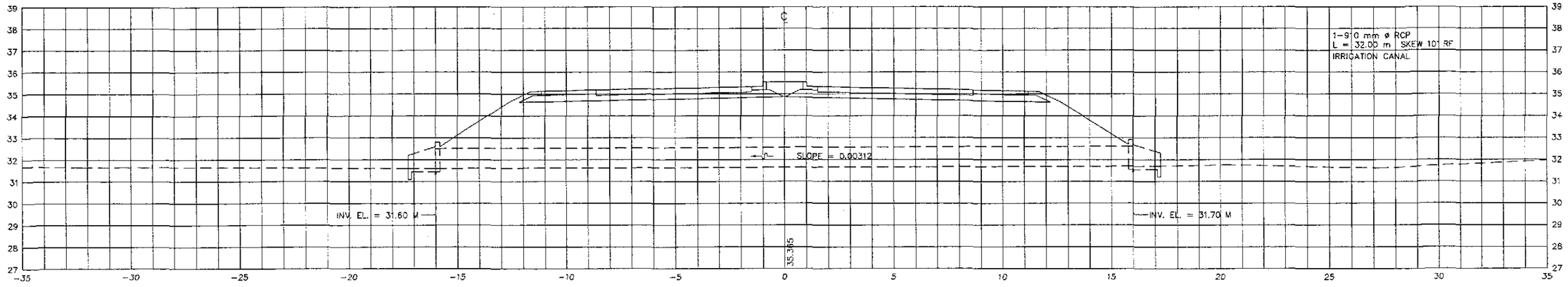
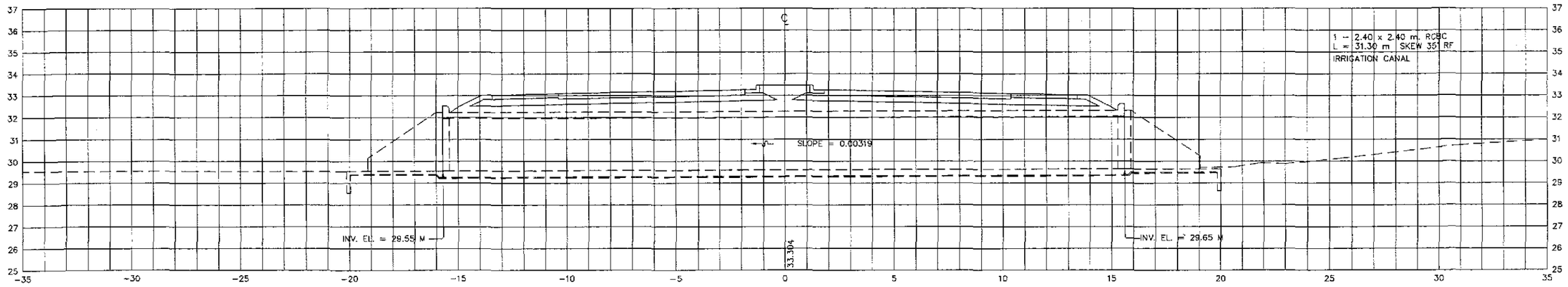
DRAINAGE

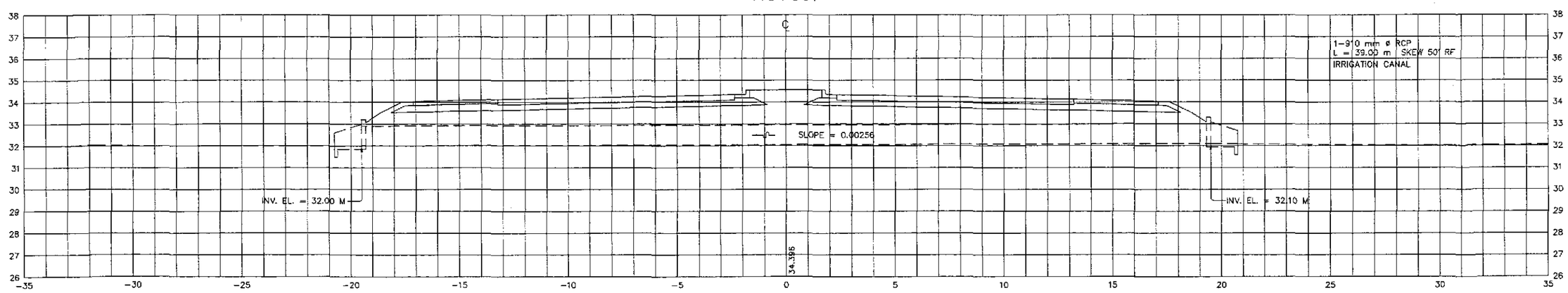
121+128



119+241



119+007



JICA
JAPAN INTERNATIONAL COOPERATION AGENCY

KEI KATAHIRA & ENGINEERS INTERNATIONAL
YEC YACHIYO ENGINEERING CO., LTD.

	DATE	SIGNATURE
DESIGNED	10/14/02	
CHECKED	10/17/02	H. TAKIMI
SUBMITTED	10/19/02	M. KUROKI TEAM LEADER

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

PJHL - PMO	BUREAU OF DESIGN		OFFICE OF THE SECRETARY	
Submitted By:	Reviewed By:	Recommended By:	Recommended By: (See cover sheet for Signature)	Approved By: (See cover sheet for Signature/Approval)
DANILO C. TRAJANO	JOSEFINA M. ALAGAR	GILBERTO S. REYES	MANUEL M. BONOAN	SIMEON A. DATUMANONG
Project Director	Chief, Highways Division	OIC, Director IV	Undersecretary	Secretary

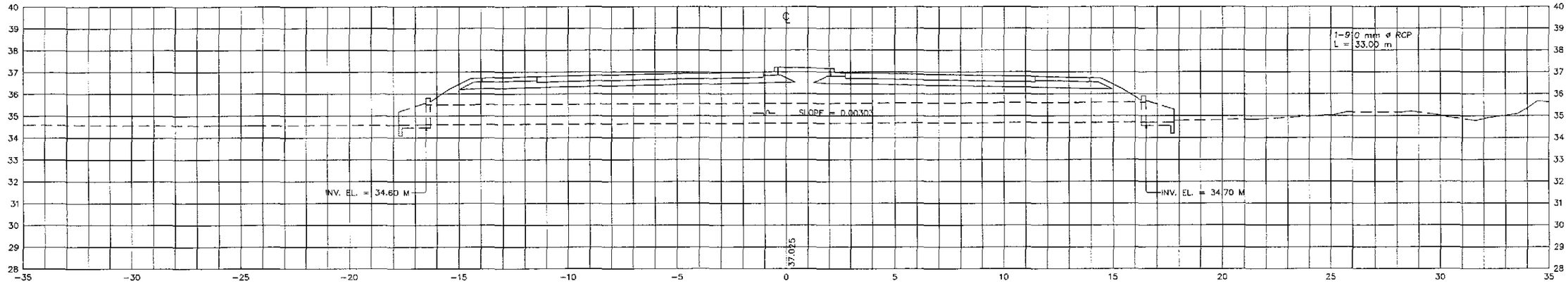
PROJECT AND LOCATION :
THE DETAILED DESIGN STUDY ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)
CABANATUAN BYPASS - CONTRACT PACKAGE III

SCALE : 1:100 FULL SIZE A1

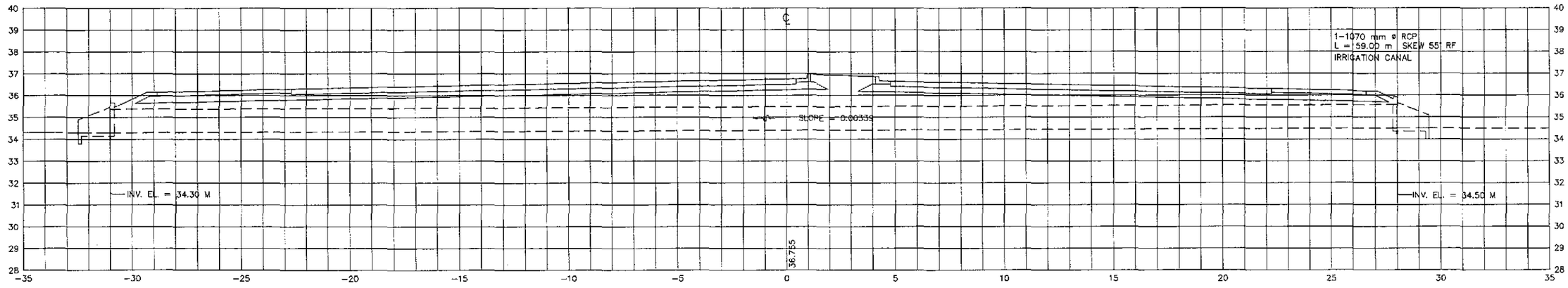
SHEET CONTENTS :
DRAINAGE CROSS-SECTION
ALONG BYPASS (ULTIMATE STAGE)
STA. 119+007 - STA. 121+128

SHEET NO. : DC-01

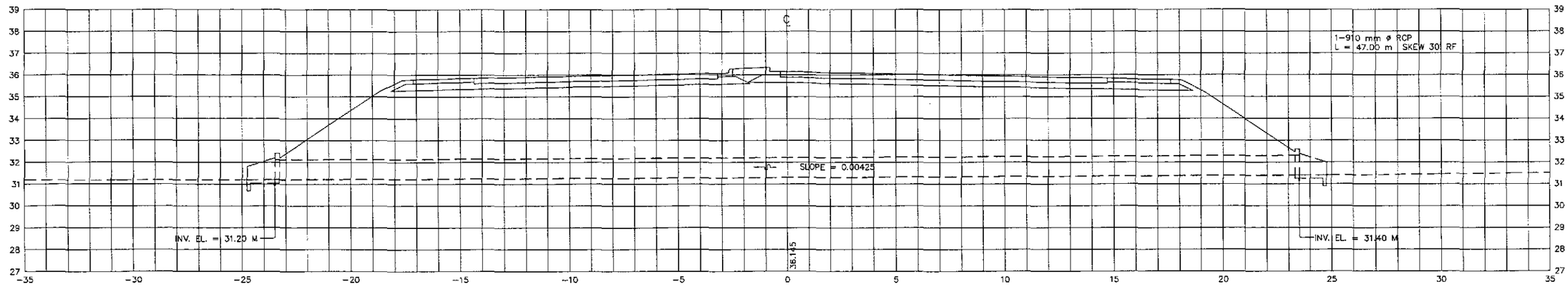
121+460



121+406



121+284



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KATAHIRA & ENGINEERS INTERNATIONAL
YACHIYO ENGINEERING CO., LTD.

	DATE	SIGNATURE
DESIGNED	9/12/00	F. STA. MARIA
CHECKED	10/17/00	
SUBMITTED	10/19/00	TEAM LEADER

REPUBLIC OF THE PHILIPPINES
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CABANATUAN BYPASS - CONTRACT PACKAGE III

SCALE : 1:100 FULL SIZE A1

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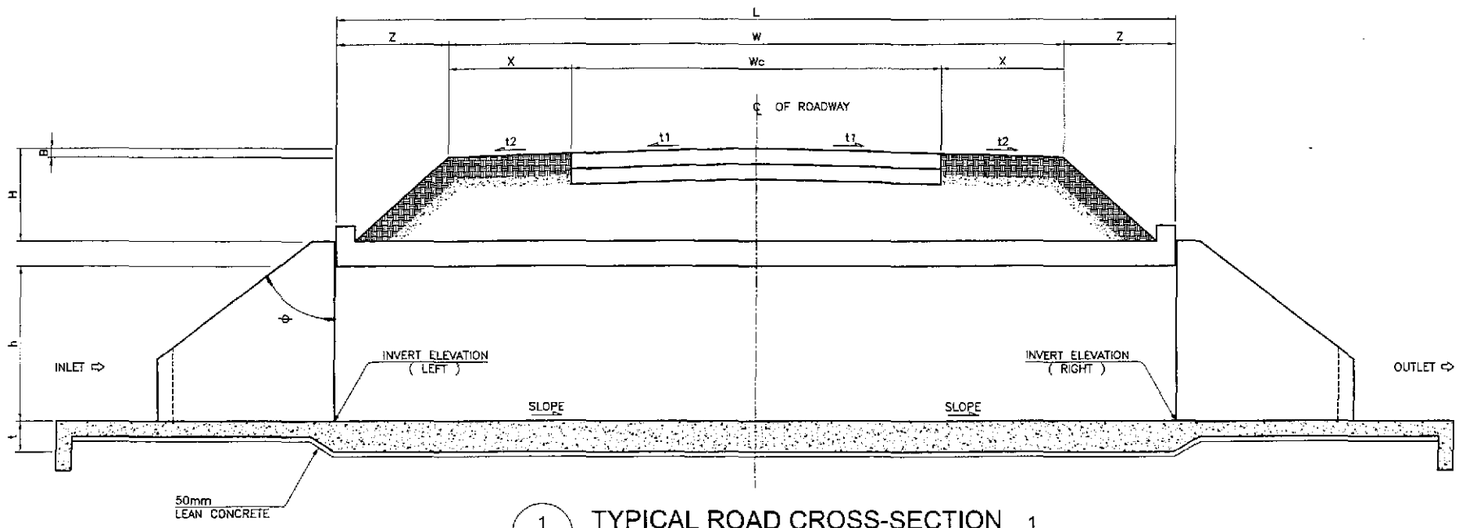
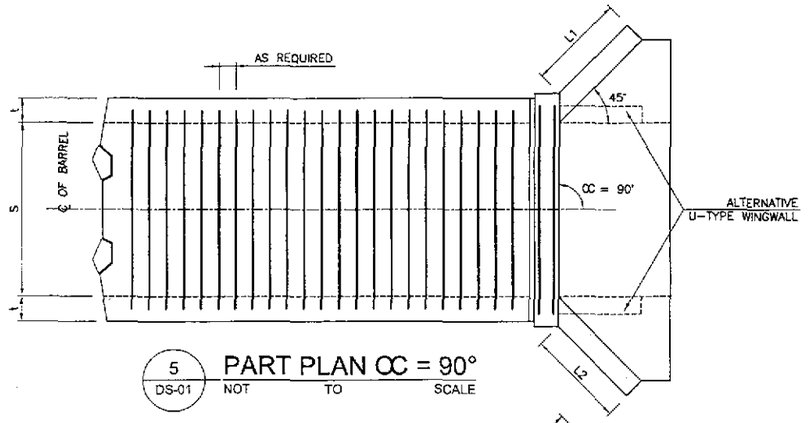
DRAINAGE CROSS-SECTION
ALONG BYPASS (ULTIMATE STAGE)
STA. 121+284 - STA. 121+460

SHEET NO. : DC-02



1 DS-01 TYPICAL ROAD CROSS-SECTION 1 NOT TO SCALE



5 DS-01 PART PLAN CC = 90° NOT TO SCALE

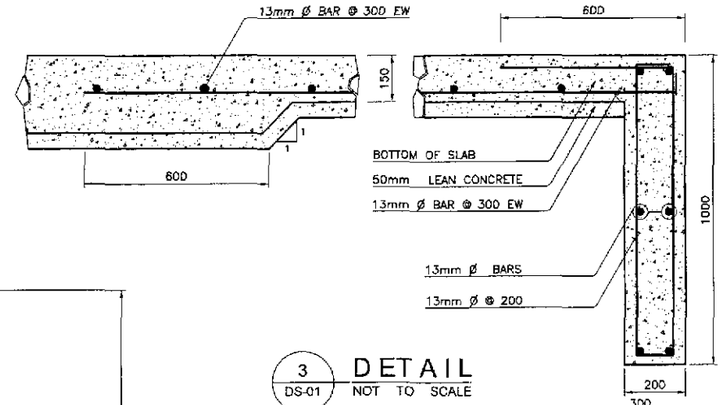
LEGEND :

W	—	WIDTH OF ROADWAY FORMATION
X	—	WIDTH OF SHOULDER
Wc	—	WIDTH OF CARRIAGEWAY
H	—	COVER ABOVE THE CULVERT
L	—	TOTAL LENGTH OF BARREL
t1	—	SLOPE OF CARRIAGEWAY
t2	—	SLOPE OF SHOULDER
Z	—	[(H+t) – (B+200)] tan Θ
B	—	$xt_2+0.5t_1Wc$
h	—	HEIGHT OF CULVERT OPENING
t	—	THICKNESS OF CULVERT WALL OR SLAB
Θ	—	SLOPE OF EMBANKMENT
CC	—	ANGLE OF SKEW

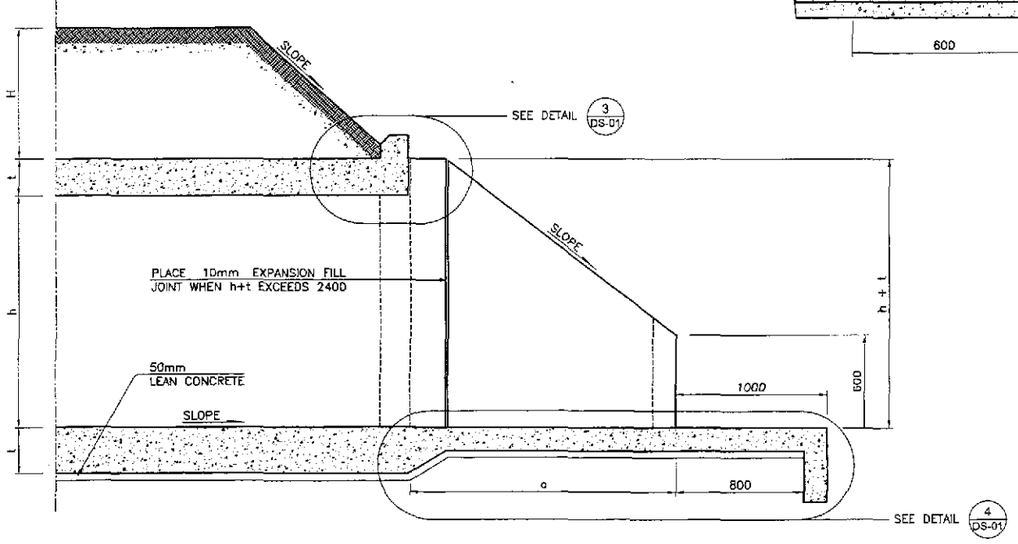
HORIZONTAL SKEW ANGLE CC	L (mm)
90°	W+2tan Θ [(H+t) – (B+200)]
60°	1.1547 (W+2tan Θ [(H+t)–(B+200)])
45°	1.4142 (W+2tan Θ [(H+t)–(B+200)])

NOTES:

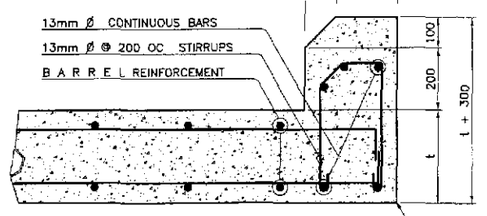
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
3. MINIMUM CONCRETE COVER SHALL BE 40 CLEAR, WHEN HEIGHT OF FILL H=0 INCREASE COVER BY 30.



3 DS-01 DETAIL NOT TO SCALE

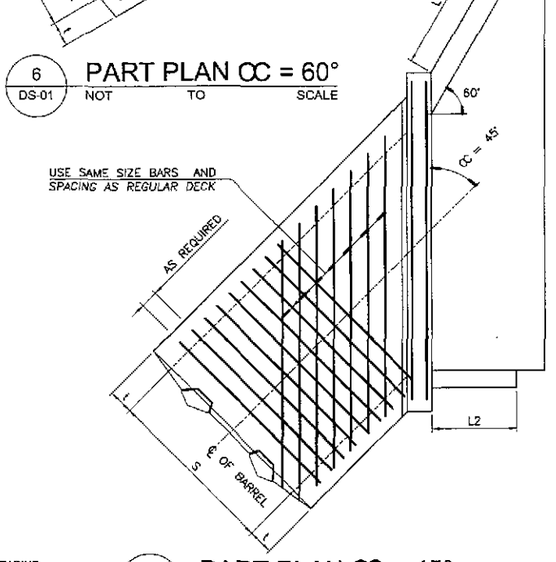


2 DS-01 PART SECTION ALONG ℄ OF CULVERT NOT TO SCALE



4 DS-01 DETAIL NOT TO SCALE

6 DS-01 PART PLAN CC = 60° NOT TO SCALE



7 DS-01 PART PLAN CC = 45° NOT TO SCALE

STANDARD DETAILS OF REINFORCED CONCRETE BOX CULVERT (RCBC)

JICA JAPAN INTERNATIONAL COOPERATION AGENCY

KEI KATAHIRA & ENGINEERS INTERNATIONAL — YEC YACHIYO ENGINEERING CO., LTD.

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

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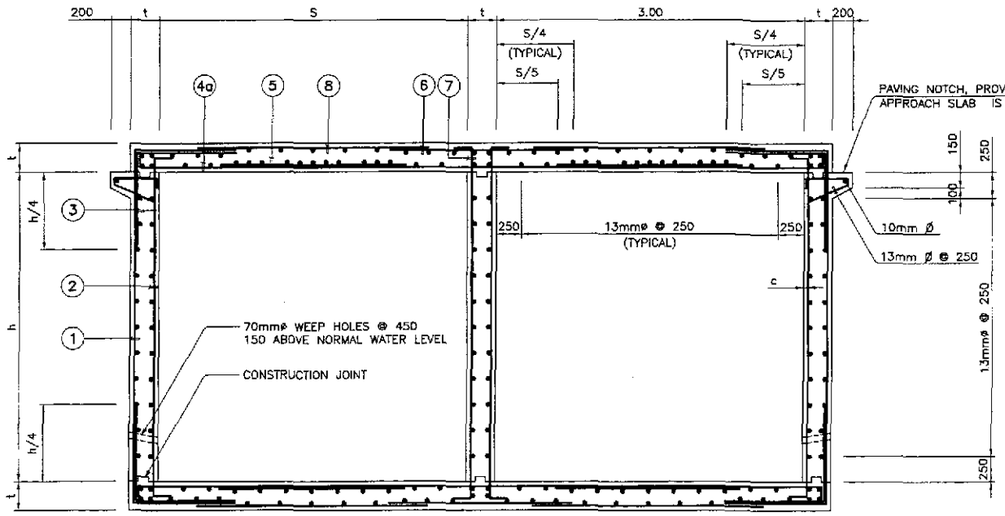
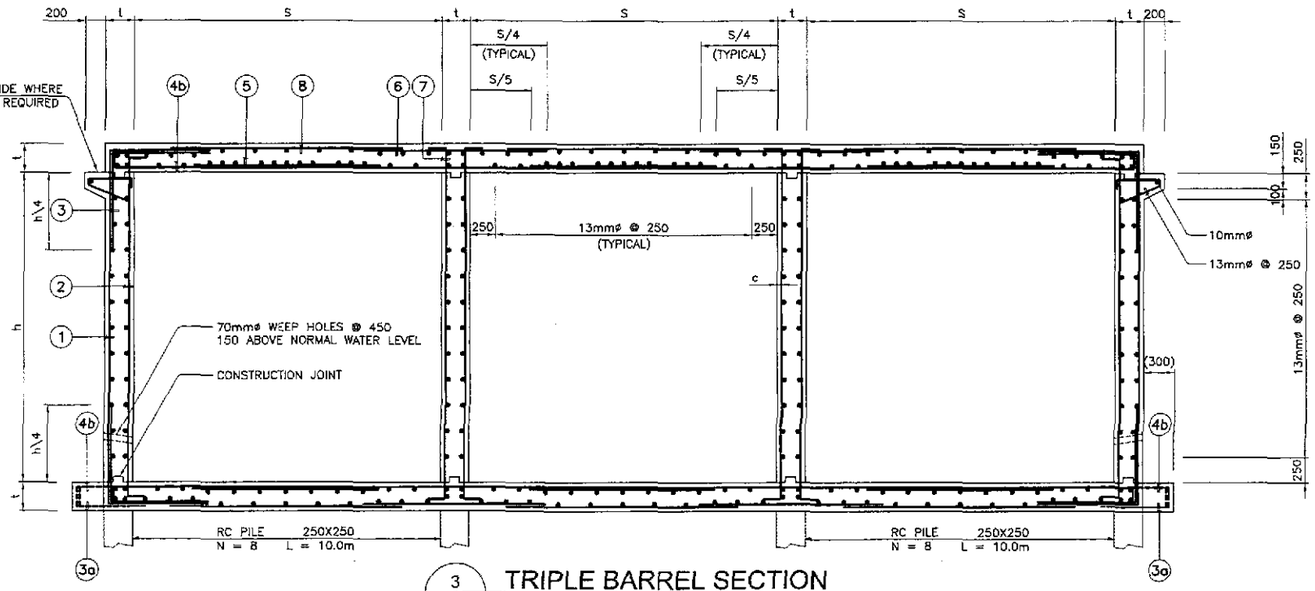
DESIGNED	10/14/02	F. STA. MARIA	Submitted By:	Reviewed By:	Recommended By:	Recommended By: (See cover sheet for Signature)	Approved By: (See cover sheet for Signature/Approval)
CHECKED	10/17/02		DANILO C. TRAJANO	JOSEFINA M. ALAGAR	GILBERTO S. REYES	MANUEL M. BONOAN	SIMEON A. DATUMANONG
SUBMITTED	10/18/02	TEAM LEADER	Project Director	Chief, Highways Division	OIC, Director IV	Undersecretary	Secretary

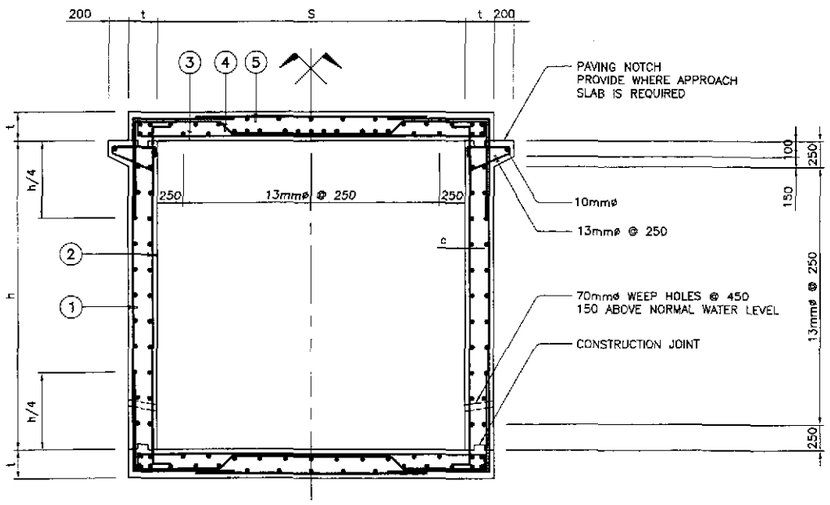
PROJECT AND LOCATION :	SCALE :	SHEET CONTENTS :	SHEET NO. :
THE DETAILED DESIGN STUDY ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)	1:100	STANDARD DETAILS OF REINFORCED CONCRETE BOX CULVERT (RCBC)	DS-01
CABANATUAN BYPASS - CONTRACT PACKAGE III	FULL SIZE A1		



2 DS-02 **DOUBLE BARREL SECTION**
SCALE 1:30



3 DS-02 **TRIPLE BARREL SECTION**
SCALE 1:30



1 DS-02 **SINGLE BARREL SECTION**
SCALE 1:30

NOTE:

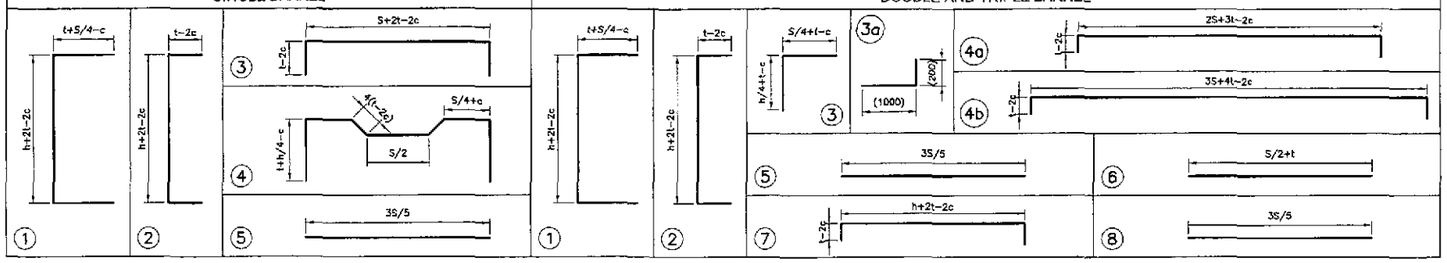
FOR WALL THICKNESS LESS THAN 240, STAGGER HORIZONTAL REINFORCEMENT AS SHOWN.

LEGEND:

c = CONCRETE CLEAR COVER (50mm)

ADDITIONAL REBARS IF FILL IS LESS THAN 600mm

BAR BENDING DIAGRAM



CLEAR SPAN S	HEIGHT h	SINGLE BARREL BOX CULVERT t	BAR 1 Ø	BAR 1 SPACING	BAR 2 Ø	BAR 2 SPACING	BAR 3 Ø	BAR 3 SPACING	BAR 4 Ø	BAR 4 SPACING	BAR 5 Ø	BAR 5 SPACING
1250	1000	180	13	300	13	300	13	300	13	300	13	300
	1250	180	13	300	13	300	13	300	13	300	13	300
	1500	180	13	300	13	280	13	300	13	300	13	300
	1800	180	13	300	13	260	13	300	13	300	13	300
1500	1000	180	16	240	16	300	16	240	16	240	13	300
	1250	180	16	240	16	300	16	240	16	240	13	300
	1500	180	16	240	16	280	16	240	16	240	13	300
	1800	180	16	240	16	280	16	240	16	240	13	300
1800	1250	200	16	260	16	300	16	260	16	260	13	280
	1500	200	16	260	16	300	16	260	16	260	13	280
	1800	200	16	260	16	280	16	260	16	260	13	280
	2100	200	16	260	16	260	16	260	16	260	13	280
2400	1800	220	16	220	16	280	16	220	16	220	13	240
	2100	220	16	220	16	260	16	220	16	220	13	240
	2400	220	16	220	16	200	16	220	16	220	13	240
	2750	*220*	*16*	*200*	*16*	*180*	*16*	*200*	*16*	*200*	*13*	*240*
3000	2100	280	16	260	16	260	16	260	16	260	13	200
	2400	280	16	260	16	260	16	260	16	260	13	200
	2750	280	16	200	16	240	16	220	16	200	13	200
	3000	280	16	200	16	220	16	200	16	200	13	200
4000	2500											

DOUBLE AND TRIPLE BARREL BOX CULVERT t	BAR 1 Ø	BAR 1 SPACING	BAR 2 Ø	BAR 2 SPACING	BAR 3 Ø	BAR 3 SPACING	BAR 4 Ø	BAR 4 SPACING	BAR 5 Ø	BAR 5 SPACING	BAR 6 Ø	BAR 6 SPACING	BAR 7 Ø	BAR 7 SPACING	BAR 8 Ø	BAR 8 SPACING
180	13	300	13	300	13	300	13	300	13	300	20	200	13	300	13	300
180	13	300	16	300	13	300	13	300	13	300	20	200	13	300	13	300
180	13	300	16	280	13	300	13	300	13	300	20	200	13	300	13	300
180	13	300	16	260	13	300	13	300	13	300	20	200	13	300	13	300
200	16	300	16	300	16	300	16	300	16	300	20	200	13	300	13	280
200	16	300	16	300	16	300	16	300	16	300	20	200	13	300	13	280
200	16	300	16	280	16	300	16	300	16	300	20	200	13	300	13	280
200	16	300	16	260	16	300	16	300	16	300	20	200	13	300	13	280
250	16	300	16	300	16	300	16	300	16	300	20	190	13	300	13	220
250	16	300	16	280	16	300	16	300	16	300	20	190	13	300	13	220
250	16	300	16	280	16	*300*	16	300	16	300	20	190	13	300	13	220
250	16	300	16	260	16	300	16	300	16	300	20	190	13	300	13	220
300	16	300	16	280	16	300	16	300	16	300	20	120	13	300	13	200
300	16	300	16	280	16	300	16	300	16	300	20	120	13	300	13	200
300	16	300	16	280	16	300	16	300	16	300	20	120	13	300	13	200
300	*16*	*300*	*16*	*280*	*16*	*300*	*16*	*300*	*16*	*300*	*20*	*120*	*13*	*300*	*13*	*200*
300	20	300	16	280	20	300	20	300	20	300	25	170	13	300	13	200
300	20	300	16	280	20	300	20	300	20	300	25	170	13	300	13	200
300	20	300	16	200	20	300	20	300	20	300	25	170	16	300	13	200
300	20	300	16	200	20	300	20	300	20	300	25	170	16	300	13	200
300	20	300	16	200	20	300	20	300	20	300	25	170	16	300	13	200

STANDARD DETAILS OF REINFORCED CONCRETE BOX CULVERT (RCBC) BARRELS

JICA JAPAN INTERNATIONAL COOPERATION AGENCY

KEI KATAHIRA & ENGINEERS INTERNATIONAL — YEC YACHIYO ENGINEERING CO., LTD.

	DATE	SIGNATURE
DESIGNED	10/19/12	F. SIA
CHECKED	10/19/12	H. ARAKI
SUBMITTED	10/19/12	TEAM LEADER

REPUBLIC OF THE PHILIPPINES
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THE DETAILED DESIGN STUDY ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)	1:30	STANDARD DETAILS OF RCBC BARRELS	DS-02
CABANATUAN BYPASS - CONTRACT PACKAGE III	FULL SIZE A1		

QUANTITIES FOR STANDARD BOX CULVERTS

CLEAR SPAN S	CLEAR HEIGHT h	QUANTITY PER METER OF BARREL – SINGLE CONCRETE (m3)	SINGLE REINFORCEMENT (kg)	DOUBLE CONCRETE (m3)	DOUBLE REINFORCEMENT (kg)	TRIPLE CONCRETE (m3)	TRIPLE REINFORCEMENT (kg)
1250	1000	0.94	113.32	1.63	209.22	2.33	296.18
	1250	1.03	121.63	1.77	216.22	2.51	312.38
	1500	1.12	130.98	1.90	232.07	2.69	330.39
	1800	1.23	141.71	2.07	249.50	2.91	352.09
1500	1000	1.03	165.90	2.04	253.90	2.92	354.80
	1250	1.12	177.10	2.19	256.00	3.12	370.20
	1500	1.21	189.60	2.34	279.60	3.32	387.10
	1800	1.32	202.50	2.52	296.20	3.56	407.10
1800	1250	1.38	189.20	3.11	312.30	4.45	437.00
	1500	1.48	199.90	3.30	326.10	4.70	454.00
	1800	1.60	214.80	3.53	342.80	5.00	475.20
	2100	1.72	239.60	3.75	357.50	5.30	494.40
2400	1800	2.04	272.70	5.04	431.80	7.20	619.10
	2100	2.17	288.50	5.31	447.30	7.56	637.10
	2400	2.31	314.10	5.58	461.80	7.92	656.40
	2750	2.46	356.70	5.90	478.60	8.34	677.70
3000	2100	3.17	308.70	6.03	635.70	8.64	899.70
	2400	3.34	321.30	6.30	652.00	9.00	919.60
	2750	3.53	374.40	6.62	705.60	9.42	895.00
	3000	3.67	413.50	6.84	721.60	9.72	1015.40

QUANTITIES FOR STANDARD WINGWALLS

m (meter)	h+t (meter)	L (meter)	QUANTITY PER WINGWALL AND APRON SLAB – SINGLE CONCRETE (m3)	SINGLE REINFORCEMENT (kg)	DOUBLE CONCRETE (m3)	DOUBLE REINFORCEMENT (kg)	TRIPLE CONCRETE (m3)	TRIPLE REINFORCEMENT (kg)
1.37	1.18	1.23	2.41	150	2.94	180	3.48	220
1.75	1.43	1.76	3.48	220	4.08	265	4.72	300
2.12	1.68	2.29	4.66	300	5.36	350	6.06	395
2.57	1.98	2.93	6.22	405	7.01	450	7.80	500
1.37	1.18	1.23	2.50	140	3.26	180	3.88	220
1.75	1.43	1.76	3.69	210	4.42	250	5.16	290
2.12	1.68	2.29	4.78	270	5.73	320	6.56	360
2.57	1.98	2.93	6.35	350	7.42	410	8.37	460
1.78	1.45	1.80	3.81	210	4.98	280	5.90	330
2.15	1.70	2.33	5.03	280	6.33	350	7.36	400
2.60	2.00	2.97	6.48	360	8.09	450	9.26	510
3.05	2.30	3.61	8.37	460	10.00	550	11.31	620
2.63	2.02	3.01	7.08	390	9.14	500	10.71	590
3.08	2.32	3.65	9.28	510	11.61	640	13.37	740
3.53	2.62	4.28	11.42	630	13.98	770	15.92	880
4.06	2.97	5.03	14.17	780	17.90	990	19.15	1050
3.17	2.38	3.78	10.08	560	12.38	680	14.53	800
3.62	2.68	4.41	12.30	680	14.83	820	17.19	940
4.15	3.03	5.15	15.15	840	17.94	990	20.57	1130
4.52	3.28	5.68	17.34	960	20.33	1120	23.15	1270

GENERAL NOTES :

SPECIFICATION :

AASHTO STANDARD SPECIFICATION FOR HIGHWAY BRIDGES, 16th EDITION 1996.

DESIGN LOAD :

LIVE LOAD MS-18 (HS 20-44)

CONCRETE :

ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSION STRENGTH IN 28 DAYS OF f'c = 20.7 MPa (3000psi). ALL EXPOSED CORNERS TO BE CHAMFERED 20 MINIMUM. NO CONSTRUCTION JOINT ARE TO BE MADE EXCEPT WHERE SHOWN. WHEN BOTTOM SLAB IS SUBJECT TO ABRASION ADD 25mm TO BOTTOM SLAB TO INCREASE COVERAGE ON STEEL.

STEEL REINFORCEMENT :

ALL REINFORCING STEEL TO BE INTERMEDIATE (GRADE 40) ASTM A-615 WITH DEFORMATIONS CONFORMING TO ASTM A-305.

GENERAL :

IN STATING CULVERT SIZE, GIVE SPAN BY HEIGHT (SPAN FIRST) WHEN HEIGHT OF FILL, H=0 THE TOP OF SURFACE OF THE UPPER SLAB SHALL FOLLOW THE CROWN OF THE FINISHED ROADWAY. THE BOX CULVERT SHALL BE CONSTRUCTED ON A LAYER OF LEAN CONCRETE 50mm MINIMUM THICKNESS.

LIVE LOAD DISTRIBUTION REINFORCEMENT :

WHEN THERE IS LESS THAN 600mm OF FILL ABOVE TOP SLAB OF CULVERT ADDITIONAL REINFORCEMENT TRANSVERSE TO THE MAIN REINFORCEMENT IS ADDED TO THE BOTTOM OF THE TOP SLAB IN ACCORDANCE WITH AASHTO 1.3.2.E.

HEIGHT OF FILL :

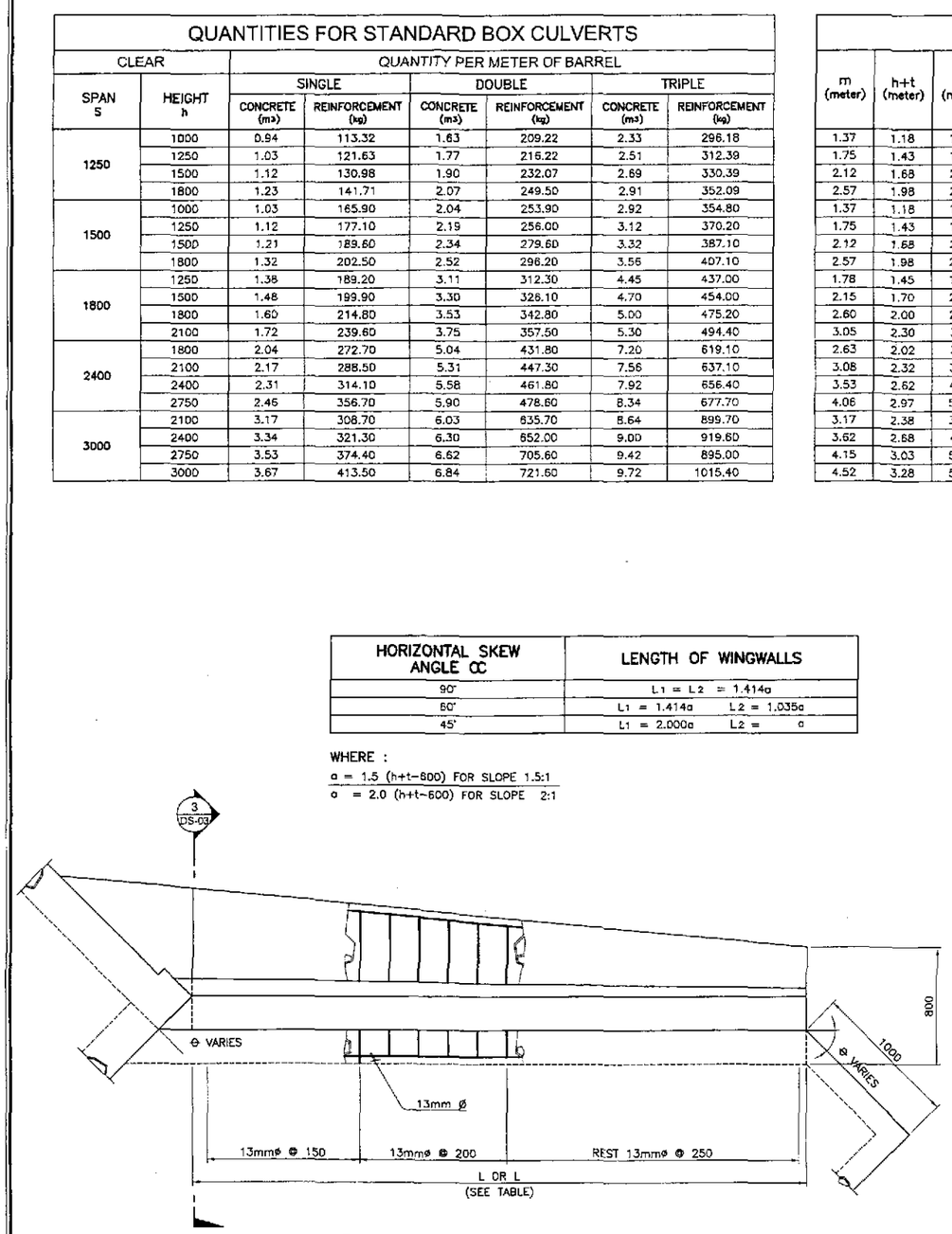
MAXIMUM HEIGHT OF FILL IS 3000mm ABOVE TOP SLAB, FOR HEIGHT OF FILL GREATER THAN 3000mm SPECIAL DESIGN OF BOX CULVERT SHOULD BE DONE.

HORIZONTAL SKEW ANGLE ∝	LENGTH OF WINGWALLS
90°	L1 = L2 = 1.414a
60°	L1 = 1.414a L2 = 1.035a
45°	L1 = 2.000a L2 = a

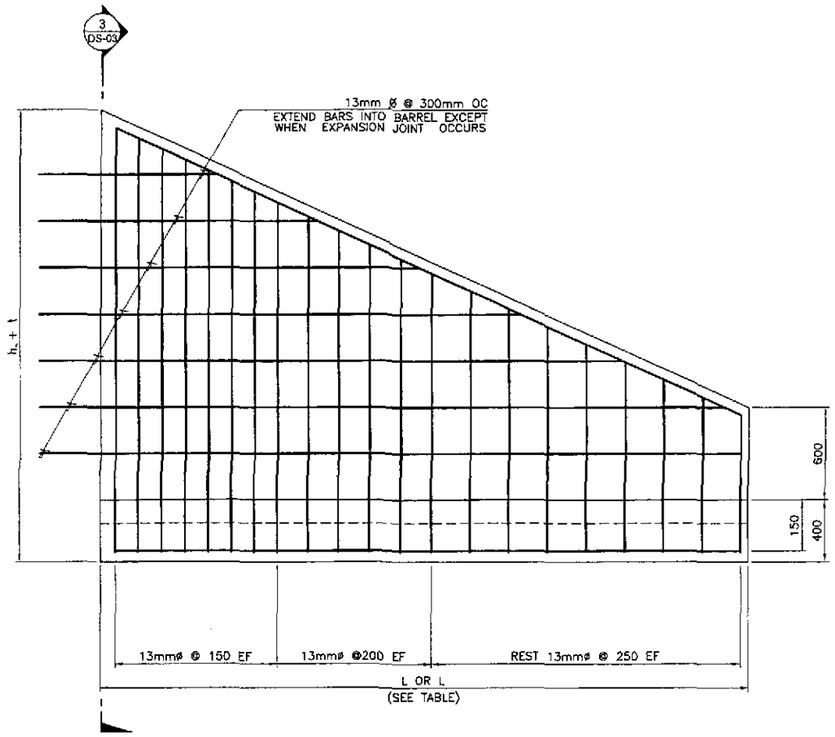
WHERE :

a = 1.5 (h+t-600) FOR SLOPE 1.5:1

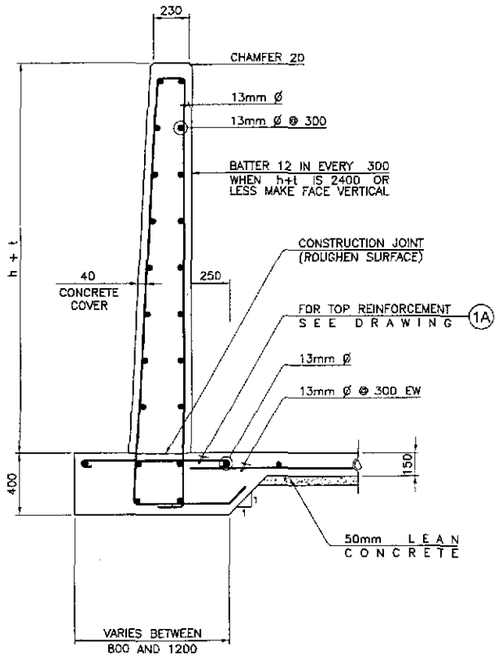
a = 2.0 (h+t-600) FOR SLOPE 2:1



1 DS-03 WINGWALL PLAN
SCALE 1:40



2 DS-03 WINGWALL ELEVATION
SCALE 1:40



3 DS-03 SECTION
SCALE 1:40

RCBC WINGWALL DETAILS

JICA JAPAN INTERNATIONAL COOPERATION AGENCY

KEI KATAHIRA & ENGINEERS INTERNATIONAL — YOO YACHIYO ENGINEERING CO., LTD.

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

	DATE	SIGNATURE
DESIGNED	10/19/02	F. S. SANTA MARIA
CHECKED	10/19/02	M. ENCINA
SUBMITTED	10/19/02	M. ENCINA TEAM LEADER

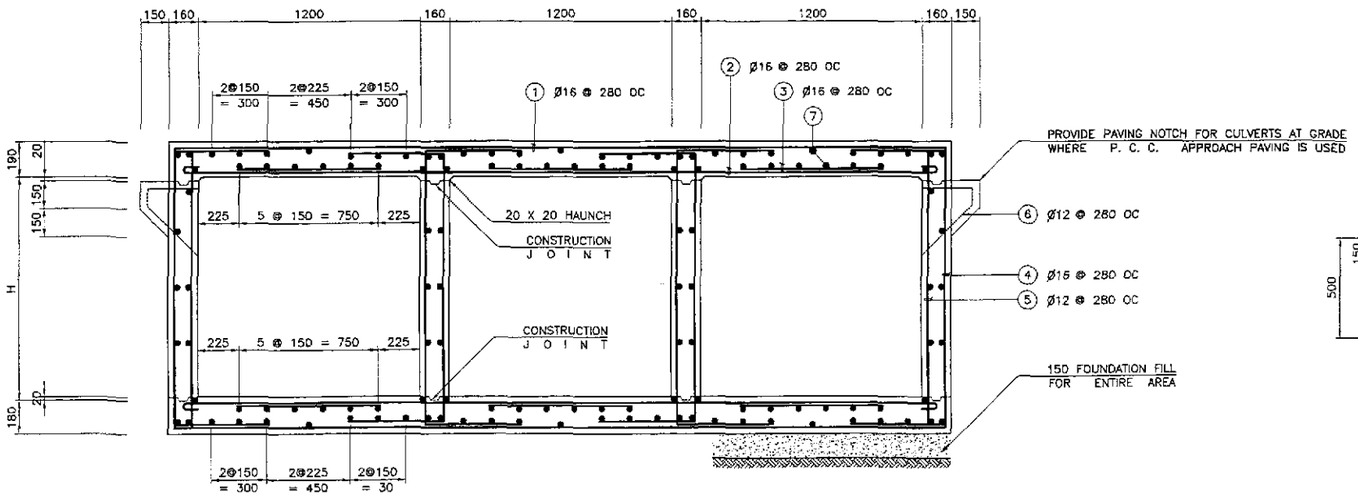
PJHL – PMO	BUREAU OF DESIGN		OFFICE OF THE SECRETARY	
Submitted By:	Reviewed By:	Recommended By:	Recommended By: (See cover sheet for Signature)	Approved By: (See cover sheet for Signature/Approval)
DANILO C. TRAJANO	JOSEFINA M. ALAGAR	GILBERTO S. REYES	MANUEL M. BONOAN	SIMEON A. DATUMANONG
Project Director	Chief, Highways Division	OIC, Director IV	Undersecretary	Secretary

PROJECT AND LOCATION :
THE DETAILED DESIGN STUDY ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)
CABANATUAN BYPASS - CONTRACT PACKAGE III

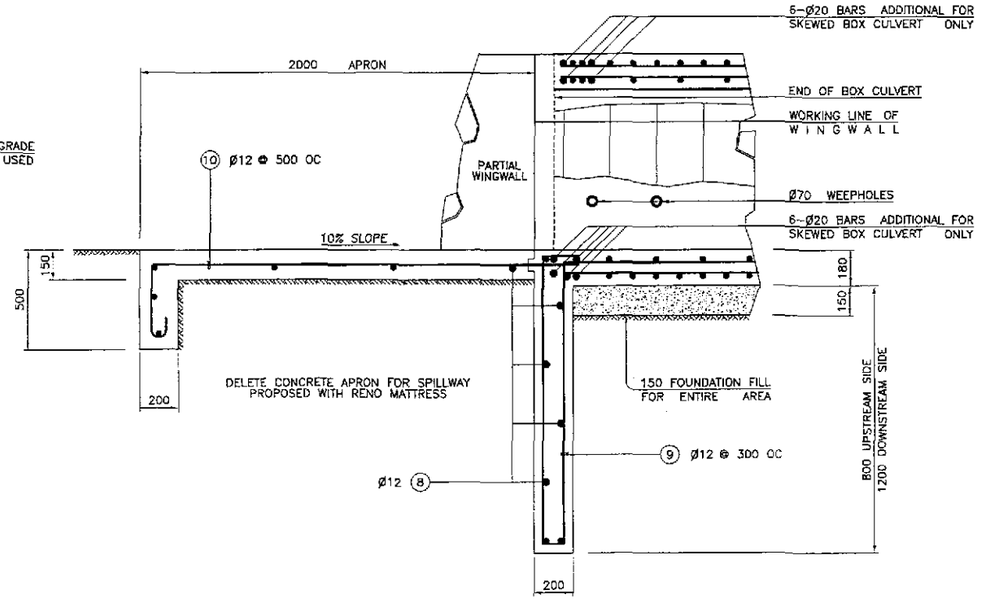
SCALE : 1:40 FULL SIZE A1

SHEET CONTENTS : STANDARD DETAILS OF RCBC WINGWALLS

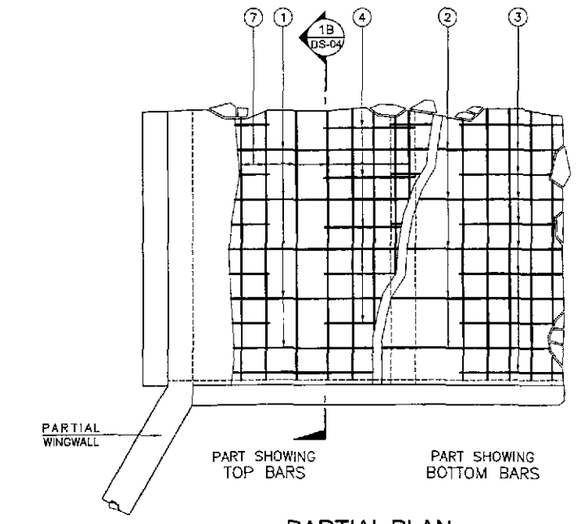
SHEET NO. : DS-03



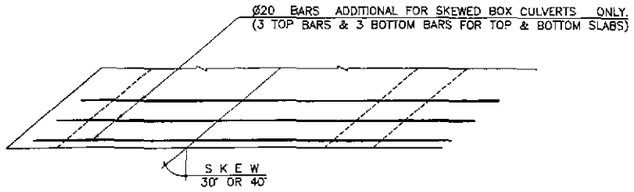
1A DS-04 SECTION ALONG ℄ OF ROADWAY NOT TO SCALE



1B DS-04 PARTIAL SECTION A NOT TO SCALE

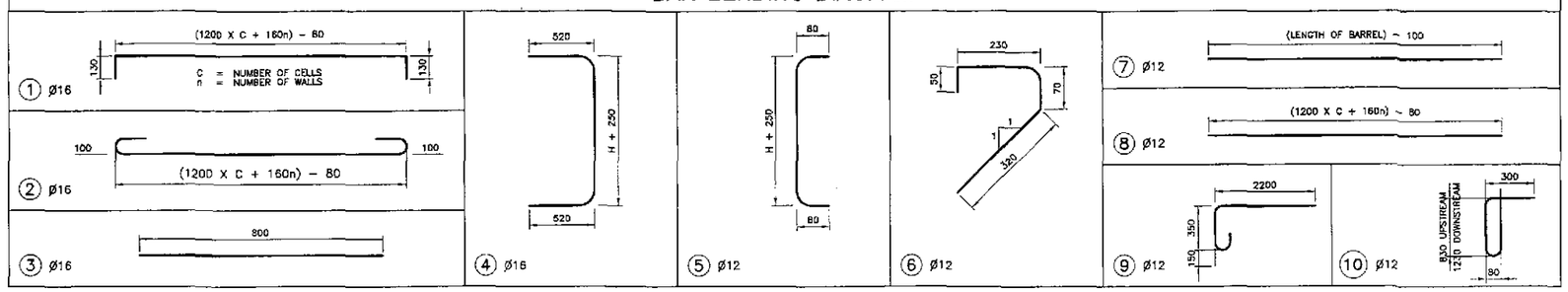


PARTIAL PLAN NOT TO SCALE



NOTE:
ALL OTHER REINFORCING BARS SHALL BE PERPENDICULAR OR PARALLEL, AS THE CASE MAYBE, TO BOX AXIS.

BAR BENDING DIAGRAM



ESTIMATE OF QUANTITIES (PER LINEAR METER OF LENGTH)

	SINGLE BARREL				DOUBLE BARREL				TRIPLE BARREL			
HEIGHT OF CELL "H" (METER)	CONCRETE CLASS "A" (m^3)	REINFORCING STEEL (kg)	EXCAVATION (m^3)	FOUNDATION F I L L (m^3)	CONCRETE CLASS "A" (m^3)	REINFORCING STEEL (kg)	EXCAVATION (m^3)	FOUNDATION F I L L (m^3)	CONCRETE CLASS "A" (m^3)	REINFORCING STEEL (kg)	EXCAVATION (m^3)	FOUNDATION F I L L (m^3)
1.20	0.95	132.59	0.67	0.27	1.64	217.00	1.12	0.48	2.34	299.62	1.56	0.68
0.90	0.85	127.30	0.67	0.27	1.50	209.08	1.12	0.48	2.14	289.04	1.56	0.68
0.60	0.75	122.01	0.67	0.27	1.35	201.15	1.12	0.48	1.95	278.48	1.56	0.68

ADDITIONAL WEIGHT OF REINFORCEMENT PER END OF BOX CULVERT
30° SKEW = 98.5 kgs. 30° SKEW = 45.5 kgs.
45° SKEW = 120.5 kgs. 45° SKEW = 57.0 kgs.

APRON AND END TOE FOR BOTH ENDS

	SINGLE BARREL			DOUBLE BARREL			TRIPLE BARREL		
COMMON TO ALL HEIGHT OF CELL	CONCRETE CLASS "A" (m^3)	REINFORCING STEEL (kg)	EXCAVATION (m^3)	CONCRETE CLASS "A" (m^3)	REINFORCING STEEL (kg)	EXCAVATION (m^3)	CONCRETE CLASS "A" (m^3)	REINFORCING STEEL (kg)	EXCAVATION (m^3)
	1.73	57.94	3.64	3.28	111.34	6.08	4.83	164.70	8.53

1 DS-04 LOW DEPTH TYPE BOX CULVERT NOT TO SCALE

JICA JAPAN INTERNATIONAL COOPERATION AGENCY
KEI KATAHIRA & ENGINEERS INTERNATIONAL
yec YACHIYO ENGINEERING CO., LTD.

	DATE	SIGNATURE
DESIGNED	10/19/07	S. M. MARIA
CHECKED	10/19/07	A. FARIAS
SUBMITTED	10/19/07	TEAM LEADER

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

PJHL – PMO	BUREAU OF DESIGN		OFFICE OF THE SECRETARY	
Submitted By:	Reviewed By:	Recommended By:	Recommended By: (See cover sheet for Signature)	Approved By: (See cover sheet for Signature/Approval)
DANILO C. TRAJANO	JOSEFINA M. ALAGAR	GILBERTO S. REYES	MANUEL M. BONOAN	SIMEON A. DATUMANONG
Project Director	Chief, Highways Division	OIC, Director IV	Undersecretary	Secretary

PROJECT AND LOCATION :
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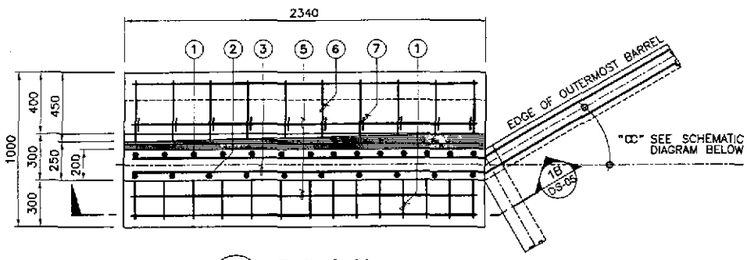
CABANATUAN BYPASS - CONTRACT PACKAGE III

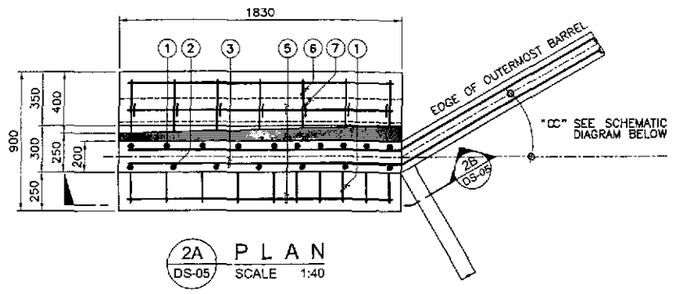
SCALE : NOT TO SCALE FULL SIZE A1

SHEET CONTENTS : STANDARD LOW DEPTH TYPE BOX CULVERT (1 of 2)

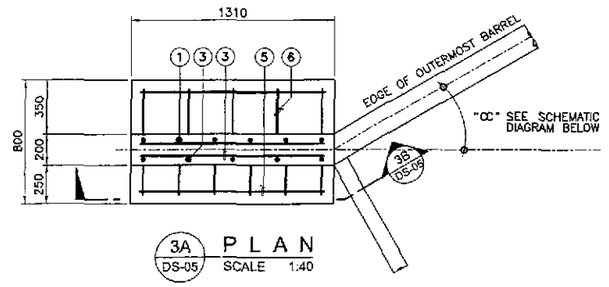
SHEET NO. : DS-04



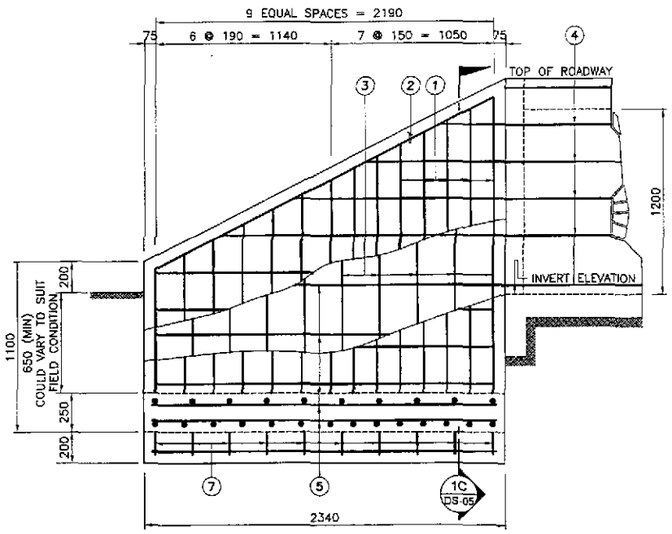
1A DS-05 PLAN SCALE 1:40



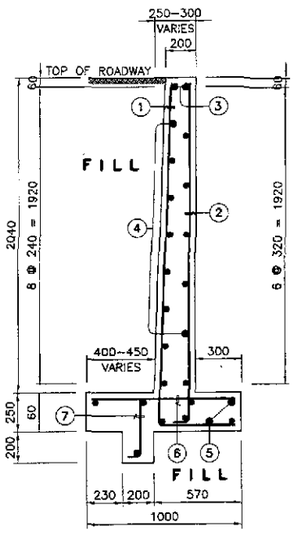
2A DS-05 PLAN SCALE 1:40



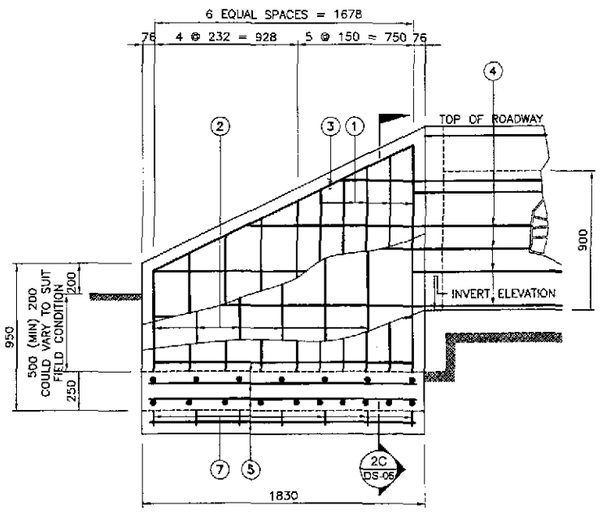
3A DS-05 PLAN SCALE 1:40



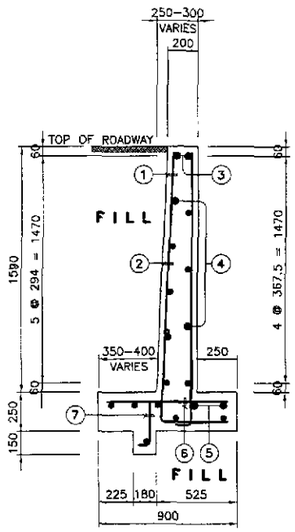
1A DS-05 ELEVATION SCALE 1:40



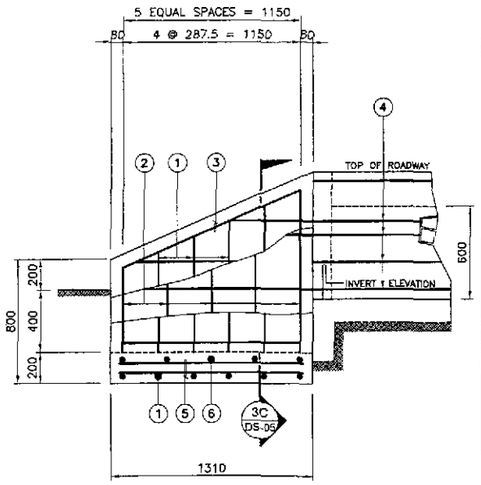
1C DS-05 SECTION SCALE 1:40



2B DS-05 ELEVATION SCALE 1:40



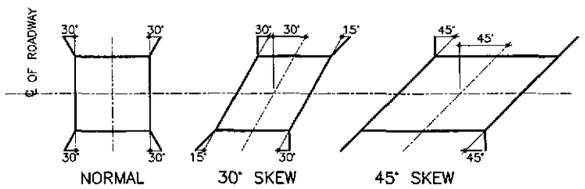
2C DS-05 SECTION SCALE 1:40



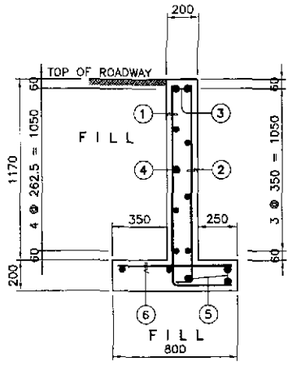
3B DS-05 ELEVATION SCALE 1:40

BAR BENDING DIAGRAM H=1200				BAR BENDING DIAGRAM H=900				BAR BENDING DIAGRAM H=600			
① 14-12mmø	② 10-12mmø	③ 2-12mmø		① 10-12mmø	② 7-12mmø	③ 2-12mmø		① 6-12mmø	② 5-12mmø	③ 2-12mmø	
④ 9-12mmø	⑤ 9-12mmø	⑥ 10-12mmø	⑦ 10-12mmø	④ 6-12mmø	⑤ 10-12mmø	⑥ 7-12mmø	⑦ 7-12mmø	④ 5-12mmø	⑤ 7-12mmø	⑥ 5-12mmø	

ESTIMATE OF QUANTITIES PER WINGWALL				
HEIGHT (m)	CONCRETE CLASS "A" (m^3)	REINFORCEMENT (kg)	EXCAVATION (m^3)	FOUNDATION FILL (m^3)
1.20	2.96	102.89	5.78	0.30
0.90	1.90	57.68	3.53	0.22
0.60	0.88	31.43	1.97	0.15



4 DS-05 SCHEMATIC DIAGRAM SHOWING FLARE OF WINGWALL NOT TO SCALE



3C DS-05 SECTION SCALE 1:40

LOW DEPTH TYPE BOX CULVERT

JICA JAPAN INTERNATIONAL COOPERATION AGENCY

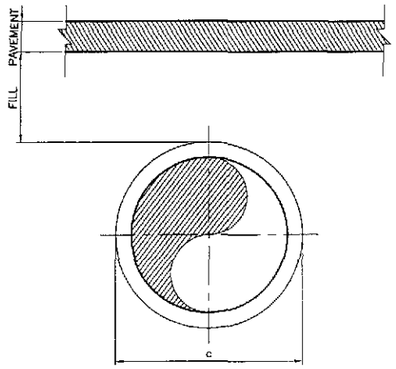
KEI KATAHIRA & ENGINEERS INTERNATIONAL — YEC YACHIYO ENGINEERING CO., LTD.

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

	DATE	SIGNATURE	PJHL – PMO	BUREAU OF DESIGN		OFFICE OF THE SECRETARY	
DESIGNED	10/16/07		Submitted By:	Reviewed By:	Recommended By:	Recommended By: (See cover sheet for Signature)	Approved By: (See cover sheet for Signature/Approval)
CHECKED	10/17/07		DANILO C. TRAJANO	JOSEFINA M. ALAGAR	GILBERTO S. REYES	MANUEL M. BONOAN	SIMEON A. DATUMANONG
SUBMITTED	10/19/07	F. STA. MARIA TEAM LEADER	Project Director	Chief, Highways Division	OIC, Director IV	Undersecretary	Secretary

PROJECT AND LOCATION :	SCALE :	SHEET CONTENTS :	SHEET NO. :
THE DETAILED DESIGN STUDY ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)	AS SHOWN	STANDARD LOW DEPTH TYPE BOX CULVERT (2 of 2)	DS-05
CABANATUAN BYPASS - CONTRACT PACKAGE III	FULL SIZE A1		

DESIGN REQUIREMENT OF REINFORCED CONCRETE PIPE CULVERT



STANDARD STRENGTH PIPES:
FILL 1/2 E.D. FOR FLEXIBLE PAVEMENT OR MIN. OF 0.60 m
0.30 m FOR RIGID PAVEMENT
EXTRA STRENGTH PIPES:
FILL: 0.30 m FOR RIGID AND FLEXIBLE PAVEMENTS

MINIMUM PIPE COVERING

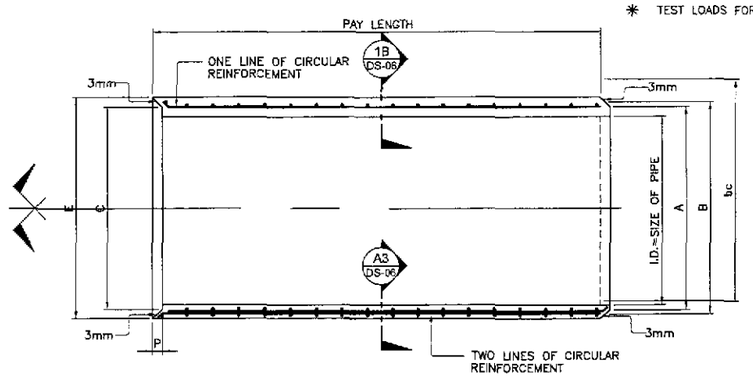
STANDARD STRENGTH REINFORCED CONCRETE PIPE CULVERTS

SIZE OF PIPE (mm)	CONCRETE 247 kg/cm² (3,500 lb/in²)								CONCRETE 317 kg/cm² (4,500 lb/in²)								STRENGTH TEST REQUIREMENTS kg/m OF PIPE	
	WALL THICKNESS (mm)	TONGUE (mm)		GROOVE (mm)		DEPTH (mm)	MINIMUM REINFORCEMENT cm²/m OF PIPE		WALL THICKNESS (mm)	TONGUE (mm)		GROOVE (mm)		DEPTH (mm)	MINIMUM REINFORCEMENT cm²/m OF PIPE ⊛		THREE-EDGE-BEARING METHOD ✳	
I.D.	t	A	B	C	E	P	CIRCULAR REINFORCEMENT	ELLIPTICAL REINFORCEMENT	t	A	B	C	E	P	CIRCULAR REINFORCEMENT	ELLIPTICAL REINFORCEMENT	0.00025mCRACK LOAD	ULTIMATE LOAD
300	57	344	363	351	370	44	1 LINE 1.48		51	495	514	502	521	44	1 LINE 1.89		3.355	5.218
380	57	344	363	351	370	44	1 LINE 1.90		51	495	514	502	521	44	1 LINE 2.33		3.914	6.060
460	64	508	527	514	534	44	1 LINE 2.54	1 LINE 2.12	51	495	514	502	521	44	1 LINE 2.96		4.473	6.709
610	76	673	692	680	699	44	1 LINE 3.60	1 LINE 2.75	64	660	680	667	686	44	1 LINE 4.23	1 LINE 3.60	4.473	7.454
760	89	838	857	845	864	51	1 LINE 4.86	1 LINE 3.60	76	825	845	832	851	51	1 LINE 5.92	1 LINE 4.44	5.032	8.573
910	102	1003	1022	1010	1029	64	2 LINES EACH 3.81	1 LINE 3.81	86	988	1007	994	1013	64	2 LINES EACH 4.66	1 LINE 4.66	6.038	9.840
1070	114	1168	1187	1175	1194	64	2 LINES EACH 4.44	1 LINE 4.44	95	1150	1165	1156	1175	64	2 LINES EACH 5.29	1 LINE 5.29	7.045	10.958
1220	127	1334	1353	1340	1359	64	2 LINES EACH 5.29	1 LINE 5.29	108	1315	1334	1321	1340	64	2 LINES EACH 6.56	1 LINE 6.56	8.051	11.927
1520	152	1664	1683	1670	1690	64	2 LINES EACH 6.98	1 LINE 6.98	127	1639	1658	1645	1664	64	2 LINES EACH 8.68	1 LINE 8.68	8.945	14.909

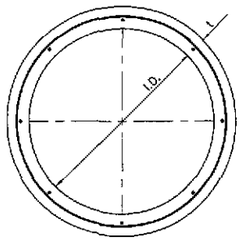
EXTRA STRENGTH REINFORCED CONCRETE PIPE CULVERTS

SIZE OF PIPE (mm)	CONCRETE 317 kg/cm² (4,500 lb/in²)								STRENGTH TEST REQUIREMENTS kg/m OF PIPE	
	WALL THICKNESS (mm)	TONGUE (mm)		GROOVE (mm)		DEPTH (mm)	MINIMUM REINFORCEMENT cm²/m OF PIPE ○		THREE-EDGE-BEARING METHOD	
I.D.	t	A	B	C	E	P	CIRCULAR REINFORCEMENT	ELLIPTICAL REINFORCEMENT	0.00025mCRACK LOAD	LOAD ULTIMATE
300	—	—	—	—	—					
380	—	—	—	—	—					
460	—	—	—	—	—					
610	76	673	692	680	699	44	1 LINE 5.50	1 LINE 4.23	5.964	8.945
760	89	838	857	845	864	51	1 LINE 6.56	1 LINE 5.08	7.454	11.182
910	102	1003	1022	1010	1029	64	2 LINES EACH 5.92	1 LINE 5.92	8.945	13.418
1070	114	1168	1187	1175	1194	64	2 LINES EACH 6.98	1 LINE 6.96	10.436	15.655
1220	127	1334	1353	1340	1359	64	2 LINES EACH 8.04	1 LINE 8.04	11.927	17.891
1520	152	1664	1683	1670	1690	64	2 LINES EACH 10.58	1 LINE 10.58	13.418	22.364

⊛ THE DISTANCE FROM CENTERLINE OF THE REINFORCEMENT TO THE NEAREST SURFACE OF THE CONCRETE HAS BEEN ASSUMED AS 32mm FOR PIPES WITH A SHELL THICKNESS OF 64mm OR MORE.
✳ TEST LOADS FOR SAND-BEARING TEST SHALL BE ONE AND ONE - HALF TIMES THOSE SPECIFIED IN THIS TABLE FOR THE THREE - EDGE BEARING TEST.

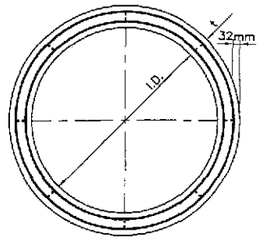


1A DS-06 LONGITUDINAL SECTION NOT TO SCALE

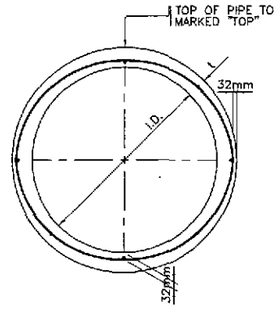


ONE LINE OF CIRCULAR REINFORCEMENT

1B DS-06 SECTION

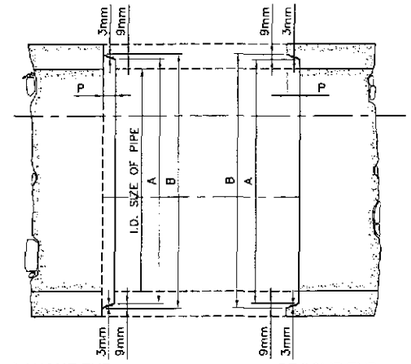


TWO LINES OF CIRCULAR REINFORCEMENT



ONE LINE OF ELLIPTICAL REINFORCEMENT

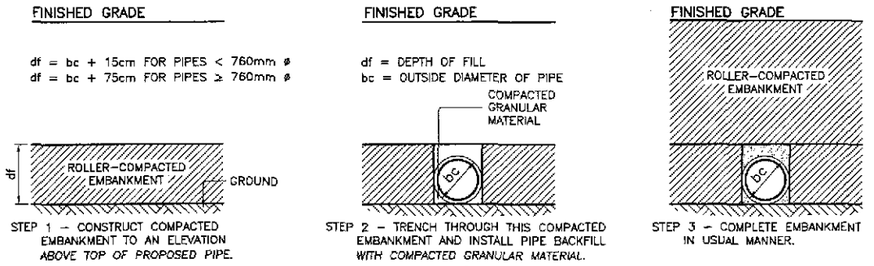
1C DS-06 SECTION



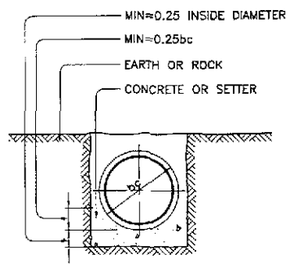
TONGUE END GROOVE END

1D DS-06 SECTION

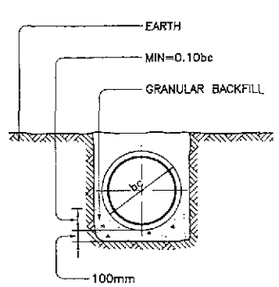
1 DS-06 STANDARD REINFORCED CONCRETE PIPE CULVERTS SCALE AS SHOWN



2 DS-06 METHODS OF PIPE INSTALLATION NOT TO SCALE

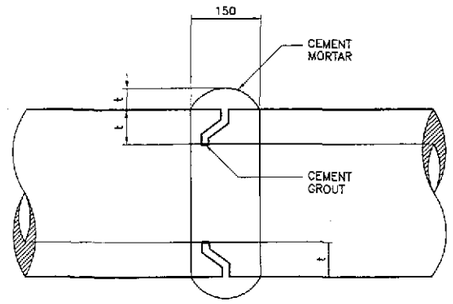


CONCRETE CRADLE BEDDING



ORDINARY BEDDINGS

3 DS-06 TYPICAL BEDDING FOR CONDUITS NOT TO SCALE



4 DS-06 DETAIL OF PIPE COLLAR NOT TO SCALE

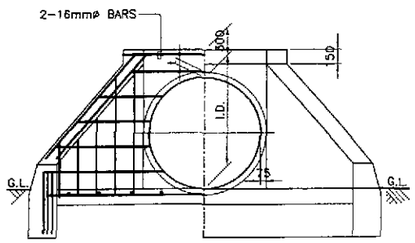
JAPAN INTERNATIONAL COOPERATION AGENCY
KEI KATAHIRA & ENGINEERS INTERNATIONAL
YEO YACHIYO ENGINEERING CO., LTD.

	DATE	SIGNATURE
DESIGNED		
CHECKED		
SUBMITTED		TEAM LEADER

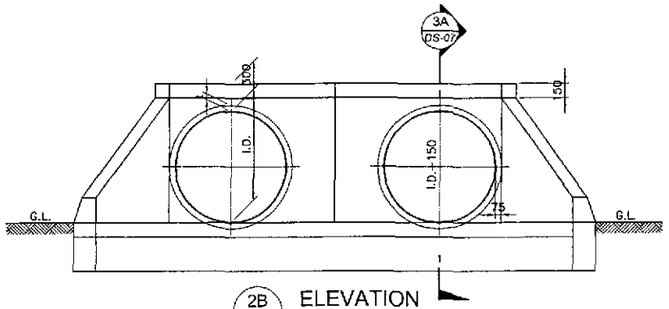
REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

PJHL - PMO	BUREAU OF DESIGN		OFFICE OF THE SECRETARY	
Submitted By:	Reviewed By:	Recommended By:	Recommended By: (See cover sheet for Signature)	Approved By: (See cover sheet for Signature/Approval)
DANILO C. TRAJANO	JOSEFINA M. ALAGAR	GILBERTO S. REYES	MANUEL M. BONOAN	SIMEON A. DATUMANONG
Project Director	Chief, Highways Division	OIC, Director IV	Undersecretary	Secretary

PROJECT AND LOCATION :	SCALE :	SHEET CONTENTS :	SHEET NO. :
THE DETAILED DESIGN STUDY ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)	AS SHOWN	STANDARD RCPC, METHOD OF PIPE INSTALLATION AND TYPICAL BEDDING FOR CONDUITS	DS-06
CABANATUAN BYPASS - CONTRACT PACKAGE III	FULL SIZE A1		



1B DS-07 ELEVATION NOT TO SCALE



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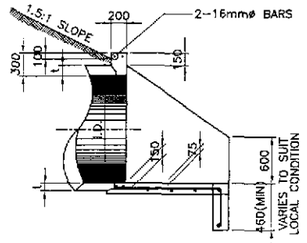

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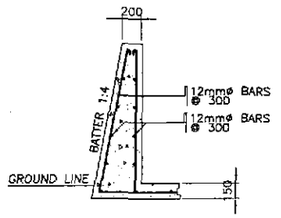

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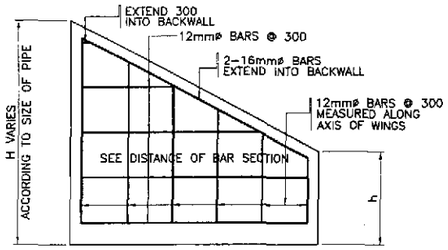
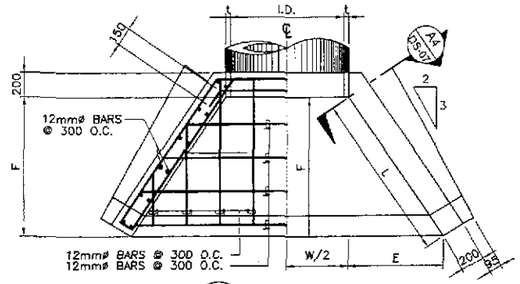
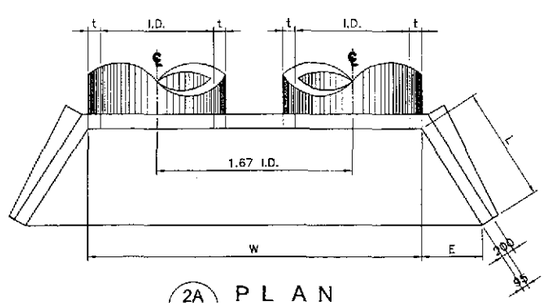


3C DS-07 SECTION NOT TO SCALE



1A DS-07 PLAN N T S



2A DS-07 PLAN N T S

1 DS-07 FLARED TYPE HEADWALL (SINGLE PIPE) SCALE AS SHOWN

2 DS-07 FLARED TYPE HEADWALL (DOUBLE PIPE) SCALE AS SHOWN

TABLE A (ONE FLARED TYPE HEADWALL 1.5:1)

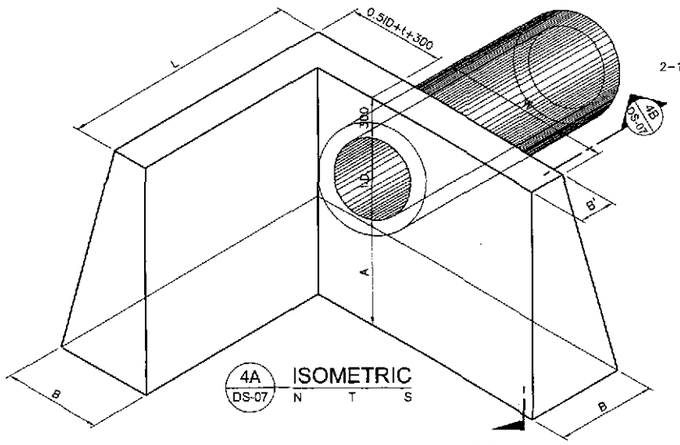
DIAMETER & THICKNESS (mm)		DIMENSIONS (mm)				SINGLE PIPE				DOUBLE PIPE				TRIPLE PIPE			
INTERNAL DIAMETER (I.D.)	MIN. THICKNESS SHELL (t)	L	E	F	h	AREA OF WATERWAY m^2	W (mm)	EST. OF QUANTITIES CONC. m^3	EST. OF QUANTITIES REINF. STEEL kg.	AREA OF WATERWAY m^2	W (mm)	EST. OF QUANTITIES CONC. m^3	EST. OF QUANTITIES REINF. STEEL kg.	AREA OF WATERWAY m^2	W (mm)	EST. OF QUANTITIES CONC. m^3	EST. OF QUANTITIES REINF. STEEL kg.
460	51	710	390	590	0	0.17	610	0.57	25.65	0.32	1380	0.83	37.35	0.51	2150	1.27	57.15
610	64	960	530	800	0	0.29	760	0.82	36.46	0.58	1780	1.16	48.39	0.87	2800	1.75	78.75
910	86	1510	840	1260	600	0.65	1070	1.55	68.92	1.30	2590	2.22	92.61	1.95	4100	3.36	150.98
1070	95	1770	980	1470	600	0.90	1230	2.38	107.10	1.80	3020	3.05	137.25	2.70	4800	3.96	178.20
1220	108	2040	1130	1690	600	1.17	1370	2.68	110.27	2.34	3400	3.71	154.77	3.51	5360	5.36	241.34
1520	127	2540	1410	2110	600	1.81	1680	3.93	174.74	3.63	4229	5.47	228.18	5.43	6760	6.76	304.20

TABLE C (ONE L-TYPE HEADWALL)

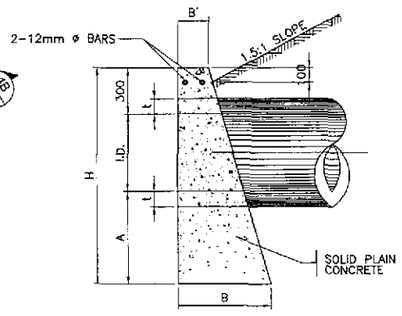
DIA. & THICKNESS (mm)		DIMENSIONS (mm)						SINGLE PIPE	
INTERNAL DIAMETER (I.D.)	MIN. THK. SHELL (t)	A	B	B'	H	W	L	CONCRETE m^3 mm	REINF. STEEL kg.
460	51	310	350	200	1070	1070	1070	0.66	6
610	64	410	430	200	1320	1220	1220	1.06	8
910	86	610	610	200	1820	1820	1820	2.76	11
1070	95	710	780	300	2080	1970	VARIES	–	–
1220	108	810	870	300	2330	2120	VARIES	–	–
1520	127	1010	980	300	3030	2420	VARIES	–	–

TABLE C (ONE STRAIGHT TYPE HEADWALL)

DIAMETER & THICKNESS (mm)		DIMENSIONS (mm)			SINGLE PIPE				DOUBLE PIPE				TRIPLE PIPE			
INTERNAL DIAMETER (I.D.)	MIN. THK. SHELL (t)	A	B	H	W (mm)	AREA OF WATERWAY m^2	CONCRETE m^3 mm	REINF. STEEL kg.	W (mm)	AREA OF WATERWAY m^2	CONCRETE m^3 mm	REINF. STEEL kg.	W (mm)	AREA OF WATERWAY m^2	CONCRETE m^3 mm	REINF. STEEL kg.
460	51	310	350	1070	1500	0.15	0.46	3.48	2800	0.33	0.63	4.90	3400	0.45	0.80	5.97
610	64	410	430	1320	2400	0.29	0.87	4.55	3500	0.58	1.20	6.50	4600	0.87	1.51	8.45
910	86	610	600	1820	3800	0.65	2.28	6.68	5200	1.30	3.16	9.52	6800	1.95	3.85	12.36
1070	95	710	780	2080	4300	0.90	3.84	7.57	6050	1.80	5.09	10.67	7900	2.70	6.43	13.96
1220	108	810	870	2330	4800	1.17	4.43	8.81	6900	2.34	6.70	12.54	9000	3.51	7.97	16.14
1520	127	1010	980	2830	6000	1.81	8.80	10.94	8600	3.63	11.93	15.56	11200	5.43	15.05	19.82

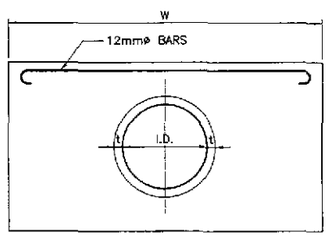


4A DS-07 ISOMETRIC N T S

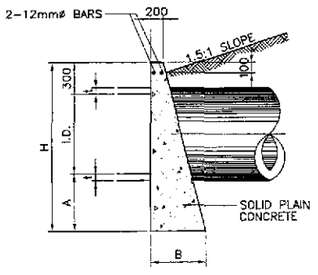


4B DS-07 SECTION NOT TO SCALE

4 DS-07 L-TYPE HEADWALL NOT AS SHOWN



5A DS-07 SINGLE PIPE NOT TO SCALE



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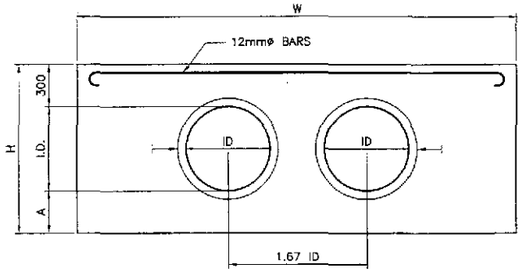


5C DS-07 DOUBLE PIPE NOT TO SCALE
1–2/3 I.D.

5 DS-07 STRAIGHT TYPE HEADWALL NOT AS SHOWN

STANDARD REINFORCED CONCRETE HEADWALL FOR RCPC

JICA JAPAN INTERNATIONAL COOPERATION AGENCY

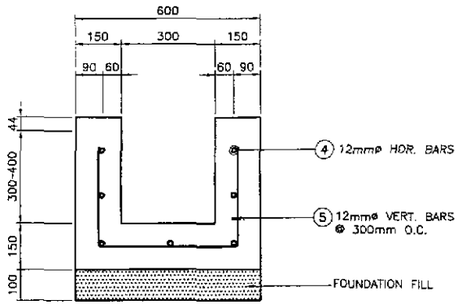
KEI KATAHIRA & ENGINEERS INTERNATIONAL — YEC YACHIYO ENGINEERING CO., LTD.

	DATE	SIGNATURE
DESIGNED	10/14/02	P. STA. MARIA TEAM LEADER
CHECKED	10/17/02	
SUBMITTED	10/19/02	

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

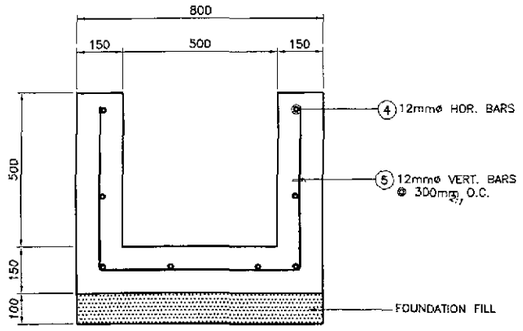
PJHL – PMO	BUREAU OF DESIGN		OFFICE OF THE SECRETARY	
Submitted By:	Reviewed By:	Recommended By:	Recommended By: (See cover sheet for Signature)	Approved By: (See cover sheet for Signature/Approval)
DANILO C. TRAJANO	JOSEFINA M. ALAGAR	GILBERTO S. REYES	MANUEL M. BONOAN	SIMEON A. DATUMANONG
Project Director	Chief, Highways Division	OIC, Director IV	Undersecretary	Secretary

PROJECT AND LOCATION :	SCALE :	SHEET CONTENTS :	SHEET NO. :
THE DETAILED DESIGN STUDY ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)	NOT TO SCALE	STANDARD REINFORCED CONCRETE HEADWALL FOR RCPC	DS-07
CABANATUAN BYPASS - CONTRACT PACKAGE III	FULL SIZE A1		



REINFORCED CONCRETE DITCH

1 / DS-08 TYPE BU
SCALE: 1:10



REINFORCED CONCRETE DITCH

2 / DS-08 TYPE U
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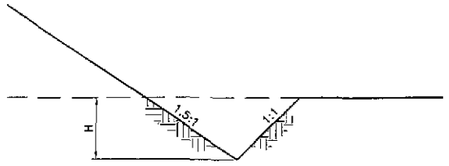
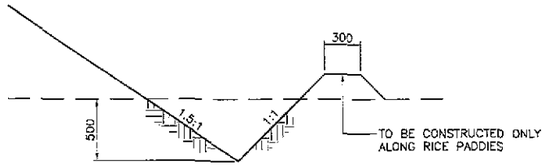


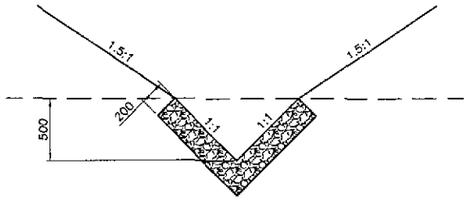
V-SHAPED UNLINED DITCH

TYPE E-4



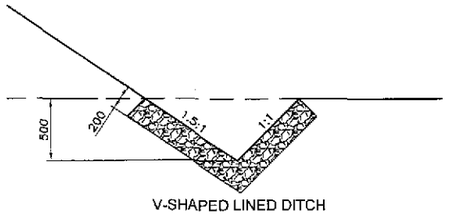
V-SHAPED UNLINED DITCH

TYPE E-3



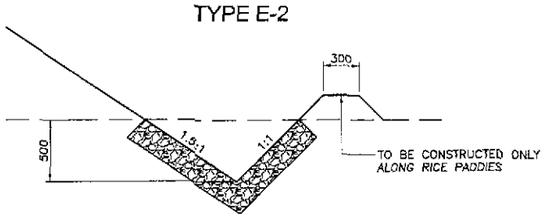
V-SHAPED LINED DITCH
(OUTER SEPARATOR DITCH)

TYPE E-2a



V-SHAPED LINED DITCH

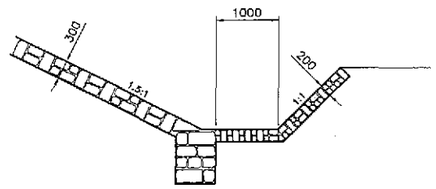
TYPE E-2



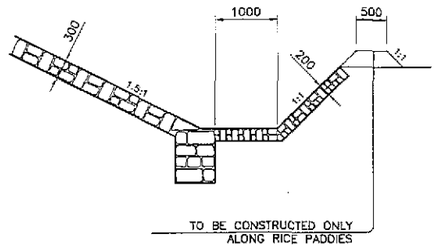
V-SHAPED LINED DITCH

TYPE E-1

3 / DS-08 TYPE E
SCALE: 1:25



TYPE C-4



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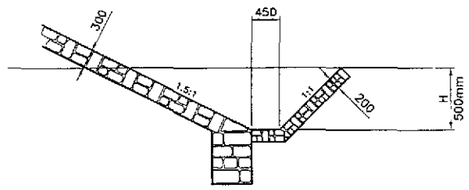

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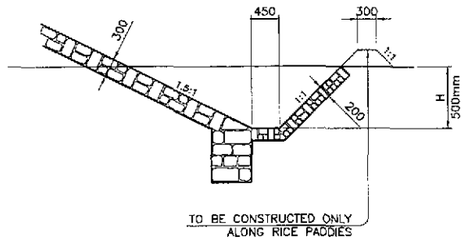
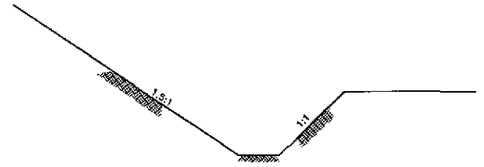


TYPE C-1

4 / DS-08 TYPE C
NOT TO SCALE



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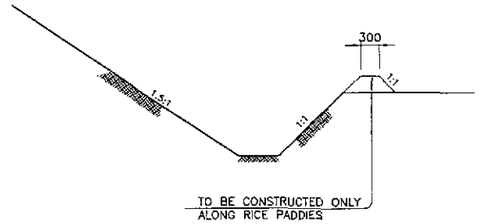
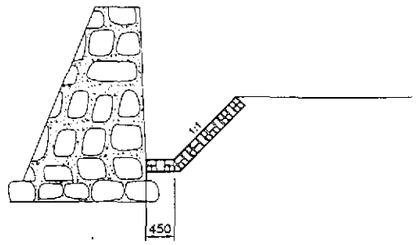
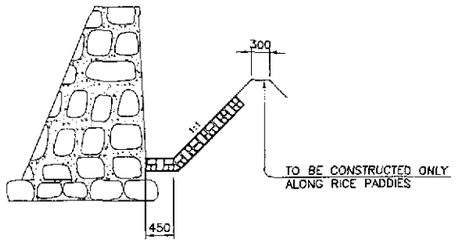


TYPE C-7



TYPE C-6



TYPE C-5

STANDARD DRAINAGE DITCHES

JICA
JAPAN INTERNATIONAL COOPERATION AGENCY
KATAHIRA & ENGINEERS INTERNATIONAL
YACHIYO ENGINEERING CO., LTD.

	DATE	SIGNATURE
DESIGNED	10/14/06	
CHECKED	10/17/06	
SUBMITTED	11/9/06	TEAM LEADER

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

PUHL – PMO	BUREAU OF DESIGN		OFFICE OF THE SECRETARY	
Submitted By:	Reviewed By:	Recommended By:	Recommended By: (See cover sheet for Signature)	Approved By: (See cover sheet for Signature/Approval)
DANILO C. TRAJANO	JOSEFINA M. ALAGAR	GILBERTO S. REYES	MANUEL M. BONDAN	SIMEON A. DATUMANONG
Project Director	Chief, Highways Division	DIC, Director IV	Undersecretary	Secretary

PROJECT AND LOCATION :	SCALE :	SHEET CONTENTS :	SHEET NO. :
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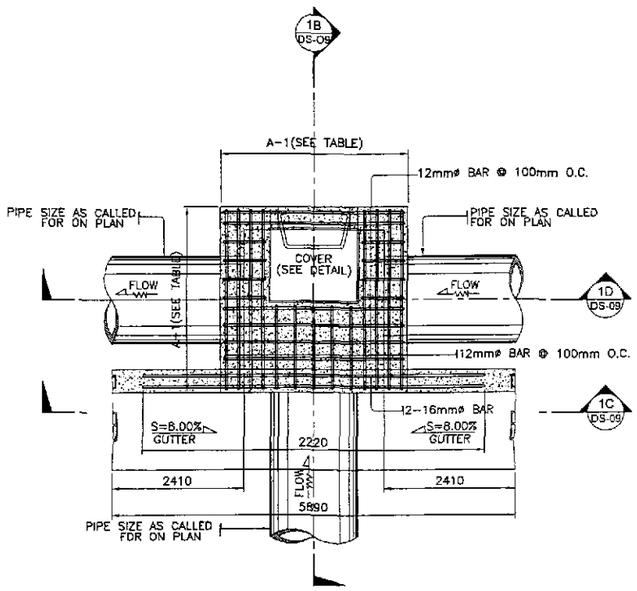
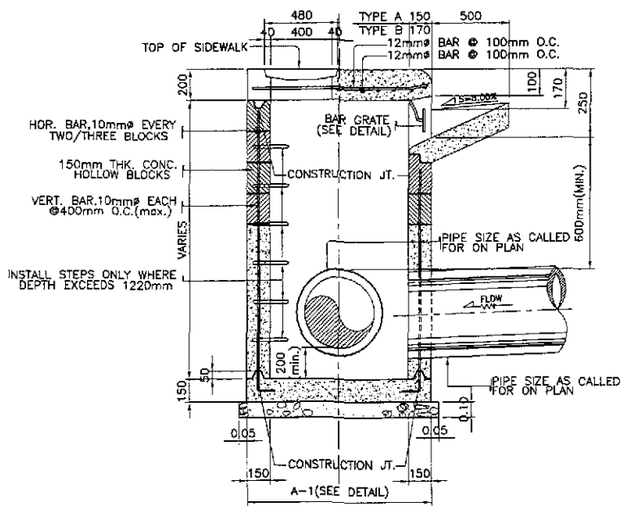
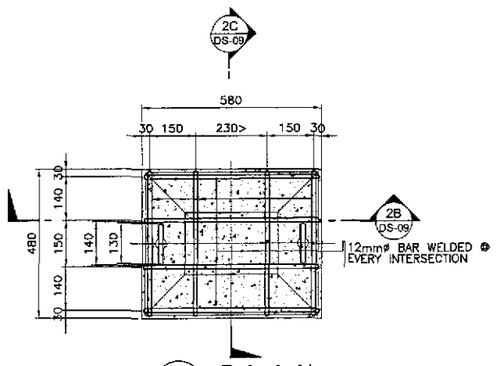
CABANATUAN BYPASS - CONTRACT PACKAGE III	FULL SIZE A1		



1A DS-09 PLAN



1B DS-09 SECTION



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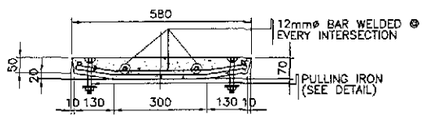
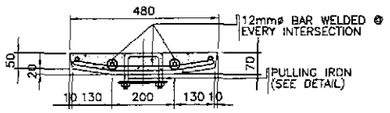
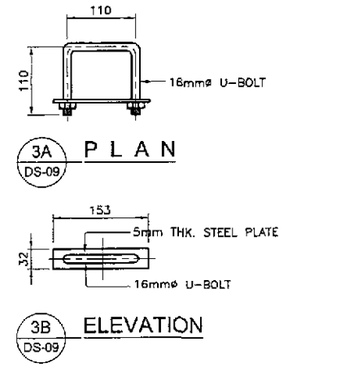


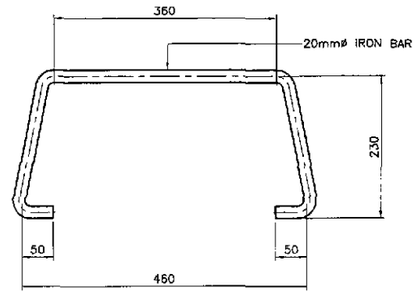
2B DS-09 SECTION



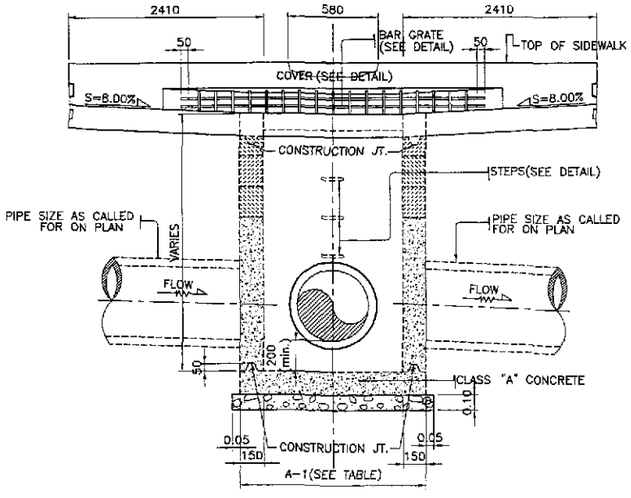
2C DS-09 SECTION



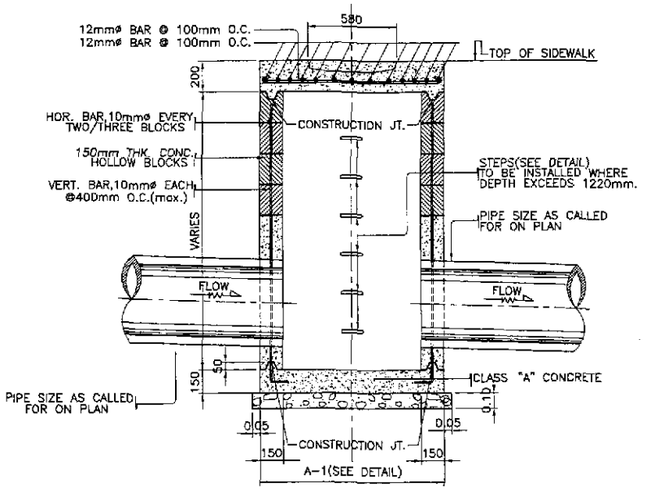
3 DS-09 PULLING IRON DETAIL
SCALE 1:5



4 DS-09 S T E P
SCALE 1:5



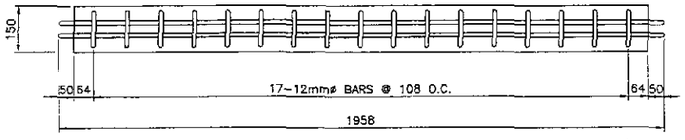
1C DS-09 SECTION
1:20



1D DS-09 SECTION

1 DS-09 CURB INLET MANHOLE
SCALE 1:20

2 DS-09 CONCRETE COVER DETAIL
SCALE 1:10



5 DS-09 DETAIL OF BAR GRATE FOR OPENING OF CURB INLET
SCALE 1:20

TABLE OF DIMENSION		
TYPE OF CIM	SIZE OF PIPE (mm)	A-1
T-1	300	1.12 M.
T-2	460	1.19 M.
T-3	610	1.37 M.
T-4	760	1.54 M.
T-5	910	1.73 M.
T-6	1070	1.90 M.
T-7	1220	2.08 M.
T-8	1520	2.43 M.

NOTES:
1. ALL CONCRETE SHALL BE CLASS "A". EXPOSED EDGES SHALL BE FINISHED WITH SUITABLE EDGER.
2. PULLING IRON, STEPS AND BAR GRATE SHALL BE PAINTED WITH ONE COAT OF ZINC CHROMATE.
3. CONSTRUCTION JOINTS SHALL CONFORM WITH THE GROOVES OF CONCRETE HOLLOW BLOCKS.
4. CONCRETE HOLLOW BLOCKS OR DRESSED ADOBE BLOCKS SHALL HAVE AN AVERAGE COMPRESSIVE STRENGTH OF 6.865MPa.
5. IN CONCRETE HOLLOW BLOCKS STRUCTURE, ALL HOLES SHALL BE FILLED WITH CEMENT MORTAR.
6. WHERE CONCRETE HOLLOW BLOCKS STRUCTURES ATTAIN A HEIGHT OF 1.20 METER, IT SHALL BE REINFORCED STEEL BARS SPACE AT NOT MORE THAN 0.60 M. O.C. BOTHWAYS.
7. INSTALL STEPS ONLY WHERE DEPTH EXCEEDS 1.22 METERS.

DETAILS OF COMBINATION CURB INLET MANHOLE

JICA JAPAN INTERNATIONAL COOPERATION AGENCY
KEI KATAHIRA & ENGINEERS INTERNATIONAL
YEC YACHIYO ENGINEERING CO., LTD.

	DATE	SIGNATURE
DESIGNED	10/14/02	F. SIY
CHECKED	10/17/02	M. HAKIM
SUBMITTED	10/19/02	M. HAKIM TEAM LEADER

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

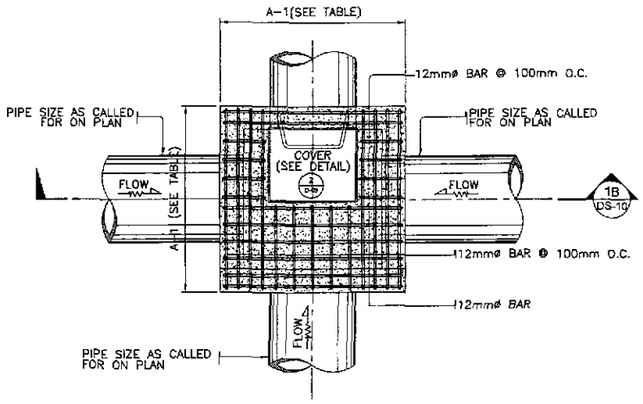
PJHL - PMO	BUREAU OF DESIGN		OFFICE OF THE SECRETARY	
Submitted By:	Reviewed By:	Recommended By:	Recommended By: (See cover sheet for Signature)	Approved By: (See cover sheet for Signature/Approval)
DANILO C. TRAJANO	JOSEFINA M. ALAGAR	GILBERTO S. REYES	MANUEL M. BONOAN	SIMEON A. DATUMANONG
Project Director	Chief, Highways Division	OIC, Director IV	Undersecretary	Secretary

PROJECT AND LOCATION :
THE DETAILED DESIGN STUDY ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)
CABANATUAN BYPASS - CONTRACT PACKAGE III

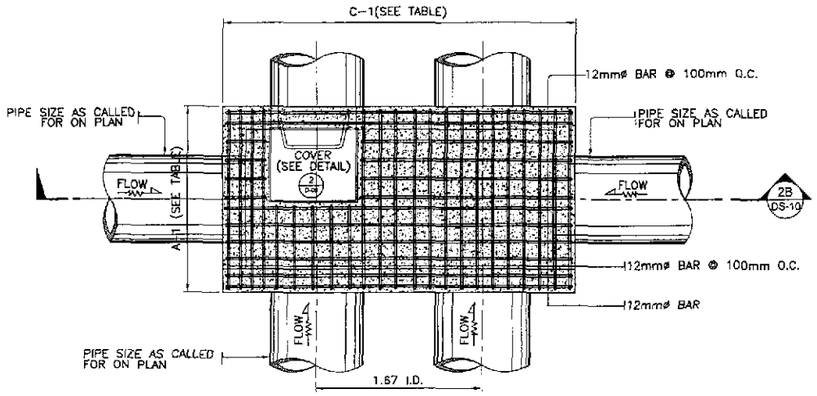
SCALE : AS SHOWN
FULL SIZE A1

SHEET CONTENTS : STANDARD COMBINATION CURB INLET MANHOLE

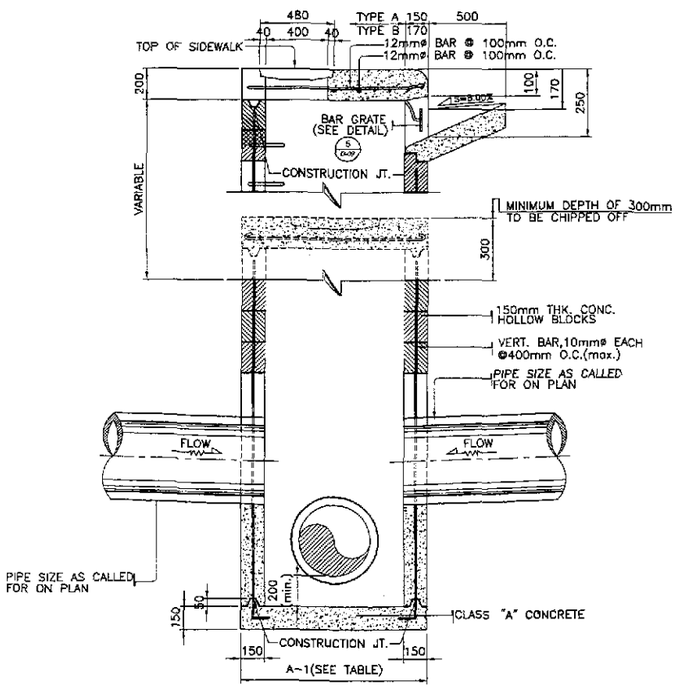
SHEET NO. : DS-09



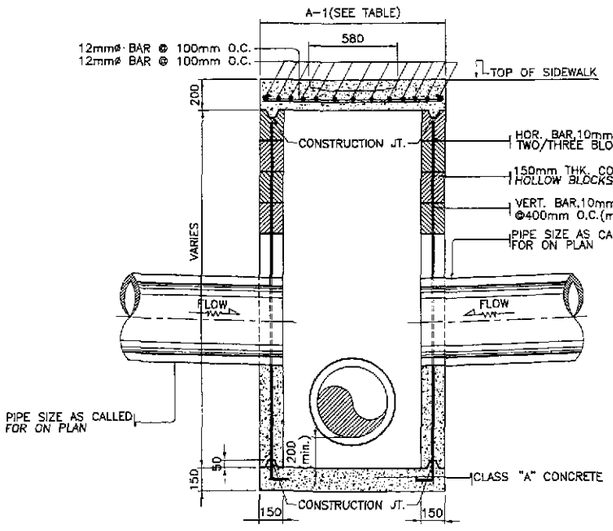
1A DS-10 PLAN BOX-TYPE MANHOLE (SINGLE PIPE)



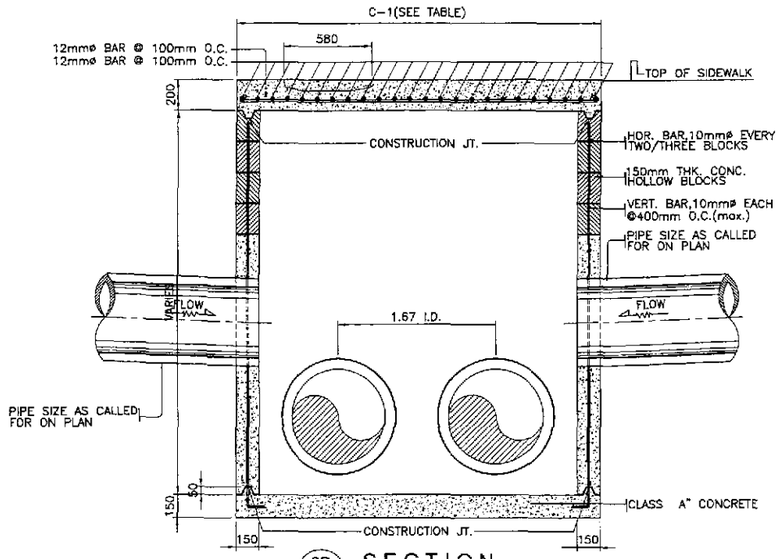
2A DS-10 PLAN BOX-TYPE MANHOLE (DOUBLE PIPE)



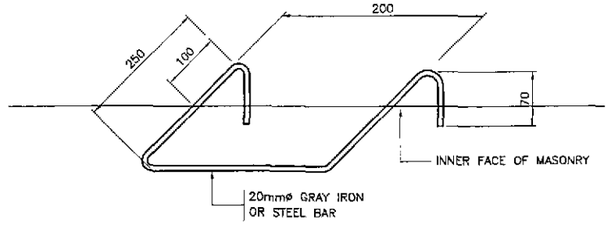
3 DS-10 BOX-TYPE CONVERTED TO CURB INLET MANHOLE



1B DS-10 SECTION



2B DS-10 SECTION



4 DS-10 STD. STEP OR RUNG

TABLE OF MANHOLE

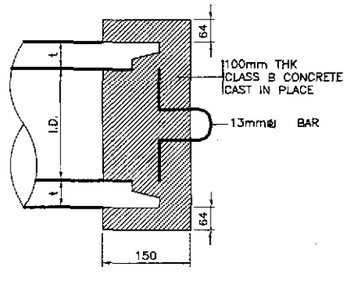
(H) HEIGHT mm.	(T) THICKNESS OF WALL (mm)	VERTICAL BARS			HORIZONTAL BARS
		INSIDE EDGE	CENTER	OUTSIDE EDGE	
1000	150mm CHB	–	10mmø @ 200	–	10mmø @ 400
2000	150mm CHB	–	12mmø @ 200	–	10mmø @ 400
3000	180mm CONC.	20mmø @ 300	–	32mmø @ 300	10mmø @ 400
4000	230mm CONC.	20mmø @ 250	–	32mmø @ 250	10mmø @ 400
5000	280mm CONC.	20mmø @ 225	–	32mmø @ 225	10mmø @ 400
6000	330mm CONC.	20mmø @ 200	–	32mmø @ 200	10mmø @ 400
7000	380mm CONC.	20mmø @ 175	–	32mmø @ 175	10mmø @ 400
8000	410mm CONC.	20mmø @ 150	–	32mmø @ 150	10mmø @ 400

TABLE OF DIMENSION

TYPE OF CIM	SIZE OF PIPE (mm)	A-1 (m)	C-1 (m)
T-1	300	1.12	1.92
T-2	460	1.19	2.26
T-3	610	1.37	2.69
T-4	760	1.54	3.11
T-5	910	1.73	3.55
T-6	1070	1.90	3.98
T-7	1220	2.08	4.42
T-8	1520	2.43	5.27

NOTES:

1. ALL CONCRETE SHALL BE CLASS "A". EXPOSED EDGES SHALL BE FINISHED WITH SUITABLE EDGER.
2. PULLING IRON, STEPS AND BAR GRATE SHALL BE PAINTED WITH ONE COAT OF ZINC CHROMATE.
3. CONSTRUCTION JOINTS SHALL CONFORM WITH THE GROOVES OF CONCRETE HOLLOW BLOCKS.
4. CONCRETE HOLLOW BLOCKS OR DRESSED ADOBE BLOCKS SHALL HAVE AN AVERAGE COMPRESSIVE STRENGTH OF 6.865MPa.
5. IN CONCRETE HOLLOW BLOCKS STRUCTURE, ALL HOLES SHALL BE FILLED WITH CEMENT MORTAR.
6. WHERE CONCRETE HOLLOW BLOCKS STRUCTURES ATTAIN A HEIGHT OF 1.20 METER, IT SHALL BE REINFORCED STEEL BARS SPACE AT NOT MORE THAN 0.60 M. O.C. BOTHWAYS.
7. INSTALL STEPS ONLY WHERE DEPTH EXCEEDS 1.22 METERS.
8. 150 mm BOTTOM SLAB THICKNESS FOR HEIGHT OF 1000 TO 4000mm. AND 200mm. FOR 5000 TO 8000mm IN HIEGHT.
9. FROM THE HEIGHT OF 3000 TO 8000mm. THE FIRST 2000mm, FROM THE TOP IS CHB WITH DETAILS FOR 2000mm HEIGHT.
10. REINFORCEMENT FOR BOTTOM SLAB ARE ALL 10mmø @ 400 B.W.
11. VERTICAL BARS ARE CUT AT HALF POINT FOR EVERY OTHER BAR AT SOLID WALL.
12. INSIDE SURFACES AND OUTSIDE SURFACES OF ALL MASONRY SHALL HAVE A PLASTER COAT 1/2" THICK.
13. BOX TYPE MANHOLE SHAL NOT BE CONSTRUCTED WITHIN THE RIDING SURFACE.



5 DS-10 CONCRETE BLOCK PLUG @ SUBSURFACE PIPE

SPECIAL JUNCTION BOX MANHOLE

JICA JAPAN INTERNATIONAL COOPERATION AGENCY

KEI KATAHIRA & ENGINEERS INTERNATIONAL — YEC YACHIYO ENGINEERING CO., LTD.

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

	DATE	SIGNATURE
DESIGNED	10/16/02	T. SUGIURA
CHECKED	10/17/02	
SUBMITTED	10/19/02	TEAM LEADER

PJHL – PMO	BUREAU OF DESIGN		OFFICE OF THE SECRETARY	
Submitted By:	Reviewed By:	Recommended By:	Recommended By: (See cover sheet for Signature)	Approved By: (See cover sheet for Signature/Approval)
DANILO C. TRAJANO	JOSEFINA M. ALAGAR	GILBERTO S. REYES	MANUEL M. BONOAN	SIMEON A. DATUMANONG
Project Director	Chief, Highways Division	OIC, Director IV	Undersecretary	Secretary

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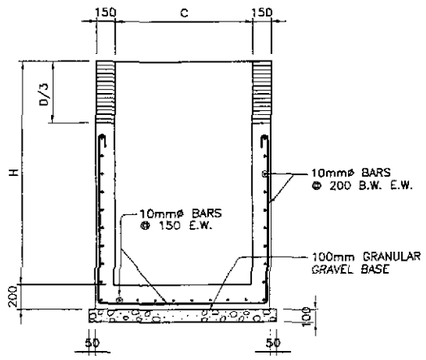
CABANATUAN BYPASS - CONTRACT PACKAGE III

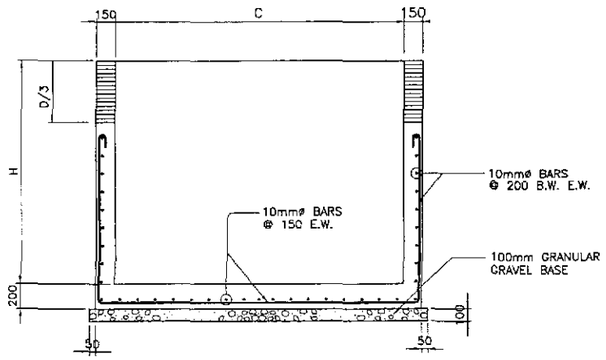
SCALE : AS SHOWN — FULL SIZE A1

SHEET CONTENTS : SPECIAL JUNCTION BOX MANHOLE

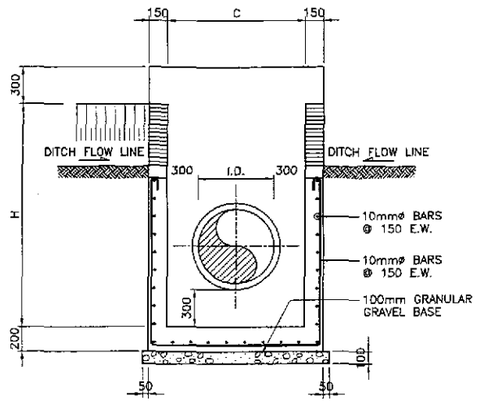
SHEET NO. : DS-10



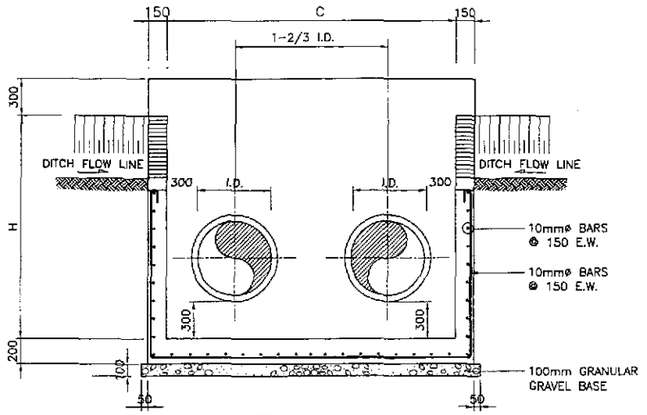
1C DS-11 SECTION



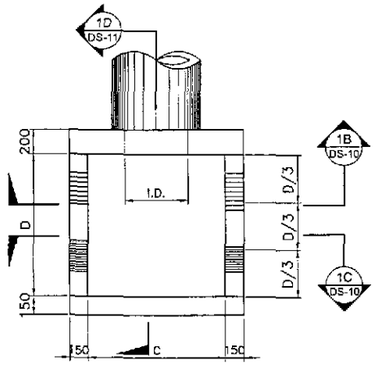
2C DS-11 SECTION



1B DS-11 SECTION

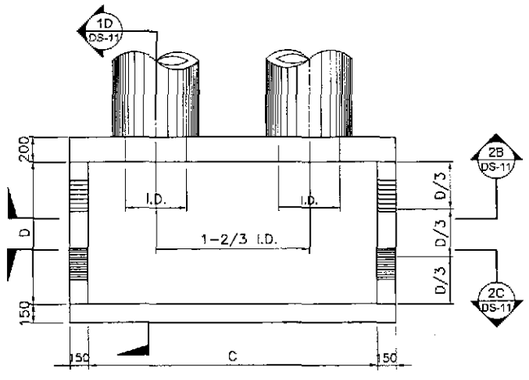


2B DS-11 SECTION



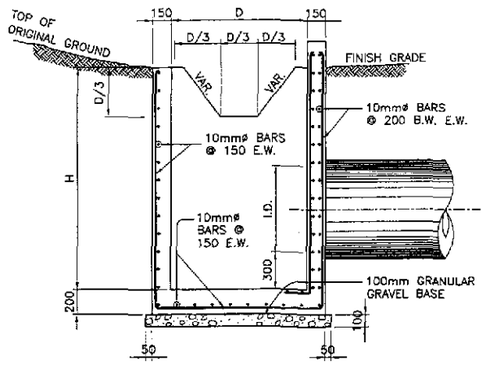
1A DS-11 PLAN

1 DS-11 CONCRETE CATCH BASIN (SINGLE PIPE)
SCALE 1:25



2A DS-11 PLAN

2 DS-11 CONCRETE CATCH BASIN (DOUBLE PIPE)
SCALE 1:25



1C DS-11 SECTION

REINFORCED CONCRETE CATCH BASIN DIMENSION FOR RCPC

PIPE DIAMETER (mm)		610	910	1070	1220	1520
COMMON TO ALL NUMBER OF BARRELS	H	1.910	2.210	2.370	2.520	2.820
	D	1.200	1.500	1.650	1.800	2.100
SINGLE	C	1.210	1.510	1.670	1.820	2.120
DOUBLE	C	2.230	3.030	3.460	3.860	4.660
TRIPLE	C	3.250	4.550	5.240	5.890	7.120

DETAILS OF REINFORCED CONCRETE CATCH BASIN FOR RCPC

JICA JAPAN INTERNATIONAL COOPERATION AGENCY

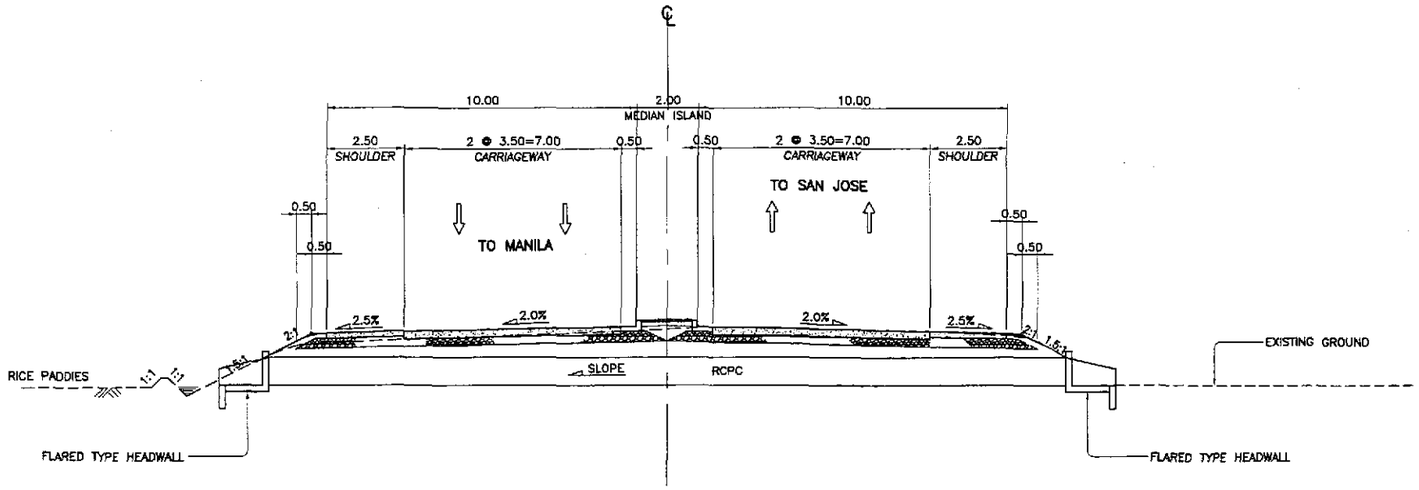
KEI KATAHIRA & ENGINEERS INTERNATIONAL — YEC YACHIYO ENGINEERING CO., LTD.

	DATE	SIGNATURE
DESIGNED	10/17/02	
CHECKED	10/17/02	
SUBMITTED	10/19/02	M. KIBOSHI TEAM LEADER

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

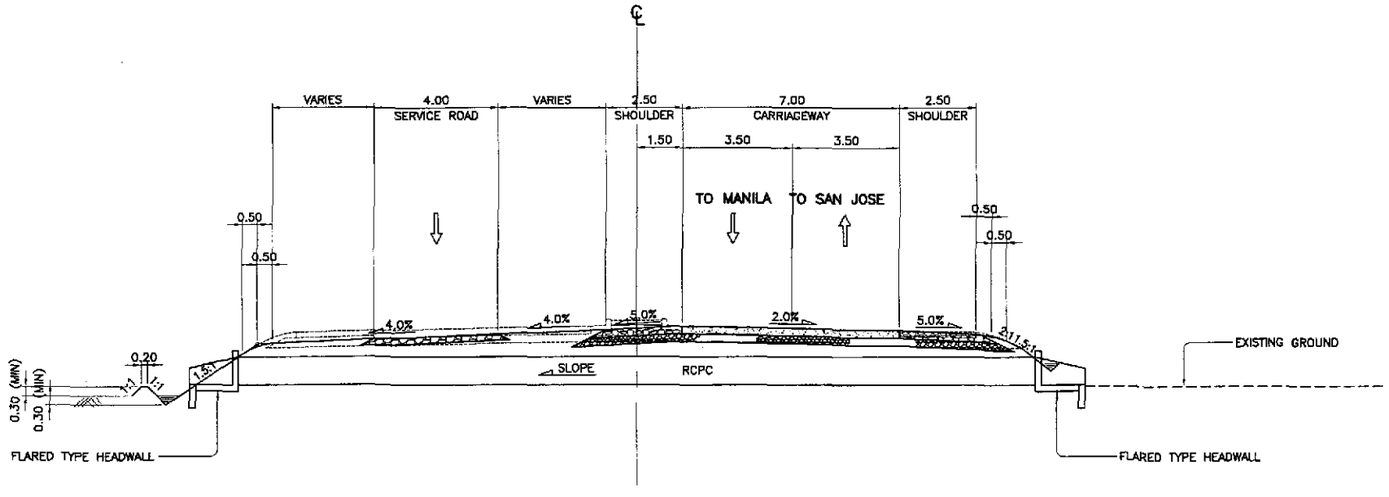
PJHL – PMO	BUREAU OF DESIGN		OFFICE OF THE SECRETARY	
Submitted By:	Reviewed By:	Recommended By:	Recommended By: (See cover sheet for Signature)	Approved By: (See cover sheet for Signature/Approval)
DANILO C. TRAJANO	JOSEFINA M. ALAGAR	GILBERTO S. REYES	MANUEL M. BONDAN	SIMEON A. DATUMANONG
Project Director	Chief, Highways Division	OIC, Director IV	Undersecretary	Secretary

PROJECT AND LOCATION :	SCALE :	SHEET CONTENTS :	SHEET NO. :
THE DETAILED DESIGN STUDY ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)	1:25	STANDARD REINFORCED CONCRETE CATCH BASIN FOR RCPC	DS-11
CABANATUAN BYPASS - CONTRACT PACKAGE III	FULL SIZE A1		



2 / DS-12 TYPICAL DRAINAGE SECTION (ULTIMATE STAGE)

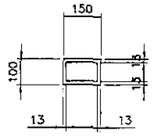
SCALE 1:100



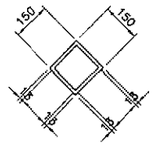
1 / DS-12 TYPICAL DRAINAGE SECTION (INITIAL STAGE)

SCALE 1:100

JICA JAPAN INTERNATIONAL COOPERATION AGENCY KEI KATAHIRA & ENGINEERS INTERNATIONAL YEC YACHIYO ENGINEERING CO., LTD.		DATE	SIGNATURE	REPUBLIC OF THE PHILIPPINES DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS			PROJECT AND LOCATION :	SCALE :	SHEET CONTENTS :	SHEET NO. :
	DESIGNED	10/14/04	SEAN MARIA	PJHL – PMO	BUREAU OF DESIGN	OFFICE OF THE SECRETARY	THE DETAILED DESIGN STUDY ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)	NOT TO SCALE FULL SIZE A1	TYPICAL DRAINAGE SECTIONS (INITIAL and ULTIMATE STAGE)	DS-12
	CHECKED	10/17/04		Submitted By:	Reviewed By: / Recommended By:	Recommended By: (See cover sheet for Signature) / Approved By: (See cover sheet for Signature/Approval)				
	SUBMITTED	10/19/04	TEAM LEADER	DANILO C. TRAJANO Project Director	JOSEFINA M. ALAGAR Chief, Highways Division / GILBERTO S. REYES DIC, Director IV	MANUEL M. BONOAN Undersecretary / SIMEON A. DATUMANONG Secretary	CABANATUAN BYPASS - CONTRACT PACKAGE III			



PLAN (POST)



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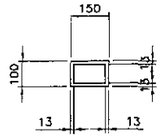

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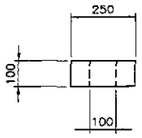

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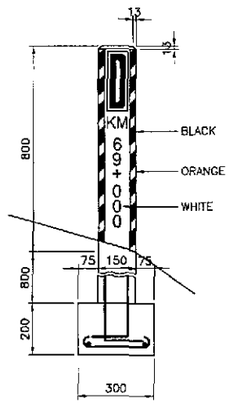
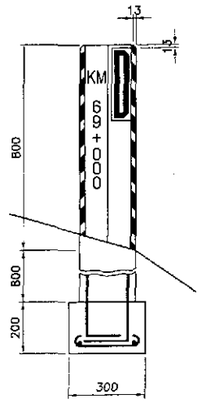
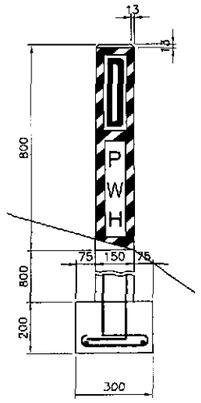


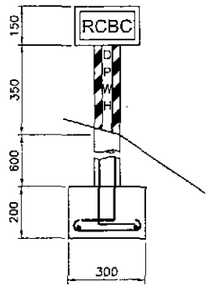
ELEVATION
CONCRETE MARKER
TYPE I-a



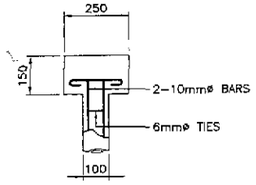
ELEVATION
CONCRETE MARKER
TYPE I-b

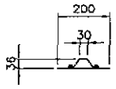


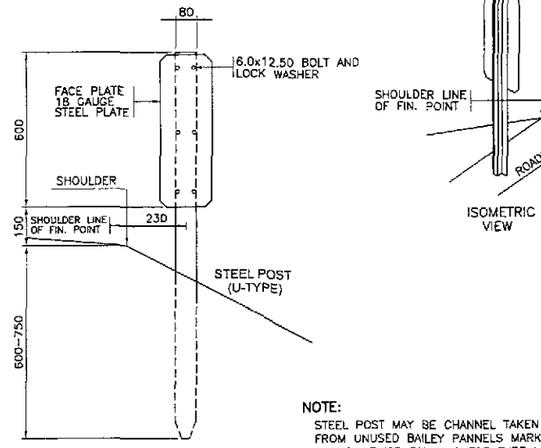
ELEVATION
CONCRETE MARKER
TYPE I-c



ELEVATION
CONCRETE MARKER
TYPE I-d

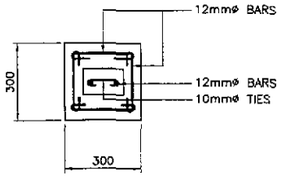




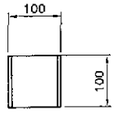


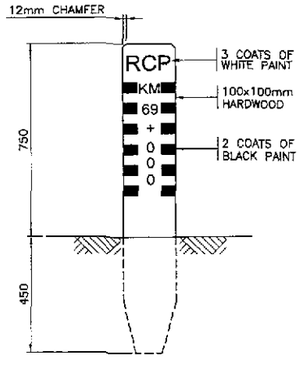
NOTE:
STEEL POST MAY BE CHANNEL TAKEN FROM UNUSED BAILEY PANNELS MARKINGS AND PAINTINGS SAME AS FOR TYPE I AND TYPE II AS SHOWN.

ELEVATION
STEEL MARKER
TYPE II

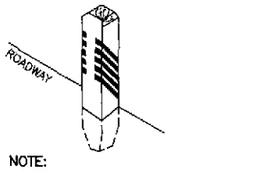


TYPICAL FOOTING DETAIL
CONCRETE MARKER
(TYPE I-a,b,c,d)



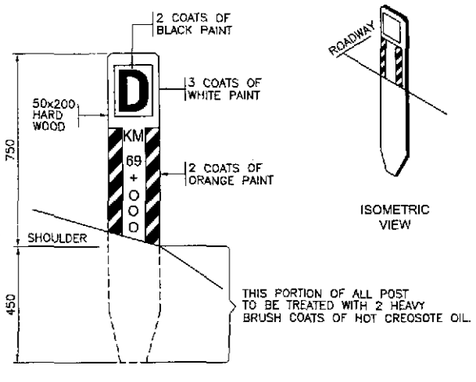


ELEVATION
WOODEN MARKER
TYPE III-a



NOTE:
FACING ROADWAY STAKED AT CENTER LINE OF DRAINAGE 254mm AWAY FROM SHOULDER LINE OF FINAL POINT.

ISOMETRIC
VIEW



ELEVATION
WOODEN MARKER
TYPE III-b

ISOMETRIC
VIEW

GENERAL NOTES

CONCRETE:
ALL CONCRETE TO BE CLASS "A" AND EXPOSED TOP TO BE CHAMFERED 13.0mm. ALL CONCRETE SHALL POURED IN THE DRY.

REINFORCING STEEL:
UNLESS OTHERWISE SHOWN ALL BAR SPACINGS ARE TO THE CENTER OF BARS AND THE MINIMUM COVERING OF BARS MEASURED FROM THE SURFACE OF THE CONCRETE TO THE FACE OF ANY BARS SHALL BE 50.0mm.

MARKINGS:
ALL RECESSED LETTERS SHALL BE CAST INTO CONCRETE AND ALL NUMBERS SHALL BE PAINTED AS SHOWN USING LETTER AND NUMBER FORM.

PAINTINGS:
ALL CONCRETE POSTS, TWO COATS OF WHITE PAINT. ALL RECESSED LETTERS ONE (1) COAT OF BLACK PAINT AND ALL BACKGOUND STRIPE SHALL BE ONE (1) COAT OF BLACK/ORANGE GLOSSED PAINT. ALL STRUCTURAL PLATES TWO COATS WHITE SHARP PAINT.

LOCATION:
DRAINAGE CULVERT MARKER TO BE SET AT SHOULDER LINE AND AT CENTER LINE OF CULVERT FACING TRAFFIC/ROADWAY AS SHOWN AND AS STAKED BY ENGINEERS.

DIMENSION:
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.

A / DS-13 STANDARD MAINTENANCE MARKERS NOT TO SCALE

JICA
JAPAN INTERNATIONAL COOPERATION AGENCY
KEI KATAHIRA & ENGINEERS INTERNATIONAL
YEC YACHIYO ENGINEERING CO., LTD.

	DATE	SIGNATURE
DESIGNED	10/4/02	F. SIM MARIA
CHECKED	10/7/02	
SUBMITTED	10/9/02	TEAM LEADER

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

PUHL – PMO	BUREAU OF DESIGN		OFFICE OF THE SECRETARY	
Submitted By:	Reviewed By:	Recommended By:	Recommended By: (See cover sheet for Signature)	Approved By: (See cover sheet for Signature/Approval)
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Project Director	Chief, Highways Division	OIC, Director IV	Undersecretary	Secretary

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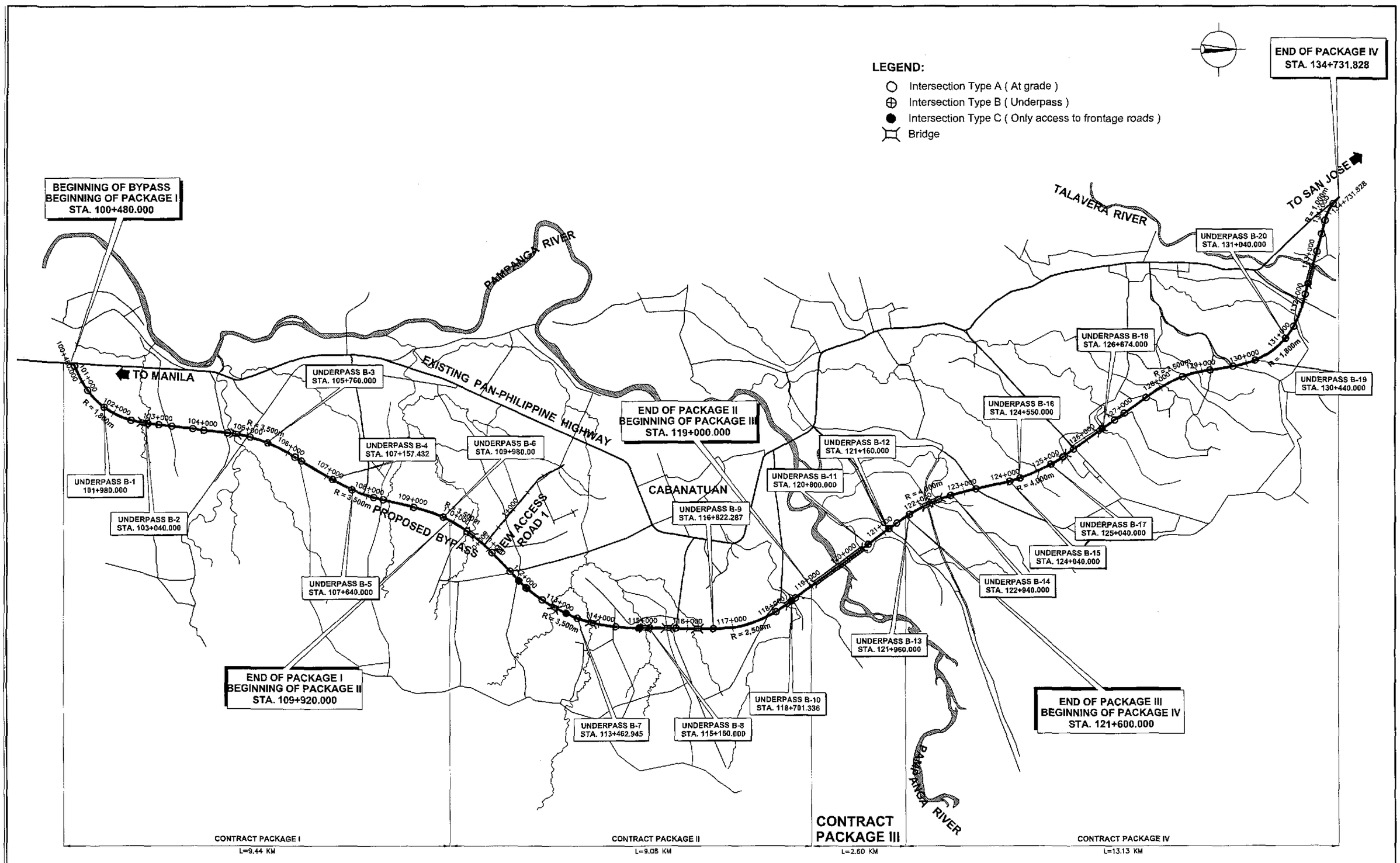
CABANATUAN BYPASS - CONTRACT PACKAGE III

SCALE : NOT TO SCALE FULL SIZE A1

SHEET CONTENTS : STANDARD MAINTENANCE MARKERS

SHEET NO. : DS-13

UNDERPASS CROSSING (BOX CULVERT)



A / UP-01 SITE DEVELOPMENT PLAN - UNDERPASSES ALONG BYPASS

SCALE 1:40,000

JICA JAPAN INTERNATIONAL COOPERATION AGENCY

KEI KATAHIRA & ENGINEERS INTERNATIONAL — YEC YACHIYO ENGINEERING CO., LTD.

	DATE	SIGNATURE
DESIGNED	10/12/02	C. CHAN
CHECKED	10/17/02	T. KAJIOKA
SUBMITTED	10/19/02	M. KUDO TEAM LEADER

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

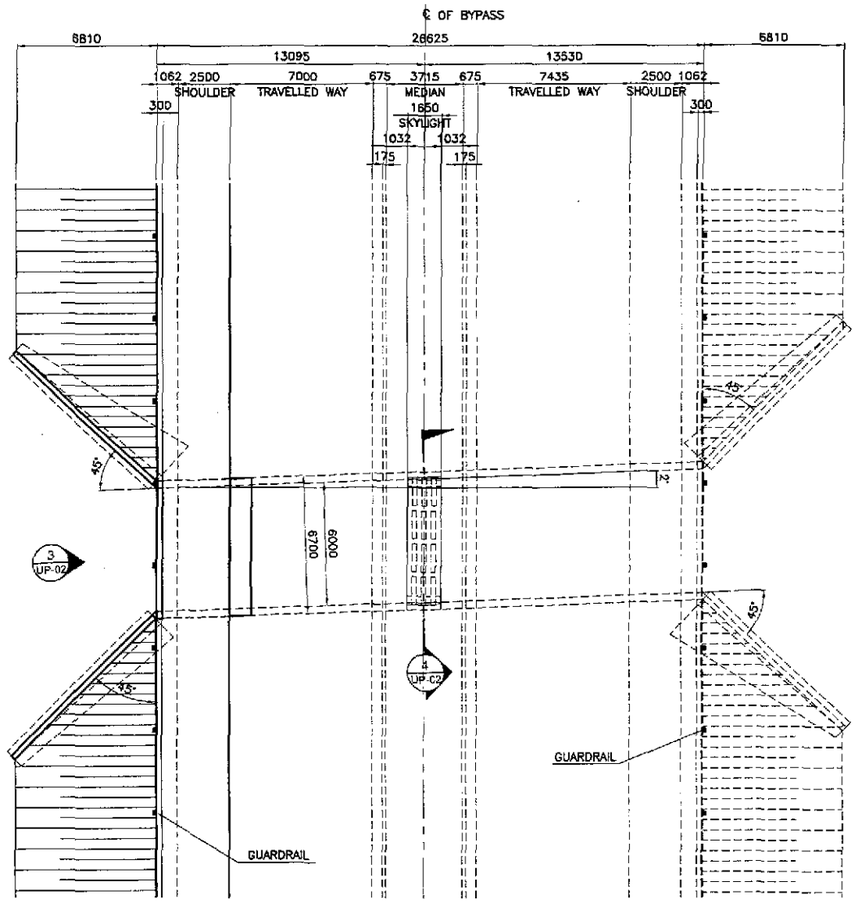
FPJHL – PMO	BUREAU OF DESIGN		OFFICE OF THE SECRETARY	
Submitted By:	Reviewed By:	Recommended By:	Recommended By: (See cover sheet for Signature)	Approved By: (See cover sheet for Signature/Approval)
DANILO C. TRAJANO	JOSEFINA M. ALAGAR	GILBERTO S. REYES	MANUEL M. BONOAN	SIMEON A. DATUMANONG
Project Director	Chief, Highways Division	OIC, Director IV	Undersecretary	Secretary

PROJECT AND LOCATION :
THE DETAILED DESIGN STUDY ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)
CABANATUAN BYPASS - CONTRACT PACKAGE III

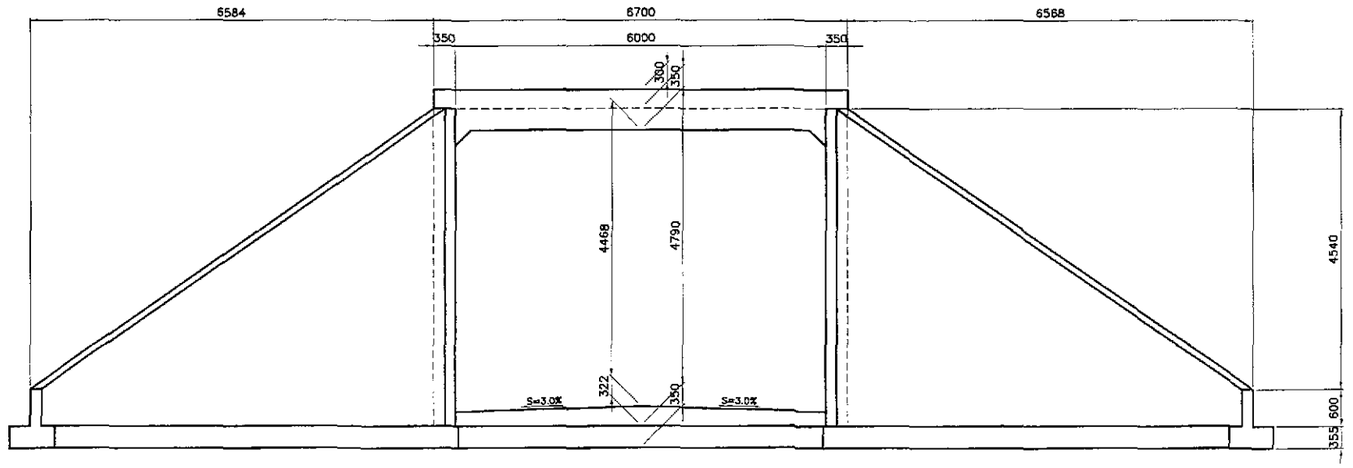
SCALE : 1:40,000 FULL SIZE A1

SHEET CONTENTS : SITE DEVELOPMENT PLAN UNDERPASSES ALONG BYPASS

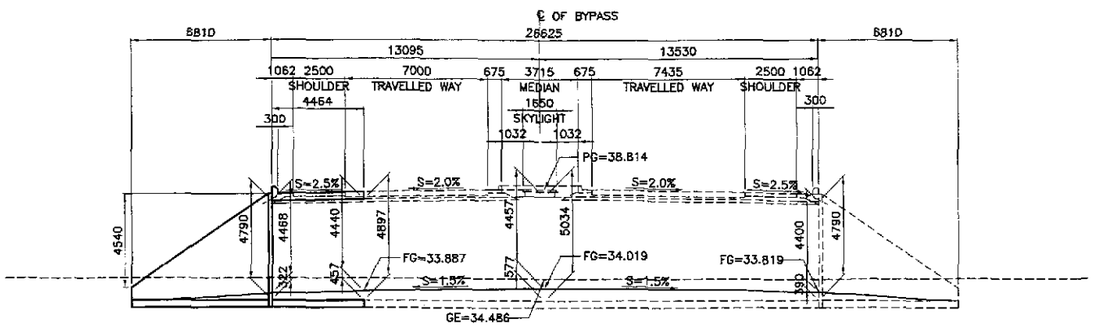
SHEET NO. : UP-01



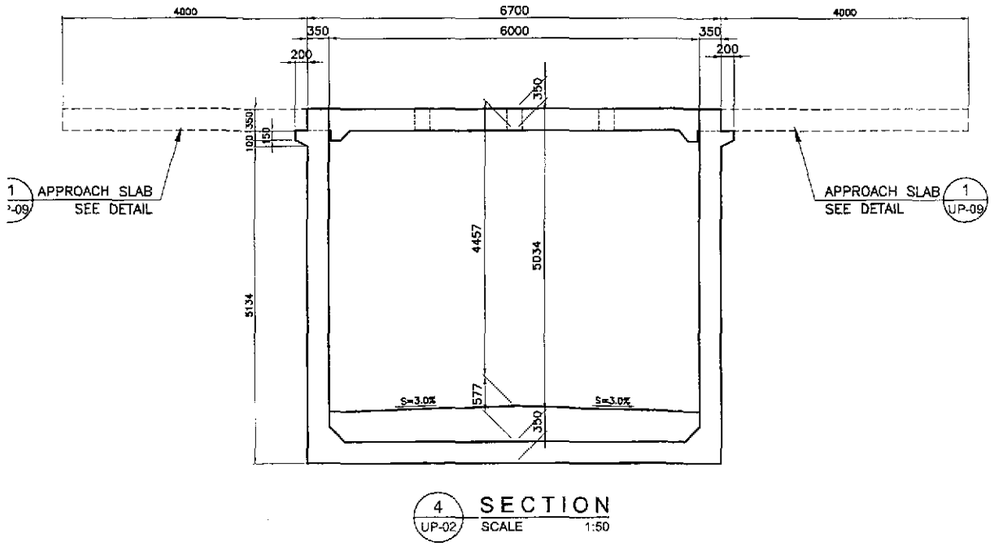
1 GENERAL PLAN
UP-02 SCALE 1:150



3 ELEVATION
UP-02 SCALE 1:50

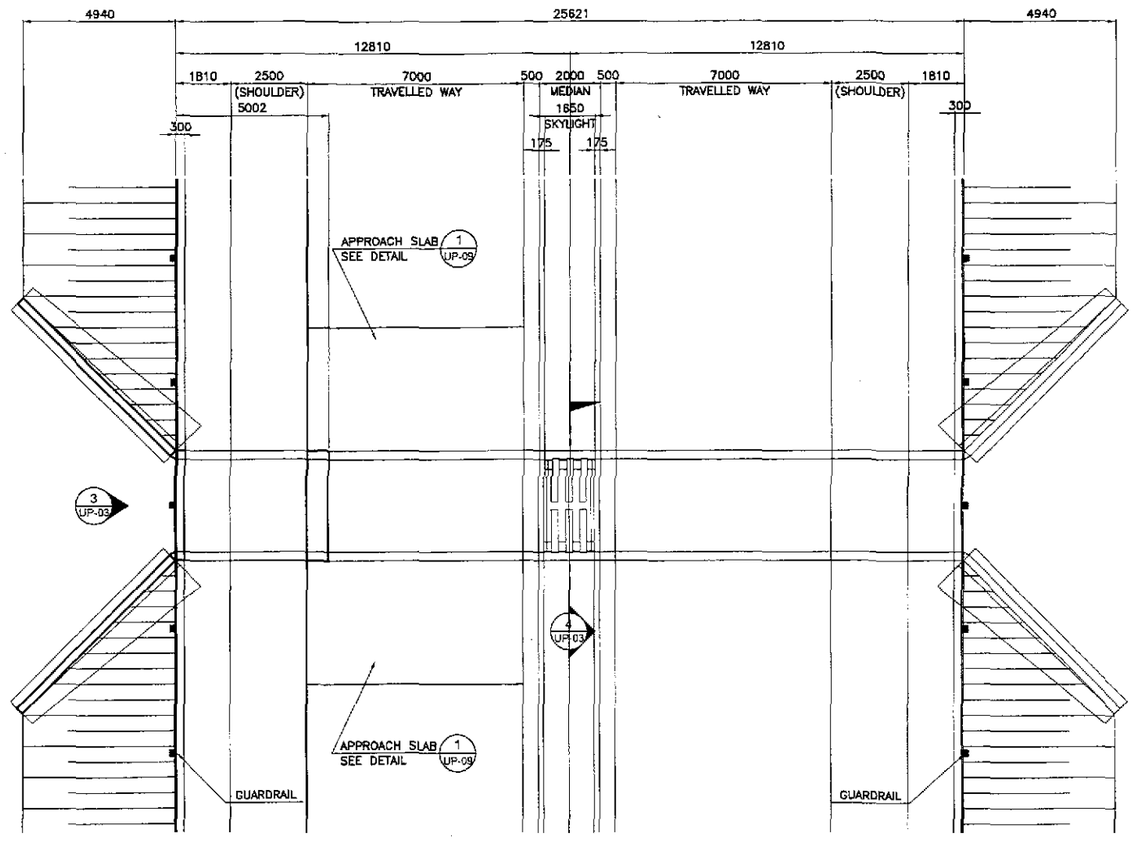


2 GENERAL ELEVATION
UP-02 SCALE 1:150

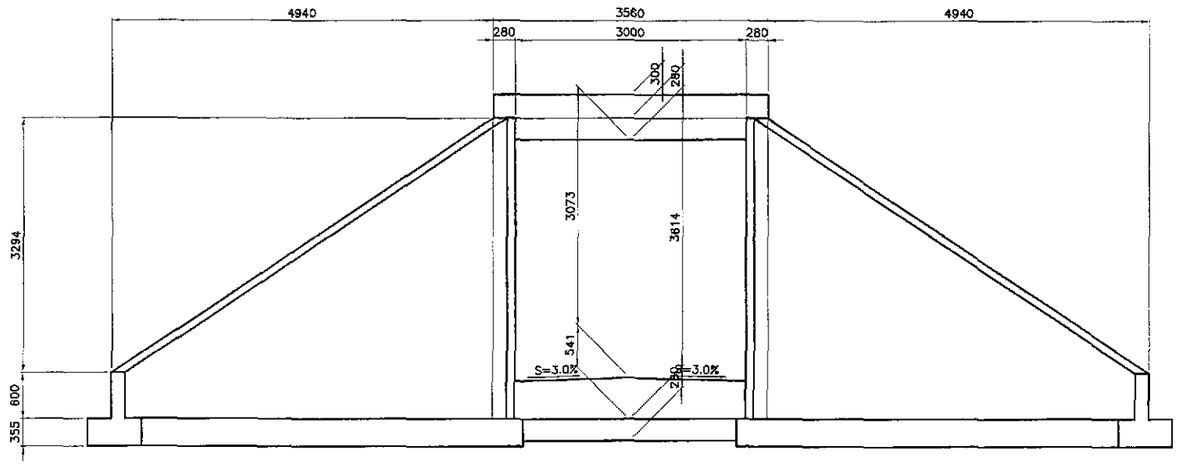


4 SECTION
UP-02 SCALE 1:50

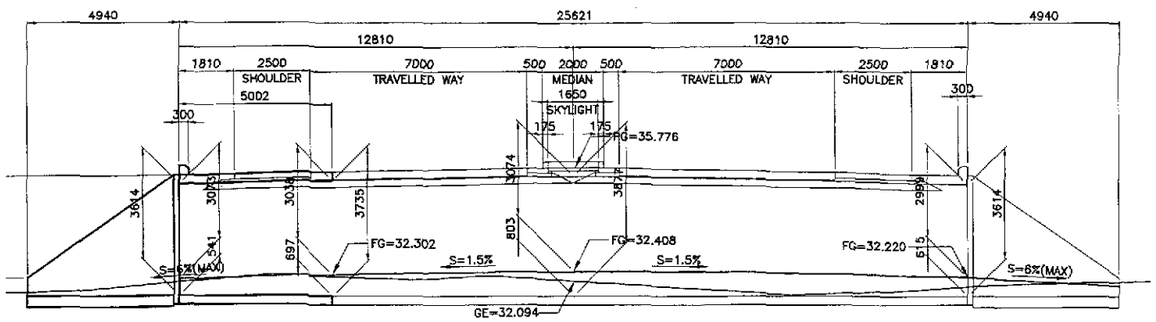
JICA JAPAN INTERNATIONAL COOPERATION AGENCY KATAHIRA & ENGINEERS INTERNATIONAL — YACHIYO ENGINEERING CO., LTD.			REPUBLIC OF THE PHILIPPINES DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS			PROJECT AND LOCATION : THE DETAILED DESIGN STUDY ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses) CABANATUAN BYPASS - CONTRACT PACKAGE III	SCALE : AS SHOWN FULL SIZE A1	SHEET CONTENTS : BOX CULVERT GENERAL PLAN, ELEVATION & SECTION (ULTIMATE STAGE) B-10 (STA. 118+701.336)	SHEET NO. : UP-02
	DATE	SIGNATURE	PJHL – PMO	BUREAU OF DESIGN		OFFICE OF THE SECRETARY			
DESIGNED	10/14/02	CHAIR	Submitted By:	Reviewed By:	Recommended By:	Recommended By: (See cover sheet for Signature)	Approved By: (See cover sheet for Signature/Approval)		
CHECKED	10/17/02	CHAIR	DANILO C. TRAJANO Project Director	JOSEFINA M. ALAGAR Chief, Highways Division	GILBERTO S. REYES DIC, Director IV	MANUEL M. BONOAN Undersecretary	SIMEON A. DATUMANONG Secretary		
SUBMITTED	10/19/02	TEAM LEADER							



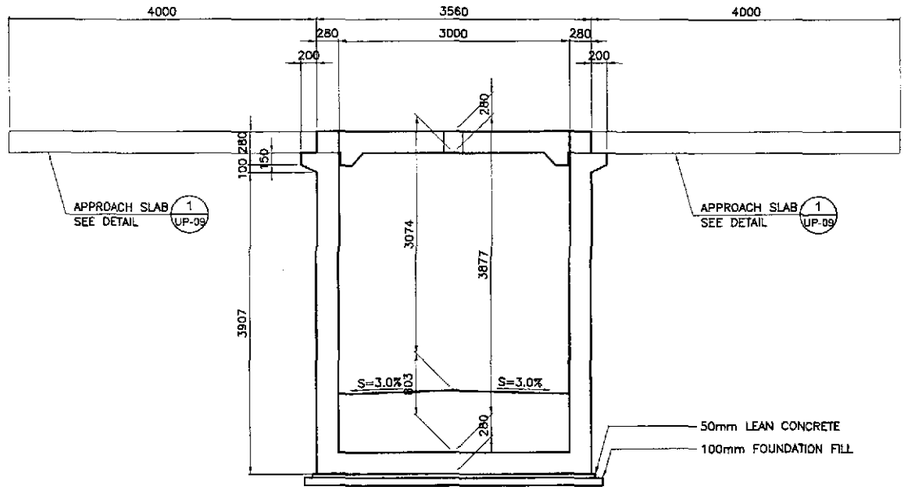
1 GENERAL PLAN
UP-03 SCALE 1:100



3 ELEVATION
UP-03 SCALE 1:40



2 GENERAL ELEVATION
UP-03 SCALE 1:100



4 SECTION
UP-03 SCALE 1:40

JICA
JAPAN INTERNATIONAL COOPERATION AGENCY
KEI KATAHIRA & ENGINEERS INTERNATIONAL
YEC YACHIYO ENGINEERING CO., LTD.

	DATE	SIGNATURE
DESIGNED	10/14/02	M. CHAN
CHECKED	10/17/02	T.K. TAKIM
SUBMITTED	10/18/02	TEAM LEADER

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

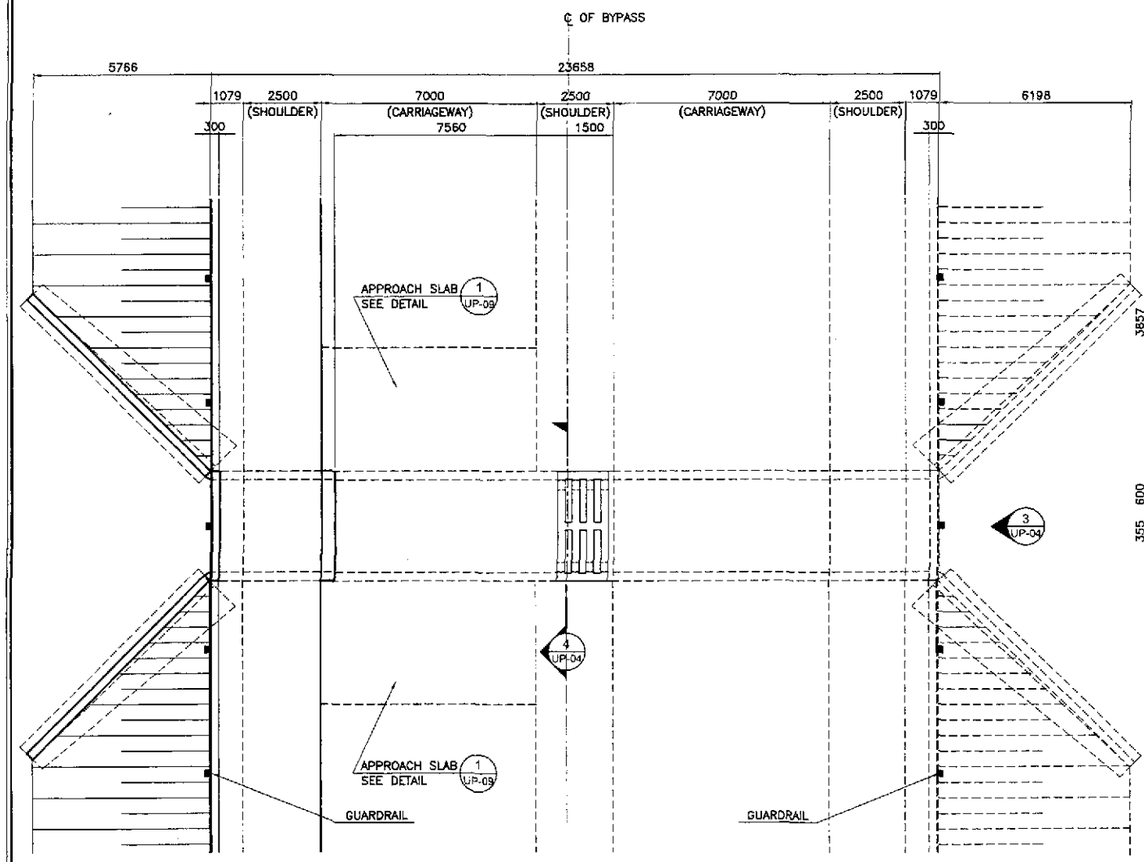
PJHL – PMO	BUREAU OF DESIGN		OFFICE OF THE SECRETARY	
Submitted By:	Reviewed By:	Recommended By:	Recommended By: (See cover sheet for Signature)	Approved By: (See cover sheet for Signature/Approval)
DANILO C. TRAJANO	JOSEFINA M. ALAGAR	GILBERTO S. REYES	MANUEL M. BONDAN	SIMEON A. DATUMANONG
Project Director	Chief, Highways Division	OIC, Director IV	Undersecretary	Secretary

PROJECT AND LOCATION :
THE DETAILED DESIGN STUDY ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (*Plaridel, Cabanatuan and San Jose Bypasses*)
CABANATUAN BYPASS - CONTRACT PACKAGE III

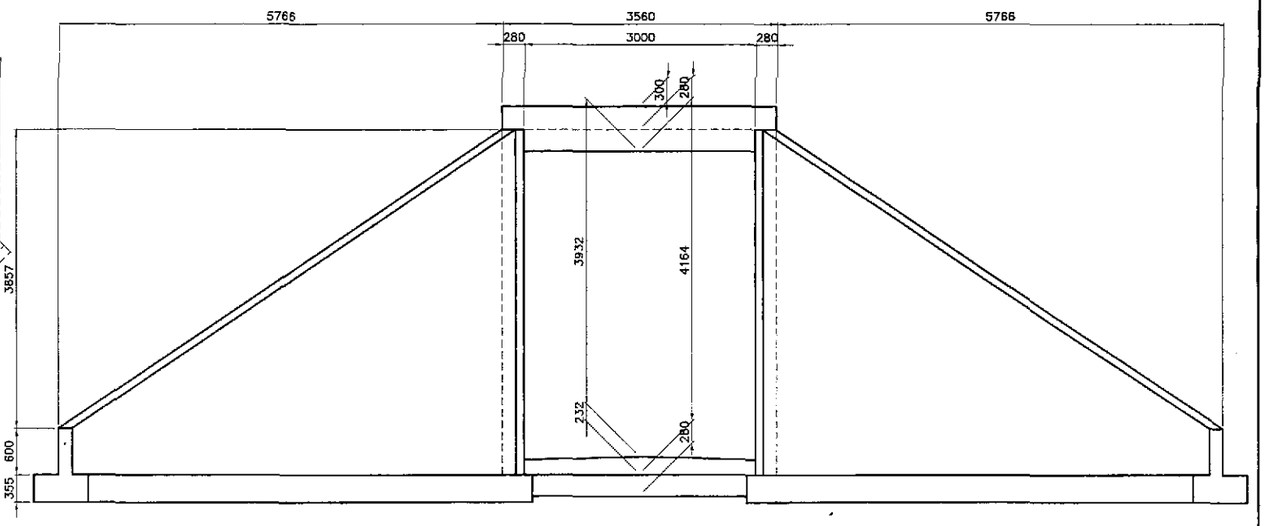
SCALE :
AS SHOWN
FULL SIZE A1

SHEET CONTENTS :
BOX CULVERT
GENERAL PLAN, ELEVATION & SECTION
(ULTIMATE STAGE)
B-11 (STA. 120+800.00)

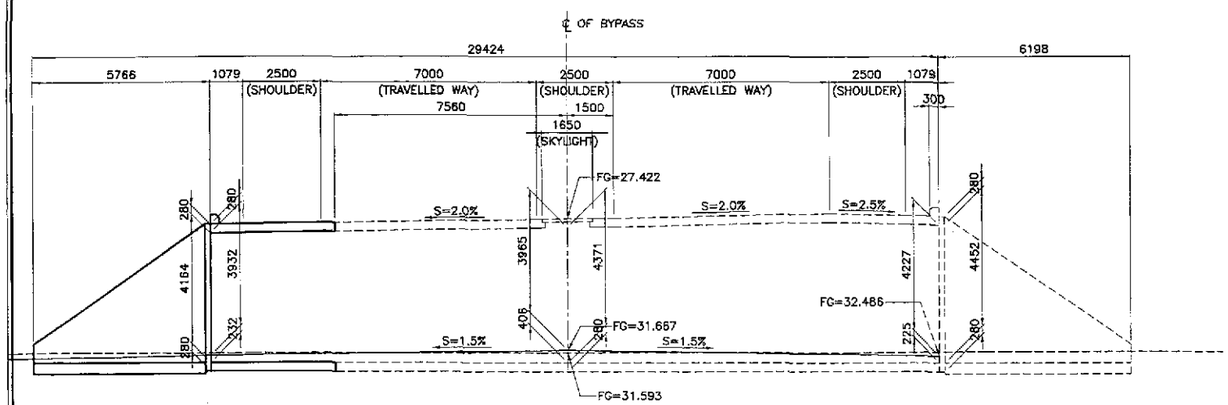
SHEET NO. :
UP-03



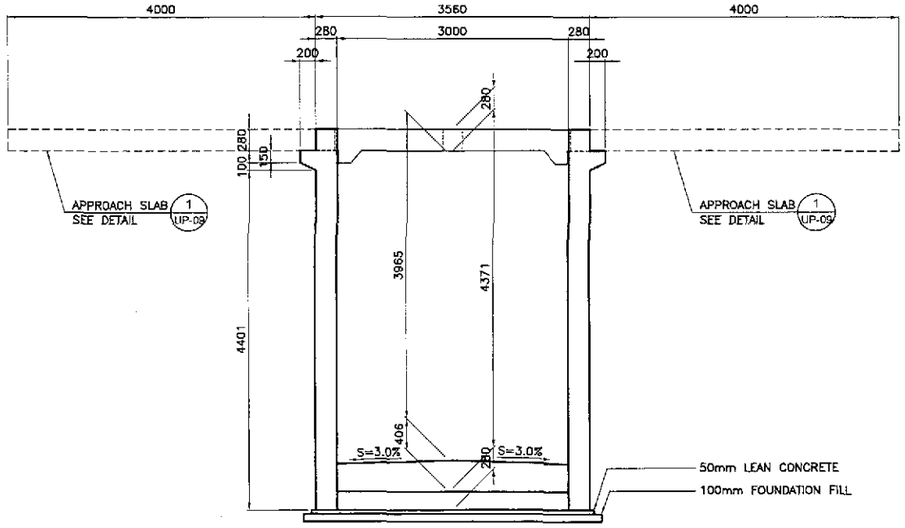
1 UP-04 GENERAL PLAN SCALE 1:100



3 UP-04 ELEVATION SCALE 1:40



2 UP-04 GENERAL ELEVATION SCALE 1:100



4 UP-04 SECTION SCALE 1:40

JICA
JAPAN INTERNATIONAL COOPERATION AGENCY

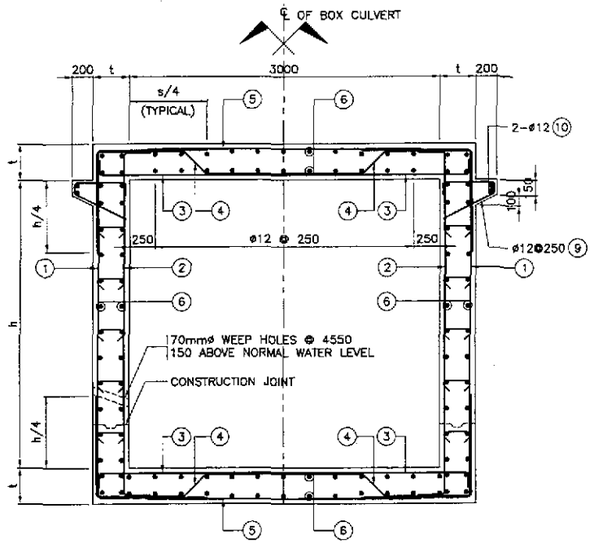
KEI KATAHIRA & ENGINEERS INTERNATIONAL
YEC YACHIYO ENGINEERING CO., LTD.

	DATE	SIGNATURE
DESIGNED	10/16/02	CHIEF
CHECKED	10/17/02	A. MARIN
SUBMITTED	10/19/02	TEAM LEADER

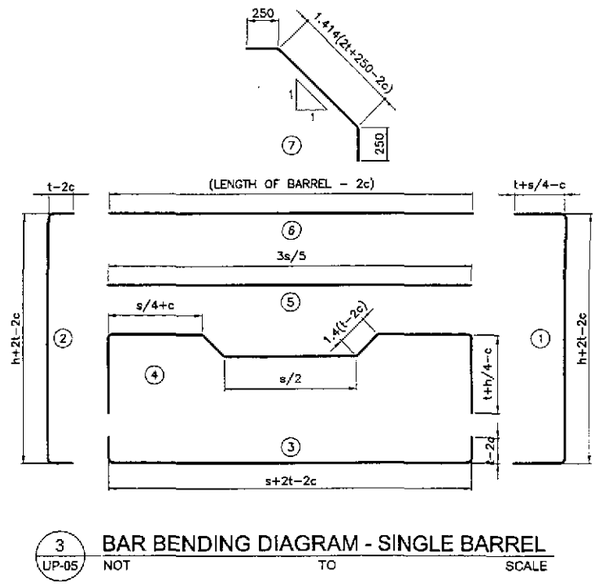
REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

PUHL – PMO	BUREAU OF DESIGN		OFFICE OF THE SECRETARY	
Submitted By:	Reviewed By:	Recommended By:	Recommended By: (See cover sheet for Signature)	Approved By: (See cover sheet for Signature/Approval)
DANILO C. TRAJANO	JOSEFINA M. ALAGAR	GILBERTO S. REYES	MANUEL M. BONOAN	SIMEON A. DATUMANONG
Project Director	Chief, Highways Division	OIC, Director IV	Undersecretary	Secretary

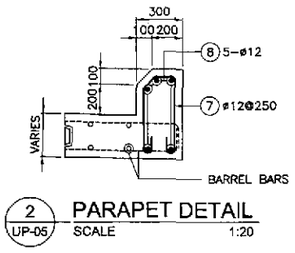
PROJECT AND LOCATION :	SCALE :	SHEET CONTENTS :	SHEET NO. :
THE DETAILED DESIGN STUDY ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses) CABANATUAN BYPASS - CONTRACT PACKAGE III	AS SHOWN FULL SIZE A1	**BOX CULVERT** GENERAL PLAN, ELEVATION & SECTION (ULTIMATE STAGE) B-12 (STA. 121+160.00)	**UP-04**



1 UP-05 SECTION - SINGLE BARREL
NOT TO SCALE



3 UP-05 BAR BENDING DIAGRAM - SINGLE BARREL
NOT TO SCALE



2 UP-05 PARAPET DETAIL
SCALE 1:20

DESIGN NOTES :

SPECIFICATIONS:
DESIGN:
BRIDGE DESIGN SPECIFICATION (1992 AASHTO SPECIFICATIONS)

LOAD FACTORS:
1.5 D 1.5 E + 2.5 (L + I)
1.3 (D + 1.67 LL + 1.00 E)
1.3 (D + 1.67 LL + 0.50 E)

WHERE:
D – DEAD LOAD
E – EARTH LOAD
L – LIVE LOAD
I – IMPACT
CAPACITY REDUCTION FACTOR IS INCLUDED.

LOADING:
LIVE LOAD:
HS20-44 TRUCK
APPLY IMPACT ONLY TO THE ROOF SLAB.

EARTH COVER (mm)	IMPACT (%)
Up to 300	30
301 to 600	20
601 to 900	10
Over 900	0

NO SURCHARGE ON WALL DUE TO LIVE LOAD.

EARTH LOAD:
EARTH PRESSURE FOR CONDITIONS:
18.8 KPa/m VERTICAL
9.4 KPa/M HORIZONTAL

UNIT STRESSES:
f'c = 28 MPa
fy = 276 MPa

DISTRIBUTION "d" BARS:
UP TO AND INCLUDING 3.0M COVER EXPRESSED AS A PERCENT OF MAIN POSITIVE REINFOCEMENT REQUIRED:
$\frac{55}{\sqrt{S}}$, MAX. 50%

OVER 3.0 COVER
#12 @ 450 mm MAXIMUM.

SHEAR:
MAXIMUM ALLOWABLE SHEAR, $v = 0.291\sqrt{f'c}$ MPa

EXCLUSIONS:
COMPRESSIVE REINFORCEMENT AND NEGATIVE-MOMENT REDUCTION (FOR CONTINUITY) DO NOT APPLY.
AXIAL LOADING ON MEMBERS HAS NOT BEEN CONSIDERED.

BAR SCHEDULE SINGLE BARREL BOX CULVERT

NAME	S	h	t	BAR 1		BAR 2		BAR 3		BAR 4		BAR 5		BAR 6		BAR 7		REMARKS
	SPAN	HEIGHT	THICKNESS	f	SPACING	f	SPACING	f	SPACING	f	SPACING	f	SPACING	f	SPACING	f	SPACING	
B-11	3000	3900	280	16	200	16	240	16	200	16	200	12	200	12	250	--	--	FLUSHED TO ROADWAY
B-12	3000	4400	280	16	200	16	240	16	200	16	200	12	200	12	250	--	--	FLUSHED TO ROADWAY

JICA JAPAN INTERNATIONAL COOPERATION AGENCY
KEI KATAHIRA & ENGINEERS INTERNATIONAL
YEC YACHIYO ENGINEERING CO., LTD.

	DATE	SIGNATURE
DESIGNED	10/14/11	M. SHIBA
CHECKED	10/17/11	A. TAKAHASHI
SUBMITTED	10/19/11	M. KUBOTA TEAM LEADER

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

PJHL – PMO	BUREAU OF DESIGN		OFFICE OF THE SECRETARY	
Submitted By:	*Reviewed By:*	*Recommended By:*	*Recommended By:* (See cover sheet for Signature)	*Approved By:* (See cover sheet for Signature/Approval)
DANILO C. TRAJANO	JOSEFINA M. ALAGAR	GILBERTO S. REYES	MANUEL M. BONOAN	SIMEON A. DATUMANONG
Project Director	Chief, Highways Division	OIC, Director IV	Undersecretary	Secretary

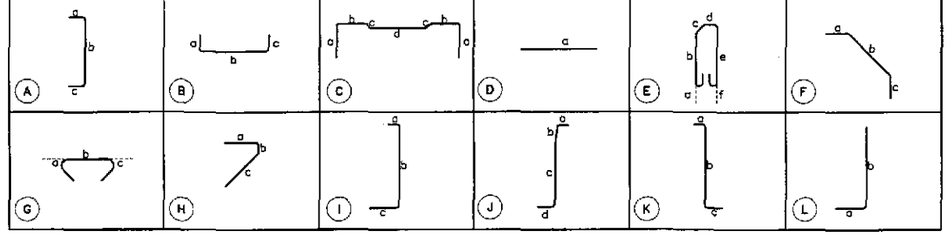
PROJECT AND LOCATION :
THE DETAILED DESIGN STUDY ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)
CABANATUAN BYPASS - CONTRACT PACKAGE III

SCALE : AS SHOWN FULL SIZE A1

SHEET CONTENTS : BOX CULVERT BARREL DETAILS (ULTIMATE STAGE)

SHEET NO. : UP-05

BAR BENDING DIAGRAM



SCHEDULE OF REINFORCEMENTS (B11 – STA. 120+800.00)

STRUCTURE COMMENT	BAR MARK	BAR SIZE	QTY.	SPACING	BAR SHAPE	DIMENSIONS (mm) a	b	c	d	e	f	LENGTH EA. BAR	TOTAL LENGTH	UNIT WT. (KG/M)	WEIGHT IN (KG)	VOLUME OF CONC. (m^3)
BARREL L=5.302m.	1	16	56	200	A	980	4206	980	–	–	–	6166	345.27	1.579	546	
	2	16	58	180	A	180	4206	180	–	–	–	4566	264.8	1.579	419	
	3	16	56	200	B	180	3460	180	–	–	–	3820	213.92	1.579	338	
	4	16	54	200	C	1186	800	255	1500	–	–	5942	320.86	1.579	507	
	5	12	56	200	D	2000	–	–	–	–	–	2000	112	0.888	100	
	6	12	132	250	D	5202	–	–	–	–	–	5202	686.86	0.888	610	22.51
	7	12	30	250	E	114	380	71	150	480	114	1309	39.26	0.888	35	
	8	12	10	AS DWG	D	3460	–	–	–	–	–	3460	34.6	0.888	31	
	9	12	58	250	H	430	70	608	–	–	–	1108	64.27	0.888	58	
	10	12	4	AS DWG	D	6900	–	–	–	–	–	6900	27.6	0.888	25	
WINGWALLS (h+0)=4.026m	W1	12	4	AS DWG	D	600	8759	–	–	–	–	9359	37.43	0.888	34	
	W2	12	26	300	D	4193 (mm)	–	–	–	–	–	4193	109.01	0.888	97	
	W3a	32	16	375	I	1711	3542 (mm)	150	–	–	–	5403	86.45	6.313	546	
	W3b	16	26	175	I	761	2257 (mm)	150	–	–	–	3168	82.38	1.579	131	
	W3c	12	12	275	I	711	1258 (mm)	150	–	–	–	2119	25.43	0.888	23	
	W4	12	50	300	I	203	2543 (mm)	150	–	–	–	2896	144.79	0.888	129	23.81
	W5a	25	14	375	D	1989 (mm)	–	–	–	–	–	1989	27.85	3.854	108	
	W5b	20	12	350	D	1453 (mm)	–	–	–	–	–	1453	17.44	2.466	44	
	W5c	12	12	275	D	912 (mm)	–	–	–	–	–	912	10.94	0.888	10	
	W6	12	14	AS DWG	D	7538	–	–	–	–	–	7538	105.53	0.888	94	
														GRAND TOTAL =	3885 KG	46.32

SCHEDULE OF REINFORCEMENTS (B12 – STA. 121+140.00)

STRUCTURE COMMENT	BAR MARK	BAR SIZE	QTY.	SPACING	BAR SHAPE	DIMENSIONS (mm) a	b	c	d	e	f	LENGTH EA. BAR	TOTAL LENGTH	UNIT WT. (KG/M)	WEIGHT IN (KG)	VOLUME OF CONC. (m^3)
BARREL L=4.319m.	1	16	46	200	A	980	4742	980	–	–	–	6702	308.27	1.579	487	
	2	16	48	180	A	180	4742	180	–	–	–	5102	244.87	1.579	387	
	3	16	46	200	B	180	3460	180	–	–	–	3820	175.72	1.579	278	
	4	16	44	200	C	1300	800	255	1500	–	–	6210	273.23	1.579	432	
	5	12	46	200	D	2000	–	–	–	–	–	2000	92	0.888	82	
	6	12	140	250	D	4219	–	–	–	–	–	4219	590.66	0.888	525	19.79
	7	12	30	250	E	114	380	71	150	480	114	1309	39.26	0.888	35	
	8	12	10	AS DWG	D	3460	–	–	–	–	–	3460	34.6	0.888	31	
	9	12	58	250	H	430	70	608	–	–	–	1108	64.27	0.888	58	
	10	12	4	AS DWG	D	6900	–	–	–	–	–	6900	27.6	0.888	25	
WINGWALLS (h+0)=4.562m.	W1	12	4	AS DWG	D	600	9569	–	–	–	–	10169	40.68	0.888	37	
	W2	12	30	300	D	4536 (mm)	–	–	–	–	–	4536	136.08	0.888	121	
	W3a	32	22	300	I	1732	3966 (mm)	150	–	–	–	5848	128.66	6.313	813	
	W3b	20	26	200	I	882	2481 (mm)	150	–	–	–	3513	91.33	2.466	226	
	W3c	12	14	275	I	732	1325 (mm)	150	–	–	–	2207	30.9	0.888	28	
	W4	12	54	300	I	203	2811 (mm)	150	–	–	–	3164	170.84	0.888	152	28.32
	W5a	25	20	300	D	2077 (mm)	–	–	–	–	–	2077	41.53	3.854	161	
	W5b	25	12	400	D	1720 (mm)	–	–	–	–	–	1720	20.64	3.854	80	
	W5c	12	14	275	D	908 (mm)	–	–	–	–	–	908	12.71	0.888	12	
	W6	12	14	AS DWG	D	8212	–	–	–	–	–	8212	114.97	0.888	103	
														GRAND TOTAL =	4073 KG	48.11

JICA
JAPAN INTERNATIONAL COOPERATION AGENCY

KEI KATAHIRA & ENGINEERS INTERNATIONAL
YEC YACHIYO ENGINEERING CO., LTD.

	DATE	SIGNATURE
DESIGNED	10/19/07	
CHECKED	10/17/07	
SUBMITTED	10/19/07	TEAM LEADER

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

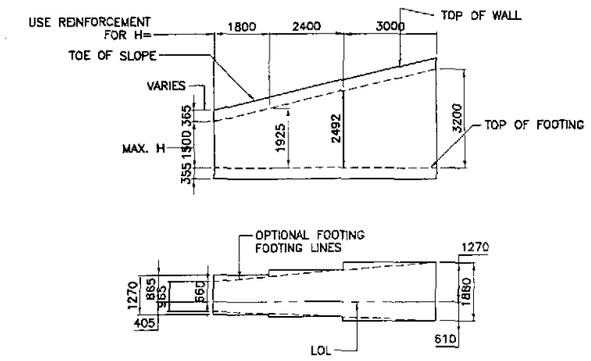
PJHL – PMO	BUREAU OF DESIGN		OFFICE OF THE SECRETARY	
Submitted By:	Reviewed By:	Recommended By:	Recommended By: (See cover sheet for Signature)	Approved By: (See cover sheet for Signature/Approval)
DANILO C. TRAJANO	JOSEFINA M. ALAGAR	GILBERTO S. REYES	MANUEL M. BONOAN	SIMEON A. DATUMANONG
Project Director	Chief, Highways Division	OIC, Director IV	Undersecretary	Secretary

PROJECT AND LOCATION :
THE DETAILED DESIGN STUDY ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)
CABANATUAN BYPASS - CONTRACT PACKAGE III

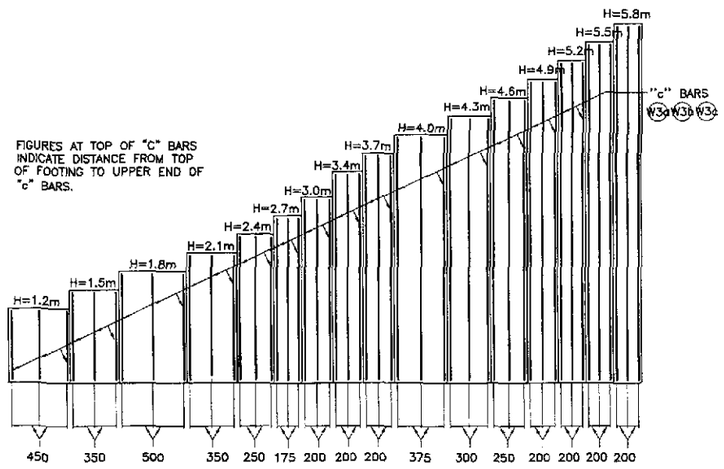
SCALE : AS SHOWN
FULL SIZE A1

SHEET CONTENTS :
BOX CULVERT
BOX CULVERT BARREL BAR SCHEDULE
(ULTIMATE STAGE)

SHEET NO. :
UP-06



1 UP-07 TYPICAL LAYOUT EXAMPLE
SCALE 1:100



REINFORCED CONCRETE WINGWALLS																
H	1200	1500	1800	2100	2400	2700	3000	3400	3700	4000	4300	4600	4900	5200	5500	5800
W	965	1120	1270	1420	1575	1730	1880	2030	2185	2335	2490	2640	2795	2945	3050	3150
C	305	355	405	455	510	560	610	660	710	760	815	865	915	965	1015	1065
B	660	765	865	965	1065	1170	1270	1370	1475	1575	1675	1775	1880	1980	2035	2085
F	355	355	355	355	355	355	355	355	355	355	355	355	355	355	355	355
Batter	None	None	None	None	None	None	None	None	None	1:25	1:25	1:25	1:25	1:25	1:26	1:27
S	305	305	305	305	305	305	305	305	305	465	475	490	500	500	500	500
"c" Bars	12@450	12@350	12@275	16@350	16@250	16@175	20@200	25@200	25@200	32@375	32@300	32@250	32@200	32@175	32@200	32@200
"d" Bars	12@450	12@350	12@275	16@350	16@250	20@350	25@400	25@400	25@400	25@375	25@300	25@250	25@200	25@175	28@200	28@200

NOTES

UNIT STRESSES: f_c =16.5 MPa, f_c =9 MPa, n=10

MAXIMUM TOE PRESSURE = 160 kPa

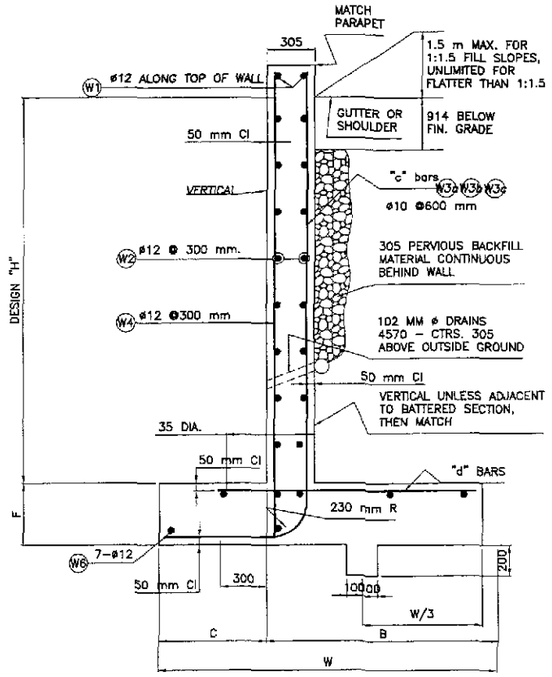
ELEVATIONS, LENGTH AND ANGLE OF FLARE OF WINGS MAY BE VARIED BY THE ENGINEER TO SUIT CONDITIONS ENCOUNTERED IN THE FIELD. WALLS DESIGNED FOR 600 mm LIVELOAD SURCHARGE, 1 : 1.5 SLOPING SURCHARGE NOT TO EXCEED 1.5 m IN ELEVATION PLUS 600 mm LIVELOAD SURCHARGE, OR UNLIMITED 1:2 SURCHARGE

DIMENSIONS "H", "L","M","N", ELEVATION "a" AND "ANGLE OF FLARES" (AS APPLY) ARE SHOWN ON THE PLANS

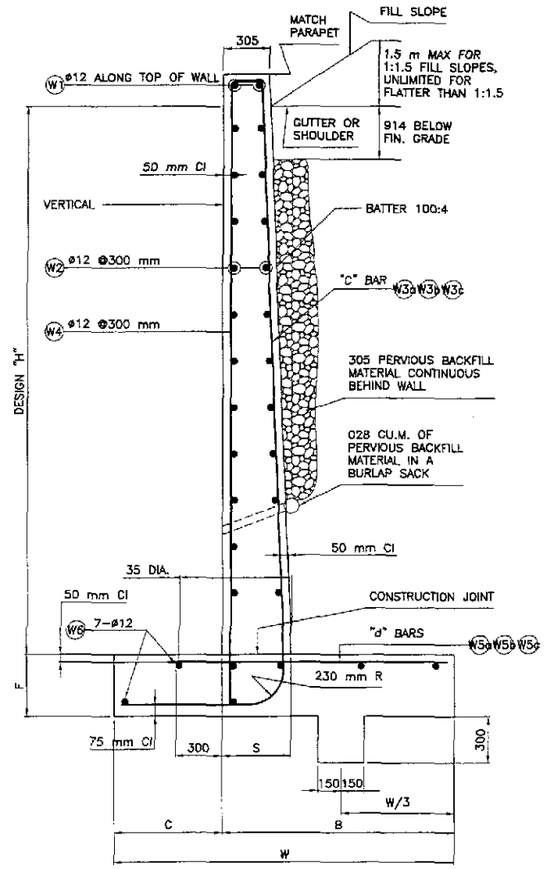
WALL HEIGHT MAY BE EXCEEDED BY 150 mm BEFORE GOING TO NEXT GREATER "H".

ELIMINATE CUTOFF WALL IF ADJACENT CHANNEL IS PAVED AND SKEW IS 20°MAXIMUM

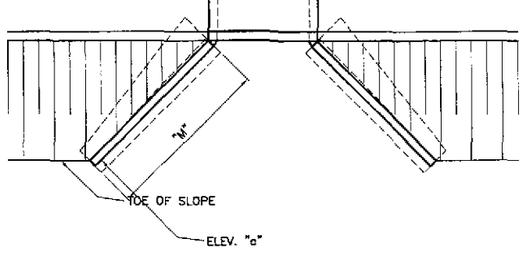
FOR WALL OFFSET VALUES, SEE STANDARD PLAN B3-8



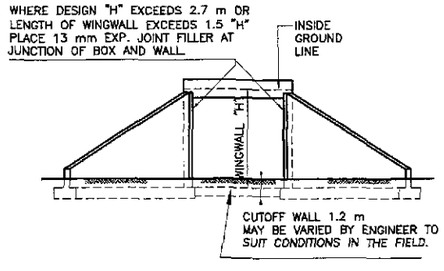
2 UP-07 TYPICAL SECTION
H=1.2 m THRU 3.7 m
SCALE 1:20



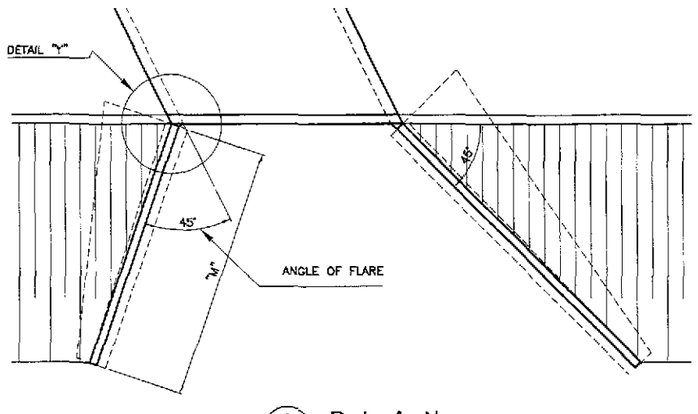
3 UP-07 TYPICAL SECTION
H=4.0 m THRU 4.9 m
SCALE 1:20



4 UP-07 PLAN
SCALE 1:100



5 UP-07 END ELEVATION
SCALE 1:100



6 UP-07 PLAN
SCALE 1:100

JAPAN INTERNATIONAL COOPERATION AGENCY

KATAHIRA & ENGINEERS INTERNATIONAL

YACHIYO ENGINEERING CO., LTD.

	DATE	SIGNATURE
DESIGNED	10/16/07	T. CHO
CHECKED	10/17/07	T. AKIM
SUBMITTED	10/19/07	TEAM LEADER

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

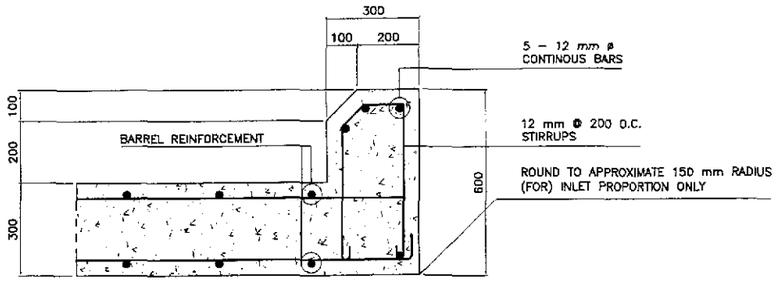
PJHL – PMO	BUREAU OF DESIGN		OFFICE OF THE SECRETARY	
Submitted By:	Reviewed By:	Recommended By:	Recommended By: (See cover sheet for Signature)	Approved By: (See cover sheet for Signature/Approved)
DANILO C. TRAJANO	JOSEFINA M. ALAGAR	GILBERTO S. REYES	MANUEL M. BONOAN	SIMEON A. DATUMANONG
Project Director	Chief, Highways Division	OIC, Director IV	Undersecretary	Secretary

PROJECT AND LOCATION :
THE DETAILED DESIGN STUDY ON UPGRADING INTER-URBAN HIGHWAY SYSTEM ALONG THE PAN-PHILIPPINE HIGHWAY (Plaridel, Cabanatuan and San Jose Bypasses)
CABANATUAN BYPASS - CONTRACT PACKAGE III

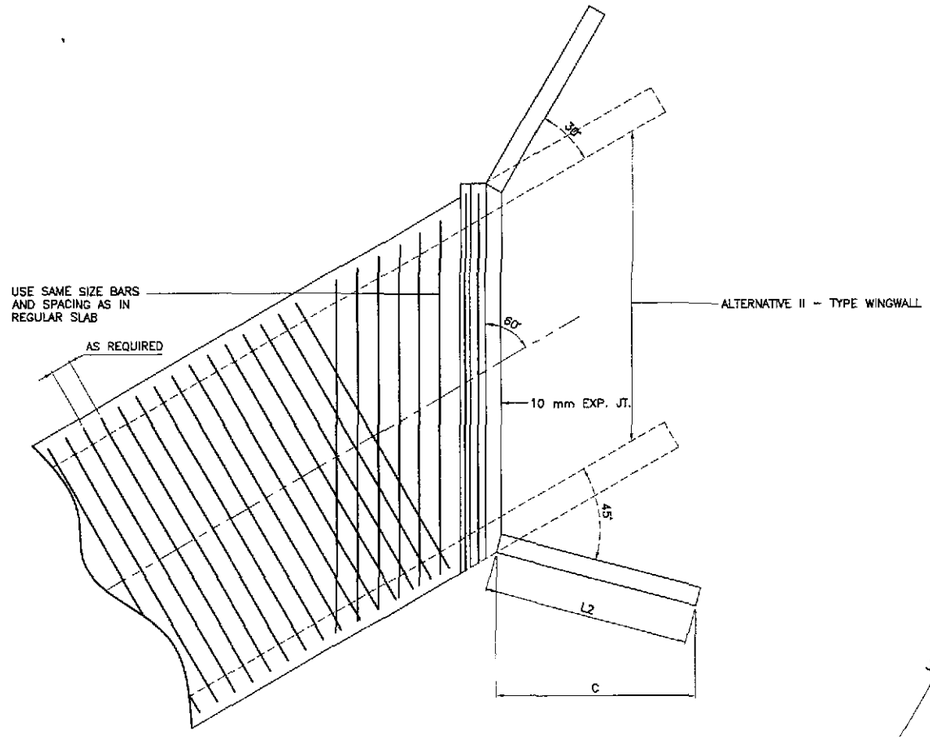
SCALE :
AS SHOWN
FULL SIZE A1

SHEET CONTENTS :
BOX CULVERT
WINGWALL DETAIL
(ULTIMATE STAGE)

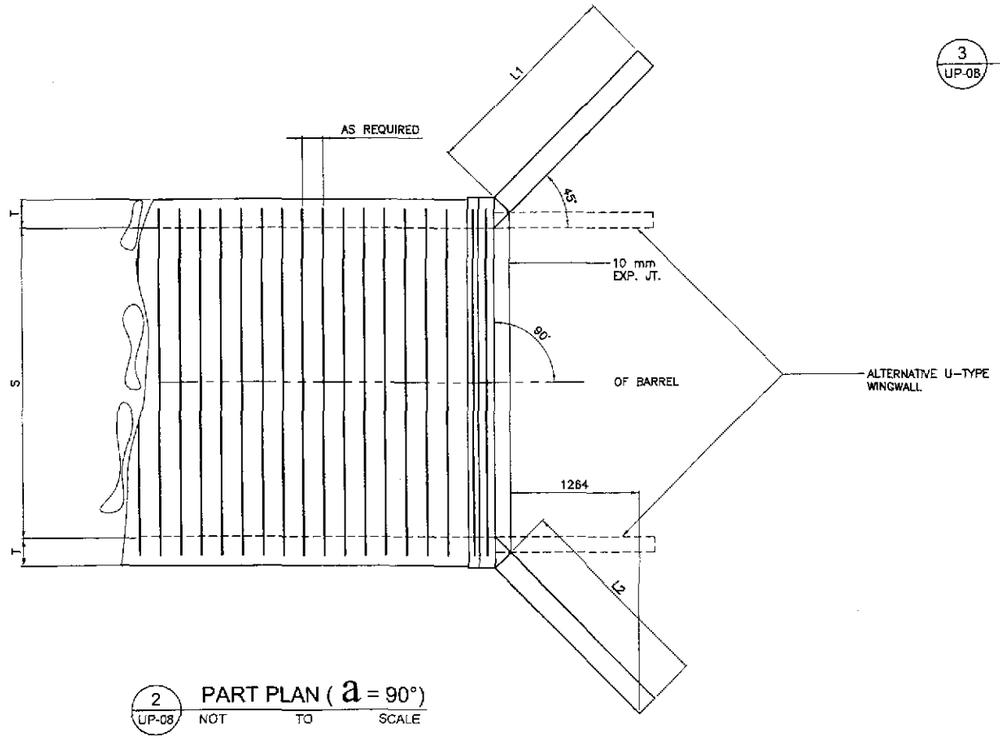
SHEET NO. :
UP-07



1 / UP-08 CURB DETAIL
SCALE 1:10



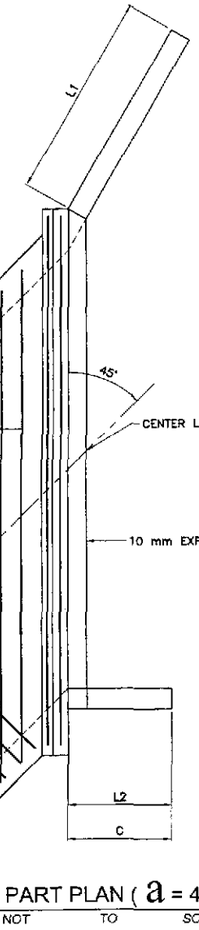
3 / UP-08 PART PLAN (a = 60°)
NOT TO SCALE



2 / UP-08 PART PLAN (a = 90°)
NOT TO SCALE

N O T E

ALL DIMENSIONS ARE IN
MILLIMETERS UNLESS
OTHERWISE SPECIFIED



4 / UP-08 PART PLAN (a = 45°)
NOT TO SCALE

JICA
JAPAN INTERNATIONAL COOPERATION AGENCY

KATAHIRA & ENGINEERS INTERNATIONAL
YACHIYO ENGINEERING CO., LTD.

	DATE	SIGNATURE
DESIGNED	10/02	
CHECKED	10/17/02	
SUBMITTED	10/19/02	TEAM LEADER

REPUBLIC OF THE PHILIPPINES
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Project Director	Chief, Highways Division	DIC, Director IV	Undersecretary	Secretary

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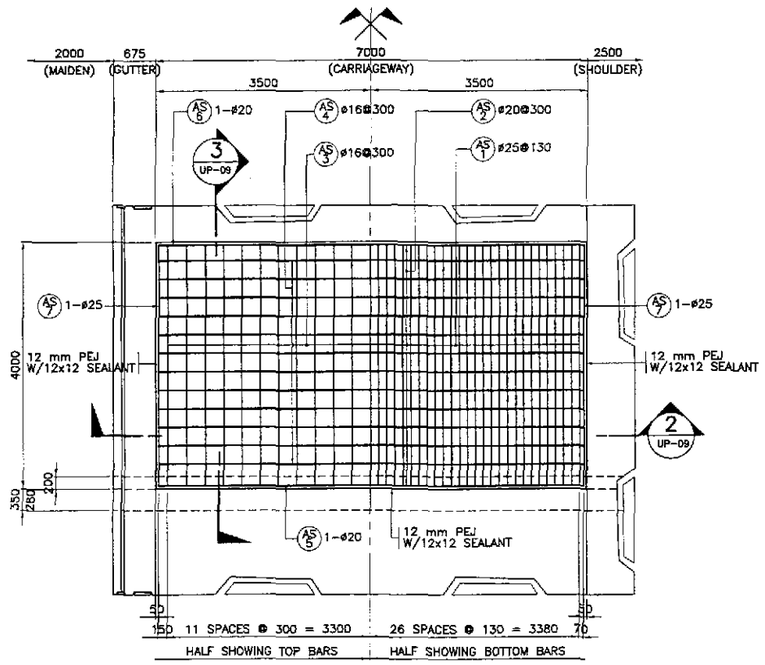
CABANATUAN BYPASS - CONTRACT PACKAGE III

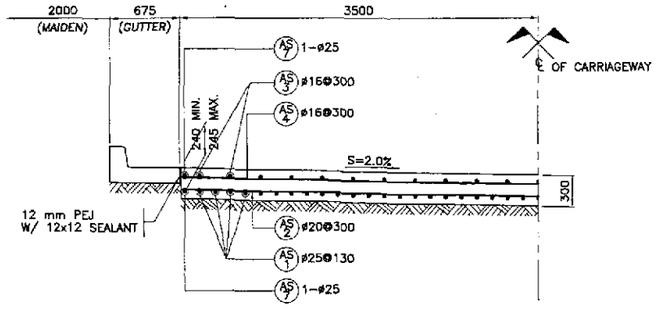
SCALE :
AS SHOWN
FULL SIZE A1

SHEET CONTENTS :
BOX CULVERT
TYPICAL PLAN REINFORCED CONCRETE AT
END BOX CULVERT AND CURB DETAIL
(ULTIMATE STAGE)

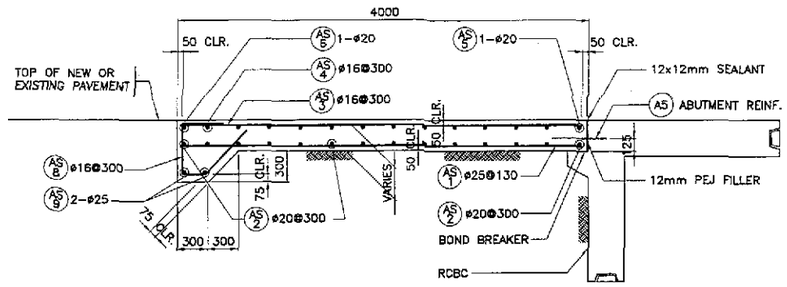
SHEET NO. :
UP-08



1 UP-09 PLAN SCALE 1:50



2 UP-09 SECTION SCALE 1:30



3 UP-09 SECTION SCALE 1:30

REINFORCEMENT SCHEDULE & ESTIMATED QUANTITIES FOR TWO LANES APPROACH SLABS

BENDING DIAGRAM (DIMENSIONS ARE OUT TO OUT OF REBARS)	REINFORCEMENT												CONCRETE VOLUME (m^3)	REMARKS
	MARK	SIZE (mm)	QUANTITY	SPACING (mm)	SHAPE	BAR DIMENSIONS (mm) a	b	c	LENGTH PER BAR (mm)	TOTAL LENGTH (m)	UNIT WEIGHT (kg/m)	TOTAL WEIGHT (kg)		
a (A)	AS1	25	69	130	B	3900	150	–	4050	226.80	3.853	874		1. QUANTITIES ARE FOR ONE (1) APPROACH SLAB
	AS2	20	14	300	A	7900	–	–	7900	55.30	2.466	136		
	AS3	16	25	300	B	3900	150	–	4050	101.25	1.578	160		
a b (B)	AS4	16	12	300	A	7900	–	–	7900	47.40	1.578	75		
	AS5	20	1	AS SHOWN	A	7200	–	–	7200	7.20	2.466	18		
	AS6	20	1	AS SHOWN	A	7900	–	–	4050	53.20	1.578	84	9.58	
	AS7	25	4	AS SHOWN	A	1965	1965	–	3930	15.72	3.853	61		
400 a c b (C)	AS8	16	27	300	C	415 MIN. 475 MAX.	250	650	1745	47.11	1.578	74		
	AS8	25	2	AS SHOWN	A	7900	–	–	7900	15.80	3.853	61		
										GRAND TOTAL =		1543	9.58	

JICA
JAPAN INTERNATIONAL COOPERATION AGENCY
KEI KATAHIRA & ENGINEERS INTERNATIONAL
YEC YACHIYO ENGINEERING CO., LTD.

	DATE	SIGNATURE
DESIGNED	10/11/02	
CHECKED	10/17/02	
SUBMITTED	10/19/02	

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SCALE : AS SHOWN FULL SIZE A1

SHEET CONTENTS : BOX CULVERT APPROACH SLAB DETAIL (ULTIMATE STAGE)

SHEET NO. : UP-09