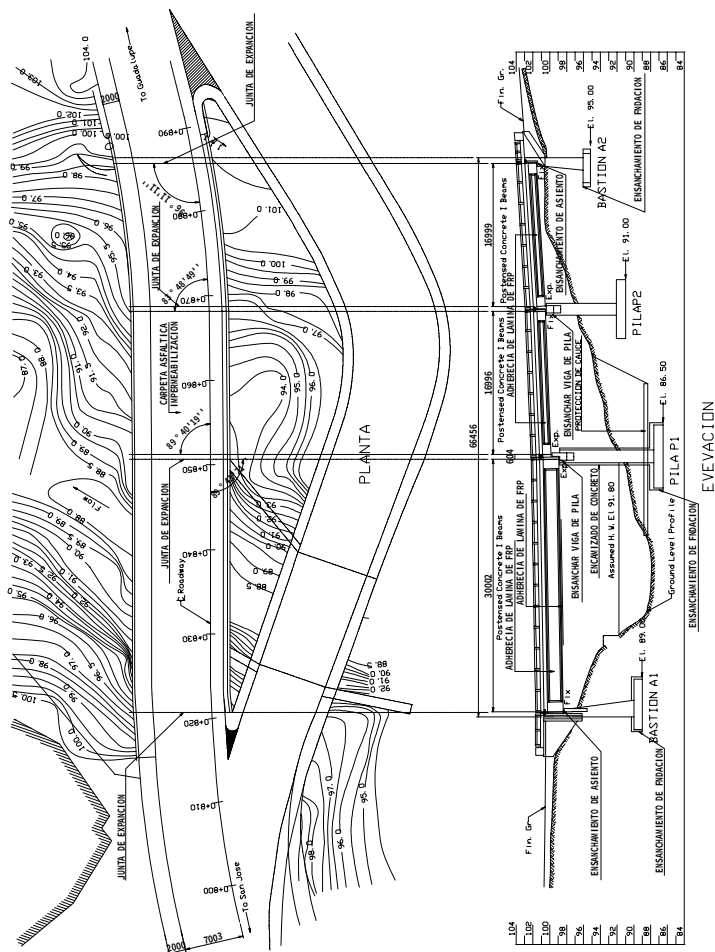


No. 29 Puente de Rio Torres

No. Plano	No. Lamina	Titulo de Planos	
		Titulo Principal del Plano	Sub Titulo del Plano
2901	1	VISTA GENERAL DE PUENTE	
2902	2	REFUERZO DE VIGAS PRINCIPALES	ADHERENCIA DE LAMINAS DE FIBRA DE CARBON
2903	3	REFUERZO DE SUBESTRUCTURA	BASTIONES A1 Y A2
2904	4	REFUERZO DE SUBESTRUCTURA	PILA P1
2905	5	REFUERZO DE SUBESTRUCTURA	PILA P2
2906	6	REFUERZO DE BASTION A1	ASIENTO
2907	7	REFUERZO DE BASTION A1	FUNDACION (1)
2908	8	REFUERZO DE BASTION A1	FUNDACION (2)
2909	9	REFUERZO DE PILA P1	VIGAS CABEZALES (1)
2910	10	REFUERZO DE PILA P1	VIGAS CABEZALES (2)
2911	11	REFUERZO DE PILA P1	FUNDACION
2912	12	REFUERZO DE PILA P1	COLUMN
2913	13	REFUERZO DE PILA P2	VIGAS CABEZALES (1)
2914	14	REFUERZO DE PILA P2	VIGAS CABEZALES (2)
2915	15	REFUERZO DE BASTION A2	ASIENTO
2916	16	REFUERZO DE BASTION A2	FUNDACION (1)
2917	17	REFUERZO DE BASTION A2	FUNDACION (2)

VISTA GENERAL DE PUENTE ESCALA 1:250



Especificaciones;
Diseño: AASHTO Standard Specifications for Highway Bridges, 17 Edición -2002, excepto en las notas.

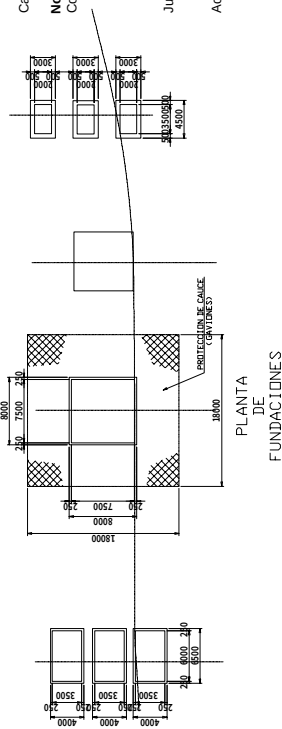
Carga Viva: HS20 + 25%.

Notas Generales:

Concreto: Todo el concreto es clase "A" a menos que se indique lo contrario. Todos el concreto debe ser colado en ambiente seco. Se debe hacer un chafán de 2cm en todos los bordes expuestos a menos que se indique lo contrario. Todas las superficies sobre la línea de terreno debe formarse con Madera de formaleja y esas superficies expuestas deben tener un acabado de repello excepto en las superficies de la losa.

Juntas de Construcción: Las juntas de construcción de la subestructura deben ser horizontales. Las superficies de concreto existente, donde se coloca concreto nuevo, deben ser picadas para lograr una buena conexión con el concreto nuevo.

Acero de Refuerzo: El acero de refuerzo debe ser de varillas corrugadas Grado 60. Todas las dimensiones relacionadas al refuerzo de acero son de centro a centro de varilla. A menos que se indique lo contrario, las varillas deben colocarse a 100mm de la superficie de concreto mas cercana. El acero de refuerzo estará sujeto rigidamente al espaciamiento especificado mientras el concreto es colocado. Todas las varillas



VISTA GENERAL DE PUENTE
PUENTE SOBRE RIO TORRES

DISEÑO No. 2007

Indicador

ESCALA

APROBADO: ANTONIO J. ROMERO CARRERO
ING. CIVIL

APROBADO: ANTONIO J. ROMERO CARRERO
ING. CIVIL

REVISADO: ANTONIO J. ROMERO CARRERO
ING. CIVIL

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ING. CIVIL

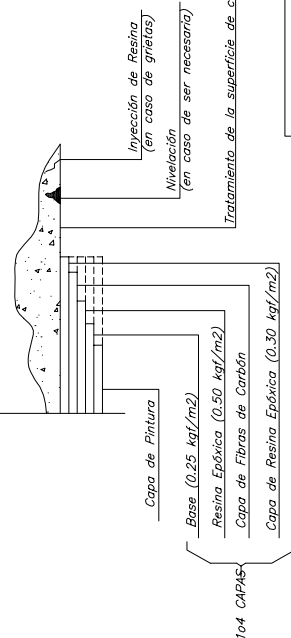
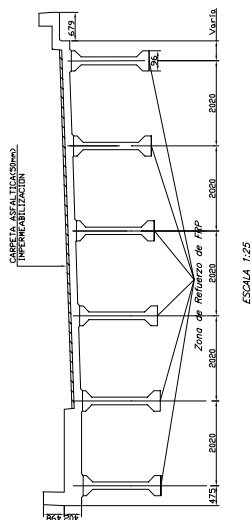
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ING. CIVIL

REVISADO: ANTONIO J. ROMERO CARRERO
ING. CIVIL

REVISADO: ANTONIO J. ROMERO CARRERO
ING. CIVIL

REVISADO: ANTONIO J. ROMERO CARRERO
ING. CIVIL

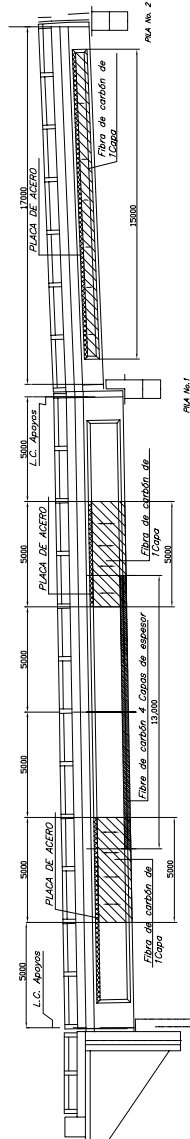
REFUERZO DE VIGAS PRINCIPALES
ADHESION DE LAMINAS DE FIBRA DE CARBON



ESCALA 1:25

ITEM	ESPECIFICACIONES
MODULO ELASTICO	640 N/mm ² (6.5x10 ⁴ kgf/cm ²)
Resistencia última	1.80 N/mm ² (20000 kgf/cm ²)
Peso Unitario	300 g/m ²
Epesor	1 capa 0.40 mm

DETALLE DE COLOCACION
DE FIBRAS DE CARBON



ELEVACION DE VIGA POSTENSADA de 30.00m
ESCALA 1:50

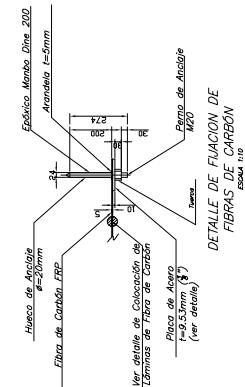
Plat. No. 1

VISTA LONGITUDINAL VIGA
DE 17.00m
ESCALA 1:30

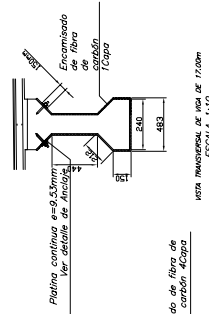
Plat. No. 2

DETALLE DE PLACA DE ACERO
PARA FIBRAS DE CARBON
ESCALA 1:10

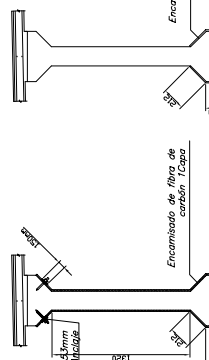
Notas:
Adhesión de laminas de fibra de carbono en la viga principal (para el No.29)
Antes de la adhesión de las laminas de fibra de carbono, las grietas existentes en la viga principal deben ser reparadas con inyección de resina. La lamina de fibra de carbono debe satisfacer las características requeridas como se muestra en la tabla.
Se deben adherir 4 capas de laminas de fibra de carbono alrededor del ala inferior de la viga principal para reforzar la capacidad al momento de flexión. La dirección de la fibra de todas las capas debe ser en dirección longitudinal a la dirección del puente.
Se debe adherir 1 capa de laminas de fibra de carbono en ambos lados y en la parte inferior de la viga principal para reforzar la capacidad a la fuerza de cortante. Esta fibra debe ser adherida de espes de adherir la fibra para el momento de flexión. La dirección de la fibra de la capa debe ser transversal a la dirección de la viga. La lamina de fibra de carbono debe ser sujeta con placas de acero en ambos lados al final como se muestra en los dibujos.
Cada capa debe ser adherida con resina adhesiva como se muestra en los detalles.



DETALLE DE FIBRACION DE
FIBRAS DE CARBON
ESCALA 1:10



VISTA TRANSVERSAL DE VIGA DE 30.00m
ESCALA 1:10



VISTA TRANSVERSAL DE VIGA DE 30.00m
ESCALA 1:10

REFUERZO DE VIGAS PRINCIPALES
PUENTE SOBRE RIO TORRES
PROYECTO:

DISEÑO No. 2002
HOLLA 2 DE 17

ESCALA: INDICADA
FECHA: ENERO 2007

APROBADO: INGENIERO CIVIL
APROBADO: INGENIERO CIVIL

DISEÑO: INGENIERO CIVIL
DISEÑO: INGENIERO CIVIL

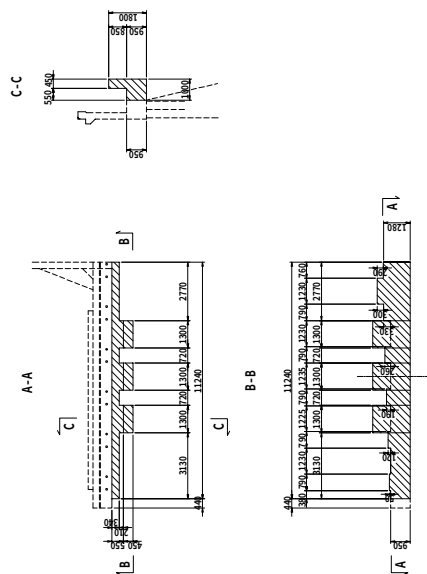
DISEÑO: INGENIERO CIVIL
DISEÑO: INGENIERO CIVIL

DIRECCION DE PUENTES
DEPARTAMENTO DISEÑO DE PUENTES

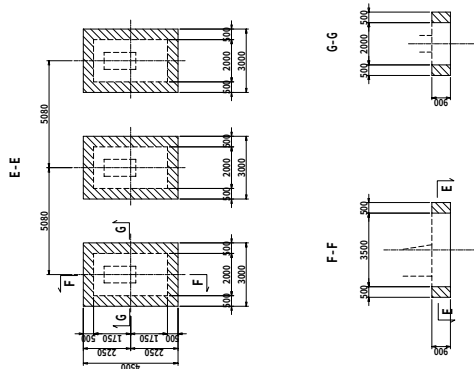
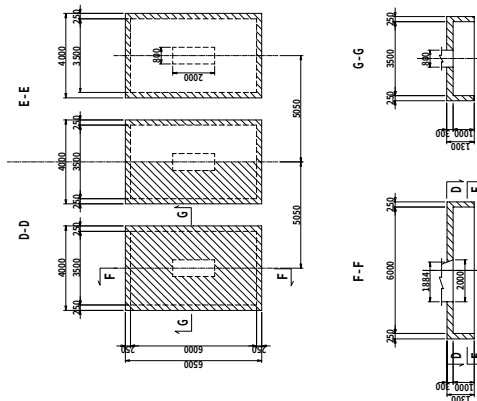
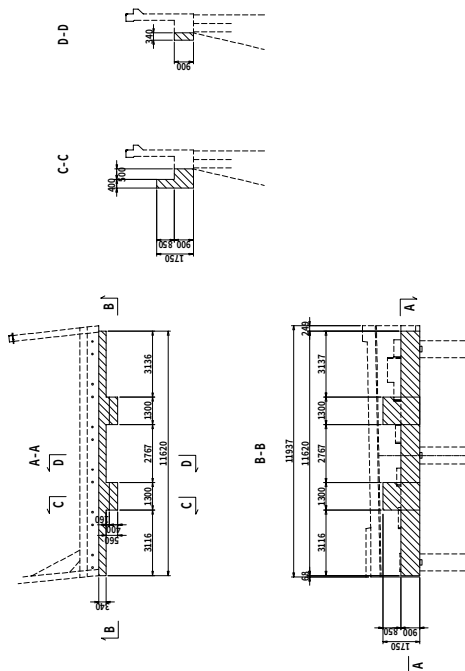
GOBIERNO DE COSTA RICA
COOPERACION JICA - MOPT

REFUERZO DE SUBESTRUCTURA ESCALA 1:100
BASTIONES A1 Y A2

BASTIONE A1



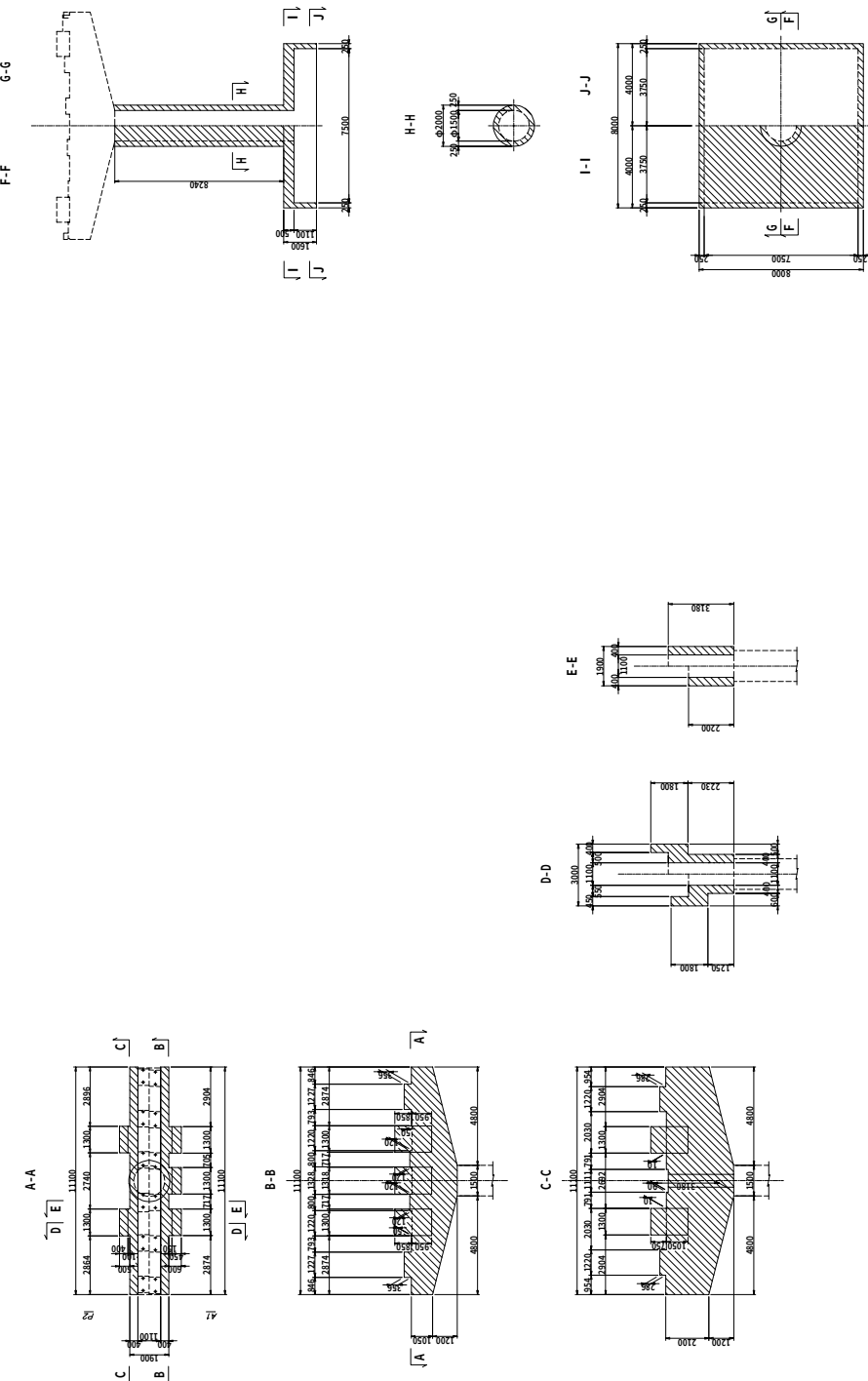
BASTIONE A2



GOBIERNO DE COSTA RICA COOPERACIÓN JICA - MOPT	DIRECCIÓN DE PUENTES DEPARTAMENTO DISEÑO DE PUENTES	DISEÑO: MANUEL JIMÉNEZ ING. CIVIL	DIBAJE: ANTONIO J. ROMERO CACERO ING. CIVIL	APROBADO: ING. J. J. ROMERO CACERO ING. CIVIL	ESCALA: INDICADA	DIBAJE NÚM.: 2003	REFUERZO DE SUBESTRUCTURA PUENTE SOBRE RÍO TORRES PROYECTO:
							HUACA 3 DE 17

REFUERZO DE SUBESTRUCTURA
PILA P1

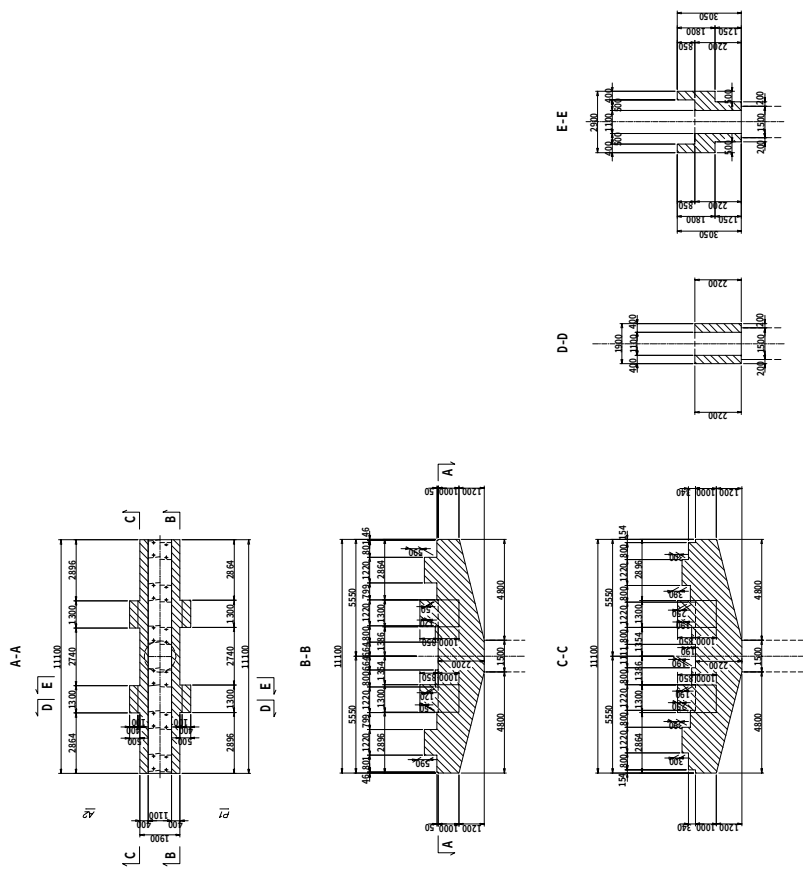
ESCALA 1:100



GOBIERNO DE COSTA RICA COOPERACIÓN JICA - MOPT	DIRECCION DE PUENTES DEPARTAMENTO DISEÑO DE PUENTES	DISEÑO: MANUEL JIMENEZ ING. CIVIL	DIBUJANTE: ANTONIO J. ROMERO CASANO ING. CIVIL	APROBADO: ING. JESUS GONZALEZ ING. CIVIL	ESCALA: MEDIANA FECHA: ENERO 2007	DIBUJO No. 2004 Hojas 4 DE 17	REFUERZO DE SUBESTRUCTURA PUENTE SOBRE RIO TORRES PROYECTO:

REFUERZO DE SUBESTRUCTURA
PILA P2

ESCALA 1:100



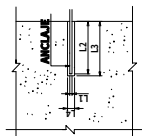
GOBIERNO DE COSTA RICA COOPERACIÓN JICA - MOPT	DIRECCION DE PUENTES DEPARTAMENTO DISEÑO DE PUENTES	DISEÑO: REVISOR: AUTOR: INIC. CIVIL	DIBUJO: AUTOR: REVISOR: INIC. CIVIL	APROBADO: AUTOR: REVISOR: INIC. CIVIL	APROBADO: AUTOR: REVISOR: INIC. CIVIL	ESCALA: FECHA: EQUIPO 2007	DIBUJO No. 2007 FOLIO 5 DE 17	REFUERZO DE SUBESTRUCTURA PUENTE SOBRE RIO TORRES PROYECTO:

REFUERZO DE BASTION A1
ASIENTO

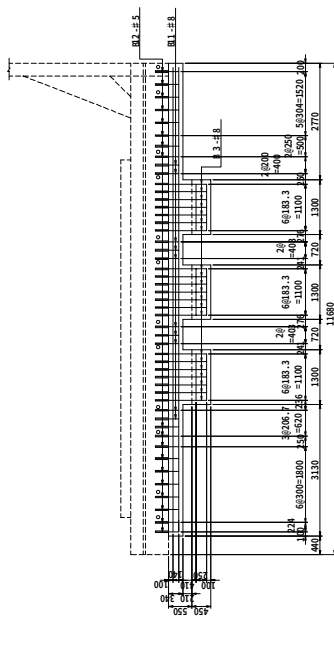
ESCALA 1:50

NOTAS:

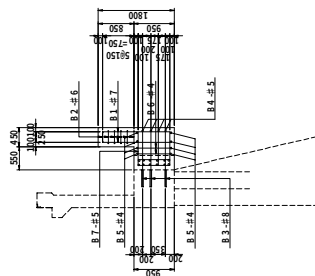
Ancies: Los huecos de anclaje deben ser perforados con la profundidad y diametro como lo muestra la tabla de acuerdo al diametro de la barra de anclaje.



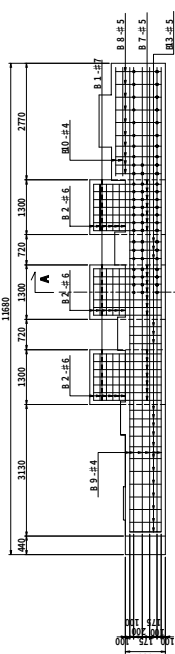
DETALLE DE ANCLAJE		TAMANO DE HOTO	
BARRA	TAMANO	LONGITUD DE ANCLAJE	DIAMETRO
4	12.7	200	21.0
5	15.9	240	25.0
6	19.1	280	29.0
7	22.3	320	33.0
8	25.4	360	37.0
9	28.7	400	41.0
10	31.8	440	45.0
11	35.0	480	49.0



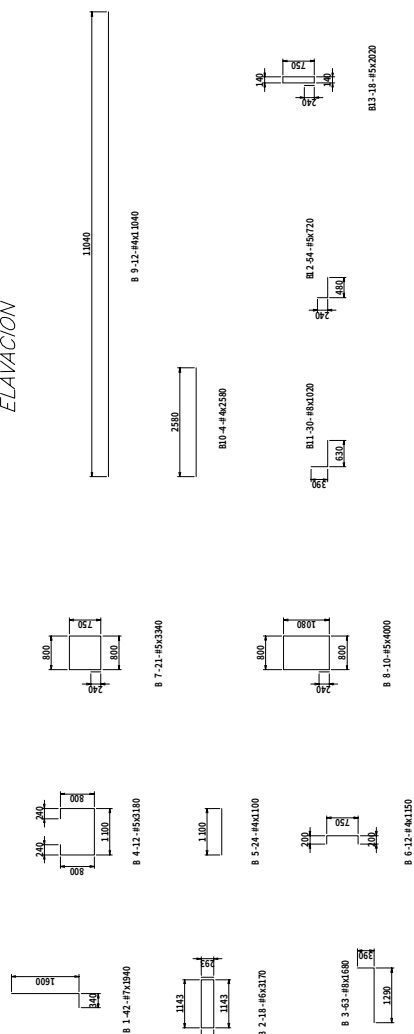
PLANTA



CORTE A



ELEVACION



REFUERZO DE BASTION A1
PUENTE SOBRE RIO TORRES

PROYECTO:

DISEÑO No. 2006

REVISADO

ESCALA

APROBADO

REVISADO

DISEÑO

REVISADO

DISEÑO

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DISEÑO

REFUERZO DE BASTION A1
PUENTE SOBRE RIO TORRES

PROYECTO:

DISEÑO No. 2006

REVISADO

ESCALA

APROBADO

REVISADO

DISEÑO

REVISADO

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DISEÑO

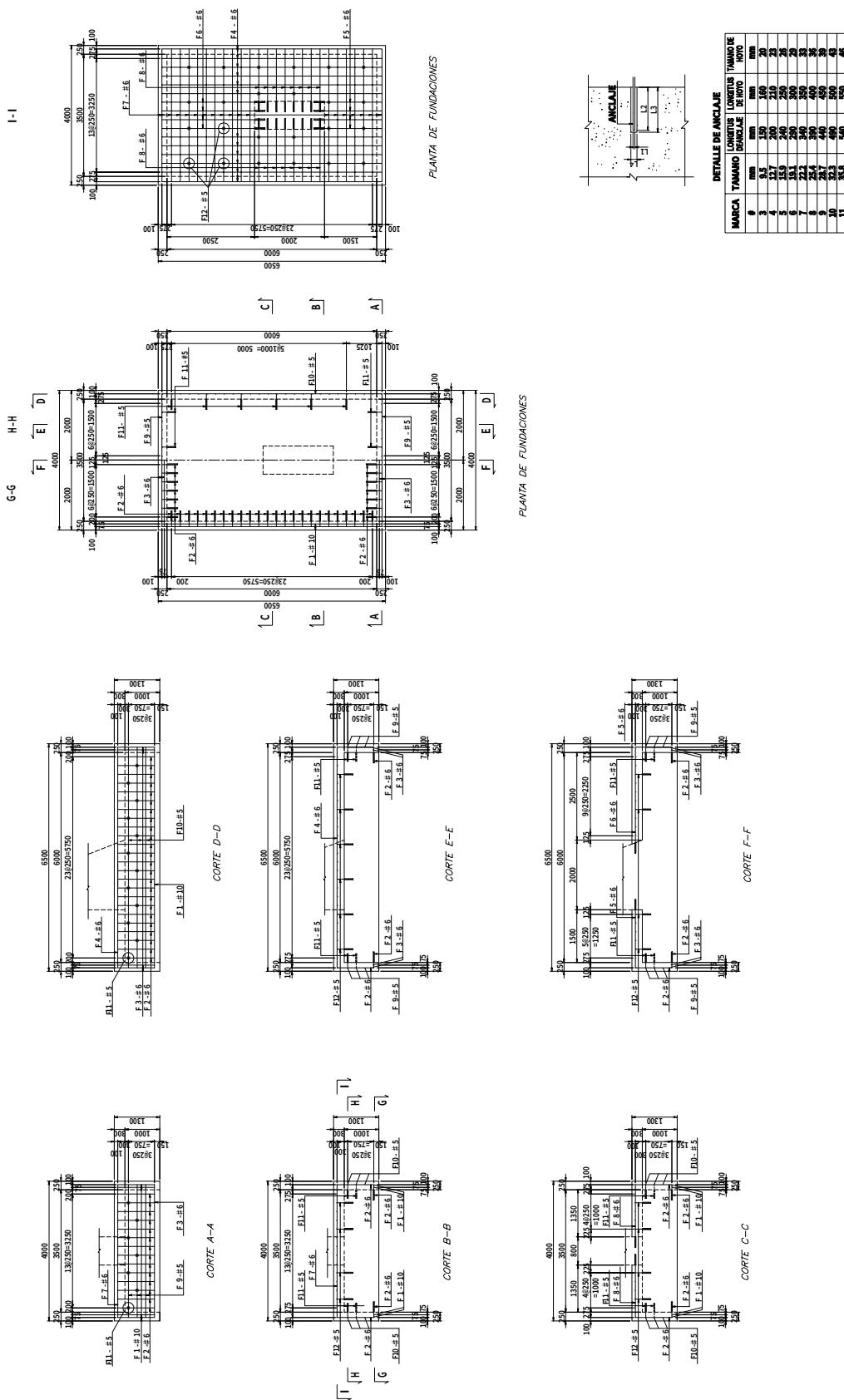
REVISADO

DISEÑO

REVISADO

DISEÑO

REFUERZO DE BASTION A1 ESCALA 1:50
FUNDACION(1)



GOBIERNO DE COSTA RICA
COOPERACIÓN JICA - MOPT

DIRECCION DE PUENTES
DEPARTAMENTO DISEÑO DE PUENTES

DISEÑO: MANUEL JIMENEZ
REVISO: MANUEL JIMENEZ

DEBILIT: ANTONIO J. ROMERO CASO
APROBADO: MANUEL JIMENEZ

APROBADO: MANUEL JIMENEZ
APROBADO: MANUEL JIMENEZ

ESCALA: 1:50
FECHA: ENERO 2007

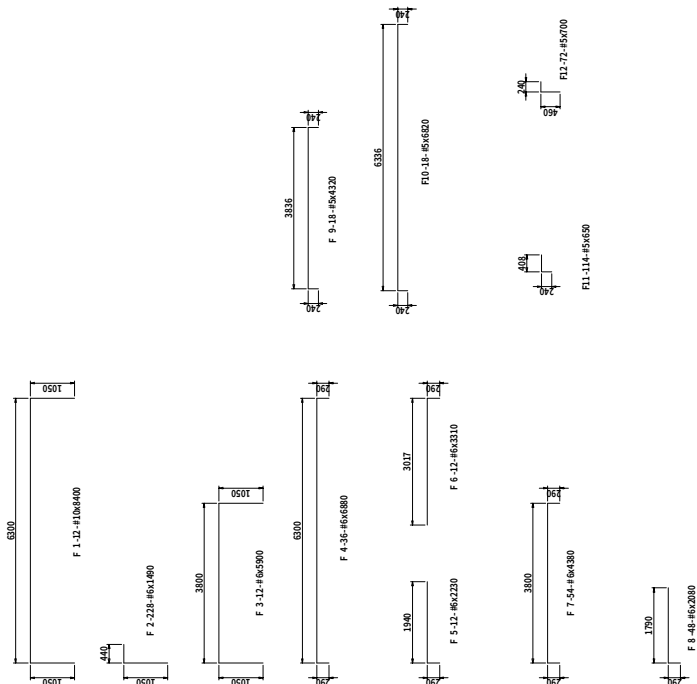
PROYECTO: REFUERZO DE BASTION A1
PUENTE SOBRE RIO TORRES

HOJA 7 DE 17
DISEÑO No. 2007

ACERO DE REFUERZO

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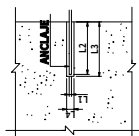
() ANCLAJE



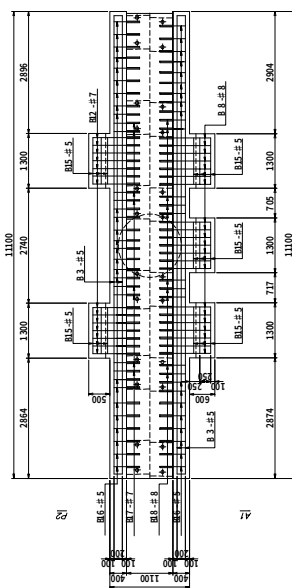
GOBIERNO DE COSTA RICA	DIRECCION DE PUENTES	DIBUJO: ANTONIO J. RAMIRO CASPIO APROBADO: _____ INC. JEFE EQUIPO CONSULTOR	ESCALA: _____ INCHES	DISEÑO No. 2908	
COOPERACIÓN JICA – MOPT	DEPARTAMENTO DISEÑO DE PUENTES	DISEÑO: MANUEL OREDO INC. CIVIL	APROBADO: _____ INC. JEFE DIRECCION PUENTES	FECHA: _____ ENERO 2007	REFUERZO DE BASTION A1 PUENTE SOBRE RIO TORRES PROYECTO:

NOTAS:

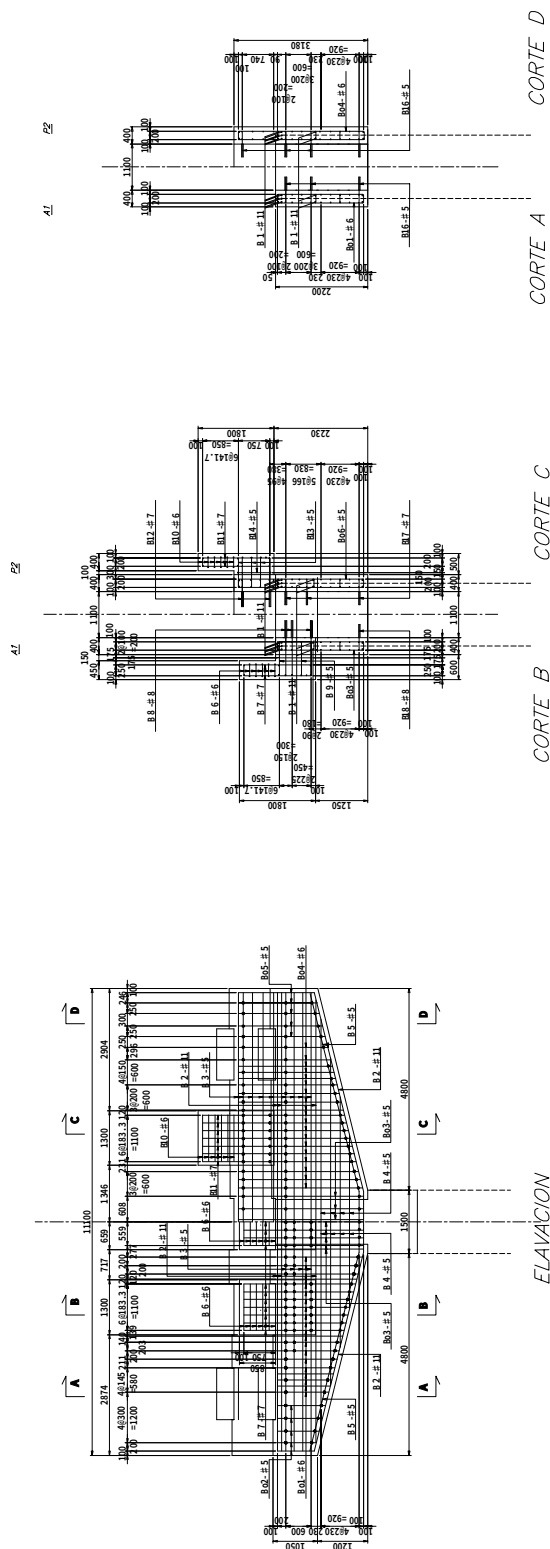
Anciajes: Los huecos de anclaje deben ser perforados con la profundidad y diámetro como lo muestra la tabla de acuerdo al diámetro de la barra de anclaje.



DETALLE DE ANCLAJE					
MARCA	TAMANO	LONGITUD DE ANCLAJE	LONGITUD DE HOTO	TAMANO DE HOTO	TAMANO DE HOTO
Ø	Ø	Ø	Ø	Ø	Ø
3	9,5	150	160	20	
4	12,7	200	210	23	
5	15,9	240	250	26	
6	19,1	290	300	29	
7	22,3	340	350	32	
8	25,4	390	400	35	
9	28,7	440	450	38	
10	32,3	490	500	43	
11	35,3	540	550	46	



PLANTA



ELAVACION

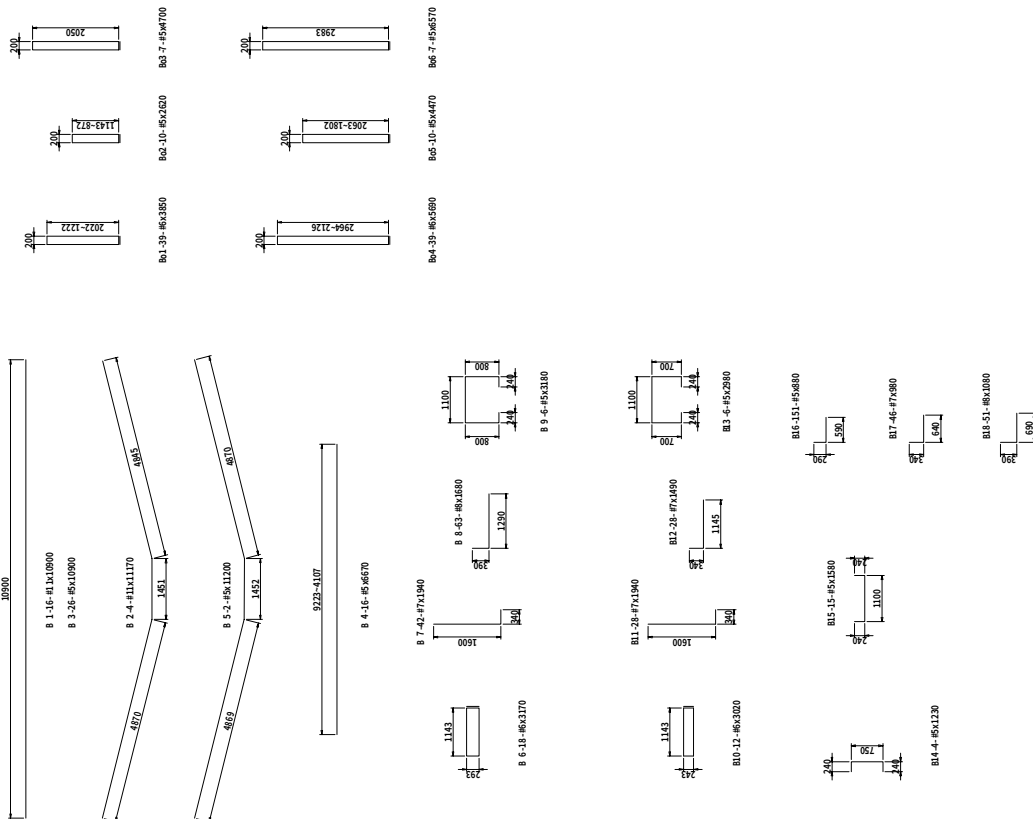
GOBIERNO DE COSTA RICA	DIRECCION DE PUENTES	DISEÑO: <u>MARCELO ORLANDO</u> INC. CIVIL	REVIZO: <u>ISAZO ORLANDO</u> INC. CIVIL	DIBUJÓ: <u>ANTONIO J. ROBERTO CASTRO</u>	APROBÓ: _____ INC. JEFE EQUIPO CONSULTOR	ESCALA: <u>1:10000</u>	DIBUJO No. <u>2909</u>
							PUEBLO SOBRE RIO TORRES PROYECTO:
COOPERACIÓN JICA – MOPT	DEPARTAMENTO DISEÑO DE PUENTES						APROBÓ: <u>MARCELO ORLANDO</u> INC. JEFE DISEÑO PUENTES FECHA: <u>ENERO 2007</u>

REFUERZO DE PILA P1 ESCALA 1:50
VIGAS CABEZAL(2)

ACERO DE REFUERZO

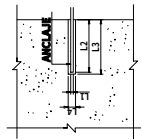
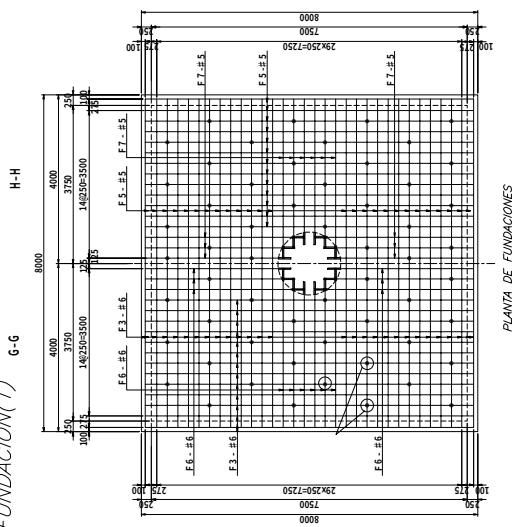
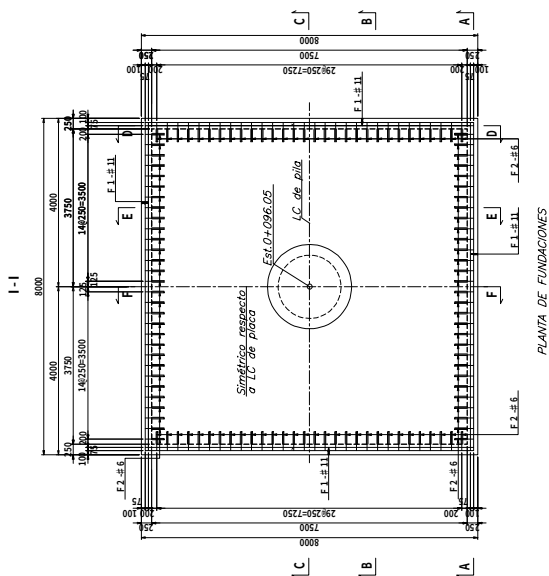
MARCA	TAMANO	LONGITUD (m)	CANTIDAD UNIDADES	PESO por UNIDAD (kg/m)	PESO (kg)	COMENTARIOS
B1	B11	10900	15	7.907	86.136	1339
B2	B11	11170	4	7.907	86.211	533
B3	B5	10900	26	1.552	86.211	862
B4	B5	10970	5	1.552	80.326	396
B5	B5	11200	2	1.552	77.284	33
B6	B6	3170	15	2.235	7.693	118
B7	B6	3170	42	3.042	5.911	248
B8	B8	3180	62	3.973	6.613	39
B9	B5	3200	6	1.552	6.921	39
B10	B5	3200	12	2.235	6.350	81
B11	B7	1040	20	3.042	5.901	365
B12	B7	1040	20	3.042	4.523	377
B13	B5	2000	6	1.552	4.523	28
B14	B5	1270	4	1.552	1.909	8
B15	B5	1500	15	1.552	2.452	37
B16	B5	800	151	1.552	1.566	265
B17	B7	900	46	3.042	2.891	337
B18	B8	1000	51	3.973	4.391	219
B19	B6	3000	39	2.235	8.605	395
B20	B5	2620	10	1.552	4.666	41
B21	B5	4700	7	1.552	7.264	51
B22	B6	5600	39	2.235	12.317	665
B23	B5	4470	10	1.552	6.937	69
B24	B5	6570	7	1.552	10.197	71
					5772 kg	
P1-1	B8	1300	15	3.973	5.463	82
P1-2	B8	2300	15	3.973	9.456	142
P1-3	B8	6040	15	3.973	31.943	479
P1-4	B8	7040	15	3.973	27.970	409
P2	B5	6100	29	1.552	9.560	277
P3	B5	560	203	1.552	0.859	176
					1576 kg	
F1	B11	10900	8	7.907	86.024	664
F2	B6	1790	120	2.235	4.001	460
F3	B6	8300	52	2.235	38.729	974
F4	B5	630	64	1.552	0.978	63
F5	B5	8200	52	1.552	12.651	668
F6	B6	3000	24	2.235	8.717	209
F7	B5	3000	24	1.552	5.898	142
F8	B5	8320	16	1.552	12.933	207
F9	B5	880	57	1.552	1.366	78
					3485 kg	
					1576 kg	
					2996 kg (0)	
					88	1763 kg (144)
					87	677 kg (74)
					86	2623 kg (144)
					85	2874 kg (401)
					TOTAL	10333 kg (763)

() ANCLAJE

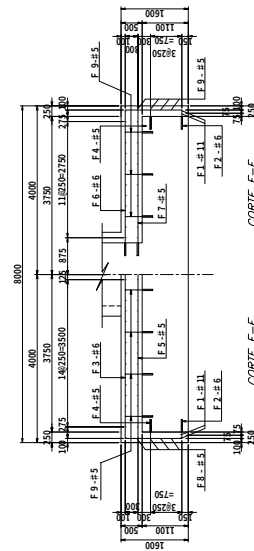
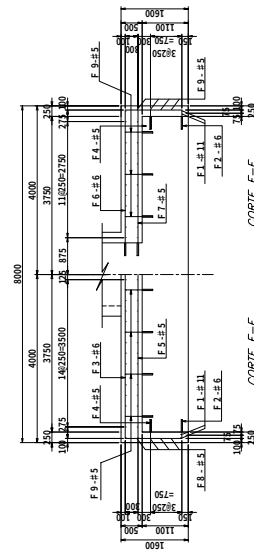
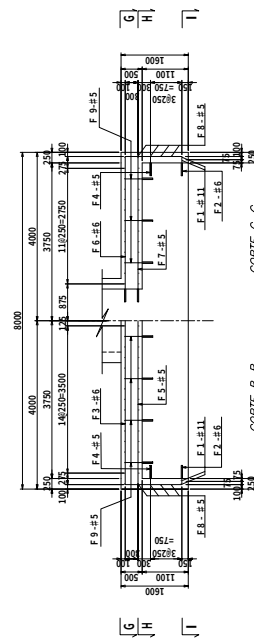
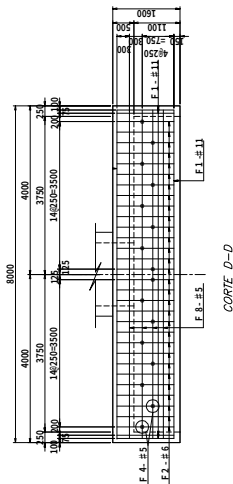
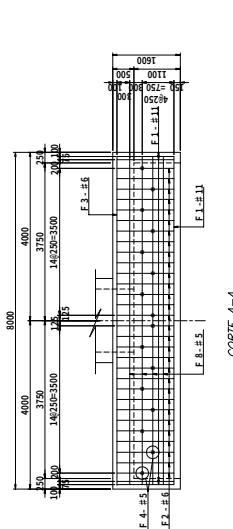


GOBIERNO DE COSTA RICA COOPERACIÓN JICA – MOPT	DIRECCION DE PUENTES DEPARTAMENTO DISEÑO DE PUENTES	DISEÑO: MANUEL GARCIA ING. CIVIL	DIBUJO: ANTONIO J. ROMERO CASANO ING. CIVIL	APROBADO: ING. JESUS GONZALEZ ING. CIVIL		ESCALA: INDICADA	DIBUJO No. 2910	REFUERZO DE PILA P1 PUENTE SOBRE RIO TORRES PROYECTO:
				APROBADO: ING. JESUS GONZALEZ ING. CIVIL				
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				APROBADO: ING. JESUS GONZALEZ ING. CIVIL</				

REFUERZO DE PILA P1
FUNDACION(1)
G-G



BARCA	TAMANO	LONGITUD DE ANCLAJE	LONGITUD DE Hoyo	TAMANO DE Hoyo
1	12	200	200	20
2	14	250	250	25
3	16	300	300	30
4	18	350	350	35
5	20	400	400	40
6	22	450	450	45
7	24	500	500	50
8	26	550	550	55
9	28	600	600	60
10	30	650	650	65
11	32	700	700	70



GOBIERNO DE COSTA RICA
COOPERACIÓN JICA - MOPT

DIRECCION DE PUENTES
DEPARTAMENTO DISEÑO DE PUENTES

DISEÑO:
MANUEL GARCIA
INC. CIVIL

REVISOR:
ANTONIO J. ROMERO CASTRO
INC. CIVIL

APROBADO:
ANTONIO J. ROMERO CASTRO
INC. CIVIL

ESCALA:
INDICADA

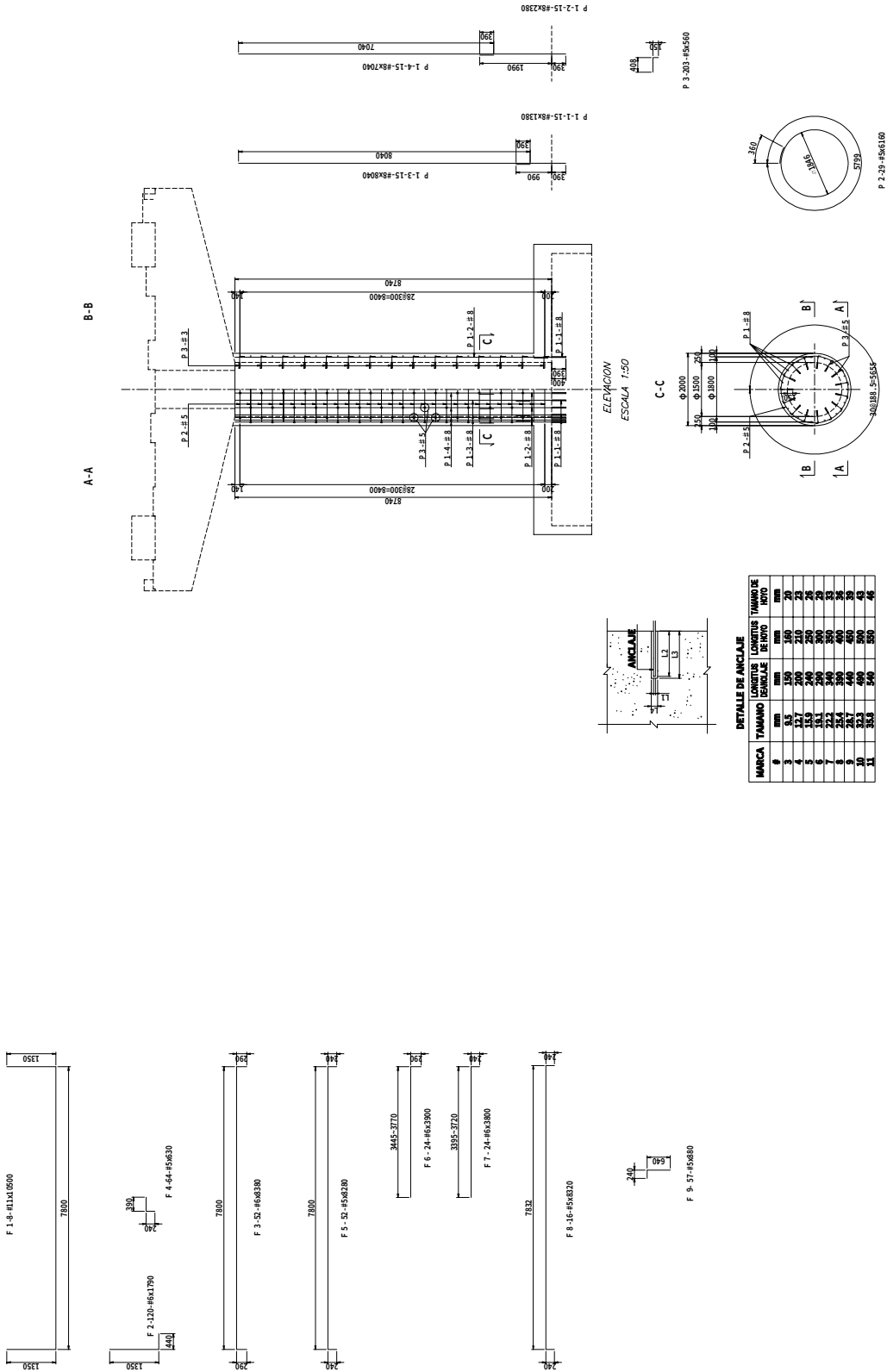
DISEÑO No. 20911

REFUERZO DE PILA P1
PUENTE SOBRE RIO TORRES
PROYECTO:

FECHA: ENERO 2007

HOLLA 11 DE 17

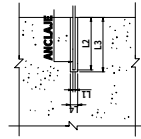
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COLUMN



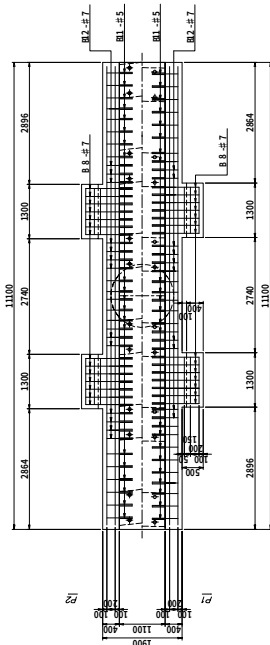
REFUERZO DE PILA P2 ESCALA 1:50
VIGAS CABEZAL(1)

NOTAS:

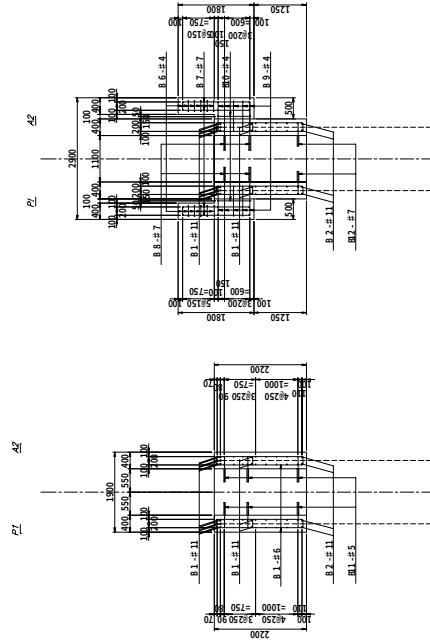
Anciales: Los huecos de anclaje deben ser perforados con la profundidad y diametro como lo muestra la tabla de acuerdo al diametro de la barra de anclaje.



DETALLE DE ANCLAJE					
MARKA	TAMANO	LONGITUD DE ANCLAJE	LONGITUD DE DESARROLLO	TAMANO DE MOTO	TAMANO DE MOTO
1	10	350	450	20	400
2	12	400	500	25	500
3	14	450	550	30	600
4	16	500	600	35	700
5	18	550	650	40	800
6	20	600	700	45	900
7	22	650	750	50	1000
8	24	700	800	55	1100
9	26	750	850	60	1200
10	28	800	900	65	1300
11	30	850	950	70	1400

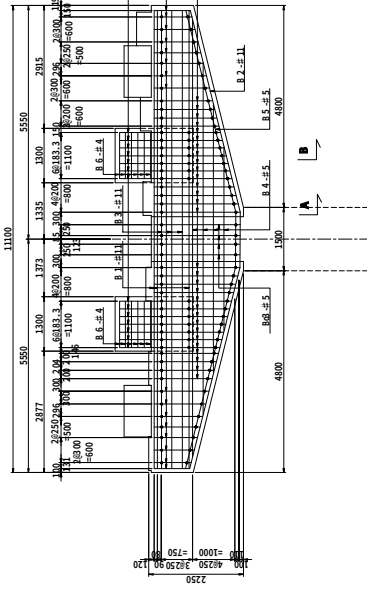


PLANTA



CORTE A

CORTE B



ELEVACION

GOBIERNO DE COSTA RICA COOPERACIÓN JICA - MOPT	DIRECCION DE PUENTES DEPARTAMENTO DISEÑO DE PUENTES	DISEÑO: MANUEL JIMENEZ ING. CIVIL	DIBUJO: ANTONIO J. RODRIGUEZ ING. CIVIL DADO CHAO ING. CIVIL	APROBADO: ING. JORGE RODRIGUEZ ING. CIVIL APROBADO: ING. JORGE RODRIGUEZ ING. CIVIL	ESCALA: MANERA FECHA: ENERO 2007	DIBUJO No. 2913 HOLLA 13 DE 17	REFUERZO DE PILA P2 PUENTE SOBRE RIO TORRES PROYECTO:

ACERO DE REFUERZO

[illegible]

ANCLAGE

REFUERZO DE PILA P2
PUENTE SOBRE RIO TORRES
PROYECTO:

2914

100

41033

TADAO OKANO

	Number of cases	Percentage of total cases
Male	10	6.7%
Female	14	9.3%
Total	24	16.0%

[illegible]

GOVERNAMENTO DO ESTADO DE COCATA BICA

COOPERACIÓN JICA - MOPT

DEPARTAMENTO DISEÑO DE PUENTES

PROBO: MARIA RAMIREZ
INC. JUST. DIVISION PUBLIC

FECHA: ENERO 200

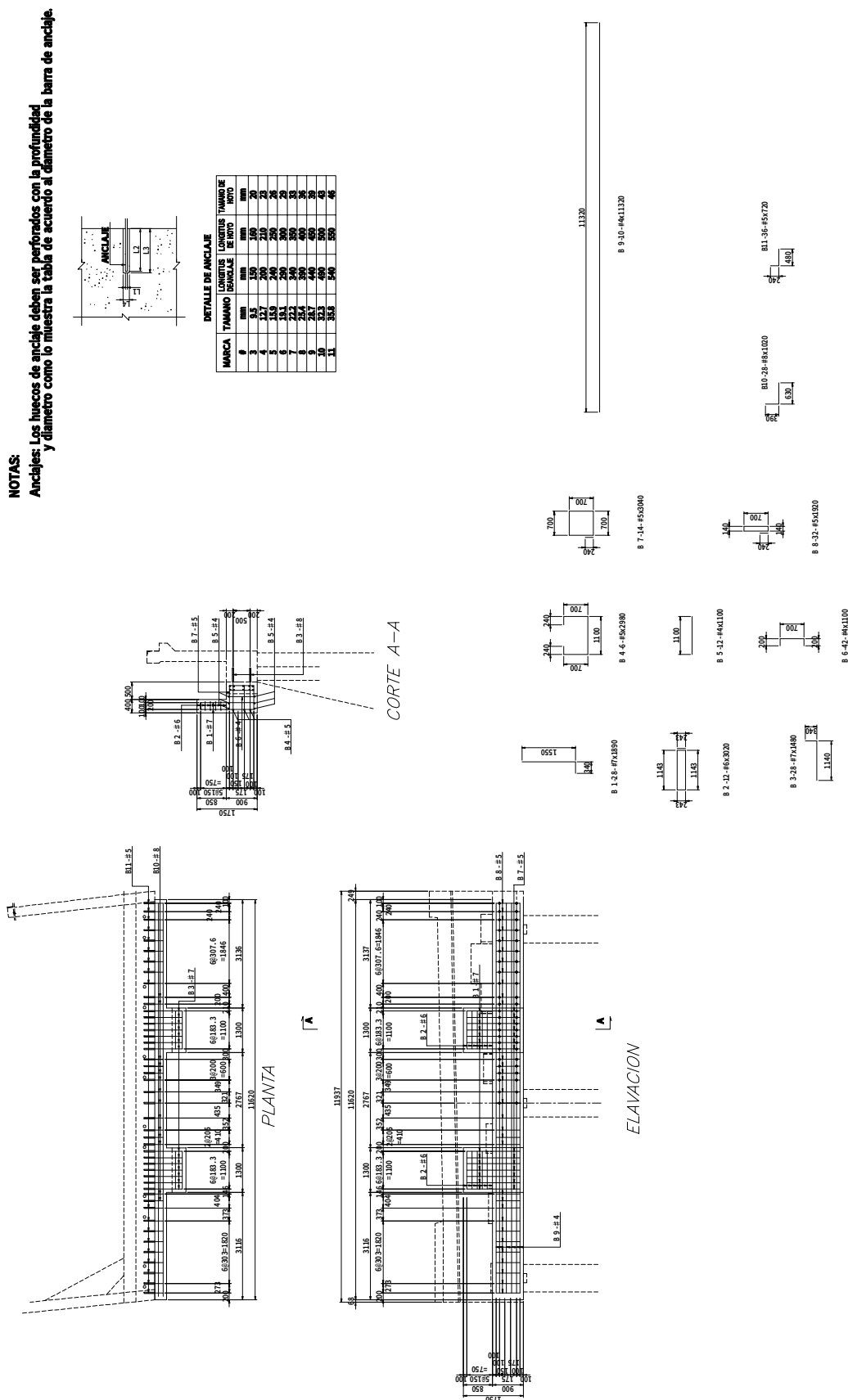
14 OF 17

PUENTE SOBRE RIO TORRES
PROYECTO:

ESCALA 1:50

NOTAS:

Ancajes: Los huecos de anclaje deben ser perforados con la profundidad y diámetro como lo muestra la tabla de acuerdo al diámetro de la barra de anclaje.

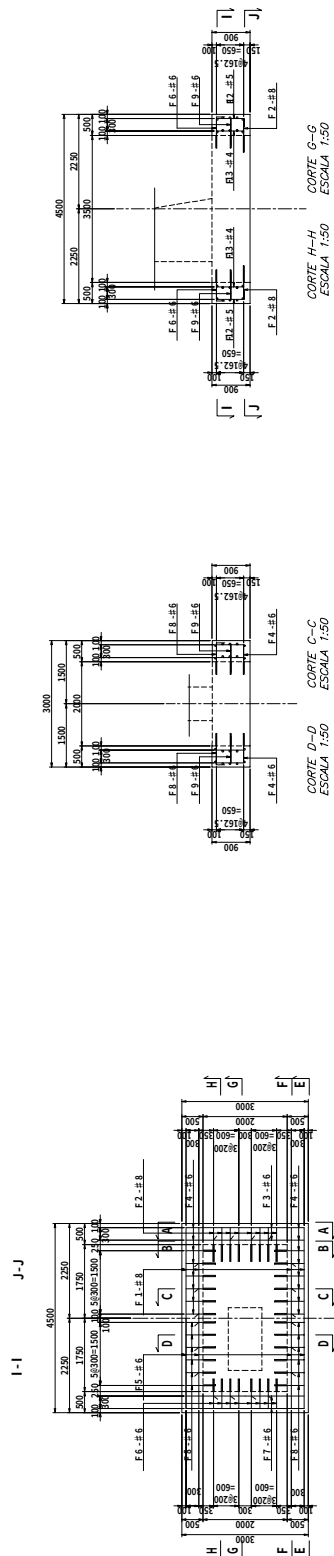


MARCA	TAMANO		LONGITUD DE DORSAL	LONGITUD DE CUELLO	LONGITUD DE PISO	TAMANO DE PISO
	cm	mm				
1	3	9,5	150	160	20	
2	4	12,7	200	210	23	
3	5	15,9	240	250	26	
4	6	18,1	290	300	29	
5	7	22,2	340	350	33	
6	8	25,4	390	400	36	
7	9	28,7	440	450	39	
8	10	32,3	490	500	43	
9	11	35,8	540	550	46	

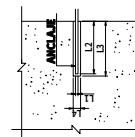
GOBIERNO DE COSTA RICA COOPERACIÓN JICA – MOPT	DIRECCION DE PUENTES DEPARTAMENTO DISEÑO DE PUENTES	DISEÑO:	MARCELO RAMIRO ING. CIVIL	DIBUJADO:	ANTONIO J. RAMIREZ CASTRO ING. ARQ. (EQUIPO COMPLETOR)	APROBADO:	ING. ENRIQUE ING. CIVIL	ESCALA:	PROPORCIONAL	REFUERZO DE BASTION A2 PUENTE SOBRE RIO TORRES PROYECTO
		REVISADO:	ENRIQUE JIMENEZ ING. CIVIL	REVISADO:	ING. ENRIQUE JIMENEZ ING. CIVIL	FECHA:	ENRIQUE JIMENEZ			
DIBUJO NO. 29/15										

REFUERZO DE BASTION A2
FUNDACION(1)

ESCALA 1:50



PLANTA
ESCALA 1:50



MARKA	TAMANO	ANCLAJE	LONGITUD DE ANCLAJE	TAMANO DE BASTION
1	10	10	10	10
2	12	12	12	12
3	14	14	14	14
4	16	16	16	16
5	18	18	18	18
6	20	20	20	20
7	22	22	22	22
8	24	24	24	24
9	26	26	26	26
10	28	28	28	28
11	30	30	30	30

REFUERZO DE BASTION A2
PUENTE SOBRE RIO TORRES

DISEÑO No. 2016

INDICADO

ESCALA

APROBADO

DISEÑO

DISEÑO

DIRECCION DE PUENTES
DEPARTAMENTO DISEÑO DE PUENTES

GOBIERNO DE COSTA RICA
COOPERACION JICA - MOPT

PROYECTO

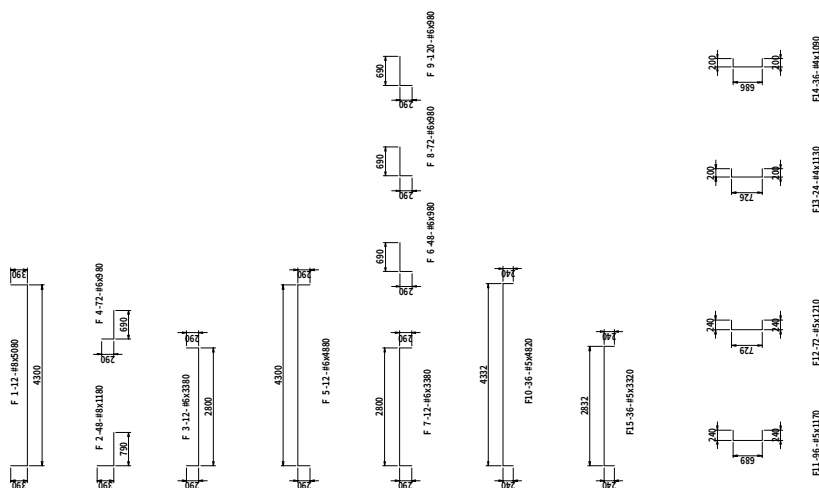
FECHA

ENERO 2007

HUAY 18 DE 17

REFUERZO DE BASTION A2
FUNDACION(2)

ESCALA 1:50



ACERO DE REFUERZO

MARCA	TAMAÑO	LONGITUD (m)	CANTIDAD POR PISO (kg/m)	PESO POR PISO (kg)	CANTIDAD TOTAL (kg)	COMENTARIOS
B1	#7	1890	28	3.042	5.749	161
B2	#6	3020	12	2.235	6.750	81
B3	#7	1480	28	3.042	4.502	126
B4	#5	2980	6	1.552	4.625	28
B5	#4	1100	12	0.994	1.093	13
B6	#4	1100	42	0.994	1.093	46
B7	#5	3040	14	1.552	4.718	66
B8	#5	1200	32	1.552	2.980	95
B9	#4	1120	10	0.994	11.252	113
B10	#8	1000	28	3.973	4.052	113
B11	#5	720	36	1.552	1.117	40
F1	#8	5000	12	3.973	20.183	242
F2	#8	1180	48	3.973	4.688	225
F3	#6	3380	12	2.235	7.594	91
F4	#6	980	72	2.235	2.190	158
F5	#6	4880	12	2.235	10.907	131
F6	#6	980	48	2.235	2.190	105
F7	#6	3380	12	2.235	7.594	91
F8	#6	980	72	2.235	2.190	158
F9	#6	980	120	2.235	2.190	263
F10	#5	4820	36	1.552	7.481	269
F11	#5	1170	96	1.552	1.816	174
F12	#5	1210	72	1.552	1.878	135
F13	#4	1130	24	0.994	1.123	27
F14	#4	1090	36	0.994	1.083	39
F15	#5	3320	36	1.552	5.133	186
					2294 kg	
					580 kg (76)	
					237 kg (28)	
					1078 kg (312)	
					993 kg (86)	
					238 kg	
					3176 kg (452)	
					() INCLUIR	

GOBIERNO DE COSTA RICA COOPERACIÓN JICA - MOPT	DIRECCION DE PUENTES DEPARTAMENTO DISEÑO DE PUENTES	DISEÑO: REVISOR: AUTOR: INCL. CIVIL	DIBUJO: AUTOR: INCL. CIVIL	APROBADO: AUTOR: INCL. CIVIL	APROBADO: AUTOR: INCL. CIVIL	ESCALA: INCL. CIVIL	DIBUJO No. 2017	REFUERZO DE BASTION A2 PUENTE SOBRE RIO TORRES PROYECTO:

APÉNDICE 2 ESTÁNDARES AMBIENTALES (RUIDO/VIBRACIÓN) IMPLEMENTADOS EN OTROS PAÍSES.

Tabla A1 resume la clasificación zonal de ruido usada en Estados Unidos.

Tabla A1 Clasificación Zonal de Ruido

	Clases de Ruido Expuestos	DNL (dBA)	Leq (hour)	HUD estándar de Ruido
A	Exposición Mínima	< 55	< 55	Aceptable
B	Exposición Moderada	55 – 65	55 - 65	
C-1	Exposición Significante	65 – 70	65- 70	Normalmente Aceptable
C-2		70 – 75	70 - 75	
D-1	Exposición Severa	75 – 80	40 - 80	Inaceptable
D-2		80 – 85	80 - 85	
D-3		> 85	. 85	

(Fuente: Larry W. Canter, 1996)

DNL: Nivel de sonido promedio Día-Noche, Ldn, definido por la siguiente fórmula;

$$Ldn = 10 \log (0.625 (10 (Ld/10)) + 0.375 (10 (Ln+10)/10))$$

donde Ld es el Leq para el día (0700 - 2200) y Ln es el Leq para la noche (2200 - 0700).

HUD: Departamento de Vivienda y Desarrollo Urbano.

Tabla A2 resume los estándares de vibración implementados en Japón.

Tabla A2 Nivel de Vibración L10 (dB)

Zona	Día (6:00 - 20:00)	Noche (20:00 - 6:00)
1	65	60
2	70	65

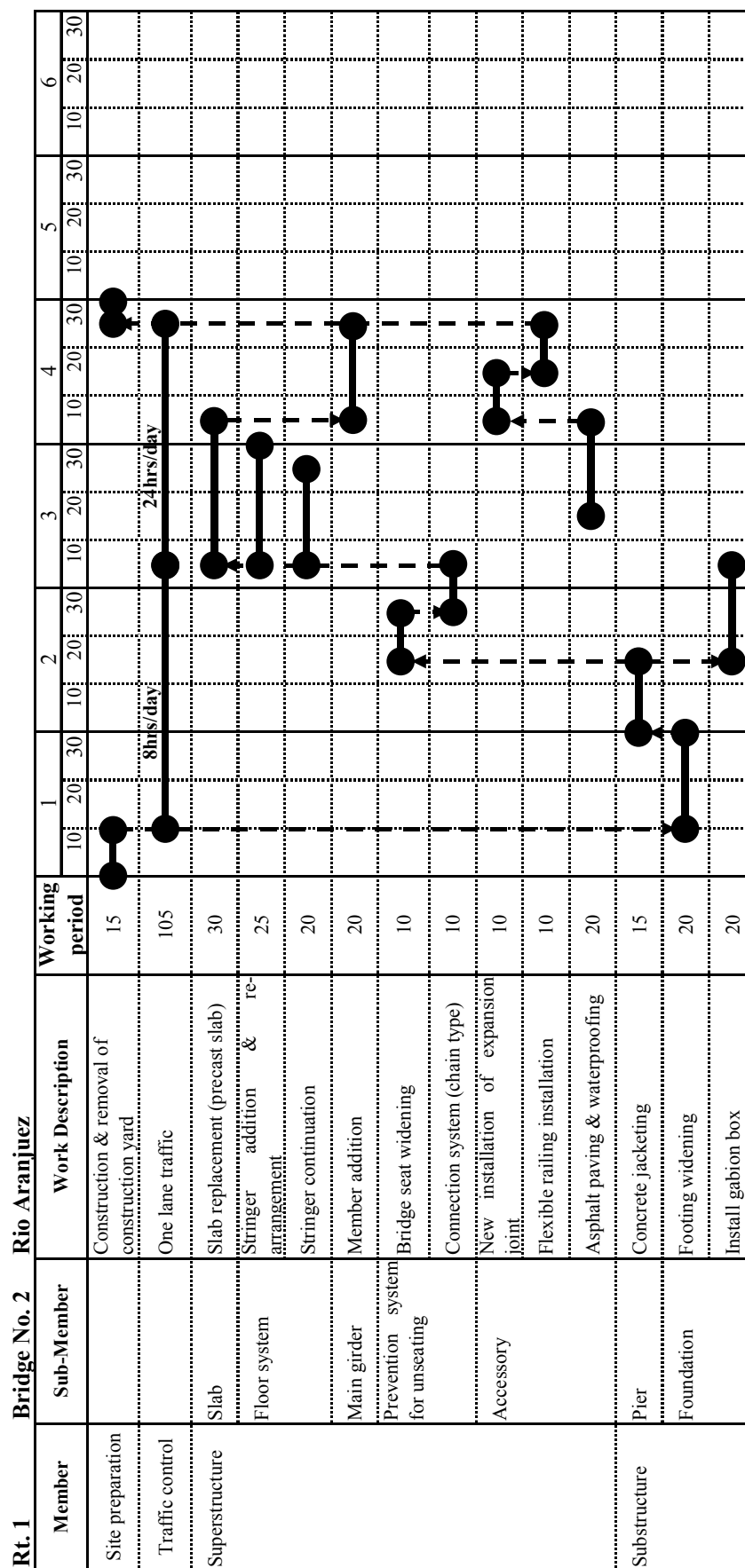
(Fuente: Japan Road Association, 1988)

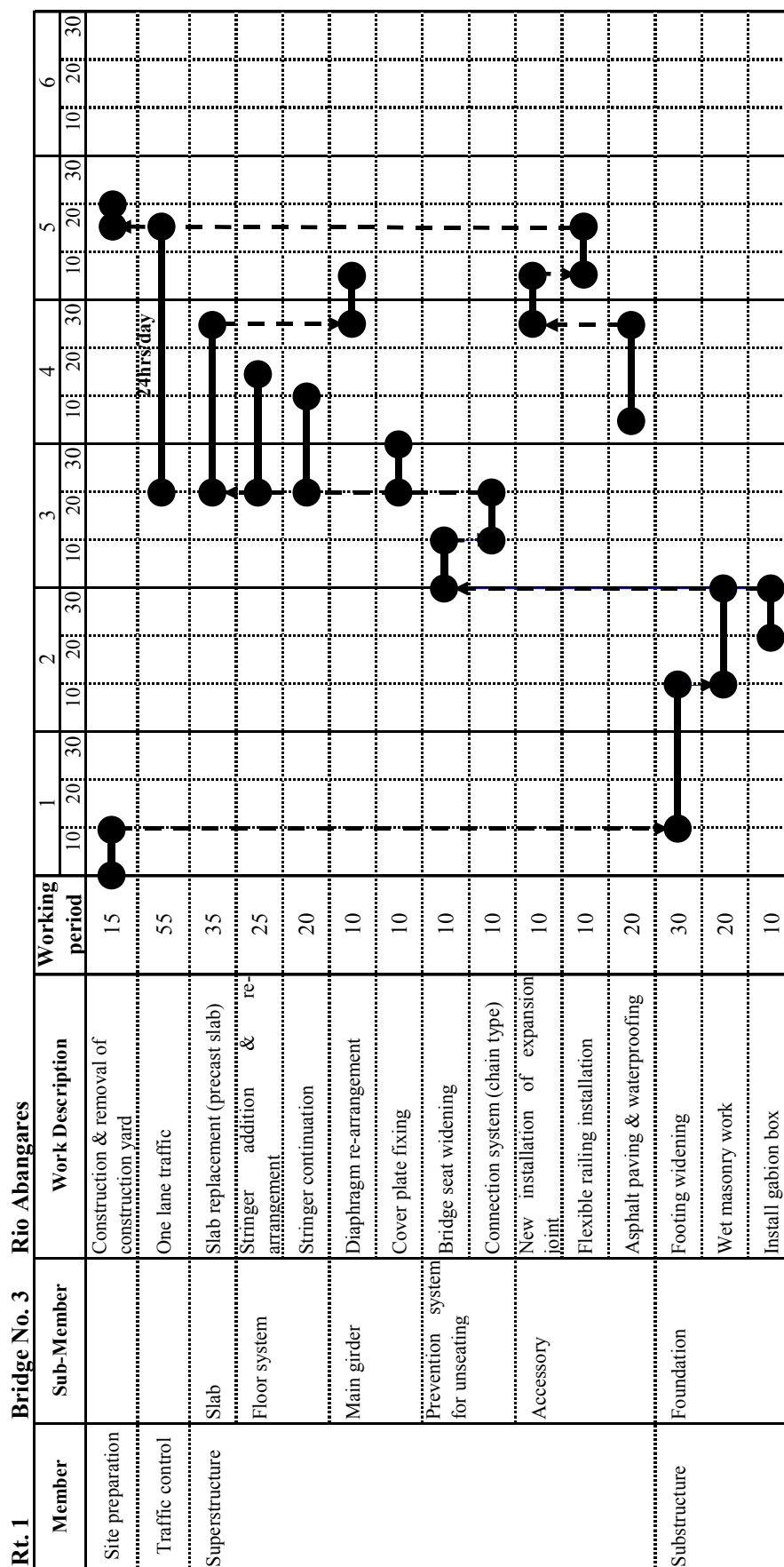
Zona 1: Zona que requiere calma moderada y un ambiente tranquilo. Básicamente, en esta zona 1 los valores aplicados para evaluaciones en áreas residenciales.

Zona 2: Zona utilizada para propósitos industriales o comerciales.

APÉNDICE 3 PLANEAMIENTO DE CONSTRUCCIÓN Y ESTIMACIÓN DE COSTOS

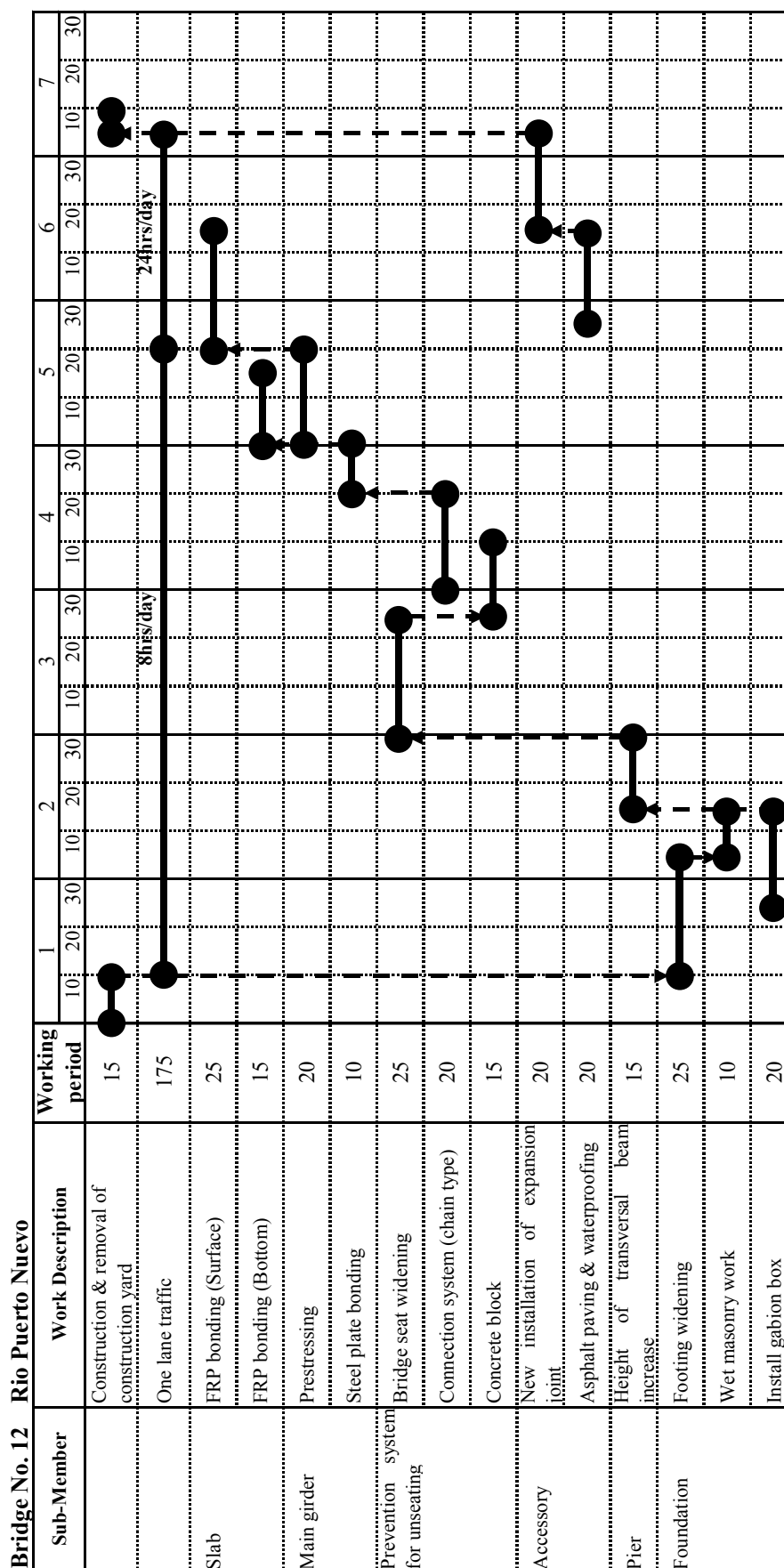
3.1. PROGRAMACIÓN DE CONSTRUCCIÓN

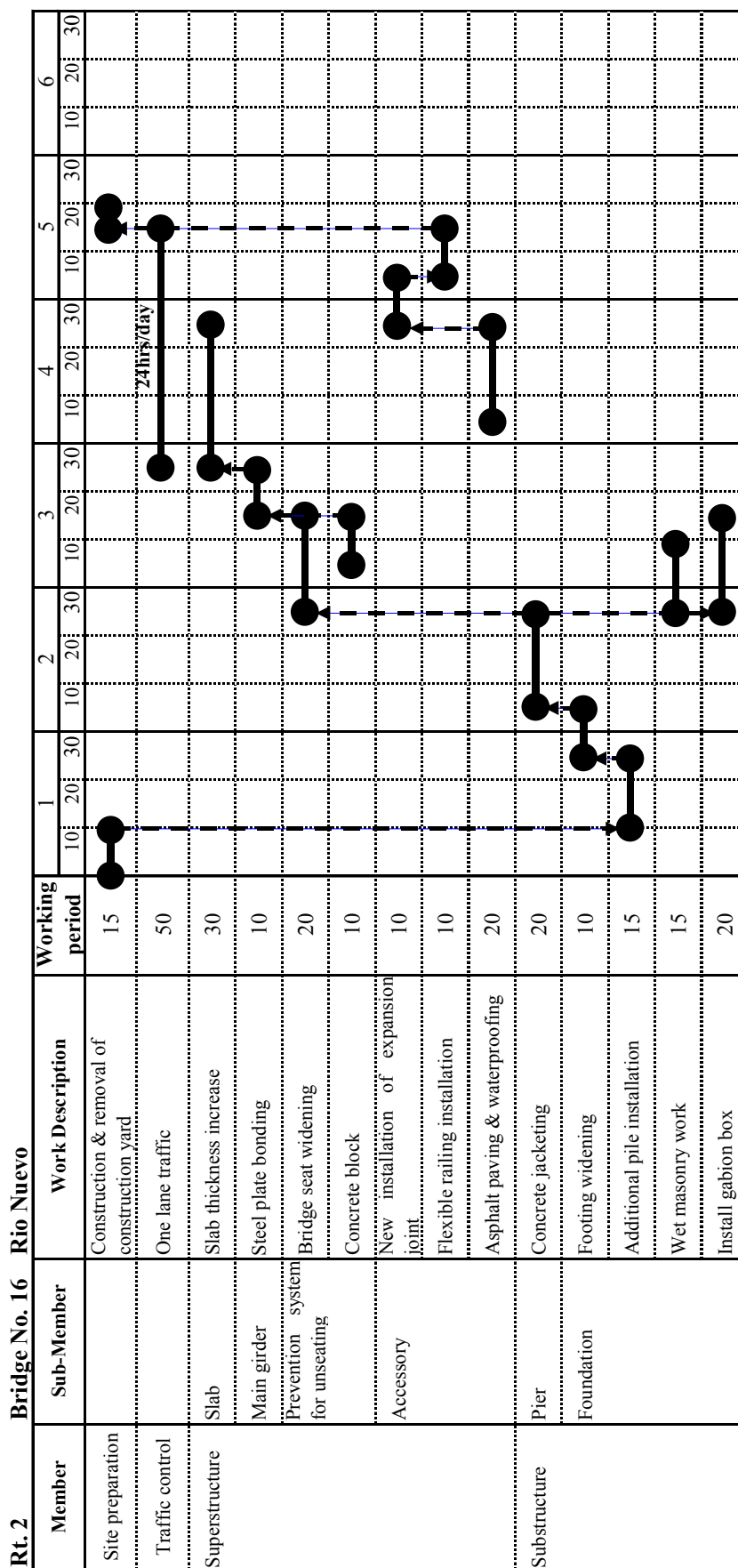




Rt. 1 Bridge No. 7 Rio Azufrado

Member	Sub-Member	Work Description	Working period	1			2			3			4			5			6		
				10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30
Site preparation		Construction & removal of construction yard	15	●									●	●							
		One lane traffic	45				●						●								
Superstructure	Slab	Slab thickness increase	25				●			●											
	Main girder	Steel plate bonding	10			●															
		Girder height increase	15			●															
	Accessory	New installation of expansion joint	10							●											
		Flexible railing installation	10							●											
Substructure		Asphalt paving & waterproofing	10							●											
	Pier	Concrete jacketing	15	●																	





Rt. 4 Bridge No. 17 Rio Chirripo

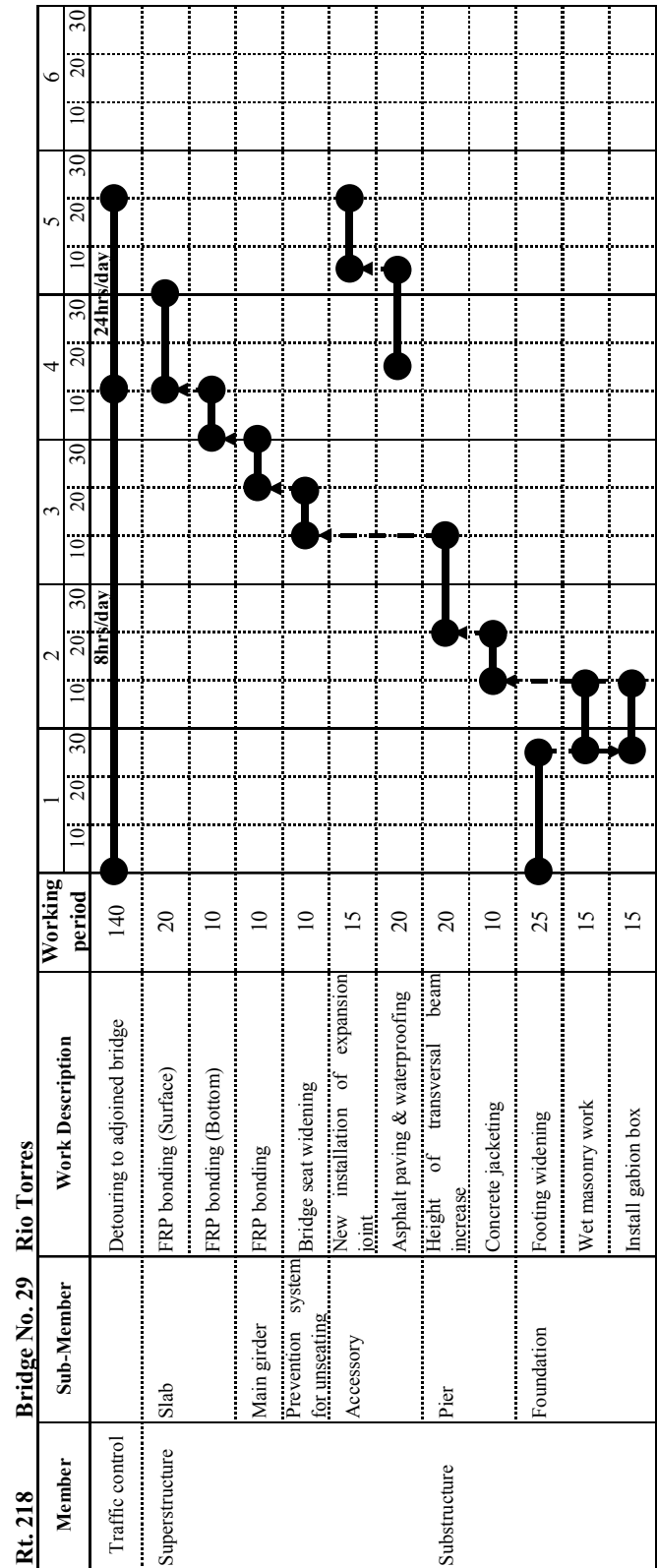
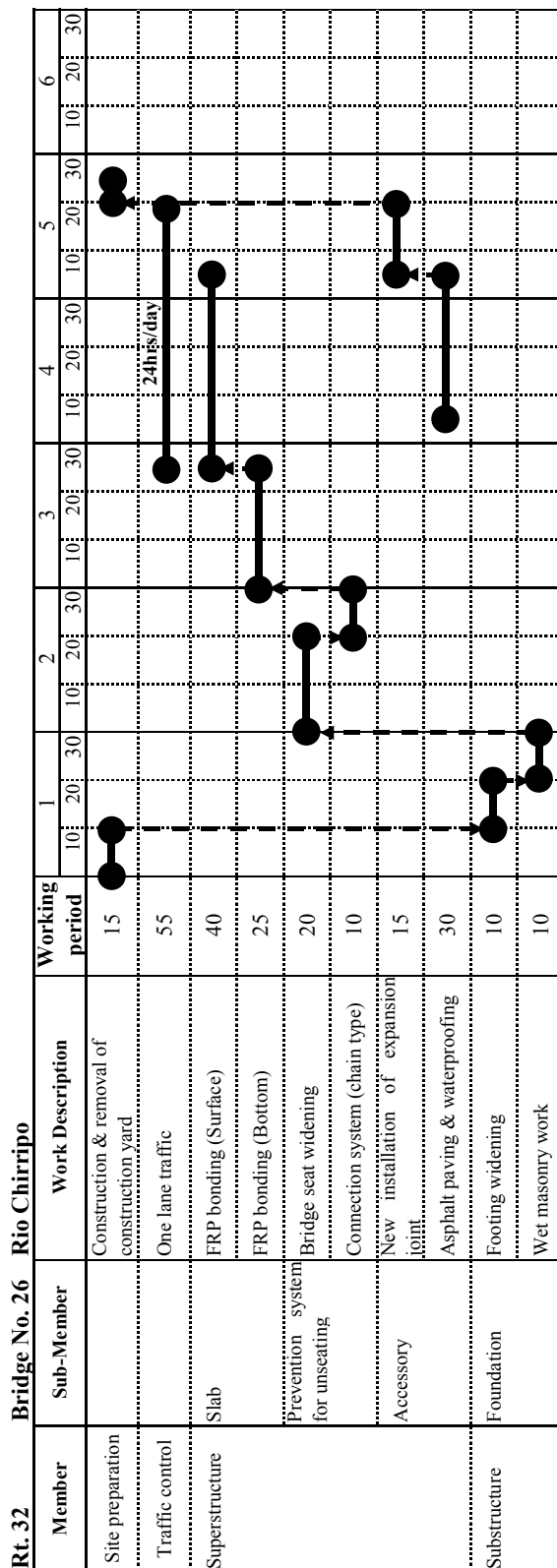
Member	Sub-Member	Work Description	Working period	1						2						3						4						5						6						
				10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	
Site preparation		Construction & removal of construction yard	15	●	●																																			
Traffic control		One lane traffic	25																																					
Superstructure		Replacement of expansion joint	10																																					
	Accessory	Asphalt paving & waterproofing	15																																					
Substructure	Pier	Rolling stone protection	20																																					
	Foundation	Footing widening	20																																					
		Install gabion box	20																																					

Rt. 4 Bridge No. 19 Rio Sarapiquí

Member	Sub-Member	Work Description	Working period	1			2			3			4			5			6			
				10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	
Site preparation	Traffic control	Construction & removal of construction yard	15	●	●																	
		One lane traffic	105	●																		
Superstructure	Slab	FRP bonding (Surface)	25																			
		FRP bonding (Bottom)	15																			
	Main girder	Prestressing	20																			
		Steel plate replacement	15																			
	Prevention system for unseating	Bridge seat widening	10																			
Connection system (chain type)		10																				
Accessory	New installation of expansion joint		10																			
		Asphalt paving & waterproofing	20																			
	Cofferdam	Install & removal of large sandbag type	15	●	●																	
Pier	Height of transversal beam increase	10																				
Foundation	Footing widening		15																			
		Additional pile installation	20																			
	Foundation	Install gabion box	20																			

Rt. 32 Bridge No. 20 Rio Sucio

Member	Sub-Member	Work Description	Working period	1			2			3			4			5			6		
				10	20	30	10	20	30	10	20	30	10	20	30	10	20	30	10	20	30
Traffic control	Accessory	One lane traffic	60	●	●	●	8hrs/day			24hrs/day											
		Replacement of expansion joint	15					●	●	●											
Superstructure	Accessory	Asphalt paving & waterproofing	25					●	●	●											
		Rolling stone protection	20	●	●	●															



3.2. ESTIMACIÓN DE COSTOS PARA PROYECTOS

Basic Data: Total project costs of 10 bridges														CODE:	SUM000
Summary		per 1.00 Ls													
Item	Spec.	Unit	Qty	Unit Price		Total Amount		Equivalent (USD)	Remarks						
				CRC	USD	JPY	CRC			USD	JPY				
No.2 Rio Aranjuez (1 of 2)	Rt.1 Steel truss, L=877.8m, Completion in 1955	site	1.00	287,241,753	30,285,792	287,241,753	30,285,792	\$815,873.33	RT001.02.1						
No.2 Rio Aranjuez (2 of 2)	Rt.1 Steel truss, L=877.8m, Completion in 1955	site	1.00	220,201,030	2,558,910	220,201,030	2,558,910	\$475,462.37	RT001.02.2						
No.2 Rio Aranjuez Total						507,442,784	26,712.52	32,844,701	\$1,291,335.71						
No.3 Rio Abangares (1 of 2)	Rt.1 Steel thru truss, L=101.34m, Completion in 1953	site	1.00	309,068,365	29,292,663	309,068,365	29,292,663	\$849,689.64	RT001.03.1						
No.3 Rio Abangares (2 of 2)	Rt.1 Steel thru truss, L=101.34m, Completion in 1953	site	1.00	198,340,941	107,080	198,340,941	107,079.52	\$521,974.79	RT001.03.2						
No.3 Rio Abangares Total						507,409,306	107,079.52	32,847,813	\$1,371,664.42						
No.7 Rio Azufrado	Rt.1 Rigid reinforced concrete frame, L=31.39m, Completion in 1955	site	1.00	117,281,252	80,042	117,281,252	80,041.50	\$432,351.76	RT001.07						
No.12 Rio Puerto Nuevo (1 of 2)	Rt.2 Steel beam & reinforced concrete girder, L=104.89m, Completion in 1961	site	1.00	78,904,061	72,287,237	78,904,061	72,287,237	\$771,271.60	RT002.12.1						
No.12 Rio Puerto Nuevo (2 of 2)	Rt.2 Steel beam & reinforced concrete girder, L=104.89m, Completion in 1961	site	1.00	265,831,855	40,021	265,831,855	40,020.75	\$599,910.01	RT002.12.2						
No.12 Rio Puerto Nuevo Total						344,735,916	40,020.75	77,488,082	\$1,371,181.61						
No.16 Rio Nuevo	Rt.2 Continuous reinforced concrete girder, L=55.47m, Completion in 1961	site	1.00	280,730,856	13,694,389	280,730,856	13,694,389	\$681,335.87	RT002.16						
No.17 Rio Chirripo	Rt.4 Concrete box girder, L=175.80m, Completion in 1978	site	1.00	226,420,000	5,438,424	226,420,000	5,438,424	\$485,435.57	RT004.17						
No.19 Rio Sarapiquí	Rt.4 Steel I-beam, L=100.96m, Completion in 1978	site	1.00	261,206,357	70,312,715	261,206,357	70,312,715	\$1,107,777.26	RT004.19						
No.20 Rio Sucio	Rt.32 Concrete box girder, L=187.25m, Completion in N.A.	site	1.00	163,653,216	4,996,830	163,653,216	4,996,830	\$359,984.29	RT032.20						
No.26 Rio Chirripo (1 of 2)	Rt.32 Continuous steel I-beam, L=431.90m, Completion in 1974-1978	site	1.00	52,217,159	222,143,100	52,217,159	222,143,100	\$2,001,344.11	RT032.26.1						
No.26 Rio Chirripo (2 of 2)	Rt.32 Continuous steel I-beam, L=431.90m, Completion in 1974-1978	site	1.00	610,636,845	9,966,921	610,636,845	9,966,921	\$1,268,978.84	RT032.26.2						
No.26 Rio Chirripo Total						682,854,005	232,110,021	\$3,270,322.96							
No.29 Rio Torres (1 of 2)	Rt.218 Concrete post-tensioned I-girder, L=66.46m, Completion in N.A.	site	1.00	34,044,448	24,762,335	34,044,448	24,762,335	\$277,802.34	RT218.29.1						
No.29 Rio Torres (2 of 2)	Rt.218 Concrete post-tensioned I-girder, L=66.46m, Completion in N.A.	site	1.00	130,581,768	3,057,081	130,581,768	3,057,081	\$279,283.14	RT218.29.2						
No.29 Rio Torres Total						164,626,216	27,819,416	\$557,085.47							
Total project costs of 10 bridges						3,236,359,907	253,854.29	512,171,387	\$10,908,474.93						
Summary		Ls													

RT001.02.1

CODE:

Basic Data: Rt.1, Steel truss, L=87.78m, Completion in 1955

No.2 Rio Aranjuez (1 of 2)

per 1.00 site

Item	Spec.	Unit	Qty	Unit Price			Total Amount			Remarks
				CRC	USD	JPY	CRC	USD	JPY	
CONSTRUCTION COST										
Site preparation	(A) Construction & removal of site facilities	Ls	1.00	15,299,333			15,299,333		79,444	DT02.SP01
Traffic control	One-way traffic in construction period	Ls	1.00	7,988,303			7,988,303			DT02.TR01
Superstructure (slab) 1 of 2	Replacement of deck slab (1 of 2)	Ls	1.00	77,810,557			77,810,557		991,427	DT02.SU01
Superstructure (slab) 2 of 2	Replacement of deck slab (2 of 2)	Ls	1.00	18,367,158			18,367,158		18,719,233	DT02.SU02
Superstructure (Floor) 1 of 2	Replacement of stringers & install cross beams	Ls	1.00	67,016,811			67,016,811		1,952,480	DT02.SU03
Superstructure (Girder)	Reinforced by additional member (brace)	Ls	1.00	21,955,665			21,955,665		870,849	DT02.SU05
Substructure (Unseat prevention) 1 of 13	Unseating prevention for A1	Ls	1.00	855,240			855,240		11,537	DT02.SU06
Substructure (Unseat prevention) 2 of 13	Unseating prevention for P1 & P2	Ls	1.00	5,259,715			5,259,715		66,057	DT02.SU07
Substructure (Unseat prevention) 4 of 13	Unseating prevention for A2	Ls	1.00	766,836			766,836		11,539	DT02.SU09
TRANSPORTATION COST									1,135,128	5% of (A)
CONTINGENCY COST									1,191,885	5% of ((A)+(B))
ADMINISTRATION COST									2,502,958	10% of ((A) + (B) + (C))
CONTRACTOR'S PROFIT									2,753,254	10% of ((A) + (B) + (C) + (D))
No.2 Rio Aranjuez (1 of 2)	Rt.1, Steel truss, L=87.78m, Completion in 1955	site					287,241,753		30,285,792	\$815,873.33

RT001.02.2

Basic Data: Rt.1, Steel truss, L=87.78m, Completion in 1955
per 1.00 site

No.2 Rio Aranjuez (2 of 2)

Item	Spec.	Unit	Qty	Unit Price			Total Amount			Remarks
				CRC	USD	JPY	CRC	USD	JPY	
CONSTRUCTION COST										
Accessory work (1 of 3)	(A) Install of expansion joint (steel)	Ls	1.00	4,831,504			701,309	4,831,504		701,309 DT02.AC01
Accessory work (2 of 3)	Waterproofing of deck slab & asphalt pavement	Ls	1.00	33,431,030			940,054	33,431,030		940,054 DT02.AC02
Accessory work (3 of 3)	Install precast handrail at site	Ls	1.00		20,024			20,024		DT02.AC03
Substructure (2 of 2)	Reinforced by concrete jacketing of P2	Ls	1.00	11,705,219			180,532	11,705,219		180,532 DT02.SB02
Foundation (1 of 3)	Expanding dimension of footing & install gabion box on P1	Ls	1.00	29,628,904			37,717	29,628,904		37,717 DT02.FD01
Foundation (2 of 3)	Expanding dimension of footing & install gabion box on P2	Ls	1.00	57,007,594			58,574	57,007,594		58,574 DT02.FD02
Foundation (3 of 3)	Install riprap & gabion box on A1	Ls	1.00	13,420,302				13,420,302		DT02.FD03
Scaffolding	Total cost for scaffolding on No.2	Ls	1.00	15,040,592				15,040,592		DT02.SCF01
TRANSPORTATION COST										
	(B)	Ls	1.00					8,253,257	1,001	95,909 5% of (A)
CONTINGENCY COST										
	(C)	Ls	1.00					8,665,920	1,051	100,705 5% of ((A)+(B))
ADMINISTRATION COST										
	(D)	Ls	1.00					18,198,432	2,208	211,480 10% of ((A) + (B) + (C))
CONTRACTOR'S PROFIT										
	(E)	Ls	1.00					20,018,275	2,428	232,628 10% of ((A) + (B) + (C) + (D))
No.2 Rio Aranjuez (2 of 2)	Rt.1. Steel truss, L=87.78m, Completion in 1955	site						220,201,030	26,713	2,558,910 \$475,462.37

Item	Spec.	Unit	Qty	Unit Price			Total Amount			Equivalent (USD)
				CRC	USD	JPY	CRC	USD	JPY	
No.2 Rio Aranjuez Total										
							507,442,784	26,712.52	32,844,701	\$1,291,335.71

RT001.03.1

CODE:

Basic Data: Rt.1, Steel thru truss, L=101.34m, Completion in 1953

No.3 Rio Abangares (1 of 2)

Item	Spec.	Unit	Qty	Unit Price			Total Amount			Remarks
				CRC	USD	JPY	CRC	USD	JPY	
CONSTRUCTION COST										
Site preparation	(A) Construction & removal of site facilities	Ls	1.00	17,151,693			17,151,693		79,444	DT03.SP01
Traffic control	One-way traffic in construction period	Ls	1.00	6,429,609			6,429,609			DT03.TR01
Superstructure (slab) 1 of 2	Replacement of deck slab (1 of 2)	Ls	1.00	72,043,453		793,141	72,043,453		793,141	DT03.SU01
Superstructure (slab) 2 of 2	Replacement of deck slab (2 of 2)	Ls	1.00	20,473,303		18,277,252	20,473,303		18,277,252	DT03.SU02
Superstructure (Floor) 1 of 3	Replacement of stringers & install cross beams	Ls	1.00	42,518,913		1,026,447	42,518,913		1,026,447	DT03.SU03
Superstructure (Floor) 2 of 3	Replacement of stringers & install cross beams	Ls	1.00	60,174,704		1,448,404	60,174,704		1,448,404	DT03.SU04
Superstructure (Girder) 1 of 2	Re-arrangement of diaphragm to keep clearance	Ls	1.00	5,879,943		187,389	5,879,943		187,389	DT03.SU06
Superstructure (Girder) 2 of 2	Reinforced by additional steel plate	Ls	1.00	3,167,570		85,085	3,167,570		85,085	DT03.SU07
Substructure (Unseat prevention) 1 of 9	Unseating prevention for A1	Ls	1.00	391,499		5,348	391,499		5,348	DT03.SU08
Substructure (Unseat prevention) 2 of 9	Unseating prevention for P1	Ls	1.00	2,882,388		47,958	2,882,388		47,958	DT03.SU09
Substructure (Unseat prevention) 3 of 9	Unseating prevention for A2	Ls	1.00	568,014		7,640	568,014		7,640	DT03.SU10
TRANSPORTATION COST										
CONTINGENCY COST										
ADMINISTRATION COST										
CONTRACTOR'S PROFIT										
No.3 Rto Abangares (1 of 2)	Rt.1, Steel thru truss, L=101.34m, Completion in 1953	site					309,068,365		29,292,663	\$849,689.64

RT001.03.2

CODE:

Basic Data: Rt.1, Steel thru truss, L=101.34m, Completion in 1953
per 1.00 site

No.3 Rio Abangares (2 of 2)

Item	Spec.	Unit	Qty	Unit Price			Total Amount			Remarks
				CRC	USD	JPY	CRC	USD	JPY	
CONSTRUCTION COST										
Substructure (Unseat prevention) ø of 9	(A) Install unseating prevention system (Chain type; 400kN) on A1, P1 & A2 (24nos)	Ls	1.00	5,306,388			5,306,388		193,350	DT03.SU16
Accessory work (1 of 3)	Install of expansion joint	Ls	1.00	6,981,919			6,981,919		1,013,449	DT03.AC01
Accessory work (2 of 3)	Waterproofing of deck slab & asphalt pavement	Ls	1.00	38,147,345			38,147,345		1,072,673	DT03.AC02
Accessory work (3 of 3)	Install precast handrail at site	Ls	1.00		20,268			20,268		DT03.AC03
Substructure	Reinforced by concrete jacketing of P1	Ls	1.00	12,281,743			12,281,743		266,694	DT03.SB01
Foundation (1 of 3)	Expanding dimension of footing on A1	Ls	1.00	13,883,143	30,000	25,317	13,883,143	30,000	25,317	DT03.FD01
Foundation (2 of 3)	Expanding dimension of footing & install gabion box on P1	Ls	1.00	39,620,012			39,620,012		60,848	DT03.FD02
Foundation (3 of 3)	Expanding dimension of footing on A2	Ls	1.00	16,807,063	30,000	32,647	16,807,063	30,000	32,647	DT03.FD03
Scaffolding	Total cost for scaffolding on No.3	Ls	1.00	15,650,965			15,650,965			DT03.SCF01
TRANSPORTATION COST										
CONTINGENCY COST										
ADMINISTRATION COST										
CONTRACTOR'S PROFIT										
No.3 Rio Abangares (2 of 2)	Rt.1, Steel thru truss, L=101.34m, Completion in 1952	site					198,340,941	107,080	3,555,149	\$521,974.79

Item	Spec.	Unit	Qty	Unit Price			Total Amount			Equivalent (USD)
				CRC	USD	JPY	CRC	USD	JPY	
No.3 Rio Abangares Total										
							507,409,306	107,079.52	32,847,813	\$1,371,664.42

RT001.07

CODE:

Basic Data: Rt.1, Rigid reinforced concrete frame, L=31.39m, Completion in 1955

No.7 Rio Azufrado

		per		1.00		site				
Item	Spec.	Unit	Qty	Unit Price			Total Amount			Remarks
				CRC	USD	JPY	CRC	USD	JPY	
CONSTRUCTION COST										
Site preparation	(A) Construction & removal of site facilities	Ls	1.00	13,446,972		79,444	13,446,972		79,444	DT07.SP01
Traffic control	One-way traffic in construction period	Ls	1.00	5,260,589			5,260,589			DT07.TR01
Superstructure (slab)	Increase thickness of slab (10cm) on surface side	Ls	1.00	7,479,884			7,479,884			DT07.SU01
Superstructure (Girder) 1 of 2	Reinforced by bonded steel plate	Ls	1.00	3,697,188		9,479,683	3,697,188		9,479,683	DT07.SU02
Superstructure (Girder) 2 of 2	Increase of girder height (approx.30cm)	Ls	1.00	1,027,092		47,348	1,027,092		47,348	DT07.SU03
Accessory work (1 of 3)	Install of expansion joint	Ls	1.00	4,694,215		681,381	4,694,215		681,381	DT07.AC01
Accessory work (2 of 3)	Waterproofing of deck slab & asphalt pavement	Ls	1.00	15,055,670		426,884	15,055,670		426,884	DT07.AC02
Substructure	Reinforced by concrete jacketing on P1 & P2	Ls	1.00	14,004,013		177,788	14,004,013		177,788	DT07.SB01
Foundation	Expanding dimension of footing on P1 & P2	Ls	1.00	17,197,830	60,000	58,536	17,197,830	60,000	58,536	DT07.FD01
Scaffolding	Total cost for scaffolding on No.7	Ls	1.00	6,051,879			6,051,879			DT07.SCF01
TRANSPORTATION COST	(B)	Ls	1.00				4,395,767	3,000	547,553	5% of (A)
CONTINGENCY COST	(C)	Ls	1.00				4,615,555	3,150	574,931	5% of ((A)+(B))
ADMINISTRATION COST	(D)	Ls	1.00				9,692,665	6,615	1,207,355	10% of ((A) + (B) + (C))
CONTRACTOR'S PROFIT	(E)	Ls	1.00				10,661,932	7,277	1,328,090	10% of ((A) + (B) + (C) + (D))
No.7 Rio Azufrado	Rt.1, Rigid reinforced concrete frame, L=31.39m, Completion in 1955	site					117,281,252	80,042	14,608,995	\$432,351.76

RT002.12.1

CODE:

Basic Data: Rt.2, Steel beam & reinforced concrete girder, L=104.89m, Completion in 1961

No.12 Rio Puerto Nuevo
(1 of 2)

Item	Spec.	Unit	Qty	Unit Price			Total Amount			Remarks
				CRC	USD	JPY	CRC	USD	JPY	
CONSTRUCTION COST										
Site preparation	(A) Construction & removal of site facilities	Ls	1.00	21,782,594		79,444	21,782,594		79,444	DT12.SP01
Traffic control	One-way traffic in construction period	Ls	1.00	10,326,342			10,326,342			DT12.TR01
Superstructure (slab) 1 of 2 Steel bridge section	Reinforced by bonded FRP sheet on top & bottom of slab (2layers/m2)	Ls	1.00	1,128,078		31,209,926	1,128,078		31,209,926	DT12.SU01
Superstructure (slab) 2 of 2 RC bridge section	Reinforced by bonded FRP sheet on top & bottom of slab (2layers/m2)	Ls	1.00	197,630			197,630		5,514,185	DT12.SU02
Superstructure (Girder) 1 of 3 Steel bridge section	Reinforced by PC cable (3@70ft section)	Ls	1.00	12,812,923			12,812,923		6,140,865	DT12.SU03.1
Superstructure (Girder) 2 of 3 Steel bridge section	Reinforced by PC cable (80ft section)	Ls	1.00	3,786,588		2,371,023	3,786,588		2,371,023	DT12.SU03.2
Superstructure (Girder) 3 of 3 RC bridge section	Reinforced by bonded steel plate	Ls	1.00	3,494,763		8,634,674	3,494,763		8,634,674	DT12.SU04
Substructure (Unseat prevention) 1 of 8	Unseating prevention for A1	Ls	1.00	462,526		6,146	462,526		6,146	DT12.SU05
Substructure (Unseat prevention) 2 of 8	Unseating prevention for A2	Ls	1.00	732,561		4,063	732,561		4,063	DT12.SU06
Substructure (Unseat prevention) 6 of 8	Unseating prevention for P1 & P2	Ls	1.00	43,641			43,641			DT12.SU10
Substructure (Unseat prevention) 7 of 8	Unseating prevention for P3 & P4	Ls	1.00	163,126			163,126			DT12.SU11
Substructure (Unseat prevention) 8 of 8	Install unseating prevention system (Chain type; 200kN on A1, P1-P4 (32nos))	Ls	1.00	4,216,590		226,992	4,216,590		226,992	DT12.SU12
TRANSPORTATION COST										
CONTINGENCY COST										
ADMINISTRATION COST										
CONTRACTOR'S PROFIT										
							2,957,368		2,709,366	5% of (A)
							3,105,237		2,844,834	5% of ((A)+(B))
							6,520,997		5,974,152	10% of ((A) + (B) + (C))
							7,173,096		6,571,567	10% of ((A) + (B) + (C) + (D))
No.12 Rio Puerto Nuevo (1 of 2)	Rt.2, Steel beam & reinforced concrete girder, L=104.89m, Completion in 1961	site					78,904,061		72,287,237	\$771,271.60

No.12 Rio Puerto Nuevo (2 of 2)														Basic Data: Rt.2, Steel beam & reinforced concrete girder, L=104.89m, Completion in 1961														CODE: RT002.12.2	
per 1.00 site																													
Item	Spec.	Unit	Qty	Unit Price			Total Amount			Remarks																			
				CRC	USD	JPY	CRC	USD	JPY																				
CONSTRUCTION COST																													
Accessory work (1 of 2)	Install of expansion joint	Ls	1.00	14,098,486																2,046,443	DT12.AC01								
Accessory work (2 of 2)	Waterproofing of deck slab & asphalt pavement	Ls	1.00	50,155,560																1,422,128	DT12.AC02								
Substructure	Expanding dimension of transversal beam on P1-P4	Ls	1.00	15,282,017																210,715	DT12.SB01								
Foundation (1 of 6)	Slope protection with wet masonry on A1	Ls	1.00	4,906,048																	DT12.FD01								
Foundation (2 of 6)	Expanding dimension of footing & install gabion box	Ls	1.00	30,088,530																40,887	DT12.FD02								
Foundation (3 of 6)	Expanding dimension of footing on P2	Ls	1.00	26,991,149																39,889	DT12.FD03								
Foundation (4 of 6)	Expanding dimension of footing on P3	Ls	1.00	20,378,819																90,443	DT12.FD04								
Foundation (5 of 6)	Expanding dimension of footing on P4	Ls	1.00	16,996,724																45,466	DT12.FD05								
Foundation (6 of 6)	Expanding dimension of footing on A2	Ls	1.00	5,279,933	30,000															10,137	DT12.FD06								
Scaffolding	Total cost for scaffolding on No.12	Ls	1.00	15,093,254																	DT12.SCF01								
TRANSPORTATION COST	(B)	Ls	1.00																	195,305	5% of (A)								
CONTINGENCY COST	(C)	Ls	1.00																	205,071	5% of ((A)+(B))								
ADMINISTRATION COST	(D)	Ls	1.00																	430,648	10% of ((A) + (B) + (C))								
CONTRACTOR'S PROFIT	(E)	Ls	1.00																	473,713	10% of ((A) + (B) + (C) + (D))								
No.12 Rio Puerto Nuevo (2 of 2)	Rt.2, Steel beam & reinforced concrete girder, L=104.89m, Completion in 1961	site																		5,210,845	\$599,910.01								
Item	Spec.	Unit	Qty	Unit Price			Total Amount			Equivalent (USD)																			
				CRC	USD	JPY	CRC	USD	JPY																				
No.12 Rio Puerto Nuevo Total																												\$1,371,181.61	
																	344,735,916			40,020.75			77,498,082						

Item	Spec.	Unit	Qty	Unit Price			Total Amount			Equivalent (USD)
				CRC	USD	JPY	CRC	USD	JPY	
No.12 Rio Puerto Nuevo Total							344 735.916	40 020.75	77 498.082	\$1 371 181.61

No.16 Rio Nuevo		Basic Data: Rt.2, Continuous reinforced concrete girder, L=55.47m, Completion in 1961										CODE: RT002.16	
Item	Spec.	Unit	Qty	Unit Price			Total Amount			Remarks			
				CRC	USD	JPY	CRC	USD	JPY				
CONSTRUCTION COST													
Site preparation	(A) Construction & removal of site facilities	Ls	1.00	17,151,693			17,151,693			DT16.SP01			
Traffic control	One-way traffic in construction period	Ls	1.00	5,845,099			5,845,099			DT16.TR01			
Superstructure (slab)	Increase thickness of slab (9cm) on surface side	Ls	1.00	13,077,540			13,077,540			DT16.SU01			
Superstructure (Girder) 1 of 2	Reinforced by bonded FRP sheet on girder (6layers & 1layer)	Ls	1.00	143,497			143,497		6,741,854	DT16.SU02.1			
Superstructure (Girder) 2 of 2	Reconstruction of edge & connection with PC bar on cross beam	Ls	1.00	628,950			628,950		1,145	DT16.SU02.2			
Substructure (Unseat prevention) 1 of 5	Unseating prevention for A1	Ls	1.00	1,850,585			1,850,585		19,369	DT16.SU03			
Substructure (Unseat prevention) 2 of 5	Unseating prevention for A2	Ls	1.00	962,114			962,114		9,813	DT16.SU04			
Accessory work (1 of 3)	Install of expansion joint	Ls	1.00	4,694,215			4,694,215		681,381	DT16.AC01			
Accessory work (2 of 3)	Waterproofing of deck slab & asphalt pavement	Ls	1.00	26,603,094			26,603,094		754,315	DT16.AC02			
Foundation (1 of 4)	Expanding of footing, install riprap & gabion box, & additional pile driving on A1	Ls	1.00	54,457,602			54,457,602		1,881,976	DT16.FD01			
Foundation (2 of 4)	Expanding of footing, wall and install riprap & gabion box on P1	Ls	1.00	60,381,796			60,381,796		50,790	DT16.FD02			
Foundation (3 of 4)	Expanding of footing & wall on P2	Ls	1.00	4,379,774			4,379,774		45,381	DT16.FD03			
Foundation (4 of 4)	Slope protection with gabion box & wet masonry on A2	Ls	1.00	10,197,156			10,197,156			DT16.FD04			
Scaffolding	Total cost for scaffolding on No.16	Ls	1.00	10,065,861			10,065,861			DT16.SCF01			
TRANSPORTATION COST													
CONTINGENCY COST	(B)	Ls	1.00				10,521,949		513,273	5% of (A)			
ADMINISTRATION COST	(C)	Ls	1.00				11,048,046		538,937	5% of ((A)+(B))			
CONTRACTOR'S PROFIT	(D)	Ls	1.00				23,200,897		1,131,768	10% of ((A) + (B) + (C))			
	(E)	Ls	1.00				25,520,987		1,244,944	10% of ((A) + (B) + (C) + (D))			
No.16 Rio Nuevo	Rt.2, Continuous reinforced concrete girder, L=55.47m, Completion in 1961	site					280,730,856		13,694,389	\$661,335.87			

No.17 Rio Chirripo		Basic Data: Rt.4, Concrete box girder, L=175.80m, Completion in 1978										CODE: RT004.17			
		per		1.00		site		Unit Price				Total Amount			Remarks
Item	Spec.	Unit	Qty	CRC	USD	JPY	CRC	USD	JPY						
CONSTRUCTION COST		(A)													
Site preparation	Construction & removal of site facilities	Ls	1.00	11,594,612		79,444	11,594,612			79,444	DT17.SP01				
Traffic control	One-way traffic in construction period	Ls	1.00	2,922,550			2,922,550				DT17.TR01				
Accessory work (1 of 2)	Replacement of expansion joint	Ls	1.00	7,504,234		1,116,839	7,504,234			1,116,839	DT17.AC01				
Accessory work (2 of 2)	Removal & install of pavement, waterproofing of deck slab	Ls	1.00	93,550,386		2,594,732	93,550,386			2,594,732	DT17.AC02				
Substructure (1 of 2)	Column of pier is covered by concrete to protect from rolling stones on P1 & P2	Ls	1.00	7,453,675		46,767	7,453,675			46,767	DT17.SB01				
Foundation (2 of 4)	Expanding dimension of footing on P1 & P2	Ls	1.00	44,438,645		238,920	44,438,645			238,920	DT17.FD02				
Scaffolding	Total cost for scaffolding on No.17	Ls	1.00	2,262,853			2,262,853				DT17.SCF01				
TRANSPORTATION COST		(B)													
CONTINGENCY COST	(C)	Ls	1.00				8,486,348			203,835	5% of (A)				
ADMINISTRATION COST	(D)	Ls	1.00				8,910,665			214,027	5% of ((A)+(B))				
CONTRACTOR'S PROFIT	(E)	Ls	1.00				18,712,397			449,457	10% of ((A) + (B) + (C))				
		Ls	1.00				20,583,636			494,402	10% of ((A) + (B) + (C) + (D))				
No.17 Rio Chirripo	Rt.4, Concrete box girder, L=175.80m, Completion in 1978	site					226,420,000			5,438,424			\$485,435.57		

RT004.19

Basic Data: Rt.4, Steel I-beam, L=100.96m, Completion in 1978
per 1.00 site

No.19 Rio Sarapiquí

Item	Spec.	Unit	Qty	Unit Price			Total Amount			Remarks
				CRC	USD	JPY	CRC	USD	JPY	
CONSTRUCTION COST										
Site preparation	(A) Construction & removal of site facilities	Ls	1.00	19,004,054			19,004,054		79,444	DT19.SP01
				6,819,283			6,819,283			DT19.TR01
Traffic control	Reinforced by bonded FRP sheet on top & bottom of slab (2layers/m2)	Ls	1.00	1,232,678		33,649,100	1,232,678		33,649,100	DT19.SU01
Superstructure (slab)	Reinforced by PC cable at support	Ls	1.00	9,223,826			9,223,826		6,179,890	DT19.SU02.1
				7,204,408			7,204,408		1,822,269	DT19.SU02.2
Superstructure (Girder)	Reinforced by bonded steel plate	Ls	1.00	3,494,763			3,494,763		8,634,674	DT19.SU02.3
Superstructure (Girder)	Partial replacement of main girder	Ls	1.00	6,611,540			6,611,540		233,856	DT19.SU03
Substructure (Unseat prevention) 1 of 4	Unseating prevention for A1 & A2	Ls	1.00	1,172,686			1,172,686		12,376	DT19.SU04
				1,317,879			1,317,879		75,094	DT19.SU07
Substructure (Unseat prevention) 4 of 4	Install unseating prevention system (Chain type; 200kN) on A1 & A2 (10nos)	Ls	1.00	3,854,642			3,854,642		559,514	DT19.AC01
				37,400,660			37,400,660		1,051,677	DT19.AC02
Accessory work (1 of 2)	Waterproofing of deck slab & asphalt pavement	Ls	1.00	5,682,087			5,682,087		79,991	DT19.SB01
Accessory work (2 of 2)	Expanding dimension of transversal beam on P1 & P2	Ls	1.00	56,384,831			56,384,831		144,163	DT19.FD01
				24,387,727			24,387,727		185,146	DT19.FD02
Foundation (1 of 3)	Expanding of footing & additional pile driving on P1	Ls	1.00	12,012,130			12,012,130			DT19.SCF01
Foundation (2 of 3)	Expanding of footing on P2	Ls	1.00							
Scaffolding	Total cost for scaffolding on No.19	Ls	1.00							
TRANSPORTATION COST										
(B)		Ls	1.00				9,790,160		2,635,360	5% of (A)
(C)		Ls	1.00				10,279,668		2,767,128	5% of ((A)+(B))
(D)		Ls	1.00				21,587,302		5,810,968	10% of ((A) + (B) + (C))
(E)		Ls	1.00				23,746,032		6,392,065	10% of ((A) + (B) + (C) + (D))
No.19 Rio Sarapiquí	Rt.4, Steel I-beam, L=100.96m, Completion in 1978	site					261,206,357		70,312,715	\$1,107,777.26

No.20 Rio Sucio		Basic Data: Rt.32, Concrete box girder, L=187.25m, Completion in N.A.										CODE: RT032.20	
		per 1.00 site		Unit Price		Total Amount			Remarks				
Item	Spec.	Unit	Qty	CRC	USD	JPY	CRC	USD	JPY				
CONSTRUCTION COST													
Site preparation	(A)	Ls	1.00	2,746,656			2,746,656			DT20.SP01			
				One-way traffic in construction period	Ls	1.00	5,455,426			5,455,426			DT20.TR01
Accessory work (1 of 2)	Replacement of expansion joint	Ls	1.00	7,136,380		1,062,092	7,136,380		1,062,092	DT20.AC01			
Accessory work (2 of 2)	Removal & install of pavement, waterproofing of deck slab	Ls	1.00	94,759,181		2,628,260	94,759,181		2,628,260	DT20.AC02			
Substructure	Column of pier is covered by concrete to protect from rolling stones on P1 & P2	Ls	1.00	10,993,278		55,328	10,993,278		55,328	DT20.SB01			
Scaffolding	Total cost for scaffolding on No.20	Ls	1.00	1,585,352			1,585,352			DT20.SCF01			
TRANSPORTATION COST													
CONTINGENCY COST	(B)	Ls	1.00				6,133,814		187,284	5% of (A)			
							6,440,504		196,648	5% of ((A)+(B))			
ADMINISTRATION COST	(D)	Ls	1.00				13,525,059		412,961	10% of ((A) + (B) + (C))			
CONTRACTOR'S PROFIT	(E)	Ls	1.00				14,877,565		454,257	10% of ((A) + (B) + (C) + (D))			
No.20 Rio Sucio	Rt.32, Concrete box girder, L=187.25m, Completion in N.A.	site					163,653,216		4,996,830	\$359,984.29			

RT032.26.1

CODE:

Basic Data: Rt.32, Continuous steel I-beam, L=431.90m, Completion in 1974-1978

per 1.00 site

Item	Spec.	Unit	Qty	Unit Price			Total Amount			Remarks
				CRC	USD	JPY	CRC	USD	JPY	
CONSTRUCTION COST										
Site preparation	(A) Construction & removal of site facilities	Ls	1.00	17,614,783			17,614,783		79,444	DT26.SP01
Traffic control	One-way traffic in construction period	Ls	1.00	6,429,609			6,429,609			DT26.TR01
Superstructure (slab)	Reinforced by bonded FRP sheet on top & bottom of slab (2layers/m2)	Ls	1.00	6,045,941			6,045,941		166,269,733	DT26.SU01
Substructure (Unseat prevention) 1 of 8	Unseating prevention for P1	Ls	1.00	1,630,144			1,630,144		6,451	DT26.SU02
Substructure (Unseat prevention) 2 of 8	Unseating prevention for P7	Ls	1.00	3,237,963			3,237,963		23,090	DT26.SU03
Substructure (Unseat prevention) 3 of 8	Unseating prevention for A2	Ls	1.00	545,123			545,123		5,019	DT26.SU04
Substructure (Unseat prevention) 8 of 8	Install unseating prevention system (Chain type) on P1, P7 & A2 (16nos)	Ls	1.00	3,639,000			3,639,000		137,205	DT26.SU09
TRANSPORTATION COST										
CONTINGENCY COST										
ADMINISTRATION COST										
CONTRACTOR'S PROFIT										
No.26 Rio Chirripo (1 of 2)	Rt.32, Continuous steel I-beam, L=431.90m, Completion in 1974-1978	site					52,217,159		222,143,100	\$2,001,344.11

No.26 Rio Chirripo (2 of 2)

Basic Data: Rt.32, Continuous steel I-beam, L=431.90m, Completion in 1974-1978

CODE: RT032.26.2

		per		1.00		site							
Item	Spec.	Unit	Qty	Unit Price			Total Amount			Remarks			
				CRC	USD	JPY	CRC	USD	JPY				
CONSTRUCTION COST	(A)												
Accessory work (1 of 2)	Install of expansion joint	Ls	1.00	8,173,954			8,173,954			1,186,477 DT26.AC01			
Accessory work (2 of 2)	Waterproofing of deck slab & asphalt pavement	Ls	1.00	181,542,870			181,542,870			5,104,843 DT26.AC02			
Substructure	Expanding dimension of transversal beam on P4	Ls	1.00	3,077,347			3,077,347			59,607 DT26.SB01			
Foundation (1 of 4)	Expanding dimension of footing on P1 & P7	Ls	1.00	31,051,721			31,051,721			118,440 DT26.FD01			
Foundation (2 of 4)	Expanding dimension of footing on P2 & P6	Ls	1.00	61,790,909			61,790,909			330,281 DT26.FD02			
Foundation (3 of 4)	Expanding dimension of footing on P3, P4 & P5	Ls	1.00	123,183,849			123,183,849			671,668 DT26.FD03			
Scaffolding	Total cost for scaffolding on No.26	Ls	1.00	48,919,531			48,919,531			DT26.SCF01			
TRANSPORTATION COST	(B)	Ls	1.00				22,887,009			373,566 5% of (A)			
CONTINGENCY COST	(C)	Ls	1.00				24,031,360			392,244 5% of ((A)+(B))			
ADMINISTRATION COST	(D)	Ls	1.00				50,465,855			823,712 10% of ((A) + (B) + (C))			
CONTRACTOR'S PROFIT	(E)	Ls	1.00				55,512,440			906,084 10% of ((A) + (B) + (C) + (D))			
No.26 Rio Chirripo (2 of 2)	Rt.32, Continuous steel I-beam, L=431.90m, Completion in 1974-1978	site					610,636,845			9,966,921 \$1,268,978.84			

Item	Spec.	Unit	Qty	Unit Price			Total Amount			Equivalent (USD)
				CRC	USD	JPY	CRC	USD	JPY	
No.26 Rio Chirripo Total										\$3,270,322.96
								662,854,005	232,110,021	

**GRUPO DE ESTUDIO JICA
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CHODAI CO., LTD**

RT218.29.2

CODE:

Basic Data: Rt.218, Concrete post-tensioned I-girder, L=66.46m, Completion in N.A.

No.29 Rio Torres (2 of 2)

Item	Spec.	Unit	Qty	Unit Price			Total Amount			Remarks
				CRC	USD	JPY	CRC	USD	JPY	
CONSTRUCTION COST										
Accessory work (1 of 2)	Install of expansion joint (steel) (A)	Ls	1.00	11,701,216			11,701,216		1,698,471	DT29.AC01
Accessory work (2 of 2)	Waterproofing of deck slab & asphalt pavement	Ls	1.00	8,263,195			8,263,195		238,902	DT29.AC02
Substructure (1 of 4)	Reinforced by concrete jacketing of P1	Ls	1.00	2,245,922			2,245,922		25,756	DT29.SB01
Substructure (3 of 4)	Expanding dimension of transversal beam on P1	Ls	1.00	6,380,226			6,380,226		91,660	DT29.SB03
Substructure (4 of 4)	Expanding dimension of transversal beam on P2	Ls	1.00	5,192,740			5,192,740		70,738	DT29.SB04
Foundation (1 of 4)	Expanding dimension of footing on A1	Ls	1.00	15,795,213			15,795,213		76,750	DT29.FD01
Foundation (2 of 4)	Expanding dimension of footing & install gabion box on P1	Ls	1.00	27,802,872			27,802,872		20,358	DT29.FD02
Foundation (4 of 4)	Expanding dimension of footing on A2	Ls	1.00	11,012,247			11,012,247		68,987	DT29.FD04
Scaffolding	Total cost for scaffolding on No.29	Ls	1.00	9,491,917			9,491,917			DT29.SCF01
TRANSPORTATION COST										
CONTINGENCY COST	(B)	Ls	1.00				4,894,277		114,581	5% of (A)
ADMINISTRATION COST	(C)	Ls	1.00				5,138,991		120,310	5% of ((A)+(B))
CONTRACTOR'S PROFIT	(D)	Ls	1.00				10,791,882		252,651	10% of ((A) + (B) + (C))
	(E)	Ls	1.00				11,871,070		277,916	10% of ((A) + (B) + (C) + (D))
No.29 Rio Torres (2 of 2)	Rt.218, Concrete post-tensioned I-girder, L=66.46m, Completion in N.A.	site					130,581,768		3,057,081	\$279,283.14

Item	Spec.	Unit	Qty	Unit Price			Total Amount			Equivalent (USD)
				CRC	USD	JPY	CRC	USD	JPY	
No.29 Rio Torres Total										\$557,085.47
								164,626,216	27,819,416	