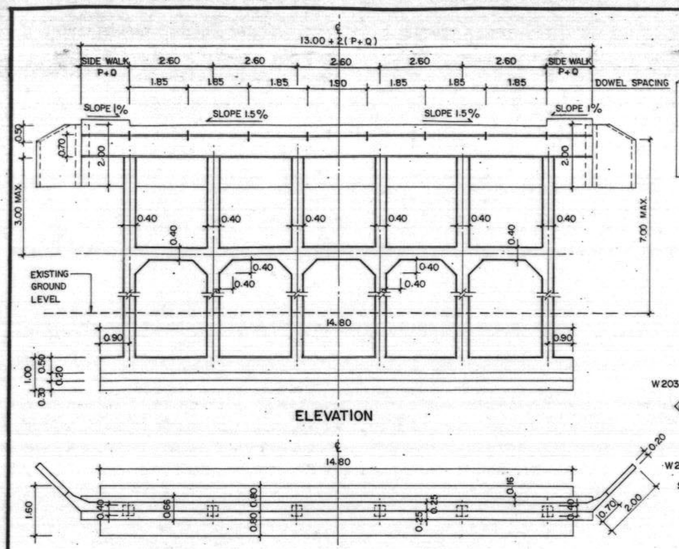
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

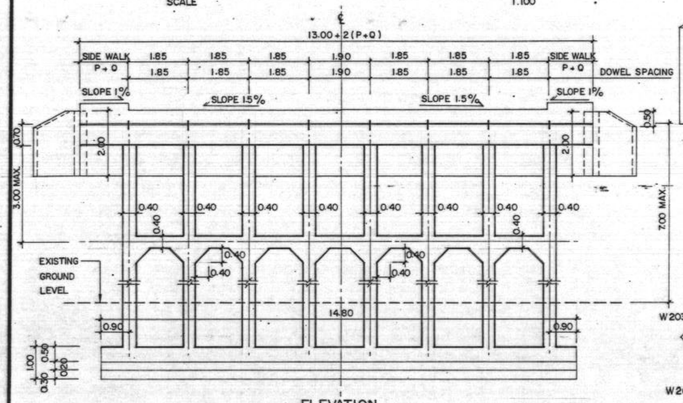
13.00 ROADWAY WIDTH SLAB BRIDGE

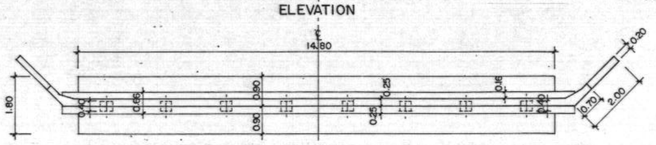
SPREAD FOOTING PIER DETAILS

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Buranagy (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : For (DIRECTOR GENERAL)		DWG. NO. ST – 20
		SHEET NO. 133

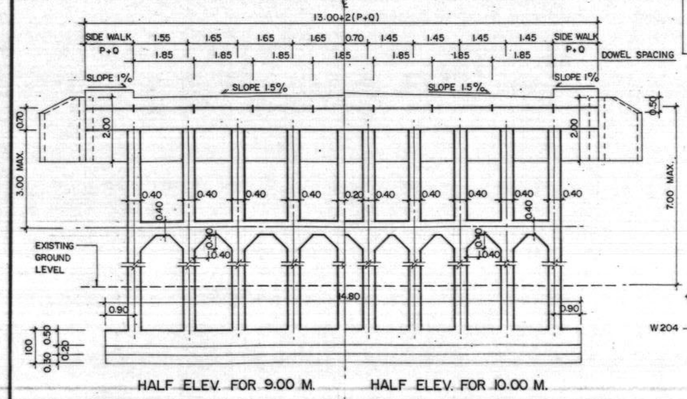


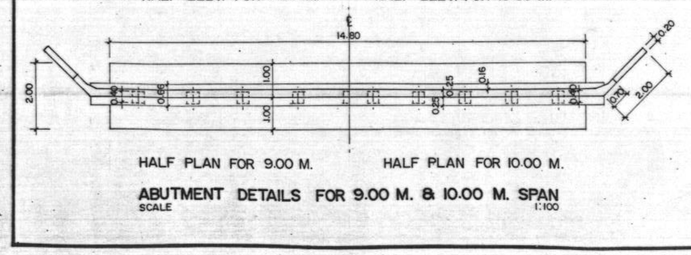
ABUTMENT DETAILS FOR 5.00-6.00 M. SPAN
SCALE 1:100



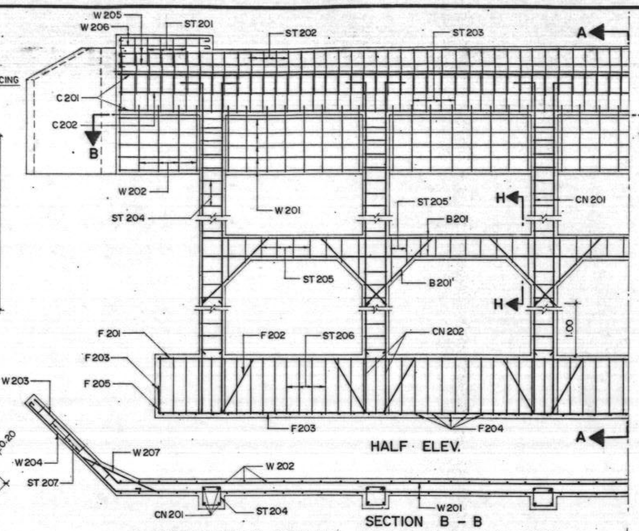


ABUTMENT DETAILS FOR 7.00-8.00 M. SPAN
SCALE 1:100

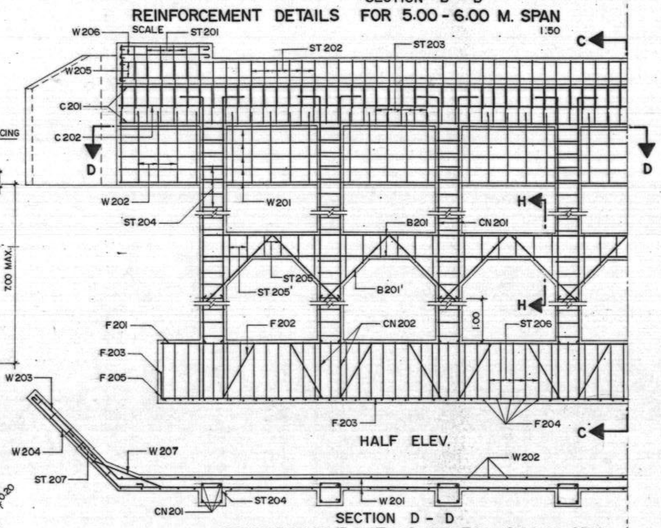




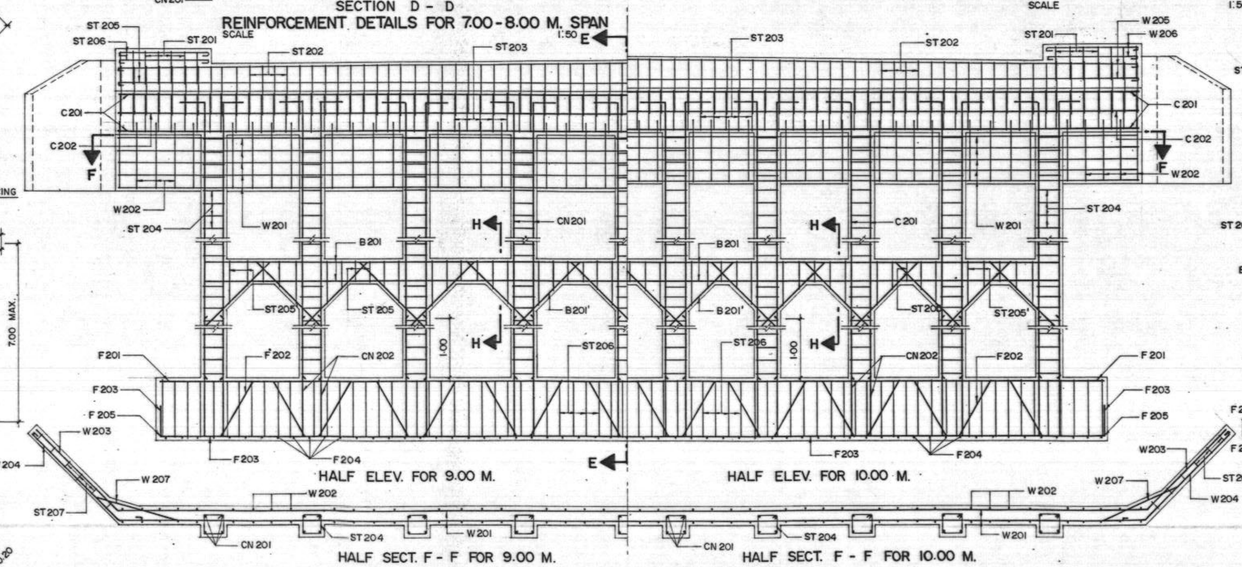
ABUTMENT DETAILS FOR 9.00 M. & 10.00 M. SPAN
SCALE 1:100



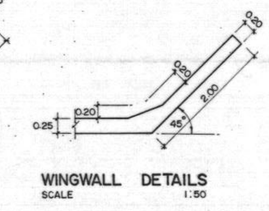
REINFORCEMENT DETAILS FOR 5.00-6.00 M. SPAN
SCALE 1:50



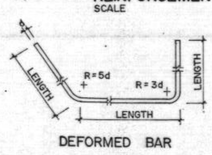
REINFORCEMENT DETAILS FOR 7.00-8.00 M. SPAN
SCALE 1:50



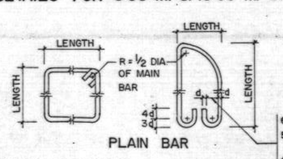
REINFORCEMENT DETAILS FOR 9.00 M. & 10.00 M. SPAN
SCALE 1:50



WINGWALL DETAILS
SCALE 1:50



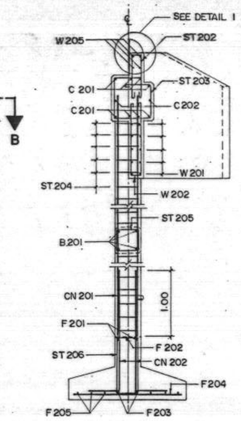
DEFORMED BAR



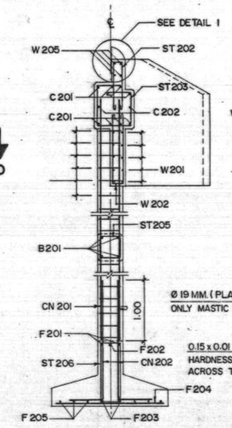
PLAIN BAR

6d FOR PRIMARY BARS
5d FOR STIRRUPS & TIES LARGER THAN Ø 16 MM.
4d FOR STIRRUPS & TIES Ø 16 MM. OR LESS

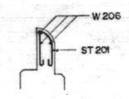
BAR BENDING DETAILS
NOT TO SCALE



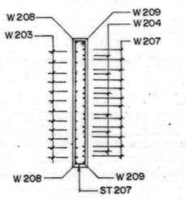
SECTION A - A
SCALE 1:50



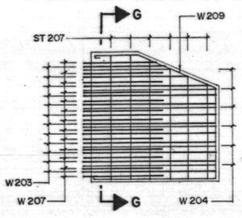
SECTION C - C
SCALE 1:50



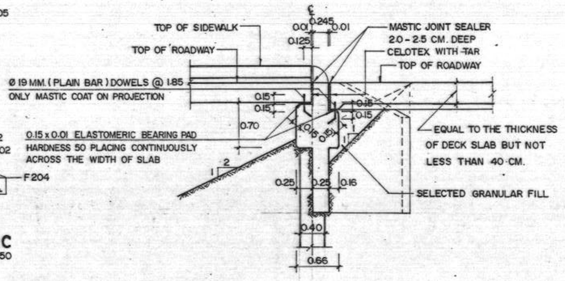
DETAIL I
SCALE 1:50



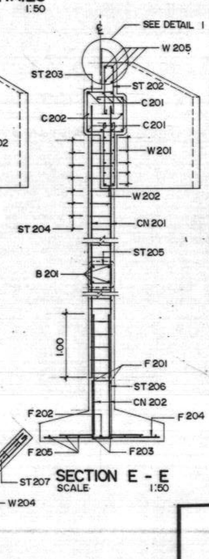
SECTION G - G
SCALE 1:50



ELEVATION WINGWALL
REINFORCEMENT DETAILS
SCALE 1:50



ABUTMENT HEAD DETAILS
SCALE 1:50



SECTION E - E
SCALE 1:50

TABLE OF REINFORCEMENT

BAR MARK	BAR BENDING DIAGRAMS	SPAN 5.00 M. #	@	NO	L	SPAN 6.00 M. #	@	NO	L	SPAN 7.00 M. #	@	NO	L	SPAN 8.00 M. #	@	NO	L	SPAN 9.00 M. #	@	NO	L	SPAN 10.00 M. #	@	NO	L
C 201		8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
C 202		4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
ST 201		2	0.20	14	1.215	2	0.20	14	1.290	2	0.20	14	1.355	2	0.20	14	1.435	2	0.20	14	1.515	2	0.20	14	1.635
ST 202		3	0.20	80	1.745	3	0.20	80	1.790	3	0.20	80	1.845	3	0.20	80	1.895	3	0.20	80	1.945	3	0.20	80	1.995
ST 203		3	0.20	80	–	3	0.20	80	–	3	0.20	80	–	3	0.20	80	–	3	0.20	80	–	3	0.20	80	–
ST 204		3	0.20	234	1.35	3	0.20	234	1.35	3	0.20	312	1.35	3	0.20	312	1.35	3	0.20	351	1.35	3	0.20	390	1.35
ST 205		3	0.25	50	1.35	3	0.25	50	1.35	3	0.25	30	1.35	3	0.25	30	1.35	3	0.25	20	1.35	3	0.25	18	1.35
ST 205'		3	–	40	–	3	–	40	–	3	–	56	–	3	–	56	–	3	–	64	–	3	–	72	–
ST 206		3	0.20	74	2.55	3	0.20	74	2.55	3	0.20	74	2.55	3	0.20	74	2.55	3	0.20	74	2.55	3	0.20	74	2.55
ST 207		2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
B 201		8	–	8	13.30	8	–	8	13.30	8	–	8	13.30	8	–	8	13.30	8	–	8	13.30	8	–	8	13.30
B 201'		6	–	40	1.55	6	–	40	1.55	6	–	56	1.55	6	–	56	1.55	6	–	64	1.55	6	–	72	1.55
CN 201		8	–	24	9.25	8	–	24	9.25	8	–	32	9.25	8	–	32	9.25	8	–	36	9.25	8	–	40	9.25
CN 202		8	–	24	2.31	8	–	24	2.31	8	–	32	2.31	8	–	32	2.31	8	–	36	2.31	8	–	40	2.31
F 201		8	–	2	14.70	8	–	2	14.70	8	–	2	14.70	8	–	2	14.70	8	–	2	14.70	8	–	2	14.70
F 202		8	–	1	–	8	–	1	–	8	–	1	–	8	–	1	–	8	–	1	–	8	–	1	–
F 203		8	–	2	15.50	8	–	2	15.50	8	–	2	15.50	8	–	2	15.50	8	–	2	15.50	8	–	2	15.50
F 204		4	0.25	59	1.50	4	0.25	59	1.50	4	0.20	73	1.70	4	0.20	73	1.70	4	0.25	118	1.90	4	0.125	118	1.90
F 205		4	–	6	14.70	4	–	6	14.70	4	–	6	14.70	4	–	6	14.70	4	–	6	14.70	4	–	6	14.70
W 201		4	0.20	10	15.90	4	0.20	10	15.90	4	0.20	10	15.90	4	0.20	10	15.90	4	0.20	10	15.90	4	0.20	10	15.90
W 202		2	0.30	53	2.70	2	0.30	53	2.60	2	0.30	53	2.60	2	0.30	53	2.50	2	0.30	53	2.40	2	0.30	53	2.30
W 203		4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–
W 204		2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
W 205		2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–
W 206		2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–
W 207		4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15
W 208		4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435
W 209		2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535

2 = Ø1/4" OR 6 MM., # 3 = Ø3/8" OR 9 MM., # 4 = Ø1/2" OR 12 MM., # 8 = Ø1" OR 25 MM., NO = TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BAR

NOTES :

1 THE BOTTOM OF A FOOTING SHALL BE EMBEDDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT IT'S CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED 10 CM. THICK OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 BY VOLUME
2 SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON/M^2
3 HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES :
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0 M., ADDITIONAL BRACING SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
4 CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, BACK WALL AND WINGWALLS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED
5 CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG./M^3 AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG./CM^2 FOR A 15 x 15 x 15 CM. CURB AT 28 DAYS CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350	KG.
SAND	0.45	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRET SLUMP / MAX.	10	CM.

6 REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS, OTHER SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED
7 LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY ENGINEER
8 LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS
9 IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM, BACK WALL AND WINGWALLS WITHOUT ALTERING THE LOCATIONS OF REBARS
10 THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING CANALBED TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL
11 QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 10.00 M.
12 ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED
13 THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5-106-14/23

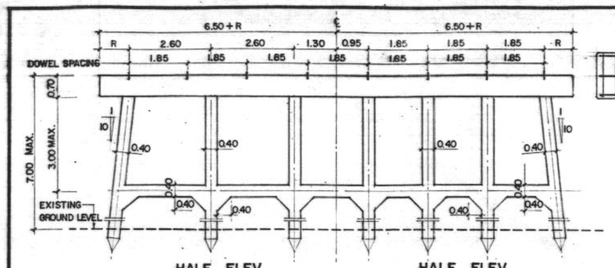
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

13.00 M. ROADWAY WIDTH SLAB BRIDGE

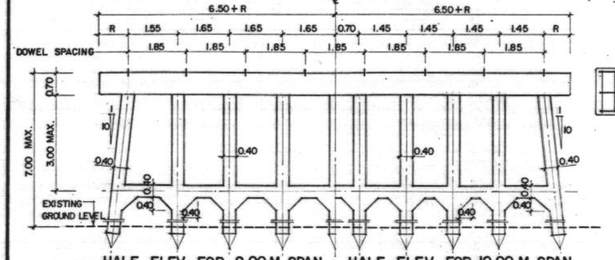
SPREAD FOOTING ABUTMENT DETAILS

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. ST-21
		SHEET NO. 134



HALF ELEV. FOR 5.00 - 6.00 M. SPAN

HALF ELEV. FOR 7.00 - 8.00 M. SPAN

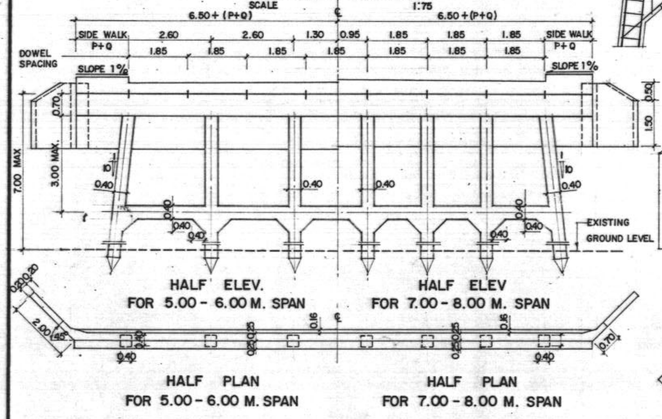


HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV. FOR 10.00 M. SPAN

PILE BENT ELEVATION

SCALE 1:75

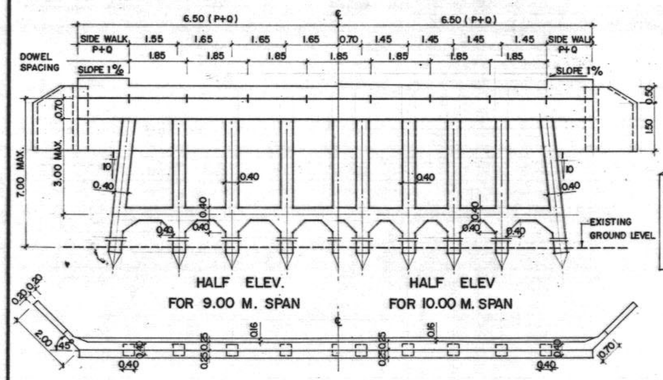


HALF ELEV. FOR 5.00 - 6.00 M. SPAN

HALF ELEV. FOR 7.00 - 8.00 M. SPAN

HALF PLAN FOR 5.00 - 6.00 M. SPAN

HALF PLAN FOR 7.00 - 8.00 M. SPAN



HALF ELEV. FOR 9.00 M. SPAN

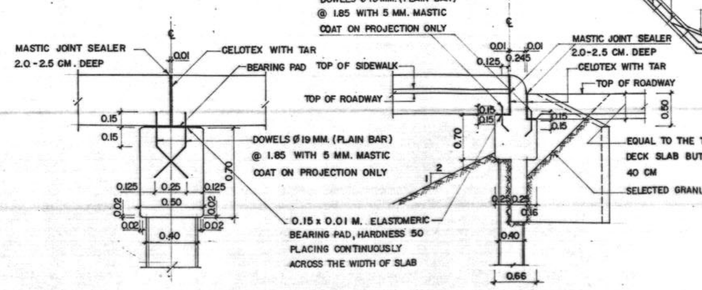
HALF ELEV. FOR 10.00 M. SPAN

HALF PLAN FOR 9.00 M. SPAN

HALF PLAN FOR 10.00 M. SPAN

ABUTMENT DETAILS

SCALE 1:75

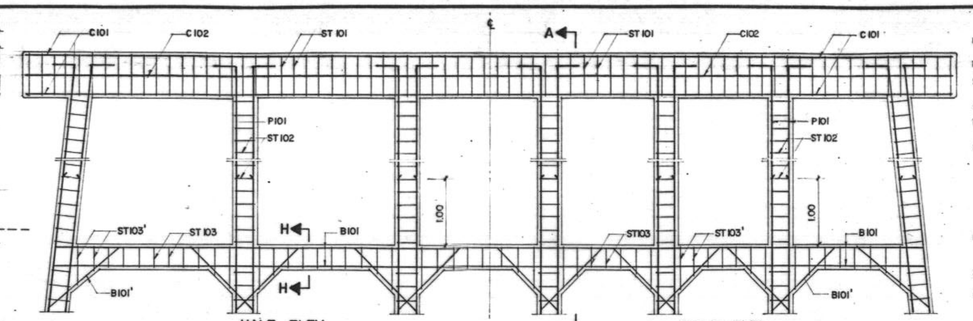


CAP BEAM DETAILS

SCALE 1:25

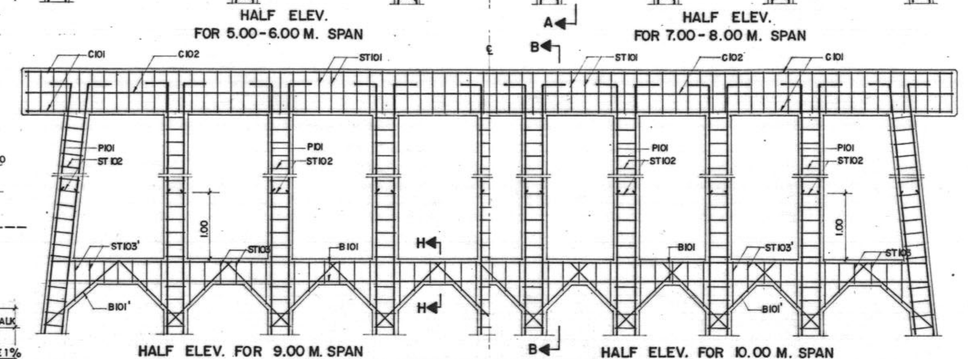
ABUTMENT HEAD DETAILS

SCALE 1:50



HALF ELEV. FOR 5.00 - 6.00 M. SPAN

HALF ELEV. FOR 7.00 - 8.00 M. SPAN

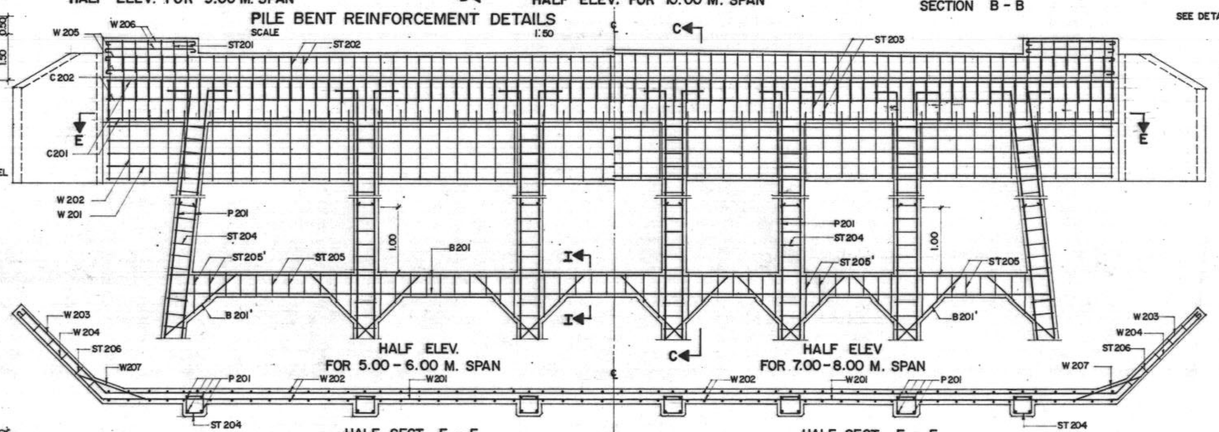


HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV. FOR 10.00 M. SPAN

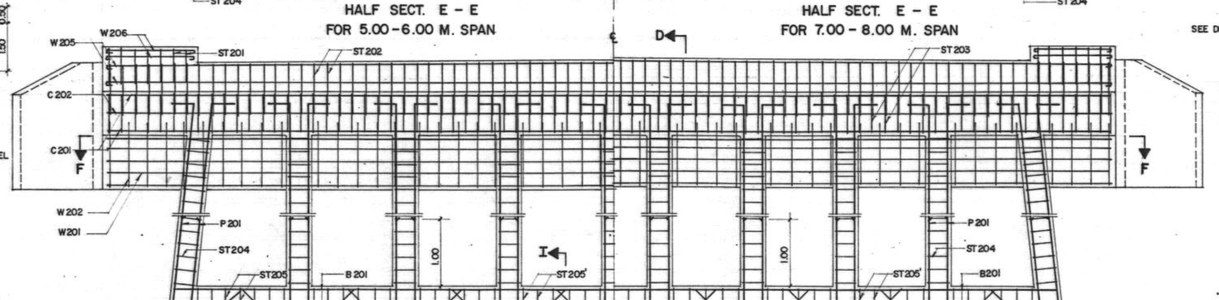
PILE BENT REINFORCEMENT DETAILS

SCALE 1:50



HALF ELEV. FOR 5.00 - 6.00 M. SPAN

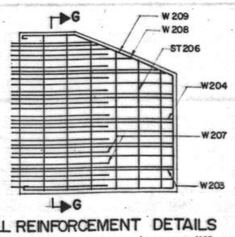
HALF ELEV. FOR 7.00 - 8.00 M. SPAN



HALF ELEV. FOR 9.00 M. SPAN

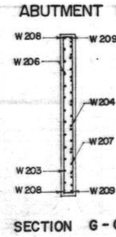
HALF ELEV. FOR 10.00 M. SPAN

ABUTMENT REINFORCEMENT DETAILS

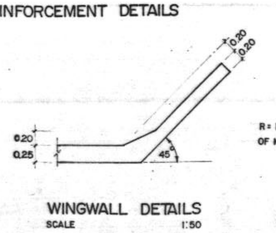


WINGWALL REINFORCEMENT DETAILS

SCALE 1:40

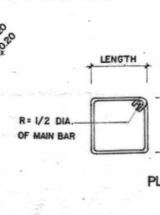


SECTION G - G

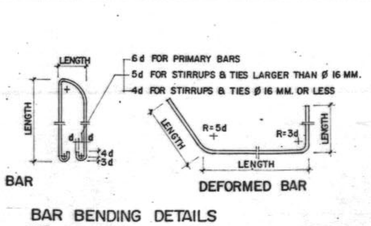


WINGWALL DETAILS

SCALE 1:50



PLAIN BAR

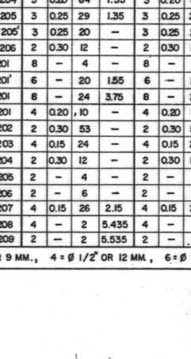


DEFORMED BAR

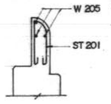
BAR BENDING DETAILS

NOT TO SCALE

SECTION C - C

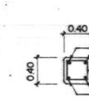


SECTION D - D

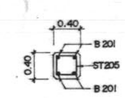


DETAIL 1

SCALE 1:50



SECTION H-H



SECTION I - I

TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M. #	@	NO.	L	SPAN 6.00 M. #	@	NO.	L	SPAN 7.00 M. #	@	NO.	L	SPAN 8.00 M. #	@	NO.	L	SPAN 9.00 M. #	@	NO.	L	SPAN 10.00 M. #	@	NO.	L
PILE BENT	C101	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–
	C102	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	ST101	3	0.20	74	2.35	3	0.20	74	2.35	3	0.20	74	2.35	3	0.20	74	2.35	3	0.20	74	2.35	3	0.20	74	2.35
	ST102	3	0.20	84	1.35	3	0.20	84	1.35	3	0.20	112	1.35	3	0.20	112	1.35	3	0.20	126	1.35	3	0.20	140	1.35
	ST103	3	0.25	29	1.35	3	0.25	29	1.35	3	0.25	19	1.35	3	0.25	19	1.35	3	0.25	16	1.35	3	0.25	11	1.35
	ST103'	3	0.25	20	–	3	0.25	20	–	3	0.25	28	–	3	0.25	28	–	3	0.25	32	–	3	0.25	36	–
	B101	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–
	B101'	6	–	20	1.55	6	–	20	1.55	6	–	28	1.55	6	–	28	1.55	6	–	32	1.55	6	–	36	1.55
	P101	8	–	24	3.75	8	–	24	3.75	8	–	32	3.75	8	–	32	3.75	8	–	36	3.75	8	–	40	3.75
ABUTMENT	C201	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
	C202	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	ST201	2	0.20	14	–	2	0.20	14	–	2	0.20	14	–	2	0.20	14	–	2	0.20	14	–	2	0.20	14	–
	ST202	3	0.20	80	–	3	0.20	80	–	3	0.20	80	–	3	0.20	80	–	3	0.20	80	–	3	0.20	80	–
	ST203	3	0.20	80	–	3	0.20	80	–	3	0.20	80	–	3	0.20	80	–	3	0.20	80	–	3	0.20	80	–
	ST204	3	0.20	84	1.35	3	0.20	84	1.35	3	0.20	112	1.35	3	0.20	112	1.35	3	0.20	126	1.35	3	0.20	140	1.35
	ST205	3	0.25	29	1.35	3	0.25	29	1.35	3	0.25	19	1.35	3	0.25	19	1.35	3	0.25	16	1.35	3	0.25	11	1.35
	ST205'	3	0.25	20	–	3	0.25	20	–	3	0.25	28	–	3	0.25	28	–	3	0.25	32	–	3	0.25	36	–
	ST206	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
	B201	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–
	B201'	6	–	20	1.55	6	–	20	1.55	6	–	28	1.55	6	–	28	1.55	6	–	32	1.55	6	–	36	1.55
	P201	8	–	24	3.75	8	–	24	3.75	8	–	32	3.75	8	–	32	3.75	8	–	36	3.75	8	–	40	3.75
	W201	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–
	W202	2	0.30	53	–	2	0.30	53	–	2	0.30	53	–	2	0.30	53	–	2	0.30	53	–	2	0.30	53	–
	W203	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–
	W204	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
	W205	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–
	W206	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–
	W207	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15
	W208	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435
	W209	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535

2= Ø 1/4" OR 6 MM., 3= Ø 3/8" OR 9 MM., 4 = Ø 1/2" OR 12 MM., 6= Ø 3/4" OR 20 MM., 8= Ø 1" OR 25 MM., NO.= TOTAL AMOUNT OF BARS, L= TOTAL LENGTH OF EACH BAR

NOTE :

1. EACH PILE SHALL BE DRIVEN TO A DEPTH WHERE SCOUR WILL NOT AFFECT CAPACITY AND SHALL HAVE A MINIMUM ULTIMATE BEARING CAPACITY OF 90 TONS FOR PILE DETAILS SEE DWG. NO. MS-02, MS-03
2. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES
   a.) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b.) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0 M., ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
3. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, BACK WALL AND WINGWALLS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED
4. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG./M. AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG./CM. FOR A 0.15 x 0.15 x 0.15 M. CUBE AT 28 DAYS CEMENT SHELL BE TIS 15 TYPE I PORTLAND CEMENT A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350	KG.
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP MAX	10	CM.

5. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD.30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR. 24 PLAIN BARS UNLESS OTHERWISE INDICATED
6. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER
7. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS
8. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT CEMENT TYPE 5 CONFROMING TO TIS. 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM, BACK WALL AND WINGWALLS WITHOUT ALTERING THE LOCATIONS OF REBARS
9. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HEIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL
10. ALL DIAMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 10.00 M.
12. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5-106-14/24

KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS

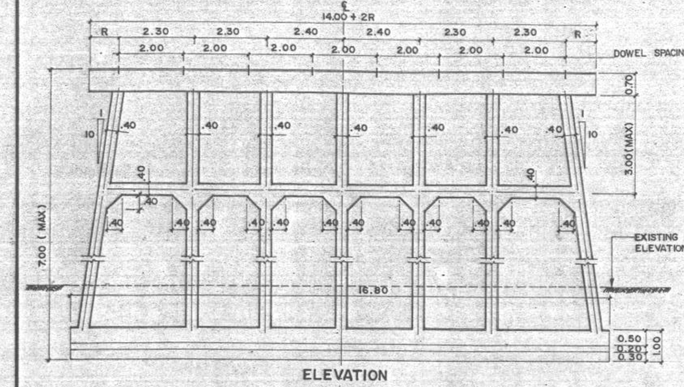
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

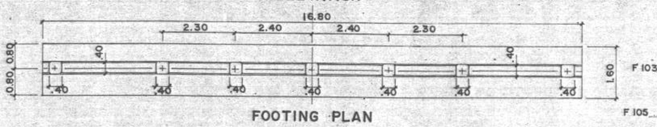
13.00 M. ROADWAY WIDTH SLAB BRIDGE

PILE BENT AND ABUTMENT DETAILS

DESIGNED : DOH & CONSULTANTS	CHECKED : Kyd	DATE JULY 1994
SUBMITTED : P. Buranapuy. (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. ST-22
		SHEET NO. 135

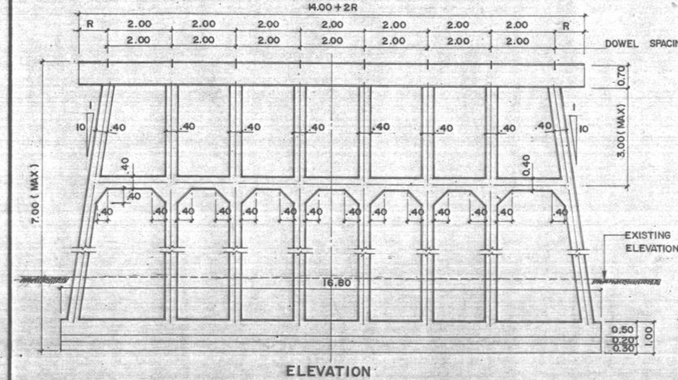


ELEVATION

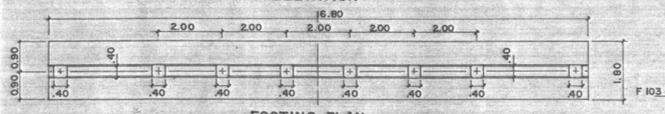


FOOTING PLAN

PIER DETAILS FOR 5.00 – 6.00 M. SPAN
SCALE 1 : 100

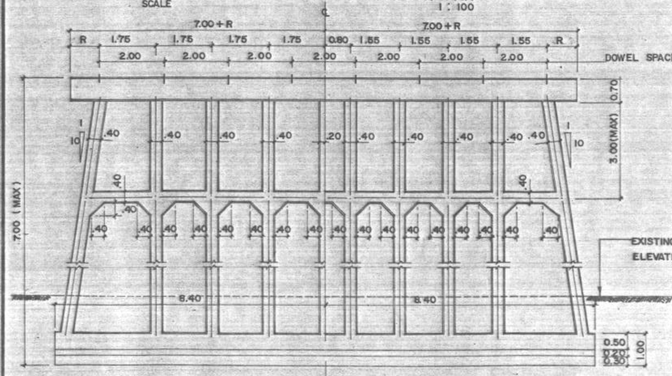


ELEVATION



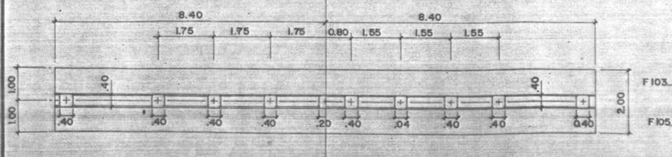
FOOTING PLAN

PIER DETAILS FOR 7.00 – 8.00 M. SPAN
SCALE 1 : 100



HALF ELEV. FOR 9.00 M. SPAN

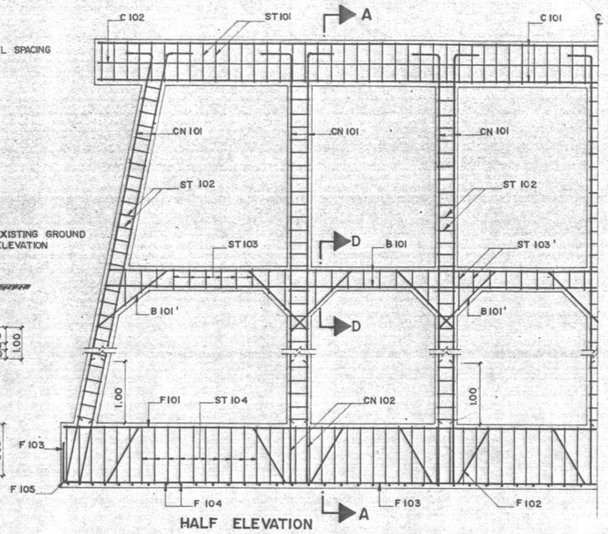
HALF ELEV. FOR 10.00 M. SPAN



HALF PLAN FOR 9.00 M. SPAN

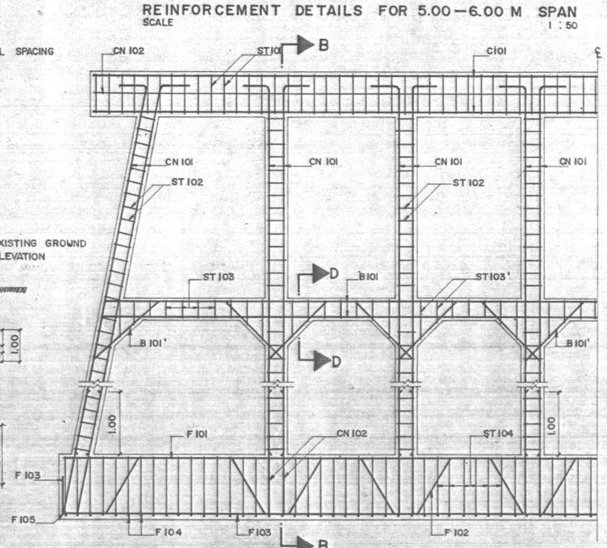
HALF PLAN FOR 10.00 M. SPAN

PIER DETAILS FOR 9.00 M. & 10.00 M. SPAN
SCALE 1 : 100



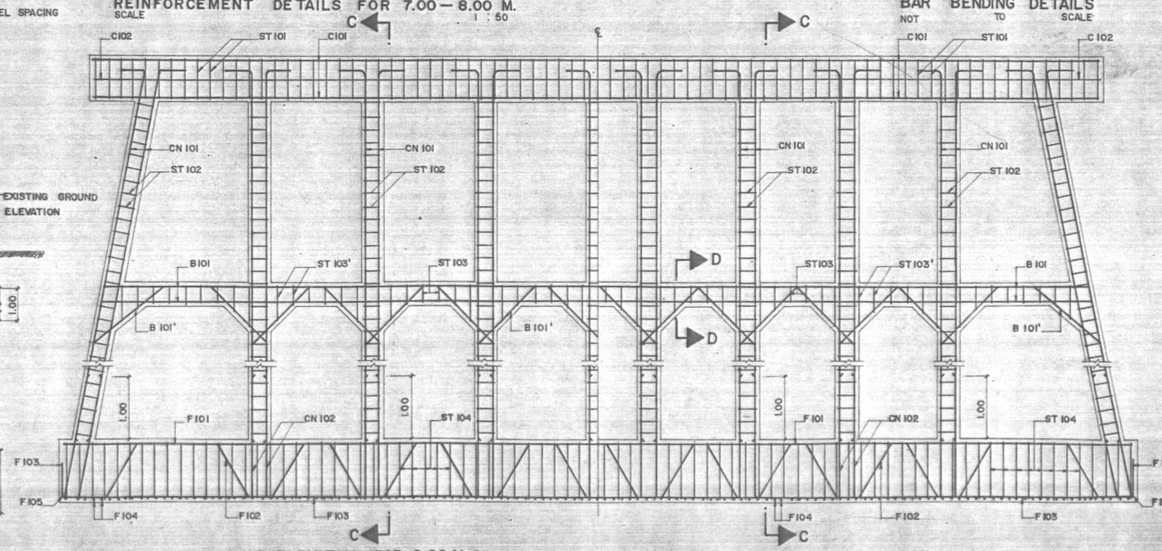
HALF ELEVATION

REINFORCEMENT DETAILS FOR 5.00 – 6.00 M SPAN
SCALE 1 : 50



HALF ELEVATION

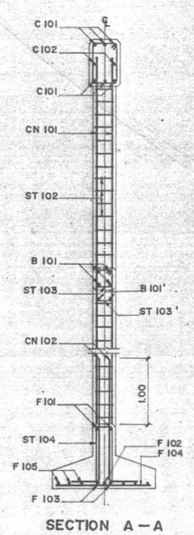
REINFORCEMENT DETAILS FOR 7.00 – 8.00 M.
SCALE 1 : 50



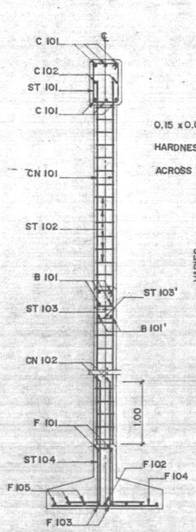
HALF ELEVATION FOR 9.00 M. SPAN

HALF ELEVATION FOR 10.00 M. SPAN

REINFORCEMENT DETAILS FOR 9.00 M. & 10.00 M. SPAN
SCALE 1 : 50



SECTION A – A

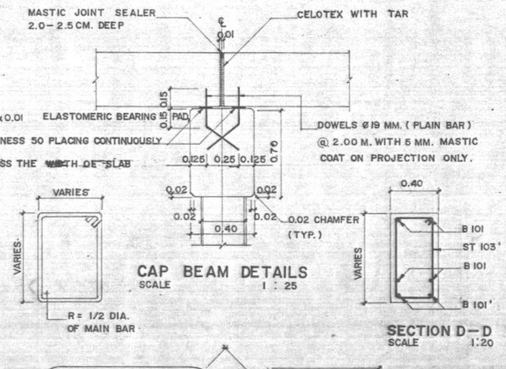


SECTION B – B

TABLE OF REINFORCEMENT

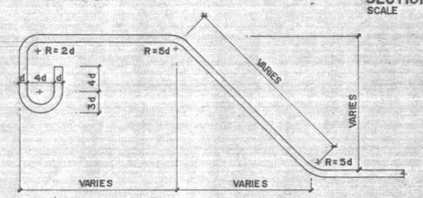
BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M.				SPAN 6.00 M.				SPAN 7.00 M.				SPAN 8.00 M.				SPAN 9.00 M				SPAN 10.00 M/			
		#	@	NO.	L	#	@	NO.	L	#	@	NO	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L
	C 101	6	–	6	15.75	6	–	6	15.75	6	–	6	15.75	6	–	6	15.75	6	–	6	15.75	6	–	6	15.75
	C 102	4	–	2	15.75	4	–	2	15.75	4	–	2	15.75	4	–	2	15.75	4	–	2	15.75	4	–	2	15.75
	CN 101	6	–	28	11.25	6	–	28	11.25	8	–	32	11.25	8	–	32	11.25	8	–	36	11.25	8	–	40	11.25
	CN 102	6	–	28	2.31	6	–	28	2.31	8	–	32	2.31	8	–	32	2.31	8	–	36	2.31	8	–	40	2.31
	ST 101	3	0.20	79	2.35	3	0.20	79	2.35	3	0.20	79	2.35	3	0.20	79	2.35	3	0.20	79	2.35	3	0.20	79	2.35
	ST 102	3	0.20	336	1.35	3	0.20	336	1.35	3	0.20	384	1.35	3	0.20	384	1.35	3	0.20	432	1.35	3	0.20	480	1.35
	ST 103	3	0.25	62	1.35	3	0.25	62	1.35	3	0.25	52	1.35	3	0.25	52	1.35	3	0.25	42	1.35	3	0.26	28	1.35
	ST 103'	3	–	48	–	3	–	48	–	3	–	56	–	3	–	56	–	3	–	64	–	3	–	72	–
	ST 104	3	0.20	84	2.60	3	0.20	84	2.60	3	0.20	84	2.60	3	0.20	84	2.60	3	0.20	84	2.60	3	0.20	84	2.60
	B 101	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
	B 101'	6	–	48	1.55	6	–	48	1.55	6	–	56	1.55	6	–	56	1.55	6	–	64	1.55	6	–	72	1.55
	F 101	8	–	2	16.75	8	–	2	16.75	8	–	2	16.75	8	–	2	16.75	8	–	2	16.75	8	–	2	16.75
	F 102	8	–	1	–	8	–	1	–	8	–	1	–	8	–	1	–	8	–	1	–	8	–	1	–
	F 103	8	–	2	17.95	8	–	2	17.95	8	–	2	17.95	8	–	2	17.95	8	–	2	17.95	8	–	2	17.95
	F 104	4	0.25	67	1.55	4	0.25	67	1.55	4	0.20	84	1.75	4	0.20	84	1.75	4	0.125	134	1.95	4	0.125	134	1.95
	F 105	4	–	6	16.75	4	–	6	16.75	4	–	6	16.75	4	–	6	16.75	4	–	6	16.75	4	–	6	16.75

3 = Ø 3/8" OR 9 MM., # 4 = Ø 1/2" OR 12 MM., # 6 = Ø 3/4" OR 20 MM., # 8 = Ø 1" OR 25 MM., NO= TOTAL AMOUNT OF BARS., L = TOTAL LENGTH OF EACH BAR.



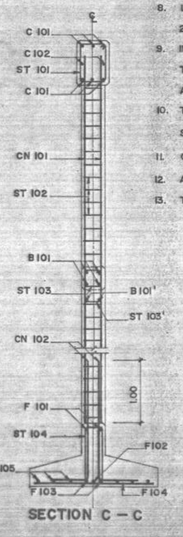
CAP BEAM DETAILS
SCALE 1 : 25

SECTION D – D
SCALE 1:20



PLAIN BAR DEFORMED BAR

BAR BENDING DETAILS
NOT TO SCALE



SECTION C – C

NOTES:

1. THE BOTTOM OF A FOOTING SHALL BE EMBEDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT IT'S CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED , 10 CM. THICKNESS OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM.WIDER THAN THE FOOTING ALL AROUND. COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 BY VOLUME.
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON/M.^{2}
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES :
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0 M., ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM , AT WHICH A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
5. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 Kg./M.^{3} AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 Kg./CM.^{2} FOR A .15 x .15 x .15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350	Kg.
SAND	0.45	M.^{3}
CRUSHED ROCK OR GRAVEL	0.86	M.^{3}
CONCRETE SLUMP MAX.	10	CM.

6. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
7. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER .
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
9. IN CASE OF SALINE PROTECTION , HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM WITHOUT ALTERING THE LOCATIONS OF REBARS.
10. THE MAXIMUN FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 12.0 M.
12. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
13. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5 – 106 – 14/10

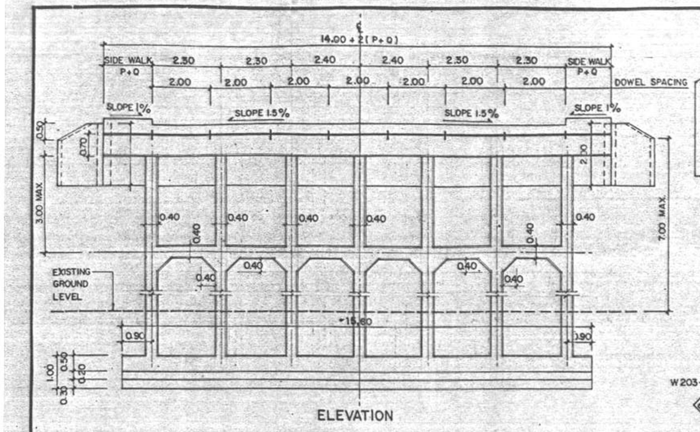
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

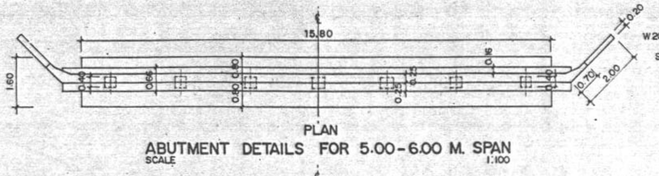
STANDARD DRAWING

14.00 M. ROADWAY WIDTH SLAB BRIDGE

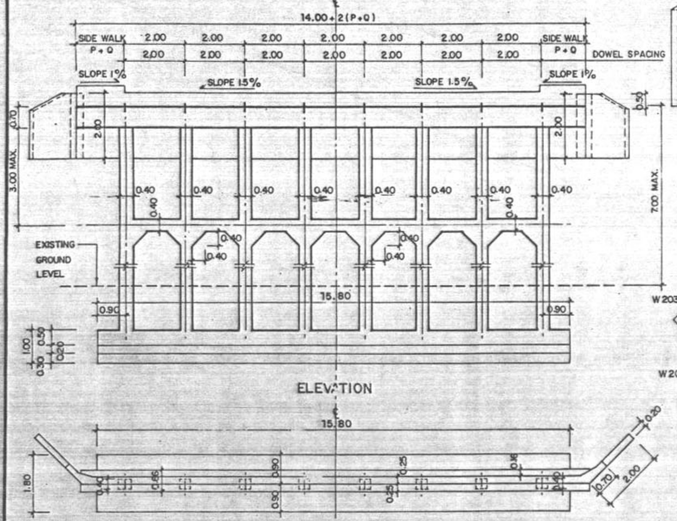
SPREAD FOOTING PIER DETAILS

DESIGNED : DOH. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. ST-23
		SHEET NO. 136

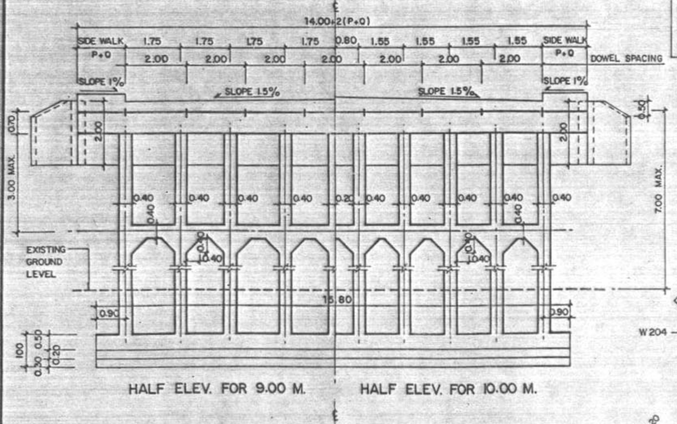




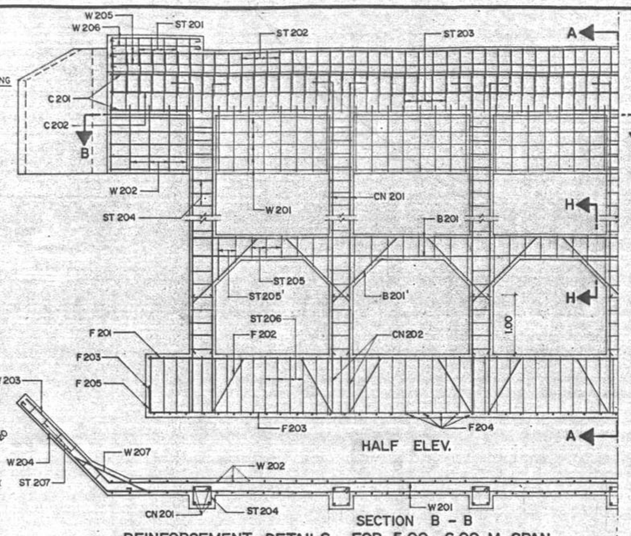
ABUTMENT DETAILS FOR 5.00 - 6.00 M. SPAN
SCALE 1:100



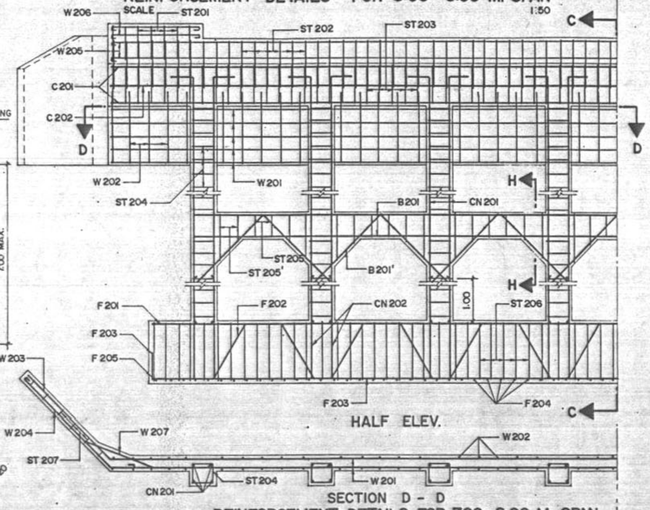
ABUTMENT DETAILS FOR 7.00 - 8.00 M. SPAN
SCALE 1:100



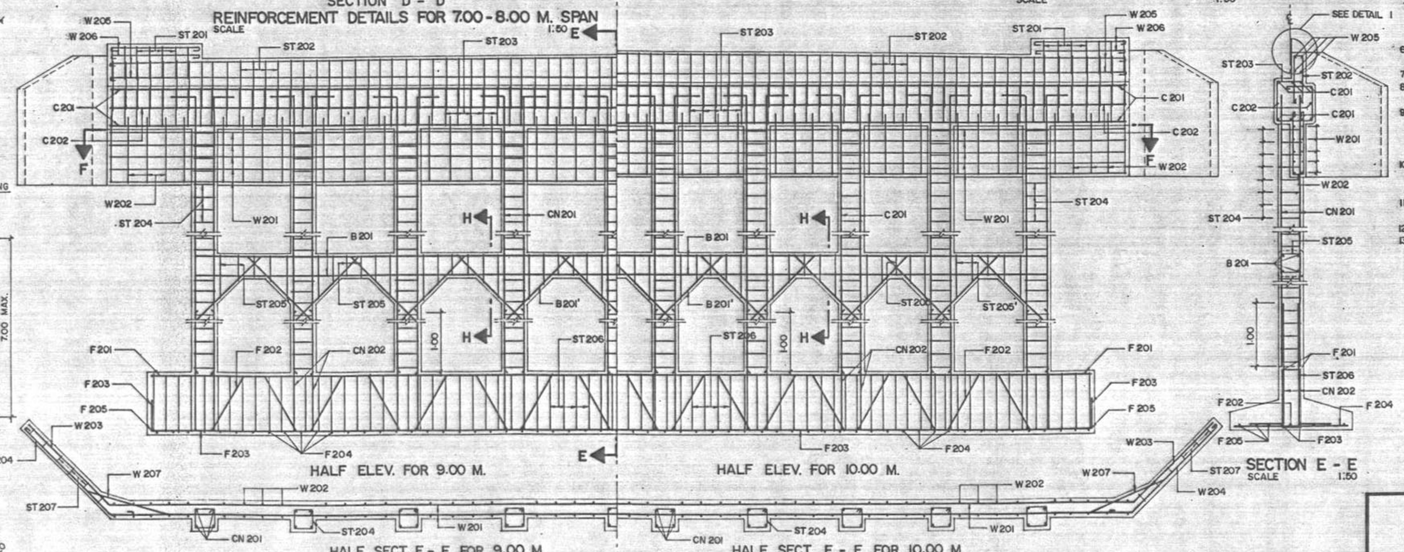
ABUTMENT DETAILS FOR 9.00 M. & 10.00 M. SPAN
SCALE 1:100



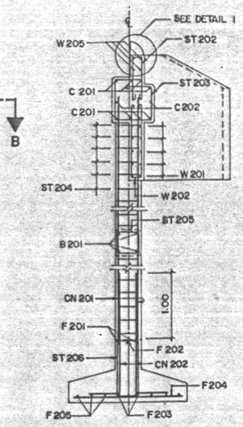
REINFORCEMENT DETAILS FOR 5.00 - 6.00 M. SPAN
SCALE 1:50



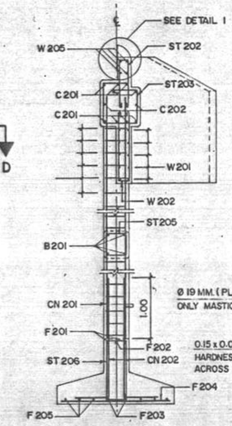
REINFORCEMENT DETAILS FOR 7.00 - 8.00 M. SPAN
SCALE 1:50



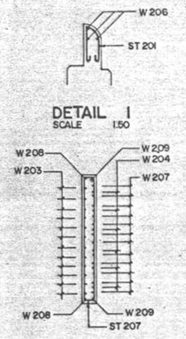
REINFORCEMENT DETAILS FOR 9.00 M. & 10.00 M. SPAN
SCALE 1:50



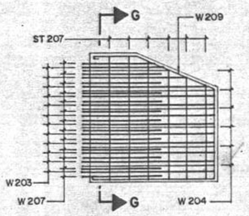
SECTION A - A
SCALE 1:50



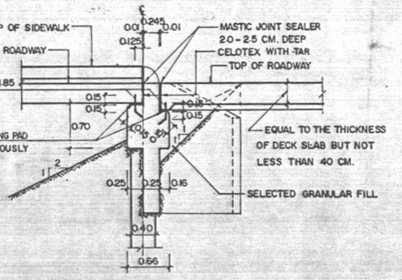
SECTION C - C
SCALE 1:50



SECTION G - G
SCALE 1:50

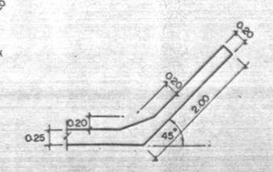


REINFORCEMENT DETAILS
SCALE 1:50

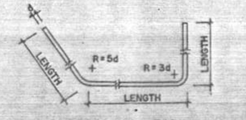


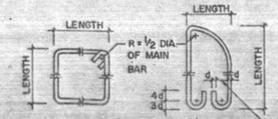
ABUTMENT HEAD DETAILS
SCALE 1:50

SECTION E - E
SCALE 1:50



WINGWALL DETAILS
SCALE 1:50





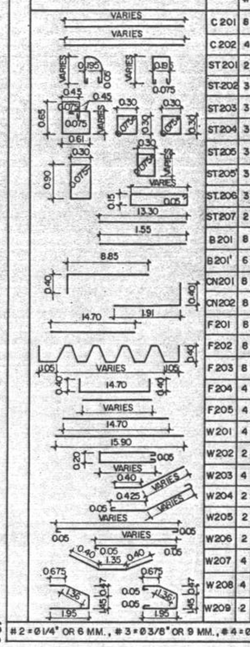
6d FOR PRIMARY BARS
5d FOR STIRRUPS & TIES LARGER THAN Ø 16 MM.
4d FOR STIRRUPS & TIES Ø 16 MM. OR LESS

BAR BENDING DETAILS
NOT TO SCALE

SECTION H - H
SCALE 1:25

TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS



BAR MARK	SPAN 5.00 M. #	@	NO	L	SPAN 6.00 M. #	@	NO	L	SPAN 7.00 M. #	@	NO	L	SPAN 8.00 M. #	@	NO	L	SPAN 9.00 M. #	@	NO	L	SPAN 10.00 M. #	@	NO	L
C 201	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-
C 202	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-
ST 201	2	0.20	14	1.215	2	0.20	14	1.290	2	0.20	14	1.355	2	0.20	14	1.435	2	0.20	14	1.515	2	0.20	14	1.635
ST 202	3	0.20	85	1.745	3	0.20	85	1.790	3	0.20	85	1.845	3	0.20	85	1.895	3	0.20	85	1.945	3	0.20	85	1.995
ST 203	3	0.20	85	-	3	0.20	85	-	3	0.20	85	-	3	0.20	85	-	3	0.20	85	-	3	0.20	85	-
ST 204	3	0.20	273	1.35	3	0.20	273	1.35	3	0.20	312	1.35	3	0.20	312	1.35	3	0.20	351	1.35	3	0.20	390	1.35
ST 205	3	0.25	54	1.35	3	0.25	54	1.35	3	0.25	34	1.35	3	0.25	34	1.35	3	0.25	24	1.35	3	0.25	22	1.35
ST 205'	3	-	48	-	3	-	48	-	3	-	64	-	3	-	64	-	3	-	72	-	3	-	80	-
ST 206	3	0.20	79	2.55	3	0.20	79	2.55	3	0.20	79	2.55	3	0.20	79	2.55	3	0.20	79	2.55	3	0.20	79	2.55
ST 207	2	0.30	12	-	2	0.30	12	-	2	0.30	12	-	2	0.30	12	-	2	0.30	12	-	2	0.30	12	-
B 201	8	-	8	14.30	8	-	8	14.30	8	-	8	14.30	8	-	8	14.30	8	-	8	14.30	8	-	8	14.30
B 201'	6	-	48	1.55	6	-	48	1.55	6	-	64	1.55	6	-	64	1.55	6	-	72	1.55	6	-	80	1.55
CN 201	8	-	28	9.25	8	-	28	9.25	8	-	32	9.25	8	-	32	9.25	8	-	36	9.25	8	-	40	9.25
CN 202	8	-	28	2.31	8	-	28	2.31	8	-	32	2.31	8	-	32	2.31	8	-	36	2.31	8	-	40	2.31
F 201	8	-	2	15.70	8	-	2	15.70	8	-	2	15.70	8	-	2	15.70	8	-	2	15.70	8	-	2	15.70
F 202	8	-	1	-	8	-	1	-	8	-	1	-	8	-	1	-	8	-	1	-	8	-	1	-
F 203	8	-	2	16.50	8	-	2	16.50	8	-	2	16.50	8	-	2	16.50	8	-	2	16.50	8	-	2	16.50
F 204	4	0.25	63	1.50	4	0.25	63	1.50	4	0.20	78	1.70	4	0.20	78	1.70	4	0.25	126	1.90	4	0.25	126	1.90
F 205	4	-	6	15.70	4	-	6	15.70	4	-	6	15.70	4	-	6	15.70	4	-	6	15.70	4	-	6	15.70
W 201	4	0.20	10	16.90	4	0.20	10	16.90	4	0.20	10	16.90	4	0.20	10	16.90	4	0.20	10	16.90	4	0.20	10	16.90
W 202	2	0.30	56	2.70	2	0.30	56	2.60	2	0.30	56	2.60	2	0.30	56	2.50	2	0.30	56	2.40	2	0.30	56	2.30
W 203	4	0.15	24	-	4	0.15	24	-	4	0.15	24	-	4	0.15	24	-	4	0.15	24	-	4	0.15	24	-
W 204	2	0.30	12	-	2	0.30	12	-	2	0.30	12	-	2	0.30	12	-	2	0.30	12	-	2	0.30	12	-
W 205	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-
W 206	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-
W 207	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15
W 208	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435
W 209	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535

2 = Ø 1/4" OR 6 MM., # 3 = Ø 3/8" OR 9 MM., # 4 = Ø 1/2" OR 12 MM., # 8 = Ø 1" OR 25 MM., NO = TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BAR

NOTES :

1 THE BOTTOM OF A FOOTING SHALL BE EMBEDDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT IT'S CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED 10 CM. THICK OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 BY VOLUME
2 SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON/M^2
3 HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES :
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0 M., ADDITIONAL BRACING SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
4 CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, BACK WALL AND WINGWALLS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED
5 CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG./M^3 AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG./CM^2 FOR A 15 x 15 x 15 CM. CURB AT 28 DAYS CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350	KG.
SAND	0.45	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRET SLUMP MAX.	10	CM.

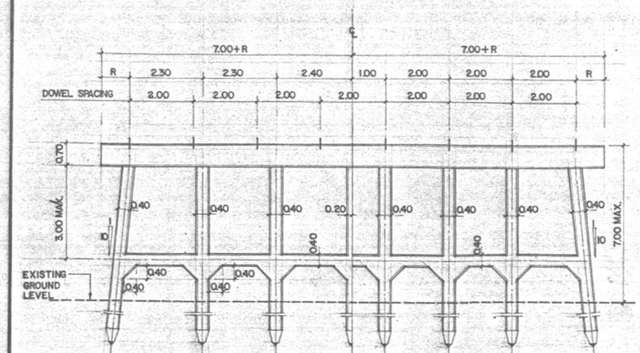
6 REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS, OTHER SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED
7 LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY ENGINEER
8 LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS
9 IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM, BACK WALL AND WINGWALLS WITHOUT ALTERING THE LOCATIONS OF REBARS
10 THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING CANALBED TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL
11 QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 10.00 M.
12 ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED
13 THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5-106-14/23.6

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

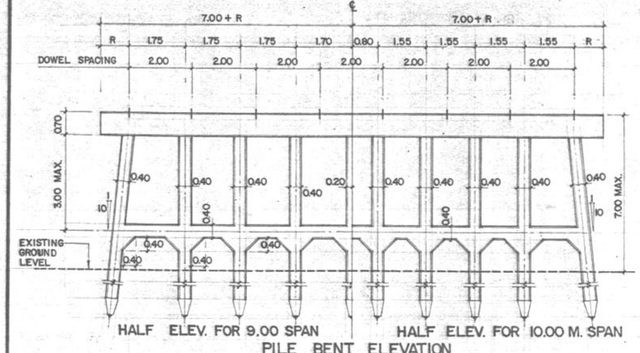
STANDARD DRAWING

14.00 M. ROADWAY WIDTH SLAB BRIDGE
SPREAD FOOTING ABUTMENT DETAILS

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. ST-24
		SHEET NO. 137

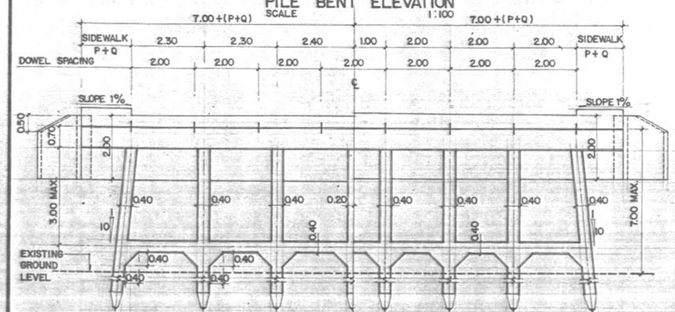


HALF ELEV. FOR 5.00-6.00 M. SPAN HALF ELEV. FOR 7.00-8.00 M. SPAN



HALF ELEV. FOR 9.00 SPAN HALF ELEV. FOR 10.00 M. SPAN

PILE BENT ELEVATION
SCALE 1:100



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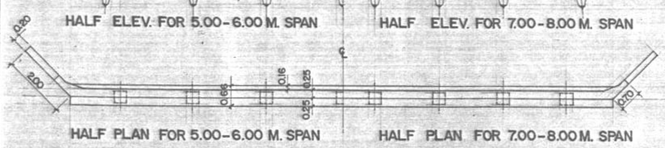

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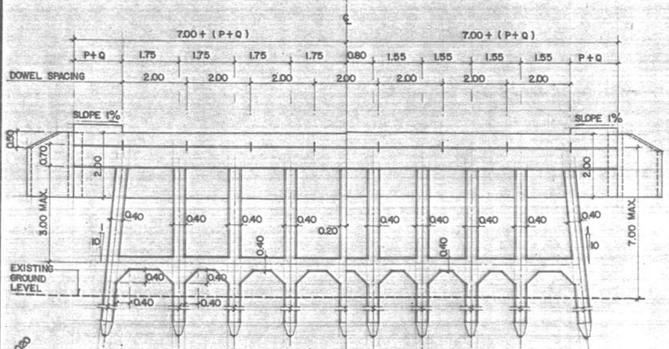

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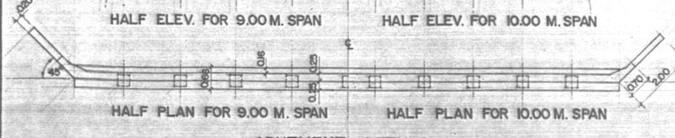
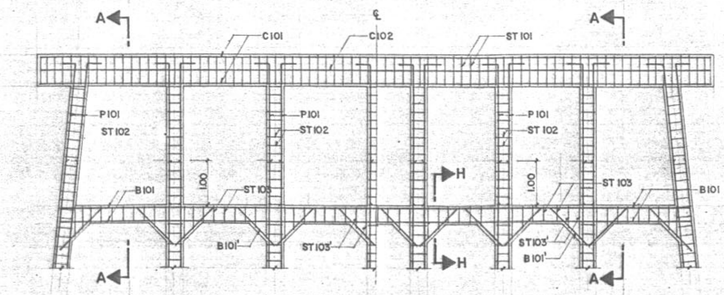


HALF PLAN FOR 9.00 M. SPAN HALF PLAN FOR 10.00 M. SPAN

ABUTMENT DETAILS
SCALE 1:100



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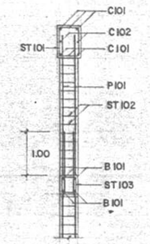
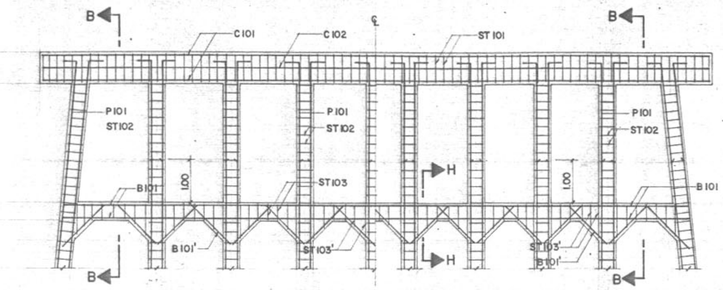
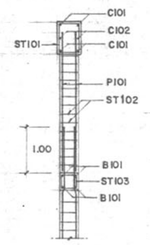


SECTION A - A
SCALE 1:75



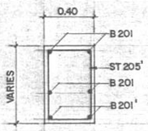
HALF ELEV. FOR 9.00 M. SPAN HALF ELEV. FOR 10.00 M. SPAN

PILE BENT REINFORCEMENT DETAILS
SCALE 1:75

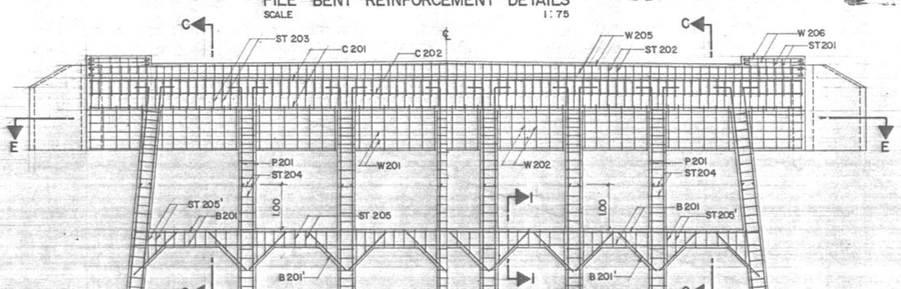


SECTION B - B
SCALE 1:75

SECTION H-H
SCALE 1:25



SECTION I - I
SCALE 1:25



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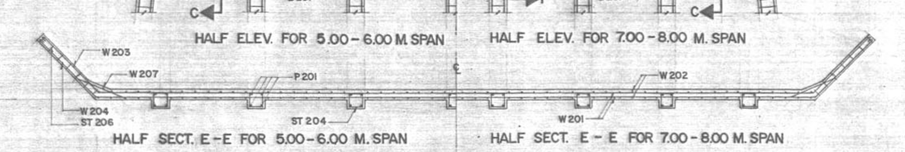

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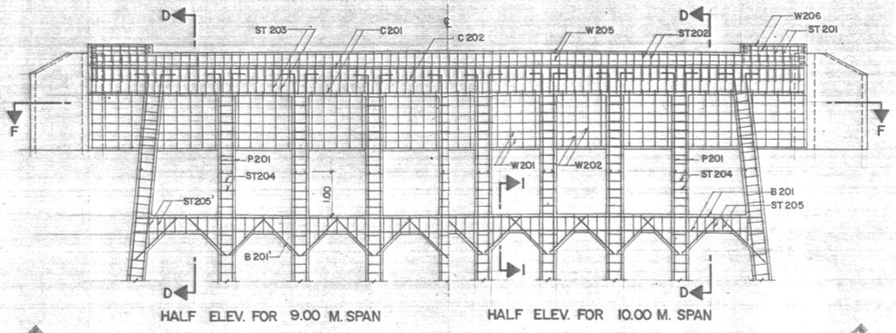

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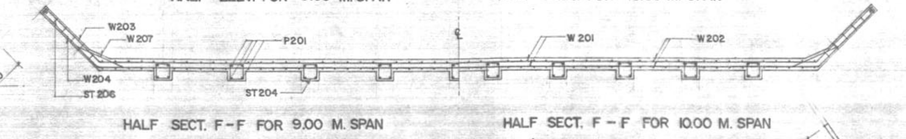

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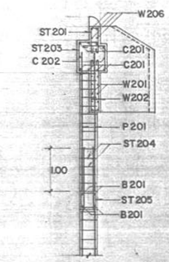
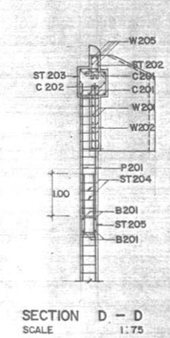
ABUTMENT REINFORCEMENT DETAILS
SCALE 1:75

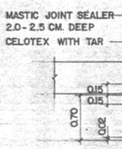


SECTION C - C
SCALE 1:75

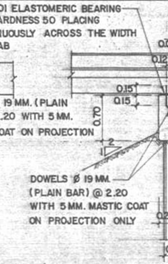
DETAIL 1



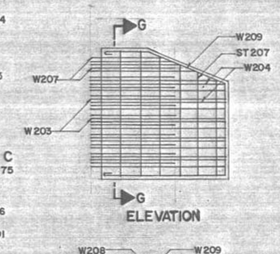
SECTION D - D
SCALE 1:75



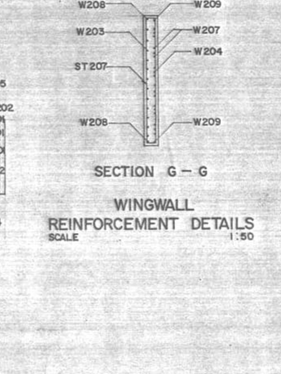
CAP BEAM DETAIL
SCALE 1:50



ABUTMENT HEAD DETAILS
SCALE 1:50

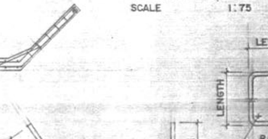


ELEVATION

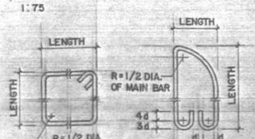


SECTION G - G

WINGWALL REINFORCEMENT DETAILS
SCALE 1:50



DEFORMED BAR

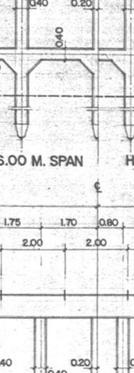


PLAIN BAR

BAR BENDING DETAILS
NOT TO SCALE

6d FOR PRIMARY BAR
5d FOR STIRRUPS & TIES LARGER THAN Ø 16 MM.
4d FOR STIRRUPS & TIES Ø16MM. OR LESS

TABLE OF REINFORCEMENT

	BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M. #	@	NO.	L	SPAN 6.00 M. #	@	NO.	L	SPAN 7.00 M. #	@	NO.	L	SPAN 8.00 M. #	@	NO.	L	SPAN 9.00 M. #	@	NO.	L	SPAN 10.00 M. #	@	NO.	L
PILE BENT		C 101	8	-	6	-	8	-	6	-	8	-	6	-	8	-	6	-	8	-	6	-	8	-	6	-
		C 102	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-
		ST 101	3	0.20	64	2.35	3	0.20	64	2.35	3	0.20	64	2.35	3	0.20	64	2.35	3	0.20	64	2.35	3	0.20	64	2.35
		ST 102	3	0.20	70	1.35	3	0.20	70	1.35	3	0.20	98	1.35	3	0.20	98	1.35	3	0.20	112	1.35	3	0.20	112	1.35
		ST 103	3	0.25	26	1.35	3	0.25	26	1.35	3	0.25	14	1.35	3	0.25	14	1.35	3	0.25	10	1.35	3	0.25	10	1.35
		ST 103'	3	0.25	16	-	3	0.25	16	-	3	0.25	24	-	3	0.25	24	-	3	0.25	28	-	3	0.25	32	-
		B 101	8	-	4	-	8	-	4	-	8	-	4	-	8	-	4	-	8	-	4	-	8	-	4	-
		B 101'	8	-	16	1.55	8	-	16	1.55	8	-	24	1.55	8	-	24	1.55	8	-	28	1.55	8	-	32	1.55
		P 101	8	-	20	3.75	8	-	20	3.75	8	-	28	3.75	8	-	28	3.75	8	-	32	3.75	8	-	36	3.75
ABUTMENT		C 201	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-
		C 202	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-
		ST 201	2	0.20	14	1.215	2	0.20	14	1.295	2	0.20	14	1.355	2	0.20	14	1.435	2	0.20	14	1.515	2	0.20	14	1.635
		ST 202	3	0.20	70	1.745	3	0.20	70	1.795	3	0.20	70	1.845	3	0.20	70	1.895	3	0.20	70	1.945	3	0.20	70	1.995
		ST 203	3	0.20	70	-	3	0.20	70	-	3	0.20	70	-	3	0.20	70	-	3	0.20	70	-	3	0.20	70	-
		ST 204	3	0.20	70	1.35	3	0.20	70	1.35	3	0.20	98	1.35	3	0.20	98	1.35	3	0.20	112	1.35	3	0.20	126	1.35
		ST 205	3	0.25	26	1.35	3	0.25	26	1.35	3	0.25	14	1.35	3	0.25	14	1.35	3	0.25	10	1.35	3	0.25	10	1.35
		ST 205'	3	0.25	16	-	3	0.25	16	-	3	0.25	24	-	3	0.25	24	-	3	0.25	28	-	3	0.25	32	-
		ST 206	3	0.30	12	-	3	0.30	12	-	3	0.30	12	-	3	0.30	12	-	3	0.30	12	-	3	0.30	12	-
		B 201	8	-	4	-	8	-	4	-	8	-	4	-	8	-	4	-	8	-	4	-	8	-	4	-
		B 201'	8	-	16	1.55	8	-	16	1.55	8	-	24	1.55	8	-	24	1.55	8	-	28	1.55	8	-	32	1.55
		P 201	8	-	20	3.75	8	-	20	3.75	8	-	24	3.75	8	-	24	3.75	8	-	32	3.75	8	-	36	3.75
		W 201	4	0.20	10	-	4	0.20	10	-	4	0.20	10	-	4	0.20	10	-	4	0.20	10	-	4	0.20	10	-
		W 202	2	0.30	47	2.70	2	0.30	47	2.60	2	0.30	47	2.60	2	0.30	47	2.50	2	0.30	47	2.40	2	0.30	46	2.50
		W 203	4	0.15	24	-	4	0.15	24	-	4	0.15	24	-	4	0.15	24	-	4	0.15	24	-	4	0.15	24	-
		W 204	2	0.30	12	-	2	0.30	12	-	2	0.30	12	-	2	0.30	12	-	2	0.30	12	-	2	0.30	12	-
		W 205	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-
		W 206	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-
		W 207	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15
		W 208	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435
		W 209	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535

1 = Ø 1/4" OR 6 MM., #3 = Ø 3/8" OR 9 MM., #4 = Ø 1/2" OR 12 MM., #6 = Ø 1" OR 25 MM., NO. = TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BAR

NOTES :

1. EACH PILE SHALL BE DRIVEN TO A DEPTH WHERE SCOUR WILL NOT EFFECT CAPACITY AND SHALL HAVE A MINIMUM ULTIMATE BEARING CAPACITY OF 90 TONS. FOR PILE DETAILS SEE DWG. NO. MS-02, MS-03.
2. HORIZONTAL CROSS BRACING BETWEEN COLUMN SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCE
   a) IF THE DISTANCE FROM EXISTING CANAL BED TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE CANAL BED EXCEEDS 3.0 M., ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
3. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, BACK WALL AND WINGWALLS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
4. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG./M.^{3} AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG./CM.^{2} FOR A 0.15x0.15x0.15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS A FOLLOWS:

PORTLAND CEMENT	350	KG.
SAND	0.45	M.^{3}
CRUSHED ROCK OR GRAVEL	0.86	M.^{3}
CONCRETE SLUMP MAX	10	CM.

5. REBARS @ 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
6. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
7. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
8. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT CEMENT TYPE 5 CONFORMING TO TIS. 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM, BACK WALL AND WINGWALLS WITHOUT ALTERING THE LOCATIONS OF REBARS.
9. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING CANAL BED TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
10. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 10.00 M.
12. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5-106-14/11.

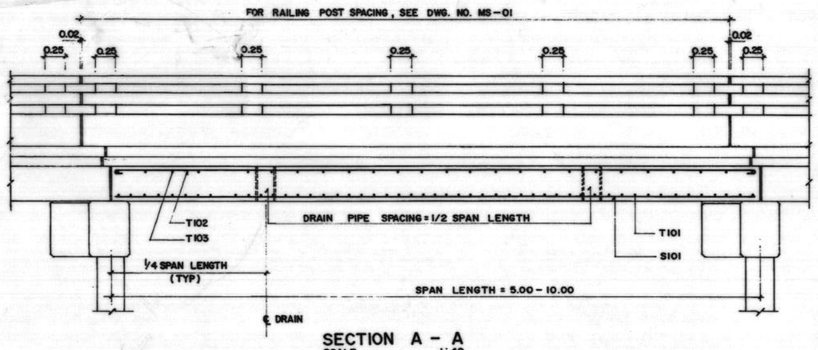
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

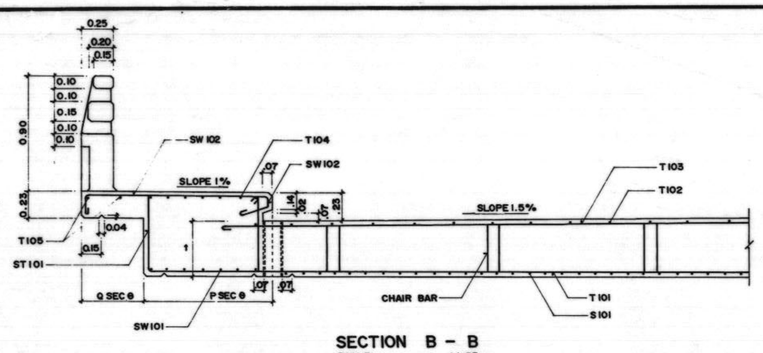
14.00 M. ROADWAY WIDTH SLAB BRIDGE

PILE BENT AND ABUTMENT DETAILS

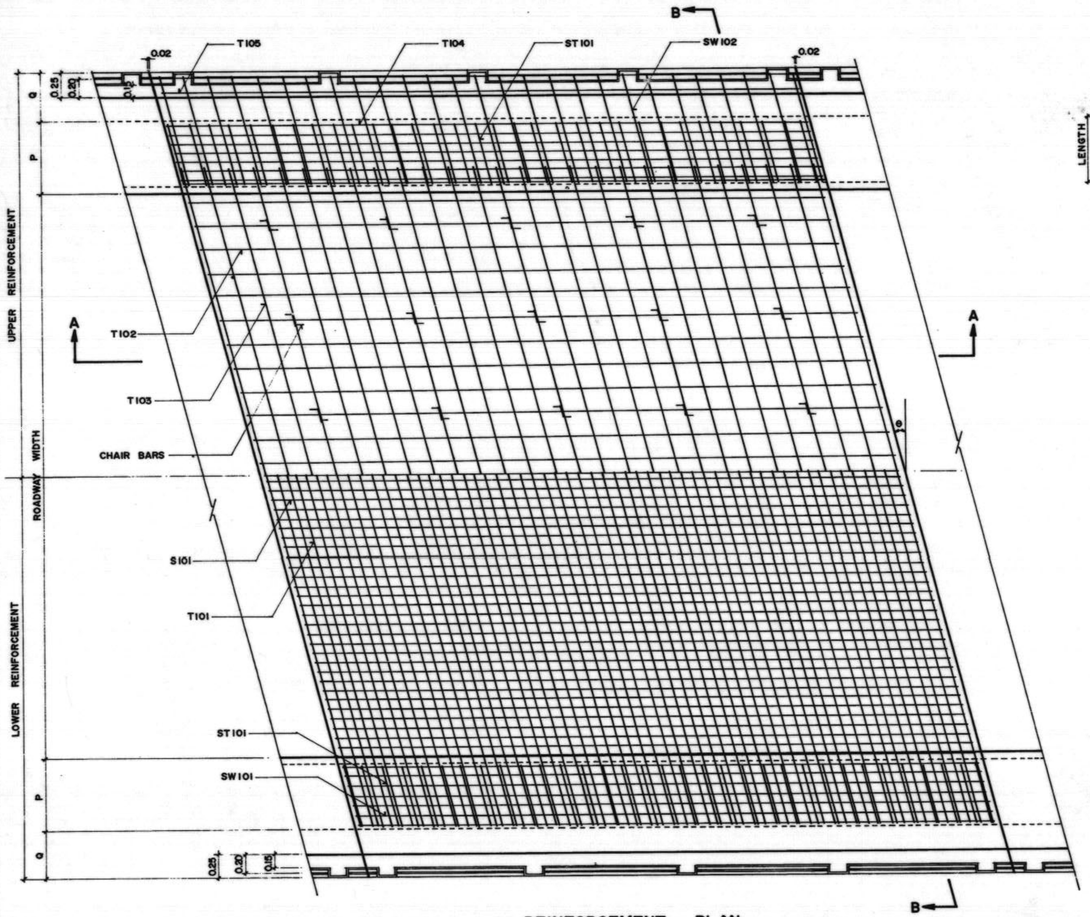
DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : for (DIRECTOR GENERAL)		DWG. NO. ST-25
		SHEET NO. 138



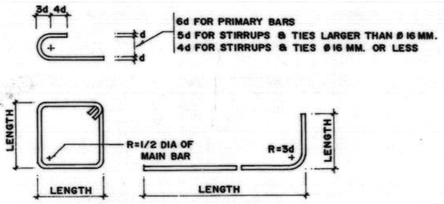
SECTION A - A
SCALE 1:40



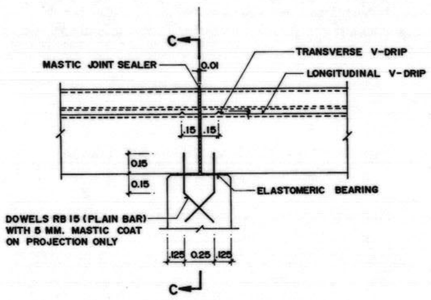
SECTION B - B
SCALE 1:25



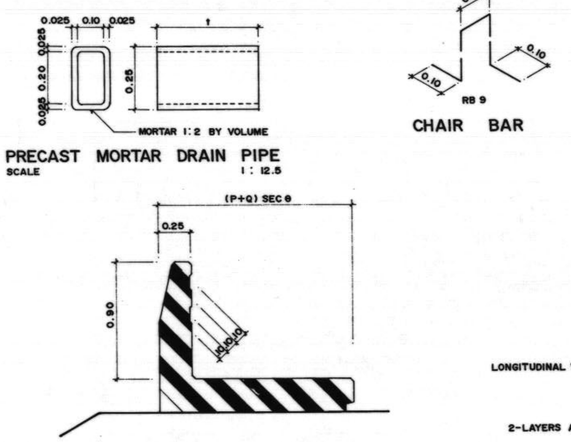
REINFORCEMENT PLAN
SCALE 1:40



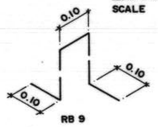
BAR BENDING DIAGRAMS
NOT TO SCALE



EXPANSION JOINT DETAILS
SCALE 1:25

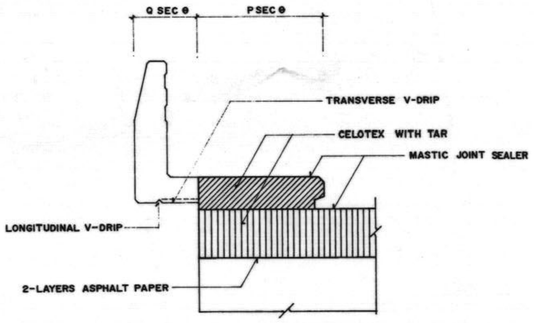


PRECAST MORTAR DRAIN PIPE
SCALE 1:12.5



CHAIR BAR

PAINTING AT BRIDGE END
SCALE 1:25



SECTION C - C
SCALE 1:25

NOTES :

1. DESIGN STRESSES :
   a) CONCRETE, fc = 70 KSC.
   b) STEEL , fc = 1,400 KSC. (DEFORMED BARS)
   fs = 1,200 KSC. (PLAIN ROUND BARS)
2. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG/M^3 AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG/CM^2 FOR A .15 x .15 x .15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350	KG.
SAND	0.45	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP MAX.	10	CM.

3. CLEAR CONCRETE COVER FOR TOP REINFORCEMENT IN SLAB BRIDGE SHALL BE 3.5 CM. ELSEWHERE OF SLAB BRIDGE AND SIDEWALK POSTS AND RAILING SHALL BE 2.5 CM.
4. ALL CONCRETE EXPOSED CORNERS SHALL HAVE A 2 CM. CHAMFER UNLESS OTHERWISE INDICATED.
5. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
6. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
7. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
8. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMMING TIS 15 SHALL BE USED AND, WITH THE EXCEPTION OF COLUMNS AND BRACING, ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED WITHOUT ALTERING THE LOCATIONS OF REBARS.
9. ALL MATERIALS SHALL BE USED UNDER THE APPROVAL OF THE ENGINEER.
10. PAINTING SHALL BE PROVIDED ON ALL SURFACES AT BRIDGE ENDS WHICH ARE EXPOSED TO TRAFFIC. WHITE AND BLACK COLOURS SHALL BE PAINTED ALTERNATELY; WHITE COLOUR SHALL BE LIGHT REFLECTED TYPE.
11. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWSE INDICATED.
12. BAR MARK S 101 MAY BE TAKEN OUT ONE BAR ON EACH SIDE OF THE BRIDGE WHEREVER THEY PASS THROUGH DRAIN PIPES. IF THE LOCATIONS OF THESE BARS ARE NEAR V-DRIP SUCH THAT CONCRETE COVER IS NOT ADEQUATE, THEY SHALL BE PLACED ON TOP OF ST 101. OTHER BARS WHICH PASS THROUGH DRAIN PIPES SHALL BE BENT ALONG THE PIPES.
13. THE SKEW ANGLE (θ) IS THE ANGLE IN DEGREES BETWEEN THE DIRECTION OF THE CANAL AND A LINE PERPENDICULAR TO THE ROADWAY.
14. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 38D5 - 106 - 14/1A.

TABLE OF SLAB THICKNESS

SPAN	5.00	6.00	7.00	8.00	9.00	10.00
SLAB THICKNESS, t	0.32	0.36	0.39	0.43	0.47	0.53

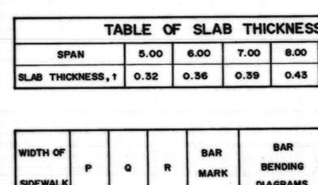
TABLE OF SEC θ

θ DEGREE	0	5	10	15	20	25	30
SEC θ	1.0000	1.0038	1.0154	1.0353	1.0642	1.1034	1.1547

TABLE OF SIDEWALK AND EDGE BEAM REINFORCEMENT

WIDTH OF SIDEWALK	P	Q	R	BAR MARK	BAR BENDING DIAGRAMS	SPAN 5.00 M. #	@	NO.	L	SPAN 6.00 M. #	@	NO.	L	SPAN 7.00 M. #	@	NO.	L	SPAN 8.00M. #	@	NO.	L	SPAN 9.00M. #	@	NO.	L	SPAN 10.00M. #	@	NO.	L	REMARK
0.50	0.50	–	0.50	SW 101	VARIES	8	–	6	4.95	8	–	6	5.95	8	–	8	6.95	8	–	8	7.95	8	–	10	8.95	8	–	12	9.95	NO = TOTAL AMOUNT OF BARS L = TOTAL LENGTH OF EACH BAR # 4 = Ø 1/2" OR 12 MM. # 8 = Ø 1" OR 25 MM.
				T104	VARIES	4	–	6	4.95	4	–	6	5.95	4	–	8	6.95	4	–	8	7.95	4	–	10	8.95	4	–	12	9.95	
				T105	——	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
1.00	0.50	0.50	0.50	SW101	VARIES	8	–	6	4.95	8	–	8	5.95	8	–	10	6.95	8	–	12	7.95	8	–	14	8.95	8	–	16	9.95	
				T 104	VARIES	4	–	6	4.95	4	–	8	5.95	4	–	10	6.95	4	–	12	7.95	4	–	12	8.95	4	–	12	9.95	
				T 105	VARIES	4	–	6	4.95	4	–	6	5.95	4	–	6	6.95	4	–	6	7.95	4	–	6	8.95	4	–	6	9.95	
1.50	1.00	0.50	1.00	SW 101	VARIES	8	–	8	4.95	8	–	10	5.95	8	–	12	6.95	8	–	16	7.95	8	–	18	8.95	8	–	20	9.95	
				T 104	VARIES	4	–	8	4.95	4	–	10	5.95	4	–	12	6.95	4	–	12	7.95	4	–	12	8.95	4	–	12	9.95	
				T 105	VARIES	4	–	6	4.95	4	–	6	5.95	4	–	6	6.95	4	–	6	7.95	4	–	6	8.95	4	–	6	9.95	

TABLE OF SLAB REINFORCEMENT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M. #	@	NO.	L	SPAN 6.00 M. #	@	NO.	L	SPAN 7.00 M. #	@	NO.	L	SPAN 8.00 M. #	@	NO.	L	SPAN 9.00 M. #	@	NO.	L	SPAN 10.00 M. #	@	NO.	L	REMARK
	S 101	8	0.16	–	4.95	8	0.15	–	5.95	8	0.13	–	6.95	8	0.12	–	7.95	8	0.10	–	8.95	8	0.09	–	9.95	NO. = TOTAL AMOUNT OF BARS L = TOTAL LENGTH OF EACH BAR
	ST 101	3	0.25	42	–	3	0.25	50	–	3	0.25	58	–	3	0.25	66	–	3	0.25	74	–	3	0.25	82	–	
	SW102	4	0.20	51	–	4	0.20	63	–	4	0.20	72	–	4	0.20	81	–	4	0.20	93	–	4	0.20	102	–	
	T 101	4	0.15	34	–	4	0.15	41	–	4	0.14	31	–	4	0.14	58	–	4	0.13	70	–	4	0.11	92	–	
	T102	3	0.30	–	5.10	3	0.30	–	6.10	3	0.30	–	7.10	3	0.30	–	8.10	3	0.30	–	9.10	3	0.30	–	10.10	
	T103	3	0.30	17	–	3	0.30	21	–	3	0.30	24	–	3	0.30	27	–	3	0.30	31	–	3	0.30	34		

3 = Ø 3/8" OR 9 MM. , # 4 = Ø 1/2" OR 12 MM. , # 8 = Ø 1" OR 25 MM.

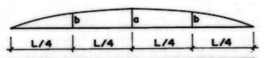
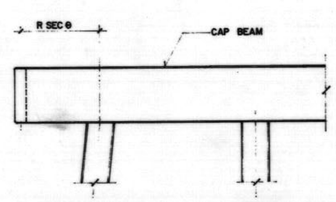


TABLE OF DEAD LOAD CAMBER

SPAN	CAMBER a	CAMBER b
5.00	0.0022	0.0016
6.00	0.0034	0.0025
7.00	0.0054	0.0040
8.00	0.0076	0.0054
9.00	0.0103	0.0074
10.00	0.0122	0.0088



OVERHANGING CAP BEAM DETAIL
NOT TO SCALE

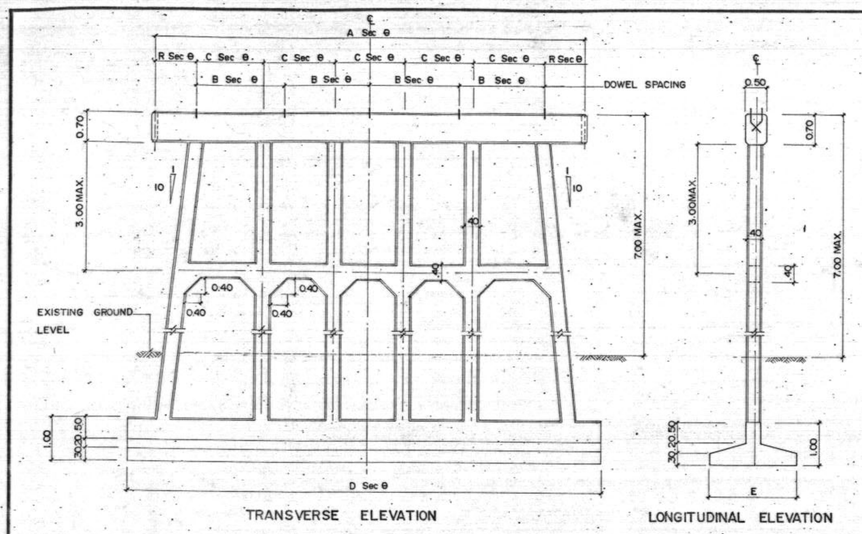
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

0° - 30° SKEW RC. SLAB BRIDGE

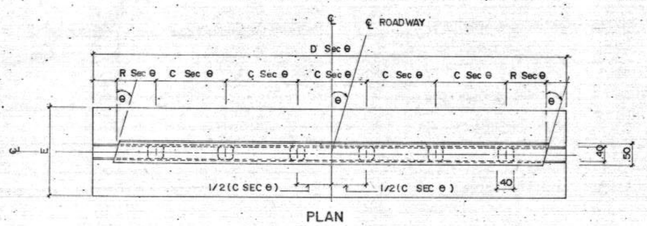
BRIDGE REINF., PLAN, SECTIONS AND DETAILS

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Buranapong (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. ST-26
		SHEET NO. 139



TRANSVERSE ELEVATION

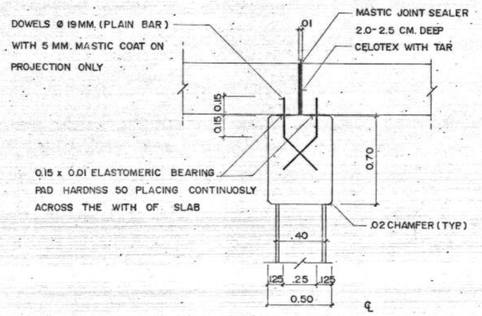
LONGITUDINAL ELEVATION



PLAN

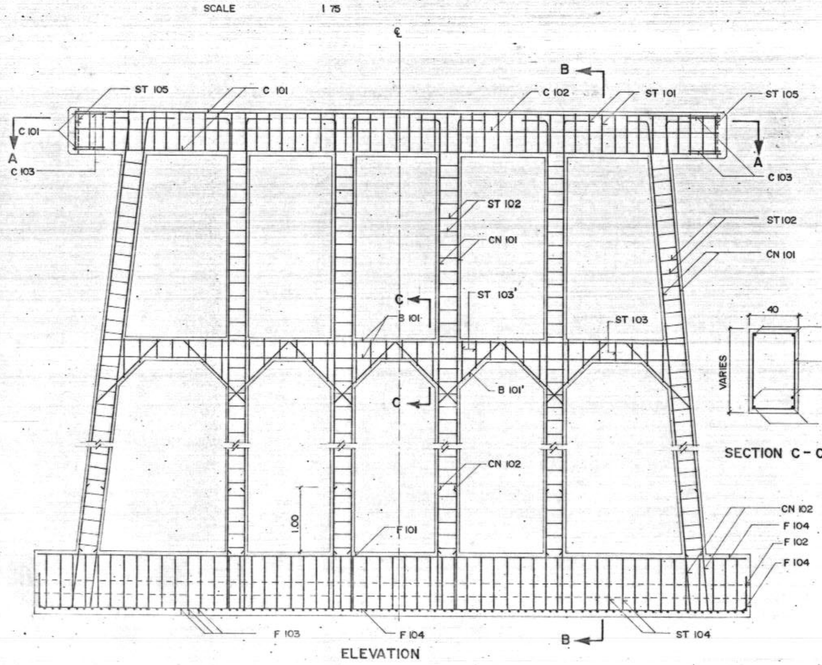
PIER DETAILS

SCALE 1:75

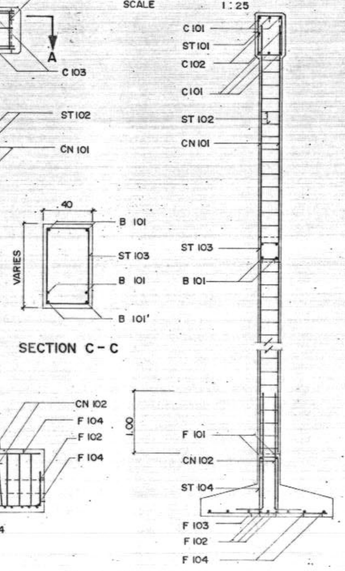


CAP BEAM DETAILS

SCALE 1:25

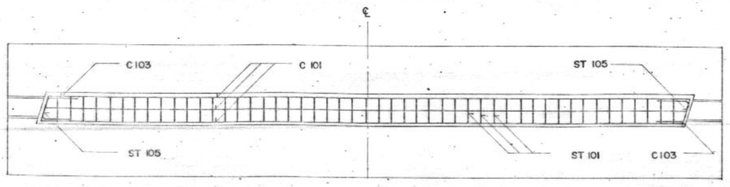


ELEVATION



SECTION B - B

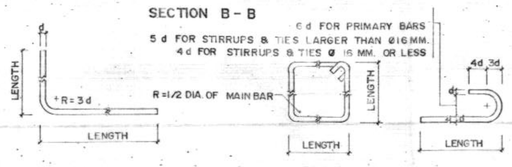
SECTION C - C



SECTION A - A

REINFORCEMENT DETAILS

SCALE 1:50



DEFORMED BAR PLAIN BAR

BAR BENDING DETAILS

NOT TO SCALE

TABLE OF PIER DIMENSIONS

ROADWAY WIDTH M.	LENGTH OF CAP BEAM A Sec θ M.	DOWEL SPACING B Sec θ M.	SPAN 5.00 M. COL. SPG. C Sec θ M.	SPAN 5.00 M. NO. OF COLUMN	SPAN 6.00 M. COL. SPG. C Sec θ M.	SPAN 6.00 M. NO. OF COLUMN	SPAN 7.00 M. COL. SPG. C Sec θ M.	SPAN 7.00 M. NO. OF COLUMN	SPAN 8.00 M. COL. SPG. C Sec θ M.	SPAN 8.00 M. NO. OF COLUMN.	SPAN. 9.00 M. COL. SPG. C Sec θ M.	SPAN. 9.00 M. NO. OF COLUMN	SPAN 10.00 M. COL. SPG. C Sec θ M.	SPAN 10.00 M. NO. OF COLUMN
6.00	(6.0 + 2R) Sec θ	2.00 Sec θ	2.00 Sec θ	4	2.00 Sec θ	4	1.50 Sec θ	5	1.60 Sec θ	5	1.20 Sec θ	6	1.20 Sec θ	6
7.00	(7.0 + 2R) Sec θ	1.75 Sec θ	2.30 Sec θ & 2.40 Sec θ	4	2.30 Sec θ & 2.40 Sec θ	4	1.75 Sec θ	5	1.75 Sec θ	5	1.40 Sec θ	6	1.40 Sec θ	6
8.00	(8.0 + 2R) Sec θ	2.00 Sec θ	2.65 Sec θ & 2.70 Sec θ	4	2.65 Sec θ & 2.70 Sec θ	4	2.00 Sec θ	5	2.00 Sec θ	5	1.60 Sec θ	6	1.60 Sec θ	6
9.00	(9.0 + 2R) Sec θ	1.80 Sec θ	3.00 Sec θ	4	3.00 Sec θ	4	2.25 Sec θ	5	2.25 Sec θ	5	1.50 Sec θ	7	1.50 Sec θ	7
10.00	(10.0+ 2R) Sec θ	2.00 Sec θ	2.50 Sec θ	5	2.50 Sec θ	5	2.00 Sec θ	6	2.00 Sec θ	6	1.40 Sec θ	8	1.40 Sec θ	8
11.00	(11.0 + 2R) Sec θ	2.20 Sec θ	2.75 Sec θ	5	2.75 Sec θ	5	1.80 Sec θ & 1.85 Sec θ	7	1.80 Sec θ & 1.85 Sec θ	7	1.50 Sec θ & 1.60 Sec θ	8	1.30 Sec θ & 1.40 Sec θ	9
12.00	(12.0 + 2R) Sec θ	2.00 Sec θ	2.40 Sec θ	6	2.40 Sec θ	6	2.00 Sec θ	7	2.00 Sec θ	7	1.70 Sec θ & 1.80 Sec θ	8	1.50 Sec θ	9
13.00	(13.0 + 2R) Sec θ	1.85 Sec θ & 1.90 Sec θ	2.60 Sec θ	6	2.60 Sec θ	6	1.85 Sec θ & 1.90 Sec θ	8	1.85 Sec θ & 1.90 Sec θ	8	1.55 Sec θ & 1.65 Sec θ	9	1.40 Sec θ & 1.45 Sec θ	10
14.00	(14.0 + 2R) Sec θ	2.00 Sec θ	2.30 Sec θ & 2.40 Sec θ	7	2.30 Sec θ & 2.40 Sec θ	7	2.00 Sec θ	8	2.00 Sec θ	8	1.75 Sec θ	9	1.55 Sec θ & 1.60 Sec θ	10

TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M. #	@	NO.	L	SPAN 6.00 M. #	@	NO.	L	SPAN 7.00 M. #	@	NO.	L	SPAN 8.00 M. #	@	NO.	L	SPAN 9.00 M. #	@	NO.	L	SPAN 10.00 M. #	@	NO.	L
VARIES	C 101	8	-	6	-	8	-	6	-	8	-	6	-	8	-	6	-	8	-	6	-	8	-	6	-
VARIES	C 102	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-
0.50 / 0.50 / 0.35	C 103	4	-	4	-	4	-	4	-	4	-	4	-	4	-	4	-	4	-	4	-	4	-	4	-
10.85 / 0.40 / 0.40 / 1.91	CN 101	8	-	-	11.25	8	-	-	11.25	8	-	-	11.25	8	-	-	11.25	8	-	-	11.25	8	-	-	11.25
	CN 102	8	-	-	2.31	8	-	-	2.31	8	-	-	2.31	8	-	-	2.31	8	-	-	2.31	8	-	-	2.31
0.65 / 0.45 / 0.075 / 0.075	ST 101	3	0.20	-	2.35	3	0.20	-	2.35	3	0.20	-	2.35	3	0.20	-	2.35	3	0.20	-	2.35	3	0.20	-	2.35
0.30 / 0.30 / 0.30 / 0.30 / 0.075 / 0.075 / 0.50	ST 102	3	0.20	-	1.35	3	0.20	-	1.35	3	0.20	-	1.35	3	0.20	-	1.35	3	0.20	-	1.35	3	0.20	-	1.35
	ST 103	3	0.25	-	1.35	3	0.25	-	1.35	3	0.25	-	1.35	3	0.25	-	1.35	3	0.25	-	1.35	3	0.25	-	1.35
	ST 103'	3	-	-	-	3	-	-		3	-	-	-	3	-	-	-	3	-	-	-	3	-	-	-
0.25 / 0.65 / 0.075 / 0.075	ST 104	3	0.20	-	2.55	3	0.20	-	2.55	3	0.20	-	2.55	3	0.20	-	2.55	3	0.20	-	2.55	3	0.20	-	2.55
VARIES	ST 105	3	-	2	1.95	3	-	2	1.95	3	-	2	1.95	3	-	2	1.95	3	-	2	1.95	3	-	2	1.95
VARIES	B 101	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-
	B 101'	6	-	-	1.55	6	-	-	1.55	6	-	-	1.55	6	-	-	1.55	6	-	-	1.55	6	-	-	1.55
VARIES	F 101	8	-	3	-	8	-	3	-	8	-	3	-	8	-	3	-	8	-	3	-	8	-	3	-
0.60 / VARIES / 0.60	F 102	8	-	3	-	8	-	3	-	8	-	3	-	8	-	3	-	8	-	3	-	8	-	3	-
VARIES	F 103	4	0.25	-	1.55	4	0.25	-	1.55	4	0.20	-	1.75	4	0.20	-	1.75	4	0.25	-	1.95	4	0.25	-	1.95
VARIES	F 104	4	-	6	-	4	-	6	-	4	-	6	-	4	-	6	-	4	-	6	-	4	-	6	-

3 = Ø 3/8" OR 9 MM. # 4 = Ø 1/2" OR 12 MM. # 8 = Ø 1 OR 25 MM. NO. = TOTAL AMOUNT OF BARS L = TOTAL LENGTH OF EACH BAR

TABLE OF FOOTING DIMENSIONS

ROADWAY WIDTH M.	LENGTH OF FOOTING D Sec θ, M	WIDTH OF FOOTING, E SPAN 5.00 - 6.00 M.	SPAN 7.00 - 8.00 M.	SPAN 9.00 - 10.00 M.
6.00	8.80 Sec θ	1.60	1.80	2.00
7.00	9.80 Sec θ	1.60	1.80	2.00
8.00	10.80 Sec θ	1.60	1.80	2.00
9.00	11.80 Sec θ	1.60	1.80	2.00
10.00	12.80 Sec θ	1.60	1.80	2.00
11.00	13.80 Sec θ	1.60	1.80	2.00
12.00	14.80 Sec θ	1.60	1.80	2.00
13.00	15.80 Sec θ	1.60	1.80	2.00
14.00	16.80 Sec θ	1.60	1.80	2.00

TABLE OF Sec θ

	15	20					
Sec	1.0000	1.0058	1.0154	1.0353	1.0642	1.1024	1.1547

NOTES

1. THE BOTTOM OF A FOOTING SHALL BE EMBEDDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT ITS CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED. 10 CM. THICK OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND. COMPOSITION OF LEAN CONCRETE SHALL BE 1: 3: 6 BY VOLUME.
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON / M^2
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES:
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M. AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0 M. ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM BACK WALL AND WINGWALLS WHERE A CLEAR COVER OF 2.5CM. SHALL BE PROVIDED
5. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 Kg/m^3 AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 Kg/Cm^2 FOR A 15 x 15 x 15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS:
   PORTLAND CEMET 350 Kg.
   SAND 0.45 m^3
   CRUSHED ROCK OR GRAVEL 0.86 m^3
   CONCRETE SLUMP MIX 10 Cm.
6. REBARS #4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
7. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
9. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM WITHOUT ALTERING THE LOCATIONS OF REBARS.
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING CANAL BED TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL
11. THE SKEW ANGLE (θ) IS THE ANGLE IN DEGREES BETWEEN THE DIRECTION OF THE CANAL AND A LINE PERPENDICULAR TO THE ROADWAY
12. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 12.0 M.
13. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
14. THIS DRAWING MAY BE USED IN COMBINATION WITH ONE OF THE FOLLOWING DRAWINGS BELOW WHICHEVER IS APPLICABLE.
    DWG. NOS. ST-02, ST-05, ST-08
15. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3805-106-14/2.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

0° - 30° SKEW R.C. SLAB BRIDGE
SPREAD FOOTING PIER DETAILS

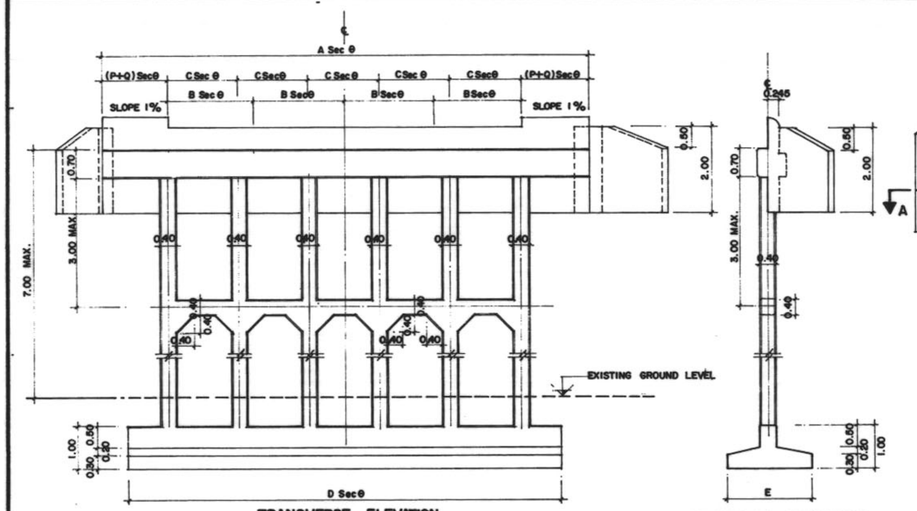
DESIGNED : DOH & CONSULTANTS | CHECKED : | DATE JULY 1994

SUBMITTED : | SCALE AS SHOWN

APPROVED : (DIRECTOR GENERAL)

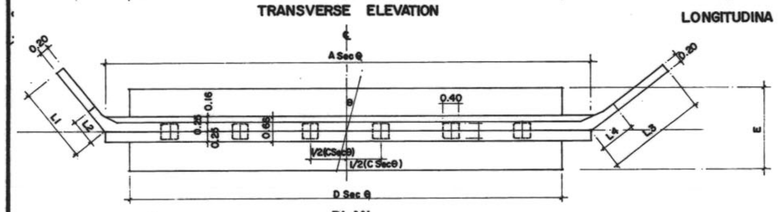
NO. ST-27

SHEET NO. 140



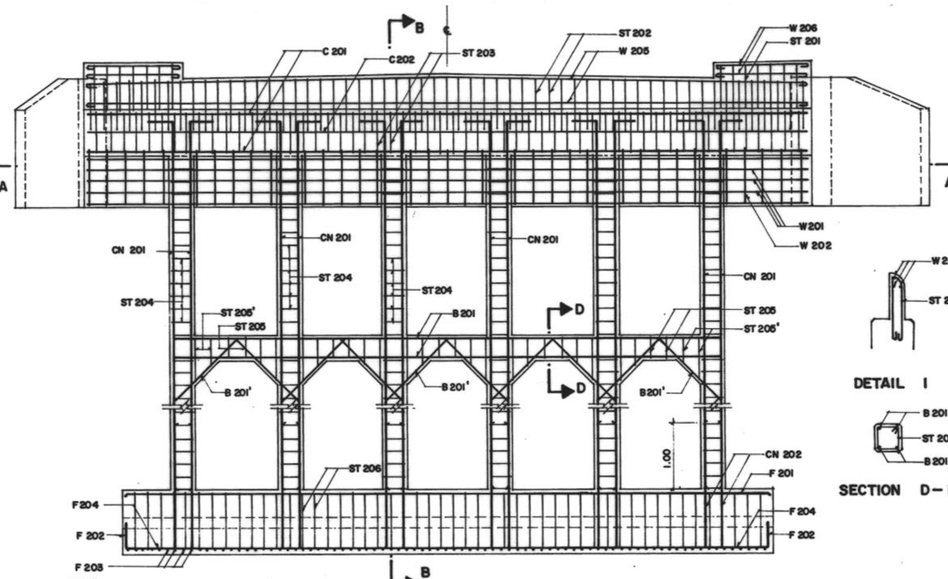
TRANSVERSE ELEVATION

LONGITUDINA ELEVATION

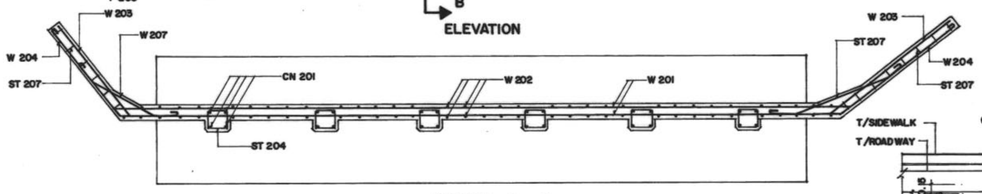


PLAN

ABUTMENT DETAILS



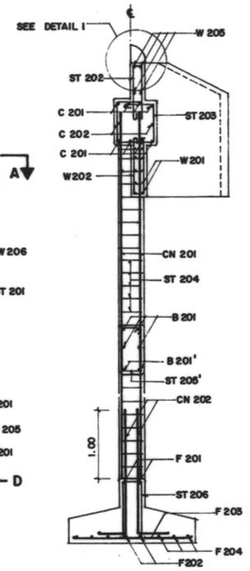
ELEVATION



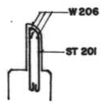
SECTION A – A

REINFORCEMENT DETAILS

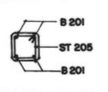
SCALE 1:50



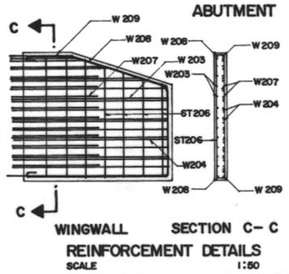
SECTION B – B



DETAIL I



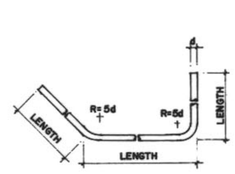
SECTION D – D



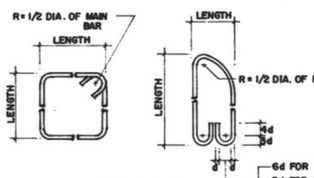
WINGWALL SECTION C – C

REINFORCEMENT DETAILS

SCALE 1:50



DEFORMED BAR

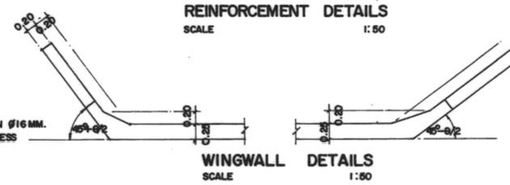


PLAIN BAR

6d FOR PRIMARY BARS.
5d FOR STIRRUPS & TIES LARGER THAN Ø16 MM.
4d FOR STIRRUPS & TIES Ø16 MM. OR LESS

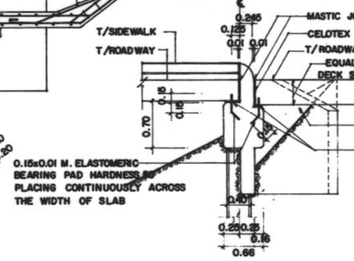
BAR BENDING DETAILS

NOT TO SCALE



WINGWALL DETAILS

SCALE 1:50



ABUTMENT HEAD DETAILS

SCALE 1:50

NOTES:

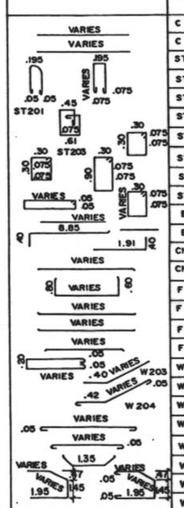
1. THE BOTTOM OF A FOOTING SHALL BE EMBEDDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT IT'S CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PERPARED, 10 CM THICK OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 BY VOLUME.
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON / M^2.
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES:
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0M. A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M. AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0 CM. ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, BACK WALL AND WINGWALLS WHEREA CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
5. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 Kg./M^3 AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 Kg/CM^2 FOR A 15X15X15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMAT MIX DESIGN PER. CUBIC METER IS AS FOLLOWS:

PORTLAND CEMENT	350	Kg.
SAND	0.45	M.^{3}
CRUSHED ROCK OR GRAVEL	0.86	M.^{3}
CONCRETE SLUMP MIX.	10	C M.

6. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD.30 DEFORMED BARS OTHERS SHALL BE TIS.20 GRAD SR 24 PLAN BARS UNLESS OTHERS SHALL BE TIS.20 GRADE SR 24 PLAN BARS UNLESS OTHERWISE INDICATED.
7. LOCATIONS OF LAP SPLICE OR REBARS SHALL BE APPROVED BY THE ENGINEER.
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
9. IN CASE OR SALINE PROTFCTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS. 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE BROVIDED FOR THE CAP BEAM WITHOUT ALTERING THE LOCATIONS OF REBARS.
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING CANAL BED TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS H GHER THAN 7.00M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
11. THE SKEW ANGLE (θ) IS THE ANGLE IN DEGREES BETWEEN THE DIRECTION OF THE CANAL AND A LINE PERPENDICULAR TO THE ROADWAY
12. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 10.00 M.
13. ALL DIMENSIONS SHOWN ARE IN METER UNLESS OTHERWISE INDICATED.
14. THIS DRAWING MAY BE USED IN COMBINATION WITH ONE OF THE FOLLOWING DRAWINGS BELOW WHICHEVER IS APPLICABLE:
    DWG. NOS. ST-03, ST-06, ST-09, ST-12, ST-15, ST-18, ST-21, ST-24.
15. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3 BDS-106-14/2 e.

TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS



BAR MARK	SPAN 5.00M.				SPAN 6.00 M.				SPAN 7.00 M.				SPAN 8.00 M.				SPAN 9.00 M.				SPAN 10.00 M.			
	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L
C 201	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
C 202	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
ST 201	2	.20	–	1.215	2	.20	–	1.295	2	.20	–	1.355	2	.20	–	1.435	2	.20	–	1.515	2	.20	–	1.635
ST 202	3	.20	–	1.745	3	.20	–	1.795	3	.20	–	1.845	3	.20	–	1.895	3	.20	–	1.945	3	.20	–	1.995
ST 203	3	.20	–	3.155	3	.20	–	3.195	3	.20	–	3.225	3	.20	–	3.265	3	.20	–	3.265	3	.20	–	3.365
ST 204	3	.20	–	1.35	3	.20	–	1.35	3	.20	–	1.35	3	.20	–	1.35	3	.20	–	1.35	3	.20	–	1.35
ST 205	3	.25	–	1.35	3	.25	–	1.35	3	.25	–	1.35	3	.25	–	1.35	3	.25	–	1.35	3	.25	–	1.35
ST 205'	3	–	–	–	3	–	–	–	3	–	–	–	3	–	–	–	3	–	–	–	3	–	–	–
ST 206	3	.20	–	2.55	3	.20	–	–	3	.20	–	–	3	.20	–	2.55	3	.20	–	2.55	3	.20	–	2.55
ST 207	2	.30	–	–	2	.30	–	–	2	.30	–	–	2	.30	–	–	2	.30	–	–	2	.30	–	–
B 201	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
B 201'	6	–	–	1.55	6	–	–	1.55	6	–	–	1.55	6	–	–	1.55	6	–	–	1.55	6	–	–	1.55
CN 201	8	–	–	9.25	8	–	–	9.25	8	–	–	9.25	8	–	–	9.25	8	–	–	9.25	8	–	–	9.25
CN 202	8	–	–	2.31	8	–	–	2.31	8	–	–	2.31	8	–	–	2.31	8	–	–	2.31	8	–	–	2.31
F 201	8	–	2	–	8	–	2	–	8	–	2	–	8	–	2	–	8	–	2	–	8	–	2	–
F 202	8	–	2	–	8	–	2	–	8	–	2	–	8	–	2	–	8	–	2	–	8	–	2	–
F 203	4	.25	–	1.55	4	.25	–	1.55	4	.20	–	1.75	4	.20	–	1.75	4	.125	–	1.95	4	.125	–	1.95
F 204	4	–	6	–	4	–	6	–	4	–	6	–	4	–	6	–	4	–	6	–	4	–	6	–
W 201	4	.20	10	–	4	.20	10	–	4	.20	10	–	4	.20	10	–	4	.20	10	–	4	.20	10	–
W 202	2	.30	–	2.70	2	.30	–	2.60	2	.30	–	2.60	2	.30	–	2.50	2	.30	–	2.40	2	.30	–	2.30
W 203	4	.15	24	–	4	.15	24	–	4	.15	24	–	4	.15	24	–	4	.15	24	–	4	.15	25	–
W 204	2	30	12	–	2	30	12	–	2	30	12	–	2	30	12	–	2	30	12	–	2	30	–	–
W 205	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–
W206	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–
W207	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15
W208	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
W209	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–

= 2 = Ø 1/4" OR 6 MM., # 3 = Ø 3/8" OR 9 MM., # 4 = Ø 1/2" OR 12 MM., # 8 = Ø 1" OR 25 MM. NO = TOTAL AMOUNT OF BARS L = TOTAL LENGTH OF EACH BARS

TABLE OF ABUTMENT DIMENSIONS

ROADWAY WIDTH M.	LENGTH OF ABUTMENT HEAD A Sec θ M.	DOWEL SPACING B Sec θ M.	SPAN 5.00 M.		SPAN 6.00 M.		SPAN 7.00 M.		SPAN 8.00 M.		SPAN 9.00 M.		SPAN 10.00 M.	
			COL. SPG. C Sec θ M.	NO. OF COL.	COL. SPG C Sec θ M.	NO. OF COL.	COL. SPG. C Sec θ M.	NO. OF COL.	COL. SPG. C Sec θ M.	NO. OF COL.	COL. SPG. C Sec θ M.	NO. OF COL.	COL. SPG. C Sec θ M.	NO. OF COL.
6.00	(6.0+2(P+Q)) Sec θ	2.00 Sec θ	2.00 Sec θ	4	2.00 Sec θ	4	1.50 Sec θ	5	1.50 Sec θ	5	1.20 Sec θ	6	1.20 Sec θ	6
7.00	(7.0+2(P+Q)) Sec θ	1.75 Sec θ	2.30 Sec θ & 2.40 Sec θ	4	2.30 Sec θ & 2.40 Sec θ	4	1.75 Sec θ	5	1.75 Sec θ	5	1.40 Sec θ	6	1.40 Sec θ	6
8.00	(8.0+2(P+Q)) Sec θ	2.00 Sec θ	2.65 Sec θ & 2.70 Sec θ	4	2.65 Sec θ & 2.70 Sec θ	4	2.00 Sec θ	5	2.00 Sec θ	5	1.60 Sec θ	6	1.60 Sec θ	6
9.00	(9.0+2(P+Q)) Sec θ	1.80 Sec θ	3.00 Sec θ	4	3.00 Sec θ	4	2.25 Sec θ	5	2.25 Sec θ	5	1.50 Sec θ	7	1.50 Sec θ	7
10.00	(10.0+2(P+Q)) Sec θ	2.00 Sec θ	2.50 Sec θ	5	2.50 Sec θ	5	2.00 Sec θ	6	2.00 Sec θ	6	1.40 Sec θ	8	1.40 Sec θ	8
11.00	(11.0+2(P+Q)) Sec θ	2.20 Sec θ	2.75 Sec θ	5	2.75 Sec θ	5	1.80 Sec θ & 1.85 Sec θ	7	1.80 Sec θ & 1.85 Sec θ	7	1.50 Sec θ & 1.60 Sec θ	8	1.30 Sec θ & 1.40 Sec θ	9
12.00	(12.0+2(P+Q)) Sec θ	2.00 Sec θ	2.40 Sec θ	6	2.40 Sec θ	6	2.00 Sec θ	7	2.00 Sec θ	7	1.70 Sec θ & 1.80 Sec θ	8	1.50 Sec θ	9
13.00	(13.0+2(P+Q)) Sec θ	1.85 Sec θ & 1.90 Sec θ	2.60 Sec θ	6	2.60 Sec θ	6	1.85 Sec θ & 1.90 Sec θ	8	1.85 Sec θ & 1.90 Sec θ	8	1.55 Sec θ & 1.65 Sec θ	9	1.40 Sec θ & 1.45 Sec θ	10
14.00	(14.0+2(P+Q)) Sec θ	2.00 Sec θ	2.30 Sec θ & 2.40 Sec θ	7	2.30 Sec θ & 2.40 Sec θ	7	2.00 Sec θ	8	2.00 Sec θ	8	1.75 Sec θ	9	1.55 Sec θ & 1.60 Sec θ	10

TABLE OF FOOTING DIMENSIONS

ROADWAY WIDTH M	LENGTH OF FOOTING D Sec θ, M.	WIDTH OF FOOTING, E		
		SPAN 5.00 – 6.00 M.	SPAN 7.00 – 8.00 M.	SPAN 9.00 – 10.00 M.
6.00	7.80 Sec θ	1.60	1.80	2.00
7.00	8.80 Sec θ	1.60	1.80	2.00
8.00	9.80 Sec θ	1.60	1.80	2.00
9.00	10.80 Sec θ	1.60	1.80	2.00
10.00	11.80 Sec θ	1.60	1.80	2.00
10.00	12.80 Sec θ	1.60	1.80	2.00
11.00	13.80 Sec θ	1.60	1.80	2.00
13.00	14.80 Sec θ	1.60	1.80	2.00
14.00	15.80 Sec θ	1.60	1.80	2.00

LENGTH OF WINGWALL

L1 = 1.414 Sec (45° – θ/2)
L2 = 0.50 Sec (45° – θ/2)
L3 = 1.414 Sec (45° + θ/2)
L4 = 0.50 Sec (45° + θ/2)

TABLE OF Sec θ OR Sec (45° ± θ/2)

θ OR 45° ± θ/2	0	5	10	15	20	25	30	35	40	45	50	55	60
Sec θ OR Sec 45±θ/2	1.0000	1.0038	1.0154	1.0353	1.0642	1.1034	1.1547	1.2208	1.3054	1.4142	1.5557	1.7434	2.0000

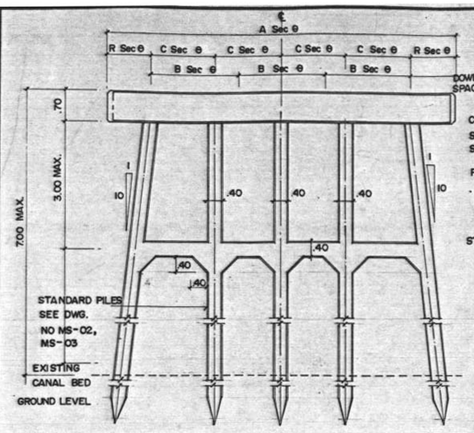
KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

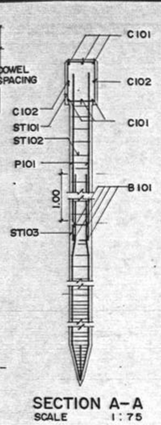
STANDARD DRAWING

0°– 30° SKEW RC. SLAB BRIDGE
SPREAD FOOTING ABUTMENT DETAILS

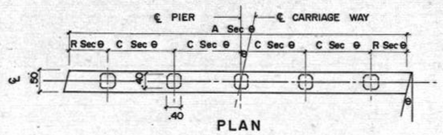
DESIGNED: DOH & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: P. Bamrung (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
		DWG. NO. ST-28
APPROVED: FOR (DIRECTOR GENERAL)		SHEET NO. 141



ELEVATION

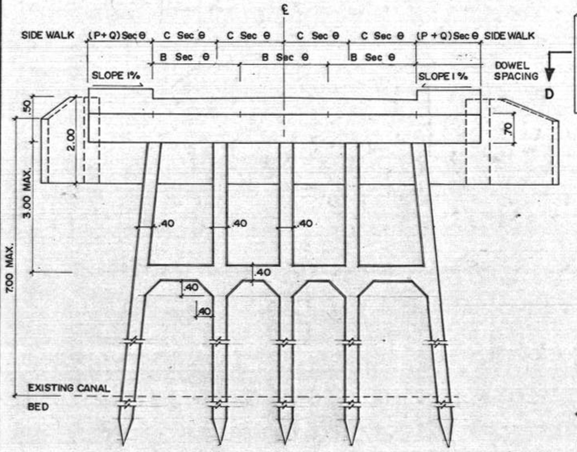


SECTION A-A
SCALE 1 : 75

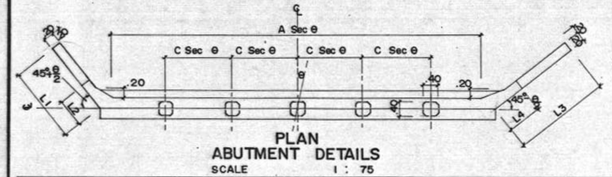


PLAN

PILE BENT DETAILS
SCALE 1 75

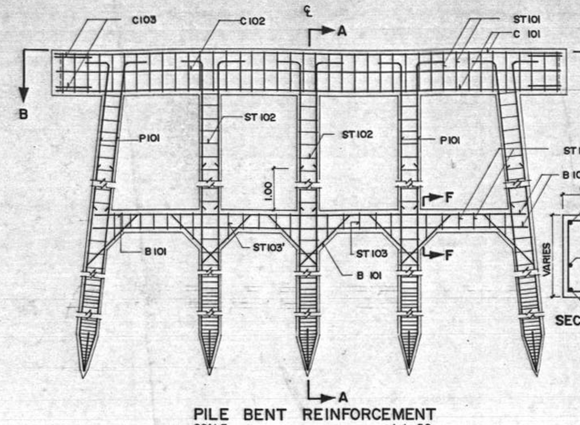


ELEVATION

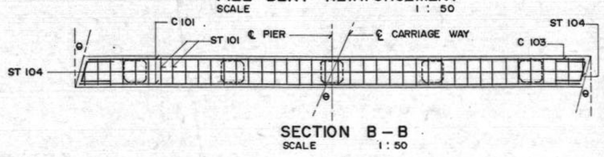


PLAN

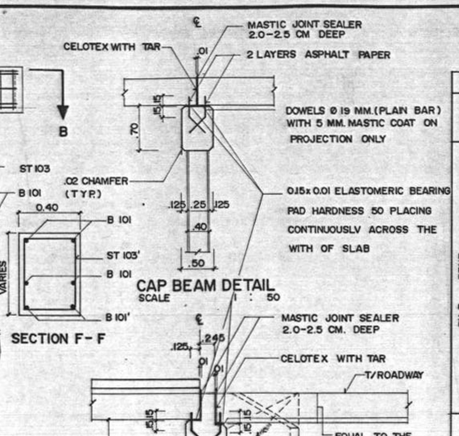
ABUTMENT DETAILS
SCALE 1 : 75



PILE BENT REINFORCEMENT
SCALE 1 : 50

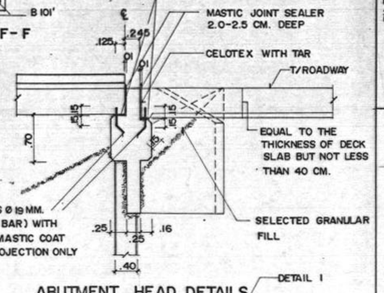


SECTION B-B
SCALE 1 : 50

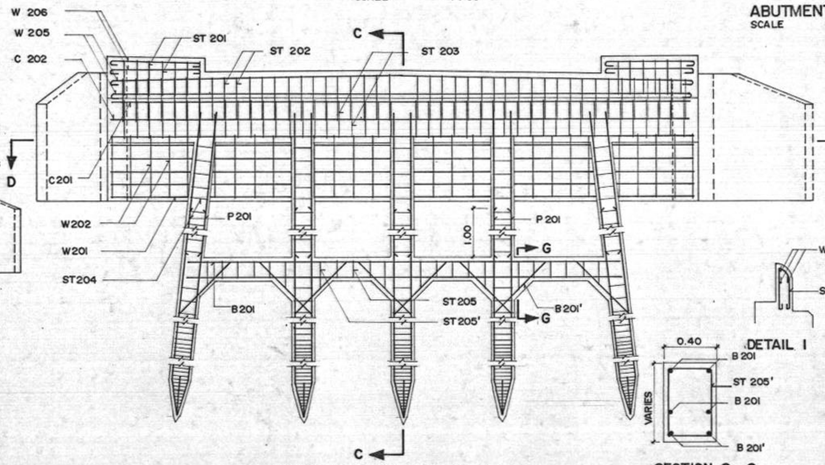


CAP BEAM DETAIL
SCALE 1 : 50

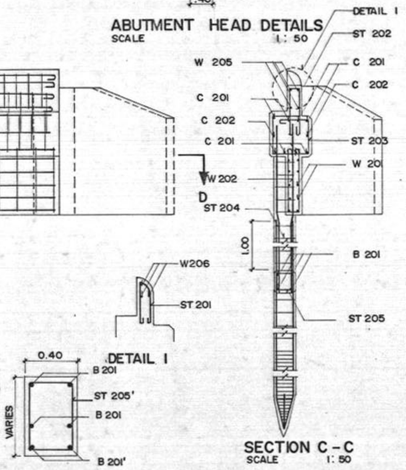
SECTION F-F



ABUTMENT HEAD DETAILS
SCALE 1 : 50

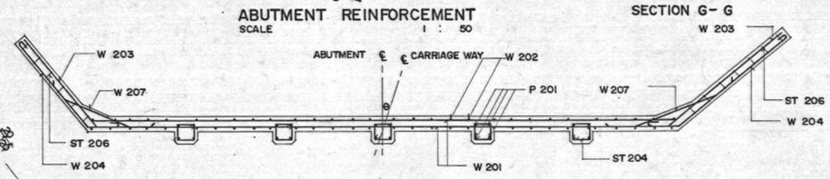


ABUTMENT REINFORCEMENT
SCALE 1 : 50

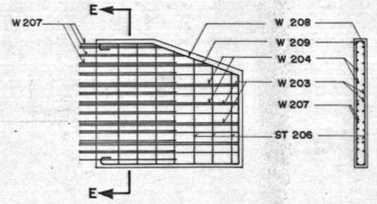


SECTION G-G

SECTION C-C
SCALE 1 : 50



SECTION D-D
SCALE 1 : 50



WINGWALL REINFORCEMENT DETAILS
SCALE 1 : 50

SECTION E-E
SCALE 1 : 50

TABLE OF REINFORCEMENT

	BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M.			SPAN 6.00 M.			SPAN 7.00 M.			SPAN 8.00 M.			SPAN 9.00 M.			SPAN 10.00 M.		
			#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L
PILE BENE	VARIES	C 101	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–
		C 102	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
		C 103	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–
		ST 101	3	.20	–	2.35	3	.20	–	2.35	3	.20	–	2.35	3	.20	–	2.35	3	.20	–	2.35
		ST 102	3	.20	–	1.35	3	.20	–	1.35	3	.20	–	1.35	3	.20	–	1.35	3	.20	–	1.35
		ST 103	3	.25		1.35	3	.25		1.35	3	.25		1.35	3	.25		1.35	3	.25		1.35
		ST 103'	3	.25	–	–	3	.25	–	–	3	.25	–	–	3	.25	–	–	3	.25	–	–
		ST 104	3	–	2	2.55	3	–	2	2.55	3	–	2	2.55	3	–	2	2.55	3	–	2	2.55
		B 101	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
		B 101'	6	–	–	1.60	6	–	–	1.60	6	–	–	1.60	6	–	–	1.60	6	–	–	1.60
		P 101	8	–	–	3.75	8	–	–	3.75	8	–	–	3.75	–	–	–	3.75	–	–	–	3.75
ABUTMENT	VARIES	C 201	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
		C 202	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
		ST 201	2	.20	–	1.215	2	.20	–	1.295	2	.20	–	1.355	2	.20	–	1.435	2	.20	–	1.515
		ST 202	3	.20	–	1.745	3	.20	–	1.795	3	.20	–	1.845	3	.20	–	1.895	3	.20	–	1.945
		ST 203	3	.20	–	–	3	.20	–	–	3	.20	–	–	3	.20	–	–	3	.20	–	–
		ST 204	3	.20	–	1.35	3	.20	–	1.35	3	.20	–	1.35	3	.20	–	1.35	3	.20	–	1.35
		ST 205	3	.25		1.35	3	.25		1.35	3	.25		1.35	3	.25		1.35	3	.25		1.35
		ST 205'	3	.25	–	–	3	.25	–	–	3	.25	–	–	3	.25	–	–	3	.25	–	–
		ST 206	2	.30	–	–	2	.30	–	–	2	.30	–	–	2	.30	–	–	2	.30	–	–
		B 201	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
		B 201'	6	–	–	1.55	6	–	–	1.55	6	–	–	1.55	6	–	–	1.55	6	–	–	1.55
		P 201	8	–	–	3.75	8	–	–	3.75	8	–	–	3.75	8	–	–	3.75	8	–	–	3.75
		W 201	4	.20	10	–	4	.20	10	–	4	.20	10	–	4	.20	10	–	4	.20	10	–
		W 202	2	.30	–	2.75	2	.30	–	2.60	2	.30	–	2.60	2	.30	–	2.50	2	.30	–	2.40
		W 203	4	.15	24	–	4	.15	24	–	4	.15	24	–	4	.15	24	–	4	.15	24	–
		W 204	2	.30	12	–	2	.30	12	–	2	.30	12	–	2	.30	12	–	2	.30	12	–
		W 205	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–
		W 206	2	–	8	–	2	–	8	–	2	–	8	–	2	–	8	–	2	–	8	–
		W 207	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15	4	.15	26	2.15
		W 208	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
		W 209	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–	2	–

# 2 = Ø4.44" OR 6 MM., # 3 = Ø3/8" OR 9 MM., # 4 = Ø1/2" OR 12 MM., # 6 = Ø3.46" OR 20 MM. NO. = TOTAL AMOUNT OF BARS
L = TOTAL LENGTH OF EACH BARS

TABLE OF PIER AND ABUTMENT DIMENSIONS

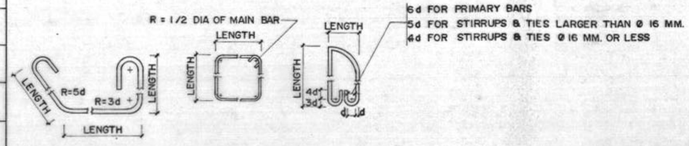
ROADWAY WIDTH M	LENGTH OF PILE BENT A Sec θ M	LENGTH OF ABUTMENT HEAD A Sec θ M	DOWEL SPACING B Sec θ M	SPAN 5.00 M COL. SPG. C Sec θ M	SPAN 5.00 M NO. OF COLUMN	SPAN 6.00 M COL. SPG. C Sec θ M	SPAN 6.00 M NO. OF COLUMN	SPAN 7.00 M COL. SPG. C Sec θ M	SPAN 7.00 M NO. OF COLUMN	SPAN 8.00 M COL. SPG. C Sec θ M	SPAN 8.00 M NO. OF COLUMN	SPAN 9.00 M COL. SPG. C Sec θ M	SPAN 9.00 M NO. OF COLUMN	SPAN 10.00 M COL. SPG. C Sec θ M	SPAN 10.00 M NO. OF COLUMN
6.00	(6.0 – 2R) Sec θ	(6.0+2(P+Q) Sec θ	2.00 Sec θ	2.00 Sec θ	4	2.00 Sec θ	4	1.50 Sec θ	5	1.50 Sec θ	5	1.20 Sec θ	6	1.20 Sec θ	6
7.00	(7.0 + 2R) Sec θ	(7.0+2(P+Q) Sec θ	1.75 Sec θ	2.30 Sec θ & 2.40 Sec θ	4	2.30 Sec θ & 2.40 Sec θ	4	1.75 Sec θ	5	1.75 Sec θ	5	1.40 Sec θ	6	1.40 Sec θ	6
8.00	(8.0 + 2R) Sec θ	(8.0 +2(P+Q) Sec θ	2.00 Sec θ	2. 65 Sec θ & 2.70 Sec θ	4	2. 65 Sec θ & 2.70 Sec θ	4	2.00 Sec θ	5	2.00 Sec θ	5	1. 60 Sec θ	6	1. 60 Sec θ	6
9. 00	(9.0 + 2R) Sec θ	(9.0 +2(P+Q) Sec θ	1.80 Sec θ	3.00 Sec θ	4	3.00 Sec θ	4	2. 25 Sec θ	5	2. 25 Sec θ	5	1.50 Sec θ	7	1.50 Sec θ	7
10.00	(10.0 + 2R) Sec θ	(10.0 + 2(P+Q) Sec θ	2.00 Sec θ	2.50 Sec θ	5	2.50 Sec θ	5	2.00 Sec θ	6	2.00 Sec θ	6	1.40 Sec θ	8	1.40 Sec θ	8
11.00	(11.0 + 2R) Sec θ	(11.0 + 2(P+Q) Sec θ	2.20 Sec θ	2.75 Sec θ	5	2.75 Sec θ	5	1.80 Sec θ & 1.85 Sec θ	7	1.80 Sec θ & 1.85 Sec θ	7	1.50 Sec θ & 1.60 Sec θ	8	1.30 Sec θ & 1.40 Sec θ	9
12.00	(12.0 + 2R) Sec θ	(2.0+2(P+Q) Sec θ	2.00 Sec θ	2.40 Sec θ	6	2.40 Sec θ	6	2.00 Sec θ	7	2.00 Sec θ	7	1.70 Sec θ & 1.80 Sec θ	8	1.50 Sec θ	9
13.00	(13.0 + 2R) Sec θ	(3.0 + 2 (P+Q) Sec θ	1.85 Sec θ & 1.90 Sec θ	2.60 Sec θ	6	2.60 Sec θ	6	1.85 Sec θ & 1.90 Sec θ	8	1.85 Sec θ & 1.90 Sec θ	8	1.55 Sec θ & 1.65 Sec θ	9	1.40 Sec θ & 1.45 Sec θ	10
14.00	(14.0 + 2R) Sec θ	(4.0+2(P+Q) Sec θ	2.00 Sec θ	2.30 Sec θ & 2.40 Sec θ	7	2.30 Sec θ & 2.40 Sec θ	7	2.00 Sec θ	8	2.00 Sec θ	8	1.75 Sec θ	9	1.55 Sec θ & 1.60 Sec θ	10

LENGTH OF WINGWALL

L1 = 1.414 Sec (45°–θ/2) , L3 = 1.414 Sec (45°+ θ/2)
L2 = 0.50 Sec (45°–θ/2) , L4 = 0.50 Sec (45°+ θ/2)

TABLE OF Sec θ OR Sec (45° ± θ/2)

θ OR 45° ± θ/2 DEGREE	0	5	10	15	20	25	30	35	40	45	50	55	60
Sec θ OR Sec 45° ± θ/2	1.0000	1.0038	1.0154	1.0353	1.0642	1.1034	1.1547	1.2208	1.3054	1.4142	1.5557	1.7434	2.0000



DEFORMED BAR PLAIN BAR

BAR BENDING DETAILS
NOT TO SCALE

NOTES.

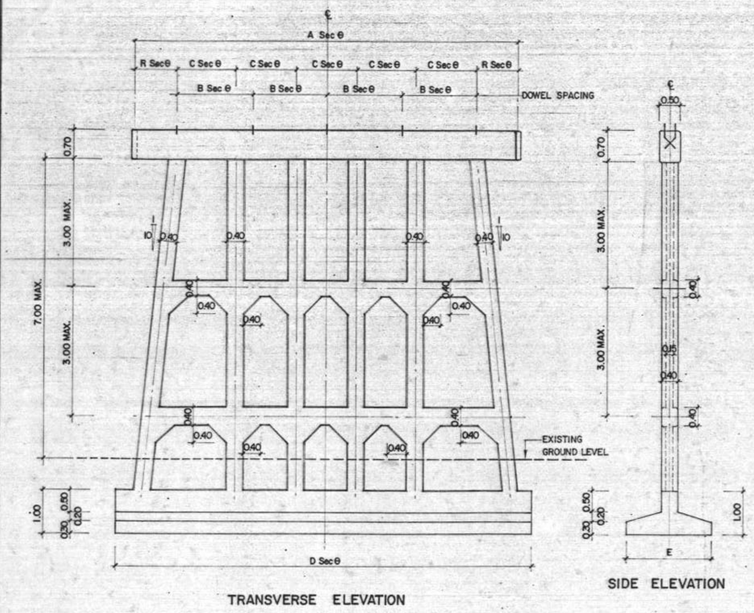
1. EACH PILE SHALL BE DRIVEN TO A DEPTH WHERE SCOUR WILL NOT AFFECT ITS CAPACITY AND SHALL HAVE A MINIMUM ULITIMATE BEARING CAPACITY OF 90 TONS. FOR PILE DETAILS SEE DWG. NO. MS-02, MS-03.
2. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES:
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0 M ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
3. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, BACK WALL AND WINGWALLS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
4. CONCRETE SHALL HAVE MINIMUM CEMENT CONTENT OF 350 KG/m^3 AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG/m^2 FOR A .15 x .15 x .15 m. CUBE AT 28 DAYS.
   CEMENT SHALL BE TIS IS TYPE I PORTLAND CEMENT A SUCESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS POLLOMS :
   PORTLAND CEMENT 350 KG , CRUSHED ROCK GRAVEL 0.86 m^3
   SAND 0.43 m^3 , CONCRETE SLUMP MAX 10 Cm
5. REBARS # 4 OR LARGER SHALL BE TIS.24 GRADE SD-30 DEFORMED BAR, OTHERS SHALL BE TIS.20 GRADE SR24 PLAIN BARS UNLESS OTHERWISE INDICATED.
6. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
7. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND. 24 DIAMETER OF BIGGER BAR FOR DEFORMED BARS.
8. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS. 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED WITHOUT ALTERING THE LOCATIONS OF REBARS.
9. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
10. THE SKEW ANGLE(θ) IS THE ANGLE IN DEGREES BETWEEN THE DIRECTION OF THE CANAL AND A LINE PERPENDICULAR TO THE ROADWAY.
11. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
12. THIS DRAWING MAY BE USED IN COMBINATION WITH ONE OF THE FOLLOWING DRAWINGS BELOW WHICHEVER IS APPLICABLE:! DWG. NOS. ST-07, ST-10
13. THIS DRAWING IS ADAPTED FROM DOH DWG NO 3805 - 106 - 14/3

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

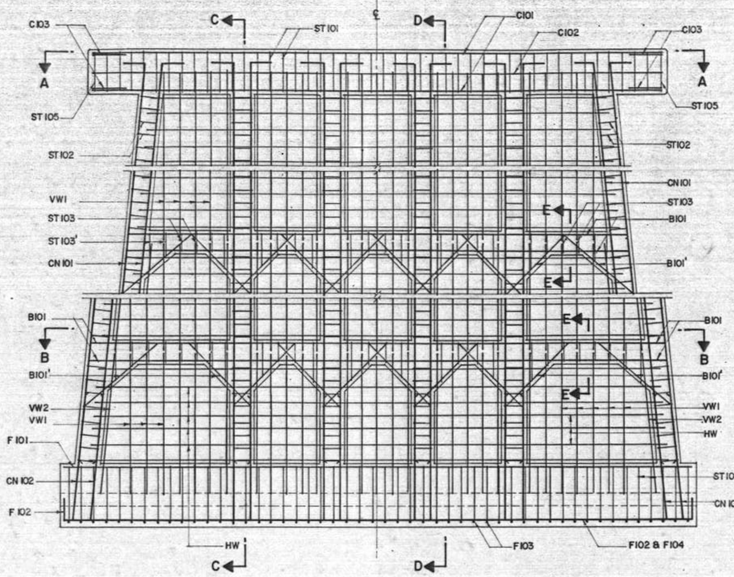
0°-30° SKEW R.C. SLAB BRIDGE
PILE BENT AND ABUTMENT DETAILS

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. ST-29
		SHEET NO. 142

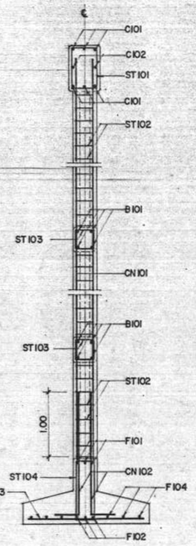


TRANSVERSE ELEVATION

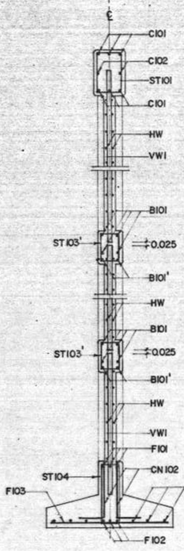
SIDE ELEVATION



ELEVATION



SECTION C – C
SCALE 1:50



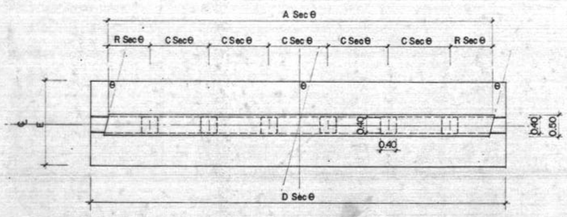
SECTION D – D
SCALE 1:50

NOTES :

1. THE BOTTOM OF A FOOTING SHALL BE EMBEDDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT ITS CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED, 10 CM. THICKNESS OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 BY VOLUME
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON / M^2
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES
   a.) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b.) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0 M., ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, AND DIAPHRAGMS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED
5. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG./M. AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG./CM. FOR A 0.15 0.15 0.15 M. CUBE AT 28 DAYS CEMENT SHALL BE TIS 15 TYPE 1 PORTLAND CEMENT A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

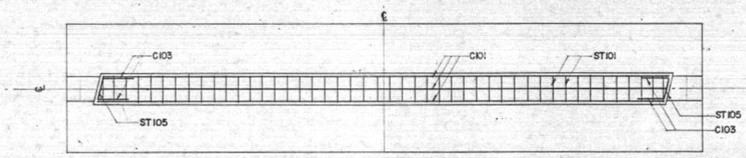
PORTLAND CEMENT	350	KG.
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP MAX	10	CM.

6. REBARS # 4 OR LARGER SHALL BE TIS. 24 GRADE SD.30 DEFORMED BARS, OTHERS SHALL BE TIS. 20. GRADE SR. 24 PLAIN BARS UNLESS OTHERWISE INDICATED
7. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETER OF BIGGER BAR FOR DEFORMED BARS
9. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT CEMENT TYPE 5 CONFROMING TO TIS. 15 SHALL BE USED AND ADDITION CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM AND DIAPHRAGMS WITHOUT ALTERING THE LOCATIONS OF REBARS
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HEIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 12.00 M.
12. THE SKEW ANGLE (θ) IS ANGLE IN DEGREES BETWEEN THE DIRECTION OF THE CANAL AND A LINE PERPENDICULAR TO THE ROADWAY
13. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED
14. THIS DRAWING MAY BE USED IN COMBINATION WITH ONE OF THE FOLLOWING DRAWINGS BELOW WHICHEVER IS APPLICABLE DWG. NO. ST-02, ST-05, ST-08
15. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 38D-106-14/4

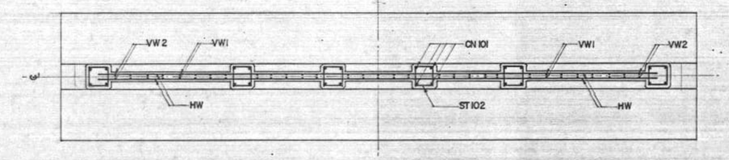


PLAN

PIER DETAILS
SCALE 1:75

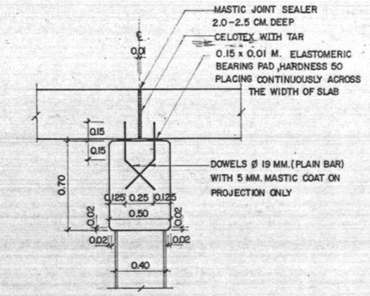


SECTION A – A

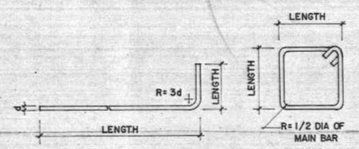


SECTION B – B

PIER REINFORCEMENT DETAILS
SCALE 1:50

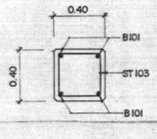


CAP BEAM DETAILS
SCALE 1:25



DEFORMED BAR PLAIN BAR

BAR BENDING DETAILS
NOT TO SCALE



SECTION E – E
SCALE 1:25

TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 8.00 M. #	@	NO.	L	SPAN 9.00 M. #	@	NO.	L	SPAN 10.00 M. #	@	NO.	L
VARIES	C101	8	–	6	–	8	–	6	–	8	–	6	–
VARIES	C102	4	–	2	–	4	–	2	–	4	–	2	–
.50 .50 .35	C103	4	–	4	–	4	–	4	–	4	–	4	–
10.85 .40	CN101	8	–	–	11.25	8	–	–	11.25	8	–	–	11.25
1.91 .40	CN102	8	–	–	2.31	8	–	–	2.31	8	–	–	2.31
.45 .65	ST101	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35
.30 .30	ST102	3	0.20	–	1.35	3	0.20	–	1.35	3	0.20	–	1.35
.30 .30	ST103	3	0.25	–	1.35	3	0.25	–	1.35	3	0.25	–	1.35
.30 .90 .30	ST103'	3	0.25	–	–	3	0.25	–	–	3	0.25	–	–
.25 .65 VARIES .30	ST104	3	0.20	–	2.55	3	0.20	–	2.55	3	0.20	–	2.55
VARIES	ST105	3	–	2	1.95	3	–	2	1.95	3	–	2	1.95
1.55	B101	8	–	12	–	8	–	12	–	8	–	12	–
VARIES	B101'	6	–	–	1.55	6	–	–	1.55	6	–	–	1.55
.60 VARIES .60	FI01	8	–	3	–	8	–	3	–	8	–	3	–
VARIES	FI02	8	–	3	–	8	–	3	–	8	–	3	–
VARIES	FI03	4	0.20	–	1.70	4	0.125	–	1.90	4	0.125	–	1.90
.10 .10 VARIES .075	FI04	4	–	6	–	4	–	6	–	4	–	6	–
.10 .10 VARIES .075	VW1	4	0.25	–	–	4	0.25	–	–	4	0.25	–	–
VARIES	VW2	4	–	6	–	4	–	6	–	4	–	6	–
	HW	4	0.25	–	–	4	0.25	–	–	4	0.25	–	–

#3=Ø 3/8" OR 9 MM. #4=Ø 1/2" OR 12 MM. #6=Ø 3/4" OR 20MM. #8=Ø 1" OR 25 MM., NO.= TOTAL AMOUNT OF BARS, L= TOTAL LENGTH OF EACH BAR

TABLE OF Sec. θ

θ	0	5	10	15	20	25	30
Sec θ	1.0000	1.0038	1.0154	1.0353	1.0642	1.1034	1.1547

TABLE OF PIER DIMENSIONS

ROADWAY WIDTH M.	LENGTH OF CAP BEAM A Sec θ, M.	DOWEL SPACING B Sec θ, M.	SPAN 8.00 M. COLUMN SPACING C Sec θ, M.	SPAN 8.00 M. NO. OF COLUMNS	SPAN 9.00 M. COLUMN SPACING C Sec θ, M.	SPAN 9.00 M. NO. OF COLUMNS	SPAN 10.00 M. COLUMN SPACING C Sec θ, M.	SPAN 10.00 M. NO. OF COLUMNS
6.00	(6.0+2R) Sec.θ	2.00 Sec θ	1.50 Sec θ	5	1.20 Sec θ	6	1.20 Sec θ	6
7.00	(7.0+2R) Sec.θ	1.75 Sec θ	1.75 Sec θ	5	1.40 Sec θ	6	1.40 Sec θ	6
8.00	(8.0+2R) Sec.θ	2.00 Sec θ	2.00 Sec θ	5	1.60 Sec θ	6	1.60 Sec θ	6
9.00	(9.0+2R) Sec.θ	1.80 Sec θ	2.25 Sec θ	5	1.50 Sec θ	7	1.50 Sec θ	7
10.00	(10.0+2R) Sec.θ	2.00 Sec θ	2.00 Sec θ	6	1.40 Sec θ	8	1.40 Sec θ	8
11.00	(11.0+2R) Sec.θ	2.20 Sec θ	1.80 Sec θ 1.85 Sec θ	7	1.50 Sec. θ 1.60 Sec. θ	8	1.30 Sec. θ 1.40 Sec. θ	9
12.00	(12.0+2R) Sec.θ	2.00 Sec θ	2.00 Sec. θ	7	1.70 Sec. θ 1.80 Sec. θ	8	1.50 Sec θ	9
13.00	(13.0+2R) Sec.θ	1.85 Sec. θ 1.90 Sec. θ	1.85 Sec. θ 1.90 Sec. θ	8	1.55 Sec. θ 1.65 Sec. θ	9	1.40 Sec θ 1.45 Sec. θ	10
14.00	(14.0+2R) Sec θ	2.00 Sec. θ	2.00 Sec. θ	8	1.75 Sec. θ	9	1.55 Sec. θ 1.60 Sec. θ	10

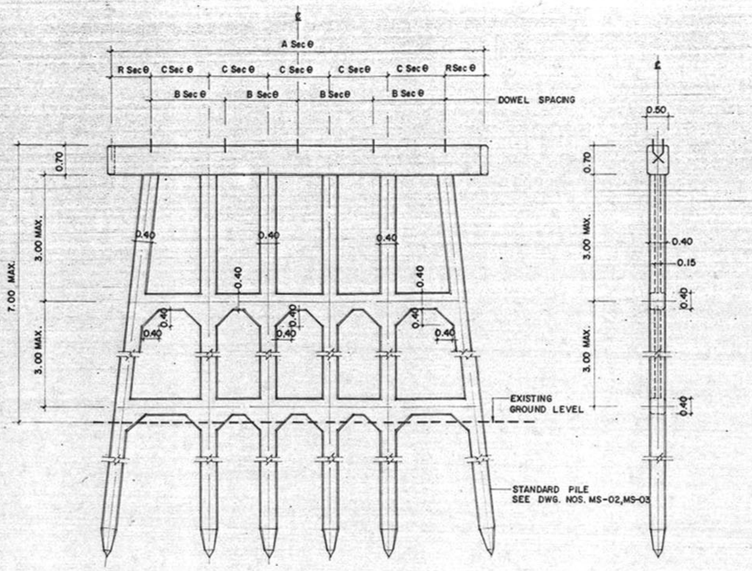
TABLE OF FOOTING DIMENSIONS

ROADWAY WIDTH M.	LENGTH OF FOOTING D Sec. θ, M.	WIDTH OF FOOTING, E, M. SPAN 8.00 M.	SPAN 9.00 M.	SPAN 10.00 M.
6.00	8.80 Sec. θ	1.80	2.00	2.00
7.00	9.80 Sec. θ	1.80	2.00	2.00
8.00	10.80 Sec. θ	1.80	2.00	2.00
9.00	11.80 Sec. θ	1.80	2.00	2.00
10.00	12.80 Sec. θ	1.80	2.00	2.00
11.00	13.80 Sec. θ	1.80	2.00	2.00
12.00	14.80 Sec. θ	1.80	2.00	2.00
13.00	15.80 Sec. θ	1.80	2.00	2.00
14.00	16.80 Sec. θ	1.80	2.00	2.00

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

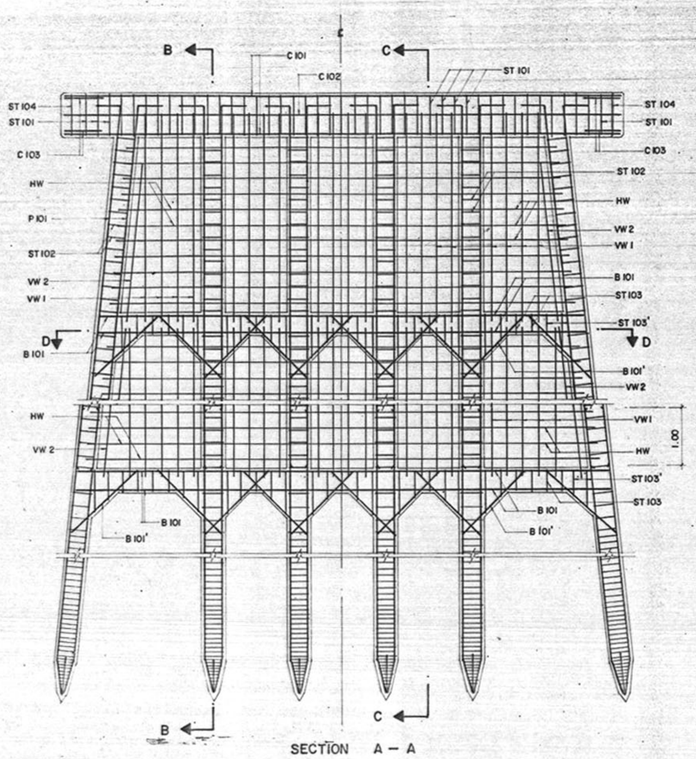
STANDARD DRAWING
0°-30° SKEW R.C. SLAB BRIDGE
WALL BRACING PIER DETAILS

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. ST-30
		SHEET NO. 143

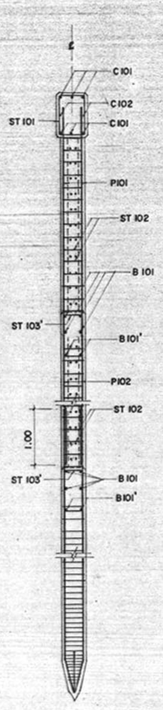


TRANSVERSE ELEVATION
SCALE 1:75

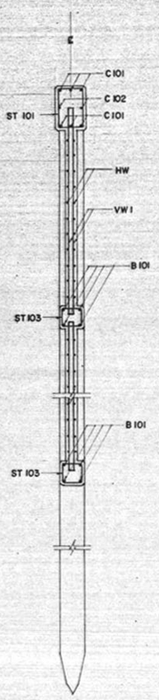
SIDE ELEVATION
SCALE 1:75



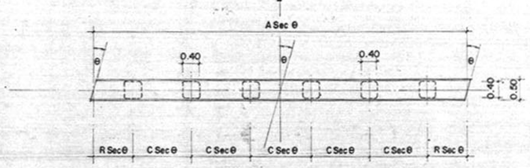
SECTION A – A



SECTION B – B

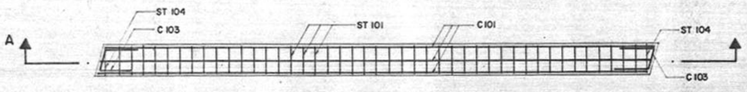


SECTION C – C

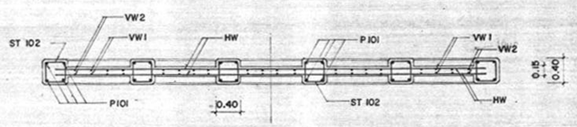


PLAN

PILE BENT DETAILS
SCALE 1:75

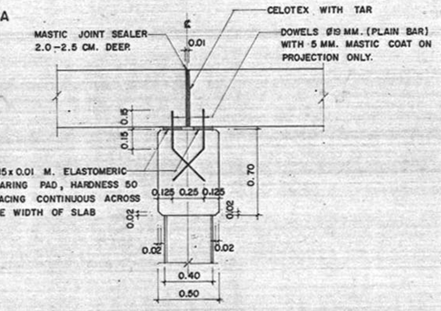


CAP BEAM

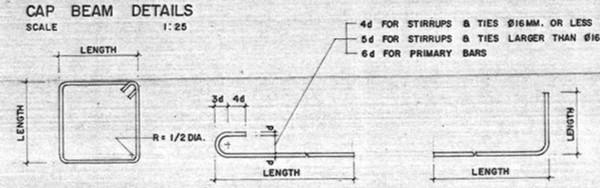


SECTION D – D

REINFORCEMENT DETAILS
SCALE 1:50



CAP BEAM DETAILS
SCALE 1:25



PLAIN BAR DEFORMED BAR

BAR BENDING DETAILS
NOT TO SCALE

NOTES

1. EACH PILE SHALL BE DRIVEN TO A DEPTH WHERE SCOUR WILL NOT AFFECT CAPACITY AND SHALL HAVE A MINIMUM ULTIMATE BEARING CAPACITY OF 90 TONS FOR PILE DETAILS SEE DWG. NOS. MS-02, MS-03.
2. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES
   a.) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.00 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.00 M., AND
   b.) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL 3.00 M. ADDITIONAL BRACING SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.00 M.
3. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM AND DIAPHRAMS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
4. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG/m.^{3} AND A A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG/cm^2 FOR A 0.15x0.15x0.15 m. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT.
   A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350	KG.
SAND	0.43	M.^{3}
CRUSHED ROCK OR GRAVEL	0.86	M.^{3}
CONCRETE SLUMP MAX.	10	CM.

5. REBARS #4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
6. LOCATION OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
7. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETER OF BIGGER BAR FOR DEFORMED BARS.
8. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM AND DIAPHRAGMS WITHOUT ALTERING THE LOCATIONS OF REBARS.
9. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.00 M. PIERS HIGHER THAN 7.00 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
10. THE SKEW ANGLE (θ) IS THE ANGLE IN DEGREES BETWEEN THE DIRECTION OF THE CANAL AND A LINE PERPENDICULAR TO THE ROADWAY.
11. QUANTITIES AND LENGTH OF REBARS SHOWN ARE BASED ON THE CONDITION THAT THE DISTANCE BETWEEN THE BOTTOM OF CAP BEAM TO THE CENTERLINE OF THE TOP CROSS BRACING IS 3.00 M.
12. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
13. THIS DRAWING MAY BE USED IN COMBINATION WITH ONE OF THE FOLLOWING DRAWING BELOW WHICHEVER IS APPLICABLE :
    DWG. NOS. ST-04, ST-07, ST-10
14. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3 BD-106-14/5

TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 8.00 M.				SPAN 9.00 M.				SPAN 10.00 M.			
		#	@	NO.	L	#	@	NO.	L	#	@	NO.	L
VARIES	C101	8	–	6	–	8	–	6	–	8	–	6	–
VARIES	C102	4	–	2	–	4	–	2	–	4	–	2	–
0.50, 0.35, 0.45, 0.075, 0.65	C103	4	–	4	–	4	–	4	–	4	–	4	–
0.50, 0.075, 0.65	ST101	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35
0.30, 0.075, 0.30	ST102	3	0.20	–	1.35	3	0.20	–	1.35	3	0.20	–	1.35
0.25, 0.075, 0.30	ST103	3	0.25	–	1.35	3	0.25	–	1.35	3	0.25	–	1.35
0.075, 0.65, 0.30, 0.075	ST103'	3	0.25	–	–	3	0.25	–	–	3	0.25	–	–
0.075, VARIES	ST104	3	–	2	1.95	3	–	2	1.95	3	–	2	1.95
VARIES	B101	8	–	8	–	8	–	8	–	8	–	8	–
1.55	B101'	6	–	–	1.55	6	–	–	1.55	6	–	–	1.55
3.35, 0.40, VARIES	P101	8	–	–	3.75	8	–	–	3.75	8	–	–	3.75
VARIES	P102	8	–	–	–	8	–	–	–	8	–	–	–
3.35, 0.00, 0.075	VW1	4	0.25	–	6.975	4	0.25	–	6.975	4	0.25	–	6.975
2.70, 0.00, 0.075	VW2	4	–	2	5.675	4	–	2	5.675	4	–	2	5.675
VARIES	HW	4	0.25	–	–	4	0.25	–	–	4	0.25	–	–

# 3 = Ø3/8" OR 9 MM., # 4 = Ø1/2" OR 12 MM., # 6 = Ø3/4" OR 20 MM., # 8 = Ø 1" OR 25 MM.
NO. = TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BAR.

TABLE OF SEC θ

θ DEGREE	0	5	10	15	20	25	30
Sec θ	1.0000	1.0038	1.0154	1.0353	1.0642	1.1034	1.1547

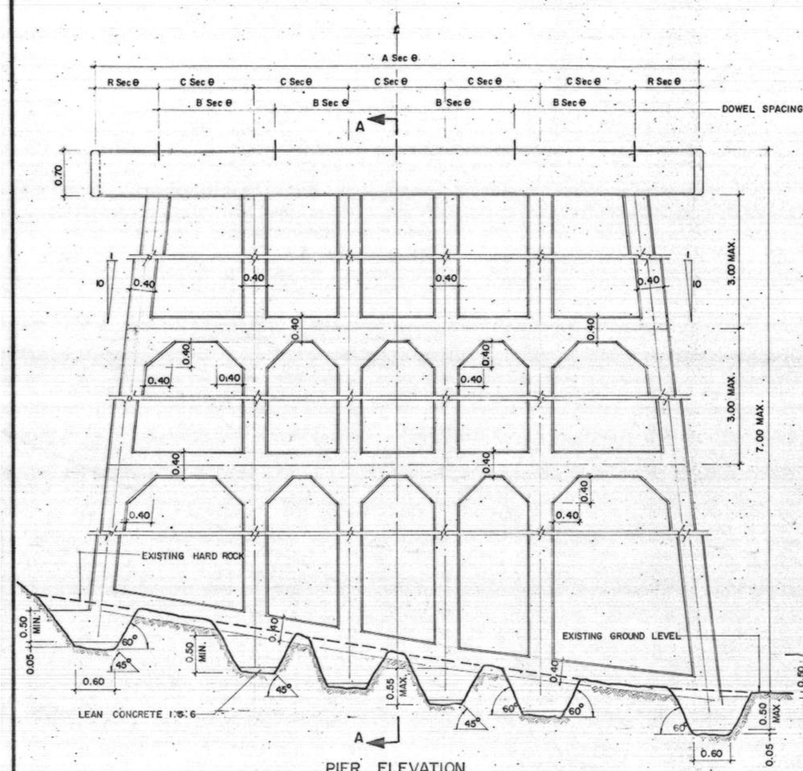
TABLE OF PILE BENT DETAILS

CARRIAGE WAY	LENGTH OF CAP BEAM A Sec θ, M.	DOWELS SPACING B Sec θ, M.	SPAN 8.00 M.		SPAN 9.00 M.		SPAN 10.00 M.	
			COL. SPG. C Sec θ, M.	NO. OF COLUMN	COL. SPG. C Sec θ, M.	NO. OF COLUMN	COL. SPG C Sec θ, M.	NO. OF COLUMN
6.00	(6.0+2R) Sec θ	2.00 Sec θ	1.50 Sec θ	5	1.20 Sec θ	6	1.20 Sec θ	6
7.00	(7.0+2R) Sec θ	1.75 Sec θ	1.75 Sec θ	5	1.40 Sec θ	6	1.40 Sec θ	6
8.00	(8.0+2R) Sec θ	2.00 Sec θ	2.00 Sec θ	5	1.60 Sec θ	6	1.60 Sec θ	6
9.00	(9.0+2R) Sec θ	1.90 Sec θ	2.25 Sec θ	5	1.50 Sec θ	7	1.50 Sec θ	7
10.00	(10.0+2R) Sec θ	2.00 Sec θ	2.00 Sec θ	6	1.40 Sec θ	8	1.40 Sec θ	8
11.00	(11.0+2R) Sec θ	2.20 Sec θ	1.80 Sec θ & 1.85 Sec θ	7	1.50 Sec θ & 1.60 Sec θ	8	1.30 Sec θ & 1.40 Sec θ	9
12.00	(12.0+2R) Sec θ	2.00 Sec θ	2.00 Sec θ	7	1.70 Sec θ & 1.80 Sec θ	8	1.50 Sec θ	9
13.00	(13.0+2R) Sec θ	1.85 Sec θ & 1.90 Sec θ	1.85 Sec θ & 1.90 Sec θ	8	1.55 Sec θ & 1.65 Sec θ	9	1.40 Sec θ & 1.45 Sec θ	10
14.00	(14.0+2R) Sec θ	2.00 Sec θ	2.00 Sec θ	8	1.75 Sec θ	9	1.55 Sec θ & 1.60 Sec θ	10

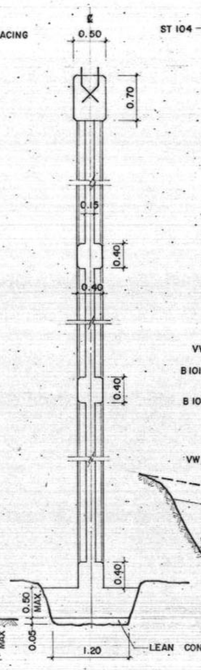
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING
0°-30° SKEW RC. SLAB BRIDGE
WALL BRACING PILE BENT DETAILS

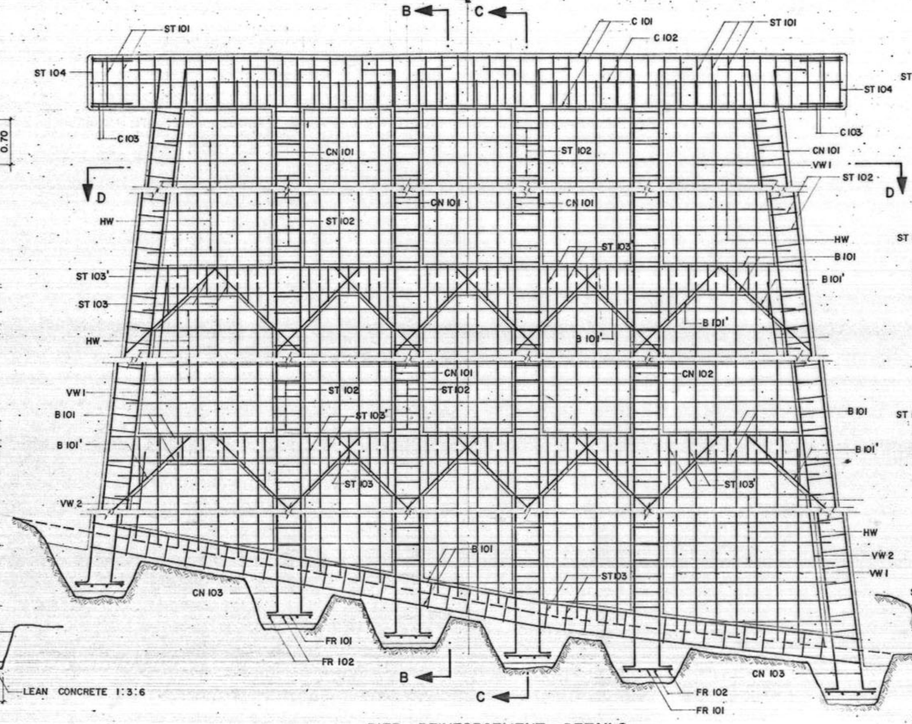
DESIGNED : DOH & CONSULTANTS	CHECKED : Royal	DATE JULY 1994
SUBMITTED : P. Burirug (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE 1:25, 1:50, 1:75
APPROVED : Thebe P.E. (DIRECTOR GENERAL)		DWG. NO. ST-31
		SHEET NO. 144



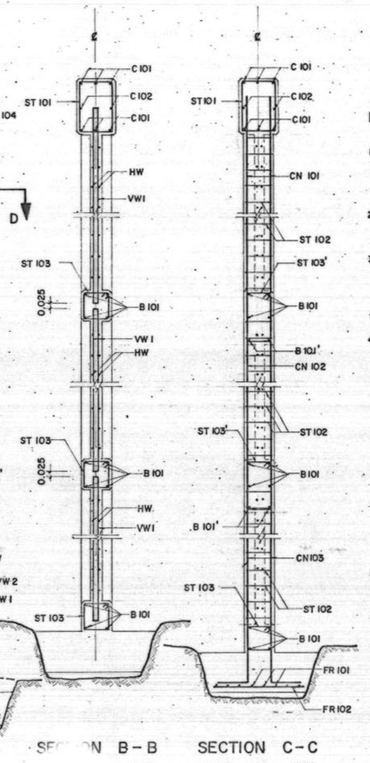
PIER ELEVATION
SCALE 1:50



SECTION A – A
SCALE 1:50

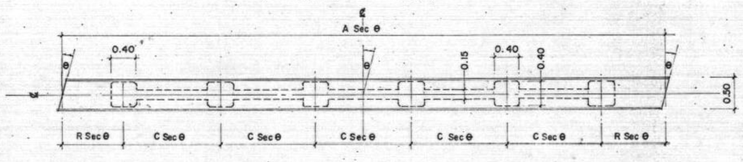


PIER REINFORCEMENT DETAILS
SCALE 1:40

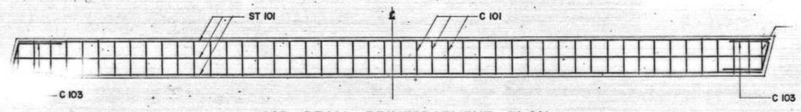


SECTION B – B
1:40

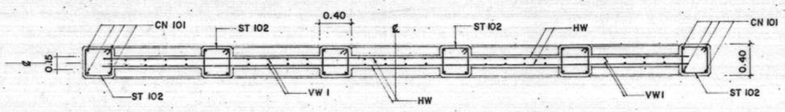
SECTION C – C
SCALE 1:40



CAP BEAM PLAN



CAP BEAM REINFORCEMENT PLAN



SECTION D – D
SCALE 1:40

TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 8.00 M. #	@	NO.	L	SPAN 9.00 M. #	@	NO.	L	SPAN 10.00 M. #	@	NO.	L
	C101	8	–	6	–	8	–	6	–	8	–	6	–
	C102	4	–	2	–	4	–	2	–	4	–	2	–
	C103	4	–	4	–	4	–	4	–	4	–	4	–
	CN101	8	–	–	–	8	–	–	–	8	–	–	–
	CN102	8	–	–	–	8	–	–	–	8	–	–	–
	CN103	8	–	–	–	8	–	–	–	8	–	–	–
	ST101	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35
	ST102	3	0.20	–	1.35	3	0.20	–	1.35	3	0.20	–	1.35
	ST103	3	0.25	–	1.35	3	0.25	–	1.35	3	0.25	–	1.35
	ST103'	3	0.25	–	–	3	0.25	–	–	3	0.25	–	–
	ST104	3	–	2	–	3	–	2	–	3	–	2	–
	B101	8	–	–	–	8	–	–	–	8	–	–	–
	B101'	6	–	–	1.55	6	–	–	1.55	6	–	–	1.55
	FR101	8	0.15	–	0.55	8	0.15	–	0.55	8	0.15	–	0.55
	FR102	8	0.15	–	1.15	8	0.15	–	1.15	8	0.15	–	1.15
	VW1	4	0.25	–	–	4	0.25	–	–	4	0.25	–	–
	VW2	4	–	–	–	4	–	–	–	4	–	–	–
	HW	4	0.25	–	–	4	0.25	–	–	4	0.25	–	–

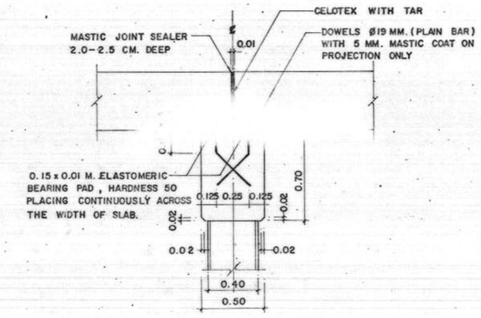
# 3 = Ø3/8" OR 9 MM., # 4 = Ø1/2" OR 12 MM., # 6 = Ø3/4" OR 20 MM., # 8 = Ø1" OR 25MM
NO. = TOTAL AMOUNT OF BARS , L = TOTAL LENGTH OF EACH BAR

TABLE OF Sec θ

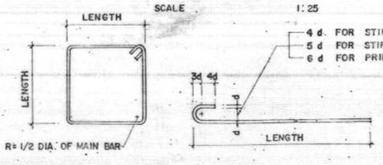
θ, DEGREE	0	5	10	15	20	25	30
Sec θ	1		1.0154	1.0353	1.0642	1.1034	1.1547

TABLE OF PIER DETAILS

ROADWAY WIDTH, M.	LENGTH OF CAP BEAM A Sec θ, M.	DOWEL SPACING B Sec θ, M.	SPAN 8.00 M. COL. SPG. C Sec θ, M.	NO. OF COL.	SPAN 9.00 M. COL. SPG. C Sec θ, M.	NO. OF COL.	SPAN 10.00 M. COL. SPG. C Sec θ, M.	NO. OF COL.
6.00	(6.0 + 2R) Sec θ	2.00 Sec θ	1.50 Sec θ	5	1.20 Sec θ	6	1.20 Sec θ	6
7.00	(7.0 + 2R) Sec θ	1.75 Sec θ	1.75 Sec θ	5	1.40 Sec θ	6	1.40 Sec θ	6
8.00	(8.0 + 2R) Sec θ	2.00 Sec θ	2.00 Sec θ	5	1.60 Sec θ	6	1.60 Sec θ	6
9.00	(9.0+2R) Sec θ	1.80 Sec θ	2.25 Sec θ	5	1.50 Sec θ	7	1.50 Sec θ	7
10.00	(10.0+2R) Sec θ	2.00 Sec θ	2.00 Sec θ	6	1.40 Sec θ	8	1.40 Sec θ	8
11.00	(11.0+2R) Sec θ	2.20 Sec θ	1.80 Sec θ & 1.85 Sec θ	7	1.50 Sec θ & 1.60 Sec θ	8	1.30 Sec θ & 1.40 Sec θ	9
12.00	(12.0+2R) Sec θ	2.00 Sec θ	2.00 Sec θ	7	1.70 Sec θ & 1.80 Sec θ	8	1.50 Sec θ	9
13.00	(13.0+2R) Sec θ	1.85 Sec θ & 1.90 Sec θ	1.85 Sec θ & 1.90 Sec θ	8	1.55 Sec θ & 1.65 Sec θ	9	1.40 Sec θ & 1.45 Sec θ	10
14.00	(14.0+2R) Sec θ	2.00 Sec θ	2.00 Sec θ	8	1.75 Sec θ	9	1.55 Sec θ & 1.60 Sec θ	10



CAP BEAM DETAILS
SCALE 1:25



PLAIN BAR

BAR BENDING DETAILS
NOT TO SCALE

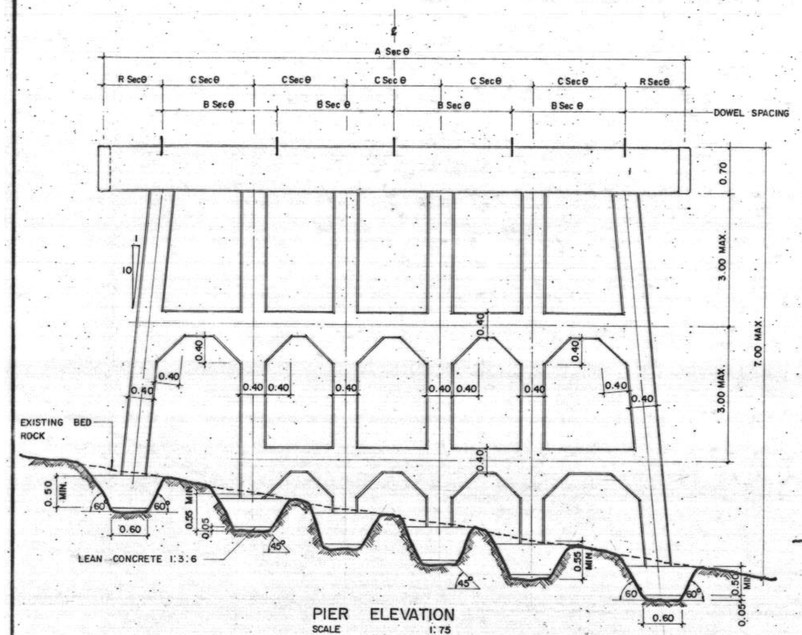
NOTES :

1. THIS STANDARD DRAWING IS APPLICABLE FOR FOUNDATIONS ON BED ROCK WHICH HAS A MINIMUM ALLOWABLE BEARING CAPACITY OF 80 TON/M^2.
2. THE BOTTOM OF THE LOWER FOOTING SHALL BE ABOVE 45° LINE FROM THE BOTTOM EDGES OF ADJACENT UPPER FOOTINGS.
3. THE EMBEDED DEPTH OF EACH FOOTING MEASURED AT THE CENTERLINE OF EACH COLUMN FROM EXISTING HARD BED ROCK TO THE BOTTOM OF EXCAVATION SHALL NOT BE LESS THAN 0.55 M. AND SHALL BE UNDER THE APPROVAL OF THE ENGINEER.
4. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES.
   a.) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.00 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.00 M.
   b.) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.00 M., ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.00 M.
5. THE BOTTOM CROSS BRACING SHALL BE LAID ON BED ROCK UNDER THE APPROVAL OF THE ENGINEER.
6. CLEAR CONCRETE COVER SHALL BE 5 CM. EXCEPT THE CAP BEAM AND DIAPHAGMS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
7. LEAN CONCRETE OF APPROXIMATELY 5 CM. EXCEPT THE CAP BEAM AND DIAPHAGMS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
8. CONCRETE SHALL HAVE MINIMUM CEMENT CONTENT OF 350 KG/m^3 AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG/cm^2 FOR A 0.15x0.15x0.15 m. CUBE AT 28 DAYS CEMENT SHALL BE TIS TYPE I PORTLAND CEMENT A SUGGESTED APPROXIMATE MIX DESIGN PER CUBE METER IS AS FOLLOWING :
   PORTLAND CEMENT 350 KG., SAND 0.43 M^3
   CRUSHED ROCK OR GRAVEL 0.86 M^3
   CONCRETE SLUM MAX. 10 CM.
9. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS. OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
10. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
11. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
12. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 1 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM AND DIAPHRAGMS WITHOUT ALTERING THE LOCATIONS OF REBARS.
13. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.00 M. PIER HIGHER THAN 7.00 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
14. THE SKEW ANGLE (θ) IS THE ANGLE IN DEGREES BETWEEN THE DIRECTION OF THE CANAL AND A LINE PERPENDICULAR TO THE ROADWAY.
15. ALL DIMENSIONS SHOWN ARE IN METER UNLESS OTHERWISE INDICATED.
16. THE DRAWING MAY BE USED IN COMBINATION WITH ONE OF THE FOLLOWING DRAWING BELOW WHICHEVER IS APPLICABLE :
17. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. SBD-106-14/6

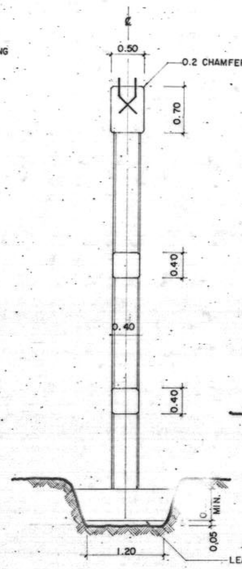
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING
0°-30° SKEW RC. SLAB BRIDGE
WALL BRACING PIER ON BED ROCK DETAILS

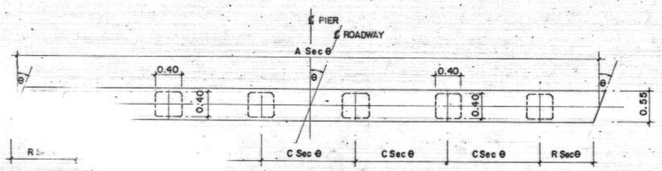
DESIGNED: DOH & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: P. Bunyi (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: For (DIRECTOR GENERAL)		DWG. NO. ST-32
		SHEET NO. 145



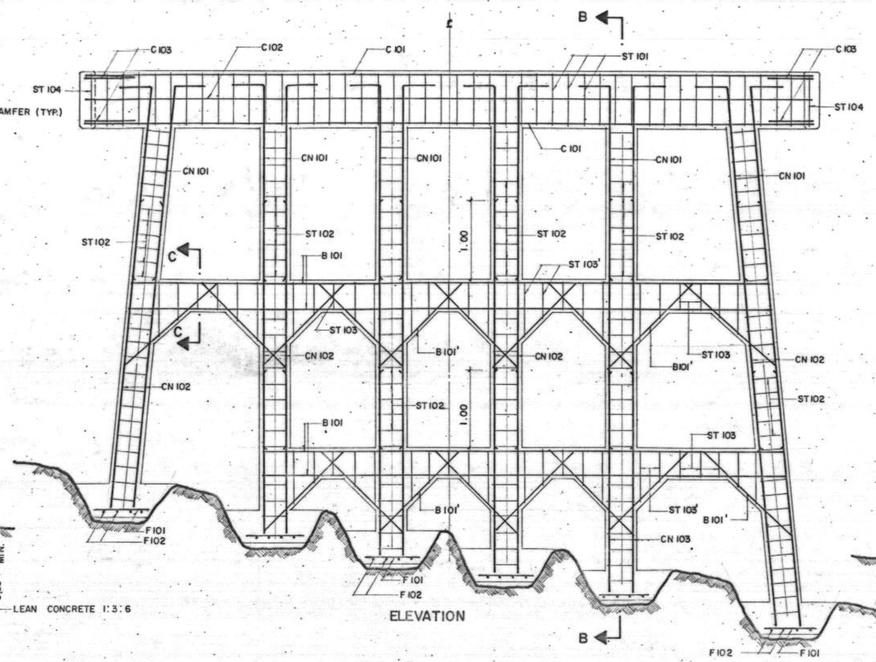
PIER ELEVATION
SCALE 1:75



SECTION A – A
SCALE 1:75

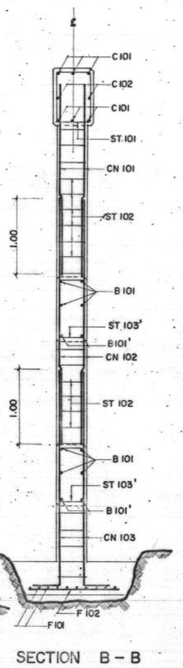


CAP BEAM PLAN
SCALE 1:50

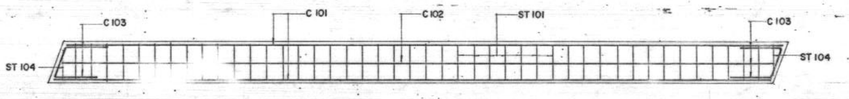


ELEVATION

PIER REINFORCEMENT DETAILS
SCALE 1:50



SECTION B – B
SCALE 1:50



CAP BEAM REINFORCEMENT PLAN
SCALE 1:50

SECTION C – C
SCALE 1:50

NOTES:

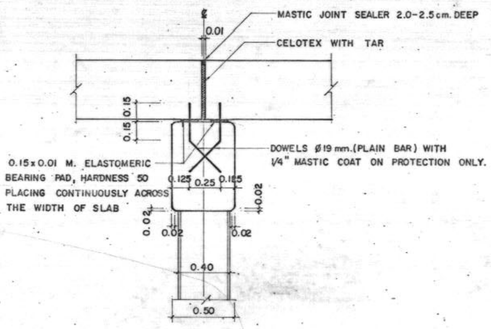
1. THIS STANDARD DRAWING IS APPLICABLE FOR FOUNDATIONS ON BED ROCK WHICH HAS A MINIMUM ALLOWABLE BEARING CAPACITY OF 80 TON/M^2
2. THE BOTTOM OF THE LOWER FOOTINGS SHALL BE ABOVE 45° LINE FROM THE BOTTOM EDGES OF ADJACENT UPPER FOOTINGS.
3. THE EMBEDDED DEPTH OF EACH FOOTING MEASURED AT THE CENTERLINE OF EACH COLUMN FROM EXISTING HARD BED ROCK TO THE BOTTOM OF EXCAVATION SHALL NOT BE LESS THAN 0.55 M. AND SHALL BE UNDER THE APPROVAL OF THE ENGINEER.
4. HORIZONTAL CROSS BRACING BETWEEN COLUMN SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES :
   a. IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.00 M., A BRACING SHALL BE PLACED IN SUCH AS A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.00 M., AND
   b. IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEED 3.00 M. ADDITIONAL BRACING SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.00 M.
5. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM AT WHICH CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
6. LEAN CONCRETE OF APPROXIMATELY 5.0 CM. THICK SHALL BE PLACED UNDER THE BOTTOM OF ALL FOOTINGS. COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 B. VOLUME.
7. CONCRETE SHALL HAVE MINIMUM CEMENT CONTENT OF 350 KG/m^3 AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG/cm^2 FOR A 0.15x 0.15x 0.15 m. CUBE AT 28 DAYS CEMENT SHALL BE TIS TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX. DESING PER CUBE METER IS AS FOLLOWING :

PORTLAND CEMENT	350 KG.	CRUSHED ROCK OR GRAVEL	0.86 M.^{3}
SAND	0.43 M.^{3}	CONCRETE SLUM MAX.	10 CM.

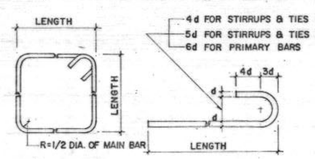
8. REBAR # 4 OR LARGER SHALL BE TIS 24 GRADE SD30 DEFORMED BARS, OTHER SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
9. LOCATION OF LAP SPLICE OF REBARS SHALL BE APPROVAL BY THE ENGINEER.
10. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETER OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
11. IN CASE OF SALINE PROTECTION , HIGH SULPHATE RESISTANCE PORTLAND CEMENT TYPE 5 CONFORMING TO TIS. 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM WITH OUT ALTERING THE LOCATION OF REBARS.
12. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.00 M. PIER HIGHER THAN 7.00 M. SMALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
13. THE SKEW ANGLE (θ) IS THE ANGLE IN DEGREES BETWEEN THE DIRECTION OF THE CANAL AND A LINE PERPENDICULAR TO THE ROADWAY
14. ALL DIMENSIONS SHOWN ARE IN METER UNLESS OTHERWISE INDICATED.
15. THE DRAWING MAY BE USED IN COMBINATION WITH ONE OF THE FOLLOWING DRAWINGS BELOW WHICHEVER IS APPLICABLE : DWG. NOS. ST-02, ST-05, ST-08
16. THIS DRAWING IS ADAPTED FROM DOH. DWG. NO. 3DB-106-14/7

TABLE OF Sec θ

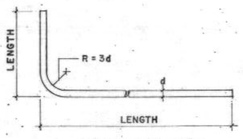
θ , DEGREE	0	5	10	15	20	25	30
Sec θ	1.0000	1.0038	1.0154	1.0353	1.0642	1.1034	1.1547



CAP BEAM DETAILS
SCALE 1:25



PLAIN BAR



DEFORMED BAR

BAR BENDING DETAILS
NOT TO SCALE

TABLE OF REINFORCEMT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M.				SPAN 6.00 M.				SPAN 7.00 M.				SPAN 8.00 M.				SPAN 9.00 M.				SPAN 10.00 M.			
		#	a	NO.	L	#	a	NO.	L	#	a	NO.	L	#	a	NO.	L	#	a	NO.	L	#	a	NO.	L
		8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–
VARIES 1.50	C102			2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
VARIES 1.50	C103	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–	4	–
VARIES 0.40	CN101	8	–	–	–	8	–	–	–	8	–	–	–	8	–	–	–	8	–	–	–	8	–	–	–
VARIES 0.40	CN102	8	–	–	–	8	–	–	–	8	–	–	–	8	–	–	–	8	–	–	–	8	–	–	–
VARIES 0.45 0.05	CN103	9	–	–	–	9	–	–	–	9	–	–	–	9	–	–	–	9	–	–	–	9	–	–	–
0.30 0.30 0.07	ST101	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35
0.30 0.30 0.07	ST102	3	0.20	–	1.35	3	0.20	–	1.35	3	0.20	–	1.35	3	0.20	–	1.35	3	0.20	–	1.35	3	0.20	–	1.35
0.30 0.30 0.07	ST103	3	0.25	–	1.35	3	0.25	–	1.35	3	0.25	–	1.35	3	0.25	–	1.35	3	0.25	–	1.35	3	0.25	–	1.35
1.85 0.30 0.07	ST103'	3	0.25	–	–	3	0.25	–	–	3	0.25	–	–	3	0.25	–	–	3	0.25	–	–	3	0.25	–	–
0.25 0.30 0.07	ST104	3	–	2	2.55	3	–	2	2.55	3	–	2	2.55	3	–	2	2.55	3	–	2	2.55	3	–	2	2.55
VARIES	B101	8	–	–	–	8	–	–	–	8	–	–	–	8	–	–	–	8	–	–	–	8	–	–	–
1.55	B101'	6	–	–	1.55	6	–	–	1.55	6	–	–	1.55	6	–	–	1.55	6	–	–	1.55	6	–	–	1.55
0.55	F101	8	0.15	–	0.55	8	0.15	–	0.55	8	0.15	–	0.55	8	0.15	–	0.55	8	0.15	–	0.55	8	0.15	–	0.55
1.15	F102	8	0.15		1.15	8	0.15		1.15	8	0.15		1.15	8	0.15		1.15	8	0.15		1.15	8	0.15		1.15

3 = Ø3/8"OR 9 MM. , # 4 = Ø1/2" OR 12 MM. , # 6 = Ø3/4" OR 20 MM., # 8 = Ø1" OR 25 MM. NO. = TOTAL AMOUNT OF BARS , L = TOTAL LENGTH OF EACH BAR.

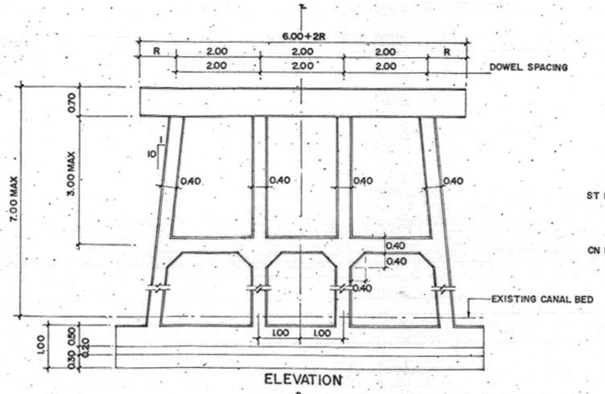
TABLE OF PIER DETAILS

ROADWAY WIDTH M.	LENGTH OF CAP BEAM A Sec θ , M.	DOWEL SPACING B Sec θ, M.	SPAN 5.00 M.		SPAN 6.00 M.		SPAN 7.00 M.		SPAN 8.00 M.		SPAN 9.00 M.		SPAN 10.00 M.	
			COL. SPG C Sec θ , M.	NO. OF COLUMN	COL. SPG. CSec θ , M.	NO. OF COLUMN	COL. SPG. C Sec θ, M.	NO. OF COLUMN	COL. SPG. C Sec θ , M.	NO. OF COLUMN	COL. SPG. CSec θ , M.	NO. OF COLUMN	COL. SPG. CSec θ , M.	NO. OF COLUMN
6.00	(6.00+2R) Sec θ	2.00 Sec θ	2.00 Sec θ	4	2.00 Sec θ	4	1.50 Sec θ	5	1.50 Sec θ	5	1.20 Sec θ	6	1.20 Sec θ	6
7.00	(7.00+2R) Sec θ	1.75 Sec θ	2.30 Sec θ & 2.40 Sec θ	4	2.30 Sec θ & 2.40 Sec θ	4	1.75 Sec θ	5	1.75 Sec θ	5	1.40 Sec θ	6	1.40 Sec θ	6
8.00	(8.00+2R) Sec θ	2.00 Sec θ	2.65 Sec θ & 2.70 Sec θ	4	2.65 Sec θ & 2.70 Sec θ	4	2.00 Sec θ	5	2.00 Sec θ	5	1.60 Sec θ	6	1.60 Sec θ	6
9.00	(9.00+2R) Sec θ	1.80 Sec θ	3.00 Sec θ	4	3.00 Sec θ	4	2.25 Sec θ	5	2.25 Sec θ	5	1.50 Sec θ	7	1.50 Sec θ	7
10.00	(10.00+2R) Sec θ	2.00 Sec θ	2.50 Sec θ	5	2.50 Sec θ	5	2.00 Sec θ	6	2.00 Sec θ	6	1.40 Sec θ & 1.45 Sec θ	8	1.40 Sec θ & 1.45 Sec θ	8
11.00	(11.00+2R) Sec θ	2.20 Sec θ	2.75 Sec θ	5	2.75 Sec θ	5	1.80 Sec θ & 1.85 Sec θ	7	1.80 Sec θ & 1.85 Sec θ	7	1.50 Sec θ & 1.60 Sec θ	8	1.30 Sec θ & 1.40 Sec θ	8
12.00	(12.00+2R) Sec θ	2.00 Sec θ	2.40 Sec θ	6	2.40 Sec θ	6	2.00 Sec θ	7	2.00 Sec θ	7	1.70 Sec θ & 1.80 Sec θ	8	1.50 Sec θ	8
13.00	(13.00+2R) Sec θ	1.85 Sec θ & 1.90 Sec θ	2.60 Sec θ	6	2.60 Sec θ	6	1.85 Sec θ & 1.90 Sec θ	8	1.85 Sec θ & 1.90 Sec θ	8	1.55 Sec θ & 1.65 Sec θ	9	1.40 Sec θ & 1.45 Sec θ	10
14.00	(14.00+2R) Sec θ	2.00 Sec θ	2.30 Sec θ & 2.40 Sec θ	7	2.30 Sec θ & 2.40 Sec θ	7	2.00 Sec θ	8	2.00 Sec θ	8	1.75 Sec θ	9	1.55 Sec θ & 1.60 Sec θ	10

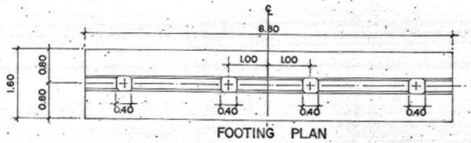
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING
0°–30° SKEW RC. SLAB BRIDGE
SPREAD FOOTING PIER ON BED ROCK DETAILS

DESIGNED : DOH & CONSULTANTS	CHECKED :
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)	DATE JULY. 1994
APPROVED : FOR (DIRECTOR GENERAL)	SCALE 1:25, 1:50
	DWG. NO. ST-33
	SHEET NO. 146

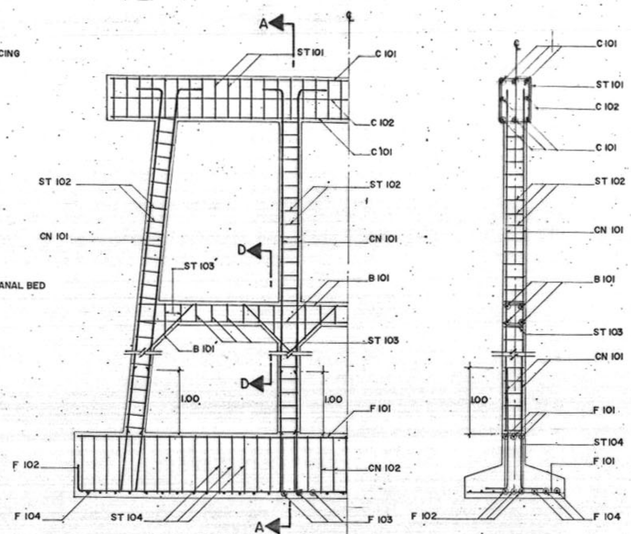


ELEVATION



FOOTING PLAN

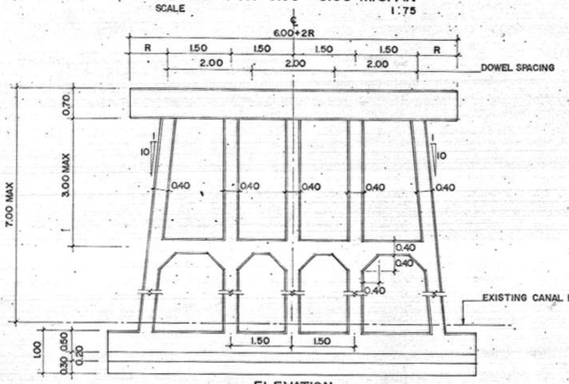
DETAILS FOR 5.00 – 6.00 M. SPAN
SCALE 1:75



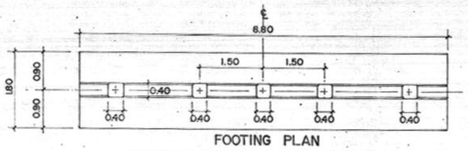
HALF ELEVATION

SECTION A – A

REINFORCEMENT DETAILS FOR 5.00 – 6.00 M. SPAN
SCALE 1:50

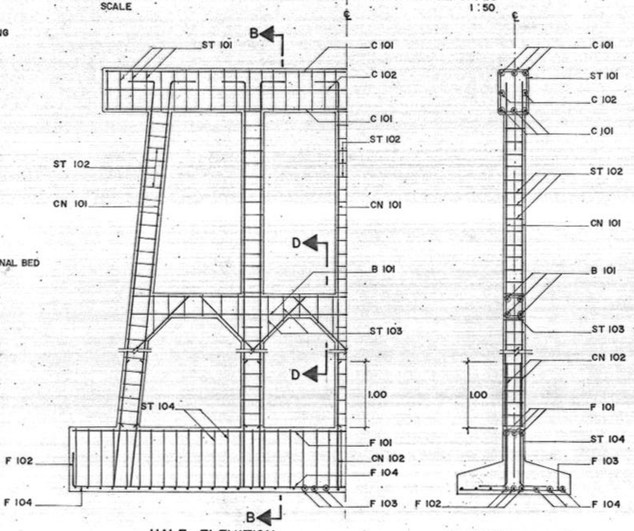


ELEVATION



FOOTING PLAN

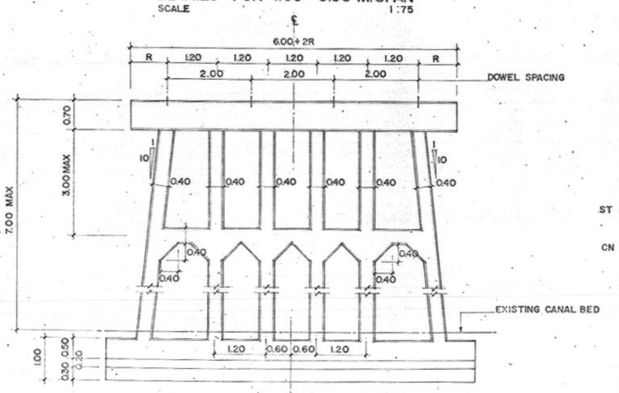
DETAILS FOR 7.00 – 8.00 M. SPAN
SCALE 1:75



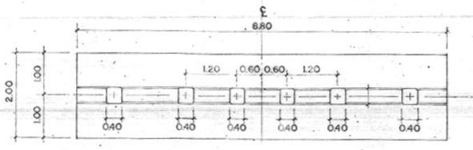
HALF ELEVATION

SECTION B – B

REINFORCEMENT DETAILS FOR 7.00 – 8.00 M. SPAN
SCALE 1:50

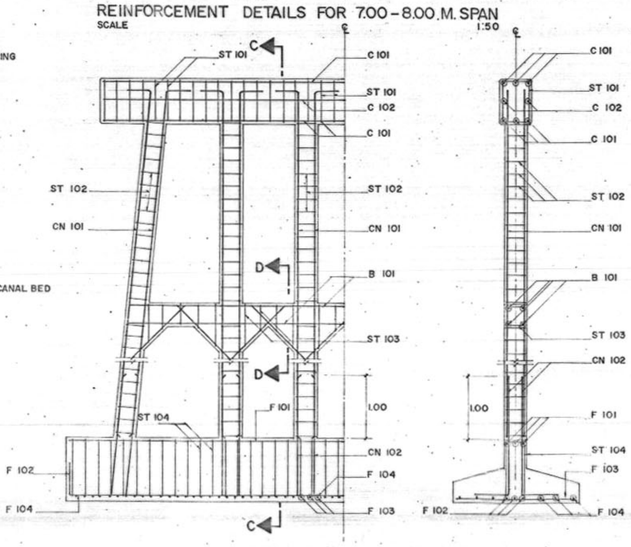


ELEVATION



FOOTING PLAN

DETAILS FOR 9.00 – 10.00 M. SPAN
SCALE 1:75



HALF ELEVATION

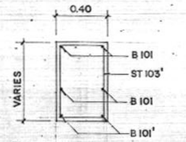
SECTION C – C

REINFORCEMENT DETAILS FOR 9.00 – 10.00 M. SPAN
SCALE 1:50

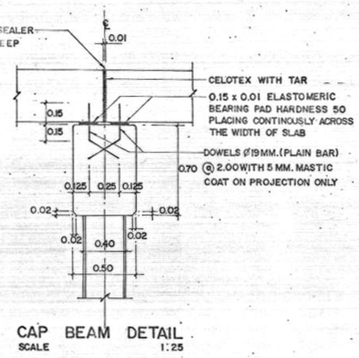
TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M. #	@	NO.	L	SPAN 6.00 M. #	@	NO.	L	SPAN 7.00 M. #	@	NO.	L	SPAN 8.00 M. #	@	NO.	L	SPAN 9.00 M. #	@	NO.	L	SPAN 10.00 M. #	@	NO.	L
	C 101	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–
	C 102	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	CN 101	8	–	16	11.25	8	–	16	11.25	8	–	20	11.25	8	–	20	11.25	8	–	24	11.25	8	–	24	11.25
	CN 102	8	–	16	2.31	8	–	16	2.31	8	–	20	2.31	8	–	20	2.31	8	–	24	2.31	8	–	24	2.31
	ST 101	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35	3	0.20	–	2.35
	ST 102	3	0.20	192	1.35	3	0.20	192	1.35	3	0.20	240	1.35	3	0.20	240	1.35	3	0.20	288	1.35	3	0.20	288	1.35
	ST 103	3	0.25	40	1.35	3	0.25	40	1.35	3	0.25	34	1.35	3	0.25	34	1.35	3	0.25	28	1.35	3	0.25	28	1.35
	ST 103'	3	0.25	12		3	0.25	12		3	0.25	16		3	0.25	16		3	0.25	20		3	0.25	20	
	ST 104	3	0.20	44	2.55	3	0.20	44	2.55	3	0.20	44	2.55	3	0.20	44	2.55	3	0.20	44	2.55	3	0.20	44	2.55
	B 101	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
	B 101'	6	–	12	1.55	6	–	12	1.55	6	–	12	1.55	6	–	12	1.55	6	–	12	1.55	6	–	12	1.55
	F 101	8	–	3	8.70	8	–	3	8.70	8	–	3	8.70	8	–	3	8.70	8	–	3	8.70	8	–	3	8.70
	F 102	8	–	3	9.90	8	–	3	9.90	8	–	3	9.90	8	–	3	9.90	8	–	3	9.90	8	–	3	9.90
	F 103	4	0.25	35	1.55	4	0.25	35	1.55	4	0.20	44	1.75	4	0.20	44	1.75	4	0.125	70	1.95	4	0.125	70	1.95
	F 104	4	–	6	8.70	4	–	6	8.70	4	–	6	8.70	4	–	6	8.70	4	–	6	8.70	4	–	6	8.70

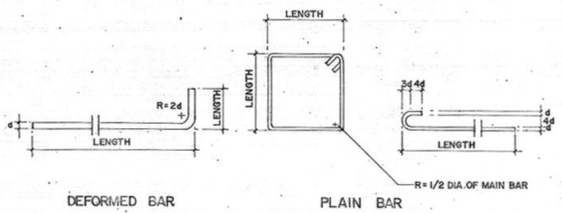
3 = Ø 3/8" OR 9 MM. # 4 = Ø 1/2" OR 12 MM. # 8 = Ø 1" OR 25 MM. NO.= TOTAL AMOUNT OF BARS L = TOTAL LENGTH OF EACH BARS



SECTION D – D
SCALE 1:25



CAP BEAM DETAIL
SCALE 1:25



DEFORMED BAR PLAIN BAR

BAR BENDING DETAILS
NOT TO SCALE

NOTES:

1. THE BOTTOM OF FOOTING SHALL BE EMBEDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT ITS CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED, 10 CM. THICK OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 BY VOLUME.
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON/M.^{2}
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES:
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEED 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEED 3.0 M., ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
5. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 Kg/M.^{3} AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 Kg/CM.^{2} FOR A .15 x .15 x .15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE 1 PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS:

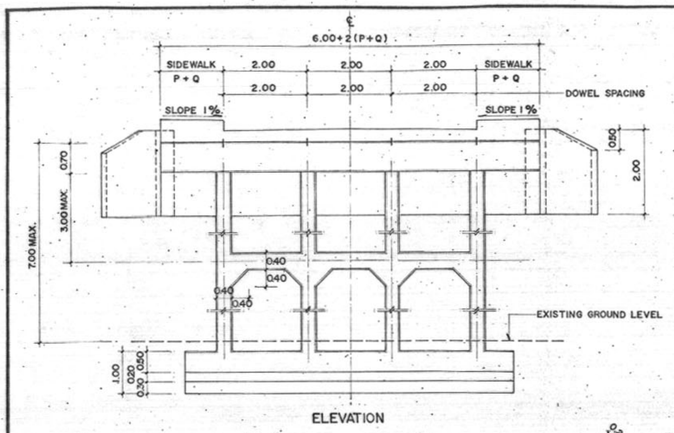
PORTLAND CEMENT	350	Kg.
SAND	0.45	M.^{3}
CRUSHED ROCK OR GRAVEL	0.86	M.^{3}
CONCRETE SLUMP MIX.	10	CM.

6. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
7. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
9. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM WITHOUT ALTERING THE LOCATIONS OF REBARS.
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING CANAL BED TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 12.0 M.
12. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
13. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5-106-14/23.

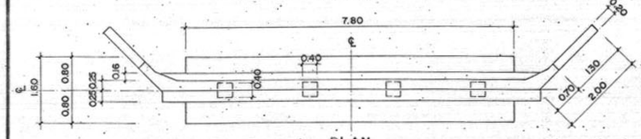
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING
6.00 M. ROADWAY WIDTH SLAB BRIDGE
SPREAD FOOTING PIER DETAILS

DESIGNED: DOH & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: (DIRECTOR GENERAL)		DWG. NO. ST-34
		SHEET NO. 147

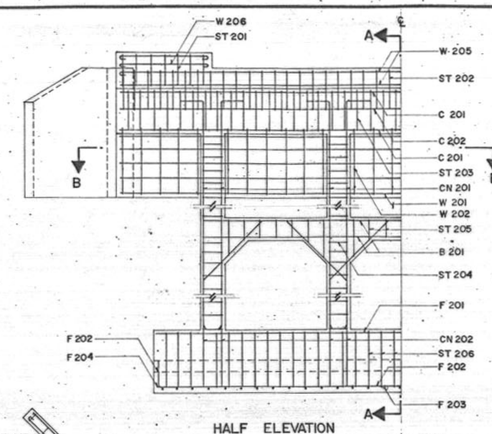


ELEVATION

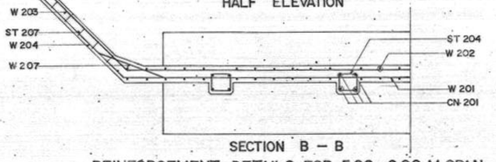


PLAN

ABUTMENT DETAILS FOR 5.00-6.00 M. SPAN
SCALE 1:75

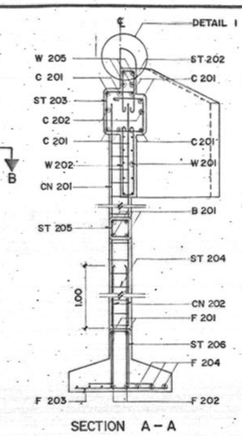


HALF ELEVATION

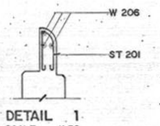


SECTION B - B

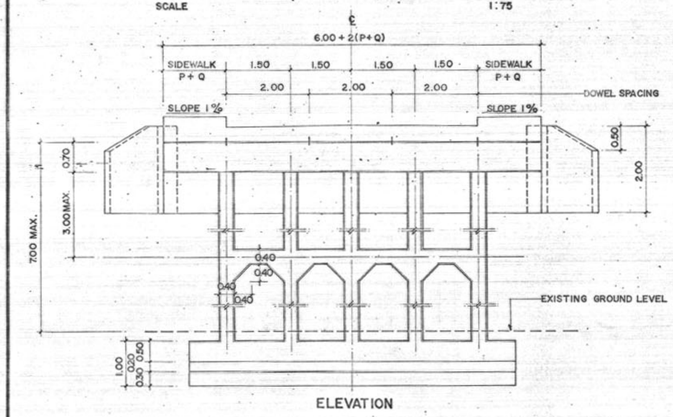
REINFORCEMENT DETAILS FOR 5.00-6.00 M.SPAN
SCALE 1:50



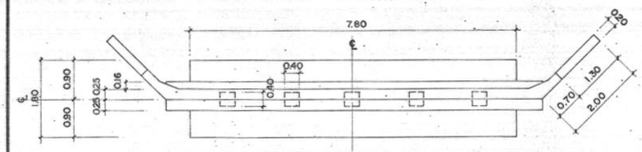
SECTION A - A



DETAIL 1
SCALE 1:50

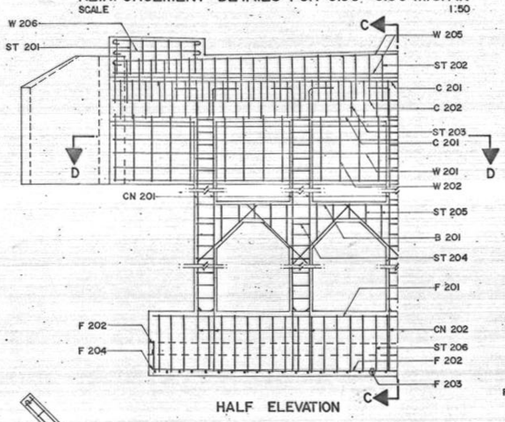


ELEVATION

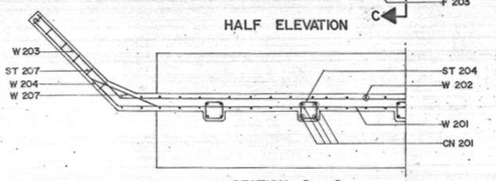


PLAN

ABUTMENT DETAILS FOR 7.00-8.00 M. SPAN
SCALE 1:75

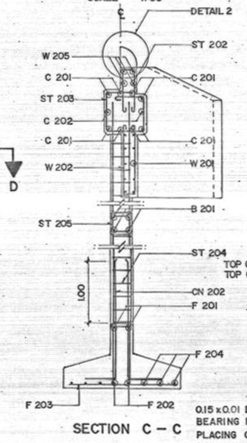


HALF ELEVATION

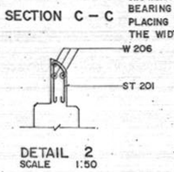


SECTION D - D

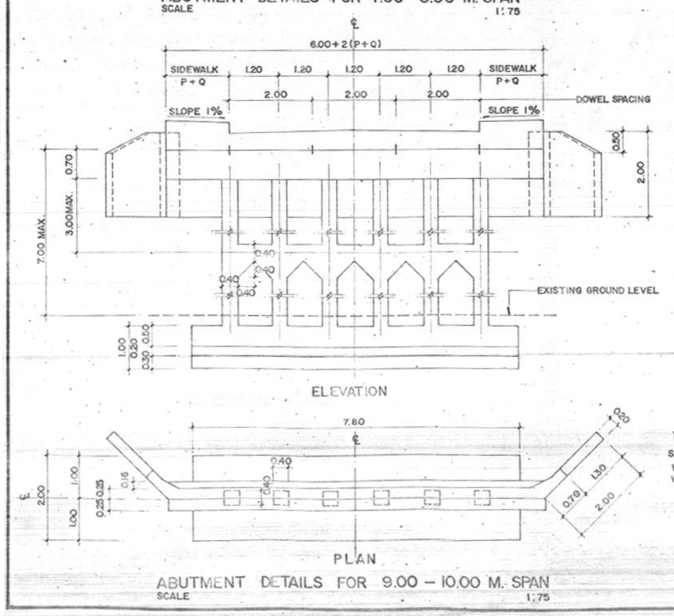
REINFORCEMENT DETAILS FOR 7.00-8.00 M.SPAN
SCALE 1:50



SECTION C - C



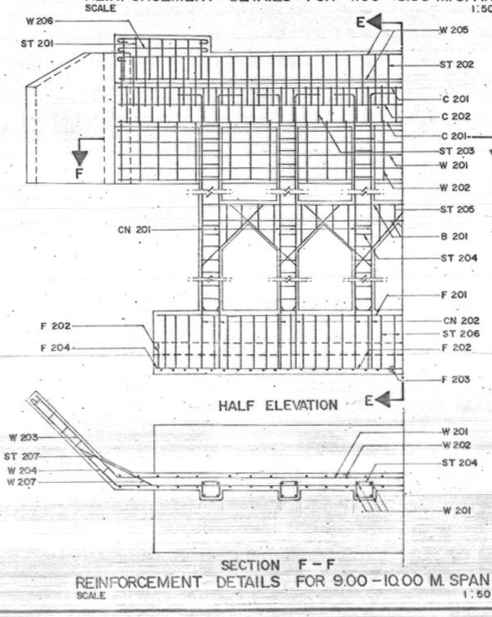
DETAIL 2
SCALE 1:50



ELEVATION

PLAN

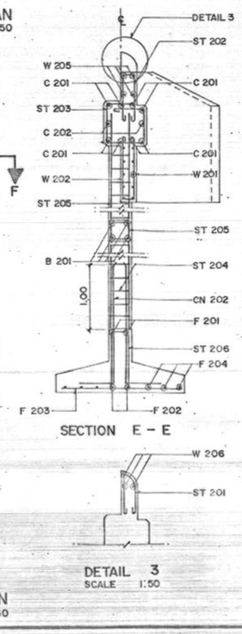
ABUTMENT DETAILS FOR 9.00 - 10.00 M. SPAN
SCALE 1:75



HALF ELEVATION

SECTION F - F

REINFORCEMENT DETAILS FOR 9.00 - 10.00 M. SPAN
SCALE 1:50

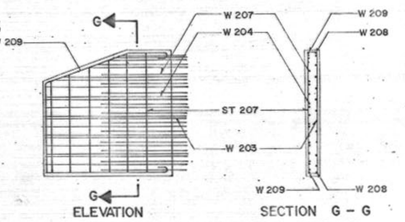


SECTION E - E

DETAIL 3
SCALE 1:50

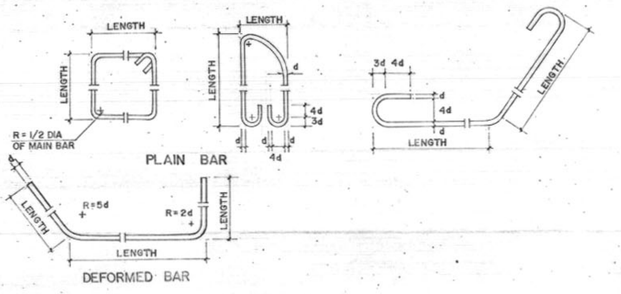
ABUTMENT HEAD DETAIL
SCALE 1:50

WINGWALL DETAIL
SCALE 1:50



ELEVATION SECTION G - G

WINGWALL REINFORCEMENT DETAILS



BAR BENDINGS DETAILS
NOT TO SCALE

TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00M.				SPAN 6.00M.				SPAN 7.00 M.				SPAN 8.00 M.				SPAN 9.00M.				SPAN 10.00M.			
		#	@	NO	L	#	@	NO	L	#	@	NO	L	#	@	NO	L	#	@	NO	L	#	@	NO	L
	C 201	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	6	–
	C 202	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	ST 201	2	0.20	–	1.215	2	0.20	–	1.295	2	0.20	–	1.355	2	0.20	–	1.435	2	0.20	–	1.515	2	0.20	–	1.635
	ST 202	3	0.20	–	1.745	3	0.20	–	1.795	3	0.20	–	1.845	3	0.20	–	1.895	3	0.20	–	1.945	3	0.20	–	1.995
	ST 203	3	0.20	–	–	3	0.20	–	–	3	0.20	–	–	3	0.20	–	–	3	0.20	–	–	3	0.20	–	–
	ST 204	3	0.20	156	1.35	3	0.20	156	1.35	3	0.20	195	1.35	3	0.20	195	1.35	3	0.20	234	1.35	3	0.20	234	1.35
	ST 205	3	0.25	18	1.35	3	0.25	18	1.35	3	0.25	8	1.35	3	0.25	8	1.35	3	0.25	–	1.35	3	0.25	–	1.35
	ST 205'	3	0.25	24	–	3	0.25	24	–	3	0.25	32	–	3	0.25	32	–	3	0.25	40	–	3	0.25	40	–
	ST 206	3	0.20	39	2.55	3	0.20	39	2.55	3	0.20	39	2.55	3	0.20	39	2.55	3	0.20	39	2.55	3	0.20	39	2.55
	ST 207	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
	B 201	8	–	8	6.30	8	–	8	6.30	8	–	8	6.30	8	–	8	6.30	8	–	8	6.30	8	–	8	6.30
	B 201'	6	–	24	1.55	6	–	24	1.55	6	–	32	1.55	6	–	32	1.55	6	–	40	1.55	6	–	40	1.55
	CN 201	8	–	16	9.25	8	–	16	9.25	8	–	20	9.25	8	–	20	9.25	8	–	24	9.25	8	–	24	9.25
	CN 202	8	–	16	2.31	8	–	16	2.31	8	–	20	2.31	8	–	20	2.31	8	–	24	2.31	8	–	24	2.31
	F 201	8	–	2	7.70	8	–	2	7.70	8	–	2	7.70	8	–	2	7.70	8	–	2	7.70	8	–	2	7.70
	F 202	8	–	2	8.90	8	–	2	8.90	8	–	2	8.90	8	–	2	8.90	8	–	2	8.90	8	–	2	8.90
	F 203	4	0.25	31	1.55	4	0.25	31	1.55	4	0.20	39	1.75	8	0.20	39	1.75	4	0.125	62	1.95	4	0.125	62	1.95
	F 204	4	–	6	7.70	4	–	6	7.70	4	–	6	7.70	4	–	6	7.70	4	–	6	7.70	4	–	6	7.70
	W 201	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–
	W 202	2	0.30	–	2.70	2	0.30	–	2.60	2	0.30	–	2.60	2	0.30	–	2.50	2	0.30	–	2.40	2	0.30	–	2.30
	W 203	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–
	W 204	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
	W 205	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–
	W 206	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–
	W 207	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15
	W 208	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435
	W 209	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535

2= Ø 1/4" OR 6 MM., # 3 = Ø 3/8" OR 9 MM., # 4 = Ø 1/2" OR 12 MM., # 6 = Ø 3/4" OR 20 MM., # 8 = Ø 1" OR 25 MM., NO= TOTAL AMOUNT OF BARS, L= LENGTH OF EACH BAR

NOTES :

1. THE BOTTOM OF A FOOTING SHALL BE EMBEDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT. IT'S CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED, 10 CM. THICKNESS OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND. COMPOSITON OF LEAN CONCRETE SHALL BE 1:3:6 BY VOLUME.
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON /M^2
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES :
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M. A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M. AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0 M. ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, BACKWALL AND WING WALLS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
5. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 300 Kg/M^3 AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 Kg/CM^2. FOR .15 x .15 x .15 M. CUBE AT 28 DAYS CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT, A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350	Kg.
SAND	0.45	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP MIX	10	CM.

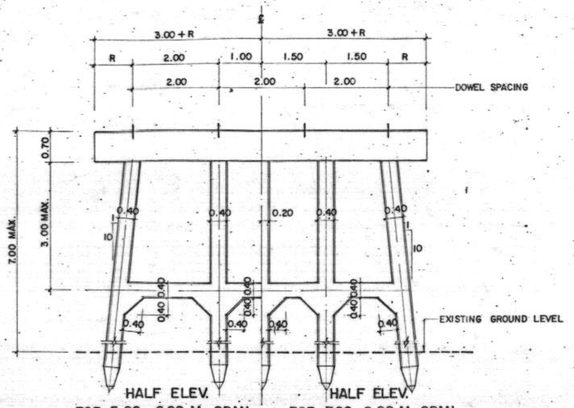
6. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS, OTHER SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
7. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
9. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM WITHOUT ALTERING THE LOCATIONS OF REBARS.
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 10.0 M.
12. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

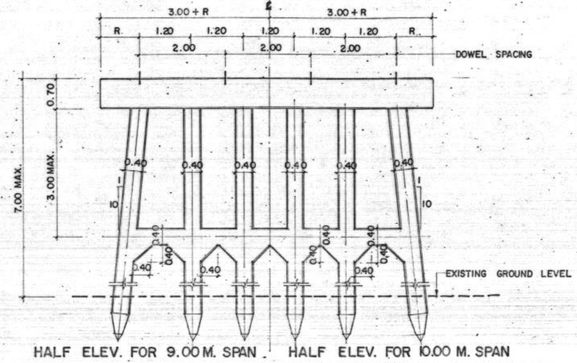
6.00 M. ROADWAY WIDTH SLAB BRIDGE
SPREAD FOOTING ABUTMENT DETAILS

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. ST-35
		SHEET NO. 148



HALF ELEV. FOR 5.00-6.00 M. SPAN

HALF ELEV. FOR 7.00-8.00 M. SPAN

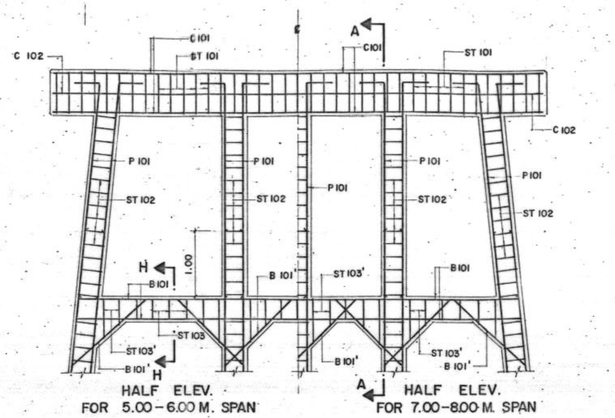


HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV. FOR 10.00 M. SPAN

PILE BENT ELEVATION

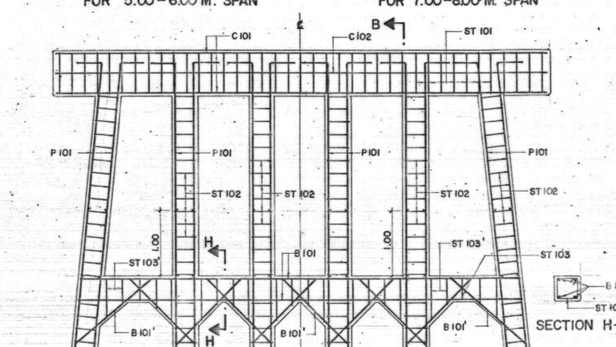
SCALE 1:75



HALF ELEV. FOR 5.00-6.00 M. SPAN

HALF ELEV. FOR 7.00-8.00 M. SPAN

SECTION A - A



HALF ELEV. FOR 9.00 M. SPAN

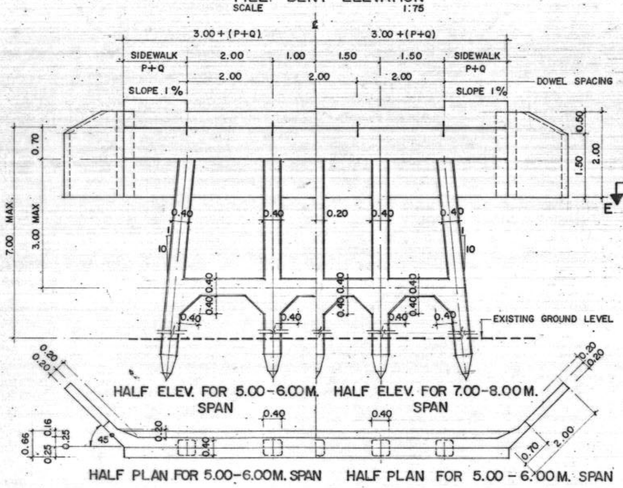
HALF ELEV. FOR 10.00 M. SPAN

SECTION H - H

SECTION B - B

PILE BENT REINFORCEMENT DETAILS

SCALE 1:50

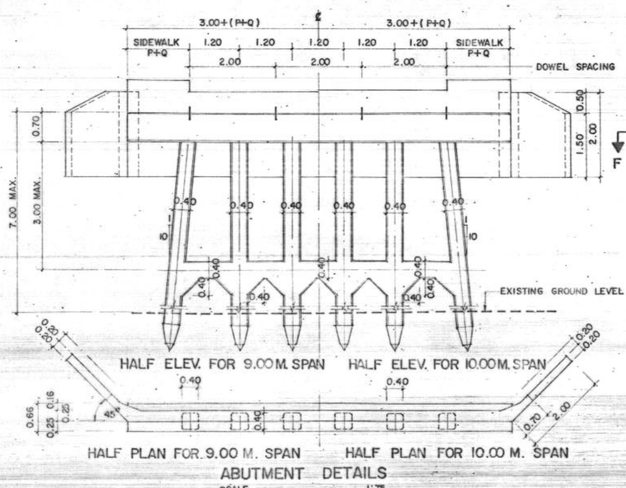


HALF ELEV. FOR 5.00-6.00 M. SPAN

HALF ELEV. FOR 7.00-8.00 M. SPAN

HALF PLAN FOR 5.00-6.00 M. SPAN

HALF PLAN FOR 5.00-6.00 M. SPAN



HALF ELEV. FOR 9.00 M. SPAN

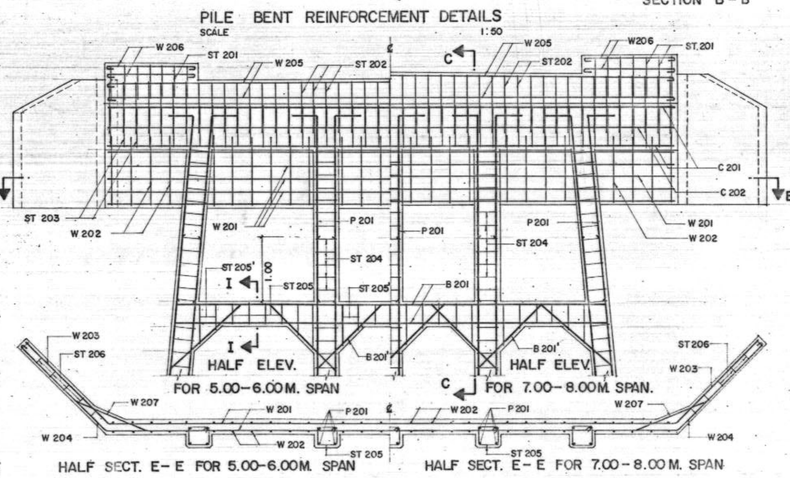
HALF ELEV. FOR 10.00 M. SPAN

HALF PLAN FOR 9.00 M. SPAN

HALF PLAN FOR 10.00 M. SPAN

ABUTMENT DETAILS

SCALE 1:75

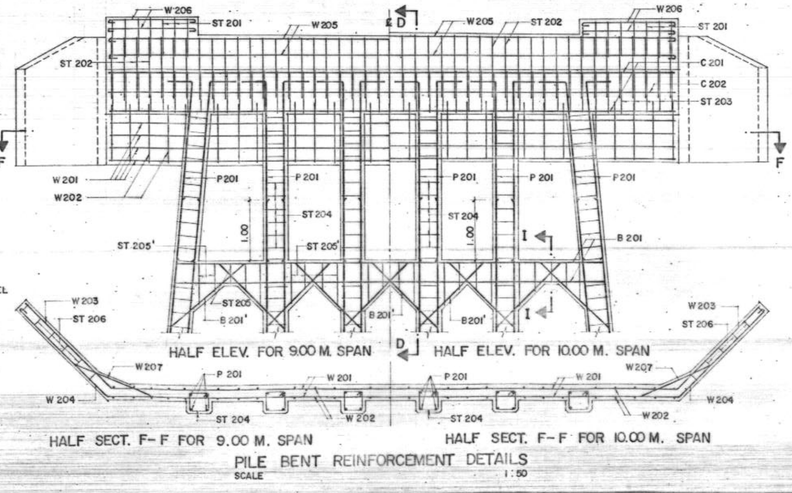


HALF ELEV. FOR 5.00-6.00 M. SPAN

HALF ELEV. FOR 7.00-8.00 M. SPAN

HALF SECT. E-E FOR 5.00-6.00 M. SPAN

HALF SECT. E-E FOR 7.00-8.00 M. SPAN



HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV. FOR 10.00 M. SPAN

HALF SECT. F-F FOR 9.00 M. SPAN

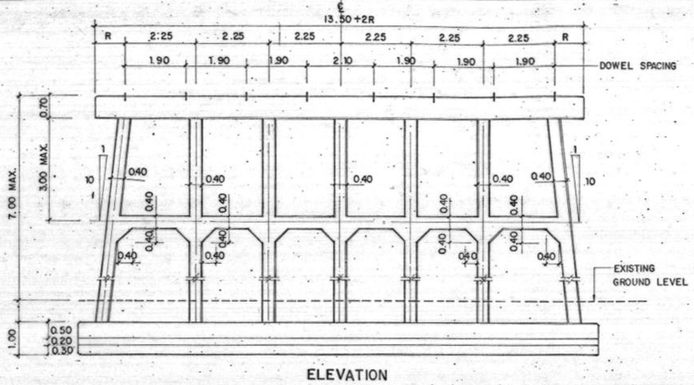
HALF SECT. F-F FOR 10.00 M. SPAN

PILE BENT REINFORCEMENT DETAILS

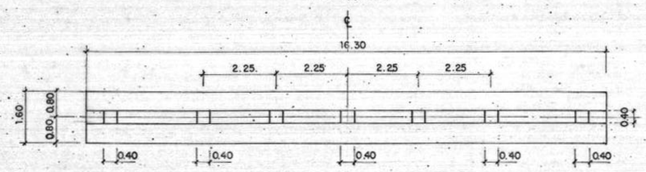
SCALE 1:50

TABLE OF REINFORCEMENT

	BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M. #	@	NO.	L	SPAN 6.00 M. #	@	NO.	L	SPAN 7.00 M. #	@	NO.	L	SPAN 8.00 M. #	@	NO.	L	SPAN 9.00 M #	@	NO.	L	SPAN 10.00 M. #	@	NO.	L
PILE BENT	VARIES	C 101	6	–	6	–	6	–	6	–	6	–	6	–	6	–	6	–	6	–	6	–	6	–	6	–
	VARIES	C 102	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	0.45 0.30 0.30 0.30



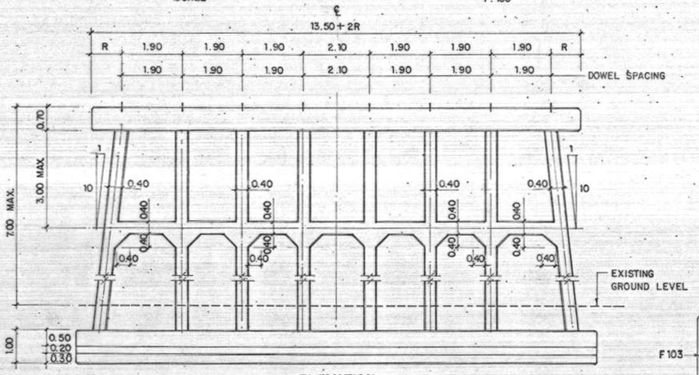
ELEVATION



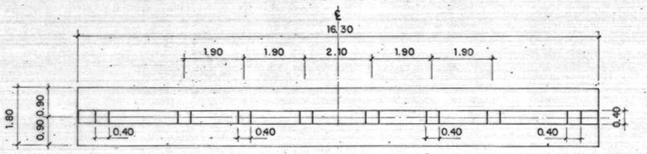
FOOTING PLAN

PIER DETAILS FOR 5.00 - 6.00 M. SPAN

SCALE 1 : 100



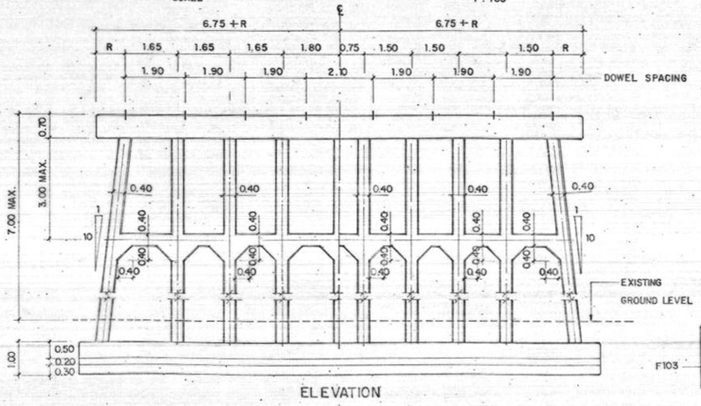
ELEVATION



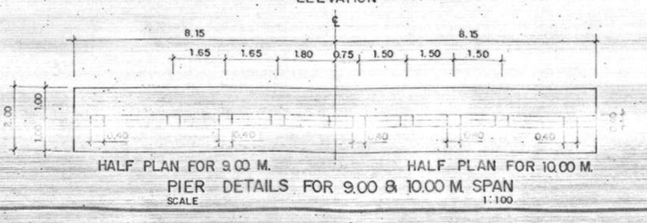
FOOTING PLAN

PIER DETAILS FOR 7.00 - 8.00 M. SPAN

SCALE 1 : 100



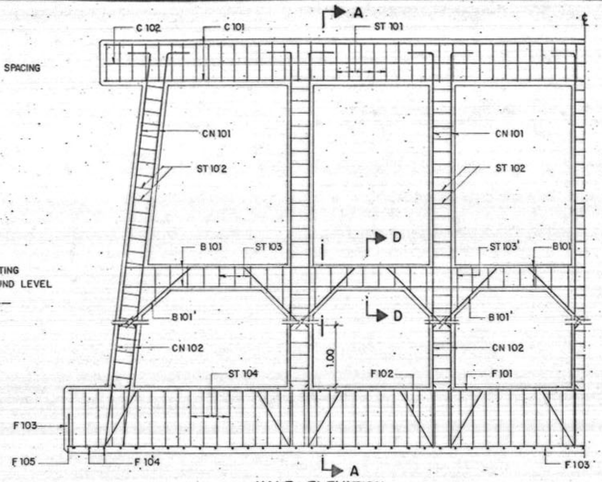
ELEVATION



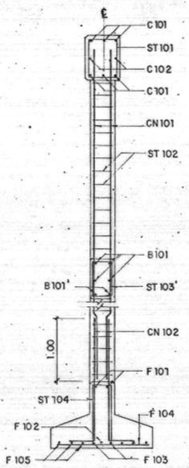
HALF PLAN FOR 9.00 M. HALF PLAN FOR 10.00 M.

PIER DETAILS FOR 9.00 & 10.00 M. SPAN

SCALE 1 : 100



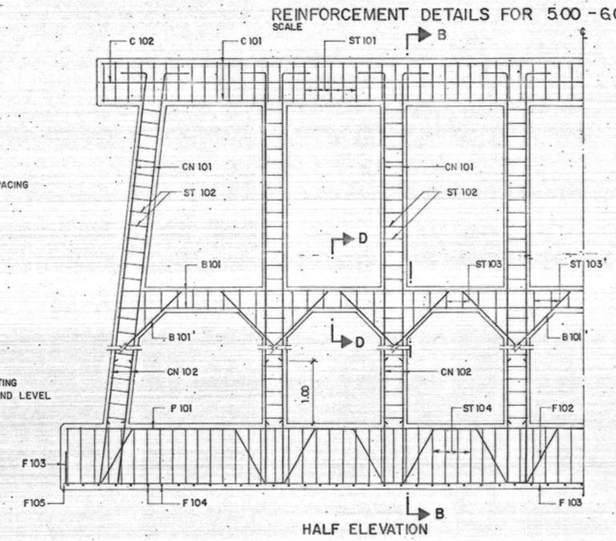
HALF ELEVATION



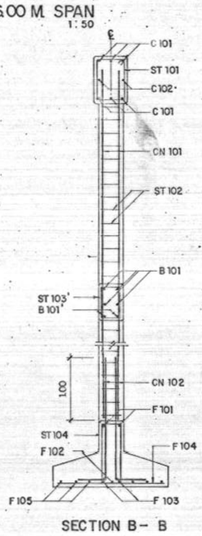
SECTION A - A

REINFORCEMENT DETAILS FOR 5.00 - 6.00 M. SPAN

SCALE 1 : 50

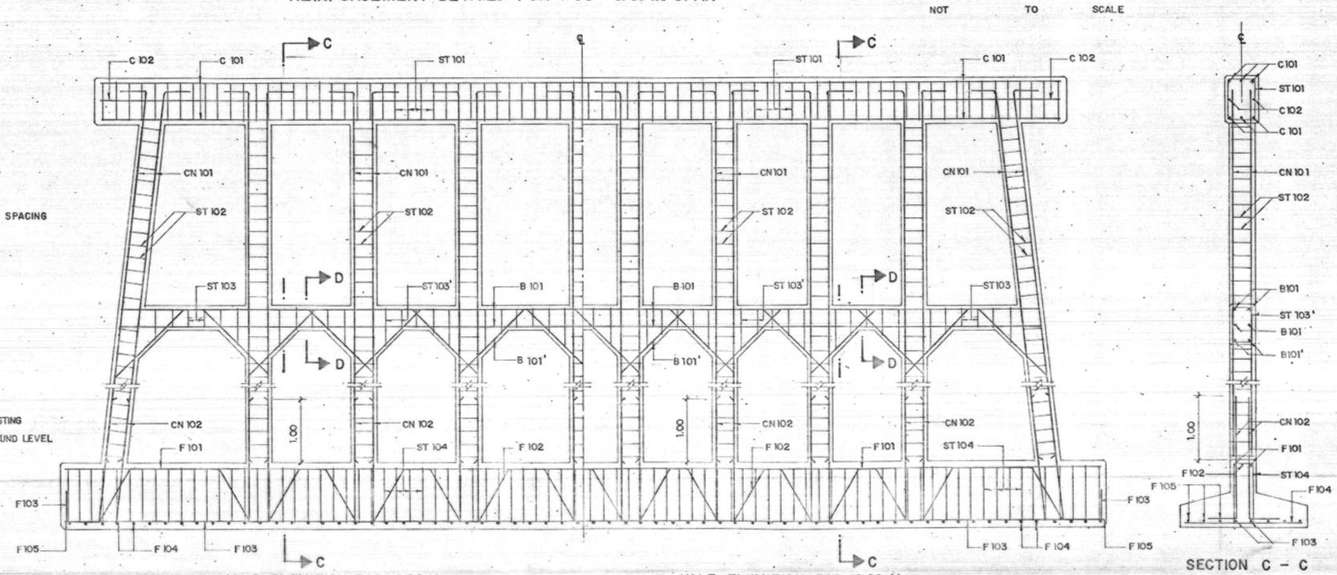


HALF ELEVATION



SECTION B- B

REINFORCEMENT DETAILS FOR 7.00 - 8.00 M. SPAN



HALF ELEVATION FOR 9.00 M. HALF ELEVATION FOR 10.00 M.

REINFORCEMENT DETAILS FOR 9.00 & 10.00 M. SPAN

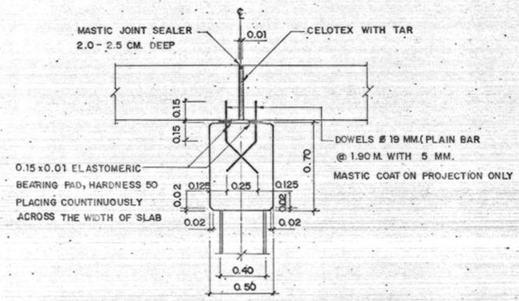
SCALE 1 : 50

SECTION C - C

TABLE OF REINFORCEMENT

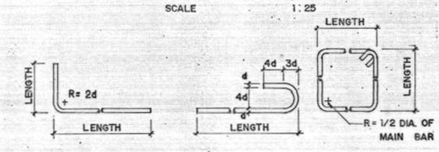
BAR BENDING DIAGRAMS	BAR	SPAN 5.00 M.				SPAN 6.00 M.				SPAN 7.00 M.				SPAN 8.00 M.				SPAN 9.00 M.				SPAN 10.00 M.			
	MARK	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L
VARIES VARIES 10.85 .40 1.91 .45 .40 Ø15 .65 .30 .30 Ø15 Ø15 .30 .30 Ø15 Ø15 VARIES .90 VARIES 1.55 16.20 .60 1.00 .60 .60 VARIES .60 .60 16.20 .60 VARIES 16.20	C 101	8	-	6	-	8	-	6	-	8	-	6	-	8	-	6	-	8	-	6	-	8	-	6	-
	C 102	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-
	CN 101	8	-	28	11.25	8	-	28	11.25	8	-	32	11.25	8	-	32	11.25	8	-	36	11.25	8	-	40	11.25
	CN 102	8	-	28	2.31	8	-	28	2.31	8	-	32	2.31	8	-	32	2.31	8	-	36	2.31	8	-	40	2.31
	ST 101	3	0.20	95	2.35	3	0.20	77	2.35	3	0.20	77	2.35	3	0.20	77	2.35	3	0.20	77	2.35	3	0.20	77	2.35
	ST 102	3	0.20	432	1.35	3	0.20	432	1.35	3	0.20	480	1.35	3	0.20	480	1.35	3	0.20	528	1.35	3	0.20	528	1.35
	ST 103	3	0.25	84	1.35	3	0.25	84	1.35	3	0.25	74	1.35	3	0.25	74	1.35	3	0.25	60	1.35	3	0.25	52	1.35
	ST 103'	3	-	48	-	3	-	48	-	3	-	56	-	3	-	56	-	3	-	64	-	3	-	72	-
	ST 104	3	0.20	99	2.55	3	0.20	82	2.55	3	0.20	79	2.55	3	0.20	79	2.55	3	0.20	79	2.55	3	0.20	79	2.55
	B 101	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-	8	-
	B 101'	6	-	48	1.55	6	-	48	1.55	6	-	56	1.55	6	-	56	1.55	6	-	64	1.55	6	-	72	1.55
	F 101	8	-	2	16.20	8	-	2	16.20	8	-	2	16.20	8	-	2	16.20	8	-	2	16.20	8	-	2	16.20
	F 102	8	-	1	-	8	-	1	-	8	-	1	-	8	-	1	-	8	-	1	-	8	-	1	-
	F 103	8	-	2	17.40	8	-	2	17.40	8	-	2	17.40	8	-	2	17.40	8	-	2	17.40	8	-	2	17.40
	F 104	4	0.25	79	-	4	0.25	79	-	4	0.20	99	-	4	0.20	99	-	4	0.125	158	-	4	0.125	158	-
	F 105	4	-	6	16.20	4	-	6	16.20	4	-	6	16.20	4	-	6	16.20	4	-	6	16.20	4	-	6	16.20

3 = Ø 3/8" OR 9 MM., # 4 = Ø 1/2" OR 12 MM., # 6 = Ø 3/4" OR 20 MM., # 8 = Ø 1" OR 25 MM., NO. = TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BAR



CAP BEAM DETAIL

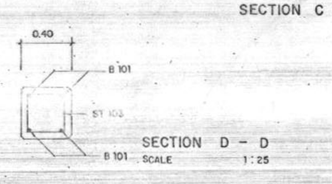
SCALE 1 : 25



DEFORMED BAR PLAIN BAR

BAR BENDING DETAILS

NOT TO SCALE



SECTION D - D

SCALE 1 : 25

NOTES :

1. THE BOTTOM OF A FOOTING SHALL BE EMBEDDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT ITS CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED, 10 CM. THICK OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 BY VOLUME.
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON / $M.^2$
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCE :
   a.) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEED 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b.) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND, LEVEL EXCEED 3.0 M. ADDTIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM., EXCEPT THE CAP BEAM AND WING WALLS WHERE A CLEAR COVER OF 5 CM. SHALL BE PROVIDED.
5. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG. / $M.^3$ AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG./$CM.^2$ FOR A 0.15 x 0.15 x 0.15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I. PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX. DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350 KG.	CRUSHED ROCK OR GRAVEL	0.86 $M.^3$
SAND	0.43 $M.^3$	CONCRETE SLUMP MAX.	10 CM.

6. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD30 DEFORMED BARS., OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
7. LOCATION OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
9. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANCE PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM WITHOUT ALTERING THE LOCATIONS OF REBARS.
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M., PIERS HIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 12.0 M.
12. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.

KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS

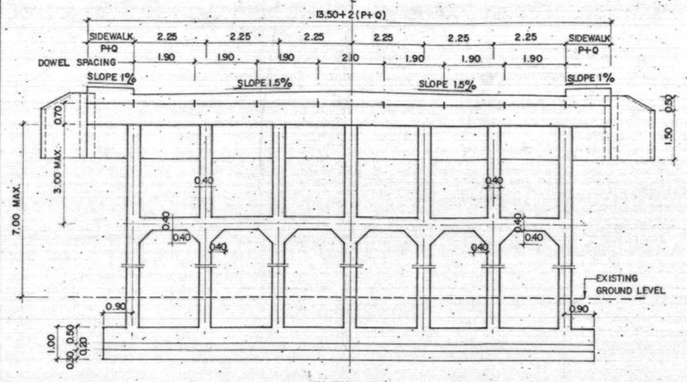
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

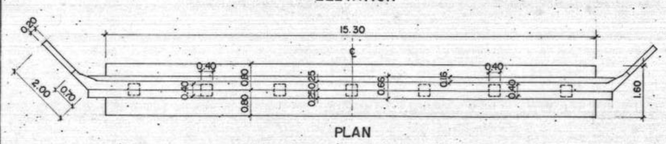
13.50 M. ROADWAY WIDTH SLAB BRIDGE

SPREAD FOOTING PIER DETAILS

DESIGNER : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. 3AD5-106-14/27
		SHEET NO. 150



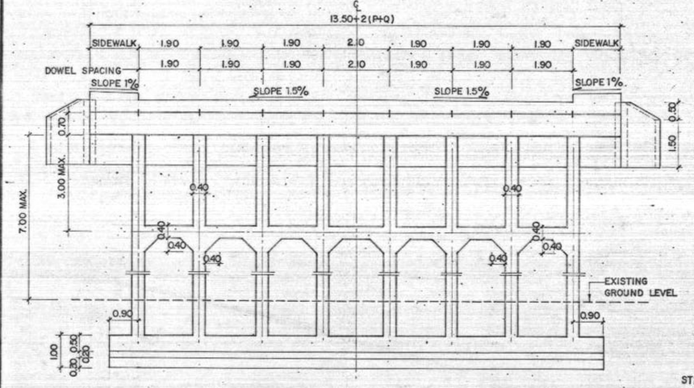
ELEVATION



PLAN

ABUTMENT DETAILS FOR 5.00 - 6.00 M. SPAN

SCALE 1:100



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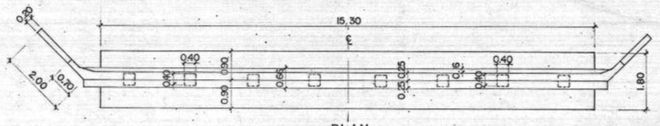
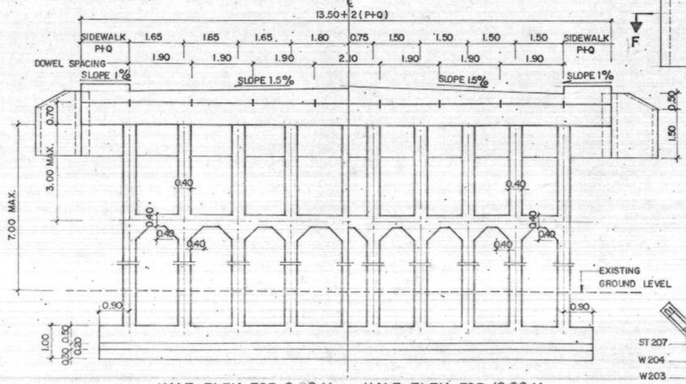
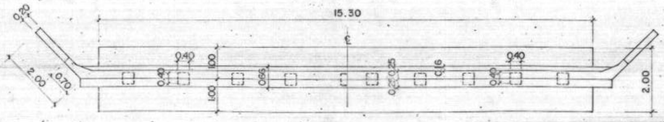


PLAN

ABUTMENT DETAILS FOR 7.00 - 8.00 M. SPAN



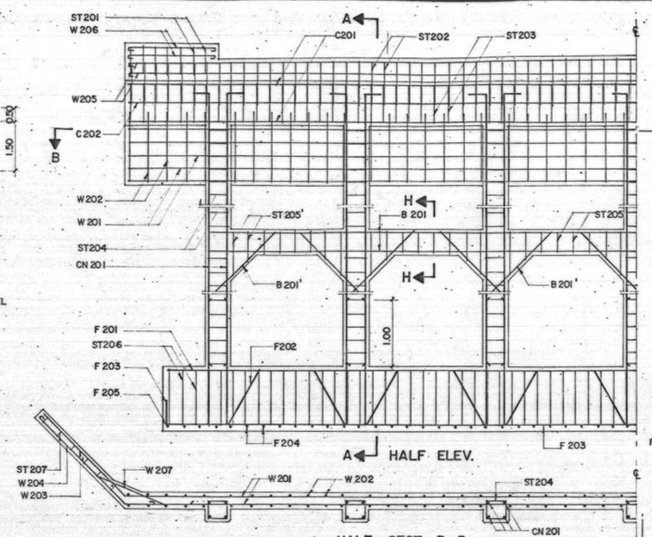
HALF ELEV. FOR 9.00 M. HALF ELEV. FOR 10.00 M.



HALF PLAN FOR 9.00 M. HALF PLAN FOR 10.00 M.

ABUTMENT DETAILS FOR 9.00 & 10.00 M. SPAN

SCALE 1:100



REINFORCEMENT DETAILS FOR 5.00-6.00 M. SPAN

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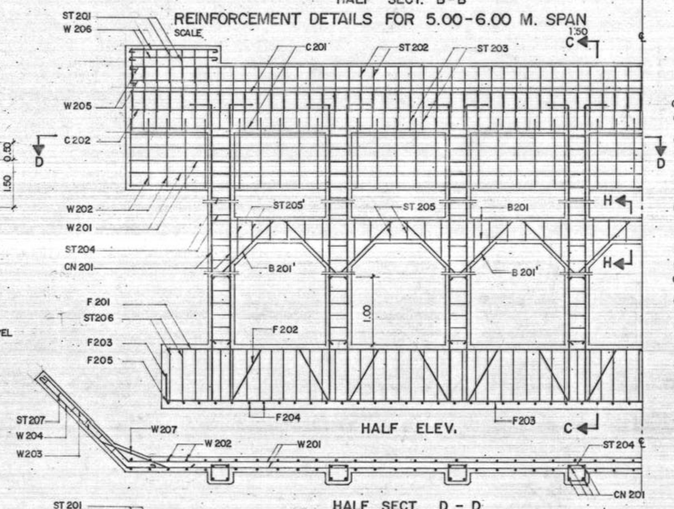

REINFORCEMENT DETAILS FOR 7.00 - 8.00 M. SPAN

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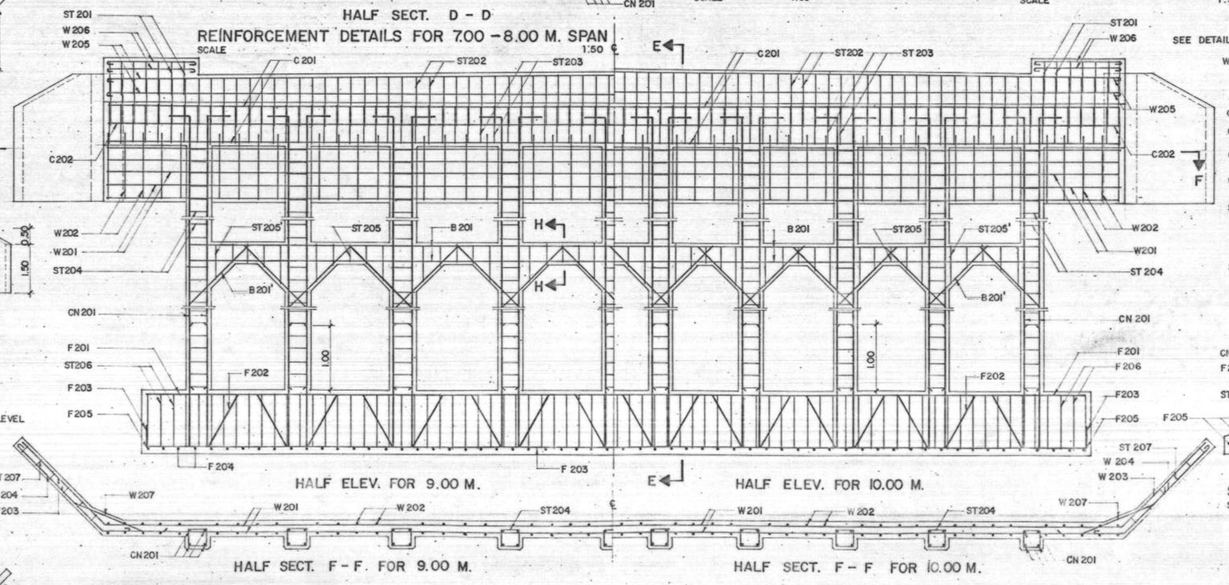
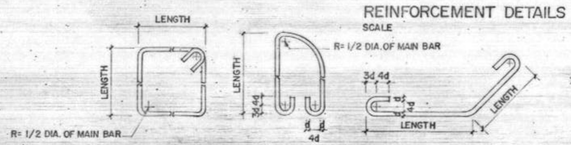
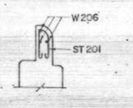


REINFORCEMENT DETAILS FOR 9.00 M. & 10.00 M. SPAN

SCALE 1:50

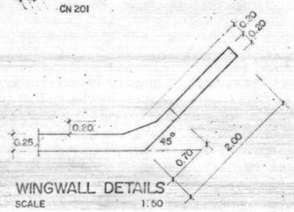


BAR BENDING DETAILS NOT TO SCALE



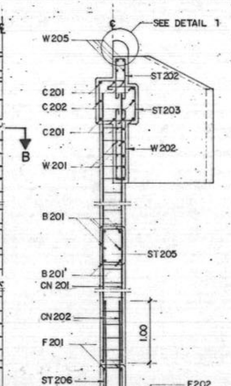
DETAIL 1

SCALE 1:50



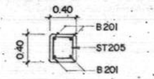
WINGWALL DETAILS

SCALE 1:50



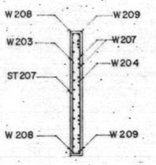
SECTION A - A

SCALE 1:50



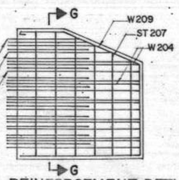
SECTION H - H

SCALE 1:50



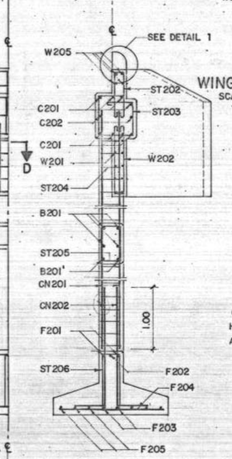
SECTION G - G

SCALE 1:50



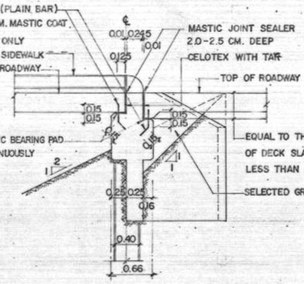
WINGWALL REINFORCEMENT DETAILS

SCALE 1:50



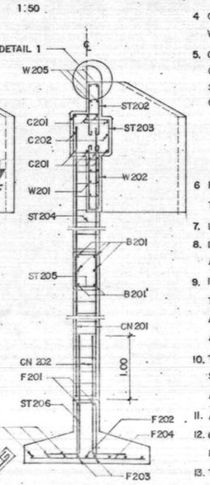
SECTION C - C

SCALE 1:50



ABUTMENT HEAD DETAILS

SCALE 1:50

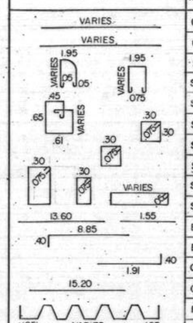


SECTION E - E

SCALE 1:50

TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS



BAR MARK	SPAN 5.00 M. #	@	NO.	L	SPAN 6.00 M. #	@	NO.	L	SPAN 7.00 M. #	@	NO	L	SPAN 8.00 M. #	@	NO.	L	SPAN 9.00 M. #	@	NO.	L	SPAN 10.00 M. #	@	NO.	L
C201	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
C202	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
ST201	2	0.20	–	1.215	2	0.20	–	1.295	2	0.20	–	1.355	2	0.20	–	1.435	2	0.20	–	1.515	2	0.20	–	1.635
ST202	3	0.20	–	1.745	3	0.20	–	1.795	3	0.20	–	1.845	3	0.20	–	1.895	3	0.20	–	1.945	3	0.20	–	1.995
ST203	3	0.20	–	–	3	0.20	–	–	3	0.20	–	–	3	0.20	–	–	3	0.20	–	–	3	0.20	–	–
ST204	3	0.20	254	1.35	3	0.20	254	1.35	3	0.20	312	1.35	3	0.20	312	1.35	3	0.20	351	1.35	3	0.20	390	1.35
ST205	3	0.25	48	1.35	3	0.25	48	1.35	3	0.25	36	1.35	3	0.25	36	1.35	3	0.25	26	1.35	3	0.25	26	1.35
ST205'	3	–	48	–	3	–	48	–	3	–	56	–	3	–	56	–	3	–	64	–	3	–	72	–
ST206	3	0.20	77	2.55	3	0.20	77	2.55	3	0.20	77	2.55	3	0.20	77	2.55	3	0.20	77	2.55	3	0.20	77	2.55
ST207	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
B201	8	–	8	13.60	8	–	8	13.60	8	–	8	13.60	8	–	8	13.60	8	–	8	13.60	8	–	8	13.60
B201'	6	–	48	1.55	6	–	48	1.55	6	–	56	1.55	6	–	56	1.55	6	–	64	1.55	6	–	72	1.55
CN201	8	–	28	9.25	8	–	28	9.25	8	–	32	9.25	8	–	32	9.25	8	–	36	9.25	8	–	40	9.25
CN202	8	–	28	2.31	8	–	28	2.31	8	–	32	2.31	8	–	32	2.31	8	–	36	2.31	8	–	40	2.31
F201	8	–	2	15.20	8	–	2	15.20	8	–	2	15.20	8	–	2	15.20	8	–	2	15.20	8	–	2	15.20
F202	8	–	1	–	8	–	1	–	8	–	1	–	8	–	1	–	8	–	1	–	8	–	1	–
F203	8		2	16.00	8		2	16.00	8		2	16.00	8		2	16.00	8		2	16.00	8		2	16.00
F204	4	0.25	61	–	4	0.25	61	–	4	0.20	76	–	4	0.20	76	–	4	0.125	122	–	4	0.125	122	–
F205	4	–	6	15.20	4	–	6	15.20	4	–	6	15.20	4	–	6	15.20	4	–	6	15.20	4	–	6	15.20
W201	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–
W202	2	0.30	–	2.70	2	0.30	–	2.60	2	0.30	–	2.60	2	0.30	–	2.50	2	0.30	–	2.40	2	0.30	–	2.30
W203	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–
W204	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
W205	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–
W206	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–
W207	4	0.15	26	2.15	4	0.15	25	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15
W208	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435
W209	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535

2 = Ø 1/4" OR 6 MM., # 3 = Ø 3/8" OR 9 MM., # 4 = Ø 1/2" OR 12 MM., # 6 = Ø 3/4" OR 20 MM., # 8 = Ø 1" OR 25 MM., NO. = TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BAR

NOTES :

1. THE BOTTOM OF A FOOTING SHALL BE EMBEDDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT ITS CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED, 10 CM. THICKNESS OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 BY VOLUME
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON / M^2
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES
   a.) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b.) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0 M., ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, BACK WALL AND WINGWALLS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED
5. CONCRETE SHALL HAVE ALUMINUM CEMENT CONTENT OF 350 KG/M. AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG./CM. FOR A 0.15 x 0.15 x 0.15 M. CUBE AT 28 DAYS CEMENT SHALL BE TIS 15 TYPE 1 PORTLAND CEMENT A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350	KG.
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP MAX	10	CM.

6. REBARS # 4 OR LARGER SHALL BE TIS. 24 GRADE SD.30 DEFORMED BARS, OTHERS SHALL BE TIS. 20. GRADE SR. 24 PLAIN BARS UNLESS OTHERWISE INDICATED
7. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETER OF BIGGER BAR FOR DEFORMED BARS
9. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT CEMENT TYPE 5 CONFROMING TO TIS. 15. SHALL BE USED AND ADDITION CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM, BACK WALL AND WINGWALLS WITHOUT ALTERING THE LOCATIONS OF REBARS
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HEIGHER THAN 7.0 M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL
11. ALL DIAMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED
12. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 10.00 M.
13. THIS DRAWING IS ADAPTED FROM DOH DWG.NO. 3A05-106-14/9

KINGDOM OF THAILAND

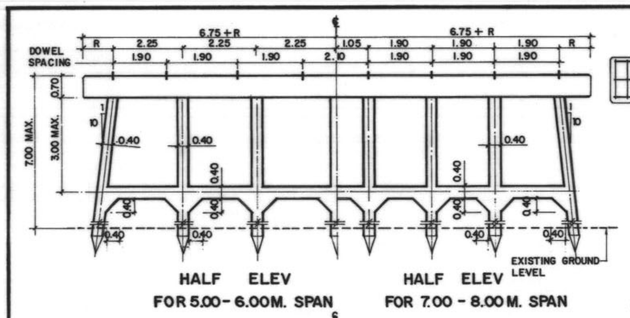
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

13.50 M. ROADWAY WIDTH SLAB BRIDGE

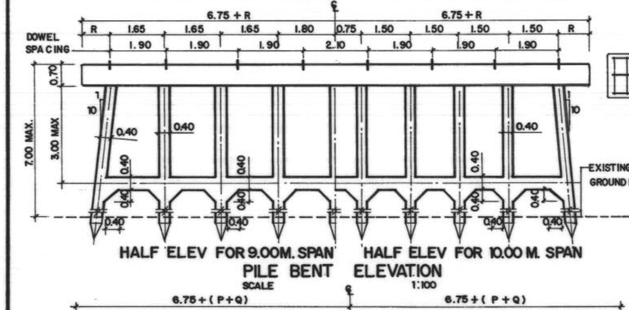
SPREAD FOOTING ABUTMENT DETAILS

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG.NO. 3A05-106-14/27
		SHEET NO. 151



HALF ELEV FOR 5.00 - 6.00 M. SPAN

HALF ELEV FOR 7.00 - 8.00 M. SPAN

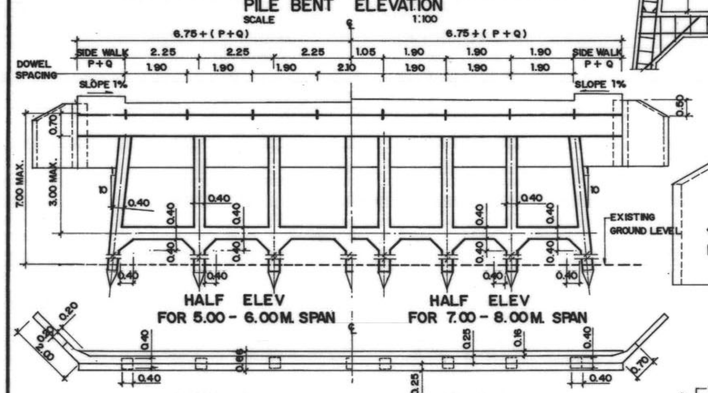


HALF ELEV FOR 9.00M. SPAN

HALF ELEV FOR 10.00 M. SPAN

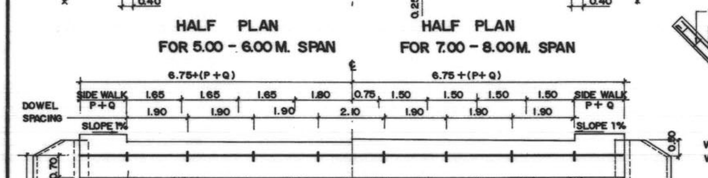
PILE BENT ELEVATION

SCALE 1:100



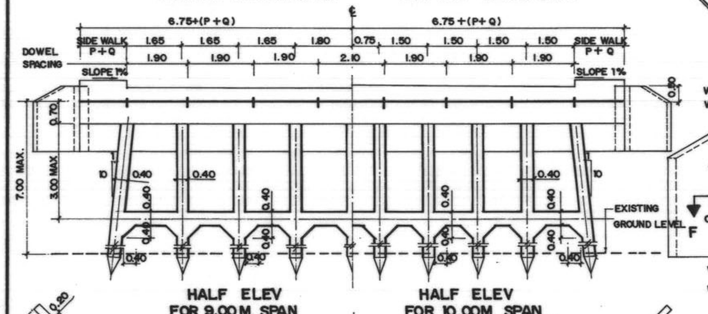
HALF ELEV FOR 5.00 - 6.00M. SPAN

HALF ELEV FOR 7.00 - 8.00 M. SPAN



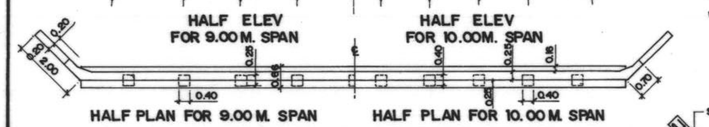
HALF PLAN FOR 5.00 - 6.00 M. SPAN

HALF PLAN FOR 7.00 - 8.00 M. SPAN



HALF ELEV FOR 9.00 M. SPAN

HALF ELEV FOR 10.00M. SPAN

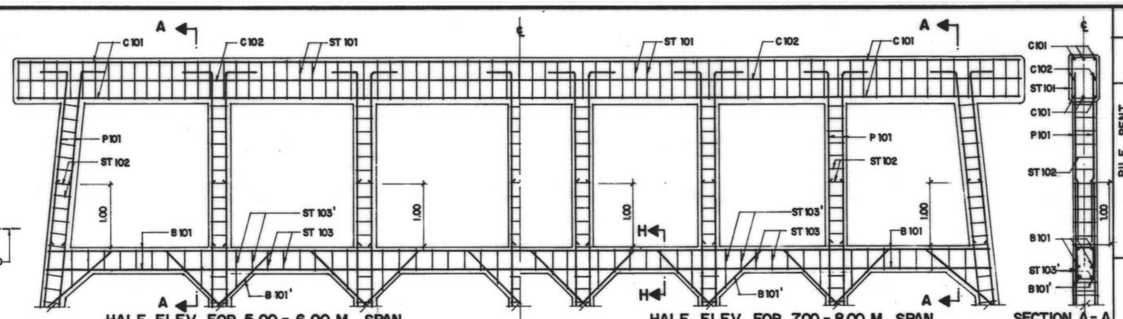


HALF PLAN FOR 9.00 M. SPAN

HALF PLAN FOR 10.00 M. SPAN

ABUTMENT DETAILS

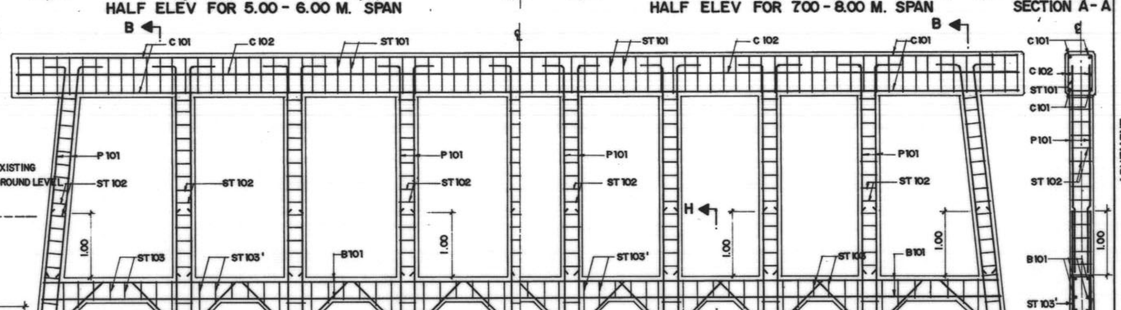
SCALE 1:100



HALF ELEV FOR 5.00 - 6.00 M. SPAN

HALF ELEV FOR 7.00 - 8.00 M. SPAN

SECTION A - A



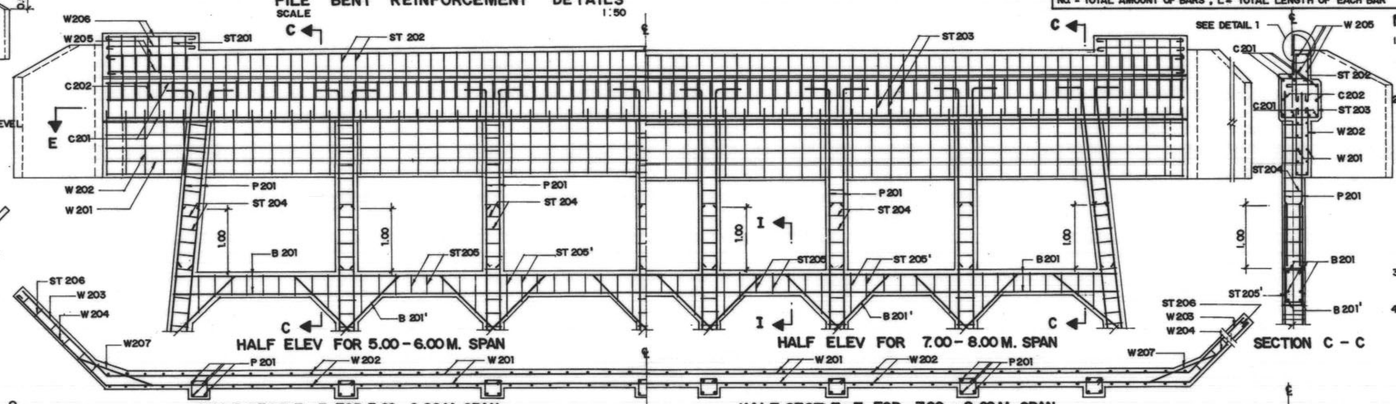
HALF ELEV FOR 9.00 M. SPAN

HALF ELEV FOR 10.00 M. SPAN

SECTION B - B

PILE BENT REINFORCEMENT DETAILS

SCALE 1:50

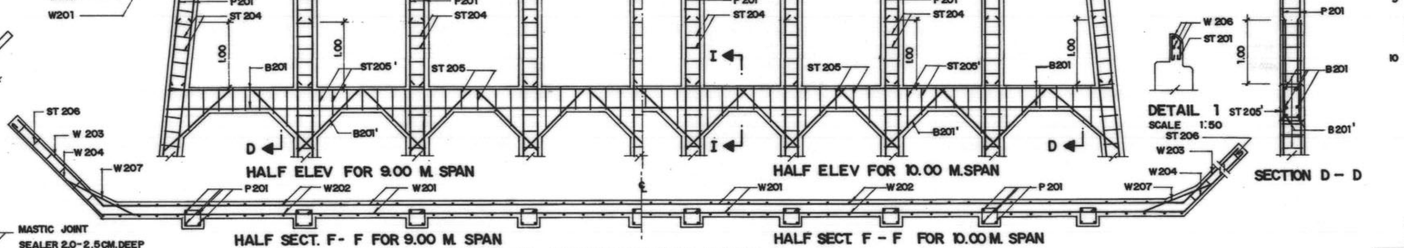


HALF ELEV FOR 5.00 - 6.00 M. SPAN

HALF ELEV FOR 7.00 - 8.00 M. SPAN

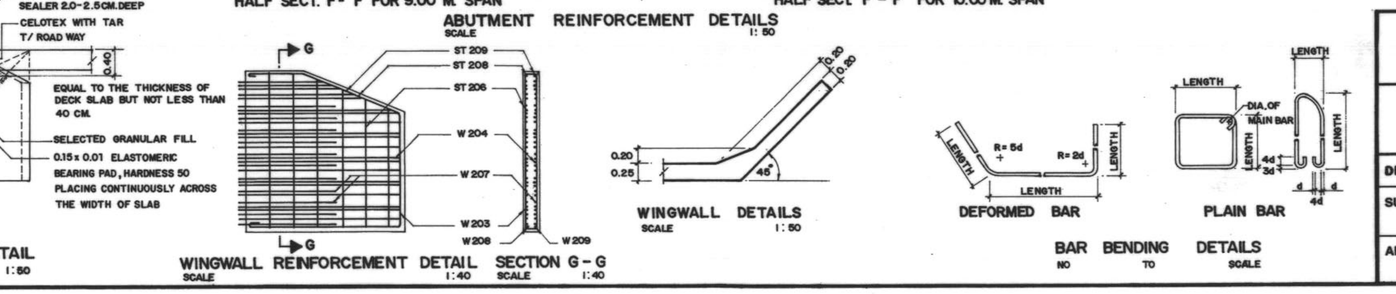
HALF SECT E-E FOR 5.00 - 6.00 M. SPAN

HALF SECT E-E FOR 7.00 - 8.00 M. SPAN



HALF ELEV FOR 9.00 M. SPAN

HALF ELEV FOR 10.00 M.SPAN

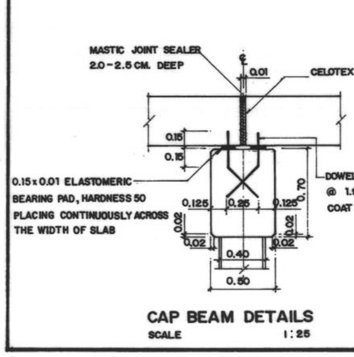


HALF SECT. F- F FOR 9.00 M. SPAN

HALF SECT F - F FOR 10.00 M. SPAN

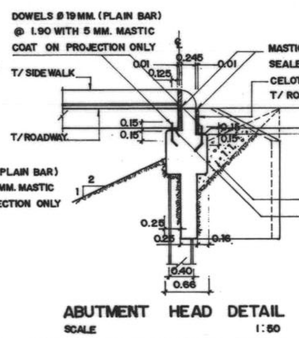
ABUTMENT REINFORCEMENT DETAILS

SCALE 1:50



CAP BEAM DETAILS

SCALE 1:25



ABUTMENT HEAD DETAIL

SCALE 1:50

WINGWALL REINFORCEMENT DETAIL SECTION G - G

SCALE 1:40 SCALE 1:40

WINGWALL DETAILS

SCALE 1:50

DEFORMED BAR

PLAIN BAR

BAR BENDING DETAILS

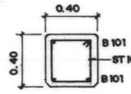
NO TO SCALE

SECTION C - C

SECTION D - D

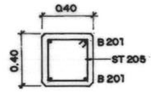
DETAIL 1

SCALE 1:50



SECTION H - H

SCALE 1:25



SECTION I - I

SCALE 1:25

TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M.				SPAN 6.00 M.				SPAN 7.00 M.				SPAN 8.00 M.				SPAN 9.00 M.				SPAN 10.00 M.			
		#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L	#	@	NO.	L
PILE BENT	C 101	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–
	C 102	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	ST 101	3	0.20	94	2.35	3	0.20	94	2.35	3	0.20	94	2.35	3	0.20	94	2.36	3	0.20	94	2.35	3	0.20	94	2.35
	ST 102	3	0.20	126	1.35	3	0.20	126	1.35	3	0.20	140	1.35	3	0.20	140	1.35	3	0.20	154	1.35	3	0.20	168	1.35
	ST 103	3	0.25	40	1.35	3	0.25	40	1.35	3	0.25	35	1.35	3	0.25	35	1.35	3	0.25	30	1.35	3	0.25	23	1.35
	ST 103'	3	0.25	24	–	3	0.25	24	–	3	0.25	28	–	3	0.25	28	–	3	0.25	32	–	3	0.25	36	–
	B 101	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–
	B 101'	6	–	24	1.55	6	–	24	1.55	6	–	28	1.55	6	–	–	1.55	6	–	32	1.55	6	–	36	1.55
	P 101	8	–	36	3.75	8	–	36	3.75	8	–	40	3.75	6	–	40	3.75	8	–	44	3.75	8	–	48	3.75
ABUTMENT	C 201	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
	C 202	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	ST 201	2	0.20	14	–	2	0.20	14	–	2	0.20	14	–	2	0.20	14	–	2	0.20	14	–	2	0.20	14	–
	ST 202	3	0.20	100	–	3	0.20	100	–	3	0.20	100	–	3	0.20	100	–	3	0.20	100	–	3	0.20	100	–
	ST 203	3	0.20	100	–	3	0.20	100	–	3	0.20	100	–	3	0.20	100	–	3	0.20	100	–	3	0.20	100	–
	ST 204	3	0.20	126	1.35	3	0.20	126	1.35	3	0.20	140	1.35	3	0.20	140	1.35	3	0.20	154	1.35	3	0.20	154	1.35
	ST 205	3	0.25	40	1.35	3	0.25	40	1.35	3	0.25	35	1.35	3	0.25	35	1.35	3	0.25	30	1.35	3	0.25	23	1.35
	ST 205'	3	0.25	24	–	3	0.25	24	–	3	0.25	28	–	3	0.25	28	–	3	0.25	32	–	3	0.25	36	–
	ST 206	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
	B 201	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–
	B 201'	6	–	24	1.55	6	–	24	1.55	6	–	28	1.55	6	–	28	1.55	6	–	32	1.55	6	–	36	1.55
	P 201	8	–	36	3.75	8	–	36	3.75	8	–	40	3.75	8	–	40	3.75	8	–	44	3.75	8	–	42	3.75
	W 201	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–
	W 202	2	0.30	55	–	2	0.30	55	–	2	0.30	55	–	2	0.30	55	–	2	0.30	55	–	2	0.30	55	–
	W 203	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–
	W 204	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
	W 205	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–
	W 206	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–
	W 207	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15
	W 208	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435
	W 209	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535

2 = Ø 1/4" OR 6MM., # 3 = Ø 3/8" OR 9MM., # 4 = Ø 1/2" OR 12 MM., # 6 = Ø 3/4" OR 20 MM., # 8 = Ø 1" OR 25 MM.

NO. = TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BAR

NOTES.

1 PILE SHALL BE DRIVEN TO A DEPTH WHERE SCOUR WILL NOT AFFECT ITS CAPACITY AND SHALL HAVE A MINIMUM ULTIMATE CAPACITY OF 90 TONS OR PILE DETAILS SEE DWG NO. MS - 02, MS - 03

2 HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES.

a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND

b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE GROUND LEVEL EXCEEDS 3.0M., ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.

3 CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, BACK AND WING WALLS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED

4 CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT 350 KG./M.^{3} AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG/CM.^{2} FOR A 0.15 x 0.15 x 0.15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS:

PORTLAND CEMENT	350 KG.	CRUSHED ROCK OR GRAVEL	0.86 M.^{3}
SAND	0.43 M.^{3}	CONCRETE SLUMP MAX.	10 CM.

5 REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BAR, OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS ORTHERWISE INDICATED.

6 LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.

7 LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER - BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.

8 IN CASE OF SALINE PROTECTION, HIGH SULPHATE CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM, BACK WALL AND WINGWALLS WITHOUT ALTERING THE LOCATIONS OF REBARS.

9 THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HEIGHER THAN 7.0 M. SHALL BE SUMITTED TO THE ENGINEER FOR APPROVAL.

10 ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.

KINGDOM OF THAILAND

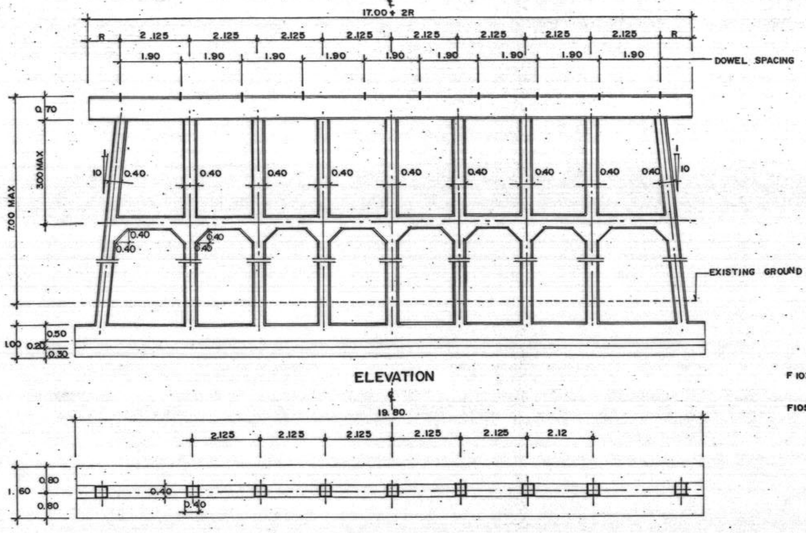
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

13.50 M. ROADWAY WIDTH SLAB BRIDGE

PILE BENT AND ABUTMENT DETAILS

DESIGNER: DOH & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: (DIRECTOR GENERAL)		DWG. NO. 3AD5 - 106 - 14/28
		SHEET NO. 152



PIER DETAILS FOR 5.00 - 6.00 M. SPAN
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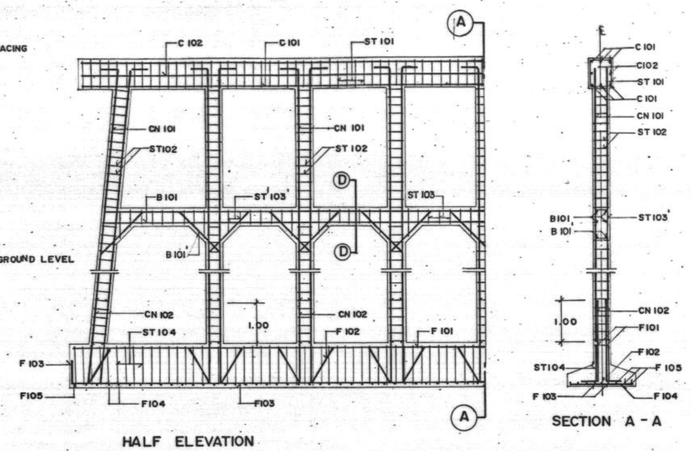
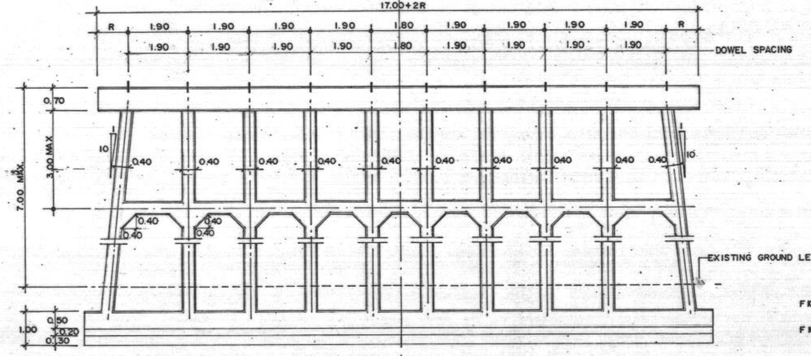


REINFORCEMENT DETAILS FOR 5.00 - 6.00M. SPAN
SCALE 1 : 7 5

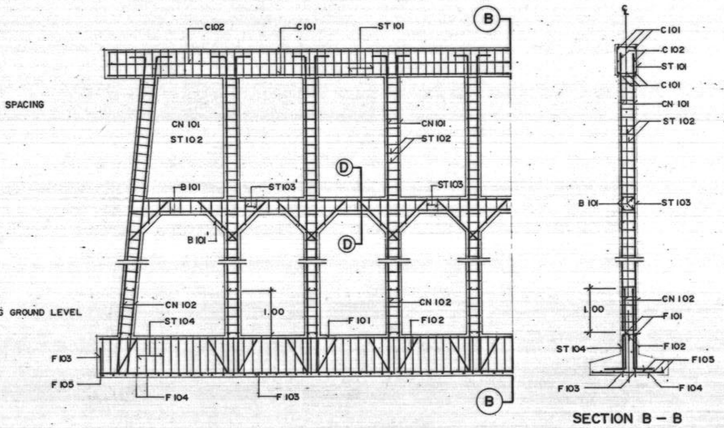
TABLE OF REINFORCEMENT

BAR MARK	SPAN 5.00 M. #	@	NO	L	SPAN 6.00 M. #	@	NO	L.	SPAN 7.00 M. #	@	NO	L	SPAN 8.00 M. #	@	NO	L	SPAN 9.00 M. #	@	NO	L	SPAN 10.00 M. #	@	NO	L
C101	8	—	6	—	8	—	6	—	8	—	6	—	8	—	6	—	8	—	6	—	8	—	6	—
C102	4	—	2	—	4	—	2	—	4	—	2	—	4	—	2	—	4	—	2	—	4	—	2	—
CN101	8	—	28	11.25	8	—	2	11.25	8	—	32	11.25	8	—	32	11.25	8	—	36	11.25	8	—	40	11.25
CN102	8	—	28	2.31	8	—	28	2.31	8	—	32	2.31	8	—	32	2.31	8	—	36	2.31	8	—	40	2.31
ST101	3	.20	95	2.35	3	.20	95	2.35	3	.20	95	2.35	3	.20	95	2.35	3	.20	95	2.35	3	.20	95	2.35
ST102	3	.20	432	1.35	3	.20	432	1.35	3	.20	480	1.35	3	.20	480	1.35	3	.20	528	1.35	3	.20	528	1.35
ST103	3	.25	68	1.35	3	.25	68	1.35	3	.25	56	1.35	3	.25	56	1.35	3	.25	48	1.35	3	.25	48	1.35
ST103'	3	—	64	—	3	—	64	—	3	—	72	—	3	—	72	—	3	—	80	—	3	—	88	—
ST104	3	.20	99	2.55	3	.20	99	2.55	3	.20	99	2.55	3	.20	99	2.55	3	.20	99	2.55	3	.20	99	2.55
B101	6	—	4	—	6	—	4	—	6	—	4	—	6	—	4	—	6	—	4	—	6	—	4	—
B101'	8	—	64	1.55	8	—	64	1.55	8	—	72	1.55	8	—	72	1.55	8	—	80	1.55	8	—	88	1.55
F101	8	—	2	19.70	8	—	2	19.70	8	—	2	19.70	8	—	2	1970	8	—	2	19.70	8	—	2	19.70
F102	8	—	1	—	8	—	1	—	8	—	1	—	8	—	1	—	8	—	1	—	8	—	1	—
F 103	8	—	2	20.90	8	—	2	20.90	8	—	2	20.90	8	—	2	20.90	8	—	2	20.90	8	—	2	20.90
F104	4	—	25	79	4	—	25	79	4	20	99	—	4	20	99	—	4	125	158	—	4	125	158	—
F 105	4	—	6	19.70	4	—	6	19.70	4	—	6	19.70	4	—	6	19.70	4	—	6	19.70	4	—	6	19.70

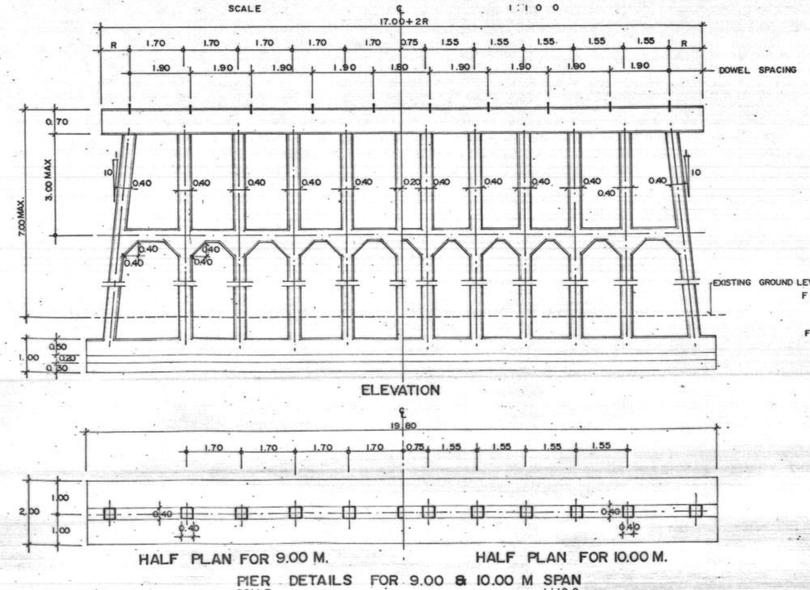
3 = ø 3/8 OR 9 MM., # 4 = ø 1/2 OR 12 MM., # 6 = ø 3/4 OR 20 MM., # 8 = ø 1" OR 25 MM., NO = TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BAR



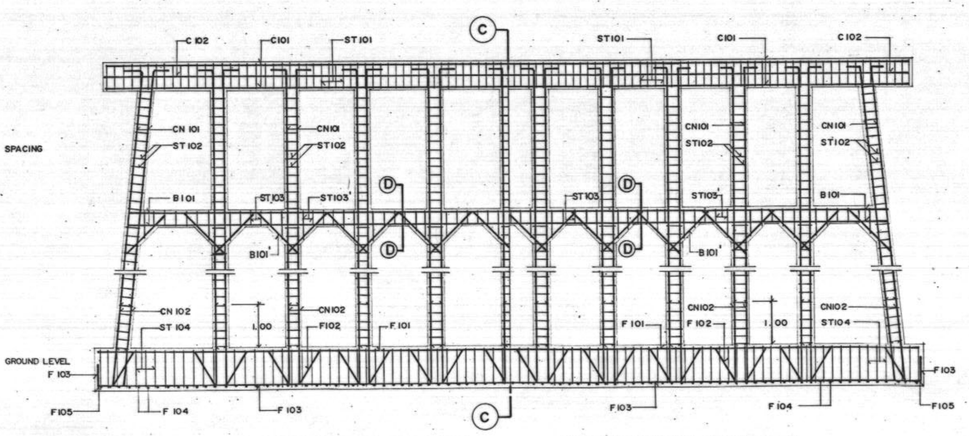
PIER DETAILS FOR 7.00 - 8.00 M. SPAN
SCALE 1 : 1 0 0



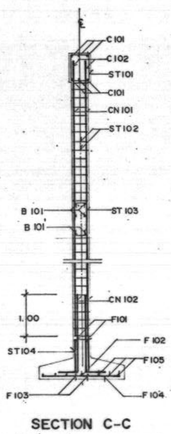
REINFORCEMENT DETAILS FOR 7.00 - 8.00 M SPAN
SCALE 1 : 7 5

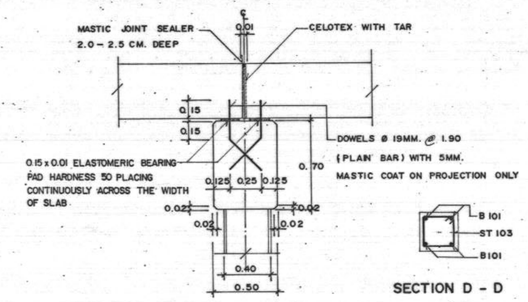


PIER DETAILS FOR 9.00 & 10.00 M SPAN
SCALE 1 : 1 0 0

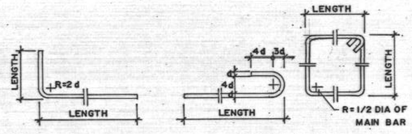


REINFORCEMENT DETAILS FOR 9.00 & 10.00M. SPAN
SCALE 1 : 7 5





CAP BEAM DETAIL
SCALE 1 : 2 5



DEFORMED BAR PLAIN BAR

BAR BENDING DETAILS
NOT TO SCALE

NOTES.

1. THE BOTTOM OF A FOOTING SHALL BE EMBEDDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT ITS CAPACITY BUT NOT LESS THAN 2.5 M. AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED 10 CM. THICK OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND. COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:5 BY VOLUME
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON / M.^{2}
3. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCE:
   a.) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b.) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0M. ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM, BACK AND WING WALLS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED
5. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG/M.^{3} AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG/CM.^{2} FOR A .15 x .15 x .15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS:

PORTLAND CEMENT	350	KG
SAND	0.45	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP MAX.	10	CM.

6. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BAR, OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED
7. LOCATION OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
9. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANCE PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM WITHOUT ALTERING THE LOCATIONS OF REBARS.
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING CANAL BED TO THE TOP OF CAP BEAM SHALL BE 7.0 M., PIER HIGHER THAN 7.0 M SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 12 M.
12. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.

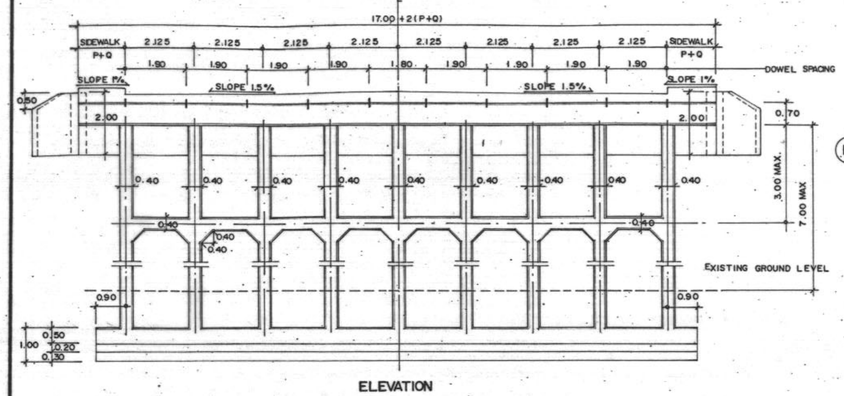
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

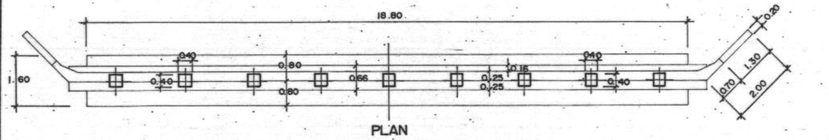
17.00 M. ROADWAY WIDTH SLAB BRIDGE

SPREAD FOOTING PIER DETAILS

DESIGNED: DOH & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS-SHOWN
APPROVED: FOR (DIRECTOR GENERAL)		DWG. NO. 3AD5-106-14/29
		SHEET NO. 153



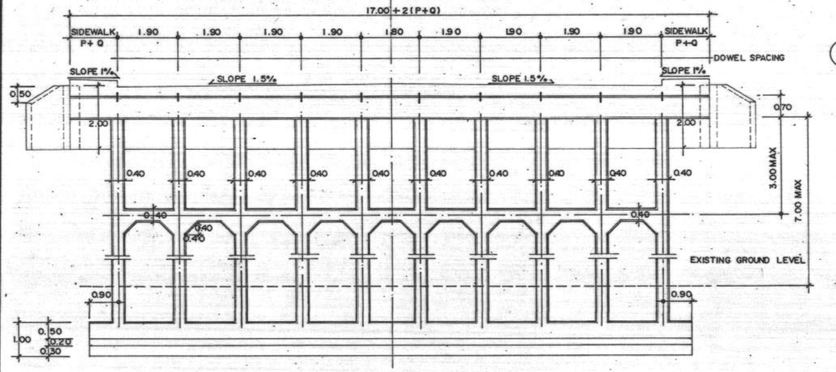
ELEVATION



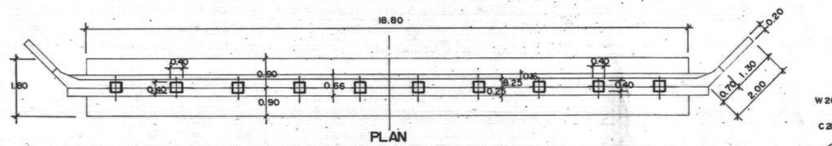
PLAN

ABUTMENT DETAILS FOR 5.00 – 6.00 M. SPAN

SCALE 1 : 100



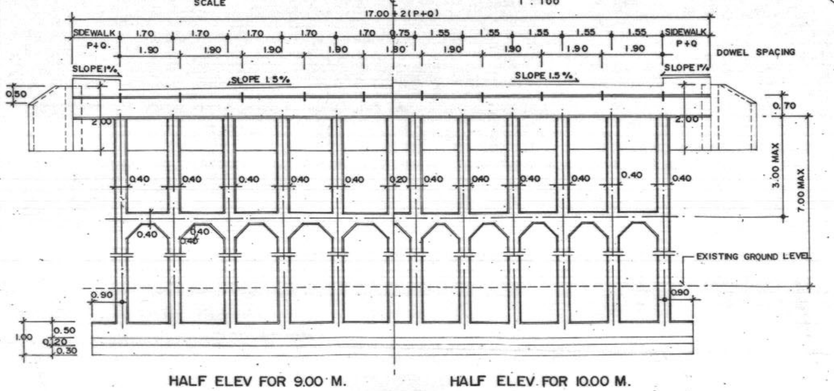
ELEVATION



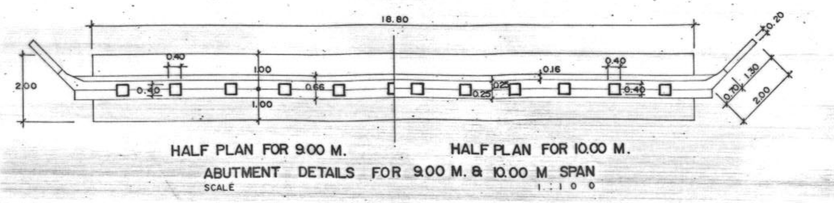
PLAN

ABUTMENT DETAILS FOR 7.00 – 8.00 M SPAN

SCALE 1 : 100



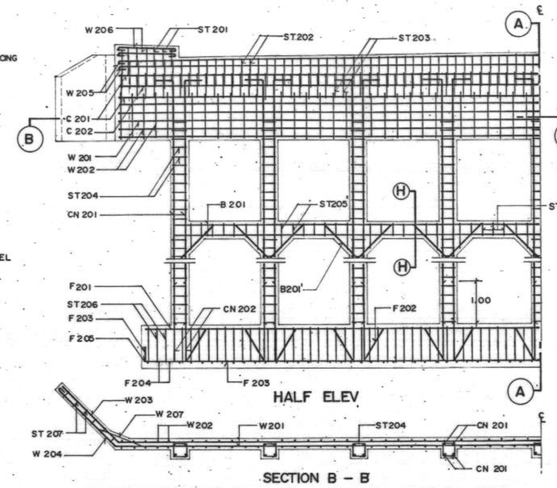
HALF ELEV FOR 9.00 M. HALF ELEV. FOR 10.00 M.



HALF PLAN FOR 9.00 M. HALF PLAN FOR 10.00 M.

ABUTMENT DETAILS FOR 9.00 M. & 10.00 M SPAN

SCALE 1 : 100

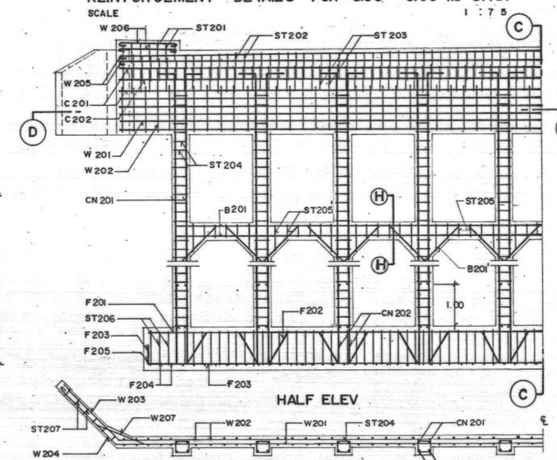


HALF ELEV

SECTION B – B

REINFORCEMENT DETAILS FOR 5.00 – 6.00 M. SPAN

SCALE 1 : 75

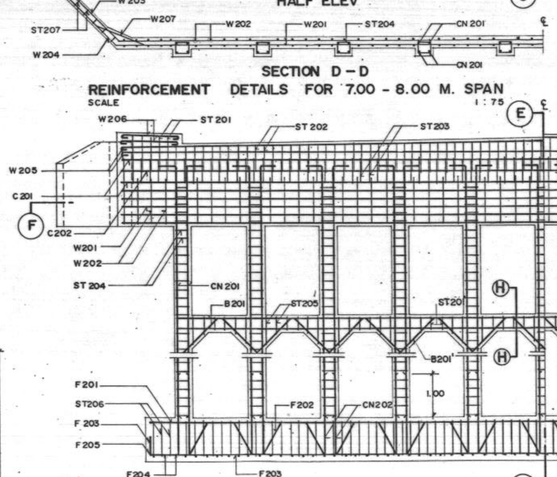


HALF ELEV

SECTION D – D

REINFORCEMENT DETAILS FOR 7.00 – 8.00 M. SPAN

SCALE 1 : 75

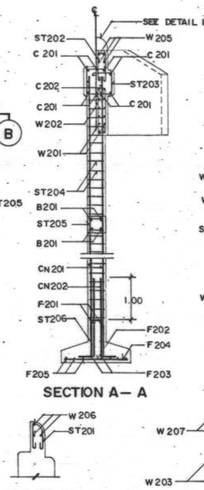


HALF ELEV FOR 9.00 M. HALF ELEV FOR 10.00 M.

HALF SECT F–F FOR 9.00 M. HALF SECT F–F FOR 10.00 M.

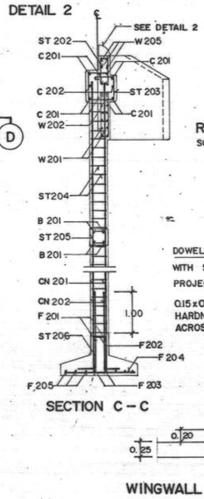
REINFORCEMENT DETAILS FOR 9.00 M & 10.00 M SPAN

SCALE 1 : 75

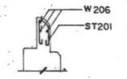


SECTION A – A

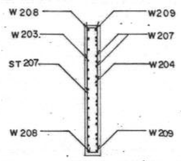
DETAIL 2



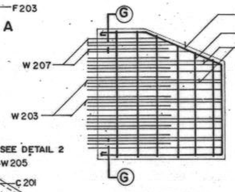
SECTION C – C



DETAIL 1



SECTION G–G

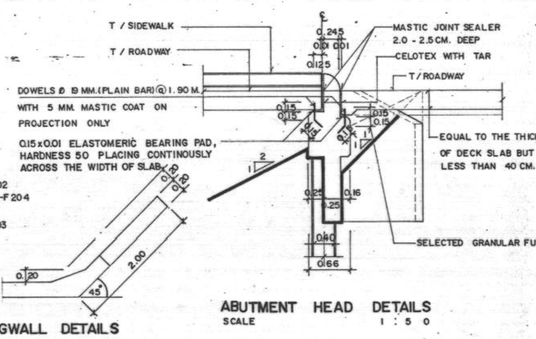


ELEVATION

WINGWALL

REINFORCEMENT DETAILS

SCALE 1 : 50

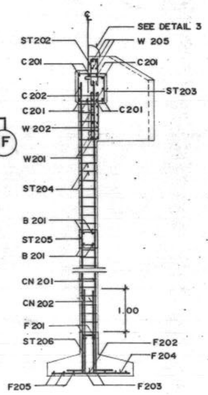


WINGWALL DETAILS

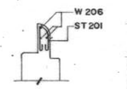
SCALE 1 : 50

ABUTMENT HEAD DETAILS

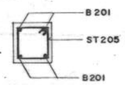
SCALE 1 : 50



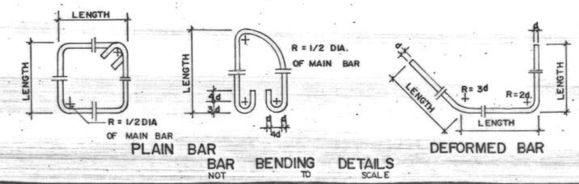
SECTION E – E



DETAIL 3



SECTION H – H



PLAIN BAR DEFORMED BAR

BAR BENDING DETAILS NOT TO SCALE

TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS	BAR	SPAN 5.00 M.			SPAN 6.00 M.			SPANN 7.00M.			SPAN 8.00 M.			SPAN 9.00 M.			SPAN 10.00 M.		
	MARK	#	NO	L	#	NO	L	#	NO	L	#	NO	L	#	NO	L	#	NO	L
VARIES	C201	8	8	-	8	8	-	8	8	-	8	8	-	8	8	-	8	8	-
VARIES	C202	4	2	-	4	2	-	4	2	-	4	2	-	4	2	-	4	2	-
	ST201	2	20	14	1.215	2	20	14	1.295	2	20	14	1.355	2	20	14	1.435	2	20	14	1.515	2	20	14	1.635
	ST202	3	20	100	1.745	3	2	100	1.795	3	20	100	1.845	3	20	100	1.895	3	20	100	1.945	3	20	100	1.995
	ST203	3	20	100	-	3	20	100	-	3	20	100	-	3	20	100	-	3	20	100	-	3	20	100	-
	ST204	3	20	254	1.35	3	20	254	1.35	3	20	312	1.35	3	20	312	1.35	3	20	35	1.35	3	20	390	1.35
	ST205	3	25	64	1.35	3	25	64	1.35	3	25	64	1.35	3	25	54	1.35	3	25	40	1.35	3	25	44	1.35
	ST205	3	-	64	-	3	-	64	-	3	-	72	-	3	-	72	-	3	-	80	-	3	-	88	-
	ST206	3	20	94	2.55	3	20	94	2.55	3	20	94	2.55	3	20	94	2.55	3	20	94	2.55	3	20	94	2.55
	ST207	2	30	12	-	2	30	12	-	2	30	12	-	2	30	12	-	2	30	12	-	2	30	12	-
	B201	8	-	8	17.30	8	-	8	17.30	8	-	8	17.30	8	-	8	17.30	8	-	8	17.30	8	-	8	17.30
	B201'	8	-	64	1.55	8	-	64	1.55	8	-	72	1.55	8	-	72	1.55	8	-	80	1.55	8	-	88	1.55
	CN201	8	-	36	9.25	8	-	36	9.25	8	-	40	9.25	8	-	40	9.25	8	-	44	9.25	8	-	48	9.25
	CN202	8	-	36	2.31	8	-	36	2.31	8	-	40	2.31	8	-	40	2.31	8	-	44	2.31	8	-	48	2.31
	F201	8	-	2	18.70	8	-	2	18.70	8	-	2	18.70	8	-	2	18.70	8	-	2	18.70	8	-	2	18.70
	F202	8	-	1	-	8	-	1	-	8	-	1	-	8	-	1	-	8	-	1	-	8	-	1	-
	F203	8	-	2	19.50	8	-	2	19.50	8	-	2	19.50	8	-	2	19.50	8	-	2	19.50	8	-	2	19.50
	F204	4	25	75	1.55	4	25	75	1.55	4	20	94	1.75	4	20	94	1.75	4	125	150	1.95	4	125	150	1.95
	F205	4	-	6	18.70	4	-	6	18.70	4	-	6	18.70	4	-	6	18.70	4	-	6	18.70	4	-	6	18.70
	W201	4	20	10	19.95	4	20	10	19.95	4	20	10	19.95	4	20	10	19.95	4	20	10	19.95	4	20	10	19.95
	W202	2	30	66	2.70	2	30	66	2.60	2	30	66	2.60	2	30	66	2.50	2	30	66	2.40	2	30	66	2.30
	W203	4	15	24	-	4	15	24	-	4	15	24	-	4	15	24	-	4	15	24	-	4	15	24	-
	W204	2	30	12	-	2	30	12	-	2	30	12	-	2	30	12	-	2	30	12	-	2	30	12	-
	W205	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-	2	-	4	-
	W206	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-	2	-	6	-
	W207	4	015	26	2.15	4	015	26	2.15	4	015	26	2.15	4	015	26	2.15	4	015	26	2.15	4	015	26	2.15
	W208	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435	4	-	2	5.435
	W209	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535	2	-	2	5.535

2 = Ø 1/4" OR 6 MM., # 3 = Ø 3/8" OR 9 MM., # 4 = Ø 1/2" OR 12 MM., # 8 = Ø 1" OR 25 MM., NO = TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BAR

NOTES

1. THE BOTTOM OF A FOOTING SHALL BE EMBEDDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT ITS CAPACITY BUT NOT LESS THAN 2.5 M AFTER THE GROUND UNDER THE BOTTOM OF FOOTING HAS BEEN PREPARED , 10 CM. THICK OF LEAN CONCRETE SHALL BE POURED AT LEAST 10 CM. WIDER THAN THE FOOTING ALL AROUND COMPOSITION OF LEAN CONCRETE SHALL BE 1:3:6 BY VOLUME .
2. SOIL UNDER THE FOOTING SHALL HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 20 TON/M^2
3. HORIZONTAL CROSS BRACING BETWEEN COLUMN SHALL BE PROVIDED IN FOLLOWING CIRCUMSTANCES
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0M., A SPACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM BOTTOM OF THE CAP BEAM TO THE CENTERLINE THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M. AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEEDS 3.0M. , ADDITIONAL BRACINGS SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M .
4. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM , BACK AND WING WALLS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVIDED.
5. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG/M^3 AND A MINIMUM ULTIMATE COMPRESSIVE NGTH OF 210 KG/CM^2 FOR A 15x15x15 M CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS

PORTLAND CEMENT	350	KG.
SAND	0.45	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP MAX	10	CM.

6. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD30 DEFORMED BARS OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED .
7. LOCATION OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER :
8. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS .
9. IN CASE OF SALINE PROTECTION , HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED WITHOUT ALTERING THE LOCATIONS OF REBARS.
10. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING CANAL BED TO THE TOP OF CAP BEAM SHALL BE 7.0M PIERS HIGHER THAN 7.0M. SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL .
11. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT 10.00 M.
12. ALL DIMENTIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.

KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS

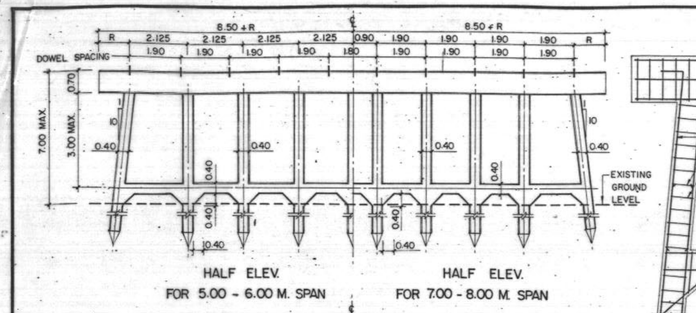
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

17.00 M. ROADWAY WIDTH SLAB BRIDGE

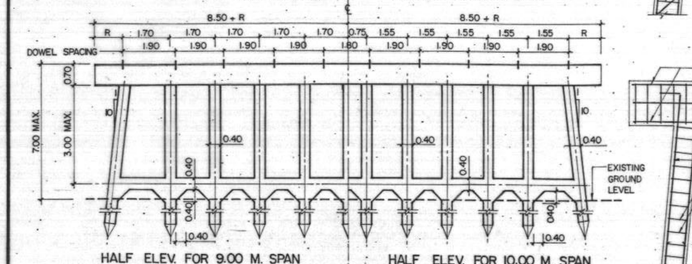
SPREAD FOOTING ABUTMENT DETAILS

DESIGNED: DOH & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: (DIRECTOR GENERAL)		DWG. NO. 3AD5-106-14/29a
		SHEET NO. 154



HALF ELEV. FOR 5.00 - 6.00 M. SPAN

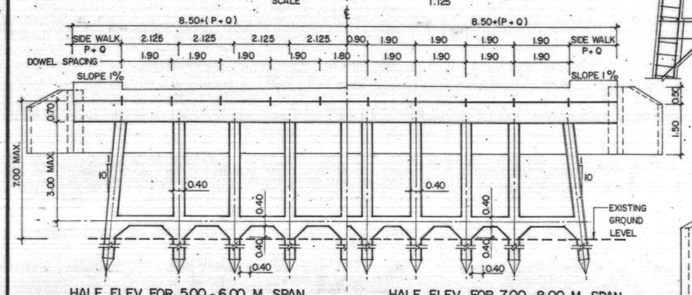
HALF ELEV. FOR 7.00 - 8.00 M. SPAN



HALF ELEV. FOR 9.00 M. SPAN

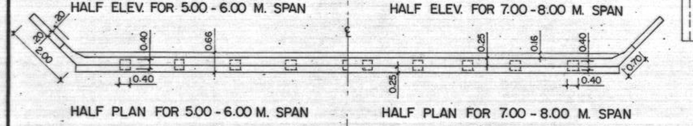
HALF ELEV. FOR 10.00 M. SPAN

PILE BENT ELEVATION
SCALE 1:125



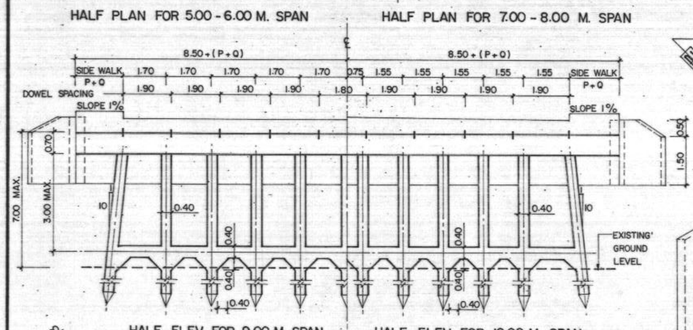
HALF ELEV. FOR 5.00 - 6.00 M. SPAN

HALF ELEV. FOR 7.00 - 8.00 M. SPAN



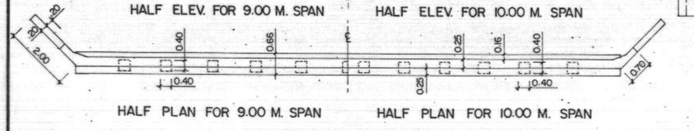
HALF PLAN FOR 5.00 - 6.00 M. SPAN

HALF PLAN FOR 7.00 - 8.00 M. SPAN



HALF ELEV. FOR 9.00 M. SPAN

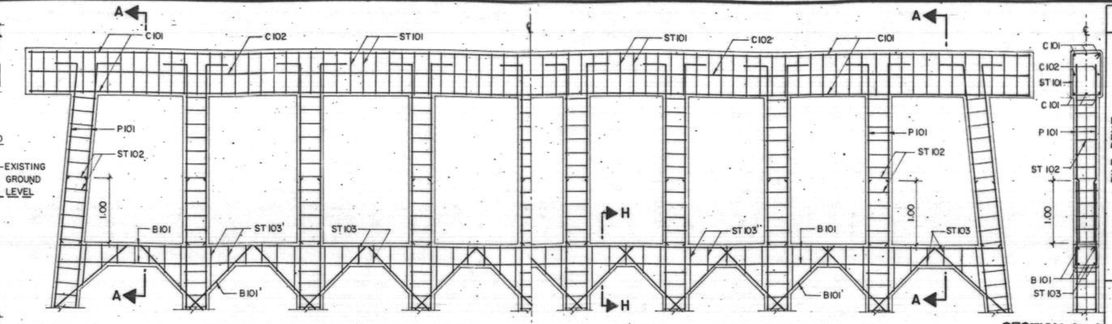
HALF ELEV. FOR 10.00 M. SPAN



HALF PLAN FOR 9.00 M. SPAN

HALF PLAN FOR 10.00 M. SPAN

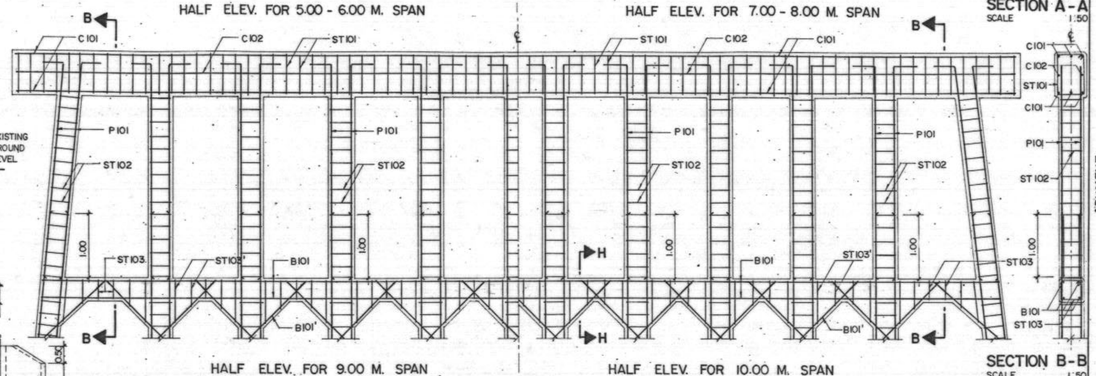
ABUTMENT DETAILS
SCALE 1:125



HALF ELEV. FOR 5.00 - 6.00 M. SPAN

HALF ELEV. FOR 7.00 - 8.00 M. SPAN

SECTION A-A
SCALE 1:50

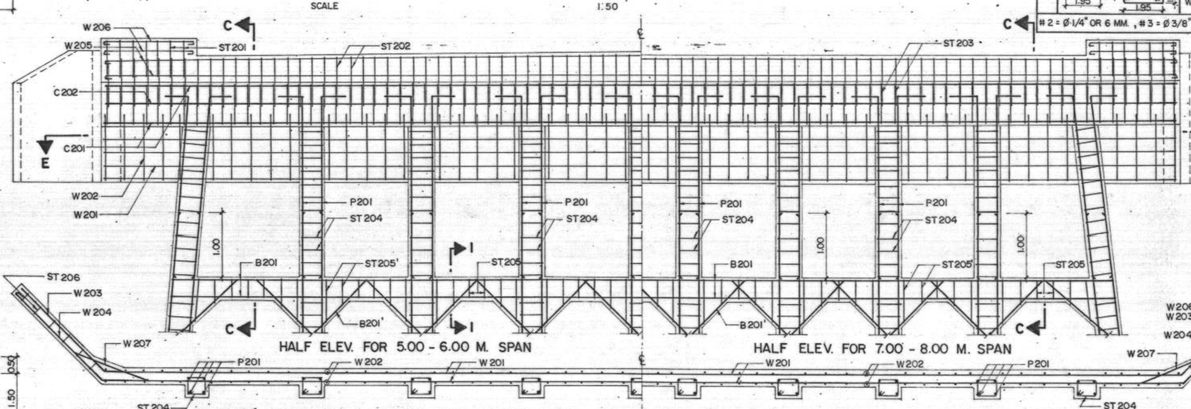


HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV. FOR 10.00 M. SPAN

SECTION B-B
SCALE 1:50

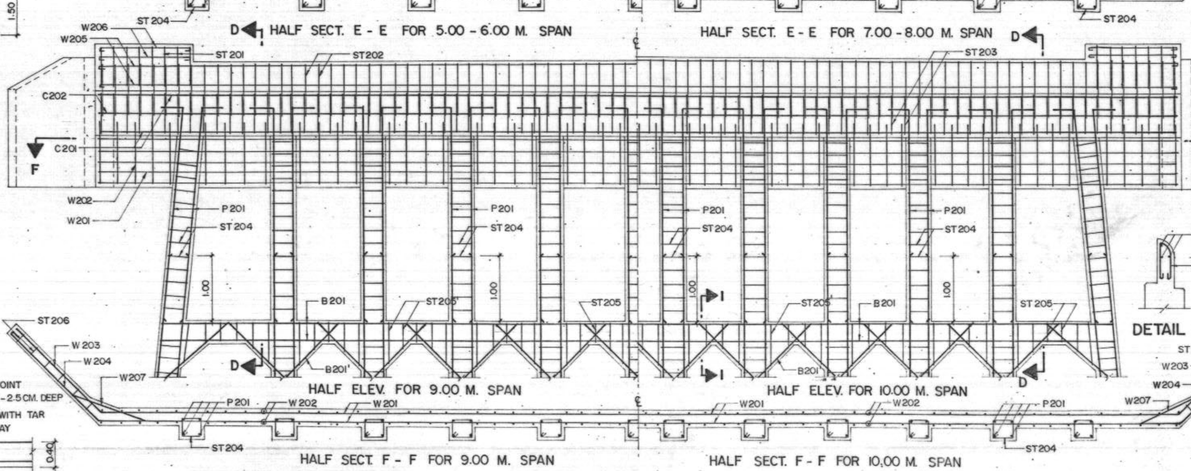
PILE BENT REINFORCEMENT DETAILS
SCALE 1:50



HALF ELEV. FOR 5.00 - 6.00 M. SPAN

HALF ELEV. FOR 7.00 - 8.00 M. SPAN

SECTION C - C
SCALE 1:50



HALF SECT. E - E FOR 5.00 - 6.00 M. SPAN

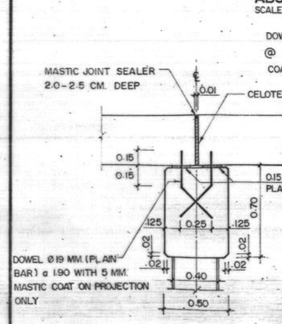
HALF SECT. E - E FOR 7.00 - 8.00 M. SPAN

HALF SECT. F - F FOR 9.00 M. SPAN

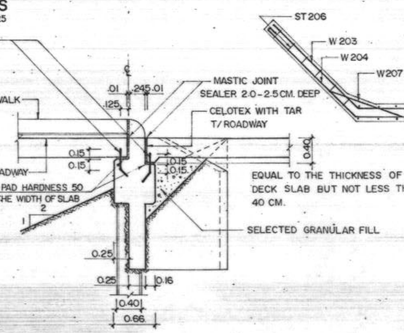
HALF SECT. F - F FOR 10.00 M. SPAN

SECTION D - D
SCALE 1:50

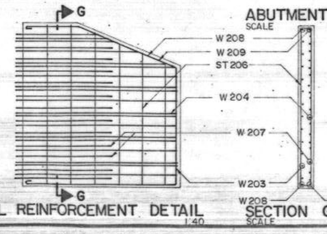
ABUTMENT REINFORCEMENT DETAILS
SCALE 1:50



CAP BEAM DETAILS
SCALE 1:25

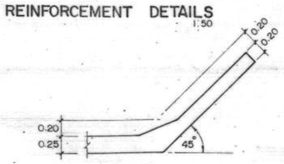


ABUTMENT HEAD DETAIL
SCALE 1:50

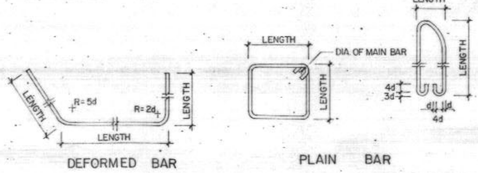


WINGWALL REINFORCEMENT DETAIL
SCALE 1:40

SECTION G - G
SCALE 1:40



WINGWALL DETAILS
SCALE 1:50



DEFORMED BAR

PLAIN BAR

BAR BENDING DETAILS
NOT TO SCALES

TABLE OF REFORCEMENT

BAR BENDING DIAGRAMS	BAR MARK	SPAN 5.00 M. #	@	NO	L	SPAN 6.00 M. #	@	NO	L	SPAN 7.00 M. #	@	NO	L	SPAN 8.00 M. #	@	NO	L	SPAN 9.00 M. #	@	NO	L	SPAN 10.00 M. #	@	NO	L
PILE BENT	C 101	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–	8	–	6	–
	C 102	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	ST 101	3	0.20	94	2.35	3	0.20	94	2.35	3	0.20	94	2.35	3	0.20	94	2.35	3	0.20	94	2.35	3	0.20	94	2.35
	ST 102	3	0.20	126	1.35	3	0.20	126	1.35	3	0.20	140	1.35	3	0.20	140	1.35	3	0.20	154	1.35	3	0.20	168	1.35
	ST 103	3	0.25	32	1.35	3	0.25	32	1.35	3	0.25	27	1.35	3	0.25	27	1.35	3	0.25	22	1.35	3	0.25	25	1.35
	ST 103'	3	0.25	32	–	3	0.25	32	–	3	0.25	36	–	3	0.25	36	–	3	0.25	40	–	3	0.25	44	–
	B 101	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–
	B 101'	6	–	32	1.05	6	–	32	1.05	6	–	36	1.05	6	–	36	1.05	6	–	40	1.05	6	–	44	1.05
	P 101	8	–	36	3.75	8	–	36	3.75	8	–	40	3.75	8	–	40	3.75	8	–	44	3.75	8	–	48	3.75
ABUMENT	C 201	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–	8	–
	C 202	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–
	ST 201	2	0.20	14	–	2	0.20	14	–	2	0.20	14	–	2	0.20	14	–	2	0.20	14	–	2	0.20	14	–
	ST 202	3	0.20	100	–	3	0.20	100	–	3	0.20	100	–	3	0.20	100	–	3	0.20	100	–	3	0.20	100	–
	ST 203	3	0.20	100	–	3	0.20	100	–	3	0.20	100	–	3	0.20	100	–	3	0.20	100	–	3	0.20	100	–
	ST 204	3	0.20	126	1.35	3	0.20	126	1.35	3	0.20	140	1.35	3	0.20	140	1.35	3	0.20	154	1.35	3	0.20	154	1.35
	ST 205	3	0.25	32	1.35	3	0.25	32	1.35	3	0.25	27	1.35	3	0.25	27	1.35	3	0.25	22	1.35	3	0.25	25	1.35
	ST 205'	3	0.25	32	–	3	0.25	32	–	3	0.25	36	–	3	0.25	36	–	3	0.25	40	–	3	0.25	44	–
	ST 206	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
	B 201	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–	8	–	4	–
	B 201'	6	–	32	1.05	6	–	32	1.05	6	–	36	1.05	6	–	36	1.05	6	–	40	1.05	6	–	44	1.05
	P 201	8	–	36	3.75	8	–	36	3.75	8	–	40	3.75	8	–	40	3.75	8	–	44	3.75	8	–	48	3.75
	W 201	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–	4	0.20	10	–
	W 202	2	0.30	55	–	2	0.30	55	–	2	0.30	55	–	2	0.30	55	–	2	0.30	55	–	2	0.30	55	–
	W 203	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–	4	0.15	24	–
	W 204		0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–	2	0.30	12	–
	W 205	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–	2	–	4	–
	W 206	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–	2	–	6	–
	W 207	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15	4	0.15	26	2.15
	W 208	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435	4	–	2	5.435
	W 209	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535	2	–	2	5.535

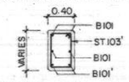
2 = Ø 1/4" OR 6 MM. , # 3 = Ø 3/8" OR 9 MM. , # 4 = Ø 1/2" OR 12 MM. , # 6 = Ø 3/4" OR 20 MM. , # 8 = Ø 1" OR 25 MM. , NO = TOTAL AMOUNT OF BARS , L = TOTAL LENGTH OF EACH BAR

NOTES :

1. PILE SHALL BE DRIVEN TO A DEPTH WHERE SCOUR WILL NOT AFFECT ITS CAPACITY AND SHALL HAVE A MINIMUM ULTIMATE CAPACITY OF 90 TONS FOR PILE DETAILS SEE DWG.NO. S18 , S19
2. HORIZONTAL CROSS BRACING BETWEEN COLUMNS SHALL BE PROVIDED IN THE FOLLOWING CIRCUMSTANCES :
   a) IF THE DISTANCE FROM EXISTING GROUND LEVEL TO THE BOTTOM OF THE CAP BEAM EXCEEDS 3.0 M., A BRACING SHALL BE PLACED IN SUCH A WAY THAT THE DISTANCE FROM THE BOTTOM OF THE CAP BEAM TO THE CENTERLINE OF THE BRACING IS NOT MORE THAN 3.0 M., AND
   b) IF THE DISTANCE BETWEEN THE CENTERLINE OF THE BRACING TO THE EXISTING GROUND LEVEL EXCEED 3.0 M., ADDITIONAL BRACING SHALL BE PROVIDED AT AN INTERVAL NOT MORE THAN 3.0 M.
3. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE CAP BEAM , BACK AND WING WALLS WHERE A CLEAR COVER OF 2.5 CM. SHALL BE PROVICED
4. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG./M^3 AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG./CM^2 FOR A. 0.15×0.15×0.15 M. CUBE AT 28 DAYS CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS :

PORTLAND CEMENT	350 KG.
SAND	0.43 M.^{3}
CRUSHED ROCK OR GRAVEL	0.83 M.^{3}
CONCRETE SLUMP MAX.	10 CM.

5. REBARS # 4 OR LARGER SHALL BE TIS 15 GRADE SD30 DEFORMED BAR OTHERS SHALL BE TIS 20 GRADE SR24 PLAIN BARS UNLESS OTHERWISE INDICATED
6. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER
7. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS
8. IN CASE OF SALINE PROTECTION , HIGH SULPHATE RESISTANT CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM , BACK WALL AND WINGWALLS WITHOUT ALTERING THE LOCATIONS OF REBARS
9. THE MAXIMUM FREE HEIGHT OF PIER FROM EXISTING GROUND LEVEL TO THE TOP OF CAP BEAM SHALL BE 7.0 M. PIERS HEIGHER THAN 7.0 M. SHALL BE SUBMITED TO THE ENGINEER FOR APPROVAL
10. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED



SECTION H - H
SCALE 1:50

SECTION I - I
SCALE 1:50

KINGDOM OF THAILAND

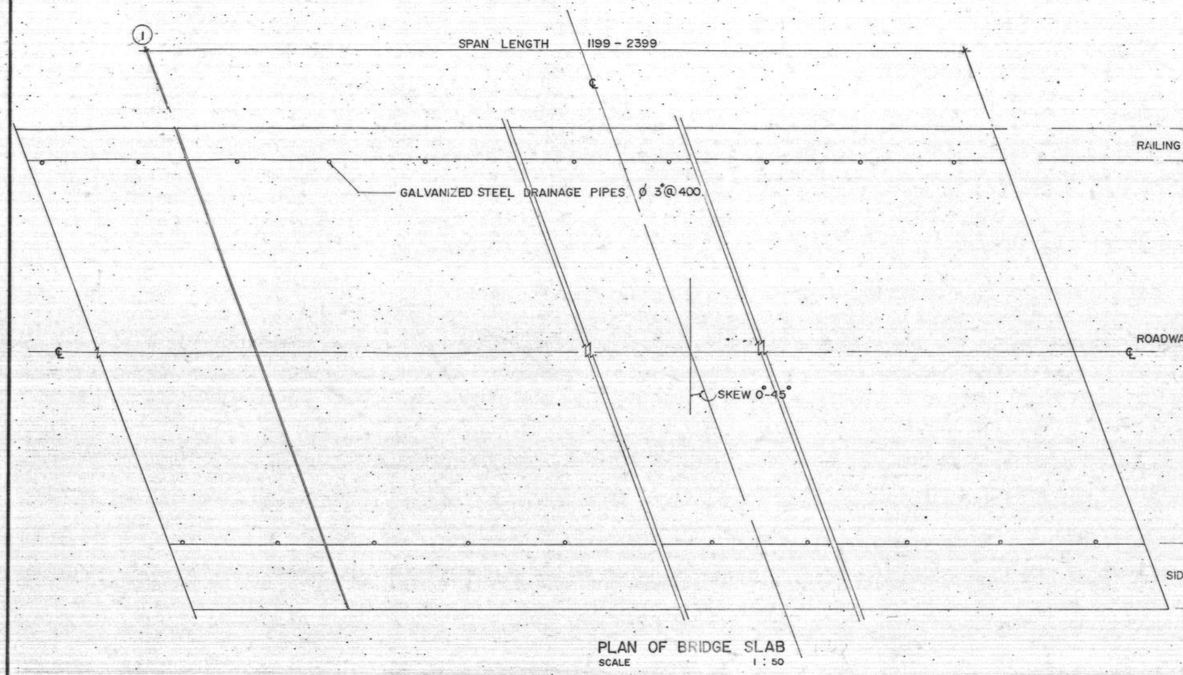
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

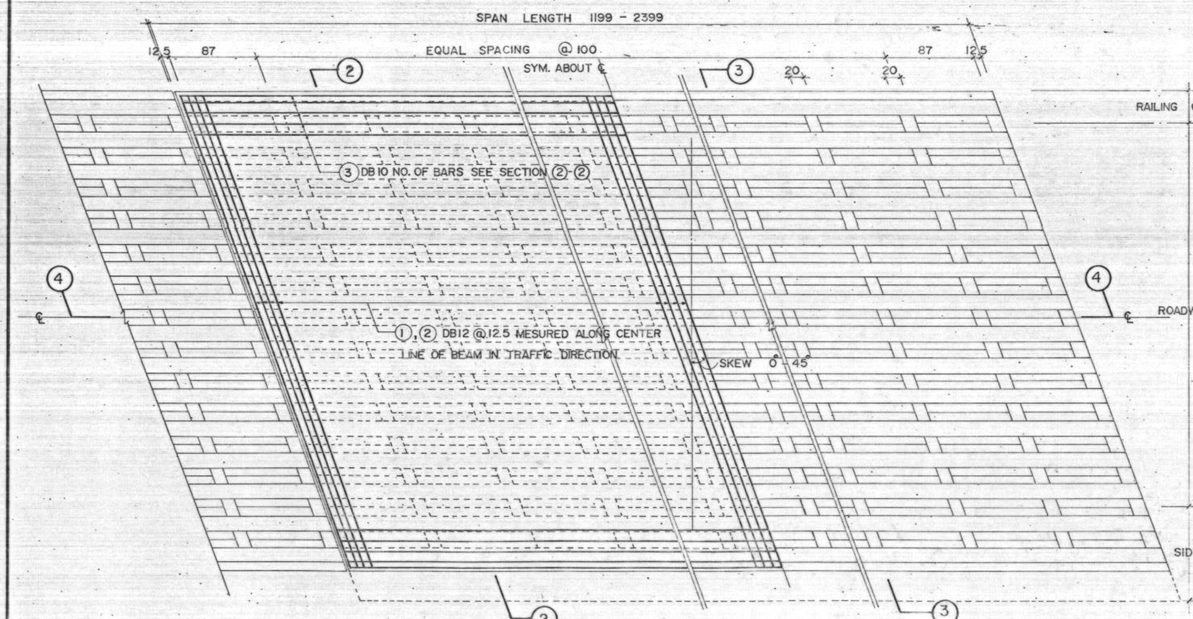
17.00 M. ROADWAY WIDTH SLAB BRIDGE

PILE BENT AND ABUTMENT DETAILS

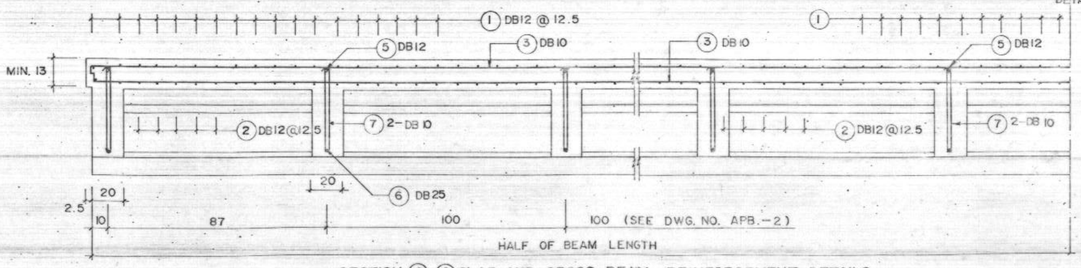
DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. 3AD5-106-14/30
		SHEET NO. 155



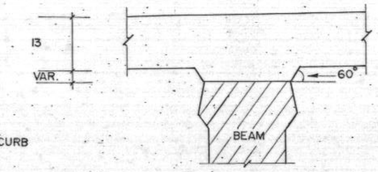
PLAN OF BRIDGE SLAB
SCALE 1 : 50



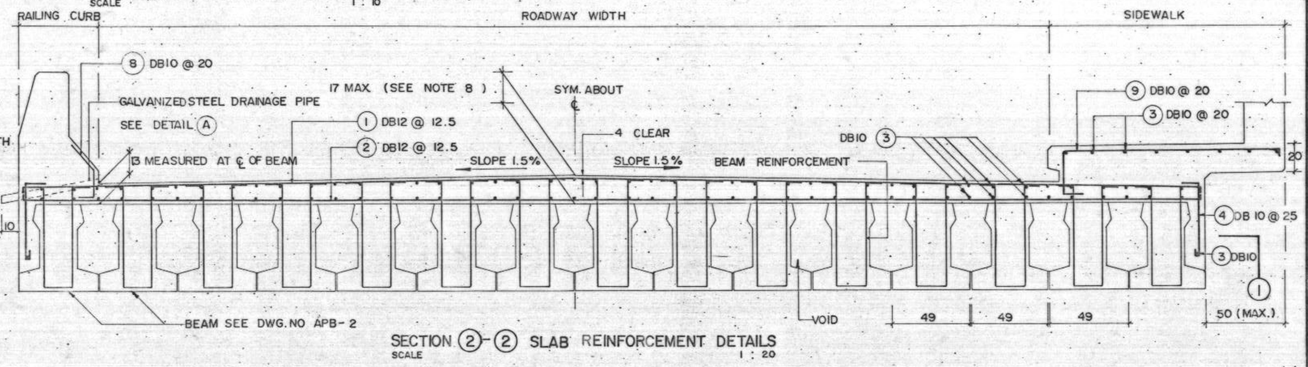
SECTION 1-1 PLAN OF CROSS BEAM AND REINFORCEMENT DETAILS
SCALE 1 : 50



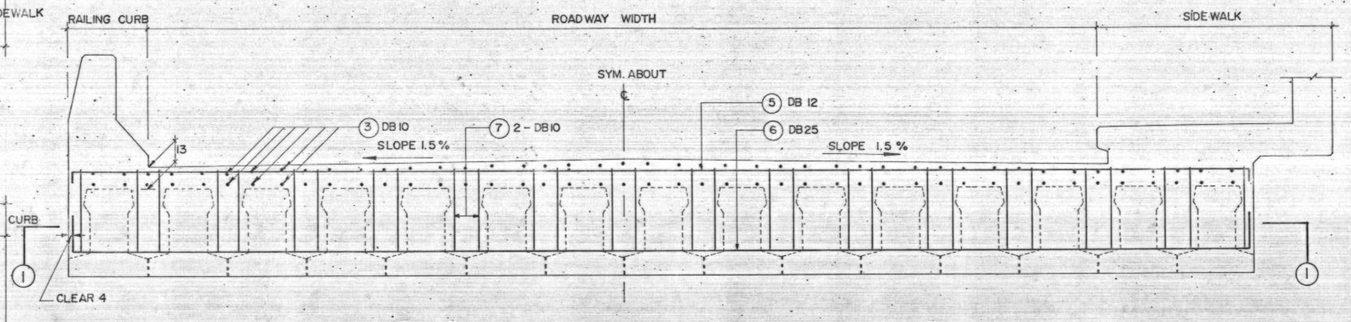
SECTION 4-4 SLAB AND CROSS BEAM REINFORCEMENT DETAILS
SCALE 1 : 20



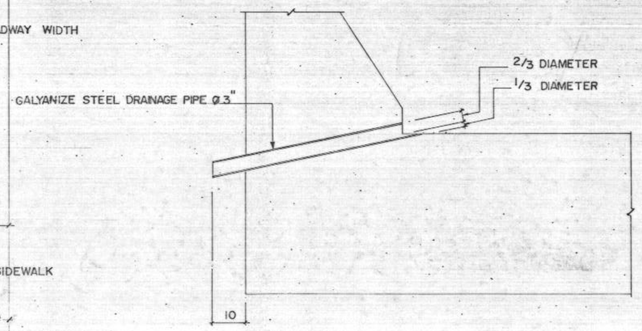
DETAIL (B) SHOWN CHAMFER DETAIL
SCALE 1 : 10



SECTION (2)-(2) SLAB REINFORCEMENT DETAILS
SCALE 1 : 20



SECTION (3)-(3) CROSS BEAM REINFORCEMENT DETAILS
SCALE 1 : 20



DETAIL (A) DRAINAGE PIPE DETAILS
SCALE 1 : 10

TABLE OF REINFORCEMENT

BAR MARK	NUMBER	BARS BENDING	BAR MARK	NUMBER	BARS BENDING
1	DB 12	5 ① 5	8	DB10	30 ⑧ 30
2	DB 12	5 ② 5	9	DB10	30 ⑨ 15
3	DB 10	5 ③ 15 5 15			
4	DB 10	50 ④ 10 ⑤ 10 50 ⑥ 50			
5	DB 12	15 15			
6	DB 25				

NOTES :

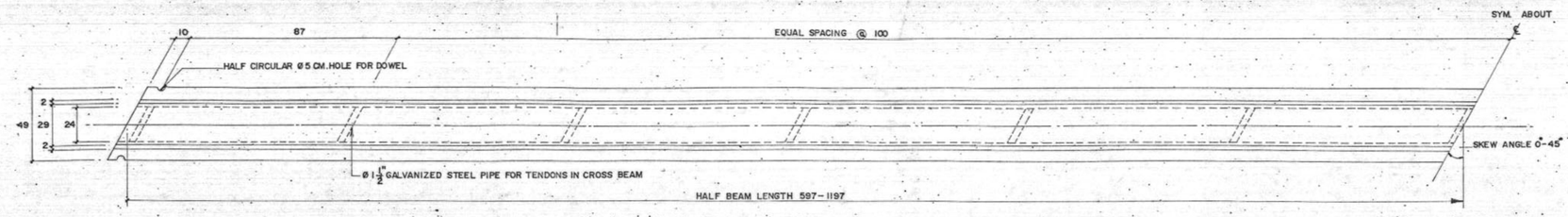
1. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHEWISE INDICATED.
2. ALL CONCRETE EXPOSED CORNERS SHALL HAVE 1 CM. CHAMFER UNLESS OTHERWISE INDICATED.
3. REBARS ø 12 MM. OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
4. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
5. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
6. CONCRETE IN SLAB AND CROSS BEAM SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 20 N/MM^2 FOR A 0.15 x 0.15 x 0.15 M. CUBE AT 28 DAYS WITH MAXIMUM CONCRETE SLUMP 8 CM.
7. CLEAR CONCRETE COVER SHALL BE 3.0 CM. UNLESS OTHEDWISE INDICATED
8. THE THICKNESS OF SLAB SHALL NOT BE GREATER THAN 17 CM. IN CASE OF HIGHER ELEVATION OF SLAB IS REGUIRED. THE SLAB SHALL BE RAISED UP AS SHOWN IN DETAILS B.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

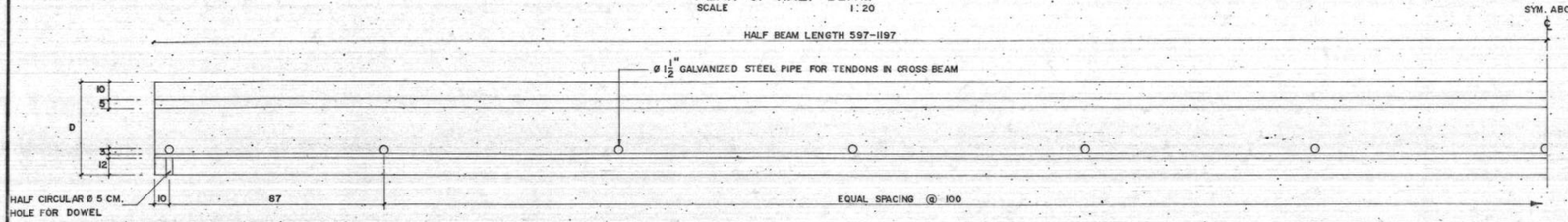
STANDARD DRAWING

12.00-24.00M. SPAN MULTI-BEAM BRIDGE PLAN, SECTIONS AND REINFORCEMENT DETAILS.

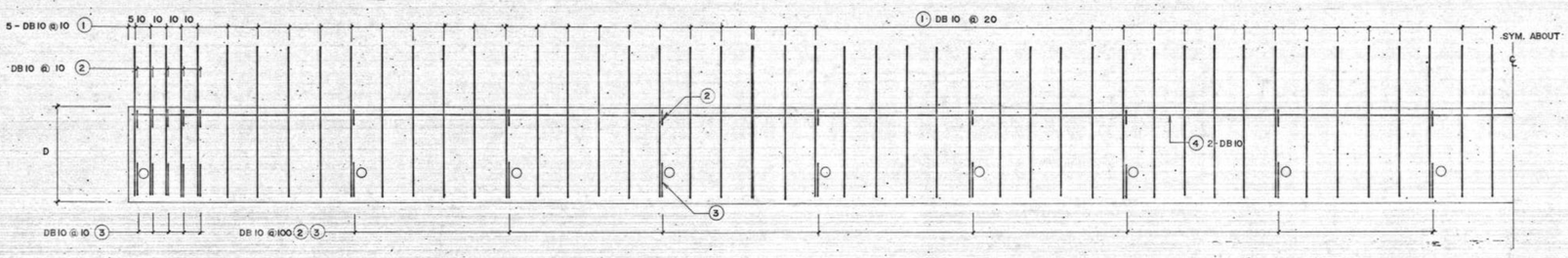
DESIGNED : DOH. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF HIGHWAY & BRIDGE ENGINEERING DIVISION)		SCALE AS SHOWN
		DWG. NO. APB-1
APPROVED : (DIRECTOR GENERAL)		SHEET NO. 156



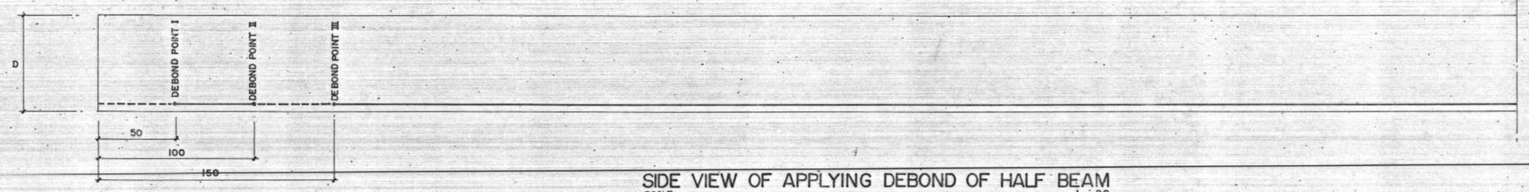
PLAN OF HALF BEAM
SCALE 1:20



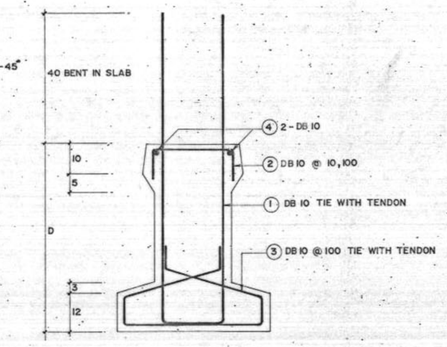
SIDE VIEW OF HALF BEAM
SCALE 1:20



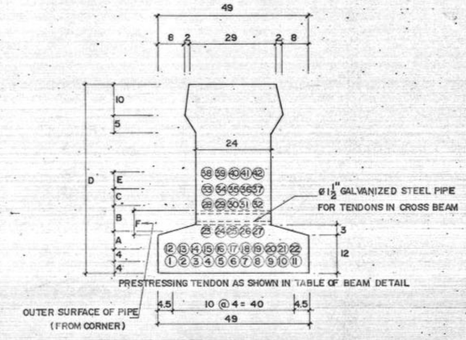
SIDE VIEW OF HALF BEAM REINFORCEMENT
SCALE 1:20



SIDE VIEW OF APPLYING DEBOND OF HALF BEAM
SCALE 1:20



SECTION OF PRESTRESSING TENDON
SCALE 1:10



SECTION OF BEAM AND PRESTRESSING TENDONS
SCALE 1:10

NOTES:

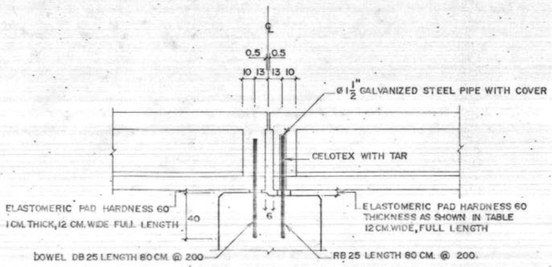
1. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. ALL EXPOSED CORNERS SHALL HAVE 1 CM. CHAMFERS UNLESS OTHERWISE INDICATED.
3. REBAR # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS; OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
4. CONCRETE SHALL HAVE THE 28-DAYS MINIMUM ULTIMATE COMPRESSIVE STRENGTH, BASED ON 15x15x15 CM. CUBE SAMPLES, OF 40 N./mm^2 AND MAXIMUM SLUMP OF 8 CM.
5. PRESTRESSING OF STRAIGHT TENDON SHALL BE AS FOLLOWS:
   A) Ø 7 mm. STRESS-RELIEVED WIRE SHALL HAVE AN MAXIMUM TENSION (BREAKING STRENGTH) OF 64 KN./TENDON.
   B) Ø 3/8" SEVEN-WIRE STRAND SHALL HAVE AN MAXIMUM TENSION OF 106 KN./TENDON.
6. APPLY FORCE TO A TENDON AT TRANSFER UNTIL THE MAXIMUM TENSION IS EQUAL TO THE CORRESPONDING FORCE SPECIFIED IN THE TABLE OF DETAIL OF BEAM.
7. DEBONDING MEANS THAT APPLY THE PLASTIC TUBE TO THE PRESTRESSING TENDON FOR PROTECT THE THEDONS FORM CONCRETE THE POINT OF APPLYING PLASTIC TUBE UP TO THE POINT AS SHOWN IN TABLE THROUGH THE END BEAM.
8. CLEAR CONCRETE COVER SHALL BE 2.5 CM. OR AS SHOWN IN THE FIGURES.
9. IN CASE OF SKEW CASTING FOR SKEWED BRIDGE, THE TENDONS SHALL ALSO BE SKEWED.
10. IN DETERMINING THE LEVEL OF THE ABUTMENT HEAD, IT MUST SUBTRACT BY THE BEAM CHAMFERS.
11. ELASTOMERIC PAD SHALL BE FOLLOWED BY THE LASTEST STANDARD OF AASHTO.

TABLE OF BEAM DETAIL

SPAN M.	BEAM LENGTH cm.	D cm.	PRESTRESSING TENDON 7 mm. WIRES NO.	A	B	C	E	F	TENSION FORCE AT TRANSFER KN/TENDON	DEBONDING NO.-FIRST POINT	PRESTRESSING TENDON 3/8" STRANDS NO.	A	B	C	E	F	TENSION FORCE AT TRANSFER KN./TENDON	DEBONDING NO.-FIRST POINT	BEARING THICKNESS cm.
12	1194	44	(22 TENDONS)	19.25	—	—	—	7	47.1	②③⑨⑩ POINT I ④⑧ POINT II ⑤⑦ POINT III (8 TENDONS)	(13 TENDONS)	9.9	—	—	—	8	77.5	①⑥⑪ POINT I ④⑧ POINT II (5 TENDONS)	2.0
14	1394	49	(27 TENDONS)	4	29	—	—	7	47.2	⑥⑦⑧ POINT I ①⑤⑦⑪ POINT II — POINT III (7 TENDONS)	(16 TENDONS)	22	—	—	—	7	77.5	③⑨ POINT I — POINT II — POINT III (2 TENDONS)	2.0
16	1594	54	(30 TENDONS)	4	24	—	—	7	47.5	④⑤⑦⑧ POINT I ③⑨ POINT II ②⑩ POINT III (8 TENDONS)	(18 TENDONS)	26	—	—	—	7	77.1	④⑧ POINT I ③⑨ POINT II — POINT III (4 TENDONS)	2.5
18	1794	59	—	—	—	—	—	—	—	—	(22 TENDONS)	43	—	—	—	7	77.5	④⑧ POINT I ②⑩ POINT II ③⑨ POINT III (6 TENDONS)	2.5
20	1994	68	—	—	—	—	—	—	—	—	(26 TENDONS)	50	—	—	—	7	77.5	⑮⑯⑰ POINT I ②④⑥⑫ POINT II ⑤⑥⑦ POINT III (10 TENDONS)	3.0
22	2194	73	—	—	—	—	—	—	—	—	(30 TENDONS)	20	16	—	—	7	77.5	⑬⑰㉑ POINT I ⑭⑮⑱⑲ POINT II ②③④⑧⑨⑯ POINT III (14 TENDONS)	3.0
24	2394	80	—	—	—	—	—	—	—	—	(34 TENDONS)	12	12	10.5	—	7	77.5	③⑰㉒ POINT I ⑭⑱⑲⑳ POINT II	3.0

TABLE OF REINFORCEMENT

BAR MARK	BAR SIZE	BAR BENDING DIAGRAMS
①	DB 10	① 15 ② 15
②	DB 10	15 15 ③
③	DB 10	
④	DB 10	10 ④ 10



FIXED BEARING FREE BEARING

CAP BEAM DETAIL
SCALE 1:25

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

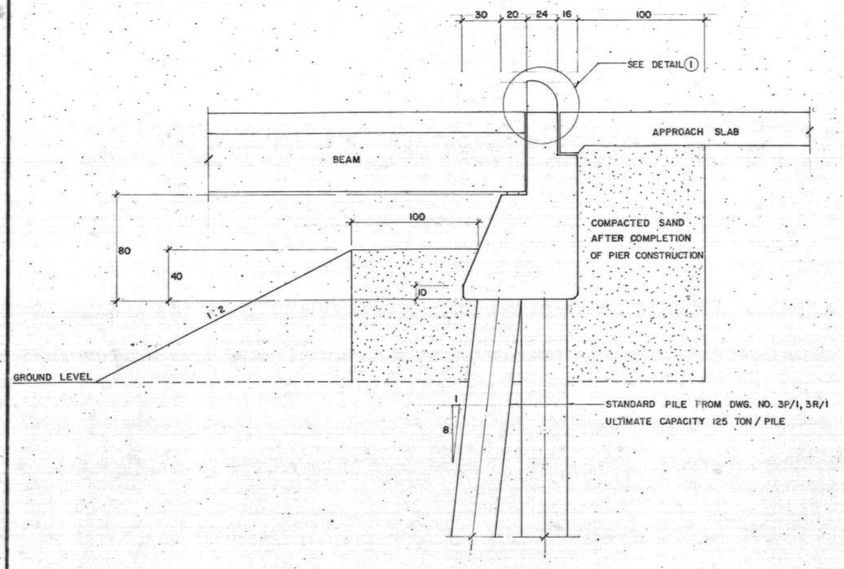
STANDARD DRAWING

12.00-24.00 M. SPAN MULTI-BEAM TYPE
PRESTRESSED CONCRETE GIRDER

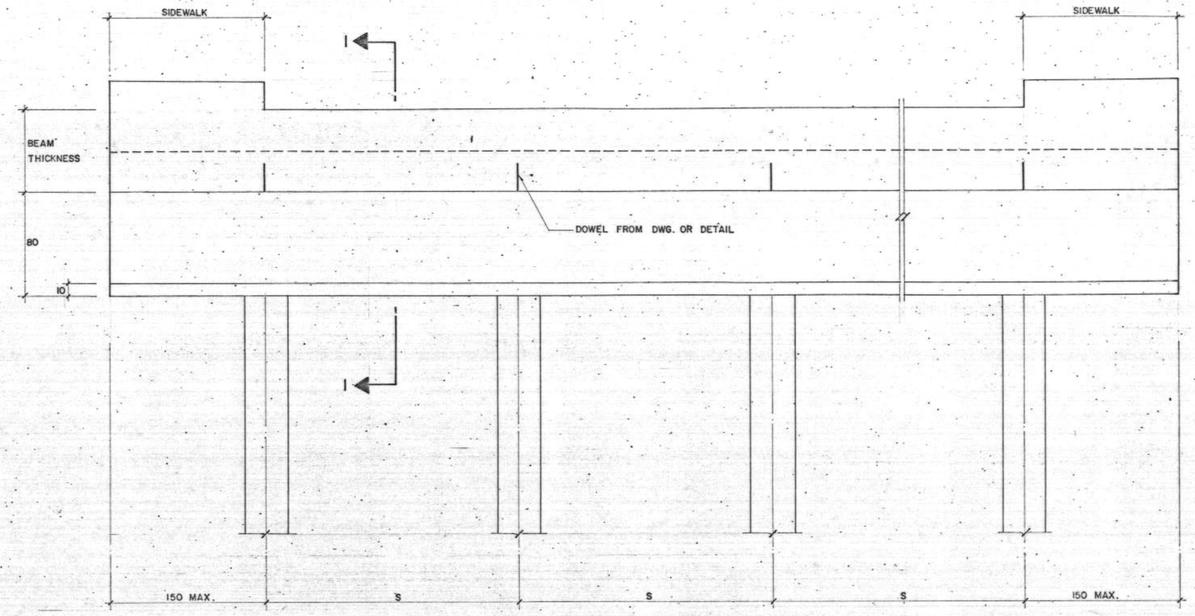
DESIGNED : DOH. & CONSULTANTS | CHECKED : Kuy | DATE JULY 1994

(DIRECTOR OF LOCATION & DESIGN DIVISION) | SCALE AS SHOWN

APPROVED : (DIRECTOR GENERAL) | DWG. NO. APB.-2 | SHEET NO. 157

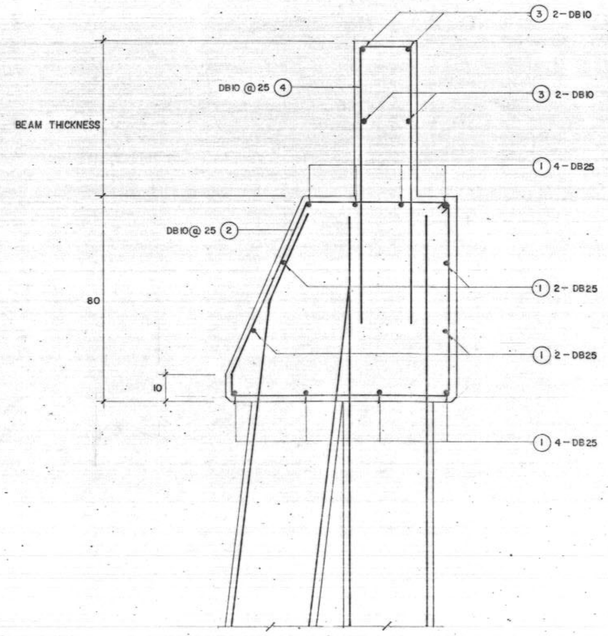


SECTION I — I ABUTMENT DETAIL
SCALE 1 : 25

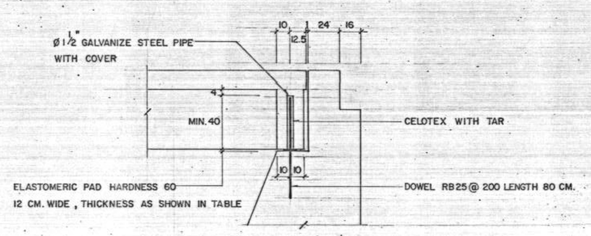


NOTES :

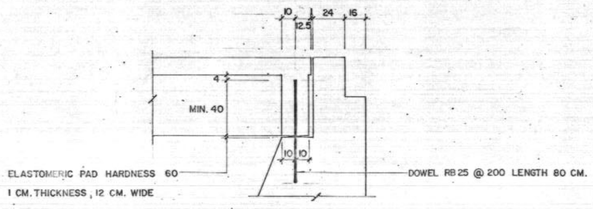
1. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. ALL EXPOSED CORNERS SHALL HAVE 1 CM. CHAMFERS UNLESS OTHERWISE INDICATED.
3. REBAR # 4 OR LARGER SHALL BE TIS 24 GRADE SD30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR24 PLAINS BARS UNLESS OTHERWISE INDICATED.
4. CONCRETE SHALL HAVE THE 28-DAY MINIMUM ULTIMATE COMPRESSIVE STRENGTH, BASED ON 15 x 15 x 15 CM. CUBE SAMPLES, OF 20 N./mm.^{2} AND MAXIMUM SLUMP OF 8 CM.
5. CLEAR CONCRETE COVER SHALL BE 3 CM. AND 5 CM. FOR HIGH SULPHATE RESISTANT.



SECTION I — I REINFORCEMENT DETAIL
SCALE 1 : 12.5

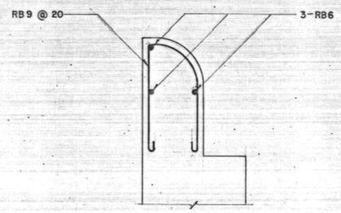


FREE BEARING



FIXED BEARING

ABUTMENT HEAD DETAIL
SCALE 1 : 50



DETAIL (1)
SCALE 1 : 12.5

SPACING OF PILE DETAIL

1. FOR PRESTRESS CONCRETE BRIDGE OF MULTI — BEAM 12.00 — 24.00 M. SPAN LENGTH.

TABLE OF PIER LOCATION AND BEARING PAD THICKNESS

SPAN LENGTH (M.)	S (CM.) MAX.	BEARING THICKNESS (CM.)
12.00	240	2
14.00	220	2
16.00	200	2.5
16.00	180	2.5
20.00	160	3
22.00	140	3
24.00	120	3

2. FOR GENERAL BRIDGE

S = AS SHOWN IN PLAN AND PROFILE OR NOTES OF BRIDGE.

TABLE OF REINFORCEMENT

BAR MARK	BAR SIZE	BAR BENDING DIAGRAMS
(1)	DB 25	10 10 (1)
(2)	DB 10	(2)
(3)	DB 10	5 5 (3)
(4)	DB 10	(4)

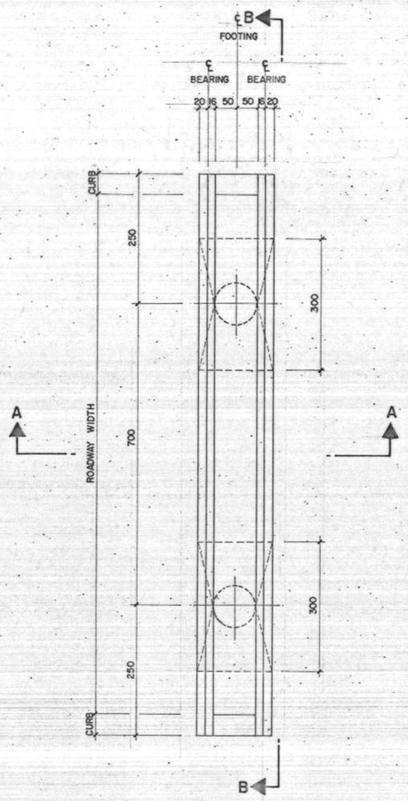
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

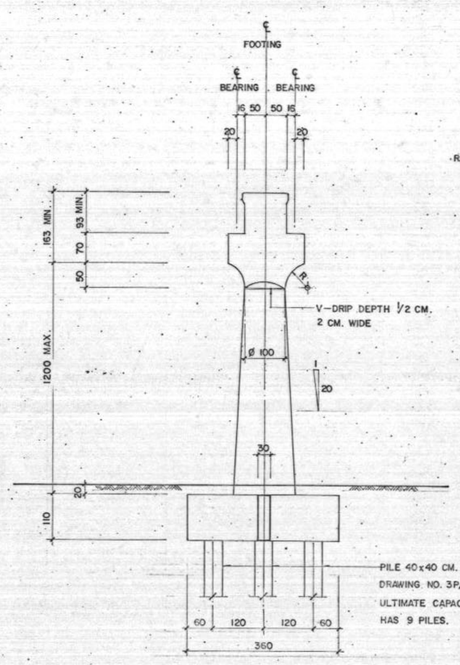
12.00 — 24.00 M. SPAN MULTI — BEAM TYPE

PILE BENT AND ABUTMENT DETAILS FOR ANY ROADWAY WIDTH

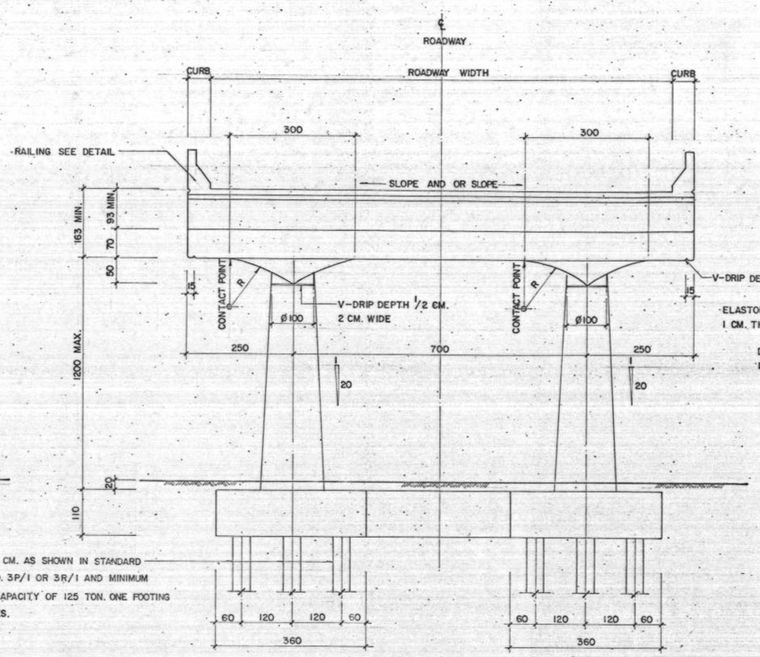
DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED :		SCALE AS SHOWN
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. A-
		SHEET NO. 158



PLAN
SCALE 1 : 75

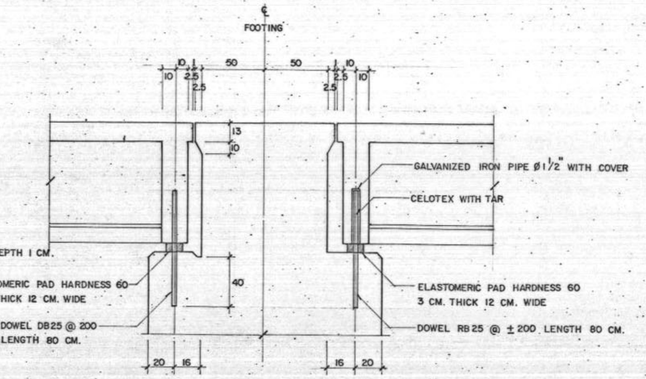


SECTION A — A
SCALE 1 : 75



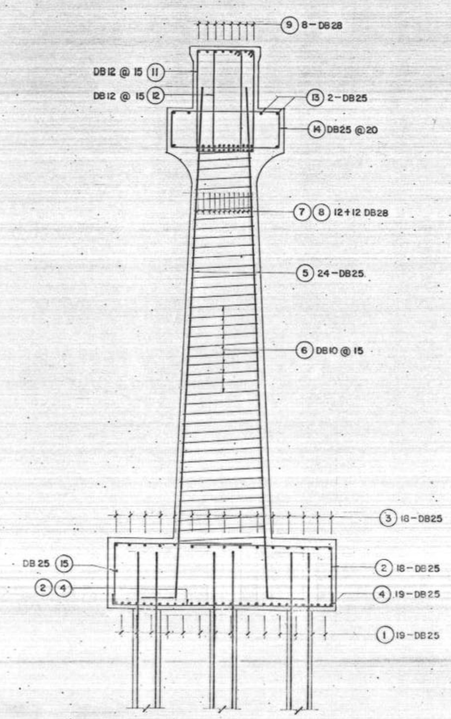
PILE 40x40 CM. AS SHOWN IN STANDARD DRAWING NO. 3P/1 OR 3R/1 AND MINIMUM ULTIMATE CAPACITY OF 125 TON. ONE FOOTING HAS 9 PILES.

SECTION B — B
SCALE 1 : 75

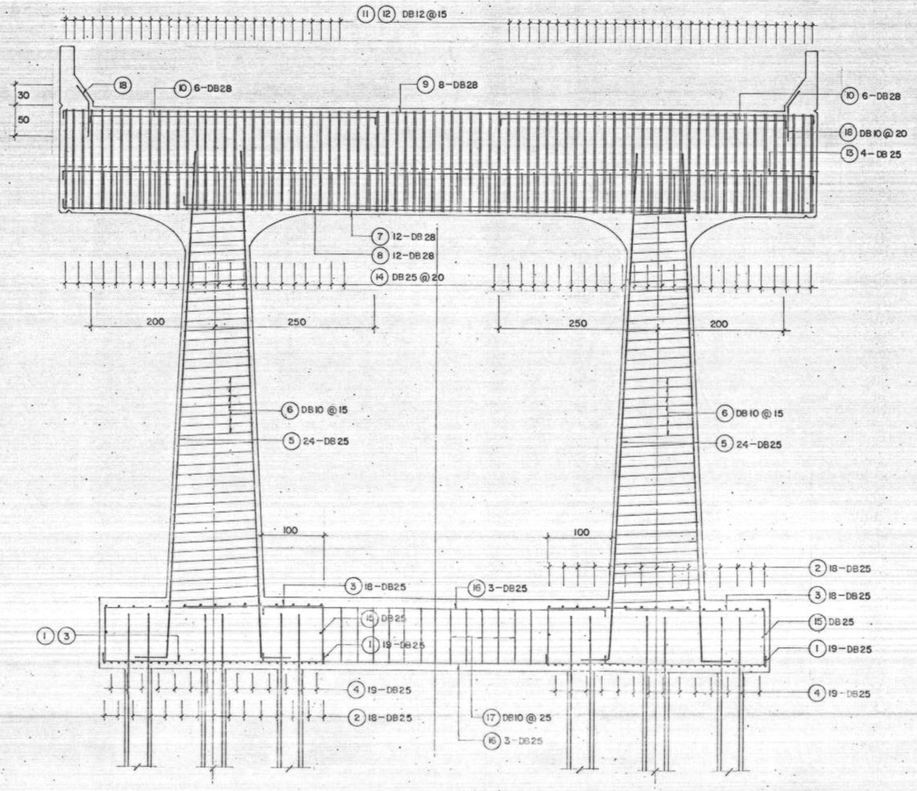


FIXED BEARING FREE BEARING

CONSTRUCTION JOINT
SCALE 1 : 25



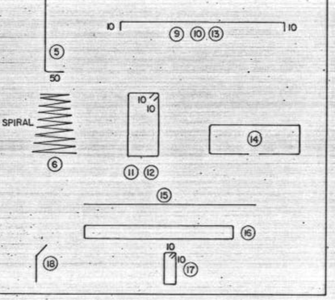
SECTION A — A FOOTING REINFORCEMENT
SCALE 1 : 50



SECTION B — B FOOTING REINFORCEMENT
SCALE 1 : 50

TABLE OF REINFORCEMENT

BAR MARK	BAR SIZE	BAR BENDING DIAGRAMS
①	DB25	
②	DB25	
③	DB25	
④	DB25	
⑤	DB25	
⑥	DB10	
⑦	DB28	
⑧	DB28	
⑨	DB28	
⑩	DB28	
⑪	DB12	
⑫	DB12	
⑬	DB25	
⑭	DB25	
⑮	DB25	
⑯	DB25	
⑰	DB10	
⑱	DB10	



NOTES :

1. ALL DIMENSIONS GIVEN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. ALL EXPOSED CORNER SHALL HAVE 1 CM. CHAMFERS UNLESS OTHERWISE INDICATED.
3. REBARS SHALL CONFORM TO THE STANDARD TIS. 24 CLASS SD30 FOR THE DEFORMED BARS.
4. CONCRETE SHALL HAVE PROPERTIES AS FOLLOW.
   - 4.1 THE MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 20 $N./mm.^2$ FOR .15 x .15 x .15 M. CUBE AT 28 DAYS.
   - 4.2 SLUMP LESS THAN 8 CM.
5. CLEAR CONCRETE COVER SHOULD BE 3 CM. UNLESS OTHERWISE INDICATED.
6. BEFORE CASTING SLAB ON ANY FOOTING, IT SHOULD BE LAID DOWN THE NEXT BEAM OF OTHERS SPAN.
7. ELASTOMERIC PAD SHALL CONFORM TO THE LATEST STANDARD OF AASHTO.

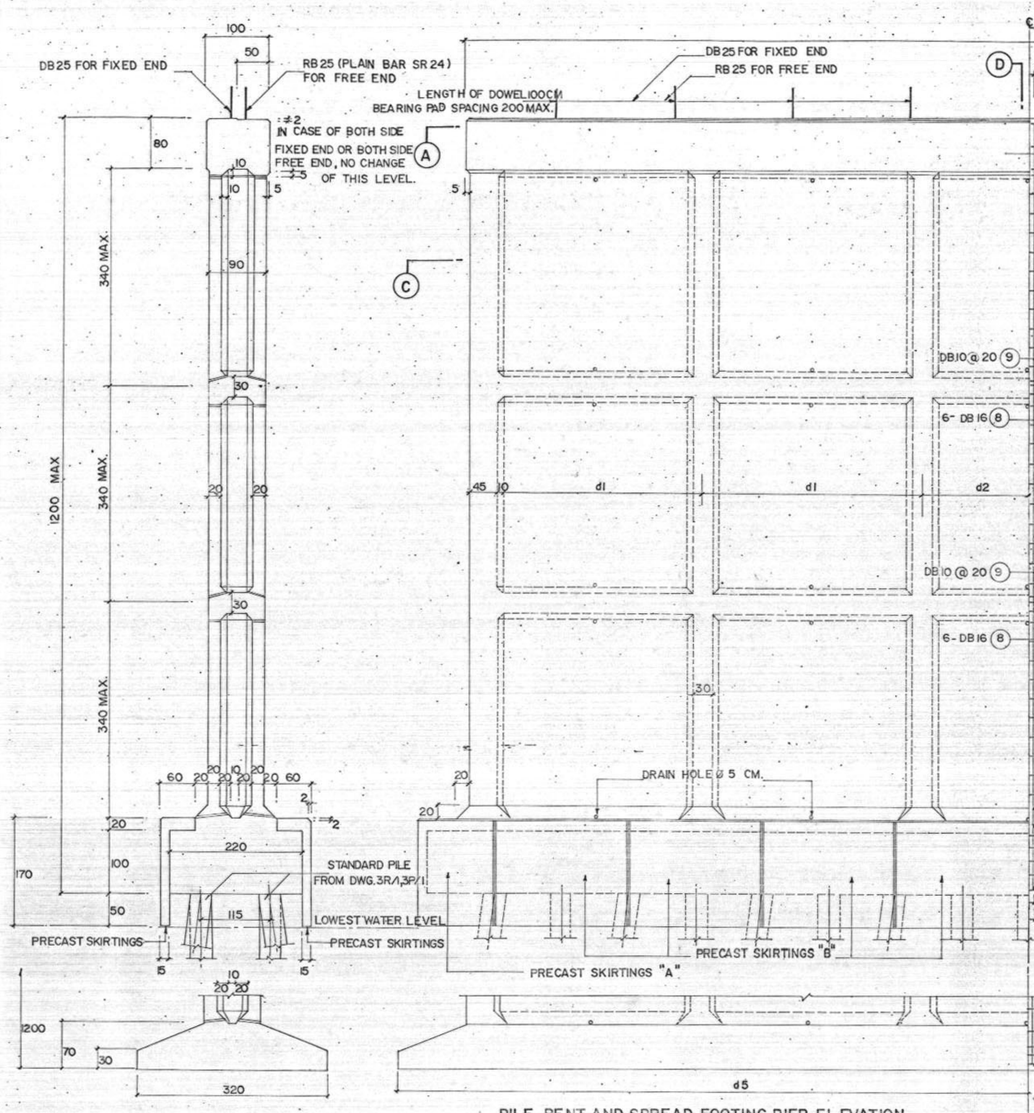
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

14.00 – 24.00 M. SPAN MULTI-BEAM TYPE

12.00 M. ROADWAY & CURB

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF BUREAU OF ROAD DESIGN)		SCALE AS SHOWN
		DWG. NO. APB-7
APPROVED : (DIRECTOR GENERAL)		SHEET NO. 159

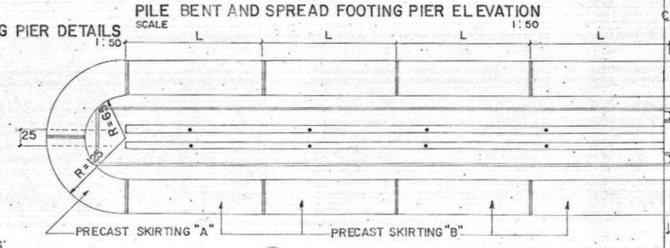


PILE BENT AND SPREAD FOOTING PIER ELEVATION
SCALE 1:50

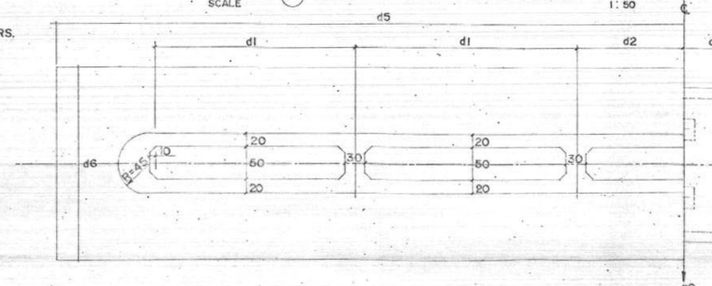
SECTION D-D (D) PILE BENT AND SPREAD FOOTING PIER DETAILS
SCALE 1:50

REMARKS :

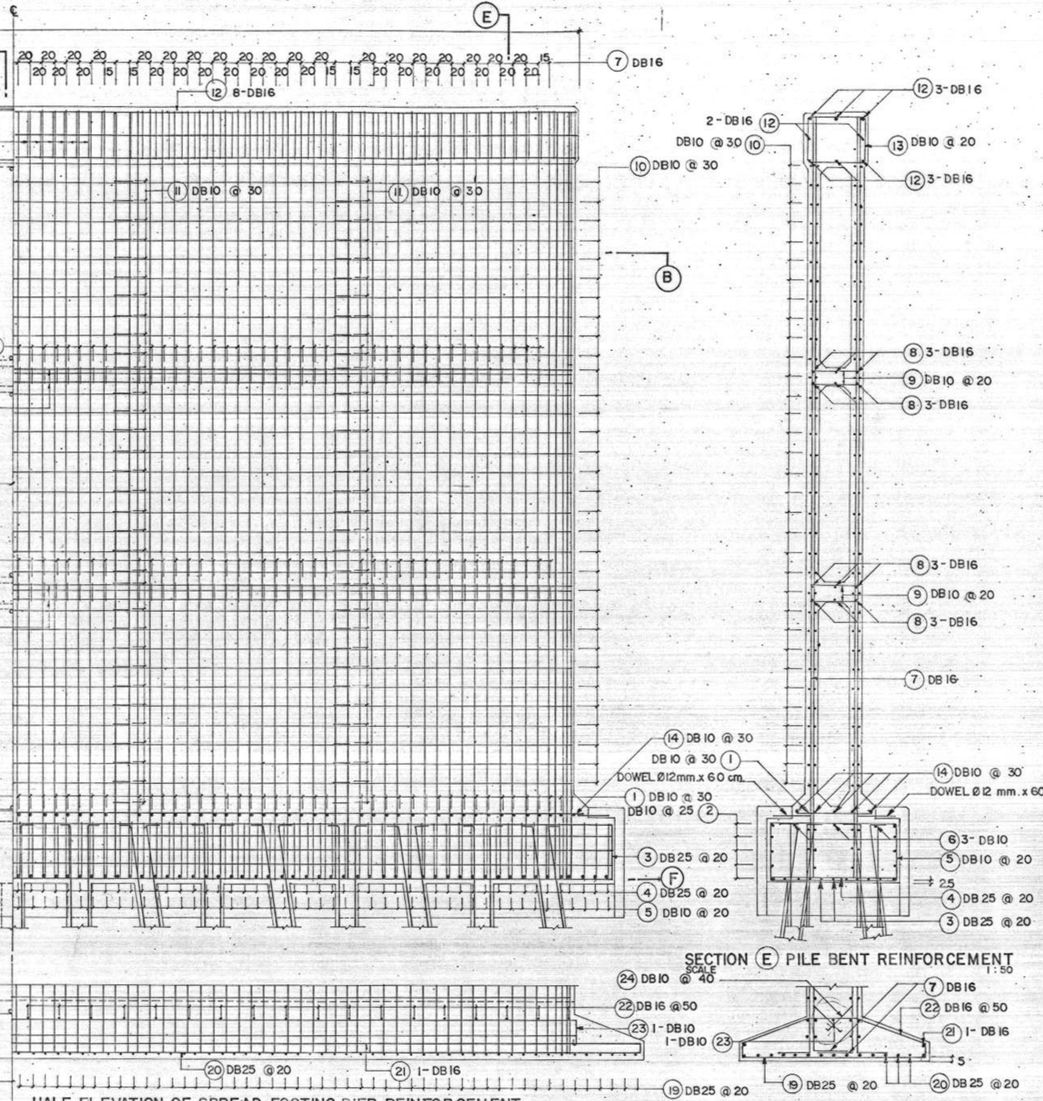
1. REBAR # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED
2. LOCATION OF LAP SPLICE OR REBARS SHALL BE APPROVED BY THE ENGINEER.
3. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR IN CASE OF PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.



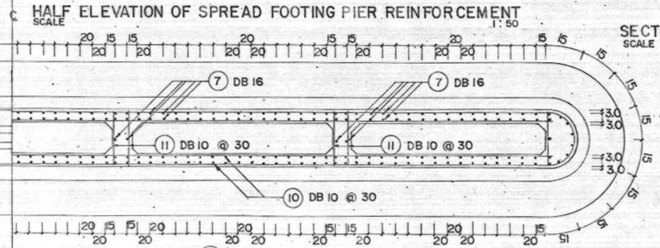
SECTION (A) PILE BENT AND SPREAD FOOTING PIER
SCALE 1:50



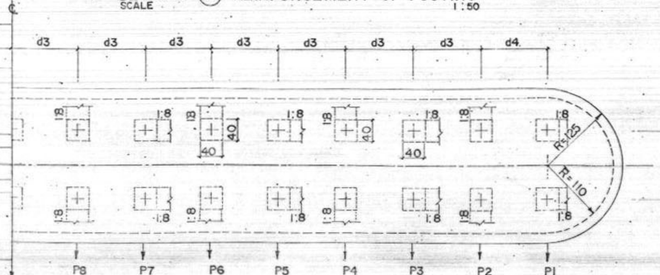
SECTION (C) PILE BENT AND SPREAD FOOTING PIER
SCALE 1:50



HALF ELEVATION OF SPREAD FOOTING PIER REINFORCEMENT
SCALE 1:50



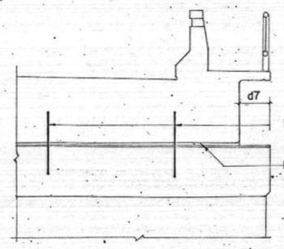
SECTION (B) REINFORCEMENT OF FOOTING
SCALE 1:50



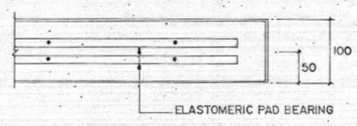
SECTION (F) FOOTING PLAN OF PILE BENT
SCALE 1:50

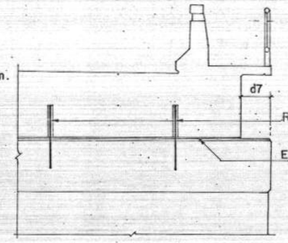
SECTION (E) PILE BENT REINFORCEMENT
SCALE 1:50

SECTION (E) SPREAD FOOTING PIER REINFORCEMENT
SCALE 1:50

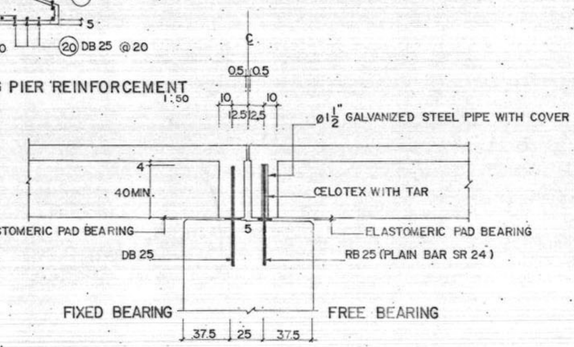


FIXED - BEARING
SCALE 1:50.

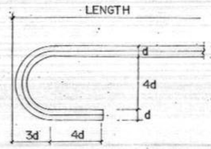




FREE - BEARING
SCALE 1:50



CAP BEAM DETAIL
SCALE 1:25



BAR BENDING DIAGRAMS
NOT TO SCALE

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

PILE BENT AND SPREAD FOOTING WITH WALL BRACING, MAXIMUM HEIGHT 12.00 M. PRESTRESSED MULTI-BEAM CONCRETE BRIDGE FOR 8.00, 10.00, 12.00 AND 15.00 M. ROADWAY WIDTH 18.00–24.00 M. SPAN

PIER FOOTING AND REINF. DETAIL

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF BRIDGE DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		SHEET NO. 160

BAR MARK	NO.	BAR BENDING DIAGRAMS (CM.)
①	DB10	
②	DB10	
③	DB 25	
④	DB25	
⑤	DB10	
⑥	DB10	
⑦	DB16	
⑧	DB16	
⑨	DB10	
⑩	DB10	
⑪	DB10	
⑫	DB16	
⑬	DB10	
⑭	DB10	
⑮	DB10	
⑯	DB10	
⑰	DB10	
⑱	DB10	
⑲	DB25	
⑳	DB25	
㉑	DB16	
㉒	DB16	
㉓	DB10	
㉔	DB10	

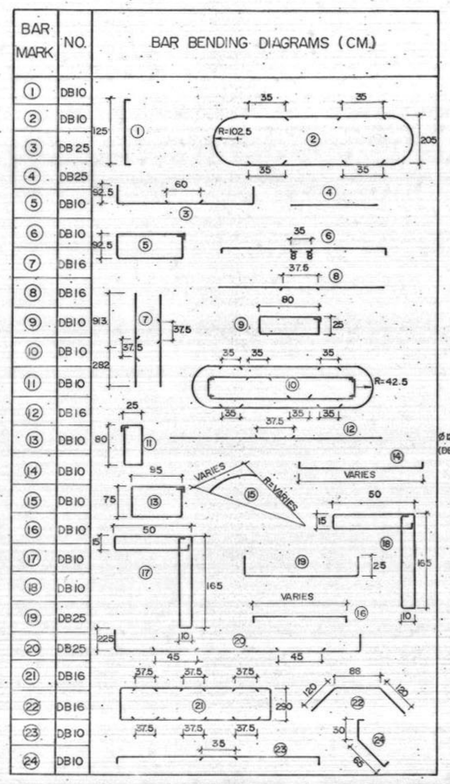
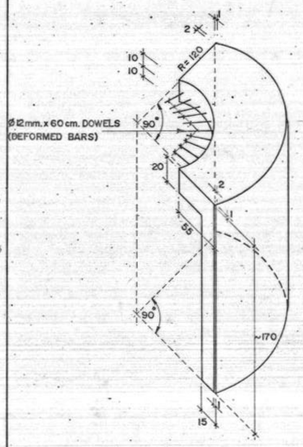
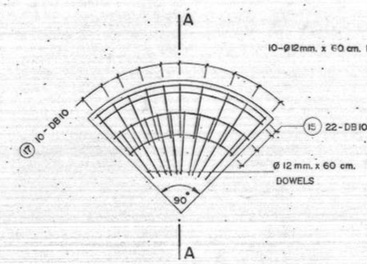


TABLE OF SIZE, LOCATION, NUMBER OF PILES OF FOOTING

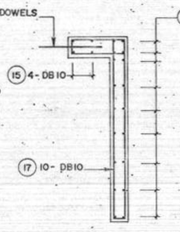
ROADWAY WIDTH	d CM.	d_1 CM.	d_7 CM.	d_2 CM.	PILE FOOTING												SPREAD FOOTING	
					NUMBER OF PILES										PILE HEAD SPACING C-C		HALF LENGTH OF FOOTING D_5 CM.	WIDTH OF FOOTING D_6 CM.
					P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9		d_3	d_4		
8.00	1,040	306	20	154	4	4	4	4	4	–	–	–	2	22	110	85	470 + 175	320
10.00	1,260	285	30	–	4	4	4	4	4	4	–	–	2	26	110	85	590 + 175	320
12.00	1,480	272	40	–	4	4	4	4	4	4	4	–	2	30	110	85	690 + 175	320
14.00	1,700	264	50	130	4	4	4	4	4	4	4	4	2	34	110	85	800 + 175	320
15.00	1,800	280	50	140	4	4	4	4	4	4	4	4	2	34	117	90	850 + 175	320



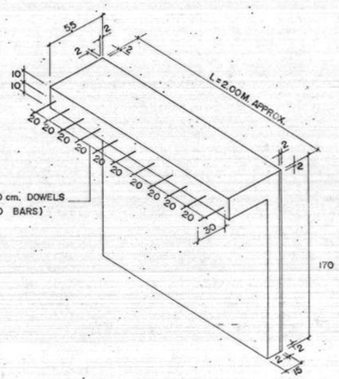
PRECAST SKIRTING 'A' DETAILS
SCALE 1:30



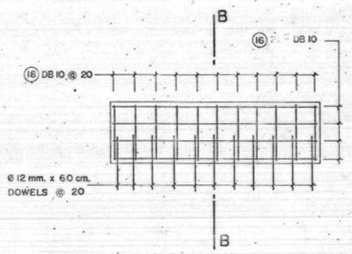
PRECAST SKIRTING 'A' REINFORCEMENT
SCALE 1:30



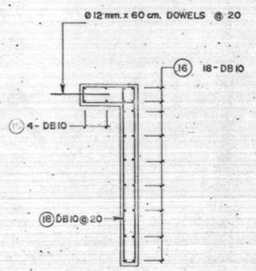
SECTION A—A
SCALE 1:30



PRECAST SKIRTING 'B' DETAILS (SKEWED BRIDGE)
SCALE 1:30



PRECAST SKIRTING 'B' REINFORCEMENT
SCALE 1:30



SECTION B—B
SCALE 1:30

NOTES :

1. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG./M.^{3} AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG./CM.^{2} FOR A 0.15x0.15x0.15 CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBE METER IS AS FOLLOWS :

PORTLAND CEMENT	350	KG.
SAND	0.43	M.^{3}
CRUSH ROCK OR GRAVEL	0.86	M.^{3}
CONCRETE SLUMP, MAX.	10	CM.

2. REBAR # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS, OTHER SHALL BE TIS 20 GRADE SR 24 PLAIN BAR UNLESS OTHERWISE INDICATED.
3. CLEAR CONCRETE COVER SHALL BE 3 CM. FOR PORTLAND CEMENT TYPE I AND 5 CM. FOR HIGH SULPHATE RESISTANT FOR PORTLAND CEMENT TYPE 5 WITHOUT ALTERING THE SIZE OF REBARS.
4. ALL EXPOSED CORNERS SHALL HAVE 2 CM. CHAMFERS UNLESS OTHERWISE INDICATED.
5. COLUMN JOINT SPACING 340 M. MAXIMUM.
6. ALL MATERIALS SHALL BE USED UNDER THE APPROVAL OF THE ENGINEER.
7. MINIMUM SAFE BEARING CAPACITY OF SOIL UNDER SPREAD FOOTING PIERS SHALL BE 20 TON/M.^{2} THE BOTTOM OF FOOTING SHALL BE EMBEDDED IN THE EXISTING GROUND AT THE LEVEL WHERE SCOUR WILL NOT AFFECT ITS CAPACITY.
8. FOR PILE FOOTING PIERS, EACH PILE SHALL HAVE A MINIMUM ULTIMATE CAPACITY OF 110TONS AND SHALL BE DRIVEN TO A DEPTH WHERE SCOUR WILL NOT AFFECT ITS CAPACITY.
9. REBARS FOR PILE FOOTING PIERS ARE BAR MARK NOS 1-18, REBARS FOR SPREAD FOOTING PIERS ARE BAR MARK NOS 7-13 AND BAR MARK NOS 19-24.
10. FOR ELASTOMERIC PAD, CONTRACTOR SHALL SUBMIT A CERTIFICATE FROM THE MANUFACTURER SHOWING THAT THEY WILL PERFORM IN ACCORDANCE WITH THE SPECIFICATION.

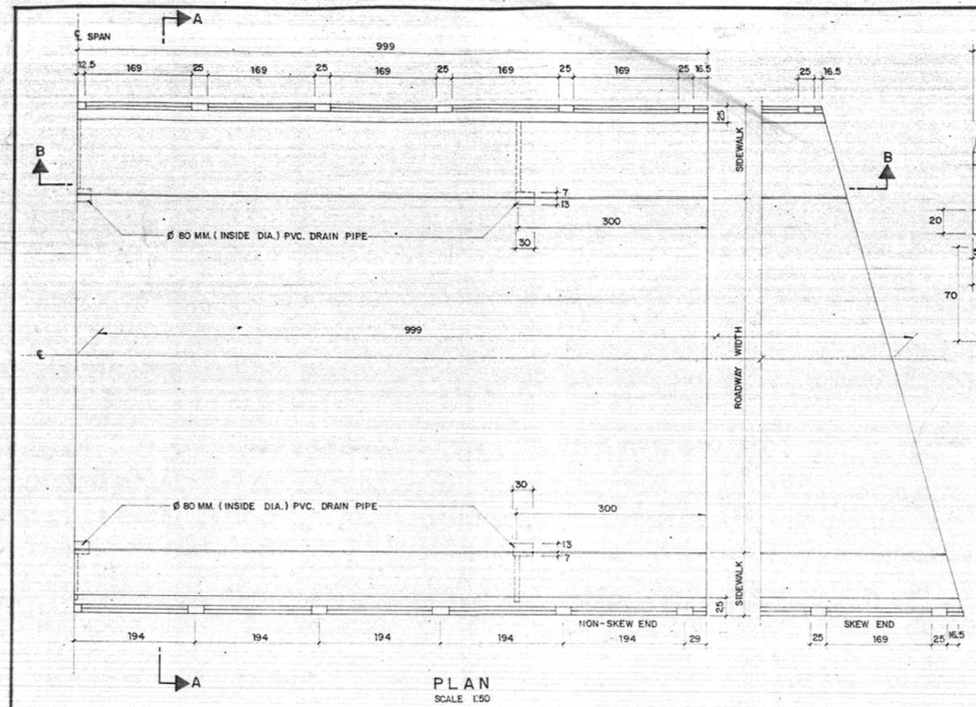
REMARKS :

1. PILES SHALL BE LOCATED BY STARTING FROM PILE NO P9 AT THE CENTERLINE OF THE PIER AND THE PILE SPACINGS D3 AND D4 SHALL BE MEASURED FROM THIS PILE IN ORDER TO LOCATE PILE NOS P8-P1 RESPECTIVELY. IF THERE IS NO PILE NO P9 AT THE CENTERLINE OF THE PIER, THE FIRST PILE SPACING D_3 ADJACENT TO THE CENTERLINE OF THE PIER SHALL BE SUBSTITUTED BY $D_{3/2}$.
2. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
3. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 12.00 M. FOR PILE FOOTING PIERS THESE QUANTITIES DO NOT INCLUDE REBARS IN THE PILES.
4. FOR SPREAD FOOTING PIERS, THE MAXIMUM HEIGHT FROM THE BOTTOM OF FOOTING TO THE TOP OF CAP BEAM SHALL BE 15.00 M.
5. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
6. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR IN CASE OF PLAIN BAR AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
7. LENGTH AND AMOUNT OF REINFORCEMENT SHOWN IN THE TABLE MAY VARY ACCORDING TO PIER SHAPE BUT SPACING SHALL BE AS SHOWN ON THE DWGS.
8. THE PRECAST SKIRTING "A" SHALL BE OBTAINED BY DIVIDING THE SEMICIRCULAR END OF A PIER INTO TWO EQUAL SECTORS OF 90°. THE PRECAST SKIRTING "B" SHALL BE OBTAINED BY DIVIDING THE STRAIGHT PORTION INTO EQUAL LENGTHS. THESE LENGTH SHALL BE AS LONG AS POSSIBLE BUT NOT MORE THAN 2.00 M.

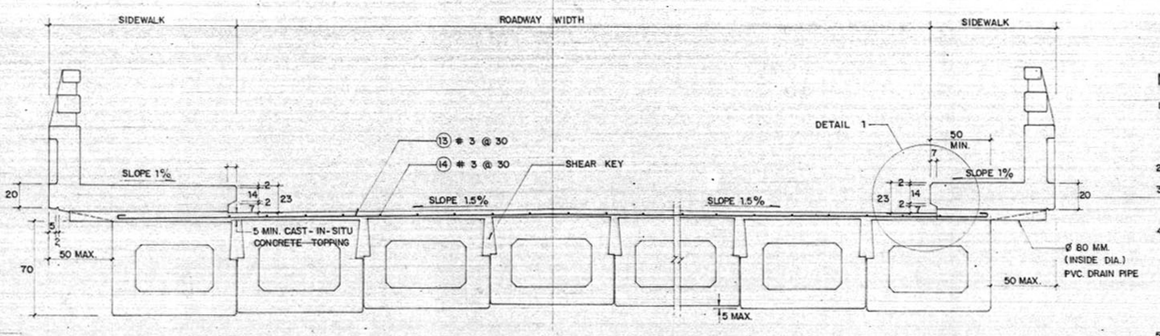
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING
PILE BENT AND SPREAD FOOTING WITH WALL BRACING, MAXIMUM HEIGHT 12.00 M.
PRESTRESSED MULTI-BEAM CONCRETE BRIDGE FOR 8.00, 10.00, 12.00 AND 15.00 M. ROADWAY WIDTH
TABLE OF REINFORCEMENT AND CONSTRUCTION DETAILS

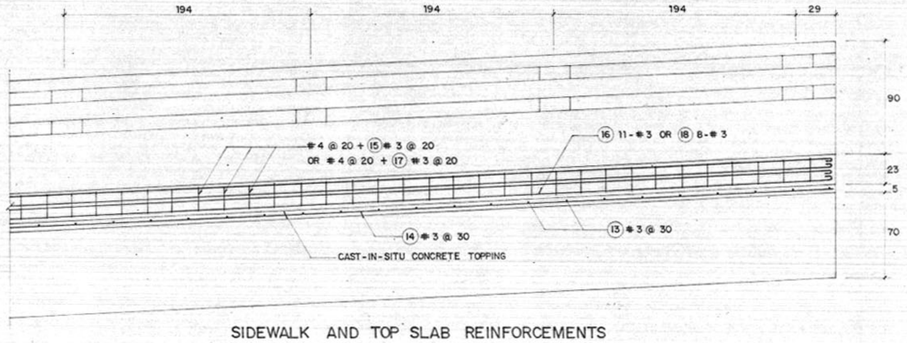
DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. AP8-9
		SHEET NO. 161



PLAN
SCALE 1:50



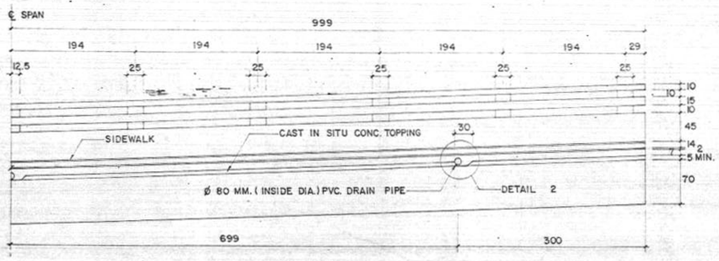
SECTION A — A



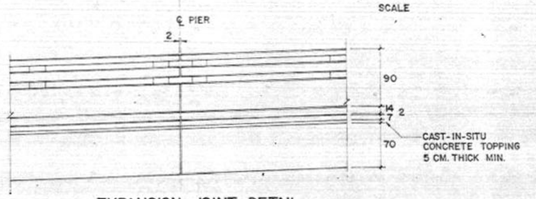
SIDEWALK AND TOP SLAB REINFORCEMENTS
SCALE 1:25

NOTES :

1. REBARS # 4 OR LARGER SHALL BE TIS. 24 GRADE SD 30 DEFORMED BARS, OTHERS SHALL BE TIS. 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
2. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
3. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
4. SURFACE OF PRECAST GIRDERS IN CONTACT WITH CAST-IN-SITU CONCRETE SHALL BE ROUGHENED AND CLEANED BEFORE CONCRETING. THE SURFACES SHALL BE SOAKED FOR AT LEAST 2 HOURS. THEN CEMENT SLURRY OR MORTAR WITH CEMENT TO SAND RATIO OF 1:1 BY WEIGHT SHALL BE APPLIED BEFORE CONCRETING.
5. CAST-IN-SITU CONCRETE FOR BRIDGE TOPPING AND SHEAR KEY BETWEEN BOX GIRDERS SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 360 KG/CM.^{2} FOR 0.15 x 0.15 x 0.15 M. CUBE AT 28 DAYS.
6. CAST-IN-SITU CONCRETE FOR SIDEWALK, CURB AND RAILING SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG/CM.^{2} FOR 0.15 x 0.15 x 0.15 M. CUBE AT 28 DAYS.
7. NUMBER OF BOX GIRDERS FOR EACH SPAN DEPENDS ON THE WIDTH OF ROADWAY, SIDEWALK AND GIRDER ARRANGEMENT. THE BOX GIRDERS SHALL BE ARRANGED IN SUCH A WAY THAT,
   a) IF SIDEWALK WIDTH IS NOT MORE THAN 50 CM., THE OUTSIDE EDGE OF THE EXTERIOR GIRDER SHALL BE LINED UP WITH THE OUTSIDE EDGE OF THE SIDEWALK.
   b) IF SIDEWALK WIDTH IS MORE THAN 50 CM. THE OVERHANGING PART OF SIDEWALK FROM OUTSIDE EDGE OF THE EXTERIOR GIRDER SHALL NOT EXCEED 50 CM. AND A MINIMUM OF 50 CM. OF THE SIDEWALK SHALL BE ON TOP OF THIS BOX GIRDER.
   c) THE OUTSIDE EDGES OF THE EXTERIOR GIRDERS SHALL BE IN LINE THROUGHOUT THE BRIDGE LENGTH REGARDLESS THE TYPES AND THE SPAN LENGTH OF THE GIRDERS.
8. SELECTION OF PRETENSION BOX GIRDERS AS SHOWN ON DWG. NO. 5BD20 S/4 OR POST-TENSION BOX GIRDERS AS SHOWN ON DWG. NO. 5 BD 20 S/2 AND DWG. NO. 5 BD 20 S/3 SHALL BE UNDER THE APPROVAL OF THE ENGINEER.
9. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.



SECTION B — B
SCALE 1:50

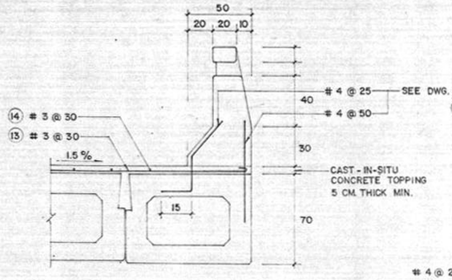


EXPANSION JOINT DETAIL
SCALE 1:50

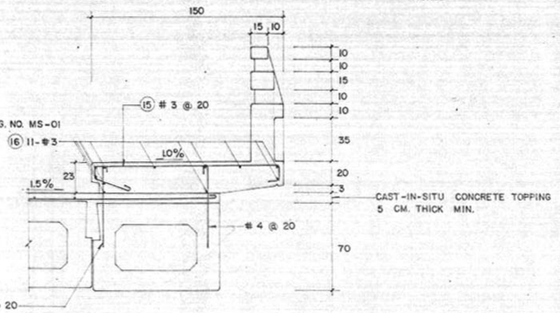
TABLE OF REINFORCEMENT

	BAR BENDING DIAGRAMS	BAR MARK	#	NO	L
TOP SLAB	VARIES 7.5 7.5 / VARIES 7.5 7.5 7.5 7.5 36	⑬	3	67	-
	985 7.5 7.5 / 985 7.5 7.5 / 99 7.5 7.5 / 7.5 36 / 36	⑭	3	-	-
150 CM. SIDEWALK	145 9 7.5 12.5 7.5 15	⑮	3	101	247
	985 7.5 7.5 / 985 7.5 36 7.5 / 99 7.5 7.5 / 36 36	⑯	3	11	-
	QUANTITIES SHOWN FOR 1 SIDE ONLY				
100 CM. SIDEWALK	95 9 7.5 12.5 7.5 15	⑰	3	67	-
	985 7.5 7.5 / 985 7.5 36 7.5 / 99 7.5 7.5 / 36 36	⑱	3	8	-
	QUANTITIES SHOWN FOR 1 SIDE ONLY				

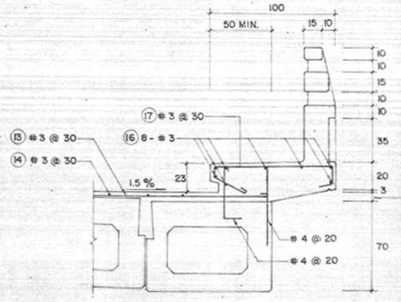
NOTES
1. REINFORCEMENTS SHOWN ARE FOR ONE SPAN ONLY
2. # 3 = Ø 3/8" OR 9 MM. # 4 = Ø 1/2" OR 12 MM.
NO = TOTAL AMOUNT OF BARS
L = TOTAL LENGTH OF EACH BAR



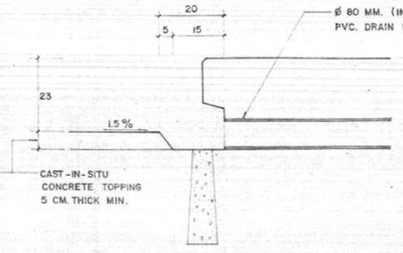
CONCRETE BARRIER DETAIL
SCALE 1:25



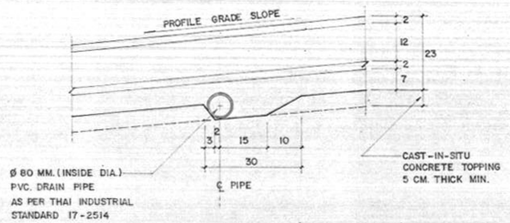
150 CM. SIDEWALK DETAIL
SCALE 1:25



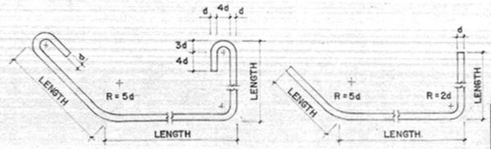
100 CM. SIDEWALK DETAIL
SCALE 1:50



DETAIL ①
SCALE 1:10



DETAIL ②
SCALE 1:10



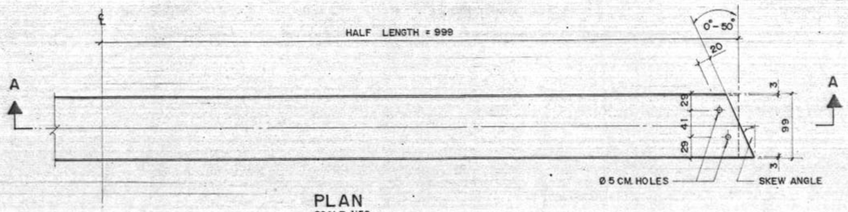
PLAIN BAR DEFORMED BAR

BAR BENDING DETAILS
NOT TO SCALE

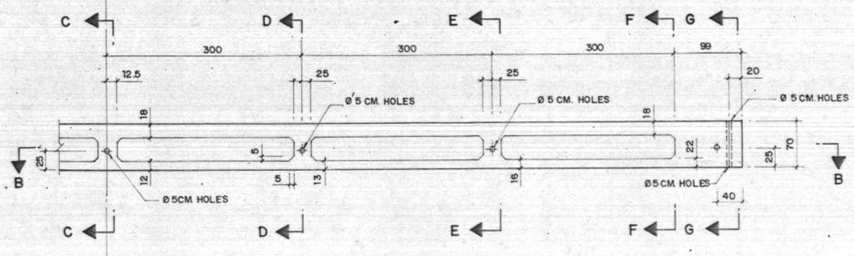
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING
0°-50° SKEW PC. BOX GIRDER BRIDGE
20.00 M. SPAN
BRIDGE DECK PLAN, SECTION AND DETAILS

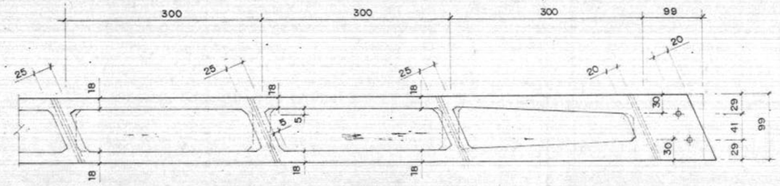
DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. 5 BD 20 S-0°-50° 1A
		SHEET NO. 162



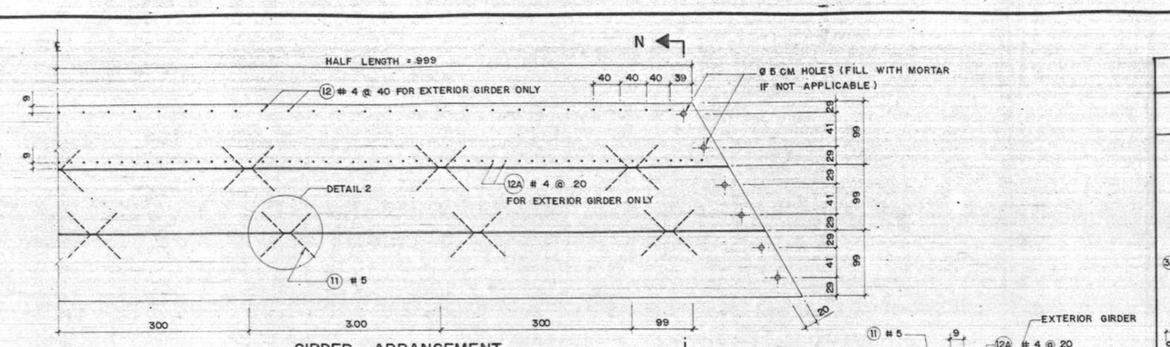
PLAN
SCALE 1:50



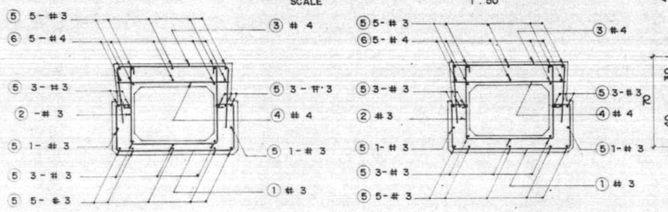
SECTION A - A
SCALE 1:50



SECTION B - B
SCALE 1:50

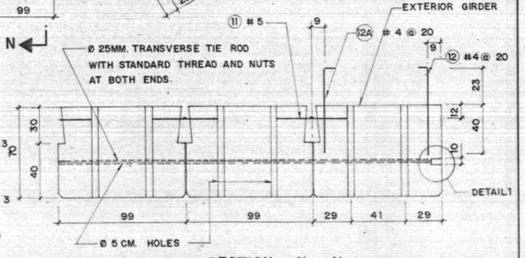


GIRDER ARRANGEMENT
SCALE 1:50

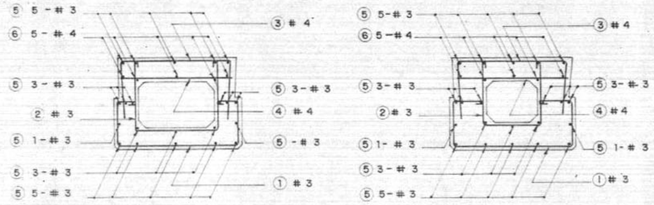


SECTION J - J
SCALE 1:25

SECTION K - K
SCALE 1:25

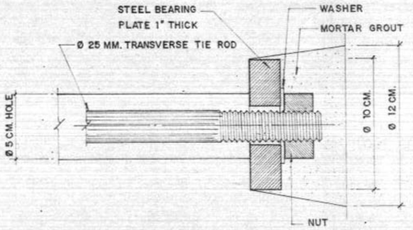


SECTION N - N
SCALE 1:25



SECTION L - L
SCALE 1:25

SECTION M - M.
SCALE 1:25



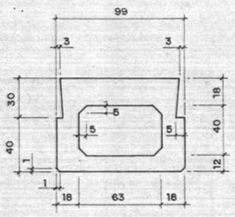
DETAIL 1
SCALE 1:25

TABLE OF REINFORCEMENT

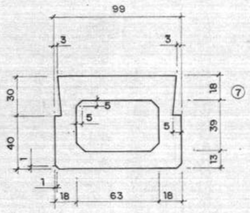
BAR BENDING DIAGRAMS	BAR MARK	#	NO.	LENGTH CM.	TOTAL LENGTH CM.
	①	3	116±	210 ±	22,020 ±
	②	3	88±	175 ±	16,188 ±
	③	4	187 ±	189	35,343 ±
	④	4	159 ±	88	13,992 ±
	⑤	3	21	2,114	44,400
	⑥	4	5	2,093	10,465
	⑦	3	50	80	4,000
	⑧	3	30	110	3,300
	⑨	4	50 ±	95 ±	4,750 ±
	⑩	4	70 ±	65 ±	4,550 ±
	⑪	5	14	135	1,890 ±
	⑫	4	49 ±	75	3,675 ±
	⑫A	4	99 ±	75	7,425 ±
#		3	4		5
TOTAL LENGTH M.		900.00	753.37		18.90

3 = Ø 3/8" OR 9 MM.
4 = Ø 1/2" OR 12 MM.
5 = Ø 5/8" OR 16 MM.

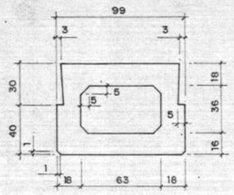
NO. = TOTAL AMOUNT OF BARS
L = TOTAL LENGTH OF EACH BAR



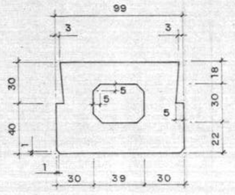
SECTION C - C
SCALE 1:25



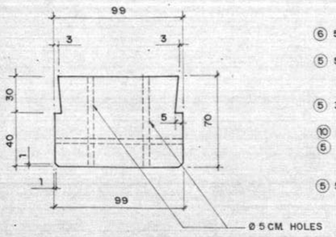
SECTION D - D
SCALE 1:25



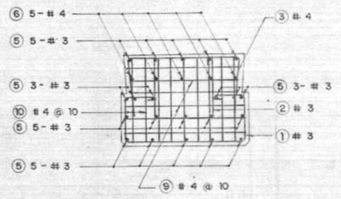
SECTION E - E
SCALE 1:25



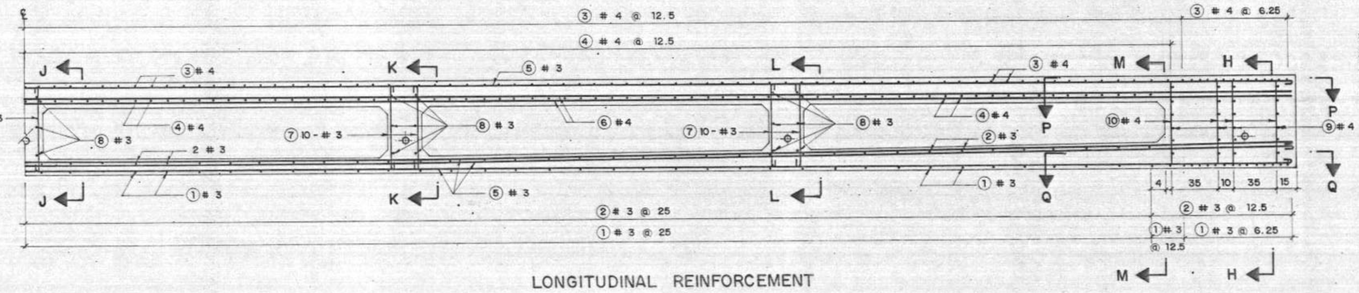
SECTION F - F
SCALE 1:25



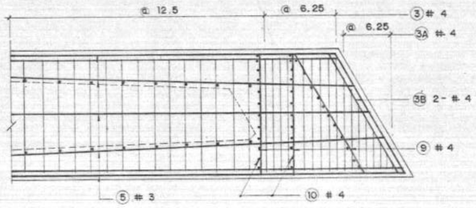
SECTION G - G
SCALE 1:25



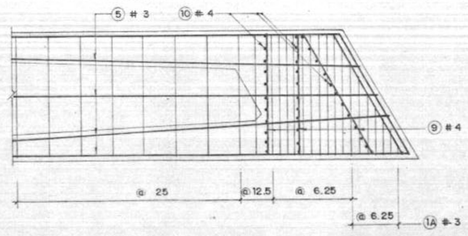
SECTION H - H
SCALE 1:25



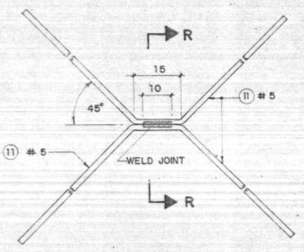
LONGITUDINAL REINFORCEMENT
SCALE 1:25



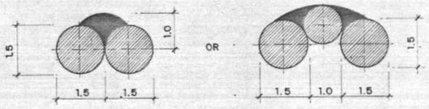
SECTION P - P
SCALE 1:25



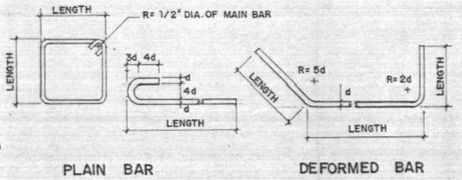
SECTION Q - Q
SCALE 1:25



DETAIL 2
SCALE 1:25



SECTION R - R
SCALE 1:1



BAR BENDING DETAILS
NOT TO SCALE

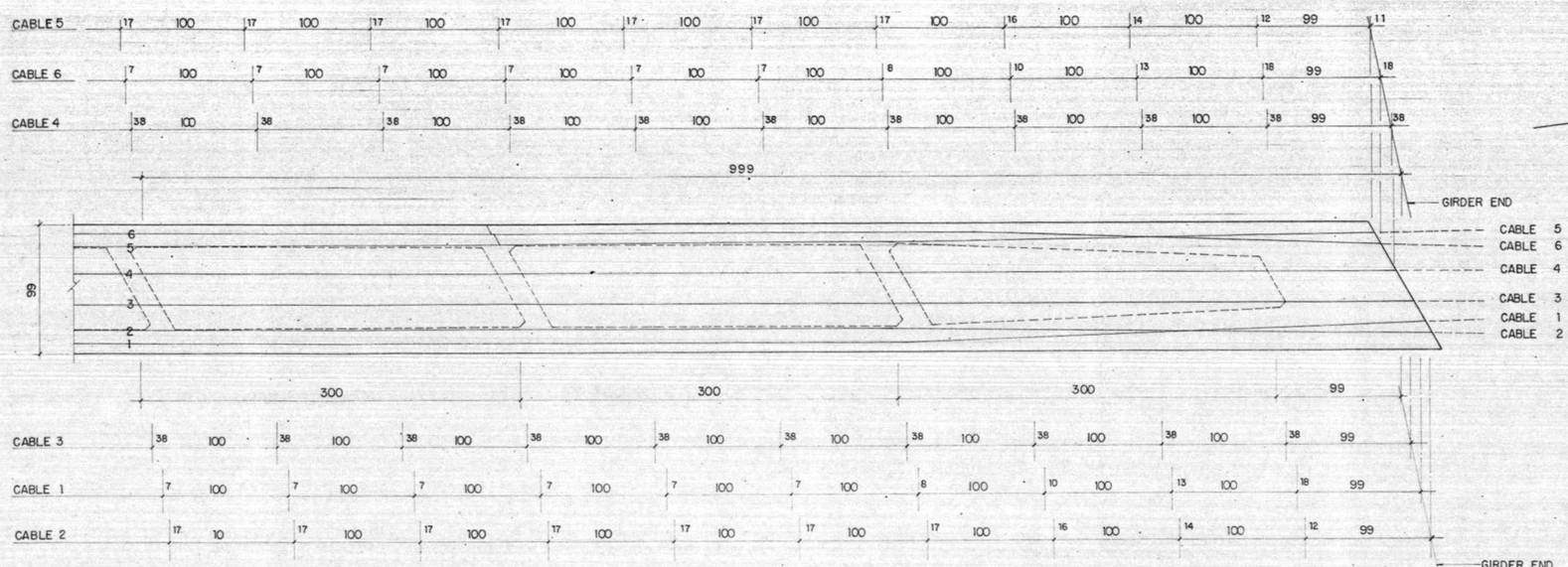
NOTES :

1. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR24 PLAIN BARS UNLESS OTHER WISE INDICATED
2. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
3. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
4. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

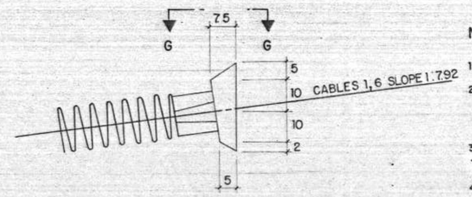
STANDARD DRAWING
POST- TENSIONED BOX GIRDER
20.00M. SPAN
PLAN, SECTION AND REINFORCEMENT DETAILS

DESIGNED: DOH & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: (DIRECTOR GENERAL)		DWG. NO. 5 BD 20 S/2
		SHEET NO. 163

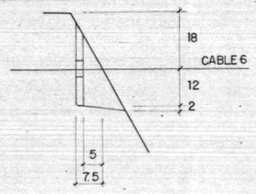


CABLES PLAN
SCALE 1:25

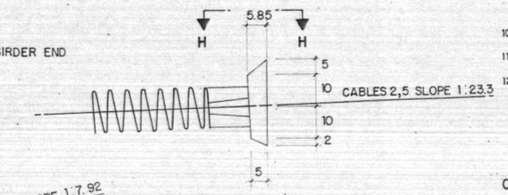
NOTE : SMALL FIGURES SHOWN INDICATE THE TRANSVERSE DISTANCES OF CABLES MEASURED FROM THE NEARER SIDE FACE OF BOX GIRDER.



CABLES 1, 6



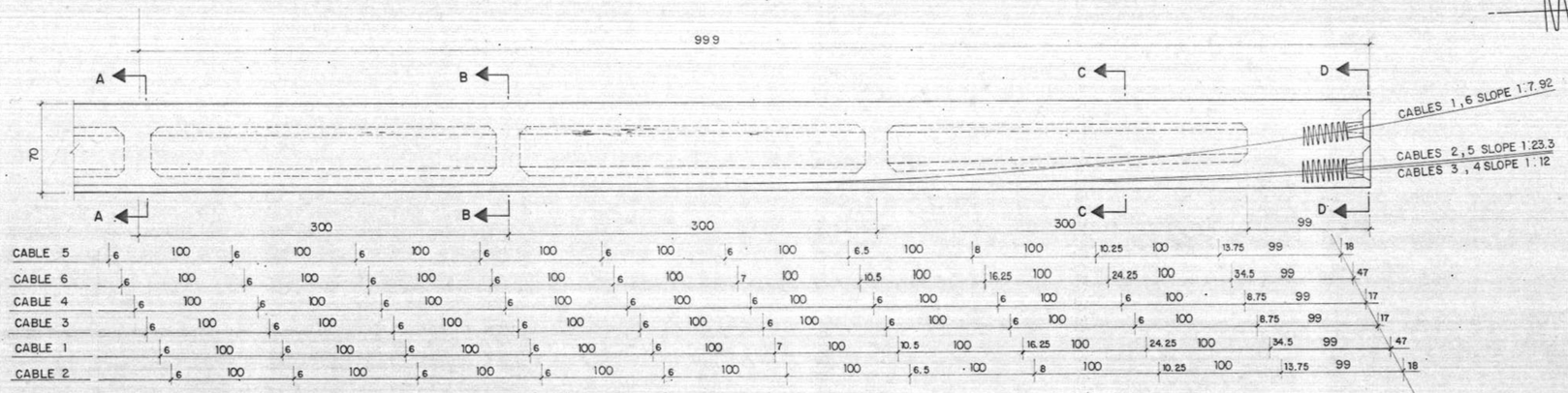
SECTION G - G



CABLES 2 , 5

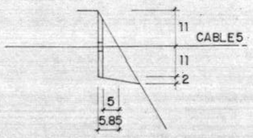
NOTES :

1. WORK THIS DRAWING WITH DWG. NO. 5BD20 S/2
2. TOTAL NUMBERS OF PRESTRESSING CABLES SHALL BE 6 EACH CABLE CONSISTS OF TWELVE OF Ø 7 mm. PRESTRESSING WIRES HAVING A MINIMUM ULTIMATE TENSILE STRENGTH OF 16,000 KG./CM.^{2}
3. ALL CABLES SHALL BE STRESSED BY JACKING AT BOTH ENDS SIMULTANEOUSLY. THE JACKING FORCES SHALL BE APPLIED TO CABLE NOS 3,4,2,5,1 AND 6 RESPECTIVELY
4. EACH CABLE SHALL HAVE AN INITAL PRESTRESSING FORCE OF 51,000 Kg. OR STRESSIES OF 11,050 KG./CM.^{2}
5. IF THE MEASUREMENT OF FORCES AS SPECIFIED IN ITEM 3 CAN NOT BE ACHIEVED, THE PRESTRESSING FORCES IN CABLES WAY BE ATTAINED BY CONTROLLING OF THE EXACT ELONGATION AT EACH END OF THE CABLES TO BE AS FOLLOWS :–
   6.4 Cm. FOR CABLE 1 AND 6
   5.95 Cm. FOR CABLE 2 AND 5
   5.85 Cm. FOR CABLE 3 AND 4
   THESE ELONGATIONS ARE BASED ON MODULUS OF ELASTICITY OF THE PRESTRESSING WIRES OF 2,000,000 KG./CM.^{2} AN ADDITIONAL ELONGATION OF 1 CM. MAY BE PROVIDED FOR SLIPPAGE THIS SHALL BE DONE UNDER THE CLOSED INSPECTION AND APPROVAL OF THE ENGINEER.
6. OTHER REBARS SHALL BE THE SAME AS THOSE SPECIFIED FOR SIDEWALKS AND RAILINGS.
7. REBAR # 3 SPACED AT 1M. IN VERTICAL AND HORIZONTAL DIRECTIONS SHALL BE USED TO HOLD THE CABLES IN POSITIONS.
8. MIX DESIGN OF CONCRETE FOR PRESTRESSED BOX GIRDERS SHALL BE SUBMITTED FOR THE APPROVAL OF THE ENGINEER. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 360 KG./CM.^{2} FOR .15 x .15 x .15 M. CUBE AT 28 DAYS.
9. TRANSVERSE TIE BARS SHALL BE T.I.S. 20 GRADE SR. 24 PLAIN BARS WITH 2 LAYERS OF RUST PROOF PAINT SUCH AS RUST-O-LIUM OR EQUIVALENT QUALITY PAINT. THREADED ENDS SHALL BE STANDARD THREAD WITH NUTS AND BEARING WASHERS.
10. ALL MATERIALS SHALL BE USED UNDER THE APPROVAL OF THE ENGINEER.
11. CABLE PROFILES SHOWN ARE AT THE CENTER OF THE CABLES.
12. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.



CABLES PROFILE
SCALE 1:25

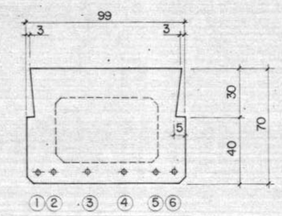
NOTE : SMALL FIGURES SHOWN INDICATE THE PROFILE ELEVATIONS MEASURED FROM THE BOTTOM FACE OF BOX GIRDER.



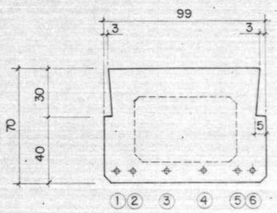
SECTION H - H

CONSTRUCTION SEQUENCES

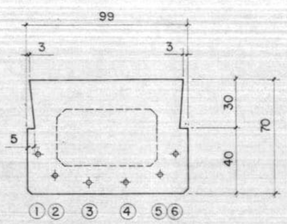
1. CAST THE GIRDER WITH THE SPECIFIED CAMBER.
2. JACKING OF PRESTRESSING TENDONS IN ACCORDANCE WITH THE SEQUENCES AS MENTIONED IN ITEM 2 OF NOTES MAY BE STARTED IF CONCRETE ATTAINED A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 290 KG./CM.^{2} FOR .15 M. STANDARD CUBE.
3. GROUT ALL CABLE DUCTS WITH CEMENT SLURRY. APPLY EPOXY RASIN TO THE RECESSES AT BOTH ENDS OF THE GIRDER JUST BEFORE FILLING THEM WITH MORTAR.
4. GIRDER SHALL BE LIFT AT BOTH ENDS. MIDSPAN LIFTING IS PROHIBITTED.
5. THE NEXT ADJACENT GIRDER SHALL BE PRESSED AGAINST THE FIRST ONE BY TIGHTENING THE TEMPORARY TIE RODS WITH A TORQUE OF 2,000 KG./CM. THEN WELD THE SHEAR CONNECTORS TOGETHER.
6. CONCRETE BRIDGE ALL SHEAR KEYS WITH CONCRETE OF THE SAME CLASS AS FOR SIDE WALK.
7. CONCRETE BRIDGE TOPPING, SIDEWALKS AND RAILINGS THEN COAT THE BRIDGE TOPPING WITH THE SPECIFIED WEARING SURFACE.
8. IF GIRDERS CAN NOT BE PLACED ACROSS THE FULL WIDTH OF THE BRIDGE DUE TO THE NEED OF PARTIAL OPENING OF TRAFFIC LANES, THE FIRST GROUP OF GIRDERS MAY BE JOINED TOGETHER AS MENTIONED IN STEP 5. THE METHOD OF PRESSING THE LATTER GROUP OF GIRDERS TO THE FIRST GROUP SHALL BE DONE UNDER THE APPROVAL OF THE ENGINEER.



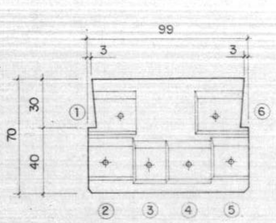
SECTION A - A
SCALE 1:20



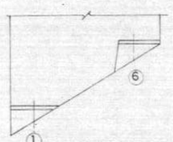
SECTION B - B
SCALE 1:20



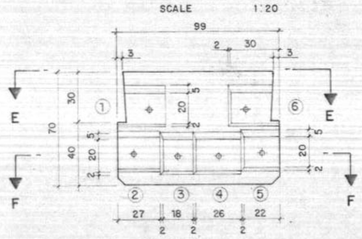
SECTION C - C
SCALE 1:20



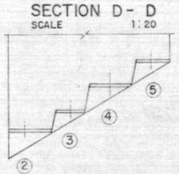
SECTION D - D
SCALE 1:20



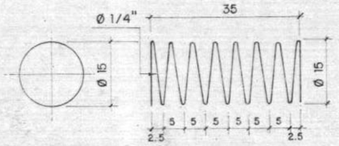
SECTION E - E
SCALE 1:20



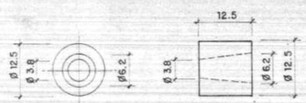
SECTION D - D
SCALE 1:20



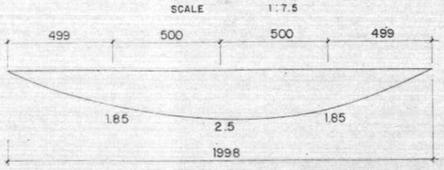
SECTION F - F
SCALE 1:20



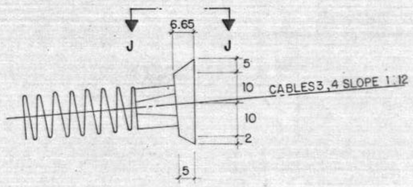
SPIRAL DETAIL
SCALE 1:7.5



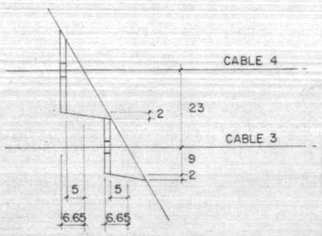
GRIP DETAILS
SCALE 1:7.5



CAMBER
SCALE 1:15



CABLE 3, 4



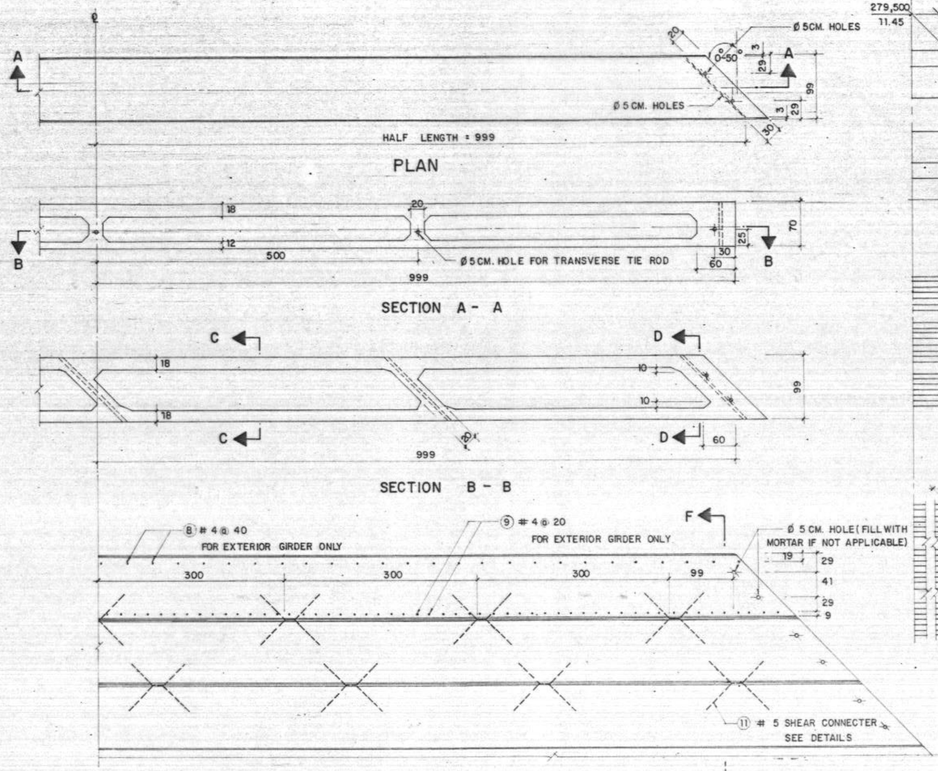
SECTION J - J

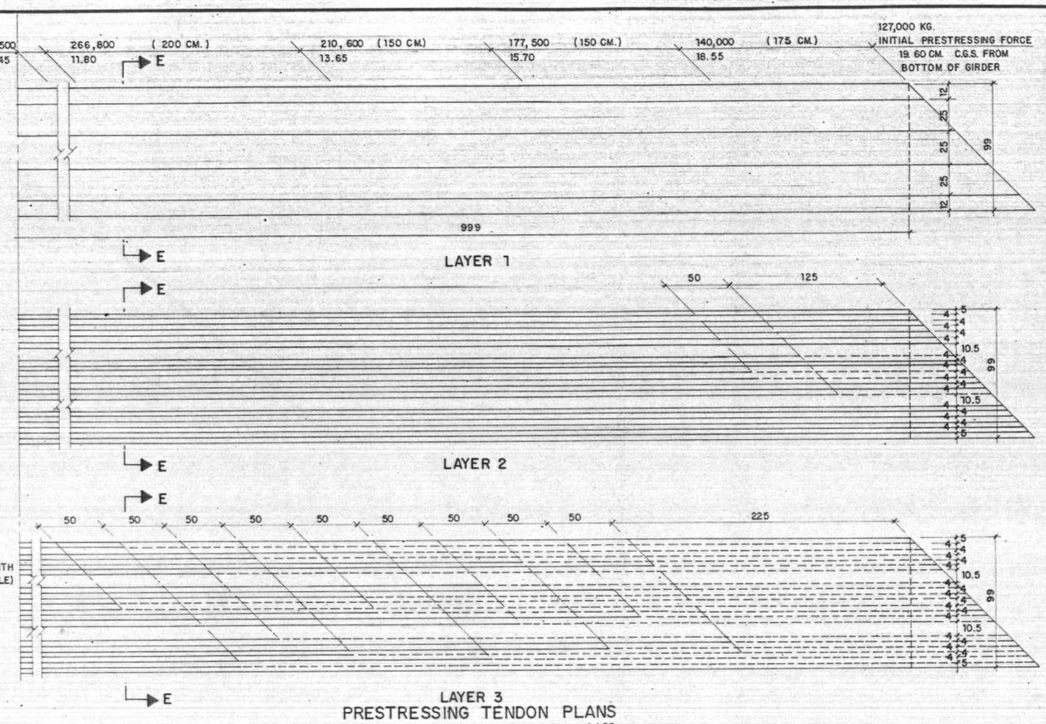
ANCHORAGE DETAILS
SCALE 1:10

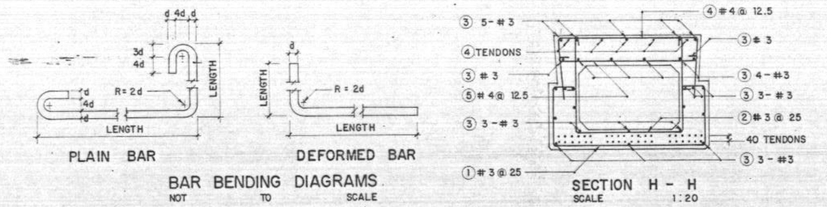
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

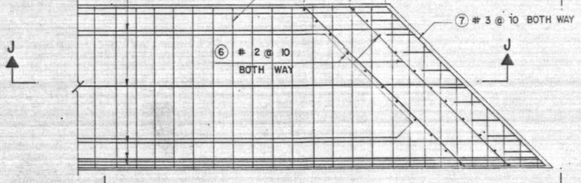
STANDARD DRAWING
POST - TENSIONED BOX GIRDER
20.00M. SPAN
PRESTRESSING CABLE ARRANGEMT

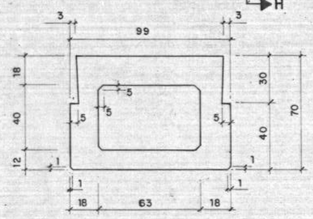
DESIGNED: DOH & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: (DIRECTOR GENERAL)		DWG. NO. 5BD20S/3
		SHEET NO. 164

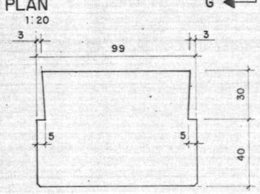


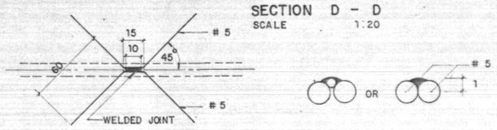


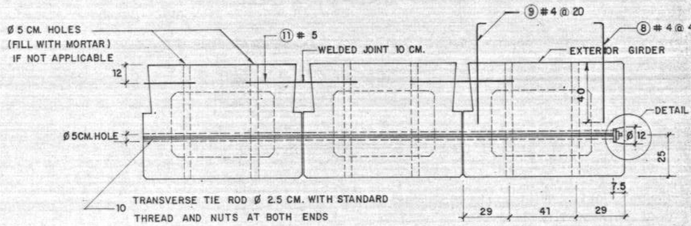


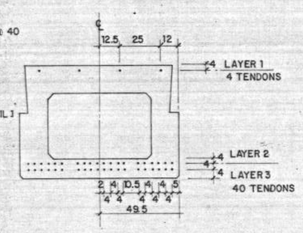


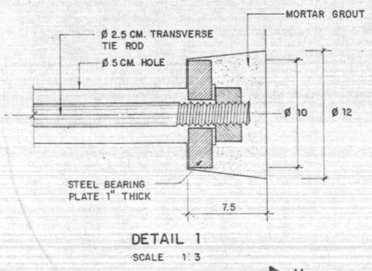


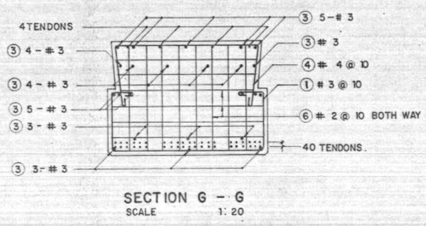












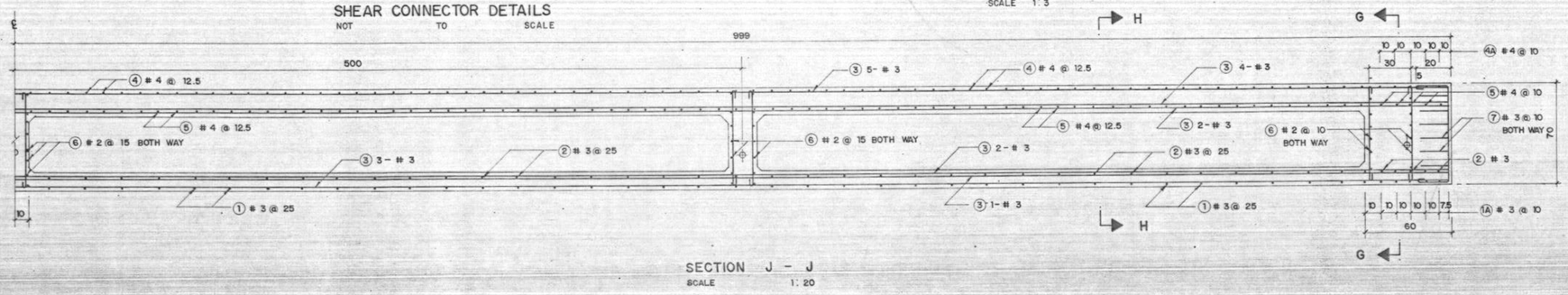


TABLE OF REINFORCEMENT FOR ONE GIRDER

BAR MARK	#	NO.	L	TOTAL LENGTH M.	TOTAL REINFORCEMENT #	TOTAL REINFORCEMENT TOTAL LENGTH M.
①	3	87	210	183.00	–	–
②	3	77	200	154.00	–	–
③	3	23	2063	475.00	–	–
④	4	160	189	302.40	–	–
⑤	4	152	87	132.24	–	–
⑥	2	150	95±	142.50	2	142.50
⑦	3	30	145±	43.50±	3	855.5
⑧	4	51	75	38.25	–	–
⑨	4	101	75	75.75	4	548.64
⑩	8	5	VARIES	VARIES	5	VARIES
⑪	5	VARIES	135	VARIES	8	VARIES

BAR BENDING DIAGRAMS (DIMENSION IN CM.)

2 = Ø 1/4" OR 6 MM. # 5 = Ø 5/8" OR 15 MM.
3 = Ø 3/8" OR 9 MM. # 8 = Ø 1" OR 25 MM.
4 = Ø 1/2" OR 12 MM.

NO = TOTAL AMOUNT OF BARS.
L = TOTAL LENGTH OF EACH BAR.

NOTES :

1. TOTAL PRESTRESSING TENDONS SHALL BE 44 TENDONS OF Ø 3/8" – OF 7 WIRE STRANDS WITH A MINIMUM ULTIMATE STRENGTH OF 17,600 KG./CM^2
2. OTHER TYPES OF PRESTRESSING TENDONS MAY BE USED UNDER THE APPROVAL OF THE ENGINEER.
3. LOCATIONS OF BOND AND DEBOND OF TENDONS SHALL BE AS SHOWN ON THE DRAWING DEBONDING SHALL BE DONE BY USING SUITABLE PLASTIC TUBES WRAPPED AROUND THE TENDONS.
4. EACH PRESTRESSING TENDON SHALL HAVE AN INITIAL STRESS OF 12,300 KG / CM^2 OR IT SHALL BE STRETCHED UNTIL AN ELONGATION OF 12.7 CM. HAS REACHED.
5. TRANSVERSE TIE RODS SHALL BE STRUCTURAL GRADE WITH 2 LAYERS OF RUST PROOF PAINT SUCH AS RUST – O – LIUM OR EQUIVALENT QUALITY PAINT THREADED ENDS SHALL BE STANDARD THREAD WITH NUTS AND BEARING WASHEDS
6. MIX. DESIGN OF CONCRETE FOR PRESTRESSED BOX GIRDERS SHALL BE SUBMITTED FOR APPROVAL OF THE ENGINEER. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 360 KG/CM^2 FOR 0.15 x 0.15 x 0.15 M. CUBE AT 28 DAYS.
7. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS EXCEPT OTHERWISE INDICATED.
8. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
9. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS
10. ALL MATERIALS SHALL BE USED UNDER THE APPROVAL OF THE ENGINEER.
11. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.

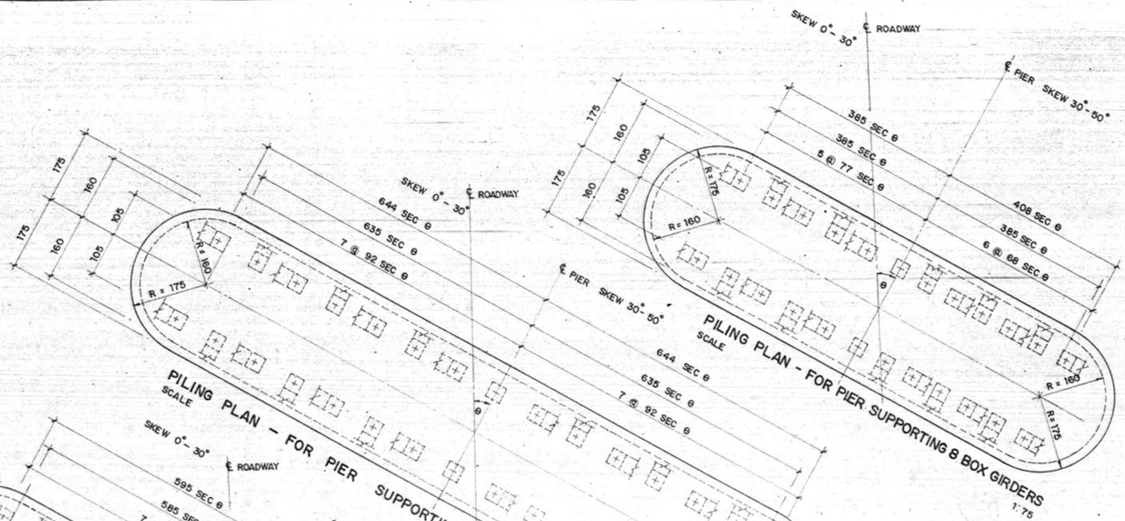
CONSTRUCTION SEQUENCES

1. CONCRETE THE BOX GIRDER AFTER A MINIMUM ULTIMATE STRENGTH OF 290 KG. / CM^2 FOR 0.15 x 0.15 x 0.15 M. CUBE HAS REACHED. THE PRE-TENSIONING TENDONS MAY BE RELEASED.
2. PLACE THE GIRDERS IN POSITIONS THEY SHALL BE LIFTED AT BOTH ENDS. MIDSPAN LIFTING IS PROHIBITTED.
3. THE NEXT ADJACENT GIRDER SHALL BE PRESSED AGAINST THE FIRST ONE BY TIGHTENING THE NUTS AT THE ENDS OF THE TRANSVERSE TIE BARS WITH A TORQUE OF 2,000 KG./CM. THEN SHEAR CONNECTORS TOGETHER.
4. CONCRETE ALL SHEAR KEYS WITH CONCRETE HAVING THE SAME PROPERTIES AS FOR THE SIDEWALK.
5. CONCRETE BRIDGE TOPPING, SIDEWALKS AND RAILINGS THEN COAT THE BRIDGE TOPPING WITH THE SPECIFIED WEARING SURFACE
6. DUE TO THE PRESENT OF THE 1.5 CM. UPWARD CAMBER OF GIRDER AT TRANSFER, THEREFORE IN CALCULATION OF THE ELEVATION OF THE TOP OF PIERS THIS QUANTITY SHALL BE TAKEN INTO ACCOUNT SO THAT THE FINAL FINISHED ELEVATION OF THE BRIDGE WILL BE IN ACCORDANCE WITH THE DESIGN DRAWINGS.
7. IF GIRDERS CAN NOT BE PLACED ACROSS THE FULL WIDTH OF THE BRIDGE DUE TO THE NEED OF PARTIAL OPENING OF TRAFFIC LANES. THE FIRST GROUP OF GIRDERS MAY BE JOINED TOGETHER AS MENTIONED IN STEPS 3 AND 4. THE METHOD OF PREESING THE LATTER GROUP OF GIRDERS TO THE FIRST GROUP SHALL BE DONE UNDER THE APPROVAL OF THE ENGINEER.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

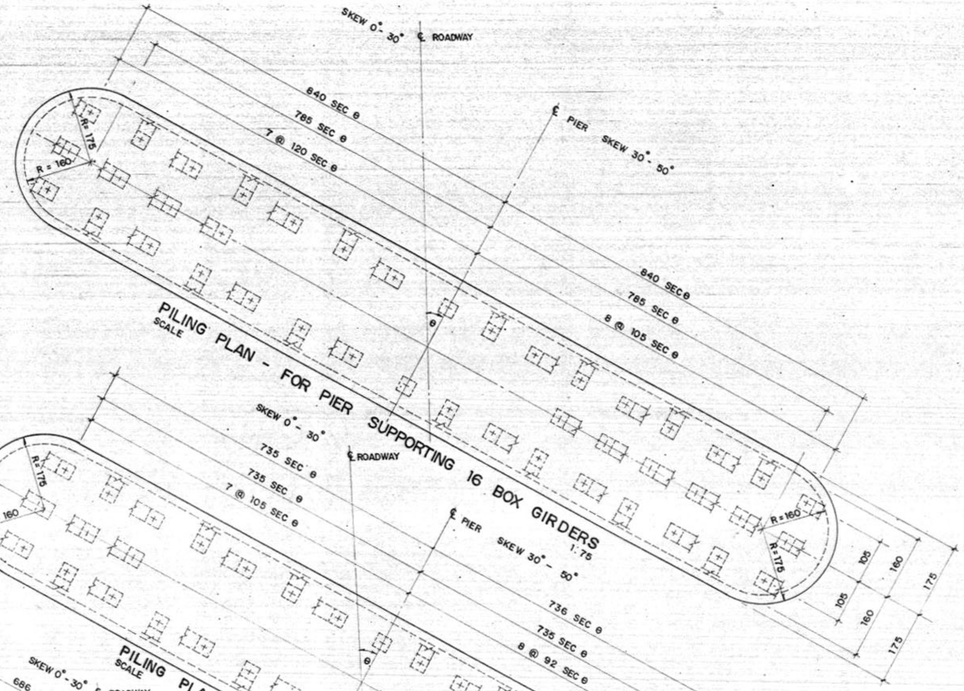
STANDARD DRAWING
PRE – TENSIONED BOX GIRDER
20.00 M. SPAN
PLAN, SECTIONS AND DETAILS

DESIGNED: DOH & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: (DIRECTOR GENERAL)		DWG. NO. 5 BD20 S/4
		SHEET NO. 165



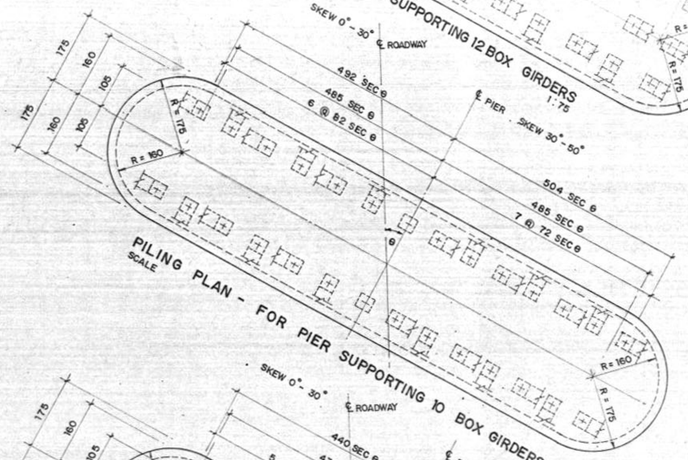
PILING PLAN - FOR PIER SUPPORTING 13 BOX GIRDERS
SCALE 1:75

PILING PLAN - FOR PIER SUPPORTING 8 BOX GIRDERS
SCALE 1:75



PILING PLAN - FOR PIER SUPPORTING 16 BOX GIRDERS
SCALE 1:75

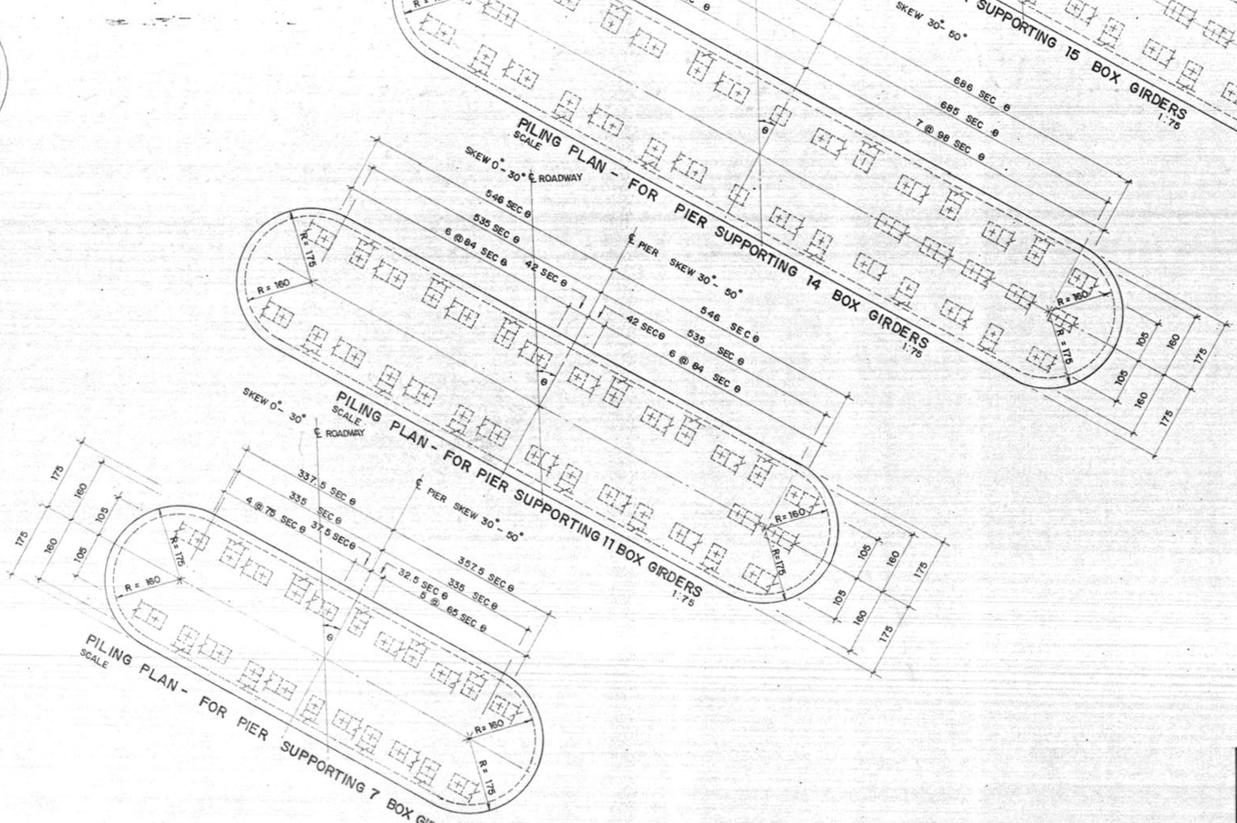
PILING PLAN - FOR PIER SUPPORTING 15 BOX GIRDERS
SCALE 1:75



PILING PLAN - FOR PIER SUPPORTING 12 BOX GIRDERS
SCALE 1:75

PILING PLAN - FOR PIER SUPPORTING 10 BOX GIRDERS
SCALE 1:75

PILING PLAN - FOR PIER SUPPORTING 9 BOX GIRDERS
SCALE 1:75



PILING PLAN - FOR PIER SUPPORTING 14 BOX GIRDERS
SCALE 1:75

PILING PLAN - FOR PIER SUPPORTING 11 BOX GIRDERS
SCALE 1:75

PILING PLAN - FOR PIER SUPPORTING 7 BOX GIRDER
SCALE 1:75

NOTES

1 WORK THIS DRAWING WITH DWG NO.5BD20-10-614/2 AND 5BD20-10-614/3.

2 SLOPES OF ALL BATTERED PILES SHALL BE 1:8

3 EACH PILE SHALL HAVE A MINIMUM ULTIMATE CAPACITY OF 90 TONS AND SHALL BE DRIVEN TO A DEPTH WHERE SCOUR WILL NOT AFFECT TIS CAPACITY.

4 THE SKEW ANGLE (θ) IS THE ANGLE IN DEGREE BETWEEN THE DIRECTION OF THE CANAL AND A LINE PERPENDICULAR TO THE ROADWAY

5 ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED

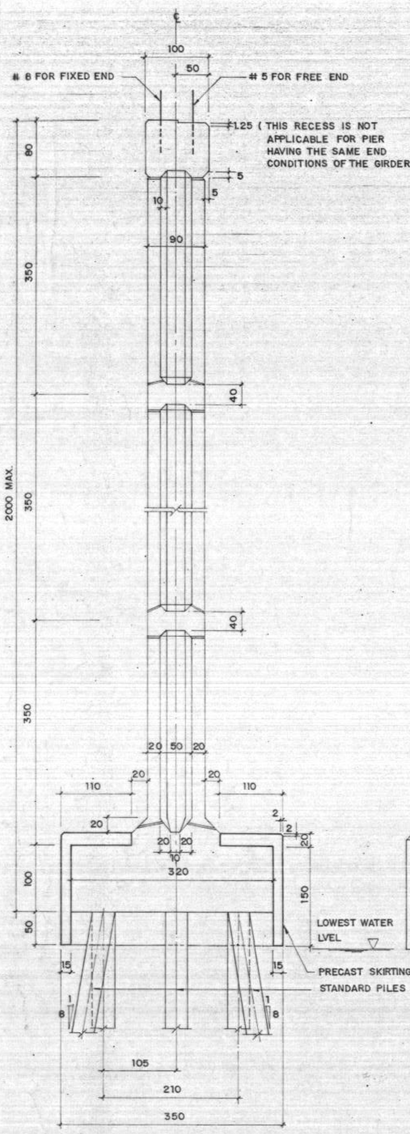
TABLE OF SEC θ

	SKEW ANGLE (θ)										
	0	5	10	15	20	25	30	35	40	45	50
SEC	1.0000	1.0038	1.0154	1.0353	1.0642	1.1034	1.1547	1.2208	1.3054	1.4142	1.5557

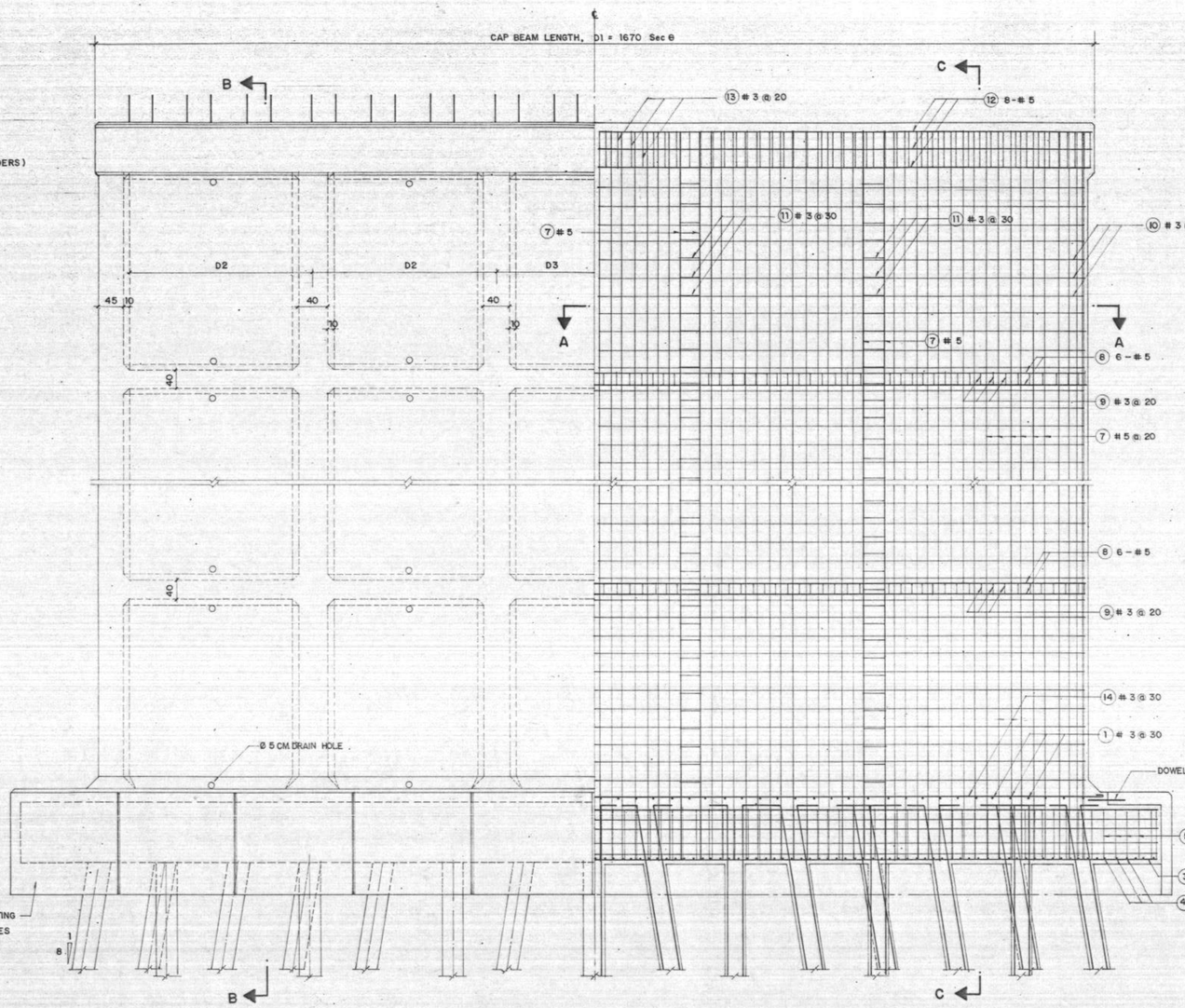
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING
0°-50° SKEW PC BOX GIRDER BRIDGE
20.00M. SPAN
PILE FOOTING PIER, PILING PLANS.

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Boonmoy. (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. 5BD20-10-614
		SHEET NO. 166

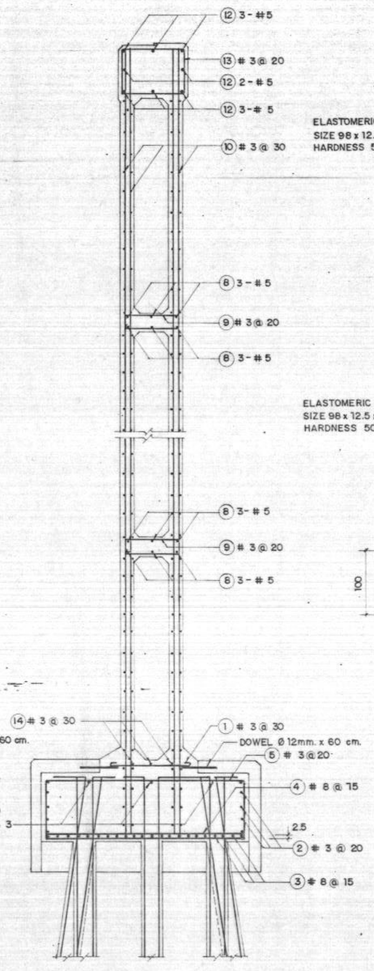


SECTION B - B
SCALE 1:50

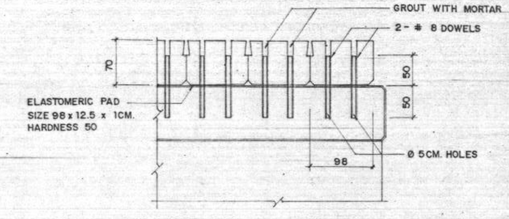


HALF PILE FOOTING ELEVATION

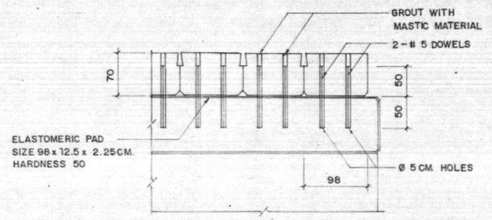
HALF PILE FOOTING REINFORCEMENT



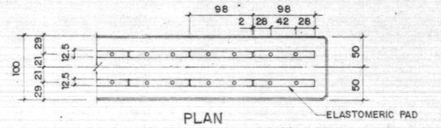
SECTION C - C
SCALE 1:50



FIXED BEARING ELEVATION

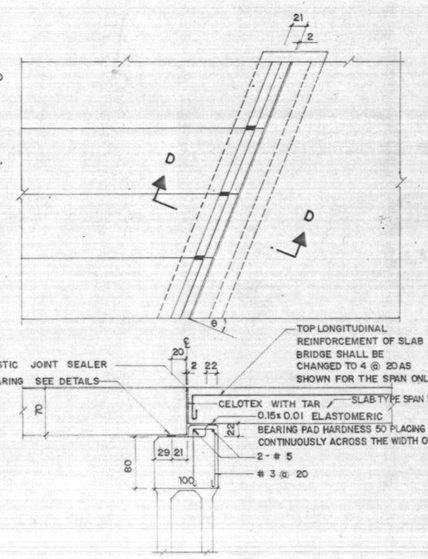


FREE BEARING ELEVATION



PLAN

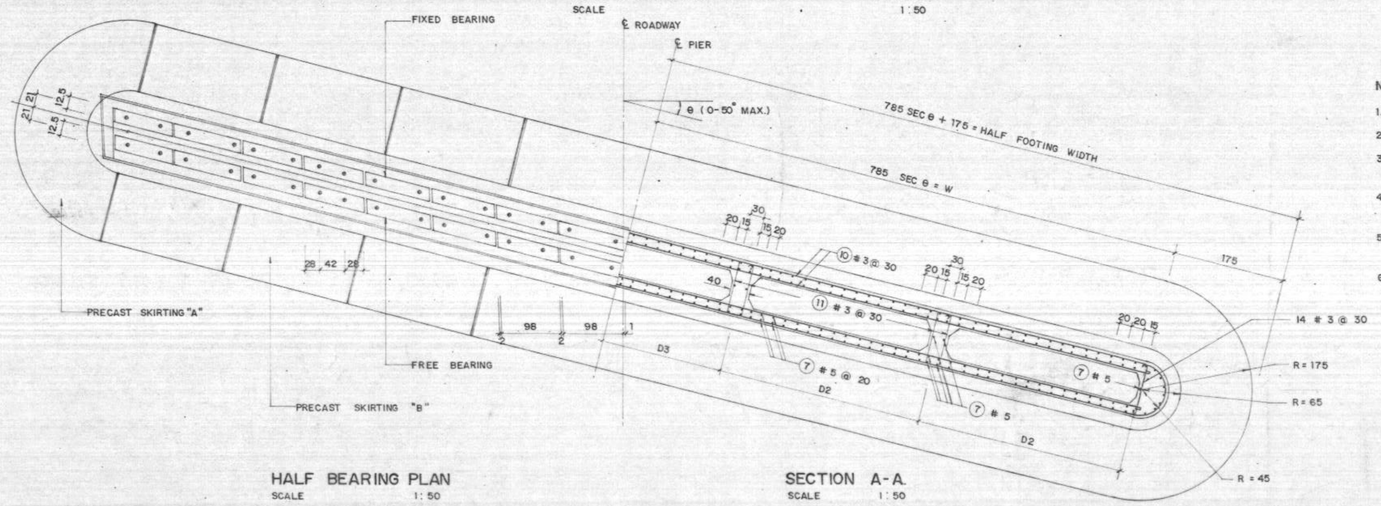
BEARING DETAILS
SCALE 1:50



SECTION D - D

PILE HEAD DETAILS
SCALE 1:50

ELEVATION AND REINFORCEMENT DETAIL
SCALE 1:50



HALF BEARING PLAN
SCALE 1:50

SECTION A-A
SCALE 1:50

NOTES :

1. WORK THIS DRAWING WITH DWG NO. 5BD20-10-614/1 AND 5BD20-10-614/3
2. FOR SKIRT DETAILS SEE DWG NO. 5BD20-10-614/3.
3. ALL EXPOSED CONCRETE CORNERS SHALL HAVE 2 CM. CHAMFERS UNLESS OTHERWISE INDICATED
4. HORIZONTAL STIFFENERS BETWEEN WALLS OF A PIER SHALL BE PROVIDED AT EQUAL SPACING OF NOT MORE THAN 3.50 M.
5. DIAPHRAGM COLUMNS SHALL BE ARRANGED IN SUCH A WAY THAT BOTH D_2 AND $2D_3$ SHALL NOT BE GREATER THAN 3.20 M.
6. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.

NOTE : BEARING AND REINFORCING PLAN SHOWN HERE ARE FOR PIER SUPPORTING 16 BOX GIRDERS.

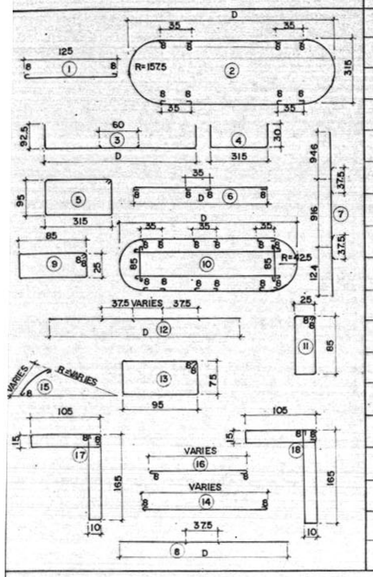
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING
0°- 50° SKEW PC BOX GIRDER BRIDGE
20.00M. SPAN
PILE FOOTING PIER DETAILS

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Bumpensy. (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : MRLA (DIRECTOR GENERAL)		DWG. NO. 5 BD20-10-614/2
		SHEET NO. 167

TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS CM.



BAR MARK	#	7 - BOX GIRDER				8 - BOX GIRDER				9 - BOX GIRDER				10 - BOX GIRDER				11 - BOX GIRDER				12 - BOX GIRDER				13 - BOX GIRDER				14 - BOX GIRDER				15 - BOX GIRDER				16 - BOX GIRDER			
		NO	D	L	TOTAL LENGTH	NO	D	L	TOTAL LENGTH	NO	D	L	TOTAL LENGTH	NO	D	L	TOTAL LENGTH	NO	D	L	TOTAL LENGTH	NO	D	L	TOTAL LENGTH	NO	D	L	TOTAL LENGTH	NO	D	L	TOTAL LENGTH	NO	D	L	TOTAL LENGTH	NO	D	L	TOTAL LENGTH
1	3	@30	–	141	3,807	@30	–	141	4,230	@30	–	141	4,798	@30	–	141	5,217	@30	–	141	5,640	@30	–	141	6,073	@30	–	141	6,637	@30	–	141	7,060	@30	–	141	7,483	@30	–	141	8,047
2	3	@20	985	2,533	12,665	@20	1,085	2733	13,665	@20	1,185	2,933	14,665	@20	1,285	3,133	15,665	@20	1,385	3,333	16,665	@20	1,485	3,533	17,665	@20	1,585	3,733	18,665	@20	1,685	3,933	19,665	@20	1,785	4,133	20,665	@20	1,885	4,333	21,665
3	8	23	1,015	1,260	28,980	23	1,115	1,360	31,280	23	1,215	1,460	33,580	23	1,315	1,560	35,880	23	1,415	1,660	38,180	23	1,515	1,760	40,480	23	1,615	1,860	42,780	23	1,715	1,960	45,080	23	1,815	2,060	47,380	23	1,915	2,160	49,680
4	8	68	–	375	25,500	75	–	375	28,125	82	–	375	30,750	88	–	375	33,000	95	–	375	35,625	101	–	375	37,875	108	–	375	40,500	115	–	375	43,125	122	–	375	45,750	128	–	375	48,000
5	3	51	–	836	19,386	56	–	836	46,616	61	–	836	50,996	66	–	836	55,176	71	–	836	59,356	76	–	836	63,536	81	–	836	67,716	86	–	836	71,896	91	–	836	76,076	96	–	836	80,256
6	3	3	1,015	–	3,045	3	1,115	–	3,346	3	1,215	–	3,645	3	1,315	–	3,946	3	1,415	–	4,246	3	1,515	–	4,546	3	1,615	–	4,846	3	1,715	–	5,146	3	1,815	–	5,446	3	1,915	–	5,746
7	5	190	–	2,061	391,590	200	–	2,061	412,200	210	–	2,061	432,810	220	–	2,06	453,420	230	–	2,061	474,030	240	–	2,061	494,640	250	–	2,061	55,250	260	–	2,061	535,860	270	–	2,061	556,470	280	–	2,061	577,080
8	5	24	750	–	18,912	24	850	–	21,312	24	950	–	23,712	24	1,050	–	26,112	24	1,150	–	28,512	24	1,250	–	30,912	24	1,350	–	33,312	24	1,450	–	35,712	24	1,550	–	38,112	24	1,650	–	40,512
9	3	120	–	236	28,320	140	–	236	33,040	160	–	236	37,760	180	–	236	42,480	200	–	236	47,200	220	–	236	51,920	240	–	236	56,640	260	–	236	61,360	280	–	236	66,080	300	–	236	70,800
10	3	58	755	3,442	199,636	58	855	3,842	222,836	58	955	4,242	246,036	58	1,055	4,642	269,236	58	1,155	5,042	292,436	58	1,255	5,442	315,636	58	1,355	5,842	338,836	58	1,455	6,242	362,036	58	1,555	6,642	385,236	58	1,655	7,042	408,436
11	3	116	–	236	27,376	116	–	236	27,376	116	–	236	27,376	116	–	236	27,376	174	–	236	41,064	174	–	236	41,064	174	–	236	41,064	232	–	236	54,752	232	–	236	54,752	232	–	236	54,752
12	5	8	765	840	6,720	8	865	940	7,520	8	965	1,040	8,320	8	1,065	1,140	9,120	8	1,165	1,240	9,920	8	1,265	1,340	10,720	8	1,365	1,440	11,520	8	1,465	1,540	12,320	8	1,565	1,640	13,120	8	1,665	1,740	13,920
13	3	38	–	356	13,528	43	–	356	15,308	48	–	356	17,088	53	–	356	18,868	58	–	356	20,648	63	–	356	22,428	68	–	356	44,208	73	–	356	45,988	78	–	356	47,768	83	–	356	49,548
14	3	@20	–	804	4,020	@20	–	904	4,520	@20	–	1,004	5,020	@20	–	1,104	5,520	@20	–	1,204	6,020	@20	–	1,304	6,520	@20	–	1,404	7,020	@20	–	1,504	7,520	@20	–	1,604	8,020	@20	–	1,704	8,520
15	3	104	–	–	26,348	104	–	–	26,348	104	–	–	26,348	104	–	–	26,348	104	–	–	26,348	104	–	–	26,348	104	–	–	26,348	104	–	–	26,348	104	–	–	26,348	104	–	–	26,348
16	3	208	–	185	38,480	208	–	204	42,432	260	–	185	48,100	260	–	205	53,300	312	–	191	59,592	312	–	206	64,272	364	–	193	70,252	364	–	207	75,348	416	–	195	81,120	416	–	208	86,528
17	3	44	–	581	25,564	44	–	581	25,564	44	–	581	25,564	44	–	581	25,564	44	–	581	25,564	44	–	581	25,564	44	–	581	25,564	44	–	581	25,564	44	–	581	25,564	44	–	581	25,564
18	3	@20	–	581	41,632	@20	–	581	51,128	@20	–	581	58,100	@20	–	581	63,910	@20	–	581	69,720	@20	–	581	76,692	@20	–	581	81,340	@20	–	581	89,474	@20	–	581	92,960	@20	–	581	102,256

#3 = Ø 3/8" OR 9MM. #4 = Ø 1/2" OR 12 MM. #5 = Ø 5/8" OR 16 MM. #6 = Ø 1" OR 25 MM. NO= TOTAL AMOUNT OF BARS L= TOTAL LENGTH OF EACH BAR

NOTES :

1 WORK THIS DRAWING WITH DWG NO. 5BD20-10-614/1 AND 5BD20-10-614/2.

2 CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG/CM^2 FOR .15 x .15 x .15 CUBE AT 28 DAYS AN APPROXIMATE MIX DESIGH PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT, MIN	350	KG.
SAND	0.43	M^3
CRUSHED ROCK OR GRAWEL	0.86	M^3
CONCRETE SLUMP, MAX	10	CM

3 CLEAR CONCRETE COVER SHALL BE 2.5 CM.

4 IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM WITHOUT ALTERING THE LOCATIONS OF REBARS.

5 REBARS #4 OR LARGER SHALL BE TIS.24 GRADE SD. 30 DEFORMMED BARS, OTHERS SHALL BE TIS.20 GRADE SR.24 PLAIN BARS, UNLESS OTHERWISE INDICATED.

6 LOCATIONS OF LAB SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.

7 LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.

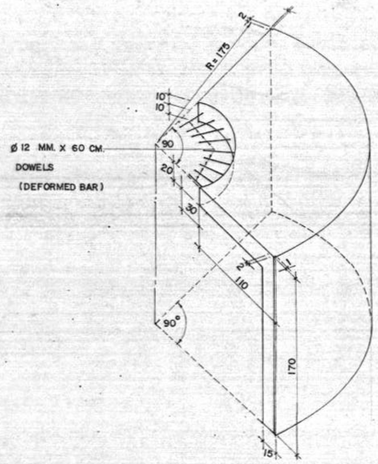
8 IN CASE OF NON-SKEW BRIDGE, BEARINGS UNDER 10.0 M. SPAN SLAB BRIDGE SHALL BE CONSTANTLY 22 CM. WIDE

9 ALL MATERIALS SHALL BE USED UNDER THE APPROVAL OF THE ENGINEER FOR ELASTOMERIC PADS, CONTRACTOR SHALL SUBMIT A CERTIFICATE FROM THE MANUFACTURER SHOWING THAT THEY WILL PERFORM IN ACCORDANCE WITH THE SPECIFICATIONS.

10 QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 20.0 M.

11 LENGTH AND AMOUNT OF REBARS SHOWN IN THE TABLE MAY VARY ACCORDING TO PIER SHAPE BUT SPACING SHALL BE AS SHOWN ON THE DRAWINGS.

12 ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLEES OTHERWISE INDICATED.

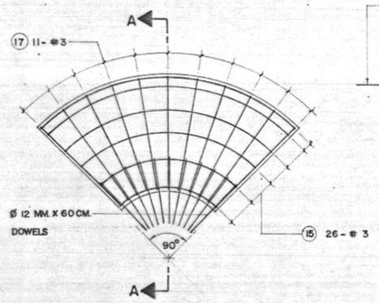


PILE FOOTING

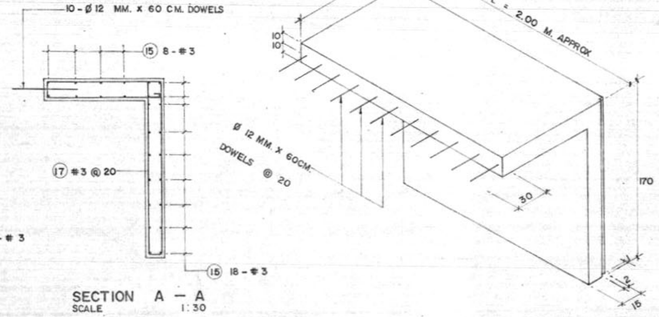
NUMBER OF BOX GIRDER	D1 CM	D2 CM	D3 CM	HALF LENGTH OF FOOTING CM	WIDTH OF FOOTING CM	NUMBER OF PILES 0°-30° SKEW	NUMBER OF PILES 30°-50° SKEW	PILE HEAD SPACING C-C 0°-30° SKEW	PILE HEAD SPACING C-C 30°-50° SKEW	W (CM.)
7	770 SEC θ	216 SEC θ	109 SEC θ	335 SEC θ + 175	350	20	24	75 SEC θ	65 SEC θ	335 SEC θ
8	870 SEC θ	250 SEC θ	–	385 SEC θ + 175	350	22	26	77 SEC θ	68 SEC θ	385 SEC θ
9	970 SEC θ	283 SEC θ	142 SEC θ	435 SEC θ + 175	350	24	28	80 SEC θ	70 SEC θ	435 SEC θ
10	1,070 SEC θ	316 SEC θ	159 SEC θ	485 SEC θ + 175	350	26	30	82 SEC θ	72 SEC θ	485 SEC θ
11	1,170 SEC θ	262.5 SEC θ	–	535 SEC θ + 175	350	28	32	84 SEC θ	84 SEC θ	535 SEC θ
12	1,270 SEC θ	287.5 SEC θ	–	585 SEC θ + 175	350	30	34	85 SEC θ	86 SEC θ	585 SEC θ
13	1370 SEC θ	312.5 SEC θ	–	635 SEC θ + 175	350	32	36	92 SEC θ	92 SEC θ	635 SEC θ
14	1,470 SEC θ	270 SEC θ	–	685 SEC θ + 175	350	34	40	98 SEC θ	98 SEC θ	685 SEC θ
15	1,570 SEC θ	290 SEC θ	–	735 SEC θ + 175	350	36	44	105 SEC θ	92 SEC θ	735 SEC θ
16	1,670 SEC θ	310 SEC θ	–	785 SEC θ + 175	350	38	46	120 SEC θ	105 SEC θ	785 SEC θ

TABLE OF SEC θ

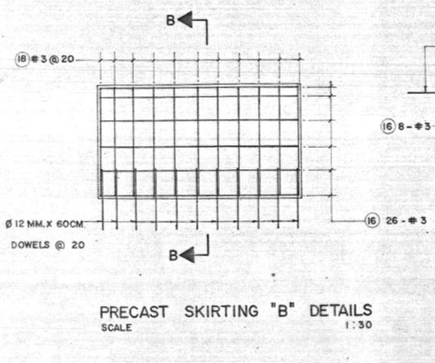
	SKEW ANGLE (θ)										
	0	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°
SEC θ	1.0000	1.0038	1.0154	1.0353	1.0642	1.1034	1.1547	1.2208	1.3054	1.4142	1.5557



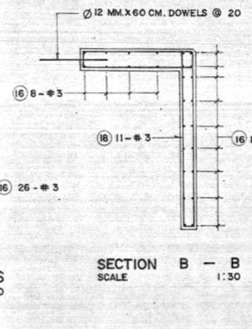
PRECAST SKIRTING "A" DETAILS
SCALE 1:30



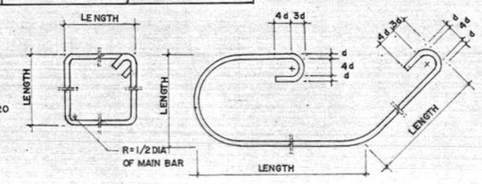
SECTION A – A
SCALE 1:30



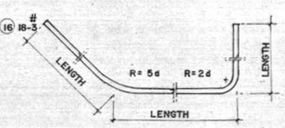
PRECAST SKIRTING "B" DETAILS
SCALE 1:30



SECTION B – B
SCALE 1:30



PLAIN BAR



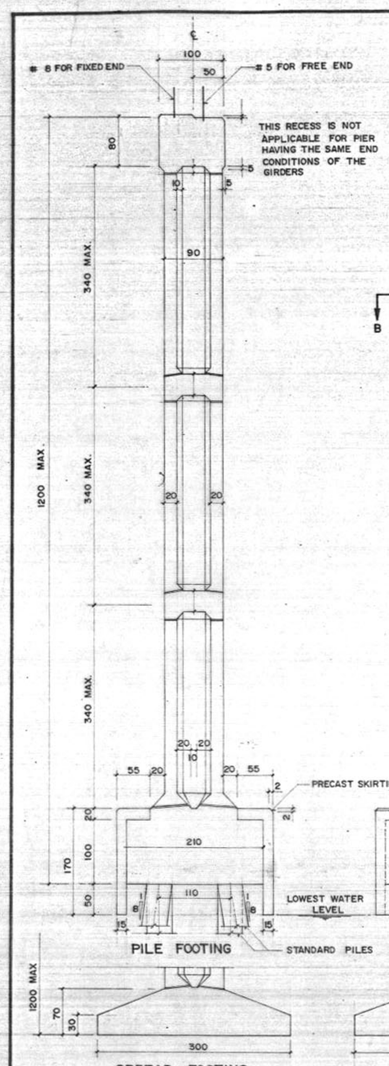
DEFORMED BAR

BAR BENDING DETAILS
NOT TO SCALE

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING
0°-50° SKEW P.C. BOX GIRDER BRIDGE
20.00 M. SPAN
PIER REINFORCING AND SKIRTING DETAILS

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Buranapary. (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. 5 BD 20-10-614/3
		SHEET NO. 168

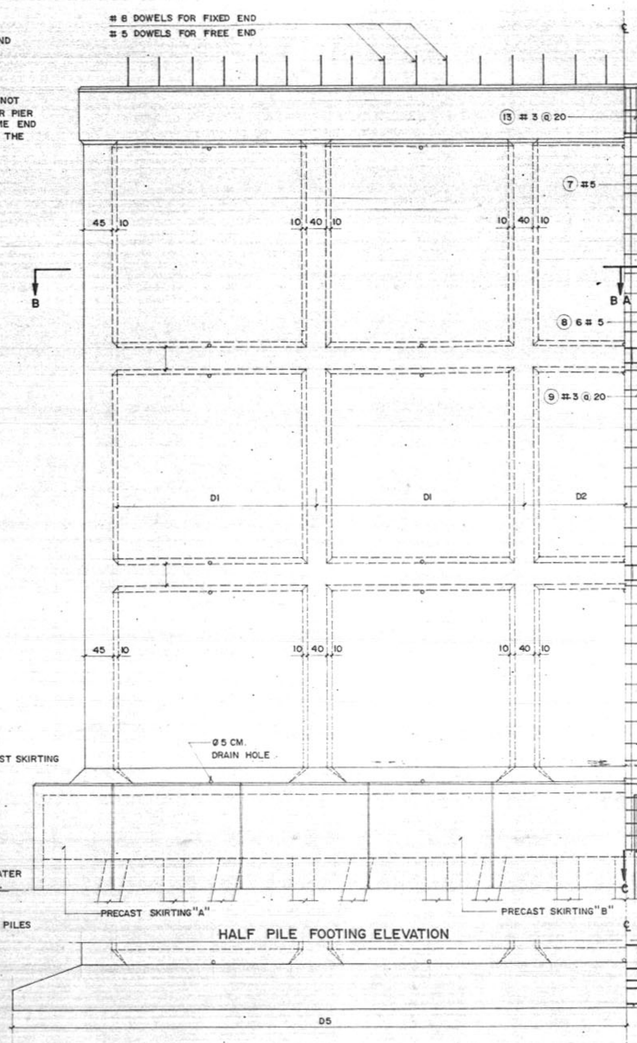


PILE FOOTING

SPREAD FOOTING

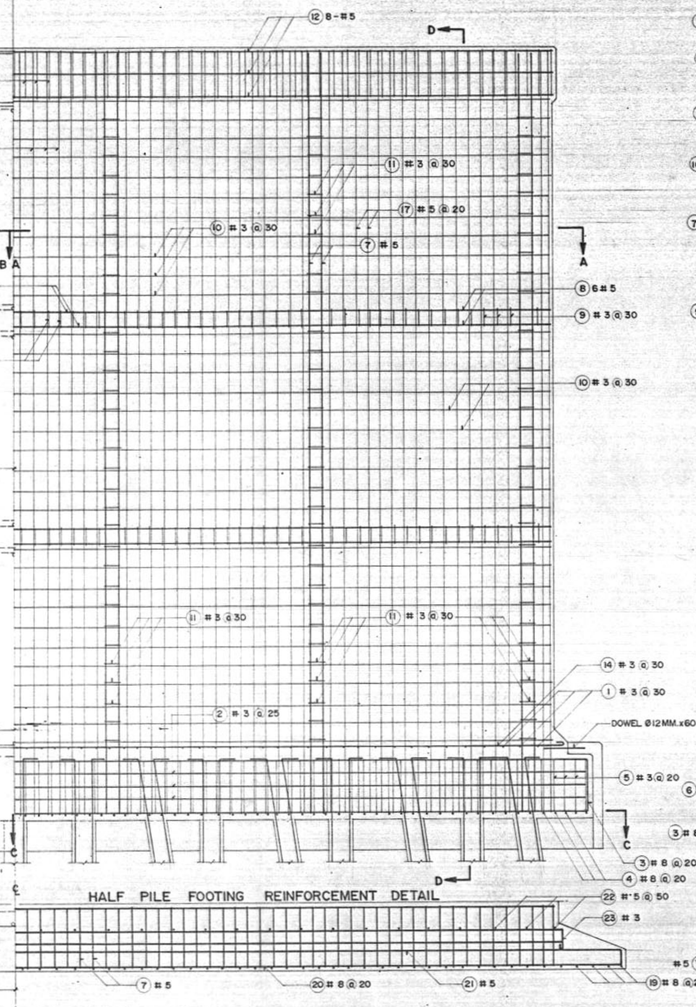
LONGITUDINAL SECTIONS

SCALE 1 : 50



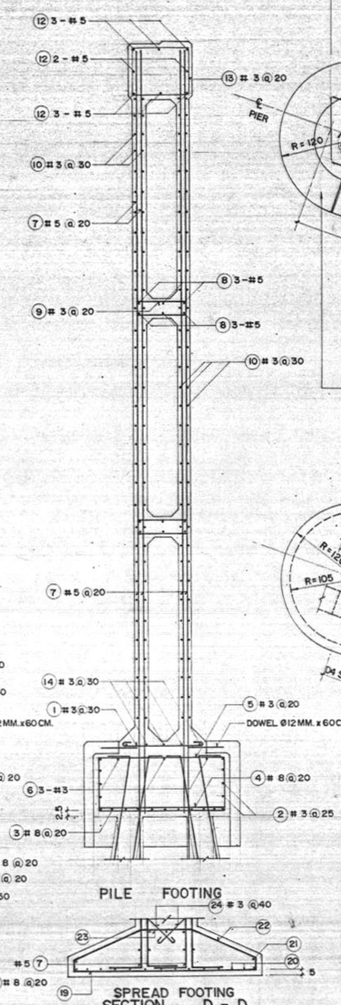
HALF PILE FOOTING ELEVATION

HALF SPREAD FOOTING ELEVATION



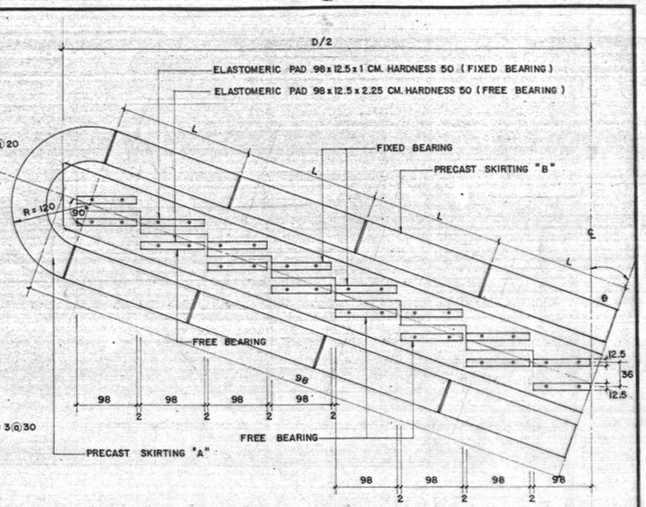
HALF PILE FOOTING REINFORCEMENT DETAIL

HALF SPREAD FOOTING REINFORCEMENT DETAIL



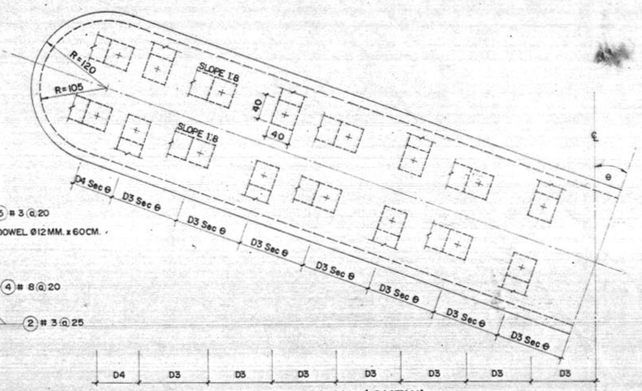
PILE FOOTING

SPREAD FOOTING



HALF BEARING PLAN (SKEW)

SCALE 1:50

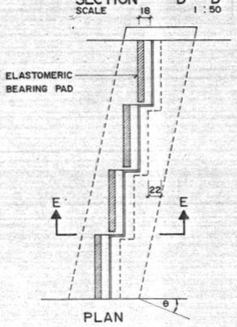


HALF PILING PLAN (SKEW)

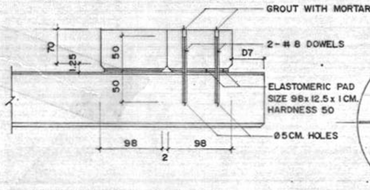
SCALE 1:50

SECTION D - D

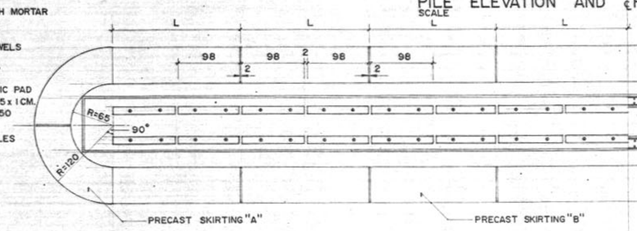
SCALE 1:50



PLAN

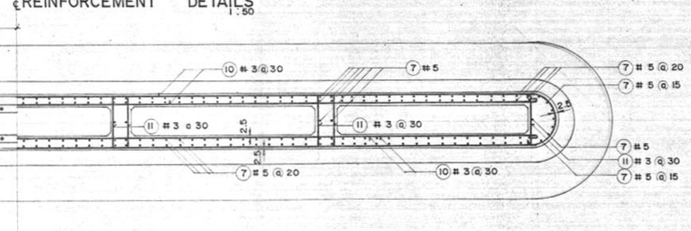


FIXED BEARING ELEVATION



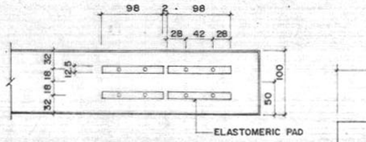
HALF PLAN

SCALE 1:50

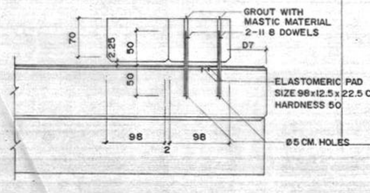


SECTION A - A

SCALE 1:50



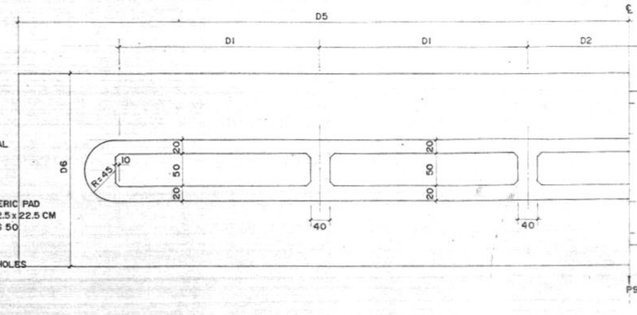
PLAN



FREE BEARING ELEVATION

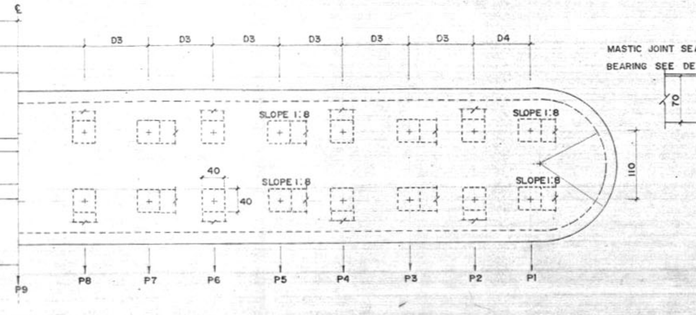
BEARING DETAILS

SCALE 1:50



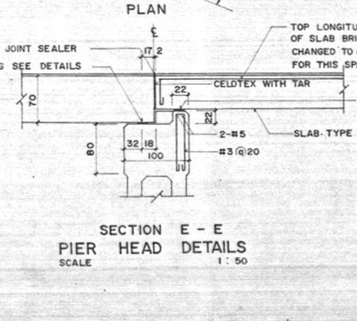
SECTION B - B

SCALE 1:50



SECTION C - C

SCALE 1:50



SECTION E - E

PIER HEAD DETAILS

SCALE 1:50

TOP LONGITUDINAL REINFORCEMENT OF SLAB BRIDGE SHALL BE CHANGED TO #4 @ 20 AS SHOWN FOR THIS SPAN ONLY

0.15x0.01 ELASTOMERIC BEARING PAD HARDNESS 50 PLACING CONTINUOUSLY ACROSS THE WIDTH OF SLAB

PILE ELEVATION AND REINFORCEMENT DETAILS

SCALE 1:50

NOTES:

1. WORK THIS DRAWING WITH DWG NO.5BD20-10-614/5.
2. ALL EXPOSED CONCRETE CORNERS SHALL HAVE 2 CM. CHAMFERS UNLESS OTHERWISE INDICATED.
3. HORIZONTAL STIFFENERS BETWEEN WALLS OF A PIER SHALL BE PROVIDED AT EQUAL SPACING OF NOT MORE THAN 3.4 M.
4. DIAPHRAGM COLUMNS SHALL BE ARRANGED IN SUCH A WAY THAT BOTH D1 AND D2 SHALL NOT BE GREATER THAN 3.2 M.
5. MINIMUM ALLOWABLE BEARING CAPACITY OF SOIL UNDER SPREAD FOOTING PIERS SHALL BE 20 TON/M THE BOTTOM OF FOOTING SHALL BE EMBEDDED IN THE EXISTING GROUND NOT LESS THAN 2.5 M. OR AT THE LEVEL WHERE SCOUR WILL NOT AFFECT ITS CAPACITY.
6. FOR PILE FOOTING PIERS, EACH PILE SHALL HAVE A MINIMUM ULTIMATE CAPACITY OF 90 TONS AND SHALL BE DRIVEN TO A DEPTH WHERE SCOUR WILL NOT AFFECT ITS CAPACITY.
7. FOR SPREAD FOOTING PIERS, THE MAXIMUM HEIGHT FROM THE BOTTOM OF FOOTING TO THE TOP OF CAP BEAM SHALL BE 12.0 M.
8. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.

KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS

DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

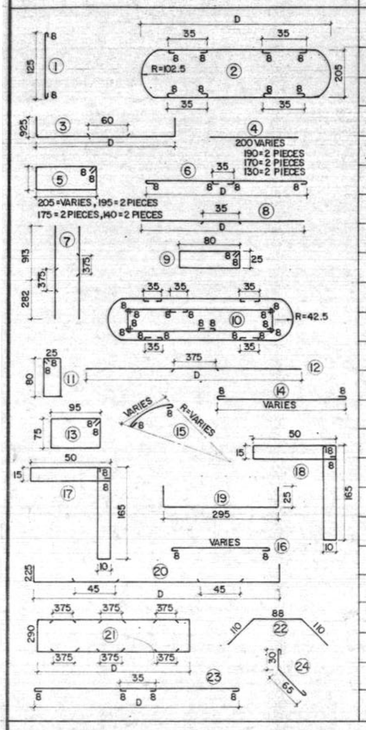
0°-50° SKEW PC. BOX GIRDER BRIDGE

SPREAD AND PILE FOOTING PIER DETAILS

DESIGNED: DOH & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: FOR (DIRECTOR GENERAL)		DWG. NO. 5 BD 20-10-614/4
		SHEET NO. 169

TABLE OF REINFORCEMENT

BAR BENDING DIAGRAMS
CM.



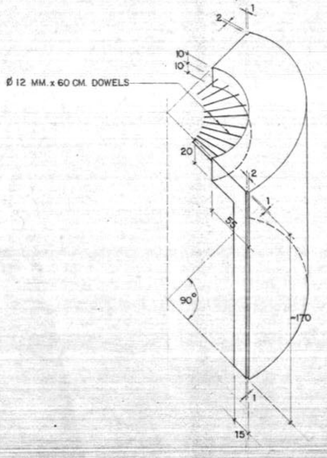
BAR MARK	#	7 - BOX GIRDER				8 - BOX GIRDE				9 - BOX GIRDER				10 - BOX GIRDER				11 - BOX GIRDER				12 - BOX GIRDER				13 - BOX GIRDER				14 - BOX GIRDER				15 - BOX GIRDER				16 - BOX GIRDER			
		NO	D	L	TOTAL LENGTH	NO	D	L	TOTAL LENGTH	NO	D	L	TOTAL LENGTH	NO	D	L	TOTAL LENGTH	NO	D	L	TOTAL LENGTH	NO	D	L	TOTAL LENGTH	NO	D	L	TOTAL LENGTH	NO	D	L	TOTAL LENGTH	NO	D	L	TOTAL LENGTH	NO	D	L	TOTAL LENGTH
1	3	@30	–	141	3,807	@30	–	141	4,230	@30	–	141	4,794	@30	–	141	5,217	@30	–	141	5,640	@30	–	141	6,073	@30	–	141	6,637	@30	–	141	7,060	@30	–	141	7,483	@30	–	141	8,047
2	3	@20	845	2,188	10,940	@20	945	2,388	11,940	@20	1,045	2,588	12,940	@20	1,145	2,788	13,940	@20	1,255	2,998	14,990	@20	1,365	3,218	16,090	@20	1,475	3,438	17,190	@20	1,585	3,658	18,290	@20	1,695	3,878	19,390	@20	1,805	4,098	20,490
3	8	11	845	1,090	11,990	11	945	1,190	13,090	11	1,045	1,290	14,190	11	1,145	1,390	15,290	11	1,255	1,500	16,500	11	1,365	1,610	17,710	11	1,475	1,720	18,920	11	1,585	1,830	20,130	11	1,695	1,940	21,340	11	1,805	2,050	22,550
4	8	44	–	200	8,800	49	–	200	9,800	54	–	200	10,800	59	–	200	11,800	64	–	200	12,800	69	–	200	13,800	74	–	200	14,800	79	–	200	15,800	84	–	200	16,800	89	–	200	17,800
5	3	44	–	611	26,884	49	–	611	29,939	54	–	611	32,994	59	–	611	36,094	64	–	611	39,104	69	–	611	42,159	74	–	611	45,214	79	–	611	48,269	84	–	611	55,324	89	–	611	58,379
6	3	3	845	904	2,712	3	945	1,004	3,012	3	1,045	1,104	3,135	3	1,145	1,204	3,612	3	1,255	1,314	3,942	3	1,365	1,424	4,272	3	1,475	1,534	4,602	3	1,585	1,644	4,932	3	1,695	1,754	5,262	3	1,805	1,864	5,592
7	5	148	–	1,232.5	182,410	172	–	1,232.5	211,990	196	–	1,232.5	241,570	220	–	1,232.5	271,150	244	–	1,232.5	300,730	268	–	1,232.5	330,310	292	–	1,232.5	359,850	316	–	1,232.5	389,470	340	–	1,232.5	419,050	364	–	1,232.5	448,630
8	5	12	845	882.5	10,590	12	945	982.5	11,790	12	1,054	1,082.5	12,990	12	1,145	1,182.5	14,190	12	1,255	1,292.5	15,510	12	1,365	1,402.5	16,830	12	1,475	1,512.5	18,150	12	1,585	1,622.5	19,470	12	1,695	1,732.5	20,790	12	1,805	1,842.5	22,110
9	3	58	–	226	13,108	68	–	226	15,368	78	–	226	17,268	88	–	226	19,889	98	–	226	22,148	108	–	226	24,408	118	–	226	26,668	128	–	226	28,928	138	–	226	31,188	148	–	226	33,448
10	3	37	825	3,394	125,578	37	925	3,794	141,000	37	1,025	4,194	154,900	37	1,125	4,594	170,000	37	1,235	4,994	184,998	37	1,345	5,394	199,800	37	1,455	5,794	214,000	37	1,565	6,194	239,000	37	1,675	6,594	244,800	37	1,785	6,994	258,988
11	3	96	–	226	21,696	96	–	226	21,696	96	–	226	21,696	96	–	226	21,696	128	–	226	28,476	128	–	226	28,476	128	–	226	28,476	160	–	226	36,160	160	–	226	36,160	160	–	226	36,160
12	5	8	735	772.5	6,180	8	835	872.5	6,980	8	935	972.5	7,780	8	1,035	1,072.5	8,580	8	1,145	1,182.5	9,460	8	1,255	1,292.5	10,340	8	1,365	1,402.5	11,220	8	1,475	1,512.5	12,100	8	1,585	1,622.5	12,980	8	1,695	1,732.5	13,860
13	3	40	–	356	14,240	45	–	356	16,020	50	–	356	17,800	55	–	356	19,580	60	–	356	21,360	65	–	356	23,140	70	–	356	24,920	75	–	356	26,700	80	–	356	28,480	85	–	356	30,260
14	3	@30	–	776	4,656	@30	–	876	5,256	@30	–	976	5,856	@30	–	1,076	6,456	@30	–	1,186	7,116	@30	–	1,296	7,776	@30	–	1,406	8,436	@30	–	1,516	9,096	@30	–	1,626	9,756	@30	–	1,736	10,416
15	3	88	–	–	16,072	88	–	–	16,072	88	–	–	16,072	88	–	–	16,072	88	–	–	16,072	88	–	–	16,072	88	–	–	16,072	88	–	–	16,072	88	–	–	16,072	88	–	–	16,072
16	3	176	–	171	30,096	176	–	196	34,496	220	–	179	39,380	220	–	199	43,780	264	–	196	49,104	264	–	204	53,856	308	–	192	59,136	308	–	208	64,064	352	–	197	69,344	352	–	211	74,272
17	3	40	–	471	18,840	40	–	471	18,840	40	–	471	18,840	40	–	471	18,840	40	–	471	18,840	40	–	471	18,840	40	–	471	18,840	40	–	471	18,840	40	–	471	18,840	40	–	471	18,840
18	3	@20	–	471	33,912	@20	–	471	38,622	@20	–	471	43,332	@20	–	471	48,984	@20	–	471	54,636	@20	–	471	60,288	@20	–	471	64,998	@20	–	471	71,592	@20	–	471	78,186	@20	–	471	82,896
19	8	40	–	345	13,800	44	–	345	15,180	48	–	345	16,560	52	–	345	17,940	56	–	345	19,320	60	–	345	20,700	64	–	345	22,080	68	–	345	23,460	72	–	345	24,840	76	–	345	26,220
20	6	16	930	1,065	17,040	16	1,030	1,165	18,640	16	1,130	1,265	20,240	16	1,230	1,365	21,840	16	1,340	1,475	23,600	16	1,450	1,585	25,360	16	1,560	1,695	27,120	16	1,670	1,805	28,880	16	1,780	1,915	30,640	16	1,890	2,025	32,400
21	5	1	930	2,680	2,680	1	1,030	2,880	2,880	1	1,130	3,080	3,080	1	1,230	3,280	3,280	1	1,340	3,500	3,500	1	1,450	3,840	3,840	1	1,560	4,214	4,214	1	1,670	4,434	4,434	1	1,780	4,664	4,664	1	1,890	4,894	4,894
22	5	17	–	293	4,981	19	–	293	5,567	21	–	293	6,153	23	–	293	6,739	25	–	293	7,325	27	–	293	7,911	29	–	293	8,497	31	–	293	9,083	33	–	293	9,669	35	–	293	10,255
23	3	1	930	985	985	1	1,030	1,085	1,085	1	1,130	1,195	1,195	1	1,230	1,305	1,305	1	1,340	1,415	1,415	1	1,450	1,525	1,525	1	1,560	1,635	1,635	1	1,670	1,745	1,745	1	1,780	1,855	1,855	1	1,890	1,965	1,965
24	3	28	–	111	3,108	34	–	111	3,774	40	–	111	4,440	46	–	111	5,106	52	–	111	5,772	58	–	111	6,438	64	–	111	7,104	70	–	111	7,770	76	–	111	8,436	82	–	111	9,102

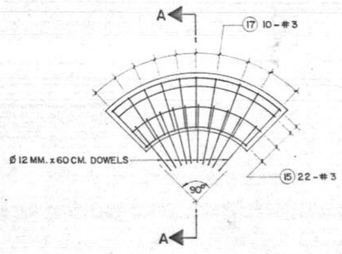
3 = Ø 3/8" OR 9 MM., # 5 = Ø 5/8" OR 16 MM., # 6 = Ø 3/4" OR 20 MM., # 8 = Ø 1" OR 25 MM. NO = TOTAL AMOUNT OF BARS, L = TOTAL LENGTH OF EACH BAR.

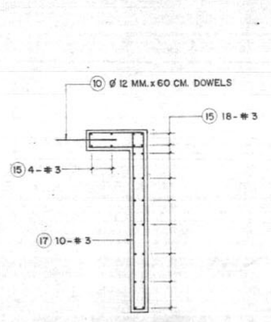
NUMBER OF BOX GIRDER	D CM.	D_1 CM.	D_7 CM.	D_2 CM.	PILE FOOTING														SPREAD FOOTING	
					NUMBER OF PILES									SKEW 0°-30°	SKEW 30°-50°	PILE HEAD SPACING C-C 0°-30° SKEW		PILE HEAD SPACING C-C 30°-50° SKEW		HALF LENGTH OF FOOTING D_5 CM.	WIDTH OF FOOTING D_6 CM.
					P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9			D_3	D_4	D_3	D_4		
7	740 Sec θ	206 Sec θ	20 Sec θ	104 Sec θ	4	4	4	4	–	–	–	–	2	16	18	94 Sec θ	85 Sec θ	80 Sec θ	80 Sec θ	320 Sec θ + 150	300
8	840 Sec θ	240 Sec θ	20 Sec θ	–	4	4	4	4	–	–	–	–	2	16	18	110 Sec θ	95 Sec θ	98 Sec θ	76 Sec θ	370 Sec θ + 150	300
9	940 Sec θ	273 Sec θ	20 Sec θ	137 Sec θ	4	4	4	4	4	–	–	–	2	18	20	110 Sec θ	90 Sec θ	98 Sec θ	77 Sec θ	420 Sec θ + 150	300
10	1,040 Sec θ	306 Sec θ	20 Sec θ	154 Sec θ	4	4	4	4	4	–	–	–	2	20	22	110 Sec θ	85 Sec θ	98 Sec θ	78 Sec θ	470 Sec θ + 150	300
11	1,150 Sec θ	257.5 Sec θ	25 Sec θ	–	4	4	4	4	4	4	–	–	2	22	24	110 Sec θ	85 Sec θ	100 Sec θ	75 Sec θ	525 Sec θ + 150	300
12	1,260 Sec θ	285 Sec θ	30 Sec θ	–	4	4	4	4	4	4	–	–	2	24	26	110 Sec θ	85 Sec θ	100 Sec θ	80 Sec θ	580 Sec θ + 150	300
13	1,370 Sec θ	312.5 Sec θ	35 Sec θ	–	4	4	4	4	4	4	4	–	2	26	28	110 Sec θ	85 Sec θ	101 Sec θ	80 Sec θ	635 Sec θ + 150	300
14	1,480 Sec θ	272 Sec θ	40 Sec θ	–	4	4	4	4	4	4	4	–	2	28	30	110 Sec θ	85 Sec θ	102 Sec θ	78 Sec θ	690 Sec θ + 150	300
15	1,590 Sec θ	294 Sec θ	45 Sec θ	–	4	4	4	4	4	4	4	4	2	30	32	110 Sec θ	85 Sec θ	103 Sec θ	75 Sec θ	745 Sec θ + 150	300
16	1,700 Sec θ	316 Sec θ	50 Sec θ	–	4	4	4	4	4	4	4	4	2	32	34	110 Sec θ	85 Sec θ	103 Sec θ	79 Sec θ	800 Sec θ + 150	300

TABLE OF Sec θ

	SKEW ANGLE (θ)										
	0°	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°
Sec θ	1.0000	1.0038	1.0154	1.0353	1.0642	1.1034	1.1547	1.2208	1.3054	1.4142	1.5557

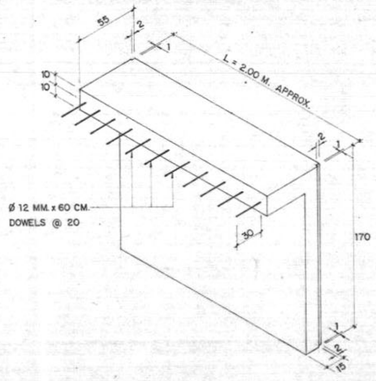




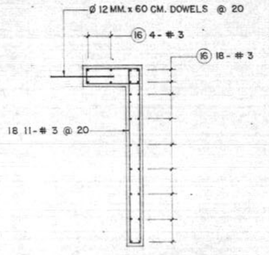


SECTION A – A

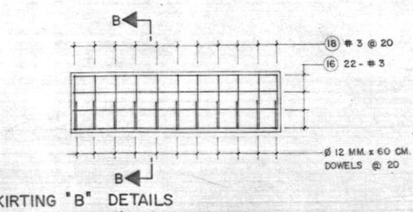
PRECAST SKIRTING "A" DETAILS
SCALE 1:30

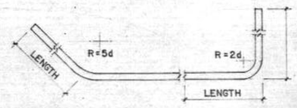


PRECAST SKIRTING "B" DETAILS
SCALE 1:30

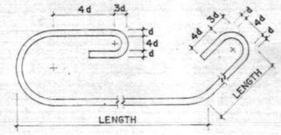


SECTION B – B

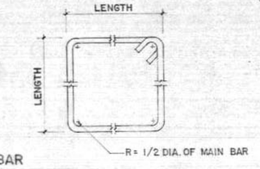




DEFORMED BAR



PLAIN BAR



BAR BENDING DETAILS
NOT TO SCALE

NOTES :

1. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KM./CM.^{2} FOR .15 x .15 x .15 CUBE AT 28 DAYS. AN APPROXIMATE DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

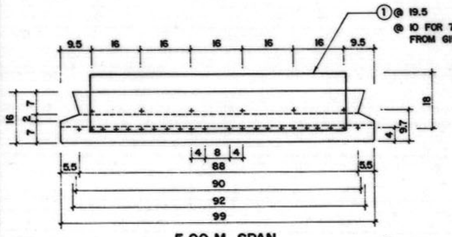
PORTLAND CEMENT, MIN.	350	KG.
SAND	0.43	M.^{3}
CRUSHED ROCK OR GRAVEL	0.86	M.^{3}
CONCRETE SLUMP, MAX.	10	CM.

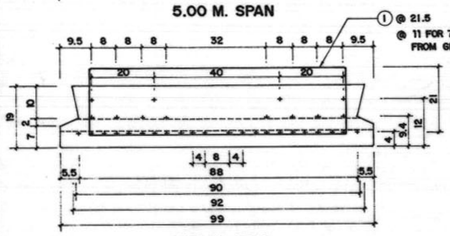
2. CLEAR CONCRETE COVER SHALL BE 2.5 CM.
3. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED FOR THE CAP BEAM WITHOUT ALTERING THE LOCATION OF REBARS.
4. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR24 PLAIN BARS UNLESS OTHERWISE INDICATED.
5. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
6. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
7. ALL MATERIALS SHALL BE USED UNDER THE APPROVAL OF THE ENGINEER FOR ELASTOMERIC PADS, CONTRACTOR SHALL SUBMIT A CERTIFICATE FROM THE MANUFACTURER SHOWING THAT TYEY WILL PERFORM IN ACCORDANCE WITH SPECIFICATIONS.
8. PILES SHALL BE LOCATED BY STARTING FROM PILE NO. P9 AT THE CENTERLINE OF THE PIER AND THE PILE SPACINGS D3 AND D4 SHALL BE MEASURED FROM THIS PILE ORDER TO LOCATE PILE NOS P8 – P1 RESPECTIVELY. IF THERE IS NO PILE NO P9 AT THE CENTERLINE OF THE PIER, THE FIRST PILE SPACING D3 ADJACENT TO THE CENTERLINE OF THE PIER SHALL BE SUBSTITUTED BY D3/2.
9. FOR PIERS WITH SKEW ANGLES OF 0°-30°, ALL PILES UNDER MARK (#) SHALL BE OMITTED AND PILES UNDER MARK (#) SHALL BE ADDED ON WHEREVER THOSE MARKS APPEAR.
10. FOR PIERS WITH SKEW ANGLES OF 30-50, ALL PILES UNDER MARK (##) SHALL BE OMITTED.
11. FOR PILE DETAILS SEE DWG. NO. 3R/1 OR 3P/1
12. IN CASE OF NON-SKEW BRIDGE, BEARING UNDER 10.0 M. SPAN SLAB BRIDGE SHALL BE CONSTANTLY 22 CM. WIDE.
13. LENGTH AND AMOUNT OF REINF. SHOWN IN THE TABLE MAY VARY ACCORDING TO PIER SHAPE BUT SPACING SHALL BE AS SHOWN ON THE DWGS.
14. REBARS FOR PILE FOOTING PIER ARE BAR MARK NO. 1-18.
15. REBARS FOR SPREAD FOOTING PIER ARE BAR MARK NO. S7-13 AND BAR MARK NO. S19-24.
16. QUANTITIES OF REBARS SHOWN IN THE TABLE ARE BASED ON THE TOTAL PIER HEIGHT OF 12.0 M. AS SHOWN ON DWG. NO. 5BD20-10-614/4 FOR PILE FOOTING PIERS. THESE QUANTITIES DO NOT INCLUDE REBARS IN THE PILES.
17. WORK THIS DRAWING WITH DWG. NO. 5BD20-10-614/4.
18. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.

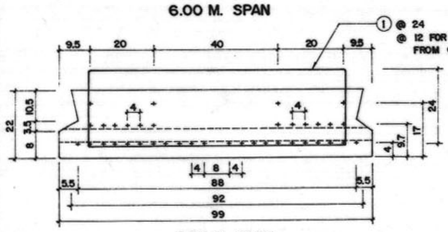
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

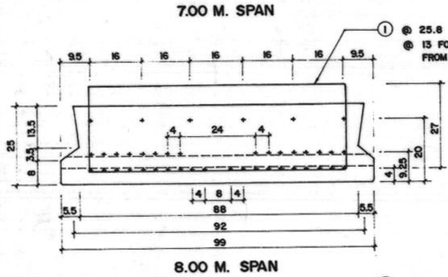
STANDARD DRAWING
0°-50° SKEW PC. BOX GIRDER BRIDGE
20.00 M. SPAN
PIER REINFORCING AND SKIRTING DETAILS

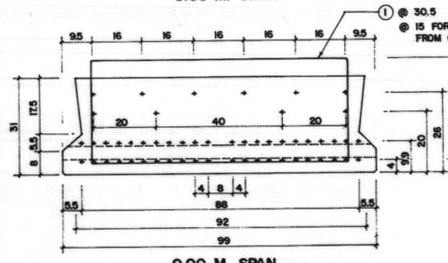
DESIGNED: DOH & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: (DIRECTOR GENERAL)		DWG. NO. 5BD20-10-614/5
		SHEET NO. 170

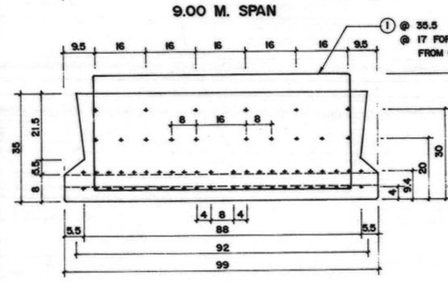




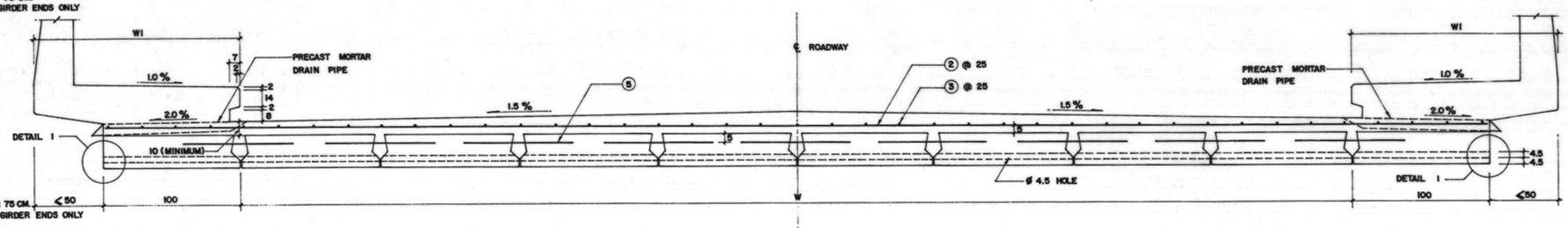




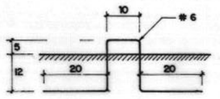




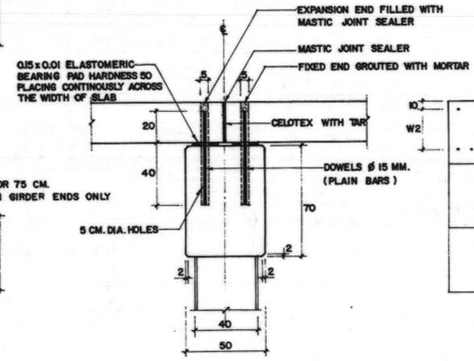
GIRDER CROSS SECTIONS
SCALE 1:10



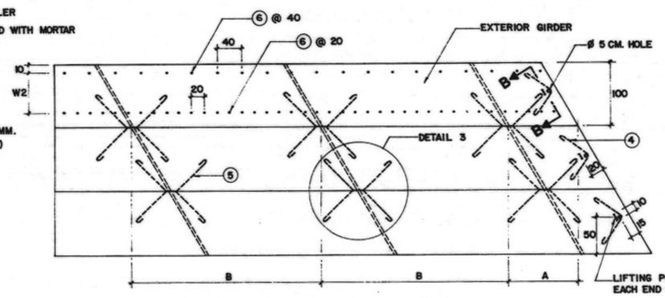
TRANSVERSE SECTION
SCALE 1:20



SECTION B – B
SCALE 1:10
(SHOWN DETAIL OF LIFTING HOOK)

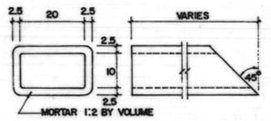


CAP BEAM DETAIL
SCALE 1:20

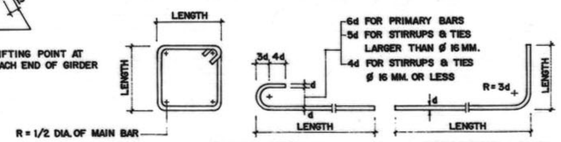


GIRDER ARRANGEMENT DETAIL
SCALE 1:50

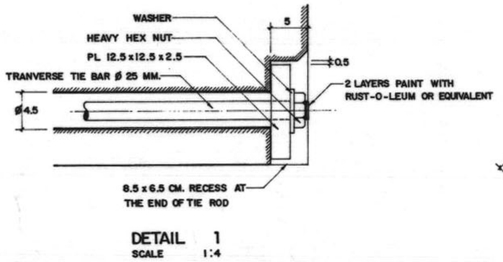
DRAIN PIPE LOCATIONS
SCALE 1:50



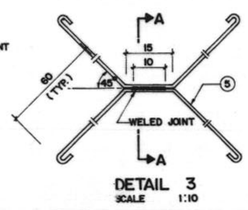
PRECAST MORTAR DRAIN PIPE
SCALE 1:10



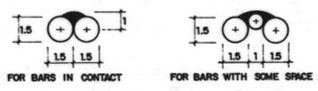
BAR BENDING DETAILS
NOT TO SCALE



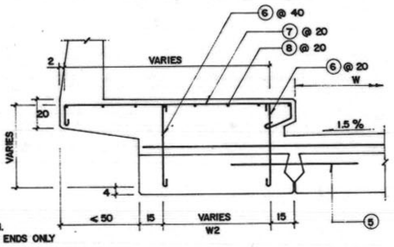
DETAIL 1
SCALE 1:4

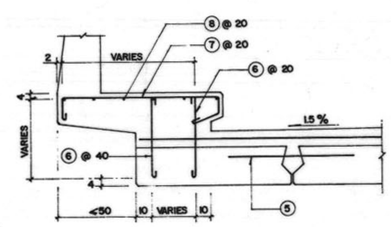


DETAIL 3
SCALE 1:10



SECTION A – A
SCALE 1:2

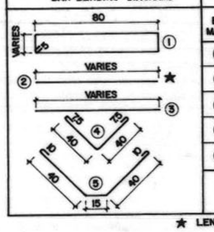




SIDEWALK DETAILS
SCALE 1:20

TABLE OF BRIDGE REINFORCEMENT (PER 1.0 M. WIDTH, 0° SKEW)

BAR BENDING DIAGRAMS



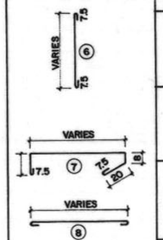
BAR MARK	SPAN 5.00 M. ⌀	NO	LENGTH CM.	TOTAL LENGTH CM.	SPAN 6.00 M. ⌀	NO.	LENGTH CM.	TOTAL LENGTH CM.	SPAN 7.00 M. ⌀	NO.	LENGTH CM.	TOTAL LENGTH CM.	SPAN 8.00 M. ⌀	NO.	LENGTH CM.	TOTAL LENGTH CM.	SPAN 9.00 M. ⌀	NO.	LENGTH CM.	TOTAL LENGTH CM.	SPAN 10.00 M. ⌀	NO.	LENGTH CM.	TOTAL LENGTH CM.
①	RB 2	34	211	7174	RB 2	36	217	7812	RB 2	35	223	7802	RB 2	37	229	8473	RB 2	36	241	8676	RB 2	34	249	8466
②	RB 3	20	100	2000	RB 3	24	100	2400	RB 3	28	100	2800	RB 3	32	100	3200	RB 3	36	100	3600	RB 3	40	100	4000
③	RB 3	4	500	2000	RB 3	4	600	2400	RB 3	4	700	2800	RB 3	4	800	3200	RB 3	4	900	3600	RB 3	4	1000	4000
④	DB 4	4	100	400	DB 4	4	100	400	DB 4	4	100	400	DB 4	4	100	400	DB 4	4	100	400	DB 4	4	100	400
⑤	DB 5	4	172.5	690	DB 5	6	172.5	1035	DB 5	6	172.5	1035	DB 5	6	172.5	1035	DB 5	6	172.5	1035	DB 5	8	172.5	1038

RB = ROUND BARS
DB = DEFORMED BARS
⌀2 = Ø 1/4" OR 6 MM.
⌀4 = Ø 1/2" OR 12 MM.
⌀3 = Ø 3/8" OR 9 MM.
⌀5 = Ø 5/8" OR 16 MM.
NO. = TOTAL AMOUNT OF BARS
L = TOTAL LENGTH OF EACH BAR

★ LENGTH OF BAR MARK ② FOLLOWS THE WIDTH OF BRIDGE DECK.

TABLE OF SIDEWALK REINFORCEMENT (0° SKEW)

BAR BENDING DIAGRAMS



SIDEWALK WIDTH CM.	BAR MARK	SPAN ⌀	5.00 M. NO.	LENGTH CM.	TOTAL LENGTH	6.00 M. NO.	LENGTH CM.	TOTAL LENGTH CM.	7.00 M. NO.	LENGTH CM.	TOTAL LENGTH CM.	8.00 M. NO.	LENGTH CM.	TOTAL LENGTH CM.	9.00 M. NO.	LENGTH CM.	TOTAL LENGTH CM.	10.00 M. NO.	LENGTH CM.	TOTAL LENGTH CM.
40	⑥	DB 4	37	62.5	2312.5	45	65.5	2947.5	53	68.5	3630.5	60	71.5	4290	68	77.5	5270	75	81.5	6112.5
	⑦	RB 3	25	90.6	2265	30	90.6	2718	35	90.6	3171	40	90.6	3264	45	90.6	4077	50	90.6	4530
	⑧	RB 3	3	500	1500	3	600	1800	3	700	2100	3	800	2400	3	900	2700	3	1000	3000
100	⑥	DB 4	37	62.5	2312.5	45	65.5	2947.5	53	68.5	3630.5	60	71.5	4290	68	77.5	5270	75	81.5	6112.5
	⑦	RB 3	25	150.6	3760	30	150.6	4518	35	150.6	5271	40	150.6	6024	45	150.6	6777	50	150.6	7530
	⑧	RB 3	5	500	2500	5	600	3000	5	700	3500	5	800	4000	5	900	4500	5	1000	5000
150	⑥	DB 4	37	62.5	2312.5	45	65.5	2947.5	53	68.5	3630.5	60	71.5	4290	68	77.5	5270	75	81.5	6112.5
	⑦	RB 3	25	200.6	5015	30	200.6	6018	35	200.6	7021	40	200.6	8024	45	200.6	9027	50	200.6	10030
	⑧	RB 3	8	500	4000	8	600	4800	8	700	5600	8	800	6400	8	900	7200	8	1000	8000

RB = ROUND BARS
DB = DEFORMED BAR
⌀ 3 = Ø 3/8" OR 9 MM.
⌀ 4 = Ø 1/2" OR 12 MM.
NO. = TOTAL AMOUNT OF BARS
L = TOTAL LENGTH OF EACH BAR

TABLE OF SHEAR CONNECTOR

SPAN M.	A M.	B M.	TOTAL AMOUNT FOR ONE GIRDER
5	1	3	4
6	1	2	6
7	1	2.5	6
8	1	3	6
9	1.5	3	6
10	0.5	3	8

NOTES:

1. ALL PRESTRESSING TENDONS ARE Ø 7 MM. STRESS-RELIEVED WIRES HAVING A MINIMUM ULTIMATE STRENGTH OF 16,000 KG/CM^2 AND CONFORM TO TIS 95.
2. INITIAL STRESSES IN PRESTRESSING TENDONS SHALL BE 11,200 KG/CM.^{2}
3. OTHER TYPES OF PRESTRESSING TENDONS MAY BE USED UNDER THE APPROVAL OF THE ENGINEER.
4. TRANSVERSE TIE BARS SHALL BE MADE FROM TIS 24 GRADE SD 30 DEFORMED BARS WITH 2 LAYERS OF RUST PROOF PAINT SUCH AS RUST-O-LIUM OR EQUIVALENT QUALITY PAINT. THREADED ENDS SHALL BE STANDARD THREAD WITH NUTS AND BEARING WASHERS. NUTS SHALL BE TURNED WITH A TORQUE OF 2,000 KG.-CM.
5. MIX DESIGN OF CONCRETE WITH A MINIMUM CEMENT CONTENT OF 350 KG/M.^{3} FOR PRESTRESSED GIRDERS SHALL BE SUBMITTED FOR THE APPROVAL OF THE ENGINEER. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 420 KG/CM^2 FOR A 0.15 x 0.15 x 0.15 M. CUBE AT 28 DAYS. PRESTRESSING TENDONS MAY BE RELEASED WHEN CONCRETE STRENGTH REACHES 80 % OF THE SPECIFIED STRENGTH.
6. REBARS SMALLER THAN ⌀ 3 SHALL BE TIS 20 GRADE SR 24 PLAIN BARS OTHERS SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS UNLESS OTHERWIS INDICATED.
7. ALL MATERIALS SHALL BE USED UNDER THE APPROVAL OF THE ENGINEER.
8. GIRDER SHALL BE LIFTED AT BOTH ENDS ONLY; MIDSPAN LIFTING IS PROHIBITED.
9. THIS TYPE OF GIRDERS MAY BE USED WITH PIERS FOR SLAB BRIDGE HAVING THE SAME SPAN LENGTH.
10. DOWELS FOR HOLDING GIRDERS TO PIERS SHALL BE PROVIDED AT EVERY ALTERNATE GIRDER.
11. CASTING LENGTH OF A GIRDER SHALL BE 1 CM. SHORTER THAN THE SPECIFI SPAN LENGTH.
12. FOR SIDEWALK AND RAILING DETAILS SEE DWG.NO. MS-01.
13. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
14. IF PIER FALL WITHIN THE TRANSITION OF HORIZONTAL CURVE, THE TOP OF CAP BEAM SHALL BE SUPERELEVATED IN ACCORDANCE WITH THE ROADWAY SUPERELEVATION, SO THAT THE GIRDERS SHALL BE ON A SMOOTHED PLANE. ELEVATION OF FINISHED SURFACE SHALL BE ATTAINED BY ADJUSTING THE CONCRETE TOPPING. THIS SHALL BE DONE WITH THE APPROVAL OF THE ENGINEE
15. THIS DRAWING IS ADAPTED FROM DOH DWG.NO. 3APD5-106-14/1e.

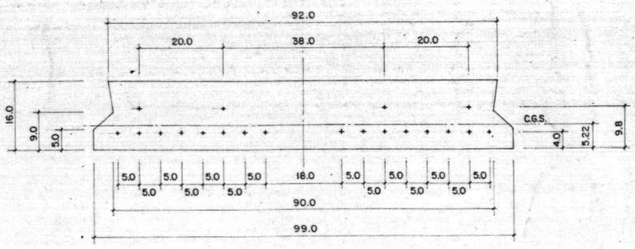
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

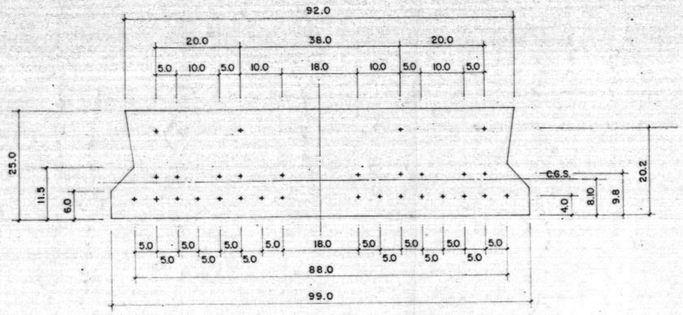
0°-30° SKEW PC. PLANK GIRDER BRIDGE

GIRDER ARRANGEMENT AND DETAILS

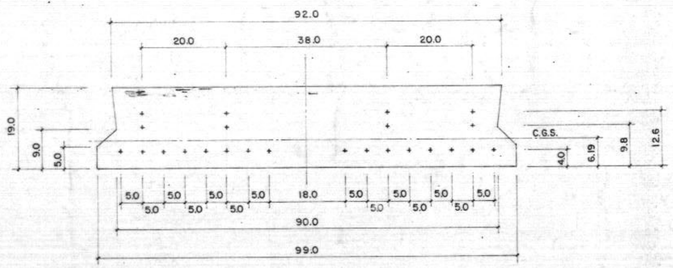
DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 19
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHO
APPROVED : (DIRECTOR GENERAL)		DWG. NO. PT-
		SHEET NO. 171



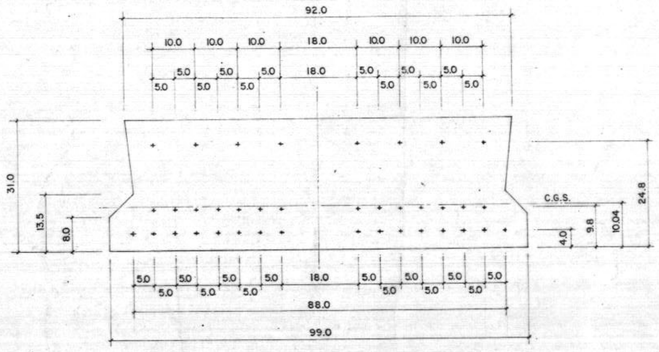
5.00 M. SPAN



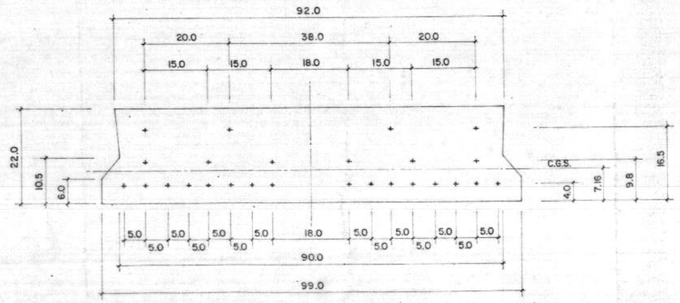
8.00 M. SPAN



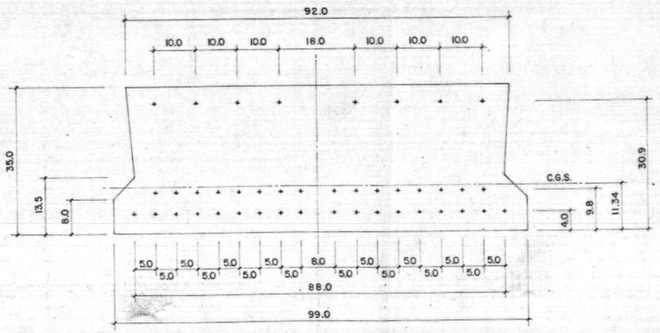
6.00 M. SPAN



9.00 M. SPAN



7.00 M. SPAN



10.00 M. SPAN

TENDON ARRANGEMENTS
SCALE 1: 7.5

NOTES :

1. THIS DRAWING SHALL BE USED IN CONJUNCTION WITH DWG. NO. PT-01 . IT SHOWS ALTERN OF THE PRESTRESSING TENDONS WHEN THE Ø 3/8" STRANDS ARE USED INSTEAD OF THI SHOWN ON DWG.NO. PT-01 .
2. ALL PRESTRESSING TENDONS SHALL BE Ø 3/8" (9.53 MM.) STRESS-RELIEVED. 7-WIRE STRANDS CONFOR TO TIS.420 GRADE 1,725 OR APPROVED EQUAL WITH THE MINIMUM ULTIMATE TENSILE LOAD OF 9,078 KG.
3. THE INITIAL PRESTRESSING FORCE PER TENDON AFTER ANCHORING SHALL BE 6,330 KG. WITH THE CORRESPONDING ELONGATION OF 0.615 CM. PER 1 METER OF TENDON LENGTH. AN ADDITIONAL ELONGATION OF 1.0 CM. SHALL BE PROVIDED TO ALLOW FOR TENDON SLIPPAGE AT ANCHORING .
4. ALL DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
5. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3APD5-106-14/1b .

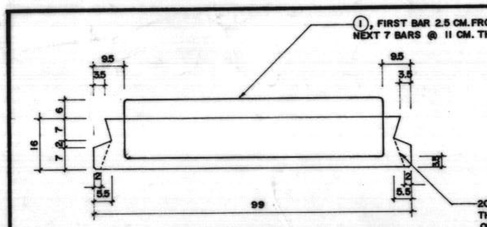
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

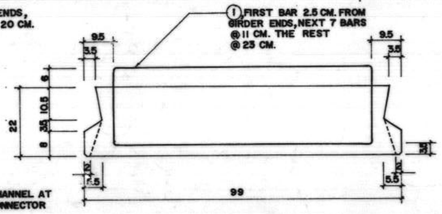
PRESTRESSED CONCRETE PLANK GIRDER

Ø 3/8" WIRE STRAND ARRANGEMENTS

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. PT-02
		SHEET NO. 172



5.00 M. SPAN



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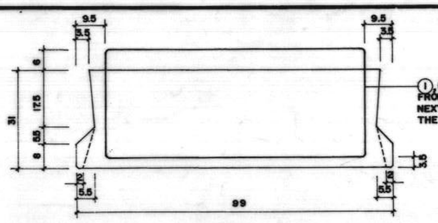

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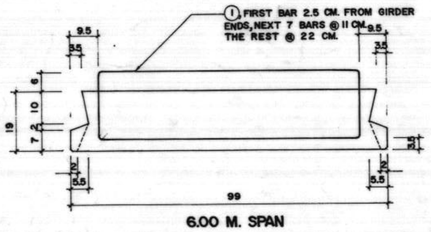

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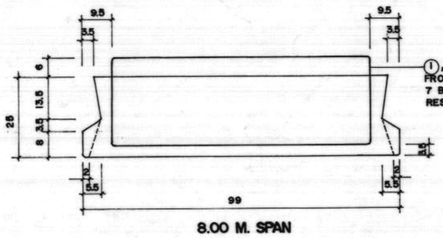

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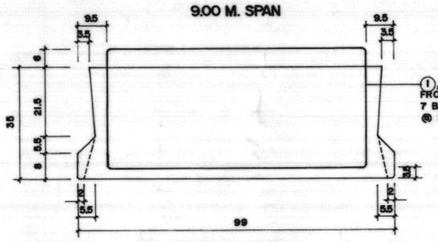


10.00 M. SPAN

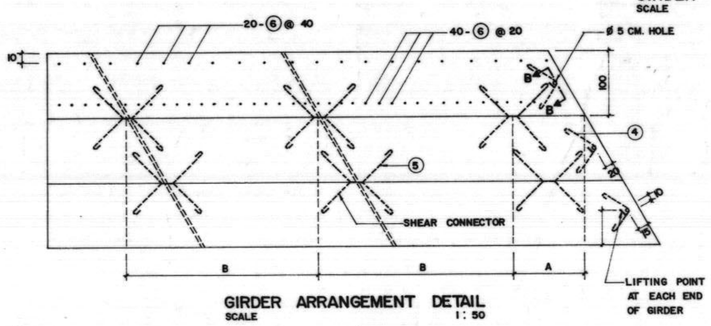
GIRDER CROSS SECTIONS
SCALE 1:10

BAR BENDING DIAGRAMS	BAR MARK	#	SPAN 5.00 M.			SPAN 6.00 M.			SPAN 7.00 M.			SPAN 8.00 M.			SPAN 9.00 M.			SPAN 10.00 M.		
			NO	LENGTH CM.	TOTAL LENGTH CM.	NO	LENGTH CM.	TOTAL LENGTH CM.	NO	LENGTH CM.	TOTAL LENGTH CM.	NO	LENGTH CM.	TOTAL LENGTH CM.	NO	LENGTH CM.	TOTAL LENGTH CM.	NO	LENGTH CM.	TOTAL LENGTH CM.
VARIES: ① 80; ② 100; ③ VARIES; ④ 25 40 25 40 25; ⑤ 7.5 40 60 40 7.5; 15	①	RB2	32	211	6752	36	217	7812	36	223	8474	40	229	9160	40	241	9640	40	249	9960
	②	RB3	20	100	2000	24	100	2400	28	100	2800	32	100	3200	36	100	3600	40	100	4000
	③	RB 3	4	500	2000	4	600	2400	4	700	2800	4	800	3200	4	900	3600	4	1000	4000
	④	DB 4	4	100	400	4	100	400	4	100	400	4	100	400	4	100	400	4	100	400
	⑤	DB 5	12	172.5	2070	16	172.5	2760	16	172.5	2760	20	172.5	3450	24	172.5	4130	24	172.5	4130

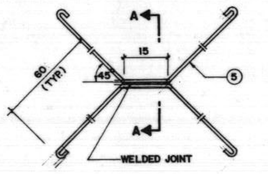
RB = ROUND BARS DB = DEFORMED BARS # 2 = Ø 1/4" OR Ø 6 MM., # 4 = Ø 1/2" OR Ø 12 MM., # 5 = Ø 5/8" OR Ø 16 MM. NO = TOTAL AMOUNT OF BARS L = TOTAL LENGTH OF EACH BAR

BAR BENDING DIAGRAMS	SIDE WALK WIDTH CM.	BAR MARK	#	SPAN 5.00 M.			SPAN 6.00 M.			SPAN 7.00 M.			SPAN 8.00 M.			SPAN 9.00 M.			SPAN 10.00 M.		
				NO	L CM.	TOTAL LENGTH CM.	NO	L CM.	TOTAL LENGTH CM.	NO	L CM.	TOTAL LENGTH CM.	NO	L CM.	TOTAL LENGTH CM.	NO	L CM.	TOTAL LENGTH CM.	NO	L CM.	TOTAL LENGTH CM.
VARIES: ⑥ 7.5 VARIES 7.5; ⑦ 12.5 7.5 40 8; VARIES ⑧ 7.5 7.5	40	⑥	DB 4	37	62.5	2312.5	45	65.5	2947.5	53	68.5	3630.5	60	71.5	4290.0	68	77.5	5270.0	75	81.5	6112.5
		⑦	RB 3	25	90.6	2265.0	30	90.6	2718.0	35	90.6	3171.0	40	90.6	3624.0	45	90.6	4077.0	50	90.6	4530.0
		⑧	RB 3	3	500	1500	3	600	1800	3	700	2100	3	800	2400	3	900	2700	3	1000	3000
	100	⑥	DB 4	37	62.5	2312.5	45	65.5	2947.5	53	68.5	3630.5	60	71.5	4290	68	77.5	5270	75	81.5	6112.5
		⑦	RB 3	25	150.6	3765	30	150.6	4518	35	150.6	5271	40	150.6	6024	45	150.6	6777	50	150.6	7530
		⑧	RB 3	5	500	2500	5	600	3000	5	700	3500	5	800	4000	5	900	4500	5	1000	5000
	150	⑥	DB 4	37	62.5	2312.5	45	65.5	2947.5	53	68.5	3630.5	60	71.5	4290	68	77.5	5270	75	81.5	6112.5
		⑦	RB 3	25	200.6	5015	30	200.6	6018	35	200.6	7021	40	200.6	8024	45	200.6	9027	50	200.6	10030
		⑧	RB 3	8	500	4000	8	600	4800	8	700	5600	8	800	6400	8	900	7200	8	1000	8000

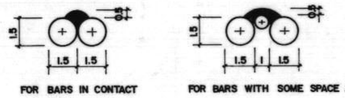
RB = ROUND BARS # 3 = Ø 3/8" OR Ø 9 MM. # 4 = Ø 1/2" OR Ø 12 MM. NO = TOTAL AMOUNT OF BARS L = TOTAL LENGTH OF EACH BARS



GIRDER ARRANGEMENT DETAIL
SCALE 1:50



SHEAR CONNECTOR DETAIL
SCALE 1:50

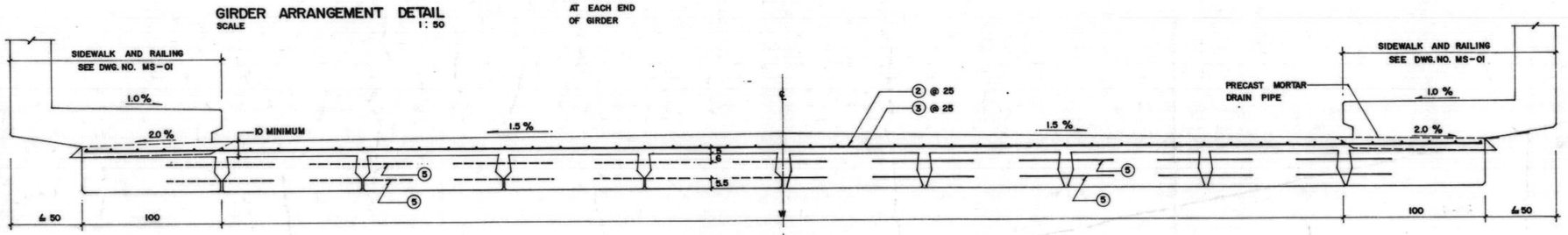


SECTION A – A
SCALE 1:2

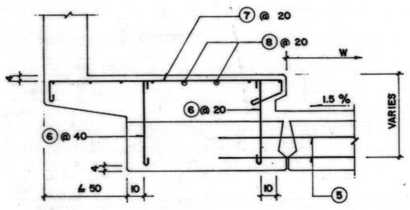
TABLE OF SHEAR CONNECTOR			
SPAN (M)	TOTAL AMOUNT FOR ONE GIRDER	A (CM)	B (CM)
5	12	70	179.50
6	16	70	153.00
7	16	70	186.36
8	20	70	164.75
9	24	50	159.80
10	24	50	178.00

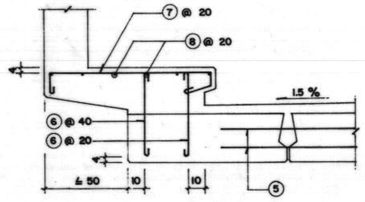
NOTES :

1. WORK THIS DRAWING WITH DWG. NO. PT-04
2. CASTING LENGTH OF A GIRDER SHALL BE 1 CM. SHORTER THAN THE SPAN LENGTH.
3. UNLESS OTHERWISE APPROVED, CEMENT USED IN THE CONCRETE MIX SHALL BE PORTLAND CEMENT TYPE I CONFORMING TO TIS 15.
4. MIX DESIGN OF CONCRETE FOR PRESTRESSED GIRDERS, BRIDGE TOPPING, SIDEWALK AND RAILING SHALL BE SUBMITTED FOR THE APPROVAL OF THE ENGINEER. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG/M. AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH FOR A .15 x .15 x .15 M. CUBE AT 28 DAYS AS FOLLOWS :-
   A) FOR PRESTRESSED GIRDER 420 KG/CM.^{2}
   B) FOR BRIDGE TOPPING 300 KG/CM.^{2}
   C) FOR SIDEWALK AND RAILING 210 KG/CM.^{2}
5. PRESTRESSING TENDONS MAY BE RELEASED AFTER CONCRETE HAS ATTAINED A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 340 KG/CM.^{2} FOR THE STANDARD CUBE.
6. REBARS SMALLER THAN # 3 SHALL BE TIS 20 GRADE SR 24 PLAIN ROUND BARS, OTHERS SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS UNLESS OTHERWISE INDICATED.
7. ALL MATERIALS SHALL BE USED UNDER THE APPROVAL OF THE ENGINEER.
8. GIRDER SHALL BE LIFTED AT BOTH ENDS ; MIDSPAN LIFTING IS PROHIBITED.
9. THIS TYPE OF GIRDERS MAY BE USES WITH PIERS FOR SLAB BRIDGE HAVING THE SAME SPAN LENGTH.
10. DOWELS FOR HOLDING GIRDERS TO PIERS SHALL BE PROVIDED AT EVERY ALTERNATE GIRDER.
11. TOP AND BOTTOM SHEAR CONNECTORS SHALL BE WELDED SIMULTANEOUSLY.
12. TIGHTENING OF THE NEXT ADJACENT GIRDER TO THE PREVIOUS ONE SHALL BE DONE IN SUCCESSION.
13. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
14. IF PIERS FALL WITHIN THE TRANSITION OF HORIZONTAL CURVE, THE TOP OF CAP BEAM SHALL BE SUPERELEVATED IN ACCORDANCE WITH THE ROADWAY SUPERELEVATION SO THAT THE GIRDERS SHALL BE ON A SMOOTH PLANE. ELEVATION OF FINISHED SURFACE SHALL BE ATTAINED BY ADJUSTING THE CONCRETE TOPPING. THIS SHALL BE DONE WITH THE APPROVAL OF THE ENGINEER.
15. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3 APD 5 – 106 – 14 / 1C.

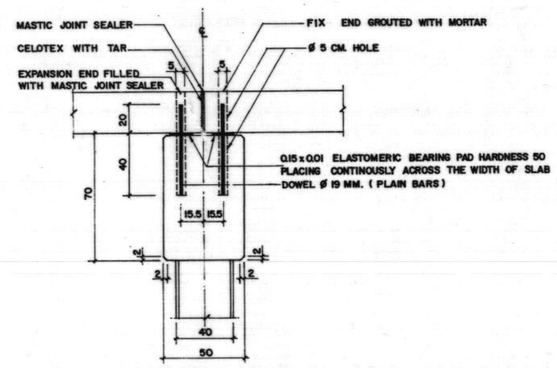


TRANSVERSE SECTION
SCALE 1:20

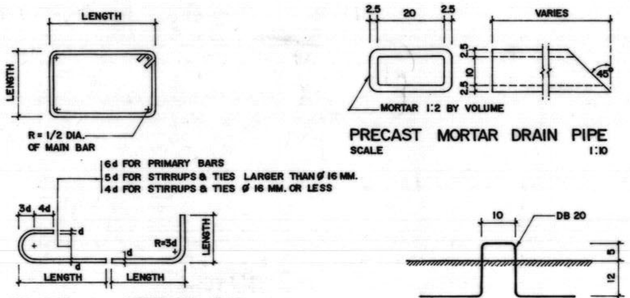




SIDEWALK DETAILS
SCALE 1:20

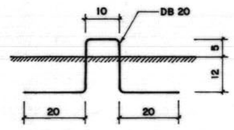


CAP BEAM DETAIL
SCALE 1:20

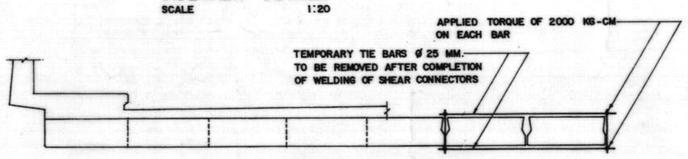


BAR BENDING DETAILS
NOT TO SCALE

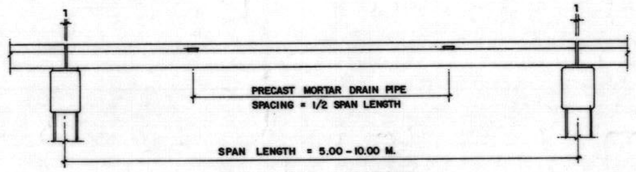
PRECAST MORTAR DRAIN PIPE
SCALE 1:10



SECTION B – B
SCALE 1:10
(SHOWN DETAIL OF LIFTING HOOK)



GIRDER ERECTION DIAGRAM
SCALE 1:40



DRAIN PIPE LOCATIONS
SCALE 1:50

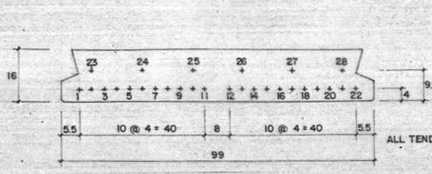
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

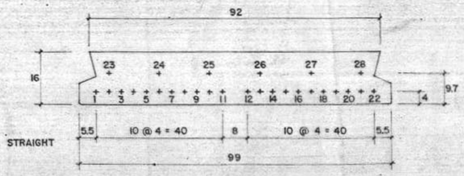
0° – 30° SKEW PC. GIRDER BRIDGE

GIRDER ARRANGEMENT AND DETAILS

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Buripan (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. PT-03
		SHEET NO. 173



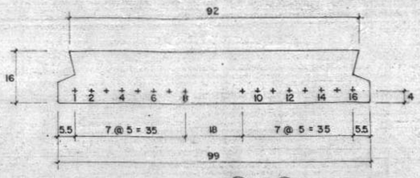
SECTION ② – ②



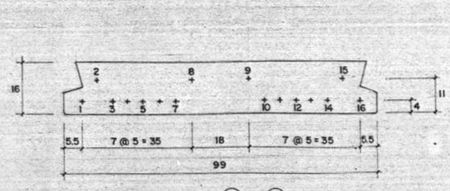
ALL TENDONS ARE STRAIGHT

SECTION ① – ①

5.00 M. SPAN

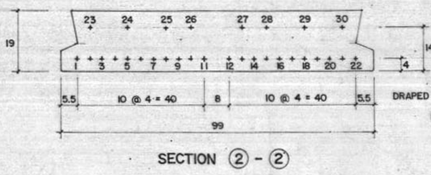


SECTION ① – ①

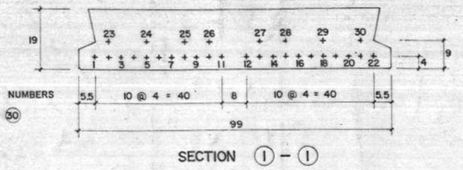


SECTION ② – ②

5.00 M. SPAN



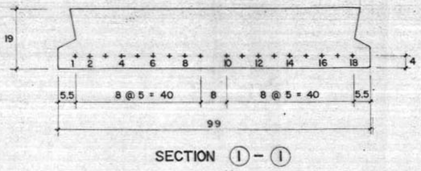
SECTION ② – ②



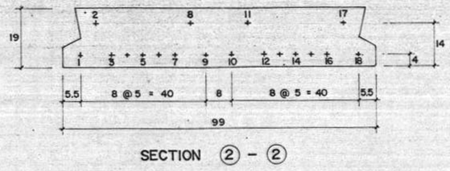
DRAPED TENDON NUMBERS (23) TO (30)

SECTION ① – ①

6.00 M. SPAN

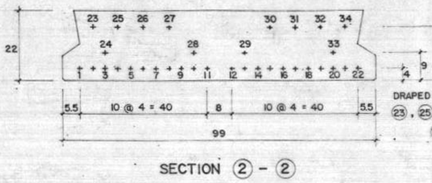


SECTION ① – ①

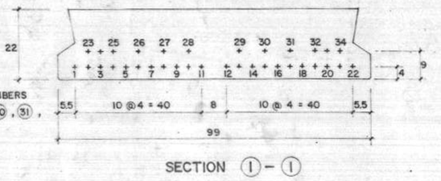


SECTION ② – ②

6.00 M. SPAN



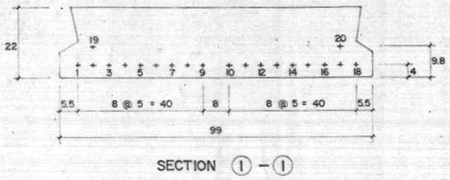
SECTION ② – ②



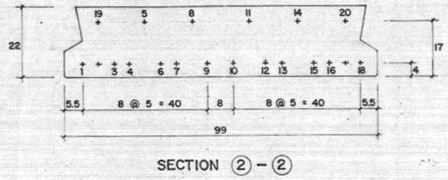
DRAPED TENDON NUMBERS (23), (25), (26), (27), (30), (31), (32) AND (34)

SECTION ① – ①

7.00 M. SPAN

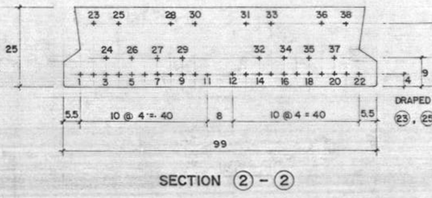


SECTION ① – ①

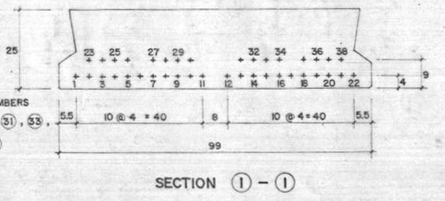


SECTION ② – ②

7.00 M. SPAN



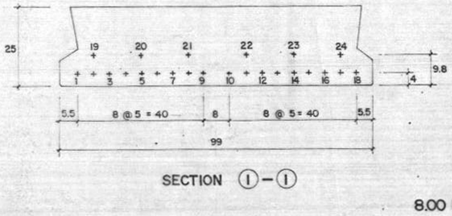
SECTION ② – ②



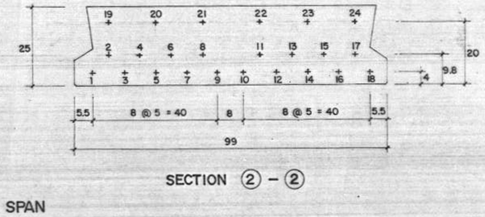
DRAPED TENDON NUMBERS (23), (25), (28), (30), (31), (33), (36) AND (38)

SECTION ① – ①

8.00 M. SPAN

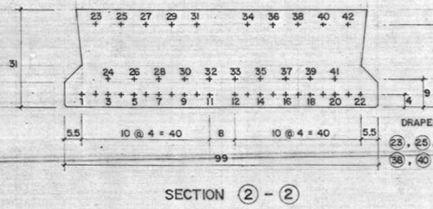


SECTION ① – ①

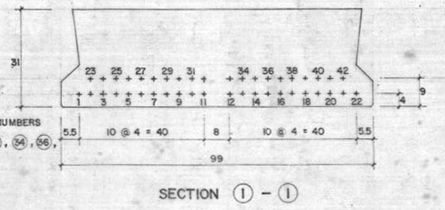


SECTION ② – ②

8.00 M. SPAN



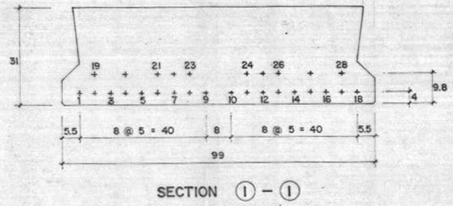
SECTION ② – ②



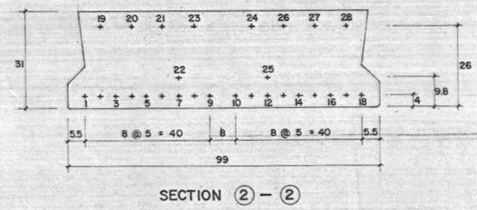
DRAPED TENDON NUMBERS (23), (25), (27), (29), (31), (34), (36), (38), (40) AND (42)

SECTION ① – ①

9.00 M. SPAN

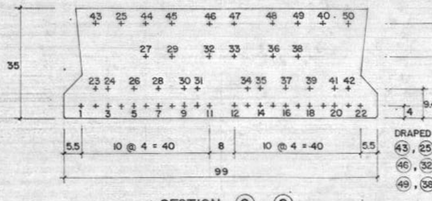


SECTION ① – ①

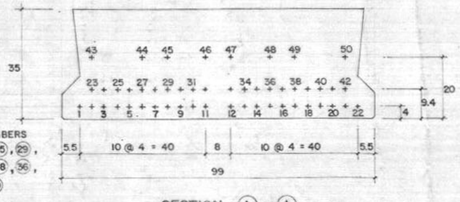


SECTION ② – ②

9.00 M. SPAN



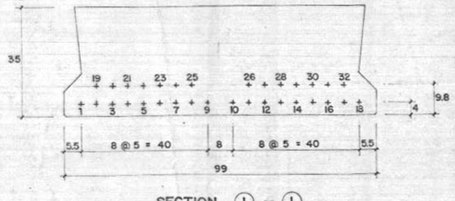
SECTION ② – ②



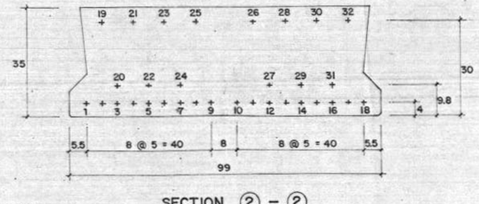
DRAPED TENDON NUMBERS (43), (25), (44), (27), (45), (29), (46), (32), (47), (33), (48), (36), (49), (38), (40) AND (50)

SECTION ① – ①

10.00 M. SPAN



SECTION ① – ①

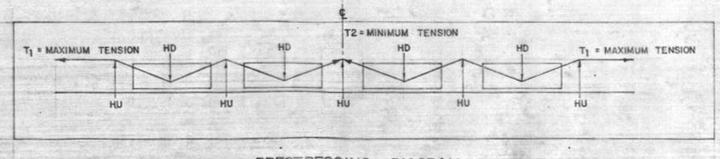


SECTION ② – ②

10.00 M. SPAN

LOCATIONS OF Ø 7 MM. STRESS-RELIEVED WIRES

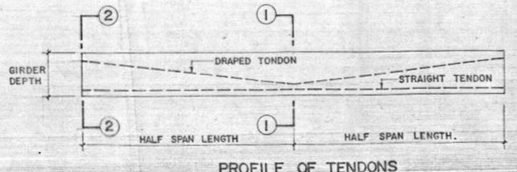
SCALE 1 : 10



PRESTRESSING DIAGRAM

LOCATIONS OF Ø 3/8" SEVEN-WIRE STRANDS

SCALE 1 : 10



PROFILE OF TENDONS

NOTES:

1. WORK THIS DRAWING WITH DWG. NO. PT-03.
2. PRESTRESSING TENDONS SHALL BE AS FOLLOWS :-
   - A) Ø 7 MM. STRESS-RELIEVED WIRE SHALL HAVE A MINIMUM ULTIMATE STRENGTH OF 16,500 KG/CM^2 AND CONFORM TO TIS 95 OR APPROVED EQUAL.
   - B) Ø 3/8" SEVEN-WIRE STRAND SHALL HAVE A MINIMUM ULTIMATE LOAD OF 9,078 KG. AND CONFORM TO TIS 420 OR APPROVED EQUAL.
3. PRESTRESSING OF STRAIGHT TENDON SHALL BE AS FOLLOWS :-
   - A) Ø 7 MM. STRESS-RELIEVED WIRE SHALL HAVE AN INITIAL PRESTRESSING FORCE OF 4,320 KG/TENDON AFTER ANCHORING.
   - B) Ø 3/8" SEVEN-WIRE STRAND SHALL HAVE AN INITIAL PRESTRESSING FORCE OF 6,330 KG/TENDON AFTER ANCHORING.
4. PRESTRESSING OF DRAPED TENDON SHALL BE AS FOLLOWS :-
   - A) TWO METHODS OF PRESTRESSING MAY BE USED :
     - FIRST METHOD : APPLY FORCE TO A HORIZONTAL TENDON AT LEVEL HD OR HU IN SUCH A WAY THAT WHEN HOLD-DOWN DEVICE (HD) AND HOLD-UP DEVICE (HU) ARE APPLIED TO HOLD THE TENDON IN POSITION THE PRESTRESSING FORCE IN THE TENDON AT MIDSPAN OF EACH GIRDER IS EQUAL TO THE CORRESPONDING FORCE SPECIFIED IN NOTE 3.
     - SECOND METHOD : FIX THE HD AND HU DEVICE IN SUCH A WAY THAT WHEN APPLYING A FORCE TO THE DRAPED PRESTRESSING TENDON IT WILL BE IN THE DESIRED POSITION, JACK THE TENDON UNTIL THE MAXIMUM TENSION IS EQUAL TO THE CORRESPONDING FORCE SPECIFIED IN NOTE 3.
     - THE MINIMUM TENSION IN THE TENDON SHALL BE AS FOLLOWS :-
       - FOR Ø 7 MM. STRESS-RELIEVED WIRE = 10,500 KG/CM^2
       - OR = 4,050 KG/TENDON
       - FOR Ø 3/8" SEVEN-WIRE STRAND = 11,500 KG/CM^2
       - = 6,000 KG/TENDON
   - B) THE SURFACES OF HD AND HU DEVICES WHICH CONTACT THE TENDONS SHALL HAVE A SMOOTH CIRCULAR SHAPE HAVING A RADIUS NOT LESS THAN 5 CM.
     - THE NUMBERS OF HD AND HU DEVICE SHALL BE ARRANGED IN SUCH A WAY THAT THE LIMITS OF FORCES AS SPECIFIED IN THE ABOVE PARAGRAPH A CAN BE ACHIEVED.
5. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
6. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3APD 5-106-14/14.

KINGDOM OF THAILAND

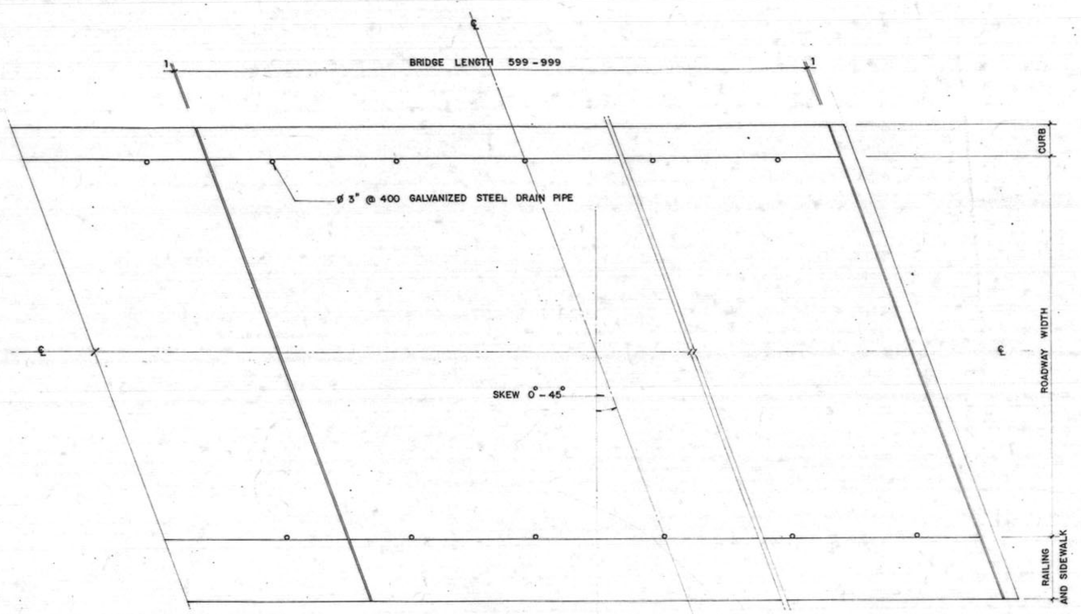
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

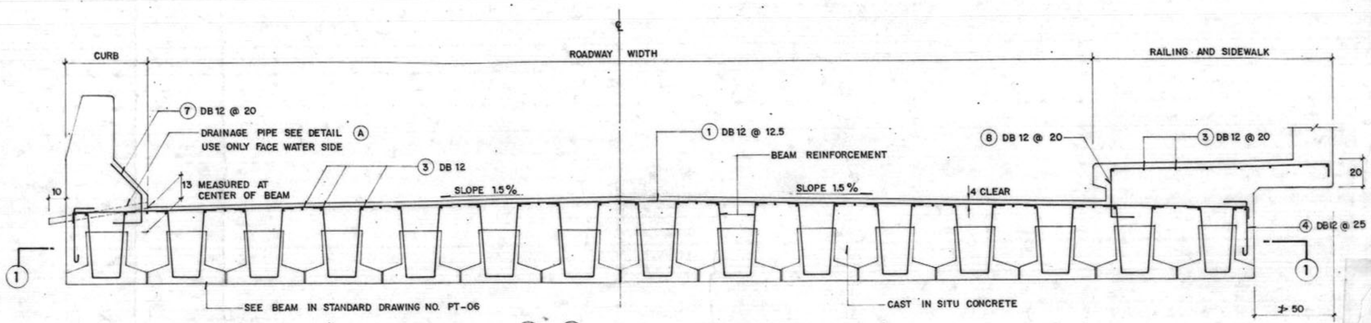
PRESTRESSED CONCRETE GIRDER

DRAPED TENDON ARRANGEMENT

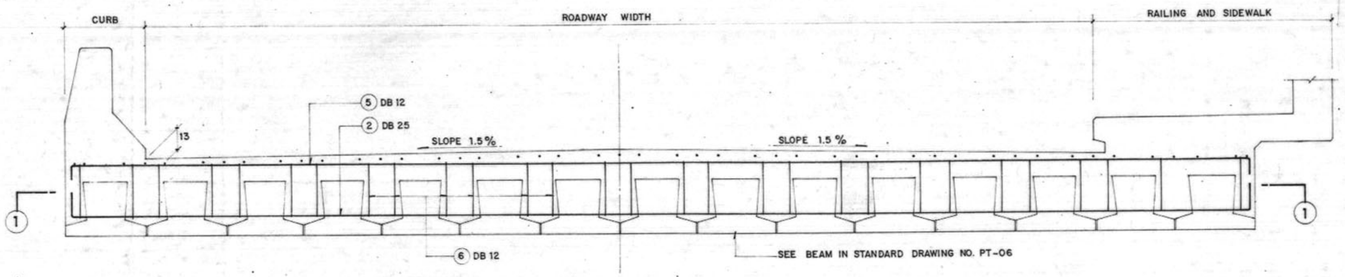
DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Buranupa (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. PT-04
		SHEET NO. 174



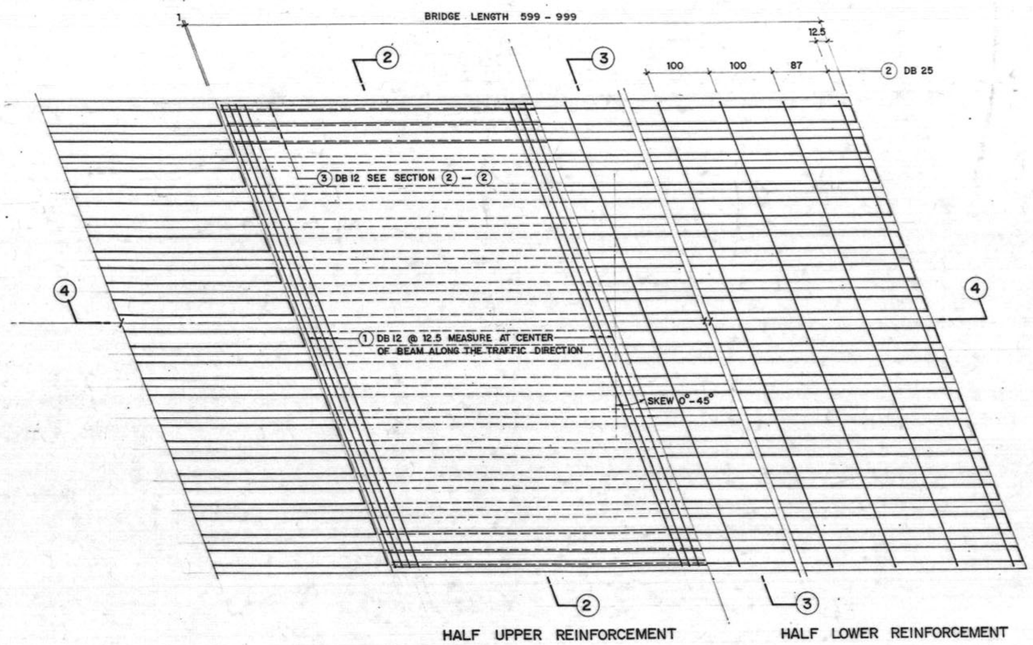
PLAN OF SLAB
SCALE 1:50



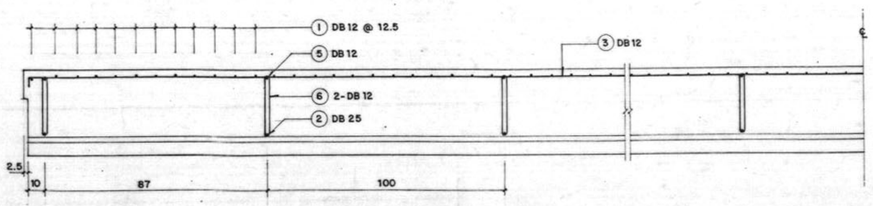
SECTION (2) - (2) SLAB REINFORCEMENT
SCALE 1:20



SECTION (3) - (3) CROSS BEAM REINFORCEMENT
SCALE 1:20



SECTION (1) - (1) PLAN OF BEAM
SCALE 1:50



SECTION (4) - (4) SLAB REINFORCEMENT
SCALE 1:20

DETAIL (A) DRAINAGE PIPE
SCALE 1:10

TABLE OF REINFORCEMENT

BAR MARK	BAR SIZE	BAR BENDING DIAGRAM
(1)	DB 12	
(2)	DB 25	
(3)	DB 12	
(4)	DB 12	
(5)	DB 12	
(6)	DB 12	
(7)	DB 12	
(8)	DB 12	

NOTES :

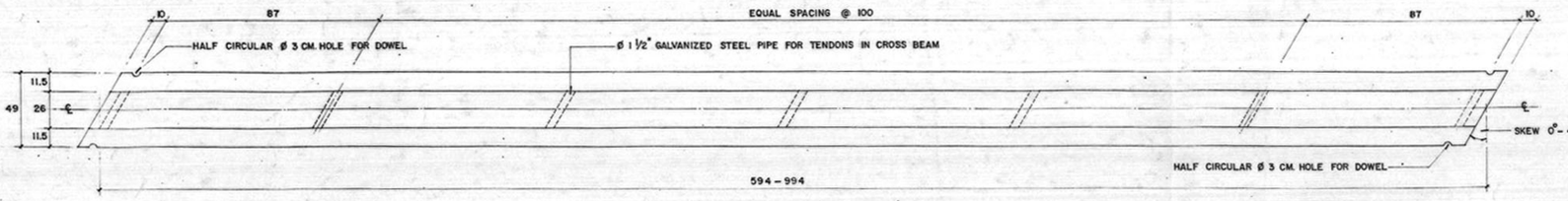
1. ALL DIMENSIONS SHOWN ARE IN CETIMETERS UNLESS OTHERWISE INDICATED.
2. ALL EXPOSED CORNERS SHALL HAVE A 1 CM. CHAMFER UNLESS OTHERWISE INDICATED.
3. REBAR Ø 12 MM. OR LARGER SHALL BE TIS 24 GRADE SD30 DEFORMED BARS OTHER SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
4. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG/M^3 AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 N/MM.^{2} FOR A 15 x 15 x 15 CM. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT AND MAXIMUM SLUMP OF 8 CM.
5. CLEAR CONCRETE COVER SHALL BE 3 CM. UNLESS OTHERWISE INDICATED.
6. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. APC-1.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

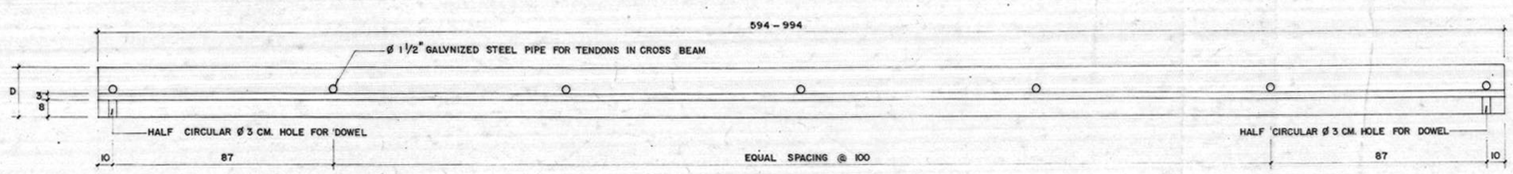
STANDARD DRAWING

6.00 - 10.00 M. SPAN MULTI - BEAM TYPE

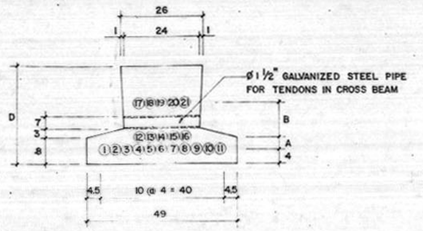
DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. PT-05
		SHEET NO. 175



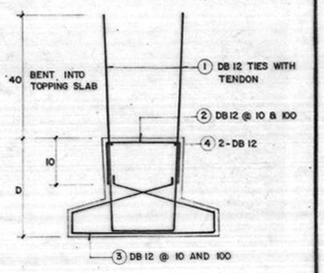
PLAN
SCALE 1:20



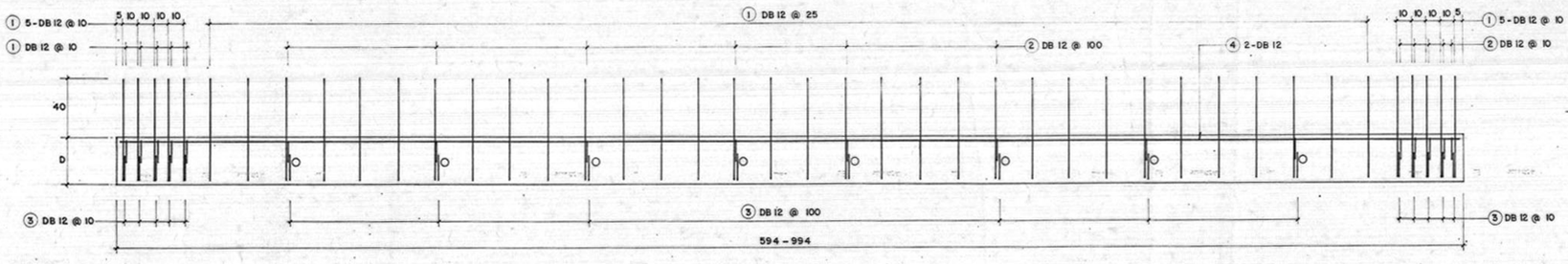
SIDE VIEW OF BEAM
SCALE 1 : 20



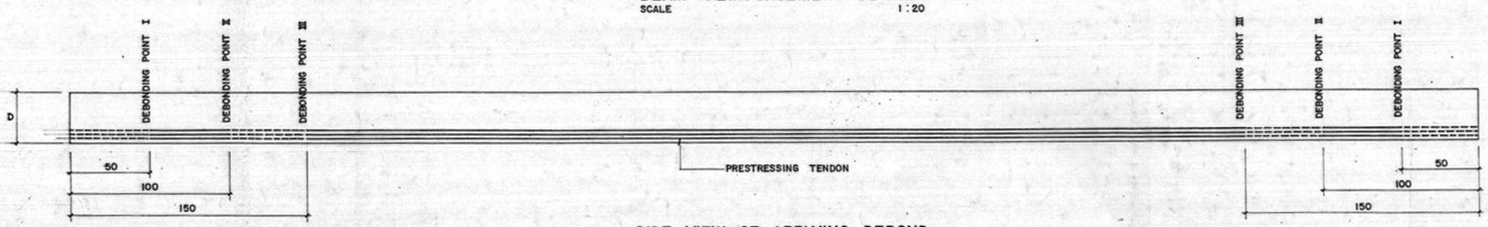
SECTION OF BEAM AND PRESTRESSING TENDONS
SCALE 1:10



SECTION OF REINFORCEMENT
SCALE 1: 10



BEAM REINFORCEMENT DETAILS
SCALE 1:20



SIDE VIEW OF APPLYING DEBOND
SCALE 1:20

TABLE OF DETAILS OF BEAMS

SPAN M.	BEAM LENGTH cm.	D cm.	PRESTRESSING TENDON 7 mm. WIRES					PRESTRESSING TENDON 3/8" STRANDS				
			NO.	TENSION FORCE AT TRANSFER KN/TENDON	A	B	DEBONDING NO.- AT POINT	NO.	TENSION FORCE AT TRANSFER KN/TENDON	A	B	DEBONDING NO.- AT POINT
6.0	594	19	(12) (14) (16) / (1)(2)(3)(4)(5)(6)(7)(8)(9)(10)(11) (14 TENDONS)	45.9	47	–	(2)(10) POINT I; (6) POINT II; POINT III (3 TENDONS)	(14) / (1)(2)(3)(6)(9)(10)(11) (8 TENDONS)	77.5	8	–	(3)(9) POINT I; (6) POINT II (3 TENDONS)
8.0	794	25	(18) (20) / (12)(13) (15)(16) / (1)(2)(3)(4)(5)(6)(7)(8)(9)(10)(11) (17 TENDONS)	47.0	4	9.25	(2)(6)(10) POINT I; (3)(9) POINT II; POINT III (5 TENDONS)	(12)(13)(15)(16) / (1)(3)(6)(7)(9)(11) (10 TENDONS)	77.5	6.25	–	(3)(9) POINT I (2 TENDONS)
10.0	994	35	(17)(18) (20)(21) / (12)(13)(14) (15)(16) / (1)(2)(3)(4)(5)(6)(7)(8)(9)(10)(11) (20 TENDONS)	47.7	4	16	(2)(6)(10) POINT I; POINT II (3 TENDONS)	(12)(13) (15)(16) / (1)(3)(4)(5) (7)(8)(9)(11) (12 TENDONS)	77.5	15	–	(3)(9) POINT I (2 TENDONS)

TABLE OF REINFORCEMENT

NO.	BAR SIZE	BAR BENDING DIAGRAM
①	DB 12	①
②	DB 12	②
③	DB 12	③
④	DB 12	10 ④ 10

NOTES :

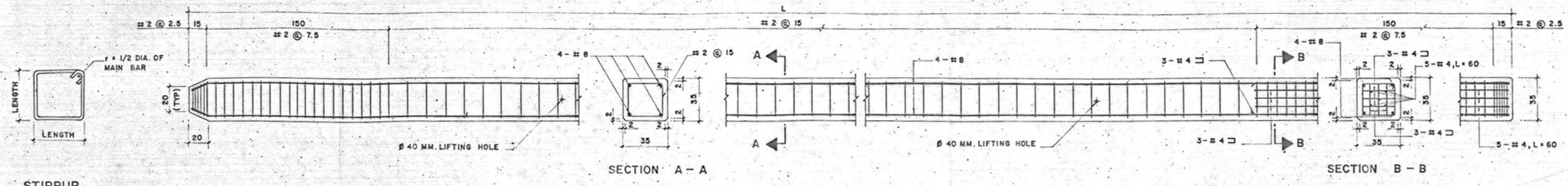
1. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. ALL EXPOSED CORNERS SHALL HAVE A 1 CM. CHAMFER UNLESS OTHERWISE INDICATED.
3. REBAR Ø 12 MM. OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS, OTHER SHALL BE TIS 20 GRADE SR24 PLAIN BARS UNLESS OTHERWISE INDICATED.
4. CONCRETE SHALL HAVE THE 28-DAYS MINIMUM ULTIMATE COMPRESSIVE STRENGTH, BASED ON 0.15x0.15x0.15 CM. CUBE SAMPLES, OF 40 N/MM^2 AND MAXIMUM SLUMP OF 8 CM.
5. PRESTRESSING OF STRAIGHT TENDON SHALL BE AS FOLLOWS :
   A) Ø 7 MM. STRESS-RELIEVED WIRE SHALL HAVE A MAXIMUM TENSION (BREAKING STRENGTH) OF 64 KN/TENDON.
   B) Ø 3/8" SEVEN-WIRE STRAND SHALL HAVE A MAXIMUM TENSION (BREAKING STRENGTH) OF 106 KN/TENDON.
6. APPLY FORCE TO A TENDON AT TRANSFER UNTIL THE MAXIMUM TENSION AT TRANSFER IS EQUAL TO THE CORRESPONDING FORCE SPECIFIED IN THE TABLE OF DETAILS OF BEAMS.
7. DEBONDING OF A PRESTRESSING TENDON IS ACHIEVED BY ENVELOPING THE TENDON WITH A PLASTIC TUBE FROM THE DEBONDING POINTS AS SHOWN IN THE TABLE THROUGH THE END OF BEAM.
8. UNLESS OTHERWISE SHOWN, CLEAR CONCRETE COVER SHALL BE 2.5 CM.
9. IN CASE OF SKEW CASTING FOR SKEW BRIDGE, THE TENDON SHALL ALSO BE SKEW.
10. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. APC-2.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

6.00 – 10.00 M. SPAN MULTI – BEAM TYPE
PRESTRESSED CONCRETE GIRDER

DESIGNED : DOH & CONSULTANTS	CHECKED : Kongsak	DATE JULY 1994
SUBMITTED : P. Bunnagpuvoj (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. PT-06
		SHEET NO. 176

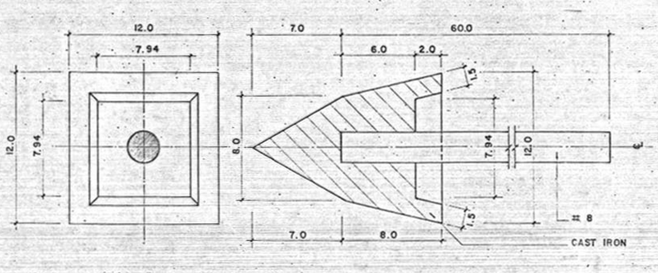


STIRRUP
NOT TO SCALE

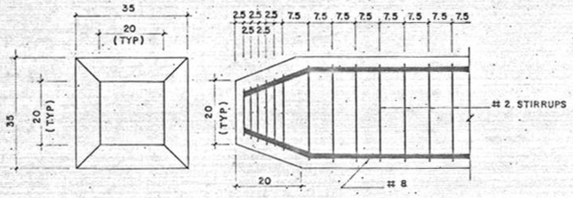
SECTION A – A

SECTION B – B

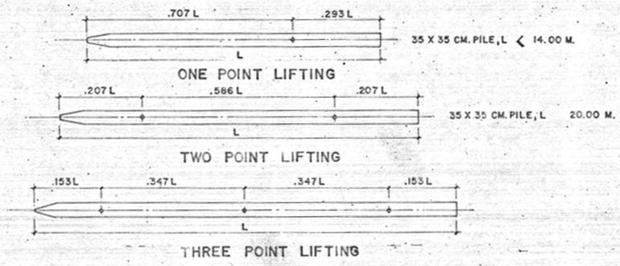
REINFORCEMENT DETAILS
SCALE 1 : 20



PILE TIP TYPE B
SCALE 1 : 2.5



PILE TIP TYPE A
SCALE 1 : 10



PILE LIFTING LOCATIONS
NOT TO SCALE

#2 = Ø 1/4" OR 6 MM. #3 = Ø 3/8" OR 9 MM.
#4 = Ø 1/2" OR 12 MM. #8 = Ø 1" OR 25 MM.

NOTES :

1 CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 300 KG./CM.^{2} FOR 0.15×0.15×0.15 CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT, MIN.	350	KG.
SAND	0.43	M.^{3}
CRUSHED ROCK OR GRAVEL	0.86	M.^{3}
CONCRETE SLUMP, MAX.	10	CM.

2 REBARS #4 OR LARGER SHALL BE TIS 24 GRADE SD30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR24 PLAIN BARS UNLESS OTHERWISE INDICATED.

3 WEIGHT OF DROP HAMMER SHALL NOT BE LESS THAN HALF THE WEIGHT OF THE PILE, NOT BE LESS THAN 3 TONS.

4 BRACING OF PILES SHALL HAVE THE SAME SECTION AND REINFORCEMENT AS OF THE PILES

5 CLEAR CONCRETE COVER SHALL BE 2.5 CM.

6 IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 5 CM. SHALL BE PROVIDED.

7 TYPE "A" OR TYPE "B" PILE TIPS SHALL BE USED UNDER THE APPROVAL OF THE ENGINEER.

8 SHOP DRAWINGS SHALL BE SUBMITTED FOR AN APPROVAL OF THE ENGINEER IF :
- a) PILES LONGER THAN 25.00 M. OR DIFFER FROM THOSE SHOWN ON THIS DRAWING ARE USED, OR
- b) 35×35 PILES LONGER THAN 20 M. ARE USED.

9 FOLLOWER SHALL NOT BE USED UNLESS IT IS NECESSARY AND AN APPROVAL OF THE ENGINEER IS GIVEN IN SUCH CASES, ITEM 10 OF NOTES SHALL BE FOLLOWED.

10 PILE LOAD TESTS MAY BE NEEDED UNDER THE JUDGMENT OF THE ENGINEER TESTING PROCEDURE SHALL BE IN ACCORDANCE WITH THE DOH SPECIFICATIONS.

11 THESE PILE CAPACITIES SHOWN ARE FOR GUIDENCE ONLY CALCULATIONS SHOWING THE ACTUAL CAPACITIES OF PILES SHALL BE SUBMITTED FOR AN APPROVAL OF THE ENGINEER.

12 ALL DIMENSIONS SHOWN ARE IN CENTIMETTERS UNLESS OTHERWISE INDICATED.

13 ALL PILE ULTIMATE CAPACITIES SHOWN IN THIS DRAWING ARE DERIVED FROM HILEY'S FORMULA $R = \frac{nWhE}{S + \frac{c}{2}}$

WHERE R, W, h AND S ARE AS STATED IN THE TABLES.

n = EFFICIENCY FACTOR $= \frac{W + Pe^2}{W + P}$

P = WEIGHT OF THE PILE IN TONS

e = COEFFICIENT OF PILE HEAD AND CUSHION
- = 0.25 FOR CONCRETE PILE WITH JUTE MAT HEAD CUSHION
- = 0.80 FOR DROP HAMMER WITH FRICTION WINCH

E = EQUIPMENT LOSS FACTOR
- = 1 FOR FREE FALLING HAMMER
- = 0.80 FOR DROP HAMMER WITH FRICTION WINCH

C = TEMPORARY COMPRESSION = $C_1 + C_2 + C_3$

C_1 = PILE SHORTENING FOR PILE LENGTH OF L M. = $\frac{72 R L}{A}$ CM.

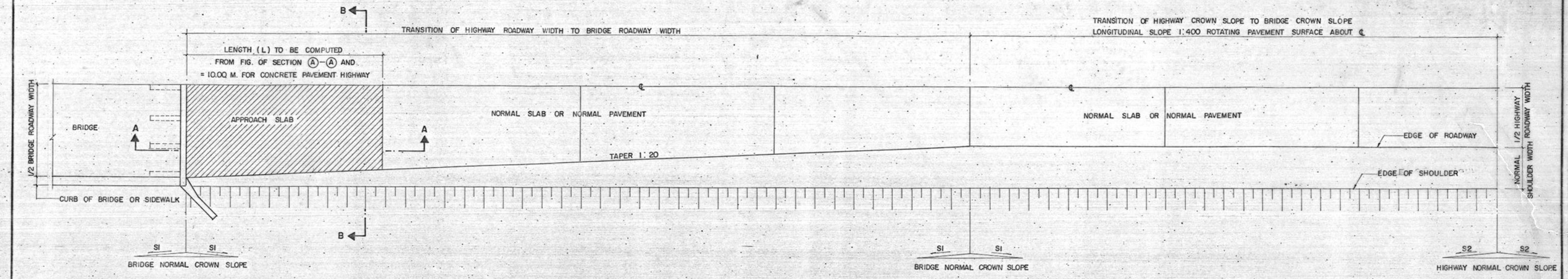
C_2 = COMPRESSION IN PILE HEAD CUSHION OF L_2 M. THICK = $1.1 \frac{R}{A} L_2$ CM.

C_3 = COMPRESSION IN THE SOIL UNDERNEATH AND SURROUNDING THE PILE = $3.6 \frac{R}{A}$ CM.

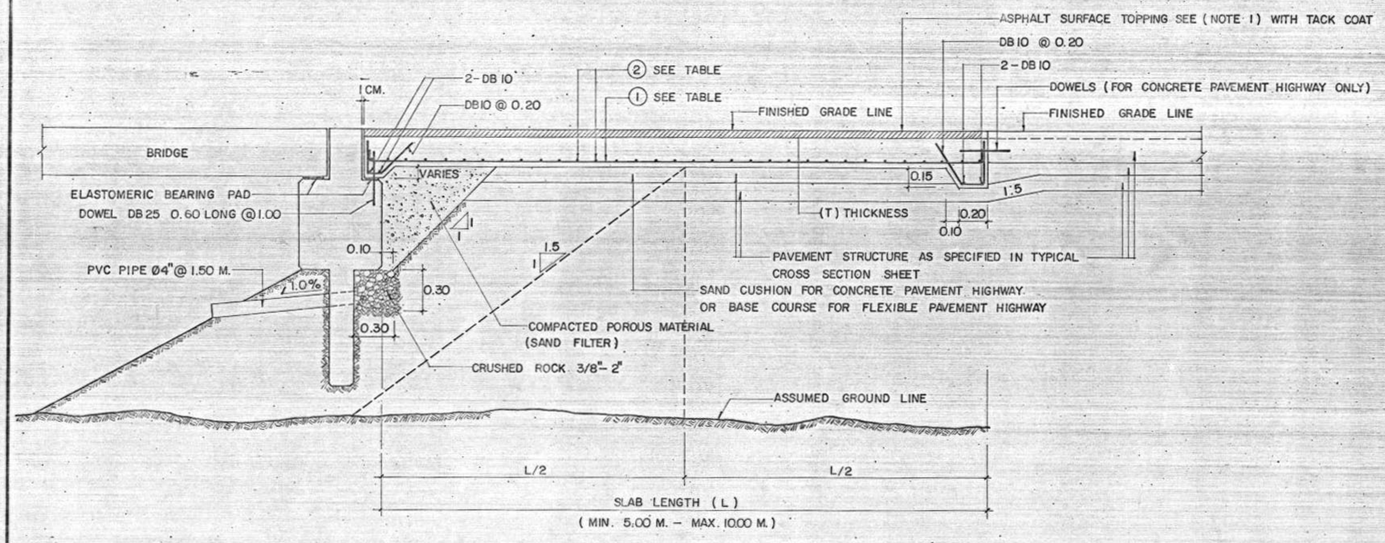
A = CROSS SECTIONAL AREA OF PILE IN CM.^{2}

TABLE OF APPROXIMATE ULTIMATE CAPACITY (R) OF 35 x 35 CM. PILE IN TONS DRIVEN BY DROP HAMMER WITH FRICTION WINCH, HAMMER WEIGHT (W) OF 3.0, 3.5 AND 4.0 TONS, DROP HEIGHT (h) OF 100, 120 AND 150 CM. WITH APPROPRIATE CUSHION OF 5 CM. THICK ON THE TOP OF PILE HEAD, IN ACCORDANCE WITH AVERAGE PILE PENETRATION (S) FOR THE LAST TEN BLOWS.

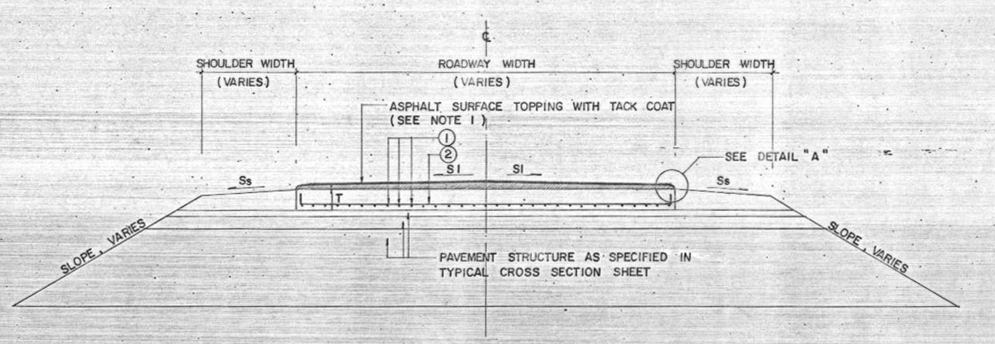
| LENGTH OF PILE (L) M. | APPROX WEIGHT OF PILE (P) TONS | 3.0 TON DROP HAMMER (W) WITH FRICTION WINCH — PENETRATION (S) — CM. | | |



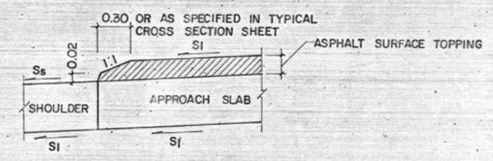
PLAN
NOT TO SCALE



SECTION A – A
SCALE 1:25



SECTION B – B
SCALE 1:50



DETAIL "A"
NOT TO SCALE

NOTES

1. THE ASPHALT SURFACE FOR THE TOPPING ON THE APPROACH SLAB SHALL BE AS FOLLOW
   - 1.1 FOR CONCRETE PAVEMENT HIGHWAY ON SOFT FOUNDATION WITH ASPHALTIC CONCRETE TREATED SHOULDER THE 5 cm. HOT MIXED ASPHALTIC CONCRETE SHALL BE USED AS THE TOPPING.
   - 1.2 FOR CONCRETE PAVEMENT HIGHWAY ON SOFT FOUNDATION WITH BITUMINOUS SURFACE TREATMENT TREATED SHOULDER OR NONTREATED SHOULDER EITHER 5 cm. COLD MIX. ASPHALTIC CONCRETE OR 5 cm. HOT MIXED ASPHALTIC CONCRETE SHALL BE USED.
   - 1.3 FOR CONCRETE PAVEMENT HIGHWAY ON NORMAL SOIL FOUNDATION NO ASPHALT SURFACE TOPPING REQUIRED AND THE APPROACH SLAB SHALL BE RAISED TO THE FINISHED GRADE LINE.
   - 1.4 FOR FLEXIBLE PAVEMENT HIGHWAY WITH ASPHALTIC CONCRETE SURFACE THE TOPPING SHALL BE THE SAME AS THE HIGHWAY ASPHALTIC CONCRETE SURFACE COURSE BUT SHOULD BE 5 cm. THICK (MINIMUM.)
   - 1.5 FOR FLEXIBLE PAVEMENT HIGHWAY WITH BITUMINOUS SURFACE TREATMENT SURFACE EITHER 5 mm. COLD MIXED ASPHALTIC CONCRETE OR 5 cm. HOT MIXED ASPHALTIC CONCRETE SHALL BE USED.
2. THE COLD MIXED AND THE HOT MIXED ASPHALTIC CONCRETE FOR THE TOPPING AS STATED IN NOTE 1 WILL BE CONFORMED TO THE SPECIAL PROVISIONS FOR ASPHALT TOPPING ON THE APPROACH SLAB STATED BY THE MATERIAL & RESEARCH DIVISION DEPARTMENT OF HIGHWAY.
3. THE TACK COAT SHALL BE REFERRED TO STANDARD DH-S 403/2531
4. THE CONSTITUENTS OF THE CONCRETE MIX PER CUBIC METER MUST CRUSHED ROCK OR GRAVEL 860 LITRES, SLUMP OF THE CONCRETE MIX NOT BE HIGHER THAN 8 cm. WITH AN ULTIMATE COMPRESSIVE STRENGTH OF STANDARD CUBE 15x15x15 cm. NOT LOWER THAN 20 N/mm^2 AT THE AGE OF 28 DAYS.
5. REINFORCING STEEL MUST CONFORM TO THE STANDARD TIS. 20-2527 FOR THE ROUND BAR AND TIS. 24-2527 CLASS SD 30 FOR THE DEFORMED BAR.
6. THE NORMAL CONCRETE CLEAR COVERING SHALL BE 3 cm. AND 5 cm. FOR SULPHATE RESISTANT
7. THE COST OF THE APPROACH SLAB SHALL INCLUDE THE COST FOR THE ASPHALT TOPPING AND THE TACK COAT AS STATED IN THIS DRAWING (IF ANY)
8. DIMENSIONS ARE IN METER UNLESS OTHERWISE INDICATED.

TABLE SHOW THE DETAILS OF THE APPROACH SLAB

SLAB LENGTH (L) M.	THICKNESS (T) CM.	REINFORCEMENT ①	REINFORCEMENT ②
5.00	20	DB20 @ 0.20	DB 10 @ 0.20
6.00	22	DB20 @ 0.15	DB 10 @ 0.15
7.00	24	DB20 @ 0.20	DB12 @ 0.20
8.00	26	DB20 @ 0.15	DB12 @ 0.15
9.00	28	DB25 @ 0.20	DB16 @ 0.20
10.00	30	DB25 @ 0.15	DB25 @ 0.15

REMARK

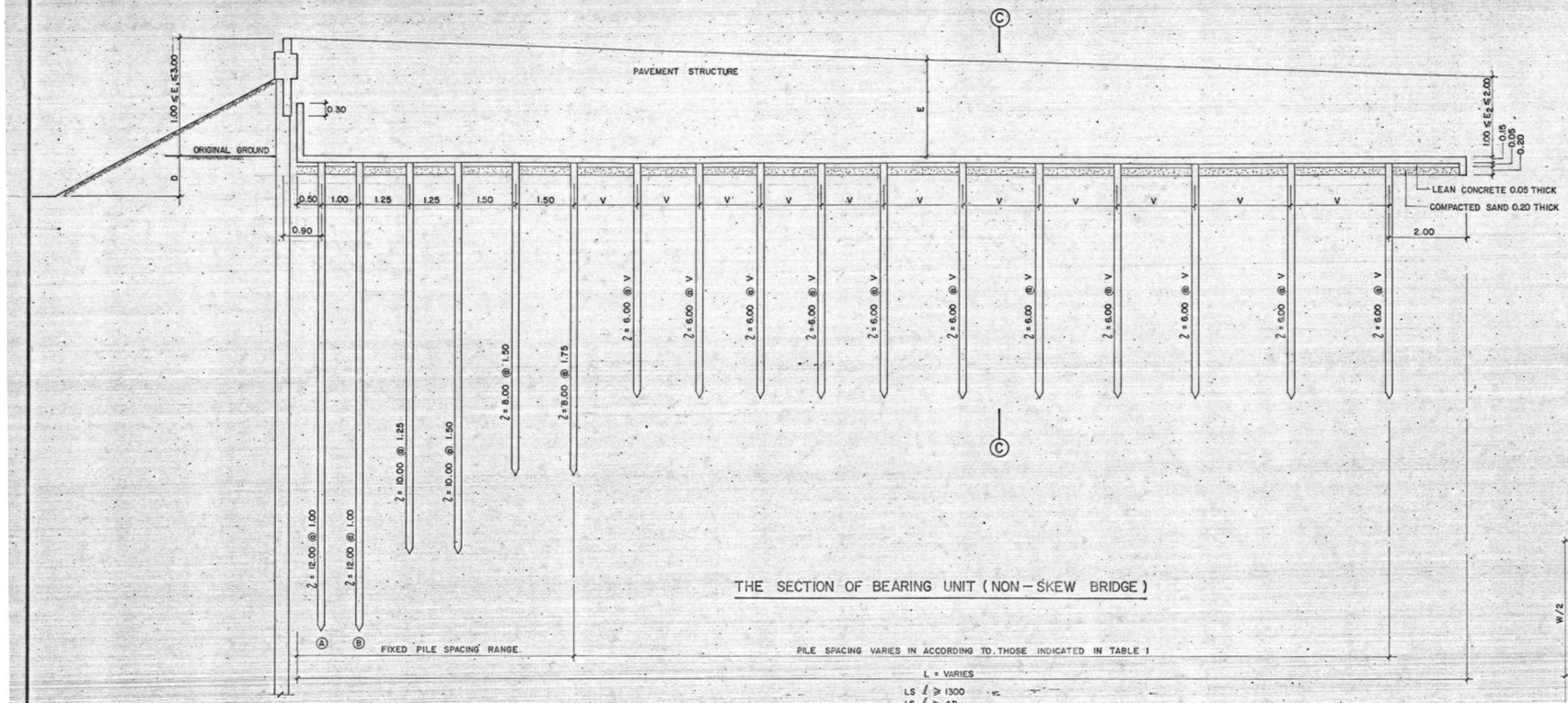
FOR SKEW BRIDGE THE SLAB LENGTH (L) WILL BE THE SHORT SIDE OF THE APPROACH SLAB BUT THE THICKNESS AND THE REINFORCEMENT SHALL BE EQUIVALENT TO THOSE OF THE SLAB WITH THE SLAB LENGTH (L) EQUAL TO THE LONG SIDE OF THE APPROACH SLAB.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

BRIDGE APPROACH SLAB AND POROUS BACKFILL MATERIALS

DESIGNED: DOH & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
		DWG. NO. AP-3
APPROVED: (DIRECTOR GENERAL)		SHEET NO. 178



THE SECTION OF BEARING UNIT (NON – SKEW BRIDGE)

L = VARIES

LS $\geq$ 13.00

LS $\geq$ 4D

LS $\geq$ 2.5 (E + D)

OR LS = THE LENGTH TO BE SPECIFIED BY THE LOCATION AND DESIGN DIVISION

BEARING SLAB SHALL HAVE 2.00 M. EXTENTION AT THE SLAB FREE END.

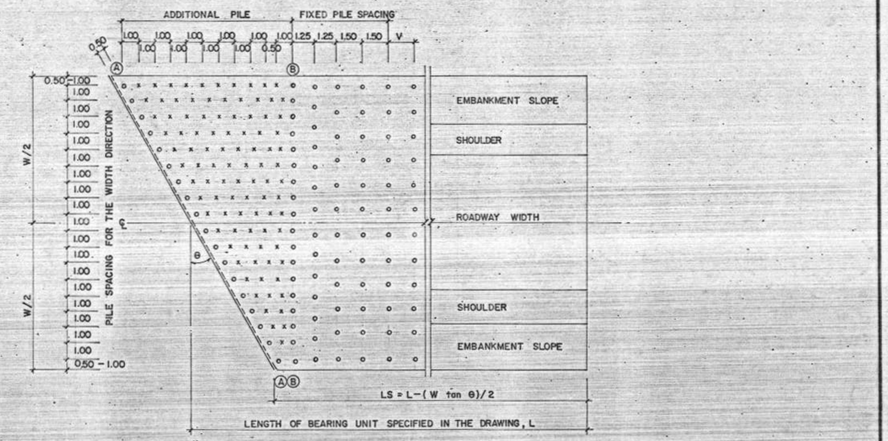
NOTES :

1. CONCRETE MIX PER 1 CU.M. SHALL APPROXIMATELY HAVE

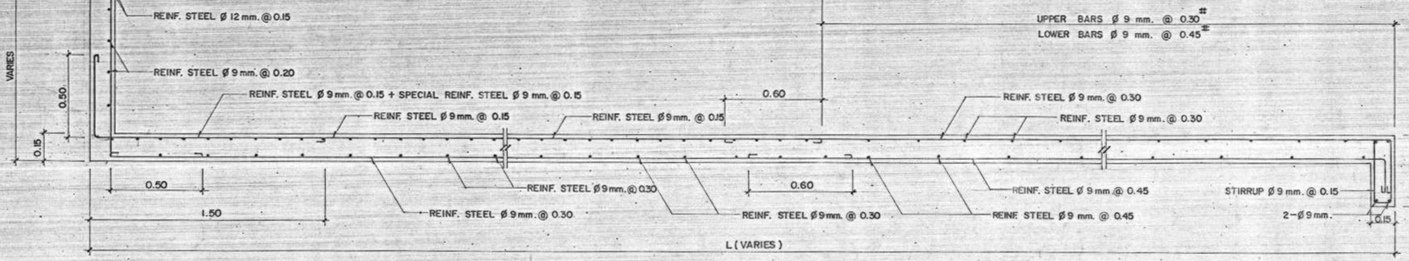
PORTLAND CEMENT IN ACCORDANCE WITH ASTM STANDARD C 150–63 TYPE I OR EQUIVALENT QUALITY, NOT LESS THAN	350 KG.
COARSE SAND	430 LITRE
CRUSHED ROCK OR GRAVEL	860 LITRE
WATER	195 LITRE
CONCRETE SLUMP NOT EXCEED	10 CM.

ULTIMATE COMPRESSIVE STRENGTH OF THE STANDARD CUBE, 15x15x15 CM. SHALL NOT BE LESS THAN 210 KG./CM.^{2}

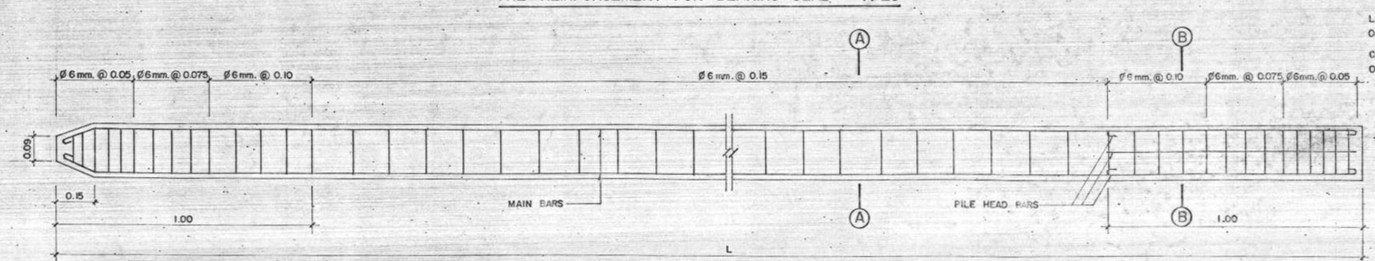
2. REINFORCEMENT STEEL, Ø 6 MM. AND Ø 9 MM. SHALL BE STRUCTURAL GRADE WHILE Ø 12 MM. AND ABOVE SHALL BE INTERMEDIATE GRADE DEFORMED BAR.
3. ANY DETAILS NOT SPECIFIED IN THE DRAWING OR UNCLEARED OR NON–CONFORMED WHICH WOULD CRETE THE PROBLEM IN CONSTRUCTION, THE DECISION OF THE DOH'S LOCATION AND DESIGN DIVISION SHALL GOVERN.
4. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE INDICATED.
5. DESIGN ASSUMPTION : SOIL CONDITION FOLLOWS THE GENERAL CHARACTERISTIC OF BANGKOK CLAY.
6. PRESTRESSED CONCRETE PILE SHALL BE ALLOWED ONLY THOSE HAVING THE EFFECTIVE PERIMETER NOT LESS THAN THE VALUE STATED IN THE DRAWING WITH THE PRIOR APPROVAL OF THE DOH'S LOCATION AND DESIGN ON CASE BY CASE BASIS.
7. IN CASE OF SKEW BRIDGE, THE LENGTH OF BEARING UNIT (L) SHALL BE MEASURED ALONG THE LINE AT THE MIDDLE OF THE WIDTH OF BEARING UNIT. THE LENGTH OF BEARING UNIT ON THE SHORT SIDE SHALL NOT BE LESS THAN (LS) AS SPECIFIED IN THE DRAWING.
8. THIS DRAWING IS ADOPTED FROM THE DOH'S STANDARD DRAWING NO. S2 / 22.



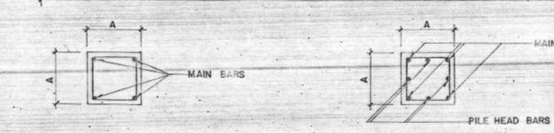
PLAN INDICATING THE LOCATION OF ADDITIONAL PILE FOR THE CASE OF SKEW BRIDGE



THE REINFORCEMENT FOR BEARING SLAB 1 : 20



THE RC. PILE 1 : 12.5



SECTION Ⓐ – Ⓐ 1 : 12.5

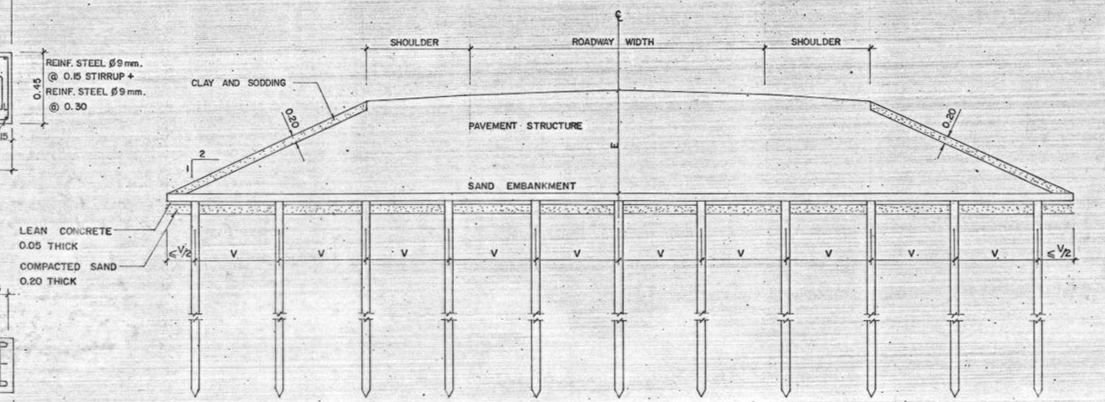
SECTION Ⓑ – Ⓑ 1 : 12.5

TABLE 1 INDICATING THE DEPTH OF FILL AND PILE SPACING

E (METER)	2.75 – 3.00	2.50 – 2.75	2.25 – 2.50	< 2.25
V (METER)	1.50	1.75	2.00	2.50

TABLE 2 INDICATING SIZE AND REINFORCEMENT FOR THE PILE

2	A	MAIN BARS	PILE HEAD BARS	LIFING POINTS (MEASURED FROM BOTH ENDS)
12.00	0.20	4 – Ø 16 mm.	4 – Ø 12 mm.	2.40
10.00	0.18	4 – Ø 12 mm.	4 – Ø 12 mm.	2.00
8.00	0.18	4 – Ø 12 mm.	4 – Ø 9 mm.	1.60
			4 – Ø 9 mm.	1.20



SECTION Ⓒ – Ⓒ 1 : 75

IN CASE OF NON – SKEW BRIDGE

1. ROW Ⓐ AND Ⓑ SHALL BE 1.00 METER APART.

IN CASE OF SKEW BRIDGE

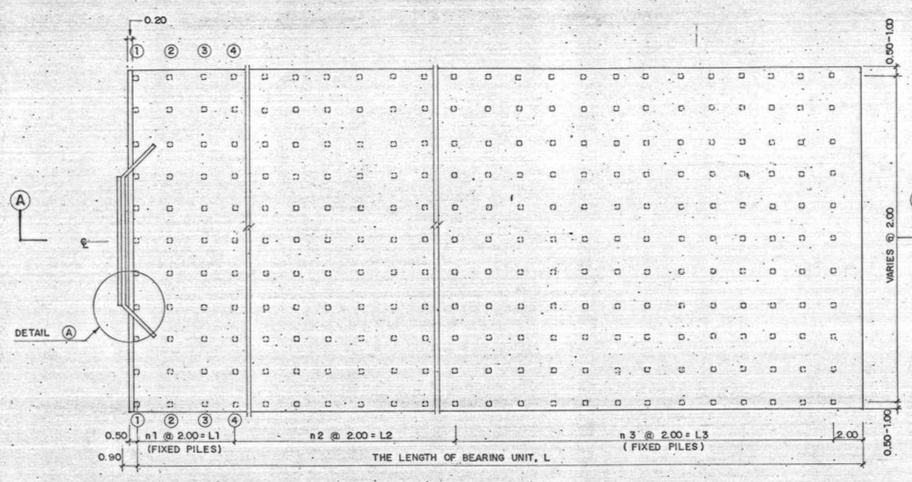
1. PILE SPACING (ADDITIONAL PART) ALONG THE LENGTH OF BEARING UNIT SHALL BE 1.00 METER BY MEASURING FROM ROW (A) TOWARD (B) FOR THE LAST PILE NEAR ROW (B), IF THE SPACING FROM ROW (B) IS LESS THAN 1.00 METER, THE SPACING OF THE LAST TWO PILES SHALL BE ADJUSTED TO HAVE THE SPACING NOT LESS THAN 0.50 METER BUT NOT EXCEED 1.00 METER.
   X ADDITIONAL PILE, 12.00 M. LONG
   O PILES AS INDICATED IN THE DRAWING
2. FOR DEFORMED BAR, NOT NECESSARY TO HOOK.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

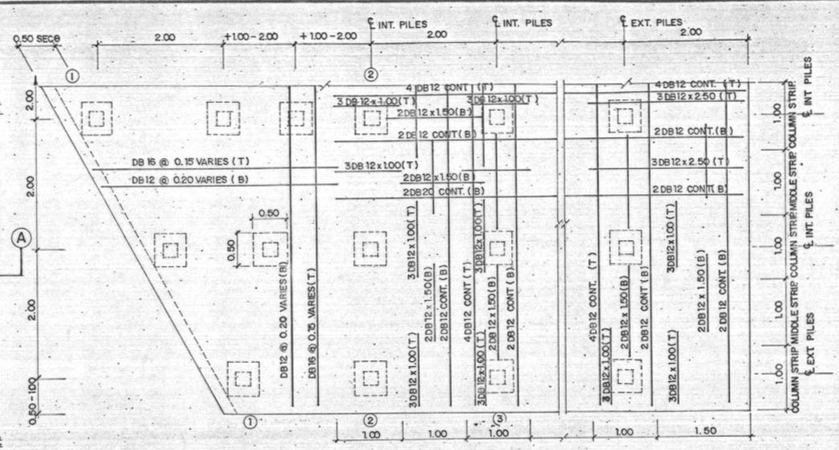
STANDARD DRAWING

BEARING UNIT AT BRIDGE END ON SOFT CLAY

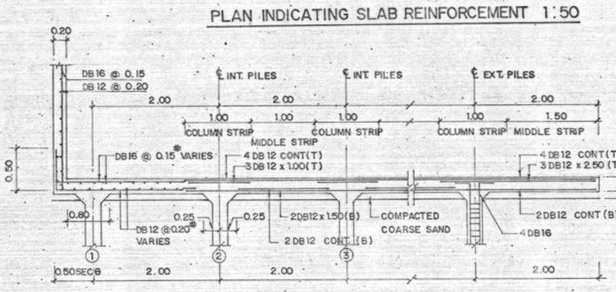
DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED :		SCALE AS SHOWN
APPROVED : FOR (DIRECTOR GENERAL)		SHEET NO. 179



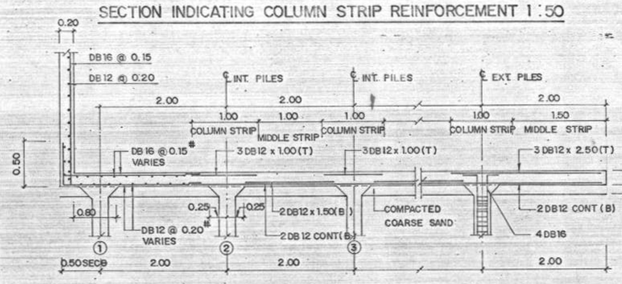
PLAN INDICATING THE LOCATION OF PILE (FOR NON-SKEW BRIDGE) 1:200



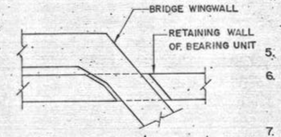
PLAN INDICATING SLAB REINFORCEMENT 1:50



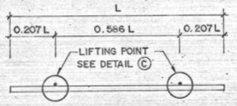
SECTION INDICATING COLUMN STRIP REINFORCEMENT 1:50



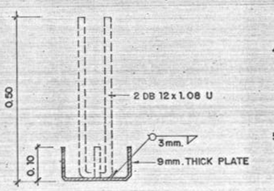
SECTION INDICATING MIDDLE STRIP REINFORCEMENT 1:50



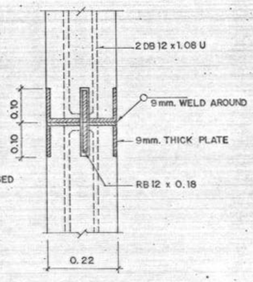
DETAIL (A) INDICATING THE SECTION OF BRIDGE WING WALL AND RETAINING WALL



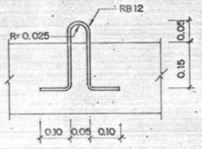
PLAN INDICATING PILE LIFTING POINTS



DETAIL (B) 1:10



SECTION INDICATING THE EXTENTION OF PILE 1:10



DETAIL (C) 1:10

TABLE I

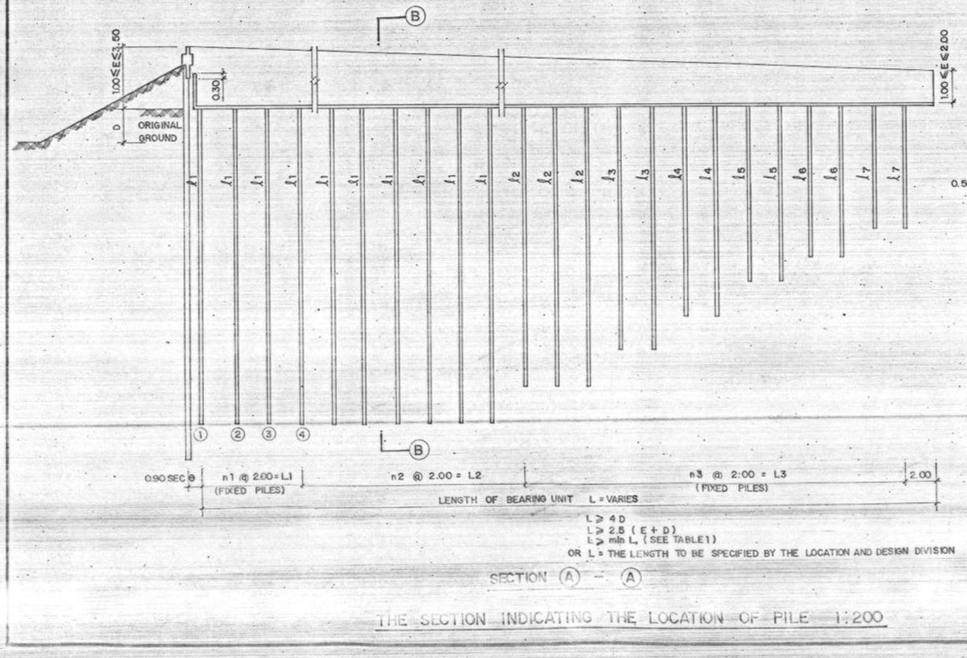
EMBANKMENT, E METER	l_1 METER	l_2 METER	l_3 METER	l_4 METER	l_5 METER	l_6 METER	l_7 METER	n_1	L_1 METER	n_2	L_2 METER	n_3	L_3 METER	min. LS
3.25-3.50	19.00	17.00	15.00	13.00	11.00	9.00	7.00	3.00	6.00	≥1	≥2	12.00	24.00	34.00
<3.25-2.75	18.00	16.00	14.00	12.00	10.00	8.00	6.00	3.00	6.00	≥1	≥2	12.00	24.00	34.00
<2.75-2.25	17.00	15.00	13.00	11.00	9.00	7.00	–	3.00	6.00	≥1	≥2	10.00	20.00	30.00
<2.25	16.00	14.00	12.00	10.00	8.00	6.00	–	3.00	6.00	≥1	≥2	10.00	20.00	30.00

GENERAL NOTES

1. CONCRETE SHALL HAVE THE ULTIMATE COMPRESSIVE STRENGTH OF STANDARD CUBE, 15x15x15 CM. AT 28 DAYS, NOT LESS THAN 350 KG / CM^2
2. CONCRETE COVERING SHALL BE 4.5 CM. (TO THE OUTER SURFACE OF REINFORCEMENT)
3. THE REINFORCEMENT AT THE MIDDLE STRIP AND COLUMN STRIP SHALL BE PLACED SIMILARLY IN BOTH DIRECTIONS (LONGITUDINAL AND TRANSVERSE).
4. THE REINFORCEMENT STEEL, RB SHALL CONFORM TO THE TIS STANDARD 20-2515, SR 24 GRADE WHILE THE DEFORMED BAR (DB) SHALL CONFORM TO THE TIS STANDARD 24-2516, SD 30 GRADE.
5. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED.
6. ANY ITEMS WHICH ARE NOT INDICATED HEREIN OR WOULD CREATE PROBLEM IN CONSTRUCTION, SHALL BE UNDER THE JURISDICTION OF THE DOH'S LOCATION AND DESIGN DIVISION.
7. IN CASE OF SKEW BRIDGE, THE LENGTH OF BEARING UNIT (L) SHALL BE MEASURED ALONG THE LINE AT THE MIDDLE OF THE WIDTH OF BEARING UNIT. THE LENGTH OF BEARING UNIT ON THE SHORT SIDE SHALL NOT BE LESS THAN (LS) AS SPECIFIED IN THE DRAWING.
8. THIS DRAWING IS ADOPTED FROM THE DOH'S STANDARD DRAWING NO. S2 / 23

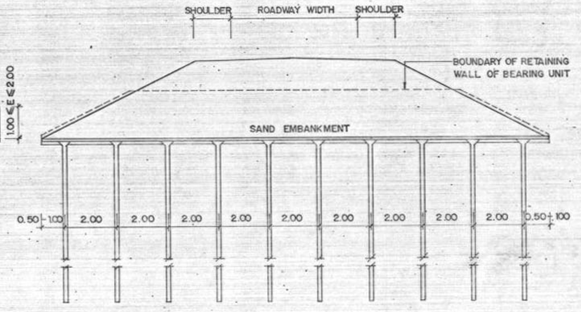
NOTES FOR BEARING UNIT PILES

1. CONCRETE SHALL HAVE ULTIMATE COMPRESSIVE STRENGTH OF STANDARD CUBE, 15x15x15 CM. AT 28 DAYS, NOT LESS THAN 200 KG/CM^2
2. THE REINFORCEMENT STEEL, RB SHALL CONFORM TO THE TIS STANDARD 20-2515, SR 24 GRADE WHILE THE DEFORME BAR, DB SHALL CONFORM TO TIS 24-2516, SD 30 GRADE
3. IF THE PILE LENGTH IS MORE THAN 10.00 M., PILE EXTENTION METHOD IS RECOMMENDED BY USING THE TWO PILES, EACH HAVING THE LENGTH OF HALF OF THE REQUIRED PILE LENGTH.
4. IN CASE OF SKEW BRIDGE, PILE SPACING FOR THE ADDITIONAL PART SHALL BE 2.00 M. IN LONGITUDINAL DIRECTION BY MEASURING FROM ROW 1 TOWARD 2 FOR THE LAST PILE NEAR ROW 2. IF THE SPACING FROM ROW 2 IS MORE THAN 2.00 M. BUT NOT OVER 4.00 M., ONE PILE SHOULD BE DRIVEN AT THE MID OF AVAILABLE SPACING.
5. PRESTRESSED CONCRETE PILE SHALL BE ALLOWED ONLY THOSE HAVING THE EFFECTIVE PERIMETER NOT LESS THAN THE VALUE INDICATED IN THE DRAWING WITH THE PRIOR APPROVAL OF THE DOH'S LOCATION AND DESIGN DIVISION ON CASE BY CASE BASIS.
6. CALCULATION OF THE PILE LENGTH (AS INDICATED IN THE DRAWING) IS BASED UPON THE GENERAL CHARACTERISTIC OF BANGKOK CLAY.
7. IF THE CONDITION OF SUBGRADE SOIL AT THE CONSTRUCTION SITE IS KNOW OR INVESTIGATED, THE PILE LENGTH AS SPECIFIED IN THE DRAWING MAY BE CHANGED AND ADJUSTED TO SUIT THE LOCAL SOIL CONDITION, HOWEVER, IT IS SUBJECT TO THE WRITTEN APPROVAL OF THE DOH'S LOCATION AND DESIGN DIVISION ON CASE BY CASE BASIS.

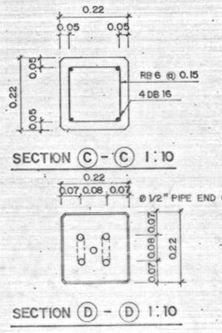


PLAN INDICATING THE LOCATION OF PILE (FOR SKEW BRIDGE) 1:200

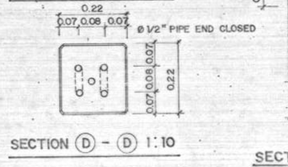
SECTION (A) - (A)



SECTION (B) - (B) 1:25



SECTION (C) - (C) 1:10



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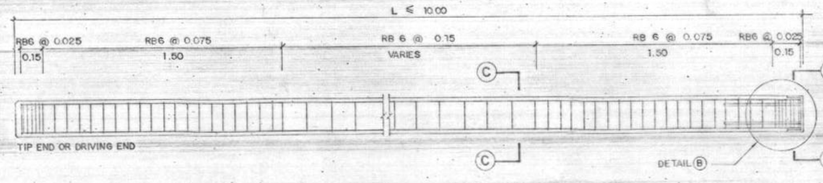


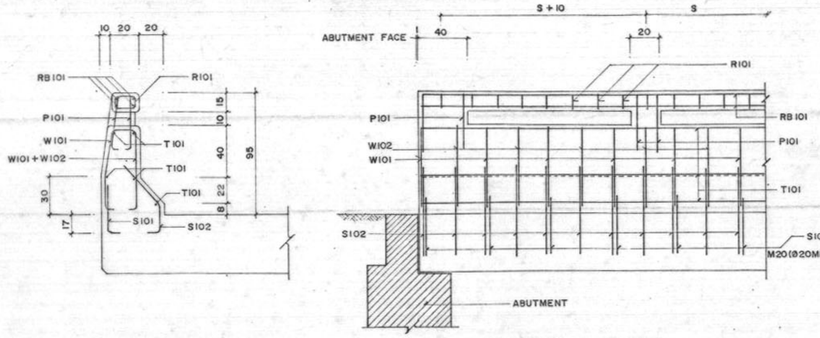
THE SECTION INDICATING THE LOCATION OF PILE 1:200

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

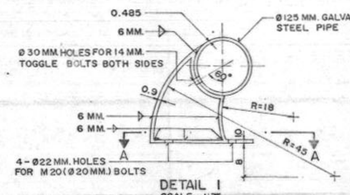
BEARING UNIT AT BRIDGE END ON SOFT CLAY ; RIGID PAVEMENT

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Bunyey. (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		SHEET NO. 180

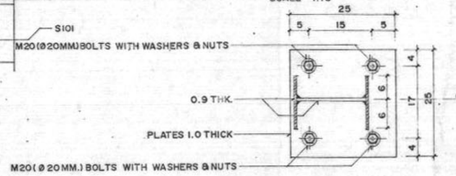


TRANSVERSE SECTION

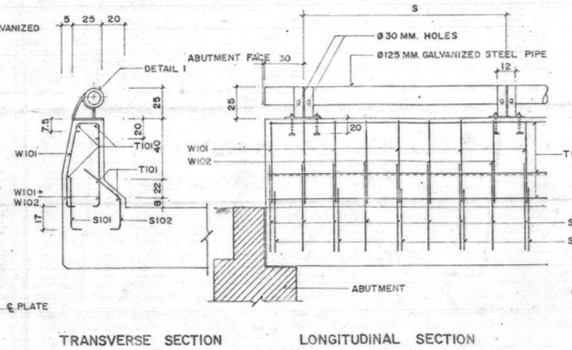
LONGITUDINAL SECTION



DETAIL 1
SCALE 1:7.5



SECTION A-A
SCALE 1:7.5



TRANSVERSE SECTION

LONGITUDINAL SECTION

TYPE 1 TRAFFIC RAILING
SCALE 1:25

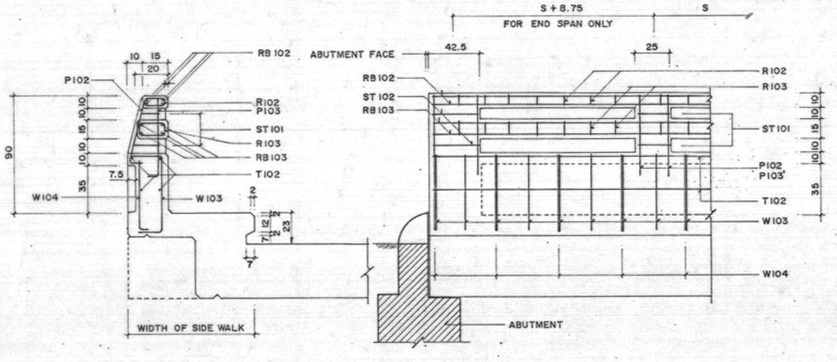
TYPE 2 TRAFFIC RAILING
SCALE 1:25

TABLE OF RAILING REINFORCEMENT														
TYPE	TYPE OF RAILING	BAR BENDING DIAGRAMS	BAR MARK	⌀	a	NO	L	TYPE	TYPE OF RAILING	BAR BENDING DIAGRAMS	BAR MARK	⌀	a	NO	L
1	TRAFFIC	44 / 15 / 5 10 / VARIES	P101	4	–	4*	51	3 AND 4	COMBINATION	7.5 VARIES 7.5 / 22.5 60 22.5 / 55 110	T102	3	–	4	–
			R101	2	20	–	60				W103	5	20	–	105
			RB101	4	–	4	–				W104	4	40	–	65
1 AND 2	TRAFFIC	7.5 VARIES 7.5 / 65 / 20 10 / 38 65 / 10 110	T101	3	–	5	–	5	TRAFFIC AND PEDESTRIAN	7.5 VARIES 7.5 / 55 25 / 20 48 120 / 110 / 10	T103	3	–	5	–
			W101	4	50	–	171				W105	5	25	–	100
			W102	4	50	–	85				W106	4	25	–	162
		40 10	S101	4	50	–	50			37 37 / 51 40 10	S103	4	25	–	55
		40 25 10	S102	4	25	–	75								
3	COMBINATION	43.5 7.5 / 60 10 / VARIES 10 / 15 20 / VARIES / 15 37.5 / 7.5 VARIES 7.5 / 10 / 15 / VARIES / 15 / 15 10	P102	4	–	2*	61								
			P103	4	–	2*	70								
			ST101	2	–	2*	–								
			ST102	2	–	2*	–								
			RB102	3	–	4	–								
			R102	2	20	–	40								
			RB103	4	–	4	–								
			R103	2	20	–	60								

L = TOTAL LENGTH OF EACH BAR
NO = TOTAL AMOUNT OF BARS
* = AMOUNT OF REINFORCEMENT IN ONE POST
#2 = Ø1/4" OR 6 MM.
#3 = Ø3/8" OR 9 MM.
#4 = Ø1/2" OR 12 MM.
#5 = Ø5/8" OR 16 MM.

TABLE OF RAILING POST SPACING

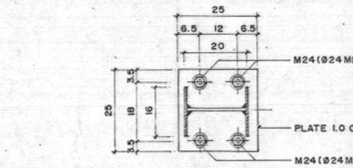
SPAN (M)	5.00	6.00	7.00	8.00	9.00	10.00	15.00	20.00	29.97
SPACING, S (M)	1.46	1.80	1.60	1.85	1.68	1.88	1.82	1.96	1.85
SPACING, S1 (M)	0.1460	0.1500	0.1451	0.1540	0.1529	0.1568	0.1517	0.1509	0.1541



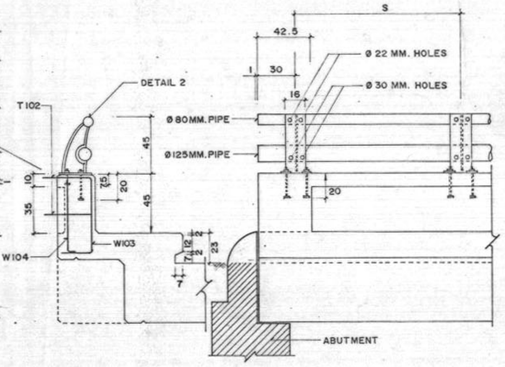
TRANSVERSE SECTION

LONGITUDINAL SECTION

TYPE 3 COMBINATION RAILING
SCALE 1:25



DETAIL 2
SCALE 1:10

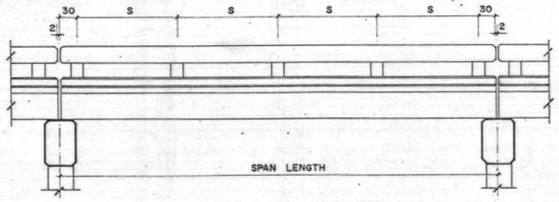


TRANSVERSE SECTION

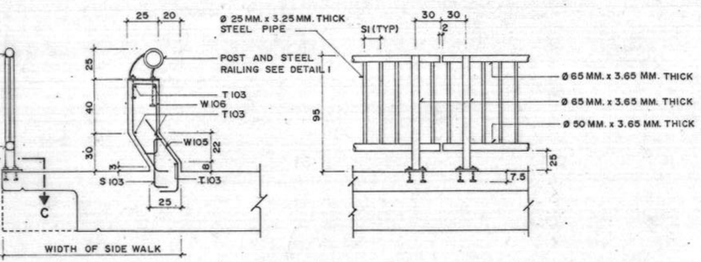
LONGITUDINAL SECTION

SECTION B-B
SCALE 1:10

TYPE 4 COMBINATION RAILING
SCALE 1:25

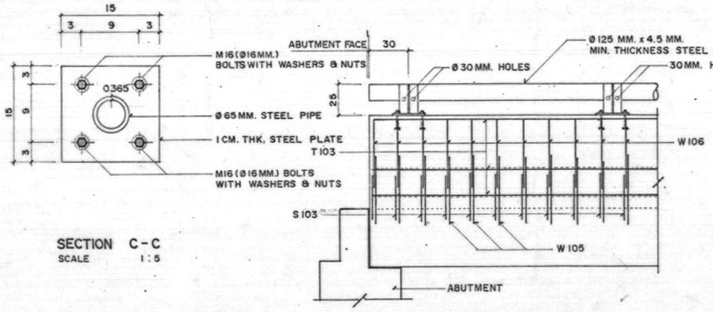


TYPICAL RAILING POST SPACING
SCALE 1:50



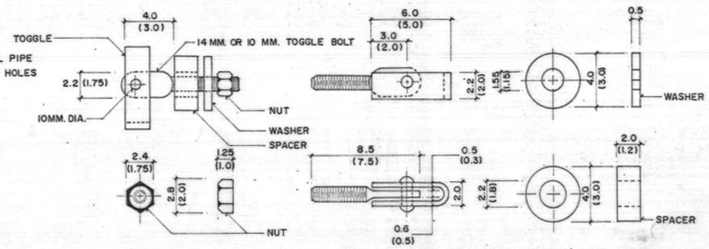
TRANSVERSE SECTION

PEDESTRIAN RAILING EXPANSION JOINT
NOT TO SCALE



SECTION C-C
SCALE 1:5

LONGITUDINAL SECTION



NOTE : NUMBERS IN BRACKETS
ARE FOR Ø10 MM. BOLT.

Ø14 MM., Ø10 MM. TOGGLE BOLT AND TOGGLE
NOT TO SCALE

TYPE 5 TRAFFIC CURB AND PEDESTRIAN RAILING
SCALE 1:25

NOTES :

1. SCOPES OF APPLICATION OF RAILING ARE AS FOLLOWS :-
   TYPE 1, FOR SHORT BRIDGES OR BRIDGES WITHOUT SIDE WALK IN GENERAL.
   TYPE 2, FOR BRIDGES WITHOUT SIDEWALK WHICH HAVE A TOTAL LENGTH OF MORE THAN 80.0M. OR FOR BRIDGES IN URBAN AREA OR WHEN STEEL RAILINGS ARE REQUIRED FOR AESTHETIC PURPOSES. IT SHALL BE SHOWN ON THE DRAWINGS BY THE ENGINEER.
   TYPE 3, FOR BRIDGES WITH .50 M. SIDEWALKS OR WIDER IN GENERAL.
   TYPE 4, FOR BRIDGES WITH .50 M. SIDEWALKS OR WIDER AND HAVING A TOTAL LENGTH OF MORE THAN 80.0M. OR WHEN STEEL RAILINGS ARE REQUIRED FOR AESTHETIC PURPOSES. IT SHALL BE SHOWN ON THE DRAWING BY THE ENGINEER.
   TYPE 5, FOR BRIDGES WITH HEAVY TRAFFIC AND DENSE PEDESTRIAN IN ORDER TO SEPARATE THE VEHICLES FROM PEDESTRIAN FOR THE SAKE OF SAFETY. IT SHALL BE SHOWN ON THE DRAWINGS BY THE ENGINEER.
2. ANY SPECIAL RAILINGS, IF DIFFERENT FROM THE ABOVE-MENTIONED MAY BE USED UNDER THE APPROVAL OF THE ENGINEER.
3. DESIGN STRESSES :
   CONCRETE fc = 70 KG/CM^2
   REBAR fs = 1200 KG/CM^2 FOR PLAIN BARS.
   fs = 1400 KG/CM^2 FOR DEFORMED BARS.
4. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG/M^3 AND A MINIMUM 28-DAYS 0.15 x 0.15 x 0.15M. CUBE STRENGTH OF 210 KG/CM^2. CEMENT SHALL BE TIS. 15 TYPE 1 PORTLAND CEMENT UNLESS SALINE PROTECTION IS SPECIFIED WHEN TYPE 5 PORTLAND CEMENT SHALL BE USED INSTEAD.
5. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR24 PLAIN BARS UNLESS OTHERWISE INDICATED.
6. CLEAR CONCRETE COVER SHALL BE 2.5 CM.
7. ALL EXPOSED CORNERS SHALL HAVE 2 CM. CHAMFERS UNLESS OTHER WISE INDICATED.
8. RAILING POST SPACINGS FOR ALL TYPES OF RAILING ARE AS SHOWN IN THE TABLE ABOVE.
9. IN SOME CASE, TRAFFIC RAILING TYPE 1 MAY BE SUBSTITUTED BY GUARD RAILS FASTENED ON CONCRETE RAILING POSTS IF APPROVED BY THE ENGINEER.
10. DIAMETERS OF GALVANIZED STEEL PIPES SHOWN ARE NOMINAL DIAMETERS.
11. ALL STRUCTURAL STEEL FOR RAILING POSTS, RAILINGS AND ALL ACCESSORIES SHALL BE GALVANIZED WITH MINIMUM OF 376 G/M^2 (1.25 OUNCE/FT^2). THE FABRICATOR SHALL SUBMIT THE SAMPLES FOR TESTING AS FOLLOWS.

QUANTITY OF PRODUCT			NUMBER OF SAMPLES
LESS	THAN	500	2
500	–	820	3
820	–	1,200	4
1,200	–	1,600	5
1,600	–	2,000	6

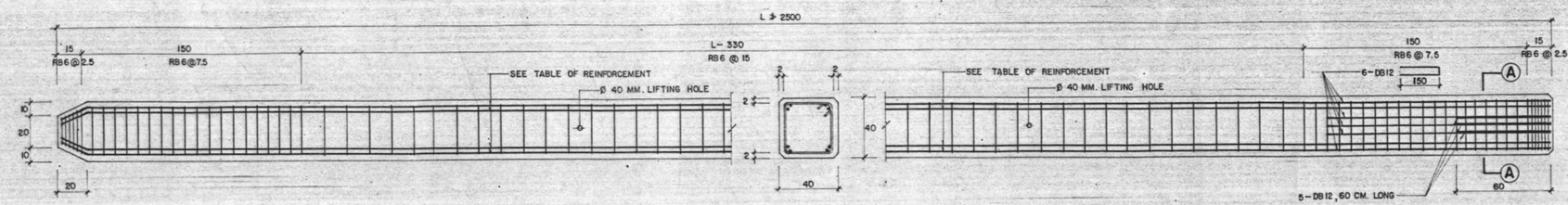
12. AT RAILING JOINT, A PIECE OF PIPE OF 0.80M. LONG HAVING AN OUTER DIAMETER SLIGHTLY SMALLER THAN THE INNER DIAMETER OF THE RAILING PIPES SHALL BE INSERTED AND FASTENED TO BOTH RAILING PIPES BY 2 - Ø10MM. SET SCREWS AT 0.15M. FROM EACH SIDE OF THE JOINT.
13. EXPANSION JOINTS SHALL BE PROVIDED FOR STEEL PIPE RAILING AT THE INTERVAL NOT MORE THAN 15.0 M. BOTH ENDS OF THE RAILING PIPES SHALL BE CLOSED BY WELDING TO THE PIPES A CIRCULAR PLATE HAVING THE SAME SIZE AND THICKNESS OF THE PIPE.
14. QUANTITIES OF REBARS SHOWN ARE FOR RAILING AND POSTS ONLY QUANTITIES OF REBARS IN SIDEWALKS AND CURBS ARE SHOWN ON SLAB BRIDGE DRAWINGS IN CONSTRUCTION OF BRIDGE DECK AND SIDEWALKS. DOWELS FOR RAILING POST SHALL BE PROVIDED IN ACCORDANCE WITH THIS DRAWING.
15. WELDED JOINTS OF PEDESTRIAN RAILING POSTS SHALL BE PAINTED BY 2 LAYERS OF ALUMINUM PAINT
16. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
17. PAINTING AT THE END FACES OF RAILING POSTS AND SIDEWALKS WHICH EXPOSED TO TRAFFIC (IF ANY) SHALL BE PROVIDED BY APPLYING ALTERNATE STRIPES OF BLACK AND WHITE COLOUR OF .10 M. WIDE EACH AND 45 TO THE HORIZONTAL PLANE. WHITE PAINT SHALL BE LIGHT REFLECTED ONE DETAILS OF THE PAINTING ARE SHOWN ON DWG NO. ST.-01 OR ST-26.
18. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3AD5-106-14/26.

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

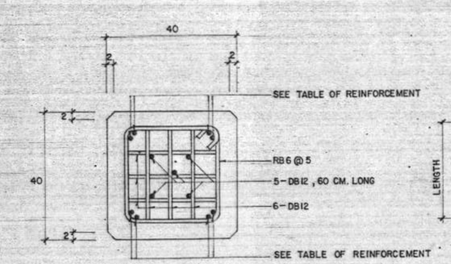
RAILING POST AND RAILING DETAILS

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE - JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. MS-01
		SHEET NO. 181



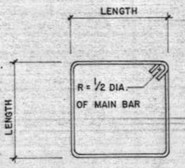
REINFORCEMENT DETAILS

SCALE 1 : 20



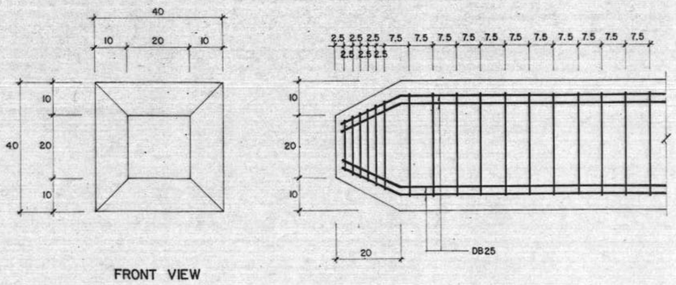
SECTION A — A

SCALE 1 : 10



STIRRUP DETAIL

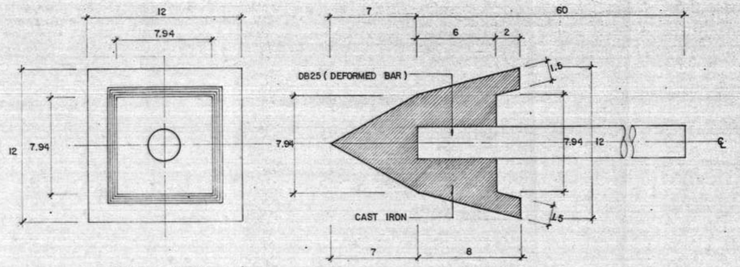
NOT TO SCALE



FRONT VIEW

PILE TIP TYPE A

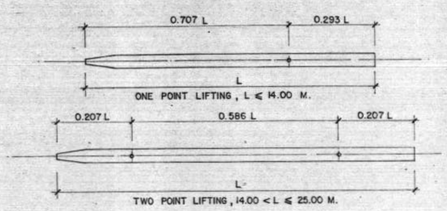
SCALE 1 : 10



FRONT VIEW

PILE TIP TYPE B

SCALE 1 : 2.5



PILE LIFTING LOCATIONS

NOT TO SCALE

TABLE OF REINFORCEMENT

LENGTH OF PILE (L)	REINFORCEMENT
NOT MORE THAN 19 M.	4-Ø 28 MM. OR 8-Ø 20 MM.
MORE THAN 19.00 M. BUT NOT MORE THAN 25.00 M.	8-Ø 25 MM.

TABLE OF APPROXIMATE ULTIMATE CAPACITY (R) 40 x 40 CM. PILE IN TONS DRIVEN BY DROP HAMMER WITH FRICTION WINCH, HAMMER WEIGHT (W) OF 3.5, 4.0 AND 4.5 TONS, DROP HEIGHT (h) OF 100, 120 AND 150 CM.
WITH APPROPRIATE CUSHION OF 5 CM. THICK ON THE TOP OF PILE HEAD, IN ACCORDANCE WITH AVERAGE PILE PENETRATION (S) FOR THE LAST FIVE BLOWS.

LENGTH OF PILE (L) M.	APPROX. WEIGHT OF PILE (P) TONS	3.5-TON DROP HAMMER (W) WITH FRICTION WINCH — PENETRATION (S) — CM.								
		1.5	1.0	0.7	0.5	0.4	0.3	0.2	0.1	0.05
		HAMMER DROP HEIGHT (H) — CM.								
		100 120 150	100 120 150	100 120 150	100 120 150	100 120 150	100 120 150	100 120 150	100 120 150	100 120 150
6	2.304	85 99 120	108 125 148	127 146 171	143 162 188	152 172 198	162 182 209	173 193 220	184 204 232	190 210 238
7	2.688	80 94 113	102 118 141	121 138 162	136 154 179	145 163 189	154 173 199	164 183 209	175 195 221	181 200 227
8	3.072	76 89 108	97 113 134	115 132 154	130 147 171	138 156 180	147 165 190	157 175 200	168 186 211	173 192 217
9	3.456	73 85 103	93 107 128	110 126 148	124 141 163	132 149 172	141 158 181	150 168 191	160 178 202	166 184 208
10	3.840	69 81 98	89 103 122	105 120 141	119 135 157	127 143 165	135 151 174	144 161 184	154 171 194	159 176 199
11	4.224	66 78 94	85 99 117	101 116 136	114 129 150	122 137 159	130 146 167	138 155 177	148 164 186	153 169 192
12	4.608	64 75 90	82 95 113	97 111 131	110 124 145	117 132 153	125 140 161	133 149 170	143 158 180	147 163 185
13	4.992	61 72 87	79 91 109	94 107 126	106 120 140	113 127 147	120 135 155	129 144 164	138 153 173	142 158 178
14	5.376	59 69 84	76 88 105	90 103 121	102 116 135	109 123 142	116 131 150	124 139 159	133 148 168	138 152 172
15	5.760	57 67 81	73 85 101	87 100 117	99 112 130	105 119 137	112 126 145	120 134 153	129 143 162	133 147 167
16	6.144	55 65 78	71 82 98	84 97 114	96 108 126	102 115 133	109 122 141	116 130 149	125 138 157	129 143 162
17	6.528	53 63 76	69 80 95	82 94 110	93 105 122	99 112 129	106 119 136	113 126 144	121 134 152	125 139 157
18	6.912	52 61 73	67 77 92	79 91 107	90 102 119	96 108 125	102 115 132	110 123 140	117 130 148	122 135 152
19	7.296	50 59 71	65 75 89	77 88 104	87 99 115	93 105 122	100 112 129	107 119 136	114 127 144	118 131 148
20	7.680	49 57 69	63 73 87	75 86 101	85 96 112	91 102 118	97 109 125	104 116 132	111 123 140	115 127 144
21	8.064	47 56 67	61 71 85	73 84 98	83 94 109	88 100 115	94 106 122	101 113 129	108 120 137	112 124 140
22	8.448	46 54 66	60 69 82	71 81 96	81 91 106	86 97 112	92 103 119	98 110 126	105 117 133	109 121 137

4.0-TON DROP HAMMER (W) WITH FRICTION WINCH — PENETRATION (S) — CM.								
1.5	1.0	0.7	0.5	0.4	0.3	0.2	0.1	0.05
HAMMER DROP HEIGHT (H) — CM.								
100 120 150	100 120 150	100 120 150	100 120 150	100 120 150	100 120 150	100 120 150	100 120 150	100 120 150
99 115 139	125 143 170	145 166 193	162 183 212	171 193 222	182 203 233	192 214 244	204 226 256	210 232 262
94 110 132	118 136 161	138 158 184	154 175 202	163 184 212	173 194 222	184 205 233	195 216 245	201 222 251
90 104 126	113 130 154	132 151 176	148 167 193	156 176 203	166 185 212	176 196 223	186 207 234	192 212 240
86 100 120	108 125 147	127 144 169	141 160 185	150 169 194	159 178 204	168 188 214	179 198 225	184 204 230
82 96 115	104 119 141	121 138 162	136 153 178	144 162 187	153 171 196	162 180 206	172 191 216	177 196 221
79 92 111	100 115 136	117 133 156	131 148 171	138 156 179	147 164 188	156 174 198	166 184 208	171 189 213
76 88 106	96 111 131	112 128 150	126 142 165	133 150 173	141 159 182	150 168 191	160 177 201	165 182 206
73 85 103	92 107 126	108 124 145	121 137 159	129 145 167	137 153 175	145 162 184	154 171 194	159 176 199
70 82 99	89 103 122	105 120 140	117 133 154	124 140 162	132 148 170	140 156 178	149 166 188	154 170 192
68 79 96	86 100 118	101 116 135	114 128 149	120 136 156	128 143 164	136 152 173	145 160 182	149 165 186
66 77 93	84 96 114	98 112 131	110 125 144	117 131 152	124 139 159	132 147 168	140 155 176	145 160 181
64 75 90	81 94 111	95 109 127	107 121 140	113 128 147	120 135 155	128 143 163	136 151 171	140 155 176
62 72 87	79 91 108	92 106 124	104 117 136	110 124 143	117 131 150	124 139 158	132 147 166	136 151 171
60 70 85	76 88 105	90 103 120	101 114 132	107 121 139	114 127 146	121 135 154	129 143 162	133 147 166
59 68 82	74 86 102	87 100 117	98 111 129	104 117 135	111 124 142	118 131 150	125 139 158	129 143 162
57 67 80	72 84 99	85 97 114	96 108 126	101 114 132	108 121 139	115 128 146	122 135 154	126 139 158
56 65 78	71 82 97	83 95 111	93 106 122	99 111 129	105 118 135	112 125 142	119 132 150	123 136 154

4.5-TON DROP HAMMER (W) WITH FRICTION WINCH — PENETRATION (S) — CM.								
1.5	1.0	0.7	0.5	0.4	0.3	0.2	0.1	0.05
HAMMER DROP HEIGHT (H) — CM.								
100 120 150	100 120 150	100 120 150	100 120 150	100 120 150	100 120 150	100 120 150	100 120 150	100 120 150
113 131 157	140 161 190	162 184 215	180 203 234	190 213 244	200 223 255	211 235 267	223 247 279	229 253 285
107 125 150	134 154 181	155 176 205	172 194 224	181 203 234	191 214 244	202 224 255	213 236 267	219 242 273
103 120 143	128 147 174	148 169 197	165 186 214	174 195 224	183 205 234	193 215 245	204 226 256	210 232 262
98 115 137	123 141 167	142 162 189	158 178 206	167 187 215	176 197 225	186 207 235	196 218 246	202 223 252
94 110 132	118 136 160	137 156 182	152 171 198	160 180 207	169 189 216	179 199 227	189 209 237	194 215 243
91 106 127	114 131 154	132 150 175	146 165 191	154 174 200	163 182 209	172 192 218	182 202 229	187 207 234
88 102 122	110 126 149	127 145 169	141 159 184	149 167 193	157 176 201	166 185 211	176 195 221	181 200 226
85 98 118	106 122 144	123 140 163	137 154 178	144 162 186	152 170 195	161 179 204	170 189 214	175 194 218
82 95 114	102 118 139	119 135 158	132 149 172	139 157 180	147 165 189	156 173 197	165 183 207	170 187 212
79 92 111	99 114 135	115 131 153	128 144 167	135 152 175	143 160 183	151 168 191	160 177 200	164 182 205
77 89 107	96 110 130	112 127 148	124 140 162	131 147 169	139 155 177	147 163 186	155 172 195	160 176 199
74 87 104	93 107 127	108 123 144	121 136 157	127 143 165	135 151 172	142 158 180	151 167 189	155 171 193
72 84 101	91 104 123	105 120 140	117 132 153	124 139 160	131 146 168	138 154 175	146 162 184	151 167 188
70 82 98	88 101 120	103 117 136	114 129 149	120 135 156	127 142 163	135 150 171	143 158 179	147 162 183
68 80 96	86 99 117	100 114 133	111 125 145	117 132 152	124 139 159	131 146 166	139 154 174	143 158 178
67 78 93	84 96 114	97 111 129	108 122 141	114 129 148	121 135 155	128 142 162	135 150 170	139 154 174
65 76 91	82 94 111	95 108 126	106 119 136	112 125 144	118 132 151	125 139 158	132 146 166	136 150 170

NOTES :

1. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG./M.^{3} AND A MINIMUM 28-DAY 0.15 M.- CUBE STRENGTH OF 300 KG./CM.^{2} CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT. A SUGGESTED APPROXIMATE MIX DESIGN PER CUBIC METER IS AS FOLLOWS.

PORTLAND CEMENT	350	KG.
SAND	0.43	M.^{3}
CRUSHED ROCK OR GRAVEL	0.86	M.^{3}
CONCRETE SLUMP, MAX.	10	CM.

2. REBAR Ø 12 MM. OR LARGER SHALL BE TIS 24 GRADE SD30 DEFORMED BAR, OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
3. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SPECIFICATIONS SHALL BE USED INSTEAD OF PORTLAND CEMENT TYPE 1.
4. CLEAR CONCRETE COVER SHALL BE 5 CM.
5. WEIGHT OF DROP HAMMER SHALL NOT BE LESS THAN HALF THE WEIGHT OF THE PILE, NOT BE LESS THAN 3.5 TONS.
6. FOLLOWER SHALL NOT BE USED UNLESS IT IS NECESSARY AND AN APPROVAL OF THE ENGINEER IS GIVEN IN SUCH CASES, ITEM 7 BELOW SHALL BE FOLLOWED.
7. PILE LOAD TESTS MAY BE NEEDED UNDER THE JUDGMENT OF THE ENGINEER. TESTING PROCEDURE AND CRITERIA SHALL BE ACCORDANCE WITH THE DOH SPECIFICATIONS.
8. SHOP DRAWING SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL FOR PILES LONGER THAN OR DIFFER FROM THOSE SHOWN ON THIS DRAWING.
9. TYPE A OR TYPE B PILE TIPS SHALL BE USED UNDER THE APPROVAL OF THE ENGINEER.
10. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
11. ALL PILE ULTIMATE CAPACITIES SHOWN IN THIS DRAWING ARE DERIVED FROM HILEY'S FORMULA.

$$R = \frac{nWhE}{S + \frac{C}{2}}$$

WHERE R, W, h AND S ARE AS STATED IN THE TABLES.

- n = EFFICIENCY FACTOR = $\frac{W + P^2}{W + P}$
- P = WEIGHT OF THE PILE IN TONS.
- e = COEFFICIENT OF PILE HEAD AND CUSHION.
  - = 0.25 FOR CONCRETE PILE WITH JUTE MAT HEAD CUSHION.
- E = EQUIPMENT LOSS FACTOR = 0.75
- C = TEMPORARY COMPRESSION = $C_1 + C_2 + C_3$
- C_1 = PILE SHORTENING FOR PILE LENGTH OF L(M.) = $\frac{10^5 RL}{AEc}$ CM.
- C_2 = COMPRESSION IN PILE HEAD CUSHION = $9.018\frac{R}{A}$ CM.
- C_3 = COMPRESSION IN THE SOIL UNDERNEATH AND SURROUNDING THE PILE = 0.25 CM.
- A = CROSS SECTIONAL AREA OF PILE IN CM.^{2}
- Ec = MODULAS OF ELASTICITY OF CONCRETE 230,500 KG./CM.^{2}

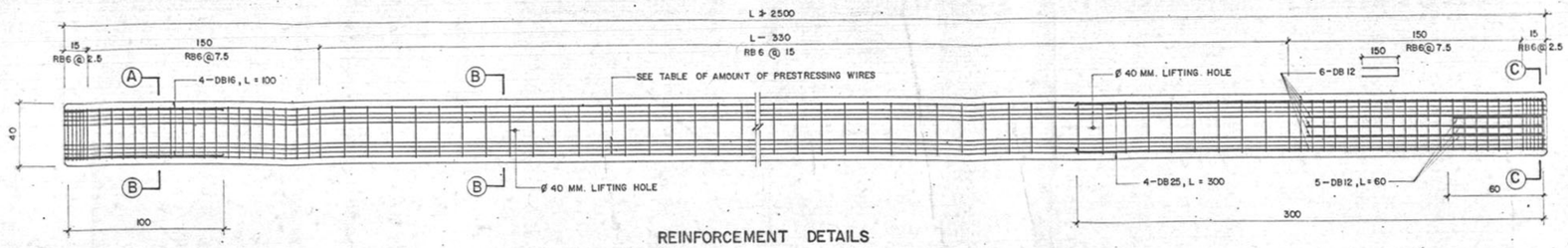
12. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3R/1

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

0.40 x 0.40 M. RC. PILE
PILE CAPACITY AND REINFORCEMENT DETAILS

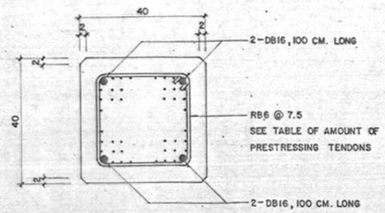
DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Bunyev (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : For (DIRECTOR GENERAL)		DWG. NO. MS-02
		SHEET NO. 182



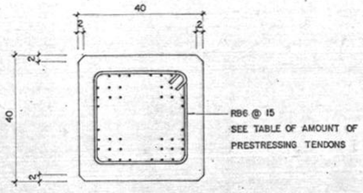
REINFORCEMENT DETAILS
SCALE 1 : 20

TABLE OF AMOUNT PRESTRESSING TENDONS

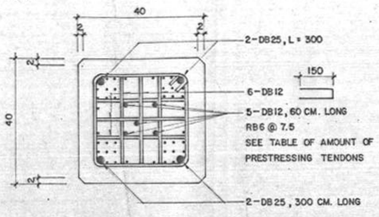
PRESTRESSING WIRES Ø 5 MM.	PRESTRESSING WIRES Ø 7 MM.	PRESTRESSING WIRES Ø 9.53 MM. (3/8")
40	24	16



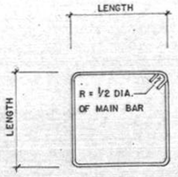
SECTION A – A
SCALE 1 : 10



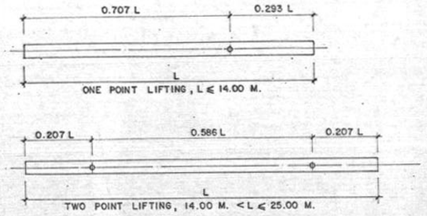
SECTION B – B
SCALE 1 : 10



SECTION C – C
SCALE 1 : 10



STIRRUP DETAIL
NOT TO SCALE



PILE LIFTING LOCATIONS
NOT TO SCALE

TABLE OF APPROXIMATE ULTIMATE CAPACITY (R) 40 x 40 CM. PILE IN TONS DRIVEN BY DROP HAMMER WITH FRICTION WINCH , HAMMER WEIGHT (W) OF 3.5 , 4.0 AND 4.5 TONS , DROP HEIGHT (h) OF 100 , 120 AND 150 CM. WITH APPROPRIATE CUSHION OF 5 CM. THICK ON THE TOP OF PILE HEAD, IN ACCORDANCE WITH AVERAGE PILE PENETRATION (S) FOR THE LAST FIVE BLOWS .

LENGTH OF PILE (L) M.	APPROX. WEIGHT OF PILE (P) TONS	3.5 – TON DROP HAMMER (W) WITH FRICTION WINCH																											
		PENETRATION (S) – CM.																											
		1.5			1.0			0.7			0.5			0.4			0.3			0.2			0.1			0.05		
		HAMMER DROP HEIGHT (H) – CM.																											
		100	120	150	100	120	150	100	120	150	100	120	150	100	120	150	100	120	150	100	120	150	100	120	150	100	120	150	
6	2.304	85	99	120	108	125	148	127	146	171	143	162	188	152	172	198	162	182	209	173	193	220	184	204	232	190	210	238	
7	2.688	80	94	113	102	118	141	121	138	162	136	154	179	145	163	189	154	173	199	164	183	209	175	195	221	181	200	227	
8	3.072	76	89	108	97	113	134	115	132	154	130	147	171	138	156	180	147	165	190	157	175	200	168	186	211	173	192	217	
9	3.456	73	85	103	93	107	128	110	126	148	124	141	163	132	149	172	141	158	181	150	168	191	160	178	202	166	184	208	
10	3.840	69	81	98	89	103	122	105	120	141	119	135	157	127	143	165	135	151	174	144	161	184	154	171	194	159	176	199	
11	4.224	66	78	94	85	99	117	101	116	136	114	129	150	122	137	159	130	146	167	138	155	177	148	164	186	153	169	192	
12	4.608	64	75	90	82	95	113	97	111	131	110	124	145	117	132	153	125	140	161	133	149	170	143	158	180	147	163	185	
13	4.992	61	72	87	79	91	109	94	107	126	106	120	140	113	127	147	120	135	155	129	144	164	138	153	173	142	158	178	
14	5.376	59	69	84	76	88	105	90	103	121	102	116	135	109	123	142	116	131	150	124	139	159	133	148	168	138	152	172	
15	5.760	57	67	81	73	85	101	87	100	117	99	112	130	105	119	137	112	126	145	120	134	153	129	143	162	133	147	167	
16	6.144	55	65	78	71	82	98	84	97	114	96	108	126	102	115	133	109	122	141	116	130	149	125	138	157	129	143	162	
17	6.528	53	63	76	69	80	95	82	94	110	93	105	122	99	112	129	106	119	136	113	126	144	121	134	152	125	139	157	
18	6.912	52	61	73	67	77	92	79	91	107	90	102	119	96	108	125	102	115	132	110	123	140	117	130	148	122	135	152	
19	7.296	50	59	71	65	75	89	77	88	104	87	99	115	93	105	122	100	112	129	107	119	136	114	127	144	118	131	148	
20	7.680	49	57	69	63	73	87	75	86	101	85	96	112	91	102	118	97	109	125	104	116	132	111	123	140	115	127	144	
21	8.064	47	56	67	61	71	85	73	84	98	83	94	109	88	100	115	94	106	122	101	113	129	108	120	137	112	124	140	
22	8.448	46	54	66	60	69	82	71	81	96	81	91	106	86	97	112	92	103	119	98	110	126	105	117	133	109	121	137	

LENGTH OF PILE (L) M.	4.0 – TON DROP HAMMER (W) WITH FRICTION WINCH																												
	PENETRATION (S) – CM.																												
	1.5			1.0			0.7			0.5			0.4			0.3			0.2			0.1			0.05				
	HAMMER DROP HEIGHT (H) – CM.																												
	100	120	150	100	120	150	100	120	150	100	120	150	100	120	150	100	120	150	100	120	150	100	120	150	100	120	150		
6	99	115	139	125	143	170	145	166	193	162	183	212	171	193	222	182	203	233	192	214	244	204	226	256	210	232	262		
7	94	110	132	118	136	161	138	158	184	154	175	202	163	184	212	173	194	222	184	205	233	195	216	245	201	222	251		
8	90	104	126	113	130	154	132	151	176	148	167	193	156	176	203	166	185	212	176	196	223	186	207	234	192	212	240		
9	86	100	120	108	125	147	127	144	169	141	160	185	150	169	194	159	178	204	168	188	214	179	198	225	184	204	230		
10	82	96	115	104	119	141	121	138	162	136	153	178	144	162	187	153	171	196	162	180	206	172	191	216	177	196	221		
11	79	92	111	100	115	136	117	133	156	131	148	171	138	156	179	147	164	188	156	174	198	166	184	208	171	189	213		
12	76	88	106	96	111	131	112	128	150	126	142	165	133	150	173	141	159	182	150	168	191	160	177	201	165	182	206		
13	73	85	103	92	107	126	108	124	145	121	137	159	129	145	167	137	153	175	145	162	184	154	171	194	159	176	199		
14	70	82	99	89	103	122	105	120	140	117	133	154	124	140	162	132	148	170	140	156	178	149	166	188	154	170	192		
15	68	79	96	86	100	118	101	116	135	114	128	149	120	136	156	128	143	164	136	152	173	145	160	182	149	165	186		
16	66	77	93	84	96	114	98	112	131	110	125	144	117	131	152	124	139	159	132	147	168	140	155	176	145	160	181		
17	64	75	90	81	94	111	95	109	127	107	121	140	113	128	147	120	135	155	128	143	163	136	151	171	140	155	176		
18	62	72	87	79	91	108	92	106	124	104	117	136	110	124	143	117	131	150	124	139	158	132	147	166	136	151	171		
19	60	70	85	76	88	105	90	103	120	101	114	132	107	121	139	114	127	146	121	135	154	129	143	162	133	147	166		
20	59	68	82	74	86	102	87	100	117	98	111	129	104	117	135	111	124	142	118	131	150	125	139	158	129	143	162		
21	57	67	80	72	84	99	85	97	114	96	108	126	101	114	132	108	121	139	115	128	146	122	135	154	126	139	158		
22	56	65	78	71	82	97	83	95	111	93	106	122	99	111	129	105	118	135	112	125	142	119	132	150	123	136	154		

LENGTH OF PILE (L) M.	4.5 – TON DROP HAMMER (W) WITH FRICTION WINCH																												
	PENETRATION (S) – CM.																												
	1.5			1.0			0.7			0.5			0.4			0.3			0.2			0.1			0.05				
	HAMMER DROP HEIGHT (H) – CM.																												
	100	120	150	100	120	150	100	120	150	100	120	150	100	120	150	100	120	150	100	120	150	100	120	150	100	120	150		
6	113	131	157	140	161	190	162	184	215	180	203	234	190	213	244	200	223	255	211	235	267	223	247	279	229	253	285		
7	107	125	150	134	154	181	155	176	205	172	194	224	181	203	234	191	214	244	202	224	255	213	236	267	219	242	273		
8	103	120	143	128	147	174	148	169	197	165	186	214	174	195	224	183	205	234	193	215	245	204	226	256	210	232	262		
9	98	115	137	123	141	167	142	162	189	158	178	206	167	187	215	176	197	225	186	207	235	196	218	246	202	223	252		
10	94	110	132	118	136	160	137	156	182	152	171	198	160	180	207	169	189	216	179	199	227	189	209	237	194	215	243		
11	91	106	127	114	131	154	132	150	175	146	165	191	154	174	200	163	182	209	172	192	218	182	202	229	187	207	234		
12	88	102	122	110	126	149	127	145	169	141	159	184	149	167	193	157	176	201	166	185	211	176	195	221	181	200	226		
13	85	98	118	106	122	144	123	140	163	137	154	178	144	162	186	152	170	195	161	179	204	170	189	214	175	194	218		
14	82	95	114	102	118	139	119	135	158	132	149	172	139	157	180	147	165	189	156	173	197	165	183	207	170	187	212		
15	79	92	111	99	114	135	115	131	153	128	144	167	135	152	175	143	160	183	151	168	191	160	177	200	164	182	205		
16	77	89	107	96	110	130	112	127	148	124	140	162	131	147	169	139	155	177	147	163	186	155	172	195	160	176	199		
17	74	87	104	93	107	127	108	123	144	121	136	157	127	143	165	135	151	172	142	158	180	151	167	189	155	171	193		
18	72	84	101	91	104	123	105	120	140	117	132	153	124	139	160	131	146	168	138	154	175	146	162	184	151	167	188		
19	70	82	98	88	101	120	103	117	136	114	129	149	120	135	156	127	142	163	135	150	171	143	158	179	147	162	183		
20	68	80	96	86	99	117	100	114	133	111	125	145	117	132	152	124	139	159	131	146	166	139	154	174	143	158	178		
21	67	78	93	84	96	114	97	111	129	108	122	141	114	129	148	121	135	155	128	142	162	135	150	170	139	154	174		
22	65	76	91	82	94	111	95	108	126	106	119	138	112	125	144	118	132	151	125	139	158	132	146	166	136	150	170		

NOTES :

1. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 450 KG./CM.^{2} FOR A 15x15x15 CUBE AT 28 DAYS.
2. MIX DESIGN PER CUBIC METER OF CONCRETE SHALL HAVE A MINIMUM TIS 15 TYPE I PORTLAND CEMENT OF 350 KG.
3. IN CASE OF SALINE PROTECTION , HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 , SHALL BE USED INSTEAD OF TYPE I CEMENT.
4. PRESTRESSING WIRES SHALL BE STRESS – RELIEVED WIRES CONFORMING TO TIS 95 .
   a.) Ø 5 MM. WIRE SHALL HAVE A MINIMUM ULTIMATE TENSILE STRENGTH OF 17,500 KG./CM.^{2}
   b.) Ø 7 MM. WIRE SHALL HAVE A MINIMUM ULTIMATE TENSILE STRENGTH OF 16,000 KG./CM.^{2}
5. PRESTRESSING TENDONS Ø 9.53 MM. (3/8") SHALL BE TIS 420 GRADE 1725 HAVING A MINIMUM ULTIMATE TENSILE LOAD OF 9,078 KG.
6. REBAR Ø 12 MM. OR LARGER SHALL BE TIS 20 GRADE SD30 DEFORMED BARS , OTHERS SHALL BE TIS 24 GRADE SR24 PLAIN BARS UNLESS OTHERWISE INDICATED.
7. INITIAL PRESTRESSING FORCE SHALL BE AS FOLLOWS :
   a.) Ø 5 MM. STRESS – RELIEVED WIRE SHALL HAVE AN INITIAL PRESTRESSING FORCE OF 2,400 KG.
   b.) Ø 7 MM. STRESS – RELIEVED WIRE SHALL HAVE AN INITIAL PRESTRESSING FORCE OF 4,310 KG.
   c.) Ø 9.53 MM. SHALL HAVE AN INITIAL PRESTRESSING FORCE OF 6,330 KG.
8. CLEAR CONCRETE COVER SHALL BE 5 CM.
9. WEIGHT OF DROP HAMMER SHALL NOT BE LESS THAN HALF THE WEIGHT OF THE PILE NOT BE LESS THAN 3.5 TONS.
10. FOLLOWER SHALL NOT BE USED UNLESS IT IS NECESSARY AND AN APPROVAL OF THE ENGINEER IS GIVEN. IN SUCH CASES, ITEM 11 BELOW SHALL BE FOLLOWED.
11. PILE LOAD TESTS MAY BE NEEDED UNDER THE JUDGMENT OF THE ENGINEER. TESTING PROCEDURE AND CRITERIA SHALL BE AN ACCORDANCE WITH THE DOH , SPECIFICATIONS .
12. SHOP DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL FOR PILES LONGER THAN OR DIFFER FROM THOSE SHOWN ON THIS DRAWING .
13. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
14. ALL PILE ULTIMATE CAPACITIES SHOWN IN THIS DRAWING ARE DERIVED FROM HILEY'S FORMULA :

$$R = \frac{n W h E}{S + \frac{C}{2}}$$

WHERE R, W, h AND S ARE AS STATED IN THE TABLES.

n = EFFICIENCY FACTOR = $\frac{W + Pe^2}{W + P}$

P = WEIGHT OF THE PILE IN TONS

e = COEFICIENT OF PILE HEAD AND CUSHION
= 0.25 FOR CONCRETE PILE WITH JUTE MAT HEAD CUSHION

E = EQUIPMENT LOSS FACTOR = 0.75

C = TEMPORARY COMPRESSION = $C_1 + C_2 + C_3$

C_1 = PILE SHORTENING FOR PILE LENGTH OF L(M.) = $\frac{10^5 RL}{AEc}$ CM.

C_2 = COMPRESSION IN PILE HEAD CUSHION OF = 9.0128 $\frac{R}{A}$ CM.

C_3 = COMPRESSION IN THE SOIL UNDERNEATH AND SURROUNDING THE PILE = 0.25 CM.

A = CROSS SECTIONAL AREA OF PILE IN CM.^{2}

Ec = MODULUS OF ELASTICITY OF CONCRETE = 230,500 KG./CM.^{2}

15. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 3P/1

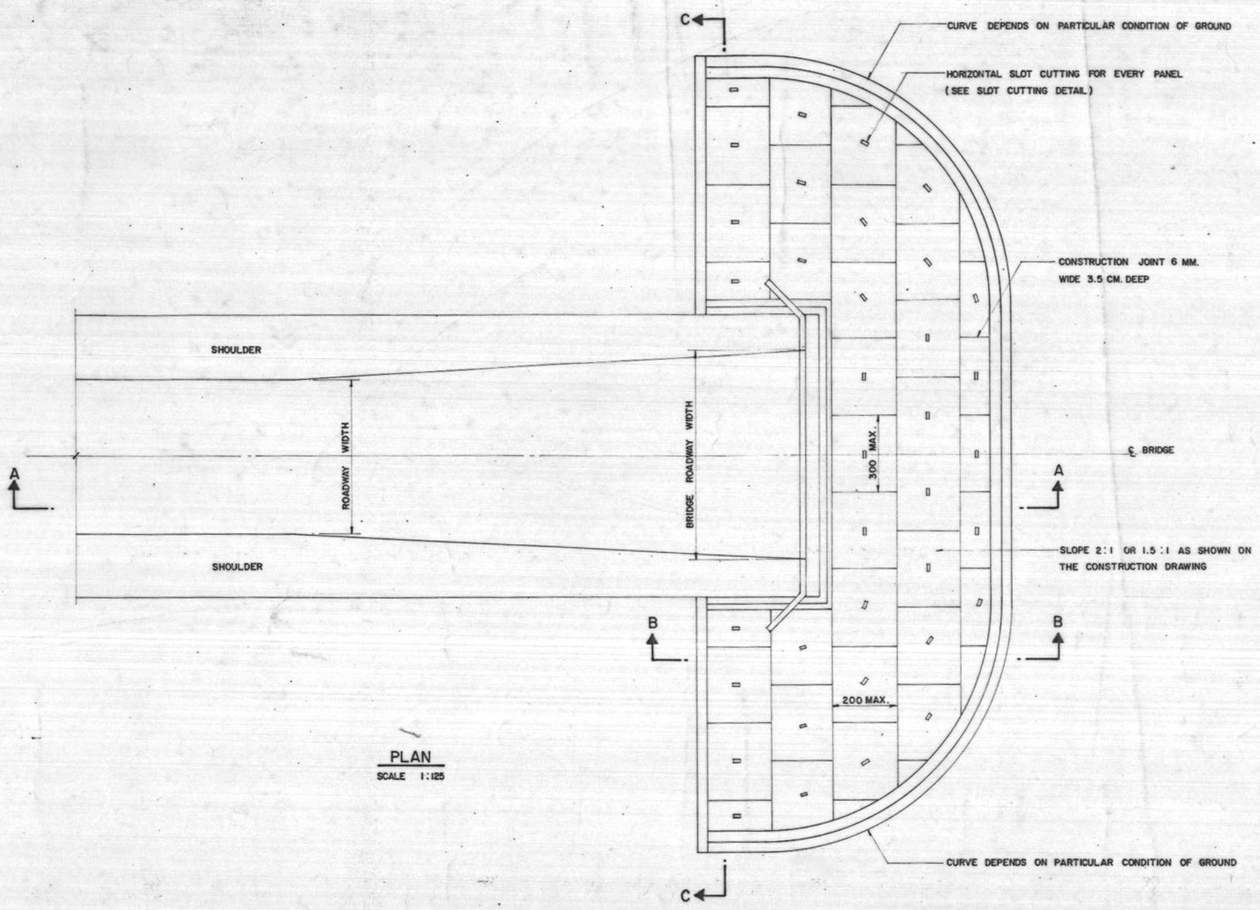
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

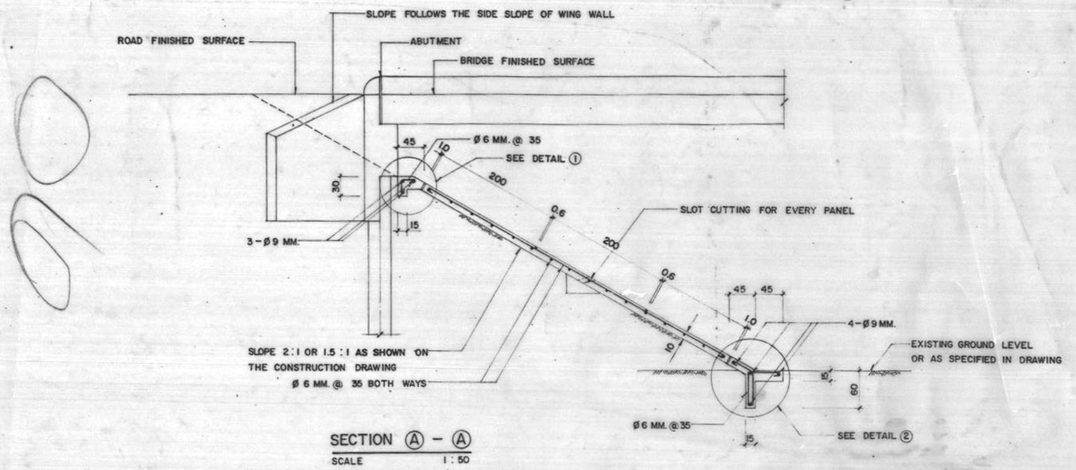
0.40 x 0.40 M. PC. PILE

PILE CAPACITY AND REINFORCEMENT DETAILS

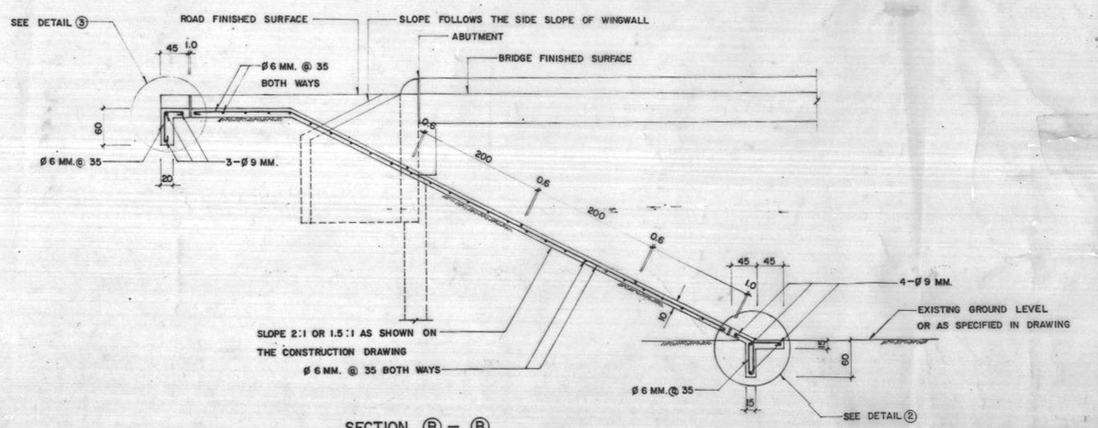
DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Burutpat (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. MS-03
		SHEET NO. 183



PLAN
SCALE 1:125



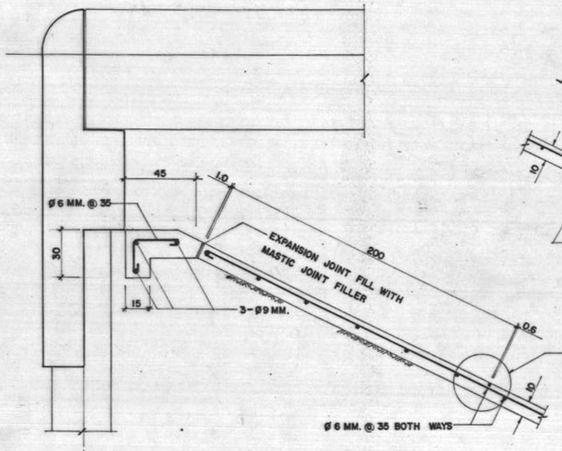
SECTION Ⓐ – Ⓐ
SCALE 1:50



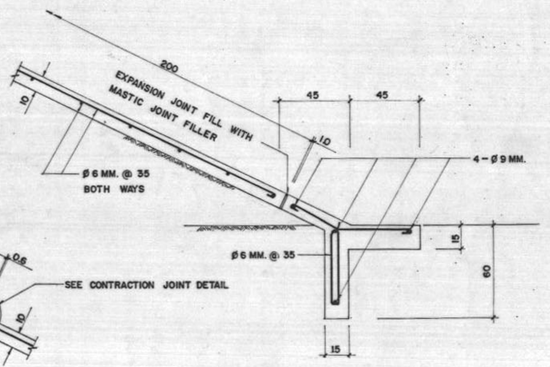
SECTION Ⓑ – Ⓑ
SCALE 1:50

NOTES :

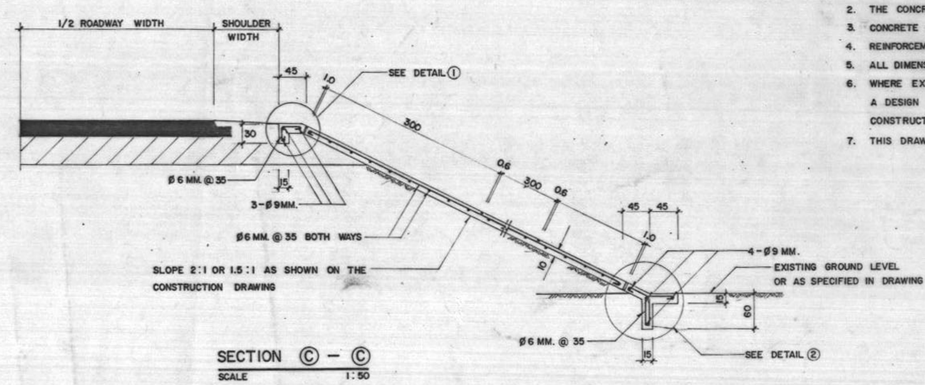
1. BEFORE POURING THE CONCRETE SLAB, THE EXISTING SLOPE SHALL BE WELL PREPARED AND COMPACTED TO MEET THE SIDE SLOPES OF THE ROADBED.
2. THE CONCRETE SLAB SHALL BE 10 CM. THICK.
3. CONCRETE SHALL BE CLASS "C".
4. REINFORCEMENT SHALL CONFORM TO THE TIS 20 GRADE SR 24.
5. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
6. WHERE EXISTING SOIL CONDITIONS ARE POOR OR WHERE ROADBED IS VERY HIGH, A DESIGN MUST BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION.
7. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. S2/10-19.



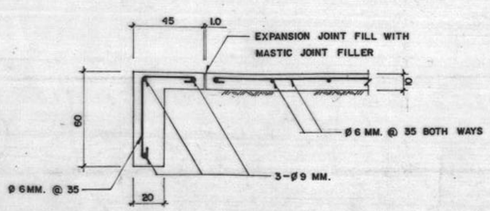
DETAIL ①
SCALE 1:20



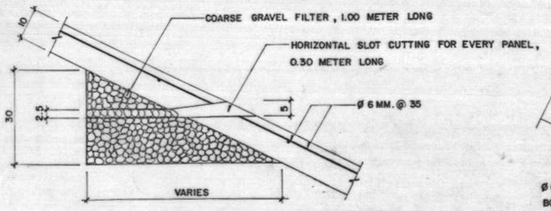
DETAIL ②
SCALE 1:20



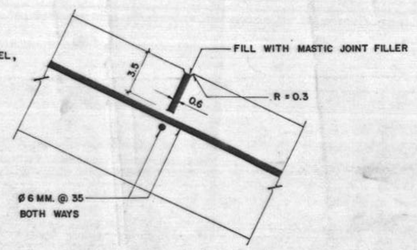
SECTION Ⓒ – Ⓒ
SCALE 1:50



DETAIL ③
SCALE 1:20



SLOT CUTTING DETAIL
SCALE 1:10



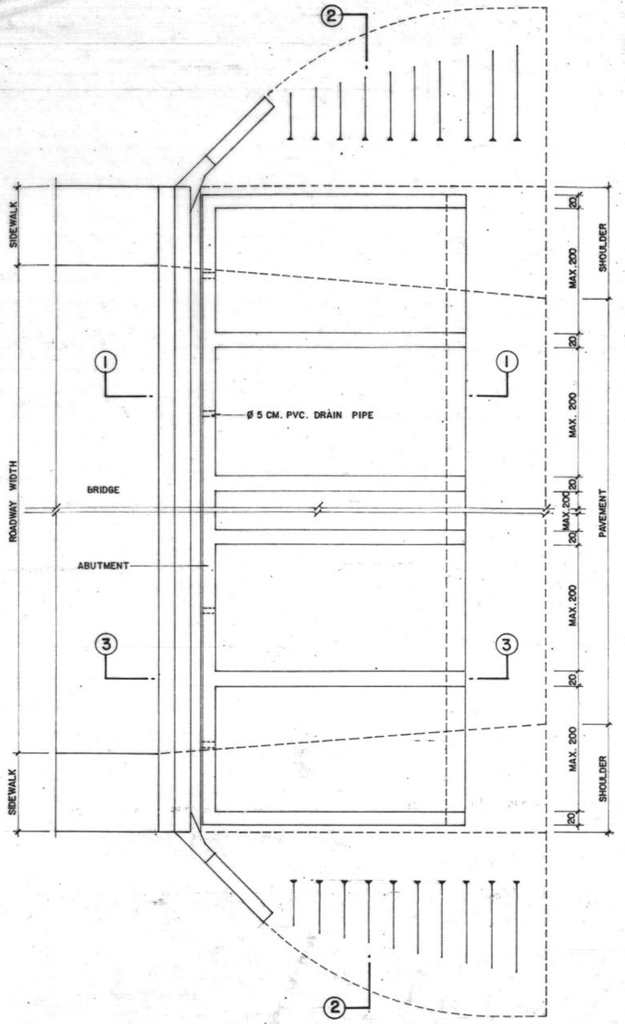
CONTRACTION JOINT DETAIL
SCALE 1:2.5

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

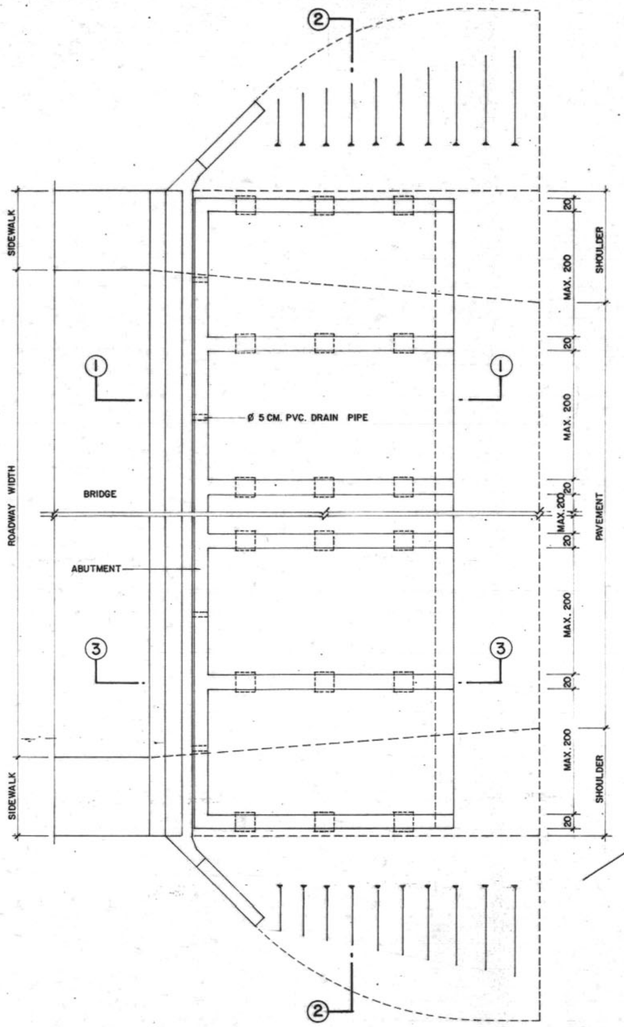
STANDARD DRAWING

CONCRETE SLOPE PROTECTION

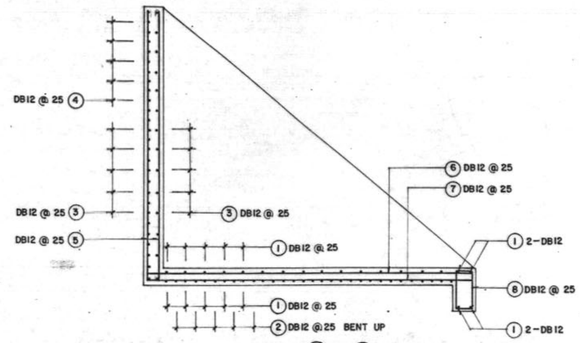
DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
		DWG. NO. MS-04
APPROVED : (DIRECTOR GENERAL)		SHEET NO. 184



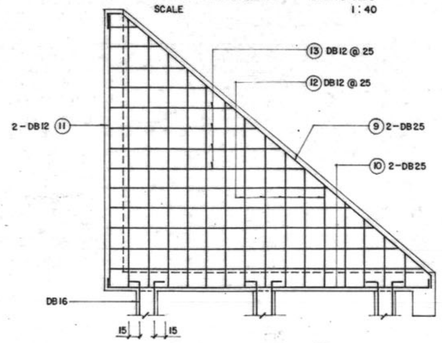
PLAN , ABUTMENT PROTECTOR TYPE (A)
SCALE 1 : 50



PLAN , ABUTMENT PROTECTOR TYPE (B)
SCALE 1 : 50



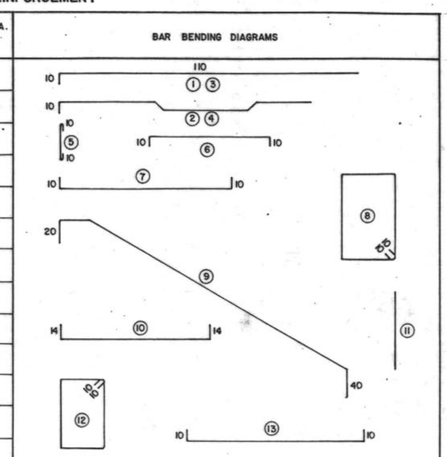
SECTION (1) – (1)
REINFORCEMENT DETAILS
SCALE 1 : 40



SECTION (1) – (1)
REINFORCEMENT DETAILS
SCALE 1 : 40

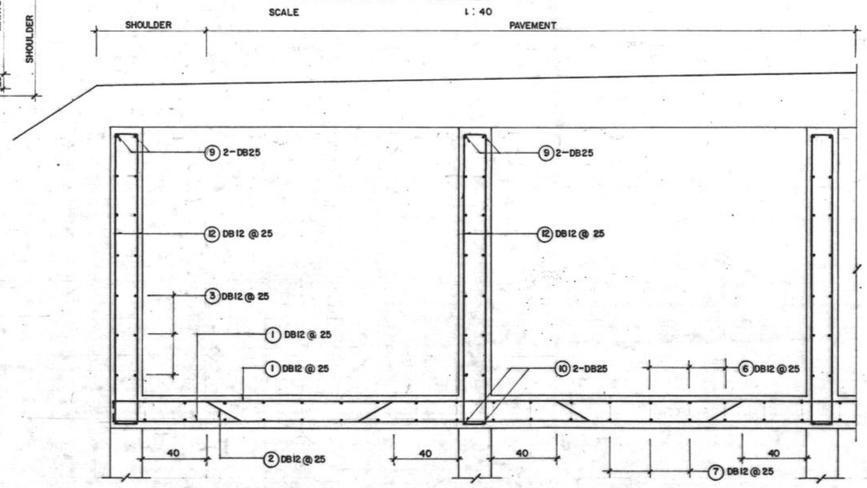
TABLE OF REINFORCEMENT

BAR MARK	BAR DIA. (MIN.)	BAR BENDING DIAGRAMS
(1)	DB 12	
(2)	DB 12	
(3)	DB 12	
(4)	DB 12	
(5)	DB 12	
(6)	DB 12	
(7)	DB 12	
(8)	DB 12	
(9)	DB 25	
(10)	DB 25	
(11)	DB 12	
(12)	DB 12	
(13)	DB 12	

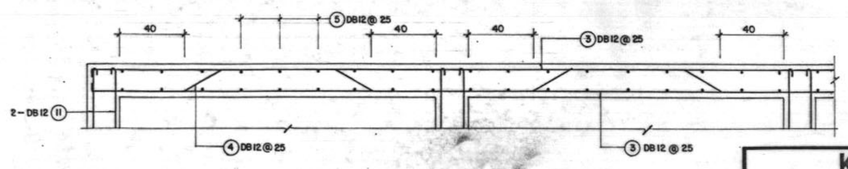


NOTES :

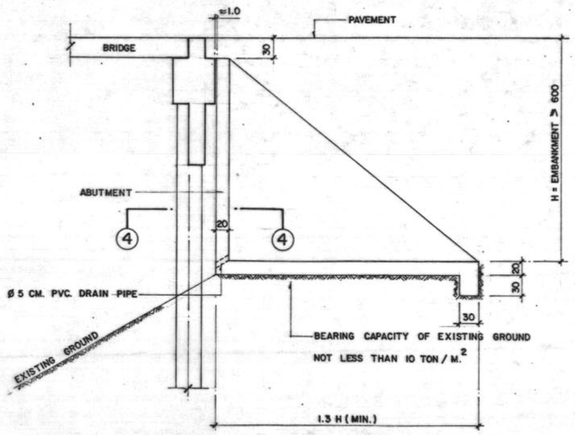
1. DEPTH OF FILL SHALL NOT EXCEED 0.60 M.
2. ALL EXPOSED CORNERS SHALL HAVE 1 CM. CHAMFER UNLESS OTHERWISE INDICATED.
3. REBARS Ø 12 MM. OR LARGER SHALL BE TIS 24 GRADE SD30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR24 PLAIN BARS UNLESS OTHERWISE INDICATED.
4. CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 350 KG/M.^{3} AND A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG./CM.^{2} FOR .15 x .15 x .15 M. CUBE AT 28 DAYS. CEMENT SHALL BE TIS 15 TYPE I PORTLAND CEMENT AND MAXIMUM SLUMP OF 10 CM.
5. CLEAR CONCRETE COVER SHALL BE 5 CM.
6. IF THE DISTANCE BETWEEN PILES IS LESS THAN 100 CM., ONE ROW OF PILES SHALL BE REDUCED. SIMILARLY, IF THE DISTANCE BETWEEN PILES IS MORE THAN 200 CM., ONE ADDITIONAL ROW OF PILES SHALL BE INTRODUCED
7. ALL DIAMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
8. DB IS THE DIAMETER OF BARS IN MILLIMETERS.
9. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. AP–2.



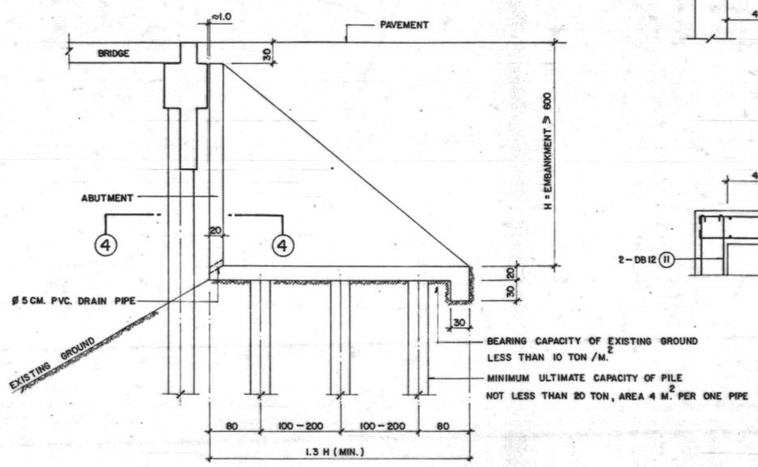
SECTION (2) – (2)
REINFORCEMENT DETAILS
SCALE 1 : 20



SECTION (4) – (4)
REINFORCEMENT DETAILS
SCALE 1 : 20



SECTION (1) – (1)
SCALE 1 : 50



SECTION (1) – (1)
SCALE 1 : 50

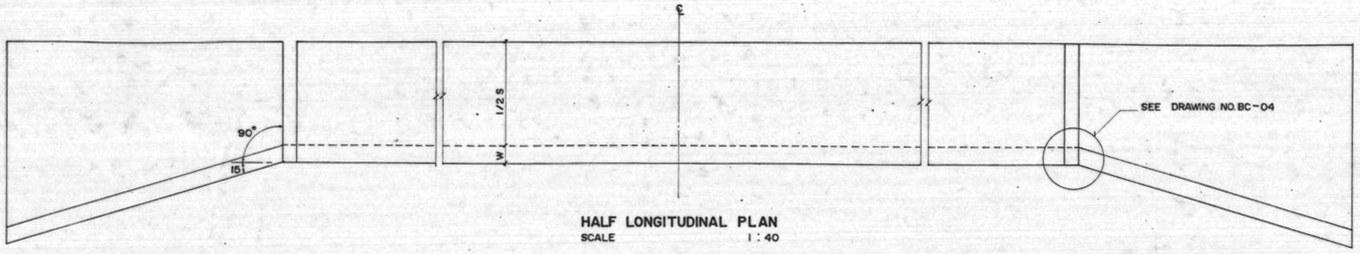
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

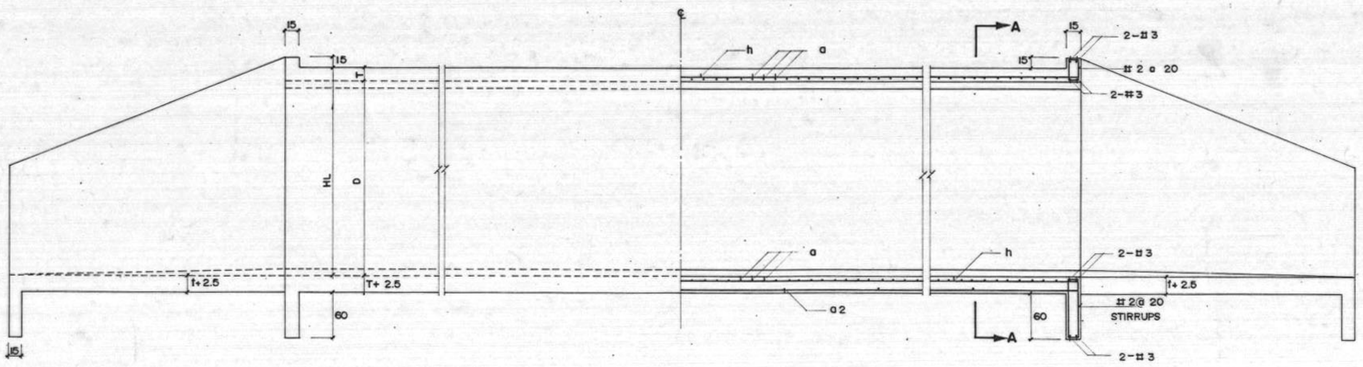
ABUTMENT PROTECTOR FOR EMBANKMENT ≥ 6.00 M.

PLAN, ELEVATION AND SECTIONS

DESIGNED : DOH & CONSULTANTS	CHECKED	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. MS–11
		SHEET NO. 185

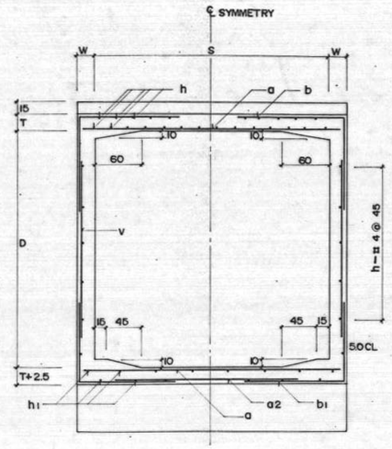


HALF LONGITUDINAL PLAN
SCALE 1 : 40

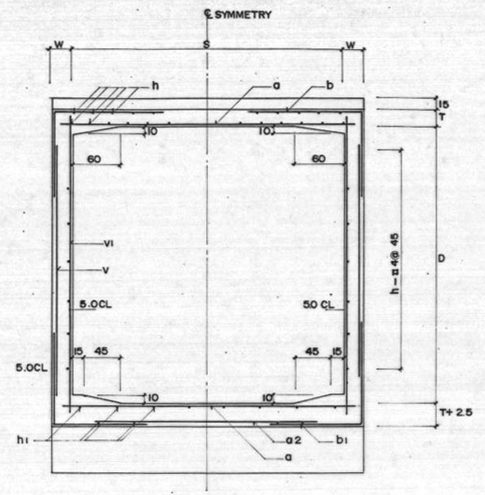


HALF LONGITUDINAL ELEVATION
SCALE 1 : 40

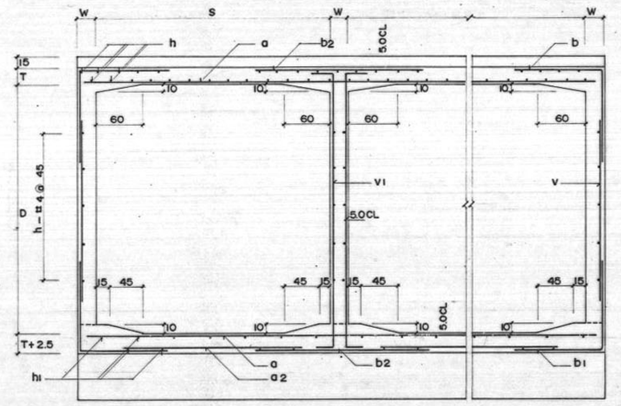
HALF LONGITUDINAL SECTION
SCALE 1 : 40



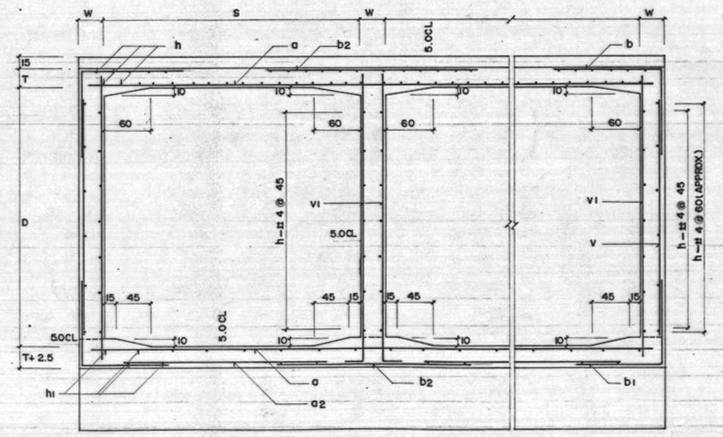
SINGLE BOX TYPE B
(FOR D > 245 CM. AND W < 30 CM.)



SINGLE BOX TYPE C
(FOR D > 245 CM. AND W ≥ 30 CM.)



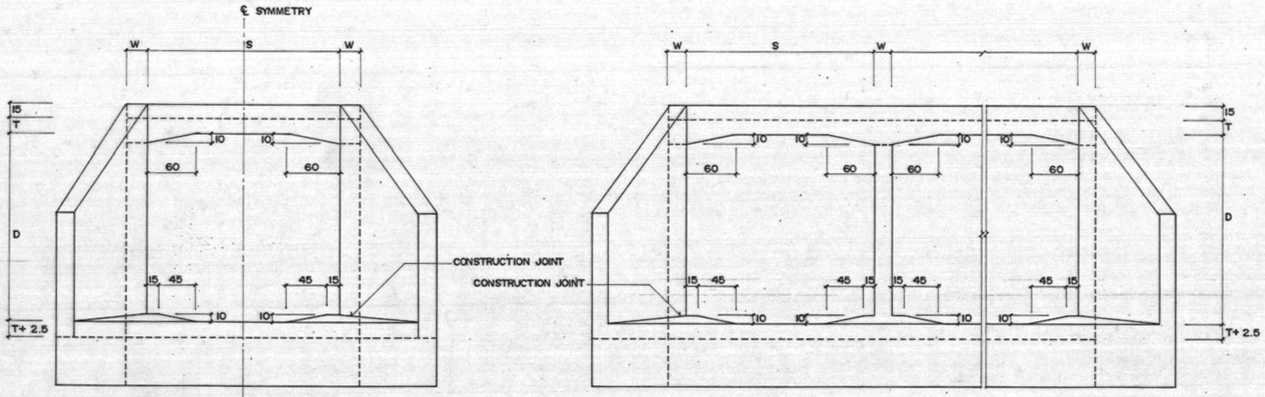
MULTIPLE BOXES TYPE B
(FOR D > 245 CM. AND W < 30 CM.)



MULTIPLE BOXES TYPE C
(FOR D > 245 CM. AND W ≥ 30 CM.)

NOTES :

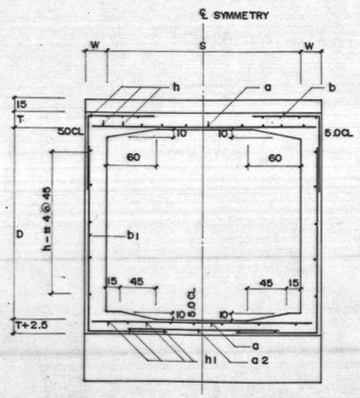
1. FOR GENERAL NOTES NOT MENTIONED IN THIS DRAWING SEE DWG. NO. BC-02
2. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE BOTTOM OF BOTTOM SLABS OR WALL WHERE CLEAR COVER OF 7.5 CM. SHALL BE PROVIDED
3. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
4. WORK THIS DRAWING WITH DWG. NOS. BC-02, BC-04
5. THIS DRAWING IS ADAPTED FROM DOH DRAWING NO. 78/7
6. THIS DRAWING SHALL BE USED FOR NEW CONSTRUCTION OF R.C. BOX CULVERT.



SINGLE BOX

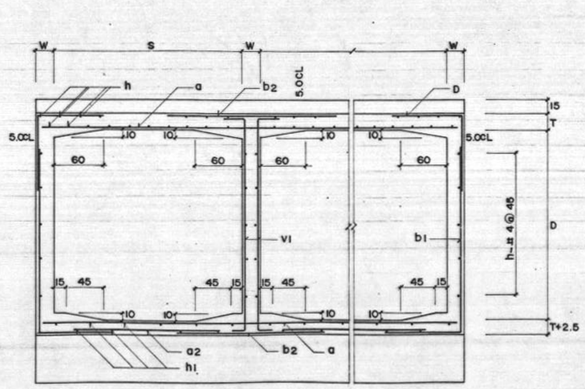
MULTIPLE BOXES

TRANSVERSE ELEVATION
SCALE 1 : 40



SINGLE BOX TYPE A
(FOR D ≤ 245 CM. AND W < 30 CM.)

SECTION A – A
SCALE 1:40



MULTIPLE BOXES TYPE A
(FOR D ≤ 245 CM. AND W < 30 CM.)

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

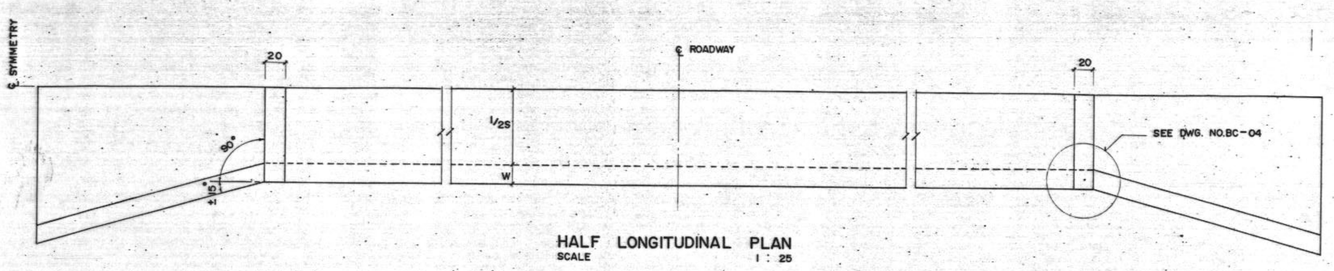
RIGID FRAME R.C. BOX CULVERT

PLAN ELEVATIONS AND SECTIONS

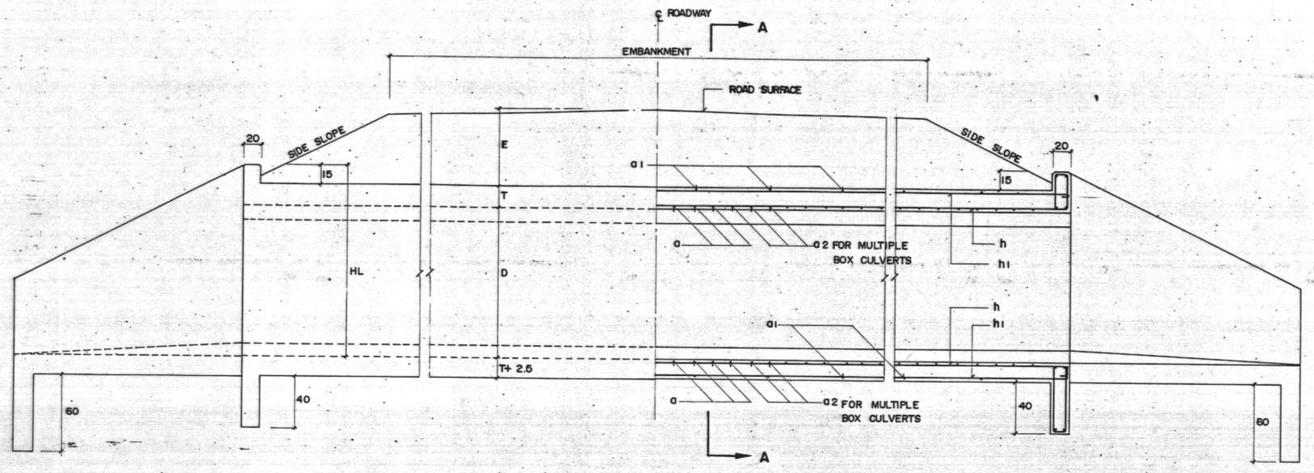
DESIGNED : DOH & CONSULTANT	CHECKED : Kopol	DATE JULY 1994
SUBMITTED : P. Bunnag. (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. BC-01
		SHEET NO. 186

S	D	FILL HEIGHT CM.	T CM.	W CM.	BAR MARK a #	BAR MARK a @ CM.	BAR MARK a L CM.	BAR MARK a2 #	BAR MARK a2 @ CM.	BAR MARK a2 L CM.	BAR MARK b&b1 #	BAR MARK b&b1 @ CM.	BAR MARK b&b1 F CM.	BAR MARK b G CM.	BAR MARK b L CM.	BAR MARK b1 GI CM.	BAR MARK b1 L CM.	BAR MARK h #	BAR MARK h @ CM.	BAR MARK h NO	BAR MARK h1 #	BAR MARK h1 @ CM.	BAR MARK h1 NO	BAR MARK v #	BAR MARK v @ CM.	BAR MARK v L CM.	BAR MARK v1 #	BAR MARK v1 @ CM.	BAR MARK v1 L CM.	BAR MARK b2 #	BAR MARK b2 @ CM.	BAR MARK b2 L CM.
CLEAR SPAN 180 CM.	210 CM.	0 - 30	24	25	5	14	270	4	±120	195	4	16.5	100	100	220	180	300	4	25	20	4	45	11	-	-	-	4	30	235	4	16.5	200
		31 - 60	21.5	25	5	16.5	270	4	±120	195	4	16.5	100	100	220	180	300	4	30	19	4	45	11	-	-	-	4	30	235	4	16.5	200
		61 - 150	20	25	5	20	270	4	±120	195	4	15	100	100	220	180	300	4	38	18	4	45	11	-	-	-	4	30	235	4	15	200
		151 - 225	20	25	5	17.5	270	4	±120	195	4	12.5	100	100	220	180	300	4	45	17	4	45	11	-	-	-	4	30	235	4	12.5	200
		226 - 300	21.5	25	5	16.5	270	4	±120	195	4	12.5	100	100	220	180	300	4	45	17	4	38	13	-	-	-	4	30	235	4	12.5	200
		301 - 375	22.5	25	5	14	270	4	±120	195	4	11.5	100	100	220	180	300	4	45	17	4	30	15	-	-	-	4	30	235	4	11.5	200
		376 - 450	24	25	6	17.5	275	4	±120	195	4	11	100	100	220	180	300	4	45	17	5	30	15	-	-	-	4	30	235	4	11	200
		451 - 600	27.5	25	6	15	275	4	±120	195	5	12.5	102.5	102.5	225	182.5	305	4	45	17	5	30	15	-	-	-	4	30	235	5	12.5	200
		601 - 750	31	25	6	13	275	4	±120	195	5	12.5	102.5	102.5	225	182.5	305	4	45	17	6	30	15	-	-	-	4	30	235	5	12.5	200
		751 - 900	36	25	6	13	275	4	±120	195	5	12.5	102.5	102.5	225	182.5	305	4	45	17	6	30	15	-	-	-	4	30	235	5	12.5	200
		901 - 1050	39	25	6	12	275	4	±120	195	5	12.5	102.5	102.5	225	182.5	305	4	45	17	6	30	15	-	-	-	4	30	235	5	12	200
		1051 - 1200	42	25	6	10	275	4	±120	195	5	12.5	102.5	102.5	225	182.5	305	4	45	17	6	30	15	-	-	-	4	30	235	5	12	200
		1201 - 1500	46	25	8	16.5	275	4	±120	195	5	12.5	102.5	102.5	225	182.5	305	4	45	17	8	30	15	-	-	-	4	30	235	5	12	200
		0 - 30	24	25	5	14	270	4	±120	195	4	16.5	100	100	220	210	330	4	25	22	4	45	11	-	-	-	4	30	265	4	16.5	200
		31 - 60	21.5	25	5	16.5	270	4	±120	195	4	16.5	100	100	220	210	330	4	30	21	4	45	11	-	-	-	4	30	265	4	16.5	200
		61 - 150	20	25	5	20	270	4	±120	195	4	15	100	100	220	210	330	4	38	20	4	45	11	-	-	-	4	30	265	4	15	200
		151 - 225	20	25	5	17.5	270	4	±120	195	4	12.5	100	100	220	210	330	4	45	19	4	45	11	-	-	-	4	30	265	4	12.5	200
		226 - 300	21.5	25	5	16.5	270	4	±120	195	4	12.5	100	100	220	210	330	4	45	19	4	38	13	-	-	-	4	30	265	4	12.5	200
		301 - 375	22.5	25	5	14	270	4	±120	195	4	11.5	100	100	220	210	330	4	45	19	4	30	15	-	-	-	4	30	265	4	11.5	200
		376 - 450	24	25	6	17.5	275	4	±120	195	4	11.5	100	100	220	210	330	4	45	19	5	30	15	-	-	-	4	30	265	4	11.5	200
		451 - 600	27.5	25	6	15	275	4	±120	195	5	12.5	102.5	102.5	225	212.5	335	4	45	19	5	30	15	-	-	-	4	30	265	5	12.5	200
		601 - 750	31	25	6	14	275	4	±120	195	5	12.5	102.5	102.5	225	212.5	335	4	45	19	6	30	15	-	-	-	4	30	265	5	12.5	200
		751 - 900	36	25	6	13	275	4	±120	195	5	12.5	102.5	102.5	225	212.5	335	4	45	19	6	30	15	-	-	-	4	30	265	5	12.5	200
		901 - 1050	39	25	6	12	275	4	±120	195	5	12.5	102.5	102.5	225	212.5	335	4	45	19	6	30	15	-	-	-	4	30	265	5	12	200
		1051 - 1200	42	25	6	10	275	4	±120	195	5	12.5	102.5	102.5	225	212.5	335	4	45	19	8	30	15	-	-	-	4	30	265	5	12	200
		1201 - 1500	46	25	8	16.5	275	4	±120	195	5	12.5	102.5	102.5	225	212.5	335	4	45	19	8	30	15	-	-	-	4	30	265	5	12	200
CLEAR SPAN 210 CM.	270 CM.	0 - 30	24	25	5	12.5	300	4	±120	225	4	17.5	110	110	240	210	340	4	23	25	4	45	13	-	-	-	4	30	285	4	17.5	220
		31 - 60	22.5	25	5	15	300	4	±120	225	4	17.5	110	110	240	210	340	4	25	24	4	45	13	-	-	-	4	30	285	4	17.5	220
		61 - 150	22.5	25	5	17.5	300	4	±120	225	4	16.5	110	110	240	210	340	4	38	21	4	45	13	-	-	-	4	30	285	4	16.5	220
		151 - 225	22.5	25	5	15	300	4	±120	225	4	14	110	110	240	210	340	4	45	20	4	45	13	-	-	-	4	30	285	4	14	220
		226 - 300	22.5	25	6	19	305	4	±120	225	4	12.5	110	110	240	210	340	4	45	20	4	38	15	-	-	-	4	30	285	4	12.5	220
		301 - 375	25	25	6	16.5	305	4	±120	225	4	12.5	110	110	240	210	340	4	45	20	4	30	17	-	-	-	4	30	285	4	12.5	220
		376 - 450	26	25	6	15	305	4	±120	225	4	11	110	110	240	210	340	4	45	20	5	30	17	-	-	-	4	30	285	4	11	220
		451 - 600	30	25	6	12.5	305	4	±120	225	5	12.5	112.5	112.5	245	212.5	345	4	45	20	5	30	17	-	-	-	4	30	285	5	12.5	220
		601 - 750	34	25	6	11	305	4	±120	225	5	12.5	112.5	112.5	245	212.5	345	4	45	20	6	30	17	-	-	-	4	30	285	5	12.5	220
		751 - 900	38	25	6	10	305	4	±120	225	5	12.5	112.5	112.5	245	212.5	345	4	45	20	6	30	17	-	-	-	4	30	285	5	12.5	220
		901 - 1050	43	25	8	17	305	4	±120	225	5	12.5	112.5	112.5	245	212.5	345	4	45	20	6	30	17	-	-	-	4	30	285	5	12	220
		1051 - 1200	46	25	8	15	305	4	±120	225	5	12.5	112.5	112.5	245	212.5	345	4	45	20	8	30	17	-	-	-	4	30	285	5	12	220
		1201 - 1500	52	25	8	13	305	4	±120	225	5	12.5	112.5	112.5	245	212.5	345	4	45	20	8	30	17	-	-	-	4	30	285	5	12	220
		0 - 30	24	25	5	12.5	300	4	±120	225	4	16.5	110	110	240	240	370	4	23	25	4	45	13	-	-	-	4	30	295	4	16.5	220
		31 - 60	22.5	25	5	15	300	4	±120	225	4	16.5	110	110	240	240	370	4	25	24	4	45	13	-	-	-	4	30	295	4	16.5	220
		61 - 150	22.5	25	5	17.5	300	4	±120	225	4	15	110	110	240	240	370	4	38	21	4	45	13	-	-	-	4	30	295	4	15	220
		151 - 225	22.5	25	5	15	300	4	±120	225	4	12.5	110	110	240	240	370	4	45	20	4	45	13	-	-	-	4	30	295	4	12.5	220
		226 - 300	22.5	25	6	20	305	4	±120	225	4	12.5	110	110	240	240	370	4	45	20	4	38	15	-	-	-	4	30	295	4	12.5	220
		301 - 375	25	25	6	17.5	305	4	±120	225	4	12.5	110	110	240	240	370	4	45	20	4	30	17	-	-	-	4	30	295	4	12.5	220
		376 - 450	26	25	6	15	305	4	±120	225	4	11	110	110	240	240	370	4	45	20	5	30	17	-	-	-	4	30	295	4	11	220
		451 - 600	30	25	6	12.5	305	4	±120	225	5	12.5	112.5	112.5	245	242.5	375	4	45	20	5	30	17	-	-	-	4	30	295	5	12.5	220
		601 - 750	34	25	6	11	305	4	±120	225	5	12.5	112.5	112.5	245	242.5	375	4	45	20	6	30	17	-	-	-	4	30	295	5	12.5	220
		751 - 900	38	25	6	10	305	4	±120	225	5	12.5	112.5	112.5	245	242.5	375	4	45	20	6	30	17	-	-	-	4	30	295	5	12.5	220
		901 - 1050	43	25	8	17	305	4	±120	225	5	12.5	112.5	112.5	245	242.5	375	4	45	20	6	30	17	-	-	-	4	30	295	5	12	220
		1051 - 1200	46	25	8	15	305	4	±120	225	5	12.5	112.5	112.5	245	242.5	375	4	45	20	8	30	17	-	-	-	4	30	295	5	12	220
		1201 - 1500	52	25	8	13	305	4	±120	225	5	12.5	112.5	112.5	245	242.5	375	4	45	20	8	30	17	-	-	-	4	30	295	5	12	220
CLEAR SPAN 240 CM.	270 CM.	0 - 30	24	25	6	19	335	4	±120	245	4	15	120	120	260	240	380	4	23	26	4	45	13	-	-	-	4	30	295	4	15	240
		31 - 60	24	25	6	20	335	4	±120	245	4	15	120	120	260	240	380	4	25	25	4	45	13	-	-	-	4	30	295	4	15	240
		61 - 150	24	25	6	22.5	335	4	±120	245	4	14	120	120	260	240	380	4	38	22	4	45	13	-	-	-	4	30	295	4	14	240
		151 - 225	24	25	6	17.5	335	4	±120	245	4	12.5	120	120	260	240	380	4	45	20	4	45	13	-	-	-	4	30	295	4	12.5	240
		226 - 300	25	25	6	16.5	335	4	±120	245	4	12.5	120	120	260	240	380	4	45	20	4	38	17	-	-	-	4	30	295	4	12.5	240
		301 - 375	27.5	25	6	15	335	4	±120	245	4	12.5	120	120	260	240	380	4	45	20	4	30	19	-	-	-	4	30	295	4	12.5	240
		376 - 450	30	25	6	12.5	335	4	±120	245	4	11	120	120	260	240	380	4	45	20	5	30	19	-	-	-	4	30	295	4	11	240
		451 - 600	32.5	25	6	10	335	4	±120	245	5	12.5	122.5	122.5	265	242.5	385	4	45	20	5	30	19	-	-	-	4	30	295	5	12.5	240
		601 - 750	37.5	25	8	17.5	340	4	±120	245	5	12.5	122.5	122.5	265	242.5	385	4	45	20	6	30	19	-	-	-	4	30	295	5	12.5	240
		751 - 900	43	27.5	8	16.5	340	4	±120	245	5	12.5	122.5	122.5	265	242.5	385	4	45	20	6	30	19	-	-	-	4	30	295	5	12.5	240
		901 - 1050	49	27.5	8	15.5	340	4	±120	245	5	12.5	122.5	122.5	265	242.5	385	4	45	20	8	30	19	-	-	-	4	30	295	5	12	240
		1051 - 1200	51	27.5	8	14	340	4	±120	245	5	12.5	122.5	122.5	265	242.5	385	4	45	20	8	30	19	-	-	-	4	30	295	5	12	240
		1201 - 1500	57	27.5	8	12	340	4	±120	245	5	12.5	122.5	122.5	265	242.5	385	4	45	20	8	30	19	-	-	-	4	30	295	5	12	240
		0 - 30	24	27.5	6	19	335	4	±120	245	4	15	120	120	260	120	260	4	23	28	4	45	13	4	30	260	4	30	325	4	15	240
		31 - 60	24	27.5	6	20	335	4	±120	245	4	15	120	120	260	120	260	4	25	27	4	45	13	4	30	260	4	30	325	4	15	240
		61 - 150	24	27.5	6	22.5	335	4	±120	245	4	15	120	120	260	120	260	4	38	24	4	45	13	4	30	260	4	30	325	4	15	240
		151 - 225	24	27.5	6	19	335	4	±120	245	4	15	122.5	122.5	265	122.5	265	4	45	22	4	45	13	4	30	260	4	30	32.5	4	15	240
		226 - 300	24	27.5	6	17.5	335	4	±120	245	4	15	122.5	122.5	265	122.5	265	4	45	22	4	38	17	4	30	260	4	30	325	4	15	240
		301 - 375	26.5	27.5	6	15	335	4	±120	245	4	15	122.5	122.5	265	122.5	265	4	45	22	4	30	19	4	30	260	4	30	325	5	14	240
		376 - 450	29	27.5	6	14	335	4	±120	245	5	14	122.5	122.5	265	122.5	265	4	45	22	5	30	19	4	28	260	4	30	325	5	12.5	240
		451 - 600	32.5	27.5	6	11	335	4	±120	245	5	12.5	122.5	122.5	265	122.5	265	4	45	22	5	30	19	4	25	260	4	30	325	5	12.5	240
		601 - 750	37.5	27.5	8	18	340	4	±120	245	5	12.5	122.5	122.5	265	122.5	265	4	45	22	6	30	19	4	25	260	4	30	32.5	5	12.5	240
		751 - 900	43	27.5	8	17.5	340	4	±120	245	5	12.5	122.5	122.5	265	122.5	265	4	45	22	6	30	19	4	25	260	4	30	325	5	12.5	240
		901 - 1050	49	27.5	8	15.5	340	4	±120	245	5	12.5	122.5	122.5	265	122.5	265	4	45	22	6	30	19	4	25	260	4	30	325	5	12	240
		1051 - 1200	51	27.5	8	14	340	4	±120	245	5	12.5	122.5	122.5	265	122.5	265	4	45	22	8	30	19	4	25	260	4	30	325	5	12	240
		1201 - 1500	57	27.5	8	12	340	4	±120	245	5	12.5	122.5	122.5	265	122.5	265	4	45	22	8	30	19	4	25	260	4	30	325	5	12	240

S	D	FILL HEIGHT CM.	T CM.	W CM.	BAR MARK a #	BAR MARK a @ CM.	BAR MARK a L CM.	BAR MARK a2 #	BAR MARK a2 @ CM.	BAR MARK a2 L CM.	BAR MARK b&b1 #	BAR MARK b&b1 @ CM.	BAR MARK b&b1 F CM.	BAR MARK b G CM.	BAR MARK b L CM.	BAR MARK b1 GI CM.	BAR MARK b1 L CM.	BAR MARK h #	BAR MARK h @ CM.	BAR MARK h NO	BAR MARK h1 #	BAR MARK h1 @ CM.	BAR MARK h1 NO	BAR MARK v #	BAR MARK v @ CM.	BAR MARK v L CM.	BAR MARK v1 #	BAR MARK v1 @ CM.	BAR MARK v1 L CM.	BAR MARK b2 #	BAR MARK b2 @ CM.	BAR MARK b2 L CM.
CLEAR SPAN 270 CM.	300 CM.	0 - 30	25	27.5	6	17.5	365	4	±120	265	4	15	130	130	280	130	280	4	21.5	30	4	45	15	4	30	260	4	30	325	4	15	265
		31 - 60	25	27.5	6	19	365	4	±120	265	4	15	130	130	280	130	280	4	22.5	29	4	45	15	4	30	260	4	30	325	5	15	265
		61 - 150	25	27.5	6	19	365	4	±120	265	5	15	132.5	132.5	285	132.5	285	4	30	26	4	45	15	4	30	260	4	30	325	5	15	265
		151 - 225	25	27.5	6	16.5	365	4	±120	265	5	15	132.5	132.5	285	132.5	285	4	45	23	4	45	15	4	30	260	4	30	325	5	15	265
		226 - 300	26.5	27.5	6	15	365	4	±120	265	5	15	132.5	132.5	285	132.5	285	4	45	23	4	38	17	4	30	260	4	30	325	5	15	265
		301 - 375	29	27.5	6	13	370	4	±120	265	5	15	132.5	132.5	285	132.5	285	4	45	23	4	30	21	4	30	260	4	30	325	5	15	265
		376 - 450	31	27.5	6	11	370	4	±120	265	5	14	132.5	132.5	285	132.5	285	4	45	23	5	30	21	4	28	260	4	30	325	5	14	265
		451 - 600	35	27.5	8	17.5	375	4	±120	265	5	12.5	132.5	132.5	285	132.5	285	4	45	23	5	30	21	4	25	260	4	30	325	5	12.5	265
		601 - 750	41	27.5	8	15.5	375	4	±120	265	5	12.5	132.5	132.5	285	132.5	285	4	45	23	6	30	21	4	25	260	4	30	325	5	12.5	265
		751 - 900	47.5	27.5	8	15.5	375	4	±120	265	5	12.5	132.5	132.5	285	132.5	285	4	45	23	6	30	21	4	25	260	4	30	325	5	12.5	265
		901 - 1050	53	27.5	8	14	375	4	±120	265	5	11	132.5	132.5	285	132.5	285	4	45	23	6	30	21	4	25	260	4	30	325	5	12	265
		1051 - 1200	56	27.5	8	13	375	4	±120	265	5	11	132.5	132.5	285	132.5	285	4	45	23	8	30	21	4	25	260	4	30	325	5	12	265
		1201 - 1500	60	27.5	8	11	375	4	±120	265	5	11	132.5	132.5	285	132.5	285	4	45	23	8	30	21	4	25	260	4	30	325	5	12	265
		0 - 30	25	30	6	17.5	365	4	±120	265	4	15	130	130	280	130	280	4	21.5	38	4	45	15	4	30	290	4	30	355	4	15	265
		31 - 60	25	30	6	20	365	4	±120	265	4	15	130	130	280	130	280	4	22.5	37	4	45	15	4	30	290	4	30	355	4	15	265
		61 - 150	25	30	6	21.5	365	4	±120	265	5	15	132.5	132.5	285	132.5	285	4	30	34	4	45	15	4	30	290	4	30	355	5	15	265
		151 - 225	25	30	6	17.5	365	4	±120	265	5	14	132.5	132.5	285	132.5	285	4	45	31	4	45	15	4	28	290	4	30	355	5	14	265
		226 - 300	26.5	30	6	16.5	365	4	±120	265	5	12.5	132.5	132.5	285	132.5	285	4	45	31	4	38	17	4	25	290	4	30	355	5	12.5	265
		301 - 375	27.5	30	6	13	370	4	±120	265	5	12.5	132.5	132.5	285	132.5	285	4	45	31	4	30	21	4	25	290	4	30	355	5	12.5	265
		376 - 450	30	30	6	12	370	4	±120	265	5	12.5	132.5	132.5	285	132.5	285	4	45	31	5	30	21	4	25	290	4	30	355	5	12.5	265
		451 - 600	35	30	8	19	375	4	±120	265	5	12.5	132.5	132.5	285	132.5	285	4	45	31	5	30	21	4	25	290	4	30	355	5	12.5	265
		601 - 750	41	30	8	16.5	375	4	±120	265	5	12.5	132.5	132.5	285	132.5	285	4	45	31	6	30	21	4	25	290	4	30	355	5	12.5	265
		751 - 900	47.5	30	8	15.5	375	4	±120	265	5	12.5	132.5	132.5	285	132.5	285	4	45	31	6	30	21	4	25	290	4	30	355	5	12.5	265
		901 - 1050	53	30	8	14	375	4	±120	265	5	11	132.5	132.5	285	132.5	285	4	45	31	6	30	21	4	25	290	4	30	355	5	12	265
		1051 - 1200	56	30	8	13	375	4	±120	265	5	11	132.5	132.5	285	132.5	285	4	45	31	8	30	21	4	25	290	4	30	355	5	12	265
		1201 - 1500	60	30	8	11	375	4	±120	265	5	11	132.5	132.5	285	132.5	285	4	45	31	8	30	21	4	25	290	4	30	355	5	12	265
CLEAR SPAN 300 CM.	330 CM.	0 - 30	26.5	30	6	17.5	405	4	±120	295	4	12.5	140	140	300	140	300	4	22.5	39	4	45	17	4	25	295	4	30	355	4	12.5	285
		31 - 60	26.5	30	6	19	405	4	±120	295	4	12.5	140	140	300	140	300	4	25	37	4	45	17	4	25	295	4	30	355	4	12.5	285
		61 - 150	26.5	30	6	17.5	405	4	±120	295	5	16.5	142.5	142.5	305	142.5	305	4	38	33	4	45	17	4	33	295	4	30	355	5	16.5	285
		151 - 225	26.5	30	6	14.5	410	4	±120	295	5	12.5	142.5	142.5	305	142.5	305	4	45	32	4	45	17	4	25	295	4	30	355	5	12.5	285
		226 - 300	27.5	30	6	14	410	4	±120	295	5	12.5	142.5	142.5	305	142.5	305	4	45	32	4	38	19	4

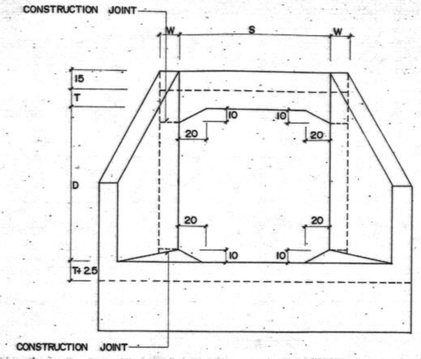


HALF LONGITUDINAL PLAN
SCALE 1 : 25

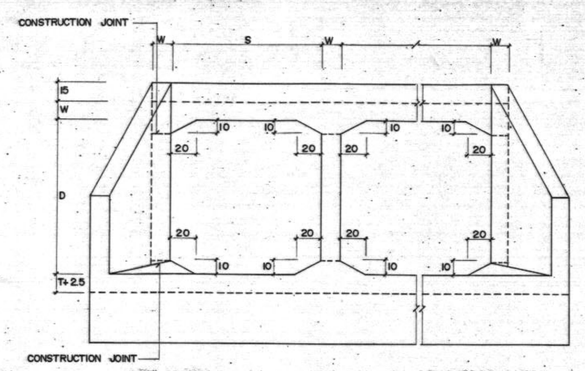


HALF LONGITUDINAL ELEVATION
SCALE 1 : 25

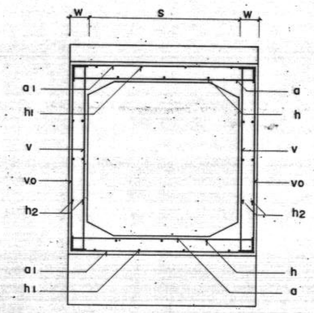
HALF LONGITUDINAL SECTION
SCALE 1 : 25



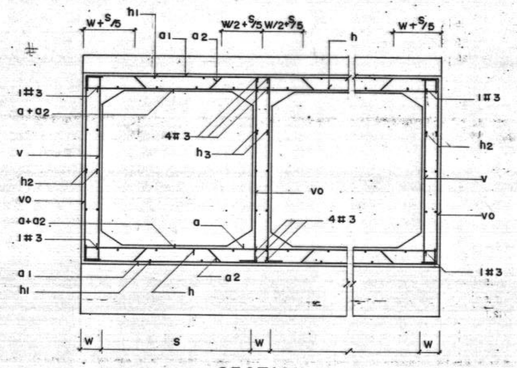
ELEVATION
SCALE 1 : 25



ELEVATION
SCALE 1 : 25



SECTION A-A
SCALE 1 : 25



SECTION A A
SCALE 1 : 25

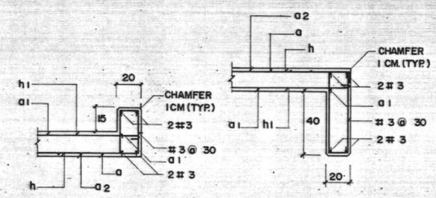
NOTES :

1. DESIGN PARAMETERS ARE
   - 1.1 LIVE LOADING : HS 20-44
   - 1.2 WORKING STEEL STRESSES :
     - PLAIN BARS, f_s = 1200 KG/CM^2
     - DEFORMED BARS, f_s = 1400 KG/CM^2
   - 1.3 WORKING CONCRETE STRESS, f_c = 60 KG/CM^2
2. CONCRETE SHALL HAVE THE 28 DAYS MINIMUM ULTIMATE COMPRESSIVE STRENGTH, BASED ON 15x15x15 CM. CUBE SAMPLES, OF 180 KG/CM^2 AND SHALL HAVE A MINIMUM CEMENT CONTENT OF 320 KG. PER CUBIC METER OF CONCRETE. THE FOLLOWING IS THE SUGGESTED CONCRETEMIX PROPORTIONS PER CUBIC METER :
   - TYPE I PORTLAND CEMENT 350 KG.
   - SAND 0.45 M^3
   - CRUSHED ROCK OR GRAVEL 0.86 M^3
   - WITH THE MAXIMUM SLUMP OF 10 CM.
3. REBARS II 4 OR LARGER SHALL BE TIS 24 GRADE SD30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR24 PLAIN BARS UNLESS OTHERWISE INDICATED.
4. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER
5. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
6. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SPECIFICATIONS SHALL BE USED INSTEAD OF TYPE I PORTLAND CEMENT.
7. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE BOTTOM OF BOTTOM SLABS AND OUTSIDE FACES OF THE EXTERIOR WALLS WHERE A CLEAR COVER OF 7.5CM. SHALL BE PROVIDED.
8. WORK THIS DRAWING WITH DWG. NO. BC-04.
9. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
10. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 78/8.
11. THIS DRAWING SHALL BE USED FOR NEW CONSTRUCTION OF R.C. BOX CULVERT

TABLE OF TOP AND BOTTOM SLAB REINFORCEMENTS

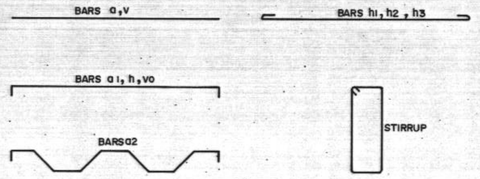
CLEAR SPAN	DEPTH OF FILL, E CM.	T CM.	SINGLE BOX CULVERT a			a1			h			h1			MULTIPLE BOX CULVERT a		a1		a2		h		h1	
			#	@	L	#	@	L	#	@	NO.	#	@	NO.	#	@	#	@	#	@	#	@	#	@
60 CM.	0 – 30	20	5	16	113	3	45	113	4	30	8	3	45	6	5	32	3	45	5	32	4	30	3	45
	31 – 60	20	4	22	113	3	60	113	4	30	8	3	45	6	4	44	3	60	4	44	4	30	3	45
	61 – 150	20	4	22	113	3	60	113	4	30	8	3	45	6	4	44	3	60	4	44	4	30	3	45
	151 – 225	20	4	22	113	3	60	113	4	30	8	3	45	6	4	44	3	60	4	44	4	30	3	45
90 CM.	0 – 30	22.5	5	15	143	3	45	143	4	25	12	3	40	8	5	30	3	45	5	30	4	25	3	40
	31 – 60	20	4	15	143	3	60	143	4	40	8	3	40	8	4	30	3	60	4	30	4	40	3	40
	61 – 150	20	4	22	143	3	60	143	4	40	8	3	40	8	4	44	3	60	4	44	4	40	3	40
	151 – 225	20	4	22	143	3	60	143	4	40	8	3	40	8	4	44	3	60	4	44	4	40	3	40
120 CM.	0 – 30	22.5	5	13	173	3	45	173	4	25	14	3	36	10	5	26	3	45	5	26	4	25	3	40
	31 – 60	20	5	16	173	3	60	173	4	30	12	3	36	10	5	32	3	60	5	32	4	30	3	40
	61 – 150	20	4	15	173	3	60	173	4	36	10	3	36	10	4	30	3	60	4	30	4	40	3	40
	151 – 225	20	4	15	173	3	60	173	4	36	10	3	36	10	4	30	3	60	4	30	4	40	3	40
150 CM.	0 – 30	24	6	18	210	3	45	210	4	25	16	3	45	10	6	36	3	45	6	30	4	25	3	45
	31 – 60	22.5	6	22	210	3	60	210	4	30	14	3	45	10	6	44	3	60	6	44	4	30	3	45
	61 – 150	20	5	16	203	3	60	203	4	45	10	3	45	10	5	32	3	60	5	32	4	45	3	45
	151 – 225	22.5	5	16	203	3	60	203	4	45	10	3	45	10	5	32	3	60	5	32	4	45	3	45
180 CM.	0 – 30	25	5	12	233	3	45	233	4	21	22	3	45	12	5	24	3	45	5	24	4	21	3	45
	31 – 60	24	5	14	233	3	60	233	4	30	16	3	45	12	5	28	3	60	5	28	4	30	3	45
	61 – 150	22.5	5	15	233	3	60	233	4	45	12	3	45	12	5	30	3	60	5	30	4	45	3	45
	151 – 225	22.5	5	14	233	3	60	233	4	45	12	3	45	12	5	28	3	60	5	28	4	45	3	45

II 3 = Ø 3/8" OR 9 MM. II 4 = Ø 1/2" OR 12 MM. NO. = TOTAL AMOUNT OF BARS
II 5 = Ø 5/8" OR 16 MM. II 6 = Ø 3/4" OR 20 MM. L = TOTAL LENGTH OF EACH BAR



TOP BEAM BOTTOM BEAM

END BEAM DETAILS
NOT TO SCALE



BAR BENDING DIAGRAMS
NOT TO SCALE

TABLE OF VERTICAL WALL REINFORCEMENT

DEPTH D CM.	SINGLE BOX CULVERT DEPTH OF FILL (E) 0-225 CM. WIDTH W CM.	REINFORCING BAR V #	REINFORCING BAR V @	REINFORCING BAR Vo #	REINFORCING BAR Vo @	REINFORCING BAR h #	REINFORCING BAR h @	MULTIPLE BOX CULVERTS DEPTH OF FILL (E) 0-225 CM. EXTERIOR WALL REINFORCING BAR V #	EXTERIOR WALL REINFORCING BAR V @	EXTERIOR WALL TOTAL AMOUNT OF h2 (II 3) EACH WALL	INTERIOR WALL REINFORCING BAR Vo #	INTERIOR WALL REINFORCING BAR Vo @	INTERIOR WALL TOTAL AMOUNT OF h3 (II 3) EACH WALL
60	20	4	30	3	30	3	30	4	30	8	3	40	4
90	20	4	30	3	30	3	30	4	30	12	3	40	6
120	20	4	30	3	30	3	30	4	30	12	3	40	6
150	22.5	4	30	3	30	3	30	4	30	16	3	40	8
180	25	4	30	3	30	3	30	4	30	20	3	40	10

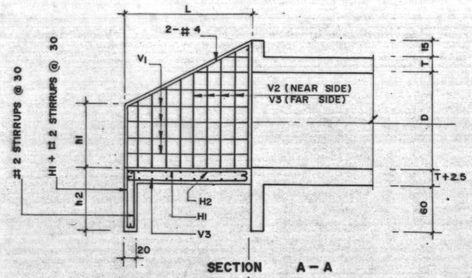
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

SIMPLE SPAN BOX CULVERT

PLAN , ELEVATIONS, SECTIONS AND DETAILS

DESIGNED : DOH & CONSULTANT	CHECKED :	DATE JULY 1994
SUBMITTED : P. Bumpenpong. (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. BC-03
		SHEET NO. 188



SECTION A – A
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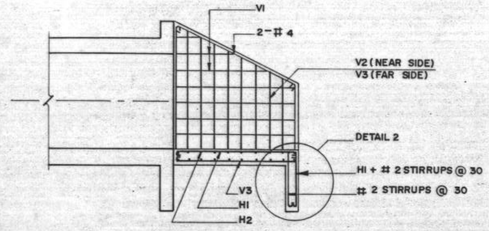

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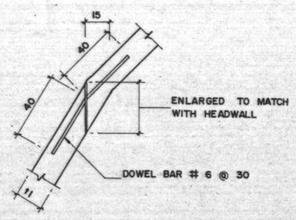
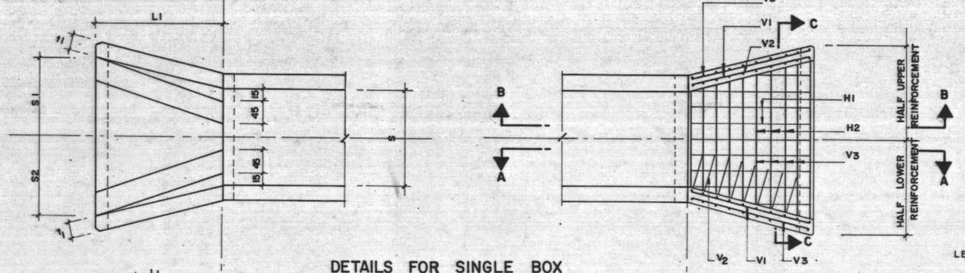
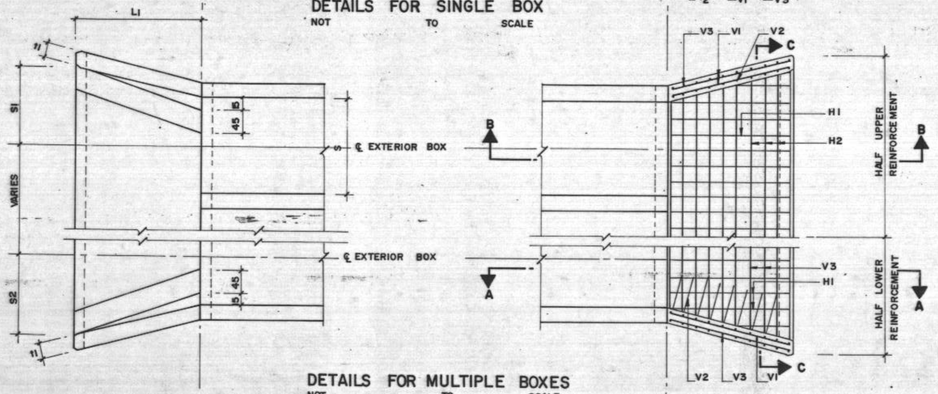


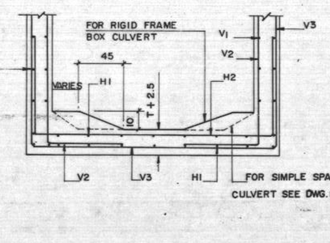
DETAIL 1
SCALE 1:20

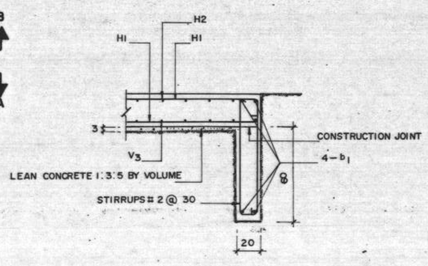


DETAILS FOR SINGLE BOX
NOT TO SCALE

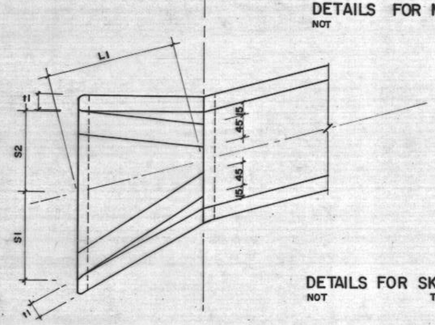


DETAILS FOR MULTIPLE BOXES
NOT TO SCALE

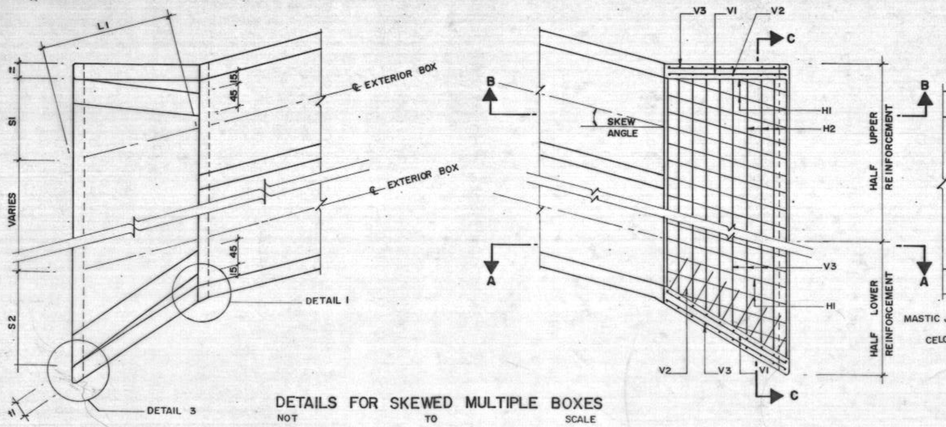




DETAIL 2
SCALE 1:20

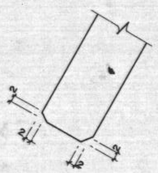


DETAILS FOR SKEWED SINGLE BOX
NOT TO SCALE

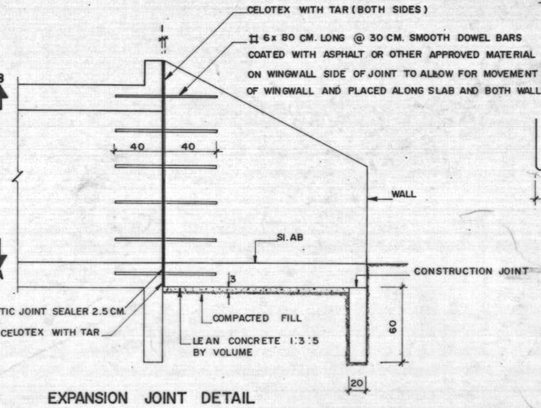


DETAILS FOR SKEWED MULTIPLE BOXES
NOT TO SCALE

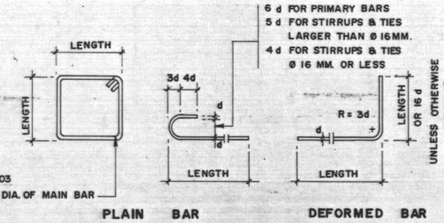
SECTION C – C
NOT TO SCALE



DETAIL 3
NOT TO SCALE

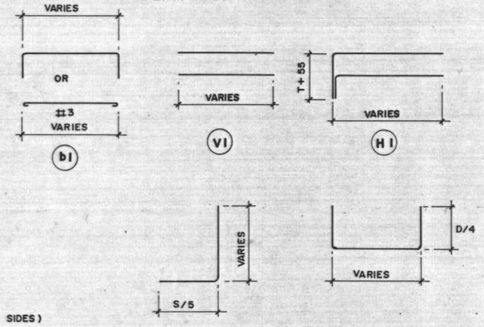


EXPANSION JOINT DETAIL
SCALE 1:25



PLAIN BAR

DEFORMED BAR



BAR BENDING DIAGRAMS
NOT TO SCALE

TABLE OF REINFORCEMENT FOR HEADWALL OF SINGLE BOX CULVERT

SIZE OF CULVERT		L	h1	t1	CULVERTS												V1		V2		V3		H1		H2		b1	
					SKEW 0°			SKEW 15°			SKEW 30°			SKEW 45°													
S	D				L1	S1	S2	L1	S1	S2	L1	S1	S2	L1	S1	S2	#	@	#	@	#	@	#	@	#	@	#	NO.
60	60	95	50	20	90	54	54	93	54	57	104	57	68	127	68	95	3	30	3	20	3	20	3	30	3	20	3	4
90	60	95	50	20	90	69	69	93	69	73	104	73	83	127	83	111	3	30	3	20	3	20	3	30	3	20	3	4
90	90	145	55	20	140	82	82	145	82	88	161	88	104	198	104	147	3	30	3	20	3	20	3	30	3	20	3	4
120	90	145	55	20	140	98	98	145	98	103	161	103	119	198	119	162	3	30	3	20	3	20	3	30	3	20	3	4
120	120	185	65	20	180	108	108	186	108	115	207	115	135	254	135	192	3	30	3	20	3	20	3	30	3	20	3	4
150	90	145	55	20	140	112	112	145	112	118	161	118	134	198	134	177	3	30	3	20	3	20	3	30	3	20	3	4
150	120	185	65	20	180	123	123	186	123	131	207	131	151	254	151	207	3	30	3	20	3	20	3	30	3	20	3	4
150	150	235	70	22.5	230	136	136	238	136	146	265	146	172	325	172	243	3	30	3	15	3	15	3	30	3	15	3	4
180	120	185	65	20	180	138	138	186	138	146	207	146	166	254	166	222	3	30	3	15	3	15	3	30	3	15	3	4
180	150	235	70	22.5	230	152	152	238	152	161	265	161	187	325	187	258	3	30	3	15	3	15	3	30	3	15	3	4
180	180	275	80	25	270	162	162	279	162	173	311	173	204	382	204	287	3	30	3	10	3	10	3	30	3	10	3	4
210	180	275	80	25	270	177	177	279	177	188	311	188	219	382	219	302	3	30	4	20	4	20	4	30	4	20	4	4
210	210	320	85	25	315	189	189	326	189	202	363	202	238	445	238	335	3	30	4	16	4	16	4	30	4	16	4	4
240	210	320	85	25	315	204	204	326	204	217	363	217	253	445	253	350	3	30	4	16	4	16	4	30	4	16	4	4
240	240	365	95	25	360	216	216	372	216	231	415	231	272	508	272	383	3	30	4	12	4	12	4	30	4	12	4	4
270	240	365	95	25	360	231	231	372	231	246	415	246	287	508	287	398	3	30	4	12	4	12	4	30	4	12	4	4
270	270	405	100	27.5	400	242	242	414	242	259	461	259	303	565	303	428	3	30	4	10	4	10	4	30	4	10	4	4
300	270	405	100	27.5	400	257	257	414	257	274	461	274	318	565	318	443	3	30	4	10	4	10	4	30	4	10	4	4
300	300	455	115	30	450	270	270	466	270	289	519	289	340	636	340	479	4	30	5	12	5	12	4	30	5	12	5	4
330	300	455	115	30	450	285	285	466	285	304	519	304	355	636	355	494	4	30	5	12	5	12	4	30	5	12	5	4
330	330	505	120	32.5	500	299	299	517	299	320	576	320	376	707	376	531	4	30	5	10	5	10	4	30	5	10	5	4
360	330	505	120	32.5	500	314	314	517	314	335	576	335	391	707	391	546	4	30	5	10	5	10	4	30	5	10	5	4
360	360	545	130	35	540	324	324	559	324	347	632	347	408	763	408	575	4	30	6	12	6	12	4	30	6	12	6	4

3 = Ø 3/8" OR 9 MM., # 4 = Ø 1/2" OR 12 MM., # 5 = Ø 5/8" OR 16 MM., # 6 = Ø 3/4" OR 20 MM. NO. = TOTAL AMOUNT OF BARS

NOTES :

1. DESIGN PARAMETERS ARE
   - 1.1 LIVE LOADING : HS 20-44
   - 1.2 WORKING STEEL STRESSES :
     - PLAIN BARS , f_s = 1,200 KG./CM.^{2}
     - DEFORMED BARS , f_s = 1,400 KG./CM.^{2}
   - 1.3 WORKING CONCRETE STRESS, f_c = 60 KG./CM.^{2}
2. CONCRETE SHALL HAVE THE 28-DAYS MINIMUM ULTIMATE COMPRESSIVE STRENGTH , BASED ON 15x15 x 15 CM. CUBE SAMPLES, OF 180 KG./CM.^{2} AND SHALL HAVE A MINIMUM CEMENT CONTENT OF 320 KG. PER CUBIC METER OF CONCRETE. THE FOLLOWING IS THE SUGGESTED CONCRETE MIX PROPORTIONS PER CUBIC METER :

TYPE I PORTLAND CEMENT	320	KG.
SAND	0.43	M.^{3}
CRUSHED ROCK OR GRAVEL	0.86	M.^{3}
WITH THE MAXIMUM SLUMP OF	10	CM.

3. CLEAR CONCRETE COVER SHALL BE 5.0 CM. EXCEPT THE BOTTOM OF BOTTOM SLABS OR WALLS AT WHICH CLEAR COVER OF 7.5 CM. SHALL BE PROVIDED.
4. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
5. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
6. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
7. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
8. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SPECIFICATIONS SHALL BE USED INSTEAD OF TYPE I PORTLAND CEMENT.
9. WORK THIS DRAWING WITH DWG. NOS. BC-01, BC-02, BC-03 AS REQUIRED.
10. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 78/9.
11. THIS DRAWING SHALL BE USED FOR NEW CONSTRUCTION OF R.C. BOX CULVERT

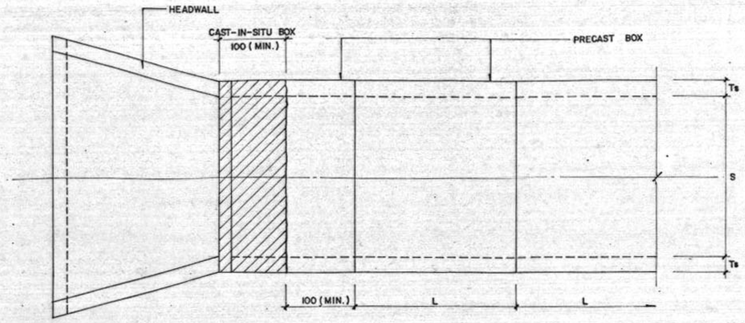
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

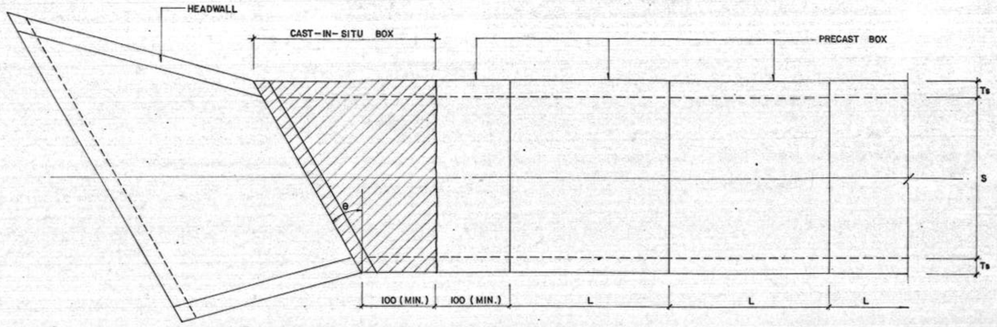
R.C. HEADWALL FOR BOX CULVERT

DIMENSIONS, REINFORCEMENT AND DETAILS

DESIGNED : DOH. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. BC-04
		SHEET NO. 189



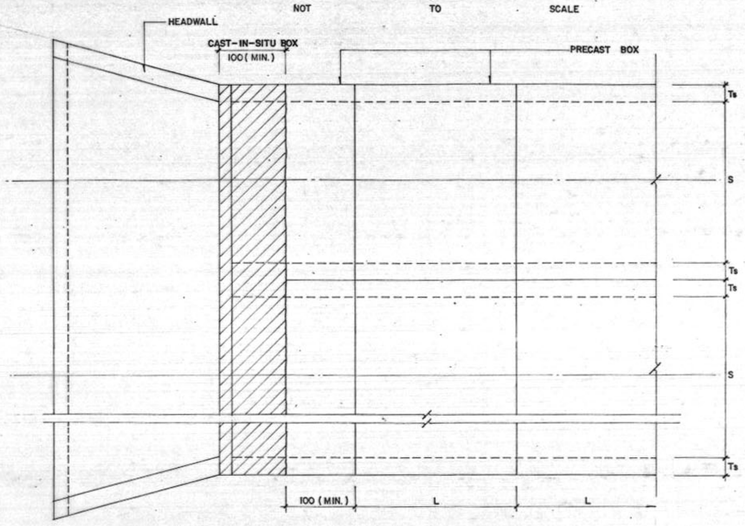
PLAN (SINGLE BOX , NON – SKEW)
NOT TO SCALE



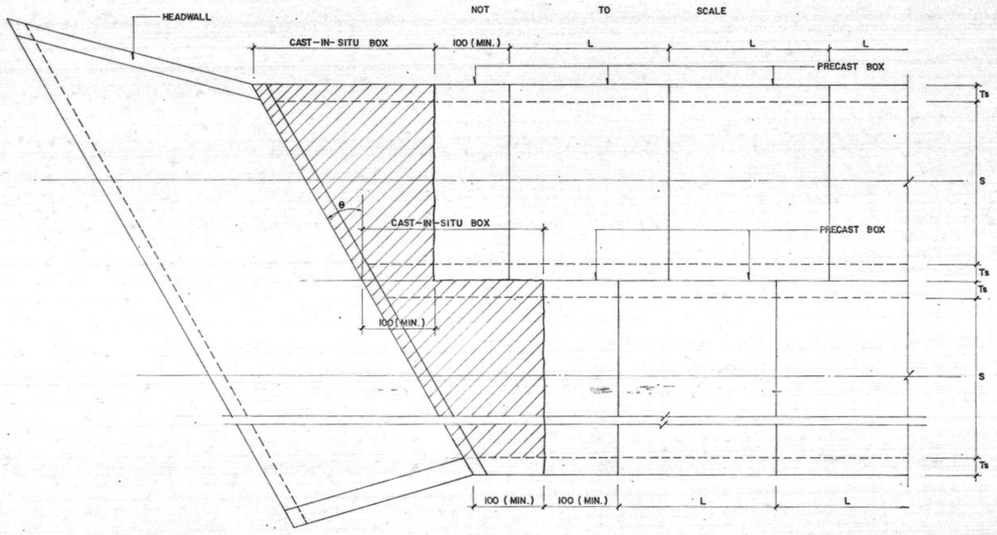
PLAN (SINGLE BOX , SKEW θ)
NOT TO SCALE

NOTES :

1. DESIGN LOAD IS HS20 – 44 .
2. DEPTH OF FILL SHALL NOT EXCEED 0.60 M.
3. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
4. WORK THIS DRAWING WITH DWG. NO. BC–06 .
5. THE SKEW ANGLE (θ) SHALL NOT BE MORE THAN 45 DEGREE .
6. W IS 15 CM. FOR NON– SKEW BOX AND IS 25 CM. FOR SKEW BOX.
7. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 7 PB/1 .



PLAN (MULTIPLE BOXES , NON – SKEW)
NOT TO SCALE



PLAN (MULTIPLE BOXES , SKEW θ)
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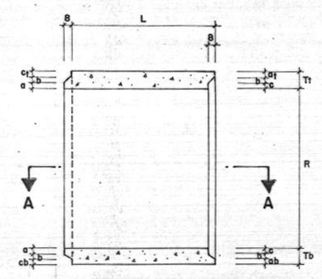
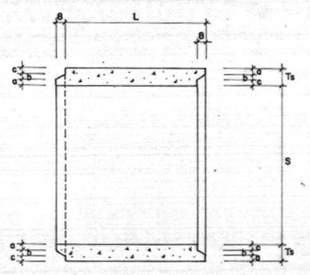


LONGITUDINAL SECTION OF PRECAST BOX
NOT TO SCALE



SECTION A– A
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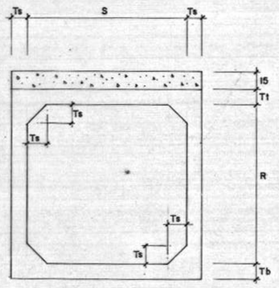

ELEVATION (SINGLE BOX, NON – SKEW)
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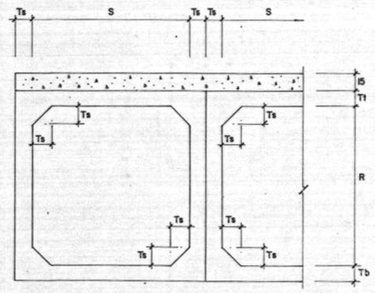

ELEVATION (MULTIPLE BOXES, NON – SKEW)
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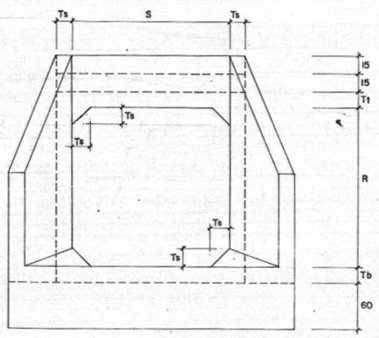
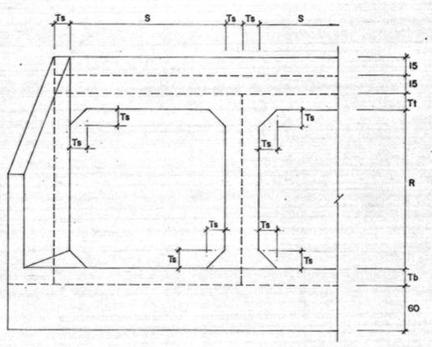
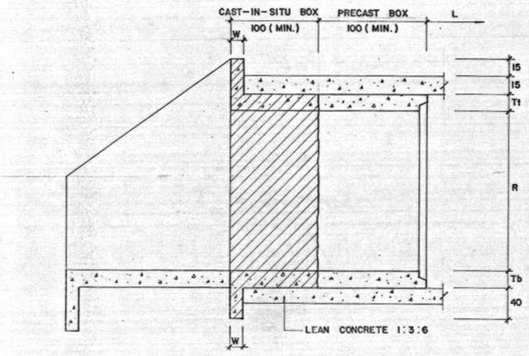


HEADWALL ELEVATION (SINGLE BOX)
NOT TO SCALE



HEADWALL ELEVATION (MULTIPLE BOXES)
NOT TO SCALE



LONGITUDINAL SECTION OF HEADWALL
NOT TO SCALE

TABLE OF DIMENSIONS

SIZE OF CULVERT	DIMENSIONS												
S x R	R	S	T_s	T_1	T_b	a	b	c	ct	ab	c_t	c_b	L (MIN.)
120 x 120	120	120	12.5	19	15	4	4.5	4	10.5	6.5	10.5	6.5	250
150 x 120	120	150	15	20	17.5	5	4.5	5.5	10	7.5	10.5	8	250
150 x 150	150	150	15	20	17.5	5	4.5	5.5	10	7.5	10.5	8	250
180 x 150	150	180	17.5	20	17.5	6	4.5	7	8.5	6	9.5	7	250
180 x 180	180	180	17.5	20	17.5	6	4.5	7	8.5	6	9.5	7	250
210 x 180	180	210	20	20	20	7.5	4.5	8	7.5	7.5	8	8	200
210 x 210	210	210	20	20	20	7.5	4.5	8	7.5	7.5	8	8	200
240 x 210	210	240	20	20	20	7.5	4.5	8	7.5	7.5	8	8	200
240 x 240	240	240	20	20	20	7.5	4.5	8	7.5	7.5	8	8	200

TABLE OF REINFORCEMENT (SQ.CM. PER 1.0 M. LENGTH OF BOX)

SIZE OF CULVERT	REINFORCEMENT BARS								END BEAM	
S x R	As1	As2	As3	As4	As7	As8	As5 *	As6 *	As9	As10
120 x 120	3.4	9.1	5.1	2.8	3.8	3.0	4.4	3.8	2–DB12	2–DB12
150 x 120	4.0	9.3	5.1	3.0	4.0	3.6	4.4	4.0	2–DB16	2–DB12
150 x 150	3.4	9.7	5.5	3.0	4.0	3.6	4.7	4.0	2–DB16	2–DB12
180 x 150	4.9	10.2	5.5	3.6	4.0	3.6	4.4	4.0	2–DB20	2–DB16
180 x 180	4.2	10.8	6.1	3.5	4.0	3.6	4.7	4.0	2–DB20	2–DB16
210 x 180	5.7	10.8	6.1	4.0	4.2	4.0	4.2	4.0	2–DB25	2–DB20
210 x 210	5.3	11.2	6.8	4.0	4.9	4.0	4.4	4.0	2–DB25	2–DB20
240 x 210	6.4	12.3	7.4	4.0	5.7	4.7	4.7	4.0	2–DB25	2–DB25
240 x 240	5.9	12.7	8.0	4.9	6.1	5.5	4.7	4.0	2–DB25	2–DB25

* STEEL AREA PER 1.0 M. WIDTH OF BOX

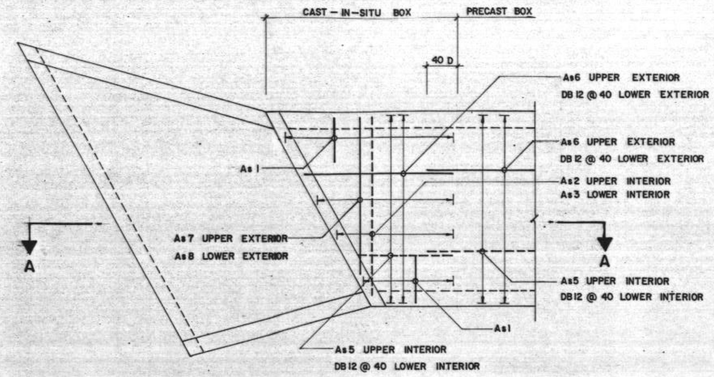
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

PRECAST BOX CULVERT DEPTH OF FILL ≯ 0.60 M.

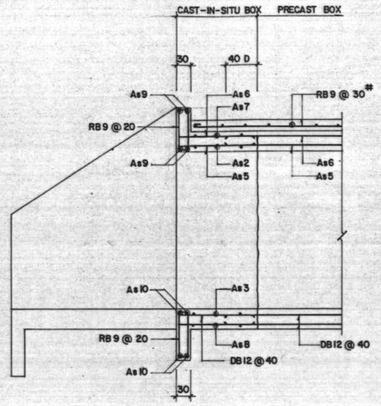
PLAN , ELEVATION AND SECTIONS

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Bamroy. (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. BC–05
		SHEET NO. 190



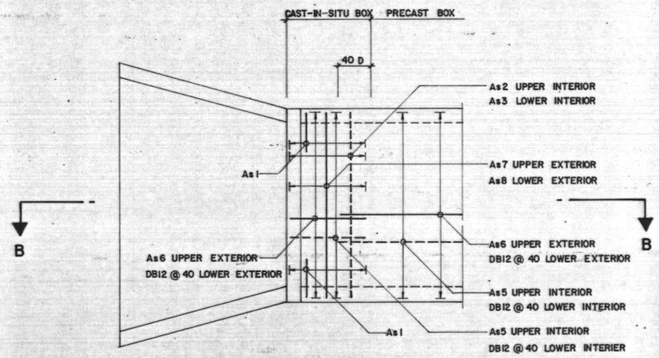
DETAILS FOR SKEW θ CAST–IN–SITU BOX

NOT TO SCALE



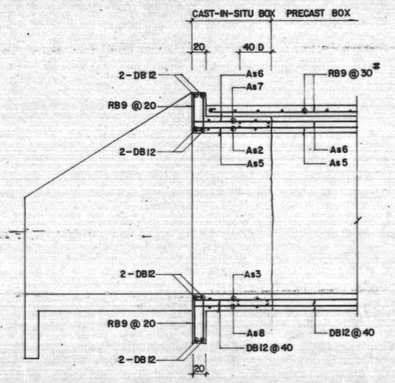
SECTION A – A

NOT TO SCALE



DETAILS FOR CAST – IN– SITU BOX

NOT TO SCALE

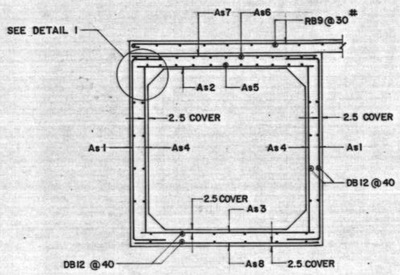


SECTION B – B

NOT TO SCALE

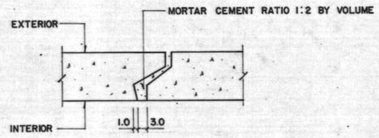
NOTES :

1. CONCRETE :
   a.) FOR PRECAST BOX CULVERT SHALL HAVE MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 44 MPa FOR .15 x .15 x .15 M. CUBE AT 28 DAYS.
   b.) FOR CAST – IN – SITU BOX CULVERT SHALL HAVE MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 35 MPa FOR .15 x .15 x .15 M. CUBE AT 28 DAYS.
2. WELDED WIRE FABRIC FOR STEEL REINFORCEMENT SHALL HAVE .A MINIMUM YIELD STRENGTH (Fsy) OF 440 MPa.
3. CLEAR CONCRETE COVER SHALL BE 2.5 CM. EXCEPT THE BOTTOM SLABS OR WALLS AT WHICH CLEAR COVER OF 5 CM. SHALL BE PROVIDED.
4. DEPTH OF FILL SHALL NOT EXCEED 0.60 M.
5. PREPARATION FOR INSTALLATION OF PRECAST BOX CULVERT.
   a.) POURING LEAN CONCRETE OF MIXING RATIO 1:3:6 BY WEIGTH AND THICKNESS NOT LESS THAN 12 CM.
   b.) THE LEVEL OF LEAN CONCRETE MUST BE APPROXIMATLY 3 CM. LOWER THAN THE EXACT LEVEL.
   c.) INSTALL PRECAST BOX CULVERT AFTER LEAN CONCRETE WAS HARDEN. BEFORE INSTALLING PRECAST BOX CULVERT, THERE MUST BE CEMENT MORTAR WITH MIXING RATIO 1:2 BY VOLUME ON THE SURFACE OF LEAN CONCRETE AND THE THICKNESS OF THESE MORTAR SHOULD BE THICK ENOUGH TO FILL THE VOID BETWEEN THE BOTTOM OF PRECAST BOX CULVERT AND TOP SURFACE OF LEAN CONCRETE.
6. REINFORCING STEEL WHICH HAS A DIFFERENT STRENGTH FROM THE ABOVE SPECIFICATIONS COULD BE USED UPON APPROVAL OF THE LOCATION AND DESIGN DIVISION.
7. FOR DETAILS OF HEADWALL SEE DRAWING NO. BC–04.
8. THE DIMENSIONS AS SHOWN IN TABLE OF DIMENSIONS ARE ONLY RECOMMENDED DIMENSIONS.
9. THE REINFORCEMENT FOR CAST–IN–SITU CONCRETE SECTION MUST BE THE SAME AS THE REINFORCEMENT IN PRECAST BOX CULVERT. FOR SKEW BOX THE REINFORCEMENT SHALL FOLLOW THIS DRAWING.
10. PROVIDE DB12 BARS AS LONGITUDINAL STEEL BARS AT THE INNER AND OUTER SIDE OF PRECAST BOX CULVERT WALL. (SPACING NOT MORE THAN 40 CM.)
11. IN CASE OF SALINE PROTECTION , HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED INSTEAD OF TYPE 1 CEMENT.
12. WORK THIS DRAWING WITH DWG. NO. BC–05.
13. DB IS THE DIAMETER OF REINFORCING BAR IN MILLIMETERS.
14. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
15. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 7 PB/2.



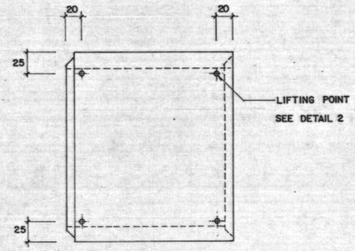
DETAILS FOR PRECAST BOX

NOT TO SCALE



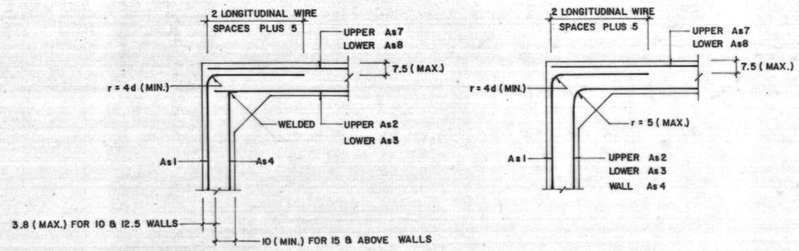
MASTIC JOINT SEALER DETAIL

NOT TO SCALE



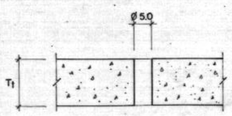
BOX LIFTING LOCATIONS

NOT TO SCALE



DETAIL 1

NOT TO SCALE



DETAIL 2

NOT TO SCALE

KINGDOM OF THAILAND

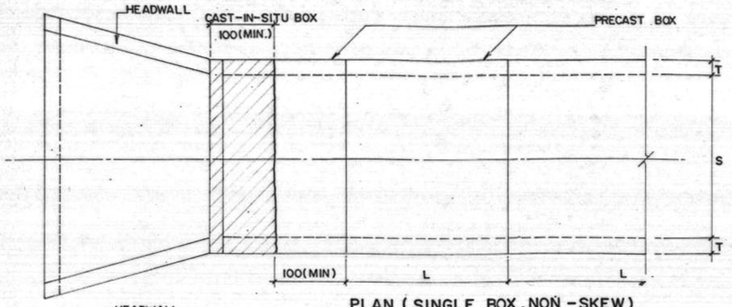
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

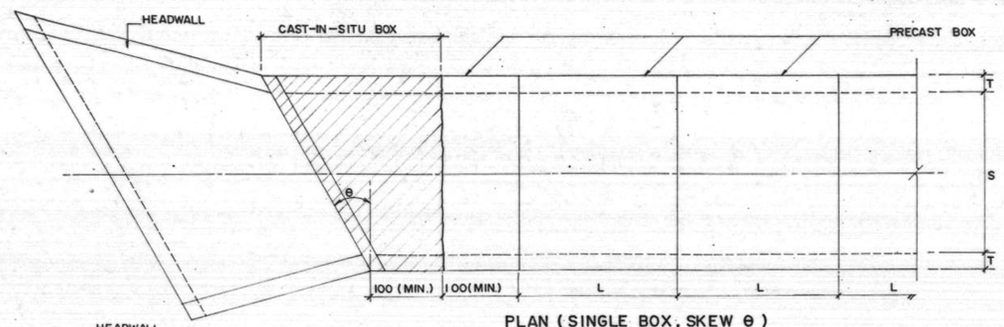
PRECAST BOX CULVERT DEPTH OF FILL ≯ 0.60 M.

REINFORCEMENT AND DETAILS

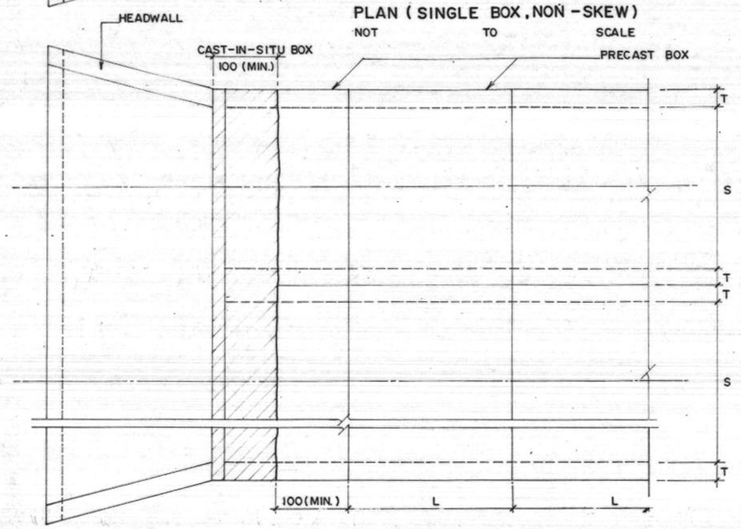
DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Bunyong. (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. BC–06
		SHEET NO. 191



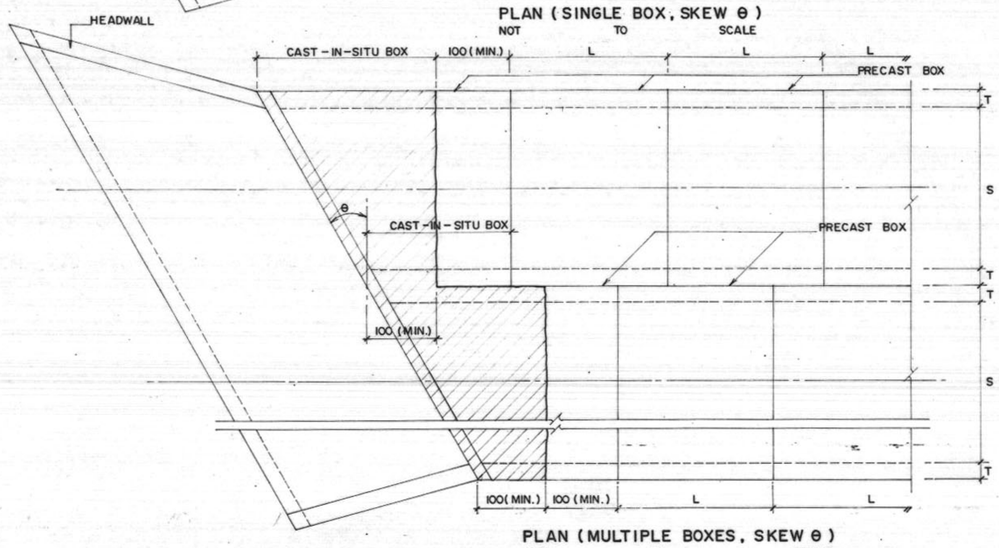
PLAN (SINGLE BOX, NON-SKEW)
NOT TO SCALE



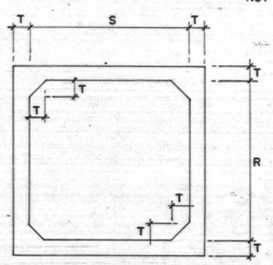
PLAN (SINGLE BOX, SKEW θ)
NOT TO SCALE



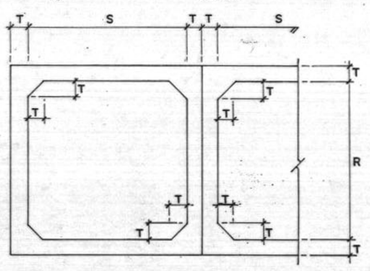
PLAN (MULTIPLE BOXES, NON-SKEW)
NOT TO SCALE



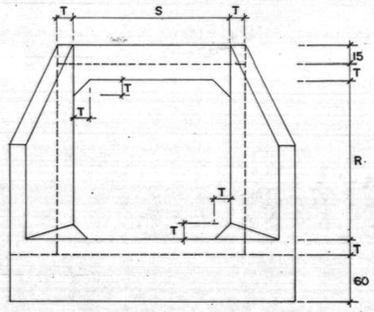
PLAN (MULTIPLE BOXES, SKEW θ)
NOT TO SCALE



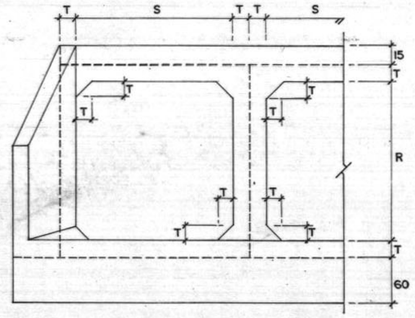
ELEVATION (SINGLE BOX, NON-SKEW)
NOT TO SCALE



ELEVATION (MULTIPLE BOX, NON-SKEW)
NOT TO SCALE



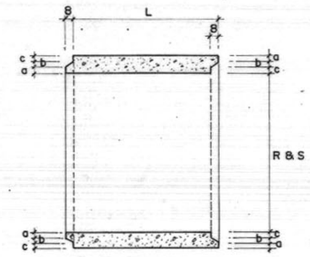
HEADWALL ELEVATION (SINGLE BOX)
NOT TO SCALE



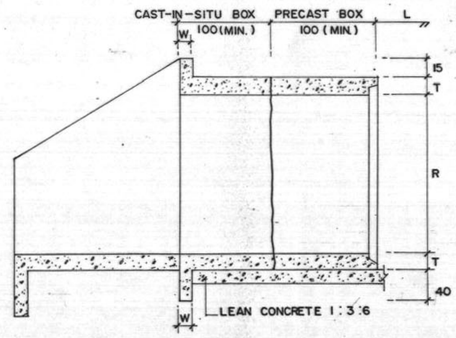
HEADWALL ELEVATION (MULTIPLE BOXES)
NOT TO SCALE

NOTES :

1. DESIGN LOAD IS HS 20 - 44.
2. DEPTH OF FILL EXCEEDS 0.60 M.
3. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
4. WORK THIS DRAWING WITH DOH DWG. NO BC - 08.
5. THE SKEW ANGLE (θ) SHALL NOT BE MORE THAN 45 DEGREES.
6. W IS 20 CM. FOR NON - SKEW BOX AND IS 30 CM. FOR SKEW BOX.
7. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 7 PB/3.



LONGITUDINAL SECTION OF PRECAST BOX
NOT TO SCALE



LONGITUDINAL SECTION OF HEADWALL
NOT TO SCALE

TABLE OF DIMENSIONS

SIZE OF CULVERT	DIMENSIONS						
S x R	R	S	T	a	b	c	L
120 x 120	120	120	12.5	4	4.5	4	250
150 x 120	120	150	15	5	4.5	5.5	250
150 x 150	150	150	15	5	4.5	5.5	250
180 x 150	150	180	17.5	6	4.5	7	250
180 x 180	180	180	17.5	6	4.5	7	250
210 x 180	180	210	20	7.5	4.5	8	200
210 x 210	210	210	20	7.5	4.5	8	200
240 x 210	210	240	20	7.5	4.5	8	200
240 x 240	240	240	20	7.5	4.5	8	200

TABLE OF REINFORCEMENT (SQ. CM. PER 1.0 M. LENGTH OF BOX)

DEPTH OF FILL (M.)	CULVERT 120 x 120					CULVERT 150 x 120					CULVERT 150 x 150					CULVERT 180 x 150					CULVERT 180 x 180					CULVERT 210 x 180					CULVERT 210 x 210					CULVERT 240 x 210					CULVERT 240 x 240				
	M	As1	As2	As3	As4	M	As1	As2	As3	As4	M	As1	As2	As3	As4	M	As1	As2	As3	As4	M	As1	As2	As3	As4	M	As1	As2	As3	As4	M	As1	As2	As3	As4	M	As1	As2	As3	As4	M	As1	As2	As3	As4
0.6	86	3.8	6.4	5.9	2.5	71	4.9	6.8	5.7	3.0	104	4.2	7.4	6.1	3.0	84	5.1	7.6	6.1	3.6	120	4.7	8.3	6.6	3.6	97	5.1	8.3	6.6	4.0	140	4.7	8.9	7.0	4.0	104	5.9	10.4	8.0	4.0	155	5.5	10.8	8.5	4.0
0.9	61	2.5	3.8	3.8	2.5	58	3.2	4.2	4.4	3.0	74	3.0	4.7	4.9	3.0	69	3.6	5.1	4.9	3.6	84	3.6	5.5	5.3	3.6	79	4.0	5.7	5.5	4.0	97	4.0	6.1	5.7	4.0	89	4.7	7.4	6.8	4.0	104	4.2	7.8	7.2	4.0
1.2	53	2.5	3.0	3.2	2.5	56	3.0	3.4	3.6	3.0	64	3.0	3.8	4.0	3.0	64	3.6	4.2	4.4	3.6	74	3.6	4.7	4.9	3.6	74	4.0	5.1	5.3	4.0	84	4.0	5.3	5.7	4.0	81	4.2	6.6	6.6	4.0	91	4.0	6.8	7.0	4.0
1.5	51	2.5	2.8	3.0	2.5	56	3.0	3.4	3.6	3.0	61	3.0	3.6	3.8	3.0	64	3.6	4.2	4.4	3.6	69	3.6	4.4	4.7	3.6	71	4.0	4.9	5.3	4.0	84	4.0	5.3	5.7	4.0	79	4.4	6.6	7.0	4.0	86	4.2	7.0	7.6	4.0
1.8	48	2.5	3.0	3.0	2.5	56	3.0	3.4	3.6	3.0	56	3.0	3.6	3.8	3.0	64	3.6	4.2	4.4	3.6	66	3.6	4.4	4.7	3.6	69	4.0	5.1	5.3	4.0	84	4.0	5.3	5.7	4.0	76	4.4	6.6	7.2	4.0	81	4.2	7.0	7.6	4.0
2.4	46	2.5	3.2	3.2	2.5	51	3.0	3.6	3.8	3.0	56	3.0	3.8	4.0	3.0	58	3.6	4.4	4.7	3.6	64	3.6	4.7	5.1	3.6	66	4.0	5.5	5.7	4.0	71	4.0	5.7	6.1	4.0	74	4.7	7.2	7.6	4.0	79	4.4	7.4	8.0	4.0
3.0	46	2.5	3.4	3.6	2.5	51	3.0	4.2	4.4	3.0	53	3.0	4.4	4.7	3.0	58	3.6	5.1	5.3	3.6	61	3.6	5.3	5.7	3.6	66	4.0	6.1	6.4	4.0	69	4.0	6.4	6.8	4.0	71	5.3	8.0	8.9	4.0	76	4.9	8.5	9.1	4.0
3.7	46	2.5	4.0	4.0	2.5	51	3.0	4.7	4.9	3.0	53	3.0	4.9	5.1	3.0	58	3.6	5.7	6.1	3.6	61	3.6	5.9	6.4	3.6	66	4.2	7.0	7.2	4.0	69	4.0	7.2	7.6	4.0	74	5.9	9.1	9.7	4.0	74	5.5	9.3	10.2	4.0
4.3	46	2.5	4.4	4.4	2.5	51	3.4	5.3	5.5	3.0	53	3.0	5.5	5.7	3.0	58	4.0	6.6	6.8	3.6	61	3.6	6.8	7.0	3.6	64	4.7	7.6	8.0	4.0	69	4.4	7.8	8.3	4.0										
4.9	46	2.5	4.9	5.1	2.5	48	3.8	5.9	6.1	3.0	53	3.4	6.1	6.4	3.0	56	4.4	7.2	7.4	3.6	61	4.0	7.4	7.8	3.6	64	5.3	8.5	8.9	4.0	69	4.9	8.7	9.1	4.0										
5.5	43	3.0	5.3	5.5	2.5	48	4.2	6.6	6.6	3.0	51	3.6	6.8	7.0	3.0	56	4.9	7.8	8.3	3.6	58	4.4	8.0	8.5	3.6	64	5.7	9.3	9.7	4.0															

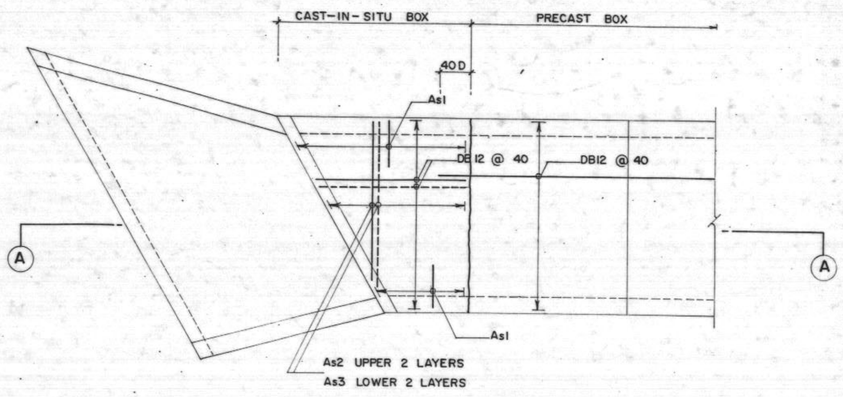
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

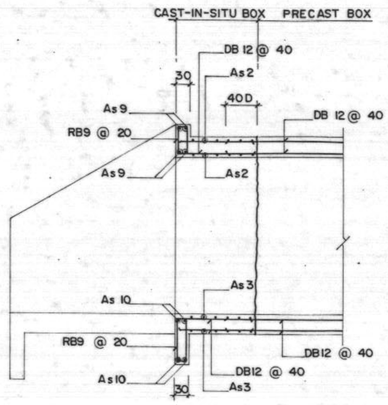
PRECAST BOX CULVERT DEPTH OF FILL > 0.60 M.

PLAN, ELEVATION AND SECTIONS

DESIGNED : DOH. & CONSULTANTS.	CHECKED :	DATE JULY 1994
SUBMITTED : P. Bangyai. (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. BC.- 07
		SHEET NO. 192



DETAILS FOR SKEW θ CAST-IN-SITU BOX
NOT TO SCALE



SECTION A – A
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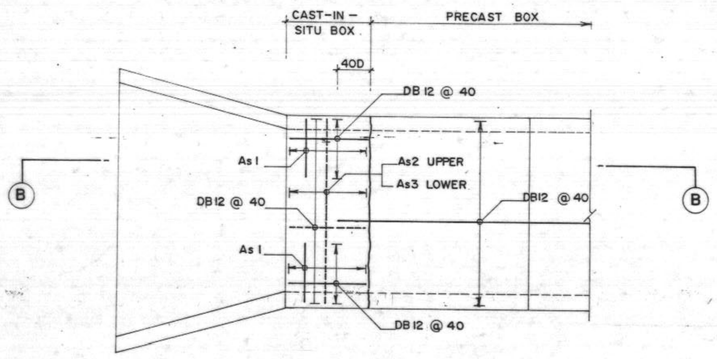
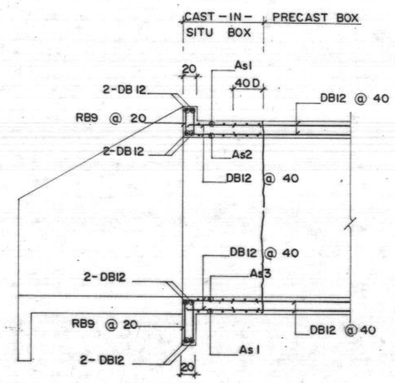
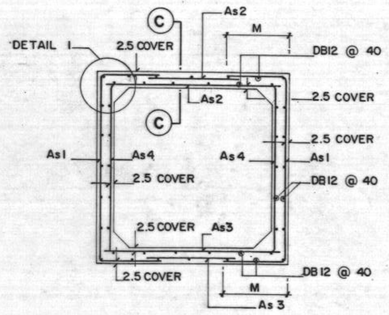


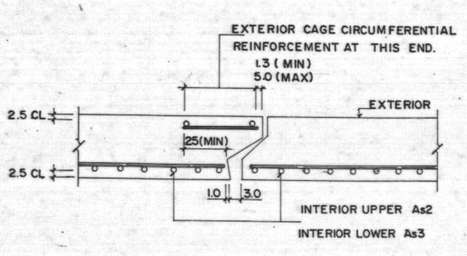
DETAILS FOR CAST-IN-SITU BOX
NOT TO SCALE



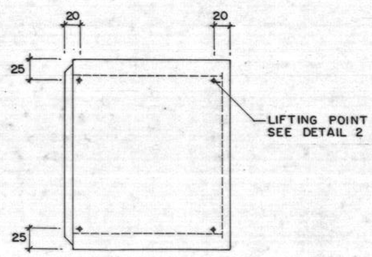
SECTION B – B
NOT TO SCALE



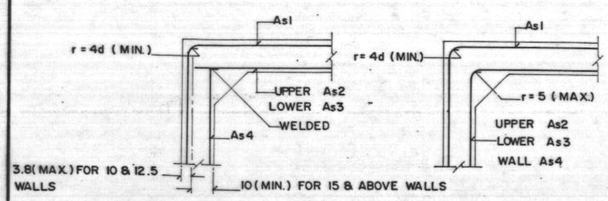
DETAILS FOR PRECAST BOX
NOT TO SCALE



SECTION C – C
NOT TO SCALE

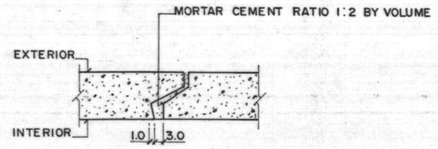


BOX LIFTING LOCATIONS
NOT TO SCALE

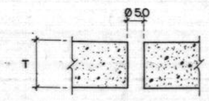


TYPE A TYPE B

DETAIL 1
NOT TO SCALE



MASTIC JOINT SEALER DETAIL
NOT TO SCALE



DETAIL 2
NOT TO SCALE

TABLE OF REINFORCEMENT
END BEAM FOR SKEW BOX

SIZE OF CULVERT S x R	END BEAM As 9	END BEAM As 10
120 x 120	2-DB 12	2-DB12
150 x 120	2-DB 16	2-DB12
150 x 150	2-DB16	2-DB12
180 x 150	2-DB20	2-DB16
180 x 180	2-DB20	2-DB16
210 x 180	2-DB25	2-DB20
210 x 210	2-DB25	2-DB20
240 x 210	2-DB25	2-DB25
240 x 240	2-DB25	2-DB25

NOTES :

1. CONCRETE :
   a) FOR PRECAST BOX CULVERT SHALL HAVE MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 44 MPa. FOR .15 X .15 X .15 M. CUBE AT 28 DAYS.
   b) FOR CAST-IN-SITU BOX CULVERT SHALL HAVE MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 35 MPa FOR .15 X .15 X .15 M. CUBE AT 28 DAYS.
2. WELDED WIRE FABRIC FOR STEEL REINFORCEMENT SHALL HAVE MINIMUM YIELD STRENGTH (Fsy) OF 440 MPa.
3. CLEAR CONCRETE COVER SHALL BE 2.5 CM. EXCEPT THE BOTTOM SLABS OR WALLS AT WHICH CLEAR COVER OF 5 CM. SHALL BE PROVIDED.
4. DEPTH OF FILL EXCEEDS 0.60 M.
5. PREPARATION FOR INSTALLATION OF PRECAST BOX CULVERT.
   a) POURING LEAN CONCRETE OF MIXING RATIO 1 : 3 : 6 BY WEIGTH AND THICKNESS NOT LESS THAN 12 CM.
   b) THE LEVEL OF LEAN CONCRETE MUST BE APPROXIMATLY 3 CM , OWER THAN THE EXACT LEVEL
   c) INSTALL PRECAST BOX CULVERT AFTER LEAN CONCRETE WAS HARDEN. BEFORE INSTALLING PRECAST BOX CULVERT, THERE MUST BE CEMENT MORTAR WITH MIXING RATIO 1:2 BY VOLUME ON THE SURFACE OF LEAN CONCRETE AND THE THICKNESS OF THESE MORTAR SHOULD BE THICK ENOUGH TO FILL THE VOID BETWEEN THE BOTTOM OF PRECAST BOX CULVERT AND TOP SURFACE OF LEAN CONCRETE.
6. REINFORCING STEEL WHICH HAS A DIFFERENT STRENGTH FROM THE ABOVE SPECIFICATIONS COULD BE USED UPON APPROVAL OF THE LOCATION AND DESIGN DIVISION.
7. FOR DETAILS OF HEADWALL SEE DRAWING NO. BC – 04.
8. THE DIMENSIONS AS SHOWN IN TABLE OF DIMENSIONS ARE ONLY RECOMMENDED DIMENSION.
9. THE REINFORCEMENT FOR CAST-IN-SITU CONCRETE SECTION MUST BE SAME AS THE REINFORCEMENT IN PRECAST BOX CULVERT. FOR SKEW BOX THE REINFORCEMENT SHALL FOLLOW THIS DRAWING.
10. PROVIDE DB12 BARS AS LONGITUDINAL STEEL BARS AT THE INNER AND OTHER SIDE OF PRECAST BOX CULVERT WALL (SPACING NOT MORE THAN 40 CM.).
11. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SHALL BE USED INSTEAD OF TYPE I CEMENT.
12. WORK THIS DRAWING WITH DWG. NO. BC-07.
13. DB IS THE DIAMETER OF REINFORCEMENT STEEL IN MILIIMETERS.
14. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
15. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 7 PB /4.

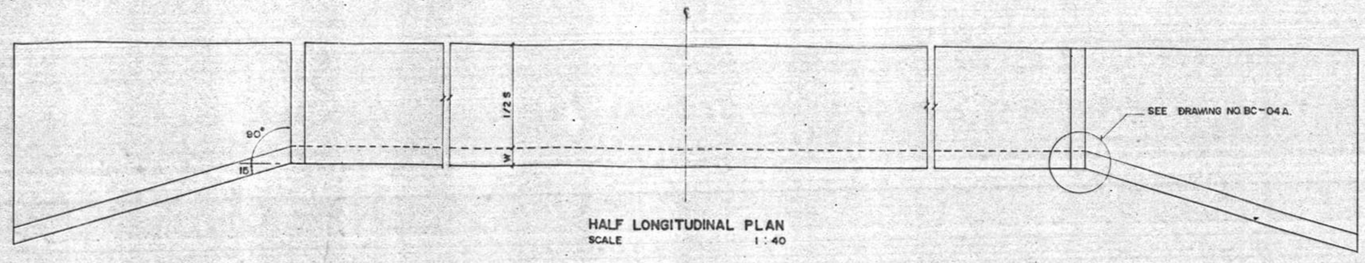
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

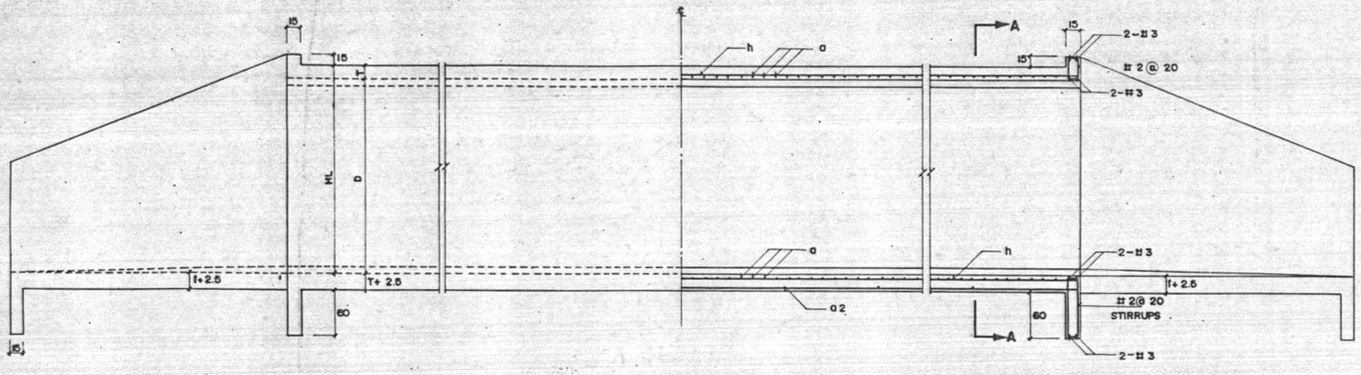
PRECAST BOX CULVERT DEPTH OF FILL > 0.60 M.

REINFORCEMENT AND DETAILS

DESIGNED : DOH. & CONSULTANTS.	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. BC-08
		SHEET NO. 193

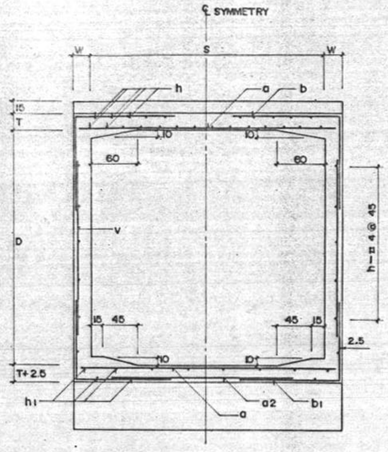


HALF LONGITUDINAL PLAN
SCALE 1 : 40

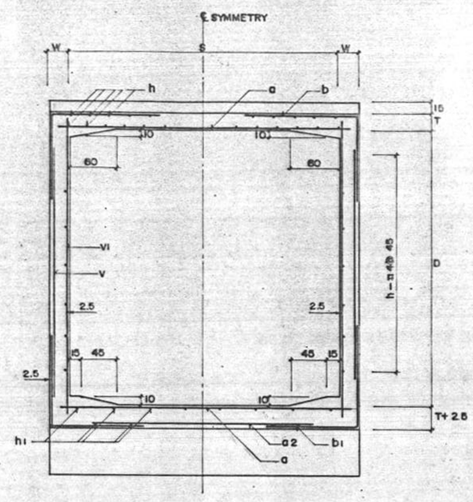


HALF LONGITUDINAL ELEVATION
SCALE 1 : 40

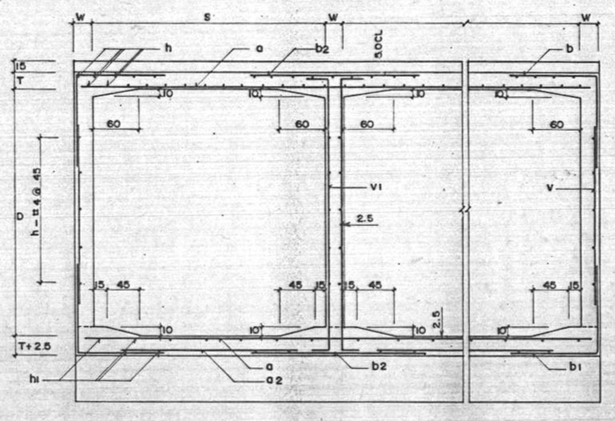
HALF LONGITUDINAL SECTION
SCALE 1 : 40



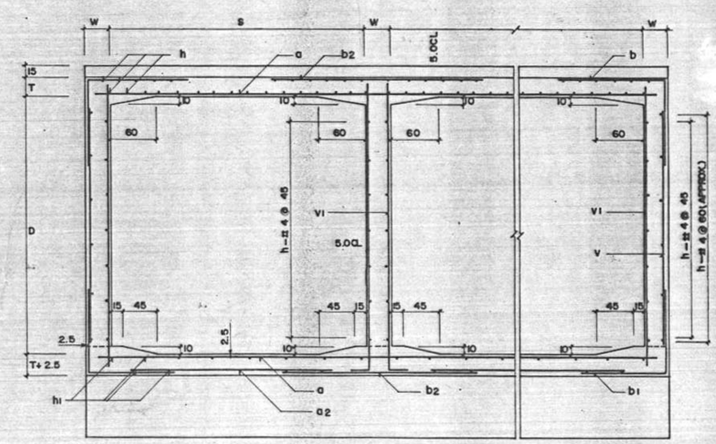
SINGLE BOX TYPE B
(FOR D > 240 CM. AND W < 25 CM.)



SINGLE BOX TYPE C
(FOR D > 240 CM. AND W ≥ 25 CM.)



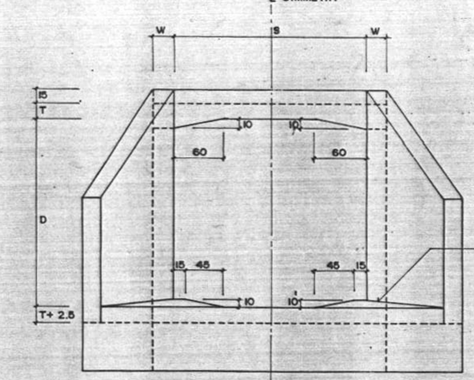
MULTIPLE BOXES TYPE B
(FOR D > 240 CM. AND W < 25 CM.)



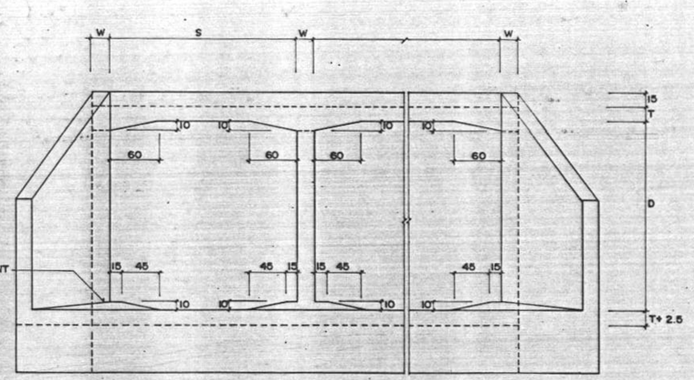
MULTIPLE BOXES TYPE C
(FOR D > 240 CM. AND W ≥ 25 CM.)

NOTES :

1. FOR GENERAL NOTES NOT MENTIONED IN THIS DRAWING SEE DWG. NO. BC-02.
2. CLEAR CONCRETE COVER SHALL BE 2.5 CM. EXCEPT THE BOTTOM OF BOTTON SLABS OR WALL WHERE CLEAR COVER OF 5 CM. SHALL BE PROVIDED
3. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
4. WORK THIS DRAWING WITH DWG. NO.BC-02A, BC-02A
5. THIS DRAWING IS ADAPTED FROM DOH DRAWING NO. 7B/7
6. THIS DRAWING SHALL BE USED FOR EXTENSION OF EXISTING R.C. BOX CULVERTS WHICH HAVE CONCRETE COVERING 2.5 CM. ONLY



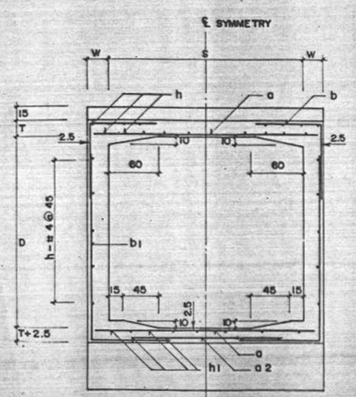
SINGLE BOX



CONSTRUCTION JOINT
CONSTRUCTION JOINT

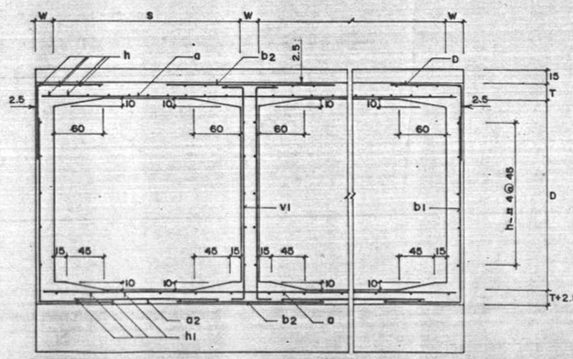
MULTIPLE BOXES

TRANSVERSE ELEVATION
SCALE 1 : 40



SINGLE BOX TYPE A
(FOR D ≤ 240 CM. AND W < 25 CM.)

SECTION A – A
SCALE 1:40



MULTIPLE BOXES TYPE A
(FOR D ≤ 240 CM. AND W < 25 CM.)

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

RIGID FRAME R.C. BOX CULVERT

PLAN ELEVATIONS AND SECTIONS

DESIGNED : DOH & CONSULTANT	CHECKED :	DATE JULY 1994
SUBMITTED : P. Bumpenpol (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO. BC-01A
		SHEET NO. 194

S	D	FILL HEIGHT CM.	T CM.	W CM.	BAR MARK a ##	BAR MARK a @ CM.	BAR MARK a L CM.	BAR MARK a2 ##	BAR MARK a2 @ CM.	BAR MARK a2 L CM.	BAR MARK b&b1 ##	BAR MARK b&b1 @ CM.	BAR MARK b&b1 F CM.	BAR MARK b G CM.	BAR MARK b L CM.	BAR MARK b1 GI CM.	BAR MARK b1 L CM.	BAR MARK h ##	BAR MARK h @ CM.	BAR MARK h NO	BAR MARK h1 ##	BAR MARK h1 @ CM.	BAR MARK h1 NO	BAR MARK v ##	BAR MARK v @ CM.	BAR MARK v L CM.	BAR MARK v1 ##	BAR MARK v1 @ CM.	BAR MARK v1 L CM.	BAR MARK b2 ##	BAR MARK b2 @ CM.	BAR MARK b2 L CM.
CLEAR SPAN 210 CM.	180 CM.	0 - 30	19	20	5	14	265	4	±120	190	4	16.5	100	100	215	180	295	4	25	20	4	45	11	-	-	-	4	30	230	4	16.5	195
		31 - 60	16.5	20	5	16.5	265	4	±120	190	4	16.5	100	100	215	180	295	4	30	19	4	45	11	-	-	-	4	30	230	4	16.5	195
		61 - 150	15	20	5	20	265	4	±120	190	4	15	100	100	215	180	295	4	38	16	4	45	11	-	-	-	4	30	230	4	15	195
		151 - 225	15	20	5	17.5	265	4	±120	190	4	12.5	100	100	215	180	295	4	45	17	4	45	11	-	-	-	4	30	230	4	12.5	195
		226 - 300	16.5	20	5	16.5	265	4	±120	190	4	12.5	100	100	215	180	295	4	45	17	4	38	13	-	-	-	4	30	230	4	12.5	195
		301 - 375	17.5	20	5	14	265	4	±120	190	4	11.5	100	100	215	180	295	4	45	17	4	30	15	-	-	-	4	30	230	4	11.5	195
		376 - 450	19	20	6	17.5	270	4	±120	190	4	11	100	100	215	180	295	4	45	17	5	30	15	-	-	-	4	30	230	4	11	195
		451 - 600	22.5	20	6	15	270	4	±120	190	5	12.5	102.5	102.5	220	182.5	300	4	45	17	5	30	15	-	-	-	4	30	230	5	12.5	195
		601 - 750	26	20	6	13	270	4	±120	190	5	12.5	102.5	102.5	220	182.5	300	4	45	17	6	30	15	-	-	-	4	30	230	5	12.5	195
		751 - 900	31	20	6	15	270	4	±120	190	5	12.5	102.5	102.5	220	182.5	300	4	45	17	6	30	15	-	-	-	4	30	230	5	12.5	195
		901 - 1050	34	20	6	12	270	4	±120	190	5	12.5	102.5	102.5	220	182.5	300	4	45	17	6	30	15	-	-	-	4	30	230	5	12	195
		1051 - 1200	37	20	6	10	270	4	±120	190	5	12.5	102.5	102.5	220	182.5	300	4	45	17	6	30	15	-	-	-	4	30	230	5	12	195
		1201 - 1500	41	20	8	16.5	270	4	±120	190	5	12.5	102.5	102.5	220	182.5	300	4	45	17	8	30	15	-	-	-	4	30	230	5	12	195
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		0 - 30	19	20	5	14	265	4	±120	190	4	16.5	100	100	215	210	325	4	25	22	4	45	11	-	-	-	4	30	260	4	16.5	195
		31 - 60	16.5	20	5	16.5	265	4	±120	190	4	16.5	100	100	215	210	325	4	30	21	4	45	11	-	-	-	4	30	260	4	16.5	195
		61 - 150	15	20	5	20	265	4	±120	190	4	15	100	100	215	210	325	4	38	20	4	45	11	-	-	-	4	30	260	4	15	195
		151 - 225	15	20	5	17.5	265	4	±120	190	4	12.5	100	100	215	210	325	4	45	19	4	45	11	-	-	-	4	30	260	4	12.5	195
		226 - 300	16.5	20	5	16.5	265	4	±120	190	4	12.5	100	100	215	210	325	4	45	19	4	38	13	-	-	-	4	30	260	4	12.5	195
		301 - 375	17.5	20	5	14	265	4	±120	190	4	11.5	100	100	215	210	325	4	45	19	4	30	15	-	-	-	4	30	260	4	11.5	195
		376 - 450	19	20	6	17.5	270	4	±120	190	4	11.5	100	100	215	210	325	4	45	19	5	30	15	-	-	-	4	30	260	4	11.5	195
		451 - 600	22.5	20	6	15	270	4	±120	190	5	12.5	102.5	102.5	220	212.5	330	4	45	19	5	30	15	-	-	-	4	30	260	5	12.5	195
		601 - 750	26	20	6	14	270	4	±120	190	5	12.5	102.5	102.5	220	212.5	330	4	45	19	6	30	15	-	-	-	4	30	260	5	12.5	195
		751 - 900	31	20	6	13	270	4	±120	190	5	12.5	102.5	102.5	220	212.5	330	4	45	19	6	30	15	-	-	-	4	30	260	5	12.5	195
		901 - 1050	34	20	6	12	270	4	±120	190	5	12.5	102.5	102.5	220	212.5	330	4	45	19	6	30	15	-	-	-	4	30	260	5	12	195
		1051 - 1200	37	20	6	10	270	4	±120	190	5	12.5	102.5	102.5	220	212.5	330	4	45	19	6	30	15	-	-	-	4	30	260	5	12	195
		1201 - 1500	41	20	8	16.5	270	4	±120	190	5	12.5	102.5	102.5	220	212.5	330	4	45	19	8	30	15	-	-	-	4	30	260	5	12	195
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CLEAR SPAN 270 CM.	210 CM.	0 - 30	19	20	5	12.5	295	4	±120	220	4	17.5	110	110	235	210	335	4	23	25	4	45	13	-	-	-	4	30	260	4	17.5	215
		31 - 60	17.5	20	5	15	295	4	±120	220	4	17.5	110	110	235	210	335	4	25	24	4	45	13	-	-	-	4	30	260	4	17.5	215
		61 - 150	17.5	20	5	17.5	295	4	±120	220	4	16.5	110	110	235	210	335	4	38	21	4	45	13	-	-	-	4	30	260	4	16.5	215
		151 - 225	17.5	20	5	15	295	4	±120	220	4	14	110	110	235	210	335	4	45	20	4	45	13	-	-	-	4	30	260	4	14	215
		226 - 300	17.5	20	6	18	300	4	±120	220	4	12.5	110	110	235	210	335	4	45	20	4	38	15	-	-	-	4	30	260	4	12.5	215
		301 - 375	20	20	6	16.5	300	4	±120	220	4	12.5	110	110	235	210	335	4	45	20	5	30	17	-	-	-	4	30	260	4	11	215
		376 - 450	21	20	6	15	300	4	±120	220	4	11	110	110	235	210	335	4	45	20	5	30	17	-	-	-	4	30	260	4	11	215
		451 - 600	25	20	6	12.5	300	4	±120	220	5	12.5	112.5	112.5	240	212.5	340	4	45	20	5	30	17	-	-	-	4	30	260	5	12.5	215
		601 - 750	29	20	6	11	300	4	±120	220	5	12.5	112.5	112.5	240	212.5	340	4	45	20	6	30	17	-	-	-	4	30	260	5	12.5	215
		751 - 900	33	20	6	10	300	4	±120	220	5	12.5	112.5	112.5	240	212.5	340	4	45	20	6	30	17	-	-	-	4	30	260	5	12.5	215
		901 - 1050	38	20	8	17	300	4	±120	220	5	12.5	112.5	112.5	240	212.5	340	4	45	20	6	30	17	-	-	-	4	30	260	5	12	215
		1051 - 1200	41	20	8	15	300	4	±120	220	5	12.5	112.5	112.5	240	212.5	340	4	45	20	8	30	17	-	-	-	4	30	260	5	12	215
		1201 - 1500	47	20	8	13	300	4	±120	220	5	12.5	112.5	112.5	240	212.5	340	4	45	20	8	30	17	-	-	-	4	30	260	5	12	215
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	240 CM.	0 - 30	19	20	5	12.5	295	4	±120	220	4	16.5	110	110	235	240	365	4	23	25	4	45	13	-	-	-	4	30	290	4	16.5	215
		31 - 60	17.5	20	5	15	295	4	±120	220	4	16.5	110	110	235	240	365	4	25	24	4	45	13	-	-	-	4	30	290	4	16.5	215
		61 - 150	17.5	20	5	17.5	295	4	±120	220	4	15	110	110	235	240	365	4	38	21	4	45	15	-	-	-	4	30	290	4	15	215
		151 - 225	17.5	20	5	15	295	4	±120	220	4	12.5	110	110	235	240	365	4	45	20	4	45	13	-	-	-	4	30	290	4	12.5	215
		226 - 300	17.5	20	6	18	300	4	±120	220	4	12.5	110	110	235	240	365	4	45	20	4	38	15	-	-	-	4	30	290	4	12.5	215
		301 - 375	20	20	6	17.5	300	4	±120	220	4	12.5	110	110	235	240	365	4	45	20	4	30	17	-	-	-	4	30	290	4	12.5	215
		376 - 450	21	20	6	15	300	4	±120	220	4	11	110	110	235	240	365	4	45	20	5	30	17	-	-	-	4	30	290	4	11	215
		451 - 600	25	20	6	12.5	300	4	±120	220	5	12.5	112.5	112.5	240	242.5	370	4	45	20	6	30	17	-	-	-	4	30	290	5	12.5	215
		601 - 750	29	20	6	11	300	4	±120	220	5	12.5	112.5	112.5	240	242.5	370	4	45	20	6	30	17	-	-	-	4	30	290	5	12.5	215
		751 - 900	33	20	6	10	300	4	±120	220	5	12.5	112.5	112.5	240	242.5	370	4	45	20	6	30	17	-	-	-	4	30	290	5	12.5	215
		901 - 1050	38	20	8	17	300	4	±120	220	5	12.5	112.5	112.5	240	242.5	370	4	45	20	6	30	17	-	-	-	4	30	290	5	12	215
		1051 - 1200	41	20	8	15	300	4	±120	220	5	12.5	112.5	112.5	240	242.5	370	4	45	20	8	30	17	-	-	-	4	30	290	5	12	215
		1201 - 1500	47	20	8	13	300	4	±120	220	5	12.5	112.5	112.5	240	242.5	370	4	45	20	8	30	17	-	-	-	4	30	290	5	12	215
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CLEAR SPAN 270 CM.	240 CM.	0 - 30	19	20	6	19	330	4	±120	240	4	15	120	120	255	240	375	4	23	26	4	45	13	-	-	-	4	30	290	4	15	235
		31 - 60	19	20	6	20	330	4	±120	240	4	15	120	120	255	240	375	4	25	25	4	45	13	-	-	-	4	30	290	4	15	235
		61 - 150	19	20	6	22.5	330	4	±120	240	4	14	120	120	255	240	375	4	38	22	4	45	13	-	-	-	4	30	290	4	14	235
		151 - 225	19	20	6	17.5	330	4	±120	240	4	12.5	120	120	255	240	375	4	45	20	4	45	13	-	-	-	4	30	290	4	12.5	235
		226 - 300	20	20	6	16.5	330	4	±120	240	4	12.5	120	120	255	240	375	4	45	20	4	38	17	-	-	-	4	30	290	4	12.5	235
		301 - 375	22.5	20	6	15	330	4	±120	240	4	12.5	120	120	255	240	375	4	45	20	4	30	19	-	-	-	4	30	290	4	12.5	235
		376 - 450	25	20	6	12.5	330	4	±120	240	4	11	120	120	255	240	375	4	45	20	5	30	19	-	-	-	4	30	290	4	11	235
		451 - 600	27.5	20	6	10	330	4	±120	240	5	12.5	122.5	122.5	260	242.5	380	4	45	20	5	30	19	-	-	-	4	30	290	5	12.5	235
		601 - 750	32.5	20	8	17.5	330	4	±120	240	5	12.5	122.5	122.5	260	242.5	380	4	45	20	6	30	19	-	-	-	4	30	290	5	12.5	235
		751 - 900	38	22.5	8	16.5	335	4	±120	240	5	12.5	122.5	122.5	260	242.5	380	4	45	20	6	30	19	-	-	-	4	30	290	5	12.5	235
		901 - 1050	44	22.5	8	15.5	335	4	±120	240	5	12.5	122.5	122.5	260	242.5	380	4	45	20	8	30	19	-	-	-	4	30	290	5	12	235
		1051 - 1200	46	22.5	8	14	335	4	±120	240	5	12.5	122.5	122.5	260	242.5	380	4	45	20	8	30	19	-	-	-	4	30	290	5	12	235
		1201 - 1500	52	22.5	8	12	335	4	±120	240	5	12.5	122.5	122.5	260	242.5	380	4	45	20	8	30	19	-	-	-	4	30	290	5	12	235
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	270 CM.	0 - 30	19	22.5	6	19	330	4	±120	240	4	15	120	120	255	120	255	4	23	28	4	45	13	4	30	255	4	30	320	4	15	235
		31 - 60	19	22.5	6	20	330	4	±120	240	4	15	120	120	255	120	255	4	25	27	4	45	13	4	30	255	4	30	320	4	15	235
		61 - 150	19	22.5	6	22.5	330	4	±120	240	4	15	120	120	255	120	255	4	38	24	4	45	13	4	30	255	4	30	320	4	15	235
		151 - 225	19	22.5	6	19	330	4	±120	240	4	15	122.5	122.5	260	122.5	260	4	45	22	4	45	13	4	30	255	4	30	320	4	15	235
		226 - 300	19	22.5	6	17.5	330	4	±120	240	4	15	122.5	122.5	260	122.5	260	4	45	22	4	38	17	4	30	255	4	30	320	4	15	235
		301 - 375	21.5	22.5	6	15	330	4	±120	240	4	15	122.5	122.5	260	122.5	260	4	45	22	4	30	19	4	30	255	4	30	320	4	15	235
		376 - 450	24	22.5	6	14	330	4	±120	240	5	14	122.5	122.5	260	122.5	260	4	45	22	5	30	19	4	28	255	4	30	320	5	14	235
		451 - 600	27.5	22.5	6	11	330	4	±120	240	5	12.5	122.5	122.5	260	122.5	260	4	45	22	5	30	19	4	25	255	4	30	320	5	12.5	235
		601 - 750	32.5	22.5	8	18	335	4	±120	240	5	12.5	122.5	122.5	260	122.5	260	4	45	22	6	30	19	4	25	255	4	30	320	5	12.5	235
		751 - 900	38	22.5	8	17.5	335	4	±120	240	5	12.5	122.5	122.5	260	122.5	260	4	45	22	6	30	19	4	25	255	4	30	320	5	12.5	235
		901 - 1050	44	22.5	8	15.5	335	4	±120	240	5	12.5	122.5	122.5	260	122.5	260	4	45	22	8	30	19	4	25	255	4	30	320	5	12	235
		1051 - 1200	48	22.5	8	14	335	4	±120	240	5	12.5	122.5	122.5	260	122.5	260	4	45	22	8	30	19	4	25	255	4	30	320	5	12	235
		1201 - 1500	52	22.5	8	12	335	4	±120	240	5	12.5	122.5	122.5	260	122.5	260	4	45	22	8	30	19	4	25	255	4	30	320	5	12	235
						*													*					*								
																														⊛	⊛	⊛

S	D	FILL HEIGHT CM.	T CM.	W CM.	BAR MARK a ##	BAR MARK a @ CM.	BAR MARK a L CM.	BAR MARK a2 ##	BAR MARK a2 @ CM.	BAR MARK a2 L CM.	BAR MARK b&b1 ##	BAR MARK b&b1 @ CM.	BAR MARK b&b1 F CM.	BAR MARK b G CM.	BAR MARK b L CM.	BAR MARK b1 GI CM.	BAR MARK b1 L CM.	BAR MARK h ##	BAR MARK h @ CM.	BAR MARK h NO	BAR MARK h1 ##	BAR MARK h1 @ CM.	BAR MARK h1 NO	BAR MARK v ##	BAR MARK v @ CM.	BAR MARK v L CM.	BAR MARK v1 ##	BAR MARK v1 @ CM.	BAR MARK v1 L CM.	BAR MARK b2 ##	BAR MARK b2 @ CM.	BAR MARK b2 L CM.
CLEAR SPAN 270 CM.	270 CM.	0 - 30	20	20	5	17.5	360	4	±120	260	4	15	130	130	275	130	275	4	21.5	30	4	45	15	4	30	255	4	30	320	4	15	260
		31 - 60	20	22.5	6	19	360	4	±120	260	4	15	130	130	275	130	275	4	22.5	29	4	45	15	4	30	255	4	30	320	4	15	260
		61 - 150	20	22.5	6	19	360	4	±120	260	5	15	132.5	132.5	280	132.5	280	4	30	26	4	45	15	4	30	255	4	30	320	5	15	260
		151 - 225	20	22.5	6	16.5	360	4	±120	260	5	15	132.5	132.5	280	132.5	280	4	45	23	4	45	15	4	30	255	4	30	320	5	15	260
		226 - 300	21.5	22.5	6	15	360	4	±120	260	5	15	132.5	132.5	280	132.5	280	4	45	23	4	38	17	4	30	255	4	30	320	5	15	260
		301 - 375	24	22.5	6	13	365	4	±120	260	5	15	132.5	132.5	280	132.5	280	4	45	23	5	30	21	4	30	255	4	30	320	5	15	260
		376 - 450	26	22.5	6	11	365	4	±120	260	5	14	132.5	132.5	280	132.5	280	4	45	23	5	30	21	4	28	255	4	30	320	5	14	260
		451 - 600	30	22.5	8	17.5	370	4	±120	260	5	12.5	132.5	132.5	280	132.5	280	4	45	23	5	30	21	4	25	255	4	30	320	5	12.5	260
		601 - 750	36	22.5	8	15.5	370	4	±120	260	5	12.5	132.5	132.5	280	132.5	280	4	45	23	6	30	21	4	25	255	4	30	320	5	12.5	260
		751 - 900	42.5	22.5	8	15.5	370	4	±120	260	5	12.5	132.5	132.5	280	132.5	280	4	45	23	6	30	21	4	25	255	4	30	320	5	12.5	260
		901 - 1050	48	22.5	8	14	370	4	±120	260	5	11	132.5	132.5	280	132.5	280	4	45	23	6	30	21	4	25	255	4	30	320	5	12	260
		1051 - 1200	51	22.5	8	13	370	4	±120	260	5	11	132.5	132.5	280	132.5	280	4	45	23	6	30	21	4	25	255	4	30	320	5	12	260
		1201 - 1500	55	22.5	8	11	370	4	±120	260	5	11	132.5	132.5	280	132.5	280	4	45	23	8	30	21	4	25	255	4	30	320	5	12	260
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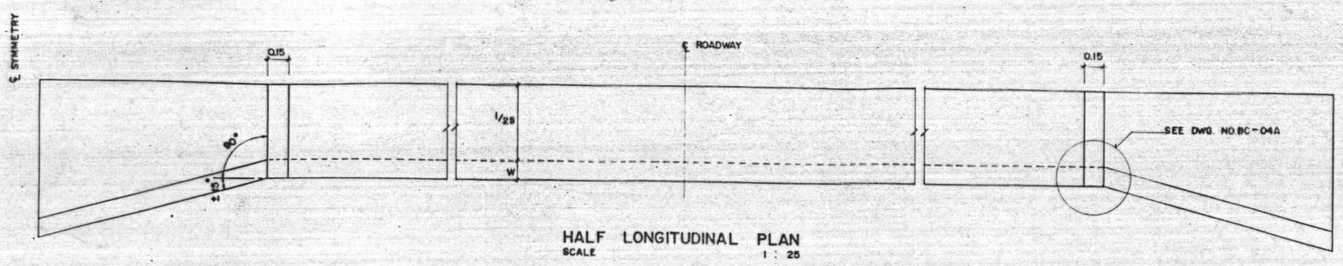
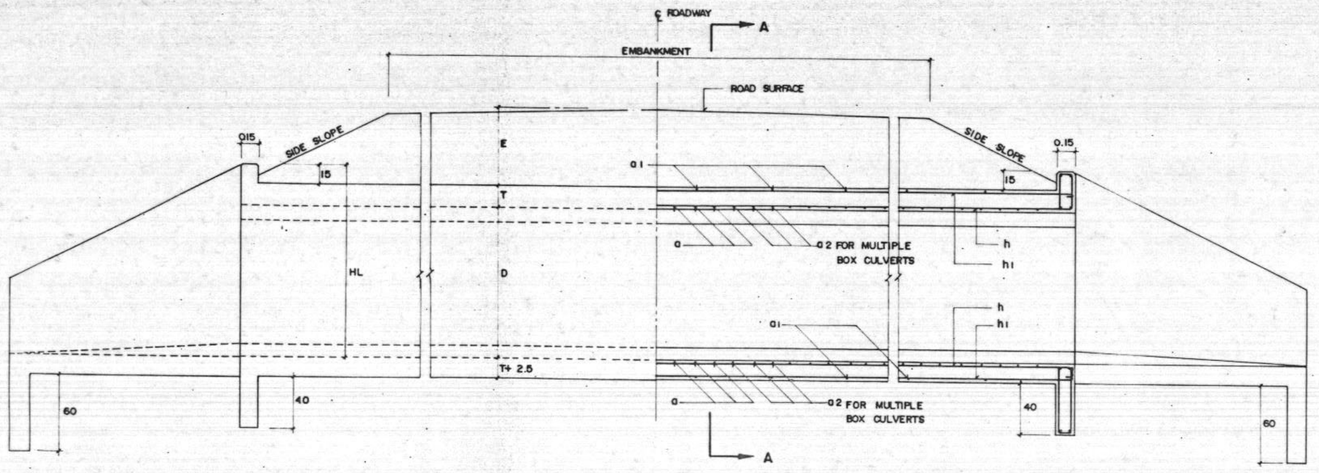
	300 CM.	0 - 30	20	25	6	17.5	360	4	±120	260	4	15	130	130	275	130	275	4	21.5	38	4	45	15	4	30	285	4	30	350	4	15	260
		31 - 60	20	25	6	20	360	4	±120	260	4	15	130	130	275	130	275	4	22.5	37	4	45	15	4	30	285	4	30	350	4	15	260
		61 - 150	20	25	6	21.5	360	4	±120	260	5	15	132.5	132.5	280	132.5	280	4	30	34	4	45	15	4	30	285	4	30	350	5	15	260
		151 - 225	20	25	6	17.5	360	4	±120	260	5	14	132.5	132.5	280	132.5	280	4	45	31	4	45	15	4	28	285	4	30	350	5	14	260
		226 - 300	21.5	25	6	16.5	360	4	±120	260	5	12.5	132.5	132.5	280	132.5	280	4	45	31	4	38	17	4	25	285	4	30	350	5	12.5	260
		301 - 375	22.5	25	6	13	365	4	±120	260	5	12.5	132.5	132.5	280	132.5	280	4	45	31	4	30	21	4	25	285	4	30	350	5	12.5	260
		376 - 450	25	25	6	12	365	4	±120	260	5	12.5	132.5	132.5	280	132.5	280	4	45	31	5	30	21	4	25	285	4	30	350	5	12.5	260
		451 - 600	30	25	8	16	370	4	±120	260	5	12.5	132.5	132.5	280	132.5	280	4	45	31	5	30	21	4	25	285	4	30	350	5	12.5	260
		601 - 750	36	25	8	16.5	370	4	±120	260	5	12.5	132.5	132.5	280	132.5	280	4	45	31	6	30	21	4	25	285	4	30	350	5	12.5	260
		751 - 900	42.5	25	8	15.5	370	4	±120	260	5	12.5	132.5	132.5	280	132.5	280	4	45	31	6	30	21	4	25	285	4	30	350	5	12.5	260
		901 - 1050	48	25	8	14	370	4	±120	260	5	11	132.5	132.5	280	132.5	280	4	45	31	6	30	21	4	25	285	4	30	350	5	12	260
		1051 - 1200	51	25	8	13	370	4	±120	260	5	11	132.5	132.5	280	132.5	280	4	45	31	8	30	21	4	25	285	4	30	350	5	12	260
		1201 - 1500	55	25	8	11	370	4	±120	260	5	11	132.5	132.5	280	132.5	280	4	45	31	8	30	21	4	25	285	4	30	350	5	12	260
						*													*					*								

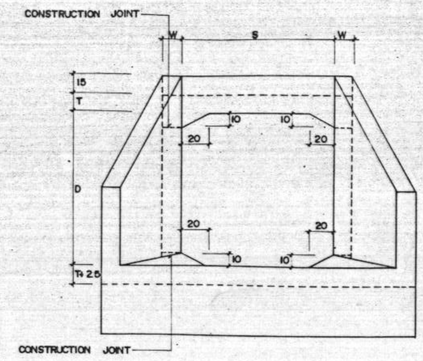


HALF LONGITUDINAL PLAN
SCALE 1 : 25

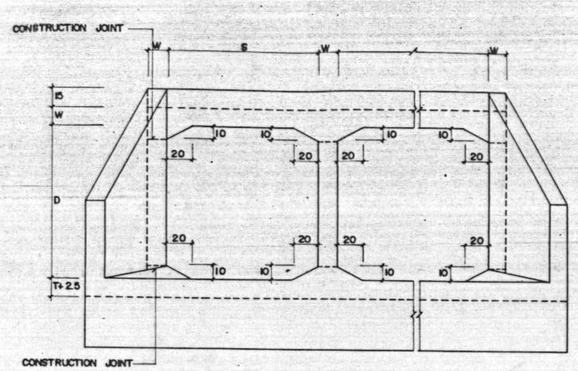


HALF LONGITUDINAL ELEVATION
SCALE 1 : 25

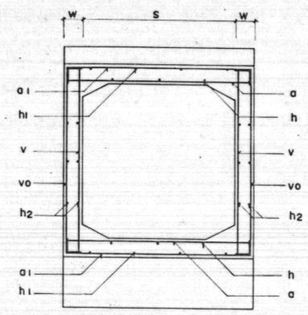
HALF LONGITUDINAL SECTION
SCALE 1 : 25



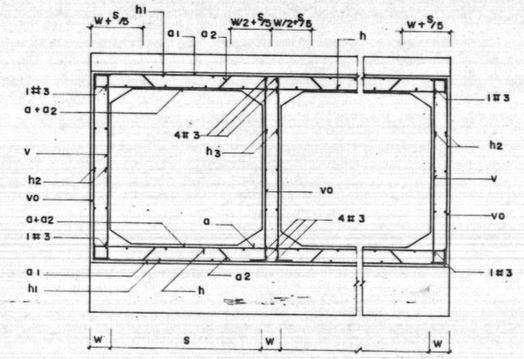
ELEVATION
SCALE 1 : 25



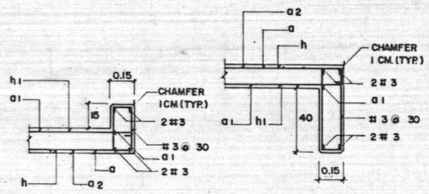
ELEVATION
SCALE 1 : 25



SECTION A-A
SCALE 1 : 25

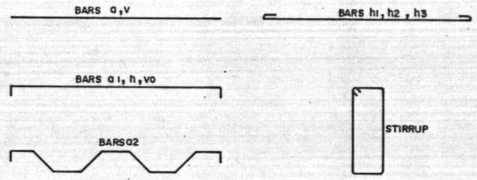


SECTION A A
SCALE 1 : 25



TOP BEAM BOTTOM BEAM

END BEAM DETAILS
NOT TO SCALE



BAR BENDING DIAGRAMS
NOT TO SCALE

TABLE OF TOP AND BOTTOM SLAB REINFORCEMENTS

CLEAR SPAN	DEPTH OF FILL, E CM.	T CM.	SINGLE BOX CULVERT												MULTIPLE BOX CULVERT									
			a			a1			h			h1			a		a1		a2		h		h1	
			#	@	L	#	@	L	#	@	NO.	#	@	NO.	#	@	#	@	#	@	#	@	#	@
60 CM.	0 – 30	15	5	16	108	3	45	108	4	30	8	3	45	6	5	32	3	45	5	32	4	30	3	45
	31 – 60	15	4	22	108	3	60	108	4	30	8	3	45	6	4	44	3	60	4	44	4	30	3	45
	61 – 150	15	4	22	108	3	60	108	4	30	8	3	45	6	4	44	3	60	4	44	4	30	3	45
	151 – 225	15	4	22	108	3	60	108	4	30	8	3	45	6	4	44	3	60	4	44	4	30	3	45
90 CM.	0 – 30	17.5	5	15	138	3	45	138	4	25	12	3	40	8	5	30	3	45	5	30	4	25	3	40
	31 – 60	15	4	15	138	3	60	138	4	40	8	3	40	8	4	30	3	60	4	30	4	40	3	40
	61 – 150	15	4	22	138	3	60	138	4	40	8	3	40	8	4	44	3	60	4	44	4	40	3	40
	151 – 225	15	4	22	138	3	60	138	4	40	8	3	40	8	4	44	3	60	4	44	4	40	3	40
120 CM.	0 – 30	17.5	5	13	168	3	45	168	4	25	14	3	36	10	5	26	3	45	5	26	4	25	3	40
	31 – 60	15	5	16	168	3	60	168	4	30	12	3	36	10	5	32	3	60	5	32	4	30	3	40
	61 – 150	15	4	15	168	3	60	168	4	36	10	3	36	10	4	30	3	60	4	30	4	40	3	40
	151 – 225	15	4	15	168	3	60	168	4	36	10	3	36	10	4	30	3	60	4	30	4	40	3	40
150 CM.	0 – 30	19	6	18	205	3	45	205	4	25	16	3	45	10	6	36	3	45	6	30	4	25	3	45
	31 – 60	17.5	6	22	205	3	60	205	4	30	14	3	45	10	6	44	3	60	6	44	4	30	3	45
	61 – 150	15	5	16	198	3	60	198	4	45	10	3	45	10	5	32	3	60	5	32	4	45	3	45
	151 – 225	17.5	5	16	198	3	60	198	4	45	10	3	45	10	5	32	3	60	5	32	4	45	3	45
180 CM.	0 – 30	20	5	12	228	3	45	228	4	21	22	3	45	12	5	24	3	45	5	24	4	21	3	45
	31 – 60	19	5	14	228	3	60	228	4	30	16	3	45	12	5	28	3	60	5	28	4	30	3	45
	61 – 150	17.5	5	15	228	3	60	228	4	45	12	3	45	12	5	30	3	60	5	30	4	45	3	45
	151 – 225	17.5	5	14	228	3	60	228	4	45	12	3	45	12	5	28	3	60	5	28	4	45	3	45

#3 = Ø 3/8" OR 9 MM. #4 = Ø 1/2" OR 12 MM. NO. = TOTAL AMOUNT OF BARS
#5 = Ø 5/8" OR 16 MM. #6 = Ø 3/4" OR 20 MM. L = TOTAL LENGTH OF EACH BAR

TABLE OF VERTICAL WALL REINFORCEMENT

DEPTH D CM.	SINGLE BOX CULVERT							MULTIPLE BOX CULVERTS					
	DEPTH OF FILL (E) 0 – 225 CM.							DEPTH OF FILL (E) 0 – 225 CM.					
	WIDTH W CM.	REINFORCING BAR V		REINFORCING BAR Ve		REINFORCING BAR h		EXTERIOR WALL			INTERIOR WALL		
								REINFORCING BAR V		TOTAL AMOUNT OF h2 (#3) EACH WALL	REINFORCING BAR Ve		TOTAL AMOUNT OF h3 (#3) EACH WALL
		#	@	#	@	#	@	#	@		#	@	
60	20	4	30	3	30	3	30	4	30	8	3	40	4
90	20	4	30	3	30	3	30	4	30	12	3	40	6
120	20	4	30	3	30	3	30	4	30	12	3	40	6
150	22.5	4	30	3	30	3	30	4	30	16	3	40	8
180	25	4	30	3	30	3	30	4	30	20	3	40	10

NOTES :

1. DESIGN PARAMETERS ARE
   - 1.1 LIVE LOADING : HS 20-44
   - 1.2 WORKING STEEL STRESSES :
     - PLAIN BARS, f_s = 1200 KG/CM^2
     - DEFORMED BARS, f_s = 1400 KG/CM^2
   - 1.3 WORKING CONCRETE STRESS, f_c = 60 KG/CM^2
2. CONCRETE SHALL HAVE THE 28 DAYS MINIMUM ULTIMATE COMPRESSIVE STRENGTH, BASED ON 15x15x15 CM. CUBE SAMPLES, OF 180 KG/CM^2 AND SHALL HAVE A MINIMUM CEMENT CONTENT OF 320 KG. PER CUBIC METER OF CONCRETE. THE FOLLOWING IS THE SUGGESTED CONCRET MIX PROPORTIONS PER CUBIC METER :
   - TYPE I PORTLAND CEMENT 350 KG.
   - SAND 0.45 M^3
   - CRUSHED ROCK OR GRAVEL 0.86 M^3
   - WITH THE MAXIMUM SLUMP OF 10 CM.
3. REBARS #4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
4. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER
5. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
6. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS 15 SPECIFICATIONS SHALL BE USED INSTEAD OF TYPE I PORTLAND CEMENT.
7. CLEAR CONCRETE COVER SHALL BE 2.5 CM. EXCEPT THE BOTTOM OF BOTTOM SLABS AND OUTSIDE FACES OF THE EXTERIOR WALLS WHERE A CLEAR COVER OF 5.0 CM. SHALL BE PROVIDED.
8. WORK THIS DRAWING WITH DWG. NO. BC-04 A.
9. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
10. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 7B/8.
11. THIS DRAWING SHALL BE USED FOR EXTENSION OF EXISTING R.C. BOX CULVERTS WHICH HAVE CONCRETE COVERING 2.5 CM. ONLY

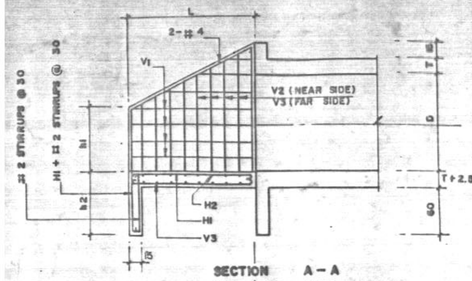
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

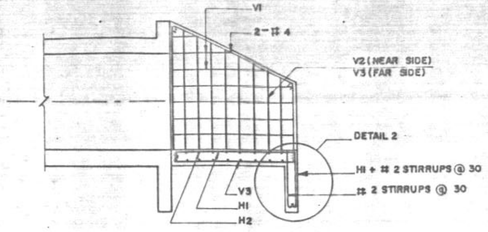
SIMPLE SPAN BOX CULVERT

PLAN, ELEVATIONS, SECTIONS AND DETAILS

DESIGNED: DOH & CONSULTANT	CHECKED:	DATE JULY 1994
SUBMITTED: P. Buranaprapuk (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: (DIRECTOR GENERAL)		DWG. NO. BC-03A
		SHEET NO. 196



SECTION A – A
NOT TO SCALE



SECTION B – B
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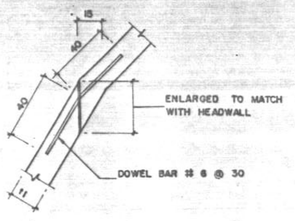
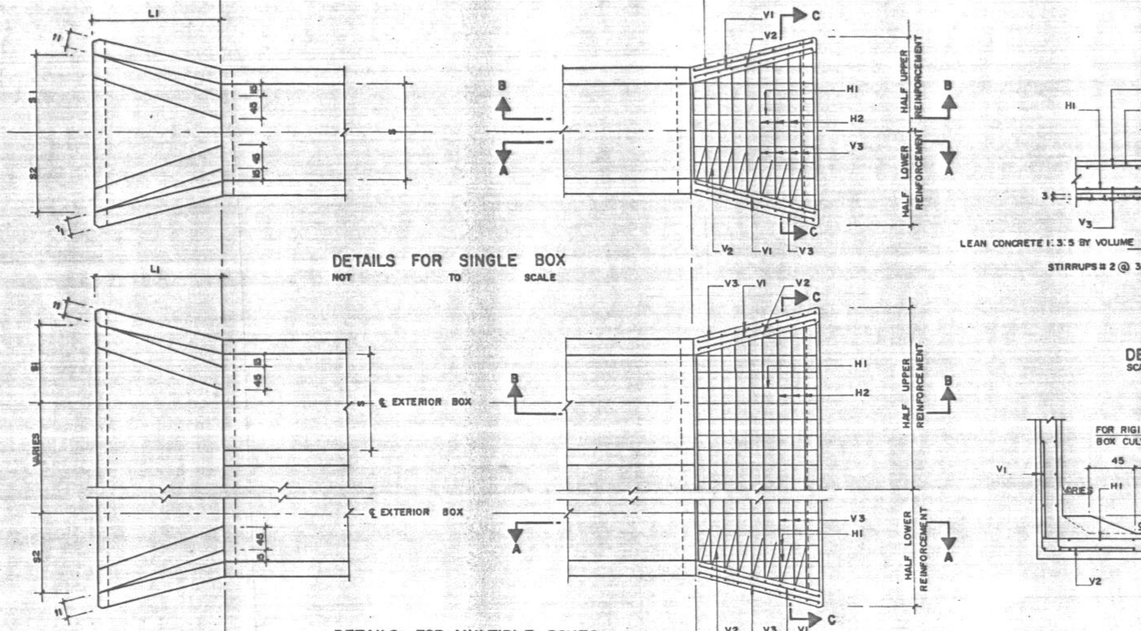
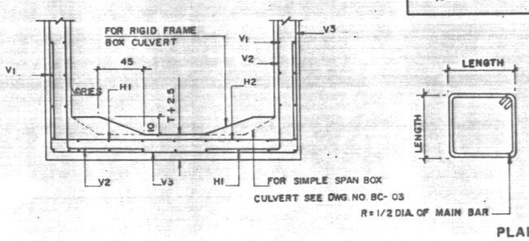


DETAIL 1
SCALE 1:20



DETAILS FOR SINGLE BOX
NOT TO SCALE

DETAILS FOR MULTIPLE BOXES
NOT TO SCALE



DETAIL 2
SCALE 1:20

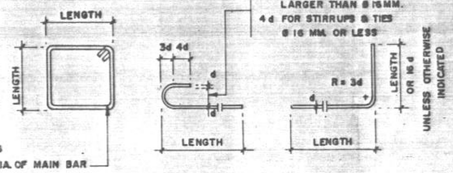


TABLE OF REINFORCEMENT FOR HEADWALL OF SINGLE BOX CULVERT

SIZE OF CULVERT		L	h1	t1	CULVERTS												V1		V2		V3		H1		H2 or		b1	
					SKEW 0°			SKEW 15°			SKEW 30°			SKEW 45°														
S	D				L1	S1	S2	L1	S1	S2	L1	S1	S2	L1	S1	S2	#	@	#	@	#	@	#	@	#	@	#	NO.
60	60	95	50	15	90	54	54	93	54	57	104	57	68	127	68	95	3	30	3	20	3	20	3	30	3	20	3	4
90	60	95	50	15	90	69	69	93	69	73	104	73	83	127	83	111	3	30	3	20	3	20	3	30	3	20	3	4
90	90	145	55	15	140	82	82	145	82	88	161	88	104	198	104	147	3	30	3	20	3	20	3	30	3	20	3	4
120	90	145	55	15	140	98	98	145	98	103	161	103	119	198	119	162	3	30	3	20	3	20	3	30	3	20	3	4
120	120	185	65	15	180	108	108	186	108	115	207	115	135	254	135	192	3	30	3	20	3	20	3	30	3	20	3	4
150	90	145	55	15	140	112	112	145	112	118	161	118	134	198	134	177	3	30	3	20	3	20	3	30	3	20	3	4
150	120	185	65	15	180	123	123	186	123	131	207	131	151	254	151	207	3	30	3	20	3	20	3	30	3	20	3	4
150	150	235	70	17.5	230	136	136	238	136	146	265	146	172	325	172	243	3	30	3	15	3	15	3	30	3	15	3	4
180	120	185	65	15	180	138	138	186	138	146	207	146	166	254	166	222	3	30	3	15	3	15	3	30	3	15	3	4
180	150	235	70	17.5	230	152	152	238	152	161	265	161	187	325	187	258	3	30	3	15	3	15	3	30	3	15	3	4
180	180	275	80	20	270	162	162	279	162	173	311	173	204	382	204	287	3	30	3	10	3	10	3	30	3	10	3	4
210	180	275	80	20	270	177	177	279	177	188	311	188	219	382	219	302	3	30	4	20	4	20	4	30	4	20	4	4
210	210	320	85	20	315	189	189	326	189	202	363	202	236	445	236	335	3	30	4	16	4	16	4	30	4	16	4	4
240	210	320	85	20	315	204	204	326	204	217	363	217	253	445	253	350	3	30	4	16	4	16	4	30	4	16	4	4
240	240	365	95	20	360	216	216	372	216	231	415	231	272	508	272	383	3	30	4	12	4	12	4	30	4	12	4	4
270	240	365	95	20	360	231	231	372	231	246	415	246	287	508	287	398	3	30	4	12	4	12	4	30	4	12	4	4
270	270	405	100	22.5	400	242	242	414	242	258	461	258	303	565	303	428	3	30	4	10	4	10	4	30	4	10	4	4
300	270	405	100	22.5	400	257	257	414	257	274	461	274	318	565	318	443	3	30	4	10	4	10	4	30	4	10	4	4
300	300	455	115	25	450	270	270	466	270	289	519	289	340	636	340	479	4	30	5	12	5	12	4	30	5	12	5	4
330	300	455	115	25	450	285	285	466	285	304	519	304	355	636	355	494	4	30	5	12	5	12	4	30	5	12	5	4
330	330	505	120	27.5	500	299	299	517	299	320	576	320	376	707	376	531	4	30	5	10	5	10	4	30	5	10	5	4
360	330	505	120	27.5	500	314	314	517	314	335	576	335	391	707	391	546	4	30	5	10	5	10	4	30	5	10	5	4
360	360	545	130	30	540	324	324	559	324	347	632	347	408	763	408	575	4	30	6	12	6	12	4	30	6	12	6	4

3 = Ø 3/8" OR 9 MM., # 4 = Ø 1/2" OR 12 MM., # 5 = Ø 5/8" OR 16 MM., # 6 = Ø 3/4" OR 20 MM.

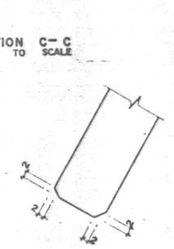
NO. = TOTAL AMOUNT OF BARS

NOTES :

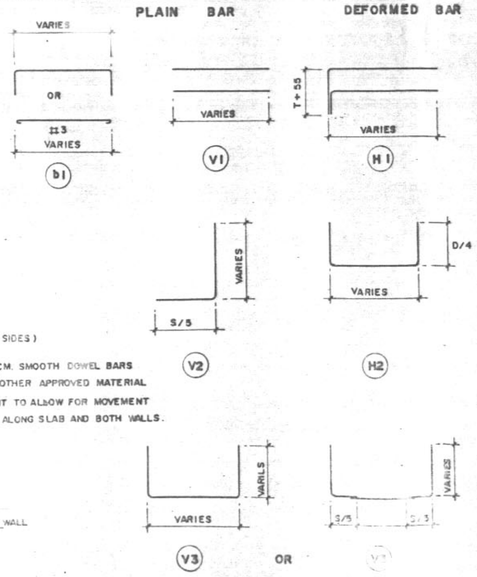
1. DESIGN PARAMETERS ARE
   - 1.1 LIVE LOADING : HS 20-44
   - 1.2 WORKING STEEL STRESSES
     - PLAIN BARS, f_s = 1,200 KG./CM.^{2}
     - DEFORMED BARS, f_s = 1,400 KG./CM.^{2}
   - 1.3 WORKING CONCRETE STRESS, f_c = 60 KG./CM.^{2}
2. CONCRETE SHALL HAVE THE 28-DAY MINIMUM ULTIMATE COMPRESSIVE STRENGTH, BASED ON 15x15 x 15 CM. CUBE SAMPLES, OF 180 KG./CM.^{2} AND SHALL HAVE A MINIMUM CEMENT CONTENT OF 320 KG. PER CUBIC METER OF CONCRETE. THE FOLLOWING IS THE SUGGESTED CONCRETE MIX PROPORTIONS PER CUBIC METER :

TYPE I PORTLAND CEMENT	320	KG.
SAND	0.43	M.^{3}
CRUSHED ROCK OR GRAVEL	0.86	M.^{3}
WITH THE MAXIMUM SLUMP OF	10	CM.

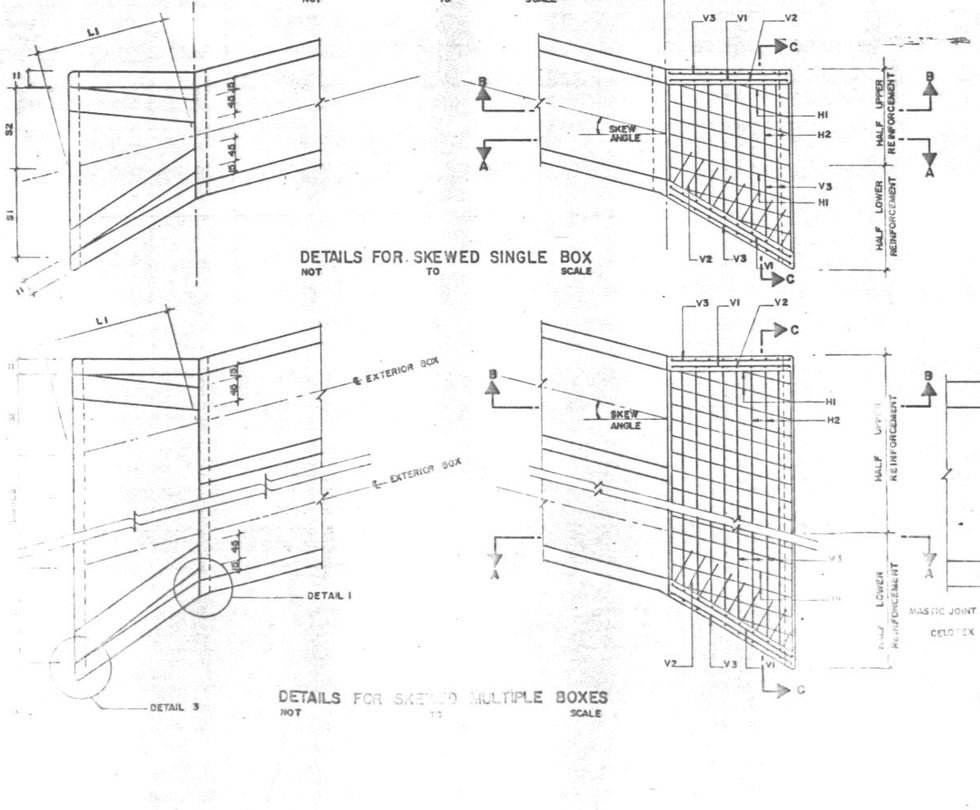
3. CLEAR CONCRETE COVER SHALL BE 2.5 CM. EXCEPT THE BOTTOM OF BOTTOM SLABS OR WALLS AT WHICH CLEAR COVER OF 5.0 CM. SHALL BE PROVIDED.
4. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
5. REBARS # 4 OR LARGER SHALL BE TIS 24 GRADE SD 30 DEFORMED BARS, OTHERS SHALL BE TIS 20 GRADE SR 24 PLAIN BARS UNLESS OTHERWISE INDICATED.
6. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
7. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
8. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMING TO TIS IS SPECIFICATIONS SHALL BE USED INSTEAD OF TYPE I PORTLAND CEMENT.
9. WORK THIS DRAWING WITH DWG NOS. BC-01A., BC-02A., BC-03AAS REQUIRED.
10. THIS DRAWING IS ADAPTED FROM DOH DWG. NO. 78/9.
11. THIS DRAWING SHALL BE USED FOR EXTENSION OF EXISTING R.C. BOX CULVERTS WHICH HAVE CONCRETE COVERING 2.5 CM. ONLY.



DETAIL 3
NOT TO SCALE

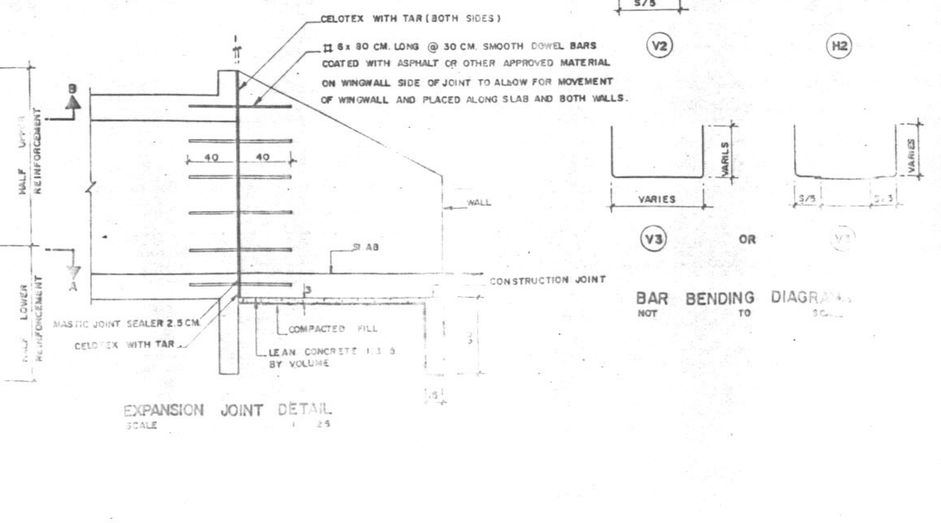


BAR BENDING DIAGRAMS
NOT TO SCALE



DETAILS FOR SKEWED SINGLE BOX
NOT TO SCALE

DETAILS FOR SKEWED MULTIPLE BOXES
NOT TO SCALE



EXPANSION JOINT DETAIL
SCALE 1:25

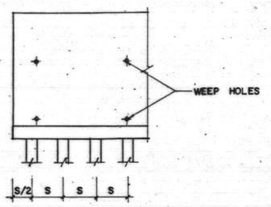
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

R.C. HEADWALL FOR BOX CULVERT

DIMENSIONS, REINFORCEMENT AND DETAILS

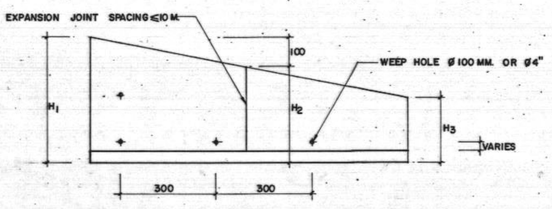
DESIGNED : DOH. & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
		DWG. NO. BC-04A
APPROVED : (DIRECTOR GENERAL)		SHEET NO. 19



SIDE VIEW OF WALL SHOWING THE POSITION OF PILE ALONG THE LENGTH OF WALL

SCALE 1:100

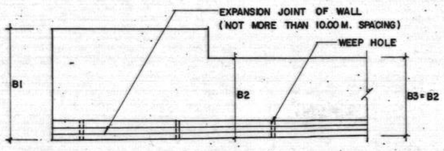
NOTE : S = 2.50 M. FOR HEIGHT (H) ≤ 1.10 M.
OTHERWISE S = 1.00 M.



SIDE VIEW OF WALL IN CASE OF HEIGHT OF WALL VARIES ALONG THE LENGTH OF WALL

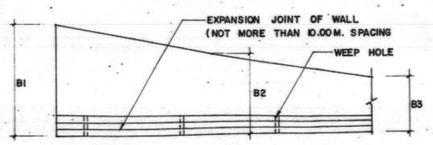
SCALE 1:100

NOTE : THE WIDTH OF BASE B1, B2 & B3 VARIES ALONG THE HEIGHT H1, H2 & H3 OF WALL



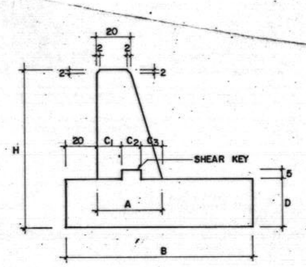
PLAN OF BASE OF PILE FOOTING IN CASE OF HEIGHT OF WALL VARIES ALONG THE LENGTH OF WALL

SCALE 1:100



PLAN OF BASE OF SPREAD FOOTING IN CASE OF HEIGHT OF WALL VARIES ALONG THE LENGTH OF WALL

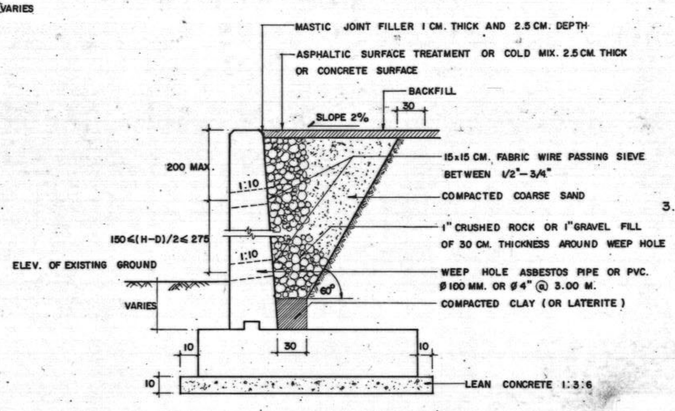
SCALE 1:100



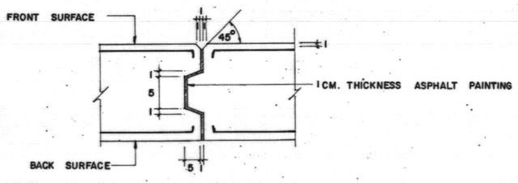
SECTION OF RETAINING WALL SHOWING DIMENSIONS AND THE POSITION OF SHEAR KEY

SCALE 1:100

NOTES : IN CASE OF HEIGHT, H, FALLS WITHIN THE RANGE OF THE HEIGHT GIVEN IN THE ABOVE TABLE, THE VALUES (D, A, C1, C2 AND C3) FOR THE HEIGHT H CAN BE CALCULATED BY VARYING THESE VALUES LINEARLY IN THE RANGE OF HEIGHT GIVEN. THE VALUE B SHALL BE CALCULATED IN THE SAME MANNER AS THE RETAINING WALL. WITH MAT FOOTING. THE VALUE B IN THE ABOVE TABLE CAN BY APPLICIABLE FOR THE RETAINING WALL WITH PILE FOOTING. FOR ANY OF H WHICH IS HIGHER THAN REQUIRED HEIGHT, e.g.; FOR H = 5.50 M. USE B = 6.00 M.



DETAIL OF BASE OF RETAINING WALL, WEEP HOLE AND EARTH BACKFILL



EXPANSION JOINT OF RETAINING WALL DETAIL

CONSTRUCTION SPECIFICATION

1. GENERAL NOTE FOR RETAINING WALL

1.1 CONCRETE SHALL HAVE MINIMUM UTIMATE STRENGTH OF 210 KG/cm^2 FOR 15x15x15 CUBE AT 28 DAYS AND CONCRETE SLUMP TEST SHALL NOT EXCEED 10 CM.

AN APPROXIMATE MIX. DESIGN OF CONCRETE PER CUBIC METER IS RECOMMENDED AS FOLLOW :-

PORTLAND CEMENT TYPE I (CONFORM TO TIS. 15 PART I)	325 KGS.
SAND	430 LITRES
CRUSHED ROCK OR GRAVEL	860 LITRES
W/C RATIO	0.45-0.50 BY WEIGHT

1.2 AFTER THE FOUNDATION UNDERNEATH IS COMPACTED, THE LEAN CONCRETE SHALL BE PLACED FOR 10 CM. THICK AS THE BASE WITH 10 CM. AROUND WIDER THAN THE FOUNDATION. THE MIX. DESIGN OF THE LEAN CONCRETE IS 1:3:6 BY VOLUME.

1.3 CONCRETE COVER SHALL BE 2.5 CM. EXCEPT FOR THE FOUNDATION STRUCTURE THE CONCRETE COVER SHALL BE 5 CM. IN CASE OF MARINE CLAY, CONCRETE COVER FOR THE OTHER PART OF THE WALL AND THE FOUNDATION FACING THE MARINE SOIL SHALL BE ADDED 2.5 CM. FROM THE DIMENSIONS SHOWN IN THIS DRAWING.

1.4 EARTH BACKFILL SHALL BE SANDY SOIL OR GRAVEL SOIL OR ROCK OR OTHE SOIL IN THE CONSTRUCTION AREA HAVING THE SAME QUALITIES BY THE APPROVAL OF THE OWNER DMSION.

2. SPECIAL NOTES OF RETAINING WALL USING SPREAD FOOTING.

2.1 THE ELEVATION OF THE FOUNDATION SHALL BE NOT LESS THAN 50 CM. FROM THE EXISTING GROUND LINE MEASURED FROM THE SURFACE OF THE LEAN CONCRETE IN NO. 1.2

2.2 EARTH BACKFILL SHALL BE SUPPORT THE ALLOWABLE LOAD NOT LESS THAN P Tons/m^2 AS TABLE FOLLOWS :-

HEIGHT OF WALL (m.)	5.0<H≤6.0	4.0<H≤5.0	3.0<H≤4.0	2.0<H≤3.0	H≤2.0
P, Tons/m^2	22.0	17.0	14.0	12.0	6.5

ALL THOSE CONSIDER WITH IN NOTES NO. 3

3. SPECIAL NOTE FOR RETAINING WALL WITH PILE FOUNDATION

3.1 THE ELEVATION OF THE FOUNDATION SHALL BE AT LEAST THE SAME LEVEL AS THE EXISTING GROUND MEASURED FROM THE SURFACE OF THE LEAN CONCRETE

3.2 VARIOUS SIZES OF RC. PILE GIVEN IN THIS DRAWING HAVE THE DETAIL AS FOLLOWS :-

3.2.1 RC. PILE SIZE 35x35 CM.^{2} SHALL BE DRIVEN UNTIL IT REACHES ALLOWABLE LOAD WHICH MUST NOT BE LESS THAN 35 TONS IF THE DEPTH OF THE DRIVEN PILE IS LESS THAN 10.00 M., PILE LOAD TEST MUST BE PERFORMED TO ENSURE THAT ALLOWABLE TENSILE STRENGTH IS NOT LESS THAN 15 TONS.

3.2.2 RC. PILE SIZE 20x20 CM.^{2} SHALL BE DRIVEN UNTIL IT REACHES ALLOWABLE LOAD WHICH MUST NOT BE THAN 12 TONS IF THE DEPTH OF THE DRIVEN PILE IS LESS THAN 10.00 M., PILE LOAD TEST MUST BE PERFORMED TO ENSURE THAT ALLOWABLE TENSILE STRENGTH IS NOT LESS THAN 4 TONS.

3.2.3 RC. PILE SIZE 18x18 CM.^{2} SHALL BE DRIVE UNTIL IT REACHES ALLOWABLE LOAD WHICH MUST NOT BE LESS THAN 2 TONS

3.2.4 TO TEST THE ALLOWABLE LOAD OF PILE, THE METHOD OF "STATIC PILE LOAD TEST" SHALL BE CONDUCTED AND THE CALCULATION OF ALLOWABLE LOAD CAN BE OBTAINED AS FOLLOW :-

A. IN CASE OF THE TESTED PILE CAN RESIST MORE THAN GIVEN ALLOWABLE LOAD FOR PILE SIZE IN 3.2.1, 3.2.2 AND 3.2.3, THE AVERAGE SETTLEMENT RATIO OF PILE (TOTAL SETTLEMENT OF PILE HEAD AT THAT TIME / LOADING SUBJECTED TO PILE HEAD AT THE SAME TIME.) SHALL NOT EXCEED 0.025 CM./PILE IN 24 HOURS THEN ALLOWABLE LOAD CAN BE OBTAINED AS A HALF OF SUBJECTED LOAD (FACTOR OF SAFETY = 2.0)

B. IN CASE OF SETTLEMENT RATIO EXCEEDING THE VALUE INDICATED IN A. OR INCREASING LOAD ON PILE HEAD UNTIL ITS FAILURE, ALLOWABLE LOAD IS OBTAINED BY DEVIDING THAT LOAD BY 2.5 (FACTER OF SAFTY = 2.5)

IN CASE OF STATIC PILE LOAD TEST CAN NOT BE PERFORMED, ALLOWABLE LOAD MIGTH BE COMPUTED BY PILE DRIVING FORMULAS SUCH AS HILEY FORMULA, JUNBO FORMULA OR DANISH FORMULA USING FACTOR OF SAFETY AT LEAST 3.0

3.2.5 CONCRETE FOR PILE SHALL HAVE ULTIMATE COMPRESSIVE STRENGTH AT LEAST 300 KG/CM.^{2} FOR 15x15x15 CUBE AT 28 DAYS AND CONCRETE SLUMP TEST CAN NOT EXCEED 8 CM.

AN APPROXIMATE MIX DESIGN OF CONCRETE PER CUBIC METER IS RECOMMENED AS FOLLOW :-

PORTLAND CEMENT TYPE I (CONFORM TO TIS. 15 PART I) MIN.-	350 KGS.
SAND	430 LITRES
CRUSH ROCK OR GRAVEL	860 LITRES
W/C RATIO	0.40-0.45 BY WEIGHT

3.2.6 BEFORE CONSTRUCTION OF BASE OF RETAINING WALL, THE TOP OF PILE SHALL BE CHISELED AND BEND THE MAIN REINFORCING STEEL AS SHOWN IN THE DRAWING OR USE THE METHOD OF WELDING THE REINFORCING STEEL WITH THE SAME SIZE OF STEEL AS SHOWN IN THE DRAWING.

3.2.7 FOR PILE SIZE 35x35 CM., USING PILE TIP EITHER TYPE A OR B DEPENDS ON OWNER DIVISION.

4. REINFORCING STEEL NOTES :

4.1 ALL REINFORCING STEEL SHALL BE INTERMEDIATE GRADE DEFORMED BAR (CONFORM TO TIS 24, SD 30) EXCEPT FOR BAR DIAMETER IS LESS THAN Ø12 mm. WHICH MAY BE STRUCTURE GRADE. (CONFORM TO TIS 20, SR 24)

4.2 IN CASE OF SPLICING OF REINFORCEMENT SPLICING SHALL BE BY AROUND BUTT-WELDING WHICH THE STRENGTH OF WELDED JOINT IS NOT LESS THAN THE ULTIMATE TENSILE STRENGTH OR BY LAPPING BARS WHICH THE LAP LENGTH SHALL NOT BE LESS THAN 20 TIMES THE BAR DIAMETER FOR THE INTERMEDIATE GRADE REINFORCING STEEL (40 TIMES THE BAR DIAMETERS FOR STRUCTURAL GRADE REINFORCING STEEL) LOCATION OF THE LAPPED BARS BE SPACED APART UNDER CONSIDERATION OF THE INSPECTOR.

NOTES

1. ALL DIMENSIONS ARE IN CENTIMETER UNLESS OTHERWISE INDICATED.
2. ANY PROBLEMS DUE THE DESIGNATIONS SHALL BE CONSIDERED AND DECIDED BY THE LOCATION AND DESIGN DIVISION.
3. RETAINING WALLS SHOWN IN THIS DRAWING SHALL BE USED FOR THE ROADWAY EMBANKMENT THAT IS PROPERTY DESIGNED.

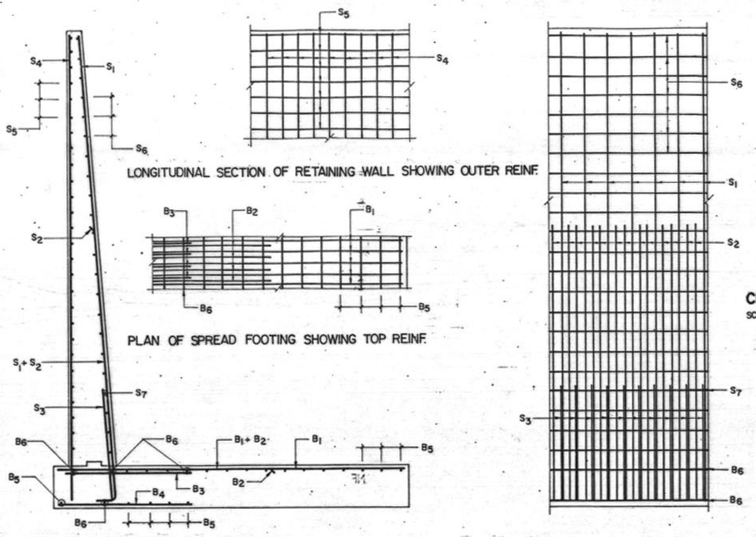
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

CANTELEVER RETAINING WALL 6.00 M. MAX. HIGH

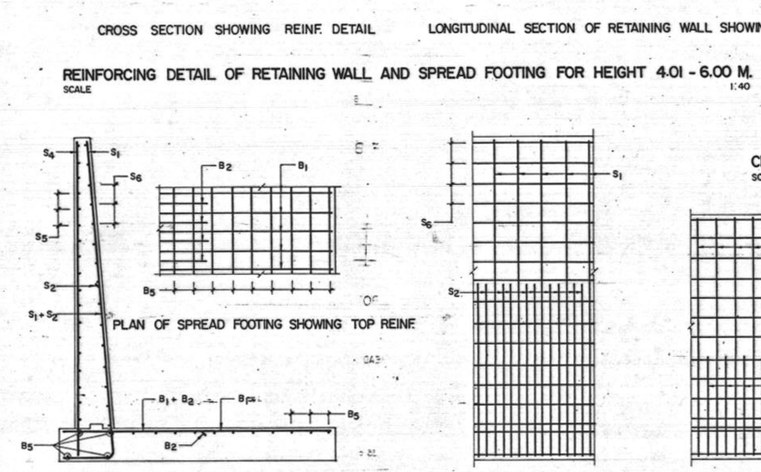
DETAILS AND SPECIFICATIONS

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Bunyaray. (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : For (DIRECTOR GENERAL)		DWG. NO. ABT 267-17/8
		SHEET NO. 198



LONGITUDINAL SECTION OF RETAINING WALL SHOWING OUTER REINF.

PLAN OF SPREAD FOOTING SHOWING TOP REINF.

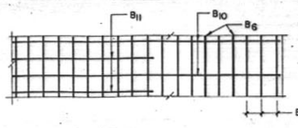


CROSS SECTION SHOWING REINF. DETAIL

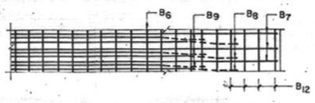
LONGITUDINAL SECTION OF RETAINING WALL SHOWING INNER REINF.

REINFORCING DETAIL OF RETAINING WALL AND SPREAD FOOTING FOR HEIGHT 4.01 - 6.00 M.

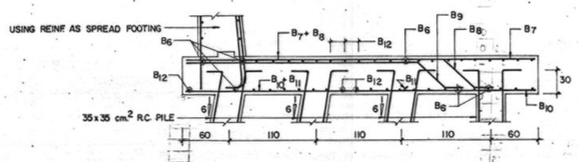
SCALE 1:40



PLAN OF PILE FOOTING SHOWING BOTTOM REINF.

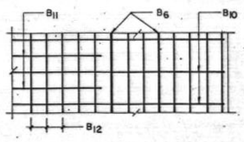


PLAN OF PILE FOOTING SHOWING TOP REINF.

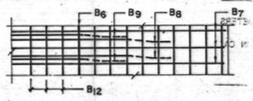


CROSS SECTION SHOWING REINFORCEMENT OF BASE OF PILE RETAINING WALL FOR HEIGHT 5.01 - 6.00 M.

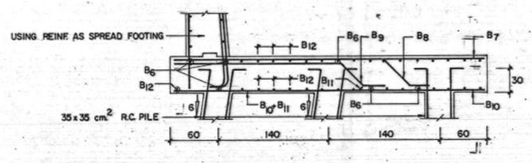
SCALE 1:40



PLAN OF PILE FOOTING SHOWING BOTTOM REINF.



PLAN OF PILE FOOTING SHOWING TOP REINF.



CROSS SECTION SHOWING REINFORCEMENT OF BASE OF PILE RETAINING WALL FOR HEIGHT 4.01 - 5.00 M.

SCALE 1:40

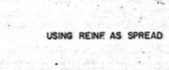
PLAN OF SPREAD FOOTING SHOWING TOP REINF.

CROSS SECTION SHOWING REINF. DETAIL

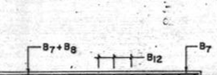
LONGITUDINAL SECTION OF RETAINING WALL SHOWING INNER REINF.

REINFORCING DETAIL OF RETAINING WALL AND SPREAD FOOTING FOR HEIGHT 2.01 - 4.00 M.

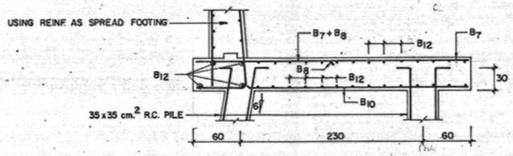
SCALE 1:40



PLAN OF PILE FOOTING SHOWING BOTTOM REINF.

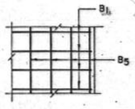


PLAN OF PILE FOOTING SHOWING TOP REINF.



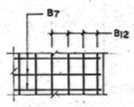
CROSS SECTION SHOWING REINFORCEMENT OF BASE OF PILE RETAINING WALL FOR HEIGHT 3.01 - 4.00 M.

SCALE 1:40

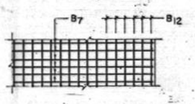


PLAN OF SPREAD FOOTING SHOWING TOP REINF.

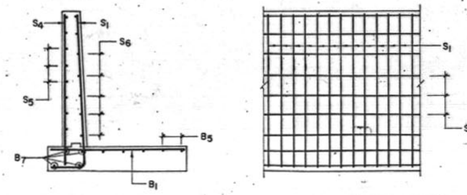
PLAN OF PILE FOOTING SHOWING TOP REINF.



PLAN OF PILE FOOTING SHOWING TOP REINF.

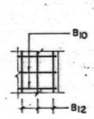


PLAN OF PILE FOOTING SHOWING TOP REINF.

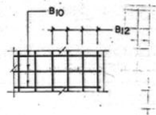


CROSS SECTION SHOWING REINF. DETAIL

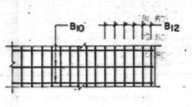
LONGITUDINAL SECTION OF RETAINING WALL SHOWING INNER REINF.



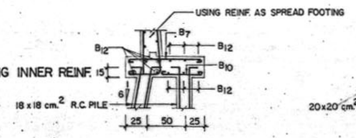
PLAN OF PILE FOOTING SHOWING BOTTOM REINF.



PLAN OF PILE FOOTING SHOWING BOTTOM REINF.

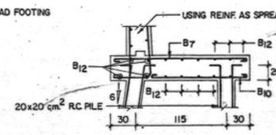


PLAN OF PILE FOOTING SHOWING BOTTOM REINF.



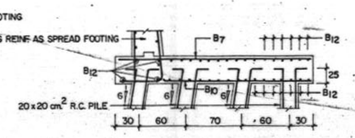
CROSS SECTION SHOWING REINFORCEMENT OF BASE OF PILE RETAINING WALL FOR HEIGHT ≤ 1.00 M.

SCALE 1:40



CROSS SECTION SHOWING REINFORCEMENT OF BASE OF PILE RETAINING WALL FOR HEIGHT 1.01 - 2.00 M.

SCALE 1:40



CROSS SECTION SHOWING REINFORCEMENT OF BASE OF PILE RETAINING WALL FOR HEIGHT 2.01 - 3.00 M.

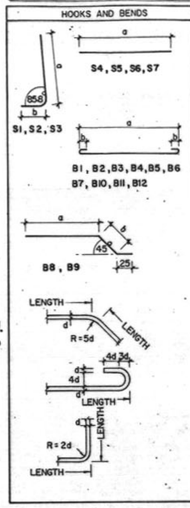
SCALE 1:40

REINFORCING DETAIL OF RETAINING WALL AND SPREAD FOOTING FOR HEIGHT ≤ 2.00 M.

SCALE 1:40

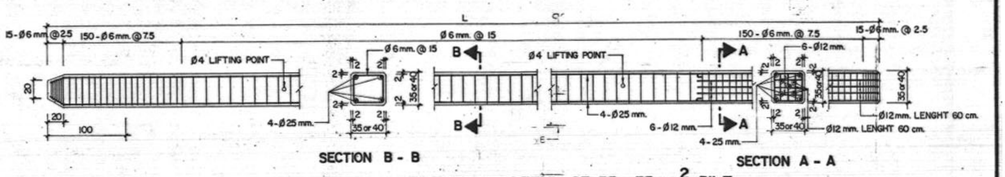
TABLE OF REINFORCEMENT FOR RETAINING WALL PER 1.00 M. LENGTH

HOOKS AND BENDS



NO. OF BARS	HEIGHT 6.00 M. ø	@	a	b	L	HEIGHT 5.00 M. ø	@	a	b	L	HEIGHT 4.00 M. ø	@	a	b	L	HEIGHT 3.00 M. ø	@	a	b	L	HEIGHT 2.00 M. ø	@	a	b	L	HEIGHT 1.00 M. ø	@	a	b	L
S1	19	30	589.5	25	614.5	16	30	489.5	25	514.5	16	30	393.5	64	457.5	12	22	293	56.5	349.5	9	12	193	47	240	9	12	93	42	135
S2	19	10	341.5	25	366.5	16	10	315	25	340	16	10	215.5	64	279.5	12	22	115.5	56.5	172	–	–	–	–	–	–	–	–	–	–
S3	19	20	141	25	166	16	20	139.5	25	164.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
S4	9	20	589.5	0	589.5	9	20	489.5	0	489.5	9	20	393.5	0	393.5	9	20	293	0	293	9	20	193	0	193	9	20	93	0	93
S5	9	20	100	0	100	9	20	100	0	100	9	20	100	0	100	9	20	100	0	100	9	20	100	0	100	9	20	100	0	100
S6	9	25	100	0	100	9	25	100	0	100	9	25	100	0	100	9	25	100	0	100	9	25	100	0	100	9	25	100	0	100
S7	25	–	100	0	100	25	–	100	0	100	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
B1	19	14	445*	0	445*	19	24	395*	0	395*	19	24	345*	0	345*	16	32	245*	0	245*	9	20	170*	7.5	185*	9	20	95*	7.5	110*
B2	19	14	277.5	0	277.5	19	24	270.5	0	270.5	19	24	182.5	0	182.5	16	32	132.5	0	132.5	–	–	–	–	–	–	–	–	–	–
B3	16	12	177.5	0	177.5	16	14	170.5	0	170.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
B4	19	25	177.5	0	177.5	19	45	177.5	0	177.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
B5	9	25*	100	0	100	9	25*	100	0	100	9	25*	100	0	100	9	25*	100	0	100	9	25*	100	0	100	9	25*	100	0	100
B6	25	–	100	0	100	25	–	100	0	100	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
B6	25	–	100	0	100	25	–	100	0	100	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
B7	25	16	445	0	445	25	20	395	0	395	19	30	345	0	345	16	12	245	0	245	9	20	170	7.5	185	9	20	95	7.5	110
B8	25	16	327.5	56.5	409	25	20	267.5	50.5	343	19	10	172.5	0	172.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
B9	16	18	295	49.5	369.5	16	30	217.5	43	285.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
B10	25	40	445	0	445	19	40	395	0	395	9	20	345	0	345	9	20	245	0	245	9	20	170	0	170	9	20	95	0	95
B11	25	40	277	0	277	19	40	215	0	215	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
B12	12	18*	100	0	100	12	20*	100	0	100	9	20**	100	0	100	9	12**	100	0	100	9	20**	100	0	100	9	20**	100	0	100

REMARK
ø = DIAMETER OF REINFORCEMENT IN MILLIMETERS
* REDUCING THE LENGTH OF REINFORCEMENT IN CASE OF HEIGHT LESS THAN THE GIVEN
* * OR AS SHOWN IN CROSS SECTION

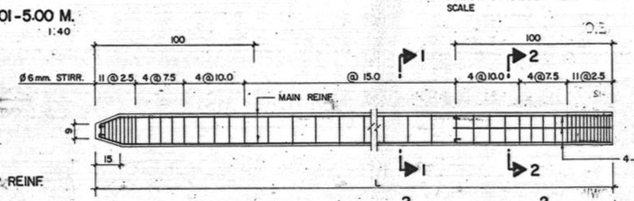


SECTION B - B

SECTION A - A

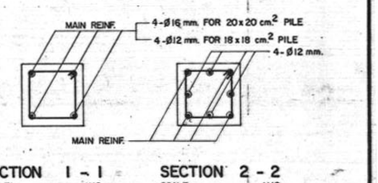
REINFORCING DETAIL OF 35 x 35 cm.^{2} PILE

SCALE 1:40



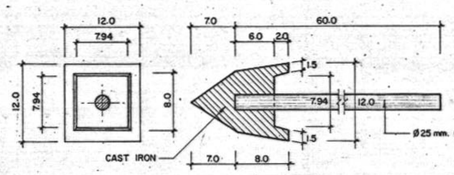
REINFORCING DETAIL OF 20 x 20 cm.^{2} AND 18 x 18 cm.^{2} PILE

SCALE 1:20



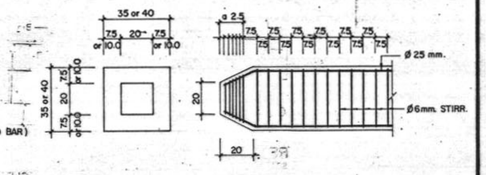
SECTION 1 - 1
SCALE 1:10

SECTION 2 - 2
SCALE 1:10



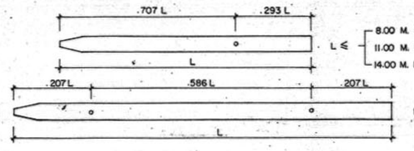
DETAIL OF PILE TIP CAST IRON TYPE B FOR 35x35 cm.^{2} PILE

SCALE 1:5

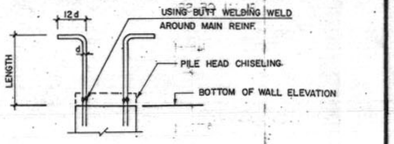


DETAIL OF PILE TIP CAST IRON TYPE A FOR 35x35 cm.^{2} PILE

SCALE 1:20



DETAIL OF LIFTING POINT



DETAIL FOR WELDING MAIN REINF. AT PILE HEAD

SCALE 1:10

KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS

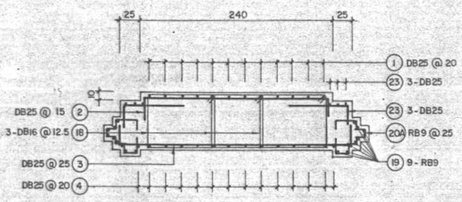
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

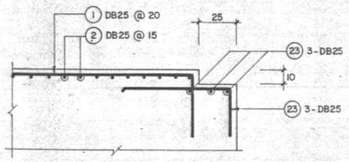
CANTILEVER RETAINING WALL 6.00 M.MAX.

REINFORCEMENT DETAILS

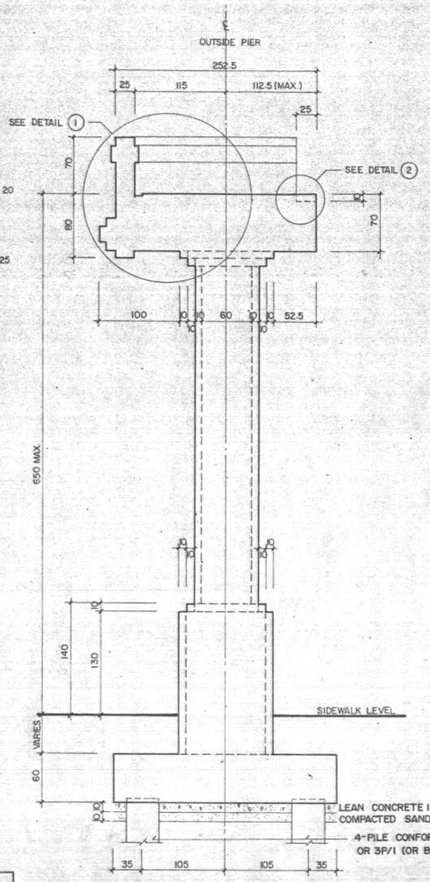
DESIGNED : DOH CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : P. Bumpry. (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
		DWG. NO. ABT 267-17/9
APPROVED : For (DIRECTOR GENERAL)		SHEET NO. 199



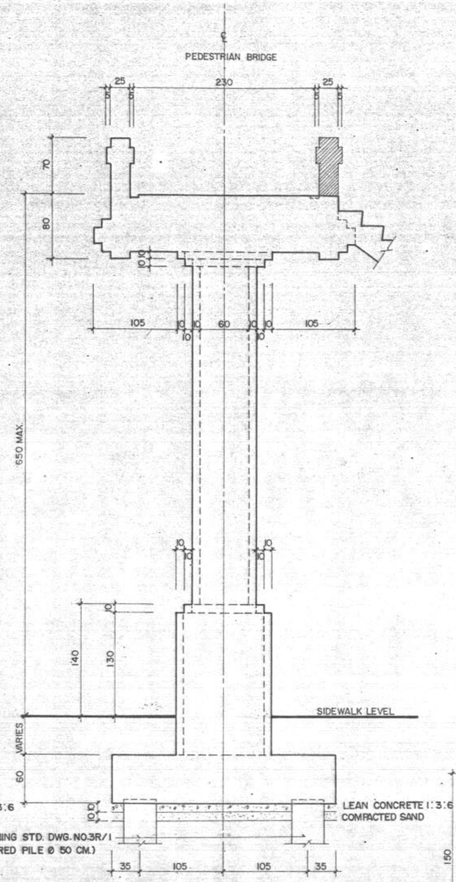
SECTION C - C
SCALE 1:40



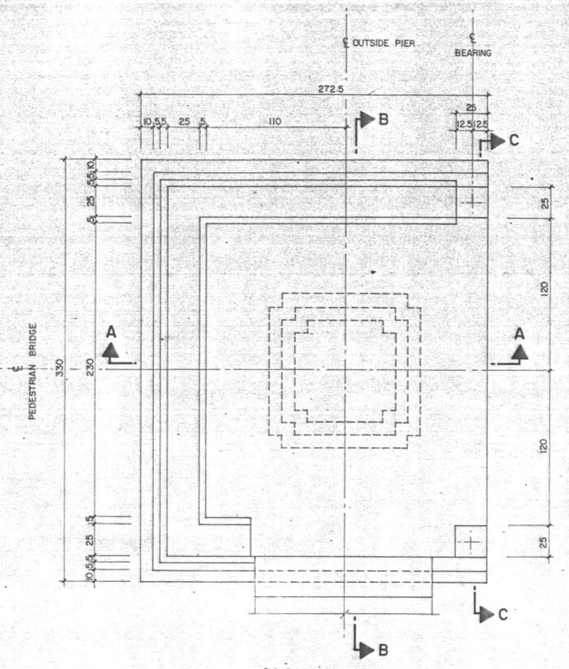
DETAIL (2)
SCALE 1:25



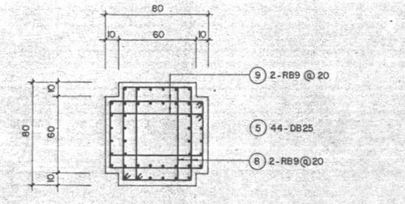
SECTION A - A
SCALE 1:40



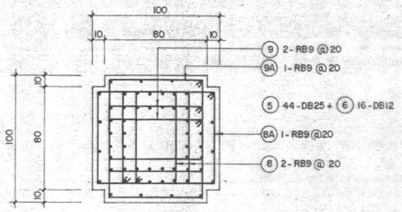
SECTION B - B
SCALE 1:40



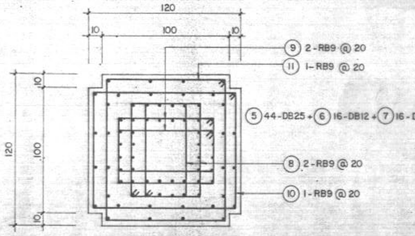
PLAN
SCALE 1:25



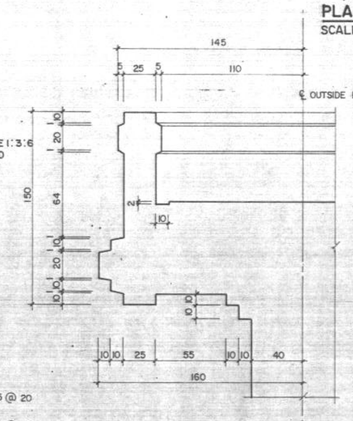
SECTION 1 - 1 (FOR SPAN ≤ 16.00 M.)
SCALE 1:25



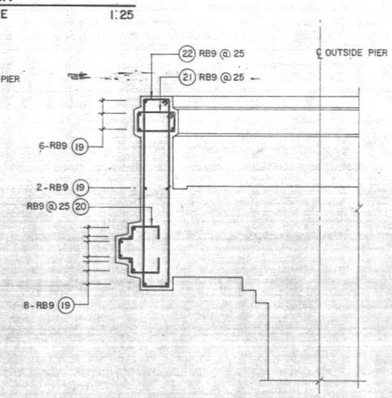
SECTION 2 - 2 (FOR SPAN ≤ 16.00 M.)
SCALE 1:25



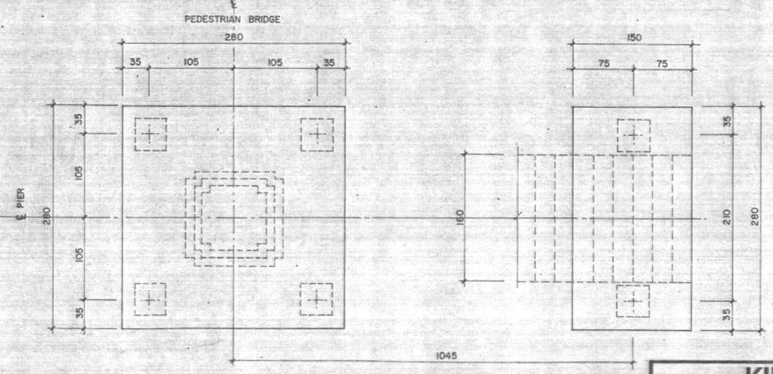
SECTION 3 - 3 (FOR SPAN ≤ 16.00 M.)
SCALE 1:25



DETAIL (1)
SCALE 1:25



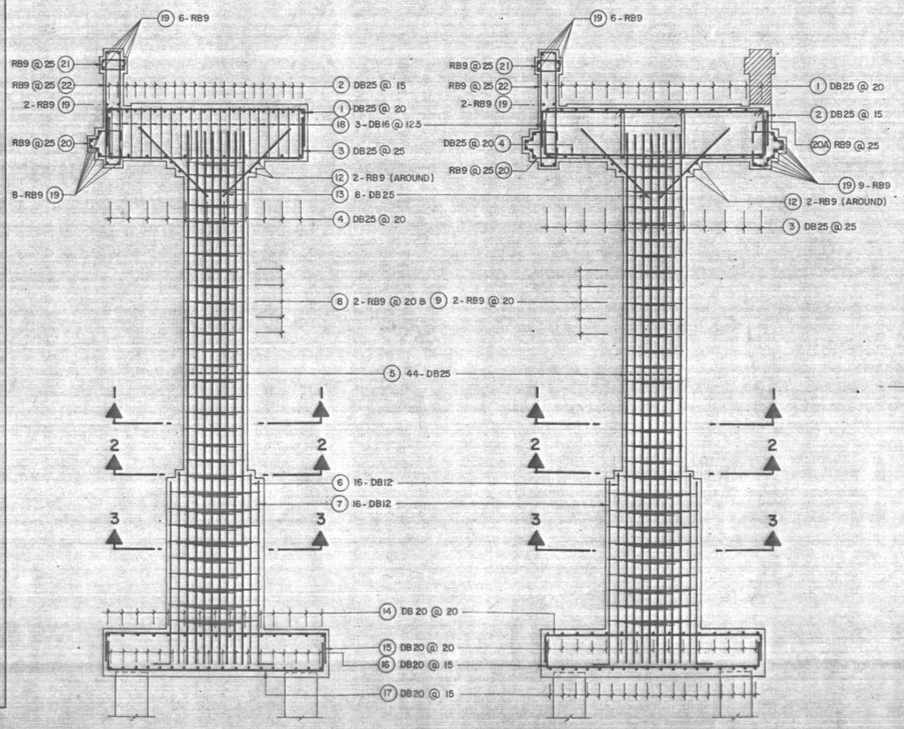
DETAIL (1) REINFORCEMENT
SCALE 1:25



PILING PLAN
SCALE 1:40

TABLE OF REINFORCEMENT

BAR MARK	BAR DIA. (MM.)	BAR BENDING DIAGRAM
(1)	DB 25	VARIES 50 (1) 50 / 50 (3) 50 VARIES; 284 50 (2) 50 / 50 (4) 50 284
(2)	DB 25	
(3)	DB 25	
(4)	DB 25	
(5)	DB 25	VARIES 50; VARIES 20 (6); VARIES 20 (7)
(6)	DB 12	
(7)	DB 12	
(8) & (8A)	RB 9	(8) & (8A)
(9) & (9A)	RB 9	(9) 6; (9A) 6
(10)	RB 9	(10) 6
(11)	RB 9	(11) 6
(12)	RB 9	(12) 6 6 20 20
(13)	DB 25	(13) 10 130 10
(14)	DB 20	45 270 45 (14) & (15)
(15)	DB 20	
(16)	DB 20	45 (16) & (17) 45 270
(17)	DB 20	
(18)	DB 16	62 (18) 10 10 270 10 10 VARIES (19) 10
(19)	RB 9	
(20)	RB 9	29 10 10 (20) 10 10 20
(20A)	RB 9	29 10 10 (20A) 10 10 20
(21)	RB 9	30 (21) 6 15
(22)	RB 9	(22) 6 144 20
(23)	DB 25	75 (23) 40



SECTION A - A REINFORCEMENT
SCALE 1:40

SECTION B - B REINFORCEMENT
SCALE 1:40

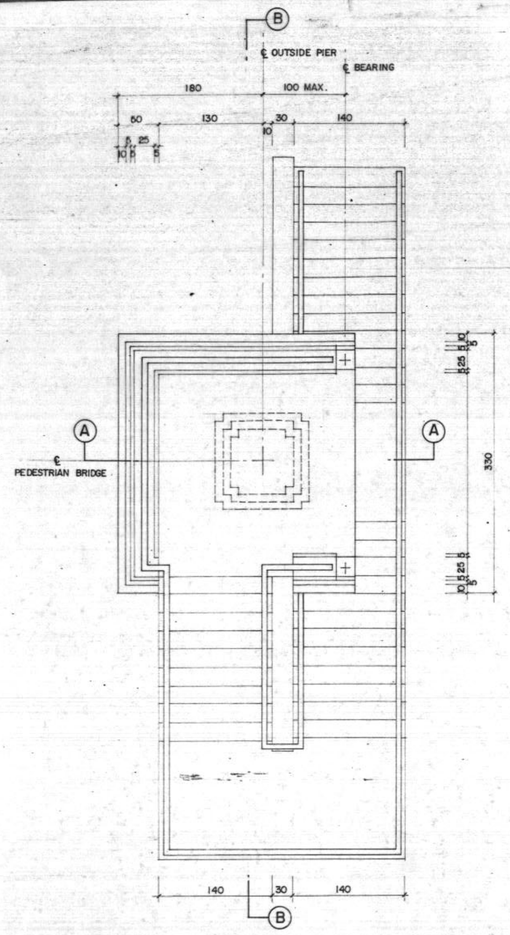
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

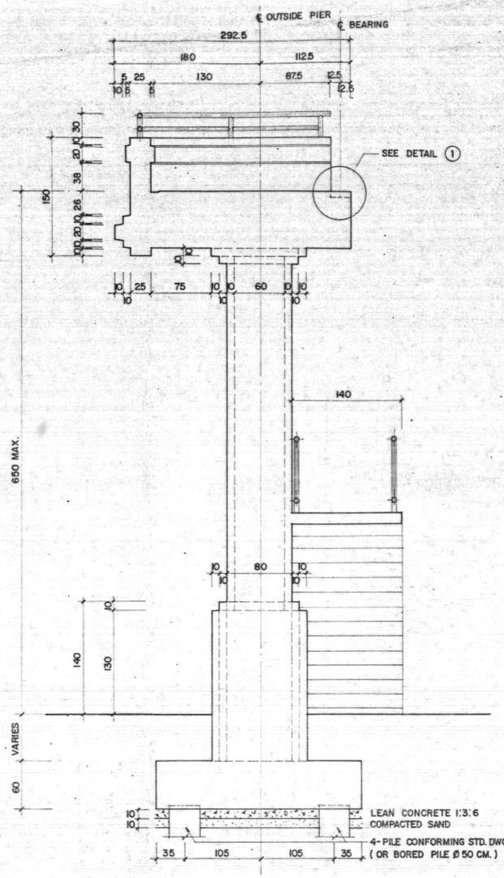
PEDESTRIAN BRIDGE

OUTSIDE PIER DETAILS FOR SPAN ≤ 16.00 M. (TYPE I)

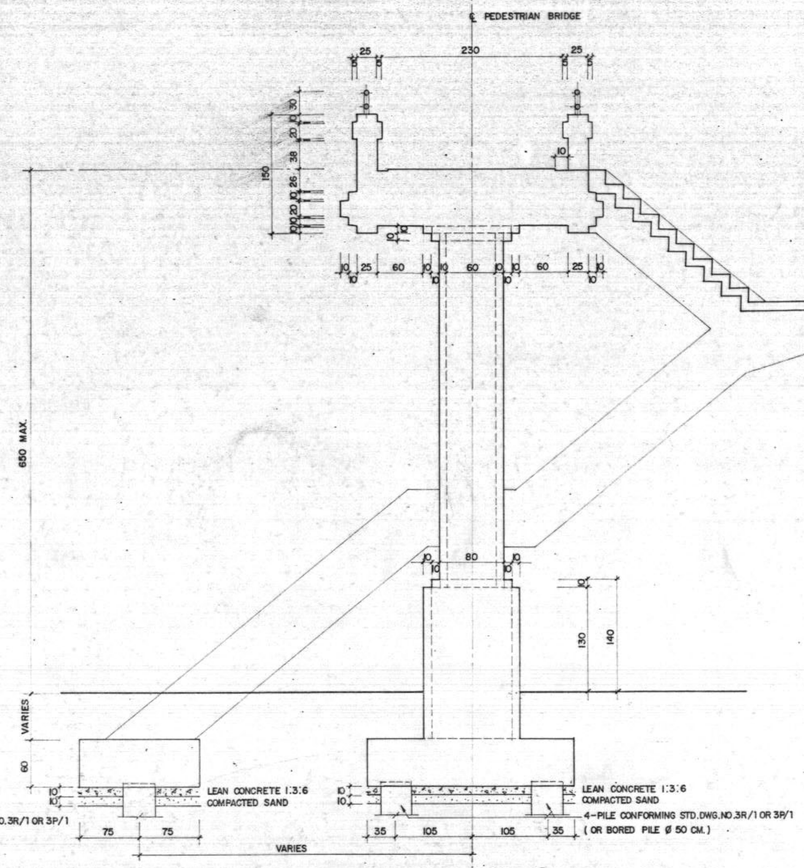
DESIGNED : DOH & CONSULTANTS	CHECKED : Kanpol	DATE JULY 1994
SUBMITTED : P. Buranapreeya (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : For (DIRECTOR GENERAL)		DWG. NO. PS-01
		SHEET NO. 200



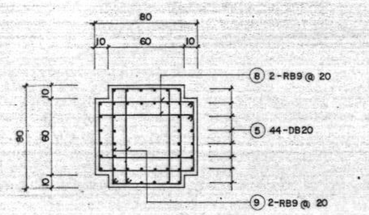
PLAN
SCALE 1:40



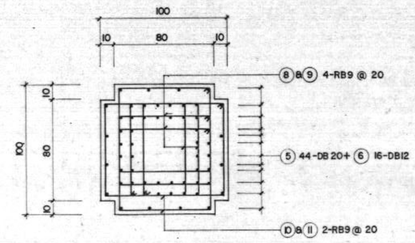
SECTION (A) - (A)
SCALE 1:40



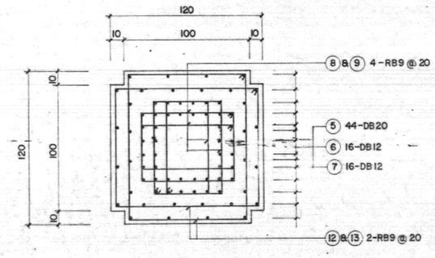
SECTION (B) - (B)
SCALE 1:40



SECTION (1) - (1) (FOR SPAN ≤ 16.00 M.)
SCALE 1:25

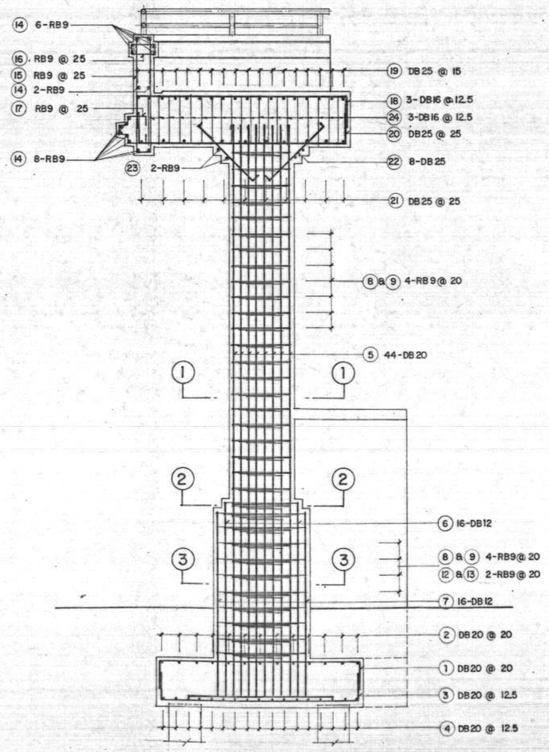


SECTION (2) - (2) (FOR SPAN ≤ 16.00 M.)
SCALE 1:25

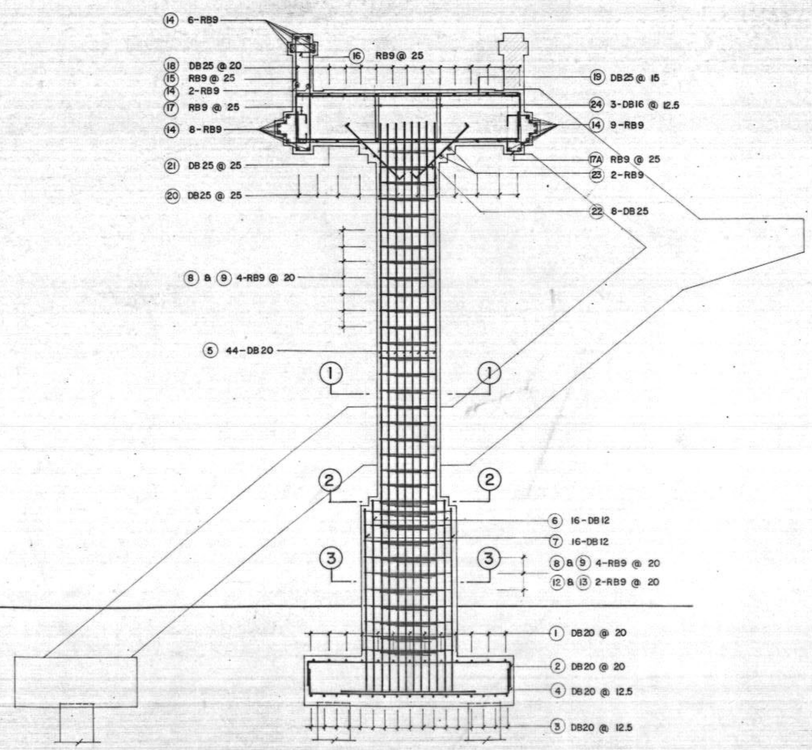


SECTION (3) - (3) (FOR SPAN ≤ 16.00 M.)
SCALE 1:25

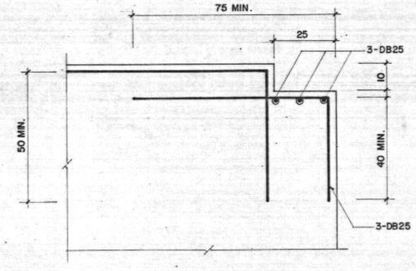
TABLE OF REINFORCEMENT		
BAR MARK	BAR DIA. (MM.)	BAR BENDING DIAGRAM
(1) & (2)	DB 20	
(3) & (4)	DB20	
(5)	DB20	
(6)	DB12	
(7)	DB12	
(8)	RB9	
(9)	RB9	
(10)	RB9	
(11)	RB9	
(12)	RB9	
(13)	RB9	
(14)	RB9	
(15)	RB9	
(16)	RB9	
(17) & (17A)	RB9	
(18) & (19)	DB25	
(20) & (21)	DB25	
(22)	DB25	
(23)	RB 9	
(24)	DB16	



SECTION (A) - (A) PIER REINFORCEMENT
SCALE 1:40



SECTION (B) - (B) PIER REINFORCEMENT
SCALE 1:40



DETAIL (1)
SCALE 1:12.5

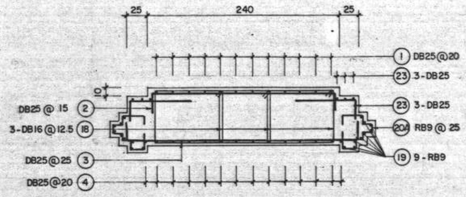
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

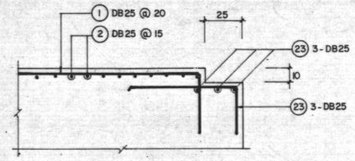
PEDESTRIAN BRIDGE

OUTSIDE PIER DETAILS FOR SPAN ≤ 16.00 M. (TYPE II)

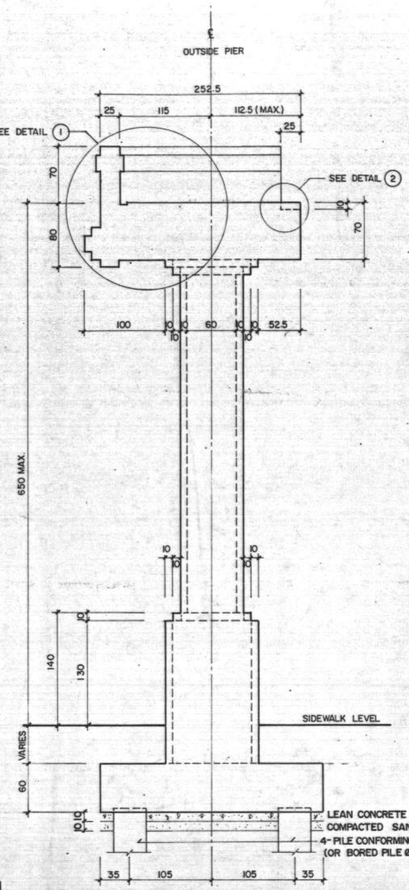
DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : for (DIRECTOR GENERAL)		DWG. NO. PS-02
		SHEET NO. 201



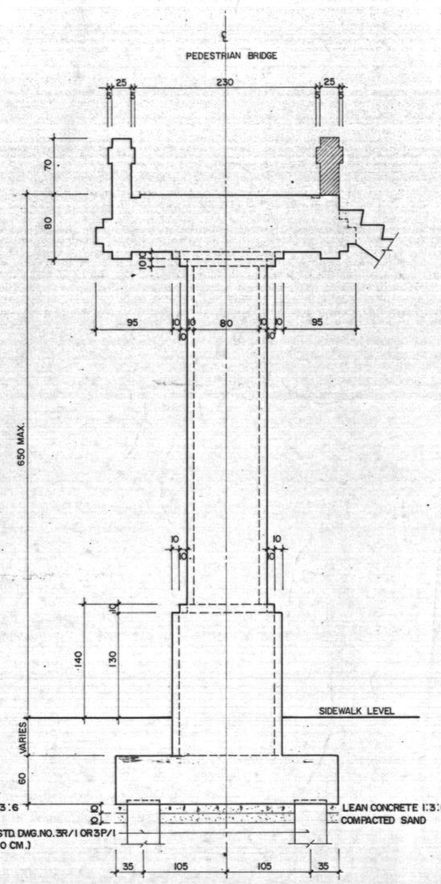
SECTION C - C
SCALE 1:40



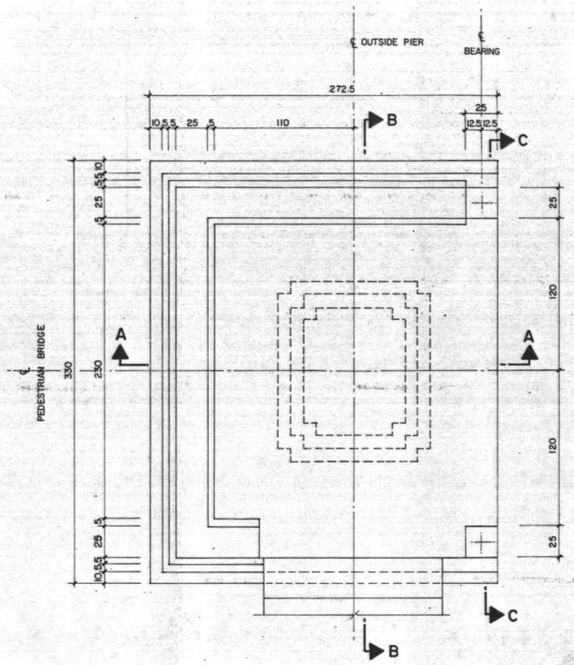
DETAIL (2)
SCALE 1:25



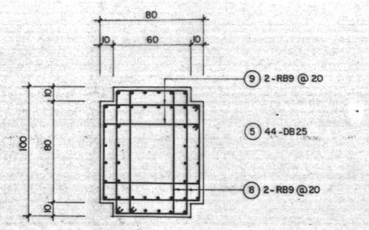
SECTION A - A
SCALE 1:40



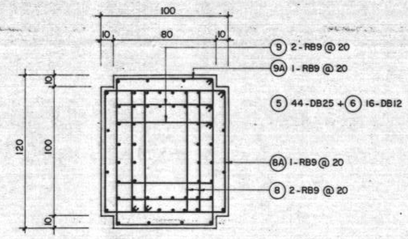
SECTION B - B
SCALE 1:40



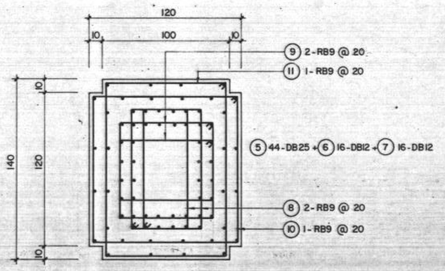
PLAN
SCALE 1:25



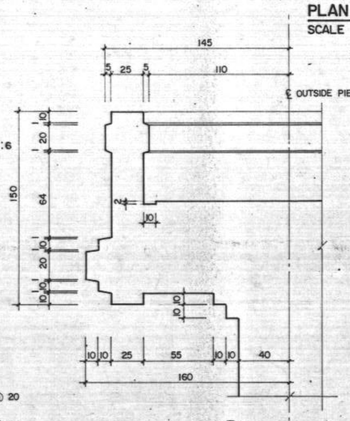
SECTION 1 - 1 (FOR SPAN 16.01 - 21.00 M)
SCALE 1:25



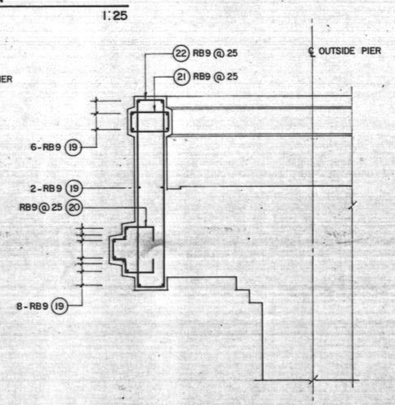
SECTION 2 - 2 (FOR SPAN 16.01 - 21.00 M.)
SCALE 1:25



SECTION 3 - 3 (FOR SPAN 16.01 - 21.00 M.)
SCALE 1:25



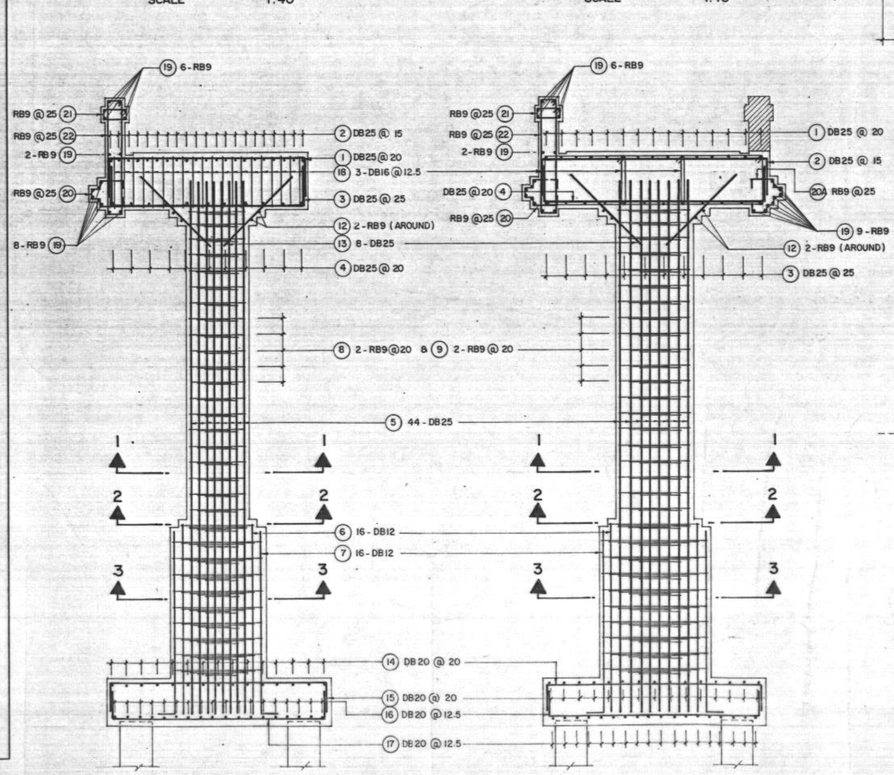
DETAIL (1)
SCALE 1:25



DETAIL (1) REINFORCEMENT
SCALE 1:25

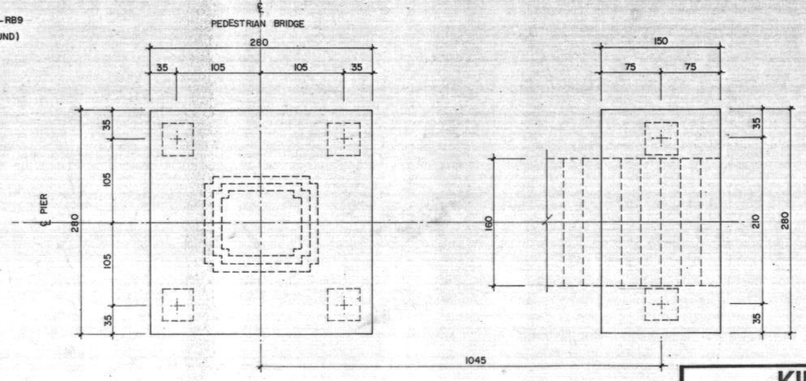
TABLE OF REINFORCEMENT

BAR MARK	BAR DIA. (MM.)	BAR BENDING DIAGRAM
(1)	DB 25	VARIES (1) 50 … 50; 284 (2) 50 … 50
(2)	DB 25	
(3)	DB 25	(3) 50 … 50 VARIES; (4) 50 … 50 284
(4)	DB 25	
(5)	DB 25	VARIES (5) 50; VARIES (6) 20; VARIES (7) 20
(6)	DB 12	
(7)	DB 12	
(8) (8A)	RB 9	(8) & (8A)
(9) (9A)	RB 9	(9); (9A)
(10)	RB 9	(10)
(11)	RB 9	(11)
(12)	RB 9	(12) 20 × 20; (13) 10
(13)	DB 25	
(14)	DB 20	45 270 45 (14) & (15)
(15)	DB 20	
(16)	DB 20	45 270 45 (16) & (17)
(17)	DB 20	
(18)	DB 16	62 (18); 10 VARIES 10 (19)
(19)	RB 9	
(20)	RB 9	29 (20); 29 (20A); 30 (21) 15
(20A)	RB 9	
(21)	RB 9	
(22)	RB 9	(22) 144
(23)	DB 25	75 (23) 40



SECTION A - A REINFORCEMENT
SCALE 1:40

SECTION B - B REINFORCEMENT
SCALE 1:40



PILING PLAN
SCALE 1:40

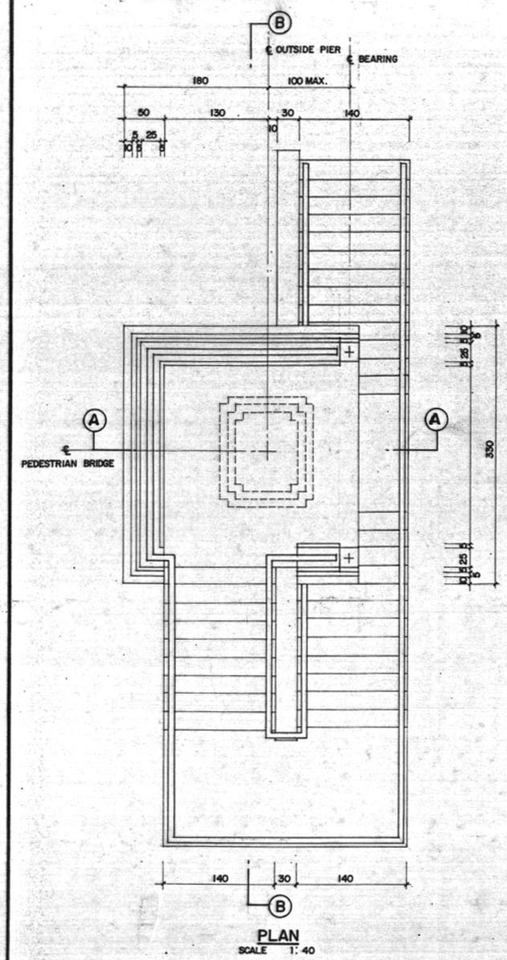
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

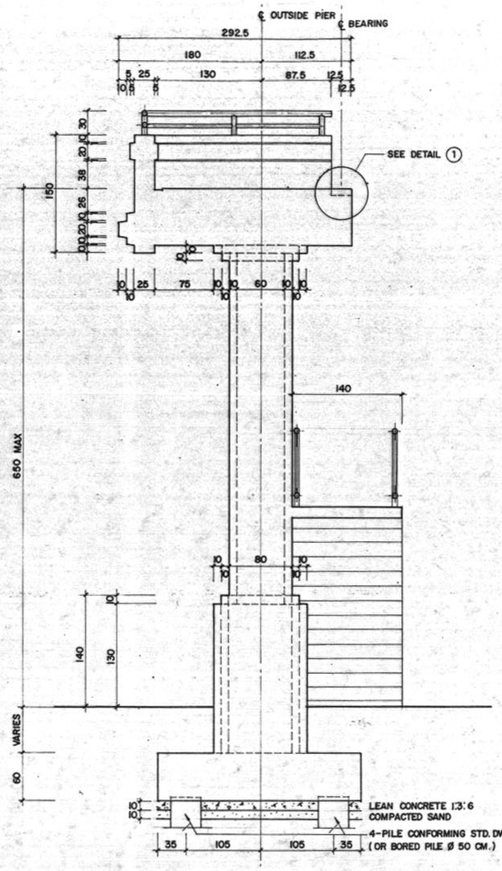
PEDESTRIAN BRIDGE

OUTSIDE PIER DETAILS FOR SPAN 16.01 – 21.00 M. (TYPE I)

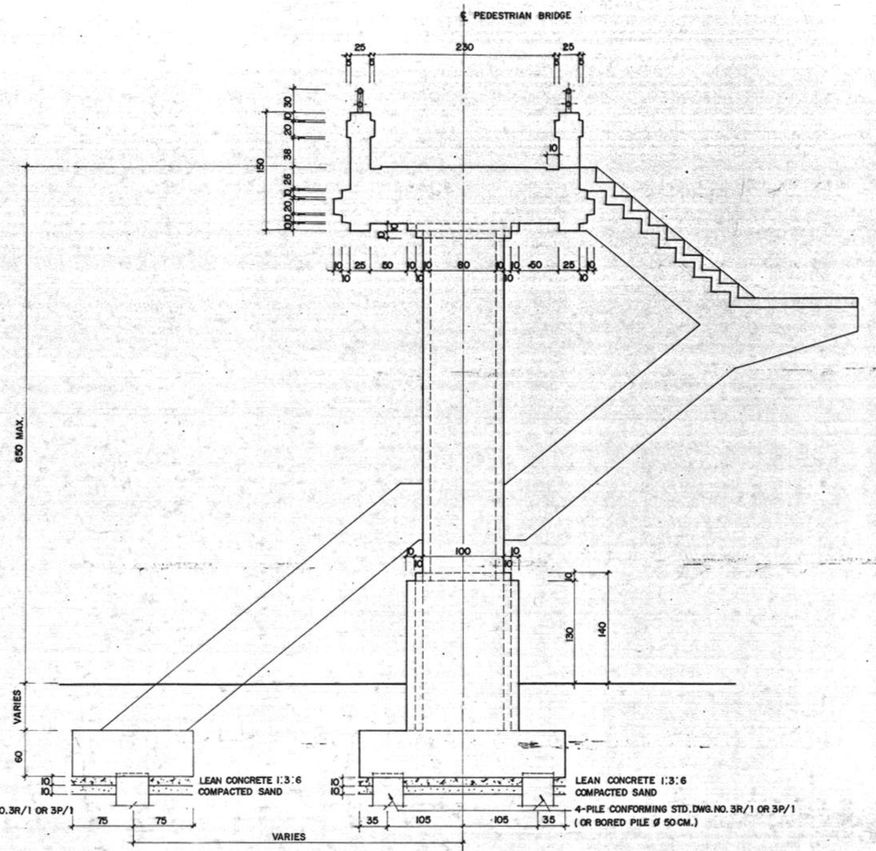
DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. PS-03
		SHEET NO. 202



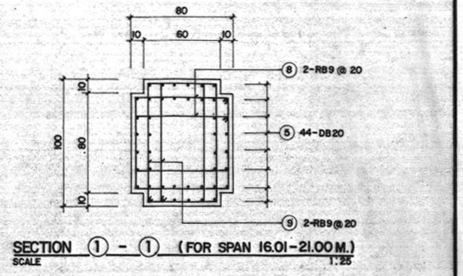
PLAN
SCALE 1:40



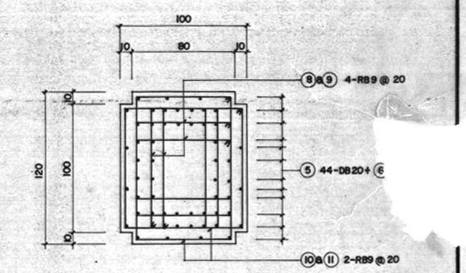
SECTION (A) - (A)
SCALE 1:40



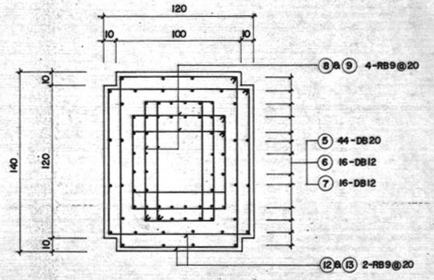
SECTION (B) - (B)
SCALE 1:40



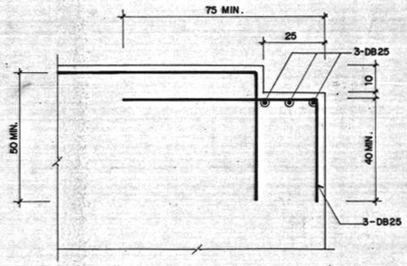
SECTION (1) - (1) (FOR SPAN 16.01-21.00 M.)
SCALE 1:25



SECTION (2) - (2) (FOR SPAN 16.01-21.00 M.)
SCALE 1:25

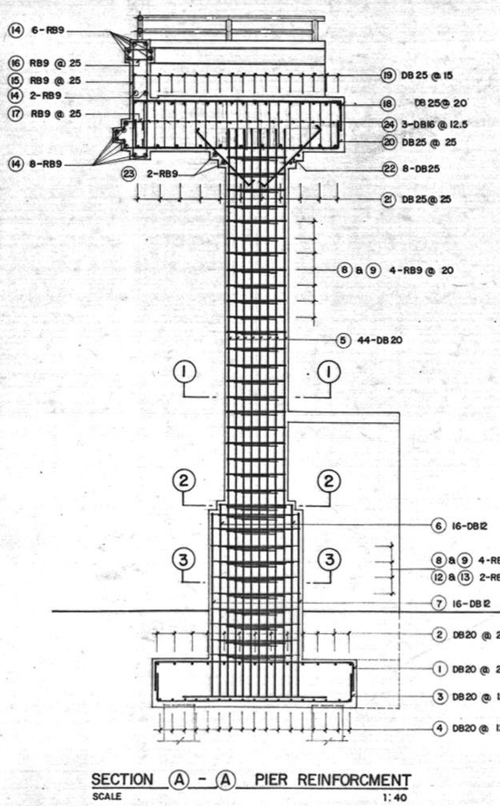


SECTION (3) - (3) (FOR SPAN 16.01-21.00 M.)
SCALE 1:25

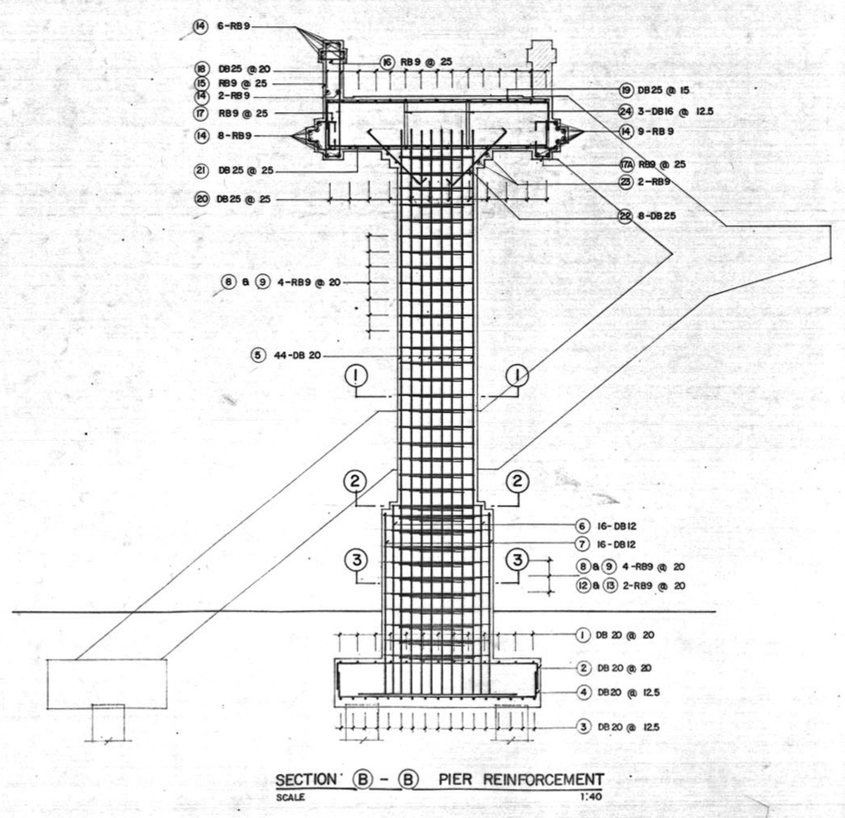


DETAIL (1)
SCALE 1:12.5

TABLE OF REINFORCEMENT		
BAR MARK	BAR DIA. (MM.)	BAR BENDING DIAGRAM
① & ②	DB 20	
③ & ④	DB 20	
⑤	DB 20	
⑥	DB 12	
⑦	DB 12	
⑧	RB 9	
⑨	RB 9	
⑩	RB 9	
⑪	RB 9	
⑫	RB 9	
⑬	RB 9	
⑭	RB 9	
⑮	RB 9	
⑯	RB 9	
⑰ & ⑰A	RB 9	
⑱ & ⑲	DB 25	
⑳ & ㉑	DB 25	
㉒	DB 25	
㉓	RB 9	
㉔	DB 16	



SECTION (A) - (A) PIER REINFORCMENT
SCALE 1:40



SECTION (B) - (B) PIER REINFORCEMENT
SCALE 1:40

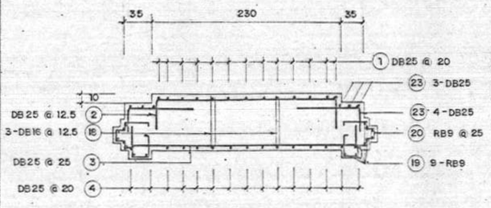
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

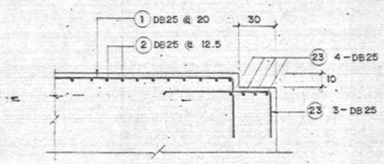
PEDESTRIAN BRIDGE

OUTSIDE PIER DETAILS FOR SPAN 16.01 - 21.00 M. (TYPE II)

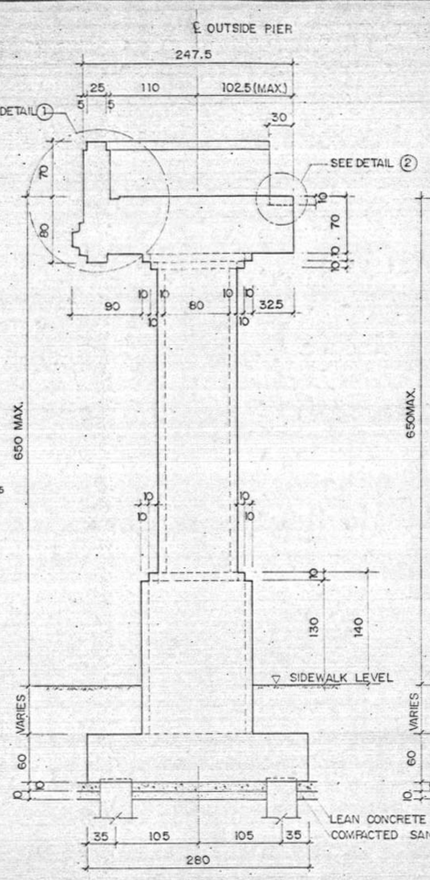
DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : For (DIRECTOR GENERAL)		DWG. NO. PS-04
		SHEET NO. 203



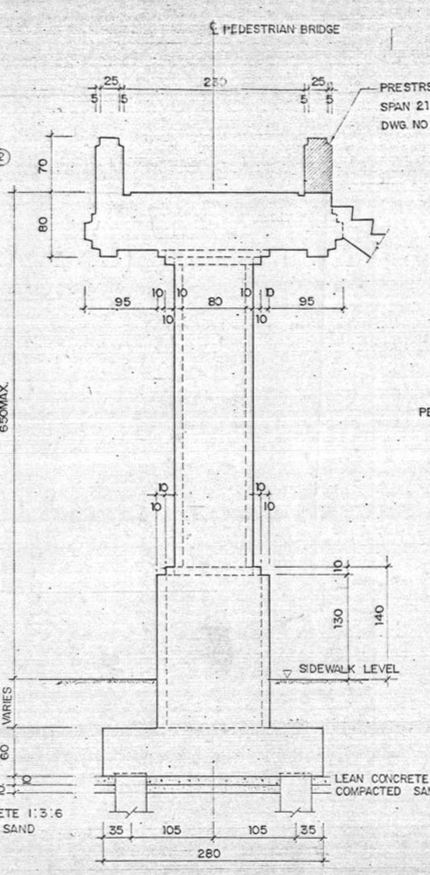
SECTION (C) - (C) 1 : 40



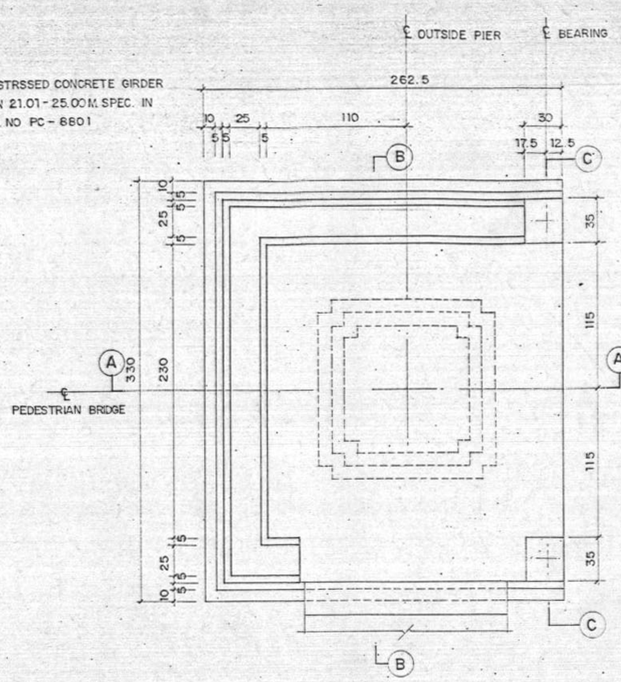
DETAIL (2) 1 : 25



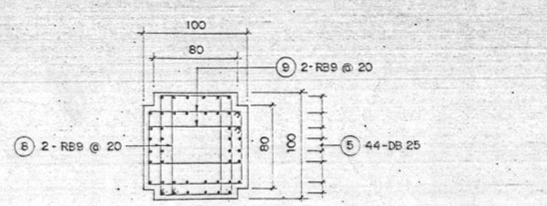
SECTION (A) - (A) 1 : 40



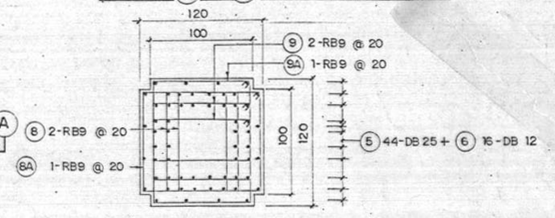
SECTION (B) - (B) 1 : 40



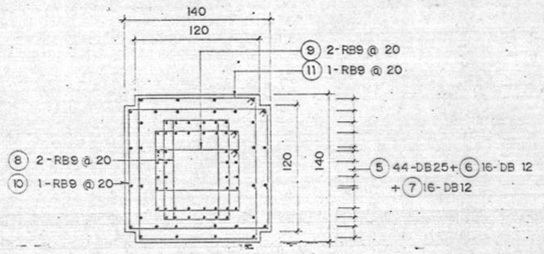
PLAN OF OUTSIDE PIER 1:25



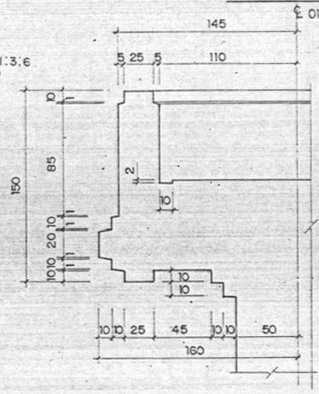
SECTION (1) - (1) 1 : 30 (FOR SPAN 21.01 - 25.00M.)



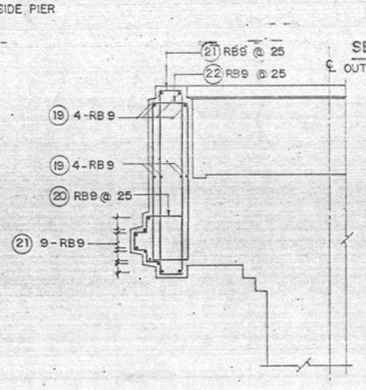
SECTION (2) - (2) 1 : 30 (FOR SPAN 21.01 - 25.00 M.)



SECTION (3) - (3) 1 : 30 (FOR SPAN 21.01-25.00M.)



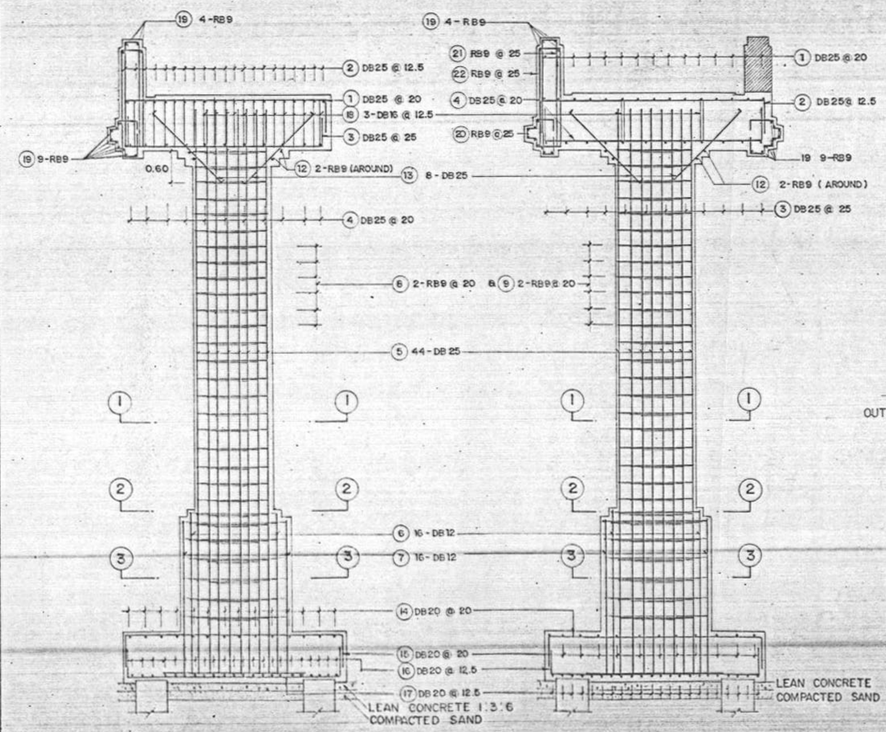
DETAIL (1)



DETAIL (1) REINFORCEMENT

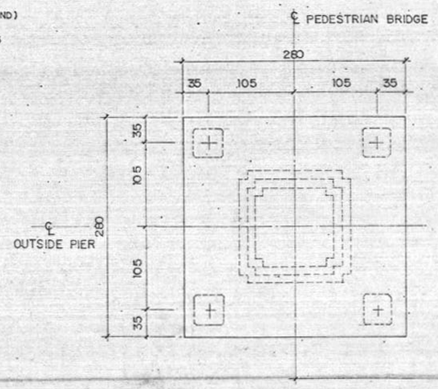
TABLE OF REINFORCEMENT

BAR MARK	BAR DIA. (MM.)	BAR BENDING DIAGRAM
(1)	DB 25	
(2)	DB 25	
(3)	DB 25	
(4)	DB 25	
(5)	DB 25	
(6)	DB 12	
(7)	DB 12	
(8) (8A)	RB 9	
(9) (9A)	RB 9	
(10)	RB 9	
(11)	RB 9	
(12)	RB 9	
(13)	DB 25	
(14)	DB 20	
(15)	DB 20	
(16)	DB 20	
(17)	DB 20	
(18)	DB 16	
(19)	RB 9	
(20)	RB 9	
(21)	RB 9	
(22)	RB 9	
(23)	DB 25	

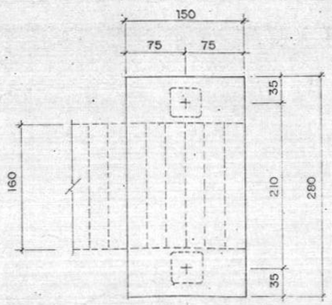


SECTION (A) - (A) 1:40
PIER REINFORCEMENT

SECTION (B) - (B) 1:40
PIER REINFORCEMENT



PILING PLAN - BRIDGE PIER FOOTING



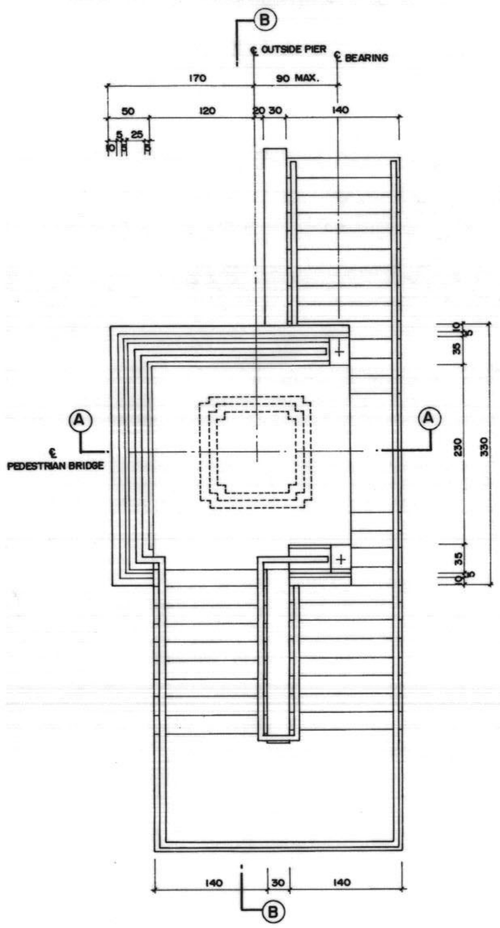
PILING PLAN - STAIR FOOTING

PILING PLAN 1:40

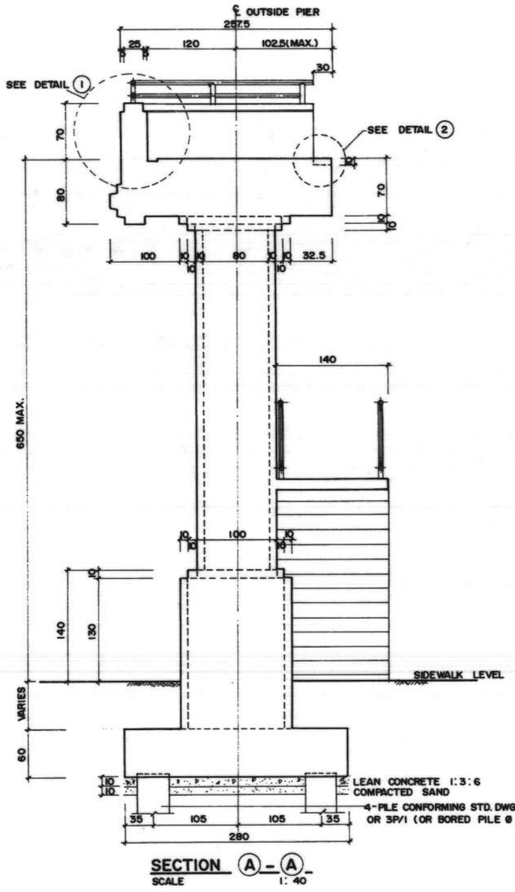
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING
PEDESTRIAN BRIDGE
OUTSIDE PIER DETAILS FOR SPAN 21.01 - 25.00 M. (TYPE I)

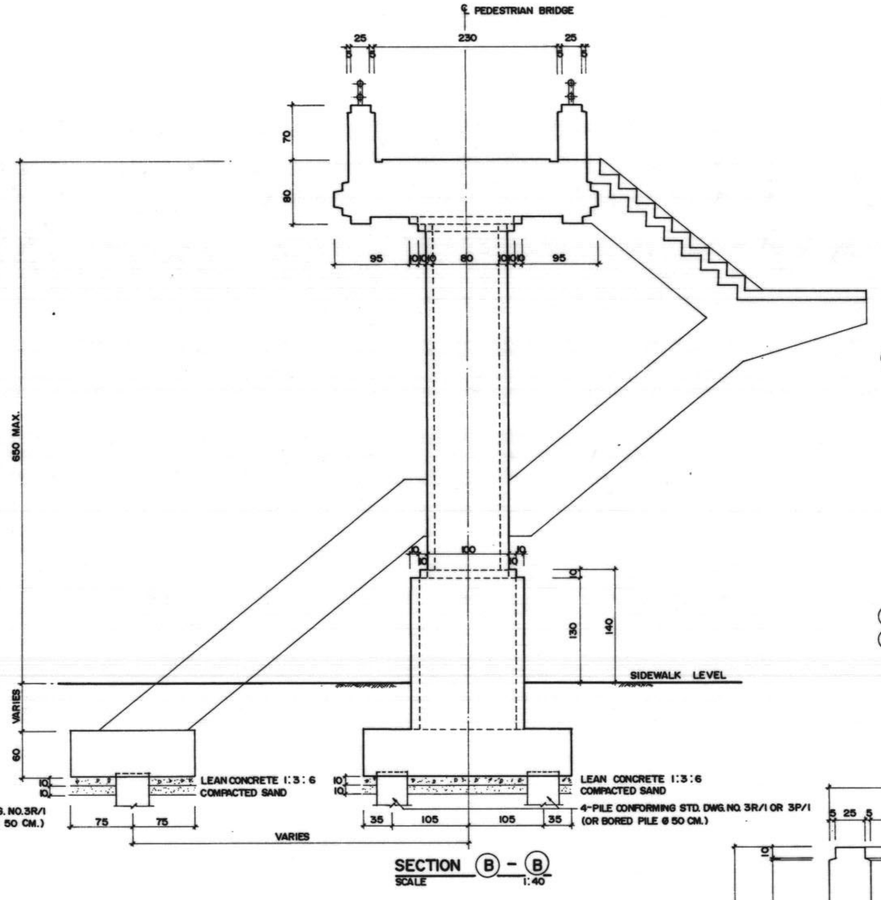
DESIGNED : DOH & CONSULTANTS	CHECKED : Kyk	DATE JULY 1994
SUBMITTED : P. Buranpraset (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : Likit (DIRECTOR GENERAL)		DWG. NO. PS-05
		SHEET NO. 204



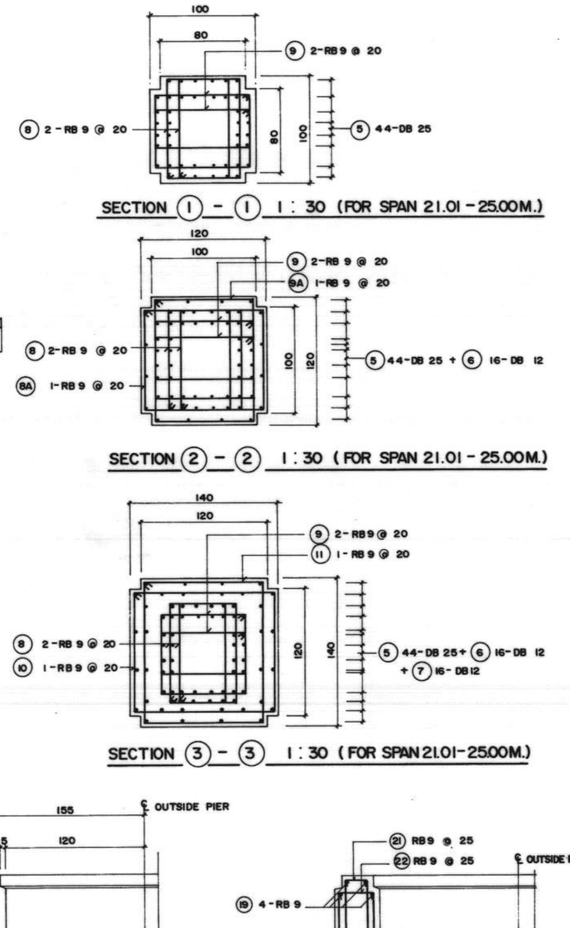
PLAN
SCALE 1:40



SECTION (A) - (A)
SCALE 1:40



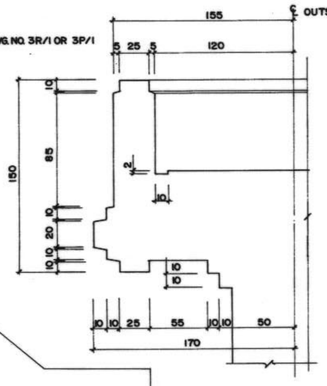
SECTION (B) - (B)
SCALE 1:40



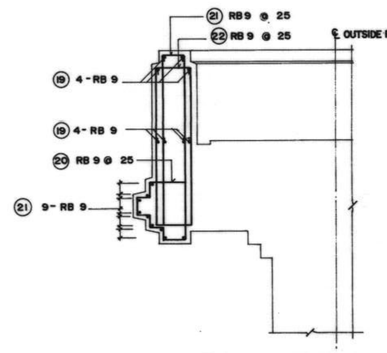
SECTION (1) - (1) 1:30 (FOR SPAN 21.01 - 25.00M.)

SECTION (2) - (2) 1:30 (FOR SPAN 21.01 - 25.00M.)

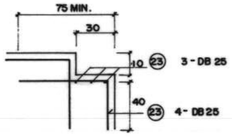
SECTION (3) - (3) 1:30 (FOR SPAN 21.01 - 25.00M.)



DETAIL (1)



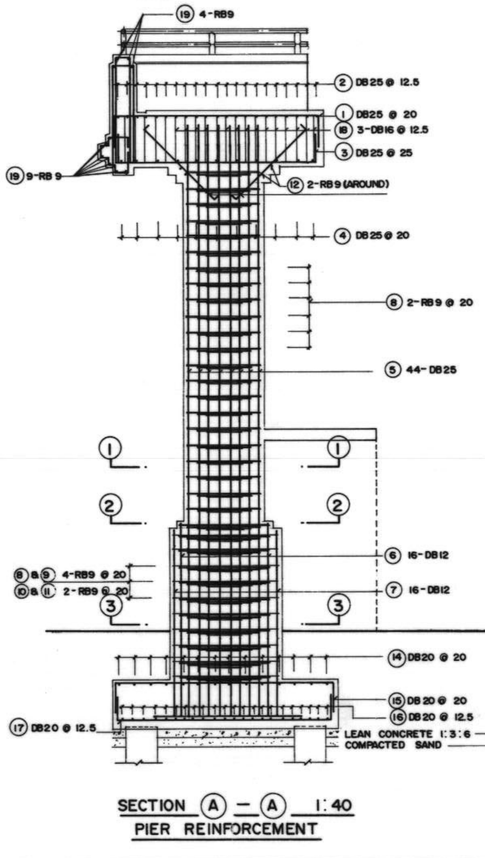
DETAIL (1) REINFORCEMENT



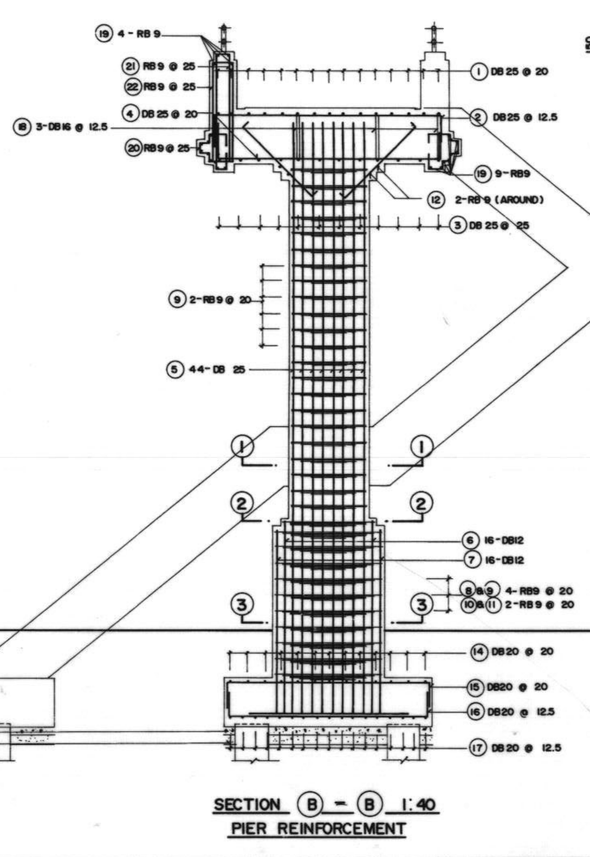
DETAIL (2)

TABLE OF REINFORCEMENT

BAR MARK	BAR DIA. (MM.)	BAR BENDING DIAGRAM
(1)	DB 25	
(2)	DB 25	
(3)	DB 25	
(4)	DB 25	
(5)	DB 25	
(6)	DB 12	
(7)	DB 12	
(8) & (9A)	RB 9	
(9) & (9A)	RB 9	
(10)	RB 9	
(11)	RB 9	
(12)	RB 9	
(13)	DB 25	
(14)	DB 20	
(15)	DB20	
(16)	DB 20	
(17)	DB 20	
(18)	DB 16	
(19)	RB 9	
(20)	RB 9	
(21)	RB 9	
(22)	RB 9	
(23)	DB 25	



SECTION (A) - (A) 1:40
PIER REINFORCEMENT



SECTION (B) - (B) 1:40
PIER REINFORCEMENT

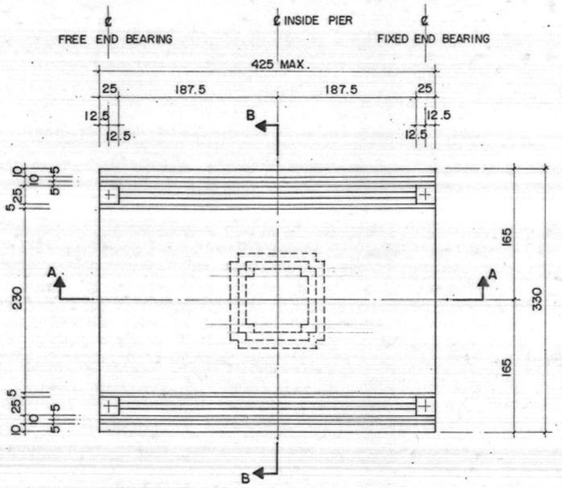
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

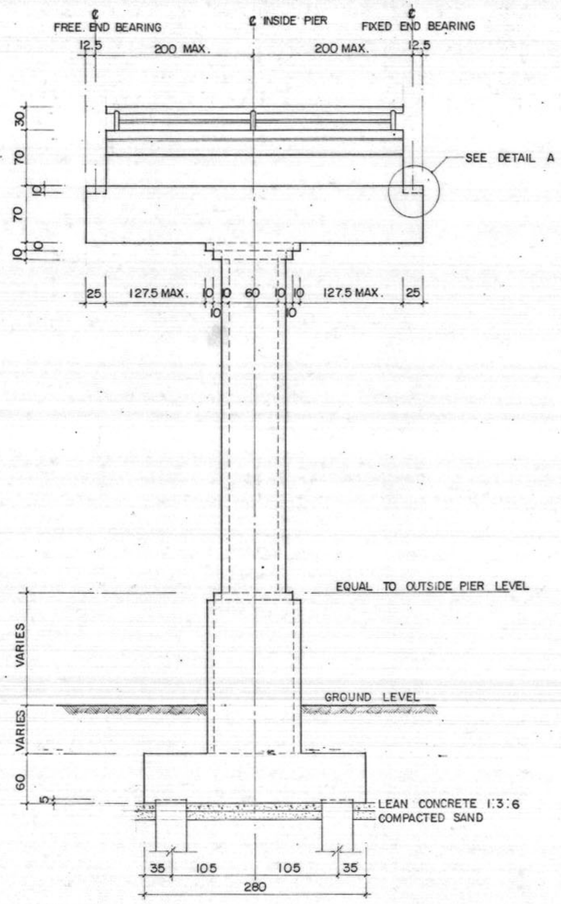
PEDESTRIAN BRIDGE

OUTSIDE PIER DETAILS FOR SPAN 21.01 - 25.00 M. (TYPE II)

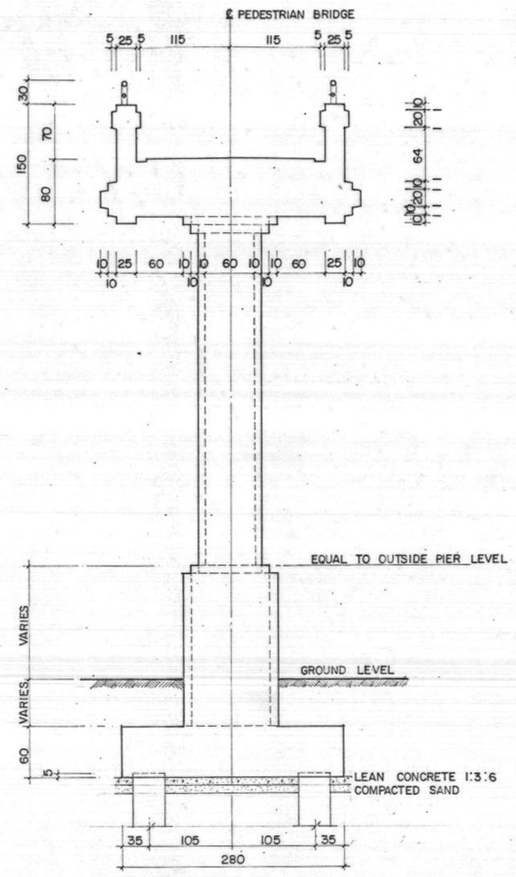
DESIGNED: DOH & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: (DIRECTOR GENERAL)		DWG. NO. PS-06
		SHEET NO. 205



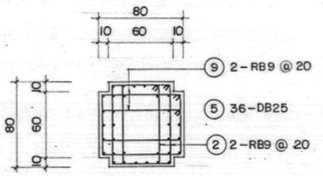
PLAN
SCALE 1:40



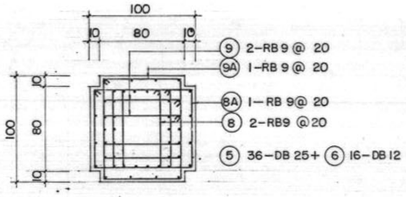
SECTION A – A
SCALE 1:40



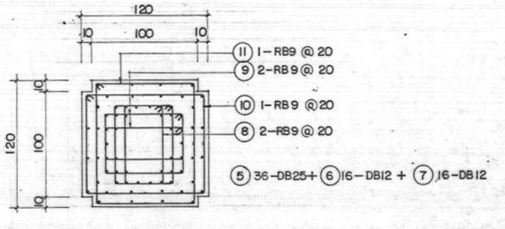
SECTION B – B
SCALE 1:40



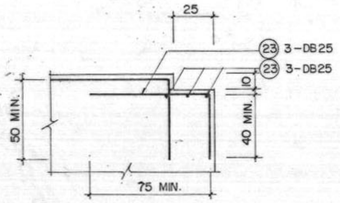
SECTION 1 – 1
SCALE 1:30



SECTION 2 – 2
SCALE 1:30



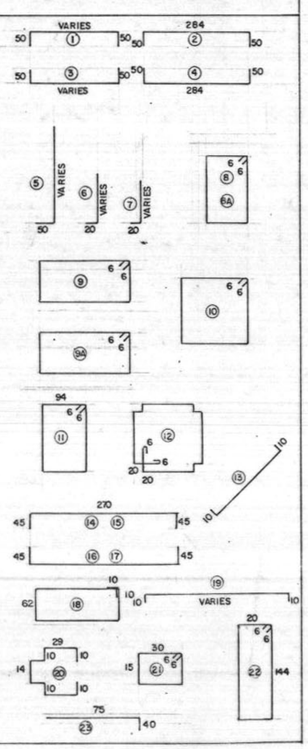
SECTION 3 – 3
SCALE 1:30

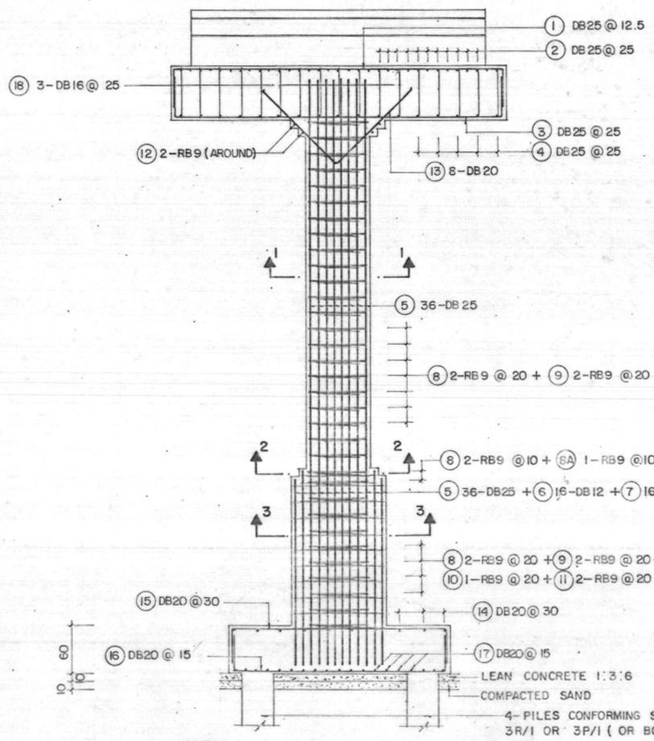


DETAIL A
SCALE 1:20

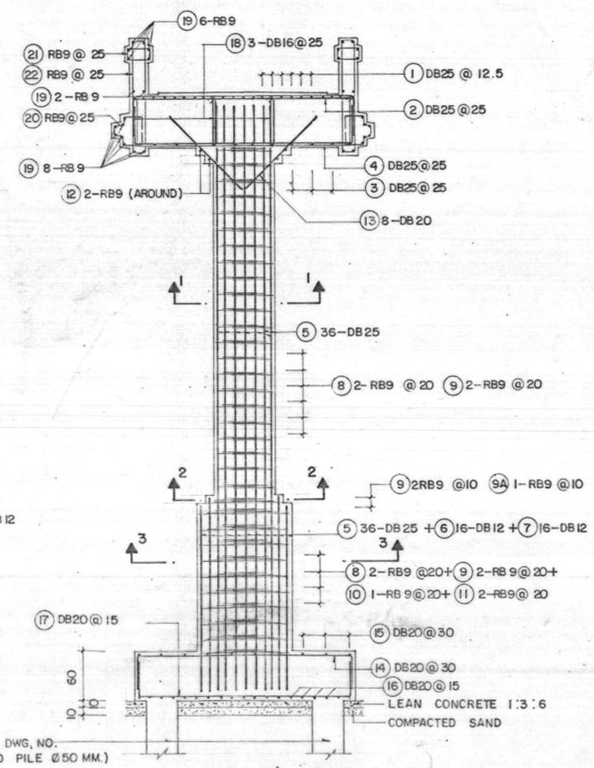
TABLE OF REINFORCEMENT

BAR MARK	BAR DIA. (MM.)	BAR BENDING DIAGRAM
①	DB 25	
②	DB 25	
③	DB 25	
④	DB 25	
⑤	DB 25	
⑥	DB 12	
⑦	DB 12	
⑧ & ⑧A	RB 9	
⑨ & ⑨A	RB 9	
⑩	RB 9	
⑪	RB 9	
⑫	RB9	
⑬	DB 20	
⑭	DB 20	
⑮	DB 20	
⑯	DB 20	
⑰	DB20	
⑱	DB 16	
⑲	RB 9	
⑳	RB 9	
㉑	RB 9	
㉒	RB 9	
㉓	DB 25	





SECTION A – A REINFORCEMENT
SCALE 1:40



SECTION B – B REINFORCEMENT
SCALE 1:40

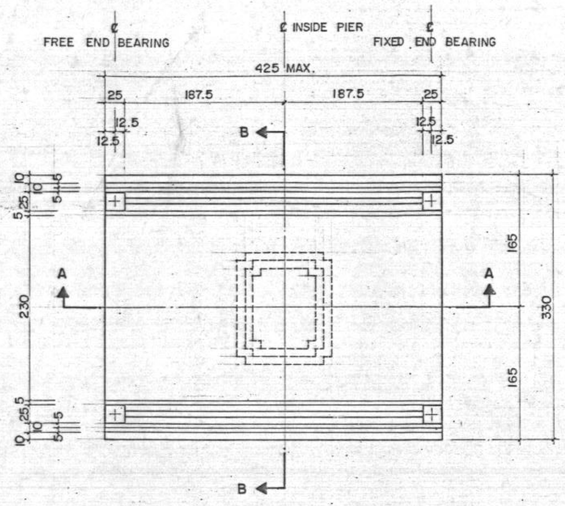
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

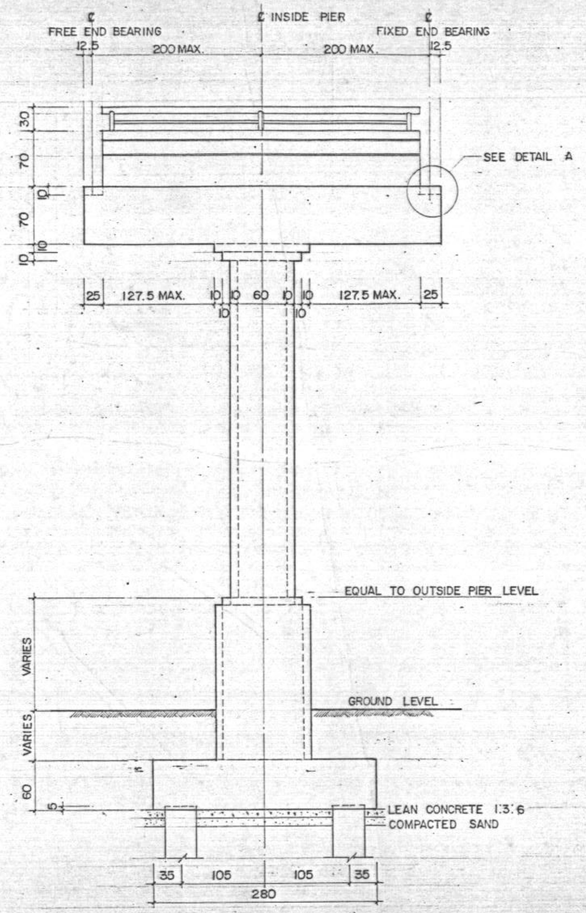
PEDESTRIAL BRIDGE

INSIDE PIER DETAILS FOR SPAN ≤ 16.00 M.

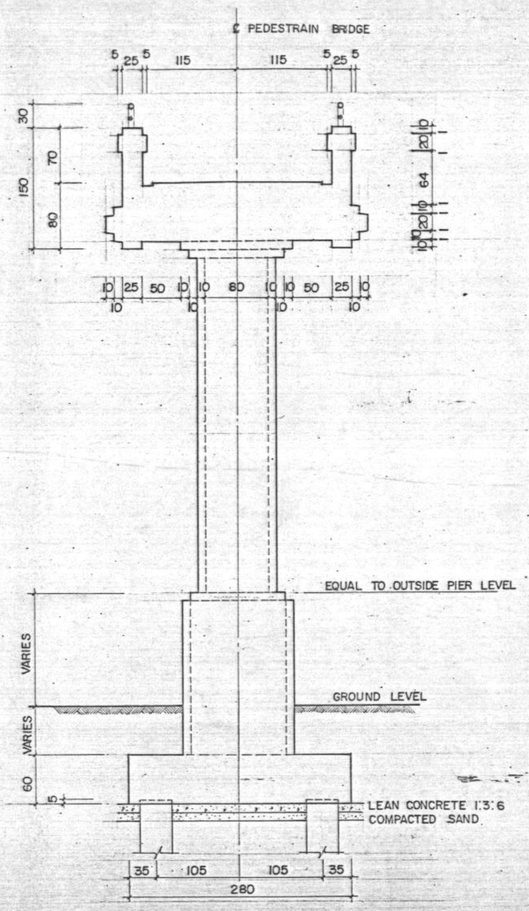
DESIGNED: DOH & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: FOR (DIRECTOR GENERAL)		DWG. NO. PS-07
		SHEET NO. 206



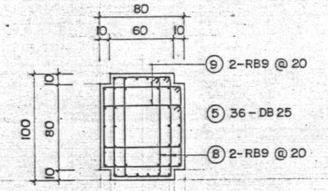
PLAN
SCALE 1:40



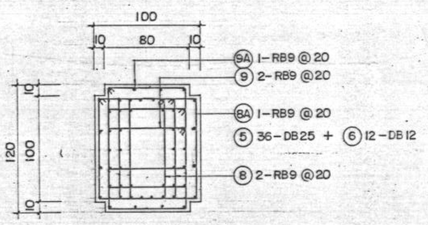
SECTION A – A
SCALE 1:40



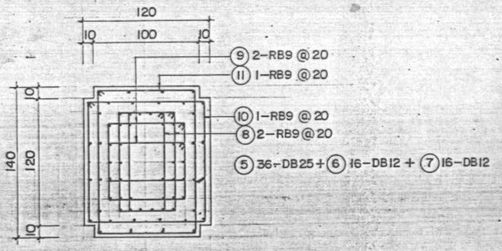
SECTION B – B
SCALE 1:40



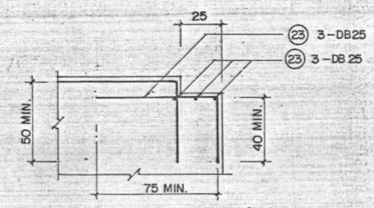
SECTION 1 – 1
SCALE 1:30



SECTION 2 – 2
SCALE 1:30



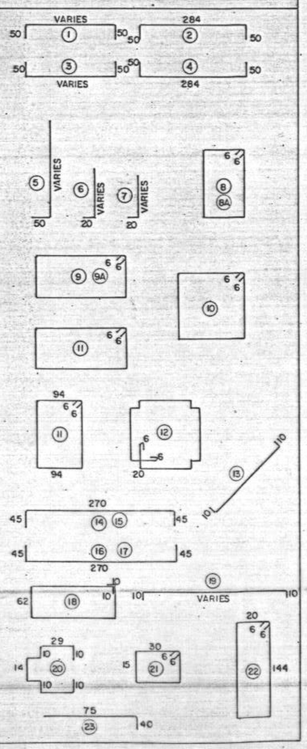
SECTION 3 – 3
SCALE 1:30

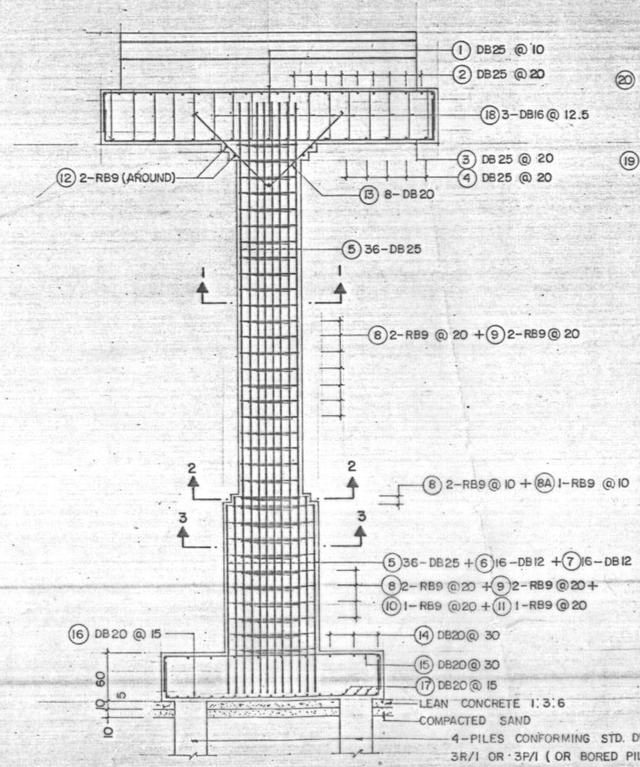


DETAIL A
SCALE 1:20

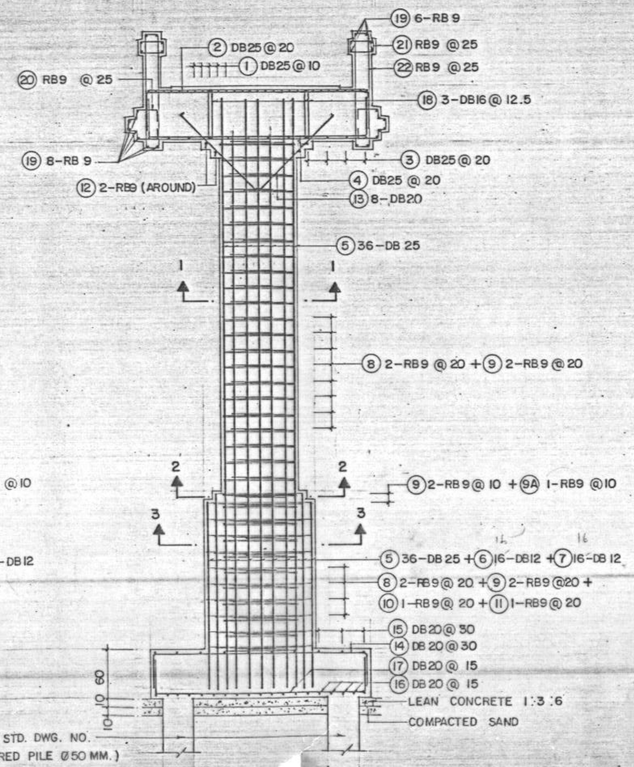
TABLE OF REINFORCEMENT

BAR MARK	BAR DIA. (MM.)	BAR BENDING DIAGRAM
①	DB 25	
②	DB 25	
③	DB 25	
④	DB 25	
⑤	DB 25	
⑥	DB 12	
⑦	DB 12	
⑧ & 8A	RB 9	
⑨ & 9A	RB 9	
⑩	RB 9	
⑪	RB 9	
⑫	RB 9	
⑬	DB 20	
⑭	DB 20	
⑮	DB 20	
⑯	DB 20	
⑰	DB 20	
⑱	DB 16	
⑲	RB 9	
⑳	RB 9	
㉑	RB 9	
㉒	RB 9	
㉓	DB 25	





SECTION A – A REINFORCEMENT
SCALE 1:40

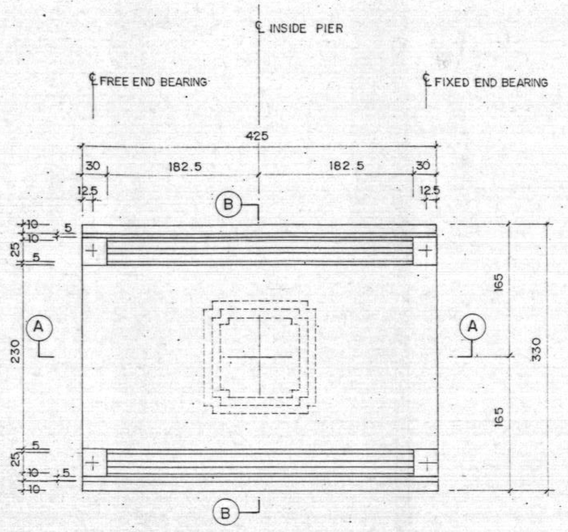


SECTION B – B REINFORCEMENT
SCALE 1:40

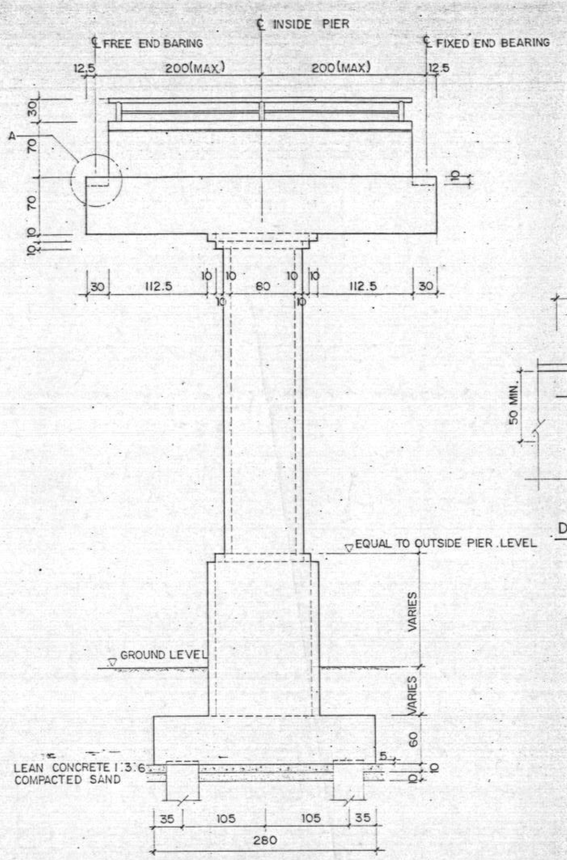
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING
PEDESTRIAN BRIDGE
INSIDE PIER DETAILS FOR SPAN 16.01–21.00 M.

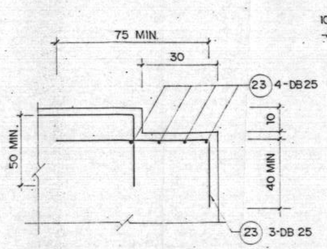
DESIGNED: DOH & CONSULTANTS	CHECKED:	DATE JULY 1994
SUBMITTED: (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED: FOR (DIRECTOR GENERAL)		DWG. NO. PS-08
		SHEET NO. 207



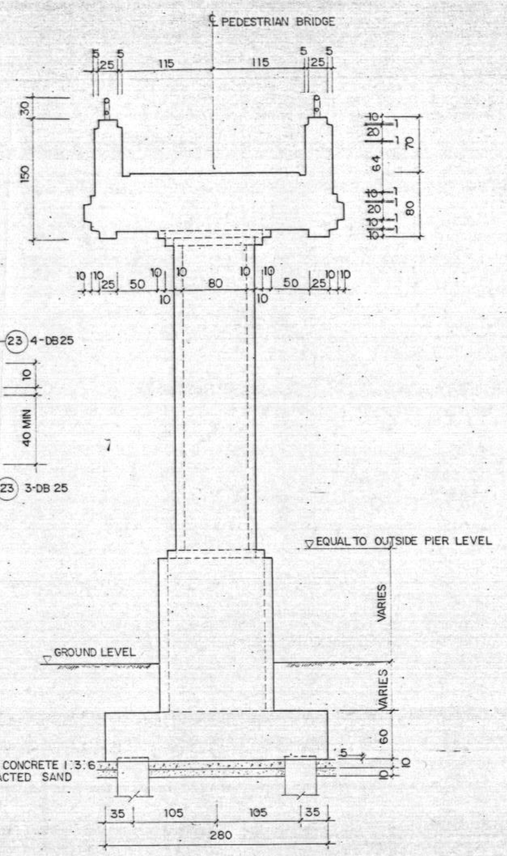
PLAN 1:40



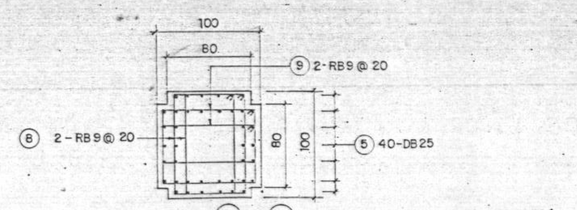
SECTION (A) - (A) 1:40



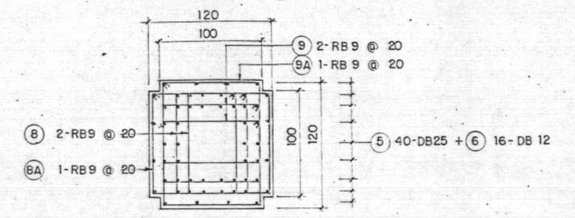
DETAIL (A) 1:12.5



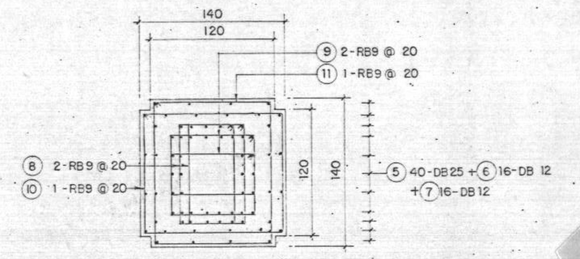
SECTION (B) - (B) 1:40



SECTION (1) - (1) 1:30 (FOR SPAN 21.01-25.00 M.)



SECTION (2) - (2) 1:30 (FOR SPAN 21.01-25.00M.)



SECTION (3) - (3) 1:30 (FOR SPAN 21.01-25.00 M.)

TABLE OF REINFORCEMENT

BAR MARK	BAR DIA. (MM.)	BAR BENDING DIAGRAM
1	DB 25	
2	DB 25	
3	DB 25	
4	DB 25	
5	DB 25	
6	DB 12	
7	DB 12	
8 & 8A	RB 9	
9 & 9A	RB 9	
10	RB 9	
11	RB 9	
12	RB 9	
13	DB 20	
14	DB 20	
15	DB 20	
16	DB 20	
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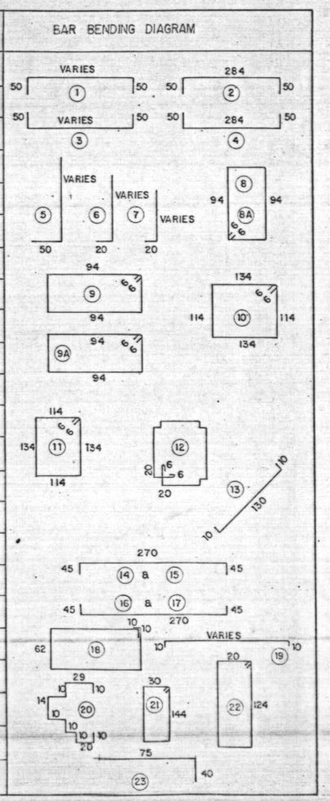
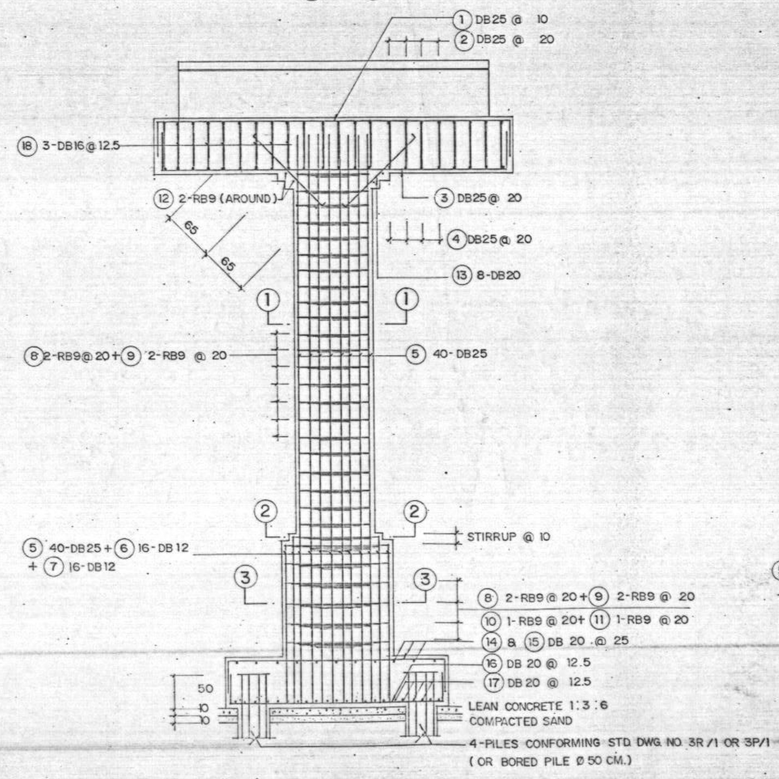
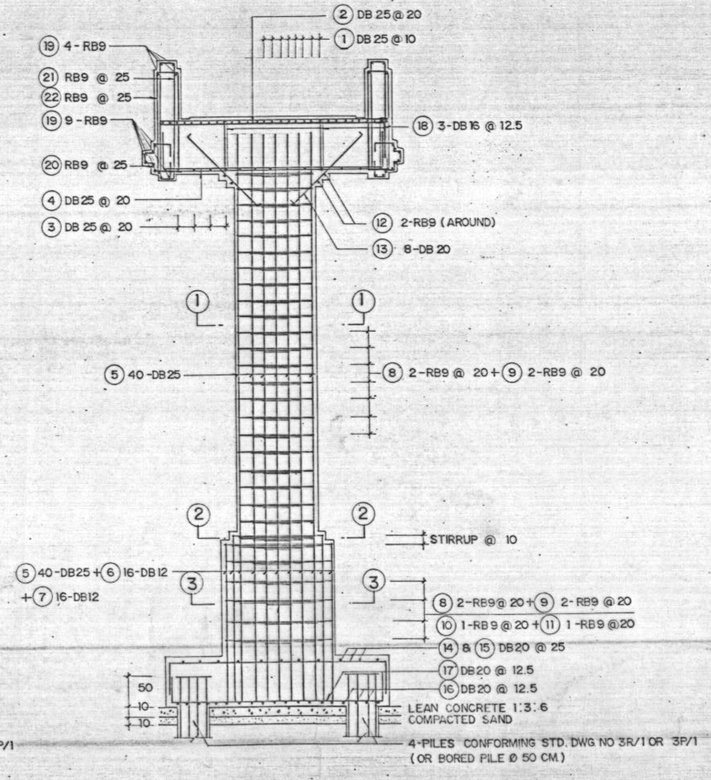
21	RB 9	
22	RB 9	
23	DB 25	





SECTION (A) - (A) PIER REINFORCEMENT 1:40

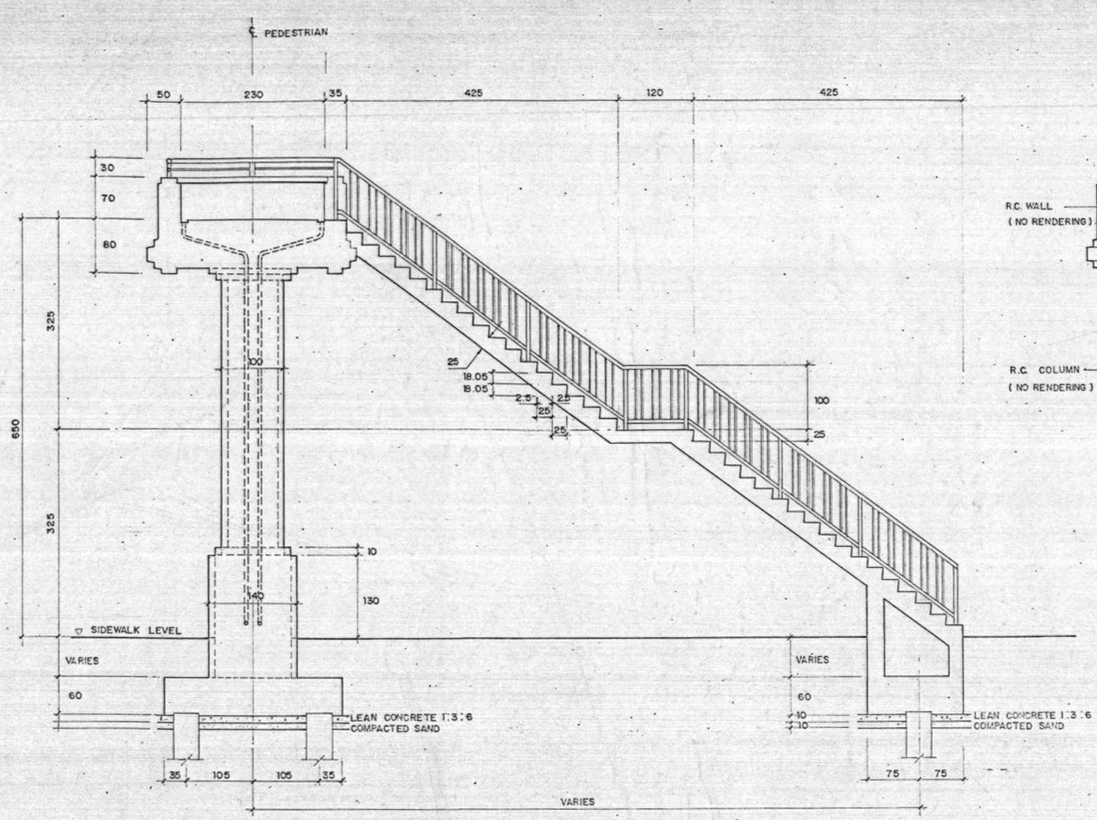


SECTION (B) - (B) PIER REINFORCEMENT 1:40

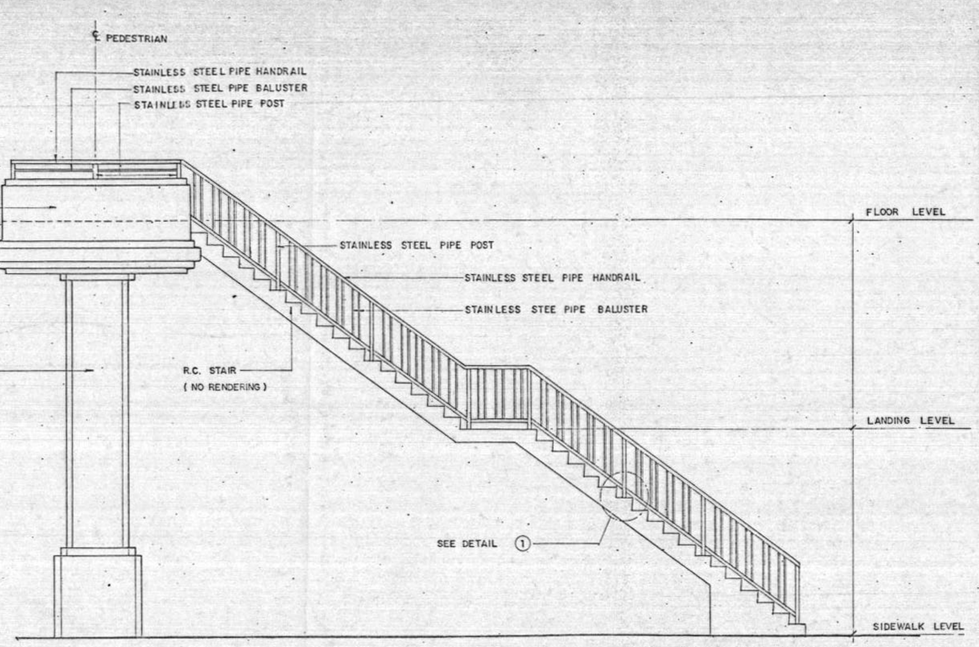
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING
PEDESTRIAN BRIDGE
INSIDE PIER DETAILS FOR SPAN 21.01-25.00M.

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : For (DIRECTOR GENERAL)		DWG. NO. PS-09
		SHEET NO. 208



SECTION (B) - (B) 1:50

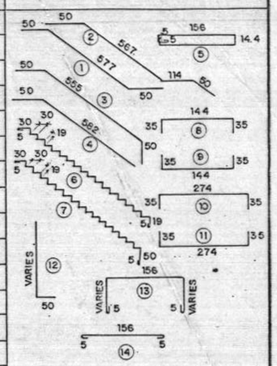


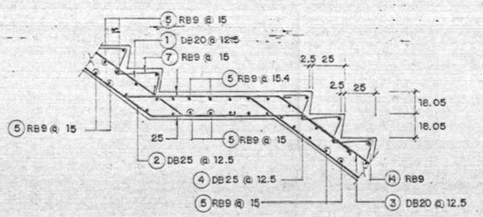
SIDE ELEVATION 1:50

TABLE OF REINFORCEMENT

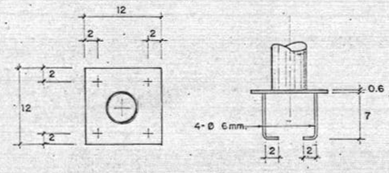
BAR MARK	BAR DIA. (MM.)
(1)	DB 20
(2)	DB 25
(3)	DB 20
(4)	DB 25
(5)	RB 9
(6)	RB 9
(7)	RB 9
(8)	DB 16
(9)	DB 16
(10)	DB 16
(11)	DB 16
(12)	DB 16
(13)	RB 9
(14)	RB 9

BAR BENDING DIAGRAM

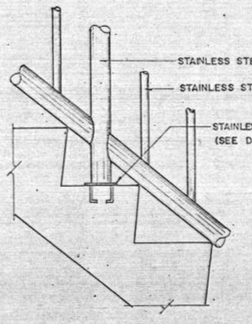




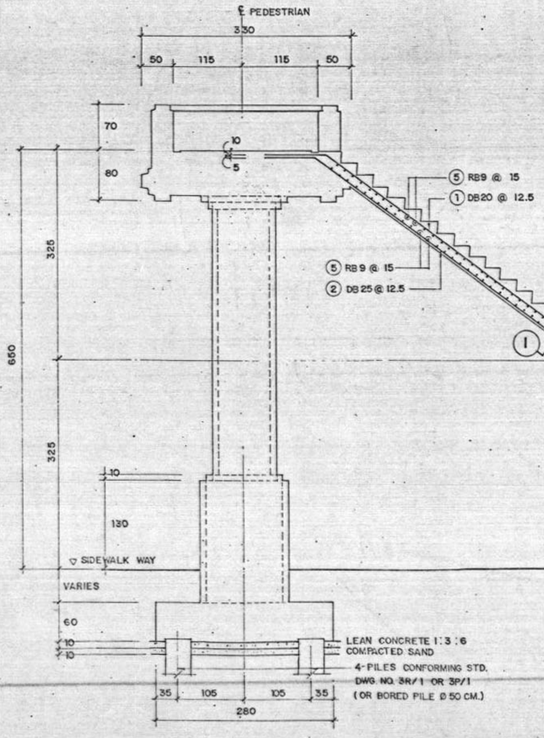
DETAIL (1) 1:25



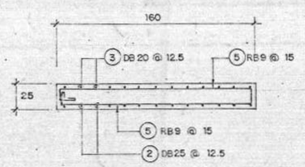
DETAIL OF STAINLESS STEEL PLATE 1:5



DETAIL (1) 1:10



DETAIL OF STAIR REINFORCEMENT 1:50



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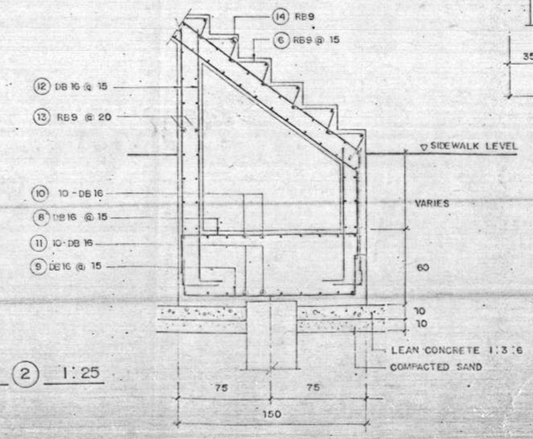
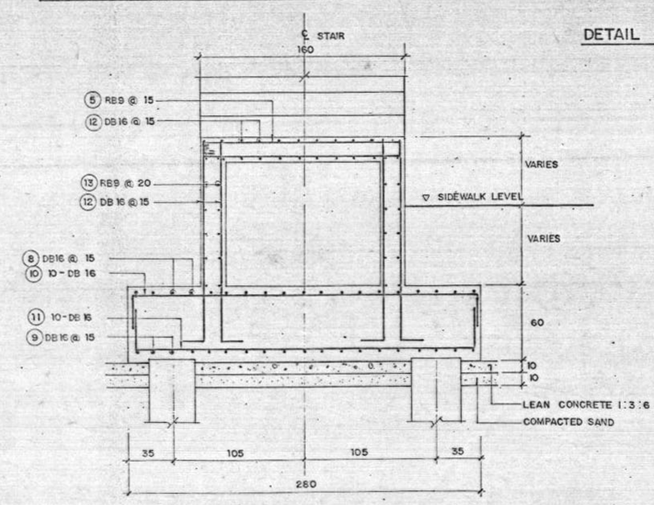


DETAIL (2) 1:25

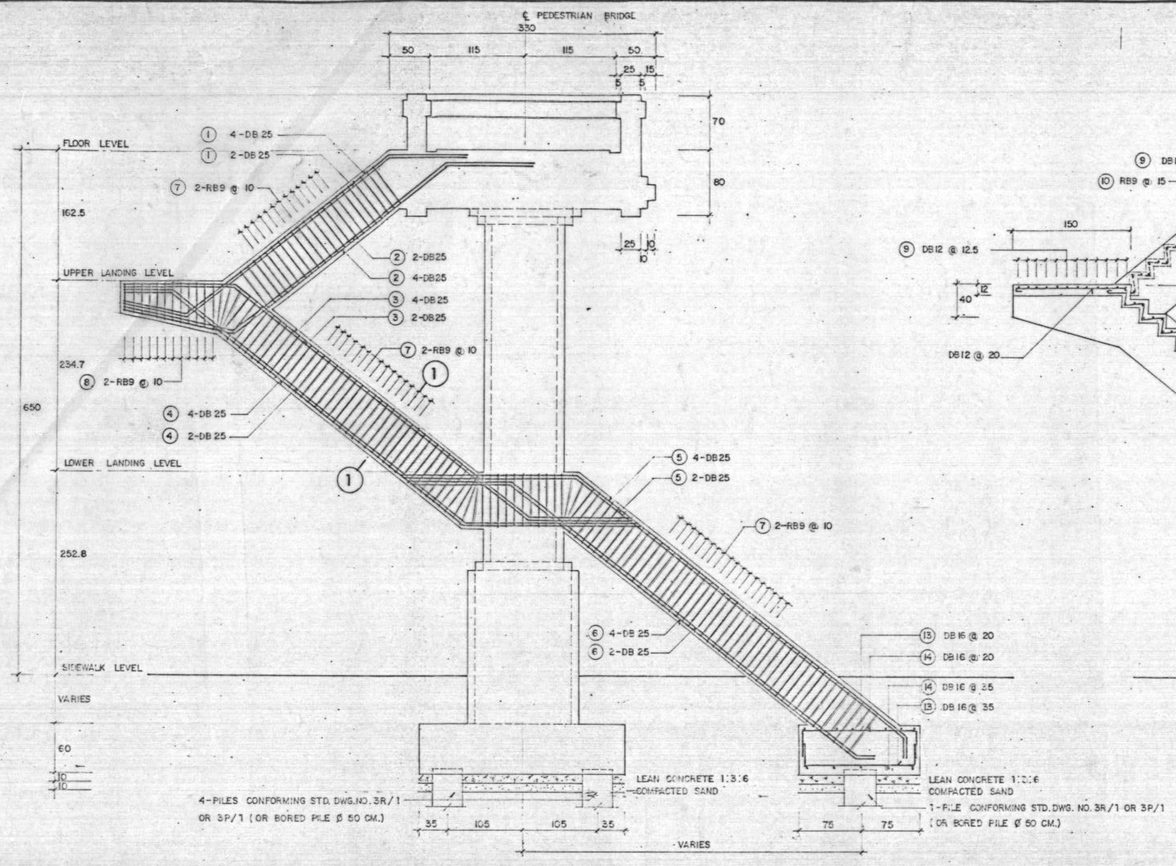


SECTION (3) - (3) 1:25

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

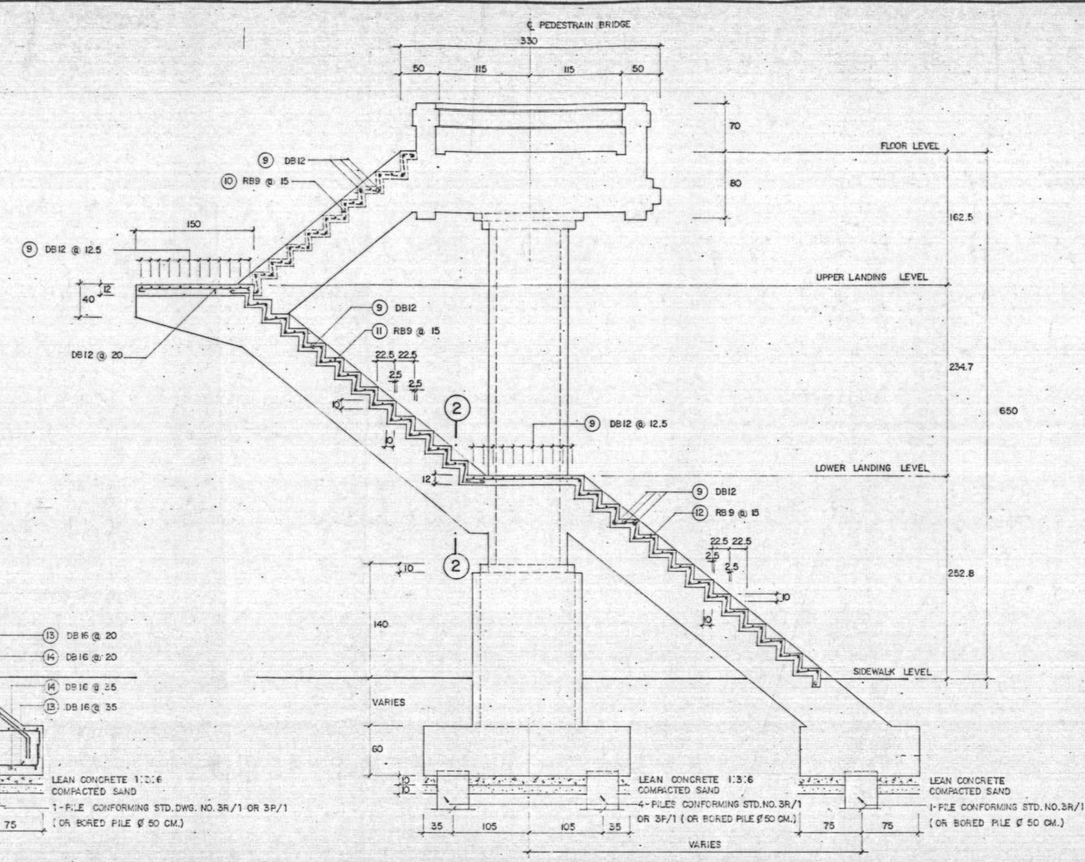
STANDARD DRAWING
PEDESTRIAN BRIDGE
STAIRS DETAILS (TYPE I)

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE : JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. PS-10
		SHEET NO. 209



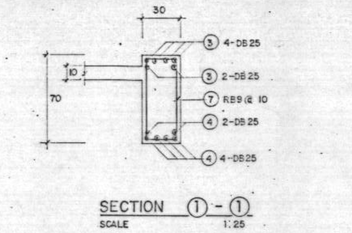
STAIR BEAM REINFORCEMENT

SCALE 1:40



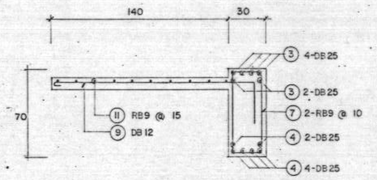
STAIR SLAB REINFORCEMENT

SCALE 1:40



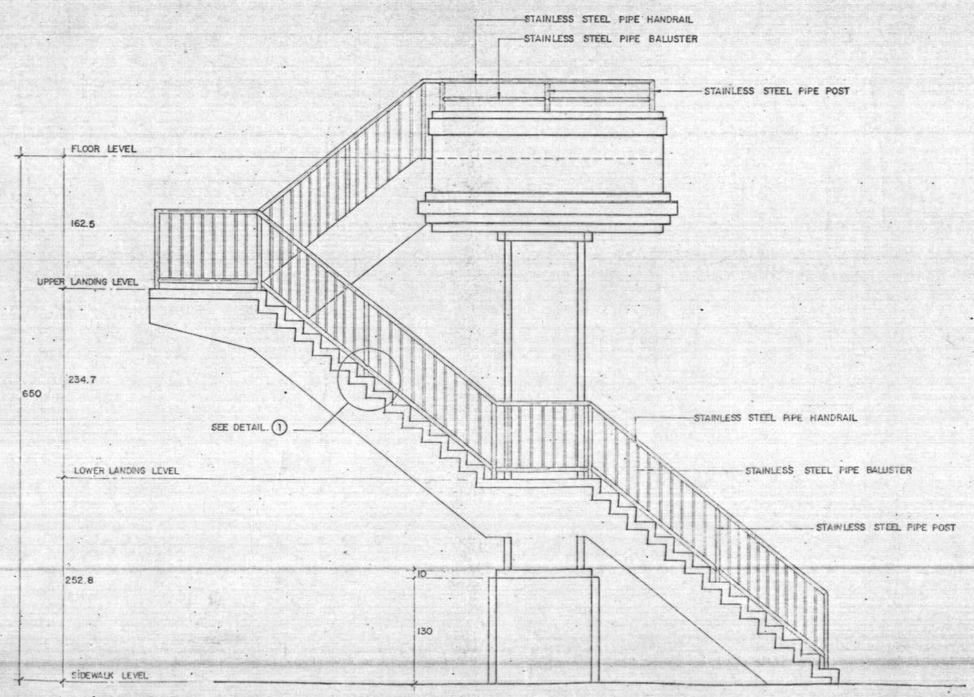
SECTION ① - ①

SCALE 1:25



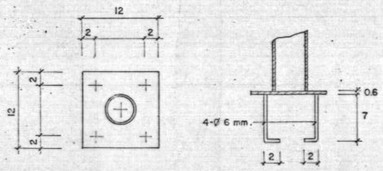
SECTION ② - ②

SCALE 1:25



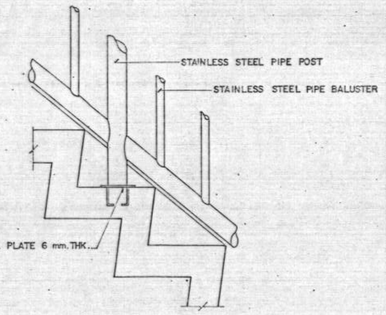
SIDE . ELEVATION

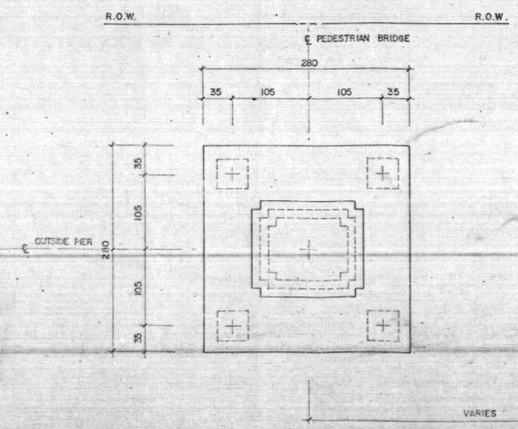
SCALE 1:40



DETAIL OF STAINLESS STEEL PLATE

SCALE 1:5





PILING PLAN

SCALE 1:40

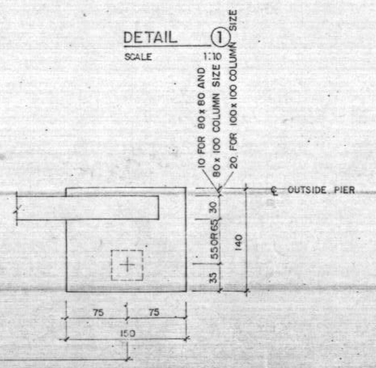


TABLE OF REINFORCEMENT		
BAR MARK	BAR DIA. (MM.)	BAR BENDING DIAGRAM
①	DB 25	
②	DB 25	
③	DB 25	
④	DB 25	
⑤	DB 25	
⑥	DB 25	
⑦	RB 9	
⑧	RB 9	
⑨	DB 12	
⑩	RB 9	
⑪	RB 9	
⑫	RB9	
⑬	DB16	
⑭	DB16	

KINGDOM OF THAILAND

MINISTRY OF TRANSPORT AND COMMUNICATIONS

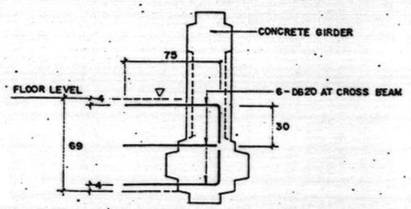
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

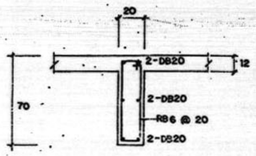
PEDESTRIAN BRIDGE

STAIRS DETAILS (TYPE II)

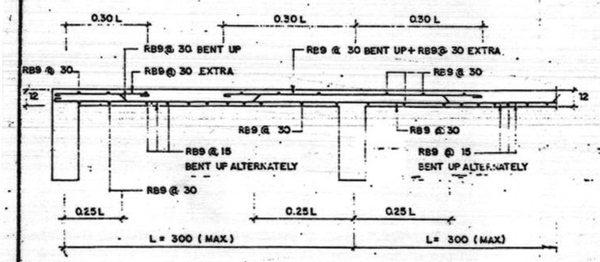
DESIGNED : DOH & CONSULTANTS	CHECKED : Kyed	DATE JULY 1994
SUBMITTED : P. Burapavong. (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
		DWG. NO. PS-11
APPROVED : Sakorn P.E. (DIRECTOR GENERAL)		SHEET NO. 210



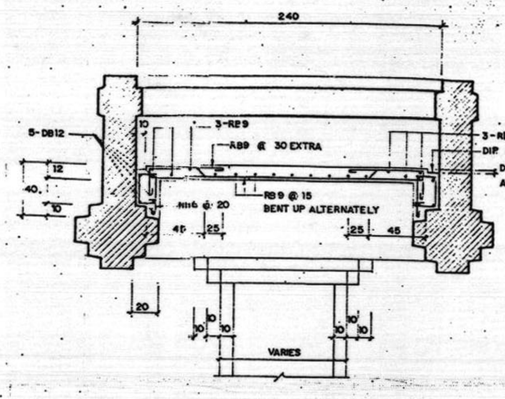
DETAIL OF PRESTRESSED CONCRETE GIRDER EXTRA REINFORCEMENT



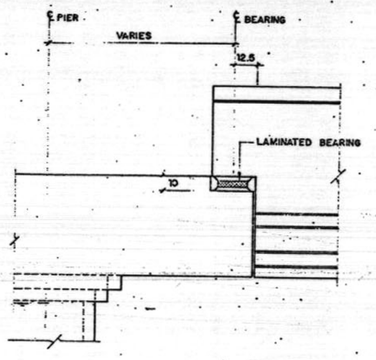
DETAIL OF CROSS BEAM REINFORCEMENT 1:25



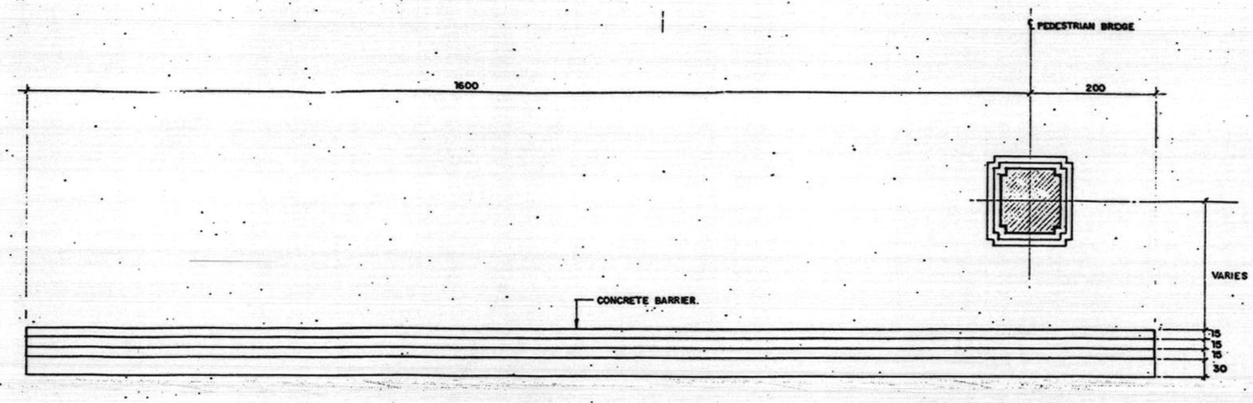
DETAIL OF SLAB REINFORCEMENT 1:25



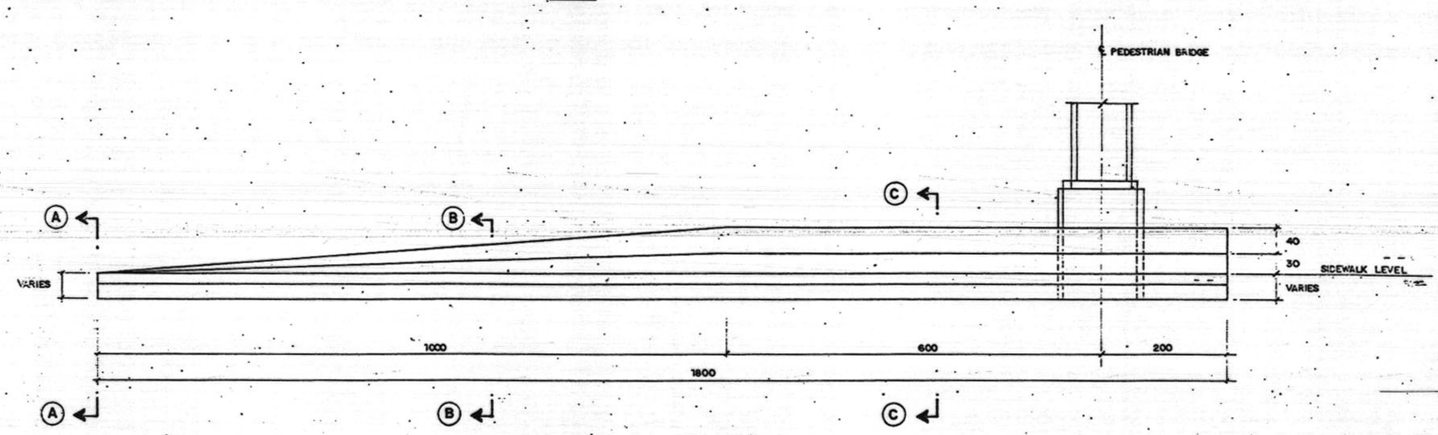
CROSS SECTION OF SLAB REINFORCEMENT 1:25



DETAIL OF BEARING



PLAN

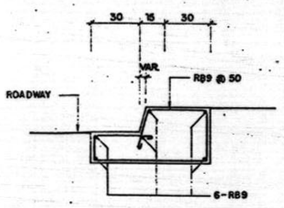


PROFILE

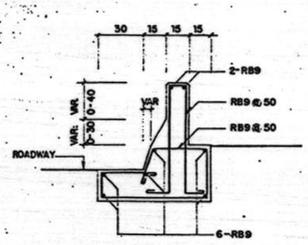
INSTALLATION CONCRETE BARRIER 1:50

CONSTRUCTION SPECIFICATION

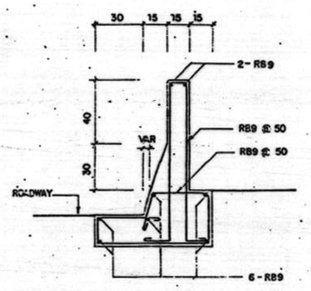
1. REINFORCING STEEL
   - 1.1 ROUND BAR (RB) SHALL CONFORM TIS 20 CLASS SR 24
   - 1.2 DEFORMED BAR (DB) SHALL CONFORM TIS 24 CLASS SD30
2. CONCRETE
   - 2.1 A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KSC. FOR A 15x15x15 CM. CUBE AT 28 DAYS.
   - 2.2 CONCRETE SLUMP, MAX. 8.0 CM.
3. CLEAR CONCRETE COVER SHALL BE 3.0 CM. UNLESS OTHERWISE INDICATED
4. PILES (SELECTED FROM 4.1 OR 4.2)
   - 4.1 R.C. PILE OR PRESTRESSED CONCRETE PILE 40 x 40 CM. SHALL CONFORM STD. DWG. NO. 3R/1 OR 3P/1 RESPECTIVELY HAVING ULTIMATE CAPACITY NOT LESS THAN 110 TONS FROM HILEY'S FORMULA OR 90 TONS FROM LOAD TEST.
   - 4.2 BORED PILE Ø 50 CM. HAVING ULTIMATE CAPACITY NOT LESS THAN 90 TONS FROM LOAD TEST.
5. BORED PILE
   - 5.1 BORED PILE Ø 50 CM. DEPTH NOT LESS THAN 21.00 M. OR TO SAND LAYER USING 10-DB16, LENGTH 20.00 M. (INCLUDED LAPPING) FOR MAIN REINFORCING STEEL, RB6 @ 15 MM. FOR STIRRUPS AND PILE HEAD MUST BE EXTRA REINFORCED 10-DB20, LENGTH 5.00 M. CONTRACTOR MUST TEST BORED PILE BY LOAD TEST AT 90 TONS. CONFORMING ASTM D1143 AND MUST HAVE TOTAL SETTLEMENT AND PERMANENT SETTLEMENT NOT OVER THAN 25 MM. AND 6.5 MM. RESPECTIVELY. ITEM OF COMPUTATION OR DETAILS SHALL BE UNDER LOCATION AND DESIGN DIVISION APPROVAL.
   - 5.2 CONCRETE SPECIFICATION FOR BORED PILE IS THE SAME AS ITEM 2.
   - 5.3 OPERATING METHOD OF BORED PILE
     - 5.3.1 CASING MUST IN VERTICAL LINE
     - 5.3.2 MUST POUR CONCRETE TO FINISHED BORE HOLE IMMEDIATELY BY CONE AND REMOVED CASING BY PRESSURED
     - 5.3.3 MUST BE NOT BORING SOIL LESS THAN 3.0 M. FROM THE PILE WHICH AGE NOT OVER 24 HRS.
     - 5.3.4 MUST HAVE 10-DB20, 80 CM. LENGTH FOR EXTRA REINFORCING STEEL IN FOUNDATION.
     - 5.3.5 TOP OF BORED PILE LEVEL MUST HIGER THAN REQUIRED LEVEL NOT LESS THAN 500 MM.
6. FOUNDATION LEVEL OF PEDESTRIAN BRIDGE MUST BE THE SAME LEVEL.
7. STAINLESS STEEL PIPE OF PEDESTRIAN BRIDGE SHALL BE APPROVED BY ENGINEER.
   - 7.1 STAIRS
     - HAND RAIL (TOP-BOTTOM) Ø 2 1/2" THICKNESS 1.5 MM. (MIN.) IS WELDED WITH BALUSTER (TOP-BOTTOM) AND POST.
     - POST Ø 2 1/2" THICKNESS 1.5 MM. (MIN.) THE TOP AND BOTTOM IS WELDED WITH HAND RAIL AND STAINLESS STEEL PLATE 10 x 10 CM. THICKNESS 6 MM. FIXED IN STAIRS SLAB RESPECTIVELY.
     - BALUSTER Ø 1 1/2" THICKNESS 1.2 MM. (MIN.) IS WELDED WITH HAND RAIL (TOP-BOTTOM)
   - 7.2 PEDESTRIAN BRIDGE HAND RAIL.
     - HAND RAIL Ø 2 1/2" THICKNESS 1.5 MM. (MIN.) IS WELDED WITH BALUSTER.
     - POST Ø 2 1/2" THICKNESS 1.5 MM. THE TOP AND BOTTOM IS WELDED WITH HAND RAIL AND STAINLESS STEEL PLATE 10 x 10 CM. THICKNESS 6 MM. FIXED IN PRESTRESSED CONCRETE GIRDER AND RC. WALL RESPECTIVELY.
     - BALUSTER Ø 1" THICKNESS 1.2 MM. (MIN.) BOTHSIDE IS WELDED WITH POST.
8. WELDING SHALL CONFORM AISC SPECIFICATIONS.
9. STAIRS, PIER AND WALL SHALL BE NOT RENDERING.
10. DETAIL OF CONCRETE BARRIER SHALL CONFORM THIS DRAWING OR ENGINEER APPROVAL
11. ALL DIMENSIONS SHOWN ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.



SECTION Ⓐ-Ⓐ 1:20



SECTION Ⓑ-Ⓑ 1:20

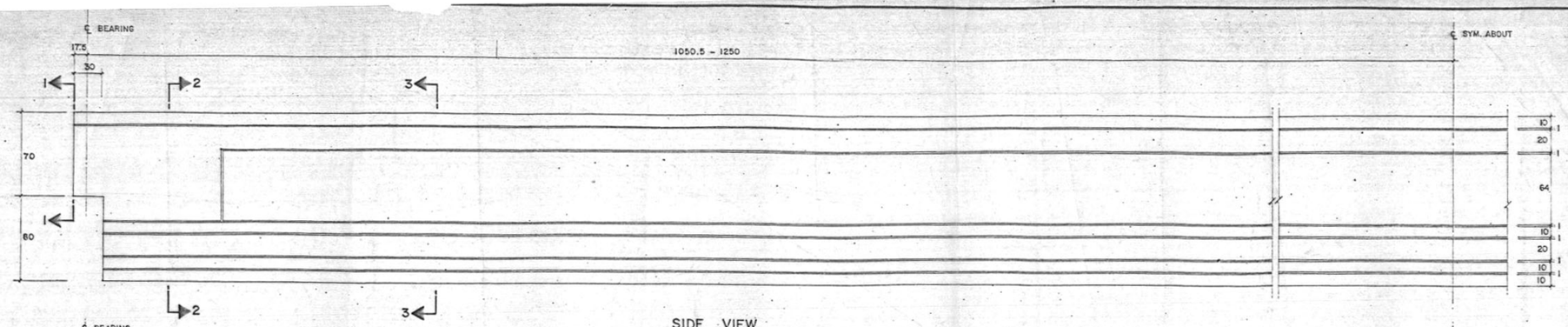


SECTION Ⓒ-Ⓒ 1:20

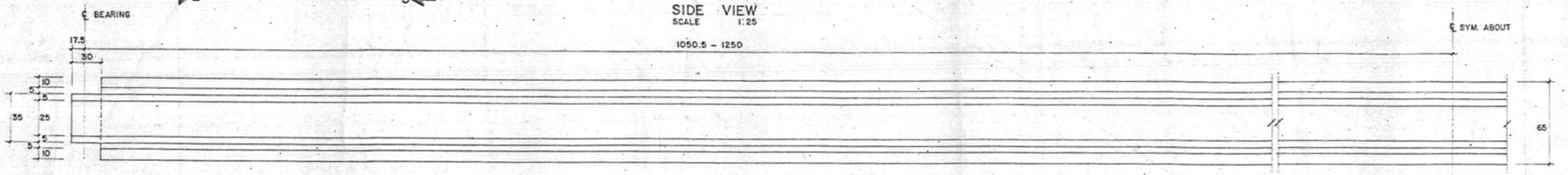
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING
PEDESTRAIN BRIDGE
CONSTRUCTION SPECIFICATION AND MISCELLENEOUS DETAILS

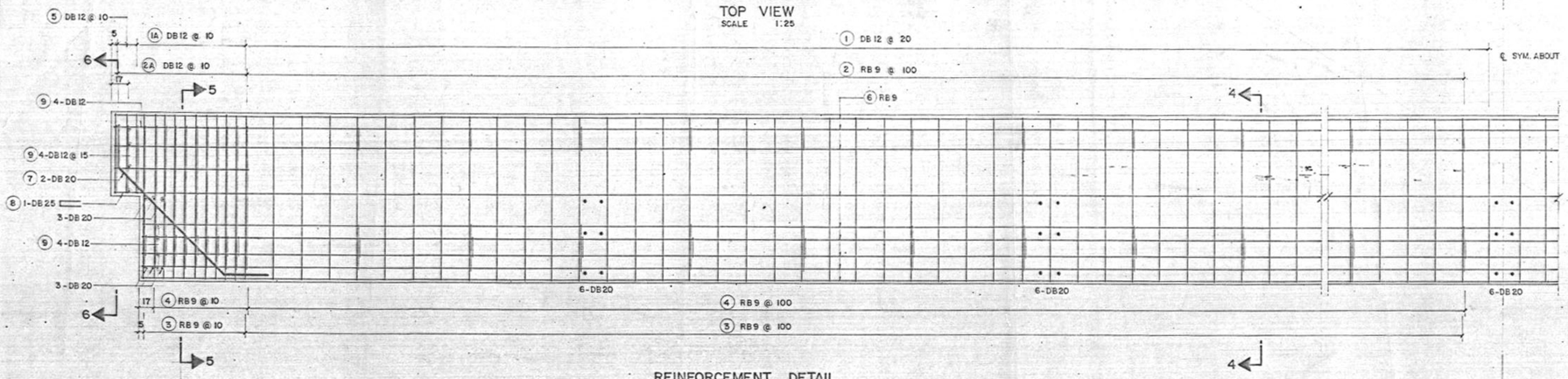
DESIGNER : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. PS-12
		SHEET NO. 21



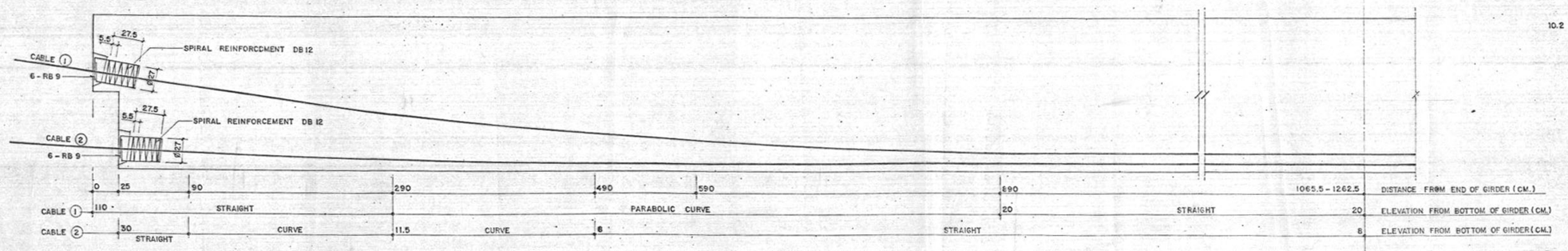
SIDE VIEW
SCALE 1:25



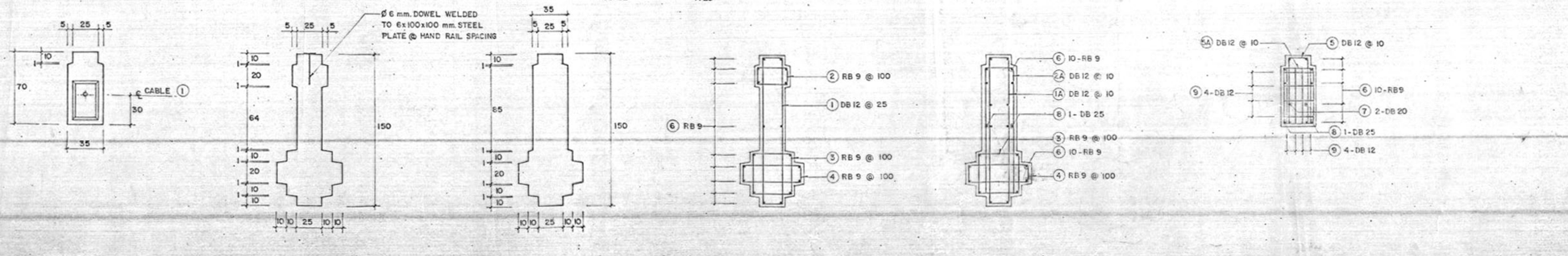
TOP VIEW
SCALE 1:25



REINFORCEMENT DETAIL
SCALE 1:25



CABLE PROFILE
SCALE 1:25



SECTION 1 – 1 SCALE 1:25

SECTION 3 – 3 SCALE 1:25

SECTION 2 – 2 SCALE 1:25

SECTION 4 – 4 SCALE 1:25

SECTION 5 – 5 SCALE 1:25

SECTION 6 – 6 SCALE 1:25

NOTES :

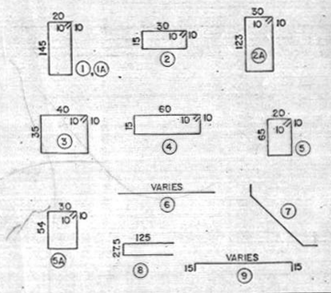
1. ALL DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. NO CHAMFERS SHALL BE PROVIDED.
3. PRESTRESSING SYSTEM SHALL CONFORM TO THE LATEST AASHTO OR BRITISH STANDARD.
4. PRESTRESSING TENDONS HAVE 2 CABLES WITH EACH BEARING LOAD NOT LESS THAN 2,200 KN. WITH THE CORRESPONDING YIELD STRENGTH AND ULTIMATE STRENGTH NOT LESS THAN 1,670 AND 1,860 $N./mm.^2$ RESPECTIVELY.
5. JACKING FORCE OF EACH CABLE SHALL BE 1,540 KN. EXCLUDING PROVISION FOR SLIPING.
6. GROUT ALL CABLE DUCTS WITH CEMENT SLURRY APPLY EPOXY RESIN TO THE RECESSES AT BOTH ENDS OF THE GIRDER JUST BEFORE FILLING THEM WITH MORTAR.
7. CLEAR CONCRETE COVER SHALL BE 3 CM. UNLESS OTHERWISE INDICATED.
8. REINFORCING STEEL
   - 8.1 ROUND BAR (RB) SHALL CONFORM TIS 20 CLASS SR 24 .
   - 8.2 DEFORMED BAR (DB) SHALL CONFORM TIS 24 CLASS SD 30 .
9. CONCRETE SHALL HAVE THE 28 DAYS MINIMUM ULTIMATE COMPRESSIVE STRENGTH , BASE ON 15 x 15 x 15 CM. CUBE SAMPLES , OF 40 $N./mm^2$ AND MAXIMUM SLUMP OF 8 CM.
10. BRIDGE BEARING
    - 10.1 BRIDGE BEARINGS SHALL BE LAMINATED BEARING CONFORMING TO THE LATEST AASHTO OR BRITISH STANDARD AND SHALL MEET WITH THE FOLLOWING PERFORMANCE REQUIREMENTS

MAX. VERT. LOAD	=	300 KN.
MIN. VERT. LOAD	=	150 KN.
HOR. LONG. LOAD (FIXED BEARING)	=	10 KN.
HOR TRANS. LOAD	=	8 KN.
HOR. MOVEMENT (FREE BEARING)	=	—
EXPANSION	=	3 MM.
CONTRACTION	=	8 MM.
ROTATION	=	0.05 RAD.

    - 10.2 BRIDGE BEARING MUST BE PLACED HORIZONTALLY. NON SHRINKAGE MATERIAL SHALL BE USED IF ANY ADJUSTMENT TO THE BRIDGE BEARING SEATINGS IS REQUIRED.

TABLE OF REINFORCEMENT

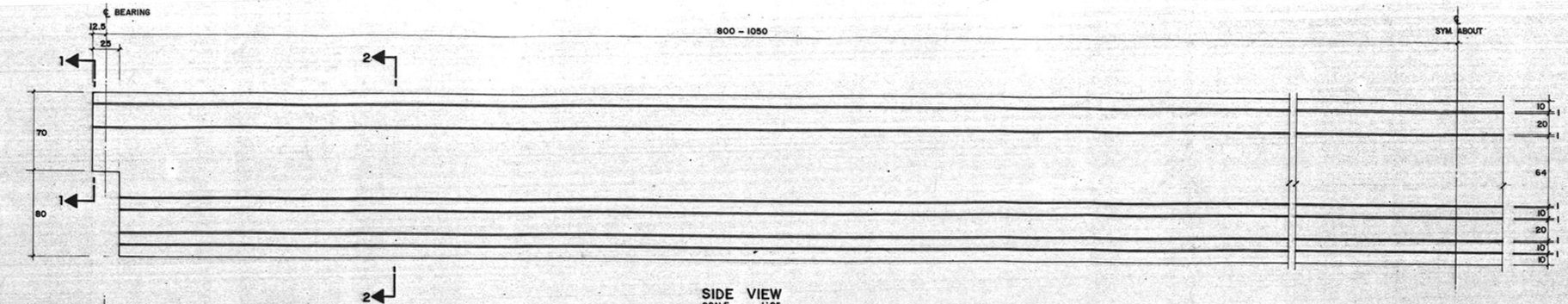
BAR MARK	BAR DIA. (MM.)	BAR BENDING DIAGRAM
(1)	DB 12	
(1A)	DB 12	
(2)	RB 9	
(2A)	DB 12	
(3)	RB 9	
(4)	RB 9	
(5)	DB 12	
(5A)	DB 12	
(6)	RB 9	
(7)	DB 20	
(8)	DB 25	
(9)	DB 12	



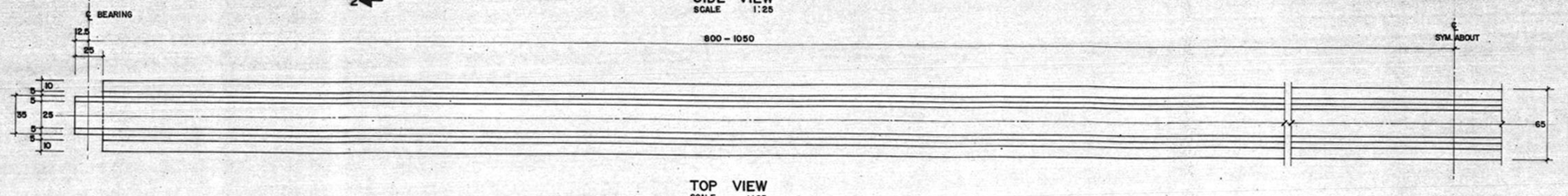
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING
PRESTRESSED CONCRETE GIRDER
FOR SPAN 21.01 – 25.00 M. (PC 8801)

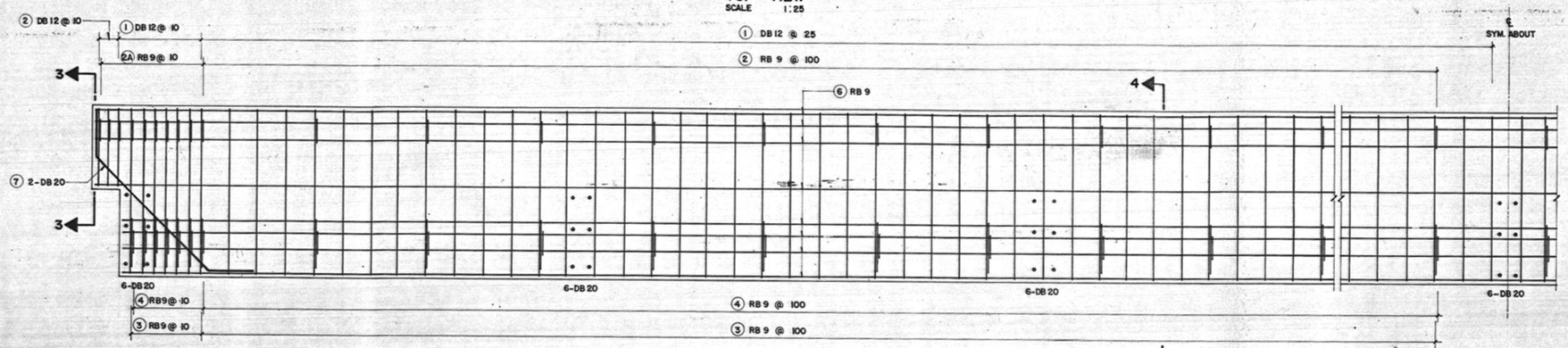
DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE	JULY 1994
SUBMITTED : P. Bunyuy. (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE	AS SHOWN
APPROVED : (DIRECTOR GENERAL)		DWG. NO.	PS-13
		SHEET NO.	212



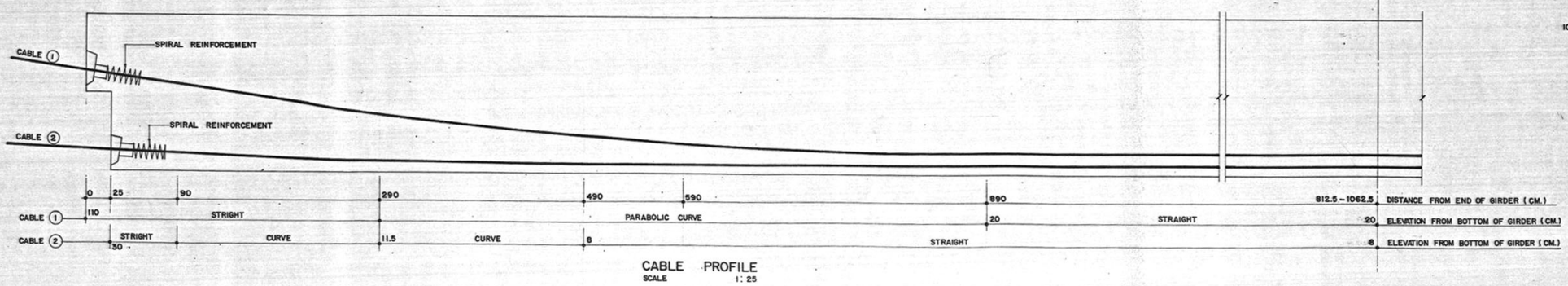
SIDE VIEW
SCALE 1:25



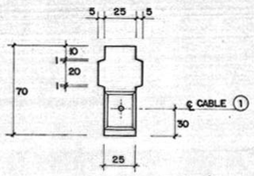
TOP VIEW
SCALE 1:25



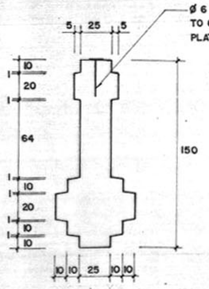
REINFORCEMENT DETAIL
SCALE 1:25



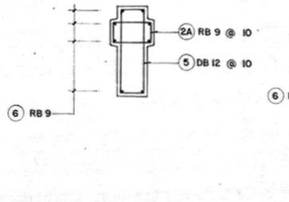
CABLE PROFILE
SCALE 1:25



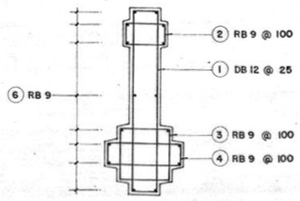
SECTION 1 – 1
SCALE 1:25



SECTION 2 – 2
SCALE 1:25



SECTION 3 – 3
SCALE 1:25



SECTION 4 – 4
SCALE 1:25

NOTES :

1. ALL DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. NO CHAMFERS SHALL BE PROVIDED.
3. PRESTRESSING SYSTEM SHALL CONFORM TO THE LATEST AASHTO OR BRITISH STANDARD.
4. PRESTRESSING TENDONS HAVE 2 CABLES WITH EACH BEARING LOAD NOT LESS THAN 1,250 KN. WITH THE CORRESPONDING YIELD STRENGTH AND ULTIMATE STRENGTH NOT LESS THAN 1,670 AND 1,860 N/mm.^{2} RESPECTIVELY.
5. JACKING FORCE OF EACH CABLE SHALL BE 875 KN. EXCLUDING PROVISION FOR SLIPING.
6. GROUT ALL CABLE DUCTS WITH CEMENT SLURRY APPLY EPOXY RESIN TO THE RECESSES AT BOTH ENDS OF THE GIRDER JUST BEFORE FILLING THEM WITH MORTAR.
7. CLEAR CONCRETE COVER SHALL BE 3 CM. UNLESS OTHERWISE INDICATED.
8. REINFORCING STEEL
   - 8.1 ROUND BAR (RB) SHALL CONFORM TIS 20 CLASS SR24.
   - 8.2 DEFORMED BAR (DB) SHALL CONFORM TIS 24 CLASS SD 30.
9. CONCRETE SHALL HAVE THE 28 DAYS MINIMUM ULTIMATE COMPRESSIVE STRENGTH, BASE ON 15 x 15 x 15 CM. CUBE SAMPLES, OF 40 N/mm.^{2} AND MAXIMUM SLUMP OF 8 CM.
10. BRIDGE BEARING
    - 10.1 BRIDGE BEARINGS SHALL BE LAMINATED BEARING CONFORMING TO THE LATEST AASHTO OR BRITISH STANDARD SHALL MEET WITH THE FOLLOWING PERFORMANCE REQUIREMENTS :

MAX. VERT. LOAD	=	250	KN.
MIN. VERT. LOAD	=	125	KN.
HOR. LONG. LOAD (FIXED BEARING)	=	10	KN.
HOR. TRANS. LOAD	=	8	KN.
HOR. MOVEMENT (FREE BEARING)	=		
EXPANSION	=	3	MM.
CONTRACTION	=	8	MM.
ROTATION	=	0.05	RAD.

    - 10.2 BRIDGE BEARING MUST BE PLACED HORIZONTALLY. NON SHRINKAGE MATERIAL SHALL BE USED IF ANY ADJUSTMENT TO THE BRIDGE BEARING SEATINGS IS REQUIRED.

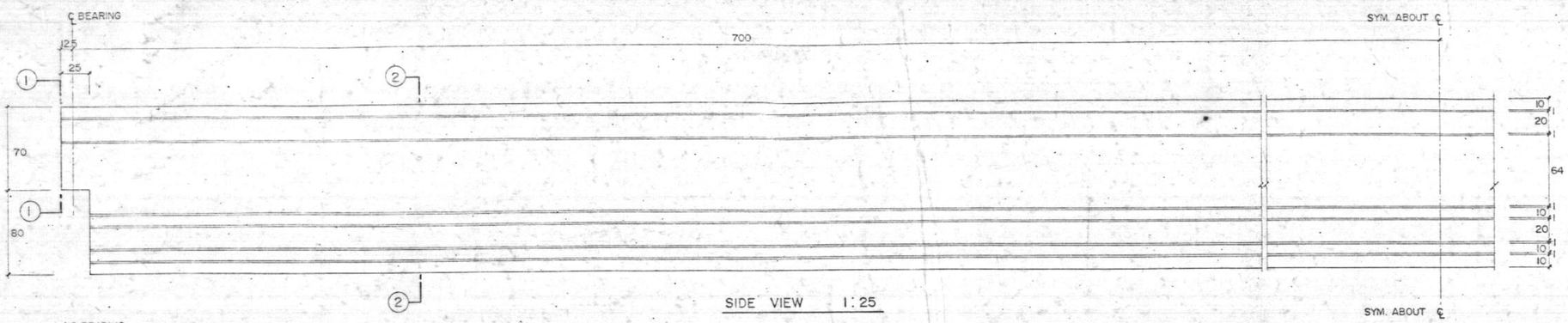
TABLE OF REINFORCEMENT

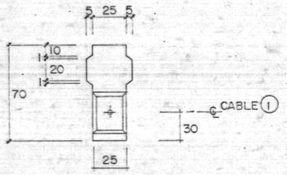
BAR MARK	BAR DIA. (MM.)	BAR BENDING DIAGRAM
①	DB 12	
② & 2A	RB 9	
③	RB 9	
④	RB 9	
⑤	DB 12	
⑥	RB 9	
⑦	DB 20	

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

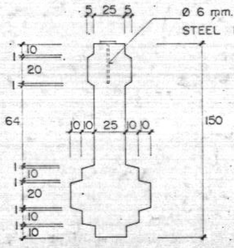
STANDARD DRAWING
PRESTRESSED CONCRETE GIRDER
FOR SPAN 16.01 – 21.00 M. (PC 8802)

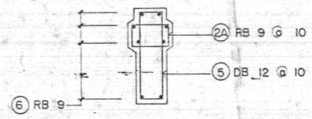
DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. PS-14
		SHEET NO. 213



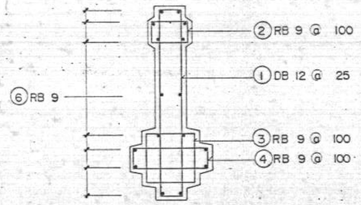


SECTION (1)-(1) 1:25





SECTION (3)-(3) 1:25



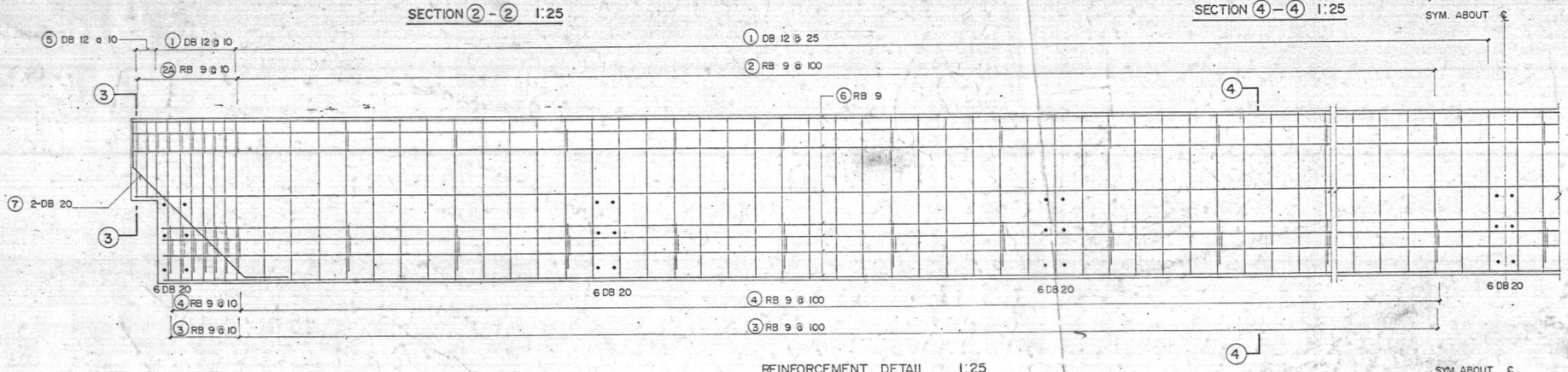
SECTION (4)-(4) 1:25

NOTES

1. ALL DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED
2. NO CHAMFERS SHALL BE PROVIDED
3. PRESTRESSING SYSTEM SHALL CONFORM TO THE LATEST AASHTO OR BRITISH STANDARD
4. PRESTRESSING TENDONS HAVE 1 CABLES WITH EACH BREAKING LOAD NOT LESS THAN 1250 KN. WITH THE CORRESPONDING YIELD STRENGTH AND ULTIMATE STRENGTH NOT LESS THAN 1670 AND 1860 N/mm^2 RESPECTIVELY
5. JACKING FORCE OF EACH CABLE SHALL BE 875 KN. EXCLUDING PROVISION FOR SLIPING.
6. GROUT ALL CABLE DUCTS WITH CEMENT SLURRY APPLY EPOXY RASIN TO THE RECESSES AT BOTH ENDS OF GIRDER JUST BEFORE FILLING THEM WITH MORTAR.
7. CLEAR CONCRETE COVER SHALL BE 3 CM. UNLESS OTHERWISE INDICATED.
8. REINFORCING STEEL
   - 8.1 ROUND BAR (RB) SHALL CONFORM TIS 20 CLASS SR 24
   - 8.2 DEFORMED BAR (DB) SHALL CONFORM TIS 24 CLASS SD 30
9. CONCRETE SHALL HAVE THE 28 DAYS MINIMUM ULTIMATE COMPRESSIVE STRENGH, BASED ON 15 x 15 x 15 CM. CUBE SAMPLES, OF 40 N/mm^2 AND MAXIMUM SLUMP OF 8 CM.
10. BRIDGE BEARING
    - 10.1 BRIDGE BEARING SHALL BE LAMINATED BEARING CONFORMING TO THE LATEST AASHTO OR BRITISH STANDARD AND SHALL MEET WITH THE FOLLOWING PERFORMANCE REQUIREMENTS.

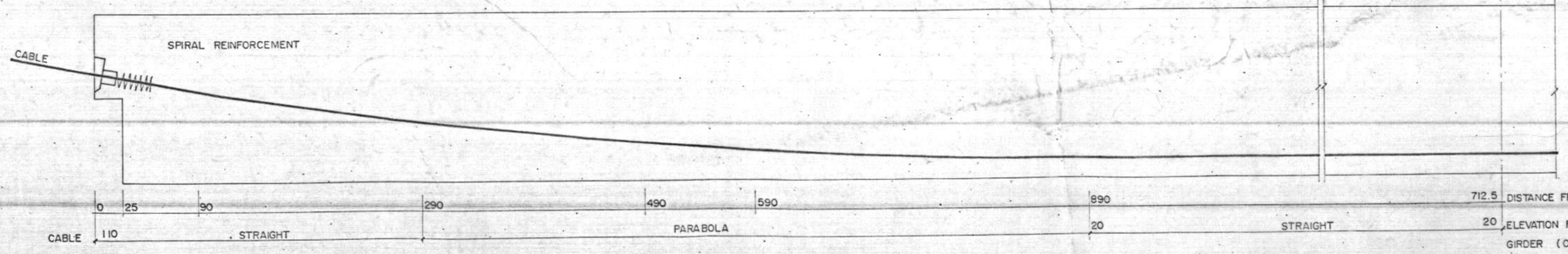
MAX. VERT. LOAD	= 200	KN.
MIN. VERT. LOAD	= 100	KN.
HOR. LONG LOAD (FIXED BEARING)	= 10	KN.
HOR. TRANS. LOAD	= 8	KN.
HOR. MOVEMENT (FREE BEARING)	= –	
EXPANSION	= 3	MM.
CONTRACTION	= 8	MM.
ROTATION	= 0.05	RAD

    - 10.2 BRIDGE BEARING MUST BE PLACED HORIZONTALLY. NON SHRINKAGE MATERIAL SHALL BE USED IF ANY ADJUSTMENT TO THE BRIDGE BEARING SEATINGS IS REQUIRED.



REINFORCEMENT DETAIL 1:25

TABLE OF REINFORCEMENT		
BAR MARK	BAR DIA. (mm.)	BAR BENDING DIAGRAM
(1)	DB 12	
(2) & (2A)	RB 9	
(3)	RB 9	
(4)	RB 9	
(5)	DB 12	
(6)	RB 9	
(7)	DB 20	



CABLE PROFILE 1:25

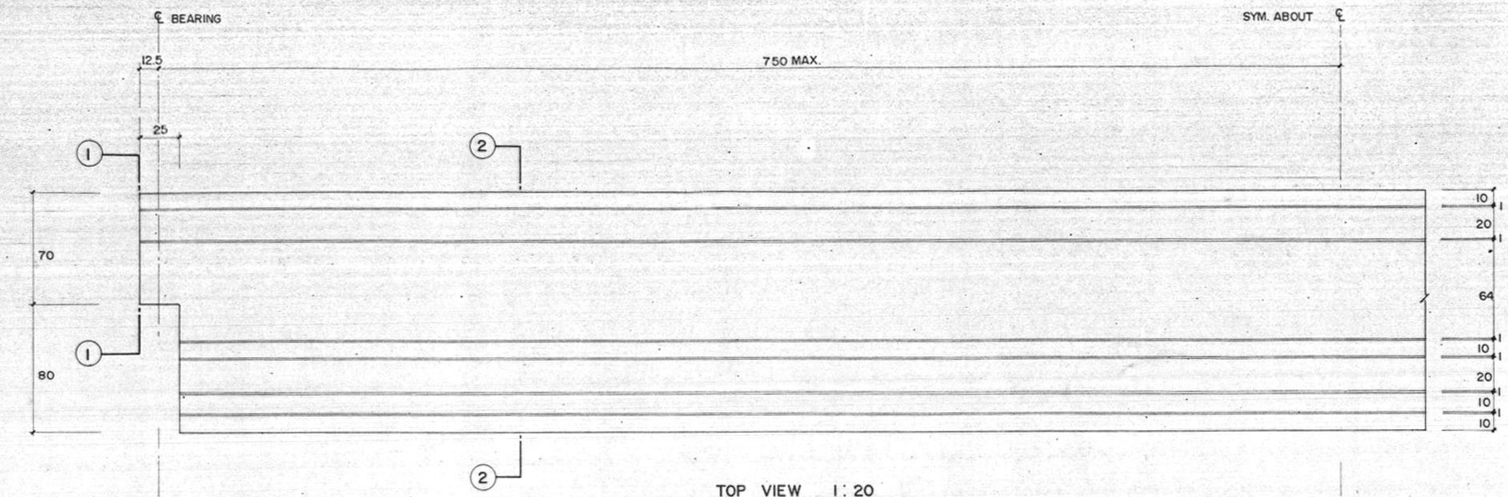
KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

PEDESTRIAN BRIDGE

PRESTRESSED CONCRETE GIRDER FOR SPAN 14.00 M. (PC-8803)

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. PS-15
		SHEET NO. 214

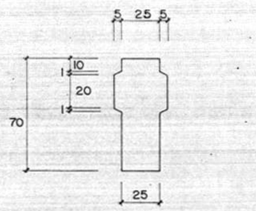


NOTES

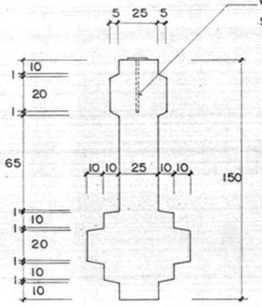
1. ALL DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED
2. NO CHAMFERED SHALL BE PROVIDED
3. REINFORCING STEEL
   - 3.1 ROUND BAR (RB) SHALL CONFORM TIS 20 CLASS SR 24
   - 3.2 DEFORMED BAR (DB) SHALL CONFORM TIS 24 CLASS SD 30
4. CONCRETE
   - 4.1 A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 30 N/mm^2 FOR A 15 x 15 x 15 CM. CUBE AT 28 DAYS
   - 4.2 CONCRETE SLUMP, MAX 8.0 CM.
5. CLEAR CONCRETE COVER SHALL BE 3.0 CM. UNLESS OTHERWISE INDICATED
6. BEARING
   - 6.1 BEARING SHALL BE LAMINATED BEARING CONFORMING TO THE LATEST AASHTO OR BRITISH STANDARDS AND SHALL MEET WITH THE FOLLDWING PERFORMANCE REQUIREMENTS

MAX VERT. LOAD	=	217 KN.
MIN VERT. LOAD	=	145 KN.
HOR. LONG LOAD (FIXED BEARING)	=	44 KN.
HOR. TRANS. LOAD	=	27 KN.
HOR. MOVEMENT	=	4 MM.
EXPANSION	=	2 MM.
CONTRACTION	=	3 MM.
ROTATION	=	0.003 RAD.

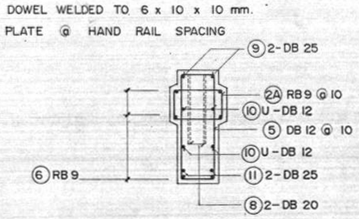
   - 6.2 BEARING MUST BE PLACED HORIZONTALLY. NON SHRINKAGE MATERIAL SHALL BE USED IF ANY ADJUSTMENT TO THE BRIDGE BEARING SEATINGS IS REQUIRED.
7. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR FOR PLAIN BAR AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BAR.



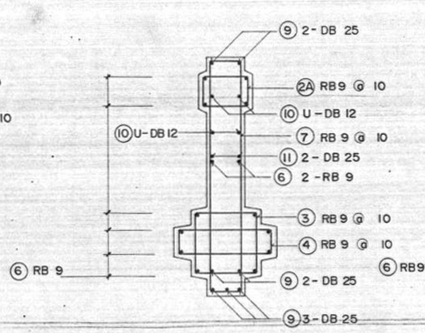
SECTION ①-① 1 : 20



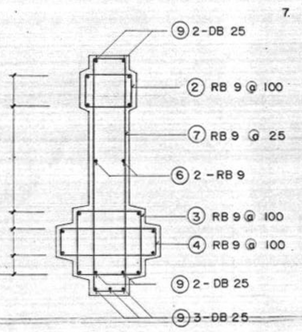
SECTION ②-② 1 : 20



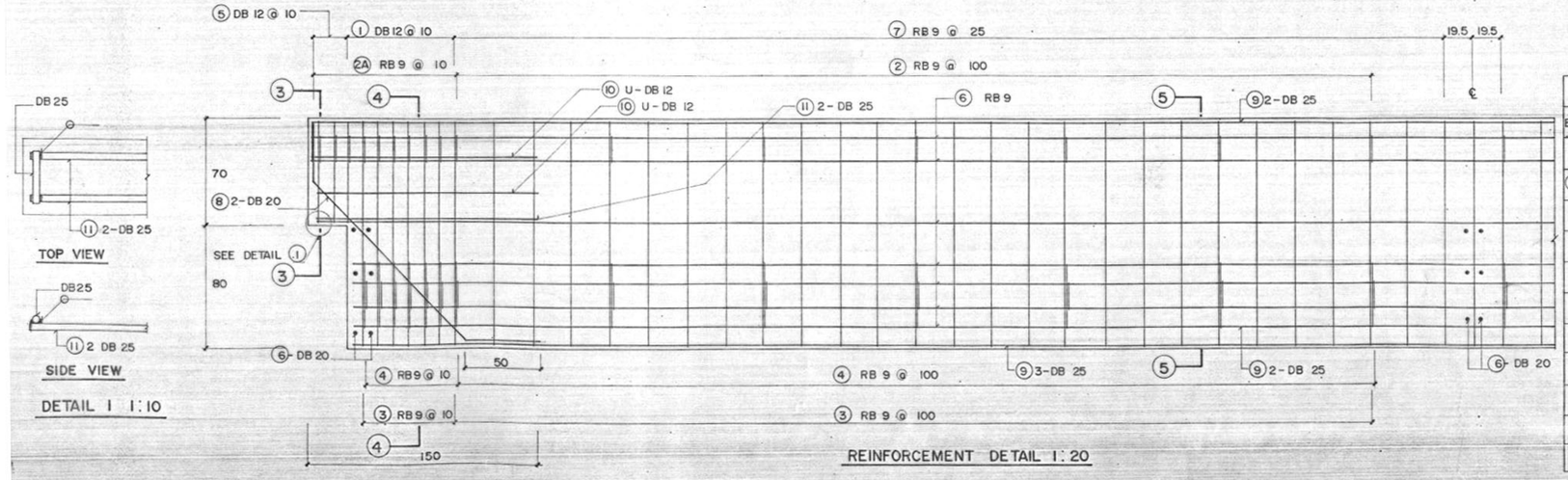
SECTION ③-③ 1 : 20



SECTION ④-④ 1 : 20



SECTION ⑤-⑤ 1 : 20



REINFORCEMENT DETAIL 1 : 20

TABLE OF REINFORCEMENT

BAR MARK	BAR DIA. (mm.)	BAR BENDING DIAGRAM
①	DB 12	
② & 2A	RB 9	
③	RB 9	
④	RB 9	
⑤	DB 12	
⑥	RB 9	
⑦	RB 9	
⑧	DB 20	
⑨	DB 25	
⑩	DB 12	
⑪	DB 25	

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

STANDARD DRAWING

PEDESTRIAN BRIDGE

REINFORCED CONCRETE GIRDER FOR SPAN = 15.00 M. (RC-920/1)

DESIGNED : DOH & CONSULTANTS	CHECKED :	DATE JULY 1994
SUBMITTED : (DIRECTOR OF LOCATION & DESIGN DIVISION)		SCALE AS SHOWN
APPROVED : FOR (DIRECTOR GENERAL)		DWG. NO. PS-16
		SHEET NO. 215