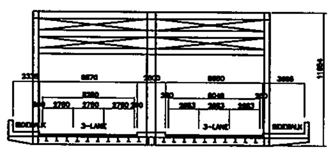
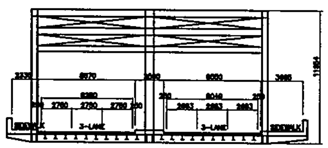
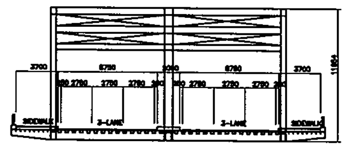
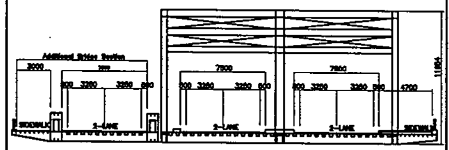
CHAPTER 14

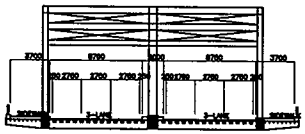
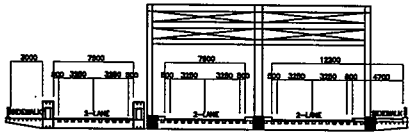
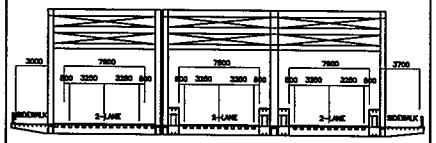
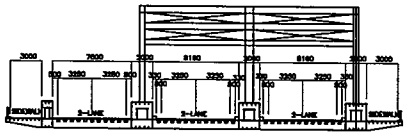
COMPARATIVE STUDY ON IMPROVEMENT MEASURES

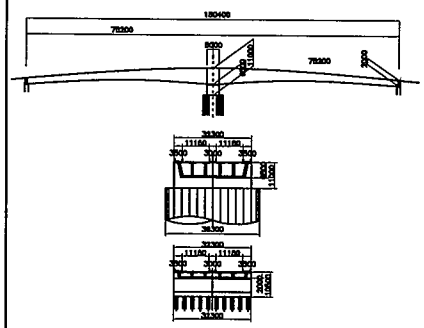
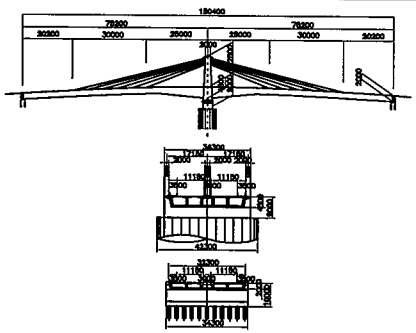
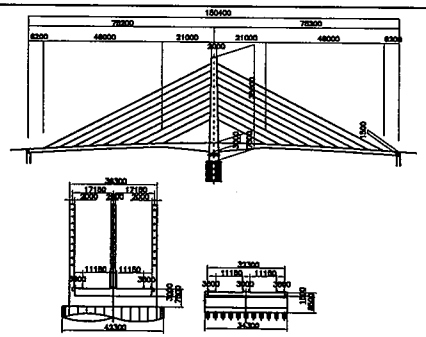
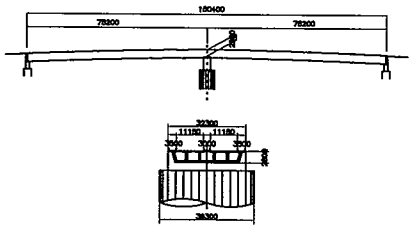
Appendix 14.2.1-1 (1/5)

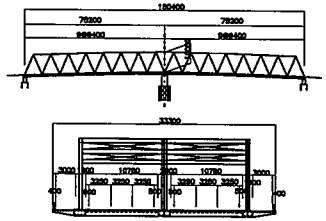
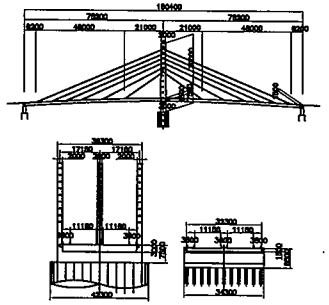
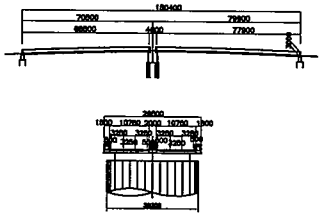
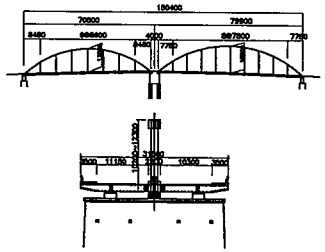
Improvement Type	Rehabilitation of Existing Bridge				Strengthening of Bridge			
	R1		R2		S1		S2	
Scheme Name	Rehabilitation/Strengthening of Damaged Joints of Truss Members		Rehabilitation/Strengthening/Replacement of Bearing Shoes and Floor System		Strengthening of Entire Lower Chords+Replacement of Floor System (Conversion to steel deck slab from RC deck slab)		Strengthening of Entire Lower Chords +Replacement of Floor System (Conversion to steel deck slab from RC deck slab) + New Bridge Construction	
Diagramatic Sketch								
Description	- To rehabilitate or strengthen heavily damaged area of the truss joints - The rehabilitation method is to replace heavily corroded steel portion or to increase section areas by adding new steel plates. - Problem with this scheme is to maintain the substandard lane width. The traffic capacity of the existing road width is estimated to be 59,000 PCU. The present Level of Service (LOS) of the existing road width is Level D (v/c ratio:0.70). In year 2010 the v/c ratio will become 1.8 if the existing road width will be maintained.		- To rehabilitate or strengthen or replace heavily damaged bearings, stringers and cross beams. The joint areas of stringers and cross beams with truss chords shall be strengthened with new steel plates due to their significant damage. - All bearings shall be replaced because they are heavily corroded and have not functioned properly.		-To strengthen the entire lower chord by adding or replacing member to meet the latest code. • To make the dead weight of Superstructure lighter by converting the existing RC deck slab to steel deck slab. With the conversion the total dead weight of the Superstructure will be decrease by 30%. • Road width and the vertical alignment are same as the existing conditions. • Regarding road width, this scheme will be improved a little bit		• This scheme is basically the same as Scheme S1 with additional from 3-lane to reduce bridge section to improve its traffic capacity. • The number of lanes on the existing bridge is reduced to 2-lane the live load in addition to the reduction of dead weight by the conversion system. • Driving condition will be improved by 2-lane use of the existing bridge comparing to Scheme S1. • The new bridge can be used as a detour by constructing ahead during improvement works for the existing bridge. • Bridge widening required additional R.O.W.	
(1) Structural Aspects	Expected Load Carrying Capacity 15 Ton	D	Expected Load Carrying Capacity 15 Ton	D	Expected Load Carrying Capacity 20 Ton	C	Expected Load Carrying Capacity 20 Ton	C
	Expected Durability 5 yrs	D	Expected Durability 5 yrs	D	Expected Durability 15 yrs	D	Expected Durability 20 yrs	C
(2) Construction Difficulty	Small work compared to other schemes	A	Small work compared to other schemes	A	Stage construction necessary for keeping the passage of traffic	A	Stage construction necessary for keeping the passage of traffic	A
(3) Economical Aspects	Minimal among proposed schemes 750 0.48	A	Minimal among proposed schemes 700 0.45	A	In between rehabilitation and new construction 1,408 0.91	B	In between rehabilitation and new construction 1,420 0.91	B
(4) Geometrical a. No. of Lanes	Substandard lane width 6 Lanes	D	Substandard lane width 6 Lanes	D	Lane width is minimum 6 Lanes	C	Lane width is minimum 6 Lanes	B
(4) Geometrical b. Gradient	Satisfies AASHTO requirements	A	Satisfies AASHTO requirements	A	Satisfies AASHTO requirements	A	Satisfies AASHTO requirements	A
(4) Geometrical c. Horizontal Alignment	Existing alignment is not smooth	B	Existing alignment is not smooth	B	Existing alignment is not smooth	B	Existing alignment is not smooth	B
(4) Geometrical d. Access to Hospicio	Grade of access road road is acceptable	A	Grade of access road road is acceptable	A	Depend on existing girder height	B	Depend on existing girder height	B
(4) Geometrical e. Nav. clearance	Does not satify regulatory clearance 3.50 meter	D	Does not satify regulatory clearance 3.50 meter	D	Satisfies regulatory clearance meter	B	Satisfies regulatory clearance meter	B
(5) Traffic Treatment	Maintains passage of existing traffic	B	Maintains passage of existing traffic	B	2-Lane detour bridge shall be provided to maintain the required 4-Lane	B	New added bridge can be used as detour bridge	B
(6) Social Environment a. Historical Aspects	Existing bridge remains	A	Existing bridge remains	A	Upper members remain	A	Upper members remain There is a new added bridge	B
(6) Social Environment b. Scenery/ Aesthetics	Good	B	Good	B	Good	B	Good	B
(6) Social Environment c. Row Acquisition Difficulty	No need	A	No need	A	Temporarily borrowed land is necessary for 2-Lane detour	B	R.O.W. acquisition is necessary for the new bridge	B
Rating	D		D		D		B	

PRELIMINARY SCREENING OF POSSIBLE SCHEMES FOR AYALA BRIDGE

PRELIMINARY SCREENING OF POSSIBLE SCHEMES FOR AYALA BRIDGE

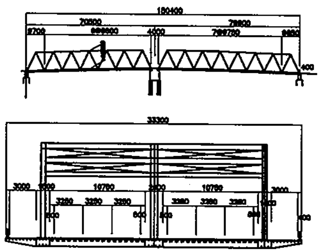
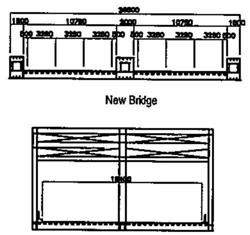
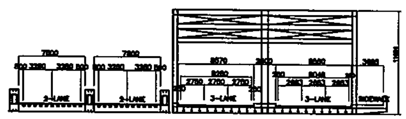
Improvement Type		Strengthening of Bridge											
		S3			S4			S5			S6		
Scheme Name		Replacement of Lower Chords + Replacement of Floor System (Conversion to steel deck slab from RC deck slab).			Replacement of Lower Chords + Replacementof Floor System (Conversion to steel deck slab from RC deck slab) + New Bridge Construction			Combining Existing Lower Chord and Steel Box Girder (Through Type) + Replacement of Floor System (Conversion to steel deck slab from RC deck slab) + New Bridge Construction			Conversion from Existing Lower Chord only to Steel Box Girder (Through Type) + Replacementof Floor System (Conversion to steel deck slab from RC deck slab) + New Bridge Construction		
Diagramatic Sketch													
Description		• The difference with Scheme S1 is the replacement of the lower chord. • Durability of the existing bridge can be increased by replacing the damaged lower chord with new one. • Road width and the vertical alignment are the same as the existing conditions. • Difficulty will be encountered when replacing the middle truss lower chord if the bridge will not be closed during construction. • Maintained 4-lane traffic needs temporary bridge as detour.			• The relationship between Scheme S3 and S4 is the same as that between Scheme S1 and S2. • The durability can be increased comparing to Scheme S2 from the same reason as Scheme S3. • Additional R.O.W. required similar to Scheme S2.			• The difference between Scheme S5 and S4 the additional steel box girder to reinforce the existing truss without replacing/strengthening lower chords. • When combining the existing lower chord with a new steel box girder, the stress of the existing main trusses can be reduced. • Construction work will be easier comparing to Scheme S4 because a new steel girder is only combined with the existing lower chord instead of replacing the damaged lower chord. • The additional steel box girder is effective only under live load condition. • Additional R.O.W similar to Scheme S2.			• The strengthened bridge is designed as a through type simple steel box girder bridge, thus this scheme does not expect the existing upper chords, diagonal and vertical members to shoulder the loads. • The difference from Scheme S4 and S5 is whether to expect the existing upper chords, diagonal and vertical members to share the loads. • This scheme is almost a new bridge construction in terms of sharing of the loads. • The existing upper members wil remain as a symbol for the people who feel nostalgia to the old Ayala Bridge or intend to preserve the old Ayala Bridge as a historical structure.		
(1) Structural Aspects	Expected Load Carrying Capacity	32 Ton	A	Expected Load Carrying Capacity	32 Ton	A	Expected Load Carrying Capacity	32 Ton	A	Expected Load Carrying Capacity	32 Ton	A
	Expected Durability	30 yrs	B	Expected Durability	30 yrs	B	Expected Durability	40 yrs	B	Expected Durability	50 yrs	A
(2) Construction Difficulty	Stage construction necessary for keeping the passage of traffic.		C	Stage construction necessary for keeping the passage of traffic.		B	Stage construction necessary for keeping the passage of traffic.		B	Stage construction necessary for keeping the passage of traffic		B
(3) Economical Aspects	In between rehabilitation and new construction	1,475 0.95	B	In between rehabilitation and new construction	1,555 1.00	B	In between rehabilitation and new construction	1,935 1.25	B	In between rehabilitation and new construction	2,028 1.30	C
(4) Geometrical a. No. of Lanes	Lane width is minimum	6 Lanes	C	Lane width is medium	6 Lanes	B	Lane width is medium	6 Lanes	B	Lane width is medium	6 Lanes	B
(4) Geometrical b. Gradient	Satisfies AASHTO requirements		A	Satisfies AASHTO requirements		A	Satisfies AASHTO requirements		A	Satisfies AASHTO requirements		A
(4) Geometrical c. Horizontal Alignment	Maintain existing alignment. In-depth study is necessary to improve the existing alignment		B	Maintain existing alignment. In-depth study is necessary to improve the existing alignment		B	Maintain existing alignment. In-depth study is necessary to improve the existing alignment		B	Maintain existing alignment. In-depth study is necessary to improve the existing alignment		B
(4) Geometrical d. Access to Hospicio	Depend on existing girder height		B	Depend on existing girder height		B	Depend on existing girder height		B	Depend on existing girder height		B
(4) Geometrical e. Nav. clearance	Satisfies regulatory clearance		B	Satisfies regulatory clearance		B	Satisfies regulatory clearance		B	Satisfies regulatory clearance		B
(5) Traffic Treatment	2-Lane detour bridge shall be provided to maintain the required 4-Lane traffic volume		B	New added bridge can be used as detour bridge		B	New added bridge can be used as detour bridge		B	New added bridge can be used as detour bridge		B
(6) Social Environment a. Historical Aspects	Remain upper members		B	Remain upper members		B	Remain upper members		B	Remain upper members		B
(6) Social Environment b. Scenery/ Aesthetics	Good		B	Good		B	Good		B	Fair		C
(6) Social Environment c. Row Acquisition Difficulty	Temporarily borrowed land is necessary for 2-Lane bridge		B	R.O.W acquisition is necessary for the new bridge		B	R.O.W acquisition is necessary for the new bridge		B	R.O.W acquisition is necessary for the new bridge		B
Rating		A High possible improvement scheme			A High possible improvement scheme			A High possible improvement scheme			B		

Improvement Type	New Bridge Construction															
	N1			N2			N3			N4		
Scheme Name	2 - Span Continuous PC Rigid Frame Bridge			2-Span PC Extradosed Bridge			2-Span PC Cable Stayed Bridge			2-Span Continuous PC Box Girder Bridge		
Diagramatic Sketch												
Description	· This bridge type requires the higher girder height because of cantilever type. · A new pier construction is necessary, which is to be constructed beside the existing pier. · Temporary work for the superstructure in the river is not required. · A 4-lane detour is necessary for securing the traffic. · Vertical grade becomes steeper due to deaper girder. The vertical grade of the access road to the Hospicio de San Jose becomes steeper because the center of bridge has a very high elevation.			· Girder height is lower than Scheme N1. · A new pier construction is necessary, which is to be constructed beside the existing pier. · Temporary work for the superstructure in the river is not required. · A 4-lane detour is necessary for securing the traffic. · Vertical grade less steep than Scheme N1 due to shallower girder. · The main tower can be expected to be come monument or landmark. · Presents an opportunity for technology transfer.			· Girder height is lower than Scheme N2. · A new pier construction is necessary, which is to be constructed beside the existing pier. · Temporary work for the superstructure in the river is not required. · A 4-lane detour is necessary for securing the traffic. · Vertical grade less steep than Scheme N2 due to shallow girder. · The main tower can be expected to become a monument or landmark due to high profile. · Presents an opportunity for technology transfer.			· A new pier construction is necessary, which is to be constructed beside the existing pier. · The girder height is 2.0 m higher than the existing one, which increases the gradesgoing to adjacent intersections and the Hospicio de San Jose. · Construction cost is cheaper comparing to other new bridge construction cost. · A 4-lane detour is necessary for securing the traffic.		
(1) Structural Aspects	Expected Load Carrying Capacity	32 Ton	A	Expected Load Carrying Capacity	32 Ton	A	Expected Load Carrying Capacity	32 Ton	A	Expected Load Carrying Capacity	32 Ton	A
	Expected Durability	50 yrs	A	Expected Durability	50 yrs	A	Expected Durability	50 yrs	A	Expected Durability	50 yrs	A
(2) Construction Difficulty	After 4-Lane detour construction relatively easy to construct		A	After 4-Lane detour construction relatively easy to construct		A	After 4-Lane detour construction relatively easy to construct		A	After 4-Lane detour construction relatively easy to construct		A
(3) Economical Aspects	Relatively expensive	2,160 1.39	B	Relatively expensive	2,350 1.40	C	Very expensive	2,474 1.59	C	Relatively expensive	1,879 1.21	B
(4) Geometrical — a. No. of Lanes	Lane width is desirable	6 Lanes	A	Lane width is desirable	6 Lanes	A	Lane width is desirable	6 Lanes	A	Lane width is desirable	6 Lanes	A
(4) Geometrical — b. Gradient	In-depth study is necessary for access road to Hospicio		C	In-depth study is necessary for access road to Hospicio		C	In-depth study is necessary for access road to Hospicio		C	In-depth study is necessary for access road to Hospicio		C
(4) Geometrical — c. Horizontal Alignment	Easy to improve existing alignment		A	Easy to improve existing alignment		A	Easy to improve existing alignment		A	Easy to improve existing alignment		A
(4) Geometrical — d. Access to Hospicio	Another route shall be studied		D	Another route shall be studied		C	Another route shall be studied		C	Another route shall be studied		D
(4) Geometrical — e. Nav. clearance	Easy to satisfy navigational limit		A	Easy to satisfy navigational limit		A	Easy to satisfy navigational limit		A	Easy to satisfy navigational limit		A
(5) Traffic Treatment	Easy because 4-Lane detour will be provided		A	Easy because 4-Lane detour will be provided		A	Easy because 4-Lane detour will be provided		A	Easy because 4-Lane detour will be provided		A
(6) Social Environment — a. Historical Aspects	Different type from existing one		D	Different type from existing one		D	Different type from existing one		D	Different type from existing one		D
(6) Social Environment — b. Scenery/ Aesthetics	Fair		C	Excellent		A	Excellent		B	Fair		C
(6) Social Environment — c. Row Acquisition Difficulty	Widening road width require the R.O.W. acquisition + temporary R.O.W. for detour bridge		C	Widening road width require the R.O.W. acquisition + temporary R.O.W. for detour bridge		C	Widening road width require the R.O.W. acquisition + temporary R.O.W. for detour bridge		C	Widening road width require the R.O.W. acquisition + temporary R.O.W. for detour bridge		C
Rating	C			A High possible improvement scheme			D			C		

Improvement Type	New Bridge Construction			
	N5	N6	N7	N8
Scheme Name	2-Span Continuous Steel Truss Bridge	2-Span Steel Cable Stayed Bridge	Simple Through Type Steel Box Girder Bridge (2-Spans)	Simple Through Type Steel Arch Bridge (2-Spans)
Diagramatic Sketch				
Description	• A new pier construction is necessary, which is to be constructed beside the existing pier. • Truss bridge is similar to the existing bridge. • In-depth study on the access road going to the existing Hospicio de San Jose shall be necessary because securing vertical and horizontal clearance for vehicles will be difficult. • Requires detour road during construction or realign bridge to utilize existing bridge.	• A new pier construction is necessary, which is to be constructed beside the existing pier. • The construction cost of the cable-stayed bridge becomes higher than other schemes of new bridge construction. • The main tower can be expected as monuments or symbol because of its high profile. • Temporary work method for the superstructure is cantilever method from the center support point or to provide a temporary bent. • Superstructure dead weight is lighter than other schemes. • Detour road is necessary.	• The existing pier can be utilized by improving/strengthening, if necessary. • The access to the Hospicio de San Jose is relatively gentle because the elevation of the bridge deck surface is to be minimized comparing with other schemes using through girder type. • There is the possibility that drivers have an oppressive feeling due to the through type. • Box girder needs protection from vehicle collision.	• The existing pier can be utilized similar to Scheme N7. • The access to the Hospicio de San Jose is relatively gentle because the elevation of the bridge deck surface is to be minimized similar to Scheme N7. • To install temporally bents or utilize barges as temporally works. • Scenery and aesthetic aspect will be good because of the arch line.
(1) Structural Aspects	Expected Load Carrying Capacity: 32 Ton — A	Expected Load Carrying Capacity: 32 Ton — A	32 Ton — A	Expected Load Carrying Capacity: 32 Ton — A
	Expected Durability: 50 yrs — A	Expected Durability: 50 yrs — A	Expected Durability: 50 yrs — A	Expected Durability: 50 yrs — A
(2) Construction Difficulty	After 4-Lane detour construction relatively easy to construct — A	After 4-Lane detour construction relatively easy to construct — A	After 4-Lane detour construction relatively easy to construct — A	After 4-Lane detour construction relatively easy to construct — A
(3) Economical Aspects	Very expensive: 2,241 / 1.44 — D	Most expensive among new bridges: 2,870 / 1.85 — D	Relatively expensive: 2,129 / 1.37 — B	Expensive: 2,316 / 1.49 — C
(4) Geometrical — a. No. of Lanes	Lane width is desirable: 6 Lanes — A	Lane width is desirable: 6 Lanes — A	Lane width is desirable: 6 Lanes — A	Lane width is desirable: 6 Lanes — A
(4) Geometrical — b. Gradient	In-depth study is necessary for access road to Hospicio — B	In-depth study is necessary for access road to Hospicio — B	Will satisfy AASHTO requirements — A	In-depth study is necessary for access road to Hospicio — B
(4) Geometrical — c. Horizontal Alignment	Easy to improve existing alignment — A	Easy to improve existing alignment — A	Easy to improve existing alignment — A	Easy to improve existing alignment — A
(4) Geometrical — d. Access to Hospicio	Another route shall be studied — D	Another route shall be studied — D	Depend on girder height — B	Depend on girder height — B
(4) Geometrical — e. Nav. clearance	Easy to satisfy navigational limit — A	Easy to satisfy navigational limit — A	Easy to satisfy navigational limit — A	Easy to satisfy navigational limit — A
(5) Traffic Treatment	Easy because 4-Lane detour will be provided — A	Easy because 4-Lane detour will be provided — A	Easy because 4-Lane detour will be provided — A	Easy because 4-Lane detour will be provided — A
(6) Social Environment — a. Historical Aspects	Different type from existing one — D	Different type from existing one — D	Different type from existing one — D	Different type from existing one — D
(6) Social Environment — b. Scenery/ Aesthetics	Good — B	Excellent — A	Fair/Bad — C	Excellent — A
(6) Social Environment — c. Row Acquisition Difficulty	Widening road width require the R.O.W. acquisition + temporary R.O.W. for detour bridge — C	Widening road width require the R.O.W. acquisition + temporary R.O.W. for detour bridge — C	Widening road width require the R.O.W. acquisition + temporary R.O.W. for detour bridge — C	Widening road width require the R.O.W. acquisition + temporary R.O.W. for detour bridge — C
Rating	B	B	A High possible improvement scheme	B

Appendix 14.2.1-1 (5/5)

PRELIMINARY SCREENING OF POSSIBLE SCHEMES FOR AYALA BRIDGE

Improvement Type	New Bridge Construction			Others					
	N9			O1			O2		
Scheme Name	Simple Through Type Truss Bridge (2-Spans)			Relocation of Existing Bridge + New Bridge Consruction			Converting Existing Bridge to Pedestrian/Light Vehicles Exclusive Use + New Bridge Construction		
				 New Bridge; Existing Bridge (to be transfered)					
Description	· The existing pier can be utilized by improvement of it as well as Scheme N7. · The access to the hospicio is relatively gentle because the elevation of the bridge deck surface is to be minimized as well as Scheme N7. · To install temporary bents or utilize barges as temporary work. · Scenery and aesthetic aspect are similar to the existing bridge.			· To transfer the existing bridge to some adequate place in order to preserve it as a historical structure or monument. · A new bridge is to be selected among the schemes of new bridge construction.			· To construct a new bridge, utilizing the existing bridge as the pedestrian and light vehicle bridge. · A new bridge is to be selected among the schemes of new bridge construction.		
(1) Structural Aspects	Expected Load Carrying Capacity	32 Ton	A	Expected Load Carrying Capacity	32 Ton	A	Expected Load Carrying Capacity	32 Ton	A
	Expected Durability	50 yrs	A	Expected Durability	50 yrs	A	Expected Durability	50 yrs	A
(2) Construction Difficulty	After 4-Lane detour construction relatively easy to construct		A	Relocation will be difficult		C	Easiest among the schemes		A
(3) Economical Aspects	Relatively expensive	2,121 1.36	B	Significantly expensive because of relocation	3,600 2.31	D	Relatively expensive	3,300 2.12	D
(4) Geometrical a. No. of Lanes	Lane width is desirable	6 Lanes	A	Lane width is desirable	6 Lanes	A	Lane width is desirable	6 Lanes	A
b. Gradient	Will satisfy AASHTO requirements		A	Will satisfy AASHTO requirements		A	Will satisfy AASHTO requirements		A
c. Horizontal Alignment	Easy to improve existing alignment		A	Easy to improve existing alignment		A	Easy to improve existing alignment		A
d. Access to Hospicio	Depend on girder height		B	Depend on girder height		B	Depend on girder height		A
e. Nav. clearance	Easy to satisfy navigational limit		A	Easy to satisfy navigational limit		A	Existing bridge does not satisfy the regulatory clearance limits		D
(5) Traffic Treatment	Easy because 4-Lane detour will be provided		A	Easy because 4-Lane detour will be provided		A	Very easy to control traffic because the existing bridge will remain		A
(6) Social Environment a. Historical Aspects	Similar appearance to the existing one		B	The existing bridge will be preserve		A	Existing bridge will remain		A
b. Scenery/ Aesthetics	Good		B	Good		B	Good		B
c. Row Acquisition Difficulty	Widening road width require the R.O.W. acquisition + temporary R.O.W. for detour bridge		C	Widening road width require the R.O.W. acquisition + temporary R.O.W. for detour bridge		C	Widening road width require the R.O.W. acquisition + temporary R.O.W. for detour bridge		D
Rating	A High possible improvement scheme			D			D		

Notes:
A = Most preferable
B = Preferable
C = Applicable
D = Not applicable

CHAPTER 15

PRELIMINARY DESIGN AND COST ESTIMATE

Basic Labor Cost

CATEGORY	COST INDEX	TOTAL RATE PER MONTH	RATE / (P/HR)
Foreman	2.14	17,715.48	84.90
Assistant Foreman/Rigger	1.98	16,345.15	78.33
Skilled Laborer	1.74	10,572.55	50.67
Diver	1.74	10,572.55	50.67
Laborer	1.00	8,338.14	39.96
Special Welder	1.00	17,715.48	84.90
Heavy Equipment Operator	1.90	13,234.19	63.42
Supervisor	1.65	13,284.79	63.67
Surveyor	1.45	9,724.42	46.60
Foreign Specialist (Pile)	1.00	380,000.00	1821.09
Foreign Specialist (Steel)	1.00	760,000.00	3642.17
Foreign Specialist (Asphalt)	1.00	380,000.00	18210.09

Basic Row Materials Cost (PP)

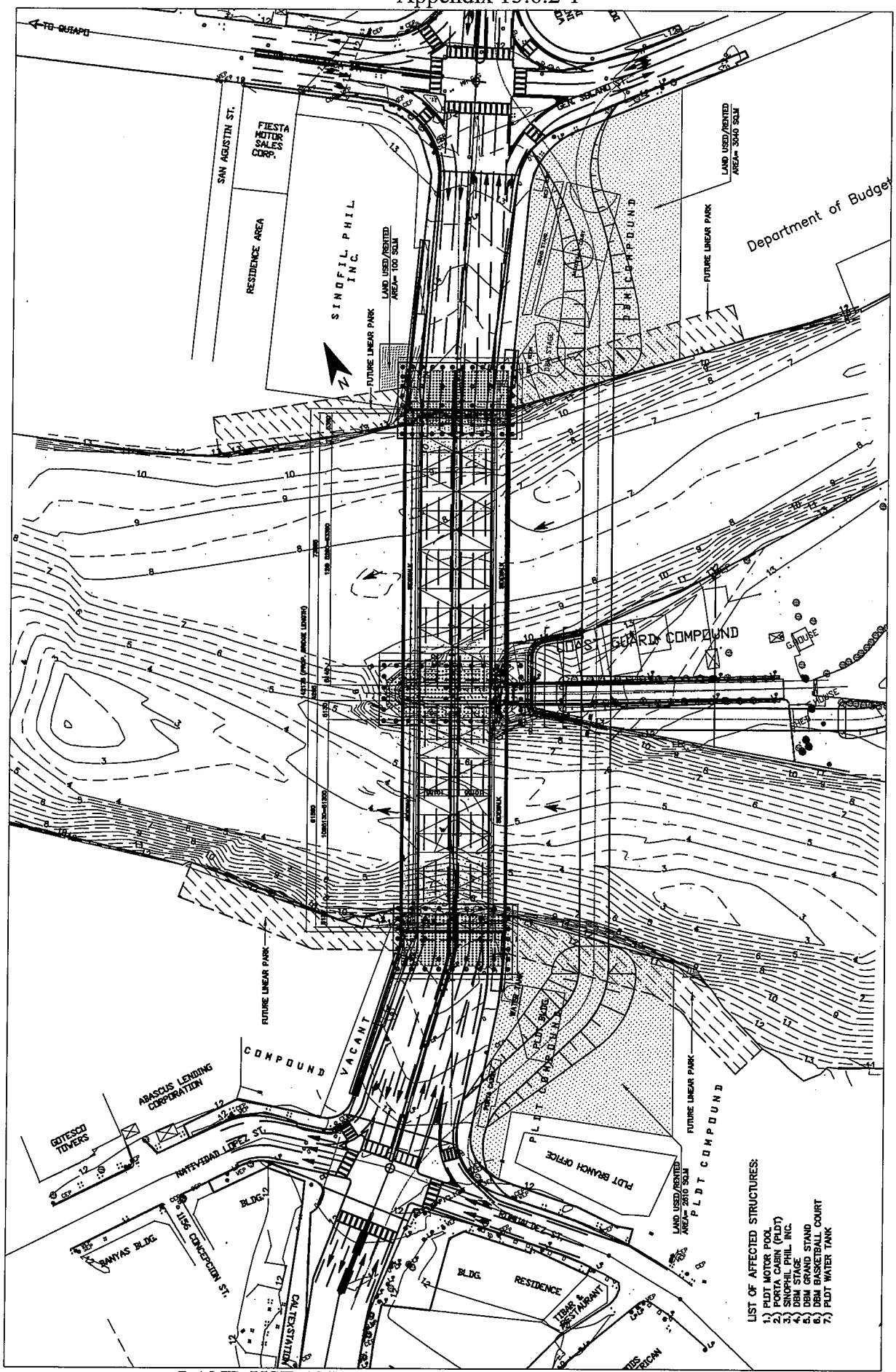
REF. No.	MATERIALS	UNIT	COMPONENTS			COST (P/unit)
			FOREIGN	LOCAL	TAXES	
MA1010	Reinforcing Steel, Grade 40	kg	10.26	6.65	2.09	19.00
MA4010	Tie Rod, 36 mmϕ × 2000mm	kg	16.15	0.76	2.09	19.00
MB3010	Fabricated Steel Girders	kg	156.40	7.36	20.24	184.00
MB3112	Structural Steel, H-200 (Used)	kg	15.30	0.72	1.98	18.00
MB3130	H-300 × 300 × 10 × 15	kg	30.60	1.44	3.96	36.00
MB3135	H-300 × 300 × 10 × 15 (Used)	kg	15.30	0.72	1.98	18.00
MB3145	H-400 × 400 × 13 × 21 (Used)	kg	15.30	0.72	1.98	18.00
MB3150	H-588 × 300 × 12 × 20 (Used)	kg	15.30	0.72	1.98	18.00
MB3155	H-1100 × 400 × 18 × 28 (Used)	kg	15.30	0.72	1.98	18.00
MB3160	[- 150 × 75 × 6.5 × 10 (Used)	kg	15.30	0.72	1.98	18.00
MB3215	[- 300 × 90 × 12 × 16 (Used)	kg	15.30	0.72	1.98	18.00
MB3225	[- 380 × 100 × 13 × 20 (Used)	kg	15.30	0.72	1.98	18.00
MB3305	L- 150 × 150 (Used)	kg	15.30	0.72	1.98	18.00
MB3315	L- 100 × 100 × 10 (Used)	kg	15.30	0.72	1.98	18.00
MB3520	Binding Wire	kg	234.04	11.01	30.29	275.34
MB3610	Metro Deck 250kg/sq.m.) (Used)	kg	12.54	0.59	1.62	14.74
MB3622	Steel Railing	l.m.	9,384.00	441.60	1,214.40	11,040.00
MB3650	Hanger and Bracket	pc	211.06	9.93	27.31	248.30
MC5030	Tubular Steel Piles, 1000mmϕ × 25mm	kg	34.00	1.60	4.40	40.00
MC6020	Sheet Pile, Type V	kg	32.30	1.52	4.18	38.00
MC6022	Steel Sheet Piles, Type FSP III (rental)	kg	17.00	0.80	2.20	20.00
MC6030	Steel Sheet Piles, Type FSP VL (rental)	kg	17.00	0.80	2.20	20.00
MD2020	Marine Plywood ½" × 4' × 8'	pc	-	623.70	69.30	693.00
MD3010	Lumber (tanguile or equal)	bd ft.	-	10.80	1.20	12.00
MD3030	Floor Planks (Apitong)	bd ft.	-	29.70	3.30	33.00
MD4010	Form Lumber	bd ft.	-	21.60	2.40	24.00
MD9020	Form Oil (used)	lit.	3.84	22.40	5.76	32.00
MG1010	Portland Cement, 40 kg	bag	44.00	49.50	16.50	110.00
MK5010	Tire Fender	pc	4,700.00	4,400.00	900.00	10,000.00
ML1050	PVC Pipe, 150 mmØ	m	57.94	235.15	47.71	340.80
ML2020	Stainless Steel Pipe, 150mmØ	m	621.00	153.00	126.00	900.00
ML4035	Floating Fender	l.m	33,280.00	3,640.00	15,080.00	52,000.00
ML4040	Navigator Detector	set	2,355,200.00	257,600.00	1,067,200.00	3,680,000.00
ML5310	Reflective Pavement Paint	gal.	133.45	541.65	109.90	785.00
ML6010	Bitt, 200 mm dia	Pc	1,020.00	4,140.00	840.00	6,000.00
MM3140	Steel Form Shuttering (Normal)	Sq.m.	1,446.40	158.20	655.40	2,260.00
MS4010	Oxygen (Content Only)	Cyl	59.40	346.50	89.10	495.00
MS4020	Acetylene (Contents Only)	Cyl	105.00	612.50	157.50	875.00

Basic Processed Materials Cost (PP)

REF. No.	MATERIALS	UNIT	COMPONENTS			COST (P/unit)
			FOREIGN	LOCAL	TAXES	
UD#338	Welding Pile on Site	Ea	4,959.52	3,599.72	1,525.34	10,084.58
UM#420	Blending Soil for Subbase and Base Course	cu.m.	56.51	113.02	32.29	201.82
UM#425	Aggregate for Subbase Material	cu.m.	57.13	127.27	30.00	214.41
UM#430	Aggregate for Base Coarse	cu.m.	161.27	163.68	55.00	379.96
UM#530	Boulders	cu.m.	117.60	235.20	67.20	420.00
UM#810	Mortar Cement, 1:3	cu.m.	958.14	1,127.15	371.01	2,456.30
UM#815	Mortar Cement, 1:2	cu.m.	1,101.65	1,299.38	423.71	2,824.75
UM#820	Concrete Class "A" , 24 MPa	cu.m.	1,081.24	1,111.75	394.66	2,587.64
UM#830	Concrete Class "A", 24 MPa (Underwater)	cu.m.	2,387.29	2,577.95	883.73	5,848.97
UM#865	Lean Concrete, 15 MPa	cu.m.	675.55	730.52	255.30	1,661.36
UM#911	Formworks	sq.m	11.07	57.65	11.47	80.19
UM#930	Formworks for Footing	sq.m	342.43	178.64	156.67	677.75
UT#140	Fitting Works for De tour Bridge	l.s	334,324.32	372,673.86	96,587.87	803.586.05

Major Equipment Hourly Operating Cost

REF. No.	TYPE OF EQUIPMENT	OPERATING COST IN P/HR COMPONENTS			TOTAL
		FOREIGN	LOCAL	TAXES	
EA1010	Bulldozer Crawler, D5 PS/DD. 105 Hp	709.28	251.68	183.04	1,144.00
EB1025	Backhoe w/ Hydraulic Breaker	502.94	178.46	129.79	811.20
EB1060	Hydraulic Backhoe, 1.32 cu m, 207 Hp	1,834.58	650.98	473.44	2,959.00
EB3010	Wheel Loader, 1.53 cu m, 545B	549.94	195.14	141.92	887.00
EB5010	Clamshell Bucket	587.93	146.98	126.69	864.60
EC1030	Cargo Truck, 6t – 8t	482.12	120.53	106.35	709.00
EC2010	Dump Truck, 8 ton, 220 Hp, 244 PS	548.76	137.19	121.05	807.00
EC5020	Water Truck, 3001 – 5000 gals	1,033.60	258.40	228.00	1,520.00
EC6010	Truck Trailer	2,720.00	680.00	600.00	4,000.00
ED1010	Crawler Crane, 25 t	855.44	213.86	188.70	1,258.00
ED1020	Crawler Crane, 35 t	942.48	235.62	207.90	1,386.00
ED2030	Truck Crane, 16 t, 180 Hp	637.84	159.46	140.70	938.00
ED3030	Portal Crane	4,926.54	1,231.64	1,086.74	7,244.92
EH2020	Concrete Pump Car, 100 cu.m/hr	2,196.77	779.50	566.91	3,543.18
EH4010	Concrete Vibrator	57.20	13.20	17.60	88.00
EH5010	Paint Stripping Machine	50.05	11.55	15.40	77.00
EH6010	Bar Shear/Cutter, 40 mm. dia.	68.80	15.88	21.17	105.84
EH6020	Bar Bender, 40 mm. dia.	44.77	10.33	13.78	68.88
EH7010	Tremie Pipe	189.28	43.68	58.24	291.20
EH7020	Concrete Bucket, 1.5 cu.m.	273.00	63.00	84.00	420.00
EJ1010	Concrete Batch Plant w/ silo, 30 cu m/hr	977.16	244.29	215.55	1,437.00
EK1030	Air Compressor, 356 – 450 cmf	527.15	121.65	162.20	811.00
EL1030	Submersible Pump, 200 mm dia × 25 m	67.39	15.55	20.73	103.67
EM1060	Generator Set, 100 kva	195.90	45.21	60.28	301.38
EM1090	Generator Set, 200 kva	398.31	91.92	122.56	612.79
EM1510	Oxygen/Acetylene Welding Outfit	51.35	11.85	15.80	79.00
EM2020	Electric Welding Machine, 500 A	230.75	53.25	71.00	355.00
EM2110	Welding Machine with Engine, 300A, DC	219.05	50.55	67.40	337.00
EN1010	Flat Barge, 300 t	489.98	113.07	150.76	753.81
EN1020	Flat Barge, 500 t	293.15	67.65	90.20	451.00
EN1030	Flat with Winch, 800 t	899.48	207.57	276.76	1,383.81
EN1040	Hopper Barge	608.40	140.40	187.20	936.00
EN1050	Crane Barge	3,494.00	2,271.10	524.10	698.80
EN2010	Tug Boat, 500 HP	1,224.60	282.60	376.80	1,884.00
EN7010	Modular Float	6,324.50	1,459.50	1,946.00	9,730.00
ED5010	Rock Drill	220.87	50.97	67.96	339.80
ED6010	Jack Hammer/Pneumatic Breaker	76.05	17.55	23.40	117.00
EE1010	Vibrating Pile Hammer, 60 kw	887.56	190.19	190.19	1,267.94
EE1020	Electric Vibro Hammer, VM2 – 4000E, 60 KW	395.50	84.75	84.75	565.00
EE2030	Diesel Hammer, D80 – 23	5,092.50	1,091.25	1,091.25	7,275.00
EG1010	Motor Grader, 130 hp, FG75A	894.04	317.24	230.72	1,442.00
EG2020	Vibratory Drum Roller, 6.5 t, CA15, 73 Hp	876.68	311.08	226.24	1,414.00
EG2110	Vibratory Plate Compactor, 12 Hp	127.72	45.32	32.96	206.00
EG4020	Pneumatic Roller, 20 t	556.32	197.40	143.57	897.29
EG5010	Concrete Paver/ Finisher	810.96	287.76	209.28	1,308.00



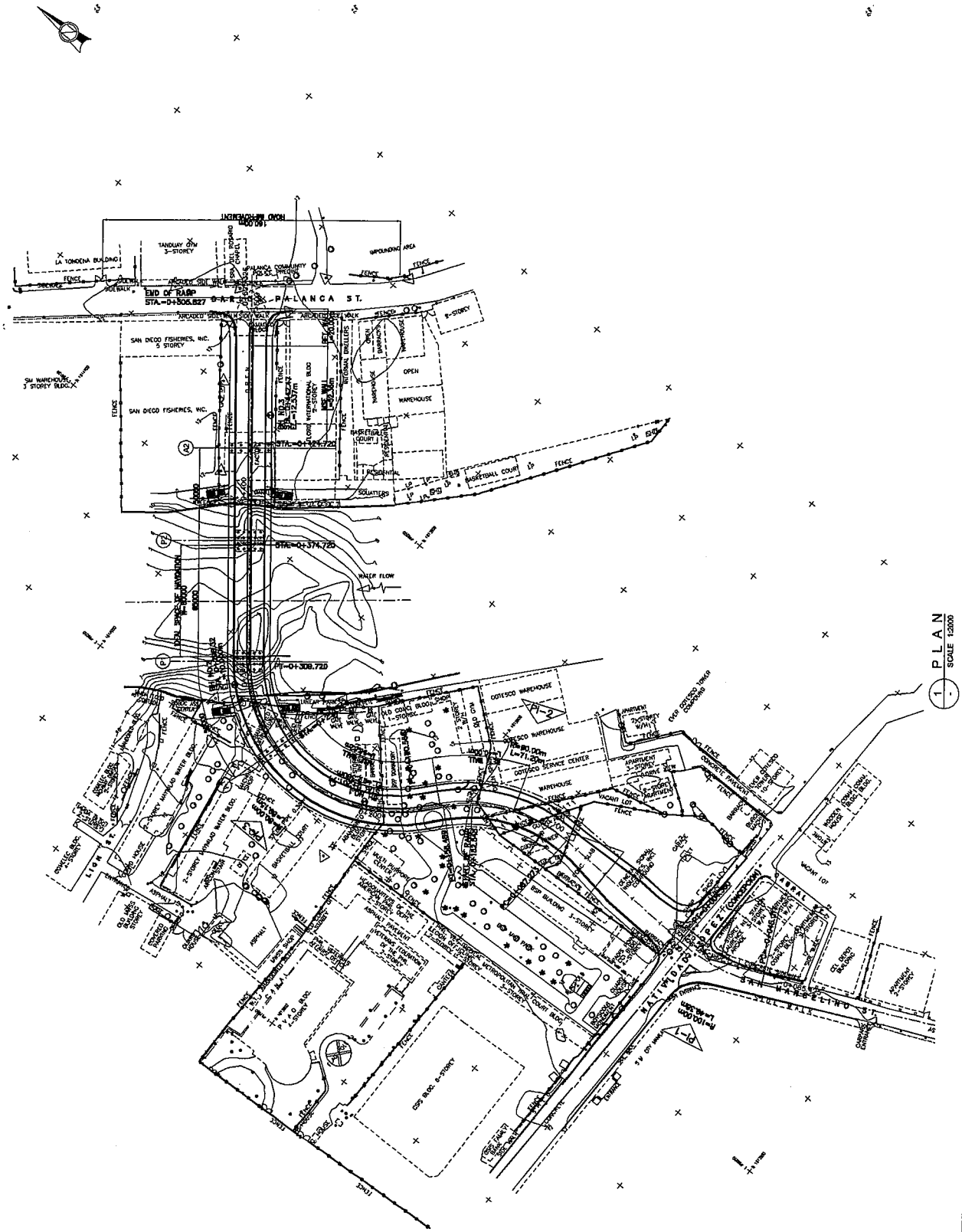
LAND USE AND LIST OF AFFECTED STRUCTURES

PART IV

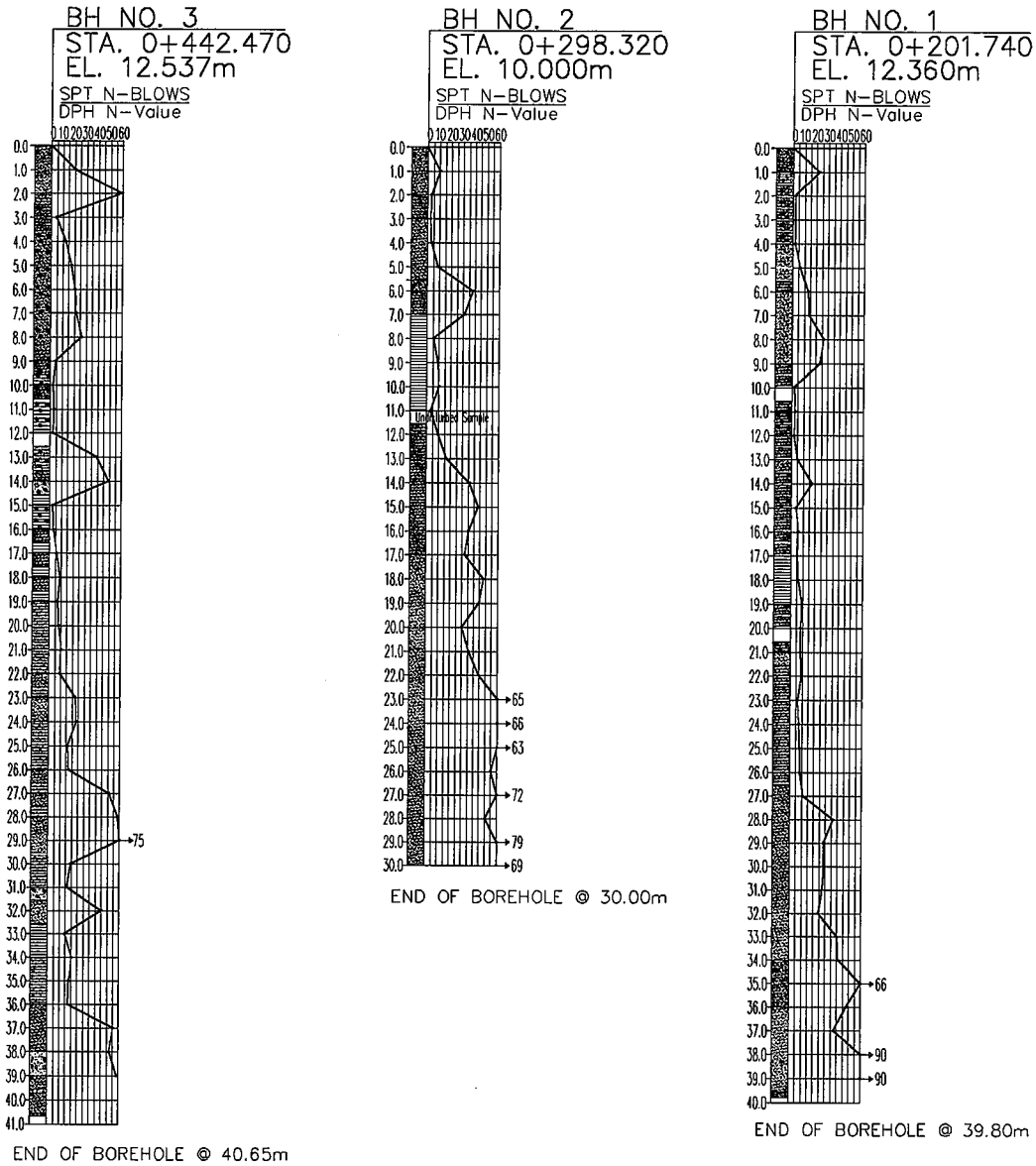
FEASIBILITY STUDY ON SELECTED BRIDGES

CHAPTER 19

FEASIBILITY STUDY OF THE SECOND AYALA BRIDGE CONSTRUCTION PLAN



TOPOGRAPHIC SURVEY OF SECOND AYALA BRIDGE


BH NO. 3
STA. 0+442.470
EL. 12.537m
SPT N-BLOWS
DPH N-Value
0 10 20 30 40 50 60
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0 30.0 31.0 32.0 33.0 34.0 35.0 36.0 37.0 38.0 39.0 40.0 41.0
75
END OF BOREHOLE @ 40.65m
BH NO. 2
STA. 0+298.320
EL. 10.000m
SPT N-BLOWS
DPH N-Value
0 10 20 30 40 50 60
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0 30.0
Undisturbed Sample
65
66
63
72
79
69
END OF BOREHOLE @ 30.00m
BH NO. 1
STA. 0+201.740
EL. 12.360m
SPT N-BLOWS
DPH N-Value
0 10 20 30 40 50 60
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0 30.0 31.0 32.0 33.0 34.0 35.0 36.0 37.0 38.0 39.0 40.0
66
90
90
END OF BOREHOLE @ 39.80m

Breakdown of Costs of Second Ayala Bridge

Description		Unit	Quantity	Unit Cost	Cost	Components		
						Foreign	Local	Taxes
Mobilization/Demobilization								
	Mobilization/Demobilization	l.s.	1.00	6,030,400.00	6,030,400.00	4,522,800.00	904,560.00	603,040.00
Substructure								
400(16)	Bored Pile 1500 mm diameter	l.m.	2,109.00	30,000.00	63,270,000.00	41,125,500.00	13,286,700.00	8,857,800.00
103	Structure Excavation	cu.m.	3,637.00	400.00	1,454,800.00	945,620.00	305,508.00	203,672.00
404	Reinforcing Steel Bars	kgs	468,394.00	50.00	23,419,700.00	15,222,805.00	4,918,137.00	3,278,758.00
405(1)	Structural Concrete	cu.m.	3,227.00	6,000.00	19,362,000.00	12,585,300.00	4,066,020.00	2,710,680.00
405(6)	Lean Concrete	cu.m.	86.00	3,800.00	326,800.00	212,420.00	68,628.00	45,752.00
SPL 415	Formworks	sq.m.	2,158.00	810.00	1,747,980.00	1,136,187.00	367,075.80	244,717.20
Superstructure								
	Box Girder	per sq.m.	4,455.00	65,000.00	289,575,000.00	188,223,750.00	60,810,750.00	40,540,500.00
	(Asphalting Works included)							
Approach								
101(3)	Removal of PCCP	sq.m.	2,560.00	150.00	384,000.00	249,600.00	80,640.00	53,760.00
103	Structure Excavation	cu.m.	7,711.00	400.00	3,084,400.00	2,004,860.00	647,724.00	431,816.00
104(1)	Embankment from Roadway	cu.m.	1,281.00	200.00	256,200.00	166,530.00	53,802.00	35,868.00
200	Subbase Course	cu.m.	2,411.00	730.00	1,760,030.00	1,144,019.50	369,606.30	246,404.20
301(1)	Tack Coat	ton	6.00	25,000.00	150,000.00	114,000.00	15,000.00	21,000.00
310	Asphalt	ton	1,329.00	3,100.00	4,119,900.00	3,131,124.00	411,990.00	576,786.00
311(1)	PCCP 250 mm	sq.m.	5,669.00	870.00	4,932,030.00	3,205,819.50	1,035,726.30	690,484.20
104(2)	Selected Fill for MSE Wall	cu.m.	13,530.00	660.00	8,929,800.00	5,804,370.00	1,875,258.00	1,250,172.00
405(1)A	Structural Concrete (21 Mpa)	cu.m.	809.00	4,500.00	3,640,500.00	2,366,325.00	764,505.00	509,670.00
405(6)	Lean Concrete	cu.m.	72.20	3,800.00	274,360.00	178,334.00	57,615.60	38,410.40
404	Reinforcing Steel Bars	kgs	49,848.00	50.00	2,492,400.00	1,620,060.00	523,404.00	348,936.00
SPL 414	Mechanically Stabilized Earthwall	sq.m.	991.00	15,000.00	14,865,000.00	9,662,250.00	3,121,650.00	2,081,100.00
Miscellaneous								
600(1)	Combination of Curb and Gutter	l.m.	1,001.00	1,000.00	1,001,000.00	650,650.00	210,210.00	140,140.00
401(1)	Parapet	l.m.	681.00	3,253.00	2,215,293.00	1,439,940.45	465,211.53	310,141.02
SPL	Traffic Fence	l.m.	681.00	9,500.00	6,469,500.00	4,205,175.00	1,358,595.00	905,730.00
SPL	Barrier Fence	l.m.	681.00	5,760.00	3,922,560.00	2,549,664.00	823,737.60	549,158.40
601	Sidewalk	sq.m.	2,042.00	810.00	1,654,020.00	1,075,113.00	347,344.20	231,562.80
Testing								
SPL 419	Pile Dynamic Test	each	4.00	35,365.00	141,460.00	91,949.00	29,706.60	19,804.40
SPL 420	Pile Integrity Test	each	20.00	252,054.00	5,041,080.00	3,276,702.00	1,058,626.80	705,751.20

Breakdown of Costs of Second Ayala Bridge

Description		Unit	Quantity	Unit Cost	Cost	Components		
						Foreign	Local	Taxes
Others								
	Temporary Cofferdam for Pier Construction	sq.m.	972.00	29,638.84	28,808,953.55	18,725,819.81	6,049,880.25	4,033,253.50
	Craneway	m	154.00	148,097.00	22,806,938.00	14,824,509.70	4,789,456.98	3,192,971.32
	Access Road	m	100.00	13,120.00	1,312,000.00	852,800.00	275,520.00	183,680.00
	Traveller Equipment Wagon	l.s.	1.00	50,000,000.00	50,000,000.00	34,000,000.00	9,000,000.00	7,000,000.00
	Right of Way Fence	m	790.00	1,200.00	948,000.00	616,200.00	199,080.00	132,720.00
	Drainage	km	0.50	8,463,158.12	4,231,579.06	2,750,526.39	888,631.60	592,421.07
	Miscellaneous	km	0.20	23,577,058.02	4,715,411.60	3,065,017.54	990,236.44	660,157.62
	Traffic Signalization	l.s.	1.00	3,000,000.00	3,000,000.00	1,950,000.00	630,000.00	420,000.00
	Stairway	each	4.00	2,500,000.00	10,000,000.00	6,500,000.00	2,100,000.00	1,400,000.00
	Landscapping	l.s.	1.00	10,000,000.00	10,000,000.00	6,500,000.00	2,100,000.00	1,400,000.00
	Streetlighting	km	0.50	5,454,500.65	2,727,250.32	1,772,712.71	572,722.57	381,815.05
Slope Protection								
	Structure Excavation	cu.m.	2,362.00	400.00	944,800.00	614,120.00	198,408.00	132,272.00
	Boulders	cu.m.	2,370.00	1,114.90	2,642,301.84	1,717,496.19	554,883.39	369,922.26
	Pre-cast Panel	sq.m.	497.00	2,873.41	1,428,084.27	928,254.78	299,897.70	199,931.80
Contingencies								
	Contingencies	l.s.	1.00	22,202,245.00	22,202,245.00	16,651,683.75	3,330,336.75	2,220,224.50
Facilities								
	Temporary Facilities	l.s.	1.00	11,318,660.54	11,318,660.54	7,357,129.35	2,376,918.71	1,584,612.48
				TOTAL	**647,606,437.18**	425,737,137.67	132,333,704.11	89,535,595.41
				% Component	**100%**	**66%**	**20%**	**14%**

Appendix 19.5.2-1
NHI POSITION ON THE CONTRUCTION OF A NEW BRIDGE

NATIONAL HISTORICAL INSTITUTE
Historic Preservation Division

For	:	**JICA**
Subject	:	NHI Position on the Construction of A New Bridge (Bridge Supplemental to the Ayala Bridge) across the Pasig River and the restructuring of the Quezon and Jones Bridges
Date	:	December 22, 2003

The NHI has studied the different schemes presented for the (a) New Bridge Supplemental to Ayala Bridge, which JICA names as Second Ayala Bridge, (b) Jones Bridge and (c) Quezon Bridge. We would like to make the following positions regarding the schemes presented to us.

A. **On the Construction of a New Bridge supplemental to Ayala Bridge**
   1. The NHI recommends Scheme B (S-Curve Scheme). Scheme B attempts to avoid affecting as many structures and sites as possible along its alignment.

B. **On the Restructuring of Jones Bridge and Quezon Bridge**
   1. The NHI interposes no objection to Scheme 3 for Jones Bridge and Scheme 2 for Quezon Bridge.
   2. The NHI stresses the retention of the basic configuration of both historic bridges to preserve their historical authenticity. Only structural repair/rehabilitation should be considered, which is typical in principle to our position regarding Ayala Bridge.

It is recommended that all three bridge projects be properly documented – before, during and after construction/restoration – and published. Documentation shall include the project study, history of the structure, feasibility, studies/designs/schemes, photographs, architectural/structural interventions and reports. The new bridge supplemental to Ayala Bridge may follow the design of the historic structure or it may follow a new avant garde design based on or stylistically reflective of the old historic Ayala Bridge.

The NHI reiterates its position that total replacement of the three bridge structures would be against conservation principles. Restructuring of the historic bridges, which would also involve cleaning, painting, replacement of parts and possible provision of additional structural supports, would be more consistent with the accepted standards of conservation. Restructuring and/or provision of a supplemental bridge/s to these historic bridges would be more acceptable than their total demolition and replacement.

Prepared by:

REYNALDO A. INOVERO
Chief, Historic Preservation Division

Noted by:

LUDOVICO D. BADOY
Executive Director